前　言

Preface

H1U/2U 系列通用 PLC 是深圳市汇川控制技术有限公司研发的高性价比控制产品，指令丰富，高速信号处理能力强，运算速度快，允许的用户程序容量可达 24K 步，且不需外扩存储设备。

The H1U/H2U series PLC is a cost effective control product developed by Shenzhen Inovance Control Technology Co., Ltd. It is designed with abundant instructions, powerful hi-speed signal processing capacity and rapid user program execution capacity. Its allowable user program capacity reaches up to 24K steps.

控制器配备了两个通讯硬件端口，方便现场接线；通讯端口支持多种通讯协议，包括 MODBUS 主站、从站协议，尤其方便了与变频器等设备的联机控制；提供了严密的用户程序保密功能，子程序单独加密功能，方便用户特有控制工艺的知识产权保护。

The controller has two communication ports that support multiple communication protocols, such as the MODBUS master/slave protocol, convenient for connecting with inverters. The encryption function for user programs and sub-programs helps to protect e intellectual property right of users' particular control process.

控制器提供了多种编程语言，用户可选用梯形图、指令表、步进梯形图、SFC 顺序功能图等编程方法。指令系统为广大工程技术人员所熟悉，而本公司提供的 AutoShop 编程环境，更是融合了众多 PLC 编程环境的优点，丰富的在线帮助信息，使得编程时无需查找说明资料，方便易用。

The controller provides multiple programming languages, including ladder diagram, instruction list, stepping ladder diagram and SFC. The AutoShop provided by Inovance integrates most PLC programming advantages and the rich Online Help information makes it easy to use.

对高速输出信号的处理部分，H1U 系列标配 3 路高速输出，H2U 系列部分 MT 型号为具有三路高速输出功能，MTQ 版本则提供了六路高速脉冲输入、五路高速脉冲输出功能，处理能力增强。

As for hi-speed signal outputs, the H1U Series come with 3-channel hi-speed outputs. Some H2U Series in MT version come with 3-channel hi-speed outputs. The H2U Series in MTR version come with 6-channel hi-speed pulse inputs and 5-channel hi-speed pulse outputs.

我们热忱欢迎读者以多种形式咨询和交流使用方法，反馈手册中的错误和遗漏。

We welcome your feedbacks on any possible errors and omissions in the user manual.
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目　录
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手册版本信息
User Manual Version

版本 Version	发布时间 Issue Date	修订说明 Revision Description
V0.8	2009-03-18	首次发布 First Release.
V0.88	2009-04-18	修订系统变量说明 Revised system variable description. 增加 PLC 原理和基本知识介绍 Added introduction to the PLC principles and basic knowledge. 增加 MTQ 版本的使用说明 Added instruction manual for MTQ Version.
V1.00	2009-10-09	增加 IST 指令说明 Added IST command description. 修订附录 5.5 节扩展卡的编程说明 Revised the programming manual of expansion card in Appendix 5.5. 增加附录 5.8 节的高速处理增强功能说明 Added Appendix 5.8, high-speed processing enhancing instruction. 增加附录 5.9 程序流程控制指令的相互关系 Added Appendix 5.9, the relationship description between control commands in the processing flow. 增加附录 5.10 部分特殊继电器和寄存器功能说明 Added Appendix 5.10, function descriptions for special relays and registers.

V1.01	2010-5-28	修订发现的错别字 Corrected typos. 对个别指令加入更详细的描述 Provided further command descriptions in detail. 增加对 H1U 的描述 Added H1U description. 增加附录 5.11 节扩展模块的详细使用 Added Appendix 5.11, expansion module instruction manual. 增加附录 5.12 H1U/2U 系列 PLC 通信说明 Added Appendix 5.12, PLC Communication descriptions for H1U/2U Series. 增加附录 5.13 CAN 通信说明 Added Appendix 5.13, CAN Communication descriptions. 增加附录 5.14 PLC 无线远程监控功能说明 Added Appendix 5.14, PLC wireless remote monitoring instruction manual.

指令详解索引 简单逻辑指令

Command Index Simple Logic Commands

FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page No.
	LD	加载常开接点 Load Open Contacts	✔	✔	65
	LDI	加载常闭接点 Load Closed Contacts	✔	✔	65
	LDP	取脉冲上升沿 Select Pulse Rising Trigger	✔	✔	65
	LDF	取脉冲下降沿 Select Pulse Falling Trigger	✔	✔	65
	AND	串联常开接点 Connect Open Contacts in Series	✔	✔	65
	ANI	串联常闭接点 Connect Closed Contacts in Series	✔	✔	65
	ANB	串联回路方块 Connect Circuit Block in Series	✔	✔	66
	ANDP	与脉冲上升沿检测串行连接 AND Connect to detected pulse	✔	✔	65

	rising trigger in series			
ANDF	与脉冲下降沿检测串行连接 AND Connect to detected pulse falling trigger in series	✔	✔	65
OR	并联常开接点 Connect Open Contacts in Parallel	✔	✔	66
ORI	并联常闭接点 Connect Closed Contacts in Parallel	✔	✔	66
ORB	并联回路方块 Connect Circuit Block in Parallel	✔	✔	66
ORP	或脉冲上升沿检测并行连接 OR Connect to detected pulse rising trigger in parallel	✔	✔	66
ORF	或脉冲(F)下降沿检测并行连接 OR Connect to detected pulse falling trigger in parallel	✔	✔	66
OUT	驱动线圈 Startup Coil	✔	✔	67
SET	置位动作保存线圈 Setting Coil and Save	✔	✔	67
RST	接点或缓存器清除 Contacts or Buffer Clear	✔	✔	68
PLS	脉冲上升沿检测线圈 Pulse rising trigger detecting coil.	✔	✔	68
PLF	脉冲下降沿检测线圈 Pulse falling trigger detecting coil.	✔	✔	68
MC	主控公用串行接点用线圈指令 Master Control Common Serial Contacts Coil Command	✔	✔	68
MCR	主控复位公用串行接点解除指令 Master Control Reset Common Serial Contacts Relief Command	✔	✔	68
MPS	存入堆栈 Save into Stack	✔	✔	67
MRD	读出堆栈 Read from Stack	✔	✔	67
MPP	读出堆栈 Read from Stack	✔	✔	67
NOP	无动作	✔	✔	69

	No Action			
INV	运算结果取反 Inverse Operation Result	✔	✔	69
END	程序结束 Program Termination	✔	✔	69
P	指针 Indicator	✔	✔	69
I	中断插入指针 Indicator Interruption Insertion	✔	✔	70

应用指令（以 FNC NO 为序）

Application Commands (Order by FNC NO.)

分类 Class.	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	 H2U	页码 Page
程序流程 Program Flow	00	CJ	条件跳转 Conditional jump	✔	✔	71
	01	CALL	子程序调用 Subroutine call	✔	✔	72
	02	SRET	子程序返回 Sub-program Reset	✔	✔	72
	03	IRET	中断返回 Interrupt Reset	✔	✔	74
	04	EI	中断许可 Interrupt Permit	✔	✔	74
	05	DI	中断禁止 Interrupt inhibit	✔	✔	74
	06	FEND	主程序结束 Master Program Termination	✔	✔	78
	07	WDT	监控定时器 Monitor Timer	✔	✔	79
	08	FOR	循环范围开始 Begin the Cycle Range	✔	✔	81
	09	NEXT	循环范围终了 Cycle Range Finish	✔	✔	80
传送与比较 Transmit and Compare	10	CMP	比较 Compare	✔	✔	82
	11	ZCP	区域比较 Regional comparison	✔	✔	83
	12	MOV	传送	✔	✔	84

			Transmit			
	13	SMOV	移位传送 Shift Transmit	—	✔	85
	14	CML	倒转传送 Reverse Transmit	—	✔	86
	15	BMOV	一并传送 Both Transmit	✔	✔	89
	16	FMOV	多点传送 Multiple Point Transmission	—	✔	90
	17	XCH	交换 Exchange	—	✔	91
	18	BCD	BCD 转换 BCD Transform	✔	✔	92
	19	BIN	BIN 转换 BIN conversion	✔	✔	93
四则逻辑运算 Four Logical Operation	20	ADD	BIN 加法 BIN Addition	✔	✔	94
	21	SUB	BIN 减法 BIN Subtraction	✔	✔	95
	22	MUL	BIN 乘法 BIN Multiplication	✔	✔	96
	23	DIV	BIN 除法 BIN Division	✔	✔	97
	24	INC	BIN 加 I BIN plus 1	✔	✔	99
	25	DEC	BIN 减 I BIN minus 1	✔	✔	100
	26	WAND	逻辑字与 Logical Character AND	✔	✔	101
	27	WOR	逻辑字或 Logical Character OR	✔	✔	101
	28	WXOR	逻辑字异或 Logical Character XOR	✔	✔	101
	29	NEG	求补码 Complemental Code	—	✔	103

分类 Class.	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models		页码 Page
				H1U	H2U	
循环移位 Cyclical	30	ROR	循环右移 Cycle Right Shift	—	✔	105
	31	ROL	循环左移	—	✔	105

Shift			Cycle Left Shift			
	32	RCR	带进位循环右移 Carry Cycle Right Shift	—	✔	106
	33	RCL	带进位循环左移 Carry Cycle Left Shift	—	✔	106
	34	SFTR	位右移 Right shift	✔	✔	107
	35	SFTL	位左移 Left shift	—	✔	107
	36	WSFR	字右移 Shift right by word	—	✔	109
	37	WSFL	字左移 Character Left Shift	✔	✔	109
	38	SFWR	移位写入 Shift Input	✔	✔	111
	39	SFRD	移位读出 Shift Output	✔	✔	112
数据处理 Data processing	40	ZRST	批次复位 Batch Reset	✔	✔	113
	41	DECO	译码 Decode	✔	✔	114
	42	ENCO	编码 Encode	✔	✔	115
	43	SUM	ON 位数 ON Median	—	✔	116
	44	BON	ON 位数判定 ON Median Determination	—	✔	117
	45	MEAN	平均值 Average	—	✔	118
	46	ANS	信号报警置位 Signal Alarm Set	—	✔	119
	47	ANR	信号报警器复位 Signal alarm reset	—	✔	120
	48	SQR	BIN 开方 BIN Square Root	—	✔	121
	49	FLT	整数→浮点数转换 Integer floating point conversion	—	✔	122
高速处理 High-speed processing	50	REF	输入输出刷新 Input/output refresh Input/output refresh	✔	✔	124
	51	REFF	滤波器调整 Filter Adjust	—	✔	126
	52	MTR	矩阵输入 Matrix input	✔	✔	127

	53	HSCS	比较置位（高速计数器） Comparative Set (High-speed counter)	✔	✔	129
	54	HSCR	比较复位（高速计数器） Comparative Reset (High-speed counter)	✔	✔	132
	55	HSZ	比较区间（高速计数器） Comparative Interval (High-speed counter)	—	✔	133
	56	SPD	脉冲密度 Pulse density	✔	✔	138
	57	PLSY	脉冲输出 Pulse output	✔	✔	141
	58	PWM	脉冲调制 Pulse Modulation	✔	✔	144
	59	PLSR	带加减速的脉冲输出 Pulse output with Acceleration and Deceleration	✔	✔	145

分类 Class.	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	 H2U	页码 Page
方便指令 Quick Command	60	IST	状态初始化 Status initialization	✔	✔	148
	61	SER	数据查找 Seek Data	—	✔	154
	62	ABSD	凸轮控制(绝对方式) Cam Control (Absolute)	✔	✔	156
	63	INCD	凸轮控制(增量方式) Cam Control (Incremental)	✔	✔	158
	64	TTMR	示教定时器 Teach timer	—	✔	160
	65	STMR	特殊定时器 Special timer	—	✔	161
	66	ALT	交替输出 Alternate state	✔	✔	164
	67	RAMP	斜坡信号 Ramp variable value	✔	✔	165
	68	RTOC	旋转工作台控制	—	✔	167

			Rotary workbench control			
	69	SORT	数据排列 Sort Data	–	✔	169
外围设备 I / O Peripheral I/O	70	TKY	数字键输入 Number key input	–	✔	171
	71	HKY	16 键输入 Hexadecimal key input	–	✔	173
	72	DSW	数字式开关 Digital Switch	✔	✔	175
	73	SEGD	7 段码译码 7-segment decoding	–	✔	177
	74	SEGL	7 段码扫描显示 7-segment scanning display	✔	✔	178
	75	ARWS	方向开关 Arrow switch	–	✔	180
	76	ASC	ASCII 码转换 ASCII code conversion	–	✔	182
	77	PR	ASCII 码打印输出 ASCII Print	–	✔	184
	78	FROM	BFM 读出 BFM Read	✔	✔	185
	79	TO	BFM 写入 BFM Input	✔	✔	186

分类 Class.	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	 H2U	页码 Page
外设设备 Peripheral Equipments	80	RS	串行数据传送 Serial communication instruction	✔	✔	189
	81	PRUN	8 进制位传送 Transmission of octal bits	✔	✔	196
	82	ASCI	HEX-ASCII 转换 HEX-ASCII Conversion	✔	✔	197
	83	HEX	ASCII-HEX 转换	✔	✔	199

			ASCII-HEX Conversion			
	84	CCD	校验码 Check parity code	✔	✔	201
	88	PID	PID 运算 PID control loop	✔	✔	203
浮点数 Number of floating point	110	ECMP	2 进制浮点数比较 Binary floating-point comparison	✔	✔	211
	111	EZCP	2 进制浮点数区间比较 Binary floating-point interval comparison	✔	✔	212
	118	EBCD	2 进制-10 进制浮点数转换 Binary-Decimal floating-point conversion	✔	✔	213
	119	EBIN	10 进制-2 进制浮点数转换 Decimal-Binary floating-point conversion	✔	✔	214
	120	EADD	2 进制浮点数加法 Binary floating-point addition	✔	✔	215
	121	ESUB	2 进制浮点数减法 Binary floating-point subtraction	✔	✔	216
	122	EMUL	2 进制浮点数乘法 Binary floating-point multiplication	✔	✔	217
	123	EDIV	2 进制浮点数除法 Binary floating-point division	✔	✔	218
	127	ESQR	2 进制浮点数开方 Binary floating-point square root	✔	✔	219
	129	INT	2 进制浮点数-BIN 整数转换 Binary floating-point-BIN integer conversion	✔	✔	220
	130	SIN	浮点数 SIN 运算	✔	✔	221

			Floating point SIN calculation			
	131	COS	浮点数 COS 运算 Floating point Cosine operation	✔	✔	222
	132	TAN	浮点数 TAN 运算 Floating point Tangent operation	✔	✔	223
	147	SWAP	上下字节变换 Upper and lower byte conversion	—	✔	224
定位 Locate	155	ABS	ABS 位置数读取 ABS position readout	✔	✔	225
	156	ZRN	原点回归 Regression through the Origin	✔	✔	227
	157	PLSV	可变脉冲输出 Variable pulse output	✔	✔	229
	158	DRVI	相对定位 Relative Positioning	✔	✔	231
	159	DRVA	绝对定位 Absolute Positioning	✔	✔	234

分类 Class	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page
时钟连算 Clock Operation	160	TCMP	时钟数据的比较 Clock data comparison	✔	✔	237
	161	TZCP	时钟数据区域比较 Clock data region comparison	✔	✔	239
	162	TADD	时钟数据加法 Clock data addition	✔	✔	240
	163	TSUB	时钟数据减法 Clock data subtraction	✔	✔	241
	166	TRD	时钟数据读出	✔	✔	242

			Clock data readout			
	167	TWR	时钟数据写入 Clock data input	✔	✔	243
	169	HOUR	计时器 Timer	✔	✔	245
外围设备 Peripheral Equipments	170	GRY	格雷码变换 Gray code conversion	✔	✔	247
	171	GBIN	格雷码逆变换 Gray code reverse conversion	✔	✔	248
	176					
	177					
接点比较 Contacts comparison	224	LD=	(S1)=(S2)	✔	✔	252
	225	LD>	(S1)>(S2)	✔	✔	252
	226	LD<	(S1)<(S2)	✔	✔	252
	228	LD<>	(S1)<>(S2)	✔	✔	252
	229	LD<=	(S1)<=(S2)	✔	✔	252
	230	LD>=	(S1)>=(S2)	✔	✔	252
	232	AND=	(S1)=(S2)	✔	✔	254
	233	AND>	(S1)>(S2)	✔	✔	254
	234	AND<	(S1)<(S2)	✔	✔	254
	236	AND<>	(S1)<>(S2)	✔	✔	254
	237	AND<=	(S1)<=(S2)	✔	✔	254
	238	AND>=	(S1)>=(S2)	✔	✔	254
	240	OR=	(S1)=(S2)	✔	✔	256
	241	OR>	(S1)>(S2)	✔	✔	256
	242	OR<	(S1)<(S2)	✔	✔	256
	244	OR<>	(S1)<>(S2)	✔	✔	256
	245	OR<=	(S1)<=(S2)	✔	✔	256
	246	OR>=	(S1)>=(S2)	✔	✔	256

应用指令（以指令助记符为序，未含简单逻辑指令）

Application Commands (Order by command symbols, quick logic commands not included)

分类 Class.	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models		页码 Page
				H1U	H2U	

A	ABS	155	ABS 现在值读出 ABS current value readout	✔	✔	225
	ABSD	62	凸轮控制(绝对方式) Cam Control (Absolute)	✔	✔	156
	ADD	20	BIN 加法 BIN Addition	✔	✔	94
	ALT	66	交替输出 Alternate state	✔	✔	164
	AND=	232	(S1)=(S2)	✔	✔	254
	AND>	233	(S1)>(S2)	✔	✔	254
	AND<	234	(S1)<(S2)	✔	✔	254
	AND<>	236	(S1)<>(S2)	✔	✔	254
	AND<=	237	(S1)<=(S2)	✔	✔	254
	AND>=	238	(S1)>=(S2)	✔	✔	254
	ANR	47	信号报警复位 Signal Alarm Reset	—	✔	120
	ANS	46	信号报警置位 Signal Alarm Set	—	✔	119
	ARWS	75	箭形开关 Arrow Switch	—	✔	180
	ASC	76	ASCII 码转换 ASCII code conversion	—	✔	182
	ASCI	82	HEX→ASCII 转换 HEX-ASCII Conversion	✔	✔	197
B	BCD	18	BCD 转换 BCD Conversion	✔	✔	92
	BIN	19	BIN 转换 BIN conversion	✔	✔	93
	BMOV	15	成批转换 Batch Conversion	✔	✔	89
	BON	44	ON 位数判定 ON Median Determination	—	✔	117
C	CALL	01	子程序调用 Subroutine call	✔	✔	72
	CCD	84	检验码 Test Code	✔	✔	201
	CJ	00	条件跳转 Conditional jump	✔	✔	71

	CML	14	取反传送 Inverse transmission	—	✔	87
	CMP	10	比较 Compare	✔	✔	82
	COS	131	浮点数 COS 运算 Floating point Cosine operation	✔	✔	222
D	DEC	25	BIN 减 1 BIN minus 1	✔	✔	100
	DECO	41	译码 Decoder	✔	✔	114
	DI	05	中断禁止 Interrupt Disable	✔	✔	74
	DIV	23	BIN 除法 BIN Division	✔	✔	97
	DRVA	159	绝对定位 Absolute Positioning	✔	✔	234
	DRVI	158	相对定位 Relative Positioning	✔	✔	231
	DSW	72	数字式开关 Digital Switch	✔	✔	175

分类 Class	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page
E	EADD	120	2 进制浮点数加法 Binary floating-point	✔	✔	215
	EBCD	118	2 进制-10 进制浮点数转换 Binary-Decimal floating-point conversion	✔	✔	213
	EBIN	119	10 进制-2 进制浮点数转换 Decimal-Binary floating-point conversion	✔	✔	214
	ECMP	110	2 进制浮点数比较 Binary floating	✔	✔	211

			point number comparison			
	EDIV	123	2 进制浮点数除法 Binary floating-point division	✔	✔	218
	EI	04	中断许可 Interrupt Permit	✔	✔	74
	EMUL	122	2 进制浮点数乘法 Binary floating-point multiplication	✔	✔	217
	ENCO	42	编码 Encode	✔	✔	115
	ESQR	127	2 进制浮点数开方 Binary floating-point square root	✔	✔	219
	ESUB	121	2 进制浮点数减法 Binary floating-point subtraction	✔	✔	216
	EZCP	111	2 进制浮点数区间比较 Binary floating-point interval comparison	✔	✔	212
F	FEND	06	主程序结束 Master Program Termination	✔	✔	78
	FLT	49	BIN 整数→2 进制浮点数转换 BIN integer Binary floating-point-conversion	✔	✔	122
	FMOV	16	多点传送 Multiple Point Transmission	—	✔	90
	FOR	08	循环范围开始 Begin the Cycle Range	✔	✔	80
	FROM	78	BFM 读出 BFM Read	✔	✔	185

G	GBIN	171	格雷码逆变换 Gray code reverse conversion	—	✔	248
	GRY	170	格雷码变换 Gray code conversion	—	✔	247
H	HEX	83	ASCII-HEX 转换 ASCII-HEX Conversion	✔	✔	199
	HKY	71	16 键输入 Hexadecimal key input	—	✔	173
	HOUR	169	计时仪	✔	✔	245
	HSCR	54	比较复位（高速计数器） Comparative Reset (High-speed counter)	✔	✔	132
	HSCS	53	比较置位（高速计数器） Comparative Reset (High-speed counter)	✔	✔	129
	HSZ	55	区间比较（高速计数器） Interval Comparison (High-speed counter)	—	✔	133

分类 Class	FNC NO.	指令助记符 Command	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page

		Symbol				
I	INC	24	BIN 加 1 BIN plus 1	✔	✔	99
	INCD	63	凸轮控制(增量方式) Cam Control (Incremental)	✔	✔	158
	INT	129	浮点数-整数转换 Floating-point - Integer conversion	✔	✔	220
	IRET	03	中断返回 Interrupt Reset	✔	✔	74
	IST	60	状态初始化 Status initialization	✔	✔	148
L	LD=	224	(S1)=(S2)	✔	✔	252
	LD>	225	(S1)>(S2)	✔	✔	252
	LD<	226	(S1)<(S2)	✔	✔	252
	LD<>	228	(S1)<>(S2)	✔	✔	252
	LD<=	229	(S1)<=(S2)	✔	✔	252
	LD>=	230	(S1)>=(S2)	✔	✔	252
M	MEAN	45	平均值 Average	—	✔	118
	MOV	12	传送 Transmit	✔	✔	84
	MTR	52	矩阵输入 Matrix input	✔	✔	127
	MUL	22	BIN 乘法 BIN Multiplication	✔	✔	96
N	NEG	29	求补码 Complemental Code	—	✔	103
	NEXT	09	循环范围终了 Cycle Range Finish	✔	✔	80
O	OR=	240	(S1)=(S2)	✔	✔	256
	OR>	241	(S1)>(S2)	✔	✔	256
	OR<	242	(S1)<(S2)	✔	✔	256
	OR<>	244	(S1)<>(S2)	✔	✔	256
	OR<=	245	(S1)<=(S2)	✔	✔	256
	OR>=	248	(S1)>=(S2)	✔	✔	256
P	PID	88	PID 运算	✔	✔	203

			PID control loop			
	PLSV	157	可变速脉冲输出 Variable speed pulse output	✔	✔	229
	PLSY	57	脉冲输出 Pulse output	✔	✔	141
	PLSR	59	有加减速脉冲输出 Pulse output with Acceleration and Deceleration	✔	✔	145
	PR	77	ASCII 键打印输出 ASCII Print out	—	✔	184
	PRUN	81	8 进制输送 Octonary transmission	✔	✔	196
	PWM	58	脉冲幅度调整 Pulse range adjustment	✔	✔	144
R	RAMP	67	斜坡信号 Ramp variable value	✔	✔	165
	RCL	33	带进位的循环左移 Carry Cycle Left Shift	—	✔	106
	RCR	32	带进位的循环右移 Carry Cycle Right Shift	—	✔	106
	REF	50	输入输出刷新 Input/output refresh	✔	✔	124
	REFF	51	滤波器调整 Filter adjust	—	✔	126
	ROL	31	循环左移 Cycle Left Shift	—	✔	105
	ROR	30	循环右移 Cycle Right Shift	—	✔	105
	ROTC	68	旋转工作台控制	—	✔	167

			Rotary workbench control			
	RS	80	串行数据输送 Serial data transmission	✔	✔	189

分类 Class	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page
S	SEGD	73	7 段码译码 Seven segment decoder	—	✔	177
	SEGL	74	七段码扫描显示 7-segment scanning display	✔	✔	178
	SER	61	数据查找 Seek Data	—	✔	154
	SFRD	39	位移读出 Shift Output	✔	✔	112
	SFTL	35	位左移 Left shift	✔	✔	107
	SFTR	34	位右移 Right shift	✔	✔	107
	SFWR	38	移位写入 Shift register write	✔	✔	111
	SIN	130	浮点数 SIN 运算 Floating point SIN calculation	✔	✔	221
	SMOV	13	移位传送	—	✔	85

			Floating point SIN calculation			
	SORT	69	数据排列 Sort Data	—	✔	169
	SPD	56	脉冲密度 Pulse density			138
	SQR	48	BIN 开方 BIN Square Root	—	✔	121
	SRET	02	子程序返回 Sub-program Reset			72
	STMR	65	特殊定时器 Special timer	—	✔	161
	SUB	21	BIN 减法 BIN Subtraction			95
	SUM	43	ON 位数 ON Median	—	✔	116
	SWAP	147	上下字节交换 Upper and lower byte conversion	—	✔	224
T	TADD	162	时钟数据加法 Clock data addition	✔	✔	240
	TAN	132	浮点数 TAN 运算 Floating point Tangent operation	✔	✔	223
	TCMP	160	时钟数据比较 Clock data comparison	✔	✔	237
	TKY	70	数字键输入 Number key input	—	✔	171

	T0	79	BFM 写入 BFM Input	✔	✔	186
	TRD	166	时钟数据读出 Clock data readout	✔	✔	242
	TSUB	163	时钟数据减法 Clock data subtraction	✔	✔	241
	TTMR	64	示教定时器 Teach timer	—	✔	160
	TWR	167	时钟数据写入 Clock data input	✔	✔	243
	TZCP	161	时钟数据区间比较 Clock data area comparison	✔	✔	239

分类 Class	FNC NO.	指令助记符 Command Symbol	功能 Function	适用机型 Applicable Models H1U	H2U	页码 Page
W	WDT	07	监控定时器 Monitor Timer	✔	✔	79
	WOR	27	逻辑字或 Logical Character OR	✔	✔	101
	WSFL	37	字左移 Character Left Shift	—	✔	109
	WSFR	36	字右移 Character Left	—	✔	109

			Shift Shift right by word			
	WXCR	28	逻辑字异或 Logical Character XOR	✔	✔	101
X	XCH	17	交换 Exchange	—	✔	91
Z	ZCP	11	区间比较 Interval Comparison	✔	✔	83
	ZRN	156	原点回归 Regression through the Origin	✔	✔	227
	ZRST	40	批次复位 Batch Reset	✔	✔	113

手册快查引导

Manual Quick Reference Guide

您若有如下疑问，可参照指引：

Please refer to the Guide should you have any following questions:

序号 Sequence Number	希望查阅的内容 Content	请参阅页面 Guide

1	简单逻辑指令的解释 Simple logic command explanation	查阅 P61～P66 指令详解 Refer to command instruction in P61~P66.
2	应用指令的解释 Application command explanation	先根据指令名查阅 P1～P6，再详查指令详解 Refer to P1~P6 for command name, and then look for command for detail explanation.
3	计时器的选用 Timer selection	查阅 3.5 节 Refer to Section 3.5
4	高速计数器的选用 High-speed counter selection	查阅 3.6 节 Refer to Section 3.6
5	高速输出指令的使用 High-speed output command’s procedure	查阅指令 Refer to commands HSCS/HSCR/HSZ/PLSY/PLSV/PWM
6	输入中断的使用与设置 Procedure and configuration for input interruption	查阅 3.8 节 Refer to Section 3.8
7	定时中断的使用与设置 Procedure and configuration for timed interruption	查阅 3.8 节 Refer to Section 3.8
8	高速计数中断的使用与设置 Procedure and configuration for high-speed counter interruption	查阅 3.8 节 Refer to Section 3.8
9	STL/SFC 的编程方法 Programming for STL/SFC.	查阅 4.1.1 节 Refer to Section 4.1.1
10	通讯格式的设置方法 Configuration for communication format	查阅 RS 指令详解<}71{>Refer to RS command instruction.
11	各种通讯协议的设置方法 Configuration for communication protocols	查阅 RS 指令详解 Refer to RS command instruction.
12	如何使用 MODBUS 主站指令 How to use MODBUS master station command	查阅 RS 指令详解 Refer to RS command instruction.

13	如何用 MODBUS 访问 H1U/2U 系列 PLC How to use MODBUS to communicate with H1U/2U Series PLC	MODBUS 内置从机协议定义 MODBUS built-in slave protocol definition
14	如何使用模拟量扩展卡 How to use virtual expansion card	查阅 5.5 附录 Refer to Appendix 5.5
15	MTQ 的高速功能与使用 MTQ high-speed functions and usage	参见 5.7 附录，查阅高速指令 Refer to Appendix 5.7, under high-speed commands
16	脉冲捕捉功能 Pulse capturing function	参见中断 P 说明、M8170~M8175 变量说明 Refer to introduction of interrupting P and M8170~M8175 variables.
17	增强版的高速处理指令 Enhanced high-speed processing command	参见 5.8 附录，增强高速指令 Refer to Appendix 5.8, enhanced high-speed commands
18	部分特殊继电器和寄存器功能说明 Functional description for some special relay and register.	参见 5.10 附录 Refer to Appendix 5.10

第一章 梯形图及梯形图程序

Chapter 1 Ladder Diagram and Procedure

1.1 梯形图的编程特点：

1.1 Ladder Diagram Programming Characteristics:

PLC 中梯形图编程方法是仿传统继电器控制系统的电气原理设计的一种设计方法，设计中使用的元件如按钮开关 X、中间继电器 M、时间继电器 T、计数器 C、触点等，都和实际的电气元件的特性相似。

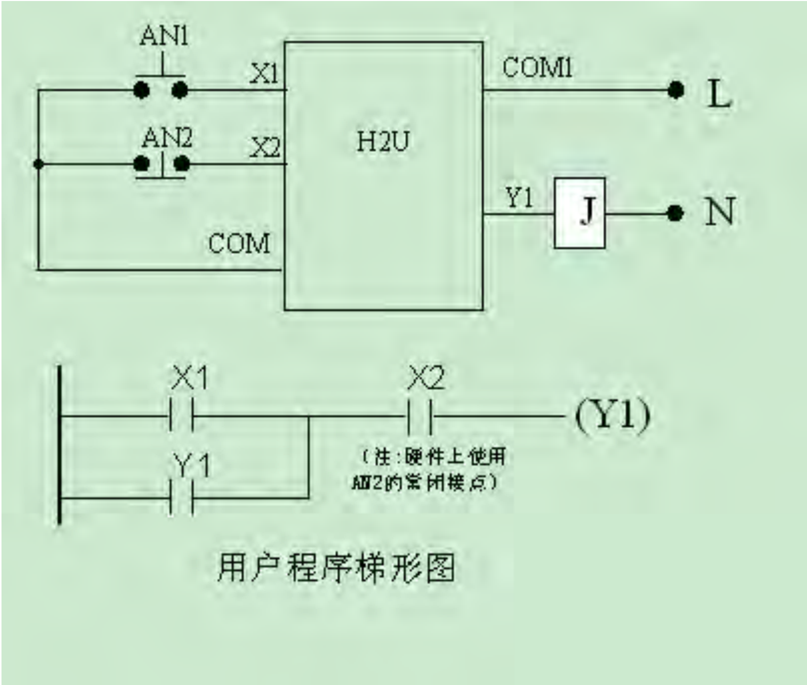
The ladder diagram programming in PLC is a designing method that adapts the electrical principle used in the conventional relay control system. The components used in a design such as switch X, median relay M, time relay T, counter C, and contacts, all have similar characteristics of the actual electrical components.

梯形图中常用“触点”和“线圈”元件，触点元件有“常开型”和“常闭型”，分别对应电工术语中的“A 接点”和“B 接点”，PLC 中同一个继电器的“触点”可被无限次使用，我们可认为一个继电器（无论中间继电器 M、时间继电器 T、还是计数器 C）元件，都具有无限个“A 接点”和“B 接点”。

In a ladder diagram, “contact” and “coil” components are often used. The contact components have two types of “normally open” and “normally closed”, which are corresponding to the “A contact” and “B contact” technical terms used in the electrical industry. The “contact” of one relay in a PLC can be used infinitely. Therefore, we can

often assume one relay component (regardless median relay M, time relay T, or counter C) has unlimited “A” and “B” contact points.
对于时间继电器、计数器，具有线圈（信号触发端）和触点，部分元件还具有掉电保持特性，选择合适序号的元件，以得到所需特性的元件。
In regards to time relay, counter, existing coil (signal trigger terminal), and contacts, certain components still have the power drop and retention characteristics. Therefore, it is necessary to select appropriate components to achieve functionalities that are desired.
随着现代 PLC 的发展，PLC 不仅可以完成顺序逻辑控制功能，还能完成数值计算功能，如数值比较、四则运算、函数运算等，数值宽度有 16bit、32bit、浮点等，在 H1U/2U 系列 PLC 中提供了大量的寄存器 D 元件，可在梯形图程序中用于数值运算。
With the development of modern PLC, not only sequential logic control function can be accomplished, other data calculation functions can also be carried out as well. These functions are such as data comparison, four operations of arithmetic, functional operation, and etc. The width of data consists of 16-bit, 32-bit, and floating-point, etc. In the H1U/2U Series of PLC, it provides D register components for the purpose of data calculation in large numbers during the ladder diagram process.
梯形图的设计思想与传统继电器控制系统的设计方法基本相同，以常见的电磁开关的电气原理为例：
The designing idea of the ladder diagram is basically identical to that in a conventional relay control system. Take the electrical principle in an electromagnetic switch as an example:

从图中可见，J1 为继电器或接触器，AN1 为启动 J1 的按钮，使用其常开接点；而 AN2 为断开 J1 的按钮，使用了其常闭接点；另外使用了 J1 的常开型辅助触点作为状态保持用。
As seen in the illustration, J1 is the relay or contactor. AN1 is the button that starts up J1, and it is used as NO contact. AN2 is the button that disconnects J1, and it is used as NC contact. In addition, J1’s normally open auxiliary contact is used for the purpose of status retention.
若按右图设计 PLC 的信号输入连接和梯形图编程便可实现相同的起停控制功能了。(出于安全的考虑，停止按键一般用常闭型接点。
If the signal input connection and the ladder diagram programming are connected and completed according to the PLC design in the illustration at right, identical controlling capabilities will then be able to be accomplished. (For safety consideration, “normally closed” contact is usually used for STOP button.）



（注：硬件上使用 AN2 的常闭接点）

(Note: hardware wise, AN2 normally closed contact is used)

用户程序梯形图

Ladder diagram programming procedure for users

1.2 梯形图编程时使用的元件符号：

1.2 Component symbols used in ladder diagram programming:

梯形图设计中使用的元件符号及特性说明如下表，通过将这些“触点”元件的“与”“或”逻辑组合，输出到元件“线圈”：

The component symbols used in a ladder diagram design and their characteristics are introduced in the list below. Through the logic combinations of “AND” and “OR” of these contact components to output to the “coil” component.

符号 Symbol	说明 Description	动作特性 Operation Characteristic
	触点元件，代表元件的常开型触点，有输入 X 信号触点、 Contact component, represents the component’s normally open contact. Consists X input signal contact.	X：当 X 端口信号接点闭合时，状态为 ON；端口信号为断开状态时，触点状态为 OFF X: when the X signal contact port is closed, status is ON; when port signal is disconnected, the contact status becomes OFF.

触点元件，代表元件的常开型触点，有输入 X 信号触点、输出 Y 的触点、中间继电器 M、时间继电器 T、计数器 C 的输出触点等。对于 Y、M、T、C 等元件，在未动作状态也为 Contact component, represents the component’s normally open contact. Consists of X input signal contact, Y output contact, output contacts for median relay M, time relay T, and counter C. OFF。 About components such as Y, M, T, C, the status remains OFF before any other action.	Y：当 Y 继电器的“线圈”得电时为 ON，否则为 OFF。Y 最后状态将对应于 PLC 的输出 Y 端口的状态。 Y: when Y relay’s “coil” is electrified, it becomes ON, or OFF otherwise. Y’s final status corresponds to the PLC’s output Y port’s status. M：当 M 继电器的“线圈”得电时为 ON，否则为 OFF M: when M relay’s “coil” is electrified, it becomes ON, or OFF otherwise. S：当 S 作为普通标志元件使用时，S 继电器的“线圈”得电时为 ON，否则为 OFF S: When S is used as a normal symbol component, the status becomes ON when it’s coil is electrified, or OFF otherwise. T：当对应的时间继电器线圈得电，且计时时间达到设定的时间，状态为 ON；否则为 OFF T: when the corresponding time relay coil is electrified and the timed time has reach the target, the status becomes ON, or otherwise OFF. C：当对应的计数器的读数达到设定的时间，状态为 ON；否则为 OFF C: when the corresponding counter’s count reaches the target time, the status becomes ON, or otherwise OFF.
触点元件，仅在触点的上升沿有效 Contact component, only	当触点元件（XYM）的状态由 OFF→ON 的上升沿变化时，该信号为有效，这个触点

effective on the rising edge of contacts	信号在一个扫描周期内有效，若下一状态不再变化，该信号恢复为“OFF” When contact component‘s (XYM) status is changing from OFF to ON with rising edge, the signal is valid. The contact signal will remain valid in one scanning cycle. Should it remains in next status, the signal returns to “OFF”.
触点元件，仅在触点的下降沿有效 Contact component, only effective on the falling edge of contacts	当触点元件（XYM）的状态由 ON→OFF 的下降沿变化时，该信号为有效，这个触点信号在一个扫描周期内有效，若下一状态不再变化，该信号恢复为“OFF” When contact component‘s (XYM) status is changing from ON to OFF with falling edge, the signal is valid. The contact signal will remain valid in one scanning cycle. Should it remains in next status, the signal returns to “OFF”.
状态取反 Inverse Status	将当前信号点的状态进行取反 Inverse the status of current signal point
步进梯形图中表示 S 状态信号 In the stepping ladder diagram it represent S status signal	步进指令状态的转移 Transition of stepping command status
线圈元件，在梯形图中是被激励的对象 Coil component, is being powered under ladder diagram	Y、M 元件的线圈“得电”时，其常开型触点动作闭合，其常闭型触点动作断开，“失电”时恢复原来状态 When the coils of Y and M components are electrified, the normally open contact closes, and the normally

closed contact disconnects. In event of power loss, it returns to original state.

T 元件的线圈“得电”时，开始计时，“失电”时恢复为默认状态。当计时时间达到设定值时，其常开型触点动作闭合，其常闭型触点动作断开。

When T component’s coil is electrified, timer starts. It returns to default under power loss. When the counted time reaches the target, the normally open contact closes, while the normally closed contact disconnects.

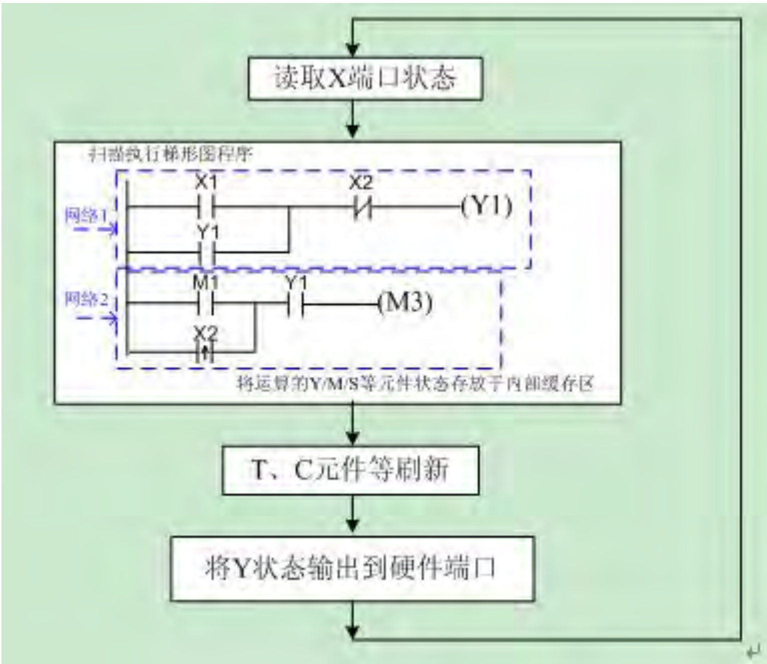
C 元件的线圈“得电”的瞬间，计数值增加 1，当计数值达到设定值时，其常开型触点动作闭合，其常闭型触点动作断开。清除其“线圈”的操作，可使其计数值和触点恢复为默认状态。

The moment the C component’s coil is electrified, count increases by 1. When count reaches the target, the normally open contact closes, and the normally closed contact disconnects. Clear the coil operation will reset the count and contact to their default status.

注意：X 输入元件没有线圈，用户程序不能修改其状态，只由外部的用户线路决定其状态。

Notes: X input component does not have coil. Therefore, user programs cannot modify its status.

		The status can only be determined by external user circuit.
	操作指令，对元件或线圈、参数等进行操作 Operating commands are used to operate components, coils, or parameter.	完成逻辑操作、数据处理等众多功能。 Used to accomplish functions such as logic operation, data processing. 如〔RST Y0〕、〔SET M2〕、〔MOV K5 D100〕、〔JC P1〕等指令。 Commands are such as (RST Y0), (SETM2), (MOV K5 D100), (JC P1), and etc.



读取 X 端口状态
X port status readout

扫描执行梯形图程序
Scan and execute ladder diagram program

网络 1
Network 1

网络 2
Network 2

将运算的 Y/M/S 等元件状态存放于内部缓存区

Save the statuses of operating Y/M/S components in the internal cache

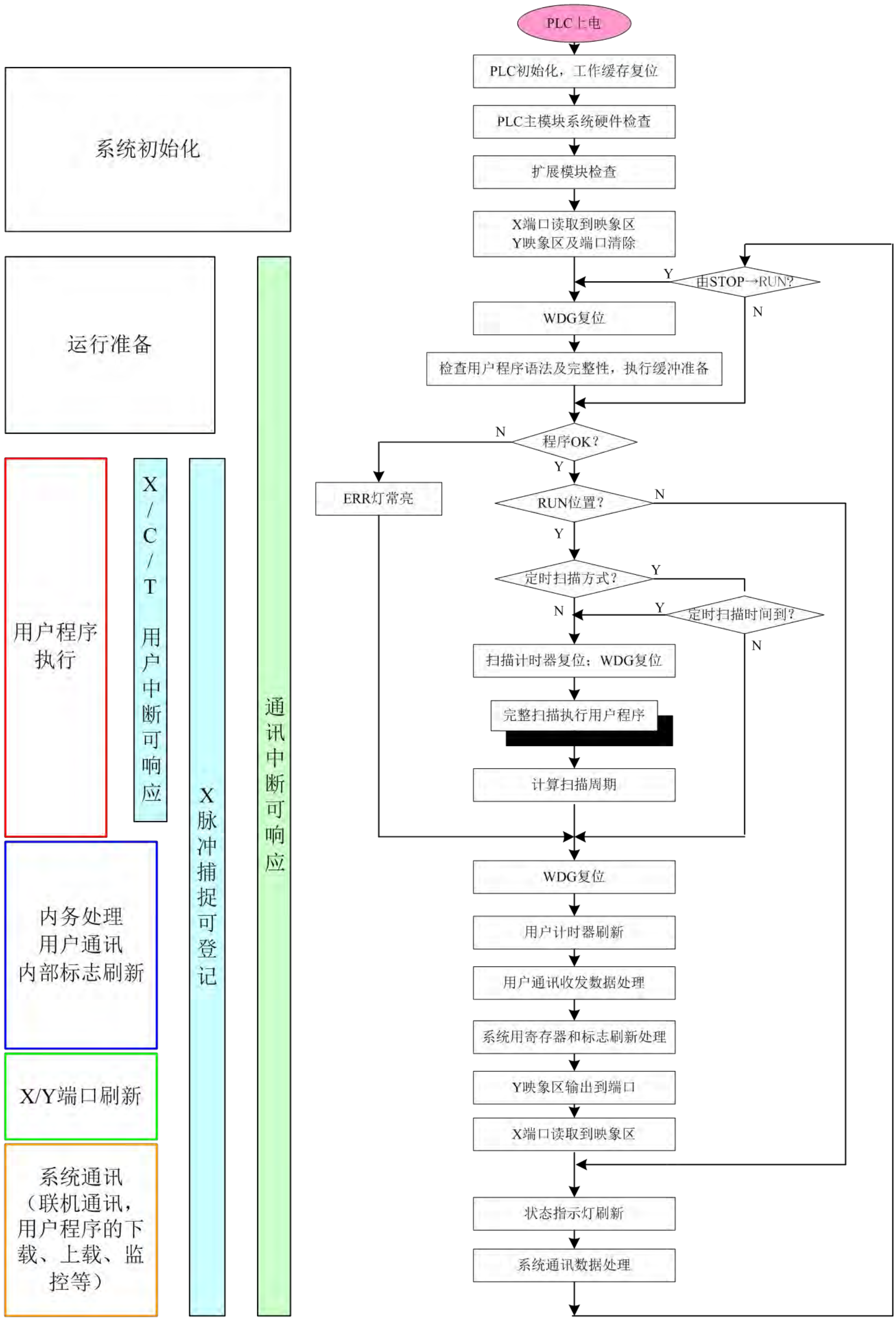
T、C 元件等刷新
Refresh T, C components

将 Y 状态输出到硬件端口
Export Y status to device ports

1.3 PLC 的执行原理
1.3 PLC’s operating principle
当编程人员将设计编译好的梯形图程序下载到 PLC 的内存后，PLC 便可以对用户程序进行扫描执行了。
After programmers downloaded the compiled ladder diagram program to the PLC’s memory, the PLC then performs scanning over the user program.
PLC 运行时，主要进行执行 X 输入检测、用户程序扫描运算、其他元件的状态刷新、将 Y 状态缓存状态输出到 PLC 的 Y 硬件端口等，这些工作内容周而复始的进行，其中的扫描执行用户程序是 PLC 的核心工作，过程如下例图：
During operation, the PLC performs X input detection, user program scanning and calculation, components status refresh, the export of Y cache status to PLC’s Y port, and etc. These tasks proceed continuously, and among them the scanning and execution of user programs is the core function of a PLC. The process is illustrated below:

每次执行用户程序前，首先将 X 硬件端口的状态读取后存放到 X 变量缓存区。
Every time before the execution of user program, first, the X port status must be read and saved in X variable cache.
用户程序的扫描执行，是以用户程序的网络块为单元进行逐步演算的，所谓“网络”是有联线关联的一组元件块，参见上图中的两个网络。执行演算从第一个网络开始，依次向下演算第二个、第三个……直到最后一个网络。而对每个网络进行演算方式是，则由左至右，逐个将元件的“触点”状态进行逻辑计算综合，直到最右边，输出到元件的“线圈”，或根据逻辑决定是否执行某个操作。
The scanning and execution of user programs are based on the successive unit calculations of user programs’ network blocks. Here, the “network” refers to a group of component blocks that are interconnected. See above two networks for illustration. The calculation starts from the first network, and then second, the third, all the way until the last network. The calculation for each network starts from left to right. It successively performs logic calculation and integration on each component’s “contact” status until the end. It exports the result to a component coil, and then the execution of one operation will be determined logically.
梯形图中，左侧目前相当于电源的“火线”，其默认的（电位）状态为 ON，每经过一个元件后，逻辑运算结果暂存都被刷新，有时也称中间计算暂存状态为“能流”，中间逻辑计算结果为 ON，即“能流”为有效，本网络的输出状态即为输出电的能流状态；若最右端为操作类型，若能流为有效，就进行操作，否则不进行操作。

Under the ladder diagram, the left side is equivalent to the “FireWire” of a power supply, and its default status (electric potential) is ON. Every time after passing through a component the logic calculation result cache will be refreshed. Sometime the intermediate calculating cache status is also described as “energy flow”. When the intermediate calculation result is ON, the “energy flow” is effective. The output status of the network also represents the energy flow status of electric output. Should the rightmost is an action type and the energy flow is effective, the operation will proceed, or not proceed otherwise.



系统初始化

System Initialization

运行准备

Ready to Operate

用户程序执行
User Program Execution

内务处理
Internal Processing

用户通讯
User Communication

内部标志刷新
Internal Symbol Refresh

X/Y 端口刷新
X/Y Port Refresh

系统通讯（联机通讯，用户程序的下载、上载、监控等）
System Communication (Online communication, user program’s download, upload, and monitoring)

X/C/T 用户中断可相应
X/C/T Corresponding User Interruption

X 脉冲捕捉可登记
X Registrable Pulse Capture

通讯中断可响应
Responsive Communication Interruption

PLC 上电
PLC Power On

PLC 初始化，工作缓存复位
PLC Initialization, Work Cache Reset

PLC 主模板系统硬件检查
PLC Main Module System Hardware Inspection

扩展模块检查
Expansion Module Inspection

X 端口读取到映象区
X Port Readout to Image Area

Y 映象区及端口清楚
Y Image Area and Clear Port

WDG 复位
WDG Reset

检查用户程序语法及完整性，执行缓冲准备
Inspect User Program for Language and Integrity, Execute Buffer Preparation

程序 OK?
Program OK?

RUN 位置？
RUN position?

ERR 灯常亮
ERR Light On

定时扫描方式？
Timing Scan Mode?

定时扫描时间到？
Timing Scan Time’s Up?

扫描计时器复位：WDG 复位
Scan Timer Reset: WDG Reset

完整扫描执行用户程序
Complete Scan and Execute User Program

计算机扫描周期
Computer Scan Cycle

WDG 复位
WDG Reset

用户计时器刷新
User Timer Refresh

用户通讯收发数据处理
User Communication Send/Receive Data Processing

系统用寄存器和标志刷新处理
System Register and Symbol Refresh Processing

Y 映象区输出到端口
Y Image Area Export to Port

X 端口读取到映象区
X Port Readout to Image Area

状态只是灯刷新
Status Indicator Refresh

系统通讯数据处理
System Communication Data Processing

由上至下，直到主程序的所有网络都扫描执行完毕，还有各定时器的刷新、例行的通讯等数据的处理后，PLC 系统程序将 Y 寄存器缓存区的变量状态输出到 Y 硬件端口中。然后又开始下一轮的用户程序扫描，如此周而复始，直到控制用户执行的“RUN/STOP”开关被拨动到 STOP 位置为止。
Until all networks in the main program have been scanned, and every timer and communication data have been processed and refreshed, the PLC system program will export the variable status in the Y register cache to Y hardware ports. Next cycle of user program scanning will be initiated again continuously until the “RUN/STOP” switch has been switched to STOP by the user.
对于整个 PLC 而言，其系统软件还需完成一些运行准备、系统通讯、中断处理等工作，系统软件运行流程如上图所示。对于复杂的用户程序，在系统扫描用户程序过程中，还可以采用“中断”处理的方法响应“用户中断”信号，对重要信号（也有称重要“事件”）作及时处理。
As for the PLC as a whole, the system software will still need to complete tasks such as operation preparation, system communication, interruption processing, and etc. The system software’s operation processes are as illustrated above. As for the complicated user programs, during the process of scanning user programs, “Interruption” method may be adopted in response to the “User Interruption” signal and perform real-time process for important signals (or sometimes described as “events”).
所谓“中断”处理，就是 CPU 检测到特定信号时，立即停下（或中断）当前的例行工作，去执行特定的子程序，子程序执行完毕，才返回到先前被停下的工作点，继续执行例行工作。中断信号的请求能得到及时的响应处理，是“中断”功能的主要特点。
The “Interruption” method means that, when the CPU detects certain signals, it will stop (or interrupt) current scheduled tasks and execute the designated sub-program. After the sub-program has been executed, it then will return to the point where the task was interrupted and continue its work. Request of interruption signals are responded and processed immediately. It is the main feature of the function.
在 PLC 中，有高速信号输入（X0~X5）、高速计数、定时等中断（有时称为“用户中断”），还有通讯中断，包括系统通讯、用户程序发起的通讯等。在 PLC 中，各中断享有同一优先级，但不同中断类型，其允许区间稍有不同（参见前页插图）。
There are high-speed signal input (X0~X5), high-speed counting, and timing interruptions (sometimes described as “User Interruption) in a PLC. There are also communication

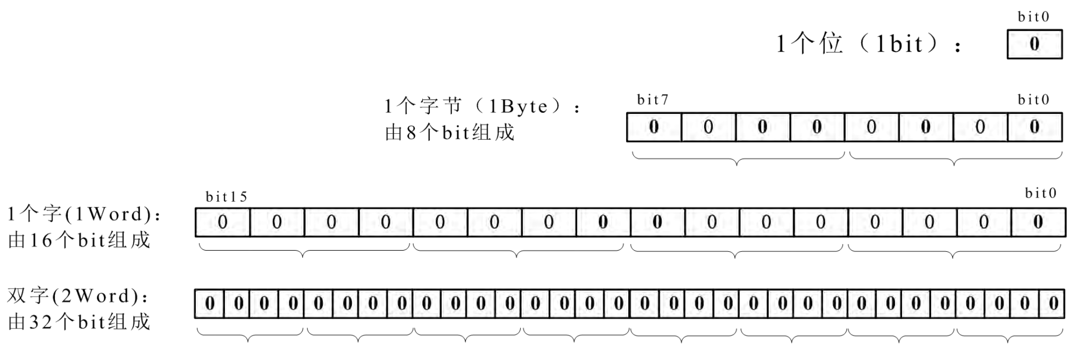
interruptions such as system communication and communication initiated by user program.
All interruptions share the same priority but different interruption types. There are slight differences between the allowable intervals (please refer to illustration in previous page).

1.4 PLC 数值的基本知识
1.4 Basic Knowledge of PLC Values

H1U/2U 系列 PLC 内部采用高性能 32bit 作为核心处理器，其工作原理与其他的计算机设备是相似的。所有的 CPU 处理器采用的都是二进制码作为内部处理数据的格式，“数据”在计算机内部是以“信号电平”的方式进行处理的，其中信号电平只有“低”或“高”两个状态，分别对应于二进制数的“0”或“1”，信号电路中不会出现电平误判，可确保处理结果的正确性。
The H1U/2U Series PLC uses high-performance 32-bit as its core processor. The operating principle is similar to that in other computers. All CPU processors use binary code as the format for their internal data processing. “Data” in a computer is processed in the method of “electric signal level”. The signal level only has two statuses, “low” or “high”, which correspond to "0" or “1” in the binary system. Therefore, no erroneous judgment will happen in a signal circuit, and this further ensures the accuracy of processing results.

二进制数
Binary Data

“二进制”用于计算机计算则是最简捷方便的进制，对于 1 位数的计算有：
0＋0＝0；0＋1＝1；1＋0＝1；1＋1＝10（有进位，此时需用 2 个位来表示）
这些计算只需用典型的“与”、“或”、“非”逻辑电路就可组合完成运算了。
“Binary” is the most convenient and simply calculation system used in computers. Calculations that involves with single digit are:
0+0=0; 0+1=1; 1+0=1; 1+1=10 (a digit is carried over, therefore it requires two digits to represent)
These calculations will only require the typical “AND”, “OR”, or “NOT” logic circuits to combine and complete operations.



1 个字（1Word）:由 16 个 bit 组成
1 Word: composed of 16 bits

双字（2Word）:由 32 个 bit 组成<}72{>2 Word: composed of 32 bits

1 个字节（1Byte）：由 8 个 bit 组成
1 Byte: composed of 8 bits

1 个位（1bit）
1 bit

当需要处理的数值比较大时，就需用多个二进制位来表示，位数越多，可表示的数值越大，现在常用的 CPU 位(bit)数有：
When value that requires processing gets larger, multiple binary digits are required to illustrate. The more number of digits used, the bigger the value can be expressed. The commonly used CPU bits are:

位数 Bit Number	可一次处理的最大数值 Maximum processing value in one time	应用说明 Application
4bit	15	消费类简单产品中还有使用，已很少 Used in simple, consumer products. Rarely used now.
8bit	255	如 8051，常用于简单的控制系统中 Such as 8051, used in uncomplicated control systems.
16bit	65，535	如 808x，工业控制中有使用，使用较少 Such as 808x, used in industrial control systems; less used.
32bit	4，294，967，295	如 ARM，目前广泛应用于工控、消费类产品 Such as ARM, is commonly used in complicated industrial and consumer products.
64bit	18446744073709551615	通用计算机中使用 Used in most computers.

位数少的 CPU，并非不能处理大的数值，只不过需要多次运算，有时还需要编程人员熟悉算法。就像大车一次可以搬运的货物，用小车就需要往返多次才能搬完，车越小，需要的次数越多，耗时也越多。
CPUs with deficient bit number cannot process large values at one. What it requires is multiple calculations, therefore, programmers need to be familiar with the calculations. It is just like for a load a big truck carries, a small car requires several more trips to finish the load. The smaller the car, the more trips and time it takes.
H1U/2U 系列 PLC 元件中，常用的数据宽度是 1Word（即 16bit）；部分计数器为 2Word（32bit）。
In the H1U/2U Series PLC component, the commonly used data bandwidth is 1 Word (16-bit); some counters are 2 Word (32-bit).对于 16bit 的无符号数据，用 2 进制表示的最大值为 1111，1111，1111，1111，换算为十进制就是 65，535。

As for the symbol-free data in 16-bit, the maximum value expressed in binary format is 1111, 1111, 1111, 1111. If converted to decimal format then it becomes 65, 535.

十六进制

Hexadecimal

当二进制数值小的时候，尚能阅读，当位数比较多的时候，就比较难读难写了，将每 4 位二进制数分成一组，用 1 个数来代表，就成了 16 进制数（HEX）；一个 16bit 二进制数用 4 位十六进制数来表示，易读性大为增加。在十六进制数中数值 10～15（十进制）的数，分别以 A~F 的字符来代替。

It is still readable when the binary value is small. But when the number of digits gets more and more, readability becomes an issue. Therefore, if every four binary values are grouped together and represented by one number, then it becomes a hexadecimal (HEX). The readability becomes much greater when one 16-bit binary value is expressed in four hexadecimal numbers. Numbers from 10~15 (decimal) under the hexadecimal format are expressed using characters A~F.

八进制

Octonary

由于传统习惯，在计算机中，以 8bit 宽度的数值、硬件端口数使用方式的为最多，8bit 被定义为 1Byte（即 1 个字节）；在 PLC 中也 8 个硬件端口作为分组，利于访问操作（读或写），如输入 X 端口、输出 Y 端口的编号就仍沿用八进制方式。

Due to conventional practices in computers, values with 8-bit bandwidth and the using of hardware ports are most commonly used. 8-bit is defined as 1 Byte (1 Word). In PLCs, 8 hardware ports are also grouped together for the convenience in communicating operation (read or write), such as the serial numbers of input X port and output Y port still use the octonary format.

八进制数是由 3 位二进制数组成的，数字范围为 000～111，即 0～7，不可能存在 8、9。

Octonary is composed of three binary numbers ranges from 000~111, or 0~7. There is no 8 or 9.由于 CPU 一般为 8、16、32bit 等，但用于数据计算时，一般还是用十六进制，而不用八进制。

Although CPU is usually in 8, 16, or 32-bits, hexadecimal is still used when comes to data calculation.

十进制

Decimal

我们生活中习惯使用的数据是采用“十进制”，基本数字为 0～9 共 10 个数，若“9”＋“1”计数，便进位处理得到“10”。

Decimal system is mostly used during our daily lives. The ten numbers are from 0 to 9. When calculating “9” + “1”, the process will carry over to next digit and obtain “10”.

日常生活中也有其他进制的，如星期日、星期一、….星期六分别以数字 0、1、…6 共 7 个数代表，就可理解为“七进制”，只不过“七进制”不便于计算，使用不多而已。

There are other calculation system in life, such as Sunday, Monday, and etc. They are represented by seven numbers from 0 to 6, and understood as “heptagon”. However, heptagon system is not easy to calculate therefore it is not used often.

BCD 码

BCD Code

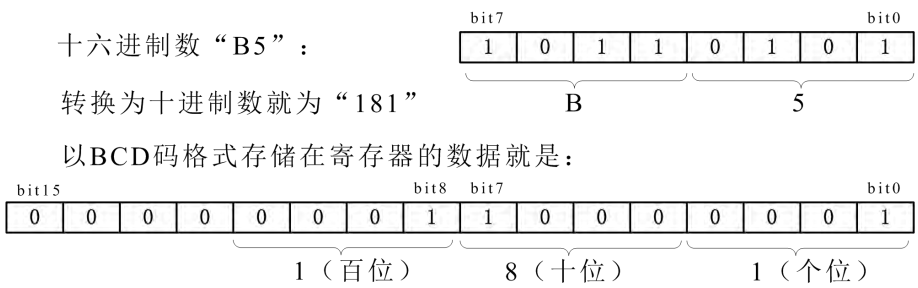
最符合人们阅读习惯的数字格式是十进制，在人们监控或设置工作参数时，往往需要采用十

进制格式进行数据显示，而计算机内部使用的是 HEX 格式，故需采用一种底层为每 4 个二进制位组成一个数字位，而每个数字位只能为十进制数的 0～9，由此组成的数值，这种格式数字在存储器中的编码称为 BCD 码(Binary-Coded Decimal)。

The numerical format that suits people’s reading habit the most is the decimal format. Decimal format is usually adopted to display data when monitoring or configuring work parameters. And yet, HEX format is used inside the computer. Therefore, every four binary values are used as a foundation to compose one digit, and every digit can only be in decimal format from 0 to 9. The encoding of numbers composed in the register is called BCD code (Binary-Coded Decimal).

在 PLC 内部，原理上用 4 位二进制数代表 1 位十进制数，在每一位 BCD 码中，不存在 HEX 格式中的 A~F。宽度的寄存器单元，能存储的最大 BCD 数只能是 99，因此将 HEX 格式转换为 BCD 码后，会占用更大的存储空间。

Inside a PLC, in principle four binary numbers are used to represent one decimal number. And in every BCD code, there is no A~F character from the HEX format.对于一个 8bit As for a register unit that has 8-bit bandwidth, the maximum BCD number that can be stored is 99. Therefore, after converting HEX format to BCD code, it will occupy more storage space.



十六进制数“B5”：转换为十进制就为“181”以 BCD 码格式储存在寄存器的数据就是：

Hexadecimal “B5”: becomes “181” in decimal format. The data format stored in register using BCD code format is：

1（百位）

1 (centesimal)

8（十位）<}74{>8 (decimal)

1（个位）

1 (unit)

PLC 内部总是按 HEX 格式进行数据计算的，在驱动非智能的显示设备（如数码管）显示数据之前，往往需要将 PLC 内部的十六进制（HEX）格式数据先转换为 BCD 码，然后进行显示输出；将用户以十进制方式设置的参数存入 PLC 内存之前，则往往需要将该 BCD 码转换为十六进制（HEX）格式。

Inside a PLC, data calculation is always done using HEX format. Before initiating and displaying data on a mis-intelligent equipment (such as numeral tubes), HEX formatted data must be converted to BCD codes first inside the PLC in order to perform display output. Before users saving the parameters configured in decimal format into the PLC cache, it is often required to convert BCD codes to HEX format first.

H1U/2U 系列 PLC 内部提供了 HEX 与 BCD 两种格式相互转换的命令，在需要进行显示输出，或设置开关读取的时候，执行该格式转换指令。

In the H1U/2U Series PLC, it provides commands for converting between HEX and BCD coding formats. Whenever necessary, the commands can be executed to perform display output or configuration switch readouts.

人们在电脑显示器上看到的十进制读数，都是经过了计算机自动作 BCD 转换后才显示的；监控时修改的参数，则是电脑软件作了 HEX 转换后写入的，无需人为干预而已。

The decimal readouts people see on a computer monitor was only displayed after the computer has completed BCD conversion. The parameters modified during monitoring are written in after the computer software performed the HEX conversion. There is no manual interference required.

各种进制数的对照举例：

Comparison Chart of the Types of Carry-Over Systems：

二进制 BIN Binary BIN	八进制 OCT Octonary OCT	十进制 DEC Decimal DEC	十六进制 HEX Hexadecimal HEX	BCD 码 BCD Code	二进制 BIN Binary BIN	八进制 OCT Octonary OCT	十进制 DEC Decimal DEC	十六进制 HEX Hexadecimal HEX	BCD 码 BCD Code
0000	0	0	0	0	1000	不存在 Non-exist	8	8	8
0001	1	1	1	1	1001		9	9	9
0010	2	2	2	2	1010		10	A	不存在 Non-exist
0011	3	3	3	3	1011		11	B	
0100	4	4	4	4	1100		12	C	
0101	5	5	5	5	1101		13	D	
0110	6	6	6	6	1110		14	E	
0111	7	7	7	7	1111		15	F	

进制的转换

Conversion of Carry-Over Systems

二进制、八进制、十六进制等进制的转换非常简单，例如 8 位的二进制数“10110101”，写成十六进制时，从右向左按 4 位一组分为“1011，0101”，用十六进制表示为“B5”；

Conversions between binary, octonary, and hexadecimal systems are very simple. For instance, 8 digits of binary are expressed as “10110101”. When it converts to hexadecimal, every four digits are grouped together from right to left as “1011, 0101”, and are expressed as “B5”.

写成八进制时，从右向左按 3 位一组分为“10，110，101”，用八进制表示为“265”；

When converting to octonary, every 3 digits are grouped together from right to left as “10, 110, 101”, and are expressed as “265” in octonary.

要将二进制数换算为十进制数，则计算要复杂很多，最通用的方法可采用权重累加法，从最右边一位开始计算：

To convert binary numbers to decimal numbers requires much complicated calculations. The most commonly used method is through power-weight accumulation method, starts from the rightmost digit:

第 1 位（bit0）为 1 时，权重为 1 ，（即 20），否则为 0；

When first digit (bit0) is 1, power-weight is 1, (equals 20), or 0 otherwise;

第 2 位（bit1）为 1 时，权重为 2 ，（即 21），否则为 0；

When second digit (bit1) is 1, power-weight is 2, (equals 21), or 0 otherwise;

第 3 位（bit2）为 1 时，权重为 4 ，（即 22），否则为 0；

When third digit (bit2) is 1, power-weight is 4, (equals 22), or 0 otherwise;

第 4 位（bit3）为 1 时，权重为 8 ，（即 23），否则为 0；

When fourth digit (bit3) is 1, power-weight is 8, (equals 23), or 0 otherwise;

第 5 位（bit4）为 1 时，权重为 16，（即 24），否则为 0；

When fifth digit (bit4) is 1, power-weight is 16, (equals 24), or 0 otherwise;

第 6 位（bit5）为 1 时，权重为 32 ，（即 25），否则为 0；

When sixth digit (bit5) is 1, power-weight is 32, (equals 25), or 0 otherwise;

第 7 位（bit6）为 1 时，权重为 64 ，（即 26），否则为 0；

When seventh digit (bit6) is 1, power-weight is 64, (equals 26), or 0 otherwise;

第 8 位（bit7）为 1 时，权重为 128 ，（即 27），否则为 0；　　……

When eighth digit (bit7) is 1, power-weight is 128, (equals 27), or 0 otherwise;

对于本例子中，将“10110101”转换为十进制数即为（128+0+32+16+0+4+0+1）=181。

Therefore, when converting “10110101” into decimal format, the result is (128+0+32+16+0+4+0+1) = 181.

对于 16bit 转换为十进制，如本例中的“B5”，也采用十六进制的权重累加法，从最右边一位开始计算：

When converting from 16-bit into decimal format, such as “B5” in the example, power-weight accumulation in hexadecimal is also adopted, starting from the rightmost digit:

第 1 位 HEX 数的权重为 1 ，（即 160），即该位的实际值×1；

When first HEX value’s power-weight is 1, (equals 160), actual value of the digit x 1;

第 2 位 HEX 数的权重为 16 ，（即 161），即该位的实际值×16；

When second HEX value’s power-weight is 16, (equals 161), actual value of the digit x 16;

第 3 位 HEX 数的权重为 256 ，（即 162），即该位的实际值×256；

When third HEX value’s power-weight is 256, (equals 162), actual value of the digit x 256;

第 4 位 HEX 数的权重为 4096 ，（即 163），即该位的实际值×4096；…..

When fourth HEX value’s power-weight is 4096, (equals 163), actual value of the digit x 4096;

对于本例子中，将“B5”转换为十进制数即为（B×16＋5×1）=（11×16＋5）＝181。

Therefore, when converting “B5” into decimal format, the result is (Bx16+5x1) = (11x16+5) = 181.

读者熟悉了 HEX 转换为十进制的方法，可先将二进制或八进制划分为十六进制（每 4bit 一组），然后再作十进制转换，计算比较简捷。

After familiarize oneself with the conversion from HEX to decimal, users may convert binary or octonary value to hexadecimal format first (group every 4-bit), and then convert it to decimal format. The calculation will be much simpler and faster.

有符号数与无符号数

Signed and unsigned numbers

PLC 内部的数据可以进行四则运算，运算结果可能产生负数，这样的计算结果就产生了“有符号数”，事实上 H1U/2U 系列 PLC 内部的寄存器 D、32bit 计数器 C 的数据、所有四则和函数运算指令都可按“有符号数”进行运算操作。

Four fundamental operations of arithmetic can be performed inside a PLC, and the calculation results may produce negative numbers. Such results produced “signed numbers”. In fact, the data in register D inside the H1U/2U Series PLC and in the 32-bit counter C can all be calculated using the four operations and function commands in the format of “signed numbers”.

16bit 的 D 寄存器中最高位（bit15）便用于代表值的符号，因此 D 寄存器值的取值范围是-32，768～32，767。当用双字（32bit，2 个连续的 D 寄存器）表示一个数据时，用最高位（bit31）代表值的符号，因此 D 寄存器值的取值范围是-2，147，483，648～2，147，483，647。符号位如下图：

The highest digit (bit15) in the 16-bit D register is used as the representative symbol. Therefore, the value-selecting range of a D register is -32, 768~32, and 767. When using two characters (32-bit, 2 continuous D register) to represent one data, the highest digit (bit31) should be used as the representative symbol. Therefore, the value-selecting range of a D register is -2, 147, 483, 648~2, 147, 483, and 647. The symbol digits are as following:

符号位

Symbol Digit

1 个字（1Word）数据

1 Word Data

Dn 单元，15 位

Dn Unit, 15 digits

双字（2Word）数据

2 Word Data

当符号位为 0 时，表示为正数，故 1Word 的正数是最大值为 HEX 格式的 H7FFF，即 32767；

2Word 的正数是最大值为 HEX 格式的 H7FFFFFFF，即 2，147，483，647。
When symbol digit is 0, it means it is positive. Therefore, 1 Word’s positive value in the maximum HEX format is H7FFF, which is 32767; 2 Word’s positive value in the maximum HEX format is H7FFFFFFF, which are 2, 147, 483, and 647.
当符号位为 1 时表示负数，是其数值的补码，其绝对值的计算方法是“先将有符号数逐位取反，然后再加 1”，例如 HEX 格式的 HFFFF，其绝对值＝H0000+1＝1，即“HFFFF”代表-1；又例如 HEX 格式的 H8000，其绝对值＝H7FFF+1＝32768，即有符号数 H8000 代表-32768，是 1Word 寄存器最小的负值。同理，2Word 的最小负值为有符号数 H80000000，即-2，147，483，648。
When symbol digit equal 1 it means it is negative, which is the make-up code for the value. The absolute value is calculated as “inverse every symbol digit individually, and then plus 1”. Take HFFFF of HEX format as an example, the absolute value is =H0000+1=1, in which “HFFFF” represents -1; another example of H8000 in HEX format, its absolute value =H7FFF+1=32768, in which the signed value H8000 is -32768 and it is the smallest negative value in 1 Word register. Using the same principle, the smallest negative value of 2 Word is the signed value of H80000000, which is -2, 147, 483, and 648.
进行数值比较大的加减运算时，要注意符号的处理，尤其是出现进位或借位操作时，要进行“借位标志”、“进位标志”的判断及相应处理，否则可能导致计算结果出错。
When performing addition or subtraction calculations for larger values, be cautious of the sign. It is especially necessary when performing carrying or borrowing operations. “Digits borrowing label” and “digits carrying label” must be carefully diagnosed and processed, otherwise calculation may result in errors.
无符号数，即没有符号位，默认都为正数，对于 1Word 的寄存器，其取值范围是 0～65535，有些计时、计数的应用场合，就只有正数，需按无符号数处理，在作加减运算时，需要防止计算结果溢出，导致计算错误。
Unsigned symbol value means there is no symbol sign and all is defaulted as positive value. For 1 Word register, the value-selecting range is from 0 to 65535. There is only positive value under some application circumstances, such as timing and counting circumstances. There is no need for signed symbol processing. When performing addition or subtraction operation, it is necessary to avoid calculation overflow or it may result in calculation error.
当进行逻辑运算时（如“逻辑与”、“逻辑或”等运算指令），操作数是当无符号数进行处理的，符号位（bit15）与其它位同等参与逻辑运算。
When performing logic operations (such as “AND”, “OR” operation commands), operands are processed as unsigned values. Bit15 and other equivalent digits are calculated logically together.

浮点数

Number of floating-points

浮点数在 PLC（或计算机）中用以近似表示任意实数，具体格式是由一个整数或定点数（即尾数）乘以某个基数（计算机中通常是 2）的整数次幂，这种表示方法类似于基数为 10 的科学记数法。
Floating-point numbers in a PLC (or computer) are used approximately to represent any actual numbers. The specific format uses a round number or fixed point number (odd

amount in addition to the round number) times the secondary round number of a certain base number (usually 2 in computers). This method of expression is similar to the scientific numbering system that has a base number of 10.
一个浮点数可用 m × b^e 来表示。其中 m 为尾数，形如±d.ddd...dd；b 为基数；e 为指数。例如 988436216 用十进制浮点数表示就可为 9.8844×108，因尾数有四舍五入，精度有下降。但可以看到，使用浮点数可表示更大范围的数值。
A floating-point number can be expressed as m × b^e. In the expression, m is the odd amount, which looks like ±d.ddd...dd; b is the base number; e is the index number.
For instance, use decimal floating-point format to express 988436216, then it is expressed as 9.8844 x 108. Because the odd amount is rounded up, the accuracy is lightly lower. We can see that using floating-point numbers allows greater range of values to be expressed.

由此可以看出，在计算机中表示一个浮点数，其结构如下：
From here, in order to express a floating-point in a computer, the structure is as follows:

尾数部分（定点小数）		阶码部分（定点整数）	
Odd amount (fixed point decimal)		Step codes (fixed point round number)	
数符±	尾数 m	阶符±	阶码 e
Symbol±	Odd amount, m	Step codes±	Step codes, e

在 PLC 或计算机内使用的浮点数，都采用了国际标准的格式，为了计算的方便，仪表都采用二进制浮点数格式。一个浮点数占用 32bit 的存储器单元。实际使用浮点数时，并不需要用户对浮点格式有特别的了解，计算机会对输入的实数自动作标准格式化处理。
Floating-points used in a PLC or a computer all use the international standard format. For the convenience of computing, instruments all adopt the binary floating-point format. One floating-point occupies 32-bit of register unit. When using floating-point in reality, users do not need to have thorough understanding of the floating-point format. The computer will automatically process and format the entered number as per the standards.
浮点计算是指浮点数参与的运算,这种运算通常伴随着因为无法精确表示而进行的近似或舍入。在 PLC 中有模拟量信号处理和运算时，可能用到浮点数。
Floating-point computer is referring to the operation that involves with floating-points. This type of operation is often accompanied with approximation or rounding-up due to inability to express accurately. When there are simulating signal processes and operations in a PLC, floating-point may be utilized.

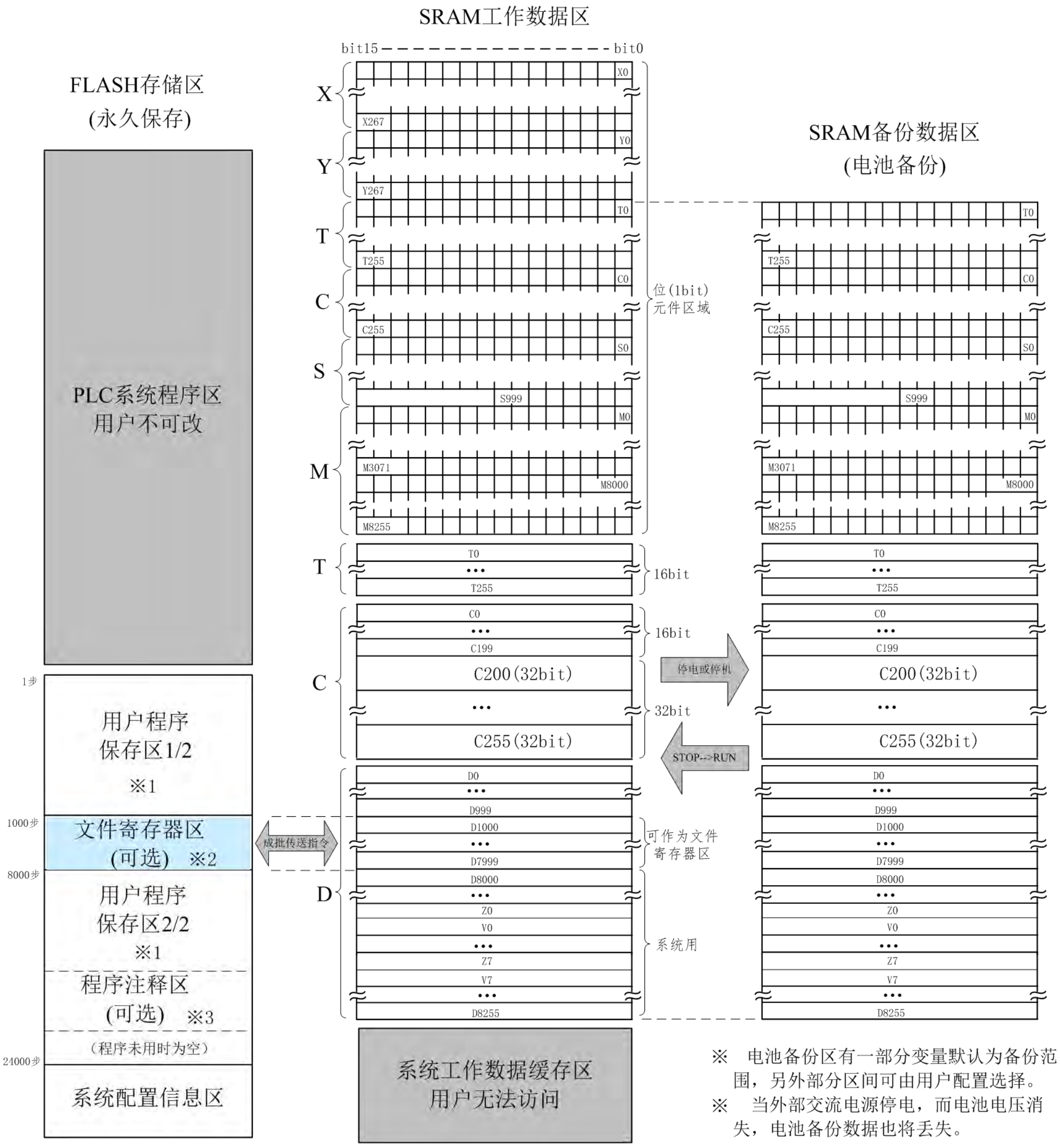
H2U 系列 PLC 的内存结构
Cache Structure of H2U Series PLC
对于微机或单片机的系统，除了 CPU 内核以外，各种特性的内存是其主要配置。H2U 系列 PLC 中有如下几种内存：
For systems equipped with microchip or single chip, beside the CPU internal processor, caches that are with different characteristics are the main devices. H2U Series PLC has the following types of cache:

类型	用途	特性

Type	Purpose	Characteristics
FLASH	保存系统程序 Save system program	永久保存 Permanent storage
	保存用户程序 Save user program	永久保存，除非人为删除，或下载刷新 Permanent storage, unless deleted manually or updated by downloads
	文件寄存器数据 File register data	永久保存，除非人为删除或改写 Permanent storage, unless deleted or edited manually
SRAM	用于存放PLC的软元件、工作数据 Used to store PLC soft components and working data	有电池供电时，即使外部停电时数据也不会丢失 When is charged by battery, data will remain even when there is an external power failure

如前所述，PLC 内的软元件有“位元件”（触点元件），有 16bit 的“字元件”（寄存器 D 、计数器 C、计时器 T 等），还有 32bit 的“双字元件”（部分高速计数器 C），在 PLC 内部如下组织：

As described earlier, soft components in a PLC consist of “bit component” (contact component), "byte component" in 16-bit (such as in register D, counter C, timer T, and etc), and “2 Word byte component” in 32-bit (some high-speed counter C). The organization in a PLC is as follows:



※1 用户程序保存区最大为24K步(Word)，存放用户程序时可自动回避文件寄存器区。

※2 文件寄存器保存区可定义，最大为7K步(Word)，占用用户程序空间。

※3 用户程序注释保存区紧接梯形图程序，空间大小由注释内容决定，共享用户程序空间。

FLASH 储存区（永久保存）

FLASH Memory (permanent storage)

PLC 系统程序区用户不可改

PLC System Program, users not modifiable

用户程序保存区 1/2*1

User Program Memory 1/2*1

文件寄存器区（可选）*2

File Register (optional) *2

用户程序保存区 2/2*1

User Program Memory 2/2*1

程序注释区（可选）*3
Program Definition (optional) *3

（程序未用时为空）
(empty when not used by program)

系统配置信息区
System Configuration Message

SRAM 工作数据区
SRAM Working Data

系统工作数据缓存区用户无法访问
System Working Data Buffer, not accessible to users

SRAM 备份数据区（电池备份）
SRAM Backup Data (battery backup)

*1 用户程序保存区最大为 24K 步（Word）,存放用户程序时可自动回避文件寄存器
*1 User program memory has the maximum of 24K Word. File register can be automatically avoided when saving user programs.

*2 文件寄存器保存区可定义，最大为 7K（Word），占用用户程序空间。
*2 File register memory can be defined with a maximum memory of 7K (Word), which will occupy user program space.

*3 用户程序注释保存区紧接梯形图程序，空间大小由注释内容决定，共享用户程序空间。
*3 User program definition memory is closely connected to the ladder diagram program. The size of space is determined by definition contents, and it shares user program space.

*电池备份区有一部分变量默认为备份范围，另外部分区间可由用户配置选择。
*Battery backup has a portion of variables that are defaulted as backup ranges. Other portions and intervals can be configured as users' desire.

*当外部交流电源停电，而电池电压消失，电视备份数据也将丢失。
*When the external AC power supply has a power failure and the backup battery has lost its battery voltage, the television backup data will be lost as well.

2.1 使用 PLC 的软件硬件需求

2.1 PLC System Requirements

项目 Item	配置要求 Configuration Requirements
电脑一台 Personal Computer x 1	PENTIUM 100MHz 以上主频；内存 256MB 以上；鼠标等 PENTIUM 100MHz or better; built-in 256MB RAM or more 运行 Windows 2000/XP 操作系统； Windows 2000/XP operating system; 硬盘剩余空间不小于 200MB； More than 200MB of hard drive free space;
AutoShop 编程软件 AutoShop Programming Software	汇川控制技术公司开发的 AutoShop 软件，安装于 PC 电脑中，用于用户程序的编写、下载、监控调试等。也可采用其他兼容机型的编程环境。 The AutoShop, developed by Inovance Control Technology Co., Ltd., is installed in PC and used for writing, downloading, monitoring, and debugging user programs. The programming software of oher compatible models may also be used.
PLC 主模块 PLC Main Module	H1U/2U 系列 PLC 主模块一只，可根据应用需要准备扩展模块 One H1U/2U Series PLC main module. Expansion modules may be prepared if required
下载电缆一条 Download cable x 1	市售 RS232-Mini DIN8 插头的 PLC 程序下载专用电缆，用于用户程序的下载、调试、监控等，还可用于 HMI 连接。 A cable with RS232-Mini DIN8 pin, used for downloading, debugging, and monitoring user programs. It may also be used for connecting HMI. 对于没有配备 DB9 型 RS232 串口的电脑，也可准备 USB-Mini DIN8 型专用下载电缆。 For PC without the DB9 RS232 serial communication port, USB-Mini DIN special-use download cable may be prepared.
电源联线和其他 Power Supply Wiring and Others	用于 PLC 供电的电源线，根据需要可准备导线、拨码开关、螺丝批等常用工具 Power cord used for power supply to PLC. Conducting wire, dial switch, screw driver, and other tools may be prepared if required.

其中 AutoShop 编程软件为汇川控制技术公司研发的编程后台软件，在该软件环境下，可进行 H1U/2U 系列 PLC 用户程序的编写、下载和监控等功能。

AutoShop programming software is a backstage programming software written and developed by Inovance Control Technology Co., Ltd. Under the programming environment, the functions of programming, downloading, and monitoring user programs can be performed in the H1U/2U Series PLC .

2.2 编程与用户程序下载

2.2 Programming and User Program Download

AutoShop 环境提供了梯形图、步进梯形图、SFC、指令表等编程语言，用户可选用自己熟悉的编程语言进行编程，根据 PLC 应用系统的控制工艺要求，设计程序。编程过程中，可随时进行按  编译，及时检查和修正编程错误。

AutoShop environment provides programming languages such as ladder diagram, step ladder diagram, SFC, command list, and etc. Users may select a familiar programming language and design and write programs according to the specific technical requirements used in the PLC system. During the programming process, compiling, real-time inspection, and error corrections can be performed at any time.

程序设计完毕，在 PLC 和电脑正常连接，并已通电的情况下，按 即可下载用户程序，程序下载完毕，将 PLC 上 RUN/STOP 拨动开关拨至"RUN"位置，PLC 即可开始运行用户程序。

After program has been designed and completed, and PLC is properly connected to a PC and powered up, press ___ to download user programs. After download is completed, flip the RUN/STOP switch of a PLC to RUN, the PLC starts operating user programs.

在 PLC 运行用户程序时，按 键即可进行运行的停止和运行命令操作；按 可监控 PLC 内各种继电器和寄存器 D 的状态和读数，在当前编程画面上显示出来，方便了程序调试。

When PLC is running the user programs, press ___ key to initiate the STOP or RESTART command; press ___ to monitor relay and register D statuses and reading in the PLC, and display the information on the current programming screen for the convenience of program debugging.

2.3 与 HMI 的配合使用

2.3 Connecting to HMI

H1U/2U 系列 PLC 提供了 MODBUS 协议，也支持 FX2N/3U 系列 PLC 的监控协议，因此目前市售的 HMI 产品，基本上都可以与 H1U/2U 系列 PLC 配合使用，包括连接电缆均可由市面购得。

Not only the H1U/2U Series PLC provides MODBUS protocol, it also supports the monitoring protocol of FX2N/3U Series PLC. Therefore, most HMI products you may find on the market are compatible with the H1U/2U Series PLC. The connection cable can also be purchased on the market.

关于 H1U/2U 系列 PLC 所支持的协议的种类和使用的详细说明，可参见 RS 通讯指令的解释。

About the types of protocol supported by H1U/2U Series PLC and their detailed instructions please refer to instructions under the RS Communication Commands.

第三章 软元件说明

Chapter 3 – Soft Component Descriptions

系统支持的软元件种类：

Types of Soft Components Supported by the System:

序号 Serial number	元件类型 Component Type	功能与分类 Features and classification
1	输入继电器 X Input Relays X	对应 PLC 的硬件开关量输入的位元件 Bit components that are used to control inputs of PLC
2	输出继电器 Y Output Relays Y	对应 PLC 的控制输出的位元件 Bit components that are used to control outputs of PLC
3	中间继电器 M Auxiliary relays M 状态继电器 S State relays S	普通中间继电器 M 位元件 Bit components that are regular medium relays 系统特殊继电器 M 位元件 Bit components that are special system relays
4	计时器 T Timers T	步进控制用状态标志位元件 Bit components that are used to control step status
5	计数器 C Counters C	具有 1ms、10ms、100ms 步长的 16bit 计时器、 16bit timers of 1ms, 10ms, 100ms steps
6	数据寄存器 D Data registers D 指针 P、I Pointers P, I	具有 16bit/32bit 增/减型计数器 16bit/32bit up/down counters 高速计数器、单/双相各种计数器 High-speed and single/two phase counter
7	常数 K、H Numerical Constants K, H 输出继电器 Y Output Relays Y 中间继电器 M Auxiliary relays M	数据寄存器 D Data registers D 数据间接寻址寄存器 V、Z Data indirect addressing registers V and Z 文件寄存器 D File registers D
8	状态继电器 S State relays S 计时器 T Timers T 计数器 C Counters C	跳转指针 P Skipping indicator P 子程序指针 P Sub-program indicator P 中断子程序 I，有高速输入、定时、计数等中断 Interruptive sub-programs I, such as high-speed input, timer, and counter
9	数据寄存器 D Data registers D	二进制、十进制、十六进制、浮点数等 Binary, decimal, hexadecimal, floating point, etc.

3.1 输入继电器 X

3.1 Input Relay X

输入继电器 X 代表 PLC 外部输入信号状态的元件，通过 X 端口来检测外部信号状态，0 代表外部信号开路，1 代表外部信号闭合。

Input relays X indicate the status of PLC external input signals. 0 means it is open and PLC receives external signals, while 1 means it is closed and PLC doesn’t receive external signals.

用程序指令方法不能修改输入继电器的状态，其接点信号（常开型、常闭型）在用户程序中都可无限次使用。

Input relay status cannot be modified by program commands. The two functions of normally open/closed contacts can be used limitlessly in user programs.

继电器信号以 X0， X1，…X7， X10， X11，等符号标识，其序号是以 8 进制方式编号。

Relay signals are identified by X0, X1… X7, X10, X11, and etc. The serial numbers are assigned by octonary.

控制器的计数器信号、外部中断信号、脉冲捕捉等功能是通过 X0～X7 端口输入。

Counter signals, external interruption signals and functions such as pulse catch of PLC are inputs through ports X0-X7.

型号 Model	输入 Input	输出 Output
H2U-1616MR/T	X000-X017	Y000-Y017
H2U-2416MR/T	X000-X027	Y000-Y017
H2U-3624MR/T	X000-X043	Y000-Y027
H2U-3624MTQ	X000-X043	Y000-Y027
H2U-3232MR/T	X000-X037	Y000-Y037
H2U-4040MR	X000-X047	Y000-Y047
H2U-6464MR/T	X000-X077	Y000-Y077
H1U-0806MR/T	X000-X07	Y000-Y005
H1U-1410MR/T	X000-X015	Y000-Y011

当接入本地扩展模块后，扩展模块上 X 端口的编号按紧接主模块上 X 端口的编号，依次向后编号，例如当主模块为 H2U-1616MR，现在要接入 H2U-1600EX 型扩展模块，因主模块最后的 X 端口编号为 X17，则扩展模块的 X 在编程时的访问编号为 X20~X37。

After connecting to the local expansion module, the X port’s serial number on the expansion module will connect tightly to the serial number of the X port on the mainframe module, and the assigned number goes on. For instance, when the serial number on a mainframe module is H2U-1616MR and the H2U-1600EX expansion module is about to make a connection, because the main module’s last X port serial number is X17, the access serial number of the expansion module’s X port must be between X20~X37 when programming the system.

注意，扩展模块的编号总是从 8 进制个位为 0 开始的，例如，当主模块为 H2U-3624MR，其最后的 X 端口编号为 X43，扩展模块的 X 在编程时的访问编号为 X50~X67，即主模块上

空缺的 X44~X47 的端口号被丢弃。扩展模块上 Y 端口也采取了同样的处理方法。
NOTE: expansion module's serial number is assigned using octonary format and start from 0. For example, when main module is H2U-3624MR and its last X port serial number is X43, the access serial number of the expansion module's X port must be between X50~X67 when programming the system. That also means that the unused X44~X47 port numbers will be discarded on the main module. The Y port on the expansion module also follows same process.
远程数字量扩展模块必须用 FROM/TO 指令来访问 X 点。具体请参考 FROM/TO 指令介绍。
Remote digital expansion module must use FROM/TO command to access X port. Please refer to FROM/TO command description for further details.

3.2 输出继电器 Y
3.2 Output Relay Y
输出继电器是直接关联到外部用户控制装置的硬件端口的软元件，在逻辑上与 PLC 的物理输出端口一一对应。PLC 每次扫描完用户程序后， 会将 Y 继电器的元件状态传送到 PLC 的硬件端口上，0 表示输出端口开路；1 表示输出端口闭合。
Output relay is directly related to the external user to control the hardware port of the software component. It corresponds to the physical output port of PLC. The component status of relay Y will be sent to the state of the hardware port on the PLC. 0 indicates that the output port is open, and 1 closed.
Y 继电器编号以 Y0， Y1，…Y7， Y10， Y11，…等符号标识，其序号是以 8 进制方式编号。Y 继电器元件可在用户程序中无限次使用；
Y relay's serial numbers use characters such as Y0, Y1… Y7, Y10, Y11, and etc. The serial numbers are assigned using octonary system. Relay device in the user program can be used an unlimited number of times.
硬件上，根据输出元件的不同，可分为继电器型、晶体管型等；若有输出扩展模块端口，按照由主模块开始，依次序进行编号。
Hardware-wise, based on the different output components being used in the system, there are types that can be used, such as relay and transistor types. If there is any output expansion module ports, similar to the main module, the serial numbers are assigned in sequence.
当接入本地扩展模块后，扩展模块上 Y 端口的编号按紧接主模块上 Y 端口的编号，依次向后编号，例如当主模块为 H2U-1616MR，现在要接入 H2U-0016EYR 型扩展模块，因主模块最后的 Y 端口编号为 Y17，则扩展模块的 X 在编程时的访问编号为 Y20~Y37。
After connecting to the local expansion module, the Y port's serial number on the expansion module will connect closely to the serial number of the Y port on the mainframe module, and numbers are assigned in sequence. For instance, when the serial number on a mainframe module is H2U-1616MR and the H2U-1600EYR expansion module is about to make a connection, because the main module's last Y port serial number is X17, the access serial number of the expansion module's X port must be between X20~X37 when programming the system.
注意：扩展模块的端口编号总是从 8 进制个位为 0 开始的。
NOTE: Expansion module's serial numbers are assigned in the octonary format and always start from 0.

远程数字量扩展模块必须用 FROM/TO 指令来访问 Y 点。
Remote digital expansion module must use FROM/TO command to access Y port.

3.3 辅助继电器 M
3.3 Auxiliary Relay M
辅助继电器 M 元件用作用户程序执行过程中的中间变量，如同实际电控系统中的辅助继电器，用于状态信息的传递，也可将多个 M 变量组成为字变量使用，M 变量与外部端口没有直接的联系，但可通过程序语句将 X 复制到 M，或将 M 复制到 Y 的方式与外界发生联系，一个 M 变量可无限次使用。
Auxiliary relays M are used as intermediate variables when user programs are in operation. Like auxiliary relays in an actual electrically-controlled system, auxiliary relays M are used to transmit status messages. Multiple M variables may also be combined and used as word variables. M variables don’t have direct relationship with external ports. but through programming languages, X can be copied to M, or copy M to Y to make contacts with outside world. One M variable can be used limitlessly.
辅助继电器 M 以 M0，M1，……M8255 等符号标识，其序号是以 10 进制方式编号。
Auxiliary relays M are identified by M0, M1, …, M8255.The serial numbers are assigned in the decimal format.
M8000 以上的变量为系统专用变量，用于 PLC 用户程序与系统状态的交互；部分 M 变量还具有掉电保存特性。
Over-M8000 variables are specifically for system use. They are used for interactions between PLC user programs and system status. Some M variables have the feature of power-failure memory.

H1U 机型
H1U Model

M 数量总计 Total number of M	一般用 General	停电保持用 Latched	特殊用 Special
1792 点 1792 points	M0-M383 M0-M383 384 点 ※1 384 points ※ 1	M284-M1535 M284-M1535 1152 点 ※3 1152 points ※ 3	M8000-M8255 M8000-M8255 256 点 256 points

H2U 机型
H2U Model

M 数量总计 Total number of M	一般用 General	停电保持用 Latched	停电保持专用 Latched dedicated	特殊用 Special
3328 点 3328 points	M0-M499 M0-M499 500 点 ※1	M500-M1023 M500-M1023 524 点 ※3	M1024-M3071 M1024-M3071 2048 点 ※3	M8000-M8255 M8000-M8255 256 点

500 points ※1 524 points ※3 2048 points ※3 256 points

※1．非停电保持区域。使用参数设定，可变更成停电保持区域。

※1. No power failure preservation areas. Parameter configuration is used; it may be modified as power failure preservation areas.

※2．停电保持区域。使用参数设定，可变更成非停电保持区域。

※2. Power failure preservation areas.Parameter configuration is used; it may be modified as no power failure preservation areas.

※3．停电保持区域，无法用参数来改变。

※3. Power failure preservation areas, cannot be modified with parameters.

可编程控制器内的一般用辅助继电器、停电保持用辅助继电器的区域分配，可通过参数设定来进行调整。

The regional distribution of the generally used auxiliary relays and the auxiliary relays that are latched in the programmable controller can be adjusted by adjusting the settings in the parameter.

可编程控制器内有大量的特殊辅助继电器。（参见系统特殊元件表）。这些特殊辅助继电器各有其特定的功能，可分为以下两类。

Inside a programmable controller there is enormous amount of special auxiliary relays. (Please refer to system special component chart). These special auxiliary relays have their unique functions, and they can be divided into the following two categories.

触点利用型的特殊辅助继电器，为 PLC 系统自动驱动线圈，用户程序只能读取使用，如：

Contact point-oriented auxiliary relays. They are used as the automatic driving coils for a PLC system. User programs can only read and use them to:

M8000：运行监视器（在运行中接通），常用于需要驱动信号的指令之前。

M8000: operate monitor (connect during operation). It is often used before the command that requires initiation signals.

M8002：初始脉冲（仅在运行开始时瞬间接通），常用于只需执行一次初始化指令。

M8002：The initial pulse (only connect shortly at the beginning of operation), it is commonly used as the initialization command.

M8012：100ms 时钟脉冲，用于产生固定间隔翻转的信号。

M8012：100ms clock pulse. It is used to generate a signal at during regular interval flips.

线圈驱动型特殊辅助继电器，为用户程序驱动线圈，用于控制 PLC 的工作状态和执行模式等，如：

Coil driven auxiliary relays. They are used as the driving coil of user programs. It is used to control PLC’s working status and operation modes. Such as:

M8030 ：电池发光两极管熄灯指令

M8030 ：The command for battery lighting and polar tube lighting.

M8033 ：停止时保持输出

M8033 ：Continue exporting when stopping

M8034 ：输出全部禁止

M8034 ：Total ban on export

M8039 ：恒定扫描

M8039 ：Constant Scanning

请注意，存在驱动时有效与 END 指令执行后有效两种情况；用户不可使用尚未定义的特殊辅助继电器。

NOTE: there are two situations after executing the command; one, the command will be in effect after initiation; two, the command will be in effect after END command has been executed. Users cannot use auxiliary relays that have not been defined yet.

可以将连续的 M 变量按字节或字来进行访问（读或写），例如：

One may perform access (read or write) to the continuous M variables based on byte or bit. For example:

其中 K4M100 表示将 M100、M101、M102……M115 共 16 个单元，组成一个字的单元进行读操作，（M100 作为字的 bit0……M115 作为字的 bit15），这样可提高编程效率。

K4M100 will group these 16 units from M100, M101, M102, …, to M115 into an unit of 1 Word to perform readout operation (M100 will become bit0…M115 will become bit15). This can help to increase programming efficiency.

3.4 状态继电器 S

3.4 Status Relay S

状态继电器 S 用于步进程序的设计和执行处理，利用 STL 步进指令控制步进状态 S 的转移，简化编程设计。

State relays S is used to design and handle step procedures, control the transfer steps of the state S by STL step instructions, and simplify programming.

若没有采用 STL 编程方式，S 可当作普通的位元件，就如 M 变量一样来使用。状态 S 变量以 S0，S1……S999 等符号标识，其序号是以 10 进制方式编号。部分 S 变量具有掉电保存功能。 如下表：

If STL programming method is not adopted, S can be treated as an ordinary bit component and used as M variables. Status S variables use S0, S1, …, S999 as their symbols and signs. The serial numbers are assigned using decimal system.

Part of the S variable has the function of power-down save.

See the following table:

H1U 机型

H1U Model

一般用 General use	停电保持用 Latched	报警器用 Alarm Used
S0-S9	S10-S899	S900-S999
S0-S9	S10-S899	S900-S999
（10）点	890 点 ※3	100 点※3
10 points	890 points ※3	100 points ※3

H2U 机型
H2U Model

一般用 General use	Latched	停电保持用 Latched	报警器用 Alarm Used
S0-S499	S0-S9	S500-S899	S900-S999
S0-S499	S0-S9	S500-S899	S900-S999
500 点 ※1	（10）点	400 点 ※2	100 点※2
S0-S499 (500) ※1	10 points	400 points ※2	100 points ※2

※1：非停电保持区域。通过参数的设定可变更成停电保持的区域。
※1. No power failure preservation areas.
Through parameter configuration it may be modified to power failure preservation areas.
※2：停电保持区域。通过参数的设定可变更成非停电保持的区域。
※2. Power failure preservation areas. Through parameter configuration it may be modified to non-power failure preservation areas.
※ 3．停电保持区域，无法用参数来改变。
※3. Power failure preservation areas, cannot be modified with parameters.

3.5 计时器 T
3.5 Timer T

计时器用于完成定时功能。每个计时器含有线圈、接点、计数时值寄存器，当计时器线圈“得电”（能流有效）时，计时器开始计时，若计时值达到预设的时间值时，其接点动作，a 接点（NO 接点）闭合，b 接点（NC 接点）断开。若线圈“失电”（能流无效）时，计时器的接点恢复初始状态，计时值自动清除。也有部分计时器具有累计、掉电保持等特性，重新上电后仍维持掉电前的数值。

The timer is used to perform the timing function . Every timekeeper includes coil, contacts, and counter time value register. When the timekeeper coil is “electrified” (effective power flow), timekeeper will start timing. When the timed value reaches the default valve, a point (NO contact point) closes and b point (NC contact point) disconnects. If coil “loses power” (ineffective power flow), timekeeper’s contact points are re-initialized and the timing value will automatically be cleared. There are some timekeepers that have other features such accumulation and power drop preservation, in which the values before the power-drop will remain after re-startup.

计时器 T 以 T0，T1……T255 等符号标识，其序号是以 10 进制方式编号。计时器有不同的计时步长，如有 1ms、10ms、100ms 等，部分具有掉电保持特性，H1U、H2U 如下表说明：

Timekeeper T uses T0, T1…T255 as its symbols and the serial numbers are assigned using the decimal system. Timekeeper has different timing intervals, such as 1ms, 10ms, 100ms, etc. Some have the power drop preservation feature. H1U and H2U are described in the following chart:

100ms Type	100ms type	10ms type	1ms type

0.1~3276.7s	0.01~327.67s	0.01~327.67s	0.001~32.767s
T0~T199 共 200 点；T0~T199, 200pts in total 其中 T192~T199 可用于中断/子程序 Among them T192~T199 can be used for interruption/sub-program	T200~T245 T200~T245 共 46 点 46pts in total	T246~T249 T246~T249 共 4 点 4pts in total 执行中断的保持用 Used for execution and maintenance of interruption	T250~T255 T250~T255 共 6 点 6 points 保持用 Used for preservation

- 没有用作定时器使用的定时器编号，也可用作数值存储用的数据寄存器。

Timer serial numbers that is not being used by the timer can be used as data registers that are used to store data.

- 定时器累计可编程控制器内的 1ms，10ms ，100ms 等的时钟脉冲，当计时的时间达到设定数值时，其触点只有在执行线圈指令或 END 指令时，输出触点才能动作。

Timer accumulation is able to program the clock pulse in the controller, such as 1ms, 10ms, 100ms. When timekeeper's time reaches the default value, its output contacts will only activate when perform coil commands or the END command.

- 采用程序存储器内的常数（K）作为设定值．也可用数据寄存器（D）的内容进行间接指定。注意，D 的内容必需在开始计时前设定好，当开始计数后，D 的数据变化只有在下一次启动计时的时候才能生效。

Use the constant (K) value in the program store as the setup value; or the contents in the data register may also be used to perform interval designation.

NOTE: D's contents must be configured before timekeeper starts. After it starts, data changes for D will only take effect after the startup of next timekeeping.

- 从驱动定时器的线圈开始到定时器的触点动作，可能的定时长度说明如下：

The timing length from activating timer's coil to the timer's contact actions are described as follows:

最长的情况为（T+T0+a），其中：T 为设定的定时时间；T0 为程序扫描执行时间；a 为定时器的计时步长。

The longest situation is (T+T0+a), and in the equation: T is the time that's been set up; T0 is the operation time for scanning programs; a is the timer's timing interval.

最短的的情况为（T－a）。

The shortest situation is (T-a).

若计时器的触点指令位于线圈指令之前，最不理想的定时长度为（T+2T0）。

If timekeeper's contact commands are used before coil commands, the worst timing length is (T+2T0)

- 利用定时器的 b 触点，可以实现延时断开、自激振荡的输出信号等。

Using the timer's b contact point allows one to realize the output signals of delayed disconnection and self-motivated shocks.

- PLC 还提供了特殊定时器指令，如 TTMR、STMR 等，请参见相应指令的说明。

PLC also provides other special timer commands, such as TTMR, STMR, and etc. Please refer to these commands instruction descriptions.

【使用举例 1】：普通计时器 T200 为 10ms 步长的计数器，实际动作延迟为 150×10ms＝1500ms，即 1.50s，动作原理为：

【Illustration 1】: the normal T200 timekeepers are timekeepers that have intervals in 10ms. The actual action is delayed as 150 x 10ms = 1500ms, which is 1.50s. The operation principle is:

【使用举例 2】：对于有掉电保持的计时器 T250，驱动信号为 OFF，或 PLC 掉电时，其内部计数值维持不变，下次驱动信号为 ON 时，继续计时，直到满足计时到设定值时，输出触点闭合。当复位计时器线圈时，计时值清除，输出触点断开，如下图。因计数器 T250 为 100ms 步长的，实际动作延迟累计为 150×100ms＝15000ms，即 15.0s，即图中的（t1＋t2）时间：

【Illustration 2】: for the T250 timekeeper that has the power-drop preservation feature, the activating signal is OFF; or when PLC has a power-drop, its internal counting value remains. If the next activating signal is ON, the timing will continue until it reaches the default value and the output contacts are closed. When resetting timekeeper coils, timing value will be cleared and the output contacts will be disconnected. See illustration below. The T250 timekeeper that has 100ms intervals, the actual action will be delayed and accumulated to 150 x 100ms = 15000ms, which is 15.0s. It has the same time (t1 + t2) as demonstrated in the illustration.

【使用举例 3】：定时器的设定动作值可通过寄存器 D 来进行设定，如下图。（计数器计时过程中，若寄存器 D 内数值变化时，在下一次计时器启动时生效。

【Illustration 3】: Timer’s setting action value can be set up through register D. See illustration below. During the counter’s timing process, if there is any value change in register D, the changes will take effect after the timekeeper has been restarted.）

3.6 计数器 C

3.6 Counter C

计数器用于完成计数功能，每个计数器含有线圈、接点、计时时值寄存器，每当计数器线圈的驱动信号由 OFF→ON 时，计数器器读数增加 1，若计时值达到预设的时间值时，其接点动作，a 接点（NO 接点）闭合，b 接点（NC 接点）断开；若清除计时值，输出 a 接点即断开，b 接点（NC 接点）闭合。部分计时器的具有掉电保持、累计等特性，重新上电后仍维持掉电前的数值。

Counter is used for counting purpose. Every counter consists of coil, contact points, and timing value register. Every time when counter coil’s driving signal is switched from OFF to ON, counter reading increases by 1. If timing value reaches the setting value, its contact points’ actions: a contact (NO point) closed and b contact (NC point) disconnected; when timing value is cleared, a contact will be disconnected while b contact (NC point) will be closed.

Some of the counters have the option to maintain values when powered-down. Select the appropriate counters according to need when using.

计数器以 C0，C1，……C255 进行标识，顺序按 10 进制编号。

Counter uses C0, C1…C255 as its symbols, and the sequence is assigned using the decimal system.

计数器中有 16bit、32bit 宽度；有单向计数型、增减计数型、双相计数型等，部分计数器的计数值还具有掉电保持特性等，使用时根据需要选择合适的计数器。

Counter also has 2 bandwidth: 16bit and 32bit. There are different types of counters, such as one-way counting, plus/minus counting, two-phase counting, and etc. Some counter’s counting value also has the feature of power-drop preservation. Therefore, when selecting suitable counters, all the necessary requirements must be considered accordingly.

H1U 机型

H1U Model

16 位顺/计数器 16bit sequence/counter 0~32，767 计数 0~32, 767 counts		32 位顺/计数器 32bit sequence/counter -2，147，483，648~+2，147483647		
一般用 General	停电保持用 Latched	一般用 General	停电保持用 Latched dedicated	高速计数器 High-speed counter
C0~C15	C16~C199	C200~C219	C220~C234	C235~C255
C0~C15	C16~C199	C200~C219	C220~C234	※3
16 点 ※1	184 点 ※3	20 点 ※1	15 点 ※3	
16 points ※1	184 points ※3	20 points ※1	15 points ※3	

H2U 机型

H2U Model

16 位顺/计数器 16bit sequence/counter 0~32，767 计数 0~32, 767 counts		32 位顺/计数器 32bit sequence/counter -2，147，483，648~+2，147483647		
一般用 General	停电保持用 Latched	一般用 General	停电保持用 Latched	高速计数器 High-speed counter
C0~C99	C100~C199	C200~C219	C220~C234	C235~C255
100 点 ※1	100 点 ※2	20 点 ※1	15 点 ※2	※2
100 points ※1	100 points ※2	20 points ※1	15 points ※2	

※1 非停电保持区域。通过设定参数可变更成停电保持区域。

※1. Non power failure preservation areas.

Through parameter configuration, it may be modified as power failure preservation areas.

※2 停电保持区域。通过设定参数可变更成非停电保持区域。

※2. Power failure preservation areas. Through parameter configuration, it may be modified as non power failure preservation areas.

※3 停电保持区域。不可通过参数的设定变更。
※3. Power failure preservation areas. It can not be changed by setting the parameters.

不作为计数器使用的计数器编号，可以作为数据记忆用的数据寄存器使用。
A counter number not used as a counter, can be used as a data register to store data
对于 32bit 计数器 D200～D234，由特殊辅助继电器 M8200～M8234 作为增计数/减计数器切换控制，见下表：
For 32bit counter D200~D234, use the auxiliary relay M8200~M8234 as a switch control between adding/subtracting counter. See chart illustrated below.

计数器 NO. Counter No.	方向切换 Direction Switch	计数器 NO. Counter No.	方向切换 Direction Switch	计数器 NO. Counter No.	方向切换 Direction Switch	计数器 NO. Counter No.	方向切换 Direction Switch
C200	M8200	C209	M8209	C218	M8218	C226	M8226
C201	M8201	C210	M8210	C219	M8219	C227	M8227
C202	M8202	C211	M8211	—	—	C228	M8228
C203	M8203	C212	M8212	C220	M8220	C229	M8229
C204	M8204	C213	M8213	C221	M8221	C230	M8230
C205	M8205	C214	M8214	C222	M8222	C231	M8231
C206	M8206	C215	M8215	C223	M8223	C232	M8232
C207	M8207	C216	M8216	C224	M8224	C233	M8233
C208	M8208	C217	M8217	C225	M8225	C234	M8234

16bit 计数器与 32bit 计数器的特点如下表所示。可按计数方向的切换与计数范围的使用条件来分开使用。
16bit counter and 32bit counter’s characteristics are illustrated in the chart below. It can be used separately according to the switching of counting directions and the counting range requirements.

项目 Item	16 位计数器 16bit counter	32 位计数器 32bit counter
计数方向 Counting direction	顺数 In sequence	顺/倒切换使用（见上表） Sequence/Reverse (see above)
设定值 Setting	1~32，767	-2，147，483，648~+2，147483647
指定的设定值 Designated Setting	常数 K 或数据寄存器 Constant K or Data Register	常数 K，也可用 2 个 D 数据寄存器 Constant K, 2 D data registers may be used
当前值的变化	顺数后不变化	顺数后变化（循环计数器）

Current value changes	No change sequence	Changes after sequence (loop counter)
输出接点	顺数后保持动作	顺数保持动作，倒数复位
Output contact	Remain action after sequence	Remain action in sequence, and reset when reversed
复位动作	执行 RST 命令时，计数器的当前值为零，输出接点复位	
Reset	When executing the RST command, the counter's current value returns to zero and the output contact resets	
当前值寄存器	16 位	32 位
Current value register	16bit	32bit

16bit 计数器

16bit counter

● 一般用计数器和停电保持用状态的分配，可通过系统参数配置进行变更设定。

The distribution between common counter and the power failure preservation status can be modified and configured through system parameter settings.

● 对于 16bit 计数器，其有效设定值为 K1～K32，767 (10 进制常数)；设定值 K0 和 K1 具有相同效果，即在第一次计数开始时输出触点就动作。如下例：

For a 16bit counter, the valid setting is between K1~K32, 767 (decimal constant); Setup value K0 and K1 carry the same effect, where the output contact will activate when first counting starts. See following illustration:

计数输入 X5 每驱动 C10 线圈一次，计数器的当前值就增加，在执行第 9 次的线圈指令时.输出触点动作。以后即使计数输入 X5 再动作，计数器的当前值不变。如果复位输入 X6 为 ON，则执行 RST 指令，计数器的当前值清为 0，输出触点复位。

Every time when C10 coil is activated by the counting input X5, the counter's present value increases. When carrying out the ninth coil command, output contact activates. Even if the counting input X5 activates again afterward, the present value of the counter remains the same. If reset input X6 is ON, the RST command will be executed, count's present value will be cleared to 0, and output contact resets.

● 计数器的设定值，除用上述常数 K 设定外，还可由数据寄存器编号指定。如上例中，指定 D20 ， 如果 D20 的内容为 9，则与设定 K9 是一样的。

Counting settings: Not only it uses the above-mentioned K constant, it can also be assigned by the data register. Use the above illustration as an example, D20 is assigned. If D20's content is 9, it has the same setting as K9.

● 在以 MOV 等指令将设定值以上的数据写入当前值寄存器时，则在下次输入时，输出线圈接通，当前值寄存器变为设定值。

When using the MOV command to write these data into the current value register, the value saved in the register will become the new setting value after the output coil has been connected.

● 对于一般用计数器，如果切断可编程控制器的电源，则计数器的计数值被清除，而停电保持用的计数器则可存储停电前的计数值，因此计数器可接着上一次数值累计计数。

For other commonly used counter, count value will be cleared if the programmable controller’s power was disconnected. Counters with the power failure preservation feature will be able to store the count value before the power failure. Therefore, the counter can continue counting from the last accumulated value.

32bit 计数器

32bit counter

● 对于 32bit 计数器，增计数 / 减计数的设定值有效范围为-2，147，483，648～+2，147483647(10 进制常数)，可用常数 K 或数据寄存器 D 的内容进行设定。利用特殊的辅助继电器 M8200~M8234 指定增计数 / 减计数的方向，如果对 C△△△驱动 M8△△△，则为减计数，不驱动时，则为增计数。

For 32bit counters, the effective settings range for a increase/decrease counter is -2, 147, 483, 648,~+2, 147483647 (decimal constant). Constant K or data register D's contents can be used for configuration. Using the auxiliary relay M8200~M8234 to assign the directions of increase/decrease counting. If M8△△△ is used to activate C△△△, then it is to decrease counts. If not activated, it is to increase counts.

当前值的增减与输出触点的动作无关，但是如果从 2，147，483，647 开始增计数，再输入一个脉冲后，则成为-2，147，483，648 。同样，如果从-2，147，483，648 开始减计数，再输入一个脉冲，则成为 2，147，483，647。(这类动作被称为环形计数)；如果复位输入 X11 为 ON，则执行 RST 指令，计数器的当前值变为 0，输出触点也复位。

Present value’s increase or decrease has no relation to the output contact’s action. However, if count increases are starting from 2, 147, 483, and 647, after a pulse has been entered, then it becomes -2, 147, 483, 648. Similarly, if count decreases are starting from -2, 147, 483, 648, after a pulse has been entered, it becomes 2, 147, 483, 647. (This type of behavior is called loop count); if reset input X11 is ON, the RST command will be executed. The counter’s present value becomes 0 and the output contact resets.

● 使用供停电保持用的计数器时，计数器的当前值、输出触点动作与复位状态停电保持。

When using counter reserved for power failure preservation, the counter’s current value, output contact action, and reset status will remain after power failure.

● 32bit 计数器也可作为 32bit 数据寄存器使用。但是，32bit 计数器不能作为 16 位应用指令中的软元件。

32bit counter can also be used as a 32bit data register. However, 32bit counter cannot be used as a soft component in any 16bit application commands.

● 在以 DMOV 指令等把设定值以上的数据写入当前值数据寄存器时，则在以后的计数输入时可继续计数，触点也不变化。

When using the DMOV command to write setup data into the current data registers, any hereafter count inputs can continue counting and the contacts will have no change.

● 对于 16bit 计数器，最高位（bit15）为符号位，处理的数据为 0～32767 范围，即只能为正数；

For a 16bit counter, the highest bit (bit15) is a sign digit. The processing data range is 0~32767, which means it can only be positive value.

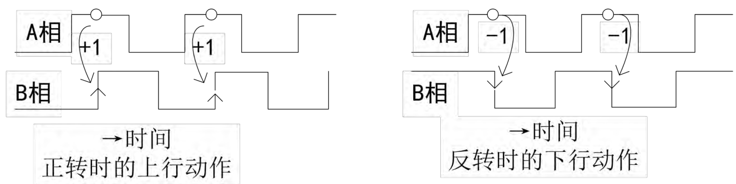
● 对于 32bit 计数器，最高位（bit31，即高字节的最高位）为符号位，处理的数据范围为-2，147，483，648～2，147，483，647；

For a 32bit counter, the highest bit (bit31, the highest byte) is a sign digit. The processing

data range is -2, 147, 483, 648~2, 147, 483, 647;
高速计数器
High-speed counter
H1U/2U 系列 PLC 的内置高速计数器如下表所示，按计数器的编号（C）分配在输入 X000~X007。
H1U/2U Series PLC's built-in high-speed counter is illustrated as the following chart. The counter's serial numbers (C) are assigned in inputs X000~X007.
而不作为高速计数器使用的 X 输入端口可在顺控程序内作为普通的输入继电器使用。.此外，不作为高速计数器使用的高速计数器编号也可作为数值存储用的 32 位数据寄存器使用。
For X input ports that are not being used by high-speed counter can be used as a regular input relays in sequential control programs. Besides, high-speed counter serial numbers that are not being used by the high-speed counter can also be used by the 32bit data registers for the purpose of storing data.

- 高速计数器有如下几种类型：

High-speed counters have the following types:
1）1 相 1 计数型，只需要 1 个计数脉冲信号输入端，由对应的特殊 M 寄存器决定为增计数或减计数；部分计数器还具有硬件复位、起停的信号输入端口；
1) Single-phase Single Count. Only one counting pulse signal input port is required. The corresponding M register determines whether it performs increase/decrease counting. Some counters are even equipped with signal input ports for hardware reset, startup, and stop.
2）1 相 2 计数型，有 2 个计数脉冲信号输入端，分别为增计数脉冲输入端和减计数脉冲输入端；部分计数器还具有硬件复位、起停的信号输入端口；
2) Single-phase Double Count. There are two counting pulse signal input ports. One for increase counting pulse signals another for decrease counting pulse signals. Some counters are even equipped with signal input ports for hardware reset, startup, and stop.
3）2 相 2 计数型，即 AB 两相计数脉冲计数器，是根据 AB 两相的相位决定计数的方向，计数方法是：当 A 脉冲为高电平时，B 相的脉冲上升沿作加计数，B 相的脉冲下降沿作减计数。通过读取 M8251-M8255 的状态，可监控 C251-C255 的增计数 / 减计数状态。
3) Two-phase Double Count. It is also called AB Two-phase counting pulse counter. The counting direction is determined by the phase status of A and B phases. The way it counts is: when A pulse is at high electrical level, counts will increase when B phase's pulse rises, and decrease when falls. C251-C255's increase/decrease counting status can be monitored through M8251-M8255 readout statuses.



A 相
A phase
B 相
B phase

时间正转时的上行动作
Ascending action when time is in sequential rotation

时间反转时的下行动作
Descending action when time is in reverse rotation

双相式编码器输出的是有 90 度相位差的 A 相和 B 相，据此高速计数器自动地进行增计数／减计数动作。
Two-phase encoder exports A phase and B phase that has a 90 degree phase difference from each other. Base on this, the high-speed counter automatically perform the increasing/decreasing counting.

● 通过特殊变量的设定，可以进行 4 倍频的 AB 相计数，可提供计数精度。
Through special variables setting, AB phase counting with 4 times of frequency can be carried out. It can also provide counting accuracy.

● 部分计数器还具有硬件复位、起停的信号输入端口。
Some counters still have signal input port for hardware reset, startup, and stop.

项目 Item	单相单计数输入 Single-phase single counting input	单相双计数输入 Single-phase double counting input	双相单双计数输入 Two-phase single/double counting input
计数方向的指定 Designating counting direction	根据 M8235-M8245 的启动与否，C235-C245 作增/减计数。 C235-C245 performs increasing/decreasing counting based on M8235-M8245's startup status.	对应于增计数输入或减计数输入的动作，计数器自动地增/减计数。 In response to increasing counting input or decreasing counting input, the counter automatically increases/decreases counts.	A 相输入处于 ON 同时，B 相输入处于 OFF→ON 时增计数动作，ON→OFF 时减计数动作。 When A phase input is ON and B phase input is from OFF to ON, it increases counts; when from ON to OFF, it decreases counts.
计数方向监控 Counting direction monitoring		通过监控 M8246-M8255，可以知道增（OFF）减（ON）情况 Through monitoring M8246-M8255, one can observe the increase (OFF)/decrease (ON) status.	

［U］：增计数输入；［D］：减计数输入；［A］：A 相输入；
[U]: increase counting input; [D]: decrease counting input; [A]: A phase input;

[B]：B 相输入；　[R]：复位输入；　[S]：启动输入
[B]: B phase input; [R]: reset input; [S]: startup input
增计数/减计数切换用特殊辅助继电器　计数方向监控用特殊辅助继电器
Auxiliary relay switch for increase/decrease counts Auxiliary relay for counting direction monitoring

种类 Types	计数器号 Counter No.	UP/DN 指定 UP/DN Designation
单相单计数输入 Single-phase single counting input	C235	M8235
	C236	M8236
	C237	M8237
	C238	M8238
	C239	M8239
	C240	M8240
	C241	M8241
	C242	M8242
	C243	M8243
	C244	M8244
	C245	M8245
	C235	M8235

种类 Types	计数器号 Counter No.	UP/DN 监控 UP/DN Monitoring
单相双计数输入 Single-phase double counting input	C246	M8246
	C247	M8247
	C248	M8248
	C249	M8249
	C250	M8250
双相双计数输入 Single-phase double counting input	C251	M8251
	C252	M8252
	C253	M8253
	C254	M8254
	C255	M8255

● 高速计数器编号与对应的 X 端口配套使用，即指定了高速计数器 Cxxx 后，对应的 X 输入端即被指定，故编程时不要让 X 端口有重复使用的情况，否则会出错。定义如下表：
High-speed counter’s serial numbers should be used in pairs with the corresponding X ports. It means that after assigning high-speed counter Cxxx, the corresponding X input port should also be designated. So that X ports will not be used repeatedly when programming. Definitions are as follows:

分配输入	单相单计数输入 Single-phase single counting input

Distribution Input	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245
X000	U/D						U/D			U/D	
X001		U/D					R			R	
X002			U/D					U/D			U/D
X003				U/D				R			R
X004					U/D				U/D		
X005						U/D			R		
X006										S	
X007											S

双计数及 A/B 相计数器如下表：
Double count and A/B phase counter:

分配输入 Distribution Input	单相单计数输入 Single-phase single counting input					A/B 相计数 A/B Phase Count				
	C246	C247	C248	C249	C250	C251	C252	C253	C254	C255
X000	U	U		U		A	A		A	
X001	D	D		D		B	B		B	
X002		R		R			R		R	
X003			U		U			A		A
X004			D		D			B		B
X005			R		R			R		R
X006				S					S	
X007					S					S

U：上升输入 ；D：下降输入 ；A：A 相输入 ；B：B 相输入 ；R：复位输入 ；S：开始输入

U: Ascension input; D: Descension input; A: A phase input; B: B phase input; R: reset input; S: startup input

H1U 机型 1 相输入的 X0、X1 输入点可达 60KHz，X2~X5 输入点可达 10KHz。

H1U Model Single-phase input's X0, X1 input points can reach 60KHz, whereas X2~X5 can reach 10KHz.

H2U 机型 1 相输入的 X0~X5 输入点均可达 100KHz（H2U¬—2416MR/MT、H2U¬—3624MR/MT 的 X0~X5 为 10KHz），且没有总频宽的限制。

H2U Model Single-phase input's X0~X5 input points can all reach 100KHz (H2U-2416MR/MT, H2U-3624MR/MT's X0~X5 are 10KHz. There is no limitation on total bandwidth.

AB 相的最大输入频率要降半使用，如果是采用四倍频，则降为四分之一，例如 H2U 机型的 C251 为 AB 相计数，占用 X0、X1，在一倍频的时候最大输入频率是 50 KHz，在四倍频

时(M8195 为 ON)最大输入频率是 25 KHz。
AB phases’ maximum input frequency must be reduced to half before using it. If four times of frequency is used, it must be reduced to 1/4 first. For instance, H2U Model’s C251 is using AB phases counting and it occupies X0 and X1. The maximum input frequency is at 50KHz. When using under four times of frequency (M8195 is ON), the maximum input frequency would be 25KHz.
不作高速计数器使用的输入端子、可以作一般输入使用。
Input ports that are not being used by the high-speed counter can be used for general input ports.
【表的阅读举例 1】
【Chart Illustration 1】
表中 C235 为单相单输入计数，使用 X0 输入口，不需要中断复位与中断启动端口；
In the chart, C235 is single-phase single input counting, and it uses X0 input port. There is no need for interruption reset and interruption startup ports;
如果使用 C235 计数器，即默认使用了 X0 输入端口，便不可再使用 C241，C244，C246，C247，C249，C251，C252，C254 和中断 I00 口或者 M8170（脉冲捕捉），因为这些计数器、中断、脉冲捕捉也需用到 X0 端口，形成了端口冲突。
If C235 counter is used, X0 input port is used by default. Therefore, C241, C244, C246, C247, C249, C251, C252, C254, interruption I00 port, or M8170 (pulse capture) cannot be used. It is because the counter, interruption, and pulse capturing all need to use X0 port, and it may result in port conflict.
【表的阅读举例 2】
【Chart Illustration 2】
表中 C254 为 2 相 2 输入计数器，即 AB 相计数器，
In the chart, C254 is a two-phase double input counter, or call AB phase counter.
X0 口作为 A 相输入，X1 口作为 B 相输入，X2 口作为中断复位输入，X6 口作为中断启动输入；
X0 port will be used for A phase input; X1 port will be used for B phase input; X2 port will be used for interruption rest input; X6 port will be used for interruption re-startup input;
如果使用 C254 计数器，即默认使用了 X0、X1、X2、X6 输入端口，与这些端口相关的计数器、中断口或者脉冲捕捉等，便都不能再使用了。
If C254 counter is used, X0, X1, X2, and X6 input ports are used by default. All other counters, interruption ports, or pulse capturing that is associated with these ports can no longer be used.
计数器使用说明：
Counter user instruction manual:
● 高速计数器根据特定的输入执行动作，在相关信号的跳变沿，采用中断方式处理进行高速动作，故与 PLC 的扫描时间无关。
High-speed counter will only activate according to specific commands. At the switching edges of relevant signals, it uses interruptive method to process and perform high-speed motion. Therefore, it has no relation to PLC’s scanning time.
● 高速计数器的当前值达到设定值时，如要立即进行输出处理，请使用高速脉冲比较指令 HSCS、HSCR、HSZ 等应用指令，具体参见指令解释。
When high-speed counter’s current value reaches the setup value, if immediate output

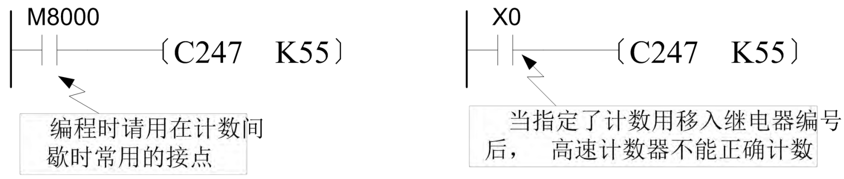
process is required, please use high-speed pulse comparative commands such as HSCS, HSCR, and HSZ. Please see command descriptions for further details.

● 高速计数器的当前值达到设定值时，如要立即进行一些逻辑处理，可使用高速计数中断，使用高速脉冲比较指令 HSCS，将指令的操作指定为 I0x0 中断（其中 x＝1~6 中断号），当然必需编写好对应中断号的子程序。

When high-speed counter’s current value reaches the setup value, if immediate logic process is required, high-speed counting interruption may be used. Use high-speed pulse comparative command HSCS and assign command operation to I0x0 interruption (x=1~6 interruption signal). Please ensure that the corresponding interruptive sub-programs have been properly programmed.

● 高速计数器的线圈驱动用触点，在高速计数时，请采用一直接通的触点。

High-speed counter coil-driven contact: under high-speed counting, please use contacts that have always been connected.



编程时请用在计数间歇时常用的接点

When programming, please use commonly used contacts between counting intervals.

当指定了计数用移入继电器编号后，高速计数器不能正确计数

After assigning relay serial numbers for counting purpose, high-speed counter cannot count correctly.

● 如果对高速计数器的线圈编程，则与其对应的输入继电器的输入滤波器会自动变为 20 s(X000，X001)，或 50 s(X002-X005)（初始值为 10ms)。此外，不作为高速计数器输入使用的输入继电器的输入滤波器维持初始值 10ms。

When programming the coil for the high-speed counter, the corresponding input relay’s input wave filter will automatically become 20s (X000, X001) or 50s (X002-X005) (initial value is 10ms). Moreover, the input wave filter of the input relay that is not being used by high-speed counter input will remain its initial value of 10ms.

● A/B 相高速计数器 C251～C255 有 1 倍频和 4 倍频两种频率模式，分别由特殊寄存器 M8195～M8199 设定，见下例：

A/B phase high-speed counter C251~C255 has two frequency modes: double and four times. They can be configured separately by the special register M8195~M8199. See following illustration:

● 高速计数器均采用了硬件方式计数，对输入脉冲的总频率没有软件方面的限制；双相高速计数器的信号，占用两个脉冲输入口，对 PLC 的等效脉冲数影响按 2 倍计算，若 C251～C255 的 A/B 输入 4 倍频模式时，为软件计数模式，高速输入频率降为 25kHz。

High-speed counters all use hardware counting method, which has no soft component limit over the input pulse’s overall frequency. Two-phase high-speed counter’s signal occupies two pulse input ports, and its equivalent pulse number toward PLC is calculated two-folded. If C251~C255’s A/B input uses four times of frequency, it is in the soft component counting mode and the high-speed input frequency drops to 25kHz.

● 由于高速 X 计数、高速 Y 脉冲输出均采用中断方式进行处理，故信号路数较多时，可能会影响程序的执行速度，向高速计数器输入信号时，其所用频率要低于上述频率。如果输入超过这一频率的信号，可能会发生监视定时器（WDT）错误。

Because high-speed X counting and high-speed Y pulse inputs all use interruptive method to process, programs operating speed may be affected when there are multiple signal channels. When inputting signals to the high-speed counter, the frequency used must be lower than the frequency mentioned above. If the signal's frequency exceeds the limit, it may lead to error in monitoring timer (WDT).

3.7 寄存器 D

3.7 Register D

数据寄存器 D

Data Register D

寄存器用于数据的运算和存储，如对定时器、计数器、模拟量参数的运算和存储等，每个寄存器的宽度为 16bit。若采用 32bit 指令，则自动将相邻的 2 个寄存器组成为 32bit 寄存器使用，地址较低的为低字节，而地址较高的为高字节。

Registers are used for the calculation and storage of data, such as timer, counter, simulative variable parameters, etc. Every register’s bandwidth is 16bit. If 32bit command is used, it will automatically combine two neighboring registers into 32bit register. Registers with lower addresses are low bytes, higher addresses are high bytes.

H2U 系列 PLC 多数指令中参与运算的数据是按有符号数进行处理的，对于 16bit 的寄存器，bit15 为符号位，0 表示正数，1 表示负数（对于 32bit 的寄存器，高字节的 bit15 为符号位），数值范围为-32，768~+32，767。

Among the commands of H2U Series PLC, data are processed according to its signs. For 16bit registers, bit15 is the sign digit. 0 represents positive while 1 represents negative values. (for 32bit registers, bit15 in high byte is the sign digit) The value ranges are -32, 768~+32, 767.

当需要处理 32bit 的数据时，可将相邻的 2 个 D 寄存器组成为 32bit 双字，例如以 32bit 格式访问 D100 时，此时将高地址 D101 寄存器作为高字，同时将高字节的 bit15 作为双字的符号位，可处理-2，147，483，648-2，147，483，647 的数值。

When 32bit data are processed, two neighboring D registers can be combined into 32bit 2 Word. For example, when accessing D100 in 32bit format, turn the high address D101 register into high byte. Meanwhile, use high bytes’ bit15 as the sign digit for the 2 Word, so that the values that can be processed are -2, 147, 483, 648-2, 147, 483, 647.

寄存器以 D0，D1，……D9，999 为标识，按 10 进制进行编号。

Registers use D0, D1…D9, 999 as their symbol and the serial numbers are assigned using the decimal system.

H1U 机型

H1U Model

一般用 General	停电保持用 Latched	特殊用 Special	变址用 For address change
D0~D127	D128~D7999	D8000~D8255	V0~V7
128 点※1	7872 点※3	256 点	Z0~Z7
128 points ※1	7872 points ※3	256 points	

H2U 机型
H2U Model

一般用 General	停电保持用 Latched	停电保持专用 Latched dedicated	特殊用 Special	变址用 For address change
D0~D199	D200~D511	D512~D7999	D8000~D8255	V0~V7
200 点※1	312 点※2	7488 点※3	256 点	Z0~Z7
200 points ※1	312 points ※2	7488 points ※3	256 points	

※1：非停电保持区域。 通过设定参数可变更成停电保持区域。
※1. No power failure preservation areas. Parameter configuration is used; it may be modified as power failure preservation areas.
※2：停电保持区域。 通过设定参数可变更成非停电保持区域。
※2. Power failure preservation areas.Parameter configuration is used; it may be modified as no power failure preservation areas.
※3：通过设定参数无法变更停电保持的特性。
※3. Power failure preservation areas, cannot be modified with parameters.

● 以两个相邻的数据寄存器表现 32 位的数据。（高位为大的号码，低位为小的号码。在变址寄存器中，V 为高位，Z 为低位）。在指定 32 位时，如果指定了低位（例如：D0），则高位为继其之后的编号（例如，D1）被自动占用。低位可用奇数或偶数的任意一种软元件编号指定，考虑到外围设备的监视功能，建议低位采用偶数软元件编号。

Express 32bit data using two neighboring data registers. (High bits are bigger numbers, low bits are smaller numbers. In the address-changeable registers, V is high bit and Z is low bit). If 32bit is assigned as low bit (ie. D0), the high bit serial numbers (ie. D1) that are assigned after will automatically be occupied. Low bit can be assigned with any odd or even soft component serial numbers. When taking into consideration for peripheral device monitoring, it is recommended to use even soft component serial numbers with low bit.

● 一旦在数据寄存器中写入数据，只要不再写入其他数据，就不会变化。但是，在 RUN→STOP 时或停电时，所有数据被清除为 0。（如果驱动特殊的辅助继电器 M8033，则可以保持。）

Once data is written into the data register, as long as there is no other data entry, there will have no change. However, when switching from RUN to STOP, or when there is a power failure, all data will be cleared to 0. (data may be retained if auxiliary relay M8033 is activated.）

对此相对停电保持用的数据寄存器在 RUN/STOP 和停电时也可保持其内容。
Also, data registers with power failure preservation feature can also retain data contents under the circumstances of RUN/STOP and power outage.

● 利用系统参数配置功能．可改变 D 寄存器的一般用与停电保持用的分配；而且将停电保持专用的数据寄存器作为一般用途时，请在程序的起始步采用 RST 或 ZRST 指令，以清除其内容。

Using the system’s parameter configuration function to change D register’s use between common usage and power failure preservation usage;When turning the data register with power failure preservation into a common register, please use RST or ZRST command in the initial stage of program startup to clear the content.

● 在使用 PLC 间简易链接或并联链接的情况下，一部分的数据寄存器作为默认区域被占用。

Under the situations where PLC quick connect or online connect is used, a port of the data registers will be used by default.

● 特殊用途的数据寄存器是指写入特定目的的数据，用于实现控制器的一些特殊功能，可理解为用户程序与 PLC 系统程序进行数据交互的特殊单元。例如，在 D8000 中，监视定时器的时间通过系统 ROM 进行初始设定，要将其改变时，利用 MOV 传送指令，在 D8000 中写入目标时间。

Special usage data registers are used to write in data of specific purpose. It is used to realize certain unique functions in the controller. It can be seen as special units that are used to perform data communication between user programs and PLC system programs.For example, under D8000, monitoring timer’s time is initialized through system ROM. In order to change it, MOV transmission command must be implemented to enter the target time in D8000.

另外还有一些特殊 D 寄存器，用于系统工作状态参数缓存，查询这些寄存器，可用于判断运行参数。

There are also other special D registers that are used as parameter cache for system working status. Refer to these registers to determine operation parameters.

● 关于特殊数据寄存器的停电保持特点请参照“特殊寄存器说明”。

About the power failure preservation feature in the special data registers, please refer to “Special Register Descriptions”.

● 数据寄存器可以处理各种数值数据，通过利用它，可以进行各种控制。如作为定时器与计数器的设定值被指定，用于数据的各种运算等，在后续的指令解释中，对支持使用 D 寄存器的指令有详细的说明。

Data registers can be used to process all kinds of numerical data. It is through these registers all kinds of controls can be implemented. For instance, it can be used to configure timer and counter settings, or all types of data calculations. Commands that support the usage of D registers will be described and explained later on in details.

数据寄存器 V、Z

Data register V, Z

变址寄存器 V 与 Z 同普通的数据寄存器一样，是进行数值数据的读入、写出的 16 位数据寄存器。V0～V7，Z0～Z7 共有 16 个。

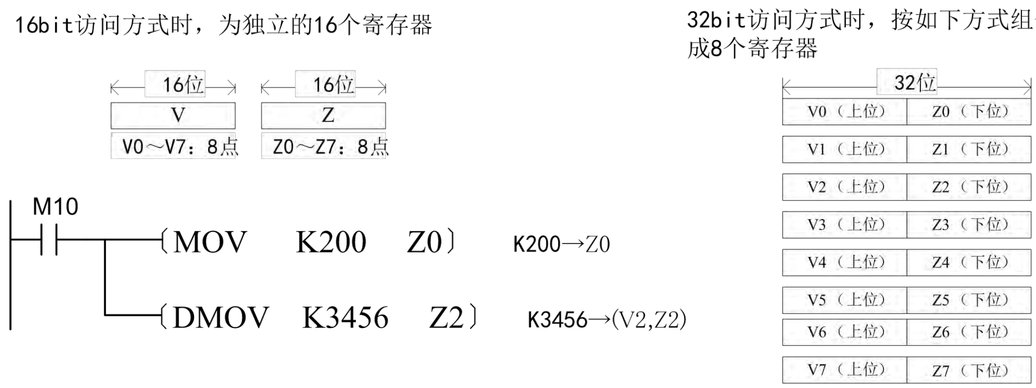
Index register V, Z is the same as the common data register, which is for the numerical data to read and write a 16-bit data register. It is a total of 64: V0～V31，Z0～Z31.V0~V7, Z0~Z7, total 16 data registers.

变址寄存器除了和普通的数据寄存器有相同的使用方法外，在应用指令的操作数中， 还可以同其他的软元件编号或数值组合使用。但需注意 LD，AND，OUT 等基本顺控指令或步进梯形图指令的软元件编号不能同变址寄存器组合使用。

The index register has the same use as the common data register, and it also can be used with other numbers or values of soft components. However, it should be noted that the soft component's serial number of basic sequential control commands or stepping ladder diagram commands such as LD, AND, and OUT, cannot be combined and used with address-changeable registers.

V、Z 寄存器可采用 16bit 和 32bit 方式进行访问，如下图说明：

V, Z registers can gain access use both 16bit and 32bit methods. See explanation below:



16bit 访问方式时，为独立的 16 个寄存器

When accessing in 16bit, there are 16 individual registers.

32bit 访问方式时，按如下方式组合成 8 个寄存器

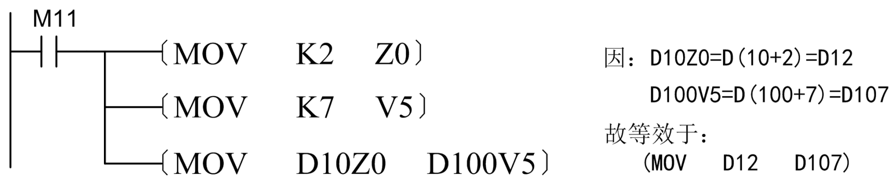
When accessing in 32bit, 8 registers can be combined using the following methods:

按照惯例，在处理 32 位应用指令中的软元件或处理超过 16 位范围的数值时，(为 32bit 寄存器方式)，V（高位)、Z（低位）被同时访问，指定的寄存器名必须为 Z0～Z7。即使指定了 V0~V7 的高位侧，也无法进行变址。

As usual, when processing the soft components in 32bit application commands or data exceeding the 16bit range, (32bit register method), V (high bit), Z (low bit) will be accessed simultaneously. The assigned register names must be Z0~Z7. Even if V0~V7 on the high bit end is assigned, address change will not be allowed.

16bit 变址应用举例：

16bit address change illustration:

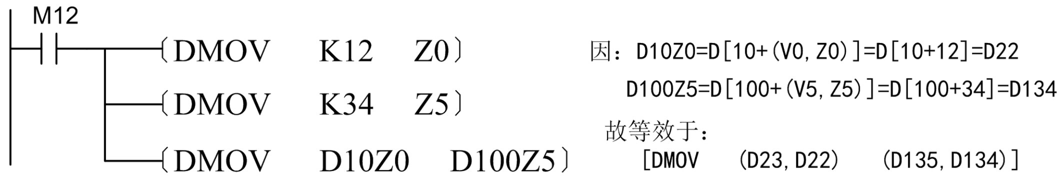


因：

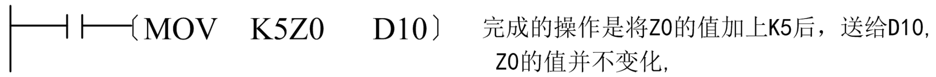
Because:

故等效于：
Therefore:

32bit 变址应用举例：
32bit address change illustration:



常数变址的特例：
Special case of address change of a constant:



完成的操作是将 Z0 的值加上 K5 后，送给 D10 Z0 的值并不变化
A completed operation is after adding K5 to Z0 value. Values transmitted to D10 Z0 will not change.

当 V、Z 间接寻址方式用于循环指令中（V、Z 随循环变量变化），进行成片数据区的操作，或用于查表操作等，简化编程，提高指令效率。
When V and Z intermediate address-searching method is used in loop commands (V, Z variables change with the loop), the operation can be done for several data regions. Or it may be used for search operation to simplify programming and increase command efficiency.

●

3.8 子程序与中断指针 P、I
3.8 Sub-program and Interruption Indicator P, I
指针（P）用于跳转程序的入口地址和子程序启始地址的标识；指针（I）则用于中断程序的启始地址标识，其编号采用十进制数分配，如下表所示：
Indicator (P) is used to indicate the entry address of startup program and the initial address of a sub-program; Indicator (I) is used to indicate the initial address of the interruption program. Its serial number is assigned using the decimal system. It is illustrated in the chart below:

H1U 机型
H1U Model

分支用 Dots used by branches	结束跳转用 Used to end startup	输入中断用 Dots used by input interrupt	高速计数器中断用 Dots used by high-speed counter interrupt
P0~P62；	P63	I00x(X0)	I010 I040
P64~P127		I10x(X1)	I020 I050

共 127 点 127 dots together	共 1 点 1pt in total	I20x(X2) I30x(X3) I40x(X4) I50x(X5) x=1 上升沿中断 X=1 ascension edge interrupt x=0 下降沿中断 X=0 descension edge interrupt 共 12 点（※注） 12 points in total (※note)	I030 I060 共 6 点 6 dots together

H2U 机型
H2U Mode

分支用 Dots used by branches	结束跳转用 Used to end startup	输入中断用 Dots used by input interrupt	定时中断用 Dots used by timer interrupt	高速计数器中断用 Dots used by high-speed counter interrupt	脉冲完成中断 Pulse interrupt complete	多用户中断 Multi-user interrupt
P0~P62； P64~P127 共 127 点 127 dots together	P63 共 1 点 1 dots together	I00x(X0) I10x(X1) I20x(X2) I30x(X3) I40x(X4) I50x(X5) x=1 上升沿中断 x=1 rising edge interrupt x=0 下降沿中断 x=0 trailing edge interrupt 共 12 点（※注） 12 dots together（※note）	I600 I700 I800 共 3 点 3 points in total	I010 I020 I030 I040 I050 I060 共 6 点 6 dots together	I502(Y0) I503(Y1) I504(Y2) I505(Y3) I506(Y4) 共 5 点 5 dots together	I507~~I530 共 24 点 24 dots together

（※注：加强功能版本的允许输入中断数有扩展，请参见附录 5.8 增强功能说明）
(※NOTE: the enhanced version of permitted input interrupts are expandable. Please refer to Appendix 5.8, Enhanced Functionalities)

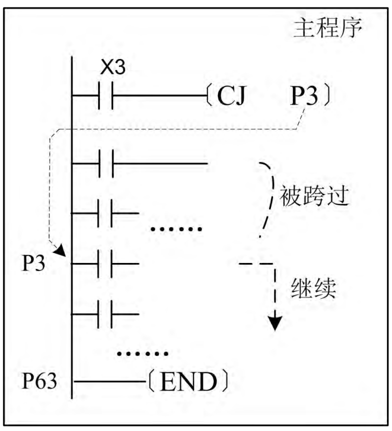
因外部输入中断、高速计数、脉冲频率测量等功能都是通过 X0~X7 端口输入的，故这几项功能所使用的 X 端口不能有重复使用的现象，故使用输入中断指针时，注意端口的功能安排，检查高速计数器、脉冲密度指令所用的输入端口号情况。

Functions such as external input interrupt, high-speed counting, and pulse frequency measurement are entered through the X0~X7 ports. Therefore, the X port these functions use cannot be used at the same time. Hence, when operating input interrupt indicator, port arrangement must be carefully considered. Input ports used by high-speed counter and pulse frequency command must be closely examined.

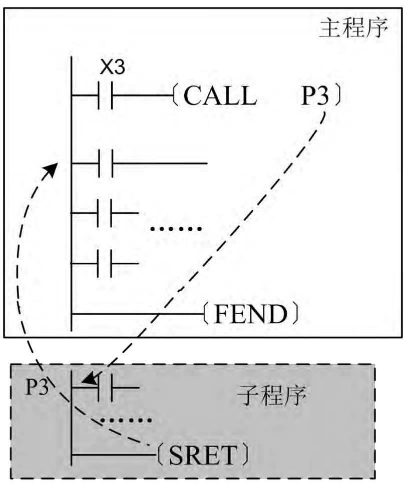
跳转指针（P）和子程序指针（P）的使用及差别如下图所示。跳转指针（P）引导的指令语句仍在主程序内，只是用于在满足条件是跨过一部分指令语句；但子程序指针（P）则用于一段子程序，若主程序中条件满足，调用子程序，在子程序执行完毕（SRET）后，要返回原调用（CALL）指令的下一步继续执行。

Jump indicator (P) and sub-program indicator's usage and differences are illustrated as below. Command statement guided by jump indicator is still within the main program. It is only used when the requirement for surpassing a portion of command statement is satisfied. However, sub-program indicator (P) must be used in one sub-program statement. If all the requirements are met in the main program, after calling up and executing SRET in sub-program, it needs to return to the CALL command and continue the operation.

跳转指针用法



子程序指针用法



跳转指针用法
Instruction for jump indicator

子程序指针用法
Instruction for sub-program indicator

主程序
Main program

被跨过
Overpass

继续
Continue

子程序
Sub-program
● 两种 P 指针使用同一种编号体现，在定义 P 指针时不要有重复；
One serial number is used for two types of P indicators. Do not duplicate when defining P indicator;
● P63 指针为专用指针编号，指向程序的结束语句 END，注意不要再对 P63 编程。
P63 indicator is an indicator assigned with a specific number and used to indicator the program’s termination state END. Do NOT program P63.
指针（I）用于指定中断程序的启始地址，而中断子程序是在“中断允许”的情况下，当信号条件满足的瞬间，PLC 系统暂停主程序的正常执行（记住当前暂停点），从指定的 I 指针所指定的地址入口，开始执行中断子程序，直到执行了 IRET 指令后，返回主程序的暂停点，继续执行。因 PLC 系统对中断信号采取了高优先的响应处理，故不受扫描时间的影响。
Indicator (I) is used to indicate the starting address of the interruption, and interruption sub-program is used under the situation of “interruption permitted”. The moment when signal requirement is satisfied, the PLC system will pause the main program’s operation (record the pause point). Interruption sub-program will be executed starting from the address indicated by the specific I indicator, until the IRET command has been executed and the system has returned to the pause point in the main program and continue its operation. Because the PLC system processes the interruption signals based on their priorities, it will not be affected by the scanning time.
PLC 系统为 H1U 提供了两种类型的中断，分别是 X 输入中断和计数器中断；为 H2U 提供了五种类型的中断，介绍如下（前两个包含 H1U）：
The PLC system provides two types of interruptions for H1U. They are X input and counter interruptions. Five types of interruptions are provided for the H2U model. They are introduced as below (the first two include H1U):
1）X 输入中断：控制器的 X0~X5 可分别设定为中断输入端口，每个中断输入口又有上升沿中断、下降沿中断，通过中断号来进行划分：如“I100”中断号代表 X1 端口的下降沿中断，而“I101”则代表 X1 端口的上升沿中断。
1) X input interruption: the controller’s X0~X5 can be configured individually as interruption input ports. Under every port there are rising and falling edge interruptions which are recognized by their interruption signals. For instance, “I100” signal represents the falling edge interruption at X1 port, while “I101” signal represents the rising edge interruption at X1 port.
2）计数器中断：根据可编程控制器内置的高速计数器的比较结果（HSCS），执行中断子程

序，优先处理计数结果的控制。

2) Counter interruption: Based on the comparison results (HSCS) of the built-in high-speed counter in the programmable controller, interruption sub-program are executed to process counting results.

当 HSCS 指令的输出目标设为 I010～I060 时，便使用了高速计数器中断，编程时需编制好相应的中断子程序，开启响应的中断允许标志，才能进行中断响应。

When HSCS command's output target is set for I010~I060, high-speed counter interruption is applied. Corresponding sub-program must be properly programmed, and the corresponding interruption symbol must be turned on in order to proceed the responding interruption.

3）定时器中断用：在各指定的中断循环时间（1ms-99ms）执行中断子程序。在需要有别于可编程控制器的运算周期的循环中断处理控制中使用。

3) Timer interruption use: execute interruption sub-program under each designated interruption cycle time (1ms-99ms). Used in the loop interruption processing control of the programmable controller's calculation cycle.

系统提供了 3 个定时中断，定时中断的周期可编程决定。定时中断使用系统内部的定时器，不占用 T0~T255。

System provides 3 timer interruptions. Timer interruption's cycle can be programmed. Timer interruption uses the timer inside the system, therefore it does not occupy T0~T255.

4）通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON， 可以实现脉冲输出完成后执行一次用户中断；在指定脉冲个数发送完毕后，立即执行用户中断 I502～I506。

4) Using the special bit M8090~M8094 (corresponds to Y0~Y4 respectively) as ON, one time user interruption can be realized after pulse output completes; after the designated pulse number has been transmitted, user interruption I502~I506 can be implemented immediately.

5）为了满足在高速计速器运行时，支持多高速自由任务，实现了高速计速器多用户中断(最大支持 24 个，均为扩展的中断号)，设定和比较用数据表格的方式定义。

5) In order to support multiple free high-speed tasks when the high-speed counter is still in operation, high-speed counter multi-user interruption has been realized (support up to 24 users, and all of them are expanded interruption signals). It is defined using the configuration and comparison data chart.

对应中断的"中断允许"标志如下表，各标志可以独立设置：

Codes that correspond to "Interruption Permitted" are as follows. Each code can be configured individually:

中断允许/禁止设置

Interruption Permitted/Prohibited Configuration

M8050	驱动 I00□中断禁止 I00 port interruption prohibited	X 输入中断，共有 12 个中断，分别对应 X0~X5 端口的上升沿中断、下降沿中断。 X input interruption,	每个标志对应 1 个外部中断的控制； Each code corresponds to one external interruption
M8051	驱动 I10□中断禁止 I10 port interruption prohibited		
M8052	驱动 I20□中断禁止		

	I20 port interruption prohibited	total 12 interruptions. Each corresponds to the rising/falling edge interruption respectively to X0~X5 ports. 口 中： Port: 1=上升沿中断； 1= ascension edge interrupt; 0=下降沿中断 0= descension edge interrupt	control; 当该 M 标志为 OFF 时，允许对应的 X 中断； When the M code is OFF, allow corresponding X to interrupt; 当该 M 标志为 ON 时，禁止对应的 X 中断； When the M code is ON, prohibit corresponding X to interrupt;
M8053	驱动 I30□中断禁止 I30 port interruption prohibited		
M8054	驱动 I40□中断禁止 I40 port interruption prohibited		
M8055	驱动 I50□中断禁止 I50 port interruption prohibited		
M8056	驱动 I600 中断禁止 I600 port interruption prohibited	定时中断 0 Timer interruption 0	
M8057	驱动 I700 中断禁止 I700 port interruption prohibited	定时中断 1 Timer interruption 1	
M8058	驱动 I800 中断禁止 I800 port interruption prohibited	定时中断 2 Timer interruption 2	
M8059	驱动 计数器中断禁止 Drive counter interrupt disabled	高速计数中断，共 6 个 High-speed counter interruption, total 6.	为 ON 时，禁止 I010～I060 的中断 When it’s ON, I010~I060 interruptions are prohibited

端口号 Port Number	使用特殊位 Special bit used	对应的用户中断 Corresponding user interruption
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

标志位 Code	使用描述 Description
M8084	为 ON 使能高速计速器多用户中断 When ON, allow high-speed counter to perform multiple user interruption.
D8084	为高速计数器序号 235~255 High-speed counter serial number 235~255
D8085	对应的用户中断个数，最大 24 个，从 I507~I530

Number of corresponding user interruption, maximum 24, I507~I530

D8086 对应多个比较点数据的序号，只能为 D 元件，且为双字宽度，如 200 为 D200 开始的双字

Correspond to multiple comparative data serial number. Can only be D component at two word bandwidth. Ie. 200 is two word starting from D200

每个中断对应的“中断允许”标志开启后，还需要开启“全局中断允许”，即执行 EI 指令（FNC04）后才最后才能使能中断功能；若执行全局中断禁止 DI 指令（FNC05），则禁止所有的中断的响应。当启用了输入编号的中断允许设定标志，输入信号满足中断设定时，将执行对应的中断子程序。

After the corresponding code for “interruption permitted” are ON, “overall interruption permitted” will need to be activated as well. EI command (FNC04) must be activated in order to use all interruption functions. Overall interruption prohibited DI command is used to prohibit correspondence to all interruptions. When the interruption permit setting code with input serial number is activated and the input signal satisfies interruption settings, corresponding sub-program will be executed.

每个中断子程序的末尾均要有 IRET 指令，以表示中断子程序完毕，PLC 执行了该语句后，便会跳回本中断程序开始执行之前的位置。(AutoShop 软件中中断程序不需要写 IRET 指令）

At the end of every interruption sub-program must have IRET command to represent the completion of interruption sub-program. After PLC executes the command, it will return to the point before the interruption program was initiated. (AutoShop’s interruption program does not require IRET command)

若需要对出现在 X0～X5 端口的瞬间脉冲信号作出反应，但对反应动作时间没有特别要求，就可以使用“脉冲捕捉”功能，PLC 会将出现在 X0～X5 端口的上升沿信号保存在 M8170~M8175 单元，主程序中可作为判断处理的依据，响应处理完毕，可人为将之清除。

The “pulse capture” function can be used when response to instantaneous pulse signal at X0～X5 ports is needed without special requirement of response time. PLC will store the rising edge signal of X0～X5 ports to M8170~M8175 which can be used by main routine to judge and process and can be cleared manually after response.

M8170~M8175 的具体使用如下：

Instruction for M8170~M8175:

执行 FNC04(EI)指令后，当输入继电器 X000~X005 OFF→ON 变化时，特殊辅助继电器 M8170~M8175 置位进行中断处理。为了再次获得输入，必须利用程序对设定的元件进行复位操作。脉冲捕捉动作同个别中断禁止用辅助继电器 M8050~M8055 的动作无关。

After executing FNC04 (EI) command, when input relay X000~X005 OFF to ON changes, auxiliary relay M8170~M8175 will reset to perform interruption process.

Reset to preset components must be carried out by program to acquire pulse again. Pulse capturing action has no relation to individual M8050~M8055 auxiliary relays.

```
|
|————————〔EI〕
| M8170
|—| |————〔OUT  M0〕    当检测到 X000 的上升沿， M8170 进行中断置位，
| X1
|—| |————〔RST  M8170〕   将X1置ON对脉冲捕捉结果M8170进行复位
|
```

当检测到 X000 的上升沿，M8170 进行中断置位，

When detecting X000’s ascension edge, M8170 performs interruption reset,

将 X1 置 ON 对脉冲捕捉结果 M8170 进行复位

Place X1 to ON to perform reset for pulse capturing result M8170

输入脉冲宽　　以上

Input pulse width　　above

输入

Input

复位

Reset

关于子程序和中断的描述请参考 4.3.2.1 章 FNC00~~FNC05 和附录 5.8 的详细说明。

About the descriptions for sub-program and interruptions, please refer to 4.3.2.1 FNC00~FNC05 and Appendix 5.8 for detailed instruction.

3.9 常数 K、H

3.9 Constant K, H

H1U/2U 系列可编程控制器根据不同的用途和目的，使用 5 种类型的数值。其作用和功能如下：

H1U/2U Series programmable controller uses 5 types of data based on any specific purposes or applications. Their role and functions as follows：

类型 Type　编程中应用说明 Application Notes in Programming

类型 Type	编程中应用说明 Application Notes in Programming
十进制数，DEC Decimal DEC	● 定时器和计数器的设定值（K 常数） The set value of timer and counter (K is a constant)

	● 辅助继电器（M），定时器（T），计数器（C)，状态 S 等的编号（软元件编号） The number of Auxiliary Relay（M），Timer（T），Counter（C）， Status（S）and so on（the number of soft component） ● 指定应用指令操作数中的数值与指令动作（K 常数） ● The value and command action in the Operand, which are applied (K is a constant)
十六进制数，HEX Hexadecimal HEX	● 同 10 进制数一样，用于指定应用指令中的操作数与指定动作（H 常数） ● As with the 10 decimal number, it is applied in the operand and the specific actions in the application commands.
二进制，BIN Binary BIN	● 以十进制数或十六进制数对定时器、计数器或数据寄存器进行数值指定，但在可编程控制器内部，这些数字都用二进制数处理。而且，在外围设备上进行监控时，这些软元件将如图所示自动变换为十进制数（也可切换为 16 进制） Use decimal or hexadecimal system to perform data designation for timer, counter, or data registers. However, inside the programmable controllers these numbers are processed using binary system. Besides, when performing monitoring on peripheral devices, these soft components will automatically be converted to decimal format as illustrated (or may be converted to hexadecimal format)
八进制，OCT Octonary OCT	● 输入继电器、输出继电器的软元件编号以 8 进制数值进行分配。因此，可进行［0-7，10-17……70-77，100-107］的进位，在 8 进制数中，不存在［8，9］ Using 8 hex values to distribute the soft component number of Input relay and output relay.Therefore, carry-overs such as [0-7, 10-17…70-77, 100-107] can be performed. In the octonary system, there is no [8, 9]
BCD	● BCD 是以 4 位二进制表示十进制数各位 0-9 数值的方法。各位的处理很容易，因此，可用于 BCD 输出形的数字式开关或七段码的显示器控制等方面 BCD is a way of using 4-bit binary to represent decimal values.Single digit process is very simple. Therefore, it can be used as digital switch in BCD output or display control in seven-segment codes.
BIN 浮点数 BIN float	● 可编程控制器具有可进行高精度的浮点运算功能，内部用二进制（BIN）浮点数进行浮点运算 ● Programmable controller has the function of high-precision floating point capabilities. In the center, use binary (BIN) floating-point to conduct

	floating-point operations
十进制浮点数 Decimal floating point	• 十进制浮点值只用于监视，便于阅读。 • Decimal floating-point value is only used for monitoring and improving readability.

常数 K

Constant K

[K]是表示 10 进制整数的符号。 主要用于指定定时器或计数器的设定值或应用指令操作数中的数值。16bit 指令中，常数 K 的取值范围为-32768～32767；32bit 指令中，常数 K 的取值范围为-2，47，483，648～2，147，483，647。

[K] is the symbol that expresses the 10 decimal integer. It is used to set the value of the timer, the counter, and the value in the operand. In 16bit commands, the value range for constant K is -32768~32767; in 32bit commands, the value range for K constant is -2, 47, 483, 648, 2, 147, 483, 647.

常数 H

Constant H

[H]是 16 进制数的表示符号。 主要用于指定应用指令的操作数的数值。常数 H 的取值范围为 0000～FFFF；32bit 指令中，常数 K 的取值范围为 0000，0000～FFFF，FFFF。

[H] is the symbol that expresses the 16 decimal integer. It is used to set the values in the application command operand. Constant H's value range is 0000~FFFF; in 32bit commands, constant K's value range is 0000, 0000~FFFF, FFFF.

3.10 控制器软元件规格

3.10 Controller soft component specifications

H_{1U} 机型的停电和非停电保持区域不能更改，H_{2U} 机型有部分区域可进行更改。

The power failure preservation areas and none power failure preservation areas of H_1u model can not be changed while some areas of H_2u can be changed.

H_{1U} 机型

H1U Model

输入端口 X Input port X	X0～X377，最大可达 256 点；XY 总和最大 256 点 X0~X377, maximum 256 points; sum of XY is maximum 256 points	X0～X5：具有中断功能； X0~X5: with interruption function;	8 进制命名规则 Octonary naming rules
输出端口 Y Output port Y	Y0～Y377，最大可达 256 点； Y0~Y377, maximum 256 points; XY 总和最大 256 点	晶体管型具 3 路高速脉冲输出功能，具体规格请看用户手册 Transistor possesses 3-way high-speed pulse output function. Details please refer to user	8 进制命名规则 Octonary naming rules

	Sum of XY is maximum 256 points		manual				
辅助继电器 Auxiliary relay M	[M0~M383] 384 点 384 points 一般用 General		[M384~M1535] 1152 点 1152 points 保存 用 For storage		M8000~M8255 256 点 256 points 特殊用 Special		
状态 Status S	[S0-S999] 1000 点 1000 points 全部保持用 All for storage use						
定时器 Timer T	T0~T199 200 点 100ms 200 point 100ms 一般用 General		T200~T245 46 点 10ms 46 point 100ms 一般用 General	[T246~T249] 4 点 1ms 累计保持用 4 points 1ms accumulation remained	[T250~T255] 6 点 100ms 累计保持用 6 points 1ms accumulation remained		
	16 位增计数器 16bit increase counter		32 位增减计数器 32bit increase/decrease counter		高速计数器 High-speed counter		
计数器 Counter C	C0~C 15 16 点 16 points 一般用 General	[C16~C199] 168 点 保持用 168 points remained	C200~C219 20 点 20 points 一般用 General	[C220~C234] 15 点保持用 15 points remained	C235~C245 单相单向计数 Single-phase single-way counting	C246~C250 单相双向计数 Single-phase two-way counting	C251~C255 C251~C255 二相计数器 Two-phase counter
数据寄存器 Data register D，V，Z	D0~D127 128 点 128 points 一般用 General	[D128~D7999] 7872 点 保持用 7872 points remained	[D1000~D7999] 最大 7000 点 Maximum 7000 points 可设为文件寄存器 Can be configured as file register	[D8000~D8255] 256 点 256 points 特殊用 Special	V7~V0， Z7~Z0 16 点 16 points 变址用 For address change		
嵌套指针 Nested indicator	N0~N7 8 点 8 points 主控用 Used in main	P 0~P127 128 点 128 points 跳转子程序用分支指针 Branch	I010～I060 共 6 点，计数中断指针 I010~I060 total 6 points, counting	I6**～I8**共 3 点，定时中断指针 I6**~I8** total 3 points, timer interruption	I00*~I50* I00*~I50* 6 点 6 points 输入中断用指针 Indicator for input interruption		

		controller	indicator used in Jump sub-program	interruption indicator	indicator
常数 constant	K	16 位 -32,768~32,767 16bit -32,768~32767			32 位 -2,147,483,648~2,147,483,647 32bit -2,147,483,648~2,147,483,647
	H	16 位 0~FFFFH 16bit 0~FFFFH			32 位 0~FFFFFFFFH 32bit 0~FFFFFFFFH
	E（浮点数） E (floating-point)	-			32 位 1175×10-41～3402×1035 32bit 1175×10-41～3402×1035

H2U 机型
H2U Model

输入端口 X Input port X	X0～X377，最大可达 256 点；XY 总和最大 256 点 X0~X377, maximum 256 points; sum of XY is maximum 256 points	X0～X5：具有中断功能； X0~X5: with interruption function; X0～X7：滤波时间可设； X0~X7: wave filtering time configurable;		8 进制命名规则 Octonary naming rules
输出端口 Y Output port Y	Y0～Y377，最大可达 256 点；XY 总和最大 256 点 X0~X377, maximum 256 points; sum of XY is maximum 256 points	晶体管型具 5 路高速脉冲输出功能，具体规格请看用户手册 Transistor possesses 5-way high-speed pulse output function. Details please refer to user manual		8 进制命名规则 Octonary naming rules
辅助继电器 Auxiliary relay M	M0～M499 500 点，通用※l 500 points, general use ※1	[M500～M1023] 524 点，保存用※2 继电器 524 points, storage use ※2 relay	[M1024～M3071] 2048 点，保存用※3 2048 points, storage use ※3	M8000～M8255 256 点，特殊用 256 points, special use
状态 S Status S	S0～S499 共 500 点※1 S0~S499, total 500 points ※1 初始用 S0～S9 Initialization use S0~S9	[S500～S899]共 400 点，掉电保存用※2 [S500~S899] total 400 points, power drop preservation use ※2		[S900～S999]共 100 点，报警用※2 [S900~S999] total 100 points, alarm use ※2
定时器 T Timer T	[T0～T199]共 200 点，100ms。 [T0~T199] total 200 points, 100ms. 子程序用：T192～T199 Sub-program use: T192~T199	T200～T245 T200~T245 共 46 点，10ms total 46 point 10ms	[T246～T249]共 4 点，1ms 累计※3 [T246~T249] total 4 points,	[T250～T255]共 6 点，100ms 累计※3 [T250~T255] total 6 points, 100ms accumulation ※3

				1ms accumulation ※3	
16 位向上计数器 C 16bit progressing counter C	[C0～C99]100 点，通用※1 [C0~C99] 100 points, general use ※1			[C100～C199]100 点，保存用※2 [C100~C199] 100 points, storage use ※2	
32 位计数器 C 32bit counter C	32 位可逆 32bit reversible		32 位高速计数可逆 32bit high-speed reversible		
	C200～C219 20 点，通用 20 points, general use ※1 ※1	[C220～C234] 15 点，掉电保存用※2 15 points, storage use ※2	[C235～C245] 单相单计数输入※2 Single-phase single counting input ※2	[C246～C250]单相双计数输入※2 [C246~C250] single-phase double counting input ※2	[C251～C255] 2 相计数输入※2 Two-phase counting input ※2
数据寄存器 D，V，Z Data register D, V, Z	D0～D199 共 200 点，通用※1 D0~D199, total 200 points, general use ※1	[D200～D511] 共 312 点，保存用※2 Total 312 points, storage use ※2	[D512～D7999] 共 7488 点，保存用※3 D7999] Total 7488 points, storage use ※3	[D8000～D8255]共 256 点，特殊用 [D8000~D8255] total 256 points, special use	V7～V0，Z7～Z0 共 16 点，变址用 V7~V0, Z7~Z0, total 16 points, address change use
嵌套指针 Nested indicator	N0～N7 8 点，主控用 8 points, main controller use	P0 ～ P127 共 128 点，跳转子程序 P0~P127, total 128 points, jump sub-program	I00* ～ I50* 共 6 点，输入中断指针 I00*~I50*, total 6 points, input interruption indicator	I6**～I8**共 3 点，定时中断指针 I6**~I8** total 3 points, timer interruption indicator	I010 ～ I060 共 6 点，计数中断指针 6 points ,Indicator for input interruption
常数 Constant	K（十进制） K(Decimal)	16 位-32，768～32，767 16bit-32，768～32，767		32 位-2，147，483，648～2，147，483，647 32bit-2，147，483，648～2，147，483，647	
	H（十六进制） H (Hexadecimal)	16 位 0～FFFFH 16bit 0~FFFFH		32 位 32bit 0～FFFFFFFFH	
	E（浮点数） E (floating-point)			32 位 32bit 1175×10-41～3402×1035	

[]内的元件为电池保存区

Component inside the [] is the battery storage area
※1：非电池保存区。
※1: Non Battery Storage Area 根据参数设定，可以变更为电池保存区。
According to parameter configurations, it can be changed to battery storage area.
※2：电池保存区。
※2: Battery Storage Area 根据参数设定，可以变更非电池保存区。
According to parameter configurations, it can be changed to non battery storage area.
※3：电池保存固定区，区域特性不能变更。
※3: Permanent Battery Storage Area, area characteristic cannot be changed.

第四章 指 令
Chapter 4 - Commands

在基本指令当中，有部分指令采用"功能号"编码方式，若以手持编程器输入程序，输入方式可使用键盘中相对应的指令按键输入或使用功能编号方式输入。每一个指令的功能和使用方法在第 7 章内有详细说明。

In the basic commands, some commands use "function number" encoding method. If program is entered using handheld programmer, input method may choose the corresponding command button input or function number button on the keyboard. Every command's function and instruction are described in details in Chapter 7.

指令符号 Instruction	FUN NO	功能 Function	操作数类型 Operand Type	指令步长 Command Length
LD		加载常开接点 Load Open Contacts	S、X、Y、M、T、C	1
LDI		加载常闭接点 Load Closed Contacts	S、X、Y、M、T、C	1
LDP	90	取脉冲上升沿 Select Pulse Rising Trigger	S、X、Y、M、T、C	1
LDF	91	取脉冲下降沿 Select Pulse Falling Trigger	S、X、Y、M、T、C	1
AND		串联常开接点 Connect Open Contacts in Series	S、X、Y、M、T、C	1
ANI		串联常闭接点 Connect Closed Contacts in Series	S、X、Y、M、T、C	1
ANB		串联回路方块 Connect Circuit Block in Series	无 None	1

ANDP	92	与脉冲上升沿检测串行连接 Connect to detected pulse rising trigger in serie		3
ANDF	93	与脉冲(F)下降沿检测串行连接 Connect to detected pulse falling trigger in series		3
OR		并联常开接点 Connect Open Contacts in Parallel	S、X、Y、M、T、C	1
ORI		并联常闭接点 Connect Closed Contacts in Parallel	S、X、Y、M、T、C	1
ORB		并联回路方块 Connect Circuit Block in Parallel	无 None	1
ORP	94	或脉冲上升沿检测并行连接 OR Connect to detected pulse rising trigger in parallel		3
ORF	95	或脉冲(F)下降沿检测并行连接 Connect to detected pulse falling trigger in parallel		
OUT		驱动线圈 Startup Coil	S、Y、M	1
SET		置位动作保存线圈指令 Setting Coil and Save	S、Y、M	1
RST		接点或缓存器清除 Contacts or Buffer Clear	S、Y、M、T、C、D	3
PLS		脉冲上升沿检测线圈指令 Pulse rising trigger detecting coil.		
PLF		脉冲(F)下降沿检测线圈指令 Pulse rising trigger detecting coil.		
MC		主控公用串行接点用线圈指令 Master Control Common Serial Contacts Coil Command	N0~N7	3
MCR		主控复位公用串行接点解除指令 Master Control Reset	N0~N7	3

		Common Serial Contacts Relief Command		
MPS		存入堆栈 Save into Stack	无 None	1
MRD		读出堆栈(能流指针不变) Readout stack (power flow indicator no change)	无 None	1
MPP		读出堆栈 Read from Stack	无 None	1
NOP		无动作 No Action	无 None	1
INV	98	运算结果取反 Inverse Operation Result	无 None	1
END		程序结束 Program Termination	无 None	1
P		指针 Indicator	0~127	1
I		中断插入指针 Indicator Interruption Insertion	I101/I201/301 等 I101/I201/301 etc.	1

4.1 STL/SFC 指令

4.1 STL/SFC Command

4.1.1 STL 编程指令

4.1.1 STL Programming Command

STL	程序跳至副母线 Program return to vice-bus	S	1
RET	程序返回主母线 Program return to main-bus	无 None	1

步进梯形图指令（STL，RET）

Stepping ladder diagram command (STL, RET)

步进梯形图是一种根据被控设备的运行过程，分解为若干个状态或工序，针对每一个状态进行逻辑编程的方式，再根据信号条件进行状态间的切换。编程时采用 STL 梯形图，这种编程方法思路清晰，简化了逻辑设计，方便调试和维护。

Stepping ladder diagram is used to break down the overall operation process of equipments into several status or working procedures, perform logic programming for each status, and then switches between each status according the signal conditions. Use STL ladder diagram when programming the procedure as it simplifies logic designs for the convenience of testing and maintenance.

步进梯形图指令可用梯形图表示，在步进梯形图中，将状态（S）看作为一个控制工序，从中将输入条件与输出控制按顺序编程。这种控制最大的特点是在工序进行时，与前一工序不

接通，以各道工序的简单顺序，即可控制设备。

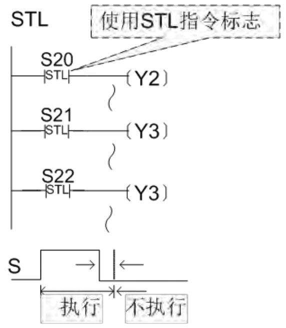
Stepping ladder diagram commands can be illustrated through a ladder diagram. In the diagram each status is treated as one control procedure when input conditions and output controls are programmed in sequence. The greatest feature of this type of control is that when a procedure is in process, it has no connection to its previous procedure. Equipments are easier to control because between each procedure the sequence is simple and uncomplicated.

步进梯形图有相应的编程规则，既包含了普通梯形图的编程方法，又与普通的梯形图编程有一定的差异，说明如下：

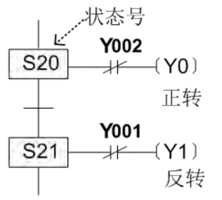
Stepping ladder diagram has its programming rules. It consists of programming methods for regular ladder diagram and yet it has certain differences as well. They are explained as follows:

● 步进梯形图程序以 STL 指令开始（注意与普通梯形图中 S 不同），以 RET 指令结束，中间的程序以 S 状态引导，后续该 S 状态的所有操作逻辑，包括条件满足时切换为下一状态的操作。

Stepping ladder diagram program starts from STL command (NOTE: different than S in regular ladder diagram) and ends with RET command. In between the program is guided by S status, which includes all operating logic of S status and the operation between procedures when conditions are satisfied.

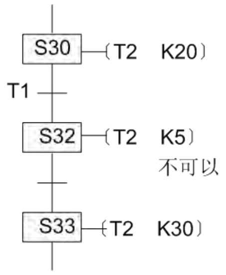


●如果STL触点S接通，则与其相连的回路动作； 若 S 触点断开，则与其相连的回路不动作。但是在一个扫描周期以后，不再执行指令（跳转状态）。
●在不同的状态 S ，可 对 同样的输出软元件（ 如 Y3）。此时，S21或S22接通时，Y3 被输出。但在同一S状态中同样存在“双线圈”处理问题，请注意。
●状态S号编号不可重复使用。



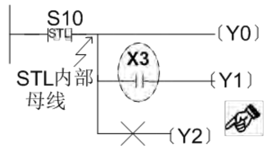
输出的互锁问题：

●在状态的转移过程中，会存在两种状态同时接通瞬间（一个扫描周期）。因此．为了避免不能同时接通的一对输出同时接通，需要在可编程控制器外部设置互锁,同时要在相应的程序上设置互锁。



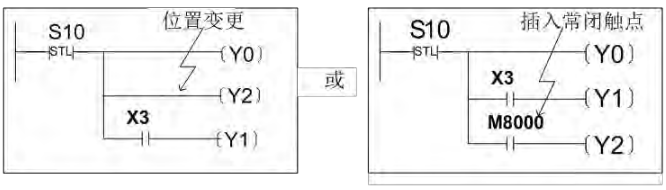
定时器重复使用的问题：

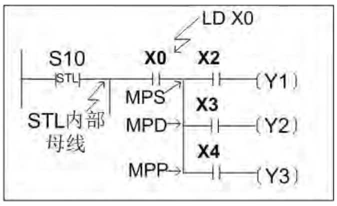
●定时器线圈与输出线圈一样，也可在不同状态间对同一软元件编程。但是，在相邻状态中则不能编程。如果在相邻状态下编程，则工序转移时定时器线圈不断开，当前值不能复位。



输出驱动方法

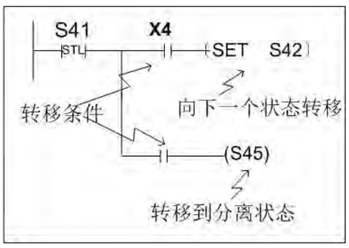
●从状态内的母线，一旦写入LD或LDI指令后，不能再使用不需要触点的指令（如左图所示），
需要按下图所示的方法改变这样的回路。





栈操作指令MPS/MRD//MPP的位置

●在状态内，不能从 STL 内母线中直接使用 MPS / MRD / MPP 指令。而是须在 LD 或 LDI 指令以后编制程序。如左图所示。



状态的转移方法

●OUT 指令与 SET 指令对于 STL 指令后的状态 (S)具有同样的功能，都将自动复位转移源。此外，还有自保持功能。
●但使用 OUT 指令时，在 SFC 图中用于向分离的状态转移。

使用 STL 指令标志
Use STL command code

执行
Execute

不执行
No execute

状态号
Status No.

正转
Forward rotation
反转
Reverse rotation

不可以
Not allowed

STL 内部母线
STL internal main bus

位置变更
Position change

或
Or

插入常闭触点
Insert normally closed contact

转移条件
Transition condition

向下一个状态转移
Transition to next status

转移到分离状态
Transition to separation status

如果 STL 触点 S 接通，则与其相连的回路动作；若 S 触电断开，则与其相连的回路不动作。If STL contact S is connected, then it acts with connected circuits; if S contact is disconnect, no action with connected circuits. 但是在一个扫描周期后，不再执行指令（跳

转状态）。
However, command will not be executed after one scanning cycle (jump status).

在不同的状态 S，可对同样的输出软元件（如 Y3）。
S in different status can still export soft component (such as Y3).此时，S21 或 S22 接通时，Y3 被输出。
When S21 or S22 is connected, Y3 will be exported.但在同一 S 状态中同样存在“双线圈”处理问题，请注意。
However, under the same S situation, there still exists the “double-coil” issue. Please be aware.

状态 S 号编号不可重复使用。
S status serial number cannot be duplicated.

输出的互锁问题：
Output interlock issue:

在状态的转移过程中，会存在两种状态同时接通瞬间（一个扫描周期）。
During status transition, two statuses being connected simultaneously may happen (one scanning cycle).因此，为了避免不能同时接通的一对输出同时接通，需要在可编程控制器外部设置互锁，同时要在相应的程序上设置互锁。
Therefore, in order to prevent the situation, interlocking is required to be configured outside the programmable controller. Also, the corresponding programs must have interlocking as well.

定时器重复使用的问题：
Issue of timer being duplicated:

定时器线圈与输出线圈一样，也可在不同状态间对同一软元件编程。
Both timer coil and output coil can program on same soft component at different statuses.但是，在相邻状态下编程，则工序转移时定时器线圈不断开，当前值不能复位。
However, when programming under the neighboring situation, the timer coil will not disconnect during the status transition and the current value will not be reset.

输出驱动方法
Output activation

从状态内的母线，一旦写入 LD 或 LDI 指令后，不能再使用不需要触点的指令（如左图所示），需要按下图所示的方法改变这样的回路。
Once LD or LDI command is written in the main bus, commands that do not require contacts can no longer be used (as illustrated on left). Following methods must be used in order to modify circuits like this.

● 可在状态内处理的顺控指令一览表：

Applicable Sequential Commands List:

命令 Command 状态 Status		LD/LDI/LDP/LDF，AND/ANI/ ANDP/ANDF，OR/ORI/ORF，INV，OUT，SET/RST，PLS/PLF	ANB/ORB MPS/MRD/MPP	MC/MCR
初始状态/一般状态 Initial status/Regular status		可使用 Applicable	可使用 Applicable	不可使用 Not applicable
分支，汇合状态 Division, concourse status	输出处理 Output process	可使用 Applicable	可使用 Applicable	不可使用 Not applicable
	转移处理 Transition process	可使用 Applicable	不可使用 Not applicable	不可使用 Not applicable

● 在中断程序与子程序内，不能使用 STL 指令。

STL command cannot be used in interruption and sub-program.

● 在 STL 指令内不禁止使用跳转指令，但其动作复杂，建议不要使用。

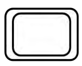
Jump command is not prohibited under STL command. However, due to its complicated nature it is recommended not to use it.

4.1.2 SFC 顺序功能图编程

4.1.2 SFC Sequential Command Diagram Programming

H1U/2U 系列可编程控制器内置有利用 SFC 图（顺序功能图）的顺控功能，SFC 采用类似流程图的方式，将控制程序按流程图方式直观表述，使得编程调试、维护的大为简化。SFC 图设计时使用的符号定义如下：

H1U/2U Series Programmable Controller uses the sequential control function in the SFC diagram. SFC adopts the concept of a flow chart to demonstrate the control process so that the testing and maintenance of the programming becomes much simplified. Symbol definitions in SFC diagram design:



启始步进点图形，用于 S0～S9 状态的启始编程点，一个用户程序中只有一个该启始符。

Start up stepper point graphics, which is used as the initial programming point for S0~S9 status. One starting symbol is used in one user program.

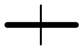
梯形图块图形，表示内部为一般步行梯形图的程序。常带梯形图块编号，如 LAD0、LAD1…等

Trapezoidal block graph, used to illustrate that the internal programs are stepping ladder diagrams. Constant trapezoidal block graph serial number, such as LAD0, LAD1, etc.

一般步进梯形图程序块图形，可使用 S10～S889 状态变量

Normal stepping trapezoidal block graph may use S10~S889 status variables

状态转移条件图形，用于标明上下相邻两状态转移的条件。



Status transition condition diagram, used to indicate conditions required between neighboring statuses.

状态分离图形，用于标明不相邻的两个状态的跳转。

Status separation diagram, used to indicate jumps between two non-neighboring statuses.

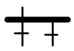
向上状态转移图形，用于标明向上转移的状态

Upward status transition diagram, used to indicate upward transition status.

状态复位图形，将程序的状态复位到启始状态 S0

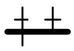
Status reset diagram, reset program status to startup status S0

选择分支图形，由同一步进点按不同条件转移到相应步进点。



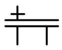
Select division diagram, under different condition, the transition happens from same stepping point to other corresponding stepping point.

选择汇合图形，由两个以上步进点状态，经相应的转移条件后，转移到相同的步进点。



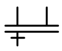
Select concourse diagram, more than two stepping points are transferred to the same stepping point through corresponding transition conditions.

并行分支图形，由同一步进点将综合体以同一转移条件转移到两个以上步进点。



Parallel division graph, one stepping point transfers the integrated body to more than two stepping points using one transition condition.

并行分支汇合图形，由两个以上不同步进点状态同时成立时，以同一转移条件转移到相同的步进点。



Parallel division concourse graph, when there are two different stepping points, under one transition condition they are transferred to the same stepping point.

4.1.2.1 SFC 的编程特点：

4.1.2.1 SFC's Programming Characteristic:

● 在该梯形图块 中，采用可编程控制器由 STOP→RUN 转换时，瞬间动作的辅助继电器 M8002，使初始状态 S0 置位（ON）；

In the trapezoidal block graph, when using the programmable controller to switch from STOP to RUN, instant acting auxiliary relay M8002 will reset to initial status S0 (ON);

● 可编程控制器中 S0-S9 为初始状态软元件；

Programmable Controller S0-S9 are initial status soft component;

● 对各动作工序分配了 S20-S889 等状态。其中也有停电保持用的状态，即使在停电时也可保存其动作状态。此外，S10-S19 可用于特殊目的；

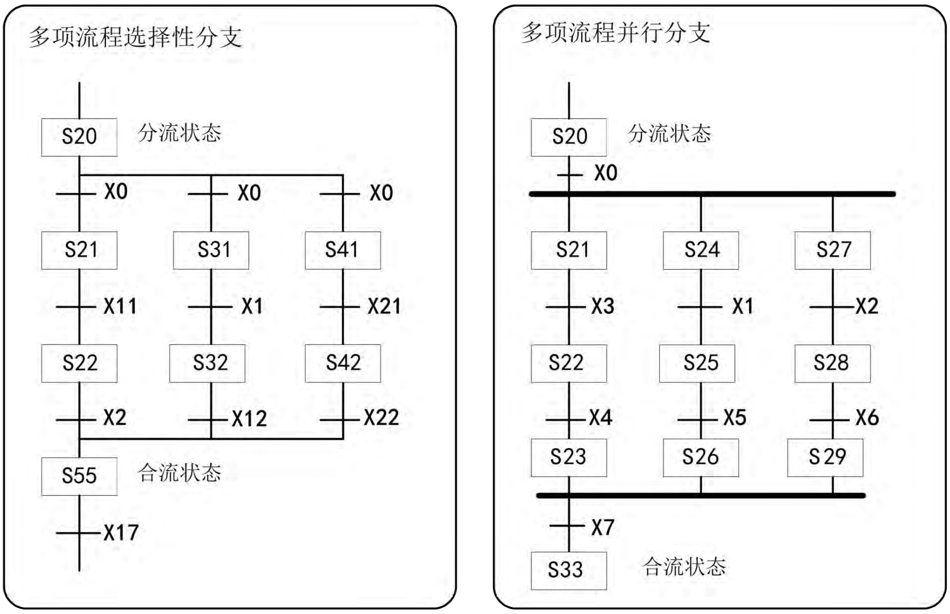
It distributes S20-S889 statuses to each working status. There is also status that is used for power failure preservation purpose, which allows operations continue in the even of power failure. Besides, S10-S19 can be used for other special purposes;

● 可编程控制器内的定时器、计数器和辅助继电器等软元件，可随意使用；

Timer, counter, auxiliary relay, and other soft components inside the programmable controller can be used as wish.

● 当有多项工序的选择、或有多个需要同时进行的工序时，采用如下方法：

When multiple working procedures are required simultaneously, follow steps below:



多项流程选择性分支
Multiple procedure selective division

分流状态
Diversion status

合流状态
Confluence status

初始步
Initiation

起始按钮
Startup button

可见在 SFC 图中，每道工序中设备的动作清晰易懂，其顺控设计容易，方便调测维护。
It is clear to see that in a SFC diagram, equipment's actions in one procedure are clearly identified and easy to understand. Sequential control design is easy to perform, as well as the testing and maintenance.

- SFC 图与步进梯形图指令都按一定的规则编程，可相互转换，其内容是一样的．也可

使用大家熟悉的继电器梯形图。

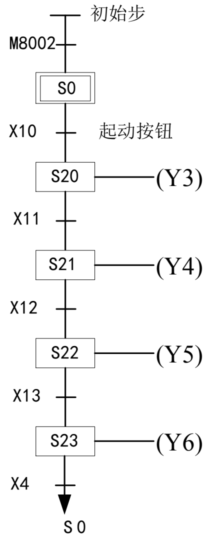
SFC diagram and stepping ladder diagram command all follows certain rules in programming. They are interchangeable and the contents are the same as well. Commonly used relay ladder diagram can also be used.

4.1.2.2 SFC 的编程方法：

4.1.2.2 Programming for SFC.

以下以举例的方式来逐项说明 SFC 编程的方法。

SFC programming will be explained step by step. Please see below.



初始状态的作用

Initial Status' Functions

● 初始状态位于 SFC 图的最前面，可使用状态号 S0-S9。

Initial status is at the beginning of a SFC diagram. Status number S0-S9 can be used.

● 初始状态也要通过其他状态（如上图示例 S23 所示）来驱动时，需要在运行开始时，利用其他方法事先驱动。

Initial status also require other status to activate (as illustrated above, S23). Before the startup, use other methods to activate first.

● 下图所示例子是在可编程控制器由 STOP→RUN 切换时，利用只有瞬间动作的特殊辅助继电器 M8002 来驱动。

Example illustrated below is when programmable controller is switching from STOP to RUN. It uses the auxiliary relay M8002 with instant acting to activate.

● 初始状态以外的一般状态一定要通过来自其他状态的 STL 指令驱动，不能从状态以外驱动。

Other regular statuses, except initial status, must be activated using other statuses' STL commands. It cannot be activated from outside the status.

● 将这种通过 STL 指令以外的触点驱动的状态称为初始状态。一定在流程的最前面表述。此外，对应初始状态的 STL 指令，必须在其之后的一系列 STL 指令之前编程。

The status that is activated by using contacts other than STL command is called initial status. It must be described at the forefront of the process. Besides, the STL command that is corresponding to the initial status must be programmed before the series of STL commands posterior to it.

没有分支与汇合的一般流程

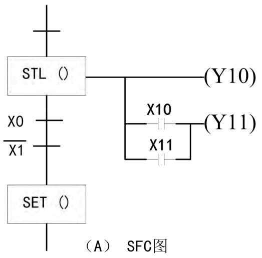
General process without division and concourse

下图 A 为典型的 SFC 图，每个状态具有驱动负载、指定转移目标以及指定转移条件三种功能。使用继电器顺控方式表示 SFC 图时，是下图（B）的步

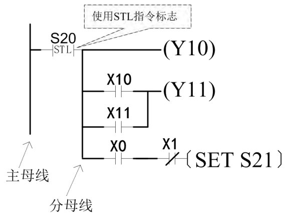
Illustration A is a typical SFC diagram. Each status has three functions: driver loading, designated transition target, and designated transition conditions. When using relay sequential control method to demonstrate a SFC diagram, see illustration B.

程序用 SFC 图或用步进梯形图均可编写。编程顺序为先进行负载的驱动处理，接着进行转移处理。当然，如果是不需要驱动负载的状态，则不需要进行负载的驱动处理。

Both SFC diagram and step ladder diagram can be used for programming. The sequence of program is processing the load driving first and then transferring. The load driving process is not necessary if the state doesn’t need it.



（A） SFC图



（B） 步进梯形图

```
STL   S20
OUT Y10
LD X10
OR X11
OUT Y11
LD X0
ANI X1
SET 21
```

(A) SFC 图

(B) 步进梯形图

主母线

分母线

使用 STL 指令标志

(A) SFC diagram

(B) step ladder diagram

Main bus bar

Branch bus bar

Usage of STL instruction flag

当然上述步进梯形图也可用指令表程序来等效描述，如右图所示。STL 指令为与主母线连接的常开触点指令，接着就可在副母线上直接连接线圈，或者可以通过触点驱动线圈。

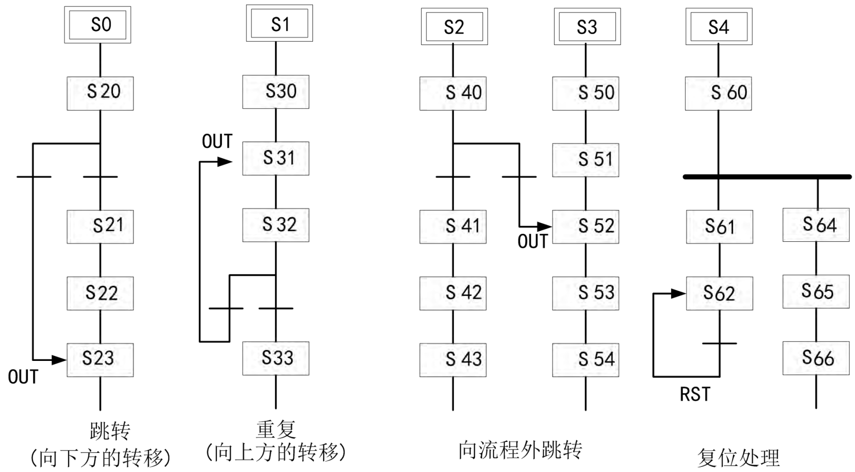
The above step ladder diagram also can be described using instruction list equivalently which is shown in right figure. The STL instruction is normally open contact instruction connected to main bus bar, and then coils can be connected to subsidary bus bar directly and drive coils through contacts.

在一系列的 STL 指令前面要有初始状态，最后一定要写入 RET 指令。

Initial state must be placed before all STL instructions and RET instruction must be written at the end of program.

带有跳转与重复的一般状态

General state with jump and loop



跳转（向下方的转移）

重复（向上方的转移）

向流程外跳转

复位处理

Jump (go downward)

Loop (go upward)

Jump out of process

Reset operation

如上图所示，向下方状态的转移（跳转）、向上方状态的转移（重复）、向流程外的转移等的分离状态转移，用 OUT 指令编程。

Going downward (jump), going upward (loop) and jumping out of process can be programmed using OUT instruction, which is shown in above figure.

选择性分支与汇合状态

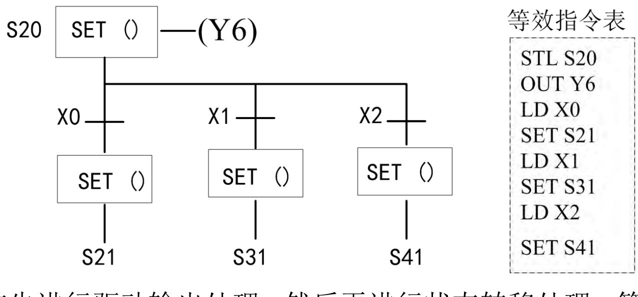
Selective branch and converge status

和一般状态的处理相同顺序，

首先进行驱动输出处理，然后

再进行状态转移处理。

等效指令列表如右图：

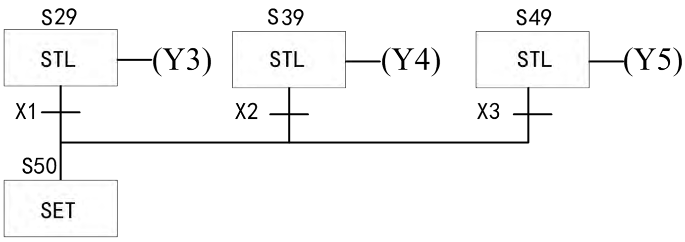


和一般状态的处理相同顺序，首先进行驱动输出处理，然后再进行状态转移处理。等效指令列表如右图:

Firstly process of driving output and then process of state transferring which is the same as the process of general status. The equivalent instruction list is shown in right figure:

等效指令表

Equivalent instruction table



STL S29
OUT Y3
STL S39
OUT Y4
STL S49
OUT Y5
STL S29
LD X1
SET S50
STL S39
LD X2
SET S50
STL S49
LD X3
SET S50

上图例为分支汇合的典型例子，右侧为等效指令表。

在分支与汇合的转移处理程序中，不能用：

MPS, MRD , MPP , ANB , ORB 指令；

另外，即使负载驱动回路也不能直接在 STL 指令后面

使用 MPS 指令。

上图例为分支汇合的典型例子，右侧为等效指令表。

Above example is a typical example of branch converge, and the equivalent instruction table is shown in right side.

在分支与汇合的转移处理程序中，不能用：MPS,MRD,MPP,ANB，ORB 指令；

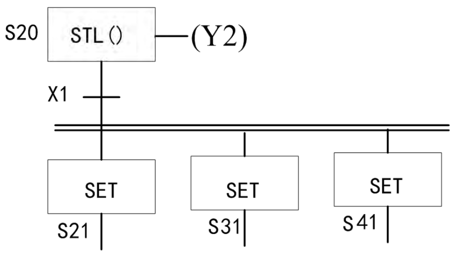
Following instructions can’t be used in the transferring process program of branch and converge: MPS,MRD,MPP,ANB and ORB;

另外，即使负载驱动回路也不能直接在 STL 指令后面使用 MPS 指令

On the other side, MPS instruction can’t be used after STL instructions directly even in the load driving circuit.

并行分支与汇合状态

Status of parallel branch and converge



和一般状态的处理相同顺序，首先进行驱动输出处理，然后再进行状态转移处理。

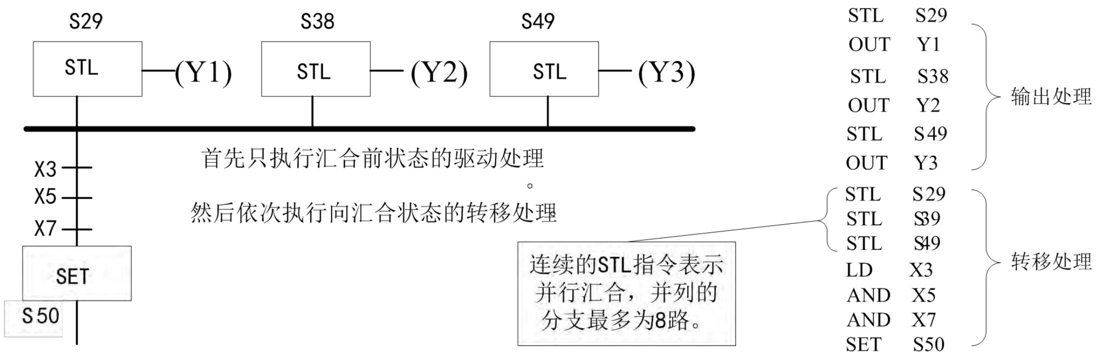
等效指令列表如右：

STL S20
OUT Y2
LD X1
SET S21
SET S31
SET S41

和一般状态的处理相同顺序，首先进行驱动输出处理，然后再进行状态转移处理。

等效指令列表如右：

Firstly process of driving output and then process of state transferring which is the same as the process of general status. The equivalent instruction list is shown in right figure:



首先只执行汇合前状态的驱动处理然后依次执行向汇合状态的转移处理

连续的 STL 指令表示并行汇合，并列的分支最多为 8 路

The dricing process of status before converge is executed firstly and then the transferring process of converge status is executed in turn.

Continuous STL instructions represent parallel converge, and the maximum parallel branch number is 8.

输出处理

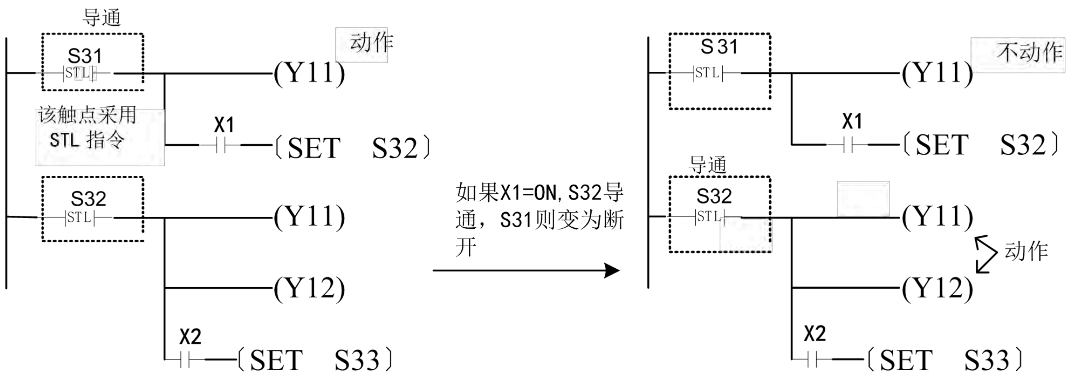
Output Process

转移处理

Transition process

步进梯形图指令及其动作如下图所示：

Step ladder diagram and corresponding actions are shown in following figures:



导通

动作

该触电采用 STL 指令

如果 X1=ON，S32 导通，S31 则变为断开

不动作

动作

Closed

Operates

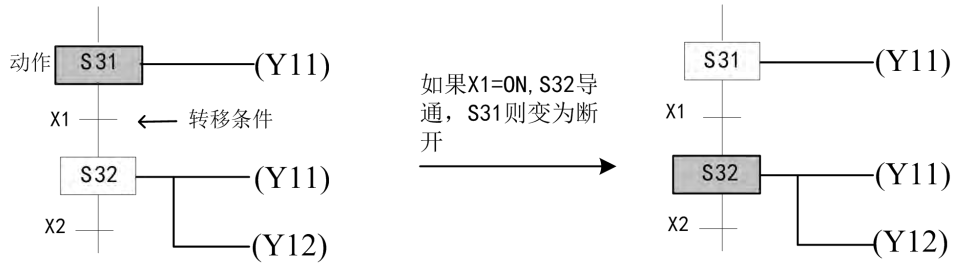
STL instruction is used for this contact

If X1=ON then S32 will be closed and S31 will be open

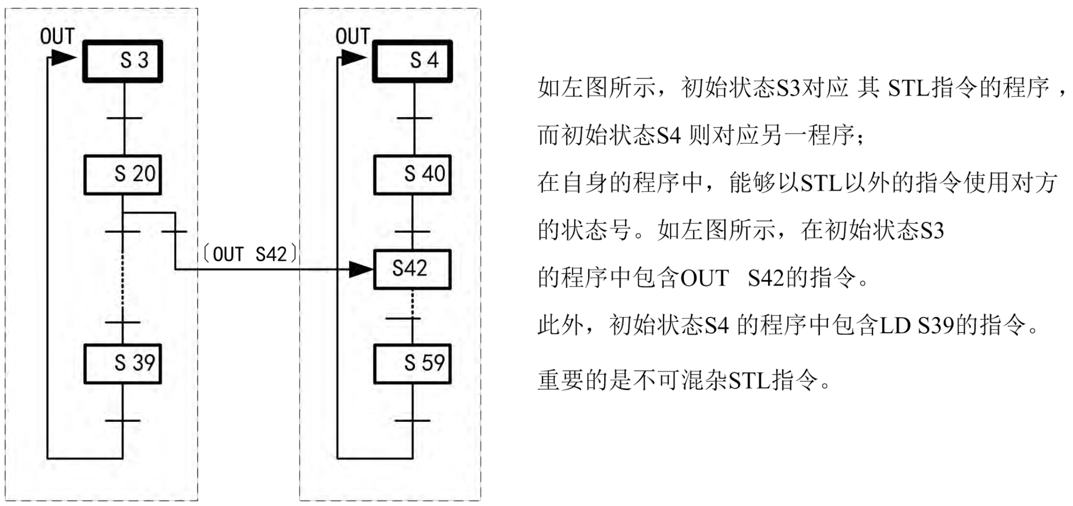
No operation

Operates

若以 SFC 图表示上图所示的步进梯形图回路，则其表示如下图所示：
If the step ladder diagram circuit is represented by SFC diagram then the representation is shown in the following figure:



动作
Operates
转移条件
Transition condition
如果 X1=ON，S32 导通，S31 则变为断开
If X1=ON then S32 will be closed and S31 will be open
具有多个初始状态的 SFC 图的程序将各初始状态分离编程。
The SFC diagram with multiple initial states can be programmed individually for each state.

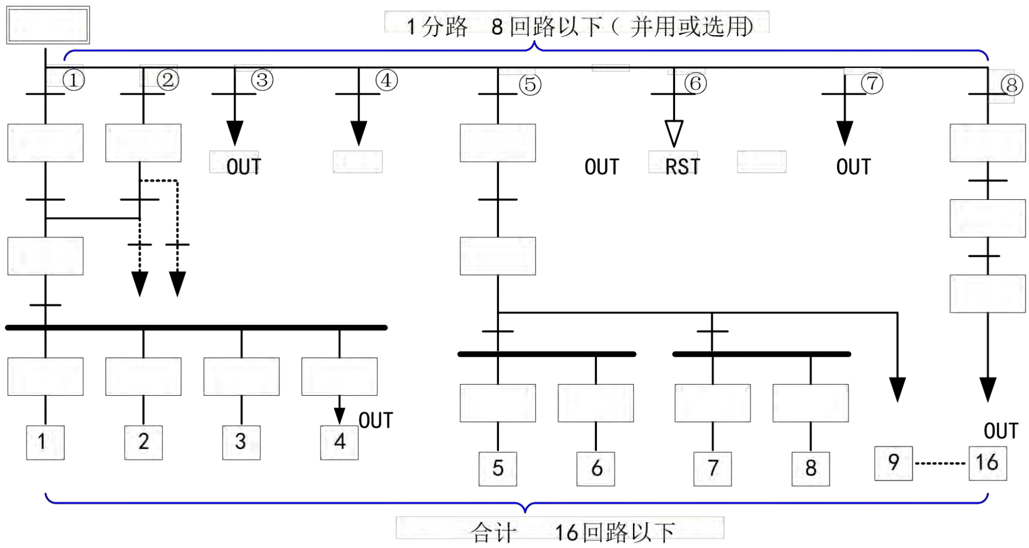


如左图所示，初始状态 S3 对应其 STL 指令的程序，而初始状态 S4 则对应另一程序；在自身的程序中，能够以 STL 以外的指令使用对方的状态号。如左图所示，在初始状态 S3 的程序中包含 OUT S42 的指令。此外，初始状态 S4 的程序中包含 LD S39 的指令。重要的是不可混杂 STL 指令。
Just as shown in the left figure, initial state S3 corresponds to its program of STL instructions and initial state S4 corresponds to another program; Instructions other than STL can use the state number of the opposite side. OUT S42 instruction is included in the program of initial state S3 just as shown in the left figure. LD S39 instruction is included in the program of initial state S4. STL instructions can’t be mixed together, which is very

important.

一条并行分支或选择性分支的回路数限定为 8 条以下；但是，有多条并行分支或选择性分支时，每个初始状态的回路总数不超过 16 条。如下图：

Circuit number of one parallel branch or selective branch must be less than 8; But circuit number of each initial state must be less than 16 if multiple parallel branch or selective branch exist.As follow:



1 分路 8 回路以下（并用或选用）

1 shunt circuit　　8 circuits or less (parallel or selective)

合计 16 回路以下

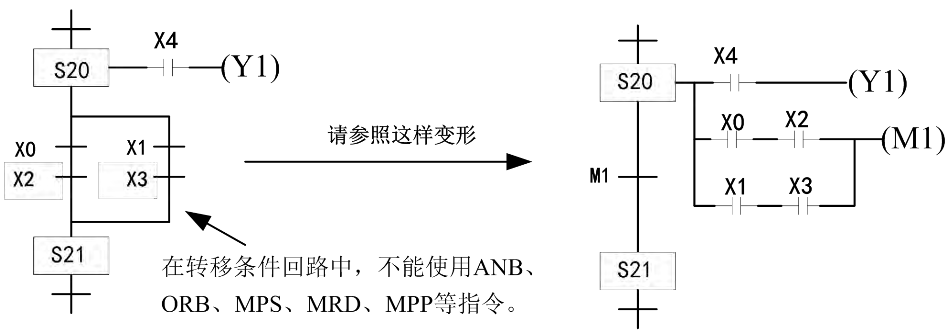
Total　16 circuits or less

不能进行从汇合线或汇合前的状态开始向分离状态的转移处理或复位处理，应设置空状态，由分支线上向分离状态进行转移与复位处理。

Transferring or reset from converge line or status before converge to separated status can't be executed. Void status should be set to execute transferring and reset process from the branch line.

对于状态转移条件比较复杂的情况，建议作简化处理，例如：

Simplified process is recommended if the condition of status transferring is complicated. For example:

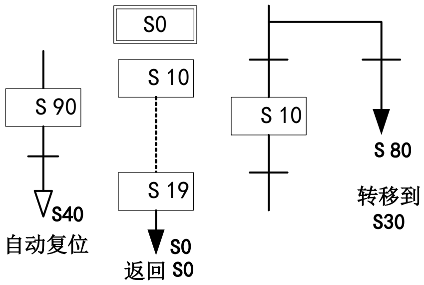


请参照这样变形

Transform like this

在转移条件回路中，不能使用 ANB、ORB、MPS、MRD、MOO 等指令
ANB、ORB、MPS、MRD and MOO instructions can’t be used in transferring circuit

状态的转移与复位：
Tranferring and reset of state:



自动复位
返回 SO
转移到 S30
Automatic reset
Return to S0
Go to S30

● 在流程中，符号 则表示向上面的状态转移重复或向下面的状态转移（跳转），或者向分离的其他流程上的状态转移。符号 则表示状态的复位处理。
● The symbol ? represents going to upward state(loop) or going to downward state (jump) in the process, or going to individual states of other processes. The symbol ? represents reset process of state.
● 状态标志 S 也可以采用 ZRST 指令对一个区间的标志进行批量复位。
● The state flag S can reset flags in an area in batches using ZRST instruction.
● 编写（SFC）图程序时，可使用如下特殊辅助继电器，提高编程效率，如下表所示说明。
● Following special auxillary relay can be used for SFC diagram program to increase programming efficiency, which is shown in following table.

软元件号 Soft Component No.	名你 designation	功能和用途 Function ans purpose
M8000	RUN 监视 RUN monitor	可编程控制器在运行过程中，需要一直接通的继电器。可作为驱动的程序的输入条件或作为可编程控制器运行状态的显示来使用。 PLC needs relay which is always closed during operation. This component can be used as input condition of driven program or display of PLC operation status.
M8002	初始脉冲 Initial pulse	在可编程控制器由 STOP→RUN 时，仅在瞬间（1 个扫描周期）接通的继电器。用于程序的初始设定或初始状态的置位。 Instantaneously (within 1 period) closed relay while PLC changing from STOP to RUN. This component can be

		used for initial setting or the set of initial state in program.
M8040	禁止转移 Transferring disabled	驱动该继电器，则禁止在所有状态之间转移。然而，即使在禁止转移状态下，由于状态内的程序仍然动作，因此，输出线圈等不会自动断开。 If this relay is driven then all the states are forbidden to be transferred. Since the program still operates even the state transferring is forbidden, the output coil will not be disconnected automatically.
M8046	STL 动作 STL operation	任一状态接通时，M8046 自动接通。用于避免与其他流程同时启动或用作工序的动作标志。 M8146 will be connected automatically if any state is ON. Used to avoid the same time start with other processes or be as the action flag for work process.
M8047	STL 监视有效 STL monitor enabled	驱动该继电器．则编程功能则可自动读出正在动作中的状态并加以显示。详细事项请参照各外围设备的手册。 If this relay is driven then the operating states can be read automatically and displayed by the programming function. Please refer to manuals of external devices for details.

● 停电保持用状态，是用电池保持其动作状态。在机械动作中途发生停电之后，再通电时从这里继续运行的情况下使用这些状态。

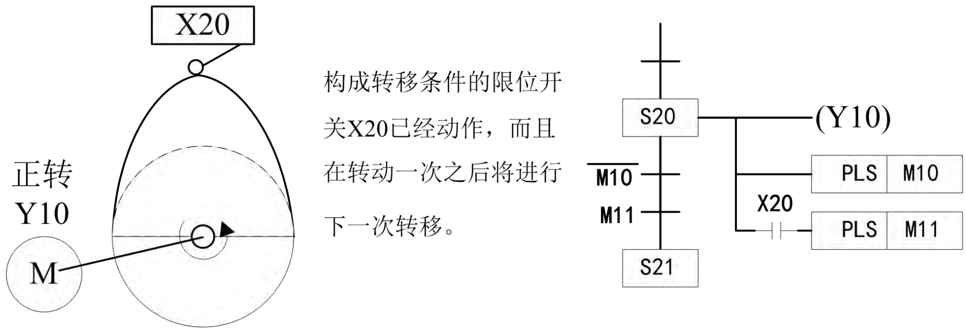
● States which will be maintained during power failure use battery to maintain its operation status. These states can be used when powered again and continue to operate after power failure during mechanical operations.

● RET 指令一定在一系列的 STL 指令的最后编写，没有编写 RET 指令时，会出现［程序出错］，可编程控制器不能运行。执行此指令，表明步进梯形图回路的结束。在希望中断一系列的工序而在主程序编程时，同样需要 RET 指令，RET 指令可多次编程。

● The RET instruction must be programmed at the end of STL instructions, or [program error] may occurs and the PLC will not run. The execution of this instruction will stop the step ladder diagram circuit. If interruption of a series of working procedure is needed in the main program then RET instruction is also needed, and multiple RET instruction can be programmed.

● 转移条件成立后状态的处理。

● State process when the transferring condition is met.



正转

Sequential Rotation

构成转移条件的限位开关 X20 已经动作，而且在转动一次之后将进行下一次转移。

The limit switch X20 has operated to meet the transferring condition, and the next transferring will be executed after rotation for once.

如上图所示的应用中，将转移条件脉冲化，S20 首次动作，通过 M10 使不产生转移。

In the application shown in above figure, the transferring condition will be converted to pulse and S20 operates for the first time to avoid transferring through M10.

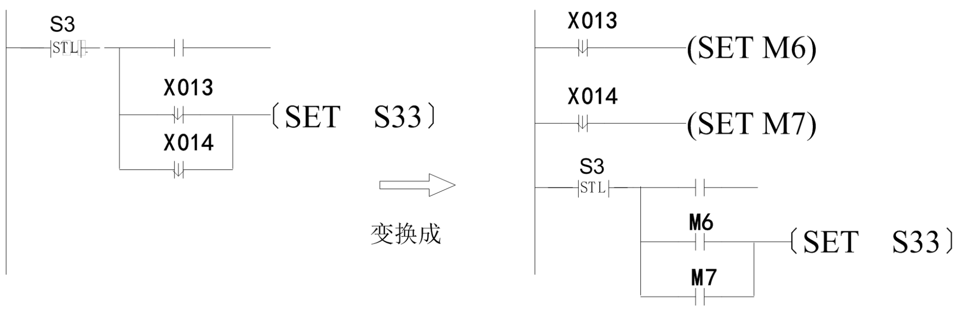
- 上升沿 / 下降沿检测触点使用时的注意事项：
- Notice of rising/falling edge detection contacts:

在状态内使用 LDP、LDF、ANDP、ANF、ORP、ORF 的上升沿 / 下降沿检侧触点时．状态断开时变化的触点，在状态再次接通时被检出。

If the rising/falling edge of LDP、LDF、ANDP、ANF、ORP and ORF is used for detecting contacts, then the contacts of which the state changes during open status will be detected when it’s closed again.

对于状态断开时变化的条件，必需上升沿 / 下降沿检侧时，请按下图所示，修改程序：

If the condition of status changing during open state need rising/falling edge detection then the program should be modified as the figure below:



变换成

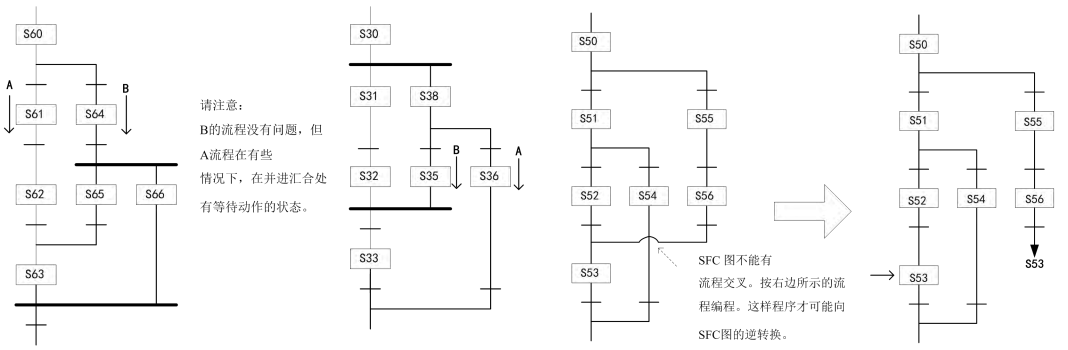
Transformed to

通过 X013 下降沿向 S33 转移后，若 X014 下降．此时因 S3 断开，X014 的下降沿无法检出，S3 再次接通时，被检测。因此，S3 第 2 次动作时，立即向 S33 转移。

If X014 falls After the transferring to S33 through the falling edge of X013, then the falling edge of X014 can’t be detected because S3 is open. The falling edge will be detected when S3 is closed again. So the program will transfer to S33 when S3 operates for the 2nd time.

分支与汇合的组合流程

Composition process of branch and converge

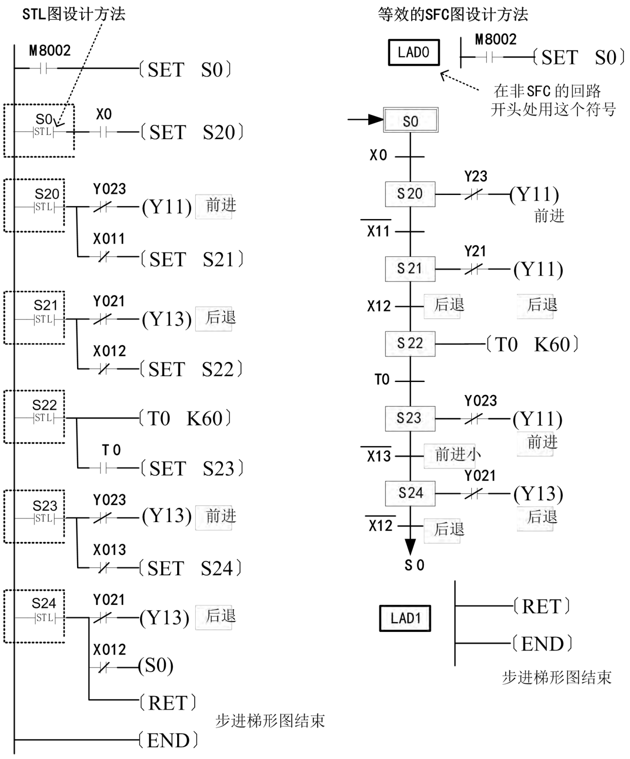


请注意：B 的流程没有问题，但 A 流程在有些情况下，在并进汇合处有等待等待动作的状态。

Note: The program flow of B has no problem, but waiting state will exist at the parallel converge point in the program flow of A.

SFC 图不能有流程编程，这样程序才可能向 SFC 图的逆转换。

Program flow crossover should not exist in SFC diagram, and the program can only transfer to the inversion of SFC diagram if programming according to the right figure.



STL 图设计方法

Programming of STL diagram

前进

Forward

步进梯形图结束

End of step ladder diagram

等效的 SFC 图设计方法

Programming of equivalent SFC diagram

在非 SFC 的回路开头处用这歌符号

This symbol should be used at the end of non-SFC circuit

后退

Backward

前进

Forward

4.2 应用指令表

4.2 Application instruction table

应用指令是指除逻辑处理指令之外的编程指令，指令功能涉及程序流控制、数值计算、高速信号处理、通讯与扩展、特殊控制功能等多个方面。这些指令除了具有指令名之外，往往还有“功能号”的编号，便于使用手持编程器设备进行编程。按功能分类列表如下，每一个指令的功能和使用方法在第 7 章内有详细说明。

Application instruction means the program instructions other than logical process instructions including program flow control, numerical calculation, high-speed signal processing, communication and extension and special control functions. These instructions not only have an instruction designation but also have a “function number” which is convenient for programming with handheld programming device. These instructions are list in the following table according to their function categories, and the function and usage of each instruction is described in detail in chapter 7.

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
程序流 Program flow control	00	CJ	–	✔	有条件跳转 Conditional jump
	01	CALL	–	✔	子程序调用 Subroutine call
	02	SRET	–	–	子程序返回 Sub-program Reset
	03	IRET	–	–	中断返回 Interrupt Reset
	04	EI	–	–	开中断 Enable interrupt
	05	DI	–	–	关中断 Disable interrupt
	06	FEND	–	–	主程序结束 Master Program Termination
	07	WDT	–	✔	监控定时器 Monitor Timer
	08	FOR	–	–	循环范围开始 Start of loop range
	09	NEXT	–	–	循环范围终了 End of loop range
传送与比较 Transmit and Compare	10	CMP	✔	✔	比较 Compare
	11	ZCP	✔	✔	区域比较 Zone comparison
	12	MOV	✔	✔	传送

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
					Transmit
	13	SMOV	–	✔	移位传送 Shift Transmit
	14	CML	✔	✔	倒转传送 Reverse Transmit
	15	BMOV	–	✔	一并传送 Both Transmit
	16	FMOV	✔	✔	多点传送 Multiple Point Transmission
	17	XCH	✔	✔	交换 Exchange
	18	BCD	✔	✔	BCD 转换 BCD conversion
	19	BIN	✔	✔	BIN 转换 BIN conversion
四则逻辑运算 Four logical arithmetic operations	20	ADD	✔	✔	BIN 加法 BIN addition
	21	SUB	✔	✔	BIN 减法 BIN subtraction
	22	MUL	✔	✔	BIN 乘法 BIN multiplication
	23	DIV	✔	✔	BIN 除法 BIN division
	24	INC	✔	✔	BIN 加 1 Increase by 1 (BIN)
	25	DEC	✔	✔	BIN 减 1 Decrease by 1 (BIN)
	26	WAND	✔	✔	逻辑字与 Logical Character AND
	27	WOR	✔	✔	逻辑字或 Logical Character OR
	28	WXOR	✔	✔	逻辑字异或 Logical Character XOR
	29	NEG	✔	✔	求补码 Complemental Code
循环移位 Rotary	30	ROR	✔	✔	循环右移 Cycle Right Shift
	31	ROL	✔	✔	循环左移

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
					Cycle Left Shift
	32	RCR	✔	✔	带进位循环右移 Carry Cycle Right Shift
	33	RCL	✔	✔	带进位循环左移 Carry Cycle Left Shift
	34	SFTR	✔	✔	位右移 Right shift
	35	SFTL	-	✔	位左移 Left shift
	36	WSFR	-	✔	字右移 Shift right by word
	37	WSFL	-	✔	字左移 Character Left Shift
	38	SFWR	-	✔	“先进先出”写入 “FIFO” write
	39	SFRD	-	✔	“先进先出”读出 “FIFO” read
数据 处理 Data processing	40	ZRST	-	✔	区间复位 Interval reset
	41	DECO	-	✔	编码 Encode
	42	ENCO	-	✔	解码 Decode
	43	SUM	✔	✔	ON 位数 Count of ON
	44	BON	✔	✔	ON 位数判定 Determination of ON count
	45	MEAN	✔	✔	平均值 Average
	46	ANS	-	-	信号报警置位 Signal Alarm Set
	47	ANR	-	✔	信号报警器复位 Signal alarm reset
	48	SOR	✔	✔	BIN 平方根 BIN square root
	49	FLT	✔	✔	浮点数与十进制数间转换 floating point to decimal conversion

分类 Class	FNCNO.	指令符号 Instruction symbol 16 位 16bit	 32 位 32bit	 P 指令 P instruction	指令功能 Function
高速处理 High speed processing	50	REF	-	✔	输入输出刷新 Input/output refresh Input/output refresh
	51	REFE	-	✔	滤波器调整 Filter Adjust
	52	MTR	-	-	距阵输入 Matrix input
	53	HSCS	✔	-	比较置位（高速计数器） Comparative Set (High-speed counter)
	54	HSCR	✔	-	比较复位（高速计数器） Comparative Reset (High-speed counter)
	55	HSZ	✔	-	比较区间（高速计数器） Comparative Interval (High-speed counter)
	56	SPD	-	-	脉冲密度 Pulse density
	57	PLSY	✔	-	脉冲输出 Pulse output
	58	PWM	-	-	脉冲幅宽调制 Pulse width modulation
	59	PLSR	✔	-	带加减速的脉冲输出 Pulse output with Acceleration and Deceleration
方便指令 Quick Command	60				
	61	SER	✔	✔	数据搜索 Data search
	62	ABSD	✔	–	绝对值式凸轮顺控 Absolute cam control
	63	INCD		–	增量式凸轮顺控 Incremental cam control
	64	TIMR	–	–	示教定时器 Teach timer
	65	STMR	–	–	特殊定时器 Special timer
	66	ALT	–	–	交替输出

分类 Class	FNCNO.	指令符号 Instruction symbol 16 位 16bit	32 位 32bit	P 指令 P instruction	指令功能 Function
					Alternate state
	67	RAMP	–	–	斜坡信号 Ramp variable value
	68	ROTC	–	–	旋转台控制 Rotary table control
	69	SORT	–	–	列表数据排列 Sort of list data
外部 设备 External device I/O	70	TKY	✔	–	0-9 数字键输入 Decimal number input 0-9
	71	HKY	✔	–	16 键输入 Hexadecimal number input
	72	DSW	–	–	数字式开关 Digital Switch
	73	SEGD	–	✔	7 段编码 7 segments coding
	74	SEGL	–	–	带锁存的 7 段显示 7 segments display with latch
	75	ARWS	–	–	矢量开关 Vector switch
	76	ASC	–	–	ASCII 码转换 ASCII code conversion
	77	PR	–	–	ASCII 码打印输出 ASCII code print
	78	FROM	✔	✔	特殊功能块读出 Special function block reading
	79	TO	✔	✔	特殊功能块写入 Special function block writing
外设 设备 External device SER	80	RS	-	-	串行数据传送 Serial communication instruction
	81	PRUN	✔	✔	并联运行 Parallel operation
	82	ASCI	-	✔	HEX→ASCII 转换 HEX→ASCII conversion
	83	HEX	-	✔	ASCII→HEX 转换 ASCII→HEX conversion
	84	CCD	-	✔	校正代码 Check sum code

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
	85				
	86				
	87				
	88	PID	-	-	PID 运算 PID calculation
	89				
浮点数 Number of floating point	110	ECMP	✔	✔	2 进制浮点数比较 Binary floating point number comparison
	111	EZCP	✔	✔	2 进制浮点数区间比较 Binary floating point zone comparison
	118	EBCD	✔	✔	2 进制→10 进制浮点数转换 Binary-decimal floating point number conversion
	119	EBIN	✔	✔	10 进制→2 进制浮点数转换 Decimal-binary floating point number conversio
	120	EADD	✔	✔	2 进制浮点数加 Binary floating point addition
	121	ESUB	✔	✔	2 进制浮点数减 Binary floating point subtraction
	122	EMUL	✔	✔	2 进制浮点数乘 Binary floating point multiplication
	123	EDIV	✔	✔	2 进制浮点数除 Binary floating point division
	127	ESOR	✔	✔	2 进制浮点数开平方 Binary floating point square root
	129	INT	✔	✔	2 进制浮点数→BIN 整数转换 Binary floating point – BIN integer conversion
	130	SIN	✔	✔	浮点数 SIN 运算 Floating point SIN operation
	131	COS	✔	✔	浮点数 COS 运算 Floating point COS operation
	132	TAN	✔	✔	浮点数 TAN 运算

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
					Floating point TAN operation
	147	SWAP	✔	✔	上下字节变换 Upper and lower byte conversion
定位指令 Locate Instruction	155	ABS	✔	-	ABS 位置数读取 ABS position readout
	156	ZRN	✔	-	原点回归 Regression through the Origin
	157	PLSV	✔	-	可变脉冲输出 Variable pulse output
	158	DRVI	✔	-	相对位置控制 Relative position control
	159	DRVA	✔	-	绝对位置控制 Absolute position control
时钟运算 Clock operation	160	TCMP	-	✔	时钟数据的比较 Clock data comparison
	161	TZCP	-	✔	时钟数据区域比较 Clock data region comparison
	162	TADD	-	✔	时钟数据加法 Clock data addition
	163	TSUB	-	✔	时钟数据减法 Clock data subtraction
	166	TRD	-	✔	时钟数据读出 Clock data readout
	167	TWR	-	✔	时钟数据写入 Clock data input
	168				
	169	HOUR	✔	-	计时器 Timer
	170	GRY	✔	✔	格雷码转换 Gray code conversion
	171	GBIN	✔	✔	格雷码逆转换 Gray code inverted conversion
接点比较 Contacts comparison	224	LD=	✔	–	(S1)=(S2)
	225	LD>	✔	–	(S1)>(S2)
	226	LD<	✔	–	(S1)<(S2)
	228	LD<>	✔	–	(S1)<>(S2)

分类 Class	FNCNO.	指令符号 Instruction symbol			指令功能 Function
		16 位 16bit	32 位 32bit	P 指令 P instruction	
	229	LD<=	✔	–	(S1)<=(S2)
	230	LD>=	✔	–	(S1)>=(S2)
	232	AND=	✔	–	(S1)=(S2)
	233	AND>	✔	–	(S1)>(S2)
	234	AND<	✔	–	(S1)<(S2)
	236	AND<>	✔	–	(S1)<>(S2)
	237	AND<=	✔	–	(S1)<=(S2)
	238	AND>=	✔	–	(S1)>=(S2)
	240	OR=	✔	–	(S1)=(S2)
	241	OR>	✔	–	(S1)>(S2)
	242	OR<	✔	–	(S1)<(S2)
	244	OR<>	✔	–	(S1)<>(S2)
	245	OR<=	✔	–	(S1)<=(S2)
	246	OR>=	✔	–	(S1)>=(S2)

4.3 指令解释

4.3 instruction description

4.3.1 基本指令解释

4.3.1 basic instruction description

指令 Instruction	操　作　数 operands						
LD LDI LDP	X0~ X377	Y0~ Y377	M0~M3071 M8000~M8255	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
LDF	✔	✔	✔	✔	✔	✔	

LD/LDI/LDP/LDF 指令用于左母线开始的接点，其中：

LD/LDI/LDP/LDF instructions are used for contacts which start from left bus bar, where:

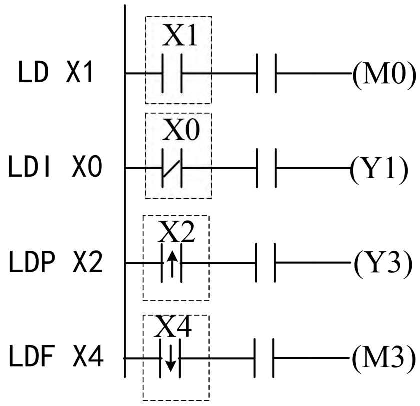
LD/LDI 指令分别是把 A 接点和 B 接点的当前能流状态保存，同时把取来的接点状态存入累计缓存器内。

LD/LDI instructions save the current power flow status of A and B contacts respectively and store the contact states into accumulative buffer.

LDP 指令用于取用接点信号的上升沿，若本次扫描中检测到对应信号的上升跳变，则触点有效，下一次扫描时，触点即变成无效。

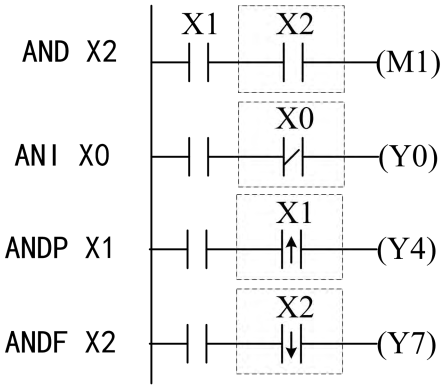
LDP instruction is used for accessing the rising edge of contact signal. If the rising edge of corresponding signal is detected during current scan period then the contact will be

effective, and the contact will be ineffective during the next scan period.
LDF 指令用于取用接点信号的下降沿，若本次扫描中检测到对应信号的下降跳变，则触点有效，下一次扫描时，触点即变成无效。
LDF instruction is used for accessing the falling edge of contact signal. If the falling edge of corresponding signal is detected during current scan period then the contact will be effective, and the contact will be ineffective during the next scan period.



指令 Instruction	操　作　数 operands						
AND ANI	X0~ X377	Y0~ Y377	M0~M3071 M8000~M8255	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
ANDP ANDF	✔	✔	✔	✔	✔	✔	

AND/ANI/ANDP/ANDF 指令用于串联接点的状态运算，其操作是先读取目前所指定串联接点的状态再与接点之前逻辑运算结果作“与”（AND）的运算，并将结果存入累计缓存器内。
AND/ANI/ANDP/ANDF instructions are used for state operation of contacts in series. These instructions read the state of the currently specified contacts in series, and then use it for logic “AND” operation with previous logical operation result of the contact, and the result will be stored into accumulative buffer.
AND/ANI 指令分别是将 A 接点和/B 接点的状态参与 AND 运算；
AND/ANI instructions carry out logical AND operation with A/B contacts respectively;
ANDP 指令是将接点的上升沿跳变状态参与 AND 运算；
ANDP instruction carries out logical AND operation with the rising edge of contact;
ANDF 指令是将接点的下降沿跳变状态参与 AND 运算；
ANDF instruction carries out logical AND operation with the falling edge of contact;



指令 Instruction	操　作　数 operands						
OR ORI ORP ORF	X0~ X377	Y0~ Y377	M0~M3071 M8000~M8255	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
	✔	✔	✔	✔	✔	✔	

OR/ORI 指令用于并联接点的状态运算，其操作是先读取目前所指定接点的状态，再与接点之前逻辑运算结果作“或”（OR）的运算，并将结果存入累计缓存器内。

OR/ORI instructions are used for state operation of parallel contacts. These instructions read the state of the currently specified contacts in series, and then use it for logic “OR” operation with previous logical operation result of the contact, and the result will be stored into accumulative buffer.

OR/ORI 指令分别是将 A 接点和/B 接点的状态参与 OR 运算；

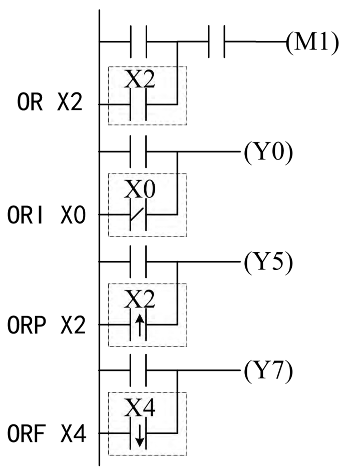
OR/ORI instructions carry out logical OR operation with A/B contacts respectively;

ORP 指令是将接点的上升沿跳变状态参与 OR 运算；

ORP instruction carries out logical OR operation with the rising edge of contact;

ORF 指令是将接点的下降沿跳变状态参与 OR 运算。

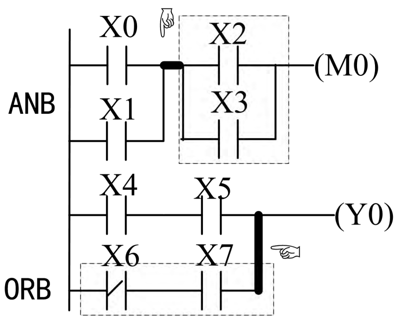
ORF instruction carries out logical OR operation with the falling edge of contact.



指令 Instruction	操　作　数 Operands
ANB	无。 None
ORB	参与块运算的是最近两次 LD（或 LDI/LDP/LDF）区间的计算能流 Calculation power flow of the last two LD (or LDI/LDP/LDF) instructions

ANB 和 ORB 是将前一保存的逻辑结果与目前累计缓存器旳内容作“与”和“或”的运算。

ANB and ORB instructions carry out logical “and” and “or” operation for the last stored logical result and the current content in the buffer.




```
☛LD X0
 OR X1
☛LD X2
 OR X3
☞ANB
 OUT M0
```

```
☛LD X4
 AND X5
☛LDI  X6
 AND  X7
☞ORB
 OUT Y0
```

指令 Instruction	操　作　数 Operands
MPS　MRD　MPP	无 None

MPS：将目前累计缓存器的内容存入堆栈。(堆栈指针加一)

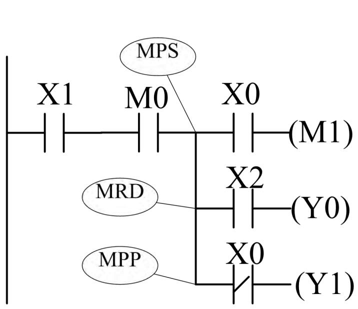
MPS： Store the current content of accumulative buffer into stack. (The stack pointer increases by 1)

MRD：读取堆栈内容存入累计缓存器。(堆栈指针不动)

MRD：Read the content of stack and then store it into accumulative buffer. (The stack pointer doesn’t change)

MPP：自堆栈取回前一保存的逻辑运算结果，存入累计缓存器。(堆栈指针减一)

MPP：Fetch the previously stored logical operation result from stack and store it into accumulative buffer. (The stack pointer decrease by 1)




```
LD X1
AND M0
 MΠΣ
AND X0
OUT M1
 MPΔ
```

```
AND X2
OUT Y0
MPP
AND X0
OUT Y1
```

指令	操　作　数

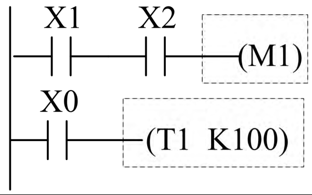
Instruction	operands						
OUT	X0~ X377	Y0~ Y377	M0~M3071 M8000~M8255	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
	✘	✔	✔	✔	✔	✔	

将 OUT 指令之前的逻辑运算结果输出至指定的元件。

Output the logical operation result before OUT instruction to specified component.

OUT M1

OUT T1 K100

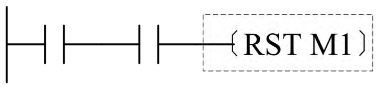


指令 Instruction	操 作 数 Operands						
SET	X0~ X377	Y0~ Y377	M0~M3071 M8000~M8255	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
		✔	✔	✔			

当 SET 指令被驱动，其指定的组件被设定为 ON，且被设定的组件会维持 ON，不管 SET 指令是否仍被驱动。可利用 RST 指令将该组件设为 OFF。

The specified component will be set to ON if SET instruction is driven, and the component will maintain state of ON no matter whether SET instruction is still driven or not. RST instruction can be used to set the component to OFF.

RST M1



元件 Component	操作结果 Operation result
S，M，Y	线圈及接点被设定为 OFF Coil and contact will be set to OFF
T，C	目前计时或计数值会被设为 0，且线圈及接点被设定为 OFF。 Current timer or counter value will be set to 0, and the coil and contact will be set to OFF.
D，V，Z	元件的值清为 0 The value of component will be cleared to 0

指令	操 作 数

Instruction	operands						
PLS PLF	X0~ X377	Y0~ Y377	M0~M3071	S0~ S999	T0~ T255	C0~ C255	D0~ D8255
		✔	✔				

当 PLS 指令被上升沿驱动时，其指定的元件被设定为 ON 状态，该 ON 状态仅持续 1 个扫描周期；

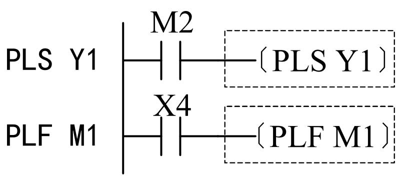
If PLS instruction is driven by rising edge then the specified component will be set to ON which will be maintained only for one scan period;

当 PLF 指令被下降沿驱动时，其指定的元件被设定为 ON 状态，该 ON 状态仅持续 1 个扫描周期。

If PLF instruction is driven by falling edge then the specified component will be set to ON which will be maintained only for one scan period.

指令举例：

Example:



指令 Instruction	操　作　数 operands
MC　MCR	N0~N7

MC 为主控起始指令，当 MC 指令执行时，位于 MC 与 MCR 指令之间的指令照常执行。当 MC 指令 OFF 时，位于 MC 与 MCR 指令之间的指令动作如下所示：

MC is the main control start instruction. The instructions between MC and MCR will be executed as usual when MC instruction is executed. The operation of instructions between MC and MCR when MC is OFF is shown below:

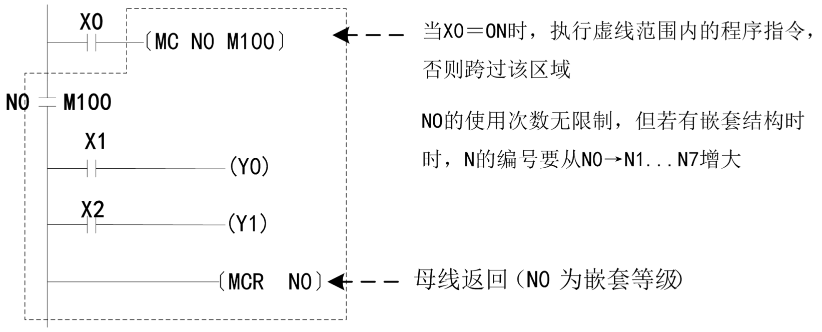
定时器 Timer	计时值归零，线圈失电，接点不动作 Timer value returns to zero, coils deenergized, contacts not operating
计数器 Counter	线圈失电，计数值及接点保持目前状态 Coils deenergized, counter value and contacts maintain current status
OUT 指令驱动的线圈 Coils driven by OUT instruction	全部不受电 All coils can’t be powered
SET，RST 指令驱动的组件 Components driven by SET and RST instruction	保持目前状态 Maintain current status
应用命令 Application instruction	全部不动作 All instructions aren’t operating

MCR 为主控结束指令，置于主控程序最后，在 MCR 指令之前不可有接点指令。

MCR is main control return instruction which is placed at the end of the main control program, and no contact instructions can be placed before MCR instruction.

MC-MCR 主控程序指令支持巢状程序结构，最多可 8 层，使用时依 N0~N7 的顺序，

MC-MCR main control program supports nested program structure and maximum 8 level can be nested which should be in the order of N0~N7.



当 X0=ON 时，执行虚线范围内的程序指令，否则跨过该区域

If X0=ON then the program instruction within the area surrounded by dashed line, or this area will be strided over

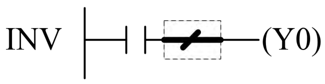
NO 的使用次数无限制，但若有嵌套结构时，N 的编号要从 N0 N1…N7 增大

The usage number of NO is unlimited, but the number of N should increase from N0 to N1…N7 if nested structure exists.

指令 Instruction	操　作　数 Operands
INV	无 None

将 INV 指令之前的逻辑运算结果反相后存入累计缓存器内。当 INV 指令之前能流为 ON，经过 INV 后能流变为 OFF；反之，变为 ON。

The previous logical operation result before INV instruction is reversed and then stored to accumulative buffer. If the power flow before INV instruction is ON then the power flow will change to OFF after the INV instruction; or vice versa.



指令 Instruction	操　作　数 Operands
NOP	无 None

指令 NOP 在程序不做任何运算，因此执行后仍会保持原逻辑运算结果，没有实际操作，在 AutoShop 编译时，会自动将之删除，减少程序空间的浪费，加快运行速度。

NOP instruction will carry out nothing, so the previous logical operation result will maintain after the execution of NOP. This instruction will be deleted automatically while compiling in AutoShop to decrease the space comsumption and increase the operation speed.

指令 Instruction	操　作　数 Operands
FEND END	无 None

在主程序的末尾才加入 FEND 指令，以指明用户主程序的结束。

FEND instruction should be placed at the end of the main program to indicate the

termination of main program.
只在梯形图程序或指令程序最后才加入 END 指令。PLC 执行时由用户程序的地址 0 扫描到 END 指令，执行之后，返回到地址 0 重新作扫描执行，对超过 END 指令之后的程序空间不再处理。在 AutoShop 编程环境中，无需用户输入 FEND 或 END 指令，系统在下载时会自动加入。
The END instruction is necessary only for ladder diagram or instructoin program.
If address 0 of user program scans and meets END instruction, then program will return to address 0 for scan and execution again after the END instruction is executed, and the program space after END instruction will not be processed.
FEND or END instruction is not need to be added by user in the AutoShop environment because the instruction will be added automatically by system while downloading.

指令 Instruction	操　作　数 operands
P	P0~P127 用于标记主程序中跳转的地址起始，其中 P63 为指向 END 的专用地址。 Used for indicating the start address of jump in the main program, and P63 is a special address pointing to END. 用于标记子程序的起始地址，每个子程序都以 SRET 为结束。 Used for indicating the start address of subroutines which are all terminated by SRET instruction.
I	I00*～I50*，6 点，输人中断指针； I00*～I50*,6 points,input interrupt pointer; I6**～I8**，3 点，定时中断指针； I6**～I8**,3 points,timing interrupt pointer; I010～I060，6 点，计数中断指针 I010～I060,6 points,counter interrupt pointer

指针(P)
Pointer (P)
指针 P 用于跳转指令 CJ 及子程序呼叫指令 CALL，使用不须从编号 0 开始，但是编号不能重复使用，否则会发生不可预期的错误。
The pointer P is used in conditional jump CJ and subroutine call CALL instructions, and it’s not necessary to use P starting from number 0. The number of P can’t be used repeatedly, or unpredictable error will occur.
使用时机如下所示：
The pointer P is used when:
1. 使用于指令 CJ，指示程序执行跳跃的目的地址，并在目标程序的开头输入同编号的指针 P。
1. used by CJ to indicating target address of conditional jump, and the pointer P with the same number should be added to the beginning of target program.
2. 使用于指令 CALL，指示子程序的目的地址，并在子程序的开头输入同编号的指针 P。
2. used by CALL to indicating target address of subroutine, and the pointer P with the same number should be added to the beginning of subroutine program.

4.3.2 应用指令解释

4.3.2.1 程序流程（00~09）

4.3.2 application instruction description

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC00	CJ P*** CJP P***	条件跳转 Conditional jump
✔		✔			
3 步		3 步 3 steps	P000~P127		

１）当能流有效时，程序自动从 CJ（或 CJP）指令的地址跳转至由 P***指定的地址后继续执行，中间地址的程序指令被跳过，不予执行；

1) If the power flow is effective, then program jumps from the address of CJ (or CJP) to the address specified by P*** and continue execution, and the instruction with intermediate address will be jumped over and not be executed;

２）当能流无效时，程序继续往下执行，此时 CJ（或 CJP）指令不被执行。

2) If the power flow is ineffective, then program continue execution and CJ (or CJP) instruction will not be executed.

若被跨越的中间地址区的程序中有 TMR 定时器或计数器，且已被驱动，则动作反应为：

If TMR timer or counter exist in the program which is jumped over and the timer or counter have been driven, then the corresponding operation will be as follows:

执行情况 Operation condition	CJ 有跳转 CJ with jump	CJ 无跳转 CJ without jump
T192~T199	正常执行 Operating normally	正常执行 Operating normally
其他定时器 Other timer	停止计时 Stop timing	
C235~C255	正常执行 Operating normally	
其他计数器 Other counter	停止计数 Stop counting	

对 P***地址指针的要求如下：

Requirements of P*** address pointer:

由 CJ（或 CJP）引用的地址指针，必须在主程序结束（FEND 指令）之前的范围；

The address pointer used by CJ (or CJP) must be before the termination of main program (FEND instruction);

P63 特指 END 的地址，不要定义到其它程序步；

The address of END which is pointed by P63 can’t be defined to other program steps;

与子程序不同，P***开始的程序后不需要 SRET 语句作为结束；

The program starting from P*** doesn’t need SRET instruction for termination, which is different from subroutines;

P***的定义地址不要有重复；

The definition address of P*** should not be duplicated;

当使用者希望某一部份程序不需要执行时，以缩短扫描周期；或者想使用两个线圈输出时，为避免双线圈的出现。可使用此指令；

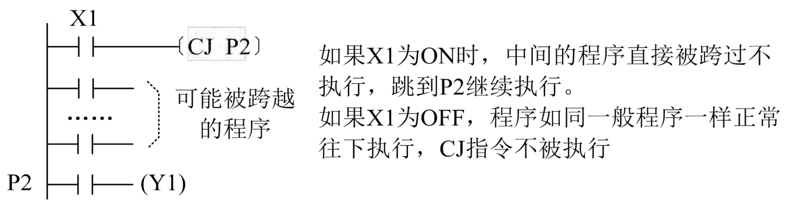
This instruction can be used when user wants part of the program not to be executed to shorten the scan period or wants to avoid dual-coils when output through two coils;

CJ 指令可重复指定同一指针 P，但不可与 CALL 指定同一指针 P，否则出错。

CJ instruction can specify the same pointer P repeatedly, but CJ can’t specify the same pointer P as the one of CALL instruction, or errors will occur.

指令举例：

Example:



如果 X 为 ON 时，中间的程序直接被跨过不执行，跳到 P2 继续执行。

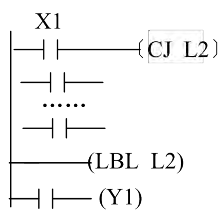
If X is ON then the intermediate program will be jumped over, and the program jumps to P2 and continues running.

如果 X1 为 OFF，程序如同一般程序一样正常往下执行，CJ 指令不被执行

If X1 is OFF then the program runs normally and CJ instruction will not executed.

在 AutoShop 编程环境中，跳转指令用 L，上例中格式如下

L is used by conditional jump instruction in AutoShop environment,and the instruction format of above example is shown below:



且子程序和中断程序单独窗口写，故不必注意 FEND 等事项，CJP63 在 AutoShop 编程环境中为 CJEND。

The subrountine and interrupt routine will be programmed in other individual windows, so FEND doesn’t need to be considered. CJP63 is CJEND in AutoShop programming environment.

16bit 16 位	32bit 32 位	P	FNC01	CALL P*** CALLP P***	子程序调用 Subroutine call
✔		✔			
3 步			P000~P127		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

当能流有效时，程序调用由 P***指定的子程序。子程序执行完毕，会返回到该 CALL（或 CALLP）语句的下一指令，继续执行后续语句。
If the power flow is effective then program will call the subroutine specified by P***. The program will return to the next statement of this CALL (or CALLP) instruction and continue for running.

对 P***地址指针的要求如下：
Requirements of address pointer P***:
由 P***开始的子程序，必须在主程序结束（FEND 指令）之后的范围；
The subroutine starting from P*** must be before the termination of main program (FEND instruction);
子程序必须以 SRET 语句结束；
The subroutine must be terminated by SRET instruction;
P***的子程序可被多处调用，也可被其他子程序调用，但嵌套层数不得超过 5 层；
The subroutine starting from P*** can be called for several times and called by other subroutines, but the nest level should not exceed 5 levels;
在子程序内不得调用自身，防止死循环或程序运行超时。
The subroutine can’t call itself within itself, which can avoid endless loop and operation overtime of program.
在子程序中，可采用 T192~T199 或 T246~T249 作为定时器。
T192~T199 or T246~T249 can be used as timer in subroutines.

在 AutoShop 编程环境中子程序在单独窗口编写，故没有 FEND、SRET 等指令的问题存在，且子程序名可任意修改（包括中文）。
The subroutine is programmed in another individual window in AutoShop programming environment, so FEND and SRET instructions are not needed to be considered. The subroutine name can be changed freely (including Chinese name).

16bit 16 位	32bit 32 位	P	FNC02	SRET	子程序完毕。 Subroutine return.
✔					

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

1 步			无需触点驱动，无操作数的单独指令 Single instruction without operand and contact driving

SRET 语句位于子程序的结束处，执行了该指令后，会退回到调用该子程序的语句处，继续随后的程序执行。

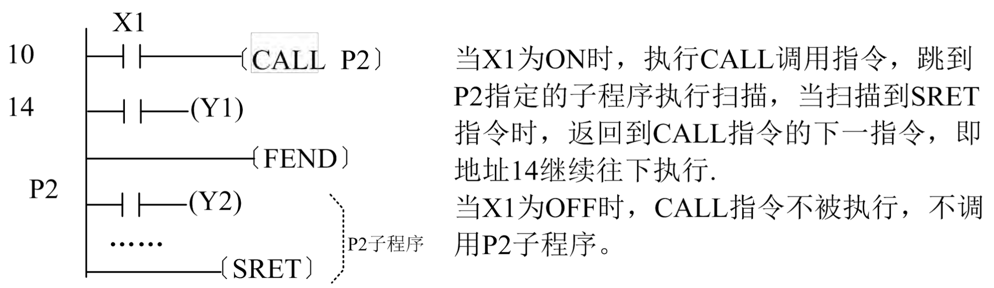
SRET instruction locates at the end of the subroutine. The program will return to the statement which calls this subroutine and continue running after the execution of this instruction.

在 AutoShop 编程环境中，子程序最后无需编写 SRET。

It’s not necessary to write SRET at the end of subroutine in AutoShop programming environment.

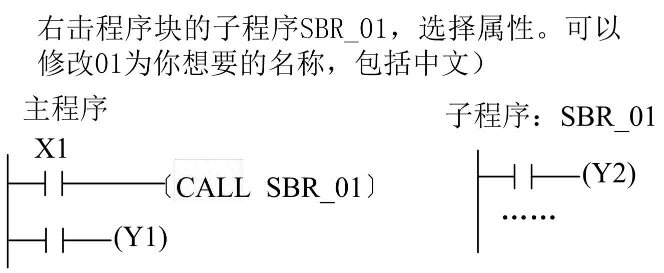
指令举例一：

EXample1：



在 AutoShop 编程环境中“指令举例一”的格式如下：

Instruction format of “instructin example 1” in AutoShop programming environment is shown below:

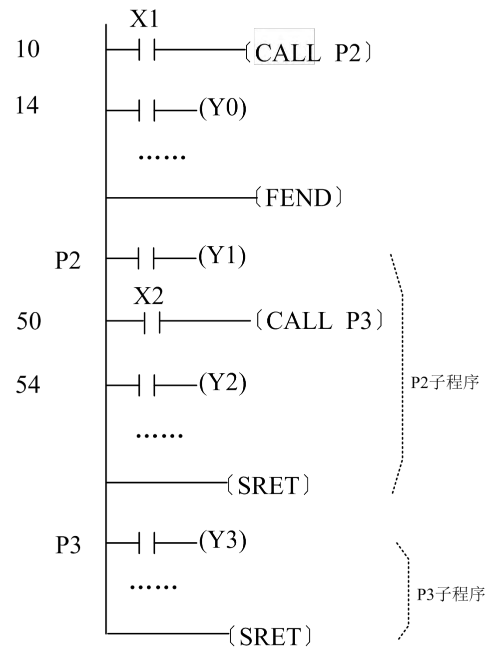


右击程序块的子程序 SBR_01，选择属性。可以修改 01 为你想要的名称，包括中文）

Right click the subroutine SBR_01 of the program block and select attribute, and then 01 can be changed to the expected name including Chinese name.

指令举例二：

Example2：



当X1为ON时，执行CALL调用指令，跳到P2指定的子程序执行扫描，分2种情况：如果扫描到地址50时X2为OFF，则继续往下扫描直到SRET指令，返回到主程序的地址14继续往下执行；如果扫描到地址50时X2为ON，则执行CALL P3，转移到P3所指定的子程序进行扫描，当执行到SRET指令时，回到P2子程序地址54继续往下执行

当 X1 为 ON 时，执行 CALL 调用指令，跳到 P2 指定的子程序执行扫描，分 2 种情况：如果扫描的地址 50 时 X2 为 OFF，则继续往下扫描直到 SRET 指令，返回到主程序的地址 14 继续往下执行；如果扫描到地址 50 时 X2 为 ON，则执行 CALL P3，转移到 P3 所指定的子程序进行扫描，当执行到 SRET 指令时，回到 P2 子程序地址 54 继续往下执行

If CALL is executed when X1 is ON then the program will jump to the subroutine specified by P2 and scan. Both following circumstances would exist: If X2 is OFF when address 50 is scanned then the program continues to scan until SRET instruction is met, then the program will return to address 14 of main program and continue running; If X2 is ON when address 50 is scanned then CALL P3 will be executed and jump to the subroutine specified by P3 and continues to scan, and the program will return to address 54 of P2 subroutine and continue running when SRET instruction is met.

16 bit 16位	32 bit 32位	P	FNC03	IRET	中断程序完毕 Interrupt routine return	无需触点驱动，无操作数的单独指令 Single instruction without operand and contact driving
✔			FNC04	EI	中断允许 Enable	

1 步	FNC05	DI	interrupt 中断禁止 Interruption forbidden

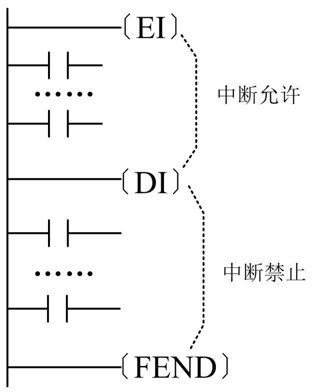
适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

IRET 语句位于中断子程序的结束处，执行了该指令后，会返回到调用该中断子程序前的语句处，继续程序执行。在 AutoShop 编程环境中，中断程序在单独窗口编写，在中断程序最后无需写 IRET 指令

IRET instruction is placed at the end of the interrupt routine. The program will return to the statement before calling this interrupt routine and continue to operate after the execution of this instruction. Interrupt routine is programmed in a separate window in the AutoShop programming environment, so IRET instruction is not necessary to be programmed in the interrupt routine.

PLC 程序开始运行时，默认为中断禁止状态；执行了 EI 语句后，中断功能允许；当中断为允许状态，执行了 DI 语句后，即进入中断禁止状态。在程序中如果没有中断插入禁止的区间时，可以不使用 DI 指令。

The interrupt is disabled when the PLC starts to run; The interrupt will be enabled after the execution of EI instruction; If the interrupt has been enabled and DI instruction is executed, then interrupt will be disabled. If there is no space for inserting interrupt disable instruction in the program, then DI instruction could not be used.



中断允许 Interrupt enabled 中断禁止 Interruption forbidden

中断的种类与设置：

Interrupt category and configuration:

1） 外部信号输入中断：可定义X0~X5输入信号的上升沿或下降沿进行中断，对于不需要即时响应的X信号，还可以采用脉冲捕捉的功能；external signal interrupt: The rising or falling edge of X0~X5 input signal can be defined for interrupt. The pulse capture function can be used if X signal doesn’t need immediate reponse;

外部信号输入中断指针与设置（H1U、H2U）：

Interrupt pointer of external signal input and its configuration (H1U, H2U):

输入编号 Input number	指针编号 Pointer number		禁止中断指令 Interrupt enable instruction
	上升中断 Rising edge interrupt	下降中断 Falling edge interrupt	
X000	I001	I000	M8050
X001	I101	I100	M8051
X002	I201	I200	M8052
X003	I301	I300	M8053
X004	I401	I400	M8054
X005	I501	I500	M8055

定时中断指针与设置（H2U）：

Timer interrupt pointer and configuration (H2U):

输入编号 Input number	中断周期 MS Interrupt period MS	中断禁止指令 Interrupt inhibit instruction
I6 口口	在指令的口口中输入 1~99 的数，如 I605 为每 5MS 执行一次定时中断 The number of 1~99 should be entered to the 口口 of instruction. For example, the interrupts will be generated once per 5MS for I605	M8056
I7 口口		M8057
I8 口口		M8058

高速计数中断指针与设置（H1U、H2U）：

High-speed counter interrupt pointer and configuration（H1U、H2U）：

输入编号 Input number	中断禁止指令 Interrupt inhibit instruction
I010	M8059
I020	
I030	
I040	
I050	
I060	

脉冲输出完成中断指针与设置：（此功能要启动 M8090~M8094 才能在脉冲输出完毕产生中断）（H2U）。

Pulse output completion interrupt pointer and its configuration: (M8090~M8094 should be enabled to generate interrupt when the pulse is output completely by this function) (H2U).

端口号 Port No.	使用特殊位 Using special bit	对应的用户中断 relative user interrupt
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

中断子程序选用不同的编号，即选择了不同的端口及中断触发沿；

Interrupting sub-program uses different numbers to select different ports and interruption trigger edge;

外部输入中断中对于同一 X 输入，不能同时对上升中断和下降中断编号。对于一个 X 输入端口，只能使用一种触发沿，触发沿通过指针编号来设定；

The rising edge and falling edge interrupt can't be numbered simultaneously for one X input in the external input interrupt. Only one trigger edge can be used for one X input, and the trigger edge is set by pointer number;

外部输入中断：如果对 M8050-M8055 在程序执行过程中“ON”，则禁止了对应 X 端口的中断功能。

External input interrupt: If M8050-M8055 are set to “ON” during the program execution then the interrupt corresponding to X terminal is disabled.

定时中断：如果对 M8056-M8058 在程序执行过程中“ON”，则禁止了对应的定时中断功能。

Timer interrupt: If M8056-M8058 are set to “ON” during the program execution then the corresponding timer interrupt will be disabled.

高速计数中断：如果对 M8059 在程序执行过程中“ON”，则禁止了所有的高速计数中断功能。

High speed counter interrupt: If M8059 is set to “ON” during the program execution then the corresponding high speed counter interrupt will be disabled.

中断的编程规定与执行特性：

Interruption instruction's programming requirements and execution features:

在 DI-EI 指令间（中断禁止区间）发生中断，亦能对其记忆并在 EI 指令后执行。

If interrupt occurs between DI-EI (interrupt disable zone), then these interrupts will be memorized and then executed after the EI instruction.

中断子程序必须写在 FEND 指令之后，子程序尾部必须以 IRET 结束，在 AutoShop 环境内，不要写在主程序中，子程序尾可省略 IRET；

The interrupt subroutine must be programmed after the FEND instruction and be terminated by IRET instruction. The subroutine should not be programmed in main routine in the AutoShop programming environment and the IRET instruction can be omitted at the end of the subroutine.

指针编号不能重复使用；

Indicator number cannot be reused.

多个中断依次发生时，以先发生的为优先。完全同时发生时，优先级别高的为优先。优先级从高到低分别为高速计数器中断、外部中断、时间中断、脉冲输出完成中断。

When multiple interruptions are occurring in sequence, the prioritization is based on the sequence. When interruptions are happening all at the same time, the priority will base on it level of classification. The priorities from high to the low end are: high-speed counter, external, timing, pulse output completion.

在中断例行程序的执行过程中，禁止其它的中断。

During the interruption execution process of regular programs, other interruptions are prohibited.

在中断处理过程中控制输入继电器及输出继电器时，使用输入输出刷新指令(REFF)，可以通过读取最新的输入状态、或者立即输出运算结果，实现高速控制；

The input/output refresh instruction (REFF) should be used for controlling input/output relay in the interrupt routine. High speed control can be implemented by reading the latest input state or immediately exporting operation result.

作为中断指针采用的输入继电器的编号，请不要与采用相同输入范围的[高速计数器]及［脉冲密度（FNC56）］等的应用命令的编号相重复。

The input relay number used as interrupt pointer should not be the same as the application instruction number of [high speed counter] and [pulse intensity (FNC56)] within the same input range.

子程序及中断例行程序内的定时器，请采用例行程序用的定时器 T192-T199；如果采用一般的定时器，除了不能进行计时外，在使用 1ms 累计定时器时亦需加注意；

Please use the timer T192-T199 which are usually used by routines in the subroutine and interrupt routine; If general timer is used then timing can’t be implemented, and the 1ms accumulative timer also should be noticed while being used;

如果指定输入中断指针 I 口 0 口，则输入继电器的输入滤波特性自动关闭。因此，无需采用 REFE(FNC51)指令及特殊数据寄存器 D8020(输入滤波器调整)。另外，不作为输入中断指针用的输入继电器的输入滤波器能维持 10ms(初始值)。

If the input interrupt pointer I0 is specifid then the input filter function of input relay will be disabled automatically. So the REFE (FNC51) instruction and special data register D8020 (input filter adjustment) are not necessary, and the input filter of input relay which is not used as input interrupt pointer will last for 10ms (initial value).

为了满足在高速计速器运行时，我们在 H2U 机型中另外新增加了 24 个高速计数中断，可

以指定任意一个高速计数器产生 24 个中断响应，此功能命名为高速计数器多用户中断。使用设置有如下规律；

24 high speed counter interrupt are added into the H2U series PLC so as to generate 24 interrupts by any one specified high speed counter while high speed counter is running. This function is called multiple interrupt of high speed counter. The principle of configuration is shown below:

标志位 Code	描述 Description
M8084	为 ON 使能高速计数器多用户中断 Multiple interrupt of high speed counter when this flag is ON
D8084	为高速计数器序号 C235~C255 Sequence number of high speed counter C235~C255
D8085	对应的用户中断个数，最大 24 个，从 I507~I530 Number of corresponding user interrupts from I507~I530, maximum 24
D8086	对应多个比较点数据的序号，只能为 D 元件，如 200 为 D200 开始的双字 Sequence number corresponding to multiple comparison data, which only can be D component. For example 200 means double words starting from D200.

比较点数据存放例子：

Example of the Comparison Point Data Storage:

D8084=235；D8086=200；D8085=5；M8084=ON；

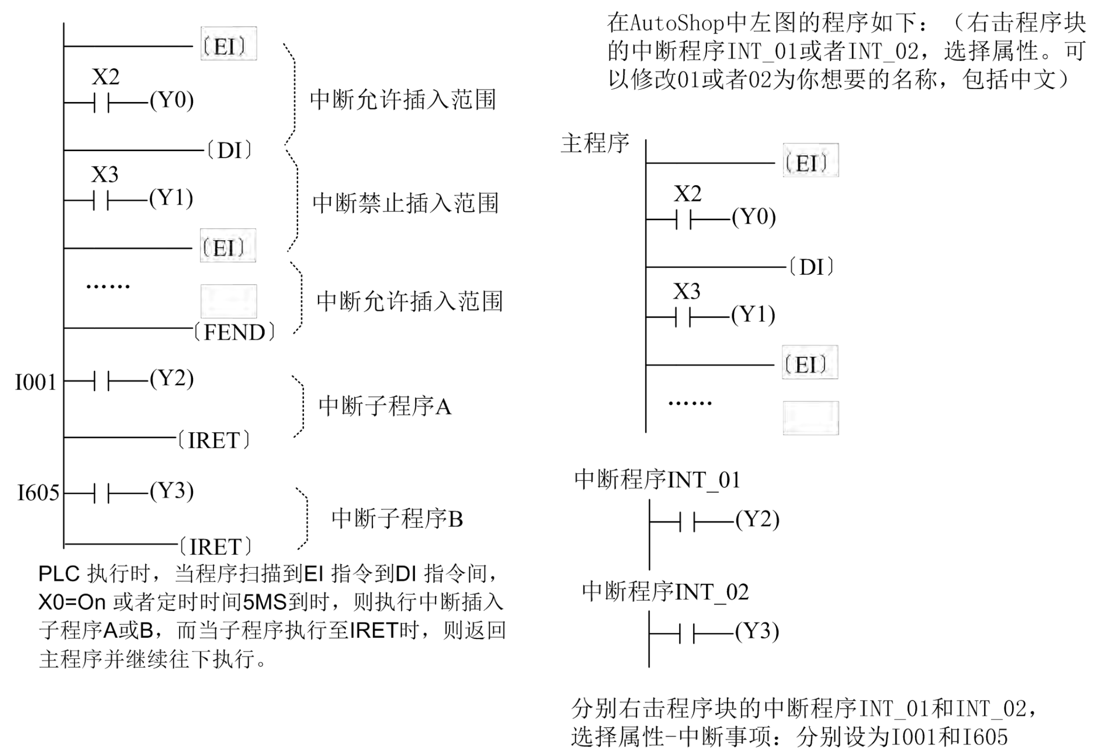
C235 的数据 Data of C235	记录单元 Recorded cell	存放单元数值 Store unit value	对应的用户中断 Relative user interruption	D8131 的数值 Value of D8131
100	D200，D201	=100	I507	0
200	D202，D203	=200	I508	1
300	D204，D205	=300	I509	2
400	D206，D207	=400	I510	3
500	D208，D209	=500	I511	4 → 0(M8133=ON)

每个中断可以由高速计数器的数值和记录单元的数值产生。

Each interrupt can be generated by the value of the high speed counter or record cell.

指令举例：

Example：



PLC 执行时，当程序扫描到 EI 指令到 DI 指令间，X0=On 或者定时时间 5MS 到时，则执行中断插入子程序 A 或 B，而当子程序执行至 IRET 时，则返回主程序并继续往下执行。

The interrupt subroutine A or B will be executed when program runs to the zone between EI and DI instruction and X0=On or 5MS timing time has elapsed. The subroutine will return to main program and continue to run when IRET is executed.

在 AutoShop 中左图的程序如下：（右击程序块的中断程序 INT_01 或者 INT_02，选择属性。可以修改 01 或者 02 为你想要的名称，包括中文）

Below is the program in AutoShop programming environment in the left figure: (right click the interrupt routine INT_01 or INT_02 of the program block and select attribute. The name of 01 or 02 can be changed to your expected name including Chinese name)

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

16bit	32bi	P	FNC06	FEND	主程序完毕。

16位	t 32位				Main program end
✔					
1步			无需触点驱动，无操作数的单独指令 Single instruction without operand and contact driving		

FEND 语句位于主程序的结束处，执行了该指令后，即结束了本次用户程序的扫描，向 0 步程序返回，再次从头对程序进行扫描。

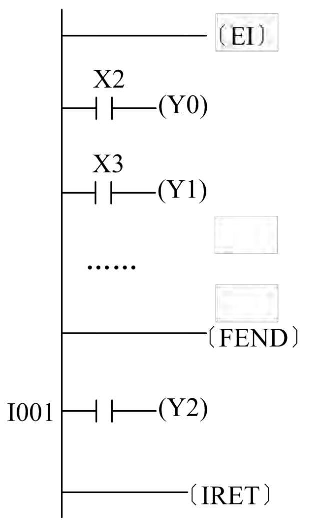
FEND instruction is at the end of main program. The current scan of user program will terminate after the execution of this instruction, and the program returns to step 0 and start scan from the beginning of the program.

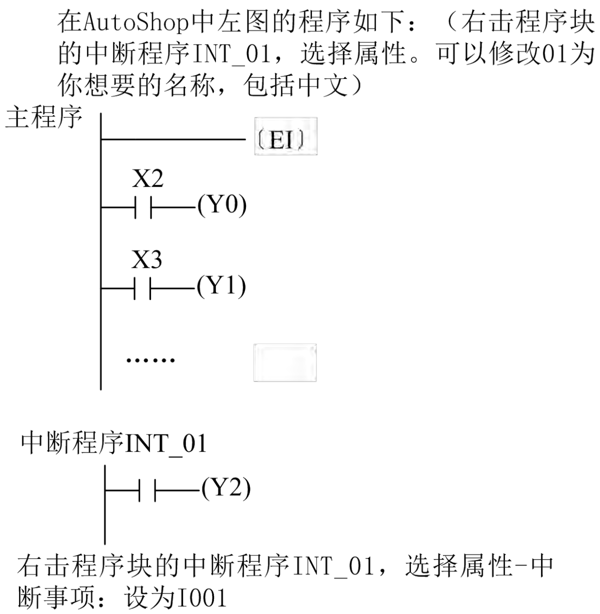
CALL 命令调用的子程序必须写在 FEND 命令后，并且在该子程序结束加上 SRET 命令；中断子程序也必须写在 FEND 之后，并在该中断程序结束加上 IRET 指令，在 AutoShop 中，子程序或中断程序必须在单独窗口编写，在主程序末尾无需加 FEND，在子程序或中断程序的末尾无需加 SRET 或 IRET。

The subroutine called by CALL instruction must be written after FEND instruction and SRET instruction must be added to the end of this subroutine; interrupt subroutine must be written after FEND instruction and IRET must be added to the end of this interrupt routine. The subroutine and interrupt routine are programmed in a individual window in AutoShop, so FEND doesn’t need to be added to the end of main program, and SRET or IRET aren’t needed to be added to the end of subroutine or interrupt routine.

指令举例：

Example：





在 AutoShop 中左图的程序如下：（右击程序块的中断程序 INT_01，选择属性。可以修改 01 为你想要的名称，包括中文）

Below is the program in AutoShop programming environment in the left figure: (right click the interrupt routine INT_01 of the program block and select attribute. The name of 01 can be changed to your expected name including Chinese name)

主程序

Main Program

中断程序

右击程序块的中断程序 INT_01，选择属性——中断事项：设为 I001

Interrupt routine

Right click the interrupt routine INT_01 of the program block, and select attribute—interrupt: set to I001

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC07	WDT	监视定时器复位。 Monitor timer reset.
✔		✔			
1 步 steps		1 步 steps	无操作数的单独指令 Single instruction without operand		

PLC 系统内有用于监视用户程序执行一次的时间是否超时的定时器，若超时即会停止用户程序的执行并报警，执行 WDT 指令即可将该监视定时器复位，让监视定时器重新开始计时，避免超时错误。

There exists timer in PLC for monitoring whether the execution is overtime. The execution of user program will be terminated and alarm if it’s overtime, and the WDT instruction will reset the monitor timer and make the timer restart to avoid timeout error.

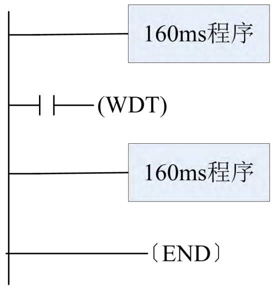
若用户程序所执行的操作过于复杂（例如过多的循环计算），执行时有可能出现运行超时错误，编程时若必要，可用 WDT 指令（例如在 FOR~NEXT 指令之间中插入该指令）；

If the operation of user program is too complex (for example too many loop operation), then timeout error may occur. So if necessary WDT instruction can be used (for example this instruction can be inserted between FOR~NEXT instruction);如果程序扫描时间大于 D8000 的值（默认 200ms），可以在程序间插入 WDT 指令将每段程序分成扫描时间低于 200ms 或者根据需要修改 D8000 的设定值。

If the scan time of program is bigger than the value of D8000 (default 200 ms), then WDT instruction can be inserted to divide each program segment to less than 200ms or modify the setting value of D8000.

指令举例：

Example：



160ms 程序

160ms program

此程序扫描时间是 320ms，用 WDT 指令将程序分割为 2 部分，使得每部分程序扫描时间都在 200ms 以下。

The scan time of this program is 320ms. WDT instruction is inserted to divide this program to two segments of which the scan time both be less than 200ms.

16bit 16位	32bit 32位	P	FNC 08	FOR	循环范围开始 Start of loop range
✔					
3 步			指令格式：FOR S1 Insturction format:		

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

操作数 Operand	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

FOR 指令用于一个循环的起始，同时指明循环执行的次数，必须与 NEXT 指令配套使用。

FOR instruction is used for beginning of one loop and indicating the loop count, which must be used in cooperation with NEXT instruction.

其中：
Where：

S1 为循环次数控制变量。

S1 is the cycle frequency controlling variable.

参见 NEXT 指令的解释与举例。
Please refer to the description and example of NEXT instruction.

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>系列
Series</td><td>系列
Series</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC09</td><td rowspan="2">NEXT</td><td rowspan="2">循环范围结束
End of loop range</td></tr>
<tr><td>✔</td><td></td><td></td></tr>
<tr><td>1 步</td><td></td><td></td><td colspan="3">指令格式：NEXT(无操作数)
Instruction format: NEXT (no operand)</td></tr>
</table>

NEXT 指令用于指示循环区域的尾部。由 FOR 指令指定 FOR~NEXT 循环来回执行 N 次后跳出 FOR~NEXT 循环往下继续执行。
The NEXT instruction is used for indicating the end of loop. The FOR~NEXT loop will execute for N times which specified in FOR instruction, then the program will jump out of the loop and continue to run.
在 FOR~NEXT 指令的循环区间，可以嵌入另一个 FOR~NEXT 循环，但规定：从最外层的 FOR~NEXT 计算，最多可内嵌 5 层 FOR~NEXT 循环。运行时 PLC 会以各 FOR~NEXT 层对应解析执行。但需要注意当循环次数过多时，会使 PLC 扫描周期延长，可能造成逾时监视定时器动作而导致错误产生。可在 FOR~NEXT 指令之间使用 WDT 指令来改善。
Another FOR~NEXT loop can be nested in the loop area of one FOR~NEXT instruction, but maximum 5 levels of FOR~NEXT loop (including the most external level) can be

nested. The PLC will parse and execute the nested loop program level by level. Please note that the scan time of PLC may be extended if there is too many loops and then the timeout monitor timer may act and cause errors. WDT instruction can be used between FOR~NEXT instruction for improvement.

有下列情况者，都会出错：

Error messages will appear under the following situations:

NEXT 指令在 FOR 指令之前；

The NEXT instruction is placed before FOR instruction;

有 FOR 指令而无 NEXT 指令；

Only FOR instruction exists without NEXT instruction;

在 FEND，END 指令以后有 NEXT 指令；

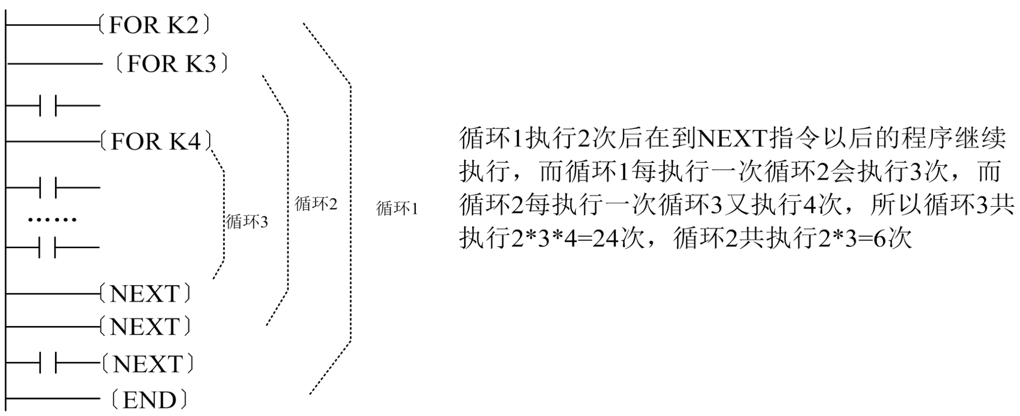
NEXT instruction exists after the FEND and END instruction;

FOR 指令与 NEXT 指令个数不一致等。

The number of FOR and NEXT instructions doesn’t match.

指令举例一：

Example 1:

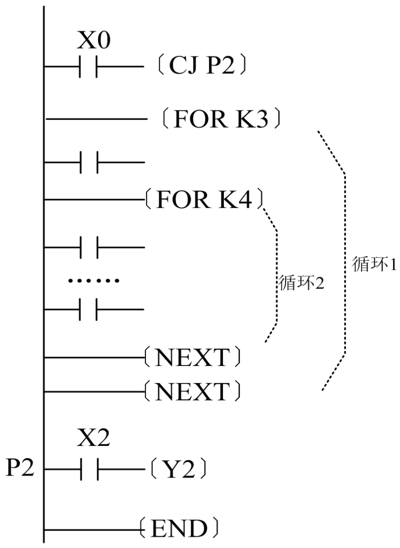


循环 1 执行 2 次后在到 NEXT 指令以后的程序继续执行，而循环 1 每执行一次 2 会执行 3 此，而循环 2 每执行一此循环 3 又执行 4 次，所以循环 3 共执行 2*3*4=24 次，循环 2 共执行 2*3=6 次

After Circle 1 is implemented two times, the program following NEXT instruction will continue to run. If circle 1 is implemented for one time, circle 2 will be implemented for three times, and if circle 2 is implemented for one time, circle 3 will be implemented for four times. So, circle 3 will be implemented for 2*3*4=24 times, and circle 2 will be implemented for 2*3=6 times.

指令举例二：

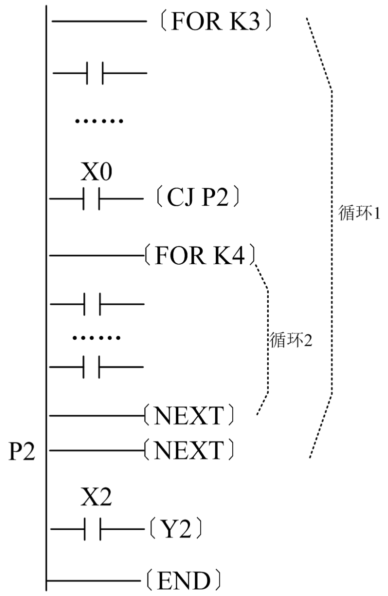
Example 2



想跳过FOR~NEXT指令时，可用CJ跳转指令实现, 范例中当X0为OFF时，执行循环1和循环2，当X0为ON时，CJ指令跳转至P2处，循环1和循环2之间的程序不被执行

指令举例三

Instruction example III:



想跳过循环内嵌套的FOR~NEXT指令时，也可用CJ跳转指令实现, 范例中当X0为OFF时，执行循环1内的循环2，当X0为ON时，CJ指令跳转至P2处，循环1内嵌套的循环2FOR~NEXT被CJ指令跳过不执行。

循环 2

Circle 2

循环 1

Circle 1
想跳过 FOR~NEXT 指令时，可用 CJ 跳转指令实现，范例中当 X0 为 OFF 时，执行循环 1 和循环 2，当 X0 为 ON 时，CJ 指令跳转至 P2 处，循环 1 和循环 2 之间的程序不被执行
If you want to skip FOR~NEXT instruction, you can use CJ jump instruction. In example, when X0=OFF, circle 1 and circle 2 is implemented; when X0=ON, CJ instruction jumps to P2, the program between circle 1 and circle 2 will not be implemented.

4.3.2.2 传送与比较（10~19）
4.3.2.2 Transmission and comparison (10~19)

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 10	CMP	两个数比较 Two variables comparison
✔	✔	✔			
7 步 7 steps	13 步 13 steps		指令格式：CMP S1 S2 D Instruction format：CMP S1 S2 D		

操作数 Operand	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔	✔	✔											

本指令完成对两个操作变量的大小作比较，将比较结果输出给指定的位变量，操作数均按有符号数进行代数比较操作。

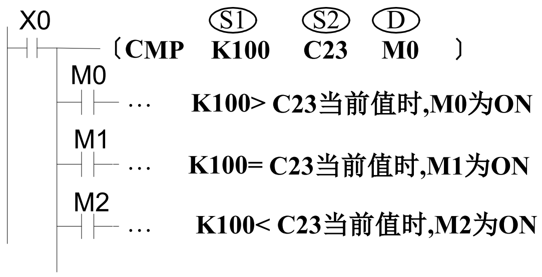
This instruction compares two operational variables and outputs the comparison result to a specified bit variable. The operands are all algebra compared according to signed data.

其中 D 会占用 3 个连续地址的位变量。

Where, D will occupy 3 bit variables in continue address.

指令举例：

Example:



当X0=ON时，M0~M2其中之一会ON。
X0由ON变OFF 时，不执行CMP指令，M0~M2仍保持X0 =OFF之前的状态,若要清除M0~M2的比较结果可用RST或者ZRST对M0~M2进行清除。
若需要得到≧、≦、≠的结果时，可将M0~M2串并联即可取得。

当 X0=0N 时，M0~M2 其中之一会 ON。

When X0=ON, One of M0~M2 will be set to ON.

X0 由 ON 变 OFF 时，不执行 CMP 指令，M0~M2 仍保持 X0=OFF 之前的状态，若要清除 M0~M2 的比较结果可用 RST 或者 ZRST 对 M0~M2 进行清楚。

When X0 changes from ON to OFF, CMP instruction will not be implemented, and M10~M12 will hold the previous state. By applying RST or ZRST instruction to clear M10~M12, the comparison result of M10~M12 will be cleared.

若需要得到≧、≦、≠的结果时，可将 M0~M2 串并联即可取得。

By series connecting or parallel connecting M0~M2, the results of ≥、≤、≠ will be obtained.

16bit 16 位	32bit 32 位	P	FNC 11	ZCP	区间比较 Zone compare
✔	✔	✔			
9 步 9 steps	17 步 17 steps		指令格式：ZCP S1 S2 S D Instruction format：ZCP S1 S2 S D		

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

操作数 Operand	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔	✔	✔											

需要触点驱动，有 4 个操作变量。当控制能流有效时，按有符号数进行代数比较操作，以 S1 S2 为区间，将 S 的值位于该区间的位置作为结果，存入 D 为起始地址的 3 个连续位变量中。

The instruction is driven by contact with four operation variables. When energy flow of control is valid, they are comapred as signed algebra. Taking S1 S2 as range, the S value, which is in the range, is the calculation result, and it is saved to three continoue bit variables started with D.

其中：

Where:

S1 为比较区间的下限； S1 is lower limit of comparison area

S2 为比较区间的上限； S2 is upper limit of comparison area

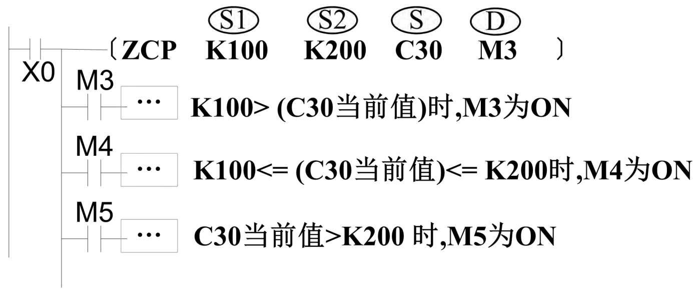
S 为比较变量； S is comparison variable

D 为比较结果存储单元，会占用 3 个连续地址的位变量。

D is the storage unit for comparison result, occupying three continue bit variables.

指令举例：

Example：



当X0=ON时，M3~M5其中之一会ON。
X0由ON变OFF 时，不执行ZCP指令，M3~M5仍保持
X0= OFF之前的状态,若要清除M3~M5的比较结果
可用RST或者ZRST对M3~M5进行清除。

当 X0=ON 时，M3~M5 其中之一会 ON。

When X0=ON, One of M3~M5 will be set to ON.

X0 由 ON 变 OFF 时，不执行 ZCP 指令，M3~M5 仍保持 X0=OFF 之前的状态，若要清除 M3~M5 的比较结果可用 RST 或者 ZRST 对 M3~M5 进行清除

When X0 changes from ON to OFF, ZCP instruction will not be implemented, and M3~M5 will hold the previous state. By applying RST or ZRST instruction to clear M3~M5, the comparison result of M3~M5 will be cleared.

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 12	MOV	数据移动 Data transmission
✔	✔	✔			
5步 5 steps	9步 9 steps		指令格式：MOV S D Instruction format：MOV S D		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 2 个操作变量，将 S 的值复制到 D 中。

The instruction is driven by contact with two operation variables. S value is copied to D.

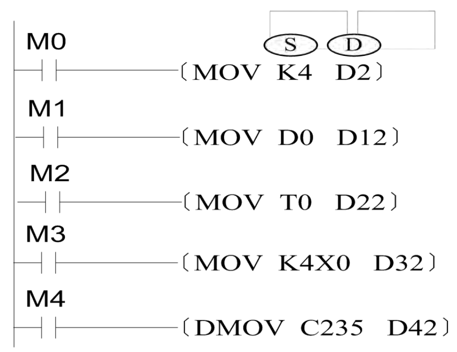
当为32bit指令（DMOV）时，S 和 D 都会使用相邻高地址的变量单元参与运算。例如语句：〔DMOV D1 D5〕的操作结果是：D1→D5；D2→D6

When it is 32bit instruction (DMOV), the corresponding S and D variable unit in high address will be involved in calculation. Example code： the calculation result for〔DMOV D1 D5〕is：D1→D5；D2→D6

指令举例：

Instruction example

梯形图



指令列表

```
LD      M0
MOV     K4     D2
LD      M1
MOV     D0     D12
LD      M2
MOV     T0     D22
LD      M3
MOV     K4X0   D32
LD      M4
DMOV    C235   D42
```

当M0为ON时，将K4复制到D2中，当M0由ON OFF时，D2保存K4的内容不变，除非用户程序再次将D2的值修改。或者PLC由STOP RUN和PLC重新上电，D2的值才会变为0，停电保持寄存器上电或者由停止到运行保持原来的值不变

当 M0 为 ON 时，将 K4 复制到 D2 中，当 M0 由 ON OFF 时，D2 保存 K2 的内容不变，除非用户程序再次将 D2 的值修改，或者 PLC 由 STOP RUN 和 PLC 重新上电，D2 的值才会变为 0，停电保持寄存器上电或者由停止到运行保持原来的值不变

When M0 is ON, K4 is copied toD2; when M0 changes from ON to OFF, K2 is kept in D2, until D2 value is modified by user program again, or D2 value is reset to 0 when PLC changes from STOP to RUN and PLC is re-powered. The register value will be held when power off

16bit 16 位	32bit 32 位	P	FNC 13	SMOV	移位传送 Shift move
✔		✔			
11 步 11 steps		11 步 11 steps	指令格式：SMOV S m1 m2 D n Instruction format: SMOV S m1 m2 D n		

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	✔	—
H2U	✔	—

操作数 Operand	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔	✔	✔
m1					✔	✔									
m2					✔	✔									
D								✔	✔	✔	✔	✔	✔	✔	✔
n					✔	✔									

需要触点驱动，最多有 5 个操作变量，其中：

The instruction is driven by contact with up to five operation variables, where:

S 为待复制的数据源变量；

S is the data source variable, which is to be copied;

m1 为数据源传送的起始位号，（1～4）范围；

m1 is the starting bit number for transmitting data source with range of 1~4;

m2 为数据源传送的位数，（1～m1）范围；

m2 is the bit number for transmitting data source with range of 1~m1;

D 为数据源传送的目的变量；

D is the target variable for transmitting data source;

n 为数据源传送的目的变量的起始位，（m2～4）范围。

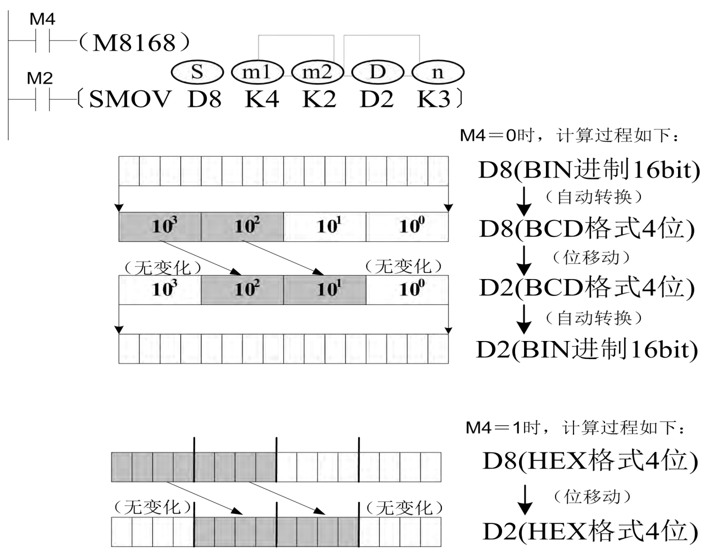
n is the starting bit of the target variable for transmitting data source with range of m2~4.

数据位的传送过程与特殊标志M8168的状态有关，当M8168为OFF时是BCD模式（十进制的位），当M8168为ON时是BIN模式，在BIN模式下以4个位作为一个单位作传送（十六进制的位）.

The data bit transmission processing is related with the state of special flag M8168. When M8168 is OFF, it is in BCD mode (decimal bit); when M8168 is ON, it is in BIN mode, in which 4-bit is taken as a unit for transmission (hexadecimal bit).

指令举例：

Example：



M4=0 时，计算过程如下：

When M4=0, the calculation procedure is listed as following;

D8（BIN 进制 16bit）

D8 (BIN, 16bit)

自动转换

Automatic conversion

D8（BCD 格式 4 位）

D8 (BCD 4bit)

（位移动）

(move bit)

D2（BCD 格式 4 位）
D2 (BCD 4bit)
D2（BIN 进制 16bit）
D2 (BIN, 16bit)

M4=1 时，计算过程如下：
When M4=1, the calculation procedure is listed as following;
D8（HEX 格式 4 位）
D8 (HEX 4bit)
D2（HEX 格式 4 位）
D2 (HEX 4bit)

假设 D8=K1234，D2=K5678，则当 M8168 为 OFF 时（BCD 模式），将 M2 置 ON，则 D2 的值变为 K5128；
If D8=K1234,D2=K5678, when M8168 is OFF (BCD mode)，M2 is set to ON and D2 value is K5128;
当 M8168 为 ON 时（BIN 模式），此时 D8=H04D2=K1234，D2=H162E=K5678，将 M2 置 ON，则 D2=H104E=K4174。
When M8168 is ON (BIN mode), D8=H04D 2=K1234， D2=H162E =K5678, M2 is set to ON and D2=H104E=K4174.

16bit 16 位	32bit 32 位	Ps	FNC 14	CML	数据取反传送 Data is negated and transmitted
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：CML S D Instruction format：CML S D		

适用机型 Available model		
系列 Series	系列 Series	系列 Series
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 2 个操作变量，将 S 的 BIN 值逐位取反后复制到 D 中。

The instruction is driven by contact with two operation variables. S (BIN) value is converted in converse bit by bit and then copied to D

当 D 的位数不足16bit时，将 S 取反后按低位对齐传送到 D 变量中；

When D digit number is less than 16bit, converting S in converse and transmitting to D variable with low bit alignment.

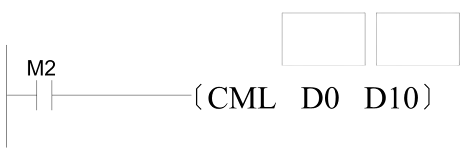
当为 32bit 指令（DCML）时， 和 都会使用相邻高地址的变量单元参与运算。例如语句：〔DCML D1 D5〕的操作结果是：/D1→D5；/D2→D6

When it is 32 bit instruction (DCML), the corresponding and variable unit in high address will be involved in calculation. Example： the calculation reuslt for 〔DCML D1 D5〕 is：/D1→D5；/D2→D6

指令举例一：

Example 1：

梯形图



指令列表

LD M2
CML D0 D10

1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 1 D0

0 1 0 1 0 1 0 1 0 1 0 1 1 0 1 0 D10

梯形图

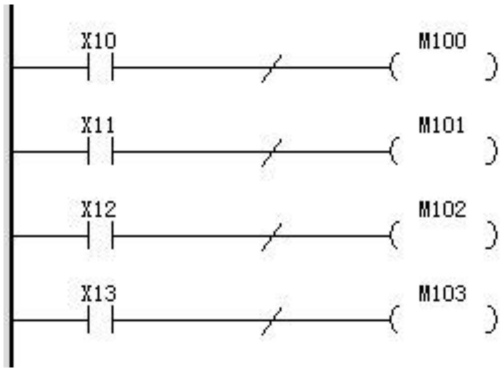
Ladder diagram

指令列表

Instruction table

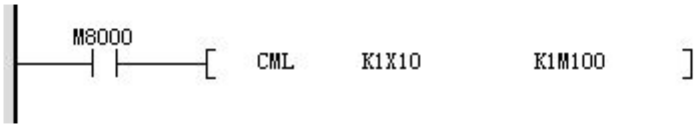
指令举例二：

Example 2：



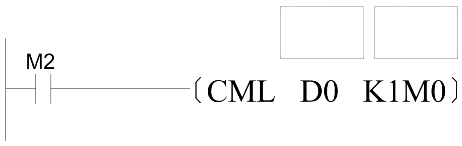
上面 2 个程序可以用下面的 CML 指令来实现

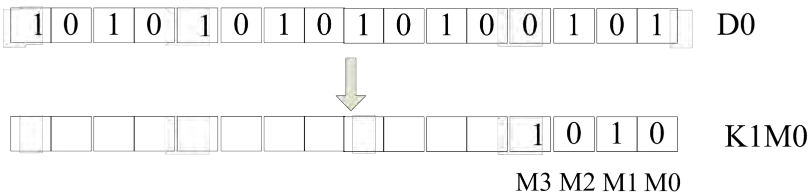
The above two program can be implemented with following CML instruction.



指令举例三：

Instruction example III:





16bit 16	32bi t	P	FNC 15	BMOV	数据成批传送 The data is

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

位	32 位				transmitted in batch.
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：BMOV S D n Instruction format：BMOV S D n		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n	常数，n＝1～512 Constant, n=1~512														

需要触点驱动，有 3 个操作变量，将由 S 指定起始地址的 n 个变量值复制到由 D 指定起始地址的 n 个单元中。

The instruction is driven by contact with three operation variables. n variables with starting address specified by S are transmitted to n units with starting address specified by D.

其中 n 的取值范围是 1～512。

Where, n is within the range of 1~512.

当特殊变量 M8024＝1 时，成批传送的方向相反，即将由 D 指定起始地址的 n 个变量值复制到由 S 指定起始地址的 n 个单元中。

When special variable M8024=1, the transmission direct is opposite, which means that n variables with starting address specified by D are transmitted to n units with starting address specified by S.

M8000
[BMOV D0 D10 K4]

完成的操作是：

D0 → D10
D1 → D11
D2 → D12
D3 → D13

当操作数为位元件时，S 和 D 位数必须相等。

When operand is bit component, the digit number of S and D should be same.

指令举例：

Instruction example:

M8000
[BMOV K1M0 K1Y0 K3]

完成的操作是：

M0 → Y0	M4 → Y4	M8 → Y10
M1 → Y1	M5 → Y5	M9 → Y11
M2 → Y2	M6 → Y6	M10 → Y12
M3 → Y3	M7 → Y7	M11 → Y13

n=3

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC 16</td><td rowspan="2">FMOV</td><td rowspan="2">数据多点传送
The data is transmitted in multipoint.</td></tr>
<tr><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>7 步
7 steps</td><td>13 步
13 steps</td><td></td><td colspan="3">指令格式：FMOV S D n

Instruction format：FMOV S D n</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enhanced</td></tr>
<tr><td>H1U</td><td>—</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n	常数，n＝1～512 Constant, n=1~512														

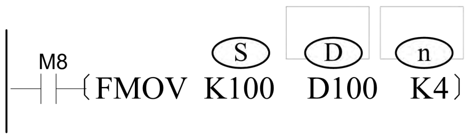
需要触点驱动，有 3 个操作变量，将由 S 的数据复制到由 D 指定起始地址的 n 个单元中。

The instruction is driven by contact with three operation variables. S data are transmitted to n units with starting address specified by D.

其中 n 的取值范围是 1～512。

Where, n is within the range of 1~512.

指令举例：
Instruction example:



当M8置ON时完成的操作是：

k100 → D100
k100 → D101
k100 → D102
k100 → D103

当 M8 置 ON 时完成的操作是：
When M8 is set to ON, the accomplished operation is:

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 17	XCH	数据交换 Date exchange
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：XCH S D Instruction format :		

			XCH S D

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S								✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		

需要触点驱动，有 2 个操作变量，将 S 和 D 的值彼此交换。

The instruction is driven by contact with two operation variables. S value and D value are exchanged each other.

指令举例一：

Example 1 for instruction:

M8 —| |——〔XCHP D110 D120〕

执行前		执行后
D110=K180	⇒	D110=K200
D120=K200		D120=K180

执行前

Before executing

执行后

After executing

指令举例二：

Example 2 for instruction:

M8 —| |——〔DXCHP D110 D120〕

执行前		执行后
D110=K180		D110=K200
D111=K150	⇒	D111=K100
D120=K200		D120=K180
D121=K100		D121=K150

执行前

Before executing

执行后
After executing

当特殊变量 M8160＝1 时，且Ⓓ与Ⓢ为同一地址，完成的操作将是高 8 位与低 8 位的交换，32 位的指令也一样，完成的操作将是高 8 位与低 8 位的交换。相当于 SWAP 指令的操作。一般用 SWAP 指令来实现。

When special variable M8160=1 and Ⓓ has the same adderess with Ⓢ, the operation is to exchange higher eight-digit and lower eight-digit. For 32bit instruction, the operation is also to exchange higher eight-digit and lower eight-digit. Equval to the SWAP instruction opreation. Normally it is implemented with SWAP instruction.

16bit 16 位	32bit 32 位	P	FNC 18	BCD	BCD 交换 BCD exchange
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：BCDⓈⒹ Instruction format：BCDⓈⒹ		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
Ⓢ								✔	✔	✔	✔	✔	✔	✔	✔
Ⓓ								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 2 个操作变量，将Ⓢ（BIN）的值进行 BCD 变换后存入Ⓓ中。该指令常用于将数据显示前的数据格式处理。

The instruction is driven by contact with two operation variables. Ⓢ (BIN) value is converted in BCD and then saved to Ⓓ. The instruction is usually used for data format processing before displaying.

使用16bit指令，当转换结果超过9999时会出错；使用32bit指令，当转换结果超过99999999时会出错。 M8067、M8068 会置 ON，D8067 记录错误代码。

If conversion result exceeds 9999(16bit) or 99999999(32bit), there will be error.M8067, M8068 will be set to ON, and the error code will be saved in D8067.

指令举例：

Instruction example:

```
M8
─┤├────〔BCD  D200  K1Y0〕
```

将D200的BIN值转换成BCD值后，将结果的个位数存于K1Y0中（Y0~Y3四个bit 元件).
若D200=H000E(十六进制）=K14（十进制），则变换后Y0~Y3=0100(BIN)
若D200=H0028(十六进制）=K40（十进制），则变换后Y0~Y3=0000(BIN)

将 D200 的 BIN 值转换成 BCD 值后，将结果的个位数存于 K1Y0 中（Y0~Y3 四个 bit 元件

After BIN value in D200 is converted to BCD value, the ones digit of the result is saved in K1Y0 (Y0~Y3 are four bit components

若 D200=H000E（十六进制）=K14（十进制），则变化后 Y0~Y3=0100（BIN）

If D200=H000E (HEX)=K14(DEC), after conversion Y0～Y3=0100（BIN）

若 D200=H0028（十六进制）=K40（十进制），则变化后 Y0~Y3=0000(BIN)

If D200=H0028 (HEX)=K40(DEC), after conversion Y0～Y3=0000（BIN）

16bit 16 位	32bit 32 位	P	FNC 19	BIN	BIN 交换 BIN exchange
✔	✔	✔			
5 步 5 step	9 步 9 steps		指令格式：BIN S D Instruction format：BIN S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S								✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 2 个操作变量，将 S (BCD)的值进行 BIN 变换后存入 D 中。该指令

常用于将外部端口读入数据（如编码盘设置）处理成能直接用于运算的 BIN 格式。

The instruction is driven by contact with two operation variables. S (BCD) value is converted in BIN and then saved to D. The instruction is usually used to convert the data, which is read from the external port, to BIN format, which can be directly applied for calculation.

S（BCD）的有效范围，16bit：0~9999；32bit：0~99，999，999

The available range of S (BCD) is 16bit:0~9999;32bit:0~99,999,999

S的数据内容不是 BCD 值（以 Hex 表示有任一位数不在 0~9 的范围内）时将会产生运算错误，M8067、M8068 会置位。

If S data is not in BCD format, there will be calculation error and M8067, M8068 will be reset.

指令举例：
Instruction example:

当M8置位时将K1Y0的BCD值作
BIN转换后存入D200中

当 M8 置位时将 K1Y0 的 BCD 值作 BIN 转后存入 D200 中
When M8 is reset，K1Y0(BCD) is converted to BIN format and then saved in D200.

4.3.2.3 四则逻辑运算（20~29）
4.3.2.3 Four logical arithmetic operations (20~29)

16bit 16 位	32bit 32 位	P	FNC 20	ADD	BIN 加法运算 BIN addtion operation
✔	✔	✔			
7 步 7 steps	13 步 13 steps		指令格式：ADD S1 S2 D Instruction format：ADD S1 S1 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—

操作数	位元件	字　元　件

Operands	bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 3 个操作变量，将S1和S2的值进行 BIN 代数相加后存入D中，参与运算的变量都按有符号数处理，最高位为符号位，0 为正数，1 为负数。

The instruction is driven by contact with three operation variables. S1 **错误！未指定文件名。** and S2**错误！未指定文件名。** is added in BIN algebra and saved in D. The involved variables are handled as signed number, whose highest digit is sign bit. 0 is positive number, and 1 is negative.

若计算结果为 0，则 0 标志(M8020)会置位；

If the calculation result is 0, the 0 flag bit (M8020) will be reset;

若计算结果超过 32，767（16bit 运算）或 2，147，483，647（32bit 运算）时，进位标志(M8022)会置位；

When the calculation result exceeds 32,767 (16bit calculation) or 2,147,483,647(32bit calculation), the carry flag bit (M8022) well be set;

若计算结果不满-32，768（16bit 运算）或-2，147，483，648（32bit 运算）时，借位标志(M8021)会置位；

When the calculation result is lower than -32,768 (16bit calculation) or -2,147,483,648 (32bit calculation), the borrow flag bit (M8021) well be set;

进行 32bit 运算时，指令中变量地址为为低 16bit 地址，相邻高编号地址单元为高 16bit，编程时防止重复或误覆盖。

When using 32bit calculation, the construction variable address is a low 16bit address, and the adjoining address is a high 16bit address. It should be prevented from repeating or overwriting in the programming.

指令举例一：

Example 1 for instruction:

```
 M8
─┤ ├────〔ADD   D100   D110   D120〕
```

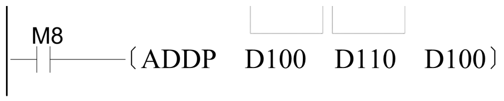
当M8置位时将被加数D100的内容加
上加数D110的内容后存放到D120
中，假如D100=K8;D110=K-12,则
D120=8+(-12)=k-4

当 M8 置位时将被加数 D100 的内容加上加数 D110 的内容后存放在 D120 中，假如 D100=K8;D100=K-12,则 D120=8+(-12)=K-4

When M8 is set, addend D100 value is added to addend D110 value and the result is saved to D120. If D100=K8;D100=K-12, D120=8+(-12)=K-4

指令举例二：

Example 2 for instruction:



当M8置位时将被加数D100的内容加上加数D110的内容后再存放回被加数D100中。

当 M8 置位时将被加数 D100 的内容加上加数 D110 的内容后再存回被加数 D100 中。

When M8 is set, addend D100 value is added to addend D110 value and the result is saved back to D100.

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC
21</td><td rowspan="2">SUB</td><td rowspan="2">BIN 减法运算
BIN subtract calculation</td></tr>
<tr><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>7 步
7 steps</td><td>13 步
13 steps</td><td></td><td colspan="3">指令格式：SUB S1 S2 D

Instruction format：SUB S1 S1 D</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enhanced</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

<table>
<tr><td rowspan="2">操作数
Operands</td><td colspan="4">位元件
bit component</td><td colspan="11">字 元 件
Word component</td></tr>
<tr><td>X</td><td>Y</td><td>M</td><td>S</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>KnS</td><td>T</td><td>C</td><td>D</td><td>V</td><td>Z</td></tr>
<tr><td>S1</td><td></td><td></td><td></td><td></td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>S2</td><td></td><td></td><td></td><td></td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td></tr>
</table>

需要触点驱动，有 3 个操作变量，将 S1 和 S2 的值进行 BIN 代数相减后存入 D 中，参与运算的变量都按有符号数处理，最高位为符号位，0 为正数，1 为负数。若计算结果为 0，则 0 标志(M8020)会置位；

The instruction is driven by contact with three operation variables. S1 and S2 is subtracted in BIN algebra and saved in D. The involved variables are handled as signed number, whose highest digit is sign bit. 0 is positive number, and 1 is negative. If the calculation result is 0, the 0 flag bit (M8020) will be reset.

若计算结果超过 32，767（16bit 运算）或-2，147，483，647（32bit 运算）时，进位标志(M8022)会置位；
When the calculation result exceeds 32,767 (16bit calculation) or -2,147,483,647(32bit calculation), the carry flag bit (M8022) well be set;
若计算结果不满　-32，768（16bit 运算）或-2，147，483，648（32bit 运算）时，借位标志(M8021)会置位；
When the calculation result is lower than -32,768 (16bit calculation) or -2,147,483,648 (32bit calculation), the borrow flag bit (M8021) well be set;
进行 32bit 运算时，指令中变量地址位为低 16bit 地址，相邻高编号地址单元为高 16bit，编程时防止重复或误覆盖。
When using 32bit calculation, the instruction variable address is low 16bit address, and the adjoining address is high 16bit address. It should be avoided from repeating or overwriting in programming.

指令举例：
Instruction example:

```
 M8
─┤├────〔SUB  D100  D110  D120〕
```

当M8置位时，将被减数D100的内容减去减数D110的内容后存放到D120中，假如D100=K10;D110=K8,则D120=10-8=K2

当 M8 置位时，将被减数 D100 的内容减去减数 D110 的内容后存放在 D120 中，假如 D100=K10,D110=K8,则 D120=10-8=K2
When M8 is set, subtrahend D100 value is subtracted with subtrahend D110 value and the result is saved to D120. If D100=K10;D100=K8, D120=10-8=K2

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC
22</td><td rowspan="2">MUL</td><td rowspan="2">BIN 乘法运算
BIN multiplication operation</td></tr>
<tr><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>7 步
7 steps</td><td>13 步
13 steps</td><td></td><td colspan="3">指令格式：MUL S1 S2 D

Instruction format：MUL S1 S2 D</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enhanced</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

需要触点驱动，有 3 个操作变量，将S1和S2的值进行 BIN 代数相乘后存入D中，参与运算的变量都按有符号数处理，最高位为符号位，0 为正数，1 为负数。需注意 32bit 相乘的时候积占用 4 个寄存器。

The instruction is driven by contact with three operation variables. S1 and S2 is multiplied in BIN algebra and saved in D. The involved variables are handled as signed number, whose highest digit is sign bit. 0 is positive number, and 1 is negative. Note that the product of 32bit multiplication occupies 4 registers.

表中 V、Z 元件仅在 16bit 运算时可用。

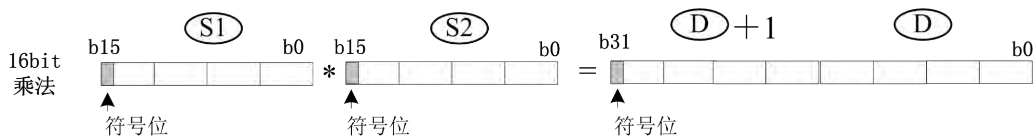
The V and Z components in the chart can only be used in 16-bit operation.

进行 32bit 运算时，指令中变量地址位为低 16bit 地址，相邻高编号地址单元为高 16bit，编

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔		

程时防止重复或误覆盖；计算的结果只能为 32bit，对于超出 32bit 范围的计算，最好采用浮点运算指令 EMUL 进行计算。

When using 32bit calculation, the instruction variable address is lower 16bit address, and the adjoining address is higher 16bit address. It should be avoided from repeating or overwriting in programming. The calculation result should be 32bit, and it prefers to floating calculation instruction EMUL for the calculation, whose result exceeds 32bit range.



16bit 乘法

16bit multiplication

符号位

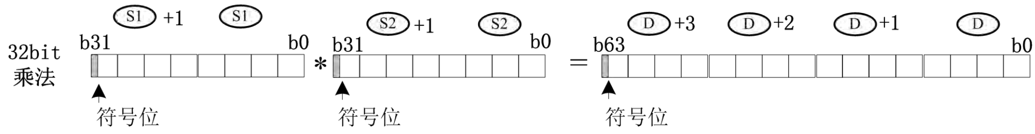
Sign Bit

符号位

Sign Bit

符号位

Sign Bit

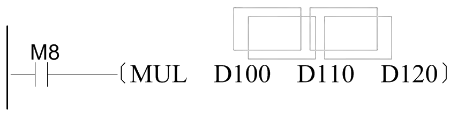


32bit 乘法
32bit multiplication

符号位
Sign Bit
符号位
Sign Bit
符号位
Sign Bit

指令举例：
Instruction example:

梯形图



指令列表

LD M8
MUL D100 D110 D120

当M8置位时将被乘数D100的内容乘以乘数D110的内容后存放到D120中.
假如D100=K5;D110=K9,则D120=5×9=K45
假如D100=K1234;D110=K5678,则D120,d121=1234×5678=K7006652,需注意此时积大于16bit,需用到D的相邻高位D121,D120

当 M8 置位时将被乘数 D100 的内容乘以乘数的 D110 的内容后存放在 D120 中。
When M8 is set, multiplicand D100 value is multiplied with multiplier D110 value and the result is saved to D120.
假如 D100=K5;D110=K9,则 D120=5×9=K45
If D100=K5;D110=K9, D120=5×9=K45

假如 D100=K1234;D110=K5678,则 D120，d121=123×5678=K7006652，需注意此时积大于 16bit，需要到 D 的相邻高位 D121,D120
If D100=K1234; D110=K5678, then D120, d121=123×5678=K7006652。Note that if the product exceeds 16bit, the adjoining higher bits D121 and D120 are required

16bit 16位	32bit 32位	P	FNC 23	DIV	BIN 除法运算 BIN Division Operation
✔	✔	✔			
7步 7 steps	13步 13 steps		指令格式：DIV S1 S2 D Instruction format：DIV S1 S1 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔		

需要触点驱动，有 3 个操作变量，将被除数 S1 和除数 S2 的值进行 BIN 代数相除后存入 D 中，参与运算的变量都按有符号数处理，最高位为符号位，0 为正数，1 为负数。表中 V、Z 元件仅在 16bit 运算时可用。

The instruction is driven by contact with three operation variables. S1 and S2 is divided in BIN algebra and saved in D. The involved variables are handled as signed number, whose highest digit is sign bit. 0 is positive number, and 1 is negative. The V and Z components in the chart can only be used in 16-bit operation.

进行 32bit 运算时，指令中 S1 和 S2 变量地址为低 16bit 地址，相邻高编号地址单元为高 16bit，编程时防止重复或误覆盖；计算所得的商存入 D、D+1 所指单元，余数存入 D+2、D+3 地址单元中。

The instruction variable address is lower 16bit address, and the adjoining address is higher 16bit address. It should be avoided from repeating or overwriting in programming. The result quotient is saved to units of D、D+1, and remainder is saved to units of D+2、D+3.

若除数(S2)为 0，会发生计算错误；

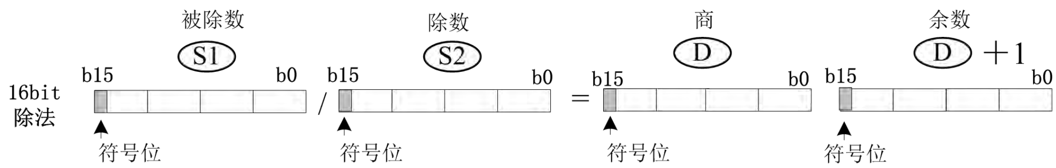
If the divisor (S2) is 0, there will be calculation error;

若将位元件（KnX/KnY/KnM/KnS）指定为(D)，不能得到余数；

If the bit component（KnX/KnY/KnM/KnS）is specified with (D), there will be no remainder;

若被除数为负数，余数即为负数。

If the dividend is negative, remainder will be negative as well.



16bit

16 位

减除数

Divisand

符号位

Sign Bit

除数

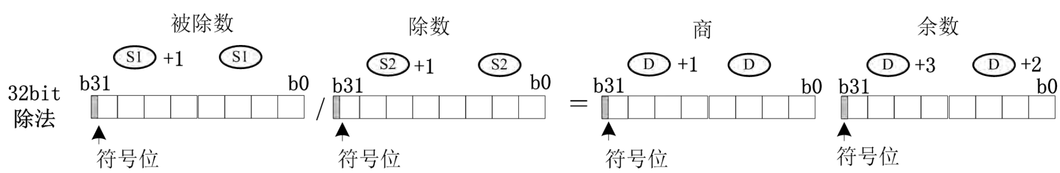
Divisor

商

Quotient

余数

Remainder



16bit

16 位

减除数

Divisand

符号位
Sign Bit

除数
Divisor

商
Quotient

余数
Remainder

指令举例：
Instruction example:

梯形图
Ladder diagram

指令列表
Instruction list

当 M8 置位时将被除数 D100 的内容除以除数 D110 的内容后存放在 D120 中。
When M8 is set, divisand D100 value is divided with divisor D110 value and the result is saved to D120.
假如 D100=K5;D110=K2,则 D120=K2,商存放于 D121,D121=K1。
If D100=K5; D110=k2， D120=K2, which is saved in D121，D121=K1.

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC
24</td><td rowspan="2">INC</td><td rowspan="2">BIN 加 1 运算
BIN Increment calculation</td></tr>
<tr><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>3 步
3 steps</td><td>5 步
5 steps</td><td></td><td colspan="3">指令格式：INC(D)

Instruction format：INC(D)</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enhanced</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D								✔	✔	✔	✔	✔	✔	✔	✔

指令每执行一次，D中的数值增加 1。

Every time instruction is implemented, D value is added with 1.

16 位运算时，32，767 再加 1 变为-32，768；32 位运算时，2，147，483，647 再加 1 变为-2，147，483，648。

When using 16bit calculation, 32,767 plusing 1 is -32,768; when using 32bit calculation, 2,147,483,647 plusing 1 is -2,147,483,648.

本指令对 0 标志、进位、借位标志都不刷新

This step will not refresh the” 0” sign or the carry and borrow sign

指令举例：

Instruction example:

```
 M5
─┤├──────〔INCP   D10〕
```

M5每置位一次，D10的值加1

M5 每置位一次，D10 的值加 1

Every time M5 is set, D10 is added with 1

16bit 16 位	32bit 32 位	P	FNC 25	DEC	BIN 减 1 运算 BIN decrement calculation
✔	✔	✔			
3 步 3 steps	5 步 5 steps		指令格式：DEC D Instruction format：DEC D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

指令每执行一次，D的数值减 1。

Every time instruction is implemented, D value is subtracted with 1.

16 位运算时，-32，768 再减 1 变为 32，767；32 位运算时，-2，147，483，648 再减 1 变为 2，147，483，647。

When using 16bit calculation, -32,768 subtracting 1 is 32,767; when using 32bit calculation, -2,147,483,648 subtracting 1 is 2,147,483,647.

本指令对 0 标志、进位、借位标志都不刷新。

The instruction will not refresh 0 flag bit, carry flag bit and borrow flag bit.

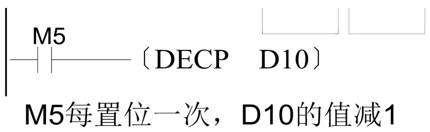
进行 32bit 运算时，指令中D变量地址位为低 16bit 地址，相邻高编号地址单元为高 16bit，编程时防止重复或误覆盖。

When using 32bit calculation, the instruction D variable address is lower 16bit address, and the adjoining address is higher 16bit address. It should be avoided from repeating or overwriting in programming.

指令举例：

Instruction example:

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D								✔	✔	✔	✔	✔	✔	✔	✔



M5 每置位一次，D10 的值减 1

Every time M5 is set, D10 is subtracted with 1

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td rowspan="2">P</td><td rowspan="3">FNC
26</td><td rowspan="3">WAND</td><td rowspan="3">逻辑与
Logic AND</td></tr>
<tr><td>✔</td><td>✔</td></tr>
<tr><td></td><td></td><td>✔</td></tr>
<tr><td>7 步
7 steps</td><td>13 步
13
steps</td><td></td><td colspan="3">指令格式：WAND S1 S2 D (32bit 指令符为 DAND)</td></tr>
</table>

			Instruction format: WAND S1 S2 D (32bit instruction symbol is DAND)

本指令执行时，将 S1 和 S2 中 BIN 值的各位对应作“逻辑与”运算，将结果存入 D 变量。

When the instruction is implemented, the corresponding bits in BIN value of S1 and S2 are implemented with “logic and” calculation, and the result is saved in D.

逻辑的‘与’（AND）运算的规则为任一为 0 结果为 0。

The rule of “logic and” calculation is that if one operand is 0, the result is 0.

1∧1=1　1∧0=0　0∧1=0　0∧0=0

16bit 16 位	32bit 32 位	P	FNC 27	WOR	逻辑或 Logic OR
✔	✔	✔			
7 步 7 steps	13 步 13 steps		指令格式:WOR S1 S2 D　(32bit 指令符为 DOR) Instruction format: WOR S1 S2 D (32bit instruction symbol is DOR)		

本指令执行时，将 S1 和 S2 中 BIN 值的各位对应作“逻辑或”运算，将结果存入 D 变量。

When the instruction is implemented, the corresponding bits in BIN value of S1 and S2 are implemented with “logic or” calculation, and the result is saved in D.

逻辑的’或’（OR）运算的规则为任一为 1 结果为 1。

The rule of logic “or” is that the result is one when anyone is one.

1V1=1 1V0=1 0V1=1 0V0=0

16bit 16 位	32bit 32 位	P	FNC 28	WXOR	逻辑异或 Logic XOR
✔	✔	✔			
7 步 7 steps	13 步 13 steps		指令格式：WXOR S1 S2 D　(32bit 指令符为 DXOR) Instruction format: WXOR S1 S2 D (32bit instruction symbol is DXOR)		

本指令执行时，将 S1 和 S2 中 BIN 值的各位对应作“逻辑异或”运算，将结果存入 D 变

量。
When the instruction is implemented, the corresponding bits in BIN value of S1 and S2 are implemented with “logic xor” calculation, and the result is saved in D.

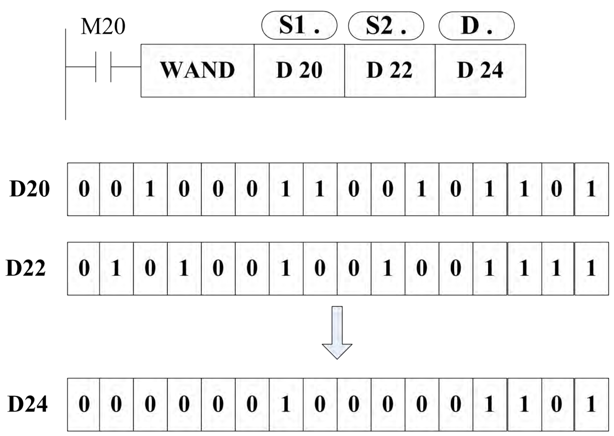
逻辑的'异或'（XOR）运算的规则为两者相同结果为 0，两者不同结果为 1。
The rule of “logic xor" calculation is that if two operand is same, the result is 0, or it is 1.
1(1=0 1(0=1 0(1=1 0(0=0
上述三个指令的适用机型
The available models for above three instructions

这三个指令操作数适用变量类型如下表，当为 32bit 指令时，寄存器变量则占用后续相邻地址的共 2 个单元：
The operand available variable types for these three instructions are listed as following table. When in 32bit operation, the register variable will occupy the following adjoining address of two units:

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

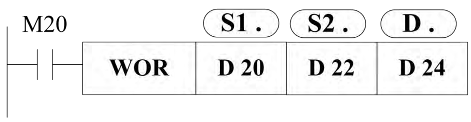
指令举例：
Instruction example:

逻辑与



逻辑与
Logic AND

逻辑或



D20	0	0	1	0	0	0	1	1	0	0	1	0	1	1	0	1
D22	0	1	0	1	0	0	1	0	0	1	0	0	1	1	1	1

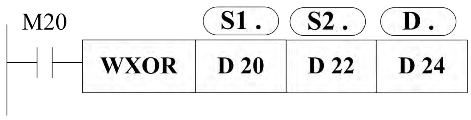
⇩

D24	0	1	1	1	0	0	1	1	0	1	1	0	1	1	1	1

逻辑与

Logic AND

逻辑异或



D20	0	0	1	0	0	0	1	1	0	0	1	0	1	1	0	1
D22	0	1	0	1	0	0	1	0	0	1	0	0	1	1	1	1

⇩

D24	0	1	1	1	0	0	0	1	0	1	1	0	0	0	1	0

逻辑异或

Logic XOR

16bit 16 位	32bit 32 位	P	FNC 29	NEG	求补运算 Complement calculation
✔	✔	✔			
3 步 3 steps	5 步 5 steps		指令格式：NEG(D) Instruction format：NEG(D)		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	Kn	T	C	D	V	Z

										S					
D								✔	✔	✔	✔	✔	✔	✔	✔

需要触点驱动，有 1 个操作变量。将 D 的数值逐位取反、再加 1，存回 D 中。

A contact drive is required and there is 1 operational variable.It is to implement bit-by-bit complement calculation for D value, and the result is saved back to D.

此指令一般用脉冲执行型指令。

ypically this instruction is of pulse execution type.

使用 NEG 指令，可得到与负的 BIN 值相对应的绝对值。

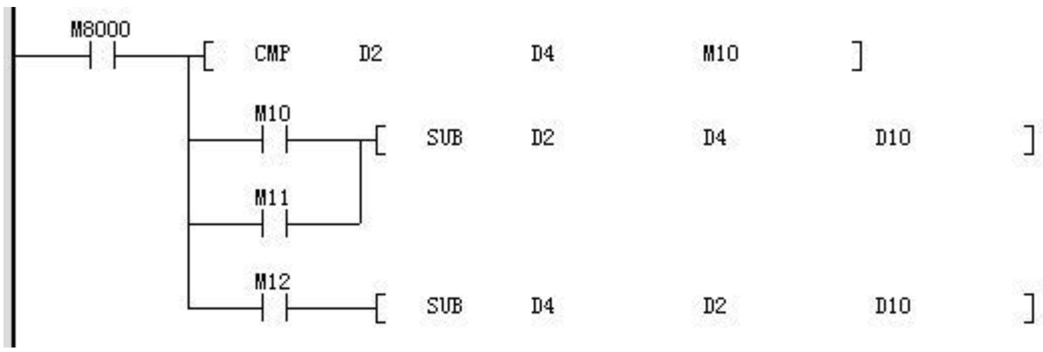
To get the absolute value corresponding to the negative BIN value, the NEG instruction can be used.

指令举例：

Instruction example:

减法运算的差取绝对值

Take the absolute value of a subtraction operation



若 D2>D4 时，M10=On。 若 D2=D4 时，M11=On。

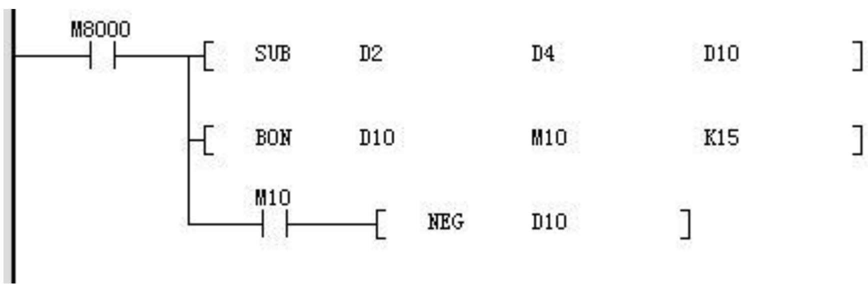
If D2>D4, then M10=On; if D2=D4, then M11=On;

若 D2<D4 时，M12=On,由此可保证 D10 为正值

If D2<D4, M12=On, which can ensure that D10 is positive value.

此程序可用下列的程序来表示

The program could be expressed with following code



当 D10 的 bit15 为“1”时（表示 D10 为负数），M10=On，用 NEG 指令将 D10 取补码可得到 D10 的绝对值。

When bit15 in D10 is “1”, which means D10 is negative, M10=on. The absolute value of D10 could be obtained with NEG instruction by complementing D10.

上述两例中假如 D2=K4，D4=K8；或者 D2=K8，D4=K4，D10 的结果均为 K4

In above two examples, if D2=K4, D4=K8; or D2=K8, D4=K4, the results of D10 are all K4.

补充说明：负数的表现及绝对值：

Additional remarks:

1. 正负数是以寄存器最上位（最左边）的位内容来表现，为“0”时为正数、为“1”时为负数。

1. The signed number is indicated with the highest bit (the leftmost bit). "0" indicates positive, and “1” indicates negative.

2. 最高位为 1 时，可使用 NEG 指令将它转成绝对值。

2. If the value of the highest bit is 1, the NEG instruction can be used to convert it into the absolute value.

(D 10)=2

0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

(D 10)=1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

(D 10)=0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(D 10)=-1

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$\overline{(D\ 10)}+1=1$

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

(D 10)=-2

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

$\overline{(D\ 10)}+1=2$

0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

(D 10)=-3

1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1

$\overline{(D\ 10)}+1=3$

0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

(D 10)=-4

1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0

$\overline{(D\ 10)}+1=4$

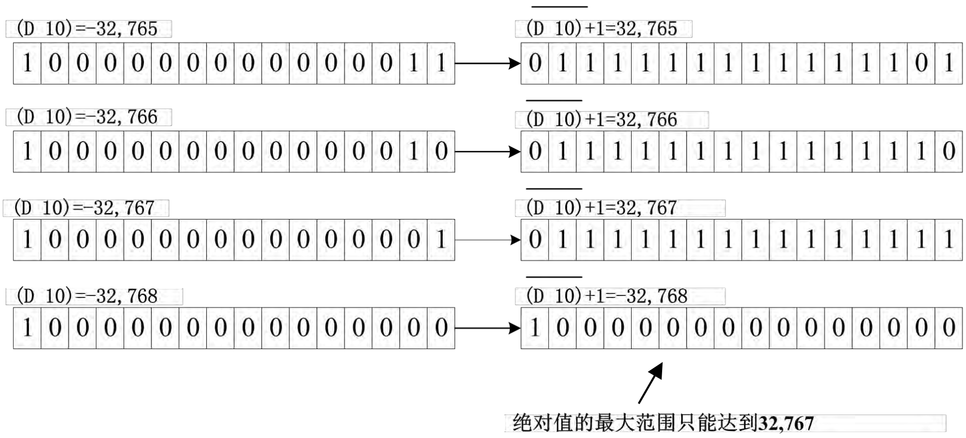
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

(D 10)=-5

1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1

$\overline{(D\ 10)}+1=5$

0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1



绝对值的最大范围只能达到 32,767
The range of absolute value is 32,767

16bit 16 位	32bit 32 位	P	FNC 30	ROR	循环右移 Cycle Right Shift
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：ROR D n Instruction format： ROR D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

将 D 的内容循环右移 n 位。本指令一般使用脉冲执行型指令。

It is to ring shift right D with n bits. The instruction usually uses pulse operation type instruction. The instruction usually uses pulse operation type instruction.

16bit 16 位	32bit 32 位	P	FNC 31	ROL	循环左移 Cycle Left Shift
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：ROL D n Instruction format： ROL D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

将 D 的内容循环左移 n 位。本指令一般使用脉冲执行型指令。

It is to ring shift left D with n bits. The instruction usually uses pulse operation type instruction. The instruction usually uses pulse operation type instruction.

上述两个指令的操作数适用变量类型如下表，当为 32bit 指令时，寄存器变量则占用后续相邻地址的共 2 个单元：

The operand available variable types for these two instructions are listed as following table. When in 32bit operation, the register variable will occupy the following adjoining address of two units:

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
n	常数，n=1~16（16bit）；n=1~32（32 bit） Constant，n=1~16（16bit）；n=1~32（32 bit）														

若 D 中指定 KnY、KnM、KnS 时，只有 K4（16bit）及 K8（32bit）有效；

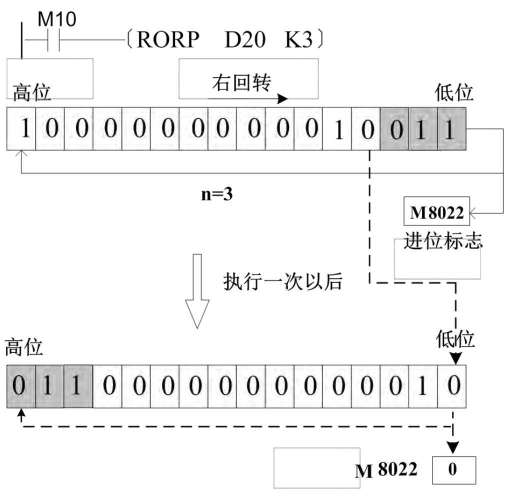
If KnY, KnM, KnS are specified in D, only K4(16bit) and K8(32bit) are valid;

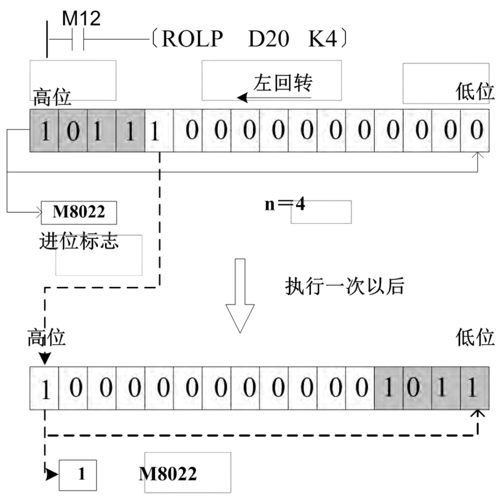
循环移动的最终位被存入进位标志中。

The final bit is circular movement into carry mark.

指令举例：

Instruction example:





高位

Higher bit

右回转

Ring shift right

低位

Lower bit

左回转
Ring shift left

执行一次
Implement one time

执行一次以后
After implementing one time

进位标志
Carry flag

16bit 16 位	32bit 32 位	P	FNC 32	RCR	带进位循环右移 Carry Cycle Right Shift
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：RCR D n Instruction format：RCR D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

将 D 的内容连同进位标志 M8022 循环右移 n 位。

It is to ring shift right D with n bits and carry flag M8022.

本指令一般使用脉冲执行型指令。
The instruction usually uses pulse operation type instruction.

16bit 16 位	32bit 32 位	P	FNC 33	RCL	带进位循环左移 Carry Cycle Left Shift
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：RCL D n Instruction format：RCL D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

将 D 的内容连同进位标志 M8022 循环左移 n 位。

It is to ring shift left D with n bits and carry flag M8022.

本指令一般使用脉冲执行型指令。
The instruction usually use pulse operation type instruction.
上述两个指令的操作数适用变量类型如下表，当为 32bit 指令时，寄存器变量则占用后续相邻地址的共 2 个单元：
The operand available variable types for these two instructions are listed as following table. When in 32bit operation, the register variable will occupy the following adjoining address of two units:

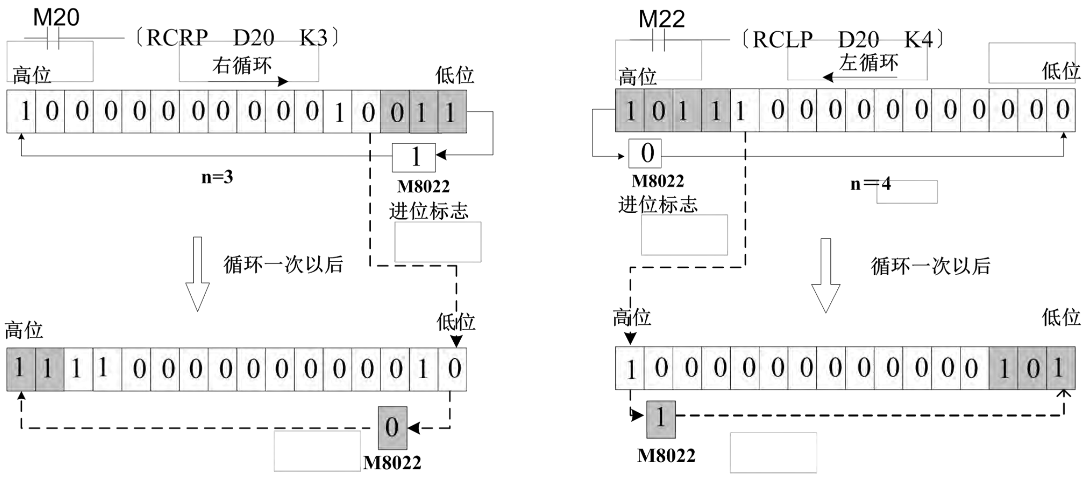
<table>
<tr><td rowspan="2">操作数
Operands</td><td colspan="4">位元件
bit component</td><td colspan="11">字　元　件
Word component</td></tr>
<tr><td>X</td><td>Y</td><td>M</td><td>S</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>KnS</td><td>T</td><td>C</td><td>D</td><td>V</td><td>Z</td></tr>
<tr><td>D</td><td></td><td></td><td></td><td></td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td></tr>
<tr><td>n</td><td colspan="15">常数，n=1~16（16bit）；n=1~32（32 bit）
Constant，n=1~16（16bit）；n=1~32（32 bit）</td></tr>
</table>

若 D 中指定 KnY、KnM、KnS 时，只有 K4（16bit）及 K8（32bit）有效；

If KnY, KnM, KnS are specified in D, only K4(16bit) and K8(32bit) are valid;

指令举例：

Instruction example:



高位

Higher bit

右循环

Ring shift right

进位标志

Carry flag

左循环

Ring shift left

循环一次以后

After one circle

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC
34</td><td rowspan="2">SFTR</td><td rowspan="2">位右移
Bit shift right</td></tr>
<tr><td>✔</td><td></td><td>✔</td></tr>
<tr><td>9 步
9 steps</td><td></td><td>9 步
9 steps</td><td colspan="3">指令格式：
SFTR S D n1 n2
Instruction format：
SFTR S D n1 n2</td></tr>
</table>

适用机型

Available model

系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

对于位变量，将 S 地址起始的 n2 位变量与 D 地址起始的 n1 变量，按向右方向移动 n2 位后，将结果保存在 D 中。

For n2 bit variables of address started with S and n1 variables of address started with D, after right shift for n2 bits, the result is saved in D.

本指令一般使用脉冲执行型指令。

The instruction usually uses pulse operation type instruction.

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td rowspan="2">P</td><td rowspan="3">FNC
35</td><td rowspan="3">SFTL</td><td rowspan="3">位左移
Bit shift left</td></tr>
<tr><td>✔</td><td></td></tr>
<tr><td rowspan="2">9 步
9 steps</td><td rowspan="2"></td><td>✔</td></tr>
<tr><td>9 步
9 steps</td><td colspan="3">指令格式：SFTL S D n1 n2
Instruction format : SFTL S D n1 n2</td></tr>
</table>

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

对于位变量，将 S 地址起始的 n2 位变量与 D 地址起始的 n1 变量，按向左方向移动 n2 位后，将结果保存在 D 中。

For S bit variables of address started with n2 and D variables of address started with n1, after left shift for n2 bits, the result is saved in D.

本指令一般使用脉冲执行型指令。

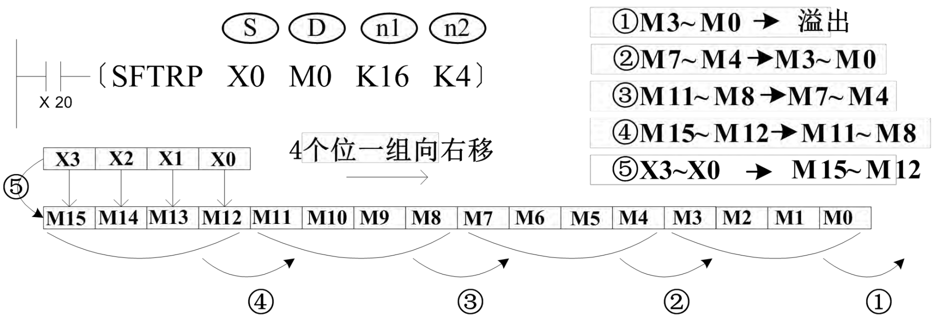
The instruction usually uses pulse operation type instruction.

上述两个指令的操作数适用变量类型如下表：

The operand available variable types for above two instructions are listed as following table:

<table>
<tr><td rowspan="2">操作数
Operands</td><td colspan="4">位元件
bit component</td><td colspan="11">字　元　件
Word component</td></tr>
<tr><td>X</td><td>Y</td><td>M</td><td>S</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>KnS</td><td>T</td><td>C</td><td>D</td><td>V</td><td>Z</td></tr>
<tr><td>S</td><td>✔</td><td>✔</td><td>✔</td><td>✔</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>D</td><td></td><td>✔</td><td>✔</td><td>✔</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>n1</td><td colspan="15">常数，n1≤1024</td></tr>
</table>

	Constant,n1≤1024
n2	常数，n2≤n1 Constant, n2≤n1



4 个位一组向右移

Right shift with 4bit as a group

溢出

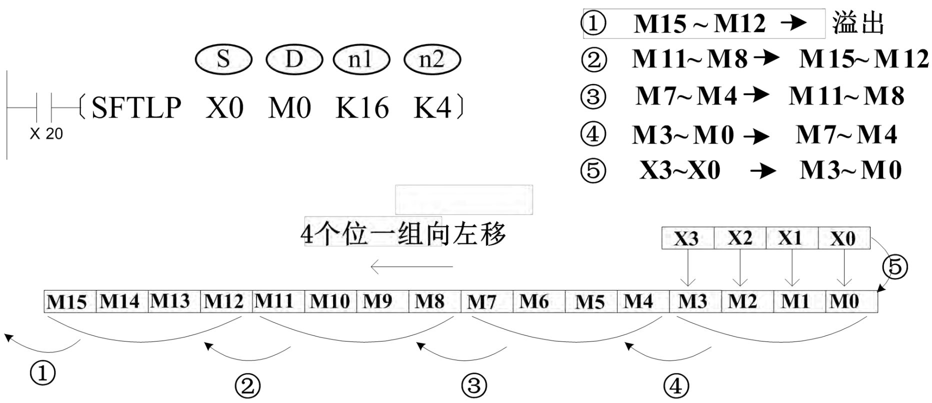
Overflow

指令举例二：

Example 2 for instruction:

SFTL 命令：

SFTL command:



4 个位一组向右移

Right shift with 4bit as a group

溢出

Overflow

16bit 16 位	32bit 32 位	P	FNC 36	WSFR	字右移 Shift right by word
✔		✔			
9 步 9 steps		9 步 9 steps	指令格式：WSFR S D n1 n2 Instruction format：WSFR S D n1 n2		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	✔

以字为单位，将 S 地址起始的 n2 字变量与 D 地址起始的 n1 字变量，按向右方向移动 n2 个字

Taking word as unit, for n2 word variables of address started with S and n1 word variables of address started with D, right shift for n2 bits.

本指令一般使用脉冲执行型指令。

The instruction usually uses pulse operation type instruction.

16bit 16 位	32bit 32 位	P	FNC 37	WSFL	字左移 Word shift left
✔		✔			
9 步 9 steps		9 步 9 steps	指令格式：WSFL S D n1 n2 Instruction format：WSFL S D n1 n2		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	✔

以字为单位，将 S 地址起始的 n2 字变量与 D 地址起始的 n1 字变量，按向左方向移动 n2 个字。

Taking word as unit, for S word variables of address started with n2 and D word variables of address started with n1, left shift for n2 bits.

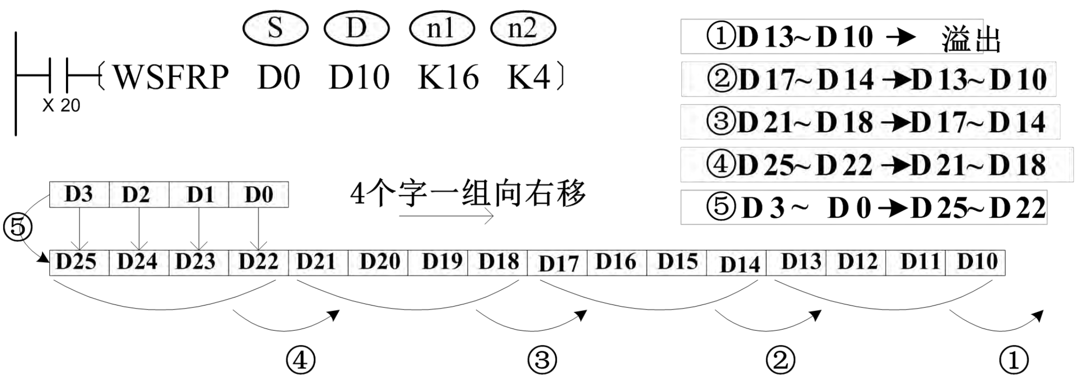
本指令一般使用脉冲执行型指令。
The instruction usually uses pulse operation type instruction.

上述两个指令的操作数适用变量类型如下表：
The operand available variable types for above two instructions are listed as following table:

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n1	常数，H1U 机型:n1≤512;　H2U 机型 n1≤2048 Constant，H1U model: n1≤512; H2U model: n1≤2048														
n2	常数，n2≤n1 Constant, n2≤n1														

指令举例一：
Example 1 for instruction:

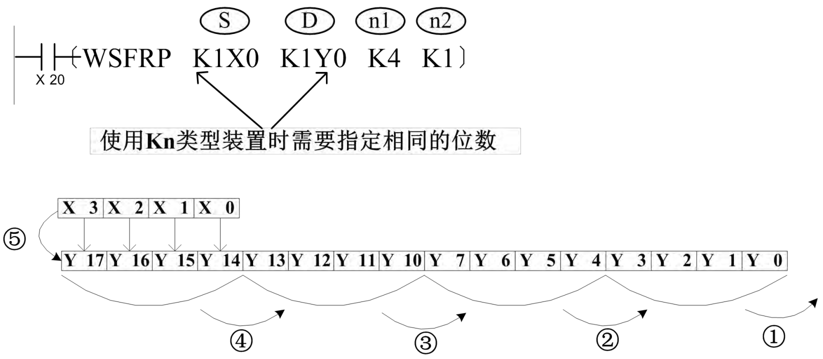
WSFR 命令：
WSFR command：



4 个位一组向右移
Right shift with 4bit as a group

溢出
Overflow

指令举例二：
Example 2 for instruction:
WSFR 命令：
WSFR command：



扫描一次的位数右移动作依照下列编号1~5 动作。

1：Y3~Y0 → 进位

2：Y17~Y14 → Y13~Y10

3：Y13~Y10 → Y7~Y4

4：Y7~Y4 → Y3~Y0

5：X3~X00 → Y17~Y14 完成

使用 Kn 类型装置时需要制定相同的位数

When using Kn model device, it needs to specify same digital number

扫描一次的位数右移动作依照下列编号 1~5 动作

According to following No. 1~5 steps, the right shift action of digital number is implemented in one scan period

进位

Carry

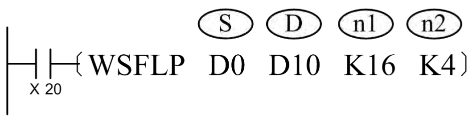
完成

Accomplished

指令举例三：

WSFL 命令：

WSFL command：



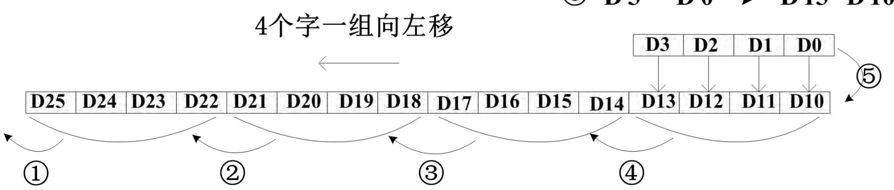
① D25~D22 → 溢出

② D21~D18 → D25~D22

③ D17~D14 → D21~D18

④ D13~D10 → D17~D14

⑤ D3~ D0 → D13~D10



4 个位一组向右移

Right shift with 4bit as a group

溢出

Overflow

16bit 16 位	32bit 32 位	P	FNC 38	SFWR	“先进先出”写入 “FIFO” write
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：SFWR S D n Instruction format：SFWR S D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n	常数，2≤n≤2048 Constant,2≤n≤2048														

将 S 的值写入由 D 地址起始，个数为 n 的“先进先出”队列中，以第一个编号装置作为指针，当指令执行时，指针内容值先加 1，之后 S 所指定的装置其内容值会写入先入先出 D 数据串列中由指针所指定的位置。

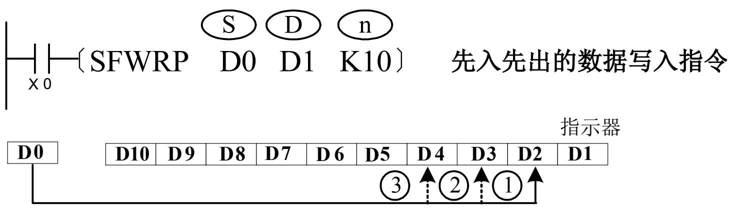
Writing S value to the address started with D. In a n FIFO stack, the first numbered device is taken as point. When implementing instruction, the point content is added by 1, and then the device value specified by S will be written to FIFO D data tandem location specified by point.

本指令一般使用脉冲执行型指令。

The instruction usually uses pulse operation type instruction.

指令举例：

Instruction example:



先入先出的数据写入指令
FIFO data write instruction

指示器
Indicator
当 X0＝1 时，D0 的内容被存入 D2，D1 的内容变为 1。当 X0 再次从 OFF→ON 时，D0 的内容被存入 D3，D1 的内容变为 2，以此类推。若 D1 的内容超过 n-1，则指令不处理，而进位标志 M8022 会置 1。
When X0=1, D0 content is saved to D2, and D1 is set to 1. When X0 is set from OFF to ON again, D0 content is saved to D3, and D1 is set to 2, and so on. If D1 value exceeds n-1, the instruction will not be implemented and the carry flag M8022 will be set with 1.

16bit 16 位	32bit 32 位	P	FNC 39	SFRD	“先进先出”读出 “FIFO” read
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：SFRD S D n Instruction format：SFRD S D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n	常数，2≤n≤2048 Constant,2≤n≤2048														

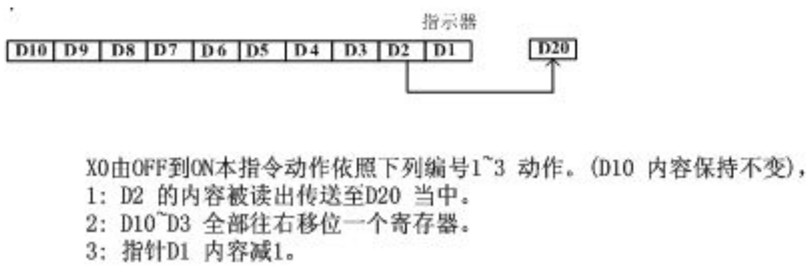
从“先进先出”队列 的首项读出到 中，然后将队列 逐字右移 1 个字，将队列指针递减。，以第一个编号装置作为指针，当指令执行时，指针内容值先减 1，之后 S 所指定的装置其内容值会写入先入先出 数据串列中由指针所指定的位置。若指针已经为 0，则指令不处理前述操作，而 0 标志 M8020 会置 1
Read the first item in “FIFO” array to , and then implementing right shift one word for array with degressive array point. The first numbered device is taken as point. When implementing instruction, the point content is subtract by 1, and then the device value specified by S will be written to FIFO data tandem location specified by point. If the point is 0, the instruction will not be processed according to above operation, and 0 flag M8020 will be set to 1.

本指令一般使用脉冲执行型指令。
The instruction usually uses pulse operation type instruction.

指令举例：
Instruction example:

X0 ─┤├─〔SFRDP (S)D1 (D)D20 (n)K10〕 先入先出的数据读出指令

陷入先出的数据读出指令
FIFO data read instruction



X0 由 OFF 到 ON 本指令动作依照下列编号 1~3 动作。（D10 内容保持不变），
According to following No. 1~3 steps, the instruction of setting X0 from OFF to ONis implemented. (D10 value is holding),
1：D2 的内容被督促传送至 D20 当中。
1: D2 value transmitted back to D20.
2：10~D3 全部往右移位一个寄存器
2: 10~D3 are all right shift for one register
3：指针 D1 内容减 1
3: Point D1 value is subtracted with 1

4.3.2.5 数据处理（40~49）
.5 Data processing (40~49)

16bit 16 位	32bit 32 位	P	FNC 40	ZRST	区间复位 Interval reset
✔		✔			
5 步 5 steps		5 步 5 ste	指令格式：ZRST D1 D2		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

		ps	Instruction format：ZRST D1 D2

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D1		✔	✔	✔							✔	✔	✔		
D2		✔	✔	✔							✔	✔	✔		

将D1至D2区间的变量全部清 0。D1 和D2可指定字变量，也可为 Y、M、S 位变量。

The variables from D1 to D2 are all cleared with 0. D1 and D2 can be specified with word variables or Y,M,S bit vaviables.

其中要求：

Request：

D1和D2必须为同一类型的软元件；

D1 and D2 should be the same type of soft componet;

编号D1应不大于D2，若两者相同时，仅复位指定的软元件；

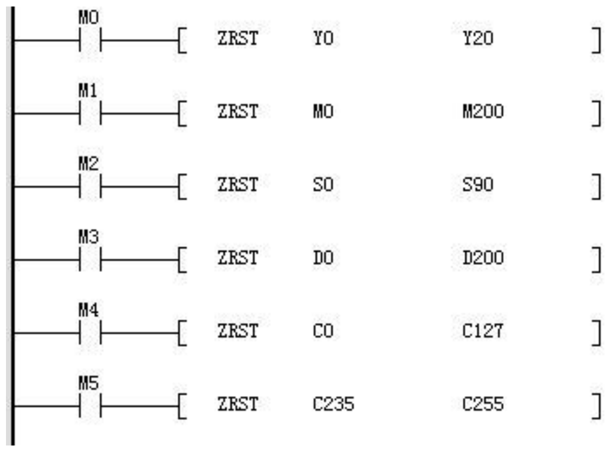
D1 number should be less than D2; if they are same, only the specified soft component is reset;

本指令为 16bit，但D1和D2可指定 32bit 的计数器，此时应同为 32bit 型或同为 16bit 型；

The instruction is 16bit, but D1 and D2 can be specified with 32bit counter, which should be synchronally 32bit or 16bit.

指令举例：

Instruction example:



补充说明：

Additional remarks:

位装置 Y、M、S 和字装置 T、C、D 也可使用 RST 指令来单独复位；字装置 T、C、D 和位寄存器 KnY、KnM、KnS 也可以用 FMOV 来多点清除。 例如：

Device of bitY、M、S and device of word T、C、D can also be reseted by RST separately. Device of T\C\D and device of T\C\D， including bit register KnY\KnM\KnS,can also be cleared from multi-points by FMOV Where:

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 41	DECO	解码 Decode
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：DECO S D n Instruction format：DECO S D n		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔	✔	✔	✔					✔	✔	✔	✔	✔
D		✔	✔	✔							✔	✔	✔		
n	常数，n=1~8。 若 n＝0，指令不执行；其他值则执行出错。 Constant, n=1~8. When n=0, the instruction will not execute; other values will be debugged.														

计算 的最后(2^)位的值，作为 bit 位指针，将 的对应位置 1，其他位清 0。

Calculating the value of S last (2^) digit and taking it as bit pointer. Setting the corresponding digit to 1, and the other digits to 0.

源地址的低 n 位（n≤4）被解码至目标地址。 n≤3 时，目标的高位都转为 0；

The low n bit(s) (n≤4) of the source address is translated to target address. If n≤3, the higher bits of the target address is set to 0;

n=0 时命令不执行，n=0~8 以外时为运算错误；

If n=0, the instruction is not implemented; if n is not within the range of 0~8, there will be calculation error;

n=8 时，如果译码命令 为位软元件时，其点数是 256 点。

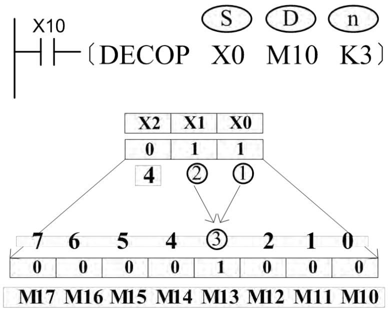
When n=8, if the code translation instruction is bit soft component, the point number is 256.

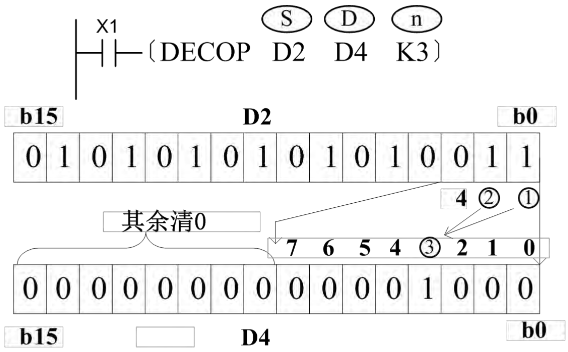
驱动输入为 OFF 时，指令不执行，正在动作的译码输出保持动作。

When driver output is OFF, the instruction is not implemented and the code translation output in operation will be implemented.The instruction usually uses pulse operation type instruction.

编程举例：

Programming Illustration:





其余清 0

The other bits are cleared with 0

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 42	ENCO	编码 Encode
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：ENCO S D n Instruction format：ENCO S D n		

操作数	位元件	字 元 件

Operands	bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔	✔	✔	✔					✔	✔	✔	✔	✔
D		✔	✔	✔							✔	✔	✔		
n	常数，n=1~8。 若 n＝0，指令不执行；其他值则执行出错。 Constant, n=1~8. When n=0, the instruction will not execute; other values will be debugged.														

计算 S 的最后 n 位的值，作为 bit 位指针，将 D 的对应位置 1，其他位清 0。

Calculating the value of S last n digit and taking it as bit pointer. Setting the corresponding D digit to 1, and the other digits are cleared with 0.

源地址内有多个位是 1 时，只计算高位侧的第一个为 1 的位；S 的所有位都为 0 时会出现运算错误；

If there are several bits with value 1 in source address, only the first bit with value 1 in higher order will be calculated ; if all bits are with value 0, there will be calculation error;

驱动输入为 OFF 时，指令不被执行，编码输出不变化。

When driver input is OFF, the instruction will not be executed, and the output number will not change.

n=8 时，编码指令的 S 如果是位元件，其点数是 256 点。

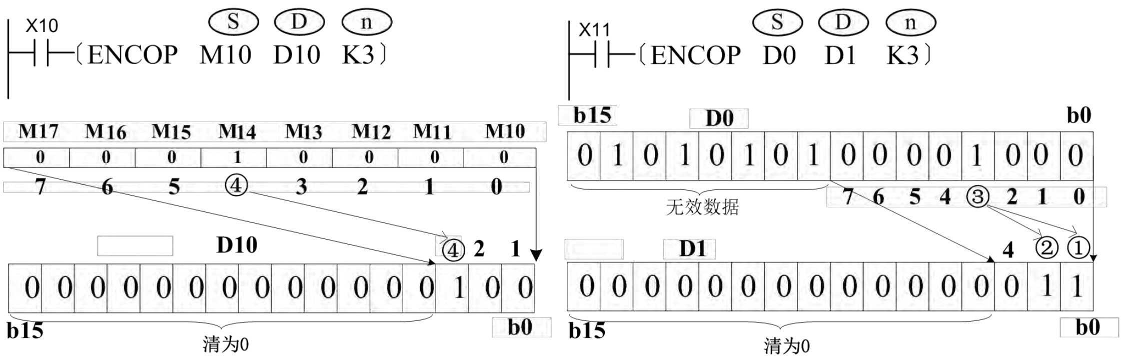
When n=8, if encode instruction S is bit component, the value is 256.

本指令一般使用脉冲执行型指令。

The instruction usually uses pulse operation type instruction.

指令举例：

Instruction example:



清为 0

Cleared with 0

无效数据
Invalid data

16bit 16 位	32bit 32 位	P	FNC 43	SUM	ON 位数 ON Median
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：SUM S D Instruction format：SUM S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

计算 的 BIN 进制值中为 1 的位个数，存入 。
It is to count the bit number with “1” in BIN value, and the result is saved to .
使用 D SUM 和 D SUM P 指令的情况下，（ +1， ）的 32 位中的 1 的个数写入 ，同时 +1 全部为 0。
When using DSUM and DSUMP instructions, the number of bit with “1” in 32bit （+1，） is written to , and +1 are all set with 0.
若 中的位全部为零，则零标志位 M8020 会置 ON
If the bits in are all 0, the zero flag bit M8020 will be set to ON.
指令举例：
Instruction example:

将 D1 中的位为 1 的个数综合存入 D2 中。
The number of the bits with value1 in D1 is counted and saved in D2.

16bit 16 位	32bit 32 位	P	FNC 44	BON	ON 位判断 ON-bit judgement
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：BON S D n Instruction format：BON S D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

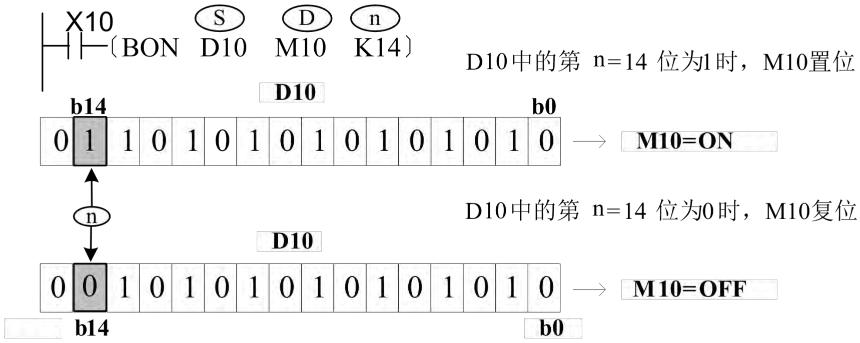
操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔	✔	✔											
n	n=0～15（16bit）；n=0～31（32bit） n=0～15（16bit）；n=0～31（32bit）														

判断 的第 位的状态，结果存入 。

Judging the state of the No. bit in , and the result is saved to D.

指令举例：

Instruction example:



X10由ON变成Off 时，M10 仍保持之前的状态。

D10 中的第 N=14 位为 1 时，M10 置位

When No.14 bit =1 in D10, M10 is set.

D10 中的第 N=14 位为 0 时，M10 复位

When No.14 bit =0 in D10, M10 is reset.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 45	MEAN	平均值 Mean
✔	✔	✔			
7 步 7 steps	13 步 13 steps		指令格式：MEAN S D n Instruction format：MEAN S D n		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔	✔	✔
n	常数，n=1～64，其他值时，计算会出错。 Constant, n=1 to 64, otherwise an error will occur.														

求取由 开始的 个变量的平均值（先求和，再除以 n），存入 。

The mean value of variables stared with (Sum firstly, and divided by n), and the result is saved to .

若计算中有余数，余数将被舍弃；

Any remainder occur during the calculation will be abandoned.

当 n 的值不在 1~64 的范围时，会计算出错。

When n value is not within the range of 1~64, there will be calculation error.

指令举例：

Instruction example:

```
    X0          S     D     n
 |--| |--[MEAN  D10   D20   K4]
 |
```

(D10+D11+D12+D13)/4=D20

假如D10=K5,D11=K5,D12=K15,D13=K52;则D20=K19.余数1被舍去

假如 D10=K5,D11=K5,D12=K15,D13=K52,则 D20=K19，余数 1 被舍去

If D10=K5, D11=K5, D12=K15, D13=K52, then D20=K19 and the remainder 1 is truncated.

16bit 16 位	32bit 32 位	P	FNC 46	ANS	报警器置位 Alarm set
✔					
7 步 7 steps			指令格式：ANS S m D Instruction format： ANS S m D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S											✔				
D				✔											
m	常数，m=1～32767，（单位为 100ms）。 Constant, m=1~32767, (unit: 100ms).														

驱动信号报警器的方便指令。

The ideal instruction is for a driver signal alarm.

其中 S 的范围为 T0~T199， D 的范围为 S900~S999。

Where, S range is T0~T199, D range is S900~S999.

指令举例：

Instruction example:

```
 X1    X2       S    m     D
─┤├────┤├──〔ANS  T0  K10  S900〕
```

如果 X1 和 X2 同时接通 l 秒以上，则 S900 被置位，以后即使 X1 或 X2 为 OFF 状态，S900 仍保持动作状态（但是 T0 会复位，值变成 0）。 若不满 1 秒， X1 或 X2 变为 OFF 时，定时器复位。

If X1 and X2 are connected for more than 1 second, S900 is set. Following that, S900 stays in a state of operation, even if X1 or X2 is set to OFF (but T0 can be reset to 0). If X1 and X2 are connected for less than 1 second, X1 or X2 will set to OFF and the timer is reset.

如果预先将 M8049（信号报警器有效）置 ON，则信号报警器 S900~S999 中最小 ON 状态编号被存入 D8049（ON 状态最小编号）且当 S900~S999 中任意一个为 ON 时，M8048（报

警器动作置 ON）。

If M8049 (signal alarm is available) is set to ON in advance, the lowest number with the ON state in signal alarm S900~S999 will be saved at D8049 (the lowest number with the ON state); when any signal in S900~S999 is ON then M8048 is set to ON (alarm operation).

16bit 16 位	32bit 32 位	P	FNC 47	ANR	报警器复位 Alarm reset
✔		✔			
1 步 1 step		1 步 1 step	指令格式：ANR(无操作数) Instruction format: ANR (invalid operand)		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

清除报警器信号的方便指令。 例如：

The ideal instruction is for a driver signal alarm. For example:

如果 X3 接通，则信号报警器 S900~S999 中正在动作的报警点被复位。 如果同时有多个报警点动作时，则复位最小编号为 ON 的报警点。

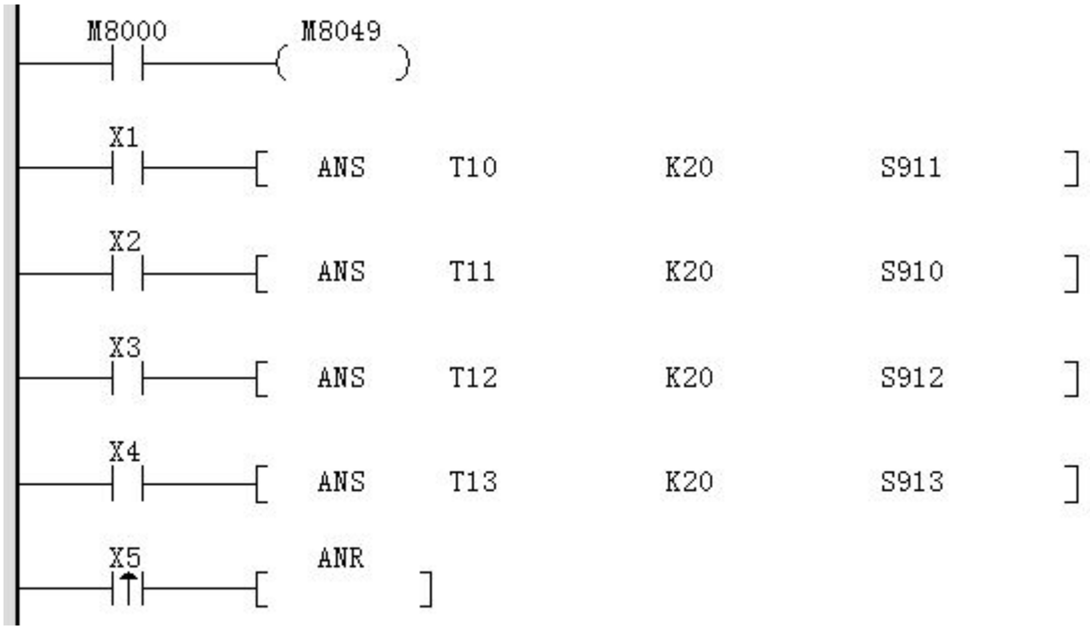
If X3 is connected, the alarm point with operation state in signal alarm S900~S999 is reset. If multiple alarm points are operating simultaneously, the alarm point with the lowest number is reset to ON

若将 X3 再次接通，则下一编号的状态被复位。 实际使用中多用 ANRP 指令。

If X3 is re-connected, the following number state is reset. Actually, ANRP instruction is preferred.

指令举例：

Instruction example:



M8049 为 ON，当程序中 S900~S999 任意一个为 ON 时，M8048 置 ON，Y0 有报警输出，
When M8049 is ON and anyone bit in S900~S999 is ON, M8048 is set to ON, and Y0 has alarm output.

假如程序中 S910、S911、S912、S913 都为 ON，则当 X5 第一次由 OFF 置 ON 时，S910 被复位，当 X5 第二次由 OFF 置 ON 时，S911 被复位，以此类推。

If S910, S911, S912, S913 in program are all ON, when X5 is set from OFF to ON by the first time, S910 is reset; when X5 is set from OFF to ON by the second time, S911 is reset, and so on.

16bit 16 位	32bit 32 位	P	FNC 48	SQR	求平方根 Square root calculation
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：SQR S D Instruction format：SQR S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

将 S 按 BIN 值开平方运算，结果存入 D 。

It is to implement BIN radication calculation for S, and the result is saved to D.

只能指定 S 为正数，如 S 为负数则运算错误标志 M8067 会置 ON，指令不被执行；

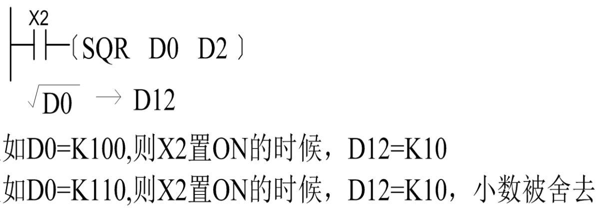
运算结果 D 只取整数。舍去小数点，有小数点被舍去时借位标志 M8021 置 ON；

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔							✔		
D													✔		

S can only be specified as positive. If S is negative, calculation error flag M8067 will be set to ON and the instruction will not be implemented, and the calculation result D will be round off. The decimal point is rounded and the borrow flag M8021 is set to ON;

指令举例：

Instruction example:



假如 D0=K100,则 X2 置 ON 的时候，D12=K10

If D0=K100, when X2 is set to ON, D12=K10

假如 D0=K11,则 X2 置 ON 的时候，D12=K10，小数被舍去

If D0=K100, when X2 is set to ON, D12=K10, and the decimal point is rounded.

16bit 16 位	32bit 32 位	P	FNC 49	FLT	BIN 整数至浮点数的转换指令

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	✔
H2U	✔	—

✔	✔	✔			The conversion instruction of Integer to Float
5 步 5 steps	9 步 9 steps		指令格式：FLT S D Instruction format：FLT S D		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

将整数 S 转换为浮点数，结果存入 D 和 D ＋1 单元。

It is to convert integer S to float, and the result is saved to D and D ＋1 units.

常数 K、H 在各浮点运算指令中自动转换，因此在本 FLT 指令中不能使用。

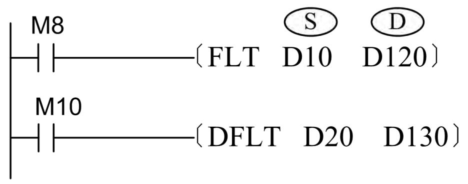
Constants K and H will be converted automatically in every floating point calculation instruction. Therefore, FLT instruction cannot be used here.

这个指令的逆变换指令是 INT（将 2 进浮点数值变换成 BIN 整数）

The instruction's inverse transformation instruction is INT (converts binary floating point values to BIN integrals).

指令举例一：

Example 1 for instruction:



当M8=ON时，将16bit数D10中(16位BIN整数)转换为二进制浮点数后，存放到（D121,D120）

当M10=ON时，将32bit数（D21,D20）中(32位BIN整数)转换为二进制浮点数后，存放到（D131,D130）

当 M8=ON 时，将 16bit 数 D10 中（16 位 BIN 整）转换为二进制浮点后，存放到（D121，D120

When M8=ON, the 16bit number in D10(16bit BIN integer) is converted to binary float and then saved to (D121, D120)

当 M10N 时，将 32bit 数(D32,D20)中（32 位 BIN 整）转换为二进制浮点后，存放到（D131， D130

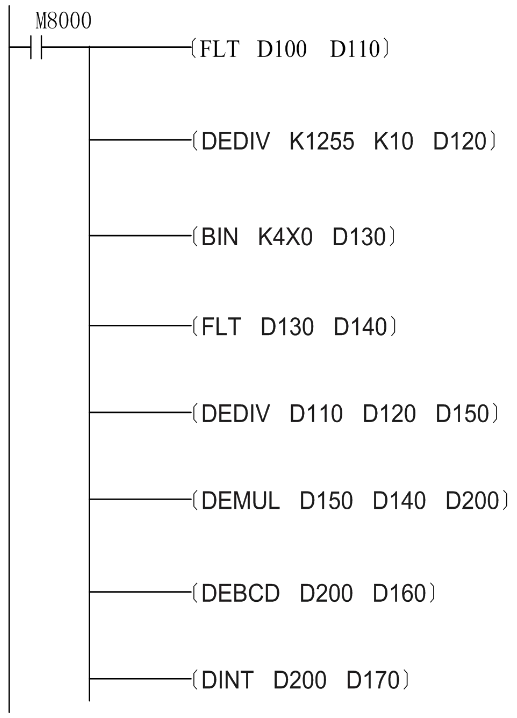
When M10N, the 32bit number in (D32, D30) (32bit BIN integer) is converted to binary float and then saved to (D131, D130)

指令举例二：

Example 2 for instruction:

使用指令来完成下列的浮点运算。

D100/K125.5*(X17~X0)=D200



将D100(内为BIN整数)变换成D111、D110(2进浮点数值)。

将 K1255÷K10 结果存于D121、D120(2 进浮点数值)。

将X17~X0(BCD 值) 变换成D130(16位BIN 整数)。

将D130(内为BIN整数)变换成D141、D140(2 进浮点数值)。

2进浮点数除法(D111、D110)÷(D121、D120)结果存于D151、D150(2 进浮点数值)。

2进浮点数乘法(D151、D150)×(D141、D140)结果存于D201、D200(2 进浮点数值)。

2进浮点数值D201、D200 变换成10 进浮点数值D161、D160。(十进制浮点监视用)

2进浮点数值D2 0 1、D2 0 0 变换成BIN整数D171、D170。(32位BIN整数)

使用指令来完成下列的浮点运算

The instruction is applied to implement float calculation

将 D100（内为 BIN 整数）变换为 D111，D110（2 进浮点数值）。

D100 (the BIN integer) is converted to D111, D110 (binary floating number).

将 K1255÷K10 结果存于 D121、D120（2 进浮点数值）。

The result of K1255÷K10 is save to D121, D120 (binary floating number).

将 X17~X0(BCD 值)变换成 D130（16 位 BIN 整数）。

X17~X0 (BCD) is converted to D130 (16bit BIN integer).

将 D130（内位 BIN 整数）变换成 D141、D140（2 进浮点数值）。

D130 (the BIN integer) is converted to D141, D140 (binary floating number).

2 进浮点数除法（D111、D110）÷（D121、D120）结果存于 D151、D150（2 进浮点数值）。

The binary floating number division result of （D111、D110）÷（D121、D120） is saved to D151, D150 (binary floating number).

2 进浮点数除法（D151、D150）×（D141、D140）结果存于 D201、D2000（2 进浮点数值）。
The binary floating number multiplication result of （D151、D150）× （D141、D140）is saved to D201, D200 (binary floating number).

2 进浮点数值 D201、200 变换成 10 进浮点数值 D161、D160(十进制浮点监视用）
Binary floating number D201, D200 is converted to decimal floating number D161, D160 (which is used for decimal float monitor)
2 进浮点数值 D2　0　1、D2　0　0　 变换成 BIN 整数 D171、D170。（32 位 BIN 整数）
Binary floating number D201, D200 is converted to BIN integer D171, D170. (32bit BIN integer)

4.3.2.6 高速处理（50~59）
6 High-speed processing (50~59)

16bit 16 位	32bit 32 位	P	FNC 50	REF	输入输出端口状态刷新 I/O port state refreshing
✔		✔			
5 步 5 steps		5 步 5 steps	指令格式：REF D Instruction format：REF D n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D	✔	✔													
n	常数，n=8~256，且为 8 的倍数 constant，n=8~256，it must be multiple of 8														

将 地址开始的 个元件状态进行立即更新。
The states of n components started with address are immediately updated.

将 D 地址开始的 n 个元件状态进行立即更新。

The states of n components started with D address are immediately updated.

由于 PLC 访问端口是按字节访问的特性，故要求：

According to the property of the PLC that it accesses the ports by byte, here is some requirements:

D的地址应为 X0、X10、…Y0、Y10、...等最低位为 0 的编号元件；

The address of D shoud be the component that the lowest bit is 0 such as X0、X10、…Y0、Y10 etc.

n的值必须是 8 的倍数（n=8~256）。

The value of n must be multiple of 8

正常情况下，输入端口 X 的状态读取在每次程序开始执行扫描之前进行，输出端口 Y 的状态刷新则在每次程序执行扫描完毕（执行到 END）之后批次进行，这样 IO 处理会有一定的延迟。 若应用中需要最新的输入信息以及希望立即输出运算结果时，可以使用立即刷新指令 REF。

Normally, the reading of the state of I/O is ahead of program scan each time. The refreshing of the state of output Y is batch processing after scanning over the program (to End) each time, so the I/O process has delay. If need the latest input information and hope to output the calculate result immediately, you can use the instruction REF to refresh immediately.

可用在 FOR~NEXT 指令之间、CJ 指令之间等。

It can be used between FOR~NEXT instruction, or between CJ instructions.

可用于中断子程序中进行输入输出刷新一获取最新的输入信息并及时输出运算结果。

It can be used in interrupt sub-routine for I/O refreshing to obtain the latest input information and output the calculation result.

实际的输入端口状态变化延迟决定于输入元件的滤波时间，X0～X7 有数字滤波功能，滤波时间在 0～60ms 范围内可设（FNC51（REFF 指令）），其余 IO 端口为硬件滤波，滤波时间约 10ms。具体参数请参考可编程控制器的用户手册。

The actual state change delay of I/O port depends on the filter time of input component. X0~X7 has digital filter function with the adjustable filter time range of 0~60ms (FNC51(REFF instruction)), and the other I/O port are hardware filter with approximate 10ms filter time. Please refer to the details in the user manual of PLC.

实际的输出端口状态变化延迟决定于输出元件（如继电器）的响应时间。输出刷新中的输出接点将在输出继电器（晶体管）应答时间后动作。继电器输出型的应答滞后时间约为 10ms（最大 20ms），晶体管输出型高速输出口约 10μs、普通点输出口约 0.5ms。具体参数请参考可编程控制器的用户手册。

The actual state change delay of I/O port depends on the response time of output component (such as relay). The output junction in the output refreshing will act after the response time of Output relay(Transistor).The response delay time of output-type relay is approximately 10ms (up to 20ms); the high-speed output of transistor output-type is 10μs, and the common point output is about 0.5ms. Please refer to the details in the user manual of PLC.

指令举例一：

Example 1 for instruction:

```
  X20
 ─┤ ├─（REF  X0  K16）
```

执行上述程序时，若 X20 为 ON 状态，会立即读取 X0~X17 的输入点状态，更新输入信号，没有产生输入延迟。

When the above program is implemented, if X20=ON, the input point state of X0~X17 will be read and the input signal will be updated without input delay.

指令举例二：

Example 2 for instruction:

执行上述程序时，若 X0 为 ON 状态，会立即将 Y0~Y17 的状态进行刷新，输出信号立即更新。不必到 END 指令才输出。

When the above program is implemented, if X0=ON, immediately the state of Y0~Y17 will be refreshed and the output signal will be updated without waiting for END instruction.

16bit 16 位	32bit 32 位	P	FNC 51	REFF	输入滤波调整 Input filter and adjustment
✔		✔			
3 步 3 steps		3 步 3 steps	指令格式：REFF n Instruction format：REFF n		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字　元　件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
n	常数，n=0~60，单位为 ms Constant，n=0~60，Unit:ms														

将 X0~X7 输入端口的滤波时间常数设定为 n。

The filter time constant of X0~X7 input port is set with n.

可编程控制器中，X0~X7 使用了数字滤波器，默认的滤波时间常数由 D8020 设定，通过 REFF 指令可将 D8020 改变为 0~60ms。 其余的 X 端口则只有硬件 RC 滤波，滤波时间常数约为 10ms，不能修改；

The inputs X0~X7 use digital filter in PLC. The default filter time constants is set by D8020. You can change the value of D8020 to 0~60ms by instruction REFF. The other X ports only have RC filter in hardware. The filter time constant is about to 10ms and its modification is forbidden.

当使用了高速计数器，或 X 输入端中断功能，则相关端口的滤波时间自动为最短时间，无关的端口的滤波时间仍为原设定值。

The relative ports' filter time is set to the shortest time automatically when you use the high-speed counter or the interrupting function of the input X.

亦可用 MOV 指令直接对 D8020 进行赋值改变滤波时间。
You can also use MOV to assign a new value to the filter time.

指令举例：
Instruction example:

```
 X10
─┤├─〔REFF  K5 〕
 X10
─┤/├─〔REFF  K15 〕
 X0
─┤├─
 X1
─┤├─

────────〔END 〕
```

X10 为 ON 时，将 X0~X7 的输入滤波时间设为 5ms， X10 为 OFF 时，将 X0~X7 的输入滤波时间设为 15ms；
Setting the input filter time of X0~X7 to 5ms as the state of X10 is ON, Setting the input filter time of X0~X7 to 15ms as the state of X10 is OFF.

<table>
<tr><td>16bit
16 位</td><td>32bit
32 位</td><td>P</td><td rowspan="2">FNC
52</td><td rowspan="2">MTR</td><td rowspan="2">矩阵输入
Matrix input</td></tr>
<tr><td>✔</td><td></td><td>✔</td></tr>
<tr><td>9 步
9 steps</td><td></td><td>9 步
9 steps</td><td colspan="3">指令格式：MTR S D1 D2 n
Instruction format：MTR S D1 D2 n</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enhanced</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>—</td></tr>
</table>

<table>
<tr><td rowspan="2">操作数
Operands</td><td colspan="4">位元件
bit component</td><td colspan="11">字 元 件
Word component</td></tr>
<tr><td>X</td><td>Y</td><td>M</td><td>S</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>KnS</td><td>T</td><td>C</td><td>D</td><td>V</td><td>Z</td></tr>
<tr><td>S</td><td>✔</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>D1</td><td></td><td>✔</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>D2</td><td></td><td>✔</td><td>✔</td><td>✔</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>n</td><td colspan="15">常数，n=2~8</td></tr>
</table>

	Constant, n=2~8

此指令只能用于晶体管输出型 PLC，通过将 8 个 X 端口与若干个 Y 端口组成矩阵输入网络，以扩大输入信号的通道数。 其中：

This instruction is only applicable to the transistor output type PLC. 8 X ports and a number of Y ports are used to form the matrix input network to expand the channel number for the input signals. Where:

S 为矩阵扫描输入的硬件 X 端口的起始地址，要求为 X0、X10…等最低位为 0 的编号元件，占用连续 8 个；

S is the start address of hardware X port for matrix scanning input, which requires the component with 0 in lowest bit, such as X0, X10 and so on, and it constantly occupies eight components;

D1 为矩阵扫描输出的硬件 Y 端口的起始地址，要求为 Y0、Y10…等最低位为 0 的编号元件，占用连续 n 个（n=2~8）；

D1 is the start address of hardware Y port for matrix scanning output, which requires the component with 0 in lowest bit, such as Y0, Y10 and so on, and it constantly occupies n components(n=2~8);

D2 为矩阵扫描读取状态的存放单元的起始地址，要求为 Y0、M0、S0 等最低位为 0 的编号元件；

D2 is the starting address of the storage unit of the reading status of the matrix scan. It should be a numbered component with a lowest bit of 0 like Y0, Y10, etc.

为矩阵扫描的列数，即扫描用 Y 输出的个数。本指令的条件接点一般都使用常 On 接点 M8000.

n is the number of the columns of the matrix scan, the number of the Y outputs used by the scan. Typically, the normally ON contact M8000 is used as the condition contact for this instruction.

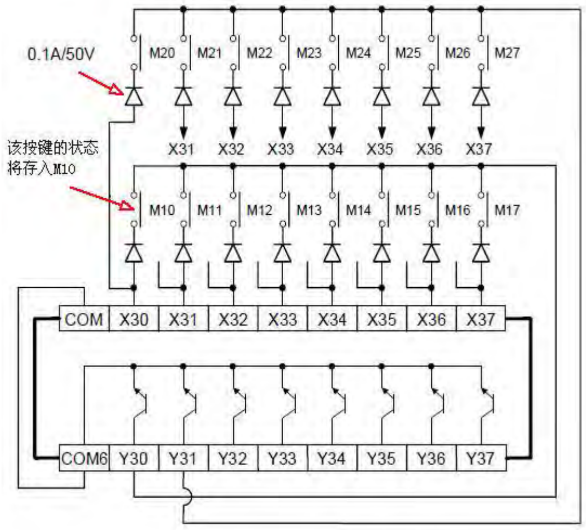
指令举例：

Instruction example:

```
 M8000
─┤├─〔MTR  X30  Y30  M10  K2〕
```

适用如下接线：

The following wiring is applicable:



改按键的状态将存入 M10
The state of changing press key is saved to M10

考虑到 X 输入滤波应答延迟 10ms，Y30、Y31 输出按每 20ms 顺序中断，进行即时输入输出处理；
Considering a response delay of 10ms for the X input filtering. The Y30 and Y31 outputs will be sequentially interrupted for each 20ms to perform the instant input/output process.

每次自动读取操作完成后，标志 M8029 置 ON；
Every time the automatic read operation is accomplished, the flag M8029 is set to ON;
若通过 8 点 X 输入和 8 点晶体管 Y 输出，可获得最大 64 点的扫描输入，但是此时所有输入的读取需要 20ms×8 列＝160ms 时间，不适应高速输入操作，故一般使用 X20 以后的端口作扫描输入；
The max 64 points scanning input could be achieved by eight X input and eight transistor Y output, at that time reading all the input needs: 20ms×8coloum=160ms, which is not avaialble for high-speed input operation. So, normally the ports after X20 are applied for scanning input;
该指令在程序中只能使用一次。
This instruction is allowed to be used only once in the program.

16位 16bit	32位 32bit	P	FNC	HSCS	比较置位（高速计数器） Comparative Reset (High-speed counter)
	✔				
	13步 13steps		指令格式：HSCS S1 S2 D Instruction format：HSCS S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操 作数 Oper ands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	Kn S	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2												✔			
D		✔	✔	✔											

当S2计数器的当前值等于设定值S1时，立即置位D。

When the current value of S2 counter is equal to pre-setting value S1, D is set immediately. 其中：Where

S1为设定的比较值，为 32bit；

S1 is pre-setting comparison value (32bit);

S2变量必须为高速计数器 C235~C255，因涉及的计数器均为 32bit 计数器，故必须采用 32bit 指令 DHSCS；

The variables should be high-speed counter C235~C255, and the involved counters should be 32bit counter, so 32bit construction DHSCS should be applied.

D为比较结果的存放单元，也可以是调用计数中断子程序：当为 Y0~Y17 范围端口时，为立即输出；当为 Y20 以后的端口时，会等到本次用户程序扫描完毕才会输出；当为 M、S 变量时，也为立即刷新；

D is the storage unit for comparison result, or calling count subroutine. When it is within the port range of Y0~Y17, it is immediately outputted; when it is the port after Y20, it will be outputted after the current user program scanning is accompolished; when it is M, S variables, it should be also refreshed immediately;

当D项为 I010～I060 时，即为调用高速计数器中断 0~5 的子程序。 当然必需编写好相应的中断子程序、开启相应中断允许标志和全局中断允许标志等，才能正常响应定时器中断。M8059 置 ON 则禁止了所有的高速计数器中断（I010-I060）。

When D is I010～I060, it is calling subrountine of high-speed counter interrupt 0～5. It is certain that the corresponding interrupting subprogram, the initiation of relevant interrupting permissible signal, and the overall interrupting permissible signal must be properly programmed in order to intercept the counter when necessary. M8059 that is positioned as ON prohibits all intercepting procedures over high-speed counters.

一般指令 Y 输出与 DHSCS 指令 Y 输出的差异：以（指令举例一）为例

Differences between Y outputs under general and DHSCS instructions: for instance,

1） 当 C255 的现在值由 99→100 变化时，C255 接点立即导通，但执行到 OUT　Y10 时，Y10 仍会受扫描周期影响，在 END 后才输出。

1) When the current value of C255 changes from 99 to100, C255 contact is powered. But when OUT Y10 is implemented, Y10 is also effected by scanning circle, which will be outputted after END instruction.

2） 当 C255 的现在值由 99→100 及 101→100 变化时，DHSCS 指令输出 Y10 是以中断方式立即输出到外部输出端，与 PLC 扫描周期无关。但仍会受输出模块继电器(10ms)或晶体管(10us)的输出延迟。

2) When the current value of C255 changes from 99 to 100 or from 101 to 100, DHSCS instruction output is immediately outputted to external output terminal with interrupt method, which has nothing to do with PLC scanning circle. However, the output will still be delayed due to the influences of the output module relay or transistor outputs.

使用说明：

Instruction for use:

● 使用 HSCS 指令时，应保证所使用的计数器已被启用（见指令举例一），否则该计数器的值将不会有变化；

When using the HSCS instruction please ensure the counters have already been activated (see instruction example 1). Otherwise the counter’s value will not change.

● 计数器是以中断方式响应计数器的输入信号，及时比较，若本次比较时满足匹配关系，比较输出立即置位。例如指令举例一中，若 C255 的当前值变为 99→100 或 101→100 时，Y10 立即置位，且一直保持该状态，之后即使 C255 与 K100 的比较结果变成不相等，Y10 仍然保持 On 状态，除非有另外的复位指令操作；

The counter uses an interceptive method to influence the counter’s input signals and perform real-time comparison. Should the comparison satisfies the matching relation, comparison output will be reset immediately.For example: in instruction I, if the current value of C255 changes form 99 to 100 or from 101 to 100, Y10 will be immediately set and hold the state. Even if the comparison result of C255 and K100 is not consistent, Y10 still holds ON state unless there are additional reset instruction operations.

● 指令的比较输出只决定于脉冲输入时的比较结果动作，即使采用 DMOV、DADD 等指令改写高速计数器 C235~C255 的内容，若没有脉冲输入，比较输出也不会变化；单纯的指令驱动能流也不能改变比较结果；

System instruction’s comparison output is determined based on the pulse input comparison result. If there was no pulse input, even if editing instructions such as DMOV or DADD is used to edit the contents in the high-speed counter C235~C255, comparison output will still bring no difference.● 指令输出若为 Y 端口，必须为 Y0~Y17 范围，这样才能保证输出得到立即响应；多次驱动 HSCS 指令或与 HSCR、HSZ 指令同时驱动，对象输出 Y 的高 2 位作为同一序号的软元件。例：使用 Y000 时为 Y000~Y007，Y010 时为 Y010~Y017 等；

Also, using any instruction to initiate power flow will not be able to change the result as well.For example: when using Y000, it is Y000~Y007; when using Y010, it is Y010~Y017, and so on;

● 当 HSCS 指令的输出目标为中断 I010～I060 时，每个中断号只能使用 1 次，不可重复。

When the HSCS instruction's output target is to interrupt I010~I060, every interrupting signal can only be used once and cannot be repeated.

● HSCS、HSCR、HSZ 与普通指令一样可以多次使用，但这些指令同时驱动的个数限制在总计 6 个指令以下。

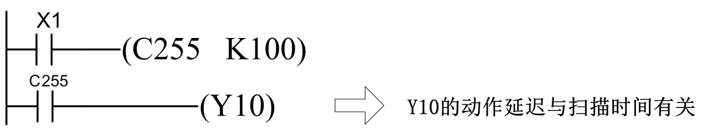
Like other general instructions, HSCS, HSCR, and HSZ instructions can be used multiple times. However, six is the limit number to execute these instructions simultaneously.

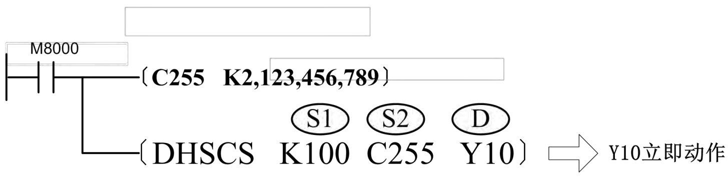
高速计数中断指针与设置：Interrupt point of high-speed count and setting:

输入编号 Input number	中断禁止指令 Interrupt inhibit instruction
I010	M8059
I020	
I030	
I040	
I050	
I060	

指令举例一：

Example 1 for instruction:





Y10 的动作延迟与扫描时间有关

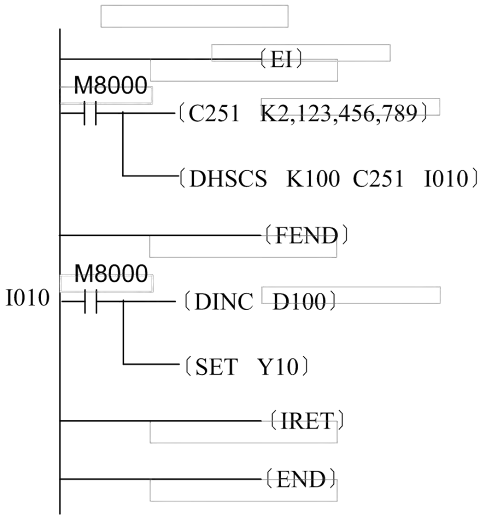
The operation delay of Y10 depends on scanning time

Y10 立即动作

Y10 immediately performs action

指令举例二：

Example 2 for instruction:



DHSCS指令的D操作数范围也可指定I0□0，□=1~6，作为计数器计数到达时，发生中断，执行该中断服务程序。
如果M8059置ON则禁止了所有的高速计数器中断。
注意此时的D装置用I010和Y、M、S输出点的ON信号区别：
1、用Y输出点:若C251的当前值变为99→100或101 →100时，Y立即置ON，且一直保持ON状态，之后即使C251与K100的比较结果变成不相等，Y仍然保持On 状态,除非有另外的复位指令操作；
2、用I010:若C251的当前值变为99→100或101 →100时，I010只会产生一次中断，不会常ON。

DHSCS 指令的 D 操作数范围也可指定I0□ 0□ □ =1~6□ 作为计数器计数到达时 发生中断 执行该中断服务程序

D operand range of DHSCS instruction can also specify I0□ 0□ □ =1~6□ as counter. When counter reaches preset value, the interrupt subrountine will be implemented.

如果 M8059 置 ON 则禁止了所有的告诉计数器中断。

If M8059 is set with ON, all the counter interrupt will be forbidden.

注意此时的 D 装置用 I101 的 Y、M、S 输出点的 ON 信号区别：

Note that Y,M,S output points ON signals of I101 are used by D device:

用 Y 输出点：若 C251 的当前值变为 99→100 或 101→100 时，Y 立即置 ON，且一直保持 ON 状态，之后即使 C251 与 K100 的比较结果变成不相等，Y 仍然保持 ON 状态，除非有另外的抚慰指令操作；

Using Y output point: if the current value of C251 changes form 99 to 100 or from 101 to 100, Y will be immediately set with ON and hold the ON state. Even if the comparison result of C251 and K100 is not consistent, Y still holds ON state unless there are additional reset instruction operations;

用 I010:若 C251 的当前值变为 99→100 或 101→100 时，I010 时，I010 只会产生一次中断，不会常 ON。

Using I010: if the current value of C251 changes from 99 to 100 or form 101 to 100, I010 can only have one interrupt, which will not hold ON state.

16	32	P	FNC	HSCR	比较复位（高速计

位 16bit	位 32bit		54		数器） Comparative Reset (High-speed counter)
	✔				
	13步 13steps 13steps		指令格式：HSCR S1 S2 D Instruction format：HSCR S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2												✔			
D2		✔	✔	✔											

当S2计数器的当前值等于设定值S1时，立即复位D。其中：Where:

S1为设定的比较值，为32bit；

S1 is pre-setting comparison value (32bit);

When the current value of S2 counter is equal to pre-setting value S1, D is reset immediately.

S2变量必须为高速计数器C235~C255，因涉及的计数器均为32bit计数器，故必须采用32bit指令DHSCR；

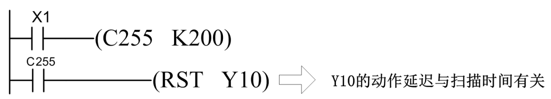
The variables should be high-speed counter C235~C255, and the involved counters should be 32bit counter, so 32bit construction DHSCR should be applied.

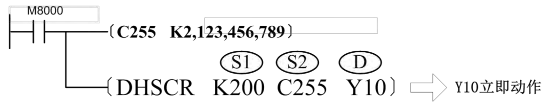
D为比较结果的存放单元：当为Y0~Y17范围端口时，为立即输出；当为Y20以后的端口时，会等到本次用户程序扫描完毕才会输出；当为M、S变量时，也为立即刷新。

D is the storage unit for comparison result. When it is within the port range of Y0~Y17, it is immediately outputted; when it is the port after Y20, it will be outputted after the current user program scanning is accomplished; when it is M, S variables, it should be also refreshed immediately;

指令举例：

Instruction example:





Y10 的动作延迟与扫描时间有关
The operation delay of Y10 depends on scanning time

Y10 立即动作
Y10 immediately performs action

指令使用说明：
Instruction Instruction:

HSCR 指令的动作原理和 HSCS 指令相似，只是 HSCR 的比较输出动作与 HSCS 指令刚好相反，即计数器的值达到相等时，指定的输出复位，因此使用中的一些规定可参考 HSCS 的说明。
The operating principle of HSCR instruction is similar to that of HSCS instruction. The only difference is that the comparison exporting operation of HSCR is opposite of the HSCS instruction, which means that assigned export reset will only initiate after the counter has reached the same value with the designated value. Please refer to the instruction in the HSCS section.

16 位 16bit	32 位 32bit	P	FNC 55	HSZ	高速计数器（区间比较）High-speed counter (interval comparison)
	✔				
	17 步 17 steps		指令格式：HSZ S1 S2 S D Instruction format：HSZ S1 S2 S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z

S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S												✔			
D		✔	✔	✔											

根据计数器S的当前值，与设定的比较区间S1和S2进行比较，将比较结果立即输出到以D地址起始的 3 个单元中。

The current value of counter S is compared with pre-set comparison interval S1 and S2 , and the comparison result is saved to three units started with address D . 其中：Where:

S1为设定的比较区间区间下限，其值的宽度（bit 位数）决定于S计数器的位数，其值必须不大于S2，即S1≤S2；

S1is the lower limit of the pre-set comparison interval, and the value length (number of bits) depends on the bits of S counter, whose value should be no more than S2, e.g.S1≤S2；

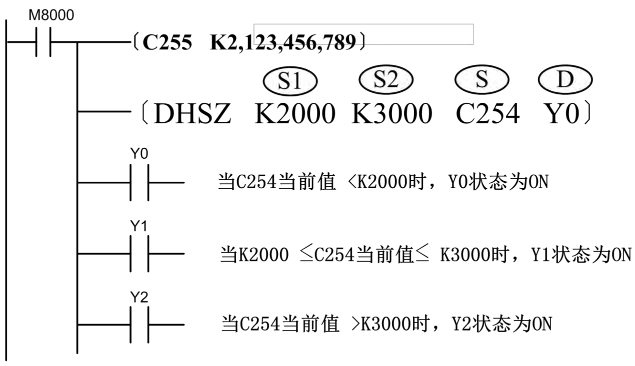
S2为设定的比较区间区间上限，其值的宽度（bit 位数）决定于S计数器的位数，其值必须不小于S1，即S1≤S2；

S2is the upper limit of the pre-set comparison interval, and the value length (number of bits) depends on the bits of S counter, whose value should be no less than S1, e.g.S1≤S2；

S变量必须为高速计数器 C235~C255，因涉及的计数器均为 32bit 计数器，故必须采用 32bit 指令 DHSZ；
The variables should be high-speed counter C235~C255, and the involved counters should be 32bit counter, so 32bit construction DHSZ should be applied.

D为比较结果的存放单元，占用以D起始的 3 个连续地址的单元：当为 Y0~Y17 范围端口时，为立即输出；当为 Y20 以后的端口时，会等到本次用户程序扫描完毕才会输出；当为 M、S 变量时，也为立即刷新。

D is the storage unit for comparison result, which occupies three continuous units started with D . When it is within the port range of Y0~Y17, it is immediately outputted; when it is the port after Y20, it will be outputted after the current user program scanning is accomplished; when it is M, S variables, it should be also refreshed immediately;
指令举例：
Instruction example:



当 C254 当前值＜K2000 时，YO 状态为 ON
When the current value of C254 ＜K2000，YO state is ON.

当 C2000 当前值≤C254 当前值≤K3000 时，Y1 状态为 ON
When the current value of C2000≤the current value of C254≤K3000, Y1 state is ON.

当 C254 当前值＞K3000 时，Y2 状态为 ON
When the current value of C254 >K3000，Y2state is ON.

使用说明：
Instruction for use:

本指令的动作原理和 HSCS、HSCR 等指令相似，差别是采用了两个比较值，比较输出使用了 3 个连续的地址单元，因此使用中的一些规定可参考 HSCR 的使用说明；
The operation theory of the instruction is similar with that of instruction HSCS, HSCR, and the difference is that two comparison values are applied, in which three continuous address units are used to compare output. So, working instruction of HSCR could be referenced;
HSZ 指令也是以中断方式进行工作的，只有当计数器对应的输入端有计数脉冲时，比较才会进行，对应的输出才会被刷新；
HSZ instruction can also work in interrupt mode. Only when there are count pulses in output port corresponding to counter, the comparison will be implemented and the corresponding output will be refreshed;
表格高速比较模式
High-speed table comparison mode

将指令〔DHSZ S1 S2 S D〕中的 D 指定为特殊辅助继电器 M8130，即表明为高速表格比较模式，指令中的各变量将按表格方式进行解析，说明如下：

If D, which is in instruction (DHSZ S1 S2 S D), is specified as special auxiliary relay M8130, it is in high-speed table comparison mode and every variable in instruction will be analysed in table mode, which is described as following;

S1 只对应数据寄存器 D 变量，用于表示比较表格的起始地址。

S1 can only be specified as data register D variable, which is used to save starting address of comparison table.可用带 V 或 Z，指令启动后不再受 V 或 Z 的影响；

It can be used with V or Z, and it will not be affected by V or Z after instruction is implemented;

S2 只可用常数变量 K、H，用于表示表格的行数，被限制为 1≤(K，H)≤128，可用带 V 或 Z，指令启动后不再受 V 或 Z 的影响；

Only constant variables K, H can be used to save table line number, which is specified in the range: 1≤(K，H)≤128. It can be used with V or Z, and it will not be affected by V or Z after instruction is implemented;

S 可以指定为高速计数器 C235~C255；

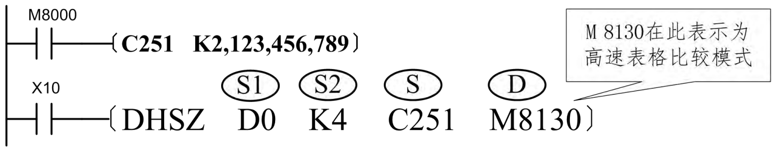
S can be specified as high-speed counter C235~C255;

D 为 M8130，指明为高速表格比较模式。

D is M8130, which indicates the high-speed table comparison mode.

例如：

For example:



M8130 在此表示为告诉表格比较模式

Here, M8130 indicates high-speed table comparison mode

等效的比较表格为：

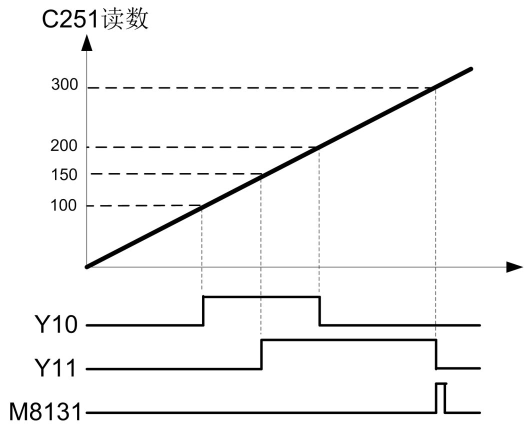
The equivalent comparison table is:

<table>
<tr><td rowspan="2">S1 表格起始变量为 D0
S1 table starting variable is D0</td><td colspan="2">比较值（32bit）
Comparison (32bit)</td><td rowspan="2">Y 输出
Y output
编号
number</td><td rowspan="2">ON/OFF
ON/OFF
状态
Status</td><td rowspan="2">表格计数器
Table counter
D8130</td></tr>
<tr><td>低字
Lower byte</td><td>高字
Upper byte</td></tr>
<tr><td rowspan="4">S2 表格行数 为 K4
S2 table line number</td><td>D0</td><td>D1</td><td>D2</td><td>D3</td><td>0</td></tr>
<tr><td>D4</td><td>D5</td><td>D6</td><td>D7</td><td>1</td></tr>
<tr><td>D8</td><td>D9</td><td>D10</td><td>D11</td><td>2</td></tr>
<tr><td>D12</td><td>D13</td><td>D14</td><td>D15</td><td>3</td></tr>
</table>

表格起始变量为 D0 table starting variable is D0	比较值（32bit）Comparison (32bit)		Y 输出 Y output 编号 number	ON/OFF ON/OFF 状态 Status	表格计数器 Table counter D8130
	低字 Lower byte	高字 Upper byte			
is K4					
参数举例 Parameter example	K100	K0	H10	K1	执行时计数器 0→1→2→3→0 依次循环 During implementation, the counter circulates in 0→1→2→3→0 order
	K150	K0	H11	K1	
	K200	K0	H10	K0	
	K300	K0	H11	K0	
说明 Instruction	在接收到第 1000 个脉冲时有动作 It operates when 1000 pulses are received (表格中各行比较值应依次增大) (The comparison value in table's each line should increase in order)		Y10 端口动作（若为 H11 则表示 Y10) Y10 port operates (H11 indicates Y10)	动作是置为ON(若为 K0 则表示 OFF 动作) Operation is set with ON (K0 indicates OFF)	

执行过程说明：

The explanation of the implementation:



C251 读数

C251 reading number

当Ⓢ所指定的高速计数器 C251 的当前值等于（D1、D0）设定值的時候 D2 所指定的输出 Y 被复制成 OFF（D3=K0）或是 ON（D3=K1）并保持住。而输出 Y 的动作完全以中断方式来处理。

When the current value of high-speed counter C251 specified by Ⓢ equals to pre-set

value (D1,D0), the output Y specified by D2 is set with OFF (D3=K0) or ON (D3=K1) and will be held. The operation of output Y will be implemented in interrupt mode.
当 C251 的当前值与表格的第一组设定值相等时，D8130=K1、与第一组设定值相等时，D8130=K2，如此的往下顺序执行比较操作，直到最后一组比较动作完成时，M8131=ON 一个扫描周期，之后 D8130 清除为 0，再返回到第一组进行比较。
When the current value of C251 equals to first setting value group in table, D8130=K1; when the first setting value group equals, D8130=K2. The comparison is implemented in order, until the last group is compared and M8131=ON. After one scanning period, D8130 is cleared with 0, and then returning to the first group to implement comparison.
当指令的条件接点 X10 变成 OFF 时，指令执行被中断，表格计数器 D8130 被清 0，但指令相关的输出状态全部被保持。
When instruction conditional point X10 is OFF, the instruction implementation is interrupted and table counter D8130 is cleared with 0, but the instruction output state will all be held.
本指令在被第一次扫描执行，直到 END 指令后，比较表格的各项设置即确定下来，因此表格中的各参数设置需在本指令之前设置完成。
After this instruction is implemented in first scanning period until END instruction, each setting in comparison table will be confirmed. So, all the parameter settings should be set before this instruction.
表格比较指令在用户程序中只能使用一次。
The table comparison instruction will be only used for one time in user program,此外，与其他用途使用的 HSCS/HSCR/HSZ 指令结合，可以同时驱动的指令被限制在 6 点以下。
Furthermore, it can be combined with HSCS/HSCR/HSZ instructions, which have other functions, and the synchronous driven instructions are limited under six points.
由指令 HSZ 和 PLSY 指令实现频率控制模式
The frequency control mode could be implemented by HSZ and PLSY instruction.
将指令〔DHSZ S1 S2 S D〕中的 D 指定为频率控制模式说明用特殊辅助继电器 M8132，通过与 DPLSY 指令的组合，可实现一个高速计数器的当前值控制 DPLSY 输出频率的功能。
D, which is in instruction DHSZ S1 S2 S D, is specified as special auxiliary realy M8130 in frequency control mode, and it can combine with DPLSY instruction to control DPLSY output frequency with the current value of a high-speed counter.
说明如下：
The explanation is as following:
S1 只对应数据寄存器 D 变量，用于表示比较表格的起始地址。可用带 V 或 Z，指令启动后不再受 V 或 Z 的影响；
S1 can only be specified as data register D variable, which is used to save starting address of comparison table. It can be used with V or Z, and it will not be affected by V or Z after instruction is implemented;
S2 只可用常数变量 K、H，用于表示表格的行数，被限制为 1≤(K，H)≤128，可用带 V 或 Z，指令启动后不再受 V 或 Z 的影响；
Only constant variables K, H can be used to save table line number, which is specified in the range: 1≤(K，H)≤128. It can be used with V or Z, and it will not be affected by V or Z after instruction is implemented;

S可以指定为高速计数器 C235~C255；

S can be specified as high-speed counter C235~C255;

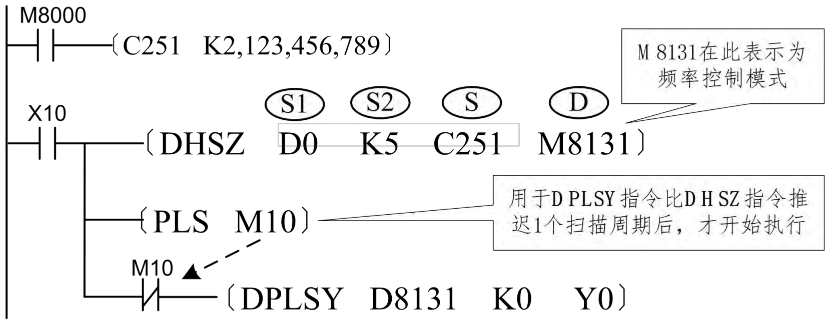
D为 M8132，指明为根据高速计数值 HSZ 指令来控制 PLSY 输出频率模式。

D M8132 is used to control PLSY output frequency mode based on high-speed count value HSZ instruction.

本指令在用户程序中只能使用一次；表格中的各个寄存器值需事先设定好；

This instruction can only be used for one times in user program; every register value in table should be set in advance;

例如：Where



M8131 在此表示为频率控制模式

Here, M8131 indicates frequency control mode

用于 DPLSY 指令比 DHSZ 指令推迟 1 个扫描后，才开始执行

DPLSY instruction is implemented after DHSZ instruction for one scanning period

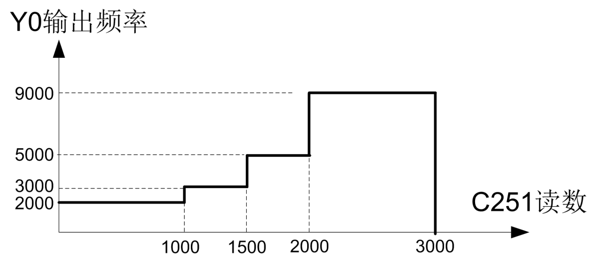
表示根据 C251 的当前频率，控制 Y0 输出频率的工作模式，等效的比较与输出频率表格为：

According to the current frequency of C251 and the working mode of controlling Y0 output frequency, the equivalent comparison and output frequency table is:

S1表格起始变量为 D0 The starting variable of S1 table is D0	Comparison (32bit)		输出频率（32bit）Output frequency (32bit)		表格计数器 Table counter D8131
	低字 Lower byte	高字 Upper byte	低字 Lower byte	高字 Upper byte	
S2表格行数为 K5 S2 table line number is K5	D0	D1	D2	D3	0
	D4	D5	D6	D7	1
	D8	D9	D10	D11	2
	D12	D13	D14	D15	3
	D16	D17	D18	D19	4
参数举例	K1000	K0	K2000	K0	执行时计

<table>
<tr><td rowspan="4">Parameter example</td><td>K1500</td><td>K0</td><td>K3000</td><td>K0</td><td rowspan="5">数 器 0→1→2→3→4→0 依次循环
During implementation, the counter circulates in 0→1→2→3→4→0 order</td></tr>
<tr><td>K2000</td><td>K0</td><td>K5000</td><td>K0</td></tr>
<tr><td>K3000</td><td>K0</td><td>K9000</td><td>K0</td></tr>
<tr><td>K0</td><td>K0</td><td>K0</td><td>K0</td></tr>
<tr><td>说明
Instruction</td><td colspan="2">接收脉冲后进行比较，（如第 1000 个脉冲）匹配时改变输出频率。
If received pulses reach preset value (such as 1000), the output frequency will be changed.
(表格中各行比较值应依次增大，最后一行可设为 0。
(The comparison value in table’s each line should increase in order, and the last line could be set with 0.))</td><td colspan="2">Y0 端口的输出频率改变为对应表格栏的设定值
The output frequency of Y0 port is set with the pre-set value in corresponding table column.</td></tr>
</table>

执行过程说明：
The explanation of the implementation:



Y0 输出频率
Y0 output frequency

C251 读数
C251 reading number

预先将所定的数据写入构成表格的数据寄存器，并有指令启动S指定的高速计数器 C251，运行中请勿改变表格内容的设置；
The data should be written to data register in advance, which constructs table, and the high-speed counter C251 is specified by instruction S. Please do not change setting of table content during operation.
当 C251 的当前值小于(D1，D0)时，PLSY 指令的输出频率为（D3，D2）的值；
When the current value of C251 is less than (D1,D0), the output frequency of PLSY instruction is (D3,D2).

当 C251 的当前值等于(D1，D0)时，PLSY 指令的输出频率变为（D7，D6）的值；当 C251 的当前值等于(D5，D4)时，PLSY 指令的输出频率变为（D11，D10）的值；依此类推；

When the current value of C251 equals to (D1,D0), the output frequency of PLSY instruction is (D7,D6); When the current value of C251 is less than (D5,D4), the output frequency of PLSY instruction is (D11,D10), and so on;

最后一行的操作完毕，完成标志 M8133 动作。

After the last line is implemented, the accomplished flag M8133 is set.并回到第一行重复运作；

Returning to first line and repeating the operation;

若希望在最后一行停止动作时，将最后的表格的频率置为 K0；

If you want to stop operation at last line, please set the frequency in last table to K0;

驱动输入 X010 为 OFF 时，脉冲输出变成 OFF，表格计数 D8131 也复位；

When driver input X010 is OFF, the pulse output is OFF and table count D8131 is also reset;

该项指令在初次指令执行后的 END 指令完成表格制作，其后开始有效。

The table is made by this instruction after the instruction is implemented and the END instruction, and then the table is valid.因此，为了使 PLSY 指令，从驱动输入 X10 为 ON 后的第 2 个扫描周期开始动作，采用〔PLS　MI0〕的触点。

Therefore, to use PLSY instruction, in the second scanning period after driver output X10 is set to ON, the contact of PLS M10 should be applied.

注意事项：

Note:

采用频率控制模式时，编程中使用其他的 PLSY 指令以及 PLSR 指令，无法同时得到 2 路脉冲输出。

When in frequency control mode, the instructions other than PLSY and PLSR in programming cannot get two pulse outputs.

16bit 16 位	32bit 32 位	P	FNC 56	SPD	脉冲密度，转速，线速度 Pulse density, rotation speed, linear speed
✔					
7 步 7steps			指令格式：SPD S1 S2 D Instruction format:SPD S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	✔

操作数 Operand	位元件 Bit component				字元件　Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z

S1	✔														
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D											✔	✔	✔	✔	✔

将 S1 指定端口在 S2 时间内检测到的脉冲数，保存到 D 地址单元。

The pulse number, which is detected in S2 time and the port specified by S1, is saved to D address unit.

其中 D 占用 3 个连续的单元，D+1 为实时脉冲计数值；D+2 为完成本次采样周期的剩余时间。

Where, D occupies three continous units, D+1 is the real-time pulse number; D+2 is the remainder time of this sampling period.

S1 脉冲信号输入端口，只能为 X0~X5；

S1 The input ports of pulse signal should be X0~X5;

S2 为设定的脉冲检测时间长度（ms)；

S2 is the pre-set pulse detecting time (ms);

D 为设定时间长度 S2 内接收的脉冲个数；

D is the pulse number received in pre-set time S2;

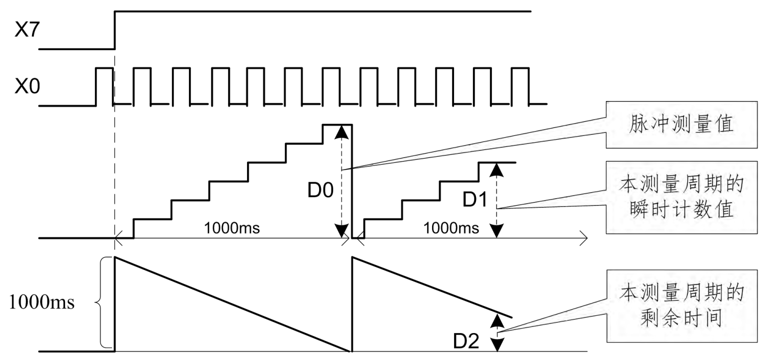
被用于 SPD 指令的 X0~X5 端口，可同时用于高速计数器或者中断输入中。

It could be used for X0~X5 port of SPD instructions, and high-speed counter or interrupt input.

指令举例一：

Example 1 for instruction:

```
         S1    S2     D
 X7
─┤├─[SPD  X0   K1000  D0 ]
```



脉冲测量值

Detected pulse number

本测量周期的瞬时计数值

The instantaneous count number in this measurement peorid

本测量周期的剩余时间

The remainder time in this measurement peorid

在图例中，X7 置 ON 时，D1 对 X0 的 OFF→ON 动作计数，1000ms 后将其结果存入 D0，随之 D1 复位，再次对 X000 的动作计数。

In the legend, when X7 is set to ON, D1 counts for the operation of X0 from OFF to ON; after 1000ms, the counting result is saved to D0, and then D1 is reset and the operation of X000 is counted again.

D2 用于测定剩余时间。

D2 is used for detecting remainder time).

因此根据 D0、S2 的设定值就可以求得脉冲的频率；若脉冲信号取自旋转编码器，可求得转速等；

Therefore, the pulse frequency could be obtained by pre-set value of D0 and S2; if the pulse signal comes from autogiration encoder, the rotation speed could be calculated;

SPD 指令指定脉冲输入端口的 ON/OFF 的最大频率与其 1 相高速计数器的频率限制相同。

The max frequency of pulse input port specified by SPD instruction is same as the frequency limitation of one-phase high speed counter.

注意：（XP 型不具备 SPD 指令的功能）

Note: (XP model does not have the function of SPD instruction)

在新版本的 H2U 系列 PLC 中，SPD 命令功能有增强，通过置位[M8100~M8105]标志，可改变计数功能，M8100~M8105 标志分别对应 X000~X005 高速端。(M8100~M8105 标志可分别置位，即 X0~X5 端口的 SPD 指令功能可分别处理。

In the new version of H2U series PLC, SPD instruction function has been enhanced. By setting [M8100~M8105] flag, which are corresponding to X000~X005 high-speed ports, the counter function could be changed. (M8100~M8105 flags could be separately set, e.g. SPD instruction function in X0~X5 ports could be separately dealt with.)

一.：如果功能使能标志为[M8100~M8105]OFF，SPD 指令如前面介绍的

A.：If function enable flag [M8100~M8105] is OFF， SPD instruction funtion has been intruduced above

S1 脉冲信号输入端口，只能为 X0~X5；

S1 The input ports of pulse signal should be X0~X5;

S2 为设定的脉冲检测时间长度(ms)1~32767；

S2 The time of detecting pulse is 1~32767(ms);

D +0：为在 S2 时间内的脉冲个数，为 16 位的数据；

D +0: the pulse number in S2 time is a 16bit data;

D +1 为实时脉冲计数值。

D +1 is the real-time pulse number.

D +2 为完成本次采样周期的剩余时间。

D +2 is the remainder time of this sampling peorid.

指令举例二：

D10 为设定时间长度 1000ms 内接收的脉冲个数；D11 为实时脉冲计数值；D12 为完成本次采样周期的剩余时间。
D10 is the pulse number in pre set time(1000ms); D11 is the real-time pulse number; D12 is the remainder time in this sampling peorid.

二：如果功能使能标志 M8100~M8105 为 ON，指令的新功能定义如下：
B: If function enable flag M8100~M8105 is set to ON, the new instruction function is defined as following:

S1 S1：脉冲信号输入端口，只能为 X0~X5；

S1: pulse signal input port, which should be X0~X5;

S2 S2：为设定的脉冲检测时间长度(ms)1~32767；

S2: the pre-set time of detecting pulse,1~32767(ms);

D +0：为在 S2 时间内的脉冲个数，为 16 位的数据；

D+0: the pulse number in S2 time is a 16bit data;

D+1，D+2：为每分钟内的脉冲个数，为 32 位的数据；

D+1，D+2 is the pulse number in each minutes, which is 32bit data.

指令举例三：

Example 3 for instruction:

```
M8002
─┤├──────〔SET   M8100 〕

               S1      S2       D
X7
─┤├──────〔SPD   X0    K1000    D10 〕
```

D10 为设定时间长度 1000ms 内接收的脉冲个数；D11，D12 为运行频率=1 分钟脉冲个数 *10(0.1 为单位).

D10 is the pulse number received in preset time (1000ms); D11, D12 is the pulse number * 10 (the unit is 0.10 in the operation frequency =1 min.

16bit 16 位	32bit 32 位	P	FNC 57	PLSY	脉冲输出 pulse output
✔	✔				
7 步 7steps	13 步 13steps		指令格式：PLSY S1 S2 D Instruction format：PLSY S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	✔

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔													

由于继电器不适合高频率动作，只有晶体管输出型 PLC 才适合使用该指令。指令功能是由 D 指定的端口，以 S1 的频率，输出 S2 个脉冲，脉冲发送完毕，M8029 标志被置位。

其中：
Since relays are not suitable for high frequency actions, only the transistor output type PLC is suitable to use the present instruction.It is to output S2 pulses in S1 frequency via the port specified by D. After pulses is sent, M8029 flag is set.。 where:

D为脉冲输出端口，H1U 机型可以指定 Y0/Y1/Y2；H2U 机型中 3624MT/2416MT 型只能指定 Y0 或 Y1，其他 MT 型可以指定 Y0/Y1/Y2，而 MTQ 型则可指定 Y0/Y1/Y2/Y3/Y4；

D is pulse output port. Y0/Y1/Y2 could be specified for H1U model; Y0 or Y1 could only be specified for 3624MT/2416MT model in H2U mode; Y0/Y1/Y2 could be specified for other MT model, and Y0/Y1/Y2/Y3/Y4 could be specified for MTQ model.

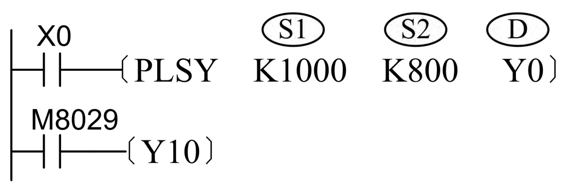
S1为设定的输出脉冲频率，对于 16bit 指令（PLSY），设定范围为 1~32，767；对于 32bit 指令（DPLSY），设定范围为 1~100，000（即 1Hz～100kHz）；在指令执行中可以改变S1的值；

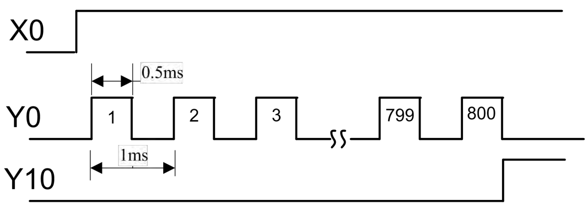
S1 is the pre-set output pulse frequency, and the setting range is 1~32,767 (16bit instruction PLSY), 1~100,000 (1Hz~100kHz) (32bit instruction DPLSY). The S1 value can be changed during instruction is implemented;

S2为设定的脉冲输出个数，对于 16bit 指令（PLSY），设定范围为 1~32，767；对于 32bit 指令（DPLSY），设定范围为 1~2，147，483，647；当S2等于零时为发送不间断的无限个脉冲。

S2 is the pre-set output pulse number, and the setting range is 1~32,767 (16bit instruction PLSY), 1~2,147,483,647(32bit instruction DPLSY); when S2 =0, infinite pulses will be sent without gap.

指令举例：
Instruction example:





使用 PLSY(16bit 指令)时，S1 和 S2 都只能是 16bit 宽度；

When using PLSY(16bit instruction), S1 and S2 are with 16bit width;

使用 DPLSY(32bit 指令)时，S1 和 S2 若为 D、C、T 变量，则按 32bit 宽度处理；

When using DPLSY (32bit instruction), if S1 and S2 are D, C, T variables, they are with 32bit width;

当执行到 PLSY 指令后，Y 即开始输出脉冲；运行中若改变 S2 元件（为 D、C、T 变量）的参数值，对当前输出的脉冲数没有影响，将从下一次启动该指令时生效；（新版本的 H2U 系列 PLC 中，可以在运行中改变输出脉冲数，具体请参考附录 5.8 说明）

When PLSY instruction is implemented, Y begins to output pulse; If the parameter value of component is changed in operation, the current outputed pulse number will not be effected and the changed parameters effects when the instruction is implemented next time; (In new version H2U series PLC, the output pulse number could be changed in operation. For more information, refer to appendix 5.8)

在 PLSY 输出脉冲过程中，若指令能流 X0 变为 OFF，则输出脉冲被停止；若 X0 变为 ON，PLSY 指令将以当前的参数重新开始脉冲输出。

In the procedure of PLSY output pulse, if X0 can be set to OFF by the instruction, the output pulse will be stopped; if X0 can be set to ON, PLSY instruction will resume the pulse output from the current parameter.

使用说明：

Instruction for use:

PLSY 所用的输出 Y 端口避免与 PWM 或 PLSR 指令所用的 Y 端口重复；

It should avoided that the output Y port used by PLSY is used by PWM or PLSR instruction;

使用 PLSY 指令时，使用了如下特殊寄存器：

When using PLSY instruction, the following special registers are applied:

寄存器 Register		定 义 Definition	备 注 Remarks
D8140	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y0 口的脉冲总数 Number of total pulses output to Y0 port set in the PLSY or PLSR instruction	可用指令：Applicable instructions: DMOV K0 D81xx DMOV K0 D81xx 进行清除操作 The clearance
D8141	高字 Upper byte		

寄存器 Register		定 义 Definition	备 注 Remarks
D8142	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y1 口的脉冲总数 Number of total pulses output to Y1 port set in the PLSY or PLSR instruction	operation
D8143	高字 Upper byte		
D8150	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y2 口的脉冲总数（3624MT/2416MT 没有此端口） Number of total pulses output to Y2 port set in the PLSY or PLSR instruction (3624MT/2416MT doesn't feature this port)	
D8151	高字 Upper byte		
D8152	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y3 口的脉冲总数（只适用于 MTQ） The total pulse number, which is set in PLSY or PLSR instruction, is outputted to Y3 port (available for MTQ)	
D8153	高字 Upper byte		
D8154	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y4 口的脉冲总数（只适用于 MTQ） The total pulse number, which is set in PLSY or PLSR instruction, is outputted to Y4 port (available for MTQ)	
D8155	高字 Upper byte		
D8136	低字 Lower byte	已向 Y0 及 Y1 输出的脉冲个数的累计值 Accumulative value of the number of the pulses already output to Y0 and Y1	
D8137	高字 Upper byte		

注意：Notice:

在新版本的 H2U 系列 PLC 中，PLSY 指令的功能有增强，可在 PLSY 指令运行过程中修改脉冲个数、或立即启动下条脉冲输出指令、或实现脉冲输出完成中断等增强功能.。

In new version H2U series PLC, PLSY instruction function has been enhanced. During instruction is implemented, the pulse number can be changed, or immediately the next pulse output instruction can be implemented, or pulse output interrupt can be achieved.

1. 通过使用特殊位 M8135~M8139(分别对应 Y0~Y4)为 ON，可以实现在运行中更改 S2 输出脉冲个数(可大可小)；

1. By setting special bit M8135~M8139(respectively corresponding to Y0~Y4) to ON, S2 output pulse number can be changed during operation (more or less);

2. 通过使用特殊位 M8085~M8089(分别对应 Y0~Y4)为 ON，可以实现马上启动下条脉冲输出指令，不需要上条能流无效的处理；

2. By setting special bit M8085~M8089 (respectively corresponding to Y0~Y4) to ON, the next pulse output instruction will be implemented immediately without handling the previous invalid instruction;

3. 通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON，可以实现脉冲输出完成中断；具体对应如下：

3. By setting special bit M8090~M8094 (respectively corresponding to Y0~Y4) to ON, the pulse output interrupt can be implemented; the detail information are listed as following:

端口号 Port number	使用特殊位 Used special bit	对应的用户中断 Relative user interrupt
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

具体可参考附录 5.8 中的说明。

For more detail information , refer to appendix 5.8.

16bit 16 位	32bit 32 位	P	FNC 58	PWM	脉宽调制 Pulse band modulation
✔					
7 步 7steps			指令格式：PWM S1 S2 D Instruction format：PWM S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔													

由于继电器不适合高频率动作，只有晶体管输出型 PLC 才适合使用该指令。指令功能是以 S1 指定的脉冲宽度，S2 指定的脉冲周期，由 D 指定的端口持续输出脉冲。

Since relays are not suitable for high frequency actions, only the transistor output type PLC is suitable to use the present instruction.In the instruction, S1 is the pulse width; S2 is the pulse period; and D is the port continue output pulse. 其中：Where：

S1 为设定的输出脉冲宽度，必须有 S1≤S2，设定范围为 0~32，767ms；

S1 is the pre-set output pulse width with range of 0~32,767ms, and S1≤S2;

S2 为设定的脉冲输出周期，必须有 S1≤S2，设定范围为 1~32，767ms；

S2 is the pre-set pulse output period with range of 0~32,767ms, and S1≤S2;

D 为脉冲输出端口，H1U 机型可以指定 Y0/Y1/Y2；H2U 机型中 3624MT/2416MT 型只能指定 Y0 或 Y1，其他 MT 型可以指定 Y0/Y1/Y2，而 MTQ 型则可指定 Y0/Y1/Y2/Y3/Y4。

D is pulse output port. Y0/Y1/Y2 could be specified for H1U model; Y0 or Y1 could only be specified for 3624MT/2416MT model in H2U mode; Y0/Y1/Y2 could be specified for other MT model, and Y0/Y1/Y2/Y3/Y4 could be specified for MTQ model.不要与 PLSY，PLSR 指令的输出端口重复。

The output port used by D should not be used by PLSY, PLSR instruction.

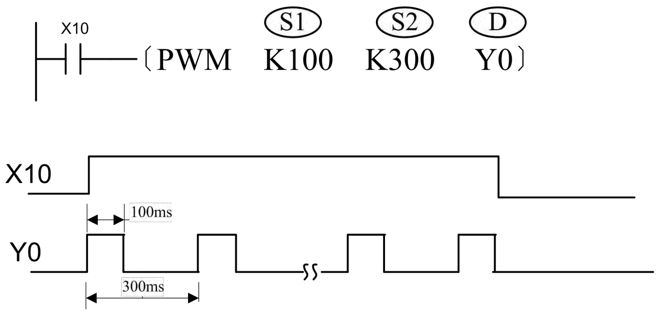
本指令是以中断方式执行，当指令能流为 OFF 时，输出停止。

、S2 可在 PWM 指令执行时更改。

The instruction is executed in an interrupted way, the output is stopped when the instruction power flow is OFF. S1 and S2 can be modified when the PWM instruction is being executed.

指令举例：

Instruction example:



适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	✔

16bit 16位	32bit32位	P	FNC 59	PLSR	带加减速脉冲输出 Pulse output with acceleration/deceleration
✔	✔				
9步 9steps	17步 17steps		指令格式：PLSR S1 S2 S3 D Instruction format: PLSR S1 S2 S3 D		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S3					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔													

由于继电器不适合高频率动作，只有晶体管输出型PLC才适合使用该指令。该功能是指带加减速功能的固定尺寸传送用脉冲输出指令。

Since relays are not suitable for high frequency actions, only the transistor output type PLC is suitable to use the present instruction.The function is to transfer pulse output instruction with fixed scale and acceleration/deceleration option. 其中：where

S1为设定的输出脉冲的最高频率，设定范围为 10~100，000Hz；

S1 is the pre-set max frequency of the output pulse with range of 10~100,000Hz;

S2为设定的输出脉冲数，16bit 指令，设定范围为 110~32，767；32bit 指令，设定范围为 110~2，147，483，647；设定的脉冲数小于 110 时，不能正常输出脉冲；

S2 is the pre-set output pulse number with range of 110~32,767(16bit instruction), or 110~2,247,483,647 (32bit instruction); if the pre-set pulse number is les than 110, the pulse cannot be output normally;

S3为设定的加减速时间，范围 50~5000(ms)，减速时间与加速时间相同，ms 单位，设定时请注意：（H2U 系列 PLC 中减速时间可单独设定，请参考后面的介绍）

S3 is the pre-set acceleration/deceleration time with range of 50~5000(ms), and the acceleration time is same as deceleration time(unit: ms): (the deceleration time in H2U series PLC can be separately set, referring to the following introduction)

D为脉冲输出端口，H1U 机型可以指定 Y0/Y1/Y2；H2U 机型中 3624MT/2416MT 型只能指定 Y0 或 Y1，1616MT/3232MT 型能指定 Y0/Y1/Y2，而 MTQ 型则可选 Y0/Y1/Y2/Y3/Y4。不要与 PLSY 指令的输出端口重复。

D is pulse output port. Y0/Y1/Y2 could be specified for H1U model; Y0 or Y1 could only be specified for 3624MT/2416MT model in H2U mode; Y0/Y1/Y2 could be specified for 1616MT/3232MT model, and Y0/Y1/Y2/Y3/Y4 could be specified for MTQ model. The output port used by D should not be used by PLSY instruction.

使用说明：

Instruction for use:

本指令是以中断方式执行，不受扫描周期的影响；

The instruction is implemented in interrupt mode and will not be affected by scanning period;

当指令能流为 OFF 时，将减速停止；当能流由 OFF→ON 时，脉冲输出处理重新开始；

When instruction energy flow is set to OFF, the deceleration is stopped; when energy flow is set form OFF to ON, the pulse output procedure will be implemented over again;

在脉冲输出过程中，改变操作数，对本次输出没有影响，修改的内容在指令下次执行的时候生效。指令执行完毕，M8029 标志置为 ON；

During pulse output procedure, the changed operand will not affect the current output and it will be effect when the instruction is implemented next time. When instruction is implemented, M8029 flag is set to ON;

与 PWM 指令的输出端口号不能重复；

the applied output port cannot be used by PWM instruction;

再次启动 PLSR 指令时，需在上次脉冲输出操作结束（Y0 结束时 M8147＝0；Y1 结束时 M8148＝0；Y2 结束时 M8149＝0；Y3 结束时 M8150＝0；Y4 结束时 M8151＝0）后，再延迟 1 个扫描周期，方可再启动该指令（在新版本的 H2U 系列 PLC 中通过设置可以不受此限制，具体请参考附录 5.8 中的说明）；

After the previous pulse output operation is accomplished (When Y0 is accomplished, M8147=0; when Y1 is accomplished, M8148=0; when Y2 is accomplished, M8149=0; when Y3 is accomplished, M8150=0; when Y4 is accomplished, M8151=0) and one more scanning period, the instruction can be implemented again(In new version H2U series PLC, the limitation will not take effect. For more detail information, refer to appendix 5.8);

指令举例：

Instruction example:

最高频率

Max frequency

总输出脉冲数

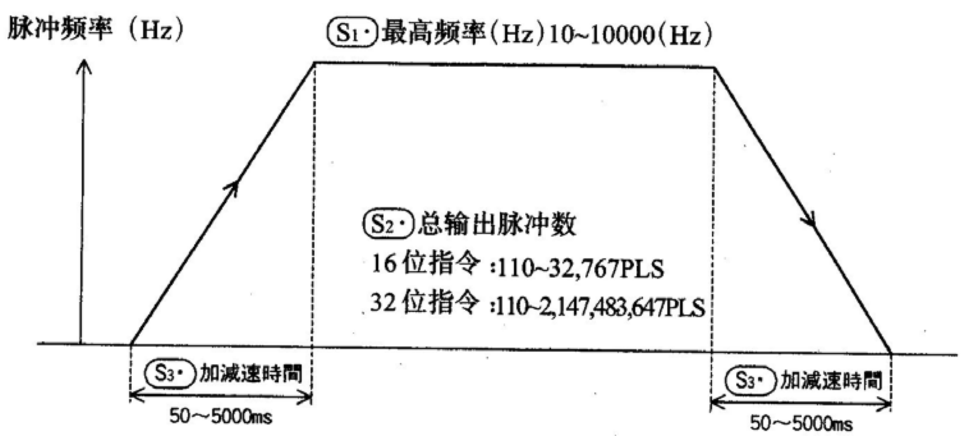
Total output pulse number

加减速时间

Acceleration/deceleration time

输出号码

Output number



脉冲频率

Pulse frequency

加减速时间
Acceleration/deceleration time

最高频率
Max frequency

中输出脉冲数
Total output pulse number

加减速时间
Acceleration/deceleration time

16 位指令
16bit instruction

32 位指令
32bit instruction
各输出端口对应的特殊寄存器如下：
The special registers corresponding to each output port are listed as follow:

寄存器 Register		定 义 Definition	备 注 Remarks
D8140	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y0 口的脉冲总数 Number of total pulses output to Y0 port set in the PLSY or PLSR instruction	可用指令： DMOV K0 D81xx 进行清除操作 Applicable instructions: use DMOV K0 D81xx to perform clear operation
D8141	高字 Upper byte		
D8142	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y1 口的脉冲总数 Number of total pulses output to Y1 port set in the PLSY or PLSR instruction	
D8143	高字 Upper byte		
D8150	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y2 口的脉冲总数（3624MT/2416MT 没有此端口） Number of total pulses output to Y2 port set in the PLSY or PLSR instruction (3624MT/2416MT doesn’t feature this port)	
D8151	高字 Upper byte		

D8152	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y3 口的脉冲总数（只适合于 MTQ） Number of total pulses output to Y3 port set in the PLSY or PLSR instruction (Only applicable to MTQ)	
D8153	高字 Upper byte		
D8154	低字 Lower byte	PLSY 或 PLSR 指令中设定的输出至 Y4 口的脉冲总数（只适合于 MTQ） Number of total pulses output to Y4 port set in the PLSY or PLSR instruction (Only applicable to MTQ)	
D8155	高字 Upper byte		
D8136	低字 Lower byte	已向 Y0 及 Y1 输出的脉冲个数的累计值 Accumulative value of the number of the pulses already output to Y0 and Y1	
D8137	高字 Upper byte		

本指令的输出频率范围为 10~100，000Hz。最高速度或加减速的高速速度转换超出该范围时，将自动转换（上升或下降）至范围内的数值后执行。但是，实际能够输出的输出频率最低值取决于以下公式：

The output frequency range of the instruction is 10~100,000Hz. When the high speed conversion with the maximum or accelerated/decelerated speed exceeds the range, it will be converted (ascended or descended) to a value in this range automatically before it is executed. Nevertheless, the lower limitation of actual output frequency depends on following formula:

最高频率 S1. Hz÷（2×（加减速时间 S3. Ms÷1000））= 输出脉冲频率的最低频率数

最高频率

Max frequency

加减速时间

Acceleration/deceleration time

输出脉冲率的最低频率数

The lower limitation of output pulse frequency

加速初期和减速末期的频率不得低于上述公式的计算结果。

The frequency in acceleration initial duration and deceleration ending duration should not be less than the calculation result of above formula.

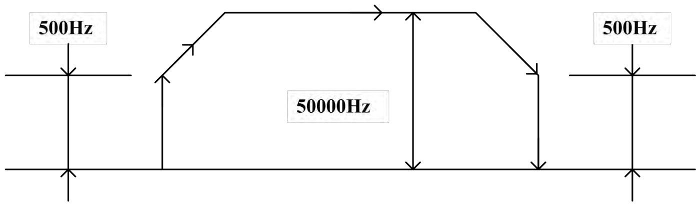
［例］最高速度：50000Hz，加减速时间：100ms

[For example] The max speed: 50000Hz; Acceleration/deceleration time

50000÷（2×（100÷1000））=500Hz

最高频率 S1.指定为 50000Hz 时。加速初期和减速末期的实际输出频率为 500Hz。

When the max frequency is specified with 50000Hz. The actual output frequency in acceleration initial duration and deceleration ending duration is 500Hz.



注意：Notice：

在新版本的 H2U 系列 PLC 中，PLSR，DRVI，DRVA 等指令的功能有增强；

In new version H2U series PLC, the functions of PLSR, DRVI, DRVA instruction have been enhanced;

1. 通过使用特殊位 M8135~M8139(分别对应 Y0~Y4)为 ON，可以实现在运行中更改输出脉冲个数(可大可小)；同时加速时间由S3决定，减速时间分别由如下寄存器定义：

   1. By setting special bit M8135~M8139 (respectively corresponding to Y0~Y4) to ON, the pulse number can be changed in operation (more or less); the acceleration time is specified by S3, and the deceleration time are defined by following registers:

2.

端口号 Port number	使用特殊位 Used special bit	修改减速时间用寄存器 The register used for changing deceleration time
Y000	M8135	D8165
Y001	M8136	D8166
Y002	M8137	D8167
Y003	M8138	D8168
Y004	M8139	D8169

2. 通过使用特殊位 M8085~M8089(分别对应 Y0~Y4)为 ON，可以实现如下功能：

2. By setting special bit M8085~M8089 (respectively corresponding to Y0~Y4) to ON, the following functions can be achieved:

在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条能流无效的处理；

When special bit is ON, the next pulse output instruction can be immediately implemented without handling last invalid energy flow;

3. 通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON，可以实现如下功能：

3. By setting special bit M8090~M8094 (respectively corresponding to Y0~Y4) to ON, the following functions can be achieved:

可以实现脉冲输出完成中断；具体对应如下：

The pulse output interrupt can be achieved; the detail information are listed as following:

端口号 Port number	使用特殊位 Used special bit	对应的用户中断 Relative user interrupt
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

具体可参考附录 5.8 中的说明。
For more detail information , refer to appendix 5.8.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 60	IST	状态初始化 Initial state
✔					
7 步 7steps			指令格式：IST S D1 D2 Instruction format：IST S D1 D2		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔												
D1				✔											
D2				✔											

注：1）该指令在用户程序中只能使用 1 次；
Note: 1) the instruction can only be used for one times in user program;
2）D1及D2只能用 S 变量 S20~S899；且必须D1<D2
D1and D2 can only use S variable S20~S899；and D1<D2

3）使用该指令时还用到系统专用的 M 变量。 3) when using this instruction, the M variable special for system should also be applied.

该应用指令可实现一个典型的多个动作循环执行机构的控制状态初始化定义，并指定运行模式的输入信号、动作状态等变量。

This instruction can be used to initialize the control status of a typical multi-action looping execution mechanism and to specify parameters for the operation mode such as the input signal, action status, etc.

```
              S        D1       D2
 M8000
──┤├──────〔IST   X10      S20      S60〕
```

S为指定运行模式的输入的起始位变量元件地址，本指令会占用S～S＋7 的连续 8 个地址单元，且每个变量的对应特定功能定义，见以下描述；

S is the starting address of bit variable component in specified operation mode, and the instruction occupies continuous eight address units from S to S +7. The special function definiction corresponding to each variable are listed as following;

S　　X10：手动操作　　X14：连续运行

S　　X10：manual operation　　X14：continue operation

X11：原点回归　　X15：原点回归启动

X11：return to original point　　X15：enable returning to original point

X12：步进　　　　X16：自动运行启动

X12：stepping　　　　X16：enable automatic operation

X13：一次循环　　X17：停止

X13：one circle　　X17：stop

D1为指定自动操作模式中，使用 S 状态的最小序号；

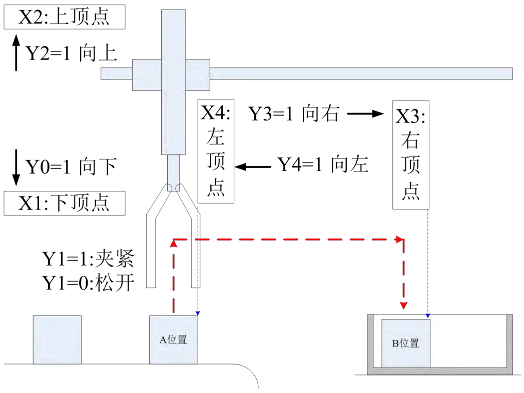
D1 is the minimum serial number using the S status in the specified automatic operation mode.

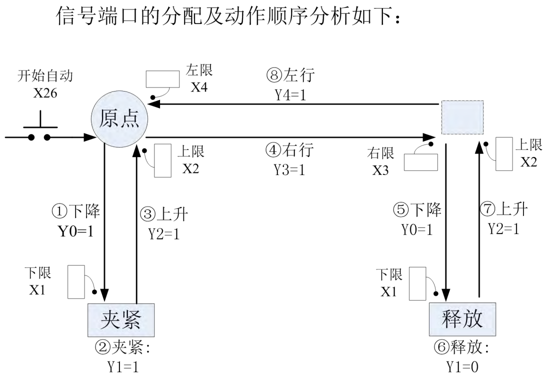
D2为指定自动操作模式中，使用 S 状态的最大序号；

D2 is the max sequence number in specified automatic operation mode when using S state;

例如下图例系统，执行机构的动作依次是，抓取机构由原点下降到 A 工件位置，将工件抓取后提升到指定高度，再平移到指定位置后下降，到达指定位置后释放夹具，之后后循原路返回，开始下一个循环动作。IST 指令可指定该操作机构的控制信号输入、状态转移的控制等，实现自动控制，还支持手动调试的单步动作、原点复位等。

For example, in the illustrated system below, the execution mechanism acts sequentially in such a way: the grabbing device drops to the position of work piece A from the base point to grab the work piece, and then it lifts the work piece to the specified height and translates to the desired position and drops. After arriving at the required position, it releases the work piece and back tracks to start the next looping action. It is possible to use the IST instruction to specify the control signal input, the control of the status transferring, etc. of the operational mechanism to achieve automatic control. In addition, it supports manual commissioning of single-step actions and base point reset, etc.





上顶点
Upper apex

向上
upward

向下
downward

下顶点
Lower apex

夹紧
clamping

松开
unlock

左顶点
Lefter apex

向右
rightward

向左
leftward

右顶点

Righter apex

A 位置
A position

B 位置
B position

信号端口的分配及动作顺序分析如下：
The assignment and operation sequence of signal port are analysed as following:

开始自动
Start automation

原点
Original point

左限
Lefter limitation

下降
descend

上限
Upper limitation

上升
ascend

下限
Lower limitation

夹紧
clamping

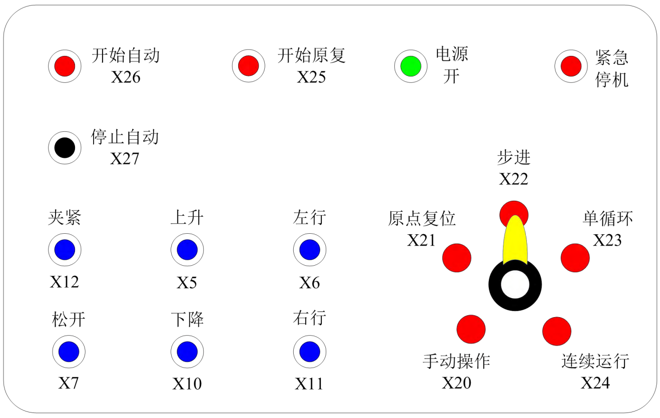
左行
Move leftward

右行
Move rightward

释放
Release

操作机构还需配备指令按键及状态切换开关，用手动试机、单次动作、循环动作等控制，以下是操作面板示意图，其中有按键端口及其功能分配：

Instruction keys and status changing switches are required to control the operational mechanism using manual commissioning, single actions, and looping actions, etc. The following is a schematic diagram of the operation panel, including the key ports and their function assignments:



对于如上图的应用，每个完整的循环动作分 8 个步骤（即 8 个状态），可使用如下的指令语句，实现控制系统的状态初始化：

For applications like the above diagram, each complete cycle can be divided into 8 steps (i.e. 8 statuses). The following instruction clauses can be used to initialize the status of the control system:

M8000 ─┤├─〔IST (S) X20 (D1) S20 (D2) S27〕

其中Ⓢ指定 X20 为运行模式的起始输入，因此随后地址的 X21～X27 输入端口也将被使用，且功能动作特性将分别定义为：（使用其他 X、M 或 Y 等变量时同理类推）

Where, X20 is specfied as initial input in operation mode by Ⓢ, and the following address X21~X27 input ports will be also applied. The function operation characteristc are seperately defined as following: (the other variables X, M or Y are similar)

X20 ：手动操作模式，用单个按钮接通或切断各控制输出信号；

X20: This is the manual operation mode to switch on/off the various control output signals using a single button.

X21：原点复归模式，按下原点复归用按钮时，使机械自动复归原点；

X21 ： Returning original point mode, when pressing the button, the machine will automatically return to original point;

X22：单步操作模式，每次按起动按钮，前进一个工序；

X22: single step operation mode, every time when pressing the button, the procedure moves forward for one step;

X23 ：循环运行一次模式，在原点位置上按起动按钮时，进行一次循环的自动运行并在原点停止。途中按停止按钮，其工作停止，若再按起动按钮，在此继续动作至原点自动停止。

X23: The is the one-cycle looping mode. When the start button is pressed, it will run the one-cycle looping automatically and stop at the base point. The operation can be stopped by pressing the stop button. Then, if the start button is pressed, the operation will continue and stop at the base point automatically.

X24 ：连续运行模式，在原点位置上按起动按钮，开始连续运行。若按停止按钮，则运转至原点位置后停止；

X24: This is the continuous operation mode to run continuously by pressing the start button.If the stop button is pressed, the operation will not stop until it runs at original point;

X25：开始原点复归命令信号；

X25: start command signal of returning original point;

X26：开始自动命令信号；

X26: Start automatic command signal;

X27：停止自动命令信号。

X27: Stop automatic command signal.

注意，这些端口信号中 X20～X24 决定了控制系统的运行模式，不能同时有为 ON 的状态，故建议采用旋转开关进行信号的选择切换。

Note: In these port signals, the operation mode is determined by X20 to X24, for which the statuses can’t be ON at the same time. Therefore, it is suggested to use rotary switches for the selection and switching of the signals.

D1和D2分别指定自动操作模式中，使用状态的最小和最大序号 S20~S27，共 8 个状态。

D1 and D2 can be specified in automatic operation mode, and eight state from S20 to S27 can be applied.

还需注意 IST 指令对如下的特殊变量的定义及使用要求：

The following special variables for the definition and use requirements of the IST instruction should be noted:

如果驱动 IST 指令，下列元件被自动切换控制，用户程序可以进行引用；为了配合 IST 指令的状态切换和控制，用户程序中还需对部分特殊变量进行操作，如下表说明：

If IST instruction is implemented, the following component will be automatically switched and controlled, which could be called in user program; in order to co-work with the state switch and control of the IST instruction, some special variables can also be proceeded in user program, which is described in following table:

IST 指令内部默认使用的变量 The variables used in IST instruction in default		用户程序中驱动的变量 The variables driven in user program	
M8040	1＝禁止所有状态的转移。 1= all states switch is forbidden.	M8043	1＝原复完毕。在原复模式中，机器返回原点后，通过用户程序将该特殊 M 变量置位。 1= Recover accomplished. In recover mode, after the machine returns original point, the special M variable is set by user program.
M8041	1＝转移开始 1=Switch begins	M8044	1＝原点条件。检测机器的原点条件，驱动该特殊辅助继电器。 1= Original point condition. Checking the machine original point condition, and the

IST 指令内部默认使用的变量 The variables used in IST instruction in default		用户程序中驱动的变量 The variables driven in user program	
			special auxiliary relay is driven.在全部模式中均置位。 Set in all mode.
M8042	1＝起动脉冲 1= starting pulse	M8045	1＝全部输出复位禁止。若在手动、原复、自动模式间进行转换时，机器不在原点位置时，则执行全部输出与动作状态的复位。但若已驱动 M8045，只有动作状态复位。 1=all output reset is forbidden. When switching in manual, reset, auto mode and machine is not in original point, resetting all outputs and operation states is implemented. But if M8045 has been driven, only operation state is reset.
S0	手动操作初始状态 Initial state of manual operation	M8047	1＝STL 监控有效。驱动 M8047 后，现正动作中的状态序号（S0~S899）按从小到大的顺序存入特殊辅助继电器 D8040~D8047 中。由此，可以监控 8 点的动作状态序号。此外，若这些状态的任何一个动作，特殊辅助继电器 M8046 将动作。 1=STL monitor takes effect. After M8047 is driven, the state sequence number (S0~S899) in operation will be save in special auxiliary relay D8040~D8047 in ascending order. Based on it, the operation state sequence number of eight points can be monitored. Additional, if there are any operation in these states, the special auxiliary relay M8046 will operat.
S1	原点复归初始状态 Original point returning initial state		
S2	自动运行初始状态 Automatically operate initial state		

在机器“自动运行”模式中，可进行自由转换：单步↔循环一次↔连续运行；

In machine “automatic operation” mode, it can switch freely: step ↔ circlate for one times ↔ continous operating;

在机器运行中，在“手动操作”↔“原点复归”↔“自动运行”之间进行转换时，当全部输出复位后，转换后模式有效。（M8045 驱动时不能复位）

In machine operation, when it can switch freely: “manual operating” ↔ “Returning original point” ↔ “automatically operating”, after all outputs are reset, the switched mode takes effect. (Reset is not applicable for M8045 drive.)

使用 IST 指令时，S10~S19 可作为原点复归用。因此，在编程中请勿将这些状态作为普通状态使用。另外，S0~S9 作为初始状态处理，S0~S2 作为如上述的手动操作，原点复归以及自动运行使用，而 S3~S9 则可以自由地使用。

When using IST instruction, S10~S19 can be used for returning original point. Additional, Therefore, don’t use these statuses as common statuses.S0~S9 can be handled as initial state; S0~S2 are used for above manual operating, returning original point and automatically operating, and S3~S9 can be applied freely.

编程时，IST 指令必须比状态 S0~S2 等一系列的 STL 电路优先编程。

When programming, IST instruction should be programmed before S0~S2 STL circuit.

为了防止其中的 X20~X24 同时为 ON 状态，须用旋转开关。

In order to avoid that X20~X24 are set to ON in the same time, the wheel switch should be applied.

原点复归完成（M8043）未动作时，如果在各个（X20），原点复归（X21），自动（X22、X23、X24）之间进行切换时，则所有输出进入 OFF 状态。

If zero return (M8043) doesn’t operate and switch among (X20), zero return(X21) and automatic (X22), then all the output will go to OFF state.

并且，自动运行在原点复归结束后，才可以再次驱动。

And the automatic operation can’t drive again until the base point reset is finished.

在用 IST 指令进行了控制指令的初始化之后，还需要对执行机构每个状态的动作，以及状态转移的条件进行编程，具体说明如下：

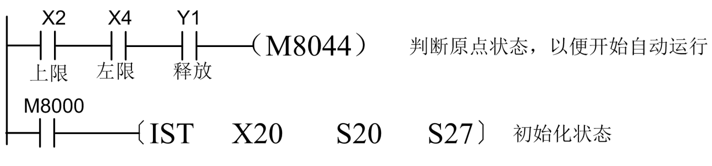
After initialization of the control instruction using the IST instruction, the action of each status of the execution mechanism and the conditions for status transferring need to be programmed, as detailed below:

1． 系统初始化：定义原点复位条件；定义 IST 指令中使用的运行模式信号的输入端口、循环动作的状态变量。

1. System initialization: Define zero return conditions; Define the input terminal of operating mode signal and state variables of cyclic operation used in IST instruction.

使用的程序语句如下图。

The program clauses used are illustrated in the following diagram.



上线 左限 释放

Upper limit left limit release

判断原点状态，以便开始自动运行

Judge the status of zero position so as to start automatic operation

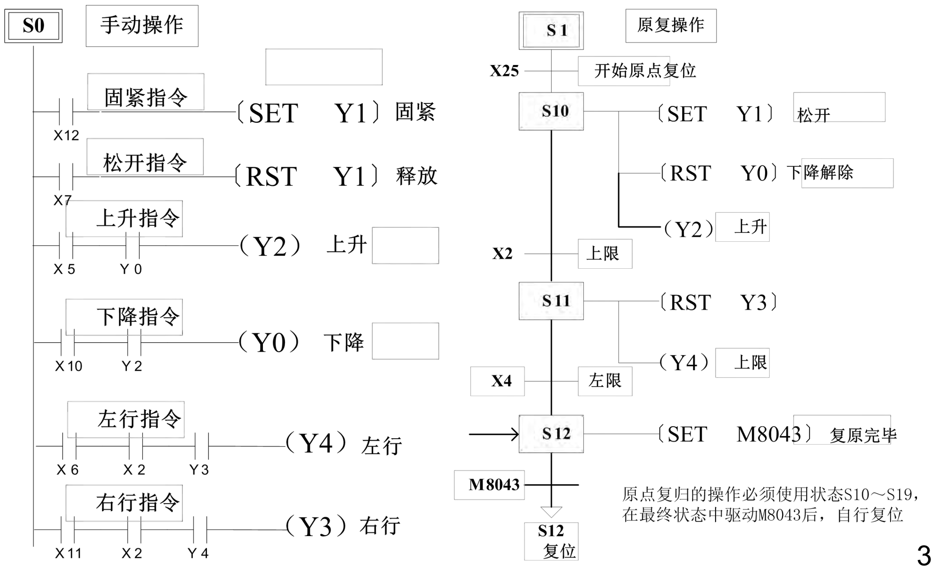
初始化状态

Initialization state

2． 手动操作：由操作盘上定义的命令信号驱动执行，见如下图中 S0 状态的程序语句。

2. Manual operation: Driven by command signal defined on operating panel, and the

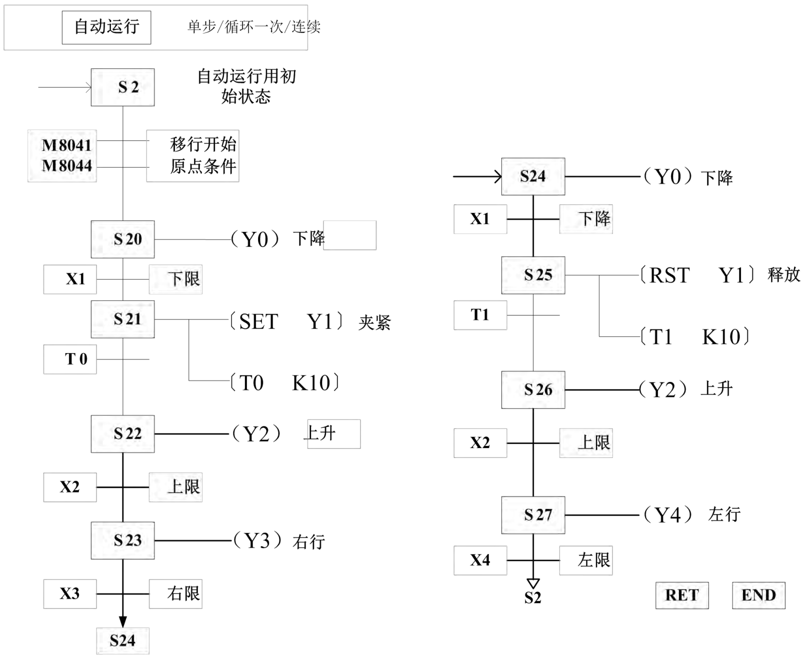
program routine of S0 state is shown in following figure.
若没有手动模式，可以不需编写该部分的程序：
This part of the program can be skipped if there is no manual mode:



3

手动操作
Manual operation
固紧指令
Hold command
松开指令
Release command
上升指令　上升
Rise command　rise
下降指令　上升
Descend command　descend
左行指令　左行
Left-motion command　move left
右行指令　右行
Right-motion command　move right
复原操作
Zero return operation
开始原点复位
Start zero return
松开
unlock
下降解除
Descend termination
上升
ascend
上限
Upper limitation

左限
Left Limit
复原完毕
Zero return completed
原点复归的操作必须使用状态 S10~S19， 在最终状态中驱动 M8043 后，自行复位
Zero return operation must use states S10~S19, and system reset automatically after M8043 is driven in the final state.
复位 Reset
3. 原点复位：根据开始复位的命令信号、复位动作的顺序，设计复位程序，如上右图。
3. zero return: Design zero return program shown in right figure according to command signal of starting zero return operation and sequence.
4. 自动运行：根据要求的动作条件和顺序、控制信号输出，编写程序如下图：
4. Automatic operation: Design program shown in following figure according to required operation condition, sequence and control signal output:



单步/循环一次/连续
Single step/single cycle/continuous
自动运行用初始状态
Initialization status of automatic operation
移行开始
Start moving
原点条件
Zero condition
下降
descend
下限
Lower limitation
夹紧

clamping
上升
ascend
上线
Upper limit
右行
Move rightward
右限
Right limit
下降
descend
释放
Release
上升
ascend
上限
Upper limitation
左行
Move leftward
左限
Lefter limitation

至此，控制系统就可以按前面的动作要求完成循环动作了。以上是为了方便阅读，采用了步进指令进行的编程说明，用户完全可以用等效梯形图来进行编程。

Up to this point, the control system is allowed to complete the looping action according to the above mentioned action requirements. The above programming description uses step instructions for the convenience of reading, while the user is free to program using the equivalent ladder diagrams.

当一个控制系统的“自动运行”模式有不同的状态数，可参考上例编程，修订D1及D2的设置项，并在“自动运行”状态中进行相应的处理。

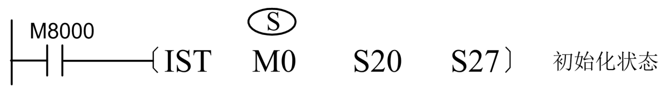
If the “automatic operation” mode of a control system has different states, then the above routine program can be referenced to modify configurations of D1 and D2 and processed in “automatic operation” state.

对于使用非连续 X 输入端的处理方法：

Process of non-continuous X input terminal:

若需要采用非连续地址的 X 输入端口作为运行模式的给定输入，可采用 M 变量来进行“过渡”传送，即先通过简单的 OUT 指令将非连续的 X 输入端状态，逐个复制到某个连续地址的 M 变量，而使用如下指令：

If an X input port with non-continuous addresses needs to be used as the provided input of the operation mode, the M variable can be used for a “transitional” transmission. That is, the non-continuous X input status will be copied to an M variable with continuous addresses one by one using the simple OUT instruction rather than the instructions below:

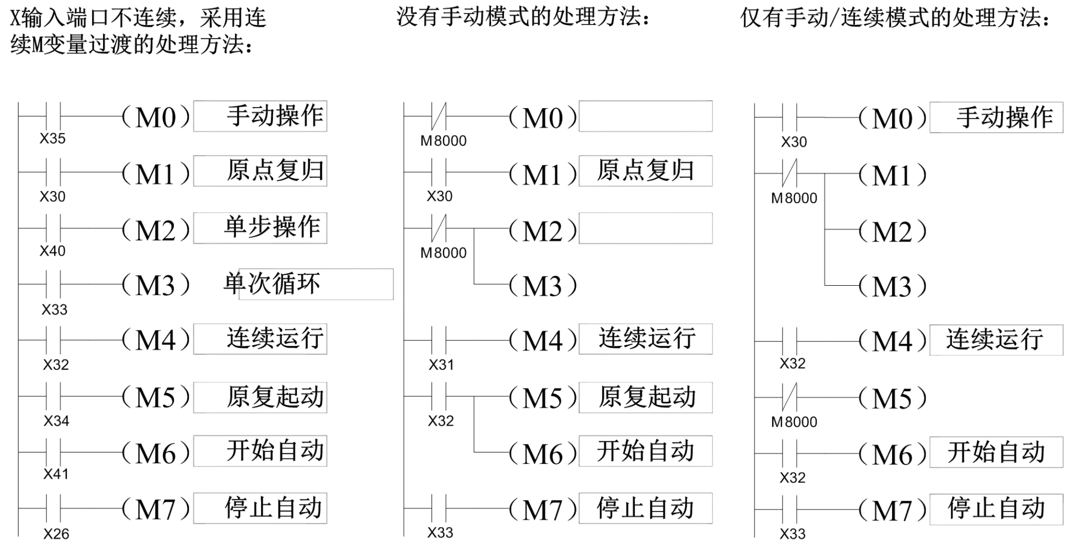


初始状态

Initialization state

在 IST 中的 指定到该连续的 M0~M7 变量区。对于不存在的控制模式，也可用编程指令进行屏蔽，举例如下图中的 X 作为模式输入端与 M 变量的对应关系；对于不需要的模式输入 M 变量，只需将之固定清 0 就可以了：

Specific to the continuous M0 to M7 variable area in the IST, the programming instructions can be used to shield the non-existent control mode. For example, the corresponding relationship between X as the mode input end and the M variable in the following diagram. For un-required modes, you simply input the M variable and fix it to zero:



X 输入端口不连续，采用连续 M 变量过度的处理方法：

Process of non-continuous X input terminal through continuous M variable transition:

手动操作

Manual operation

原点复归

Zero return

单步操作

Single step operation

单次循环

Single cycle

连续运行

Continuous operation

原复启动

Start of zero return

开始自动

Start automation

停止自动

Stop automatic operation
没有手动模式的处理方法：
Process method when manual mode can't be selected:
原点复归
Zero return
连续运行
Continuous operation
原复启动
Start of zero return
开始自动
Start automation
停止自动
Stop automatic operation
仅有手动/连续模式的处理方法：
Process method when only manual/continuous mode can be selected:
手动操作
Manual operation
连续运行
Continuous operation
开始自动
Start automation
停止自动
Stop automatic operation

16bit 16位	32bit 32位	P	FNC 61	SER	数据查找 Seek Data
✔	✔	✔			
9步 9steps	17步 17steps		指令格式：SER S1 S2 D n Instruction format:		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1							✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔
n					✔	✔							✔		

	取值范围：16bit 指令：n＝1～256；32bit 指令：n＝1～128 Value range: 16bit instruction：n＝1～256；32bit instruction：n＝1～128

该指令用于从一组数据中，查找相同数据的单元、同时对最大值、最小值的检索。

The instruction is to search the unit(s) with same data, maximum value and minimum value

其中：where

小值的检索。

Search of minimum value

其中：where

为数据组的的起始地址；

S1 is the starting address of the data array:

S2 为待检索的数据；

S2 is the data, which is to be searched;

D 为检索结果存放区的起始地址；

D is the starting address of storage range for search result;

n 为被检索数据区的长度。

n is the length of data range, which is to be searched.

当使用 32bit 指令时，S1 S2 D 均指向 32bit 变量，n 也按 32bit 变量宽度进行计算。

If 32bit instruction is used then S1 S2 D point to 32bit variables, and n is calculated with 32bit variable width.

指令举例：

Example 1 for instruction:

```
 X20          S1     S2    D     n
─┤├─〔SER   D10    D0    D80   K10 〕
```

S1	被检索数据例	S2	元件序号	参数状况
D 10	(D 10)=K100	比较数据 (D0) =K100	0	相等
D 11	(D 11)=K123		1	
D 12	(D 12)=K100		2	相等
D 13	(D 13)=K98		3	
D 14	(D 14)=K111		4	
D 15	(D 15)=K66		5	最小
D 16	(D 16)=K100		6	相等
D 17	(D 17)=K100		7	相等
D 18	(D 18)=K210		8	最大
D 19	(D 19)=K88		9	

n

检索结果

D	参数	定义
D80	4	相等参数的个数
D81	0	第一个相等参数的序号
D82	7	最后一个相等参数的序号
D83	5	最小参数的序号
D84	8	最大相等参数的序号

被检索数据例

Search data example

比较数据

Comparison data

元件序号

Component sequence number

超速状况

Condition

相等

Equal to

最小

Minimum value

最大

Maximum value

检索结果

Search result

参数

paramter

定 义

Definition

相等参数的个数

Number of equal parameters

第一个相等参数的序号

Sequence number of the first equal parameter

最小参数序号

Sequence number of the minimum parameter

最大相等参数序号

Sequence number of the maximum equal parameter

使用说明：

Instruction for use:

Instruction for use:

当指令能流 X20 为 ON 时，方才进行比较；

Comparison will be executed only when the power flow X20 is ON;

比较的方法为有符号数的代数比较方法进行，例如－8<2；

Comparison is executed as algebraic comparison pricinple of signed numbers, for example -8<2;

当最小值、最大值有多个时，分别显示序号最大的元件；

The conponents of which sequence number is maximum will be displayed repectively if there are several minimum and maximum numbers;

存储检索结果的单元占用 D 开始的 5 个连续单元。

The search result will occupy 5 continuous storage cell starting from D.

若不存在相等数据时，上例中的 D80～D82 均为 0。

If there is no same data, D80~D82 in above example are all 0.

16bit 16 位	32bit 32 位	P	FNC 62	ABSD	凸轮控制绝对方式 Absolute cam control
✔	✔				
9 步 9steps	17 步 17 steps		指令格式：ABSD S1 S2 D n Instruction format:		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1							✔	✔	✔	✔	✔	✔	✔		
S2												✔			
D		✔	✔	✔											
n	常数，n＝1～64； Constant, n=1~64;														

S1 操作数为 KnX、KnY、KnM、KnS 时，若为 16bit 指令，必须指定 K4；若为 32bit 指令，必须指定 K8 且 X、Y、M、S 的元件编号必须是 8 的倍数；

When the operand S1 is KnX, KnY, KnM or KnS, then K4 must be specified if 16bit

instruction is used; K8 must be specified and the sequence number of X, Y, M and S component must be multiple of 8 if 32bit instruction is used; S1操作数在 16bit 指令时只能指定 C0~C199；32bit 指令时则只能指定 C200~C254； Only C0~C199 can be specified when the operand S1 is used in 16bit instruction; only C200~C254 can be specified when 32bit instruction is used;

该指令完成的操作是多区段比较，用于实现凸轮控制，比较用的表格、计数器等均按绝对方式设置。该指令是主程序中扫描执行，比较结果受扫描时间的滞后影响。其中：

This instruction does a multi-section comparison, which is used for realizing cam control. The table and counter for comparison are all set in absolute mode. The instruction is implemented in the scanning main program, and the comparison result is affected by scan time delay. Where:

S1为比较表格的起始元件地址；

S1 is the comparison table.

S2为计数器元件序号，使用 32bit 指令时，可为 32bit 计数器；

S2 is the sequence number of timer component, and the timer can be a 32bit timer if 32bit instruction is used;

D为比较结果存放区的起始地址，占用n个连续地址的 bit 变量单元；

D is the start address of comparison result storage area, and it occupies n continuous bit variable cells.

n为多段比较数据的组数。

n is the number of multi-segment comparison sets.

当使用 32bit 指令时，S1 S2 D均指向 32bit 变量，n也按 32bit 变量宽度进行计算。

If 32bit instruction is used then S1 S2 D point to 32bit variables, and n is calculated with 32bit variable width.

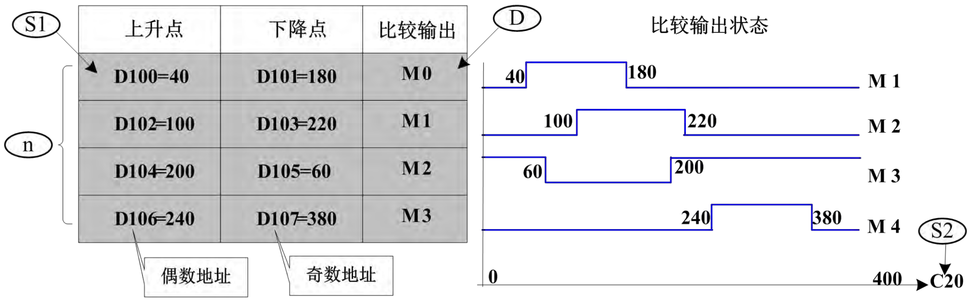
指令举例：

Example 1 for instruction:

```
     X10              (S1)    (S2)   (D)   (n)
├─┤├─{ABSD    D100    C20    M0    K4 }
 M8013
├─┤├─{C20   K400}
 X11
├─┤├────────{RST     C20}
```

若已给相关变量按如下赋值，当 X10＝ON 时，执行结果如下图：

If the relevant variables have been set as follows, when X10=ON, the implementation result is shown in the following figure.



上升点

Rise point

下降点

Descend point

比较输出

Comparison outpuit

偶数支持

Even address

奇数地址

Odd address

比较输出状态

Comparison output status

使用说明：

Instruction for use:

ABSD 指令执行前，应给相关表格的各变量用 MOV 指令赋值；

Before ABSD instruction is implemented, all the variables in the form should be assigned with a MOV instruction.

即使 DABSD 指令中采用了高速指令，比较输出 D 也受用户程序扫描时间的滞后影响，对于需要及时响应的应用，可采用 HSZ 高速比较指令；

The comparison output will be influenced by the scan time hysteresis of user program even high speed instruction is used in DABSD instruction, so HSZ high speed comparison instruction can be used for applications which need timely response.

程序中只能使用 ABSD 指令一次。

ABSD instruction can only be used one time in the program.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 63	INCD	凸轮控制增量方式 Increment method of cam control
✔					
9步 9steps			指令格式：INCD S1 S2 D n Instruction format:		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1							✔	✔	✔	✔	✔	✔	✔		
S2												✔			
D		✔	✔	✔											
n	常数，n＝1～64； Constant, n=1~64;														

S1操作数为 KnX、KnY、KnM、KnS 时，若为 16bit 指令，必须指定 K4；若为 32bit 指令，必须指定 K8 且 X、Y、M、S 的元件编号必须是 8 的倍数；

When the operand S1 is KnX, KnY, KnM or KnS, then K4 must be specified if 16bit instruction is used; K8 must be specified and the sequence number of X, Y, M and S component must be multiple of 8 if 32bit instruction is used;

S1 操作数在 16bit 指令时指定 C0~C234；

If the operand S1 is used in 16bit instruction then C0~C234 should be specified;

该指令完成的操作是多区段比较，用于实现凸轮控制，比较用的表格、计数器等均按增量方式设置。
The function of this instruction is multi-regional comparison and it's used for cam control. The table and timer for comparison are configured as incremental mode.
该指令是主程序中扫描执行，比较结果受扫描时间的滞后影响。 其中：
The instruction is implemented in the scanning main program, and the comparison result is effected by scan time delay. Where:

S1 为比较表格的起始元件地址；

S1 is the comparison table.

S2 为计数器元件序号，其相邻的 S2 ＋1 单元则被用于计算比较匹配后计数器复位的次数；

S2 is the sequence number of timer component, and the adjacent S2 ＋1 is used for calculating reset time of timer after comparison matches;

D 为比较结果存放区的起始地址，占用 n 个连续地址的 bit 变量单元；

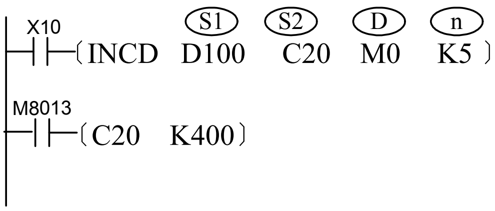
D is the start address of comparison result storage area, and it occupies n continuous bit variable cell;

n 为多段比较数据的组数。

n is the number of multi-segment comparison sets.

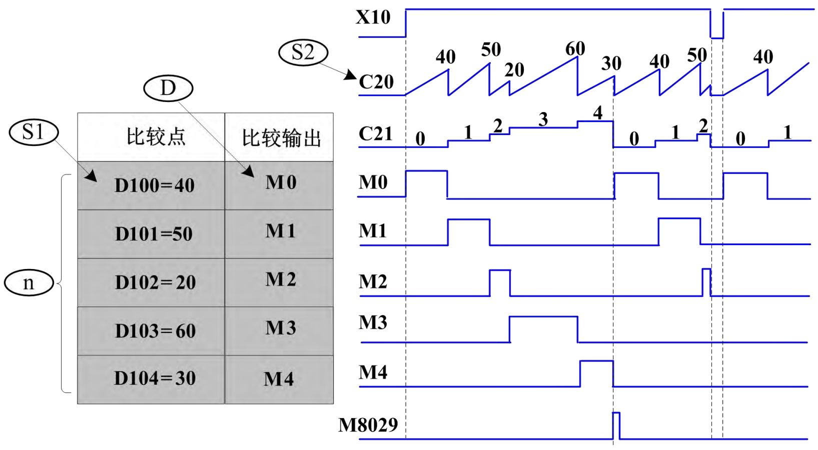
n 的组数比较完成时，指令执行完毕标志 M8029 会置 On。
If n group of data are compared completely then M8029 will be set to On.

指令举例：
Example 1 for instruction:



若已给相关变量按如下赋值，当 X10＝ON 时，执行结果如下图：

If the relevant variables have been set as follows, when X10=ON, the implementation result is shown in the following figure.



比较点

Comparison point

比较输出

Comparison output

使用说明：

Instruction for use:

INCD 指令执行前，应给相关表格的各变量用 MOV 指令赋值；

All the variables of the relevant tables should be assigned using the MOV instruction before beginning the INCD process.

比较输出也受用户程序扫描时间的滞后影响，对于需要及时响应的应用，可采用 HSZ 高速比较指令；

The comparison output is also affected by the delay of the user program scan. Therefore, the HSZ high speed comparison instruction can be used for applications that are needed quickly.

程序中只能使用 INCD 指令一次。

The INCD instruction can only be used once in the program.

适用机型 Available model		
系列 Series	通用 Common	增强 Enh

		anc ed
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 64	TTMR	演示定时器 delay timer
✔					
5 步 5steps			指令格式：TTMR D n Instruction format:		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D													✔		
n					✔	✔									

该指令的功能是将指定输入端口的按键保持时间乘以 n 倍数后存入变量 D，一般用于参数设定。

The function of this instruction is multiplying the key-press holding time of specified input terminal by n and then storing the result to variable D, and it's usually used for parameter setup.

其中：Where：

D 为按键保持时间以秒为单位乘以 n 倍数后的乘积，按键释放后 D 内容没有变化；而 D ＋1 单元则用于保存按键的按压时间，按键释放后 D ＋1 的内容被复位为 0，D ＋1 的时间单位为 100ms；

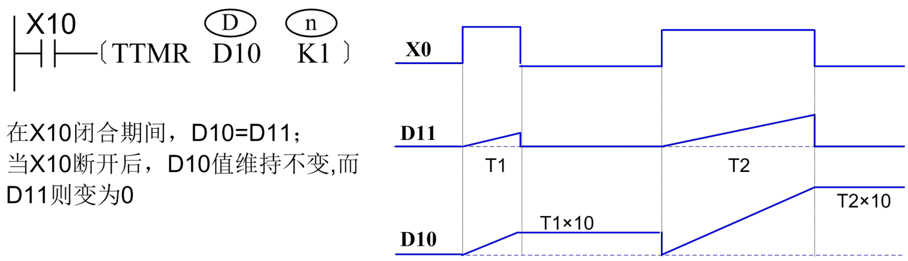
D is the product of keypress holding time (seconds) and n, and the content of D will not change after the key is released; D +1 is used for storing the key-pressing time, and the content of D +1 will be reset to 0 after the key is released, the time unit of is 100ms;

n 为倍数设定，注意实际倍数为 10n 计算方式，(n=0~2)

n is the multiple, and please notice that the actual multiple for calculation is 10n (n=0~2)

n＝K0 时，实际倍数为×1；
n＝K1 时，实际倍数为×10；
n＝K2 时，实际倍数为×100。
If n=K0 then actual multiple is x1;
If n=K1 then actual multiple is x10;
If n=K2 then actual multiple is x100;

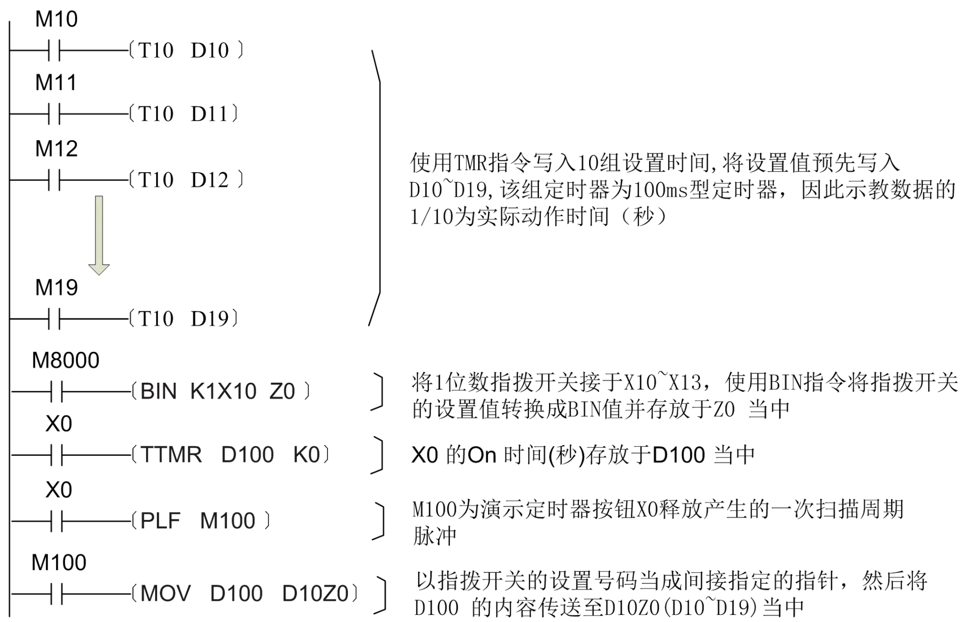
指令举例一：
Example 1 for instruction:



在 X10 闭合期间，D10=D11：
当 X10 断开后，D10 值维持不变，而 D11 则变为 0
D10=D11 while X10 is closed;
D10 maintains its state and D11 changes to 0 after X10 is open
假如 X10 的按键保持时间为 T 秒，D10、D11 与 n 三者之间的关系如下：
If holding time of pressing key X10 is T seconds, the relationships between D10, D11, and n are listed as following:

n	D10	D11(单位：100 毫秒) D11(unit: 100 ms)
K0(单位：秒) K0(unit: second)	1×T	D11=D10×10
K1(单位：100 毫秒) K1(unit: 100 ms)	10×T	D11=D10
K2(单位：10 毫秒) K2(unit:10 ms)	100×T	D11=D10/10

指令示例 2：
Example 2 for instruction:



使用 TMR 指令写入 10 组设置时间，将设置值预先写入 D10~D19，该租定时器为 100ms 型定时器，因此示教数据的 1/10 为实际动作时间（秒）

Write 10 group of preset time into D10~D19 through TMR instruction. This group of timers are of 100ms type, so the actual operation time (second) is 1/10 of the teaching value

将 1 位数指拨开关接于 X10~X13，使用 BIN 指令将指拨开关的设置值转换成 BIN 值并存放于 Z0 当中

Connect the 1-digit dip switch to X10~X13, and convert the setting value of dip switch to BIN value and store the result to Z0 throuth BIN instruction.

X0 的 ON 时间（秒）存放于 D100 当中

ON time (second) of X0 is stored in D100.

M100 为演示定时器按钮 X0 释放产生的一词扫描周期脉冲

M100 is a pulse of one scan cycle generated by releasing the delay timer button X0

以指拨开关的设置号码当成加你金额指定的指针，然后将 D100 的内容传送至 D10Z0（D10~D19）当中

Treat the setting number of dip switch as indirect pointer and then transfer the content of D100 to D10Z0 (D10~D19)

适用机型 Available model		
系列	通用	增

Series	Common	强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 65	STMR	特殊定时器 Special timer
✔					
7步 7steps			指令格式：STMR S m D Instruction format:		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S											✔				
m	常数，m＝1～32767														
D		✔	✔	✔											

该指令的功能是根据指令能流，产生4种延时动作的专用指令。 其中：

The instruction functions to create four special instructions for delay actions according to power flow. Where：

S用于产生延迟动作的计时器序号，可用 T0~T199；

S Timer no.T0~T19 can be used for triggering delay action

m 为延时设定值，单位为100ms，设定值范围为K1～K32767；

m is delay setting in 100 ms ranging from K1 to K32767;

D 为延时动作输出元件的起始编号，共占用4个连续单元。

D is starting number for delay action outputting components and occupies 4 consecutive units.

使用注意事项：

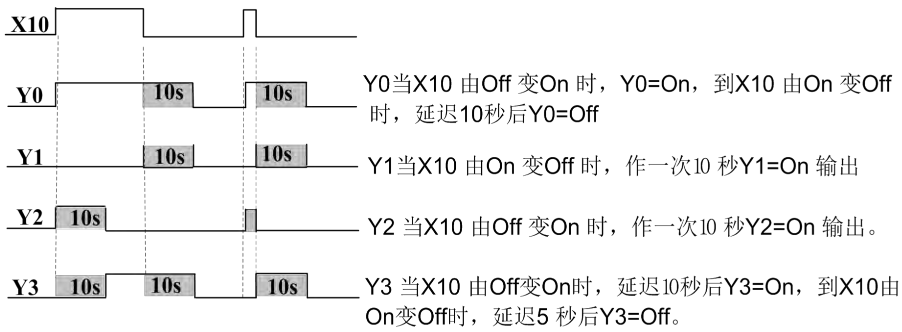
CAUTION:

在本指令中使用的计时器不得再用于其他指令中重复使用；输出也不可重复使用。

Timers and output used in this instruction can’t be used again in other instructions.

指令举例一：

Example 1 for instruction:

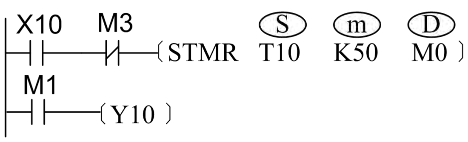


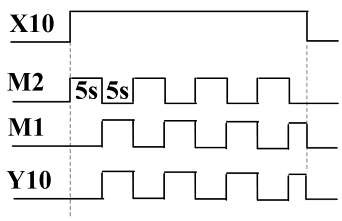
Y0 当 X10 由 OFF 变 ON 时　Y0=ON　到 X10 由 ON 变 OFF 时　延迟 10 秒后 Y0=OFF
Y0　When X10 changes from OFF to ON then Y0=ON; When X10 changes from ON to OFF then Y0=OFF after a delay of 10 seconds
Y1 当 X10 由 ON 变 OFF 时 作一次 10 秒 Y1=ON 输出
Y1　When X10 changes from ON to OFF then Y1=ON and output after a delay of 10 seconds
Y2= X10 由 Off 变 On 时　作一次 10 秒后 Y2=ON 输出
Y2　When X10 changes from OFF to ON then Y2=ON and output after a delay of 10 seconds
Y3 当 X10 由 OFF 变 ON 时　延迟 10 秒后 Y3=ON　到 X10 由 ON 变 OFF 时　延迟 5 秒后 Y3=OFF
Y3　When X10 changes from OFF to ON then Y3=ON after a delay of 10 seconds; When X10 changes from ON to OFF then Y3= OFF after a delay of 5 seconds

指令示例 2：
Example 2 for instruction:

若在指令能流中引入 D 的元件，可方便地实现振荡器输出（此功能也可以用 ALT 指令来实现），如下图：

If D component is introduced into the power flow then oscillating output can be implemented conveniently (this function is also can implemented by ALT instruction), and the program routine is shown as following:





适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 66	ALT	ON/OFF 交替 ON/OFF alternation
✔		✔			
3步 3steps		3步 3steps	指令格式：ALT D Instruction format		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D		✔	✔	✔											

该指令的功能是能流有效时，将 元件的状态反转。其中 为位变量元件。

The instruction can reverse the compnent state when the power flow is effective.

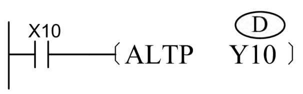
? is a bit variable component.

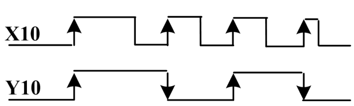
一般使用脉冲执行型 ALTP 指令。

Usually, the pulse operation type is preferred.

指令举例一：

Example 1 for instruction:

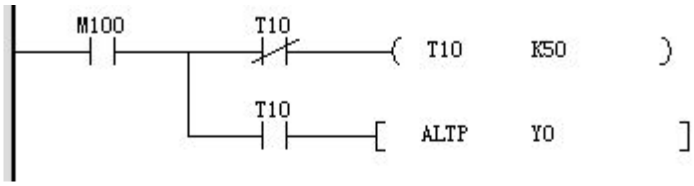




如下指令产生的动作与之相同：

The following instruction operation is the same:

指令示例 2：
Example 2 for instruction:
若在指令能流中引入定时器，可方便地实现振荡器输出（此功能也可以用特殊定时器 STMR 指令来实现），如下图：
If the timer is introduced in the instruction power flow, it is easy to implement oscillator output (the function can also be implemented by using a special timer STMR instruction), which is shown in the following figure:



适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 67	RAMP	斜坡指令 Ramp instruction
✔					
9 步 9steps			指令格式：RAMP S1 S2 D n Instruction format:		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1													✔		
S2													✔		
D													✔		

n	常数，1～32767 Constant, n=1~64;

该指令的功能是在给定的两个数据中间，在指定的时间区间，进行线性插值，按扫描执行的时间依次输出过程值，直到区间末端的终点值为止。 其中：

This function of command is carrying on linear interpolation among two given data or appointed time sector in order to output procedure value according to the turn of scanning execution time, until sector terminal endpoint. Where,

S1 斜坡信号的起始值单元；

S1 The starting value unit of slope signal

S2 斜坡信号的终点值单元；

S2 The end-point value unit of slope signal

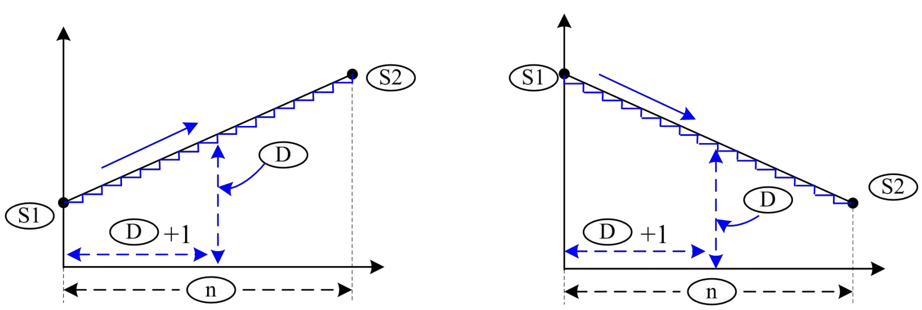
D 为线性插值信号的过程值存放单元，而插值次数的计时器存放在 D ＋1 单元；

D is the storage cell of intermediate value of linear interpolation signal, and the timer for interpolation time is stored in D ＋1;

n 完成插补过程的程序扫描执行次数。 由于插值输出是在正常主循环中进行的，为了保证插值输出的线性，需要将程序执行设置为固定扫描方式（见 M8039、D8039 说明）。

插值计算按整型数计算，丢弃了计算小数。 指令功能如下图： n The times of program scanning execution for process of interpolation .Because the output of interpolation is carried on during main loop, it’s necessary to set the program execution to fixed scanning mode .(the demonstration is on M8039、D8039)

The interpolation calculation is based on integer number and has discarded the computation decimal. Command function is showed in the chart followed:

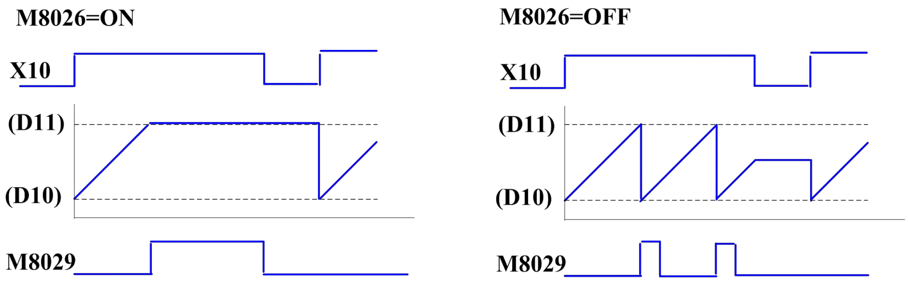


RAMP 指令执行有 2 种模式，由 M8026 标志进行选择；每次插值运算完毕，M8029 置 ON。

The RAMP instruction can be executed in two different modes which can be selected by

M8026 flag; M8029 is set to ON after interpolation is completed each time.
执行特点如下例：
Command function is showed in the chart followed:

X10 —〔RAMP (S1) D10 (S2) D11 (D) D12 (n) K100 〕



16bit 16位	32bit 32位	P	FNC 68	ROTC	旋转台控制指令 Rotary table control
✔					
9步 9steps			指令格式：ROTC S m1 m2 D Instruction format:		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D		✔	✔	✔											
m1	2～32767，m1≧m2														
m2	0～32767， m1≧m2														

该指令是用于旋转工作台上工件取放控制的简捷指令，旋转工作台的位置检测信号需按指定方式配置才能正常工作。 其中：
This instruction is the compact instruction being used to fetch the workpiece on rotary workbench. The position detection signal of rotary workbench shall be configured by

desired method to work properly. Where:

S计数变量的起始单元；

S The initial cell of count variable

m1旋转工作台上的工位数，必须m1 ≧ m2；

m1 is the number of stations on rotary table, and m1 ≧ m2 must be met;

m2旋转工作台上的低速工位数，必须m1 ≧ m2；

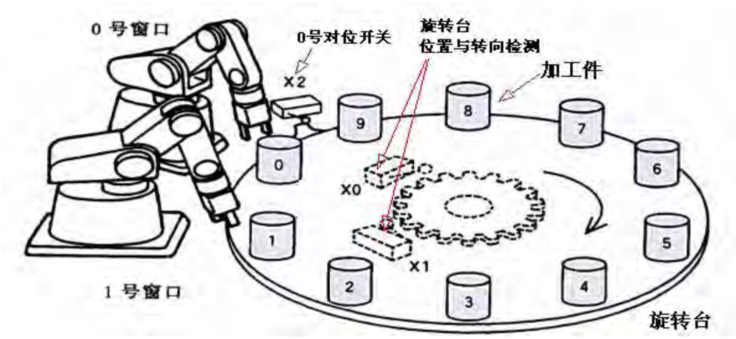
m2 is the number of low-speed stations on rotary table, and m1 ≧ m2 must be met;

D为旋转台位置检测信号存放的起始单元，占用随后的 8 个位变量单元。

D is the initial cell to storage position detection signal of rotary workbench, which occupies the next 8 bit variable units

信号配置方式如下图，图中 X0、X1 分别接 AB 正交编码器的 A 相和 B 相输出信号，也可采用机械开关得到正交相位的信号；X2 接用于 0 号工位的检测输入（当旋转到 0 号工位时为 ON 状态），由此 3 个信号即可检测旋转工作台的当前转动速度和转向和工位。

Signal configuratin is shown in following figure, in which X0 and X1 is connected to phase A and B output signal of AB quadrature encoder repectively or the quadrature phase signal obtained by mechanical switches; X2 is connected to detection input of station 0 (when the rotary table rotates to station 0 the output signal is ON); Then these 3 signals can be used for detecting current rotation speed, direction and station of the rotary table.



0 号窗口

Window 0

1 号窗口

Window 1

0 号对位开关

Alignment switch 0

旋转台

Rotary table

位置与检测

Position and direction detection
加工件
Workpiece
旋转台
Rotary table

应用举例：
Application example:

```
 X10           S      m1    m2     D
─┤├───(ROTC  D200   K10   K2    M0 )
```

该代码实际使用的变量空间说明如下：
The code actually uses the variable space as follows:

<table>
<tr><td>变量
variable</td><td>功能定义
define of function</td><td>操作说明
operation descriptions</td></tr>
<tr><td>D200</td><td>作为计数寄存器使用
Used as counter register</td><td rowspan="3">由用户程序事先设定好该 3 个单元
Pre-configured by the user program of the three units</td></tr>
<tr><td>D201</td><td>调用窗口号码设定
call the set of window number</td></tr>
<tr><td>D202</td><td>调用工件号码设定
call the set of workpiece number</td></tr>
<tr><td>M0</td><td>A 相信号
signal of A phase</td><td rowspan="3">用户程序每次扫描本语句前执行：
User program each scan before the execution of this statement
X0 ─┤├─(M0)
X1 ─┤├─(M1)
X2 ─┤├─(M2)</td></tr>
<tr><td>M1</td><td>B 相信号
signal of B phase</td></tr>
<tr><td>M2</td><td>O 点检测信号
detection signal of O</td></tr>
<tr><td>M3</td><td>高速正转
high speed forword</td><td>当 X10 为 ON 时，可以自动得到 M3~M7 的结果；</td></tr>
</table>

		Result of M3~M7 can be obtained automatically when X10 is ON; 当 X10 为 OFF 时，M3~M7 均为 OFF： When X10 is OFF , M3~M7 a OFF
M4	低速正转 low speed forword	
M5	停止 stop	
M6	低速反转 low speed reverse	
M7	高速反转 high speed reverse	

在后续的用户程序中，将 M3~M7 从 Y 输出口中输出，控制外部执行元件即可。程序中只能使用 1 次 ROTC 指令。

In the following user program，let M3~M7 go out from the Y output to control the external executive components. You can use the instruction ROTC only once in the program

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 69	SORT	数据排序 Data sorting
✔					
11 步 11 steps			指令格式：SORT S m1 m2 D n Instruction format:		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		

m1	常数，1～32 Constant, 1～32														
m2	常数，1～6 Constant, 1～6														
D													✔		
n					✔	✔							✔		

该指令是将 m1 行×m2 列的数组（由　描述），以第 列参数排序后，该指令是将 m1 行×m2 列的数组（由 S m1 m2 描述），以第 n 列参数排序后，存放于由 D 单元起始的变量区域。

This instruction sorts the array of m1 row x m2 column (represented by S m1 m2) according to parameter of the n th column and then stores the result to variable area starting from D component.

其中：Where

S 为第 1 行（或称第 1 条记录）的首个变量的起始单元；

S is the starting unit of the first variable in first line (or called first record);

m1 数组的行数，或称记录数；

m1 is the line number of the array, or called record number;

m2 数组的列数，或称每条记录的栏目数；

m2 is the row number, or called item number in each record;

D 为排序后存放的起始单元，占用随后的变量单元数目与排序前的数组变量数目相同；

D is the starting unit for saving result, occupying following variable unit number is same as that of array before sorting;

n 为以排序为依据的数组列号。

n is the array row number, according which the sort operation is implemented.

其中 n 的值在 1～m2 范围。

Where n ranges from 1～m2.

指令举例：

Example 1 for instruction:

```
 X10      S      m1   m2    D     n
-| |---(SORT D100  K5   K4  D200  K2 )
```

当 X10＝ON 时，开始排序运算，指令执行完毕，M8029 被置 ON；

Sort operation starts when X10=ON, and M8029 is set to ON after the instruction is executed completely;

若需要再次排序，需将 X10＝OFF 一次。

X10 needs to be set OFF once if sort operatin is needed again.

上述指令的等效表格及其数据举例：

S　m2　m1

行号 \ 列号	1 学号	2 语文	3 数学	4 物理
1	D 100 1	D 105 85	D 110 78	D 115 83
2	D 101 2	D 106 82	D 111 91	D 116 81
3	D 102 3	D 107 77	D 112 89	D 117 88
4	D 103 4	D 108 90	D 113 81	D 118 75
5	D 104 5	D 109 87	D 114 95	D 119 77

按指令要求 n ＝K2排序后的表格数据结果：

D　n =K2

行号 \ 列号	1 学号	2 语文	3 数学	4 物理
1	D200 3	D205 77	D210 89	D215 88
2	D201 2	D206 82	D211 91	D216 81
3	D202 1	D207 85	D212 78	D217 83
4	D203 5	D208 87	D213 95	D218 77
5	D204 4	D209 90	D214 81	D219 75

若指令中 n ＝K4，则排序后的表格数据结果如下：

D　n =K4

行号 \ 列号	1 学号	2 语文	3 数学	4 物理
1	D200 4	D205 90	D210 81	D215 75
2	D201 5	D206 87	D211 95	D216 77
3	D202 2	D207 82	D212 91	D217 81
4	D203 1	D208 85	D213 78	D218 83
5	D204 3	D209 77	D214 89	D219 88

上述指令的等效表格及其数据举例：

Equivalent table and relevant data example of above instruction:

按指令要求 n =K2 排序后的表格数据结果：

Sort result of table data according to condition of n =K2:

若指令中 n =K4，则排序后的表格数据结果如下：

Sort result of table data according to condition of n =K4:

行号

Row number
列号
Column number
学号
Student number
数学
Math
语文
Chinese
物理
Physics

4.3.2.8 外围设备 I/O（70~79）

4.3.2.8 external device I/O (70~79）

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 70	TKY	0～9 数字键输入 Key input of digits 0～9
✔	✔				
7 步 7steps	13 步 13steps		指令格式：TKY S D1 D2 Instruction format:		

操作数	位元件 bit component	字元件 Word component

Operands	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔	✔											
D1								✔	✔	✔	✔	✔	✔	✔	✔
D2		✔	✔	✔											

该指令是指定 10 个连续的位变量单元（如 X 输入端口），依次代表 10 进制的 0～9 按键，当有按键动作（状态为 ON）时，以按键的动作顺序，可输入十进制 0～9999 的 4 位数值；若采用 32bit 指令，则可输入十进制 0～99，999，999 的 8 位数值。

This instruction specifies 10 continuous bit variables (such as input terminal) to represent key-presses of decimal 0～9 repectively. Decimal number of 4 digits ranges from 0～9999 can be entered according to press sequence of keys when key-press is operated (the state is ON); 8 digits decimal number ranges from 0～99，999，999 can be entered when 32bit instruction is used.

其中：Where

S

为按键的起始输入端口，使用随后的共 10 个位单元（如 X 端口）；

Is the starting input port of pressing key, occupying the following ten bit units (such as X port);

D1

为已输入数值的存放单元；

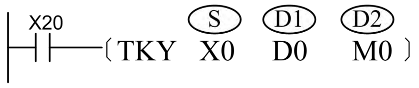
Is the storage unit for inputted value;

D2

为按键组当前状态的暂存起始单元，占用随后的共 11 个位单元。

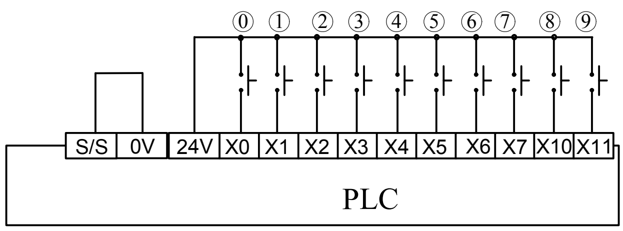
Is the temp starting unit for state of current pressing key group, occupying the following eleven bit 指令举例：

Example 1 for instruction:



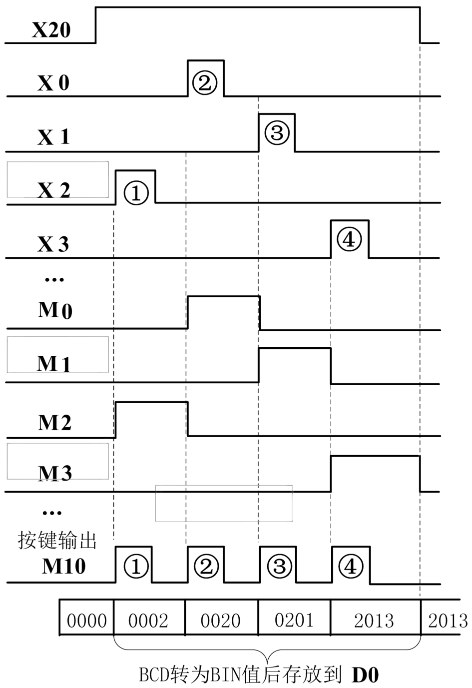
对应的硬件接线如下图：

The corresponding hardware wiring is shown as following:



若要输入数字“2013”，按顺序按键②⓪①③（X2、X0、X1、X3）即可，PLC 内部变量的动作如下图。

If number “2013” is needed then the keys ②⓪①③ should be pressed in order, and the action of internal PLC variables are shown as following:



按键输出

Key-press outpu

BCD 转为 BIN 值后存放到 D0

BCD value is converted to BIN format and stored into D0

由指令中参数的设置，X0～X11 分别对应 0～9 数字键；M0~M9 对应键的状态；当有任何按键按下时，按键输出单元 M10 都会置位；

X0～X11 correspond to digital keys 0～9 according to parameter setting of instruction; M0~M9 correspond to state of keys; key-press output M10 will be set when any key is pressed;

按键值（如 2013）被转换为 BIN 格式后存入指定的 D1 单元 D0；（D0＝0x7DD），即使驱动的能流变为 OFF，D0 也不会改变；

Entered number (for example 2013) is converted to BIN format and then stored into specified D1 cell D0; (D0=0x7DD), and D0 will not change even the driven power flow goes to OFF;

当有多个按键按下时，先检测到的按键有效；当输入的数字超过 4 位后，最先输入的数字变化溢出，只留下输入的最后 4 个数字。

If multiple keys are pressed then earlier pressed keys are effective; If entered number exceeds 4-digits number then the earlier number will overflow and only the final 4-digits number is effective.

若采用 32bit 指令（DTKY），D1 占用 32bit 的变量，对上例即为 D1、D0，分别为高字和低字。

If 32bit instruction is used (DTKY), then D1 occupies 32bit variable. In previous example D1 and D0 are high word and low word repectively.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 71	HKY	16键输入 Hexadecimal key input
16bit 16 位	32bit 32 位	P	FNC 71	HKY	16键输入 Hexadecimal key input
✔	✔				
9 步 9steps	17 步 17steps		指令格式：HKY S D1 D2 D3 Instruction format:		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔														

D1		✔													
D2										✔	✔	✔	✔	✔	✔
D3		✔	✔	✔											

该指令是读取 4×4 矩阵型共 16 个按键，依次代表 10 进制的 0～9 按键，以及 A~F 的功能按键，当有按键动作（状态为 ON）时，以按键的动作顺序，可输入十进制 0～9999 的 4 位数值，或 A~F 的功能键；若采用 32bit 指令，则可输入十进制 0～99，999，999 的 8 位数值，或 A~F 的功能键。

This instruction reads from 16 kyes of 4x4 matrix which represent decimal digital keys 0～9 and function keys A~F. Decimal number of 4 digits ranges from 0～9999 or function keys A~F can be entered according to press sequence of keys when keys are pressed (the state is ON); 8 digits decimal number ranges from 0～99，999，999 or function keys A~F can be entered when 32bit instruction is used.

其中：Where：

S 为按键的扫描输入 X 端口的起始端口号，使用随后的共 4 个 X 端口；

S is the number of the starting port of the scanning input port X of the keys, 4 X ports starting with which will be used;

D1 为按键的扫描输出 Y 端口的起始端口号，使用随后的共 4 个 Y 端口；

D1 is the starting port button of scanning output Y port, and it uses the four succeeding Y ports.

D2 为按键输入值存放单元，0~9999；当为 32bit 指令时可输入 0～99，999，999 范围内的数值；

D2 is the storage cell of input number which ranges from 0~9999; 8 digits decimal number ranges from 0～99，999，999 can be entered when 32bit instruction is used;

D3 为按键输入状态起始单元地址，共占用连续的 8 个位变量单元。

D3 is the address of the starting unit of the entering status of the keys, which occupies a variable unit of 8 continuous bits.

此指令只能用于晶体管输出型 PLC。

This instruction can only be used for transistor-output type PLC.

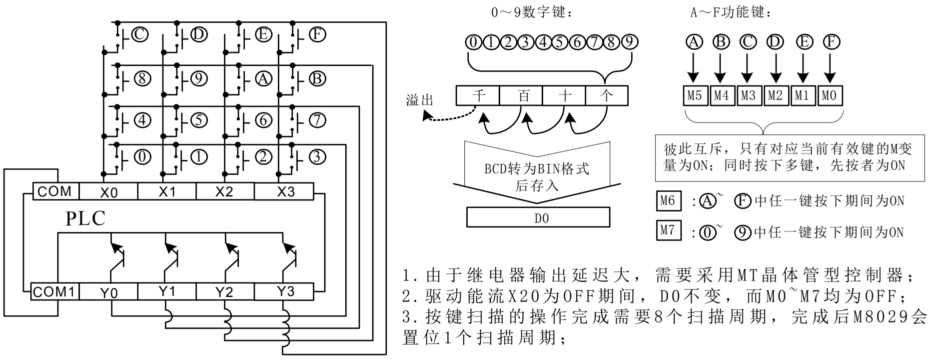
指令举例：

Example 1 for instruction:

```
 X20          S    D1   D2    D3
|-| |---[HKY  X0   Y0   D0    M0 ]
```

对应的接线图及参数响应说明如下：

The corresponding wiring diagram and parameter responses are described as below:



0~9 数字键：

Digital keys 0~9:

A~F 功能键

Function keys A~F

溢出 千 百 十 个

Overflow thousands hundreds tens units

BCD 转为 BIN 格式后存入

BCD number is converted to BIN format and stored

彼此互斥，只有对应当前有效键的 M 变量为 ON；同时按下多建，先按者为 ON

Mutually exclusive to each other, only ON for M component corresponding to current effective key; If multiple keys are pressed then earlier pressed key is ON

A~F 中任一键按下期间为 ON

0~9 中任一键按下期间为 ON

ON while any one of keys A~F is pressed

ON while any one of keys 0~9 is pressed

1. 由于继电器输出延迟大，需要采用 MT 晶体管型控制器；
2. 驱动能留 X20 为 OFF 期间，D0 不变，而 M0~M7 均为 OFF；
3. 按键扫描的操作完成需要 8 个扫描周期，完成后 M8029 会置位一个扫描周期；

1. MT transistor type controller should be used because relay has large output delay;
2. While driving power flow X20 is OFF then D0 doesn't change and are M0~M7 OFF;
3. The key scan operation will take 8 scan cycles and after its completion M8029 will set a scan cycle;

由于键扫描操作需要多个执行周期完成，为避免 X 端口滤波的影响，请采用“恒定扫描”模式，或定时中断处理。

Since key scan operation needs several operating cycles, “constant scan" mode or timing interruption process should be used to avoid influence of X terminal filter.

扩展功能说明：

Extented function description:

当将特殊变量 M8167 置为 ON，本指令将⓪～Ⓕ按键按 16 进制数据进行存储，保存到 D2 单元。

If the special variable M8167 is set to ON, then this instruction will store the keys ⓪～Ⓕ to D2 cell as hexadecimal value.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16 位	32bit 32 位	P	FNC 72	DSW	读取数字开关设定 Read digital switch setting
✔					
9 步 9steps			指令格式：DSW S D1 D2 n		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔														
D1		✔													
D2											✔	✔	✔	✔	✔
n	常数，n＝1～2 Constant, n＝1～2														

该指令是读取矩阵型设置开关的状态，以 4 个 BCD 设定开关为 1 组，将设定值读取后存放到指定单元，最多可读取 2 组设定开关。其中：

The instruction is used to read the status of matrix-setting switch. One set includes four BCD setting switches. After settings are read, they will be saved in the designated units. Two are the maximum number of switch sets that can be read, where:

S 为按键的扫描输入 X 端口的起始端口号，若 n ＝1，使用随后的共 4 个 X 端口；若 n ＝2，则使用随后的共 8 个 X 端口；

S is the start terminal number of key scanning X terminal. If n ＝1 then the following 4 X terminals will be used; If (n) =2 then the following 8 X terminals will be used;

(D1)为按键的扫描输出 Y 端口的起始端口号，使用随后的共 4 个 Y 端口；

(D1) is the starting port button of scanning output Y port, and it uses the four succeeding Y ports.

(D2)为按键输入值存放单元，0~9999；

(D2) is the storage cell of key input value, 0~9999；

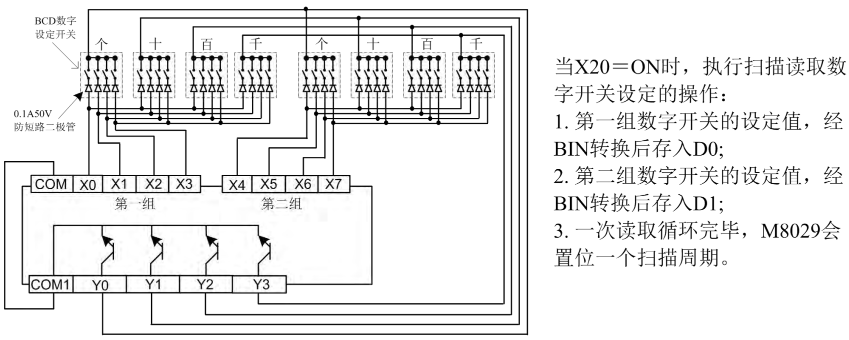
(n) 为数字设定开关的组数，只能取 1～2。

(n) is the number of switch set. Only 1~2 can be selected.

指令举例：

Example 1 for instruction:

```
 X20                S    D1   D2    n
─┤├──〔DSW   X0   Y0   D0   K2 〕
```



BCD 数字设定开关

BCD digital switch

0.1A50V 防短路二极管

Short-circuit-proof diode of 0.1A50V

当 X20=ON 时，执行扫描读取数值开关设定的操作：

1. 第一组数字开关的设定值，经 BIN 转换后存入 D0；
2. 第一组数字开关的设定值，经 BIN 转换后存入 D1；
3. 一次读取循环完毕，M8029 会置位一个扫描周期。

When X20=ON, the scan and read operation of digital switch setting will be executed:

1. Setting value of the first group digital switch is converted to BIN format and stored to D0;

2. Setting value of the second group digital switch is converted to BIN format and stored to D1;

3. M8029 will set a scan cycle after completion of one read cycle.

使用说明：

Instruction for use:

需要使用晶体管输出型 PLC 才能正常检测数字开关；

Only the PLCs with transistor outputs can detect the digital switch.

一个数字开关设定的读取操作需要多个扫描周期才能完成，若采用按键启动读取操作，建议采用如下程序语句，保证可读取周期的完整：

The READ operation of one digital switch requires multiple scanning cycles to complete. If the READ operation is activated using buttons, it is recommended to use the following programming statements to ensure the readable cycle’s integrity.

```
 X20
─┤├──(SET  M1)
 M1
─┤├──(DSW  X0   Y0   D0   K2)
 M8029
─┤├──(RST  M1)
```

16bit 16位	32bit 32位	P	FNC 73	SEGD	七段码译码 Seven segment decoder
✔		✔			
5步 5steps		5步 5steps	指令格式：SEGD (S) (D) Instruction format:		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔

该指令是数据源的低 4 位，翻译成 7 段显示码，存放到目的变量的低 8 位中。 其中：

This instruction is to translate the low 4 bites of the data source into 7 segment display code, and store it into the low 8 bits of the destination variable.

S 为待译码的数据源（取 BIN 内容的最低四个位 b0~b3）；

S is the data source waiting to be translated (take the lowest 4 bits b0~b3 of BIN content);

为译码后存放 7 段码的变量。

D is the variable depositing the 7 yards after decoding.

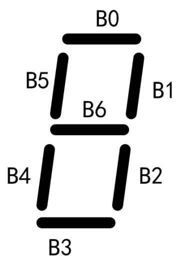
指令举例：

Example 1 for instruction:

```
  X20          S      D
──┤├──〔SEGD   D0   K2Y10〕
```

操作是，当 X20 为 ON 时，将 D0 内数据低 4 位译码后，输出到 Y10～Y17 端口。翻译用的对应表如下表。该表格不需用户准备，PLC 系统内部已具备该对照表。

Operations, when X20 is in the state of ON, translate the low 4 bits of the data storing in D0, and output to port Y10~Y17. The corresponding table used for translating, as follows. The users do not need to prepare the table, the PLC system has already had the check list.

数　据		数码管组合	内部译码表值								译码后字符
HEX数	BIN数		B7	B6	B5	B4	B3	B2	B1	B0	
0	0000	 每位对应一个笔段 1＝笔段点亮 0＝笔段熄灭	0	0	1	1	1	1	1	1	0
1	0001		0	0	0	0	0	1	1	0	1
2	0010		0	1	0	1	1	0	1	1	2
3	0011		0	1	0	0	1	1	1	1	3
4	0100		0	1	1	0	0	1	1	0	4
5	0101		0	1	1	0	1	1	0	1	5
6	0110		0	1	1	1	1	1	0	1	6
7	0111		0	0	0	0	0	1	1	1	7
8	1000		0	1	1	1	1	1	1	1	8
9	1001		0	1	1	0	1	1	1	1	9
A	1010		0	1	1	1	1	0	1	1	A
B	1011		0	1	1	1	1	1	0	0	b
C	1100		0	1	1	1	1	0	0	1	C
D	1101		0	1	0	1	1	1	1	0	d
E	1110		0	1	1	1	1	0	0	1	E
F	1111		0	1	1	1	0	0	0	1	F

数据

Data

HEX 数　BIN 数

HEX number BIN number

数码管组合

Nixie tube

内部译码表值

Internal decoding table

译码后字符

Decoded character

每位对应一个笔段

Each bit corresponds to a segment

1=笔段点亮
1=segment illuminated
0=笔段熄灭
0=segment extinguished

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 74	SEGL	七段码扫描显示 7-segment scanning display
✔					
7步 7steps			指令格式：SEGL S D n Instructin format:		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D		✔													
n	常数，n＝0~7 constant, n=0~7														

该指令是利用 8 个或 12 个 Y 端口，用于 4 位或 8 位七段锁存数码管的显示驱动，显示方式为扫描驱动方式。 其中：

This instruction uses 8 or 12 Y ports for the display driver of the 4 or 8-bit seven-segment digital tube latch, the display mode is the scan driver mode. Where:

S 为待显示的数据，其值在 BCD 转换后才送到数码管进行显示；

S is the data to be displayed, its value will be sent to the digital tube for display after BCD conversion.

D 为显示驱动用的 Y 端口起始地址号；

D is the start address number of the port used for display driver;

n 为根据显示数据的组数、信号正负逻辑等相关的设定值，见下面的详细描述。

n is the settings related of the data show’s group number、signal’s positive and negative logic and etc. .You can see the following detailed description of n .

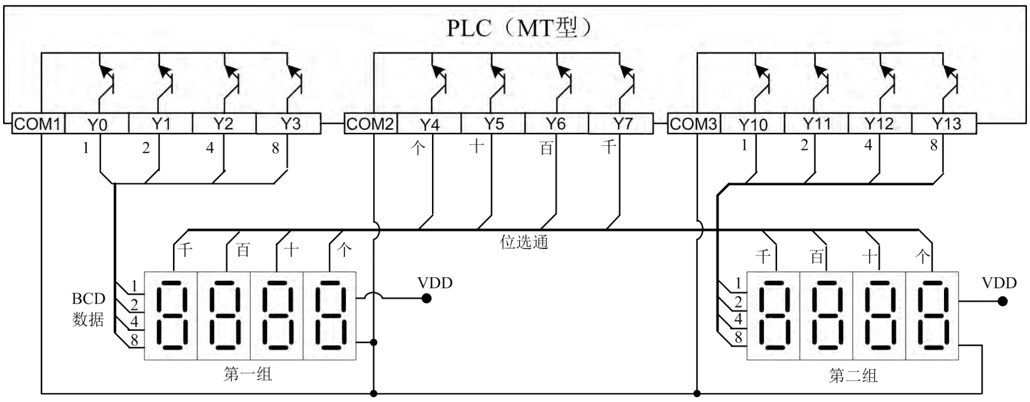
指令举例：

Example 1 for instruction:

```
 X10            S     D     n
─┤├──〔SEGL    D0    Y0    K6〕
```

对应的硬件接线如下图，在第一组数码管上显示 D0 的内容，在第二组数码管上显示 D1 的内容，若 D0 或 D1 的读数超过 9999，程序运行就会出错：

Corresponding hardware connection is as follows. The contents of D0 are displayed in the first group of digital tube, the contents of D1 are displayed in the second group of digital tube and the procedure operation will run error when D0 or D1’s numerical reading exceeds 9999:



BCD 数据

BCD data

千　百　十　个

Thousands hundreds tens units

第一组

1st group

PLC（MT 型）

PLC (MT type)

位选通

Bit selection

第二组

2nd group

接线图中所使用的数码管，自带显示数据锁存、7 段译码和驱动、负逻辑型（输入端口为低电平时，表示输入的数据为 1，或被选通）的 7 段数码显示管。显示处理中，PLC 的 Y4~Y7 端口会自动循环扫描，每次只有 1 个端口为 ON，作为位选通信号，此时 Y0~Y3 口上的数据即为送给对应位的 BCD 码数据，当位选通信号由 ON→OFF 时，即被锁存到数码管内的锁存器中，经过内部的译码和驱动后，数码管将数字显示出来。

The digital tubes in the wiring diagram come with the data show’s latch, decoding and driving of 7 segment digital tube, negative logic type (the input data is considered as 1, or strobe when input port is low) 7-segment digital display tubes.During display process Y4~Y7 terminals of PLC will automatically repeatedly scan, and each time only one terminal can be ON as a bit selection signal, at this time the data on Y0~Y3 terminals is the BCD data which is sent to corresponding bits. When the bit selection signal changes from ON to OFF the data will be latched to the flip-latch of the nixie tube, and after internal decoding and drive the number will be displayed.

PLC 系统依次将 Y4～Y7 循环作同样处理，直到将 4 位都处理完毕。同样的道理，Y10~Y13 是第二组 4 位数码管的数据输出端口，共用 Y4~Y7 的位选通线，处理方法相同，两组的显示处理是同时进行的。 范例中若 D0=K2468，D1=K9753，则第一组将会显示 2 4 6 8，第二组显示 9 7 5 3。

PLC systems will deal with Y4 ~ Y7 cycle in turn and by the same process until all the 4 bits has been processed. Similarly, Y10 ~ Y13 is the second group data output port of 4-bit digital tubes and share Y4 ~ Y7 bit strobe line, so the process is in the same and both groups’ display is processed at the same time. For the example, the first group will display 2468 and the second group will display 9753 when D0=K2468，D1=K9753.

完成一次显示刷新需要 12 个扫描周期，处理完成后，M8029 标志置 ON。

12 scan cycles are needed to complete a time of display refresh, and after that M8029 will be set to ON.

n 的选择：根据可编程控制器的正负逻辑、七段码的正负逻辑等因素，按以下原则选择：

一组 4 位数的时候 n=0~3。 二组 4 位数的时候 n=4~7

The choice of n: according to the effects of positive and negative logic of PCL、7 segment code and so on, it can be select by following principle:

If there is one group has 4 digits, n=0~3.If there are two groups have 4 digits, n=4~7.

显示组数 Display group number	1 组 1st group				2 组 2nd group			
Y 数据输出极性 Output polarity of Y data	PNP		NPN		PNP		NPN	
选通与数据极性 Gating selection	相同 Sam	相反 rever	相同 same	相反 rever	相同 sam	相反 rever	相同 sam	相反 rever

and data polarity	e	se		se	e	se	e	se
n 的取值 Value of n	0	1	2	3	4	5	6	7

PLC 的晶体管输出极性与 7 段显示器的输入极性是否相同或者是不同时，可透过参数 n 的设置值来相互匹配

When the polarity of PLC's transistor output and the input polarity of 7 segment display is equal or not, it can match by the set-value of n.

H1U/2U 系列晶体管输出型的 Y 输出极性为 NPN 型。

Y output polarity of H1U/2U series transistor type PLC is NPN type.

该指令在程序中最多只能使用 2 次。

This instruction only can be used twice.

使用说明：

Instruction for use:

由于继电器不适合较高频率的扫描输出动作，晶体管输出型 PLC 才能使用该指令。

Since relay is not suitable for high frequency scaning output operation, this function can only be used by transistor type PLC.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit 16位	32bit 32位	P	FNC 75	ARWS	方向开关 Directive switch
✔					
9步 9steps			指令格式：ARWS S D1 D2 n Instruction format:		

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z

操作数 Operands	位元件 bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔	✔											
D1											✔	✔	✔	✔	✔
D2		✔													
n	常数，n＝0~3 Constant, n=1~3														

该指令可指定 X 作为编辑按键、Y 端口驱动 4 位 7 段数码管，用作寄存器的参数编辑的简易界面。其中：

The instruction specifies X as the edit key, and the Y port is a 4-digit, 7-fragment nixie tube, which is used as a simple interface for registering edited parameters, where:

S 为指定按键输入的起始地址，占用后续的共 4 个位单元；

S is the start address of key-press input which occupies the following 4 bit cells;

D1 用于被显示及修改的变量，只能显示一个 16bit 宽度的变量；

D1 is used for displayed and modified variables, and it only can display a variable of 16bit width;

D2 用作数码管显示驱动的 Y 端口起始地址，占用后续的共 8 个 Y 端口；

D2 is used as the start address of Y terminal for driving the nixie tube display, and it occupies the following 8 Y terminals;

n 为信号逻辑的设定值，参见前面 SEGL 指令中关于 n 的详细描述。

n is the setting value of signal logic, please refer to above detailed description of n in SEGL instruction.

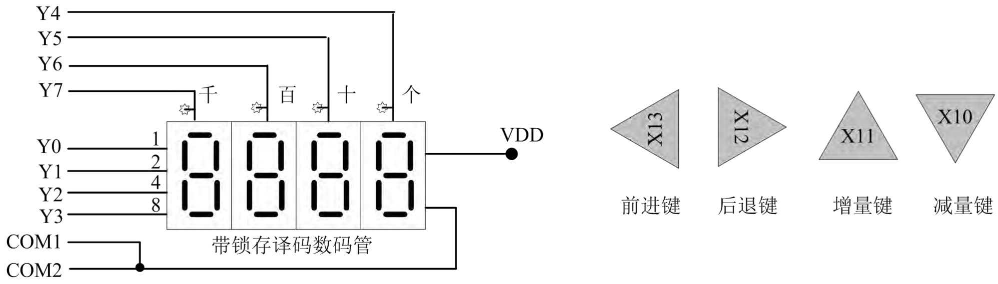
指令举例：

Example 1 for instruction:

```
 X20          S     D1   D2   n
─┤├──〔ARWS  X10   D0   Y0   K2〕
```

对应的硬件接线如下图所示，PLC 应为晶体管输出型：

The corresponding hardware wiring is shown in the following figure, in which PLC is the transistor output type:



操作方法：

Operation method:图中数码管显示 D0 的数值，按下 X10~X13 可修改其中的数值，D0 的数值只能在 0～9999 之间；

The number of D0 is displayed in the nixie tube as shown in the figure, and the number can be modified by pressing X10~X13 and the range of D0 is 0～9999;

当 X20 为 ON 时，光标位为千位。每次按后退键（X12）时，指定位按“千→百→十→个→千”的顺序切换；若按前进键（X13），则切换顺序相反；光标位由选通脉冲信号（YO04~YOO7）连接的 LED 指示；

When X20 is ON the cursor will flash on the thousands position. The cursor will switch in the order of “thousands→hundreds→tens→units→thousands” every time pressing the backward key (X12); The switch sequence is reverse while pressing forward key (X13); Cursor position is indicated by LED connected to the gating selection pulse signals (YO04~YOO7);

对于光标位，每次按增量键（X11）该位的内容按 0→1→2→……8→9→0→1 变化。按减量键（X10）时，则按 0→9→8→7→……→1→0→9 变化，修改的值立即生效。

The number of flashing cursor positon will change in the order of 0→1→2→……8→9→0→1 every time pressing increase key (X11). The number will change in the order of 0→9→8→7→……→1→0→9 when pressing decrease key (X10). The modified value will take effective immediately.

指令使用说明：

Instruction for use:

当用户程序扫描时间短时，请使用恒定扫描模式，或在定时中断内按固定时间间隔运行。

When the scan time in the user program scan time is short, please use the constant scan mode instead, or scan in constant intervals using the interrupt timer.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

16bit	32bi	P	FNC	ASC	ASCII 转换

16 位	t 32 位		76		ASCII conversion
✔					
11 步 11 steps			指令格式：ASC S D Instruction format		

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	在指令输入时，由常数变量输入，允许长度为 8 个字符。 When inputting instruction, it is inputted by a constant 8 characters in length.														
D											✔	✔	✔		

S 为欲执行 ASCII 码变换的英文字母，由计算机输入，最大允许长度为 8 个字符；

S is the English character which will be converted to ASCII code and it's entered from computer, and the permissible maximum length is 8 characters;

D 为存放 ASCII 码的起始单元号，占用随后的共 4 个（M8161=0）或 8 个变量单元指令（M8161=1）。

D stores the starting cell number of ASCII code and it occupies the following 4 (M8161=0) or 8 (M8161=1) variable cells.

举例：

Example:

	高字节	低字节
D200	54（t）	53（S）
D201	50（p）	4F（o）
D202	45（e）	50（p）
D203	20	44（d）

当 X20=ON 时，D200~D2003 的赋值如右图

The right figure shows the evaluation of D200~D2003 when X20=ON

高字节

High byte

低字节

Low byte

若将特殊寄存器 M8161 置为 ON，则每个 ASCII 字符在转换后占用 1 个 16bit 变量，如下图，每个变量的高字节填 0 处理：

If the special register M8161 is set to ON, every ASCII character occupies one 16bit variable after conversion, which is shown in the following figure, and the higher byte of every variable is set to 0.

	高字节	低字节
D200	00	53（S）
D201	00	54（t）
D202	00	4F（o）
D203	00	50（p）
D204	00	50（p）
D205	00	45（e）
D206	00	44（d）
D207	00	20

高字节
High byte
低字节
Low byte
附：《 ASCII 代码对照表 》
Attached: "ASCII code parallel fable”

10 进制位 Decimal digit	ASCII (16 进制数) ASCII code (Hexadecimal number)
0	30
1	31
2	32
3	33
4	34
5	35
10 进制位 Decimal digit	ASCII (16 进制数) ASCII code (Hexadecimal number)
6	36
7	37
8	38
9	39

英语字母	ASCII(16	英语字母	ASCII(16

English letter	进制) ASCII (sexadecimal)	English letter	进制) ASCII (sexadecimal)
A	41	N	4E
B	42	O	4F
C	43	P	50
D	44	Q	51
E	45	R	52
F	46	S	53
G	47	T	54
H	48	U	55
I	49	V	56
J	4A	W	57
K	4B	X	58
L	4C	Y	59
M	4D	Z	5A

代码 Code	ASCII（16 进制) ASCII (sexadecimal)
STX	02
ETX	03

16bit 16 位	32bit 32 位	P	FNC 77	PR	ASCII 打印输出 ASCII print output
✔					
5 步 5steps			指令格式：PR S D Instruction format:		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operands	位元件 bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S											✔	✔	✔		
D		✔													

该指令将指定变量单元的数值，通过 Y 输出端口以同步方式逐个字节对外输出。其中：

This instruction is used to output the values of the specified variable units byte by byte synchronously through the Y output port. Where:

S为待输出的变量单元起始地址；

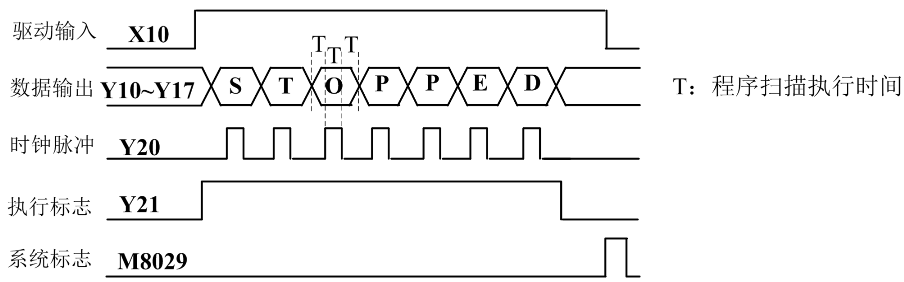
S is the starting address of the variable units to be output;

D为进行输出打印的的 Y 端口起始号。

D is the starting number of the Y port for output print.

指令举例：
Example 1 for instruction:

若 D200~D203 中的 ASCII 码为“STOPPED”，则对应的输出端口信号及其时序如下图：
If the ASCII code of D200~D203 is “STOPPED”, then the corresponding output terminal signal and its timing sequence are shown as follows:



驱动输入
Drive input
数据输出
Data input
时钟脉冲
Clock pulse
执行标志
Execution flag
系统标志
System flag
T：程序扫描执行时间
T:　program scan time
当 020 有效时，执行 ASC 指令，将字符串“STOPPED”转换成相应 ASCII 码存放在 D200~D203 中；当 X021 有效时，执行 PR 打印指令，将 D200~D203 中存放的 ASCII 码数据按“S→T→O→P→P→E→D”的顺序依次经 Y10~Y17 发送到外部显示器进行打印。
If 020 is effective and ASC instruction is executed, then the string “STOPPED” will be converted to ASCII code and stored in D200~D203; If X021 is effective and PR print instruction is executed, then the ASCII code stored in D200~D203 will be transferred in the order of “S→T→O→P→P→E→D” through Y10~Y17 to external display and be printed out.
使用说明：
Instruction for use:

　　必须使用晶体管输出型 PLC，才能完成该指令功能；
The function of this instruction can only be implemented by using transistor type PLC;

打印过程中，驱动信号 X10 变为 OFF 时，打印输出即被中断。
If the drive signal X10 changes to OFF during print process, then the print output will be interrupted immediately.
X10 再次为 ON 时，打印动作重新开始
The printing action will start again when X10 is ON;
打印输出过程中，遇到“00”的字符时，会自动结束打印操作，之后的文字不再处理；
If the character “00” is processed during print out process, then the print operation will be ended automatically and the following characters will not be processed any more;
M8027=Off 时，最多可执行 8 个字符的串行的输出；当 M8027=On 时，则可执行 1~16 个字符的串行输出；
If M8027=Off then maximum 8 characters can be serially output; If M8027=On then 1~16 characters can be serially output;
M8027 为 Off 时：能流无效后 M8029 不动作；
If M8027 is Off, then M8029 will not operate after the power flow is ineffective;
M8027 为 ON 时： M8029 完成标志在驱动能流信号无效后会置 ON；
If M8027 is ON, then M8029 flag will set to ON after the driving power flow is ineffective;
指令按扫描周期（图中 T）执行，若扫描周期短时，请用恒定扫描模式；若过长则可以在定时中断程序中执行。
This instruction executes according to the scan period (T in the figure). If the scan period is short please use constant scan mode; If the scan period is too long then it can be executed in the timing interruption routine.

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit 16位	32bit 32 位	P	FNC 78	FROM	BFM 区读取 Read BFM area
✔	✔	✔			
9 步 9steps	17 步 17 steps		指令格式：FROM m1 m2 D n Instruction format:		

操 作 数	位元件 bit component	字 元 件 Word component

Operands	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D								✔	✔	✔	✔	✔	✔	✔	✔

m1=0～7（本地），100+站号（远程）；
m1=0～7（local），100+station number（remote）；
m2=0～32767；
n=1～32767；

D 元件指定时，16bit 指令可用 K1~K4；32bit 指令可用 K1~K8；m1，m2，n 不支持字符装置 D 寄存器

If D is specified then K1~K4 can be used for 16bit instruction and K1~K8 can be used for 32bit instruction; m1，m2，n don't support character device D register

该指令用于读取特殊扩展模块的 BFM 区寄存器的数据读取操作。 其中：
The instruction is used to read the data retrieval operation of the BFM register in the special extended module.。where:

m1 为扩展模块的地址编号：

m1 is the address number of extension module:

在本地扩展模块中，取值范围 0～7，最靠近主模块的为 0，依次编号，最多允许有 8 个本地扩展模块。
The address number can be selected from 0～7 for local extension module. The extension module which is closest to main module is number 0 and so forth. Maximum 8 local extension modules are permissible.
适用于本地模拟量模块、温度模块等，不能用于本地数字量扩展模块。
It applies to local analogue module, temperature module and etc, and it can't apply to local digital extension module.
在远程扩展模块中，取值范围为模块通信站号+100，最多允许有 63 个远程扩展模块。
The address number range is module station number+100 for remote extension module. Maximum 63 remote extension modules are permissible.
适用于所有远程扩展模块，包括远程数字量扩展模块，需注意本地数字量模块和远程数字量模块的使用区别；
It applies to all kind of remote extension module including remote digital extension module, but the differences of usage between local digital module and remote digital module must be noticed;

m2 为特殊模块内 BFM 的寄存器地址号，取值范围 0～32767；

m2 is the register address code of BFM inside the special module. It has values ranging from 0~32767;

D 为读取参数在主模块中的存放地址，当读取的寄存器数多于 1 个时，占用随后的单元；

D is the storage address after reading the parameters in the main module. When the number of register read is more than one, it occupies the following units.

n 本次读取参数的个数（按 Word 计算），取值范围 1～32767，为按寄存器地址依次读取。

n The number of parameters read during the operation (counted by Word). It has values ranging from 1~32767. The values will be read in sequence according to the register addresses.

注意 H1U 只能使用远程扩展模块。
Please note that H1U only can use remote extension module.
指令举例一：
Example 1 for instruction:

```
 X0              m1   m2    D     n
─┤├──〔FROM      K1   K20  D200   K1〕
```

访问本地扩展模块，表示当 X0 为 ON 时，将#1 号特殊模块中的第 20 号地址（16bit 宽度）的内容读出到 PLC 的 D200 寄存器中，一次读取一笔（n=1）。
Access local extension module: when X0 is ON then the content of address of number 20 (16bit) in #1 special module will be read out to D200 register of the PLC, one at a time (n=1).
当 X0 为 OFF 时，不执行操作。
When X0 is OFF, no operation will be executed.
指令举例二：
Example 2 for instruction:

```
 X0              m1     m2    D      n
─┤├──〔FROM      K101   K9   D200   K1〕
```

访问远程扩展模块，假设访问的是 H2U-4ADR
K101 代表（100+站号 1）；远程模块在使用 FROM/TO 指令时，增加站号偏移 100。
K9 表示 4AD 模块的 BFM9。
D100 表示读出的 BFM9 放在 PLC 的 D0 中
K1 表示读取 1 个 16 位 BFM。
Access remote extension module which is assumed to be H2U-4ADR
K101 represents (100+station number 1); The station offset will be increased 100 when FROM/TO instruction is used by remote module.
K9 represents BFM9 of the 4AD module.
D100 means that BFM9 which is read out is stored in D0 of the PLC
K1 means that a 16bit BFM will be read.
指令举例三：
Example 3 for instruction:

```
M8000              m1     m2    D      n
─┤├──┬─〔FROM    K101   K0   D200   K1〕
     │
     └─〔MOV  D200  K4M100〕
```

本例子介绍远程数字量扩展模块 H2U-1600ENDR 的访问方法，因为 16 点的输入模块用一个 BFM 区代表了所有的输入点，即 BFM 区的 K0（一个寄存器）的每个位即为每个输入点，故可以将模块的状态读取回来后用 MOV D200 K4M100 来分别取位，此时 M100~M107 为远程模块的 X0~X7，M108~M115 为远程模块的 X10~X17，我们可以通过读取 M100~M115 就能读取 X0~X17 的状态，注意：为了保证能读取到数字量扩展模块输入点的最新状态，请使用 M8000 来驱动 FROM 指令，在每个扫描周期都能更新。

Here the method of accessing remote digital extension module H2U-1600ENDR will be introduced in this example. Since the 16 points input module uses a BFM area to represent all input points and each bit of K0 (a register) in BFM area corresponds to one input point, the module state can be read back and then fetch each bit from it through MOV D200 K4M100. At this time M100~M107 represents X0~X7 of the remote module, and M108~M115 represents X10~X17 of the remote module, so we can read the status of X0~X17 through reading M100~M115. Note: Please use M8000 to drive the FROM instruction to ensure the latest status of input points in the digital extension module can be read, and the status can refresh in each scan period.

当用 32bit 指令时， 指定的地址为低 16bit 地址， ＋1 为高 16bit 地址。

When using 32bit instruction, the specified address is lower 16bit address, +1 is higher 16bit address.

适用机型 Applicable Models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit	32bit	P	FNC 79	TO	BFM 区写入 Write to BFM area
✔	✔	✔			
9 步 9	17 步		指令格式：TO m1 m2 D n		

steps	17 steps		Instruction format:

操作数 Operand	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
D								✔	✔	✔	✔	✔	✔	✔	✔

m1=0～7（本地），100+站号（远程）；
m1=0～7 (local)，100+station number (remote);
m2=0～32767；
n=1～32767；

元件指定时，16bit 指令可用 K1~K4；32bit 指令可用 K1~K8；m1，m2，n 不支持字符装置 D 寄存器

If D is specified then K1~K4 can be used for 16bit instruction and K1~K8 can be used for 32bit instruction; m1，m2，n don't support character device D register

该指令用于向特殊扩展模块的 BFM 区寄存器的作数据写入操作。 其中：
The instruction is used to implement data writing operation to BFM register in specially extended module. Where:

m1 为特殊扩展模块的地址编号：

m1 is the address number of special extension module;

在本地扩展模块中，取值范围 0～7，最靠近主模块的为 0，依次编号，最多允许有 8 个本地扩展模块。 适用于本地模拟量模块、温度模块等，不能用于本地数字量扩展模块。
The address number can be selected from 0～7 for local extension module. The extension module which is closest to main module is number 0 and so forth. Maximum 8 local extension modules are permissible. It applies to local analogue module, temperature module and etc, and it can't apply to local digital extension module.
在远程扩展模块中，取值范围为模块通信站号+100，最多允许有 63 个远程扩展模块。 适用于所有远程扩展模块，包括远程数字量扩展模块，需注意本地数字量模块和远程数字量模块的使用区别；
The address number range is module station number+100 for remote extension module. Maximum 63 remote extension modules are permissible. It applies to all kind of remote extension module including remote digital extension module, but the differences of usage between local digital module and remote digital module must be noticed.

m2 为特殊模块内 BFM 的寄存器地址号，取值范围 0～32767；

m2 is the register address code of BFM inside the special module. It has values ranging from 0~32767;

D 为主模块中参数寄存器地址，其参数作为写操作数据的来源。 当写操作的寄存器数多于 1 个时，占用随后的单元；

D is the parameter register address in main module, and the parameters can taken as the source of writing operation data. When the register for writing operation is more than one, the following units can be occupied;

n 本次写入参数的笔数，取值范围 1～32767，为按寄存器地址依次写入。

n is the number of written parameters with the range of 1~32767, which could be written in turn according to register address.

注意 H1U 只能使用远程扩展模块。

Please note that H1U only can use remote extension module.

指令举例一：

Example 1 for instruction:

```
 X1         m1    m2    D      n
─┤├──〔TO   K1    K24   D220   K1〕
```

表示当 X1 为 ON 时，将 PLC 的 D220 寄存器中的数据，写入到#1 号特殊模块中的第 24 号地址中，一次只写入 1 一笔。 当 X1 为 OFF 时，不执行操作。

When X1 is ON, the data saved in PLC D220 register can be written to the No. 24 address in #1 special module, each for one time. When X1 is OFF, the operation will not be implemented.

指令举例二：

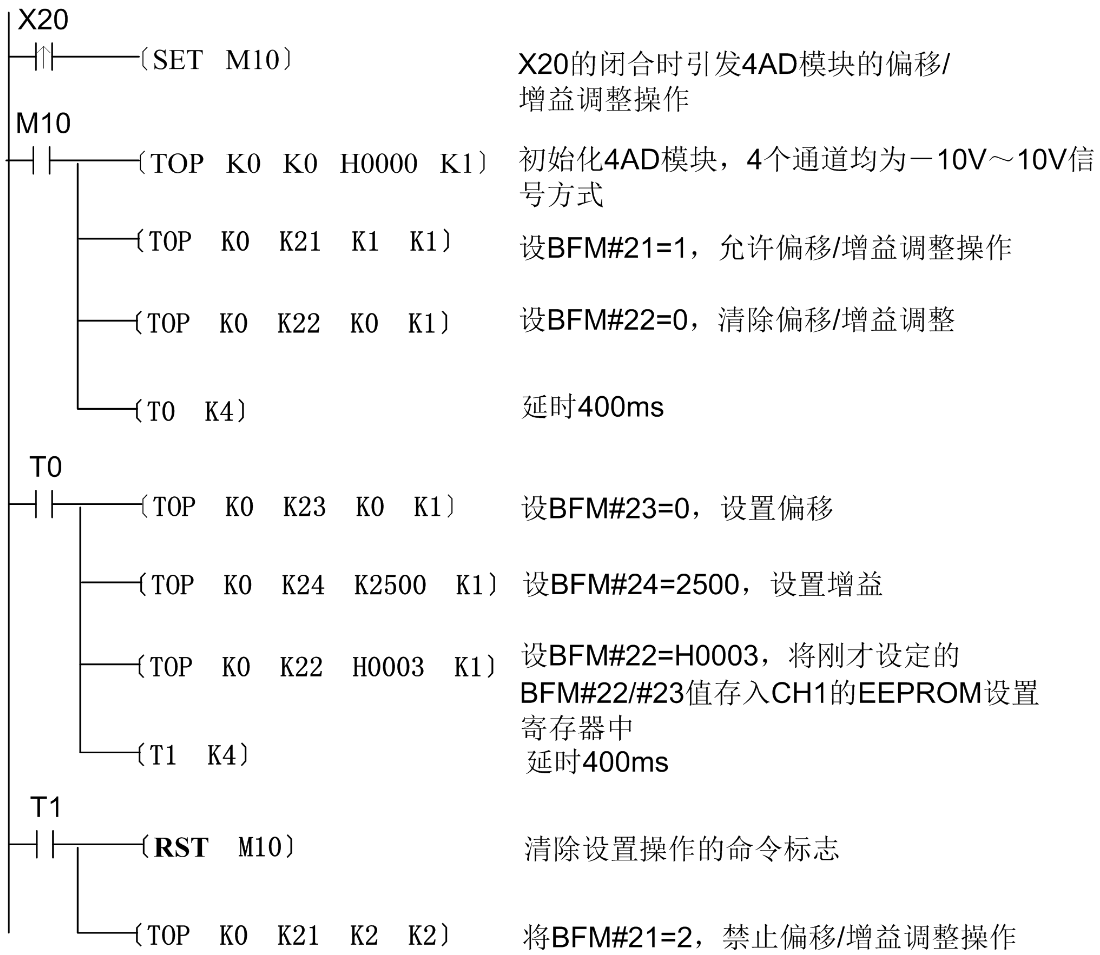
Example 2 for instruction:

```
 M8000
─┤├──┬──〔MOV  K4M100  D100〕
     │
     │          m1     m2    D      n
     └──〔TO    K101   K0    D100   K1〕
```

本例子介绍远程数字量扩展模块 H2U-0016ERDR 的访问方法，因为 16 点的输入模块用一个 BFM 区代表了所有的输出点，即 BFM 区的 K0（一个寄存器）的每个位即为每个输出点，故可以将全部输出点的状态放到一个字里面后再传送到模块里面去，例子中 M100~M107 为远程模块的 Y0~Y7，M108~M115 为远程模块的 Y10~Y17，我们可以通过改变 M100~M115 就可以改变远程模块中 Y0~Y17 的状态，在远程数字量输出模块中，可以在每次更新输出点后再驱动 TO 指令，也可以用 M8000 来驱动。

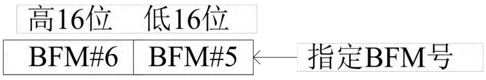
Here the method of accessing remote digital extension module H2U-0016ERDR will be introduced in this example. Since the 16 points input module uses a BFM area to represent all input points and each bit of K0 (a register) in BFM area corresponds to one input point, the state of all input points can be placed in a word and then transferred into the module. At this time M100~M107 represents X0~X7 of the remote module, and

M108~M115 represents X10~X17 of the remote module, so we can change the status of Y0~Y17 in the remote module through changing M100~M115. The TO instruction can be either driven after each time the output point is refreshed or by M8000.
指令举例三：
Example 3 for instruction:
对一个＃0 编号地址的 H2U-4AD 模块的 CH1 通道作偏移/增益设置操作，编程如下：
An example code of setting offset/gain operation for H2U-4AD module CH1 channel with #0 number address is listed as following:



X20 的闭合时引发 4AD 模块的偏移/增益调整操作
Offset/gain adjustment of 4AD module when X20 is closed
初始化 4AD 模块，4 个通道均为-10V~10V 信号方式
Initialization of 4AD module, all the 4 channels are -10V~10V signal type
设 BFM#21=1,允许便宜/增益调整操作
Set BFM#21=1 to enable offset/gain adjustment operation
设 BFM#22=0，清楚便宜/增益调整
Set BFM#22=0 to disable offset/gain adjustment
延时 400ms
Delay for 400ms
设 BFM#23=0，设置偏移

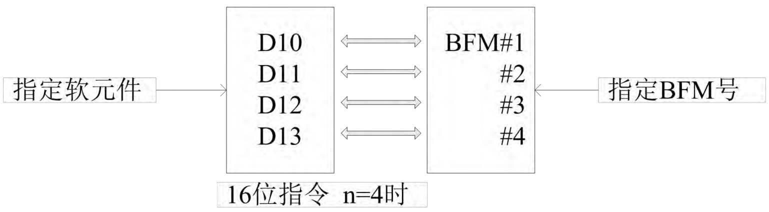
Set BFM#23=0 to set the offset
设 BFM#22=H0003，将刚才设定的 BFM#22/#23 值存入 CH1 的 EEPROM 设置寄存器中
Set BFM#22=H0003 so as to store the specifed value of BFM#22/#23 into EEPROM setup register in the CH1
延时 400ms
Delay for 400ms
清楚设置操作的命令标志
Clear the command flag of setup operation
将 BFM#21=2，禁止偏移/增益调整操作
Set BFM#21=2 to disable offset/gain adjustment operation
当用 32bit 指令时， 指定的地址为低 16bit 地址， ＋1 为高 16bit 地址。 例如：
When using 32bit instruction, the specified address is lower 16bit address, +1 is higher 16bit address. For example:

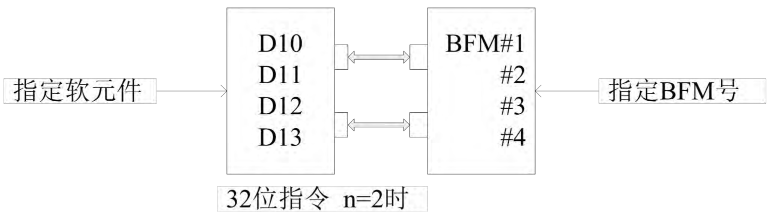


高 16 位
低 16 位
High 16bits
Low 16bits
指定 BFM 号
Specify BFM number

n 表示操作的参数个数，16bit 指令中，n＝2 表示 2 Word；而 32bit 指令中，n＝1 表示 2 Word，即 16 位指令的 n=2 与 32 位指令的 n=1 意义相同，请注意。 例如：

n is the number of operating data, n=2 meaning 2 Word (16bit instruction); n=1 meaning 2 Word (32bit instruction). So please pay attention to that n=2 (16bit instruction) and n=1(32bit instruction) have the same meanings. For example:





指定软元件
Specify software component
16 位指令 n=4 时
16bit instruction when n=4

指定 BFM 号
Specify BFM number
指定软元件
Specify software component
32 位指令 n=2 时
32bit instruction when n=2
指定 BFM 号
Specify BFM number
关于 FROM/TO 指令的使用说明：
The description of FROM/TO instruction:

与 FROM/TO 指令有关的特殊寄存器的说明：
Description of special registers relevant to FROM/TO instruction:

1. M8164（FROM/T0 指令的传送点数可变模式）
若 M8164＝ON，执行 FROM/T0 指令时，特殊数据寄存器 D8164（FROM/T0 指令的传送点数指定寄存器）的内容作为传送点数 n 进行处理；
1. M8164 (variable transferring points mode of FROM/TO instruction)
If M8164=ON then content of special data register D8164 (transferring points register of FROM/TO instruction) can be treated as the number of transferring points;
2. 用 FROM/TO 指令访问扩展模块是比较耗时的操作，执行多个 FROM/T0 指令或传送多个缓冲存储器数据时，PLC 的扫描周期会延长。
2. Accessing the extension module through FROM/TO instruction is a time-consuming operation, so the scan period of PLC will be longer when multiple FROM/TO instructions are executed or the data of multiple buffer memory are transferred.
为了防止运行超时，可在 FROM / T0 前加入延长监视定时器时间的 WDT 指令，或者错开 FROM / T0 指令的执行时间，或者用脉冲执行型指令。
In order to prevent overtime, you can add WDT instruction for extending monitor timer cycle before FROM/TO instruction, or stagger the operation time of FROM/TO instruction, or use pulse operational instruction.
3. 关于特殊模块的连接方法和输入输出编号等使用方法，请参阅各特殊模块附带的专用手册。
3. The usage of connection and input/output number of the special module can be referred to specific manual accompanied with corresponding special module.
4. 远程模块的配置请参考附录 5.13《CAN 通讯说明》
4. Please refer to Annex 5.13 《CAN communication description》 for the configuration of remote module.

适用机型 Applicable Models		
系列 Series	通用 Common	增强 Enhanc

		ed
H1U	✔	✔
H2U	✔	✔

16bit	32bit	P	FNC 80	RS	串行数据传送 Serial data transfer
✔					
9 步			指令格式：RS S m D n Instruction format:		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
m					✔	✔							✔		
D													✔		
n					✔	✔							✔		

该指令是一个通讯收发指令，将指定寄存器区域的数据，自动向串口依次发送，将串口接收到的数据存放到指定区域，相当于用户程序直接访问通讯缓冲区，借助用户程序对通讯收发缓冲区的处理，实现自定义协议的通讯。 其中：

This instruction is a communication transceiver instruction. It sends the data in specified register to the serial ports automatically, and deposit the data to the designated area. This is equivalent to that the user program accesses the communication buffer directly, deals with the communication receiving and sending buffer with the user program, and achieves a custom communication protocol. Where:

S 为待发送数据存放的寄存器区的起始地址；

S is the initial address of the register area where the data to be sent will be stored;

m 为待发送数数据的长度（字节数），取值范围 0～256；

m is the length of the data to be sent (bytes), ranges (0~256);

D 为通讯接收数据的存放寄存器区的起始地址；

D is the initial address of the storage register which receives communication data;

n 本通讯接收的数据长度（字节数），取值范围 0～256。

n is the length of the communication data received (bytes), ranges (0~256).

H1U/2U 系列 PLC 对 RS 指令还有扩展功能，当选择了 MODBUS 主站协议，此时 RS 指令即为 MOD 指令功能，此功能在本指令后面介绍。

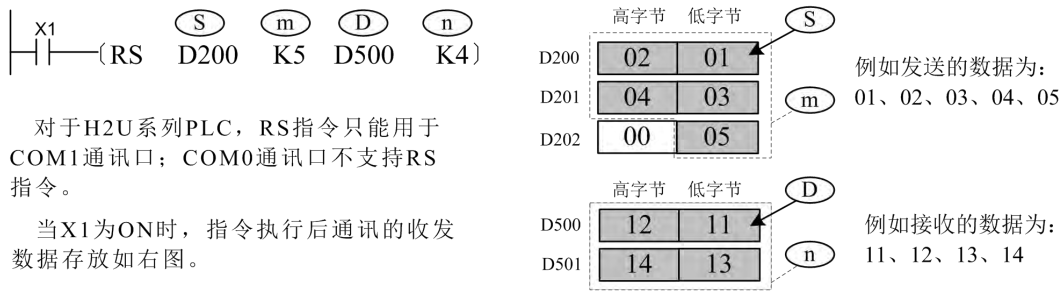
H1U/2U series PLC also has extension function of RS instruction. If MODBUS master station protocol is selected then the function of RS instruction is the same as MOD instruction which will be introduced in detail later.

RS 指令半双工/全双工模式由 D8120 的 Bit10 设定。用户程序可以写多条 RS 指令，但是同一时间只能有一条 RS 指令被驱动。在每次驱动 RS 指令前，必须将 M8122 置位；

The half-duplex/full-duplex mode of RS instruction is set by Bit10 of D8120. Multiple RS instrucions can be used in the user program but only one instruction can be executed at a time. M8122 must be set before every time the RS instruction is driven;

指令举例一：

Example 1 for instruction:



对于 H2U 系列 PLC，RS 指令只能用于 COM1 通讯口；COM0 通讯口不支持 RS 指令。

The RS instruction only can be used for COM1 port for H2U series PLC; The COM0 port doesn't support RS instruction.

当 X1 为 ON 时，指令执行后通讯的手法数据存放如右图。

The transferred/received data storage of the communication after the instruction is executed when X1 is ON is shown in right figure.

高字节

High byte

低字节

Low byte

例如发送的数据位：01、02、03、04、05、

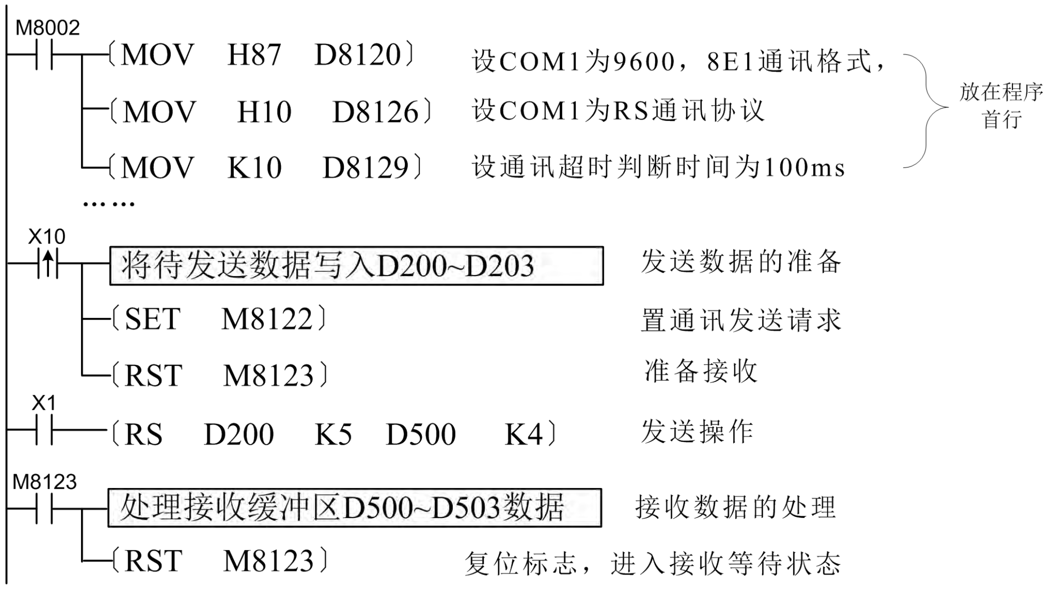
Transferred data bits:01、02、03、04、05、

例如接收的数据位：01、02、03、04、05、

Received data bits: 01、02、03、04、05、

实际编程时，需要作一些串行通讯的配置和准备，如设定串口的收发模式、波特率、位数、校验位、软件协议的设定、超时判断条件、收发缓冲区的数据准备、收发标志处理等，才能按预期的要求进行通讯。 仍以上述语句为例，一个比较完整的 RS 通讯设置程序如下：

You need do some configuration and preparation in serial communication during the actual programming. For example, setting serial port transceiver mode, baud rate, bits, parity bit, setting the software protocol, judging the conditions of overtime, the preparation of sending and receiving buffer data, sending and receiving symbol processing and so on. Then the system can communicate as you expect. Take the last statement for example, a more complete RS communication setup as followes:



设 COM1 为 9600,8E1 通讯格式，

Set the communication configuration of COM1 to 9600,8E1

设 COM1 为 RS 通讯协议

Set the communication protocol of COM1 to RS protocol

设通讯超时判断时间为 100ms

Set the judge time of the communication timeout to be 100ms

放在程序首行

Place in the first line of the program

将数据写入 D200~D203

Write data into D200~D203

处理接收缓冲区 D500~D503 数据

Process the data of receive buffer D500~D503

发送数据的准备

Preparations of sending data

置通讯发送请求

Set communication sending request

准备接收

Prepare for receiving data

发送操作

Send operation

接收数据的处理

Processing of received data

复位标志，进入接收等待状态

Reset flag, get into the reception wait state

通讯端口的硬件格式和协议选择，涉及许多专用寄存器和标志，说明如下：

串口的通讯格式设定：

The hardware configuration and protocol selection of communication port are relative to many special registers and flags which are described below:

项目 Item	设定位 Setting bit	定 义 Definition	COM0 端口说明 COM0 port description	COM1 端口说明 COM1 port description
			D8110	D8120
数据位 Data bit	Bit0	0b-7Bits	MODBUS-RTU 从站协议及指令只支持 8 位数据位，否则将造成通信出错 MODBUS-RTU slave station protocol and instruction only support 8bit data bit, or error will occur to the communication	
		1b-8Bits		
校验位 Parity bit	Bit2~Bit1	00b-无校验(N) 00b-none (N)		
		01b-奇校验(O) 01b-odd (O)		
		11b-偶校验(E) 11b- even(E)		
停止位 Stop bit	Bit3	0-1Bits		
		1-2Bits		
波特率 baudrate	Bit7~Bit4	0011b-300bps		
		0100b-600bps		
		0101b-1200bps		
		0110b-2400bps		
		0111b-4800bps		
		1000b-9600bps		
		1001b-19200bps		
		1010b-38400bps		
		1011b-57600bps		
		1100b-115200bps		
起始字符 Start character	Bit8	0b-无 0b- none		
		1b-(D8124)		
终止字符 Termination character	Bit9	0b-无 0b- none		
		1b-(D8125)		
半双工/全双工 Half-dupl	Bit10	0b-全双工 0b- full-duplex		RS 指令适用 Applicable to RS instruction

项目 Item	设定位 Setting bit	定 义 Definition	COM0 端口说明 COM0 port description	COM1 端口说明 COM1 port description
			D8110	D8120
ex/full-duplex				

协议的设定：

COM0 通讯口的可用协议设置：

Protocol setup:

Usable protocol configuration of COM0 communication port:

COM0 协议 COM0 protocol	D8116 设定 D8116 setup	半/全双工模式 Half/full duplex mode	通信格式 Communication format
下载协议/HMI 监控协议 Download protocol/HMI monitor protocol	01h	由跳线 JP0 决定 Determined by jumper JP0	固定为“7E1” Fixed to “7E1”
MODBUS-RTU 从站 MODBUS-RUT slave station	02h	半双工 Half-duplex	由 D8110 决定 Determined by D8110
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half-duplex	由 D8110 决定 Determined by D8110
其他协议（含 RS 指令） Other protocol (RS instruction included)	不支持 No support		

COM1 通讯口的可用协议设置：

Usable protocol configuration of COM1 communication port:

COM0 协议 COM0 protocol	D8126 设定 D8126 setup	半/全双工模式 Half/full duplex mode	通信格式 Communication format
RS 指令 RS instruction	00h	由 D8120 的 Bit10 设定* Determined by Bit10 of D8120	由 D8120 决定 Determined by D8120
HMI 监控协议 HMI monitor protocol	01h	半双工 Half-duplex	固定 Fixed
并联协议主站	50h	半双工	固定

Parallel link protocol master station		Half-duplex	Fixed
并联协议从站 Parallel link protocol slave station	05h	半双工 Half-duplex	固定 Fixed
N：N 协议主站 N:N protocol master station	40h	半双工 Half-duplex	固定 Fixed
N：N 协议从站 N:N protocol slave station	04h	半双工 Half-duplex	固定 Fixed
计算机链接协议 Computer link protocol	06h	半双工 Half-duplex	由 D8120 决定 Determined by D8120
MODBUS-RTU 从站 MODBUS-RTY slave station	02h	半双工 Half-duplex	
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half-duplex	
RS 指令 RS instruction	10h	由 D8120 的 Bit10 设定* Determined by Bit10 of D8120 *	
MODBUS RTU 指令 MODBUS RTU instruction	20h	半双工 Half-duplex	
MODBUS-ASC 指令 MODBUS-ASC instruction	30h	半双工 Half-duplex	

通讯相关的特殊寄存器

Special registers relevant to communication

寄存器 Register	功能定义 Definition of function	寄存器 Register	功能定义 Definition of function
M8120	保留 Reserved	D8120	通讯格式，界面配置设定，默认为 0 Communication format, the interface

			configuration with a default of 0
M8121	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8121	站号设置，界面配置设定，默认为 1 Station number settings, the interface configuration settings with a default of 1
M8122	发送标志（RS 指令） 指令执行状态（MODBUS） Sending flag (RS instruction) Instruction execution status	D8122	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)
M8123	接收完成标志（RS） 通讯错误标志（MODBUS） Receiving complete flag (RS) Communication error flag (MODBUS)	D8123	接收到的数据数量（仅对 RS 指令） Amount of data already received (Only to RS instruction)
M8124	接收中(仅对 RS 指令） Receiving (only to RS instruction)	D8124	起始字符 STX（仅对 RS 指令） Start character STX (Only to RS instruction)
M8125	保留 Reserved	D8125	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8126	保留 Reserved	D8126	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8127	保留 Reserved	D8127	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8128	保留 Reserved	D8128	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8129	超时判断 Overtime judgment	D8129	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication overtime judgment, the interface configuration settings with a default of 10（100msec）

协议的选择方法：

上面描述了各串口支持的协议种类，但每个通讯口在同一时间只能支持一种协议，而协议类型必须事先选择，才能保证通讯正常。这些协议的确定原则如下：

Protocol selection:

Many supported protocols are described above, but each communication port only can use one protocol at a time, so the protocol must be selected in advance to make sure normal communication. The principle of determining protocol is described below:

4.1 COM0 的适用协议的确定原则：

① 停机状态，协议固定为下载协议/HMI 监控协议；

② 停机转运行时，若跳线 JP0 接通，协议为下载协议(或称 HMI 监控协议)；

③ 停机转运行时，若跳线 JP0 断开，协议由 D8116 决定，D8116 在 PLC 第一个扫描周期内确定的值对协议有效，运行后 D8116 的更改不能改变协议，D8116 与协议对应关系见协议设置表；

④ PLC 运行后，协议将维持不变。

4.1 Principle of determining protocol which applies to COM0 port

① The protocol is download protocol/HMI monitor protocol during stop state;

② When machine is shutting down, if the jumper JP0 is closed then the protocol is download protocol (or HMI monitor protocol);

③ When machine is shutting down, if the jumper JP0 is open then the protocol is determined by D8116. The value of D8116 during the first scan period of the PLC is effective to determine protocol, and the protocol will not be changed by D8116 after the start of operation. The relationship of D8116 and corresponding protocols is shown in the protocol configuration table;

④ The protocol will not change after the start of PLC operation.

4.2 COM1 的适用协议的确定原则：

在停机状态或第一次运行时，系统按优先级检查协议设置：

① N：N 协议；

② 并联主站协议；

③ 并联从站协议；

④ 计算机链接协议

若存在优先级别较高的协议，就按检测到的协议进行通讯，将不再检查优先级低的协议，若上述协议均没有配置，则按：

⑤ COM1 口的通讯协议由 D8126 决定。一旦 PLC 运行后，协议将维持不变；

4.2 Principle of determining protocol which applies to COM1 port

System will check the protocol configuration according to priority during stop state or operation for the first time:

① N：N protocol；

② parallel link master station protocol；

③ parallel link slave station protocol；

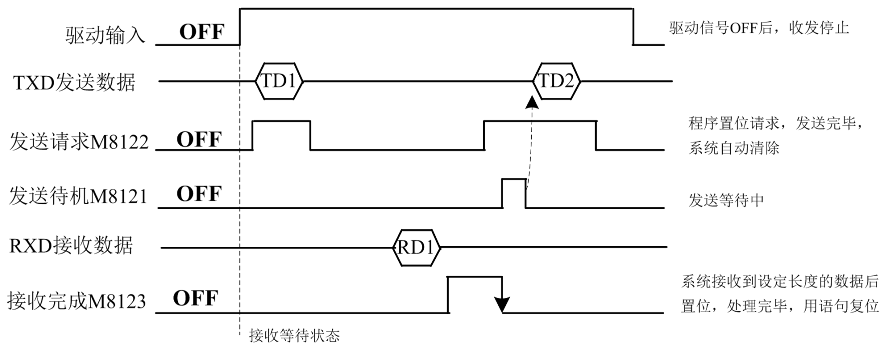
④ computer link protocol

If protocol with higher priority exists then the detected protocol will be used, and protocol with lower priority will not be checked anymore. If all the protocols above are not configured then:

⑤ The communication protocol of COM1 port is determined by D8126. The protocol will not change after the start of PLC operation.

5、 通讯相关的专用标志的时序与操作说明;

5. Timing sequence and operation description of special flags relevant to communication;



驱动输入

Drive input

TXD 发送数据

TXD transferred data

发送请求 M8122

Transfer request M8122

发送待机 M8121

Transfer standby M8121

RXD 接收数据

RXD received data

接收完成 M8123

Receive completed M8123

接收等待状态

Receive wait state

驱动信号 OFF 后，收发停止

Transfer/receive stop after driving signal is OFF

程序置位请求，发送完毕,系统自动清除

Program request of set which will be cleared automatically after the transfer process is completed

发送等待中

Transfer waiting

系统接收到设定长度的数据后置位，处理完毕，用语句复位

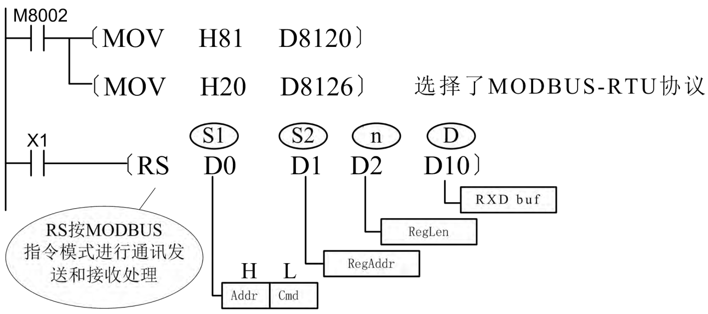
It will be set after data of specified length is received completely, and it should be reset by program after the process is completed.

RS 指令的扩展功能（MODBUS 主站协议通讯）:

Extension function of RS instruction (MODBUS master station protocol):

当 COM1 口的通讯协议配置中选择了 MODBUS 主站协议（将 D8126 设定为 H20 或 H30）时，RS 指令将以 MODBUS 通讯协议进行通讯。 通讯过程中占用的寄存器定义与标准 RS 指令不同，请予注意：

If MODBUS master protocol is selected in communication protocol configuration of COM1 port (D8126 is set to H20 or H30), then the RS instruction will communicate through MODBUS protocol. The definition of registers occupied by the communication process is different from the one of standard RS instruction, so please pay attention to this:



RS 按 MODBUS 指令模式进行通讯发送和接受处理

The transfer and receive operation of RS instruction will be processed as MODBUS instruction mode

选择 MODBUS-RTU 协议

MODBUS-RTU protocol is selected

S1 为从机地址（高字节）、通讯命令（低字节，按 MODBUS 协议定义）；

S1 is slave address (high byte), communication command (low byte, defined as MODBUS protocol).

S2 为访问从站的寄存器起始地址号；

S2 is the register start address of slave station accessed.

n 欲读或写的数据长度；

n is the length of data which is to be read or written.

D 为读或写数据的存放单元起始地址，占用后续地址单元，长度由 n 决定。

D is the start address of read/written data storage and it occupies the following address cells of which the length is determined by n.

操作数 字 元 件

Operand Word component

操作数	字 元 件 Word component

Oper and	K	H	KnX	KnY	KnM	Kn S	T	C	D	V	Z
S1									✔		
S2	✔	✔							✔		
n									✔		
D									✔		

MODBUS 指令有两种，一种符合 MODBUS RTU 协议，一种符合 MODBUS ASC 协议，用哪种协议由从站所支持的协议格式定，若从站两种协议都支持而用户要求较快速的通信，建议选用 RTU 协议。两种协议只是通信格式不一样，对用户编程都一样，下面仅就 RTU 协议做说明。

There are two type of MODBUS instructions, one of which accords with MODBUS RTU protocol and another accords with MODBUS ASC protocol. Which one to use is determined by supported protocol of slave station, and if both protocols are supported by the slave station and user wants to use high-speed communication then the RTU protocol is recommended. The user programming of both protocols are the same, and the communication format is the only difference, so only RTU protocol is described below.

指令格式：RS(ADDR&CMD，REGADDR，REGLEN，DATABUF)

ADDR&CMD：从机地址和 MODBUS 功能码，高 8 位表示从机地址，即目标设备地址，低 8 位表示

MODBUS 功能码，由标准 MODBUS 协议定义，目前支持 0x01，0x02，0x03，0x04，0x05，0x06，0x0f，0x10。具体含义请参照标准 MODBUS 协议或目标设备 MODBUS 协议。

Instruction format: RS(ADDR&CMD，REGADDR，REGLEN，DATABUF)

ADDR&CMD：slave address and MODBUS function code. The high byte represents slave address (target device address) and the low byte represents MODBUS function code which is defined by standard MODBUS protocol. 0x01，0x02，0x03，0x04，0x05，0x06，0x0f，0x10 are supported now for the function code. Please refer to standard MODBUS protocol or target device MODBUS protocol for detailed definition.

REGADDR：所要读或写的从机线圈（1 位）或寄存器（16 位）地址，取值参考从机 MODBUS 协议。可为软元件或常数

REGLEN：所要读写的从机线圈或寄存器个数

DATABUF：主机用于存放数据的起始寄存器，即数据缓冲区。缓冲区长度与 REGLEN 相关，至少取 1。若 MODBUS 命令为读，指令成功执行完后，把从机数据读到缓冲区中。

若 MODBUS 命令为写，把缓冲区发送给从机。用户在设计程序时需要计算缓冲区长度，预留足够的寄存器作缓冲区。

REGADDR：The address of slave coil (one bit) or registers (16bit) which will be read or written, and its value can be referred to slave MODBUS protocol. It can be software component or constant.

REGLEN：Number of slave coil or register which will be read or written

DATABUF：Data buffer or the start register of data storage of master. The buffer length is relative to REGLEN and should be at least 1. If the MODBUS instruction is read instruction then slave data will be read to buffer after the execution of this instruction. If the

MODBUS instruction is write instruction then data will be transferred to the slave. User should calculate the buffer length while programming so as to reserve enough registers as buffer.

相关状态标志

M8122：MODBUS 指令执行状态指示，OFF 时表示指令执行完毕，ON 时为执行中。若 M8122 为 OFF，且指令在一个扫描周期内能流有效，M8122 置为 ON，系统将会把指令参数记录下来，转入后台执行该指令的通信要求。通信执行完后，当再次运行到此指令的位置时，无论该指令能流是否有效，均会把 M8122 复位为 OFF，立即扫描下一条能流有效的指令，记录指令参数并转入后台执行该指令的通信要求。

Relevant state flag

M8122: Operation state indication of MODBUS instruction, OFF when the instruction is executed completely, ON when it's executing. If M8122 is OFF and power flow is effective during one scan period of the instruction, then M8122 is set to ON and the system will record the instruction parameter and implement the communication reqirements of this instruction in background. After the communication is completed, when the system executes to the same position of the instruction then M8122 will be reset to OFF no matter whether the instruction power flow is effective or not, and the next power-flow-effective instruction will be scaned immediately and the system will record instruction parameter and implement the communication requirements in background.

M8123：指令通信情况指示，ON 表示通信异常，OFF 表示通信正常

M8063：指令错误指示，错误码存于 D8063。

D8063 错误码如下

M8123：indication of instruction communication, ON for normal communication and OFF for abnormal communication

M8063：indication of instruction error, and the error code is stored in D8063.

D8063 error code is described below

6331：数据帧长度错误

6332：地址错误

6333：CRC 检验错误

6334：不支持的命令码

6335：接收超时

6336：数据错误

6337：缓冲区溢出

6338：帧错误

6331：data frame length error

6332：address error

6333：CRC check error

6334：not supported function code

6335：receive timeout

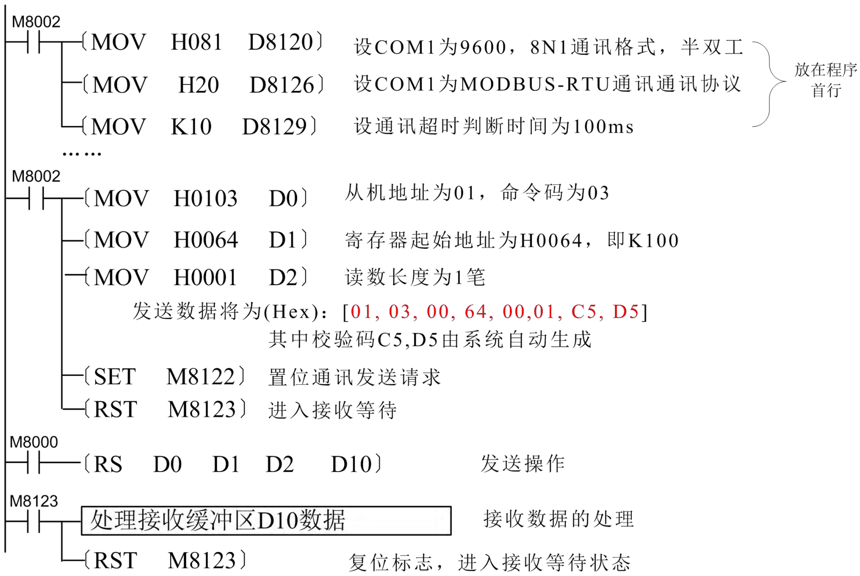
6336：data error

6337：buffer overflow

6338：frame error

指令举例二：

Example 2 for instruction:



设 COM1 为 9600，8N1 通讯格式，半双工

Set COM1 to 9600，8N1 and half-duplex

设 COM1 为 MODBUS-RTU 通讯通讯协议

Set the communication protocol of COM1 to MODBUS-RTU

设通讯超时判断时间为 100ms

Set the judge time of the communication timeout to be 100ms

放在程序首行

Place in the first line of the program

从机地址为 01，命令码为 03

Slave address is 01, and function code is 03

寄存器器始地址为 03

Start address of the register is 03

寄存器其实地址为 H0064，即 K100

Start address of the register is H0064 or K100

读书长度为 1 笔

Data length is 1

发送数据位(Hex):

Transferred data bit will be (Hex):

其中校验码 C5，D5 由系统自动生成

The check code C5 and D5 are generated automatically by system

置位通讯发送请求

Set the transfer request of communication

进入接收等待

Start receive waiting
发送操作
Send operation
处理接受混冲去 D10 数据
Process of D10 data in receive buffer
接受数据的处理
Process of received data

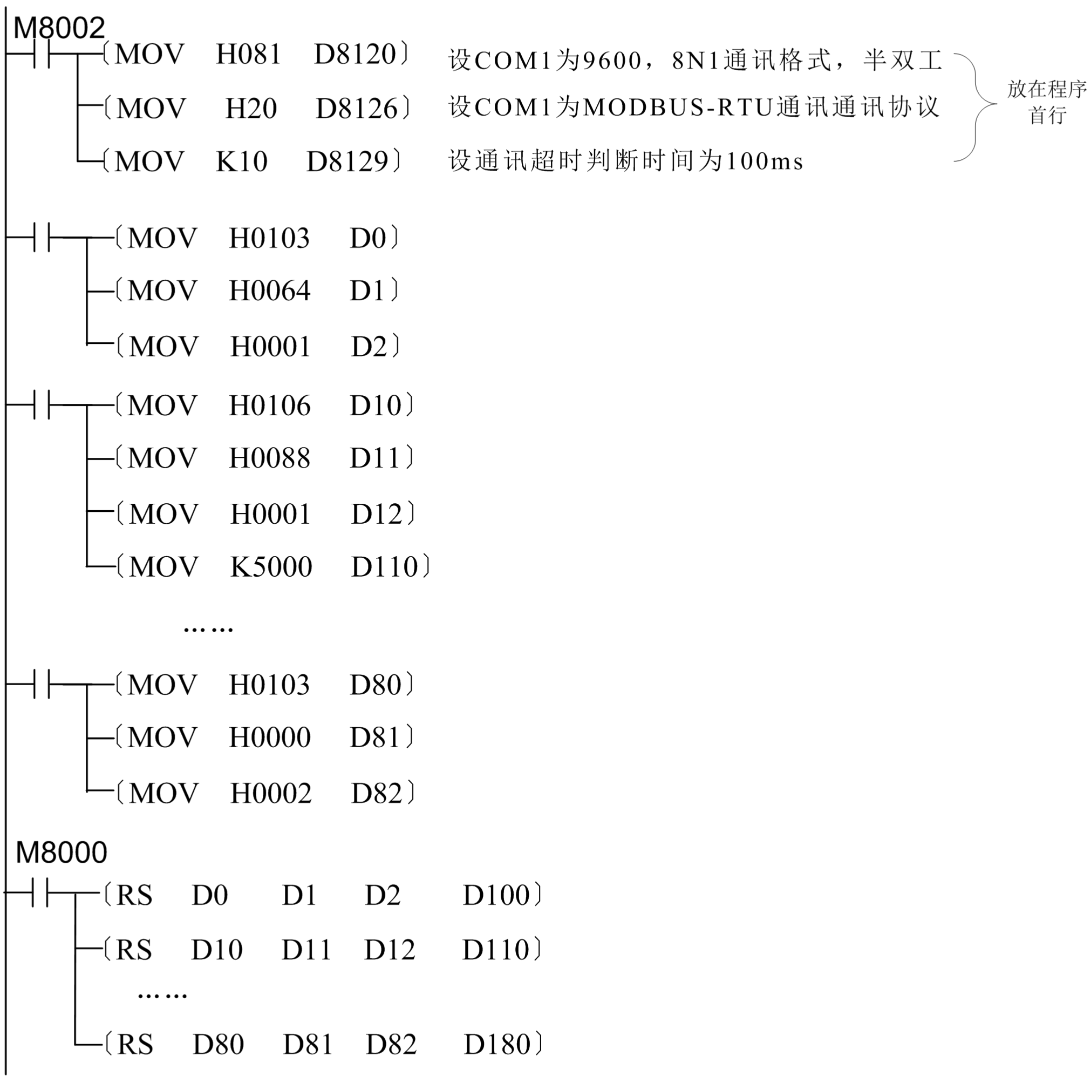
复位标志，进入接受等待状态
Reset the flag and go to receive waiting state

该指令用于具有 MODBUS 协议从站设备（如 MD320/300/280 等系列变频器）进行通讯，将非常方便，指令举例二中，PLC 不断的读#1 从机内，地址为 100 的寄存器，数据存于 D10 单元，编程时初始化是：
This instruction is used for communication between slave devices which equip with MODBUS protocol (such as MD320/300/280 series inverters) and it’s very convenient. PLC repeatedly reads the register of address 100 in #1 slave device and stores the data to D10. Program initialization is shown as follows:

D8126=H0020　　设定通信协议为 MODBUS RTU 指令
D8120=H0081　　设定 COM1 通信格式为：9600，8N1
D0=H0103　　Addr&Cmd 从机地址为 01 和 MODBUS 命令码为 03，读寄存器
D1=H0064　　RegAddr 要操作的从机的寄存器地址
D2=H0001　　RegLen 要操作的寄存器的个数
D8126=H0020　　set the communication protocol to MODBUS RTU
D8120=H0081　　set the communication cofiguration of COM1to 9600，8N1
D0=H0103　　Addr&Cmd slave address is 01and MODBUS function code is 03，read register
D1=H0064　　RegAddr- register address of slave which will be operated
D2=H0001　　RegLen- length of registers which will be operated

D10　　PLC 数据缓冲区，本例中读命令通信成功后数据存于 D10
通讯发送、接收过程中不占用用户寄存器缓存，由系统自行处理。
PLC data buffer, the data will be stored in D10 after successful execution of read instruction in this example
Buffer of user registers is not occupied during transfer and receive process, and it will be processed automatically by system.
使用说明：
Instruction for use:
1、 程序中可多次使用 RS 指令，和标准 RS 不同，MODBUS 协议中的 RS 指令可有多处 RS 指令被同时使能。
2、 可省略对 M8122 的置 ON，可省略对 M8123 的复位。
1. RS instructions can be used for several times in program. For the RS instruction of MODBUS protocol several RS instructions can be enabled simultaneously, which is

different from standard RS instruction.
2. Set of M8122 and reset of M8123 can be omitted.
指令举例三：
Example 3 for instruction:



设 COM1 为 9600，8N1 通讯格式，办双工
Set COM1 to 9600，8N1 and half-duplex mode
设 COM1 为 MODBUS-RTU 通讯通讯协议
Set the communication protocol of COM1 to MODBUS-RTU

设通讯超时判断为 100ms
Set the communication timeout threshold to 100ms
放在程序首行
Place in the first line of the program

适用机型
Applicable models

系列 Series	通用 Common	增强 Enhanc

		ed
H1U	✔	✔
H2U	✔	✔

16bit	32bit	P	FNC 441	MODBUS	数据传送 Data transfer
✔					
9步 9 steps			指令格式：MODBUS S1 S2 n D Instruction format:		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
n					✔	✔							✔		
D													✔		

为了直观方便，在标准 MODBUS 主站协议通讯中的 RS 指令我们可以用 MODBUS 来代替。各定义如下：

To be intuitive and convenient MODBUS can be used to replace the RS instruction of standard MODBUS master protocol communication. The definition of each parameters are defined as follows:

S1 为从机地址（高字节）、通讯命令（低字节，按 MODBUS 协议定义）；

S1 is slave address (high byte), communication command (low byte, defined as MODBUS protocol).

S2 为访问从站的寄存器起始地址号；

S2 is the register start address of slave station accessed.

n 预读或写的数据长度；

D 为读或写数据的存放单元起始地址，占用后续地址单元，长度由 n 决定。

n is the length of data which will be read or written;

D is the start address of storage data which will be read or written, and it occupies the following address cells of which the length is determined by n.

选择了 MODBUS-RTU 协议
MODBUS-RTU protocol is selected

16bit	32bit	P	FNC 442	CANTX	CAN 数据发送 CAN data transfer
✔					
13 步 13 steps			指令格式：CANTX S1 S2 D n Instruction format:		

适用机型 Applicable models		
系列 Series	系列 Series	系列 Series
H1U	✔	✔
H2U	✔	✔

16bit	32bit	P	FNC 443	CANRX	CAN 数据接收 CAN data transfer
✔					
13 步 13 steps			指令格式：CANRX S1 S2 D n Instruction format:		

适用机型 Applicable models		
系列 Series	系列 Series	系列 Series
H1U	✔	✔
H2U	✔	✔

操作数 Operand	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
D													✔		
n					✔	✔							✔		

H1U 系列主模块 PLC 和 H2U 的 MRN(MTN)系列主模块 PLC 通过 CAN 扩展卡，可以

组建 CAN 网络。
CAN network can be made up of H1U series main module PLC and H2U series MRN(MTN) main module PLC through CAN extension card.

在 CAN 网络中，通过 CANTX/CANRX 自由指令，用户可编写任意 CAN 通信用户协议，各参数定义如下：
Any CAN communication protocol can be programmed by users through CANTX/CANRX instruction in the CAN network, in which parameters are defined as follows:

S1，S2两个参数共同组成 CAN 地址：S1的 bit15 和 bit14 保留，S1的 bit13 为 CAN 地址位数设定，“0”表示标准 CAN 地址（11 位），“1”表示扩展 CAN 地址（29 位）；若为 11 位地址，则由S2的 bit0~bit10 位表示地址，此时S1为 0，S2不能大于 H7FF。若为 29 位地址，由S2（低 16 位地址）和S1的 bit0~bit12（高 13 位地址）共同组成，此时S1的 bit13 为 1。

S1 and S2 together make up the CAN address: bit15 and bit14 of S1 are reserved, and bit13 of S1 is the number of bit of CAN address. If bit13 is “0” then it means it’s standard CAN address (11 bits), and “1” means extended CAN address (29 bits); If the CAN address is of 11 bits then bit0~bit10 of S2 represent the address, and at this time S1 is 0 and S2 can’t be more than H7FF. If the CAN address is of 29 bits then S2 (low 16bit address) and bit0~bit12 (high 13bit address) together make up the address, and bit13 of S1 is 1.

D在 CANTX 指令中为发送缓冲区，在 CANRX 指令中为接收缓冲区；从该 D 元件开始的最大 4 个 D 元件作为发送或者接收缓冲区。

D is transfer buffer in CANTX instruction and be receive buffer in CANRX instruction; Maximum 4 D components from this D component can be used as transfer or receive buffer.

n在 CANTX 指令中为发送数据个数，在 CANRX 指令中为接收数据个数；以字节为单位，最大为 8。

n is the number of transferred data in CANTX instruction and be the number of received data in CANRX instruction; Its unit is byte and maximum value is 8.

一条 CANTX/CANRX 指令最多只能发送/接收 8 个字节，但是在程序里可以写多条 CANTX/CANRX 指令以便交换更多的数据，且不用分时驱动。
One CANTX/CANRX instruction can transfer/receive maximum 8 bytes, but several CANTX/CANRX can be used in program to exchange more data and time-sharing driving is not necessary for these instructions.

注意： 可以同时用 M8000 同时驱动 CANRX 接收指令，但是 CANRX 接收只能是逐条接收，第一条接收完成或接收超时了，才能开始执行下一条指令接收，顺序执行，这个分时 PLC 后台自动处理，不用用户做程序做分时。若发送指令和接收指令的 ID 不能匹配，数据就会丢失。
Note: M8000 can be used to drive CANRX instructions simultaneously, but CANRX only can receive data one by one. After the completion of receiving previous instruction or the receiving process is timeout, then the next instruction can be received and executed sequentially. PLC will process the time-sharing in background and users are not needed to consider the time-sharing in program. Data will be lost if the ID of transferred and received instructions can't match to each other.
指令举例一：
Example 1 for instruction:

10ms 发送一组数据，缓冲区为 D100~103，D110 存发送的字节数
Data will be transferred one group per 10ms. D100~103 is buffer and D110 stores the byte count of transferred data

若 D110 = k8，D100 = h1234，D101 = h5678，D102 =h 9ABC，D103 = hDEF0
发送的数据如下表：
If D110 = k8，D100 = h1234，D101 = h5678，D102 =h 9ABC，D103 = hDEF0 then the transferred data is shown in following table:

第一字节	第二字节	第三字节	第四字节	第五字节	第六字节	第七字节	第八字节
1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
h12	h34	h56	h78	h9A	hBC	hDE	hF0

若接收端字节从高到低，CAN 接收数据寄存器 MDL =h12345678，MDH = h9ABCDEF0
若 D110 = k1，只发送一个字节：h12
若 D110 = k3，发送前三个字节：h12，h34，h56
If the data is received from high byte to low byte, then the received data register of CAN communication will be MDL =h12345678，MDH = h9ABCDEF0
If D110 = k1，then only one byte is transferred:h12

If D110 = k3，then the first three bytes are transferred: h12, h34, h56
依次类推。
And so on.

指令举例二：（S1的 bit13 为 0）

假设有 8 台 PLC 连接在 CAN 网络中，其中一台 PLC 程序里面写了如下发送指令

Instruction example 2: (bit13 of S1 is 0)

Assume that 8 PLC are connected in CAN network and following transfer instruction is programmed in one PLC of them

这台 PLC 往地址 H200 发送了 D10~D13 寄存器里面的数据，因为 CAN 协议不分主从站，所以这台 PLC 往地址 H200 发送的数据是开放的，在网络中的其他任意一台 PLC 想接收这台 PLC 里面 D10~D13 的数据，都可以在这任意一台 PLC 的程序里面写入如下接收指令:
This PLC transfer data stored in registers D10~D13to address H200, and since CAN protocol doesn't distinguish master and slave station, the data transferred to address H200 is open. If any PLC in the network wants to receive the data of D10~D13 then following receive instruction can be written into the program in this PLC:

只要执行了上面的语句，即可接收地址为 H200 的数据存放在 D100~D103 里面。可以在多台 PLC 里面分别写程序接收这一数据。
The execution of above program can receive the data of address H200 and store it into D100~D103.   Program can be written in several PLC to receive this data.

同样，这任意一台 PLC 想发送数据。亦可在程序里面写入 CANTX 指令，S1S2的地址可以由用户自由定义（注意需遵循 11 位标识符和 29 位标识符的定义规则），只要接收方在 CANRX 指令中写入同样地址就可以接收到这个用户定义地址的数据。
If this PLC wants to transfer data then CANTX instruction can be programmed also, and the address of S2 and S1 can be defined freely by users (please obey the rules of defining 11bits and 29bits identifiers). The data of this address defined by users can be received just by using the same address in CANRX instruction.

指令举例三：（S1的 bit13 为 1）

Instruction example 3: (bit13 of S1 is 1)

此时S1为 H334F（二进制的 11，0011，0100，1111），S2为 H200（0000，0010， 0000，0000）。S1 的 bit13 为 1，表示 29 位地址，此时的地址由 S2（低 16 位地址）和 S1 的 bit0~bit12（高 13 位地址）共同组成，即 S1 的 11，0011，0100，1111 和 S2 共同组成了地址 11，0011，0100，1111，0000，0010，0000，0000（十六进制的 H334F0200）。即是 PLC 往地址 H334F0200 发送了 D100~D103 寄存器里面的数据

Here S1 is H334F（binary value 11，0011，0100，1111），S2 is H200（0000，0010，0000，0000）. Bit13 of S1 is 1，which represents 29bits address, and now the address is made up of S2（low 16bits address） and bit0~bit12 of S1（high 13bits address） together. In other word the value 11，0011，0100，1111 of S1 and the value of S2 make up the address 11，0011，0100，1111，0000，0010，0000，0000（hexadecimal value H334F0200）.

在满足 CAN-LINK 协议或远程扩展模块访问协议的设备中，通过扩展模块 FROM/TO 指令，可读写通过 CAN 连接的远程扩展模块（需要扩展模块支持）和远程 PLC。
在自由 CAN 协议中，不需分配 PLC 的站号，在 CAN-LINK 协议或远程扩展模块访问协议的设备中需要分配各 PLC 或远程扩展模块的站号，详细使用请参考《附录 5.13 CAN 通信说明》。
In the device which supports CAN-LINK protocol or remote extension module accessing protocol, remote extension module (extension module support is needed) and remote PLC which are connected through CAN network can be read/written using FROM/TO instruction.
Station number assignment of PLC is not necessary in free CAN protocol, and station number assignment of PLC or remote extension module of devices which support CAN-LINK or remote extension module accessing protocol is needed. Please refer to 《Annex 5.13 CAN communication description》 for details.

适用机型 Applicable models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit	32bit	P	FNC 81	PRUN	并联运行 Parallel operation
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：PRUN S D Instruction format:		

操作数 Operand	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔		✔						
D								✔	✔						

该指令是将 S 起始连续地址的位变量（以 8 进制为宽度单位），成批复制到 D 起始位变量组中。

This instruction will copy continuous bit variables (octal width) start from S to bit variable group start from D in batches.

其中：

Where:

S 为待复制的位变量的起始地址，要求地址的个位必需为 0，如 X10，M20 等；

S is the starting address of the bit variables to be copied, where the unit digit of the addresses must be 0, such as X10, M20, etc.

D 为复制的目的位变量起始地址，同样要求地址的个位必需为 0，如 M30，Y10 等。

其中 Kn 中，允许 n＝1～8。

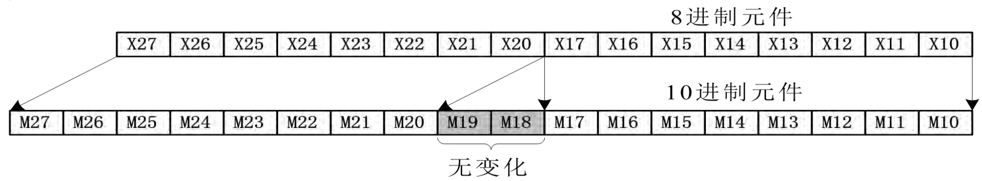
D is the starting address of the target bit variables. Also, the unit digit of the addresses must be 0, such as M30, Y10, etc.

指令举例一：

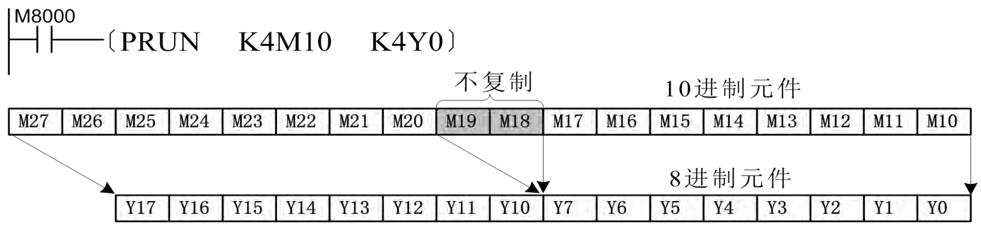
Example 1 for instruction:

M8000

(PRUN K4X10 K4M10)

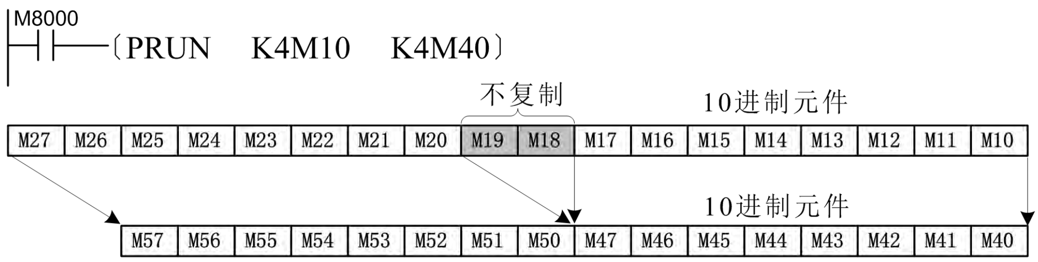


8 进制元件
Octal component
10 进制元件
Decimal component
无变化
No change
指令举例二：
Example 2 for instruction:



不复制
Not copy
8 进制元件
Octal component
10 进制元件
Decimal component

指令举例三：
Example 3 for instruction:



不复制
Not copy
8 进制元件
Octal component
10 进制元件
Decimal component

适用机型 Applicable models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit	32bit	P	FNC 82	ASCI	HEX－ASCII 转换 HEX-ASCII conversion
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：ASCI S D n Instruction format:		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔		
n	常数，n=1~256 Constant, n=1~256														

该指令是将S的值转换成 ASCII 码后，存储到D为起始地址的变量中。

This instruction will convert the value of S to ASCII code and then store it into variable start from D.

其中：

Where:

S为待转换的变量地址或常数数值；

D为转换后 ASCII 码的存放起始地址；

n为转换的字符位数。

S is the address of variable which will be converted or constants;

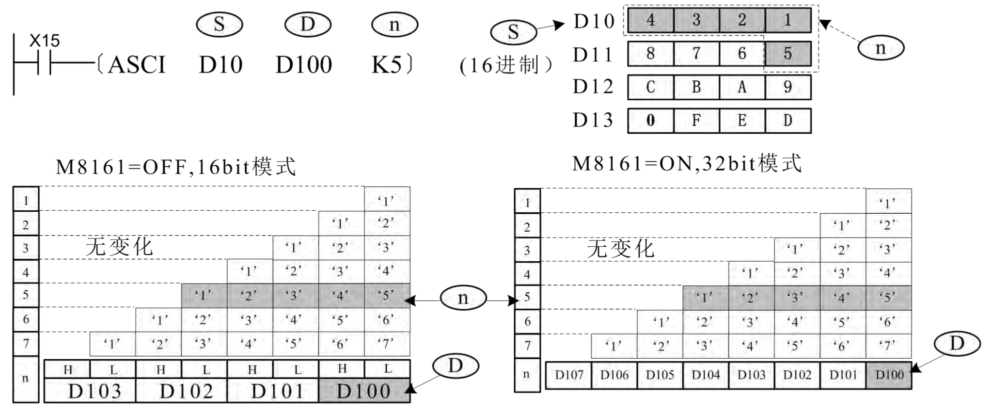
D is the start address of ASCII code stored after conversion;

n is the byte counts of characters which are converted.

ASCI 数值转换遵照 ASCII 与 HEX 进制数值对照表，如：ASCII‘0’对应 HEX‘H30’；ASCII‘F’对应 HEX‘H46’等。关于 HEX 和 ASCII 的对照关系请参考 FNC76（ASC）指令后面的附录。
The ASCII conversion will be executed according to the coparison table of ASCII and HEX value. For example: ASCII ‘0’ corresponds to HEX ‘H30’; ASCII ‘F’ corresponds to HEX ‘H46’, etc. The corresponding rlationship of HEX and ASCII can be referred to the annex following to FNC76 (ASC) instruction.

指令举例：

Instruction example:



M8161=OFF，16bit 模式

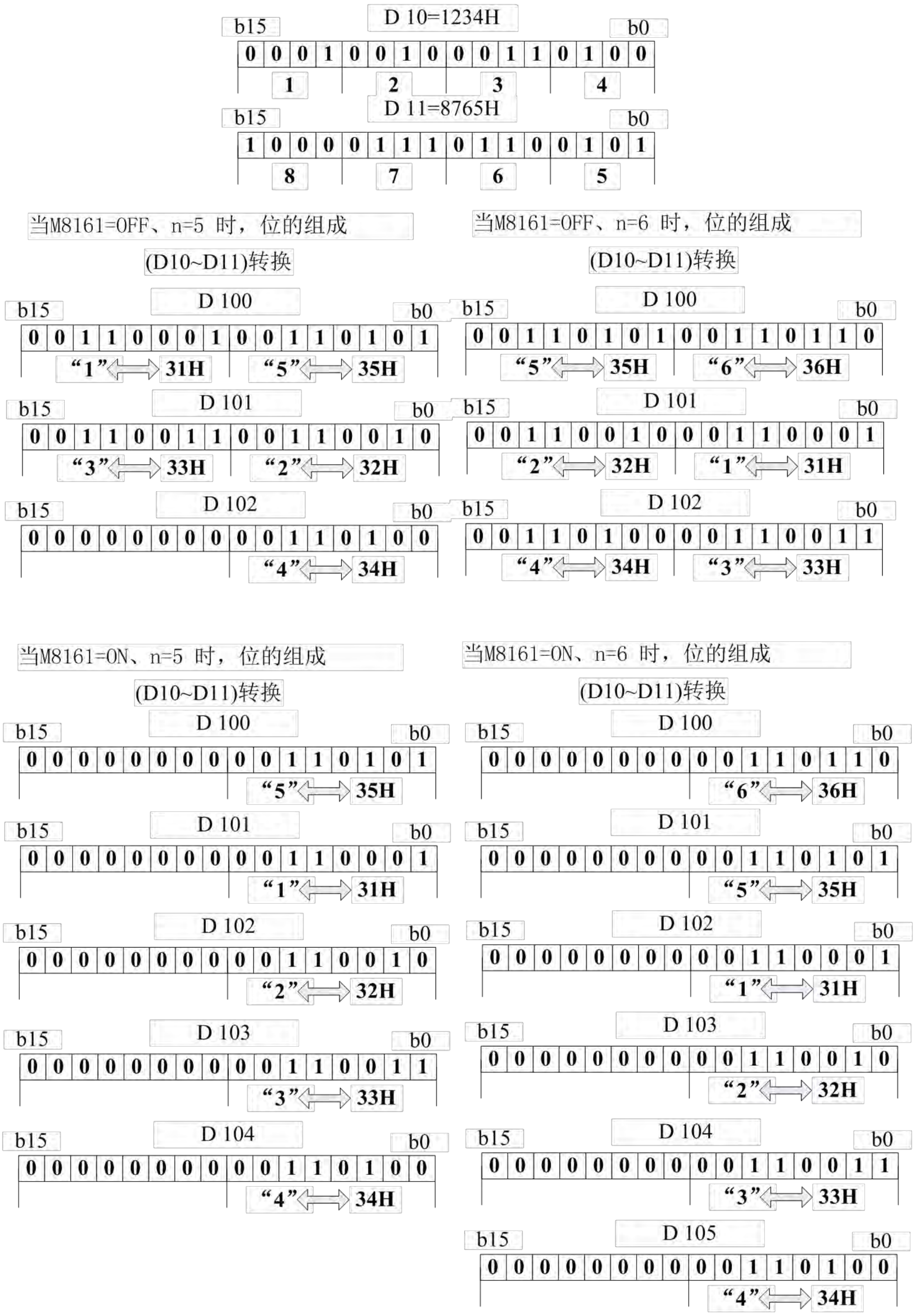
M8161=OFF，16bit mode

无变化

No change

M8161=ON，16bit 模式
M8161=ON，16bit mode

其中，M8161 标志决定了计算结果存放目的变量的宽度模式，当 M8161=OFF 时，为 16bit 模式，即变量的高字节和低字节分别存储；当 M8161=ON 时，为 8bit 模式，只有变量的低字节存储结果，因此实际使用变量区域的长度增加。
The M8161 flag determines the width mode of the target variable for calculation result storage. When M8161=OFF, it is 16bit mode, which means the higher byte and lower byte are saved respectively. When M8161=ON, it is 8bit mode, which means that only the lower byte is used to save result and the actual variable range length is longer.



当 M8161=OFF、n=5 时，位的组合　　　（D10~D11）转换

Bit composition when M8161=OFF、n=5　　（D10~D11）　conversion

当 M8161=OFF、n=6 时，位的组合（D10~D11）转换

Bit composition when M8161=OFF、n=6　　（D10~D11）　conversion

当 M8161=ON、n=5 时，位的组合（D10~D11）转换

Bit composition when M8161=ON、n=5 （D10~D11） conversion
当 M8161=ON、n=6 时，位的组合（D10~D11）转换
Bit composition when M8161=ON、n=6 （D10~D11） conversion

注：RS/HEX/ASCI/CCD 等指令共用 M8161 模式标志，编程时注意。
Note: M8161 mode flag is shared by RS/HEX/ASCI/CCD instructions, which should be noticed while programming.

16bit	32bit	P	FNC 83	HEX	ASCII－HEX 转换 ASCII-HEX conversion
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：HEX S D n Instrution format:		

适用机型 Applicable models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D								✔	✔	✔	✔	✔	✔	✔	✔
n	常数，n=1~256 Constant, n=1~256														

该指令是将 S 起始变量的值转换成 HEX 码后，存储到 D 为起始地址的变量中，转换的字符数、存储模式可以设定。

This instruction will convert the variable data start from S to HEX code and then store to the variable start from D, and the byte count and storage mode can be configured.

其中：
Where:

S 为待转换的变量地址或常数数值，若为寄存器变量，以 32bit 变量宽度（即 4 个 ASCII 字符）为单位进行转换分隔；
S is the variable address or constant to be converted. If it is a register variable, the conversion interval will has a width of a 32bit variable (i.e. 4 ASCII chars);

D 为转换后 HEX 码的存放起始地址，占用的变量空间与 n 有关；

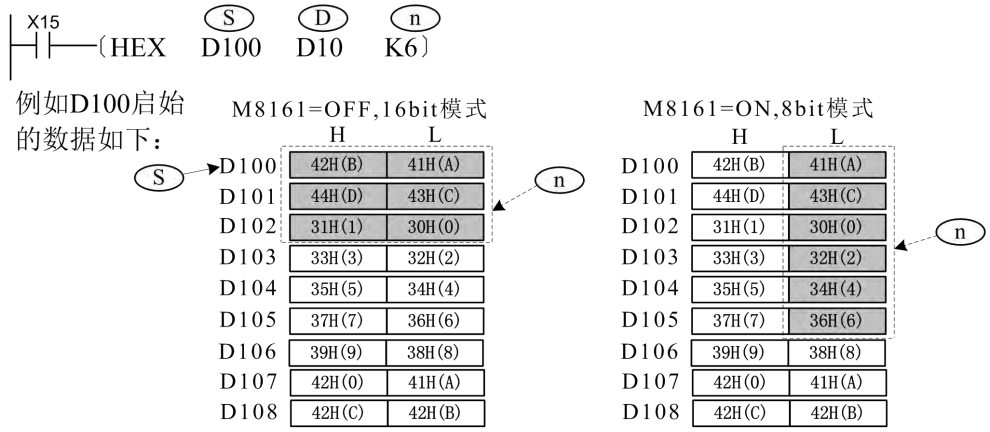
n 为转换的字符位数。

D is the start address of HEX code storage after conversion, and the occupied variable space is relative to n;

n is the byte count of converted characters.

指令举例：

Instruction example:



例如 D100 启动的数据如下：

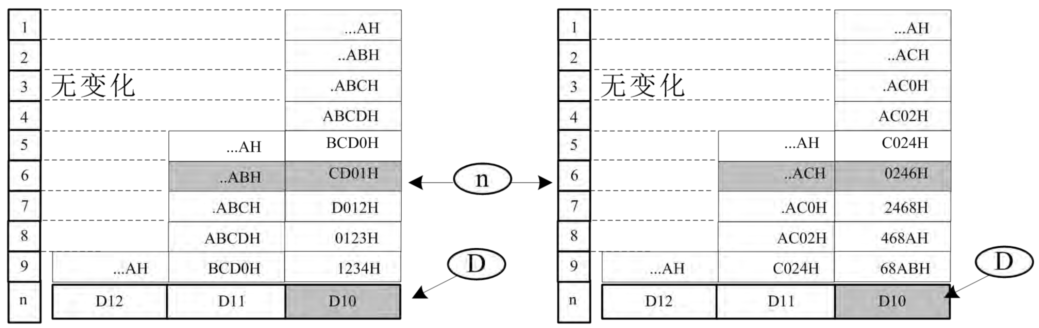
For example the data start from D100 is as follows:

M8161=OFF，16bit 模式

M8161=OFF，16bit mode

M8161=OFF，8bit 模式

M8161=OFF，8bit mode

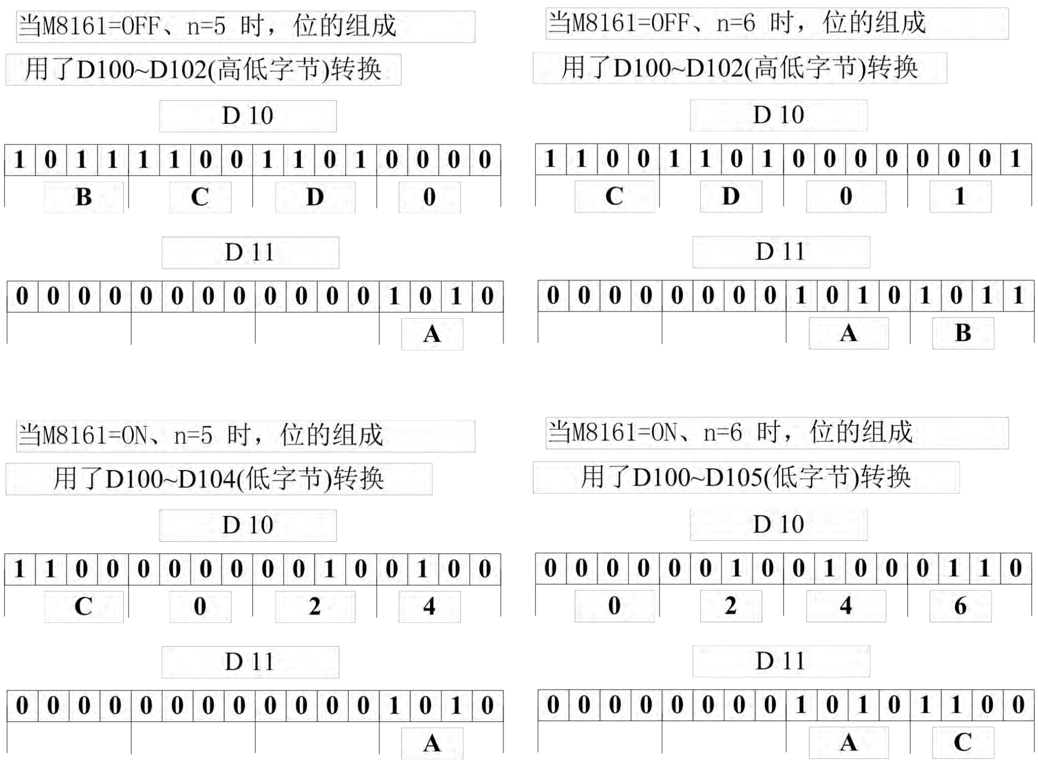


无变化

No change

其中，M8161 标志决定了变量宽度模式，当 M8161=OFF 时，为 16bit 模式，即变量的高字节和低字节都参与运算；当 M8161=ON 时，为 8bit 模式，只有变量的低字节参与运算，高字节的内容丢弃，因此实际使用变量区域 S 的长度增加。

M8161 flag determines the variable width mode. If M8161=OFF then 16bit mode is selected, which means both high and low byte of variable will be calculated; If M8161=ON then 8bit mode is selected, which means only low byte of variable will be calculated and the high byte be discarded and the length of acual used variable area S will increase.



当 M8161=OFF、n=5 时，位的组合用了 D100~D110（高低字节）转换
Bit composition used D100~D110 (high and low byte) conversion when M8161=OFF, n=5
当 M8161=OFF、n=6 时，位的组合用了 D100~D110（高低字节）转换
Bit composition used D100~D110 (high and low byte) conversion when M8161=OFF, n=6
当 M8161=ON、n=5 时，位的组合用了 D100~D110（高低字节）转换
Bit composition used D100~D110 (high and low byte) conversion when M8161=ON, n=5
当 M8161=ON、n=6 时，位的组合用了 D100~D110（高低字节）转换
Bit composition used D100~D110 (high and low byte) conversion when M8161=ON, n=6
注：
RS/ HEX/ ASCI/ CCD 等指令共用 M8161 模式标志，编程时注意；
Note: RS/ HEX/ ASCI/ CCD instructions share the M8161 mode flag, which should noticed when programming;

S 数据区的源数据必需为 ASCII 码字符，否则转换出错；

The source data of S data area must be of ASCII chars, otherwise errors will occur during the conversion.
若输出的数据为 BCD 格式，HEX 转换后，需要进行 BCD－BIN 转换，才是正确的数值。
If the output data if of BCD format, a BCD-BIN conversion is required after HEX convers to get the correct value.

适用机型 Applicable models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit	32bit	P	FNC 84	CCD	求校验和 Checksum calculation
✔		✔			
7 步 7 steps		7 步 7 steps	指令格式：CCD S D n Instruction format:		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S							✔	✔	✔	✔	✔	✔	✔		
D								✔	✔	✔	✔	✔	✔		
n	常数，n=1~256 Constant, n=1~256														

该指令是对 S 启始的 n 个变量进行两种校验和运算，将直接加法的求和运算结果存于 D；将逐个异或逻辑运算的结果存于 D ＋1 单元中。

This instruction will carry out two kind of checksum calculation to n variables start from S and store the result of direct sum operation to D; The result of binary exclusive or operation will be stored to D ＋1.

本指令用于作通信时，为了确保数据传输时的正确性所做的字符串总和检查（SumCheck）。其中：

When used for communication, the instruction is implemented to string SumCheck for the correctness of data transmission. Where:

S 为待求校验和运算的变量启始地址，使用后续地址的变量单元；

D用于存放校验和；D＋1 单元用于存放逐项异或逻辑运算结果；

n为用于校验的变量字节数。

S is the start address of variables of which the checksum will be calculated and it occupies the following variable cell;

D is used for storing checksum; D＋1 is used for storing the result of binary exclusive or operation;

n is the byte count of variable which will be sum-checked.

指令举例：
Instruction example:

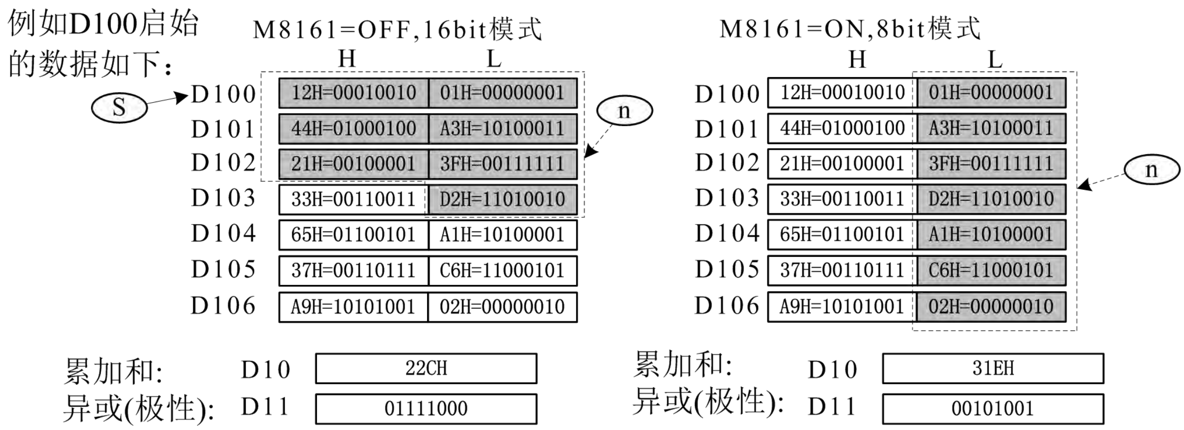
```
        S      D     n
X15
─┤├──〔CCD  D100  D10  K7〕
```

M8161 标志决定了变量宽度模式，当 M8161=OFF 时，为 16bit 模式，即变量的高字节和低字节都参与运算；当 M8161=ON 时，为 8bit 模式，只有变量的低字节参与运算，高字节的内容被丢弃，因此实际使用变量区域的长度增加，见下例图；
M8161 flag determines the variable width mode. If M8161=OFF then 16bit mode is selected, which means both high and low byte of variable will be calculated; If M8161=ON then 8bit mode is selected, which means only low byte of variable will be calculated and the high byte be discarded and the length of acual used variable area S will increase. Please refer to the figure below;

"累加和"就是将指定的 n 个变量直接相加的计算结果；
"Accumulative summation" refers to the addition calculation result of specified n variables.
"异或"逻辑运算的方法则是：
The "exclusive-or" logical calculation means:
1） 将参与运算的变量都换算为二进制数；
2） 先统计每个变量的 bit0 为 1 的个数，若为偶数个，则异或结果的 bit0 为 0；若为奇数个，则异或结果的 bit0 为 1；
3） 再统计每个变量的 bit1 为 1 的个数，若为偶数个，则异或结果的 bit1 为 0；若为奇数个，则异或结果的 bit1 为 1；
4） 依次类推，逐个计算 bit2～bit7，所得的二进制数换算为 HEX 数值即为异或结果（或称极性值）。
1) Convert all the variables which will be calculated to binary value;
2) determine the count of variables of which bit0 is 1, and if the count is even then bit0 of the result of exclusive or operation is 0; If the count is odd then bit0 of the result is 1;

3) Then determine the count of variables of which bit1 is 1, and if the count is even then bit1 of the result of exclusive or operation is 0; If the count is odd then bit1 of the result is 1;

4) Calculate for bit2～bit7 in the same way, and the HEX value converted from binary value is the final result of exclusive or operation (or polarity value).



例如 D100 起始的数据如下：

Data starts from D100 are as follows:

累加和：异或（极性）

Accumulative sum: exclusive or (polarity)

M8161=OFF，16bit 模式

M8161=OFF，16bit mode

M8161=ON，16bit 模式

M8161=ON，16bit mode

RS/ HEX/ ASCI/ CCD 等指令共用 M8161 模式标志，编程时注意该标志的处理。

RS/ HEX/ ASCI/ CCD instructions share the M8161 mode flag, which should be paid attention to when programming.

适用机型 Applicable models		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	—
H2U	✔	—

16bit	32bit	P	FNC 88	PID	PID 运算 PID operations
✔					
9 步 9 steps			指令格式：PID S1 S2 S3 D Instruction format:		

操作数 Operand	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1													✔		
S2													✔		
S3													✔		
D													✔		

该指令是完成 PID 运算，用于闭环控制系统参数的控制。 PID 控制在机械设备、气动设备、恒压供水和电子设备等等中有着广泛的应用。 其中：

The present instruction is used for implementation of PID operations used to control parameters of close-loop control systems. PID control is widely applied in mechanical equipments, pneumatic equipments, constant-pressure water supply and electronic equipments, etc. Where:

S1为 PID 控制的目标值；

S1 denotes the object value of PIC control;

S2为实测的反馈值；

S2 denotes the feedback value of practical measures;

S3为 PID 运算所需设定参数、中间结果保存的缓存区启始地址，占用随后地址的共 25 个变量单元，取值范围是 D0~D7975，最好指定停电保持区，在电源 OFF 后仍保持设定值，否则首次启动运算前需对缓存区作赋值处理。 其中每个单元的功能和参数描述详见本节说明；

S3 denotes the starting address of storage buffers preserving parameters set and intermediate results essential for PID operations. It occupies up to 25 variable units of subsequent addresses, and its span is D0~D7975. Furthermore, it is advisable that power-off holding area is assigned and the set values are still preserved after the power is off, or assignments to storage buffers are needed before starting operations for the first time. For more details about functions and parameters description of every unit of S3 you can refer to instructions in the present session.

D为 PID 计算结果的存放单元，请指定D为非电池保持区，否则首次启动运算前需对其作初始化清 0 处理。

D is the storage cell of PID calculation, and D should be specified to be non-volatile area without batery, or it should be cleared for initialization before the first operation.

指令举例：

Instruction example:

```
 X10        S1    S2     S3      D
─┤├──〔PID   D9    D10    D200    D130〕
```

其中参数说明如下：

Parameters are explained just as follows:

D9 中存放的是 PID 调节的目标值，D10 为闭环反馈值，注意 D9、D10 必需为同一量纲，如都为 0.01MPa 单位，或都为 1℃单位等等；

The target value of PID regulation is stored in D9 and the closed-loop feedback value is stored in D10. Please note that D9 and D10 must have the same unit such as 0.01 MPa or 1℃;

D200～D224 共 25 个单元用于存放 PID 运算的设定值与过程值，这些值在首次 PID 计算前就必需逐项进行设定；

D200～D224:25 units together are applied to preserve the set values and the process values of PID operations, which must be assigned one by one before the first PID calculation.

D130 单元则用于存放计算后的控制输出值，用于控制执行的动作。

D130 is then applied to preserve calculated control output values, which is used to control executable moves.

就S3启始的各单元参数值的功能和设定方法说明如下表：

Function and setting description of parameters in each cell starting from (S3) are shown in the figuer below:

单元 Unit	功能 Function	设定说明 Setting instructions
(S3)	采样时间（TS） Sampling time（TS）	设定范围 1～32767（ms），但需大于 PLC 程序扫描周期 Setting span is 1～32767（ms）, but greater than the scanning period of the PLC routine.
(S3)+1	动作方向（ACT） Action direction（ACT）	bit0：0＝正动作；1＝逆动作 bit1：0＝输入变化量报警无效；1＝输入变化量报警有效 bit2：0＝输出变化量报警无效；1＝输出变化量报警有效 bit3：不可使用 bit0：0＝forward；1＝reverse bit1：0＝input variance alarm disabled；1＝input variance alarm enabled bit2：0＝output variance alarm disabled；1＝output variance alarm enabled bit3：not usable bit4：0＝自整定不动作；1＝执行自整定（目前版本暂时不提供此项功能） bit5：0＝输出值上下限设定无效；l＝输出值上下限设定有效 bit6~bit15 不可使用 另外，请不要使 bit5 和 bit2 同时处于 ON。 bit4：0＝no self-tuning；1＝self-tuning（not supported in current version） bit5：0＝output upper/lower limit disabled；l＝output upper/lower limit enabled bit6~bit15 are't usable In addition please note that bit5 and bit2 should not be ON at the same time.
(S3)+2	输入滤波常数（α） Input filter constant（α）	0~99[%]，0＝没有输入滤波 0~99[%]，0 means no input filter.
(S3)+3	比例增益（Kp） Proportional gain（Kp）	1~32767[%]
(S3)+4	积分时间（T1） Integration time（T1）	0~32767（×100ms），0＝作为∞处理（无积分） 0~32767（×100ms），0 is processed as ∞ (no integration).
(S3)+5	微分增益（KD） Differentiation gain	0~100[%]，0＝无积分增益 0~100[%]，0 means no integration gain.

单元 Unit	功能 Function	设定说明 Setting instructions
	（KD）	
S3+6	微分时间（TD） Differentiation time（TD）	0~32767（×10ms），0＝无微分处理 0~32767（×10ms），0 means no differentiation.
S3+(7～19)	PID 运算的内部处理占用，首次运行前应清为 0 This unit is occupied by internal processing of PID operations, and should be reset before the first time operation.	
在<ACT>的 bit1=1，bit2=1 或 bit5=1 时，S3+（20～24）被占用，定义如下： S3+（20～24） are occupied when bit1=1，bit2=1 or bit5=1 in <ACT>, and the definition is as follows:		
S3+20	输入变化量（增侧）报警设定值	0~32767，（<ACT>的 bit1=1 时有效） 0~32767，（enabled when bit1=1 in <ACT>）
S3+21	输入变化量（减侧）报警设定值 Set alarm value for input variable (increment side)	0~32767，（<ACT>的 bit1=1 时有效） 0~32767，（enabled when bit1=1 in <ACT>）
S3+22	输出变化量（增侧）报警设定值 Set alarm value for output variable (increment side)	0~32767，（<ACT>的 bit2=1，bit5=0 时有效） 0~32767，（enabled when bit2=1 and bit5=0 in <ACT>） 输出上限设定值-32768~32767 （<ACT>的 bit1=1，bit5=1 时有效） Output upper limit setting -32768~32767 （enabled when bit1=1 and bit5=1 in <ACT>）
S3+23	输出变化量（减侧）报警设定值 Set alarm value for output variable (decrement side)	0~32767（S3+1<ACT>的 bit2=1，bit5=0 时有效） 0~32767，（ enabled when bit2=1 and bit5=0 in S3+1<ACT>） 输出下限设定值-32768~32767 （<ACT>的 bit1=0，bit5=1 时有效） -32768~32767 （enabled when bit1=0 and bit5=1 in <ACT>）
S3+24	报警输出 Alarm output	bit0 输入变化量（增侧）溢出 bit1 输入变化量（减侧）溢出 Bit0 input variance (increase side) overflow Bit1 input variance (decrease side) overflow Bit2 输出变化量（增侧）溢出 Bit2 output variance (increase side) overflow Bit3 输出变化量（减侧）溢出 Bit3 output variance (decrease side) overflow （<ACT>的 bit1=1 或 bit2=1 时有效） （enabled when bit1=1 and bit2=1 in <ACT>）

PID的理论运算公式如下：

正逻辑

$$\triangle MV=Kp\left|(EVn-\mathbf{EVn\text{-}1})+\frac{\mathbf{Ts}}{\mathbf{Ti}}EVn+Dn\right|$$

EVn=PVnf-SV

$$Dn=\frac{\mathbf{T_D}}{\mathbf{Ts+\alpha_D*T_D}}(-2PVnf\text{-}l+PVnf+PVnf\text{-}2)+\frac{\mathbf{\alpha_D*T_D}}{\mathbf{Ts+\alpha_D*T_D}}*Dn\text{-}1$$

$$MVn=\Sigma\triangle MVn$$

逆逻辑

$$\triangle MV=Kp\left|(EVn-\mathbf{EVn\text{-}1})+\frac{\mathbf{Ts}}{\mathbf{Ti}}EVn+Dn\right|$$

EVn=SV-PVnf

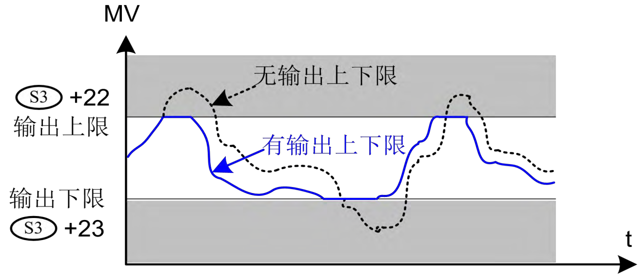
$$Dn=\frac{\mathbf{T_D}}{\mathbf{Ts+\alpha_D*T_D}}(2PVnf\text{-}l-PVnf-PVnf\text{-}2)+\frac{\mathbf{\alpha_D*T_D}}{\mathbf{Ts+\alpha_D*T_D}}*Dn\text{-}1$$

$$MVn=\Sigma\triangle MVn\triangle$$

PID 的理论运算公式如下：
Theoretical formula of PID calculation:
正逻辑
Positive logic
逆逻辑
Negative logic
EVn ：本次采样时的偏差
EVn: offset during current sample
Dn ：本次的微分项
Dn: current differential coefficient
EVn-1：1 个周期前的偏差
EVn-1: offset 1 period before
Dn- 1 ：1 个周期前的微分项
Dn-1: diffenrential coefficient 1 period before
SV ：目标值
SV: target value
Kp ：比例增益
Kp: propotional gain
PVnf ：本次采样时的测定值（滤波后）
PVnf: measured value during current sample (filtered)
Ts ：采样周期
Ts: sample period
PVnf-l：l 个周期前的测定值（滤波后）

PVnf-1: measured value 1 period before (filtered)
TI　　：积分常数
T1: integral constant
PVnf-2：2 个周期前的测定值（滤波后）
PVnf-2: measured value 2 period before (filtered)
TD　：微分常数
TD : differential constant
△　MV：输出变化量
△　MV：　output variance
△　αD　：微分增益
△　αD　：Differential gain
△　MVn ：本次的操作量
△　MVn ：current controlled variable

PVnf 是根据读入的测定值由下列运算式求得的值：
［滤波后的测定值 PVnf］ = PVn + L (PVnf - l - PVn)
PVnf is calculated from the measured value using following formula:
[measured value after filter PVnf] = PVn + L (PVnf - l - PVn)
PVn ：本次采样时的测定值
L ：滤波系数
PVnf - 1 ：1 个周期前的测定值（滤波后）
PVn ：measured value during current sample
L ：filter coefficient
PVnf - 1 ：measured value 1 period before (filtered)
正逻辑也称正方向，如恒温控制系统的加热功率调节等，属于正逻辑 PID 控制；负逻辑也称反方向，如恒温控制系统的散热风扇运转速度控制，属于负逻辑 PID 控制。
Positive logic is also referred to as positive direction, e.g. heat power adjustment of constant-temperature control system etc., which belongs to positive logic PID control; Negative logic is also referred to as negative direction, e.g. radiator fans' running speed control of constant-temperature control system, which belongs to negative logic PID control.
输出上下限设定：
Settings for output upper limit and lower limit:
对于多数应用系统，PID 的调节输出范围是有限的，如电平信号幅值范围、变频器调节频率范围等。 根据实际情况设定 PID 运算中的输出上限、输出下限，让闭环系统的执行装置在正常运行参数下工作。
For the purpose of achieving the best capacity, the output range of PID adjustment is limited, such as level signal amplitude range and adjustable frequency range of frequency transformer, etc. Thus, output upper limit and lower limit of PID operations should be set according to practical circumstances so that executive equipments of close-loop systems can work under normal running parameters.



输出上线

Output upper limit

输出下限

Output lower limit

无输出上下限

Without output upper/lower limit

有输出上下限

With output upper/lower limit

超限报警设定：

Settings for over-limit alarm:

若需要检查控制器的输入量（反馈量）的变化量是否超限（上限或下限）、PID 的运算输出的变化量是否过大（超过上限或下限），可在 ACT（S3＋1）单元中，将 ACT 的 bit1＝ON，bit2＝ON，启用报警功能；在 S3＋（20～23）单元中分别设定变化量报警限值，运行中就可在 S3＋24 单元读取参数的超限状态了。

If it’s needed to check whether the variance of input (feedback) variable exceeds limit (upper/lower limit) and the variance of PID output exceeds limit (upper/lower limit) for the controller, then bit1＝ON，bit2＝ON in ACT can be set within ACT（S3＋1）and the alarm should be enabled; Then the alarm threshold of variance should be set in S3＋（20～23）so as to read the overrun state of parameters in S3＋24 .

这在一些需要判断调节状态的场合，简化了运算。

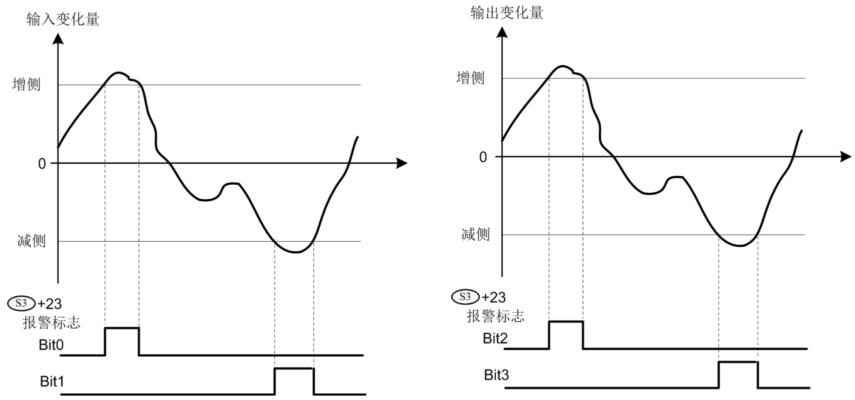
The adjustments said simplify operations when adjusting conditions need to be assessed.

使用输出变化量的报警功能时，S3+1（ACT）的 bit5 请必须被设置为 OFF。

Bit5 of S3+1（ACT） must be set to OFF while using the output variance alarm function.

这里所述的“变化量”＝（上次的数值）－（本次的数值），对应动作示意图如下：

The “variance” described here equals to (last value) – (current value), and the illustration of corresponding actions is shown below:



输入变化量
Input variation

增量
Increment side

减侧
Decrement side

报警标志
Alarm flag

输出变化量
Output variation

可见“减侧”的告警下限设定值为负值。为避免输入量波动过大，一般对输入的信号进行硬件滤波处理，还可在用户程序中进行软件滤波处理。
The alarm lower limitation value in decrement side is negative value. To avoid too wide input fluctuation, we generally use some hardware filter processing for input signals or software filter processing in user routines.

PID 常数的设定：
Settings for PID constants:

PID 的 Kp、Ki、Kd、Ts 等常数选择，对 PID 控制特性至关重要，这三个参数对稳定性的定性影响为：
Selecting the following constants: Kp, Ki, Kd, Ts, etc. is critical for PID control performance. The qualitative influence of these parameters for stability is shown as follows:

1） 比例增益 Kp 过大，将出现过冲，甚至无法稳定；Kp 过小，调节过程缓慢；设置恰当时，系统 PID 调节的响应速度效果好；
If proportional gain Kp is too large, there will be overshoot and even instable; if Kp is too small, the adjustment procedure will be very slow; if it is set properly, the response speed of system PID adjustment will have good result;

2） 积分时间 Ti 过大，调节过程缓慢；Ti 过小，输出突变大，难以稳定；设置恰当时，稳定快，偏差小；

If integration time Ti is too large, the adjustment procedure is slow; if it is too small, the output will have large step, which cannot be stabilized; if it is set properly, the stable can be achieved quickly with small deviation;

3） 微分增益 Kd 过大，系统极易自激振荡，无法稳定；Kd 小对稳定影响小；设置恰当时利于快速逼近设定值。由于该参数对稳定的影响大，多数应用中常不使用微分调节，即将其增益设为 0；

If differentiae gain Kd is too large, the oscillation is easy to be self-excited, which cannot be stabilized; if Kd is too small, it cannot make effects to stabilization; if it is set properly, it can help to approach setting value quickly. Furthermore, providing this parameter has a large influence on stability, differentiation adjustment usually is not used in most applications, i.e. Kd is usually set to 0.

4） 采用周期 Ts 对应于执行 PID 运算的时间间隔，其设定值应大于 PLC 程序的扫描执行时间，为保证 PID 调节效果，PLC 程序最好采用固定扫描周期的模式运行，或将 PID 运行放在定时中断中运行。

The period Ts corresponding to time interval of implementing PID calculation is applied, and the setting value should be larger than scanning implementation time of PLC program to ensure PID adjustment effect. PLC program is recommended to be implemented in fixed scanning period mode or PID is implemented in timing interrupt.

错误代码

控制参数的设定值或 PID 运算中的数据发生错误时，则运算错误 M8067 变为 ON 状态，根据其错误内容 D8067 中存入下述数据。

Error code

When something is wrong with the set value of control parameters or data in PID operations, operational error M8067 turns ON. According to the specific error correspondingly, the following data will be stored in D8067:

<table>
<tr><th>代码
Code</th><th>错误内容
Error description</th><th>处理状态
Solution conditions</th><th>处理方法
Solution methods</th></tr>
<tr><td>K6705</td><td>应用指令的操作数在对象软元件范围外
Operators applying instructions are out of the object software range</td><td rowspan="4">PID 命令运算停止
PID instructions operations end</td><td rowspan="4">请确认控制数据的内容
Please verify control data</td></tr>
<tr><td>K6706</td><td>应用指令的操作数在对象软元件范围外
Operators applying instructions are out of the object software range</td></tr>
<tr><td>K6730</td><td>采样时间(TS)在对象软元件范围外(TS<0)
Sampling time (TS) is not in the range of object soft component (TS<0)</td></tr>
<tr><td>K6732</td><td>输入滤波常数在对象(α)范围外(α<0 或 100≤α)
The input filter constant is not in the rang of object (α) (α<0or100≤α)</td></tr>
</table>

代码 Code	错误内容 Error description	处理状态 Solution conditions	处理方法 Solution methods
K6733	比例增益(KP)在对象范围外(KP<0) Proportion gain (KP) is not in the range of object (KP<0)		
K6734	积分时间(TI)在对象范围外(TI<0) Integral time(TI) is not in the range of object (TI<0)		
K6735	微分增益(KD)在对象范围外(KD<0 或 201≤KD) Differentiate gain (KD) is not in the range of object(KD<0 or 201≤KD)		
K6736	微分时间(TD)在对象范围外(KD<0) Differentiate time(TD) is not in the range of object (KD<0)		
K6740	采样时间(Ts)≤运算周期 Sampling time(Ts)≤operational period	PID 命令运算继续 PID instructions operations continue	
K6742	测定值变化量超过((PV<-32768 或 32767 < (PV) Variation of measured values is out of the range of PV<-32768 or 32767 < PV		
K6743	偏差超过(EV<-32768 或 32767 < EV) Deviation out of the range of EV<-32768 or 32767 < EV		
K6744	积分计算值超过(-32768~32767 以外) Integral calculating value exceeds the rang of -32768~32767		
K6745	由于微分增益(舒）超过微分值超过 Due to differentiation gains out of range, differentiation value is out of the range		
K6746	微分计算值超过(-32768~ 32767 以外) Calculated differentiation value is out of the range of -32768~ 32767		
K6747	PID 运算结某超过(-32768~32767 以外) PID operations results out of the range of -32768~32767		
K6750	自整定结果不良 Self-setting results aren't expected	自整定结束 Self-setting ends	自整定开始时的测定值和目标值的差为 150 以下或自整定开始时的测定值和目标值的差的 l / 3 以上则结束确认测定值、目标值后，请再次进行自整定。

代码 Code	错误内容 Error description	处理状态 Solution conditions	处理方法 Solution methods
			When the variation between measured value and object value is above 150 or measured value exceeds 1/3 of object value at the beginning of self-setting, please repeat the self-setting after finishing with verifying of measured values and object values.
K6751	自整定动作方向不一致 Self-setting action direction is out of step	自整定继续 Self-setting continues	从自整定开始时的的测定值预测的动作方向和自整定用输出时实际动作方向不一致。 请使目标值、自整定用输出值、测定值的关系正确后，再次进行自整定。 Actions directions predicted according to the measured values at the beginning of self-setting and practical action directions are inconsistent. Please make sure that the relations among the object value, the output value for self-setting use and the measured value are correct, after which self-setting can be repeated.

代码 Code	错误内容 Error description	处理状态 Solution conditions	处理方法 Solution methods
K7652	自整定动作不良 Self-setting action isn't expected	自整定 Self-setting	自整定中测定值因上下变化不能正确动作。请使采样时间远远大于输出的变化周期，增大输入滤波常数。设定变更后,请再次进行自整定。 Self-setting cannot do correct actions owing to measured values' thereabout fluctuation. Please set the sampling time to be far greater than output variation period, and increase the input filter constant. After setting is modified, please make self-regulation again.

要点

必须在PID运算执行前，将正确的测定值读入PID测定值（PV）中。特别对模拟量输入模块的输入值进行PID运算时，需注意其转换时间。

编程说明：

Programming notes:

1、 PID 指令在程序中可多次使用，可同时执行，但各 PID 指令中使用的 变量区域不要有重叠；在步进指令、跳转指令、定时中断、子程序中也可以使用，在此情况下执行 PID 指令时，需事先清除 S3 ＋7 缓存单元。

PID instruction could be applied in program in multiple times, which can also be used simultaneously, but the variable ranges used by each PID instruction should not overlap each other; it can be used in step instruction, jump instruction, timing interrupt, and subroutine, and when PID instruction is implemented, the buffer unit S3 +7 should be cleared in advance.

2、 采样时间 TS 的最大误差为-（1 运算周期+1ms）~+（1 运算周期）。如果采样时间 TS≤可编程控制器的 1 个运算周期，则发生下述的 PID 运算错误（K6740），并以 TS＝运算周

期执行 PID 运算。在这种情况下，建议最好使用恒定扫描模式或在定时器中断（I6□□～I8□□）中使用 PID 指令。

The max error of sampling time TS is –(1 calculation period +1ms)~ +(1 calculation period). If sampling time TS≤ 1 calculation period of PLC, the following PID calculation error (K6740) occurs,and PID calculation will be implemented with TS= calculation period. In this condition, it is recommended that the PID instruction is implemented in constant scanning mode or in timer interrupt （I6□□～I8□□）.

4.3.2.10 浮点数（110~147）

4.3.2.10 Floating number（110~147）

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

16bit 16bit	32bit 32bit	P	FNC 110	ECMP	二进制浮点数比较 Binary floating point data compare
	✔	✔			
	13 步 13 steps	13 步 13 steps	指令格式：ECMP S1 S2 D Instruction format：ECMP S1 S2 D		

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		

D		✔	✔	✔											

该指令是进行 2 个浮点数变量的比较，将比较的结果输出到 启始的 3 个变量中。 其中：
The instruction is to compare two floating variables, and output the comparison result to three variables started with. Where:

S1 为待比较的二进制浮点数 1；

S1 is the binary floating value 1 for comparison;

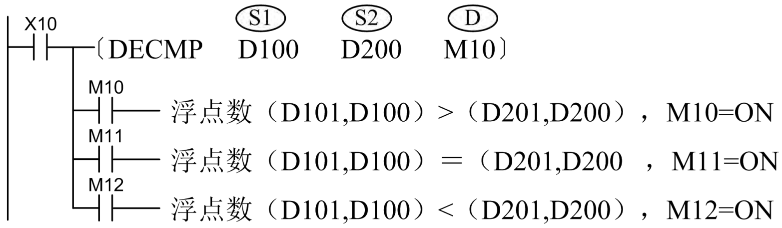
S2 为待比较的二进制浮点数 2；

S2 is the binary floating value 2 for comparison;

D 为比较结果的存放单元，共占用 3 个（位）变量单元。

D is the storage unit for comparison result, occupying three variable units.

指令举例：
Instruction example:



当X10=ON时，M10~M12其中之一会ON。
X10由ON变OFF 时，不执行DECP指令，M10~M12仍保持X10
=OFF之前的状态,要清除M10~M12的比较结果可用RST或者ZRST
对M10~M12进行清除。
若需要得到≧、≦、≠的结果时，可将M10~M12
串并联即可取得。

浮点数
Floating point number
当 X10=ON 时，M10~M12 其中之一会 ON。
When X10=ON, One of M10~M12 will be set to ON.

X10 由 OFF 时，不执行 DECP 指令，M10~M12 仍保持 X10=OFF 之前的状态，要清楚 M10~M12 的比较结果可用 RST 或者 ZRST 对 M10~M12 进行清除。
When X10=OFF, DECP instruction will not be implemented, and M10~M12 will hold the previous state. By applying RST or ZRST instruction to clear M10~M12, the comparison result of M10~M12 will be cleared.
若 M10~M12 进行清除。
M10~M12 will be cleared.
若需要得到≥、≤、≠的结果时，可将 M10~M12 串并联即可取得。

By series connecting or parallel connecting M10~M12, the results of ≥、≤、≠ will be obtianed.

若 S1 或 S2 为 K、H 常数，系统会自动转换为浮点数参与运算。

If S1 or S2 is K, H constant, they will be automatically converted to floating for calculation.

16bit	32bit	P	FNC 111	EZCP	二进制浮点数区域比较 Binary floating-point zone comparison
	✔	✔			
	17 步 17 steps	17 步 17 steps	指令格式：EZCP S1 S2 S D Instruction format : EZCP S1 S2 S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	✔
H1U		
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
S					✔	✔							✔		
D		✔	✔	✔											

该指令是进行二进制浮点数变量的区间比较，将比较的结果输出到 启始的 3 个变量中。 其中：

The instruction compares the inter-zoning variables of binary floating-points, and then exports the result to the three (3) initiative variables, where:

S1 为二进制浮点变量区间的下限；

S1 is the lower limitation of the binary floating variable range;

S2 为二进制浮点变量区间的上限；

S2 is the upper limitation of the binary floating variable range;

Ⓢ待比较的二进制浮点变量；

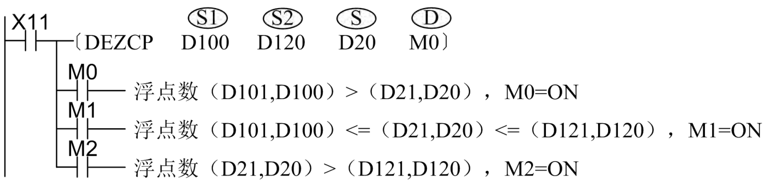
Ⓢ is the binary floating variable for comparison;

Ⓓ为比较结果的存放单元，共占用 3 个（位）变量单元。

Ⓓ is the storage unit for comparison result, occupying three variable units.

指令举例：

Instruction example:



当X11=ON时，M0~M2其中之一会ON。
当X11由ON变OFF时，不执行DEZCP指令，M0/M1/M2保持X11=OFF以前的状态
不变。要清除M0~M2的比较结果可用RST或者ZRST对M0~M2进行清除。

浮点数

Floating point number

当 X11=ON 时，M0~M2 其中之一会 ON。

When X11=ON, One of M0~M2 will be set to ON.

当 X11 有 ON 变 OFF 式，不执行 DEZCP 指令，MO/M1/M2 保持 X11=OFF 以前的状态不变,要清楚 M0~M2 的比较结果可用 RST 或者 ZRST 对 M0~M2 进行清除。

When X11=OFF, DEZCP instruction will not be implemented, and M0/M1/M2 will hold the previous state. By applying RST or ZRST instruction to clear M0~M2, the comparison result of M0~M2 will be cleared.

<table>
<tr><td>16bit
16bit</td><td>32bit
32bit</td><td>P</td><td rowspan="2">FNC
FNC
118</td><td rowspan="2">EBCD
EBCD</td><td rowspan="2">二进制浮点数→十进制浮点转换
Converting binary floating to decimal floating</td></tr>
<tr><td></td><td>✔</td><td>✔</td></tr>
<tr><td></td><td>9 步
9 steps</td><td>9 步
9 steps</td><td colspan="3">指令格式：EBCD Ⓢ Ⓓ

Instruction format：EBCD Ⓢ Ⓓ</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型
Available model</td></tr>
<tr><td>系列
Series</td><td>通用
Common</td><td>增强
Enh</td></tr>
</table>

		anc ed
H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是进行二进制浮点数转换为十进制浮点的运算。 其中：

This instruction converts binary floating to decimal floating. Where:

S 为二进制浮点变量；

S is binary floating variable;

D 为转换为十进制浮点数结果的存放单元。

D is the storage unit for converted decimal floating result.

指令举例：

Instruction Example:

X1 ┤├──〔DEBCD S D2 D D10〕

将二进制浮点数（D3,D2）转换成十进制浮点数后，存放于（D11,D10）单元。

其中2 进制浮点数[D3,D2]实数23 位，指数 8 位，符号位 1 位

10 进制浮点数[D 11， D 10]指数(D3)实数(D2),用科学计算式表示为D2 X 10^{D3}

将二进制浮点数[D3,D2]实数 23 位，指数 8 位，符号位 1 位 10 进制浮点书[D11,D10]指数（D3）实数（D2），用科学计算式表示为 D2×10D3

There are 23 bits real number, 8 bits exponent, and1 bit signal in binary floating [D3,D2], which will be converted to decimal floating [D11,D10], and it could be expressed with science formula of D2×10D3

PLC 内部浮点数据计算均为二进制形式，转换为十进制，可方便监控。

The floating data calculation in PLC is all in binary format, and it is converted to decimal for ease of monitoring.

16bit 16bit	32bit 32bit	P	FNC FNC 119	EBIN	十进制浮点数→二进制浮点转换 Converting decimal floating to binary floating
	✔	✔			
	9步 9 steps	9步 9 steps	指令格式：EBIN S D Instruction format：EBIN S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是进行十进制浮点数转换为二进制浮点的运算。 其中：

This instruction converts decimal floating to binary floating. Where:

S 为十进制浮点变量；

S is decimal floating variable;

D 为转换为二进制浮点数结果的存放单元。

D is the storage unit for converted binary floating result.

指令举例：

Instruction Example:

```
  X2
├┤├─┬─〔MOVP   K3142   D10〕
│   ├─〔MOVP   K-3     D11〕
│   │           S       D
│   └─〔DEBIN   D10     D2〕
```

将十进制浮点数 3.142（先放于 D11，D10）转换成二进制浮点数后，存放于（D3，D2）单元。

The decimal floating 3.142, which is saved in D11,D10, is converted to binary floating and then saved in (D3,D2).

16bit 16bit	32bit 32bit	P	FNC120 FNC120	EADD	二进制浮点加法运算 Binary floating addition calculation
	✔	✔			
	13步 13 steps	13步 13 steps	指令格式：EADD S1 S2 D Instruction format：EADD S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
D													✔		

该指令是进行二进制浮点的加法运算。 其中：

This instruction implements binary floating addition calculation. Where:

S1和S2分别为二进制浮点的被加数和加数；

S1 and S2 are respectively binary floating addends;

D为二进制浮点加法和的存放单元。

D is the storage unit for binary floating addition.

S1 或 S2 来源操作数若是常数 K 或 H ，会自动将该常数变换成二进制浮点数值来作加法运算；

If the source operand of S1 or **错误！未指定文件名。** S2 is constant K or H, it will automatically be converted to binary floating value for addition calculation.

若计算结果为零，则 0 标志（M8020）会置位。

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

若运算结果的绝对值大于可表示的最大浮点值，则进位标志（M8022）会置位。

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

若运算结果的绝对值小于可表示的最小浮点值，则借位标志（M8021）会置位。

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

指令举例：

Instruction Example:

```
                          S1       S2        D
 X10
─┤├──〔DEADD      D2       D4        D10〕
 X11
─┤├──〔DEADDP     D20      K123      D20〕
```

当 X10＝ON 时，二进制浮点数（D3，D2）与二进制浮点数（D5，D4）相加后，二进制浮点数和存放于（D11，D10）；

When X10=ON and binary floating variable (D3, D2) is added by binary floating variable (D5, D4), the result will be saved in (D11, D10);

当 X11 由 OFF 变为 ON 时，二进制浮点数（D21，D20）的值增大 123。这里的常数 K123 在运算前已自动被调整为二进制浮点数；

When X11 is set from OFF to ON, the binary floating (D21, D20) value is added by 123. The constant K123 is automatically converted to binary floating value before calculation;

和的存放单元可以与加数或被加数为同一单元，此时请使用脉冲执行型指令 DEADDP，否则若采用连续执行指令，则程序每扫描一次，计算就会被执行一次。

The storage unit for result could be the storage unit for addends, in which the pulse-type DEADD instruction is recommended, or the continue implementation instruction will be applied, in which the calculation will be implemented every time the program is scanned.

16bit 16bit	32bit 32bit	P	FNC121 FNC121	ESUB	二进制浮点减法运算 Binary floating subtraction calculation
	✔	✔			

	13 步 13 steps	13 步 13 steps	指令格式：ESUB S1 S2 D Instruction format：ESUB S1 S2 D

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
D													✔		

该指令是进行二进制浮点的减法运算。 其中：

The instruction performs subtraction operation based on the binary floating-point system, where:

S1和S2分别为二进制浮点的被减数和减数；

S2and S2 are respectively binary floating subtracters;

D为二进制浮点减法差的存放单元。

D is the storage unit for binary floating subtraction.

S1 或 S2 来源操作数若是常数 K 或 H ，会自动将该常数变换成二进制浮点数值来作减法运算；

Should the source operand of S1 or S2 be constant K or H, it will automatically convert the constant to a binary floating-point value to further perform subtraction operation;

若计算结果为零，则 0 标志（M8020）会置位。

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

若运算结果的绝对值大于可表示的最大浮点值，则进位标志（M8022）会置位。

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

若运算结果的绝对值小于可表示的最小浮点值，则借位标志（M8021）会置位。

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

指令举例：

Instruction Example:

```
 X10                 (S1)    (S2)    (D)
─┤├──〔DESUB    D2      D4      D10〕
 X11
─┤├──〔DESUBP   D10     K123    D10〕
```

当 X10＝ON 时，二进制浮点数（D3，D2）减去二进制浮点数（D5，D4）后，二进制浮点数差存放于（D11，D10）；

When X10=ON and binary floating variable (D3, D2) is subtracted by binary floating variable (D5, D4), the result will be saved in (D11, D10);

当 X11 由 OFF 变为 ON 时，二进制浮点数（D11，D10）的值减小 123。这里的常数 K123 在运算前已自动被调整为二进制浮点数；

When X11 is set from OFF to ON, the binary floating (D11, D10) value is subtracted by 123. The constant K123 is automatically converted to binary floating value before calculation;

差的存放单元可以与减数或被减数为同一单元，此时请使用脉冲执行型指令 DESUBP，否则若采用连续执行指令，则程序每扫描一次，计算就会被执行一次。

The storing unit for the subtraction difference can be seemed as same one unit with the subtrahend and minuend. Please use the pulse execution instruction DESUBP under this circumstance. Otherwise, if selected the progressive execution instruction, the subtraction operation will be carried out again every time when the program is scanned.

16bit 16bit	32bit 32bit	P	FNC 122 FNC 122	EMUL	二进制浮点乘法运算 Binary floating multiplication calculation
	✔	✔			
	13 步 13 steps	13 步 13 steps	指令格式：EMUL S1 S2 D Instruction format：EMUL S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z

S1					✔	✔							✔		
S2					✔	✔							✔		
D													✔		

该指令是进行二进制浮点的乘法运算。 其中：

The instruction performs multiplication operation based on the binary system, where：

S1和S2分别为二进制浮点的被乘数和乘数；

S1 and S2 are respectively binary floating multiplicands.

D为二进制浮点乘法积的存放单元。

D is the storage unit for binary floating multiplication.

S1 或 S2 来源操作数若是常数 K 或 H ，会自动将该常数变换成二进制浮点数值来作乘法运算；

Should the source operand of S1 or S2 be constant K or H, it will automatically convert the constant to a binary floating-point value to further perform multiplication operation.

若计算结果为零，则 0 标志（M8020）会置位。

if the result of calculation is zero, it will be flagged and positioned at M8020.

若运算结果的绝对值大于可表示的最大浮点值，则进位标志（M8022）会置位。

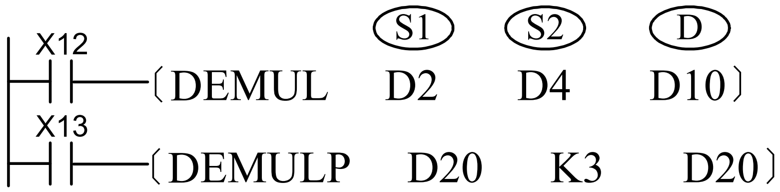
If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

若运算结果的绝对值小于可表示的最小浮点值，则借位标志（M8021）会置位。

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

指令举例：

Instruction Example:



当 X12＝ON 时，二进制浮点数（D3，D2）乘以二进制浮点数（D5，D4）后，二进制浮点数积存放于（D11，D10）；

When X12=ON and binary floating variable (D3, D2) is multiplied by binary floating variable (D5, D4), the result will be saved in (D11, D10);

当 X13 由 OFF 变为 ON 时，二进制浮点数（D21，D20）的值乘以 3 倍后存回（D21，D20）。这里的常数 K3 在运算前已自动被调整为二进制浮点数；

积的存放单元可以与乘数或被乘数为同一单元，此时请使用脉冲执行型指令 DEMULP，否则若采用连续执行指令，则程序每扫描一次，计算就会被执行一次。

When X13 is set from OFF to ON, binary floating (D21,D20) is multiplied by 3 and then the result is saved back to (D21,D20).

16bit 16bit	32bit 32bit	P	FNC 123 FNC 123	EDIV EDIV	二进制浮点除法运算 Binary floating division calculation
	✔	✔			
	13 步 13 steps	13 步 13 steps	指令格式：EDIV S1 S2 D Instruction format：EDIV S1 S2 D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔							✔		
S2					✔	✔							✔		
D													✔		

该指令是进行二进制浮点的除法运算。 其中：

This instruction is to implement binary floating division calculation, where,

S1 和 S2 分别为二进制浮点的被除数和除数；

S1 and S2 **错误！未指定文件名。** are respectively binary floating dividend and divisor;

D 为二进制浮点除法商的存放单元启始地址。

D is the starting address of the binary floating division result storage unit.

S1 或 S2 来源操作数若是常数 K 或 H，会自动将该常数变换成二进制浮点数值来作除法运算；

If the source operand of S1 or **错误！未指定文件名。** S2 is constant K or H, it will be automatically converted to binary floating value for division calculation;

若计算结果为零，则 0 标志（M8020）会置位。

If the calculation result is 0, the 0 flag bit (M8020) will be reset.
若运算结果的绝对值大于可表示的最大浮点值，则进位标志（M8022）会置位。
If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.
若运算结果的绝对值小于可表示的最小浮点值，则借位标志（M8021）会置位。
If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.
除数不得为 0，否则计算出错，M8067、M8068 会置 ON。
The divisor should not be 0, or there will be an error and M8067, M8068 will be set to ON.
指令举例：
Instruction Example:

```
                        S1      S2       D
  X14
|-| |---[DEDIV     D2      D4       D10]
  X15
|-| |---[DEDIVP    D10     K10      D10]
```

当 X14＝ON 时，二进制浮点数（D3，D2）除以二进制浮点数（D5，D4）后，二进制浮点数商存放于（D11，D10）；
When X14=ON and binary floating variable (D3, D2) is divided by binary floating variable (D5, D4), the result will be saved in (D11, D10);
当 X15 由 OFF 变为 ON 时，二进制浮点数（D11，D10）的值除以 10 后存回（D11，D10）。这里的常数 K10 在运算前已自动被调整为二进制浮点数；
When X15 is set from OFF to ON, binary floating (D11,D10) is divided by 10 and then the result is saved back to (D11,D10). The constant K10 is automatically converted to a binary floating value before calculation;
商的存放单元可以与除数数或被除数为同一单元，此时请使用脉冲执行型指令 DEDIVP，否则若采用连续执行指令，则程序每扫描一次，计算就会被执行一次。
The storage unit for the result could be the storage unit for the dividend or divisor, in which the pulse-type DEDIVP instruction is recommended, or the continue implementation instruction will be applied, in which the calculation will be implemented every time when the program is scanned.

<table>
<tr><td>16bit
16bit</td><td>32bit
32bit</td><td>P</td><td rowspan="2">FNC127
FNC127</td><td rowspan="2">ESQR
ESQR</td><td rowspan="2">二进制浮点开平方运算
Binary floating radication calculation</td></tr>
<tr><td></td><td>✔</td><td>✔</td></tr>
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9 steps</td><td colspan="3">指令格式：ESQR S D

Instruction format：ESQR S D</td></tr>
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<tr><td colspan="3">适用机型
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</table>

		ed
H1U H1U	✔	✔
H2U	✔	—

操 作 数 Operand	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔							✔		
D													✔		

该指令是进行二进制浮点的开平方运算，即求二进制浮点数的平方根。 其中：

The command performs the square root calculation of the binary floating-points, where:

S为待求平方根的二进制浮点数变量；

S is the binary floating variable for radication calculation;

D为二进制浮点平方根的存储单元。

D is the storage unit for binary floating radication

操作数S若是常数 K 或 H，会自动将该常数变换成二进制浮点数值来作开方运算；

If the operand S **错误！未指定文件名。** is constant K or H, it will be automatically converted to binary floating value for radication calculation;

若计算结果为零，则 0 标志（M8020）会置位。

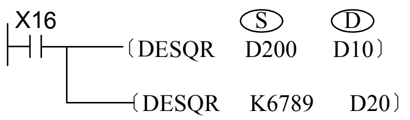
If the calculation result is 0, the 0 flag bit (M8020) will be reset.

S只有正数有效，如果是负数则计算出错，M8067、M8068 会置 ON。

Only positive S is valid. If it is negative, there will be calculation error and M8067, M8068 will be set to ON.

指令举例：

Instruction Example:



将二进制浮点数开方结果 $\sqrt{(D201,D200)}$ 存放到→ (D11,D10)

将二进制浮点数K6789做开方，结果存放到→ (D21,D20)，

这里的常数K6789在运算前已自动被调整为二进制浮点数；

将二进制浮点数开方结果 $\sqrt{(D201,D200)}$ 存放到→（D11，D10）

The binary floating radication result $\sqrt{(D201,D200)}$ is saved to（D11，D10）

将二进制浮点数 K6789 做开放，结果存放到→（D21，D20）
The binary floating value K6789 is radicated, and result is saved to（D21，D20）

这里的常数 K6789 在运算前已被调整为二进制浮点数；
The constant K10 is converted to binary floating value before calculation.

16bit 16bit	32bit 32bit	P	FNC129 FNC129	INT	二进制浮点→BIN 整数变换 Converting binary floating to BIN integer
✔	✔	✔			
5 步 5 steps	9 步 9 steps		指令格式：INT S D Instruction format：INT S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U H1U	✔	✔
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是进行二进制浮点的取整运算，丢弃小数部分，将二进制结果存于 中。其中：
The instruction is to implement round calculation for binary floating, in which the decimal part is abandoned, and the binary result is saved in. Where:

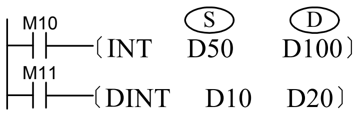
S 为待取整变换的二进制浮点数变量；

S is the binary float variable to be round converted.

D 为变换后 BIN 整数结果的存储单元。

D is the storage unit of the resulted BIN integer after the conversion.

若计算结果为零，则 0 标志（M8020）会置位。
If the calculation result is 0, the 0 flag bit (M8020) will be reset.
若运算结果有浮点数被舍弃时，则借位标志（M8021）会置位。
If any fractional part is abandoned during the operation, the borrow sign (M8021) will be set.
若运算结果若超出下列范围时（溢位），则进位标志（M8022）会置位。
If the operation result exceeds the following ranges (overflow), the carry sign (M8022) will be set.
16 位指令：-32，768~32，767
16bit instruction：-32，768~32，767
32 位指令：-2，147，483，648~2，147，483，647
32bit instruction：-2，147，483，648~2，147，483，647
指令举例：
Instruction Example:



将浮点数(D51,D50)取整后，存放到→ (D100)

将浮点数(D11,D10)取整后，存放到→ (D21,D20)

注意INT和DINT指令存放结果的区别

将浮点数（D51,D50）取整后，存放到→（D100）
After floating (D51, D50) is rounded off, the result is saved to (D100)

将浮点数（D11,D10）取整后，存放到→（D21，D20）
After floating (D11, D10) is rounded off, the result is saved to (D21, D20)

注意 INT 和 INT 指令存放结果的区别
Note that the difference of result storage between INT and INT instruction

16bit 16bit	32bit 32bit	P	FNC130 FNC130	SIN SIN	浮点 SIN 运算 Floating SIN calculation
	✔	✔			
	9 步 9 steps	9 步 9 steps	指令格式：SIN S D Instruction format：SIN S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enh

		anc ed
H1U	✔	✔
H1U H2U	✔	

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是求指定角度（RAD，弧度）的 SIN（正弦）值，变量为二进制浮点存储格式。 其中：

The instruction is used to calculate the SIN value of the designated angle (RAD, radian). The variables are in the storage format of binary floating points, where:

S 为待求正弦值的角度变量，RAD 单位，以二进制浮点数表示。取值范围 0<=α<=2π；

S is the angle variable that needs to be calculated in order to obtain SIN value. The unit is in RAD, and the value is expressed in binary floating points. With the available range of 0<=α<=2π；

D 为变换后 SIN 计算结果的存储单元，二进制浮点数格式。

D is the storage unit for the SIN calculation results after its conversion. It is in binary floating point format.

指令举例一：

Example 1 for instruction:

```
 X1                 S       D
-| |---〔DSIN    D20     D30〕   将弧度(D21,D20)求SIN值，存放到→ (D31,D30)
```

将弧度（D21，D20）求 SIN 值，存放到→（D31，D30）

After radian (D21,D20) is implemented with SIN calculation, the result is saved to (D31, D32)

这里计算的源数据、SIN 结果都为二进制浮点数格式。

The calculated source data and SIN results are all in binary floating point value format.

RAD(弧度)值＝角度×π/180°，如角度 360°对应的弧度＝360°×π/180°＝2π。

RAD(radian)value＝angle×π/180°， for example, the radian corresponding to angle 360° ＝360°×π/180°＝2π.

指令举例二：

Example 2 for instruction:

```
根据角度值求对应SIN值的程序：

 X0
-| |---〔MOVP    K45     D10〕 } 由X0、X1决定角度值，45°，或60°，存D10
 X1
-| |---〔MOVP    K60     D10〕 }
 M8000
-| |---〔FLT   D10    D20〕   将D10由十进制转换为二进制浮点数，存（D21,D20）
     |-〔DEDIV   K31415926    K1800000000    D24〕  求取 (π/180)浮点数，存于(D25,D24)
     |-〔DEMUL    D20    D24    D30〕 再求取浮点数角度（D21,D20）对应的浮点数弧度，存于(D31,D30)
     └-〔DSIN   D30    D40〕   再求取浮点数弧度（D31,D30）的正弦值，浮点数格式，存于(D41,D40)
```

根据角度值求对应 SIN 值的程序：

The program for SIN calculation with angle value:

由 X0、X1 决定角度值，45°、或 60°，存 D10
The angle 45°or 60°determined by X0, X1 is saved to D10

将 D10 由十进制转换为而进制浮点数，存（D21，D20）
The decimal D10 is converted to binary floating, and the result is saved to (D21, D20)

求（π/180）浮点数，存于（D25，D24）
The floating（π/180）is saved to（D25，D24）

再求取浮点数角度（D21，D20）对应的浮点数弧度，存于（D31，D30）
The floating radian corresponding to floating angle (D21, D20) is saved to (D31, D30)

再求浮点数弧度（D31，D30）的正弦值，浮点数格式，存于（D41，D40）
The SIN value of floating radian (D31, D30) is calculated, and the result in floating format is saved to (D41,D40)

16bit 16bit	32bit 32bit	P	FNC131 FNC131	COS	浮点 COS 运算 Floating COS calculation
	✔	✔			
	9 步 9 steps	9 步 9 steps	指令格式：COS S D Instruction format：COS S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	✔
H1U		
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是求指定角度（RAD，弧度）的 COS（余弦）值，变量为二进制浮点存储格式。 其中：
The instruction is to calculate the COS value for the specified angle (RAD, radian), in which the variables are in a binary floating format. Where:

S 为待求余弦值的角度变量，RAD 单位，以二进制浮点数表示。

S is the angle variable for COS calculation, and RAD unit is displayed in binary

floating.取值范围 0<=α<=2π；
With the available range of 0<=α<=2π；

D 为变换后 COS 计算结果的存储单元，二进制浮点数格式。

D is the storage unit for converted COS calculation result in binary floating format.

指令举例：
Instruction Example:

```
      X1           S       D
├┤├──〔DCOS    D20     D30〕  将弧度(D21,D20)求COS值，存放到→ (D31,D30)
```

将弧度（D21，D20）求 COS 值，存放到→（D31，D30）
After radian (D21,D20) is implemented with COS calculation, the result is saved to (D31, D32)
这里计算的源数据、COS 结果都为二进制浮点数格式。
The calculated source data and COS results are all in binary floating format.
RAD(弧度)值＝角度×π/180°，如角度 360°对应的弧度＝360°×π/180°＝2π。
RAD(radian)value＝angle×π/180°，for example, the radian corresponding to angle 360°＝360°×π/180°＝2π.
关于以角度求取 COS 值的编程语句，可参考 SIN 指令中的举例。
For the program instruction for the COS calculation of an angle, please refer to examples in the SIN instruction.

16bit 16bit	32bit 32bit	P	FNC132 FNC132	TAN TAN	浮点 TAN 运算 Floating TAN calculation
	✔	✔			
	9 步 9 steps	9 步 9 steps	指令格式：TAN S D Instruction format：TAN S D		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	✔	✔

H2U	✔	—

操 作 数 Oper and	位元件 Bit component				字 元 件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S													✔		
D													✔		

该指令是求指定角度（RAD，弧度）的 TAN（正切）值，变量为二进制浮点存储格式。 其中：

The instruction is used to calculate the TAN (tangent) value of the designated angle (RAD, radian). The variables use the binary floating point storage format. Where:

S为待求正切值的角度变量，RAD 单位，以二进制浮点数表示。取值范围 0<=α<2π；

S is the angle variable that needs to be calculated to obtain the TAN value. The unit is in RAD, and the value is expressed in binary floating points.With the available range of 0<=α<=2π；

D为变换后 TAN 计算结果的存储单元，二进制浮点数格式。

D is the storage unit for the TAN calculation results after its conversion. It is in binary floating point format.

指令举例：

Instruction Example:

```
 X2              S       D
─┤├──〔DTAN    D20     D30〕  将弧度(D21,D20)求TAN值，存放到→ (D31,D30)
```

将弧度（D21，D20）求 TAN 值，存放到→（D31，D30）

After radian (D21,D20) is implemented with TAN calculation, the result is saved to (D31, D30)

这里计算的源数据、TAN 结果都为二进制浮点数格式。

The calculated source data and SIN results are all in binary floating point value format.

RAD(弧度)值＝角度×π/180°，如角度 360°对应的弧度＝360°×π/180°＝2π。

RAD(radian)value＝angle×π/180°，for example, the radian corresponding to angle 360°＝360°×π/180°＝2π.

关于以角度求取 TAN 值的编程语句，可参考 SIN 指令中的举例。

In regards to the programming statements used to calculate the TAN value, please refer to the example in the SIN instruction section.

16bit 16bit	32bit 32bit	P	FNC147 FNC147	SWAP	高低字节交换 Exchange higher and lower byte
✔	✔	✔			
3 步 3 steps	5 步 5 steps		指令格式：SWAP (S) Instruction format：SWAP (S)		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced
H1U	—	—
H2U	✔	—

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)								✔	✔	✔	✔	✔	✔	✔	✔

该指令是将指定变量(S)的高低字节的值进行互相交换。

The instruction is to exchange the value between higher and lower byte of specified variable (S)**错误！未指定文件名。**.

16 位指令时，高 8 位与低 8 位的值进行互相交换。

When using 16bit instruction, the exchange operation is implemented between higher 8 bits and lower 8 bits.

32 位指令时，两个寄存器的高 8 位与低 8 位的值各自进行互相交换

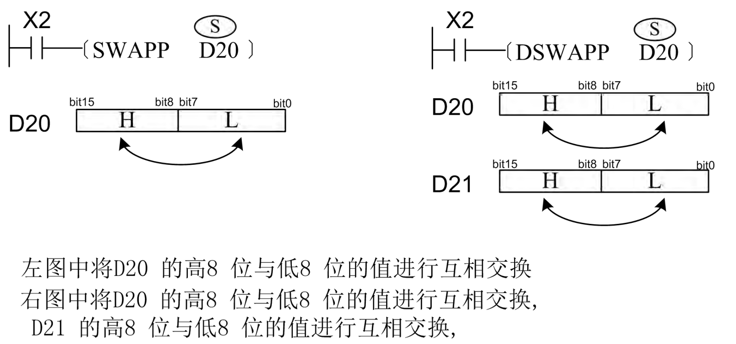
When using 16bit instruction, the exchange operation is implemented between higher 8 bits and lower 8 bits.

注意此指令一般使用脉冲执行型指令，否则若采用连续执行指令，则程序每扫描一次，就会进行一次交换。

Notice: the instruction is normally applied as pulse implementation instruction, or if it is applied as continues implementation instruction, the exchange operation will be implemented every time when the program is scanned.

指令举例：

Instruction Example:



左图中将 D20 的高 8 位与低 8 位的值进行互相交换
In left figure, the exchange operation is implemented between higher 8 bits and lower 8 bits in D20.

右图中将 D20 的高 8 位与低 8 位的值进行互相交换
In right figure, the exchange operation is implemented between higher 8 bits and lower 8 bits in D20.

D21 的高 8 位与低 8 位的值进行互相交换，
The exchange operation is implemented between higher 8 bits and lower 8 bits in D21.

4.3.2.11 定位控制（155~159）
4..3.2.11 Location control (155~159)

16bit 16bit	32bit 32bit	P	FNC155 FNC155	ABS ABS	ABS 位置数据读取 ABS reading location data
	✔				
	13 步 13 steps		指令格式：ABS S D1 D2 Instruction format：ABS S D1 D2		

适用机型 Available model		
系列 Series	通用 Common	增强 Enhanced

H1U	✔	—
H1U		
H2U	✔	✔

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S	✔	✔	✔	✔											
D1		✔	✔	✔											
D2								✔	✔	✔	✔	✔	✔	✔	✔

该指令是通过高速输入端口读取伺服驱动器中电机的绝对位置（ABS）数据。 其中：

The instruction is to read the motor absolute position (ABS) data from the servo driver via the high-speed input port. Where:

S 为读取伺服装置的输入信号，占用后续共 3 个单元；

S is the input signal for reading servo device, occupying the following three units;

D1 为传送至伺服装置的控制信号，占用后续共 3 个单元；

D1 is the control signal transmitted to servo device, occupying the following three units;

D2 则是从伺服读取数据的存储单元，32bit 宽度，占用 D2 ＋1、D2 单元，通常指定 D8140。

D2 is the storage unit for the data read from servo with 32bit width, occupying D2 +1, D2 unit with specifying D8140.

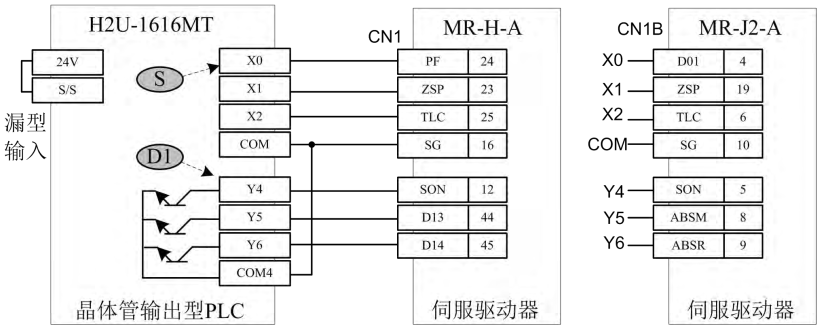
指令举例：

Instruction Example:

```
  M10                S      D1     D2
 ─┤ ├──〔DABS        X0     Y4     D8140〕
```

对应的接线方式如下图，其中伺服驱动器为市售三菱公司产品，配合有绝对位置检测的编码器的伺服马达：

The corresponding wiring method is shown in the following figure, in which the servo driver is a Mitsubishi product equipped with an absolute position detection encoder servo motor.



漏型输入

Missing type input

晶体管输出型 PLC

Transistor output type PLC

伺服驱动器

Servo driver

当指令驱动 M10 变为 ON 时开始读取，读取完毕，M8029 标志置为 ON；

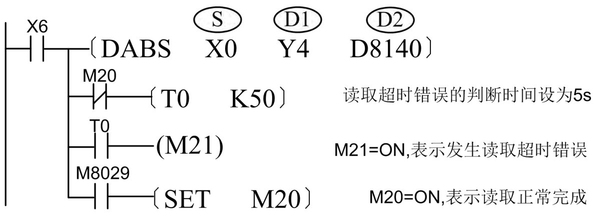
When the instruction driver M10 is set to ON, it begins to read. When this is completed, the M8029 flag is set to ON;

当指令执行过程中，驱动标志变为 OFF，读取操作即被中断；

When the instruction implementation operation is in process and the driver flag is set to OFF, the read operation will be interrupted;

读取 ABS 数据的编程举例如下，当 X6 端子闭合时才读取 ABS 数据，若 5s 内没有完成读取操作，超时标志 M21 被置位，编程如下：

The programming example for reading ABS data is as follows: when the X6 terminal is closed, it begins to read. If it is not completed in 5s, the timeout flag M21 will be set. The code is listed as following:



读取超时错误的判断时间设为 5s

The time threshold of reading timeout error is set to 5s

M21=ON，表示发生读取超时错福

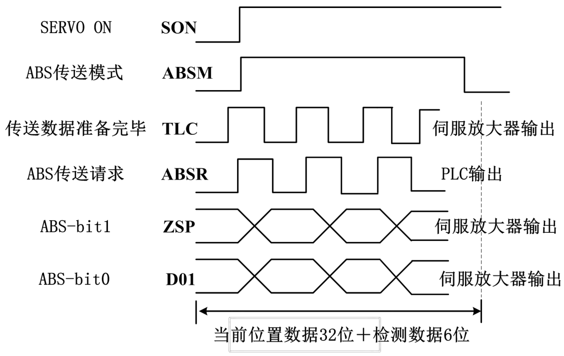
When M21=ON, it means there is reading timeout error.

M20=ON，表示读取正常完成

When M20=ON, it means reading operation is normally implemeted

ABS 读操作的信号时序如下图，指令执行时，PLC 会按该实现自动完成与伺服驱动器的访问操作：

The signal time sequence of the ABS read operation is shown in the following figure. When implementing an instruction, the PLC will automatically implement the access operation with servo driver.



ABS 传送模式
ABS transmission mode

传送数据准备完毕
The transmission data is ready

ABS 传送请求
ABS transmission request

伺服放大器输出
Servo amplifier output

PLC 输出
PLC output

该指令只能以 32bit 方式执行，即指令为 DABS。
The instruction can only be implemented in 32bit mode, meaning the instruction is DABS.

16bit	32bit	P	FNC156	ZRN	原点回归
✔	✔				
9 步 9 step	17 步 17 step		指令格式：ZRN S1 S2 S3 D Instruction format		

适用机型 Suitable model		
系列 Series	通用 General	增强 enhanced
H1U	✔	—
H2U	✔	✔

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S3	✔	✔	✔	✔											
D		✔													

该指令是 PLC 与伺服驱动器配合工作时，用指定脉冲速度和脉冲输出端口，让执行机构向动作原点（DOG）移动，直到遇到原点信号满足条件为止。 其中：

When servo driver cooperates with PLC, this instruction is used to enable actuator to move toward DOG with designated impulse speed and impulse-output port, until condition of encountering original point is satisfied. Where:

为原点回归动作的启始速度。16bit 指令时，范围是 10～32，767Hz；32bit 指令时，范围是 10～100，000Hz；

S1 is start speed of the regression through the origin action . 16bit instruction, range is 10 ~ 32,767 Hz; 32bit instruction, range is 10-100,000 Hz

为原点信号变为 ON 后的爬行速度，范围是 10～32，767Hz；

Is a crawling velocity after the origin of the signal turns into ON, range is 10 ~ 32,767Hz

S3 原点信号（DOG）输入，虽然 XYMS 信号都可以，但只有 X 信号的及时性最好；

S3 is input of DOG，Although signal XYMS is well，timeliness of signal X function best.

为脉冲输出启始地址。对于 3624MT/2416MT 型只能指定 Y0 或 Y1；其他 MT 型只能 Y0/Y1/Y2；而 MTQ 型则可指定 Y0/Y1/Y2/Y3/Y4 等；

D is start address of impulse output. For 3624MT / 2416MT type can be designated to Y0 or Y1; Other MT types can be Y0 / Y1 / Y2; And MTQ type can be specified to Y0 / Y1 / Y2 / Y3 / Y4 ,

相对位置控制指令 DRVI（FNC158）和绝对位置控制指令 DRVA（FNC159）在执行时，控制器会计算自身已发出的正转脉冲或反转脉冲数，并将之保存在寄存器[D8141，D8140]（Y000）和[D8143，D8142]（Y001)。 但该寄存器的数据在断电时会消失，故上电时和初

始运行时，必须执行原点回归指令 ZRN，以事先将机械动作的原点位置的数据写入。

In the execution of relative position control instruction DRVI (FNC158) and absolute position control instructions DRVA (FNC159), controller will calculate the pulse count forward or reverse already issued by itself, and saved in the register [D8141, D8140](Y000) and [D8143, D8142] (Y001). But data in that register will disappear after power failure, so instruction ZRN must be executed when system is power on and initialized run, so the data of original position of mechanical movement can be read in beforehand.

指令举例：

Instruction example:

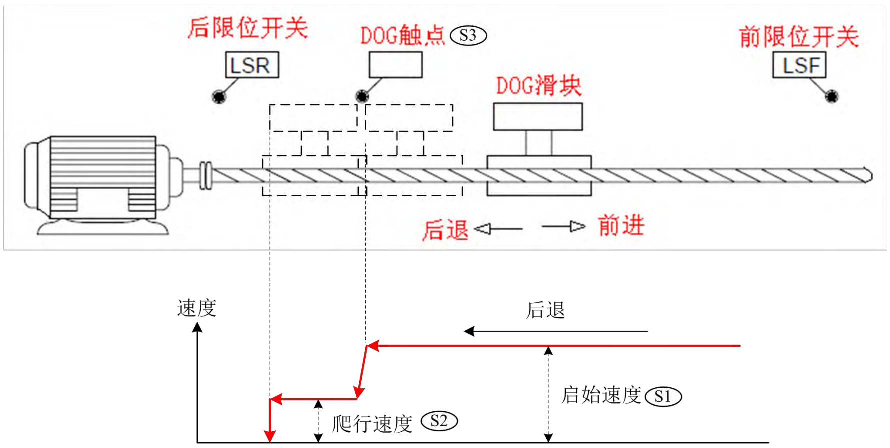
M10 ─┤├─〔ZRN K1000(S1) K80(S2) X3(S3) Y0(D)〕

本指令的动作是，当 M10 变为 ON 后，PLC 从 Y0 高速输出端口，开始以 1000Hz 发出脉冲，令步进电机向原点作后退，当遇到 DOG 信号变为 ON 时（此时 DOG 滑块刚好碰到 DOG 触点），输出频率降为 80Hz，作低速爬行，直到 DOG 信号再变为 OFF 时，Y0 停止输出脉冲，向当前值寄存器（Y000：[D8141，D8140]，Y001：[D8143，D8142]）中写入 0。 另外， M8140 （清零信号输出功能）ON 时，同时输出清零信号。随后，当执行完成标志（M8029）置为 ON 的同时，脉冲输出中监控（Y000：[M8147]，Y001：[M8148]）变为 OFF。

The action of the instruction is, when M10 turned to ON, PLC begins to pulse in 1000Hz from high speed output port, making step motor backward to the origin. When signal DOG turned to ON (a slider DOG just met contact DOG), output frequency drops to 80Hz, crawl in low speed. Until the DOG turned to OFF again, Y0 stops pulse output, write 0 into the present registers (Y000: [D8141: D8140], Y001: [D8143, D8142]). In addition, when M8140 turns ON, Y0 resets. Later, at the same time of the execution end flag (M8029) sets ON, pulse output monitoring (Y000: [M8147], Y001: [M8148]) turns into OFF.

参见下图：

See figure below:



本指令执行中，涉及的系统变量有：

The involved system variables during the execution of the present instruction:

1. D8141（高位），D8140（低位）：Y000 输出的当前值寄存器（使用 32 位）

D8141 (high bit), D8140 (low bit): Current value registers of Y000 output (32bit)

2. D8143（高位），D8142（低位）：Y001 输出的当前值寄存器（使用 32 位）

D8143 (high bit), D8140 (low bit): Current value registers of Y001 output (32bit)

3. M8145：Y000 脉冲输出停止（立即停止）

M8145: stop Y0000 pulse output (stop immediately)

4. M8146：Y001 脉冲输出停止（立即停止）

M8146: stop Y0001 pulse output (stop immediately)

5. M8147：Y000 脉冲输出中监控（BUSY/READY）

M8147: Y000 pulse output monitor（BUSY/READY）

6. M8148：Y001 脉冲输出中监控（BUSY/READY）

M8148: Y001 pulse output monitor（BUSY/READY）

由于伺服驱动器对位置信息具有掉电保持功能，该指令并不需要每次上电时都需进行；指令执行中，仅能单方向运动（后退方向），所以回原点动作必须在 DOG 信号前端开始。

Since servo driver has the function of power-fail-safeguard towards location information, this command does not need to excute after power-on every time. Meanwhile, for servo driver can only move one way, movement of backing to original point must be done before DOG.

注意事项：

Note:

定位指令（ZRN/PLSV/DRVI/DRVA）在程序中可多次使用，但不要对同一高速 Y 输出口同时进行操作；

Positioning instructions（ZRN/PLSV/DRVI/DRVA）can be used repeatedly in program, but don't operate the same high speed output port Y,

当指令的驱动能流 OFF 之后，再次驱动 ON 时，必需在状态位（Y 000 ： [M8147]，Y001；[M8148]）OFF 后，经过一个运算周期后，方能再次驱动。

When next drive of instruction sets ON after the drive OFF, the next drive can work only after 1 operation cycle as soon as the status bit（Y 000 ： [M8147]，Y001；[M8148]）be OFF.

定位指令再次驱动时，必须有 1 个周期以上的 OFF 时间，若以比上述条件更短的时间内执行再驱动时，将在最初指令执行（运算）时发生「运算错误」。

When driving positioning instruction again, the time OFF have to be more than 1 cycle. If the time is less than above explain, [Operation Error] will happen when the initial instructions are executed (operated).

<table>
<tr><td>16bit</td><td>32bit</td><td>P</td><td rowspan="2">FNC157</td><td rowspan="2">PLSV</td><td rowspan="2">可变速度脉冲输出</td></tr>
<tr><td>✔</td><td>✔</td><td></td></tr>
<tr><td>7 步</td><td>13 步</td><td></td><td colspan="3">指令格式：PLSV S D1 D2</td></tr>
</table>

<table>
<tr><td colspan="3">适用机型</td></tr>
<tr><td>系列</td><td>通用</td><td>增强</td></tr>
<tr><td>H1U</td><td>✔</td><td>—</td></tr>
<tr><td>H2U</td><td>✔</td><td>✔</td></tr>
</table>

操 作	位元件	字 元 件

数 Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D1		✔													
D2		✔	✔	✔											

该指令是按指定的端口、频率和运行方向输出脉冲频率，没有加减速过程，当驱动能流无效时，输出脉冲直接停止。 只有晶体管输出 PLC 才能使用该指令。 其中：

The present instruction outputs pulse frequency according to the specified port, frequency and operation direction without acceleration/deceleration. The pulse output will be stopped directly when the driving power flow is ineffective. Only the PLC with the transistor output can execute the instruction. Where:

为指定的输出脉冲频率。16bit 指令时，范围是 1～32，767Hz；－1～－32，768Hz；32bit 指令时，范围是 1～100，000Hz；－1～－100，000Hz。 其中负号表示反方向运行的指令信号；

S represents the specified output pulse frequency 16bit instruction, range is 10 ~ 32,767 Hz; －1～－32，768Hz；32bit instruction, range is 1-100,000 Hz；－1～－100，000Hz。Where the negative sign indicates instruction signals in inverse operation;

为脉冲输出端口；H1U 机型可以指定 Y0/Y1/Y2；H2U 机型中 3624MT/2416MT 型只能指定 Y0 或 Y1，其他 MT 型可以指定 Y0/Y1/Y2，而 MTQ 型则可指定 Y0/Y1/Y2/Y3/Y4；

Is pulse output port. For H1U mode3624MT / 2416MTmode can be designated to Y0 / Y1 / Y2; For 3624MT / 2416MT type of H2U mode can be designated to Y0 or Y1; Other MT types can be Y0 / Y1 / Y2; And MTQ type can be specified to Y0 / Y1 / Y2 / Y3 / Y4

D2 运行方向输出端口或位变量，输出为 ON 状态，表示为正向运行；否则为反向运行。

D2 is the operating direction output port or variant. When the output is in ON state, the system is operating in the forward direction, and vice versa.

指令举例：

Instruction Example:

```
 M1              S        D1     D2
─┤├──〔PLSV    K10000     Y1     Y4〕
```

语句表示，当 M1 为 ON 时，由 Y1 端口输出 10kHz 频率的脉冲，Y4 用于控制运行方向，若 Y4=ON 表示为正方向。

Expressing using sentences, when M1 is ON, the Y1 port will output pulses of 10 kHz frequency and the Y4 port will be used to control the motion direction. Y4=ON indicates the positive direction.

本指令执行中，涉及的系统变量有：

During this command is excuted, systemic variables concerned are:

1. D8141（高字节），D8140（低字节）：Y000 输出脉冲数。 反转时减少。（使用 32 位）

D8141 (high byte), D8140 (low byte): Y000 output pulse count. Decrease when reverse. (using 32bit)

2. D8143（高字节），D8142（低字节）：Y001 输出脉冲数。 反转时减少。（使用 32 位）
D8143 (high byte), D8142 (low byte): Y001 output pulse count. Decrease when reverse. (using 32bit)
3. D8151（高字节），D8150（低字节）：Y002 输出脉冲数。 反转时减少。（使用 32 位）
D8151 (high byte), D8150 (low byte): Y002 output pulse count. Decrease when reverse. (using 32bit)
4. D8153（高字节），D8152（低字节）：Y003 输出脉冲数。 反转时减少。（使用 32 位）
D8153 (high byte), D8152 (low byte): Y003 output pulse count. Decrease when reverse. (using 32bit)
5. D8155（高字节），D8154（低字节）：Y004 输出脉冲数。 反转时减少。（使用 32 位）
D8155 (high byte), D8143 (low byte): Y004 output pulse count. Decrease when reverse. (using 32bit)
6. M8145：Y000 脉冲输出停止（立即停止）
M8145: Y000 pulse output stop (stop imediately)
7. M8146：Y001 脉冲输出停止（立即停止）
M8146: Y001 pulse output stop (stop imediately)
8. M8152：Y002 脉冲输出停止（立即停止）
M8152: Y002 pulse output stop (stop imediately)
9. M8153：Y003 脉冲输出停止（立即停止）
M8153: Y003 pulse output stop (stop imediately)
10. M8154：Y004 脉冲输出停止（立即停止）
M8154: Y004 pulse output stop (stop imediately)
11. M8147：Y000 脉冲输出中监控（BUSY/READY）
M8147: Y000 pulse output monitor（BUSY/READY）
12. M8148：Y001 脉冲输出中监控（BUSY/READY）
M8148: Y001 pulse output monitor（BUSY/READY）
13. M8149：Y002 脉冲输出中监控（BUSY/READY）
M8149: Y002 pulse output monitor（BUSY/READY）
14. M8150：Y003 脉冲输出中监控（BUSY/READY）
M8150: Y003 pulse output monitor（BUSY/READY）
15. M8151：Y004 脉冲输出中监控（BUSY/READY）
M8151: Y004 pulse output monitor（BUSY/READY）

16bit	32bit	P	FNC158	DRVI	相对位置控制 Relative position control
✔	✔				
9 步 9 step	17 步 17 step		指令格式：DRVI S1 S2 D1 D2 Instruction format		

适用机型 Suitable model		
系列 series	通用 general	增强 enhanced
H1U	✔	—
H2U	✔	✔

操作数 Operand	位元件 Bit component				字元件 Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
S1					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
S2					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
D1		✔													
D2		✔	✔	✔											

该指令是按指定的端口、频率和运行方向输出指定的脉冲数，令伺服执行机构在当前位置的基础上作给定偏移量的运动。 只有晶体管输出 PLC 才能使用该指令。 其中：

Based on the assigned port, frequency, and the assigned pulse output value of the operating direction, the instruction allows machines to perform offset movement according to its present position. Only the PLC with the transistor output can execute the instruction, where:

为指定的输出脉冲数。16bit 指令时，范围是－32768～32，767；32bit 指令时，范围是-2，147，483，648～2，147，483，647。 其中负号表示反方向；

Is the designated output pulse count. 16bit instruction, range is -32768 ~ 32,767; 32bit instruction, range is -2，147，483，648～2，147，483，647. The negative symbol indicates the opposite direction.

为指定的输出脉冲频率，16bit 指令时，范围为 10～32767Hz；32bit 指令时，范围为 10～100，000Hz；

Is the designated output pulse frequency. 16bit instruction, range is 10 ~ 32,767 Hz; 32bit instruction, range is

10-100,000 Hz

为脉冲输出端口；H1U 机型可以指定 Y0/Y1/Y2；H2U 机型中 3624MT/2416MT 型只能指定 Y0 或 Y1，其他 MT 型可以指定 Y0/Y1/Y2，而 MTQ 型则可指定 Y0/Y1/Y2/Y3/Y4；

Is pulse output port. For H1U model3624MT / 2416MTmode can be designated to Y0 / Y1 / Y2; For 3624MT / 2416MT type of H2U model can be designated to Y0 or Y1; Other MT types can be Y0 / Y1 / Y2; And MTQ type can be specified to Y0 / Y1 / Y2 / Y3 / Y4

D2 运行方向输出端口或位变量，输出为 ON 状态，表示为正向运行；否则为反向运行。

D2 is the operating direction output port or variant. When the output is in ON state, the system is operating in the forward direction, and vice versa.

输出脉冲数，是相对于下面的当前值寄存器作为相对位置：
Output pulse value is treated as the relative position when comparing with the current value of the register described below:
向［Y000］输出时，当前寄存器为[D8141（高字节），D8140（低字节）]（使用 32 位）
When output [Y000], the current register is [D8141 (high byte), D8140 (low speed)] (32bit)
向［Y00I］输出时，当前寄存器为[D8143（高字节），D8142（低字节）]（使用 32 位）
When output [Y001], the current register is [D8143 (high byte), D8142 (low speed)] (32bit)
向［Y002］输出时，当前寄存器为[D8151（高字节），D8150（低字节）]（使用 32 位）
When output [Y002], the current register is [D8151 (high byte), D8150 (low speed)] (32bit)
向［Y003］输出时，当前寄存器为[D8153（高字节），D8152（低字节）]（使用 32 位）
When output [Y003], the current register is [D8153 (high byte), D8152 (low speed)] (32bit)
向［Y004］输出时，当前寄存器为[D8155（高字节），D8154（低字节）]（使用 32 位）
When output [Y004], the current register is [D8155 (high byte), D8154 (low speed)] (32bit)
反转时，当前值寄存器的数值减小。
when in reverse, the current value of the register reduces.
在指令执行过程中，即使改变操作数的内容，也无法在当前运行中表现出来。 只在下一次指令执行时才有效。
Even if the operand contents are being changed during the instruction execution process, it will not show the effect in the currently running operation. The change will only become effective in next instruction execution.
若在指令执行过程中，指令驱动的接点变为 OFF 时，将减速停止。此时执行完成标志 M8029 不会动作；
When the instruction-driven contacts become OFF during the execution process, the machine will start to decelerate and eventually stop. The completion signal of M8029 will be executed at this time and not further action will be carried out.
指令驱动接点变为 OFF 后，在脉冲输出中断标志 M8147（Y000）、M8148（Y001）、M8149（Y002）、M8150（Y003）、M8151（Y004）处于 ON 时，将不接受指令的再次驱动。
After the instruction-driven contacts become OFF, and the pulse output interruption signals M8147 (Y000), M8148 (Y001), M8149 (Y002), M8150 (Y003), and M8151 (Y004) are in ON state, re-initiation instruction will not be accepted.

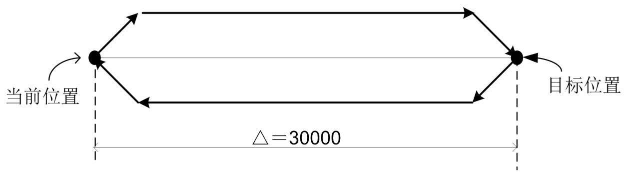
指令举例：

Instruction example:

```
 M11            (S1)        (S2)     (D1)    (D2)
─┤├──〔DRVI   K30000     K4000     Y0      Y3〕
```

表示以 4kHz 的频率、由 Y0 端口输出 30000 个脉冲，令外部伺服执行机构运行，方向则由 Y3 决定。

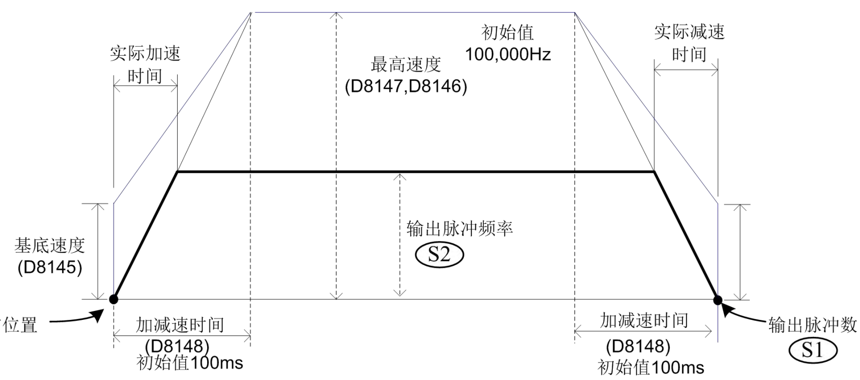
Means that port Y0 outputs 30,000 pulses in frequency 4kHz to execute external servo actuator. The direction is decided by Y3.



当前位置
Current position
目标位置
Target position

脉冲输出过程中，频率会按预定值加减速：

In the process of pulse output, the frequency can be accelerated or decelerated at predetermined value



当前位置
Current postion

基底速度
Based speed

实际加速时间
The actual acceleration time

加减速时间
Acceleration or deceleration time
初始值 100ms
Initial value 100ms
最高速度
Max speed

初始值
Initial value

输出脉冲频率
Output pulse frequency

实际减速时间
The actual deceleration time
加减速时间
Acceleration or deceleration time

初始值 100ms
Initial value 100ms

输出脉冲数
Output pulse count

实际能够输出的输出脉冲频率的最低频率数，根据以下公式所决定：
The actual minimum pulse output frequency is determined according to the following formula:
输出脉冲频率的最低频率数＝$\sqrt{\text{最高速度}[D8147, D8146]Hz \div (2 \times (\text{加减速时间}[D8148]ms \div 1000))}$
Minimum pulse output frequenc $\sqrt{\text{最高速度}[D8147, D8146]Hz \div (2 \times (\text{加减速时间}[D8148]ms \div 1000))}$
即使指定了低于上面计算结果的数值，仍将输出计算值的频率。 加速初期和减速最终部分的频率也不可低于上述计算结果.
Even if the assigned value is lower than the above calculated result, the frequency to be exported will still be the calculated value.The frequencies in the initial stage of acceleration and in the final section of deceleration must not be lower than the above calculated result.
指令执行中涉及的系统变量如下：
During the instruction execution, the involved system variables are as follows:
［D8145］：执行 FNC158(DRVI)，FNC159(DRVA）指令时的基底速度。控制步进电机时，设定速度时需考虑步进电机的共振区域和自动起动频率。设定范围：最高速度（D8147，D8146）的 1/10 以下。
[D8145]: the based speed of executing instructions FNC158(DRVI), FNC159(DRVA）. During the operation of stepping motor, the stepping motor’s resonance region and automatic start frequency must be considered when setting up the speed. Set range: below 1/10 of the max speed （D8147，D8146）

超过该范围时，自动降为最高速度的 1 / 10 数值运行。
If the setting value were to exceed this range, then the actual speed will be 1/10 of the maximum speed.
［D8147（高字节），D8146（低字节）]：执行 FNC158(DRVI)，FNC159(DRVA）指令时的最高速度。

［D8147（high byte），D8146（low byte）]： the based speed of executing instructions FNC158(DRVI), FNC159(DRVA）

S2指定的输出脉冲频率必须小于该最高速度。设定范围：10~100，000（Hz）

The output pulse frequency assigned by S2 must be lower than the maximum speed. Set range: 10~100，000（Hz）

［D8148]：执行 FNC158(DRVI)，FNC159(DRVA）指令时的加减速时间。加减速时间表示到达最高速度（D8147，D8146）所需的时间。因此，当输出脉冲频率S2低于最高速度（D8147，D8146）时，实际加减速时间会缩短。设定范围：50~5，000(ms)

［D8148］：Acceleration or deceleration time of executing instructions FNC158(DRVI), FNC159(DRVA）. Acceleration or deceleration time means the time of reaching the max speed （D8147，D8146）. Therefore, when the output pulse frequency S2 is lower than the max speed, the actual acceleration or deceleration time shrinks.

［M8145]：Y000 脉冲输出停止（立即停止）

[M8145]: Y000 pulse output stop (stop imediately)

［M8146]：Y001 脉冲输出停止（立即停止）

[M8146]: Y001 pulse output stop (stop imediately)

［M8152]：Y002 脉冲输出停止（立即停止）

[M8152]: Y002 pulse output stop (stop imediately)

［M8153]：Y003 脉冲输出停止（立即停止）

[M8153]: Y003 pulse output stop (stop imediately)

［M8154]：Y004 脉冲输出停止（立即停止）

[M8154]: Y004 pulse output stop (stop imediately)

［M8147]：Y000 脉冲输出中监控（BUSY/READY）

[M8147]: Y000 pulse output monitor（BUSY/READY）

［M8148]：Y001 脉冲输出中监控（BUSY/READY）

[M8148]: Y001 pulse output monitor（BUSY/READY）

［M8149]：Y002 脉冲输出中监控（BUSY/READY）

[M8149]: Y002 pulse output monitor（BUSY/READY）

［M8150]：Y003 脉冲输出中监控（BUSY/READY）

[M8150]: Y003 pulse output monitor（BUSY/READY）

［M8151]：Y004 脉冲输出中监控（BUSY/READY）

[M8151]: Y004 pulse output monitor（BUSY/READY）

M8093	**Y3 输出完成中断使能** Y3 Output complete interrupt enabled	**D8093**	**保留** Reserved
M8094	Y4 输出完成中断使能 Y4 Output complete interrupt enabled	D8094	保留 Reserved

M8095	保留 Reserved	D8095	保留 Reserved
M8096	保留 Reserved	D8096	字元件地址号 No.0 Word component address number No.0
M8097	保留 Reserved	D8097	字元件地址号 No.1 Word component address number No.1
M8098	保留 Reserved	D8098	字元件地址号 No.2 Word component address number No.2
高速环形计数器 High speed ring counter			
M8099	高速环形计数器计数启动 High speed ring counter operation	D8099	[0~32767] 上升动作环形计数器 (0.1ms) [0~32767]Rising operation ring counter (0.1ms)
其它功能使用 Other functions			
M8100	SPD(X000)具有-脉冲个数/分钟 SPD(X000) - pulse numbers/minute	D8100	保留 Reserved
M8101	SPD(X001)具有-脉冲个数/分钟 SPD(X001) - pulse numbers/minute	D8101	单板程序版本，如 24100H2U=24，100 版本 V1.00 Single board program version, such as 24100H2U=24 ， 100 version V1.00
M8102	SPD(X002)具有-脉冲个数/分钟 SPD(X002) - pulse numbers/minute	D8102	系统提供给用户程序的程序容量 Program capacity provided by system to user program
M8103	SPD(X003)具有-脉冲个数/分钟 SPD(X003) - pulse numbers/minute	D8103	保留 Reserved
M8104	SPD(X004)具有-脉冲个数/分钟 SPD(X004) - pulse numbers/minute	D8104	DRVI，DRVA 执行时加速时间[默认 100] 由 M8176 决定是否有效[Y0] [F04] When DRVI，DRVA is implemented, the effectiveness of acceleration time [default time 100] depends on M8176[Y0] [F04]
M8105	SPD(X005)具有-脉冲个数/分钟 SPD(X005) - pulse numbers/minute	D8105	DRVI，DRVA 执行时加速时间[默认 100] 由 M8177 决定是否有效[Y1] [F04] When DRVI，DRVA is implemented,

			the effectiveness of acceleration time [default time 100] depends on M8177[Y1] [F04]
M8106	保留 Reserved	D8106	DRVI，DRVA 执行时加速时间[默认 100] 由 M8178 决定是否有效[Y2] [F04] When DRVI，DRVA is implemented, the effectiveness of acceleration time [default time 100] depends on M8178[Y2] [F04]
M8107	保留 Reserved	D8107	DRVI，DRVA 执行时加速时间[默认 100] 由 M8179 决定是否有效[Y3] [F04] When DRVI，DRVA is implemented, the effectiveness of acceleration time [default time 100] depends on M8179[Y3] [F04]
M8108	保留 Reserved	D8108	DRVI，DRVA 执行时加速时间[默认 100] 由 M8180 决定是否有效[Y4] [F04] When DRVI，DRVA is implemented, the effectiveness of acceleration time [default time 100] depends on M8180[Y4] [F04]
M8109	输出刷新错误 Output refresh error	D8109	输出刷新错误的输出地址编号 Output refresh error address number
COM0 通讯.链接 COM0 communication link			
M8110	保留 Reserved	D8110 注 1 D8110 Note 1	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration with a default of 0
M8111	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8111 注 1 D8111 Note 1	站号设置，界面配置设定，默认为 1 Station number settings, the interface configuration settings with a default of 1
M8112	发送标志（RS 指令） Transmission flag (RS instruction) 指令执行状态（MODBUS） Instruction implementation state (MODBUS)	D8112	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)
M811	接收完成标志（RS）	D8113	接收到的数据数量（仅对 RS 指令）

3	Receive accomplishment flag (RS) 通讯错误标志（MODBUS） Communication error flag (MODBUS)		Amount of data already received (Only to RS instruction)
M8114	接收中（仅对 RS 指令） Receiving (only to RS instruction)	D8114	起始字符 STX（仅对 RS 指令） Start character STX (Only to RS instruction)
M8115	保留 Reserved	D8115	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8116	保留 Reserved	D8116	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8117	保留 Reserved	D8117	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8118	保留 Reserved	D8118	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8119	超时判断 Time-out judgement	D8119	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication time-out judgement, the interface configuration settings with a default of 10（100ms）
COM1 通讯.链接 COM1 communication link			
M8120	保留 Reserved	D8120 注 1 D8120 Note 1	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration with a default of 0
M8121	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8121 注 1 D8121 Note 1	站号设置，界面配置设定，默认为 1 Station number settings, the interface configuration settings with a default of 1
M8122	发送标志（RS 指令） Transmission flag (RS instruction) 指令执行状态（MODBUS） Instruction implementation state (MODBUS)	D8122	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)

M8123	接收完成标志（RS） Receive accomplishment flag (RS) 通讯错误标志（MODBUS） Communication error flag (MODBUS)	D8123	接收到的数据数量（仅对 RS 指令） Amount of data already received (Only to RS instruction)
M8124	接收中（仅对 RS 指令） Receiving (only to RS instruction)	D8124	起始字符 STX（仅对 RS 指令） Start character STX (Only to RS instruction)
M8125	保留 Reserved	D8125	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8126	为 ON 时 485BD 扩展卡有效 When it is ON, 485BD extended card is valid.	D8126	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8127	保留 Reserved	D8127	计算机链接协议接通要求数据起始地址号； The computer link protocol connection requests the data starting address number; SETEX 协议：从站（PLC）发送给主站（显示屏）缓冲区起始地址，缓冲区大小为 18。 SETEX protocol: slave station (PLC) sends buffer starting address to master station (display screen), and the buffer size is 18.
M8128	保留 Reserved	D8128	计算机链接协议接通要求发送数据数量； The computer link protocol connection requests the quantity of transmission data; SETEX 协议：主站（显示屏）发送给从站（PLC）缓冲区起始地址，缓冲区大小为 19。 SETEX protocol: master station (display screen) sends buffer starting address to slave station (PLC), and the buffer size is 19.
M8129	超时判断 Time-out judgement	D8129	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication time-out judgement, the interface configuration settings with a

			default of 10（100ms）
高速&定位 High speed & positioning			
M8130	HSZ 指令平台的控制模式 Control mode of HSZ instruction platform	D8130	HSZ 高速比较平台使用(记录号) Special bit for high-speed model (record number)
M8131	和 M8130 联合使用 Paralleled with M8130	D8131	HSZ&PLSY 速度模型使用(记录号) HSZ & PLSY completion mark of comparison mode (record number)
M8132	HSZ&PLSY 速度模式 HSZ&PLSY speed mode	D8132	HSZ&PLSY 速度模型频率使用 HSZ & PLSY frequency control mode
M8133	和 M8132 联合使用 Paralleled with M8132	D8133	
M8134	保留 Reserved	D8134	HSZ&PLSY 速度模型比较脉冲数使用 Completion mark for HSZ & PLSY frequency control mode
M8135	Y0 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y0 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA] It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]	D8135	

M8136	**Y1 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA]** **Y1 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA]** **在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA]I** It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]	**D8136**	**Y000&Y001 输出脉冲合计数** **The total number of Y000&Y001 output pulses**
M813	Y2 在通用上加减速时间和脉冲	D8137	

7	更改有效[ON-PLSR，DRVI，DRVA] Y2 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA] It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]		
M8138	Y3 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y3 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA] It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]	D8138	保留 Reserved
M8139	Y4 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y4 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA] It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]	D8139	保留 Reserved
M8140	ZRN 的 CLR 信号输出功能有效 CLR signal output function of ZRN is enabled.	D8140	PLSY&PLSR 输出 Y000 对应的脉冲个数累积值 PLSY&PLSR output Y000 corresponding cumulative value for the pulse number
M8141	保留 Reserved	D8141	
M814	保留	D8142	PLSY&PLSR 输出 Y001 对应的脉冲

2	Reserved		个数累积值 PLSY&PLSR output Y001 corresponding cumulative value for the pulse number
M8143	保留 Reserved	D8143	
M8144	保留 Reserved	D8144	
M8145	Y000 脉冲输出停止 Y000 pulse output stop	D8145	DRVI，DRVA 执行时的偏置速度 The bias speed during DRVI, DRVA is implemented
M8146	Y001 脉冲输出停止 Y001 pulse output stop	D8146	DRVI，DRVA 执行时的最高速度[默认 100，000] The max speed [default: 100,000] during DRVI, DRVA is implemented
M8147	Y000 脉冲输出监控 Y000 pulse output monitor	D8147	
M8148	Y001 脉冲输出监控 Y001 pulse output monitor	D8148	DRVI，DRVA 执行时加减速时间[默认 100] The acceleration/deceleration time[default 100] during DRVI, DRVA is implemented
M8149	Y002 脉冲输出监控 Y002 pulse output monitor	D8149	保留 Reserved
M8150	Y003 脉冲输出监控 Y003 pulse output monitor	D8150	PLSY&PLSR 输出 Y002 对应的脉冲个数累积值 PLSY&PLSR output Y002 corresponding cumulative value for the pulse number
M8151	Y004 脉冲输出监控 Y004 pulse output monitor	D8151	
M8152	Y002 脉冲输出停止 Y002 pulse output stop	D8152	PLSY&PLSR 输出 Y003 对应的脉冲个数累积值 PLSY&PLSR output Y003 corresponding cumulative value for the pulse number
M8153	Y003 脉冲输出停止 Y003 pulse output stop	D8153	
M8154	Y004 脉冲输出停止 Y004 pulse output stop	D8154	PLSY&PLSR 输出 Y004 对应的脉冲个数累积值 PLSY&PLSR output Y004 corresponding cumulative value for the pulse number
M8155	保留 Reserved	D8155	
M8156	保留 Reserved	D8156	Y0 端口清零信号定义(ZRN)[默认 5=Y005] Clear definition of Y0 port signal (ZRN)[Default 5=Y005]
M8157	保留 Reserved	D8157	Y1 端口清零信号定义(ZRN)[默认 6=Y006] Clear definition of Y1 port signal (ZRN)[Default 6=Y006]
扩展功能			
M8158	保留 Reserved	D8158	Y2 端口清零信号定义(ZRN)[默认 7=Y007]

			Clear definition of Y2 port signal (ZRN)[Default 7=Y007]
M8159	保留 Reserved	D8159	Y3 端口清零信号定义(ZRN)[默认 8=Y010] Clear definition of Y3 port signal (ZRN)[Default 8=Y010]
M8160	(XCH)的 SWAP 功能 Selection of XCH operation to swap bytes in a single data word	D8160	Y4 端口清零信号定义(ZRN)[默认 9=Y011] Clear definition of Y4 port signal (ZRN)[Default 9=Y011]
M8161	ASC/RS/ASCII/HEX/CCD 的位处理模式 Selection of 8 bit operations for applied instructions ASC, RS, ASCI, HEX, CCD	D8161	保留 Reserved
M8162	高速并联连接模式 High speed mode for parallel connection	D8162	保留 Reserved
M8163	保留 Reserved	D8163	保留 Reserved
M8164	(FROM/TO)传送点数可变模式 (FROM/TO)Move points variable mode	D8164	(FROM/TO)传送点数指定模式 (FROM/TO) Move points fixed mode
M8165	保留 Reserved	D8165	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8135 决定是否有效 Commonly, the validation is decided by M8135 F04 由 M8176 决定是否有效 F04 validation is decided by M8176
M8166	保留 Reserved	D8166	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8136 决定是否有效 Commonly, the validation is decided by M8136 F04 由 M8177 决定是否有效 F04 validation is decided by M8177
M816	(HEY)HEX 数据处理功能	D8167	PLSR，DRVI，DRVA 执行时减速时

7	(HEY)HEX data processing function		间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8137 决定是否有效 Commonly, the validation is decided by M8137 F04 由 M8178 决定是否有效 F04 validation is decided by M8178
M8168	(SMOV)HEX 数据处理功能 (SMOV)HEX data processing function	D8168	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8138 决定是否有效 Commonly, the validation is decided by M8138 F04 由 M8179 决定是否有效 F04 validation is decided by M8179
M8169	保留 Reserved	D8169	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8139 决定是否有效 Commonly, the validation is decided by M8139 F04 由 M8180 决定是否有效 F04 validation is decided by M8180
脉冲捕捉 Pulse capture		通讯.链接 Communication link	
M8170	X000 脉冲捕捉 X000 pulse capture	D8170	保留 Reserved
M8171	X001 脉冲捕捉 X001 pulse capture	D8171	保留 Reserved
M8172	X002 脉冲捕捉 X002 pulse capture	D8172	保留 Reserved
M8173	X003 脉冲捕捉 X003 pulse capture	D8173	本站站号设定状态 Station No. set status
M8174	X004 脉冲捕捉 X004 pulse capture	D8174	通讯子站设定状态 Communication sub-station set status
M8175	X005 脉冲捕捉 X005 pulse capture	D8175	刷新范围设定状态 Refresh range set status

M8176	Y0 的加减速时间与速度控制 [F04] Y0 acceleration/deceleration time and speed control [F04]	D8176	本站站号设定 Station No. setting
M8177	Y1 的加减速时间与速度控制 [F04] Y1 acceleration/deceleration time and speed control [F04]	D8177	通讯子站数设定 Communication sub-station number setting
M8178	Y2 的加减速时间与速度控制 [F04] Y2 acceleration/deceleration time and speed control [F04]	D8178	刷新范围设定 Refresh range setting
M8179	Y3 的加减速时间与速度控制 [F04] Y3 acceleration/deceleration time and speed control [F04]	D8179	重试次数设定 Retry count setting
M8180	Y4 的加减速时间与速度控制 [F04] Y4 acceleration/deceleration time and speed control [F04]	D8180	通信超时设置 Communication overtime setup
通讯．链接	变址寻址 Index addressing		
M8181	保留 Reserved	D8181	保留 Reserved
M8182	保留 Reserved	D8182	位元件地址号 No.2/Z1 寄存器内容 Bit component address number No.2/Z1 register contents
M8183	数据传送主站出错 Data transfer master station error	D8183	位元件地址号 No.3/V1 寄存器内容 Bit component address number No.3/V1 register contents
M8184	数据传送从站 1 出错 Data transfer slave station 1 error	D8184	位元件地址号 No.4/Z2 寄存器内容 Bit component address number No.4/Z2 register contents
M8185	**数据传送从站 2 出错** Data transfer slave station 2 error	**D8185**	**位元件地址号 No.5/V2 寄存器内容** Bit component address number No.5/V2 register contents
M8186	数据传送从站 3 出错 Data transfer slave station 3 error	D8186	位元件地址号 No.6/Z3 寄存器内容 Bit component address number No.6/Z3 register contents
M8187	数据传送从站 4 出错 Data transfer slave station 4 error	D8187	位元件地址号 No.7/V3 寄存器内容 Bit component address number No.7/V3 register contents

M8188	数据传送从站 5 出错 Data transfer slave station 5 error	D8188	位元件地址号 No.8/Z4 寄存器内容 Bit component address number No.8/Z4 register contents
M8189	数据传送从站 6 出错 Data transmission error from station 6	D8189	位元件地址号 No.9/V4 寄存器内容 Bit component address number No.9/V4 register contents
M8190	数据传送从站 7 出错 Data transmission error from station 7	D8190	位元件地址号 No.10/Z5 寄存器内容 Bit component address number No.10/Z5 register contents
M8191	数据传送进行中 Data transferring	D8191	位元件地址号 No.11/V5 寄存器内容 Bit component address number No.11/V5 register contents
M8192	CAN 接收超时[N 系列] [F03] CAN receive time-out [N series] [F03]	D8192	位元件地址号 No.12/Z6 寄存器内容 Bit component address number No.12/Z6 register contents
M8193	自由CAN指令接收状态[N 系列] [F03] Free CAN instruction receive state[N series] [F03]	D8193	位元件地址号 No.13/V6 寄存器内容 Bit component address number No.13/V6 register contents
M8194	CAN 自由指令发送失败[N 系列] [F03] Free CAN instruction send fail[N series] [F03]	D8194	位元件地址号 No.14/Z7 寄存器内容 Bit component address number No.14/Z7 register content
M8195	C251 倍频控制 C251 Double-frequency	D8195	位元件地址号 No.15/V7 寄存器内容 Bit component address number No.15/V7 register content
M8196	C252 倍频控制 C252 Double-frequency	D8196	保留 Reserved
M8197	C253 倍频控制 C253 Double-frequency	D8197	保留 Reserved
M8198	C254 倍频控制 C254 Double-frequency	D8198	本机作为 CAN-LINK 远程设备的标识，H2U 为 10224，H1U 为 10226 Local machine is the identification of CAN-LINK remote device, H2U being 10224; H1U being 10226
M8199	C255 倍频控制 C255 Double-frequency	D8199 注 2 D8199 Note 2	扩展卡类型号，H2U 为自动识别，D8199 显示此卡的类型号； Extended card type, H2U is automatically recognized type; D8199 is the card model number; H1U 不能自动识别，需要通过 D8199 设定扩展卡类型。 H1U cannot be automatically recognized, which should be set

			with extended card type by D8199. 扩展卡类型如下： The extended card type is listed as following: 1 RS232 扩展卡 RS232 extended card 2 RS422/485 通讯扩展卡 RS422/485 communication extended card 3 AD 扩展卡 AD extended card 4 DA 扩展卡 DA extended card 5 6A/6B/3A 扩展卡 6A/6B/3A extended card 6 高速扩展卡 High-speed extended card 7 CAN 扩展卡 CAN extended card
	计数器增/减控制或状态 Up/down counter control and status	通讯.链接 Communication link	
M8200	C200 控制 C200 control	D8200	汇川软件版本号 XXX.YY，XXX：软件号，YY：软件版本号 Huichuan software version XXX.YY, XXX: software number, YY: software version
M8201	C201 控制 C201 control	D8201	当前连接扫描时间 Currently connection scan time
M8202	C202 控制 C202 control	D8202	最大连接时间 Maximum connection scan time
M8203	C203 控制 C203 control	D8203	主站通讯错误次数 Master station communication error number
M8204	C204 控制 C204 control	D8204	从站 1 通讯错误次数 Slave station 1 communication error number
M8205	C205 控制 C205 control	D8205	从站 2 通讯错误次数 Slave station 2 communication error number
M8206	C206 控制 C206 control	D8206	从站 3 通讯错误次数 Slave station 3 communication error number
M820	C207 控制	D8207	从站 4 通讯错误次数

7	C207 control		Slave station 4 communication error number
M8208	C208 控制 C208 control	D8208	从站 5 通讯错误次数 Slave station 5 communication error number
M8209	C209 控制 C209 control	D8209	从站 6 通讯错误次数 The number of communication error from station 6
M8210	C210 控制 C210 control	D8210	从站 7 通讯错误次数 The number of communication error from station 7
M8211	C211 控制 C211 control	D8211	主站通讯错误代码 Master station communication error code
M8212	C212 控制 C212 control	D8212	从站 1 通讯错误代码 Slave station 1 communication error code
M8213	C213 控制 C213 control	D8213	从站 2 通讯错误代码 Slave station 2 communication error code
M8214	C214 控制 C214 control	D8214	从站 3 通讯错误代码 Slave station 3 communication error code
M8215	C215 控制 C215 control	D8215	从站 4 通讯错误代码 Slave station 4 communication error code
M8216	C216 控制 C216 control	D8216	从站 5 通讯错误代码 Slave station 5 communication error code
M8217	C217 控制 C217 control	D8217	从站 6 通讯错误代码 The communication error code from station 6
M8218	C218 控制 C218 control	D8218	从站 7 通讯错误代码 The communication error code from station 7
M8219	C219 控制 C219 control	D8219	保留 Reserved
M8220	C220 控制 C220 control	D8220	扩展卡发送缓冲区 The sending buffer of extended card
M8221	C221 控制 C221 control	D8221	扩展卡发送缓冲区 The sending buffer of extended card
M8222	C222 控制 C222 control	D8222	扩展卡发送缓冲区 The sending buffer of extended card
M8223	C223 控制 C223 control	D8223	扩展卡发送缓冲区 The sending buffer of extended card
M8224	C224 控制 C224 control	D8224	扩展卡发送缓冲区 The sending buffer of extended card
M8225	C225 控制 C225 control	D8225	扩展卡发送缓冲区 The sending buffer of extended card

M822 6	C226 控制 C226 control	D8226	扩展卡发送缓冲区 The sending buffer of extended card
M822 7	C227 控制 C227 control	D8227	扩展卡发送缓冲区 The sending buffer of extended card
M822 8	C228 控制 C228 control	D8228	扩展卡发送缓冲区 The sending buffer of extended card
M822 9	C229 控制 C229 control	D8229	扩展卡发送缓冲区 The sending buffer of extended card
M823 0	C230 控制 C230 control	D8230	扩展卡发送缓冲区 The sending buffer of extended card
M823 1	C231 控制 C231 control	D8231	扩展卡发送缓冲区 The sending buffer of extended card
M823 2	C232 控制 C232 control	D8232	扩展卡发送缓冲区 The sending buffer of extended card
M823 3	C233 控制 C233 control	D8233	扩展卡发送缓冲区 The sending buffer of extended card
M823 4	C234 控制 C234 control	D8234	扩展卡发送缓冲区 The sending buffer of extended card
M823 5	C235 控制 C235 control	D8235	扩展卡发送缓冲区 The sending buffer of extended card
M823 6	C236 控制 C236 control	D8236	扩展卡发送缓冲区 The sending buffer of extended card
M823 7	C237 控制 C237 control	D8237	扩展卡发送缓冲区 The sending buffer of extended card
M823 8	C238 控制 C238 control	D8238	扩展卡发送缓冲区 The sending buffer of extended card
M823 9	C239 控制 C239 control	D8239	扩展卡通信错误计数器 The error counter of extended card communication
M824 0	C240 控制 C240 control	D8240 注 1 D8240 Note 1	CAN 功能设置，参见 CAN 通信手册 [N 系列] [F03] CAN function settings, refer to CAN communication manual [N series] [F03]
M824 1	C241 控制 C241 control	D8241 注 1 D8241 Note 1	CAN 接收超时设定(ms) [N 系列] [F03] CAN receive time-out settings(ms) [N series] [F03]
M824 2	C242 控制 C242 control	D8242 注 1 D8242 Note 1	CAN_LINK 地址设定/显示地址[N 系列] [F03] CAN_LINK address settings/display address [N series] [F03]
M824	C243 控制	D8243	CAN 波特率辅助设定，或显示拨码设

3	C243 control	注 1 D8243 Note 1	定的波特率[N 系列] [F03] CAN baud rate auxiliary settings or displaying the baud rate of dial settings [N series] [F03]
M8244	C244 控制 C244 control	D8244 注 1 D8244 Note 1	CAN 波特率设定[N 系列] [F03] CAN baud rate setting [N series] [F03]
M8245	C245 控制 C245 control	D8245 注 1 D8245 Note 1	设定 CAN-LINK 网络设备信息保存起始寄存器[N 系列] [F03] The starting register for saving CAN-LINK network device information settings [N series] [F03]
M8246	C246 状态 C246 state	D8246 注 1 D8246 Note 1	CAN 命令及状态[N 系列] [F03] CAN command and state [N series] [F03]
M8247	C247 状态 C247 state	D8247	同步时钟计数器 L[N 系列] [F03] Synchronous clock counter L[N series] [F03]
M8248	C248 状态 C248 state	D8248	同步时钟计数器 H[N 系列] [F03] Synchronous clock counter H[N series] [F03]
M8249	C249 状态 C249 state	D8249	网络设备个数[N 系列] [F03] The number of network device [N series] [F03]
M8250	C250 状态 C250 state	D8250	CAN 中断错误[N 系列] [F03] CAN interrupt error[N series] [F03]
M8251	C251 状态 C251 state	D8251	CAN 自由指令接收到的数据长度（MCFL）[N 系列] [F03] Received data length of CAN free instruction (MCFL) [N series] [F03]
M8252	C252 状态 C252 state	D8252	CAN 自由指令接收到的数据 MDLL[N 系列] [F03] Received data length of CAN free instruction (MDLL) [N series] [F03]
M8253	C253 状态 C253 state	D8253	CAN 自由指令接收到的数据 MDLH[N 系列] [F03] Received data length of CAN free instruction (MDLH) [N series] [F03]
M8254	C254 状态 C254 state	D8254	CAN 自由指令接收到的数据 MDHL[N 系列] [F03] Received data length of CAN free instruction (MDHL) [N series] [F03]

M8255	C255 状态 C255 state	D8255	CAN 自由指令接收到的数据 MDHH[N 系列] [F03] Received data length of CAN free instruction (MDHH) [N series] [F03]

注 1：掉电保存

Note1: Power-down save

注 2：仅在 H1U 中掉电保持

Note 2: Only hold in H1U power failure

注：[N 系列]、[F03]、[F04]指专机使用的指令。

Note: [N series], [F03],[F04] refer to the instruction used for special device.

5.2 出错信息说明

5.2 Error information explaination

特殊数据寄存器 D8060～D8067，存储的错误代码和内容如下表所示。

The special data register D8060~D8067, the saved error codes and contents are listed in following table.

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
I/O 结构出错 I/O structure error M8060(D8060)继续运行 M8060(D8060)proceed	例 1020 Example 1020	没有装 I/O 起始元件号“1020”时：1=输 X(0＝输出 Y)，020=元件号 When it is not equipped with I/O starting component with number “1020”: 1= output X (0=output Y), 020=component number	还没有装的输入继电器，输出继电器的编号被编入程序。 可编程控制器可以继续运行，若是程序员，请进行修改。 The input and output relay numbers will be written into the program. Programmable controller can continue the operation. Programmer please modify the program.

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
PC 硬件出错 PC hardware error M8061(D8061) M8061(D8061) 停止运行 Stop running	0000	无异常 Normal	
	6101	RAM 出错 RAM error	
	6102	运算电路出错 Calculation circuit error	检查扩展电线的连接是否正确。 Check extension cable's connection.
	6103	I/O 总线出错(M8069 驱动时) I/O bus error (when M8069 is driven)	
	6104	扩展设备 24V 以下(M8069ON 时) Extended device below 24V (When M8069=ON)	
	6105	监视定时器出错 Monitoring timer error	运算时间超过 D8000 的值，检查程序。 If the calculation time exceeds the value of D8000, please check the programming.
	6106	系统错误 System error	
	6107	系统 IO 设定错误 System IO setting error	
PC/PP 通信出错 M8062(D8062) PC/PP communication error M8062(D8062) 继续运行 proceed	0000	无异常 Normal	
	6201	奇偶出错；超过出错；成帧出错 Parity error; overrun error; frame error	程序面板(PP)或程序连口连接的设备与可编程控制器(PC)间的连接是否正确。
	6202	通信字符有误 Communication character error	程序面板(PP)或程序连口连接的设备与可编程控制器(PC)间的连接是否正确。
	6203	通信数据的求和不一致 Checksum of communication data differs	Check the connections between the programmable controller and the program panel (PP) or program interface
	6204	数据格式有误 Data format error	
	6205	指令有误 Instruction error	
并行连接 Parallel	0000	无异常 No abnormity	检查双方的可编程控制器的电源是否为 ON，适配器

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
connection 通信出错 Communication error M8063(D8063) M8063(D8063) 继续运行 proceed	6301	奇偶出错；超过出错；成帧出错 Parity error; overrun error; frame error	和控制器之间，以及适配器之间连接是否正确。 Check to ensure that the power of both programmable controllers is ON. In addition, check to ensure that the connections between the adapter and the controller and between adapters are correct.
	6302	奇偶出错 超过出错 成帧出错 Odd/even parity error Overtime error Framing error	
	6303	通信字符有误 Communication character error	
	6304	通信数据的和数不一致 Communication data checksum differs	
	6305	数据格式有误 Data format error	
	6306	指令有误 Instruction error	
	6307~6311	监视定时器溢出 Monitor timer overflow	
	6312	无 None	
	6313	并行连接字符出错 Parallel link character error	
	6314	并行连接和数出错 Parallel link checksum error	
	6330	并行连接格式出错 Parallel link format error	COM0 通讯出错 COM0 communication error 请检查 COM0 的通讯电缆是否正确连接；检查通讯双方通讯格式是否匹配；检查通讯协议是否匹配； Please check whether COMM0 communication cable is correctly connected; whether the communication format of two sides are matched; whether the communication protocol is matched;
	6331	MODBUS 从站地址设置错误 MODBUS slave address setup error	
	6332	数据帧长度错误 Data frame length error	
	6333	地址错误 Address error	
	6334	CRC 检验错误 CRC check error	
	6335	不支持的命令码 Function cede not supported	
	6336	接收超时 Receiving overtime	
	6337	数据错误	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
		Data error	
	6338	帧错误 Frame error	检查是否开机，COM0 只能在开机状态才可能做自由口，若关机只能做监控或下载口；检查 JP0 跳线是否插入，COM0 只能在跳线断开时作为 RS485 自由口，JP0 若接通，COM0 只能做监控或下载口，且是 RS422 模式 Check whether it is powered on. Only in power-on state, can COM0 be used as free port. In power-off state, it can just be used for monitoring or download port. Check whether JP0 jumper is inserted. Only when jumper is disconnected, COM0 can be used as RS485 free port. If JP0 is connected, COM0 can only be used for monitoring or download port and in RS422 mode.
	6340	MODBUS 从站地址设置错误 MODBUS slave address setup error	COM1 通讯出错，请检查 COM1 的通讯电缆是否正确连接； If there is COM1 communication error, please check whether the COM1 communication cable is correctly connected;
	6341	数据帧长度错误 Data frame length error	
	6342	地址错误 Address error	
	6343	CRC 检验错误 CRC check error	
	6344	不支持的命令码 Function code not supported	检查通讯双方通讯格式是否匹配； Check whether the communication format of two sides are matched;
	6345	接收超时 Receiving overtime	
	6346	数据错误	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
		Data error	
	6347	缓冲区溢出 Buffer overflow	
	6348	帧错误 Frame error	
	0000	无异常 Normal	
参数出错 Parameter error M8064(D8064) M8064(D8064) 停止运行 Stop running	6401	程序的求和不一致 Inconsistant checksum of programs	停止可编程控制器的运行，用参数方式设定正确值。 Terminate the operation of the programmable controller and set up the correct alue by using parameters.
	6402	存储的容量设定有误 Storage capacity setting error	
	6403	保存区域设定有误 Storage setting error	
	6404	指令区的设定有误 Instruction setting error	
	6405	文件寄存器的区设定有误 File register setting error	
	0000	无异常 Normal	
语法出错 Syntax error M8065(D8065) M8065(D8065) 停止运行 Stop running	6503	①OUT T，OUT C 之后无设定值 ①After OUT T，OUT C, there is no setting value ②应用指令操作数数量不足 ②There are not enough application instruction operands	检查编程时对各个指令的使用是否正确？产生错误时请用程序模式进行修改。 Check the programming of each instruction. Modify the programming when errors happened.
	6504	①标号重复 ①duplicated labels	
	6505	元件号范围溢出 Component number overflow	
	6506	使用了未定义指令 Undefined instruction	
	6507	卷标编号(P)定义出错 Incorrect volume label (P) definition	
	6508	中断输入(I)的定义出错 Incorrect interrupt input(I) definition	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
	6511	中断输入和高速计数器输入重复 Duplicated interrupt input and high speed counter input	
	0000	无异常 Normal	
	6605	①MPS 的连续使用次数在 9 次以上 ①MPS has been continosly used for more than nine times ②在 STL 内有 MC，MCR，I(中断)，SRET ②There are MC, MCR, I(interrupt), SRET in STL ③在 STL 外有 RET，没有 RET ③There is RET outside the STL, or there is no RET	
电路出错 Electric circuit error M8066(D8066) M8066(D8066) 停止运行 Stop running	6606	①没有 P(指针)，I(中断) ① There is no P(point), I(interrupt) ②没有 SRET，IRET ②There is no SRET, IRET ③I(中断)，SRET，IRET 在主程序中。 ③There are I(interrupt), SRET, IRET in main program. ④STL，RET，MC，MCR 在子程序和中断子程序中 ④STL, RET, MC and MCR exist in sub programs and interrupt programs	对整个电路而言，当指令组合不对时，对指令关系有错时都能产生错误。a 在程序中要修改指令的相互关系，使之正确无误。 Incorrect instruction group or instruction relationship can cause errors. It’s required to change the relationship of instructions in program to make corrections.
	6607	①FOR 和 NEXT 关系有错误，嵌套在 6 次以上 ① There is error in FOR and Next relationship and the number of nestification is more than 6 ②在 FOR-NEXT 之间有 STL，RET，MC，MCR，IRET，SRET，FEND，END	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
		② There are STL, RET, MC, MCR, IRET, SRET, FEND, END in FOR-NEXT	
	6608	①MC 和 MCR 的关系有错误 ①There is error in MC and MCR relationship ②MCR 没有 NO ②There is no NO in MCR ③MC-MCR 间有 SRET，IRET，I(中断) ③There are SRET, IRET, I (interrupt) in MC-MCR	
	6618	只能在主程序中使用的的指令却在主程序之外(中断，子程序等)。 Instructions can only be used inside the main program used outside of main program (interrupt and sub programs).	
	6619	FOR-NEXT 之间使用了不能用的指令。 STL,RET,MC,MCR,I, IRET Instructions such as STL, RET, MC, MCR, I and IRET which can not be used between FOR and NEXT are used there.	
	6620	FOR～NEXT 间嵌套溢出 Nesting overflow between FOR～NEXT	
	6621	FOR～NEXT 数的关系有错误 Error relationship of FOR～NEXT numbers	
	6622	没有 NEXT 指令 No NEXT instruction	
	6623	没有 MC 指令 No MC instruction	
	6624	没有 MCR 指令 No MCR instruction	
	6625	STL 的连续使用次数在 9 次以	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
		上 STL is used continuously for more than 9 times	
	6626	在 STL～RET 之间有不能用的指令 There is invalid instructions in STL~RET, MC，MCR，I，SRET，IRET Such as:MC，MCR，I，SRET，IRET	
	6627	没有 RET 指令 No RET instruction	
	6628	在主程序中有不能用的指令 I，SRET，IRET There are invalid instruction in main program, such as: I, SRET, IRET	
	6629	无 P，I There is no P, I.	
	6630	没有 SRET，IRET 指令 There is no SRET, IRET instruction.	
	6631	SRET 位于不能用的场所 SRET exists in incorrect location	
	6632	FEND 位于不能用的场所 FEND exists in incorrect location	
	6635	高速输入和高速输出使用硬件端口超过限制 Hardware terminals used by high speed input and output have exceeded the limit	
运算出错 Calculation error M8067 (D8067) 继续运行	**0000**	没有异常 Normal	**运算过程中产生错误，以及程序的修改或应用指令的操作数的内容是否有错误。既使语法、电路没有出错，上述原因也可能产生运算错误。**
	6701	①CJ，CALL 没有跳转地址 ①There is no jump address for CJ, CALL ②在 END 指令后面有卷标	

		②There is volume label after END instruction. ③在 FOR～NEXT 间或子程序之间有单独的卷标 ③There is independent volume label in FOR～NEXT or subroutine.	（例）**T200Z 虽没有错但运算结果 Z=100 时，T=300，这样，元件编号则溢出。** Check correctness of the operation, the programming, and the operands. Because they may cause error even if the syntax and circuit are correct. (example) when Z=100 and T=300 the component number will overflow even T200Z is not wrong.
	6702	CALL 的嵌套级在 6 层以上 Nesting level of CALL is more than 6	
	6704	FOR-NEXT 的嵌套级在 6 层以上 Nesting level of FOR-NEXT is more than 6	
	6705	应用指令的操作数在目标元件以外 Operands of application instruction is outside the target component	
	6706	应用指令的操作数的元件号范围和数据值溢出 Component number and application data operands instruction overflow	
	6707	因没有设定文件寄存器的参数而存取了文件寄存器 Accessing file registers without setting the parameters.	
	6708	FROM～TO 指令出错 FROM～TO Instruction error	
	6709	其它(IRET，SRET 忘记，FOR～NEXT 关系有错误等) Other (IRET, SRET is forgotten; there is error in FOR～NEXT relationship, and so on)	
	6720	CALL 指令 SRET 不配套 CALL instruction SRET is not matched.	
	6730	取样时间(TS)在目标范围外（TS=0） Sample time (TS) is out of range (TS = 0)	PID 运算停止 PID 运算停止 Stop PID operation 产生控制参数的设定值和

[redacted]	6732	输入滤波器常数(a)在目标范围外〔a<0 或 100<a) Input filter constant (a) is not in the target range (a<0 or 100<a)		PID 运算中产生数据错误。请检查参数。 The setting value for generating control parameters and PID operation result are incorrect. Please check the parameters.
	6733	比例阀(KP)在目标范围外（KP<0) Proportional coefficient (KP) is out of range (KP<0)		
	6734	积分时间(TI)在目标范围外〔TI<0) Integral time(TI) is not in the target range (TI<0)		
	6735	微分阀(KD)在目标范围外〔KD<0 或 201<KD) Differentiate vavle (KD) is not in the target range (KD<0 or 201<KD)		
	6736	微分时间在目标范围外(TD<0) Differential time is out of range (TD <0)		
	6740	取样时间(TS)<运算周期 Sample time (TS)<operation period		
	6742	测定值变量溢出(△PV<32768 或 <△PV) Measurement variable overflow (△PV<32768 or <△PV)		
	6743	偏差溢出(EV<-32768 或 32767<EV〕 Bias overflow (EV<-32768 r 32767<EV)	将运算数据作MAX值，继续运算。 Taking calculation data as MAX value, go on calcuating	
	6744	积分计算值溢出(-32768～32767 以外) Integral calculation value overflow(out of -32768 ～ 32767 range)		
	6745	因微分阀(KP)溢出，产生微分值溢出 Differential calculation value overflows because of KP overflow		
	6746	微分计算值值溢出(-32768～		

[redacted]		32767 以外) Differential calculation value overflow(out of -32768 ～ 32767 range)
	6747	PID 运算结果溢出(-32768～32767 以外) PID operation result overflow (out of -32768～32767 range)
	6760	高速指令(DHSZ 等)超过 6 条限制 Number of high speed instructions (such as DHSZ and so on) exceeds the limit of 6 lines

5.3 错误代码存贮

5.3 Error code storage

H1U/2U 系列 PLC 的错误按下述定时检查，把前项的出错代码存入特殊数据寄存器 D8060～D8067。

H1U/2U series PLC error should be checked according to following requirement, and the error code is saved in special data register D8060~D8067。错误代码存储寄存器

Error code storage register

出错项目 Error item	电源 OFF→ON Power OFF→ON	电源 ON 后初次 STOP→RUN 时 After power on, it shifts from STOP to RUN	其它 others
M8060 I/O 地址号构成出错 M8060 I/O address error	检查 Check up	检查 Check up	运算中 In operation
M8061 PC 硬件出错 M8061 PC hardware error	检查 Check up	-	运算中 In operation
M8062 PC/PP 通信出错 M8062 PC/PP communication error	-	-	从 PP 接收信号时 Receiving signal from PP
M8063 连接模块通值出错 M8063 connection module communication error	-	-	从对方接受信号时 Receiving signal from another side
M8064 参数出错 M8064 Parameter error	检查 Check up	检查 Check up	程序变更时(STOP) When program is

M8065 语法出错 M8065 Syntax error M8066 电路出错 M8066 Electric circuit error			changed (STOP) 程序传送时(STOP) When program is transmitted (STOP)
M8087 运算出错 M8087 Calculation error M8088 运算出错锁存 M8088 calculation error latch	-	-	运算中(RUN) In operation (RUN)

D8060～D8067 各存一个出错内容，同一出错项目产生多次出错时，每当消除出错原因时，仍存储发生中的出错代码。无出错时存入“0”。

Each of D8060～D8067 stores one error. If the same error item generates errors more than once then the current error code is still stored when eliminating the error causes. If there is no error then “0” will be stored.

5.4 PLC 内置 MODBUS 从站通讯协议说明

5.4 Communication protocol introduction for PLC built-in MODBUS slave station

概述：

Overview:

支持 MODBUS 协议功能码 0x01，0x03，0x05，0x06，0x0f，0x10；通过这些功能码，可读写的线圈有 M，S，T，C，X（只读），Y 等变量；寄存器有 D，T，C。

It supports MODBUS protocol function code 0x01，0x03，0x05，0x06，0x0f，0x10，based on which the readable and writable coils are M, S, T, C, X(read only), Y and registers are D, T, C.

1. MODBUS 帧格式（以 MODBUS-RTU 为例）

1. MODBUS frame format (taking MODBUS-RTU as example)

1.1 功能码 0x01（01）：读线圈

1.1 Function code 0x01(01): read coil

请求帧格式：从机地址+0x01+线圈起始地址+线圈数量+CRC 检验

Request Frame Format: slave address + 0x01 + coil start address + coil count + CRC*

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** instructions		
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121		
2	0x01（功能码） 0x01 (function code)	1 个字节 1 byte	读线圈 Read coil		
3	线圈起始地址 Coil starting address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing		

4	线圈数量 Coil number	2 个字节 2 byte	高位在前，低位在后（N） Lower bytes follows higher bytes (N)		
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes		

响应帧格式：从机地址+0x01+字节数+线圈状态+CRC 检验

Response Frame Format: slave address + 0x01 + byte count + coil status + CRC

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x01（功能码） 0x01 (function code)	1 个字节 1 byte	读线圈 Read coil
3	字节数 Byte number	1 个字节 1 byte	值：[（N+7）/8] Value：[（N+7）/8]
4	线圈状态 Coil state	[（N+7）/8]个字节 [（N+7）/8]byte	每 8 个线圈合为一个字节，最后一个若不足 8 位，未定义部分填 0。前 8 个线圈在第一个字节，最地址最小的线圈在最低位。依次类推 A byte consistent of eight coils, and if the last one has less than eight bits, the undefined bits should be set with 0. The first eight coils are in first byte, and the coil with min address is in lowest bit. And so forth.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error Response: Please refer to the error response frame.

注：N，H2U 最大为 2000，H1U 最大为 800。

Note: N, up to 2000(H2U), up to 800 (H1U).

1.2 功能码 0x03（03）：读寄存器

1.2 function 0x03(03): read register

请求帧格式：从机地址+0x03+寄存器起始地址+寄存器数量+CRC 检验

Request Frame Format: slave address + 0x03 + register start address + register count + CRC

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x03（功能码） 0x03 (function code)	1 个字节 1 byte	读寄存器 Read register
3	寄存器起始地址 Register starting address	2 个字节 2 byte	高位在前，低位在后，见寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 Register number	2 个字节 2 byte	高位在前，低位在后（N） Lower bytes follows higher bytes (N)
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x03+字节数+寄存器值+CRC 检验

Response Frame Format: slave address + 0x03 + byte count + register value + CRC

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x03（功能码） 0x03 (function code)	1 个字节 1 byte	读寄存器 Read register
3	字节数 Byte number	1 个字节 1 byte	值：N*2 Value：N*2
4	寄存器值 Register value	N*2 个字节 N*2 byte	每两字节表示一个寄存器值，高位在前低位在后。

			One register value is expressed by two bytes, and the lower bit follows higher bit. 寄存器地址小的排在前面 The register with lower address is set in front
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error Response: Please refer to the error response frame.

注：N，H2U 最大为 1250，H1U 最大为 50。

Note: N, up to 1250(H2U), up to 50 (H1U).

1.3 功能码 0x05（05）：写单线圈

1.3 Function code 0x05(05): write single-coil

请求帧格式：从机地址+0x05+线圈地址+线圈状态+CRC 检验

Request Frame Format: slave address + 0x05 + coil address + coil status + CRC

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x05（功能码） 0x05 (function code)	1 个字节 1 byte	写单线圈 Write single-coil
3	线圈地址 Coil address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈状态 Coil state	2 个字节 2 byte	高位在前，低位在后。 Lower bytes follows higher bytes.非 0 即为有效 If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x05+线圈地址+线圈状态+CRC 检验

Response Frame Format: slave address + 0x05 + coil address + coil status + CRC check

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x05（功能码） 0x05 (function code)	1 个字节 1 byte	写单线圈 Write single-coil
3	线圈地址 Coil address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈状态 Coil state	2 个字节 2 byte	高位在前，低位在后。 Lower bytes follows higher bytes.非 0 即为有效 If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error Response: Please refer to the error response frame.

1.4 功能码 0x06（06）：写单个寄存器

1.4 function code 0x06 (06): write single-regestier

请求帧格式：从机地址+0x06+寄存器地址+寄存器值+CRC 检验

Request Frame Format: slave address + 0x06 + register address + register value + CRC

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x06（功能码） 0x06 (function code)	1 个字节 1 byte	写单寄存器 Write single-register
3	寄存器地址 Register address	2 个字节 2 byte	高位在前，低位在后，见寄存器值编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器值	2 个字节	高位在前，低位在后。

	Register value	2 byte	Lower bytes follows higher bytes.非 0 即为有效 If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x06+寄存器地址+寄存器值+CRC 检验。

Response frame format: slave address + 0x06 + register address + register value + CRC check

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x06（功能码） 0x06 (function code)	1 个字节 1 byte	写单寄存器 Write single-register
3	寄存器地址 Register address	2 个字节 2 byte	高位在前，低位在后，见寄存器值编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器值 Register value	2 个字节 2 byte	高位在前，低位在后。 Lower bytes follows higher bytes.非 0 即为有效 If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧。

Error response error: referring to error response frame.

1.5 功能码 0x0f（15）：写多个线圈

1.5 Function code 0x0f (15): write multi-coil

请求帧格式：从机地址+0x0f+线圈起始地址+线圈数量+字节数+线圈状态+CRC 检验。

Request frame format: slaver address + 0x0f + coil starting address + coil number + byte number + coil state + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址	1 个字节	取值 1~247，由 D8121

	Slaver address	1 byte	设定 Value range 1~247, defined by D8121
2	0x0f（功能码） 0x0f (function code)	1 个字节 1 byte	写多个单线圈 Write multi-coil
3	线圈起始地址 Coil starting address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈数量 Coil number	2 个字节 2 byte	高位在前，低位在后。 Lower bytes follows higher bytes.
5	字节数 byte count	1 个字节 1 byte	值：值：[（N+7）/8] Value：[（N+7）/8]
6	线圈状态 coil status	[（N+7）/8]个字节 [（N+7）/8]byte	每 8 个线圈合为一个字节，最后一个若不足 8 位，未定义部分填 0。前 8 个线圈在第一个字节，最地址最小的线圈在最低位。依次类推 A byte consistent of eight coils, and if the last one has less than eight bits, the undefined bits should be set with 0. The first eight coils are in first byte, and the coil with min address is in lowest bit. And so forth.
7	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x05+线圈起始地址+线圈数量+CRC 检验
Response Frame Format: slave address + 0x05 + start address of coil + coil count + CRC check

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247,

			defined by D8121
2	0x0f（功能码） 0x0f (function code)	1 个字节 1 byte	写多个单线圈 Write multi-coil
3	线圈起始地址 Coil starting address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈数量 Coil number	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧。

Error response error: referring to error response frame.

注：N，H2U 最大为 1968，H1U 最大为 800。

Note: N, up to 1968 (H2U), up to 800 (H1U).

1.6 功能码 0x10（16）：写多个寄存器

1.6 function code 0x10 (16): write multi-register

请求帧格式：从机地址+0x10+寄存器起始地址+寄存器数量+字节数+寄存器值+CRC 检验。

Request frame format: slaver address + 0x10 + register starting address + register number + byte number + register value + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x10（功能码） 0x10 (function code)	1 个字节 1 byte	写多个寄存器 Write multi-register
3	寄存器起始地址 start address of register	2 个字节 2 byte	高位在前，低位在后，见寄存器值编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register count	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes
5	字节数 byte count	1 个字节 1 byte	值：N*2 Value: N*2
6	寄存器值 register value	N*2（N*4）	

7	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x05+线圈起始地址+线圈数量+CRC 检验。

Response frame format: slaver address + 0x05 + coil starting address + coil number + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x10（功能码） 0x10 (function code)	1 个字节 1 byte	写多个寄存器 Write multi-register
3	寄存器起始地址 start address of register	2 个字节 2 byte	高位在前，低位在后，见寄存器值编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register count	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧。

Error response error: referring to error response frame.

注：N，H2U 最大为 120，H1U 最大为 50。

Note: N, up to 120 (H2U), up to 50 (H1U).

1.7 错误响应帧

1.7 Error response frame

错误响应：从机地址+（功能码+0x80）+错误码+CRC 校验。

Error response: slaver address + （function code + 0x80） + error code + CRC check

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 instructions
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	功能码+0x80	1 个字节	错误功能码

	Function code + 0x80	1 byte	Error function code
3	错误码 Error code	1 个字节 1 byte	1~4
4	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

2. 变量编址

2. Variable addressing

2.1 线圈编址

2.1 Coil addressing

线圈：指位变量，只有两种状态 0 和 1。 在本 PLC 中包含 M，S，T，C，X，Y 等变量。
coil: bit variable the status of which can be either 0 or 1. There are M,S,T,C,X and Y variables in this PLC.

变量名称 **Variable name**	**起始地址** **Starting address**	**线圈数量** coil count	**说明** instructions	
M0~3071	0（0）	3072		
M8000~M8256	0x1F40（8000）	256		
S0~S999	0xE000（57344）	1000		
T0~T256	0xF000（61440）	256		
C0~C255	0xF400（62464）	256		
X0~X255 X0~X255	0xF800（63488） 0xF800（63488）	256		
Y0~Y255 Y0~Y255	0xFC00（64512） 0xFC00（64512）	256		

2.2 寄存器编址

2.2 Register addressing

寄存器：指 16 位或 32 位变量，在本 PLC 中，16 位变量包含 D，T，C0~199；32 位变量为 C200~255。

Register: referring to 16bit or 32bit variables. In this PLC, 16bit variables include D, T, C0~199; 32bit variables include C200~255.

变量名称 **Variable name**	**起始地址** **Start address**	**线圈数量** coil count	**说明** instructions
D0~D8255	0（0）	8256	
T0~2T255	0xF000（61440）	256	
C0~C199	0xF400（62464）	200	
C200~C255	0xF700（63232）	56	32 位寄存器 32bit register

说明：

通过 MODBUS 访问 C200~C255 段 32 位寄存器时，一个寄存器作两寄存器看待，一个 32 位寄存器占用两个 16 寄存器空间。比如用户要读或写 C205~C208 这 4 个寄存器，MODBUS

地址为 0xF70A（0xF700+10），寄存器数量 8（4*2）。
Note:
While accessing 32 bit registers between C200~C255 through MODBUS, one register will be treated as two 16 bit registers, and one 32 bit register occupies the space of two16 bit registers.
For example, if user wants to read or write the 4 registers C205~C208, then the MODBUS address is 0xF70A（0xF700+10）and the register count is 8 (4*2). The function code “write single register”(0x06) is not supported for 32 bit registers.

M8093	**Y3 输出完成中断使能** **Y3 Output complete interrupt enabled**	**D8093**	**保留** **Reserved**
M8094	Y4 输出完成中断使能 Y4 Output complete interrupt enabled	D8094	保留 Reserved
M8095	保留 Reserved	D8095	保留 Reserved
M8096	保留 Reserved	D8096	字元件地址号 No.0 Word component address number No.0
M8097	保留 Reserved	D8097	字元件地址号 No.1 Word component address number No.1
M8098	保留 Reserved	D8098	字元件地址号 No.2 Word component address number No.2
高速环形计数器 High speed ring counter			
M8099	高速环形计数器计数启动 High speed ring counter operation	D8099	[0~32767] 上升动作环形计数器 (0.1ms) [0 to 32767] increased action ring-counter (0.1 msec)
其它功能使用 Miscellaneous Devices			
M8100	SPD(X000)具有-脉冲个数/分钟 SPD(X000) - pulse numbers/minute	D8100	保留 Reserved
M8101	SPD(X001)具有-脉冲个数/分钟 SPD(X001) - pulse numbers/minute	D8101	单板程序版本，如 24100H2U=24，100 版本 V1.00 Single board program version, for example 24100 H2U = 24, 100 version V1.00
M8102	SPD(X002)具有-脉冲个数/分钟 SPD(X002) - pulse	D8102	系统提供给用户程序的程序容量 Program capacity provided by

	numbers/minute		system to user program
M8103	SPD(X003)具有-脉冲个数/分钟 SPD(X003) - pulse numbers/minute	D8103	保留 Reserved
M8104	SPD(X004)具有-脉冲个数/分钟 SPD(X004) - pulse numbers/minute	D8104	DRVI，DRVA 执行时加速时间[默认 100] 由 M8176 决定是否有效 [Y0] [F04] Acceleration time when executing DRVI and DRVA [default 100], M8176 determines that it's whether effective or not [Y0] [F04]
M8105	SPD(X005)具有-脉冲个数/分钟 SPD(X005) - pulse numbers/minute	D8105	DRVI，DRVA 执行时加速时间[默认 100] 由 M8177 决定是否有效 [Y1] [F04] Acceleration time when executing DRVI and DRVA [default 100], M8177 determines that it's whether effective or not [Y1] [F04]
M8106	保留 Reserved	D8106	DRVI，DRVA 执行时加速时间[默认 100] 由 M8178 决定是否有效 [Y2] [F04] Acceleration time when executing DRVI and DRVA [default 100], M8178 determines that it's whether effective or not [Y2] [F04]
M8107	保留 Reserved	D8107	DRVI，DRVA 执行时加速时间[默认 100] 由 M8179 决定是否有效 [Y3] [F04] Acceleration time when executing DRVI and DRVA [default 100], M8179 determines that it's whether effective or not [Y3] [F04]
M8108	保留 Reserved	D8108	DRVI，DRVA 执行时加速时间[默认 100] 由 M8180 决定是否有效 [Y4] [F04] Acceleration time when executing DRVI and DRVA [default 100], M8180 determines that it's whether effective or not [Y4] [F04]
M8109	输出刷新错误 Output refresh error	D8109	输出刷新错误的输出地址编号 Output refresh error address number
COM0 通讯.链接 COM0 communication link			

M8110	保留 Reserved	D8110 注 1	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration with a default of 0
M8111	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8111 注 1	站号设置，界面配置设定，默认为 1 Station number settings, the interface configuration settings with a default of 1
M8112	发送标志（RS 指令） 指令执行状态（MODBUS） Sending flag (RS instruction) Instruction execution status (MODBUS)	D8112	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)
M8113	接收完成标志（RS） 通讯错误标志（MODBUS） Receiving complete flag (RS) Communication error flag (MODBUS)	D8113	接收到的数据数量（仅对 RS 指令） Amount of data already received (Only to RS instruction)
M8114	接收中（仅对 RS 指令） Receiving (only to RS instruction)	D8114	起始字符 STX（仅对 RS 指令） Start character STX (Only to RS instruction)
M8115	保留 Reserved	D8115	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8116	保留 Reserved	D8116	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8117	保留 Reserved	D8117	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8118	保留 Reserved	D8118	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8119	超时判断 Time-out judgement	D8119	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication time-out judgement, the interface configuration settings with a default of 10（100msec）
COM1 通讯.链接 COM1 communication link			
M8120	保留 Reserved	D8120 注 1	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration with a default of 0

M8121	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8121 注 1	站号设置，界面配置设定，默认为 1 Communication format, the interface configuration with a default of 2
M8122	发送标志（RS 指令） 指令执行状态（MODBUS） Sending flag (RS instruction) Instruction execution status	D8122	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)
M8123	接收完成标志（RS） 通讯错误标志（MODBUS） Receiving complete flag (RS) Communication error flag (MODBUS)	D8123	接收到的数据数量（仅对 RS 指令） Amount of data already received (Only to RS instruction)
M8124	接收中（仅对 RS 指令）	D8124	起始字符 STX（仅对 RS 指令）
M8125	保留 Reserved	D8125	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8126	为 ON 时 485BD 扩展卡有效 The expansion card 485BD valid when ON	D8126	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8127	保留 Reserved	D8127	计算机链接协议接通要求数据起始地址号； Computer link protocol of data starting address; SETEX 协议：从站（PLC）发送给主站（显示屏）缓冲区起始地址，缓冲区大小为 18。 SETEX protocol: slave station (PLC) sends buffer starting address to master station (display screen), and the buffer size is 18.
M8128	保留 Reserved	D8128	计算机链接协议接通要求发送数据数量； The computer link protocol connection requests the quantity of transmission data; SETEX 协议：主站（显示屏）发送给从站（PLC）缓冲区起始地址，缓冲区大小为 19。 SETEX protocol: master station (display screen) sends buffer starting address to slave station

			(PLC), and the buffer size is 19.
M8129	超时判断 Time-out judgement	D8129	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication time-out judgement, the interface configuration settings with a default of 10（100msec）
高速&定位 High speed & positioning			
M8130	HSZ 指令平台的控制模式 Control mode of HSZ instruction platform	D8130	HSZ 高速比较平台使用(记录号) Special bit for high-speed model (record number)
M8131	和 M8130 联合使用 Paralleled with M8130	D8131	HSZ&PLSY 速度模型使用(记录号) HSZ & PLSY completion mark of comparison mode (record number)
M8132	HSZ&PLSY 速度模式 HSZ&PLSY speed mode	D8132	HSZ&PLSY 速度模型频率使用 HSZ & PLSY frequency control mode
M8133	和 M8132 联合使用 Paralleled with M8132	D8133	
M8134	保留 Reserved	D8134	HSZ&PLSY 速度模型比较脉冲数使用 Completion mark for HSZ & PLSY frequency control mode
M8135	Y0 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y0 speed-down time and pulse output can be change to be enabled [ON-PLSR,DRVI,DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA]	D8135	
M8136	Y1 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] 在 F04 脉冲更改有效[ON-PLSY，PLSR，DRVI，DRVA] It is valid in changing F04 pulse [ON-PLSY，PLSR，DRVI，DRVA]	D8136	Y000&Y001 输出脉冲合计数 The total number of Y000&Y001 output pulses
M8137	Y2 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y2 is valid in changing acceleration/deceleration time	D8137	

	and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY， PLSR， DRVI， DRVA] It is valid in changing F04 pulse [ON-PLSY ， PLSR ， DRVI，DRVA]		
M8138	Y3 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y3 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY， PLSR， DRVI， DRVA] It is valid in changing F04 pulse [ON-PLSY ， PLSR ， DRVI，DRVA]	D8138	保留 Reserved
M8139	Y4 在通用上加减速时间和脉冲更改有效[ON-PLSR，DRVI，DRVA] Y4 is valid in changing acceleration/deceleration time and pulse [ON-PLSR, DRVI, DRVA] 在 F04 脉冲更改有效[ON-PLSY， PLSR， DRVI， DRVA] It is valid in changing F04 pulse [ON-PLSY ， PLSR ， DRVI，DRVA]	D8139	保留 Reserved
M8140	ZRN 的 CLR 信号输出功能有效 CLR signal output function of ZRN is enabled.	D8140	PLSY&PLSR 输出 Y000 对应的脉冲个数累积值 PLSY&PLSR output Y000 corresponding cumulative value for the pulse number
M8141	保留 Reserved	D8141	
M8142	保留 Reserved	D8142	PLSY&PLSR 输出 Y001 对应的脉冲个数累积值 PLSY&PLSR output Y001 corresponding cumulative value for the pulse number
M8143	保留 Reserved	D8143	
M814	保留	D8144	

4	Reserved		
M8145	Y000 脉冲输出停止 Y000 pulse output stop	D8145	DRVI，DRVA 执行时的偏置速度 The offset speed when DRVI,DRVA execution
M8146	Y001 脉冲输出停止 Y001 pulse output stop	D8146	DRVI，DRVA 执行时的最高速度[默认 100，000]
M8147	Y000 脉冲输出监控 Y000 pulse output monitor	D8147	
M8148	Y001 脉冲输出监控 Y001 pulse output monitor	D8148	DRVI，DRVA 执行时加减速时间[默认 100] Maximum speed of DRVI,DRVA execution[Default 100,000]
M8149	Y002 脉冲输出监控 Y002 pulse output monitor	D8149	保留 Reserved
M8150	Y003 脉冲输出监控 Y003 pulse output monitor	D8150	PLSY&PLSR 输出 Y002 对应的脉冲个数累积值 PLSY&PLSR output Y002 corresponding cumulative value for the pulse number
M8151	Y004 脉冲输出监控 Y004 pulse output monitor	D8151	
M8152	Y002 脉冲输出停止 Y002 pulse output stop	D8152	PLSY&PLSR 输出 Y003 对应的脉冲个数累积值 PLSY&PLSR output Y003 corresponding cumulative value for the pulse number
M8153	Y003 脉冲输出停止 Y003 pulse output stop	D8153	
M8154	Y004 脉冲输出停止 Y004 pulse output stop	D8154	PLSY&PLSR 输出 Y004 对应的脉冲个数累积值 PLSY&PLSR output Y004 corresponding cumulative value for the pulse number
M8155	保留 Reserved	D8155	
M8156	保留 Reserved	D8156	Y0 端口清零信号定义(ZRN)[默认 5=Y005] Clear definition of Y0 port signal (ZRN)[Default 5=Y005]
M8157	保留 Reserved	D8157	Y1 端口清零信号定义(ZRN)[默认 6=Y006] Clear definition of Y1 port signal (ZRN)[Default 6=Y006]
扩展功能			
M8158	保留 Reserved	D8158	Y2 端口清零信号定义(ZRN)[默认 7=Y007] Clear definition of Y2 port signal (ZRN)[Default 7=Y007]
M8159	保留 Reserved	D8159	Y3 端口清零信号定义(ZRN)[默认 8=Y010] Clear definition of Y3 port signal (ZRN)[Default 8=Y010]

M8160	(XCH)的 SWAP 功能 Selection of XCH operation to swap bytes in a single data word	D8160	Y4 端口清零信号定义(ZRN)[默认 9=Y011] Clear definition of Y4 port signal (ZRN)[Default 9=Y011]
M8161	ASC/RS/ASCII/HEX/CCD 的位处理模式 Selection of 8 bit operations for applied instructions ASC, RS, ASCI, HEX, CCD	D8161	保留 Reserved
M8162	高速并联连接模式 High speed mode for parallel connection	D8162	保留 Reserved
M8163	保留 Reserved	D8163	保留 Reserved
M8164	(FROM/TO)传送点数可变模式 (FROM/TO)Move points variable mode	D8164	(FROM/TO)传送点数指定模式 (FROM/TO) Move points fixed mode
M8165	保留 Reserved	D8165	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8135 决定是否有效 Commonly, the validation is decided by M8135 F04 由 M8176 决定是否有效 F04 validation is decided by M8176
M8166	保留 Reserved	D8166	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8136 决定是否有效 Commonly, the validation is decided by M8136 F04 由 M8177 决定是否有效 F04 validation is decided by M8177
M8167	(HEY)HEX 数据处理功能 (HEY)HEX data processing function	D8167	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8137 决定是否有效 Commonly, the validation is decided

			by M8137 F04 由 M8178 决定是否有效 F04 validation is decided by M8177
M816 8	(SMOV)HEX 数据处理功能 (SMOV)HEX data processing function	D8168	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8138 决定是否有效 Commonly, the validation is decided by M8138 F04 由 M8179 决定是否有效 F04 validation is decided by M8179
M816 9	保留 Reserved	D8169	PLSR，DRVI，DRVA 执行时减速时间[默认 100] [Y0] The deceleration time[default 100][Y0] during PLSR, DRVI, DRVA is implemented 通用的由 M8139 决定是否有效 Commonly, the validation is decided by M8139 F04 由 M8180 决定是否有效 F04 validation is decided by M8180
脉冲捕捉 Pulse capture		通讯.链接 Communication link	
M817 0	X000 脉冲捕捉 X000 pulse capture	D8170	保留 Reserved
M817 1	X001 脉冲捕捉 X001 pulse capture	D8171	保留 Reserved
M817 2	X002 脉冲捕捉 X002 pulse capture	D8172	保留 Reserved
M817 3	X003 脉冲捕捉 X003 pulse capture	D8173	本站站号设定状态 Station No. set status
M817 4	X004 脉冲捕捉 X004 pulse capture	D8174	通讯子站设定状态 Communication sub-station set status
M817 5	X005 脉冲捕捉 X005 pulse capture	D8175	刷新范围设定状态 Refresh range set status
M817 6	Y0 的加减速时间与速度控制 [F04] Y0 acceleration/deceleration time and speed control [F04]	D8176	本站站号设定 Station No. setting
M817	**Y1 的加减速时间与速度控制**	**D8177**	**通讯子站数设定**

7	**[F04]** **Y1 acceleration/deceleration time and speed control [F04]**		**通讯子站数设定** **Communication sub-station number setting**
M8178	Y2 的加减速时间与速度控制 [F04] Y2 acceleration/deceleration time and speed control [F04]	D8178	刷新范围设定 Refresh range setting
M8179	Y3 的加减速时间与速度控制 [F04] Y3 acceleration/deceleration time and speed control [F04]	D8179	重试次数设定 Retry count setting
M8180	Y4 的加减速时间与速度控制 [F04] Y4 acceleration/deceleration time and speed control [F04]	D8180	通信超时设置 Communication overtime setup
通讯.链接 Communication link		变址寻址 Index addressing	
M8181	保留 Reserved	D8181	保留 Reserved
M8182	保留 Reserved	D8182	位元件地址号 No.2/Z1 寄存器内容 Bit component address number No.2/Z1 register contents
M8183	数据传送主站出错 Data transfer master station error	D8183	位元件地址号 No.3/V1 寄存器内容 Bit component address number No.3/V1 register contents
M8184	数据传送从站 1 出错 Data transfer slave station 1 error	D8184	位元件地址号 No.4/Z2 寄存器内容 Bit component address number No.4/Z1 register contents
M8185	数据传送从站 2 出错 Data transfer slave station 2 error	D8185	位元件地址号 No.5/V2 寄存器内容 Bit component address number No.5/V2 register contents
M8186	数据传送从站 3 出错 Data transfer slave station 3 error	D8186	位元件地址号 No.6/Z3 寄存器内容 Bit component address number No.6/Z3 register contents
M8187	数据传送从站 4 出错 Data transfer slave station 4 error	D8187	位元件地址号 No.7/V3 寄存器内容 Bit component address number No.7/V3 register contents
M8188	数据传送从站 5 出错 Data transfer slave station 5 error	D8188	位元件地址号 No.8/Z4 寄存器内容 Bit component address number No.8/Z4 register contents
M8189	数据传送从站 6 出错 Data transfer slave station 6 error	D8189	位元件地址号 No.9/V4 寄存器内容 Bit component address number No.9/V4 register contents

M8190	数据传送从站 7 出错 Data transfer slave station 7 error	D8190	位元件地址号 No.10/Z5 寄存器内容 Bit component address number No.10/Z1 register contents
M8191	数据传送进行中 Data transferring	D8191	位元件地址号 No.11/V5 寄存器内容 Bit component address number No.11/V5 register contents
M8192	CAN 接收超时[N 系列] [F03] CAN receive time-out [N series] [F03]	D8192	位元件地址号 No.12/Z6 寄存器内容 Bit component address number No.12/Z6 register contents
M8193	自由 CAN 指令接收状态[N 系列] [F03] Free CAN instruction receive state [N series] [F03]	D8193	位元件地址号 No.13/V6 寄存器内容 Bit component address number No.13/V6 register contents
M8194	CAN 自由指令发送失败[N 系列] [F03] Free CAN instruction send fail [N series] [F03]	D8194	位元件地址号 No.14/Z7 寄存器内容 Bit component address number No.14/Z7 register contents
M8195	C251 倍频控制 C251 Double-frequency	D8195	位元件地址号 No.15/V7 寄存器内容 Bit component address number No.15/V7 register contents
M8196	C252 倍频控制 C252 Double-frequency	D8196	保留 Reserved
M8197	C253 倍频控制 C253 Double-frequency	D8197	保留 Reserved
M8198	C254 倍频控制 C254 Double-frequency	D8198	本机作为 CAN-LINK 远程设备的标识，H2U 为 10224，H1U 为 10226
M8199	C255 倍频控制 C255 Double-frequency	D8199 注 2	扩展卡类型号，H2U 为自动识别，D8199 显示此卡的类型号； H1U 不能自动识别，需要通过 D8199 设定扩展卡类型。 扩展卡类型如下： 1 RS232 扩展卡 2 RS422/485 通讯扩展卡 3 AD 扩展卡 4 DA 扩展卡 5 6A/6B/3A 扩展卡 6 高速扩展卡 7 CAN 扩展卡
	计数器增/减控制或状态 Up/down counter control and status	通讯.链接 Communication link	
M8200	C200 控制 C200 control	D8200	汇川软件版本号 XXX.YY，XXX：软件号，YY：软件版本号 Inovance software version XXX.YY,

			XXX: software number, YY: software version
M8201	C201 控制 C201 control	D8201	当前连接扫描时间 Currently connection scan time
M8202	C202 控制 C202 control	D8202	最大连接时间 Maximum connection scan time
M8203	C203 控制 C203 control	D8203	主站通讯错误次数 Master station communication error number
M8204	C204 控制 C204 control	D8204	从站 1 通讯错误次数 Slave station 1 communication error number
M8205	C205 控制 C205 control	D8205	从站 2 通讯错误次数 Slave station 2 communication error number
M8206	C206 控制 C206 control	D8206	从站 3 通讯错误次数 Slave station 3 communication error number
M8207	C207 控制 C207 control	D8207	从站 4 通讯错误次数 Slave station 4 communication error number
M8208	C208 控制 C208 control	D8208	从站 5 通讯错误次数 Slave station 5 communication error number
M8209	C209 控制 C209 control	D8209	从站 6 通讯错误次数 Slave station 6 communication error number
M8210	C210 控制 C210 control	D8210	从站 7 通讯错误次数 Slave station 7 communication error number
M8211	C211 控制 C211 control	D8211	主站通讯错误代码 Master station communication error code
M8212	C212 控制 C212 control	D8212	从站 1 通讯错误代码 Slave station 1 communication error code
M8213	C213 控制 C213 control	D8213	从站 2 通讯错误代码 Slave station 2 communication error code
M8214	C214 控制 C214 control	D8214	从站 3 通讯错误代码 Slave station 3 communication error code
M8215	C215 控制 C215 control	D8215	从站 4 通讯错误代码 Slave station 4 communication error code
M8216	C216 控制 C216control	D8216	从站 5 通讯错误代码 Slave station 5 communication error code
M821	C217 控制	D8217	从站 6 通讯错误代码

7	C217 control		Slave station 6 communication error code
M821 8	C218 控制 C218 control	D8218	从站 7 通讯错误代码 Slave station 7 communication error code
M821 9	C219 控制 C219 control	D8219	保留 Reserved
M822 0	C220 控制 C220 control	D8220	扩展卡发送缓冲区 The sending buffer of extended card
M822 1	C221 控制 C221 control	D8221	扩展卡发送缓冲区 The sending buffer of extended card
M822 2	C222 控制 C222 control	D8222	扩展卡发送缓冲区 The sending buffer of extended card
M822 3	C223 控制 C223 control	D8223	扩展卡发送缓冲区 The sending buffer of extended card
M822 4	C224 控制 C224 control	D8224	扩展卡发送缓冲区 The sending buffer of extended card
M822 5	C225 控制 C225 control	D8225	扩展卡发送缓冲区 The sending buffer of extended card
M822 6	C226 控制 C226 control	D8226	扩展卡发送缓冲区 The sending buffer of extended card
M822 7	C227 控制 C227 control	D8227	扩展卡发送缓冲区 The sending buffer of extended card
M822 8	C228 控制 C228 control	D8228	扩展卡发送缓冲区 The sending buffer of extended card
M822 9	C229 控制 C229 control	D8229	扩展卡发送缓冲区 The sending buffer of extended card
M823 0	C230 控制 C230control	D8230	扩展卡接收缓冲区 The sending buffer of extended card
M823 1	**C231 控制 C231 control**	**D8231**	**扩展卡接收缓冲区 The sending buffer of extended card**
M823	C232 控制	D8232	扩展卡接收缓冲区

2	C232 control		The sending buffer of extended card
M8233	C233 控制 C233 control	D8233	扩展卡接收缓冲区 The sending buffer of extended card
M8234	C234 控制 C234 control	D8234	扩展卡接收缓冲区 The sending buffer of extended card
M8235	C235 控制 C235 control	D8235	扩展卡接收缓冲区 The sending buffer of extended card
M8236	C236 控制 C236 control	D8236	扩展卡接收缓冲区 The sending buffer of extended card
M8237	C237 控制 C237 control	D8237	扩展卡接收缓冲区 The sending buffer of extended card
M8238	C238 控制 C238 control	D8238	扩展卡接收缓冲区 The sending buffer of extended card
M8239	C239 控制 C239 control	D8239	扩展卡通信错误计数器 The error counter of extended card communication
M8240	C240 控制 C240 control	D8240 注 1 D8240 Note 1	CAN 功能设置，参见 CAN 通信手册[N 系列] [F03] CAN function settings, refer to CAN communication manual [N series] [F03]
M8241	C241 控制 C241 control	D8241 注 1 D8241 Note 1	CAN 接收超时设定(ms) [N 系列] [F03] CAN receive time-out settings(ms) [N series] [F03]
M8242	C242 控制 C242 control	D8242 注 1 D8242 Note 1	CAN_LINK 地址设定/显示地址[N 系列] [F03] CAN_LINK address settings/display address [N series] [F03]
M8243	C243 控制 C243 control	D8243 注 1 D8243 Note 1	CAN 波特率辅助设定，或显示拨码设定的波特率[N 系列] [F03] CAN baud rate auxiliary settings or displaying the baud rate of dial settings [N series] [F03]
M8244	C244 控制 C244 control	D8244 注 1 D8244 Note 1	CAN 波特率设定[N 系列] [F03] CAN baud rate setting [N series] [F03]
M8245	C245 控制 C245 control	D8245 注 1 D8245 Note 1	设定 CAN-LINK 网络设备信息保存起始寄存器[N 系列] [F03] The starting register for saving CAN-LINK network device information settings [N series] [F03]

M8246	C246 状态 C246 control	D8246 注 1 D8246 Note 1	CAN 命令及状态[N 系列] [F03] CAN command and state [N series] [F03]
M8247	C247 状态 C247 control	D8247	同步时钟计数器 L[N 系列] [F03] Synchronous clock counter L[N series] [F03]
M8248	C248 状态 C248 control	D8248	同步时钟计数器 H[N 系列] [F03] Synchronous clock counter H[N series] [F03]
M8249	C249 状态 C249 control	D8249	网络设备个数[N 系列] [F03] The number of network device [N series] [F03]
M8250	C250 状态 C250 control	D8250	CAN 中断错误[N 系列] [F03] CAN interrupt error[N series] [F03]
M8251	C251 状态 C251 control	D8251	CAN 自由指令接收到的数据长度（MCFL）[N 系列] [F03] Received data length of CAN free instruction (MCFL) [N series] [F03]
M8252	C252 状态 C252 control	D8252	CAN 自由指令接收到的数据 MDLL[N 系列] [F03] Received data MDLL of CAN free instruction [N series] [F03]
M8253	C253 状态 C253 control	D8253	CAN 自由指令接收到的数据 MDLH[N 系列] [F03] Received data MDLH of CAN free instruction [N series] [F03]
M8254	C254 状态 C254 control	D8254	CAN 自由指令接收到的数据 MDHL[N 系列] [F03] Received data MDHL of CAN free instruction [N series] [F03]
M8255	C255 状态 C255 control	D8255	CAN 自由指令接收到的数据 MDHH[N 系列] [F03] Received data MDHH of CAN free instruction [N series] [F03]

注 1：掉电保存

Note1: Power-off save

注 2：仅在 H1U 中掉电保持

Note 2: Only hold in H1U power failure

注：[N 系列]、[F03]、[F04]指专机使用的指令。

Note: [N series], [F03],[F04] refer to the instruction used for special device.

5.2 出错信息说明

5.2 Error information explaination

特殊数据寄存器 D8060～D8067，存储的错误代码和内容如下表所示。

The special data register D8060~D8067, the saved error codes and contents are listed in following table.

类型 Type	**出错代码** Error code	**出错内容** Causes	**处理方法** Trouble-shooting
I/O 结构出错 I/O structure error M8060(D8060)继续运行 M8060(D8060)Continue operation	例 1020 e.g. 1020	没有装 I/O 起始元件号"1020"时：1=输 X(0＝输出 Y)，020=元件号 When it is not equipped with I/O starting component with number "1020": 1= output X (0=output Y), 020=component number	还没有装的输入继电器，输出继电器的编号被编入程序。 可编程控制器可以继续运行，若是程序员，请进行修改。 The input and output relay numbers will be written into the program. Programmable controller can continue the operation. Programmer please modify the program.
PC 硬件出错 PC hardware error M8061(D8061) M8061(D8061) 停止运行 Stop operation	0000	无异常 Normal	
	6101	RAM 出错	检查扩展电线的连接是否正确。 Check extension cable's connection.
	6102	运算电路出错	
	6103	I/O 总线出错(M8069 驱动时)	
	6104	扩展设备 24V 以下(M8069ON 时) Extended device below 24V (When M8069=ON)	
	6105	监视定时器出错 Monitoring timer error	运算时间超过 D8000 的值，检查程序。 If the calculation time exceeds the value of D8000, please check the programming.

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
	6106	系统错误 System error	
	6107	系统 IO 设定错误 System IO setting error	
PC/PP 通信出错 M8062(D8062) 继续运行 PC/PP communication error M8062(D8062) Continue operation	0000	无异常 Normal	程序面板(PP)或程序连口连接的设备与可编程控制器(PC)间的连接是否正确。 Check the connections between the programmable controller and the program panel (PP) or program interface
	6201	奇偶出错；超过出错；成帧出错 Parity error; overrun error; frame error	
	6202	通信字符有误 Communication character error	
	6203	通信数据的求和不一致 Communication data checksum differs	
	6204	数据格式有误 Data format error	
	6205	指令有误 Instruction error	
并行连接 通信出错 M8063(D8063) 继续运行 Parallel link communication error M8063(D8063). Continue running.	0000	无异常 Normal	检查双方的可编程控制器的电源是否为 ON，适配器和控制器之间，以及适配器之间连接是否正确。 Check to ensure that the power of both programmable controllers is ON. In addition, check to ensure that the connections between the adapter and the controller and between adapters are correct.
	6301	奇偶出错；超过出错；成帧出错 Parity error; overrun error; frame error	
	6302	通信字符有误 Communication character error	
	6303	通信数据的和数不一致 Communication data checksum differs	
	6304	数据格式有误 Data format error	
	6305	指令有误 Instruction error	
	6306	监视定时器溢出 Monitor timer overflow	
	6307~6311	无 None	
	6312	并行连接字符出错 Parallel link character error	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
	6313	并行连接和数出错 Parallel link checksum error	
	6314	并行连接格式出错 Parallel link format error	
	6330	MODBUS 从站地址设置错误 MODBUS slave address setup error	COM0 通讯出错 请检查 COM0 的通讯电缆是否正确连接；检查通讯双方通讯格式是否匹配；检查通讯协议是否匹配； 检查是否开机，COM0 只能在开机状态才可能做自由口，若关机只能做监控或下载口；检查 JP0 跳线是否插入，COM0 只能在跳线断开时作为 RS485 自由口，JP0 若接通，COM0 只能做监控或下载口，且是 RS422 模式 COM0 communication error please check to ensure that the COM0 communication cable is connected correctly. Check to ensure that the communication format of both sides matches each other. Check to ensure that the communication protocols match. Check to ensure that the system is powered on because COM0 can only be used as a free port in the power-on state. Otherwise, it can only be used as download port. Check to ensure that the JP0 jumper is inserted because COM0 can only be used as a RS485 free port when the
	6331	数据帧长度错误 Data frame length error	
	6332	地址错误 Address error	
	6333	CRC 检验错误 CRC check error	
	6334	不支持的命令码 Function cede not supported	
	6335	接收超时 Receiving time-out	
	6336	数据错误 Data error	
	6337	缓冲区溢出 Buffer overflow	
	6338	帧错误 Frame error	
	6340	MODBUS 从站地址设置错误 MODBUS slave address setup erro	
	6341	数据帧长度错误 Data frame length error	
	6342	地址错误	
	6343	CRC 检验错误	
	6344	不支持的命令码	

类型 Type	出错代码 Error code	出错内容 Causes	处理方法 Trouble-shooting
			jumper is open. If the JP0 is closed, then COM0 can only be used as a monitor or a download port and is in RS422 mode.
	6345	接收超时	COM1 通讯出错，请检查 COM1 的通讯电缆是否正确连接； 检查通讯双方通讯格式是否匹配；
	6346	数据错误	
	6347	缓冲区溢出	
	6348	帧错误	

参数出错 M8064(D8064) 停止运行	**0000**	**无异常 Normal**	**停止可编程控制器的运行，用参数方式设定正确值。 Terminate the operation of the programmable controller and set up the correct alue by using parameters.**
	6401	程序的求和不一致 Inconsistant checksum of programs	
	6402	存储的容量设定有误 Storage capacity setting error	
	6403	保存区域设定有误 Storage setting error	
	6404	指令区的设定有误 Instruction setting error	
	6405	文件寄存器的区设定有误 File register setting error	
语法出错 M8065(D8065) 停止运行 Syntax error M8065(D8065) Stop operation	0000	无异常 Normal	检查编程时对各个指令的使用是否正确？产生错误时请用程序模式进行修改。 COM1 communication error please check to ensure that the COM1 communication cable is connected correctly. Check to ensure that the communication format of both sides matches each other. Check to ensure that the communication protocols match. Check the programming of each instruction. Modify the
	6503	①OUT T，OUT C 之后无设定值 ②应用指令操作数数量不足 ①no setting value after OUT T，OUT C ② insufficient operands of application instructions	
	6504	① 标号重复 ①duplicated labels	
	6505	元件号范围溢出 Component number overflow	
	6506	使用了未定义指令 Undefined instruction	
	6507	卷标编号(P)定义出错	

		Incorrect volume label (P) definition	programming when errors happened.
	6508	中断输入(I)的定义出错 Incorrect interrupt input(I) definition	
	6511	中断输入和高速计数器输入重复 Duplicated interrupt input and high speed counter input	
	0000	无异常 Normal	
	6605	①MPS 的连续使用次数在 9 次以上 ②在 STL 内有 MC，MCR，I(中断)，SRET ③在 STL 外有 RET，没有 RET ①MPS is used continuously for more than 9 times ② MC, MCR, I (interrupt) and SRET exist under STL instruction ③ RET exists outside the STL	
电路出错 M8066(D8066) 停止运行	6606	①没有 P(指针)，I(中断) ②没有 SRET，IRET ③I(中断)，SRET，IRET 在主程序中。 ④STL，RET，MC，MCR 在子程序和中断子程序中 ① no P (pointer) and I (interrupt) ②No SRET and IRET ③I(interrupt), SRET and IRET exist in main program. ④STL, RET, MC and MCR exist in sub programs and interrupt programs	对整个电路而言，当指令组合不对时，对指令关系有错时都能产生错误。 在程序中要修改指令的相互关系，使之正确无误。 Incorrect instruction group or instruction relationship can cause errors. It’s required to change the relationship of instructions in program to make corrections.
	6607	①FOR 和 NEXT 关系有错误，嵌套在 6 次以上 ②在 FOR-NEXT 之间有 STL，RET，MC，MCR，IRET，SRET，FEND，END ①Error relationship of FOR and NEXT, nesting level is more than 6	

	②STL，RET，MC，MCR，IRET，SRET， FEND and END exist between FOR and NEXT
6608	①MC 和 MCR 的关系有错误 ②MCR 没有 NO ③MC-MCR 间有 SRET，IRET，I(中断) ①Error relationship of MC and MCR ②MCR doesn't have NO ③SRET, IRET and I(interrupt) exist between MC and MCR
6618	只能在主程序中使用的的指令却在主程序之外(中断，子程序等)。 Instructions can only be used inside the main program used outside of main program (interrupt and sub programs).
6619	FOR-NEXT 之间使用了不能用的指令。 STL，RET，MC，MCR，I，IRET Instructions such as STL, RET, MC, MCR, I and IRET which can not be used between FOR and NEXT are used there.
6620	FOR～NEXT 间嵌套溢出 Nesting overflow between FOR～NEXT
6621	FOR～NEXT 数的关系有错误 Error relationship of FOR～NEXT numbers
6622	没有 NEXT 指令 No NEXT instruction
6623	没有 MC 指令 No MC instruction
6624	没有 MCR 指令 No MCR instruction
6625	STL 的连续使用次数在 9 次以上 STL is used continuously for more than 9 times
6626	在 STL～RET 之间有不能用的

		指令 MC，MCR，I，SRET，IRET Instructions such as MC, MCR, I, SRET and IRET cannot be used between STL as RET are used in there.	
	6627	没有 RET 指令 No RET instruction	
	6628	在主程序中有不能用的指令 I，SRET，IRET Instructions such as I, SRET and IRET which cannot be used in main program.	
	6629	无 P，I No P and I	
	6630	没有 SRET，IRET 指令 No SRET and IRET instruction	
	6631	SRET 位于不能用的场所 SRET exists in incorrect location	
	6632	FEND 位于不能用的场所 FEND exists in incorrect location	
	6635	高速输入和高速输出使用硬件端口超过限制 Hardware terminals used by high speed input and output have exceeded the limit	
运算出错 M8067 (D8067) 继续运行 Operation error M8067 (D8067) Continue Operation	0000	没有异常 Mormal	运算过程中产生错误，以及程序的修改或应用指令的操作数的内容是否有错误。既使语法、电路没有出错，上述原因也可能产生运算错误。（例）T200Z 虽没有错但运算结果 Z=100 时，T=300，这样，元件编号则溢出。 Check correctness of the operation, the programming, and the operands. Because they may cause error even if the syntax and circuit are correct. (example) when
	6701	①CJ，CALL 没有跳转地址 ②在 END 指令后面有卷标 ③在 FOR～NEXT 间或子程序之间有单独的卷标 ①CJ and CALL don’t have target address ②Volume label exists after END instruction ③Individual labels exist between FOR and NEXT or between subprograms	
	6702	CALL 的嵌套级在 6 层以上 Nesting level of CALL is more than 6	

	6704	FOR-NEXT 的嵌套级在 6 层以上 Nesting level of FOR-NEXT is more than 6	Z=100 and T=300 the component number will overflow even T200Z is not wrong.	
	6705	应用指令的操作数在目标元件以外 Operands of application instruction is outside the target component		
	6706	应用指令的操作数的元件号范围和数据值溢出 Component number and application data operands instruction overflow		
	6707	因没有设定文件寄存器的参数而存取了文件寄存器 Accessing file registers without setting the parameters.		
	6708	FROM～TO 指令出错 FROM～TO Instruction error		
	6709	其它(IRET，SRET 忘记，FOR～NEXT 关系有错误等) Others (IRET and SRET are forgot, and error relationship of FOR～NEXT ,etc.)		
	6720	CALL 指令 SRET 不配套 CALL instruction SRET is not matched.		
	6730	取样时间(TS)在目标范围外（TS=0） Sample time (TS) is out of range (TS = 0)	PID 运算停止 Stop PID operation	产生控制参数的设定值和 PID 运算中产生数据错误。 请检查参数。 The setting value for generating control parameters and PID operation result are incorrect.
	6732	输入滤波器常数(a)在目标范围外〔a<0 或 100<a) Input filter constant (a) is out of range (a<0 或 100<>		
	6733	比例阀(KP)在目标范围外〔KP<0) Proportional coefficient (KP) is out of range (KP<0)		
	6734	积分时间(TI)在目标范围外〔TI<0) Integration time (TI) is out of		

		range (TI <0)		Please check the parameters.
	6735	微分阀(KD)在目标范围外〔KD<0 或 201<KD) Differential coefficient (KD) is out of range (KD <0 or 201 <>		
	6736	微分时间在目标范围外(TD<0) Differential time is out of range (TD <0)		
	6740	取样时间(TS)<运算周期 Sample time (TS)<operation period	将运算数据作 MAX 值，继续运算。 Continue operation using the calculated data as the MAX value	
	6742	测定值变量溢出(△PV<32768 或 <△PV) Measurement variable overflow (△PV<32768 or <△PV)		
	6743	偏差溢出(EV<-32768 或 32767<EV〕 Deviation overflow (EV<-32768 or 32767<>		
	6744	积分计算值溢出(-32768～32767 以外) Integral calculation value overflow(out of -32768 ～ 32767 range)		
	6745	因微分阀(KP)溢出，产生微分值溢出 Differential calculation value overflows because of KP overflow		
	6746	微分计算值值溢出(-32768～32767 以外) Differential calculation value overflow(out of -32768 ～ 32767 range)		
	6747	PID 运算结果溢出(-32768～32767 以外) PID operation result overflow (out of -32768～32767 range)		
	6760	高速指令(DHSZ 等)超过 6 条限制 Number of high speed instructions (such as DHSZ and so on) exceeds the limit of		

		6 lines		

5.3 错误代码存贮

5.3 Error code storage

H1U/2U 系列PLC的错误按下述定时检查，把前项的出错代码存入特殊数据寄存器D8060～D8067。 错误代码存储寄存器

H1U/2U series PLC error should be checked according to following requirement, and the error code is saved in special data register D8060~D8067。Error code storage register

出错项目 Error item	电源 OFF→ON Power OFF→ON	电源 ON 后初次 STOP→RUN 时 The first time STOP→RUN after power ON	其它 others
M8060 I/O 地址号构成出错 M8060 I/O address error	检查 Check up	检查 Check up	运算中 In operation
M8061 PC 硬件出错 M8061 PC hardware error	检查 Check up	-	运算中 In operation
M8062 PC/PP 通信出错 M8062 PC/PP communication error	-	-	从 PP 接收信号时 Receiving signal from PP
M8063 连接模块通值出错 M8063 connection module communication error	-	-	从对方接受信号时 Receiving signal from another side
M8064 参数出错 M8064 parameter error M8065 语法出错 M8065 syntax error M8066 电路出错 M8066 circuit error	检查 Check up	检查 Check up	程序变更时(STOP) Program changing (STOP) 程序传送时(STOP) Program transferring (STOP)
M8087 运算出错 M8087 operation error M8088 运算出错锁存 M8088 operation error latch	-	-	运算中(RUN) In operation (RUN)

D8060～D8067 各存一个出错内容，同一出错项目产生多次出错时，每当消除出错原因时，

仍存储发生中的出错代码。 无出错时存入“0”。
Each of D8060～D8067 stores one error. If the same error item generates errors more than once then the current error code is still stored when eliminating the error causes. If there is no error then “0” will be stored.

5.4 PLC 内置 MODBUS 从站通讯协议说明
5.4 Communication protocol introduction for PLC built-in MODBUS slave station
概述：
概述：
支持 MODBUS 协议功能码 0x01，0x03，0x05，0x06，0x0f，0x10；通过这些功能码，可读写的线圈有 M，S，T，C，X（只读），Y 等变量；寄存器有 D，T，C。
It supports MODBUS protocol function code 0x01，0x03，0x05，0x06，0x0f，0x10，based on which the readable and writable coils are M, S, T, C, X(read only), Y and registers are D, T, C.
1. MODBUS 帧格式（以 MODBUS-RTU 为例）
1. MODBUS frame format (taking MODBUS-RTU as example)
1.1 功能码 0x01（01）：读线圈
1.1 Function code 0x01(01): read coil
请求帧格式：从机地址+0x01+线圈起始地址+线圈数量+CRC 检验
Request Frame Format: slave address + 0x01 + coil start address + coil count + CRC*

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description	
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121	
2	0x01（功能码） 0x01 (function code)	1 个字节 1 byte	读线圈 Read coil	
3	线圈起始地址 Coil starting address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing	
4	线圈数量 coil count	2 个字节 2 byte	高位在前，低位在后（N） Lower bytes follows higher bytes (N)	
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes	

响应帧格式：从机地址+0x01+字节数+线圈状态+CRC 检验

Response Frame Format: slave address + 0x01 + byte count + coil status + CRC

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x01（功能码） 0x01 (function code)	1 个字节 1 byte	读线圈 Read coil
3	字节数 Byte number	1 个字节 1 byte	值：[（N+7）/8] Value：[（N+7）/8]
4	线圈状态 Coil state	[（N+7）/8]个字节 [（N+7）/8]byte	每 8 个线圈合为一个字节，最后一个若不足 8 位，未定义部分填 0。 前 8 个线圈在第一个字节，最地址最小的线圈在最低位。 依次类推 A byte consistent of eight coils, and if the last one has less than eight bits, the undefined bits should be set with 0. The first eight coils are in first byte, and the coil with min address is in lowest bit.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error response error: referring to error response frame.

注：N，H2U 最大为 2000，H1U 最大为 800。

Note: N, up to 2000(H2U), up to 800 (H1U).

1.2 功能码 0x03（03）：读寄存器

1.2 function 0x03(03): read register

请求帧格式：从机地址+0x03+寄存器起始地址+寄存器数量+CRC 检验

Request Frame Format: slave address + 0x03 + register start address + register count + CRC

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址	1 个字节	取值 1~247，由 D8121

	Slaver address	1 byte	设定 Value range 1~247, defined by D8121
2	0x03（功能码） 0x03 (function code)	1 个字节 1 byte	读寄存器 Read Register
3	寄存器起始地址 0x01 (function code)	2 个字节 2 byte	高位在前，低位在后，见寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register number	2 个字节 2 byte	高位在前，低位在后（N） Lower bytes follows higher bytes (N)
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x03（功能码） 0x03 (function code)	1 个字节 1 byte	读寄存器 Read Register
3	寄存器起始地址 Register starting address	2 个字节 2 byte	高位在前，低位在后，见寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register number	2 个字节 2 byte	高位在前，低位在后（N） Lower bytes follows higher bytes (N)
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error response error: referring to error response frame.

注：N，H2U 最大为 1250，H1U 最大为 50。

Note: N, up to 1250(H2U), up to 50 (H1U).

1.3 功能码 0x05（05）：写单线圈

1.3 Function code 0x05(05): write single-coil

请求帧格式：从机地址+0x05+线圈地址+线圈状态+CRC 检验

Request Frame Format: slave address + 0x05 + coil address + coil status + CRC

序号 **Serial number**	数据(字节)意义 **Data(byte) meaning**	字节数量 **Byte quantity**	说明 **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x05（功能码） 0x05 (function code)	1 个字节 1 byte	写单线圈 write single-coil
3	线圈地址 coil address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈状态 Coil state	2 个字节 2 byte	高位在前,低位在后。非 0 即为有效 Lower bytes follows higher bytes. If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x05+线圈地址+线圈状态+CRC 检验

Response frame format: slave address + 0x05 + register address + register value + CRC check

序号 **Serial number**	数据(字节)意义 **Data(byte) meaning**	字节数量 **Byte quantity**	说明 **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x05（功能码） 0x05 (function code)	1 个字节 1 byte	写单线圈 Write coil
3	线圈地址 coil address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈状态 Coil state	2 个字节 2 byte	高位在前,低位在后。非 0 即为有效 Lower bytes follows higher bytes. If it is not 0, it is valid.

5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧

Error response error: referring to error response frame.

1.4 功能码 0x06（06）：写单个寄存器

1.4 function code 0x06 (06): write single-register

请求帧格式：从机地址+0x06+寄存器地址+寄存器值+CRC 检验

Request Frame Format: slave address + 0x06 + register address + register value + CRC

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x06（功能码） 0x06 (function code)	1 个字节 1 byte	写单寄存器 write single-register
3	寄存器地址 Register address	2 个字节 2 byte	高位在前，低位在后，见寄存器值编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器值 Register value	2 个字节 2 byte	高位在前，低位在后。非 0 即为有效 Lower bytes follows higher bytes. If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x06+寄存器地址+寄存器值+CRC 检验。

Response frame format: slave address + 0x06 + register address + register value + CRC check

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x06（功能码） 0x06 (function code)	1 个字节 1 byte	写单寄存器 Write single-register
3	寄存器地址	2 个字节	高位在前，低位在后，见

	Register address	2 byte	寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器值 Register value	2 个字节 2 byte	高位在前，低位在后。非 0 即为有效 Lower bytes follows higher bytes. If it is not 0, it is valid.
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

错误响应：见错误响应帧。

Error response error: referring to error response frame.

1.5 功能码 0x0f（15）：写多个线圈

1.5 Function code 0x0f (15): write multi-coil

请求帧格式：从机地址+0x0f+线圈起始地址+线圈数量+字节数+线圈状态+CRC 检验。

Request frame format: slaver address + 0x0f + coil starting address + coil number + byte number + coil state + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x0f（功能码） 0x0f (function code)	1 个字节 1 byte	写多个单线圈 Write single-coil
3	线圈起始地址 coil start address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈数量 coil count	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes 。
5	字节数 Byte count	1 个字节 1 byte	值：[（N+7）/8] Value：[（N+7）/8]
6	线圈状态 Coil state	[（N+7）/8]个字节 [（N+7）/8]byte	每 8 个线圈合为一个字节，最后一个若不足 8 位，未定义部分填 0。前 8 个线圈在第一个字节，最地址最小的线圈在最

			低位。 依次类推。 A byte consistent of eight coils, and if the last one has less than eight bits, the undefined bits should be set with 0. The first eight coils are in first byte, and the coil with min address is in lowest bit.
7	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes 。

响应帧格式：从机地址+0x05+线圈起始地址+线圈数量+CRC 检验

序号 **Serial number**	**数据(字节)意义** **Data(byte) meaning**	**字节数量** **Byte quantity**	**说明** **Description**
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x0f（功能码） 0x0f (function code)	1 个字节 1 byte	写多个单线圈 Write multi-coil
3	线圈起始地址 coil start address	2 个字节 2 byte	高位在前，低位在后，见线圈编址 Lower bytes follows higher bytes, referring to coil addressing
4	线圈数量 coil count	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes 。
5	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes 。

错误响应：见错误响应帧。

Error response error: referring to error response frame.

注：N，H2U 最大为 1968，H1U 最大为 800。

Note: N, H2U up to 2000, H1Uup to 800.

1.6 功能码 0x10（16）：写多个寄存器

1.6 function code 0x10 (16): write multi-register

请求帧格式：从机地址+0x10+寄存器起始地址+寄存器数量+字节数+寄存器值+CRC 检验。

Request frame format: slaver address + 0x10 + register starting address + register number + byte number + register value + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x10（功能码） 0x10 (function code)	1 个字节 1 byte	写多个寄存器 Write multi-register
3	寄存器起始地址 Register starting address	2 个字节 2 byte	高位在前，低位在后，见寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register number	2 个字节 2 byte	高位在前，低位在后。 Write multi-register.
5	字节数 byte count	1 个字节 1 byte	值：N*2
6	寄存器值	N*2（N*4）	
7	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

响应帧格式：从机地址+0x05+线圈起始地址+线圈数量+CRC 检验。

Response frame format: slaver address + 0x05 + coil starting address + coil number + CRC check.

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	0x10（功能码） 0x10 (function code)	1 个字节 1 byte	写多个寄存器 Write multi-register
3	寄存器起始地址 Register starting address	2 个字节 2 byte	高位在前，低位在后，见寄存器编址 Lower bytes follows higher bytes, referring to register addressing
4	寄存器数量 register number	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes 。
5	CRC 校验	2 个字节	高位在前，低位在后

	CRC check	2 byte	Lower bytes follows higher bytes

错误响应：见错误响应帧。

Error response error: referring to error response frame.

注：N，H2U 最大为 120，H1U 最大为 50。

Note: N, H2U up to 120, H1Uup to 50.

1.7 错误响应帧

1.7 Error response frame

错误响应：从机地址+（功能码+0x80）+错误码+CRC 校验。

Error response: slaver address + （function code + 0x80） + error code + CRC check

序号 Serial number	数据(字节)意义 Data(byte) meaning	字节数量 Byte quantity	说明 Description
1	从机地址 Slaver address	1 个字节 1 byte	取值 1~247，由 D8121 设定 Value range 1~247, defined by D8121
2	功能码+0x80 Function code + 0x80	1 个字节 1 byte	错误功能码 Error function code
3	错误码 Error code	1 个字节 1 byte	1~4
4	CRC 校验 CRC check	2 个字节 2 byte	高位在前，低位在后 Lower bytes follows higher bytes

2. 变量编址

2. Variable addressing

2.1 线圈编址

2.1 Coil addressing

线圈：指位变量，只有两种状态 0 和 1。 在本 PLC 中包含 M，S，T，C，X，Y 等变量。

coil: bit variable the status of which can be either 0 or 1. There are M,S,T,C,X and Y variables in this PLC.

变量名称 Variable name	起始地址 Start address	线圈数量 coil count	说明 Description	
M0~3071	0（0）	3072		
M8000~M8256	0x1F40（8000）	256		
S0~S999	0xE000（57344）	1000		
T0~T256	0xF000（61440）	256		
C0~C255	0xF400（62464）	256		
X0~X255	0xF800（63488）	256		
Y0~Y255	0xFC00（64512）	256		

2.2 寄存器编址

2.2 Register addressing

寄存器：指 16 位或 32 位变量，在本 PLC 中，16 位变量包含 D，T，C0~199；32 位变量为 C200~255。

Register: referring to 16bit or 32bit variables. In this PLC, 16bit variables include D, T, C0~199; 32bit variables include C200~255.

变量名称 Variable name	起始地址 Start address	寄存器数量 **register number**	说明 **Description**
D0~D8255	0（0）	8256	
T0~T255	0xF000（61440）	256	
C0~C199	0xF400（62464）	200	
C200~C255	0xF700（63232）	56	32 位寄存器 32bit register

说明：

Note :

通过 MODBUS 访问 C200~C255 段 32 位寄存器时，一个寄存器作两寄存器看待，一个 32 位寄存器占用两个 16 寄存器空间。 比如用户要读或写 C205~C208 这 4 个寄存器，MODBUS 地址为 0xF70A（0xF700+10），寄存器数量 8（4*2）。

While accessing 32 bit registers between C200~C255 through MODBUS, one register will be treated as two 16 bit registers, and one 32 bit register occupies the space of two16 bit registers. For example, if user want to read or write four registers C205~C208, MODBUS address is 0xF70A (0xF700+10) and register number is 8 (4×2)。

32 位寄存器不支持写单个寄存器（0x06）功能码。

The function code “write single register”(0x06) is not supported for 32 bit registers.

5.5 H1U/2U 系列 3A/6A/6B 扩展卡使用说明

Operational illustration of Expansion card 3A/6A/6B in Serie H1U/2U

扩展卡类型号，H2U 为自动识别，D8199 显示此卡的类型号；H1U 不能自动识别，需要通过 D8199 设定扩展卡类型。 扩展卡类型如下：

Expansion card type number, H2U for the automatic identification, D8199 display the number of this card type; H1U can not be automatically recognized, has to set the expansion card type by D8199. The extended card type is listed as following:

1 RS232 扩展卡

RS232 expansion card

2 RS422/485 通讯扩展卡

RS422/485 communication expansion card

3 AD 扩展卡

AD expansion card

4 DA 扩展卡

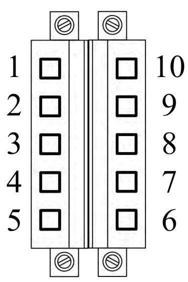
DA expansion card
5　6A/6B/3A 扩展卡
6A/6B/3A expansion card
6　高速扩展卡
High-speed extended card
7　CAN 扩展卡
CAN expansion card
8　测试
Test
比如我们需要在 H1U 中使用 6A 扩展卡，则需要在程序中执行 LD M8002　MOV K5 D8199
For example, if we want to use 6A expansion card in H1U, LD M8002　MOV K5 D8199 has to be executed in program.

模拟量扩展卡选件可实现在主模块上的模拟量信号的输入和输出功能，端口配置如下：
Analog expansion card can realize I/O function of analog signal in the main module. The port configuration is as follows:

型号 Model	独立通道数 Number of independent channels	输入端口 Input ports		输出端口 Output ports	
		0～10V 型	0～20mA 型	0～10V 型 0～10V type	0～20mA 型 0～20mA type
H2U	3A	V1/V2	I1/I2	V1	I1
H2U	6A	V1/V2	I3/I4	V1/V2	I1/I2
H2U	6B	—	I1/I2/I3/I4	V1/V2	I1/I2

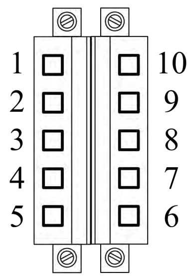
PLC 主模块与扩展卡之间采用了通讯帧的方式进行数据交互，通讯帧由 PLC 自动组织和收发处理，使用时，用户程序只需：在特定的系统缓冲区写入需要访问的扩展小板类型、输出值，在特定的寄存器中读取输入端口的检测数据即可。
The way of a communication frame is used to exchange data between PLC main module and the expansion card. PLC automatically organizes, receives or sends communication frame. When programming, user’s operation is only to write type of expansion card and output value into special system buffer, read the sense data of input port from special register.

3A 扩展卡引脚功能：
Pin function of 3A expansion card:



引脚 Pin	**名称 Name**	**功能描述 Function**	**引脚 Pin**	**名称 Name**	**功能描述 Function**

		description			description
1	V1＋	Ch1 电压信号输入端 Ch1 voltage signal input terminal	10	V2＋	Ch2 电压信号输入端 Ch2 voltage signal input terminal
2	I1＋	Ch1 电流信号采样电阻端 Ch1 current signal sampling resistor terminal	9	I2＋	Ch2 电流信号采样电阻端 Ch2 current signal sampling resistor terminal
3	V1-	Ch1 信号输入参考端 Ch1 signal input reference terminal	8	V2-	Ch2 信号输入参考端 Ch2 signal input reference terminal
4	VO＋	AO 电压信号输出端 AO voltage signal output terminal	7	IO＋	AO 电流输出端 AO current output terminal
5	GND	AO 电压信号参考端 AO voltage signal output terminal	6	NC	功能保留 Reserved



6A 扩展卡引脚功能：

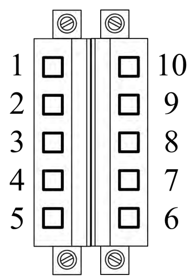
Pin function of 6A expansion card:

引脚 **Pin**	信号 **Signal**	功能描述 **Function**	引脚 **Pin**	信号 **Signal**	功能描述 **Function**

		description			description
1	V1＋	Ch1 电压信号输入端 Ch1 voltage signal input terminal	10	VO2＋	Ch2 电压输出端 Ch2 voltage output terminal
2	V2＋	Ch2 电压信号输入端 Ch2 voltage signal input terminal	9	IO2＋	Ch2 电流输出端 Ch2 current output terminal
3	I3＋	Ch1 电流信号采样电阻端 Ch1 current signal sampling resistor terminal	8	V01＋	Ch1 电压输出端 Ch1 voltage output terminal
4	I4＋	Ch2 电流信号采样电阻端 Ch2 current signal sampling resistor terminal	7	IO1＋	Ch1 电流输出端 Ch1 current output terminal
5	GND	输入公共接地端 Input GND	6	GND	输出公共接地端 Output GND

6B 扩展卡引脚功能：

Pin function of 6B expansion card:



引脚 **Pin**	信号 **Signal**	功能描述 **Function description**	引脚 **Pin**	信号 **Signal**	功能描述 **Function description**
1	I1＋	Ch1 电流信号	10	VO2＋	Ch2 电压输出

		输入端 Ch1 current signal input terminal			端 Ch2 voltage output terminal
2	I2＋	Ch2 电流信号输入端 Ch2 current signal input terminal	9	IO2＋	Ch2 电流输出端 Ch2 current output terminal
3	I3＋	Ch3 电流信号输入端 Ch3 current signal input terminal	8	V01＋	Ch1 电压输出端 Ch1 voltage output terminal
4	I4＋	Ch4 电流信号输入端 Ch4 current signal input terminal	7	IO1＋	Ch1 电流输出端 Ch1 current output terminal
5	GND	输入公共接地端 Input GND	6	GND	输出公共接地端 Output GND

访问扩展卡时的相关寄存器及其定义：

Related registers when getting access to expansion cards and their definition:

序号 Serial number	**数据 名称 Data name**	**PLC 发送到扩展卡 PLC send to expansion card**	**访问 H2U-3A-BD 时的写入值 Writing value during access to H2U-3A-BD**	**访问 H2U-6A-BD 时的写入值 Writing value during access to H2U-6A-BD**	**访问 H2U-6B-BD 时的 写入值 Writing value during access to H2U-6B-BD**
1	控制字 Control word	D8220		/	/
2	数据 1 Data 1	D8221	模拟量输出通道 1 的输出设定值（量程：0-10000） Setting value of analog output channel 1 (range:	模拟量输出通道 1 的输出设定值（量程：0-10000） Setting value of analog output channel 1 (range:	模拟量输出通道 1 的输出设定值（量程：0-10000） Setting value of analog output channel 1 (range:

			0-10000)	0-10000)	0-10000)
3	数据 2 Data 2	D8222	/	模拟量输出通道 2 的输出设定值（量程：0-10000） Setting value of analog output channel 2 (range: 0-10000)	模拟量输出通道 2 的输出设定值（量程：0-10000） Setting value of analog output channel 2 (range: 0-10000)
4	数据 3 Data 3	D8223	/	/	/
5	数据 4 Data4	D8224	/	/	/
6	数据 5 Data 5	D8225	/	/	/
7	数据 6 Data 6	D8226	/	/	/
8	数据 7 Data 7	D8227	/	/	/
9	数据 8 Data 8	D8228	/	/	/
10	CRC 校验码 CRC CheckSUM	D8229	PLC 系统自动计算，用户无需关心 PLC system will calculate automatically with user's attention		

扩展卡应答的数据及存放地址：
Data and store address answered by expansion card

序号 **Serial number**	**数据名称** **Data name**	**PLC 从扩展卡接收** **PLC receive from expansion card**	**H2U-3A-BD 应答的数据** **H2U-3A-BD answered data**	**H2U-6A-BD 应答的数据** **H2U-6A-BD answered data**	**H2U-6B-BD 应答的数据** **H2U-6B-BD answered data**
1	控制字 Control word	D8230	3A21h	6A42h	6B42h
2	数据 1 Data 1	D8231	模拟量输入通道 1 的当前值（量程：0-10000） Current value of analog input channel 1	模拟量输入通道 1 的当前值（量程：0-10000）对应 0-10V Current value of analog input	模拟量输入通道 1 的当前值（量程：0-10000） 对应 0-20mA Current value of analog input

			(range: 0-10000)	channel 1 (range: 0-10000) corresponds 0-10V	channel 1 (range: 0-10000) corresponds to 0-20mA
3	数据 2 Data 2	D8232	模拟量输入通道 2 的当前值（量程：0-10000） Current value of analog input channel 2 (range: 0-10000)	模拟量输入通道 2 的当前值（量程：0-10000）对应 0-10V Current value of analog input channel 2 (range: 0-10000) corresponds 0-10V	模拟量输入通道 2 的当前值（量程：0-10000） 对应 0-20mA Current value of analog input channel 2 (range: 0-10000) corresponds to 0-20mA
4	数据 3 Data 3	D8233	模拟量输出通道 1 的输出设定值（量程：0-10000） Setting value of analog output channel 1 (range: 0-10000)	模拟量输入通道 3 的当前值（量程：0-10000）对应 0-20mA Current value of analog input channel 3 (range: 0-10000) corresponds 0-20mA	模拟量输入通道 3 的当前值（量程：0-10000）对应 0-20mA Current value of analog input channel 3 (range: 0-10000) corresponds to 0-20mA
5	数据 4 Data 4	D8234	/	模拟量输入通道 4 的当前值（量程：0-10000）对应 0-20mA Current value of analog input channel 4 (range: 0-10000) corresponds 0-20mA	模拟量输入通道 4 的当前值（量程：0-10000） 对应 0-20mA Current value of analog input channel 4 (range: 0-10000) corresponds to 0-20mA
6	数据 5 Data 5	D8235	/	模拟量输出通道 1 的输出设定值（量程：	模拟量输出通道 1 的输出设定值（量程：

				0-10000）对应 0-10V，或对应 0-20mA Setting value of analog output channel 1 (range: 0-10000) corresponds 0-10V or 0-20mA	0-10000）对应 0-10V，或对应 0-20mA Setting value of analog output channel 1 (range: 0-10000) corresponds to 0-10V or 0-20mA
7	数据 6 Data 6	D8236	/	模拟量输出通道 2 的输出设定值（量程：0-10000）对应 0-10V，或对应 0-20mA Setting value of analog output channel 2 (range: 0-10000) corresponds 0-10V or 0-20mA	模拟量输出通道 2 的输出设定值（量程：0-10000）对应 0-10V，或对应 0-20mA Setting value of analog output channel 2 (range: 0-10000) corresponds 0-10V or 0-20mA
8	数据 7 Data 7	D8237	/	/	/
9	数据 8 Data 8	D8238	/	/	/
10	数据 9 Data 9	D8239	通信错误计数，若通信正常，自动置 0；非 0，表示通信连续出错次数 Communication error count. If the communications, the auto-set to 0; non-0 means times of communication errors	通信错误计数，若通信正常，自动置 0；非 0，表示通信连续出错次数 Communication error count. If the communications, the auto-set to 0; non-0 means times of communication errors	通信错误计数，若通信正常，自动置 0；非 0，表示通信连续出错次数 Communication error count. If the communications, the auto-set to 0; non-0 means times of communication errors

			continuously	continuously	continuously

由上面表格的说明可知，3A/6A/6B 扩展卡的使用编程方法相同，只需要向系统的专用 D 变量进行读（输入）或写（输出）操作即可，以下以 3A 扩展卡的编程举例来说明使用方法。

应用编程举例 1：

Note from the table above shows, the use of programming 3A/6A/6B expansion card is the same way, you can only read (input) or write (output) dedicated D variables of system, the following example of 3A expansion card to illustrate the use of programming

使用 H2U-3A-BD 卡，要求 AO 输出通道输出 5V；将 AI1 输入通道的采样值放入 D100，AI2 输入通道的采样值放入 D101。

Use H2U-3A-BD card required output channel AO output 5V; put the sampling value of the AI1 input channel into D100, put the sampling value of the AI2 input channel into D101

程序如下：

Show the program as follow:

```
 ┤├──┬─〔MOV   H3A21    D8220〕
M8002 ├─〔MOV   K5000    D8221〕
      └─〔MOV   K1       D8239〕
┤〔=  D8239   K0〕┬─〔MOV   D8231   D100〕
                 └─〔MOV   D8232   D101〕
├──────(END)
```

说明：当 D8239 的值非 0 时，表示 PLC 尚未正确读取到扩展小板的值，编程时需注意；AO 通电的输出值 D8221 可根据具体应用在用户程序中进行刷新。

Note: when the D8239's value is not 0, that means the PLC has not correctly read the value of expansion small board, which should be paid attention when programming; Output value D8221 of powered AO can be refreshed in the user program according to specific applications

应用编程举例 2：

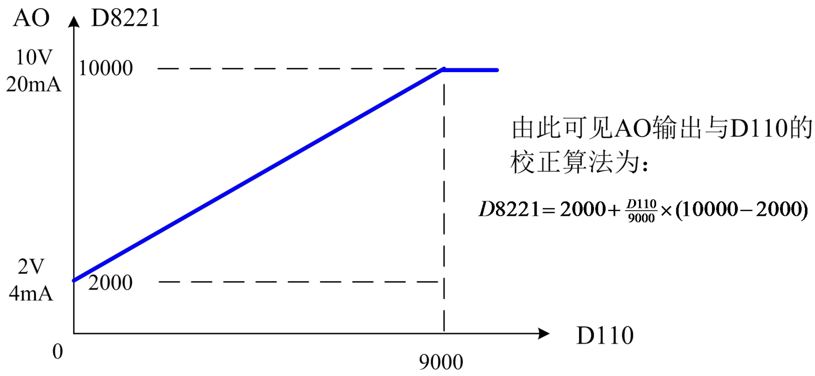
Application programming example 2:

接上例，使用 H2U-3A-BD 卡，将 AI1 输入通道的采样值放入 D100，AI2 输入通道的采样值放入 D102；但要求其 AO 电流输出与 D110 寄存器当前值相关，当 D110＝0 时，输出 4mA；当 D110＝9000 时，输出 20mA。

Consider the above case, use H2U-3A-BD card, put the sampling value of AI1 input channel into D100, put the sample value of AI2 input channel into D102; but request that the AO current output is associated with the current value of register D110. When D110 = 0, output 4mA; when D110 = 9000, output 20mA

分析：AO 的电流输出信号与电压输出信号，分别是〔0～20mA〕或〔0～10V〕对应 D8221 专用寄存器的〔0～10000〕，若要 4～20mA 对应用户的寄存器值，需要用户程序作校正后写入 D8221，才能得到希望的信号电流。（注意：校正后 AO 的电压信号特性也发生了变化。）

Analysis: AO's current output signal and voltage output signal respectively is that〔0 ~ 20mA 〕or (0 ~ 10V〕corresponding special register D8221 (0-10000〕. If 4 ~ 20mA corresponds to the value of user register, require entering modified user program into D8221. The desired signal current can be gotten. (Note: AO corrected voltage signal characteristics have also changed.)

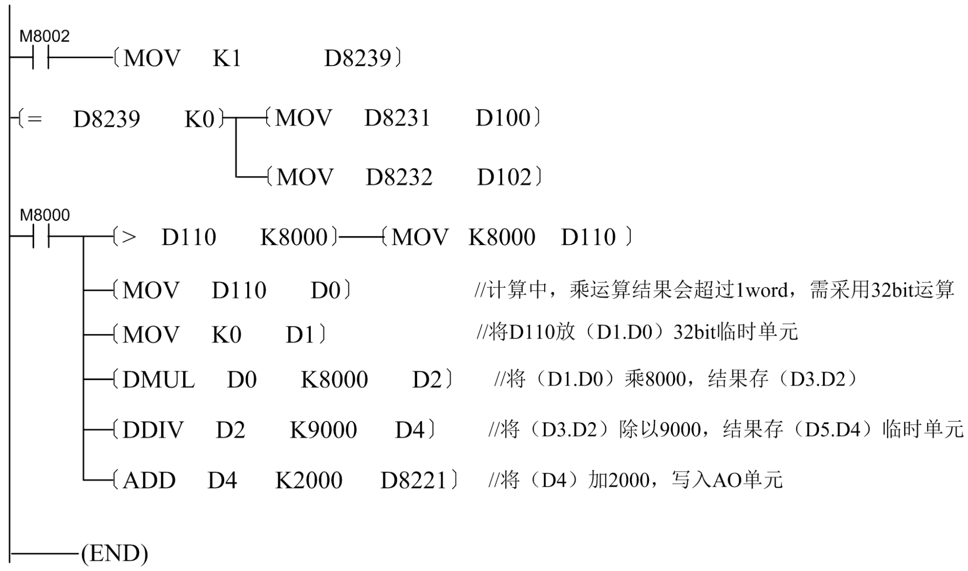


由此可见 AO 输出与 D110 的校正算法为

So the correction algrithm of AO output and D110 is:

$$D8221=2000+\frac{D110}{9000}\times(10000-2000)$$

程序如下：



计算中，乘运算结果会超过 1word，需采用 32bit 运算

In caculation, the result of multiply operation is over 1 word, so the 32bit operation is required.

将 D110 放（D1，D0）32bit 临时单元

Put D110 into 32bit temporary unit (D1,D0)

将（D1，D0）乘 8000，结果存（D3，D2）

Store the result of (D1,D0) multiplying 8000 into (D3,D2)

将（D3，D2）除以 9000，结果存（D5，D4）临时单元

Store the result of (D3,D2) dividing by 9000 into temporary unit (D5,D4)

将(D4)加 2000，写入 A0 单元

Write the result of (D4) plus 2000 into A0 unit

5.6 H1U/2U 系列通讯扩展卡说明

Illustration of communication expansion card in series H1U/2U

扩展卡类型号，H2U 为自动识别，D8199 显示此卡的类型号；H1U 不能自动识别，需要通过 D8199 设定扩展卡类型。 扩展卡类型如下：

Expansion card type number, H2U for the automatic identification, D8199 display the number of this card type; H1U can not be automatically recognized, has to set the expansion card type by D8199. The extended card type is listed as following:

1 RS232 扩展卡

RS232 expansion card

2 RS422/485 通讯扩展卡

RS422/485 communication expansion card

3 AD 扩展卡

AD expansion card

4 DA 扩展卡

DA expansion card

5 6A/6B/3A 扩展卡

6A/6B/3A expansion card

6 高速扩展卡

High-speed extended card

7 CAN 扩展卡

CAN expansion card

8 测试

Test

比如我们需要在 H1U 中使用 RS485 扩展卡，则需要在程序中执行 LD M8002 MOV K2 D8199

For example, we need to use RS485 expansion card in H1U, you need to execute the program LD M8002 MOV K2 D8199

1、 H2U-232-BD 扩展卡

1. H2U-232-BD expansion card

H2U-232-BD 扩展卡为 H1U/2U 系列 PLC 主模块用通讯扩展卡，该卡的 DB9 信号插座提供了标准的 RS232 电平，在物理上是 PLC 主模块的 COM1 通讯端口，因此该板的通讯口与 PLC 原配 RS485 电平的 COM1 口不能同时使用，否则会发生通讯冲突。使用该扩展板，能实现 PLC 与 PC 机、HMI、MODEM、PLC、智能仪表等设备的通讯，通讯格式可由编程决定。

H2U-232-BD expansion card is the communication expansion card used by main module of the H1U/2U series PLC. The standard RS232 electrical level is provided in the DB9 signal socket. It is the communication port COM1 of PLC main module in physical. So the communication port of the board can not be used as the same time as PLC Original RS485 communication port, otherwise communication conflicts occur. The expansion board can realize the communication between PLC and equipments such as PC, HMI, MODEM, PLC, intelligent instruments, esc. Communication format is decided by the program.

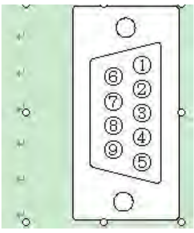
产品规格：

Product specify:

端口接头型式	DB9 型，公座

Type of port	DB9, male
信号标准 Signal standard	RS-232C
传输距离 Transfer distance	与波特率有关，最远为 15 米 The max distance is 15m, depend on the baud rate
通讯方式 Communication mode	支持全双工、半双工方式 Full duplex, half duplex
协议 Protocol	MODBUS 主、从协议；用于自定义协议 MODBUS Master, Slave protocol. Self defined protocol
工作电源 Power supply	5VDC，PLC 内部电源提供 5VDC, provided by PLC internal power supply
信号隔离 Signal isolation	与 PLC 内部逻辑电路不隔离 No isolation with PLC internal logic circuit

引脚定义：
Pin definition:



引脚号 **Pin number**	信号名称 **Signal name**	功能描述 **Function description**
1	CD	数据载波检查端（输入） Check terminal of data carrier (input)
2	RXD	接收数据端口（输入） Receiving data terminal (input)
3	TXD	发送数据端口（输出） Sending data terminal (input)
4	DTR	发送数据请求（输出） Sending data request
5	GND	信号地

		Singal ground
6	DSR	发送使能（输入） Sending enable (input)
7，8	—	两引脚内部直接联接 Internal direct connection between two pins
9	—	内部无联接 No internal connection

与电脑、触摸屏等的连接方式和设置请参考《H2U 通讯扩展卡用户手册》

Connections and settings with the computer, touch screen, esc refer to <H2U communication expansion card user manual>.

2、 H2U-485-BD 扩展卡

3、 H2U-485-BD expansion card

H2U-485-BD 扩展卡为 H1U/2U 系列 PLC 主模块用扩展通讯卡，该卡提供了 RS485 电平，将 TX 和 RX 信号线分别连接，又可作为 RS422 信号端口使用。在物理上是 PLC 主模块的 COM1 通讯端口，因此该板的通讯口与 PLC 原配 RS485 电平的 COM1 口不能同时使用，否则会发生通讯冲突。使用该扩展板，能实现 PLC 与 PC 机、HMI、PLC、智能仪表等设备的通讯，通讯格式可由编程决定。此卡需要 M8126 为 ON 时才有效。

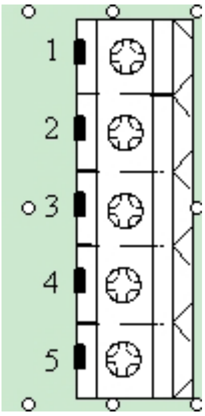
H2U-485-BD expansion card is the communication expansion card used by main module of H1U/2U series PLC. The card provides RS485 level, and the TX and RX signal lines are connected. The port can also be used as a RS422 signal port. In physics it is the communications port COM1 of the PLC main module. So the communication port of the board can not be used as the same time as PLC Original RS485 communication port, otherwise communication conflicts occur. The expansion board can realize the communication between PLC and equipments such as PC, HMI, MODEM, PLC, intelligent instruments, esc. Communication format is decided by the program. This card is valid only when M8126 is ON

端口功能定义：

Port function definition:

引脚号 **Pin number**	**信号名称** **Signal name**	**功能描述** **Function description**
1	RA	485 信号的 RXD 信号＋ Signal RXD + of RS485
2	RB	485 信号的 RXD 信号－ Signal RXD － of RS485
3	TA	485 信号的 TXD 信号＋

		Signal RXD + of RS485
4	TB	485 信号的 TXD 信号－ Signal RXD － of RS485
5	GND	信号地 Signal ground



与电脑、触摸屏等的连接方式和设置请参考《H2U 通讯扩展卡用户手册》

Connections and settings with the computer, touch screen, esc refer to <H2U communication expansion card user manual>.

4、 H2U-422-BD 扩展卡

5、 H2U-422-BD expansion card

H2U-422-BD 扩展卡是 H1U/2U 系列 PLC 主模块用通讯扩展卡，该卡的 Mini DIN8 信号插座提供了 RS422 电平，在物理上是 PLC 主模块的 COM1 通讯端口，因此该板的通讯口与 PLC 原配 RS485 电平的 COM1 口不能同时使用，否则会发生通讯冲突。使用该扩展板，能实现 PLC 与 PC 机、HMI、PLC、智能仪表等设备的通讯，通讯格式可由编程决定。H1U/2U 系列 PLC 使用该卡后，可使得 PC 和 HMI 与之同时通讯。

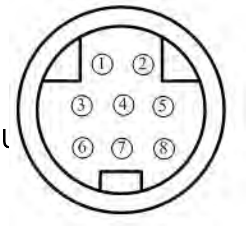
H2U-422-BD expansion card is the communication expansion card used by main module of H1U/2U series PLC. The card provides RS422 level in Mini DIN8 signal socket. In physics it is the communications port COM1 of the PLC main module. So the communication port of the board can not be used as the same time as PLC Original RS485 communication port, otherwise communication conflicts occur. The expansion board can realize the communication between PLC and equipments such as PC, HMI, MODEM, PLC, intelligent instruments, esc. Communication format is decided by the program. PC and HMI can communicate synchronously with H1U/2U series PLC through this card.

端口功能定义：

Port function definition:

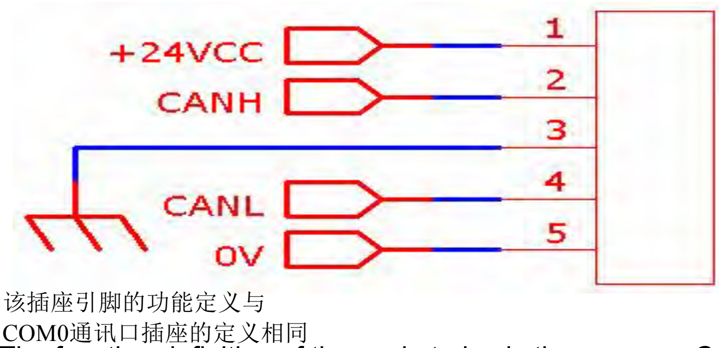
引脚号 **Pin number**	**信号名称** **Signal name**	**功能描述** **Function description**

1	RB	485 信号的 RXD 信号－ Signal RXD – of RS485
2	RA	485 信号的 RXD 信号＋ Signal RXD ＋ of RS485
3	GND	信号地 Singal ground
4	TB	485 信号的 TXD 信号－ Signal RXD – of RS485
5	VDD	5V＋
6	NC	NC
7	TA	485 信号的 TXD 信号＋ Signal RXD ＋ of RS485
8	NC	NC
金属壳 Metal shell	GND	信号地 Singal ground



与电脑、触摸屏等的连接方式和设置请参考《H2U 通讯扩展卡用户手册》。
Connections and settings with the computer, touch screen, esc refer to <H2U expansion card user manual>.

4、H2U-CAN-BD 扩展卡
4. H2U-CAN-BD expansion card



The function definition of the socket pins is the same as COM0 communication socket.

CAN-LINK 接口定义
CAN-LINK interface definition:

管脚号 Pin number	信号 Signal	描述 **Description**
1	＋24Vcc	外接直流 24V 供电电源正 Connect the positive of external DC 24V power supply
2	CANH	CAN 总线正 CAN bus positive
3	PGND	屏蔽地线，接通信电缆屏蔽层

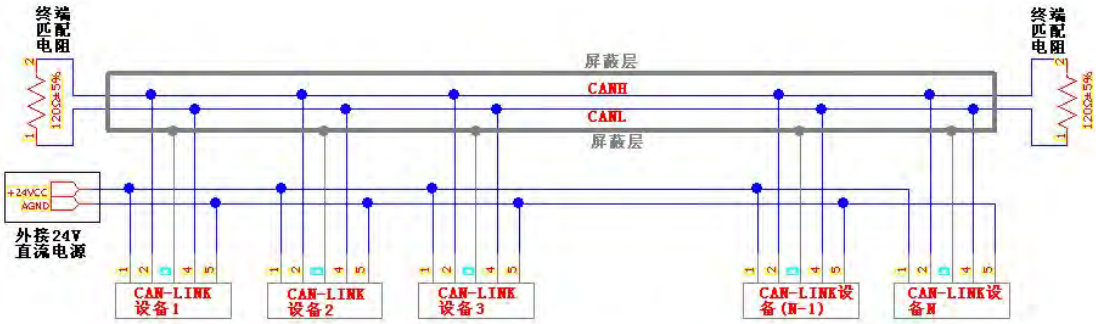
		Shield ground, connect communication cable shield
4	CANL	CAN 总线负 CAN bus negtive
5	0V	外接直流 24V 供电电源负 Connect the negtive of external DC 24V power supply

CAN-LINK 接口引脚定义

pins definition of CAN-LINK interface

组成 CAN-LINK 网络时，所有设备的以上五根线均要一一对应连在一起。并且＋24Vcc 和 0V 间需要外接 24V 直流电源。总线的两端均要加 120 欧姆的 CAN 总线匹配电阻。CAN-LINK 接线图如下图所示：

In CAN-LINK network, the five lines of all devices are linked correspondently. An external 24V DC power supply is provided between 0V and +24 Vcc. 120 ohm CAN bus termination resistor is necessary both ends of the bus. The CAN-LINK connection diagram is shown as follow:



终端匹配电阻

Termination resistor

外接 24V 直流电源

External 24V DC power supply

屏蔽层

The shield

CAN-LINK 设备 1

CAN-LINK equipment 1

CAN-LINK 设备 2

CAN-LINK equipment 2

CAN-LINK 设备 3

CAN-LINK equipment 3

CAN-LINK 设备（N-1）

CAN-LINK equipment (N-1)

CAN-LINK 设备 N

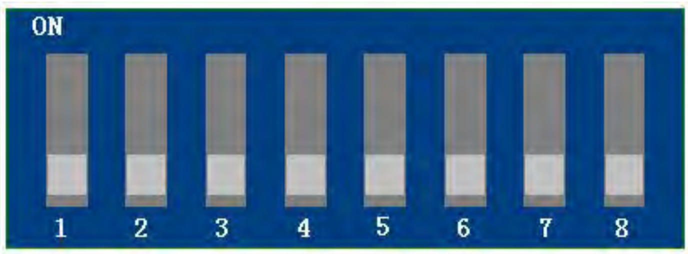
CAN-LINK equipment N

多台设备组成 CAN-LINK 网络接线图

Connection diagram of multi equipments CAN-LINK network

H1U/H2U 远程扩展卡和 CAN 接口卡均内置了匹配电阻，可通过拨码开关接入或断开。标准的拨码开关定义如下：

H1U/H2U remote expansion cards and CAN interface cards are built-in matching resistor. It can be connected or disconnected by the DIP switch. Standard definition of DIP switch as follow:



CAN-LINK 拨码开关

CAN-LINK DIP switch

拨码号　信号　　描述

DIP No. Signal　Description

拨码号 DIP No.	信号 Signal	描述 **Description**
1	地址线 A1 Address bus A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号（若为 PLC 主模块，还可以通过 D 元件设置站号）。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 This 6-bit DIP switch build from high to low six into one 6-bit binary digits, used to identify the local station number (if the PLC main module, you can also set the station number by D component). "ON" said 1, "OFF" means 0. High bit in the high and low bit in the low. Combination of the following ways: A6A5A4A3A2A1. Such as A1 = ON, the other bits are OFF, the binary address: 000001, decimal address: K01, hex address: h01. If the A5, A4 are all ON, the others are OFF, the binary address is: 011 000, decimal address: K24, hex address: h18.
2	地址线 A2 Address bus A2	
3	地址线 A3 Address bus A3	
4	地址线 A4 Address bus A4	
5	地址线 A5 Address bus A5	
6	地址线 A6 Address bus A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high speed mode, baud rate 500Kbps, ON: low speed mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch is ON, means connecting120 ohm termination resistor, or disconnecting

CAN-LINK 拨码开关定义

CAN-LINK DIP switch definition

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。

If you change the DIP switch, in addition to matching resistor, the baud rate and address can not immediately take effect, the system has to re-power on before using the new setting parameters

具体软件配置请参考附录 5.13《CAN 通信说明》

Refer to appendix 5.13 <CAN communication specify> for detail software configuration.

5.7 H2U 系列 MTQ 型与 MT 型的软件差别

5.7 Software difference between type MTQ and type MT in H2U series

H2U 系列的 MTQ 型 PLC，具有 6 路高速输入，5 路高速输出，高速信号处理频率提升，以满足具有多路高速应用的需求。

MTQ-type of H2U series PLC has 6-channel high-speed input, 5-channel high-speed output. Enhance the frequency of high-speed signal processing to meet with multiple high-speed applications.

硬件响应特性比较：

Comparison of response characteristics of the hardware

输入端口 **Input ports**	**2416MT/3624MT** **2416MT/3624MT**	**1616MT/3232MT** **1616MT/3232MT**	**MTQ 型** **Type MTQ**
X0	100kHz	100kHz	100kHz
X1	100kHz	100kHz	100kHz
X2	10kHz	100kHz	100kHz
X3	10kHz	100kHz	100kHz
X4	10kHz	100kHz	100kHz
X5	10kHz	100kHz	100kHz
其它 X 端口 Other port X	指标相同 The same indicators		
Y0	100kHz	100kHz	100kHz
Y1	100kHz	100kHz	100kHz
Y2	—	100kHz	100kHz
Y3	—	—	100kHz
Y4	—	—	100kHz
其它 Y 端口 Other port Y	指标相同 The same indicators		

AB 相高速计数器最高频率指标比较：

Indicator comparison of the highest frequency of AB quadrature high-speed counter

AB 相计数器 AB quadrature counter	H2U-2416MR/T H2U-3624MR/T	H2U-1616MR/T H2U-3232MR/T H2U-4040MR/T H2U-6464MR/T	H2U-3232MTQ
C251～C255	10kHz	30kHz	30kHz

支持指令比较：

Supported instruction comparison:

指令 **instruction**	2416MT/3624MT 支持的输出端口 Output port supported by 2416MT/3624MT	1616MT/3232MT 支持的输出端口 Output port supported by 1616MT/3232MT	MTQ 支持的输出端口 Output portes supported by MTQ
PLSY	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
PLSR	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
PLSV	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
PWM	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
DRVI	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
DRVA	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4
ZRN	Y0、Y1	Y0、Y1、Y2	Y0、Y1、Y2、Y3、Y4

MT/MTQ 型高速脉冲输出时涉及的系统监控寄存器说明：

The description of the system control register Involved in high-speed pulse output in type MT/MTQ

M8145	Y000 脉冲输出停止 Y000 pulse output stop	D8145	DRVI，DRVA 执行时的偏置速度 DRVI,DRVA execution speed bias
M8146	Y001 脉冲输出停止 Y001 pulse output stop	D8146	DRVI，DRVA 执行时的最高速度[默认 100，000] DRVI,DRVA execution max speed
M8147	Y000 脉冲输出监控 Y000 pulse output	D8147	

	monitor		[default: 100,000]
M8148	Y001 脉冲输出监控 Y001 pulse output monitor	D8148	DRVI，DRVA 执行时加减速时间[默认 100] DRVI,DRVA execution acceleration and deceleration time [default: 100]
M8149	Y002 脉冲输出监控 Y002 pulse output monitor	D8149	保留 Reserved PLSY&PLSR 输出 Y002 对应的脉冲个数累积值 PLSY&PLSR output Y002 corresponding cumulative value for the pulse number
M8150	Y003 脉冲输出监控 Y003 pulse output monitor	D8150	
M8151	Y004 脉冲输出监控 Y004 pulse output monitor	D8151	PLSY&PLSR 输出 Y003 对应的脉冲个数累积值 PLSY&PLSR output Y003 corresponding cumulative value for the pulse number
M8152	Y002 脉冲输出停止 Y002 pulse output stop	D8152	
M8153	Y003 脉冲输出停止 Y003 pulse output stop	D8153	PLSY&PLSR 输出 Y004 对应的脉冲个数累积值 PLSY&PLSR output Y004 corresponding cumulative value for the pulse number
M8154	Y004 脉冲输出停止 Y004 pulse output stop	D8154	
M8155	保留 Reserved	D8155	
M8156	保留 Reserved	D8156	Y0 端口清零信号定义(ZRN)[默认 5=Y005] Clear definition of Y0 port signal (ZRN)[Default 5=Y005]
M8157	保留 Reserved	D8157	Y1 端口清零信号定义(ZRN)[默认 6=Y006] Clear definition of Y1 port signal (ZRN)[Default 6=Y006]

M8158	保留 Reserved	D8158	Y2 端口清零信号定义(ZRN)[默认 7=Y007] Clear definition of Y2 port signal (ZRN)[Default 7=Y007]
M8159	保留 Reserved	D8159	Y3 端口清零信号定义(ZRN)[默认 8=Y010] Clear definition of Y3 port signal (ZRN)[Default 8=Y010]
M8160	(XCH)的 SWAP 功能 Selection of XCH operation to swap bytes in a single data word	D8160	Y4 端口清零信号定义(ZRN)[默认 9=Y011] Clear definition of Y4 port signal (ZRN)[Default 9=Y011]
M8161	ASC/RS/ASCII/HEX/CCD 的位处理模式 Selection of 8 bit operations for applied instructions ASC, RS, ASCI, HEX, CCD	D8161	保留 Reserved
M8162	高速并联连接模式 High speed mode for parallel connection	D8162	保留 Reserved
M8163	保留 Reserved	D8163	保留 Reserved
M8164	(FROM/TO)传送点数可变模式 (FROM/TO)Move points variable mode	D8164	(FROM/TO)传送点数指定模式 (FROM/TO) Move points fixed mode
M8165	保留 Reserved	D8165	PLSR，DRVI，DRVA 执行时减速时间[默认 100]由 M8135 决定是否有效[Y0] PLSR， DRVI,DRVA execution acceleration and deceleration time [default: 100] is decided valid [Y0] by M8135

M8166	保留 Reserved	D8166	PLSR，DRVI，DRVA 执行时减速时间[默认 100]由 M8136 决定是否有效[Y1] When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8136 whether it is enabled. [Y1]
M8167	(HEY)HEX 数据处理功能 (HEY)HEX data processing function	D8167	PLSR，DRVI，DRVA 执行时减速时间[默认 100]由 M8137 决定是否有效[Y2] When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8137 whether it is enabled. [Y2]

5.8 H2U 系列高速处理指令的增强功能说明

Enhanced function description of H2U series high speed processing instruction

H2U 系列 PLC 高速编程指令除了能兼容 FX1n/FX2n 的指令之外，对其中部分指令功能作了加强，这些加强功能一般通过系统的 M 变量来配合实现。 涉及的高速指令功能如下：

In addition to the compatibility with FX1n/FX2n instructions, the H2U series PLC also enhances part of high speed processing instructions, and generally these enhanced functions can be implemented through cooperation with M variable. Following is the explanation of relevant enhanced high speed instructions:

指令 instruction	配合使用的 M 变量 With the use of Variable M	M 标志为 ON 时指令的加强功能 Instruction enhanced function when Mark M is ON
SPD	M8100~M8105 分别对应 X0 ～X5 端口 M8100 ~ M8105 corresponding to port X0 ~	新增 1 分钟脉冲个数（运行速度）计算，该数据是通过实时采样输入端脉冲频率再通过内部运算得出的。

	X5	Add 1 minute pulse counter (operation speed) calculation. The data is gotten by internal operations for input pulse frequency of real-time sampling
PLSY	M8135~M8139 分别对应 Y0~Y4 M8135~M8139 corresponding to port Y0~Y4	可以在运行中更改输出脉冲个数。 Change the number of output pulses in operation
	M8085~M8089 分别对应 Y0~Y4 M8135~M8139 corresponding to port Y0~Y4	在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条能流无效的处理。 If the drive special bit is ON, the next output pulse instruction can be immediately started without invalid processing of the last power flow.
	M8090~M8094 分别对应 Y0~Y4 M8090~M8094 corresponding to port Y0~Y4	可以实现脉冲输出完成后产生一次用户中断。 User interruption can occur after pulse output
PLSR DRVI DRVA	M8135~M8139 分别对应 Y0~Y4 M8135~M8139 M8135~M8139 corresponding to port Y0~Y4	可以在运行中更改输出脉冲个数； Change the number of output pulses in operation 可以更改减速时间（使加减速时间不同）。 Change acceleration or deceleration time (make them different)
	M8085~M8089 分别对应 Y0~Y4	在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条指令能流无效的处理。 Driving special bit to ON, you can immediately start the next pulse output instruction, not waiting for the last instruction operation invalid
	M8090~M8094 分别对应	可以实现脉冲输出完成后产

	Y0~Y4	生一次用户中断。 User interruption can occur after pulse output
高速计速器中断 High speed counter interrupt	M8084；D8084~D8086	高速计速器多用户中断(最大支持 24 个：I507~I530) Multi user interrupt for high speed counter (Max No.: 24, I507-I530)

涉及的加强高速指令使用说明如下：

Following is the explanation of relevant enhanced high speed instructions:

1.SPD 指令的描述

1. SPD instruction description

16bit 16bit	32bit 32bit	P	FNC56	SPD	脉冲密度，转速，线速度 Pulse density, rotating speed, line speed
✔			指令格式：**SPD** S1 S2 D Instruction format:		
7 步 7 step					

X000~X005 分别使用了功能使能标志 M8100~M8105 作为增强功能的生效标志，每个标志可单独设置。

X000~X005 respectively use function flags M8100~M8105 as enable flag of enhanced functions, and each flag can be individually set.

1）. 如果功能使能标志为[M8100~M8105]OFF，SPD 为基本功能：

2) If the feature enable flag is the [M8100 ~ M8105] OFF, SPD is the basic function:

S1 ：脉冲信号输入端口，只能为 X0~X5；

The input ports of pulse signal should be X0~X5;

S2 ：为设定的脉冲检测时间长度(ms)1~32767；

The time of detecting pulse is 1~32767(ms);

+0：为在 S2 时间内的脉冲个数，为 16 位的数据；

+0: pulse number in time S2, 16bit data;

+l：本次时间段对脉冲的计数。

+1: pulse counter in this time section.

+2：用于测定剩余时间(ms)。

+2: measure time left (ms)

指令举例：

Instruction example:

```
          S1    S2    D
M0
─┤├─〔SPD  X0    D0    D10〕
```

X0 为脉冲信号输入端口；

X0 is pulse signal input port

D0 为单位时间(ms)；

D0 is the unit time (ms);

D10 为 D0 时间段总脉冲个数；

D10 is total number of pulse in D0 time

D11 为 D0 时间段正在计的数据；

D11 is the counting data in D0 time;

D12 为时间段剩于的时间(MS)；

D12 is the time left of time section (MS);

2）.如果功能使能标志为[M8100~M8105]ON，SPD 为加强功能：

2) if the function enable flag is [M8100~M8105]ON, SPD is the enhanced function.

S1：脉冲信号输入端口，只能为 X0~X5；

S1: pluse signal input port, must be X0-X5;

S2：为设定的脉冲检测时间长度 1~32767(ms)；

S2: the length of the set pulse detection time

+0：为在 S2 时间内的脉冲个数，为 16 位的数据；

+0: number of pulse in S2 time, 16 bit data

+1，D +2：为每分钟内的脉冲个数，为 32 位的数据；

+1，D +2：number of pulse in each minute, 32 bit data;

指令举例：

Instruction example:

```
          S1    S2    D
M0
─┤├─〔SPD  X0    D0    D10〕
```

X0 为脉冲信号输入端口；

X0 is pulse signal input port;

D0 为单位时间 1~32767(ms)；

D0 is the unit time 1~32767(ms)；

D10 为 D0 时间段总脉冲个数；

D10 is total number of pulse in D0 time

D11，D12 为运行频率=1 分钟脉冲个数*10(0.1 为单位)；

D11, D12 are operation frequency = pulse number in 1 minute * 10 (The unit 0.1);

2.PLSY 指令的特殊说明

Special description of PLSY instruction

16bit	32bit	P	FNC57	**PLSY**	脉冲输出 Pulse output
✔	✔		指令格式：**PLSY** S1 S2 D Instruction format		
7 步 7 step	13 步 13 step				

1）. 通过使用特殊位 M8135~M8139(分别对应 Y0~Y4)为 ON，可以实现如下功能：

1) Making special bits M8135~M8139 (correponding Y0~Y4) as ON, following function can be realized.

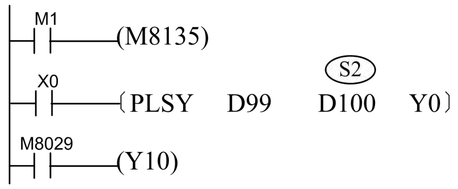
可以在运行中更改输出脉冲个数(可改大，也可改小)。

Change output pulse counts to bigger or smaller during operation.

编程举例：

Programming Illustration:

\



M1 为 ON，该特殊功能有效，此时 X0 导通执行 PLSY 指令，脉冲发送过程中可以更改 D100（脉冲个数），脉冲个数可以增加也可以减少；（注意：更改后的 D100 的数据要大于该指令已经发送的脉冲个数）

This special function is enabled when M1 is set to ON. X0 is turned on to execute PLSY instruction and D100 can be changed during pulse transmission to increase or decrease the number of pulse (notice: the modified content in the D100 should be larger than the number of pulse sent by the instruction.)

2）. 通过使用特殊位 M8085~M8089(分别对应 Y0~Y4)为 ON，可以实现如下功能：

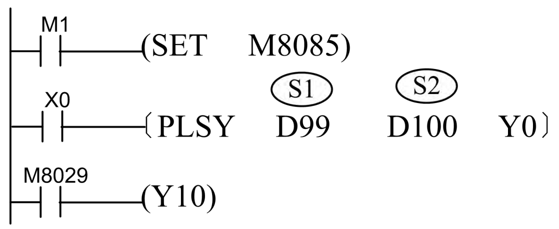
2) Making special bits M8085~M8089 (correponding Y0~Y4) as ON, following function can be realized.

在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条能流无效的处理。

If the drive special bit is ON, the next output pulse instruction can be immediately started without invalid processing of the last power flow.

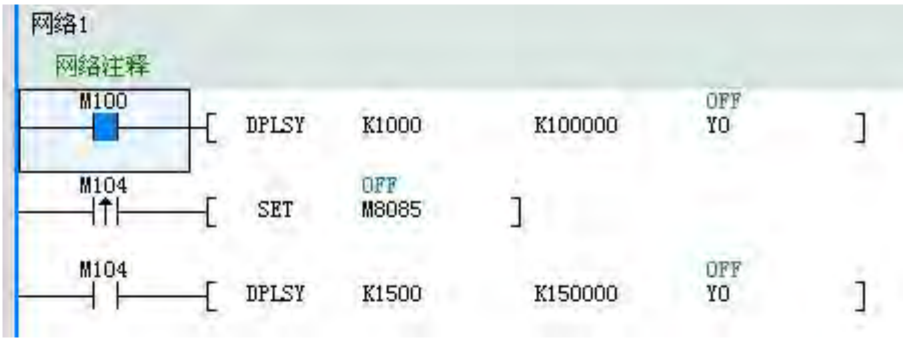
编程举例：

Programming Illustration:



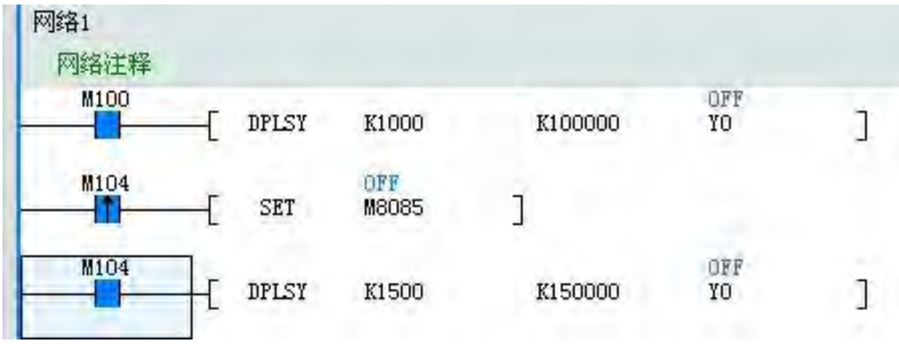
当 X0=1，PLSY 在指令发脉冲过程中，或脉冲发送完毕，若 M8085 被置位，PLSY 指令就会重启，按设定的频率和脉冲数 、 （即 D99、D100 的当前值）重新开始发送脉冲，而无需指令驱动 X0 由 ON OFF ON 变化一次。

When X0=1, during the pulse transmission, or pulse transmission is completed, if the M8085 is set, PLSY instruction will be restarted, restart pulse transmission according to set frequency and pulse number. No necessary to drive X0 change ON OFF ON once.



当 M100 启动，正在发脉冲过程中(如上图)，启动 M104，则 M100 驱动的那一脉冲指令自动清除，马上执行 M104 驱动的脉冲输出指令（如下图），不需等 M100 断开。

When the M100 start, in the process of sending pulses (as above diagram), M104 start. The pulse instruction driven by M100 is automatically cleared. At once pulse output instruction driven by M104 runs, No waiting for M100 disconnection.



3）.通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON，可以实现如下功能：

3) Making special bits M8090~M8094 (correponding Y0~Y4) as ON, following function can be realized.

可以实现脉冲输出完成后执行一次用户中断；具体对应如下：

The user interrupt runs after pulse output can be achieved; specific correspondence as follows:

端口号 **Port number**	使用特殊位 **Used special bit**	对应的用户中断 **Relative user interrupt**
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

当特殊功能位（M8090-M8094）为 ON，则在指定脉冲个数发送完毕后，立即执行用户中断 I502～I506。

If the special function bits M8090~M8094 turn ON, user interrupt task I502～I506 will be executed immediately after sending a specified number of pulses.

3.PLSR，DRVI，DRVA 指令的特殊说明

3. Special description of instruction PLSR，DRVI，DRVA

1）. 通过使用特殊位 M8135~M8139(分别对应 Y0~Y4)为 ON，可以实现如下功能：

1) Making special bits M8135~M8139 (correponding Y0~Y4) as ON, following function can be realized.

可以在运行中更改输出脉冲个数(可大可小)，同时加速和减速时间分别由如下寄存器定义，时间单位为 ms：（PLSR 的加速时间是由 PLSR S1 S2 S3 D 中的 S3 决定）

The number of output pulse can be changed in operation (more or less), acceleration and deceleration time are defined by following registers. The time of unit ms; (the acceleration time is decided by PLSR S3 **in** S1 S2 S3 D)

端口号　使用特殊位　修改加速时间用寄存器

Port number　　used special bit　　　　register modified for acceleration time

端口号	使用特殊位	修改加速时间用寄存器
Y000	M8135	D8104
Y001		D8105
Y002		D8106
Y003		D8107
Y004		D8108

端口号	使用特殊位	修改减速时间 用寄存器
Y000	M8135	D8165
Y001	M8136	D8166
Y002	M8137	D8167
Y003	M8138	D8168
Y004	M8139	D8169

端口号　使用特殊位　修改减速时间
用寄存器

Port number　　used special bit　　　　register modified for acceleration

Y000　M8135　D8165

Y001　M8136　D8166

Y002　M8137　D8167

Y003　M8138　D8168

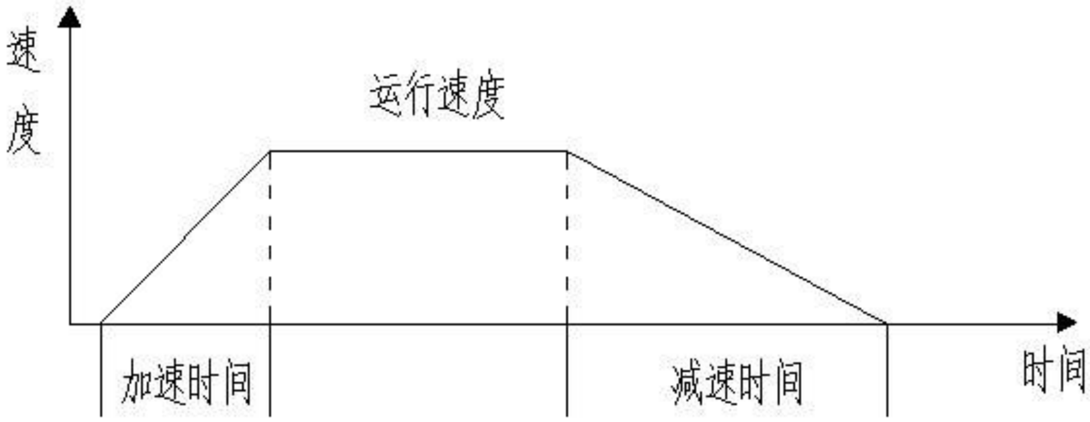
Y004　M8139　D8169

当特殊位(M8135～M8139)为 ON 时，PLSR，DRVI，DRVA 指令执行过程中，可以随时更改脉冲总数(注意：更改后的脉冲总数必须大于当前已经发送的脉冲数量)

When the special bit (M8135 ~ M8139) is ON,, in PLSR, DRVI, DRVA instruction execution process, the total number of pulses can be changed (note: the total number of pulses after the change must be greater than the number of the current pulse has been sent)

加速时间和减速时间可以不同，但是必须在指令执行之前修改好加减速时间。

Acceleration time and deceleration time can be different, but must be amended before the instruction good acceleration and deceleration time



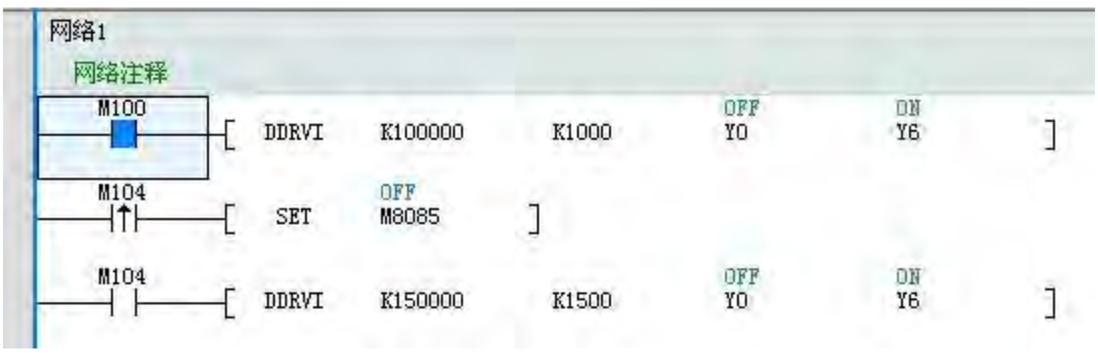
速度
speed
运行速度
Operation speed
加速时间
Acceleration time
减速时间
Deceleration time
时间
Time

2）. 通过使用特殊位 M8085~M8089(分别对应 Y0~Y4)为 ON，可以实现如下功能：

2) Making special bits M8085~M8089 (correponding Y0~Y4) as ON, following function can be realized.

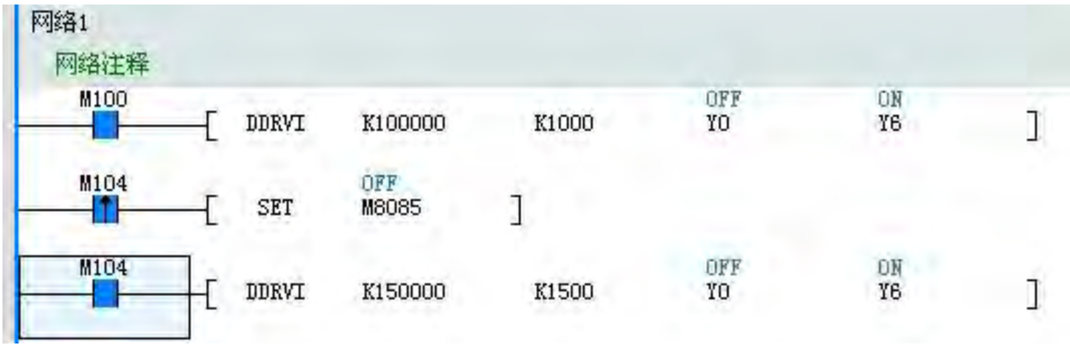
在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条能流无效的处理。

If the drive special bit is ON, the next output pulse instruction can be immediately started without invalid processing of the last power flow.



当 M100 启动，正在发脉冲过程中(如上图)，启动 M104，则 M100 驱动的那一脉冲指令自动清除，马上执行 M104 驱动的脉冲输出指令（如下图），不需等 M100 断开。

When the M100 start, in the process of sending pulses (as above diagram), M104 start. The pulse instruction driven by M100 is automatically cleared. At once pulse output instruction driven by M104 runs, No waiting for M100 disconnection.



3）.通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON，可以实现如下功能：

3) Making special bits M8085~M8089 (correponding Y0~Y4) as ON, following function can be realized.

可以实现脉冲输出完成后执行一次用户中断;，具体对应如下：

The user interrupt runs after pulse output can be achieved; specific correspondence as follows:

端口号 **Port number**	使用特殊位 **Used special bit**	对应的用户中断 **Relative user interrupt**
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

4.高速计速器多用户中断的使用描述

4. Multiple user interrupts of high speed counter

为了满足在高速计速器运行时，支持多高速自由任务，实现了高速计速器多用户中断(最大支持 24 个，均为扩展的中断号)，设定和比较用数据表格的方式定义：

In order to meet supporting multi high speed free task in the operation of the high-speed counter. Achieve high-speed multi-user interrupt (up to 24, are extended interrupt number), Define data comparison and setting in the table form:

标志位 **Flag bit**	使用描述 **Operation description**
M8084	为 ON 使能高速计速器多用户中断 ON enable multi user interruption of high speed counter
D8084	为高速计数器序号 235~255 Serial number of high speed counter 235-255
D8085	对应的用户中断个数，最大 24 个，从 I507~I530 Number of relative user interruption. The max is 24, I507-I530

D8086	对应多个比较点数据的序号，只能为 D 元件，且为双字宽度，如 200 为 D200 开始的双字 Serial number corresponding the data of multi comparison points. Only D component, and for the double-word width, such as 200 is the double word start from D200

比较点数据存放的例程：

Examples storing comparison data:

使用高速计数器 C235 时，D8084=235；使用 D200 开头的 32 位寄存器作为数据比较值时，D8086=200；要执行 5 个中断输出时，D8085=5；最后 M8084=ON 该功能有效

If the high speed counter C235 is used then D8084=235；If the 32 bit register starting from D200 is used as comparing data then D8086=200； If five interrupts are to be executed then D8085=5；Finally M8084=ON will enable this function.

C235 的数据 **C235 Data**	**记录单元** **Record unit**	**存放单元数值** **Store unit value**	**对应的用户中断** **Relative user interrupt**	**D8131 的数值** **D8131 value**
100	D200，D201	=100	I507	0
200	D202，D203	=200	I508	1
300	D204，D205	=300	I509	2
400	D206，D207	=400	I510	3
500	D208，D209	=500	I511	4→0(M8133=ON)

每个中断可以由高速计数器的数值和记录单元的数值产生。

Each interrupt can be generated by the value of the high speed counter or record cell.

注意：该表格执行时，首先从上到下依次执行，只有每一格数据比较成功后才会继续往下一格执行，表格的最后一格执行完成后 M8133=ON，此时数据比较又返回到表格的第 1 格，建议在返回到第 1 格时把 C235 数据清零，这样表格就会循环执行。 该功能只有在增计数时才有效！

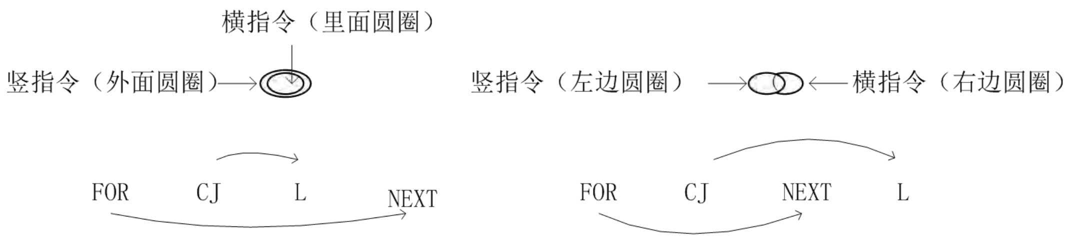
Note: This form is executed, the first executive order from top to bottom, only the data of each cell will continue after the comparison of cell data successful. After the completion of the last cell, M8133 = ON. Then compare the data returned to 1st cell. Propose clearing C235 data to 0 after return to the 1st cell. So this form will loop. This function is effective only for upward count!

5.9 程序流程控制指令的相互关系

Corelation of programs flow control instruction.

各种程序流程控制指令之间的相互关系如下所示。下表中 表示包含关系 表示前后区间重复。在 AutoShop 编程环境中子程序和中断程序单独写，故没有 P-SRET、I-IRET、FEND-END、O-FEND、O-END，

A variety of program flow control instructions as follows between the inter-relationship. In the following table, means including relation, means forward-backward area duplication. In AutoShop programming environment, Write a separate subroutine and interrupt programs, so no P-SRET、I-IRET、FEND-END、O-FEND、O-END，



竖 \ 横	MC-MCR	CJ-L	EI-DI	FOR-NEXT	STL-RET
MC-MCR	○ △	○ △	○ ○	○ ×(6607)	○ ×(6605)
CJ-L	○ △	○ △	○ ○	○ △	○ △
EI-DI	○ ○	○ ○	○ ○	○ ○	○ ○
FOR-NEXT	×(6607) ×(6607)	○ △	○ ○	○ ※2	×(6607) ×(6607)
STL-RET	×(6605) ×(6605)	△ △	○ ○	○ ×(6607)	○ ○
P-SRET	×(6606) ×(6608)	○ △	○ ○	○ ×(6607)	×(6606) ×(6605)
I-IRET	×(6606) ×(6606)	○ △	○ ○	○ ×(6607)	×(6606) ×(6606)
FEND-END	○ ×(6608)	○ ×(6701)	○ ※1	○ ×(6607)	△ ×(6605)
O-FEND	○ ×(6608)	○ ○	○ ○	○ ×(6607)	○ ×(6605)
O-END（无FEND）	○ ×(6608)	○ ×(6701)	○ ※1	○ ×(6607)	○ ×(6605)

竖指令（外面圆圈）

Vertical instruction (outside circle)

横指令（里面圆圈）

Horizontal instruction (inside circle)

竖指令（左边圆圈）

Vertical instruction (left circle)

横指令（右边圆圈）

Horizontal instruction (right circle)

竖 vertical	横 horizontal					

○ 能够没有问题的互相组合使用。
× 禁止使用的组合，（）之中为错误序号。
△ 虽然不属于禁止范围，但是可能会导致动作的复杂化，建议尽量避免组合使用。

横 竖	P-SRET	I-IRET	FEND-END	备注
MC-MCR	× (6608) × (6606)	× (6608) × (6606)	× (6608) × (6608)	※1为忘记DI的状态。 不属于错误。 ※2 FOR FOR NEXT NEXT 按照实线所示方式动作。 ※3最初的FEND和END有效，不是 目的的程序。 不属于错误。 除了部分例外，具有包含关系的指令可以进行组合使用。 但是必须注意以下特例情况。 ①在FOR-NEXT，STL-RET，P-SRET，I-RET中无法使用MC-MCR。 ②在FOR-NEXT，P-SRET，I-IRET中无法使用STL-RET。 ③在MC-MCR，FOR-NEXT，P-SRET，I-IRET指令间无法使用I，IRET，SRET，FEND，END等指令进行屏蔽操作。
CJ-L	△ △	△ △	× ○	
EI-DI	○ ○	○ ○	※1 ○	
FOR-NEXT	× (6607) × (6701)	× (6607) × (6607)	× (6607) × (6607)	
STL-RET	× (6605) × (6606)	× (6605) × (6606)	× (6605) × (6605)	
P-SRET	× (6606) × (6606)	× (6606) × (6606)	× (6709) × (6709)	
I-IRET	× (6606) × (6606)	× (6606) × (6606)	× (6606) × (6606)	
FEND-END	○ × (6709)	○ × (6709)	※3 ※3	
O-FEND	× (6606) × (6709)	× (6606) × (6606)	※3 ※3	
O-END (无FEND)	× (6606) × (6709)	× (6606) × (6706)	※3 ※3	

能够没有问题的互相组合使用
No problem to be used in combination with each other
禁止使用的组合（）之中为错误序号

Error serial number is in Prohibited combination ()

虽然不属于禁止范围，但是可能会导致动作的复杂化，建议尽量避免组合使用。

Although not a prohibition, but the action may lead to complications, it is recommended to avoid combination

竖 vertical	横 horizontal					备 注 Note
						*1 为忘记 DI 的状态不属于错误。 do not belong to error for forgetting the state of DI. 按照实线所示方式动作。 Action as shown by the solid line *3 最初的 FEND 和 END 有效，不是目的的程序。 Initial FEND and END are valid,not target program. 不属于错误。 Don’t belong to error. 除了部分例外，具有包含关系的指令可以进行组合使用。 With some exceptions, instructions with the including relations can be used in
（无FEND） （NoFEND）						

						combination 但是必须注意一下特例情况。 However, we must take note of exceptional cases 1 在 FOR-NEXT, STL-RET,P-SRET,I-RET 中无法使用 MC-MCR。 MC-MCR can’t be used in FOR-NEXT, STL-RET, P-SRET, I-RET 2 在 FOR-NEXT, P-SRET,I-IRET 中无法使用 STL-RET。 STL-RET can’t be used in FOR-NEXT, P-SRET, I-IRET 3 在 MC-MCR，FOR-NEXT, P-SRET,I-IRET 指令间无法使用 I，IRET,SRET,

						FEND,END 等指令进行屏蔽操作。 I can't be used in MC-MCR ，FOR-NEXT, P-SRET, I-IRE. Instructions IRET,SRET, FEND,END are shield operation

5.10 部分特殊继电器和寄存器功能说明

5.10 function description of some special relays and registers

系统运行状态

System running state

PLC 的运行标志 M8000-M8003

PLC Running flag M8000-M8003

1. M8000：M8000 为 RUN 中常时 ON 接点，即运行监视常开接点（A 接点），PLC 在 RUN 的状态下，M8000 一直保持为 ON。

1. M8000: When M8000 is often contacts ON of RUN, that is run to monitor normally open contacts (A Contact), PLC in RUN state, M8000 has been maintained at ON.

2. M8001：M8001 为 RUN 中常时 OFF 接点，即运行监视常闭接点（B 接点），PLC 在 RUN 的状态下，M8001 一直保持为 OFF。

2. M8001: When M8001 is often contacts OFF of RUN, that is run to monitor normally close contacts (B Contact), PLC in RUN state, M8000 has been maintained at OFF.

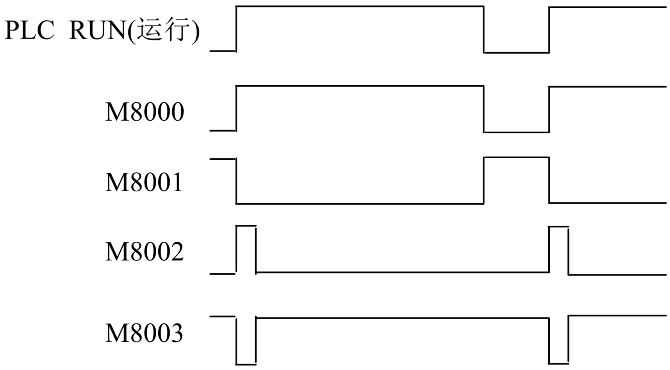
3. M8002：PLC 开始 RUN 的第一次扫描 ON，之后保持为 OFF。 该脉冲的宽度为一次扫描时间，当要作各种初始设置工作时可以使用本接点。

3. M8002: PLC start the first scan ON of RUN, then remain OFF. The width of this pulse is the time of one scan process, and this contact could be used when any initialization is needed.

4. M8003：PLC 开始 RUN 的第一次扫描周期 OFF，之后一直 ON。 即启始负向（RUN 的瞬间'OFF'）脉冲。

4. M8003: PLC start the first scan OFF of RUN, then remain ON. So it is a negative startup

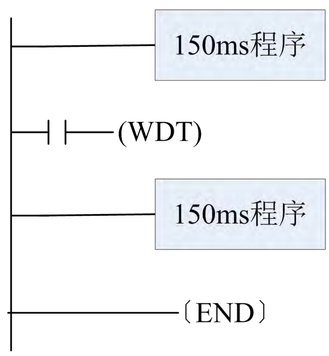
pulse (instantaneous ‘OFF’ of RUN).



PLC RUN（运行）
PLC RUN（run）
监控定时器 D8000
Monitor Timer D8000
1、 监控定时器专门用来监视 PLC 的扫描时间，当扫描时间超过监控定时器的设置时，ERROR 红色指示灯长亮，输出全部变成 Off。
Monitoring timer designed to monitor the PLC's scan time. When the scan time exceeds the monitoring timer setting, red indicator ERROR light for long, all outputs turn into Off.

监控定时器时间的初始值为 200ms，当指令运算过于复杂或者是 PLC 主机连接众多的特殊模块时都会造成扫描时间过长，扫描时间是否超过 D8000 的设置值，请监视 D8010~D8012。此种情况下，可于程序中使用 MOV 指令来变更监控定时器的设置值，将监控定时器的设置值变更为 300ms，也可于 PLC 程序中加入 WDT 指令，当 CPU 执行至 WDT 指令时，内部监控定时器被清除为零，使得扫描时间不会超过监控定时器的设置时间。
The initial time setting of the monitor timer is 200ms, and too complex instruction operation or too many special modules connected to PLC master would cause too much longer scan time. D8010~D8012 can be monitored so as to know whether the setting time of D8000 is exceeded. In this situation, MOV instruction could be used in the program to change the time setting of monitor timer to 300ms, or the WDT instruction could be added to the program to clear the internal monitor timer to zero when the WDT instruction is executed, so the scan time will not exceed the setting time of monitor timer.

或者



或者
OR

150ms 程序
150ms program

2、 监控定时器最大可设置至 32767ms，但必须注意，监控定时器设置过大时，运算异常发生的检出时机将会跟着被拖慢。 因此，若非复杂的运算使得扫描时间超过 200ms，一般的情况下请维持在 200ms 以下较佳。
Monitoring timer can be set to the maximum 32767ms. It must be noted, when monitoring timer setting is too large, the detection time of Operation Exception will be slowed down along. So except for complex operations which force the scan time to be longer than 200ms, the setting time should be less than 200ms.

单板程序版本 D8001
Single board program version D8001
单板程序版本，如 D8001=24120 的含义是：24 为 H2U，120 为版本 V1.20，即版本号为 V1.20 的 H2U 型 PLC；26 为 H1U。
Board version of the program, such as D8001 = 24120 means: 24 to H2U, 120 for the version V1.20, the version number is V1.20 of the H2U model PLC; 26 to H1U.

程序容量 D8002
Program capacity D8002

程序容量，4K、8K、16K、24K 等，H2U 型号 PLC 的容量是 24K，H1U 型号 PLC 的容量是 8K。
Program capacity, 4K, 8K, 16K, 24K, etc., H2U model PLC's capacity is 24K, H1U model PLC's capacity is 8K.
语法检查信号 M8004，D8004
The syntax check signal M8004, D8004
M8004：当错误信号 M8060~M8067(除了 M8062 外)中任意一个为 ON 时，M8004 为 ON。可用来监控 PLC 中有无系统错误。
M8004: When anyone of the wrong signal M8060 ~ M8067 (except M8062) is ON, M8004 is ON. It can be used to monitor system error of PLC.
D8004：M8060~M8067 的 BCD 值，初始值为 0。
D8004: BCD value of M8060~M8067, the initial value is 0.
电压电池检测 M8005~M8009 D8005~D8009 M8030
Battery voltage measurementM8005~M8009 D8005~D8009 M8030

1、当电池电压 D8005 的检测值低于 D8006（初始值为 2.6V）时，M8005 有输出；
1. If battery voltage D8005 is lower than D8006 (initial value is 2.6V), then M8005 will output;
2、电池电压低报警有出现（M8005 为 ON）过，M8006 就置 ON（锁存），PLC 掉电再上电时复位，程序无法对其进行复位；
2. If there is any low battery voltage alarm (M8005 is ON), then the M8006 will be set to

ON (latched). Program can’t reset it even the PLC is restarted and reset.

3、当交流电失电 5ms 后 M8007、M8008 动作，失电时间在 D8008 之内 PLC 程序继续运行、在 D8008 之外用户程序不执行，M8000 为 OFF；

3. If the system loses AC power for 5ms then the M8007 and M8008 will be actuated. PLC program will continue running if the power failure time is within D8008, or the user program will not be executed and M8000 is OFF;

4、扩展模块 24V 掉电时 M8009 为 ON，D8009 记录掉电扩展模块的编号；

4. M8009 is ON when the expanded module loses 24V power, and D8009 will record the module number;

5、M8030 为 ON 时，屏蔽电池电压低的警告。

5. If M8030 is ON then the low battery voltage alarm will be masked.

系统时钟

System clock

扫描时间监视 D8010~D8012

Scan time monitor D8010~D8012

程序扫描时间的现在值、最小值及最大值被存放在 D8010~D8012 当中。

The current value, minimum value and maximum value of program scan time are stored in D8010~D8012.

1. D8010：扫描时间的现在值；

1. D8010: current value of scan time;

2. D8011：扫描时间的最小值；

2. D8011: minimum value of scan time;

3. D8012：扫描时间的最大值。

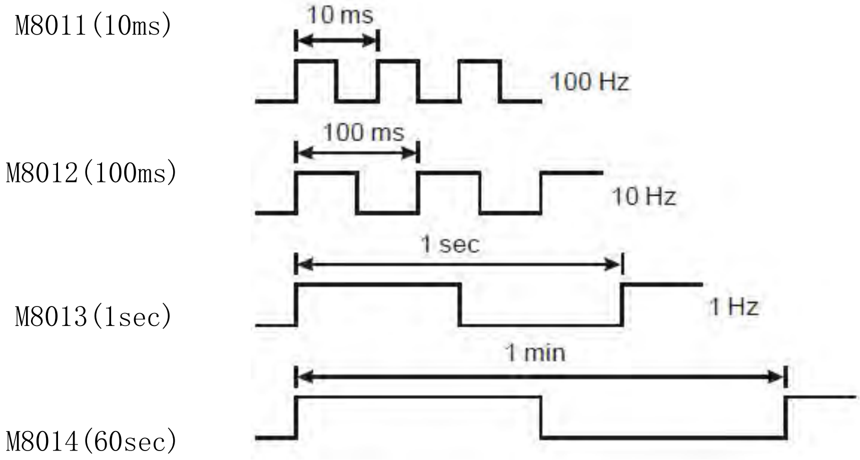
3. D8012: maximum value of scan time.

周期振荡时钟 M8011~M8014

Period oscillating clock M8011~M8014

PLC 主机内部均具备下列 4 种振荡时钟，只要 PLC 通上电源，这 4 种振荡时钟就会自动动作。PLC 处于 STOP 状态下，振荡时钟也会动作，所以振荡时钟启动时序及 RUN 的启动时序并不会同步。

There are 4 types of clock crystal oscillator in the PLC. The oscillator starts automatically as soon as the PLC is powered on, and they may continue running even when PLC is in STOP state. So the startup timing of clock oscillator and RUN is not synchronous.



实时时钟 D8013~D8019 M8015~M8019

Real-time clock D8013~D8019 M8015~M8019

1、M8015 为 ON 时，时钟计时停止；

The clock stops when M8015 is ON;

2、M8017 每 ON 一次，PLC 内部时钟作±30 秒校正动作，这里的校正是指当 PLC 的内部时钟的秒针 D8013 在 1~29 时，会被自动归为“0”秒而分针不变、D8013 在 30~59 时，也会被自动归为“0”秒，分针加 1 分钟。

2. When M8017 is ON every time, the internal clock of PLC act ± 30 seconds correction. Where the correction means that when the second D8013 of PLC's internal clock is in 1 ~ 29, it will be automatically set as "0" and minute no change, when the second D8013 in 30 to 59, it will also be automatically set as "0" and minute plus 1 minute

3、通常的情况下年只显示 2 位数（例：2009 年只显示 09），若需要将“年”采用显示 4 位的格式，仅需在一个扫描周期执行如下语句，就可以切换成 4 位显示格式：

The year value is typically displayed using 2 digits (for example, the year 2009 is displayed as “09”). If a four-digit year display is desired, execute the following instruction:

```
 M8002
|-| |-----[MOV   K2500   D8018]
```

请在可编程控制器每次运行时执行本程序。 而且即使传送 K2000 使显示切换至公历 4 位，也不会影响当前时间。

Please run this program every time the PLC runs. Switching the K2000 to a four-digit display does not affect the current time value.

地址号 **Address No.**	**名称** **Name**	**动作功能** **Action fnction**
M8015	时钟停止和时间校准 Clock stops and time calibration	ON 时时钟停止，利用 ON→OFF 的边沿写入时间，执行再动作。 when ON the clock stops, write time at the edge of ON → OFF, then react.
M8016	时间显示停止 Stop time display	ON 时时钟显示停止（计时保持动作） When ON the clock display stops

		(timing continues)
M8017	±30 秒修正 ±30 seconds correction	利用 OFF→ON 的边沿修正秒。（当秒数为 0~29 秒时变为 0 秒。当秒数为30~59秒时向分进一位，将秒变为 0 秒） Calibrate second at the edge of OFF→ON (Second is 0 when second is 0~29. second becomes 0 with carrying 1 to minute when second is 30 ~59)
M8018	安装检侧 Install detection	常时处于 ON 状态 Status ON normally
M8019	RTC 错误 Error RTC	校准时间时，当特殊数据寄存器的数据超过设定范围时变为 ON。 When calibrating time, be ON if data of special data register exceeds limits

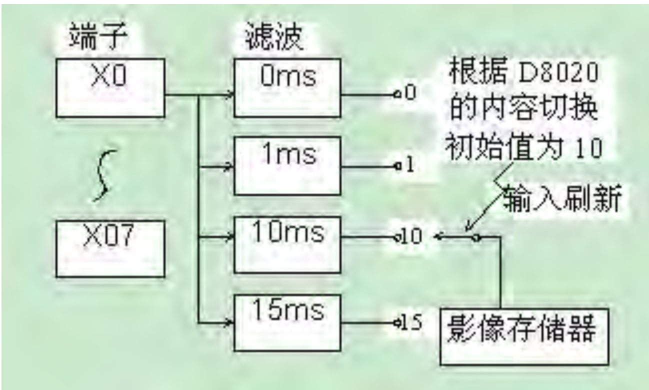
地址号 **Address number**	**名称** **Name**	**设定值的范围** **Ranage of setting value**	**动作功能** **Action function**
D8013	秒 second	0~59	用于写入校准时间的初始值，或读取当前时间。 For writing the initial value of calibration time, or reading the current time
D8014	分 minute	0~59	
D8015	时 Hour	0~23	
D8016	日 Day	0~31	
D8017	月 Month	0~12	
D8018	年 Year	0~99（公历后两位） 0~99（the last bits of calender）	
D8019	星期 week	0~6（对应日~六） 0~6（Sunday – satuday）	

指令标志

Instruction flags

输入滤波调整 D8020
Input Filter Adjustment D8020

1、X0~X7 输入端，可由 D8020 的内容来设置输入端接收脉冲的反应时间，设置范围 0~60ms。 默认 10ms，
1. Inputs X0–X7. The input pulse response time can be set in D8020 a value between 0 ms and 60 ms. The default value is 10ms.
2、当程序中使用高速计数器、中断插入等功能时，则相关端口的滤波时间自动为最短时间，无关的 X0~X7 端口的滤波时间仍为原设定值 D8020。
2. If high-speed counter and interrupt-insertion functions are used in the program, the filter time of the relevant input port will automatically be the shortest time, and the filter times of the remaining ports X0–X7 will remain those of the original D8020 setting.



端子
Terminal

滤波
filter

根据 D8020 的内容切换初始值为 10
Change intial value as 10 according to D8020

输入刷新
Fresh input
影像存储器
Image memory

3、PLC 电源 Off→On 变化时，D8020 的内容自动变成 10
D8020 content automatically becomes 10 when Off→On of PLC power.
4、若执行以下程序，滤波常数变为 0ms 。 但是实际上该输入端设置了 C-R 滤波器硬件，即使是将其指定为 0，但也不会低于 10 （40 点、60 点 PLC 的 X2~X5 不会低于 50 ）。

Executing the following program can change the filter constant to 0 ms, but this input port actually has a built-in RC hardware filter, so even if the constant is set to 0, the actual value will be at least 10 ms (ports X2–X5 of 40 or 60 PLC points will have a minimum value of 50 ms).

```
M8000
--| |--------(MOV  K0  D8020)
```

运算标志　M8020~M8022

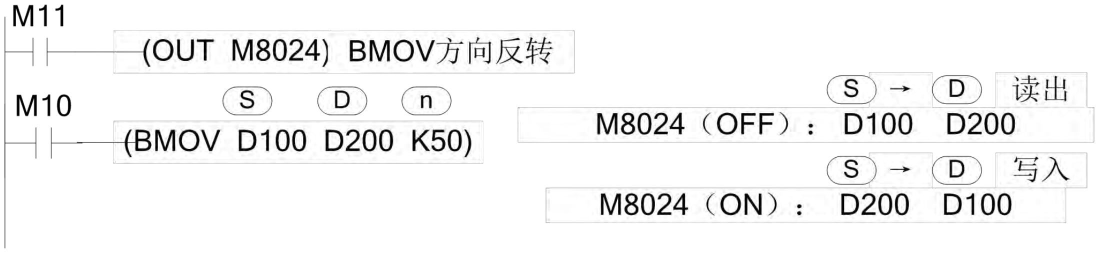
运算标志 M8020~M8022
Operation Flags M8020–M8022

在所有运算中的各种标志的动作如下。
The operation flags are:

1、零标志：结果值为 0 时，M8020=ON
Zero Flag: if results is 0, M8020=ON
2、借位标志：结果值超出最小处理单位时，M8021=ON
Borrow flag: if the results exceeded the value of the minimum processing units, M8021=ON
3、进位标志：结果绝对值超出最大使用范围时，M8022=ON
Carry flag: if Absolute value of the results exceeds the maximum use range, M8022=ON

指令赋值换向　M8024

指令赋值换向 M8024
Instruction assignment change direction M8024
通过控制 BMOV 指令的反向标记 M8024 ，可用一个程序指令向两个方向传送数据。
One program instruction can be used for bidirectional data transfer by controlling the reverse flag (M8024) of the BMOV instruction.



BMOV 方向反转

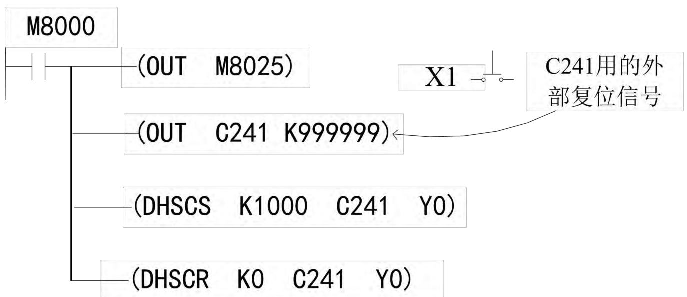
BMOV direction reverse
S D 读出
Read SD
S D 写入
Write SD

HSC指令模式 M8025

HSC 指令模式 M8025
HSC Instruction Mode M8025

高速计数器的输出接点、FNC53（D HSCS）、FNC54（D HSCR）、FNC55(D HSZ)指令中的比较输出，都随计数输入的当前值寄存器的变化而动作。 即使通过传送指令 DMOV 改变当前值（C235~C255），只要没有计数输入，比较输出就不发生变化。 这正如前面“注意事项”讲述的那样，关于高速计数器 C241 等，备有外部复位端子（R），通过复位输入信号的上升沿，执行指令、输出比较结果。 详见以下内容。 外部复位模式 C241 用的外部复位端子。

High-speed counter output contacts, FNC53 (D HSCS), FNC54 (D HSCR), FNC55 (D HSZ) Comparison output of the instruction, all changes in action with the current value of the register count input. Even if we can change the current value (C235~C255) through data move instruction DMOV, the comparing output will not change as long as there is no counter input. Just like the description above in “Notes” section, the high speed counter C241 has a external reset terminal (R) which can be used to reset the rising edge of input signal so as to execute instruction and output the comparing result. Following is the details. External reset terminal of external reset mode C241.



C241 用的外部复位信号
C241 with an external reset signal

在上例中，当 M8025 为 ON 时，C241 的现在值假如为 2000，此时 Y0 为 ON，如果按下外部复位按钮 X1，C241 的现在值变为 0，即使 X0 没有计数输入，此时 Y0 也复位。
In the above example, when M8025 is ON, if the present value of C241 is 2000, Y0 is ON. If an external reset button X1 pressed, the current value of C241 becomes 0, even without counting input of X0, Y0 also reset at this time.

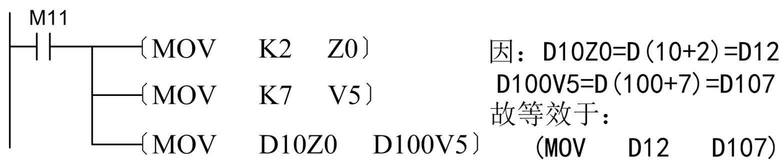
执行完毕标志 M8029

执行完毕标志 M8029
execution finished flag M8029

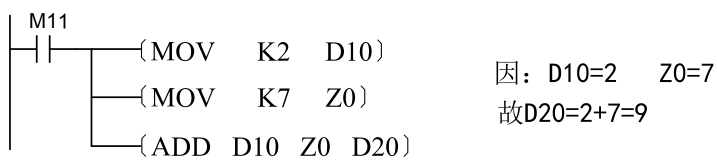
高速脉冲输出、通讯、MTR、HKY、DSW、SEGL、PR 等指令执行完毕标志。
The execution finished flag of high speed pulse output, communication, MTR, HKY, DSW, SEGL and PR instructions.

变址寄存器 D8028、D8029 D8182~D8195

变址寄存器 D8028,D8029,D8182~D8195
Index register
变址寄存器除了和普通的数据寄存器有相同的使用方法外，在应用指令的操作数中， 还可以同其他的软元件编号或数值组合使用。但需注意 LD，AND，OUT 等基本顺控指令或步进梯形图指令的软元件编号不能同变址寄存器组合使用，在程序中我们一般用 Z 或者 V 来进行变址修饰：
The variable address registers can be used in the same way as ordinary data registers, and they can also be used in the operands of application instructions in cooperation with other software component number and value. But should pay attention the soft component ID of LD, AND, OUT, and other basic sequence program instruction or step ladder program instruction can not be used in combination with the index register, we generally use V or Z modified in the program,

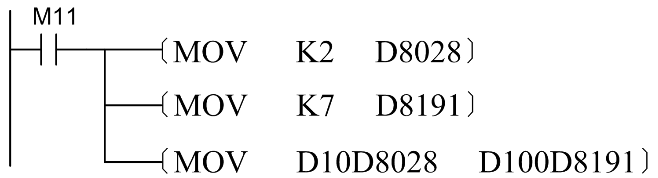


因：
故等效与：
Because:
Equivalent to
亦可以将 Z 、V 当普通寄存器使用
Z and V also can also be used as ordinary registers.



因：
故
Because:

Z、V 有对应的特殊寄存器，如第一个程序等效于
Z and V have corresponding special registers, so the first program is equivalent to



D8028 为 Z0 寄存器内容；D8029 为 V0 寄存器内容；
D8028 is the content of Z0 register; D8029 is the content of V0 register;
D8182 为 Z1 寄存器内容；D8183 为 V1 寄存器内容；
D8182 is the content of Z1 register; D8183 is the content of V1 register;
D8184 为 Z2 寄存器内容；D8185 为 V2 寄存器内容；
D8184 is the content of Z2 register; D8185 is the content of V2 register;
D8186 为 Z3 寄存器内容；D8187 为 V3 寄存器内容；
D8186 is the content of Z3 register; D8187 is the content of V3 register;
D8188 为 Z4 寄存器内容；D8189 为 V4 寄存器内容；
D8188 is the content of Z4 register; D8189 is the content of V4 register;
D8190 为 Z5 寄存器内容；D8191 为 V5 寄存器内容；
D8190 is the content of Z5 register; D8191 is the content of V5 register;
D8192 为 Z6 寄存器内容；D8193 为 V6 寄存器内容；
D8192 is the content of Z6 register; D8193 is the content of V6 register;
D8194 为 Z7 寄存器内容；D8195 为 V7 寄存器内容；
D8194 is the content of Z7 register; D8195 is the content of V7 register;

位状态 M8031~M8034
bit state M8031~M8034
1、 M8031 为 ON 时，清除所有非停电保持的寄存器、继电器等；
M8031 is ON, remove all non-latched registers, relays, etc.
Y、一般用 M、一般用 S 接点状态
contact state of Y component, generally used M component and generally used S component
一般用 T 的接点及计时线圈
contact and timer coil of generally used T component
一般用 C 的接点及计数线圈及复位线圈
contact, timer coil and reset coil of generally used C component
一般用 D 的现在值寄存器
current value register of generally used D component
一般用 T 的现在值寄存器
current value register of generally used T component
一般用 C 的现在值寄存器
current value register of generally used C component

2、 M8032 为 ON 时，清除所有停电保持的寄存器、继电器等；
2, M8032 ON, clears all latched registers, relays, etc.
停电保持用 M、S 的接点状态

contact state of M and S components which can hold their status during power cut
累计型定时器 T 的接点及计时线圈
contact and timer coil of accumulative timer T component
停电保持用 C 及高速计数器 C 的接点、计数线圈
contact and counter coil of C which can hold its status during power cut and high speed counter C component
停电保持用 D 的现在值寄存器
current value register of D component which can hold its status during power cut
累计型定时器 T 的现在值寄存器
current value register of accumulative timer T component
停电保持用 C 及高速计数器 C 的现在值寄存器
current value register of C component which can hold its status during power cut and high speed counter C component

3、 M8033 为 ON 时，停机状态所有的软元件保持运行前的状态不变
3. M8033 ON, all soft components in shutdown maintain the status before running
所有 Y、M、S 的接点状态
All the contact states of Y, M and S component
所有 T 的接点及计时线圈
All the contacts and timer coil of T component
所有 C 及高速计数器 C 的接点、计数线圈
All the contacts and timer coil of C component and high speed C component
所有 D、T、C 的现在值寄存器
All the current value register of D, T and C component

4、 M8034 为 ON 时，所有输出点 Y 变成 OFF。
4. M8034 is ON, all output point Y becomes OFF.
5、 通过强制 RUN/STOP 操作使 M8035(强制 RUN 模式)和 M8036(强制 RUN)变为 ON，起动可编程控制器。
5. By forcing the RUN / STOP operation the M8035 (mandatory RUN mode) and M8036 (mandatory RUN) becomes ON, starting PLC
6、 将 M8037(强制 STOP)置于 ON，可以停止可编程控制器的运行。
6. The M8037 (mandatory STOP) sets ON, to stop the operation of PLC.

恒定扫描模式	M8039	D8039

恒定扫描模式 M8039 D8039
constant scan mode M8039 D8039

驱动辅助继电器 M8039，将目标扫描时间（以 1ms 为单位）预先写入数据寄存器 D8039 中，则可编程控制器的运算周期不会低于该值。 即使运算提早结束时，也在剩余时间内进行等待，扫描时间够 D8039 的值后才返回 0 步。 如果 D8039 的内容小于实际上程序的扫描时间时，则以实际上程序的扫描时间为主。
Drive the auxiliary relay M8039 and then write the target scan time (ms) into data register D8039 in advance, so the operating period of the PLC will not be lower than this value.

Even the operation completed ahead of time the system will wait in the remaining time and return to step 0 only when the scan time equals to the value of D8039. If the D8039 value is less than the actual scan time of the program then the system relies on the latter one.

恒定扫描模式

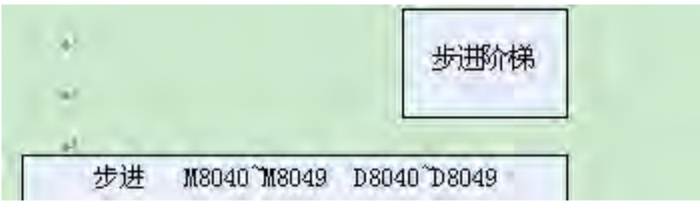
Constant scan mode

将恒定扫描时间设定为 20ms

Set constant scan time as 20ms

和扫描时间有关的指令 RAMP、HKY、SEGL、ARWS、PR，应用上必须用“固定扫描时间模式”或者是和“定时插入中断”搭配使用。特别是 HKY 指令，它是以 4×4 矩阵方式作 16 个数字按钮的输入操作，使用时扫描时间必须固定在 20ms 以上。 D8010~D8012 所显示的扫描时间也包括固定的扫描时间。

Scanning time-related instructions RAMP, HKY, SEGL, ARWS, PR, have to be "fixed scan time mode" or be used with "inserted periodically interrupted". Especially the HKY instruction which implements input of 16 digital buttons through 4x4 matrix, its scan time must be fixed to more than 20ms. The displayed scan time of D8010~D8012 also contains constant scan time.



步进阶梯

stepper ladder

步进 M8040~M8049 D8040~D8049

stepper M8040~M8049 D8040~D8049

1、驱动 M8040 后，即使具备了转移条件也无法进行状态之间的转移。 而且停止状态内的输出将继续其动作。

When M8040 is ON the STL transfer is disabled and the stop state output will continue.

2、步进开始，IST 指令用标志 M8041。

Step start, IST instruction uses the flag M8041

3、启动脉冲，IST 指令用标志 M8042。

Pulse start, IST instruction uses the flag M8042.

4、原点回归状态结束，IST 指令用标志 M8043。

Zero return status end, IST instruction uses the flag M8043.
5、检测到机械原点动作，IST 指令用标志 M8044。
Detect the action of mechanical origin, IST instruction uses the flag M8044.
6、所有输出复位禁止，IST 指令用标志 M8045。
Prohibit all output reset, IST instruction uses the flag M8045.
7、当 M8047 为 ON 后，S0~S999 中任何一个为 ON 时，M8046 自动接通。用于避免与其他流程同时启动或用作工序的动作标志。
When M8047 is ON and any of S0~S999 is ON then M8046 will be closed automatically. Used to avoid the same time start with other processes or be as the action flag for work process.
8、当 M8049 为 ON 后，S900~S999 中任何一个为 ON 时，M8048 自动接通。用于避免与其他流程同时启动或用作工序的动作标志。
When M8049 is ON and any of S900~S999 is ON then M8048 will be closed automatically. Used to avoid the same time start with other processes or be as the action flag for work process.
9、D8040~D8047：将 S0~S999 的最小动作地址号保存在 D8040 中，其他依次。 最大的报警地址号保存在 D8047 中。
9、D8040~D8047：the minimum action address number of S0 ~ S999 will be stored in the D8040, the other in turn. The maximum alarm address is stored in M8047.
10、当 M8049 为 ON 后，D8049 保存 S900~S999 的报警的最小地址号。
10, when M8049 is ON,, D8049 saves the alarm smallest address number of S900 ~ S999

中断禁止
interrupt disable
禁止中断 M8050~M8059
interrupt disable M8050~M8059

使能了相对应的中断禁止以后，即使有中断信号，此时也不会产生中断，例如 M8050 为 ON 后，即使 X0 有中断脉冲如入，I00□也不会产生。
If the interrupt is disabled then the interrupt will not be generated even if there comes the interrupt signal. For example, when M8050 is ON the I00 port will not output even if there is interrupt pulse input to the X0 port.
各个对应的中断定义如下：
The corresponding interrupts are defined respectively as following:

中断允许/禁止设置 **enable interrupt/ disable setting**			
M8050	驱动 I00□中断禁止 Drive I00□ interrupt disabled	X 输入中断，共有 12 个中断，分别对应 X0~X5 端口的上升沿中断、下降沿中断。中： 1=上升沿中断； 0=下降沿中断 X input interrupt, 12 interrupt, corresponding to port X0 ~ X5 rising edge interrupt, falling edge interrupt. 1 = rising edge interrupt, 0 = falling edge interrupt.	每个标志对应 1 个外部中断的控制； Each flag corresponds to an external interrupt control 当该 M 标志为 OFF 时，允许对应的 X 中断； When the M flag is OFF, allowing the corresponding X interrupt; 当该 M 标志为 ON 时，禁止对应的 X 中断； When the M flag is OFF, prohibiting the corresponding X interrupt;
M8051	驱动 I10□中断禁止 Drive I10□ interrupt disabled		
M8052	驱动 I20□中断禁止 Drive I20□ interrupt disabled		
M8053	驱动 I30□中断禁止 Drive I30□ interrupt disabled		
M8054	驱动 I40□中断禁止 Drive I40□ interrupt disabled		
M8055	驱动 I50□中断禁止 Drive I50□ interrupt disabled		
M8056	驱动 I6 口口中断禁止 Drive I6 disable interrupt	定时中断 0 Time interrupt 0	
M8057	驱动 I7 口口中断禁止 Drive I7□□ interrupt disabled	定时中断 1 Timer interruption1	
M8058	驱动 I8 口口中断禁止 Drive I8□□ interrupt disabled	定时中断 2 Timer interruption 2	
M8059	驱动 计数器中断禁止 Drive counter interrupt disabled	高速计数中断，共 6 个 High speed counter interrupt, total 6	为 ON 时，禁止 I010～I060 的中断 When ON, prohibit interrupt I010～I060

但 X0~X5 的脉冲捕捉功能不受中断禁止的限制。

But X0 ~ X5 pulse capture function is not restricted by interrupt prohibition.

联机功能
link operation function

并联协议 M8070~M8073 M8162 D8070
Parallel protocol M8070~M8073 M8162 D8070

并联协议，M8070 置位为并联协议主站，M8071 置位为并联协议从站，M8070 与 M8071 在一台 PLC 中不能同时置位，若同时置位并联协议无效，若不存在其它优先协议，可通过 D8126 设置，D8126=50h 为并联协议主站，D8126=5h 为并联协议从站。
M8070 will be driven when the PLC is a master station in a parallel link application. M8071 will be driven when the PLC is a slave station in a parallel link application. The M8070 and M8071 can’t be driven simultaneously in one PLC, or the parallel link protocol will be invalid. The parallel link protocol can also be setup through D8126 if there aren’t any other high level protocols. Setting D8126 to 50h can set the PLC to a master station in a parallel link application, and setting D8127 to 5h can set the PLC to a slave station.

D8070：判断通讯出错的时间设定，默认为 500。
D8070: the time set of determine communication error, the default is 500
M8162：高速并联连接模式。
M8162: high speed parallel connection mode

	主站发送（从站接收） Master send (Slave receive)	从站发送（主站接收） Salve send (Master receive)
普通模式 Normal mode M8162=0	M800~M899 D490~D499	M900~M999 D500~D509
高速模式 High speed mode M8162=1	D490~D491	D500~D501

具体功能应用设置请看通讯部分并联协议的介绍。
Application of specific functions set see parallel communication protocol

N:N 协议
N:N protocol

用户只需要设置一台 PLC 为 N：N 协议主站，另外多 PLC 设置为 N：N 协议从站，且所有使用该协议的 PLC 串口连接起来，不需要用户程序干预，即可实现多台 PLC 间互相交换数据。

Users only need to set up a PLC for the N:N protocol master station, the other PLCs are set to N:N protocol master station, and all use of the PLC serial link protocol, without user intervention program, you can achieve more than one PLC to exchange data.

D8176：站点号，范围 0~7，0 表示主站点；

D8176: station number, range 0~7. 0 is master station.

D8177：从站点的总数，范围 1~7，仅主站需要；

D8177：number of salve stations, range 1~7. Only master needs it.

D8178：刷新范围（模式）设置，范围 0~2，仅主站需要；

D8178：Fresh range (mode) setting, range 0~2. only master needs it.

D8179：重试次数设定，仅主站需要；

D8179： retry times setting. Only master needs it.

D8180：通信超时设置，*10ms，仅主站需要；

D8180：communication over time setting, *10ms. Only master needs it.

M8183～M8190：通信出错标志，M8183 对应第 0 号站点（主站），M8184 对应第 1 号站点，依次类推，M8190 对应第 7 号站点；

Communications error flag, M8183 corresponds to No.0 station (main station), M8184 to No. 1, and so on, M8190 to No. 7;

M8191：正在执行数据传送；

M8191：Ongoing data transmission

D8201：监控当前连接扫描时间；

D8201： Monitoring the current connection scan time

D8202：监控最大连接时间；

D8202：Monitoring the maximum connection time

D8203：监控主站通讯错误次数，最大计数到 10000 次就停止计数；

D8203：Monitoring the number of master station communication error, the maximum count to 10,000 times to stop counting

D8204~D8210：分别监控从站 1~7 通讯错误次数，最大计数到 10000 次就停止计数；

D8204~D8210：Seperately monitoring the number of slave stations 1~7 communication error, the maximum count to 10,000 times to stop counting

D8211：主站通讯错误代码；

D8211：Master station communication error code

D8212~D8218：分别为从站 1~7 通讯错误代码。D8211~D8218 的错误代码含义可查出错信息说明。

D8212~D8218: The slave station 1~7 communication error code. The error information can be found from error codes D8211 ~ D8218.

朗读

显示对应的拉丁字符的拼音

字典 - 查看字典详细内容

具体功能应用设置请看通讯部分 N：N 协议的介绍。
See N: N protocol description of communications application specific for detail function application.

特殊功能
special function

输出口初始化 M8085~M8089
output initialization M8085~M8089

通过使用特殊位 M8085~M8089(分别对应 Y0~Y4)为 ON，在 PLSY，PLSR，DRVI，DRVA 指令中可以实现如下功能：
By using a special bit M8085 ~ M8089 (corresponding to Y0 ~ Y4) is ON, the PLSY, PLSR, DRVI, DRVA instruction can achieve the following functions:
在驱动特殊位为 ON，可以马上启动下条脉冲输出指令，不需要上条能流无效的处理；
Drive special bit as ON, you can immediately start the next section pulse output instruction, not invalid on the last section process;

输出完成中断 M8090~M8084
Output completion interrupt M8090~M8084
通过使用特殊位 M8090~M8094(分别对应 Y0~Y4)为 ON，在 PLSY，PLSR，DRVI，DRVA 指令中可以实现如下功能：
By using a special bit M8090 ~ M8094 (corresponding to Y0 ~ Y4) is ON, the PLSY, PLSR, DRVI, DRVA instruction can achieve the following functions:
可以实现脉冲输出完成中断；具体对应如下：
Pulse output completion interrupt can be achieved; specific correspondence is as follows:

端口号 Port No.	使用特殊位 Using special bit	对应的用户中断 Relative user interrupt
Y0	M8090	I502
Y1	M8091	I503
Y2	M8092	I504
Y3	M8093	I505
Y4	M8094	I506

具体功能设置请看 H2U 特殊功能的介绍。

See H2U specific feature set introduction to detail functions

加减速时间M8135~M8139 D8104~D8108 D8165~D8169

加减速时间

Acceleration and deceleration time

通过使用特殊位 M8135~M8139(分别对应 Y0~Y4)为 ON，在 PLSY，PLSR，DRVI，DRVA 指令中可以实现如下功能：

By using a special bit M8135 ~ M8139 (corresponding to Y0 ~ Y4) is ON, the PLSY, PLSR, DRVI, DRVA instruction can achieve the following functions:

可以在运行中更改输出脉冲个数(可大可小，只能在加速和匀速的时候变，在减速的时候无效)；

You can change the output pulse number in running (can be very flexible, can only be changed when the acceleration and constant speed, slowing down invalid);

同时在 PLSR，DRVI，DRVA 指令中减速时间分别由如下寄存器定义：

At the same time deceleration time in PLSR, DRVI, DRVA instruction is defined by the following register:

端口号 Port No.	使用特殊位 Using special bit	对应的寄存器 Relative register
Y0	M8135	D8165
Y1	M8136	D8166
Y2	M8137	D8167
Y3	M8138	D8168
Y4	M8139	D8169

在 M8135 为 ON 的时候，YO 的减速时间由 D8165 决定，默认 100ms。依次类推，在 DRVI，DRVA 指令中加速时间分别由如下寄存器定义：

When M8135 is ON the deceleration time of YO is determined by D8165, and the default value is 100ms. And so on, acceleration time in DRVI, DRVA instruction is defined by the following register:

端口号 Port No.	使用特殊位 Using special bit	对应的寄存器 Relative register
Y0	M8135	D8104
Y1	M8136	D8105
Y2	M8137	D8106

Y3	M8138	D8107
Y4	M8139	D8108

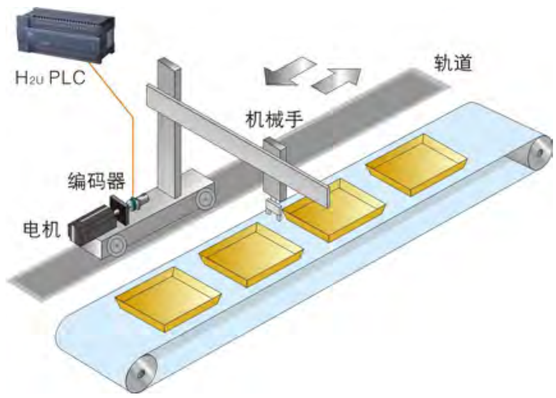
在 M8135 为 ON 的时候，YO 的加速时间由 D8104 决定，默认 100ms。依次类推。
When M8135 is ON the acceleration time of YO is determined by D8104, and the default value is 100ms. And so on.
具体功能设置请看 H2U 特殊功能的介绍。
See H2U specific feature set introduction to detail functions

高速计速器多用户中断M8084 D8084~D8086

高速计速器用户中断
High speed counter user interrupt
为了满足在高速计速器运行时，支持多高速自由任务，可以设置任意一个高速计数器（C235~C255）产生多个中断，实现了如下使用规律：此功能命名为高速计速器多用户中断，最大支持 24 个；
In order to meet the high-speed meter speed runs, support high-speed free multi-task, you can set any high-speed counter (C235 ~ C255) to generate multiple interrupts. Achieve the following law: This feature is called high-speed counter multi-user interrupt, maximum support 24;

标志位 Flag bit	描述 Description
M8084	为ON使能高速计速器多用户中断 Be ON, enable high speed counter multi-user interrupt
D8084	为高速计数器序号C235~C255 High speed counter serial number C235~C255
D8085	对应的用户中断个数，最大24个，从I507~I530 Number of relative user interrupt, max 24, I507~I530
D8086	对应多个比较点数据的序号，只能为D元件，如200为D200开始的双字 Correspond to multi serial number of comparison point data, only D componnents, such as 200 for the double word start from D200

例如：当行车在轨道上执行装卸任务时，要求运行在不同位置时快速执行不同任务，使用高速计数器多用户中断处理功能，具有响应快操作简单的优势。
For example: when bridge crane on the track handling goods, required to run fast when in different locations to perform different tasks, handling capabilities of high-speed counter multi-user interrupt is with the advantage of quick response and simple operation.



电机
motor
编码器
encoder
机械手
robot
轨道
rail

具体功能设置请看 H2U 特殊功能的介绍。
See H2U specific feature set introduction to detail functions

计米器、测速表功能 M8100~M8105

机米器、测速表功能 M810~M8105
Meter, velocity meter function M810~M8105
在 SPD 指令中，如果功能使能标志 M8100~M8105(分别对应 X0~X5)为 ON，则 SPD S1 S2 D 写法中的 D 的定义和原指令有改变，

In SPD Instruction, if the feature enable flag M8100 ~ M8105 (corresponding to X0 ~ X5) is ON, the definition and the original instruction of the D in the SPD S1 S2 D has changed

对应的 M8100~M8105 为 OFF 时：
When the corresponding M8100~M8105 is OFF:

D +0：为在 S2 时间内的脉冲个数，为 16 位的数据； D +1：本次时间段对脉冲的计数； D +2：用于测定剩余时间(MS)。

+0: The number of pulses in the time period S2 for the 16-bit data; D +1: the pulse count of this time; D +2: used to determine the remaining time (MS).

对应的 M8100~M8105 为 ON 时：

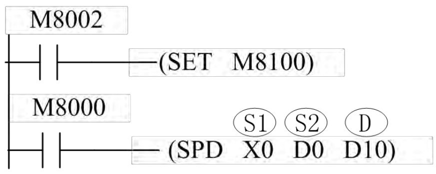
When the corresponding M8100~M8105 is ON:

+0：为在S2 时间内的脉冲个数，为 16 位的数据； D +1， D+2：为每分钟内的脉冲个数，为 32 位的数据；

+0: The number of pulses in the time period S2 for the 16-bit data; D+1, D+2: The number of pulses per minute for 32-bit data;

例如指令：

For example:



X0为输入端口;
D0为单位时间(mS);
D10 为D0 时间段总脉冲个数;
D11,D12 为运行频率=1 分钟脉冲个数*10(0.1 为单位);

X0 为输出端口；

X0 is output port;

D0 为单位时间（mS）；

D0 is unit time (mS);

D10 为 D0 时间段总脉冲个数；

D10 is number of pulse in D0 time section;

D11，D12 为运行频率=1 分钟脉冲个数*10（0.1 为单位）；

D11, D12 is running frequency = number of pulse per minute * 10 (the unit: 0.1)

具体功能设置请看 H2U 特殊功能的介绍。

See H2U specific feature set introduction to detail functions

输出端口清零 M8140 D8156~D8160

输出端口清零

Output port clear 0

当 M8140 为 ON 的时候，用 ZRN 指令回到原点后 D8156~D8160 对应的输出点有一个扫描周期的 ON 输出，用来 CLR 伺服。

When M8140 is ON the output point corresponding to D8156~D8160 will be ON for one scan period after the system returned to zero by ZRN instruction, which can be used for CLR servo control.

D8156：Y0 端口清零信号定义，默认 5=Y05

D8156：Signal definition of Port Y0 clear 0. Default 5=Y05

D8157：Y1 端口清零信号定义，默认 6=Y06

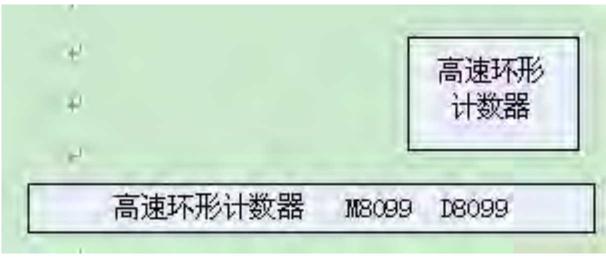
D8157：Signal definition of Port Y1 clear 0. Default 6=Y06

D8158：Y2 端口清零信号定义，默认 7=Y07

D8158：Signal definition of Port Y2 clear 0. Default 7=Y07

D8159：Y3 端口清零信号定义，默认 8=Y10

D8159：Signal definition of Port Y3 clear 0. Default8=Y10
D8160：Y4 端口清零信号定义，默认 9=Y11
D8160：Signal definition of Port Y4 clear 0. Default 9=Y11



高速环形计数器
high speed ring counter

特殊数据寄存器 D8099 在 M8099 被驱动后，从下一个扫描周期开始，以 0.1ms 时钟累计计算。 当 D8099 内容超过 32767 时，从 0 开始重新计算。
After M8099 is driven the special data register D8099 will increase 0.1ms accumulatively from the next scan period. The value of D8099 will restart from 0 when it exceeds 32767.
利用累积型的 1ms 定时器或特殊数据寄存器 D8099（高速环形计数器），可以测定 1ms 或 0.1ms 为单位的脉冲的宽度
The pulse width which takes 1ms or 0.1ms as unit can be measured through accumulative type 1ms timer or special data register D8099 (high speed ring counter).

通讯、链接
communication and link

COM0协议 COMO protocol	D8116 设定 D8116	半/全双工 模式 Half/full	通信格式 Communi cation

	setting	duplex mode	format
下载协议/HMI监控协议 Download protocol/ HMI monitoring protocol	01h	由跳线JP0决定 set by jumper JP0	固定为“7E1” Fixed to be “7E1”
MODBUS-RTU 从站 MODBUS-RTU slave station	02h	半双工 Half duplex	由 D8110 决定 set by D8110
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half duplex	由 D8110 决定 set by D8110
其他协议（含RS指令） Other portocol (including RS instruction)	不支持 No support		

COM1: M8121~M8124 M8129 D8110~D8119

COM1 协议 COM1 protocol	D8126 设定 D8126 setting	半/全双工模式 Half/full duplex mode	通信格式 Communication format
RS 指令 RS instruction	00h	由 D8120 的 Bit10 设定* Set by Bit10 in D8120	由 D8120 决定 Set by D8120
HMI 监控协议 HMI monitoring protocol	01h	半双工 Half duplex	固定 Fixed
并联协议主站 Parallel protocol master station	50h	半双工 Half duplex	固定 Fixed
并联协议从站 Parallel protocol slave station	05h	半双工 Half duplex	固定 Fixed

N：N 协议主站 N:N protocol master station	40h	半双工 Half duplex	固定 Fixed
N：N 协议从站 N:N protocol slave station	04h	半双工 Half duplex	固定 Fixed
计算机链接协议 Computer link protocol	06h	半双工 Half duplex	由 D8120 决定 Set by D8120
MODBUS-RTU 从站 MODBUS-RTU Slave station	02h	半双工 Half duplex	
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half duplex	
RS 指令 RS instruction	10h	由 D8120 的 Bit10 设定* Set by Bit 10 in D8120	
MODBUS RTU 指令 MODBUS RTU instruction	20h	半双工 Half duplex	
MODBUS-ASC 指令 MODBUS-ASC instruction	30h	半双工 Half duplex	

*RS 指令半双工/全双工模式由 D8120 的 Bit10 设定：

* half duplex/ full duplex mode of RS instruction can be set by Bit10 of D8120:

1：半双工 RS485（使用标配端口）

1: half duplex RS485 (standard port)

0：全双工 RS232C/RS422（需要使用扩展小板 H2U-232BD 或 H2U-422BD）

0: full duplex RS232C/RS422 (with expansion board H2U-232BD or H2U-422BD)

M8120	保留 Reserved	D8120	通讯格式，界面配置设定，默认为0 Communication format, the interface configuration settings, the default is 0
M81	发送等待中（RS指令） Waiting to send (RS instruction)	D81	站号设置，界面配置设定，默认为1 Station number setting, the

21		21	interface configuration settings, the default is 1
M8122	发送标志（RS指令） Send flag (RS instruction) 指令执行状态（MODBUS） Instruction execution state (MODBUS)	D8122	传送剩余数据数量（仅对RS指令） The amount of remaining data transmitted (RS instruction only)
M8123	接收完成标志（RS） Receive complete flag (RS) 通讯错误标志（MODBUS） Communication error flag (MODBUS)	D8123	接收到的数据数量（仅对RS指令） The amount of received data (RS instruction only)
M8124	接收中（仅对RS指令） Receiving (only RS instruction)	D8124	起始字符STX（仅对RS指令） Start character STX (only RS instruction)
M8125	保留 Reserved	D8125	终止字符ETX（仅对RS指令） Termination character ETX (only RS instruction)
M8126	为ON时485BD扩展卡有效 The expansion card 485BD valid when ON	D8126	通讯协议设定，界面配置设定，默认为0 Protocol settings, the interface configuration settings, the default is 0
M8127	保留 Reserved	D8127	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8128	保留 Reserved	D8128	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8129	超时判断 Time-out judgement	D8129	通讯超时时间判断，界面配置设定，默认为10（100ms） Determination of communication time-out, interface configuration settings, the default is 10

			（100ms）

COM0与COM1的功能区别

COM0 硬件为标准 RS485 和 RS422，两者兼容，通过跳线决定。 接口端子为 8 孔鼠标头母座。

COM0 hardware is standard RS485 and RS422 which are compatible with each other, and selection can be made through jumper. The connection terminal is a female 8-pins PS/2 connector.

COM1 硬件为 RS485，接口为接线端子。

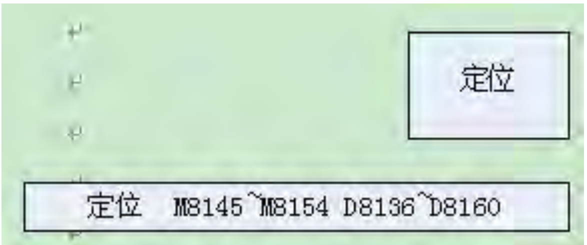
COM1 hardware is RS485 and the terminal is terminal block.

COM0 的 485 只能做从站，不能做主站，不支持 RS 指令、联机功能、计算机链接协议等；

COM1 的 485 可做主站或者从站，支持 RS 指令、联机功能、计算机链接协议等。

The 485 of COM0 can only be slave station which doesn’t support RS instruction, linking function and computer link protocol and so on;

The 485 of COM1 can be master or slave station, and it supports RS instruction, linking function and computer link protocol and so on;



定位

Positioning

M8145：在发脉冲的时候将 M8145 置 ON。 则 Y0 马上停止脉冲输出，PLSY、DRVI 等指令在下一次驱动能流的时候重新从零发脉冲。 DRVA 指令在下一次驱动能流的时候接着发剩余的脉冲。

M8145：When the M8145 is set to ON during the pulse output process, Y0 will stop the output pulse immediately, and the PLSY and DRVI instruction will output pulses from zero when conducting the next power flow. The DRVA instruction can output the remaining pulses when conducting the next power flow.

M8146：在发脉冲的时候将 M8146 置 ON。 则 Y1 马上停止脉冲输出，PLSY、DRVI 等指令在下一次驱动能流的时候重新从零发脉冲。 DRVA 指令在下一次驱动能流的时候接着发剩余的脉冲。

M8146：When the M8146 is set to ON during the pulse output process, Y1 will stop the output pulse immediately, and the PLSY and DRVI instruction will output pulses from zero when conducting the next power flow. The DRVA instruction can output the remaining pulses when conducting the next power flow.

M8152：在发脉冲的时候将 M8152 置 ON。 则 Y2 马上停止脉冲输出，PLSY、DRVI 等指令在下一次驱动能流的时候重新从零发脉冲。 DRVA 指令在下一次驱动能流的时候接着发剩余的脉冲。
M8152：When the M8152 is set to ON during the pulse output process, Y2 will stop the output pulse immediately, and the PLSY and DRVI instruction will output pulses from zero when conducting the next power flow. The DRVA instruction can output the remaining pulses when conducting the next power flow.
M8153：在发脉冲的时候将 M8153 置 ON。 则 Y3 马上停止脉冲输出，PLSY、DRVI 等指令在下一次驱动能流的时候重新从零发脉冲。 DRVA 指令在下一次驱动能流的时候接着发剩余的脉冲。
M8153：When the M8153 is set to ON during the pulse output process, Y3 will stop the output pulse immediately, and the PLSY and DRVI instruction will output pulses from zero when conducting the next power flow. The DRVA instruction can output the remaining pulses when conducting the next power flow.
M8154：在发脉冲的时候将 M8154 置 ON。 则 Y4 马上停止脉冲输出，PLSY、DRVI 等指令在下一次驱动能流的时候重新从零发脉冲。 DRVA 指令在下一次驱动能流的时候接着发剩余的脉冲。
M8154：When the M8154 is set to ON during the pulse output process, Y4 will stop the output pulse immediately, and the PLSY and DRVI instruction will output pulses from zero when conducting the next power flow. The DRVA instruction can output the remaining pulses when conducting the next power flow.
M8147：在 Y0 有脉冲输出的时候，M8147 为 ON，停止时为 OFF，可用来做监控；
M8147: If YO has pulse output, then M8147 will be ON, and if the pulse output stops then M8147 will be OFF. So this can be used for monitoring;
M8148：在 Y1 有脉冲输出的时候，M8148 为 ON，停止时为 OFF，可用来做监控；
M8148: If Y1 has pulse output, then M8148 will be ON, and if the pulse output stops then M8148 will be OFF. So this can be used for monitoring;
M8149：在 Y2 有脉冲输出的时候，M8149 为 ON，停止时为 OFF，可用来做监控；
M8149: If Y2 has pulse output, then M8149 will be ON, and if the pulse output stops then M8149 will be OFF. So this can be used for monitoring;
M8150：在 Y3 有脉冲输出的时候，M8150 为 ON，停止时为 OFF，可用来做监控；
M8150: If Y3 has pulse output, then M8150 will be ON, and if the pulse output stops then M8150 will be OFF. So this can be used for monitoring;
M8151：在 Y4 有脉冲输出的时候，M8151 为 ON，停止时为 OFF，可用来做监控。
M8151: If Y4 has pulse output, then M8151 will be ON, and if the pulse output stops then M8151 will be OFF. So this can be used for monitoring;
D8136：Low word；D8137：High word
作为 Y0 和 Y1 输出定位指令的当前值数据累加寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y0 and Y1 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these

instructions, the current value are the accumulated value of number of pulse output;
D8140：Low word；D8141：High word
作为 Y0 输出定位指令的当前值数据寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y0 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these instructions, the current value are the accumulated value of number of pulse output;

D8142：Low word；D8143：High word
作为 Y1 输出定位指令的当前值数据寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y1 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these instructions, the current value are the accumulated value of number of pulse output;

D8150：Low word；D8151：High word
作为 Y2 输出定位指令的当前值数据寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y2 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these instructions, the current value are the accumulated value of number of pulse output;

D8152：Low word；D8153：High word
作为 Y3 输出定位指令的当前值数据寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y3 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these instructions, the current value are the accumulated value of number of pulse output;

D8154：Low word；D8155：High word
作为 Y4 输出定位指令的当前值数据寄存器使用，用 DRVI、DRVA 指令时，对应旋转方向增减当前值，另外，由于 PLSY、PLSR 只有脉冲输出没有方向信号的指令亦使用相同的当

前值寄存器，因此当执行这些指令时，当前值为脉冲输出数的累加值；
A current value of the data accumulative register used as Y4 output the positioning instruction. With DRVI, DRVA instruction, the corresponding increase or decrease the current value of the rotation direction. In addition, since PLSY, PLSR which are the instructions only output pulse without direction signal use the same register, when implementing these instructions, the current value are the accumulated value of number of pulse output;

D8145：执行 DRVI、DRVA 等指令时的基底速度。 控制步进电机时，设定速度时需考虑步进电机的共振区域和自动起动频率。设定范围：最高速度（D8147，D8146）的 1/10 以下。超过该范围时，自动降为最高速度的 1 / 10 数值运行。
D8145： The base speed to execute such instruction DRVI, DRVA. Speed setting should take the resonant area and self-start frequency of the stepper motor into consideration when controlling stepper motors. Setting range: maximum speed (D8147, D8146) of 1 / 10. If the setting value were to exceed this range, then the actual speed will be 1/10 of the maximum speed.

D8146：Low word；D8147：High word

执行 DRVI 、DRVA 等指令时的最高速度。 高速输出口输出脉冲的频率必须小于该最高速度。设定范围：10~100，000（Hz）
This is the maximum speed when executing DRVI and DRVA instructions. The pulse frequency of the high speed output port should not exceed this speed. Setting range: 10~100，000（Hz）
D8148：DRVI、DRVA、PLSR 指令时的加减速时间。加减速时间表示到达最高速度（D8147，D8146）所需的时间。因此，当输出脉冲频率低于最高速度（D8147，D8146）时，实际加减速时间会缩短。设定范围：50~5，000(ms)；
D8148：The acceleration and deceleration time of DRVI、DRVA、PLSR instruction. The acceleration and deceleration time means the time required to reach maximum speed (D8147, D8146). Therefore, when the output pulse frequency is lower than the highest speed (D8147, D8146), the actual acceleration and deceleration time will be shortened. Setting range: 50~5，000(ms)；
M8135～M8139:(D8165～D8169)
M8135：Y0 端口更改脉冲和减速时间有效标志位；通过使用该特殊位可以实现在运行中更改输出的脉冲个数同时减速时间可以单独修改。D8165 对应 Y0 的减速时间。
M8135：Flag for Y0 port change pulse and deceleration time valid; by using the special bit can change output pulses in the operation while the deceleration time can be individually modified. D8165 corresponds to Y0’s deceleration time.
M8136：Y1 端口更改脉冲和减速时间有效标志位；通过使用该特殊位可以实现在运行中更改输出的脉冲个数同时减速时间可以单独修改。D8166 对应 Y0 的减速时间。
M8136：Flag for Y1 port change pulse and deceleration time valid; by using the special bit can change output pulses in the operation while the deceleration time can be individually modified. D8166 corresponds to Y1’s deceleration time.

M8137：Y2 端口更改脉冲和减速时间有效标志位；通过使用该特殊位可以实现在运行中更

改输出的脉冲个数同时减速时间可以单独修改。D8167 对应 Y0 的减速时间。
M8137：Flag for Y2 port change pulse and deceleration time valid; by using the special bit can change output pulses in the operation while the deceleration time can be individually modified. D8167 corresponds to Y2's deceleration time.

M8138：Y3 端口更改脉冲和减速时间有效标志位；通过使用该特殊位可以实现在运行中更改输出的脉冲个数同时减速时间可以单独修改。D8168 对应 Y0 的减速时间。
M8138：Flag for Y3 port change pulse and deceleration time valid; by using the special bit can change output pulses in the operation while the deceleration time can be individually modified. D8168 corresponds to Y3's deceleration time.

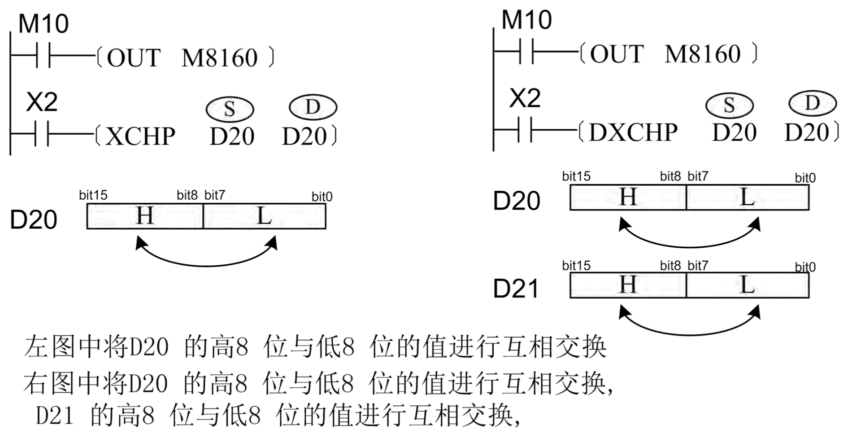
M8139：Y4 端口更改脉冲和减速时间有效标志位；通过使用该特殊位可以实现在运行中更改输出的脉冲个数同时减速时间可以单独修改。D8169 对应 Y0 的减速时间。
M8139：Flag for Y4 port change pulse and deceleration time valid; by using the special bit can change output pulses in the operation while the deceleration time can be individually modified. D8169 corresponds to Y4's deceleration time.

M8135～M8139 只适用于以下指令:PLSY.PLSR.DRVI.DRVA。
M8135～M8139 only applies to the following instructions: PLSY.PLSR.DRVI.DRVA。

数据处理
Data processing
XCH 的 SWAP 功能
SWAP function of XCH

当特殊变量 M8160＝1 时，且 D 与 S 为同一地址，完成的操作将是高 8 位与低 8 位的交换，32 位的指令也一样，完成的操作将是将两个寄存器的高 8 位与低 8 位的值各自进行互相交换。相当于 SWAP 指令的操作，一般用 SWAP 指令来实现.

When special variable M8160 ＝ 1, and D is the same address with S , the operation will be the exchange between high 8-bit and low 8-bit. Similar to 32bit instructions, the operation will be to exchange values of two registers between high 8-bit and low 8-bit respectively. SWAP instruction is equivalent to the operation, generally with a SWAP instruction to achieve.



左图中将 D20 的高 8 位与低 8 位的值进行互相交换
In left diagram D20 exchanges its value between low 8-bit and high 8-bit
右图中将 D20 的高 8 位与低 8 位的值进行互相交换，
In right diagram D20 exchanges its value between low 8-bit and high 8-bit
D21 的高 8 位与低 8 位的值进行互相交换，
D21 exchanges its value between low 8-bit and high 8-bit

8位与16位模式　M8161

8 位与 16 位模式
8 bit and 16 bit mode
M8161 标志决定了变量的宽度模式，当 M8161=OFF 时，为 16bit 模式；当 M8161=ON 时，为 8bit 模式，因此实际使用变量区域的长度增加。
M8161 flag determines the width mode of variables. If M8161 = OFF then the variables are 16 bit mode; If M8161 = ON then the variables are 8 bit mode, so the actual length of variable area will increase.
在 ASC/RS/ASCII/HEX/CCD 中应用。
move points variable mode M8164 D8164

传送点数可变模式　M8164　D8164

Variable transmission points mode

FROM/T0 指令的传送点数可变模式：若 M8164＝ON，执行 FROM/T0 指令时，特殊数据寄存器 D8164（FROM/T0 指令的传送点数指定寄存器）的内容作为传送点数 n 进行处理；
FROM/TO move points variable mode: If M8164 = ON then the value of special data register D8164 (move points register of FROM/TO instruction) will be treated as move points n;

位切换字功能　M8167

位切换字功能
The function to change bit to word
在 HEY 指令中将 M8167 置为 ON，HEY 指令将⓪～Ⓕ按键按 16 进制数据进行存储，保存

到 D2 单元。

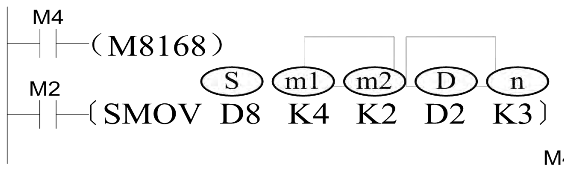
HEY sets M8167 as ON, stores button ⓪～Ⓕ at Hex binary data, save to unit D2.

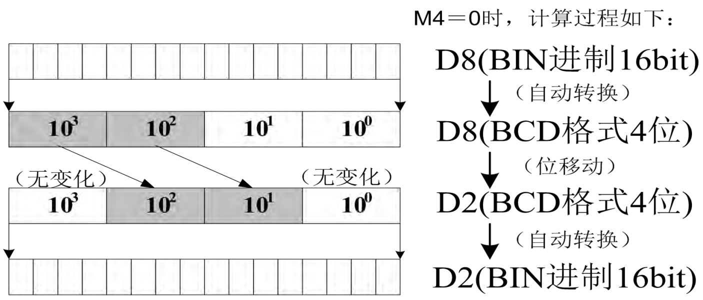
例：[123BF]输入后，D2 中以 BIN 形式存储[123BF]，即将 A~F 的功能改变，详细介绍请参考 HEY 指令。

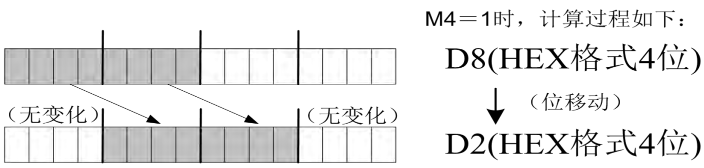
Example: input [123BF], [123BF] is stored at the BIN in D2, change A ~ F function. please refer HEY instruction for detailed.

SMOV十进制与十六进制切换功能 M8168

SMOV 十进制与十六进制切换功能
SMOV: function switching decimal and hexadecimal
在 SMOV 指令中，当 M8168 为 OFF 时是 BCD 模式（十进制的位），当 M8168 为 ON 时是 BIN 模式，在 BIN 模式下以 4 个位作为一个单位作传送（十六进制的位）.
In SMOV instruction, when M8168 is OFF it is a BCD mode (decimal digits), when the M8168 is ON it is BIN mode. In BIN mode, the four bits as a unit for transfer (hex digits).







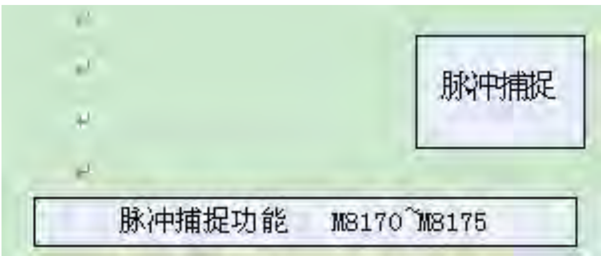
（无变化）
(No change)
M4=0 时，计算过程如下：
When M4=0, Calculated as follows:
D8(BIN 进制 16bit)
D8(BIN digit16bit)
自动转换
Automatic conversion
D8（BCD 格式 4 位）
D8（BCD format 4 bits）

（位移动）
(move bit)
D2（BCD 格式 4 位）
D2（BCD format 4 bits）

D2（BIN 进制 16bit）
D2（BIN digit16bit）
M4=1 时，计算过程如下：
D8（HEX 格式 4 位）
D8（HEX format 4 bits）

D2（HEX 格式 4 位）
D2（HEX format 4 bits）

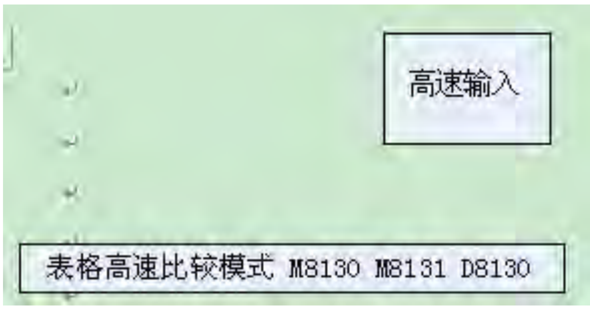
假设 D8=K1234，D2=K5678，则当 M8168 为 OFF 时（BCD 模式），将 M2 置 ON，则 D2 的值变为 K5128；
Assuming D8 = K1234, D2 = K5678, then when M8168 is OFF, (BCD mode), the M2 is set ON, then the value of D2 into K5128;
当 M8168 为 ON 时（BIN 模式），此时 D8=H04D2=K1234，D2=H162E=K5678，将 M2 置 ON，则 D2=H104E=K4174
When M8168 is ON, (BIN mode), then D8 = H04D2 = K1234, D2 = H162E = K5678, M2 is set to ON, then D2 = H104E = K4174



脉冲捕捉
pulse capture
脉冲捕捉功能
Pulse capture function

M8170 X00 脉冲捕捉
M8170 X00 pulse capture
M8171 X01 脉冲捕捉
M8171 X01 pulse capture
M8172 X02 脉冲捕捉
M8172 X02 pulse capture

M8173　X03 脉冲捕捉
M8173 X03 pulse capture
M8174　X04 脉冲捕捉
M8174 X04 pulse capture
M8175　X05 脉冲捕捉
M8175 X05 pulse capture
若需要对出现在 X0～X5 端口的瞬间脉冲信号作出反应，但对反应动作时间没有特别要求，就可以使用"脉冲捕捉"功能，PLC 会将出现在 X0～X5 端口的上升沿信号保存在 M8170~M8175 单元，主程序中可作为判断处理的依据，响应处理完毕，可人为将之清除。执行中断允许 EI 指令后，当输入点 X000~X005OFF→ON 变化时，特殊辅助继电器 M8170~M8175 置位进行中断处理。 为了再次获得输入，必须利用程序对设定的元件进行复位操作。脉冲捕捉动作同个别中断禁止用辅助继电器 M8050~M8055 的动作无关，M8050~M8055 的置 ON 不能禁止此捕捉功能。
The "pulse capture" function can be used when response to instantaneous pulse signal at X0～X5 ports is needed without special requirement of response time. PLC will store the rising edge signal of X0～X5 ports to M8170~M8175 which can be used by main routine to judge and process and can be cleared manually after response. Execute EI instruction for Interrupt enable, when the input changes X000 ~ X005OFF → ON, the special auxiliary relay M8170 ~ M8175 set for interrupt handling. Reset to preset components must be carried out by program to acquire pulse again. It is unrelated between the action of pulse capture with the action of the individual interrupt prohibits auxiliary relays M8050 ~ M8055. Setting ON in M8050 ~ M8055 does not prohibit the capture function.



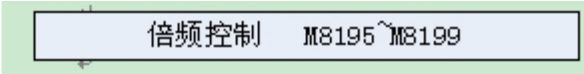
告诉输入
High speed input

表格高速比较模式
High speed table comparison mode

在表格高速比较模式中，第一行的数据一致时，表格计数器 D8130 变为 1，并进入第二行操作。 以下同样动作，最后一行操作完毕时，完毕标志 M8l31 动作，回到初始行重复动作。
In the high speed table comparison mode, when the data of first row is the same then the table counter D8130 changes to 1 and proceed to the second row and so forth. After the last row the operation finished flag M8131 actuated and returns to the initial row.

具体应用请参照：HSZ 指令。

Please refer to the specific application: HSZ instructions



倍频控制

Double frequency control

A/B 相高速计数器 T251～T255 有 1 倍频和 4 倍频两种频率模式，分别由特殊寄存器 M8195～M8199 设定。 AB 相高速计数器的信号，占用两个脉冲输入口，对 PLC 的等效脉冲数影响按 2 倍计算，若 C251～C255 的 A/B 输入 1 倍频模式时，最大高速输入频率为 50kHz。 若 C251～C255 的 A/B 输入 4 倍频模式时，为软件计数模式，最大高速输入频率降为 25kHz。

A/B phase high speed counter T251～T255 has two frequency modes of 1 double-frequency and 4 fold frequency which is defined respectively by special registers M8195～M8199. The signal of AB phase high speed counter occupies two pulse input ports and the equivalent pulse number of PLC will be multiplied by 2. If the A/B input mode of C251～C255 is double-frequency mode then the maximum high speed input frequency is 50kHz. If the A/B input mode of C251～C255 is 4 fold frequency mode then the counter is in software mode and the maximum high speed input frequency is 25kHz.

当 M8195 为 OFF 的时候，C251 的 AB 相输入为一倍频；当 M8195 为 ON 的时候，C251 的 AB 相输入为四倍频，如下图：

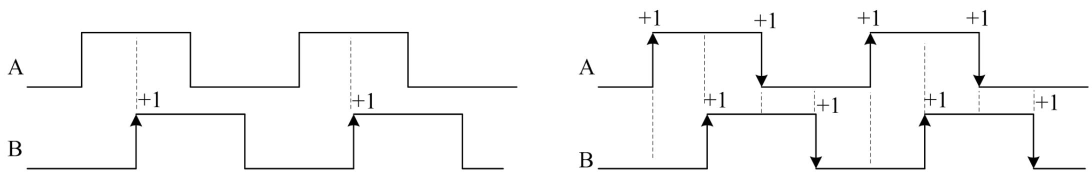
显示对应的拉丁字符的拼音

字典 - 查看字典详细内容

显示对应的拉丁字符的拼音

字典 - 查看字典详细内容

When M8195 is OFF, the AB phase input of C251 is the base frequency; when the M8195 is ON, the AB phase input of C251 is the quadrature frequency, as shown below



M8195=0，C251为1倍频的A/B计数　　M8195=1，C251为4倍频的A/B计数

M8195=0，C251 为 1 倍频的 A/B 计数

M8195=0，C251 is the A/B count with base frequency

M8195=1C251 为 4 倍频的 A/B 计数

M8195=1, C251 is the A/B count with quadrature frequency

和 C251 一样；

As the same as C251

当 M8196 为 OFF 的时候，C252 的 AB 相输入为一倍频；当 M8196 为 ON 的时候，C252 的 AB 相输入为四倍频；

When M8196 is OFF, the AB phase input of C252 is the base frequency; when the M8196 is

ON, the AB phase input of C252 is the quadrature frequency, as shown below

当 M8197 为 OFF 的时候，C253 的 AB 相输入为一倍频；当 M8197 为 ON 的时候，C253 的 AB 相输入为四倍频；

If M8197 is OFF then the AB phase input of C253 is one double frequency mode; If M8197 is ON then the AB phase input of C253 is four fold frequency mode.

当 M8198 为 OFF 的时候，C254 的 AB 相输入为一倍频；当 M8198 为 ON 的时候，C254 的 AB 相输入为四倍频；

If M8198 is OFF then the AB phase input of C254 is one double frequency mode; If M8198 is ON then the AB phase input of C254 is four fold frequency mode.

当 M8199 为 OFF 的时候，C255 的 AB 相输入为一倍频；当 M8199 为 ON 的时候，C255 的 AB 相输入为四倍频。

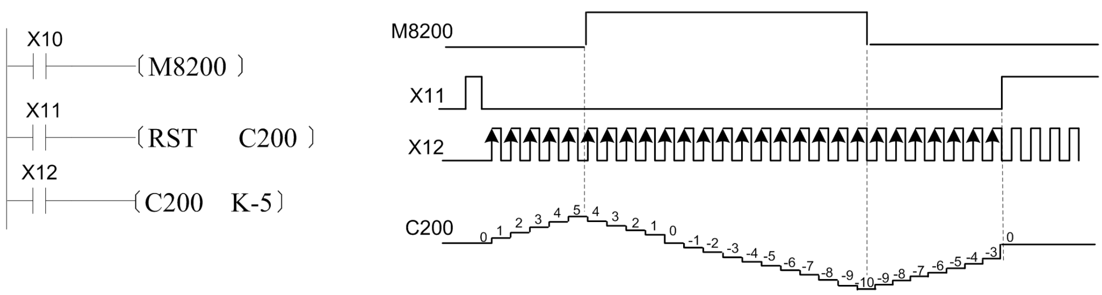
If M8199 is OFF then the AB phase input of C255 is one double frequency mode; If M8199 is ON then the AB phase input of C255 is four fold frequency mode.

32位计数增减控制　M8200~M8234

32 位计数增减控制

Increase and decrease 32 bit count control

对于普通的 32 位增减计数，可利用特殊的辅助继电器 M8200~M8234 指定增计数 / 减计数的方向，如对 C△△△驱动 M8△△△，则为减计数，不驱动时，则为增计数，如下例：
Special auxiliary relays M8200~M8234 can be used to define up/down counter direction for general 32 bit up/down counters. If C△△△ drives M8△△△ then the counter will count down, or the counter will count up, for example:



当 M8200 为 OFF 时，C200 为增计数；当 M8200 为 ON 时，C200 为减计数

When M8200 is OFF, C200 increase count; when the M8200 is ON, C200 decrease count;

和 C200 一样：

As the same as C200:

当 M8201 为 OFF 时，C201 为增计数；当 M8201 为 ON 时，C201 为减计数

If M8201 is OFF then the C201 will count up; If M8201 is ON then the C201 will count down.

当 M8202 为 OFF 时，C202 为增计数；当 M8202 为 ON 时，C202 为减计数

If M8202 is OFF then the C202 will count up; If M8202 is ON then the C202 will count down.

当 M8203 为 OFF 时，C203 为增计数；当 M8203 为 ON 时，C203 为减计数

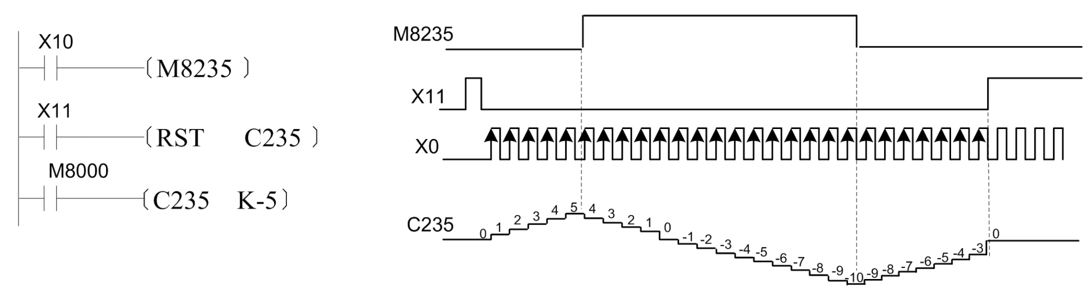
If M8203 is OFF then the C203 will count up; If M8203 is ON then the C203 will count down.
当 M8204 为 OFF 时，C204 为增计数；当 M8204 为 ON 时，C204 为减计数
If M8204 is OFF then the C C204 will count up; If M8204 is ON then the C204 will count down.
当 M8205 为 OFF 时，C205 为增计数；当 M8205 为 ON 时，C205 为减计数
If M8205 is OFF then the C205 will count up; If M8205 is ON then the C205 will count down.
当 M8206 为 OFF 时，C206 为增计数；当 M8206 为 ON 时，C206 为减计数
If M8206 is OFF then the C206 will count up; If M8206 is ON then the C206 will count down.
当 M8207 为 OFF 时，C207 为增计数；当 M8207 为 ON 时，C207 为减计数
If M8207 is OFF then the C207 will count up; If M8207 is ON then the C207 will count down.
当 M8208 为 OFF 时，C208 为增计数；当 M8208 为 ON 时，C208 为减计数
If M8208 is OFF then the C208will count up; If M8208 is ON then the C208 will count down.

当 M8209 为 OFF 时，C209 为增计数；当 M8209 为 ON 时，C209 为减计数
If M8209 is OFF then the C209 will count up; If M8209 is ON then the C209 will count down.
当 M8210 为 OFF 时，C210 为增计数；当 M8210 为 ON 时，C210 为减计数
If M8210 is OFF then the C210 will count up; If M8210 is ON then the C210 will count down.
当 M8211 为 OFF 时，C211 为增计数；当 M8211 为 ON 时，C211 为减计数
If M8211 is OFF then the C211 will count up; If M8211 is ON then the C211 will count down.
当 M8212 为 OFF 时，C212 为增计数；当 M8212 为 ON 时，C212 为减计数
If M8212 is OFF then the C212 will count up; If M8212 is ON then the C212 will count down.
当 M8213 为 OFF 时，C213 为增计数；当 M8213 为 ON 时，C213 为减计数
If M8213 is OFF then the C213 will count up; If M8213 is ON then the C213 will count down.
当 M8214 为 OFF 时，C214 为增计数；当 M8214 为 ON 时，C214 为减计数
If M8214 is OFF then the C214 will count up; If M8214 is ON then the C214 will count down.
当 M8215 为 OFF 时，C215 为增计数；当 M8215 为 ON 时，C215 为减计数
If M8215 is OFF then the C215 will count up; If M8215 is ON then the C215 will count down.
当 M8216 为 OFF 时，C216 为增计数；当 M8216 为 ON 时，C216 为减计数
If M8216 is OFF then the C216 will count up; If M8216 is ON then the C216 will count down.

当 M8217 为 OFF 时，C217 为增计数；当 M8217 为 ON 时，C217 为减计数
If M8217 is OFF then the C217 will count up; If M8217 is ON then the C217 will count down.
当 M8218 为 OFF 时，C218 为增计数；当 M8218 为 ON 时，C218 为减计数
If M8218 is OFF then the C218 will count up; If M8218 is ON then the C218 will count down.
当 M8219 为 OFF 时，C219 为增计数；当 M8219 为 ON 时，C219 为减计数
If M8219 is OFF then the C219 will count up; If M8219 is ON then the C219 will count down.
当 M8220 为 OFF 时，C220 为增计数；当 M8220 为 ON 时，C220 为减计数
If M8220 is OFF then the C220 will count up; If M8220 is ON then the C220 will count down.
当 M8221 为 OFF 时，C221 为增计数；当 M8221 为 ON 时，C221 为减计数
If M8221 is OFF then the C221 will count up; If M8221 is ON then the C221 will count down.
当 M8222 为 OFF 时，C222 为增计数；当 M8222 为 ON 时，C222 为减计数
If M8222 is OFF then the C222 will count up; If M8222 is ON then the C222 will count down.
当 M8223 为 OFF 时，C223 为增计数；当 M8223 为 ON 时，C223 为减计数
If M8223 is OFF then the C223 will count up; If M8223 is ON then the C223 will count down.
当 M8224 为 OFF 时，C224 为增计数；当 M8224 为 ON 时，C224 为减计数

高速单相单计数增减控制	M8235~M8245

高速单相计数增减控制
High-speed single-phase counter increase and decrease control
单相单计数型高速计数输入，只有 1 个计数脉冲信号输入端，其计数的增减由程序利用对应的特殊 M 寄存器决定为增计数或减计数
The single phase high speed counter input has only 1 counter pulse input port, and the program determines the count direction through respective special M registers.



当 M8235 为 OFF 时，C235 为增计数；当 M8235 为 ON 时，C235 为减计数
When M8235 is OFF, C235 increase count; when the M8235 is ON, C235 decrease count;
和 C235 一样：
As the same as C235:
当 M8236 为 OFF 时，C236 为增计数；当 M8236 为 ON 时，C236 为减计数
If M8236 is OFF then the C236 will count up; If M8236 is ON then the C236 will count

down.
当 M8237 为 OFF 时，C237 为增计数；当 M8237 为 ON 时，C237 为减计数
If M8237 is OFF then the C237 will count up; If M8237 is ON then the C237 will count down.
当 M8238 为 OFF 时，C238 为增计数；当 M8238 为 ON 时，C238 为减计数
If M8238 is OFF then the C238 will count up; If M8238 is ON then the C238 will count down.
当 M8239 为 OFF 时，C239 为增计数；当 M8239 为 ON 时，C239 为减计数
If M8239 is OFF then the C239 will count up; If M8239 is ON then the C239 will count down.
当 M8240 为 OFF 时，C240 为增计数；当 M8240 为 ON 时，C240 为减计数
If M8240 is OFF then the C240 will count up; If M8240 is ON then the C240 will count down.
当 M8241 为 OFF 时，C241 为增计数；当 M8241 为 ON 时，C241 为减计数
If M8241 is OFF then the C241 will count up; If M8241 is ON then the C241 will count down.
当 M8242 为 OFF 时，C242 为增计数；当 M8242 为 ON 时，C242 为减计数
If M8242 is OFF then the C242 will count up; If M8242 is ON then the C242 will count down.
当 M8243 为 OFF 时，C243 为增计数；当 M8243 为 ON 时，C243 为减计数
If M8243 is OFF then the C243 will count up; If M8243 is ON then the C243 will count down.
当 M8244 为 OFF 时，C244 为增计数；当 M8244 为 ON 时，C244 为减计数
If M8244 is OFF then the C244 will count up; If M8244 is ON then the C244 will count down.
当 M8245 为 OFF 时，C245 为增计数；当 M8245 为 ON 时，C245 为减计数
If M8245 is OFF then the C245 will count up; If M8245 is ON then the C245 will count down.
C241~C245 具有硬件复位输入功能，部分具有硬件起停输入功能

高速计数增减监控　M8246~M8255

高速计数增减监控
High-speed counter increase and decrease monitor

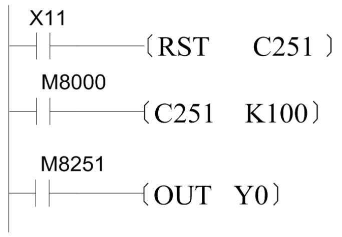
单相 2 输入高速计数和 AB 相输入高速计数利用外部端口的输入，可自动增计数或减计数。单相 2 计数型，有 2 个计数脉冲信号输入端，分别为增计数脉冲输入端和减计数脉冲输入端；部分计数器还具有硬件复位、起停的信号输入端口；
Single phase 2 input high speed counter and AB phase input high speed counter can automatically count up or down through external input. Single-phase 2 count type, 2 counts pulse signal input. Respectively, counting up pulse input and counting down pulse input; part of the counter also has a hardware reset, the start and stop signal input port;
AB 相计数型，是根据 AB 两相的相位决定计数的方向，计数方法是：当 A 脉冲为高电平时，

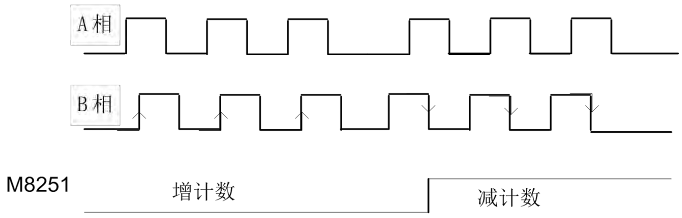
B 相的脉冲上升沿作加计数，B 相的脉冲下降沿作减计数。

AB phase count type is based on the phase of two-phase AB to decide the direction of counting. The count is: when the A pulse is high, count up for rising edge of B-phase pulse, count down for falling edge of B-phase pulse.

通过读取 M8246-M8255 的状态，可监控 C246-C255 的增计数 / 减计数状态。 如下图 C251 的监控：

The up/down counting status of C246-C255 can be monitored by reading out the states of M8246-M8255.





增计数

减计数

当 C251 为增计数时，M8251 为 OFF；当 C251 为减计数时，M8251 为 ON。通过监控 M8251 可以知道 C251 是增计数还是减计数

If C251 counts up then M8251 is OFF; If C251 counts down then M8251 is ON. By monitoring the M8251 can know the C251 is by counting up or by counting down

和 C251 一样：

AS the same with C251

当 C246 为增计数时，M8246 为 OFF；当 C246 为减计数时，M8246 为 ON。通过监控 M8246 可以知道 C246 是增计数还是减计数

If C246 counts up then M8246 is OFF; If C246 counts down then M8246 is ON. Monitoring M8246 can indicate that whether C246 counts up or down.

当 C247 为增计数时，M8247 为 OFF；当 C247 为减计数时，M8247 为 ON。通过监控 M8247 可以知道 C247 是增计数还是减计数

If C247 counts up then M8247 is OFF; If C247 counts down then M8247 is ON. Monitoring M8247 can indicate that whether C247 counts up or down.

当 C248 为增计数时，M8248 为 OFF；当 C248 为减计数时，M8248 为 ON。通过监控 M8248 可以知道 C248 是增计数还是减计数

If C248 counts up then M8248 is OFF; If C248 counts down then M8248 is ON. Monitoring M8248 can indicate that whether C248 counts up or down.

当 C249 为增计数时，M8249 为 OFF；当 C249 为减计数时，M8249 为 ON。通过监控 M8249 可以知道 C249 是增计数还是减计数

If C249 counts up then M8249 is OFF; If C249 counts down then M8249 is ON. Monitoring M8249 can indicate that whether C249 counts up or down.

当 C250 为增计数时，M8250 为 OFF；当 C250 为减计数时，M8250 为 ON。通过监控 M8250 可以知道 C250 是增计数还是减计数

If C250 counts up then M8251 is OFF; If C250 counts down then M8250 is ON. Monitoring M8250 can indicate that whether C250 counts up or down.

当 C252 为增计数时，M8252 为 OFF；当 C252 为减计数时，M8252 为 ON。通过监控 M8252

可以知道 C252 是增计数还是减计数
If C252 counts up then M8252 is OFF; If C252 counts down then M8252 is ON. Monitoring M8252 can indicate that whether C252 counts up or down.
当 C253 为增计数时，M8253 为 OFF；当 C253 为减计数时，M8253 为 ON。通过监控 M8253 可以知道 C253 是增计数还是减计数
If C253 counts up then M8253 is OFF; If C253 counts down then M8253 is ON. Monitoring M8253 can indicate that whether C253 counts up or down.
当 C254 为增计数时，M8254 为 OFF；当 C254 为减计数时，M8254 为 ON。通过监控 M8254 可以知道 C254 是增计数还是减计数
If C254 counts up then M8254 is OFF; If C254 counts down then M8254 is ON. Monitoring M8254 can indicate that whether C254 counts up or down.
当 C255 为增计数时，M8255 为 OFF；当 C255 为减计数时，M8255 为 ON。通过监控 M8255 可以知道 C255 是增计数还是减计数
If C255 counts up then M8255 is OFF; If C255 counts down then M8255 is ON. Monitoring M8255 can indicate that whether C255 counts up or down.

5.11 扩展模块的使用说明
Using description of expansion module
命名规则
Naming rule

数字量扩展模块：
Digital expansion module:

H2U-0016ERNR
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①：汇川控制器
Inovance controller
②：系列号
Serial number
③：输入点数
Input points
④：输出点数
Output points
⑤：产品类型。E-表示扩展模块
Product type. E means expansion module
⑥：输出类型。N-表示无输出；R-表示继电器输出；T-表示晶体管输出
Output type. N- means no output; R- means relay output; T- means transistor output
⑦：表示输入电源类型。N-表示无电源输入；D 表示 24VDC 输入
Means input power supply type. N- means no power supply input; D means 24VDC input.

⑧：表示远程或本地扩展。R-表示远程扩展模块，缺省-表示本地扩展模块
Means remote or local expansion. R- means remote expansion module, default- means local expansion module

模拟量扩展模块：
Analog expansion module

H2U-4ADR
① ② ③ ④ ⑤

①：汇川控制器
Inovance controller
②：系列号
Serial number
③：通道数
Channels
④：特殊功能模块类型。AD-表示模拟量输入；DA-表示模拟输出；PT-表示热电阻输入；TC-表示热电耦输入；AM-表示混合模拟量模块；
Type of special function modules. AD-means analog input; DA-means analog output; PT-means RTD input; TC-means thermocouple input; AM-expressed mixed analog module;
⑤：表示远程或本地扩展。R-表示远程扩展模块，缺省-表示本地扩展模块
Means remote or local expansion. R- means remote expansion module, default- means local expansion module

基本型号
Base type
表：基本型号
Table: base type

<table>
<tr><th rowspan="3">产品型号
Product type</th><th rowspan="3">产品名称
Product name</th><th rowspan="3">描述
Description</th><th colspan="3">适用机型
Applicable models</th></tr>
<tr><th rowspan="2">H1U</th><th colspan="2">H2U</th></tr>
<tr><th>通用
general</th><th>N</th></tr>
<tr><td>H2U-0016ERN</td><td>H2U 系列本地继电器输出扩展模块
H2U series local relay output expansion module</td><td>16 点继电器输出本地模块
16 points relay output local module</td><td>—</td><td>√</td><td>√</td></tr>
<tr><td>H2U-0016ETN</td><td>H2U 系列本地晶体管输出扩展模块
H2U series local transistor output expansion module</td><td>16 点晶体管输出本地模块
16 points transistor output local module</td><td>—</td><td>√</td><td>√</td></tr>
</table>

H2U-1600ENN	H2U 系列本地输入扩展模块 H2U series local input expansion module	16 点输入本地模块 16 points local module	—	√	√
H2U-2AD	H2U 系列本地模拟量输入模块 H2U series local analog input module	2 通道电压电流输入本地模块 2 channels voltage and current input local module	—	√	√
H2U-2DA	H2U 系列本地模拟量输出模块	2 通道电压电流输出本地模块 2 channels voltage and current output module	—	√	√
H2U-4AD	H2U 系列本地模拟量输入模块 H2U series local analog input module	4 通道电压电流输入本地模块 4 channels voltage and current input local module	—	√	√
H2U-4DA	H2U 系列本地模拟量输出模块 H2U series local analog out put module	4 通道电压电流输出本地模块 4 channels voltage and current output local module	—	√	√
H2U-4PT	H2U 系列本地热电阻输入模块 H2U series local heat resistance input module	4 通道热电阻输入本地模块 4 channels heat resistance input local module	—	√	√
H2U-4TC	H2U 系列本地热电耦输入模块 H2U series local thermocouple input module	4 通道热电偶输入本地模块 4 channels thermocouple input local module	—	√	√
H2U-4AM	H2U 系列本地模拟量混合模块 H2U series local analog combined module	2 通道电压电流输入 2 通道电压电流输出本地模块 local module with 2-channel voltage and current input and 2-channel voltage and current output	—	√	√
H2U-6AM	H2U 系列本地模拟量混合模块 H2U series local analog	4 通道电流输入 2 通道电压电流输出本地模块 Local module with 4	—	√	√

	combined module	channels current input and 2 channels voltage and current output			
H2U-0016ERDR	远程继电器输出扩展模块 Remote Relay Output Expansion Module	16 点继电器输出远程模块 16 points relay output remote module	√	—	√
H2U-0016ETDR	远程晶体管输出扩展模块 Remote transistor output expansion module	16 点晶体管输出远程模块 16 points transistor output remote module	√	—	√
H2U-1600ENDR	远程输入扩展模块 Remote input expansion module	16 点输入远程模块 16 points input remote module	√	—	√
H2U-2ADR	远程模拟量输入模块 Remote analog input module	2 通道电压电流输入远程模块 2 channels voltage and current input remote module	√	—	√
H2U-2DAR	远程模拟量输出模块 Remote analog output module	2 通道电压电流输出远程模块 2 channels voltage and current output remote module	√	—	√
H2U-4ADR	远程模拟量输入模块 Remote analog input module	4 通道电压电流输入远程模块 4 channels voltage and current input remote module	√	—	√
H2U-4DAR	远程模拟量输出模块 Remote analog output module	4 通道电压电流输出远程模块 4 channels voltage and current output remote module	√	—	√
H2U-4PTR	远程热电阻输入模块 Remote heat resistance input module	4 通道热电阻输入远程模块 4 channels heat resistance input remote module	√	—	√
H2U-4TCR	远程热电耦输入模块 Remote thermocouple input module	4 通道热电偶输入远程模块 4 channels thermocouple input remote module	√	—	√

H2U-4AMR	远程模拟量混合模块 Remote analog combined module	2 通道电压电流输入 2 通道电压电流输出远程模块 Remote module with 2-channel voltage and current input and 2-channel voltage and current output	√	—	√
H2U-6AMR	H 远程模拟量混合模块 H remote analog combined module	4 通道电流输入 2 通道电压电流输出远程模块 Local module with 4 channels current input and 2 channels voltage and current output	√	—	√

备注：H1U 仅能接远程扩展模块，需要配 H1U-CAN-BD 卡

Note: H1U can only access remote expansion modules, you need to with H1U-CAN-BD card

H2U 分两种，通用机型仅能接本地模块，N 系列带 CAN 机型可接本地和远程模块，接远程模块需要配 H2U-CAN-BD 卡。

H2U at the two kinds, General models can only access the local module, N Series models can be connected with CAN local and remote module, remote module needs to access with H2U-CAN-BD card

主模块 CAN BD 卡通信接口定义：

Main module CAN BD card communication interface definition:

所有远程扩展模块通过 CAN 接口，连接到 H2U-CAN-BD（或 H1U-CAN-BD）板，与 PLC 进行数据交互。CAN BD 卡定义如下：

All through remote expansion modules connected to the H2U-CAN-BD (or H1U-CAN-BD) plates by the CAN interface. With the PLC for data exchange. CAN BD card is defined as follows

CAN 端口定义

CAN port definition

管脚号 Pin number	信号 Signal	描述 Description
1	0V	电源负 Power -
2	CAN-	CAN 通讯负 CAN transmission
3	GND	接屏蔽层 Connect to shield
4	CAN+	CAN 通讯正 CAN communication
5	+24V	电源正 Power supply +

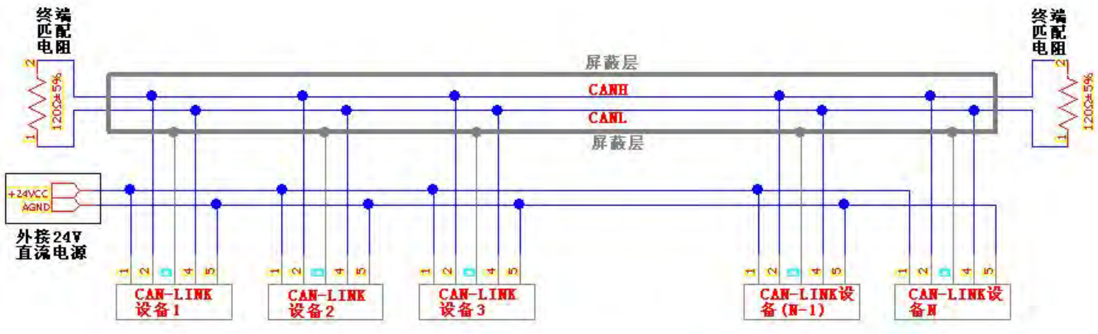
组成 CAN-LINK 网络时，所有设备的以上五根线均要一一对应连在一起。并且＋24Vcc 和 0V 间需要外接 24V 直流电源。总线的两端均要加 120 欧姆的 CAN 总线匹配电阻，CAN BD 卡本身有匹配电阻，使用时拨上即可，无需外接电阻。

In CAN-LINK network, the five lines of all devices are linked correspondently. An external 24V DC power supply is provided between 0V and +24 Vcc. 120 ohm CAN bus termination resistor is necessary both ends of the bus. The CAN-LINK connection diagram is shown as follow:

远程模块拨码开关说明

Remote module DIP switch definition

1-6	代表二进制的站号。（需改变站号，需重新对模块上下电） Represent the station with.binary number (if need to change the station, need to re-power the module)
7	波特率选择，默认为 OFF。 Baud rate selection, default is OFF OFF：500k/bits。最大总线距离 100M OFF：500k/bits。Max bus length is 100M ON：100k/bits。最大总线距离 500M ON：100k/bits。Max bus length is 500M
8	匹配电阻。（在使用时，请在 CAN 总线两端拨上两个匹配电阻，以保证通信正常） Matching resistor. (When in use, please call on both ends of the CAN bus, two matched resistors, in order to ensure normal traffic)



终端匹配电阻

Terminal matching resistance

外接 24V 直流电源

Extended 24V DC power supply

屏蔽层

shield

CAN-LINK 设备 1
CAN-LINK equipment 1

CAN-LINK 设备 2
CAN-LINK equipment 2

CAN-LINK 设备 3
CAN-LINK equipment 3

CAN-LINK 设备（N-1）
CAN-LINK equipment (N-1)
CAN-LINK 设备 N
CAN-LINK equipment N

多台设备组成 CAN-LINK 网络接线图
Composed of multiple devices CAN-LINK network wiring diagram
注：在使用 CAN 接口模块时，推荐使用网线作为传输导线。
Note: When using the CAN interface module is recommended to use cable as a transmission wire
H2U-1600ENN H2U-1600ENDR
1．电气规格：
2．Electrical specify:

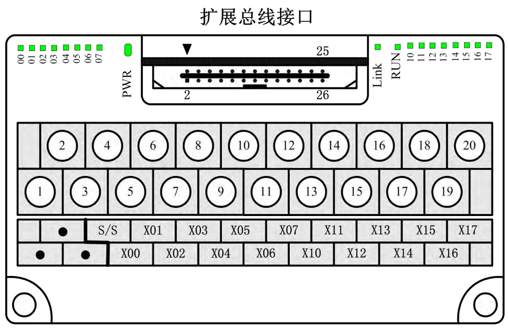
项目 Project		指标 Instruct
输入端口 Input port	输入阻抗 Input resistance	3.3k～4.3k
	输入电流 Input current	5.3mA TYP.
	ON 电流 ON current	3.5mA Min
	OFF 电流 OFF voltage	1.5mA Max
	滤波时间 Filter time	约 10mA about 10mA
	脉冲捕捉 Plus capture	无该功能 No such function
隔离 Isolation		光耦隔离 Optical isolation

3．模块用户接口表
4．User connection interface table

<table>
<tr><td>项目
Project</td><td colspan="2">说明
Comments</td></tr>
<tr><td>接线端子功能
Terminal function</td><td colspan="2">X00~X17：输入点
X00~X17：input point
S/S：输入点公共端，漏型输入接＋24V，源型输入接 0V
S/S ： Input common, sink type input connected +24 V, 0V connection-oriented input</td></tr>
<tr><td rowspan="2">指示灯
Instructer lamp</td><td>本地扩展模块
Local extended module</td><td>PWR：模块数字电路供电正常
Digital circuit power supply module is normal
X00~ X17：输入点指示灯
X00~ X17：input port instructor lamp.
LINK：主模块访问扩展模块时点亮
LINK: light when main module access expansion module.
RUN；当模块正常工作时点亮。
RUN: light when module work normally
PWR：</td></tr>
<tr><td>远程扩展模块
Remote expansion module</td><td>PWR：模块 24V 供电正常
Power supply module 24V is normal
X00~ X17：输入点指示灯
X00~ X17：input port instructor lamp.
COM：点亮表示模块进行通讯
COM: light means module communicating
ERR：点亮表示有错误发生。
ERR: light means error occurs.</td></tr>
<tr><td rowspan="2">扩展端口
Expansion port</td><td>本地扩展模块
Local expansion module</td><td>扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。
Extended input uses ladder connector with 26 pins. Access module through the flat cable; Extended output uses ladder connector with 26 pins.</td></tr>
<tr><td>远程扩展模块
Remote expansion module</td><td>扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线
Extended input use the 5-pin hole plugs, suggest using 4-core shielded twisted pair transmission line or network cable</td></tr>
</table>

3、端口定义图

Port description



H2U-1600ENN

扩展总线接口

Extended bus interface

4、H2U-1600ENN 本地扩展编程方法：

H2U-1600ENN Local extension programming

当本地扩展模块后接到主模块上后，扩展模块上 X 端口的编号紧接主模块上 X 端口的编号，依次向后编号，例如当主模块为 H2U-1616MR，现在要接入 H2U-1600EX 型扩展模块，因主模块最后的 X 端口编号为 X17，则扩展模块的 X 在编程时的访问编号为 X20~X37，即扩展模块上的 X0 点对应程序里的 X20，依次类推。

After the local expansion module connects the main module, the X port number on the expansion module next to the X port number on the main module. Number followed by back. For example, when the main module for the H2U-1616MR, now to access H2U-1600EX type expansion module, the main module's the last X port number is X17. The access code of X extension module in programming is the X20 ~ X37. The point X0 on expansion module corresponds X20 in programs, and so on.

注意，扩展模块的编号总是从 8 进制个位为 0 开始的，例如，当主模块为 H2U-3624MR，其最后的 X 端口编号为 X43，扩展模块的 X 在编程时的访问编号为 X50~X67，即主模块上空缺的 X44~X47 的端口号被丢弃。扩展模块上 Y 端口也采取了同样的处理方法。

Note that the expansion module number always starts from 0 at octal digit. For example, when the main module is H2U-3624MR, its last X port number is X43. The access number of expansion module X in programming is for the X50 ~ X67. The X44 ~ X47 port number that main module vacancies is discarded. Y-port on expansion module has also taken the same approach

5、H2U-1600ENDR 远程扩展编程方法

H2U-1600ENDR remote extension programming

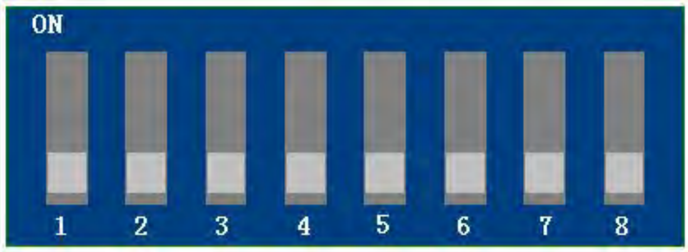
在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In the remote extension module, remote module address is: No. +100 communication station, allowing up to 63 remote extension modules. Through toggle the DIP switch on the Station NO, to set the station number of the modules. DIP switch interface definition as follows:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表

列出了每一位的定义。

Each remote module has a 8 bit DIP switch. Through the DIP switch, the user can set the module's station number, select the baud rate, whether the termination matching resistor. The figure below shows, each bit of a DIP switch has code, "ON" that logic "1." The following table lists the definition of each.



CAN-LINK 拨码开关

CAN-LINK DIP switch

拨码开关位定义

Bit definition of DIP switch

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 This DIP switch from high to low into one of six bit binary digits, used to identify the local station number. "ON" said 1, "OFF" means 0. High in the high and low in the low. Combination of the following ways: A6A5A4A3A2A1. Such as A1 = ON, the other bit is OFF, the binary address: 000001, decimal K01, 16 hex for the h01. If the A5, A4 are all ON, the other is OFF, the binary address is: 011 000,
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	

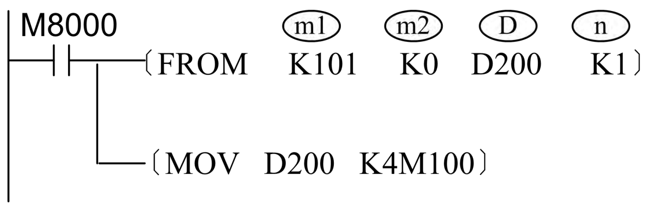
		decimal K24, 16 hex for the h18.
7	波特率 Baud rate	OFF：高速模式，波特率500Kbps，ON：低速模式，波特率 100Kbps OFF: high speed mode, baud rate 500Kbps, ON: low speed mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch ON, means connect 120ohm terminal matching resistor, or disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If A5, A4 on one module are both ON, others are OFF, the binary address is: 011 000, decimal K24, then when we use the FORM / TO instruction program the module is K24 +100, which is # 124

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。远程数字量扩展模块不能直接访问 X、Y 点。必须通过 FROM/TO 指令访问，编程方式如下：

If you change the DIP switch, in addition to matching resistor, the baud rate and address can not immediately take effect, the system may be used to re-power on before setting the new parameters. Note CAN address is the unique. We can not have the same address. Remote digital expansion module can not directly access X, Y points. Only be accessed by FROM / TO instruction. The programming as follows:



本例子介绍远程数字量扩展模块 H2U-1600ENDR 的访问方法，因为 16 点的输入模块用一个 BFM 区代表了所有的输入点，即 BFM 区的 K0（一个寄存器）的每个 bit 位对应每个输入点，故可以将模块的状态读取回来后用 MOV D200 K4M100 来分别取位，此时 M100~M107 为远程模块的 X0~X7，M108~M115 为远程模块的 X10~X17，我们可以通过读取 M100~M115 就能读取 X0~X17 的状态，注意：为了保证能读取到数字量扩展模块输入点的最新状态，请使用 M8000 来驱动 FROM 指令，以便在每个扫描周期都能更新。

This example describes a remote digital expansion module H2U-1600ENDR access methods. Because the 16-point input module with a BFM area represent all of the input point, the BFM area K0 (a register) for each bit position corresponding to each input point, it can be read back after the state of the module with the MOV D200 K4M100 to take place, respectively, when M100 ~ M107 remote module X0 ~ X7, M108 ~ M115 for the remote module X10 ~ X17, we can change M100 ~ M115 to change Y0 ~ Y17 status in remote module. Pay attention: In order to ensure that digital content can be read into the latest expansion module input state, use the M8000 to drive FROM command, so that each scanning cycle can be updated.

H2U-0016ERN　H2U-0016ERDR　H2U-0016ETN　H2U-0016ETDR

1．电气规格：

2．Electrical specify:

项目 Project		继电器输出端口 Relay outpout port	晶体管输出端口 Transistor output port
回路电源电压 Circuit power supply voltage		250VAC，30VDC 以下	5~24 VDC
输出回路电流 Output circuit current		单点：2.0A /250VAC。共 COM 端的 8 点总电流小于 8A Single point: 2.0A /250VAC。Sum current of COM from 8 points is less 8A	0.3A 24VDC，共 COM 端的 8 点总电流小于 2A 0.3A 24VDC，Sum current of COM from 8 points is less 2A
隔离 isolation		继电器机械绝缘 Relay Mechanical Insulation	光耦隔离 Opto isolation
动作指示 Action instructor		继电器输出触点闭合 LED 点亮 Light LED when relay output contacts OFF	光耦被驱动时 LED 点亮 Light LED when opto is driven.
开路时漏电流 Leakage current when open		—	小于 0.1mA/30VDC Less than 0.1mA/30VDC
最小负载 Min load		2mA/5VDC	5mA（5~24VDC）
最大输出电流 Max output current	电阻负载 Resistive load	0.5A/1 点；0.8A/4 点；1.6A/8 点 0.5A/1 point; 0.8A/4 point; 1.6A/8 point	2A/1 点；8A/4 点组公共端；8A/8 点组公共端 2A/1 point; 8A/4 point common terminal; 8A/8 point common terminal
	感性负载 Inductance load	7.2W/24VDC	80VA
	电灯负载 Lamp load	其它：1.5W/24VDC Other: 1.5W/24VDC	100W
ON 响应时间 ON Responding time		20ms Max	0.5ms Max

OFF 响应时间 OFF responding time	20ms Max	0.5ms Max
输出公共端 Output common terminal	每 8 个端口使用 1 个公共端，每个公共端之间彼此隔离。 ports each with a common, each separated from each other between the common	每 8 个端口使用 1 个公共端，每个公共端之间彼此隔离。 ports each with a common, each separated from each other between the common
输出熔断器保护 Output fuse protection	无 None	无 None

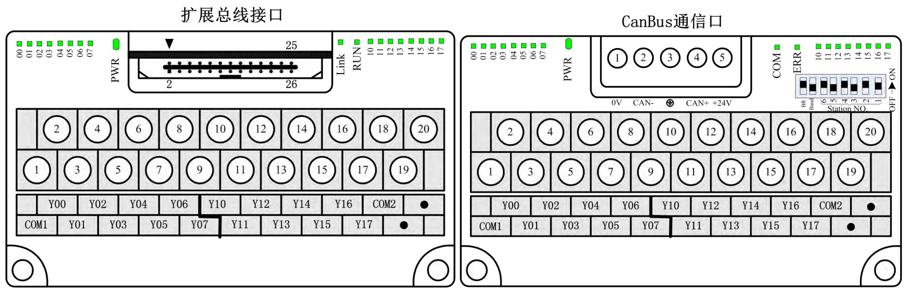
3. 模块用户接口表
4. Module user interface table

<table>
<tr><td>项目
project</td><td colspan="2">说明
description</td></tr>
<tr><td>接线端子功能
Terminal function</td><td colspan="2">Y00~Y17：输出点
Y00~Y17：Output point
COM1~2：输出点公共端
COM1~2：output point common</td></tr>
<tr><td rowspan="2">指示灯
indicator</td><td>本地扩展模块
Local expansion module</td><td>PWR：模块数字电路供电正常
Digital circuit power supply module is normal
Y00~ Y17：输入点指示灯
Y00~ Y17：input port instructor lamp.
LINK：主模块访问扩展模块时点亮
LINK: light when main module access expansion module.
RUN；当模块正常工作时点亮。
RUN: linght when module work normally
PWR：</td></tr>
<tr><td>远程扩展模块
Remote expansion module</td><td>PWR：模块 24V 供电正常
Power supply module 24V is normal
Y00~ Y17：输入点指示灯
Y00~ Y17：input port instructor lamp.
COM：点亮表示模块进行通讯
COM: light means module communicating
ERR：点亮表示有错误发生。
ERR: light means error occurs.</td></tr>
<tr><td>扩展端口
Expansion port</td><td>本地扩展模块
Local expansion module</td><td>扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。
Extended input uses ladder connector with 26 pins. Access module through the flat cable; Extended output uses ladder connector with 26 pins.</td></tr>
</table>

	远程扩展模块 Remote expansion module	扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线 Extended input use the 5-pin hole plugs, suggest using 4-core shielded twisted pair transmission line or network cable

3、端口定义图

Port definition



H2U-0016ER(T)N H2U-0016ER(T)DR

扩展总线接口

Extended bus interface

CanBus 通信口

CanBus commnication port

4、H2U-0016ERN、H2U-0016ETN 本地扩展编程方法

H2U-0016ERN、H2U-0016ETN Local extension programming

当本地扩展模块后接到主模块上后，扩展模块上 Y 端口的编号按紧接主模块上 Y 端口的编号，依次向后编号，例如当主模块为 H2U-1616MR，现在要接入 H2U-0016EYR 型扩展模块，因主模块最后的 Y 端口编号为 Y17，则扩展模块的 X 在编程时的访问编号为 Y20~Y37，即扩展模块上的 Y0 点对应程序里的 Y20，依次类推。

After the local expansion module connects the main module, the Y port number on the expansion module next to the Y port number on the main module. Number followed by back. For example, when the main module for the H2U-1616MR, now to access H2U-1600EYR type expansion module, the main module's the last X port number is Y17. The access code of Y extension module in programming is the Y20 ~ Y37. The point Y0 on expansion module corresponds Y20 in programs, and so on.

注意：扩展模块的端口编号总是从 8 进制个位为 0 开始的。

Note that the expansion module number always starts from 0 at octal digit.

继电器输出扩展模块可以接到继电器或者晶体管主模块上面；同样，晶体管输出扩展模块也可以接到晶体管或者继电器主模块上面。

Relay output expansion module can be connected to the relay or transistor of the main module; Similarly, the transistor output expansion modules can be connected to the transistor or relay of the main module.

5、H2U-0016ERDR、H2U-0016ETDR 编程方法

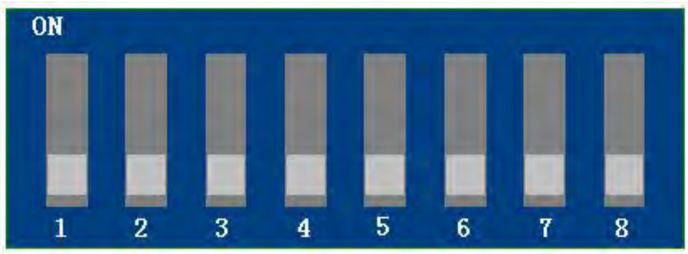
5、H2U-0016ERDR、H2U-0016ETDR programming method

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In the remote extension module, remote module address is: No. +100 communication station, allowing up to 63 remote extension modules. Through toggle the DIP switch on the Station NO. To set the station number of the modules. DIP switch interface definition as follows:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

Each remote module has a 8 bit DIP switch. Through the DIP switch, the user can set the module's station number, select the baud rate, whether the termination matching resistor. The figure below shows, each bit of a DIP switch has code, "ON" that logic "1." The following table lists the definition of each.



CAN-LINK 拨码开关

CAN-LINK DIP switch

拨码开关位定义

Bit definition of DIP switch

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 This DIP switch from high to low into one of six bit binary digits, used to identify the
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	

		local station number. "ON" said 1, "OFF" means 0. High in the high and low in the low. Combination of the following ways: A6A5A4A3A2A1. Such as A1 = ON, the other bit is OFF, the binary address: 000001, decimal K01, 16 hex for the h01. If the A5, A4 are all ON, the other is OFF, the binary address is: 011 000, decimal K24, 16 hex for the h18.
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high speed mode, baud rate 500Kbps, ON: low speed mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch ON, means connect 120ohm terminal matching resistor, or disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124
If A5, A4 on one module are both ON, others are OFF, the binary address is: 011 000, decimal K24, then when we use the FORM / TO instruction program the module is K24 +100, which is # 124

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。远程数字量扩展模块不能直接访问 X、Y 点。必须通过 FROM/TO 指令访问，编程方式如下：
If you change the DIP switch, in addition to matching resistor, the baud rate and address can not immediately take effect, the system may be used to re-power on before setting the new parameters. Note CAN address is the unique. We can not have the same address. Remote digital expansion module can not directly access X, Y points. Only be accessed by FROM / TO instruction. The programming as follows:

M8000

〔MOV K4M100 D100〕

m1 m2 D n

〔TO K101 K0 D100 K1〕

本例子介绍远程数字量扩展模块 H2U-0016ERDR 的访问方法，因为 16 点的输入模块用一个 BFM 区代表了所有的输出点，即 BFM 区的 K0（一个寄存器）的每个 bit 位对应每个输出点，故可以将全部输出点的状态放到一个字里面后再传送到模块里面去，例子中 M100~M107 为远程模块的 Y0~Y7，M108~M115 为远程模块的 Y10~Y17，我们通过改变 M100~M115 就可以改变远程模块中 Y0~Y17 的状态，在远程数字量输出模块中，可以在每次更新输出点后再驱动 TO 指令，也可以用 M8000 来驱动。

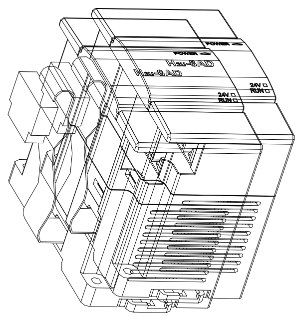
This example describes a remote digital expansion module H2U-1600ERDR access methods. Because the 16-point input module with a BFM area represent all of the input point, the BFM area K0 (a register) for each bit position corresponding to each input point, it can be read back after the state of the module with the MOV D200 K4M100 to take place, respectively, when M100 ~ M107 remote module Y0 ~ Y7, M108 ~ M115 for the remote module Y10 ~ Y17, we can change M100 ~ M115 to change Y0 ~ Y17 status in remote module. Pay attention: In order to ensure that digital content can be read into the latest expansion module output state, use the M8000 to drive TO command, so that each scanning cycle can be updated.

H2U－4AD H2U－4ADR 4 通道模拟输入扩展模块

4 channels analog input expansion module

1、 简介

2、 introduce



4AD（R）扩展模块可配合 H2U 系列主模块工作，实现 4 个模拟输入通道的信号检测，将 -10V～10V 或-20mA～20mA 的信号转换为 12bit 的数字量，供 PLC 主模块读取。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元。

4AD (R) expansion modules can work with H2U series of the main module, 4 analog input channels to achieve signal detection, the-10V ~ 10V or-20mA ~ 20mA signal is converted to 12bit digital content, the main module for the PLC to read. The main module by FROM / TO instruction access to the extension unit within the BFM register

2、产品规格

2. product spec:

H2U－4AD、H2U－4ADR 电气规格

H2U－4AD、H2U－4ADR electrical spec

项　目 project	指　标 quota	说　明 description
电压输入信号电平 Voltage input signal level	-10～10V DC，	每个通道可独立选择电压信号类型。用户需根据接入的信号类型，设置相应的 BFM 区。 Each channel can independently select the voltage signal type. Users need to set the corresponding BFM area. according to the type of the signal accessed.
电压通道输入阻抗 Voltage channel input resistance	200KΩ	
电流输入信号 Current input signal	-20mA～20mA，	
电流输入采样电阻 Current input sampling resistance	250Ω	
输入通道数 Input channels	4 通道 4 channels	
输入信号频率 Input signal frequency	小于 10Hz Less than 10Hz	
转换速度 Conversion speed	15ms/通道（常速），6ms/通道（最快） 15ms/channel(normal speed), 6ms/channel (the fast)	
数字输出 Digital output	12bit：-2000～＋2000	
分辩率 resolusion	电压输入 5mV，或电流输入 20μA Voltage input 5mV, or current input 20uA	
精度 accuracy	±1％全范围 ±1％ all scope	

占用 I/O 点数 Used I/O points	不占用主模块 I/O 点数 Don't use I/O of main module	
隔离设计 Isolation design	模拟电路和数字电路之间用光电耦合器隔离； 模拟电路和外部电源之间用 DC/DC 进行隔离； 模拟输入信号通道之间不隔离。 Optocoupler isolation between analog and digital circuits; Dc/DC isolation between analog and external power supply; No isolation between analog input channels.	

3、电源规格

Power spec

项　目 project	指　标 quota
模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 电流消耗 80mA (取自于主模块的 24V/COM，或其它的 24VDC 电源) 24V DC -15%/+20%， 5% of the maximum allowable ripple voltage Current Consumption 80mA (taken from the 24V/COM of the main module, or other 24VDC power supply)
数字电路 Digital circuit	5V DC 50mA (通过模块扩展电缆，取自主模块电源内部电源) 5V DC 50mA (through the module extension cable, internal power to take independent power modules)
备 注 Comment	远程扩展模块无需数字电路电源。 Remote extension modules don't need digital circuit power supply.

4、LED 状态指示灯说明：

LED status indicator shows:

4.1　本地扩展模块 LED 状态指示灯说明

4.1 Local expansion module LED status indicator shows

项目 project	说明 description
PWR	模块数字电路供电正常 Digital circuit power supply module is normal

24V	当外部 24V 电源供电正常时点亮 light when external 24V power supply normal.
COM	点亮表示有 FROM/TO 指令访问模块。 light means FROM/TO instruction access module

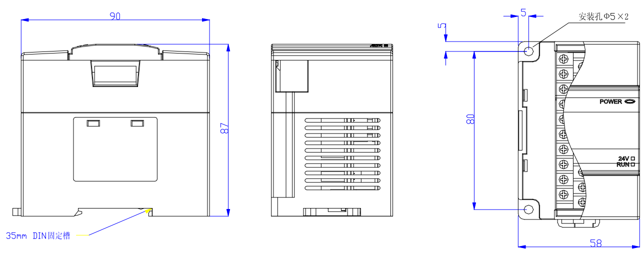
4.2 远程扩展模块 LED 状态指示灯说明

4.2 Remote expansion module LED status indicator shows

项目	说明
PWR	模块 24V 供电正常 24V power supply module is normal
COM	点亮表示模块进行通讯。 light means module is communicating
ERR	点亮表示有错误发生。 light means error occurs

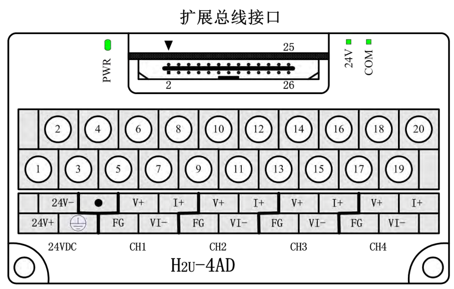
5、.模块的安装尺寸：

5. install size of module



1、 接线端子布局：

1. Terminal block layout



H2U-4AD

扩展总接线接口

Total Connection Interface extension

7、输入信号与扩展电缆的接线：

7. Input signal and the extension cable wiring:

模拟输入信号通过双绞线连接到扩展模块的输入端口，布线时不要与交流电源线或干扰信号的线路靠近；

Analog input signal is connected to the input port of expansion module through the twisted pair. When cabling don't be near to AC power cable and disturbing signal cable;

Listen

Read phonetically

Dictionary - View detailed dictionary

若模拟信号的干扰严重时，可采用屏蔽线连接，并在输入端口并联 1 只 0.1μF/25V 的高频电容；

If the analog signal interference is severe, shielded cable connection can be used, and a 0.1μF/25V high-frequency capacitance is paralleled in the input port;

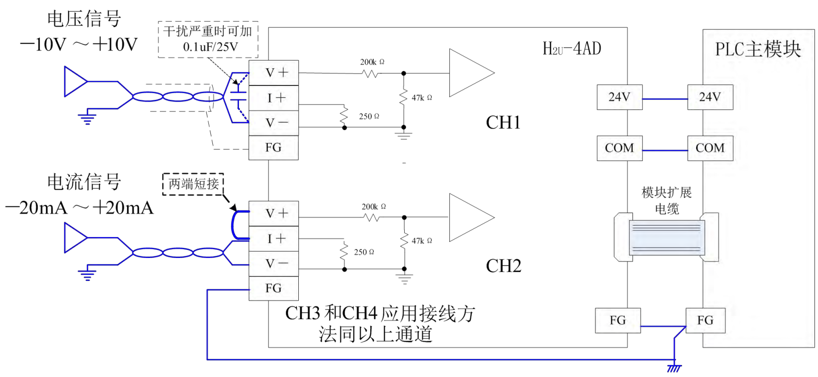
Listen

Read phonetically

Dictionary - View detailed dictionary

信号源及其屏蔽线的外壳与 H2U－4AD(R)的信号接地端 FG 相连，共同接地。

Signal source, the shield shell and H2U-4AD (R) signal ground FG connected to a common ground.



电压信号-10V~+10V

Voltage signal -10V~+10V

干扰严重时可加 0.1uF/25V

Use 0.1uF/25V capacitor if disturbance severe.

两端短接

Shorten connection

CH3 和 CH4 应用接线方法同以上通道

Wiring method of CH3 and CH4 channel is as the same as above

模块扩展电缆

Module extension cable

PLC 主模块

PLC main module

8、本地特殊扩展模块的地址编号：

8. The address ID of the local special extension module:

除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。

In addition to IO extension modules a variety of other expansion modules (such as 4AD/4DA/4TC/CC-Link modules) collectively referred to as a special module. PLC main module power each time, it will automatically check all the extension modules connected and number special modules and IO expansion port. The user can not interfere or change the results of their number, unless you change the order of module connections.

主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的 IO 扩展模块不参与编号，如下图中，两个 4AD 扩展模块的模块地址编号依次为＃0 和＃1，后续的 4PT 模块地址为＃2，以此类推，最多可接入 8 个特殊模块：

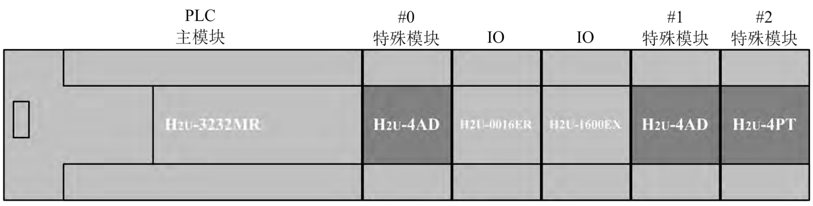
The rule of the main module numbering special modules is beginning from tight to the main PLC module, followed by # 0, # 1, ... # 7, etc.. The IO expansion module inserted in the middle is not numbered. As shown in the following figure, the module address numbers of two 4AD expansion modules are # 0 and # 1, follow-up 4PT module address is # 2, and so on. Up to 8 special modules can be accessed:

Listen

Read phonetically

Dictionary - View detailed dictionary

1. **noun**
    1. number
    2. serial number



PLC 主模块

PLC main module

#0 特殊模块

#0 special module

#1 特殊模块

#1 special module

#2 特殊模块

#2 special module

即使中间插有若干 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。

Even if a number of IO expansion modules are inserted, numbering order is also not affected. Understanding the rule of addressing above, the user can be accurately programmed to access the specified module

上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，4AD 模块也能同时上电。若 4AD 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；

Properly connection between the external 24V/COM power supply terminal and PLC main module 24V/COM before power on. 4AD module can simultaneously power. If the external power supply of 4AD module powers lag, may lead to PLC main module can not correctly identify the module type;

PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障；

PLC main module only checks once all the extension modules connected in system when power on. PLC main module can not normally check the expansion module inserted in system running. PLC can not access it correctly. Plugging extension module may damage the device when system running. More serious may lead to the unpredictability of the output control state, causing the user equipment failure;

9、远程特殊扩展模块的地址编号：

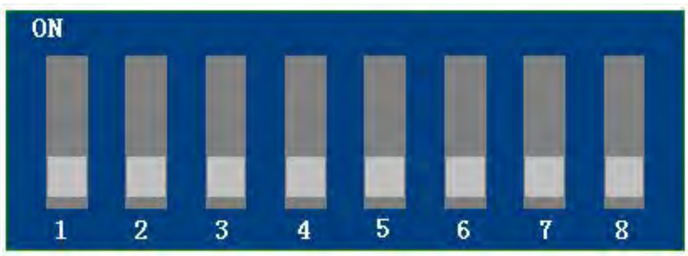
9. The address ID of the remote special extension module:

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In the remote extension module, remote module address is: No. +100 communication station, allowing up to 63 remote extension modules. Through toggle the DIP switch on the Station NO, to set the station number of the modules. DIP switch interface definition as follows:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

Each remote module has a 8 bit DIP switch. Through the DIP switch, the user can set the module's station number, select the baud rate, whether the termination matching resistor. The figure below shows, each bit of a DIP switch has code, "ON" that logic "1." The following table lists the definition of each.



CAN-LINK 拨码开关

CAN-LINK DIP switch

拨码开关位定义

Bit definition of DIP switch

拨码号　信号　　描述

DIP No. Signal　Description

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 This DIP switch from high to low into one of six bit binary digits, used to identify the local station number. "ON" said 1, "OFF" means 0. High in the high and low in the low. Combination of the following ways: A6A5A4A3A2A1. Such as A1 = ON, the other bit is OFF, the binary address: 000001, decimal K01, 16 hex for the h01. If the A5, A4 are all ON, the other is OFF, the binary address is: 011 000, decimal K24, 16 hex for the h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high speed mode, baud rate 500Kbps, ON: low speed mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch ON, means connect 120ohm terminal matching resistor, or disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If A5, A4 on one module are both ON, others are OFF, the binary address is: 011 000, decimal K24, then when we use the FORM / TO instruction program the module is K24 +100, which is # 124

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

If you change the DIP switch, in addition to matching resistor, the baud rate and address can not immediately take effect, the system may be used to re-power on before setting the new parameters.

10、访问 4AD（R）模块的 BFM 区：

10. Access 4AD (R) module BFM area

　　PLC 主模块是通过读取 4AD（R）模块的寄存器缓存单元（BFM 区）的方式读取数字化 AD 转换结果，通过改写特定 BFM 区的方式来设置模块状态。PLC 主模块通过读写指令

FROM/TO 访问这些 BFM 单元。
PLC main module read digital AD conversion results by a way to read the 4AD (R) module's register cache unit (BFM area). Set the module status by a way to rewrite specific BFM area. PLC main module access the BFM module by read and write isntructions FROM / TO.

扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。
Expansion modules are equipped with EEPROM memory cell, to save some of BFM settings, such as analog input channels for each signal type, offset value, gain value, and so on. The preservation of these units is decided and auto completed by the setting state of the corresponding BFM unit.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 4AD（R）模块的 BFM 区定义如下表：
Each register width of BFM zone is 16bit (ie 1Word). The definition in accordance with the 4AD (R) module BFM area is as follows:

BFM	R/W 属性 R/W property	内容 contents
＃0（E）	WR	通道信号模式选择，每个 HEX 位代表 1 个输入通道，最高位为 ch4，最低位为 ch1：（默认值＝H0000） Channel signal mode selection. Each HEX input means one channel, the highest bit is ch4, lowest is ch1: (default = H0000) 0＝-10V～10V；对应数字输出：-2000～2000 1＝4mA～20mA；对应数字输出：0～1000 2＝-20mA～20mA；对应数字输出：-1000～1000 3＝本通道关闭； 4＝-10V～10V；对应数字输出：-10000～10000 5=4mA～20mA；对应数字输出：0～10000 6＝-20mA～20mA；对应数字输出：-10000～10000 0＝-10V～10V；correponding to digital output：-2000～2000 1＝4mA～20mA；correponding to digital output：0～1000 2＝-20mA～20mA；correponding to digital output：-1000～1000 3＝本通道关闭； 4＝-10V～10V；correponding to digital output：-10000～10000 5=4mA～20mA；correponding to digital output：0～10000

		6＝-20mA～20mA；correponding to digital output：-10000～10000	
＃1	WR	通道 1 Channel 1	平均滤波常数，即用于平均计算的采样值个数，设定范围 1～4096，默认值 8。若要高速采集，可设定为 1。当 BFM#15 改变时，自动恢复为默认值 Average filter constant, that is, the number of samples for the average calculation, setting range 1 to 4096, the default value of 8. To high speed collection, can be set to 1. When BFM # 15 is changed, automatically revert to default Listen Read phonetically Dictionary - View detailed dictionary 1. **noun** 1. number 2. serial number
＃2	WR	通道 2 Channel 2	
＃3	WR	通道 3 Channel 3	
＃4	WR	通道 4 Channel 4	
＃5	R	通道 1 Channel 1	输入通道采集值平均滤波后的数据 The data by average filter of acquisition value of the input channels
＃6	R	通道 2 Channel 2	
＃7	R	通道 3 Channel 3	
＃8	R	通道 4 Changnel 4	
＃9	R	通道 1 Changnel 1	输入通道当前采集的数据，即未滤波处理的瞬时值。 Acquisition value of the input channels. That is, not filtering the instantaneous values
＃10	R	通道 2 Channel 2	
＃11	R	通道 3 Channel 3	
＃12	R	通道 4 Channel 4	
＃13~14	—		保留； Reserved
＃15	WR	ADC 速率选择	0＝正常速度，15ms/通道（默认值）； 1＝快速转换，6ms/通道；

<table>
<tr><td></td><td></td><td>ADC speed selection</td><td colspan="8">1000～30000＝高速采样，对应 1ms～30ms/通道
0＝normal，15ms/channel（default）；
1＝fast conversion，6ms/channel；
1000～30000＝fast sampling, equal to 1ms～30ms/channel</td></tr>
<tr><td>（ #16~19</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td># 20（E）</td><td>WR</td><td colspan="9">1＝复位设定参数到默认值（出厂值）。默认值＝0
1= Reset configuration parameters to the default values (default). Default = 0</td></tr>
<tr><td># 21（E）</td><td>WR</td><td colspan="9">2＝禁止调整偏移/增益；
2= Prohibition of adjustment offset / gain
1＝允许调整偏移/增益，（默认值）；
1=Permision of adjustment offset / gain</td></tr>
<tr><td rowspan="2"># 22（E）</td><td rowspan="2">WR</td><td>低 8bit 位对应 4 个通道的操作
Low 8bit bit corresponds to the operation of 4 channels</td><td>G4</td><td>O4</td><td>G3</td><td>O3</td><td>G2</td><td>O2</td><td>G1</td><td>O1</td></tr>
<tr><td colspan="9">偏移/增益调整使能，当非 0 时，模块会将 BFM23/24 值写入其内部对应通道控制寄存器中，初始值＝H00
Offset / gain adjustment is enabled. When a non-0, the module will write the value into its internal BFM23/24 channel control register. The initial value = H00</td></tr>
<tr><td># 23（E）</td><td>WR</td><td colspan="9">偏移值，数字输出为 0 时的模拟输入值（0、1、2 模式）初始值为 0
Offset, the analog input value for digital output 0 (0,1,2 mode). The initial value 0</td></tr>
<tr><td># 24（E）</td><td>WR</td><td colspan="9">增益值，数字输出为＋1000 时的模拟输入值（0、1、2 模式）初始值为 5000
Gain value, the analog input value for the digital output +1000 (0,1,2 mode). The initial value 0</td></tr>
<tr><td># 25~26</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>#27</td><td>R</td><td colspan="9">4AD 模块软件版本
4AD module software version</td></tr>
<tr><td>#28</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>#29</td><td>R</td><td colspan="9">错误状态</td></tr>
</table>

		Error status
＃30	R	扩展模块识别码，H2U－4AD（R）的识别码为 K2010 Extension module ID, ID of H2U－4AD（R）is K2010
＃31	—	保留，不可访问 Reserved, inaccessible

其中状态信息字 BFM #29 的意义说明如下：

State information which the meaning of the word BFM # 29 as follows

BFM＃29 位号　ON 状态 OFF 状态

BFM # 29 bit number　　ON status OFF status

b0: 存在错误。b0~b3 中任一个非 0，A/D 转换停止　无错误

b0: Errors. Either in b0 ~ b3a non-0, A / D conversion stops　　no errors

b1: 模块内 EEPROM 的偏移/增益设置有误　偏移/增益数据正确

b1: Module EEPROM offset / gain setting is wrong　　Offset / gain data correct

b2: （不可能）　电源正常

b2: (impossible) power supply normal

b3: 模块硬件故障　　硬件正常

b3: Module hardware failure　　Hardware Normal

b10:数字输出超出-2048～2047 的范围　数字输出值正常

b10: Digital output exceeds the range of -2048 ~ 2047　　Digital output value normal

b11:采样滤波常数超出 1～4096 范围　　采样滤波常数正常

b11: Sampling filter constant beyond the range of 1 ~ 4096　　Sampling filter constant normal

b12:禁止 BFM#21 的值设为 K2 允许 BFM#21＝K2

b12: Prohibition of the value of BFM # 21 set K2　permit BFM#21＝K2

BFM＃29 的其它 bit4～7，bit13～15 等没有定义。

The other bit4 ~ 7, bit13 ~ 15 of BFM # 29 and so is not defined

其中表中的“（E）”字样的 BFM 单元为存入 EEPROM 的项目，具有掉电保持特性。

BFM unit "(E)" in table is the project stored in EEPROM, with a property of power-down to maintain.

寄存器改写说明：

Register rewrite description:

BFM#0、#23、#24 等带(E)单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，每个 Word 约需 300ms 时间，因此在需要改写多个带(E)的 BFM 单元时，注意 PLC 编程时，用户程序中每写一个上述的 BFM 单元后要延时一段时间，不要连续进行写操作，确保写指令的正确完成。

Rewrite BFM # 0, # 23, # 24, etc. with the (E) unit trigger the operation to write EEPROM within the module. And write operation takes some time. Word will take about 300ms each time. So pay attention to PLC programming, when with the need to rewrite the multiple (E) BFM units, the user program delay for some time after to write a BFM unit above each time, do not write continuously to ensure that written instructions correctly.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。
Note: external 24V power supply of local expansion module failure. The system flag M6708 of PLC main module is set. Programming can regularly check the sign, and can find the error.

11、部分 BFM 区解释
Some explain of BFM area
BFM#0　通道选择
BFM#0 channel selection
通道的初始化，默认 4 个通道都为-10V~10V，由 BFM #0 的十六进制 HXXXX 控制，最低位控制通道一，依次顺序，最高位控制通道四，每个字符的控制方式如下：
Channel initialization. The 4 default channels are -10V ~ 10V, controlled by hexadecimal HXXXX of the BFM # 0. The lowest bit controls channel 1, followed by the order, the highest bit controls channel 4. Control mode of each character is as follows:
Listen
Read phonetically

Dictionary - View detailed dictionary

X=0 预设范围 -10V~10V （对应数字 -2000~2000）
X=1 预设范围 4mA~20 mA （对应数字 0~1000）
X=2 预设范围 -20mA~20 mA （对应数字-1000~1000）
X=3 本通道关闭
X=4 预设范围-10V~10V （对应数字-10000~10000）
X=5 预设范围 4mA ~20 mA （对应数字 0~10000）
X=6 预设范围 -20mA ~20 mA （对应数字-10000~10000）

X=0 Preset range -10V~10V （corresponding to -2000~2000）
X=1 Preset range 4mA~20 mA （corresponding to 0~1000）
X=2 Preset range -20mA~20 mA （corresponding to -1000~1000）
X=3 The channel closed
X=4 Preset range -10V~10V （corresponding to -10000~10000）
X=5 Preset range 4mA ~20 mA （corresponding to 0~10000）
X=6 Preset range -20mA ~20 mA （corresponding to -10000~10000）

例如：BFM#0 为 H1230，表示通道一为-10V~10V；通道二关闭；通道三为-20mA~20 mA；通道四为 4mA~20 mA。
For example: BFM # 0 is the H1230, says Channel 1 is-10V ~ 10V; channel 2 closed; channel 3 for-20mA ~ 20 mA; channel 4 for the 4mA ~ 20 mA.
Listen
Read phonetically

Dictionary - View detailed dictionary

1. **noun**
    1. correspondence
    2. parallelism
2. **verb**
    1. correspond

没有用到的通道，可以关闭，也可以不关闭，关闭的通道不占用转换时间（BFM#15），例子中通道二关闭了，则整个通道转换一次时间为没有关闭的三个通道的转换时间（3×BFM#15）。

If channel is not used, can be turned off, you can not turn off. Turning off the channel do not take conversion time (BFM # 15). In the case channel 2 closed, the entire conversion time is conversion time of three channels not closed (3 × BFM # 15).

BFM #1~#4　平均采样数

BFM #1~#4 the number of average sampling

每个通道(BFM#9~#12)对应的采样值累加采样数（BFM #1~#4）的个数后再除以采样数（BFM #1~#4），存放到（BFM #5~#8）

Sample values corresponding to Each channel (BFM # 9 ~ # 12) accumulate number of samples (BFM # 1 ~ # 4) and then divided by the number of number of samples (BFM # 1 ~ # 4), stored (BFM # 5 ~ # 8)

BFM #5~#8　存放平均采样值

BFM #5~#8　Store the average sample value

BFM #9~#12　存放即时采样值

BFM #9~#12 Store Instantaneous sample value

BFM #15　ADC 速率时间

BFM #15　ADC rate time

每个通道转换一次需要的时间，需注意更新一次数据需要的时间是 BFM#15 的时间乘以没有关闭的通道数。

The time required of each channel is converted once. Note the time required to update the data is the time of BFM # 15 multiplied by the numbers of not closed channels.

Listen

Read phonetically

Dictionary - View detailed dictionary

1. **noun**
    1. correspondence
    2. parallelism
2. **verb**
    1. correspond

例如：BFM #0 为 H3310，BFM #1 为 K7，BFM #2 为 K6，BFM #15 为 K10；则 BFM

#9 和 BFM #10 刷新一次数据时间为 BFM#0×BFM#15=2×10=20MS，BFM #5 刷新一次数据时间为 BFM#0×BFM#15×BFM#1=2×10×7=140MS，BFM #6 刷新一次数据时间为 BFM#0×BFM#15×BFM#2=2×10×6=120MS。程序中 FROM/TO 指令比较耗时，故此模块参数在程序中采集 BFM#5 的数据可以用 LDP M8012 FROM K0 K5 D10 K1 指令读取，和 LD M8000 FROM K0 K5 D10 K1 的效果是一样的，但是后面用 M8000 驱动的指令每个扫描周期都读取一次，大大加长了程序的扫描周期。

For example: BFM # 0 is H3310, BFM # 1 is K7, BFM # 2 is K6, BFM # 15 isK10. The data refresh time of BFM # 9 and BFM # 10 is BFM # 0 × BFM # 15 = 2 × 10 = 20MS. The data refresh time of BFM # 5 is BFM # 0 × BFM # 15 × BFM # 1 = 2 × 10 × 7 = 140MS. The data refresh time of BFM # 6 is BFM # 0 × BFM # 15 × BFM # 2 = 2 × 10 × 6 = 120MS. FROM / TO instruction consumes more time in programs. So the module parameters data of collecting BFM # 5 can use LDP M8012 FROM K0 K5 D10 K1 instruction read, and it's effect is the same as LD M8000 FROM K0 K5 D10 K1. But M8000-driven instruction read once in each scan cycle, greatly extended the program scan cycle.

BFM #20 回归出厂值

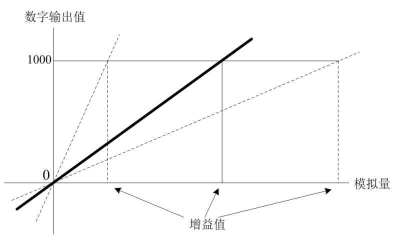
BFM #20 return to default value

将#20 设定为 1 可以恢复到默认值。

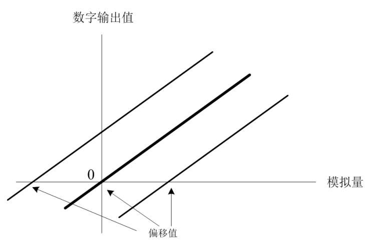
20 is set to 1 will be restored to default values.

BFM #21~#24 偏移和增益的定义与设定方法：

BFM #21~#24 The definition and setting method of offset and gain:



增益是当数字输出值为1000时对应的模拟输入值



偏移值是当数字输出值为0时对应的模拟输入值

数字输出值

Digital output value

增益值

Gain value

模拟量

Analog value

增益是当数字输出值为 1000 时对应的模拟输入值

Gain is the analog input value when digital output is 1000

偏移值

Offset value

偏移值是当数字值为 0 时对应的模拟输入值

Offset is the analog input value when digital output is 0

偏移和增益可以独立设定或一起设定，正常的增益值设定范围是 1V～15V 或 4mA～32mA。正常的偏移值设定范围为-5V～5V，或-20mA～20mA。

Offset and gain can be set independently or together. The normal gain setting range is 1V ~ 15V or 4mA ~ 32mA. The normal offset value is set to the range -5V ~ 5V, or -20mA ~ 20mA.

增益/偏移设定前，需先将 BFM#21 设为 1，再修改 BFM#23/24；然后开各个通道的允许偏

移增益 BFM#22，修改完毕，应将 BFM#21 再设为 2，避免再次被改变。
Before Gain / offset setting, BFM # 21 has to be set to 1 at first, then BFM # 23/24 is modified; then allow offset gain BFM # 22 of each channel is open. When change is completed, BFM # 21 should be set to 2, avoid to be changed again.

注意需要修改偏移增益的通道都一样的，不能这个通道偏移数据为 1000，另外一个通道偏移数据为 1200
Note the offset gain of the channel needed to modify are the same. You can not set the channel offset data for 1000, while another channel offset data for 1200.

例如：在 BFM#0 为模式 0 中，需要修改通道一、通道二的偏移和增益分别为 0.5V 和 6V，则需要按如下步骤操作：
For example: In BFM # 0 is in Mode 0, modify the offset and gain of channel 1, channel 2, respectively 0.5V and 6V. You need to do the following:

先将 BFM#21 改为 1；过 300MS 以后将 K500 和 K6000 分别送到 BFM#23 和 BFM#24 去；再过 300MS 后开允许增益 BFM#22，本例子中 BFM#22 应为二进制的 00001111，即是将 BFM#22 修改为 H000F；修改完毕。最后将 BFM#21 改为 2，以防再次被修改。
First change BFM # 21 to 1; 300MS later the K500 and K6000 are sent to BFM # 23 and BFM # 24; 300MS later again open to allow the gain BFM # 22. BFM # 22 in this example should be binary 00001111, that is BFM # 22 is amended to H000F; modification is completed. Finally, the BFM # 21 is changed to 2, to prevent further modification.

编程举例 1：
Program example 1:
一只 H2U－4AD 扩展模块接于 PLC 主模块后方，按编号原则为＃0 号模块，其中 CH1 端口需要采集-10V～10V 的电压信号，CH2 需要采集 4～20mA 的电流信号，CH3/CH4 未使用。要求改滤波次数为 6，将两个通道采集得到的数据分别存于 D10、D11。编写的用户程序如下：
A H2U-4AD PLC expansion module connected to the rear of the main module. Number module # 0 according to rule. CH1 port need to collect -10V ~ 10V voltage signal, CH2 need to collect 4 ~ 20mA current signal, CH3/CH4 are not used. Asked to change filter number as 6. The data collected from two channels are stored in D10, D11. User program written as follows:

读取#0 号模块中 BFM#30 的读数，暂存与 D0 检查模块标识，判断是否为 H2U-4AD 模块，这样判断可避免当连接顺序与设计顺序不一致时，发生操作错误
Read BFM #30 of #0 module. Store temporarily the data to D0. Check module identification to determine whether the H2U-4AD module. Such judgments can avoid operation error when the connection order is inconsistent with the design.

若接入模块正确，初始化 4AD 模块，CH4/CH3 通道关闭，CH2 设为 4~20mA 方式，CH1 设为-10V~10V 方式.将 BFM#1 和 BFM#2 分别改写平均滤波为 6 次。

If the access module is correct, initialize 4AD module. CH4/CH3 channels close, CH2 is set to 4 ~ 20mA mode, CH1 is set-10V ~ 10V mode. BFM # 1 and BFM # 2 are respectively rewritten the average filter as 6 times.

读取模块的报警信息单元的状态字

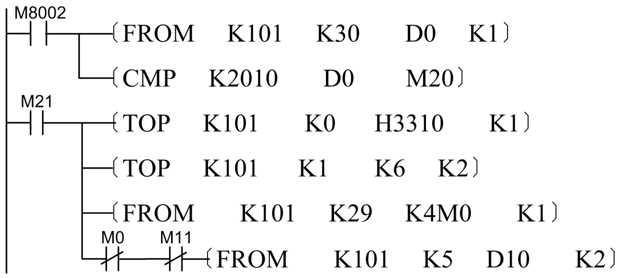
Read the status word of module alarm information unit

读取 BFM#5 和 BFM#6 单元（转换结果），分别存入 D10 和 D11

Read BFM # 5 and BFM # 6 units (conversion results), respectively store them into D10 and D11

例子中如果改成 H2U－4ADR 远程模块，CAN 站号为 1。则此例子程序如下：

If H2U-4ADR remote module in the example, CAN station is number 1. This example program is as follows:



编程举例 2：

Program example 2:

对于一个＃0 编号地址的 4AD 模块，要求通过一个 X20 按钮引发对其 CH1 通道的偏移/增益设置操作。编程如下：

For a 4AD module with No # 0 address, called for the adoption of a button X20 to trigger the setting operation of its channel CH1 offset / gain. The program is as follows:

X20 的闭合时引发 4AD 模块的偏移/增益调整操作

初始化 4AD 模块，4 个通道均为-10V~10V 信号方式

设 BFM#21=1，允许偏移。增益调整操作

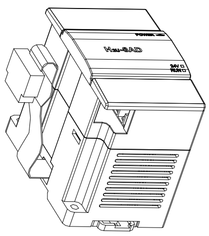
设 BFM#22=0，清楚偏移、增益调整

延时 400ms

设 BFM#23=0，设置偏移
设 BFM#24=2500，设置增益
设 BFM#22=H0003，将刚才设定的 BFM#22、#23
清除设置操作的命令标志
将 BFM#21=2，禁止偏移/增益调整操作

Closing X20 triggers the adjustment operation of 4AD module offset / gain
Initialize 4AD module, 4 channels are -10V ~ 10V signal mode
Let BFM # 21 = 1, allow the offset. Gain adjustment operation
Let BFM # 22 = 0, clearly offset, gain adjustment
Delay 400ms
Let BFM # 23 = 0, set the offset
Let BFM # 24 = 2500, set the gain
Let BFM # 22 = H0003, to just set the BFM # 22, # 23
Clear flag to set the operation command
The BFM # 21 = 2, prohibits offset / gain adjustment operation
-
使用注意事项：
CAUTION:
禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；
It is forbidden to push and pull in live line. Only when main module and application system is cut-off, the extended module can be connected or removed to ensure personal safety or property damage.

H2U－2AD　H2U－2ADR　2 通道模拟输入扩展模块
H2U－2AD　H2U－2ADR　Dual channel analog input extended module
1、简介
1. Introduction



2AD（R）扩展模块可配合 H2U 系列主模块工作，实现 2 个模拟输入通道的信号检测，将-10V～10V 或-20mA～20mA 的信号转换为 12bit 的数字量，供 PLC 主模块读取。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元。
The signal detection of dual channel analog input can be achieved by 2AD(R) extended module and H2U series main module, to convert -10V～10Vor -20mA～20mA to 12bit digital signal applied for PLC main doule. The main module accesses the BFM unit in the extended module register via FROM/TO instruction.
2、产品规格

2. Product specification

电气规格：

Electric specification:

项目 Item		指标 Indication	
电源 Power	模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 输入电流 80mA(来自于主单元的外部电源) 24V DC -15%/+20%， Max authorized ripple voltage 5% input current 80mA(from the extenal power supply)	
	数字电路 Digital circuit	5V DC 50mA(来自于主电源内部电源)（远程扩展模块无需数字电路电源。 5V DC 50mA(from internal power supply) (the digital circuit power is not requested by the remote extended module).）	
占用 I/O 点数 Occupying I/O points		不占用主模块 I/O 点数 The main module I/O points are not occupied	
转换速度 Conversion speed		15ms/通道（常速），6ms/通道（快速），1ms/通道（最快） 15ms/channel（normal speed），6ms/channel（fast speed），1ms/channel（fastest speed）	
模拟输入范围 Analog input range	电压输入 Voltage input	-10 ～ 10V DC，（输入阻抗为 200KΩ） -10～10V DC，(Input impedance is 200KΩ）	通过设定 BFM 可进行输入范围选择 The input range could be selected by setting BFM.
	电流输入 Current input	-20～20mA(输入阻抗为 250Ω) -20 ～ 20mA(Input impedance is 250Ω)	
数字输出 Digital output		默认设置为：–2000 ～ +2000 Default setting: –2000 ～ +2000	
分辨率 Resolution	电压输入 Voltage input	5mV	
	电流输入 Current input	20μA 20μA	
精度 Precision		±1%	
隔离 Isolation		模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。 The photo-coupler should be applied for isolating analog circuit and digital circuit.. DC/DC should be applied for isolating analog circuit and external power. The isolation is not needed between analog channels.	

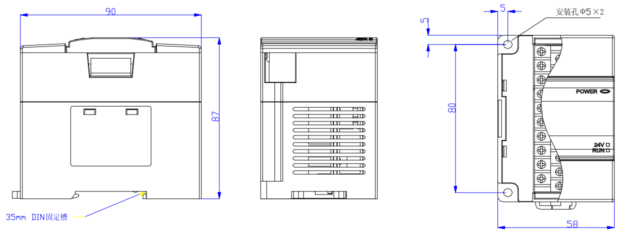
3、模块用户接口表：

3. the table of module user interface:

<table>
<tr><td>项目
Item</td><td colspan="2">说明
Description</td></tr>
<tr><td>接线端子功能
The function of connecting terminal</td><td colspan="2">V+：通道的电压正输入\输出端子；
V+：Channel voltage positive input\input terminal;
I+：通道的电流正输入\输出端子；
I+：Channel current positive input\output terminal;
VI-：通道的输入\输出公共端；
VI-: Channel input\output common terminal;
24+/24-:外部 24V 输入端子；
24+/24-: external 24V input terminal;
GND：保护接地。
GND: Protective grounding.</td></tr>
<tr><td rowspan="2">指示灯
Indicator</td><td>本地扩展模块
Local extended module</td><td>PWR：当与主模块连接且主模块上电的情况下点亮。
PWR: lighted when it is connected with powered main module.
COM：当模块正常工作时高速闪烁，故障时慢速闪烁。
COM: When module runs normally, it flashes in high speed; when there is fault, it flashes in low speed.
24V：当外部 24V 接通时点亮。
24V: When external 24V is connected, it is lighted.</td></tr>
<tr><td>远程扩展模块
Remote extended module</td><td>PWR：模块 24V 供电正常
PWR: Module 24V power supplies normally
COM：点亮表示模块进行通讯
COM: It lighting indicates that the module will make communication.
ERR：点亮表示有错误发生。
ERR: It lighting indicates that there is error.</td></tr>
<tr><td rowspan="2">扩展端口
Expended port</td><td>本地扩展模块
Local extended module</td><td>扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。
The 26-pin ladder connector is applied for the extended input port, and module is connected via flat cable; the 26-pin ladder connector is also applied for the extended output port.</td></tr>
<tr><td>远程扩展模块
Remote extended module</td><td>扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线
The 5-pin hole plug is applied for extended input, and it is recommended to use spiral-eight shield cable or network line as transmission cable.</td></tr>
</table>

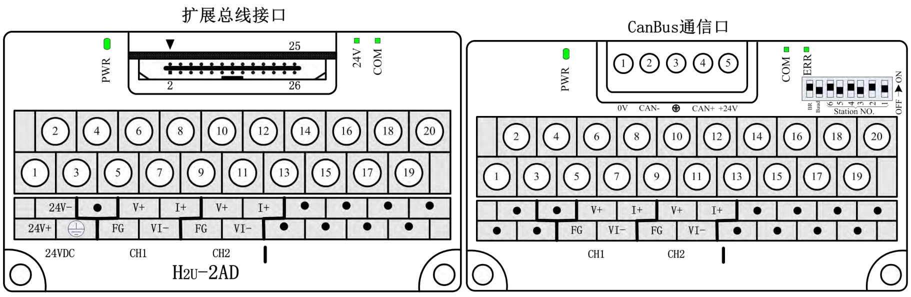
4、模块的安装尺寸：

4. The module install size:



5、接线端子布局：

5. The layout of connecting terminal



H2U-2AD H2U-2ADR

扩展总线接口

Extended bus interface

CanBus 通信口

CanBus communication port

6、输入信号与扩展电缆的接线：

6. Wiring input signal and extended cable:

模拟输入信号通过双绞线连接到扩展模块的输入端口，布线时不要与交流电源线或干扰信号的线路靠近；

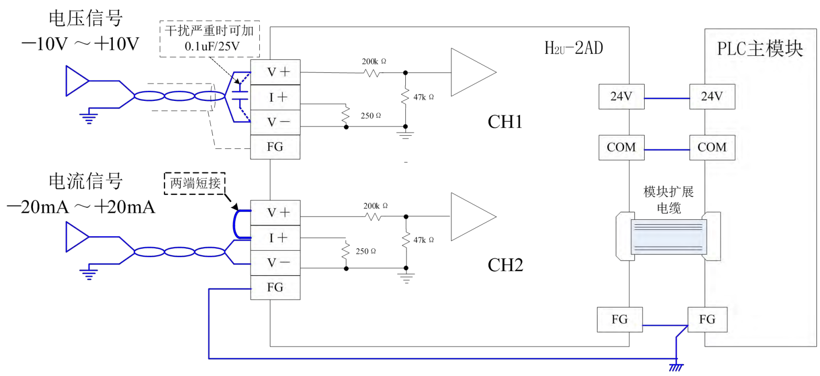
The analog input signal is connected to the input port of extended module via twisted pair. When wiring, it should not be closed to AC power line or interfering signal circuit;

若模拟信号的干扰严重时，可采用屏蔽线连接，并在输入端口并联 1 只 0.1μF/25V 的高频电容；

If the analog signal interferes badly, it could be connected with shield cable, and parallel connecting a high-frequency capacity of 0.1μF/25V on input port;

信号源及其屏蔽线的外壳与 H2U－2AD(R)的信号接地端 FG 相连，共同接地。

The signal source and the shield cable should be connected with signal grounding port FG of H2U-2AD(R) and grounding.



电压信号-10V~+10V

Voltage signal -10V~+10V

电流信号-20mA~+20mA

Current signal -20mA~+20mA

干扰严重时可加 0.1uF/25V

If it is interfered badly, a capacity of 0.1uF/25V could be involved

两端相接

Connecting two ports

模块扩展电缆

Module extended cable

PLC 主模块

PLC main module

7、本地特殊扩展模块的地址编号：

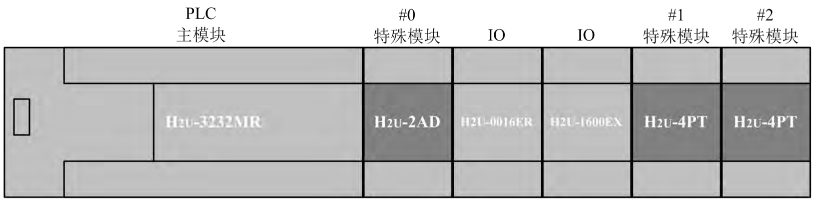
7. Address numbering of local special extended module:

除 IO 扩展以外的各种扩展模块（如 2AD/2DA/4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。

Except for IO extended module, all kinds of extended module are called as special module, such as 2AD/2DA/4AD/4DA/4TC/CC-Link and so on. When PLC is powered, all connected extended modules will be checked for one time, and respectively the special modules and IO extended ports are numbered. User cannot intervent or change the numbering result, unless the module connection order is modified.

主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的 IO 扩展模块不参与编号，如下图中，一个 2AD 扩展模块的模块地址编号为＃0，后续的两个 4PT 模块地址依次为＃1 和＃2，以此类推，最多可接入 8 个特殊模块：

The address numbering rule of main module for special modules is: started with the module closed to PLC main module, they are numbered with #0, #1,…,#7 in order, and the IO extended modules are not involved. For example, the module address numbering of a 2AD extended module is #0; the following two 4PT modules address are #1 and #2, and so on, and at most eight special modules could be connected:



PLC 主模块
PLC main module
特殊模块
Special module

即使中间插有若干 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。

Even if there are several IO extended modules, the numbering order will not be affected. After understanding the above address numbering rule, user can correctly access the specified module in programming.

上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，2AD 模块也能同时上电。

In order that main module and 2AD module can be powered at same time, before powered, the external 24V/COM power supply of the module should be correctly connected to the corresponding 24V/COM port of the PLC main module.若 2AD 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；

If the external power of 2AD module is powered with delay, it will cause that PCL main module will not correctly recognize the module type;

PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障；

Only when powered, PLC main module will check all extended modules connected to system for one times, and it cannot recognize and normally access the extended modules which is connected during operation. If user pushes or pulls extended module in operation, the device will be damaged, and more badly it will cause the un-precognition of the output state and user device faulty;

8、远程特殊扩展模块的地址编号：

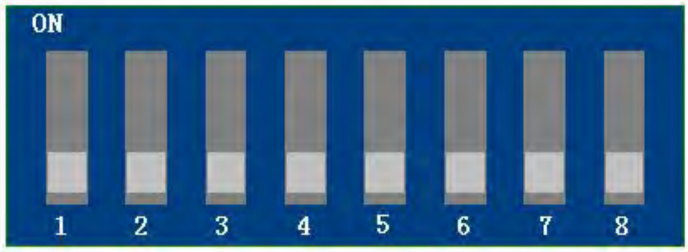
8. Address numbering of remote special extended module:

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In remote extended module, the address is: module communication station number+100, and at most 63 remote extended modules are allowed. By toggling the code switch on Station No., the module station number could be set, and the code switch interface is defined as following:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

There is a 8bit code switch on every remote module. By toggling code switch, user can set module station number, selecting baud rate, and terminate match resistance or not. Every bit on code switch has a number, and “ON” indicates logical “1”, which is shown as following figure. The definition of every bit is listed as following table.



CAN-LINK 拨码开关

CAN-LINK code switch

拨码开关位定义

The definition of code switch bit

拨码号 Code	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 A 6bit binary number is made up of six bit code switches, which is used for identifying the module station number. “ON” indicates 1, and “OFF”indicates 0. Lower bytes follow higher bytes. The format is as following: A6A5A4A3A2A1. Such as A1=ON, the other bits are all OFF, which indicates the binary address: 000001, decimal number: K01, hex number h01. Such as A5, A4=ON, the other bits are all OFF, which indicates the binary address: 011000, decimal number: K24, hex number h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode, baud rate 500Kbps; ON: low-speed mode, baud rate 100Kbps
8	匹配电阻 Matched resistance	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If code switch is ON, it indicates a terminal matched resistance of 120Ω is connected; or it is disconnected.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124；若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设

置参数。
If A5, A4=ON, and other bits are all OFF, which indicates the binary address: 011000, decimal number K24, the module number is K24+100 (#124) in FROM/TO instruction programming; if code switch is modified, except for matched resistance, baud rate and address will not take effect immediately. After the system is powered again, the new setting parameter will take effect.
需注意 CAN 地址的唯一性，不能有同样的地址。
The uniqueness of CAN address should be paid attention to, which means there should not be any same address.

9、访问 2AD（R）模块的 BFM 区：
9. Access BFM area of 2AD(R) module
PLC 主模块是通过读取 2AD（R）模块的寄存器缓存单元（BFM 区）的方式读取数字化 AD 转换结果，通过改写特定 BFM 区的方式来设置模块状态。
The digital AD conversion result is read by PLC main module by reading register buffer unit (BFM) of 2AD(R) module, and the module state is set by modifying specified BFM.PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。
PLC main module accesses these BFM units via read/write instruction FROM/TO.
扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。
The extended module is equipped with EEPROM storage unit, which is used for saving several BFM setting value, such as signal type, deviant, gain value of every analog input channel, and these units are automatically saved by setting corresponding BFM unit state.
BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 2AD（R）模块的 BFM 区定义如下表：
Every register width of BFM area is 16bit (1Word), and according to 2AD (R) BFM area the BFM is defined as following table:

BFM BFM	R/W 属性 R/W attribution	内容 Content
＃ 0（E）	WR	通道信号模式选择，每个 HEX 位代表 1 个输入通道，2AD(R)模块取低 8 位中的高 HEX 位为 ch2，低 HEX 位为 ch1：（默认值＝H00） Selecting channel signal modes, each HEX bit represents a input channel. In lower 8bit of 2AD(R) module, the higher HEX bit is ch2, and lower HEX bit is ch1: (default value=H00) 0＝-10V～10V；对应数字输出：-2000～2000 0 ＝ -10V ～ 10V ； the corresponding digital output:-2000～2000 1＝4mA～20mA；对应数字输出：0～1000 1 ＝ 4mA ～ 20mA ； the corresponding digital

		output:0～1000 2＝0mA～20mA；对应数字输出：0～1000 2 ＝ 0mA ～ 20mA ； the corresponding digital output:0～1000 3＝本通道关闭； 3= the channel is closed; 4＝-10V～10V；对应数字输出：-10000～10000 4 ＝ -10V ～ 10V ； the corresponding digital output:：-10000～10000 5＝4mA～20mA；对应数字输出：0～1000 5 ＝ 4mA ～ 20mA ； the corresponding digital output:：0～1000 6＝0mA～20mA；对应数字输出：0～1000 6 ＝ 0mA ～ 20mA ； the corresponding digital output:0～1000	
＃1	WR	通道 1 Channel 1	平均滤波常数，即用于平均计算的采样值个数，设定范围 1～4096，默认值 8。若要高速采集，可设定为 1。当 BFM#15 改变时，自动恢复为默认值 Average filter constant, which is the sampling number used for average calculation with setting range of 1~4096, default value =8. Setting to 1 means high-speed sampling. When BFM#15 changes, it automatically is reset to default value.
＃2	WR	通道 2 Channel 2	
＃3~4	—	保留 Reserved	
＃5	R	通道 1 Channel 1	输入通道采集值平均滤波后的数据 The sampling data of input channel after average filter
＃6	R	通道 2 Channel 2	
＃7~8	—	保留 Reserved	
＃9	R	通道 1 Channel 1	输入通道当前采集的数据，即未滤波处理的瞬时值。 The sampling data of input channel means the instantaneous value before filter processing.
＃10	R	通道 2 Channel 2	

<table>
<tr><td>#
11~14</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>#15</td><td>WR</td><td>ADC 速率选择
ADC speed selection</td><td colspan="8">0＝正常速度，15ms/通道（默认值）；
0 ＝ normal speed, 15ms/channel（default value）；
1＝快速转换，6ms/通道；
1＝fast conversion，6ms/channel；
1000～30000＝高速采样，对应 1ms～30ms/通道
1000 ～ 30000 ＝ high-speed sampling, which is corresponding to 1ms～30ms/channel</td></tr>
<tr><td>#
16~19</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td># 20
（E）</td><td>WR</td><td colspan="9">1＝复位设定参数到默认值（出厂值）。
1=reset setting parameter to default value (production value).默认值＝0
Default value=0</td></tr>
<tr><td># 21
（E）</td><td>WR</td><td colspan="9">2＝禁止调整偏移/增益，（默认值）；
2=adjusting deviation/gain is forbidden, (default value);
1＝允许调整偏移/增益
1=adjusting deviation/gain is allowed</td></tr>
<tr><td rowspan="2"># 22
（E）</td><td rowspan="2">WR</td><td>低 4 位对应 2 个通道的操作
The lower 4bit is corresponding to 2 channels</td><td>-</td><td>-</td><td>-</td><td>-</td><td>G2</td><td>O2</td><td>G1</td><td>O1</td></tr>
<tr><td colspan="9">偏移/增益调整使能，当非 0 时，模块会将 BFM23/24 值写入其内部对应通道控制寄存器中
Enable deviation/gain adjustment. When it is not 0, the module write BFM23/24 value to the internal channel control register.</td></tr>
<tr><td># 23
（E）</td><td>WR</td><td colspan="9">偏移值，数字输出为 0 时的模拟输入值（0、1、2 模式）初始值为 0
Deviation value: when digital output is 0, the initial value of analog input value (0,1,2 mode) is 0</td></tr>
<tr><td># 24
（E）</td><td>WR</td><td colspan="9">增益值，数字输出为＋1000 时的模拟输入值（0、1、2 模式）初始值为 5000
Gain value: when digital output is +1000, the</td></tr>
</table>

		initial value of analog input value (0,1,2 mode) is 5000
＃25~26	—	保留 Reserved
＃27	R	2AD 模块软件版本 2AD module software version
＃28	—	保留 Reserved
＃29	R	错误状态 Error state
＃30	R	扩展模块识别码，H2U－2AD（R）的识别码为 K2011 Extended module identification code, the ID code of H2U-2AD (R) is K2011
＃31	—	保留，不可访问 Reserved, cannot be accessed

其中状态信息字 BFM #29 的意义说明如下：
Where, the definition of state information word BFM #29 is described as following:

BFM＃29 位号 BFM#29 bit number	ON 状态 ON state	OFF 状态 OFF state
b0:	存在错误。 There is an error.b0~b3 中任一个非 0，A/D 转换停止 If anyone of b0~b3 is not 0, AD conversion is stopped	无错误 No error
b1:	模块内 EEPROM 的偏移/增益设置有误 The deviation/gain setting is error in module EEPROM	偏移/增益数据正确 The deviation/gain data is correct.
b2:	（不可能） n/a	电源正常 Power runs normally
b3:	模块硬件故障 Module hardware faulty	硬件正常 Hardware runs normally
b10:	数字输出超出-2048～2047 的范围 The value exceeds the rang of -2048～2047	数字输出值正常 Data output value is normal
b11:	采样滤波常数超出 1～	采样滤波常数正常

	4096 范围 The sampling filter constant exceeds the range of 1~4096	The sampling filter constant is normal
b12:	禁止 BFM#21 的值设为 K2 It is forbidden that BFM#21 value is set to K2	允许 BFM#21＝K2 It is allowed that BFM#21 value is set to K2
BFM＃29 的其它 bit4～7，bit13～15 等没有定义。 The other bits bit4~7, bit13~15 in BFM#29 is not defined.		

其中表中的“（E）”字样的 BFM 单元为存入 EEPROM 的项目，具有掉电保持特性。
where, the BFM unit marked with “(E)” in table is the item saved in EEPROM, which has the characteristic of power failure holding.

寄存器改写说明：
The description of register rewriting:

BFM#0、#23、#24 等带(E)单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，每个 Word 约需 300ms 时间，因此在需要改写多个带(E)的 BFM 单元时，注意 PLC 编程时，用户程序中每写一个上述的 BFM 单元后要延时一段时间，不要连续进行写操作，确保写指令的正确完成。
Rewriting BFM #0, #23, #24, which are marked with (E), will cause the module internal writing operation to EEPROM, and writing operation needs a certain time about 300ms per word. So, when rewriting multiple BFM units marked with (E) in PLC programming, after writing a above BFM unit in user program, there should be a delay time instead of continuous writing operation, which ensures that the writing instruction is correctly accomplished.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。
Note: when the external 24V power supply of the local extended module is power off, the system flag M6708 of PLC main module will be set. The flag should be timely checked in programming, the problem can be found in time.

10、部分 BFM 区解释
10. The description of partial BFM area
BFM0#　通道选择
BFM0# selecting channel
通道的初始化，默认 2 个通道都为-10V~10V，由 BFM 0#的十六进制 HXX 控制，最低位控制通道一，第二位控制通道二，每个字符的控制方式如下：
Two channels are initialed as -10V~10V in default, controlled by BFM0# hex HXX. The lower bit controls channel 1, and higher bit controls channel 2. The control method of each

character are listed as following:
X=0 预设范围-10V~10V （对应数字-2000~2000）
X=0 The pre-set range -10V~10V (corresponding value -2000~2000)
X=1 预设范围 4mA~20 mA （对应数字 0~1000）
X=1 The pre-set range -4mA~20mA (corresponding value 0~1000)
X=2 预设范围-20mA~20 mA （对应数字-1000~1000）
X=2 The pre-set range -20mA~20mA (corresponding value -1000~1000)
X=3 本通道关闭
X=3 the channel is closed;
X=4 预设范围-10V~10V （对应数字-10000~10000）
X=4 The pre-set range -10V~10V (corresponding value -10000~10000)
X=5 预设范围 4mA ~20 mA （对应数字 0~10000）
X=5 The pre-set range 4mA~20mA (corresponding value 0~1000)
X=6 预设范围-20mA ~20 mA （对应数字-10000~10000）
X=6 The pre-set range -20mA~20mA (corresponding value -10000~10000)
例如：BFM#0 为 H30，表示通道一为-10V~10V；通道二关闭。
For example: BFM#0=H30 means channel 1 is -10V~10V and channel 2 is closed.
没有用到的通道，可以关闭，也可以不关闭，关闭的通道不占用转换时间（BFM#15），例子中通道二关闭了，则整个通道转换一次时间为通道一乘以 BFM#15。
The unused channel can be closed or unclosed, and the closed channel will not occupy conversion time (BFM#15). In example, channel 2 is closed, then the conversion time of the whole channel = channel 1 × BFM#15.
BFM #1~#2 平均采样数
BFM #1~#2 average sampling number
每个通道(BFM#9~#10)对应的采样值累加采样数（BFM #1~#2）的个数后再除以采样数（BFM #1~#2），存放到（BFM #5~#6）
After the sample value in each channel (BFM#9~#10) is added with sampling number (BFM#1~#2), the sum is divided by sampling number (BFM#1~#2), and the result is saved to (BFM #5~#6)
BFM #5~#6 存放平均采样值
BFM #5~#6 for saving average sampling value
BFM #9~#10 存放即时采样值
BFM #9~#10 for saving instant sampling value
BFM #15 ADC 速率时间
BFM #15 ADC speed time
每个通道转换一次需要的时间，需注意更新一次数据需要的时间是 BFM#15 的时间乘以没有关闭的通道数。
The channel conversion will cost a certain time, and the required time of updating data is BFM#15×the unclosed channel number.
例如：BFM #0 为 H10，BFM #1 为 K7，BFM #2 为 K6，BFM #15 为 K10；则 BFM #9 和 BFM #10 刷新一次数据时间为 BFM#0×BFM#15=2×10=20MS，BFM #5 刷新一次数据时间为 BFM#0×BFM#15×BFM#1=2×10×7=140MS，BFM #6 刷新一次数据时间为 BFM#0×BFM#15×BFM#2=2×10×6=120MS。
For example: BFM #0=H10， BFM #1=K7， BFM #2=K6， BFM #15=K10; the time of

updating BFM #9 and BFM #10 data = BFM#0×BFM#15=2×10=20MS; the time of updating BFM #5 data = BFM#0×BFM#15×BFM#1=2×10×7=140MS; the time of updating BFM #6 = BFM#0×BFM#15×BFM#2=2×10×6=120MS.程序中 FROM/TO 指令比较耗时，故此模块参数在程序中采集 BFM#5 的数据可以用 LDP　M8012　　FROM　K0　K5　D10　K1 指令读取，和 LD　M8000　　FROM　K0　K5　D10　K1 的效果是一样的，但是后面用 M8000 驱动的指令每个扫描周期都读取一次，大大加长了程序的扫描周期。

In program, FROM/TO instruction is time-consuming, so the module parameter can read BFM#5 data in program via LDP M8012　FROM K0 K5 D10 K1 or LD M000　 FROM K0 K5 D10 K1. The latter one applying M8000 instruction will read once in each scanning period, which greatly enlarge the scanning period of the program.

BFM #20　回归出厂值

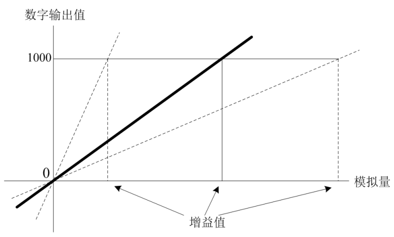
BFM #20　Return to default value

将#20 设定为 1 可以恢复到默认值。

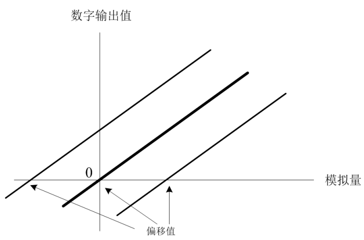
Setting #20 to 1can return to the default value.

BFM #21~#24　偏移和增益的定义与设定方法：

BFM #21~#24　the definition and setting method of deviation and gain



增益是当数字输出值为1000时对应的模拟输入值



偏移值是当数字输出值为0时对应的模拟输入值

数字输出值

Digital output value

增益值

Gain value

模拟量

Analog value

增益是当数字输出值为 1000 时对应的模拟输出值

Gain is the analog output value when digital output value is 1000

偏移值

Deviation value

偏移值是当数字输出值为 0 时对应的模拟输出值

Deviation is the analog output value when digital output value is 0

偏移和增益可以独立设定或一起设定，正常的增益值设定范围是 1V～15V 或 4mA～32mA。正常的偏移值设定范围为-5V～5V，或-20mA～20mA。

Deviation and gain can be set together or separately, and the setting range of the normal gain value is 1V～15Vor 4mA～32mA. The setting range of the normal deviation value is -5V～5V, or -20mA～20mA.

增益/偏移设定前，需先将 BFM#21 设为 1，再修改 BFM#23/24；然后开各个通道的允许偏移增益 BFM#22，修改完毕，应将 BFM#21 再设为 2，避免再次被改变。

Before setting gain/deviation, MFM#21 should be set to 1 firstly, and then BFM#23/24 is modified; The allowable deviation and gain of each channel BFM#22 is modified, after which BFM#21 should be set to 2 to avoid to be modified again.

注意需要修改偏移增益的通道都一样的，不能这个通道偏移数据为 1000，另外一个通道偏移数据为 1200

Note: The deviation gain value for each channel should be same. It is forbidden that one channel deviation value is 1000, and the other channel deviation value is 1200.

例如：在 BFM#0 为模式 0 中，需要修改通道一、通道二的偏移和增益分别为 0.5V 和 6V，则需要按如下步骤操作：

For example: when in BFM#0=0 mode, it requires that the deviation and gain of channel 1 and channel 2 should be respectively modified to 0.5V and 0.6V, and it should be operated according to the following steps:

先将 BFM#21 改为 1；过 300MS 以后将 K500 和 K6000 分别送到 BFM#23 和 BFM#24 去；再过 300MS 后开允许增益 BFM#22，本例子中 BFM#22 应为二进制的 1111，即是将 BFM#22 修改为 HF；修改完毕。最后将 BFM#21 改为 2，以防再次被修改。

1. Modifying BFM#21 to 1;2. After 300ms, K5000 and K6000 are respectively transmitted to BFM#23 and BFM#24;3. After another 300ms, gain BFM#22 is set. In the example, BFM#22 should be binary 1111(HF);4. End . Finally, BFM#21 should be modified to 2 to avoid to be modified again.

编程举例 1：

Programming example 1:

一只 H2U－2AD 扩展模块接于 PLC 主模块后方，按编号原则为＃0 号模块，其中 CH1 端口需要采集-10V～10V 的电压信号，CH2 需要采集 4～20mA 的电流信号。要求改滤波次数为 6，将两个通道采集得到的数据分别存于 D10、D11。编写的用户程序如下：

A H2U-2AD extended module is connected following PLC main module, which is numbered as #0 module according to numbering rule; CH1 port samples voltage signal of -10V~10V, and CH2 port samples current signal of 4~20mA. The filter number should be modified to six, and the data sampled from two channels are respectively saved to D10, D11. The user program is listed as following:

读取#0 号模块中 BFM#30 的读书，暂存于 D0

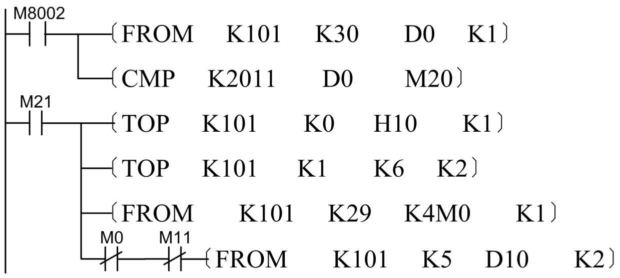
Read the data in BFM#30 of #0 module, and the data is temporarily saved to D0

检查模块标识，判断是否为 H2U-2AD 模块，这样判断可避免当连接顺序与设计顺序不一致时，发生操作错误若接入模块正确，初始化 2AD 模块，CH2 设为 4~20mA 方式，CH1 设为-10V~10V 方式

Checking module identity whether it is H2U-2AD module can help to avoid the disagreement error between connection sequence and design sequence. If the module is connected correctly, 2AD module is initialed, and CH2, CH1 are respectively set in

4~20mA and -10V~10 modes.
将 BFM#1 和 BFM#2 分别改写平均滤波为 6 次。
BFM#1 and BFM#2 average filter number are respectively set to six.
读取模块的报警信息单元的状态字
The state word of module alarm information unit are read.
读取 BFM#5 和 BFM#6 单元（转换结果）分别存入 D10 和 D11
BFM#5 and BFM#6 units (conversion result) are read and saved in D10 and D11

例子中如果改成 H2U－2ADR 远程模块，CAN 站号为 1。则此例子程序如下：
In example, if it is changed to H2U-2ADR remote module, the CAN station number is 1. The example program is listed as following:



编程举例 2：
Programming example 2:

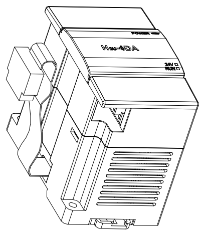
对于一个＃0 编号地址的 H2U－2AD 模块，要求通过一个 X20 按钮引发对其 CH1 通道的偏移/增益设置操作。编程如下：
For a H2U-2AD module numbered as #0, the deviation/gain setting operation for CH1 channel is activated by X20 button. The program is listed as following:

X20 的闭合引发 2AD 模块的偏移。
The deviation of 2AD module is activated by X20 close.增益调整操作
Gain adjustment operation
初始化 2AD 模块，2 个通道均为-10V~10V 信号方式
2AD module is initiated and two channels is set both in -10V~10V signal mode
设 BFM#21=1，允许偏移/增益调整操作
Setting BFM#21=1, enabling deviation/gain adjustment operation
设 BFM#22=0，清除偏移、增益调整

Setting BFM#22=0, the deviation and gain adjustment is cleared.
延时 400ms
Delay 400ms
设 BFM#23=0，设置偏移
Setting BFM#23=0, setting deviation
设 BFM#24=2500，设置增益
Setting BFM#24=2500, setting gain
设 BFM#22=H0003，将刚才设定的 BFM#22、#23 值存入 CH1 的 EEPROM 设置寄存器中
Setting BFM#22=H0003, BFM#22,#23 value are saved in CH1 EEPROM register
延时 400ms
Delay 400ms
清除设置操作的命令标志
The command flag of setting operation is cleared
将 BFM#21=2，禁止偏移、增益调整操作
Setting BFM#21=2, forbidding deviation/gain adjustment operation

使用注意事项：
Caution:
禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；
It is forbidden to push and pull in live line. Only when main module and application system is cut-off, the extended module can be connected or removed to ensure personal safety or property damage.

H2U－4DA　H2U－4DAR　4 通道模拟输出扩展模块
H2U－4DA　H2U－4DAR　Four channel analog input extended module
1、简介
1. Introduction



4DA（R）扩展模块可配合 H2U 系列主模块工作，实现 4 个模拟信号通道的输出，每个通道都具有电压信号及电流信号输出端口，信号幅值分别可为 0～10V 或 0～20mA。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元，实现模拟输出信号的控制。
Four analog signal channels output can be achieved by 4DA(R) extended module and H2U series main module, and each channel has voltage output and current signal output port with signal amplitude of 0~10V or 0~20mA. The main module accesses the BFM unit in the extended module register via FROM/TO instruction, to achieve controlling analog output signal.

2、产品规格

2. Product specification

H2U-4DA(R)电气规格：

H2U-4DA(R) electric specification:

<table>
<tr><th>项　目
Item</th><th>指　标
Indication</th><th>说　明
Description</th></tr>
<tr><td>电压输出信号电平
Voltage output signal level</td><td>-10V～10V，</td><td rowspan="4">每个通道可独立选择电压信号类型。用户需根据接入的信号类型，设置相应的 BFM 区。
The voltage signal type could be separately selected for each channel. According to the connected signal type, user can setting corresponding BFM area.</td></tr>
<tr><td>电压通道允许最小电阻
The minimum resistance allowed by voltage chnnel</td><td>2kΩ</td></tr>
<tr><td>电流输出信号
Current output signal</td><td>4mA～20mA</td></tr>
<tr><td>电流通道允许电阻
The resistance allowed by current channel</td><td>100Ω～500Ω</td></tr>
<tr><td>输出通道数
The number of output channels</td><td>4 通道
Four channels</td><td></td></tr>
<tr><td>信号转换速率
Signal conversion rate</td><td>4ms/通道
4ms/channel</td><td></td></tr>
<tr><td>转换速度
Conversion speed</td><td>15ms/通道（常速），6ms/通道（最快）
15ms/channel (normal speed), 6ms/channel (fastest)</td><td></td></tr>
<tr><td>数字输出
Digital output</td><td>默认设置：-2000 ~ 2000
Default setting: -2000 ～ 2000</td><td>允许范围：
Allowed range:
-10000 ~ 10000</td></tr>
<tr><td>电压信号分辩率
Voltage signal resolution</td><td>5mV</td><td>对应于 10V/2000，
Corresponding to 10V/2000,</td></tr>
</table>

电流信号分辨率 Current signal resolution	20μA	对 应 于 20mA /1000 Corresponding to 20mA/1000,
精度 Precision	±1%全范围 ±1% full range	
占用 I/O 点数 Occupying I/O points	不占用主模块 I/O 点数 The main module I/O points are not occupied	
隔离设计 Isolation design	模拟电路和数字电路之间用光电耦合器隔离； The photo-coupler should be applied for isolating analog circuit and digital circuit; 模拟电路和外部电源之间用 DC/DC 进行隔离； DC/DC should be applied for isolating analog circuit and external power; 模拟输入信号通道之间不隔离。 The isolation is not needed between analog input signal channels.	

3、电源规格

3. Power supply specification

项　目 Item	指　标 Indication
模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 24V DC -15%/+20%， Max authorized ripple voltage 5% 电流消耗 200mA (取自于主模块的 24V/COM，或其它的 24VDC 电源) Current consumption 200mA (from 24V/COM of main module or other 24VDC power supply)
数字电路 Digital circuit	5V DC 50mA (通过模块扩展电缆，取自主模块电源内部电源) 5V DC 50mA (from main module internal power supply via module extended cable)
备 注 Comment	远程扩展模块无需数字电路电源。 Remote extended module without digital circuit power supply.

4、LED 状态指示灯说明：

4. LED state indicator description:

4.1 本地扩展模块 LED 状态指示灯说明

LED state indicator description of local extended module

项目 Item	说明 Description
PWR	模块数字电路供电正常 Module digital circuit is powered normally
24V	当外部 24V 电源供电正常时点亮 Lighted when external 24V power supplies normally
COM	点亮表示有 FROM/TO 指令访问模块。 Lighting indicates there is FROM/TO instruction accessing module.

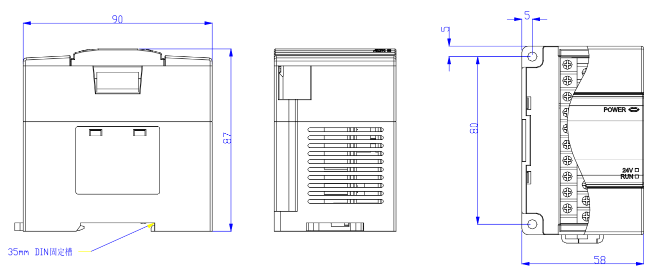
4.2 远程扩展模块 LED 状态指示灯说明

LED state indicator description of remote extended module

项目 Item	说明 Description
PWR	模块 24V 供电正常 Module 24V power supplies normally
COM	点亮表示模块进行通讯。 Lighting indicates that the module will make communication.
ERR	点亮表示有错误发生。 Lighting indicates that there is error.

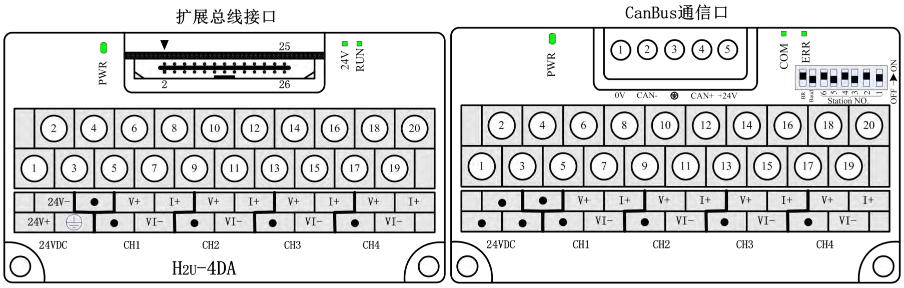
5、模块的安装尺寸：

5. The module install size:



6、接线端子布局如下图：

6. The layout of connecting terminal is shown as following:



H2U-4DA H2U-4DAR

扩展总线接口

Extended bus interface

CanBus 通信口

CanBus communication port

7、输出信号的接线：

7. Wiring output signal:

模拟输入信号通过双绞线连接到扩展模块的输入端口，布线时不要与交流电源线或干扰严重的线路靠近；

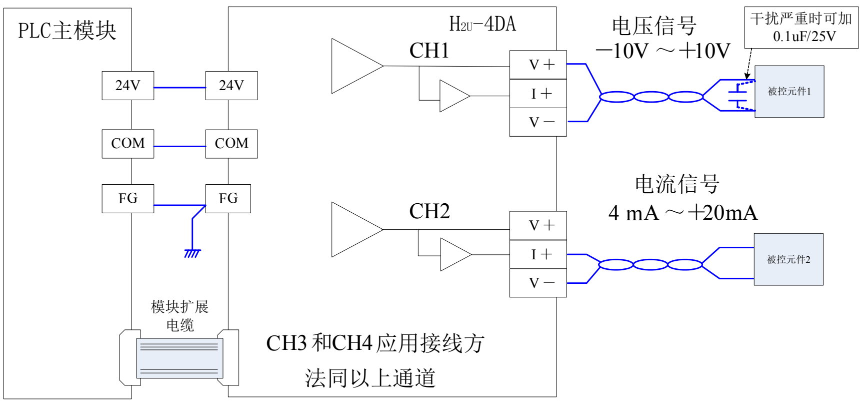
The analog input signal is connected to the input port of extended module via twisted pair. When wiring, it should not be closed to AC power line or badly interferred circuit;

若现场的干扰严重时，可采用屏蔽线进行信号连接，并在被控设备电压输入端口并联 1 只 0.1μF/25V 的高频电容；

If the field interferes badly, it could be connected with shield cable, and parallel connecting a high-frequency capacity of 0.1μF/25V on input port;

信号源及其屏蔽线的外壳与 PLC 的 FG 端、被控设备的信号接地端相连，共同接地。

The signal source and the shell of the shield cable should be connected with signal grounding port FG of the device and grounding.



PLC 主模块

PLC main module

模块扩展电缆

Module extended cable

CH3 和 CH4 应用接线方法同以上通道

CH3 and CH4 connecting method is same as the above channels

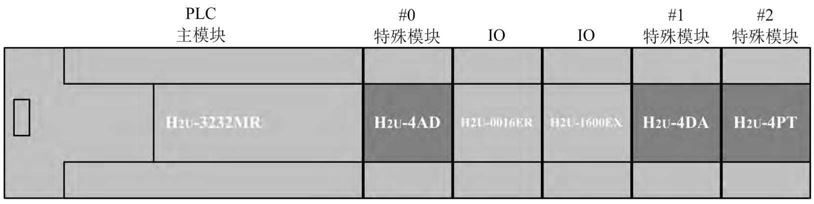
电压信号-10V~+10V

Voltage signal -10V~+10V

电流信号 4mA~+20mA
Current signal 4mA~+20mA
干扰严重时可加 0.1uF25V
If it is interfered badly, a capacity of 0.1uF/25V could be involved
被控元件 1
The controlled component 1
被控元件 2
The controlled component 2

8、本地特殊扩展模块的地址编号：
8. Address numbering of local special extended module:

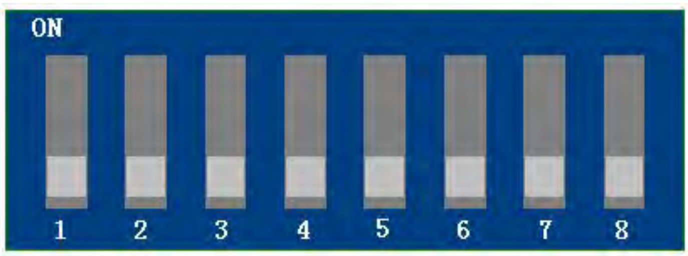
除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。
Except for IO extended module, all kinds of extended module are called as special module, such as 4AD/4DA/4TC/CC-Link and so on. When PLC is powered, all connected extended modules will be checked for one time, and respectively the special modules and IO extended ports are numbered. User cannot intervent or change the numbering result, unless the module connection order is modified.
主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的 IO 扩展模块不参与编号，如下图中，4DA 扩展模块的模块地址编号为＃1，后续的 4PT 模块地址为＃2，以此类推，最多可接入 8 个特殊模块：
The address numbering rule of main module for special modules is: started with the module closed to PLC main module, they are numbered with #0, #1,…,#7 in order, and the IO extended modules are not involved. For example, the module address numbering of a 4DA extended module is #1; the following 4PT modules address are #2, and so on, and at most eight special modules could be connected:



PLC 主模块
PLC main module
特殊模块
Special module

即使中间插有若干 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。
Even if there are several IO extended modules, the numbering order will not be affected. After understanding the above address numbering rule, user can correctly access the specified module in programming.
上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，4DA 模块也能同时上电。若 4DA 模块的外部电源上电滞后，可能导致

PLC 主模块不能正确辨识模块类型；
In order that main module and 4DA module can be powered at same time, before powered, the external 24V/COM power supply of the module should be correctly connected to the corresponding 24V/COM port of the PLC main module. If the external power of 4DA module is powered with delay, it will cause that PCL main module will not correctly recognize the module type;
PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。
Only when powered, PLC main module will check all extended modules connected to system for one times, and it cannot recognize and normally access the extended modules which is connected during operation. If user pushes or pulls extended module in operation, the device will be damaged, and more badly it will cause the un-precognition of the output state and user device faulty.
9、远程特殊扩展模块的地址编号：
9. Address numbering of remote special extended module:
在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：
In remote extended module, the address is: module communication station number+100, and at most 63 remote extended modules are allowed. By toggling the code switch on Station No., the module station number could be set, and the code switch interface is defined as following:
每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。
There is a 8bit code switch on every remote module. By toggling code switch, user can set module station number, selecting baud rate, and terminate match resistance or not. Every bit on code switch has a number, and “ON” indicates logical “1”, which is shown as following figure. The definition of every bit is listed as following table.



CAN-LINK 拨码开关
CAN-LINK code switch
拨码开关位定义
The definition of code switch bit

拨码号 Code	信号 Signal	描述 Description
1	地址线 A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本

	Address line A1	机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 A 6bit binary number is made up of six bit code switches, which is used for identifying the module station number. “ON” indicates 1, and “OFF”indicates 0. Lower bytes follow higher bytes. The format is as following: A6A5A4A3A2A1. Such as A1=ON, the other bits are all OFF, which indicates the binary address: 000001, decimal number: K01, hex number h01. Such as A5, A4=ON, the other bits are all OFF, which indicates the binary address: 011000, decimal number: K24, hex number h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode, baud rate 500Kbps; ON: low-speed mode, baud rate 100Kbps
8	匹配电阻 Matched resistance	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If code switch is ON, it indicates a terminal matched resistance of 120Ω is connected; or it is disconnected.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124 若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

If A5, A4=ON, and other bits are all OFF, which indicates the binary address: 011000, decimal number K24, the module number is K24+100 (#124) in FROM/TO instruction programming; if code switch is modified, except for matched resistance, baud rate and address will not take effect immediately. After the system is powered again, the new setting parameter will take effect. The uniqueness of CAN address should be paid attention to, which means there should not be any same address.

10、访问 4DA(R)模块的 BFM 区：

10. Access BFM area of 4DA(R) module

PLC 主模块是通过向 4DA(R)模块的寄存器缓存单元（BFM 区）的写入数字值，由 4DA(R)转换为模拟量输出，通过改写特定 BFM 区的方式来设置模块状态。PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

PLC main module writes data value in the register buffer unit (BFM area) of 4DA(R) module, which is converted to analog output by 4DA(R), and module state is set by modifying special BFM area. PLC main module accesses these BFM units via read/write instruction FROM/TO.

扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。

The extended module is equipped with EEPROM storage unit, which is used for saving several BFM setting value, such as signal type, deviant, gain value of every analog input channel, and these units are automatically saved by setting corresponding BFM unit state.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 4DA(R)模块的 BFM 区定义如下表：

Every register width of BFM area is 16bit (1Word), and according to 4DA(R) BFM area the BFM is defined as following table:

BFM BFM	R/W 属性 R/W attribution	内容 Content
＃0（E）	WR	输出模式选择，每个 HEX 位代表 1 个输入通道，最高位为 ch4，最低位为 ch1：（默认值＝H0000） Selecting output mode, each HEX bit represents one input channel; the highest bit is ch4, and the lowest bit is ch1: (default value=H0000) 0＝-10V～10V；对应数字输出：-2000～2000 0＝-10V～10V；the corresponding digital output:-2000～2000 1＝4mA～20mA；对应数字输出：0～1000 1＝4mA～20mA；the corresponding digital output:0～1000 2＝0mA～20mA；对应数字输出：0～1000 2＝0mA～20mA；the corresponding digital output:0～1000 4＝-10V～10V；对应数字输出：-10000～10000 4＝-10V～10V；the corresponding digital output:：-10000～10000 5＝4mA～20mA；对应数字输出：0～10000 5＝4mA～20mA；the corresponding digital output:：0～10000 6＝0mA～20mA；对应数字输出：0～10000 6＝0mA～20mA；the corresponding digital output:0～10000

<table>
<tr><td>#1</td><td>WR</td><td>通道 1
Channel 1</td><td colspan="3" rowspan="4">通道输出值，初始值为 0
Channel output value, initial value = 0</td></tr>
<tr><td>#2</td><td>WR</td><td>通道 2
Channel 2</td></tr>
<tr><td>#3</td><td>WR</td><td>通道 3
Channel 3</td></tr>
<tr><td>#4</td><td>WR</td><td>通道 4
Channel 4</td></tr>
<tr><td>#5（E）</td><td>WR</td><td colspan="4">PLC 停机时数值保留模式，每个 HEX 位代表 1 个通道（Hxxxx,最高位为 CH4,最低位为 CH1），当：
When PLC shuts down, the data value is held; each HEX bit represents a channel (Hxxxx, the highest bit is CH4, and lowest bit is CH1),when
x＝0，保持停机前的输出；x＝1，将输出复位到偏移设定值
x=0, the output before shut down is held; x=1, the output is reset to the deviation pre-set value</td></tr>
<tr><td>#6～7</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td rowspan="2">#8（E）</td><td rowspan="2">WR</td><td>G2</td><td>O2
O2</td><td>G1</td><td>O1
O1</td></tr>
<tr><td colspan="4">CH2/CH1 的偏移/增益设置命令，按 HEX（4 个 2 进制的 bit）位设置，初始值＝H0000
CH2/CH1 setting deviation/gain command, which is set according to HEX(4 binary bit)bit, initial value =H0000
0＝禁止改变；1＝允许改变 EEPROM 对应数据
0=forbid to modify; 1=allow to modify EEPROM data</td></tr>
<tr><td rowspan="2">#9（E）</td><td rowspan="2">WR</td><td>G4</td><td>O4
O4</td><td>G3</td><td>O3
O3</td></tr>
<tr><td colspan="4">CH3/CH4 的偏移/增益设置命令，按 HEX（4 个 2 进制的 bit）位设置，初始值＝H0000
CH3/CH4 setting deviation/gain command, which is set according to HEX(4 binary bit)bit, initial value =H0000</td></tr>
</table>

<table>
<tr><td></td><td></td><td colspan="2">0＝禁止改变；1＝允许改变对应 BFM 的数据
0=forbid to modify; 1=allow to modify BFM data</td></tr>
<tr><td>＃10</td><td>WR</td><td>偏移数据 CH1
Deviation data CH1</td><td rowspan="8">单位：mV 或μA
Unit: mV or μA
初始偏移值：0
Initial deviation value: 0
初始增益值：＋5000,对应模式 0
Initial gain value: +5000, according to mode 0</td></tr>
<tr><td>＃11</td><td>WR</td><td>增益数据 CH1
Gain data CH1</td></tr>
<tr><td>＃12</td><td>WR</td><td>偏移数据 CH2
Deviation data CH2</td></tr>
<tr><td>＃13</td><td>WR</td><td>增益数据 CH2
Gain data CH2</td></tr>
<tr><td>＃14</td><td>WR</td><td>偏移数据 CH3
Deviation data CH3</td></tr>
<tr><td>＃15</td><td>WR</td><td>增益数据 CH3
Gain data CH3</td></tr>
<tr><td>＃16</td><td>WR</td><td>偏移数据 CH4
Deviation data CH4</td></tr>
<tr><td>＃17</td><td>WR</td><td>增益数据 CH4
Gain data CH4</td></tr>
<tr><td>＃18～19</td><td>—</td><td colspan="2">保留
Reserved</td></tr>
<tr><td>＃20（E）</td><td>WR</td><td colspan="2">初始值＝0，当写入 1 时，所有 BFM 单元将初始化为默认值。
Initial value = 0, when writing with 1, all BFM units are initialled to default value.</td></tr>
<tr><td>＃21（E）</td><td>WR</td><td colspan="2">1＝允许调整输出特性（初始值)；设为 2＝禁止调整输出特性
1=allow to adjust output characteristic (initial value); 2= forbid to adjust output characteristic</td></tr>
<tr><td>＃22～26</td><td>—</td><td colspan="2">保留
Reserved</td></tr>
<tr><td>＃27</td><td>R</td><td colspan="2">扩展模块软件版本
Extended module software version</td></tr>
<tr><td>＃28</td><td>—</td><td colspan="2">保留
Reserved</td></tr>
<tr><td>＃29</td><td>R</td><td colspan="2">错误状态字
Error state word</td></tr>
<tr><td>＃30</td><td>R</td><td colspan="2">模块识别码，4DA（R）模块的识别码为</td></tr>
</table>

		K3020 Module identity code, 4DA(R) module identity code=K3020
＃31	—	保留 Reserved

其中状态信息字 BFM #29 的意义说明如下：

Where, the definition of state information word BFM #29 is described as following:

BFM ＃ 29 位号 BFM#29 bit number	ON 状态 ON state	OFF 状态 OFF state
b0:	存在错误。b1~b3 中任一个非 0， D/ A 转换停止 There is an error. If anyone of b1~b3 is not 0, D/A conversion is stopped	无错误 No error
b1:	模块内 EEPROM 的偏移/增益设置有误 The deviation/gain setting is error in module EEPROM	偏移/增益数据正确 The deviation/gain data is correct.
b2:	（不可能） n/a	电源正常 Power runs normally
b3:	模块硬件故障 Module hardware faulty	硬件正常 Hardware runs normally
b10:	写入数字值超出指定的范围 Writing data value exceeds the specified range	数字输出值正常 Data output value is normal
b12:	禁止 BFM#21 的值没有设为 K1 Forbid BFM#21=K1	BFM#21＝K1 BFM#21＝K1
BFM＃29 的其它 bit4～7，bit11，bit13～15 等没有定义。 The other bits bit4~7, bit11, bit13~15 in BFM#29 is not defined.		

寄存器改写说明：

The description of register rewriting:

表格中（E）表示存于 EEPROM 中，注意 BFM＃8、＃9、＃20 等带（E）的单元不能频繁写操作，以免损坏 EEPROM 单元。

(E) represents it exits in EEPROM, and it is recommended that the writing operation should not be continually implemented on BFM#8, #9, #20 units, which is with (E) to avoid EEPROM damage.

BFM＃0 等带（E）单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，共约需 3s 时间。注意 PLC 编程时，在改写 BFM＃10～＃17 单元之前，需要要延时 3s 的时间；且不要连续进行写操作，每次写之前安排约 300ms 的延时间隔，确保写指令的正确完成。

The modification of BFM#0, which is with (E), will cause module internal writing operation to EEPROM, and writing operation needs about 3s. Note: when in PLC programming, before modifying BFM#10~#17 units, it needs 3s delay time; it is forbidden to implement continuous writing operation and it requires about 300ms delay time before writing operation to ensure that the writing instruction is correctly accomplished.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。

Note: when the external 24V power supply of the local extended module is power off, the system flag M6708 of PLC main module will be set. The flag should be timely checked in programming, the problem can be found in time.

11、部分 BFM 区解释

11. Some explain of BFM area

BFM#0　通道选择

BFM#0　channel selection

通道的初始化，默认 4 个通道都为-10V~10V，由 BFM #0 的十六进制 HXXXX 控制，最低位控制通道一，依次顺序，最高位控制通道四，每个字符的控制方式如下：

Channel initialization. The 4 default channels are -10V ~ 10V, controlled by hexadecimal HXXXX of the BFM # 0. The lowest bit controls channel 1, followed by the order, the highest bit controls channel 4. Control mode of each character is as follows:

X=0　预设范围-10V~10V　（对应数字-2000~2000）
X=1　预设范围 4mA~20 mA　（对应数字 0~1000）
X=2　预设范围 0mA~20 mA　（对应数字 0~1000）
X=4　预设范围-10V~10V　（对应数字-10000~10000）
X=5　预设范围 4mA ~20 mA　（对应数字 0~10000）
X=6　预设范围 0mA ~20 mA　（对应数字 0~10000）

X=0 Preset range -10V~10V　（corresponding to -2000~2000）
X=1 Preset range 4mA~20 mA　（corresponding to 0~1000）
X=2 Preset range 0mA~20 mA　（corresponding to 0~1000）
X=4 Preset range -10V~10V　（corresponding to -10000~10000）
X=5 Preset range 4mA ~20 mA　（corresponding to 0~10000）
X=6 Preset range 0mA ~20 mA　（corresponding to 0~10000）

例如：BFM#0 为 H1220，表示通道一为-10V~10V；通道二和三为 0mA~20 mA；通道四为 4mA~20 mA。

For example: BFM # 0 is the H1220, says Channel 1 is-10V ~ 10V; channel 2 and channel 3 for 0mA ~ 20 mA; channel 4 for the 4mA ~ 20 mA.

BFM #1~#4　通道输出值

BFM #1~#4　channel output

用 TO 指令往 BFM #1~#4 写数据，可以控制模拟量输出。初始值均为 0.

With TO instruction to write data to the BFM # 1 ~ # 4, you can control the analog output. The initial values are 0.

BFM #5　　数据保持模式

BFM #5　　Data retaining mode

当主模块在由 RUN 至 STOP 状态时 RUN 最后的模式被保持(X=0)或者为偏移值(X=1)输出，

When the main module is in the state RUN to STOP, the final model are kept (X = 0) or the offset value (X = 1) output.

例如：BFM#0 为 H0000，BFM#5 为 H0101，4 个通道的偏移值均为 0.1V，由 RUN 至 STOP 变化时 BFM#1~#4 里面的值均为 1500（7.5V），当 STOP 后，通道 1 和通道 3 输出电压变成 0.1V，通道 2 和通道 4 输出电压保持在 7.5V。

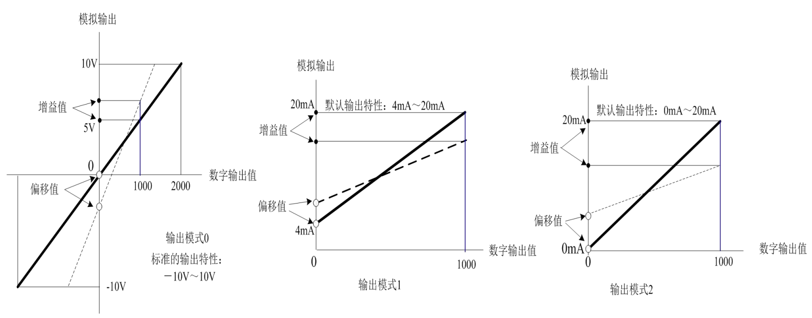
For example: BFM # 0 is the H0000, BFM # 5 is the H0101, offset of 4 channels are 0.1V. Changes from the RUN to STOP, BFM # 1 ~ # 4 inside the values are 1500 (7.5V), when STOP, the channel 1 and channel 3 output voltage becomes 0.1V, Channel 2 and Channel 4, the output voltage remains at 7.5V.

BFM #8~#17、BFM #21 偏移和增益的定义与设定方法：

BFM # 8 ~ # 17, BFM # 21 The definition of offset and gain setting method:

H2U－4DA(R)共有三种工作模式，特性曲线如下图：

H2U-4DA (R) There are three operating modes, characteristic curve as shown below:



模拟输出

Analog output

增益值

Gain value

偏移值

Offset value

输出模式 0 标准输出特性：-10V~10V

Output Mode 0 standard output features: -10V ~ 10V

默认输出特性：4mA~20mA

The default output characteristics: 4mA ~ 20mA

输出模式 1

Output mode 1

数字输出值

Digital output value

其中，增益值为数字 1000 时对应的模拟量输出；偏移值则是数字为 0 时对应的模拟量输出。偏移和增益可以独立设定或一起设定，设定参数的单位是 mV（模式 0）和μA（模式 1 和 2）

Among them, Gain value is the analog input value when digital output is 1000; Offset value is the analog input value when digital output is 0. Offset and gain settings can be set independently or together, set the parameters of the unit is mV (mode 0) and μA (mode 1 and 2)

BFM #8~#9 为偏移、增益设置命令，十六进制的每 HEX（二进制的 4 个 bit 位组成）位来控制禁止或者允许，注意在 AD 输入模块中是二进制的每个 bit 位来控制，DA 模块和 AD 模块在偏移、增益设置命令有所区别。BFM #10~#17 为偏移、增益设置值，BFM #21 为曲线特性设置命令

BFM # 8 ~ # 9 are the offset, gain setting instruction, each hex HEX (binary four bits) to control the prohibited or permitted, pay attention to in the AD input module it is each bit in a binary bit to control. The offset, gain setting instruction of DA module and the AD module differ. BFM # 10 ~ # 17 are the offset, gain settings, BFM # 21 are the instruction to set curve characteristics.

增益/偏移设定前，需先将 BFM＃21 设为 1，再根据需要修改 BFM＃10～＃17 的相关单元数值；再向 BFM＃8、＃9 单元写入操作允许字，修改完毕，应将 BFM＃21 再设为 2，避免再次被改变。

Before Gain / offset setting, BFM # 21 has to be set to 1 at first, then relative units of BFM＃10～＃17 are modified; then write the word of allowing operation to BFM#8, #9. When change is completed, BFM # 21 should be set to 2, avoid to be changed again.

例如：在 BFM#0 为模式 H0000 中，需要修改通道一的偏移和增益分别为 0.2V 和 5.5V；通道三的偏移和增益分别为 0.5V 和 6V，则需要按如下步骤操作：

For example: In BFM # 0 as a model H0000, the offset and gain of channel 1 needed to modify are 0.2V and 5.5V; offset and gain of channel 3 are 0.5V and 6V. You need to do the following:

先将 BFM#21 改为 1；过 300MS 以后将 K200、 K5500、K500、K6000 分别送到 BFM#10、#11、#14、#15 中去；紧跟着 BFM#8~#9 开允许偏移、增益，即是将 BFM#8、BFM#9 都修改为 H0011；修改完毕。最后将 BFM#21 改为 2，以防再次被修改。

First change BFM # 21 to 1; 300MS later the K200、 K5500、K500 and K6000 are sent to BFM#10、#11、#14、#15; Followed by BFM # 8 ~ # 9 to open to allow offset, gain, that is to amend BFM # 8, BFM # 9 as H0011; modification is completed. Finally, the BFM # 21 is changed to 2, to prevent further modification.

BFM #20　　回归出厂值

BFM #20　　return to default value

将 BFM #20 设定为 1 可以恢复到默认值。

The BFM # 20 is set to 1 can be restored to the default values

编程举例 1：

Program example 1:

一台 H2U－4AD 扩展模块接于 PLC 主模块后方，紧跟着接了一台 H2U－4DA 扩展模块，按编号原则 H2U－4DA 为＃1 号模块，其中需要 CH1 端口输出 6mA～20mA 的电流信号，CH2 端口输出-10V～10V 的电压信号，CH3/CH4 未使用。要求 X21 端口的闭合引发 4DA 模块的初始化操作。编写的用户程序如下：

A H2U-4AD PLC expansion module connected to the rear of the main module. And next to connect a H2U-4DA expansion module. Number H2U-4DA module #1 according to rule. CH1 port need to output 6mA～20mA current signal, CH2 need to output -10V～10V voltage signal, CH3/CH4 are not used. Ask to close port X21 to trigger 4DA module initialization. User program written as follows:

X21 的闭合引发 4AD 模块的偏移。增益调整操作

The close of X21 trigger the offset/gain adjustment operation of 4AD module.

初始化 4AD 模块，CH1 通道为 4mA~20mA 信号方式,CH2 通道为-10V~10V 信号，CH3,CH4 关闭

Initialize 4AD module, CH1 channel is 4mA~20mA signal mode, CH2 channel is -10V~10V signal mode, CH3, CH4 are closed.

设 BFM#21=1，允许偏移/增益调整操作

Let BFM # 21 = 1, allow the offset/ Gain adjustment operation

延时 3s

设 BFM#10=6000，设置 CH1 偏移为 6mA

设 BFM#11=20000，设置 CH1 增益为 20mA

设 BFM#22=H0003，将刚才设定的 BFM#22、#23 值存入 CH1 的 EEPROM 设置寄存器中

延时 3s

清除设置操作的命令标志

将 BFM#21=2,禁止偏移/增益调整操作

Delay 3s

Let BFM # 10 = 6000, set the offset of CH1 6mA.

Let BFM # 11 = 20000, set the gain of CH1 20mA

Let BFM # 22 = H0003, save the set of BFM # 22, # 23 into EEPROM configuration register of CH1.

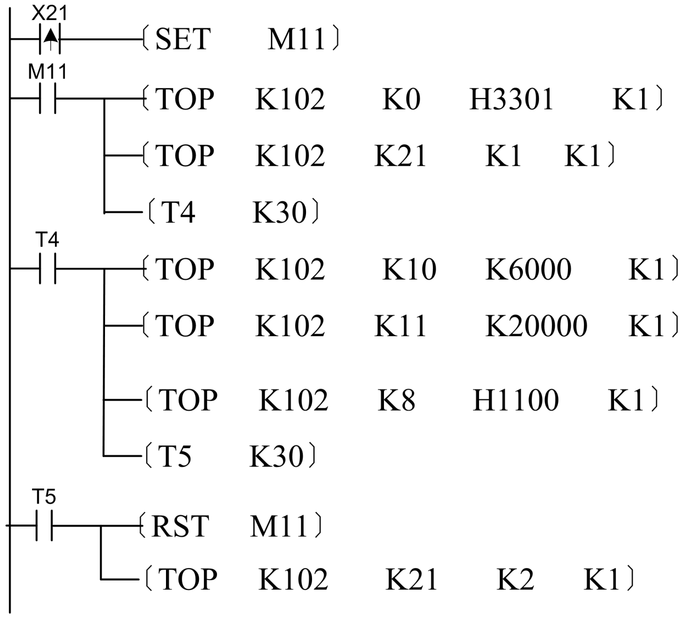
Delay 3s

Clear flag to set the operation command

The BFM # 21 = 2, prohibits offset / gain adjustment operation

例子中如果改成 H2U－4DAR 远程模块，CAN 站号为 2。则此例子程序如下：

If H2U-4ADR remote module in the example, CAN station is number 2. This example program is as follows:



编程举例 2：

Programming example 2:

接上例本地模块的举例，若要求将 D100、D101 的值分别从 CH1、CH2 端口输出，每 1 秒中检查一次 4DA 模块的工作状态。编程如下：

In the example of local module, if it requires that D100, D101 is outputted from CH1, CH2, and the operation state of 4DA module will be checked every 1s. The program is listed as following:

将 D100、D101 分别写入 CH1、CH2 端口对应的 BFM#1、#2 单元

D100, D101 is written to BFM#1, #2 units corresponding to CH1, CH2 ports.

读取 4DA 的错误状态字单元

The error state word unit of 4DA is read.

检查 FROM、TO 指令完成情况，以及是否有错指示 4DA 错误状态标志的保存

Check whether FROM, TO instructions are accomplished, and there is 4DA error state flag

其中若 4DA 模块的外部 24V 电源失电，系统标志 M6708 会置位。

Where, if the external 24V power supply of 4DA module is off, the system flag M6708 will be set.

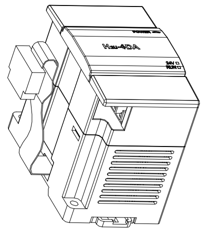
使用注意事项：

Caution:

禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；
It is forbidden to push and pull in live line. Only when main module and application system is cut-off, the extended module can be connected or removed to ensure personal safety or property damage.

H2U－2DA　H2U－2DAR　2 通道模拟输出扩展模块
H2U－2DA　H2U－2DAR　Dual channel analog output extended module

1、简介
1. Introduction



2DA（R）扩展模块可配合 H2U 系列主模块工作，实现 2 个模拟信号通道的输出，每个通道都具有电压信号及电流信号输出端口，信号幅值分别可为 0～10V 或 0～20mA。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元，实现模拟输出信号的控制。
Dual analog signal channels output can be achieved by 2DA(R) extended module and H2U series main module, and each channel has voltage output and current signal output port with signal amplitude of 0~10V or 0~20mA. The main module accesses the BFM unit in the extended module register via FROM/TO instruction, to achieve controlling analog output signal.

2、产品规格
2. Product specification

项目 Item		指标 Indication
电源 Power	模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 输入电流 200mA(来自于主单元的外部电源) 24V DC -15%/+20%， Max authorized ripple voltage 5% input current 200mA(from the extenal power supply)
	数字电路 Digital circuit	5V DC 50mA(来自于主电源内部电源或有源扩展单元) （远程扩展模块无需数字电路电源。 5V DC 50mA(from internal power supply) (the digital circuit power is not requested by the remote extended module).）
占用 I/O 点数 Occupying I/O points		不占用主模块 I/O 点数 The main module I/O points are not occupied
转换速度		2 通道 2.1mS

<table>
<tr><td colspan="2">Conversion speed</td><td>2 channels 2.1ms</td></tr>
<tr><td rowspan="2">模拟输出范围
Analog output range</td><td>电压输出
Voltage output</td><td>-10～10V DC(外部负载阻抗为 2KΩ～1MΩ)
-10～10V DC(External load resistence is 2KΩ～1MΩ)</td></tr>
<tr><td>电流输出
Current output</td><td>0～20mA(外部负载阻抗为 500Ω或更小)
0～20mA(external load resistence is 500Ω or less)</td></tr>
<tr><td colspan="2">数字输入
Digital input</td><td>默认设置：-2000 ~ 2000，允许范围：-10000 ~ 10000
Default setting: -2000~2000, allowable range: -10000~10000</td></tr>
<tr><td rowspan="2">分辨率
Resolution</td><td>电压输出
Voltage output</td><td>5mV(10V/2000)
5mV(10V/2000)</td></tr>
<tr><td>电流输出
Current output</td><td>20μA(20mA /1000)
20μA(20mA /1000)</td></tr>
<tr><td colspan="2">总体精度
Total precision</td><td>±1%（对于 10V 的全范围）
±1%（corresponding to full range of 10V）
±1%（对于 20mA 的全范围）
±1%（corresponding to full range of 20mA）</td></tr>
<tr><td colspan="2">隔离
Isolation</td><td>模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路电源和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。
The photo-coupler should be applied for isolating analog circuit and digital circuit. DC/DC should be applied for isolating analog circuit and external power. The isolation is not needed between analog channels.</td></tr>
</table>

3、模块用户接口表：

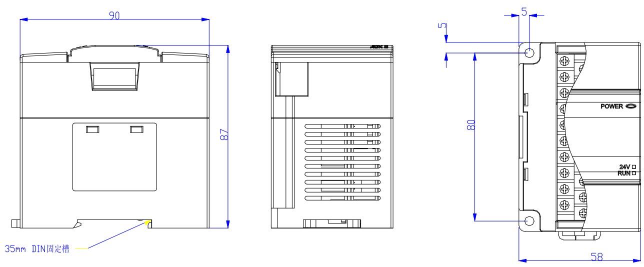
3. the table of module user interface:

项目 Item	说明 Description
接线端子功能 The function of connecting terminal	V+：通道的电压正输出端子； V+：Channel voltage positive output terminal; I+：通道的电流正输出端子； I+：Channel current positive output terminal; VI-：通道的输出公共端； VI-: Channel output common terminal; 24+/24-:外部 24V 输入端子； 24+/24-: external 24V input terminal; GND：保护接地。 GND: Protective grounding.

指示灯 Indicator	本地扩展模块 Local extended module	PWR：当与主模块连接且主模块上电的情况下点亮。 PWR: lighted when it is connected with powered main module. COM：当模块正常工作时高速闪烁，故障时慢速闪烁。 COM: When module runs normally, it flashes in high speed; when there is fault, it flashes in low speed. 24V：当外部 24V 接通时点亮。 24V: When external 24V is connected, it is lighted.
	远程扩展模块 Remote extended module	PWR：模块 24V 供电正常 PWR: Module 24V power supplies normally COM：点亮表示模块进行通讯 COM: It lighting indicates that the module will make communication. ERR：点亮表示有错误发生。 ERR: It lighting indicates that there is error.
扩展端口 Expended port	本地扩展模块 Local extended module	扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。 The 26-pin ladder connector is applied for the extended input port, and module is connected via flat cable; the 26-pin ladder connector is also applied for the extended output port.
	远程扩展模块 Remote extended module	扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线 The 5-pin hole plug is applied for extended input, and it is recommended to use spiral-eight shield cable or network line as transmission cable.

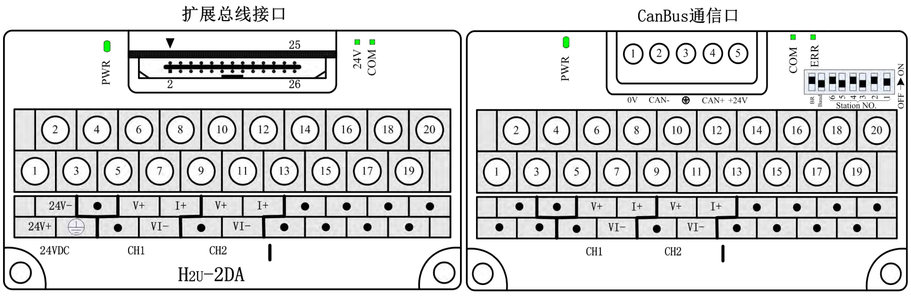
4、模块的安装尺寸：

4. The module install size:



5、接线端子布局如下图：

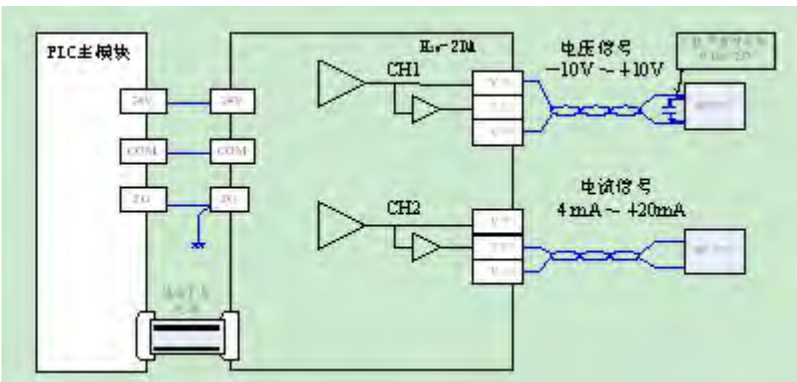
5. The layout of connecting terminal is shown as following:



H2U-2DA H2U-2DAR

扩展总线接口
Extended bus interface
CanBus 通信口
CanBus communication port

6、输出信号的接线：
6. Wiring output signal:
模拟输出信号通过双绞线连接到被控元件，布线时不要与交流电源线或干扰严重的线路靠近；
The analog output signal is connected to the controlled component via twisted pair. When wiring, it should not be closed to AC power line or badly interfered circuit;
若现场的干扰严重时，可采用屏蔽线进行信号连接，并在被控设备电压输入端口并联 1 只 0.1μF/25V 的高频电容；
If the field interferes badly, it could be connected with shield cable, and parallel connecting a high-frequency capacity of 0.1μF/25V on input port;
信号源及其屏蔽线的外壳与 PLC 的 FG 端、被控设备的信号接地端相连，共同接地。
The signal source and the shell of the shield cable should be connected with signal grounding port FG of the device and grounding.



PLC 主模块
PLC main module

模块扩展电缆
Module extended cable

电压信号-10V~+10V
Voltage signal -10V~+10V
电流信号 4mA~+20mA
Current signal 4mA~+20mA
干扰严重时可加 0.1uF/25V
If it is interfered badly, a capacity of 0.1uF/25V could be involved

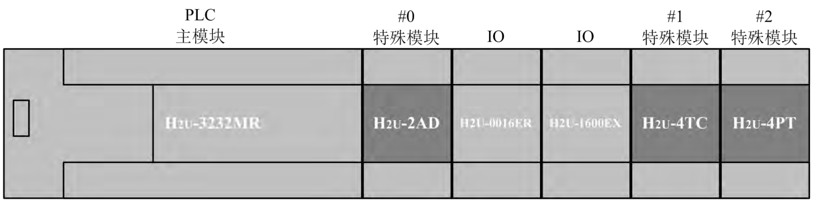
7、本地特殊扩展模块的地址编号：
7. Address numbering of local special extended module:

除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。

Except for IO extended module, all kinds of extended module are called as special module, such as 4AD/4DA/4TC/CC-Link and so on. When PLC is powered, all connected extended modules will be checked for one time, and respectively the special modules and IO extended ports are numbered. User cannot intervent or change the numbering result, unless the module connection order is modified.

主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的 IO 扩展模块不参与编号，如下图中，2AD 扩展模块的模块地址编号为#0，后续的 4TC 和 4PT 模块地址依次为＃1 和＃2，以此类推，最多可接入 8 个特殊模块：

The address numbering rule of main module for special modules is: started with the module closed to PLC main module, they are numbered with #0, #1,…,#7 in order, and the IO extended modules are not involved. For example, the module address numbering of a 2AD extended module is #0; the following 4TC and 4PT modules address are #1 and #2, and so on, and at most eight special modules could be connected:



PLC 主模块
PLC main module
特殊模块
Special module

即使中间插有若干 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程

时就可以准确地访问指定模块。

Even if there are several IO extended modules, the numbering order will not be affected. After understanding the above address numbering rule, user can correctly access the specified module in programming.

上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，2DA 模块也能同时上电。若 2DA 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；

In order that main module and 224VDA module can be powered at same time, before powered, the external 24V/COM power supply of the module should be correctly connected to the corresponding 24V/COM port of the PLC main module. If the external power of 2DA module is powered with delay, it will cause that PCL main module will not correctly recognize the module type;

PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。

Only when powered, PLC main module will check all extended modules connected to system for one times, and it cannot recognize and normally access the extended modules which is connected during operation. If user pushes or pulls extended module in operation, the device will be damaged, and more badly it will cause the un-precognition of the output state and user device faulty.

8、远程特殊扩展模块的地址编号：

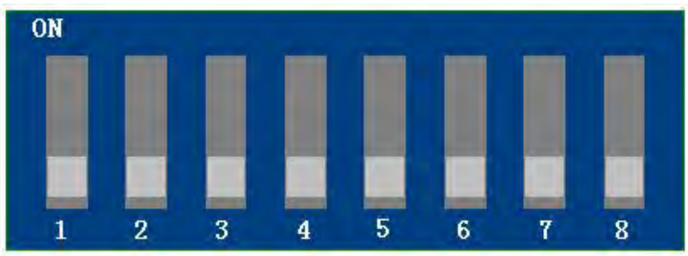
8. Address numbering of remote special extended module:

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In remote extended module, the address is: module communication station number+100, and at most 63 remote extended modules are allowed. By toggling the code switch on Station No., the module station number could be set, and the code switch interface is defined as following:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

There is a 8bit code switch on every remote module. By toggling code switch, user can set module station number, selecting baud rate, and terminate match resistance or not. Every bit on code switch has a number, and “ON” indicates logical “1”, which is shown as following figure. The definition of every bit is listed as following table.



CAN-LINK 拨码开关

CAN-LINK code switch

拨码开关位定义

The definition of code switch bit

拨码号 Code	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。 “ON” indicates 1, and “OFF”indicates 0.高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 A 6bit binary number is made up of six bit code switches, which is used for identifying the module station number. Lower bytes follow higher bytes. The format is as following: A6A5A4A3A2A1. Such as A1=ON, the other bits are all OFF, which indicates the binary address: 000001, decimal number: K01, hex number h01. Such as A5, A4=ON, the other bits are all OFF, which indicates the binary address: 011000, decimal number: K24, hex number h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode, baud rate 500Kbps; ON: low-speed mode, baud rate 100Kbps
8	匹配电阻 Matched resistance	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If code switch is ON, it indicates a terminal matched resistance of 120Ω is connected; or it is disconnected.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If A5, A4 in certain module are all ON, and the other bits are OFF, (binary: 011000; decimal K24), the module numbering in FROM/TO instruction is K24+100, (#124)

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

If code switch is modified, except for matched resistance, baud rate and address will not take effect immediately. After the system is powered again, the new setting parameter will take effect. The uniqueness of CAN address should be paid attention to, which means there should not be any same address.

9、访问 2DA（R）模块的 BFM 区：

9. Access BFM area of 2DA(R) module

PLC 主模块是通过向 2DA（R）模块的寄存器缓存单元（BFM 区）的写入数字值，由 2DA（R）转换为模拟量输出，通过改写特定 BFM 区的方式来设置模块状态。PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

PLC main module writes data value in the register buffer unit (BFM area) of 2DA(R) module, which is converted to analog output by 2DA(R), and module state is set by modifying special BFM area. PLC main module accesses these BFM units via read/write instruction FROM/TO.

扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。

The extended module is equipped with EEPROM storage unit, which is used for saving several BFM setting value, such as signal type, deviant, gain value of every analog input channel, and these units are automatically saved by setting corresponding BFM unit state.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 2DA（R）模块的 BFM 区定义如下表：

Every register width of BFM area is 16bit (1Word), and according to 2DA(R) BFM area the BFM is defined as following table:

BFM BFM	R/W 属性 R/W attribution	内容 Content
＃0（E）	WR	输出模式选择，每个 HEX 位代表 1 个输出通道，2DA（R）模块取低 8 位中的高 HEX 位为ch2，低HEX位为ch1：（默认值＝H00） Selecting output modes, each HEX bit represents an output channel. In lower 8bit of 2DA(R) module, the higher HEX bit is ch2, and lower HEX bit is ch1: (default value=H00) 0＝-10V～10V；对应数字输出：-2000～2000 0＝-10V～10V；the corresponding digital output:-2000～2000 1＝4mA～20mA；对应数字输出：0～1000 1＝4mA～20mA；the corresponding digital output:0～1000 2＝0mA～20mA；对应数字输出：0～1000 2＝0mA～20mA；the corresponding digital output:0～1000 4＝-10V～10V；对应数字输出：-10000～10000 4＝-10V～10V；the corresponding digital output:：-10000～10000

<table>
<tr><td></td><td></td><td colspan="4">5＝4mA～20mA；对应数字输出：0～10000
5＝4mA～20mA；the corresponding digital output:：0～10000
6＝0mA～20mA；对应数字输出：0～10000
6＝0mA～20mA；the corresponding digital output:0～10000</td></tr>
<tr><td>＃1</td><td>WR</td><td>通道 1
Channel 1</td><td colspan="3" rowspan="2">通道输出值，初始值为 0
Channel output value, initial value = 0</td></tr>
<tr><td>＃2</td><td>WR</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃3～4</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td>＃5（E）</td><td>WR</td><td colspan="4">PLC 停机时数值保留模式，每个 HEX 位代表 1 个输出通道，2DA（R）模块取低 8 位中的高 HEX 位为 ch2，低 HEX 位为 ch1，当：
Selecting value holding modes when PLC shuts down, each HEX bit represents an output channel. In lower 8bit of 2DA(R) module, the higher HEX bit is ch2, and lower HEX bit is ch1, when:
x＝0，保持停机前的输出；x＝1，将输出复位到偏移设定值
x=0, the output before shut down is held; x=1, the output is reset to the deviation pre-set value</td></tr>
<tr><td>＃6～7</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td rowspan="2">＃8（E）</td><td rowspan="2">WR</td><td>G2</td><td>O2
O2</td><td>G1</td><td>O1
O1</td></tr>
<tr><td colspan="4">CH2/CH1 的偏移/增益设置命令，按 HEX 位设置，初始值＝H0000
CH2/CH1 setting deviation/gain command, which is set according to HEX bit, initial value =H0000
0＝禁止改变；1＝允许改变 EEPROM 对应数据
0=forbid to modify; 1=allow to modify EEPROM data</td></tr>
<tr><td>＃9</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td>＃10</td><td>WR</td><td>偏 移 数 据</td><td colspan="3">单位：mV 或μA</td></tr>
</table>

		CH1 Deviation data CH1	Unit: mV or μA 初始偏移值：0 Initial deviation value: 0 初始增益值：＋5000,对应模式 0 Initial gain value: +5000, according to mode 0 （0、1、2 模式） （0、1、2 modes）
＃11	WR	增益数据 CH1 Gain data CH1	
＃12	WR	偏移数据 CH2 Deviation data CH2	
＃13	WR	增益数据 CH2 Gain data CH2	
＃14～19	—	保留 Reserved	
＃ 20（E）	WR	初始值＝0，当写入 1 时，所有 BFM 单元将初始化为默认值。 Initial value = 0, when writing with 1, all BFM units are initialled to default value.	
＃ 21（E）	WR	1＝允许调整输出特性（初始值）；设为 2＝禁止调整输出特性 1=allow to adjust output characteristic (initial value); 2= forbid to adjust output characteristic	
＃22～26	—	保留 Reserved	
＃27	R	扩展模块软件版本 Extended module software version	
＃28	—	保留 Reserved	
＃29	R	错误状态字 Error state word	
＃30	R	模块识别码，2DA（R）模块的识别码为 K3021 Module identity code, 2DA(R) module identity code=K3021	
＃31	—	保留 Reserved	

其中状态信息字 BFM #29 的意义说明如下：

Where, the definition of state information word BFM #29 is described as following:

BFM # 29 位号 BFM#29 bit number	ON 状态 ON state	OFF 状态 OFF state
b0:	存在错误。b1~b3 中任一个非 0， D/ A 转换停止 There is an error. If anyone of b1~b3 is not 0, D/A conversion is stopped	无错误 No error
b1:	模块内 EEPROM 的偏移/增益设置有误 The deviation/gain setting is error in module EEPROM	偏移/增益数据正确 The deviation/gain data is correct.
b2:	（不可能） n/a	电源正常 Power runs normally
b3:	模块硬件故障 Module hardware faulty	硬件正常 Hardware runs normally
b10:	写入数字值超出指定的范围 Writing data value exceeds the specified range	数字输出值正常 Data output value is normal
b12:	禁止 BFM#21 的值没有设为 K1 Forbid BFM#21=K1	BFM#21＝K1 BFM#21＝K1
BFM＃29 的其它 bit4～7，bit11，bit13～15 等没有定义。 The other bits bit4~7, bit11, bit13~15 in BFM#29 is not defined.		

寄存器改写说明：

The description of register rewriting:

表格中（E）表示存于 EEPROM 中，注意 BFM＃8、＃20 等带（E）的单元不能频繁写操作，以免损坏 EEPROM 单元。

(E) represents it exits in EEPROM, and it is recommended that the writing operation should not be continually implemented on BFM#8, #20 units, which is with (E) to avoid EEPROM damage.

BFM＃0 等带（E）单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，共约需 3s 时间。注意 PLC 编程时，在改写 BFM＃10～＃13 单元之前，需要要延时 3s 的时间；且不要连续进行写操作，每次写之前安排约 300ms 的延时间隔，确保写指令的正确完成。

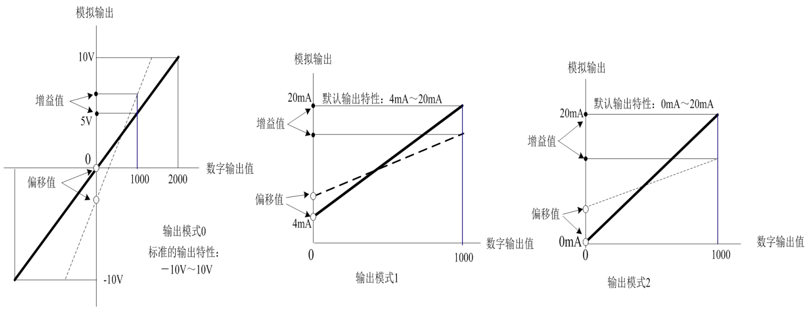
The modification of BFM#0, which is with (E), will cause module internal writing operation to EEPROM, and writing operation needs about 3s. Note: when in PLC programming, before modifying BFM#10~#13 units, it needs 3s delay time; it is forbidden to implement continuous writing operation and it requires about 300ms delay time before writing

operation to ensure that the writing instruction is correctly accomplished.
注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。
Note: when the external 24V power supply of the local extended module is power off, the system flag M6708 of PLC main module will be set. The flag should be timely checked in programming, the problem can be found in time.

10、部分 BFM 区解释
10. The description of partial BFM area
BFM#0　通道选择
BFM#0 selecting channel
通道的初始化，默认 2 个通道都为-10V~10V，由 BFM 0#的十六进制 HXX 控制，最低位控制通道一，第二位控制通道二，每个字符的控制方式如下：
Two channels are initialed as -10V~10V in default, controlled by BFM0# hex HXX. The lower bit controls channel 1, and higher bit controls channel 2. The control method of each character are listed as following:
X=0 预设范围-10V~10V　　（对应数字-2000~2000）
X=0 The pre-set range -10V~10V　　(corresponding value -2000~2000)
X=1 预设范围 4mA~20 mA　（对应数字 0~1000）
X=1 The pre-set range -4mA~20mA　　(corresponding value 0~1000)
X=2 预设范围 0mA~20 mA　（对应数字 0~1000）
X=2 The pre-set range 0mA~20mA　　(corresponding value 0~1000)
X=4 预设范围-10V~10V　　（对应数字-10000~10000）
X=4 The pre-set range -10V~10V　　(corresponding value -10000~10000)
X=5 预设范围 4mA ~20 mA　（对应数字 0~10000）
X=5 The pre-set range 4mA~20mA　　(corresponding value 0~1000)
X=6 预设范围 0mA ~20 mA　（对应数字 0~10000）
X=6 The pre-set range 0mA~20mA　　(corresponding value 0~10000)

例如：BFM#0 为 H10，表示通道一为-10V~10V；通道二为 4mA~20mA。
For example: BFM#0=H10 means channel 1 is -10V~10V and channel 2 is 4mA~20mA.
BFM #1~#2　通道输出值
BFM #1~#2　channel output value
用 TO 指令往 BFM #1~#2 写数据，可以控制模拟量输出。
Writing data to BFM #1～#2 with TO instruction to control analog output.初始值均为 0.
The initial values are all 0.
BFM #5　数据保持模式
BFM #5　Data holding mode
当主模块在由 RUN 至 STOP 状态时 RUN 最后的模式被保持(X=0)或者为偏移值(X=1)输出，
When main module is in the state from RUN to STOP, the final mode of RUN will be held (X=0) or deviation (X=1) output,
例如：BFM#0 为 H00，BFM#5 为 H01，2 个通道的偏移值均为 0.1V，由 RUN 至 STOP 变化时 BFM#1~#2 里面的值均为 1500（7.5V），当 STOP 后，通道 1 输出电压变

成 0.1V，通道 2 输出电压保持在 7.5V。
For example: BFM#0=H00, BFM#5=H01, the deviation value in two channels are all 0.1V. When it changes from RUN to STOP, the values in BFM#1~#2 are all 1500 (7.5V); After STOP, output voltage in channel 1 changes to 0.1V, and output voltage in channel 2 holds to 7.5V.
BFM #8、BFM #10~#13、BFM #21 偏移和增益的定义与设定方法：
BFM #8, #10~#13, BFM#21 the definition and setting method of deviation and gain：
H2U－2DA（R）共有三种工作模式，特性曲线如下图：
There are totally three operation modes for H2U-2DA(R), and the characteristic curve is shown as following figure:



模拟输出
Analog output
增益值
Gain value
数字输出值
Digital output value
偏移值
Deviation value
输出模式 0 标准输出特性：-10V~10V
The standard output characteristic in output mode 0: -10V~10V
默认输出特性 4mA~20mA
Default outpu charachteristic 4mA~20mA
输出模式 1
Output mode 1
数字输出值
Digital output value

其中，增益值为数字 1000 时对应的模拟量输出；偏移值则是数字为 0 时对应的模拟量输出。偏移和增益可以独立设定或一起设定，设定参数的单位是 mV（模式 0）和μA（模式 1 和 2）
Where, the gain value is the analog output corresponding to data 1000; and deviation value is the analog output corresponding to data 0. Deviation and gain can be set separately or together, and the parameter unit is mV(mode 0) and μA (mode 1 and 2)
BFM #8 为偏移、增益设置命令，十六进制的每 HEX（二进制的 4 个 bit 位组成）位来控制禁止或者允许，注意在 AD 输入模块中是二进制的每个 bit 位来控制，DA 模块和 AD 模块在偏移、增益设置命令有所区别。BFM #10~#13 为偏移、增益设置值，BFM #21 为曲线特性设置命令

BFM#8 is deviation and gain setting command, and each HEX (which is composed of four binary bits) bit will control forbid or enable. Note: it is every binary bit to control in AD input module, and the deviation and gain setting command are different in DA module and AD module. BFM#10~#13 is deviation, gain setting value, and BFM#21 is curve characteristic setting command.

增益/偏移设定前，需先将 BFM＃21 设为 1，再根据需要修改 BFM＃10～＃13 的相关单元数值；再向 BFM＃8 单元写入操作允许字，修改完毕，应将 BFM＃21 再设为 2，避免再次被改变。

Before setting gain/deviation, BFM#21 should be set to 1, and then BFM #10~#13 unit values are modified according to requirements; after that, the operation allowable word is written to BFM#8 unit. After modification is accomplished, BFM#21 is set to 2 to avoid to be changed again.

例如：在 BFM#0 为模式 H00 中，需要修改通道一的偏移和增益分别为 0.2V 和 5.5V，则需要按如下步骤操作：

For example: when in BFM#0=H00 mode, it requires that the deviation and gain of channel 1 should be modified to 0.2V and 5.5V, and it should be operated according to the following steps:

先将 BFM#21 改为 1；过 300MS 以后将 K200、 K5500 分别送到 BFM#10、#11、中去；紧跟着 BFM#8 开允许偏移、增益，即是将 BFM#8 修改为 H0011；修改完毕。最后将 BFM#21 改为 2，以防再次被修改。

1. Modifying BFM#21 to 1;
2. After 300ms, writing K200, K5500 to BFM#10 #11 respectively;
3. Setting BFM#8 to enable deviation, gain, which means modifying BFM#8 to H0011;
4. End.

Finally, BFM#21 should be modified to 2 to avoid to be modified again.

BFM #20　回归出厂值

BFM #20　Return to default value

将 BFM #20 设定为 1 可以恢复到默认值。

Setting BFM#20 to 1can return to the default value.

编程举例 1：

Programming example 1:

一台 H2U－2AD 扩展模块接于 PLC 主模块后方，紧跟着接了一台 H2U－2DA 扩展模块，按编号原则 H2U－2DA 为＃1 号模块，其中需要 CH1 端口输出 6mA～20mA 的电流信号，CH2 端口输出-10V～10V 的电压信号。要求 X21 端口的闭合引发 2DA 模块的初始化操作。编写的用户程序如下：

A H2U-2AD extended module is connected to PLC main module, and followed by a H2U-2DA extended module. According to numbering rule, H2U-2DA is numbered as #1 module, in which 6mA~20mA current signal is requested in CH1 port output and -10V~10V voltage signal is requested in CH2 port output. It requests X21 port close will cause initial operation of 2DA module. The user program is listed as following:

X21 的闭合时引发 2DA 模块的偏移、增益调整操作

X21 close will cause deviation, gain adjustment operation of 2DA module

初始化 2DA 模块，CH1 通道为 4mA~20mA 信号方式

2DA module is initialed, and setting CH1 channel in 4mA~20mA signal mode.

设 BFM#21=1，允许偏移/增益调移操作

Setting BFM#21=1, enabling deviation/gain adjustment operation

延时 3s

Delay 3s

设 BFM#10=6000，设 CH1 偏移为 6mA

Setting BFM#10=6000 and CH1 deviation to 6mA.

设 BFM#11=20000，设置 CH1 增益为 20mA

Setting BFM#11=20000 and CH1 gain to 20mA.

设 BFM#12=0，设置 CH2 偏移为 0mV

Setting BFM#12=0 and CH2 deviation to 0mV.

设 BFM#13=5000，设置 CH2 增益为 5000V

Setting BFM#13=5000 and CH2 gain to 5,000V.

设 BFM#8=H0003，将刚才设定的 BFM#22/#23 值存入 CH1 的 EEPROM 设置寄存器中

Setting BFM#8=H0003, BFM#22/#23 value are saved in CH1 EEPROM register

延时 3s

Delay 3s

清除设置操作的命令标志

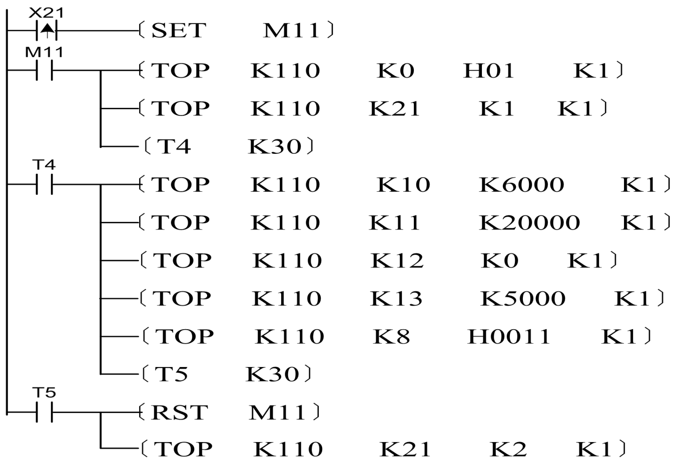
The command flag of setting operation is cleared

将 BFM#21=2，禁止偏移/增益调整操作

Setting BFM#21=2, forbidding deviation/gain adjustment operation

例子中如果改成 H2U－2DAR 远程模块，CAN 站号为 10。则此例子程序如下：

In example, if it is changed to H2U-2DAR remote module, the CAN station number is 10. The example program is listed as following:



编程举例 2：

Programming example 2:

接上例本地模块举例，若要求将 D100、D101 的值分别从 CH1、CH2 端口输出，每 1 秒中检查一次 2DA 模块的工作状态。编程如下：

In the example of local module, if it requires that D100, D101 is outputted from CH1, CH2, and the operation state of 2DA module will be checked every 1s. The program is listed as following:

将 D100，D101 分别写入 CH1/CH2 端口对应的 BFM#1、#2 单元

D100, D101 is written to BFM#1/#2 units corresponding to CH1, CH2 ports.

读取 2DA 的错误状态字单元

The error state word unit of 2DA is read.

检查 FROM/TO 指令完成情况，以及是否有错指示 2DA 错误状态标志的保存

Check whether FROM, TO instructions are accomplished, and there is 2DA error state flag

其中若 2DA 模块的外部 24V 电源失电，系统标志 M6708 会置位。

Where, if the external 24V power supply of 2DA module is off, the system flag M6708 will be set.

使用注意事项：

Caution:

禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；

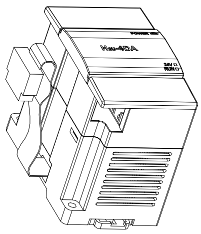
It is forbidden to push and pull in live line. Only when main module and application system is cut-off, the extended module can be connected or removed to ensure personal safety or property damage.

H2U－4AM　H2U－4AMR　　　　　　　　　2 通道模拟输入/2 通道模拟输出混合扩展模块

H2U－4AM　H2U－4AMR　　　　　　　　　Dual channel analog input/dual channel analog ouput combined extended module

1、简介

1. Introduction



H2U 本地扩展模块可配合 H2U 系列主模块工作，实现 2 个模拟输入通道的信号检测和 2 个模拟信号通道的输出。每个输入通道将-10V～10V 或-20mA～20mA 的信号转换为 12bit 的数字量，供 PLC 主模块读取；每个输出通道都具有电压信号及电流信号输出端口，信号幅值分别可为 0～10V 或 0～20mA。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元，实现模拟输出信号的控制。

The signal detection of dual channel analog input and output of dual channel analog signal can be achieved by H2U local extended module and H2U series main module. The signal of -10V~10V or -20mA~20mA can be converted to 12bit digital signal by each input channel for PLC main module reading; each output channel has output port of voltage signal and current signal with signal amplitude of 0~10V or 0~20mA. The main module accesses the BFM unit in the extended module register via FROM/TO instruction, to achieve controlling analog output signal.

2、电气规格：

2. Electric specification:

<table>
<tr><td rowspan="2">电源
Power</td><td>模拟电路
Analog circuit</td><td>24V DC -15%/+20%，最大允许纹波电压 5% 输入电流 200mA(来自于主单元的外部电源)
24V DC -15%/+20%， Max authorized ripple voltage 5% input current 200mA(from the extenal power supply)</td></tr>
<tr><td>数字电路
Digital circuit</td><td>5V DC 50mA(来自于主电源内部电源) （远程扩展模块无需数字电路电源）
5V DC 50mA(from internal power supply) (the digital circuit power is not requested by the remote extended module)</td></tr>
<tr><td colspan="2">项目
Item</td><td>AD 部分指标
Indicator in AD section</td></tr>
<tr><td colspan="2">占用 I/O 点数
Occupying I/O points</td><td>不占用主模块 I/O 点数
The main module I/O points are not occupied</td></tr>
<tr><td colspan="2">转换速度
Conversion speed</td><td>15ms/通道（常速），6ms/通道（快速），1ms/通道（最快）
15ms/channel（normal speed），6ms/channel（fast speed），1ms/channel（fastest speed）</td></tr>
</table>

<table>
<tr><td rowspan="2">模拟输入范围
Analog input range</td><td>电压输入
Voltage input</td><td>0～10V DC，（输入阻抗为 200KΩ）
0～10V DC，（Input impedance is 200KΩ）</td><td rowspan="2">通过设定 BFM 可进行输入范围选择
The input range could be selected by setting BFM.</td></tr>
<tr><td>电流输入
Current input</td><td>0～20mA(输入阻抗为 250Ω)
0～20mA(Input impedance is 250Ω)</td></tr>
<tr><td colspan="2">数字输出
Digital output</td><td colspan="2">默认设置为：0 ～ +2000
Default setting: 0 ～ +2000</td></tr>
<tr><td rowspan="2">分辨率
Resolution</td><td>电压输入
Voltage input</td><td colspan="2">5mV</td></tr>
<tr><td>电流输入
Current input</td><td colspan="2">20μA</td></tr>
<tr><td colspan="2">精度
Precision</td><td colspan="2">±1%</td></tr>
<tr><td colspan="2">隔离
Isolation</td><td colspan="2">模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。
The photo-coupler should be applied for isolating analog circuit and digital circuit. DC/DC should be applied for isolating analog circuit and external power. The isolation is not needed between analog channels.</td></tr>
<tr><td colspan="2">项目
Item</td><td colspan="2">DA 部分指标
Indicator in DA section</td></tr>
<tr><td colspan="2">占用 I/O 点数
Occupying I/O points</td><td colspan="2">不占用主模块 I/O 点数
The main module I/O points are not occupied</td></tr>
<tr><td colspan="2">转换速度
Conversion speed</td><td colspan="2">2 通道 2.1mS
2 channels 2.1ms</td></tr>
<tr><td rowspan="2">模拟输出范围
Analog output range</td><td>电压输出
Voltage output</td><td colspan="2">-10～10V DC(外部负载阻抗为 2KΩ～1MΩ)
-10～10V DC(External load resistence is 2KΩ～1MΩ)</td></tr>
<tr><td>电流输出
Current output</td><td colspan="2">0～20mA(外部负载阻抗为 500Ω或更小)
0～20mA(external load resistence is 500Ω or less)</td></tr>
<tr><td colspan="2">数字输入
Digital input</td><td colspan="2">默认设置：-2000 ~ 2000，允许范围：-10000 ~ 10000
Default setting: -2000~2000, allowable range: -10000~10000</td></tr>
<tr><td rowspan="2">分辨率
Resolution</td><td>电压输出
Voltage output</td><td colspan="2">5mV(10V/2000)
5mV(10V/2000)</td></tr>
<tr><td>电流输出
Current output</td><td colspan="2">20μA(20mA /1000)
20μA(20mA /1000)</td></tr>
<tr><td colspan="2">总体精度
Total precision</td><td colspan="2">±1%（对于 10V 的全范围）
±1%（corresponding to full range of 10V）
±1%（对于 20mA 的全范围）</td></tr>
</table>

	±1%（corresponding to full range of 20mA）
隔离 Isolation	模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路电源和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。 The photo-coupler should be applied for isolating analog circuit and digital circuit. DC/DC should be applied for isolating analog circuit and external power. The isolation is not needed between analog channels.

3、模块用户接口表：

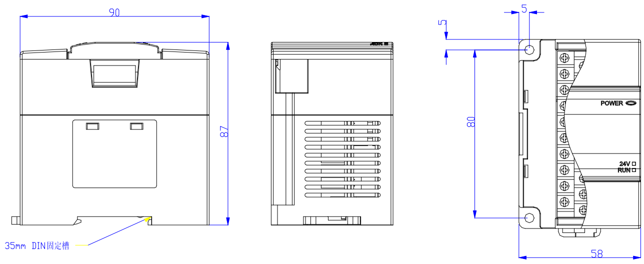
3. the table of module user interface:

项目 Item	说明 Description	
接线端子功能 The function of connecting terminal	V+：通道的电压正输入\输出端子； V+：Channel voltage positive intpu\input terminal; I+：通道的电流正输入\输出端子； I+：Channel current positive input\output terminal; VI-：通道的输入\输出公共端； VI-: Channel input\output common terminal; 24+/24-:外部 24V 输入端子； 24+/24-: external 24V input terminal; GND：保护接地。 GND: Protective grounding.	
指示灯 Indicator	本地扩展模块 Local extended module	PWR：当与主模块连接且主模块上电的情况下点亮。 PWR: lighted when it is connected with powered main module. COM：当模块正常工作时高速闪烁，故障时慢速闪烁。 COM: When module runs normally, it flashes in high speed; when there is fault, it flashes in low speed. 24V：当外部 24V 接通时点亮。 24V: When external 24V is connected, it is lighted.
	远程扩展模块 Remote extended module	PWR：模块 24V 供电正常 PWR: Module 24V power supplies normally COM：点亮表示模块进行通讯 COM: It lighting indicates that the module will make communication. ERR：点亮表示有错误发生。 ERR: It lighting indicates that there is error.

扩展端口 Expended port	本地扩展模块 Local extended module	扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。 The 26-pin ladder connector is applied for the extended input port, and module is connected via flat cable; the 26-pin ladder connector is also applied for the extended output port.
	远程扩展模块 Remote extended module	扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线 The 5-pin hole plug is applied for extended input, and it is recommended to use spiral-eight shield cable or network line as transmission cable.

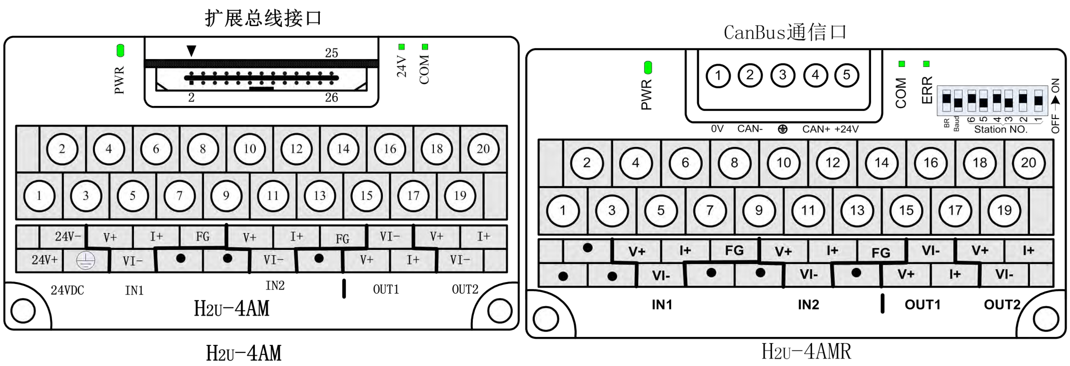
4、模块的安装尺寸：

4. The module install size:



5、接线端子布局如下图：

5. The layout of connecting terminal is shown as following:



扩展总线接口

Extended bus interface

CanBUS 通信口

CanBus communication port

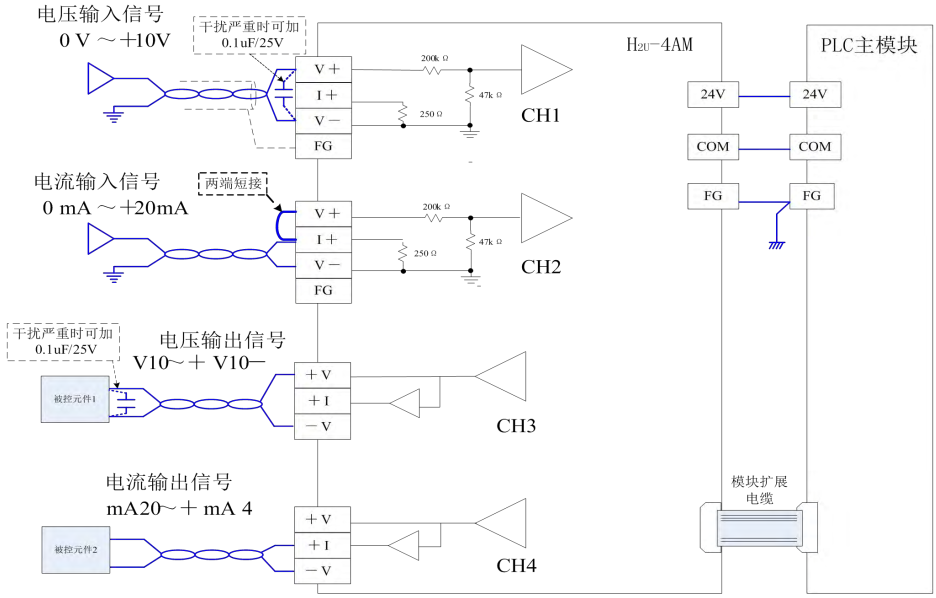
外部配线：

External wiring:

模拟信号通过双绞线连接到扩展模块的输入\输出端口，布线时不要与交流电源线或干扰信号的线路靠近；

The analog signal is connected to the input\output port of extended module via twisted pair. When wiring, it should not be closed to AC power line or interfering signal circuit;

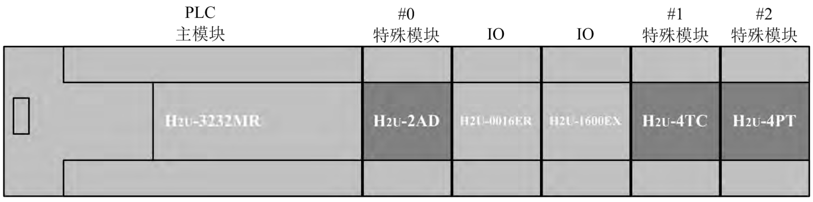
若模拟信号的干扰严重时，可采用屏蔽线连接，并在输入端口并联 1 只 0.1μF/25V 的高频电容；
If the analog signal interferes badly, it could be connected with shield cable, and parallel connecting a high-frequency capacity of 0.1μF/25V;
信号源/被控元件及其屏蔽线的外壳与 H2U－2AM 的信号接地端 FG 相连，共同接地。
The signal source/controlled component and the shell of the shield cable should be connected with signal grounding port FG of H2U-2AM and grounding.



电压输入信号 0V~+10V
Voltage input signal 0V~+10V
电流输入信号 0mA~+20mA
Current input signal 0mA~+20mA
两端相接
Connecting two ports
干扰严重时可加 0.1uF/25V
If it is interfered badly, a capacity of 0.1uF/25V could be involved
被控元件
The controlled component
模块扩展电缆
Module extended cable
PLC 主模块
PLC main module

6、本地特殊扩展模块的地址编号：
6. Address numbering of local special extended module:
除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。
Except for IO extended module, all kinds of extended module are called as special module, such as 4AD/4DA/4TC/CC-Link and so on. When PLC is powered, all connected

extended modules will be checked for one time, and respectively the special modules and IO extended ports are numbered. User cannot intervent or change the numbering result, unless the module connection order is modified.
主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的 IO 扩展模块不参与编号，如下图中，2AD 扩展模块的模块地址编号为#0，后续的 4TC 和 4PT 模块地址依次为＃1 和＃2，以此类推，最多可接入 8 个特殊模块：
The address numbering rule of main module for special modules is: started with the module closed to PLC main module, they are numbered with #0, #1,…,#7 in order, and the IO extended modules are not involved. For example, the module address numbering of a 2AD extended module is #0; the following 4TC and 4PT modules address are #1 and #2, and so on, and at most eight special modules could be connected:



PLC 主模块
PLC main module
特殊模块
Special module

即使中间插有若干 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。
Even if there are several IO extended modules, the numbering order will not be affected. After understanding the above address numbering rule, user can correctly access the specified module in programming.
上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，4AM 模块也能同时上电。若 4AM 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；
In order that main module and 4AM module can be powered at same time, before powered, the external 24V/COM power supply of the module should be correctly connected to the corresponding 24V/COM port of the PLC main module. If the external power of 4AM module is powered with delay, it will cause that PCL main module will not correctly recognize the module type;
PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。
Only when powered, PLC main module will check all extended modules connected to system for one times, and it cannot recognize and normally access the extended modules which is connected during operation. If user pushes or pulls extended module in operation, the device will be damaged, and more badly it will cause the un-precognition of the output state and user device faulty.
7、远程特殊扩展模块的地址编号：

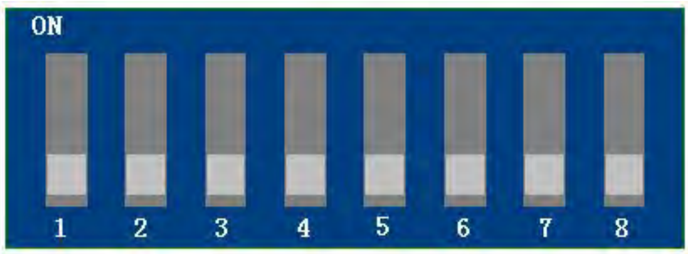
7. Address numbering of remote special extended module:

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

In remote extended module, the address is: module communication station number+100, and at most 63 remote extended modules are allowed. By toggling the code switch on Station No., the module station number could be set, and the code switch interface is defined as following:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

There is a 8bit code switch on every remote module. By toggling code switch, user can set module station number, selecting baud rate, and terminate match resistance or not. Every bit on code switch has a number, and “ON” indicates logical “1”, which is shown as following figure. The definition of every bit is listed as following table.



CAN-LINK 拨码开关

CAN-LINK code switch

拨码开关位定义

The definition of code switch bit

拨码号 Code	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 A 6bit binary number is made up of six bit code switches, which is used for identifying the module station number. “ON” indicates 1, and “OFF”indicates 0. Lower bytes follow higher bytes. The format is as following: A6A5A4A3A2A1. Such as A1=ON, the other bits are all OFF, which indicates the binary address: 000001, decimal number: K01, hex number h01. Such as A5, A4=ON, the other bits are all OFF, which indicates the binary address: 011000, decimal number: K24, hex number h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6	

	Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode, baud rate 500Kbps; ON: low-speed mode, baud rate 100Kbps
8	匹配电阻 Matched resistance	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If code switch is ON, it indicates a terminal matched resistance of 120Ω is connected; or it is disconnected.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If A5, A4 in certain module are all ON, and the other bits are OFF, (binary: 011000; decimal K24), the module numbering in FROM/TO instruction is K24+100, (#124)

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

If code switch is modified, except for matched resistance, baud rate and address will not take effect immediately. After the system is powered again, the new setting parameter will take effect. The uniqueness of CAN address should be paid attention to, which means there should not be any same address.

8、访问 4AM（R）模块的 BFM 区：

8. Access BFM area of 4AM(R) module

PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

PLC main module accesses these BFM units via read/write instruction FROM/TO.

扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入/输出通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。

The extended module is equipped with EEPROM storage unit, which is used for saving several BFM setting value, such as signal type, deviant, gain value of every analog input /output channel, and these units are automatically saved by setting corresponding BFM unit state.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 4AM（R）模块的 BFM 区定义如下表：

Every register width of BFM area is 16bit (1Word), and according to 4AM module the BFM area is defined as following table:

BFM BFM	R/W 属性 R/W attribution	输入通道内容 Input channel content
＃0（E）	WR	通道信号模式选择，每个 HEX 位代表 1 个输入通道，4AM（R）模块取低 8 位中的高 HEX 位为 ch2，低 HEX 位为 ch1：（默认值＝H00） Selecting channel signal modes, each HEX

<table>
<tr><td></td><td></td><td colspan="2">bit represents a input channel. In lower 8bit of 4AM(R) module, the higher HEX bit is ch2, and lower HEX bit is ch1: (default value=H00)
0＝0V～10V；对应数字输出：0～2000
0 ＝ 0V ～ 10V ； the corresponding digital output:0～2000
1＝4mA～20mA；对应数字输出：0～1000
1＝4mA～20mA；the corresponding digital output:0～1000
2＝0mA～20mA；对应数字输出：0～1000
2＝0mA～20mA；the corresponding digital output:0～1000
3＝本通道关闭；
3= the channel is closed;
4＝0V～10V；对应数字输出：0～10000
4 ＝ 0V ～ 10V ； the corresponding digital output: 0～10000
5＝4mA～20mA；对应数字输出：0～1000
5＝4mA～20mA；the corresponding digital output:：0～1000
6＝0mA～20mA；对应数字输出：0～1000
6＝0mA～20mA；the corresponding digital output:0～1000</td></tr>
<tr><td>＃1</td><td>WR</td><td>通道 1 Channel 1</td><td rowspan="2">平均滤波常数，即用于平均计算的采样值个数，设定范围 1～4096，默认值 8。若要高速采集，可设定为 1。当 BFM#15 改变时，自动恢复为默认值
Average filter constant, which is the sampling number used for average calculation with setting range of 1~4096, default value =8. Setting to 1 means high-speed sampling. When BFM#15 changes, it automatically resumes to default value.</td></tr>
<tr><td>＃2</td><td>WR</td><td>通道 2 Channel 2</td></tr>
<tr><td>＃3~4</td><td>—</td><td colspan="2">保留
Reserved</td></tr>
<tr><td>＃5</td><td>R</td><td>通道 1 Channel 1</td><td rowspan="2">输入通道采集值平均滤波后的数据
The sampling data of input channel after average filter</td></tr>
<tr><td>＃6</td><td>R</td><td>通道 2 Chann</td></tr>
</table>

<table>
<tr><td></td><td></td><td>el 2</td><td colspan="8"></td></tr>
<tr><td>＃7~8</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>＃9</td><td>R</td><td>通道 1
Changnel 1</td><td colspan="8" rowspan="2">输入通道当前采集的数据，即未滤波处理的瞬时值。
The sampling data of input channel means the instantaneous value before filter processing.</td></tr>
<tr><td>＃10</td><td>R</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃11~14</td><td>—</td><td colspan="9">保留</td></tr>
<tr><td>＃15</td><td>WR</td><td>ADC 速率选择
ADC speed selection</td><td colspan="8">0＝正常速度，15ms/通道（默认值）；
0 ＝ normal speed, 15ms/channel （default value）；
1＝快速转换，6ms/通道；
1＝fast conversion，6ms/channel；
1000～30000＝高速采样，对应 1ms～30ms/通道
1000 ～ 30000 ＝ high-speed sampling, which is corresponding to 1ms～30ms/channel</td></tr>
<tr><td>＃16~19</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>＃20（E）</td><td>WR</td><td colspan="9">1 ＝ 复位设定， 将所有输入通道参数（BFM#0~BFM#32）恢复到默认值（出厂值）。
1=reset setting, reset all input channel parameters (BFM#0~BFM#32) to default value 默认值＝0
Default value=0</td></tr>
<tr><td>＃21（E）</td><td>WR</td><td colspan="9">2＝禁止调整偏移/增益，（默认值）；
2=adjusting deviation/gain is forbidden, (default value);
1＝允许调整偏移/增益
1=adjusting deviation/gain is allowed</td></tr>
<tr><td>＃22（E）</td><td>WR</td><td>低 4 位对应 2 个通道的操作
The lower 4bit is corresponding to 2 channel</td><td>-</td><td>-</td><td>-</td><td>-</td><td>G2</td><td>O2</td><td>G1</td><td>O1</td></tr>
</table>

		s									
		偏移/增益调整使能，当非 0 时，模块会将 BFM23/24 值写入其内部对应通道控制寄存器中 Enable deviation/gain adjustment. When it is not 0, the module write BFM23/24 value to the internal channel control register.									
＃23（E）	WR	偏移值，数字输出为 0 时的模拟输入值（0、1、2 模式） Deviation value: when digital output is 0, the analog input value (0,1,2 mode)									
＃24（E）	WR	增益值，数字输出为＋1000 时的模拟输入值（0、1、2 模式） Gain value: when digital output is +1000, the analog input value (0,1,2 mode)									
＃25~26	—	保留 Reserved									
＃27	R	4AM 模块软件版本 4AM module software version									
＃28	—	保留 Reserved									
＃29	R	输入通道错误状态 Input channel error state									
＃30	R	扩展模块识别码，H2U－4AM（R）的识别码为 K4051 Extended module identification code, the ID code of H2U-4AM (R) is K4051									
＃31	—	保留，不可访问 Reserved, cannot be accessed									

BFM
BFM　R/W 属性
R/W attribution　输出通道内容
Output channel content

BFM BFM	R/W 属性 R/W attribution	输出通道内容 Output channel content
＃32（E）	WR	输出模式选择，每个 HEX 位代表 1 个输出通道，4AM（R）模块取低 8 位中的高 HEX 位为 ch4，低 HEX 位为 ch3：（默认值＝H00） Selecting output modes, each HEX bit

		represents an output channel. In lower 8bit of 2DA(R) module, the higher HEX bit is ch2, and lower HEX bit is ch1: (default value=H00) 0＝-10V～10V；对应数字输出：-2000～2000 0＝-10V～10V； the corresponding digital output:-2000～2000 1＝4mA～20mA；对应数字输出：0～1000 1＝4mA～20mA； the corresponding digital output:0～1000 2＝0mA～20mA；对应数字输出：0～1000 2＝0mA～20mA； the corresponding digital output:0～1000 4＝-10V～10V；对应数字输出：-10000～10000 4＝-10V～10V； the corresponding digital output:-10000～10000 5＝4mA～20mA；对应数字输出：0～10000 5＝4mA～20mA； the corresponding digital output:0～10000 6＝0mA～20mA；对应数字输出：0～10000 6＝0mA～20mA； the corresponding digital output:0～10000	
＃33	WR	通道 3 Channel 3	通道输出值，初始值为 0 Channel output value, initial value = 0
＃34	WR	通道 4 Channel 4	
＃35～36	—	保留 Reserved	
＃37（E）	WR	PLC 停机时数值保留模式，每个 HEX 位代表 1 个输出通道，4AM（R）模块取低 8 位中的高 HEX 位为 ch4，低 HEX 位为 ch3，当： Selecting value holding modes when PLC shuts down, each HEX bit represents an output channel. In lower 8bit of 4AM(R) module, the higher HEX bit is ch4, and lower HEX bit is ch3, when: x＝0，保持停机前的输出；x＝1，将输出复位到偏移设定值 x=0, the output before shut down is held; x=1, the output is reset to the deviation	

<table>
<tr><td></td><td></td><td colspan="4">pre-set value</td></tr>
<tr><td>＃38～39</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td rowspan="2">＃40（E）</td><td rowspan="2">WR</td><td>G2</td><td>O2</td><td>G1</td><td>O1</td></tr>
<tr><td colspan="4">CH4/CH3 的偏移/增益设置命令，按 HEX 位设置，初始值＝H0000
CH4/CH3 setting deviation/gain command, which is set according to HEX bit, initial value =H0000
0＝禁止改变；1＝允许改变 EEPROM 对应数据
0=forbid to modify; 1=allow to modify EEPROM data</td></tr>
<tr><td>＃41</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td>＃42</td><td>WR</td><td colspan="2">偏 移 数 据 CH3
Deviation data CH3</td><td colspan="2" rowspan="4">单位：mV 或μA
Unit: mV or μA
初始偏移值：0
Initial deviation value: 0
初始增益值：＋5000,对应模式 0
Initial gain value: +5000, according to mode 0
（0、1、2 模式）
（0、1、2 modes）</td></tr>
<tr><td>＃43</td><td>WR</td><td colspan="2">增 益 数 据 CH3
Gain data CH3</td></tr>
<tr><td>＃44</td><td>WR</td><td colspan="2">偏 移 数 据 CH4
Deviation data CH4</td></tr>
<tr><td>＃45</td><td>WR</td><td colspan="2">增 益 数 据 CH4
Gain data CH4</td></tr>
<tr><td>＃46～51</td><td>—</td><td colspan="4">保留
Reserved</td></tr>
<tr><td>＃52（E）</td><td>WR</td><td colspan="4">初始值＝0，当写入 1 时，所有输出通道 BFM 单元（BFM#32~BFM#64）将初始化为默认值。
Initial value = 0, when writing with 1, all output channels BFM units(BFM#32~BFM#64) are initialled to default value.</td></tr>
<tr><td>＃53（E）</td><td>WR</td><td colspan="4">1＝允许调整输出特性（初始值）；设为 2＝禁止调整输出特性
1=allow to adjust output characteristic (initial value); 2= forbid to adjust output characteristic</td></tr>
</table>

＃54～60	—	保留 Reserved
＃61	R	输出通道错误状态 Output channel error state

其中状态信息字 BFM #29 的意义说明如下：

Where, the definition of state information word BFM #29 is described as following:

BFM＃29 位号 BFM#29 bit number	ON 状态 ON state	OFF 状态 OFF state
b0:	存在错误。 There is an error.b0~b3 中任一个非 0，A/D 转换停止 If anyone of b0~b3 is not 0, AD conversion is stopped	无错误 No error
b1:	模块内 EEPROM 的偏移/增益设置有误 The deviation/gain setting is error in module EEPROM	偏移/增益数据正确 The deviation/gain data is correct.
b2:	（不可能） n/a	电源正常 Power runs normally
b3:	模块硬件故障 Module hardware faulty	硬件正常 Hardware runs normally
b10:	数字输出超出-2048～2047 的范围 The value exceeds the rang of -2048～2047	数字输出值正常 Data output value is normal
b11:	采样滤波常数超出 1～4096 范围 The sampling filter constant exceeds the range of 1~4096	采样滤波常数正常 The sampling filter constant is normal
b12:	禁止 BFM#21 的值设为 K2 It is forbidden that BFM#21 value is set to K2	允许 BFM#21＝K2 It is allowed that BFM#21 value is set to K2
BFM＃29 的其它 bit4～7，bit13～15 等没有定义。 The other bits bit4~7, bit13~15 in BFM#29 is not defined.		

其中表中的“（E）”字样的 BFM 单元为存入 EEPROM 的项目，具有掉电保持特性。
where, the BFM unit marked with “(E)” in table is the item saved in EEPROM, which has the characteristic of power failure holding.

寄存器改写说明：

The description of register rewriting:

BFM#0、#32、等带（E）单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，每个 Word 约需 300ms 时间，因此在需要改写多个 BFM 单元时，注意 PLC 编程时，用户程序中每写一个上述的 BFM 单元后要延时一段时间，不要连续进行写操作，确保写指令的正确完成。

Rewriting BFM #0, #32, which are marked with (E), will cause the module internal writing operation to EEPROM, and writing operation needs a certain time about 300ms per word. So, when rewriting multiple BFM units in PLC programming, after writing a above BFM unit in user program, there should be a delay time instead of continuous writing operation, which ensures that the writing instruction is correctly accomplished.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。
Note: when the external 24V power supply of the local extended module is power off, the system flag M6708 of PLC main module will be set.编程时可定时检查该标志，能及时发现该现象。
The flag should be timely checked in programming, the problem can be found in time.

9、输入通道部分 BFM 区解释

9. Explanation of input channel BFM section

BFM0#　输入通道选择

BFM0# selecting input channel

输入通道的初始化，默认 2 个通道都为-10V~10V，由 BFM 0#的十六进制 HXX 控制，最低位控制通道一，第二位控制通道二，每个字符的控制方式如下：

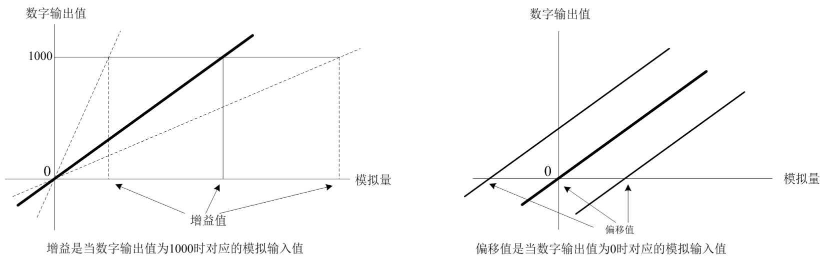
Two input channels are initialled as -10V~10V in default, controlled by BFM0# hex HXX. The lower bit controls channel 1, and higher bit controls channel 2. The control method of each character is listed as following:

X=0 预设范围 0V~10V （对应数字 0~2000）
X=0 The pre-set range 0V~10V (corresponding value 0~2000)
X=1 预设范围 4mA~20 mA （对应数字 0~1000）
X=1 The pre-set range 4mA~20 mA (corresponding value 0~1000)
X=2 预设范围 0mA~20 mA （对应数字 0~1000）
X=2 The pre-set range 0mA~20 mA (corresponding value 0~1000)
X=3 本通道关闭
X=3 the channel is closed;
X=4 预设范围 0V~10V （对应数字 0~10000）
X=4 The pre-set range 0V~10V (corresponding value 0~10000)
X=5 预设范围 4mA ~20 mA （对应数字 0~10000）
X=5 The pre-set range 4mA ~20 mA (corresponding value 0~10000)
X=6 预设范围 0mA ~20 mA （对应数字 0~10000）

X=6 The pre-set range 0mA ~20 mA (corresponding value 0~10000)

例如：BFM#0 为 H30，表示通道一为 0V~10V；通道二关闭。
For example: BFM#0=H30 means channel 1 is 0V~10V and channel 2 is closed.
没有用到的通道，可以关闭，也可以不关闭，关闭的通道不占用转换时间（BFM#15），例子中通道二关闭了，则整个通道转换一次时间为通道一乘以 BFM#15。
The unused channel can be closed or unclosed, and the closed channel will not occupy conversion time (BFM#15). In example, channel 2 is closed, then the conversion time of the whole channel = channel 1 × BFM#15.
BFM #1~#2 输入平均采样数
BFM #1~#2 average input sampling number
每个通道(BFM#9~#10)对应的采样值累加采样数（BFM #1~#2）的个数后再除以采样数（BFM #1~#2），存放到（BFM #5~#6）
After the sample value in each channel (BFM#9~#10) is added with sampling number (BFM#1~#2), the sum is divided by sampling number (BFM#1~#2), and the result is saved to (BFM #5~#6)
BFM #5~#6 输入存放平均采样值
BFM #5~#6 for saving average input sampling value
BFM #9~#10 输入存放即时采样值
BFM #9~#10 for saving instant input sampling value
BFM #15 输入 ADC 速率时间
BFM #15 input ADC speed time
每个输入通道转换一次需要的时间，需注意更新一次数据需要的时间是 BFM#15 的时间乘以没有关闭的通道数。
The input channel conversion will cost a certain time, and the required time of updating data is BFM#15×the unclosed channel number.
例如：BFM #0 为 H10，BFM #1 为 K7，BFM #2 为 K6，BFM #15 为 K10；则 BFM #9 和 BFM #10 刷新一次数据时间为 BFM#0×BFM#15=2×10=20MS，BFM #5 刷新一次数据时间为 BFM#0×BFM#15×BFM#1=2×10×7=140MS，BFM #6 刷新一次数据时间为 BFM#0×BFM#15×BFM#2=2×10×6=120MS。程序中 FROM/TO 指令比较耗时，故此模块参数在程序中采集 BFM#5 的数据可以用 LDP M8012 FROM K0 K5 D10 K1 指令读取，和 LD M8000 FROM K0 K5 D10 K1 的效果是一样的，但是后面用 M8000 驱动的指令每个扫描周期都读取一次，大大加长了程序的扫描周期。
For example: BFM #0=H10，BFM #1=K7，BFM #2=K6，BFM #15=K10; the time of updating BFM #9 and BFM #10 data = BFM#0×BFM#15=2×10=20MS; the time of updating BFM #5 data = BFM#0×BFM#15×BFM#1=2×10×7=140MS; the time of updating BFM #6 = BFM#0×BFM#15×BFM#2=2×10×6=120MS. In program, FROM/TO instruction is time-consuming, so the module parameter can read BFM#5 data in program via LDP M8012 FROM K0 K5 D10 K1 or LD M000 FROM K0 K5 D10 K1. The latter one applying M8000 instruction will read once in each scanning period, which greatly enlarge the scanning period of the program.
BFM #20 输入通道回归出厂值
BFM#20 resetting input channel to default value
将#20 设定为 1 可以恢复到默认值。

Setting #20 to 1can return to the default value.
BFM #21~#24　　输入通道偏移和增益的定义与设定方法：
BFM #21~#24　　the definition and setting method of input channel deviation and gain
H2U－4AM（R）的输入通道共有两种工作模式，特性曲线如下图：
There are totally two operation modes for H2U-4AM(R) input channel, and the characteristic curve is shown as following figure:



数字输出值
Digital output value
增益值
Gain value
模拟量
Analog value
增益是当数字输出值为 1000 时对应的模拟输入值
Gain is the analog input value when digital output value is 1000
偏移值
Deviation value
偏移值是当数字输出值为 0 时对应的模拟输入值
Deviation is the analog input value when digital output value is 0

偏移和增益可以独立设定或一起设定，正常的增益值设定范围是 1V～15V 或 4mA～32mA。正常的偏移值设定范围为 0V～5V，或 0mA～20mA。
Deviation and gain can be set together or separately, and the setting range of the normal gain value is 1V～15Vor 4mA～32mA. The setting range of the normal deviation value is 0V～5V, or 0mA～20mA.
增益/偏移设定前，需先将 BFM#21 设为 1，再修改 BFM#23/24；然后开各个通道的允许偏移增益 BFM#22，修改完毕，应将 BFM#21 再设为 2，避免再次被改变。
Before setting gain/deviation, MFM#21 should be set to 1 firstly, and then BFM#23/24 is modified; The allowable deviation and gain of each channel BFM#22 is modified, after which BFM#21 should be set to 2 to avoid to be modified again.
注意需要修改偏移增益的通道都一样的，不能这个通道偏移数据为 1000，另外一个通道偏移数据为 1200
Note: The deviation gain value for each channel should be same. It is forbidden that one channel deviation value is 1000, and the other channel deviation value is 1200.
例如：在 BFM#0 为模式 0 中，需要修改通道一、通道二的偏移和增益分别为 0.5V 和 6V，则需要按如下步骤操作：
For example: when in BFM#0=0 mode, it requires that the deviation and gain of channel 1 and channel 2 should be respectively modified to 0.5V and 0.6V, and it should be

operated according to the following steps:
先将 BFM#21 改为 1；过 300MS 以后将 K500 和 K6000 分别送到 BFM#23 和 BFM#24 去；再过 300MS 后开允许增益 BFM#22，本例子中 BFM#22 应为二进制的 1111，即是将 BFM#22 修改为 HF；修改完毕。
1. Modifying BFM#21 to 1;2. After 300ms, K5000 and K6000 are respectively transmitted to BFM#23 and BFM#24;3. After another 300ms, gain BFM#22 is set. In the example, BFM#22 should be binary 1111(HF);4. End 最后将 BFM#21 改为 2，以防再次被修改。
Finally, BFM#21 should be modified to 2 to avoid to be modified again.
10、输出通道部分 BFM 区解释
10. Explanation of output channel BFM section
BFM#32　输出通道选择
BFM#32 output channel selection
输出通道的初始化，默认 2 个通道都为-10V~10V，由 BFM 32#的十六进制 HXX 控制，最低位控制通道三，第二位控制通道四，每个字符的控制方式如下：
Two output channels are initialled as -10V~10V in default, controlled by BFM32# hex HXX. The lower bit controls channel 3, and higher bit controls channel 4. The control method of each character is listed as following:
X=0 预设范围-10V~10V　（对应数字-2000~2000）
X=0 The pre-set range -10V~10V　(corresponding value -2000~2000)
X=1 预设范围 4mA~20 mA　（对应数字 0~1000）
X=1 The pre-set range 4mA~20 mA　(corresponding value 0~1000)
X=2 预设范围 0mA~20 mA　（对应数字 0~1000）
X=2 The pre-set range 0mA~20 mA　(corresponding value 0~1000)
X=4 预设范围-10V~10V　（对应数字-10000~10000）
X=4 The pre-set range -10V~10V　(corresponding value -10000~10000)
X=5 预设范围 4mA ~20 mA　（对应数字 0~10000）
X=5 The pre-set range 4mA ~20 mA　(corresponding value 0~10000)
X=6 预设范围 0mA ~20 mA　（对应数字 0~10000）
X=6 The pre-set range 0mA ~20 mA　(corresponding value 0~10000)
例如：BFM#32 为 H10，表示通道三为-10V~10V；通道四为 4mA~20mA。
For example: BFM#32=H10 means channel 3 is -10V~10V and channel 4 is 4mA~20mA.
BFM #33~#34 输出通道输出值
BFM #33~#34　output channel output value
用 TO 指令往 BFM #33~#34 写数据，可以控制模拟量输出。
Writing data to BFM #33～#34 with TO instruction to control analog output.初始值均为 0. The initial values are all 0.
BFM #37　输出通道数据保持模式
BFM#37　output channel data holding mode
当主模块在由 RUN 至 STOP 状态时 RUN 最后的模式被保持(X=0)或者为偏移值(X=1)输出，
When main module is in the state from RUN to STOP, the final mode of RUN will be held (X=0) or deviation (X=1) output,
例如：BFM#32 为 H00，BFM#37 为 H01，2 个通道的偏移值均为 0.1V，由 RUN 至 STOP 变化时 BFM#33~#34 里面的值均为 1500（7.5V），当 STOP 后，通道 3 输出电压

变成 0.1V，通道 4 输出电压保持在 7.5V。

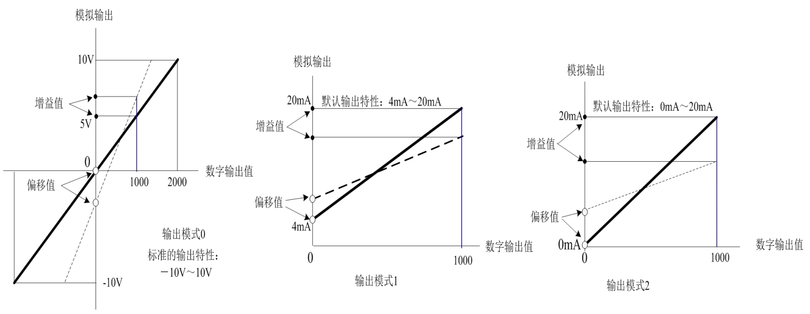
For example: BFM#32=H00, BFM#37=H01, the deviation value in two channels are all 0.1V. When it changes from RUN to STOP, the values in BFM#33~#34 are all 1500 (7.5V); After STOP, output voltage in channel 4 changes to 0.1V, and output voltage in channel 2 holds to 7.5V.

BFM #40、BFM #42~#45、BFM #53 输出通道偏移和增益的定义与设定方法：

BFM #40, #42~#45, BFM#53 the definition and setting method of output channel deviation and gain：

H2U－4AM（R）的输出通道共有三种工作模式，特性曲线如下图：

There are totally three operation modes for H2U-4AM(R) output channel, and the characteristic curve is shown as following figure:



其中，增益值为数字 1000 时对应的模拟量输出；偏移值则是数字为 0 时对应的模拟量输出。偏移和增益可以独立设定或一起设定，设定参数的单位是 mV（模式 0）和μA（模式 1 和 2）

The gain is the corresponding analog output when the numerical value is 1000, while the offset is the corresponding output when the numerical value is 0. The offset and gain can be configured individually or collectively. The unit for setting parameters is mV (mode 0) and μA (mode 1 and 2)

BFM #40 为偏移、增益设置命令，十六进制的每 HEX（二进制的 4 个 bit 位组成）位来控制禁止或者允许，注意在 AD 输入模块中是二进制的每个 bit 位来控制，DA 模块和 AD 模块在偏移、增益设置命令有所区别。BFM #10~#13 为偏移、增益设置值，BFM #53 为曲线特性设置命令

BFM#40 is the setting command for offset and gain values. Every HEX bit (composed of 4 binary bit) in the hexadecimal prohibits or permits the command. Please note that the AD input module is controlled by every binary bit, while the DA and AD modules possesses differentiation in gain and offset setting commands respectively. BFM #10~#13 are the offset/gain settings, and BFM #53 is the curve characteristic setting command.

增益/偏移设定前，需先将 BFM＃53 设为 1，再根据需要修改 BFM＃42～＃45 的相关单元数值；再向 BFM＃40 单元写入操作允许字，修改完毕，应将 BFM＃53 再设为 2，避免再次被改变。

例如：在 BFM#40 为模式 H00 中，需要修改通道三的偏移和增益分别为 0.2V 和 5.5V，则需要按如下步骤操作：

For example, when BFM#40 is under the H00 mode, the offset and gain values that require channel modifications are 0.2V and 5.5V. The operation procedure is as follows:

先将 BFM#53 改为 1；过 300MS 以后将 K200、 K5500 分别送到 BFM#42、#43、中去；紧跟着 BFM#40 开允许偏移、增益，即是将 BFM#40 修改为 H0011；修改完毕。最后将

BFM#53 改为 2，以防再次被修改。

First, modify BFM#53 to 1; after passes 300MS, transfer K200 and K5500 to BFM#42 and #43 respectively; immediately switch BFM#40 on to allow offset/gain command to modify BFM#40 to H0011. The modification is now complete. Modify BFM#53 to 2 to prevent other changes.

BFM #52　输出通道回归出厂值

BFM#52 Output channel returns to default factory settings

将 BFM #52 设定为 1 可以恢复到默认值。

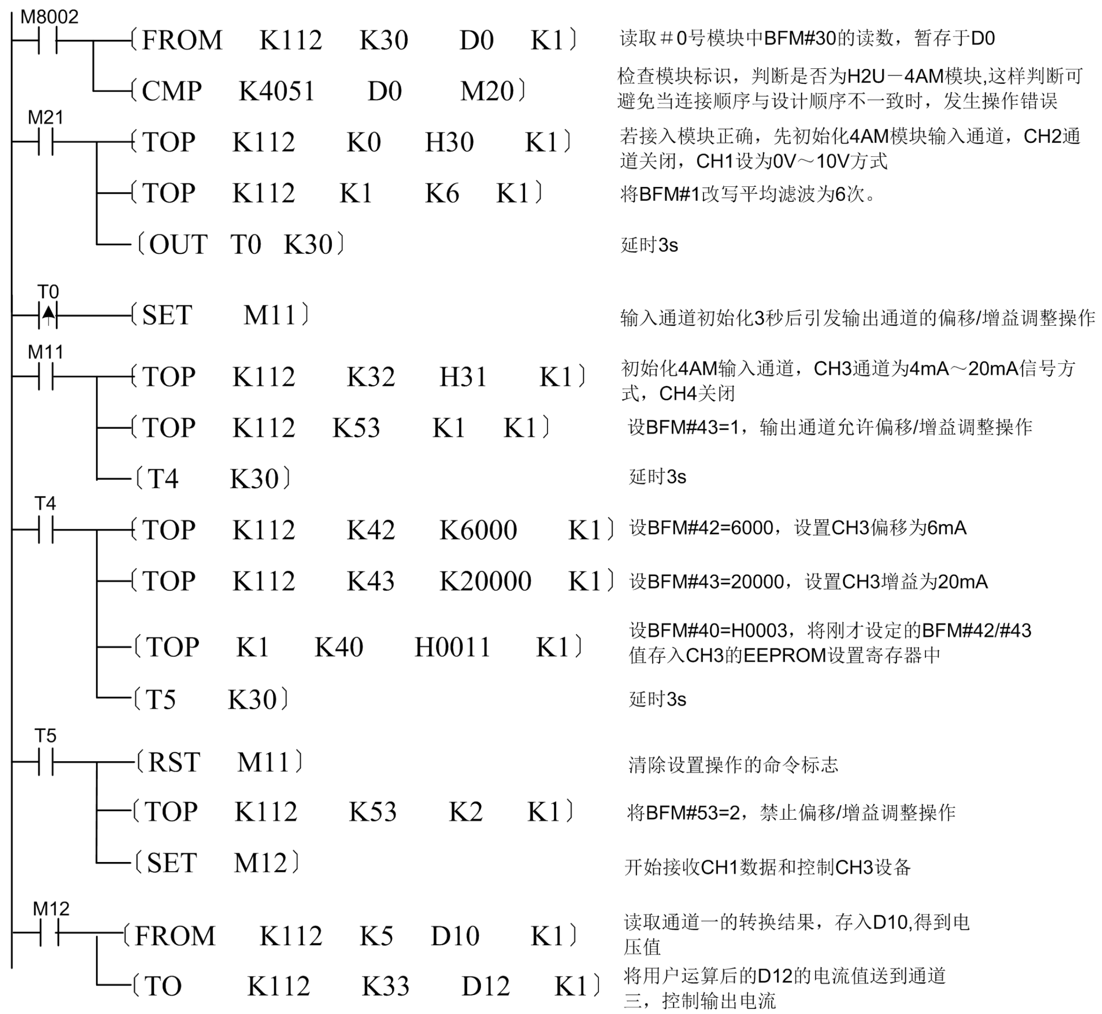
Modify BFM#52 to 1 to return to the default values.

编程举例 1：

Programming Example 1:

一只 H2U－4AMR 远程扩展模块，CAN 站号为 12，其中 CH1 端口需要采集 0V～10V 的电压信号，要求改滤波次数为 6，将采集得到的数据存于 D10。CH3 端口由 D12 输出 6mA～20mA 的电流信号。编写的用户程序如下

In one H2U-4AMR remote expansion module, the CAN station number is 12. In the module, the CH1 port requires 0~10V of signals to modify filter frequency to 6 and save the collected data in D10. CH3 port the exports 6~10mA of signals through D12. The user program is written as:

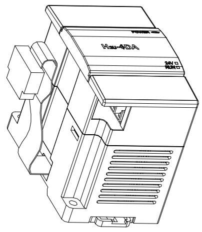


读取#0 号模块中 BFM#30 的读数，暂存于 D0
Retrieve the BFM#30's readout in #0 module and save in D0 temporarily.
检查模块标识，判断是否为 H2U-4AM 模块，这样判断可避免当连接顺序与设计顺序不一致时，发生操作错误若接入模块正确，先初始化 4AM 模块输入通道，CH2 通道关闭，CH1 设为 0V~10V 方式
Check the logo to ensure it is the H2U-4AM module. By performing the inspection it prevents any operation errors caused by inconsistant connection and programming sequences. When the module connected is correct, first initiate 4AM module input channel, turn CH2 channel off, and configure the setting of CH1 to 0~10V
将 BFM#1 改写平均滤波为 6 次。
Modify the average filter frequency number in BFM#1 to 6.
延时 3s
Delay 3s
输入通道初始化 3 秒后引发输出通道的偏移/增益调整操作
3 seconds after the input channel initiation, lauch the output channel's offset/gain adjustment operation.
初始化 4AM 输入通道，CH3 通道为 4mA~20mA 信号方式，CH4 关闭
Initiate 4AM input channel, CH3 channel will be in 4~20mA signaling, CH4 is turned off.
设 BFM#43=1，输出通道允许偏移、增益调整操作
Configure BFM#43 to 1 so that it allows offset/gain adjustment operation for the output channel.
延时 3s
Delay 3s
设 BFM#42=6000，设置 CH3 偏移为 6mA
Configure BFM#42 to 6000, CH3 offset to 6mA
设 BFM#43=20000，设置 CH3 增益为 20mA
Configure BFM#43 to 20000, CH3 gain to 20mA
设 BFM#40=H0003，将刚才设定的 BFM#42/#43 值存入 CH3 的 EEPROM 设置寄存器中
Configure BFM#40 to H0003, save the values in BFM#42/#43 to the EEPROM setting registers in CH3.
延时 3s
Delay 3s
清除设置操作的命令标志
Clear configuration command marks
将 BFM#53=2，禁止偏移/增益调整操作
Configure BFM#53 to 2 to prohibit offset/gain adjustment operation.
开始接受 CH1 数据和控制 CH3 设备
Start accepting CH1 data and controlling CH3 equipments
读取通道一的 zhuanhuan 结果，存入 D10，得到电压值
Retrieve the zhuanhua results in channel one and save in D10 to obtain voltage value.
将用户运算后的 D12 的电流值送到通道三，控制输出电流
Transmit the D12 current vaule calculated to Channel 3 and control the output current.
使用注意事项：
CAUTION:

禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；
Hot swap is prohibited. In order to ensure safety and prevent equipment damages caused by hot swap, expansion module connection and removal can only be performed when the main module and application system are turned off.

H2U－6AM　H2U－6AMR　4 通道模拟输入/2 通道模拟输出混合扩展模块
H2U-6AM　H2U-6AMR　4-channel analog input/2-channel analog output mixture expansion module

1、简　介　Introduction



H2U 本地扩展模块可配合 H2U 系列主模块工作，实现 4 个模拟输入通道的信号检测和 2 个模拟信号通道的输出。每个输入通道将-20mA～20mA 的信号转换为 12bit 的数字量，供 PLC 主模块读取；每个输出通道都具有电压信号及电流信号输出端口，信号幅值分别可为-10V～10V 或 0～20mA。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元，实现模拟输出信号的控制。
Together with the H2U local expansion module and H2U series main module, 4-channel analog input signal detections and 2-channel analog signal output can be accomplished. Every input channel will convert -20~20mA of signals into 12bit digital value so that it can be read out by PLC main module. Every output channel has voltage and current signal output ports, and the signal amplitude ranges from -10~10V or 0~10mA. Using the FROM/TO command, the main module accesses the BFM unit in the local expansion module’s registers to control the analog output signals.

2、电气规格：
2. Electrical Specifications:

电源 Power Supply	模拟电路 Analog Circuit	24V DC -15%/+20%，最大允许纹波电压 5% 输入电流 200mA(来自于主单元的外部电源) 20V DC -15%/+20%. Maximum ripple voltage 5%, Input current 200mA (from the external power supply of the main unit)
	数字电路 Digital Circuit	5V DC 50mA(来自于主电源内部电源)（远程扩展无需数字电路电源） 5V DC 50mA (from the internal power supply of the main source) (remote expansion does not require digital circuit power supply)
项目 Item		AD 部分指标 AD Indicators
占用 I/O 点数 I/O Points Occupied		不占用主模块 I/O 点数 No I/O point is used in main module

<table>
<tr><td colspan="2">转换速度
Conversion speed</td><td>15ms/通道（常速），6ms/通道（快速），1ms/通道（最快）
15ms/channel (regular), 6ms/channel (fast), 1ms/channel (fastest)</td></tr>
<tr><td>模拟输入范围
Analog input range</td><td>电流输入
Current input</td><td>0～20mA(输入阻抗为 250Ω)
0~20mA (input impedance is 250Ω)</td></tr>
<tr><td colspan="2">数字输出
Digital output</td><td>默认设置为：0 ～ +1000
Default setting: 0 ~ +1000</td></tr>
<tr><td>分辨率
Resolution</td><td>电流输入
Current input</td><td>20μA
20μA</td></tr>
<tr><td colspan="2">精度
Accuracy</td><td>±1%</td></tr>
<tr><td colspan="2">隔离
Isolation</td><td>模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。
Isolation between analog and digital circuits is done using optocoupler. Isolation between analog circuit and external power supply is done using DC/DC. Between analog channels no isolation is used.</td></tr>
<tr><td colspan="2">项目
Item</td><td>DA 部分指标
DA Indicators</td></tr>
<tr><td colspan="2">占用 I/O 点数
I/O points occupied</td><td>不占用主模块 I/O 点数
No I/O point is used in main module</td></tr>
<tr><td colspan="2">转换速度
Conversion speed</td><td>2 通道 2.1mS
2-channel 2.1mS</td></tr>
<tr><td rowspan="2">模拟输出范围
Analog output range</td><td>电压输出
Voltage output</td><td>-10～10V DC(外部负载阻抗为 2KΩ～1MΩ)
-10~10V DC (external load impedance is 2KΩ～1MΩ)</td></tr>
<tr><td>电流输出
Current output</td><td>0～20mA(外部负载阻抗为 500Ω或更小)
0~20mA (external load impedance is 500Ω or smaller)</td></tr>
<tr><td colspan="2">数字输入
Digital input</td><td>默认设置：-2000 ~ 2000，允许范围：-10000 ~ 10000
Default setting: -2000 ~ 2000, allowed range: -10000 ~ 10000</td></tr>
<tr><td rowspan="2">分辨率
Resolution</td><td>电压输出
Voltag output</td><td>5mV(10V/2000)</td></tr>
<tr><td>电流输出
Current output</td><td>20μA(20mA /1000)</td></tr>
<tr><td colspan="2">总体精度
Overall accuracy</td><td>±1%（对于 10V 的全范围）
±1% (overall range of 10V)
±1%（对于 20mA 的全范围）
±1% (overall range of 20mA)</td></tr>
</table>

隔离 Isolation	模拟电路和数字电路之间用光电耦合器进行隔离。模拟电路电源和外部电源用 DC/DC 进行隔离。模拟通道之间不隔离。 Isolation between analog and digital circuits is done using optocoupler. Isolation between analog circuit and external power supply is done using DC/DC. Between analog channels no isolation is used.

3、模块用户接口表：

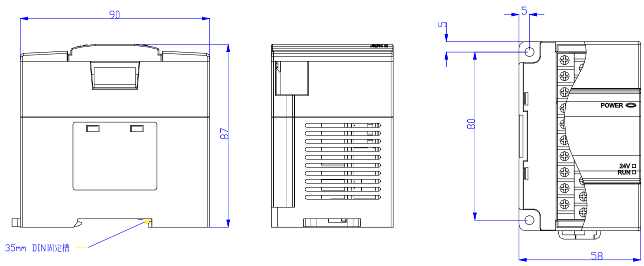
3. Module User Interface Table

<table>
<tr><td>项目
Item</td><td colspan="2">说明
Description</td></tr>
<tr><td>接线端子功能
Terminal functions</td><td colspan="2">I+：通道的电流正输入\输出端子；
I+: channel positive current input/output terminal;
I-：输入通道的公共端；
I-: input channel’s common terminal;
V+：输出通道的电压正输出端子；
V+: output channel’s positive voltage output terminal
VI-：输出通道的公共端；
VI-: output channel’s common terminal;
24+/24-:外部 24V 输入端子；
24+/24-: external 24V input terminal;
GND：保护接地。
GND: ground protection</td></tr>
<tr><td rowspan="2">指示灯
Indicators light</td><td>本地扩展模块
Local expansion module</td><td>PWR：当与主模块连接且主模块上电的情况下点亮。
PWR: lights up when main module is connected and powred on.
COM：当模块正常工作时高速闪烁，故障时慢速闪烁。
COM: flashes rapidly when module is functioning normally; slow flashes when error occurs.
24V：当外部 24V 接通时点亮。
24V: lights up when external 24V is connected.</td></tr>
<tr><td>远程扩展模块
Remote expansion module</td><td>PWR：模块 24V 供电正常
PWR: 24V normal power supply to the module
COM：点亮表示模块进行通讯
COM: lights up when module is communicating
ERR：点亮表示有错误发生。
ERR: lights up when error occurs.</td></tr>
</table>

扩展端口 Expansion terminal	本地扩展模块 Local expansion module	扩展输入端采用 26 针梯形连接头，通过扁平电缆接入模块；扩展输出端采用 26 针梯形连接头。 Expansion input terminal uses 26-pin trapezoidal connector and connects to module through flat cables; expansion output terminal uses the same connectors.
	远程扩展模块 Remote expansion module	扩展输入采用 5 针孔插头，建议用 4 芯双绞屏蔽线或者网线做传输导线 Expansion input terminal uses 5-pin plugs. 4-core shielded twisted pair (STP) cable or network cable is recommeded.

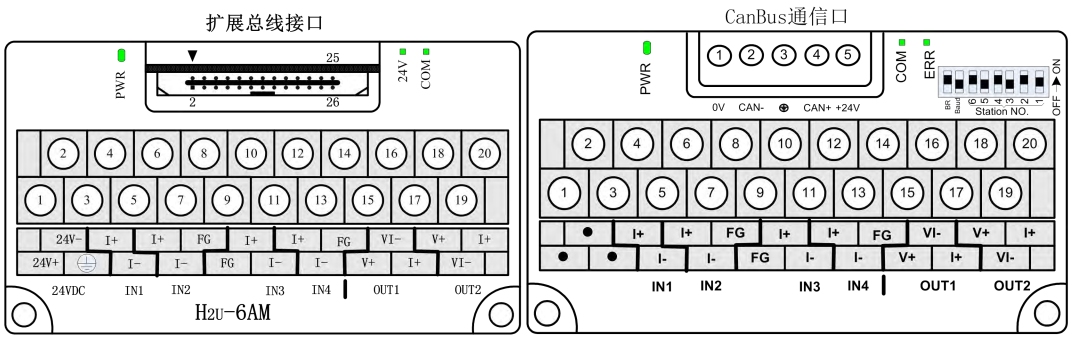
4、模块的安装尺寸：

4. Module Installation Dimension:



5、接线端子布局如下图：

5. Terminal Distribution, as follows:



H2U-6AM H2U-6AMR

扩展总线接口

Expansion bus interface

CanBus 通信口

CanBus communication port

6、外部配线：

6. External wiring:

模拟信号通过双绞线连接到扩展模块的输入\输出端口，布线时不要与交流电源线或干扰信

号的线路靠近；

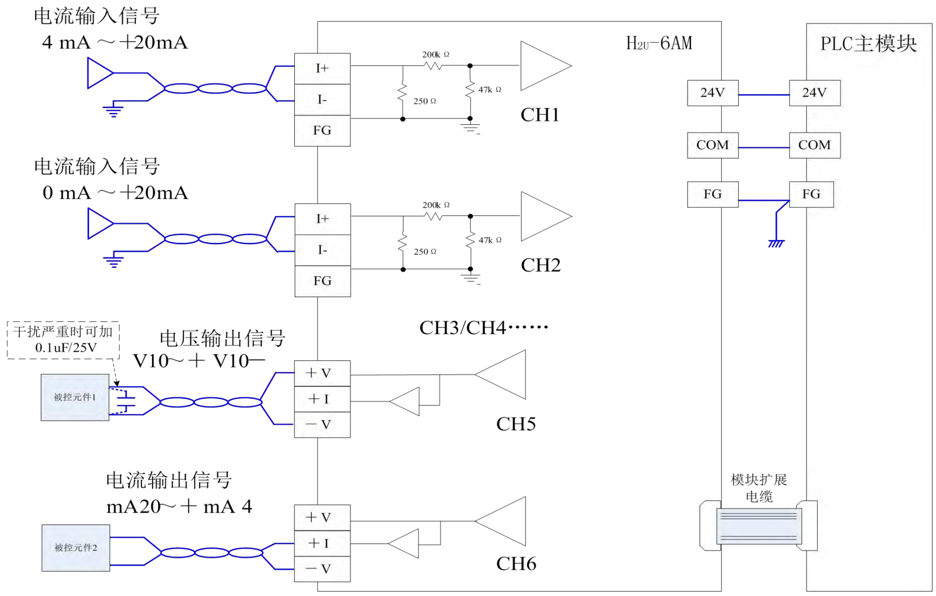
Analog signals are transmitted to the expansion module’s input/output terminal through the twisted cable. When wiring the cables, do not get near with any AC cables or signal-interfering cables to prevent signal interference.

若模拟信号的干扰严重时，可采用屏蔽线连接，并在输入端口并联 1 只 0.1μF/25V 的高频电容；

When the analog signal is interfered seriously, shielded cable can be used for wiring. One 0.1μF/25V high-frequency capacitance should be in parallel connection with the input terminal.

信号源/被控元件及其屏蔽线的外壳与 H2U－6AM 的信号接地端 FG 相连，共同接地。

Signal source/controlled component and the shell of the shielded cable should be connected to the H2U-6AM’s signal grounding terminal, FG, and grounded together.



电流输入信号

Current input signal

干扰严重可加 0.1uF/25V

0.1μF/25V can be added when high interference

电压输出信号

Voltage output signal

模块扩展电缆

Module expansion cable

PLC 主模块

PLC main module

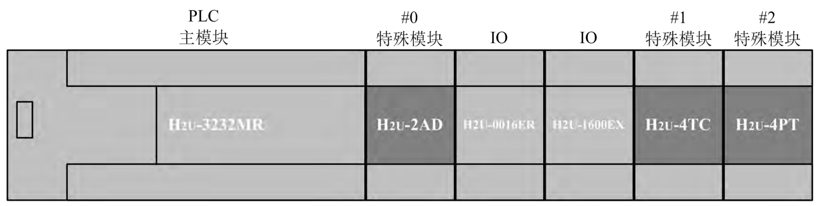
7、本地特殊扩展模块的地址编号：

7. Local expansion module’s address numbering:

除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4TC/CC-Link 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。

All expansion modules (such as 4AD/4DA/4TC/CC-Link), except the IO expansion

module, are called special module. Every time when a PLC main module powers on, it will automatically detect all the connected expansion modules and assign numbers to these special modules and the IO expansion terminal. Users cannot interfer or modify the numbering, unless the connection sequence of the module is changed.
主模块对特殊模块的地址编号方法是，由紧靠近主PLC模块开始进行，依次为＃0、＃1、…#7等编号，中间若插入的IO扩展模块不参与编号，如下图中，2AD扩展模块的模块地址编号为#0，后续的4TC和4PT模块地址依次为＃1和＃2，以此类推，最多可接入8个特殊模块：
The address numbering system the main module uses on special modules is that, the numbering will start from the module closest to the PLC module and start from #0, #1…#7, and etc. IO expansion module inserted in mid way will not be numbered. As illustrated below, 2AD expansion module's address number is #0. The 4TC and 4PT module addresses are #1, #2, and etc. Maximum 8 special modules can be connected:



PLC 主模块
PLC main module
特殊模块
Special module

即使中间插有若干IO扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。
If certain IO expansion modules are inserted in middle, numbering sequence will not be influenced. By understanding the numbering principle, users can accurately access designated modules when programming the system.
上电前需要将模块的外部24V/COM电源端与PLC主模块的24V/COM对应连接妥当，以便主模块上电时，6AM模块也能同时上电。若6AM模块的外部电源上电滞后，可能导致PLC主模块不能正确辨识模块类型；
Before powering up, the module's external 24V/COM power terminal and PLC main module's 24V/COM corresponding terminal must be properly connected. 6AM module can also be powered up at the same time. If the 6AM module's external power supply experiences hysteresis, the PLC main module may not be able to correctly identify module types;
PLC主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被PLC主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。
PLC main module only inspects once all the expansion modules connected to system when powered up. As for the expansion modules inserted during operation, PLC main module will not be able to detect and access them. If the expansion modules are

unplugged during operation, not only it will damage devices, more seriously, it may also result in unpredictable output control status and user equipment breakdowns.

8、远程特殊扩展模块的地址编号：

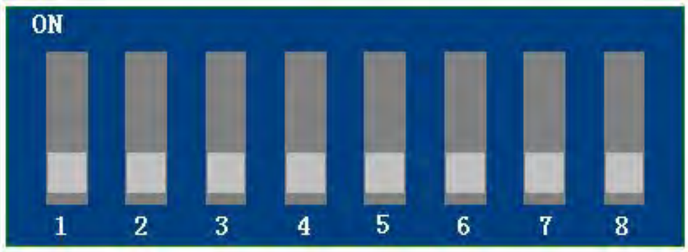
8. Address numbering for remote special expansion module

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

The address numbering system in a remote expansion module is: module communication station number +100, and a maximum number of 63 remote expansion modules can be added. The module station number can be configured by switching the DIP on the Station NO. The DIP switch interface defines as:

每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。

Every remote module has one octonary DIP switch. Through the DIP switch users can set up the station number, select Baud rate, connect matching resistor or not. As illustrated below, every DIP switch is assigned with one number. “ON” represents logic “1”. The following table lists the definition for every number.



CAN-LINK 拨码开关

CAN-LINK DIP switch

拨码开关位定义

DIP switch definition

拨码号 信号 描述

DIP No. Signal Description

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 These six DIP switches from top to bottom make up six binary digits used to mark station numbers. “ON” represents 1 and “OFF” 0. They are composed according the following method: A6A5A4A3A2A1. For instance, when A1=ON and other digits are OFF, the binary address becomes 000001, K01 for decimal and
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address	

	line A4	h01 for hexadecimal. When A5 and A4 are ON and others are OFF, the binary address becomes 011000, K24 for decimal and h18 for hexadecimal.
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud Rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode. Baud rate is 500Kbps; ON: low-speed mode, Baud rate is 100Kbps.
8	匹配电阻 Matching Resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch is ON, it means a terminal matching resistor of 120ohms is connected, or it will disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If in a module A5 and A4 are ON and others are OFF, the binary address becomes 011000, and K24 for decimal. Therefore, when using the FROM/TO command to program the system, the module's serial number become K24+100, which equals #124.

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

When DIP switches are modified, besides the matching resistor, Baud rate and addresses will not take effect immedately. The system needs to restart in order to adopt the new configuration parameters. CAN addresses consistancey must be noted and not duplicated addresses are allowed.

9、访问 6AM（R）模块的 BFM 区：

9. Accessing the BFM zone in 6AM(R) Module

PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

The PLC module accesses the BFM units using the FROM/TO reading/writing command.

扩展模块内设有 EEPROM 存储单元，用于保存一些 BFM 设定值,例如每个模拟输入/输出通道的信号类型、偏移值、增益值等，这些单元的保存动作是由相应 BFM 单元的设置状态决定而自行完成的。

An expansion module is equipped with EEPROM storage units, which are used to store BFM configuration settings, such as analog input/output channel's signal types, offset values, gain values, etc. The storing function of these units is performed automatically by the configuration status in the corresponding BFM units.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 6AM（R）模块的 BFM 区定义如下表：

Every register's bandwidth in a BFM is 16bit (equal to 1Word). The BFM are defined according to the 6AM (R) module and as follows:

BFM	R/W 属性	输入通道内容

	R/W Property	Input channel contents	
＃0（E）	WR	通道信号模式选择，每个 HEX 位代表 1 个输入通道，最高位为 ch4，最低位为 ch1：（默认值＝H1111） Select channel signal mode. Every HEX represents 1 input channel. The highest is ch4, and lowest is ch1: (Default Value=H1111) 1＝4mA～20mA；对应数字输出：0～1000 1 = 4mA ～ 20mA; corresponding digital output: 0～1000 2＝0mA～20mA；对应数字输出：0～1000 2 = 0mA~20mA; corresponding digital output: 0~1000 3＝本通道关闭； 3 = channel closed; 5＝4mA～20mA；对应数字输出：0～10000 5 = 4mA ～ 20mA; corresponding digital output: 0～10000 6＝0mA～20mA；对应数字输出：0～10000 5 = 0mA ～ 20mA; corresponding digital output: 0～10000	
＃1	WR	通道 1 Channel 1	平均滤波常数，即用于平均计算的采样值个数，设定范围 1～4096，默认值 8。若要高速采集，可设定为 1。当 BFM#15 改变时，自动恢复为默认值 Average filter constant. Used to determine sample numbers for averaging calculation. Setting range is 1~4096, default value at 8. If rapid sampling is required, value can be set at 1. When BFM#15 changes, it restores to the default value.
＃2	WR	通道 2 Channel 2	
＃3	WR	通道 3 Channel 3	
＃4	WR	通道 4 Channel 4	
＃5	R	通道 1 Channel 1	输入通道采集值平均滤波后的数据 Input channel sampling value data that has been averaged
＃6	R	通道 2 Channel 2	
＃7	R	通道 3 Chann	

<table>
<tr><td></td><td></td><td>el 3</td><td colspan="8" rowspan="2"></td></tr>
<tr><td>＃8</td><td>R</td><td>通道 4
Channel 4</td></tr>
<tr><td>＃9</td><td>R</td><td>通道 1
Channel 1</td><td colspan="8" rowspan="4">输入通道当前采集的数据，即未滤波处理的瞬时值。
Present data collected from input channel, which is the instantaneous value before filtering process.</td></tr>
<tr><td>＃10</td><td>R</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃11</td><td>R</td><td>通道 3
Channel 3</td></tr>
<tr><td>＃12</td><td>R</td><td>通道 4
Channel 4</td></tr>
<tr><td>＃13~14</td><td>—</td><td></td><td colspan="8">保留；
Reserved:</td></tr>
<tr><td>＃15</td><td>WR</td><td>ADC 速率选择
Select ADC rate</td><td colspan="8">0＝正常速度，15ms/通道（默认值）；
0=normal speed, 15ms/channel (default);
1＝快速转换，6ms/通道；
1=faster conversion, 6ms/channel;
1000～30000＝高速采样，对应 1ms～30ms/通道
1000~30000=rapid sampling, corresponds to 1ms~30ms/channel</td></tr>
<tr><td>＃16~19</td><td>—</td><td colspan="9">保留
Reserved</td></tr>
<tr><td>＃20（E）</td><td>WR</td><td colspan="9">1＝复位设定，将所有输入通道参数（BFM#0~BFM#32）恢复到默认值（出厂值）。默认值＝0
1=restore settings. Restore all input channel parameters (BFM#0~BFM#32) to default value (factory setting). Default value=0</td></tr>
<tr><td>＃21（E）</td><td>WR</td><td colspan="9">2＝禁止调整偏移/增益，（默认值）；
2=offset/gain adjustment prohibited (default);
1＝允许调整偏移/增益
1=offset/gain adjustment permitted</td></tr>
<tr><td>＃22（E）</td><td>WR</td><td>低 8 位对应 4 个通道的操作
Operatio</td><td>G4</td><td>O4</td><td>G3</td><td>O3</td><td>G2</td><td>O2</td><td>G1</td><td>O1</td></tr>
</table>

		n of the lower 8bits correspond to 4 channels								
		偏移/增益调整使能，当非 0 时，模块会将 BFM23/24 值写入其内部对应通道控制寄存器中 Offset/gain adjustment function. When it is not 0, the module will write the BFM23/24 value in the internal corresponding channel control registers.								
＃23（E）	WR	偏移值，数字输出为 0 时的模拟输入值（0、1、2 模式）初始值 400 Offset value. Analog input value (0, 1, 2 modes) when digital output is 0. Default value is 400.								
＃24（E）	WR	增益值，数字输出为＋1000 时的模拟输入值（0、1、2 模式）初始值 20000 Gain value. Analog input value (0, 1, 2 modes) when digital output is +1000. Default value is 20000.								
＃25~26	—	保留 Reserved								
＃27	R	6AM 模块软件版本 6AM module software revision								
＃28	—	保留 Reserved								
＃29	R	输入通道错误状态 Input channel error status								
＃30	R	扩展模块识别码，H2U－6AM（R）的识别码为 K4050 Expansion module identification code. H2U-6AM (R)'s identification code is K4050.								
＃31	—	保留，不可访问 Reserved. Not accessible.								

BFM	R/W 属性 R/W property	输出通道内容 Output channel contents

<table>
<tr><td>＃32（E）</td><td>WR</td><td colspan="2">输出模式选择，每个 HEX 位代表 1 个输出通道，6AM（R）模块取低 8 位中的高 HEX 位为 ch6，低 HEX 位为 ch5：（默认值＝H00）
Select output mode. Every HEX represents 1 output channel. 6AM (R) module selects the highest in the lower 8bits as ch6, and lowest HEX as ch5: (Default Value=H00)
0＝-10V～10V；对应数字输出：-2000～2000
0=-10V~10V; correponding digital output: -2000~2000
1＝4mA～20mA；对应数字输出：0～1000
1 = 4mA～20mA; correponding digital output: 0～1000
2＝0mA～20mA；对应数字输出：0～1000
2 = 0mA～20mA; correponding digital output: 0～1000
4＝-10V～10V；对应数字输出：-10000～10000
4＝-10V～10V; correponding digital output: -10000～10000
5＝4mA～20mA；对应数字输出：0～10000
5＝4mA～20mA; correponding digital output: 0～10000
6＝0mA～20mA；对应数字输出：0～10000
6＝0mA～20mA; correponding digital output: 0～10000</td></tr>
<tr><td>＃33</td><td>WR</td><td>通道 5
Channel 5</td><td rowspan="2">通道输出值，初始值为 0
Channel output value, initial value is 0</td></tr>
<tr><td>＃34</td><td>WR</td><td>通道 6
Channel 6</td></tr>
<tr><td>＃35～36</td><td>—</td><td colspan="2">保留
Reserved</td></tr>
<tr><td>＃37（E）</td><td>WR</td><td colspan="2">PLC 停机时数值保留模式,每个 HEX 位代表 1 个输出通道，6AM（R）模块取低 8 位中的高 HEX 位为 ch6，低 HEX 位为 ch5，当：x＝0，保持停机前的输出；x＝1，将输出复位到偏移设定值
Data preservation mode when PLC is powered down. Every HEX represents 1 output channel. 6AM (R) module selects the highest in the lower 8bits as ch6, and lowest HEX as ch5. When x=0, output before the</td></tr>
</table>

<table>
<tr><td></td><td></td><td colspan="5">power down is retained; when x=0, output will be reset to the offset setting.</td></tr>
<tr><td>＃38～39</td><td>—</td><td colspan="5">保留
Reserved</td></tr>
<tr><td rowspan="2">＃40（E）</td><td rowspan="2">WR</td><td>低 4bit 位对应 2 个通道的操作
Operation of the lower 4bits corresponding to 2 channels</td><td>G2</td><td>02</td><td>G1</td><td>01</td></tr>
<tr><td colspan="5">CH6/CH5 的偏移/增益设置命令，按 HEX 位设置，初始值＝H0
CH6/CH5’s offset/gain configuration command. Set up according to HEX bits. Initial value=H0.
0＝禁止改变；1＝允许改变 EEPROM 对应数据
0=modification prohibited; 1=modification of EEPROM corresponding data is permitted</td></tr>
<tr><td>＃41</td><td>—</td><td colspan="5">保留
Reserved</td></tr>
<tr><td>＃42</td><td>WR</td><td>偏移数据 CH5
Offset data CH5</td><td colspan="4" rowspan="4">单位：mV 或μA
Unit: mV or μA
初始偏移值：0
Initial offset value: 0
初始增益值：＋5000,对应模式 0
Initial gain value: +5000, corresonding mode 0
（0、1、2 模式）
(0, 1, 2 mode)</td></tr>
<tr><td>＃43</td><td>WR</td><td>增益数据 CH5
Gain dta CH5</td></tr>
<tr><td>＃44</td><td>WR</td><td>偏移数据 CH6
Offset data CH6</td></tr>
<tr><td>＃45</td><td>WR</td><td>增益数据 CH6
Gain dta CH6</td></tr>
<tr><td>＃46～51</td><td>—</td><td colspan="5">保留
Reserved</td></tr>
<tr><td>＃52（E）</td><td>WR</td><td colspan="5">初始值＝0，当写入 1 时，所有输出通道 BFM 单元（BFM#32~BFM#64）将初始化为默认值。
Initial value=0. When 1 is written, all output channel BFM units (BFM#32~BFM#64) will be restored to default values.</td></tr>
</table>

＃53（E）	WR	1＝允许调整输出特性（初始值）；设为2＝禁止调整输出特性 1= output property adjustment (initial value) permitted; 2=output property adjustment prohibited
＃54～60	—	保留 Reserved
＃61	R	输出通道错误状态 Output channel error status

其中状态信息字 BFM #29 的意义说明如下：
Status message BFM#29 is explained as follows:

BFM＃29 位号 BFM#29 Bit No.	ON 状态 ON Status	OFF 状态 OFF Status
b0:	存在错误。b0~b3 中任一个非 0，A/D 转换停止 Error occurs. Any one of b0~b3 is not 0. A/D conversion terminated.	无错误 No Error
b1:	模块内 EEPROM 的偏移/增益设置有误 Errors in module EEPROM's offset/gain settings	偏移/增益数据正确 offset/gain data correct
b2:	（不可能） (Not valid)	电源正常 Power supply normal
b3:	模块硬件故障 Module hardware failure	硬件正常 Hardware normal
b10:	数字输出超出-2048～2047 的范围 Digital output exceeds the range of -2048~2047	数字输出值正常 Digital output value normal
b11:	采样滤波常数超出 1～4096 范围 Sampling filter constant exceeds 1~4096 range	采样滤波常数正常 Sampling filter constant normal
b12:	禁止 BFM#21 的值设为 K2 BFM#21 value setting to K2 is prohibited	允许 BFM#21＝K2 BFM#21=K2 permitted
BFM＃29 的其它 bit4～7，bit13～15 等没有定义。		

Bit4~7 and bit13~15 in BFM#29 have no definition.

状态信息字 BFM #61 的意义说明如下：

Status message BFM#61 is explained as follows:

BFM ＃ 61 位号 BFM#61 bit no.	ON 状态 ON Status	OFF 状态 OFF Status
b0:	存在错误。b1~b3 中任一个非 0， D/ A 转换停止 Error occurs. Any one of b0~b3 is not 0. D/A conversion terminated.	无错误 No Error
b1:	模块内 EEPROM 的偏移/增益设置有误 Errors in module EEPROM's offset/gain settings	偏移/增益数据正确 offset/gain data correct
b2:	（不可能） (Not valid)	电源正常 Power supply normal
b3:	模块硬件故障 Module hardware failure	硬件正常 Hardware normal
b10:	写入数字值超出指定的范围 Digital value input exceeds specified range	数字输出值正常 Digital output value normal
b12:	禁止 BFM#21 的值没有设为 K1 BFM#21 value setting to K1 is prohibited	BFM#21＝K1
BFM＃61 的其它 bit4～7，bit11，bit13～15 等没有定义。 Bit4~7 and bit13~15 in BFM#29 have no definition.		

其中表中的“（E）”字样的 BFM 单元为存入 EEPROM 的项目，具有掉电保持特性。

In the chart, the BFM unit with "(E)" mark is the item stored in EEPROM, which has the power failure preservation feature.

寄存器改写说明：

Register modification instruction:

BFM#0、#32、等带（E）单元的改写引发模块内部对 EEPROM 的写操作，而写操作需要一定时间，每个 Word 约需 300ms 时间，因此在需要改写多个 BFM 单元时，注意 PLC 编程时，用户程序中每写一个上述的 BFM 单元后要延时一段时间，不要连续进行写操作，确保写指令的正确完成。

The modifications on BFM#0, #32, and (E) unit will result in the module to perform the write operation on EEPROM. The operation takes certain time and each Word requires approximately 300ms. Therefore, when modifying multiple BFM units is required during the PLC programming process, time delay must be added after every above-mentioned BFM unit. Continuous write operation is not recommended as the write command must be correctly completed.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。

NOTE: when local expansion module's external 24V power supply has a power loss, PLC main module's system mark M6708 will reset. Regular inspection on the system mark during the programming process can help identify the status in a timely manner.

10、输入通道部分 BFM 区解释

10. Input channel BFM area description

BFM#0　输入通道选择

BFM#0 Select input channel

输入通道的初始化，默认 4 个通道都为 4mA~20mA，由 BFM #0 的十六进制 HXXXX 控制，最低位控制通道一，依次顺序，最高位控制通道四，每个字符的控制方式如下：

Initialization of input channel. The four default channels are all 4~20mA and are controlled by the hexadecimal HXXXX of BFM#0. The lowest control channel is one and the highest control channel is four. Every character's controlling methods are as follows:

X=1 预设范围 4mA~20 mA　（对应数字 0~1000）

X=1 default range 4~20mA (corresponding number 0~1000)

X=2 预设范围-20mA~20 mA　（对应数字-1000~1000）

X=2 default range -20~20mA (corresponding number -1000~1000)

X=3 本通道关闭

X=3 channel closed

X=5 预设范围 4mA ~20 mA　（对应数字 0~10000）

X=5 default range 4~20mA (corresponding number 0~10000)

X=6 预设范围-20mA ~20 mA　（对应数字-10000~10000）

X=6 default range -20~20mA (corresponding number -10000~10000)

例如：BFM#0 为 H2235，表示通道一 4mA ~20 mA；通道二关闭；通道三和通道四为 4mA~20 mA。

For example: when BFM#0 is H2235, channel one is 4~20mA; channel two is closed; channel three and four are 4~20mA.

没有用到的通道，可以关闭，也可以不关闭，关闭的通道不占用转换时间（BFM#15），例子中通道二关闭了，则整个通道转换一次时间为没有关闭的三个通道的转换时间（3×BFM#15）。

Channels not in use can be either closed or not. Closed channel does not take up conversion time (BFM#15). As channel two in the example is closed, the conversion time for the whole channel become the conversion time of the three channels that are not closed (3×BFM#15).

BFM #1~#4　输入通道平均采样数

BFM #1~#4　Input channel average sampling number

每个通道(BFM#9~#12)对应的采样值累加采样数（BFM #1~#4）的个数后再除以采样数（BFM #1~#4），存放到（BFM #5~#8）

After every channel’s (BFM#9~#12) corresponding sampling values are accumulated with the sampling number (BFM #1~#4), divide it by the sampling number (BFM #1~#4) and save the result in (BFM #5~#8).

BFM #5~#8　输入通道存放平均采样值

BFM #5~#8 saves input channel average sampling values

BFM #9~#12　输入通道存放即时采样值

BFM #9~#12 saves input channel real-time sampling values

BFM #15　输入通道 ADC 速率时间

BFM #15　Input channel ADC time

每个通道转换一次需要的时间，需注意更新一次数据需要的时间是 BFM#15 的时间乘以没有关闭的通道数。

Time required for every channel conversion. Please note that the time required for every data update is the product of BFM#15 multiplying the number of channels that are not closed.

例如：BFM #0 为 H3311，BFM #1 为 K7，BFM #2 为 K6，BFM #15 为 K10；则 BFM #9 和 BFM #10 刷新一次数据时间为 BFM#0×BFM#15=2×10=20MS，BFM #5 刷新一次数据时间为 BFM#0×BFM#15×BFM#1=2×10×7=140MS，BFM #6 刷新一次数据时间为 BFM#0×BFM#15×BFM#2=2×10×6=120MS。程序中 FROM/TO 指令比较耗时，故此模块参数在程序中采集 BFM#5 的数据可以用 LDP M8012 FROM K0 K5 D10 K1 指令读取，和 LD M8000 FROM K0 K5 D10 K1 的效果是一样的，但是后面用 M8000 驱动的指令每个扫描周期都读取一次，大大加长了程序的扫描周期。

For example, BFM #0 is H3311, BFM #1 is K7, BFM #2 is K6, BFM #15 is K10; so the data update time required for BFM #9 and BFM #10 is BFM#0×BFM#15=2×10=20MS. The time required for BFM #5 is BFM#0×BFM#15×BFM#1=2×10×7=140MS. The time required for BFM #6 is BFM#0×BFM#15×BFM#2=2×10×6=120MS. In the program, the FROM/TO command usually takes more time to function. Therefore, the BFM#5 data collected during the process can be retrieved and read using LDP M8012 FROM K0 K5 D10 K1 command, which has the same result of using LD M8000 FROM K0 K5 D10 K1 command. However, the command initiated with M8000 drive will be read in every scanning cycle, which greatly lengthens the program’s scanning cycle.

BFM #20　输入通道回归出厂值

BFM #20　Input channel restores to factory setting

将#20 设定为 1 可以恢复到默认值。

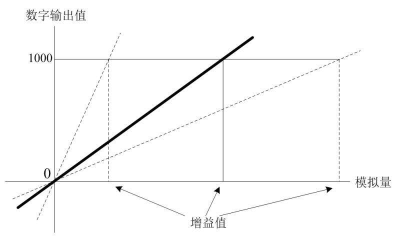
Modify #20 to 1 can restore to the default value.

BFM #21~#24　输入通道偏移和增益的定义与设定方法：

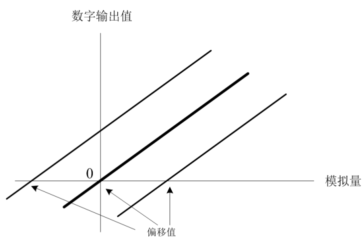
BFM #21~#24　Input channel offset/gain's definition and configuration instruction:

H2U－6AM（R）的输入通道共有两种工作模式，特性曲线如下图：

H2U-6AM (R)’s input channel has two operation modes. The curve properties are as follows:



增益是当数字输出值为1000时对应的模拟输入值



偏移值是当数字输出值为0时对应的模拟输入值

输入通道偏移和增益可以独立设定或一起设定，正常的增益值设定范围是 4mA～32mA。正常的偏移值设定范围为-20mA～20mA。

Input channel’s offset and gain values can be configured individually or collectively. The normal gain value’s setting range is 4~32mA. The normal offset value’s setting range is -20~20mA.

增益/偏移设定前，需先将 BFM#21 设为 1，再修改 BFM#23/24；然后开各个通道的允许偏移增益 BFM#22，修改完毕，应将 BFM#21 再设为 2，避免再次被改变。

Before configuring gain/offset values, BFM#21 must be modified to 1 and then BFM#23/24 can be modified. Every channel’s offset/gain BFM#22 is allowed and turned on in order to complete the modification. BFM#21 should be modified to 2 to prevent further changes.

注意需要修改偏移增益的通道都一样的，不能这个通道偏移数据为 1000，另外一个通道偏移数据为 1200

All offset/gain values must be consistent for all channels. One channel cannot have an offset value of 1000 while another has an offset value of 1200.

例如：在 BFM#0 为模式 1111 中，需要修改通道一、通道二的偏移和增益分别为 5mA 和 18mA，则需要按如下步骤操作：

For example: when BFM#0 is in 1111 mode, the modifying offset and gain values for channel one and two are 5mA and 18mA respectively. Following the procedure below:

先将 BFM#21 改为 1；过 300MS 以后将 K5000 和 K18000 分别送到 BFM#23 和 BFM#24 去；再过 300MS 后开允许增益 BFM#22，本例子中 BFM#22 应为二进制的 00001111，即是将 BFM#22 修改为 H000F；修改完毕。最后将 BFM#21 改为 2，以防再次被修改。

Modify BFM#21 to 1; after 300MS transmit K5000 and K18000 to BFM#23 and BFM#24 respectively; after another 300MS, allow gain in BFM#22 and in this case, and the BFM#22 should be 00001111 in binary mode, which the BFM#22 is modified to H000F; modification is completed. At the end, modify BFM#21 to 2 to prevent further changes.

10.输出通道部分 BFM 区解释

10. Output channel BFM area description

BFM#32　输出通道选择

BFM#32　Select output channel

输出通道的初始化，默认 2 个通道都为-10V~10V，由 BFM 32#的十六进制 HXX 控制，最低位控制通道五，第二位控制通道六，每个字符的控制方式如下：

Output channel initialization. The two default channel are -10~10V, which is controlled by the hexadecimal HXX of BFM #32. The lowest control channel is five and the second control channel is six. Every character’s controlling method is as follows:

X=0　预设范围-10V~10V　　（对应数字-2000~2000）

X=0 default range -10~10V (corresponding number -2000~2000)
X=1 预设范围 4mA~20 mA （对应数字 0~1000）
X=1 default range 4mA~20 mA (corresponding number 0~1000)
X=2 预设范围 0mA~20 mA （对应数字 0~1000）
X=2 default range0mA~20 mA (corresponding number 0~1000)
X=4 预设范围-10V~10V （对应数字-10000~10000）
X=4 default range -10V~10V (corresponding number -10000~10000)
X=5 预设范围 4mA ~20 mA （对应数字 0~10000）
X=5 default range 4mA ~20 mA (corresponding number 0~10000)
X=6 预设范围 0mA ~20 mA （对应数字 0~10000）
X=6 default range 0mA ~20 mA (corresponding number 0~10000)

例如：BFM#32 为 H10，表示通道五为-10V~10V；通道六为 4mA~20mA。
For example: when BFM#32 is H10, Channel Five is -10~10V; Channel Six is 4~20mA
BFM #33~#34 输出通道输出值
BFM #33~#34 Output channel output value

用 TO 指令往 BFM #33~#34 写数据，可以控制模拟量输出。初始值均为 0.

Use the TO command to write in data in BFM #33~#34, which can also control the analog output. Both initial values are 0.

BFM #37 输出通道数据保持模式
BFM #37 Output channel data retention mode

当主模块在由 RUN 至 STOP 状态时 RUN 最后的模式被保持(X=0)或者为偏移值(X=1)输出，

When the main module is switching from RUN to STOP mode, the last mode of RUN will be retained (X=0), or the offset value (X=1) will be outputted.

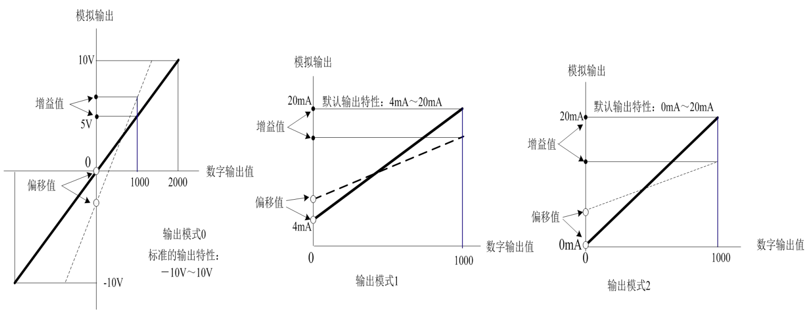
例如：BFM#32 为 H00，BFM#37 为 H01，2 个通道的偏移值均为 0.1V，由 RUN 至 STOP 变化时 BFM#33~#34 里面的值均为 1500（7.5V），当 STOP 后，通道 5 输出电压变成 0.1V，通道 6 输出电压保持在 7.5V。

For example: when BFM#32 is H00 and BFM#37 is H01, the offset values in both channels are 0.1V. When switching from RUN to STOP, BFM#33 and #34's values are 1500 (7.5V). After STOP has completed, channel 5's output voltage becomes 0.1V, while channel 6's output voltage remain at 7.5V.

BFM #40、BFM #42~#45、BFM #53 输出通道偏移和增益的定义与设定方法：
BFM #40, BFM #42~#45, BFM #53 Output channel offset/gain definition and setting instruction.

H2U－6AM（R）的输出通道共有三种工作模式，特性曲线如下图：

H2U-6AM (R)'s output channel has three working modes. Curve properties are as follows:



其中，增益值为数字 1000 时对应的模拟量输出；偏移值则是数字为 0 时对应的模拟量输出。偏移和增益可以独立设定或一起设定，设定参数的单位是 mV（模式 0）和μA（模式 1 和 2）

Among them, the gain value is the corresponding analog output when digital output value is 1000; the offset value is the corresponding analog output when digital output value is 0. Offset and gain values can be set up individually or collectively. The setting parameter's units are mV (in mode 0) and μA (in mode 1 and 2).

BFM #40 为偏移、增益设置命令，十六进制的每 HEX（二进制的 4 个 bit 位组成）位来控制禁止或者允许，注意在 AD 输入模块中是二进制的每个 bit 位来控制，DA 模块和 AD 模块在偏移、增益设置命令有所区别。BFM #10~#13 为偏移、增益设置值，BFM #53 为曲线特性设置命令

BFM #40 is the offset/gain configuration command. Every HEX digit (composed of 4 binary bits) in hexadecimal controls the prohibition or permission status. Please note that the AD input module is controlled by every binary bit. DA and AD modules use different configuration commands in offset/gain configuration. BFM #10~#13 are the offset/gain configuration values and BFM #53 is the curve property configuration command.

增益/偏移设定前，需先将 BFM＃53 设为 1，再根据需要修改 BFM＃42～＃45 的相关单元数值；再向 BFM＃40 单元写入操作允许字，修改完毕，应将 BFM＃53 再设为 2，避免再次被改变。

Before offset/gain value are configured, BFM #53 must be set up to 1. Relevant unit values in BFM #42~#45 then are modified accordingly. Finally, write in the operating permission character in BFM #40 unit to complete the modification. BFMn #53 should be set to 2 to prevent further modifications.

例如：在 BFM#40 为模式 H00 中，需要修改通道五的偏移和增益分别为 0.2V 和 5.5V，则需要按如下步骤操作：

For example: when BFM#40 is in mode H00, offset and gain values in channel five must be modified to 0.2V and 5.5V respectively. Follow the procedures below:

先将 BFM#53 改为 1；过 300MS 以后将 K200、 K5500 分别送到 BFM#42、#43、中去；紧跟着 BFM#40 开允许偏移、增益，即是将 BFM#40 修改为 H0011；修改完毕。最后将 BFM#53 改为 2，以防再次被修改。

Set BFM#53 to 1; after 300MS transmit K200 and K5500 to BFM#42 and BFM#43 respectively; turns on BFM#40 to allow offset/gain value, which is to modify BFM#40 to H0011 to complete the procedure. Set BFM#53 to 2 to prevent further modifications.

BFM #52　输出通道回归出厂值

BFM #52　Output channle restore to factory setting

将 BFM #52 设定为 1 可以恢复到默认值。

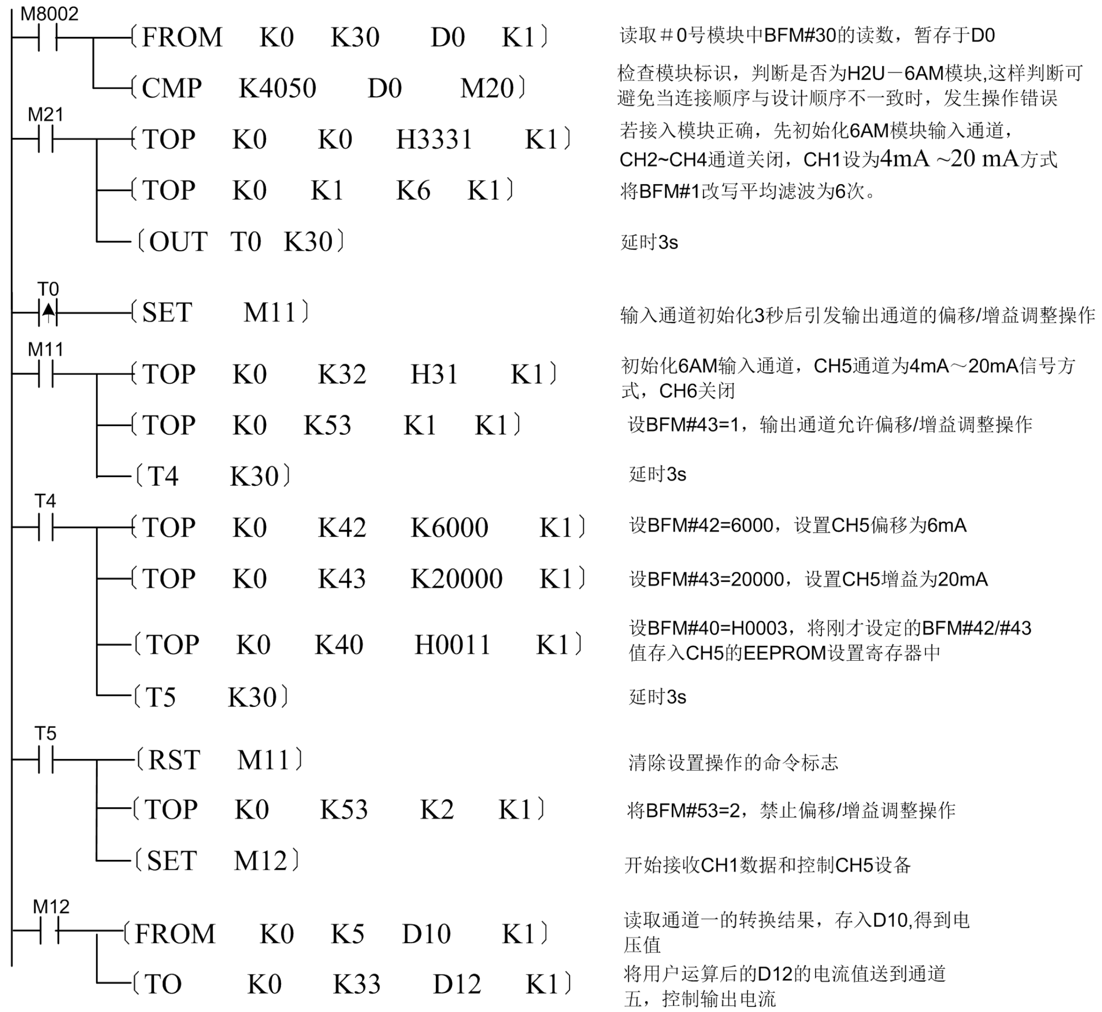
Set BFM #52 to 1 to restore to the default value.

编程举例 1：

Programming Example 1:

一只 H2U－6AM 扩展模块接于 PLC 主模块后方，按编号原则为＃0 号模块，其中 CH1 端口需要采集 4mA ~20 mA 的电压信号，要求改滤波次数为 6，将采集得到的数据存于 D10。CH5 端口由 D12 输出 6mA～20mA 的电流信号。编写的用户程序如下

Connect one H2U-6AM expansion module to the back of the PLC main module, and module #0 is numbered in sequential order. CH1 terminal needs to collect 4~20mA voltage signal and modify the filtering frequency to 6 to save the collected data in D10. CH5 terminal outputs 6~20mA of current signal through D12. The user program is written as:



读取#0 号模块中 BFM#30 的读数，暂存于 D0

Retrieve the BFM#30 readout from #0 module and save temporarily in D0

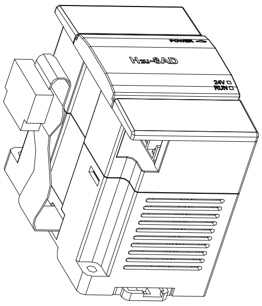
检查模块标识，判断是否为 H2U-6AM 模块，这样判断可避免当连接顺序与设计顺序不一致时，发生操作错误若接入模块正确，先初始化 6AM 模块输入通道，CH2~CH4 通道关闭，CH1 设为 4V~20V 方式

Inspect the logo on the module to ensure it is the H2U-6AM module. This prevents

operation errors caused by inconsistant connection and design sequences. If module connection is correct, initialize 6AM module input channel and close CH2~CH4 channels. Set CH1 to 4~20V mode.
将 BFM#1 改写平均滤波为 6 次。
Modify the average filtering frequency in BFM#1 to 6.
延时 3s
Delay 3s
输入通道初始化 3 秒后引发输出通道的偏移/增益调整操作
Three seconds after the input channel initialization, the offset/gain adjustment operation will be underway.
初始化 6AM 输入通道，CH5 通道为 4mA~20mA 信号方式，CH6 关闭
Initialize 6AM input channel while CH5 channel is in 4~20mA signal mode, and CH6 is closed.
设 BFM#43=1，输出通道允许偏移、增益调整操作
Set BFM#43=1. Offset/gain adjustment operation is allowed for output channels
延时 3s
Delay 3s
设 BFM#42=6000，设置 CH3 偏移为 6mA
Set BFM#42=6000, configure CH3 offset to 6mA
设 BFM#43=20000，设置 CH3 增益为 20mA
Set BFM#43=20000, configure CH3 gain to 20mA
设 BFM#40=H0003，将刚才设定的 BFM#42/#43 值存入 CH5 的 EEPROM 设置寄存器中
Set BFM#40=H0003, and save BFM#42/#43 values in CH5's EEPROM setting registers
延时 3s
Delay 3s
清除设置操作的命令标志
Clear configuration command mark
将 BFM#53=2，禁止偏移/增益调整操作
Set BFM#53=2, and prohibit offset/gain adjustment operation
开始接受 CH1 数据和控制 CH3 设备
Start accepting CH1 data and controlling CH3 equipment
读取通道一的转换结果，存入 D10，得到电压值
Retrieve conversion results in channel one, save into D10 and obtain voltage value
将用户运算后的 D12 的电流值送到通道三，控制输出电流
Transmit the calculated D12 current value to channel three, and control the output current
使用注意事项：
Caution:
禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；
Hot swap is prohibited. To ensure personnel safety and prevent device damage caused by hot swap, expansion module can only be connected or removed when both the main module and system are powered off.

H2U－4PT　H2U－4PTR　4 通道温度检测扩展模块

H2U-4PT　H2U-4PTR　4 Channel temperature detection expansion module



1、简介　Introduction

H2U 扩展模块可配合 H2U 系列主模块工作，实现 4 路 PT100 温度信号检测，将之转换为 12bit 精度的数字量，供 PLC 主模块读取。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元。

4-way PT100 temperature signal detection can now be realized by incorporating the H2U expansion module into the H2U series main module, which converts the signal into 12bit digital figures so that it can be read by the PLC main module. Through the FROM/TO command, the main module can access the BFM units in the registers of the expansion module.

2、电气规格

2. Electrical Specifications

项　目 Item	指　标 Index	说　明 Description
温度检测传感器 Temperature detection sensor	Pt100	
温度检测范围 Temperature detecting range	摄氏：-100℃到+600℃ Celsius: -100C to +600C 华氏：-148F 到+1112F Fahrenheit: -148F to +1112F	
输入通道数 Input channel no.	4 通道 4 channels	
转换速度 Conversion rate	15ms/通道 15ms/channel	
数字输出 Digital output	12bit：-2000～＋2000	
分辩率 Resolution	0.1℃	
总精度 Overal accuracy	±1％全范围 ±1％ of all range	

占用 I/O 点数 I/O points nused	不占用主模块 I/O 点数 I/O points not used in main module	
隔离设计 Isolation design	模拟电路和数字电路之间用光电耦合器隔离； Optocoupler is used to isolate between analog and digital circuits; 模拟电路和外部电源之间用 DC/DC 进行隔离； DC/DC is used to isolate between analog circuit and external power supplies; 模拟输入信号通道之间不隔离。 No isolation is required between analog input signal channels.	

3、电源规格

3. Power supply specification

项　目 Item	指　标 Index
模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 24V DC -15%/+20%, maximum allowed ripple voltate 5% 电流消耗 80mA (取自于主模块的 24V/COM，或其它的 24VDC 电源) Power consumption 80mA (retrieves from the main module’s 24V/COM, or other 24VDC power supplies
数字电路 Digital circuit	5V DC 50mA (通过模块扩展电缆，取自主模块电源内部电源) 5V DC 50mA (through the module expansion cable, it retrieves from the main module’s internal power supply)
备 注 Comment	远程扩展模块无需数字电路电源。 Digital circuit power supply is not required for remote expansion module.

4、LED 状态指示灯说明：

4. LED status indicator description:

4、1 本地扩展模块 LED 状态指示灯说明

4.1 Local expansion module LED status indicator description:

项目 Item	说明 Description
PWR	模块数字电路供电正常 Module digital circuit power supply is normal

24V	当外部 24V 电源供电正常时点亮 Lights on when external 24V power supply is normal
COM	点亮表示有 FROM/TO 指令访问模块。 Lights on when FROM/TO command is accessing the module.

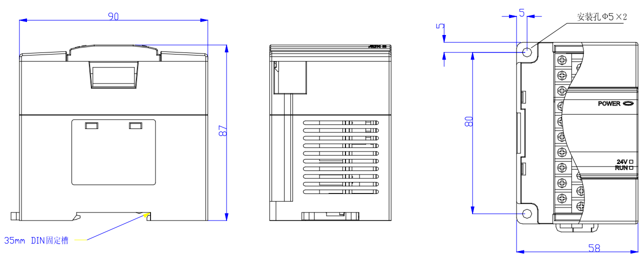
4、2 远程扩展模块 LED 状态指示灯说明

4.2 Remote expansion module LED status indicator description:

项目 Item	说明 Description
PWR	模块 24V 供电正常 Module 24V power supply normal
COM	点亮表示模块进行通讯。 Lights on when module is communicating.
ERR	点亮表示有错误发生。 Lights on when error occurs.

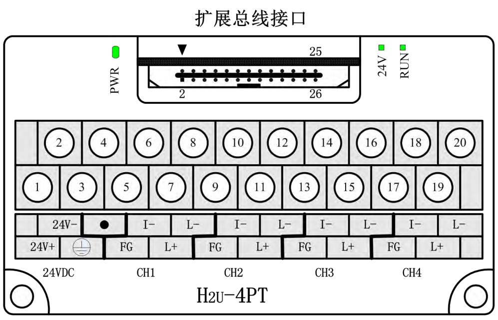
5、模块的安装尺寸：

5. Module Installation Dimension:

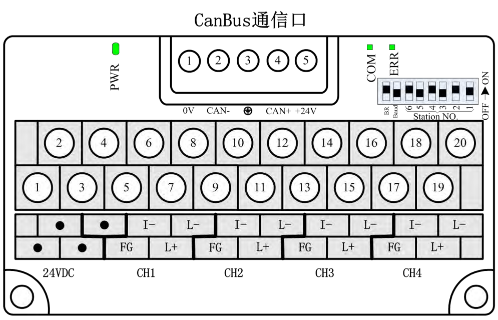


6、接线端子布局：

6. Terminal Distribution:



H2U-4PT



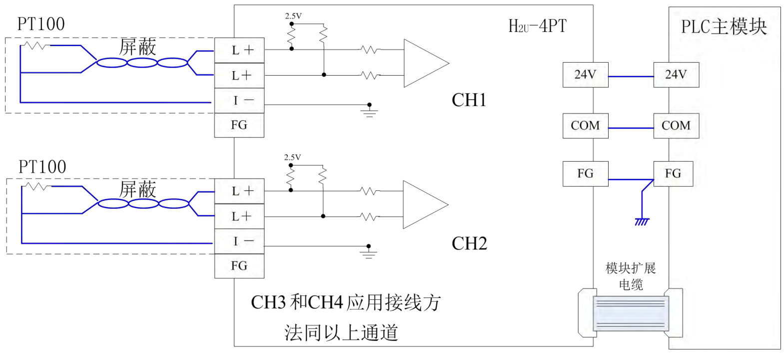
H2U-4PTR

扩展总线接口

Expansion bus interface

CanBus 通信口
CanBus communication port

7、输入信号与扩展电缆的接线：
7. Wiring between input signal and expansion cable:
模拟输入信号通过双绞线连接到扩展模块的输入端口，布线时不要与交流电源线或干扰信号的线路靠近；
Analog input signals are transmitted to the expansion module's input terminal through the twisted cable. When wiring the cables, do not get near with any AC cables or signal-interfering cables.
信号源及其屏蔽线的外壳与 H2U－4PT（R）的信号接地端 FG 相连，共同接地。
Signal source and the shell of the shielded cable should be connected to the H2U-4PT (R)'s signal grounding terminal, and be grounded together.

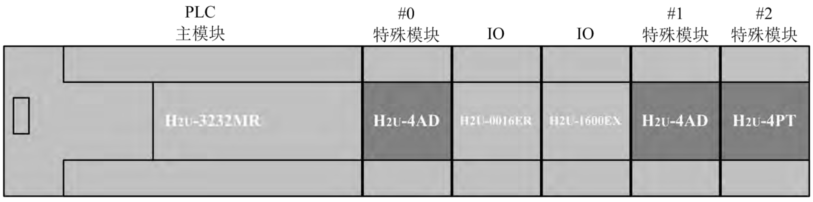


屏蔽
Shielded
CH3 和 CH4 应用接线方法同以上通道
CH3 and CH4 wiring should be completed as above-mentioned
模块扩展电缆
Module expansion cable
PLC 主模块
PLC main module

8、特殊扩展模块的地址编号：
8. Special expansion module's address numbering:
除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4PT/4TC 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行"编号"，用户无法干预或更改其编号结果，除非改变模块的连接顺序。
All expansion modules (such as 4AD/4DA/4TC/CC-Link), except the IO expansion module, are called special module. Every time when a PLC main module powers on, it will automatically detect all the connected expansion modules and assign numbers to these special modules and the IO expansion terminal. Users cannot interfer or modify the numbering, unless the connection sequence of the module is changed.
主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、...#7 等编号，中间若插入的数字量 IO 扩展模块不参与编号，如下图中，两个 4AD 扩展模块的模块地址编号依次为＃0 和＃1，后续的 4PT 模块地址为＃2，以此类推，最多可接入 8 个特

殊模块：

The address numbering system the main module uses on special modules is that, the numbering will start from the module closest to the PLC module and start from #0, #1…#7, and etc. IO expansion module inserted in mid way will not be numbered. As illustrated below, two 4AD expansion modules’ address numbers are #0 and #1. The 4PT module’s address is #2, and etc. Maximum 8 special modules can be connected:



主模块

Main module

特殊模块

Special module

即使中间插有若干数字量 IO 扩展模块，编号顺序也不受影响。了解了上述编址原则，用户在编程时就可以准确地访问指定模块。

If certain IO expansion modules are inserted in middle, numbering sequence will not be influenced. By understanding the numbering principle, users can accurately access designated modules when programming the system.

上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，4PT 模块也能同时上电。若 4PT 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；

Before powering up, the module’s external 24V/COM power terminal and PLC main module’s 24V/COM corresponding terminal must be properly connected. 4PT module can also be powered up at the same time. If the 4PT module’s external power supply experiences hysteresis, the PLC main module may not be able to correctly identify module types;

PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。

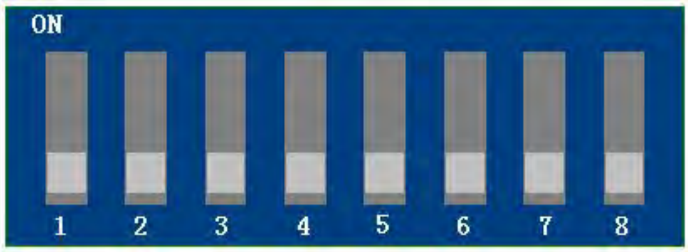
PLC main module only inspects once all the expansion modules connected to system when powered up. As for the expansion modules inserted during operation, PLC main module will not be able to detect and access them. If the expansion modules are unplugged during operation, not only it will damage devices, more seriously, it may also result in unpredictable output control status and user equipment breakdowns.

9、远程特殊扩展模块的地址编号：

9. Address numbering for remote special expansion module

在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：

The address numbering system in a remote expansion module is: module communication station number +100, and a maximum number of 63 remote expansion modules can be added. The module station number can be configured by switching the DIP on the Station NO. The DIP switch interface defines as:
每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。下表列出了每一位的定义。
Every remote module has one octonary DIP switch. Through the DIP switch users can set up the station number, select Baud rate, connect matching resistor or not. As illustrated below, every DIP switch is assigned with one number. “ON” represents logic “1”. The following table lists the definition for every number.



CAN-LINK 拨码开关
CAN-LINK DIP switch
拨码开关位定义
DIP switch definition

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。“ON”表示 1，“OFF”表示 0。 高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。 若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 These six DIP switches from top to bottom make up six binary digits used to mark station numbers. "ON" said 1, "OFF" means 0. They are composed according the following method: A6A5A4A3A2A1. Such as A1 = ON, the other bit is OFF, the binary address: 000001, decimal K01, 16 hex for the h01. If the A5, A4 are all ON, the other is OFF, the binary address is: 011 000, decimal K24, 16 hex for the h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high speed mode, baud rate 500Kbps, ON: low speed

		mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch ON, means connect 120ohm terminal matching resistor, or disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If in a module A5 and A4 are ON and others are OFF, the binary address becomes 011000, and K24 for decimal. Therefore, when using the FROM/TO command to program the system, the module's serial number become K24+100, which equals #124.

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。需注意 CAN 地址的唯一性，不能有同样的地址。

When DIP switches are modified, besides the matching resistor, Baud rate and addresses will not take effect immedately. The system needs to restart in order to adopt the new configuration parameters. CAN addresses uniqueness must be noted and not duplicated addresses are allowed.

10、访问 4PT（R）模块的 BFM 区：

10. Accessing the BFM zone in 4PT (R) module

PLC 主模块是通过读取 4PT（R）模块的寄存器缓存单元（BFM 区）的方式读取数字化 AD 转换结果，通过改写特定 BFM 区的方式来设置模块状态。PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

The PLC main module reads the digital AD conversion results through 4PT(R) module's register cache units (BFM zone). Module condition is configured through modifying in specific BFM zones. The PLC module accesses the BFM units using the FROM/TO reading/writing command.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 4PT（R）模块的 BFM 区定义如

Every register's bandwidth in the BFM zone is 16bit (equals to 1Word). According to the 4PT(R) module, the BFM zone is defined as:

下表：

The following chart:

BFM	R/W 属性 R/W property	内容 Contents	
＃0	－	保留 Reserved	
＃1	WR	通道 1 Channnel 1	平均滤波常数，即用于平均计算的采样值个数，设定范围 1～4096，默认值 8。若要高速采集，可设定为 1。 Average filter constant. Used to determine sample numbers for averaging calculation. Setting
＃2	WR	通道 2 Channnel 2	
＃3	WR	通道 3	

		Channnel 3	range is 1~4096, default value at 8. If rapid sampling is required, value can be set at 1.
#4	WR	通道 4 Channnel 4	
#5	WR	通道 1 Channnel 1	CH1 到 CH4 在 0.1℃单位下的平均温度 Average temperature from CH1 to CH4 under 0.1C unit
#6	WR	通道 2 Channnel 2	
#7	WR	通道 3 Channnel 3	
#8	WR	通道 4 Channnel 4	
#9	WR	通道 1 Channnel 1	CH1 到 CH4 在 0.1℃单位下的当前温度 Current temperature from CH1 to CH4 under 0.1C unit
#10	WR	通道 2 Channnel 2	
#11	WR	通道 3 Channnel 2	
#12	WR	通道 4 Channnel 4	
#13	WR	通道 1 Channnel 1	CH1 到 CH4 在 0.1F 单位下的平均温度 Average temperature from CH1 to CH4 under 0.1F unit
#14	WR	通道 2 Channnel 2	
#15	WR	通道 3 Channnel 3	
#16	WR	通道 4 Channnel 4	
#17	WR	通道 1 Channnel 1	CH1 到 CH4 在 0.1°F 单位下的当前温度 Current temperature from CH1 to

＃18	WR	通道 2 Channnel 2	CH4 under 0.1F unit
＃19	WR	通道 3 Channnel 3	
＃20	WR	通道 4 Channnel 4	

BFM	R/W 属性 R/W property	内容 Contents
＃21~26	—	保留 Reserved
＃27	R	4PT 模块软件版本 4PT module software edition
＃28	R/W	数字范围错误锁存（可检测热电阻断线） Digital range error latch (thermal resistance disconnection can be detected)
＃29	R	错误状态 Error
＃30	R	扩展模块识别码，H2U－4PT（R）的识别码为 K2040 Expansion module identification code. H2U-4PT(R)'s identification code is K2040.
＃31	—	保留，不可访问 Reserved, not accessible

其中状态信息字 BFM #28 的意义说明如下：
Status message BFM#28 is described as:

b15 到 b8 b15 to b8	b7	b6	b5	b4	b3	b2	b1	b0
未用 Unused	高 High	低 Low	高 High	低 Low	高 High	低 Low	高 High	低 Low
	CH4		CH3		CH2		CH1	

低：当温度测量值低于最低可测量温度时，锁存 ON。

Low: when temperature measured is lower than the minimum detectable temperature, latch ON.

高：当温度测量值高于最高可测量温度时，或者热电阻断开时，锁存 ON。

High: when temperature measured is higher than the maximum detectable temperature, latch ON.

若出现错误之后，温度回到正常范围，则错误仍然被锁存在 BFM#28 中。
Temperature returns to normal range after error occurs. Error will still be latched in BFM#28.
用 TO 指令向 BFM28 写入 K0 或者关闭电源，可清除错误。
Use TO command to write K0 into BFM28 or turn the power off to clear errors.

其中状态信息字 BFM #29 的意义说明如下：
Status message BFM#29 is described as:

BFM＃29 位号 BFM#29 No.	ON 状态 ON status	OFF 状态 Off status
b0:	存在错误。b0~b3 中任一个非 0，A/D 转换停止 Error occurs. When any of b0~b3 is not 0, A/D conversion stops.	无错误 No erros
b1:	保留 Reserved	保留 Reserved
b2:	（不可能） (not valid)	电源正常 Power supply normal
b3:	模块硬件故障 Module hardware failure	硬件正常 Hardware normal
b10:	数字输出超出指定范围 Digital output exceed designated range	数字输出值正常 Digital output normal
b11:	采样滤波常数超出 1～4096 范围 Sampling filter constant exceeds the range of 1~4096	采样滤波常数正常 Sample filter constant normal
b12:	保留 Reserved	保留 Reserved
BFM＃29 的其它 bit4～7，bit13～15 等没有定义。 Bit4~7, bit13~15 in BFM#29 has no definition.		

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。编程时可定时检查该标志，能及时发现该现象。
NOTE: when the external 24V power supply of the local expansion module has a power failure, PLC main module’s system mark M6708 will be reset. The mark should be regularly checked for immediate notice.

编程举例：
Programming Example:
一只 H2U－4PT 扩展模块接于 PLC 主模块后方，按编号原则为＃0 号模块，其中

CH1-CH4 端口需要采集 PT100 的电压信号。要求改滤波次数为 6，将四个通道采集得到的数据分别存于 D10、D11、D12、D13。编写的用户程序如下：

Connect one H2U-4PT expansion module to the back of the PLC main module, and module #0 is numbered in sequential order. CH1-CH4 terminals need to collect PT100 voltage signal and modify the filtering frequency to 6. Save the collected data from four channels in D10, D11, D12, and D13 respectively. The user program is written as:

读取#0 号模块中 BF#30 的读书，暂存与 D0

Retrieve the BFM#30 readout from #0 module and save temporarily in D0

检查模块标识，判断是否为 H2U-4PT 模块，这样可避免当连接顺序与设计顺序不一致时，发生的操作错误

Inspect the logo on the module to ensure it is the H2U-4PT module. This prevents operation errors caused by inconsistant connection and design sequences.

接入模块设定滤波次数为 6

Connected module’s filter frequency set to 6

将 CH1-CH4 当前平均温度读入 D10-D13

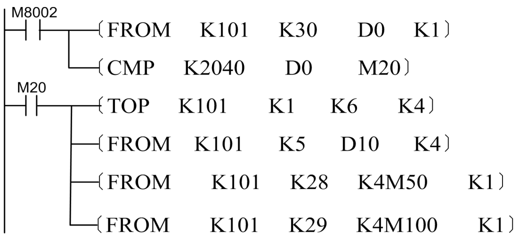
Read the current average termpertures from CH1-CH4 to D10-D13

读取模块的数字范围错误锁存状态字

Read the module digital range’s error latch status message

例子中如果改成 H2U－4PTR 远程模块，CAN 站号为 1。则此例子程序如下：

In the example, if H2U-4PTR remote module is used instead, the CAN station number becomes 1. The programming for this example will be as follows:



使用注意事项：

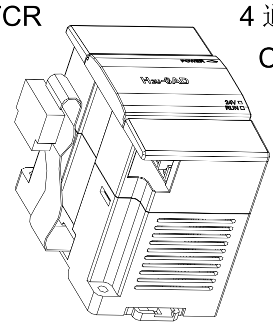
Caution：

禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；

Hot swap is prohibited. To ensure personnel safety and prevent device damage caused by hot swap, expansion module can only be connected or removed when both the main module and system are powered off.

H2U － 4TC H2U － 4TCR 4 通道温度检测扩展模块

H2U-4TC H2U-4TCR 4 Channel temperature detection expansion module



1、 简介 Introduction

H2U 扩展模块可配合 H2U 系列主模块工作，实现 4 路 K 型/J 型温度信号检测，将之转换为 12bit 精度的数字量，供 PLC 主模块读取。主模块通过 FROM/TO 指令访问本扩展模块内寄存器的 BFM 单元。

4-way K/J type temperature signal detection can be realized by incorporating the H2U expansion module into the H2U series main module, which converts the signal into 12bit digital figures so that it can be read by the PLC main module. Through the FROM/TO command, the main module can access the BFM units in the registers of the expansion module.

2、电气规格

2. Electrical Specifications

项目 Project	摄氏 °C	华氏 °F
温度检测传感器 Temperature detection sensor	K/J 型热电偶 K/J type thermocouple	
温度检测范围 Temperature detection range	K 型：-100℃到+1200℃ K type: -100C to +1200C J 型：-100℃到+600℃ J type: -100C to +600C	K 型：-148F 到+2192F K type: -148F to +2192F J 型：-148F 到+1112F J type: -148F to +1112F
输入通道数 Input channel no.	4 通道 4 channels	
转换速度 Conversion rate	240ms/4 通道 240ms/4 channel	
数字输出 Digital output	K 型：-1000 到+12000 K type: -1000 to +12000 J 型：-1000 到+6000 J type: -1000 to +6000	K 型：-1480 到+21920 K type: -1480 to +21920 J 型：-1480 到+11120 J type: -1480 to +11120

分辩率 Resolution	0.1℃	0.1F
总精度 Overall accuracy	±0.5%全范围+1℃ ±0.5% of overall range +1℃	
占用 I/O 点数 I/O points used	不占用主模块 I/O 点数 I/O points not used in main module	
隔离设计 Isolation	模拟电路和数字电路之间用光电耦合器隔离； Optocoupler is used to isolate between analog and digital circuits; 模拟电路和外部电源之间用 DC/DC 进行隔离； DC/DC is used to isolate between analog circuit and external power supplies; 模拟输入信号通道之间不隔离。 No isolation is required between analog input signal channels.	

3、电源规格

3. Power supply specifications

项目 Project	指　标 Index
模拟电路 Analog circuit	24V DC -15%/+20%，最大允许纹波电压 5% 24V DC -15%/+20%, maximum allowed ripple voltate 5% 电流消耗 80mA (取自于主模块的 24V/COM，或其它的 24VDC 电源) Power consumption 80mA (retrieves from the main module's 24V/COM, or other 24VDC power supplies)
数字电路 Digital circuit	5V DC 50mA (通过模块扩展电缆，取自主模块电源内部电源) 5V DC 50mA (through the module expansion cable, it retrieves from the main module's internal power supply)
备 注 Comment	远程扩展模块无需数字电路电源。 Digital circuit power supply is not required for remote expansion module.

4、LED 状态指示灯说明：

4. LED status indicator description:

4.1 本地扩展模块 LED 状态指示灯说明

4.1 Local expansion module LED status indicator description:

项目 Project	说明 Description

PWR	模块数字电路供电正常 Module digital circuit power supply is normal
24V	当外部 24V 电源供电正常时点亮 Lights on when external 24V power supply is normal
COM	点亮表示有 FROM/TO 指令访问模块。 Lights on when FROM/TO command is accessing the module.

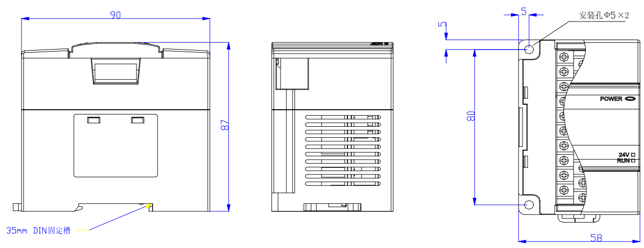
4.2 远程扩展模块 LED 状态指示灯说明

4.2 Remote expansion module LED status indicator description:

项目 Project	说明 Comment
PWR	模块 24V 供电正常 Module 24V power supply normal
COM	点亮表示模块进行通讯。 Lights on when module is communicating.
ERR	点亮表示有错误发生。 Lights on when error occurs.

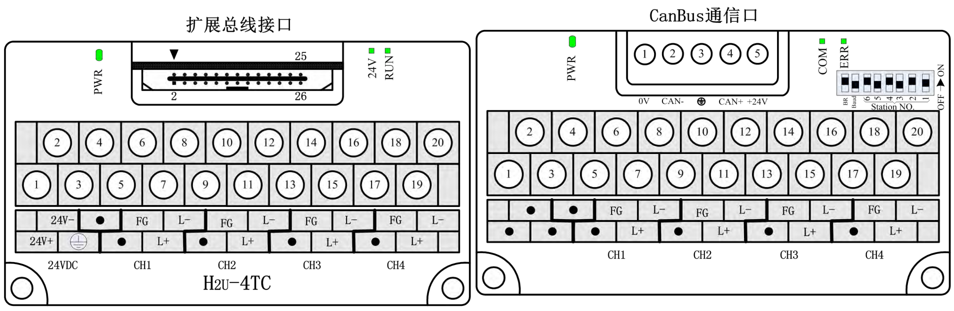
5、模块的安装尺寸：

5. Module Installation Dimension:



6、接线端子布局：

6. Terminal Distribution:



H2U-4TC H2U-4TCR

扩展总线接口

Expansion bus interface

CanBus 通信口

CanBus communication port

7、输入信号与扩展电缆的接线：

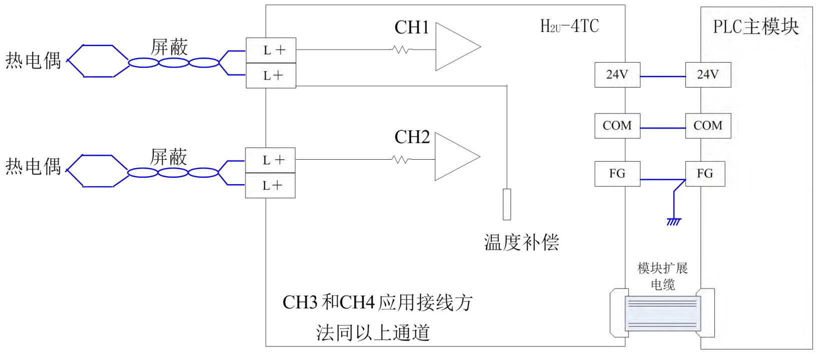
7. Wiring between input signal and expansion cable:

模拟输入信号通过双绞线连接到扩展模块的输入端口，布线时不要与交流电源线或干扰信号的线路靠近；

Analog input signals are transmitted to the expansion module’s input terminal through the twisted cable. When wiring the cables, do not get near with any AC cables or signal-interfering cables.

信号源及其屏蔽线的外壳与 H2U－4TC（R）的信号接地端 FG 相连，共同接地。

Signal source and the shell of the shielded cable should be connected to the H2U-4PT (R)’s signal grounding terminal, and be grounded together.



热电偶

Thermocouple

闭屏

Shielded

CH3 和 CH4 应用接线方法同以上通道

CH3 and CH4 wiring should be the same as above-mentioned

PLC 主模块

PLC main module

模块扩展电缆

Module expansion cable

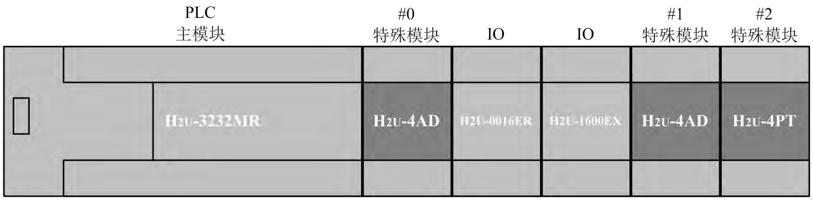
8、特殊扩展模块的地址编号：

8. Special expansion module’s address numbering:

除 IO 扩展以外的各种扩展模块（如 4AD/4DA/4PT/4TC 等模块），统称为特殊模块，PLC 主模块每次上电时，会自动检查一次已接入的所有扩展模块，并分别对特殊模块和 IO 扩展端口进行“编号”，用户无法干预或更改其编号结果，除非改变模块的连接顺序。

All expansion modules (such as 4AD/4DA/4TC/CC-Link), except the IO expansion module, are called special module. Every time when a PLC main module powers on, it will automatically detect all the connected expansion modules and assign numbers to these special modules and the IO expansion terminal. Users cannot interfer or modify the numbering, unless the connection sequence of the module is changed.

主模块对特殊模块的地址编号方法是，由紧靠近主 PLC 模块开始进行，依次为＃0、＃1、…#7 等编号，中间若插入的数字量 IO 扩展模块不参与编号，如下图中，两个 4AD 扩展模块的模块地址编号依次为＃0 和＃1，后续的 4PT 模块地址为＃2，以此类推，最多可接入 8 个特殊模块：
The address numbering system the main module uses on special modules is that, the numbering will start from the module closest to the PLC module and start from #0, #1…#7, and etc. IO expansion module inserted in mid way will not be numbered. As illustrated below, two 4AD expansion modules' address numbers are #0 and #1. The 4PT module's address is #2, and etc. Maximum 8 special modules can be connected:



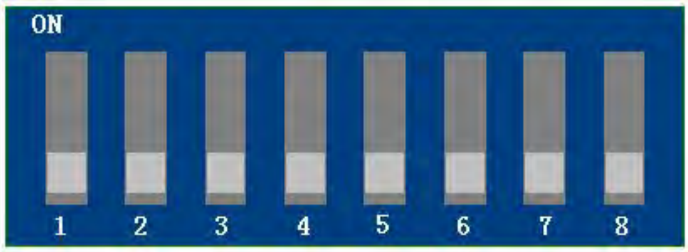
主模块
main module

特殊模块
Special module
即使中间插有若干数字量 IO 扩展模块，编号顺序也不受影响。 了解了上述编址原则，用户在编程时就可以准确地访问指定模块。
Even if a number of IO expansion modules are inserted, numbering order is also not affected. Understanding the rule of addressing above, the user can be accurately programmed to access the specified module
上电前需要将模块的外部 24V/COM 电源端与 PLC 主模块的 24V/COM 对应连接妥当，以便主模块上电时，4TC 模块也能同时上电。若 4TC 模块的外部电源上电滞后，可能导致 PLC 主模块不能正确辨识模块类型；
Before powering up, the module's external 24V/COM power terminal and PLC main module's 24V/COM corresponding terminal must be properly connected. 4TC module can also be powered up at the same time. If the 4TC module's external power supply experiences hysteresis, the PLC main module may not be able to correctly identify module types;
PLC 主模块只在电源上电时检查一次接入系统的所有扩展模块，对运行中插入的扩展模块，不会被 PLC 主模块检查到，无法正常对其进行访问；运行中插拔扩展模块，可能损坏器件，更严重的是可能导致控制输出状态的不可预知，导致用户设备故障。
PLC main module only inspects once all the expansion modules connected to system when powered up. As for the expansion modules inserted during operation, PLC main module will not be able to detect and access them. If the expansion modules are unplugged during operation, not only it will damage devices, more seriously, it may also result in unpredictable output control status and user equipment breakdowns.

9、远程特殊扩展模块的地址编号：
9. The address ID of the remote special extension module:
在远程扩展模块中，远程模块地址是：模块通信站号+100，最多允许有 63 个远程扩展模块，

通过拨动 Station NO.上面的拨码开关可以设定本模块站号， 拨码开关接口定义如下：
每个远程模块都有一个八位的拨码开关，通过拨码开关，用户可以设定模块的站号，选择波特率，是否端接匹配电阻。 下图所示，拨码开关每一位都有编号，“ON”表示逻辑“1”。 下表列出了每一位的定义。

In the remote extension module, remote module address is: No. +100 communication station, allowing up to 63 remote extension modules. Through toggle the DIP switch on the Station NO, to set the station number of the modules. DIP switch interface definition as follows: Each remote module has a 8 bit DIP switch. Through the DIP switch, the user can set the module's station number, select the baud rate, whether the termination matching resistor. The figure below shows, each bit of a DIP switch has code, "ON" that logic "1." The following table lists the definition of each.



CAN-LINK 拨码开关
CAN-LINK DIP switch

拨码开关位定义
Bit definition of DIP switch

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号。 “ON”表示 1，“OFF”表示 0。 高位在高，低位在低。 按以下方式组合：A6A5A4A3A2A1。 比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。 若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 This DIP switch from high to low into one of six bit binary digits, used to identify the local station number. "ON" said 1, "OFF" means 0. High in the high and low in the low. Combination of the following ways: A6A5A4A3A2A1. Such as A1 = ON, the other bit is OFF, the binary address: 000001, decimal K01, 16 hex for the h01. If the A5, A4 are all ON, the other is OFF, the binary address is: 011 000, decimal K24, 16 hex for the h18.
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4 Address line A4	
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps

	Baud rate	OFF: high-speed mode, baud rate 500Kbps, ON: low speed mode, baud rate 100Kbps
8	匹配电阻 Matching resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch ON, means connect 120ohm terminal matching resistor, or disconnect.

某一个模块如果 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，则我们在用 FORM/TO 指令编程的时候此模块编号为 K24+100，即是#124

If A5, A4 on one module are both ON, others are OFF, the binary address is: 011 000, decimal K24, then when we use the FORM / TO instruction program the module is K24 +100, which is # 124

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。 需注意 CAN 地址的唯一性，不能有同样的地址。

If you change the DIP switch, in addition to matching resistor, the baud rate and address can not immediately take effect, the system may be used to re-power on before setting the new parameters.

10、访问 4TC（R）模块的 BFM 区：

10. Accessing the BFM zone in 4TC (R) module

PLC 主模块是通过读取 4TC（R）模块的寄存器缓存单元（BFM 区）的方式读取数字化 AD 转换结果，通过改写特定 BFM 区的方式来设置模块状态。 PLC 主模块通过读写指令 FROM/TO 访问这些 BFM 单元。

The PLC main module reads the digital AD conversion results through 4TC(R) module’s register cache units (BFM zone). Module condition is configured through modifying in specific BFM zones. PLC main module access the BFM module by read and write instructions FROM / TO.

BFM 区的每个寄存器宽度为 16bit（即 1Word），按照 4TC（R）模块的 BFM 区定义如下表：

Every register’s bandwidth in the BFM zone is 16bit (equals to 1Word). According to the 4TC(R) module, the BFM zone is defined as:

BFM	R/W 属性 R/W property	内容 Contents
＃0	WR	输出模式选择，每个 HEX 位代表 1 个输入通道，最高位为 ch4，最低位为 ch1：（默认值＝H0000） Select output mode. Every HEX bit represents 1 input channel. The highest bit is Ch4 and the lowest bit is Ch1: (default is H0000) 0＝K 型

<table>
<tr><td></td><td></td><td colspan="2">0=K Type
1＝J 型
1=J Type</td></tr>
<tr><td>＃1</td><td>WR</td><td>通道 1
Channel 1</td><td rowspan="4">平均滤波常数，即用于平均计算的采样值个数，设定范围 1～256，默认值 8。 若要高速采集，可设定为 1。
Average filter constant, that is, the number of samples for the average calculation, setting range 1 to 256, the default value of 8. To high speed collection, can be set to 1.</td></tr>
<tr><td>＃2</td><td>WR</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃3</td><td>WR</td><td>通道 3
Channel 3</td></tr>
<tr><td>＃4</td><td>WR</td><td>通道 4
Channel 4</td></tr>
<tr><td>＃5</td><td>WR</td><td>通道 1
Channel 1</td><td rowspan="4">CH1 到 CH4 在 0.1℃单位下的平均温度
Average temperature from CH1 to CH4 under 0.1C unit</td></tr>
<tr><td>＃6</td><td>WR</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃7</td><td>WR</td><td>通道 3
Channel 3</td></tr>
<tr><td>＃8</td><td>WR</td><td>通道 4
Channel 4</td></tr>
<tr><td>＃9</td><td>WR</td><td>通道 1
Channel 1</td><td rowspan="4">CH1 到 CH4 在 0.1℃单位下的当前温度
Current temperature from CH1 to CH4 under 0.1C unit</td></tr>
<tr><td>＃10</td><td>WR</td><td>通道 2
Channel 2</td></tr>
<tr><td>＃11</td><td>WR</td><td>通道 3
Channel 3</td></tr>
<tr><td>＃12</td><td>WR</td><td>通道 4
Channel 4</td></tr>
<tr><td>＃13</td><td>WR</td><td>通道 1
Channel 1</td><td rowspan="2">CH1 到 CH4 在 0.1F 单位下的平均温度
Average temperature from CH1 to CH4 under 0.1F unit</td></tr>
<tr><td>＃14</td><td>WR</td><td>通道 2
Channel</td></tr>
</table>

		2	
#15	WR	通道 3 Channel 3	
#16	WR	通道 4 Channel 4	
#17	WR	通道 1 Channel 1	CH1 到 CH4 在 0.1F 单位下的当前温度 Current temperature from CH1 to CH4 under 0.1F unit
#18	WR	通道 2 Channel 2	
#19	WR	通道 3 Channel 3	
#20	WR	通道 4 Channel 4	

BFM	R/W 属性	内容 Contents
# 21~26	—	保留 Reserved
#27	R	4TC 模块软件版本 4TC module software edition
#28	R/W	数字范围错误锁存，（可检测热电偶断线） Digital range error latch (thermal resistance disconnection can be detected)
#29	R	错误状态 Error state
#30	R	扩展模块识别码，H2U－4TC(R)的识别码为 K2030 Expansion module identification code. H2U-4TC(R)'s identification code is K2030.
#31	—	保留，不可访问 Reserved, not accessible

其中状态信息字 BFM #28 的意义说明如下：
Status message BFM#28 is described as:

b15 到 b8 b15 to b8	b7	b6	b5	b4	b3	b2	b1	b0

未用 Unused	高 High	低 Low	高 High	低 Low	高 High	低 Low	高 High	低 Low
	CH4		CH3		CH2		CH1	

低：当温度测量值低于最低可测量温度时，锁存 ON。

Low: when temperature measured is lower than the minimum detectable temperature, latch ON.

高：当温度测量值高于最高可测量温度时，或者热电偶断开时，锁存 ON。

High: when temperature measured is higher than the maximum detectable temperature, latch ON.

若出现错误之后，温度回到正常范围，则错误仍然被锁存在 BFM#28 中。

Temperature returns to normal range after error occurs. Error will still be latched in BFM#28.

用 TO 指令向 BFM28 写入 K0 或者关闭电源，可清除错误。

Use TO command to write K0 into BFM28 or turn the power off to clear errors.

注意：本地扩展模块的外部 24V 电源失电，PLC 主模块的系统标志 M6708 会置位。 编程时可定时检查该标志，能及时发现该现象。

NOTE: when the external 24V power supply of the local expansion module has a power failure, PLC main module’s system mark M6708 will be reset. The mark should be regularly checked for immediate notice.

其中状态信息字 BFM #29 的意义说明如下：

BFM＃29 位号	ON 状态	OFF 状态
b0:	存在错误。 b0~b3 中任一个非 0，A/D 转换停止 Error occurs. When any of b0~b3 is not 0, A/D conversion stops.	无错误 No error
b1:	保留 Reserved	保留 Reserved
b2:	（不可能） (not valid)	电源正常 (power supply normal)
b3:	模块硬件故障 (module hardware failure)	硬件正常 Hardware normal
b10:	数字输出超出指定范围 Digital output exceed designated range	数字输出值正常 Digital output normal
B11:	采样滤波常数超出 1～256 范围 Sampling filter constant exceeds the range of 1~256	采样滤波常数正常 Sample filter constant normal

b12:	保留 Reserved	保留 Reserved
BFM＃29 的其它 bit4～7，bit13～15 等没有定义。 Bit4~7, bit13~15 in BFM#29 has no definition.		

编程举例：

Programming Example:

一只 H2U－4TC 扩展模块接于 PLC 主模块后方，按编号原则为＃0 号模块，其中 CH1-CH4 端口需要采集 J 型热电偶的温度。 要求改滤波次数为 6，将四个通道采集得到的数据分别存于 D10、D11、D12、D13。 编写的用户程序如下：

Connect one H2U-4TC expansion module to the back of the PLC main module, and module #0 is numbered in sequential order. CH1-CH4 terminals need to collect the temperature value of the J type thermocouple. Asked to change filter number as 6. The data collected from two channels are stored in D10, D11. User program written as follows:

读取#0 号模块中 BFM#30 的读书，暂存于 D0

Retrieve the BFM#30 readout from #0 module and save temporarily in D0

检查模块标识，判断是否为 H2U-4TC 模块，这样可避免当连接顺序与设计顺序不一致时，发生的晁错错误设定为 J 型热电偶

Inspect the module logo to ensure it is the H2U-4TC module. This prevents errors in setting up the J type thermocouple caused by inconsistant connection and design sequences.

接入模块设定滤波次数为 6

Connected module's filter frequency set to 6

将 CH1-CH4 当前平均温度读入 D10-D13

Read the current average termpertures from CH1-CH4 to D10-D13

读取模块的数字范围错误锁存状态字

Read the module digital range's error latch status message

读取模块的错误状态的状态字

Error status message read from the module

例子中如果改成 H2U－4TCR 远程模块，CAN 站号为 1。 则此例子程序如下：

In the example, if H2U-4TCR remote module is used instead, the CAN station number becomes 1. The programming for this example will be as follows:

```
M8002
─┤├──┬─〔FROM   K101   K30    D0   K1〕
     └─〔CMP   K2030    D0    M20〕
M20
─┤├──┬─〔TOP   K101    K0   H1111    K1〕
     ├─〔TOP   K101    K1    K6    K4〕
     ├─〔FROM  K101    K5   D10    K4〕
     ├─〔FROM    K101   K28   K4M50     K1〕
     └─〔FROM    K101   K29   K4M100    K1〕
```

使用注意事项：

Caution:

禁止带电插拔，只有在主模块和应用系统停电的情况下，才能进行扩展模块的接入或拆除工作，以保证人身安全，防止因带电插拔损坏器件；

Hot swap is prohibited. To ensure personnel safety and prevent device damage caused by hot swap, expansion module can only be connected or removed when both the main module and system are powered off.

5.12 H1U/H2U 系列 PLC 通信说明

5.12 H1U/H2U Series PLC Communication

一、 概述

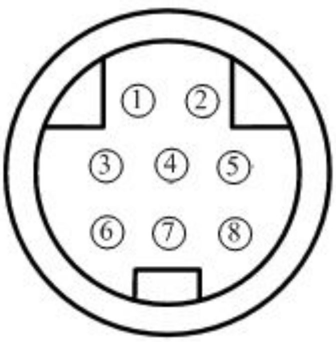
A. Introduction

H1U/H2U 系列 PLC 主模块包含两独立物理串行通信口，分别命名为 COM0 和 COM1。COM0 具有编程、监控功能，若需要也可由用户定义为其他功能。COM1 功能即完全由用户自由定义。

H1U/H2U Series PLC main module contains two independent physical serial communication ports, they are COM0 and COM1. COM1 is used for programming and monitoring purpose. When necessary, user may define it for other purposes. COM1

definition can be totally controlled by users.
主模块整机硬件标准配置，COM0 硬件为标准 RS485 和 RS422，两者兼容，接口端子为 8 孔鼠标头母座。 COM1 硬件为 RS485，接口为接线端子。
Main module standard hardware configurations: the standard RS485 and RS422 are both compatible for COM0, which uses 8-hole female mouse interface terminal. COM1 hardware is RS485 and the terminal is terminal block.

除主模块标准配置的通信硬件外，还可以通过三款通信扩展卡供用户选择。H2U-485-BD 通信扩展卡接口方式为接线端子，可支持 2 线半双工 RS485 标准通信和 4 线制全双工 RS422 通信，需要用户配线。H2U-422-BD 通信扩展卡接口方式为 8 孔鼠标头，需要同时选配专用电缆，仅支持全双工 RS422 通信。H2U-232-BD 通信扩展卡接口方式为 DB9，支持 3 线 RS232 标准通信，可选用标准 RS232 通信线连接用户设备。
Besides the standard hardware configuration for main module, three other communication expansion cards are optional for users. H2U-485-BD expansion card uses terminals for its interface. It supports the 2-wire helf-duplex RS485 as standard mean of communicate, and the 4-wire full-duplex RS422 communication, which requires users wiring. H2U-422-BD expansion card uses 8-hole mouse head for its interface and dedicated cable is required to support solely full-duplex RS422 communication. H2U-232-BD expansion card uses DB9 for its interface. It supports standard 3-wire RS232 communication and uses the standard RS232 communication cable to connect to user equipments.
硬件及通信连线
Heardware and communication wiring
整机硬件标准配置，COM0 硬件为标准 RS485 和 RS422，通过跳线 JP0 选择，若跳线插入，为纯 RS422 模式，若跳线断开，为 RS485 模式，接口端子为 8 孔鼠标头母座。
Machine standard hardware configuration: through the jumper, JP0, select either the RS485 or RS422 for COM0. If jumper is inserted, it is in RS422 mode. If jumper is disconnected, it is in RS485 mode and the interface terminal uses 8-hole female mouse head.
接口定义：
Interface definition:



COM0 程序下载口
COM0 Program download

管脚号 Pin number	信号 Signal	描述 Description
1	RXD-	接收负 Negative received
2	RXD+	接收正 Positive received
3	GND	地线，9、10 没有电气连接 Ground, no electrical connection in 9 and 10
4	TXD-/RXD-	对外发送负，若为 RS485，也作接收负 Transmit negative values externally. If RS485 is used, negative values will also be received.
5	+5V	对外供电+5V，与内部用的逻辑+5V 相同 Provides +5V externally, with the same internal logic +5V.
6	CCS	通讯方向控制线，高电平表示发，低电平表示收，在串口作 RS485 时由 PLC 控制 4、7 脚是接收还是发送。若为 RS422 时固定为高，4、7 脚一直处于发送 Communication direction control line. Send when in high level, and receive when in low level. When connect RS485 in serial, PLC controls both directions for pin no. 4 and 7. When RS422 is used and fixed at high level, pin no. 4 and 7 will always be in sending mode.
7	TXD+/RXD+	对外发送正，若为 RS485，也作接收正 Transmit positive values externally. If RS485 is used, positive value will also be received.
8	NC	空脚 Void pin no.

通过 COM0，PLC 与计算机或触摸屏或其它设备的连接有三种方式。

Through COM0, there are three types of connections available between PLC and computer, touchscreen, or other devices:

方式 1（JP0 需要接通）：PLC 侧为 RS422，计算机侧为 USB。计算机通过专用的 USB 下载电缆连接到 COM0 的程序下载口（见上图）。

Method 1 (JP0 connected): RS422 is used on a PLC while USB is used on the computer. Through a dedicated USB cable the computer connects to COM0 program download port (see illustration above).

方式 2（JP0 需要接通）：PLC 侧为 RS422，计算机侧为 RS232，计算机通过专用的串口下载电缆连接到 COM0 的程序下载口（见上图）。

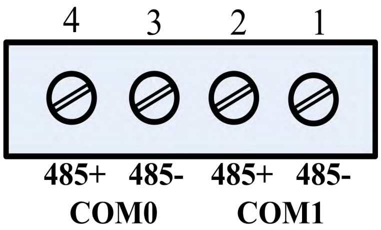
Method 2 (JP0 connected): RS422 is used on a PLC while RS232 is used on the computer. Through a dedicated serial download cable the computer connects to COM0 program download port. (see illustration above)

方式 3（JP0 需要断开）：PLC 侧为 RS485，计算机侧为 RS485，通过端子（见下图）连线，连接电缆由用户自行配线。

Method 3 (JP0 disconnected): RS485 is used on a PLC while RS485 is used on the computer. Through the terminals (see illustration below) connects the devices. Connection cable wiring is provided by users.

COM1 硬件为 RS485，接口为接线端子，接口定义：

COM1 hardware uses RS485, and terminals are used as interfaces. Interfaces are defined as:



通信接线端子

Communication terminals

COM1 与其它设备通信连接方式。

Communication connections between COM1 and other devices

通过接线端子，用户现场配线。

Users configure the on-site wiring through terminals.

两串口若通过 RS485 通信，均只支持半双工通信模式。

If two serial ports communicate through RS485, both only support the semi-duplex communication mode.

二、 H2U 通信协议切换逻辑说明

B. H2U Communication Protocol Switching Logic Description

1、 COM0 协议切换逻辑

1. COM0 Protocol Switching Logic

1） 停机状态，协议固定为下载协议/HMI 监控协议。

1) When machine is off, the protocol is fixed as download protocol/HMI monitoring protocol.

2） 停机转运行时，若跳线 JP0 接通，协议为下载协议/HMI 监控协议。

2) If jumper JP0 is connected when machine is shutting down, download/HMI monitoring protocol is in place.

3） 停机转运行时，若跳线 JP0 断开，协议由 D8116 决定，D8116 在 PLC 第一个扫描周期内确定的值对协议有效，运行后 D8116 的更改不能改变协议，D8116 与协议对应关系见协议设置表。

3) If jumper JP0 is disconnected when machine is shutting down, D8116 determins the protocol. The value D8116 validifies during PLC's first scanning cycle is valid to the protocol in place. After in process, changes in D8116 will not affect the protocol. Please refer to the configuration chart for D8116 and corresponding protocols.

4） PLC 运行后，协议不能改变。

4) Protocol cannot be changed after PLC is in operation.

2、 COM1 协议切换逻辑

2. COM1 Protocol Switching Logic

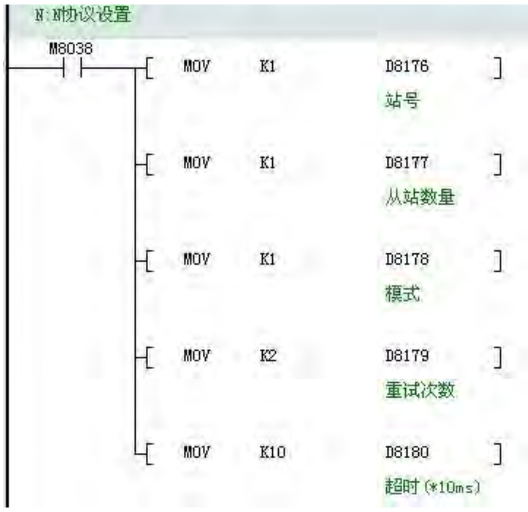
1） 在停机状态或第一次运行时，协议可以随时切换，系统按优先级检查协议，若存在优先级别较高的协议，将不再检查优先级低的协议。协议优先级如下：N:N，并联主站，并联从

站，计算机链接。

1) Protocol can be switched at any time when in the shutdown status or during the initial operation. System checkes the protocols based on their priorities. If there is protocol with higher priority exists, lower priority protocols will not be checked. Protocol priorities are as: N:N, parallel master, parallel slave, computer link.

2） N:N 协议触发方式：从 0 步开始，存在以下指令，系统设置为 N:N 协议。

2) N:N protocol trigger: starts from 0 step and consists the following commands. System configuration is in N:N protocol.



N：N 协议设置

N:N protocol configuration

站号

station number

从站数量

Slave numbers

模式

Mode

重试次数

Retries

超时

Timeout

N:N 协议设置

N:N protocol configuration

3） 并联协议，M8070 置位为并联协议主站，M8071 置位为并联协议从站，M8070 与 M8071 不能同时置位，若同时置位并联协议无效。

3) Parallel protocol. M8070 is set as parallel protocol master, while M8071 is set as

parallel protocol slave. M8070 and M8071 cannot be set at the same time, or the parallel protocol will not be valid.

4） 计算机链接协议，D8120 的 bit14 = 1，系统设置 COM1 协议为计算机链接协议。

4) Computer link protocol. When D8120’s bit14 = 1, the COM1 protocol in system configuration becomes computer link protocol.

5） 以上设置均不存在，协议由 D8126 决定，D8126 在 PLC 第一个扫描周期内确定的值对协议有效，运行后 D8126 的更改不能改变协议，D8126 与协议对应关系见协议设置表。

5) Protocols will be determined by D8126 when above configurations are not available. The value D8126 validifies during PLC’s first scanning cycle is valid to the protocol in place. After in process, changes in D8126 will not affect the protocol. Please refer to the configuration chart for D8126 and corresponding protocols.

6） PLC 运行后，协议不能改变。

6) No change to protocol when PLC is in operation.

3、 串口通信格式设置

3. Serial communication configuration

协议设置表

Protocol Configuration Chart

COM0 协议 COM0 protocol	D8116 设定 D8116 setup	半双工/全双工模式 Semi/Full duplex mode	COM0 通信格式 COM0 Comm.
下载协议/HMI 监控协 Download protocol/HMI monitor protocol 议	01h	由跳线 JP0 决定 Determined by jumper JP0	固定 Fixed
并联协议主站 Parallel link protocol master station	不支持 No support	不支持 No support	不支持 No support
并联协议从站 Parallel link protocol slave station	不支持 No support	不支持 No support	不支持 No support
N:N 协议主站 N:N Protocol Master	不支持 No support	不支持 No support	不支持 No support
N:N 协议从站 N:N protocol slave station	不支持 No support	不支持 No support	不支持 No support
计算机链接协议 Computer link protocol	不支持 No support	不支持 No support	不支持 No support
MODBUS-RTU 从站 MODBUS-RTY slave station	02h	半双工 Half-duplex	由 D8110 决定 Determined by D8110
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half-duplex	由 D8110 决定 Determined by D8110

RS 指令 RS instruction	不支持 No support	不支持 No support	不支持 No support
MODBUS RTU 指令 MODBUS RTU instruction	不支持 No support	不支持 No support	不支持 No support
MODBUS-ASC 指令 MODBUS-ASC instruction	不支持 No support	不支持 No support	不支持 No support

COM1 协议 COM1 protocol	D8126 设定 D8126 setup	半双工/全双工模式 Semi/Full duplex mode	COM1 通信格式 COM1 Comm.
RS 指令 RS instruction	00h	由 D8120 的 Bit10 设定* Determined by D8120*	由 D8120 决定 Determined by D8120*
HMI 监控协议 HMI monitor protocol	01h	半双工 Half-duplex	固定 Fixed
并联协议主站 Parallel link protocol master station	50h	半双工 Half-duplex	固定 Fixed
并联协议从站 Parallel link protocol slave station	05h	半双工 Half-duplex	固定 Fixed
N:N 协议主站 N:N Protocol Master	40h	半双工 Half-duplex	固定 Fixed
N:N 协议从站 N:N Protocol Slave	04h	半双工 Half-duplex	固定 Fixed
计算机链接协议 Computer link protocol	06h	半双工 Half-duplex	由 D8120 决定 Determined by D8120*
MODBUS-RTU 从站 MODBUS-RTY slave station	02h	半双工 Half-duplex	由 D8120 决定 Determined by D8120*
MODBUS-ASC 从站 MODBUS-ASC slave station	03h	半双工 Half-duplex	由 D8120 决定 Determined by D8120*
RS 指令 RS instruction	10h	由 D8120 的 Bit10 设定* Determined by D8120*	由 D8120 决定 Determined by D8120*
MODBUS RTU 指令 MODBUS RTU instruction	20h	半双工 Half-duplex	由 D8120 决定 Determined by D8120*
MODBUS-ASC 指令 MODBUS-ASC	30h	半双工 Half-duplex	由 D8120 决定 Determined by

instruction			D8120*

*RS 指令半双工/全双工模式由 D8120 的 Bit10 设定；
*RS command in either semi or full duplex mode is configured by D8120 Bit10;
1:半双工 RS485；
1: semi-duplex RS485;
0:全双工 RS232C/RS422；
0: full-duplex RS232C/RS422;
（COM1 本机标配为 RS485，若使用 RS485，D8120 的 Bit10 必须设置为 ON；若用户需要使用全双工的 RS422 或 RS232C，需要购买通讯扩展板，并把 D8120 的 Bit10 置为 OFF）。
(COM1 uses RS485 as standard. If RS485 is used, D8120 Bit10 must set to ON; if user prefers full-duplex RS422 or RS232C, communication expansion board is required, and D8120 Bit10 must be turned OFF.)

协议与通信格式对照表
Protocol and Communication formats comparison chart

协议名称 Protocol Name	波特率 baudrate	数据位 Parity bit	校验位 Parity bit	停止位 Stop bit
N:N 协议 N:N Protocol	默认为 38400 Default: 38400 若 D8120 的 Bti7~Bit4 不为 0000b，波特率由 D8120 设定 If D8120's Bit7~Bit4 is not 0000b, Baud rate will be configured by D8120	固定为 7 Set at 7	固定为偶校验 E Set at even verification E	固定为 1 位 Set at 1
并联协议 Parallel Protocol	默认为 19200 Default: 19200 若 D8120 的 Bti7~Bit4 不为 0000b，波特率由 D8120 设定 If D8120's Bit7~Bit4 is not 0000b, Baud rate will be configured by D8120	固定为 7 Set at 7	固定为偶校验 E Set at even verification E	固定为 1 位 Set at 1 bit
HMI 监控协议 HMI Monitoring Protocol	固定为 9600 Set at 9600	固定为 7 Set at 7	固定为偶校验 E Set at even verification E	固定为 1 位 Set at 1 bit
计算机链接协议 Computer link	串口 0 由 D8110、串口 1 由 D8120 的 Bit7~Bit4 设定：	串口 0 由 D8110、串口 1 由 D8120 的	串口 0 由 D8110、串口 1 由 D8120 的 Bit2~Bit1 设	串口 0 由 D8110、串口 1 由

protocol	Serial port 0 and port 1 is configured by D8110 and D8120's Bit7~Bit4. 0011b-300Bits/s 0100b-600Bits/s 0101b-1200Bits/s 0110b-2400Bits/s 0111b-4800Bits/s 1000b-9600Bits/s 1001b-19200Bits/s 1010b-38400Bits/s 1011b-57600Bits/s 1100b-115200Bits/s	Bit0 设定： Serial port 0 and port 1 is configured by D8110 and D8120's Bit0. 0b-7Bits 1b-8Bits 注： MODBUS-RTU 从站协议及指令只支持 8 位数据位，否则将造成通信出错 Note: MODBUS-RTU slave station protocol and instruction only support 8bit data bit, or error will occur to the communication	定： Serial port 0 and port 1 is configured by D8110 and D8120's Bit2~Bit1. 00b-无校验(N) 00b-none (N) 01b-奇校验(O) 01b-odd (O) 11b-偶校验(E) 11b- even(E)	D8120 的 Bit3 设定: Serial port 0 and port 1 is configured by D8110 and D8120's Bit3. 0-1Bits 1-2Bits
MODBUS-RT 从站 MODBUS-RT Slave				
MODBUS-AS 从站 MODBUS-AS Slave				
RS 指令 RS instruction				
MODBUS RTU 指令 MODBUS RTU instruction				
MODBUS-AS 指令 MODBUS-AS command				

4、 串口通信格式设置软元件一览表

4. Listing for Serial Communication Format Configuration and Soft Components

COM0 串口设定：

COM0 Serial Setting:

M8110	保留 Reserved	D8110	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration settings, the default is 0
M8111	发送等待中（RS 指令） Waiting to send (RS instruction)	D8111	站号设置，界面配置设定，默认为 1 Station number setting, the interface configuration settings, the default is 1
M8112	发送标志（RS 指令）指令执行状态（MODBUS） Send flag (RS instruction) Instruction execution	D8112	传送剩余数据数量（仅对 RS 指令） The amount of remaining data transmitted (RS instruction only)

	state (MODBUS)		
M8113	接收完成标志（RS） 通讯错误标志（MODBUS） Receive complete flag (RS) Communication error flag (MODBUS)	D8113	接收到的数据数量（仅对 RS 指令） The amount of received data (RS instruction only)
M8114	接收中（仅对 RS 指令） Receiving (only RS instruction)	D8114	起始字符 STX（仅对 RS 指令） Start character STX (only RS instruction)
M8115	保留 Reserved	D8115	终止字符 ETX（仅对 RS 指令） Termination character ETX (only RS instruction)
M8116	保留 Reserved	D8116	通讯协议设定，界面配置设定，默认为 0 Protocol settings, the interface configuration settings, the default is 0
M8117	保留 Reserved	D8117	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8118	保留 Reserved	D8118	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8119	超时判断 Time-out judgement	D8119	通讯超时时间判断，界面配置设定，默认为 10（100ms） Determination of communication time-out, interface configuration settings, the default is 10（100ms）

COM1 串口设定：
COM1 Serial Port Configuration:

M8120	保留 Reserved	D8120	通讯格式，界面配置设定，默认为 0 Communication format, the interface configuration with a default of 0
M8121	发送等待中（RS 指令） Sending and waiting (RS instruction)	D8121	站号设置，界面配置设定，默认为 1 Station number settings, the interface configuration settings with a default of 1
M8122	发送标志（RS 指令） 指令执行状态（MODBUS）	D8122	传送剩余数据数量（仅对 RS 指令） Amount of remaining data to be transmitted (Only to RS instruction)

	Sending flag (RS instruction) Instruction execution status (MODBUS)		
M8123	接收完成标志（RS） Receiving complete flag (RS) 通讯错误标志（MODBUS） Communication error flag (MODBUS)	D8123	接收到的数据数量（仅对 RS 指令） Amount of data already received (Only to RS instruction)
M8124	接收中（仅对 RS 指令） Receiving (only to RS instruction)	D8124	起始字符 STX（仅对 RS 指令） Start character STX (Only to RS instruction)
M8125	保留 Reserved	D8125	终止字符 ETX（仅对 RS 指令） Termination character ETX (Only to RS instruction)
M8126	保留 Reserved	D8126	通讯协议设定，界面配置设定，默认为 0 Communication protocol, the interface configuration with a default of 0
M8127	保留 Reserved	D8127	计算机链接协议接通要求数据起始地址号 Computer link protocol of data starting address
M8128	保留 Reserved	D8128	计算机链接协议接通要求发送数据数量 Computer link protocol sending data amount
M8129	超时判断 Time-out judgement	D8129	通讯超时时间判断，界面配置设定，默认为 10（100ms） Communication overtime judgement, the interface configuration settings with a default of 10（100msec）

5、 通讯错误码一览表

5. Communication Error Code List

并行连接通信出错 M8063(D8063) 继续运行 Parallel link communication error M8063(D8063). Continue	0000	无异常 Normal	检查双方的可编程控制器的电源是否为 ON，适配器和控制器之间，以及适配器之间连接是否正确。 Check to ensure that the power of both programmable controllers is ON. In addition, check to ensure that the connections between the adapter and the controller and between

running.			adapters are correct.
	6301	奇偶出错 超过出错 成帧出错 Odd/even parity error Overtime error Framing error	
	6302	通信字符有误 Communication character error	
	6303	通信数据的和数不一致 Communication data checksum differs	
	6304	数据格式有误 Data format error	
	6305	指令有误 Instruction error	
	6306	监视定时器溢出 Monitor timer overflow	
	6307~6311	无 None	
	6312	并行连接字符出错 Parallel link character error	
	6313	并行连接和数出错 Parallel link checksum error	
	6314	并行连接格式出错 Parallel link format error	
	6330	MODBUS 从站地址设置错误 MODBUS slave address setup error	COM0 通讯出错 请检查 COM0 的通讯电缆是否正确连接；检查通讯双方通讯格式是否匹配；检查通讯协议是否匹配； 检查是否开机，COM0 只能在开机状态才可能做自由口，若关机只能做监控或下载口；检查 JP0 跳线是否插入，COM0 只能在跳线断开时作为 RS485 自由口，JP0 若接通，COM0 只能做监控或下载口，且是 RS422 模式 In the event of a COM0 communication error, please check to ensure that the COM0 communication cable is connected correctly. Check to ensure
	6331	数据帧长度错误 Data frame length error	
	6332	地址错误 Address error	
	6333	CRC 检验错误 CRC check error	
	6334	不支持的命令码 Function cede not supported	
	6335	接收超时 Receiving time-out	
	6336	数据错误 Data error	
	6337	缓冲区溢出 Buffer overflow	
	6338	帧错误 Frame error	

			that the communication format of both sides matches each other. Check to ensure that the communication protocols match. Check to ensure that the system is powered on because COM0 can only be used as a free port in the power-on state. Otherwise, it can only be used as download port. Check to ensure that the JP0 jumper is inserted because COM0 can only be used as a RS485 free port when the jumper is open. If the JP0 is closed, then COM0 can only be used as a monitor or a download port and is in RS422 mode.
	6340	MODBUS 从站地址设置错误 MODBUS slave address setup error	COM1 通讯出错，请检查 COM1 的通讯电缆是否正确连接； 检查通讯双方通讯格式是否匹配； If there is COM1 communication error, please check whether the COM1 communication cable is correctly connected; Check whether the communication format of two sides are matched;
	6341	数据帧长度错误 Data frame length error	
	6342	地址错误 Address error	
	6343	CRC 检验错误 CRC check error	
	6344	不支持的命令码 Function cede not supported	
	6345	接收超时 Receiving time-out	
	6346	数据错误 Data error	
	6347	缓冲区溢出 Buffer overflow	
	6348	帧错误 Frame error	

注：M8063，D8063 在故障消失后仍然保持，直到用户强行清除。

NOTE: M8063 and D8063 will remain after error has been corrected, until users clear them.

三、 通信协议说明

C. Communication protocol description

1、 HMI 监控协议

1. HMI Monitoring Protocol

硬件配置与软件设置：

Hardware and software configuration:

通过 COM0 通信，连接方式为 RS422，只能通过下载口连接，需要插入 JP0；

Communicates via COM0 and connects with RS422. Connection can only be done through the download port and JP0 insertion is required;

通过 COM0 通信，连接方式为 RS485，可通过接线端子配线，需要拔下 JP0；

Communicates via COM0 and connects with RS485. Wiring can be done through terminals and JP0 needs to be removed;

通过 COM1 通信，连接方式为 RS485，需要设置 D8126=01h，通过接线端子配线，也可通过 H2U-485-BD 扩展卡配线连接。

Communicates via COM1 and connects with RS485 with the configuration of D8126=01h. Wiring can be done through terminals or H2U-485-BD expansion card.

通过 COM1 通信，连接方式为 RS422，需要设置 D8126=81h，通过 H2U-485-BD 扩展卡配线或通过 H2U-422-BD 扩展卡连接。H2U-485-BD 扩展卡需要配置为 4 线制。H2U-422-BD 需要通过专用电缆连接。

Communicates via COM1 and connects with RS422 with the configuration of D8126=81h. Wiring and connection are done through H2U-485-BD or H2U-422-BD expansion card. H2U-485-BD expansion card requires 4-wire configuration, while H2U-422-BD requires a dedicated cable for connection.

本协议通信格式及波特率固定。

The protocol’s communication format and Baud rate are unchanged.

协议说明：

Protocol description:

HMI 监控协议为 PLC 内部协议，用于 AUTOSHOP 软件与 PLC 通信，AUTOSHOP 通过该协议，可以擦除、读取和下载用户程序；可以对 PLC 实施遥测、遥调与遥控。具体为可监测 PLC 中任意元件的状态，可强制更改任何元件，还可以控制 PLC 的启动和停止。

HMI monitoring protocol is a PLC internal protocol used for the communication between AUTOSHOP software and a PLC. Through the protocol AUTOSHOP is able to erase, read, and download user programs. It also allows for PLC remote testing, adjustment, and controls. More particularly, component status monitoring and modifications, and PLC startup and shutdown operations are now made feasible for AUTOSHOP to implement.

为保护用户程序，建议 PLC 工作中除调试程序外，其它设备不要使用该协议连接 PLC。

In order to protect the user program, other than PLC program debugging, it is recommended that other devices should not use the protocol to connect to the PLC.

若 COM1 设置为该协议，不支持擦除、读取和下载用户程序。

If COM1 is configured with the protocol, it will not support the erase, read, and download function of the user program.

2、 并联协议

2. Parallel Protocol

硬件配置与软件设置：

Hardware and software configuration:

并联协议只能用于 COM1，设置 COM1 为并联协议有两种方法，一、设置 D8126=50h，PLC 即为并联协议主站。设置 D8126=05h，PLC 即为并联协议从站。二、设置 M8070=on，PLC 即为并联协议主站。设置 M8071=on，PLC 即为并联协议从站。

Parallel protocol can only be used on COM1. There are two methods to configure COM1 as a parallel protocol. First, configure D8126=50h, and the PLC becomes a parallel protocol master. Configure D8126=05h, then the PLC becomes a parallel protocol slave. Second, configure D8070=on, and the PLC becomes a parallel protocol master. Configure D8071=on, then the PLC becomes a parallel protocol slave.

本协议通信格式及波特率固定。

The protocol's communication format and Baud rate are unchanged.

协议说明：

Protocol description:

并联协议为 PLC 内部协议，用于两台 PLC 并联时互相交换信息，用户只需要设置一台 PLC 为并联协议主站，另一台设置为并联协议从站，两台 PLC 使用该协议的串口连接起来，不需要用户程序干预，即可实现两台 PLC 间互相交换数据。

Parallel protocol is a PLC internal protocol, and is used for exchanges of information when two PLCs are connected in parallel. User only requires to configure one PLC as the parallel protocol master with the other as the slave. The two PLC are connected using the protocol's serial port, and without the user program's in place, the two PLC can now exchange data.

并联模式交换数据软元件表：

Parallel Mode Data Exchange Soft Component Chart:

	主站发送（从站接收） Master transmits (Slave receives)	从站发送（主站接收） Slave transmits (Master receives)
普通模式 Normal Mode M8162=0	M800~M899 D490~D499	M900~M999 D500~D509
高速模式 High-speed Mode M8162=1	D490~D491	D500~D501

与控制相关的变量如下：

Variables relevant to controls are as follows:

M8070：设定并联连接为主站；

M8070: Configure parallel connection for master;
M8071：设定并联连接为从站；
M8071: Configure parallel connection for slave;
M8162：高速并联连接模式；
M8162: High-speed parallel connection mode;
M8072：并联连接运行中；
M8072: Parallel connection in process;
M8073：并行连接设定异常；
M8073: Abnormal parallel connection configuration;
M8063：串行通信出错；
M8063: Errors in serial communication;
D8070：判断出错的时间设定，默认为 500；
D8070: Determine erroneous time setting, default is 500;
D8063：串行通信出错代码（见通信错误码一览表）。
D8063: Serial communication error code (see communicate error code chart)

注：M8070 置位为并联协议主站，M8071 置位为并联协议从站，若不存在其它优先协议，可通过 D8126 设置，D8126=50h 为并联协议主站，D8126=5h 为并联协议从站。
NOTE: M8070 is set as the parallel protocol master, while M8071 is set as the slave. If there is no other priority protocols in place, through D8126, D8126=50h can be set as the parallel protocol master and D8126=5h can be set as the parallel protocol slave.
3、 N:N 协议
3. N:N Protocol
硬件配置与软件设置：
Hardware and software configuration:
该协议只能用于 COM1，设置 COM1 为 N:N 协议有两种方法：一、设置 D8126=40h，PLC 即为 N:N 协议主站。设置 D8126=04h，PLC 即为 N:N 协议从站。二、在程序起始加一段程序
The protocol can only be used on COM1. There are two ways to configure COM1 as a N:N protocol. First, configure D8126=40h, and the PLC becomes a N:N protocol master. Configure D8126=04h, then the PLC becomes a N:N protocol slave. Second, at the beginning of the program write another procedure segment.
本协议通信格式及波特率固定。
The protocol’s communication format and Baud rate are unchanged.
协议说明：
Protocol description:
N:N 协议为 PLC 内部协议，用于多台（2～8 台）PLC 并联时互相交换信息，用户只需要设置一台 PLC 为 N:N 协议主站，另外多 PLC 设置为 N:N 协议从站，且所有使用该协议的 PLC 串口连接起来，不需要用户程序干预，即可实现多台 PLC 间互相交换数据。
N:N protocol is a PLC internal protocol, and is used for exchanges of information between multiple (2~8 consoles) parallel PLCs. User only requires to configure one PLC as the N:N protocol master with the others as the slaves. Connect all PLCs that use the protocol, and without the user program’s in place, multiple PLCs can now exchange data.

<table>
<tr><td rowspan="3">模式
Mode</td><td rowspan="3">站点号
Station No.</td><td colspan="2">软元件号
Soft Component No.</td></tr>
<tr><td>位软元件（M）
Bit Soft Component (M)</td><td>字软元件（D）
Word Soft Component (D)</td></tr>
<tr><td>0 个
0</td><td>4 个
4</td></tr>
<tr><td rowspan="8">模式 0
Mode 0
D8178=0

交换数据
0 个 M 元件
4 个 D 元件
Exchange data
0 M component
4 D component</td><td>第 0 号
No. 0</td><td>无
None</td><td>D0 到 D3
D0 to D3</td></tr>
<tr><td>第 1 号
No. 1</td><td>无
None</td><td>D10 到 D13
D10 to D13</td></tr>
<tr><td>第 2 号
No. 2</td><td>无
None</td><td>D20 到 D23
D20 to D23</td></tr>
<tr><td>第 3 号
No. 3</td><td>无
None</td><td>D20 到 D23
D20 to D23</td></tr>
<tr><td>第 4 号
No. 4</td><td>无
None</td><td>D40 到 D43
D40 to D43</td></tr>
<tr><td>第 5 号
No. 5</td><td>无
None</td><td>D50 到 D53
D50 to D53</td></tr>
<tr><td>第 6 号
No. 6</td><td>无
None</td><td>D60 到 D63
D60 to D63</td></tr>
<tr><td>第 7 号
No. 7</td><td>无
None</td><td>D70 到 D73
D70 to D73</td></tr>
</table>

模式 1 Mode 1 D8178=1 交换数据 32 个 M 元件 4 个 D 元件 Exchange data 32 M component 4 D component	第 0 号 No. 0	M1000 到 M1031 M1000 to M1031	D0 到 D3 D0 to D3
	第 1 号 No. 1	M1064 到 M1095 M1064 to M1095	D10 到 D13 D10 to D13
	第 2 号 No. 2	M1128 到 M1159 M1128 to M1159	D20 到 D23 D20 to D23
	第 3 号 No. 3	M1192 到 M1223 M1192 to M1223	D30 到 D33 D30 to D33
	第 4 号 No. 4	M1256 到 M1287 M1256 to M1287	D40 到 D43 D40 to D43
	第 5 号 No. 5	M1320 到 M1351 M1320 to M1351	D50 到 D53 D50 to D53
	第 6 号 No. 6	M1384 到 M1415 M1384 to M1415	D60 到 D63 D60 to D63
	第 7 号 No. 7	M1448 到 M1479 M1448 to M1479	D70 到 D73 D70 to D73

模式 2 Mode 2 D8178=2 交换数据 64 个 M 元件 8 个 D 元件 Exchange date 64 M component 8 D component	第 0 号 No. 0	M1000 到 M1063 M1000 to M1063	D0 到 D7 D0 to D7
	第 1 号 No. 1	M1064 到 M1127 M1064 to M1127	D10 到 D17 D10 to D17
	第 2 号 No. 2	M1128 到 M1191 M1128 to M1191	D20 到 D27 D20 to D27
	第 3 号 No. 3	M1192 到 M1255 M1192 to M1255	D30 到 D37 D30 to D37
	第 4 号 No. 4	M1256 到 M1319 M1256 to M1319	D40 到 D47 D40 to D47
	第 5 号 No. 5	M1320 到 M1383 M1320 to M1383	D50 到 D57 D50 to D57
	第 6 号 No. 6	M1384 到 M1447 M1384 to M1447	D60 到 D67 D60 to D67
	第 7 号 No. 7	M1448 到 M1511 M1448 to M1511	D70 到 D77 D70 to D77

M8183～M8190：通信出错标志，M8183 对应第 0 号站点（主站），M8184 对应第 1 号站点，依次类推，M8190 对应第 7 号站点；
M8183~M8190: communication error marks. M8183 corresponds to Station No.0 (master), M8184 No.1, and etc. to M8190 with No.7.
M8191：正在执行数据传送。
M8191: data transmission underway

D8063	串行通信出错代码（见通信错误码一览表） Serial communication error code (see communication error code chart)
D8070	并联联机错误时间，默认为 500ms Parallel connection with time error, default is at 500ms
D8173	本站站号设定状态 Station No. set status
D8174	通讯子站设定状态 Communication sub-station set status
D8175	刷新范围设定状态 Refresh range set status
D8176	站点号，范围 0~7，0 表示主站点 Station No. ranges 0~7. 0 is the master station.
D8177	从站点的总数，范围 1~7，仅主站需要 Total number of slave stations, ranges 1~7, required for master station
D8178	刷新范围（模式）设置，范围 0~2，仅主站需要

	Refresh range (mode) configuration, ranges 0~2, required for master station
D8179	重试次数设定，仅主站需要 Retries setting, required for master station
D8180	通信超时设置，*10ms，仅主站需要 Communication timeout setting, *10ms, required for master station
D8201	当前连接扫描时间 Currently connection scan time
D8202	最大连接时间 Maximum connection scan time
D8203	主站通讯错误次数 Master station communication error number
D8204	从站 1 通讯错误次数 Slave station 1 communication error number
D8205	从站 2 通讯错误次数 Slave station 2 communication error number
D8206	从站 3 通讯错误次数 Slave station 3 communication error number
D8207	从站 4 通讯错误次数 Slave station 4 communication error number
D8208	从站 5 通讯错误次数 Slave station 5 communication error number
D8209	从站 6 通讯错误次数 Slave station 6 communication error number
D8210	从站 7 通讯错误次数 Slave station 7 communication error number
D8211	主站通讯错误代码 Master station communication error code
D8212	从站 1 通讯错误代码 Slave station 1 communication error code
D8213	从站 2 通讯错误代码 Slave station 2 communication error code
D8214	从站 3 通讯错误代码 Slave station 3 communication error code
D8215	从站 4 通讯错误代码 Slave station 4 communication error code
D8216	从站 5 通讯错误代码 Slave station 5 communication error code
D8217	从站 6 通讯错误代码 Slave station 6 communication error code
D8218	从站 7 通讯错误代码 Slave station 7 communication error code

4、 计算机链接协议

4. Computer link protocol

硬件配置与软件设置：

Hardware and software configuration

该协议只能用于 COM1，设置 COM1 计算机链接协议有两种方法：一、设置 D8126=06h ，PLC 即为计算机链接协议。二、D8120 的 bit14 = 1，波特率及通信格式由 D8120 决定。

The protocol can only be used on COM1. There are two ways to configure COM1 as a computer link protocol. First, configure D8126=06h, and the PLC becomes the computer link protocol. Second, configure D8120's bit14=1, and the Baud rage and communication format will be determined by D8120.

协议说明：

Protocol description:

1) 数据序列

1) Data Sequence

格 式： 控制代码 站号 PC 号 命令 消息等待时间 内容数据 [校验和] [LF CR]

Format: Control Code Station No. PC No. Command Wait Time Content Data [Verification Sum] [LF CR]

字节数： 1 2 2 2 1 X 2 2

Bytes:

控制代码

Control Code

信号 Signal	代码（16 进制） Code (hexadecimal)	描述 Description
STX	02H	文本起点 Start text
ETX	03H	文本终点 End text
EOT	04H	传送结束 End of Transmission
ENQ	05H	询问 Enquiry
ACK	06H	确认 Acknowledge
LF	0AH	换行 Next line
CL	0CH	清除 Clear

CR	0DH	回车 Enter
NAK	15H	不确认 Not acknowledged

站号

Station number

即地址，用来区分本 PLC 与其它 PLC 的通信，D8121 设定，取值 00~0FH。

Address. It is used to differentiate communications between local PLC and other PLCs. Configured via D8121, select value 00~0FH.

PC 号

PC number

A 系列用，FX 系列固定为“FF”。

Used for A series. FX series is always “FF”

命令

Command

			命令 Command		描述 Description	每一通讯中单元的最大数 Maximum communication unit
			符号 Symbol	ASCII 代码 ASCII code		
软元件存储器 Soft component memory	批读 Read	位单元 Bit unit	BR	42H,52H	读一组位软元件（X，Y，M，S，T，C），结果以 1 点为单元 One group of bit soft component (X, Y, M, S, T, C) is read, result uses 1 point as the unit.	256
		字单元 Word unit	WR	57H,52H	读一组位软元件（X，Y，M，S），结果以 16 点为单元 One group of bit soft component (X, Y, M, S) is read, result uses 16 points as the unit.	32 字 32 words 512 点 512 points
					读一组字软元件（D，T，C），结果以 1 元件为单元 One group of word soft component (D, T, C) is read, result uses 1 component as the unit.	64 点 64 points
	批写	位单元 Bit unit	BW	42H,57H	写一组位软元件（X，Y，M，S，T，C），结果以 1 点为单	160 点 160 points

	Write				元 One group of bit soft component (X, Y, M, S, T, C) is written, result uses 1 point as the unit.	
		字单元 Word unit	WW	57H,57H	写一组位软元件（X，Y，M，S），结果以 16 点为单元 One group of bit soft component (X, Y, M, S) is written, result uses 1 point as the unit.	10 字 10 words 160 点 160 points
					写一组字软元件（D，T，C），结果以 1 元件为单元 One group of word soft component (D, T, C) is written, result uses 1 component as the unit.	64 点 64 points
	测试 Test	位单元 Bit unit	BT	42H,54H	有选择地以 1 点为单元设定/复位单独位软元件（X,Y,M,S,T,C） Selectively use 1 point as the unit setting/reset independent bit soft component (X, Y, M, S, T, C)	20 点 20 points
		字单元 Word unit	WT	57H,54H	有选择地以 16 点为单元设定/复位位软元件（X,Y,M,S） Selectively use 16 point as the unit setting/reset bit soft component (X, Y, M, S)	10 字 10 words 160 点 160 points
					有选择地以 1 元件为单元写字软元件（D,T,C(除高速 C200~255 计数器)） Selectively use 1 component as the unit word writing soft component (D, T, C (besides high-speed C200~255 counter))	10 点 10 points
PC	远程运行 Remote run		RR	52H,52H	向可编程控制器发送远程运行/停止请求 Transmit remote run/stop request to PLC	/
	远程停止 Remote		RS	52H,53H		

	stop				
	读 PC 类型 PC type readout	PC	50H,43H	读 PC 类型名称（代码） PC type name readout (code)	
接地 Grounding		GW	47H,57H	对所有连接的可编程控制器设定/复位接地标记（对 FX 系列为 M8126） Configure/reset grounding marks to all connected PLC (M8126 for FX series)	1 点 1 point
接通要求 Connection requirement				仅在 1:1 系统配置有可能从可编程控制器发送请求 Request can only be transmitted from the PLC when system configuration is 1:1.	最大 64 字 Maximum 64 words
环路回送测试 Circle loopback test		TT	54H,54H	从计算机接收的字符直接被发送回到计算机 Characters received from the computer will be transmitted directly back to the computer.	254 字符 254 characters

消息等待时间

Message wait time

PLC 收到消息后到回应前的最小延时，取值“0”~“F”，代表 0~150ms。

Minimum response delay after PLC receives messages. Select a value between 0~F, which represents 0~150ms.

内容数据

Content data

例如序列：“M00160510101”：

For example, the sequence “M00160510101”:

“M0016”：表示从 M0016 开始；

“M0016”: starting from M0016

“05”：表示操作 5 个变量；

“05”: 5 variables are operated

“10101”：表示变量值。

“10101": variable values

校验和

check sum

可选，是否添加由 D8120 的 b13 决定。

Optional. Determined by D8120’s b13.

LF CR

可选，是否添加由所选协议来定，协议选定由 D8120 的 b15 决定。
Optional. Determined by selected protocol. Protocol is determined by D8120’s b15.
命令详解
Detailed command
位元件的成批读（BR 命令）
Bit components batch read (BR command)
计算机命令（帧最小 15 字节）：
Computer command (minimum 15 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 BR BR command	2	BR
5	消息等待时间 Message wait time	1	A
6	头元件 First component	5	X0040
7	元件数 N(1~255) Component number N (1~255)	2	05
8	和校验（可选） Check sum (optional)	2	47
9	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFBRAX00400547\CR\LF
Communication data example: \ENQ05FFBRAX00400547\CR\LF

PLC 响应：
PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	STX	1	\STX
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	指定元件的数据	N	01101

	Data of designated component		
5	ETX	1	\ETX
6	和校验（可选） Check sum (optional)	2	E7
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\STX05FF01101\ETXE7\CR\LF

Communication data example: \STX05FF01101\ETXE7\CR\LF

计算机确认：

Computer acknowledgement:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF

通信数据例子：\ACK05FF

Communication Data example: \ACK05FF

字软元件的成批读（WR 命令）

Word soft component's batch readout (WR command)

计算机命令（帧最小 15 字节）：

Computer command (minimum 15 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 WR WR command	2	WR
5	消息等待时间 Message wait time	1	0
6	头元件 First component	5	X0040
7	元件数 N(1~255/200/100)	2	02

	Component numbers N(1~255/200/100)		
8	和校验（可选） Check sum (optional)	2	48
9	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFWR0X00400248\CR\LF
Communication data example: \ENQ05FFWR0X00400248\CR\LF

PLC 响应：
PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	STX	1	\STX
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	指定元件数据 Designated component data	N*4(16 位元件)/N*8(32 位元件) N*4(16-bit component)/N*8(32-bit component)	1234ABCD
5	ETX	1	\ETX
6	和校验（可选） Check sum (optional)	2	08
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\STX05FF1234ABCD \ETXC08\CR\LF
Communication data example: \STX05FF1234ABCD \ETXC08\CR\LF

计算机确认：
Computer acknowledgement:

序号 Serial	名称 Name	数据长度 Data	例子 Example

		length	
1	ACK	1	\ACK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF

通信数据例子：\ACK05FF。

Communication data example: \ACK05FF

位软元件的成批写（BW 命令）

Bit soft component batch write (BW command)

计算机命令（帧最小 16 字节）：

Computer command (minimum 16 bytes)

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 BW BW command	2	BW
5	消息等待时间 Message wait time	1	0
6	头元件 First component	5	M0903
7	元件数 N(1~160) Component number N(1~160)	2	05
8	指定元件的数据 Designated component data	N	01101
9	和校验（可选） Check sum (optional)	2	2B
10	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFBW0M090305011012B\CR\LF

Communication data example: \ENQ05FFBW0M090305011012B\CR\LF

PLC 响应：

PLC Response:

序号 Serial	名称 Name	数据长度 Data	例子 Example

		length	
1	ACK	1	\ACK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF

通信数据例子：\ACK05FF。

Communication data example: \ACK05FF

字软元件的成批写（WW 命令）

Word soft component batch write (WW command)

计算机命令（帧最小 19 字节）：

Computer command (minimum 19 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 WW WW command	2	WW
5	消息等待时间 Message wait time	1	0
6	头元件 First component	5	M0640
7	元件数 N(1~64) Component number N(1~64)	2	02
8	指定元件的数据 Designated component data	N*4(16 位元件)/N*8(32 位元件) N*4(16-bit component)/N*8(32-bit component)	2347AB96
9	和校验（可选） Check sum (optional)	2	0A
10	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFWW0M0640022347AB960A\CR\LF
Communication data example: \ENQ05FFWW0M0640022347AB960A\CR\LF

PLC 响应：
PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF

通信数据例子：\ACK00FF。
Communication data example: \ACK00FF
位软元件测试（BT 命令）
Bit soft component testing (BT command)
计算机命令（帧最小 16 字节）：
Computer command (minimum 16 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 BT BT command	2	BT
5	消息等待时间 Message wait time	1	0
6	元件数 N(1~20) Component number N(1~20)	2	03
7	元件 1 Component 1	5	M0500
	元件 1 的数据(0/1） Component 1 data (0/1)	1	1
	元件 2 Component 2	5	S0100
	元件 2 的数据(0/1） Component 2 data	1	0

	(0/1)		
	元件 3 Component 3	5	Y0001
	元件 3 的数据（0/1） Component 3 data (0/1)	1	1
	…		
8	和校验（可选） Check sum (optional)	2	EC
9	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFBT003M05001S01000Y00011EC\CR\LF

Communication data example: \ENQ05FFBT003M05001S01000Y00011EC\CR\LF

PLC 响应：

PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF

通信数据例子：\ACK05FF。

Communication data example: \ACK05FF.

字软元件测试（WT 命令）

Word soft component testing (WT command)

计算机命令（帧最小 19 字节）：

Computer command (minimum 19 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 WT WT command	2	WT
5	消息等待时间 Message wait time	1	0
6	元件数 N(1~10) Component	2	03

	number N(1~10)		
7	元件 1	5	D0500
	元件 1 的数据(0/1) Component 1 data (0/1)	4	1234
	元件 2 Component 2	5	Y0100
	元件 2 的数据(0/1) Component 2 data (0/1)	4	BCA9
	元件 3 Component 3	5	CN100
	元件 3 的数据(0/1) Component 3 (0/1)	4	0064
	…		
8	和校验（可选） Check sum (optional)	2	07
9	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFWT003D05001234Y0100BCA9CN100006407\CR\LF。

Communication data example: \ENQ05FFWT003D05001234Y0100BCA9CN100006407\CR\LF

PLC 响应：

PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号	2	05
3	PC 号	2	FF

通信数据例子：\ACK05FF。

Communication data example: \ACK05FF

远程运行/停止（RR/RS 命令）

Remote run/stop (RR/RS command)

计算机命令(帧最小 8 字节)：

Computer command (minimum 8 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号	2	05

	Station No.		
3	PC 号 Pc No.	2	FF
4	命令 RR 或 RS RR or RS command	2	RR
5	消息等待时间 Message wait time	1	0
6	和校验（可选） Check sum (optional)	2	C5
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFRR0C5\CR\LF。

Communication data example: \ENQ05FFRR0C5\CR\LF

PLC 响应：

PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号	2	05
3	PC 号	2	FF

通信数据例子：\ACK05FF。

Communication data example: \ACK05FF。

有效执行命令条件：

Effective command execution requirements:

远程运行：可编程控制器应处于停止状态；

Remote run: PLC should in OFF mode;

远程停止：可编程控制器应为强制运行模式。

Remote stop: PLC should be in operation mode.

注意：断电后强制运行模式不会恢复。可编程控制器在强制运行模式时，若电源被关闭后再打开，特殊辅助继电器 M8035，M8036，M8037 都会复位到关，且可编程控制器保持停止。

NOTE: forced opration mode will not restore after a power failure. When PLC is in forced operation mode, after it’s been turned OFF and ON, special auxiliary relay M8035, M8036, M8037 will all be reset to OFF, with the PLC remains at OFF.

读取可编程控制器类型（PC 命令）

PLC readout type (PC command)

计算机命令(帧最小 8 字节)：

Computer command (minimum 8 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example

1	ENQ	1	\ENQ
2	站号	2	0F
3	PC 号	2	FF
4	命令 PC PC command	2	PC
5	消息等待时间 Message wait time	1	0
6	和校验（可选） Check sum (optional)	2	C5
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ0FFFPC0C5\CR\LF。

Communication data example: \ENQ0FFFPC0C5\CR\LF

PLC 响应：

PLC Response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	STX	1	\STX
2	站号	2	0F
3	PC 号	2	FF
4	内容 PC 号 Content PC No.	2	02
5	ETX	1	\ETX
6	和校验（可选） Check sum (optional)	2	C5
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ0FFFRR\ETXC5\CR\LF。

Communication data example: \ENQ0FFFRR\ETXC5\CR\LF

计算机确认：

Computer acknowledgement:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ACK	1	\ACK
2	站号	2	05
3	PC 号	2	FF

通信数据例子：\ACK05FF。

Communication Data example: \ACK05FF.

全局功能（GW 命令）

Global function (GW command)
计算机命令(帧最小 9 字节)：
Computer command (minimum 9 bytes):

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	ENQ	1	\ENQ
2	站号 Station No.	2	FF
3	PC 号 PC No.	2	FF
4	命令 GW GW command	2	GW
5	消息等待时间 Message wait time	1	0
	控制标志（1：打开，0：关闭） Control marks (1: ON, 0: OFF)	1	1
6	和校验（可选） Check sum (optional)	2	17
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQFFFFGW01C5\CR\LF。
Communication data example: \ENQFFFFGW01C5\CR\LF
PLC 不做响应：
PLC no response:
注：站号 FF 表示所有站，打开全局变量标志后 M8126 置位，关闭全局变量标志后 M8126 复位。
NOTE: Station No. FF represents all stations. M8126 will be set after turning ON global variable mark; M8126 will be reset after turning OFF global variable mark.
疑问：无论是否打开或关闭全局变量标志，均无法通过地址"FF"控制或设置 PLC，仍然只能通过 PLC 具体站号来控制或设置 PLC。
QUESTION: Regardless of turning ON or OFF the global variable mark, PLC still cannot be controlled or configured through address "FF". It can only be done through specific PLC station numbers.

环路回送测试（TT 命令）
Circle loopback testing (TT command)
计算机命令(帧最小 11 字节)：
Computer command (minimum 11 bytes):

序号 Serial	名称 Name	数据长度 Data	例子 Example

		length	
1	ENQ	1	\ENQ
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	命令 TT TT command	2	TT
5	消息等待时间 Message wait time	1	0
6	字符数 N Character number N	2	08
7	字符串 Character series	N	12345678
8	和校验（可选） Check sum (optional)	2	FB
9	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ENQ05FFTT00812345678FB\CR\LF。

Communication data example: \ENQ05FFTT00812345678FB\CR\LF

PLC 响应：

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	STX	1	\STX
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	字符数 Character number	2	08
5	内容 PC 号 Content PC No.	2	02
6	ETX	1	\ETX
7	和校验（可选） Check sum (optional)	2	C5
8	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\STX05FF0812345678\ETXC5\CR\LF。

Communication data example: \STX05FF0812345678\ETXC5\CR\LF

错误响应

Error response
PLC 错误响应：
PLC error response:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	NAK	1	\ NAK
2	站号 Station No.	2	05
3	PC 号 PC No.	2	FF
4	错误码 Error code	2	02
5	CR，LF（可选） CR, LF (optional)	2	\CR\LF

通信数据例子：\ NAK 05FF02\CR\LF。
Communication data example: \ NAK 05FF02\CR\LF
注：
Note:
1）错误响应不存在和检验；
1) Error response does not exist sum verification;
2）错误码：
2) Error code:
“02”:Check sum error, 和校验错误；
“03”:COMM Mode error, 通信格式错误；
“06”:char buf error, 字符区错误；
“07”:char error, 字符错误不在 0~F 间；
“10”:PC code error, PC 号错误；
“18”:control error, 远程控制错误。
接通要求（PLC 作主站发送数据到计算机）
Connection request (PLC as master station transmitting data to the computer)
若 D8128 非 0，PLC 将主动通过端口发送数据。发送数据的内容为 D8127 指定的软元件，数据长度由 D8128 指定。D8127 与 D8128 之和不超过 8000，即不能访问 D8000 以后的数据。
If D8128 is not 0, PLC will transmit data through terminals. Data contents are soft components designated by D8127, while the data length is determined by D8128. Sum of D8127 and D8128 does not exceed 8000, which means data that is after D8000 is not accessible.
数据发送中，M8127 置位，发送完成后 M8127 复位。数据范围错误，M8128 置位，不发送数据。M8129 由为 ON，数据寄存器按 8 位处理，OFF，数据寄存器按 16 位处理。
M8127 is set for data transmission. M8127 resets after transmission completes. M8128 is set when there is error in data range, and data will not be transmitted. When M8129 is ON, data register is processed with octonary; when OFF, data register is processed with

hexadecimal system.
例子：
Example:
用户程序：　D8127 = 5，D8128 = 3，M8129 = OFF；
User Program:
D5 = 501h，D6 = 602h，D7 = 703h。
PLC 处理：　M8127 = ON；
通过串口 1 发送如下数据：\STX05FE 050106020703\ETX；
Through serial port 1, data is transmitted: \STX05FE 050106020703\ETX;
M8127 = OFF。
PLC 主动发送的数据：
Data transmitted by PLC:

序号 Serial	名称 Name	数据长度 Data length	例子 Example
1	STX	1	\STX
2	站号 Station No.	2	05
3	PC 号（固定为 FE） PC No. (always FE)	2	FE
4	内容(D 元件数据) Content (D component data)	N*4（或 2） N*4 (or 2)	05010602 0703
5	ETX	1	\ETX
6	和校验（可选） Check sum (optional)	2	C5
7	CR，LF（可选） CR, LF (optional)	2	\CR\LF

5、 RS 指令
5. RS command
硬件配置与软件设置：
Hardware and software configuration:
RS 指令只能用于 COM1 通信，连接方式为全双工或半双工，支持本机标准通信口，也支持所有的通讯扩展卡。
RS command only uses COM1 for communication, and is connected by either full- or semi-duplex. It supports local machine standard communication ports, as well as all other communication expansion cards.
可以设置 D8126=10h 来启动。
It can be activated by configuring D8126=10h.
本协议通信格式及波特率由 D8120 设定。D8120 的定义见下表：
The protocol communication format and Baud rate is configured by D8120. See chart below for D8120 definition:

位号 Bit No.	名称 Name	内容 Content	
		0（OFF）	1（ON）
b0	数据长 Data length	7 位	8 位
b2b1	奇偶性 Parity	00:无 00: Nil 01:奇校验（ODD） 01: Odd check 11:偶校验（EVEN） 11: Even check	
b3	停止位 Stop bit	1 位 1bit	2 位 2bits
b7b6b5b4	波特率（bps） Baud rate (bps)	0011：300 0100：600 0101：1200 0110：2400 0111：4800 1000：9600 1001：19200 1010：38400 1011：57600 1100：115200	
b8	起始符 Start mark	无 None	有，D8124 为起始符 Yes, D8124 as the start mark
b9	终止符 End mark	无 None	有，D8125 为起始符 Yes, D8125 as the start mark
b10	全半双工 Full/semi-duplex	全双工 Full-duplex	半双工 Half-duplex
b11	保留 Reserved	不可使用 Unavailable	
b12	保留 Reserved	不可使用 Unavailable	
b13	和校验 Sum check	不附加 No included	附加 Included
b14	协议 Protocol	不使用 Not in use	使用 Used
b15	控制顺序 Control sequence	方式 1 Mothod 1	方式 4 Mothod 4

注：b12～b14 只用于计算机链接协议，与 RS 指令无关.

NOTE: b12~b14 is only used for computer link protocol, and has no relevance with RS command.

协议说明：

Protocol description:

RS 指令格式为：

RS command format is:

RS(TXDADDR，TXDLEN，RXDADDR，RXDLEN)；
TXDADDR：要发送数据地址，必须是 D 元件；
TXDADDR: data address transmitted, must be D component;
TXDLEN：发送数据长度，可以是变量和常数；
TXDLEN: data length transmitted, can either be variable or constant;
RXDADDR：接收数据地址：必须是 D 元件；
RXDADDR: data ddress received, must be D component;
RXDLEN：接收数据长度，可以是变量和常数。
RXDLEN: data length received, can either be variable or constant
发送请求命令：M8122，若程序把 M8122 置为 ON，并且 RS 指令被驱动，即从 TXDADDR 指定的 D 元件地址起，发送 TXDLEN 个数据到 COM1（若指定有起始符或中止符或校验和，会一起发出）。发送完成后系统自动复位 M8122。
Transmit request command: M8122. When setting M8122 to ON in the program and activate the RS command, starting from the D component address designated by TXDADR the TXDLEN data will be transmitted to COM1 (if there is start mark, end mark, or check sum desginated, all will be transmitted together). After the transission the system will automatically reset to M8122.
接收标志：M8123，接收数据完成后，M8123 自动置为 on，复位将进入下一次接收状态。
Receive mark: M8123. After data receive completes, M8123 will automatically be set to ON. Reset to receive the next transmission.
接收超时：若接收数据不足，且时间大于设定时间（D8129×10ms），接收超时，M8129 置为 on。注意：若一个数据都没有收到，M8129 是不会置位的。用户需要根据收到的数据量（D8123）来判断通讯是否正常。
Receive timeout: when data received is not sufficient and when time used is greater than then the time configured (D8129x10ms), it has a receive timeout. M8129 will be set to ON. NOTE: if no data is received, M8129 will not be set up. User must determine communication normality according to the amount of data (D8123) received.
6、 MODBUS 从站协议
6. MODBUS slave protocol
硬件配置与软件设置：
Hardware and software configurations:
COM0 设置：若 D8116=02h，COM0 协议为 MODBUS-RTU 从站；若 D8116=03h，COM0 协议为 MODBUS-ASC 从站；
COM0 configuration: if D8116=02h, COM0 protocol is MODBUS-RTU slave; if D8116=03h, COM0 protocol is MODBUS-ASC slave;
COM1 设置：若 D8126=02h，COM1 协议为 MODBUS-RTU 从站；若 D8126=03h，COM1 协议为 MODBUS-ASC 从站；
COM1 configuration: if D8126=02h, COM1 protocol is MODBUS-RTU slave; if D8126=03h, COM1 protocol is MODBUS-ASC slave;

协议说明：
Protocol description:

MODBUS 从站协议包括 MODBUS RTU 协议（以下简称 RTU 协议）和 MODBUS ASC 协

议（以下简称 ASC 协议），两者区别在与数据链路，通信传送的数据 RTU 协议为真实数据，ASC 协议传送的数据是转换为 ASC 码的数据。另外两者在帧结构上也有区别，RTU 协议是以时间来区分数据帧的，若通信中有 3.5 个字节的时间没有接收到数据，则认为对方数据传送完毕；ASC 协议即是以 ASC 码“：”为帧起始符，以\CR\LF(0D0Ah)为帧结束符，从通信效率来看，RTU 协议高于 ASC 协议，大概 RTU 协议大概为 ASC 协议到两倍。具体可参照标准 MODBUS 协议相关文档，这些文档是开放到，可在网上下载或到 MODBUS 相关官方网上下载。

MODBUS slave protocol includes MODBUS RTU protocol (RTU protocol hereafter) and MODBUS ASC protocol (ASC protocol hereafter). The difference between the two protocols lays in the data link. Data transmitted through RTU protocol is the real data, when the data transmitted through ASC protocol is the data after conversion to ASC codes. Also, there is also structural difference between the two protocols. RTU protocol uses time to differentiate data. If no data is received in 3.5 bytes of time during communication, data transmission is consider completed from the other side; ASC protocol uses ASC code “:” as the start mark and \CR\LF(0D0Ah) as the end mark. Communication efficiency-wise, RTU has as twice higher efficiency when compared with ASC protocol. For more information, please refer to relevant documents for Standard MODBUS Protocols. These documents are availabe for download from the Internet or MODBUS’s official site.

本机支持到 MODBUS 功能码及数据编址见附录 5.4《PLC 内置 MODBUS 从站通讯协议说明》。

The machine supports MODBUS function code and data addressing. Please see Appendix 5.4 "PLC built-in MODBUS Slave Communication Protocol Description"

与控制相关的变量及标志表：

Chart of Variables and Marks relevant to Controls

变量 Variable	说明 Description	备 注 Comment
D8120	通讯格式设定 Communication format configuration	例： Example: 81h：9600bps，8N1 91h：19200bps，8N1
D8121	设定本 PLC 的从站地址 Configure PLC’s slave address	程序运行中随时更新有效 Update can be executed when program in operation
D8126	从站协议设定 Slave protocol configuration	02h：MODBUS RTU 从站 02h: MODBUS RTU slave 03h：MODBUS ASC 从站 03h: MODBUS ASC slave
M8063	MODBUS 通讯错误指示 MODBUS communication error indicator	只读，用户程序清除或关机到开机时清除 Read-only. Cleared by user program or when restarted.
D8063	通信错误码	只读，用户程序清除或关机到开机

	Communication error code （见通信错误码一览表） (see communication error code chart)	时清除 Read-only. Cleared by user program or when restarted.

7、 MODBUS 指令

7. MODBUS command

硬件配置与软件设置：

Hardware and software configuration

RS 指令只能用于 COM1 通信，若 D8126=20h，COM1 协议为 MODBUS-RTU 主站（指令）；若 D8126=30h，COM1 协议为 MODBUS-ASC 主站（指令）；

RS command can only be used for COM1 communication. When D8126=20h, COM1 protocol is MODBUS-RTU master (command); when D8126=30h, COM1 protocol is MODBUS-ASC master (command);

协议说明：

Protocol description:

MODBUS 指令对串口 COM1 有效，用户可通过 MODBUS 指令编程，把 PLC 作为主站与 MODBUS 从站设备通信。

MODBUS command is effective for serial port COM1. Users may program using MODBUS command to make PLC as the master to communicate with MODBUS slave devices.

MODBUS 指令有两种，一种符合 MODBUS RTU 协议，一种符合 MODBUS ASC 协议，通过 D8126 确定。用哪种指令由从站所支持的协议格式定，若从站两种协议都支持而用户要求较快速的通信，建议选用 RTU 协议。 两种协议只是通信格式不一样，对用户编程都一样，下面仅就 RTU 协议做说明。

MODBUS command has two types: one conforms with MODBUS RTU protocol, and another conforms with MODBUS ASC protocol, both is confirmed through D8126. Command to be used is determined by the protocol format supported by the slave. If the slave supports both protocols and users require faster communication, RTU protocol is recommended. The user programming of both protocols are the same, and the communication format is the only difference, so only RTU protocol is described below.

MODBUS 指令可以同时存在多条并且全部被驱动，系统内部会协调指令的顺序执行，MODBUS 协议要求无论写还是读，从站均需要有应答（广播除外）。一条 MODBUS 指令可能需要执行较长时间，一般需要多个扫描周期。在一个扫描周期内，指令被驱动，但不一定被执行。

MODBUS command can have multiple executions and function simultaneously. System will coordinate and execute the commands according to their order. Regardless of write or read, MODBUS protocol requires responses (except broadcasting) from slave stations. One MODBUS command requires longer time for execution and normally requires multiple scanning cycles. The command can be initiated in one scanning cycle, but may not necessary be executed.

若存在多条 MODBUS 指令，其执行顺序是这样的：从开机开始，扫描第一条被驱动的 MODBUS 指令，若扫描到，把该 MODBUS 的参数记录下来，在后台执行。执行完后，返回用户程序，从刚执行的 MODBUS 指令位置开始扫描下一条被驱动的 MODBUS 指令并执

行，周而复始。
If multiple MODBUS commands exist, the execution order goes as: starting from startup, scan the first initiated MODBUS command. If scanned, record the MODBUS parameters and execute at the backstage. After the execution, return to the user program and scan for the next initiated MODBUS command at the MODBUS command location that just had been executed. Exeute the command and so on.
指令格式：RS(ADDR&CMD，REGADDR，REGLEN，DATABUF)
Instruction format: RS(ADDR&CMD，REGADDR，REGLEN，DATABUF)
ADDR&CMD：从机地址和 MODBUS 功能码，高 8 位表示从机地址，即目标设备地址。低 8 位表示 MODBUS 功能码，由标准 MODBUS 协议定义，目前支持功能码有 0x01，0x02，0x03，0x04，0x05，0x06，0x0f，0x10。 具体含义请参照标准 MODBUS 协议或目标设备 MODBUS 协议。
ADDR&CMD: slave device address and MODBUS functional codes. The top 8 digits represent the slave address, which is the target device address. The low 8 digits represent the MODBUS functional codes, which are defined by the standard MODBUS protocol. The functional codes supported are: 0x01，0x02，0x03，0x04，0x05，0x06，0x0f，and 0x10. Please refer to standard MODBUS protocol or target device MODBUS protocol for detailed definition.
REGADDR：所要读或写的从机线圈（1 位）或寄存器（16 位）地址，取值参考从机 MODBUS 协议。可为元件或常数
REGADDR：The address of slave coil (one bit) or registers (16bit) which will be read or written, and its value can be referred to slave MODBUS protocol. It can be a component or constant.

REGLEN：所要读写的从机线圈或寄存器个数，可为元件或常数
REGLEN: the number of slave coils or registers to be read/written. It can be components or constants.
DATABUF：只能为 D 元件。本机用于存放数据的起始寄存器，即数据缓冲区。 缓冲区长度与 REGLEN 相关，至少取 1。若 MODBUS 命令为读，指令成功执行完后，把从机数据读到缓冲区中，若 MODBUS 命令为写，把缓冲区发送给从机。 用户在设计程序时需要计算缓冲区长度，预留足够的寄存器作缓冲区。
DATABUF: D component only. Used in the starting register for data storage, the data buffer. The buffer length is relative to REGLEN and should be at least 1. If the MODBUS command is to read, after the command has been successfully executed, read the slave data to the buffer. If MODBUS command is to write, transmit buffer to the slave. User should calculate the buffer length while programming so as to reserve enough registers as buffer.

相关状态标志
Relevant state flag

M8122：MODBUS 指令执行状态指示，OFF 时表示指令执行完毕，ON 时为执行中。 若 M8122 为 OFF，且指令在一个扫描周期内能流有效，M8122 置为 ON，系统将会把指令参数记录下来，转入后台执行该指令的通信要求。 通信执行完后，当再次运行到此指令的位

置时，无论该指令能流是否有效，均会把 M8122 复位为 OFF，立即扫描下一条能流有效的指令，记录指令参数并转入后台执行该指令的通信要求。

M8122: Operation state indication of MODBUS instruction, OFF when the instruction is executed completely, ON when it's executing. If M8122 is OFF and power flow is effective during one scan period of the instruction, then M8122 is set to ON and the system will record the instruction parameter and implement the communication reqirements of this instruction in background. After the communication is completed, when the system executes to the same position of the instruction then M8122 will be reset to OFF no matter whether the instruction power flow is effective or not, and the next power-flow-effective instruction will be scaned immediately and the system will record instruction parameter and implement the communication requirements in background.

M8123：指令通信情况指示，ON 表示通信异常，OFF 表示通信正常；

M8123: command communication status indicator. ON when communication errors, OFF when communication is normal;

M8063：指令错误指示，错误码存于 D8063；

M8063: command error indicator. Error code is saved in D8063;

D8063：错误码（见通信错误码一览表）。

D8063: error codes (see communication error code chart).

注意：

Note：

读写寄存器时，H1U 最大支持一次读写 50 个十六位寄存器。H2U 满足 MODBUS 协议标准要求，最大支持一次读 125 个寄存器，写 120 个寄存器。若读写超出最大值，将报参数错。

When write/read the registers, the maximum number of hexadecimal registers H1U suuports at once is 50. H2U meets the MODBUS protocol standard requirements, in which it supports a maximum of 125 registers for reading, and 120 registers for writing. If the number for read/write exceeds the maximum, parameter error message displays.

读写线圈时，H1U 最大支持一次读写 800 个线圈。H2U 满足 MODBUS 协议标准要求，最大支持一次读 2000 个线圈，写 1968 个线圈。若读写超出最大值，将报参数错。

When reading or writing coils, H1U support a maximum of 800 coils. H2U meets the MODBUS protocol standard requirements, in which it supports a maximum of 2000 coils for reading, and 1968 coils for writing. If the number for read/write exceeds the maximum, parameter error message displays.

例子 1：不断的读从机地址为 100 的寄存器，数据存于 D10。

Example 1: constantly reading a register with a slave address of 100. Data is stored in D10.

初始化：

Initialization:

D8126 = H0020　　设定通信协议为 MODBUS RTU 指令；

D8126 = H0020　　Configure communication protocol to MODBUS RTU command;

D8120 = H0081　　设定 COM1 通信格式为：9600，8N1；

D8120 = H0081　　Configure COM1 communication format to 9600, 8N1;

D0 = H0103　　Addr&Cmd 从机地址为 01 和 MODBUS 命令码为 03，读寄存器；

D0 = H0103 Addr&Cmd slave address is 01, and MODBUS command code is 03, read register;
D1 = H0064 RegAddr 要操作的从机的寄存器地址；
D1 = H0064 RegAddr, the slave register address to be operated;
D2 = H0001 RegLen 要操作的寄存器的个数；
D2 = H0001 RegLen, the number of registers to be operated
D10 Buf 本 PLC 数据缓冲区，本例中读命令通信成功后数据存于 D10。
Buf, data buffer of the PLC. In the example after the read command communication is successful, data is stored in D10.
梯形图如下：
Ladder diagram is as follows:

通信协议设置
Communication protocol configuration

通信格式设置
Communication format configuration

站号和命令
Station number and command

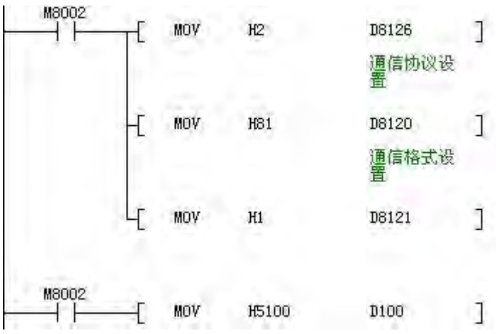
寄存器地址
Register address

寄存器个数
Register number

站号和命令
Station number and command

寄存器地址
Register address

寄存器个数
Number of the registers
通信缓冲区
Communicatino buffer zone

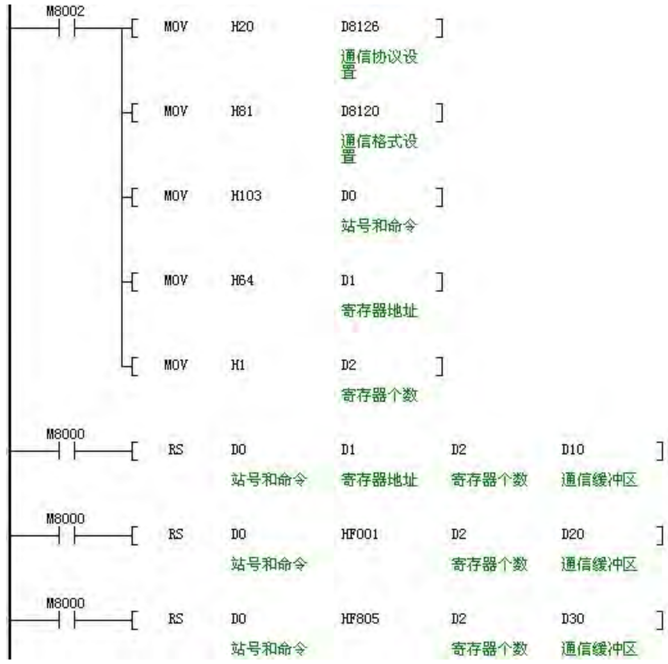
执行结果：开机后，PLC 不断读从机地址为 100 的寄存器，通过 COM1 发送以下一帧数据（16 进制）：01 03 00 64 00 01 C5 D5
Execution result: after booting up, PLC constantly reads registers with a slave address of 100. Through COM1 transmit the next set of data (in hexadecimal): 01 03 00 64 00 01 C5 D5
01：代表从机地址，D0 的高 8 位；
01: slave address, D0's high 8 digits
03：MODBUS 命令码，D0 的低 8 位，意义为读从机寄存器；
03: MODBUS command code, D0's low 8 digits, meaning to read slave registers.
00 64：所要读读从机寄存器地址，D1 的值；
00 64: slave register address to be read, D1's value;
00 01：所要读的寄存器个数，D2 的值；
00 01: register number to be read, D2's value
C5 D5：CRC 校验码。
C5 D5: CRC check code
若从机也是 H1U/H2U 系列 PLC，设定为 MODBUS RTU 从站协议，梯形图如下：
If slave is also a H1U/H2U series PLC, configure it to MODBUS RTU slave protocol. The ladder diagram is as follows:


通信协议设置
Communication protocol configuration

通信格式设置
Communication format configuration

从机正确响应数据帧（16 进制）：01 03 02 51 00 85 D4
Slave responds data correctly (in hexadecimal): 01 03 02 51 00 85 D4
从机把 D100（寄存器地址为 H0064）发给主机：
Slave transmits D100 (register address as H0064) to the master:
01：代表从机地址；
01: slave address

03：MODBUS 命令码；
03: MODBUS command code
02：表示回复 2 个字节的有效数据；
02: valid data for restoring 2 bytes;
51 00：寄存器数据，即 D100 的值；
51 00: register data, D100 value
85 D4：CRC 校验码。
85 D4: CRC check code
例子 2：用三条 MODBUS 指令，分别的读从机地址为 H0064，F001 和 F805 的寄存器，数据存于 D10，D20 和 D30 中。
Example 2: use three MODBUS commands to read registers with slave addresses as H0064, F001, and F805, and save the data in D10, D20, and D30.

梯形图如下：
Ladder mode:


通信协议设置
Communication protocol configuration

通信格式设置
Communication format configuration

站号和命令
Station number and command

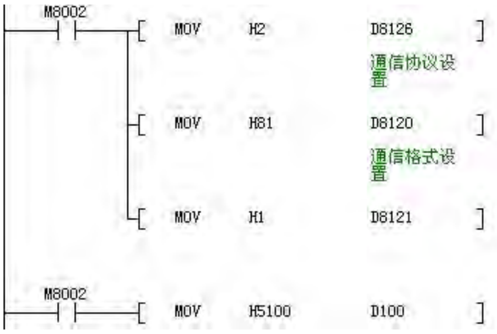
寄存器地址
Register address

寄存器个数

Register number

通信缓冲区
Communicatino buffer zone

执行结果，PLC 通过串口 COM1 依次循环发送以下三帧数据（16 进制）：
Execution result. PLC transmits in order the following three frames of data (in hexadecimal) through the serial port COM1:
01 03 00 64 00 01 C5 D5
01 03 F0 01 00 01 E6 CA
01 03 F8 05 00 01 A5 6B
回复：从机仍然是 H1U/H2U 系列 PLC，设定为 MODBUS RTU 从站协议，梯形图如下：
Reply: slave is still the H1U/H2U series PLC, with configuration of MODBUS RTU slave protocol. Ladder diagram is as follows:



通信协议设置
Communication protocol configuration

通信格式设置
Communication format configuration

从机响应：
Slave Response:
对第一帧数，从机响应数据帧为（16 进制）：01 03 02 51 00 85 D4
First frame: slave responds to the data frame (in hexadecimal) of: 01 03 02 51 00 85 D4
意义是：从机把 D100（D100 寄存器的地址为 H0064）的值 H5100 发给主机；
Meaning: slave transmits the value, H5100, from D100 (D100 register’s address is H0064) to the master;
对第二帧数，从机响应数据帧为（16 进制）：01 03 02 00 00 B8 44
Second frame: slave responds to the data frame (in hexadecimal) of: 01 03 02 00 00 B8 44
意义是：从机把 T1（T1 寄存器地址为 F001，参见附录 5.4《H 系列 PLC 内置 MODBUS 从站通讯协议说明》）的值 H0000 发给主机；
Meaning: slave transmits the value of H0000 of T1 (T1 register address is F001. See Appendix 5.4 “H Series PLC Built-in MODBUS Slave Communication Protocol

Description")to the master;
对第三帧数，从机响应数据帧为（16 进制）：01 83 02 C0 F1
Third frame: slave responds to the data frame (in hexadecimal) of: 01 83 02 C0 F1
意义是：读寄存器错误。
Meaning: register read error
01：从站地址；
01: slave address
83：读寄存器错误；
83: register read error;
02：错误码，地址错误，原因是地址 HF805 的寄存器不存在；
02: error code, address error, because register with HF805 address does not exist;
C0 F1：CRC 校验码。
C0 F1: CRC check code.

5.13 CAN 通讯说明

5.13 CAN Communication Description

概述

Introduction

H1U/H2U 系列 PLC 具有 CAN 通信功能，硬件上需要配置 CAN 通讯卡。在 PLC 主模块上，可支持自由 CAN 通信指令，可支持远程模块访问指令 FROM/TO，同时支持 CAN-LINK 网络功能。

H1U/H2U Series PLC possesses the CAN communication feature, which requires the installation of CAN communication card on the PLC main module. It supports free CAN communication commands, remote module access command FROM/TO, and CAN-LINK network function.

CAN-LINK 是汇川控制技术公司开发的基于 CAN 总线的网络协议，该协议是一个开放的协议，支持该协议的设备均可接入 CAN-LINK 网络。

CAN-LINK is a network protocol developed by Inovance Control Technology Co., Ltd. based on CAN bus. The protocol is an open protocol. All devices support the protocol can be connected to CAN-LINK network.

H1U/H2U 系列 PLC 及其远程扩展模块均可以支持 CAN-LINK 协议，CAN-LINK 组网设备数量最大可达 63 台。

H1U/H2U Series PLC and its remote expansion module both support CAN-LINK protocol. CAN-LINK supports a maximum number of 63 units of networking devices.

关键词

Keywords

CAN-LINK：汇川控制技术公司开发的基于 CAN 总线的网络协议，该协议是一个开放的协议，支持该协议的设备均可接入 CAN-LINK 网络。

CAN-LINK: a network protocol developed by Inovance Control Technology Co., Ltd. based on CAN bus. The protocol is an open protocol. All devices support the protocol can be connected to CAN-LINK network.

CAN-LINK 网络管理主机：CAN-LINK 协议是不存在主从之分的，但需要有一台或多台设备负责配置和管理 CAN-LINK 网络，承担 CAN-LINK 网络配置和管理功能的设备称为 CAN-LINK 网络管理主机，同一个 CAN-LINK 网络可以有多台网络管理主机。

CAN-LINK network management host: there is no master or slave differentiation in CAN-LINK protocol. However, one or multiple units are required for CAN-LINK network configuration and management. Devices used for CAN-LINK network configuration and management is called CAN-LINK network management host. Multiple network management hosts can exist in one CAN-LINK network.

CAN-LINK 网络设备：满足 CAN-LINK 协议，并接入 CAN-LINK 网络的设备均称为 CAN-LINK 网络设备。

CAN-LINK network device: device that meets CAN-LINK protocol, and is connected to CAN-LINK network is called CAN-LINK network device.

自由 CAN 通信指令：H1U/H2U 控制器均支持自由 CAN 通信指令，用户可通过指令编程，实现与具有 CAN 通信功能的设备之间的通信。具体指令名称为 CAN 发送指令：CANTX；CAN 接收指令：CANRX。

Free CAN communication command: H1U/H2U controller supports free CAN communication command. Users can realize communications between CAN communication enabled devices through command programming. The specific command name is CAN transmitting command: CANTX; CAN receiving command: CANRX.

远程模块访问指令：H1U/H2U 控制器支持远程模块、远程 PLC 的访问指令，通过远程模块访问指令可实现对远程模块的读写。具体指令名称为读指令：FROM；写指令：TO。兼容本地扩展模块的读写指令。其它满足 CAN 远程访问协议的设备也可以用此两条指令访问。

Remote module access command: H1U/H2U controller supports the accessing command for remote module and remote PLC. Through the remote module accessing command, read or write operation for remote module can be realized. The specific command name is read command: FROM; write command: TO. The read/write command is compatible to the local expansion module. Other devices that meets the CAN remote access protocol can also use these two commands to acccess.

CAN-LINK 网络

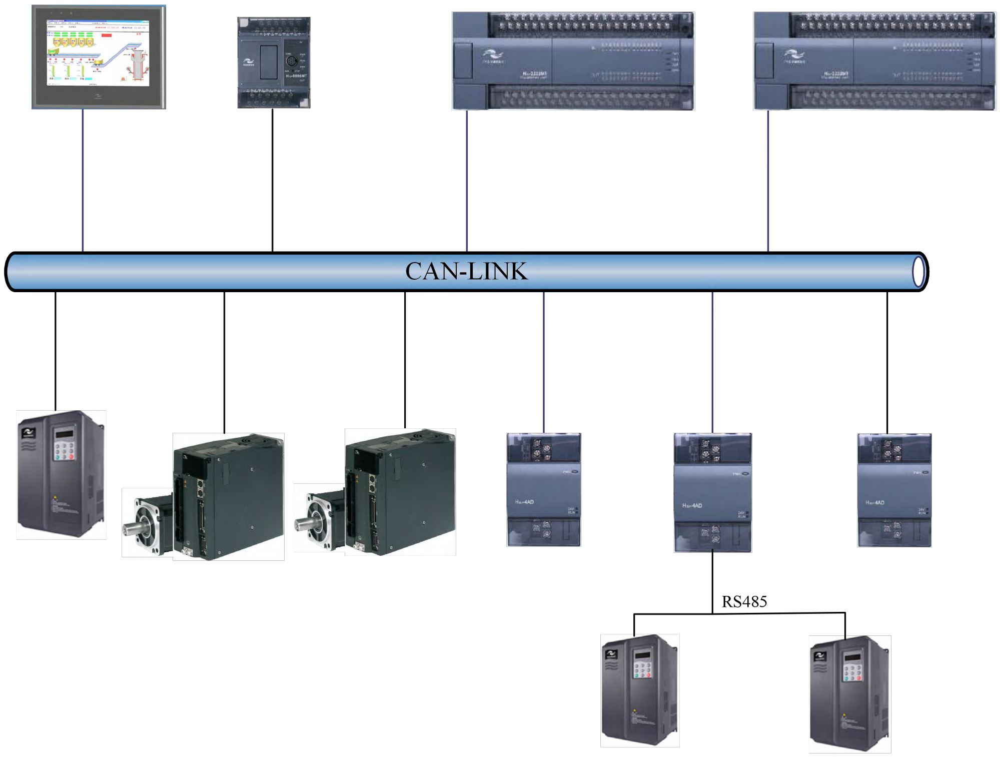
CAN-LINK network

硬件接口

Hardware interface

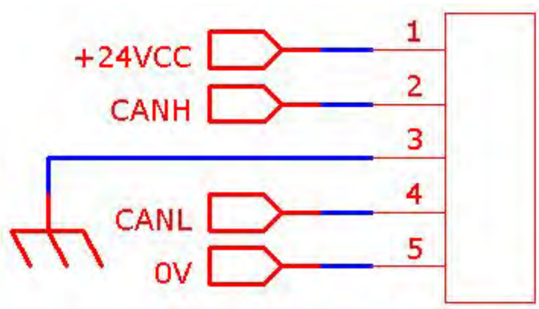
CAN-LINK 网络示意图：

CAN-LINK network illustration:



H1U/H2U CAN 扩展卡接口定义：

H1U/H2U CAN expansion card interface definition:



CAN-LINK 接口引脚定义：

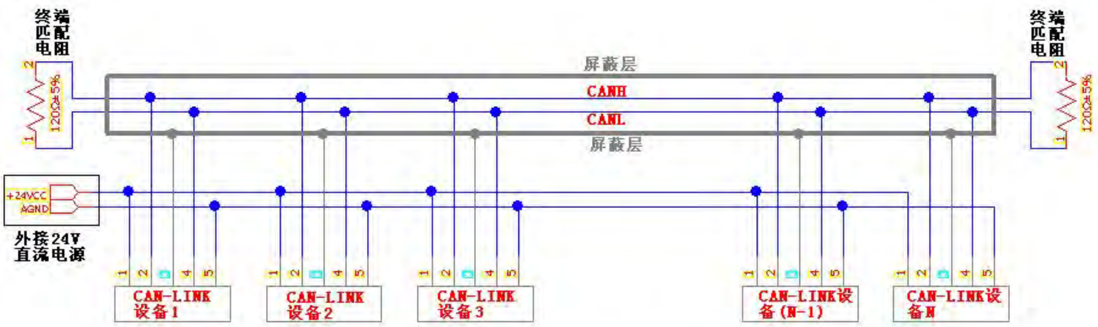
CAN-LINK interface pin definition:

管脚号 Pin no.	信号 Signal	描述 Description
1	＋24Vcc	外接直流 24V 供电电源正 Positive external DC 24V power supply

2	CANH	CAN 总线正 Positive CAN bus
3	PGND	屏蔽地线，接通信电缆屏蔽层 Shielded ground, connect to communication cable shielding layer
4	CANL	CAN 总线负 Negative CAN bus
5	0V	外接直流 24V 供电电源负 Negative external DC 24V power supply

组成 CAN-LINK 网络时，所有设备的以上五根线均要一一对应连在一起。并且＋24Vcc 和 0V 间需要外接 24V 直流电源。总线的两端均要加 120 欧姆的 CAN 总线匹配电阻。CAN-LINK 接线图如图所示：

When establishing a CAN-LINK network, all devices' five wires must be connected correspondingly. Also, external 24V DC power supply must be connected between +24VCC and 0V. 120Ohms of CAN bus matching resistor must be added on both ends of the bus. CAN-LINK wiring is illustated below:



中断匹配电阻

Interrupt matching resistor

外接 24V 直流电源

External 24V DC power supply

屏蔽层

Shield

设备 1

Device 1

设备 2

Device 2

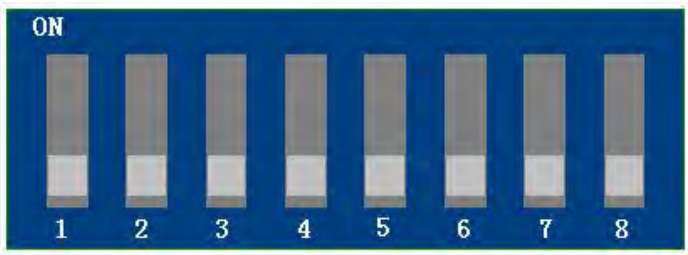
设备 3
Deviece 3

设备（N-1）
Device (N-1)

设备 N
Device N

多台设备组成 CAN-LINK 网络接线图
CAN-LINK network wiring composed of multiple devices

H1U/H2U 远程扩展卡和 CAN 接口卡均内置了匹配电阻，可通过拨码开关接入或断开。标准的拨码开关定义如下：
Both H1U/H2U remote expansion card and CAN interface card have built-in matching resistor. It can be connected or disconnected using DIP switch. Standard DIP switch is defined as:



CAN-LINK 拨码开关
CAN-LINK DIP Switch
CAN-LINK 拨码开关定义
CAN-LINK DIP Switch Definition

拨码号 DIP No.	信号 Signal	描述 Description
1	地址线 A1 Address line A1	此六位拨码开关由高到低组合成一个六位二进制数字，用来标识本机站号（若为 PLC 主模块，还可以通过 D 元件设置站号）。“ON”表示 1，“OFF”表示 0。高位在高，低位在低。按以下方式组合：A6A5A4A3A2A1。比如 A1＝ON，其它位为 OFF，即二进制地址为：000001，十进制为 K01，16 进制为 h01。若 A5，A4 都为 ON，其它为 OFF，即二进制地址为：011000，十进制为 K24，16 进制为 h18。 These six DIP switches from top to bottom make up six binary digits used to mark station numbers (if it is the PLC main module, station number can be configured through D component). “ON”
2	地址线 A2 Address line A2	
3	地址线 A3 Address line A3	
4	地址线 A4	

	Address line A4	represents 1 and “OFF” 0. They are composed according the following method: A6A5A4A3A2A1. For instance, when A1=ON and other digits are OFF, the binary address becomes 000001, K01 for decimal and h01 for hexadecimal. When A5 and A4 are ON and others are OFF, the binary address becomes 011000, K24 for decimal and h18 for hexadecimal.
5	地址线 A5 Address line A5	
6	地址线 A6 Address line A6	
7	波特率 Baud rate	OFF：高速模式，波特率 500Kbps，ON：低速模式，波特率 100Kbps OFF: high-speed mode. Baud rate is 500Kbps; ON: low-speed mode, Baud rate is 100Kbps.
8	匹配电阻 Matching Resistor	若拨码开关为 ON，表示接入 120 欧姆的终端匹配电阻，否则断开 If DIP switch is ON, it means a terminal matching resistor of 120ohms is connected, or it will disconnect.

若改变拨码开关，除匹配电阻外，波特率和地址并不能立即生效，需要给系统重新上电才可能使用新的设置参数。

When DIP switches are modified, besides the matching resistor, Baud rate and addresses will not take effect immedately. The system needs to restart in order to adopt the new configuration parameters.

CAN-LINK 软件配置

CAN-LINK software configuration

系统通过以下步骤完成 CAN-LINK 网络的配置

System completes CAN-LINK network configuration with following steps

通过 AUTOSHOP 完成 CAN-LINK 网络组态，定义需要交换的数据。

Complete CAN-LINK network configuration through AUTOSHOP, and define data needed exchange.

把配置信息下载到 H2U 或 H1U 系列 PLC 中。

Download configuration information to H2U or H1U Series PLC.

所有 PLC 等可编程设备均要启动 CAN-LINK 网络功能，若非特殊说明，H1U/H2U 系列扩展模块默认是启用 CAN-LINK 功能的，不需要特殊的设置。并且，在有 CAN-LINK 配置的 PLC 中，需要通过用户程序启动 CAN-LINK 网络配置。

All PLCs need to turn CAN-LINK network function on. Unless stated otherwise, H1U/H2U Series expansion modules have CAN-LINK activated as default and not special configuration is required. Also, in PLCs with CAN-LINK configuration, user program is used to activate CAN-LINK network configuration.

CAN-LINK 网络组态

CAN-LINK network configuration

CAN-LINK 网络组态有两种方式，绘图式、填表式或指令编写。绘图式比较直观，填表式即较为简单，指令编写即需要用户用 CANTX 编写满足 CAN-LINK 配置帧的用户程序。以下简单介绍一下绘图式，更详细的操作请参见 AUTOSHOP 软件使用说明。

CAN-LINK network configuration has three types: drawing, form, and command programming. Drawing is for straight viewing, form is for its simplicity, and command programming requires users to use CANTX to compile user programs that meets

CAN-LINK configurations. Drawing style will be briefly introduced here. For more detailed operation, please refer to software instruction in AUTOSHOP User Manual.

在 AUTOSHOP 软件中，点击新建 CAN-LINK 网络，系统将出现一条 CAN-LINK 总线，然后增加设备，把需要组成 CAN-LINK 网络的设备拖进来，若系统中没有该设备，可以增加其它设备。CAN-LINK 网络如图 1。

Click Establich a new CAN-LINK network in the AUTOSHOP software. System will show a CAN-LINK bus and increase devices. Drag all required CAN-LINK device components into the bus. If there is such device is shown in system, click add other devices. CAN-LINK network is as Illustration 1.

在 CAN-LINK 网络系统中，需要指定一台网络管理主机，网络管理主机一般是 PLC。当然，若其它设备支持 CAN-LINK 网络管理，也可指定该设备做网络管理主机。

In the CAN-LINK network system, one network management host needs to be assigned. Generally speaking, a PLC is assigned as a network management host. Of course, if other devices also support CAN-LINK network management, it can also be assigned as the network management host.

接着设定每台机器的地址，注意，该地址必须与物理地址对应，即必须与拨码开关地址或通过其它手段设定的地址对应，CAN-LINK 网络目前仅支持 6 位二进制地址，网络最大支持 64 台设备。

Configure address for each device. NOTE: the address must correspond to the physical address, which means it must corresponds to the DIP switch address or address configured through other means. CAN-LINK network currently supports 6 binary addresses. The network supports a maximum number of 64 devices.

设定地址后，设定每台设备提供的服务，每条服务信息包括：本机服务内容及数量，服务对象站号，服务对象存储该内容的寄存器起始地址，服务信息发送间隔时间。

After addresses are configured, set up the services each device will provide. Every service information includes: device service content and amount, service target station number, register's start address for the service target to save its content, service message transmission interval.

配置完成后，把配置信息下载到所指定得网络管理主机中。

After configuration is complete, download configuration information to the assigned network management host.

CAN-LINK 网络监控与运行

CAN-LINK network monitoring and operation

CAN-LINK 的网络管理是在网络管理主机上完成的，若此网络主机下载有配置信息，即可执行网络监控功能。

CAN-LINK network management is achieved on the network management host. When the host downloaded with configuration information, network monitoring can be execuated immediately.

PLC 在第一次运行时初始化 CAN 硬件的，硬件初始化后 PLC 才能接入 CAN-LINK 网络，也就是说 PLC 必须在运行后才能执行网络监控命令。

CAN hardware is initialized when PLC is running for the first time. PLC can only connect to CAN-LINK network after the hardward has been initialized. In other words, PLC can only execute network monitoring command after in operation.

D8246.1：更新网络配置，用本机的配置信息覆盖原来的配置信息，若通过 CANTX 指令配

置网络，不需要使用该命令。
D8246.1: update network configuration. Write over the original configuration information with local configuration information. If CANTX command is used to configure the network, this command is not necessary.
D8246.2：在原来配置的接触上增加配置信息，此命令一般用于具有多台网络管理主机时使用。此命令要慎用，特别是不能重复执行，否则会造成网络配置信息不断增加，从而造成网络通信量增加，最终可能造成网络通信量过重而使得 CAN-LINK 网络通信缓慢。
D8246.2: place additional configuration information on the contacts of the original configuration. Generally speaking, this command is used when there are multiple network management hosts. The command must be used with cautions, especially when it cannot be repeated, or it may cause sharp increase in network configuration information and communication, and result in slow CAN-LINK network communication due to infomration overload.
网络配置命令执行后，CAN-LINK 网络将自动执行，各设备开始自动交互数据。
After network configuration command is executed, CAN-LINK network will initiate automatically and devices will start exchanging data.
CAN 指令
CAN Command
远程扩展模块访问指令
Remote expansion module access command
通过扩展模块指令，可读写通过 CAN 连接的远程扩展模块（需要扩展模块支持）和远程 PLC。该指令兼容本地扩展模块访问指令。
By using expansion module commands, remote expansion module (requires expansion module supports) and remote PLC connected with CAN can now be read or written. The command is compatible with local expansion module access command.
硬件接口参考 1.1。
Hardware interface refers to 1.1.
指令格式如下：
Command format is as follows:
读模块数据指令：FROM(M1，M2，D，n)
Module data read command: FROM (M1, M2, D, n)
写模块数据指令：TO(M1，M2，D，n)
Module data write command: TO (M1, M2, MD, n)
参数说明：
Parameter description:
M1：大于 100 表示 CAN 远程模块，模块地址＋100。小于 100 表示本地扩展模块。
M1: indicates CAN remote module when greater than 100, module address +100. Indicates local expansion module when less than 100.
M2：模块寄存器地址。对扩展模块来说是 BFM 地址，对 PLC 来说是 D 元件序号。
M2: module register address. To a expansion module it is a BFM address; to a PLC it is a D component serial number.
D：PLC 通信缓冲区。若为 FROM 指令，即把指定地址的模块的指定寄存器读到此缓冲区中；若为 TO 指令，即把此缓冲区的数据写入到指定地址的模块的指定寄存器中。
D: PLC communication buffer. If FROM command is used, assigned register in the

assigned address module will be read to the buffer; if TO command is used, data in buffer is written to the assigned register in the assigned address module.

n:表示读写的寄存器（BFM 区）个数

n: indicates the number of read/write registers (BFM area)

指令执行说明：该指令被驱动后，马上通过 CAN 对外部模块发送一帧数据，等待外部模块响应，若在规定时间（D8241 设定，以 ms 为单位）收到外部模块的正确响应数据，指令执行正常并更新数据，否则报错。若是超时，M8192 将置位。

Command instruction: after the command is initiated, a frame of data will be transmitted through CAN to an external module and wait for response. If correct response data from the external module is received within the specified time (set by D8241, ms as unit), command will run and update the data, or an error message will show. When it is timeout, M8192 will be reset.

CAN 自由指令

CAN free command

CAN 自由指令目的是方便用户与不满足 CAN-LINK 协议或远程扩展模块访问协议的设备通信用，通过该指令，用户可编写任意 CAN 通信用户协议。

The purpose of the CAN free command is to provide users the convenience of programming any CAN communication user protocol through the command when CAN-LINK protocol cannot meet the demands, or when it is required for remote expansion module access protocol communications.

CAN 数据发送指令

CAN data transmission command

指令格式：CANTX(Addr1，Addr0，D，n)

Command format: CANTX (Addr1, Addr0, D, n)

Addr1,Addr0：CAN 标识符（地址）

Addr1, Addr0: CAN marks (address)

Addr1,bit15：保留

Addr1,bit15: reserved

Addr1,bit14：保留

Addr1,bit14: reserved

Addr1,bit13：CAN 标识符位数设定。“0”表示标准 CAN 标识符（11 位标识符），“1”表示扩展 CAN 标识符（29 位标识符）。若为 11 位标识符，Addr0 的低 11 位表示标识符。若为 29 位标识符，Addr0 表示低 16 位标识符，Addr1 的 0~12 位表示高 13 位标识符。

Addr1,bit13: CAN identifier digit set. “0” indicates the standard CAN identifier (11bit identifier), “1” indicates expansion CAN identifier (29bit identifier). When 11bit identifier is in place, Addr0’s low 11bit represents the identifier. If 29bit identifier is in place, Addr0 represents the low 16bit identifier, and Addr1’s 0~12bit represents the high 13bit identifier.

D：发送缓冲区，D 元件。从该 D 元件开始的最大 4 个 D 元件作为发送缓冲区。

D: transmission buffer, D component. The greatest 4 D components starting from D component are used as transmission buffer.

n：发送数据个数，以字节为单位，最大为 8。

n: number of transmission data, unit in byte, maximum is 8.

CAN 数据发送指令是立即执行的，若 3ms 内没有发送成功，将报 6380 故障；若 CAN 忙，将报 6382 故障。

CAN data transmission command functions immediately. Within 3ms if transmission is not successful, error code 6380 will be reported; if CAN is busy, error code 6382 will be reported.

举例 1：10ms 发送一组数据，缓冲区为 D10~13，D0 存发送的字节数

Example 1: one group of data is transmitted in 10ms, buffer zone is D10~13, D0 saves the transmitted byte number.

CAN 指令

CAN Command

若 D0 = k8，D10 = h1234，D11 = h5678，D12 = h9ABC，D13 = hDEF0

If D0 = k8，D10 = h1234，D11 = h5678，D12 = h9ABC，D13 = hDEF0

发送的数据如下表：

then the transferred data is shown in following table:

第一字节 1st byte	第二字节 2nd byte	第三字节 3rd byte	第四字节 4th byte	第五字节 5th byte	第六字节 6th byte	第七字节 7th byte	第八字节 8th byte
h12	h34	h56	h78	h9A	hBC	hDE	hF0

若接收端字节从高到低，CAN 接收数据寄存器 MDL =h12345678，MDH = h9ABCDEF0

If the data is received from high byte to low byte, then the received data register of CAN communication will be MDL =h12345678，MDH = h9ABCDEF0

若 D0 = 1，只发送一个字节：h12

If D0 = 1, one byte transmitted only: h12

若 D0 = 3，发送前三个字节：h12，h34，h56

If D0 = 3, first three bytes are transmitted: h12, h34, h56

依次类推。

So on forth.

举例 2：

Example 2:

通过 CANTX 配置 CAN-LINK 网络，假设有 7 台 PLC 组成一个 CAN-LINK 网络，站号从 1~7。

Configure CAN-LINK network through CANTX. If there are 7 PLC in one CAN-LINK network, the station number starts from 1~7.

要求：

Requirements:

1、通过 CANTX 指令来配置 CAN-LINK 网络。

1. Configure CAN-LINK network using CANTX command.

2、所有 PLC 的 D110~D179 的数据相同，其中 D110～D119 由 1#PLC 更新，D120～D129 由 2#PLC 更新，……，D170～D179 由 7#PLC 更新

2. All PLCs have same data in D110~D137. Among them, D110~D119 are updated by 1#PLC; D120~D129 are updated by 2#PLC; D170~D179 are updated by 7#PLC.

分析：

Analysis:

由于 CANTX 指令无法发数据给本 PLC，所以要在两台 PLC 中，通过 CANTX 指令配置 CAN-LINK 网络。本例通过 1#PLC 配置 2#～7#PLC，通过 2#PLC 配置 1#PLC。需要在 1#PLC 和 2#PLC 上编写一段配置程序。其它 PLC 不需要配置程序。

Because CANTX command cannot transmit data to the PLC, therefore, CANTX command is needed to configure CAN-LINK network in two PLCs. In this example, 2#~7#PLC are configured through 1#PLC, and 1#PLC is configured through 2#PLC. One configuration program needs to be written between 1#PLC and 2#PLC. Other PLCs do not require configuration program.

由于 CAN-LINK 是采用 1 对 1 的通信方式，即任一台 PLC 需要给另 6 台 PLC 分别发数据，每台发送数据量为 10 个 16 位数据，CAN-LINK 一帧最多只能发送 2 个 16 位数据，所以需要给每台 PLC 发送 5 帧数据，即任一台机器需要发送的数据帧总数为 5×6＝30 帧，CAN-LINK 总线上总帧数为 30×7＝210 帧，使用 500K 波特率，一帧数据所用时间大约是 300us，所以更新一次数据一共需要 300us×210＝63ms。为避免总线过分拥挤，取 100ms 刷新一次数据比较合理。

CAN-LINK uses 1-to-1 communication method, which means any one PLC transmits data to six other PLCs separately. Every PLC’s data transmission amount is 10 16-bit data. In one CAN-LINK a maximum of 2 16-bit data can be transmitted. Therefore, every PLC needs to transmit five frames of data, which means the total data frames one PLC needs transmit is 5x6=30 frames. On the CAN-LINK bus, the total frame number is 30 x 7 = 210 frames. If 500K Baud rate is used, the time required to transmit one frame of data is approximately 300us. Therefore, it totals up to 300us x 210 = 63ms when updating data. In order to prevent bus overloaded, it is more reasonable to refresh data every 100ms.

编程：

Programming:

1#PLC 编程

1#PLC Programming

配置 2#PLC，服务接收站起始寄存器为 D120；服务提供站起始寄存器也是 D120，寄存器个数为 10，时间间隔为 100ms，服务发送站号为 2，服务接收站号分别为 1,3,4,5,6,7。取 D10~D13 作为 CANTX 发送缓冲区。即有

Configure 2#PLC, and the start register in a service receiving station is D120; service providing station’s start register is also D120. Regiser number is 10 and the time interval is 100ms. Service transmitting station number is 2, and service receiving station numbers are 1, 3, 4, 5, 6, 7. Select D10~D13 as CANTX transmission buffer zone:

MOV K120 D10 //服务接收站起始寄存器

// service receiving station start register

MOV K120 D11 //服务提供站起始寄存器

// service providing station start register

MOV HA06 D12 //h0a 为寄存器个数（10），06 为时间间隔高位（h64）

//h0a is the number of registers (10), 06 is the time interval high bit (h64)

MOV H4042 D13 //h4 为时间间隔低位（h64），h042 展开为二进制为 0000,01;00,0010。分号前的 6 位表示 1#站为服务接收站，分号后的 6 位表示 2#站为服务提供站。只需要改变服务接收站分别为 1,3,4,5,6,7 即可。

//h4 is the time interval low bit (h64), h042 expands to binary format as 0000, 01;00, 0010. The six digits before the semicolon represents 1# station, service receiving station. The six sigits after the semicolon represents 2# station, service providing station. It only needs to change the service receiving station numbers to 1, 3, 4, 5, 6, 7.

```
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 1#站
                                  // configure 2# station to transmit data to 1# station.
ADD          H40 D13 D13
ADD          H40 D13 D13
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 3#站
                                  // configure 2# station to transmit data to 3# station.
ADD          H40 D13 D13
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 4#站
                                  // configure 2# station to transmit data to 4# station.
ADD          H40 D13 D13
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 5#站
                                  // configure 2# station to transmit data to 5# station.
ADD          H40 D13 D13
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 6#站
                                  // configure 2# station to transmit data to 6# station.
ADD          H40 D13 D13
CANTX        H0 H502 D10 K8      //配置 2#站发送数据给 7#站
                                  // configure 2# station to transmit data to 7# station.
```

同理，配置 3#~7#PLC 梯形图

Similarly, configure 3#~7# PLC Ladder Diagram

```
MOV          K130 D10
MOV          K130 D11
MOV          HA06 D12
MOV          H4043 D13
CANTX        H0 H503 D10 K8
ADD          H40 D13 D13
CANTX        H0 H503 D10 K8
ADD          H40 D13 D13
ADD          H40 D13 D13
CANTX        H0 H503 D10 K8
ADD          H40 D13 D13
CANTX        H0 H503 D10 K8
ADD          H40 D13 D13
CANTX        H0 H503 D10 K8
ADD          H40 D13 D13
CANTX        H0 H503 D10 K8
MOV          K140 D10
MOV          K140 D11
```

```
MOV     HA06 D12
MOV     H4044 D13
CANTX   H0 H504 D10 K8
ADD     H40 D13 D13
CANTX   H0 H504 D10 K8

ADD     H40 D13 D13
CANTX   H0 H504 D10 K8
ADD     H40 D13 D13
ADD     H40 D13 D13
CANTX   H0 H504 D10 K8
ADD     H40 D13 D13
CANTX   H0 H504 D10 K8
ADD     H40 D13 D13
CANTX   H0 H504 D10 K8
MOV     K150 D10
MOV     K150 D11
MOV     HA06 D12
MOV     H4045 D13
CANTX   H0 H505 D10 K8
ADD     H40 D13 D13
CANTX   H0 H505 D10 K8
ADD     H40 D13 D13
CANTX   H0 H505 D10 K8
ADD     H40 D13 D13
CANTX   H0 H505 D10 K8
ADD     H40 D13 D13
ADD     H40 D13 D13
CANTX   H0 H505 D10 K8
ADD     H40 D13 D13
CANTX   H0 H505 D10 K8
MOV     K160 D10
MOV     K160 D11
MOV     HA06 D12
MOV     H4046 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
```

```
ADD     H40 D13 D13
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
MOV     K170 D10
MOV     K170 D11
MOV     HA06 D12
MOV     H4047 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
```

2#PLC 编程
2#PLC Programming

CAN-LINK 软件配置
CAN-LINK software configuration
系统通过以下步骤完成 CAN-LINK 网络的配置
System completes CAN-LINK network configuration with following steps
通过 AUTOSHOP 完成 CAN-LINK 网络组态，定义需要交换的数据。
Complete CAN-LINK network configuration through AUTOSHOP, and define data needed exchange.
把配置信息下载到 H2U 或 H1U 系列 PLC 中。
Download configuration information to H2U or H1U Series PLC.
所有 PLC 等可编程设备均要启动 CAN-LINK 网络功能，若非特殊说明，H1U/H2U 系列扩展模块默认是启用 CAN-LINK 功能的，不需要特殊的设置。并且，在有 CAN-LINK 配置的 PLC 中，需要通过用户程序启动 CAN-LINK 网络配置。
All PLCs need to turn CAN-LINK network function on. Unless stated otherwise, H1U/H2U Series expansion modules have CAN-LINK activated as default and not special configuration is required. Also, in PLCs with CAN-LINK configuration, user program is used to activate CAN-LINK network configuration.
CAN-LINK 网络组态
CAN-LINK network configuration
CAN-LINK 网络组态有两种方式，绘图式、填表式或指令编写。 绘图式比较直观，填表式即较为简单，指令编写即需要用户用 CANTX 编写满足 CAN-LINK 配置帧的用户程序。 以下简单介绍一下绘图式，更详细的操作请参见 AUTOSHOP 软件使用说明。\
CAN-LINK network configuration has three types: drawing, form, and command

programming. Drawing is for straight viewing, form is for its simplicity, and command programming requires users to use CANTX to compile user programs that meets CAN-LINK configurations. Drawing style will be briefly introduced here. For more detailed operation, please refer to software instruction in AUTOSHOP User Manual.

在 AUTOSHOP 软件中，点击新建 CAN-LINK 网络，系统将出现一条 CAN-LINK 总线，然后增加设备，把需要组成 CAN-LINK 网络的设备拖进来，若系统中没有该设备，可以增加其它设备。 CAN-LINK 网络如图 1。

Click Establich a new CAN-LINK network in the AUTOSHOP software. System will show a CAN-LINK bus and increase devices. Drag all required CAN-LINK device components into the bus. If there is such device is shown in system, click add other devices. CAN-LINK network is as Illustration 1.

在 CAN-LINK 网络系统中，需要指定一台网络管理主机，网络管理主机一般是 PLC。 当然，若其它设备支持 CAN-LINK 网络管理，也可指定该设备做网络管理主机。

In the CAN-LINK network system, one network management host needs to be assigned. Generally speaking, a PLC is assigned as a network management host. Of course, if other devices also support CAN-LINK network management, it can also be assigned as the network management host.

接着设定每台机器的地址，注意，该地址必须与物理地址对应，即必须与拨码开关地址或通过其它手段设定的地址对应，CAN-LINK 网络目前仅支持 6 位二进制地址，网络最大支持 64 台设备。

Configure address for each device. NOTE: the address must correspond to the physical address, which means it must corresponds to the DIP switch address or address configured through other means. CAN-LINK network currently supports 6 binary addresses. The network supports a maximum number of 64 devices.

设定地址后，设定每台设备提供的服务，每条服务信息包括：本机服务内容及数量，服务对象站号，服务对象存储该内容的寄存器起始地址，服务信息发送间隔时间。

After addresses are configured, set up the services each device will provide. Every service information includes: device service content and amount, service target station number, register’s start address for the service target to save its content, service message transmission interval.

配置完成后，把配置信息下载到所指定得网络管理主机中。

After configuration is complete, download configuration information to the assigned network management host.

CAN-LINK 网络监控与运行

CAN-LINK network monitoring and operation

CAN-LINK 的网络管理是在网络管理主机上完成的，若此网络主机下载有配置信息，即可执行网络监控功能。

CAN-LINK network management is achieved on the network management host. When the host downloaded with configuration information, network monitoring can be execuated immediately.

PLC 在第一次运行时初始化 CAN 硬件的，硬件初始化后 PLC 才能接入 CAN-LINK 网络，也就是说 PLC 必须在运行后才能执行网络监控命令。

CAN hardware is initialized when PLC is running for the first time. PLC can only connect to CAN-LINK network after the hardward has been initialized. In other words, PLC can

only execute network monitoring command after in operation.
D8246.1：更新网络配置，用本机的配置信息覆盖原来的配置信息，若通过 CANTX 指令配置网络，不需要使用该命令。
D8246.1: update network configuration. Write over the original configuration information with local configuration information. If CANTX command is used to configure the network, this command is not necessary.
D8246.2：在原来配置的接触上增加配置信息，此命令一般用于具有多台网络管理主机时使用。此命令要慎用，特别是不能重复执行，否则会造成网络配置信息不断增加，从而造成网络通信量增加，最终可能造成网络通信量过重而使得 CAN-LINK 网络通信缓慢。
D8246.2: place additional configuration information on the contacts of the original configuration. Generally speaking, this command is used when there are multiple network management hosts. The command must be used with cautions, especially when it cannot be repeated, or it may cause sharp increase in network configuration information and communication, and result in slow CAN-LINK network communication due to infomration overload.
网络配置命令执行后，CAN-LINK 网络将自动执行，各设备开始自动交互数据。
After network configuration command is executed, CAN-LINK network will initiate automatically and devices will start exchanging data.
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通过扩展模块指令，可读写通过 CAN 连接的远程扩展模块（需要扩展模块支持）和远程 PLC。该指令兼容本地扩展模块访问指令。
By using expansion module commands, remote expansion module (requires expansion module supports) and remote PLC connected with CAN can now be read or written. The command is compatible with local expansion module access command.
硬件接口参考 1.1。
Hardware interface refers to 1.1.
指令格式如下：
Command format is as follows:
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Module data read command: FROM (M1, M2, D, n)
写模块数据指令：TO(M1，M2，D，n)
Module data write command: TO (M1, M2, MD, n)

参数说明：
Parameter description:
M1：大于 100 表示 CAN 远程模块，模块地址＋100。小于 100 表示本地扩展模块。
M1: indicates CAN remote module when greater than 100, module address +100. Indicates local expansion module when less than 100.
M2：模块寄存器地址。对扩展模块来说是 BFM 地址，对 PLC 来说是 D 元件序号。
M2: module register address. To a expansion module it is a BFM address; to a PLC it is a D component serial number.

D：PLC 通信缓冲区。若为 FROM 指令，即把指定地址的模块的指定寄存器读到此缓冲区中；若为 TO 指令，即把此缓冲区的数据写入到指定地址的模块的指定寄存器中。

D: PLC communication buffer. If FROM command is used, assigned register in the assigned address module will be read to the buffer; if TO command is used, data in buffer is written to the assigned register in the assigned address module.

n:表示读写的寄存器（BFM 区）个数

n: indicates the number of read/write registers (BFM area)

指令执行说明：该指令被驱动后，马上通过 CAN 对外部模块发送一帧数据，等待外部模块响应，若在规定时间（D8241 设定，以 ms 为单位）收到外部模块的正确响应数据，指令执行正常并更新数据，否则报错。若是超时，M8192 将置位。

Command instruction: after the command is initiated, a frame of data will be transmitted through CAN to an external module and wait for response. If correct response data from the external module is received within the specified time (set by D8241, ms as unit), command will run and update the data, or an error message will show. When it is timeout, M8192 will be reset.

CAN 自由指令

CAN free command

CAN 自由指令目的是方便用户与不满足 CAN-LINK 协议或远程扩展模块访问协议的设备通信用，通过该指令，用户可编写任意 CAN 通信用户协议。

The purpose of the CAN free command is to provide users the convenience of programming any CAN communication user protocol through the command when CAN-LINK protocol cannot meet the demands, or when it is required for remote expansion module access protocol communications.

CAN 数据发送指令

CAN data transmission command

指令格式：CANTX(Addr1，Addr0，D，n)

Command format: CANTX (Addr1, Addr0, D, n)

Addr1,Addr0：CAN 标识符（地址）

Addr1, Addr0: CAN marks (address)

Addr1,bit15：保留

Addr1,bit15: reserved

Addr1,bit14：保留

Addr1,bit14: reserved

Addr1,bit13：CAN 标识符位数设定。“0”表示标准 CAN 标识符（11 位标识符），“1”表示扩展 CAN 标识符（29 位标识符）。 若为 11 位标识符，Addr0 的低 11 位表示标识符。 若为 29 位标识符，Addr0 表示低 16 位标识符，Addr1 的 0~12 位表示高 13 位标识符。Addr1,bit13: CAN identifier digit set.“0” represents the standard CAN mark (11bit mark), “1” represents the expansion CAN mark (29bit mark). When 11bit identifier is in place, Addr0’s low 11bit represents the identifier. If 29bit identifier is in place, Addr0 represents the low 16bit identifier, and Addr1’s 0~12bit represents the high 13bit identifier.

D：发送缓冲区，D 元件。从该 D 元件开始的最大 4 个 D 元件作为发送缓冲区。

D: transmission buffer, D component. The greatest 4 D components starting from D component are used as transmission buffer.

n：发送数据个数，以字节为单位，最大为 8。

n: number of transmission data, unit in byte, maximum is 8.
CAN 数据发送指令是立即执行的，若 3ms 内没有发送成功，将报 6380 故障；若 CAN 忙，将报 6382 故障。
CAN data transmission command functions immediately. Within 3ms if transmission is not successful, error code 6380 will be reported; if CAN is busy, error code 6382 will be reported.
举例 1：10ms 发送一组数据，缓冲区为 D10~13，D0 存发送的字节数
Example 1: one group of data is transmitted in 10ms, buffer zone is D10~13, D0 saves the transmitted byte number.

CAN 指令
CAN Command

若 D0 = k8，D10 = h1234，D11 = h5678，D12 = h9ABC，D13 = hDEF0
发送的数据如下表：
If D0 = k8，D10 = h1234，D11 = h5678，D12 = h9ABC，D13 = hDEF0 then the transferred data is shown in following table:

第一字节 1^{st} byte	第二字节 2^{nd} byte	第三字节 3^{rd} byte	第四字节 4^{th} byte	第五字节 5^{th} byte	第六字节 6^{th} byte	第七字节 7^{th} byte	第八字节 8^{th} byte
第一字节 1^{st} byte	第二字节 2^{nd} byte	第三字节 3^{rd} byte	第四字节 4^{th} byte	第五字节 5^{th} byte	第六字节 6^{th} byte	第七字节 7^{th} byte	第八字节 8^{th} byte

若接收端字节从高到低，CAN 接收数据寄存器 MDL = h12345678，MDH = h9ABCDEF0
If the data is received from high byte to low byte, then the received data register of CAN communication will be MDL =h12345678，MDH = h9ABCDEF0

若 D0 = 1，只发送一个字节：h12
If D0 = 1, one byte transmitted only: h12
若 D0 = 3，发送前三个字节：h12，h34，h56
If D0 = 3, first three bytes are transmitted: h12, h34, h56
依次类推。And so on.
举例 2：
Example 2:
通过 CANTX 配置 CAN-LINK 网络，假设有 7 台 PLC 组成一个 CAN-LINK 网络，站号从 1~7。
Configure CAN-LINK network through CANTX. If there are 7 PLC in one CAN-LINK network, the station number starts from 1~7.
要求：
Requirements:
1、通过 CANTX 指令来配置 CAN-LINK 网络。
1. Configure CAN-LINK network using CANTX command.
2、所有 PLC 的 D110~D179 的数据相同，其中 D110～D119 由 1#PLC 更新，D120～D129 由 2#PLC 更新，……，D170～D179 由 7#PLC 更新
2. All PLCs have same data in D110~D137. Among them, D110~D119 are updated by

1#PLC; D120~D129 are updated by 2#PLC; D170~D179 are updated by 7#PLC.

分析：

Analysis:

由于 CANTX 指令无法发数据给本 PLC，所以要在两台 PLC 中，通过 CANTX 指令配置 CAN-LINK 网络。 本例通过 1#PLC 配置 2#～7#PLC，通过 2#PLC 配置 1#PLC。需要在 1#PLC 和 2#PLC 上编写一段配置程序。 其它 PLC 不需要配置程序。

Because CANTX command cannot transmit data to the PLC, therefore, CANTX command is needed to configure CAN-LINK network in two PLCs. In this example, 2#~7#PLC are configured through 1#PLC, and 1#PLC is configured through 2#PLC. One configuration program needs to be written between 1#PLC and 2#PLC. Other PLCs do not require configuration program.

由于 CAN-LINK 是采用 1 对 1 的通信方式，即任一台 PLC 需要给另 6 台 PLC 分别发数据，每台发送数据量为 10 个 16 位数据，CAN-LINK 一帧最多只能发送 2 个 16 位数据，所以需要给每台 PLC 发送 5 帧数据，即任一台机器需要发送的数据帧总数为 5×6＝30 帧，CAN-LINK 总线上总帧数为 30×7＝210 帧，使用 500K 波特率，一帧数据所用时间大约是 300us，所以更新一次数据一共需要 300us×210＝63ms。为避免总线过分拥挤，取 100ms 刷新一次数据比较合理。

CAN-LINK uses 1-to-1 communication method, which means any one PLC transmits data to six other PLCs separately. Every PLC’s data transmission amount is 10 16-bit data. In one CAN-LINK a maximum of 2 16-bit data can be transmitted. Therefore, every PLC needs to transmit five frames of data, which means the total data frames one PLC needs transmit is 5x6=30 frames. On the CAN-LINK bus, the total frame number is 30 x 7 = 210 frames. If 500K Baud rate is used, the time required to transmit one frame of data is approximately 300us. Therefore, it totals up to 300us x 210 = 63ms when updating data. In order to prevent bus overloaded, it is more reasonable to refresh data every 100ms.

编程：

Programming:

1#PLC 编程

1#PLC Programming

配置 2#PLC，服务接收站起始寄存器为 D120；服务提供站起始寄存器也是 D120，寄存器个数为 10，时间间隔为 100ms，服务发送站号为 2，服务接收站号分别为 1,3,4,5,6,7。 取 D10~D13 作为 CANTX 发送缓冲区。即有

Configure 2#PLC, and the start register in a service receiving station is D120; service providing station’s start register is also D120. Regiser number is 10 and the time interval is 100ms. Service transmitting station number is 2, and service receiving station numbers are 1, 3, 4, 5, 6, 7. Select D10~D13 as CANTX transmission buffer zone:

```
MOV     K120 D10     //服务接收站起始寄存器
MOV     K120 D10     // service receiving station start register
MOV     K120 D11     //服务提供站起始寄存器
MOV     K120 D11     // service providing station start register
MOV     HA06 D12     //h0a 为寄存器个数（10），06 为时间间隔高位（h64）
```

MOV HA06 D12 //h0a is the number of registers (10), 06 is the time interval in high bit (h64)

MOV H4042 D13 //h4 为时间间隔低位（h64），h042 展开为二进制为 0000,01;00,0010。分号前的 6 位表示 1#站为服务接收站，分号后的 6 位表示 2#站为服务提供站。 只需要改变服务接收站分别为 1,3,4,5,6,7 即可。

MOV H4042 D13 //h4 is the time interval low bit (h64), h042 expands to binary format as 0000, 01;00, 0010. The six digits before the semicolon represents 1# station, service receiving station. The six sigits after the semicolon represents 2# station, service providing station. It only needs to change the service receiving station numbers to 1, 3, 4, 5, 6, 7.

```
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 1#站
CANTX    H0 H502 D10 K8    // configure 2# station to transmit data to 1# station.
ADD      H40 D13 D13
ADD      H40 D13 D13
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 3#站
CANTX    H0 H502 D10 K8    // configure 2# station to transmit data to 3# station.
ADD      H40 D13 D13
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 4#站
CANTX    H0 H502 D10 K8    // configure 2# station to transmit data to 4# station.
ADD      H40 D13 D13
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 5#站
CANTX    H0 H502 D10 K8    // configure 2# station to transmit data to 5# station.
ADD      H40 D13 D13
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 6#站
CANTX    H0 H502 D10 K8    // configure 2# station to transmit data to 6# station.
ADD      H40 D13 D13
CANTX    H0 H502 D10 K8    //配置 2#站发送数据给 7#站
CANTX    H0 H502 D10 K8    //configured 2#station transmits data to 7# station
```

同理，配置 3#~7#PLC 梯形图

Similarly, configure 3#~7# PLC Ladder Diagram

```
MOV      K130 D10
MOV      K130 D11
MOV      HA06 D12
MOV      H4043 D13
CANTX    H0 H503 D10 K8
ADD      H40 D13 D13
CANTX    H0 H503 D10 K8
ADD      H40 D13 D13
ADD      H40 D13 D13
CANTX    H0 H503 D10 K8
ADD      H40 D13 D13
CANTX    H0 H503 D10 K8
```

```
ADD      H40 D13 D13
CANTX    H0 H503 D10 K8
ADD      H40 D13 D13
CANTX    H0 H503 D10 K8
MOV      K140 D10
MOV      K140 D11
MOV      HA06 D12
MOV      H4044 D13
CANTX    H0 H504 D10 K8
ADD      H40 D13 D13
CANTX    H0 H504 D10 K8
ADD      H40 D13 D13
CANTX    H0 H504 D10 K8
ADD      H40 D13 D13
ADD      H40 D13 D13
CANTX    H0 H504 D10 K8
ADD      H40 D13 D13
CANTX    H0 H504 D10 K8
ADD      H40 D13 D13
CANTX    H0 H504 D10 K8
MOV      K150 D10
MOV      K150 D11
MOV      HA06 D12
MOV      H4045 D13
CANTX    H0 H505 D10 K8
ADD      H40 D13 D13
CANTX    H0 H505 D10 K8
ADD      H40 D13 D13
CANTX    H0 H505 D10 K8
ADD      H40 D13 D13
CANTX    H0 H505 D10 K8
ADD      H40 D13 D13
ADD      H40 D13 D13
CANTX    H0 H505 D10 K8
ADD      H40 D13 D13
CANTX    H0 H505 D10 K8
MOV      K160 D10
MOV      K160 D11
MOV      HA06 D12
MOV      H4046 D13
CANTX    H0 H506 D10 K8
ADD      H40 D13 D13
CANTX    H0 H506 D10 K8
ADD      H40 D13 D13
```

```
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
ADD     H40 D13 D13
ADD     H40 D13 D13
CANTX   H0 H506 D10 K8
MOV     K170 D10
MOV     K170 D11
MOV     HA06 D12
MOV     H4047 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
ADD     H40 D13 D13
CANTX   H0 H507 D10 K8
```

2#PLC 编程

2#PLC Programming