INOVANCE

User Guide

AM600-3200END

Digital Input Module

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1. Overview

Thank you for purchasing the AM600-3200END digital input expansion module developed and manufactured independently by Inovance.

This product is a 32-channel digital transistor (SOURCE and SINK) input module used together with the AM600 series medium-sized PLC and the H3U series PLC main modules.

This guide describes the specifications, characteristics and using methods of the product. Please read this guide carefully before using to ensure more safely usage. Please refer to the AM600 Series PLC Hardware Manual and the AM600 Series PLC Programming Manual to understand the use of the user program development environment and design method of the user program of the product. You can download the latest materials from www.inovance.com.

2. Safety Information and Precautions

Safety information and precautions are identified into two grades: Warning and Caution. Please make sure to operate properly with adequate safety assurance.

| ⚠ WARNING | Indicates the improper operation which, if not avoided, may cause death or serious injury; |
| ⚠ CAUTION | Indicates the improper operation which, if not avoided, may cause moderate or minor injury, as well as equipment damage. |

In some cases, even failure to follow "Cautions" may also lead to serious consequences. Please make sure to follow both warnings and cautions, otherwise, it may cause death or serious injury, as well as product and relevant equipment and system damage.

Please keep this guide well so that it can be read when necessary and forward this guide to the end user.

During control system design

⚠ WARNING

◆ Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or PLC fault occurs.
◆ Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

⚠ CAUTION

◆ An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and a upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the machine.
◆ To ensure safe operation, for the output signals that may cause critical accidents, please design external protection circuit and safety mechanism;
◆ Once PLC CPU detects abnormality in the system , all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation;
◆ If the PLC's output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands;
◆ The PLC is designed to be used in indoor electrical environment (overvoltage category II). The power supply must have a system-level lightning protection device, assuring that overvoltage due to lightning shock can't be applied to the PLC's power supply input terminals, signal input terminals and output terminals and so forth, so as to avoid damage to the equipment.

During installation

⚠ WARNING

◆ Installation must be carried out by the specialists who have received the necessary electrical training and understood enough electrical knowledge.
◆ Disconnect all external power supplies of the system before module assembly/ disassembly and wiring. Failure to do so may result in electric shock, module fault or malfunction. Failure to do so may result in electric shock, module fault or malfunction.
◆ Do not use the PLC where there are dust, oil smoke, conductive dust, corrosive or combustible gases, or exposed to high temperature, condensation, wind & rain, or subject to vibration and impact. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
◆ The PLC is open-type equipment that must be installed in a control cabinet with lock (cabinet housing protection >IP20). Only the personnel who have received the necessary electrical training and understood enough electrical knowledge can open the cabinet.

⚠ CAUTION

◆ Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
◆ Ensure there are no foreign matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
◆ Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault or fall-off.

During wiring

⚠ WARNING

◆ Wiring must be carried out by personnel who have received the necessary electrical training and understood enough electrical knowledge.
◆ Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
◆ Install the terminal cover attached to the product before power-on or operation after wiring is completed. Failure to comply may result in electric shock.
◆ Perform good insulation on terminals so that insulation distance between cables will not reduce after cables are connected to terminals. Failure to comply may result in electric shock or damage to the equipment.

⚠ CAUTION

◆ Prevent dropping metal filings and wire ends drop into ventilation holes of the PLC at wiring. Failure to comply may result in fire, fault and malfunction.
◆ The external wiring specification and installation method must comply with local regulations. For details, see the wiring section in this guide.
◆ To ensure safety of equipment and operator, use cables with sufficient diameter and connect the cables to ground reliably.
◆ Wire the module correctly after making clear of the connector type. Failure to comply may result in module and external equipment fault.
◆ Tighten bolts on the terminal block in the specified torque range. If the terminal is not tight, short-circuit, fire or malfunction may be caused. If the terminal is too tight, fall-off, short-circuit, fire or malfunction may be caused.
◆ If the connector is used to connect with external equipment, perform correct crimping or welding with the tool specified by manufacturer. If connection is in poor contact, short-circuit, fire or malfunction may be caused.
◆ A label on the top of the module is to prevent foreign matters entering the module. Do not remove the label during wiring. Remember to remove it before system operation, facilitating ventilation.
◆ Do not bundle control wires, communication wires and power cables together. They must be run with distance of more than 100 mm. Otherwise, noise may result in malfunction.
◆ Select shielded cable for high-frequency signal input/output in applications with serious interference so as to enhance system anti-interference ability.

During maintenance & inspection

⚠ WARNING

◆ Maintenance & inspection must be carried out by personnel who have the necessary electrical training and experience.
◆ Do not touch the terminals while the power is on. Failure to comply may result in electric shock or malfunction.
◆ Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
◆ Disconnect all external power supplies of the system before removing the module or connecting/removing the communication wirings. Failure to comply may result in electric shock or malfunction.

⚠ CAUTION

◆ Get acquainted with the guide and ensure safety before online modification, forcible output, and RUN/STOP operation.
◆ Disconnect the power supply before installing/removing the extension card.

At disposal

⚠ CAUTION

◆ Treat scrapped module as industrial waste. Dispose the battery according to local laws and regulations.

3. Product Information

■ Model and Nameplate

AM600-3200END

Product Information	Series	I/O Points	Module Type	Input Signal
AM Inovance medium-sized PLC automation-motion	600 AM600 series controller	32 32 inputs / 00 0 output	E Logic I/O expansion module	D 24 VDC
			Output Type	
			N No output	

Nameplate
MODEL: AM600-3200END
POWER INPUT:NONE
OUTPUT: NONE
VER: xxxxx
01022087YE400001

01022087YE400001

Figure 1 Description of model and nameplate

Model	Classification	Description	Applicable to
AM600-3200END	Digital input module	32-point DI module; 24 VDC input	AM600 series, H3U series

■ External Interface

Figure 2 Diagram of digital input module interface

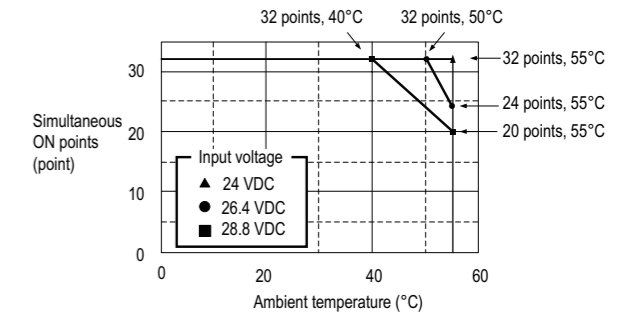| Interface Name	Function
User input terminal	8-channel inputs x 4
Signal indicators	Corresponding to various input signals ON: input active OFF: input inactive
Local expansion module back-end interface	Connect back-end module, not supporting hot plugging

Interface Name	Function
Local expansion module front-end interface	Connect front-end module, not supporting hot plugging

■ General Specifications

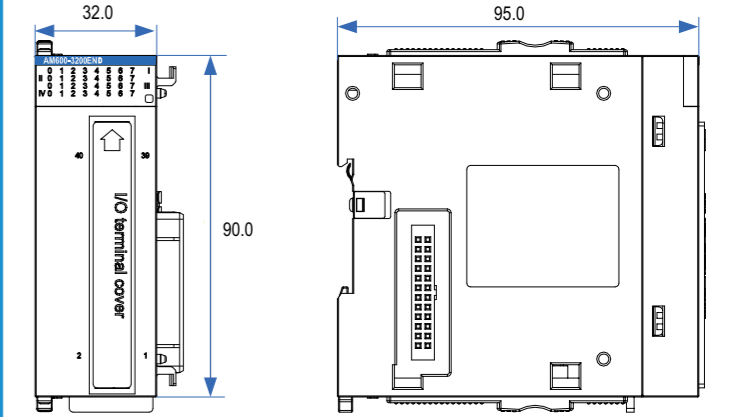| Item	Specifications
Input channel	32
Input connecting mode	40-pin high-density terminal
Input type	Digital input
Input mode	SINK/SOURCE
Input voltage class	24 VDC (max.: 30 V)
Internal 5 V power consumption	65 mA(typical)
Input current (typical)	4 mA
ON voltage	19 VDC
OFF voltage	< 5 VDC
Interface hardware filter time constant	10 ms
Input resistance	5.6 K
Input signal form	DC voltage input, supporting SINK/SOURCE input
Isolation method	Opto-couplers isolation
Input action display	Input indicator ON when the input is in the driving state

■ Power De-rating Diagram

The number of channels used must be derated in different temperature environments (especially in the high temperature environment) to ensure module application reliability and safety.

4. Mechanical Design Reference

■ Mounting Dimensions

Figure 3 Mounting dimensions (in mm)

5. Electrical Design Reference

■ Cable Selection

Cable Name	Model	Applicable Cable Diameter		Manufacturer	Crimping Tool
		MM²	AWG		
Tubular lug	GTVE10006	1.0	18	Suzhou Yuanli	YAC-5

Those cable lugs are applicable to AM600-3200END digital modules, and the cable rated temperature is required to be above 75 °C.

■ Cable Preparation Procedures

1) Strip back the wire outer coating by 6 mm. Pass the cable through the tube of proper wire size.
2) Insert the exposed end into the hole of the cable lug, and then crimp it with recommended crimping tool.
3) Put the cable lug onto the terminal and tighten the screw with a screwdriver. The maximum tightening torque is 0.45 N.m.
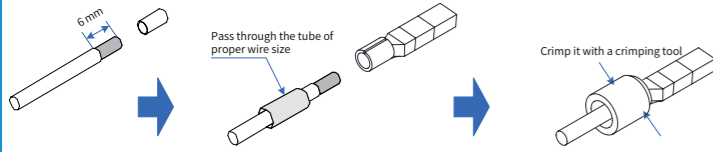

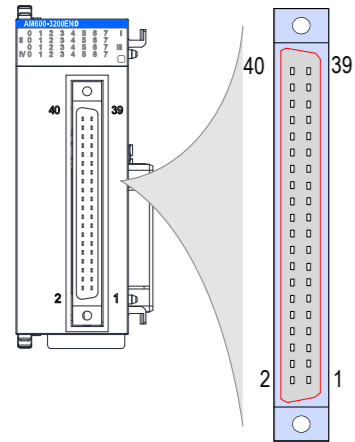Figure 4 Diagram of cable preparing

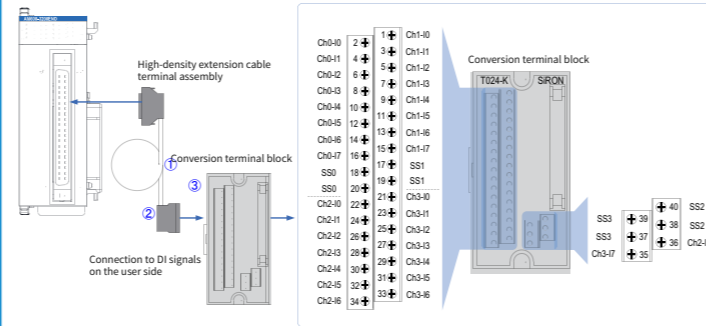## ■ Terminal Signal Arrangement

Figure 5 Terminal definition of the AM600-3200END digital input module

The following figure shows the internal circuit and external wiring of the interface. Please finish corresponding wiring according to actual requirements:

External Wiring	Signal Name		Terminal No.		Signal Name		Internal Circuit
	Column B				Column A		
24VDC	CH2 common terminal (SS 2)	40		39	CH3 common terminal (SS 3)		
	CH2 common terminal (SS 2)	38		37	CH3 common terminal (SS 3)		
	CH2 input 7 (Ch2-I7)	36		35	CH3 input 7 (Ch3-I7)		33kΩ
	CH2 input 6 (Ch2-I6)	34		33	CH3 input 6 (Ch3-I6)		33kΩ
	CH2 input 5 (Ch2-I5)	32		31	CH3 input 5 (Ch3-I5)		33kΩ
	CH2 input 4 (Ch2-I4)	30		29	CH3 input 4 (Ch3-I4)		33kΩ
	CH2 input 3 (Ch2-I3)	28		27	CH3 input 3 (Ch3-I3)		33kΩ
	CH2 input 2 (Ch2-I2)	26		25	CH3 input 2 (Ch3-I2)		33kΩ
	CH2 input 1 (Ch2-I1)	24		23	CH3 input 1 (Ch3-I1)		33kΩ
	CH2 input 0 (Ch2-I0)	22		21	CH3 input 0 (Ch3-I0)		33kΩ
24VDC	CH0 common terminal (SS 0)	20		19	CH1 common terminal (SS 1)		
	CH0 common terminal (SS 0)	18		17	CH1 common terminal (SS 1)		
	CH0 input 7 (Ch0-I7)	16		15	CH1 input 7 (Ch1-I7)		33kΩ
	CH0 input 6 (Ch0-I6)	14		13	CH1 input 6 (Ch1-I6)		33kΩ
	CH0 input 5 (Ch0-I5)	12		11	CH1 input 5 (Ch1-I5)		33kΩ
	CH0 input 4 (Ch0-I4)	10		9	CH1 input 4 (Ch1-I4)		33kΩ
	CH0 input 3 (Ch0-I3)	8		7	CH1 input 3 (Ch1-I3)		33kΩ
	CH0 input 2 (Ch0-I2)	6		5	CH1 input 2 (Ch1-I2)		33kΩ
	CH0 input 1 (Ch0-I1)	4		3	CH1 input 1 (Ch1-I1)		33kΩ
	CH0 input 0 (Ch0-I0)	2		1	CH1 input 0 (Ch1-I0)		33kΩ

When converting the wiring using a SIRON T024-K conversion terminal, the following figure shows the relation between terminal numbers and module terminal pin numbers (confirm the actual correspondence of the terminal when using conversion terminals of other models):

As shown in the preceding figure, ① high-density extension cable ② connecting plug (necessary for any self-made cable) ③ conversion terminal block are available from Inovance. Ordering information is as follows:

No.	Order code	Description	Remark
①	15300119	40-pin FCN-to-MIL cable (500 mm)	High-density conversion cable containing one 40-pin FCN connecting plug and one 40-pin MIL connecting plug with a cable length of 500 mm
	15300193	40-pin FCN-to-MIL cable (2000 mm)	High-density conversion cable containing one 40-pin FCN connecting plug and one 40-pin MIL connecting plug with a cable length of 2000 mm
②	15050180	40-pin FCN connecting plug	You can purchase this plug for any self-made cable.
③	15020452	40-pin MIL-to-screw terminal block	

6. Programming Examples

■ Wiring Precautions

1) Do not bundle the extension cable together with power cables (high voltage, large current) which produce strong interference signals. Separate it from other cables and avoid cabling in parallel.
2) Select recommended cables and pinboards for connection. It is recommended that shielded cables be used as extension cables to enhance capacity of resisting interference.
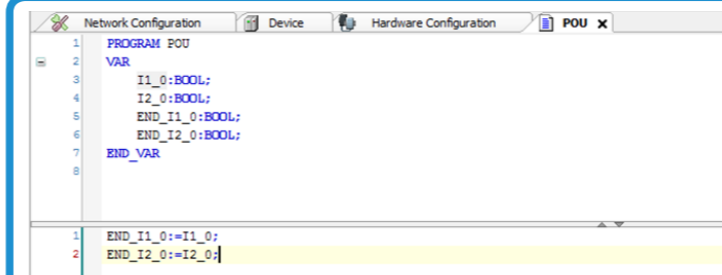
■ Programming Example for AM600+AM600-3200END Module

Use AM600 CPU as main control module and assign channel 0 and 1 sampling values of the AM600-3200END to different variables.
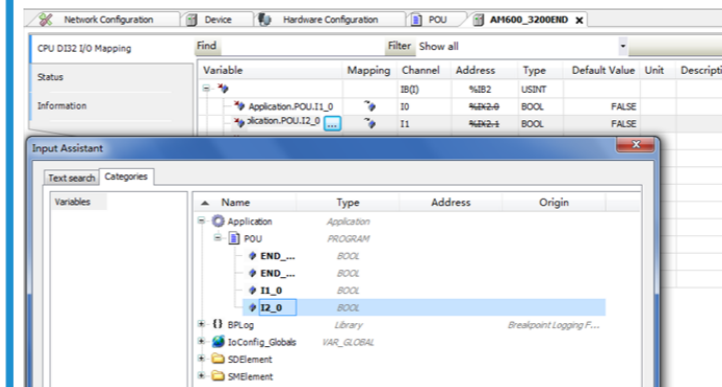
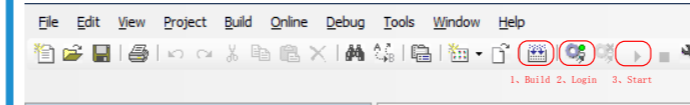1) Create a project and perform hardware configuration as follows:

2) Use ST programming language to program the END module, define the mapping variables I1_0 and I2_0, and assign states of corresponding channels of mapping variables to the variables END_I1_0 and END_I2_0.

Map the mapping tags I1_0 and I2_0 defined in the program to channels 0 and 1 of the AM600-3200END module respectively, shown in the following figure.
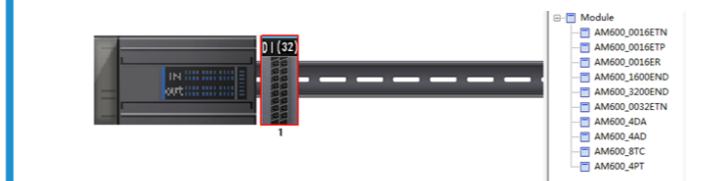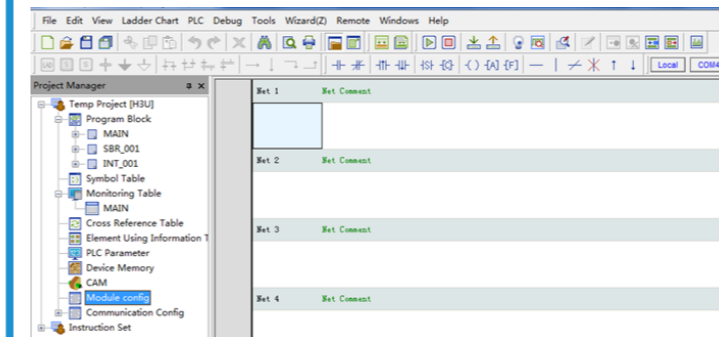

3) After successful compiling, log in to download the project and run it.
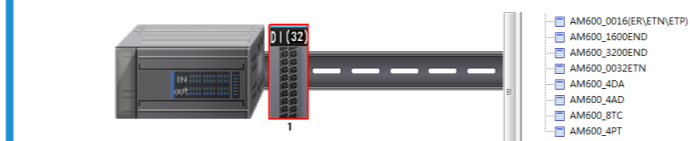

■ Programming Example for H3U+AM600-3200END Module

Use H3U as main control module and assign the first channel sampling value of the AM600-3200END to component X.

1) Create a project, select "H3U". Then the system enters the main page. ① double-click "Module Configuration"; ② The simulation graphics of the rack to be configured appears.
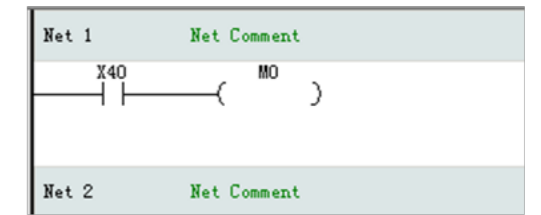

2) Select the moduleAM600-3200END to be added from the module list. Double-click the module to automatically add it to the expansion rack, or use the left mouse button to drag it onto the expansion rack.

For a digital module, I/O will be automatically extended in sequence. For example, if an AM600-3200END module is added on the H3U-3232MT as the first one, then the the input point corresponding to the first output of the AM600-3200END and H3U-0808PMRTA modules is X40 and X10 respectively. Just use the user program directly.

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3) Perform programming on inputs of the AM600-3200ENDAM600-3200END by using a ladder diagram as follows:

Note: X represents the component in the PLC's external input signal state. When a local expansion module is connected to the H3U, the X port on the expansion module is numbered in a way that the number closely and sequentially follows the number of the X port on the main module. For example, when the AM600-3200END expansion module is connected to the H3U-3232MT main module, as the last series number of the X port on the main module is Y37, series numbers of the X port on the expansion module are programmed to Y40-X57.

The ports of expansion modules are always numbered from an octal number starting with 0. For example, when the main module is H3u-3624MT, its last X port series number is X43 and series numbers of the X port on the expansion module are programmed to X50-X67, i.e. the vacant series numbers X44-X47 on the main module are discarded. The Y port on the expansion module uses the same processing method.

4) After successful compiling, download the project and run it.

INOVANCE Warranty Agreement

1) Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
   a. Improper use or repair/modification without prior permission
   b. Fire, flood, abnormal voltage, natural disasters and secondary disasters
   c. Hardware damage caused by dropping or transportation after procurement
   d. Operations not following the user instructions
   e. Damage out of the equipment (for example, external device factors)
3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
4) If there is any problem during the service, contact Inovance's agent or Inovance directly.
5) Inovance reserves the rights for explanation of this agreement.

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