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1. Overview

Thank you for purchasing the AM600-0032ETN digital output expansion module developed and manufactured independently by Inovance.

This product provides NPN outputs, and is used together with the AM600CPU, AM600-RTU-ECT, AM600-RTU-COP, AM600-RTU-DP and H3U modules to expand the digital output ports.

This guide describes the specifications, characteristics and using methods of AM600-0032ETN digital output expansion module. Please read this guide carefully before using to ensure more safe 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.



During control system design

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 level >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.
- ◆ In application scenarios with serious interference, shielded cables should be used as the input or output cables of high-frequency signals to ensure the resistance to interference.

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

AM 600-0032 ETN

Product Information	Series	I/O Points	Module Type	Output Type
AM Inovance medium-sized PLC automation module	600 Two RS485, one CANopen/CANlink One LAN, EtherCAT bus	40 4 input 32 32 outputs	E Logic/Discrete module	4 Relay output TP Transistor output (SOURCE) TN Transistor output (SINK)

Nameplate

MODEL: AM600-0032ETN
POWER INPUT: NONE
OUTPUT: NONE
VER: xxxxxx
01022087YE400001
01022087YE400001

Figure 1 Description of model and nameplate

Model	Classification	Description	Applicable to
AM600-0032ETN	Digital output module	32-point DO module; transistor output (Drain)	AM600 series, H3U

External Port

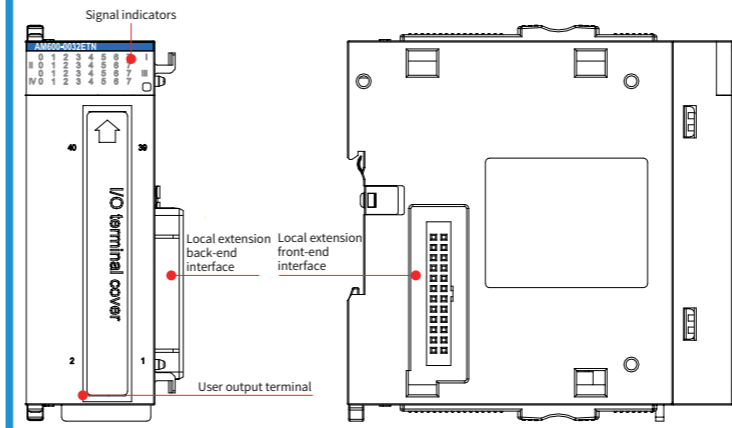


Figure 2 Diagram of digital output module interface

Interface Name	Function
User input terminals	4groups output with 8 channels in each group
Signal indicators	Corresponding to various output signals. ON: output active OFF: output inactive
Local expansion module back-end interface	Connect back-end module, not supporting hot plugging
Local expansion module front-end interface	Connect front-end module, not supporting hot plugging

General Specifications

Item	AM600-0016ETN	
Output channel	32	
Output connecting mode	40-pin high-density terminal	
Output type	Transistor, low-side output	
Power supply voltage	24 VDC (-15% to +20%)	
Output voltage class	12 V to 24 V (-15% to +20%)	
Internal 5 V power consumption	170 mA (typical value)	
Maximum leakage current when the module is turned OFF	Less than 0.5 mA	
Response time when the module is turned ON	Less than 0.5 ms (for hardware)	
OFF response time	Less than 0.5 ms (for hardware)	
Maximum load	Resistive load	0.5 A/point; 2 A/common terminal
	Inductive load	12 W/24 VDC (total)
	Lamp load	2 W/24 VDC (total)
Isolation method	Opto-couplers isolation	
Output action display	Output indicator ON when opto-coupler driving is applied	
Short circuit-proof output	Yes	

4. Mechanical Design Reference

Mounting Dimensions

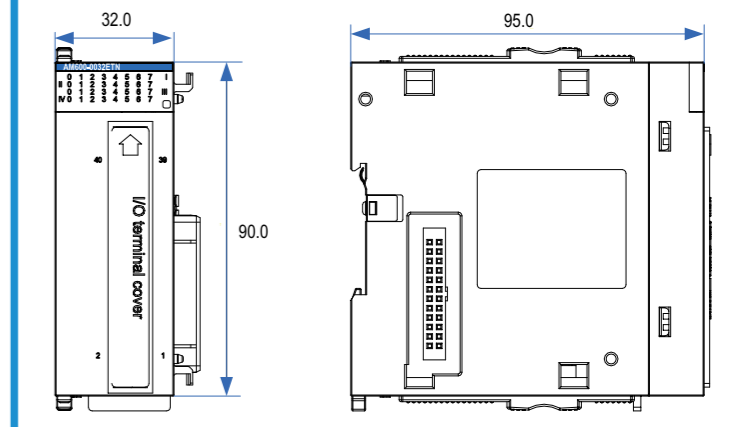


Figure 3 Mounting dimensions (in mm)

5. Electrical Design Reference

Cable Selection

Cable Name	Model	Applicable Cable Diameter		Manufacturer	Crimping Tool
		MM ²	AWG		
Tubular lug	GTVE10006	1.0	18	Suzhou Yuanli	YAC-5

Those cable lugs are applicable to AM600-0032ETN digital modules, and the cable rated temperature is required to be above 75 °C.

Cable Preparing Procedures

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

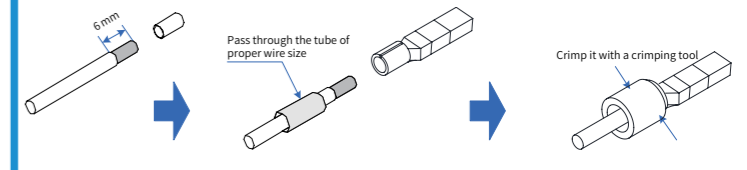


Figure 4 Diagram of cable preparing

Terminal Arrangement

The AM600-0032ETN module supports 32-channel digital output and uses a 40-pin high-density terminal as a user terminal. The following figure shows the interface diagram:

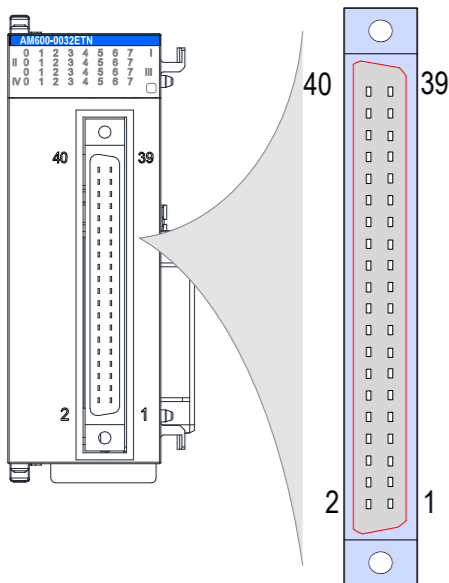
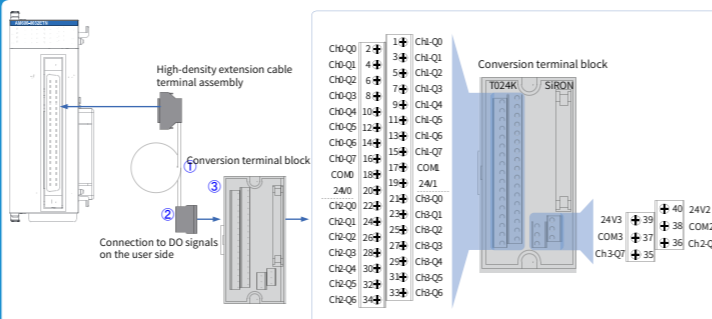


Figure 5 Terminal definition of the AM600-0032ETN digital output module

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	
	24 V power supply (24V2)	40	24 V power supply (24V3)	Internal power supply
	CH2 common terminal (COM 2)	38	CH3 common terminal (COM 3)	Isolating component
	CH2 output 7 (Ch2-Q7)	36	CH3 output 7 (Ch3-Q7)	Isolating component
	CH2 output 6 (Ch2-Q6)	34	CH3 output 6 (Ch3-Q6)	Isolating component
	CH2 output 5 (Ch2-Q5)	32	CH3 output 5 (Ch3-Q5)	Isolating component
	CH2 output 4 (Ch2-Q4)	30	CH3 output 4 (Ch3-Q4)	Isolating component
	CH2 output 3 (Ch2-Q3)	28	CH3 output 3 (Ch3-Q3)	Isolating component
	CH2 output 2 (Ch2-Q2)	26	CH3 output 2 (Ch3-Q2)	Isolating component
	CH2 output 1 (Ch2-Q1)	24	CH3 output 1 (Ch3-Q1)	Isolating component
	CH2 output 0 (Ch2-Q0)	22	CH3 output 0 (Ch3-Q0)	Isolating component
	24 V power supply (24V0)	20	24 V power supply (24V1)	Internal power supply
	CH0 common terminal (COM 0)	18	CH1 common terminal (COM 1)	Isolating component
	CH0 output 7 (Ch0-Q7)	16	CH1 output 7 (Ch1-Q7)	Isolating component
	CH0 output 6 (Ch0-Q6)	14	CH1 output 6 (Ch1-Q6)	Isolating component
	CH0 output 5 (Ch0-Q5)	12	CH1 output 5 (Ch1-Q5)	Isolating component
	CH0 output 4 (Ch0-Q4)	10	CH1 output 4 (Ch1-Q4)	Isolating component
	CH0 output 3 (Ch0-Q3)	8	CH1 output 3 (Ch1-Q3)	Isolating component
	CH0 output 2 (Ch0-Q2)	6	CH1 output 2 (Ch1-Q2)	Isolating component
	CH0 output 1 (Ch0-Q1)	4	CH1 output 1 (Ch1-Q1)	Isolating component
	CH0 output 0 (Ch0-Q0)	2	CH1 output 0 (Ch1-Q0)	Isolating component

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 (500 mm)
	15300193	40-pin FCN-to-MIL cable (2000mm)	High-density conversion cable containing one 40-pin FCN connecting plug and one 40-pin MIL connecting plug (2000mm)
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	

Wiring Precautions

Do not bundle the terminal connection cables together with power cables (high voltage, large current) which produce strong interference signals. Separate it from other cables and avoid cabling in parallel.

Select recommended cables and pinboards for connection. It is recommended that shielded cables be used as terminal connection cables to enhance capacity of resisting interference.

6. Programming Examples

Electric Shock Protection When Using Inductive Load

When the inductive load is applied, large back EMF will be produced between contacts and arc discharge is also caused when the inductive load stops. This may result in contact failure or contact sag, shortening the contact lifetime. Therefore, it is recommended to use the products which have built-in relay protection circuit. The freewheel diode must satisfy: ① reverse voltage is 5 to 10 times of load voltage; ② forward current is larger than load current.

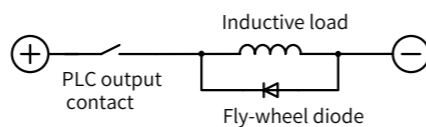


Figure 6 Electric shock protection when using inductive load

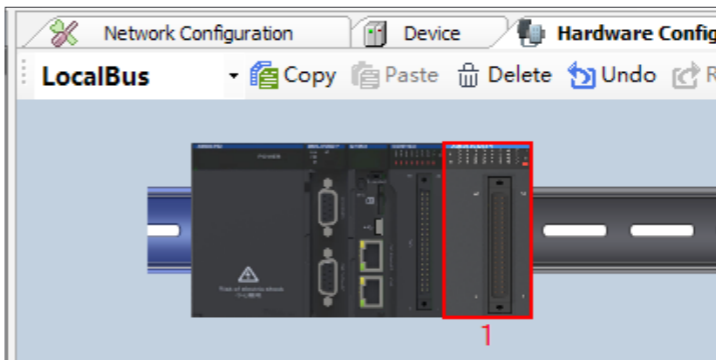
Electric Shock Protection When Using Capacitive Load

No large capacitive load shall be connected to the output interfaces of this product, otherwise false fault may be detected when a channel is turned off.

Programming Example for AM600+AM600-0032ETN Module

Use the CPU module of AM600 as the main control module and set channels 0 and 1 of the AM600-0032ETN module to active; the usage of AM600-0032ETN is described as follows:

1) Create a project and perform hardware configuration as follows:



2) Use ST programming language to program the ETN module, define the Q1_0 and Q2_0 channel mapping tags, and set corresponding channels of mapping tags to active.

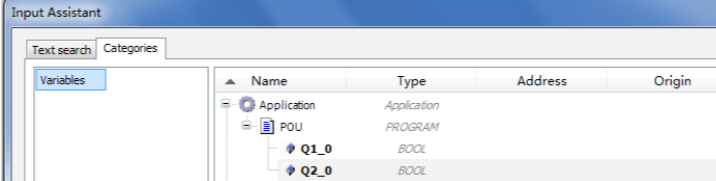
```

PROGRAM PLC_PRG
VAR
    Q1_0 : BOOL;
    Q2_0 : BOOL;
END_VAR

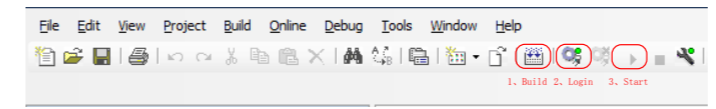
Q1_0 := TRUE;
Q2_0 := TRUE;
    
```

3) Map the Q1_0 and Q2_0 mapping tags defined during programming to channels 0 and 1 of the AM600-0032ETN module respectively, as shown in the following figure.

Variable	Mapping	Channel	Address	Type
Application.POU.Q1_0	Q0	Q0	%QB1	BOC
Application.POU.Q2_0	Q1	Q1	%QB1.2	BOC



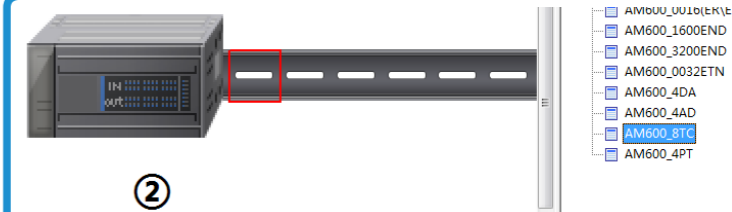
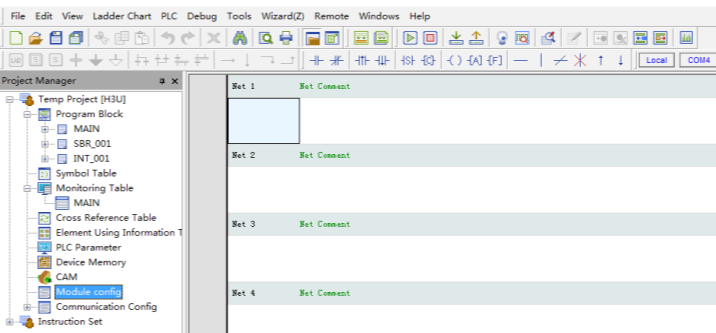
4) After successful compiling, log in to download the project and run it.



Programming Example for H3U + AM600-0032ETN Module

Use H3U as the main control module and set the first channel of the AM600-0032ETN module to active; the usage of AM600-0016ETP is described as follows:

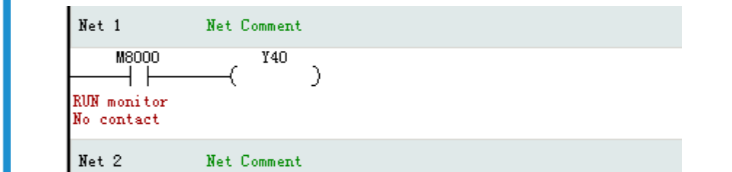
1) Create a project, select "H3U". Then the system enters the main page. ① Double-click "Module Configuration"; ② The simulation graphics of the rack to be configured appears.



2) Select the module AM600-0032ETN to be added from the module list. Double-click the module to automatically add it to the expansion rack, or use left mouse button to drag it onto the expansion rack.



3) Perform programming on outputs of the AM600-0032ETN by using the ladder diagram.



Note: Y represents the bit component used to control PLC's output. When a local expansion module is connected to the H3U, the Y port on the expansion module is numbered in a way that the number closely and sequentially follows the number of the Y port on the main module. For example, when the AM600-0032ETN expansion module is connected to the H3U-3232MT main module, as the last series number of the Y port on the main module is Y37, series numbers of the Y port on the expansion module are programmed to Y40~Y57.

The ports of expansion modules are always numbered from an octal number starting with 0.

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

INOVANCE Warranty Agreement

- 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.
- Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
 - Improper use or repair/modification without prior permission
 - Fire, flood, abnormal voltage, natural disasters and secondary disasters
 - Hardware damage caused by dropping or transportation after procurement
 - Operations not following the user instructions
 - Damage out of the equipment (for example, external device factors)
- The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
- If there is any problem during the service, contact Inovance's agent or Inovance directly.
- Inovance reserves the rights for explanation of this agreement.

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