INOVANCE

1. Overview

Thank you for purchasing the GL10-4PM local pulse positioning module developed and manufactured independently by Inovance.

This product is a 4-channel positioning output module used together with the H3U series PLC main module. It support 4-channel pulse output, with the highest output frequency of 200 kHz. Each channel contains 4 digital inputs, which can be used for positive and negative limit, home switch, and normal input.

This guide describes the specifications, characteristics and using methods of the product. Please read this guide carefully before using to ensure more safely usage. For how to use the user program development environment and how to design user programs, see the H3U Series PLC Instructions and Programming Guide (AM600 series main modules do not support this product). Visit our website (www.inovance. com) for the latest version of the guide.

2. Safety Information

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 that failure to comply with the notice will result in minor or moderate personal injury or 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 cannot 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 removing/ installing the module. 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 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
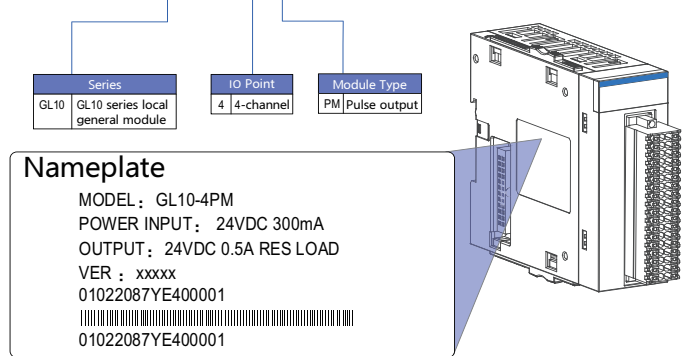
■ Model and Nameplate

GL10-4PM

	Series	IO Point	Module Type
GL10	GL10 series local general module	4	4-channel	PM	Pulse output

Nameplate
MODEL：GL10-4PM
POWER INPUT：24VDC 300mA
OUTPUT：24VDC 0.5A RES LOAD
VER：xxxxx
01022087YE400001
01022087YE400001

Figure 1　Description of model and nameplate

Model	Classification	Description	Applicable Model
GL10-4PM	Local pulse positioning module	4-channel pulse positioning output	H3U series

■ External Interface
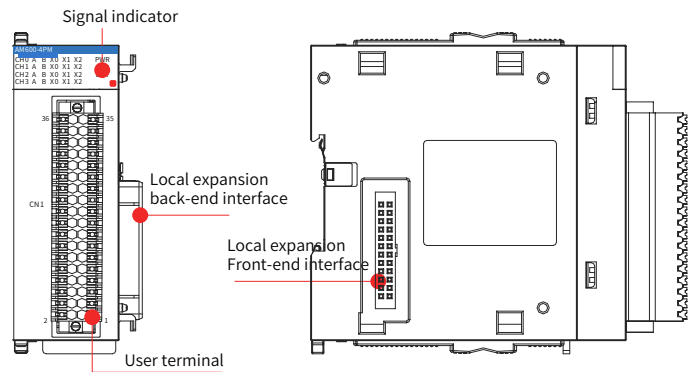
Figure 2　Module interfaces

Name		Function		
Signal indicator	PWR	Power indicator	Green	ON when power supply is switched on.
	RUN	Running status indicator	Green	ON when the module is in normal operation
	ERR	Error indicator	Red	Is ON after an error occurs
I/O signal indicator		For input and output signals ON: active OFF: inactive		
Local expansion module back-end interface		Connect back-end module, not supporting hot plugging		
Local expansion module front-end interface		Connects front-end module and does not support hot plugging		
Wiring terminal		4-channel pulse output terminal, see "Electrical Design Reference"		

■ Output specification

Item	Specifications
Output channels	4 (high-speed)
Output type	Transistor, SINK output
Power supply voltage	24 VDC (–15% to +20%)
Output voltage class	12 V to 24 V (-5% to 20%)
ON response time	1 us (hardware response time)
OFF response time	1 us (hardware response time)
Output frequency	200 kHz (external equivalent load of 20 mA or more is required when output is above 50 kHz)
Maximum load current	0.5 A/point
Isolation mode	Opto-couplers isolation

■ Input specification

Item	Specifications
Input channels	16
Input type	Supports SINK and SOURCE input
Input voltage	24 VDC (–15% to +20%)
ON current	More than 3.5 mA
OFF current	Less than 1.5 mA
Input resistance	3.3 KΩ
Isolation method	Opto-couplers isolation

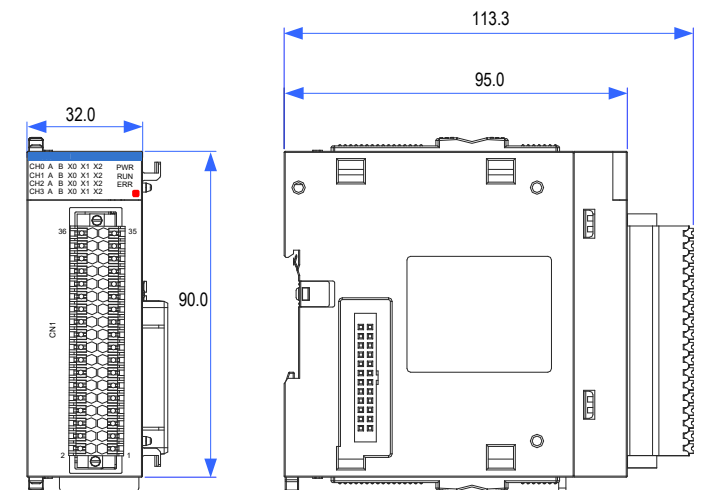## 4. Mechanical Design Reference

■ Mounting Dimensions

Figure 3　Installation dimensions (mm)

5. Electrical Design Reference

■ Cable Selection

Cable Name	Model	Applicable Cable Diameter		Manufacturer	Crimping Tool
		Chinese Standard/MM	AWG		
Tubular lug	GTVE07512	0.75	21	Suzhou Yuanli	YAC-5

■ Cable Preparing Procedures

◆ Remove the insulation of the cable so that a length of 11–14 mm of the conductor is exposed, and put the cable through a cable marking sleeve.
◆ Insert the exposed end into the hole of the cable lug, and then crimp it with
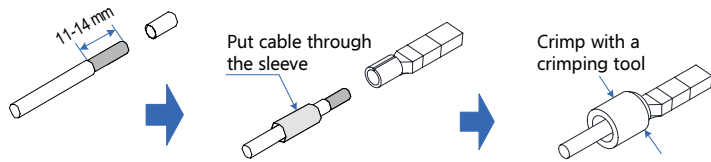
recommended crimping tool.

Put cable through the sleeve

Crimp with a crimping tool

Figure 4　Diagram of cable preparing

■ Terminal Arrangement
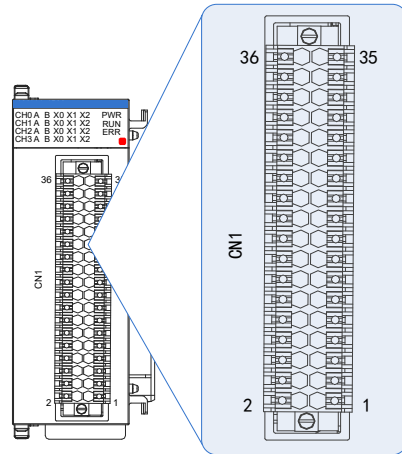
Figure 5　Terminal definition of the module

■ External Wiring

Ext. Wiring	Signal Name Column B	Terminal No.		Signal Name Column A	Ext. Wiring
	CH1 POS limit (CH1-X0)	36	35	CH0 POS limit (CH0-X0)	
	CH1 NEG limit (CH1-X1)	34	33	CH0 NEG limit (CH0-X1)	
	CH1 HOME switch (CH1-X2)	32	31	CH0 HOME switch (CH0-X2)	
24VDC	CH1 normal input (CH1-X3)	30	29	CH0 normal input (CH0-X3)	24VDC
	CH1 input COM (SS0)	28	27	CH0 input COM (SS0)	
	CH3 POS limit (CH3-X0)	26	25	CH2 POS limit (CH2-X0)	
	CH3 NEG limit (CH3-X1)	24	23	CH2 NEG limit (CH2-X1)	
	CH3 HOME switch (CH3-X2)	22	21	CH2 HOME switch (CH2-X2)	
24VDC	CH3 normal input (CH3-X3)	20	19	CH2 normal input (CH2-X3)	24VDC
	CH3 input COM (SS1)	18	17	CH2 input COM (SS1)	
	(Vacant)	16	15	(Vacant)	
Load	CH1 output A (CH1-A)	14	13	CH0 output A (CH0-A)	Load
Load	CH1 output B (CH1-B)	12	11	CH0 output B (CH0-B)	Load
Load	CH3 output A (CH3-A)	10	9	CH2 output A (CH2-A)	Load
Load	CH3 output B (CH3-B)	8	7	CH2 output B (CH2-B)	Load
24VDC	output COM (COM)	6	5	output COM (COM)	24VDC
	24 V power + (24V)	4	3	24 V power - (GND)	
	24 V power + (24V)	2	1	24 V power - (GND)	

■ internal equivalent circuit

Input 0 (X0)
Input COM (SS)
Output 0 (CH-A)
Output COM (COM)
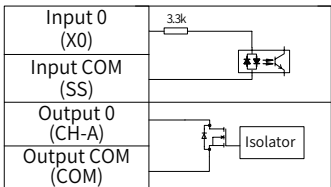
■ Precautions

After the IO terminal block is mounted on CN1, fix it with a torque of 0.2–0.25 N·m, as shown in the figure.
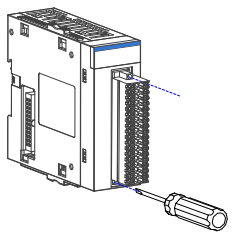
Do not bundle the terminal connection cables together with power cables (high voltage, large current) which produce strong interference signals. Separate it from other cables and avoid cabling in parallel.

Use recommended cables and adapter boards. It is recommended to use shielded cables as terminal cables for increased anti-interference ability.

■ Contact protection in the case of 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, you can use a parallel flywheel diode with the load to extend the lifetime of the product. The freewheel diode must satisfy: ① reverse voltage is 5 to 10 times of load voltage; ② forward current is larger than load current.
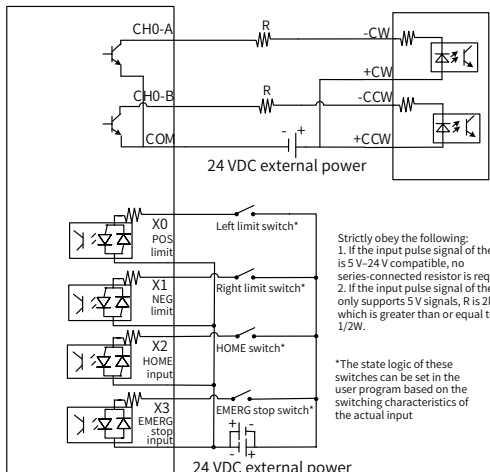

PLC output contact — Inductive load — Flywheel diode
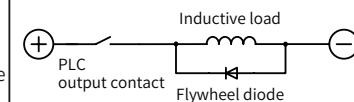
■ Wiring

This module supports CW/CCW and pulse+direction pulse output, and the wiring is as follows.

◆ Pulse output mode 1: CW/CCW

GL10-4PM

24 VDC external power

Strictly obey the following:
1. If the input pulse signal of the drive is 5 V–24 V compatible, no series-connected resistor is required.
2. If the input pulse signal of the drive only supports 5 V signals, R is 2k, which is greater than or equal to 1/2W.

*The state logic of these switches can be set in the user program based on the switching characteristics of the actual input

24 VDC external power

◆ Pulse output mode 2: pulse+direction

GL10-4PM   Servo motor drive

24VDC external power

24VDC external power
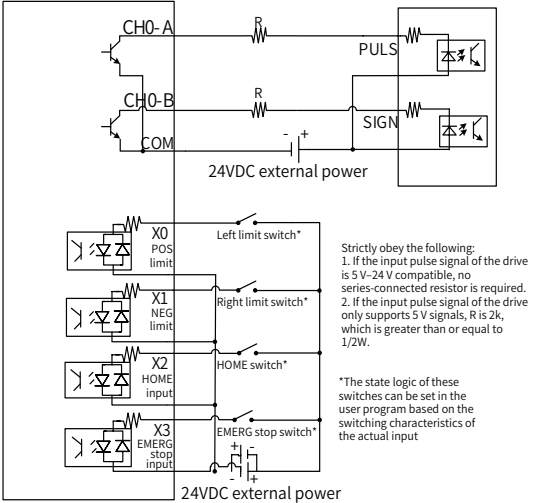
NOTE During wiring, follow the specifications of the corresponding servo drive or stepper motor drive.

6. Programming Reference

■ Supported H3U Instructions

| Instruction	Parameter Description					
PMDRVA	S1	S2	S3	S4	D1	D2
Absolute positioning	Module bit No. (1–8)	Channel No. (0–3)	Position (absolute position)	Speed	Positioning completed	Error code
PMDRVI	S1	S2	S3	S4	D1	D2
Relative positioning	Module bit No. (1–8)	Channel No. (0–3)	Position (relative position)	Speed	Positioning completed	Error code
PMPLSV2	S1	S2	S3		D1	D2
Speed mode motion	Module bit No. (1–8)	Channel No. (0–3)	Speed		Speed reached	Error Code
PMHOME	S1	S2	S3		D1	D2
Homing	Module bit No. (1–8)	Channel No. (0–3)	Position (the target position of homing)		Return to zero completed	Error Code
PMSETPOS	S1	S2	S3		D1	D2
Set current position	Module bit No. (1–8)	Channel No. (0–3)	Position (target position set value)		completed	Error Code
PMESTOP	S1	S2			D1	D2
Stop output immediately	Module bit No. (1–8)	Channel No. (0–3)			completed	Error Code
PMWRPARA	S1	S2	S3	S4	D1	D2
Write special function parameters	Module bit No. (1–8)	Channel No. (0–3)	Parameter Address	Parameter data	completed	Error Code

■ Programming example:

In the following example, this module is used with the H3U series main module to realize the following function: the relative positioning instruction is called to send 10000 pulses in the mode of pulse+direction through channel CH0 with a frequency of 10 KHz. The acceleration time is 100 ms and the deceleration time is 100 ms. After the position is reached through trapezoidal deceleration, the enabling signal is disconnected, and the next relative positioning instruction is enabled. -20000 pulses in the mode of pulse+direction is sent through channel CH0 with a frequency of 10 KHz, in which case the acceleration time is 100 ms and the decelerating time is 100 ms. After this instruction is completed through trapezoidal deceleration, channel CH0 stops outputting.

1) Start AutoShop, select Module Configuration, and then select the GL10-4PM module and drag it to the red block.
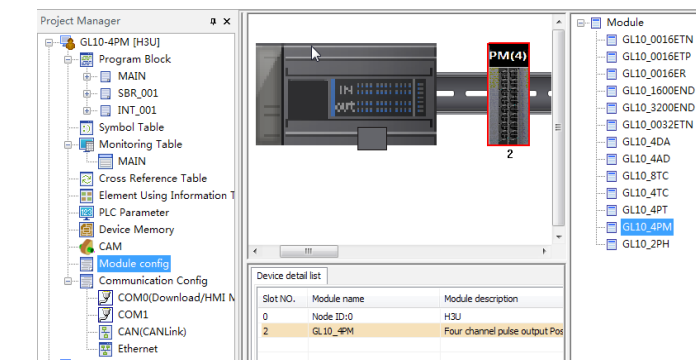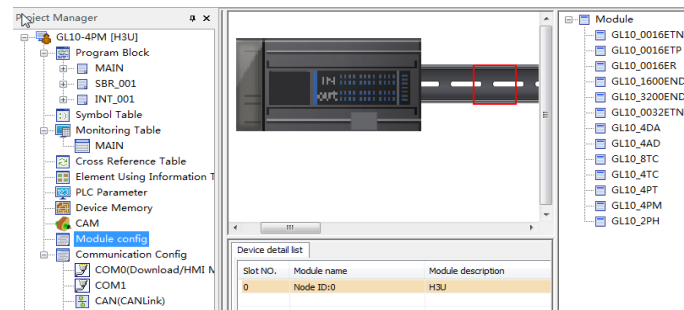
2) Double-click the GL10-4PM module in the figure to configure it.

Select the channel to be used. As shown in the figure below, the configuration window provides detailed settings including the pulse output mode, input signal positive and negative logic, and speed parameters for each output channel:
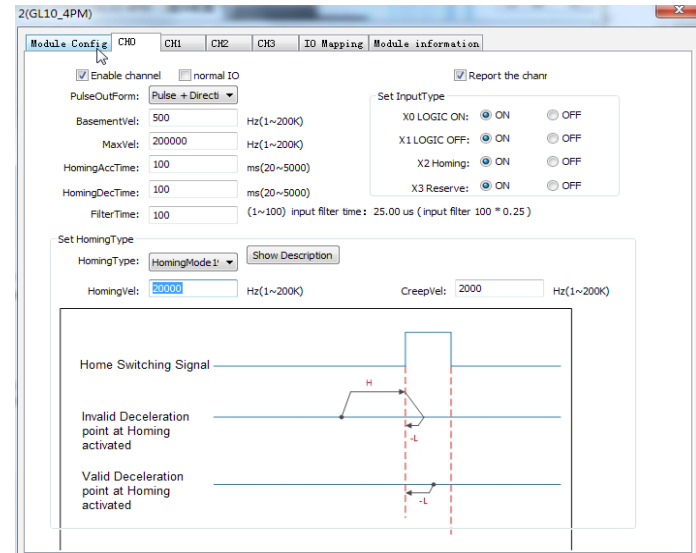
◆ Enable channel: Check to use the current channel.
◆ Pulse output mode: Two modes are available: CW/CCW and pulse+direction.
◆ Base speed: limits the minimum speed of the pulse module.
◆ Maximum speed: limits the maximum pulse output frequency of the current module.
◆ Acceleration time: the pre-set time for the base speed to reach the target speed, in ms.
◆ Deceleration time: the pre-set time for the target speed to decelerate to the base speed, in ms.
◆ Homing:

4 homing modes are available. The user can input positive limit, negative limit, homing and other signals according to the actual mechanical structure to achieve expected homing. As shown in the figure above, when you select "mode 19", there are two types of homing actions depending on the current position.

◆ Homing speed: the set value of high-speed homing speed.
◆ Approaching speed: the set speed to approach the target position.
◆ Input filtering: reduces interference with signals such as positive limit, negative limit, and homing.
◆ Input signal logic:

Configure according to the contactor type of the input terminal. The NO contact is defined as positive logic and the NC contact is defined as negative logic. Note: The default contact type is normally open (positive logic).

3) After configuring the channel parameters according to the actual application scenario, select I/O mapping to map the D component and R component to the corresponding channel position and state.

| Channel map element	Channel	Type
D1000	CH0 state	16-bit int
D1001,D1002	CH0 address	32-bit int
D1003	CH1 state	16-bit int
D1004,D1005	CH1 address	32-bit int
D1006	CH2 state	16-bit int
D1007,D1008	CH2 address	32-bit int
D1009	CH3 state	16-bit int
D1010,D1011	CH3 address	32-bit int

The data of each channel position is a 32-bit signed integer, and the channel state is 16-bit (as shown in the figure above, D1000 is mapped to the current state of CH0, D1003 to CH1, and so on). The meaning of each bit is as shown in the following table [data format: BOOL-(1bit)].

Bit	Buff Definition	Bit	Buff Definition
Bit0	Pulse output completion flag, the pulse has been output	Bit9	Reserved input
Bit1	Pulse output ongoing flag, the pulse is being output	Bit10	Completion of return to zero
Bit2	Accelerating	Bit11	Reserved
Bit3	Uniform speed	Bit12	
Bit4	Decelerating	Bit13	
Bit5	Pulse output direction	Bit14	Error code, for details, see "Error Codes and Solutions" below
Bit6	Positive limit signal input		
Bit7	Negative limit signal input	Bit15	
Bit8	Home switch signal input		

4) PLC programming
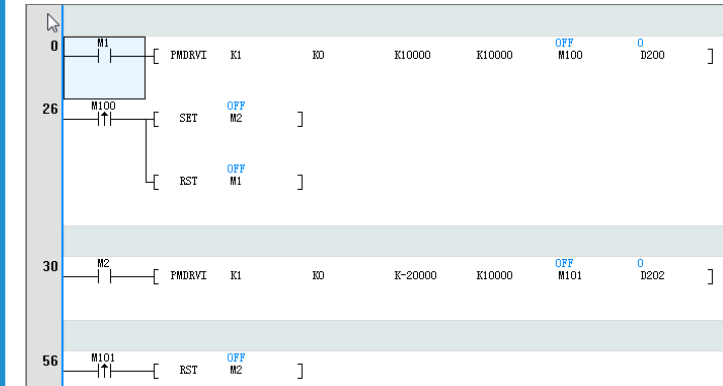
◆ PMDRVI relative positioning, module No.: 1, channel: CH0, pulses: 10000, target speed: 10000 Hz, error flag: D200, positioning completion flag: M100.
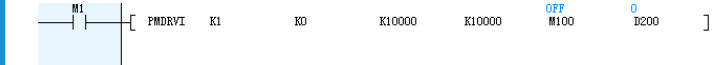
◆ Enable M1. After 10000 pulses are output, M100 turns ON, which means the instruction is executed. The position of CH0 is 10000. At this time, M1 will be reset and M2 will be set, which enables the next relative positioning instruction, with the number of pulses being -20000, the target speed being 10000 Hz, the error flag being D202, and the positioning completion flag being M101. After the instruction is completed, the enabling signal is disconnected, CH0 stops outputting, and the position of CH0 is -10000.

7. Fault Code and Solutions

By checking Bit12–Bit15 of the channel mapping component (for the mapping component set by the user in the module configuration, see step 3 of Programming Examples above), you can determine the module error type; you can also check the error code information of the PLC program through the software tool to determine the host error type or module error type.

Item	Error Code	Description
Module reported errors	1	The module cannot run because the 24 V power supply is off; check if the 24 V power supply is normal
	2	Reserved
	3	Reserved
	4	Reserved
	5	Positive limit error; pulse output stops and forward pulse positioning cannot continue because the positive limit is unexpectedly reached
	6	Negative limit error; pulse output stops and backward pulse positioning cannot continue because the negative limit is unexpectedly reached
	7	Channel output conflict; a new output instruction is received while pulse positioning output is in progress
	8	Reserved
	9	Reserved
	10	Position out of range; the received position parameter exceeds the minimum or maximum allowable range
	11	Speed out of range; the received speed parameter exceeds the minimum or maximum allowable range
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
Host reported error	1000	Positioning module instruction error: module bit number error, module channel error, module type is not a positioning module
	1001	Positioning module instruction error: position parameter error, the position parameter of the instruction exceeds the minimum or maximum allowable range
	1002	Positioning module instruction error: speed parameter error, the speed parameter of the instruction exceeds the minimum or maximum allowable range
	1003	Positioning module instruction error: channel output conflict; a new channel output positioning instruction is triggered while the channel is in pulse output positioning
	1004	Positioning module instruction error: I/O mapping soft element is not set in the current channel
	1005-1099	Reserved
	1100	Positioning module instruction error: unsupported output mode or output instruction
	1101-1199	Reserved

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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