INOVANCE

User Guide

H1U Series Programmable Logic Controller

19010084

B01

Thank you for purchasing the H1U Series PLC developed by Inovance Control Technology Co., Ltd.

Please read this manual carefully so as to ensure that you fully understand the features and use the H1U Series PLC more safely.

This manual mainly describes the specifications, features and usage of the H1U series PLC. For the developing environment and design of user programs, see the "AutoShop Online Help" and the "H1U/H2U Series Programmable Logic Controller Instruction & Programming Manual" that are also issued by our company.

Ų Features of the H1U Series Programmable Logic Controller:

※ Built-in large program memory space can reach up to 8K steps.

※ User programs and values of all retentive components will be held permanently even in the case of power down. Real-time clock can keep running for at least 15 days at power down.

※ It provides high-speed and multi-channel I/O ports, and has rich operation and positioning control functions.

※ It integrates three independent communication ports, which support multiple communication protocols including MODBUS instruction and is convenient for system integration.

※ It supports CANlink networking.

※ It provides comprehensive encryption function that can protect users' intellectual property rights.

Safety Precautions

■ Control System Design Precautions

DANGER

Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or PLC fault occurs. Take the following aspects into considerations in design:

Outside the PLC, an emergency stop circuit, a protection circuit, an interlock circuit and a positioning limit circuit may be necessary to prevent damage to your machine.

To ensure safe operation of the machine, please design external protection circuit and safety mechanism for the output signals that may cause heavy accidents.

When the PLC CPU detects its own system abnormality, all outputs may be turned off. When the controller circuit failure occurs, related outputs may be out of control. Thus, design an appropriate external circuit to ensure normal operation of the machine.

When output units such as relay or transistor are damaged, related outputs may be kept on the "ON" or "OFF" status.

PLC is designed for indoor electric environment. Its power supplies should have lightning protection device. Make sure that lightening over-voltage is not applied on PLC terminals so as to avoid damage to the machine.

■ Installation Precautions

CAUTION

Do not install the PLC in the places where dust, oil smoke, conducting dust, corrosive gas, or combustible gas exists; where it will be exposed to high temperature, dew, wind and rain; and where vibration or shock occurs. In addition, electric shock, fire, maloperation may also cause damage and deterioration to the machine.

When handling screw holes and wiring, do not make metal filings and wire lead drop into the controller vent holes. Otherwise, a fire, failure, and malfunction may be caused.

Ensure there are no foreign bodies including packaging materials like dustproof paper on the face of ventilation after installation is complete. Otherwise, poor heat dispersion may be caused during running, which may lead to a fire, failure and malfunction.

The Installation and wiring should be fixed and reliable. Otherwise, poor contact may cause malfunction.

■ Wiring Precautions

DANGER

Make sure all power supplies are cut off before the installation or wiring work.

Please connect AC power supply to the L/N terminal correctly.

Don't connect wires or remove cable plug at power-on. Otherwise, electric shock or circuit damage may be caused.

When handling screw holes and wiring, do not make metal filings and wire lead drop into the controller vent holes. Otherwise, a fire, failure, or malfunction may be caused.

CAUTION

Don't supply external power to terminal [24+] of the main unit or expansion units. Do not wire vacant terminals externally.

Select shielded cables as high-frequency signal input/output cables in applications with serious interference so as to enhance system anti-interference ability.

Please use wires of above 2mm² to connect the ground terminal of the main unit to avoid sharing grounding with the heavy electrical system.

■ Startup And Maintenance Precautions

DANGER

Do not touch any terminal while power is on. Otherwise, electric shock or malfunction may be caused.

Make sure power supplies are cut off before cleaning or retightening terminal. Otherwise, you may be shocked by electricity.

Please connect or remove the communication cable and the cables of expansion modules and control unit after cutting off all power supplies. Otherwise, machine damage or malfunctions may be caused.

Perform operations such as online modification, coercible output, RUN and STOP after understanding the instruction manual and ensuring the safety of the machine.

CAUTION

When inserting or removing remote extension card, make sure that power supplies are cut off.

Please dispose scrapped PLC as industrial wastes.

Product Information

■ Main Module Designation Rules

H1U-0806MRAX-XP

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①. Product Information H: Inovance controller

②. Series No. 1U: 1U series controller
③. Input points 08: 8 points input
④. Output points 06: 6 points input
⑤. Module classification M: Main module of general purpose controller; P: Positioning controller; N: Network controller; E: Expansion module;
⑥. Output type R: Relay output type ; T: Transistor output type
⑦. Power Supply type A: AC 220V Input omitted default:AC220V; B: AC110V input; C: AC24V input ; D: DC24V;
⑧. Special function identification, such as high speed I/O and analog function, etc.
⑨. Auxiliary version No. XP: 9

■ Basic Parameters

Table 1 Basic Parameters

Model	Total I/Os	I/O Features					
		Total I/Ps	Hi-speed I/Ps	Input Voltage	Total O/Ps	Hi-speed O/Ps	Output Type
H1U-0806MR-XP	14	8	Two 60 kHz Four 10 kHz	DC24V	6	/	Relay
H1U-0806MT-XP						Three 100 kHz	Transistor
H1U-1410MR-XP	24	14	Two 60 kHz Four 10 kHz	DC24V	10	/	Relay
H1U-1410MT-XP						Three 100 kHz	Transistor
H1U-1614MR-XP	30	16	Two 60 kHz Four 10 kHz	DC24V	14	/	Relay
H1U-1614MT-XP						Three 100 kHz	Transistor
H1U-2416MR-XP	40	24	Two 60 kHz Four 10 kHz	DC24V	10	/	Relay
H1U-2416MT-XP						Three 100kHz	Transistor
H1U-3624MR-XP	60	36	Two 60 kHz Four 10 kHz	DC24V	10	/	Relay
H1U-3624MT-XP						Three 100kHz	Transistor

Note: total frequency of hi-speed input hits no more than 70kHz.

■ General Specifications

Table 2 General Specifications

Environmental Parameter				Ambient Condition	Transport Ambient Condition Type	Storage Ambient Condition Parameter
	Type	Parameter	Unit			
Climatic- Condition	Ambient Temperature	Low Temperature	℃	Climatic-condition	Ambient temperature	Low temperature
		High Temperature	℃			High temperature
	Humidity	Relative Humidity	%		Humidity	Relative humidity
	Atmospheric Pressure	Low Pressure	kPa		Atmospheric pressure	Low pressure
		High Pressure	kPa			High pressure
Mechanica-l Stress	Sine Vibration	Displacement	mm	Mechanica-l stress	Sine vibration	Displacement
		Acceleration	m/s^2			Acceleration
	Random Vibration	Acceleration Spectral Density	m^2/s^3(dB/Oct)		Random vibration	Acceleration spectral density
		Frequency Range	Hz			Frequency range
		Vibration Direction	/			Vibration direction
	Shock	Type	/		Shock	Type
		Acceleration	m/s^2			Acceleration
	Dipping	Dipping Height	m		Dipping	Dipping height

Electric Design

■ Mounting Dimension

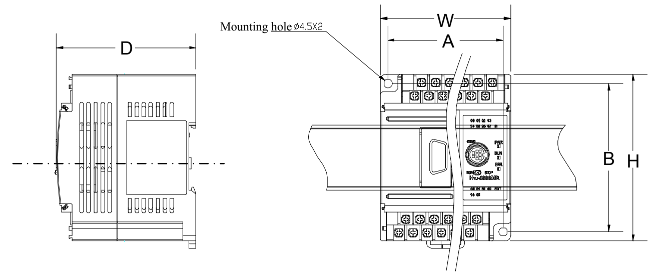


Fig.1 Mounting Dimension Diagram

Table 3 Mounting Dimension

Model	Total I/Os	Mounting Dimension		Physical Dimension W×H×D (mm)
		A (mm)	B (mm)	
H1U-0806M_	14	62	80	70×90×75
H1U-1410M_	24	83	80	93×90×75
H1U-1614M_	30	100	80	110×90×75
H1U-2416M_	40	123	80	133×90×75
H1U-3624M_	60	169	80	179×90×75

Mechanical Design

■ Product Structure

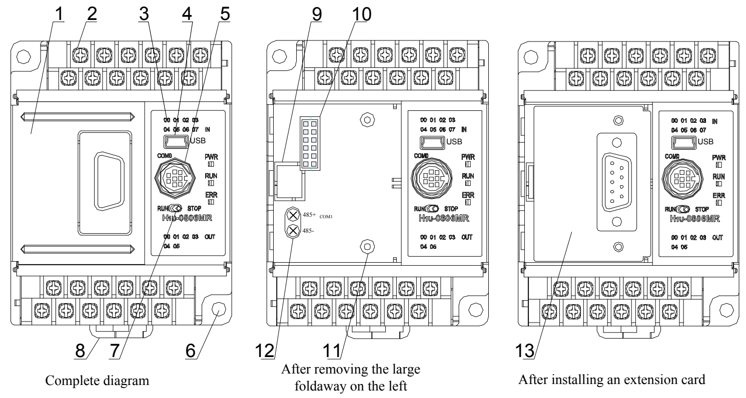


Fig.2 Product Structure Diagram

Component names and function description:

1) Foldaway
2) Power supply, auxiliary power supply and detachable terminals for signal input
3) Indicator LEDs
4) USB port
5) User program download port (COM0)
6) Screw holes (two)
7) RUN/STOP switch
8) Buckle for two DIN rail mounting
9) System program port (User's operation is prevented here.)
10) Special function extension card interface
11) Special function extension card fixed bolts (Screw specification: M2.6×6)
12) Wiring terminal for RS485 communication port
13) Special function extension card (an optional accessory)

■ System Expansion

The H1U series PLC does not support local expansion. But it can be connected with expansion modules through the CANlink network. In such case, the connected modules are called remote expansion modules. The CANlink protocol is defined by Inovance Technology. If you need to connect remote expansion modules, it is necessary to install the H1U-CAN-BD communication extension card, which is an optional accessory.

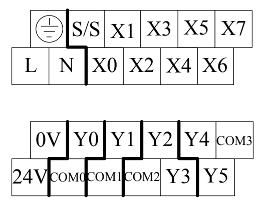
For the use of the H1U-CAN-BD, see the "H1U-CAN-BD User Manual". For the use of remote extension cards, see the "H1U/H2U Series Expansion Module Instruction Manual". For CAN communication functions, see the "H1U/H2U Series Programmable Logic Controller Instruction & Programming Manual".

The CANlink network can be connected with up to 63 stations, including CANlink master/slave stations. Any device that meets the CANlink protocol can be connected.

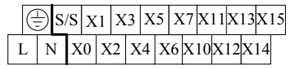
■ Hardware Interface

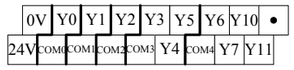
Terminal Definition

Terminal definition of the H1U -0806MR-XP, H1U -0806MT-XP

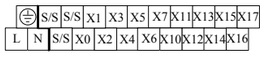


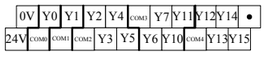
Terminal definition of the H1U -1410MR-XP, H1U -1410MT-XP



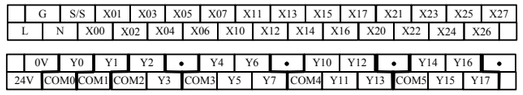


Terminal definition of the H1U -1614MR-XP, H1U -1614MT-XP

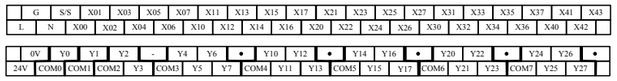




Terminal definition of the H1U -2416MR-XP, H1U -2416MT-XP



Terminal definition of the H1U -3624MR-XP, H1U -3624MT-XP



Note: The terminals in the thick line isolation circle belong to a group on the output side. For example: Y0/COM0 is a group and Y1/COM1 is a group.

Terminal wiring specification: 22-14AWG wire.

The terminal block of the PLC models mentioned above is detachable. To detach a terminal block, loosen the screws on both sides of the terminal block by a screwdriver. It’ s suggested that you loosen one screw about half and then loosen the other one. Alternately loosen them until both are completely loosened. Then gently raise up the terminal block. Remember not to loosen the two screws one by one.

To mount a terminal block put terminal pins into correct position and then slightly tighten one screw. After ensuring the screw doesn’ t fall off, tighten the other one. Alternately tighten them until they are fixed. During the process, insert the two sides of the terminal block as balanced as possible. Otherwise, terminals may damage, which may cause bad contact or short circuit.

Communication Interface Definition：

The main PLC unit provides three communications ports. COM0 hardware is standard RS422. The terminal interface is Mini-DIN8 socket. COM1 hardware is standard RS485.The third communication port is the mini USB. You can download programs through COM0 or USB.

Table 4 COM0 Port Definition

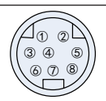


Fig.3 COM0 Communication Port

Fig.4 COM1 Communication Port

Pin No.	Signal	Description
1	RXD-	Receive negative data
2	RXD+	Receive positive data
3	GND	Grounding, no electrical connections for 9 and 10
4	TXD-/RXD-	External transmit negative data.
5	+5V	External power supply +5V, the same with the internal logic +5V.
6	CCS	Communication direction control wire
7	TXD+/ RXD+	External send positive data.
8	NC	Non-pin

■ Power Supply Specification

Table 5 Power Supply Circuit Specification

Item	Unit	Min. Value	Typical Value	Max. Value	Remark
Rated operating voltage	Vac	100	220	240	Normal startup and operating range
Voltage limit	Vac	85	/	264	Derating for usage When AC85 to100V and AC240 to 264V,see Figure 3-2.
Input current	A	/	/	1	AC 85V input,full-loading output
Input power	W/VA	/	/	15W/25VA	
24VCC/COM	V	21.6	24	26.4	Output3
	mA	10	200	200	

Output3 in Table 5 provides external power supply to input terminals of the main module. During the system configuration, do not supply power to expansion modules or other devices through Output3 as possible as you can. If you do it, make sure the supply doesn’ t exceed the maximum capacity of Output 3.

■ Input Specifications

Table 6 Input Specifications

Item		Hi-speed Inputs X0-X5	General Inputs
Signal input mode		Sink/Source mode.It is sink input when S/S terminal and 24V are shorted connection,it is source when s/s terminal and COM are shorted connection.	
Electrical parameters	Detection voltage	DC24V	
	Input resistance	3.3k	4.3k
	Input :ON	Input current is more than 4.5mA.	Input current is more than 3.5 mA.
	Input : OFF	Input current is less than 1.5mA	Input current is less than 1.5mA.
Filter Function	Digital Filter	X0 to X7 has digital filter function, the filter time can be set during the range of 0 to 60 msec.	
	Hardware Filter	Except X0 to X7, the other I/O port is hardware filter The filter time is about 10 msec.	
Hi-speed Function		X0 to X5 can realize the function with high-speed counting,interrupt and pluse capture,etc. The maximum frequency of the X0 and X1 counting reaches up to 60kHz. The maximum frequency of the X2 to X5 counting reaches up to 10kHz.	
Common Connection Terminal		Only a common terminal: S/S	

Note: S/S connecting to 24V+ or COM determines the Sink or Source input mode. The connecting mode is effective to all input points’ signals of the main module.

■ Output Specifications

Table 7 Output Specifications

Item		Relay outputs	Transistor outputs
Circuit Voltage		Less than AC250V; or less than DC30V	DC5V to DC24V
Circuit Insulation		Relay Mechanical Insulation	Light coupling insulation
LED		When the relay output contacts close, the LED light is on.	When the light coupling is driven,the LED light is on.
Leakage current during open circuit		None	Less than 0.1mA/DC30V
Min.load		2mA/DC5V	5mA（DC5V～DC24V）
Max. output current	Resistive load	2A/1 point : 8A/4 points common port, 8A/8 points common port	Max. output current
	Inductive load	AC220V，80VA	
	Lamp Load	AC220V，100W	
ON response delay		20 msec Max.	High speed output: 10 μ s Others: 0.5msec
OFF response delay		20 msec Max.	
High-speed output frequency		None	100kHz per channel (Max.)
Output common ports		Each group shares a common port COM. The groups are insulated .	
Fuse protection		None	

■ Internal equivalent circuit

PLC has a built-in power supply (DC24V) to detect user switch status, so you only need to connect input signals of dry contact. OC output type is needed if you connect an active transistor or sensor.

PLC signal input and internal equivalent circuit are shown as Figure 5 and Figure 6. User’ s circuit and PLC internal circuit are connected by the terminal. Figure 5 shows the Sink input mode, determined by short connection of “S/S” and “24V” terminals.

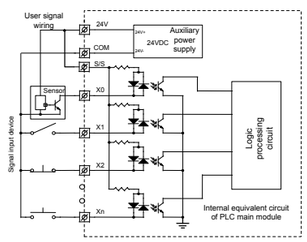


Fig. 5 Sink Input Connection

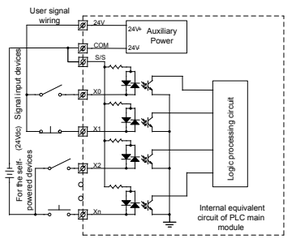


Fig. 6 Source Input Connection

In some special applications, Source input mode may be required. The equivalent input circuit of such mode is shown as Figure 6. The "S/S" and "COM" terminals are shortly connected.

Figure 7 shows the internal equivalent circuit of the relay output module. The output terminals are divided into several groups, and the groups are electrically insulated. The output contacts of different groups are connected with different power circuits.

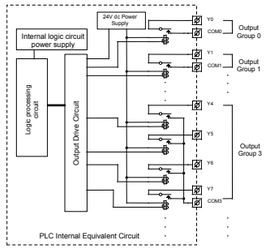


Fig. 7 Relay Output Equivalent Circuit

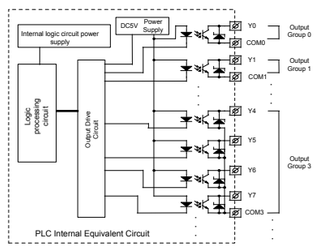


Fig. 8 Transistor Output Internal Equivalent Circuit

The internal equivalent circuit of transistor output is shown as Figure 8.The output terminals are divided into several groups, and the groups are electrically insulated. The transistor output can be used for DC24V load circuit only.

For the inductive load in AC circuit, you need add a RC component instead, and for the inductive load in DC circuit, you need add a freewheeling diode, as shown in Figure 9.

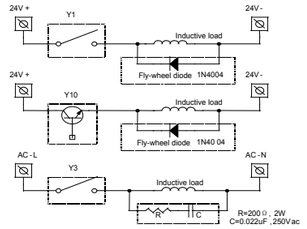


Fig. 9 Diagram for Inductive Load Absorbing Circuit

Programming

■ Soft component arrangement and power-off retentive description.

Table 8 Soft Component Arrangement

	H1U-0806M-XP_	H1U-1410M-XP_	H1U-1614M-XP_	H1U-2416M-XP_	H1U-3624M-XP_
Input Relay X	X000-X007 8 points	X000-X015 14 points	X000-X017 16 points	X000-X027 24 points	X000-X043 36 points
Output Relay Y	Y000-Y005 6 points	Y000-Y011 10 points	Y000-Y015 14 points	Y000-Y017 16 points	Y000-Y027 24 points

Auxiliary Relay M	[M0-M383] 384 points General		[M384-M1535] 1152 points Latched		M8000-M8255 256 points Special
State	[S0-S999] 1000 points Retentive				
Timer	T0-T199 200 points 100ms General		T200-T245 46 points 10ms General	[T246-T249] 4 points 1ms Accumulative, retentive	[T250-T255] 6 points 100ms Actuarial, retentive
Counter	16 bit count-up counter		32 bit count-up/down counter		High-speed counter
	C0-C15 16 points General	[C16-C199] 168 points Retentive	C200-C219 20 points General	[C220-C234] 15 points Retentive	[C235-C255] 21 points Retentive
Data Register D，V，Z	D0-D127 128 points General	[D128-D7999] 7872 points Retentive	[D1000-D7999] Max.7000 points It can be set to file register.	[D8000-D8255] 256 points Special	V7-V0，Z7-Z0 16 points Index
Nesting Pointer	N0-N7 8 points Master Control		P 0-P127 128 points Branch pointers/Subprogram		I00*-I50* 6 points Input interrupt pointers

Countants	K	16 bit -32,768-32,767	32 bit -2,147,483,648-2,147,483,647
	H	16 bit 0-FFFFH	32 bit 0-FFFFFFFFH
	E	-	32 bit 1175×10^{-41}-3402×10^{35}

Retentive soft components in the H1U Series PLC hold their value permanently, meaning the value of retentive components is not lost at power down. Real-time clock keeps running for 15 days or longer with the precondition that the power-on time of the main module must be longer than 5 minutes.

Model and Order Index of H1U Related Products

Model	Name	Type	Order No.
H1U-0806MR-XP	14-point PLC, relay output	H1U main module	1022053
H1U-0806MT-XP	14-point PLC, transistor output (three high-speed output)	H1U main module	1022054
H1U-1410MR-XP	24-point PLC, relay output	H1U main module	1022055
H1U-1410MT-XP	24-point PLC, transistor output (three high-speed output)	H1U main module	1022056
H1U-1614MR-XP	30-point PLC, relay output	H1U main module	1022051
H1U-1614MT-XP	30-point PLC, transistor output (three high-speed output)	H1U main module	1022052
H1U-2416MR-XP	40-point PLC, relay output	H1U main module	1022057
H1U-2416MT-XP	40-point PLC, transistor output (three high-speed output)	H1U main module	1022059
H1U-3624MR-XP	60-point PLC, relay output	H1U main module	1022058
H1U-3624MT-XP	60-point PLC, transistor output (three high-speed output)	H1U main module	1022060
H2U-0016ERDR	16-point relay output remote module	Remote relay output expansion module	1024004
H2U-0016ETDR	16-point transistor output remote module	Remote transistor output expansion module	1024002
H2U-1600ENDR	16-point input remote module	Remote input expansion module	1024014
H2U-2ADR	2-channel voltage/current input remote module	Remote analog input module	1024024
H2U-2DAR	2-channel voltage/current output remote module	Remote analog output module	1024026
H2U-4ADR	4-channel voltage/current input remote module	Remote analog input module	1024008
H2U-4DAR	4-channel voltage/current output remote module	Remote analog output module	1024009
H2U-4PTR-XP	4-channel heat resistance input remote module	Remote heat resistance input module	1024032
H2U-4TCR-XP	4-channel thermocouple input remote module	Remote thermocouple input module	1024034
H2U-4AMR	2-channel voltage/current output remote module	Remote mixed-analog module	1024025
H2U-6AMR	4-channel current input 2-channel voltage/current output remote module	Remote mixed-analog module	1024027
H2U-6CMR	4-channel voltage input 2-channel voltage/current output remote module	Remote mixed-analog module	1024029
H1U-CAN-BD	H1Useries CAN communication extension card for remote expansion module	H1U extension card (BD block)	1023011
H2U-232-CAB	232 download cable for PLC special use	cable	15042148

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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