IVC1 Series DC PLC Quick Start User Manual

Thank you for using INVT programmable logic controller (PLC). Before using the product, please carefully read this booklet so as to better understand it, fully use it, and ensure safety.

This quick start manual is to offer you a quick guide to the design, installation, connection and maintenance of IVC1 series DC-powered PLC, or DC PLC, convenient for on-site reference. This booklet briefly introduces the hardware specs, features, and usage of IVC1 series DC PLC, plus the optional parts and FAQ for your reference. For detailed product information, please refer to our *IVC1 Series PLC User Manual*, *Auto Station Programming Software User Manual,* and IVC *Series Micro-PLC Programming Manual*. For ordering the above user manuals, contact your INVT distributor or sales office. You can also download the PLC technical documents or feed back PLC-related problems by visiting our web site at www.invt.com.cn.

To Customers:

Thank you for choosing our products. To improve the product and provide better service for you, could you please fill in the form after the product has been operated for 1 month, and mail or fax it to our Customer Service Center. Thank you very much!

Invt Control Technology Co., Ltd.

Product Quality Feedback Form

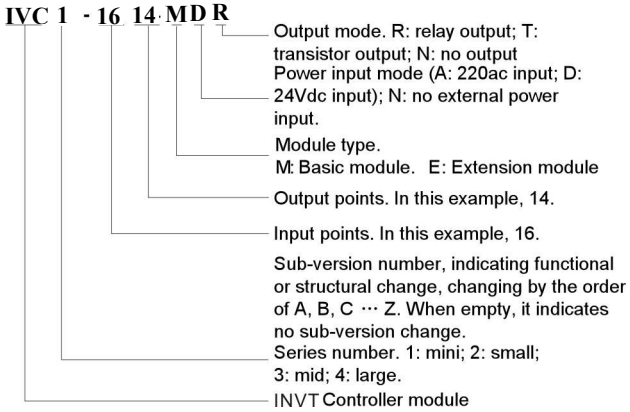
Customer name		Tele	
Address		Zip code	
Model		Date of use	
Machine SN			
Appearance or structure			
Performance			
Package			
Material			
Quality problem during usage			
Suggestion about improvement			

Address: Gaofa Industrial Park, Longjing, Nanshan District, 518055, Shenzhen, PRC. Tel: +86 755

1 Introduction

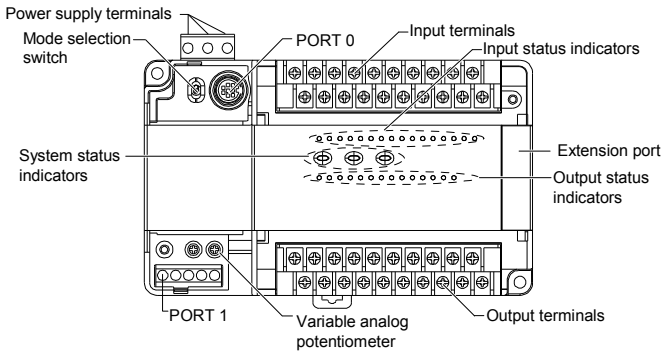
1.1 Model Designation

The model designation is shown in the following figure.



1.2 Outline

The outline of the basic module is shown in the following figure by taking the example of IVC1-1614MDR.



PORT 0 and PORT 1 are communication terminals. PORT 0 uses RS232 mode with Mini DIN8 socket. PORT 1 uses RS485 or RS232 mode. The busbar socket is for connecting the extension module. The mode selection switch has three positions: ON, TM and OFF.

1.3 Terminal Introduction

The layouts of terminals of different I/O points are shown below:

1) 16-point

Input terminal:

•	S/S	X0	X2	X4	X6	X10	
•	•	X1	X3	X5	X7	X11	

Output terminal:

Y0	•	Y1	•	Y2	Y3	Y5	
COM 0	•	COM 1	•	COM 2	Y4	•	

2) 24-point

Input terminal:

S/S	X0	X2	X4	X6	X10	X12	X14	
•	X1	X3	X5	X7	X11	X13	X15	

Output terminal:

•	Y0	Y1	•	Y2	Y4	Y6	Y10	
•	COM 0	COM 1	COM 2	Y3	Y5	Y7	Y11	

3) 30-point

Input terminal:

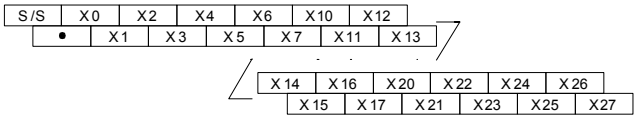
•	S/S	X0	X2	X4	X6	X10	X12	X14	X16
•	•	X1	X3	X5	X7	X11	X13	X15	X17

Output terminal:

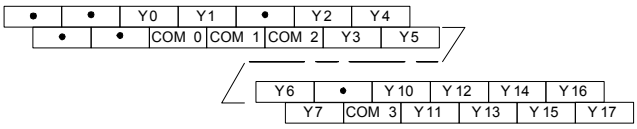
Y0	Y1	•	Y2	Y4	Y6	•	Y10	Y12	Y14
COM 0	COM 1	COM 2	Y3	Y5	Y7	COM 3	Y11	Y13	Y15

4) 40-point

Input terminal:

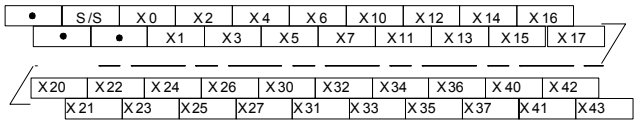


Output terminal:

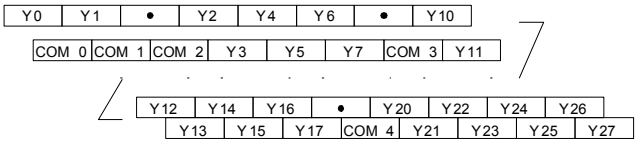


5) 60-piont

Input terminal:



Output terminal:



2 Power Supply

The specification of PLC built-in power source is listed in the following table.

Item		Unit	Min.	Rated	Max.	Note
Power supply voltage		Vac	19	24	30	For normal startup and operation. Enhanced or double insulation is required
Input current		A	/	0.85	/	24Vdc input
Output current	5V/GND	mA	/	900	/	The total power of two outputs ≤ 10.4W
	24V/GND	mA	/	300	/	

3 Digital Inputs & Outputs

3.1 Input Characteristic And Specification

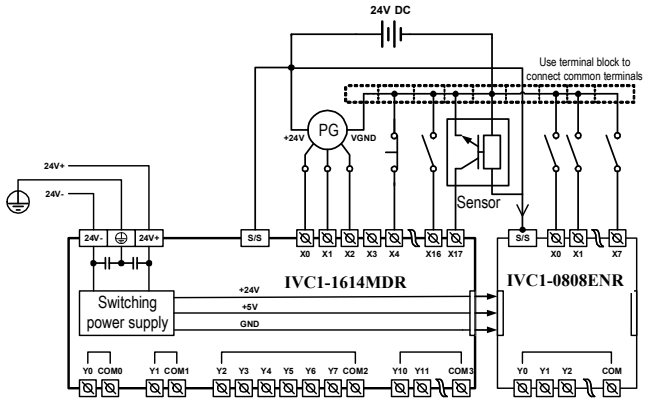
The input characteristic and specs are shown as follows:

Item		High-speed input terminals X0~X7	General input terminal
Input mode		Source mode or sink mode, set through s/s terminal	
Electric parameters	Input voltage	24Vdc	
	Input impedance	3.3kΩ	4.3kΩ
	Input ON	External circuit resistance < 400Ω	
	Input OFF	External circuit resistance > 24kΩ	
Filtering function	Digital filter	X0~X17 have digital filtering function. Filtering time: 0, 8, 16, 32 or 64ms (selected through user programme)	
	Hardware filter	Input terminals other than X0 ~ X17 are of hardware filtering. Filtering time: about 10ms	
High-speed function		X0~X7: high-speed counting, interrupt, and pulse catching X0 and X1: up to 50kHz counting frequency X2~X5: up to 10kHz counting frequency The sum of input frequency should be less than 60kHz	
Common terminal		Only one common terminal: COM	

The input terminal acting as a counter has a limit over the maximum frequency. Any frequency higher than that may result in incorrect counting or abnormal system operation. Make sure that the input terminal arrangement is reasonable and the external sensors used are proper.

Input connection example

The following diagram shows an example of IVC1-1614MDR in connection with an IVC1-0808ENR, which realizes simple positioning control. The positioning signals from the PG are input through high speed counting terminals X0 and X1, the limit switch signals that require high-speed response can be input through high-speed terminals X2 ~ X7. Other user signals can be input through any other input terminals.



3.2 Output Characteristic And Specification

The following table shows the relay output and transistor output.

Item	Relay output	Transistor output
Output mode	When output state is ON, the circuit is closed; OFF, open	
Common terminal	Divided into multiple groups, each with a common terminal COMn, suitable for control circuits with different potentials. All common terminals are isolated from each other	
Voltage	220Vac; 24Vdc, no polarity requirement	24Vdc, correct polarity required
Current	Accord with output electric specs (see following Table)	
Difference	High driving voltage, large current	Small driving current, high frequency, long lifespan
Application	Loads with low action frequency such as intermediate relay, contactor coil, and LEDs	Loads with high frequency and long life, such as control servoamplifier and electromagnet that action frequently

The following table shows the electric specs of output terminals.

Item			Relay output terminal	Transistor output terminal
Switched voltage			Below 250Vac, 30Vdc	5~24Vdc
Circuit isolation			By Relay	PhotoCoupler
Operation indication			Relay output contacts closed, LED on	LED is on when optical coupler is driven
Leakage current of open circuit			/	Less than 0.1mA/30Vdc
Minimum load			2mA/5Vdc	5mA (5~24Vdc)
Max. output current	Resistive load		2A/1 point; 8A/4 points, using a COM 8A/8 points, using a COM	Y0, Y1: 0.3A/1 point; Others: 0.3A/1 point, 0.8A/4 point, 1.2A/6 point, 1.6A/8 point. Above 8 points, total current increases 0.1A at each point increase
	Inductive load		220Vac, 80VA	Y0, Y1: 7.2W/24Vdc Others: 12W/24Vdc
	Illumination load		220Vac, 100W	Y0, Y1: 0.9W/24Vdc Others: 1.5W/24Vdc
Response time		OFF→ON	20ms Max	Y0, Y1: 10us Others: 0.5ms
		ON→OFF	20ms Max	
Y0, Y1 max. output frequency			/	Each channel: 100kHz
Output common terminal			Y0-COM0; Y1-COM1. After Y2, every 8 terminals use one isolated common terminal	
Fuse protection			None	

Output connection example

The following diagram shows an example of IVC1-1614MDR in connection with an IVC1-0808ENR. Different output groups can be connected to different signal circuits with different voltages. Some (like Y0-COM0) are connected to the 24Vdc circuit, some (like Y1-COM1) are connected to the 5Vdc low voltage signal circuit, others (like Y2~Y7) are connected to the 220Vac voltage signal circuit.

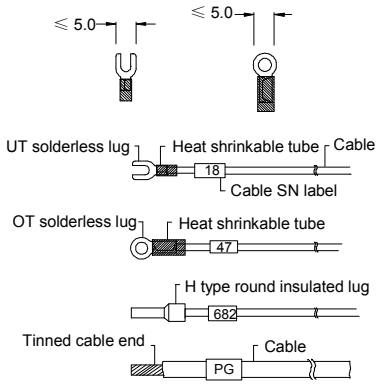
Cable specification

When wiring a PLC, use multi-strand copper wire and ready-made insulated terminals to ensure the quality. The recommended model and the cross-sectional area of the cable are shown in the following table.

Wire	Cross-sectional area	Recommended model	Cable lug and heat shrinkable tube
Power cable (24V+, 24V-)	1.0~2.0mm^2	AWG12, 18	H1.5/14 round insulated lug, or tinned cable lug
Earth cable (⏚)	2.0mm^2	AWG12	H2.0/14 round insulated lug, or tinned cable end
Input signal cable (X)	0.8~1.0mm^2	AWG18, 20	UT1-3 or OT1-3 solderless lug
Output signal cable (Y)	0.8~1.0mm^2	AWG18, 20	Φ3 or Φ4 heat shrinkable tube

Fix the prepared cable head onto the PLC terminals with screws. Fastening torque: 0.5 ~ 0.8Nm.

The recommended cable processing method is shown in the following figure.



6 Power-on Operation And Maintenance

Startup

1. Check the cable connection carefully. Make sure that the PLC is clear of alien objects and the heat dissipation channel is clear.

2. Power on the PLC, the PLC POWER indicator should be on.

3. Start the *Auto Station* software on the host and download the compiled user program to the PLC.

4. After checking the download program, switch the mode selection switch to the ON position, the RUN indicator should be on. If the ERR indicator is on, the user program or the system is faulty. Loop up in the *EC series Small PLC Programming Manual* and remove the fault.

5. Power on the PLC external system to start system debugging.

Routine maintenance

Do the following:

1. Ensure the PLC a clean environment. Protect it from aliens and dust.

2. Keep the ventilation and heat dissipation of PLC in good condition.

3. Ensure that the cable connections are reliable and in good condition.

7 Troubleshooting

If the PLC is faulty, take the following measures:

1. Check the connection of the power supply cable, and the related switches & protective devices.

2. Ensure the user terminal connections are reliable.

3. Ensure that the mode selection switch is in the right position.

If all the conditions are normal but the PLC still does not work, you can analyze the problem according to the PLC operation state and the I/O state LEDs by referring to *IVC1 Series PLC User Manual*.

Warning

1. Never connect the transistor output to an AC circuit (like 220Vac). The design of the output circuit must abide by the requirements of electric parameters, and no over-voltage or over-current is allowed.

2. Use the relay contacts only when necessary, because the life span of relay contacts depends largely on its action times.

3. The relay contacts can support loads smaller than 2A. To support larger loads, use external contacts or mid-relay.

4. Note that the relay contact may fail to close when the current is smaller than 5mA.

Notice

1. The warranty range is confined to the PLC only.

2. **Warranty period is 18 months**, within which period INVT conducts free maintenance and repairing to the PLC that has any fault or damage under the normal operation conditions.

3. **The start time of warranty period is the delivery date of the product**, of which the product SN is the sole basis of judgment. PLC without a product SN shall be regarded as out of warranty.

4. Even within 18 months, maintenance will also be charged in the following situations:

- Damages incurred to the PLC due to mis-operations, which are not in compliance with the User Manual;
- Damages incurred to the PLC due to fire, flood, abnormal voltage, etc;
- Damages incurred to the PLC due to the improper use of PLC functions.

5. The service fee will be charged according to the actual costs. If there is any contract, the contract prevails.

6. Please keep this paper and show this paper to the maintenance unit when the product needs to be repaired.

7. If you have any question, please contact the distributor or our company directly.

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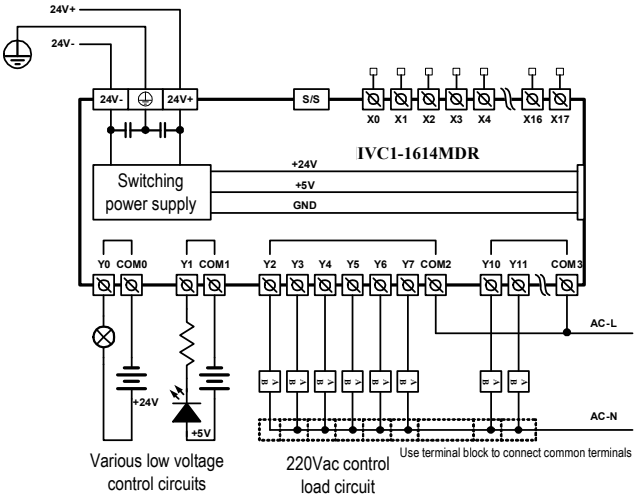
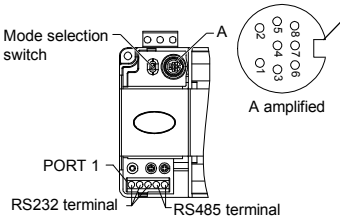


4 Communication Port

IVC1 series DC PLC basic module has two serial asynchronous communication ports: PORT 0 and PORT 1. The supported baud rates include:

115200bps	57600bps	38400bps	19200bps
9600bps	4800bps	2400bps	1200bps

The mode selection switch determines the communication protocol of PORT 0.



Pin No.	Name	Description
3	GND	Ground
4	RXD	Serial data receiving pin (from RS232 to PLC)
5	TXD	Serial data transmitting pin (from PLC to RS232)
1 ,2 ,6 , 7 , 8	Reserved	Undefined pin, leave it suspended

As a terminal dedicated to user programming, PORT 0 can be converted to programming protocol through the mode selection switch. The relationship between PLC operation status and the protocol used by PORT 0 is shown in the following table.

Mode selection switch position	Status	PORT 0 operation protocol
ON	Running	Programming protocol, or Modbus protocol, or free-port protocol, or N: N network protocol, as determined by user program and system configuration
ON→TM	Running	Converted to programming protocol
OFF→TM	Stop	
OFF	Stop	If the system configuration of user program is free-port protocol, it converts to programming protocol automatically after stop; or system protocol keeps unchanged

PORT 1 is ideal for connection with equipment that can communicate (such as inverters). With Modbus protocol or RS485 terminal free protocol, it can control multiple devices through the network. Its terminals are fixed with screws. You can use a shielded twisted-pair as the signal cable to connect communication ports by yourself.

Note: Never use RS232 and RS485 terminals at the same time. Besides, suspend the unused terminals, or communication could be interrupted.

5 Installation

PLC is applicable to Installation category II, Pollution degree 2.

The DIN rail fixing slots in the following figures are all 35mm wide.

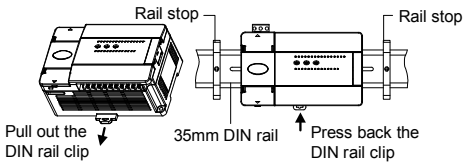
5.1 Installation Dimensions

Model	Length	Width	Height	Weight
IVC1-1006MDT IVC1-1006MDR	135mm	90mm	71.2mm	500g
IVC1-1410MDT IVC1-1410MDR				600g
IVC1-1614MDT IVC1-1614MDR	150mm	90mm	71.2mm	650g
IVC1-2416MDT IVC1-2416MDR	182mm	90mm	71.2mm	750g
IVC1-3624MDT IVC1-3624MDR	224.5mm	90mm	71.2mm	950g

5.2 Installation Method

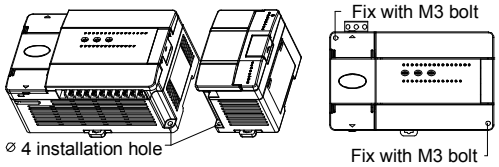
DIN rail mounting

Generally you can mount the PLC onto a 35mm-wide rail (DIN), as shown in the following figure.



Screw fixing

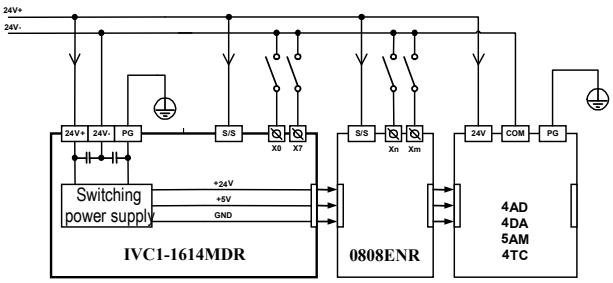
Fixing the PLC with screws can stand greater shock than DIN rail mounting. Use M3 screws through the mounting holes on PLC enclosure to fix the PLC onto the backboard of the electric cabinet, as shown in the following figure.



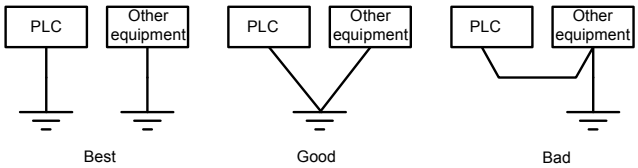
5.3 Cable Connection And Specs

Cable connection

The power supply connection example is shown in the following figure.



Connect the PLC ⏚ terminal to the grounding electrode. To ensure reliable grounding cable connection, which makes the equipment safer and protects it from EMI, use AWG12~16 cable, and make the cable as short as possible. Use independent grounding. Avoid sharing route with the grounding cable of other equipment (particularly those with strong EMI). See the following figure.



If PLC functional modules are used, it is recommended to ground the functional modules respectively, as shown in the following figure.