# INVT IVC1L-4AD Analog Input Module Analog Points Relay User Manual

**Contents**

**INVT IVC1L-4AD Analog Input Module Analog Points Relay**

**Note**
To reduce the chance of an accident, please carefully read the operating instructions and safety precautions prior to use. Only adequately trained personnel shall install or operate this product. In operation, strict compliance with applicable safety rules in the industry, the operating instructions, and safety precautions in this book are required.

**Port Description**

**Port**
The extension port and user port of IVC1 L-4AD are both protected by a cover, as shown in Figure 1-1. Removing the covers reveals the extension port and user port, as shown in Figure 1-2.

The extension cable connects IVC1L-4AD to the system, while the extension port connects IVC1L-4AD to another extension module of the system. For details on connection, see 1.2 Connecting Into System.
The user port of IVC1 L-4AD is described in Table 1-1.
**Note**: an input channel cannot receive both voltage signals and current signals at the same time. If you intend to use a channel for current signal measurement, please short its voltage signal input terminal and current signal input terminal.

**Connecting Into System**

Through the extension cable, you can connect the IVC1L-4AD to the IVC1L series basic module or other extension modules. While through the extension port, you can connect other IVC1 L series extension modules to IVC1L-4AD. See Figure 1-3.

**Wiring**
Figure 1-4 shows the wiring of the user port.

The circled 1-7 stands for the seven points to be observed during wiring.

1. It is recommended to use a shielded twisted pair for the analog input. Route them separately from power

cables and any cable that may generate EMI.

2. If the input signal fluctuates or there is strong EMI in external wiring, it is advisable to use a smoothing capacitor (0.1 µF-0.47µF/25V).

3. If a channel is used for current input, short its voltage input terminal and current input terminal.

4. If strong EMI exists, connect the FG terminal and PG terminal.

5. Properly ground the module's PG terminal.

6. The basic module's 24Vdc auxiliary power or other qualified external power supply can be used as the power source of the module's analog circuit.

7. Do not use the NC terminal of the user port.

## Indices

### Power Supply

### Performance
### Buffer Memory

IVC1L-4AD exchanges data with the basic module through Buffer Memory (BFM). After IVC1L-4AD is set through the host software, the basic module will write data into IVC1 L-4AD BFM to set the state of IVC1L-4AD and display the data from IVC1L-4AD on the host software interface. See Figure 4-2-Figure 4-6.

Table 2-3 describes the contents of the BFM of IVC1 L-4-AD.

### Table 2-3 BFM Contents

### Explanation

1. CH1 stands for channel 1; CH2, channel 2; CH3, channel 3, and so on.

2. Property explanation: R means read-only. An R element cannot be written. RW means read and write. Reading from a non-existent element will get 0.

3. The status information of BFM#300 is shown in Table 2-4.

4. BFM#600: input mode selection, used to set the input modes of CH1-CH4. See Figure 2-1 for their correspondence.

### Figure 2-1 Mode setting element vs. channel
Table 2-5 shows the status information of BFM#600.

For example, if #600 is written as '0x0103', the setting will be like this: CH1: closed
**Input range of CH3**: -5V-5V or -20mA-20mA (note the wiring difference in voltage and current, see 1.3 wiring); Input CH2, and CH4 mode: -10V-10V.

**BFM#700 – BFM#703:** average sampling times setting; setting range: 1-4096. Default: 8 (normal speed); choose 1 if high speed is needed.
**BFM#900–BFM#915:** channel characteristics settings, which are set using a two-point method. DO and D1 represent the channel's digital outputs, while AO and A1, in the mV unit, represent the channel's actual inputs. Each channel occupies 4 words. To simplify the setting operation without affecting functions, AO and A1 are respectively fixed to 0 and the maximum analog value in the present mode. After changing the channel mode (BFM #600), AO and A1 will change automatically according to the mode. Users cannot change them.
**Note:** If the channel input is a current signal (-20mA-20mA), the channel mode should be set to 1. As the channel's internal measurement is based on voltage signals, current signals should be converted into voltage

signals (-5V-5V) by the 2500 resistor at the current input terminal of the channel. A1 in the channel's characteristics setting is still in mV unit, i.e., S000mV (20mAx250O =5000mV). 7. BFM#2000: AD conversion speed setting. 0: 15ms/channel (normal speed); 1: 6ms/channel (high speed). Setting BFM#2000 will restore BFM#700 – #703 to the default values, which should be noted in programming. If necessary, you can re-set BFM#700 – #703 after you change the conversion speed.

**BFM#4094:** module software version, displayed automatically as Module Version in IVC1 L-4AD Configuration dialogue box of the host software, as shown in Figure 4-2. 8. BFM#4095 is module ID. ID of IVC1L-4AD is 0x1041. The user program in PLC can use this ID to identify the module before transceiving data.

## Setting Characteristics

The input channel characteristic of IVC1 L-4-AD is the linear relationship between the channel's analog input A and digital output D. It can be set by the user. Each channel can be considered as the model shown in Figure 3-1. As it is of linear characteristics, the channel characteristics can be defined by just two points: PO (AO, DO) and P1 (A1, D1), where DO is the channel's digital output corresponding to analog input AO, and D1 is the channel's digital output corresponding to analog input A1.

To simplify the operation process without affecting functions, AO and A1 are respectively fixed to 0 and the maximum analog value in the present mode. That is to say, in Figure 3-1, AO is 0 and A1 is the maximum analog input in the present mode. AO and A1 will change according to the mode when BFM#600 is changed. Users cannot change their values.
If you just set the channel mode (BFM#600) without changing the DO and D1 of the corresponding channel, the channel characteristics vs. mode should be as shown in Figure 3-2. The A in Figure 3-2 is default.

You can change the channel characteristics by changing DO and D1. The setting range of DO and D1 is -10000-10000. If the setting is outside this range, IVC1 L-4AD will not accept it, but maintain the original valid setting. Figure 3-3 provides for your reference an example of changing channel characteristics.

**A**

- Mode 0, DO = 0, D1 = 10,000
- Analog input 10V outputs 10,000
- Analog input 0V outputs 0
- Analog input -1 0V outputs -10,000

**B**

- Mode 1, DO = -500, D1 = 2000
- Analog input 5V (or 20mA)
- outputs 2000 Analog input 1V (or 4mA)
- outputs 0 Analog input -5V (or -20mA)
- outputs -3000

**Application Example**
**Basic Application**
IVC1-4AD is selected for both IVC1L-4AD and IVC1-4AD in the system block. Example: IVC1 L-4AD module address is 1 (for the addressing of extension modules, see IVC Series PLC User Manual). Use CH1 and CH3 for voltage input (-10V-10V), use CH2 for current input (-20-20mA), close CH4, set the average sampling times to 8, and use data registers D1, D2, and D3 to receive the average value, as shown in the following figures.

**Changing Characteristics**
Example: The IVC1 L-4AD module address is 3 (for the addressing of extension modules, see IVC Series PLC User Manual). Set the average sampling times to 4, set characteristics A and B in Figure 3-3 respectively for CH1 and CH2, close CH3 and CH4, and use data registers D1 and D2 to receive the average value, as shown in the following figures. See IVC Series PLC Programming Manual for details.

## Operation Inspection

### Routine Inspection

1. Check that the wiring of the analog input meets the requirements (see 1.3 wiring).
2. Check that the extension cable of IVC1 L-4AD is properly inserted in the extension port.
3. Check that the 5V and 24V power supplies are not overloaded. Note: the digital circuit of IVC1 L-4AD is powered by the basic module through the extension cable.
4. Check the application and make sure the operation method and parameter range are correct.
5. Set the IVC1 L main module to RUN state.

### Inspection Upon Fault
In case of abnormality, check the following items:

- The status of the POWER indicator
- ON: the extension cable is properly connected;
- OFF: check the extension cable connection and the basic module.
- The wiring of analog input
- The status of the 24V indicator
- ON: 24Vdc power supply normal;
- OFF: 24Vdc power supply possibly faulty, or IVC1 L-4AD faulty.

### The status of the RUN indicator

- Flash quickly: IVC1 L-4AD in normal operation;
- Flash slowly or OFF: Check the Error Status in IVC1 L-4AD
- Configuration dialogue box through the host software.

### Notice

1. The warranty range is confined to the PLC only.
2. The warranty period is 18 months, within which period INVT conducts free maintenance and repair to the PLC that has any fault or damage under normal operation conditions.
3. The start time of the 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 misoperation, 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 questions, please contact the distributor or our company directly.

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## Documents / Resources

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