



## **Allen-Bradley Analog Input Module (8-Bit)**

(Cat. No. 1771-IE)

### Product Data



### **Description**

The Analog Input Module (8-bit) (cat. no. 1771-IE) measures analog signals at its inputs and converts this data to 3-digit BCD values (0-255) for transfer to a PC processor. Up to eight analog devices, sensing such variables as temperature, pressure, light intensity, and position, can be connected to the module. All the outputs of these devices should conform to the single voltage or current range for which the module has been calibrated. The module can be used with any PC processor that uses the 1771 I/O structure.

The term “8-bit” indicates that the module’s resolution is 1 part in  $2^8$  (1 part in 256). This defines the number of steps in which the module divides its voltage or current range.

The module is a single-slot module and is shipped with field wiring arm (cat. no. 1771-WB).

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The module is compatible with the requirements of the Instrument Society of America Standard ISA S50.1 (1975). Compatibility of Analog Signals for Electronic Industrial Process Instruments.

## Input Ranges

The analog input module has eight single-ended input channels having the same voltage or current range. Specify the input range when ordering the module. Although this range is factory calibrated, you can recalibrate the module to a different current or voltage range with procedures outlined in the User's Manual (publication 1771-6.5.7), or return the module to us for recalibration.

| Nominal Input Range | Actual Range      | Resolution   |
|---------------------|-------------------|--------------|
| +1 to +5 VDC        | + 1 to +4.984 VDC | 15.60 mV/Bit |
| 0 to +5 VDC         | 0 to +4.980 VDC   | 19.53 mV/Bit |
| 0 to +10 VDC        | 0 to +9.960 VDC   | 39.06 mV/Bit |
| -10 to +5 VDC       | -10 to +9.922 VDC | 78.13 mV/Bit |
| 0 to +20 mA         | 0 to +19.922 mA   | 0.078 mA/Bit |
| +4 to +20 mA        | 4 to +19.937 mA   | 0.063 mA/Bit |
| -20 to +20 mA       | -20 to +19.844 mA | 0.156 mA/Bit |

You select the input range of all eight channels as a unit.

## Ordering Information

When you order the analog input module, identify the desired input voltage or current range by adding a code to the catalog number.

## Purchase Codes

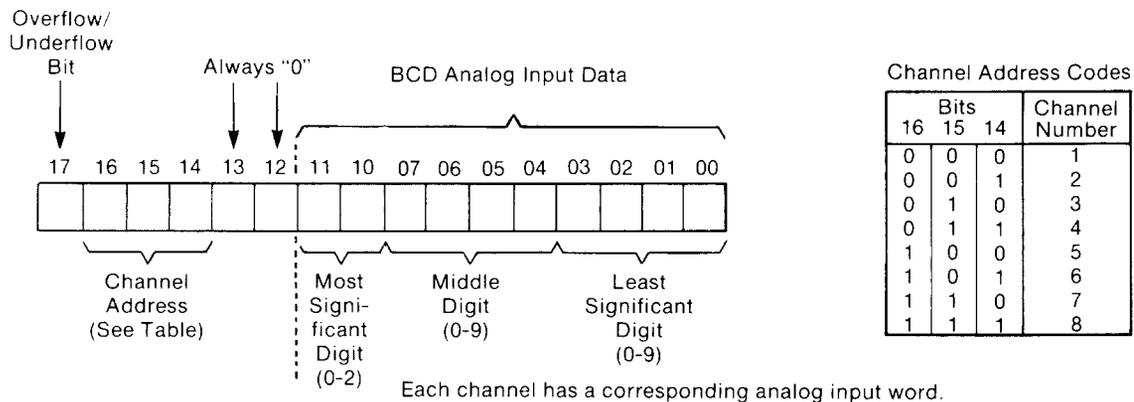
| Catalog No. | Identifying Code-XX |                |
|-------------|---------------------|----------------|
| 1771-IE-XX  | Codes               | Range          |
|             | 01                  | +1 to +5 VDC   |
|             | 02                  | 0 to +5 VDC    |
|             | 03                  | -10 to +10 VDC |
|             | 04                  | 0 to +10 VDC   |
|             | 05                  | +4 to +20 mA   |
|             | 06                  | 0 to +20 mA    |
|             | 07                  | -20 to +20 mA  |

For example, if a 0 to +10 VDC range is required, then specify catalog number 1771-IE-04.

## Programming

The module's eight input channels use eight words of the PC processor's input image table. The module converts analog voltage or current inputs to 3-digit BCD values (0-255) for transfer to the PC processor's input image table. The module places the BCD value in the lower 12 bits of each word and reserves the upper four bits to identify the channel number and status data (figure 1). The processor manipulates 3-digit BCD values in ladder logic instructions without conversion to another data base.

**Figure 1**  
**Analog Input Word**



Each channel has a corresponding analog input word.

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The PC processor transfers up to eight input words from the module to its designated input image table in a single scan using block transfer programming. The module's User's Manual (publication 1771-6.5.7) gives information on programming.

## Self-Diagnostics

The module monitors the conversion and transmission of data for errors, and the user-supplied voltage ( $\pm 15$  VDC and  $+5$  VDC) for correct level. Upon detecting an error, the module stops transferring data. You must correct the cause of the error before restarting the transmission of data.

Bit 17 in each word is a status bit that indicates overflow. The module sets the overflow bit in a word when it detects that the value in the word has reached the maximum or minimum limit of 0 or 255. Your ladder program should check the overflow bit as a condition for using data received from the module.

## Backplane Power

The module requires a current of 400 mA from the  $+5$  VDC Backplane Power backplane supply. This amount should be totalled with the current requirements of other modules in the chassis to avoid overloading the supply or exceeding the backplane current capacity.

## External Power

The analog input module requires a separate power supply for  $\pm 15$  VDC and +5 VDC. Using a separate supply protects analog signals from line transients caused by the switching of digital or power circuits.

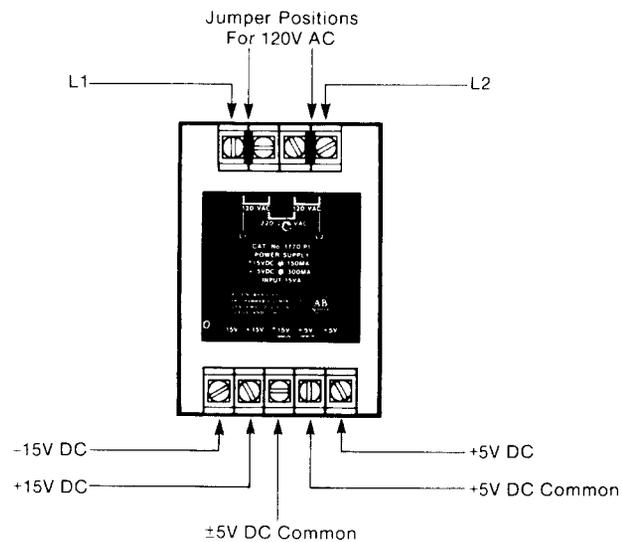
## Customer Power Supply Requirements

| Characteristics                               | +5 VDC +15VDC -15VDC  |              |              |
|---|-----------------------|--------------|--------------|
| Current (per module)                          | 150 mA                | 60ma         | 60 mA        |
| Output Voltage Tolerance                      | 5%                    | 1%           | 1%           |
| Regulation (Type)                             | .. Linear (Series) .. |              |              |
| Line Regulation (for 10 VAC RMS input change) | .. + 0.02% ...        |              |              |
| Load Regulation                               | $\pm 0.04\%$          | $\pm 0.02\%$ | $\pm 0.02\%$ |
| Ripple  | .. 1 mV ...           |              |              |
| Overvoltage Protection                        | +7V                   | +18V         | -18V         |
| Current Limit (% full load)                   | .. 125% ...           |              |              |

The module has no overvoltage protection from the external power supply.

We recommend that you use power supply (cat. no. 1770-P1) or (cat. no. 1778-P2) with the analog input module. Either supply operates on 120 VAC or 220/240 VAC. The P1 supply (figure 2) provides sufficient power for two analog input modules. The P2 supply provides 1 amp at +15 VDC, 1 amp at -15 VDC and 8 amps at +5 VDC.

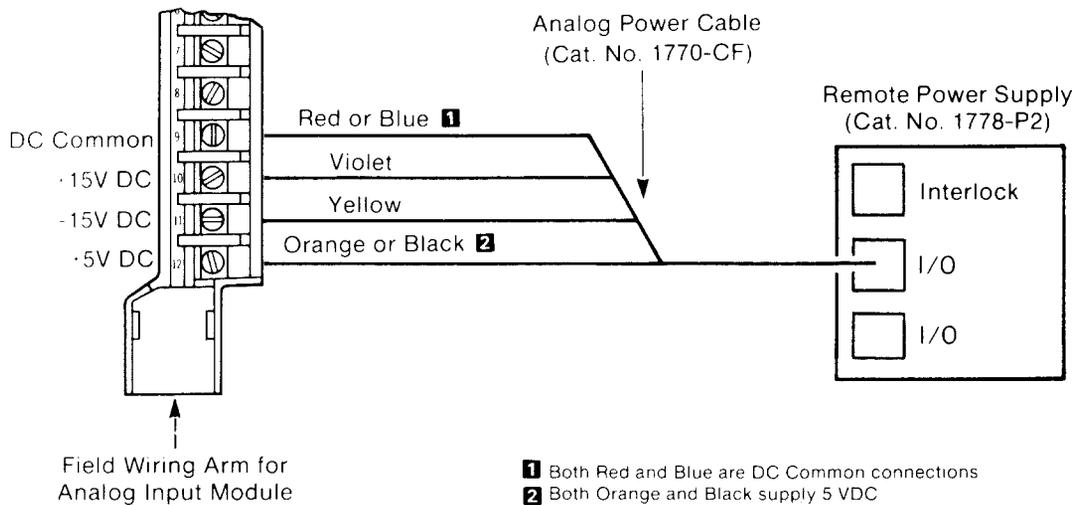
**Figure 2**  
**Connections to Power Supply 1770-P1**



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When using the P2 power supply (figure 3), you can use an 8-foot power cable (cat. no. 1770-CF) or a 3-foot power cable (cat. no. 1770-CG). We recommended that no more than 15 analog input modules be connected using either cable because of voltage drop in the cable. If you use this supply to power analog modules, do not use the +5 VDC output of this supply for backplane power. It may pick up transients from the backplane.

**Figure 3**  
**Connections to Power Supply 1778-P2**



Wiring for power cable (Cat. No. 1770-CF) is described in publication 1770-2.25

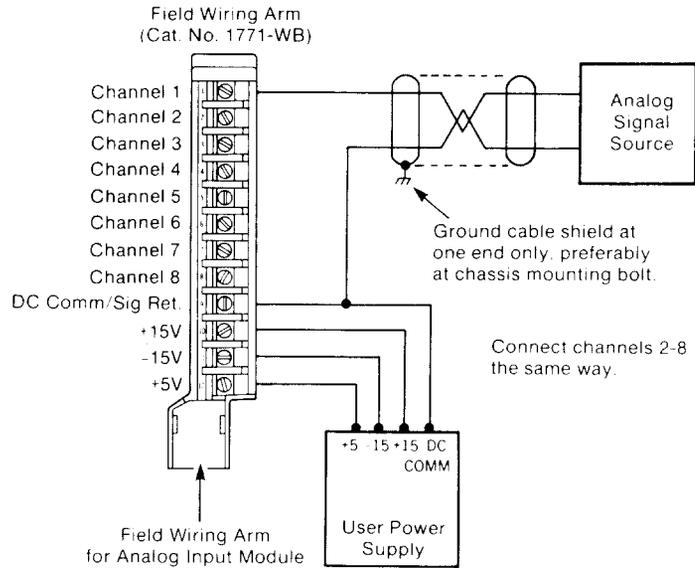
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## Connections

Use Belden 8761 or equivalent cable to connect the analog devices to the module's field wiring arm (figure 4). Because of the module's sensitivity, take care to correctly shield the module's signal leads.

**Figure 4**  
**Signal and Power Connections**

(See application codes and laws.)



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Do not confuse the signal return wire with the cable shield. The signal return wire is one of the insulated wires enclosed by the cable shield. Connect the signal return to DC common, the shield to ground.

We recommend a maximum cable length of 50 ft for voltage mode input devices. This recommendation is based on considerations of signal degradation and noise immunity in typical industrial environments. Cable length for current mode input devices need not be as restrictive because current mode signals are less sensitive to induced electrical noise. Limit the cable length so that cable resistance, when added to the module's input resistance, does not overload the analog driving device.

Power and common connections can be jumpered from one analog input module to the next.

## Module Installation

Place the analog input module in any I/O slot. To minimize noise, group analog input modules together within an I/O chassis whenever possible. Avoid placing analog modules close to AC modules or high voltage DC modules.



**WARNING:** Remove power from the 1771I/O chassis backplane and wiring arm before removing or installing an I/O module.

- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.
- Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

## Keying

Plastic keying bands, shipped with each I/O chassis, provide an easy method for keying I/O slots to accept only one type of module. We strongly recommend the use of keying bands.

The analog input module is slotted in two places on the rear edge of each board. The position of the keying bands on the backplane connector must correspond to these slots to allow insertion of the module. You can key any I/O chassis connector to receive this module. Place the keying bands between the following numbers on the backplane connectors:

- Between 4 and 6
- Between 26 and 28

## Electrostatic Discharge

Under some conditions, electrostatic discharge can degrade performance or damage the module. If you observe the following precautions you can guard against electrostatic damage to the module.

- Touch a grounded object to discharge yourself before handling the module.
- Do not touch the backplane connector or connector pins.
- When you need to configure or replace internal components, do not touch other circuit components inside the module. If available, use a static-safe work station.
- When not in use, keep the module in its static-shield bag.

## Specifications

### Number and Type of Inputs

- 8 single-ended

### Input Voltage Ranges

- +1 to +5 VDC
- 0 to +5 VDC
- -10 to +VDC
- 0 to +10 VDC

### Input Current Ranges

- 4 to +20 mA
- 0 to +20 mA
- -20 to +20 mA

### Input Impedance

- > 10,000 megohms for voltage ranges
- 250 ohms for current ranges

### Input Overvoltage Protection

- ± 35VDC
- 25 VRMS (sinusoidal)
- ± 30 mA continuous current

### Electrical-Optical Isolation

- 1500 v (transient)

### A/D Conversion.

- Type: successive approximation, monotonic
- Resolution: 8-bit
- Linearity: ± 0.1% of full scale at 25° C
- Absolute Accuracy: (including linearity, offset, and gain at 25° C): 0.3% of full scale + 1/2 LSB
- Quantizing Error: ± 1/2 LSB (0.19% of full scale)
- Temperature Coefficient: ± 85ppm/° C of full scale
- Calibration Stability: check yearly, recalibrate if necessary

### BCD Output to Processor

- 000 to 255 for any input range

### Backplane Requirement

- 400 mA

### External Power Requirement

- +15 VDC, 60 mA
- -15 VDC 60 mA
- +5 VDC 150mA

### Ambient Temperature Rating

- Operational: 0 to 60°C (32 to 85° F)
- Storage: -40 to 85°C (-40 to 185°F)

### Relative Humidity

- 5 to 95% (without condensation)

### Module Location

- 1771I/O chassis, single-slot

### Keying

- Insert keying bands between 4 and 6  
26 and 28

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