

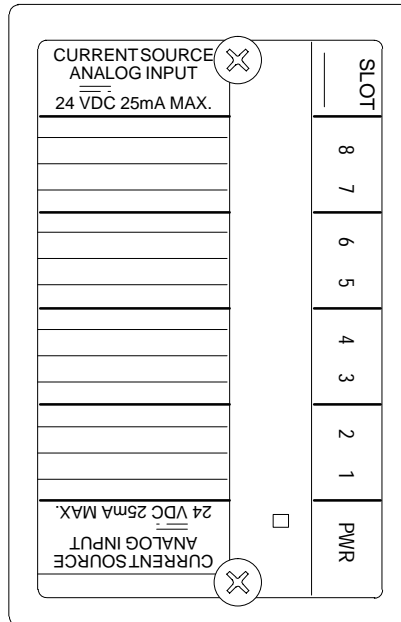
# Analog Input Module

IC670ALG230

GFK-0893G  
June 1997

## Current Source Analog Input Module

The Current Source Analog Input Module (IC670ALG230) accommodates 8 inputs on a common power supply.



46432

### Power Sources

The same 24 volt power supply used for the Bus Interface Unit can provide loop power in most cases. Separate power supply(s) must be used if isolation between circuits is required. The most common application uses a loop supply local at the module to drive multiple isolated transducers, isolated analog inputs, or differential analog inputs.

### LED

An LED, visible through the transparent portion of the module top, is on when both backplane and field power are present, and the fuse is not blown.

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### Host Interface

The Current-Source Analog Input Module converts current levels to unscaled analog input data. Analog scaling is performed by the Bus Interface Unit, which provides the scaled data to the host. Software Range selections of 0 to 20 mA and 4 to 20 mA are configurable on a per-channel basis.

The default range is 0 to 20 mA. The default scaling for the module is:

```

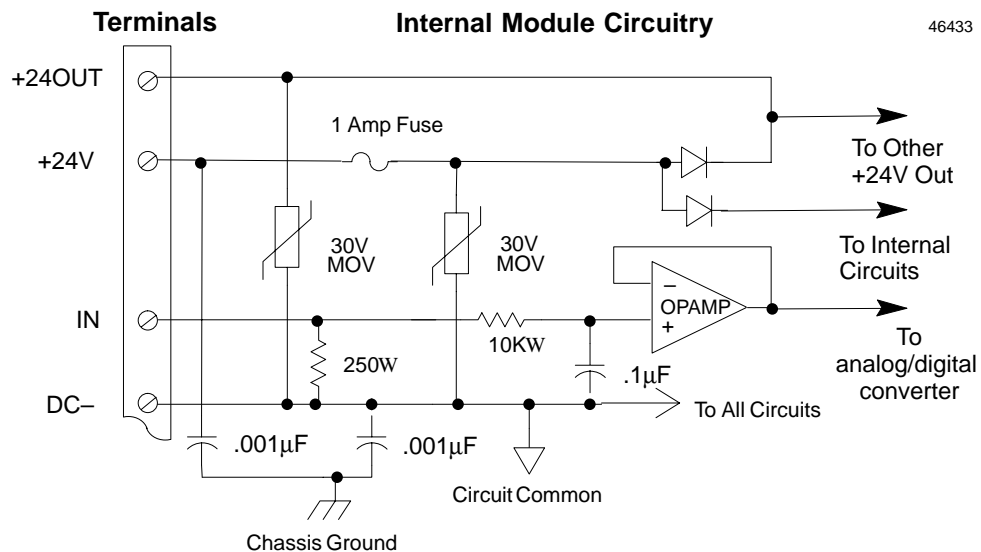
Eng Lo =    0
Eng Hi = 20,000
Int Lo  =    0
Int Hi  = 20,000

```

The module has 8 words (16 bytes) of analog input data. A Bus Interface Unit is required to provide this input data to the host and/or local processor.

### Module Operation

The 250 ohm resistor converts input current to a voltage with respect to common. The input R-C filters high-frequency noise, while the opamp buffers the signal to the analog/digital converter. All eight +24 VDC Out terminals are common to each other. The chassis ground goes to the I/O Terminal Block ground terminal.



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## Module Specifications

Module Characteristics	
Input or channel to channel common mode	None; single ended grouped input
Power supply voltage, including minimum/maximum ripple	18 Volts minimum 24 Volt typical 30 Volts maximum
24V Power input current Module only Including loop	50 mA minimum 210 mA (including loop current), maximum
Isolation to ground and logic	1500 VAC for 1 minute, 250 VAC continuous.
Current drawn from BIU power supply	51 mA maximum
Input Characteristics	
Digital Resolution	12 bits, typical
Analog Resolution	5.0 microAmps
Input current span	0.1 mA minimum, 20 mA maximum
Input Over-range fault indication	20.000 mA minimum, 20.500 mA maximum (note 1)
Maximum Input	30 mA
Input Open Wire (4-20 mA scaling only)	2.0 mA typical (note 2)
Input impedance	249.75 to 250.25 Ohms
Conversion time @ 1 MHz clock	60 Microseconds per channel, typical
Input filter Type Transition frequency	1st order RC 160 Hz typical
Maximum error at 25 degrees C (note 3)	+/- .05% full scale, 0.1 < Input < 20 mA
Non-linearity	+/- .025% of full scale
Temperature coefficient	+/- .002% of value per degree C, typical, +/- .005% of value per degree C, maximum

**note 1:** BIU produces the over-range diagnostic if the input data is over full scale.

**note 2:** BIU produces the open wire diagnostic if input data is below minimum value for 4-20 scaling.

**note 3:** In the presence of severe RF interference (IEC 801-3, 10V/m), accuracy may be degraded to 5% of full scale.

## Keying Locations

Optional keying locations for the Current Source Analog Input Module are:

Keying Locations									
A	B	C	D	E	F	G	H	J	K
✓			✓			✓	✓		

## Field Wiring

The input signals share a single signal common return. For good noise immunity, establish system signal commons, power supply reference points, and grounds close to such single-ended points. Signal common (as defined by most Standards) for the input module is the negative side of the 24 volt supply. The module's chassis ground goes to the I/O Terminal Block ground terminal. To improve noise immunity, connect this to the enclosure chassis with a short length of wire.

**Two wire loop powered transmitters (type 2)** should have isolated or ungrounded sensor inputs. Loop powered devices should use the same power supply as the input module. If a different supply must be used, connect the signal common to the module common. Also, ground only one point on the signal common, preferably at the input module. If the power supply is not grounded, the entire analog network is at a floating potential (except for the cable shields). Thus this circuit can be isolated if it has a separate isolated supply.

If shielded wire is used to reduce noise pickup, the shield drain wires should have a separate path to ground from any loop power supply ground to avoid inducing noise due to drain current.

**Three wire transmitters** require a third wire to provide power. The shield may be used as the power supply return. If the system is isolated, a third wire (triad cable) should be used instead of the shield for the power, and the shields grounded.

A separate, remote power supply can also be used. A floating supply should be used for best results. Grounding both supplies creates a ground loop. The circuit may still work despite this, however achieving good results requires very good voltage compliance of the transmitter.

**Isolated 4 wire transmitters** can avoid ground loop problems with remotely powered sensors.

If the module is installed on an I/O Terminal Block with Box Terminals or an I/O Terminal Block with Barrier Terminals, an Auxiliary Terminal Block must be used to provide additional wiring terminals. For the I/O Terminal Block with Wire to Board Connectors, external connection points are usually preferred, although an Auxiliary Terminal Block can be used.

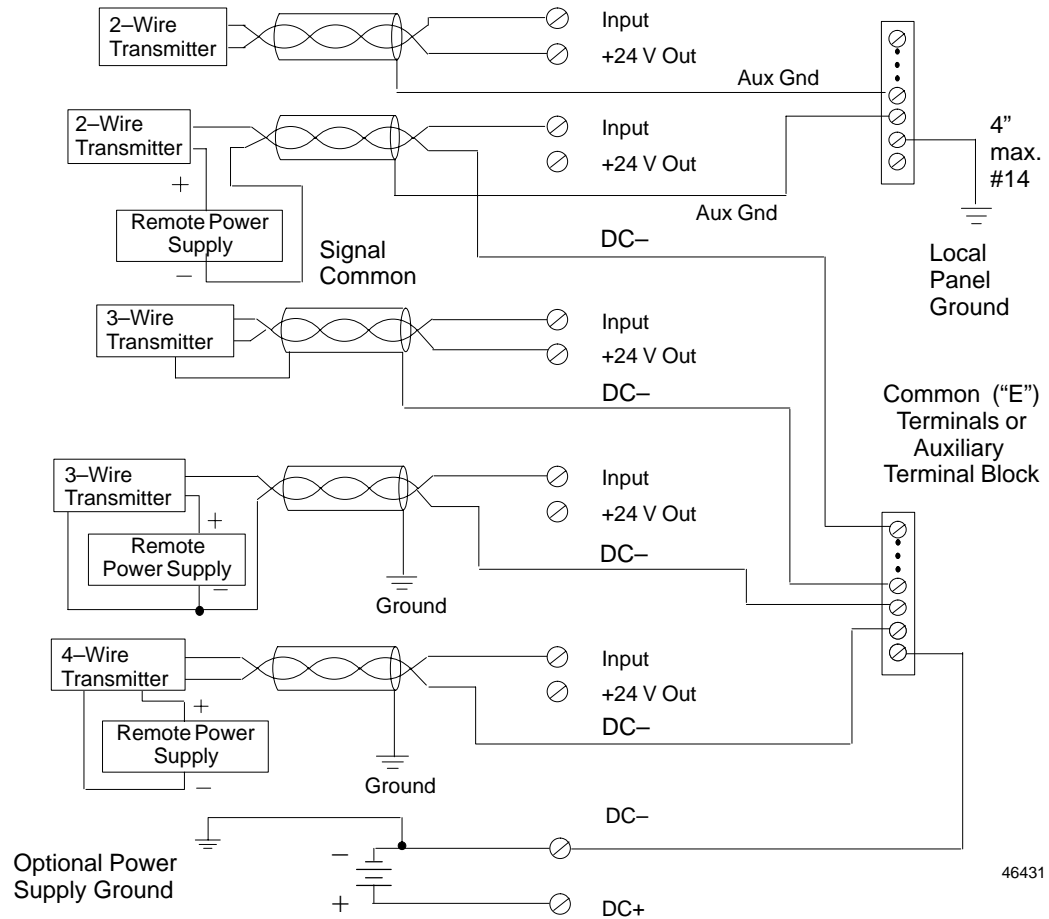
Auxiliary Terminal Blocks have all terminals connected together internally. The Auxiliary Terminal Block with box terminals has 13 terminals, each of which accommodates one AWG #14 (avg 2.1mm<sup>2</sup> cross section) to AWG #22 (avg 0.36mm<sup>2</sup> cross section) wire, or two wires up to AWG #18 (avg. 0.86mm<sup>2</sup> cross section). The Auxiliary Terminal Block with barrier terminals has nine terminals, each of which can accommodate one or two wires up to AWG #14 (avg 2.1mm<sup>2</sup> cross section).

For 3-wire and 4-wire transmitters, an I/O Terminal Block with box terminals and Auxiliary I/O Terminal Block can be used without any additional terminal strip. An additional terminal strip is needed for an I/O Terminal Block with barrier terminals and an Auxiliary Terminal Block.

The +24V Out terminals are a common fused output from DC+ to drive loop-powered 2 wire sensors. For anything other than 2-wire transmitters, jumper the Auxiliary Terminal Block to DC-.

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I/O Terminal Block wiring assignments for this module are shown below.

I/O Terminal Block with Box Terminals (IC670CHS002 and 102)	I/O Terminal Block with Barrier Terminals (IC670CHS001 and 101)	I/O Terminal Block with Wire to Board Connectors (IC670CHS003 and 103)																																																																																																																																				
<table border="1"> <tr><td>+24 V Out</td><td>16</td><td>15</td><td>Input 8</td></tr> <tr><td>+24 V Out</td><td>14</td><td>13</td><td>Input 7</td></tr> <tr><td>Common</td><td>E8</td><td></td><td></td></tr> <tr><td>+24 V Out</td><td>12</td><td>11</td><td>Input 6</td></tr> <tr><td>+24 V Out</td><td>10</td><td>9</td><td>Input 5</td></tr> <tr><td>Common</td><td>E6</td><td></td><td></td></tr> <tr><td>+24 V Out</td><td>8</td><td>7</td><td>Input 4</td></tr> <tr><td>+24 V Out</td><td>6</td><td>5</td><td>Input 3</td></tr> <tr><td>Common</td><td>E4</td><td></td><td></td></tr> <tr><td>+24 V Out</td><td>4</td><td>3</td><td>Input 2</td></tr> <tr><td>+24 V Out</td><td>2</td><td>1</td><td>Input 1</td></tr> <tr><td>Common</td><td>E2</td><td>E1</td><td>Common</td></tr> <tr><td>DC-</td><td>B2</td><td>A2</td><td>DC+</td></tr> <tr><td>DC-</td><td>B1</td><td>A1</td><td>DC+</td></tr> </table> <p>Terminals E1, E2, E4, E6, and E8 are electrically connected together, A1 and A2 are electrically connected together, B1 and B2 are electrically connected together.</p>	+24 V Out	16	15	Input 8	+24 V Out	14	13	Input 7	Common	E8			+24 V Out	12	11	Input 6	+24 V Out	10	9	Input 5	Common	E6			+24 V Out	8	7	Input 4	+24 V Out	6	5	Input 3	Common	E4			+24 V Out	4	3	Input 2	+24 V Out	2	1	Input 1	Common	E2	E1	Common	DC-	B2	A2	DC+	DC-	B1	A1	DC+	<table border="1"> <tr><td>+24V Out</td><td>16</td><td>15</td><td>Input 8</td></tr> <tr><td>+24V Out</td><td>14</td><td>13</td><td>Input 7</td></tr> <tr><td>+24V Out</td><td>12</td><td>11</td><td>Input 6</td></tr> <tr><td>+24V Out</td><td>10</td><td>9</td><td>Input 5</td></tr> <tr><td>+24V Out</td><td>8</td><td>7</td><td>Input 4</td></tr> <tr><td>+24V Out</td><td>6</td><td>5</td><td>Input 3</td></tr> <tr><td>+24V Out</td><td>4</td><td>3</td><td>Input 2</td></tr> <tr><td>+24V Out</td><td>2</td><td>1</td><td>Input 1</td></tr> <tr><td>DC-</td><td>B</td><td>A</td><td>DC+</td></tr> </table>	+24V Out	16	15	Input 8	+24V Out	14	13	Input 7	+24V Out	12	11	Input 6	+24V Out	10	9	Input 5	+24V Out	8	7	Input 4	+24V Out	6	5	Input 3	+24V Out	4	3	Input 2	+24V Out	2	1	Input 1	DC-	B	A	DC+	<table border="1"> <tr><td>Input 6</td><td>11</td><td>10</td><td>+24V Out</td></tr> <tr><td>+24V Out</td><td>12</td><td>9</td><td>Input 5</td></tr> <tr><td>Input 7</td><td>13</td><td>8</td><td>+24V Out</td></tr> <tr><td>+24V Out</td><td>14</td><td>7</td><td>Input 4</td></tr> <tr><td>Input 8</td><td>15</td><td>6</td><td>+24V Out</td></tr> <tr><td>+24V Out</td><td>16</td><td>5</td><td>Input 3</td></tr> <tr><td>DC+</td><td>A2</td><td>4</td><td>+24V Out</td></tr> <tr><td>DC+</td><td>A1</td><td>3</td><td>Input 2</td></tr> <tr><td>DC-</td><td>B2</td><td>2</td><td>+24V Out</td></tr> <tr><td>DC-</td><td>B1</td><td>1</td><td>Input 1</td></tr> </table>	Input 6	11	10	+24V Out	+24V Out	12	9	Input 5	Input 7	13	8	+24V Out	+24V Out	14	7	Input 4	Input 8	15	6	+24V Out	+24V Out	16	5	Input 3	DC+	A2	4	+24V Out	DC+	A1	3	Input 2	DC-	B2	2	+24V Out	DC-	B1	1	Input 1
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