OPTOMUX DATA BOOK

Form 524-001002 — October, 2000

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The information in this manual has been checked carefully and is believed to be accurate; however, Opto 22 assumes no responsibility for possible inaccuracies or omissions. Specifications are subject to change without notice.

Opto 22 warrants all of its products to be free from defects in material or workmanship for 30 months from the manufacturing date code. This warranty is limited to the original cost of the unit only and does not cover installation, labor, or any other contingent costs. Opto 22 I/O modules and solid-state relays with date codes of 1/96 or later are guaranteed for life. This lifetime warranty excludes reed relay, SNAP serial communication modules, SNAP PID modules, and modules that contain mechanical contacts or switches. Opto 22 does not warrant any product, components, or parts not manufactured by Opto 22; for these items, the warranty from the original manufacturer applies. These products include, but are not limited to, OptoTerminal-G70, OptoTerminal-G75, and Sony Ericsson GT-48; see the product data sheet for specific warranty information. Refer to Opto 22 form number 1042 for complete warranty information.

Document Conventions

- **Bold** typeface indicates text to be typed. Unless otherwise noted, such text may be entered in upper or lower case. (Example: "At the DOS prompt, type **cd \windows**.")
- *Italic* typeface indicates emphasis and is used for book titles. (Example: "See the *OptoControl User's Guide* for details.")
- File names appear in all capital letters. (Example: "Open the file TEST1.TXT.")
- Key names appear in small capital letters. (Example: "Press SHIFT.")
- Key press combinations are indicated by plus signs between two or more key names. For example, SHIFT+F1 is the result of holding down the SHIFT key, then pressing and releasing the F1 key. Similarly, CTRL+ALT+DELETE is the result of pressing and holding the CTRL and ALT keys, then pressing and releasing the DELETE key.
- "Press" (or "click") means press and release when used in reference to a mouse button.
- Menu commands are sometimes referred to with the Menu➠Command convention. For example, "Select File➠Run" means to select the Run command from the File menu.
- Numbered lists indicate procedures to be followed sequentially. Bulleted lists (such as this one) provide general information.

Table of Contents

Welcome

Overview

Thank you for your interest in the OPTOMUX digital product line. This data book provides complete details on every G4 digital I/O product component, including adapter cards, I/O modules, and mounting racks.

This data book is organized as follows:

- Mounting racks listed by increasing module capacity
- Digital I/O modules listed by inputs and then outputs
- Adapter cards, cables, fuses, and jumper straps.

Software

IBM PC and PS/2
OptoWare Software Models 8800 and 9900

Description

Optoware IBM is a software package which includes an assembly language subroutine for interfacing between Optomux and application programs written in high level languages. The Optoware driver subroutine can be called from Basic, Turbo Pascal, C, or assembly. Complete, commented assembly language source code is included for tailoring the Optoware driver to interface with other high level language not directly supported.

The Optoware software package also includes a Utility diskette which contains:

HOST This program sends ASCII Hex command characters out to the Optomux network.

OS This program checks out the hardware and communications of the Optomux network.

USER This program, an on-line tutorial, generates Optomux commands using the Optoware driver.

The 8,800 Optoware software package is in the 3.5 inch, 720 KB format and the 9,900 package is in the 5.25 inch, 360 KB format. The 8,800 Optoware software package consists of one micro-floppy diskette which contains all the Source and Utility files. The 9,900 package consists of two floppy diskettes (Source and Utility).

Digital I/O Module Data Sheets

Optomux
B1 Brain Board
Form 463-990609

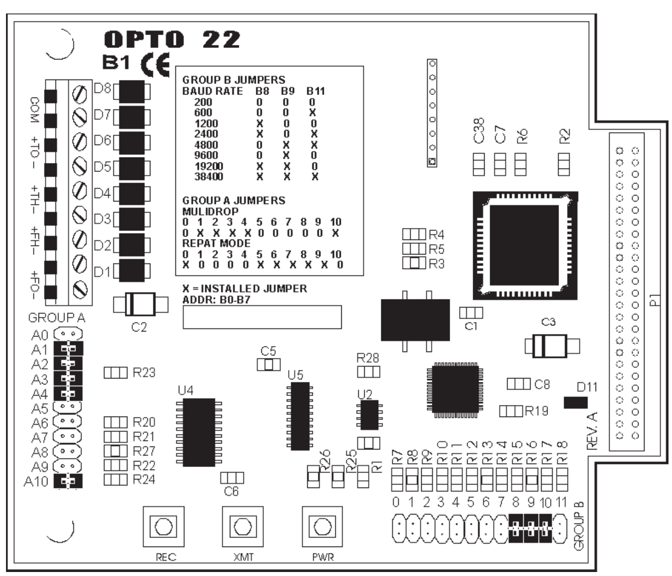
Description

The B1 Digital Optomux brain board is an intelligent digital controller that operates as a slave device to a host computer. Each B1 contains a microprocessor that provides the necessary intelligence to carry out serial communications with a host computer and also perform control functions at each channel of I/O. The B1 brain boards are designed to mount on most Opto 22 I/O mounting racks that have header connectors. I/O mounting racks that accept single-channel Standard and G4 I/O modules, Quad Pak I/O modules, SNAP I/O modules or have built-in integrated I/O circuitry are all available.

When combined with an I/O mounting rack, the B1 brain board can perform the following functions:

- Read Inputs
- Write Outputs
- Latching
- Counting
- Pulse Measurement
- Time Delays
- Pulsed Outputs

Communication with a host computer is via an RS422/485 serial link composed of a dual twisted pair line that connects to each Optomux station. The serial data link operates at selectable baud rates from 300 to 38.4k baud. Optomux stations can be configured for either multidrop or repeat mode operation. In multidrop mode, up to 100 Optomux stations can be networked over a total line length of up to 5,000 feet. In repeat mode operation, up to 256 Optomux stations can be networked with up to 5,000 feet between stations.



Specifications

B1 Power Requirements	5 VDC ± 0.1 V @ 0.5 amps (includes digital module requirements)
B2 Power Requirements	5 VDC ± 0.1 V @ 0.5 amps (excludes analog module requirements*)
Operating Temperature	0° C to 70° C 95% humidity, non-condensing
Interface	RS-422/485 communications 50-pin female header connector to I/O mounting rack
Data Rates	300, 600, 1200, 2400, 4800, 9600, 19200, and 38400 baud
Range: Multidrop Repeat Mode	 Up to 5,000 feet total length with up to 32 Optomux stations maximum.** Up to 5,000 feet between stations with up to 256 Optomux stations maximum.
Communications	Full duplex, two twisted pairs, a signal common wire, and a shield
LEDs	Power, receive, and transmit
Jumper-selectable Options	Address (0 to 255) Baud rate Multidrop or repeat mode 2- or 4-pass protocol

* ±15 VDC ± 0.25 V required for the analog modules. Current depends on the number and type of modules installed. A 24 VDC power supply is required for analog modules that need a current loop source.

**Extend line length and/or number of Optomux stations with the AC30A/B network repeater.

Error Codes

Optomux Detected Errors:

- -1 Power Up Clear Expected
- -2 Undefined Command
- -3 Checksum Error
- -4 Input Buffer Overrun
- -5 Non-printable ASCII Character Received
- -6 Data Field Error
- -7 Serial Watchdog Timeout
- -8 Invalid Limit Set

OptoWare Driver Detected Errors:

- -20 Invalid Command Number
- -21 Invalid Module Position
- -22 Data Range Error
- -23 Invalid First Modifier
- -24 Invalid Second Modifier
- -25 Invalid Address
- -27 Not Enough Return Data
- -28 Invalid Return Data
- -29 Turnaround Time Out (Optomux did not respond within the specified time interval)
- -30 Input Buffer Overrun
- -31 Checksum Error
- -33 Send Error (Message cannot be sent out; probable serial port problem)
- -34 Incorrect Command Echo In Four-Pass

Digital Command Set

System Commands
Power Up Clear
Reset
Set TurnAround Delay
Set Digital Watchdog Delay
Set Enhanced Digital Watchdog Timeout
Set Optomux Protocol
Identify Optomux Type
Set Timer Resolution

Configure Commands
Configure Positions
Configure As Inputs
Configure As Outputs

Read and Write Commands
Write Digital Outputs
Write Binary Outputs
Activate Digital Outputs
Deactivate Digital Outputs
Read On/Off Status
Read Binary On/Off Status
Read Configuration

Latch Commands
Set Latch Edges
Set Off-To-On Latches
Set On-To-Off Latches
Read Latches
Read And Clear Latches
Clear Latches
Read Binary Latches
Read And Clear Binary Latches

Counting Commands
Start And Stop Counters
Start Counters
Stop Counters
Read Counters
Read And Clear Counters
Clear Counters

Time Delay And Pulse Commands
Set Time Delay
Initiate Square Wave
Turn Off Time Delay/Square Wave
High Resolution Square Wave
Retrigger Time Delay
Generate N Pulses
Start On Pulse
Start Off Pulse

Duration Measurement Commands
Set Pulse Trigger Polarity
Trigger On Positive Pulse
Trigger On Negative Pulse
Read Pulse Complete Bits
Read Pulse Duration Counters
Read And Clear Duration Counters
Clear Duration Counters

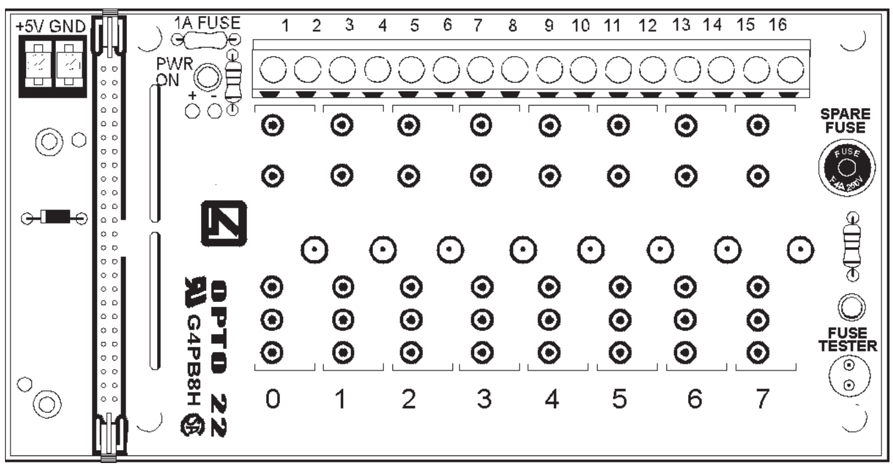
Driver Commands
Command Numbers
Set Driver Protocol
Set TurnAround Delay
Set Serial Port Number
Set Number Of Retries
Configure Serial Port

G4PB8H
Eight-Channel I/O Mounting Rack
Form 647-990609

Description

The G4PB8H I/O mounting rack accommodates up to eight G4 I/O modules. A header connector accepts a standard 50-pin cable, the Optomux® B1, Pamux® B5, or B100 brain board for logic connections. Barrier strips with screw terminals provide the field and mounting rack power connections.

Insert and remove modules easily and quickly without disturbing field wiring. Modules are secured to the mounting rack with a threaded captive hold-down screw. The logic supply is fused with a 1A fuse.



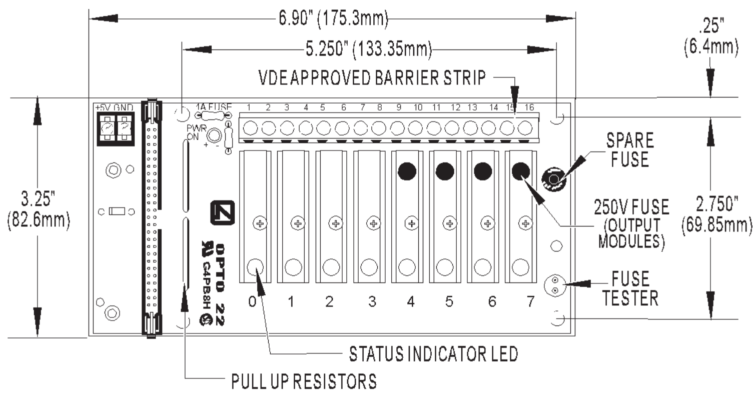
Features

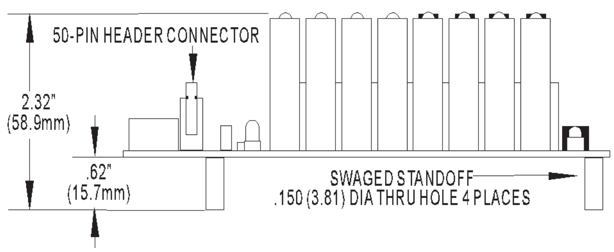
- Requires minimum panel space
- Built-in fuse tester
- Spare fuse on board
- UL recognized, CSA certified, CE approved
- May be used with Optomux B1, Pamux B5, and Mistic B100 Brain Boards
- Power indicator light
- Works with Opto 22 PBSA/B/C power supply
- Uses a single 5, 15, or 24 VDC power supply for control power

Specifications

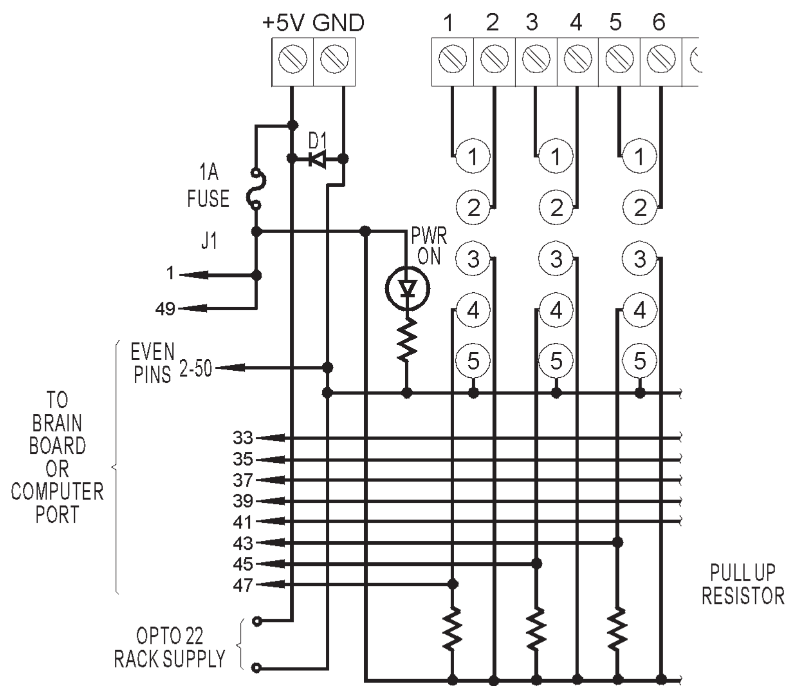
Operating temperature:	0 to 70° C 95 percent relative humidity, non-condensing
Interface connector: Field: Control: Power:	 Screw-type terminal strip accommodates up to 10 AWG wire 50-conductor header connector 2-position screw terminal or Opto 22 PBSA/B/C power supply

Dimensions





Connections



Notes:

1. Even pins on control connector are connected by etch to common.
2. +VCC and return connected to terminals marked +5V and GND.
3. At each module position on the field terminal strip, the lower number is always connected to pin 1 of the I/O module.
4. Use only 5 VDC logic modules when using the mounting rack with a brain board.

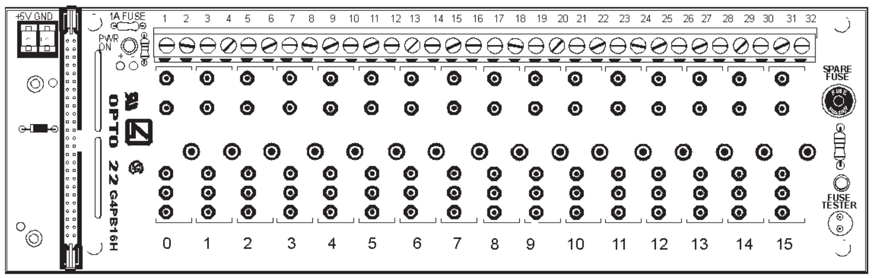
Module Position	Control (Header Connector)	Field (Terminal Strip)
0	47	1 and 2
1	45	3 and 4
2	43	5 and 6
3	41	7 and 8
4	39	9 and 10
5	37	11 and 12
6	35	13 and 14
7	33	15 and 16

G4PB16H
16–Channel I/O Mounting Rack
Form 274-990609

Description

The G4PB16H I/O mounting rack accommodates up to 16 G4 I/O modules. A header connector accepts a standard 50-pin cable, the Optomux® B1, Pamux® B5, or B100 brain board for logic connections. Barrier strips with screw terminals provide the field and mounting rack power connections.

Insert and remove modules easily and quickly without disturbing field wiring. Modules are secured to the mounting rack with a threaded captive hold-down screw. The logic supply is fused with a 1A fuse.



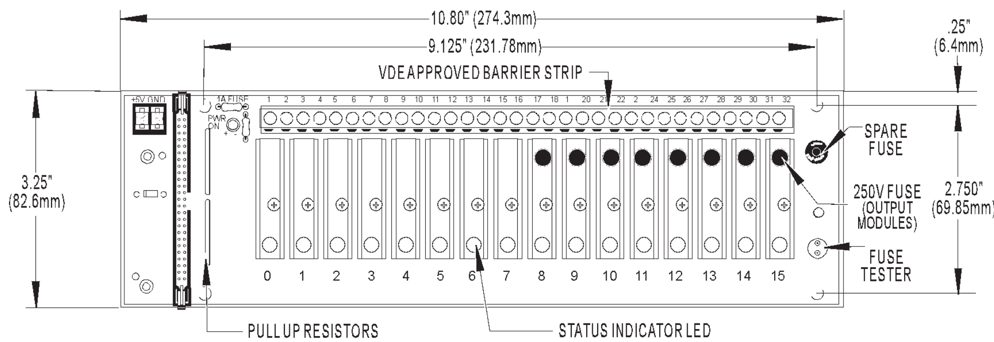
Features

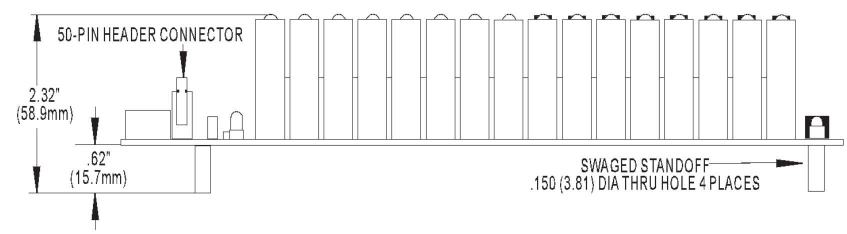
- Requires minimum panel space
- Built-in fuse tester
- Spare fuse on board
- For use with Optomux B1, Pamux B5, and B10 brain boards
- Power indicator light
- Works with Opto 22 PBSA/B/C power supply
- UL recognized, CSA certified, CE approved
- Uses a single 5, 15, or 24 VDC power supply for control power

Specifications

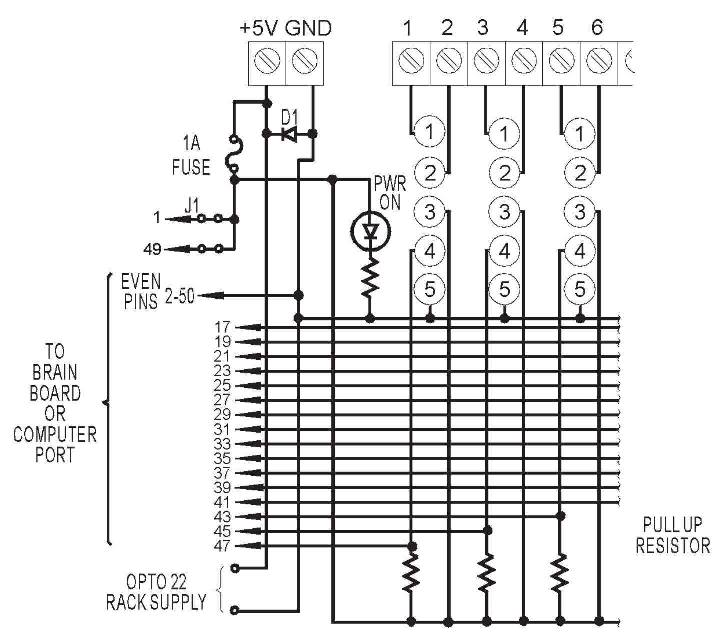
Operating temperature:	0 to 70° C 95 percent relative humidity, non-condensing
Interface connector: Field: Control: Power:	 Screw-type barrier strip accommodates up to 10 AWG wire 50-conductor header connector Two-position screw terminal or Opto 22 PBSA/B/C Power Supply

Dimensions





Connections



Connections (cont.)

Notes:

1. Even pins on control connector are connected by etch to common.
2. +VCC and return connected to terminals marked +5V and GND.
3. At each module position on the field terminal strip, the lower number is always connected to pin 1 of the I/O module.
4. Use only 5 VDC logic modules when using the mounting rack with a brain board.

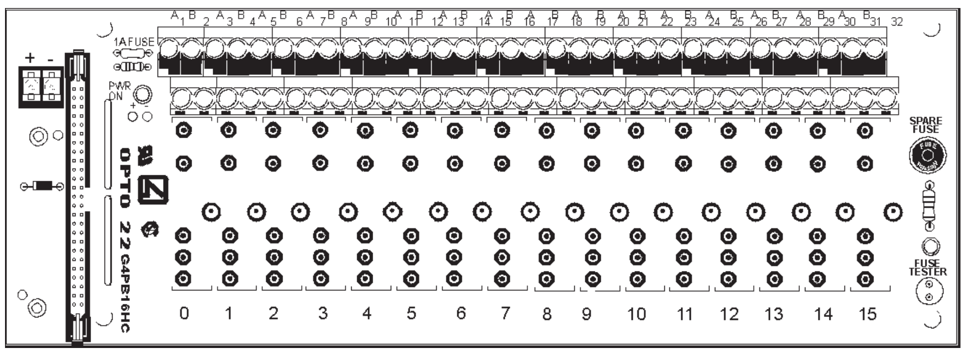
Module Position	Control (Header Connector)	Field (Terminal Strip)
0	47	1 and 2
1	45	3 and 4
2	43	5 and 6
3	41	7 and 8
4	39	9 and 10
5	37	11 and 12
6	35	13 and 14
7	33	15 and 16
8	31	17 and 18
9	29	19 and 20
10	27	21 and 22
11	25	23 and 24
12	23	25 and 26
13	21	27 and 28
14	19	29 and 30
15	17	31 and 32

G4PB16HC
16–Channel I/O Mounting Rack
Form 390-990609

Description

The G4PB16HC I/O mounting rack accommodates up to 16 G4 I/O modules and features an extra row of terminals for field loop power connections. A header connector accepts a standard 50-pin cable, the Optomux® B1, Pamux® B5, or B100 brain board for logic connections. Barrier strips with screw terminals provide the field and mounting rack power connections.

Insert and remove modules easily and quickly without disturbing field wiring. Modules are secured to the mounting rack with a threaded captive hold-down screw. The logic supply is fused with a 1A fuse.



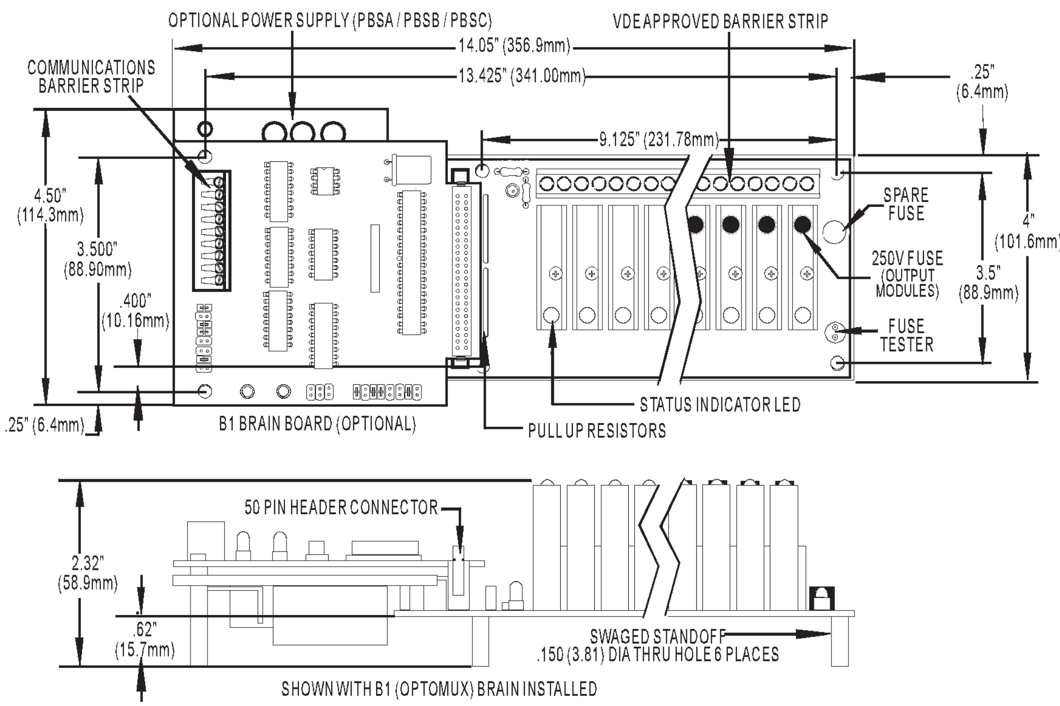
Features

- Requires minimum panel space
- Built-in fuse tester
- Spare fuse on board
- For use with Optomux B1, Pamux B5, or B100 brain boards
- Power indicator light
- Works with Opto 22 PBSA/B/C power supply
- Extra row of terminals provides field loop power connections
- UL recognized, CSA certified, CE approved
- Uses a single 5, 15, or 24 VDC power supply for control power

Specifications

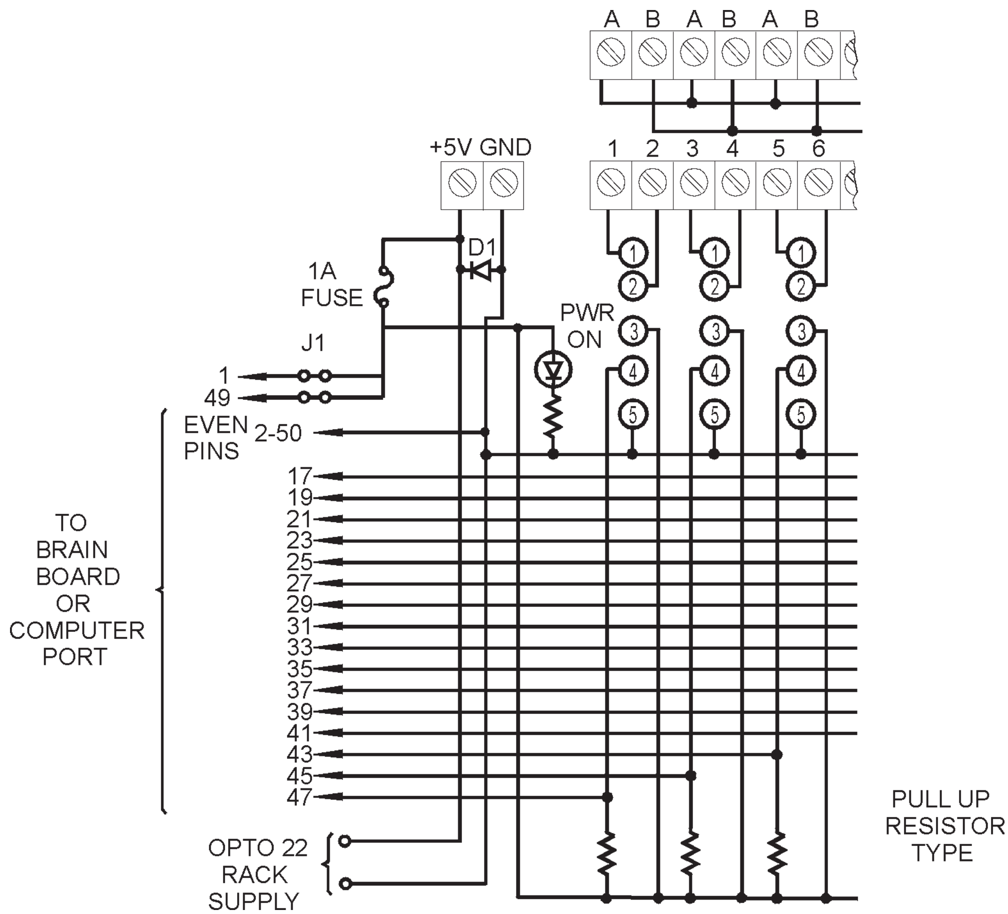
Operating temperature:	0 to 70° C 95 percent relative humidity, non-condensing
Interface connector: Field: Control: Power:	 Screw-type barrier strip accommodates up to 10 AWG wire 50-conductor header connector Two-position screw terminal or Opto 22 PBSA/B/C Power Supply

Dimensions



*OVERALL DIMENSION OF THE G4PB16H

Connections



Connections (cont.)

Notes:

- Even pins on control connector are connected by etch to common.
- +VCC and return connected to terminals marked +5V and GND.
- At each module position on the field terminal strip, the lower number is always connected to pin 1 of the I/O module.
- Use only 5 VDC logic modules when using the mounting rack with a brain board.

Module Position	Control (Header Connector)	Field (Terminal Strip)
0	47	1 and 2
1	45	3 and 4
2	43	5 and 6
3	41	7 and 8
4	39	9 and 10
5	37	11 and 12
6	35	13 and 14
7	33	15 and 16
8	31	17 and 18
9	29	19 and 20
10	27	21 and 22
11	25	23 and 24
12	23	25 and 26
13	21	27 and 28
14	19	29 and 30
15	17	31 and 32

Digital AC Input Modules

Form 251-990609

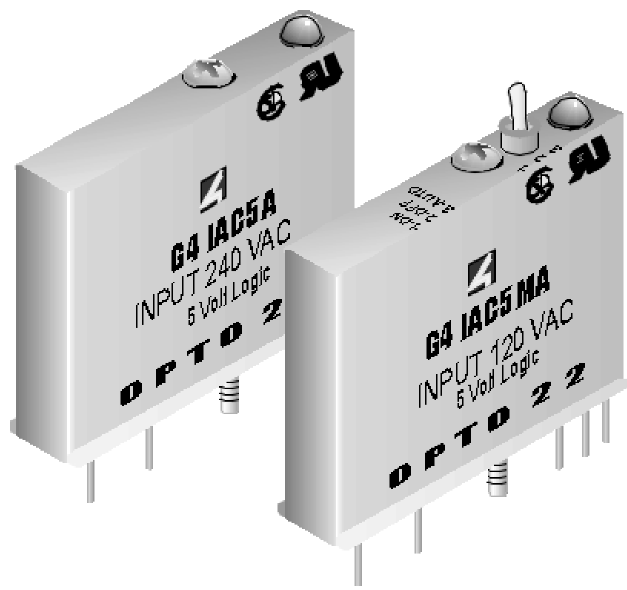
Description

Opto 22's G4 AC input modules are used to detect on/off AC voltage levels. Each module provides up to 4,000 V_{rms} of optical-isolation between field inputs and the logic output of the circuit.

All AC input modules are designed with filtering on the input and a hysteresis amplifier, providing high noise rejection and transient-free "clean" switching.

The G4IAC5MA is a special module featuring a manual-on/manual-off/automatic switch, ideal for diagnostic testing of control applications.

Typical applications for AC input modules include sensing the presence or absence of voltage, and sensing contact closure from sources such as proximity switches, limit switches, float switches, selector switches, push buttons, toggle switches, and thermostats.



Features

- 4,000 V_{rms} optical isolation
- Built-in LED status indicator
- Small footprint design, reducing mounting space by approximately 50 percent
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)
- Built-in filtering for transient suppression and noise rejection
- Operating temperature: -30° C to 70° C

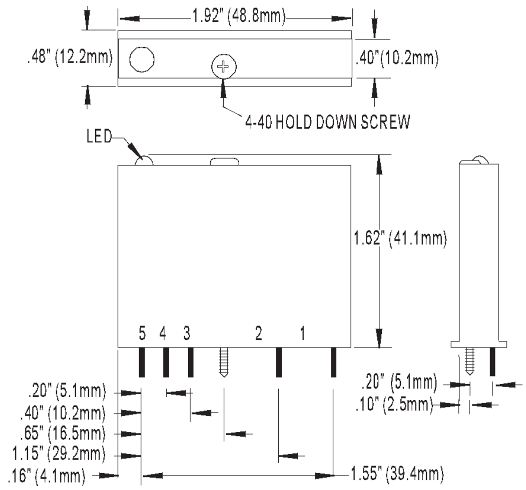
Specifications

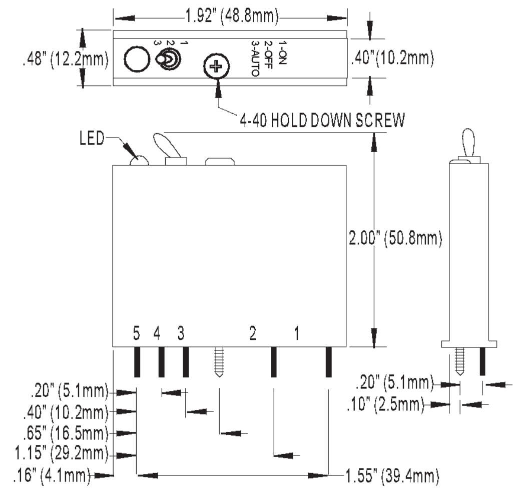
	Units	G4IAC5	G4IAC5A	G4IAC5MA
Input Voltage Range	VDC or VAC	90-140	180-280	90-140
Key Feature		---	---	Diagnostic switch
Input Current at Maximum Line	mA	11	5	11
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000
Turn-on time	ms	20	20	20
Turn-off time	ms	20	20	20
Input Allowed for Off-state	mA, V	3, 45	1, 45	3, 45
Nominal Output Voltage Supply	VDC	5	5	5
Output Supply Voltage Range	VDC	4.5-6	4.5-6	4.5-6
Output Supply Current at Nominal Logic Voltage	mA	12	12	12
Input Resistance (R1 in schematic)	W	14K	70K	14K
Control Resistance (Rc in schematic)	W	220	220	220
Output Voltage Drop	V @ 50 mA	.4	.4	.4
Output Current (sinking)	mA	50	50	50
Output Leakage with no Input	µA @ 30 VDC	100	100	100
Transistor	V breakdown	30	30	30
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

Specifications (cont.)

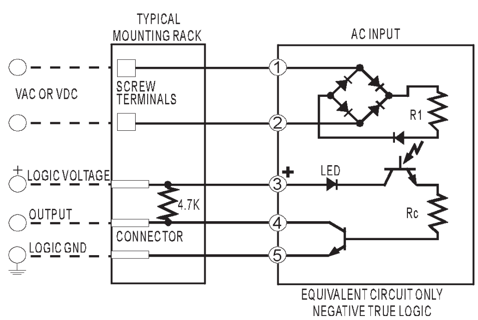
	Units	G4IAC15	G4IAC15A	G4IAC24	G4IAC24A
Input Voltage Range	VDC or VAC	90-140	180-280	90-140	180-280
Key Feature		---	---	---	---
Input Current at Maximum Line	mA	11	5	11	5
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000
Turn-on time	ms	20	20	20	20
Turn-off time	ms	20	20	20	20
Input Allowed for Off-state	mA, V	3, 45	1, 45	3, 45	1, 45
Nominal Output Voltage Supply	VDC	15	15	24	24
Output Supply Voltage Range	VDC	12-18	12-18	20-30	20-30
Output Supply Current at Nominal Logic Voltage	mA	15	15	15	15
Input Resistance (R1 in schematic)	W	14K	70K	14K	70K
Control Resistance (Rc in schematic)	W	1K	1K	2.2K	2.2K
Output Voltage Drop	V @ 50 mA	.4	.4	.4	.4
Output Current (sinking)	mA	50	50	50	50
Peak Repetitive Voltage	VAC	500	500	500	500
Output Leakage with no Input	µA @ 30 VDC	100	100	100	100
Transistor	V breakdown	30	30	30	30
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

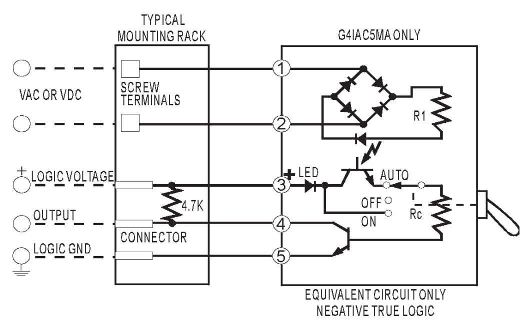
Dimensions





Schematics





Digital AC Output Modules

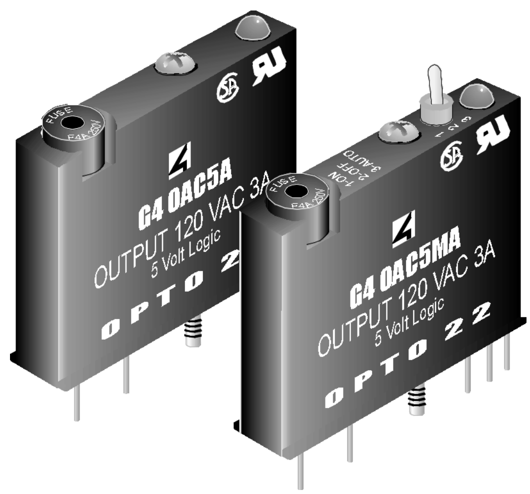
Form 252-990609

Description

Opto 22's G4 AC output modules are used to control or switch AC loads. Each module provides up to 4,000 V_{rms} of optical-isolation between field outputs and the control side of the circuit, and each features zero voltage turn-on and zero current turn-off. All AC output modules are equivalent to single-pole, single-throw, normally open contacts (Form A, SPST-NO) except the G4OAC5A5, which is equivalent to a single-pole, single-throw, normally closed contact (Form B, SPST-NC).

The G4OAC5MA and the G4OAC5AMA are special modules featuring a manual-on/manual-off/automatic switch, ideal for diagnostic testing of control applications.

Typical applications for AC output modules include switching loads such as AC relays, solenoids, motor starters, heaters, lamps, and indicators.



Features

- 4,000 V_{rms} optical-isolation
- Built-in LED status indicator
- Logic levels of 5, 15, and 24 VDC
- Removable fuse
- Current rating: 3 amps at 45° C
- Ability to withstand one-cycle surge of 80 amps
- Operating temperature: -30° C to 70° C
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge withstand Specification (IEEE-472)

Specifications

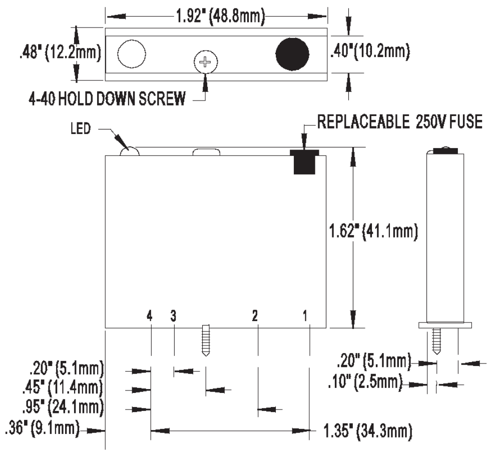
	Units	G4OAC5*	G4OAC5A*	G4OAC5A5*	G4OAC5MA*	G4OAC5AMA*
Nominal Line Voltage	VAC	120	240	120/240	120	240
Output Voltage Range	VAC	12-140	24-280	24-280	12-140	24-280
Key Feature		---	---	Normally closed	Diagnostic switch	Diagnostic switch
Current Rating: At 45° C ambient At 70° C ambient	 A A	 3 2	 3 2	 3 2	 3 2	 3 2
UL Motor Load Rating	A	1.5	1.5	1.5	1.5	1.5
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000	4,000
Off-state Leakage at Nom. Voltage-60 Hz	mA_{rms}	5	2.5	2.5	5	2.5
Nominal Logic Voltage	VDC	5	5	5	5	5
Logic Voltage Range	VDC	4-8	4-8	4-8	4-8	4-8
Logic Pickup Voltage	VDC	4	4	4	4	4
Logic Dropout Voltage	VDC	1	1	1	1	1
Logic Input Current at Nominal Logic Voltage	mA	12	12	12	12	12
Control Resistance (Rc in schematic)	W	220	220	220	220	220
One-cycle Surge	A peak	80	80	80	80	80
Turn-on Time	µs	1/2 cycle max zero volts	1/2 cycle max zero volts	1/2 cycle max zero volts	1/2 cycle max zero volts	1/2 cycle max zero volts
Turn-off Time	µs	1/2 cycle max zero amps	1/2 cycle max zero amps	1/2 cycle max zero amps	1/2 cycle max zero amps	1/2 cycle max zero amps
Peak Repetitive Voltage	VAC	500	500	500	500	500
Minimum Load Current	mA	20	20	20	20	20
Output Voltage Drop Maximum Peak	V	1.6	1.6	1.6	1.6	1.6
Operating Frequency	Hz	25-65	25-65	25-65	25-65	25-65
dV/dT-off-state	V/µs	200	200	200	200	200
dV/dT-commutating		snubbed for 0.5 power factor load	snubbed for 0.5 power factor load	snubbed for 0.5 power factor load	snubbed for 0.5 power factor load	snubbed for 0.5 power factor load
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

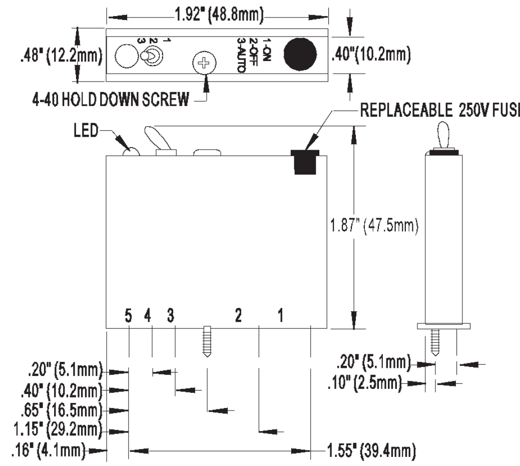
* Also available with an FM rating; add FM to the part number (example: G4OAC5FM).

Specifications (cont.)

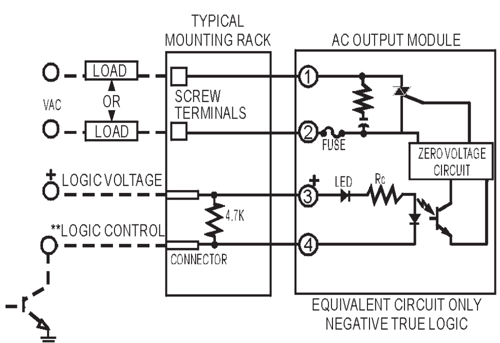
	Units	G4OAC15	G4OAC15A	G4OAC24	G4OAC24A
Nominal Line Voltage	VAC	120	240	120	240
Key Feature		---	---	---	---
Current Rating: At 45° C ambient At 70° C ambient	 A A	 3 2	 3 2	 3 2	 3 2
UL Motor Load Rating	A	1.5	1.5	1.5	1.5
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000
Off-state Leakage at Nom. Voltage-60 Hz	mA_{rms}	5	2.5	5	2.5
Logic Voltage Range	VDC	10.5-16	10.5-16	19.5-32	19.5-32
Logic Pickup Voltage	VDC	10.5	10.5	19.5	19.5
Logic Dropout Voltage	VDC	1	1	1	1
Logic Input Current at Nominal Logic Voltage	mA	15	15	18	18
Control Resistance (Rc in schematic)	W	1K	1K	2.2K	2.2K
One-cycle Surge	A peak	80	80	80	80
Turn-on Time	µs	1/2 cycle max zero volts	1/2 cycle max zero volts	1/2 cycle max zero volts	1/2 cycle max zero volts
Turn-off Time	µs	1/2 cycle max zero amps	1/2 cycle max zero amps	1/2 cycle max zero amps	1/2 cycle max zero amps
Peak Repetitive Voltage	VAC	500	500	500	500
Minimum Load Current	mA	20	20	20	20
Output Voltage Drop Maximum Peak	V	1.6	1.6	1.6	1.6
Operating Frequency	Hz	25-65	25-65	25-65	25-65
dV/dT-off-state	V/µs	200	200	200	200
dV/dT-commutating		snubbed for 0.5 power factor load	snubbed for 0.5 power factor load	snubbed for 0.5 power factor load	snubbed for 0.5 power factor load
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

Dimensions

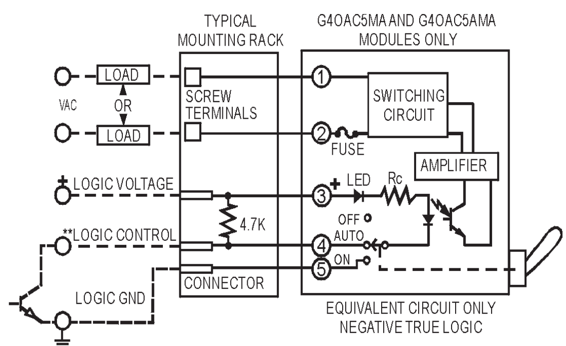




Schematics



**Control line is compatible with totem pole or tri-state output device.



** Control line is compatible with totem pole or tri-state output device.

Digital DC Input Modules

Form 253-990609

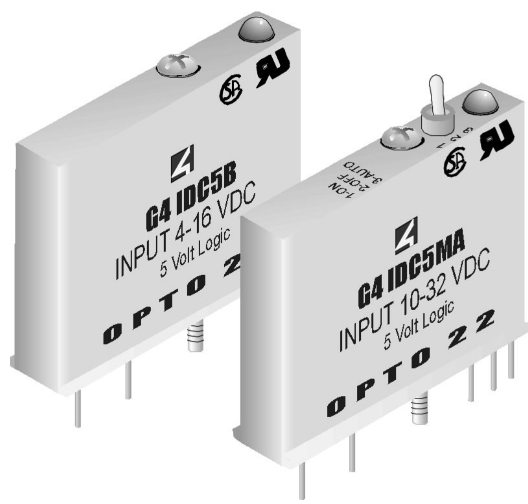
Description

Opto 22's G4 DC input modules are used to detect on/off DC voltage levels. Each module provides up to 4,000 V_{rms} of optical-isolation between field inputs and the logic output of the circuit.

All DC input modules except the G4IDC5K and G4IDC5D are designed with filtering on the input and a hysteresis amplifier, providing high noise rejection and transient-free, "clean" switching. The G4IDC5K is a fast-switching module used to detect signals produced by photoelectric switches and TTL devices. The low-cost G4IDC5D is used for data acquisition.

The G4IDC5MA is a special module featuring a manual-on/manual-off/automatic switch, ideal for diagnostic testing of control applications.

Typical applications for DC input modules include sensing the presence or absence of voltage, and sensing contact closure from sources such as proximity switches, limit switches, selector switches, push buttons, photoelectric switches, and TTL-compatible devices.



Features

- 4,000 V_{rms} optical isolation
- Built-in LED status indicator
- Small footprint design, reducing mounting space by approximately 50 percent
- Built-in filtering for transient suppression and noise rejection
- Operating temperature: -30° C to 70° C
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)

Specifications

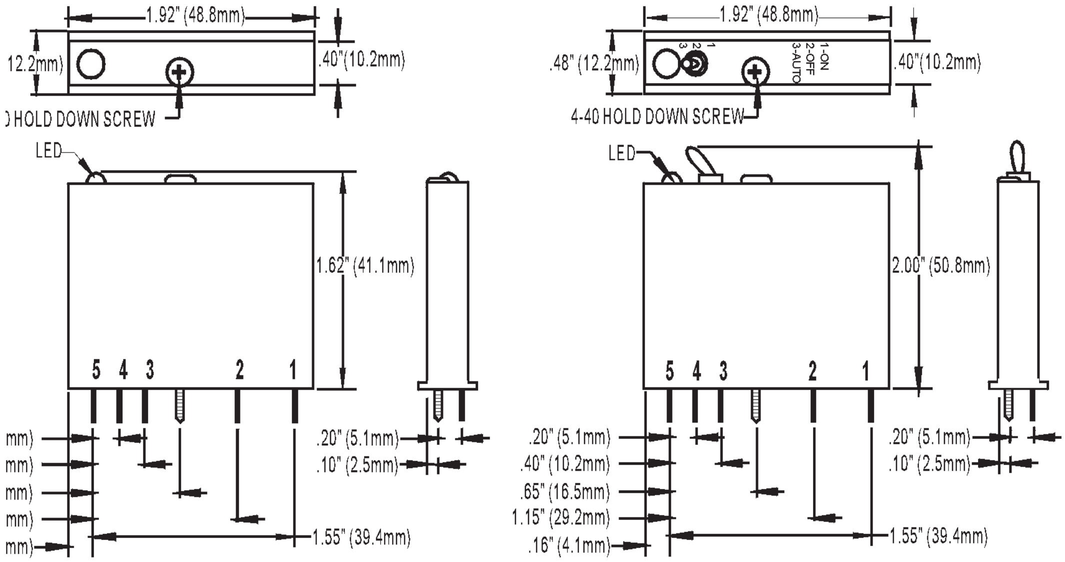
	Units	G4IDC5	G4IDC5B	G4IDC5D	G4IDC5G
Input Voltage Range	VDC VAC	10-32 12-32	4-16 4-16	2.5-28 ---	35-60 35-60
Key Feature		---	Higher speed	High speed	---
Input Current at Maximum Line	mA	25	45	30	6
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000
Turn-on time	ms	5	0.05	1	10
Turn-off time	ms	5	.1	1.5	10
Input Allowed for Off-state	mA, V	1, 3	.7, 1	.2, 1	.7, 7
Nominal Output Voltage Supply	VDC	5	5	5	5
Output Supply Voltage Range	VDC	4.5-6	4.5-6	4.5-6	4.5-6
Output Supply Current at Nominal Logic Voltage	mA	12	12	12	12
Input Resistance (R1 in schematic)	Ohm	1.5K	300	900	10K
Control Resistance (Rc in schematic)	Ohm	220	220	470	220
Output Voltage Drop	V @ 50 mA	.4	.4	.4	.4
Output Current (sinking)	mA	50	50	50	50
Output Leakage with no Input	µA @ 30 VDC	100	100	10	100
Transistor	V breakdown	30	30	30	30
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

Specifications (cont.)

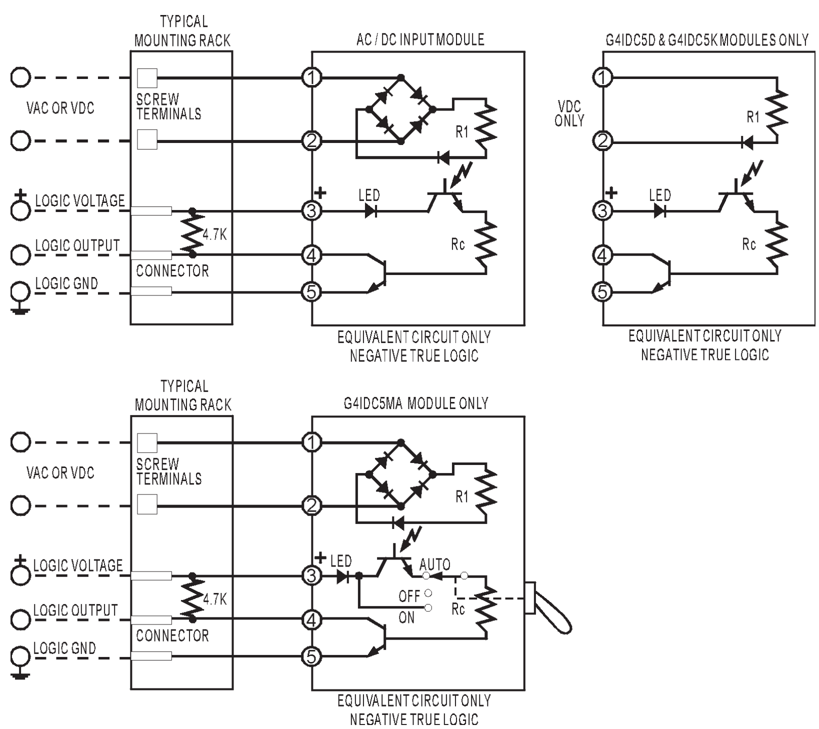
	Units	G4IDC5K	G4IDC5MA	G4IDC15	G4IDC24
Input Voltage Range	VDC VAC	2.5-16 ---	10-32 12-32	10-32 12-32	10-32 12-32
Key Feature		Highest speed	Diagnostic switch	---	---
Input Current at Maximum Line	mA	30	25	25	25
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000
Turn-on time	ms	.025*	5	5	5
Turn-off time	ms	.025*	5	5	5
Input Allowed for Off-state	mA, V	.2, 1	1, 3	1, 3	1, 3
Nominal Output Voltage Supply	VDC	5	5	15	24
Output Supply Voltage Range	VDC	4.5-6	4.5-6	12-18	20-30
Output Supply Current at Nominal Logic Voltage	mA	12	12	15	18
Input Resistance (R1 in schematic)	Ohm	500	1.5K	1.5K	1.5K
Control Resistance (Rc in schematic)	Ohm	220	220	1K	2.2K
Output Voltage Drop	V @ 50 mA	.4	.4	.4	.4
Output Current (sinking)	mA	50	50	50	50
Output Leakage with no Input	µA @ 30 VDC	100	100	100	100
Transistor	V breakdown	30	30	30	30
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

*At 5Vp-p square wave input, 50% duty cycle.

Dimensions



Schematics



Digital DC Output Modules

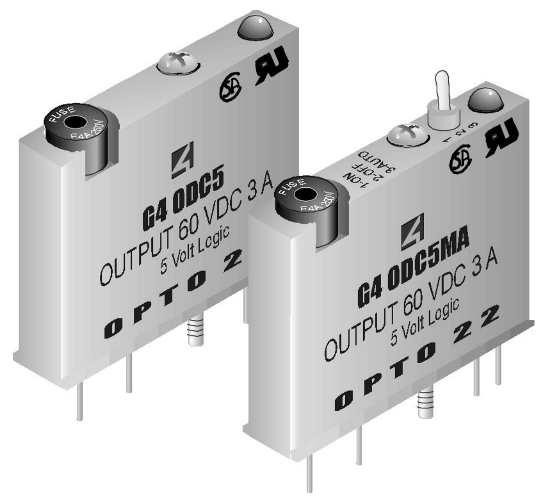
Form 254-990609

Description

Opto 22's G4 DC output modules are used to control or switch DC loads. Each module provides up to 4,000 V_{rms} of optical-isolation between field devices and control logic.

The G4ODC5MA is a special module featuring a manual-on/manual-off/automatic switch, ideal for diagnostic testing of control applications.

Typical applications for DC output modules include switching loads such as DC relays, solenoids, motor starters, lamps, and indicators.



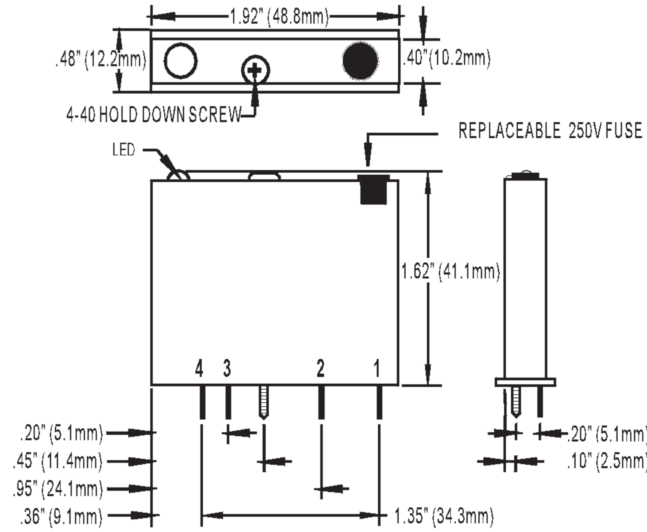
Features

- 4,000 V_{rms} optical-isolation
- Built-in LED status indicator
- Logic levels of 5, 15, and 24 VDC
- Removable fuse
- Ability to withstand one-second surge of 5 amps
- Operating temperature: -30° C to 70° C
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)Features

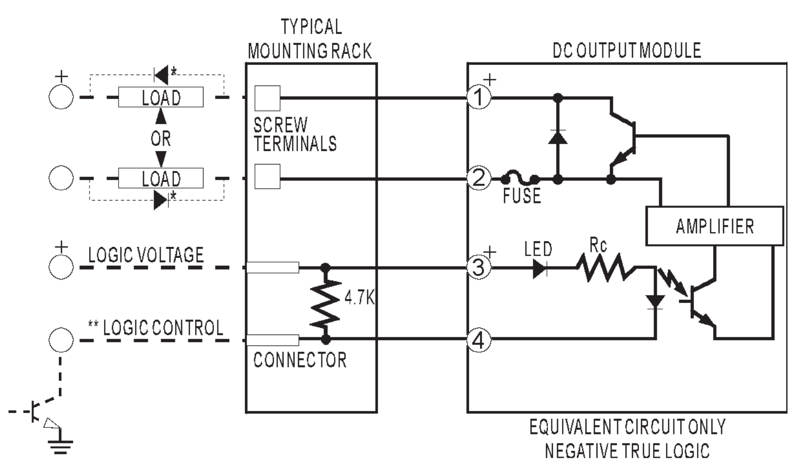
Specifications

	Units	G4ODC5*	G4ODC5A*	G4ODC5MA*	G4ODC15	G4ODC24	G4ODC24A
Maximum Line Voltage	VDC	60	200	60	60	60	200
Output Voltage Range	VDC	5-60	5-200	5-60	5-60	5-60	5-200
Key Feature		---	---	Diagnostic switch	---	---	---
Current Rating: At 45° C ambient At 70° C ambient	 A A	 3 2	 1 0.55	 3 2	 3 2	 3 2	 1 0.55
Isolation Input-to-output	V_{rms}	4,000	4,000	4,000	4,000	4,000	4,000
Off-state Leakage at Maximum Voltage	mA	1	2	1	1	1	2
Control Resistance (Rc in schematic)	Ohm	220	220	220	1K	2.2K	2.2K
One-second Surge	A	5	5	5	5	5	5
Turn-on Time	µs	50	100	50	50	50	100
Turn-off Time	µs	50	750	50	50	50	750
Output Voltage Drop Maximum Peak	V	1.6	1.6	1.6	1.6	1.6	1.6
Nominal Logic Voltage	VDC	5	5	5	15	24	24
Logic Voltage Range	VDC	4-8	4-8	4-8	10.5-16	19.5-32	19.5-32
Logic Pickup Voltage	VDC	4	4	4	10.5	19.5	19.5
Logic Dropout Voltage	VDC	1	1	1	1	1	1
Logic Input Current at Nominal Logic Voltage	mA	12	12	12	15	18	18
Temperature: Operating Storage	 °C °C	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85	 -30 to +70 -30 to +85

Dimensions



Schematics



* Commutation diode must be used on inductive loads. Typically, use diode IN4005.
** Control line is compatible with totem pole or tri-state output device.

Dry Contact Output Modules

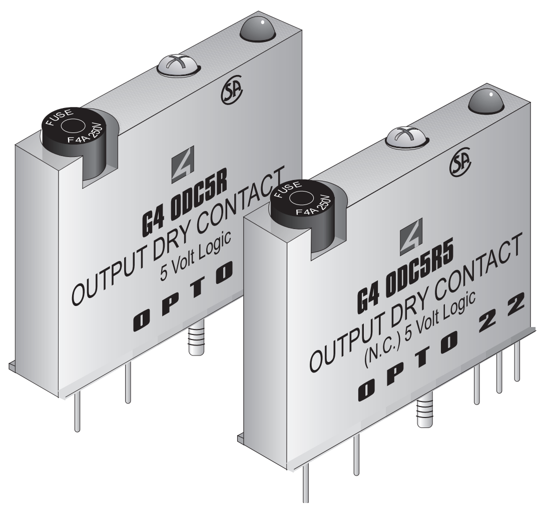
Form 364-990910

Description

Opto 22's G4 family of modules includes two dry-contact, low-contact-resistance DC output modules, the G4ODC5R and the G4ODC5R5.

The G4ODC5R is a single-pole, single-throw, normally open mechanical relay (Form A, SPST-NO). The G4ODC5R5 is a single-pole, single-throw, normally closed mechanical relay (Form B, SPST-NC).

Typical applications for these dry-contact modules include analog signal and communication line multiplexing.



Features

- Contact switching voltage of 100 VDC or 130 VAC maximum
- Contact switching current of 0.5 A maximum
- Contact resistance of 200 mΩ maximum
- Mechanical life of $5x10^6$ cycles
- Coil 5 VDC at 14 mA
- Operating temperature: -30° C to 70° C
- CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)

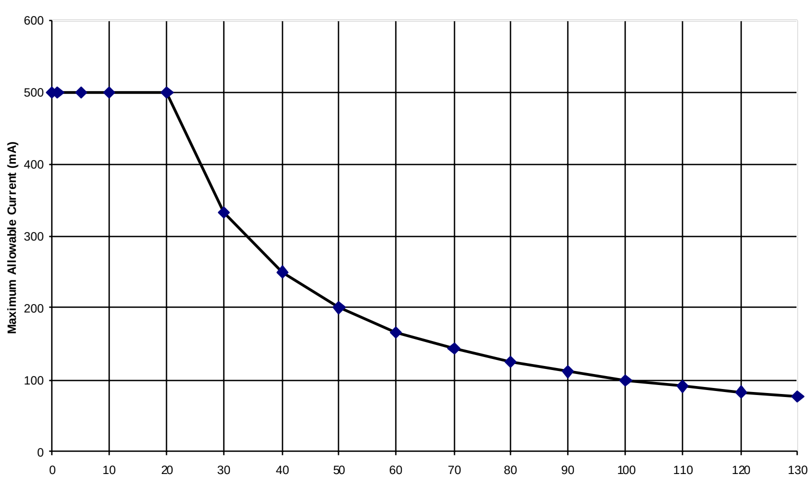
Specifications

	Units	G4ODC5R[ab]	G4ODC5R5[ab]
Contact form		Form A SPST mechanical relay	Form B SPST mechanical relay
Normal position	-------	Open	Closed
Line Voltage - Range	VDC VAC	0-100 VDC 0-130 VAC (see note 1)	0-100 VDC 0-130 VAC (see note 1)
Current Rating 0°C to 70°C Ambient	Amps	0.5 Switching (see note 1)	0.5 Switching (see note 1)
Contact rating	VA	10	10
Switching voltage	VDC VAC	100 max 130 max	100 max 130 max
Switching current	A max	0.5	0.5
Carry current	A max	1.5	1.5
Contact resistance	µW	200	200
Turn-on time	µs	500	500
Turn-off time	µs	500	500
Contact bounce	µs	250	250
Mechanical life	cycles	5×10^6	5×10^6
Logic voltage range	VDC	4.8-6	4.8-6
Logic pickup voltage[a]	VDC	0.8	0.8
Logic dropout voltage[a]	VDC	3.8	3.8
Logic input current at nominal logic voltage	mA	14	14
Isolation voltage Input-to-output	VDC	1,500	1,500
Ambient temperature: Operating Storage	 °C °C	 0 to 70 -60 to +105	 0 to 70 -60 to +105
[a] Pickup and dropout voltages are measured from 5 VDC logic ground.			
[b] Also available with an FM rating; add FM to the part number (example: G4ODC5RFM).			

* Note 1:
The power rating of the dry contact module must not exceed 10 VA under steady state or momentary in-rush conditions. For voltages at or below 20 volts, the current limit is 0.5 amps. For voltages above 20 volts, the maximum allowable current is determined by the following equation:

$$\frac{10\text{ VA}}{\text{Voltage}} = \text{Current maximum}$$

10 VA RATING FOR REED RELAY (DRY CONTACT) MODULES

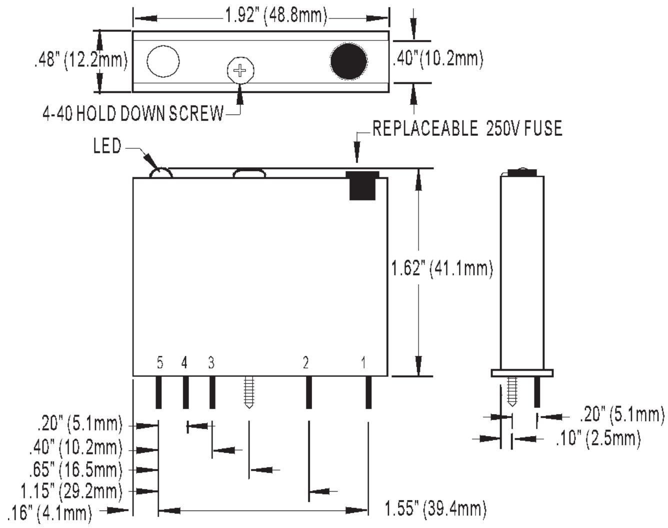


Current Limit at Key Voltages	
V	mA
5	500
12	500
24	416
100[1]	100
120	83
130[2]	76

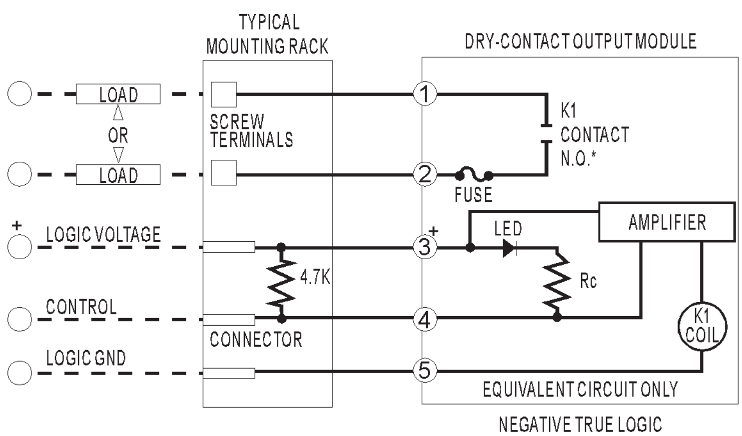
Note 1: Maximum DC voltage is 100 VDC.

Note 2: Maximum AC voltage is 130 VAC.

Dimensions



Schematics



Note: Also compatible with Totem Pole or Tri-State Output.
Will not plug into G4PB4R mounting rack.

* Normally open for G4ODC5R, normally closed for G4ODC5R5.

Digital Input Test Module

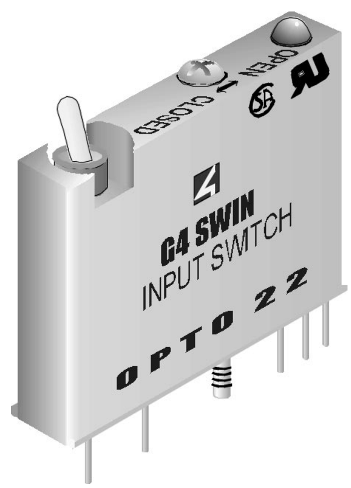
Form 374-990609

Description

Opto 22's G4SWIN input test module is used to simulate an input on an I/O mounting rack. Each module contains a toggle switch that closes a contact on the logic side of the module. An internal resistor limits the current through the switch and provides a load similar to that of an actual input module. An internal debounce circuit allows rapid switch closures without false counts.

The G4SWIN module works with logic voltages of 5, 15, and 24 volts. Internally, there is no connection to the field inputs.

The G4SWIN module is ideal for simulating discrete external events when testing application software.



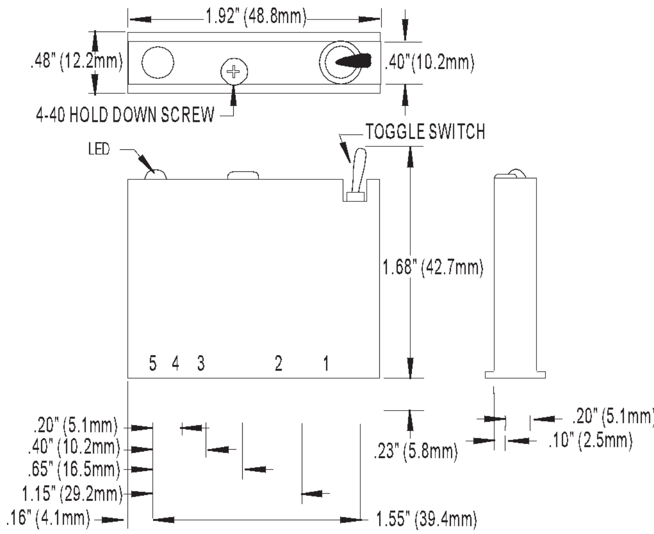
Features

- On/off switch, ideal for testing application software
- Ability to simulate an external input
- Built-in LED status indicator
- Logic levels of 5, 15, and 24 VDC
- Small footprint design matches that of other G4 I/O modules
- Debounced for rapid counting
- Operating temperature: -30° C to 70° C
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)

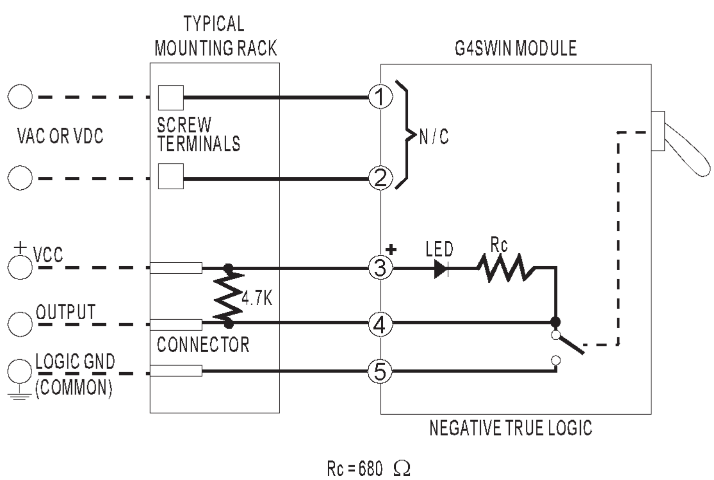
Specifications

Isolation input-to-output:	4,000 Vrms
Ambient temperature: Operating: Storage:	 -30 to +70°C -30 to +85°C

Dimensions



Schematics



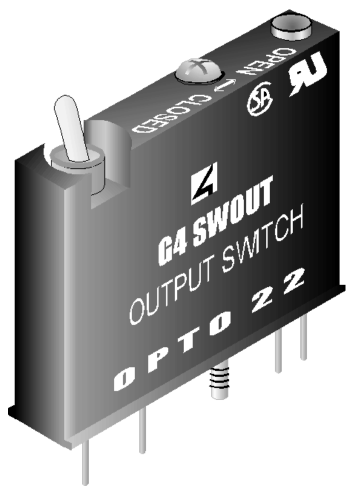
Digital Output Simulation Module

Form 375-990609

Description

Opto 22's G4SWOUT output test module provides a manual toggle switch on the field side. The switch closes a contact that shorts the field terminals to turn on a field output. Internally, there is no connection to the logic side of the module.

The G4SWOUT module is ideal for testing field wiring and devices by simulating an output from the computer. The switch will handle 3 amps at 250 VAC/VDC.



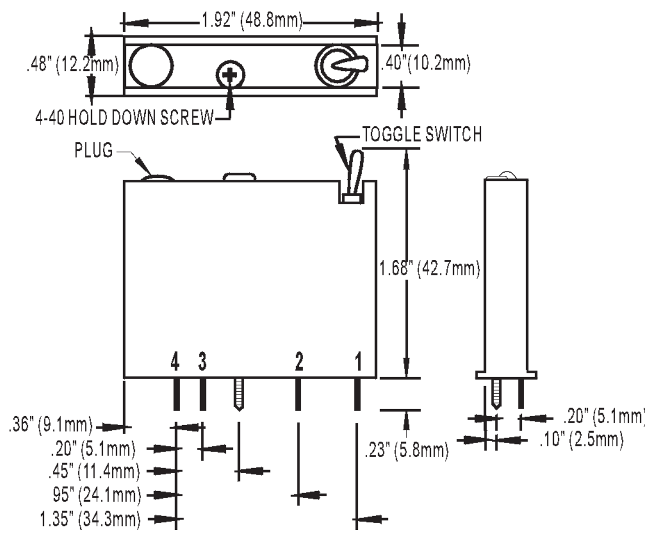
Features

- On/off switch, ideal for testing field wiring
- Ability to simulate a G4 module output
- Small footprint design matches that of other G4 I/O modules
- Operating temperature: -30° C to 70° C
- UL recognized, CSA certified, CE approved
- Passes NEMA Showering Arc Test (ICS 2-230)
- Meets IEEE Surge Withstand Specification (IEEE-472)

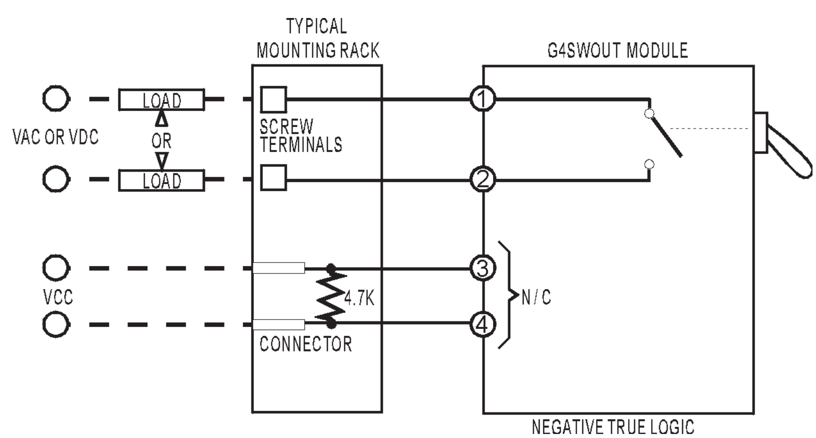
Specifications

Output voltage range:	250 VAC/VDC
Isolation input-to-output:	4,000 V_{rms}
Ambient temperature: Operating: Storage:	 -30 to +70° C -30 to +85° C

Dimensions



Schematics



PB16J/K

16 Position Integral DC Input Channel Racks

Form 480-990609

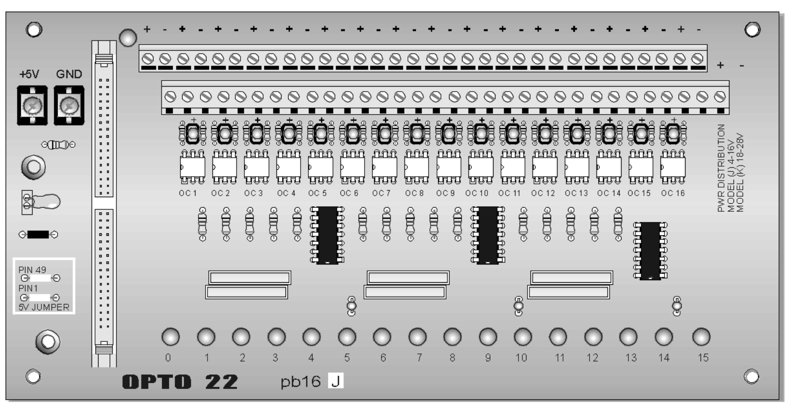
Description

The PB16J and PB16K DC input racks provide 16 channels of optically-isolated inputs for sensing ON/OFF DC voltage levels. All input circuitry is on the board and all channels are identical. There is no provision on the board for plug-in modules. Both models feature an extra row of terminal strips for power distribution. The PB16J and PB16K racks are smaller than a standard PB16H I/O mounting rack; the result is a 40 percent savings in cabinet space. Indicators are provided for all input channels and power.

Both the PB16J and PB16K racks feature a 50-pin header connector for easy interface to computer parallel I/O ports via 50-conductor ribbon cables. The 50-pin connector also allows direct connection to Mistic, Optomux, and Pamux brain boards.

The PB16J and PB16K DC Input racks are useful for connecting to the following devices:

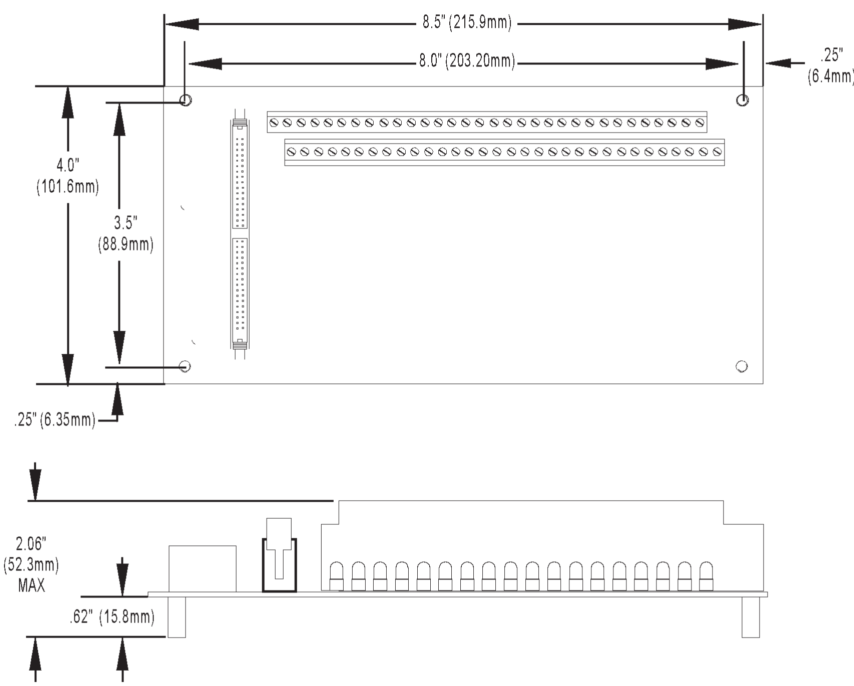
- BCD Devices
- TTL Level Devices
- Thumbwheel Switches
- Bar Code Readers



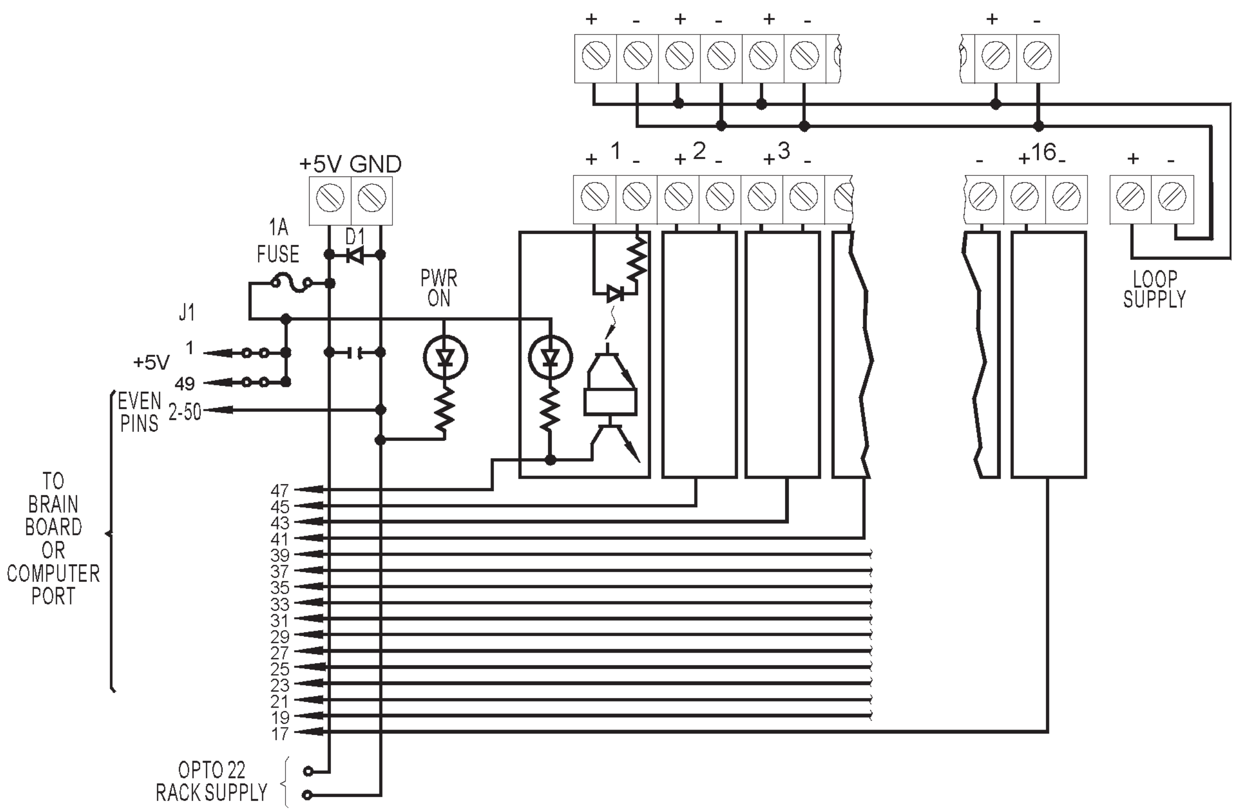
Specifications

	PB16J	PB16K
Input Line Voltage	4 - 16 VDC	16 - 28 VDC
Input Current	3.3 mA @ 4 VDC 16 mA @ 16 VDC	3.4 mA @ 16 VDC 6.3 mA @ 28 VDC
Isolation Input-to-Output Channel-to-Channel	4,000 Vrms 300 Vrms continuous	4,000 Vrms 300 Vrms continuous
Capacitance Input-to-Output	8 pF/channel	8 pF/channel
Input Allowed For No Output	1 VDC (0.2 mA)	1 VDC (0.2 mA)
Turn-on Time	2.5 ms maximum	3 ms maximum
Turn-off Time	3.5 ms maximum	4.5 ms maximum
Logic Supply Voltage	4.5 - 6 VDC	4.5 - 6 VDC
Logic Supply Current	190 mA @ 5 VDC	190 mA @ 5 VDC
Operating Ambient Temperature	- 30° to 70° C	- 30° to 70° C

Dimensions



Connections



PB16L
16 Position Integral DC Output Channel Rack

Form 481-990609

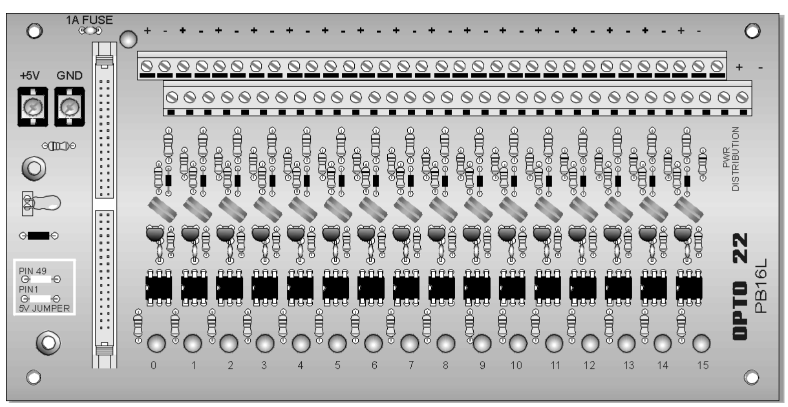
Description

The PB16L DC Output Rack provides 16 individual channels of optically-isolated output for controlling or switching small DC loads. Each channel provides up to 4,000 V_{rms} of optical isolation between the field devices and the control logic. All the output circuitry is on the board and all channels are identical. There is no provision on the board for plug-in modules. The PB16L DC Output Rack is smaller than a standard PB16H I/O mounting rack; the result is a 40 percent savings in cabinet space. All outputs are individually fused and indicators are provided for all output channels and power.

The PB16L DC Output rack uses a 50-pin header connector for easy interface to computer parallel I/O ports via 50-conductor ribbon cables. The 50-pin connector also allows direct connection to Mistic, Optomux, and Pamux digital brain boards. The PB16L works with Opto 22 PBSA/B/C power supplies.

Uses for the PB16L DC Output rack include, but are not limited to, controlling the following:

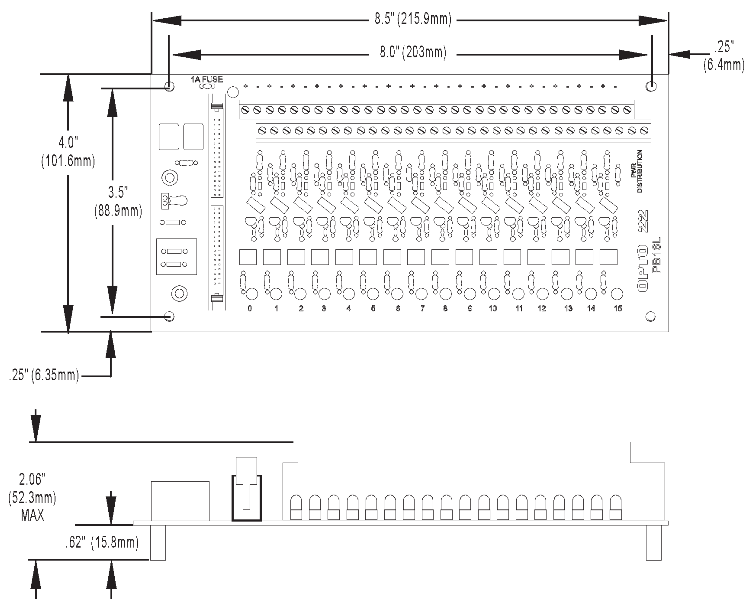
- Low Power DC Relays
- Low Power DC Solenoids
- DC Lamps and Indicators.



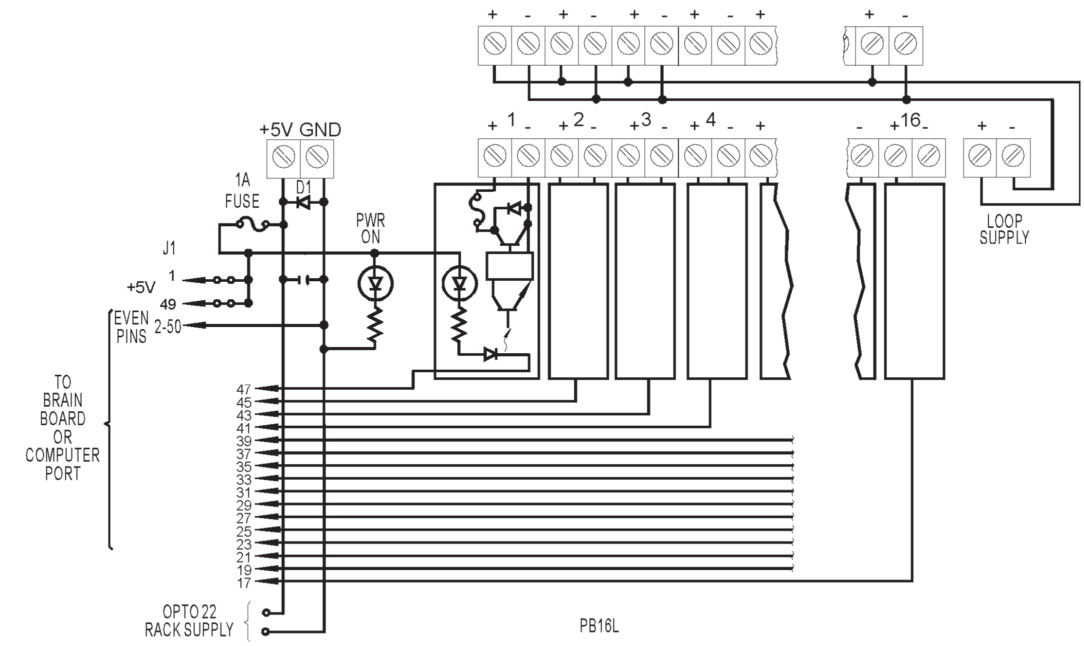
Specifications

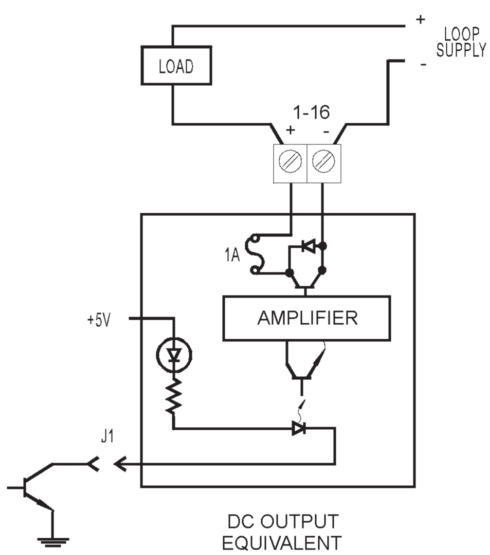
Load Voltage Rating	5 - 60 VDC
Output Current Rating	0.5 amp @ 45° C 0.2 amp @ 70° C
One Second Surge	1.3 amp
Output Voltage Drop	1.6 VDC maximum
Off-state Leakage @ Maximum Voltage	1 mA maximum
Isolation Input-to-Output Channel-to-Channel	 4,000 Vrms 300 Vrms continuous
Turn-on Time:	100 microseconds
Turn-off Time:	100 microseconds
Logic Supply Voltage Range:	4.5 to 6.0 VDC
Logic Supply Current:	190 mA @ 5 VDC
Operating Ambient Temperature:	- 30° to 70° C

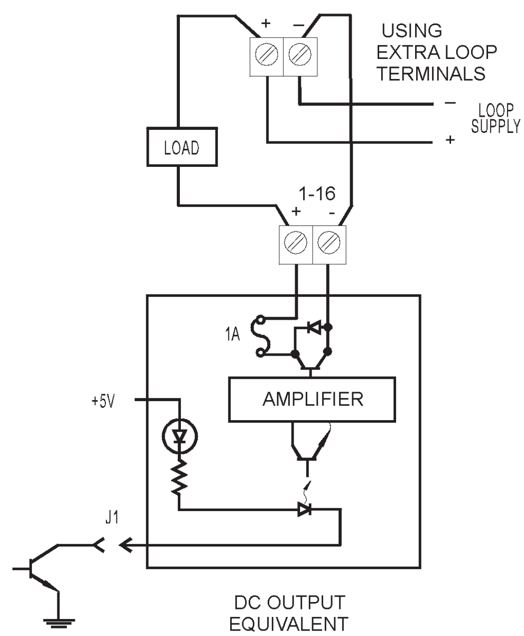
Dimensions



Connections







Analog I/O Module Data Sheets

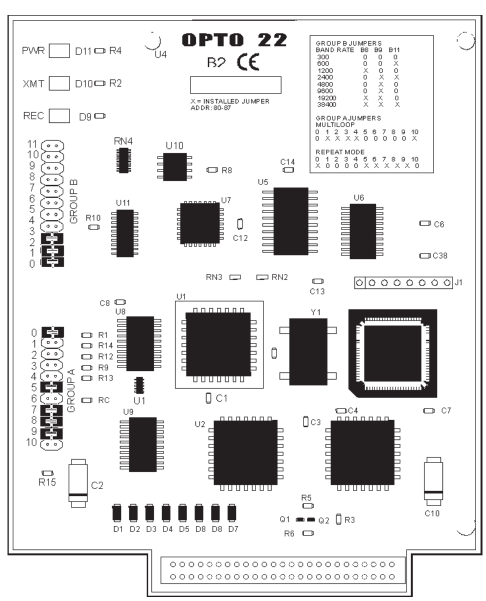
Optomux
B2 Brain Board
Form 464-990609

Description

The Analog OPTOMUX Brain Board is an intelligent analog controller which operates as a slave device to a host computer. Each Analog OPTOMUX Brain Board contains a microprocessor that provides the necessary intelligence to carry out serial communications with a host computer and also perform control functions at each channel of I/O. The Analog OPTOMUX Brain Boards are designed to mount on the Opto 22 I/O mounting racks which have header connectors. When combined with an I/O mounting rack, the Analog OPTOMUX Brain Board can perform the following functions:

- Read Analog
- Write Analog
- Input Averaging
- High/Low Limit Monitoring
- Peak and Valley Recording
- Gain and Offset Calculations
- Output Waveform Generation

Communication with a host computer is over an RS-422/485 serial link composed of a dual twisted pair line which connects to each OPTOMUX station. The serial link operates at selectable baud rates from 300 to 38.4k baud. OPTOMUX stations can be configured for either multidrop or repeat mode operation. In multidrop mode, up to 100 OPTOMUX stations can be networked over a total line length of up to 5,000 feet. In repeat mode operation, up to 256 OPTOMUX stations can be networked with up to 5,000 feet between stations.



Specifications

Power Requirements	5 VDC ± 0.1 V @ 0.5 amps
Operating Temperature	0° C to 70° C 95% humidity, non-condensing
Interface:	RS-422/485 communications 50-pin female header connector to I/O mounting rack
Data Rates	300, 600, 1200, 2400, 4800, 9600, 19200, and 38400 baud
Range: Multidrop Repeat Mode	 Up to 5,000 feet total length * 100 Optomux stations maximum * Up to 5,000 feet between stations 256 Optomux stations maximum
Communications:	Full duplex, two twisted pairs, and a ground
Indicators	Power, transmit, and receive
Options Jumper selectable	 Address (0 to 255) Baud rates Multidrop or repeat mode 2 or 4-pass protocol

* Extend line length and/or number of OPTOMUX stations with the AC30A/B network adapter.

Error Codes

Optomux Detected Errors:

-1 Power Up Clear Expected

-2 Undefined Command

-3 Checksum Error

-4 Input Buffer Overrun

-5 Non-printable ASCII Character Received

-6 Data Field Error

-7 Serial Watchdog Timeout

-8 Invalid Limit Set

OptoWare Driver Detected Errors:

-20 Invalid Command Number

-21 Invalid Module Position

-22 Data Range Error

-23 Invalid First Modifier

-24 Invalid Second Modifier

-25 Invalid Address

-27 Not Enough Return Data

-28 Invalid Return Data

-29 Turnaround Time Out (Optomux did not respond within the specified time interval)

-30 Input Buffer Overrun

-31 Checksum Error

-33 Send Error (Message cannot be sent out; probable serial port problem)

-34 Incorrect Command Echo In Four-Pass

Analog Command Set

System Commands
Power Up Clear
Reset
Set Turn Around Delay
Set Analog Watchdog Delay
Set Analog Watchdog Timeout
Set Optomux Protocol
Identify Optomux Type

Configure Commands
Configure Positions
Configure As Inputs
Configure As Outputs
Set Temperature Probe Type

Read and Write Commands
Write Analog Outputs
Read Analog Outputs
Read Analog Inputs
Average And Read Inputs
Update Analog Outputs
Start Averaging Inputs
Read Average Complete Bits
Read Averaged Inputs
Read Configuration
Read Temperature Inputs

INPUT RANGE COMMANDS
Set Input Range
Read Out-of-Range Latches
Read And Clear Out-of-Range Latches
Clear Out-of-Range Latches
Read Lowest Values
Read And Clear Lowest Values
Clear Lowest Values
Read Peak Values
Read And Clear Peak Values
Clear Peak Values

Gain And Offset Commands
Calculate Input Offsets
Set Input Offsets
Calculate And Set Input Offsets
Calculate Gain Coefficients
Set Gain Coefficients
Calculate And Set Gain Coefficients

Waveform Commands
Set Output Waveform
Turn Off Existing Waveforms
Enhanced Ouput Waveform
Cancel Enhanced Waveforms

Driver Commands
IBM PC Software Driver
Driver Commands
Set Driver Protocol
Set Turnaround Delay
Set Serial Port Number
Set Number Of Retries
Configure Serial Port

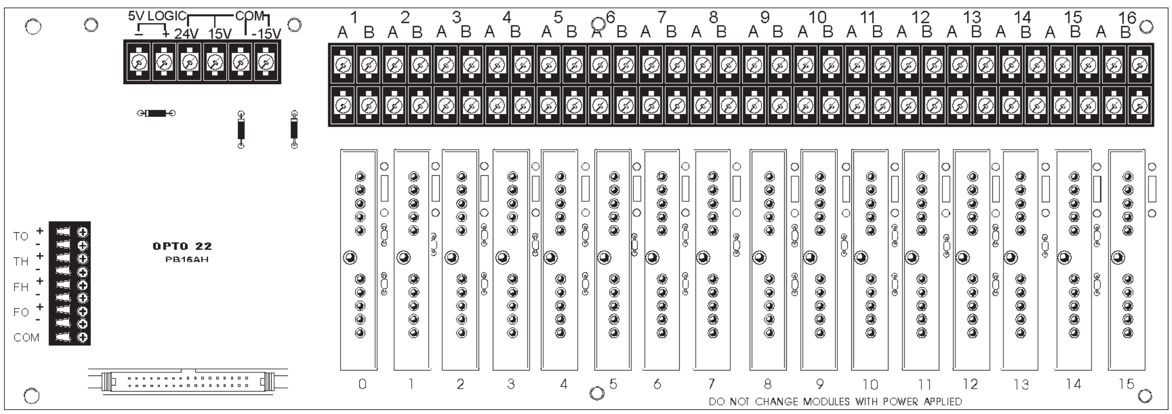
PB16AH

16 Position I/O Mounting Rack

Form 484-990609

Description

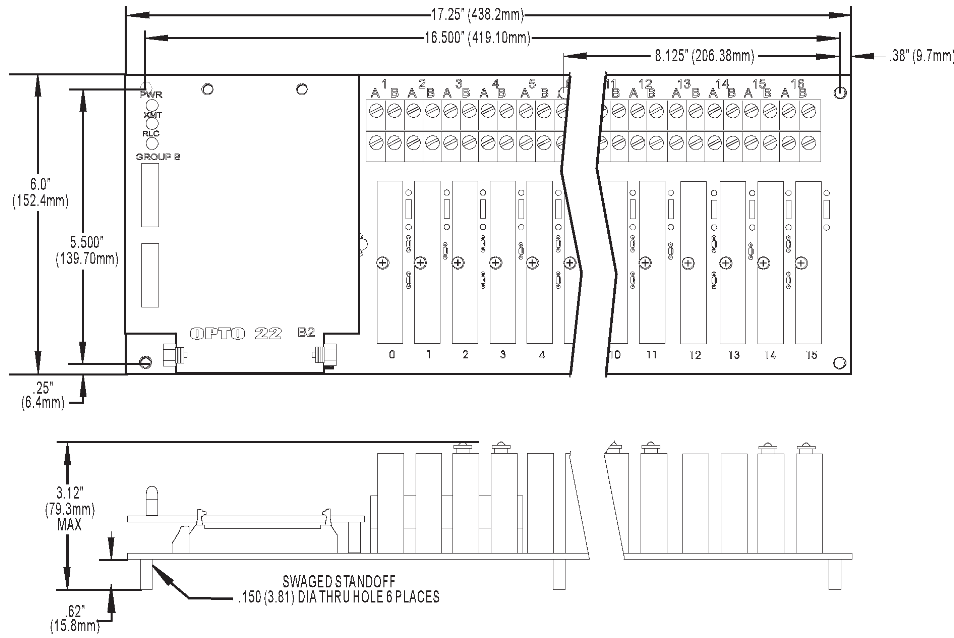
The PB16AH I/O mounting rack can accommodate up to 16 standard analog I/O modules in any combination. The PB16AH is designed to interface with Classic style brain boards (Mistic®, Optomux®, and Pamux®) via a 50-pin header connector.



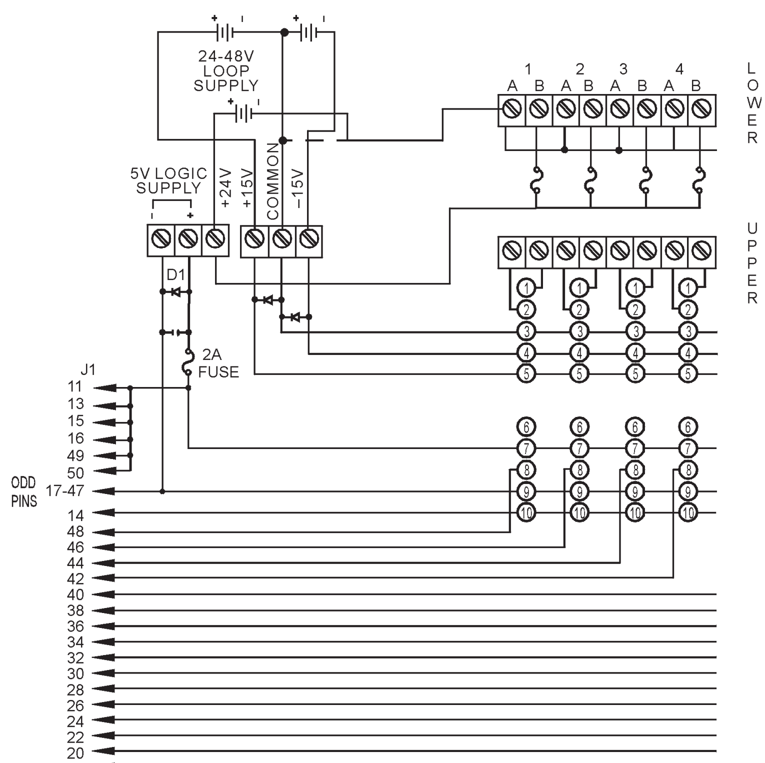
Specifications

Operating Temperature	0° to 70° C
Relative Humidity	95%, Non-condensing
Field Interface Connector	6-32 Screw Terminals
Logic Interface Connector	50-pin Male Header Connector
Power Interface Connectors	2-position Screw Terminals to Supply 5 Volts to Brain Board. 3-position Screw Terminals to Supply ±15 Volts to Analog Modules. Screw Terminal for Optional 24-Volt Loop Supply for Current Loop Modules.

Dimensions with Optomux Brain Board (P/N B2)



Schematics



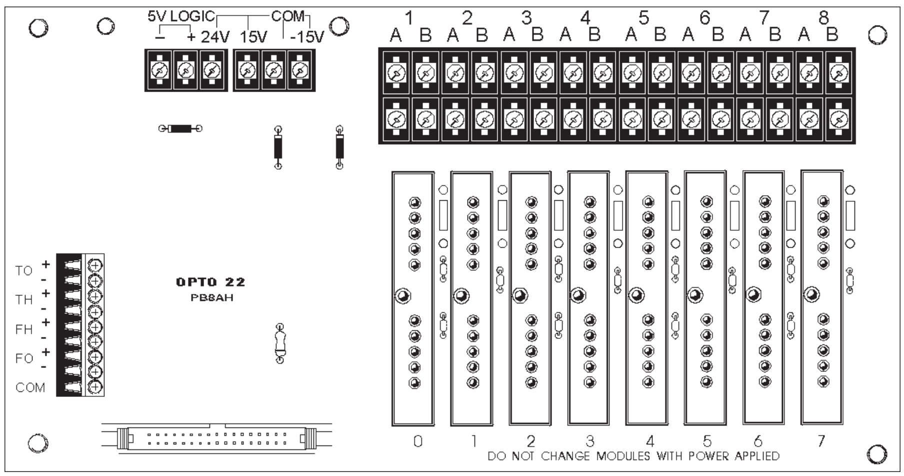
PB8AH

8 Position I/O Mounting Rack

Form 483-990609

Description

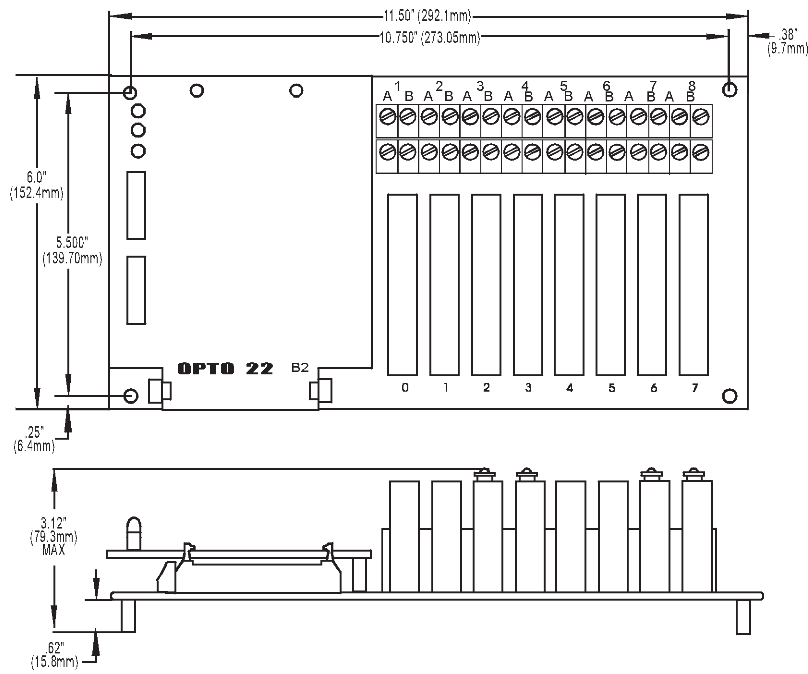
The PB8AH I/O mounting rack can accommodate up to eight standard analog I/O modules in any combination. The PB8AH is designed to interface with Classic style brain boards (Mistic®, Optomux®, and Pamux®) via a 50-pin header connector.



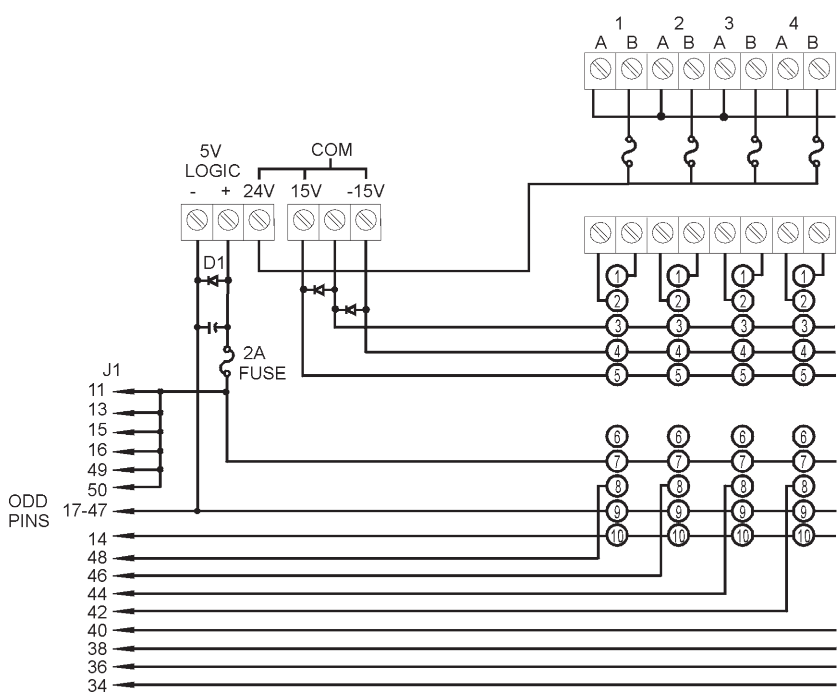
Specifications

Operating Temperature	0° to 70° C
Relative Humidity	95%, Non-condensing
Field Interface Connector	6-32 Screw Terminals
Logic Interface Connector	50-pin Male Header Connector
Power Interface Connectors	2-position Screw Terminals to Supply 5 Volts to Brain Board. 3-position Screw Terminals to Supply ±15 Volts to Analog Modules. Screw Terminal for Optional 24-Volt Loop Supply for Current Loop Modules.

Dimensions with Optomux Brain Board (P/N B2)



Schematics



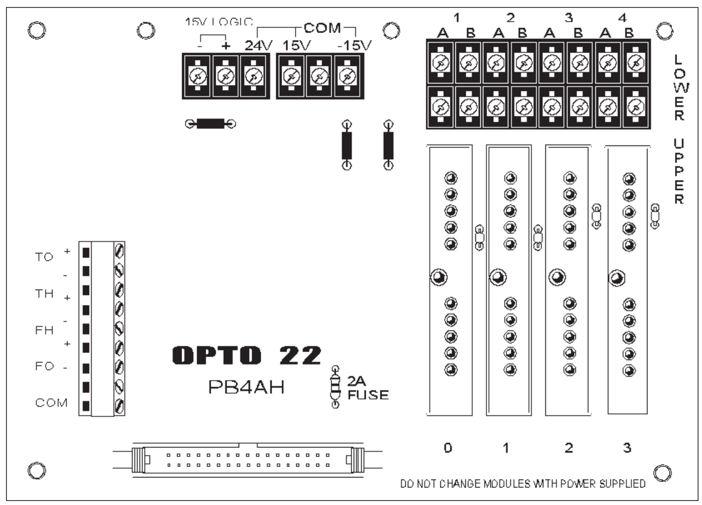
PB4AH

4 Position I/O Mounting Rack

Form 482-990609

Description

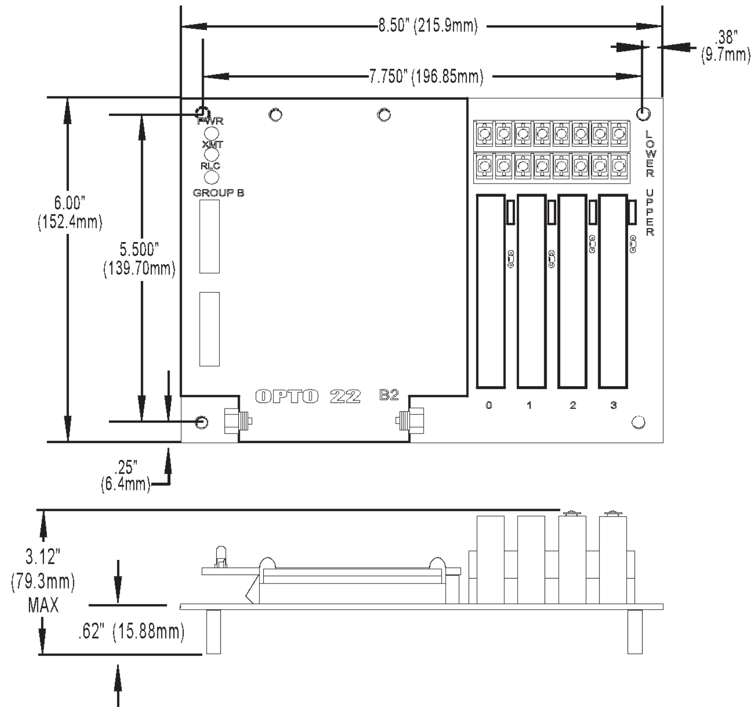
The PB4AH I/O mounting rack can accommodate up to four standard analog I/O modules in any combination. The PB4AH is designed to interface with Classic style brain boards (Mistic®, Optomux®, and Pamux®) via a 50-pin header connector.



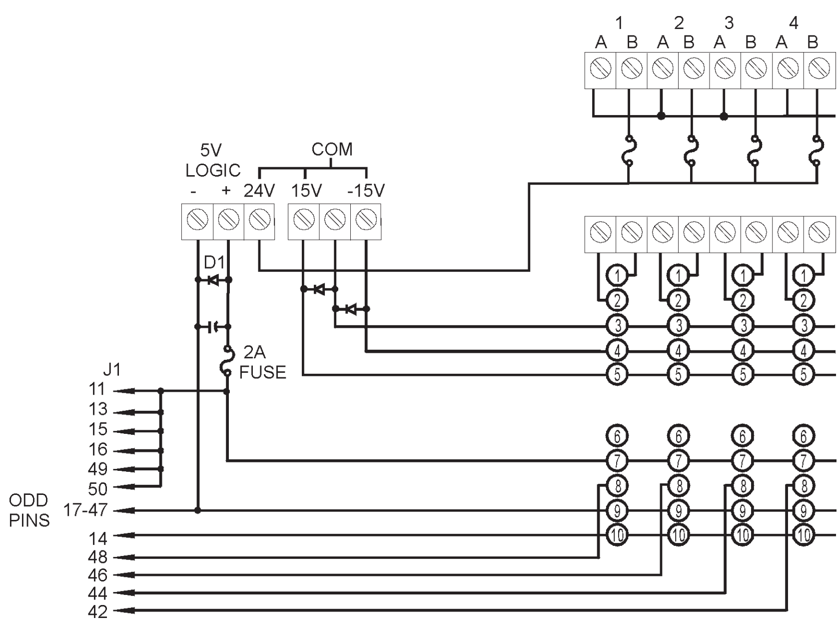
Specifications

Operating Temperature	0° to 70° C
Relative Humidity	95%, Non-condensing
Field Interface Connector	6-32 Screw Terminals
Logic Interface Connector	50-pin Male Header Connector
Power Interface Connectors	2-position Screw Terminals to Supply 5 Volts to Brain Board. 3-position Screw Terminals to Supply ±15 Volts to Analog Modules. Screw Terminal for Optional 24-Volt Loop Supply for Current Loop Modules.

Dimensions with Optomux Brain Board (P/N B2)



Schematics



Thermocouple Input Modules

Form 439-000929

Description

The thermocouple analog modules provide a single channel of optically isolated temperature-to-digital conversion. The modules offer wide nominal input and special over/under range capabilities. The 'T' module also includes 4000 Vrms channel-to-channel isolation which eliminates any ground loop problems. Modules plug into a Classic standard analog I/O rack and are secured by a captive screw.

Features

- Rugged Packaging
- 4000 Vrms Transient Isolation
- 12-bit Resolution
- Factory Calibrated, No User Adjustments
- Operating Temperature: 0° to 70° C
- "T" Models Offer Channel-to-Channel Isolation
  * For 'T' models only.
  ** Accuracy figure requires use of gain and offset commands.

Module Specifications

	AD5	AD5T	AD8	AD8T
Thermocouple Type	J	J	K	K
Nominal Temperature Range ° C	0° to 700°	0° to 700°	-100° to 924°	-100° to 924°
Nominal Temperature Range ° F	32° to 1292°	32° to 1292°	-148° to 1695°	-148° to 1695°
Over/Under Range Capability ° C	-20° to 1200°	-20° to 1200°	-125° to 1250°	-125° to 1250°
Over/Under Range Capability ° F	- 4° to 2192°	- 4° to 2192°	-193° to 2282°	-193° to 2282°
Average Resolution	0.18° C (0 to 700° C) 0.36° C (700 to 1200° C)	0.18° C (0 to 700° C) 0.36° C (700 to 1200° C)	± 0.25° C (-100 to 924° C) ± 0.5° C (924 to 1250° C)	± 0.25° C (-100 to 924° C) ± 0.5° C (924 to 1250° C)
Accuracy*	± 3° C (0 to 700° C)	± 3° C (0 to 700° C)	± 3° C (-100 to 924° C)	± 3° C (-100 to 924° C)
Repeatability	± 1° C	± 1° C	± 1° C	± 1° C
Power Requirements	17 mA at +15 VDC 12 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC	17 mA at +15 VDC 12 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC

*Accuracy may be improved by the use of "Set Offset" and "Set Gain" commands in the OPTOMUX command set.

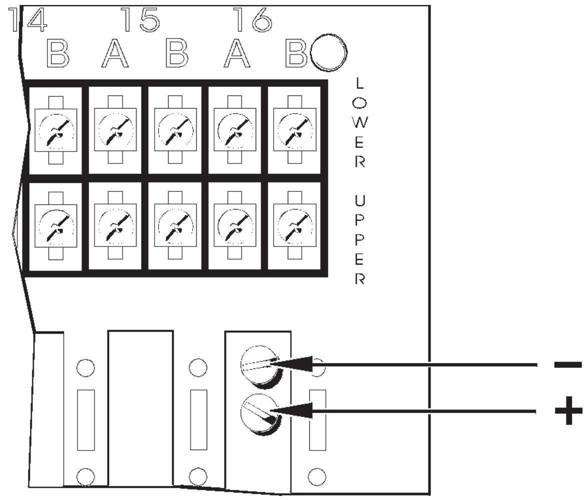
	AD17T	AD17T	AD18T	AD19T
Thermocouple Type	R	S	T	E
Nominal Temperature Range ° C	0° to 960°	0° to 1034°	-200° to 224°	-100° to 435°
Nominal Temperature Range ° F	32° to 1760°	32° to 1893°	-328° to 435°	-148° to 815°
Over/Under Range Capability ° C	-50° to 1768°	-50° to 1768°	-200° to 400°	-100° to 900°
Over/Under Range Capability ° F	-58° to 3214°	-58° to 3214°	-328° to 752°	-148° to 1652°
Average Resolution	0.23° C (200 to 960° C) 0.35° C (960 to 1768° C)	0.25° C (200 to 1034° C) 0.48° C (1034 to 1768° C)	0.1° C (-200 to 244° C) 0.14° C (244 to 400° C)	0.13° C (-100 to 435° C) 0.23° C (435 to 900° C)
Accuracy*	± 5° C (200 to 960° C) ± 3.5° C (960 to 1768° C)	± 5.2° C (200 to 1034° C) ± 4.2° C (1034 to 1768° C)	± 3° C (-100 to 224° C) ± 2° C (224 to 400° C)	± 3° C
Repeatability	± 2.5° C (200 to 960° C) ± 1.8° C (960 to 1768° C)	± 2.6° C (200 to 1034° C) ± 2.1° C (1034 to 1768° C)	± 1.0° C (-100 to 0° C) ± 0.6° C (0 to 224° C) ± 0.4° C (224 to 400° C)	± 0.8° C (-100 to 0° C) ± 0.6° C (0 to 435° C) ± 0.5° C (435 to 900° C)
Power Requirements	30 mA at +15 VDC 30 mA at -15 VDC	30 mA at +15 VDC 30 mA at -15 VDC	30 mA at +15 VDC 30 mA at -15 VDC	30 mA at +15 VDC 30 mA at -15 VDC

*Accuracy may be improved by the use of "Set Offset" and "Set Gain" commands in the OPTOMUX command set.

General Specifications

Isolation: Input-to-Output Input-to-Analog Supply*	 4000 Vrms (Transient) 4000 Vrms
Cold Junction Compensated:	Yes
Open Thermocouple Detection:	Yes
Input Response Time:	5% of scale change in 8.5 ms 63% of scale change in 165 ms
Ambient Temperature: Operating Storage	 0° to 70°C - 25° to 85°C
Resolution:	12 bits

Connection Diagram



Model	T/C Type	Polarity/Color	
		+	-
AD5/AD5T	J	WHITE	RED
AD8/AD8T	K	YELLOW	RED
AD17T	R	BLACK	RED
AD18T	T	BLUE	RED
AD19T	E	PURPLE	RED
AD17T	S	BLACK	RED

Voltage Input Modules

Form 440-001002

Description

The voltage input analog module provides a single channel of optically-isolated voltage-to-digital conversion. The modules offer wide nominal input and special over/under range capabilities. The "T" module also includes 4,000 V_{rms} channel-to-channel isolation which eliminates any ground loop problems. Modules plug into a Standard analog I/O rack and are secured by a captive screw.

	AD6 AD6HS	AD6T	AD7	AD9T
Nominal Voltage Input	0 to 5 VDC	0 to 5 VDC	0 to 10 VDC	0 to 50 mV
Over/Under Range Capability	-.125 to 11 VDC	-.125 to 11 VDC	-.250 to 11 VDC	-.125 to 110 mV
Accuracy*	± 5 mV	± 5 mV	± 10 mV	± 100 mV
Power Requirements	16 mA at +15 VDC 11 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC	16 mA at +15 VDC 11 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC

*May be improved by the use of the "Set Offset" or "Set Gain" commands in the OPTOMUX command set.

	AD11	AD12 AD12T	AD13T
Nominal Voltage Input	-5 to + 5 VDC	-10 to 10 VDC	0 to 100 mV
Over/Under Range Capability	-5.25 to 11 VDC	-10.5 to 11 VDC	-.250 to 220 mV
Accuracy*	± 10 mV	± 20 mV	± 100 mV
Power Requirements	15 mA at +15 VDC 12 mA at -15 VDC	15 mA at +15 VDC 12 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC

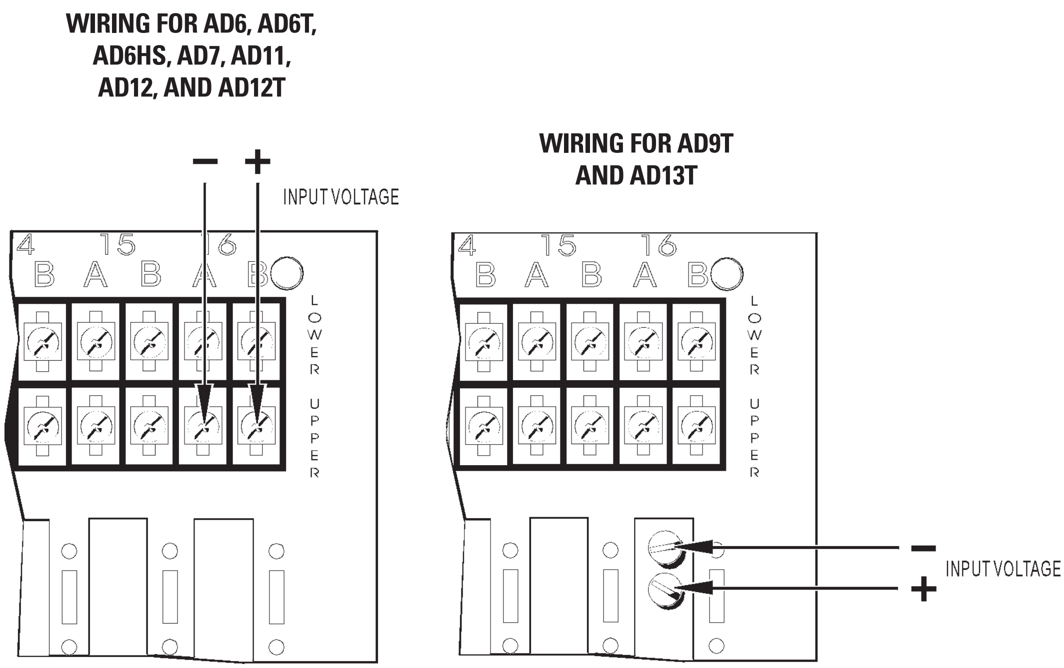
*May be improved by the use of the "Set Offset" or "Set Gain" commands in the OPTOMUX command set.

Specifications

Input Response Time*	5% of scale change in 8.5 ms 63% of scale change in 165 ms
Resolution	12-bits
Isolation Input-to-Output Input-to-Analog Supply ("T" Modules)	 4,000 Vrms 4,000 Vrms
Temperature Operating Storage	 0° to 70° C -25° to 85° C

*AD6HS input response 100% step change in less than 3 milliseconds.

Connections



Voltage Output Modules

Form 441-000922

Description

The voltage output analog module provides a single channel of optically-isolated digital-to-voltage conversion. The "T" module is transformer isolated which eliminates any ground loop problems. The modules are available in uni-polar and bi-polar versions. Modules plug into a Standard analog I/O rack and are secured by a captive screw.

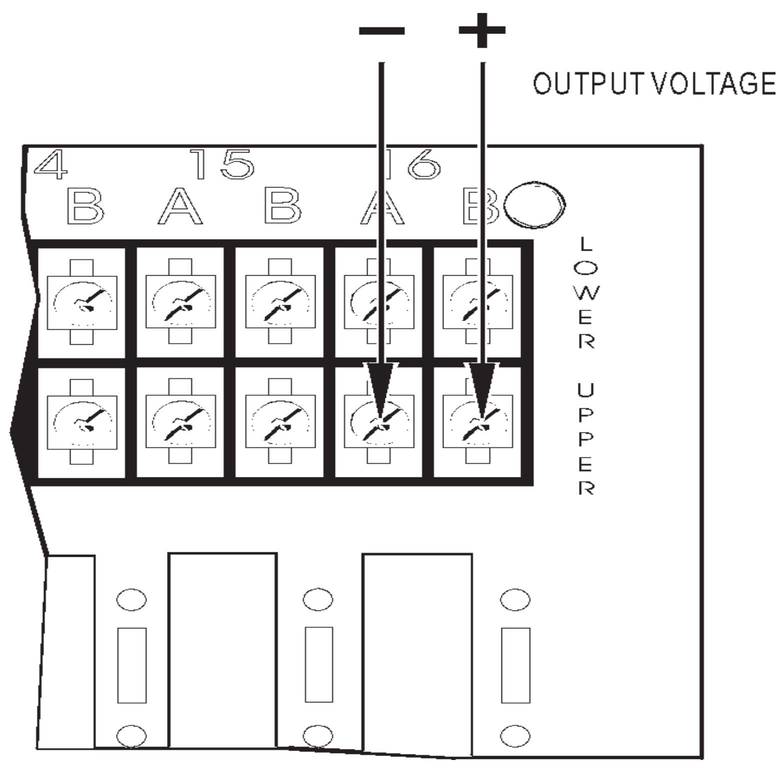
Output Ranges by Module

	DA4	DA4T	DA5	DA6	DA7
Output Voltage	0 to 5 VDC	0 to 5 VDC	0 to 10 VDC	- 5 to + 5 VDC	- 10 to + 10 VDC
Accuracy	± 5 mV	± 5 mV	± 10 mV	± 10 mV	± 20 mV
Power Requirements	20 mA at +15 VDC 10 mA at -15 VDC	35 mA at +15 VDC 35 mA at -15 VDC	20 mA at +15 VDC 10 mA at -15 VDC	20 mA at +15 VDC 10 mA at -15 VDC	20 mA at +15 VDC 10 mA at -15 VDC

Specifications

Output Current DA4, DA5, DA6, DA7 DA4T	 70 mA 25 mA
Output Response Time	Full-scale step change in 3 ms
Resolution	12 bits
Isolation Input-to-Output Input-to-Analog Supply	 4,000 Vrms (Transient) 4,000 Vrms
Temperature Operating Storage	 0°C to 70°C - 25°C to 85°C

Connections



Current Output Modules

Form 442-000922

Description

The current output modules provide a single channel of optically- isolated digital-to-current conversion. The "T" module is transformer isolated which eliminates any ground loop problems. Modules plug into any Standard Classic analog I/O rack and are secured by a captive screw.

Output Ranges by Module

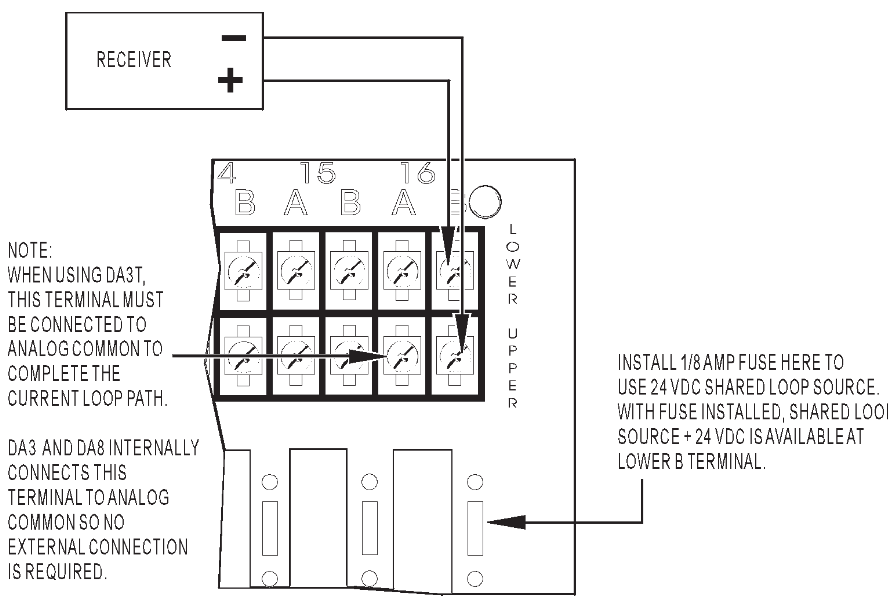
	DA3	DA3T	DA8
Output Current	4 - 20 mA	4 - 20 mA	0 - 20 mA
Accuracy	16 µA	16 µA	20 µA
Power Requirements	20 mA at +15 VDC 10 mA at -15 VDC	22 mA at +15 VDC 22 mA at -15 VDC	20 mA at +15 VDC 10 mA at -15 VDC

Specifications

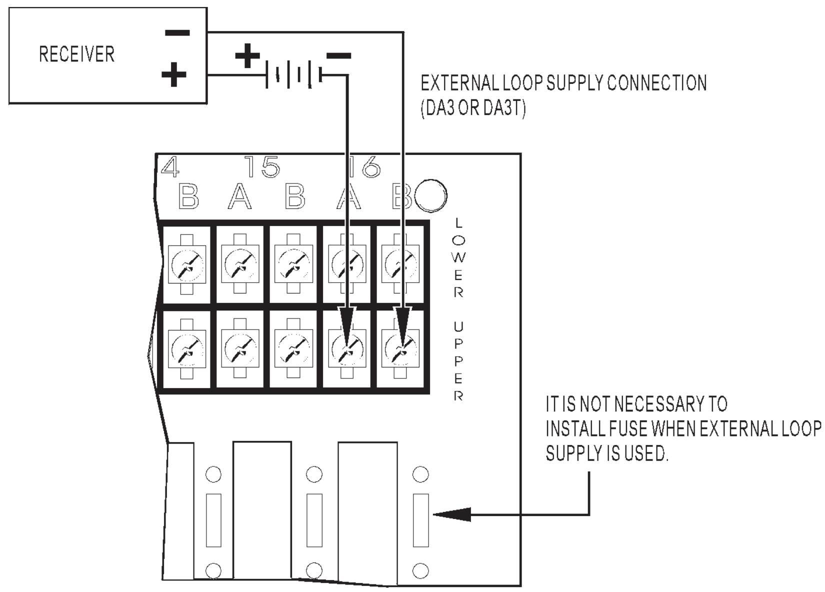
Response Time	Full scale step change in 3 ms
Resolution	12 bits
Isolation Input-to-Output Input-to-Analog Supply (T Modules)	 4,000 Vrms 4,000 Vrms
Temperature Operating Storage	 0° C to 70° C - 25° C to 85° C

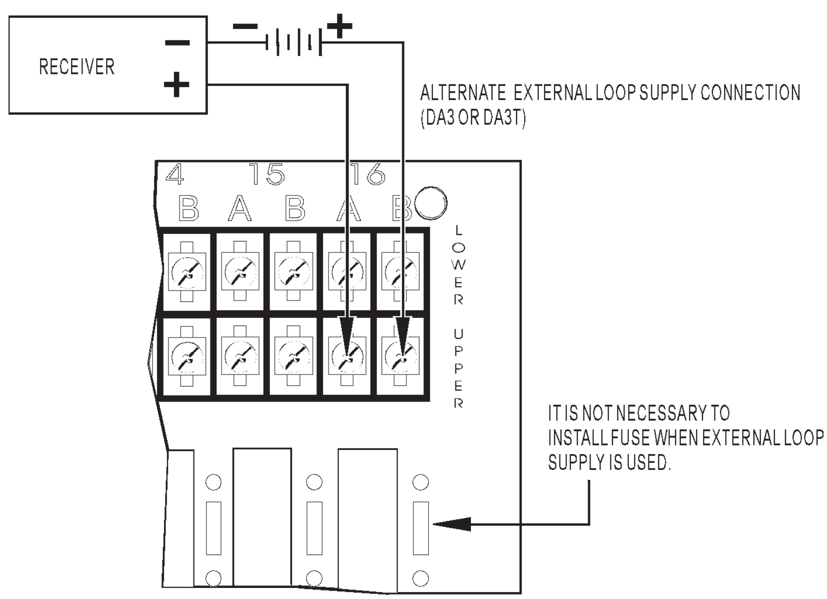
DA3T: All of the lower A terminals on the mounting rack are tied together. These provide a convenient tie point for shared loop source return. To use the DA3T with a common loop supply, connect any one lower A terminal to the shared loop source "-", then jumper upper A to lower A for each DA3T.

Connections

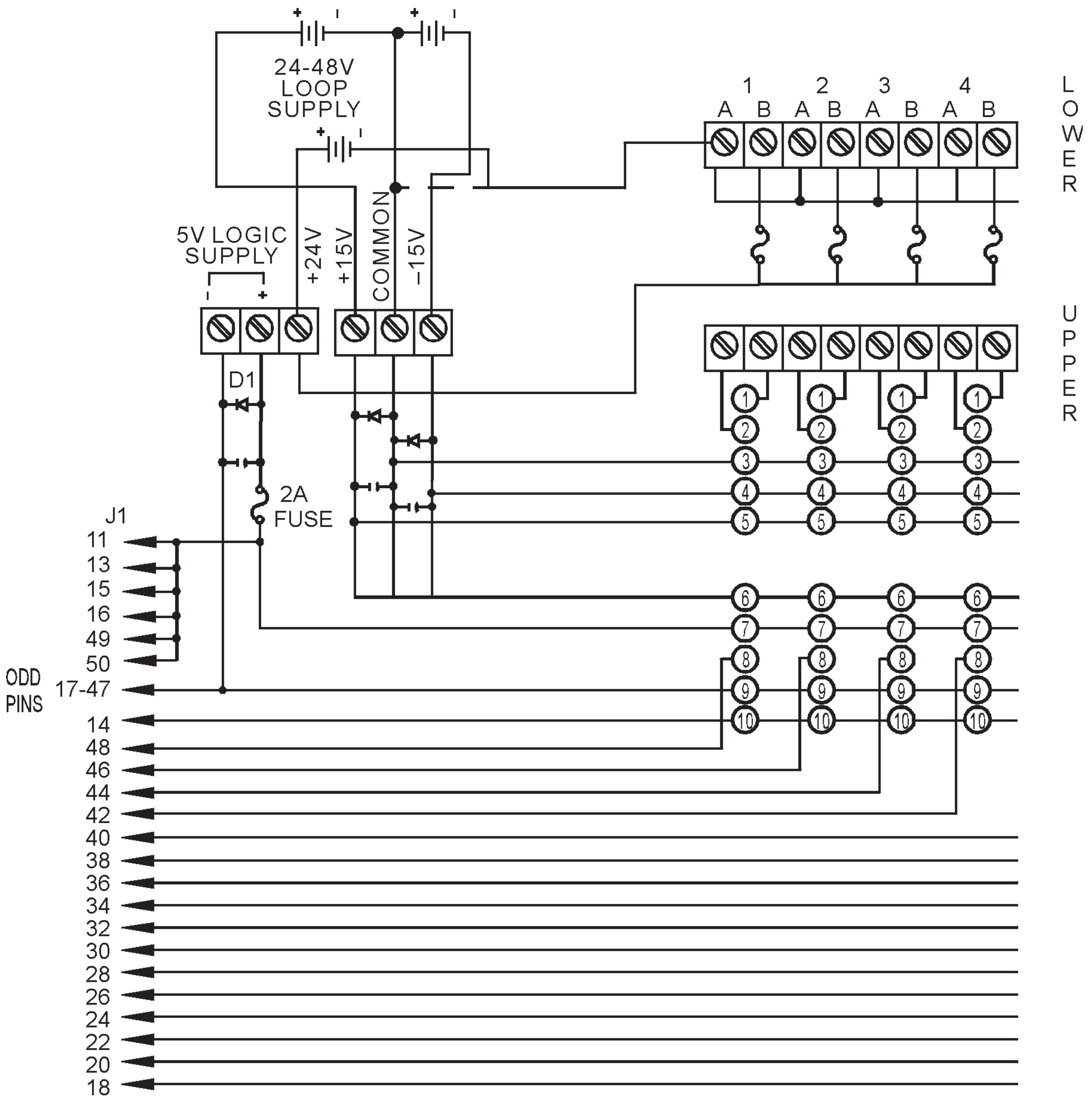


Connections (cont.)





Schematics



24-48V
LOOP
SUPPLY
1 2 3 4
A B A B A B A B
LOWER
5V LOGIC
SUPPLY
+24V
+15V
COMMON
–15V
UPPER
D1
2A
FUSE
J1
11
13
15
16
49
50
ODD PINS 17-47
14
48
46
44
42
40
38
36
34
32
30
28
26
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22
20
18

4–20 Milliamp
Input Modules

Form 443-000921

Description

The AD3 module provides a single channel of optically-isolated current-to-digital conversion. The AD3T module offers additional channel-to-channel isolation. The nominal input range is 4 to 20 milliamps (mA) with an under/over range capability from less than 3 mA to greater than 35 mA. The “T” module also provides 4,000 V_{rms} channel-to-channel isolation which eliminates any loop problems. Modules plug into a Classic Standard analog I/O rack and are secured by a captive screw.

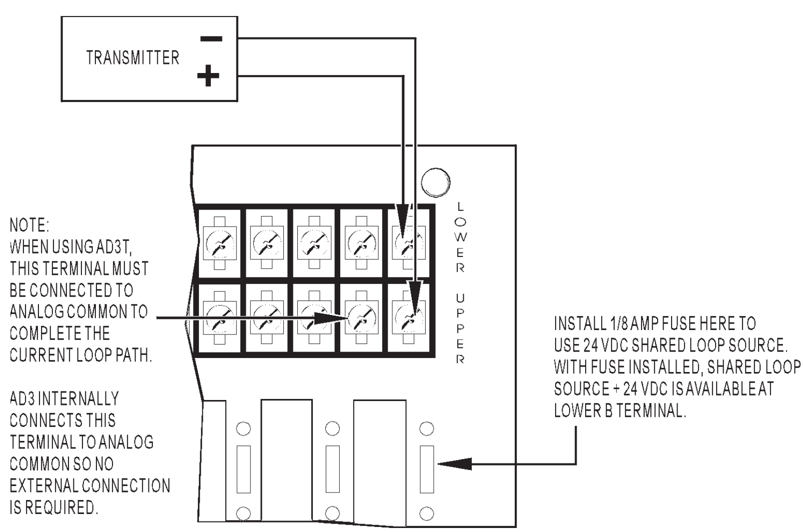
Specifications

Input Impedance	249 Ohms
Nominal Input Range	4 to 20 mA
Over/under Range	3 to 35 mA
Accuracy	16 µA
Resolution	12 bits
Response Time	Full-scale step change in 3 ms
Isolation Transient Input-to-Output Input-to-Analog Supply*	 4,000 Vrms 4,000 Vrms
Power Requirements AD3 AD3T	 13 mA at +15 VDC 7.5 mA at -15 VDC 35 mA at +15 VDC 35 mA at -15 VDC
Ambient Temperature: Operating Storage	 0° to 70° C - 25° to 85° C

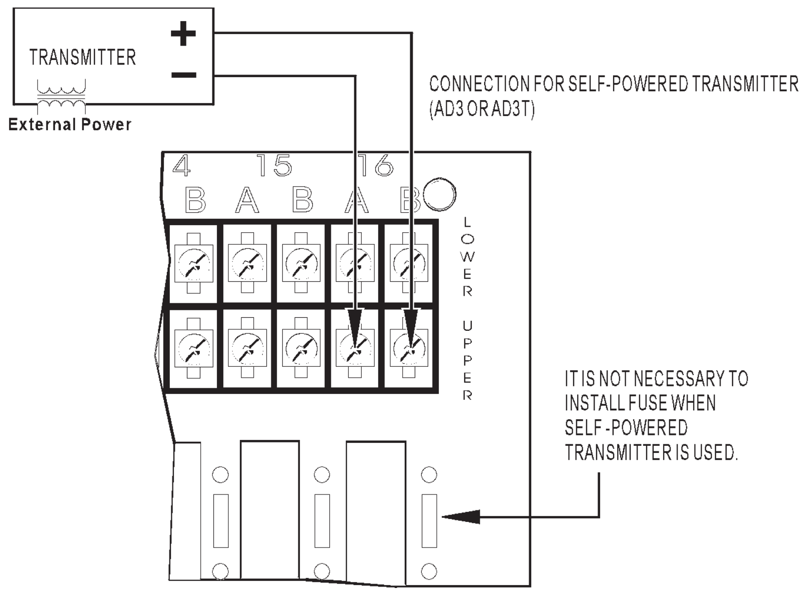
* For "T" models only.

Connections AD3 Modules Using Self-Powered Transmitter

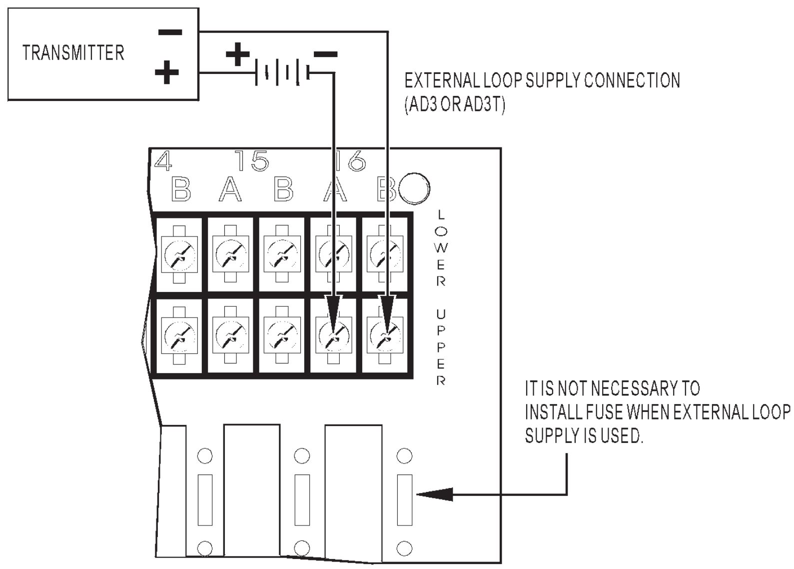
AD3T: All of the lower A terminals on the mounting rack are tied together. These provide a convenient tie point for shared loop source return. To use the AD3T module with a common loop power supply, connect any one lower A terminal to the shared loop source "-", then jumper upper A to lower A for each AD3T.

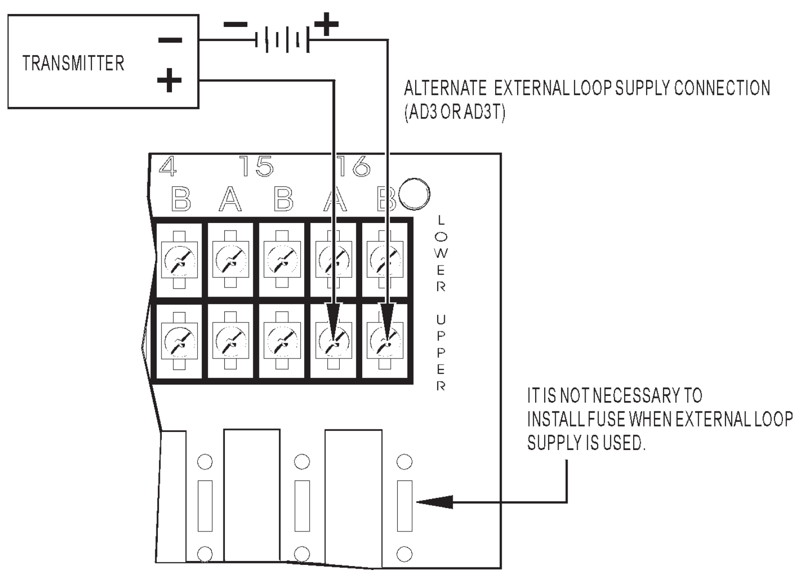


Connections (cont.)

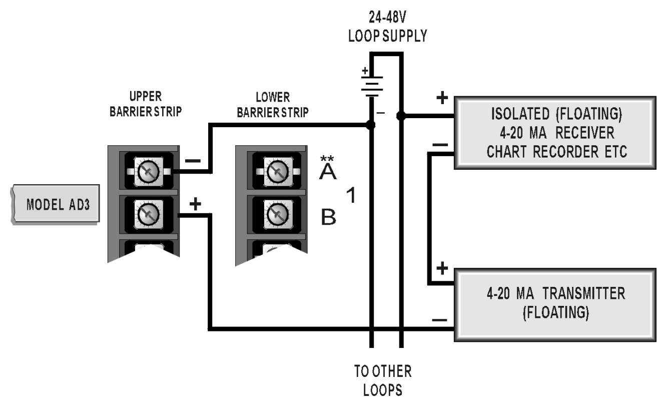


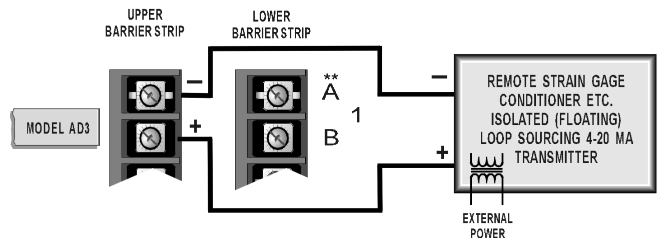
Connections (cont.)

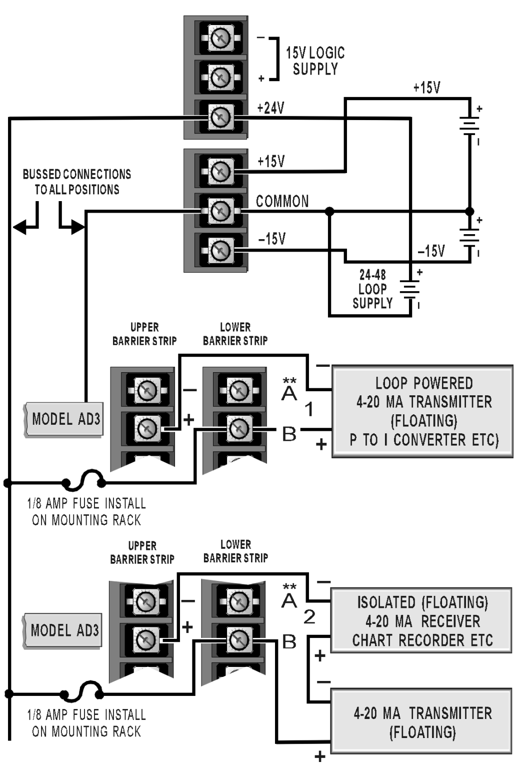




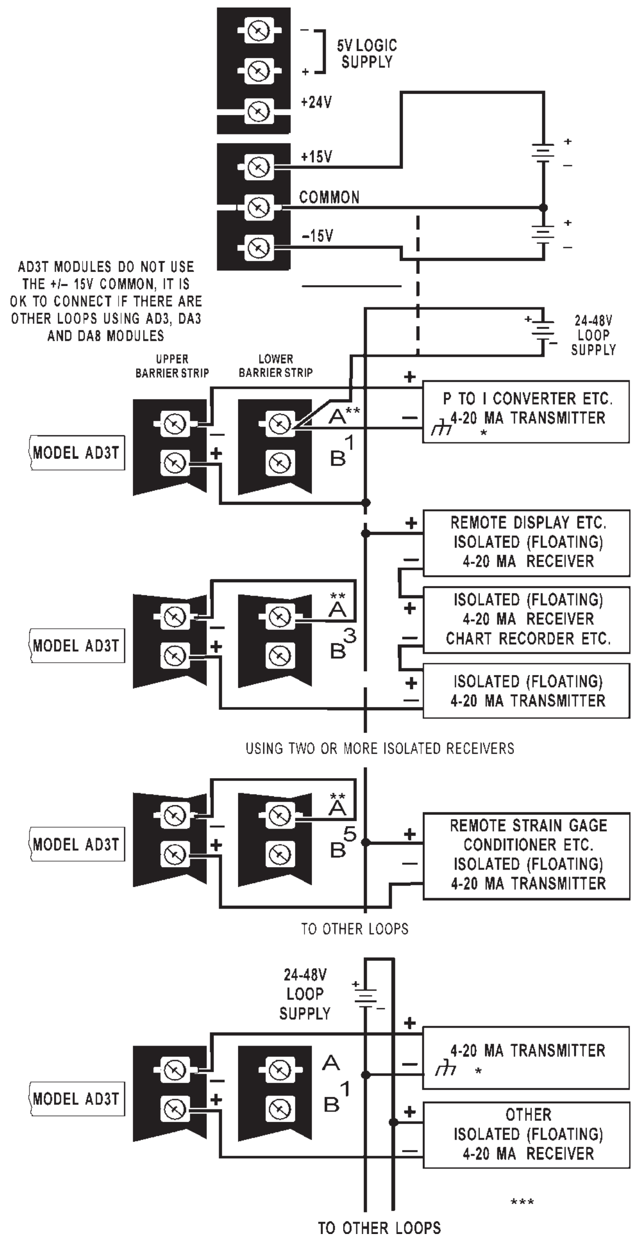
Connections Loop Supply



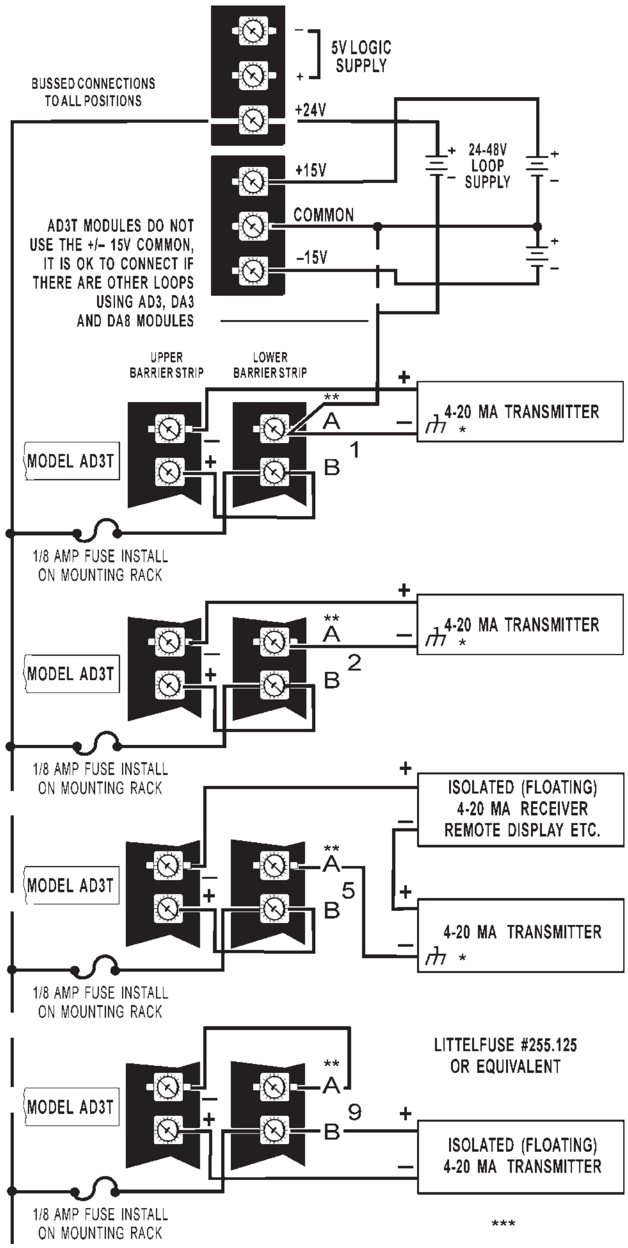




Connections Loop Supply (cont.)

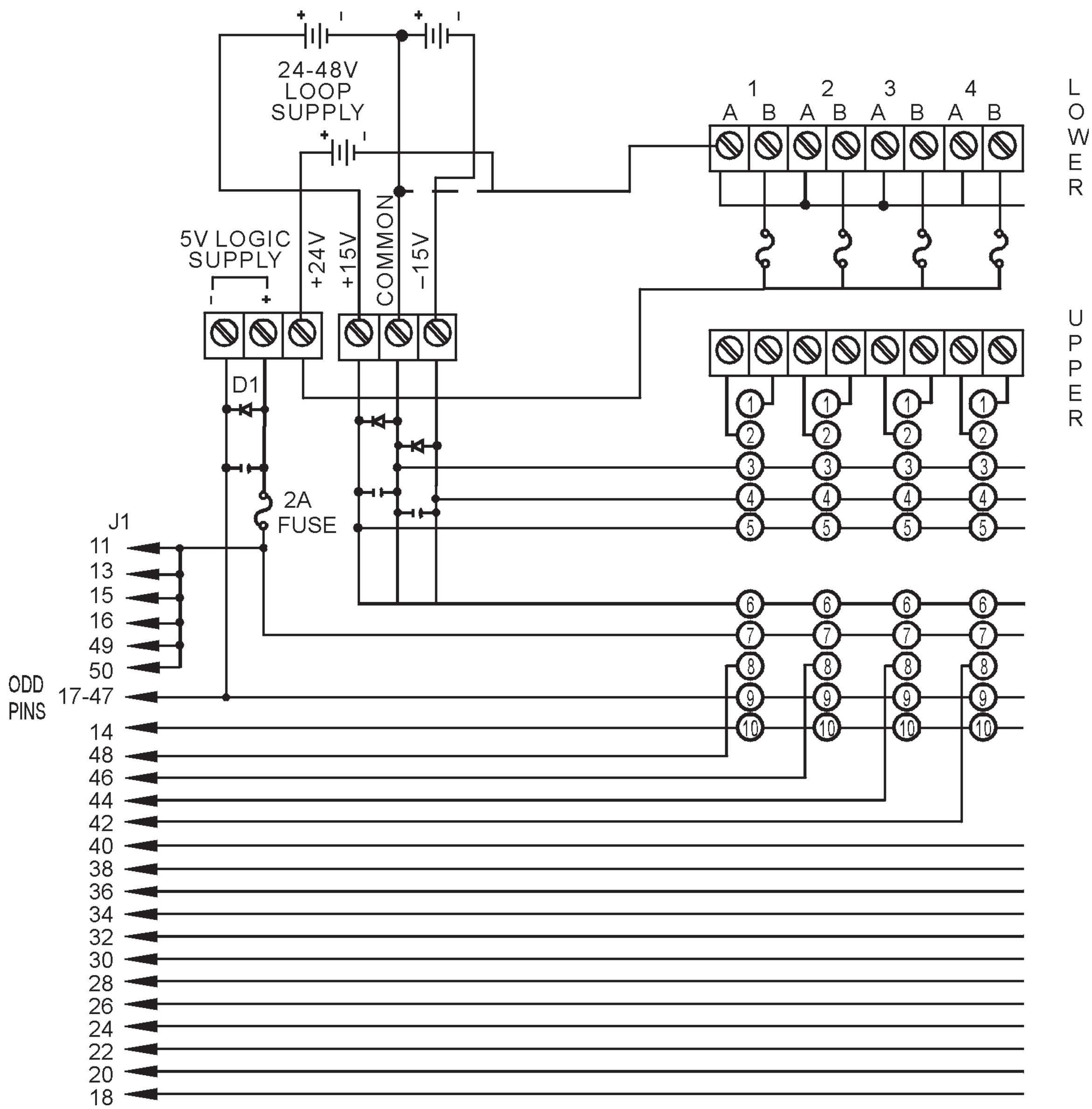


Connections Loop Supply (cont.)



Schematics

Analog Mounting Rack Schematic (PB4AH, PB8AH, PB16AH)



10 and 100 Ohm RTD
Input Modules

Form 444-000921

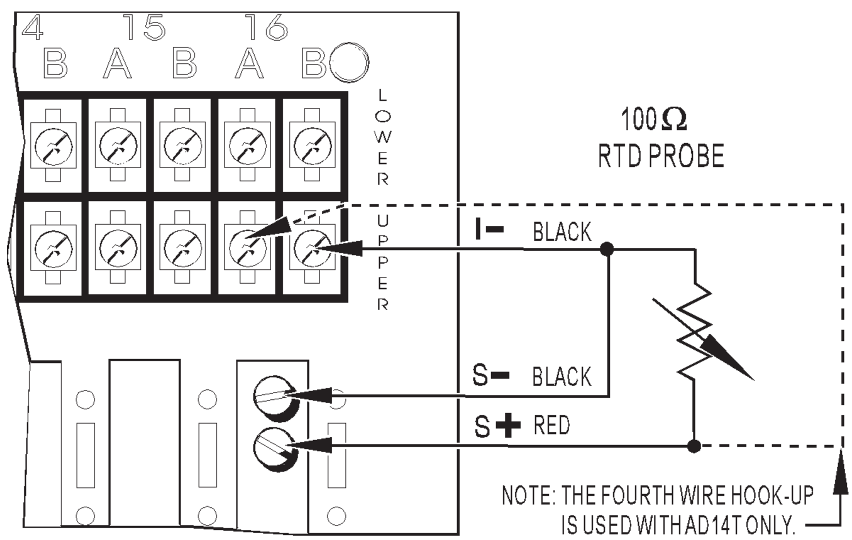
Description

The AD10T2 and AD14T modules provide a single channel of optically-isolated RTD temperature-to-digital conversion with 4,000 V_{rms} of transient isolation. Modules plug into any Standard Analog I/O rack and are secured by a captive screw. Field connections to the modules are made via a terminal on the base of the analog I/O rack and two terminals on the top of the I/O module. The AD10T2 and AD14T modules are suitable for temperature measurements where the RTD probe is grounded or when ground loop currents exist.

Specifications

	AD10T2	AD14T
RTD Input	100 Ω platinum (∝ = 0.00385)	10 Ω copper
Nominal Temperature Range	- 50° C to 350° C	- 55° C to 150° C
Nominal Temperature Range	- 58° F to 662° F	- 67° F to 302° F
Over/Under Range	- 60° C to 812° C	N/A
Over/Under Range	- 140° F to 1493° F	N/A
Accuracy	± 0.4° C	± 0.6° C
Resolution	12 bits	12 bits
Response Time	full scale step change in 100 ms	full scale step change in 100 ms
Isolation Transient Input-to-Output Input-to-Analog Supply	 4,000 Vrms 4,000 Vrms	 4,000 Vrms 4,000 Vrms
Temperature Operating Storage	 0° C to 70° C - 25° C to 85° C	 0° C to 70° C - 25° C to 85° C

Connections



0–5 Amp AC/DC
Current Input Modules
Form 445-000921

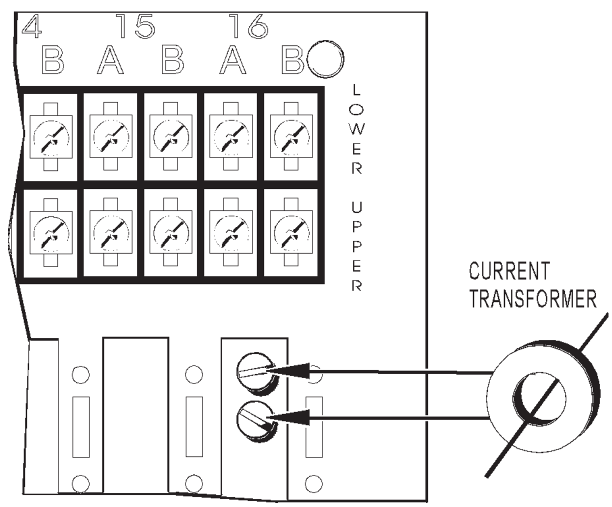
Description

The AD16T module provides a single channel of optically-isolated true RMS current-to-digital conversion. Modules plug into any Standard Analog I/O rack and are secured by a captive screw. Field connections to the module are made via two terminals on the top of the analog I/O module. The AD16T is transformer as well as optically-isolated to eliminate any ground loop problems. An ideal input is the 5-amp secondary of a standard current transformer used to monitor AC line current.

Specifications

Input	0 - 5 amps AC/DC
Input Impedance	.02 Ohms
Maximum Input	8 amps AC/DC
Accuracy	±25 mA
Resolution	12 bits
Response Time	Full-scale step change in 100 ms
Isolation Input-to-Analog Supply (T model)	 4,000 Vrms 4,000 Vrms
Power Requirements	35 mA at +15 VDC 35 mA at -15 VDC
Ambient Temperature: Operating Storage	 0° to 70° C - 25° to 85° C

Connections

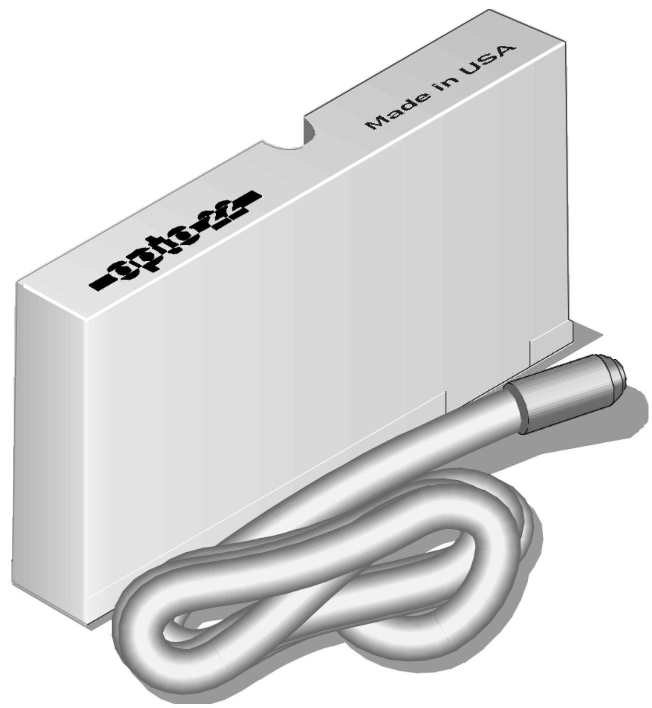


ICTD Temperature Input Modules

Form 446-000922

Description

The AD4 module provides a single channel of optically-isolated temperature-to-digital conversion. Modules plug into any Opto 22 standard analog I/O rack and are secured by a captive screw. Field connections to the module are made via two terminals on the analog I/O rack. The AD4 module is designed for use with an ICTD probe from Opto 22 or from other vendors. The ICTD probe is encapsulated and completely isolated from ground loop possibilities. The ICTD can be used in energy management, freezer control, etc.



Specifications

AD4

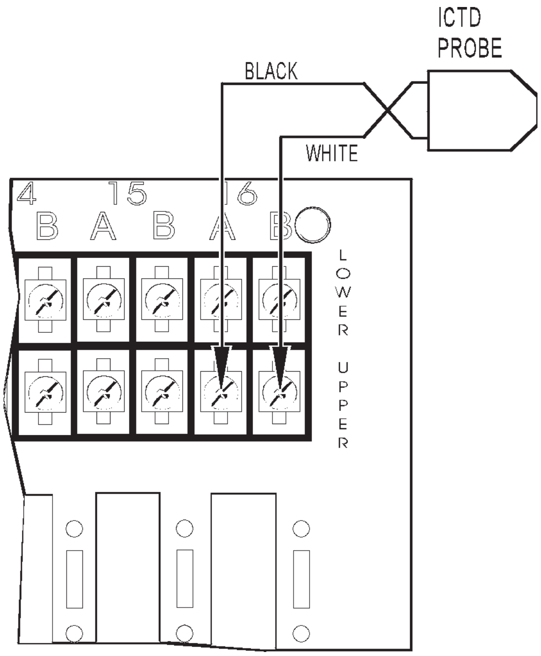
Input Temperature Range	- 188.4° C to 150° C
Input Response Time	5% full scale step change in 7.8 seconds 63% full scale step change in 150 seconds
Accuracy of AD4 Accuracy with ICTD Probe	± 0.3° C ± 0.8° C
Resolution with ICTD Probe	0.083°C
Power Requirements: Module Logic	 16 mA at +15 VDC 11 mA at -15 VDC 1.6 mA at 5 VDC
Thermal Time Constant	2.5 minutes typical (still air)
Cable Length	> 2,000 feet (610 meters)
Isolation Input-to-Output	 4,000 Vrms
Ambient Temperature Operating Storage	 0° C to 70° C -25° C to 85° C

ICTD

Input Temperature Range	- 40°C to 100°C
Output	233 µA @ -40°C 373 µA @ 100°C
Sensitivity	1 µA/°K
Input Response Time (% of Span/Δ °C/Δ Time)	5 %/7°C/7.8 seconds 20 %/28°C/33.6 seconds 63.2 %/88.48°C/150 seconds
Output Accuracy	±0.5°C @ 25°C
Repeatability	±0.25°C
Thermal Time Constant	2.5 minutes typical (still air)
Cable Length	>2,000 ft (610 meters)

Connections

AD4 Connection Diagram



28 to 140 VAC
Input Module
Form 497-000920

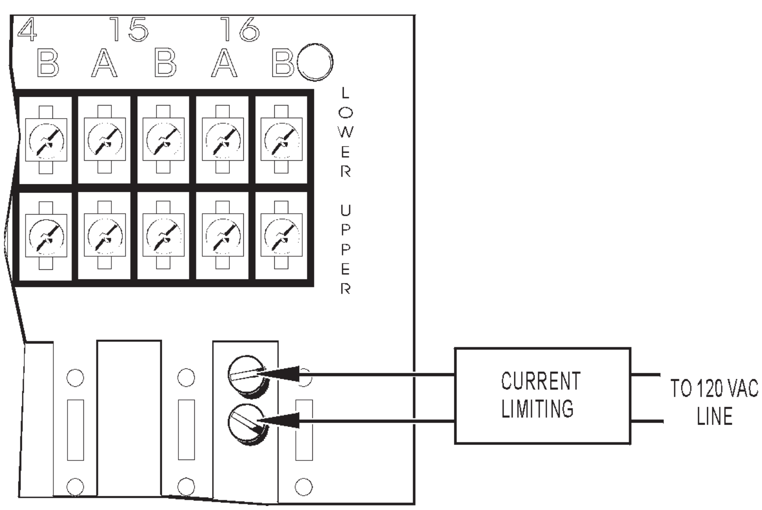
Description

The AD15T module provides a single channel of optically-isolated voltage-to-digital conversion with 4,000 V_{rms} transient-isolation. The AD15T is transformer isolated from the analog power supply so that it may operate with 1,500 volts between the input terminals and analog common. The AD15T is suitable for monitoring line voltage when connected to the appropriate voltage transformer. The module reads the average voltage. Fusing the input lines is recommended. Modules plug into any Standard Analog I/O mounting rack and are secured by a captive screw. Field connections to the module are made via terminals located on top of the module.

Specifications

Input Range	28 to 140 VAC
Input Under/Over Range	25 to 280 VAC
Resolution	27 mVAC
Input Response Time	full scale step change in 1.5 seconds
Input Impedance	270 k ohms
Maximum Differential Input	280 VAC
Accuracy	0.5%
Isolation: Input-to-Logic Output Module-to-Module	 4,000 Vrms (optically coupled) 1,500 Vrms (transformer coupled)
Power Requirements	35 mA at +15 VDC 35 mA at - 15 VDC
Ambient Temperature: Operating Storage	 0° to 70° C - 25° to 85° C

Connections



Rate Input Module

Form 498-001002

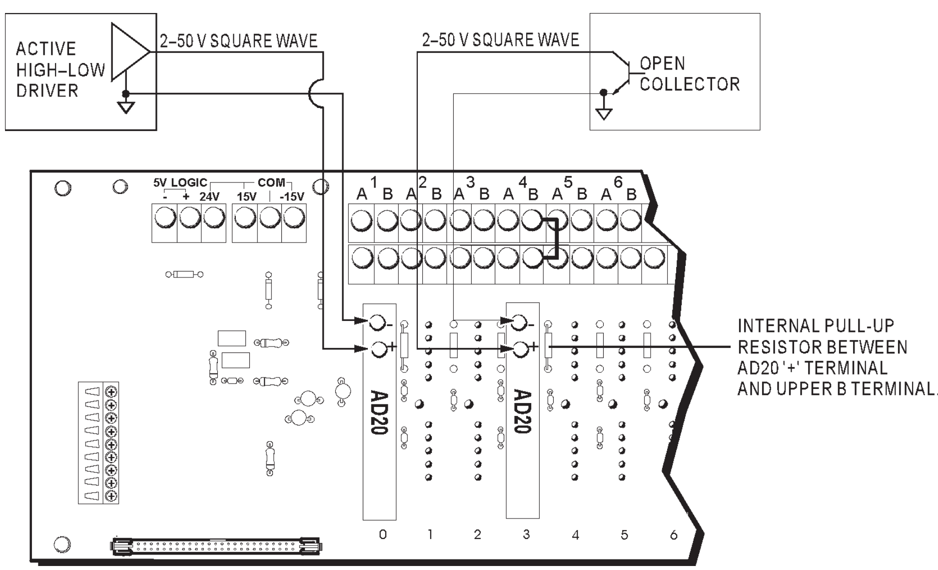
Description

The AD20 module provides a single channel of frequency-to-digital conversion with 4,000 V_{rms} transient isolation. Modules plug into the Classic Standard analog I/O mounting racks and are secured by a captive screw. The AD20 provides the ability to monitor frequencies from digital tachometers, shaft-encoders, Hall effect switches, etc. The AD20 may be driven from TTL or open collector outputs (pull-up resistor built-in).

Specifications

Input Range	0 - 4,095 Hz
Input Overrange	4,095 - 10,800 Hz
Resolution 0 to 4,095 Hz 4,096 to 8191 Hz 8,192 to 10,800 Hz	 1 Hz 2 Hz 4 Hz
Input Parameters Input Amplitude Minimum Pulse Width Input Impedance	 2.0 to 50 V peak-to-peak square wave 40 microseconds 50 k ohms (- input to + input)
Loop Supply Voltage	2.5 - 50 V
Pull-Up Resistor	10 k ohms
Accuracy	± 2 Hz or ± 0.5% of the input frequency (whichever is greater)
Input Response Time	Full-scale step change in 1 second
Isolation Input-to-Output	4,000 Vrms (optically-coupled)
Power Requirements	25 mA at +15 VDC 15 mA at -15 VDC

Connections



Analog Module Power Requirements

Module Type	Model	+15 VDC	-15 VDC
Input Modules			
4 to 20 mA	AD3	13 mA	7.5 mA
4 to 20 mA, Isolated	AD3T	35 mA	35 mA
ICTD Temperature Probe	AD4	16 mA	11 mA
Type J Thermocouple	AD5	17 mA	12 mA
Type J, Isolated	AD5T	35 mA	35 mA
0 to 5 VDC	AD6	16 mA	11 mA
0 to 5 VDC, High Speed	AD6HS	16 mA	11 mA
0 to 5 VDC, Isolated	AD6T	35 mA	35 mA
0 to 10 VDC	AD7	16 mA	11 mA
Type K Thermocouple	AD8	17 mA	12 mA
Type K, Isolated	AD8T	35 mA	35 mA
0 to 50 mV	AD9T	35 mA	35 mA
100 Ohm RTD, Isolated	AD10T2	45 mA	45 mA
-5 to 5 VDC	AD11	15 mA	12 mA
-10 to 10 VDC	AD12	15 mA	12 mA
0 to 100 mV, Isolated	AD13T	35 mA	35 mA
10 Ohm RTD, Isolated	AD14T	48 mA	48 mA
28 to 140 VAC, Isolated	AD15T	35 mA	35 mA
0 to 5 Amp AC/DC, Isolated	AD16T	35 mA	35 mA
Type R or S, Isolated	AD17T	30 mA	30 mA
Type T, Isolated	AD18T	30 mA	30 mA
Type E, Isolated	AD19T	30 mA	30 mA
Frequency (Rate) Input	AD20	25 mA	15 mA
Output Modules			
4 to 20 mA	DA3	20 mA	10 mA
4 to 20 mA, Isolated	DA3T	22 mA	22 mA
0 to 5 VDC	DA4	20 mA	10 mA
0 to 5 VDC, Isolated	DA4T	35 mA	35 mA
0 to 10 VDC	DA5	20 mA	10 mA
-5 to 5 VDC	DA6	20 mA	10 mA
-10 to 10 VDC	DA7	20 mA	10 mA
0 to 20 mA	DA8	20 mA	10 mA

Accessories

LC4A, B, and DC
Local Controller

Form 475-990609

Description

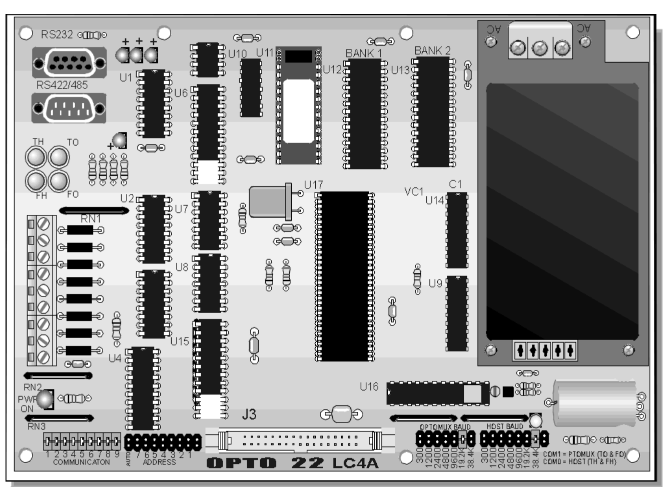
The LC4 is a powerful, low cost, single-board computer which performs the function of a local controller on a Pamux or Optomux network. The LC4 can be programmed in either BASIC or FORTH. The BASIC interpreter is command-set compatible with the IBM PC BASIC interpreter, except for commands related to screen and disk I/O.

The LC4 Local Controller has an expansion port which can accept a daughter card to provide various functions. A daughter card (EX1) is available to allow LC4 to control a Pamux bus. Another daughter card (EX2) is available to provide two additional serial ports as well as a 24-bit, bi-directional parallel port for direct connection to Opto 22 digital I/O mounting racks.

The LC4A includes an onboard 115 VAC power supply, the LC4B includes an onboard 220 VAC power supply, and the LC4DC requires a 10 to 28 VDC power source. The maximum inrush current for the LC4DC is three (3) amperes.

The LC4 Local Controller can be used to replace a host computer for stand-alone applications or several LC4's can be networked to a host computer for distributed applications. The following are several areas where LC4 can be applied:

- Distributed Process Control
- PID Loop Control
- Energy Management
- Protocol Conversion
- Remote Telemetry Unit (RTU)
- Data Acquisition



Specifications

Hardware

Power Requirements: LC4A LC4B LC4DC	 115 VAC ± 10 VAC, 60 Hz 220 VAC ± 20 VAC, 50 Hz 10 - 28 VDC, 1.5 amperes @ 10 VDC, 0.50 amperes @ 24 VDC
Power Dissipation:	less than 8 watts @ 25o C
Operating Temperature:	0° to 70o C 95% relative humidity, non-condensing
Interface:	one full duplex, RS-422/485 serial port one full duplex, selectable RS-232 or RS-422/485 port one expansion bus for daughter card
Baud Rate:	300 to 38,400 baud
Distance: RS-422/485 RS-232	 up to 5,000 feet total length up to 100 multidrop stations up to 50 feet
CPU:	64180, 8-bit microprocessor
CPU Clock Frequency:	6.144 MHz
EPROM:	32K bytes
RAM:	64K CMOS with battery backup (32K for the application program and 32K for a RAM disk)
Real-Time Clock:	clock/calendar with battery backup, 0.01 second resolution (Interrupt)
RAM/Clock Battery:	3 volt lithium, over 10 year life
Indicators:	power, host transmit and receive, and Optomux transmit and receive
Jumper Options:	auto run baud rates LC4 address termination and biasing resistors

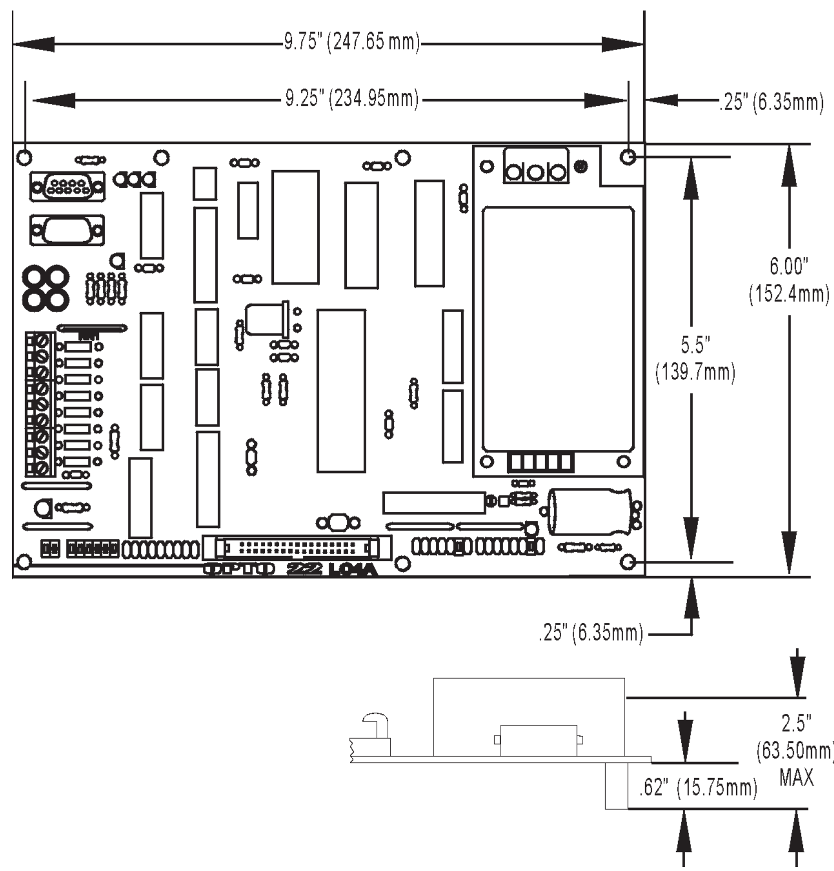
Specifications

Software

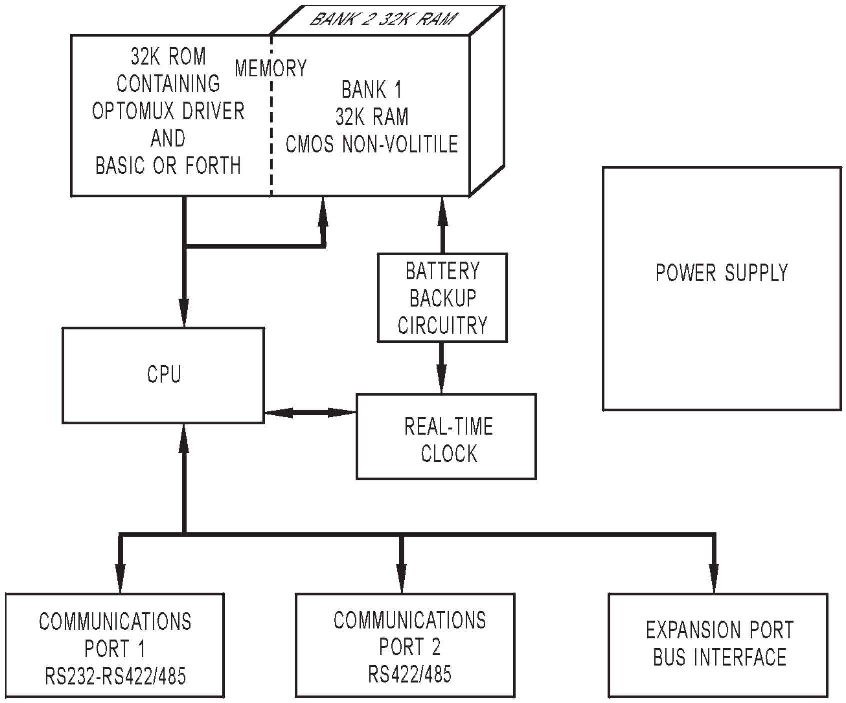
Machine Control

- IBM PC command compatible BASIC interpreter
- FORTH interpreter (subset of FORTH-83 Standard)
- OptoWare (Optomux communications Driver) and Pamux Driver
- Integer and IEEE floating-point arithmetic

Dimensions



Architecture



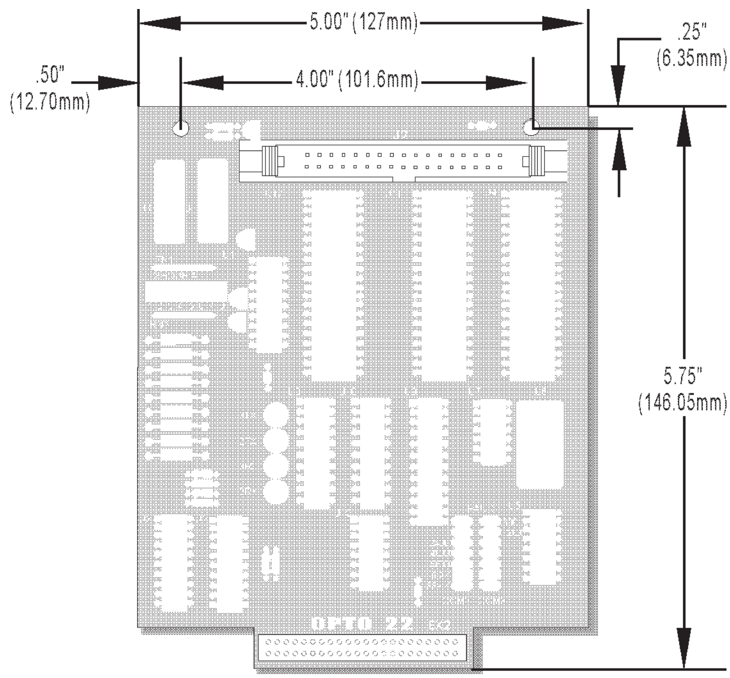
EX2
Serial/Parallel Daughter Card for LC4

Form 412-990609

Description

The EX2 daughter card is an expansion card for the LC4. The EX2 provides two, independent, full-duplex serial communications ports and a 24-line bidirectional parallel port. The parallel port provides a direct interface to 4-, 8-, 16-, and 24-point I/O module mounting racks. One communication port can be RS-232 with full handshaking or a multidrop compatible RS-422/485 port. The second port is RS-422/485 compatible only.

Dimensions



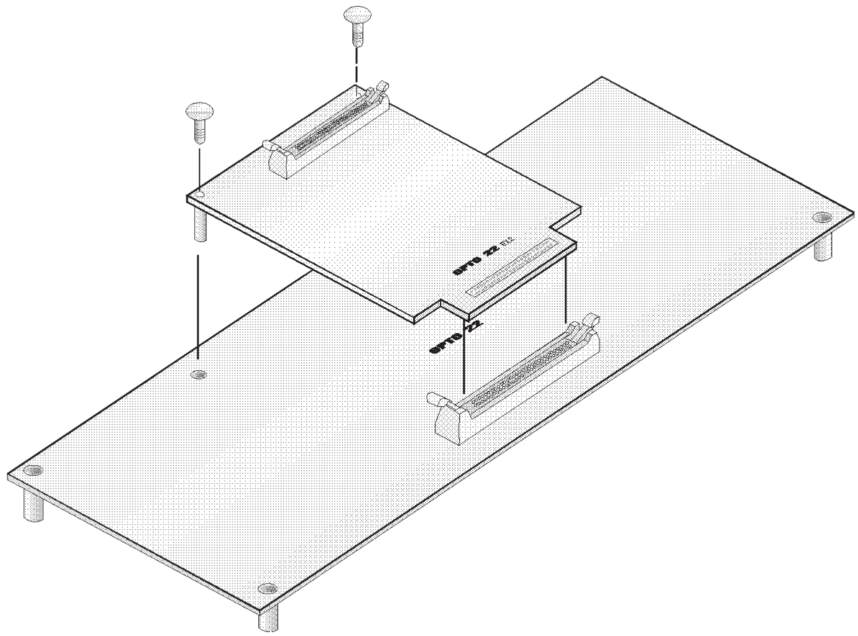


Figure 2: EX2 Mounting

Serial Ports

The communications ports use a Z80 Dual Asynchronous Receiver Transmitter (DART) device which is directly accessible from LC4 BASIC and FORTH. The DART registers reside at I/O locations 70 to 73 hex. Baud rates for each serial port are selectable via jumpers labeled "BAUD". The serial ports are labeled as COM 2 for the combination RS-232/RS422/485 port and COM 3 for the RS/485 port. The RS-422/485 lines of both ports are accessible from the female 9-pin D-shell connector labeled J3. The RS-232 lines are accessible from the male 9-pin D-shell connector labeled J4.

LED indicators are provided for the transmit and receive lines of both serial ports. The RS-232 lines are wired-OR with the RS-422/485 lines on the COM 2 port so that two different devices can be permanently connected together. However it is important to note that only one device can access the port at any one time or characters will be erroneous.

A jumper block labeled "Group A" provides termination and bias resistor connections for both RS-422/485 ports.

RS-232 Connection Pin Descriptions

Pin	Description
1	No Correction
2	Transmit (TX)
3	Receive (RX)
4	Request-to-Send (RTS)
5	Clear-to-Send (CTS)
6	No Connection
7	Ground (GND)
8	No Connection
9	Data Terminal Ready (DTR)

RS-422/485 Connection Pin Descriptions

Pin	Description
1	COM 2 Transmit + (2TX+)
2	COM 2 Transmit - (2TX-)
3	Ground (GND)
4	COM 3 Transmit + (3TX+)
5	COM 3 Transmit - (3TX-)
6	COM 2 Receive + (2RX+)
7	COM 2 Receive - (2RX-)
8	COM 3 Receive + (3RX+)
9	COM 3 Receive - (3RX-)

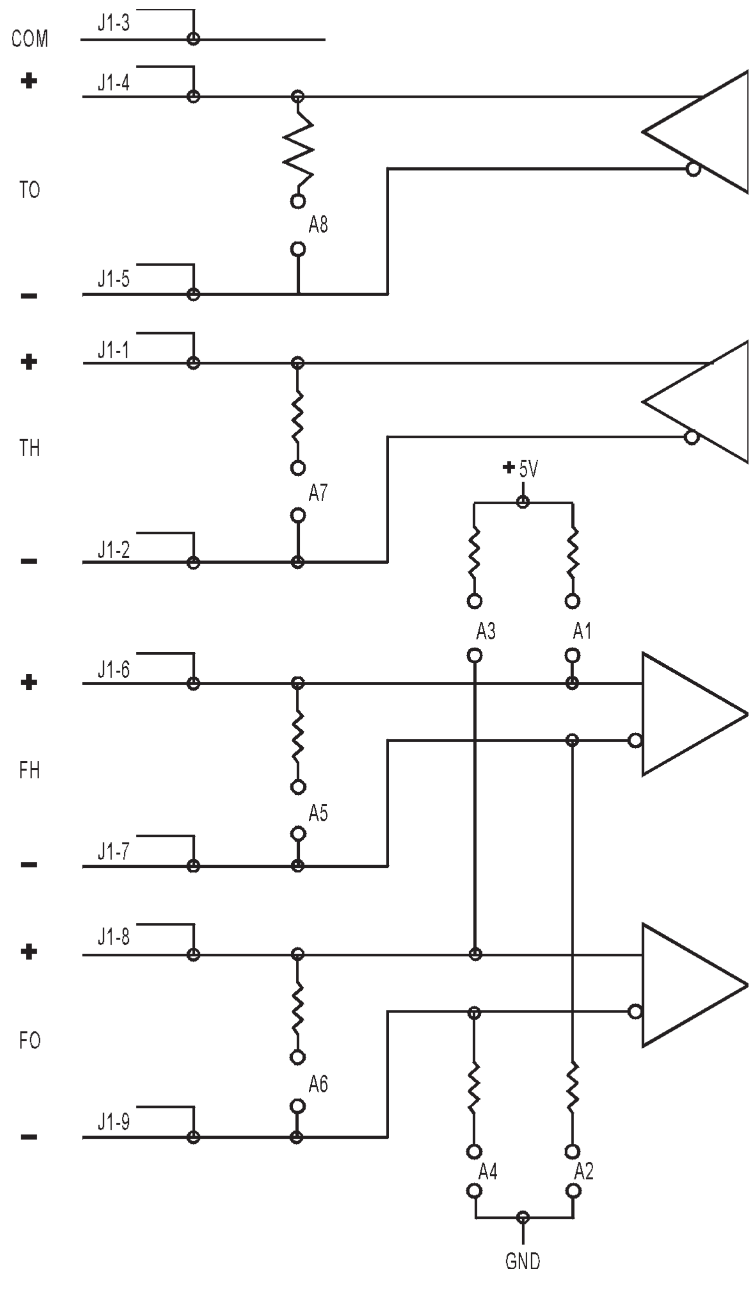


Figure 3: Group A Communications Jumpers

Parallel Port

The parallel interface consists of two 6821 Peripheral Interface Adapter (PIA) chips which provide a total of 24 lines of unbuffered bidirectional I/O lines. The registers of the PIA for the lower 16 lines resides at I/O locations 80 to 83 hex. The registers of the PIA for the upper 8 I/O lines (port A of 6821) resides at I/O locations 88 to 8B hex. The second PIA's port B is not connected. The parallel lines are accessed via connector J2 on the EX2 daughter card. Ports CA and CB on both PIA's are unused.

Pin	Description
J2-1	PIA2-A7
J2-3	PIA2-A6
J2-5	PIA2-A5
J2-7	PIA2-A4
J2-9	PIA2-A3
J2-11	PIA2-A2
J2-13	PIA2-A1
J2-15	PIA2-A0
J2-17	PIA1-B7
J2-19	PIA1-B6
J2-21	PIA1-B5
J2-23	PIA1-B4
J2-25	PIA1-B3
J2-27	PIA1-B2
J2-29	PIA1-B1
J2-31	PIA1-B0
J2-33	PIA1-A7
J2-35	PIA1-A6
J2-37	PIA1-A5
J2-39	PIA1-A4
J2-41	PIA1-A3
J2-43	PIA1-A2
J2-45	PIA1-A1
J2-47	PIA1-A0

Notes: PIA1 is at I/O address 80–83 hex.

PIA2 is at I/O address 88–8B hex.

All even numbered pins on J2 are connected to ground.

Programming

There are 8 I/O locations used by both PIA devices. These locations are shown in the following table:

Address	Register	I/O Lines
80 hex	Data Reg. A	J2-47 to J2-33
81 hex	Control Reg. A	
82 hex	Data Reg. B	J2-31 to J2-17
83 hex	Control Reg. B	
88 hex	Data Reg. A	J2-15 to J2-1
89 hex	Control Reg. A	
8A hex	Unused	
8B hex	Unused	

Programming the PIA devices requires that the devices first be initialized. Each I/O line is configurable as an input line is configurable as an input line or an output line and therefore a configuration byte must be written to each port. The following steps show the sequence of operations for initializing a port.

1. Write a 0 to the corresponding control register.
2. Write the configuration byte to the data register. (Setting a bit to 1 sets the corresponding I/O line to an output. Setting a bit to 0 sets that I/O line to an input).
3. Write a hex 34 to the control register.

Example:

The following BASIC example initializes the I/O lines at J2–47, J2–45 as outputs and lines J2–43 through J2–33 as inputs. Remember, the PIA devices are I/O mapped and require the use of the OUT and INP () statements in BASIC, (or the P! and P@ words in FORTH).

```
100 OUT &h81,0                          'set control reg. A

110 OUT &h80,3                          'first two bits = 1, rest = 0

120 OUT &h81,&h34                       'reset control reg. A
```

After initialization, data can be read or written by accessing that port's data register. The following example reads the status of the input lines J2–47 through J2–33.

```
200 STATUS% = INP(&h80) AND &h03        'read and mask off first two bits
```

The following example shows how to activate I/O lines J2–47 and J2–45 and leave all others off.

```
300 OUT &h80,&hFC                       'Turn on first two bits
```

Serial Ports

The two serial ports on the EX2 daughter card can be accessed using the BASIC statements, OPEN, ON COM..., PRINT #, and INPUT #.

LC Communicator
for Optomux Network

Form 494-990609

Description

The Opto 22 LC Communicator is an ASCII-based operator terminal with a 20 key numeric keypad and a two line, 16 character/line alphanumeric back-lited LCD display.

The LC Communicator communicates on an RS-232 or RS-422/485 network as an addressable device. The communications protocol is similar to the OPTOMUX protocol and can thereby reside on an OPTOMUX network. Address, baud rate, and setup parameters are programmable from the keyboard. The LC Communicator uses non-volatile memory for storing the setup parameters.

The LC Communicator has four different modes of operation: OPTOSCAN, OPTOMUX Host, OPTOMUX Slave, and Terminal. The different modes of operation allow the LC Communicator to function as a multi-purpose handheld terminal for industrial applications.

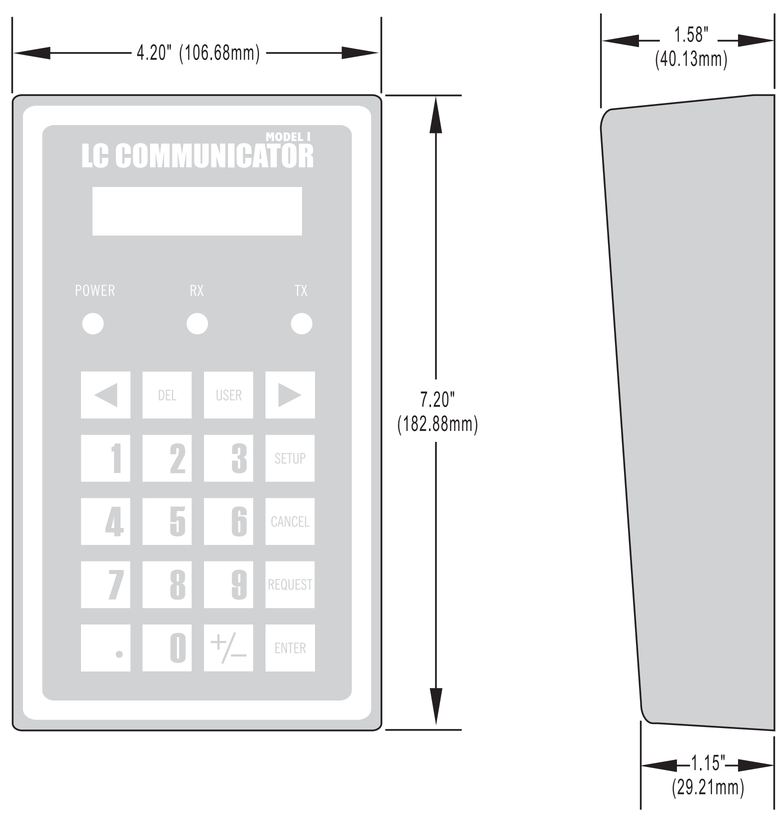
The LC Communicator, with its different modes of operation, allows the user to apply it in many different applications.

- Remote Message Display and/or Data Entry
- System Checkout of OPTOMUX Network
- Troubleshooting and Maintenance Tool
- Direct Support From the Paragon LC and Cyrano Software Packages

Specifications

Power Requirements:	5 VDC @ 300 milliamperes, regulated or 9 to 12VDC @ 300 milliamperes, unregulated
Operating Range:	0° to 50o C95% relative humidity, non-condensing (with gasket provided by Opto 22)
Interface:	RS-232 or RS-422/485 (DB 9 female connector)
Range: RS-232 RS-422/485	50 feet 5,000 feet
Communication Rates:	110 to 38,400 baud
Setup Options:	address, baud rate, terminal lockout, mode, and password
Modes Of Operation:	OPTOSCAN, OPTOMUX Host, OPTOMUX Slave, and Terminal
Indicators:	power, receive, and transmit

Dimensions



AC24 and AC24AT

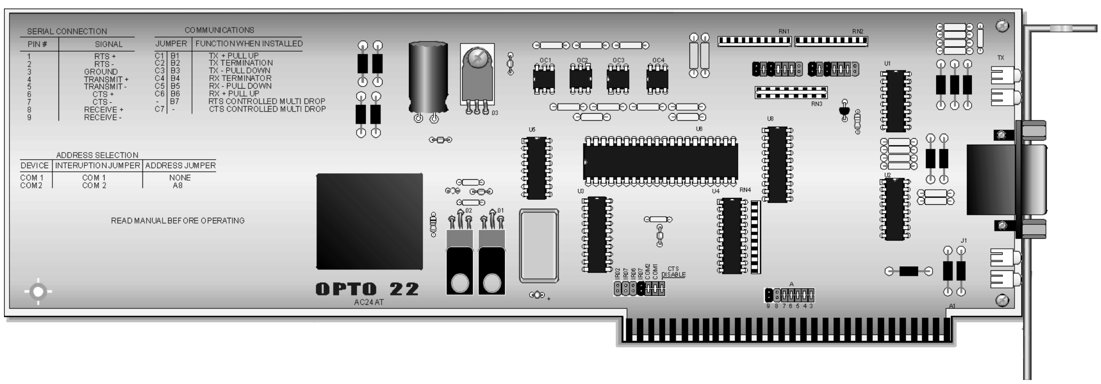
Traditional PC Adapter Cards

Form 468-990609

Description

The AC24AT is an RS-422/485 adapter card that plugs directly into the IBM PC bus and provides up to 4,000 VAC isolation between the PC bus and the communications link. The AC24AT is also transient protected, features bi-directional handshake lines for RTS and CTS, and can drive up to 100 devices on a multidrop network. The AC24AT adapter card can be jumpered for operation as COM1, COM2, COM3, or COM4 and offers full hardware and software compatibility with IBM AT, PS/2 Model 30 286, and compatible computers.

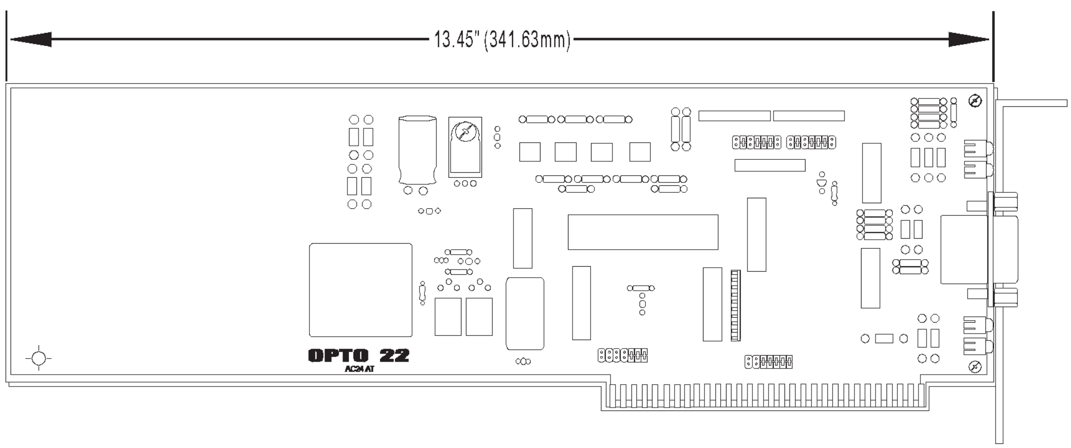
The AC24AT operates as a full duplex device with transmission speeds up to 38,400 baud for distances up to 5,000 feet using two twisted pairs and a ground wire.



Specifications

Power Requirements	250 mA at 5 VDC 150 mA at 12 VDC 150 mA at -12 VDC
Operating Temperature Range	0° C to 60° C 95% relative humidity, non-condensing
Isolation	4,000 VAC
Interface	RS-422/485 (9-pin, D-shell female connector)
Baud Rate	up to 38,400 baud
Distance	up to 5,000 feet
Communications	full duplex over two twisted pairs and a ground additional twisted pairs for RTS and CTS
Indicators	transmit, receive, RTS, and CTS

Dimensions



Jumper Installation

Configuration for AC24AT and AC422AT

Before installing your adapter card, configure your board by selecting the appropriate address, interrupt, and communications jumpers.

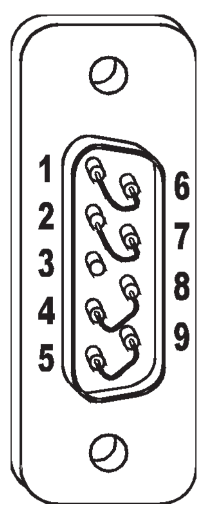
These adapter cards can be configured as COM1 through COM4. Select which COM port is to be used based on the current configuration of the COM ports in the host PC. Refer to the following table for jumper settings for the various COM ports.

AC24AT AC422AT	Address	IRQ	Group A Jumpers Installed	IRQ Jumpers
COM1	3F8 Hex	4	None	COM1
COM2	2F8 Hex	3	8	COM2
COM3	348 Hex	2	4,5,7	IRQ2
COM4	340 Hex	5	3,4,5,7	IRQ5

Compatibility

The AC422AT and AC24AT models use the same UART used in the AT model computers.

The RS-422/485 adapter cards are seen by the computer as a standard serial port and will pass the IBM Advanced Diagnostics program if a loop-back connector is used. The following is a diagram of a loop-back connector for use in diagnosing the adapter card.



Communication Jumpers

Installing jumpers B2 and B4 connects 220 ohm terminating resistors from positive (+) to negative (-) on the transmitter (to OPTOMUX) and receiver (from OPTOMUX), respectively. In a normal OPTOMUX network these jumpers should both be installed.

Installing Jumpers C2 and C4 connects 220 Ohm terminating resistors for positive (+) to negative (-) on the RTS and CTS, respectively. In a normal network these jumpers should both be installed.

NOTE: If multiple host computers are used, Jumpers B2, B4, C2, and C4 should only be installed on the adapter card which is physically at the end of the serial network cable.

Jumper B7 controls the enabling of the RS-422/485 driver. With the jumper removed, the driver is always enabled. With the jumper installed, the enabling is under the control of the RTS output on the UART. When the RTS is active, the driver will be enabled. When RTS is inactive, the driver is disabled.

If Jumper B7 is installed, jumpers B1 and B3 must also be installed. These jumpers passively pull the transmit lines (to OPTOMUX) to the inactive state.

If the adapter card is operating with a multidrop OPTOMUX network, jumpers B5 and B6 must be installed. These jumpers passively pull the receive (from OPTOMUX) to the inactive state. Also, C5 and C6 must be installed to passively pull the CTS to the inactive state.

Jumper C7 controls the enabling of the RS-422/485 driver. With the jumper installed, the enabling is under the control of the CTS input from the RS-422/485 connection. Jumpers B7 and C7 should never be installed at the same time.

Never install jumper B8 on the AC422AT model.

The CTS jumper should always be installed on the adapter card when the RTS/CTS handshake lines are NOT being used. With earlier revision adapter cards which do not have a CTS jumper, the RTS outputs must be looped back to the CTS inputs. This is done by connecting the RTS positive (+) pin to the CTS positive (+) pin, and the RTS negative (-) pin to the CTS negative (-) pin using a suitable jumper wire soldered on the 9-pin connector on the adapter end of the cable.

The 2-wire jumper switches the card from 4-wire to 2-wire mode. A jumper out, which is the factory default, sets the card into 4-wire mode. A jumper installed sets the card into 2-wire mode.

Address Jumpers

On the RS-422/485 adapter card there are seven jumpers labeled A3 through A9. These jumpers are used for selecting the base address of the adapter card.

The IBM personal computers only use 10 address lines (A0 through A9) for addressing I/O boards. The UART chip on the adapter card uses the lower three address lines (A0 through A2) directly. This leaves 7 address lines (A3 through A9) for decoding the base address of the adapter card.

The adapter card compares the address lines A3 through A9 on the bus with the address jumpers A3 through A9. When the address lines match the jumper lines, the adapter card is selected.

When a jumper is present, the jumper value is low (zero). When a jumper is not present, the jumper value is high (one).

With no address jumpers present, the adapter card will be selected from address 3F8 to 3FF hex (Addressed as COM1).

You can set the adapter card for a particular base address as follows:

- First, write the desired base address as a three-digit, hexadecimal number. The number must be less than 3FF and have a zero or an eight as the last digit. Also, the number must be chosen so as not to conflict with the base address of any other installed cards in the computer.
- Second, translate the number to binary and discard the first two zeros and the last three zeros.
- Finally, install a jumper in each location corresponding to a zero. The most significant bit corresponds to A9, and the least significant to A3. For example:

Install jumpers at A8, remove A3 through A7, and A9.

NOTE: If you address the adapter card for an address other than COM1 or COM2, you will need to provide your own interface and initialization routines. The IBM PC/AT Technical Reference manual has a good section on the operation of the UART and a listing of the code used in the BIOS to access the communications ports.

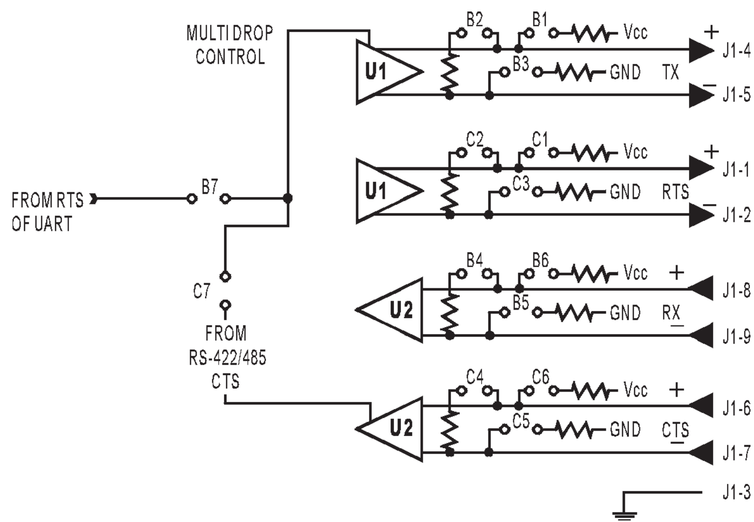
Address	Binary	Discard Ends
2	0010	10
F	1111	1111
8	10	1

Interrupt Jumpers

If you need to select a specific interrupt line for your software, jumpers for interrupt request lines IRQ2 and IRQ5 through IRQ7 are provided in addition to the COM1 (IRQ4) and COM2 (IRQ3) jumpers. IBM PC BASIC uses interrupt driven communications, and therefore requires that the COM1 (or COM2) interrupt jumpers be installed when doing communications using COM1 (or COM2) from BASIC.

Group B and C Jumpers

The figure below shows the normal jumper arrangement for jumper positions B1 through B7 and C1 through C7 on the AC24AT and B1 through B8 and C1 through C7 on the AC422AT. This arrangement is suitable if the adapter card is being used to communicate with an OPTOMUX network. For other possible configurations, refer to the figure below.



Group B and C Jumper Schematic

The adapter card is now ready to be plugged into any open slot of the computer.

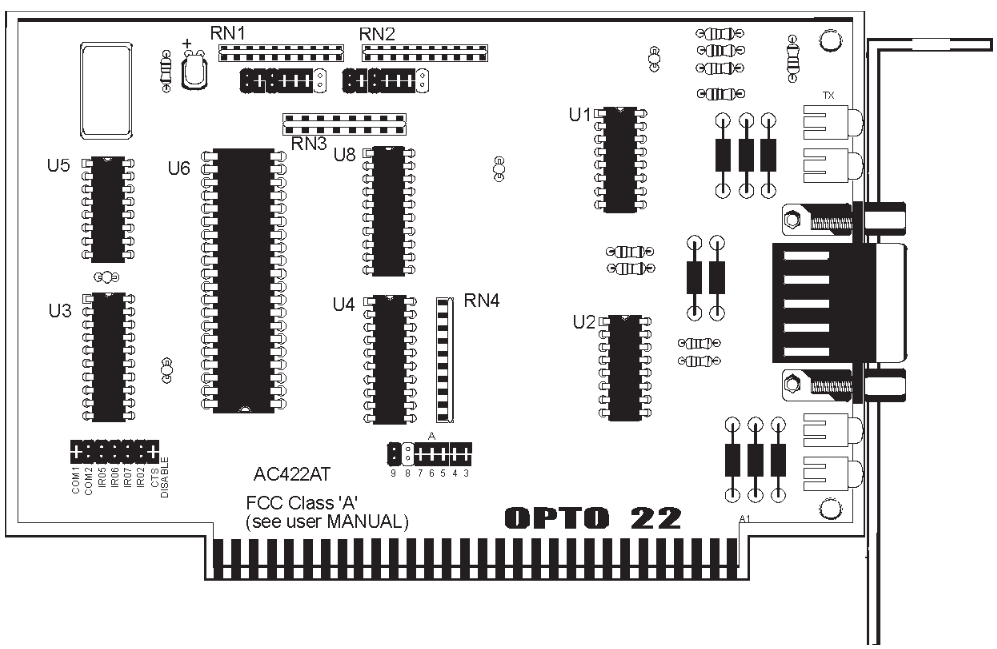
AC422 and AC422AT

Traditional PC Adapter Cards

Form 473-990609

Description

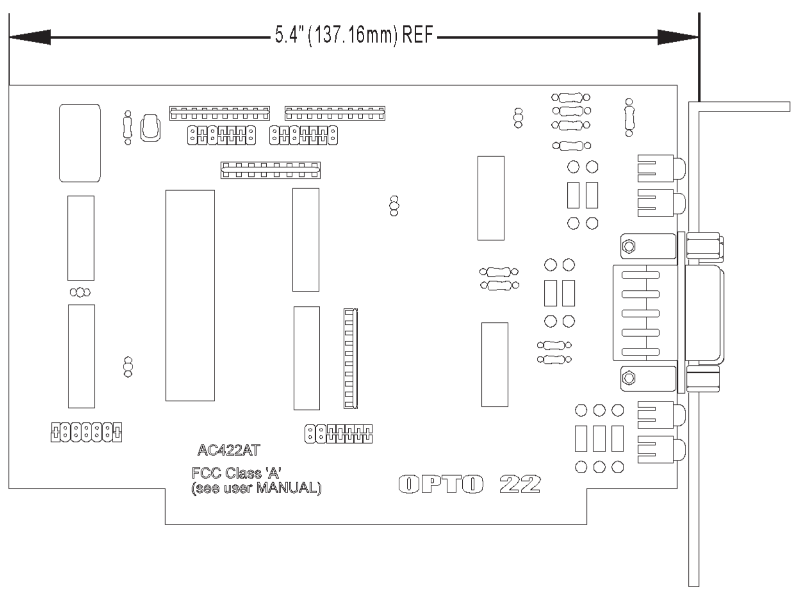
The AC422AT is a non-isolated RS-422/485 adapter card that plugs directly into the IBM PC bus. The AC422AT is transient-protected, features bi-directional handshake lines for RTS and CTS, and can drive up to 100 devices on a multidrop network. The AC422AT can be jumpered for operation as COM1, COM2, COM3, or COM4 and offers full hardware and software compatibility with IBM PC, XT, and compatible computers.



Specifications

Power Requirements	250 mA at 5 VDC 150 mA at 12 VDC 150 mA at 12 VDC
Operating Temperature Range	0° C to 60° C 95% relative humidity, non-condensing
Interface	RS-422/485 (9-pin, D-shell female connector)
Baud Rate	up to 38,400 baud
Distance	up to 5,000 feet
Communications	full duplex over two twisted pairs and a ground additional twisted pairs for RTS and CTS
Indicators	transmit, receive, RTS, and CTS

Dimensional Drawing



Jumper Installation

Configuring For The AC422AT

Before installing your adapter card, configure your board by selecting the appropriate address, interrupt, and communications jumpers.

These adapter cards can be configured as COM1 through COM4. Select which COM port is to be used based on the current configurations of the COM ports in the host PC. Refer to the following diagrams for jumper settings for the various COM ports.

AC24AT and AC422AT	Address	IRQ	Group A Jumpers Installed	IRQ Jumpers
COM1	3F8 Hex	4	NONE	COM1
COM2	2F8 Hex	3	8	COM2
COM3	348 Hex	2	4, 5, 7	IRQ2
COM4	340 Hex	5	3, 4, 5, 7	IRA5

Compatibility

The AC422AT use the same UART used in the AT model computers.

The RS-422/485 adapter cards are seen by the computer as a standard serial port and will pass the IBM Advanced Diagnostics program if a loop-back connector is used.

Jumper Installation (cont.)

Communication Jumpers

Installing jumpers B2 and B4 connects 220 ohm terminating resistors from positive (+) to negative (-) on the transmitter (to Optomux) and receiver (from Optomux), respectively. In a normal OPTOMUX network these jumpers should both be installed.

Installing jumpers C2 and C4 connects 200 ohm terminating resistors for positive (+) to negative (-) on the RTS and CTS, respectively. In a normal network these jumpers should both be installed.

NOTE: If multiple host computers are used, jumpers B2, B4, C2, and C4 should only be installed on the adapter card which is physically at the end of the serial network cable.

Jumper B7 controls the enabling of the RS-422/485 driver. With the jumper removed, the driver is always enabled. With the jumper installed, the enabling is under the control of the RTS output on the UART. When the RTS is active, the driver will be enabled. When RTS is inactive, the driver is disabled.

If jumper B7 is installed, jumpers B1 and B3 must also be installed. These jumpers passively pull the transmit lines (to OPTOMUX) to the inactive state.

If the adapter card is operating with a multidrop OPTOMUX network, jumpers B5 and B6 must be installed. These jumpers passively pull the receive (from OPTOMUX) to the inactive state. Also, C5 and C6 must be installed to passively pull the CTS to the inactive state.

Jumper C7 controls the enabling of the RS-422/485 driver. With the jumper installed, the enabling is under the control of the CTS input from the RS-422/485 connection. Jumpers B7 and C7 should never be installed at the same time.

The CTS jumper should always be installed on the adapter card when the RTS/CTS handshake lines are NOT being used. With earlier revision adapter cards which do not hae a CTS jumper, the RTS outputs must be looped back to the CTS inputs. This is done by connecting the RTS positive (+) pin to the CTS positive (+) pin, and the RTS negative (-) pin to the CTS negative (-) pin using a suitable jumper wire soldered on the 9-pin connector on the adapter end of the cable.

The 2-wire jumper switches the card from 4-wire to 2-wire mode. A jumper out, which is the factory default, sets the card into 4-wire mode. A jumper installed sets the card into 2-wire mode.

Jumper Installation (cont.)

Address Jumpers

On the RS-422/485 adapter card, there are seven jumpers labeled A3 through A9. These jumpers are used for selecting the base address of the adapter card.

The IBM personal computers only use 10 address lines (A0 through A9) for addressing I/O boards. The UART chip on the adapter card uses the lower three address lines (A0 through A2) directly. This leaves seven address lines (A3 through A9) for decoding the base address of the adapter card.

The adapter card compares the address lines A3 through A9 on the bus with the address jumpers A3 through A9. When the address lines match the jumper lines, the adapter card is selected.

When a jumper is present, the jumper value is low (zero). When a jumper is not present, the jumper value is high (one).

With no address jumpers present, the adapter card will be selected from address 3F8 to 3FF hex (addressed as COM1).

You can set the adapter card for a particular base address as follows:

First, write the desired base address as a three-digit, hexadecimal number. The number must be less than 3FF and have a zero or an eight as the last digit. Also, the number must be chosen so as not to conflict with the base address of any other installed cards in the computer.

Second, translate the number to binary and discard the first two zeros and the last three zeros.

Finally, install a jumper in each location corresponding to a zero. The most significant bit corresponds to A9, and the least significant to A3. For example:

Address	Binary	Discard Ends
2	0010	10
F	1111	1111
8	10	1

Install jumpers at A8, remove A3 through A7, and A9.

NOTE: If you address the adapter card for an address other than COM1 or COM2, you will need to provide your own interface and initialization routines. The IBM PC or PC/AT Technical Reference Manual has a good section on the operation f the UART and a listing of the code used in the BIOS to access the communications ports.

Jumper Installation (cont.)

Interrupt Jumpers

If you need to select a specific interrupt line for your software, jumpers for interrupt request lines IRQ2 and IRQ5 through IRQ7 are provided in addition to the COM1 (IRQ4) and COM2 (IRQ3) jumpers. IBM PC BASIC uses interrupt driven communications, and therefore requires that the COM1 (or COM2) interrupt jumpers be installed when doing communications using COM1 (or COM2) from BASIC.

Group B and C Jumpers

The tables below show the normal jumper arrangement for jumper positions B1 through B8 and C1 through C7. This arrangement is suitable if the adaper card is being used to communicate with an OPTOMUX network. For other possible configurations, refer to figure 1.

Group B and C Jumpers

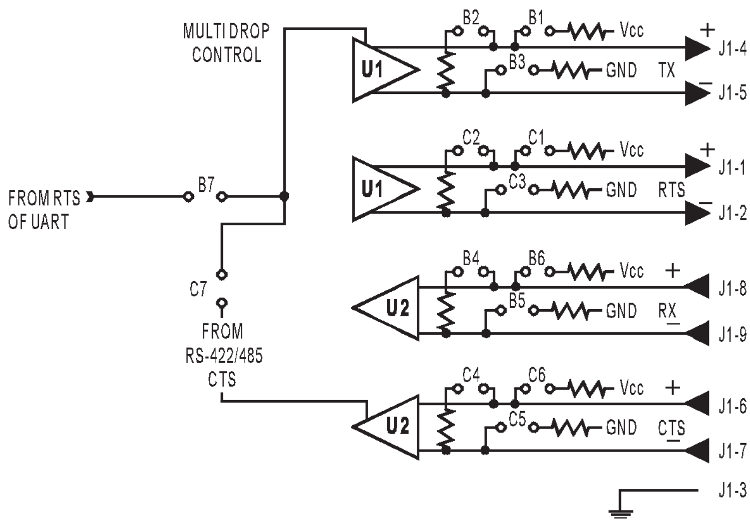
:	X	:	X	X	X	:	:
1	2	3	4	5	6	7	8

Group B and C Jumpers

:	X	:	X	X	X	:
1	2	3	4	5	6	7

X = Jumper Installed

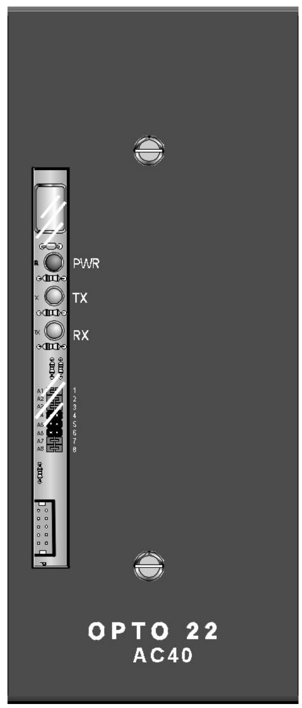
: = Jumper not Installed



AC40A, B and C
Fiber Optic Link Adapter
Form 521-990609

Description

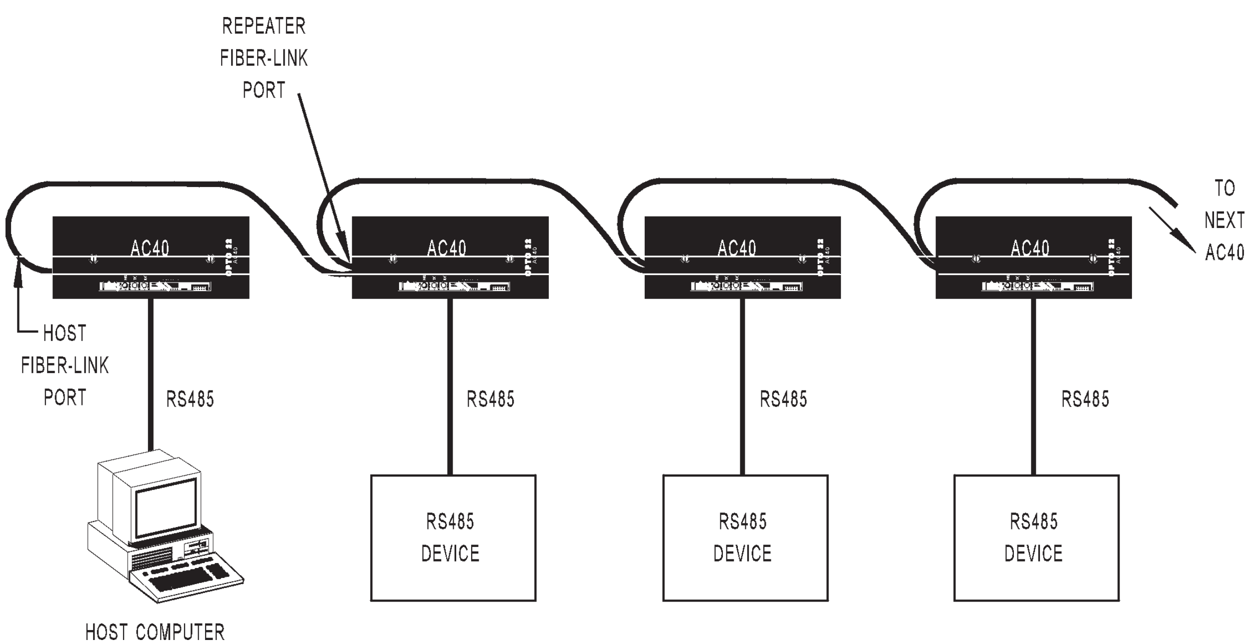
The AC40 is a fiber optic repeater designed to allow RS-485 communication devices to communicate over a fiber optic data link. AC40 has a host fiber optic port, a repeater fiber link port, and an RS-485 port. A daisy chain of AC40's connected by fiber optic cable provides complete electrical isolation and high baud rates over very long distances.



Specifications (for Architecture)

Fiber Optics	3.5 Kilometer Distance Between AC40's ST Style Connectors/Duplex Cable Optimized for 62.5/125 mm Cable
RS-485	3,000 Feet Twisted Pair Wiring 2-wire or 4-wire Hook-up Asynchronous Operation Independent of Baud Rate, Parity or Stop Bits 300 - 115.2 KB Jumpers for Termination and Biasing

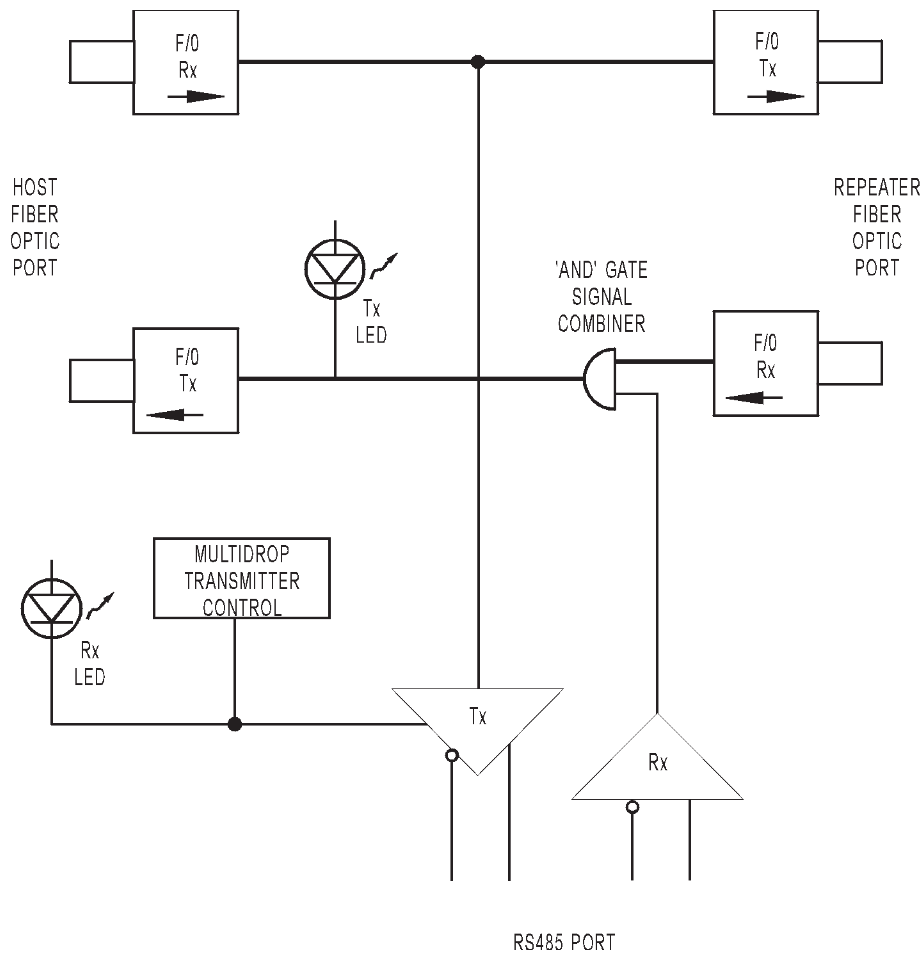
Architecture



Introduction

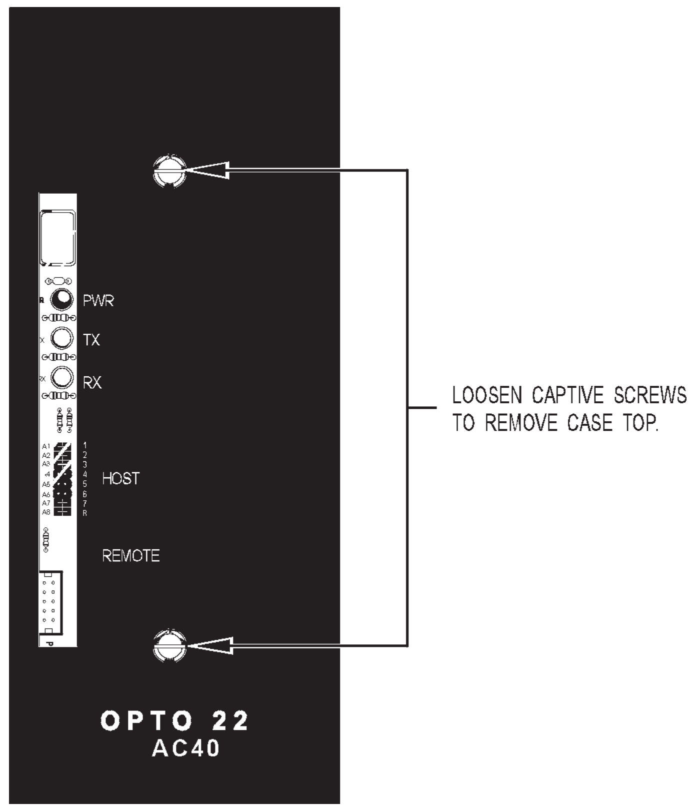
Industrial automation often requires reliable communications between equipment sites separated by long distances or harsh electrical environments. The AC40 fiber optic data link adapter satisfies the requirements of industrial communications by using light instead of conventional electrical signals. The fiber optic data link between two pieces of equipment is electrically isolated and completely immune to electrical noise.

The AC40 has three I/O ports; the RS-485 port, the host fiber port, and the repeater fiber port. When operating, the AC40 passes and amplifies all signals between the host and repeater fiber port. All signals from the host fiber port receiver are transmitted out the RS-485 port, and any signals received at the RS-485 port are transmitted out the host fiber port.



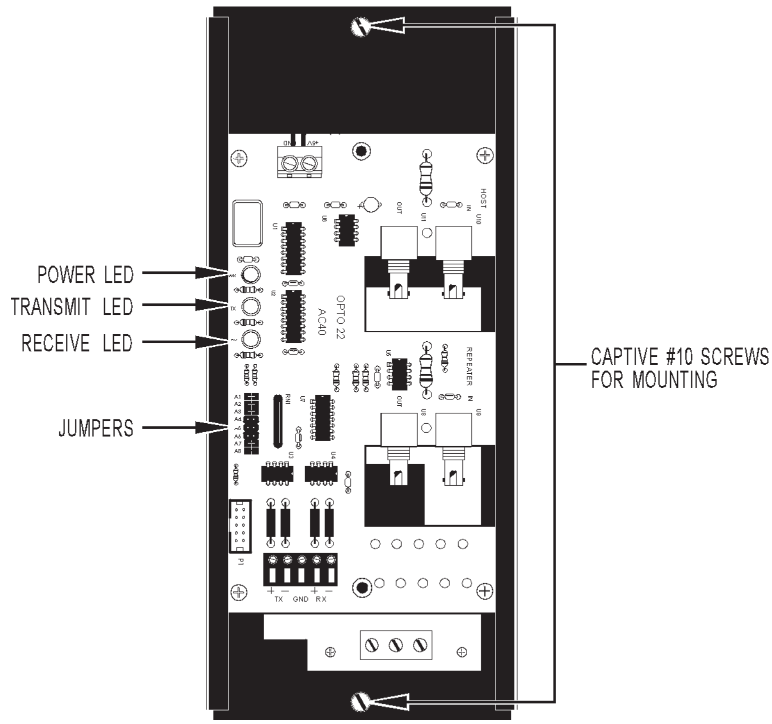
Disassembly

The AC40 must be disassembled to access the mounting hardware, power, and communications connectors. The case is opened by turning the two captive screws on the top of the AC40 counterclockwise.



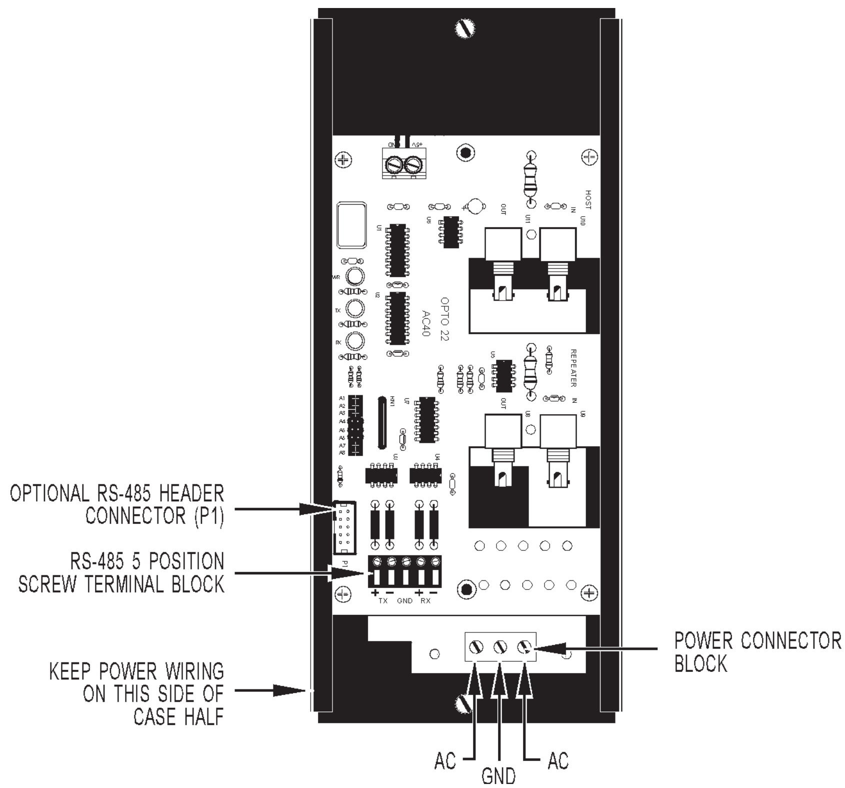
Mounting

The bottom case half has two captive #10 screws for mounting. If the AC40 is being mounted in a Mistic panel, it is typically mounted in the bottom left corner of the panel.



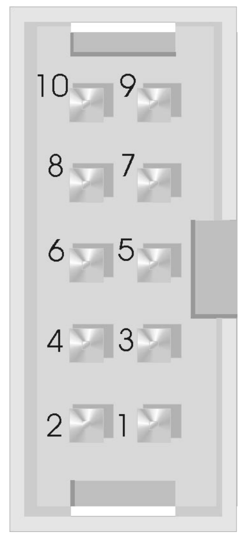
Power Wiring

The AC40 has 3 different power supply options. The AC40A has a 120 VAC power requirement; the AC40B has a 240 VAC power requirement; and the AC40C has a 10 - 28 VDC power requirement. The power wires are routed to the power connector block on the lower PC board. The power wiring should be run along the left side of the case half.

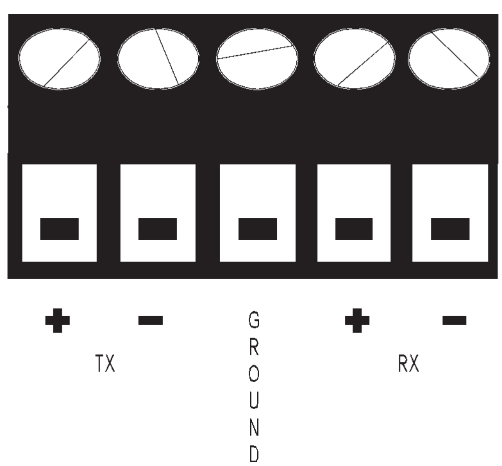


RS-485 Connection

The AC40 supports two connection methods for the RS-485 port. The primary connection is through the 5 position screw terminal block located on the lower edge of the elevated printed circuit board. The optional connection method is through the 10 position male header connector labeled P1. The optional connection method allows for easy hook-up to Mistic remote panels using the flat 10-pin twisted pair cable found in a G4RCOMMKIT.



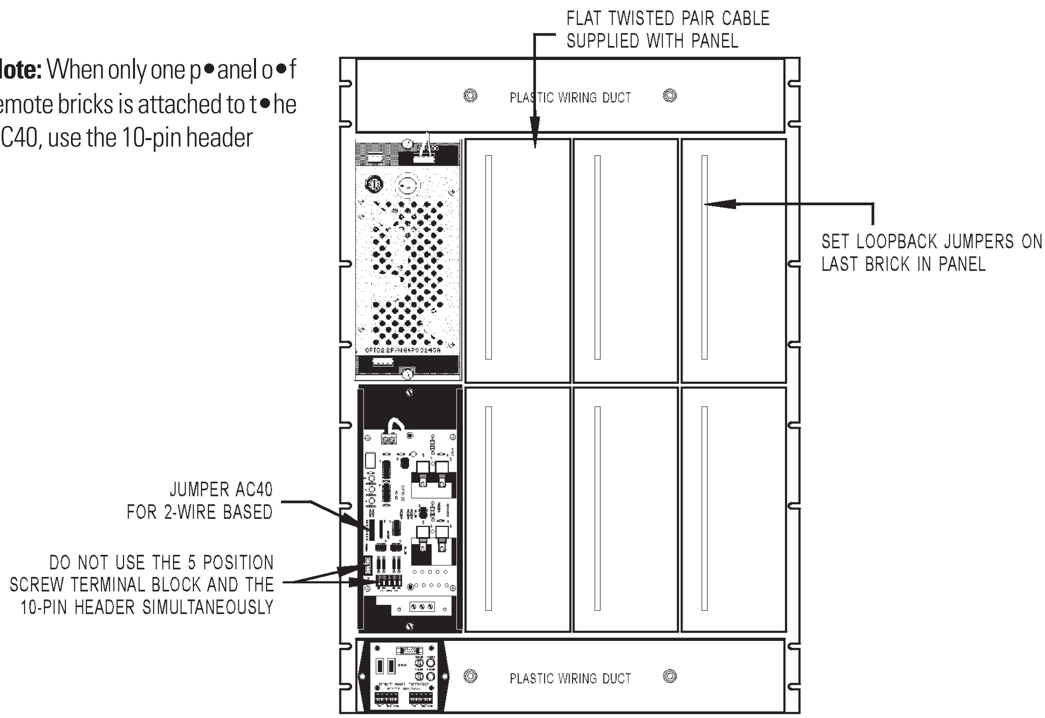
When connecting to the 5 position screw terminal block, the option of 2-wire or 4-wire hook-up is available.* The 10-pin header can only operate in 2-wire hook-up. When the 5 position screw terminal block is set to 2-wire operation, use the TX + and TX - terminals.



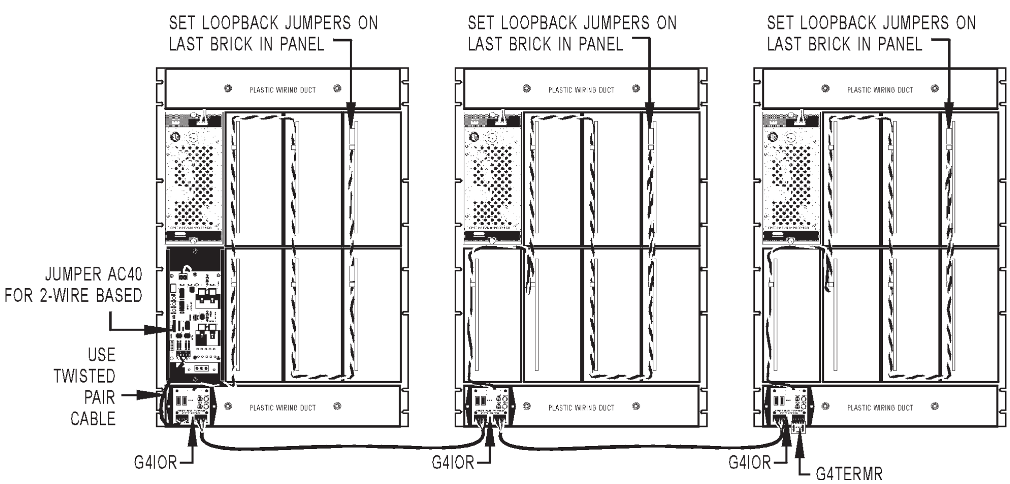
RS-485 Wiring Examples

NOTE: The AC40 does **not** support the interrupt capability of remote bricks.
***** Jumpering information is on page 10.

Note: When only one p•anel o•f remote bricks is attached to t•he AC40, use the 10-pin header



Note: When using multiple panels of remote bricks, use the 5-position screw terminal.



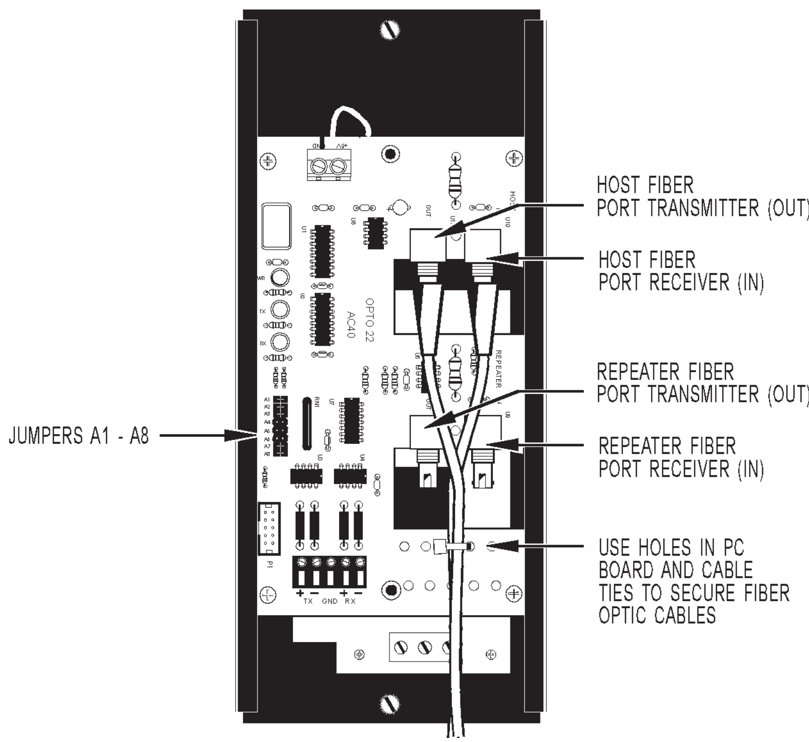
Fiber Optic Connection

The fiber optic connectors on the AC40 are 'ST' style female. The 'ST' male is inserted and the outer barrel rotated until the posts on the female connector lock in place.

The AC40 is optimized to operate with 62.5 mm/125 mm fiber optic cable. It is possible to use other fiber diameters, however, the performance specifications fall off rapidly.

Connect a fiber optic cable to the transmitter port on the AC40. Connect the other end of this fiber optic cable to the receiver port of the connecting device. Likewise, connect a fiber optic cable to the receiver port on the AC40, and connect the other end of the cable to the transmitter port of the connecting device.

After the fiber connections are in place, use cable ties to secure the fiber cables.



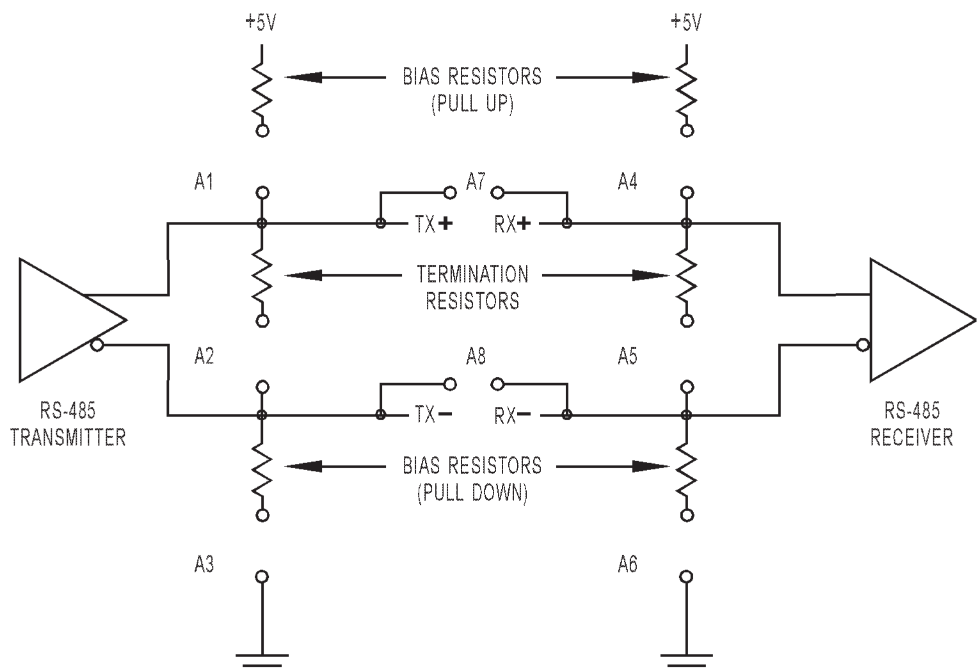
Jumpering

A group of 8 jumpers labeled A1 - A8 are located on the left-hand side of the upper printed circuit board on the AC40. The jumpers are inserted to configure the AC40 RS-485 port. Jumpers A1 - A6 select various possibilities for biasing and termination of the RS-485 link. Jumpers A7 and A8 are used to select 2-wire or 4-wire mode.

Mode	Install Jumpers
2-wire Terminated/Not Biased	A2, A7, A8
2-wire Unterminated	A7, A8
2-wire Terminated/Biased	A1, A2, A3, A7, A8 (AC40 is shipped with these jumpers installed.)
4-wire Unterminated	No Jumpers
4-wire Terminated/Biased	A1, A2, A3, A4, A5, A6
4-wire Terminated/Not Biased	A2, A5

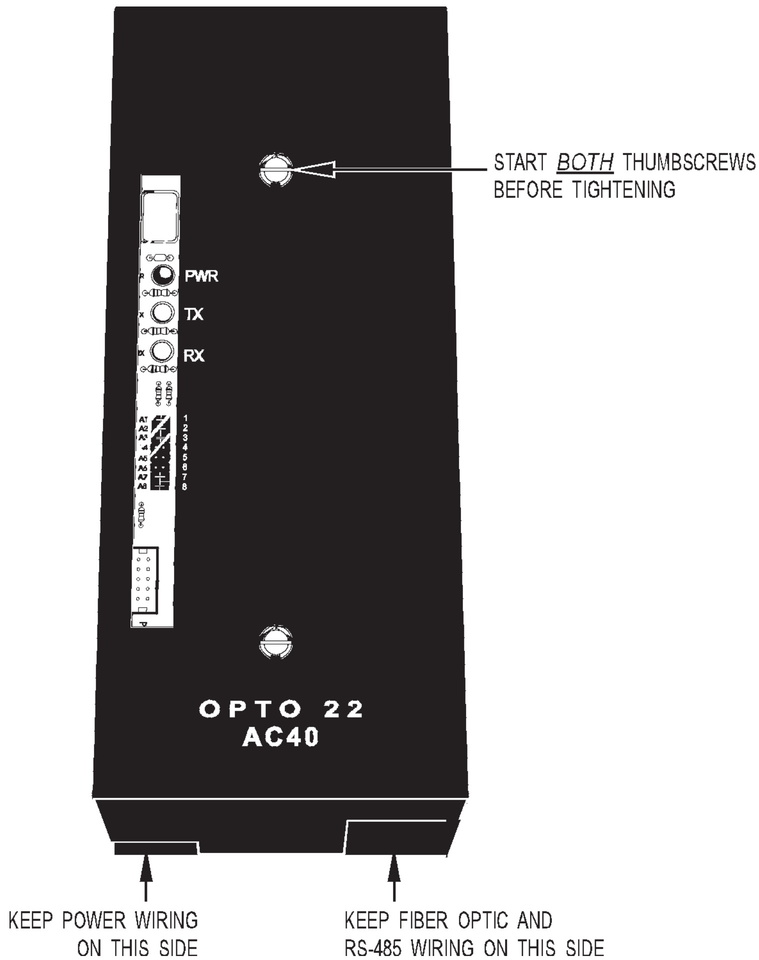
When you configure your AC40 RS-485 communications link, keep these facts in mind:

- RS-485 requires termination at both ends of the communications wiring.
- The link must be biased in one place only.
- Opto 22 remote Bricks have no bias or termination options.
- The G4TERMR terminator does not have bias options.
- When G4LC32 RS-485 serial ports are terminated, they are automatically biased.
- Biasing is usually done at the "HOST" end.



Reassembly

After all connections and jumpering is complete, the AC40 can be reassembled. It is important that all wires are routed so they will not be pinched by the case top. After case top has been placed on top of the case bottom, start both thumbscrews. Tighten both thumbscrews even•vly until the top case is secured



LEDs/Diagnostics

When power is applied to the AC40, the green LED labeled PWR is on. If it is not on - check voltage and polarity of input power.

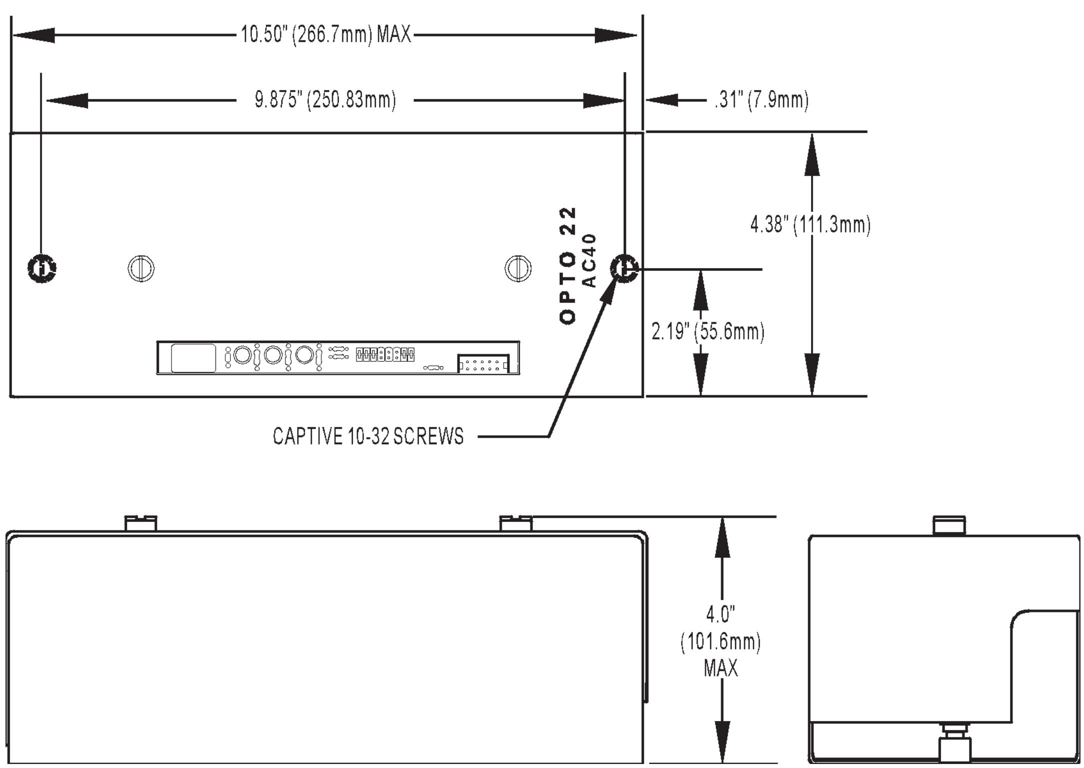
When the LED labeled RX is illuminated, data is being received from the host fiber port and transmitted down the RS-485 port and the repeater fiber port.

When the LED labeled TX is illuminated, data is being received from either the repeater fiber port or the RS-485 port and transmitted down the host fiber port.

The most common start-up problems on the AC40 are:

- Receive and transmit fiber optic cables are swapped.
- The RS-485 port is incorrectly jumpered. Check:
  (a) 2-wire or 4-wire option
  (b) termination at both ends
  (c) biasing at one place only
- The RS-485 port is incorrectly wired. Check:
  (a) polarity of signals
  (b) twisted pair cable must be used

Dimensions



Specifications

Ambient Temperature:	0° C - 70° C 95% relative humidity, non-condensing
Power: AC40A: AC40B: AC40C:	 120 VAC ± 10 VAC 60 Hz 240 VAC ± 20 VAC 50 Hz 10 - 28 VDC - 750 mA
Fiber Optic: Recommended Fiber Size:	 62.5/125 µm
Recommended Fiber: "ST" Style Connectors:	Belden Type 225812 (Duplex) Belden Type 225811 (Single)
Maximum Fiber Length:	3.5 kilometers
Transmitter Characteristics (All Typical) Optical Power Output: Peak Emission Wavelength: Numerical Aperture: Optical Port Diameter:	 -12.0 dBm 820 nm 0.31 150 µm
Receiver Characteristics (All Typical) Receiver Sensitivity: Equivalent Numerical Aperture: Optical Port Diameter:	 -24.0 dBm 0.50 400 µm
RS-485: Maximum Cable Length:	 3,000 feet
Recommended Cable Type (twisted pair):	100 ohms impedence 12.5 picofarads per foot
Termination Resistance:	220 ohms
Tri-state Biasing Resistance:	470 ohms

Features:
* 2-wire or 4-wire hook-ups
* Asynchronous operation independent of baud rate, parity, or stop bits
* Baud rates to 115.2K baud
* Jumpers for optional termination and biasing
* Up to 32 AC40s per fiber link

Cable and Connector Manufacturers

Belden Wire And Cable
P. O. Box 1980
Richmond, IN 47375
800/235-3361

Model: 62.5/125 Single - 225811
62.5/125 Duplex - 225812

AT&T Network Systems
505 No. 51st. Avenue
Phoenix, AZ 85043
800/344-0223

Hewlett-Packard
3003 Scott Blvd.
Santa Clara, CA 95054
408/988-7000

Distributor of Fiber Optic Cables, Connectors, and Accessories

Fibertron
6400 Artesia Blvd.
Buena Park, CA 90620
Tel: (714) 670-7711
Fax: (714) 670-8811

AC32
Dual RS–422/485 Adapter
Form 471-990609

Description

The AC32 is a dual RS-422/485 adapter card which plugs directly into the IBM PS/2 Micro Channel bus. The AC32 is transient protected and features two independent asynchronous channels (each able to drive up to 100 devices on a multidrop network). Channel A can be selected for COM1 through COM8 and channel B can be selected for COM2 through COM8. The AC32 offers full hardware and software compatibility with IBM PS/2 Models 50, 60, 70, 80, and compatible computers.

The AC32 operates as a full duplex device with transmission speeds up to 38,400 baud for distances up to 5,000 feet using two twisted pairs per channel and a ground.

Specifications

Power Requirements	5 VDC @ 1 ampere
Operating Temperature Range	0° C to 60° C 95% relative humidity, non-condensing
Interface	two RS-422/485 (9-pin, D-shell female connector)
Baud Rate	up to 38,400 baud
Distance	up to 5,000 feet
Communications	each channel full duplex over two twisted pairs and a ground
Indicators	transmit and receive for channels A and B

AC34
Isolated RS-422/485 Adapter
Form 472-990609

Description

The AC34 is an isolated RS-422/485 adapter card which plugs directly into the IBM PS/2 Micro Channel bus. The AC34 is transient protected, can drive up to 100 devices on a multidrop network, and features bi-directional handshake lines for RTS and CTS. The AC34 adapter card can be configured for operation as COM1 through COM8 and offers full hardware and software compatibility with IBM PS/2 Models 50, 60, 70, 80, and compatible computers.

The AC34 operates as a full duplex device with transmission speeds up to 38,400 baud for distances up to 5,000 feet using two twisted pairs and a ground.

Specifications

Power Requirements	5 VDC @ 1 ampere
Operating Temperature Range	0° C to 60° C 95% relative humidity, non-condensing
Isolation	4,000 VAC
Interface	one RS-422/485 (9-pin, D-shell female connector)
Baud Rate	up to 38,400 baud
Distance	up to 5,000 feet
Communications	full duplex over two twisted pairs and a ground
Indicators	transmit, receive, RTS, and CTS

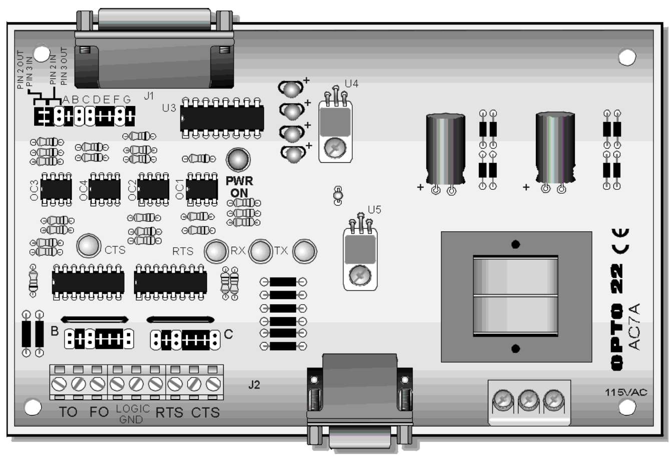
AC7A and AC7B

Isolated RS–232 to RS–422/485 Converter

Form 960-990609

Description

The AC7A/B is a stand-alone adapter card that converts RS-232 serial communication to RS-422/485 serial communication, which is directly compatible with the Optomux family of intelligent brain boards.



Features

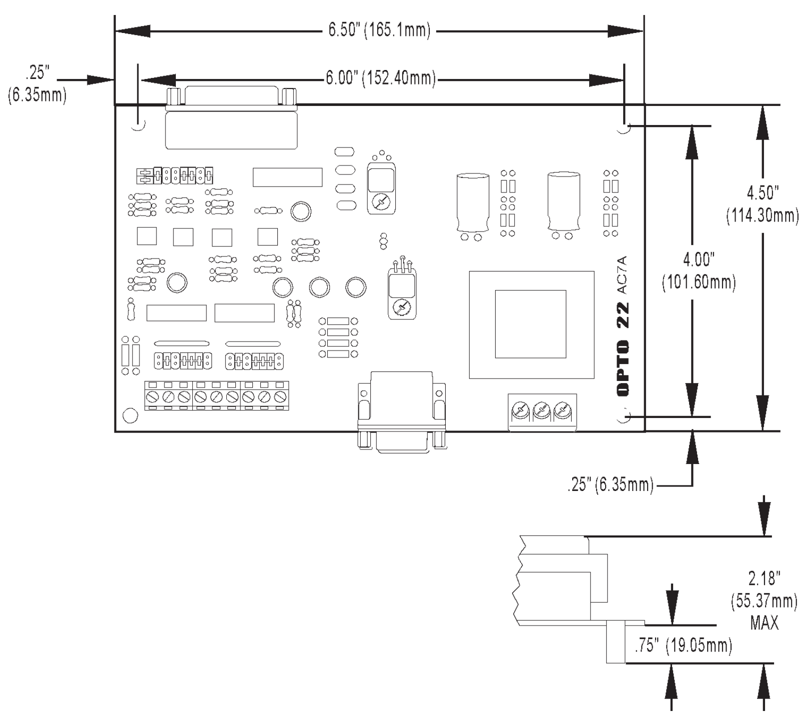
- RS-422/485 balanced line drivers
- Operates with up to 5,000 feet of RS422/485 cable
- Optical isolation between RS-232 and RS-422/485 lines
- Visual LED indicators for transmit, receive, RTS, CTS, and power
- Transmission speeds up to 115,200 bits per second.

  Only "REV L" boards and above (AC7A) and "Rev C" boards and above (AC7B), can be used up to 115,200 baud. Earlier revision boards will operate up to 38,400 baud only.

Specifications

Power Requirements AC7A AC7B	 115 VAC ± 10 VAC @ 50-60 Hz 220 VAC ± 20 VAC @ 50-60 Hz
Power Consumption	0.1 amps @ 115 VAC 5 watts (dissipation)
Operating Temperature Range	0° C to 70° C 0 to 95% Humidity (non-condensing)
Optical Isolation	4,000 V between RS-232 and RS-422/485
RS-232 Interface	25-pin, DB-25 female connector
RS-422/485 Interface	Screw terminals or 9-pin, DB-9 female connector
Baud Rate	Up to 38,400 baud; 115.2KBd in Rev. L (AC7A) and later and in Rev. C (AC7B) and later.
RS-232 Distance	Up to 50 feet
RS-422/485 Distance	Up to 5,000 feet at 38,400 baud (3,000 feet at 115,200 baud)
Communications	RS-422/485 full duplex over two twisted pairs and a ground. Additional twisted pairs for RTS and CTS. Also supports RS-485 2-wire mode. This requires user to build a custom RS-232 cable.
Indicators	Transmit, receive, RTS, CTS, and power

Dimensions



AC30A and AC30B

RS–422/485 Multidrop Repeater

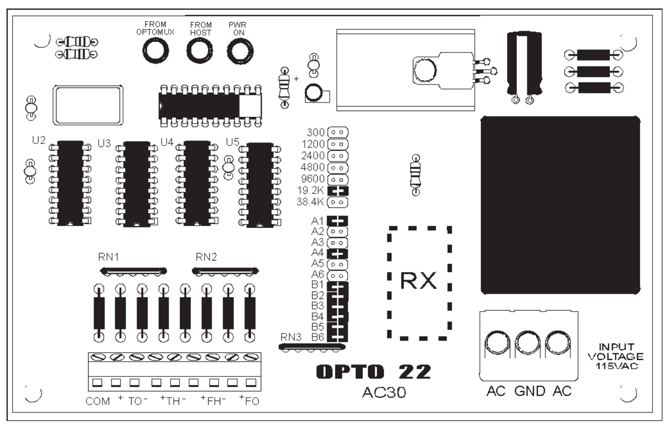
Form 469-990609

Description

The AC30A and AC30B adapter cards provide the ability to extend a multidrop RS-422/485 communications link beyond 5,000 feet and also allow branching from an RS-422/485 link. When used as a repeater, the AC30A/B retransmits data on the communications link, extending the total cable length an additional 5,000 feet. A star network topology can also be implemented using up to 100 AC30A/B adapter cards on a single RS-422/485 data link.

The AC30A/B operates at baud rates up to 38,400 in a half-duplex mode using two twisted pairs and a signal common.

The AC30A includes an onboard 115 VAC power supply and the AC30B includes a 220 VAC power supply.



Introduction

The AC30A/B is an adapter card that extends or branches an Opto 22 RS-422/485 serial link. This allows the addition of up to 5,000 feet of cable for long runs.

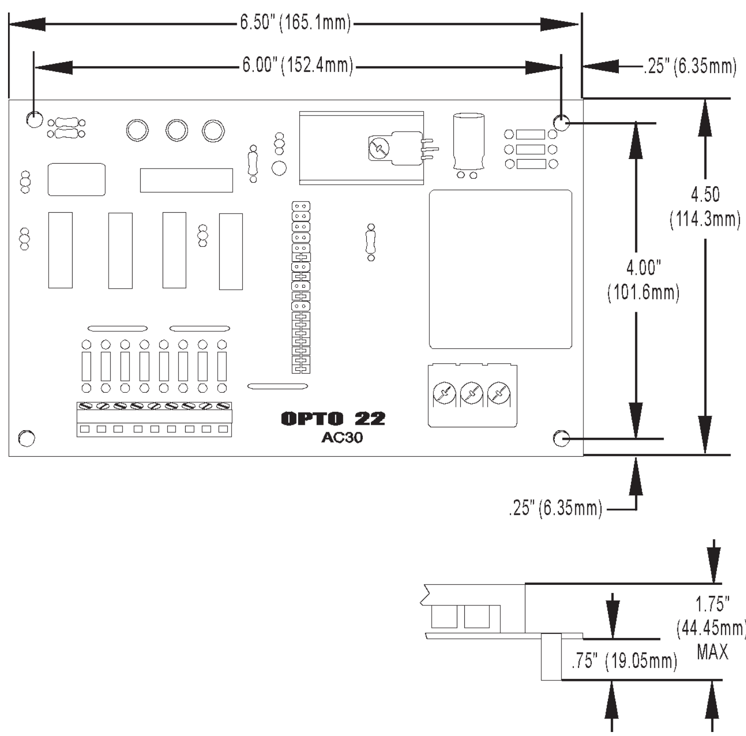
Features

- RS-422/485 balanced line drivers
- Operates with up to 5,000 feet of cable
- Visual transmit, receive and power indicators
- Transmission speeds from 300 to 38.4K baud
- Multidrop repeater station
- Network branching
- Onboard power supply
- Full termination and biasing options on all RS-422/485 lines

Specifications

Power Requirements AC30A AC30B	 115 VAC ± 10 VAC @ 50-60 Hz 220 VAC ± 20 VAC @ 50-60 Hz
Power Consumption	0.1 amps @ 115 VAC 5 watts (dissipation)
Operating Temperature Range	0° to 70° C 0 to 95% Humidity (non-condensing)
Isolation	None
Interface	RS-422/485 (4-40 screw terminals)
Baud Rate	Up to 38,400 baud
Distance	Up to 5,000 feet (RS-422/485)
Communications	Half-duplex over two twisted pairs plus a signal common with automatic transmit enable for multidrop
Indicators	Transmit, receive, and power

Dimensions



Configuration

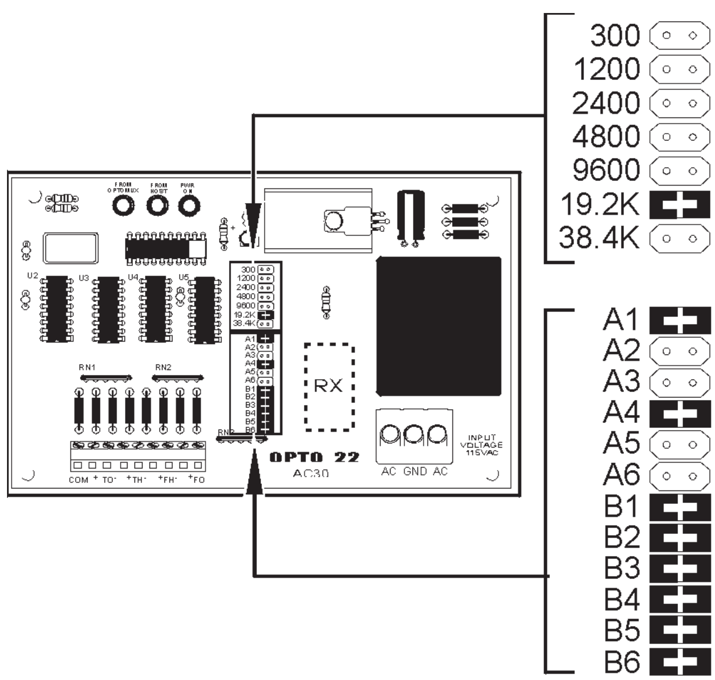
Before using the AC30A/B, it must be configured by selecting the appropriate termination, biasing, and baud rate jumpers. To set the baud rate, install jumper of desired setting. The options are 300, 1200, 2400, 4800, 9600, 19200 and 38400 baud.

Installing Jumpers B1 and B4 connects 220 Ohm terminating resistors from + to - on the transmitter (to Optomux) and receiver (from Optomux), respectively. In a normal Optomux network these jumpers should both be installed.

Installing Jumpers A1 and A4 connects 220 Ohm terminating resistors from + to - on the transmitter (to Host) and receiver (from Host), respectively. In a normal Optomux network these jumpers should both be installed.

The passive pull up/pull down resistors (A2, A3, B5, B6, A5, A6, B2, B3) should be installed only if no other device on the links have pull up/pull down resistors active.

On an Optomux link, if the AC30A/B is used as a repeater, the jumper setting should be A1, A4, and B1 through B6.



FACTORY SETTING FOR
REPEATER OPTOMUX

Installation

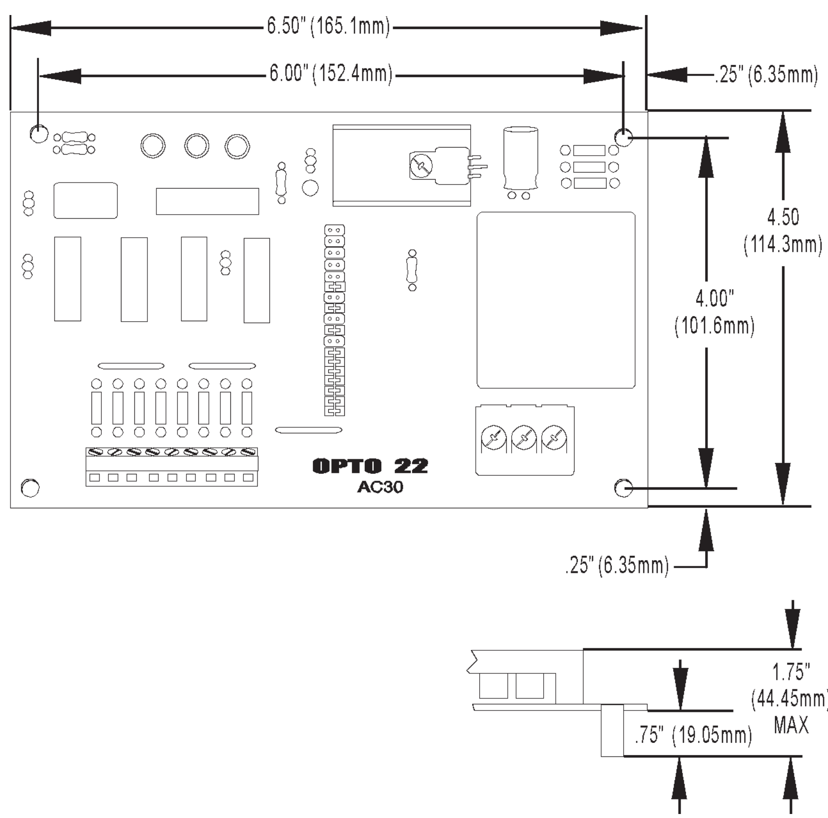
Equipment Required

The following should be available during AC30A/B installation.

- Medium size flat-blade screwdriver
- Small size flat-blade screwdriver
- Wire stripper
- Variety of color-coded wires
  - 22-gauge for data link
  - 18-gauge stranded for power supply wiring.

Mounting the AC30A/B

The AC30A/B can be mounted in any attitude on any flat surface. The AC30A/B is supplied with ¾" standoffs. All the standoffs should be using #6 hardware to provide maximum physical strength. Leave sufficient space around the AC30A/B for data link and power wiring.

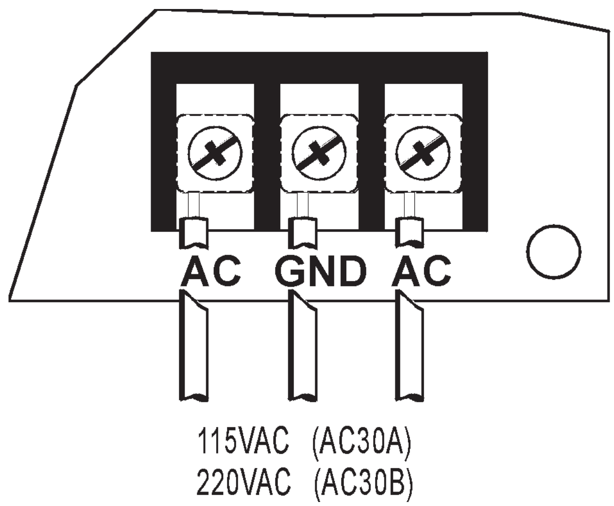


Power Supply Requirements

The AC30A and AC30B contain onboard DC power supplies. The AC30A requires 110 VAC and AC30B requires 220 VAC.

Connecting AC Power to AC30A and AC30B

Caution: Ensure that AC power is OFF while making or removing all connection to the AC30A/B.



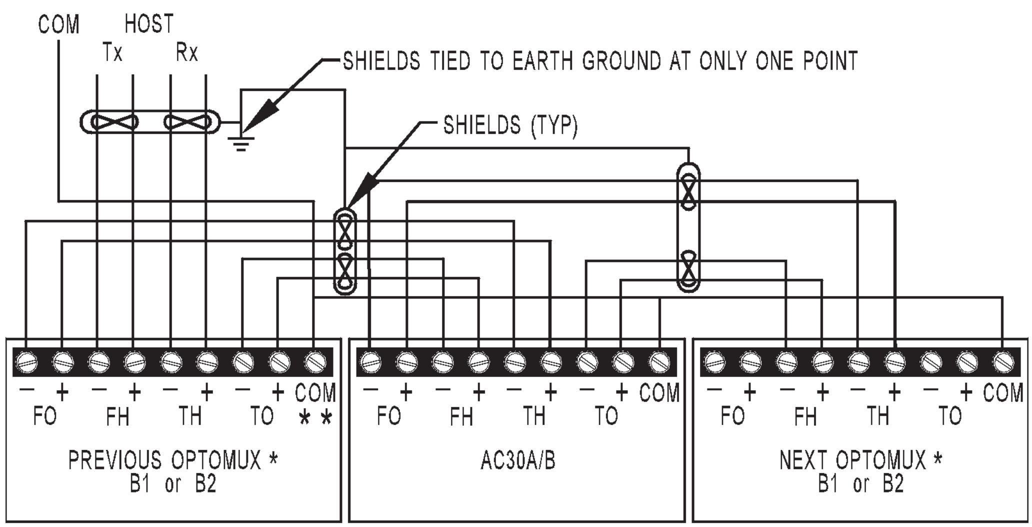
Connecting Common to Ground on AC30A and AC30B

The AC30A and AC30B provide the ability to tie the RS-422/RS-485 Common terminal to ground by installing a ½ watt, 100 ohm resistor at location RX. This is not normally necessary. Note that RS-422 communication links should only be grounded on one end, if at all, to avoid ground loops.

Connecting the Data Link

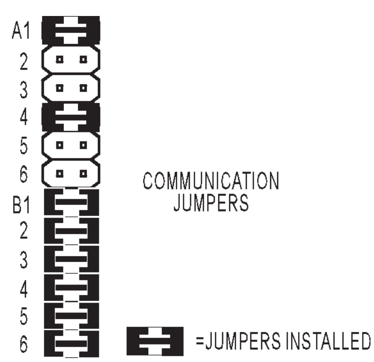
Multidrop Repeater Station

Examine the diagram below for installing the AC30A/B in your Optomux network as a multidrop repeater station.



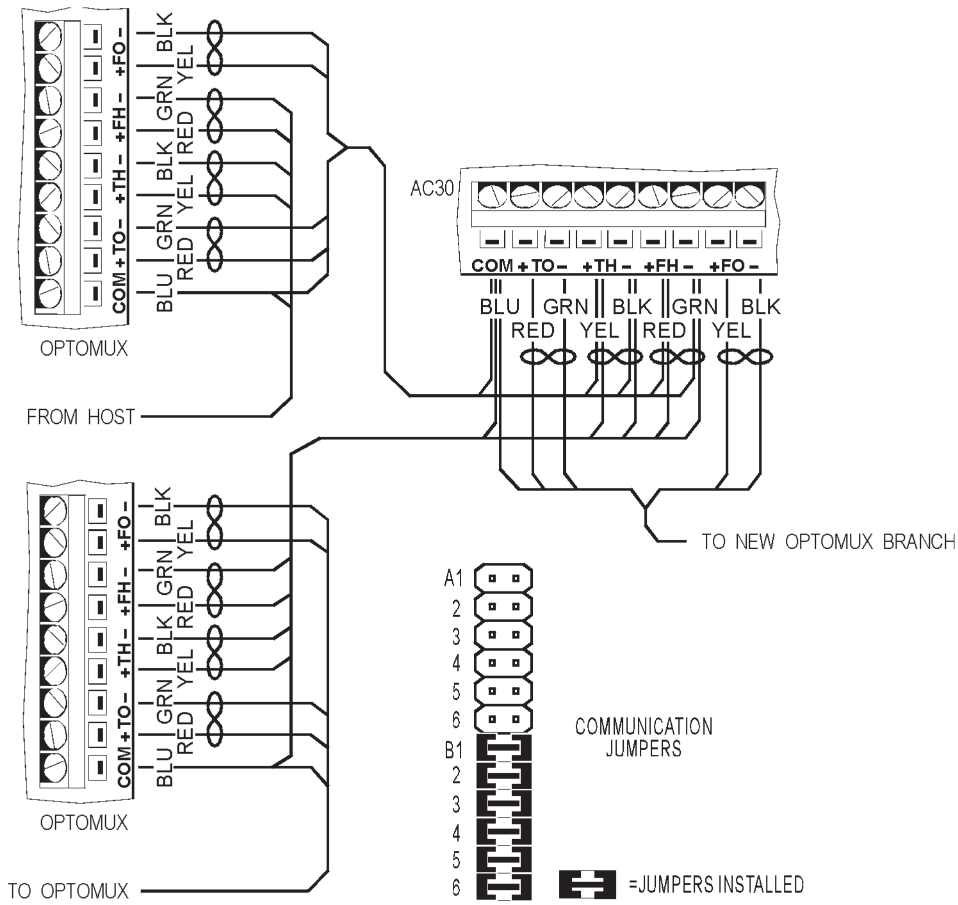
* B2 COMMUNICATION CONNECTIONS ARE MADE TO THE RACK (PB4AH, PA8AH OR PB16AH), NOT TO THE BRAIN BOARD.

** DO NOT CONNECT ANY "COM" POINT TO EARTH GROUND.

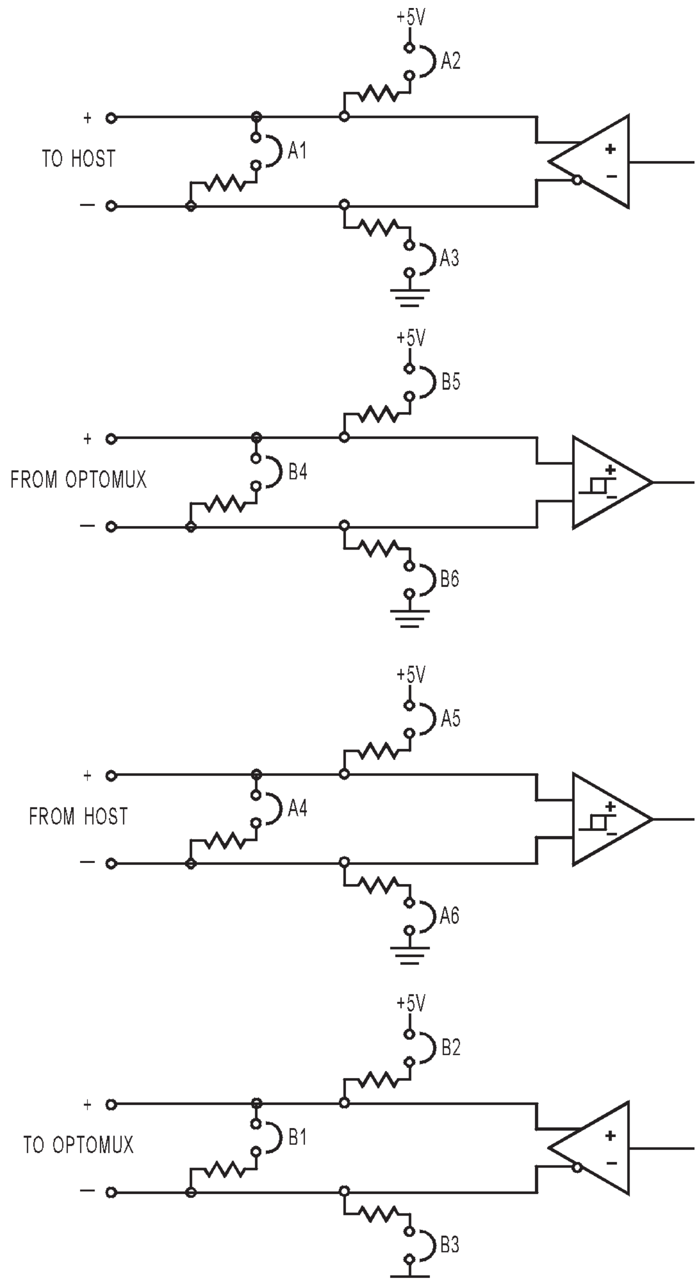


Network Branch

Examine the diagram below for installing the AC30A/B in your Optomux network as a network branch.



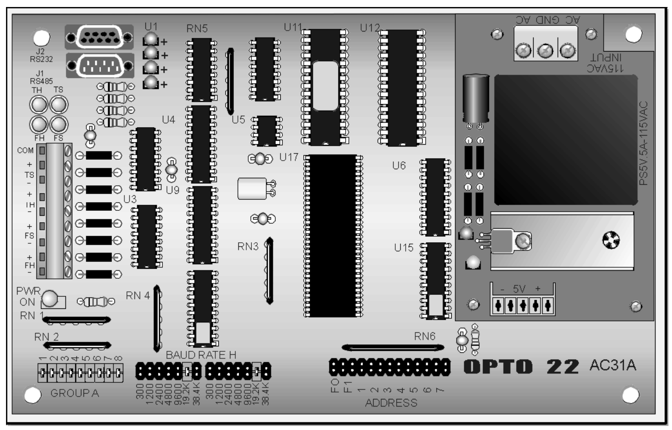
AC30A/B Schematic



AC31A, AC31B, and AC31C
Network Interface Adapter
Form 470-990609

Description

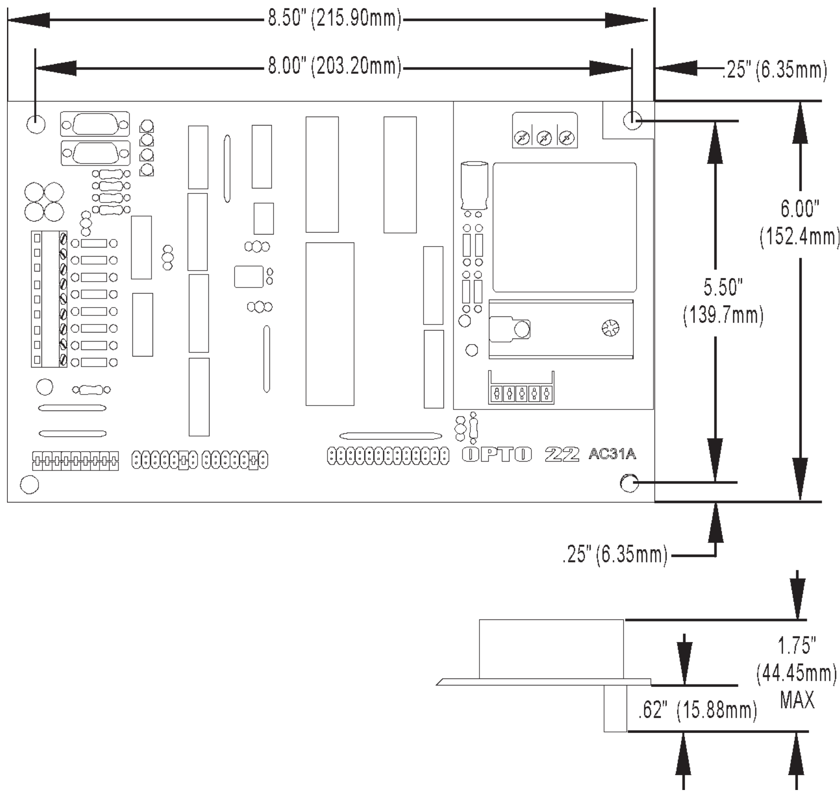
The AC31 adapter card is a general purpose addressable interface that allows any slave serial device that uses asynchronous serial communications (terminals, printers, barcode readers, etc.) to be addressed and attached to a multidrop network. The host side of the interface is RS485/422. The slave side of the interface is either RS232 or RS485/422.



Specifications

Power Requirements AC31A AC31B AC31C	 115 VAC ± 10 VAC @ 60 Hz 220 VAC ± 20 VAC @ 50 Hz 10 - 28 VDC; 10 VDC @ 0.75 amps, 24 VDC @ 0.25 amps
Power Dissipation	Less than 4 watts @ 25° C
Operating Temperature Range	0° to 70° C 0 to 95% Humidity (non-condensing)
Interface Slave Interface Host	Full duplex selectable RS232 & RS485/422 serial port Full duplex RS-485/422 serial port
Baud Rate	300, 1200, 2400, 4800, 9600, 19200, and 38400 baud
CPU	64,180 8-bit microprocessor
CPU Clock Frequency	6.144 MHz
EPROM	32K bytes
RAM	32K bytes
Indicators	Transmit, receive, and power
Options Jumper Selectable	 Address (0 to 255) Baud rates Terminating and biasing resistors

Dimensions



8.50" (215.90mm)
8.00" (203.20mm)
.25" (6.35mm)
6.00"
(152.4mm)
5.50"
(139.7mm)
OPTO 22 AC31A
.25" (6.35mm)
1.75"
(44.45mm)
MAX
.62" (15.88mm)

AC8, AC8A, and AC8B

Half Duplex Modem Adapter

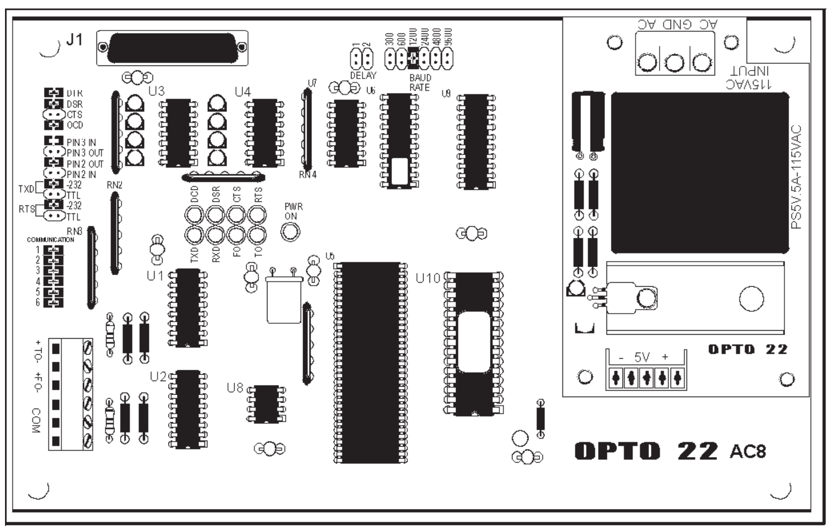
Form 467-990609

Description

The AC8 modem adapter card links a half duplex RS-232 modem to a full duplex RS-422/485 multidrop network. The AC8 is ideal for use with half duplex, non-intelligent modems such as a radio modem. Full RTS/CTS handshaking is provided.

The AC8 provides transient protection on the RS-422/485 port. The modem adapter card operates as a half or full duplex device with transmission speeds up to 9,600 baud for distances up to 5,000 feet using two twisted pairs.

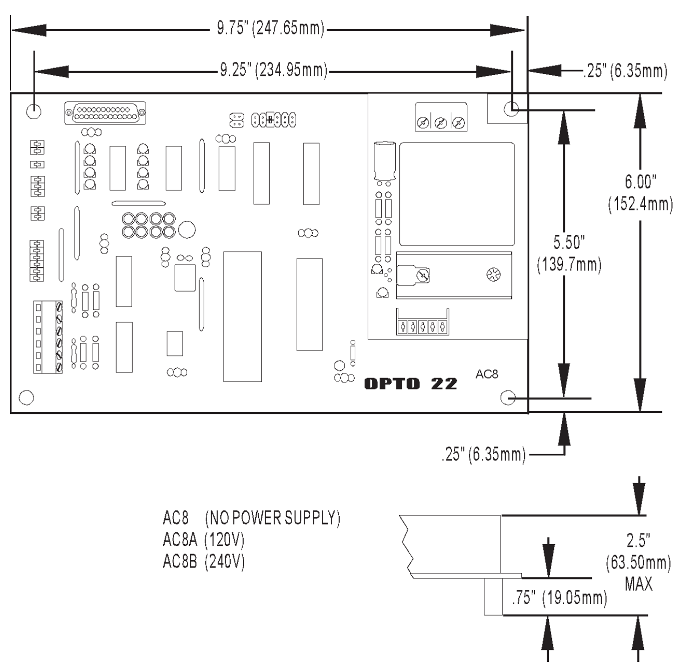
The AC8 requires a 5 VDC power supply. The AC8A is powered by an onboard 115 VAC power supply while the AC8B comes with an onboard 220 VAC power supply.



Specifications

Power Requirements AC8 AC8A AC8B	 5 VDC @ 500 mA 115 VAC ± 10 VAC @ 50 - 60 Hz 220 VAC ± 20 VAC @ 50 - 60 Hz
Power Consumption	0.1 amps @ 115 VAC .06 amps @ 220 VAC
Operating Temperature Range	0 to 70° C 95% relative humidity (non-condensing)
Isolation	None
Interface RS-232C RS-422/485	 25-pin, D-shell female connector 4-40 screw terminals
Baud Rate	Up to 9,600 baud
Distance RS-232C RS-422/485	 Up to 50 feet Up to 5,000 feet
Communications	Half or full duplex over two twisted pairs
Indicators	Transmit, receive, RTS, CTS, DCD, DCR, and power

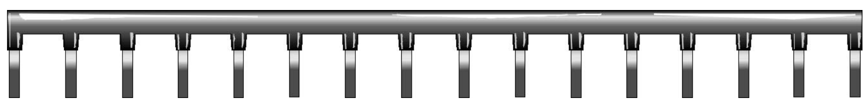
Dimensions



G4STRAP
Jumper Straps
Form 508-990609

Description

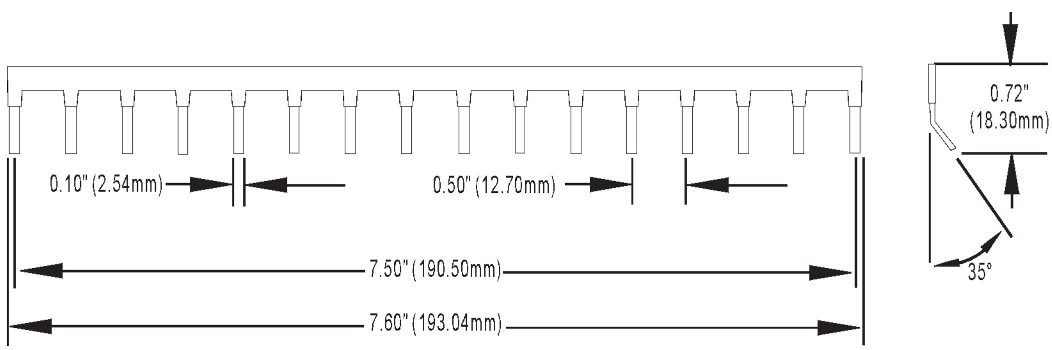
Jumper straps are used in applications that require a common connection between each I/O module position. The G4STRAP can be used on all G4 I/O mounting racks.



Features

- Simplifies wiring
- Insulated coating
- Can be cut to size

Dimensions



*Cannot be used with models, G4PB16J, G4PB16K, and G4PB16L mounting racks.

FUSES

Form 489-990609

Description

Each Classic Standard I/O mounting rack has plug-in 5-amp fuses for each I/O module position. Some mounting racks also have a 1-amp fuse in series with the V_{CC} rack power.

Generation 4 output modules use a 4-amp fuse mounted on the module rather than on the mounting rack.

Ordering Guide

Part Numbers	Description
FUSE01	1-amp fuse for digital logic power, (old p/n 232) (Littelfuse, p/n 251-001)
FUSE02	2-amp fuse for all analog logic power, and digital logic power for PB32HQ and G4PB32H (Littelfuse, p/n 251-002)
FUSE05	5-amp fuse for digital I/O modules (old p/n 190) (Littelfuse, p/n 251-005)
FUSE.125	0.125-amp fuse for all analog loop source power applications (Littelfuse, p/n 251-125)
FUSEG4	4-amp fuse for Generation 4 output modules (Wickmann, p/n 19370K)
FUSE01G4	1-amp fuse for Generation 4 digital logic power and brick power regulators (Wickmann, p/n 19373-1A)

Phone Numbers

Littelfuse (847) 824-1188

Wickmann (404) 699-7820

PBSA, PBSB, AND PBSC
POWER SUPPLIES

Form 491-990609

Description

The PBSA, PBSB, and PBSC power supplies are designed to work with the Optomux B1 brain board and the Mistic B100 brain board. The PBSC can also be used with the Pamux B5 brain board.

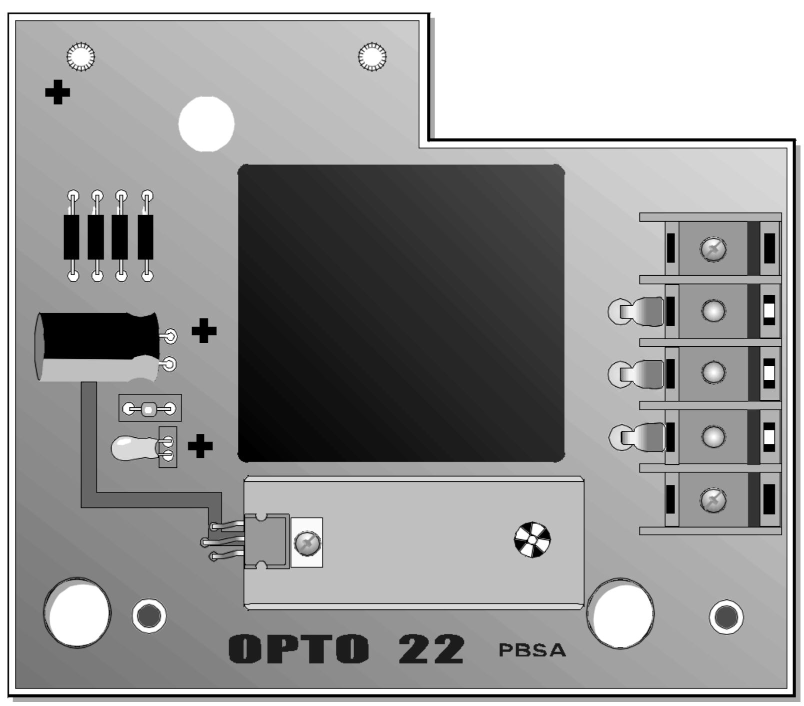
The power supplies are sized appropriately to provide power for the brain board as well as logic power for 16 digital I/O modules. When the PBSC is used with a Pamux B5 brain board, it can also supply power for a Pamux Term1 terminating resistor connected to the B5.

The power supplies mount directly to the appropriate digital I/O mounting racks. The electrical connection is made with two screws to threaded contacts on the digital I/O mounting rack. The brain board mounts directly above (on top of) the power supply.

The PBSC is a 5 VDC power supply that runs on 12/24 VDC. It mounts directly to single-channel racks having a header connector. The power supply connects with two screws to threaded contacts on the rack. The power supply mounting allows an OPTOMUX or PAMUX brain board to be mounted above the supply. The power supply provides sufficient current to power 16 channels of I/O and one OPTOMUX or PAMUX brain board.

The power supply is only for use with standard or G4 modules that use a 5-volt logic voltage, such as ODC5, OAC5, IDC5, IAC5, etc.

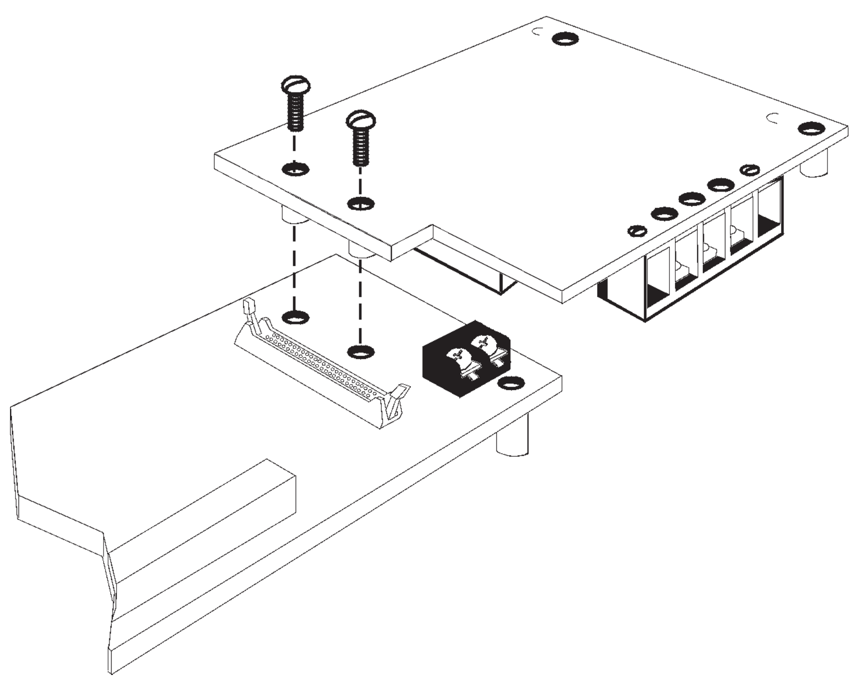
The PBSC is ideal for battery-backed applications, such as remote telemetry, remote data logging, and security.



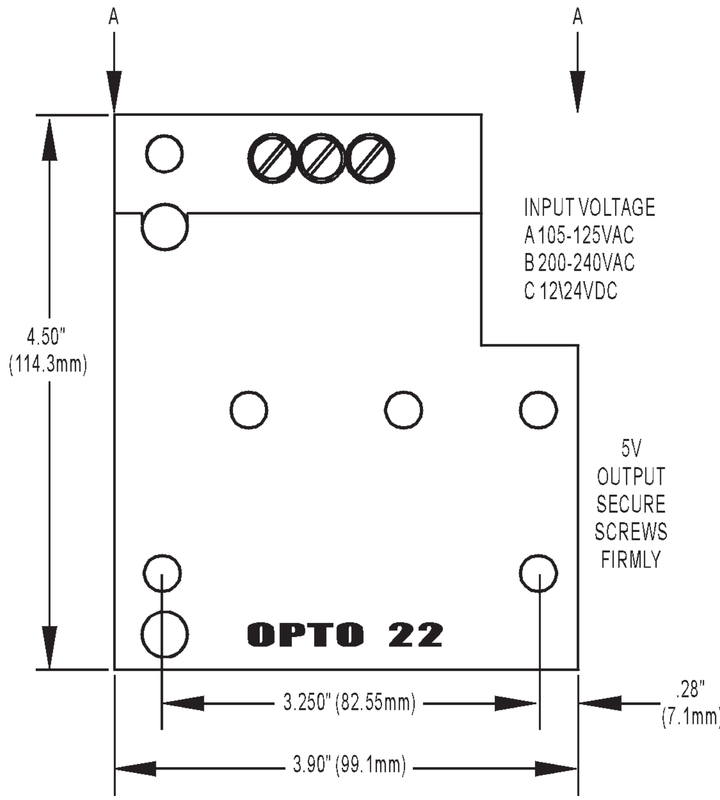
Specifications

Model	PBSA	PBSB	PBSC
Input Range	105-125 VAC	200-240 VAC	10-28 VDC
Output Voltage	5 VDC	5 VDC	5 VDC
Output Current	0.5 amps	0.5 amps	1.5 amps
Operating Temperature	-25° to 65° C	-25° to 65° C	-25° to 65° C
Isolation Breakdown Voltage	2,500 VAC	2,500 VAC	500 VAC
Power Dissipation	3-9 Watts	3-9 Watts	3-10 Watts
Humidity (non-condensing)	0-95%	0-95%	0-95%
Compatible Brain Boards	B1 and B100	B1 and B100	B1, B5, and B100
Compatible digital I/O mounting racks (All 3 power supplies are compatible with these racks)	Standard: PB4H, PB8H, PB16H, PB16HC Quad Pak: PB16HQ G4: G4PB8H, G4PB16H, G4PB16HC		

Installation



Dimensions


A
A
INPUT VOLTAGE
A 105-125VAC
B 200-240VAC
C 12\24VDC
4.50"
(114.3mm)
5V
OUTPUT
SECURE
SCREWS
FIRMLY
OPTO 22
3.250" (82.55mm)
.28"
(7.1mm)
3.90" (99.1mm)