OPTO 22

DATA SHEET
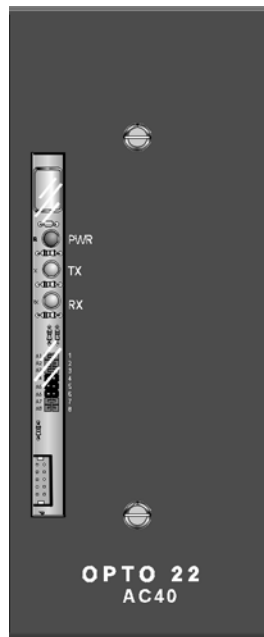
Form 521-070823

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.

Part Numbers	Description
AC40A	Fiber Optic Repeater-120 VAC
AC40B	Fiber Optic repeater-240 VAC

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

DATA SHEET

Form 521-070823

Specifications

AC40 Specifications

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

AC40 Architecture
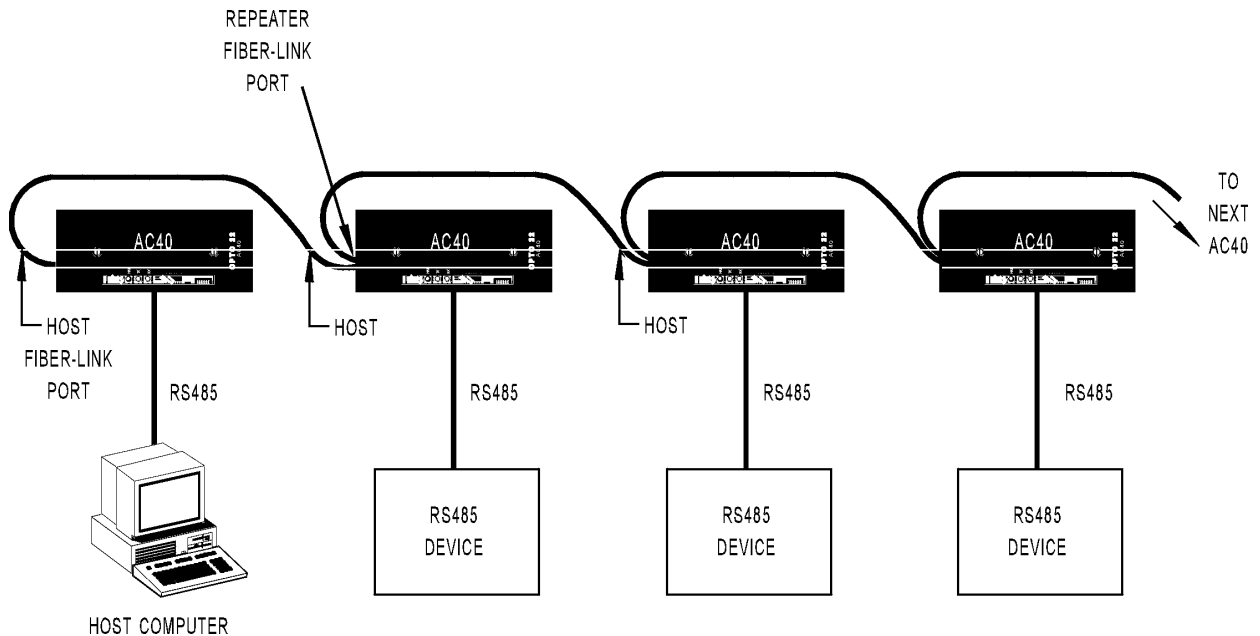
The host fiber port on the first AC40 must be connected to the host fiber port on the next AC40. All others are connected host to repeater of the previous AC40.
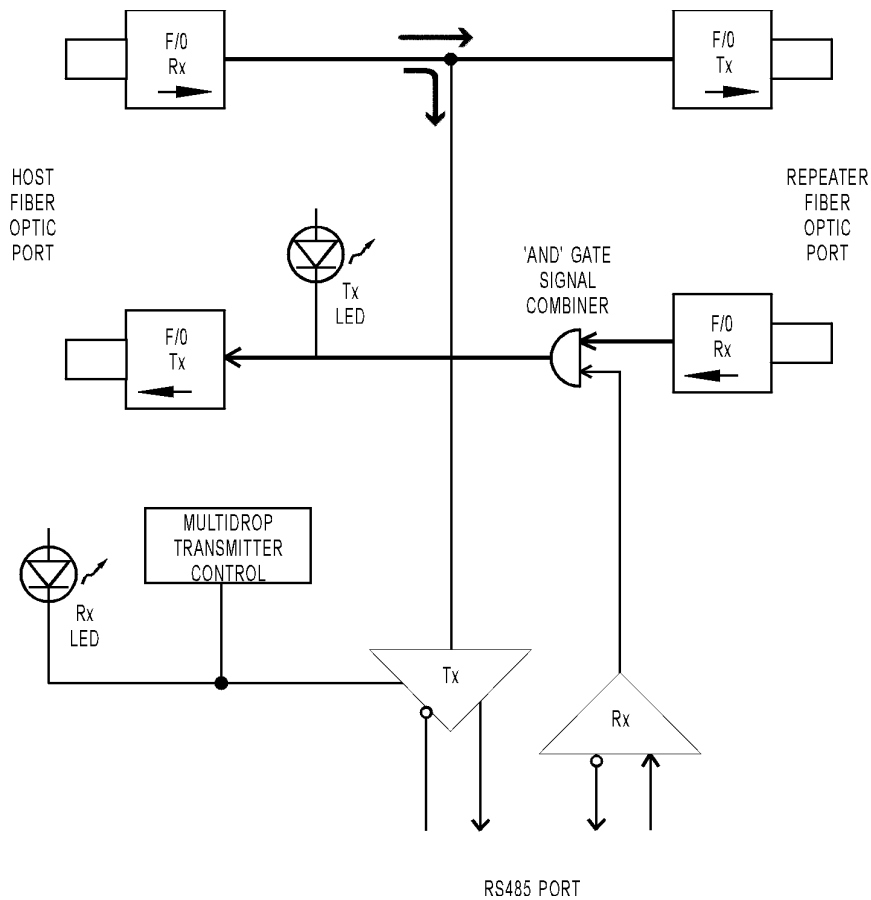
OPTO 22

INTERFACES
TRADITIONAL
STAND ALONE

DATA SHEET

page 3/14

Form 521-070823

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 ports. 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.

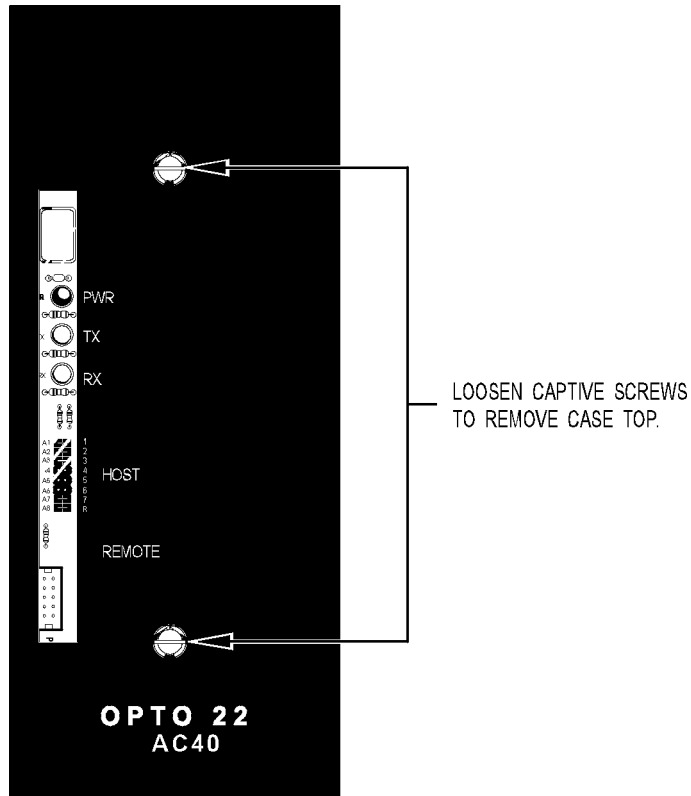NOTE: *Signals are not passed from the repeater fiber port to the RS-485 port nor are they passed from the RS-485 port to the repeater port.*

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

INTERFACES
TRADITIONAL
STAND ALONE

DATA SHEET   page 4/14
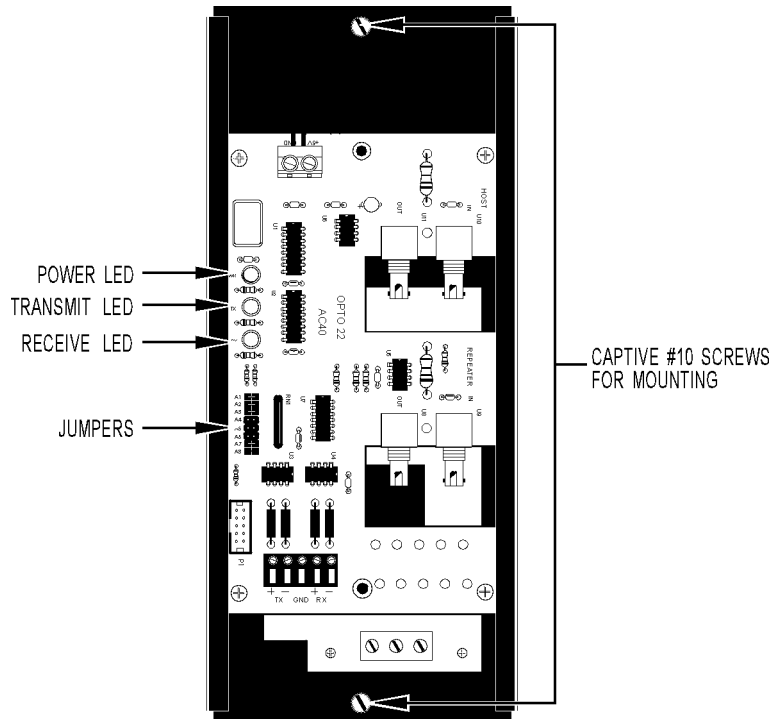
Form 521-070823

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.

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

INTERFACES
TRADITIONAL
STAND ALONE

OPTO 22

DATA SHEET

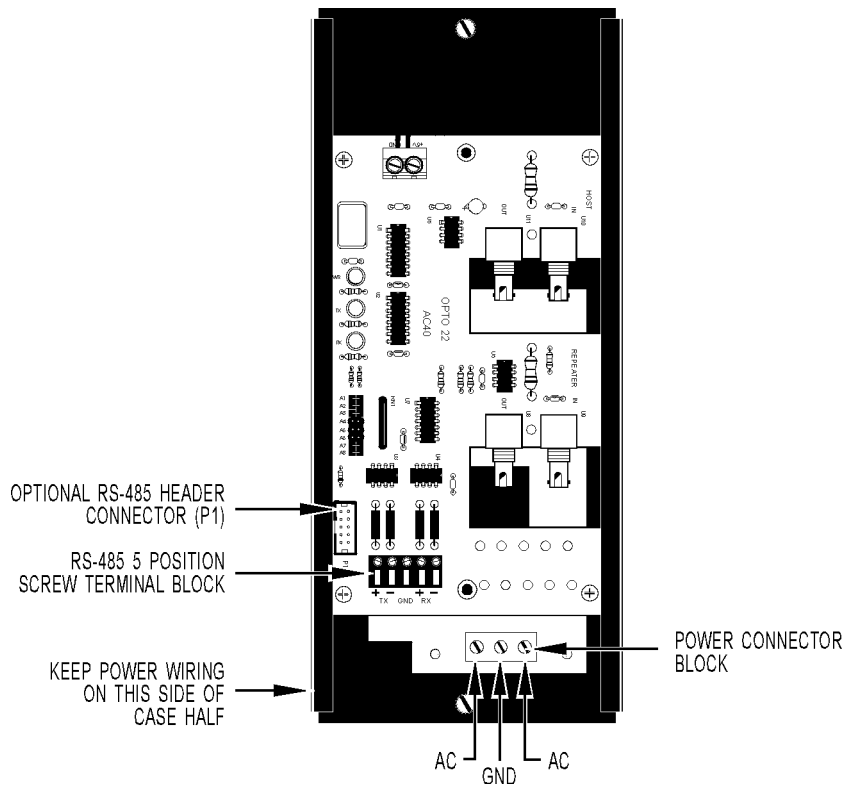page 5/14

Form 521-070823

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 LED
TRANSMIT LED
RECEIVE LED

JUMPERS

CAPTIVE #10 SCREWS
FOR MOUNTING

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

INTERFACES
TRADITIONAL
STAND ALONE

OPTO 22

DATA SHEET   **page 6/14**

Form 521-070823

POWER WIRING

The AC40 has two power supply options. The AC40A has a 120 VAC power requirement; the AC40B has a 240 VAC 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.

OPTIONAL RS-485 HEADER
CONNECTOR (P1)

RS-485 5 POSITION
SCREW TERMINAL BLOCK

KEEP POWER WIRING
ON THIS SIDE OF
CASE HALF

POWER CONNECTOR
BLOCK

AC   GND   AC

OPTO 22

INTERFACES
TRADITIONAL
STAND ALONE

DATA SHEET

page 7/14
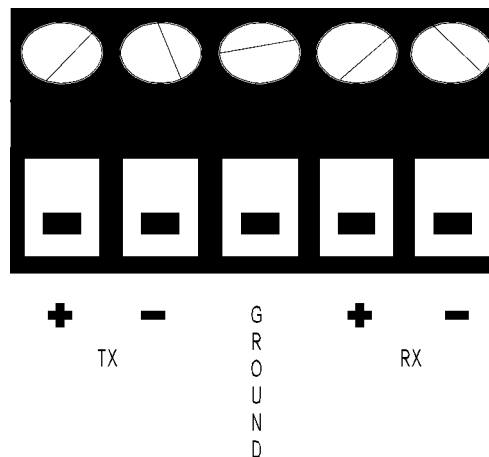
Form 521-070823

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.

10-PIN HEADER

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.

5-POSITION SCREW TERMINAL BLOCK

OPTO 22

INTERFACES
TRADITIONAL
STAND ALONE
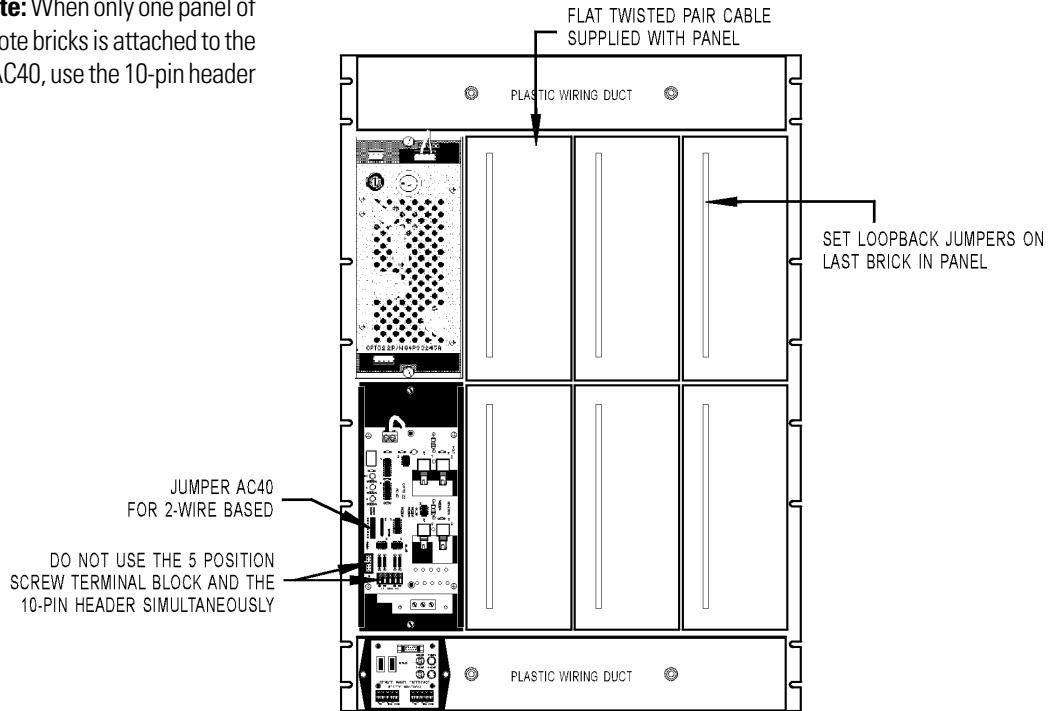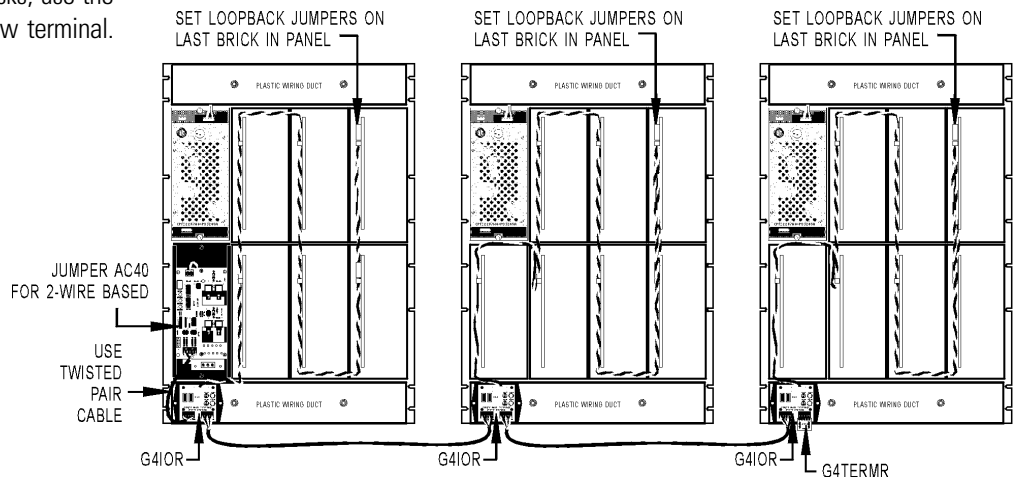
DATA SHEET

page 8/14

Form 521-070823

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 panel of remote bricks is attached to the AC40, use the 10-pin header

FLAT TWISTED PAIR CABLE SUPPLIED WITH PANEL

PLASTIC WIRING DUCT

SET LOOPBACK JUMPERS ON LAST BRICK IN PANEL

JUMPER AC40 FOR 2-WIRE BASED

DO NOT USE THE 5 POSITION SCREW TERMINAL BLOCK AND THE 10-PIN HEADER SIMULTANEOUSLY

PLASTIC WIRING DUCT

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

SET LOOPBACK JUMPERS ON LAST BRICK IN PANEL

JUMPER AC40 FOR 2-WIRE BASED

USE TWISTED PAIR CABLE

G4IOR G4IOR G4IOR G4TERMR

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

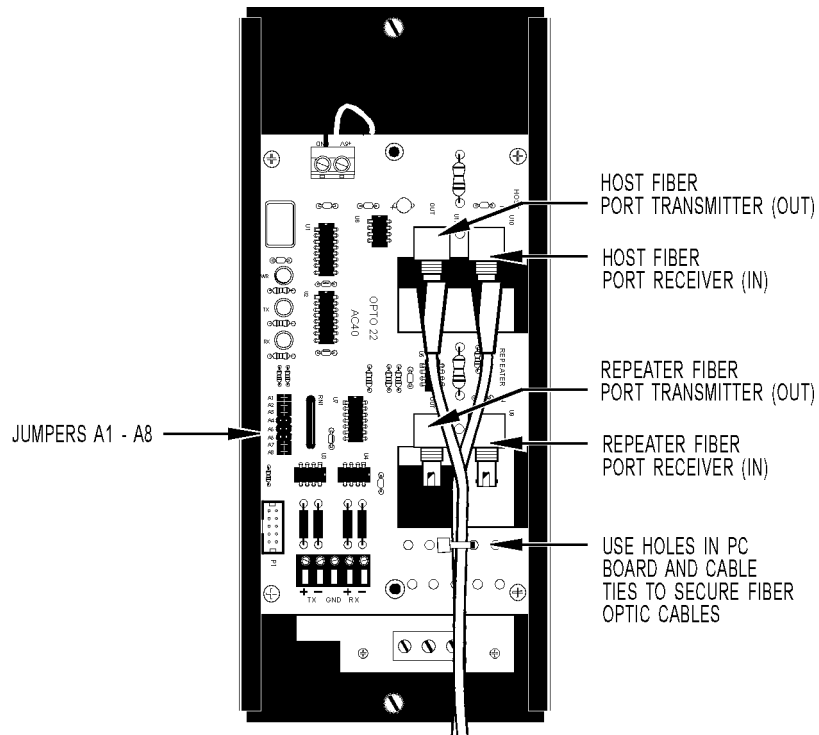# OPTO 22

DATA SHEET

Form 521-070823

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 μm/125 μm 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.

HOST FIBER
PORT TRANSMITTER (OUT)

HOST FIBER
PORT RECEIVER (IN)

REPEATER FIBER
PORT TRANSMITTER (OUT)

JUMPERS A1 - A8

REPEATER FIBER
PORT RECEIVER (IN)

USE HOLES IN PC
BOARD AND CABLE
TIES TO SECURE FIBER
OPTIC CABLES

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

INTERFACES
TRADITIONAL
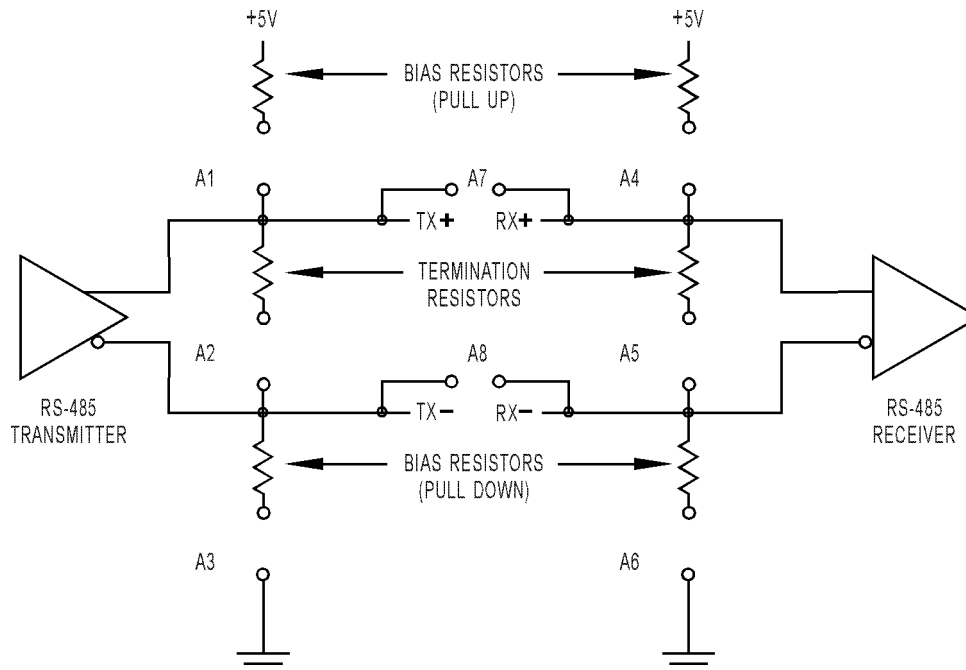### STAND ALONE

DATA SHEET

page 10/14

Form 521-070823

JUMPERING

A group of 8 jumpers labeled A1 - A8 is 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:
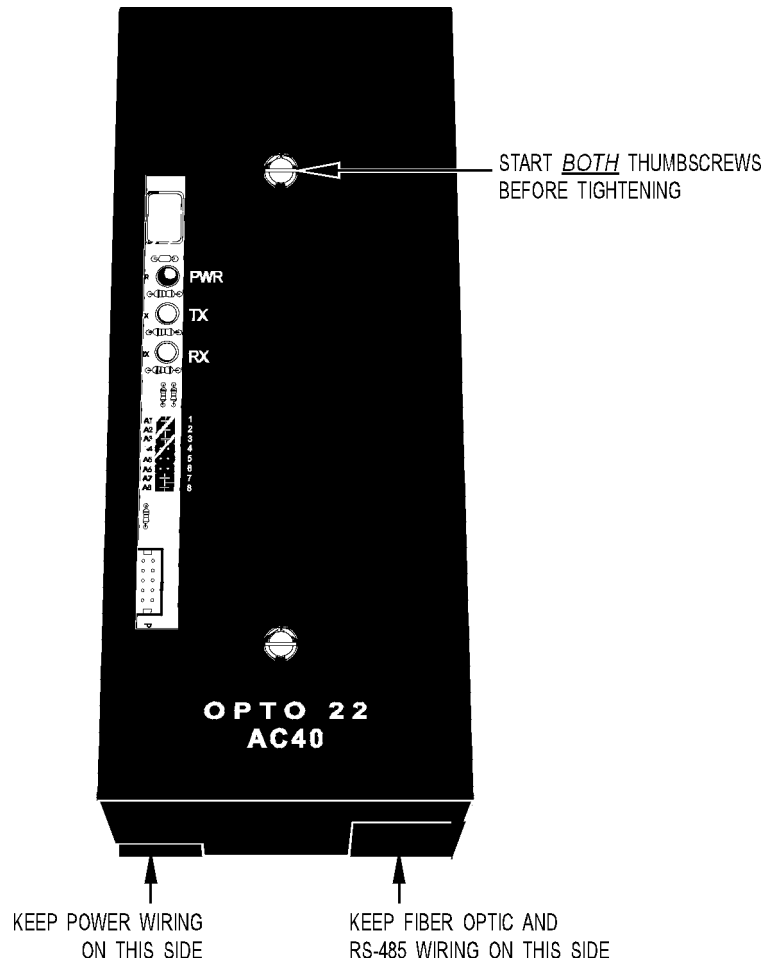
1) RS-485 requires termination at both ends of the communications wiring.
2) The link must be biased in one place only.
3) Opto 22 remote Bricks have no bias or termination options.
4) The G4TERMR terminator does not have bias options.
5) When G4LC32 RS-485 serial ports are terminated, they are automatically biased.
6) Biasing is usually done at the "HOST" end.

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

INTERFACES
TRADITIONAL
STAND ALONE

DATA SHEET

page 11/14

Form 521-070823

REASSEMBLY

   After all connections and jumpering are 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 evenly until the top case is secured

.

START _BOTH_ THUMBSCREWS
BEFORE TIGHTENING

PWR
TX
RX

OPTO 22
AC40

KEEP POWER WIRING
ON THIS SIDE

KEEP FIBER OPTIC AND
RS-485 WIRING ON THIS SIDE

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

DATA SHEET
Form 521-070823

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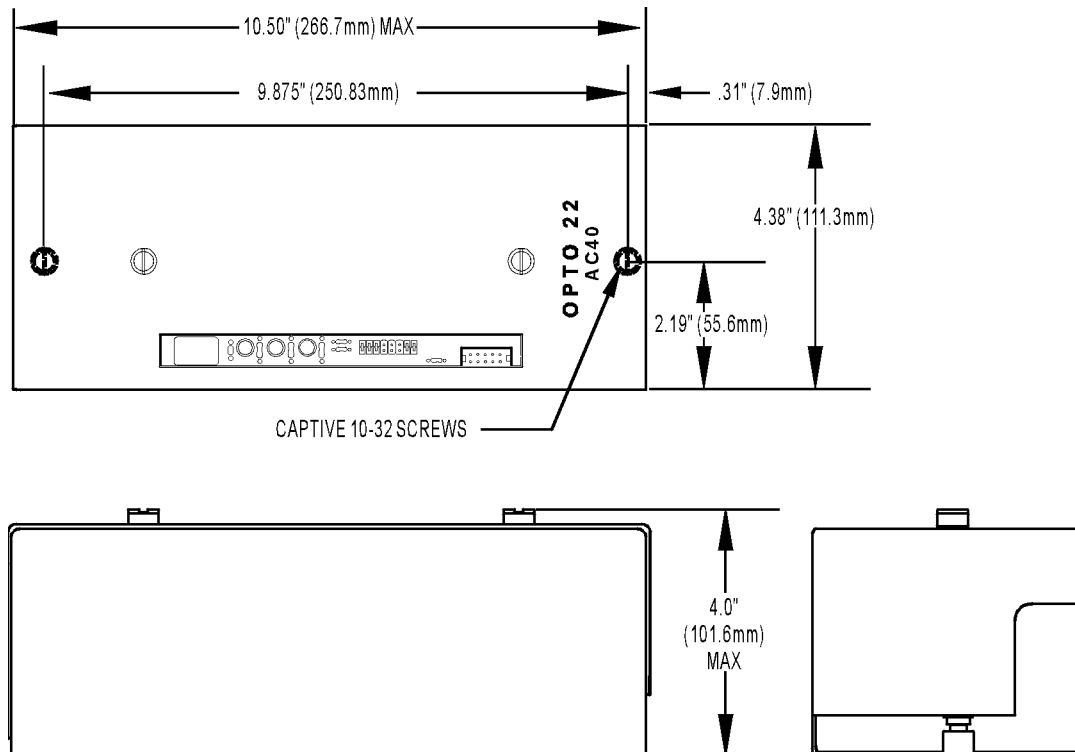
When the LED labeled RX is illuminated, data is being received from the host fiber port and transmitted down the RS-485 port and the repeater fiber port.

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:

1) Receive and transmit fiber optic cables are swapped.
2) 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
3) The RS-485 port is incorrectly wired. Check:
    (a) polarity of signals
    (b) twisted pair cable must be used

DIMENSIONS

CAPTIVE 10-32 SCREWS

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

INTERFACES
TRADITIONAL
STAND ALONE

OPTO 22

DATA SHEET

page 13/14

Form 521-070823

SPECIFICATIONS

Ambient Temperature:	0° C - 70° C 95% relative humidity, non-condensing
Power: AC40A: AC40B:	 120 VAC ± 10 VAC 60 Hz 240 VAC ± 20 VAC 50 Hz
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) 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

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800)TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • E-mail: sales@opto22.com

OPTO 22

DATA SHEET

Form 521-070823

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

Products

Opto 22 produces a broad array of reliable, flexible hardware and software products for industrial automation, remote monitoring, enterprise data acquisition, and machine-to-machine (M2M) applications.

SNAP Ethernet Systems

Based on the Internet Protocol (IP), SNAP Ethernet systems offer flexibility in their network connectivity and in the software applications they work with. The physical network may be a wired Ethernet network, a cellular wireless network, or a modem. A wide variety of software applications can exchange data with SNAP Ethernet systems, including:

- Opto 22's own ioProject™ suite of control and HMI software
- Manufacturing resource planning (MRP), enterprise management, and other enterprise systems
- Human-machine interfaces (HMIs)
- Databases
- Email systems
- OPC client software
- Custom applications
- Modbus/TCP software and hardware.

SNAP Ethernet system hardware consists of controllers and I/O units. Controllers provide central control and data distribution. I/O units provide local connection to sensors and equipment.

SNAP OEM Systems

Opto 22 SNAP OEM I/O systems are highly configurable, programmable processors intended for OEMs, IT professionals, and others who need to use custom software with Opto 22 SNAP I/O modules.

Linux® applications running on these systems can read and write to analog, simple digital, and serial I/O points on SNAP I/O modules using easily implemented file-based operations. Applications can be developed using several common development tools and environments, including C or C++, Java, and shell scripts.

M2M Systems

Machine-to-machine (M2M) systems connect your business computer systems to the machines, devices, and environments you want to monitor, control, or collect data from. M2M systems often use wireless cellular communications to link remote facilities to central systems over the Internet, or to provide monitoring and control capability via a cellular phone.

Opto 22's Nvio™ systems include everything you need for M2M—interface and communications hardware, data service plan, and Web portal—in one easy-to-use package. Visit nvio.opto22.com for more information.

Opto 22 Software

Opto 22's ioProject and FactoryFloor® software suites provide full-featured and cost-effective control, HMI, and OPC software to power your Opto 22 hardware. These software applications help you develop control automation solutions, build easy-to-use operator interfaces, and expand your manufacturing systems' connectivity.

Quality

In delivering hardware and software solutions for worldwide device management and control, Opto 22 retains the highest commitment to quality. We do no statistical testing; each product is made in the U.S.A. and is tested twice before leaving our 160,000 square-foot manufacturing facility in Temecula, California. That's why we can guarantee solid-state relays and optically-isolated I/O modules *for life*.

Product Support

Opto 22's Product Support Group offers comprehensive technical support for Opto 22 products. The staff of support engineers represents years of training and experience, and can assist with a variety of project implementation questions. Product support is available in English and Spanish from Monday through Friday, 7 a.m. to 5 p.m. PST.

Opto 22 Web Sites

- www.opto22.com
- nvio.opto22.com
- www.internetio.com (live Internet I/O demo)

Other Resources

- OptoInfo CDs
- Custom integration and development
- Hands-on customer training classes.

About Opto 22

Opto 22 manufactures and develops hardware and software products for industrial automation, remote monitoring, enterprise data acquisition, and machine-to-machine (M2M) applications. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's input/output and control systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, and electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel.

Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for quality and reliability.

Opto 22 • 43044 Business Park Drive • Temecula, CA 92590-3614 • Phone: (951) 695-3000 • (800) 321-OPTO • Fax: (951) 695-3095 • www.opto22.com

Inside Sales: (800) 321-OPTO • Product Support: (800) TEK-OPTO • (951) 695-3080 • Fax: (951) 695-3017 • Email: sales@opto22.com • Form 1335-050601