

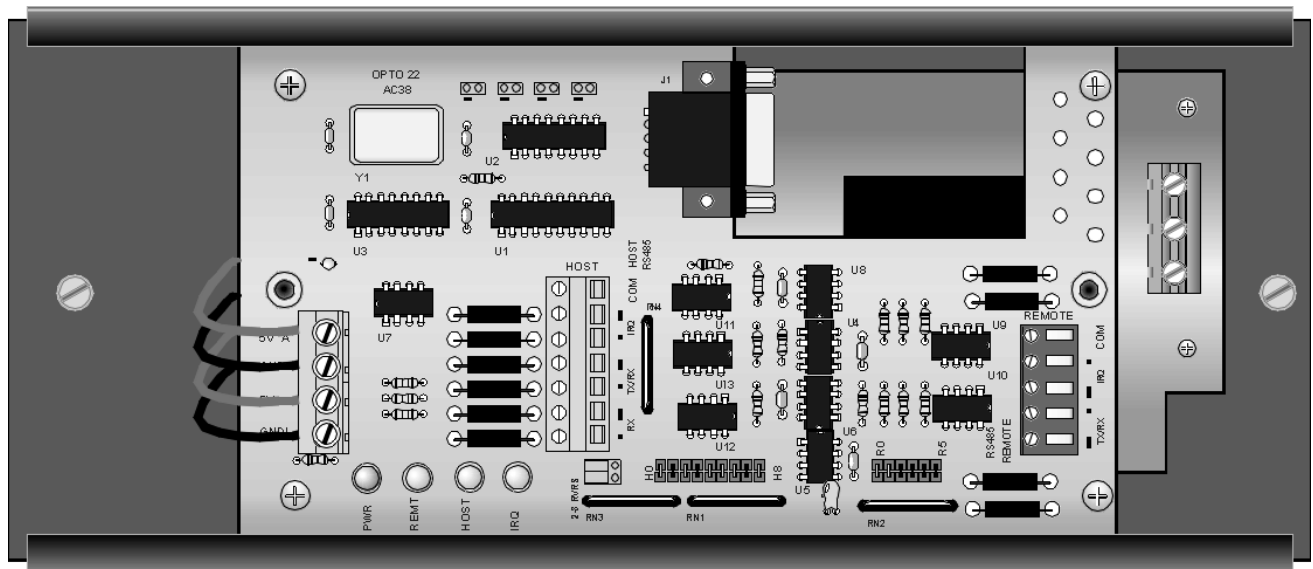
## DATA SHEET

Form 519-100915

### Description

The AC38 is an optically-isolated RS-485 repeater. AC38 can operate at up to 115.2K baud and is completely independent of parity, stop bits, and data word size considerations. The AC38 has 3 connection ports; the host RS-485 port, the host RS-232 port, and the remote RS-485 port. The remote RS-485 port is always a 2-wire connection and the host RS-485 port can be 2-wire or 4-wire mode. The AC38 fully supports the Mystic protocol IRQ interrupt line.

Part Numbers	Description
AC38A	High Speed RS485 Repeater 120 VAC
AC38B	High Speed RS485 Repeater 220 VAC



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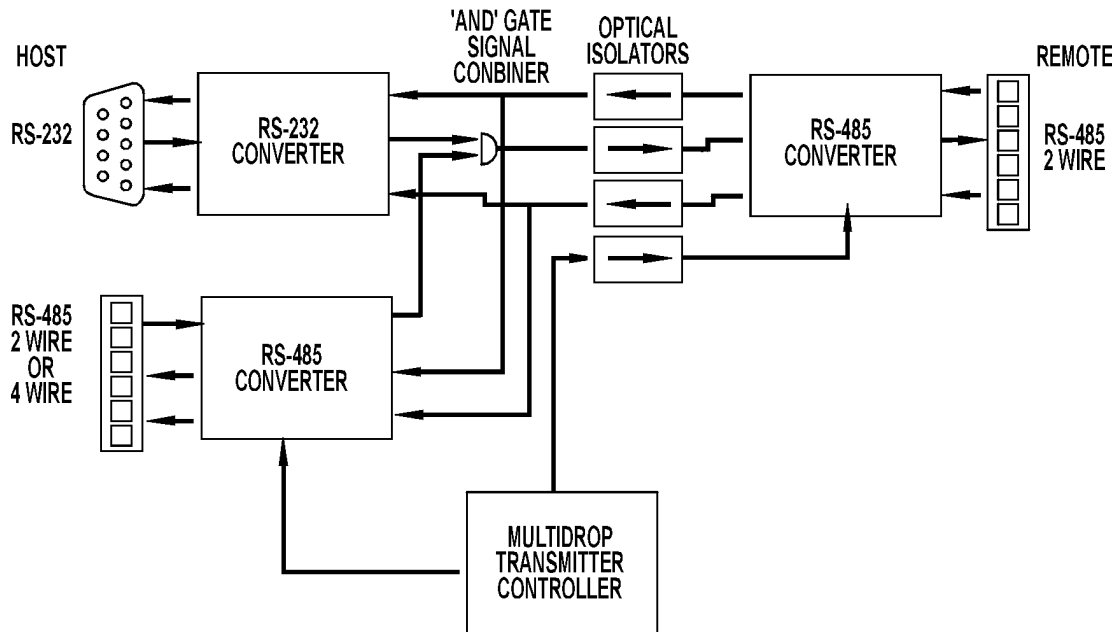
*Specifications***AC38 Specifications**

Power Requirements AC38A: AC38B:	120 VAC $\pm$ 10 VAC 60 Hz 240 VAC $\pm$ 20 VAC 50 Hz
Ambient Temperature:	0° C - 70° C 95% relative humidity, non-condensing
Host RS-485 Port:	3,000 feet maximum cable length twisted pair wire 2-wire or 4-wire hook ups Asynchronous operation, independent of baud rate, parity, stop bits or data word size 115.2 KBd maximum Supports Mystic IRQ interrupt line
Host RS-232 Port:	30 feet maximum 38.4 KBd maximum Mistic IRQ interrupt line is on pin 8 of connector (CTS) Has option jumpers to reverse pins 2 and 3
Remote RS-485 Port:	3,000 feet maximum cable length twisted pair wiring 2-wire hook-up only Asynchronous operation independent of baud rate, parity, stop bits or data word size 115.2 KBd maximum Supports Mystic IRQ interrupt line

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### INTRODUCTION

The AC38 is an optically isolated 2-wire to 2-wire RS-485 repeater. The AC38 can operate at up to 115.2 KBd and is completely independent of parity, stop bit, and data word size considerations. The AC38 has three connection ports; the host RS-485 port, the host RS-232 port, and the remote RS-485 port. The remote RS-485 port is always a 2-wire connection; the host RS-485 can be used in 2-wire or 4-wire mode. The host RS-232 port allows an interface with a maximum baud rate of 38.4 KBd; this interface will echo any data transmitted out of it, and it will receive communication coming from either the HOST or REMOTE RS-485 ports provided it does not exceed 38.4 KBd.



While the AC38 is primarily an RS-485 repeater, it can also perform other convenient functions.

#### These are:

#### RS-485 REPEATER

The AC38 may be used simply as an RS-485 communications line repeater. When used in this manner, it is typically the last drop of one RS-485 link and the first drop of another. The AC38 will transfer data from one link to the other, amplifying the signal in the process. Up to 3,000 feet of cable and 32 drops are permitted on each RS-485 link. Electrical isolation exists between the two links.

#### RS-485 'T-BRANCH' OR 'STAR' ADAPTER

The AC38 also allows RS-485 communication links to be wired in a 'T' configuration. By making an AC38 one drop in the middle of an RS-485 link, data can be transferred to and from a separate communication.

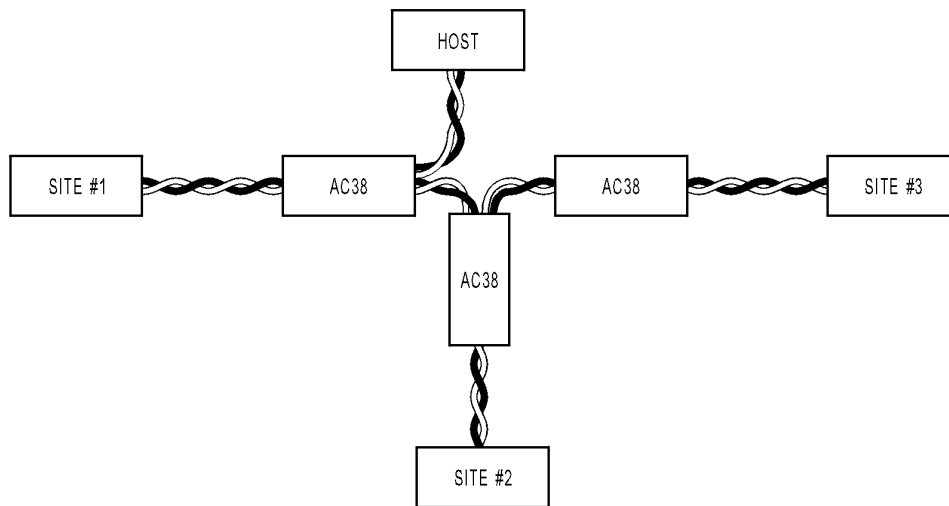
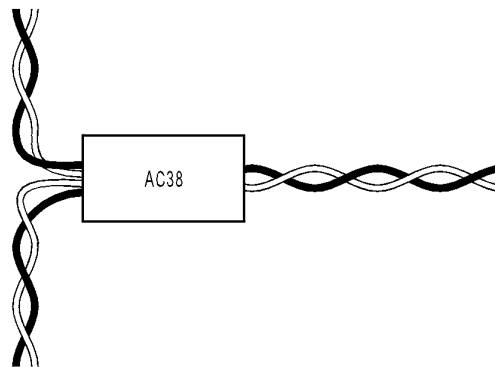
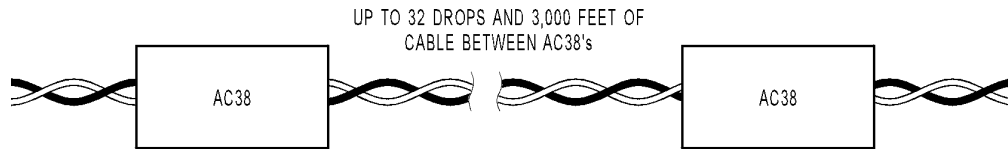
#### RS-232 TO RS-485 ADAPTER

The RS-232 port is designed to connect directly to an IBM AT RS-232 serial COM port, allowing it to be the host (master) of an Opto 22 Remote I/O Bus. The AC38 will convert the RS-232 signal to RS-485 while maintaining electrical isolation between the two links. NOTE: The RS-232 port will automatically echo-back any data transmitted out of it, and it will receive communication coming from either the HOST or REMOTE RS-485 ports provided it does not exceed 38.4 KBd.

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### 4-WIRE RS-485/422 TO 2-WIRE RS-485 ADAPTER

The AC38 may be used to convert RS-422 signals to RS-485. Many RS-422 communication ports do not have the ability to enable and disable the drivers used to transmit data and therefore cannot be used on a two-wire network. (The Remote I/O Bus is a two-wire communications network) The host RS-485 port of the AC38 may be used with either 4-wire or 2-wire communication lines. The AC38 will transfer data to and from the 2-wire network on the Remote port while maintaining electrical isolation from the host link.

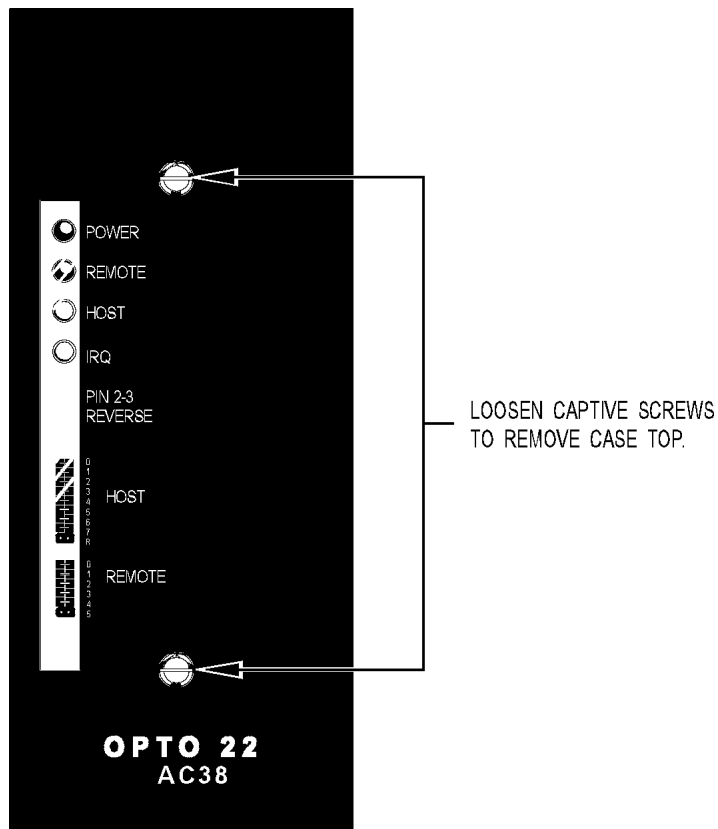


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When configuring RS-485 communication lines, it is important to remember that it must be terminated at each END of the link and that each link may have only TWO ends. Wiring RS-485 communication lines in a 'star' configuration is not permitted. If it is necessary to run a link in multiple directions, an AC38 may be used to bridge electrically separate links.

### DISASSEMBLY

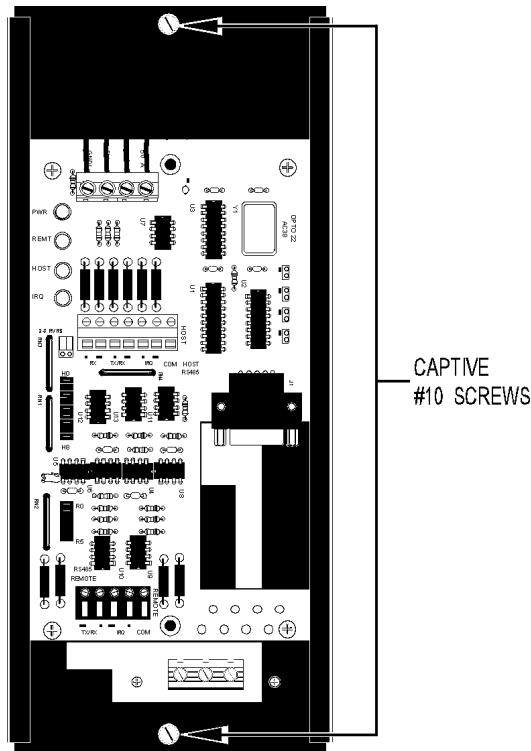
The AC38 must be disassembled to access the mounting hardware, power and communications connectors. The case is opened by turning the two captive screws on the top of the AC38 counterclockwise.



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### MOUNTING

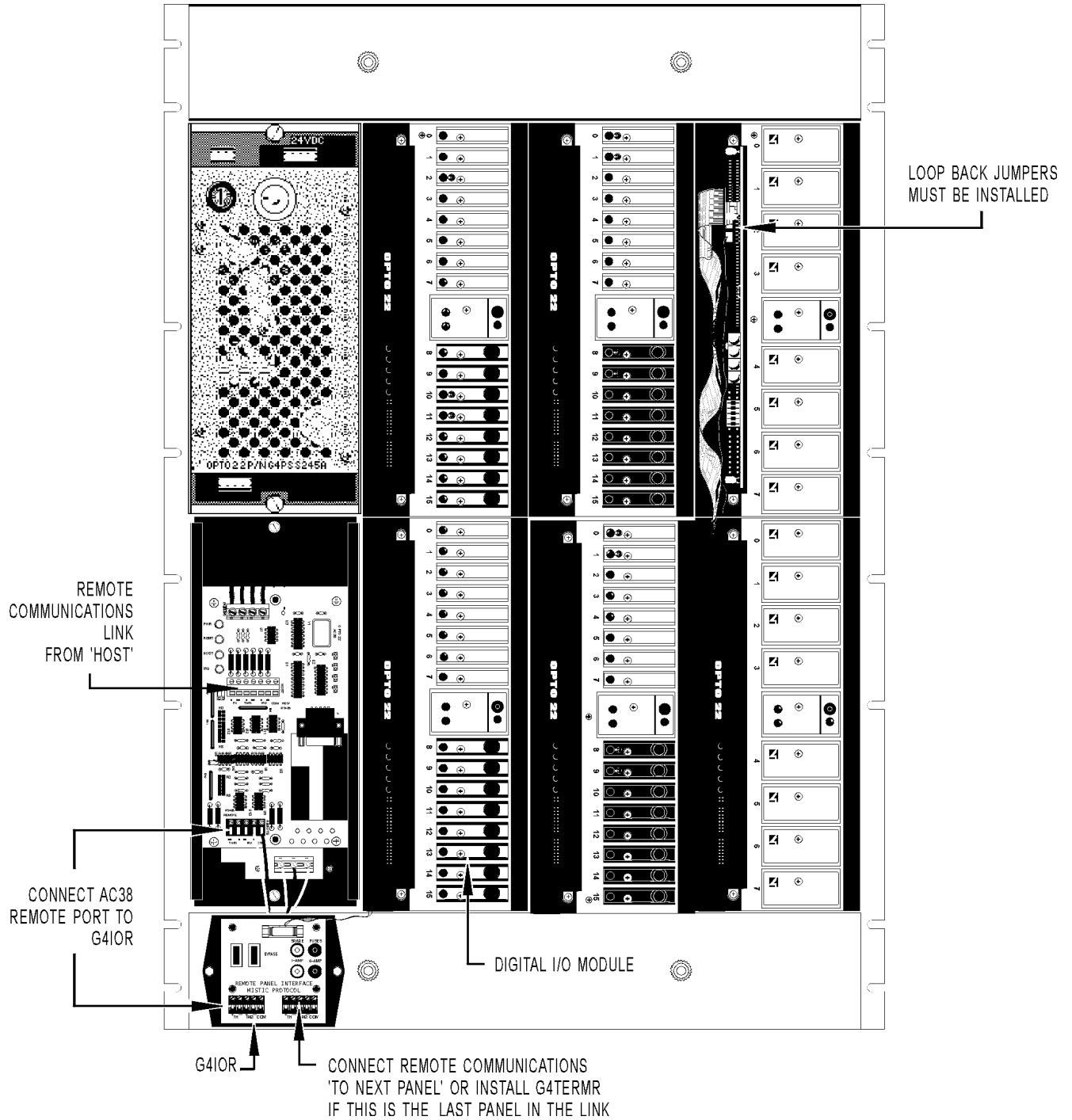
The bottom case half has two captive #10 screws for mounting. If the AC38 is being mounted in a Mystic panel, it is typically mounted in the bottom left corner of the panel.





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### REMOTE PANEL WIRING



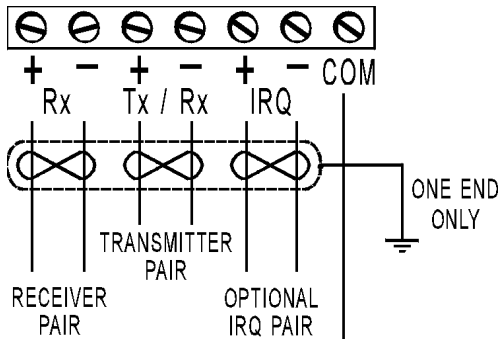


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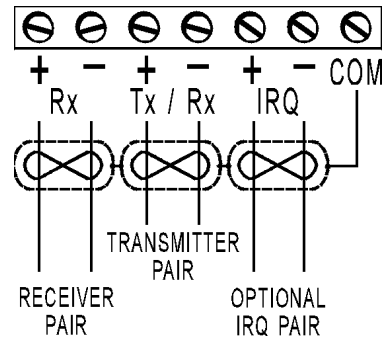
### RS-485 CONNECTION

The AC38 has two RS-485 ports; the host port and the remote port. The remote port is 2-wire hook up only; the host port can be 2-wire or 4-wire. When the AC38 is being used to repeat a Mystic remote communications link, the host port will be wired for 2-wire operation. The IRQ line only repeats from the remote port to the host port.

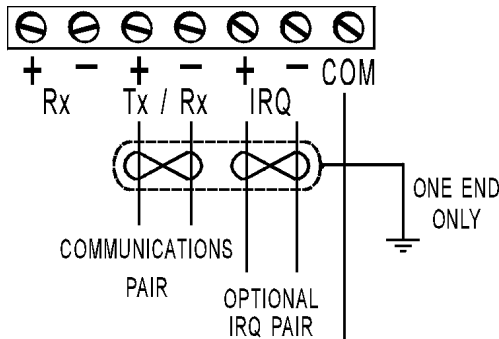
The following diagrams show recommended and alternate wiring for host 4-wire and 2-wire connections and for remote 2-wire connections.



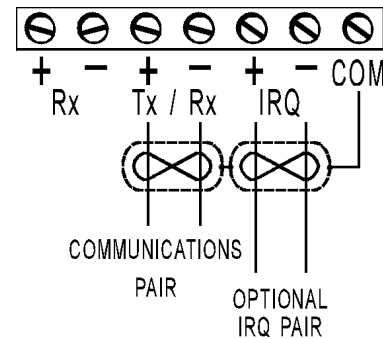
**Recommended Host RS-485 4-Wire Connection**



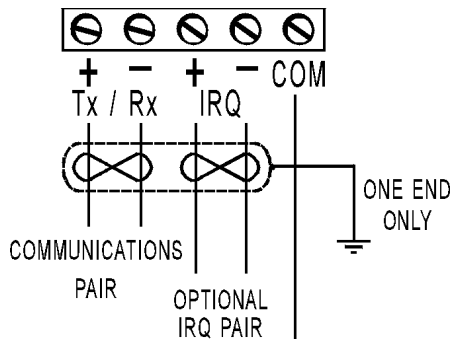
**Alternate Host RS-485 4-Wire Connection**



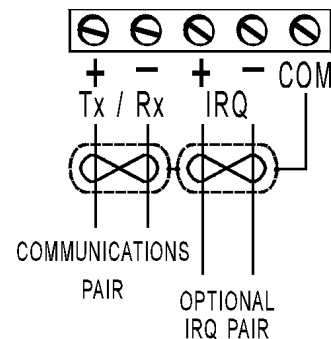
**Recommended Host RS-485 2-Wire Connection**



**Alternate Host RS-485 2-Wire Connection**



**Recommended Remote RS-485 2-Wire Connection**



**Alternate Remote RS-485 2-Wire Connection**

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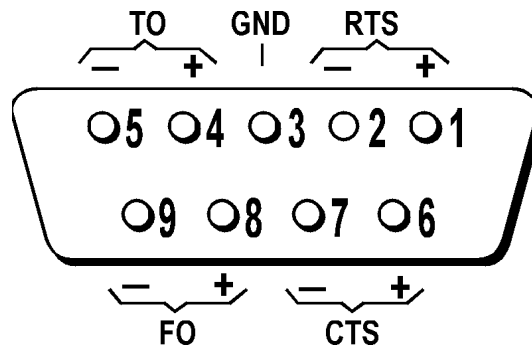
### RS-232 CONNECTION

The AC38 has an RS-232 option for the host port which has been designed to connect directly to an IBM AT serial COM port. The RS-232 and RS-485 host port connections should not normally be used at the same time. Baud rates of 38,400 or less are compatible while using the RS-232 port. The pin assignments for the RS-232 DB-9 connector are:

Pin:	1)	No Connection
	2)	RX/TX *
	3)	TX/RX *
	4)	N/C
	5)	Ground
	6)	No Connection
	7)	No Connection
	8)	CTS - Used as IRQ output from the AC38.
	9)	No Connection

With the '2 - 3 RVRS' jumpers installed in the upper position, pin 2 of the DB-9 connector will be the transmit output from the AC38 and pin 3 will be the receive input to the AC38. This is the factory installed configuration.

With the '2 - 3 RVRS' jumpers installed in the lower position, pin 2 becomes the receive input to the AC38 and pin 3 becomes the transmit output from the AC38.



HOST RS-232 CONNECTOR FEMALE DB-9

\* Using Jumper '2-3RVRS' to choose RX/TX

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**RS-485 SERIAL LINE TERMINATION AND BIASING**

Two groups of jumpers are provided which are used to connect terminating and biasing resistors. The group labeled H0 - H8 is used to configure the host RS-485 port while the group labeled R0 - R5 is used to configure the remote RS-485 port. The function of each jumper is as follows:

Jumper H0: Pull-up for host IRQ + line.

Jumper H1: Terminator for host IRQ lines.

Jumper H2: Pull-down for host IRQ - line.

Jumper R0: Pull-up for remote IRQ + line.

Jumper R1: Terminator for remote IRQ lines.

Jumper R2: Pull-down for remote IRQ - line.

Jumper H3: Pull-up for host TX/RX + line.

Jumper H4: Terminator for host TX/RX lines.

Jumper H5: Pull-down for host TX/RX - line.

Jumper R3: Pull-up for remote TX/RX + line.

Jumper R4: Terminator for remote TX/RX lines.

Jumper R5: Pull-down for remote TX/RX - line.

Jumper H6: Pull-up for host RX + line.

Jumper H7: Terminator for host RX lines.

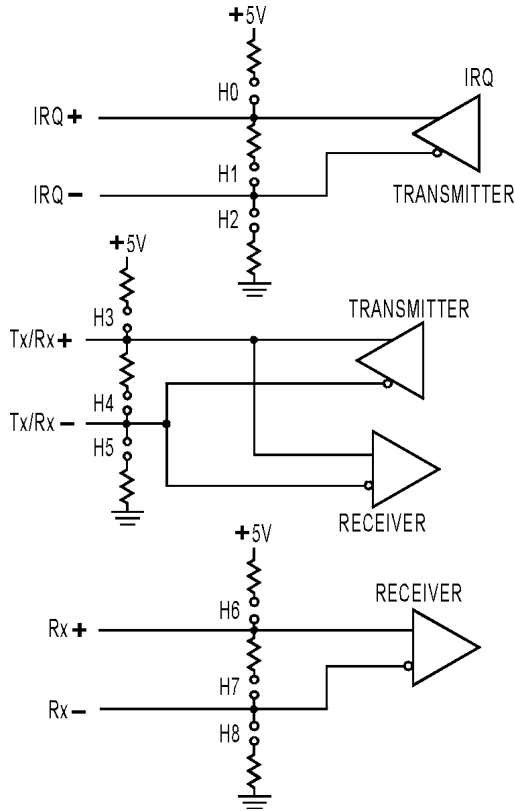
Jumper H8: Pull-down for host RX - line.

RS-485 communication links must be terminated at both ends and biased at only one place. When using a G4LC32 RS-485 serial port, biasing is done automatically when terminators are installed.

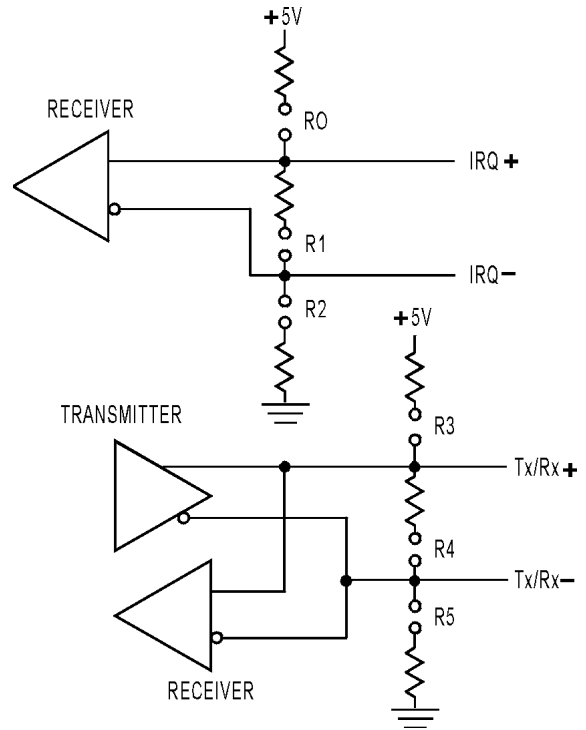
When using the AC38 as a simple, 2-wire repeater located at the end of both RS-485 links, jumpers H0, H1, H2, H4, H6, H7, H8, and all remote port jumpers, R0 - R5, should be installed. If biasing is needed on the host link, jumpers H3 and H5 should be installed.

When using the AC38 as an RS-232 to RS-485 converter, all host and remote port jumpers should be installed.

When the AC38 is used anywhere except the end of a link, the appropriate jumpers should be removed to disconnect terminating and biasing resistors.



A. HOST RS-485

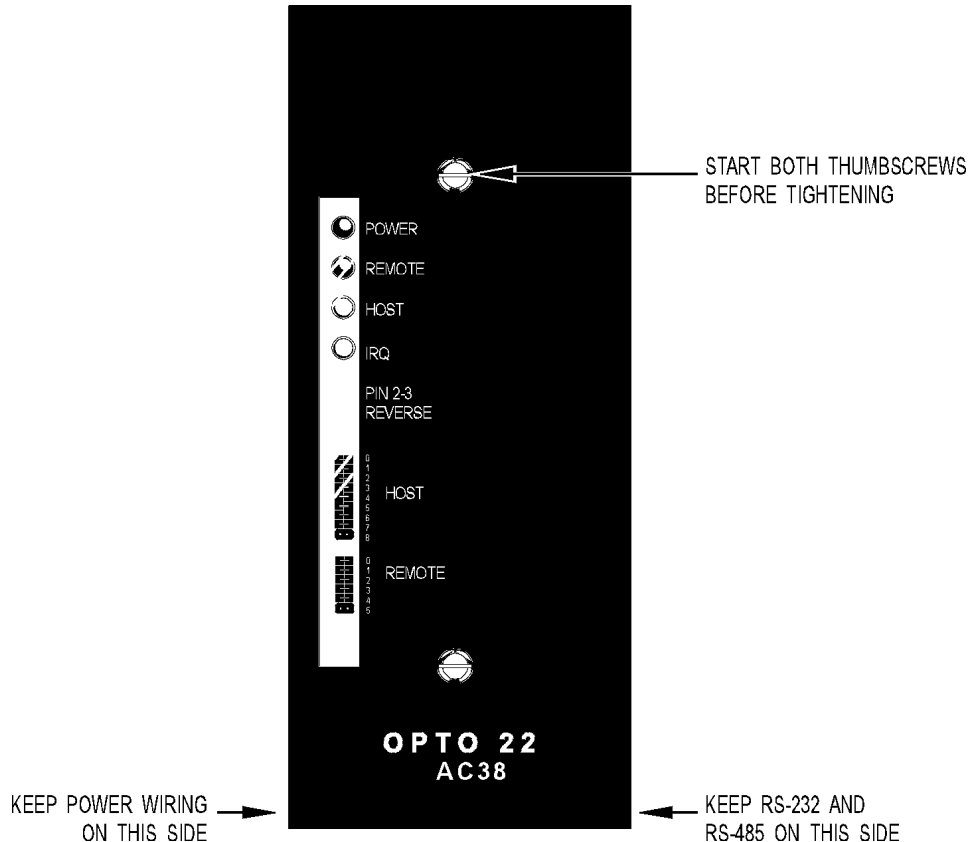


B. REMOTE RS-485

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### REASSEMBLY

After all connections and jumperings are complete, the AC38 can be reassembled. It is important all the wires are routed so they will not be pinched by the case top. After the case top has been placed on top of the case bottom, start both thumbscrews. Tighten both thumbscrews evenly until the top case is secured.



### LEDS

When power is applied to the AC38, the green LED labeled PWR should glow. If it does not, check voltage and hook up of input power. When the LED labeled HOST is illuminated, data is being received from the host port and transmitted out the remote port. When the LED labeled REMOTE is illuminated, data is being received from the remote port and transmitted out the host port. When the LED labeled IRQ is illuminated, the remote port has activated the interrupt line.

### CABLES

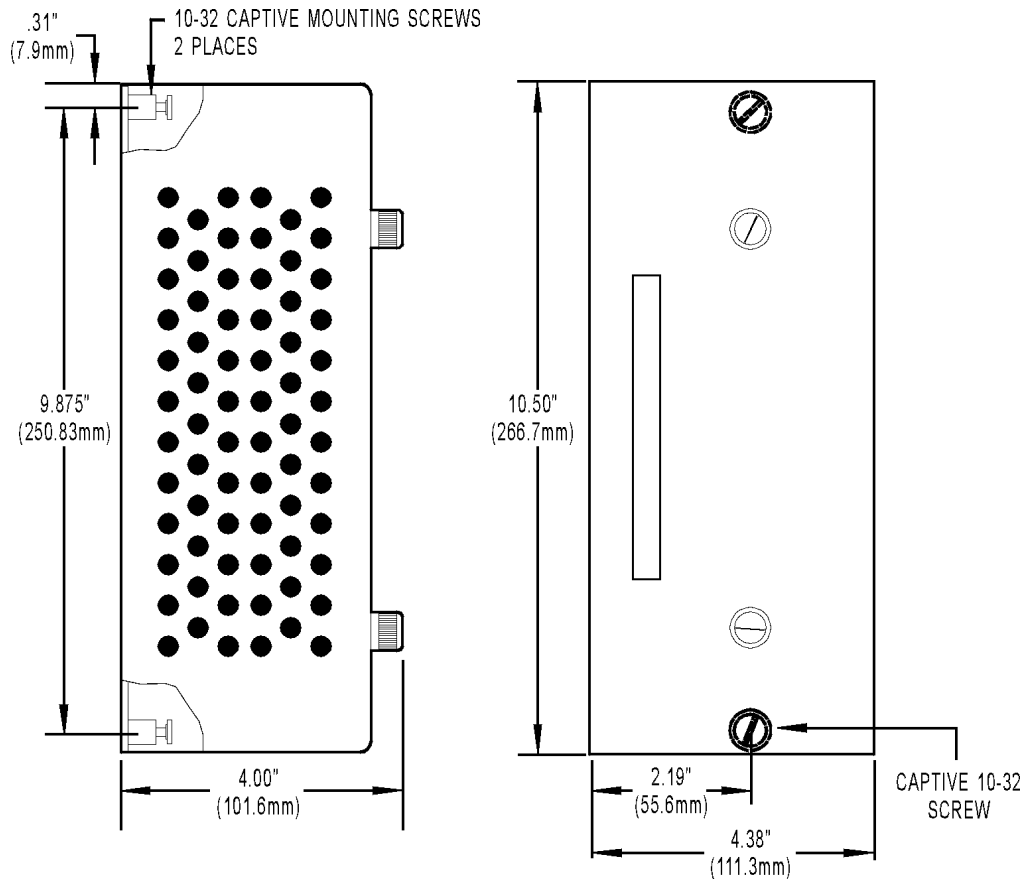
RS-485 serial lines require twisted pair cable. Maximum cable length is 3,000 feet. The recommended cable type is 2 twisted pair of 24 gauge conductors with a shield. Nominal impedance is 100 ohms and capacitance is 12.5 picofarads per foot. Typical manufacturer part numbers are:

**Manhattan Electric Cable - M3475**  
**Belden Wire and Cable - 9729**

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### DIMENSIONS



TOLERANCES .XX +/- .02 (.5) .XXX +/- .010 (.25)

## More About Opto 22

### Products

Opto 22 develops and manufactures reliable, flexible, easy-to-use hardware and software products for industrial automation, remote monitoring, and data acquisition applications.

### SNAP PAC System

Designed to simplify the typically complex process of understanding, selecting, buying, and applying an automation system, the SNAP PAC System consists of four integrated components:

- SNAP PAC controllers
- PAC Project™ Software Suite
- SNAP PAC brains
- SNAP I/O™

### SNAP PAC Controllers

Programmable automation controllers (PACs) are multifunctional, multidomain, modular controllers based on open standards and providing an integrated development environment.

Opto 22 has been manufacturing PACs for many years. The latest models include the standalone SNAP PAC S-series and the rack-mounted SNAP PAC R-series. Both handle a wide range of digital, analog, and serial functions and are equally suited to data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

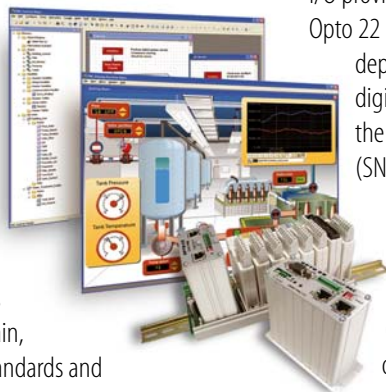
SNAP PACs are based on open Ethernet and Internet Protocol (IP) standards, so you can build or extend a system without the expense and limitations of proprietary networks and protocols.

### PAC Project Software Suite

Opto 22's PAC Project Software Suite provides full-featured and cost-effective control programming, HMI (human machine interface) development and runtime, OPC server, and database connectivity software to power your SNAP PAC System.

These fully integrated software applications share a single tagname database, so the data points you configure in PAC Control™ are immediately available for use in PAC Display™, OptoOPCServer™, and OptoDataLink™. Commands are in plain English; variables and I/O point names are fully descriptive.

PAC Project Basic offers control and HMI tools and is free for download on our website, [www.opto22.com](http://www.opto22.com). PAC Project Professional, available for separate purchase, adds OptoOPCServer, OptoDataLink, options for Ethernet link redundancy or segmented networking, and support for legacy Opto 22 serial *mistic*™ I/O units.



### SNAP PAC Brains

While SNAP PAC controllers provide central control and data distribution, SNAP PAC brains provide distributed intelligence for I/O processing and communications. Brains offer analog, digital, and serial functions, including thermocouple linearization; PID loop control; and optional high-speed digital counting (up to 20 kHz), quadrature counting, TPO, and pulse generation and measurement.

### SNAP I/O

I/O provides the local connection to sensors and equipment. Opto 22 SNAP I/O offers 1 to 32 points of reliable I/O per module, depending on the type of module and your needs. Analog, digital, serial, and special-purpose modules are all mixed on the same mounting rack and controlled by the same processor (SNAP PAC brain or rack-mounted controller).

### Quality

Founded in 1974 and with over 85 million devices sold, Opto 22 has established a worldwide reputation for high-quality products. All are made in the U.S.A. at our manufacturing facility in Temecula, California. Because we do no statistical testing and each part is tested twice before leaving our factory, we can guarantee most solid-state relays and optically isolated I/O modules for life.

### Free Product Support

Opto 22's Product Support Group offers free, comprehensive technical support for Opto 22 products. Our staff of support engineers represents decades of training and experience. Product support is available in English and Spanish, by phone or email, Monday through Friday, 7 a.m. to 5 p.m. PST.

### Free Customer Training

Hands-on training classes for the SNAP PAC System are offered at our headquarters in Temecula, California. Each student has his or her own learning station; classes are limited to nine students. Registration for the free training class is on a first-come, first-served basis. See our website, [www.opto22.com](http://www.opto22.com), for more information or email [training@opto22.com](mailto:training@opto22.com).

### Purchasing Opto 22 Products

Opto 22 products are sold directly and through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at 800-321-6786 or 951-695-3000, or visit our website at [www.opto22.com](http://www.opto22.com).

[www.opto22.com](http://www.opto22.com)