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# OPTO 22 DATA SHEET

# INTERFACES TRADITIONAL ADAPTER CARDS STAND-ALONE

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Part Number	Description
AC8	Half Duplex Modem Interface

## Description

### Introduction

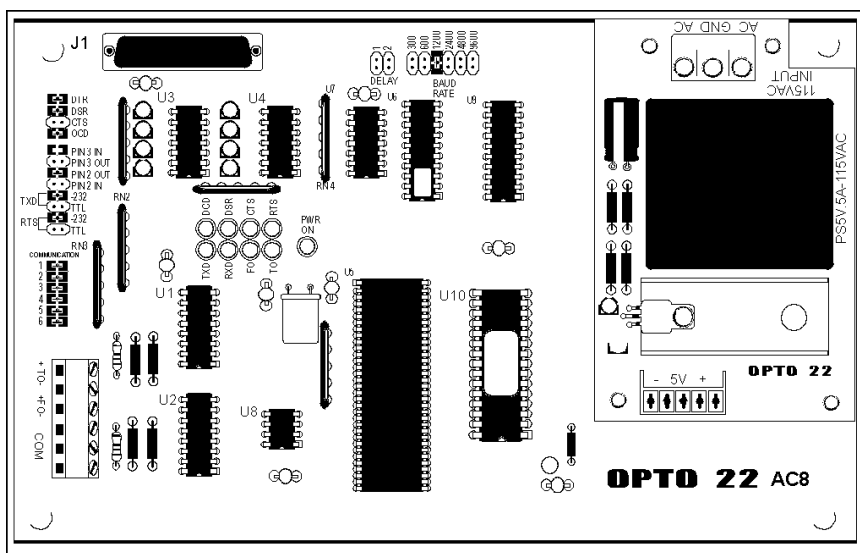
[Obsolete] The AC8 adapter card is a communications interface board that provides bi-directional RS-232 to half duplex RS-485/422 conversion, allowing half-duplex modems to be use with the Optomux network.

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 on-board 115 VAC power supply.

### General information

Optomux uses a RS-422/485 serial communications link. Most modems use the RS-232 serial standard. In addition, modems may be either full- or half-duplex. Half-duplex communication requires flow control which the full-duplex Optomux protocol does not support. The AC8 serves two functions: it provides RS-422/485 conversion to RS-232, and also provides the flow control signals required for half-duplex communication.



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#### Features

The AC8 includes the following features:

- Baud rates of 300, 1200, 2400, 4800, and 9600 baud.
- LEDs to indicate the state of all modem control and data signals.
- Signal delay from Clear to Send (CTS) to beginning of data transmission adjustable to 1, 25, 100, or 500 milliseconds.

#### Specifications

##### AC8 and AC8A 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

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### Power Supplies for the AC8

There are two versions of the AC8 adapter card. The AC8 requires a 5 VDC power source at about 500 milliamperes, and the AC8A requires a 120 VAC power source.

### Environmental Requirements

The operating temperature range of the AC8 is from 0° C to 60° C, while the storage temperature range is from -25° to 85° C. The relative humidity is from 10 to 95 %, non-condensing.

### Physical Description

The AC8 is a rectangular, printed circuit board designed to bolt to a panel inside an electrical enclosure. The layout of the AC8 is the same for both versions of the AC8 adapter card.

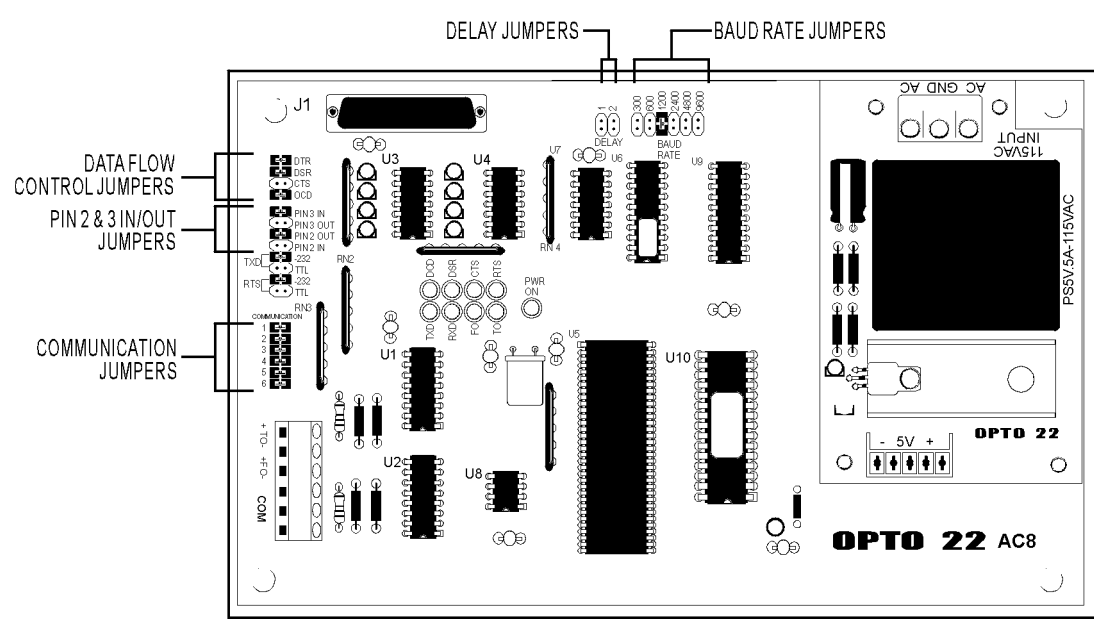


Figure 1 - Dimensions and Layout of the AC8 Adapter Card

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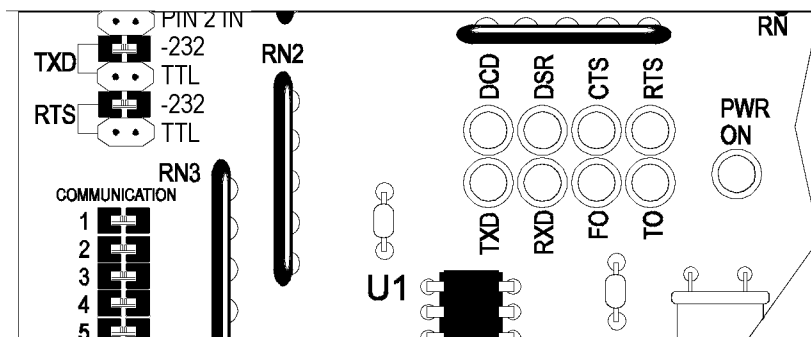
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### LED Indicators

There are nine LEDs on the AC8, which indicate power, control and data signals



**Figure 2 - Layout of the AC8 LED's**

The following table lists the LEDs and their descriptions. The LEDs indicate the state of the RS-232 signals with the exception of the PWR ON, FO, and TO LEDs. The PWR ON is on when power is applied to the AC8 adapter card. The FO (From Optomux) and TO (To Optomux) LEDs refer to the RS-422/485 receive and transmit data signals, respectively.

LED	Description	LED	Description
TXD	Transmit Data	DCD	Data Carrier Detect
RXD	Received Data	DSR	Data Set Ready
FO	From Optomux	CTS	Clear To Send
TO	To Optomux	RTS	Request to Send
PWR ON	Power On		

### Configuration Jumpers

There are five groups of configuration jumpers on the AC8 card. The configuration jumpers allow the user to configure the operation of the AC8. The five jumper groups are: delay, baud rate, data flow control, pins 2 & 3 in/out and communication.

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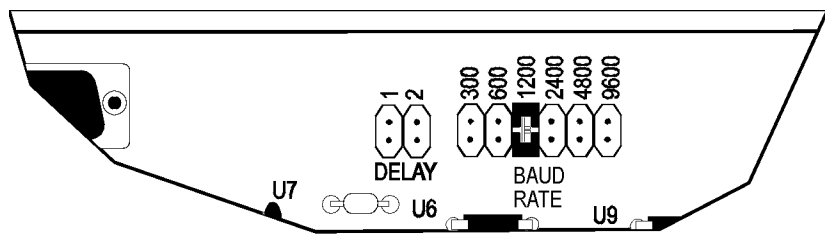
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### Delay

The delay jumpers (Figure 3, set the delay from the Clear To Send (CTS) line to the beginning of data transmission (TXD). For most modems, no delay is required and neither jumper is installed.

Delay 1	Jumpers 2	Delay Time
0	0	1 millisecond (default)
X	0	25 milliseconds
0	X	100 milliseconds
X	X	500 milliseconds



 = JUMPER INSTALLED

**Figure 3 - Jumpers for selectable Delay and Baud Rate**

### Baud Rate

The baud rate jumper (Figure 3) determines the baud rate of the AC8. Selectable baud rates are: 300, 600, 1200, 2400, 4800, and 9600. The AC8 must be set to the same baud rate as the modem and the Optomux network. The default baud rate is 1200 baud.

### Data Flow Control

This group of jumpers (Figure 4) configures the RS-232 interface (DTR, DSR, CTS, and DCD). The default jumper settings are to install jumpers DTR, DSR, and DCD. This means that the corresponding signals are not available from your modem. If the jumpers are installed, the above signals are always true.

The DTR jumper should be installed if your modem expects this signal. If the jumper is installed, the signal is always true. This signal can be used by a modem to determine if an AC8 is connected and operating.

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### Pin 2 & 3 In/Out

The pin 2 & 3 In/Out jumpers (Figure 4) allow the AC8 to be used with either a null modem (pin 2 to 3 and pin 3 to 2) or a straight-through (pin 2 to 2 and pin 3 to 3) cable. The default jumper setting is for the straight-through cable, jumpers on PIN 3 OUT and PIN 2 IN. To configure for a null modem cable, install jumpers on PIN 3 IN and PIN 2 OUT.

Also included in this group of jumpers are the RS-232 or TTL level selection for the TXD and RTS lines. The default jumper settings are RS-232 on both the TXD and RTS lines. If your modem uses TTL signal levels, install both TTL jumpers and remove the RS-232 jumpers.

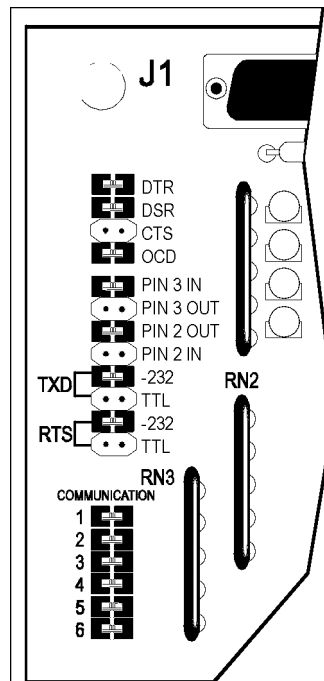


Figure 4 - Jumpers for the Data flow Control and Pins 2 and 3

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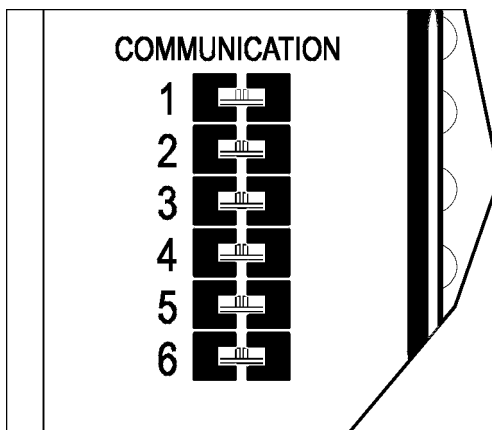
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#### Communication

The communication jumpers (Figure 5) set the pull-up, pull-down and terminating resistors for the RS-422/485 signal (FO and TO). The default setting is to have all six (6) jumpers installed. Default settings should be used.

LED	Description	LED	Description
TXD	Transmit Data	DCD	Data Carrier Detect
RXD	Received Data	DSR	Data Set Ready
FO	From Optomux	CTS	Clear To Send
TO	To Optomux	RTS	Request to Send
PWR ON	Power On		



 = JUMPER INSTALLED

Figure 5 - Jumpers for the Optomux Communication

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### Installation

#### Installing the AC8

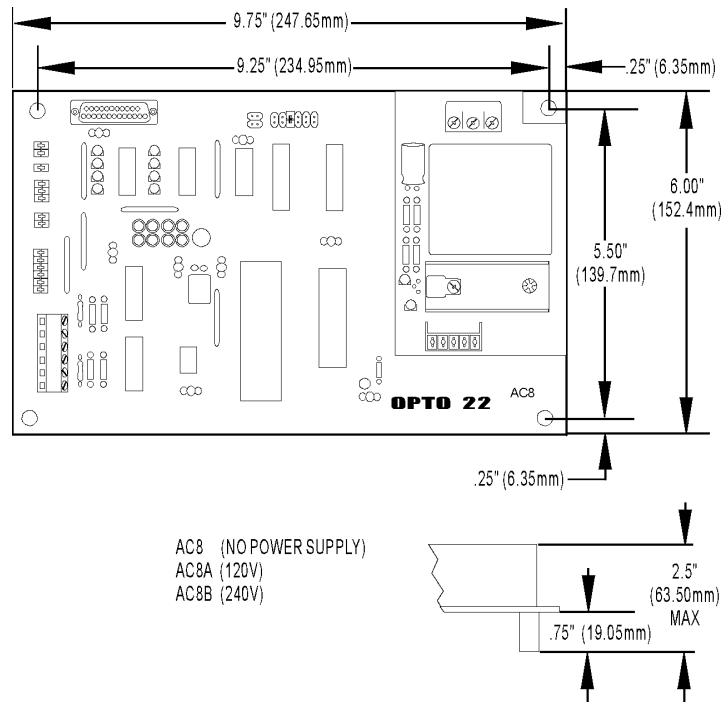
The following tools and materials are necessary for installing the AC8

- Drill and tap for #6 screws or equivalent
- Medium sized, flat-blade screwdriver
- Wire stripper
- Mounting hardware, #6 or equivalent
- Variety of color-coded wires, #22 AWG or larger
- A standard DB25, RS-232 data cable with a male connector for the AC8 end

**Caution:** Before connecting or disconnecting anything, turn off the power on the Optomux network and the modem. This is absolutely necessary; as with power applied, it is possible to damage the circuits.

#### Mounting the AC8 Adapter Card

The AC8/AC8A/AC8B (Figure 6), is designed to operate inside an electrical enclosure. Mount the AC8 to a surface with screws through the four stand-offs in the corners of the AC8 adapter card. The AC8 can be mounted in any physical orientation.



**Figure 6 - Dimensions and Layout of the AC8 Adapter Card**



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### Connecting the AC8 to the Optomux Network

Connecting the AC8 to the Optomux Network is described below. "Optomux Network" refers to one or more B1 (digital) or B2 (analog) brain boards on a RS-422/485 serial communication link.

Follow these steps to connect the AC8 to an Optomux network:

1. Locate the +TO (+ To Optomux), -TO (- To Optomux), +FO (+ From Optomux), -FO (- From Optomux), and COM terminals. (There are two terminals for the COM signal on the AC8, both are internally jumpered together.)
2. Locate the corresponding terminal on the Optomux board. The labels on the Optomux board are: +TH (+ To Host), -TH (- To Host), +FH (+ From Host), -FH (-From Host), and COM.
3. Wire the AC8 to the Optomux network by connecting two twisted pairs of wire to the terminal strip. It is very important that the wires are twisted to negate possible noise signal on the wires.

AC8 Terminals	Optomux Terminals
+TO	+FH (From Host)
-TO	-FH
+FO	+TH (To Host)
-FO	-TH
COM	COM

### Connecting a Modem to the AC8

To connect a modem to the AC8, follow the steps below:

1. Connect the DB25 RS-232 cable to your modem.
2. The other end which will connect to the AC8, must be a male DB25 connector. The pinout of the AC8 connector is described below.

Pin Number	Description
1	Protective Ground
2	Transmit Data
3	Receive Data
4	Request to Send
5	Clear to Send
6	Data Set Ready
7	Signal Ground
8	Data Carrier Detect
20	Data Terminal Ready

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## **Operation**

### **Transmitting From Host To Optomux**

When the modem is operational and ready to receive a message from the host computer, it sets a true condition (positive voltage) on the DSR control line.

When the host computer establishes communication, the modem sets a true condition on the DCD control line.

When both DSR and DCD are true, AC8 passes any serial data appearing on the RXD signal line to the OPTOMUX network. If either DSR or DCD is not provided by the modem, you can jumper those signals to be permanently true on the AC8.

### **Transmitting From Optomux To Host**

When an Optomux brain board sends a reply on the Optomux network, the AC8 stores the message in its buffer. It sets a true condition on the control line.

When the modem receives the RTS signal, it reverses the direction of the communication link. It sets a true condition on the CTS control line and a negative condition on the DCD control line.

When the AC8 receives the CTS signal, it delays for 1, 25, 100, or 500 milliseconds, (depending on the delay jumper setting) before transmitting the message stored in its buffer.

When the buffer is empty, it sets a negative condition on RTS and the modem is free to reverse the direction of the communication link once more.

Please note that it may be necessary to increase the time-out time on the host computer's serial port when using the AC8.

If you have any problems interfacing with the AC8 Adapter Card, please call Opto 22 Product Support at 909-695-3080 or 1-800-835-OPTO (outside of California) for assistance.

## PRODUCTS

Opto 22 develops and manufactures reliable, easy-to-use, open standards-based hardware and software products. Industrial automation, process control, remote monitoring, data acquisition, and industrial internet of things (IIoT) applications worldwide all rely on Opto 22.

### groov RIO®

groov RIO edge I/O offers a single, compact, PoE-powered industrial package with web-based configuration and IIoT software built in, support for multiple OT and IT protocols, and security features like a device firewall, data encryption, and user account control.

Standing alone, groov RIO connects to sensors, equipment, and legacy systems, collecting and securely publishing data from field to cloud. Choose a universal I/O model with thousands of possible field I/O configurations, with or without Ignition from Inductive Automation®, or a RIO EMU energy monitoring unit that reports 64 energy data values from 3-phase loads up to 600 VAC, Delta or Wye.

You can also use groov RIO with a Modbus/TCP master or as remote I/O for a groov EPIC system.

### groov EPIC® System

Opto 22's groov Edge Programmable Industrial Controller (EPIC) system gives you industrially hardened control with a flexible Linux®-based processor with gateway functions, guaranteed-for-life I/O, and software for your automation and IIoT applications.

#### groov EPIC Processor

The heart of the system is the groov EPIC processor. It handles a wide range of digital, analog, and serial functions for data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

In addition, the EPIC provides secure data communications among physical assets, control systems, software applications, and online services, both on premises and in the cloud. No industrial PC needed.

Configuring and troubleshooting I/O and networking is easier with the EPIC's integrated high-resolution color touchscreen. Authorized users can manage the system locally on the touchscreen, on a monitor connected via the HDMI or USB ports, or on a PC or mobile device with a web browser.

#### groov EPIC I/O

groov I/O connects locally to sensors and equipment. Modules have a spring-clamp terminal strip, integrated wireway, swing-away cover, and LEDs indicating module health and discrete channel status. groov I/O is hot swappable, UL Hazardous Locations approved, and ATEX compliant.

#### groov EPIC Software

The groov EPIC processor comes ready to run the software you need:

- Programming: Choose flowchart-based PAC Control, CODESYS Development System for IEC61131-3 compliant programs, or secure shell access (SSH) to the Linux OS for custom applications
- Node-RED for creating simple IIoT logic flows from pre-built nodes
- Efficient MQTT data communications with string or Sparkplug data formats
- Multiple OPC UA server options
- HMI: groov View to build your own HMI viewable on touchscreen, PCs, and mobile devices; PAC Display for a

Windows HMI; Node-RED dashboard UI

- Ignition or Ignition Edge® from Inductive Automation (requires license purchase) with OPC-UA drivers to Allen-Bradley®, Siemens®, and other control systems, and MQTT communications

#### Older products

From solid state relays, to world-famous G4 and SNAP I/O, to SNAP PAC controllers, older Opto 22 products are still supported and working hard at thousands of installations worldwide. You can count on us for the reliability and service you expect, now and in the future.

## QUALITY

Founded in 1974, 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 test each product twice before it leaves our factory rather than testing a sample of each batch, we can afford to guarantee most solid-state relays and optically isolated I/O modules for life.

## FREE PRODUCT SUPPORT

Opto 22's California-based Product Support Group offers free technical support for Opto 22 products from engineers with decades of training and experience. Support is available in English and Spanish by phone or email, Monday–Friday, 7 a.m. to 5 p.m. PST.

Support is always available on our website, including [free online training](#) at OptoU, how-to [videos](#), [user's guides](#), the Opto 22 KnowledgeBase, and [OptoForums](#).

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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** (toll-free in the U.S. and Canada) or **+1-951-695-3000**, or visit our website at [www.opto22.com](http://www.opto22.com).

