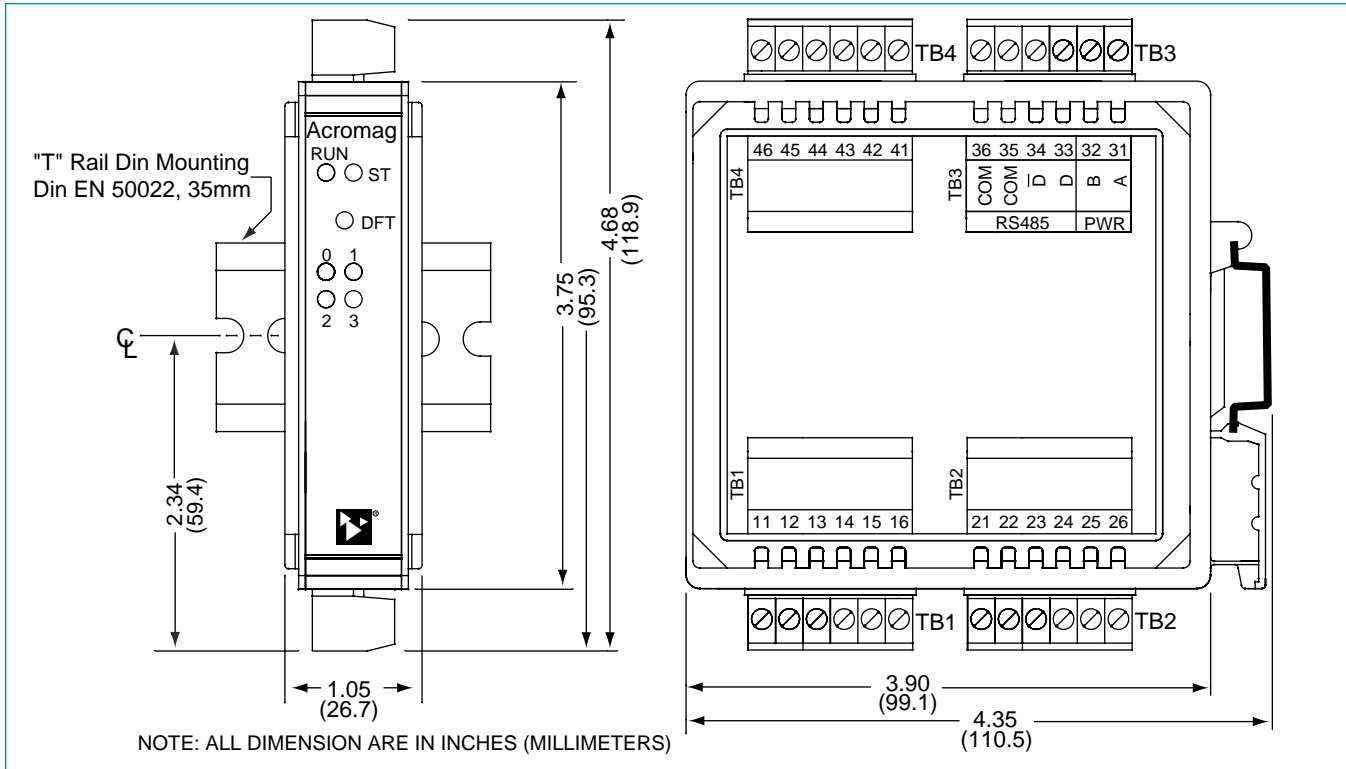




## 900MB Series Technical Diagrams

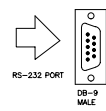


PERSONAL COMPUTER  
W/ WINDOWS 95/98 OR NT



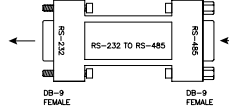
INSTALL MODBUS  
CONFIGURATION  
SOFTWARE

RS-232 SERIAL  
PORT CONNECTOR  
AT BACK OF PC



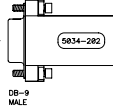
CONNECT THE RS-232  
SIDE OF CONVERTER  
TO THE PC

RS-232 TO RS-485 CONVERTER  
MODEL 5034-214



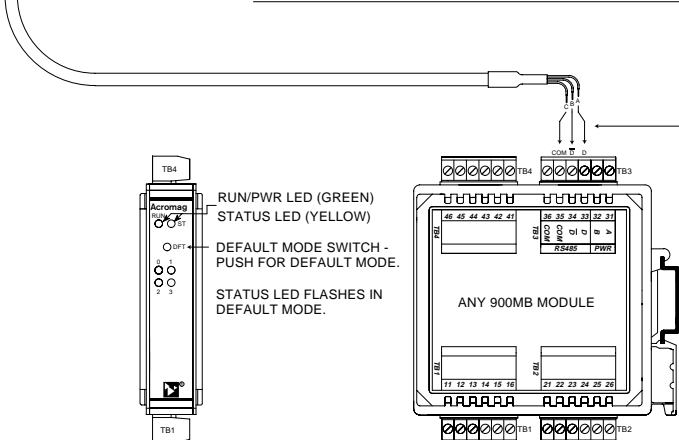
CONNECT THE RS-485  
SIDE OF CONVERTER  
TO THE CABLE

CABLE 5034-202



CAUTION: DO NOT CONNECT THE  
CABLE DIRECTLY TO THE PC WITHOUT  
THE CONVERTER, OR DAMAGE TO  
THE MODULE MAY RESULT.

### 900C-SIP COMMUNICATION CONNECTIONS



CONNECT WIRES AS SHOWN

WIRE	COLOR	RS-485
A	RED	D
B	BLACK	D̄
C	GREEN	COM

REFER TO THE USER'S MANUAL  
THAT CAME WITH YOUR MODULE  
TO COMPLETE THE MODULE'S  
POWER AND I/O CONNECTIONS

### USB-to-RS232 Adapter



Model 5034-225  
USB-to-RS232 adapter  
Length: 3.15 in (8.0 cm)  
Height: 0.80 in (2.03 cm)  
Width: 1.75 in (4.44 cm)  
Weight: 1.6 oz (45.36 g)



### Configuration Kit

Software Interface Package  
Model No. 900C-SIP

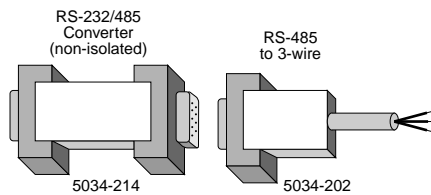
RS-485 Cable (DB-9)

RS-232 to RS-485 Converter (non-isolated)

Configuration Software for Windows 95/98/NT

## Software Interface Package

This package includes Windows® Configuration Software, an RS-232-to-485 Serial Port Converter, and an RS-485 Signal Cable. These components provide everything you need to set up a Series 900 I/O module from your desktop PC before installing it on the network.



### Ordering Information

- 900C-SIP  
Software Interface Package.  
Includes Configuration Software (5034-186), Non-isolated RS-232 to RS-485 Serial Port Converter (5034-214), and RS-485 Cable (5034-202).  
Items can also be ordered separately below.
- 5034-186  
Configuration Software for Windows (95/98/ME, NT4, 2000) on CD-ROM.
- 5034-214  
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.
- 5034-202  
RS-485 to 3-wire Cable Converter, DB-9M to 3 x 12AWG RS-485 Cable, 8 ft.

### Network Power

DC ON

OUTPUT 24VDC 2.1A

50W OUTPUT

PS5R-D24

V.ADJ

INPUT 50-250VAC 100-240VAC 1.15A

CE, UL LISTED, TUV

## Universal 50W Power Supply

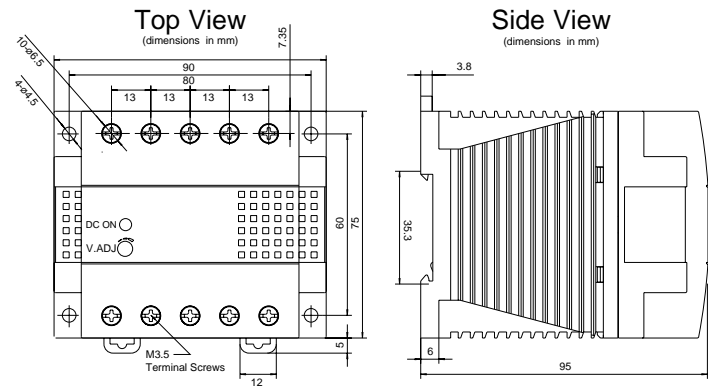
The PS5R-D24 is the ideal power source to drive your network.

**Input Power Requirement**  
Universal power  
85 to 264V AC,  
105 to 370V DC

**Output**  
24V DC, 2.1A (50W)

### Ordering Information

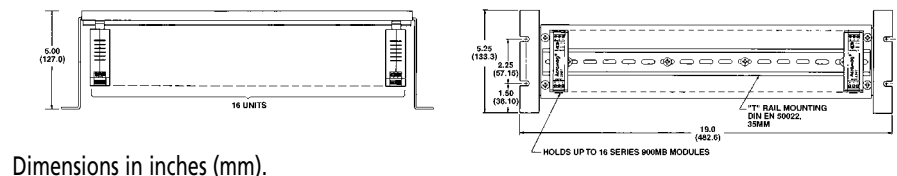
- PS5R-D24  
Universal Power Supply



### Mounting Hardware

## DIN-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.



Dimensions in inches (mm).



## RS-232 to RS-485



### 4SCC-TTM x Isolated Signal Converter

This unit provides an isolated interface between the host PC's RS-232 port and RS-485 Modbus network devices. Signal conversion is bidirectional with operation that is transparent to all devices. The RS-485 network supports up to 32 devices (including the 4SCC-TTM Converter) across 4000 foot distances. Installation of additional network devices or extending the distance requires the 4SCR-TTM Network Repeater.

### Specifications

**Baud Rates**  
Switch-selectable from 300 to 38.4K baud.

**Duplex**  
Half duplex only.

**Network Termination Resistors**  
Two terminal blocks and 120 ohm resistors provided to terminate both ends of the RS-485 network.

**Wiring Connectors**  
Terminal blocks with screw clamps for 14-26AWG.

**Operating Temperature Range**  
-25 to 60°C (-13 to 140°F).

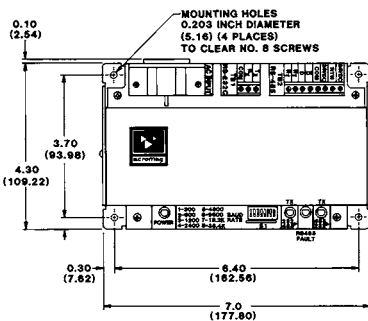
**Isolation**  
Withstands 1500V AC surge for 60 seconds (250V AC or 354V DC continuous).

### Ordering Information

**4SCC-TTM-1**  
Signal Converter, 115V AC (power cord included)

**4SCC-TTM-2**  
Signal Converter, 230V AC (power cord included)

**5020-924**  
Signal Cable, 8ft. long, DB-9 to three wires. Connects PC's RS-232 port to 4SCC-TTM-x.



Dimensions in inches (mm).

**Shipping Weight**  
3.0 lbs. (1.4 kg) packed.

BusWorks® Modbus I/O

## RS-485 to RS-485



### 4SCR-TTM x Isolated Network Repeater

This unit isolates and boosts RS-485 signals to extend communication distances or increase the number of devices on the network. Each Repeater permits the addition of a network branch with up to 32 devices (including the 4SCR-TTM) and will transmit RS-485 signals another 4000 feet. Operation is transparent to all devices and no handshaking is required. Two terminal blocks are provided for 120 ohm resistors to terminate both ends of the network branch.

### Specifications

**Baud Rates**  
Switch-selectable from 300 to 38.4K baud.

**Duplex**  
Half duplex only.

**Network Termination Resistors**  
Two terminal blocks and 120 ohm resistors provided to terminate both ends of the RS-485 network.

**RS-485 Wiring Connectors**  
Terminal blocks with screw clamps for 14-26AWG.

**Power Wiring Connections**  
Terminal block with screw clamps for 12-18AWG.

**Operating Temperature Range**  
-25 to 60°C (-13 to 140°F).

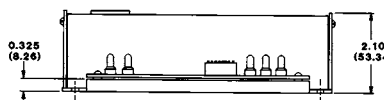
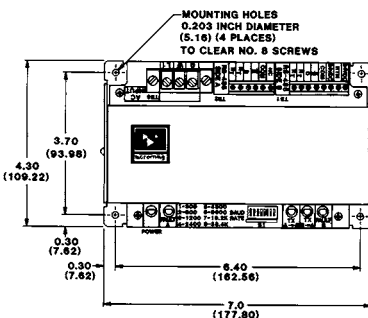
**Isolation**  
Withstands 1500V AC surge for 60 seconds (250V AC or 354V DC continuous).

### Ordering Information

**4SCR-TTM-1**  
Signal Converter, 115V AC power

**4SCR-TTM-2**  
Signal Converter, 230V AC power

**40LC-GBW-1**  
115V AC power cord

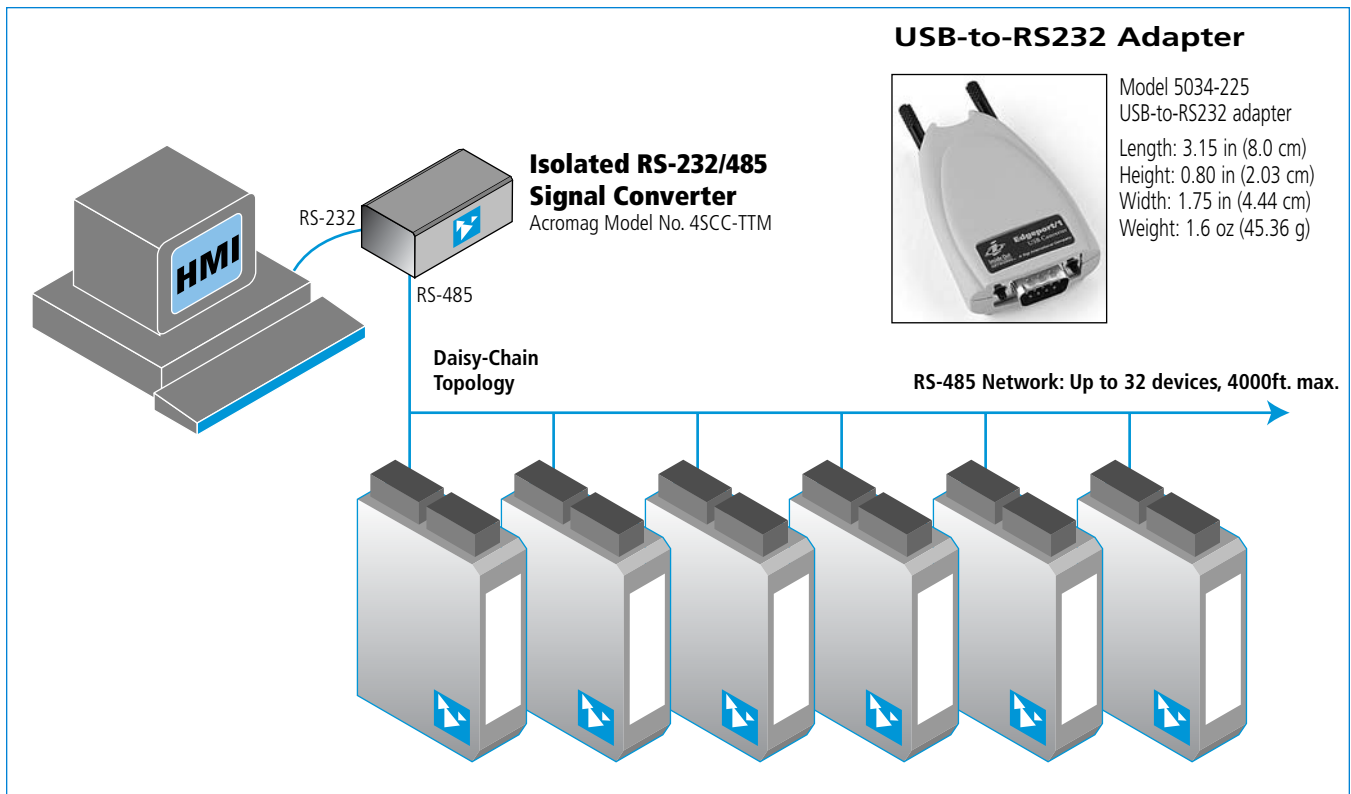


Dimensions in inches (mm).

**Shipping Weight**  
3.0 lbs. (1.4 kg) packed.

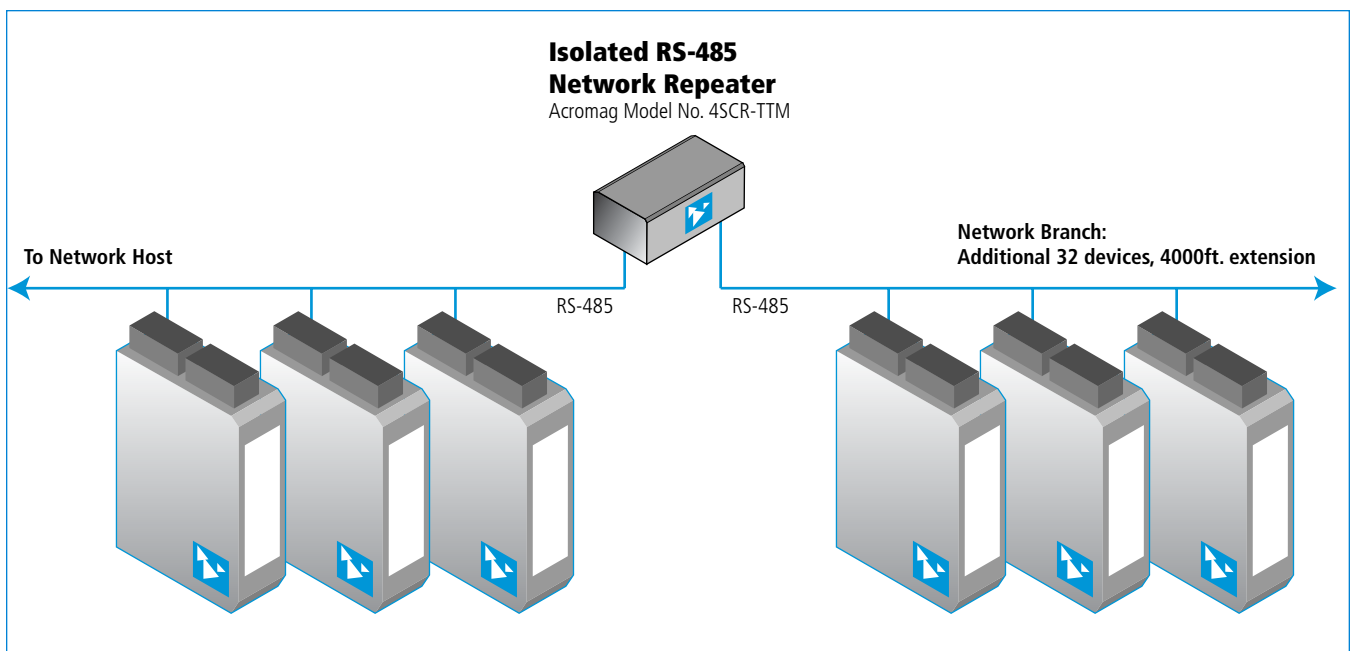


## System Connection



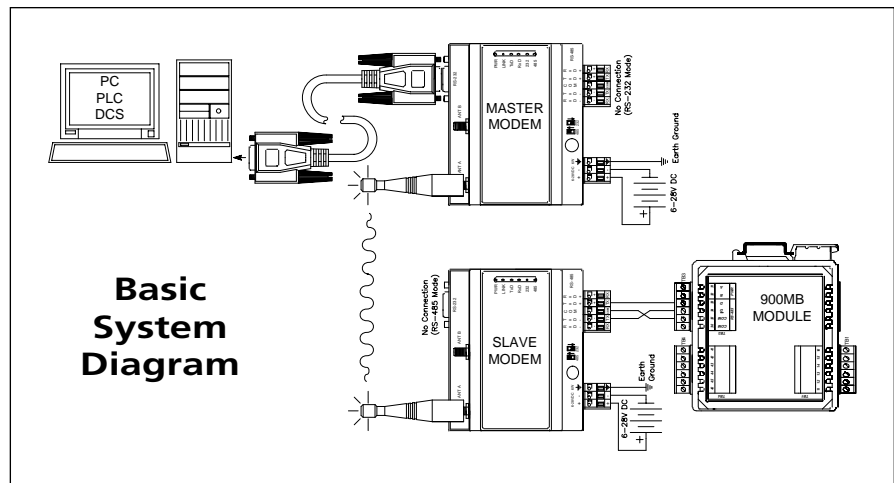
BusWorks® Modbus I/O

## Extending the Network





## Modbus/RS-485



**Basic System Diagram**

BusWorks® Modbus I/O

## OS2400-485 Radio Modem for Modbus

### Description

The OS2400-485 industrial grade spread spectrum radio modem uses advanced digital signal processing (DSP) to provide the ultimate in performance and reliability. The versatility of the DSP core and small, DIN rail-mountable form factor make the OS2400-485 ideally suited for your industrial and utility wireless applications.

The OS2400-485 operates in the license-free 2.4 GHz ISM band and can be used throughout the world with no site licenses or monthly leased line / wireless service fees.

### Serial Data Interface

RS-485, RS-422, RS-232

### Communication/Protocol

Asynchronous half/full-duplex, Modbus, DNP3. Data rates of 1200 bps to 115.2 Kbps full-duplex.

### Power Requirement

6 to 28V DC

### Operating Temperature

-40 to 75°C

### Approvals

CE marked. UL, cUL, FCC, Industry Canada, and Europe listed. Class I, Div 2, Groups A, B, C, D

### Special Features

- Universal RS-232/422/485 radio operates as a master, slave or as a repeater
- Secure, wireless, and license-free communication with ARC4 and 2.4 GHz FHSS technology
- Compact DIN rail-mount packaging with pluggable terminals
- Full-duplex asynchronous communication rates to 115.2 Kbps
- Low latency for real-time applications
- Integrated Modbus and DNP3 router
- Automatic antenna diversity (supports two antennae for local/long-distance)
- 32 unique, user-selectable data channels
- Supports network-wide diagnostics from any radio
- User programmable with easy to use, Windows-based software

### Applications

- Distributed I/O
- Industrial Automation
- Oil and Gas Field Monitoring
- SCADA
- Water and Waste Water Management

### Benefits

#### Peace of Mind

Designed for high interference environments, the OS2400-485 combines advanced frequency hopping and digital signal processing technology with outstanding receiver sensitivity and antenna diversity. The result is exceptional noise and interference rejection and peace of mind for you.

#### Flexibility

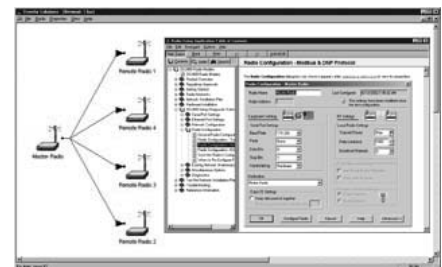
Configure the OS2400-485 to operate in point-to-point, broadcast, or point-to-multipoint modes. Addressable, multidrop RS-485 operation is built in. The RF output levels are user configurable and 32 data channels allow multiple networks to operate in the same area.

#### Speaks Your Language

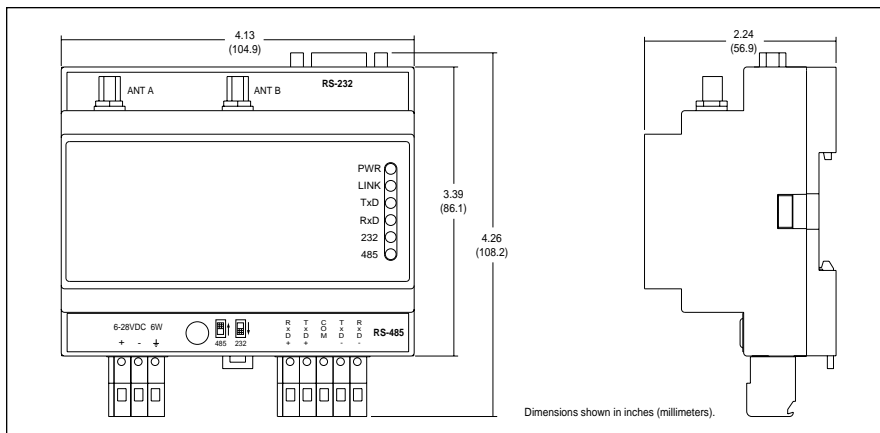
With integrated Modbus RTU support, this unit directly supports your industrial application's RS-232, 422, 485 or DNP3 data interfaces.

#### Easy to Use

Windows-based software for setup and remote diagnostics is included. A graphic interface makes the OS2400-485 easy to install and operate.



*Software simplifies configuration of your system.*



## Performance

### General

#### Physical

114 x 105 x 59 mm (4.5" W x 4.12" H x 2.32"D).  
224 grams (8 ounces).

#### Antenna

Two RP SMA connectors; automatic antenna diversity.  
Supports two antennas for superior reception and operation as a "repeater" device.

#### Typical Indoor Range

150 to 450 meters.

#### Typical Outdoor Range

3+ kilometers with 2dbi omni antenna; up to 25 kilometers line of sight with high gain antennas.

#### Software

Windows-based user setup, diagnostic, and communication software (included with Setup Kit and each modem purchase).

### Data Interface

#### Serial Data Interface

RS-485, RS-422, RS-232.

#### Communication

Asynchronous half/full-duplex, Modbus and DNP3.

#### I/O Data Rate

1200 bps to 115.2 Kbps full-duplex.

#### Network Topology

Point-to-point, store & forward repeater, point-to-multipoint, and peer-to-peer (DNP3 only).

#### Hop Patterns

32 user selectable, non-interfering, networks.

#### Error Detection / Correction

32 bit CRC with ARQ (Automatic Re-Send Query).

#### Encryption

ARC4 (40 bit).

#### Latency

<20 ms.

### Environmental

#### Ambient Temperature

Operating: -40 to 75°C.

#### Humidity

To 90% RH (noncondensing).

#### Power

Supply Voltage: 6 to 28V DC.

Power (Average): 2.5W master, 1.25W remote.

#### Approvals

FCC listed (FCC Part 15.247).

Industry Canada listed (RSS 210).

Europe listed (ETSI300.328, ETSI 300.826, EN60950).

CSA marked (C22.2 No. 142-M1987, 213-1987).

UL listed (UL1604 Class 1: Div. 2; Groups A,B,C,D Temp. Code: T4A).

### Transceiver Characteristics

#### Frequency

2.4 to 2.4835 GHz for USA; varies for other countries.

#### Radio Type

Frequency hopping spread spectrum (FHSS).

#### Number of Frequency Channels

79 for USA; varies for other countries.

#### Output Power

1 mW to 250 mW, programmable.

#### Channel Data Rate

250 Kbps.

#### Receiver Sensitivity

-96 dBm @ 10<sup>-6</sup> BER.

#### Adjacent Channel Rejection

> 40 dB.

#### Spurious Rejection

> 50 dB.

## Ordering Info

### Modems

#### OS2400-485-SK1\*

Starter Kit #1-US and Canada  
Includes: 2 each OS2400-485-1 modems

#### OS2400-485-SK2\*

Starter Kit #2-Europe  
Includes: 2 each OS2400-485-2 modems

#### OS2400-485-1

Radio frequency modem: US and Canada

#### OS2400-485-2

Radio Modem: Europe

\* Each kit also includes:

Two 2dbi straight antennas, one 6 ft. DB9 serial cable, two power supplies, software, and user's manual (PDF)

### Cables

#### 5035-818

RP N bulkhead jack - RA RP SMA plug, 2 ft.

#### 5035-822

RP RA SMA plug - RP N plug, 2 ft.

#### 5035-957

RS232 communication cable, DB9, Male/Female, 6 ft.

### Antennas

#### 5035-888

Omni-directional straight, 2dbi, 2.4Ghz, RP SMA

#### 5035-876

Omni-directional articulating, 5dbi, 2.4Ghz, RP SMA

#### 5035-880

Omni-directional collinear, 8dbi, 2.4Ghz, RP N

#### 5035-884

Directional patch, 11dbi, 2.4Ghz, RP SMA

#### 5035-898

Omni-directional antenna mounting bracket, 8dbi

### Lightning Protection

#### 5035-945

RP N (female) jack - RP N (female) bulkhead jack

#### 5035-949

RP N (female) bulkhead jack - RP N (male) plug

### Miscellaneous

#### 5035-961

Power supply, 120V AC to 12V DC w/connector

#### 5035-971

Setup and diagnostic software on CD-ROM with user's manual (PDF format only) for OS2400-485

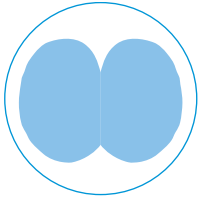
#### 5035-953

Antenna site survey kit



## OS2400 Antennas, Cables, and Lightning Protection

Omni-directional (2dBi)  
Model 5035-888



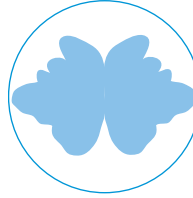
Side view of antenna pattern

Omni-dir. Articulating (5dBi)  
Model 5035-876



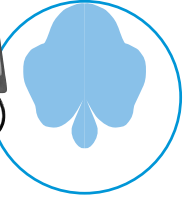
Side view of antenna pattern

Omni-dir. Collinear Array (8dBi)  
Model 5035-880



Side view of antenna pattern

Directional Patch (11dBi)  
Model 5035-884



Side view of antenna pattern

### Choosing the Right Antenna

Link Gain is a composite of the gains of each of the antennas (the Master's antenna and the Remote's antenna) as well as any cable loss. For example, if you want to communicate over a 2 mile (3.2km) unobstructed distance, you should include at least 7dB of Link Gain.

Master antenna gain: 8 dBi (Omni-directional xxx-xxxx)  
Remote antenna gain: 8 dBi (----)  
Cable at the Master: -2 dBi (4 feet or 1.2 meters)  
Cable at the Slave: -5 dBi (10 feet or 3.0 meters)  
Total Link Gain: 9 dBi

More gain will give you more distance. It doesn't make any difference whether the gain is on the Master or the Remote radio. The gains of the two antennas is additive.

Make the choice for each antenna pair (if you have a point-multipoint system).

### Distance Chart

The chart to the right has been adjusted to allow for 10dB of "margin" in your system. This margin accounts for expected changes in the environment during operation.

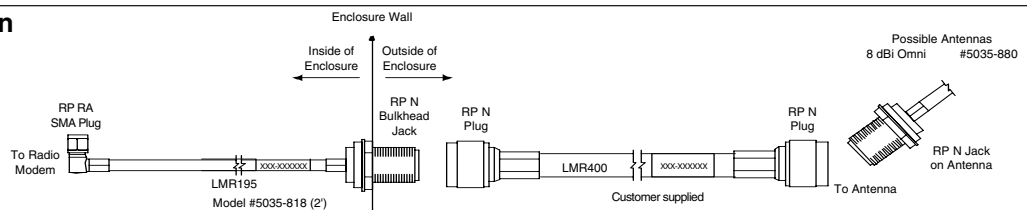
Link Gain (dB)	*Unobstructed Distance
35	15 mi (24.2 km)
30	12 mi (19.4 km)
25	10 mi (16.1 km)
15	5 mi (8.0 km)
7	2 mi (3.2 km)
4	1 mi (1.6 km)

\* Radio power set to Max.

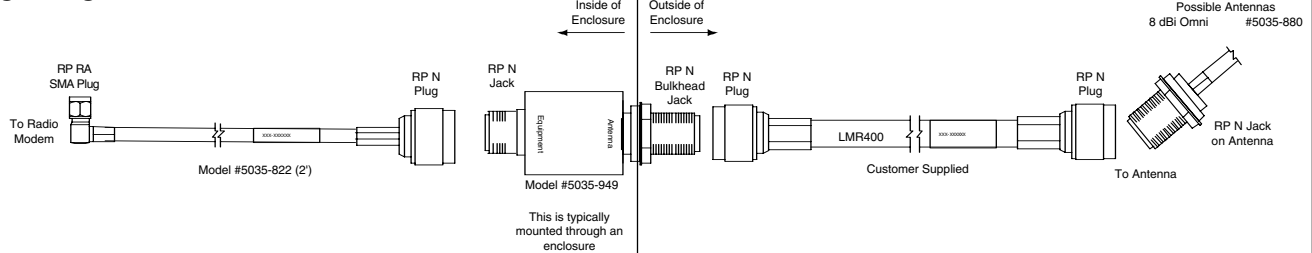
NOTE: Contact factory for a reference list of antenna and cable suppliers if needed.

### No Lightning Protection

RP = Reverse Polarity  
RA = Right Angle



### Lightning Protection Inside Box



### Lightning Protection Outside Box

