

**AXxess Interface Module**  
**RS-485 and Fiber Optic Local Bus**  
**Installation and**  
**Troubleshooting Manual**

***MAX***  ***xess***

# Contents

<b>Introduction .....</b>	<b>5</b>
<b>AXxess Interface .....</b>	<b>6</b>
<b>Overview .....</b>	<b>6</b>
<b>Operating Modes .....</b>	<b>6</b>
<b>Connections .....</b>	<b>7</b>
RS-232 to Computer .....	7
Power Supply .....	7
RS-485 Bus .....	8
Fiber Optic Bus .....	8
<b>RS-485 Multidrop Communication .....</b>	<b>9</b>
<b>RS-485 Specifications .....</b>	<b>9</b>
<b>RS-485 Installation .....</b>	<b>9</b>
<b>Fiber Optic Multidrop Communication .....</b>	<b>11</b>
<b>Fiber Optic Specifications .....</b>	<b>11</b>
<b>Fiber Optic Installation .....</b>	<b>11</b>
<b>Fiber Optic Cable Types .....</b>	<b>12</b>
<b>Fiber Optic Repeater .....</b>	<b>13</b>
<b>Short Haul Modems .....</b>	<b>14</b>
<b>Dial-up Connections .....</b>	<b>15</b>
<b>Jumpers .....</b>	<b>16</b>
<b>Troubleshooting .....</b>	<b>17</b>
<b>Lights .....</b>	<b>17</b>
<b>Waveforms .....</b>	<b>18</b>
RS-232 Signals .....	18
RS-485 Waveforms .....	18



# Introduction

---

This manual contains information for installing and troubleshooting the communication bus used to communicate between a PC running the AXxess 202 software and the attached panels.

This document contains the following sections:

- AXxess Interface
- RS-485 Multidrop Communication
- Fiber Optic Multidrop Communication
- Fiber Optic Repeater
- Short-haul Modems
- Dial-up Connections
- Jumpers
- Troubleshooting

new art here

# AXxess Interface

---

## Overview

The AXxess Interface is an RS-232/RS-485/Fiber Optic converter. It is designed to interface between a computer with an RS-232 serial port and panels which communicate using either RS-485 multidrop protocol or multimode fiber optic cable with ST connectors. The unit is built using Surface Mount Technology (SMT) in order to reduce power and size and improve reliability.

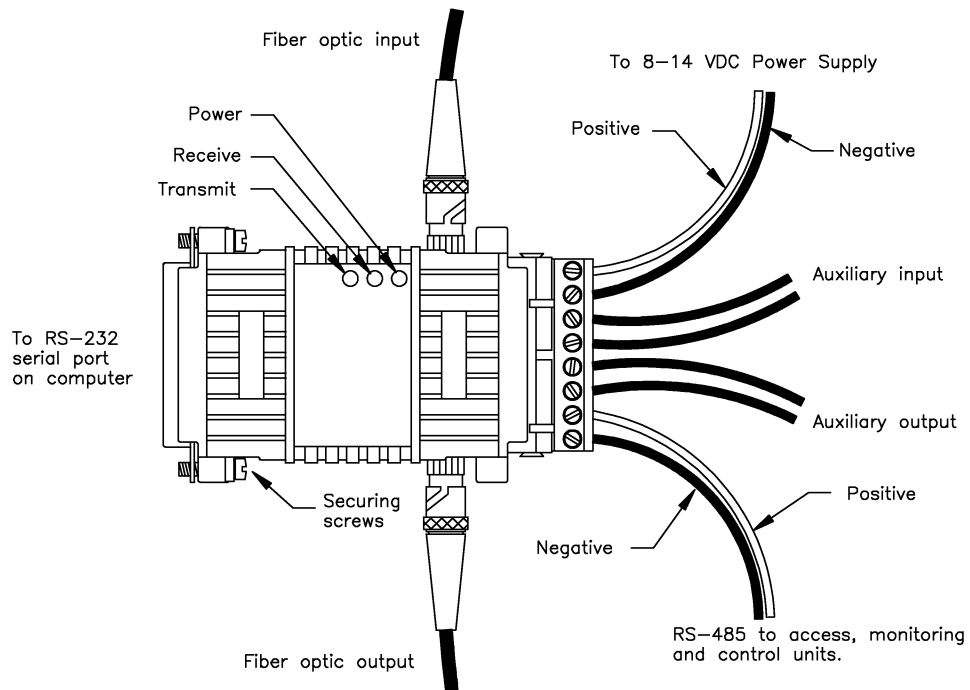


Figure 1

## Operating Modes

The AXxess Interface can be run in a variety of modes. The standard operating modes of the module can be used without modifying the unit from its factory defaults. However, there are several internal jumpers used for some operating modes, including:

- RS-232 and RS-485
- RS-232 and Fiber
- RS-485 and RS-485
- Fiber Booster

# Connections

The connections to the AXxess Interface are shown above in Figure 1 and are described in the following paragraphs.

## **RS-232 to Computer**

This connector is used to interface to an RS-232 port on the system controller computer. The signals used by the AXxess Interface from the RS-232 interface are as follows:

<u>Pin</u>	<u>RS-232 name</u>	<u>Function</u>
1	SHIELD	Connected to the computer frame and cable shield
2	TX	Data transmitted to the converter from the computer
3	RX	Data received from the converter by the computer
4	RTS	Enable for the RS-485 driver (OFF to transmit)
6	DSR	Auxiliary input (ON when closed)
7	GROUND	Signal ground to computer

## **Power Supply**

The unit requires 8 to 14 volts DC to operate. A 120 VAC to 9 VDC power supply is shipped with the unit in the domestic market. The power supply is not supplied with units shipped internationally.

Normally, the power supply will be plugged into the same mains outlet as the computer and will have uninterruptable power if the computer is so equipped.

Optionally, to provide power during extended power outages, the unit can be powered from a 12 VDC Back Up Power Supply (BUPS). This, however, is unnecessary unless the computer is equipped with a back-up supply.

The power supply is connected to the appropriate terminals on the converter.

---

### **✘ Caution**

Observe correct polarity when connecting the power supply to the converter otherwise it will not work.

---

## RS-485 Bus

The RS-485 specification defines the voltage levels for transmitting messages between multiple devices. There are two versions of the specification for using either a 2-wire or a 4-wire bus. All access control products use the 2-wire bus neither of which are grounded.

---

✓ **Note**

The communication protocol for the message content is not part of the specification. This protocol is determined by the devices connected to the RS-485 interface. Typical data can be NRZ, biphasic or one of several other standard formats.

---

The RS-485 interface uses a balanced wire pair which allows it to operate over relatively large distances with minimum susceptibility to interference.

Up to 35 unit loads can be connected directly to the AXxess Interface, however, only one unit can be transmitting or talking at any point in time. All other units will be receiving or listening. Every unit on the bus must have a unique address which is used in all communications to it.

Communication on the two wire bus is under the direction of the system controller. This unit will sequentially interrogate all units connected to the bus to determine if they are present and if they have any messages to communicate.

## Fiber Optic Bus

The fiber optic bus is a directional bus that must be looped from one unit to the next. After the last unit, the bus is routed back to the converter.

As the communication signal passes through each unit, it is amplified and retransmitted. Thus, there is really no limitation to the total bus length as long as individual sections do not exceed the recommended maximum.

# RS-485 Multidrop Communication

---

## RS-485 Specifications

---

Maximum number of units	100 with repeater
Connection method	Daisy chain
Interconnect wire	18 AWG [0.75mm <sup>2</sup> ] twisted, foil shielded
Maximum cable length	6000' [2 km] <sup>1</sup>
Maximum length of stubs	50' [15 m]
Baud rate	9600
Format	Non return to zero (NRZ)
Parity	Odd, even or none.
Bits	7 or 8
Stop bits	1
Response time	1-6 milliseconds (turn-around time)

---

✓ **Note**

<sup>1</sup> Actual maximum cable length can be affected by cable resistance, cable capacitance, site noise levels, data signaling rate and by routing.

---

# RS-485 Installation

**✘ Caution**

Observe correct polarity when connecting the RS-485 bus to the AXxess Interface otherwise it will not work correctly and damage may result to the AXxess Interface or to equipment connected to it.

When shipped from the factory, the AXxess Interface can operate as an RS-232 to RS-485 converter or as an RS-232 to Fiber Optic converter.

The two wires of the RS-485 multidrop bus are connected to the converter as shown in Figures 1 and 2. It is recommended that all RS-485 connections be made with 18 AWG (0.75mm<sup>2</sup>), shielded, twisted wire.

The RS-485 bus must be connected by daisy chaining from one unit to the next as shown in Figure 3. The RS-485 converter can be located anywhere in the bus.

In order to provide the best possible shielding for both radiated interference and for noise susceptibility and to comply with FCC regulations, the shields for the communication bus must be connected as shown in Figure 2.

The RS-485 bus must be terminated at both ends with 120 ohm resistors as shown in Figure 2. Failure to install these resistors results in inconsistent communication.

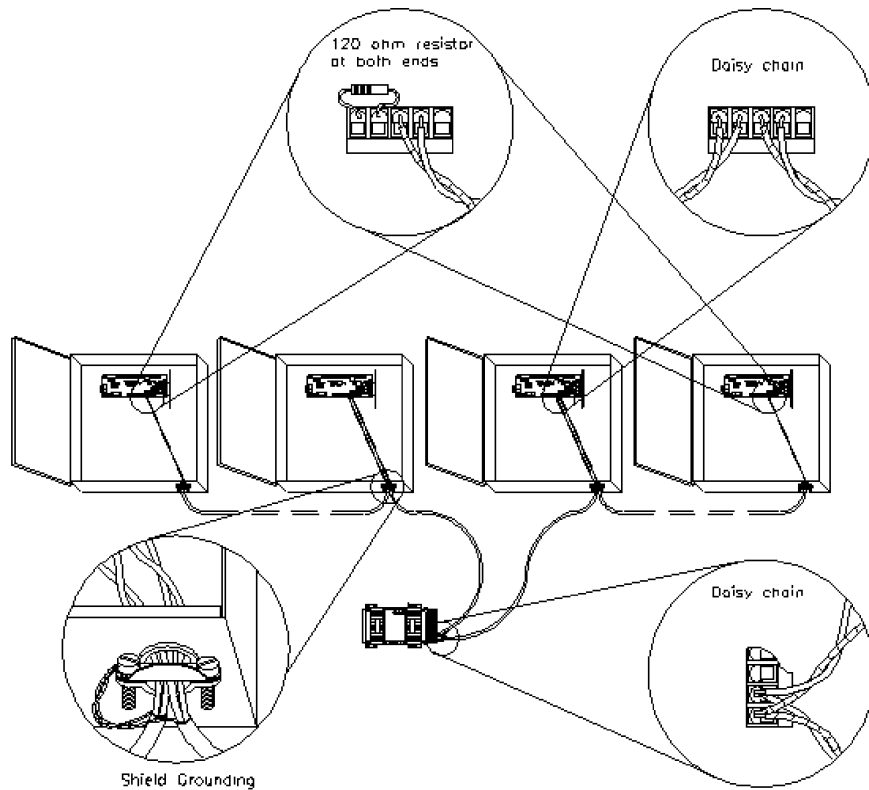


Figure 2

# Fiber Optic Multidrop Communication

## Fiber Optic Specifications

Maximum number of units	100
Connection method	Loop
Interconnect cable	62.5/125 multimode fiber optic cable with ST connectors
Maximum cable length	9000' [3 km] between units
Maximum length of stubs	Not applicable
Baud rate	9600
Format	Non return to zero (NRZ)
Parity	Odd, even, or none
Bits	8
Stop bits	1
Response time	1-6 milliseconds

## Fiber Optic Installation

Up to 50 units can be connected to the AXxess Interface Module, however, only one unit can be transmitting or talking at any point in time. All other units will be receiving or listening. Every unit on the bus must have a unique address which is used in all communications to it.

To connect the different components on the fiber loop together, it is necessary to connect the fiber transmitter output from each unit to the fiber receive input on the next unit as shown in Figure 3. This is continued until all units are connected in a single loop. It does not matter where a unit is connected in the loop.

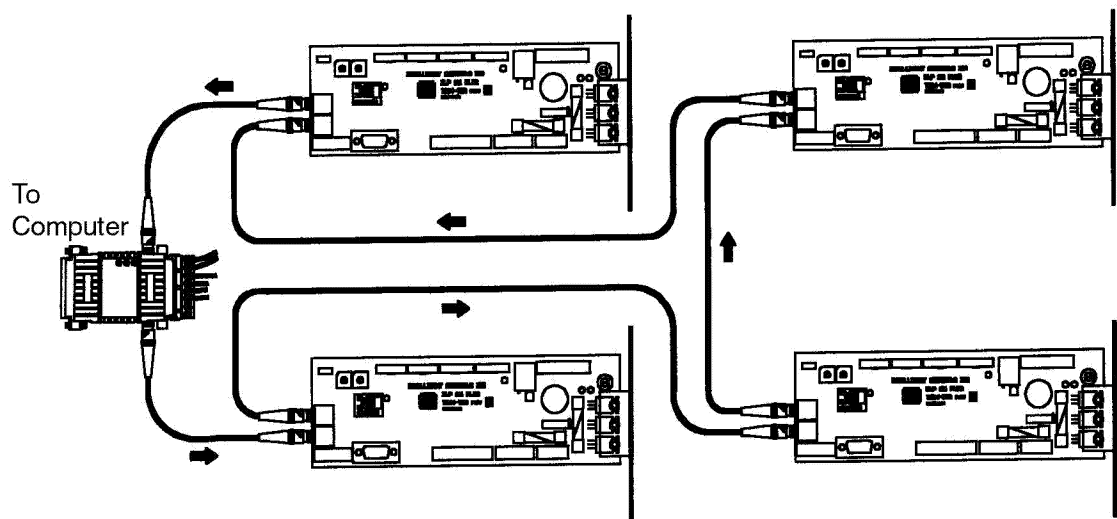


Figure 3

## **Fiber Optic Cable Types**

There are many types of fiber cables designed for different applications. The fiber bus employs 820 nm light and is designed to be used with 50, 62.5 or 100  $\mu\text{m}$  graded index or 200  $\mu\text{m}$  stepped index, multi-mode cables equipped with ST connectors. These cables can be purchased from various companies already built up or can be fabricated on site. The 200  $\mu\text{m}$  cable can employ a crimp and cleave technique to attach the connector. This can be performed in about three minutes. The other cables require glue melt or epoxy with polished connections. These are somewhat superior but require five to thirty minutes to make a connection.

The actual distance that can be run between units will vary depending on the type of cable and connection method. With 62.5/125 cable, typically up to 3 kilometers can be realized.

---

### **✘ Caution**

If glass fiber is pulled too hard ( $> 75$  lbs [35 kg]) or bent too sharply ( $< 2^\circ$  [5 cm]), damage to the fiber may result. This can result in permanent signal attenuation that results in loss of signal at the receiving end.

---

# Fiber Optic Repeater

---

As shown above, the distance between units is limited by the losses in the glass fiber and the loss in the connectors. In order to increase the distance between units, the AXxess Interface Module can function as a fiber optic repeater.

When used in this repeater mode, the only connections to the unit are the fiber in and fiber out and the 12 volt power supply input. All other connections on the RS-232 connector, which normally connects to the computer, and the 8-pin connector must be left disconnected.

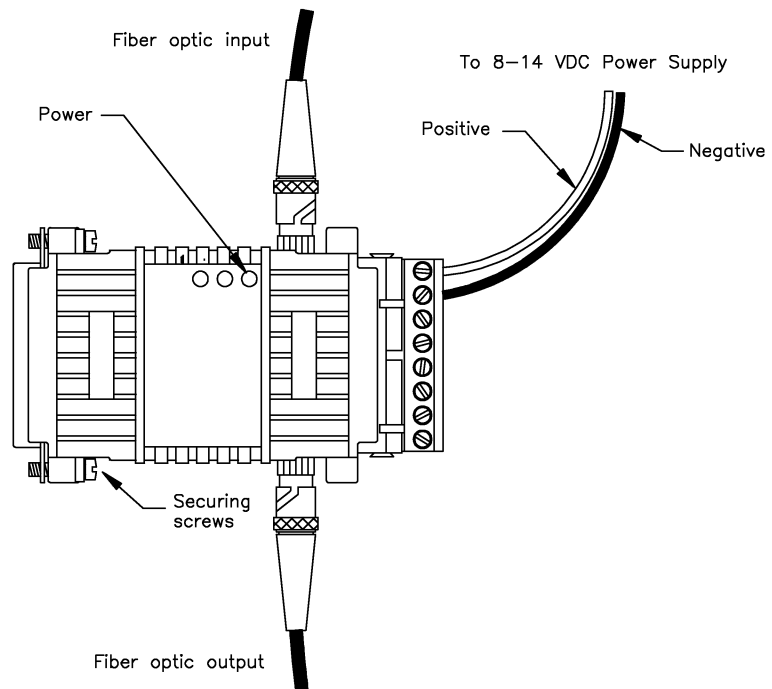


Figure 4

Refer to "Jumpers" for the correct jumper position of the Fiber Optic Repeater.

# Short Haul Modems

In order to extend the range of the communication bus or to use regular telephone lines to communicate between panels, it is necessary to use short haul modems. These devices normally convert RS-232 signals to signals which are compatible with conventional telephone lines. To use them with the RS-485 bus it is necessary to convert the RS-485 signals to RS-232 levels and then use the short haul modem to connect through the telephone lines.

Many short haul modems steal their power from the RS-232 connection. These modems do not operate consistently with the AXxess interface and should not be used.

Figure 5 shows a typical connection where it is necessary to run communication lines between two buildings using telephone lines.

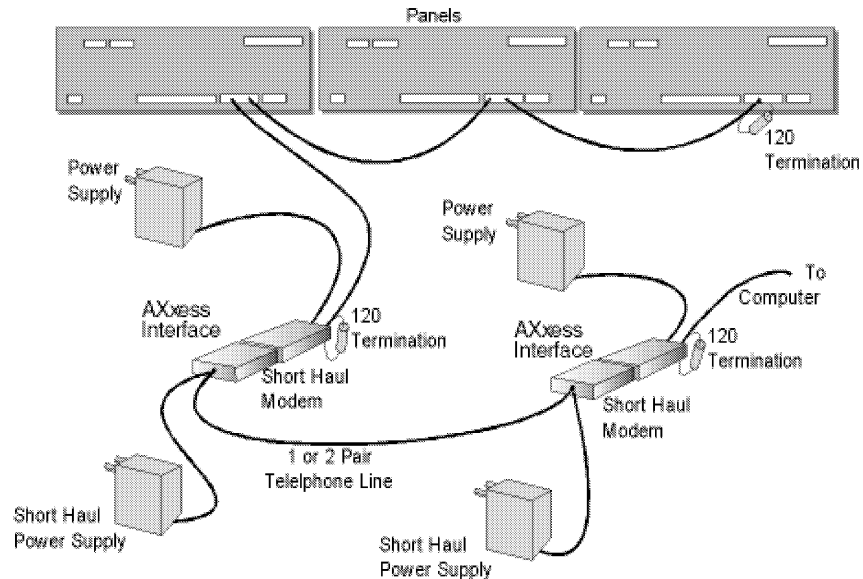


Figure 5

# Dial-up Connections

Dial-up telephone lines can be used to communicate between the computer and the panels. When only one panel is used at the remote location, a modem can be directly connected to the panel by configuring the panel to use the RS-232 port.

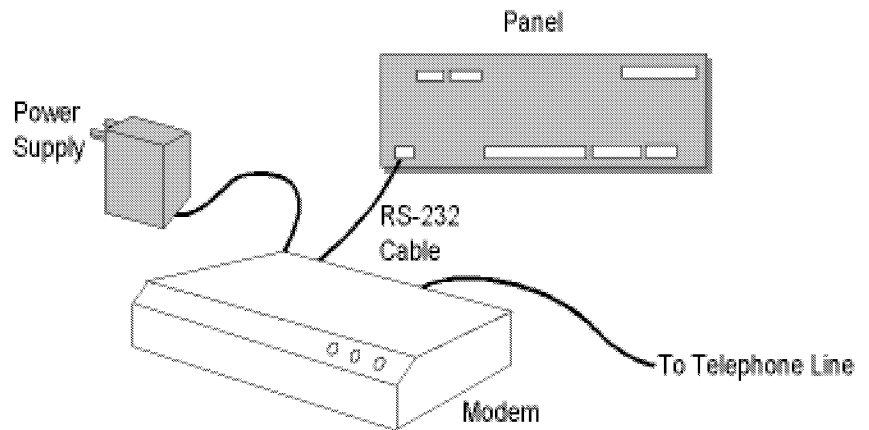


Figure 6

When it is necessary to have several panels at the remote location, the AXxess Interface can be used to create a local RS-485 multidrop bus as shown in Figure 7.

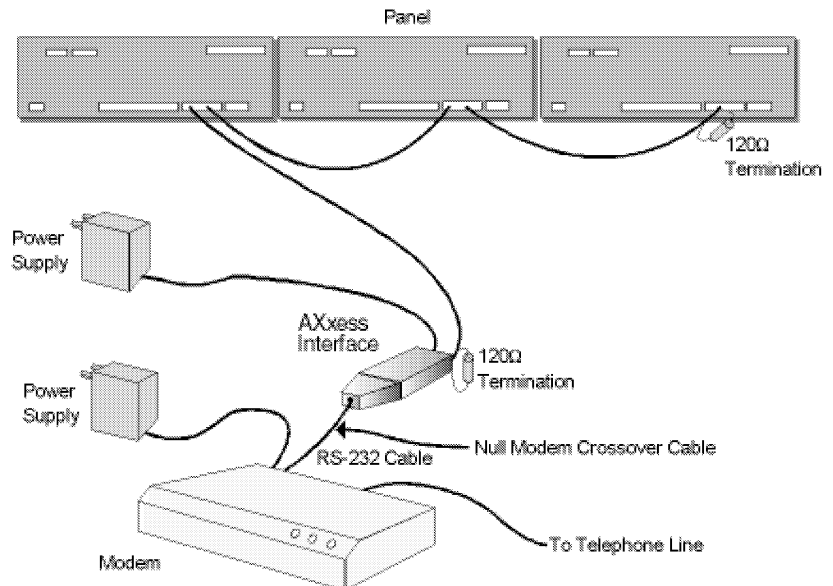


Figure 7

# Jumpers

---

The jumpers in the AXxess Interface are shipped from the factory in the RS-232/RS-485 position. This is also the position for RS-232 to Fiber. If you are operating the AXxess Interface in one of its other modes, you must open the module and change the jumpers as shown below in Figure 8.

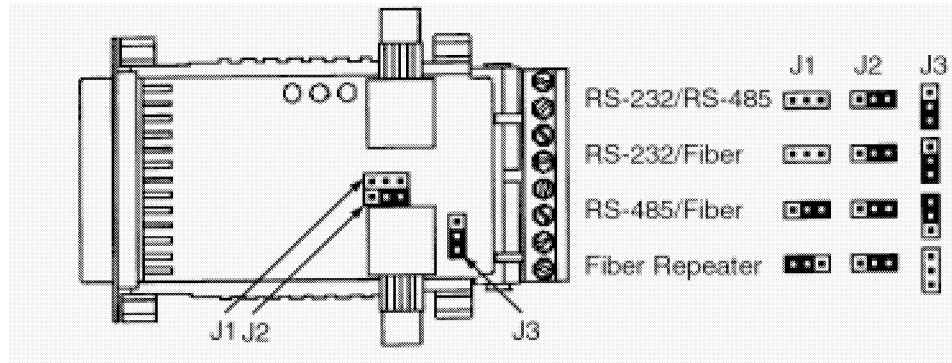


Figure 8

---

**✘ Caution**

The RS-485/Fiber Option is intended only for converting RS-485 to fiber and then back to RS-485. It is not intended for use with the panels with built-in fiber connectors.

---

# Troubleshooting

---

When troubleshooting a communication system, it is usually necessary to break it down into its components and verify that each component is working correctly.

Many of the components in the system include troubleshooting lights to indicate the presence of signals. In many cases, these can be used to isolate invalid programming or broken connections. However, if the problem is caused by short circuits, loading or equipment failure, the lights may not show enough information and other equipment may be necessary.

Because the signals in a communication system are continually changing, a voltmeter is of limited use in analyzing the signals. An oscilloscope is generally used to examine the signals and compare them to reference waveforms. In addition, the oscilloscope can also show extraneous electrical signals which may be present on the communication channel and which can interfere with the proper signals.

The Access software includes a step by step procedure to help isolate communication problems. Search the on-line help feature using the keyword **Troubleshooting**.

## Lights

To help troubleshoot communication problems, the AXxess Interface, panels, and dial-up modems all have lights which indicate the flow of data in both directions. Starting at the computer, observe the lights to trace the data flow both from the computer to the panels and back to the computer.

# Waveforms

## RS-232 Signals

RS-232 signals are two state signals that will either be positive or negative. The RS-232 standard calls for a voltage of -3 to -25 volts when the line is in the Off or Marking state. When the signal switches to the On or Spacing state, the voltage will be +3 to +25 volts.

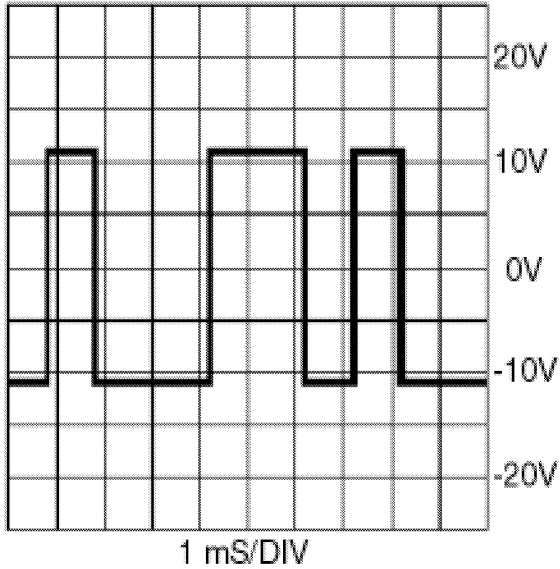


Figure 10

## RS-485 Waveforms

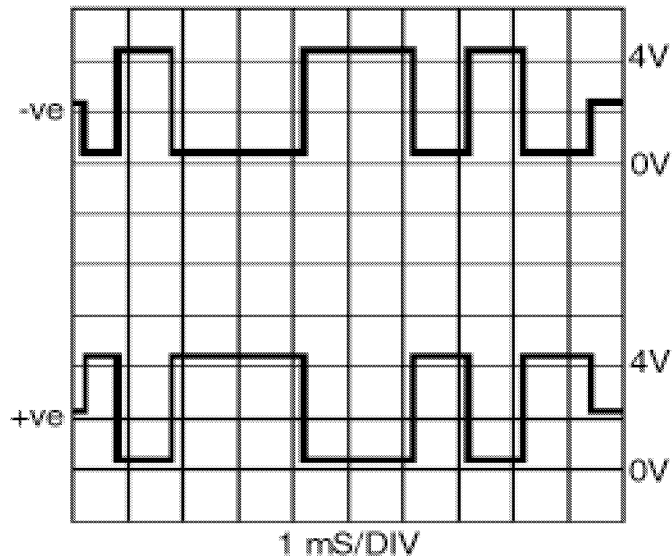


Figure 9

# **Two Year Limited Warranty**

During the period of two (2) years after sale to the original end-user, the manufacturer warrants this product in workmanship and material.

The manufacturer will replace all necessary parts without a charge for parts or labor.

The warranty shall not apply to defects resulting from unauthorized modification, misuse, fire, floods, acts of nature or alterations of serial number.

The manufacturer makes no other warranty, either expressed or implied, with respect to its products. The manufacturer specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. However, any implied warrant of merchantability or fitness that may apply is limited to time periods listed above. Some states or provinces do not allow exclusion or limitations on implied warranties, so the above limitation or exclusion may not apply.

The manufacturer shall have no liability for any loss or damage, direct or consequential, arising out of the use or inability to use the product.

---

**North and South American Information**

1515 South Manchester Avenue  
Anaheim, California USA 92802-2907

**Sales:**

Tel: 714.772.1000 or 800.842.0221 \*

Fax: 714.780.7592

**Technical Service and Support:**

Tel: 714.772.1000 or 800.842.0221

Fax: 714.780.7592

**European, Middle East, and African Information**

Beaumont, The Conference Centre  
Burfield Road

Old Windsor, Berkshire

United Kingdom SL4 2JP

**Sales and Technical Support**

Tel: +44 (0) 175 372 1075

Fax: +44 (0) 175 372 1076

The logo for MAXxess, featuring the word "MAX" in a bold, sans-serif font, followed by "xess" in a smaller, italicized sans-serif font. A small icon of a computer monitor is integrated into the letter "x" of "xess".

MAXxess on the Internet

[maxxess-systems.com](http://maxxess-systems.com)

Information furnished by MAXxess Systems Inc. is believed to be accurate and reliable. However, no responsibility is assumed by MAXxess Systems Inc for its use nor for any infringements of patents or other rights of third parties that may result from its use. No license is granted by implication or otherwise under any patent rights of MAXxess Systems Inc. Specifications subject to change without notice.

\* 800 phone numbers only available in USA and Canada