Installation Instructions for SymCom's Model RS485MS-2W Communications Module

MODULE FUNCTIONS

The Model RS485MS-2W Communications Module serves two very important functions. From a communication network view, its primary purpose is to electrically isolate the communications network from the high voltages present in SymCom's units and to convert the communications signals from the microprocessor's 5-volt levels into RS-485 levels. The second function of the RS485MS-2W is to provide power to the RM-1000 remote monitor.

SymCom's units are connected to high AC voltages with a floating ground circuit. As long as there are three balanced line voltages present, the resulting ground level will often be near case ground. However, if one phase is lost or if the line voltages become unbalanced, the floating ground may be as much as 480 volts above the case ground. The RS485MS-2W has two high speed optical isolation chips on the receive and transmit pins and a low speed opto-isolator on the transmit/receive pin to isolate the communication network from the AC line voltages.

The signals from the microprocessor go through resistors to provide current limiting before connecting to the 9-pin external connector. Therefore, the 9-pin SUB D connector on the SymCom unit provides un-isolated CMOS signals and is NOT RS232 or TTL compatible. The RS485MS-2W does not have support for four wire communications systems.

> *Note: Do not plug a modem or any other PC compatible device directly into the 9-pin SUB D connector on SymCom's units.*

RS-485 NETWORKING

To utilize SymCom's RS-485 network, three key components are required:

1. **Modbus Slave Device –** SymCom model series 601, 77C, or 777 with the Model *RS485MS-2W* communications module**.**
2. **18 to 24 AWG shielded twisted-pair cable –** The twisting of the wires helps minimize the effect of noise on the data signal.
3. **Modbus Master Device –** RM-1000, RM-2000, PLC, or computer. On a PC, PC compatible device, and a PLC without an RS-485 port an RS-232 to RS-485 converter is required.

WIRING

Slave Side:

The terminals of the *RS485MS-2W* are marked as follows:

Terminal	Function
A	RS-485 A Connection
B	RS-485 B Connection
S	Shield Connection
V+	Positive power connection for the RM-1000
V-	Negative power connection for the RM-1000
R	External reset connection
R	External reset connection
G	Reserved, do not use
P	Reserved, do not use

Master Side:

RS-232 to RS-485 converter:

The converter is a port-powered device that changes TD and RD RS-232 lines to balanced half-duplex, two wire RS-485 signals. Send Data Control automatically enables the RS-485 driver when data is present on the RS-232 side. The converter has a DB-9 female connector on the RS-232 side and on the RS-485 side terminal blocks for signal and DC power supply connections. An optional power supply may be required for laptops or other computers with low power serial ports.

The converter will work with only a few RS-485 devices attached within a few hundred feet. This configuration normally will not require terminating resistors on the RS-485 network. If you have very many RS-485 devices or the network must span several hundred feet or more, you may need to connect a 12-volt DC external power supply to the converter. Terminating resistors may also be required under these conditions. If terminating resistors are required, one set of 120-ohm resistors should be placed at the two extreme ends of the network across the A and B terminals. Only two terminating resistors are permitted on each twisted pair of wires in the network. If the converter is being used along with 120-ohm terminating resistors, external power will be required (see Appendix, Figure 3).

When connecting more than one SymCom unit on an RS-485 network, only one unit is connected to the RS-232 to RS-485 converter with A to RD(B) and B to RD(A). All remaining units are wired with terminals labeled A connected together and terminals labeled B connected together.

TROUBLESHOOTING COMMUNICATIONS PROBLEMS

Note: In this section, "Model 777" refers to any Symcom RS-485 compatable unit.

If there is no communications, check the following:

1. Visually check that the wires are physically connected to the network adapters. If the connections are OK, check the network wires. If possible, use an Ohmmeter to verify the continuity of each wire.

2. Verify the network connections and jumpers with the wiring schematic. If your installation does not use the RS-232 to RS-485 converter and the wiring diagram in the Appendix, Figure 2 does not apply, try switching the polarity of the wires. In other words, switch the connections at the A and B terminals of the RS485MS-2W module. If possible, send a START or STOP command from the Modbus Master device to the Model 777, since the START and STOP commands will be executed whether or not the Model 777 returns an acknowledgment.

3. If a PC is used as the Master device, check the serial port on the PC. You will need a voltage meter to measure voltages on the connectors of the converter and the RS485MS-2W module. The voltages are measured in the DC 10 volt range between case ground on the computer or the metal sheath of the DB-9 converter to the RD(B) connection of the converter module or to the (A) or (B) connections on the RS485MS-2W module. Close the COMM port by shutting down the Modbus Master program. Leave the converter module plugged into the COMM port on your computer, but unplug the RS485MS-2W module from the Model 777. The COMM port should not be open so there should be no voltage at connections A and B on the RS485MS-2W module. Measure the voltage with the voltage meter's positive probe touching the (A) terminal of the RS485MS-2W module and the voltage meter's negative probe touching the PC's case. If the case is not metal, such as a laptop computer, you can use the metal shell of the DB-9 connector of the RS-232 to RS-485 converter for a ground. If there is voltage resent, there may be another program using the RS-232 port on the PC. Next, open the COMM port by starting the master program. When the RS-232 port is opened, you should be able to measure around 4 volts at the RD(B) connection of the RS-232 to RS-485 converter. You should also be able to measure 4 volts on the (A) labeled connection of the RS485MS-2W module that plugs into the Model 777. You should measure 0 volts on the (B) labeled connection. If the voltages are switched at (A) and (B), the polarity is not correct and the two wires should be switched. If you do not measure 4 volts on the (A) connections of the RS485MS-2W module, the RS-232 port may not be opened correctly and the Modbus Master program will not be able to talk to the Model 777.

4. If you have any Model 777's that were built before August 1998, they may have been programmed using a proprietary protocol from Cimetrics. All Model 777's that are programmed for Modbus have a small sticker near the 9 pin interface connector that says "Modbus". These Model 777's have the option "11" code in the part number. If you have a Model 777 that is not Modbus, it can be re-chipped for a nominal fee. Please contact SymCom, Inc. at the number at the end of this section for more information.

If you continue to have problems, please contact SymCom, Inc. at (800)-843-8848 or (605) 348-5580

Appendix
Figure 1: Typical RS-485 Network

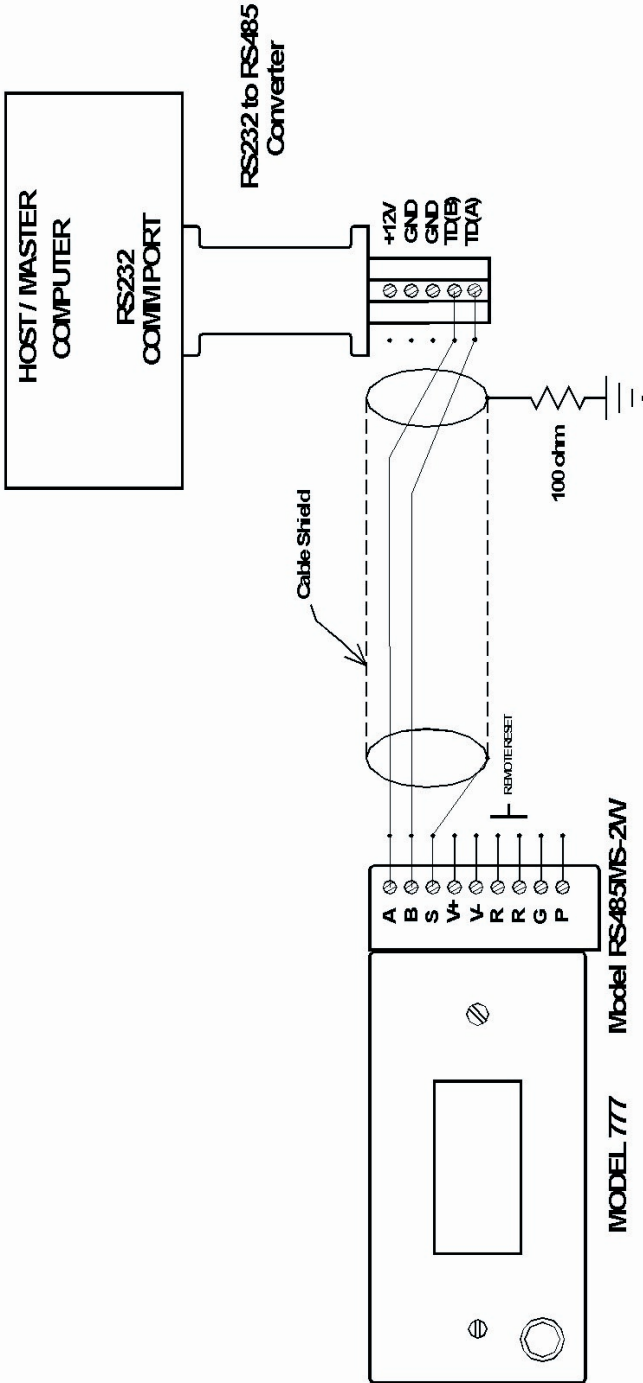

Typical RS485 Network
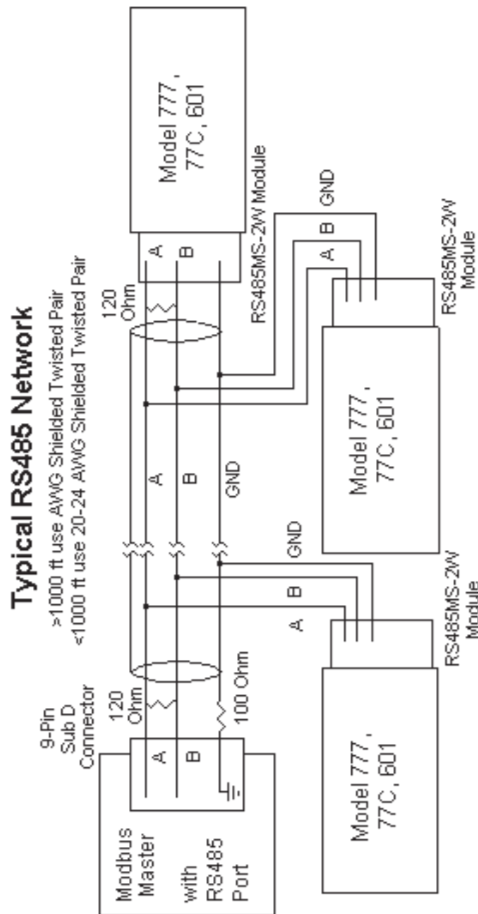
Figure 2: Basic Wiring Diagram

Figure 3: Basic Extended Network Diagram
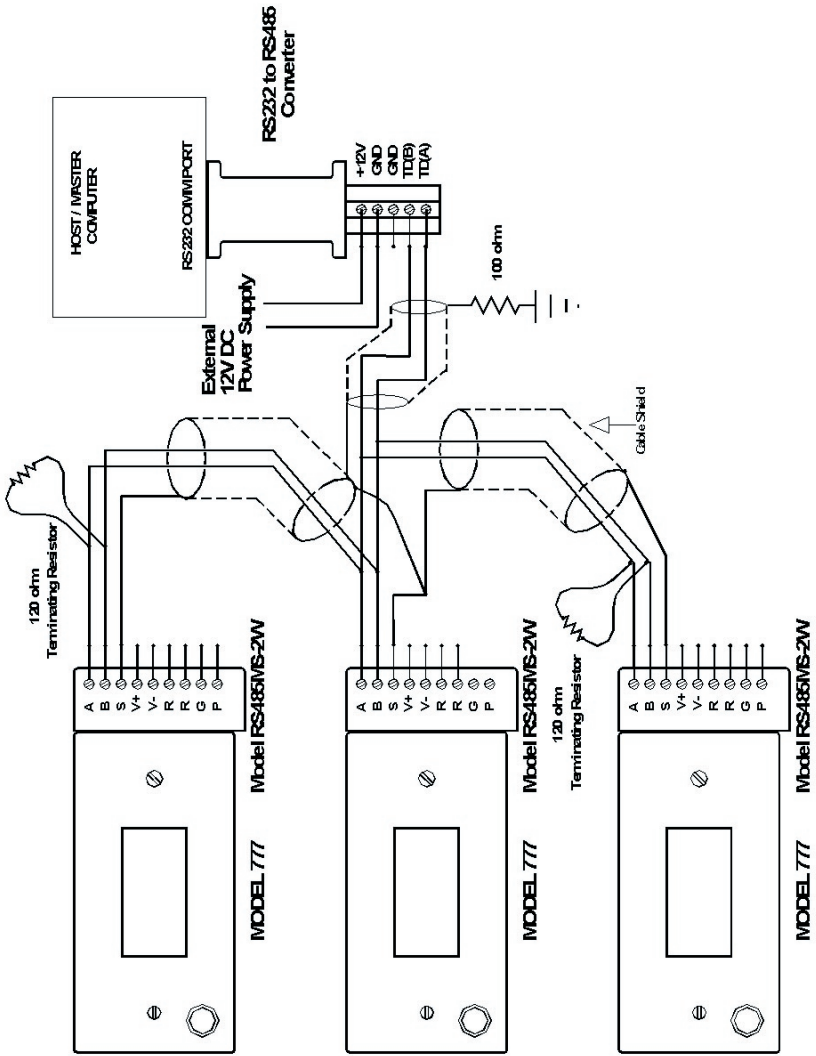
Figure 4: Basic RM-2000 Network
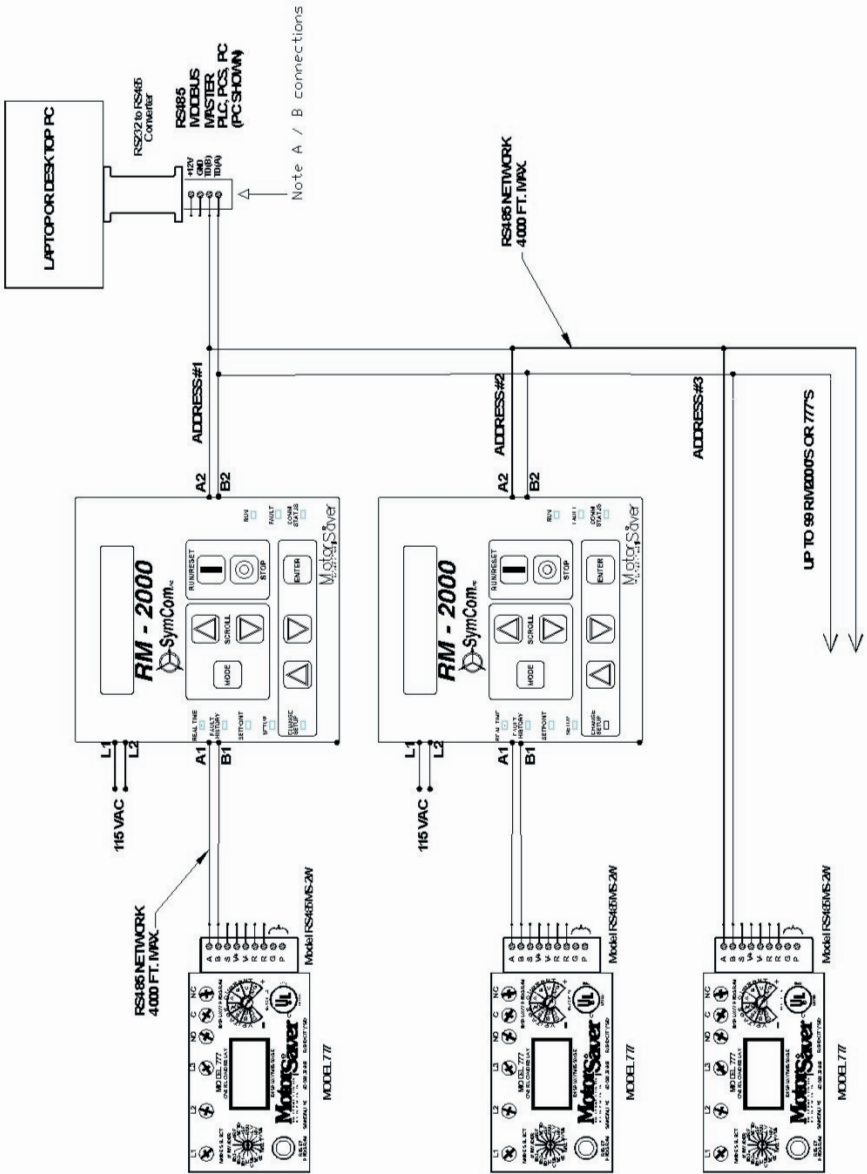
Figure 5: Basic RM1000 Network