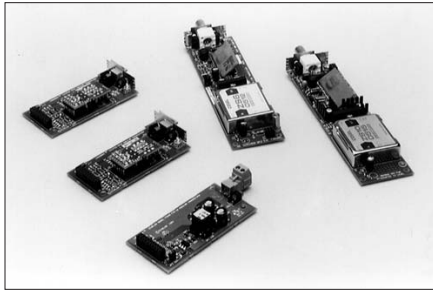


SMX™ Transceivers

Models 77010, 77030, 77040, 77050, and 77162



Description

The LONWORKS® Standard Modular Transceiver (SMX) family provides a modular, flexible solution for interfacing a variety of LONWORKS devices to different LONWORKS communications media. LONWORKS devices such as the PCLTA-20 LonTalk® Adapter and Development Tools comply with the SMX interface standard to support a wide variety of media types. OEMs can also use these transceivers with other products of their own design.

The LONWORKS SMX interface standard defines a common form factor for transceiver daughter-boards that can be used with a variety of products. The SMX interface standard defines two length options: standard and extended. The standard length specification is used for compact SMX transceivers such as free topology and twisted pair. The extended length specification is used for transceivers that require more board area, such as units with DC-to-DC converters that supply voltages other than +5VDC.

SMX Mechanical Information

The following figure is a component-side view of a motherboard ready to accept an SMX transceiver:

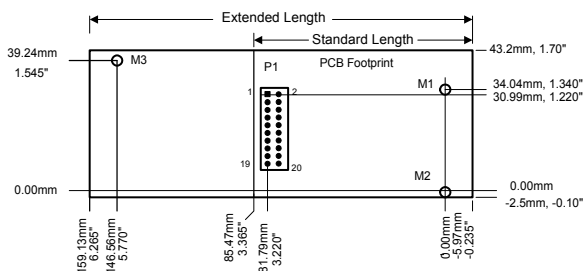


Figure 1. Motherboard for SMX Transceiver

- ▼ Compatible with the LONWORKS SMX interface standard
- ▼ Built-in transceiver ID output supports automatic configuration of communications parameters
- ▼ Metal faceplate with network connector customized for each transceiver

Standard-length SMX transceivers are 91.4mm x 45.7mm (3.60" x 1.80"). Extended-length versions are 165.1mm x 45.7mm (6.50" x 1.80"). P1 is a 2x10 header with 0.64mm (0.025") square posts on 2.54mm (0.100") centers on the motherboard. Pin 1 is shown with a square pad. M1, M2, and M3 are mounting hole locations. SMX transceivers use #4 mounting hardware. 3.6mm (0.14") plated-through holes with 6.4mm (0.25") pads should be used on the motherboard. M1 and M2 should be connected to a low-impedance chassis ground, if available.

SMX transceivers use a 2x10 0.64mm (0.025") square post socket to connect to the P1 connector on the motherboard. The boards mate with components facing each other. The transceiver daughter-board carries the appropriate network connector. M1 and M2 on the transceiver are used to attach the included metal faceplate. The network connector fits through in the faceplate. This approach enhances EMI shielding.

SMX Transceiver Installation

Different SMX transceivers require varying operating current levels. In particular, the PLM module requires significant current, and the user should verify that the equipment power supply can provide the necessary current, especially when multiple PLM transceivers are powered from a common power supply.

The PLM transceiver incorporates a DC-DC converter that protrudes approximately 14mm (9/16") above the level of the PCB. Since the DC-DC converter might physically contact components on an adjacent card when the SMX transceiver is installed on an ISA or PCI card, the PC motherboard slot adjacent to the DC-DC converter must be left unoccupied.

SMX transceivers are shipped with a mounting standoff and washer(s) on the top screw (referenced from the component side of the transceiver PCB) that must first be removed from the transceiver and then installed on a PC I/O card, as an example, before the transceiver can be properly installed. The TPM transceivers are supplied with a single washer and standoff, while the PLM module has three washers and two taller stand-

offs. Extended length transceivers have a second washer and standoff assembly which must be removed and mounted on the PC I/O card.

Remove the standoff and washer(s) using the following figure to identify the location of the standoff and spacer(s):

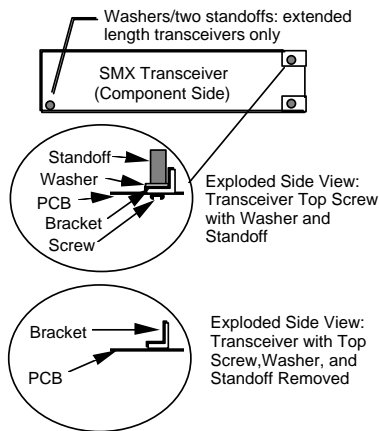


Figure 2. Standoff and Spacer Location

Echelon PC I/O Cards such as the PCLTA and PCNSS are shipped with faceplate mounting nuts attached to a center stud (referenced from the component side of the PCB) that must first be removed and discarded before an SMX transceiver can be properly installed. After the nut is discarded, the standoff and washer(s) previously removed from the SMX transceiver must be threaded onto the stud from which the nut was removed.

Remove the nut and install the standoff and washer(s) using the following figure to identify the location of the parts. Please note that the drawing shows a typical Echelon single channel PC I/O Card; dual channel PC I/O Cards include space for a second SMX transceiver, the installation of which should be identical to that discussed for a single transceiver.

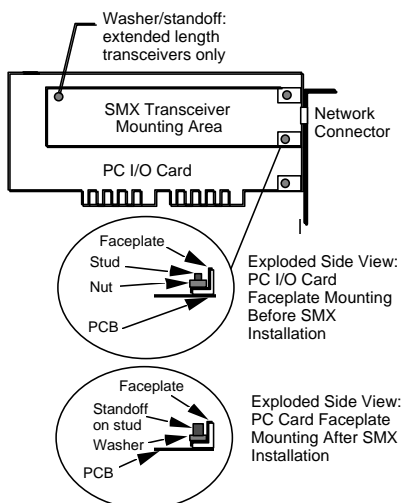


Figure 3. Standoff and Washer Location

The SMX transceiver uses a female 2x10 0.64mm (0.025”) square post socket to interface with a matching male connector on the PC I/O card. The transceiver and PC I/O card mate with the component side of the two assemblies facing each other. Before inserting the transceiver connector into the PC I/O card connector, ensure that the transceiver faceplate with the network connector is aligned inside of the PC I/O card faceplate hole. The transceiver faceplate includes spring-like edges that push against the inside of the PC I/O card faceplate, creating an EMI seal. After the PCBs are correctly aligned, insert the 20 pin socket on the transceiver over the 20-pin connector on the PC I/O card and firmly press the two assemblies together.

Re-install the screw that was removed above through the transceiver and into the standoff. Tighten the screw using modest, but not excessive, torque.

SMX Transceiver Configuration

The TPM-78 and TPM-1250 transceivers are shipped preconfigured. The FTM-10 transceiver includes a jumper to optionally enable network termination. Optional free and bus topology terminators are included on the FTM-10. Only one free topology terminator can be enabled per free topology TP/FT-10 segment; only two bus topology terminators, one at each end of the bus, can be enabled for bus topology TP/FT-10 segments. The following figures illustrate the jumper configurations:

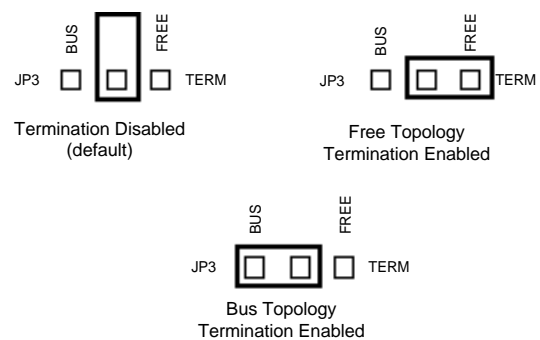


Figure 4. FTM-10 Jumper Configurations

The TPM-RS485 transceiver can be configured for 39kbps, 625kbps, or 1.25Mbps operation depending on the S1 jumper selection. The following figure illustrates the four jumper configurations:

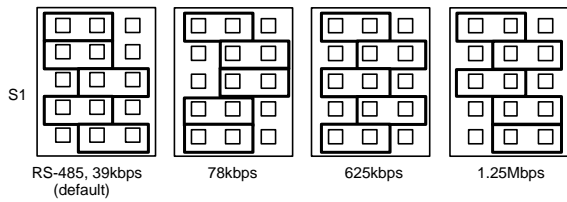


Figure 5. TPM-RS485 S1 Jumper Configurations

The PLM-22 power line modular transceiver requires an external power line coupler. The power line coupler attaches to the SMX transceiver and the power line as shown in the following diagram.

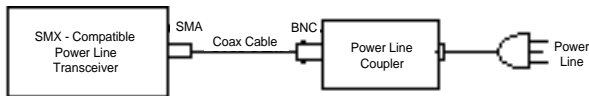


Figure 6. Power Line Coupler

Model 78200-series power line couplers are available from Echelon. Custom power line couplers can be built for coupling to AC or DC power mains at voltage levels other than those supported by the Echelon power line couplers. For developing custom coupling circuits, the circuits in figure 7 illustrates the coupler front end that is included on each SMX power line transceiver.

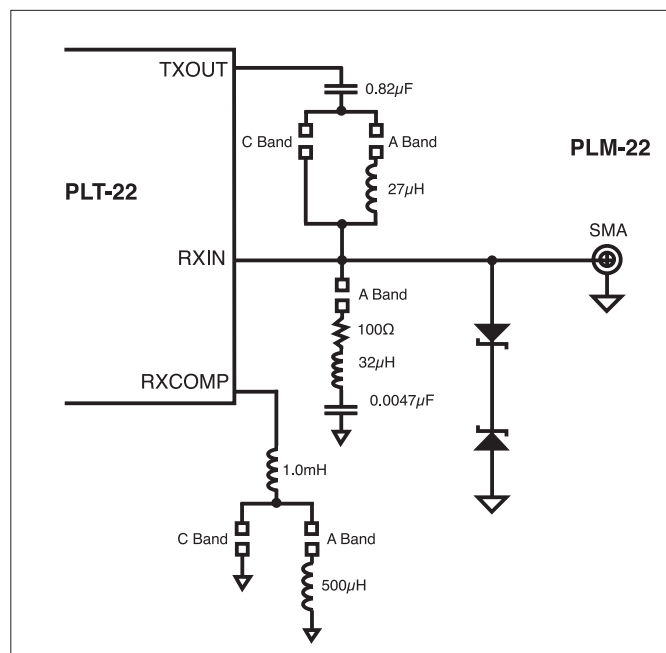


Figure 7. PLM-22 SMX On-board Interface Circuitry

The PLM-22 transceiver includes jumpers to select the PLT-22 transceiver transmit signal level (JP1) and to enable or disable the CENELEC EN50065-1 compliant access protocol (JP2). JP3 is used to select communications bands (C Band/A Band) for the PLT-22 transceiver. Figure 8 illustrates the jumper configuration.

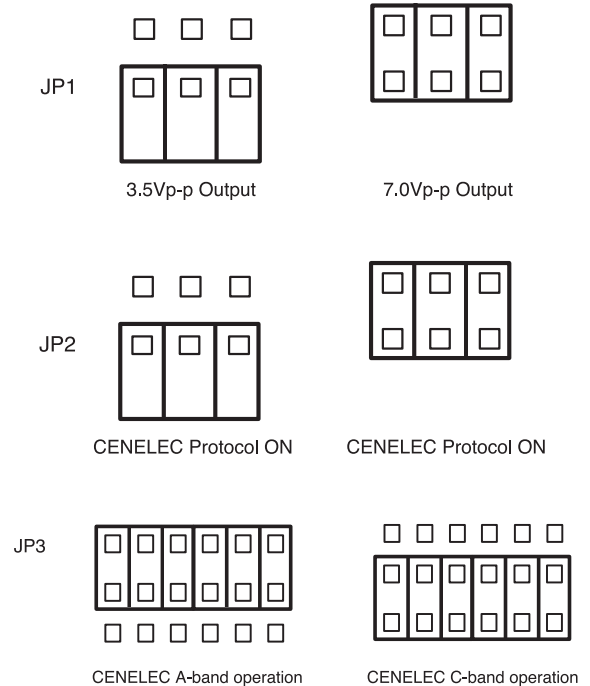


Figure 8. PLM-22 JP1, JP2, and JP3 Jumper Settings

SMX Connector

This table presents the pinout of the 20 pin SMX interface connection. Markings for pin 1 (lower left corner from component side of SMX transceiver) plus pins 2, 19, and 20 are printed on the transceiver.

Name	Function	Pin
~BUSY	Busy LED input	18
CLK	Neuron Chip CLK2 input	17
CP0	Neuron Chip communication port 0	10
CP1	Neuron Chip communication port 1	8
CP2	Neuron Chip communication port 2	6
CP3	Neuron Chip communication port 3	12
CP4	Neuron Chip communication port 4	4
~RESET	Neuron Chip reset input and output (transceiver dependent)	16
XID0	Transceiver ID 0 output (LSB)	3
XID1	Transceiver ID 1 output	5
XID2	Transceiver ID 2 output	7
XID3	Transceiver ID 3 output	9
XID4	Transceiver ID 4 output (MSB)	11
V _{CC}	+5VDC input	1,19
GND	Ground	2,20
NC	No connect	13, 14, 15

Transceiver ID

The 5-bit transceiver ID output, XID (4..0), specifies the transceiver type as listed in the following table:

ID (hex)	Channel	Medium	Bit Rate
01 (01)	TP/XF-78	Transformer Isolated Twisted Pair	78kbps
03 (03)	TP/XF-1250	Transformer Isolated Twisted Pair	1.25Mbps
04 (04)	TP/FT-10	Free Topology and Link Power	78kbps
05 (05)	TP-RS485-39	RS-485 Twisted Pair	39kbps
07 (07)	RF-10	49MHz Radio Frequency	4.9Kbps
10 (0A)	TP-RS485-625	RS-485 Twisted Pair	625kbps
11 (0B)	TP-RS485-1250	RS-485 Twisted Pair	1.25Mbps
12 (0C)	TP/RS485-78	RS-485 Twisted Pair	78kbps
15 (0F)	PL-20A	A-Band Power Line	3.6kbps
16 (10)	PL-20C	C-Band Power Line, CENELEC compliant access protocol on	5kbps
17 (11)	PL-20N	C-Band Power Line CENELEC compliant access protocol off	5kbps
24 (18)	FO-10	Fiber Optic	1.25Mbps
27 (1B)	DC-78	Direct Connect	78kbps
28 (1C)	DC-625	Direct Connect	625kbps
29 (1D)	DC-1250	Direct Connect	1.25Mbps
30 (1E)	Custom	Custom	N/A

SMX Transceiver LEDs

SMX transceivers include a busy (BSY) or packet (PKT) LED that is controlled by the host board. The function of the BSY LED varies according to both the type of SMX transceiver and the type of host board. The function of the BSY LED is shown in the following table:

Host Board	BSY or PKT LED
PCLTA	Transmitting a packet
Protocol Analyzer	Receiving a packet
NSS-10 Evaluation Board	Host busy or transmitting a packet
LonBuilder	Not used
NodeBuilder Motherboard	Transmitting a packet
PCNSS	Host busy or transmitting a packet

The PLM transceiver includes additional activity and status LEDs as described in the following table:

LED	Purpose
BIU	Band-in-use
PKD	Packet detect
7Vp-p	7Vp-p output enabled

TPM-78 & TPM-1250 Restrictions

The TPM-78 and TPM-1250 SMX transceivers have installation restrictions that affect both the number of nodes on a twisted pair segment and the manner in which the segment is wired. For the purpose of calculating the number of nodes on a twisted pair segment, the TPM-78 and TPM-1250 SMX transceivers each present a 2-transceiver load to the twisted pair network, i.e., one TPM-78 SMX transceiver equals two TPT/XF-78 transceivers, and one TPM-1250 SMX transceiver equals two TPT/XF-1250 transceivers.

In addition, the TPM-78 and TPM-1250 SMX transceivers must be installed with a zero-length stub. This restriction means that the TPM-78 and TPM-1250 SMX transceiver stub length must be zero while on the same segment any TPT/XF-78 transceivers can have 3 meter stubs and TPT/XF-1250 transceivers can have 0.3 meter stubs.

Failure to follow the node loading and stub length restrictions may affect the performance of the twisted pair network.

Network Connectors

The twisted pair transceivers use a 2-pin or 3-pin (77050 only) Weidmüller connector with the following pin-out (one 2-pin plug is included with each transceiver):

Name	Function	Pin
Network	Polarity-insensitive	1, 2
Ground	Shield (Model 77050 only)	3

The terminal pin designations of the 2-pin and 3-pin Weidmüller BLA connectors are shown in the following figure:

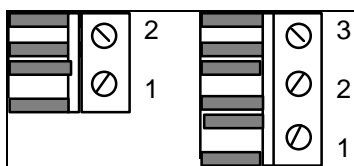


Figure 9. Pin 1 Designations

The PLM-22 transceiver uses an SMA connector with the following pin-out.

Name	Function	Conductor
Network	Transmit/receive data	Center
Ground	Ground	Shield

Specifications

Network Connectors	Weidmüller 2-pin connector for Models 77010, 77030, and 77040 Weidmüller 3-pin connector for Model 77050 SMA connector for Model 77162
Motherboard SMX Connector or equal	0.025" square post sockets, arranged in a 2x10 configuration, Samtec MTSW-11022-TD-440
Network Stub Wiring ¹	See transceiver user's guide
Network Stub Length ¹	See transceiver user's guide
Operating Input Voltage	+5VDC ±5%
Operating Input Current (BSY LED sinks 13mA when active)	
Model 77010, 77050	10mA typical (+10mA from Neuron Chip)
Model 77030	10mA typical (+25mA from Neuron Chip)
Model 77040	17mA typical, 20mA max transmit 2mA typical, 4mA max receive
Model 77162	750mA @5V max transmit
Temperature	
Operating	-40 to +85°C
Non-operating (12 hour)	-40 to +85°C
Humidity (non-condensing)	
Operating	
Models 77010, 77030, 77040 and 77050:	10 to 95%RH @40°C
Model 77162:	10 to 95%RH @40°C
Non-operating (12 hour)	10 to 95%RH @85°C
Dimensions (without faceplate)	
Models 77010, 77030, 77040, and 77050:	91.4mm x 45.7mm x 13.2mm, (3.60"x1.80"x.52")
Model 77162:	165.1mm x 45.7mm x 15.3mm, (6.50"x1.80"x.60")

1. Refer to Echelon's engineering bulletin Junction Box and Wiring Guidelines For Twisted Pair LONWORKS Networks for information on twisted pair network wiring recommendations.

Documentation

Detailed descriptions of the operational characteristics of SMX transceivers are described in the pertinent transceiver module data sheets and user's guides. Twisted pair networks must be terminated as described in the user's guides.

Ordering Information

The following SMX transceivers are available from Echelon (see the Model 78200 Power Line Coupler data sheet for ordering information on power line couplers):

Product	Echelon Model Number
TPM/XF-78 Twisted Pair Modular Transceiver ¹	77010
TPM/XF-1250 Twisted Pair Modular Transceiver ^{1,2}	77030
FTM-10 Free Topology Modular Transceiver	77040
TPM/RS485 Twisted Pair Modular Transceiver	77050
PLM/PL-20 Power Line Modular Transceiver	77162

1. TPM/XF-78 and TPM/XF-1250 transceivers are not LonMark approved.

2. Proper operation of TP-1250 segment requires that no more than eight (8) TPT/XF-1250 (TPM/XF-1250) and/or TP/XF-1250 modules be used in any 16 meter (53 foot) sections of bus wiring.

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003-0336-01C