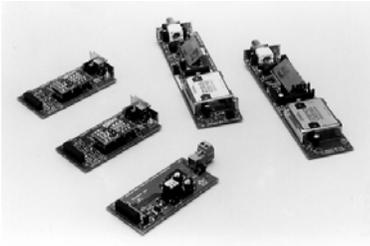


LONWORKS® SMX™ TRANSCEIVER Installation Instructions



The LONWORKS SMX interface standard defines a common form factor for transceiver daughter-boards that can be used with a variety of products.

TPM transceivers are used for twisted pair channels, while PLM transceivers contain power line transceivers and are intended for use with the external couplers on power line channels.

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.

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.

SMX MECHANICAL INFORMATION

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

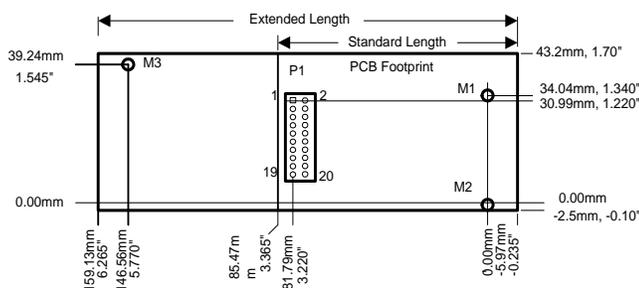


Figure 1 Motherboard for SMX Transceiver

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 a cutout in the faceplate. This approach enhances EMI shielding.

SMX TRANSCEIVER INSTALLATION

Different SMX transceivers require varying operating current levels. In particular, the PLM modules require 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 transceivers incorporate 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 components side of the transceiver PCB) that must first be removed from the transceiver and then installed on a Network Interface 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 modules have three washers and two taller standoffs. Extended length transceivers have a second washer and standoff assembly which must be removed and mounted on the Network Interface card.

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

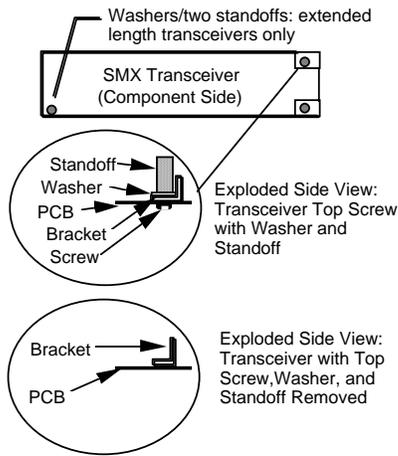


Figure 2 Standoff and Spacer Locations

Echelon Network Interface cards 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 Network Interface card; dual channel Network Interface cards include space for a second SMX transceiver, the installation of which should be identical to that discussed for a single transceiver.

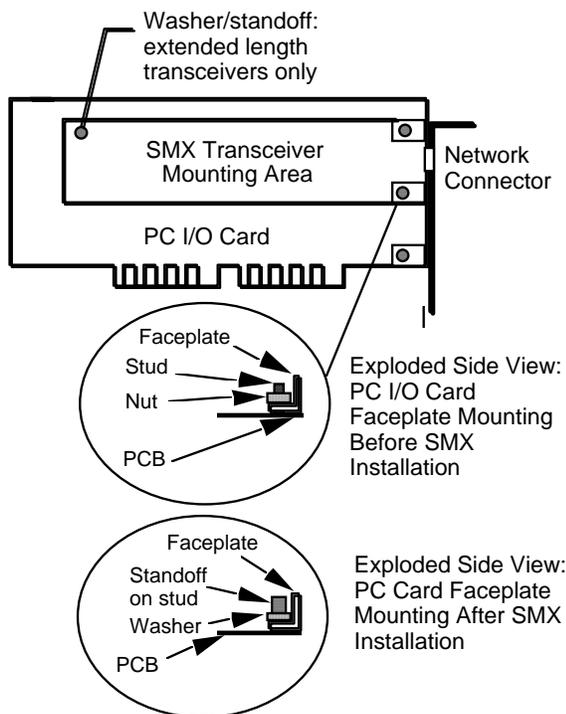


Figure 3 Standoff and Washer Locations

The SMX transceiver uses a female 2x10 0.64mm (0.025") square post socket to interface with a matching male connector on the Network Interface card. The transceiver and Network Interface card mate with the component side of 2

the two assemblies facing each other. Before inserting the transceiver connector into the Network Interface card connector, ensure that the transceiver faceplate with the network connector is aligned inside of the Network Interface card faceplate hole. The transceiver faceplate includes spring-like edges that push against the inside of the Network Interface 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 Network Interface 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 CONFIGURATON

The TPM-78 and TPM-1250 transceivers are shipped preconfigured. The FTM-10 transceiver includes a jumper to 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:

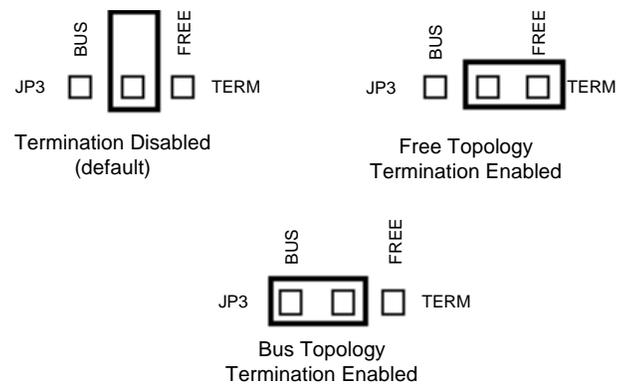


Figure 4 FTM-10 JP3 Jumper Configurations

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 three jumper configurations:

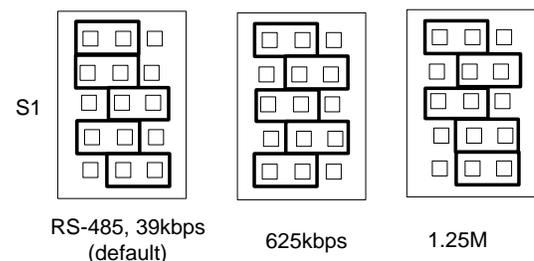


Figure 5 TPM-RS485 S1 Jumper Configurations

The PLM-10, PLM-22, and PLM-30 power line modular transceivers require an external power line coupler. The power line coupler attaches to the SMX transceiver and the power line as shown in the following diagram.

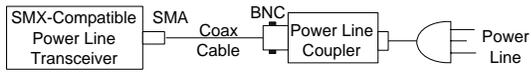


Figure 6 Power Line Coupler

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 the following figures illustrate the coupler circuitry that is included on each of the SMX power line transceivers.

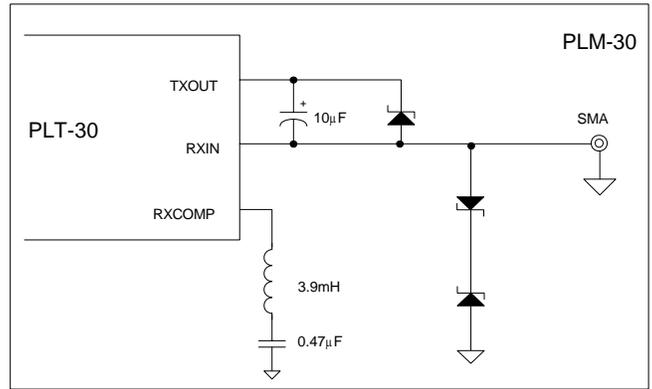


Figure 9 PLM-30 SMX Circuitry

The PLM-10 transceiver includes a set of 3 jumper positions to select between Line-to-Neutral and Line-to-Earth modes, and to select the power mains voltage range. A jumper must be installed in one of the 3 positions as shown in figure 10.

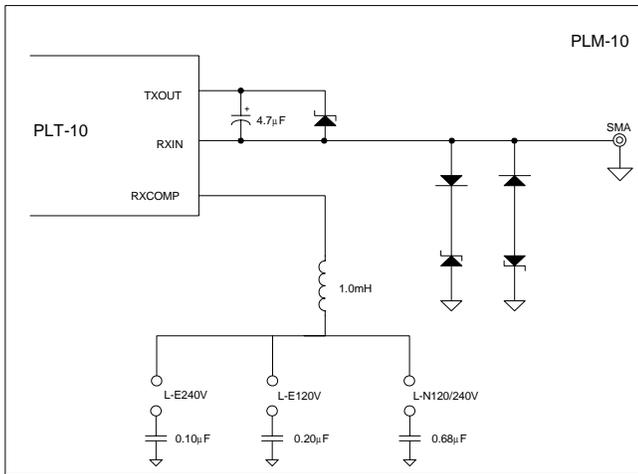


Figure 7 PLM-10 SMX Circuitry

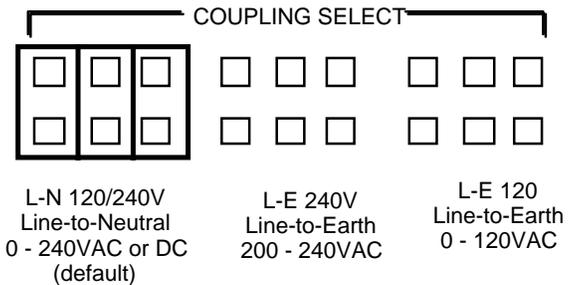


Figure 10 PLM-10 Jumper Settings

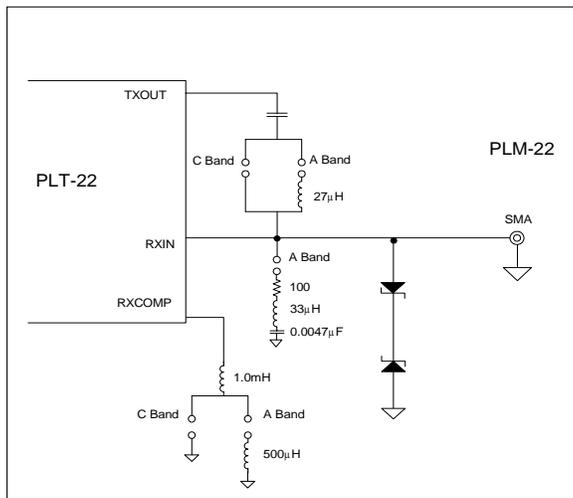


Figure 8 PLM-22 SMX Circuitry

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 11 illustrates the jumper configuration.

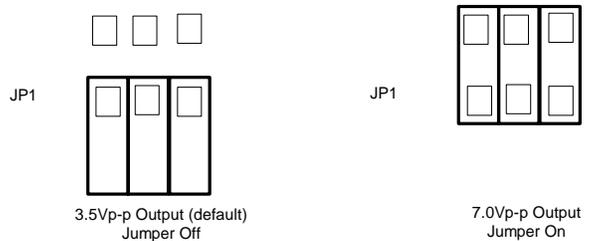


Figure 11A PLM-22 JP1, JP2, and JP3 Jumper Settings

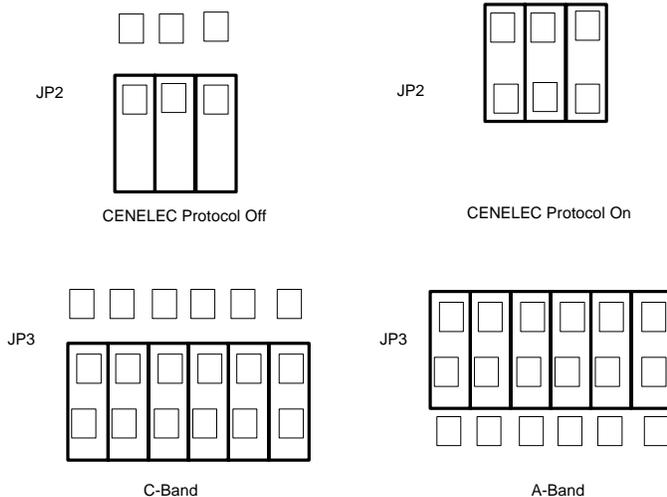


Figure 11B PLM-22 JP1, JP2, and JP3 Jumper Settings

The PLM-30 transceiver includes a jumper to enable full power or attenuated output. Full power is typically used. With this setting, a zero impedance load at the transceiver output will cause the PLM-30 to draw up to 2A@+5VDC of supply current. The maximum supply current can be limited with the attenuated output setting. This setting adds an internal 2.5 Ohm resistor in series with the transceiver output, degrading the external transmit level and performance but limiting maximum supply current to approximately 1A@+5VDC. The following figure illustrates the jumper configuration:

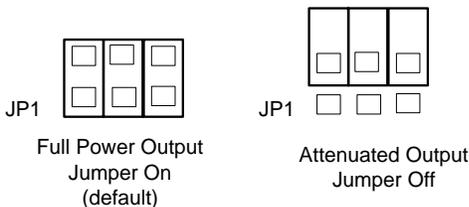


Figure 12 PLM-30 Jumper Settings

SMX CONNECTOR

Table 1 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.

Table 1 20-Pin SMX Connector

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
VCC	+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:

Table 2 Transceiver Types

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
09 (09)	PL-10	Spread Spectrum Power Line (100kHz - 450kHz)	10kbps
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	Narrow Band Power Line, CENELEC compliant access protocol on (125kHz - 140kHz)	5kbps
17 (11)	PL-20N	Narrow Band Power Line CENELEC compliant access protocol off (125kHz - 140kHz)	5kbps
18 (12)	PL-30	Spread Spectrum Power Line (9kHz - 95kHz)	2kbps
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:

Table 3 BSY/PKT LED Function

Host Board	TPM	PLM
PCLTA	Transmitting a packet	Not transmitting a packet
Protocol Analyzer	Receiving a packet	Not receiving a packet
NSS-10 Evaluation Board	Host busy or transmitting a packet	Host not busy and not transmitting a packet
LonBuilder®	Not used	Not used
NodeBuilder® Motherboard	Transmitting a packet	Not transmitting a packet
PCNSS	Host busy or transmitting a packet	Host not busy and not transmitting a packet

The PLM transceivers include additional activity and status LEDs as described in the following table:

Table 4 PLM Transceiver Activity

LED	Transceiver	Purpose
240V	PLM-10	240V Line-to-Earth line voltage (off for 120V or Line-to-Neutral mode)
BIU	PLM-22	Band-in-use
DM	PLM-10, PLM-22	(L-N) coupling when on; (L-E) when off
PKD	All	Packet detect
No label	PLM-30	Not used
TXL	PLM-30	Transmit level (on for full power; off for attenuated output)
7Vp-p	PLM-22	7Vp-p output enabled
PKT	PLM-22	On steadily, flashes with packet transmission

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:

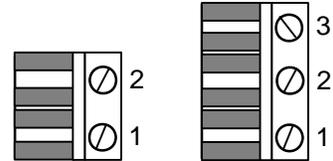


Figure 13 Pin 1 Designations

The PLM-10, PLM-22, and PLM-30 transceiver use an SMA connector with the following pin-out.

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

SMX TRANSCEIVER MODELS

TPM/XF-78	77010	PLM-10	77090
TPM/XF-1250	77030	PLM-20	77162, 77162R
TPM-RS485	77050	PLM-30	77180
FTM-10	77040, 77040R		

SPECIFICATIONS

Network Connectors	Weidmüller 2-pin connector for Models 77010, 77030, and 77040, and Weidmüller 3-pin connector for Model 77050 SMA connector for Models 77090, 77162, 77180
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Motherboard SMX Connector	0.025" square post sockets, arranged in a 2x10 configuration, Samtec MTSW-11022-TD-440 or equal
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Network Stub Wiring ¹	See transceiver user's guide
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Network Stub Length ¹	See transceiver user's guide
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Operating Input Voltage	+5VDC ±5%
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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, 77040R ²	17mA typical, 20mA max transmit 2mA typical, 4mA max receive

Specifications (continued)

Model 77090,77162,77162R ²	750mA @5V max transmit
Model 77180	2A @5V max transmit (JP1 on) 1A @5V max transmit (JP1 off)
Temperature	
Operating	0 to +40°C
Non-operating	-40 to +85°C
Humidity (non-condensing)	
Operating	
Models 77010, 77030, 77040 and 77050:	10 to 95%RH @40°C
Models 77090, 77162, 77180:	10 to 95%RH @40°C
Non-operating	10 to 95%RH @85°C
Dimensions (without faceplate)	
Models 77010, 77030, 77040, and 77050:	(3.60"x1.80"x.52") 165.1mm x 45.7mm x 15.3mm
Models 77090, 77162, 77180:	(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.

2. Model Numbers ending in "R" are RoHS-compliant versions of the corresponding model numbers without ending in "R".

For more information, visit the Echelon web site at www.echelon.com.

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