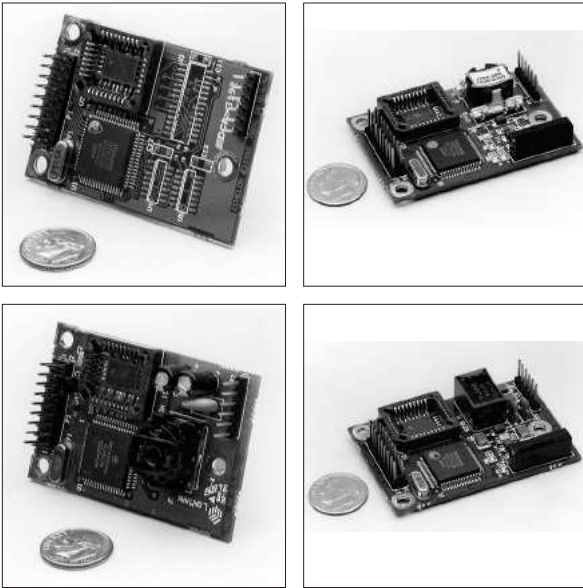


## Twisted Pair and Generic Control Modules

### Models 55010-00, 55010-10, 55020-01, 55020-10, 55030-10, 55010R-00, 55010R-10, 55020R-01, 55020R-10, and 55030R-10



### Description

Control modules provide a simple, cost-effective method of adding LONWORKS® technology to any control system. A control module consists of a miniature circuit card containing a Neuron® 3150® Chip, PROM, or flash (TP/FT-10F, TP/XF-78F) memory socket, a communication transceiver, and connectors for power, I/O, and the network. Three transceiver options are available for twisted pair control modules:

- Free topology, transformer-isolated, 78kbps, differential Manchester encoded (TP/FT-10, TP/FT-10F);
- Transformer-isolated, 78kbps, differential Manchester encoded (TP/XF-78, TP/XF-78F);
- Transformer-isolated, 1.25Mbps, differential Manchester encoded (TP/XF-1250).

The small size of the control modules permits them to be mounted on or inside an OEM's product, directly adjacent to the sensors, outputs, or displays that the module will control.

Using the control modules can save hundreds of hours of development time compared with designing custom modules. The control modules are designed to comply with both FCC and VDE Level B requirements, minimizing time-consuming and expensive laboratory testing, component selection, and layout redesign work. As UL, CSA, and TÜV Recognized components, the control modules can be integrated into a product with minimal additional safety testing.

Models 55010R-00, 55010R-10, 55020R-01, 55020R-10, and 55030R-10 are compliant with the European Directive

- ▼ On-board Neuron 3150 Chip
- ▼ Local event processing
- ▼ Differential Manchester encoded signaling for polarity-insensitive network wiring
- ▼ Transformer-isolation
- ▼ 78 kilobits per second (TP/FT-10, TP/FT-10F, TP/XF-78, TP/XF-78F) and 1.25 megabits per second (TP/XF-1250) network bit rates
- ▼ Distances up to 500 meters worst case<sup>1</sup> in free topology (TP/FT-10, TP/FT-10F)
- ▼ Distances up to 2700 meters worst case<sup>1</sup> in doubly terminated bus topology (TP/FT-10, TP/FT-10F)
- ▼ Flash memory support on TP/FT-10F and TP/XF-78F
- ▼ Common form factor makes control modules interchangeable
- ▼ Low power consumption
- ▼ Designed to comply with FCC and VDE Level B requirements
- ▼ UL, CSA, TÜV Recognized components (TP/XF-78F pending)
- ▼ LONMARK® certifiable

2002/95/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment.

All control modules are the same size and use the same wiring connectors, allowing the user to change communication speeds and transceivers without developing new modules. This design also allows the modules to be exchanged for one another without modifying the application electronics motherboard.

The control modules are supplied as compact circuit boards already including the surface-mount technology (SMT) Neuron 3150 Chip, eliminating the need for the customer to operate an SMT board assembly operation. The control modules are economically priced for both low and high volume users.

The TP/FT-10, TP/FT-10F, TP/XF-78, and TP/XF-78F modules communicate at 78kbps, the TP/XF-1250 at 1.25Mbps. All of the modules provide high speed throughput to meet a wide range of control applications. The Neuron 3150 Chip is operated at a 5MHz clock speed on the TP/FT-10 and TP/XF-78 modules, and at 10MHz on the TP/FT-10F, TP/XF-78F and TP/XF-1250 modules.

The TP/FT-10F and TP/XF-78F modules include circuitry to support an Atmel 29C257 (32K) or 29C512 (64K total, 56K usable), or 29C010A (128K total, 56K usable, 72K unusable)

flash memory. This feature allows new parameters and applications to be downloaded into the module via the network, and is ideal for applications that require field programming changes or where nodes will be physically inaccessible.

The TP/FT-10, TP/FT-10F, TP/XF-78, TP/XF-78F, and TP/XF-1250 modules use a transformer to isolate them from the twisted pair network cable. This design provides excellent common mode rejection and permits the system to operate in electrically noisy environments. It also reduces the susceptibility of the system to ground loops caused by the use of multiple node power supplies that are floating relative to ground. This architecture makes these modules ideal for communicating over long distances in industrial environments.

Echelon offers a comprehensive range of development tools, network interfaces, routers, and network services tools to simplify the task of designing and commissioning products using the control modules. Technical support for the modules is available through Echelon's technical support program.

## Connectors

### 18-Pin I/O (P1) — All Modules

Function	Pin
N/C	1
IO 0	2
GND	3
IO 1	4
GND	5
IO 2	6
GND	7
IO 3	8
~RESET	9
IO 4	10
IO 5	11
+5V	12
IO 6	13
IO 9	14
IO 7	15
IO 10	16
IO 8	17
~SERVICE	18

### 6-Pin Network (P2) — TP/FT-10, TP/FT-10F

Function	Pin
NC	1, 2, 5, 6
DATA B	3
DATA A	4

### 6-Pin Network (P2) — TP/XF-78, TP/XF-78F, TP/XF-1250

Function	Pin
CT B	1
CT A	2
DATA B	3
DATA A	4
N/C	5, 6

## Female Connector Part Numbers

Supplier	18-pin (2 x 9) (P1)	6-pin (1 x 6) (P2)
Samtech S	SW-109-01-T-D	SSW-106-01-TS
Advanced Interconnections	BC-009-124TL	BC006-123TL
Methode	9000-209-303	9000-106-303

## Sources for 32K X 8 OTP ROM TP/FT-10, TP/XF-78

### (32-LEAD JEDEC PLCC PACKAGE)

Supplier	5 MHz Clock (150-200ns)
AMD	AM27C256-200JC
Atmel	AT27C256R-20JC
Intel	N27C256-20/L
Microchip	27C256-20/L
National	NMC27C256.20
Signetics	27C256-20A
Texas Instruments	TMS27C256.20

## Sources for Flash Memory TP/FT-10F, TP/XF-78F

### (32-LEAD JEDEC PLCC PACKAGE)

Supplier	10 MHz Clock (t <sub>DS</sub> 35ns)
Atmel	AT29C257-90JC (32K x 8)
Atmel	AT29C512-90JC (64K x 8, 56K usable)
Atmel	AT29C010A-90JC (128K x 8, 56K usable)

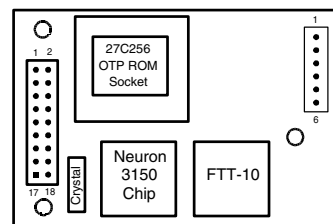
## Sources FOR 32 K X 8 OTP ROM TP/XF-1250

### (32-LEAD JEDEC PLCC PACKAGE\*)

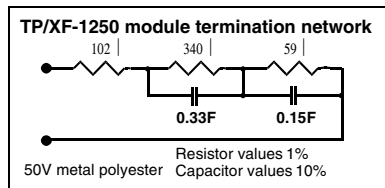
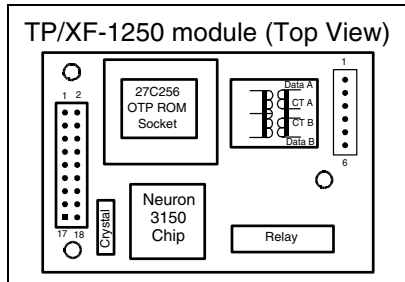
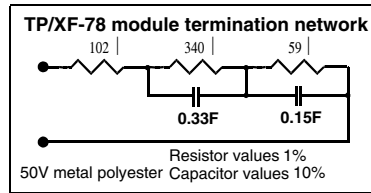
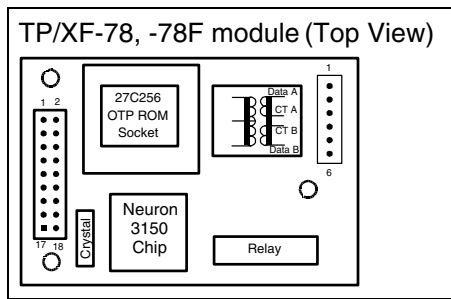
Supplier	10 MHz Clock (90ns)
AMD	AM27C256-90JC
Catalyst	CAT27HC256LN-90
Microchip	27HC256-90/L

\* TP/XF-1250 modules with a manufacturing date code on or before January 1995 (revision code A to G) require a memory with a 90ns access time. TP/XF-1250 modules with a manufacturing date code after February 1, 1995, (revision code H or later) require a memory with a 90ns or 120ns access time.

### TP/FT-10, -10F modules (Top View)



For termination options, consult the User's Guide.



## Specifications

Microprocessor	Neuron 3150 Chip
Crystal Oscillator Clock	TP/FT-10, TP/XF-78: 5MHz TP/FT-10F, TP/XF-78F, TP/XF-1250: 10MHz
Memory Socket and Type	TP/FT-10, TP/XF-78, TP/XF-1250: PLCC type for 32-lead JEDEC 32 KB OTP ROM TP/FT-10F, TP/XF-78F: Flash memory chip not included. Flash memory must have $t_{DS}$ 35ns. Linker will allocate 64 bytes of dedicated Neuron 3150 Chip RAM for 32K flash memory and 128 bytes of dedicated Neuron 3150 Chip RAM for 64K flash memory (56K usable, 8K unusable).
Data Communication Type	Differential Manchester coding
Transceiver Type	Transformer-isolated
Network Compatibility with Echelon Transceivers	TP/FT-10, TP/FT-10F: compatible with FTT-10, FTT-10A, and LPT-10. TP/XF-78 and TP/XF-78F: compatible with TPT/XF-78. TP/XF-1250: compatible with TPT/XF-1250.
Isolation Between Network and I/O Connectors <sup>3</sup>	0-60 Hz (60 seconds): 1000VRMS
Common Mode Range 0-60 Hz	277VRMS
Typical Supply Current <sup>4</sup>	TP/FT-10: 25mA receive, 40mA transmit TP/XF-78: 35mA receive, 45mA transmit TP/XF-78F: 50mA receive, 60mA transmit TP/XF-1250: 55mA receive, 80mA transmit
Electrostatic Discharge to Network Connector <sup>5</sup>	TP/FT-10, TP/FT-10F: Designed to comply with IEC801-2, Level 4 TP/XF-78, TP/XF-78F, TP/XF-1250: No errors to 15kV, no hard failures to 20kV tested per MIL-STD-883
EMI	Designed to comply with FCC Part 15 Level B and VDE 0871 Level B
Listings	UL 1950, CSA C22.2 No. 950, TÜV EN60950
Transceiver Bit Rate	TP/FT-10, TP/FT-10F, TP/XF-78, TP/XF-78F: 78kbps TP/XF-1250: 1.25Mbps
Maximum Nodes Per Channel	TP/FT-10, TP/FT-10F: 64 (-40 to +85°C) TP/XF-78, TP/XF-78F: 64 (0 to 70°C), 44 (-40 to +85°C) TP/XF-1250 <sup>6</sup> : 64 (0 to 70°C), 32 (-20 to +85°C), 16 (-40 to +85°C)
Network Wiring	TP/FT-10, TP/FT-10F: 22 to 16AWG twisted pair; see User's Guide for qualified cable types TP/XF-78, TP/XF-78F, TP/XF-1250: Level 4, 22AWG twisted pair <sup>7</sup>
Network Length in Free Topology <sup>2</sup>	TP/FT-10, TP/FT-10F only: 1000m (3280 feet) maximum total wire with one repeater 500m (1640 feet) maximum total wire with no repeaters 500m (1640 feet) maximum node to node distance with no repeaters

Network Length in Doubly-Terminated Bus Topology <sup>2</sup>	TP/FT-10, TP/FT-10F: up to 2700m (8850 feet) worst case <sup>1</sup> TP/XF-78, TP/XF-78F: 1400m (4600 feet) worst case <sup>1</sup> TP/XF-1250: 130m (430 feet) worst case <sup>1</sup>
Maximum Stub Length in Doubly-Terminated Bus Topology	TP/FT-10, TP/FT-10F, TP/XF-78, TP/XF-78F: 3m (9.8 feet) TP/XF-1250: 0.3m (12 inches)
Network Bus Polarity	Polarity insensitive
Power-down Bus Protection	High impedance when unpowered
Supply Voltage	5V ± 5%
I/O Connector	2 x 9 on 2.54 mm (0.1") centers
Network Connector	1 x 6 on 2.54 mm (0.1") centers
Network Termination	One terminator in free topology (TP/FT-10, TP/FT-10F only), two terminators in doubly-terminated bus topology for all others
Operating Temperature <sup>6</sup>	-40 to +85°C (excluding flash memory)
Non-operating Temperature	-40 to +85°C
Operating Humidity	25 - 90% RH @ 50°C, non-condensing
Non-operating Humidity	95% RH @ 50°C, non-condensing
Dimensions	61 mm x 18 mm x 41 mm (2.4" x 0.7" x 1.6")

## Ordering Information

Product	Echelon Model Number
TP/FT-10 Module	55020-01, 55020R-01 (RoHS-compliant)
TP/FT-10F Module	55020-10, 55020R-10 (RoHS-compliant)
TP/XF-78 Module	55010-00, 55010R-00 (RoHS-compliant)
TP/XF-78F Module	55010-10, 55010R-10 (RoHS-compliant)
TP/XF-1250 Module	55030-10, 55030R-10 (RoHS-compliant)
<i>LONWORKS Twisted Pair Control Module User's Guide</i> (order separately—not shipped with product)	078-0015-01

### Notes:

1. Worst case distance figures are based on variations in node distribution, node temperature, node voltage, wire characteristics, transceiver characteristics, and Neuron Chip characteristics, and allow for an average wire temperature of up to +55°C.
  2. Network length for TP/FT-10 varies depending on wire type. See *LonWorks FTT-10 Free Topology Transceiver User's Guide* for detailed specifications.
  3. Safety agency hazardous voltage barrier requirements are not supported.
  4. These figures include typical PROM current consumption of 4mA @ 5MHz; or 5mA @ 10MHz. During flash memory write cycles an additional 50mA will be consumed by the TP/XF-78F module. These figures exclude current due to loading on the I/O connector pins.
  5. The I/O pins of P1 connect directly to the Neuron Chip and do not contain additional protection beyond what is available with a typical advanced CMOS device.
  6. See *Motorola or Toshiba Neuron Chip Data Book* for operational temperature limitations of the Neuron Chip. In particular, versions of the Neuron Chip may be unable to write to the EEPROM at temperatures below -20°C, even though all other non-write operations are supported at -40°C.
  7. For wire specifications, see *Junction Box and Wiring Guidelines for Twisted Pair LonWorks Networks, 005-0023-01 Rev D or later*.
  8. Wiring topology restrictions apply to TP/XF-1250 modules for proper operation. No more than eight (8) TP/XF-1250 modules may be located within any sixteen (16) meter section of bus cable. Topology restrictions apply to TPM-1250 SMX Transceiver Modules as well, and each TPM-1250 module equals two TP/XF-1250 or TPT/XF-1250 modules from the perspective of number of devices on a channel.
- \* Neuron Chips and Control Modules were not designed for use in equipment or systems which involve danger to human health or safety or a risk of property damage and Echelon assumes no responsibility or liability for use of the Neuron Chips or Control Modules in such applications.

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