

TC3024

FIBER OPTIC MODE CONVERTER/REPEATER

30bps to 10Mbps

User's Manual

MODEL: _____

S/N: _____

DATE: _____

Notice!

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TC Communications, Inc. 17881 Cartwright Road - Irvine, CA 92614

Tel: (949) 852-1972 Fax: (949) 852-1948 Web Site: www.tccomm.com Email: info@tccomm.com

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User's Manual
Rev. 1.3

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Description

The TC3024 gives users the ability to convert Multimode fiber optic signals to Single Mode format for data transmission. These conversions can benefit users by extending transmission distances and/or enabling dissimilar fiber optic devices to be used with different fiber types. The optic receiver detects the incoming optical signal and regenerates it for transmission through the second optic transmitter. The TC3024 is available in multiple configurations depending on your communication requirements. When both sides have the same wavelength, the TC3024 works like an optical signal repeater.

Data Rates

30bps to 10Mbps (Burst or Continuous Data)

Optical Specifications

Transmitter:	LED; typical Launch Power:	-14 to -19 dBm* (850nm Multimode @62.5/125 μ m)
	LASER; typical Launch Power:	-5 to -8 dBm* (1310nm Single Mode @9/125 μ m)
	LASER; typical Launch Power:	-5 to 0 dBm* (1550nm Single Mode @9/125 μ m)
Receiver:	PIN DIODE; typical Sensitivity:	< -34 dBm* (850nm Multimode @62.5/125 μ m)
		< -30 dBm* (1310nm Single Mode @9/125 μ m)
		< -30 dBm* (1550nm Single Mode @9/125 μ m)
Loss Budget:	850nm, MM @62.5/125 μ m	> 15 dB
	1310nm, SM @9/125 μ m	> 22 dB
	1550nm, SM @9/125 μ m	> 25 dB
Distance:	850nm Multimode @62.5/125 μ m	up to 2km*
	1310nm Single Mode @9/125 μ m	up to 60km*
	1550nm Single Mode @9/125 μ m	up to 80km*
Wavelength:	850nm Multimode (LED)	
	1310nm Single Mode (LASER)	
	1550nm Single Mode (LASER)	
Note:	Only 850nm wavelength is available on Multimode side. The Single Mode side is available in 1310nm or 1550nm wavelengths. (The TC3024s <u>MUST</u> work in pairs)	
Connector:	Multimode, ST Only	
	Single mode, ST (Optional FC)	

*Launch power, sensitivity and distance are listed for reference only. These numbers may vary.

Front Panel LEDs, DIP Switches and Connectors

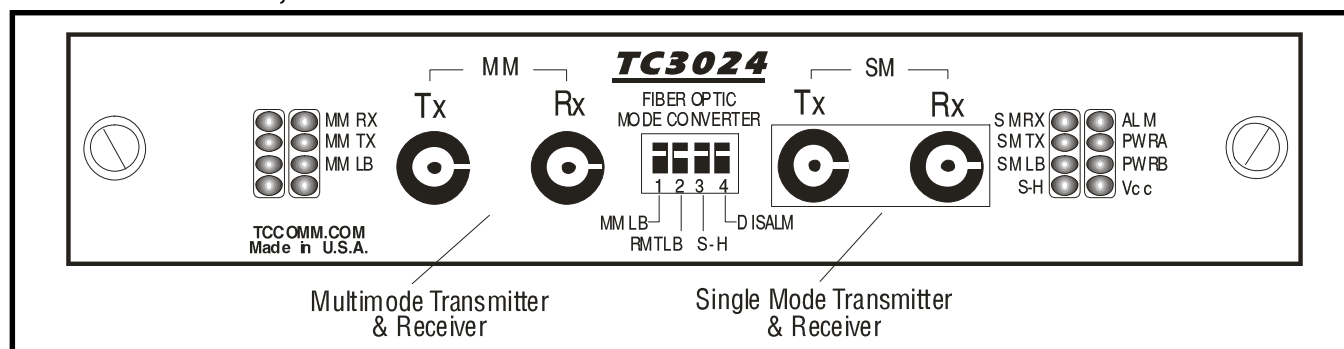


Figure 1. TC3024's Front Panel

LEDs Functions

Alarm-

ALM: Alarm indicator conditions:

- Solidly lit, indicates that the MM or SM optical signal is lost or power is lost on the remote unit.
- Flashing, indicates that the unit is in diagnostic mode (MMLB or RMTLB)
- Off, indicates that the unit is working under normal conditions.

Power Supply Status-

Power A/B: These LEDs indicate from which power connector on the rear panel the unit is drawing power.

- Solidly lit, indicates power supply is good. If power redundancy is utilized, both LEDs will be lit.
- Off, indicates the power supply failed or card fuse is burned.

Vcc: +5V Voltage indicator. This LED should light whenever power is connected to the unit. It indicates the correct operating voltage is being derived from the power source.

Single Mode Optic Signal Status LED Indicators-

SM RX: -Solidly lit, it indicates that SM optical signal is above sensitivity threshold and receiving data.

-Off, it indicates the SM optical signal is above sensitivity threshold but not receiving data.

-Flashing, it indicates the SM optical signal is below sensitivity threshold or is lost.

SM TX: -Solidly lit, it indicates the SM optic is transmitting optical data.

-Off, it indicates the SM optic is not transmitting optical data.

SM LB: -Off (Normal condition), on the remote unit, it indicates that the Remote loopback function is disabled (on the local TC3024). Note, on the local unit the "SM LB" LED will be off whether the remote loopback function is enabled or not.

-Flashing (on remote unit only), it indicates that the remote loopback function has been enabled on the local unit. When the remote loopback is enabled on the local unit, the "ALM" LED will flash on both the local and remote units to indicate that the units are in diagnostic mode.

S-H: -Off, indicates that the unit is set to low speed, for data rate below 5Mbps.

-Solidly lit, indicates that the unit is set to high speed, for data rate above 5Mbps.

MM Mode Optic Signal Status LED Indicators-

MM RX: -Solidly lit, it indicates that MM optical signal is above sensitivity threshold.

-Flashing, it indicates that the MM optical signal is below sensitivity threshold or is lost.

MM TX: -Solidly lit, it indicates the MM optic is transmitting optical data.

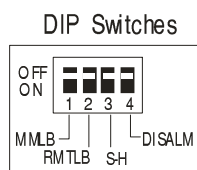
-Off, it indicates the MM optic is not transmitting optical data.

MM LB: -Off(Normal condition), it indicates that the MMLB functions is disabled.

-Flashing, it indicates that the MM LB function is enabled. When enabled, the "ALM" LED will also be flashing to indicate that the unit is in diagnostic mode. Refer to the Multimode Loopback Test on page 9.

DIP Switch Functions

Front panel diagnostic DIP switches, slide the switch to the down (On) position to activate the function.



MM LB: Enables the Multimode Optical Loopback Test. Refer to the Multimode Loopback Test on page 9.

RMT LB: (Enabled on the local TC3024 unit). Remote loopback, when turned "On" on the local unit, the remote unit will loopback the SM (single mode) signal back to the local unit. Refer to the Remote Loopback Test on page 10.

S-H: Enables low speed or high speed on the TC3024 units.

OFF: Enables low speed, for data rate less than 5Mbps.

ON: Enables hi speed, for data rate above 5Mbps.

DISALM: Disables the audio alarm buzzer & dry contact relay alarm.

Rear Panel Connectors

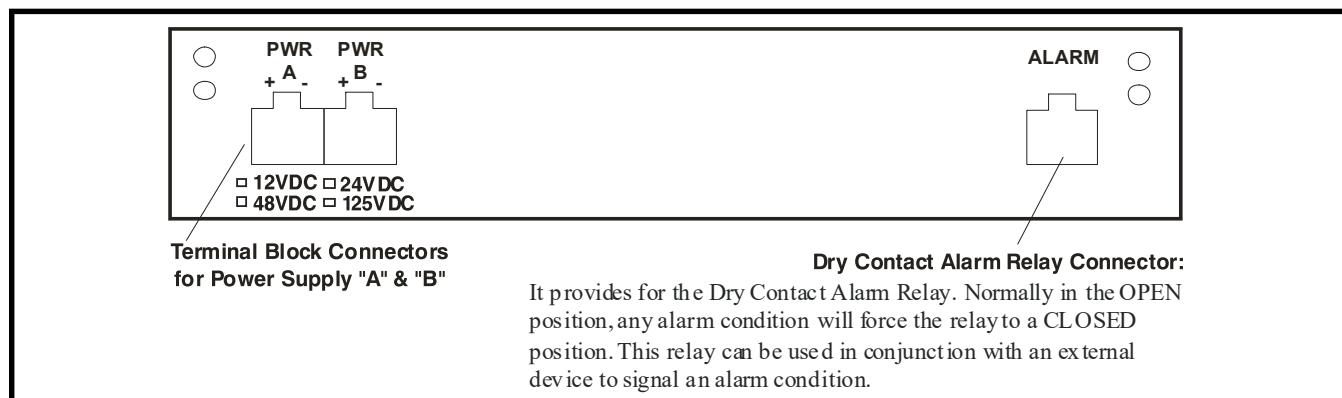


Figure 2. TC3024's Rear Panel

Unpacking the Unit

Before unpacking any equipment, inspect all shipping containers for evidence of external damage caused during transportation. The equipment should also be inspected for damage after it is removed from the container(s). Claims concerning shipping damage should be made directly to the pertinent shipping agencies. Any discrepancies should be reported immediately to the Customer Service Department at TC Communications, Inc.

Equipment Location

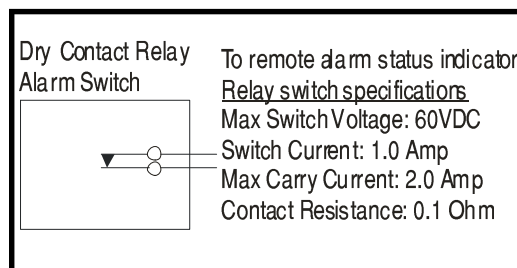
The TC3024 should be located in an area that provides adequate light, work space, and ventilation. Avoid locating it next to any equipment that may produce electrical interference or strong magnetic fields, such as elevator shafts or heavy duty power supplies. As with any electronic equipment, keep the unit from excessive moisture, heat, vibration, and freezing temperatures.

Power Supply

Standard input power to the TC3024 is 12VDC @200mA. There are two pairs of terminal block connectors on the rear panel (labeled "PWR A" and "PWR B"). Only one pair is required to power the unit. Polarity is indicated on each connector block. If both pairs are connected, the built-in power redundancy feature will be utilized. When this feature is utilized, both "A" and "B" share the load. If one power source fails, the other will assume the full load. Polarity is indicated on each connector block. Alternate power sources are available as an option (see Chapter 4 - Specifications).

Dry Contact Relay Alarm

A terminal block connector on the rear panel (labeled "ALARM") provides for the dry contact relay alarm (see Figure 2). Normally in the OPEN position, the loss of either fiber optic signal or power will trigger an alarm condition and force the switch to the CLOSED position. This relay can be used in conjunction with an external device to monitor the condition of the fiber optic links. Note: If SW4 (DISALM) on the front panel is in the Down position, the on-board audio buzzer will not sound and the dry contact relay will not activate.



Note: Dry Contact Alarm Relay (DCAR) can be ordered in Normal Closed configuration. Please contact the factory prior to purchasing.

When used in NC (Normal Close) configuration, the relay will OPEN if the unit loses power completely or the alarm is triggered by the loss of either fiber optic signal. If fiber optic signal is lost, the alarm "ALM" LED will be lit and the on-board audio buzzer will be on. The relay remains CLOSED during normal operation.

Installation Diagram

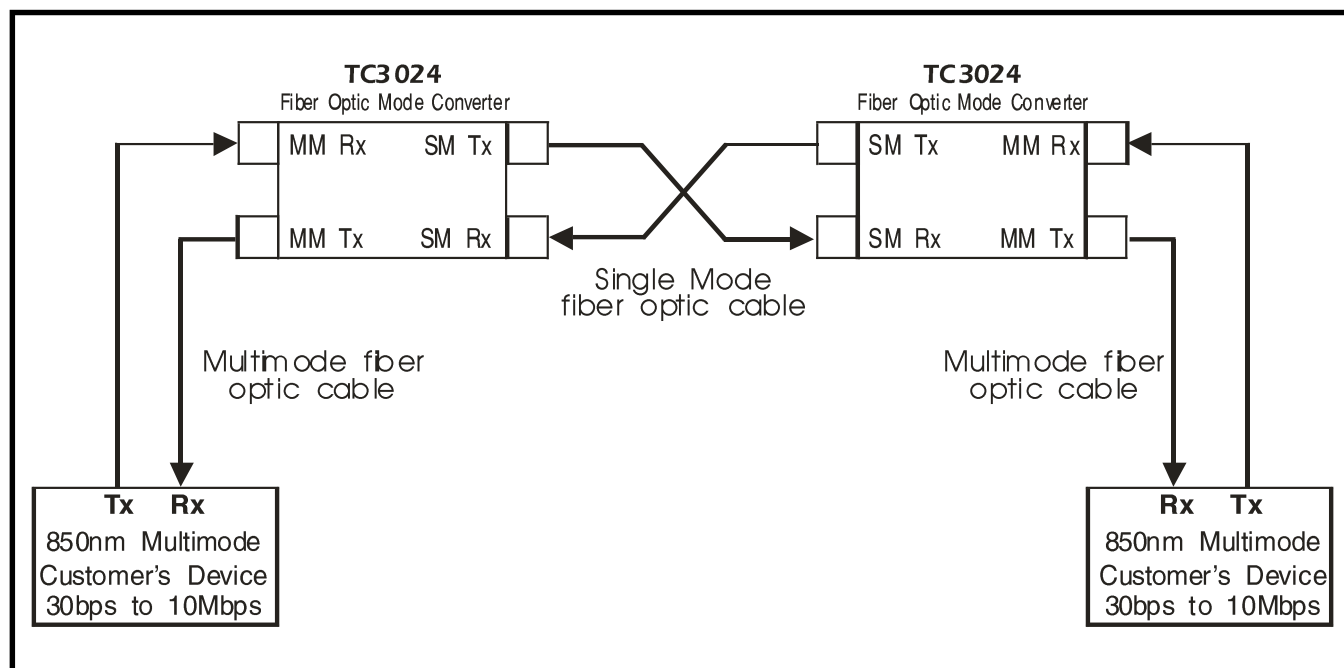


Figure 3. Installation Diagram for Dual TC3024 Application

Typically, most problems encountered with the TC3024 are related to optic receiver overdrive. The maximum optic power that can be received without distortion is referred to as the optic receiver's "saturation level." When the incoming optic power is greater than the saturation level of the receiver, optic "overdrive" can occur.

The TC3024 Multimode optic receivers have a typical saturation level of -14 dBm. If the user's equipment's launch power is higher than -14dBm (i.e. -13dBm or greater) and the fiber run is very short and has low signal loss, it is likely to overdrive the TC3024 Multimode receiver. The Single mode optic receivers have a typical saturation level of -5 dBm. However, the TC3024 has been adjusted at the factory so that the Single Mode transmitter will not overdrive the Single Mode receiver even when short cables are used to connect them; hence, the overdrive condition happens most frequently at the Multimode receiver optic.

The consequences of overdrive can be high error rates or the device's failure to recognize the incoming optic signal at all. If you suspect the Multimode receiver has an optic overdrive condition, a simple test will help verify it. At the receiving optic in question, simply disconnect the optic connector and back it out of the receptacle (about 1/8 of an inch), creating a gap between the fiber connector and the receiver. Verify that the equipment is still in "sync" with the optic signal and that the overdrive condition has been corrected. To resolve the overdrive condition permanently, insert a 5dB or 10dB in-line attenuator into the problem link. In-line attenuators can be purchased from Metrotek* at (727) 547-8307. A few part numbers are given below:

Description:	ST@5dB	ST@10dB	FC@5dB	FC@10dB
Part Number:	68-JJ-7-0513	68-JJ-7-1013	68-FF-0513	68-FF-1013

The following diagram illustrates the TC3024 Mode Converters used to convert an 850nm Multimode optical signal from a customer's device (1-10 Mbps) into a 1310/1550nm Single mode optic signal between the TC3024s & back to 850nm Multimode optical signal to be received by a remote device (1-10 Mbps) & vice versa. In-line attenuators are used to correct optic overdrive conditions that exist on either side of the TC3024.

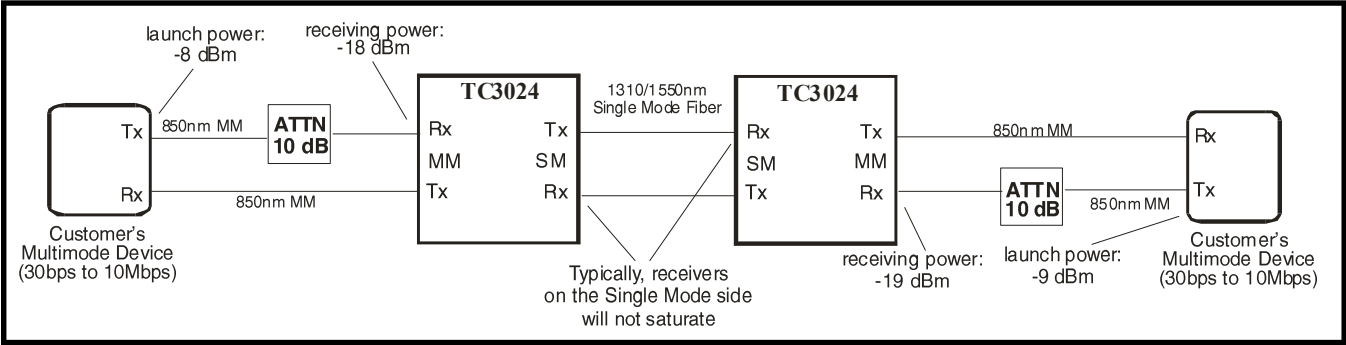


Figure 4. In-line Attenuator Placement Diagram

Multimode Local Loopback and Remote Loopback Tests

If you are having trouble establishing communication with your equipment and the TC3024 unit(s), you can test the unit(s) by performing the following simple assessment tests. You will need to perform a Multimode Loopback Test & a Remote Loopback Test on your TC3024 unit(s). These tests should be done using your PC's hyperterminal or a Tester. Please refer to the next to tests.

Note: Make sure that your equipment's wavelengths match with that of the TC3024's. The 850nm wavelength is shown as a reference only on the following figures.

Multimode Loopback Test

The purpose of this test is to verify that the optical Multimode TX/RX connectors are receiving and transmitting the incoming signal coming from the PC/Tester back to the PC/Tester. This test will ensure that the TC3024 unit(s) are working properly.

This test will require the testing setup shown on Figure 5. Follow the connections shown on the figure below and connect your equipment accordingly. You will need to locate the DIP switches on the front panel of the TC3024 and enable the (MMLB) switch (SW2-1) to the down "On" position as shown on Figure 5. The rest of the DIP switches must be in the up "Off" position.

1. Use an RS-232 adapter and connect it from your PC/Tester to a Multimode TC1200 RS-232 fiber modem or a compatible RS-232 fiber modem.
2. After completing all of the connections, you should be able to transmit and receive data.
3. You should observe that the (MM TX), (MM RX) are lit solidly and the "MM LB" & "ALM" LEDs are flashing indicating that the unit is in diagnostic mode. This indicates that the TC3024 unit is working properly.
4. After you finish this test, reset switch (SW2-1) to the up "Off" position.

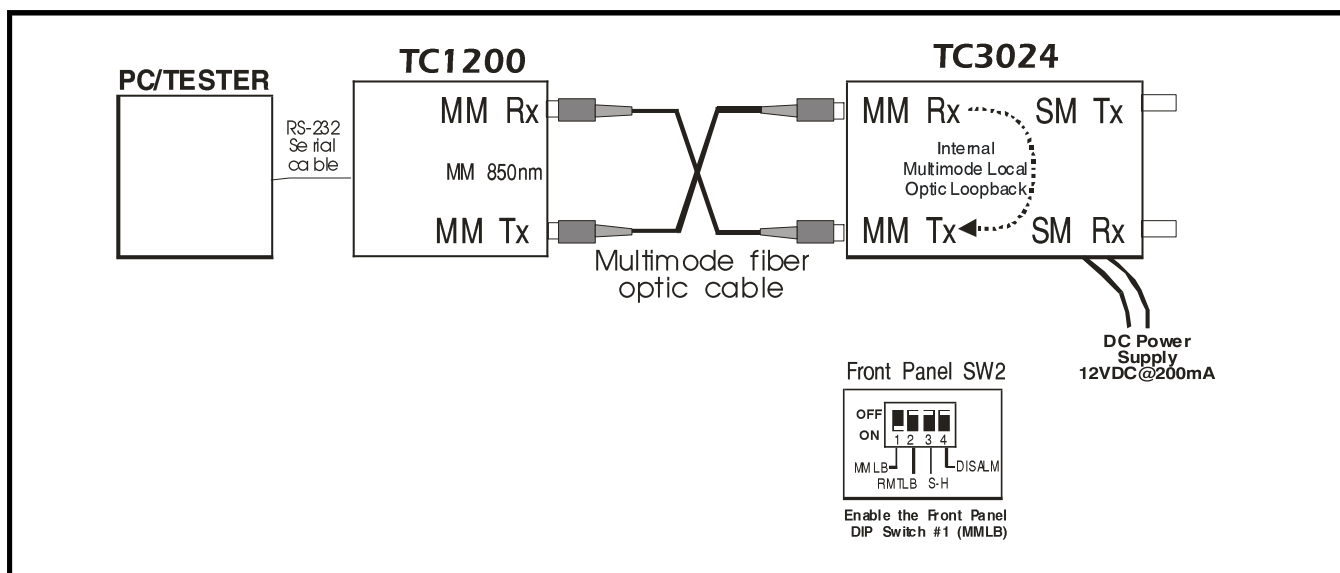


Figure 5. Multimode Local Loopback Test Diagram

Remote Loopback Test using two TC3024 units

The purpose of this test is to verify that the optical Single mode TX/RX connectors on the remote unit are receiving and transmitting the incoming signal coming from the PC/Tester back to the PC. This test will ensure that the TC3024 unit(s) are working properly.

Testing your TC3024's for performance will require the testing setup shown on Figure 6. Follow the connections shown on this figure and connect your equipment accordingly. You will need to locate the DIP switches on the front panel of the local unit and enable SW2-2 (RMT LB) to the down "On" position as shown on Figure 6. The rest of the DIP switches must be in the up "Off" position.

1. Use an RS-232 adapter and connect it from your PC to a Multimode TC1200 fiber modem or a compatible RS-232 fiber modem.
2. After completing all of the connections you should be able to transmit and receive data.
3. On the local unit, you should observe that the (MM TX), (MM RX), (SM TX), and (SM RX) LEDs are lit solidly. On the remote unit, you should observe that the (SM RX) & (SM TX) LEDs are lit solidly and that the "SM LB" & "ALM" LEDs are flashing. This indicates that both of the units are working properly.

Note: When this function is enabled on the local unit: Both the local unit & remote unit will have the "ALM" LEDs flashing to indicate that both units are in diagnostic mode.

4. After you finish this test, reset SW2-2 (RMT LB) on the local unit to the up "Off" position.

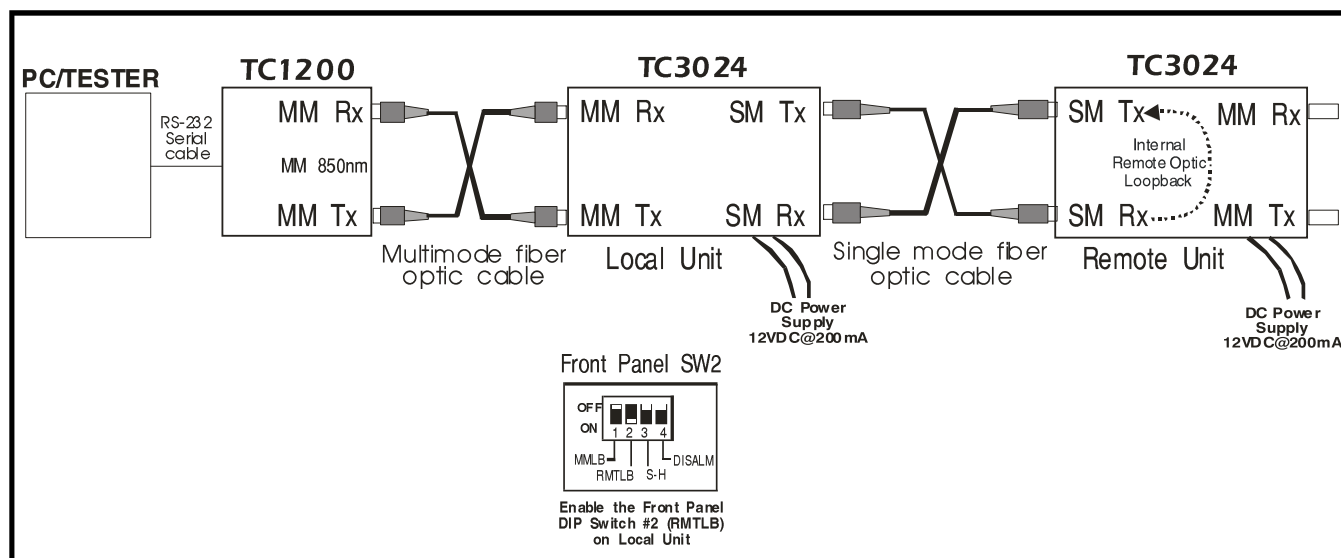


Figure 6. Remote Loopback Test Diagram

Fiber Signal Loss Alarm Trigger Time Settings

The TC3024 is equipped with an internal “Fiber Signal Loss Alarm Trigger Time Settings” to compensate the idle time (in seconds) if the customer’s device is sending bursty optical data signals. If the idle time exceed the setting value, it is assumed that the optical signal is lost and will trigger the alarm.

The “Fiber Signal Loss Alarm Trigger Time Settings” value can be set to 1 second, 2 seconds, 4 seconds or 8 seconds by means of resetting the internal 8-position SW-1 DIP switch (DIPS # 7 and # 8) as shown on Table 1 below.

Important Note: If the need arises to have these internal settings changed, you must contact the Technical Support Department at TC Communications, Inc. to prevent voiding the warranty of your unit(s) at (949) 852-1973 or technicalsupport@tccomm.com.

SW1-7	SW1-8	(Trigger Time)
Off	Off	1Sec
On	Off	2Sec
Off	On	4Sec
On	On	8Sec

Table 1. Fiber Signal Loss Alarm Trigger Time Settings

Data Rates

..... 30bps to 10Mbps

Optical

See page 3

Indicators

System statusPWRA, PWRB, ALM, Vcc
Optic Signal Status MM Rx, MM Tx, SM Rx, SM Tx
Diagnostic Status MM LB, SM LB, S-H

Power Source

Standard 12VDC @200mA (typical)
Optional 24VDC or -48VDC

Temperature

Operating -10°C to 50°C
..... Hi-Temp Version (Optional) -20°C to 70°C
..... Extreme Temp Version (Optional) -40°C to 80°C
Storage -40°C to 90°C
Humidity 95% non-condensing

Physical Characteristics

Rack Mountable Card

Height: 7.0" (17.7 cm)
Width: 1.2" (3.1 cm)
Depth: 5.8" (14.8 cm)
Weight: 8.5 oz. (188 gm)

Stand Alone Unit

Height: 1.4" (3.5 cm)
Width: 7.2" (18.2 cm)
Depth: 6.6" (16.6 cm)
Weight: 1.5 lbs. (512 gm)

*Consult factory for higher requirements .

Return Policy

To return a product, you must first obtain a Return Material Authorization number from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please provide a description of the problem and any results of diagnostic tests that have been conducted.

Warranty

Damages by lightning or power surges are not covered under this warranty.

All products manufactured by TC Communications, Inc. come with a five year (beginning 1-1-02) warranty. TC Communications, Inc. warrants to the Buyer that all goods sold will perform in accordance with the applicable data sheets, drawings or written specifications. It also warrants that, at the time of sale, the goods will be free from defects in material or workmanship. This warranty shall apply for a period of five years from the date of shipment, unless goods have been subject to misuse, neglect, altered or destroyed serial number labels, accidents (damages caused in whole or in part to accident, lightning, power surge, floods, fires, earthquakes, natural disasters, or Acts of God.), improper installation or maintenance, or alteration or repair by anyone other than Seller or its authorized representative.

Buyer should notify TC Communications, Inc. promptly in writing of any claim based upon warranty, and TC Communications, Inc., at its option, may first inspect such goods at the premises of the Buyer, or may give written authorization to Buyer to return the goods to TC Communications, Inc., transportation charges prepaid, for examination by TC Communications, Inc. Buyer shall bear the risk of loss until all goods authorized to be returned are delivered to TC Communications, Inc. TC Communications, Inc. shall not be liable for any inspection, packing or labor costs in connection with the return of goods.

In the event that TC Communications, Inc. breaches its obligation of warranty, the sole and exclusive remedy of the Buyer is limited to replacement, repair or credit of the purchase price, at TC Communications, Inc.'s option.

To return a product, you must first obtain a Return Material Authorization (RMA) number and RMA form from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please fill out RMA form provided with a description of the problem(s) and any results of diagnostic tests that have been conducted. The shipping expense to TC Communications should be prepaid. The product should be properly packaged and insured. After the product is repaired, TC Communications will ship the product back to the shipper at TC's cost to U.S. domestic destinations. (Foreign customers are responsible for all shipping costs, duties and taxes [both ways]. We will reject any packages with airway bill indicating TC communications is responsible for Duties and Taxes. To avoid Customs Duties and Taxes, please include proper documents indicating the product(s) are returned for repair/retest).

Limitation of Liability

In no event shall the total liability of TC Communications, Inc. to purchaser and/or end user for all damages including but not limited to compensatory, consequential and punitive damages, exceed the total amount paid to TC Communications, Inc. by purchaser for the goods from which the claim arose, in no event shall TC Communications, Inc. be responsible for indirect and consequential damages.

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Limitation of Liability (Cont.)

In no event shall liability attached to TC Communications, Inc. unless notice in writing is given to TC Communications, Inc. within ten days of the occurrence of the event giving rise to such claim.

TC Communications, Inc. shall not be responsible for delays or non-deliveries directly or indirectly resulting from or contributed to by foreign or domestic embargoes, seizure, fire, flood, explosion, strike, act of God, vandalism, insurrection, riot, war, or the adoption or enactment of any law, ordinances, regulation, or ruling or order or any other cause beyond the control of TC Communications, Inc.

TC Communications, Inc. shall not be responsible for loss or damage in transit and any claims for such loss or damage shall be filed by the purchaser with the carrier.