

T1/E1/J1 modules are physical layer, SNMP-manageable devices that convert twisted pair to fiber optics and operate at a switch-selectable protocol rate of T1 (1.544), E1 (2.048) and the Japanese J1 (1.544).

Each T1/E1/J1, TP/Fiber module includes one RJ-48 and one pair of ST or SC fiber optic connectors (one one small form factor connector) and requires one slot in an SNMP-manageable media conversion chassis (such as the High Density Media Converter System II) or an unmanaged 1-Slot Desktop Chassis.

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 **CAUTION! RJ-48 connectors are not for use with telephone networks. If used in this manner, damage to the telephone network may result.** 

| | | |
|---------|-----------------------------------|-----------------------|
| LME001A | T1/E1/J1, TP/Fiber-MM1300-ST | T1/E1 Module [2 Km] |
| LME002A | T1/E1/J1, TP/Fiber-MM1300-SC | T1/E1 Module [2 Km] |
| LME003A | T1/E1/J1, TP/Fiber-MM1300-MT | T1/E1 Module [2 Km] |
| LME004A | T1/E1/J1, TP/Fiber-SM1310/PLUS-ST | T1/E1 Module [40 Km] |
| LME005A | T1/E1/J1, TP/Fiber-SM1310/PLUS-SC | T1/E1 Module [40 Km] |
| LME006A | T1/E1/J1, TP/Fiber-SM1310/LONG-ST | T1/E1 Module [80 Km] |
| LME007A | T1/E1/J1, TP/Fiber-SM1310/LONG-SC | T1/E1 Module [80 Km] |
| LME008A | T1/E1/J1, TP/Fiber-SM1550/LONG-SC | T1/E1 Module [100 Km] |

NOTE

In order to function correctly, you must have Black Box T1/E1/J1 modules at **BOTH** ends of the conversion. The data transmitted on the fiber ports can only be received and interpreted by the receive fiber of another T1/E1/J1 module.

Configuration Instructions

T1/E1/J1 modules include various features (see page 3-5) which help improve the performance and reliability for your T1/E1/J1 requirements. Following are instructions for both managed and unmanaged modules.

MANAGED MODULES— To manage *T1/E1/J1* modules, chassis must have an SNMP agent: some chassis require a management module; other chassis include embedded management. When using *T1/E1/J1 Modules* in a managed environment, manually configure features which you cannot configure via management software prior to installing the module. (See pages 2-5 for configuration instructions/description of the functions). After completing hardware configuration, install the *T1/E1/J1 Module* (see page 5), and configure additional features via the software.

The features which are configurable via management software include: *Loop Back Selection*, *Transmit Data Source*, *Line Encoding*, *NRZ* and *EGL*. Configure these settings within *iView² for Media Conversion* in the Module Detail section of the main viewing screen, under the picture of the module. Refer to the help file for more information.

When installed in an unmanaged chassis, *T1/E1/J1* modules are only SNMP-manageable/software configurable if connected to a *T1/E1/J1* module installed in a managed chassis. Some features may not be software configurable on a remote unit.

NOTE

Management software will override any hardware settings (e.g., jumper, switch, etc.), so you **MUST** configure a module that you will manage, via the software. Until you configure a module via the software, the module (and its LEDs) may not work properly.

INSTALLATION TIP

When testing, Black Box recommends testing your modules first in an **unmanaged** environment. To do this, turn the SNMP management switch to OFF, or remove the management module from the chassis (depending on chassis type). Follow the unmanaged configuration instructions, then install the module, connect the cables and test the LEDs. When finished, reactivate management and configure the unit via the software.

UNMANAGED MODULES— Before installing, configure an unmanaged *T1/E1/J1* module for its hardware-selectable features via DIP switches located at position **S2** and **S3** on the PCB (see the diagram and switch chart below for settings).

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class A computing device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

The use of non-shielded I/O cables may not guarantee compliance with FCC RFI limits.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

FIBER OPTIC CLEANING GUIDELINES

Fiber optic transmitters and receivers are extremely susceptible to contamination by particles of dirt or dust which can obstruct the optic path and cause performance degradation. Good system performance requires clean optics and connector ferrules.

- 1) Use fiber patch cords (or connectors, if you terminate your own fiber) only from a reputable supplier; low-quality components can cause many hard-to-diagnose problems in an installation.
- 2) Dust caps are installed at Black Box to ensure factory-clean optical devices. These protective caps should not be removed until the moment of connecting the fiber cable to the device. Assure that the fiber is properly terminated, polished and free of any dust or dirt and that the location is as free from dust and dirt as possible.
- 3) Store spare caps in a dust-free environment such as a sealed plastic bag or box so that, when reinstalled, they do not introduce any contamination to the optics.
- 4) Should it be necessary to disconnect the fiber device, reinstall the protective dust caps.
- 5) If you suspect that the optics have been contaminated, alternate between blasting with clean, dry, compressed air and flushing with methanol to remove particles of dirt.

ELECTROSTATIC DISCHARGE PRECAUTIONS

Electrostatic discharge (ESD) can cause damage to your add-in modules. Always observe the following precautions when installing or handling an add-in module or any board assembly.

- 1) Do not remove unit from its protective packaging until you're ready to install.
- 2) Wear an ESD wrist grounding strap before handling any module or component. If you do not have a wrist strap, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.

WARNING! Integrated circuits and fiber optic components are extremely susceptible to electrostatic discharge damage. Do not handle these components directly unless you are a qualified service technician and use tools and techniques that conform to accepted industry practices.

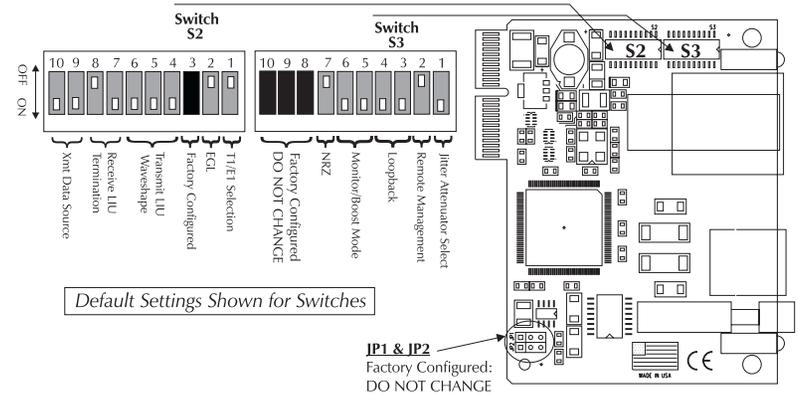
- 3) Hold boards by the edges only; do not touch the electronic components or gold connectors.
- 4) After removal, always place the boards on a grounded, static-free surface, ESD pad or in a proper ESD bag. Do not slide the board over any surface.

SPECIFICATIONS

Environmental

Operating Temperature: 32° - 104° F (0° - 40° C)
Storage Temperature: 0° - 160° F (-20° - 70° C)
Humidity: 5 - 95% (non-condensing)

Power Consumption (Typical) : .550 Amp



T1/E1/J1 Dip Switch and Jumper Locations

Choosing Your Settings

To ensure that your T1/E1/J1 module functions properly, make a several pre-installation decisions such as the distance to the main office and the troubleshooting capabilities desired. Please see page 5 for chart of settings.

T1/E1/J1 SELECTION

This feature selects the data rate that the module will use when converting: T1, E1 or J1. The default is **OFF**, T1 mode selected.

RECEIVE EQUALIZER GAIN LIMIT (EGL)

This option allows the user to compensate for diminishing signal intensity over the data line by adjusting the sensitivity of the UTP receiver. By setting the *Receive Equalizer Gain Limit (EGL)* correctly, the reliability of the signal will be ensured.

LINE ENCODING

This option allows the user to set the transmit/receive encoding for HDB3, B8ZS or AMI.

TRANSMIT LIU WAVESHAP (LINE BUILDOUT)

This controls the waveshape being output by the transmitter. This helps to correct problems related to cabling (i.e. cross-talk, electromagnetic interference, etc.). Improperly setting this switch will cause signal degradation.

RECEIVE LIU TERMINATION (LINE TERMINATION)

This sets the receive termination. This is used to properly terminate cables in order to prevent signal reflections which can cause signal degradation.

TRANSMIT DATA SOURCE

A diagnostic tool that sends specific patterns of data to determine problems along the cable. The user can set the module to send either a PRBS (*pseudorandom bit sequence*), an alternating ones and zeros (*TAOZ*) or an unframed all ones (*TUA1*) code, depending on diagnostic needs. The default is with both switches in the **ON** position (standard data).

JITTER ATTENUATOR SELECT

The user selects Jitter Attenuation on the UTP transmit or receive side. This decreases jitter in the data stream which increases data reliability. The jitter attenuator is always enabled.

LOOPBACK SELECTION

Another diagnostic tool that enables the user to test the integrity of the line by allowing the data to be looped back. Loopback test modes include: *Fiber Analog Loopback*, *Fiber Digital Loopback* and *Twisted Pair Digital Loopback*.

REMOTE MANAGEMENT

This mode allows for the configuration of a remote unit, facilitating easy testing of the line integrity of the remote unit's copper port. Since you always deploy *T1/E1/J1* modules in pairs, if remote management is desired, you must enable the *Remote Management* feature on the REMOTE unit only. When you enable *Remote Management* on the remote unit, the local unit can configure all SNMP-configurable features for both units. Refer to the *LED Operation* section (page 6) for functionality.

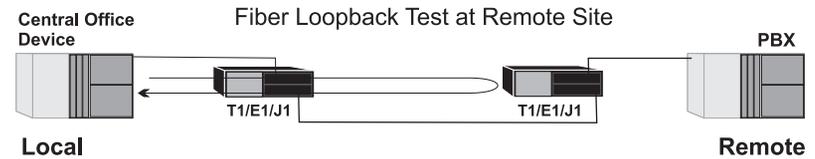
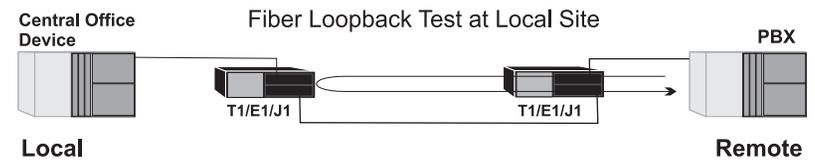
NOTE: When you enable the *Remote Management* feature on the remote unit, you must **disable** SNMP-management on the remote unit's chassis (i.e. turn the SNMP switch OFF or do not install a management module (depending on chassis type)).

MONITOR/BOOST MODE

This mode boosts the UTP receive signal (i.e. internal linear gain boost). This helps the UTP receiver to compensate for line loss.

NRZ (NON-RETURN-TO-ZERO)

A method for transmitting and recording data so that it keeps the sending and receiving clocks synchronized. This is especially helpful in situations where using bit stuffing—the practice of adding bits to a data stream so it conforms with communications protocols.



TESTING WITH PSEUDORANDOM BIT SEQUENCE (PRBS)

To test using Pseudorandom Bit Sequence, configure the *T1/E1/J1* modules for No Loopback, then configure the Transmit Data Source to "Transmit Pseudorandom Bit Sequence". (Refer to page 5 for all settings). Configure the local router for loopback, conduct the test, then refer to the LED Operation section of this manual (page 6) to verify errors were not received.



General Information

Black Box Customer Service Information

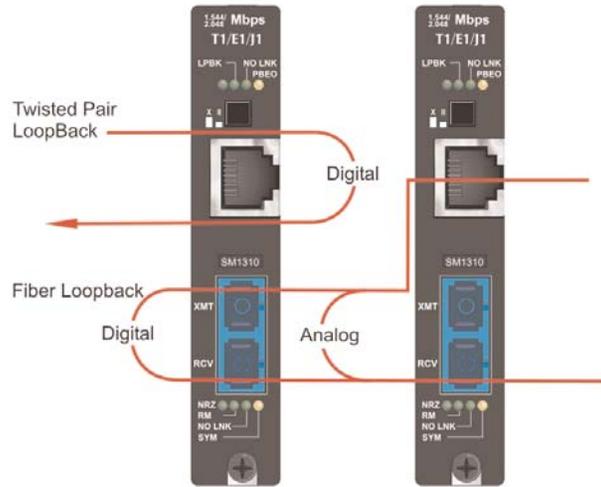
Order toll-free in the U.S.: Call 877-877-BBOX
(outside U.S. call 724-746-5500)
FREE technical support, 24 hours a day, 7 days a week:

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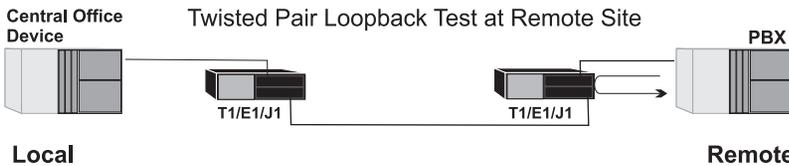
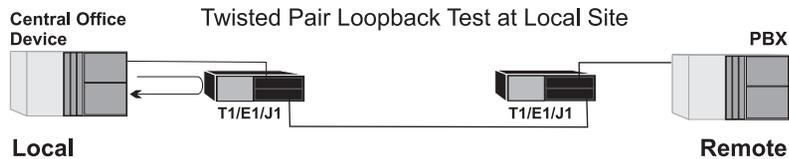
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Loopback testing aids in troubleshooting problems with network connections should they occur. "Looping" received data back onto the transmit path helps determine whether a connection is still valid. Twisted pair digital loopback tests isolate problems on the copper run between a T1/E1 converter and the connected device, while fiber digital loopback tests isolate problems on the fiber run.

The following four illustrations show a typical progression of digital loopback tests; this series allows you to individually test each segment of the conversion. Start by checking the copper segment at the local side, then the copper segment at the remote side, etc.



SWITCH SETTINGS FOR T1/E1/J1 MODULES

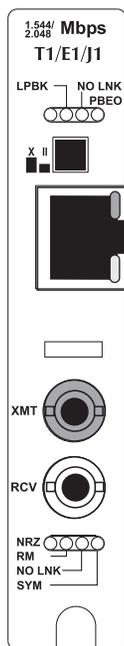
| FUNCTION (* Configurable via SNMP) | SWITCH SETTINGS | RESULT ((D) = Default Setting) |
|--|----------------------|-------------------------------------|
| T1/E1 SELECTION | 1: OFF | T1 Mode Selected (D) |
| | 1: ON | E1 Mode Selected |
| RECEIVE EQUALIZER GAIN LIMIT (EGL)* | 2: ON | -12 dB (Short Haul) |
| | 2: OFF | -43 dB (Long Haul) |
| | 2: ON | -36 dB (Long Haul) |
| | 2: OFF | -30 dB (Limited Long Haul) (D) |
| LINE ENCODING* | 3: ON | HDB3 (E1) / B8ZS (T1) |
| | 3: OFF | AMI (D) |
| TRANSMIT LIU WAVESHAPE | 4: ON 5: ON 6: ON | 75 ohms |
| | 4: OFF 5: ON 6: ON | 125 ohms |
| | 4: ON 5: ON 6: OFF | 75 s ohms w/ High Return Loss |
| | 4: OFF 5: ON 6: OFF | 125 s ohms w/ High Return Loss |
| | 4: ON 5: ON 6: ON | DSX-1 (0 to 133 ft) 0 dB CSU (D) |
| | 4: OFF 5: ON 6: ON | DSX-1 (133 to 266 ft) |
| | 4: ON 5: OFF 6: ON | DSX-1 (266 to 399 ft) |
| | 4: OFF 5: OFF 6: ON | DSX-1 (399 to 533 ft) |
| | 4: ON 5: ON 6: OFF | DSX-1 (533 to 655 ft) |
| | 4: OFF 5: ON 6: OFF | -7.5 dB CSU |
| | 4: ON 5: OFF 6: OFF | -15 dB CSU |
| | 4: OFF 5: OFF 6: OFF | -22.5 dB CSU |
| RECEIVE LIU TERMINATION | 7: ON 8: ON | Receive Side Termination Disabled |
| | 7: OFF 8: ON | Receive Side 120 ohms Enabled |
| | 7: ON 8: OFF | Receive Side 100 ohms Enabled (D) |
| | 7: OFF 8: OFF | Receive Side 75 ohms Enabled |
| TRANSMIT DATA SOURCE* | 9: ON 10: ON | Standard Data (D) |
| | 9: OFF 10: ON | Transmit Pseudorandom Bit Sequence |
| | 9: ON 10: OFF | Transmit Alternating Ones and Zeros |
| | 9: OFF 10: OFF | Transmit Unframed All Ones |

| FUNCTION | SWITCH SETTINGS | RESULT |
|---------------------------------|------------------------|---|
| JITTER ATTENUATOR SELECT | 1: ON | Place Jitter Attenuator on RCV Side (D) |
| | 1: OFF | Place Jitter Attenuator on XMT Side |
| REMOTE MANAGEMENT | 2: ON | Remote Management Enabled |
| | 2: OFF | Remote Management Disabled (D) |
| LOOPBACK SELECTION* | 3: ON 4: ON | No Loopback (D) |
| | 3: OFF 4: ON | Fiber Analog Loopback |
| | 3: ON 4: OFF | Fiber Digital Loopback |
| | 3: OFF 4: OFF | Twisted Pair Digital Loopback |
| MONITOR/BOOST MODE | 5: ON 6: ON | Normal Operation (No Boost) (D) |
| | 5: OFF 6: ON | 20 dB |
| | 5: ON 6: OFF | 26 dB |
| | 5: OFF 6: OFF | 32 dB |
| NRZ SELECTION* | 7: ON | Disable NRZ |
| | 7: OFF | Enable NRZ (D) |
| FIBER TYPE | 8: Factory Configured | DO NOT CHANGE |
| | 9: Factory Configured | DO NOT CHANGE |
| | 10: Factory Configured | DO NOT CHANGE |

Installing T1/E1/J1 Modules

Install *T1/E1/J1* modules in Black Box SNMP-manageable chassis. Each module requires one slot in the chassis. To install a module, remove the blank brackets covering the slots where the module is to be installed (if present) by removing the screws on the outside edges of the bracket. Slide the module into the chassis, via the card guides, until the module is seated securely in the connector. Secure the module to the chassis by tightening the captive screw. Save any “blanks” removed during installation for future use should your configuration requirements change.

LED Operation



LEDs NEAR UNTWISTED PAIR PORT

- LPBK** Glows green when module is in a *Loopback* mode.
- NO LNK** Glows green when a *link* is NOT established.
- PBEO** When *Transmit Data Source* is set to Pseudo-random Bit Sequence, this LED will glow amber when *T1/E1/J1* receives a Pseudorandom Bit Sequence **with** errors. The LED stays off when the converter receives a Pseudorandom Bit Sequence **without** errors.
- When *Transmit Data Source* is set to any other configuration besides Pseudorandom Bit Sequence, this LED remains off as well.

FIBER OPTIC LEDs

- NRZ** Glows green when *NRZ* is enabled.
- RM** Glows green on the remote unit when *Remote Management* is enabled. Glows green on the local unit when it has discovered a manageable remote unit.
- NO LNK** Glows green when a *link* is NOT established.
- SYM** Glows amber when a *symbol error* has occurred.

Crossover/Pass-Through Connection

T1/E1/J1 modules come with an RJ-48 UTP connector that features a push-button switch, located next to the port, for selecting a crossover workstation or pass-through connection. To select a cross-over connection, press the push-button **IN**. A pass-through connection is selected when the push-button is **OUT**. If unsure what type of connection you need, set the push button to the position that **DOES NOT** make the NO LNK LED glow.

Installation Troubleshooting

GENERAL TROUBLESHOOTING

- During installation, first test your fiber and UTP connections with all troubleshooting features disabled, then enable these features, if desired, just before final installation. This will reduce the features' interference with testing.
- When working with units where the features cannot be disabled, you must establish BOTH your UTP and fiber connections; the **NO LNK** LEDs **should not** be lit (i.e. **NO LNK** LED not lit = good connection, **NO LNK** LED lit = problem).
- To test a media converter by itself, first make sure you have an appropriate fiber patch cable, then follow these steps to test:
Step 1: Connect the media converter to the UTP device with a UTP cable.
Step 2: Loop a single strand of fiber from the transmit port to the receive port of your media converter.
Or, for single-strand fiber products, connect a single fiber cable from the local site *T1/E1/J1* to a remote site's *T1/E1/J1* module.
Step 3: Verify that you have a valid connection for both the UTP and fiber ports (see *LED Operation*) on your media converter.

LOOPBACK TESTING

As stated earlier in this manual, *T1/E1/J1* modules include three loopback test modes: fiber digital loopback, twisted pair digital loopback and fiber analog loopback. A digital loopback test retransmits the signal after regenerating its bits and reconditioning the signal, while an analog loopback test simply redirects the incoming signal back out to the origin. The following illustration shows the path that a signal takes in each of the three loopback test modes.