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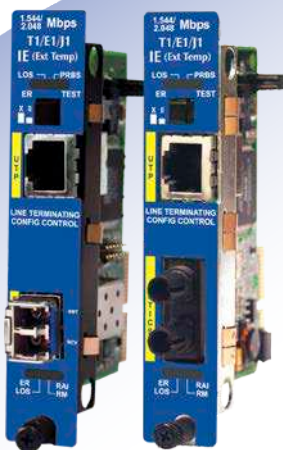Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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IE-iMcV-T1/E1/J1-LineTerm SFP and 1x9

Operation Manual

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Table of Contents

About the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP

NOTE
Unless noted otherwise, any reference is applicable for both the 1x9 and SFP version of the *IE-iMcV-T1/E1/J1-LineTerm* in this manual.

IE-iMcV-T1/E1/J1-LineTerm, TP/SFP is an SNMP-Manageable module that converts standard TDM-based copper transports (T1, E1, J1) to a single-mode or multi-mode fiber signal. It performs a standard "Line Termination" function as defined in GR-820-CORE. This function transmits an Alarm Indication Signal (AIS) on the line whenever the received signal is lost. Line faults can easily be isolated to one line section and do not propagate over multiple-line sections as they do with normal line repeaters.

Each module includes one RJ-48 connector, one pair of ST or SC fiber optic connectors or an SFP port, which can support any fiber type at 155Mbps; dual strand available in LC connectors, and Single Strand Fiber SFPs available in SC connectors. IE-iMcV-T1/E1/J1-LineTerm, TP/SFP modules install into any modular, SNMP manageable iMediaChassis, as well as the MediaChassis series, which is unmanaged. The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP offers an extended temperature range of -40°C to +85°C; when installed in an IE-MediaChassis/1 or 2, available in AC and DC, the module can be installed in challenging heat or cold-related environments.

An IE-iMcV-T1/E1/J1-LineTerm, TP/SFP with SFP Module with Configuration Control, configured as a Host, allows an SNMP Management Module in a managed chassis to manage the Remote. All settings are enabled and enforced through the SNMP. The Host keeps a copy of the Remote's configuration settings. Each module offers the feature Configuration Control; please refer to the appropriate section.

When the Host unit is not in a managed chassis, the Host configures the Remote. This ensures that the Remote's configuration will not revert to its DIP Switch settings and potentially disrupt traffic. However, if the user changes the DIP Switch settings on the Remote, the new configuration of the Remote will be enabled.

When SNMP management is installed at the Host, the following functions at the Remote are controlled from the Host unit:

- Loopback
- Line Code
- Transmit Data Source

- Fault Loopback

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP with SFP Host unit can also display the DDMI information from the Remote LineTerm module. Please download the latest SNMP Management Module firmware and iVIew[2] software to ensure the full support and functionality of the modules.

NOTE
IE-iMcV-T1/E1/J1-LineTerm, TP/SFP with SFP Module can be installed in an iMediaChassis and MediaChassis series.

Installing an iMcV–Module

iMcV-Modules install in B&B Electronics' SNMP manageable iMediaChassis series or in any MediaChassis/IE-MediaChassis series.

To install an iMcV-Module:

1. Remove the blank bracket covering the slot where the module is to be installed by removing the screws on the outside edges of the bracket.
2. Slide the iMcV-Module into the chassis, via the cardguides, until the module is seated securely in the connector.
3. Secure the module to the chassis by tightening the captive screw.
4. Save any "blanks" removed during installation for future use if the configuration requirements change.

NOTE
All modules are hot-swappable

Crossover/Straight–Through Connection

IE-iMcV-T1/E1/J1-LineTerm, TP/SFP comes with an RJ-48 UTP connector that features a push-button switch, located next to the port, for selecting a crossover connection, push-button IN. A straight-through connection is selected when the push-button is OUT. When unsure what type of connection is needed, set the push button to the position that turns the LOS LED off.

Configuration

Proper configuration of the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP is required for maximum performance and reliability. The following sections describe the prerequisites and the configurations available for both managed and unmanaged modules.

Prerequisites

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP conforms to any T1/E1/J1-based environment. Ensure all of the relevant information about the expected installation environment is available before configuring the module. This information includes:

- Line Type T1 or E1
- Line Coding used on T1: either AMI or B8ZS
- Distance of the copper run for DSX1 lines (655 feet MAX)
- Required CSU line Build-out (0db to -22db)
- Receiver BOOST for T1 and E1 applications
- Fiber transceivers must be for appropriate fiber run, i.e. (SM or MM)
- Management location must be at HOST unit

Managed Modules

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP modules are installed as a HOST-REMOTE pair and can be remotely managed when the HOST is installed in an iMediaChassis with an SNMP Management module.

For a managed environment, first manually configure the desired features through DIP Switch settings to ensure this configuration is maintained if management is ever lost. After the module is installed, the SNMP enabled features for troubleshooting can be modified by using the included iView[2] SNMP management software. Ensure the software settings match the desired configuration requirements for the installation as the chassis may maintain an old setting from a previous installation for that slot location. Module Details will provide information such as serial number, date code and part number. Please download the current SNMP firmware and iView[2] software to ensure all functionality of the modules.

NOTE
If installing an IE-iMcV-T1/E1/J1-LineTerm, available in a fixed fiber transceiver model (series 850-141XX), as a Host and an IE-iMcV-T1/E1/J1-LineTerm with SFP and Configuration Control (850-18100) as a Remote, connectivity will be established and data will pass. However, there is no possibility of obtaining DDMI information of the SFP from the Remote end, since the Host is not capable of it. If the Host and the Remote units are both IE-iMcV-T1/E1/J1-LineTerm with SFP and Configuration Control, then the Host can extract DDMI information from the SFP at the Remote end.

Configuration Control

Some iMcV-Modules offer configuration control; labels on the front faceplate are identified as such. Configuration control has been implemented to assist the end user by retaining the latest configuration regardless of how that configuration was implemented (via DIP Switch settings or SNMP).

Historically, SNMP would override DIP Switch settings. If changes are made to the module via iView[2], the SNMP settings determine the configuration of the board and the DIP Switches had no effect. Configuration control enables the user to use iView[2] or DIP Switches to modify the configuration.

With configuration control, the end user has three conditions under which the configuration of the iMcV-Module with Configuration Control may be impacted:

- Installing an IE-iMcV-T1/E1/J1-LineTerm, TP/SFP into a chassis already loaded with iMcV-Modules or replacing an IE-iMcV-T1/E1/J1-LineTerm, TP/SFP
  - The iMcV-Module will transfer its saved configurations. The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP will not override the module's configuration.
- Replacing the same type of iMcV-Module
  - If the DIP Switch settings are the same as the settings on the removed iMcV-Module, the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP determines the configuration settings through the chassis's management.
  - If the DSW are different, then the configuration of the module is determined by the DIP Switch settings. (The settings are forwarded to the chassis's management module and the value is saved.)
- Installing a new model of iMcV-Module
  - If another type of module is installed into the same slot in a chassis, the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP clears the memory of the previous configuration for that slot; the settings of a new module are adopted and stored in the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP.

The SNMP Write Lock switch does not impact any iMcV-Module or IE-iMcV-Module with Configuration Control. Removing and installing a new SNMP Management Module will no longer impact these modules either. However, if there is a mixture of iMcV-Modules with and without Configuration Control, the Write Lock Switch and a new SNMP Management Module must be taken into consideration.

If the command cleandb is applied to an SNMP Management Module, all the settings for the modules will be removed, but the Configuration Control modules will still be based on the last change made, while those without Configuration Control will be set to their default settings.

NOTE
If the end user has a mixture of standard iMcV-Modules as well as Configuration Control iMcV-Modules, it is important to understand how SNMP and DIP Switches will impact the cards depending on their capability. Standard iMcV-Modules cannot be upgraded to Configuration Control capability, so it is strongly recommended to set the DIP Switches on the modules and then configure them via software to match the same settings.

iView² Management Software

iView² is the B&B Electronics management software designed specifically for the B&B Electronics "iMcV" family of modules. It features a *GUI* and gives network managers the ability to monitor and control the manageable B&B Electronics products.

iView² is available in several versions, including WebServer version 3.0, and can also function as a snap-in module for HP OpenView Network Node Manager and other third party SNMP Management software.

iView² supports the following platforms:
- Windows 2000
- Windows XP
- Windows Vista
- Windows 7

Please see the *SNMP* Management Module installation guide for software configuration options.

Unmanaged Modules

Before installing the module in an unmanaged chassis, manually configure all of the desired DIP Switch selectable features. Refer to Tables on page 7 and 8.
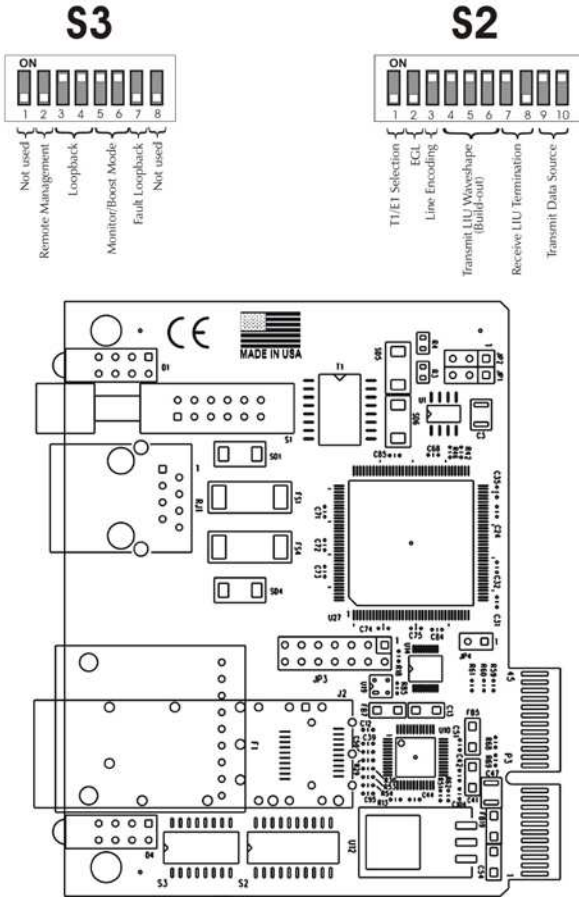
Modules must be configured as a HOST-REMOTE pair via DIP Switches. Modules are shipped in the default setting as a HOST.

HOST: S3-2 OFF

REMOTE: S3-2 ON

DIP Switches

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP DIP Switches are located on S2 and S3 on the PCB. The location of the S2 and S3 DIP Switches are displayed in the following diagram:

DIP Switch Settings (S2, S3)

Switch Settings for Switch S2					
T1/E1 Selection					
S2-1: OFF	T1 Mode Selected				default
S2-1: ON	E1 Mode Selected				
Receive Equalizer Gain Limit (EGL)					
E1				*iVIEW*[2]	
S2-2: ON	-12 dB (Short Haul)			*iVIEW*[2]	
S2-2: OFF	-43 dB (Long Haul)			*iVIEW*[2]	
T1				*iVIEW*[2]	
S2-2: ON	-36 dB (Long Haul)			*iVIEW*[2]	
S2-2: OFF	-30 dB (Limited Long Haul)			*iVIEW*[2]	default
Line Encoding *iVIEW*[2]				*iVIEW*[2]	
S2-3: ON	HDB3 (E1) / B8ZS (T1)			*iVIEW*[2]	default
S2-3: OFF	AMI **(Required for Passive Mode)**			*iVIEW*[2]	
Transmit LIU Waveshape (Build-out)					
E1					
S2-4: ON	S2-5: ON	S2-6: ON	75 ohms		
S2-4: OFF	S2-5: ON	S2-6: ON	125 ohms		
S2-4: ON	S2-5: ON	S2-6: OFF	75 S ohms w/ High Return Loss		
S2-4: OFF	S2-5: ON	S2-6: OFF	125 S ohms w/ High Return Loss		
T1					
S2-4: ON	S2-5: ON	S2-6: ON	DSX-1 (0 to 133 ft) 0 dB CSU		default
S2-4: OFF	S2-5: ON	S2-6: ON	DSX-1 (133 to 266 ft)		
S2-4: ON	S2-5: OFF	S2-6: ON	DSX-1 (266 to 399 ft)		
S2-4: OFF	S2-5: OFF	S2-6: ON	DSX-1 (399 to 533 ft)		
S2-4: ON	S2-5: ON	S2-6: OFF	DSX-1 (533 to 655 ft)		
S2-4: OFF	S2-5: ON	S2-6: OFF	-7.5 dB CSU		
S2-4: ON	S2-5: OFF	S2-6: OFF	-15 dB CSU		
S2-4: OFF	S2-5: OFF	S2-6: OFF	-22.5 dB CSU		
Receive LIU Termination					
S2-7: ON	S2-8: ON	Receive Side Termination Disabled			
S2-7: OFF	S2-8: ON	Receive Side 120 ohms Enabled			
S2-7: ON	S2-8: OFF	Receive Side 100 ohms Enabled			default
S2-7: OFF	S2-8: OFF	Receive Side 75 ohms Enabled			
Transmit Data Source *iVIEW*[2]					
S2-9: ON	S2-10: ON	Standard Data		*iVIEW*[2]	default
S2-9: OFF	S2-10: ON	Transmit Pseudorandom Bit Sequence (PRBS)		*iVIEW*[2]	
S2-9: ON	S2-10: OFF	Transmit Alternating Ones and Zeros		*iVIEW*[2]	
S2-9: OFF	S2-10: OFF	Transmit Unframed All Ones		*iVIEW*[2]	

SWITCH S2 (row label for all rows)

| Switch Settings for Switch S3				
Reserved				
S3-1: ON	Reserved			
S3-1: OFF	Reserved			default
Remote Management				
S3-2: ON	Remote Management Enabled (only at the REMOTE end)			
S3-2: OFF	Remote Management Disabled (only at the LOCAL end)			default
Loopback Selection *iVIEW*[2]				
S3-3: ON	S3-4: ON	None	*iVIEW*[2]	default
S3-3: OFF	S3-4: ON	Fiber Analog Loopback	*iVIEW*[2]	
S3-3: ON	S3-4: OFF	Internal Fiber Loopback	*iVIEW*[2]	
S3-3: OFF	S3-4: OFF	Copper Remote Loopback	*iVIEW*[2]	
Monitor/Boost Mode				
S3-5: ON	S3-6: ON	Normal Operation (No Boost)		default
S3-5: OFF	S3-6 ON	20 dB		
S3-5: ON	S3-6 OFF	26 dB		
S3-5: OFF	S3-6 OFF	32 dB		
Fault Loopback				
S3-7: ON	Send AIS is sent back toward the fault on the RJ-45 port		*iVIEW*[2]	
S3-7: OFF	AIS is only sent toward the fiber on detecting a fault on the RJ-45 port		*iVIEW*[2]	default
Fiber Type				
S3-8: Factory Configured DO NOT CHANGE				
S3-9: Factory Configured DO NOT CHANGE				
S3-10: Factory Configured DO NOT CHANGE				

(left margin vertical label: SWITCH S3)

NOTE: on newer Modules, there will be no DSW 8,9,or 10 on Bay S3. Instead, the fiber type will be programmed into the board at point of manufacturing, and there will only be 8 DSW instead of 10.

Features

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module includes several features to facilitate maintenance and troubleshooting in any T1/E1/J1 based TDM environment.

SFP

SFPs with Data and Diagnostics Management Information (DDMI) can be installed in the SFP port of the host and the remote. This allows the end user to view the DDMI information through the chassis's management using the SFP button in iView[2].
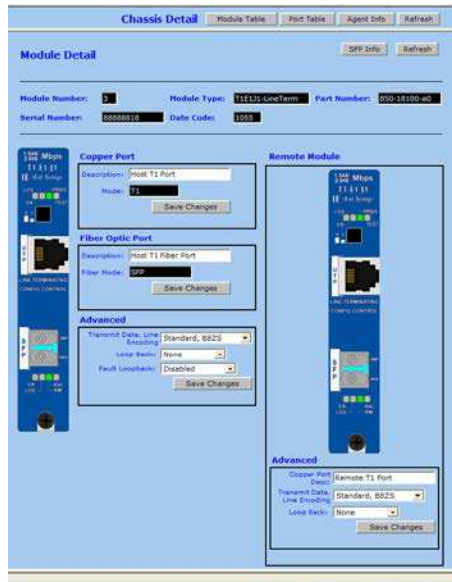
Loopback Modes

This feature allows three distinct Loopbacks to be activated either through DIP Switches or iView[2] Management.

Fiber Loopback	An analog Loopback at the copper port back to the fiber port. It copies the received optical signal back to the optical line at the copper port and continues to drive the copper port, but can be corrupted by noise on the copper port.
Internal Fiber Loopback	A local Loopback at the fiber port. It copies the received optical signal back to the optical line at a digital point internal to the unit. It continues to drive the copper port, and normal copper line monitoring is maintained on the copper port, but the returning data pattern is not affected.
Copper Loopback	A remote Loopback to copper port at the fiber driver. It copies the received copper signal back to the copper port and continues to drive the fiber port.

By default all Loopbacks are set to OFF for normal data operation.

The following illustrations show the path that a signal takes in each of the Loopback test modes.
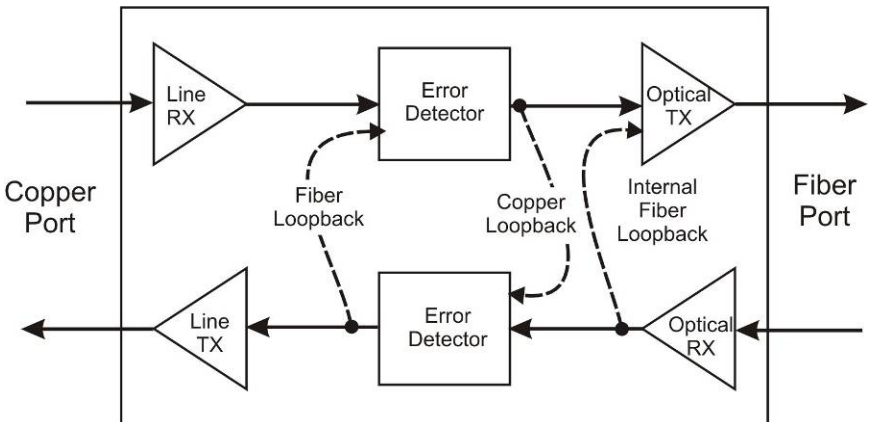
This feature can be controlled by SNMP–Management software (iView[2]) when the HOST IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module is installed in a managed chassis.

Fault Loopback

This switch enables or disables the Fault Loopback feature on the copper port. A normal copper line LOS fault will cause a Remote Alarm Indictor (RAI) to be sent on to the fiber line segment causing the normal AIS to be sent on the far end copper port. The fault loopback feature provides for a fault indication to be sent back to the copper line as an AIS signal. In this way, both upstream and downstream personnel are alerted to a copper cable fault.

The Fault Loopback feature is always active on the fiber line. When a fiber line becomes unavailable, the module detects the LOS on the fiber link and lights the LOS LED. The module then sends AIS to the local copper port and sends a RAI signal back to the fiber. The far end unit turns ON the RAI LED and outputs AIS to the far end copper line. With this, a local site administrator can quickly determine where a fiber fault is located from either end of the fiber line.

The AIS is transmitted as an unframed all ones pattern on the copper port.

The default loopback DIP Switch is disabled by default.

This feature can be controlled by SNMP-Management software (iView^2) when the HOST IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module is installed in a managed chassis.

Transmit LIU Waveshape and Gain (Line Build-Out)

This group of switches can be configured for the length of line the unit is driving, from 0 feet to a maximum of 655 feet. For longer length lines, the unit can be configured for CSU signal gain to address -7.5 db, -15db, and -22.5 db degraded signals.

By default this feature is set to 0 to 133 feet line Build-out for DSX1 lines.

Transmit Data Source

These switches select the transmit mode used by the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module. The transmit modes that can be selected include the following:

- Standard data
- Unframed All Ones (diagnostic)
- Alternating Ones and Zeros (diagnostic)
- Pseudorandom Bit Sequence Pattern for T1 and 2^{15}-1 PRBS Pattern for E1)

These standard Telco transmission pattern modes are provided to help diagnose transmission errors in the line.

By default this feature is set to Standard Data.

This feature can be controlled by SNMP-Management software (iView[2]) when the HOST IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module is installed in a managed chassis.

T1, E1 and J1 Selection

This switch selects the data rate to use on the copper line. The data rate selections available include the following:

- **T1/J1** (1.544 Mbps +/- 32 ppm)
- **E1** (2.048 Mbps +/- 32 ppm)

By default this feature is set to **T1.**

This feature can be selected only by setting the DIP Switches manually.

Remote Management

A DIP Switch enables or disables the Remote Management mode. By default this feature is Disabled. Remote Management must be enabled on the REMOTE module. This allows all SNMP-configurable features for the REMOTE modules to be configured from the HOST module.

An IE-iMcV-T1/E1/J1-LineTerm w/SFP Module with Configuration Control, configured as a Host, allows an SNMP Management Module in a managed chassis to manage the Remote. All settings are enabled and enforced through the SNMP. The Host keeps a copy of the Remote's configuration settings.

When the Host unit is in a managed chassis, the Host configures the Remote. This ensures that the Remote's configuration will not revert to its DIP Switch settings and potentially disrupt traffic. However, if the customer changes the DIP Switch settings on the Remote, the new configuration of the Remote will be saved by the host.

When SNMP management is installed at the Host, the following functions at the Remote are controlled from the Host unit:

- Loopback
- Line Code

- Transmit Data Source
- Fault Loopback

<table>
<tr><th>NOTE</th></tr>
<tr><td>IE-iMcV-T1/E1/J1-LineTerm, TP/SFP with SFP Module can be installed in an iMediaChassis and MediaChassis series. However, there is no support for the module in the iMediaCenter Series.</td></tr>
</table>

LED Operation

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module features several diagnostic LEDs per port. The following LED display functions are provided:

Copper Port LEDs

ER   Flashes yellow whenever a line code violation is received.

LOS   Glows red when the RJ-48 is receiving no signal and is in an LOS ALARM state. This condition will also send an RAI signal to the fiber port. If the Fault Loopback is set to ON, an AIS will also be sent to the local copper port.

PRBS Glows green when the copper port receives a valid Pseudorandom Bit Sequence (PRBS). It is OFF when the port is not receiving a PRBS.

TEST Glows yellow when any Loopback mode is active.

Fiber Port LEDs

ER   Glows yellow when a fiber symbol error has been received.

LOS   Glows red when a fiber link is not established and is in a LOS ALARM state.

RM   Glows green on the REMOTE unit when Remote Management is enabled. Glows green on the HOST unit when it has discovered a manageable REMOTE unit. Under normal operation this LED is the only LED that is ON at the unit.

RAI   Glows yellow when a Remote Alarm Indication (RAI) is received on the fiber port. This indicates a fault exists at the far end unit.

NOTE
Unless noted otherwise, any reference is applicable for both the 1x9 and SFP version of the *IE-iMcV-T1/E1/J1-LineTerm* in this manual.

Loopback Testing

The IE-iMcV-T1/E1/J1-LineTerm, TP/SFP includes three Loopback test modes: Copper Loopback, Fiber Loopback and Internal Fiber Loopback.

The following illustrations show a typical progression of Loopback tests (i.e., starting by checking the copper segment at the local side, then the fiber segment at the REMOTE side, etc).
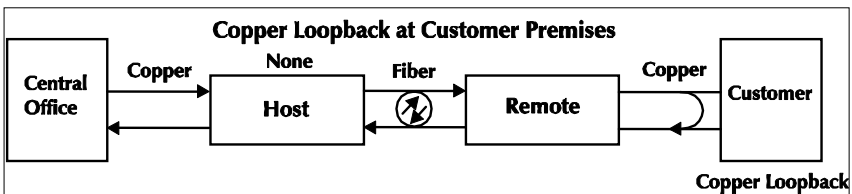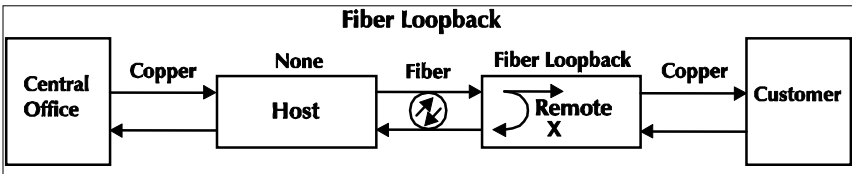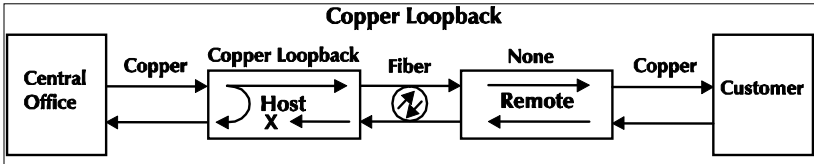

Each Loopback performs the following:

- Copies the incoming signal back out to the origin while continuing to transmit this signal downstream.

- Blocks upstream data from transmitting on the looped data line.

Loopback testing is useful for troubleshooting problems with network connections should they occur. Looping received data back onto the transmit path helps determine whether a connection is still valid. Copper Loopback tests isolate problems on the copper run between an IE-iMcV-T1/E1/J1-LineTerm, TP/SFP module and the connected device, while Fiber Loopback tests can isolate problems on the fiber connected to the module.

Pseudorandom Bit Sequence (PRBS) Testing

To test using PRBS, configure the IE-iMcV-T1/E1/J1-LineTerm, TP/SFP modules for No Loopback, and then configure the Transmit Copper Data Source to PRBS. Configure the local device for Loopback and start the test. Verify the PRBS LED is ON indicating no errors are being received.
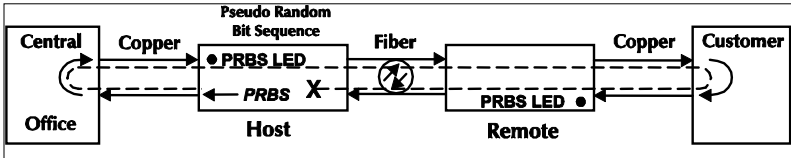

Installation Troubleshooting

General Troubleshooting

- The copper port can easily be tested using the internal PRBS signal generator and detector and a physical wire loop on the copper interface.

- The fiber port is internally tested at all times by a working pair of units. With one unit configured for Local Management (S3-2 set OFF) and the other for Remote Management (S3-2 set ON), the fiber line is verified if the RM LED is ON at both ends of the fiber line. Under normal operation only the RM LED is ON at both HOST and REMOTE.

- To test a media converter by itself, first verify that the fiber patch cable is appropriate, then follow these steps to test:

  1. Connect the media converter to the RJ-48 device with a copper cable.

  2. Loop a single strand of fiber from the transmit port to the receive port of the media converter.

  3. Verify that there is a valid connection for both the RJ-48 and fiber ports on the media converter. (No ER or LOS LED ON)

- If there is trouble with link connectivity, verify that the cable connection and DIP Switch settings are correct.
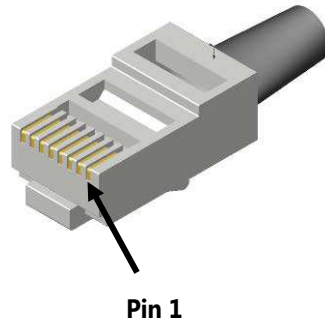
Use the following LED indications to identify the fault location:
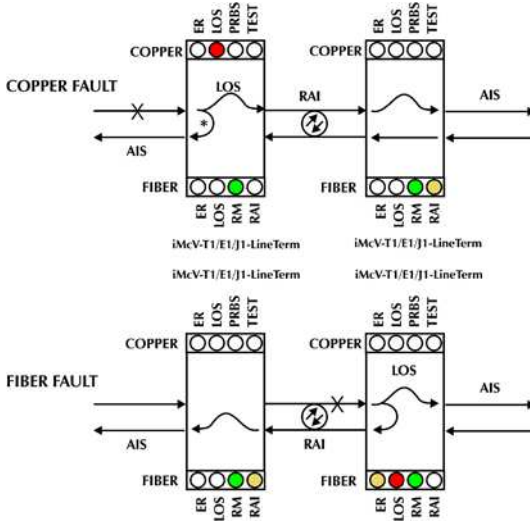
*DIP Switch S3-7 must be set to ON for Fault Loopback to operate as illustrated.

The following table lists the pin configuration for the RJ-48 connector.

Pin	Signal
1	Receive Ring
2	Receive Tip
3	No Connection
4	Transmit Ring
5	Transmit Tip
6	No Connection
7	No Connection
8	No Connection

Pin 1

Specifications

Standards Compliance (T1, E1, J1):
ANSI T1.102-1993
ANSI T1.107.1995
GR-820-CORE

T1, E1, J1 Interface:
T1 (1.544 Mbps +/- 32 ppm)
E1 (2.048 Mbps +/- 32 ppm)
J1 (1.544 Mbps +/- 32 ppm)

Power Consumption (Typical):
0.550 Amps @ 5 V

Operating Temperature:
-4°F to +158°F (-20°C to +70°C)

Storage Temperature:
-40°F to +185°F (-40°C to +85°C)

Humidity:
5% to 95% non-condensing

Dimensions:
Single Slot iMcV-Module

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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 B&B Electronics to ensure factory-clean optical devices. These protective caps should not be removed until the moment of connecting the fiber cable to the device. Should it be necessary to disconnect the fiber device, reinstall the protective dust caps.

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. 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 any product, add-in modules or stand alone units, containing electronic components. Always observe the following precautions when installing or handling these kinds of products

1. Do not remove unit from its protective packaging until ready to install.

2. Wear an ESD wrist grounding strap before handling any module or component. If the wrist strap is not available, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.

3. Hold the units by the edges; 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 modules or stand alone units over any surface.

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.

Certifications

CE: The products described herein comply with the Council Directive on Electromagnetic Compatibility (2004/108/EC)

$$C\epsilon$$

> **Class 1 Laser product, Luokan 1 Laserlaite,
> Laser Klasse 1, Appareil A'Laser de Classe 1**

European Directive 2002/96/EC (WEEE) requires that any equipment that bears this symbol on product or packaging must not be disposed of with unsorted municipal waste. This symbol indicates that the equipment should be disposed of separately from regular household waste. It is the consumer's responsibility to dispose of this and all equipment so marked through designated collection facilities appointed by government or local authorities. Following these steps through proper disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about proper disposal, please contact local authorities, waste disposal services, or the point of purchase for this equipment.

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Document Number 50-80104-00 A1   **February 2016**