iMcV-T1/E1/J1 Repeater

Operation Manual

B&B ELECTRONICS

Make The Right Connections

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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.
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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.

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About the iMcV-T1/E1/J1 Repeater

The iMcV-T1/E1/J1 Repeater chassis mounted media conversion module allows the end user to extend the distances between T1, J1, and E1 copper telephony systems by adding a fiber segment. The distances can support up to 100km depending on the module used and the fiber type available.

Each iMcV-T1/E1/J1 Repeater includes one RJ-48 connector and one pair of SC or ST fiber optic connectors, which can support any fiber type in MultiMode or SingleMode. The Repeater series is also available in Single Strand Fiber, with SC connectors.

Installating an iMcV-T1/E1/J1 Repeater

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 the configuration requirements change.

Crossover/Straight-Through Connection

iMcV-T1/E1/J1 Repeater comes with an RJ-48 UTP connector that features a push-button switch, located next to the port, for selecting a crossover or straight-through connection. To select a cross-over connection, press the 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 NO LNK LED off.

The iMcV-T1/E1/J1 Repeater Host and Remote modules cannot be both installed in managed chassis. The recommendation, if using a managed chassis, is to install the Host in the managed chassis; the Remote Unit should be installed in an unmanaged chassis.

NOTE
Before installing the modules, they must be configured for Host/Remote via the DIP Switches. The Master/Slave condition requires this configuration: *S3-2: ON Remote Unit Enabled (only at the REMOTE end)* *S3-2: OFF Remote Unit Disabled (only at the LOCAL end)*

Configuration Instructions

The iMcV-T1/E1/J1 Repeater module is factory-configured to use the following default features:

T1/E1 Mode	T1
Receive Equalizer Gain Limit (EGL)	-30 dB (Limited Long Haul)
Line Encoding	AMI (Passive Mode)
Transmit LIU Waveshape (Build-out)	DSX-1 (0 to 133 ft) 0 dB CSU
Receive LIU Termination	Receive Side 100 ohms Enabled
Transmit Data Source	Standard Data
Jitter Attenuator Select	Place Jitter Attenuator on TX Side
Remote Unit	Remote Unit Disabled
Loopback Selection	No Loopback
Monitor/Boost Mode	No Boost
NRZ Selection	Disable NRZ (Passive Mode)

The iView^2 management software can be used to change some of the iMcV-T1/E1/J1 Repeater features after installing the modules in the chassis. Refer to the iView^2 online help for more information.

Passive Mode

It is recommended that the default Passive mode configuration is used for most typical applications. Passive mode allows the fiber segment to pass data unchanged between the T1/E1 segments independent of the actual line coding (AMI, B8ZS, or HDB3). All errors and fault conditions from one T1/E1 end will pass through the fiber to the other end as if there were one long T1/E1 connection.

Requirements

Before installing the iMcV-T1/E1/J1 Repeater modules, perform the following:

- Make sure the modules are correct for the fiber type and distance requirements.
- Make sure that T1 UTP lines **DO NOT** use simplex power (no wet lines).
- Before installing the iMcV-T1/E1/J1 Repeater modules, verify the DIP Switches are configured for the feature wanted.

- Make sure to deploy the iMcV-T1/E1/J1 Repeater modules in pairs, as Host/Remote.
- Make sure the Remote Chassis is not managed.

Managed Modules

To manage iMcV-T1/E1/J1 Repeater modules, an SNMP agent must be present; the iMediaChassis requires an SNMP management module. For a managed environment, first manually configure all of the desired DIP Switch selectable features to match what will be configured through the SNMP Management Module.

NOTE
Before installing the modules, they must be configured for Host/Remote via the DIP Switches. The Master/Slave condition requires this configuration: *S1-10: ON Remote Unit Enabled (only at the REMOTE end) (Remote)* *S1-10: OFF Remote Unit Disabled (only at the LOCAL end) (Host)*

Use the Graphical User Interface (GUI) to enable features by using the iView^2 SNMP management software. In a managed chassis, the software settings take priority over the SNMP enabled feature DIP Switch settings. Make sure that the software settings match the desired configuration requirements for the installation.

iView² Management Software

iView^2 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.

iView^2 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.

iView^2 supports the following platforms:

- Windows 2000
- Windows XP
- Windows Vista
- Windows 7

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

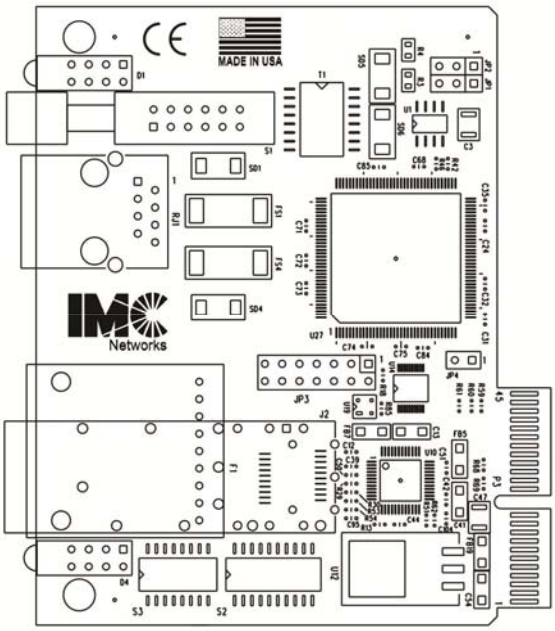
NOTE
B&B Electronics' iView^2 software is available for downloading from the web site: www.imcnetworks.com.

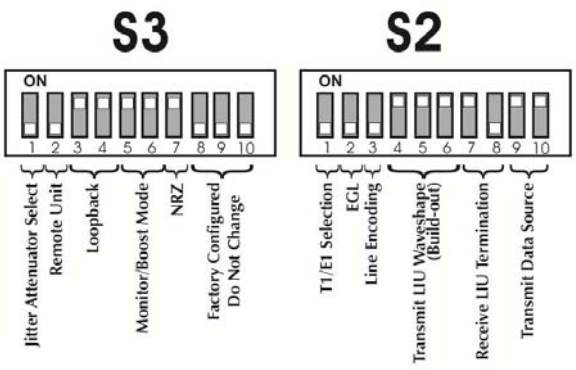
Unmanaged Modules

Before installing the iMcV-T1/E1/J1 Repeater module into an unmanaged chassis, configure the modules for Host/Remote Units. For further information concerning the remaining DSW support Passive Module, see the Passive Mode section of this manual.

DIP Switches

All ***iView^2*** enabled switches are overridden by management software.





	Switch Settings for Switch S2					
SWITCH S2	**T1/E1 Selection**					
	S2-1: OFF	T1 Mode Selected				default
	S2-1: ON	E1 Mode Selected				
	Receive Equalizer Gain Limit (EGL)					
	E1				***iVIEW²***	
	S2-2: ON	-12 dB (Short Haul)			***iVIEW²***	
	S2-2: OFF	-43 dB (Long Haul)			***iVIEW²***	
	T1				***iVIEW²***	
	S2-2: ON	-36 dB (Long Haul)			***iVIEW²***	
	S2-2: OFF	-30 dB (Limited Long Haul)			***iVIEW²***	default
	Line Encoding *iVIEW²*				***iVIEW²***	
	S2-3: ON	HDB3 (E1) / B8ZS (T1)			***iVIEW²***	
	S2-3: OFF	AMI **(Required for Passive Mode)**			***iVIEW²***	default
	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 *iVIEW²*				
	S2-9: ON	S2-10: ON	Standard Data	***iVIEW²***	default
	S2-9: OFF	S2-10: ON	Transmit Pseudorandom Bit Sequence (PRBS)	***iVIEW²***	
	S2-9: ON	S2-10: OFF	Transmit Alternating Ones and Zeros	***iVIEW²***	
	S2-9: OFF	S2-10: OFF	Transmit Unframed All Ones	***iVIEW²***	

	Switch Settings for Switch S3				
SWITCH S3	**Jitter Attenuator Select**				
	S3-1: ON		Place Jitter Attenuator on RCV Side		
	S3-1: OFF		Place Jitter Attenuator on XMT Side		default
	Remote Unit				
	S3-2: ON		Remote Unit Enabled (only at the REMOTE end)		
	S3-2: OFF		Remote Unit Disabled (only at the LOCAL end)		default
	Loopback Selection *iVIEW²*				
	S3-3: ON	S3-4: ON	None	***iVIEW²***	default
	S3-3: OFF	S3-4: ON	Local Loopback	***iVIEW²***	
	S3-3: ON	S3-4: OFF	Analog Loopback	***iVIEW²***	
	S3-3: OFF	S3-4: OFF	Remote Loopback	***iVIEW²***	
	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		
	NRZ Selection *iVIEW²*				
	S3-7: ON		Disable NRZ **(Required for Passive Mode)**	***iVIEW²***	default
	S3-7: OFF		Enable NRZ (Line Terminating Mode)	***iVIEW²***	
	Fiber Type				
	S3-8: Factory Configured DO NOT CHANGE				
	S3-9: Factory Configured DO NOT CHANGE				
	S3-10: Factory Configured DO NOT CHANGE				

Description of DIP Switch-Selectable Options

The iMcV-T1/E1/J1 Repeater module includes DIP Switches for hardware settings for the optional features. Some of these switch options are overridden by the

SNMP configuration of a managed chassis (refer to the *DIP Switch Table* section for a list of the iView^2 managed switches).

The following section contains a brief description of the available options.

T1/E1/J1 Mode

This option allows the user to select the data rate standard that the module will use when converting: T1/J1 (default) or E1. The default is OFF, T1/J1 mode selected.

Receive Equalizer Gain Limit (EGL)

The copper line receiver sensitivity can be adjusted with this setting. This can be used to extend the service distance beyond the normal line length.

T1 Lines	Can extend the effective received signal level from -30dB to -36dB
E1 Lines	Can extend the effective received signal level from -12dB to -43dB

The addition of this gain can extend the service distance of these lines to 2K feet.

Line Encoding

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

NOTE
There are currently no applications that use any other settings than **AMI encoding** and **NRZ disabled** (Passive mode). Changing the encoding setting to anything other than **AMI** can result in data corruption.

Transmit LIU Waveshape (Line Build-out)

The copper line driver for T1 applications can be adjusted to provide standard pre-distortion (LBO) of the transmitted signal for DSX1 connections. The transmitted signal level can also be reduced (-7.5dB to -22.5dB) when connecting directly to a CSU that has limited input range.

For E1 circuits, the transmitter can be configured for either 75 ohm or 120 ohm drive with normal or high (21db) return loss.

NOTE
The receive termination resistance should match this setting.

Receive LIU Termination (Line Termination)

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

Transmit Data Source

This option allows the user to set the module to send normal data (default) or to send specific test-patterns of data to determine problems along the cable as a diagnostic tool. The user can set the module to send a PRBS (2^{15}-1 for E1 and 2^{20}-1 for T1), an alternating ones and zeros, or an unframed all ones code, depending on the diagnostic requirements.

Jitter Attenuator Select

This option allows the user to select Jitter Attenuation on the UTP transmit or receive side. This decreases jitter in the data stream which increases data reliability.

NOTE
The jitter attenuator must always be enabled on the transmit side of the copper line.

Loopback Selection

This option allows the user to set the Loopback location on the module. Loopback is a diagnostic tool that enables the user to test the integrity of the line by allowing the data to be looped back. The following independent loopback locations are included on the module:

Analog Loopback	Set this switch on the Remote module to loop the data back from the remote copper port (refer to the *Remote Copper Loopback Mode* section for more information).
Local Loopback	Set this switch on the Remote module to loop the data back from the remote fiber port (refer to the *Remote Fiber Loopback Mode* section for more information).
Remote Loopback	Set this switch on the local module to loop the data back from the local fiber port (refer to the *Local Fiber Loopback Mode* section for more information).

Refer to the *Loopback Testing* section for application examples of the loopback testing modes.

Remote Unit

This option allows the user to enable Remote Unit on the module. The Remote Unit feature is designed to work only as the remote module of the Local/Remote pair in the required Master/Slave configuration. With Remote Unit enabled, the user can easily perform the following:

- Test the line integrity of the remote copper port.
- Use the Local unit to configure all SNMP-configurable features for both units.
- Use the Local unit to download firmware for both units.

Refer to the *Module LED Functions* section for more information.

NOTE
When the user enables the Remote Unit feature on the remote module, it is necessary to disable SNMP-management on the chassis in which the remote unit is installed (i.e. turn the iMediaChassis enter chassis SNMP switch off, or do not install an SNMP

Management module in either an iMediaChassis or iMcV series chassis.

Monitor/Boost Mode

This mode adds 20dB to 32dB of gain to the T1/E1 Receive port allowing it to be connected to standard T1/E1 passive Monitor Jacks found on most cross connect patch panels. This mode allows the unit to function as a remote monitor of an active T1 or E1 circuit. The "Trapped" active circuit can then be carried back across the fiber lien to the maintenance center for remote monitoring.

NRZ (Non-Return-to-Zero)

This option allows the user to enable or disable the NRZ mode.

NOTE
There are currently no applications that use any other settings than **AMI encoding** and **NRZ disabled** (Passive mode). Enabling NRZ can result in data corruption.

Enabling NRZ terminates the line coding on the copper line. This forces the module to send raw data to the fiber line without line code information.

LED Operation

This section describes the LEDs and their functions. The Fiber port LED RM is the only LED that should be lit on the modules under normal operating conditions.

Copper Port LEDs

LPBK	Glows green when the module is set to one of the Loopback modes.
NO LNK	Glows green when a UTP link is **NOT** established.
PBEO	Only used when the **Transmit Data Source** option is set to PRBS. This LED will glow amber when the iMcV-T1/E1/J1 Repeater module receives errors and will stay dark when the converter receives a PRBS without errors.

Fiber Port LEDs

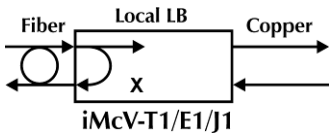
NRZ	Glows green when the NRZ mode is enabled.
RM	Glows green on the Remote Unit when set to DSW S3-2. Glows green on the Local unit when it has discovered a Remote management with Remote Unit enabled.
NO LNK	Glows green when a fiber link has **NOT** been established.
SYM	Glows amber when a 4-bit to 5-bit (4b/5b) symbol encoding error in the fiber line is detected.

The iMcV-T1/E1/J1 Repeater includes the following loopback locations:

- Local
- Remote
- Analog

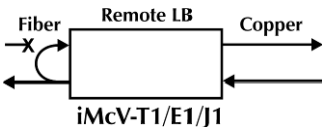
Local Loopback

The Local loopback location on the module loops the fiber-receive port to the fiber-transmit port.



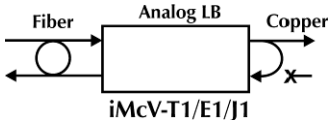
Remote Loopback

The Remote loopback location on the module loops the fiber-transmit port to the fiber-receive port.



Analog Loopback

The Analog loopback location on the module loops the copper-transmit port to the copper-receive port.



The iMcV-T1/E1/J1 Repeater can be configured to use the following loopback test modes:

Local Fiber Loopback Mode	This setting tests the path from the CO copper port to the Local iMcV-T1/E1/J1 Repeater module fiber port and back.
Remote Fiber Loopback Mode	This setting tests the path from the CO copper port to the Remote iMcV-T1/E1/J1 Repeater module fiber port and loops it back.
Remote Copper Loopback	This setting tests the path from the CO copper port to the Remote iMcV-T1/E1/J1

Mode	Repeater module copper port and loops it back.

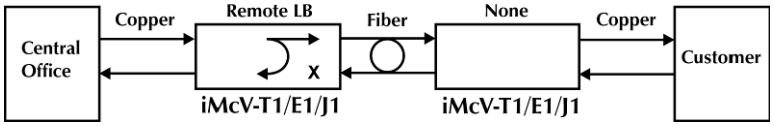
The following illustrations show a typical progression of digital loopback tests; this series allows the user to individually test each segment of the conversion. To test the copper segment at the remote location requires the PRBS test described in the next section.

`Local Fiber Loopback Mode`

To set the loopback testing mode to Local Fiber Loopback Mode, perform the following:

1. Set the Local iMcV-T1/E1/J1 Repeater module to **Remote** Loopback (DIP Switch S3-3=Off and S3-4=Off)
2. Set the Remote iMcV-T1/E1/J1 Repeater module Loopback to **None** (DIP Switch S3-3=On and S3-4=On).

This configuration allows the user to test the path from the CO copper port to the Local iMcV-T1/E1/J1 Repeater module fiber port and loop it back. The transmitted data is sent unhindered and the received data is ignored.

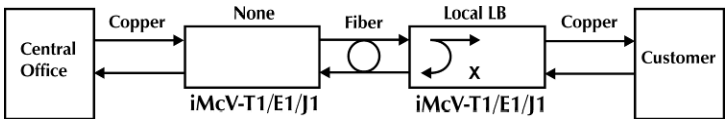


`Remote Fiber Loopback Mode`

To set the loopback testing mode to Remote Fiber Loopback Mode, perform the following:

1. Set the Local iMcV-T1/E1/J1 Repeater module Loopback to **None** (DIP Switch S3-3=On and S3-4=On)
2. Set the Remote iMcV-T1/E1/J1 Repeater module to **Local** Loopback (DIP Switch S3-3=Off and S3-4=On).

This configuration allows the user to test the path from the CO copper port to the Remote iMcV-T1/E1/J1 Repeater module fiber port and loop it back. The transmitted data is sent unhindered and the received data is ignored.

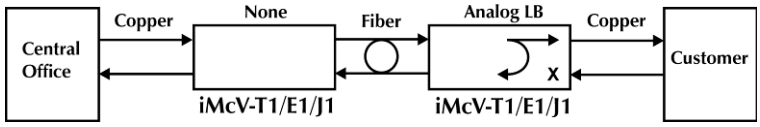


Remote Copper Loopback Mode

To set the loopback testing mode to Remote Copper Loopback Mode, perform the following:

1. Set the Local iMcV-T1/E1/J1 Repeater module Loopback to **None** (DIP Switch S3-3=On and S3-4=On)
2. Set the Remote iMcV-T1/E1/J1 Repeater module to **Analog** Loopback (DIP Switch S3-3=On and S3-4=Off).

This configuration allows the user to test the path from the CO copper port to the Remote iMcV-T1/E1/J1 Repeater module copper port and loop it back. The transmitted data is sent unhindered and the received data is ignored.

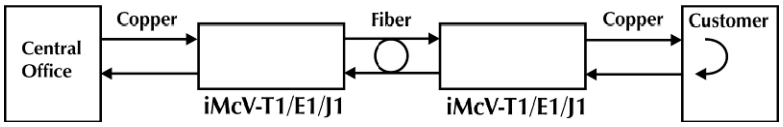


After the user has confirmed the integrity of these data paths, the user can activate the PRBS data generator on the Remote module and place a loopback on the customer premise equipment to test the final copper segment (refer to the Testing with PRBS section for more information).

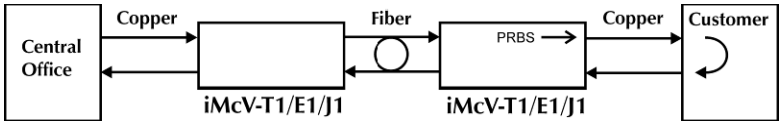
Testing with Pseudorandom Bit Sequence (PRBS)

To test the copper segment from the Remote module to the Customer Premises Equipment (CPE) by using PRBS, perform the following:

1. Set the CPE to loopback the signal.



2. Set the Remote module to generate PRBSs (DIP Switch S2-9=On and S2-10=Off).



Check the LEDs to verify errors are not received (refer to the Module LED Functions section for more information).

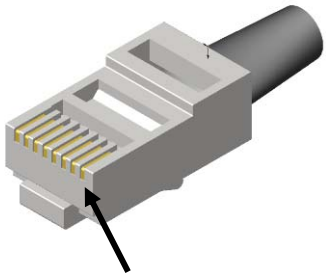
Fiber Optic Specifications

For fiber optic specifications, visit our Web site at www.imcnetworks.com.

RJ-48 Pinout

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

Troubleshooting

To test a media converter by itself, first make sure there is an appropriate fiber patch cable, then perform the following steps:

1. Connect the media converter to the T1/E1 device with a standard UTP cable. If the **NO LNK** LED for the copper port remains on, a valid signal is not being received. Push the crossover push button on the front of the unit. Verify that the **NO LNK** LED for the copper port is off.
2. Loop a single strand of fiber from the transmit port to the receive port of the media converter. Verify that the **NO LNK** LED for the fiber port is off.

   Or

   For single-strand fiber products, connect a single fiber cable from the Local iMcV-T1/E1/J1 Repeater to the remote iMcV-T1/E1/J1 Repeater. Verify that the **NO LNK** LED for the fiber port is off.

NOTE
iMcV-T1/E1/J1 Repeater modules cannot be connected to iMcV-T1/E1/J1 LineTerm modules successfully.

Specifications

Power Consumption (Typical)
0.550 Amp @ 5V

Operating Temperature
+32°F to +122° F (0°C to +50° C)

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

Humidity
5 to 95% (non-condensing); 0 to 10,000 ft. altitude

Dimensions
Single Slot iMcV-Module

B&B Electronics Technical Support

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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.

UL/CUL: Listed to Safety of Information Technology Equipment, including Electrical Business Equipment.

CE

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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