empower with light™

Medallion 6000 Series

1550 nm Transmitter

User Manual

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EMCORE Broadband
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Safety Information

Power Requirements

The system can operate from an AC power source that supplies 100 V AC to 240 V AC 47-63 Hz or a DC power source that supplies 36 to 72 V DC.

Safety Instructions

The following safety instructions must be observed whenever the unit is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user's manual is in direct violation of the standards of design, manufacture, and intended use of the unit. Emcore assumes no liability for the customer's failure to comply with any of these safety requirements.

Before Initializing and Operating the Unit

☑ Inspect the unit for any signs of damage, and read the user's manual thoroughly.

☑ Install the unit as specified in the **Getting Started** section.

☑ Ensure that the unit and any devices or cords connected to it are properly grounded.

Safety Symbols

The following symbols and messages can be marked on the unit (Table 1). Observe all safety instructions that are associated with a symbol.

Table 1: Safety Symbols

Symbol	Description
	Laser safety. See the user's manual for instructions on handling and operating the unit safely.
	See the user's manual for instructions on handling and operating the unit safely.
	Electrostatic discharge (ESD). See the user's manual for instructions on handling and operating the unit safely.
	Frame or chassis terminal for electrical grounding within the unit.
	Protective conductor terminal for electrical grounding to the earth.

WARNING	**The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.**
CAUTION	The procedure can result in serious damage to or destruction of the unit if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.

Getting Started

Before Initializing and Operating the Unit

1. Inspect the transmitter for any signs of damage, and read the User's Manual thoroughly.
2. Install the transmitter as specified in the *Getting Started* section.
3. Ensure that the transmitter and any devices or cords connected to it are properly grounded.
4. Become familiar with all safety symbols and instructions to ensure that the transmitter is operated and maintained safely.

Initial Inspection

WARNING

WARNING: To avoid electrical shock, do not initialize or operate the unit if it bears any sign of damage to any portion of its exterior surface, such as the outer cover or panels.

Check that the unit and contents are complete:

1. Wear an anti-static wrist strap and work in an electrostatic discharge (ESD) controlled area.
2. Inspect the shipping container for any indication of excessive shock to the contents, and inspect the contents to ensure that the shipment is complete.
3. Inspect the unit for structural damage that can have occurred during shipping.

Note: Keep the packaging.

Immediately inform Emcore and, if necessary, the carrier if the contents of the shipment are incomplete, if the unit or any of its components are damaged or defective, or if the unit does not pass the initial inspection.

Operating Environment

In order for the unit to meet the warranted specifications, the operating environment must meet the following conditions for temperature and humidity.

Temperature

The unit can be operated in the temperature range of 0 to 50°C (standard).

Humidity

The transmitter can be operated in environments with up to 85% humidity, non-condensing (0°C to 50 °C). Do not expose it to any environmental conditions or changes to environmental conditions that can cause condensation to form inside the transmitter.

WARNING

- **WARNING: Do not use the unit outdoors.**
- **WARNING: To prevent potential fire or shock hazard, do not expose the unit to any source of excessive moisture.**

Storing and Shipping

To maintain optimum operating reliability, do not store the unit in locations where the temperature falls below -40°C or rises above 85°C. Avoid any environmental condition that can result in internal condensation. Ensure that these temperature and humidity requirements can also be met whenever the unit is shipped.

Claims and Repackaging

Immediately inform Emcore and, if necessary, the carrier, if

•The contents of the shipment are incomplete
•The unit or any of its components are damaged or defective
•The unit does not pass the initial inspection

In the event of carrier responsibility, Emcore will allow for the repair or replacement of the unit while a claim against the carrier is being processed.

Returning Shipments to Emcore

Emcore will only accept returns for which an approved Return Material Authorization (RMA) has been issued. This number must be obtained prior to shipping any material to Emcore. The owner's name and address, the model number and full serial number of the unit, the RMA number, and an itemized statement of claimed defects must be included with the return material.

Ship the return material in the original shipping container and packing material. If these are not available, typical packaging guidelines are as follows:

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1. Wear an anti-static wrist strap and work in an ESD controlled area.
2. Wrap the unit in anti-static packaging. Use anti-static connector covers, as applicable.
3. Pack the unit in a reliable shipping container.
4. Use enough shock-absorbing material (10 to 15 cm or 4 to 6 in on all sides) to cushion the unit and prevent it from moving inside the container. Pink poly anti-static foam is recommended.
5. Seal the shipping container securely.
6. Clearly mark FRAGILE on its surface.
7. Always provide the model and serial number of the unit and, if necessary, the RMA number on any accompanying documentation.
8. Please contact the RMA department, using the contact information at the beginning of this document, to provide an RMA number and a shipping address.

Unpacking

1. Inspect the shipping boxes for any obvious damage.
2. Unpack the unit from all packaging boxes.
3. Inspect the appearance of the unit for any shipping damage.
4. In case of damage, document and inform the shipping company and your local representative.
5. Save the shipping boxes and their inserts for any future reshipment for upgrade or repair.

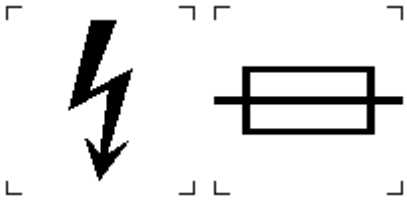
NOTE: *In the event of a reshipment back to the manufacturer, any additional damage caused by not using the original boxes will be considered the responsibility of the customer.*

Transmitter Mounting and Power Connection

1. Mount the unit into a 19-inch wide rack or cabinet (or 23-inch with optional mounting kit).
2. Turn the unit power supply switch(es) located on the rear panel off.
3. Turn the key switch located on the front panel to the OFF position.
4. For dual AC powered models: Plug the two power cords supplied with the transmitter into the three-prong connectors on the rear panel of the transmitter and plug the other ends of the two power cords into a 100-240 VAC, 47-63 Hz power source (e.g. wall socket).
5. For DC powered models: Connect wires DC+, DC-, and GND to the pluggable terminal block that is connected to the DC input of the power supply. The DC power source must be 36 – 72VDC and wires used must handle 65VA.
6. Turn the unit power switch to the ON position.

Note: The transmitter can operate with a single power supply and/or from two different power sources.

CAUTION: **DOUBLE POLE/NEUTRAL FUSING**



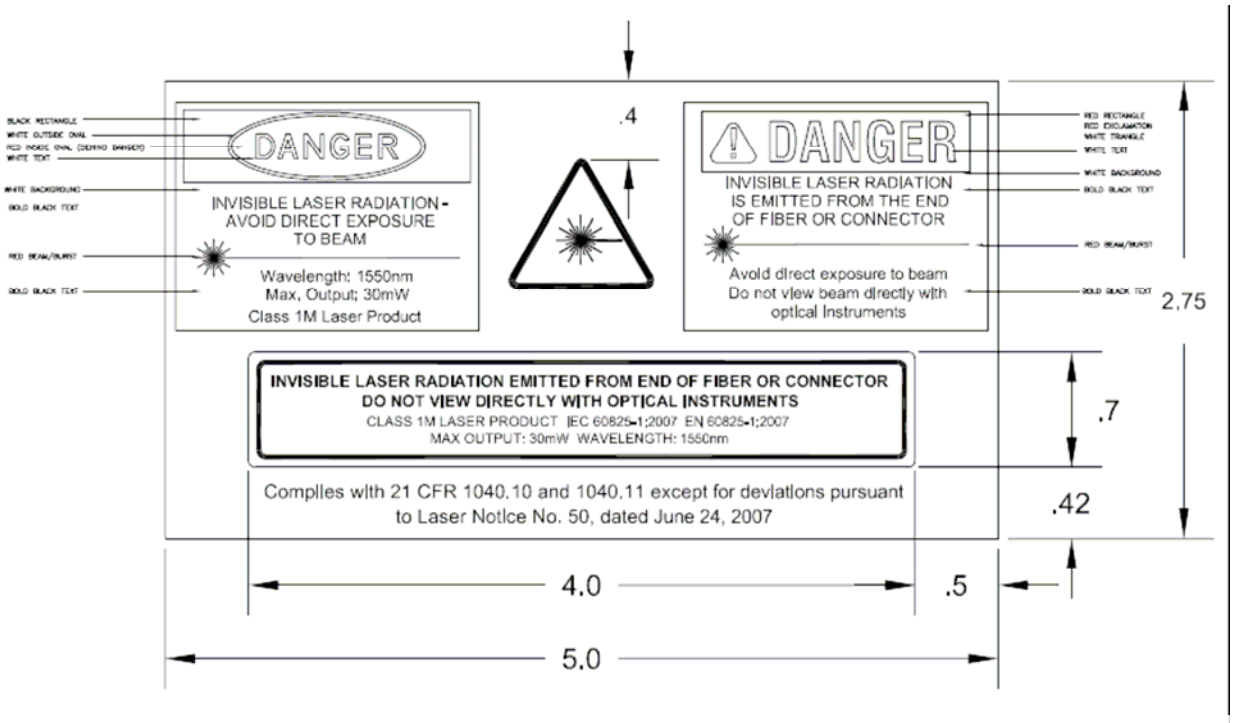
Earth grounding of AC supplies in Scandinavian countries.

Finland: "Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan "

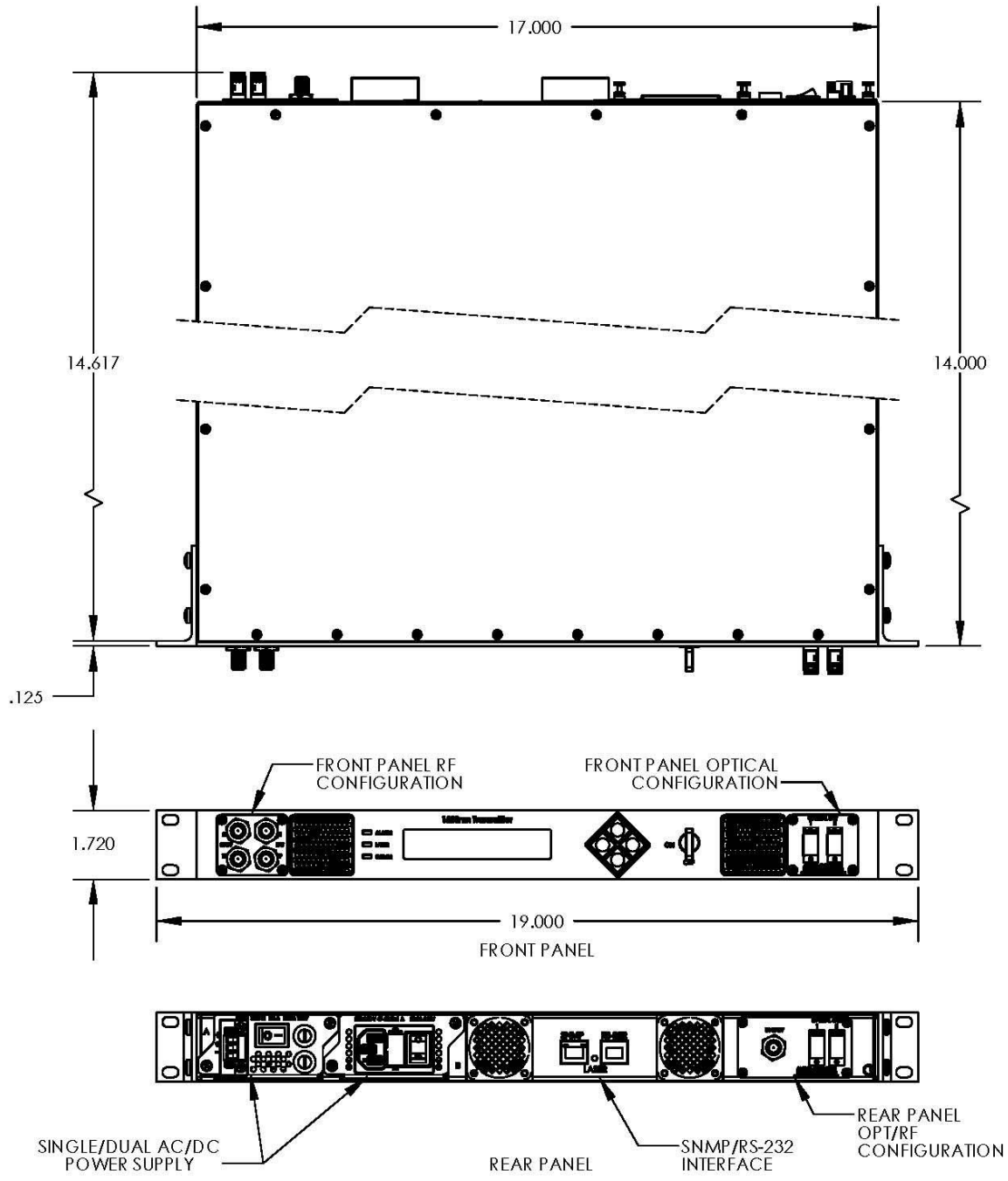
Norway : "Apparatet må tilkoples jordet stikkontakt"

Sweden: "Apparaten skall anslutas till jordat uttag."

Laser Safety Label



Transmitter Dimensions



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Operating the Transmitter

WARNING

To avoid the risk of injury or death, always observe the following precautions before initializing the transmitter.

- If using a voltage-reducing autotransformer to power the transmitter, ensure that the common terminal connects to the earthed pole of the power source.
- Use only the type of power cord supplied with the transmitter.
- Connect the power cord only to a power electrical outlet equipped with a protective earth contact. Never connect to an extension cord that is not equipped with this feature.
- Willfully interrupting the protective earth connection is prohibited.
- Never look into the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible, and direct exposure can severely injure the human eye. For more information, see the User's Manual of the laser source in use.
- Turning off the power to the laser component does not always block the externally supplied radiation to the connector at the output of the transmitter.
- Do not use the transmitter outdoors.
- To prevent potential fire or shock hazard, do not expose the transmitter to any source of excessive moisture.
- Do not operate the transmitter when its covers or panels have been removed.
- Do not interrupt the protective earth grounding. Any such action can lead to a potential shock hazard that can result in serious personal injury.
- Do not operate the transmitter if an interruption to the protective grounding is suspected. In this case, ensure that the transmitter remains inoperative.
- Use only the type of fuse specified by the manufacturer as appropriate for this transmitter. Do not use repaired fuses, and avoid any situations that can short-circuit the fuse.
- Unless absolutely necessary, do not attempt to adjust or perform any maintenance or repair procedure when the unit is opened and connected to a power source.
- Repairs are to be carried out only by a qualified professional.
- Do not attempt any adjustment, maintenance, or repair procedure to the transmitter's internal mechanism if immediate first aid is not accessible.
- Disconnect the power cord from the unit before adding or removing any components.
- Operating the unit in the presence of flammable gases or fumes is extremely hazardous.
- Do not perform any operating or maintenance procedure that is not described in the User's Manual.
- Some of the transmitter's capacitors can be charged even when the unit is not connected to the power source.

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Optical and RF Characteristics

Optical Characteristics

Number of Optical Outputs	One (1): D-type, N-Type Two (2): L-Type, F-type, S-type, H-type
Optical Output Connector Type	SC/APC Bulkhead *(standard)* *(FC/APC and E2000 to be provided as version specific option)*
Optical fibers for connectors shall be retained internally to allow user removal of optical bulkhead connector for cleaning.	
Optical Connector Location	Front or Rear panel mounted

Optical Connections

1. Clean all fiber patch cords before connecting to the transmitter.
   Cleaning Guidelines:

   Fiber Patch cord connectors

   - Remove the fiber connectors dust cap and wipe the fiber connector tip with a dry lint-free cloth (such as Kimwipes®). Inspect for scratches or debris on connector surface by using a microscopes (ie.100x or 200x).
   - If no scratches or debris are found the connector is now clean and ready for connection. If debris or scratches are found then repeat the fiber patch cord connector cleaning guidelines.

   Fiber Bulkhead connectors

   - Compressed air may be used to clean fiber bulkhead connectors. Use compressed air with at least the following specifications:
     - Non-residue, inert gas for precision dust removal
     - Ultra-filtered to < 0.2 microns
     - Recommended for optical systems.

     - Using compressed air as listed above, remove the bulkhead dust cover and hold the can of compressed air about 6 inches from the connector. After spraying a few short bursts into the bulkhead the connector is clean and ready for connection.

     - If compressed air is not available, the transmitter fiber bulkhead connector may be cleaned by 2.5 mm cotton swap or connector plate may be removed to clean the internal fiber patch cords.

CAUTION

CAUTION: Use caution when handling fibers. Do not exceed fiber manufacturers pulling tension or bend radius specifications when removing fiber bulkhead connector plate.

- To remove the transmitter optical connector plate, remove the screw on the far left of the optical plate and remove the screw on the far right of the optical plate. Do not remove the screws on the optical bulkhead connector.
- Slowly remove the optical connector plate from the rear panel and disconnect each fiber connector from the bulkhead mounted on the plate.
- Clean each fiber connector according to section A of the fiber cleaning guidelines.

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2. Make sure the laser key switches on the front panel of the transmitter are in the OFF position.
3. Connect a fiber patch cord from the output of the transmitter to an optical power meter.
4. Turn the transmitter laser key switch to the ON position.
5. Using the optical power meter verify the transmitter optical power is within specification.
6. Turn the transmitter laser key switch to the OFF position.

RF Characteristics

Number of RF Inputs	One (1), Two (2) for L-Type
RF Input Connector Type	Female 'F' type: D-Hole Connector Front or Rear Mounted
RF Test Point Connector Type	Female 'F' type: D-Hole Connector Front or Rear Mounted

Set each channel to the correct RF level. This is dependant on the operating mode.

PROPERTY	REQUIREMENT	COMMENTS
Input Power Range	17 +/-1 dBmV/ch 80 NTSC channels	Manual mode
	15 +/-1 dBmV/ch 110 NTSC channels	Manual mode
	18 +/-1 dBmV/ch 60 PAL channels	Manual mode
	16 +/-1 dBmV/ch 89 PAL channels	Manual mode
	27 +/-1 dBmV/ch SAT-IF channels	Manual mode
Input Power Range	19 +/-2 dBmV/ch 80 NTSC channels	CW mode
	17 +/-2 dBmV/ch 110 NTSC channels	CW mode
	20 +/-2 dBmV/ch 60 PAL channels	CW mode
	18 +/-2 dBmV/ch 89 PAL channels	CW mode
	29 +/-2 dBmV/ch SAT-IF channels	AGC mode
Front Panel RF Gain / OMI Adjustment Range	+2 / -4 dB from nominal setting	CATV Performance can vary slightly
CATV Frequency Range	45MHz – 1003 MHz	
CATV Flatness	+/- 0.50 dB	45MHz - 550MHz
	+/- 0.75 dB	45MHz – 1003 MHz
CATV Flatness – N-Type	+/- 0.75 dB	45MHz – 1003 MHz N-Type
CATV Input impedance	75Ω	
CATV Input Return Loss	16dB min	45MHz – 1003 MHz
CATV Front Panel RF Tap	-20 +/- 1 dB down from RF input	
CATV Front Panel RF Tap Flatness	+/- 1 dB	45MHz – 1003 MHz
SAT-IF Frequency Range	950MHz – 2800 MHz	
SAT-IF Flatness	+/- 2 dB	
SAT-IF Input impedance	75Ω	
SAT-IF Input Return Loss	10dB min	950MHz – 2800 MHz
SAT-IF Front Panel RF Tap	7 +/- 2.5 dBmV/Ch at 1% OMI/ch	
SAT-IF Front Panel RF Tap Flatness	+/- 1 dB	950MHz – 2800 MHz

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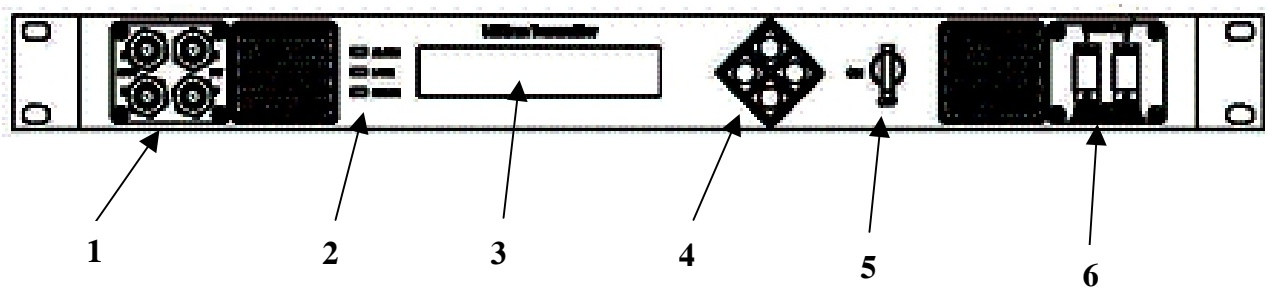
Connect the RF (CATV) channels to the F connector labeled “CATV IN”.

Connect the RF (SAT) channels to the F connector labeled “SAT IN”. L-Type Only

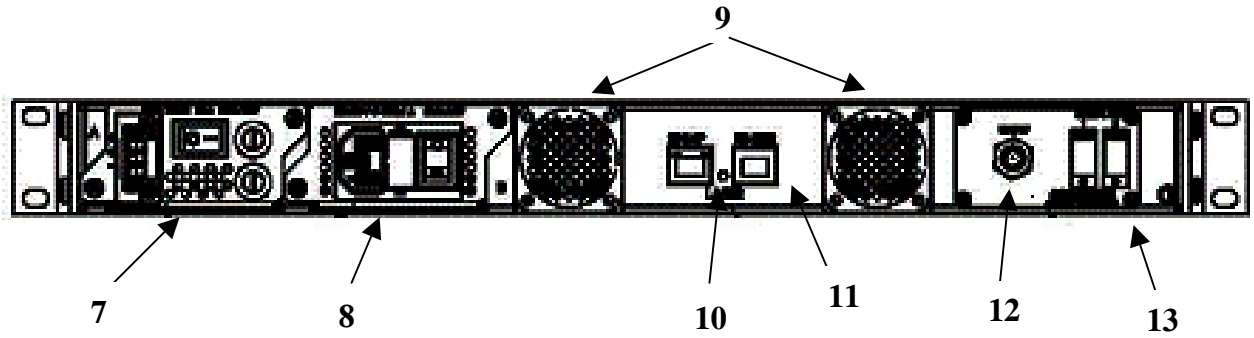
Transmitter Controls and Indicators

Front Panel



1. RF Inputs and Test Port Output (-20dB from RF Input) (Front panel option)
2. Laser LED (Red=OFF, Green=ON), Status LED, COMM LED
3. VFD- Vacuum Florescence Display (Shows parameters, status, and alarms)
4. Control Buttons (up, down, left, and right)
5. Laser control Key Lock switch
6. Optical Connectors (Front Panel Option)

Rear Panel



7. DC Power Supply (can be installed in any location)
8. AC Power Supply (can be installed in any location)
9. Field Replaceable Fan Assemblies (2)
10. Laser ON LED (Optical Power is present when lit)
11. Ethernet Interface Connector, RS-232 interface connector
12. RF Inputs and Test Port Output (-20dB from RF Input) (Rear panel option)
13. Optical Output connectors (may only be one depending on model)

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   Fiber Bulkhead connectors

   - Compressed air may be used to clean fiber bulkhead connectors. Use compressed air with at least the following specifications:
     - Non-residue, inert gas for precision dust removal
     - Ultra-filtered to < 0.2 microns
     - Recommended for optical systems.
     - Using compressed air as listed above, remove the bulkhead dust cover and hold the can of compressed air about 6 inches from the connector. After spraying a few short bursts into the bulkhead the connector is clean and ready for connection.
     - If compressed air is not available, the transmitter fiber bulkhead connector may be cleaned by 2.5 mm cotton swap or connector plate may be removed to clean the internal fiber patch cords.

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- Slowly remove the optical connector plate from the rear panel and disconnect each fiber connector from the bulkhead mounted on the plate.
- Clean each fiber connector according to section A of the fiber cleaning guidelines.

2. Make sure the laser key switches on the front panel of the transmitter are in the OFF position.
3. Connect a fiber patch cord from the output of the transmitter to an optical power meter.
4. Turn the transmitter laser key switch to the ON position.
5. Using the optical power meter verify the transmitter optical power is within specification.
6. Turn the transmitter laser key switch to the OFF position.

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User Interface

VFD: Front Panel Menus and Operation

The following section describes the error reporting via the front panel display. Additional warnings and alarms are available through the SNMP interface.

The Front panel is separated into two sub menus, Show parameters and Show alarms:

Show Parameters

Press right arrow button on front panel at the display shown after power on

Menu #1 – *Model Number*
This is a read only menu, which tells the operator what type of transmitter they are operating – Default “6000-xxxx-xxxxx”.

Menu #2 – Serial Number:
This is a read only menu, which tells the operator the production serial number of the unit in operation – set by factory

Menu #3 – Date Code:
This is a read only menu, which tells the operator the date the Tx was manufactured – set by factory

Menu #4 – FW revision
This is a read only menu, which tells the operator the version of the FW installed in unit

Menu #5 – CATV AGC Mode:
Use this menu to select between manual, CW or Video AGC modes.

Manual mode – The AGC has no effect at this setting and therefore if the RF input changes then so does the end of line link performance.

CW mode – The AGC controls and maintains the factory setting for the OMI of the Tx. If the RF input is lowered or raised within the specified range then the end of line link performance will still be held constant.

Video mode – Functions identically to the CW mode with the exception that it sets the OMI to a 3dB lower level to compensate for modulated carriers.

Menu #6 – CATV OMI Setting / *RF attenuation AGC* – Mode selective Menu
If the Tx has been put in CW or Video mode this menu will display “ OMI Setting” This control allows the user to adjust the factory set OMI AGC point in 0.1 dB steps. -4 to +2 dB range.

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If the Tx has been put in MANUAL mode this menu will display "*RF attenuation AGC*"
This control allows the user to adjust the factory set RF attenuator setting in 0.1 dB steps. -4 to +2 dB range.

Menu #7 – SAT AGC Mode: ***** Available for L-Type Models Only *****
Use this menu to select between manual or CW modes.

Menu #8 – SAT OMI Setting / *RF attenuation* : *** Available for L-Type Models Only ***
This control allows the user to adjust the factory set OMI AGC point or RF Gain in 0.5 dB steps. -5 to +5 dB range.

Menu #13 – *System Temp* – This is a read only menu, this parameter tells the user the temperature of the Tx module itself.

Menu #14 – *Laser Current* – This is a read only menu, which tells the operator the current of the DFB laser in mA.

Menu #15 – *Laser Temp* – This is a read only menu, which tells the operator the temperature setting on the DFB laser. Generally this is how the wavelength is set on a particular Tx.

Menu #16 – *TEC current* – This is a read-only menu; this is the current setting for the thermoelectric cooler device used to keep the DFB laser temperature constant.

Menu #17 – *Optical Power Port 1* – This is a read-only menu; reported in dBm to the nearest 0.1dB.

Menu #18 – Optical power port 2 - This is a read-only menu; reported in dBm to the nearest 0.1dB.

Menu #19 – CATV *Input RF* – This menu indicates the relative RF composite input power from the factory nominal setting in dB.

Menu #20 – CATV Composite RF:
This menu shows a relative value of the actual RF input power compared to the factory set desired RF input power. For both AGC modes CW and Video this should be 0.0 because this is set by the control circuitry. For manual mode this will depend on the amount and RF level of the channels present at the input of the Tx.

Menu #19 – SAT *Input RF* – This menu indicates the relative RF composite input power from the factory nominal setting in dB

Menu #20 – SAT Composite RF:
This menu shows a relative value of the actual RF input power compared to the factory set desired RF input power. For CW mode this should be 0.0 because this is set by the

control circuitry. For manual mode this will depend on the amount and RF level of the channels present at the input of the Tx.

The following menus are present in transmitter model types that support Variable SBS and Dispersion Compensation functions.

Menu #X – SBS Suppression: *** (S-Type, H-Type and F-Type) ****
This menu is where the SBS level of the Tx would be tuned to match the launch power

Menu #X – Fiber dispersion Control: *** (S-Type and H-Type) ****
This menu allows the user to enable or disable Electronic Fiber Dispersion Compensation. This function would be used if the user would like to improve the CSO performance of a point-to-point link. The following three settings (Menus 8,9 and 10) allows the user to fine tune the level of dispersion compensating CSO products. This is used to negate the CSO produced by non-linear fiber effects such as Chromatic Dispersion and Self Phase modulation.

Menu #X – *Fiber Dispersion Gain*: Allow the user to vary the amount of Fiber Dispersion Gain in 0.1 Volt increments.

Menu #X – *Fiber Dispersion Phase*: Allow the user to vary the amount of phase in 0.1 Volt increments.

Show Alarms

Press left arrow button on front panel at the display shown after power on

Alarm #1 – Laser Temp:
This alarm is triggered when the temperature of the laser deviates from it's factory setting.

Alarm #2 – Laser Current:
This alarm is triggered when the current of the laser deviates from it's factory setting.

Alarm #3 – Comp RF level:
This alarm is only valid when the Tx is used in Manual mode. The RF low/high alarm is triggered when either the total RF power at the input of the Tx is +2.5 dB (high) or –6 dB (low) away from the original nominal input set at the factory. This nominal value is directly dependant on channel loading and RF level per CW carrier.

Alarm #4 – 2 GHz and 6 GHz:
These alarm(s) are triggered when the power of one or both of the SBS tones decreases below initial factory setting.

Alarm #5 – System Temp:
This alarm is triggered when the module temp reaches 70 deg C(High) or respectively the module temp reaches 0 deg C(Low).

Alarm #6 – TEC Alarm:
This alarm is triggered only when the current on the TEC reaches a value of 1500 mA.

Alarm #7 - +5v power supply:
This alarm is triggered if the voltage exceeds preset limits. Also if either condition is met the microprocessor resets due to the fact that this is a critical voltage supplied to the chip.

Alarm #8 - -5v power supply:
This alarm is triggered if the supply exceeds preset limits.

Alarm #9 - +12v power supply:
This alarm is triggered if the supply exceeds preset limits.

Alarm #10 - -12v power supply:
This alarm is triggered if the supply exceeds preset limits.

Alarm #11 - +24v power supply:
This alarm is triggered if the supply exceeds preset limits.

Alarm #12 – Fan(s) 1 & 2:
This alarm is independent for each fan. It is generated when the current reaches either 200 mA (high) or 50 mA (low) indicating a fan failure.

Alarm #13 – Optical Power, Port 1 or 2:
This alarm is independent for each port. It is generated when the optical power reaches either <5.0 dBm (low) or > 14 dBm (high).

Alarm #14 – TPDC Bias (related to CSO control loop):
This alarm is a high/low warning that is generated when the voltage reaches +/- 4.5 volts. The CSO loop will actually will reset at +/- 5 volts.

Alarm #15 – Keyswitch ON/OFF:
This alarm is generated when the key is on the OFF position.

Alarm #16 – Remote Keyswitch ON/OFF:
This alarm is generated when the key switch is remotely programmed to the OFF position via SNMP command.

Alarm #17 – Communication Error
This alarm is generated when there is an internal digital error.

Alarm #18 – Cooling Fan A Failure
This alarm is generated when rear panel cooling fan failure is detected.

Alarm #19 – Cooling Fan B Failure
This alarm is generated when rear panel cooling fan failure is detected.

Alarm #20 – Power Supply A Failure
This alarm is generated when a failure is detected with one or more power supply DC voltage outputs.

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Alarm #21 – Power Supply B Failure
This alarm is generated when a failure is detected with one or more power supply DC voltage outputs.

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Display Warnings/Alarm Parameters

Warning/Alarm Description	WarningAlarm Limit	VFD Display
RF Alarms		
RF input level (Manual mode only)	-6.0 dB 2.5 dB	Input RF Level HI Input RF Level LO
AGC Control Loop Unlocked (AGC mode only)	+/- 1.25 dB from OMI setpoint	AGC Unlocked
Optical Output Power Alarms	14 dBm 5 dBm	Optical Power Output HI Optical Power Output LO
Laser Bias Current Alarms	100ma 450ma	Laser Current LO Laser Current HI
Laser Temperature Alarms	16 deg C 35 deg C	Laser Temp LO Laser Current HI
Laser TEC Failure Alarm	+/- 1.5 amp	TEC Current HI
Unit Internal Temperature Alarm	0 deg C 70 deg C	System Temp LO System Temp HI
Cooling Fan Failure Alarm	< 50 mA > 200 mA	Fan Current LO Fan Current HI
Power Supply Alarm	+5VDC -5VDC +12VDC -12VDC +24VDC	Plus 5V Supply HI /LO Minus 5V Supply HI / LO Plus 12V Supply HI / LO Minus 12V Supply HI / LO Plus 24V Supply HI / LO
SBS Suppression Failure Alarm	0.1 Volts 0.1 Volts	2 GHz SBS Power LO 6 GHz SBS Power LO
Key Switch Position		Keyswitch OFF
Remote Key Switch		Remote Keyswitch OFF
Internal Communication		Communication Failure
Modulator Bias	+/- 4.5 Volts	Mod Bias HI / LO

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Remote Monitoring: SNMP

General Background of SNMP

Simple Network Management Protocol (SNMP) is an application layer protocol that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite. SNMP enables end users to manage network performance, find and solve network problems, and plan for future network growth.

Management Information Base (MIB) is a collection of information that is organized hierarchically, and these MIBs are accessed using SNMP. They are comprised of managed objects and are identified by object identifiers

SNMP

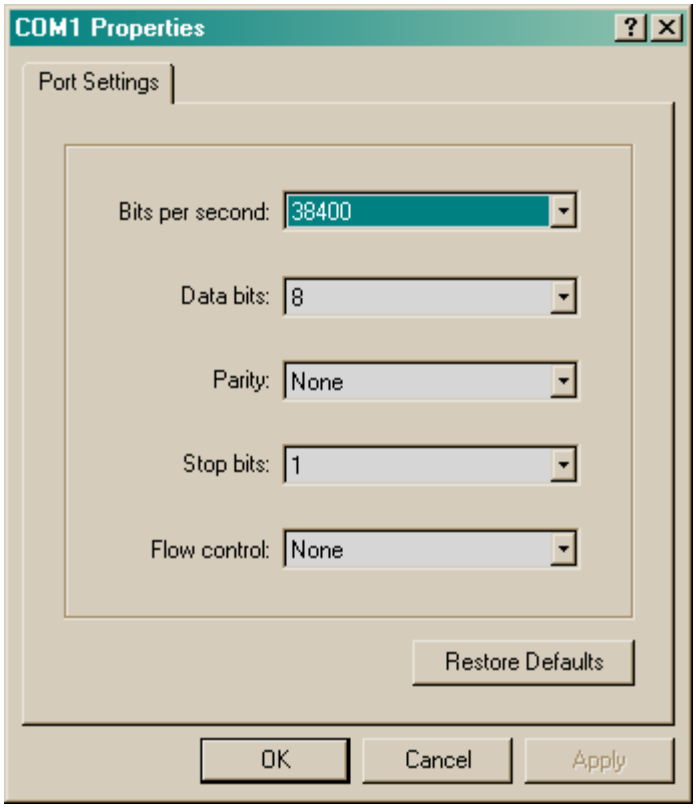
The transmitter provides a serial communications interface that conforms to the IEEE-802.3 physical layer specifications. This interface supports connections to proprietary element and network management systems. This interface assumes a master/slave type of relationship between EMS/NMS and transmitter. The host computer system is capable of querying connected equipment for status as well as sending control information through SNMP. The physical interface is a two-wire (and ground) multi-drop bus. The communications channel is half-duplex.

Configuring the Transmitter for Network Communication

When the transmitter is operated initially, the SNMP Agent and IP Address are in a default state that needs to be configured. This initial configuration is supported via the RS-232 interface.

Connecting to the RS-232 interface

1. With the transmitter power off, connect a straight through RS232 cable between a personal computer and the transmitter's RS232 DB-9 connector on the back.
2. Power up transmitter.
3. Invoke a terminal emulation program on the PC such as Microsoft® HyperTerminal (used in this example).
4. Configure the communication channel (in this example COM1) with 38,400 Bits Per Second, 8 data bits, no parity, one stop bit and no flow control (see screenshot).



5. Set the Port settings as in the screen shot and press "OK".

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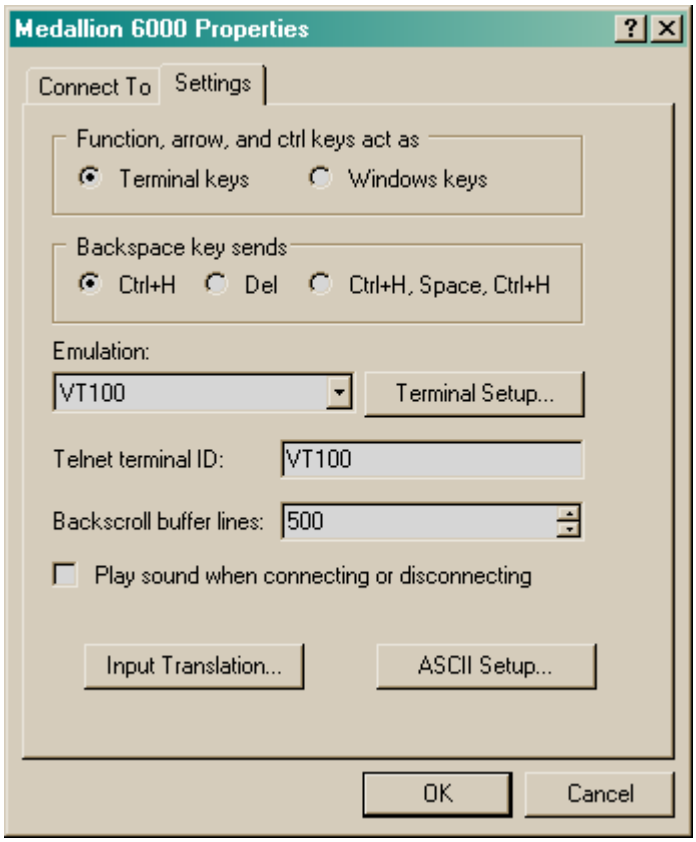
6. Under the “file” pull down menu on HyperTerminal, select “properties”, and click on the settings tab.
7. Ensure that the settings match the screen shot below.
8. Press “OK”



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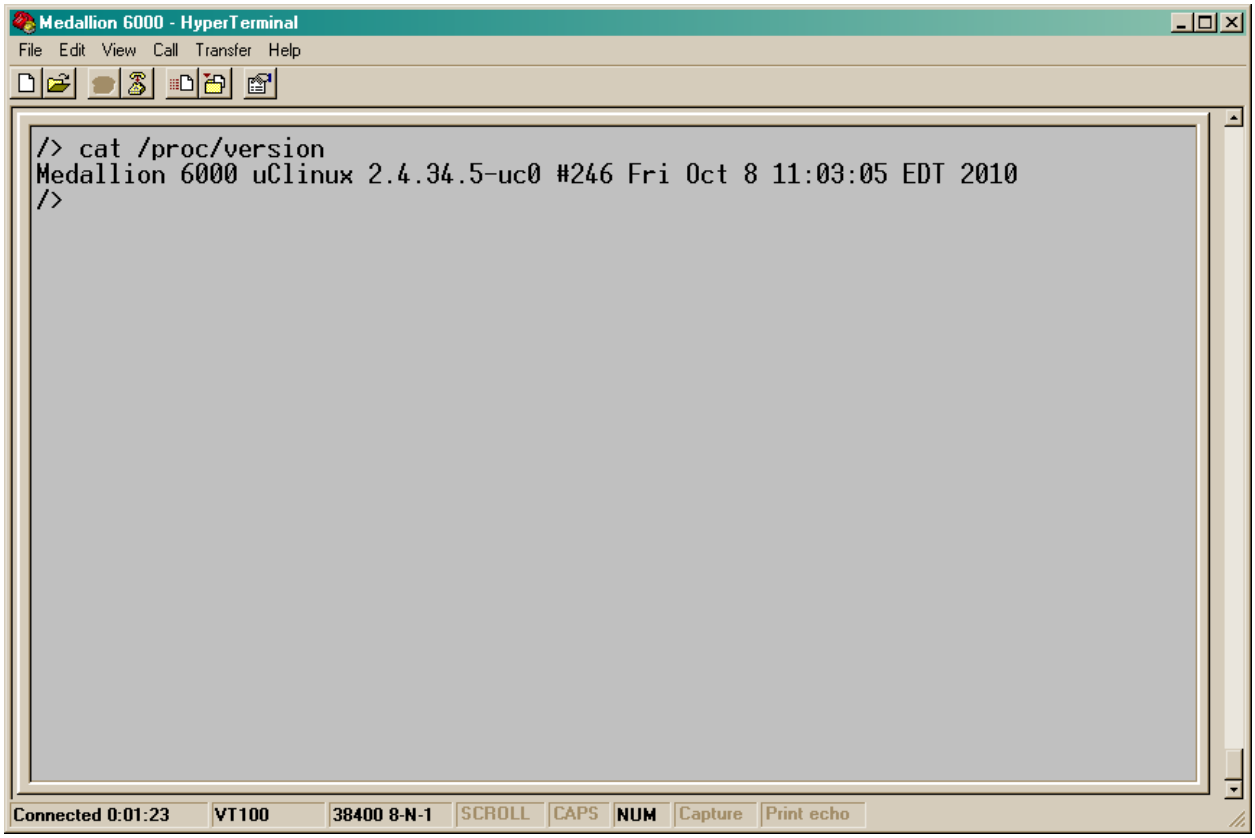
9. At the command prompt, type the following case sensitive command:
   cat /proc/version
10. A script will run, and user will see something similar to the screen shot below in the HyperTerminal window. After this script completes, and the command prompt: **/>** appears, the transmitter is ready for IP and SNMP configuration.



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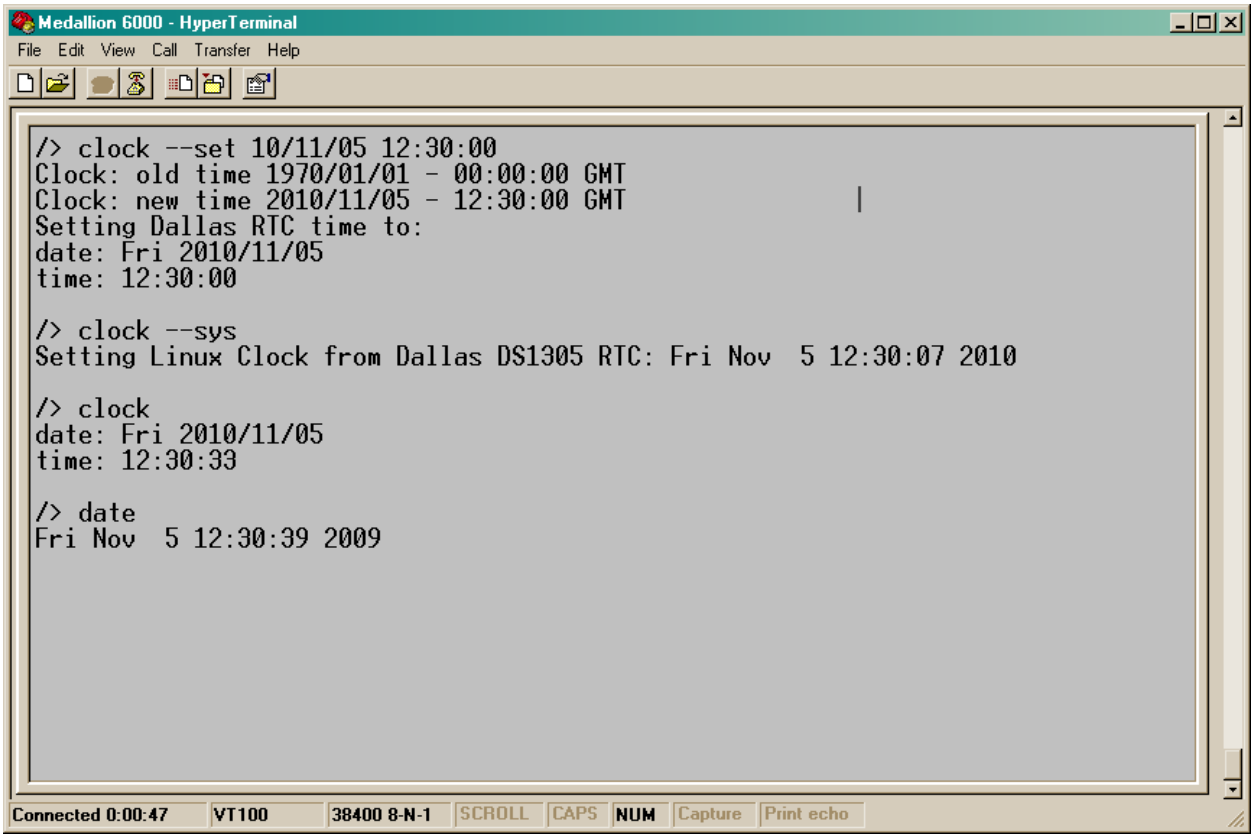
Setting the real-time clock

1. Type **clock –set YY/MM/DD HH:MM:SS** at the command prompt.
   YY (year) [00-99] = 20xx, MM (month), DD (day)
   HH (hour), MM (minute), SS (second) in 24 hour format
2. Type **clock –sys** to synchronize real-time clock to system time.
3. Commands **clock** and **date** may be used to read actual date and time.
   (see examples below).



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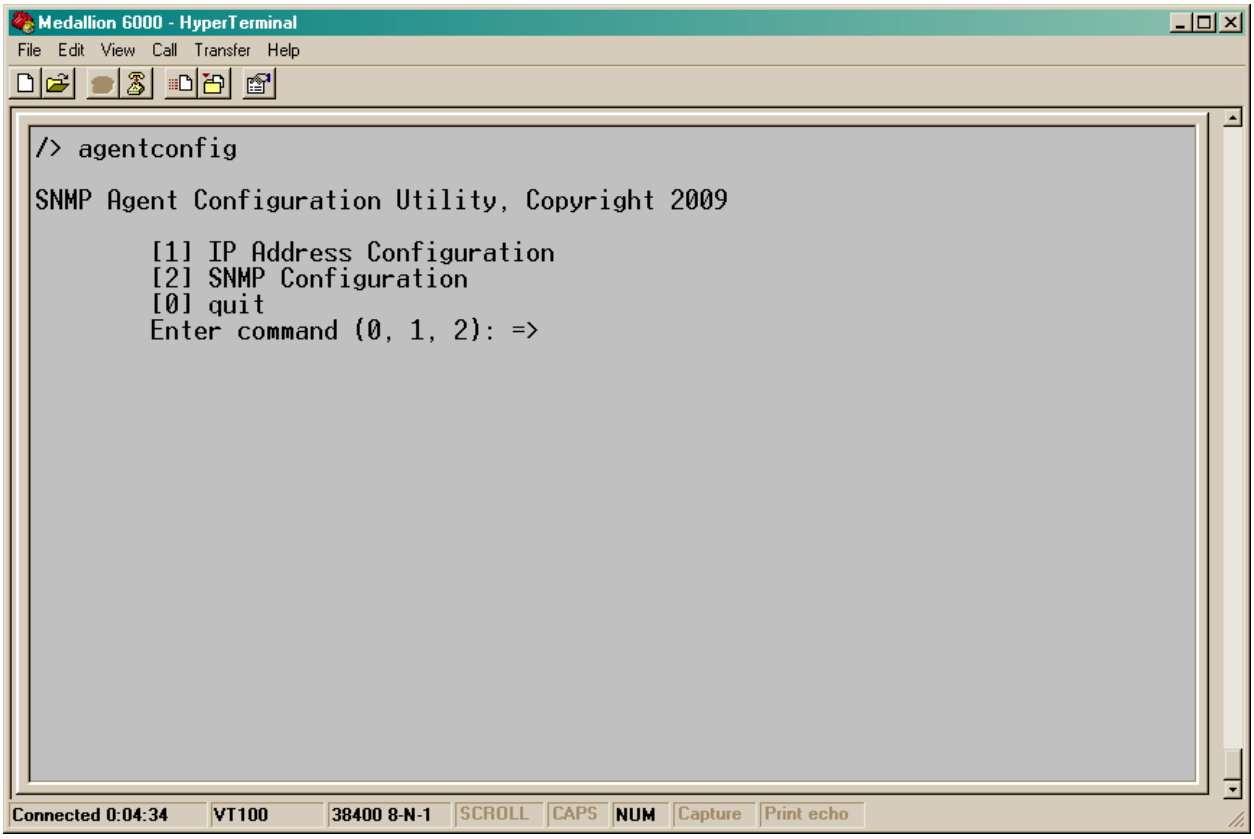
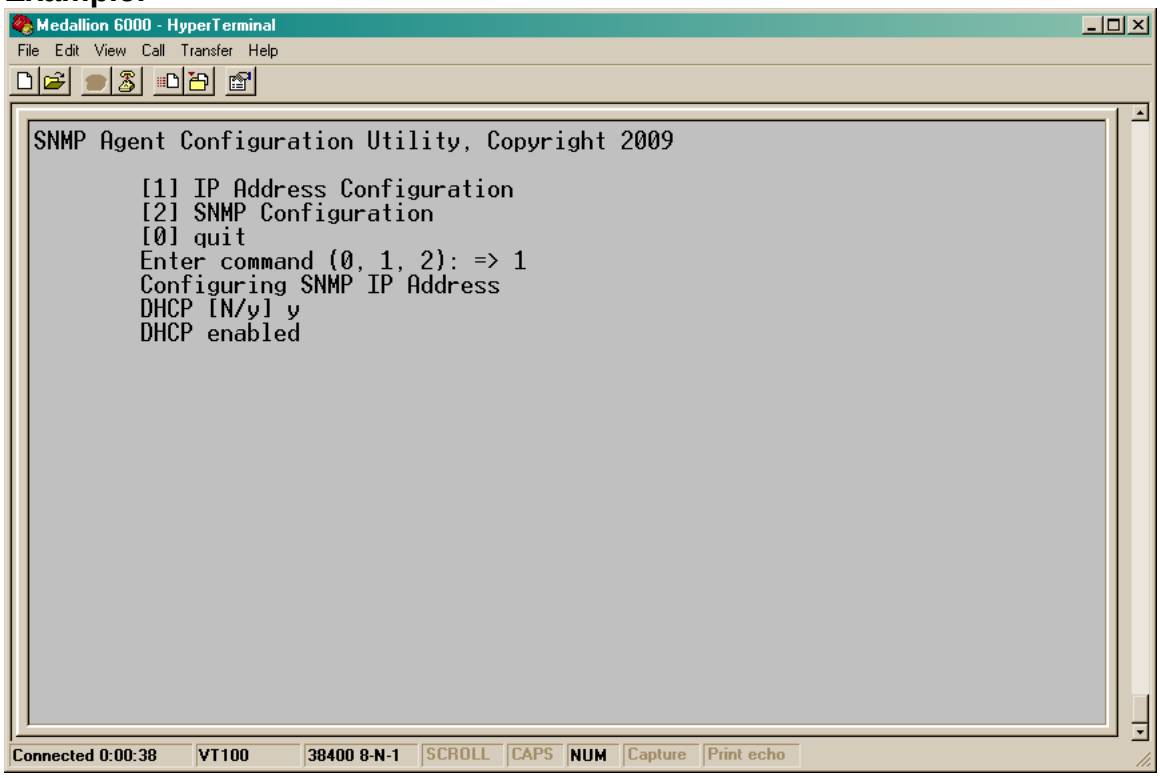
Setting the IP address of the transmitter

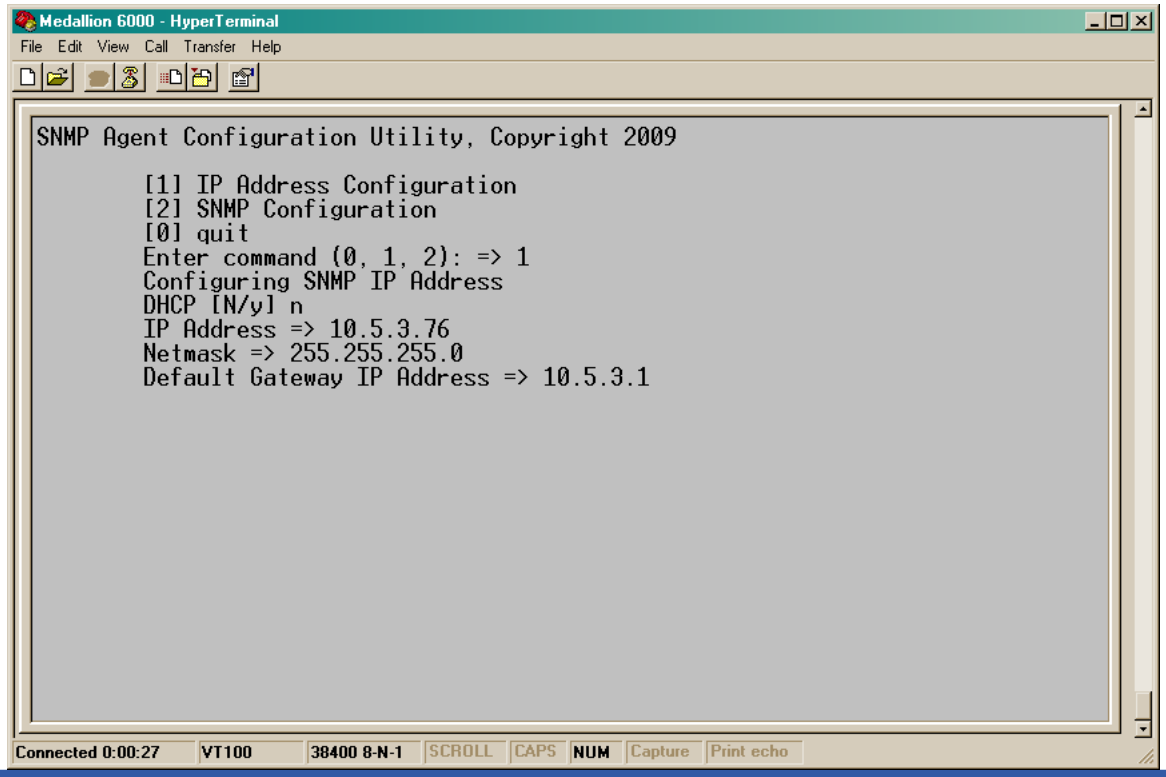
1. Type **agentconfig** at the command prompt.
2. Enter **1** for IP Address Configuration and choose a preference for the Dynamic Host Configuration Protocol (DHCP) service. If DHCP is selected then the IP address will be assigned automatically by the host network, otherwise the user must manually enter the IP address, NetMask, and default gateway to match user's network requirements. (see example below).



Example:



OR



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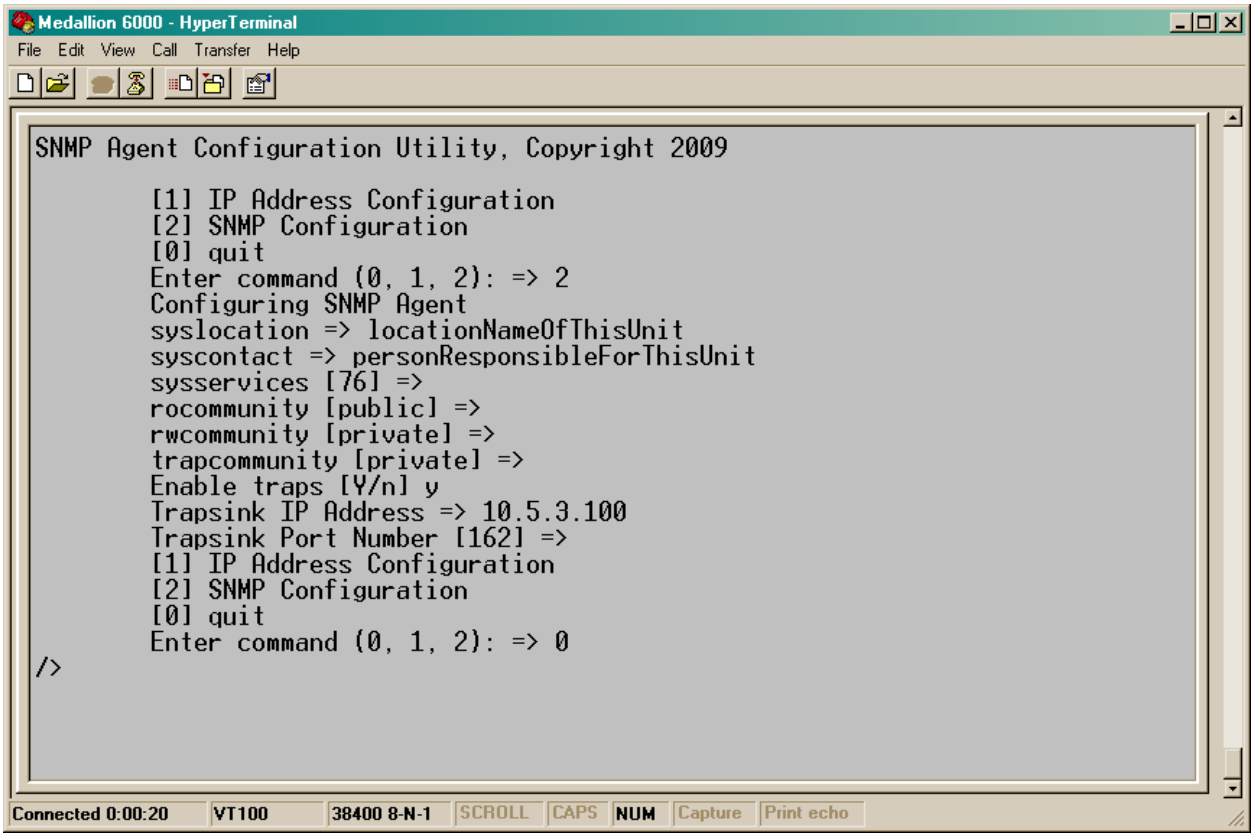
Configuring the SNMP agent

1. With the IP Address Configuration now completed, select **2** from the menu to configure the SNMP agent.
2. The script will prompt user for “syslocation”, this is a user settable information text field intended to describe the physical location of the transmitter.
3. “syscontact” is a user settable information text field intended to capture the person(s) or entity responsible for supporting the transmitter.
4. “sysservices” select default [76], by pressing the return key.
5. User can set community strings “read only”, “read/write” and “trap communities” to any appropriate string values. Commonly used values are “**public**” or “**private**.”



6. Enter ‘**y**’ if you want to set the Trap Agent’s IP address. This is the IP address that all alarms will be sent to.
7. Enter ‘**0**’ to exit configuration.
8. Next step is to configure the power supply configuration for the unit.

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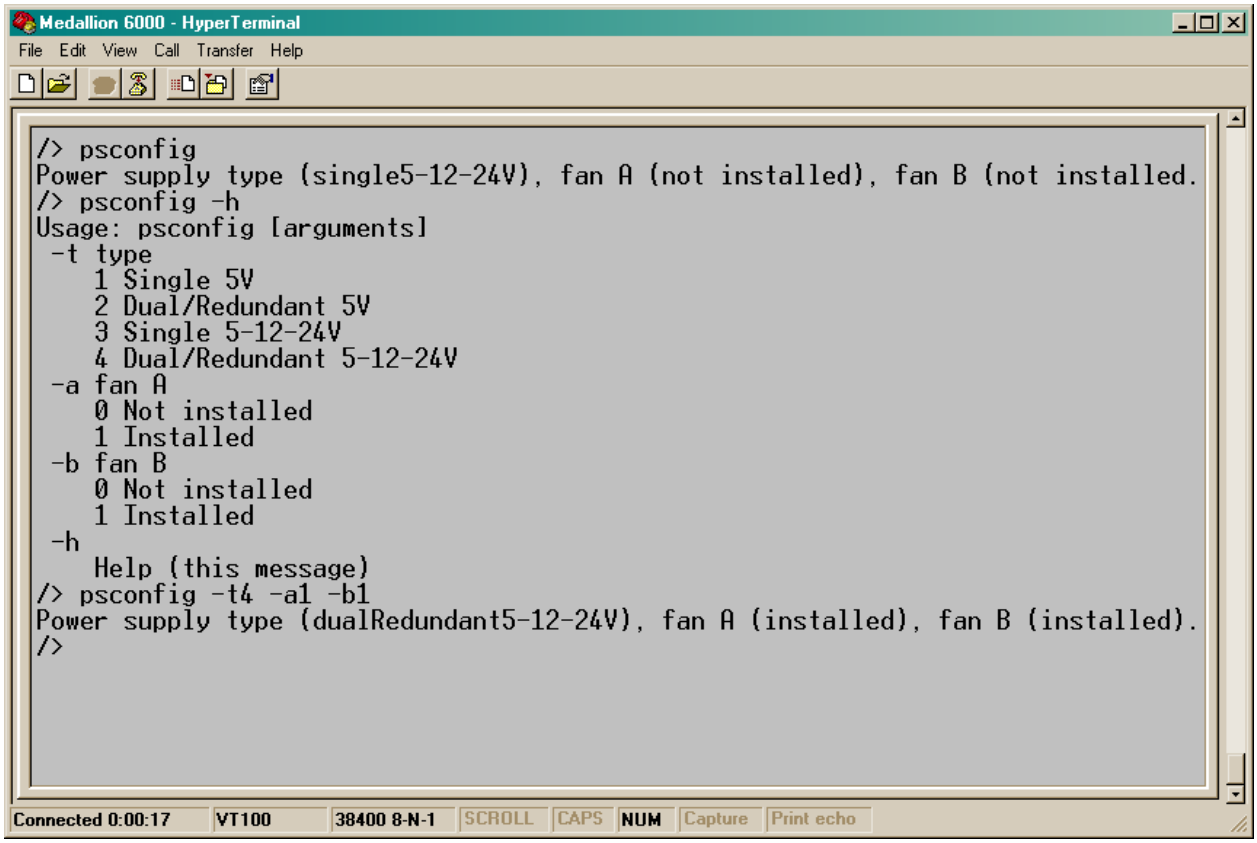
Power supply configuration

1. At command prompt **/>** type **psconfig** for the current configuration or **psconfig –h** for a list of power supply configuration options that are selectable.
2. Type in the command that matches the units configuration: e.g. **psconfig –t3 –a1 –b1**
   Note: **psconfig** will need to be re-run if user changes the power supply configuration in the future.



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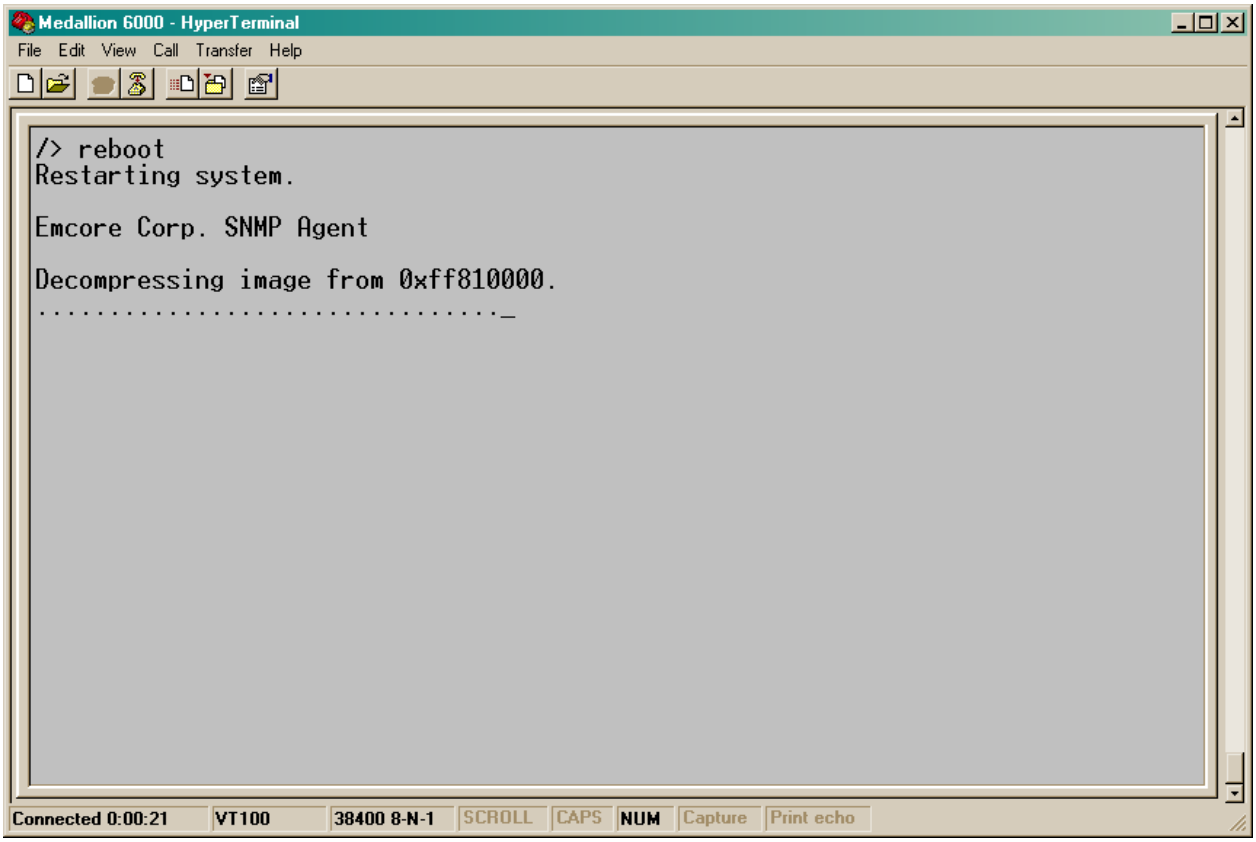
Establish updated network connection

1. Recycle power to the transmitter or at the command prompt **/>** type **reboot** to restart the unit.



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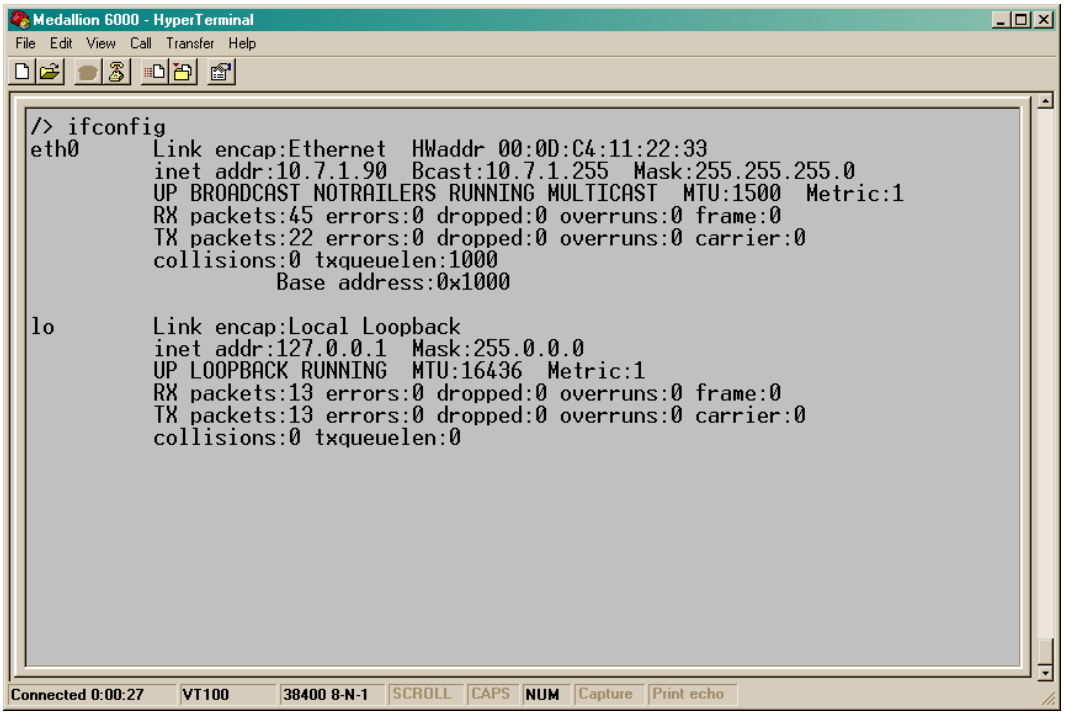
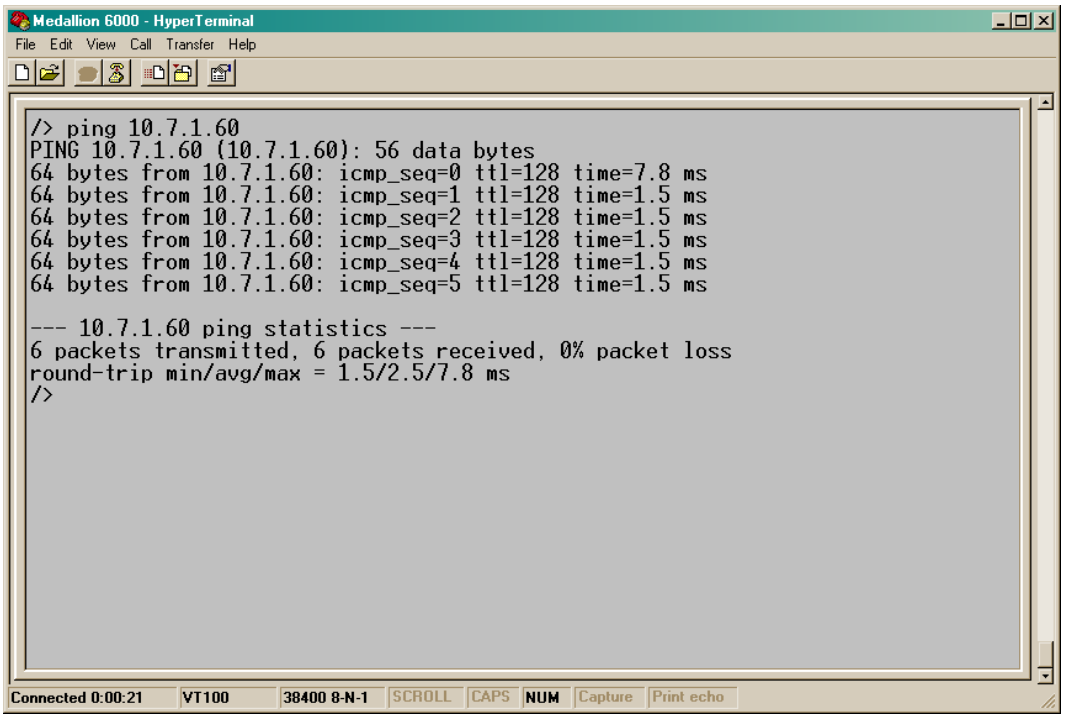
Network configuration

2. Now your Management software should be able to establish communication with this unit with the IP address configured.
   This may be confirmed by issuing commands **ifconfig** or **ping**.





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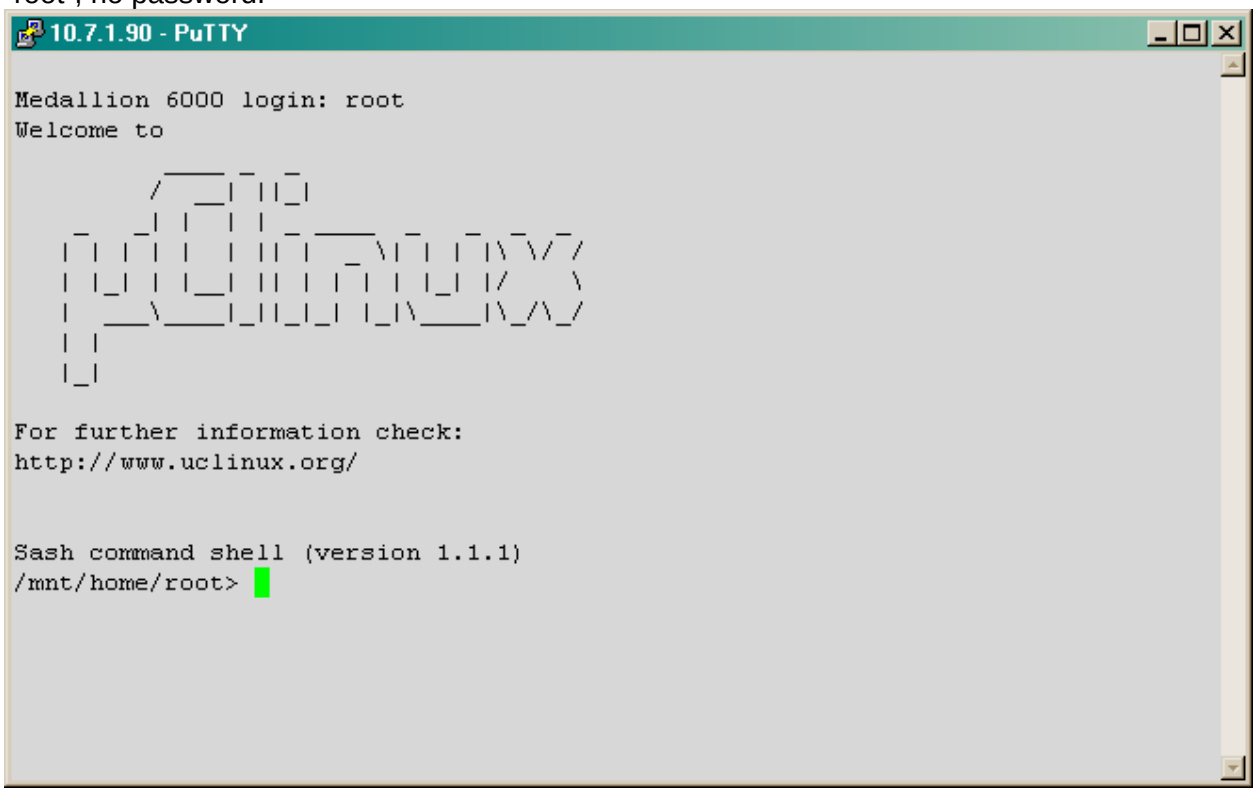
Telnet service

3. After network is configured, Telnet may be used to access unit console over Ethernet network instead of physical RS232 DB-9 hardware connection if desired. Default login username is “root”, no password.



MIBs

A complete set of SNMP MIB's is included with the transmitter on a CD-ROM.

All OID's support SNMP GET. The OID's with an [S] support SNMP SET as well:

tagID [S] (ASCII string up to 16 characters)
modelNumber
mfgDate
serialNum
firmwareRev
engRev
systemTemp
laserCurrent
laserTemperature
inputRFLevel
compositeRFLevel
opticalPowerOut1
opticalPowerOut2
tecCurrent
attenuationSet [S] (-7.0 to +3.0 dB in 0.1 dB steps, manual AGC mode)
omiSetpoint [S] (-3.0 to +3.0 dB in 0.1 dB steps, CW or Video AGC mode)
agcMode [S] (Manual, CW or Video enumeration)
sbsSuppression [S] (14.0 to 18.0 dBm & 20.0 dBm for "F-type" in 0.5 dB steps)
fiberDispersion [S] (On or Off enumeration to enable or disable fiber dispersion compensation)
fiberDispersionGain [S] (–2.000 to +2.000 in 0.025 steps)
fiberDispersionPhase [S] (TBD)
fiberDispersionSlope [S] (TBD)
laserOnOff
keyswitch
remoteLaserControl [S] (On or Off enumeration to turn laser On or Off)
resetCause
resetControl [S] (Force software reset by writing a value of 1)
sbs2GHzPower
sbs6GhzPower
monitor5v
monitor12v
monitor24v
monitorM5v
monitorM12v
unitStatusEnable [S] (Selective enable or disable of alarms by writing an encoded 16 bit value)
unitStatusMajor
unitStatusMinor
unitStatusHistory [S] (Clear alarm history by writing a value of 0)
miscStatusEnable [S] (Selective enable or disable of alarms by writing an encoded 16 bit value)
miscStatusMajor
miscStatusMinor
miscStatusHistory [S] (Clear alarm history by writing a value of 0)
fontPanelLEDStatus
upTime

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Unique notification objects for each power supply and cooling fan is included.

The power supply MIB is located under the emcoreProducts node separately, as it is a common element for other products. Notification objects will be declared in the MIB to handle specific power supply alarms as well as entry into the SCTE alarm log if these events occur.

Unit Alarms (enabled through unitStatusEnable OID bits)

systemTempHigh(0)
systemTempLow(1)
laserCurrentHigh(2)
laserCurrentLow(3)
laserTempHigh(4)
laserTempLow(5)
inputRFHigh(6)
inputRFLow(7)
opticalPowerHigh(8)
opticalPowerLow(9)
tecCurrentHigh(10)
agcUnlock(11)
keyInOffPosition(12)
remoteOffModeSet(13)

Miscellaneous Alarms (enabled through miscStatusEnable OID bits)

sbs2GHzPowerHigh(0)
sbs2GHzPowerLow(1)
sbs6GHzPowerHigh(2)
sbs6GHzPowerLow(3)
system5VPowerHigh(4)
system5VPowerLow(5)
system12VPowerHigh(6)
system12VPowerLow(7)
system24VPowerHigh(8)
system24VPowerLow(9)
systemM5VPowerHigh(10)
systemM5VPowerLow(11)
systemM12VPowerHigh(12)
systemM12VPowerLow(13)
communicationFailure(14)
powerSupplyAFailure(16)
powerSupplyAFailure(17)
coolingFanAFailure(18)
coolingFanBFailure(19)

SCTE MIB support

SCTE head-end MIB support includes alarmsIdent, propertyIdent and commonIdent nodes

SNMPv2 Traps

transmitterNoAlarmsPresent
transmitterSystemTemperatureHigh
transmitterSystemTemperatureLow
transmitterLaserCurrentHigh
transmitterLaserCurrentLow
transmitterLaserTemperatureHigh
transmitterLaserTemperatureLow
transmitterInputRFLevelHigh
transmitterInputRFLevelLow
transmitterOpticalPowerOutputHigh
transmitterOpticalPowerOutputLow
transmitterTECCurrentHigh
transmitterAGCUnlocked
transmitterKeySwitchOffPosition
transmitterRemoteLaserOffModeSet
transmitter2GHzSBSPowerHigh
transmitter2GHzSBSPowerLow
transmitter6GHzSBSPowerHigh
transmitter6GHzSBSPowerLow
transmitterSystem5VPowerHigh
transmitterSystem5VPowerLow
transmitterSystem12VPowerHigh
transmitterSystem12VPowerLow
transmitterSystem24VPowerHigh
transmitterSystem24VPowerLow
transmitterSystemM5VPowerHigh
transmitterSystemM5VPowerLow
transmitterSystemM12VPowerHigh
transmitterSystemM12VPowerLow
transmitterCommunicationFailure
transmitterPowerSupplyAFailure
transmitterPowerSupplyBFailure
transmitterCoolingFanAFailure
transmitterCoolingFanBFailure

Transmitter Setup Tips For SBS adjustability and EDC Functionality

This section of the manual will give an overview of how to use and setup the transmitter for your particular network deployment. Refer back to this manual to select the proper menu to perform some of the functions described below.

Setting SBS level to correct value for your optical network

Follow the steps below to determine correct SBS value for you optical network:

1. Look at the network design that the Tx will be used in and determine the highest optical power launched into the actual transmission fiber. Keep in mind this in not necessarily the launch

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power out of the EDFA or the power into the passive devices that may be place ahead of the fiber. If possible measure the actual power that will be launched into the transmission fiber.
2. After determining the highest value of optical launch power in the network record this value.
3. Now using the SBS adjust menu on the front panel set the SBS threshold to this value you have recorded in step 2. Your system is now at it's optimized operating point for both CNR (low frequencies) and CSO (high frequencies)
4. If this value is higher than +18 dBm then you will have add loss to your optical network at this point, the transmitter does not support a SBS level higher than this.
5. If the value is lower than +14 dBm then set the Tx to this minimum setting and the your network will be at it's optimized operating point.
6. To verify that you are not beyond the SBS threshold or that the Tx SBS setting is correct you can measure the CNR at the lowest frequency channel in your system. If the CNR is within specification then you do not have any SBS setting issues.

Optimizing High Frequency CSO using Electronic Dispersion Compensation (EDC) functionality

Follow the steps below to determine correct EDC value for you optical network:

1. First determine if you need or can use EDC in your optical network.

   You DO NOT want to use EDC if the following are true:

   a. You have many passive optical splits after the Tx and the transmission distances to the nodes fed by that one Tx are at varying lengths of fiber.
   b. If the CSO at the high frequencies meets the minimum specification then there is no need to use EDC

   You DO want to use EDC if the following are true:

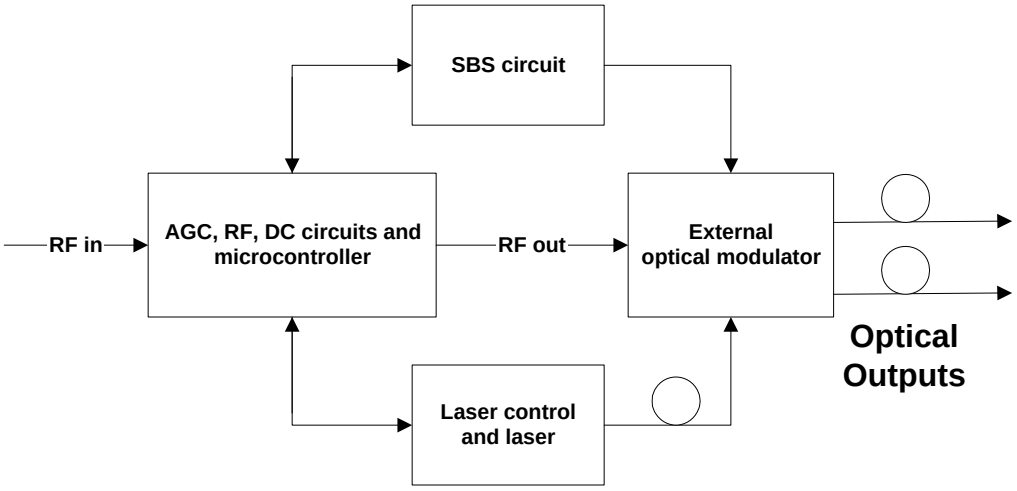
   a. If the CSO at the high frequencies does not meet the minimum specification.
   b. If you have a point-to-point optical network or any splits that you have to N nodes travel over equal amounts of fiber.

2. If you have determined that you don't need EDC then using the appropriate front panel menu make sure EDC is turned OFF. If you do want to use the EDC functionality then turn EDC ON before continuing to the next step.
3. Now that you have EDC on you can now adjust the amplitude, phase and slope of the compensating distortions.

Transmitter Basic Principle of Operation

The following block diagram outlines the essential elements of a transmitter.

Transmitter signal flow



The RF signal enters the transmitter through the F connector on the rear panel. After entering the transmitter the RF travels through the AGC and RF sections of the transmitter. The RF section minimizes the CTB by producing CTB products the same amplitude but 180° out of phase of the CTB produced later in the modulator. The RF signal then is input to the external optical modulator and modulated onto the light passing through the modulator. Controlling the operating point of the modulator minimizes CSO. The light source is a DFB laser spliced to the optical modulator. The SBS circuit is also connected to the modulator. This circuit compensates for any non-linear effects due to Stimulated Brillouin Scattering (SBS), which occur in optical fibers carrying optical signals launched at high powers. A microprocessor controls and monitors the operation of the transmitter's internal circuits.

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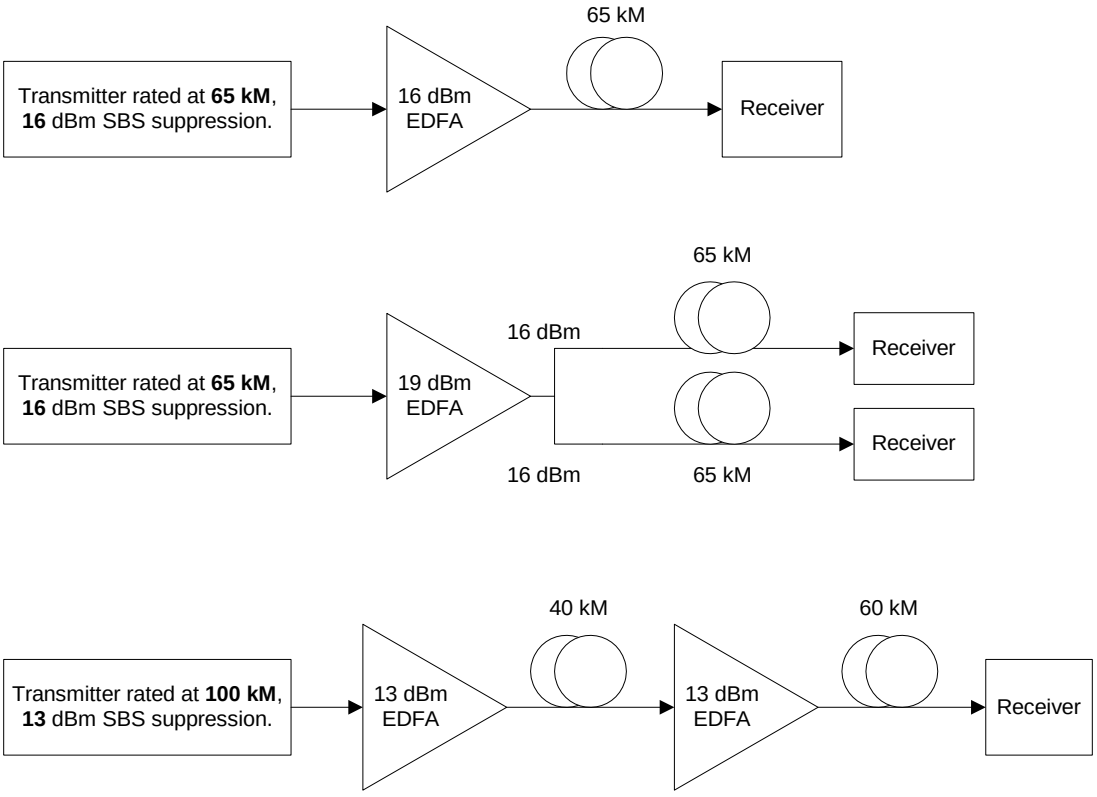
Transmitter and EDFA System Deployment

Choosing the Correct Transmitter and EDFA for a System

When deploying a system it is important to understand the specifications of the transmitter SBS suppression and maximum fiber distance. If the transmitter specification reads, “16 dBm SBS suppression, 65 km of fiber”, the transmitter may be used with an EDFA launch power not exceeding 16 dBm at a fiber distance not exceeding 65 Km.

Figure 3.0



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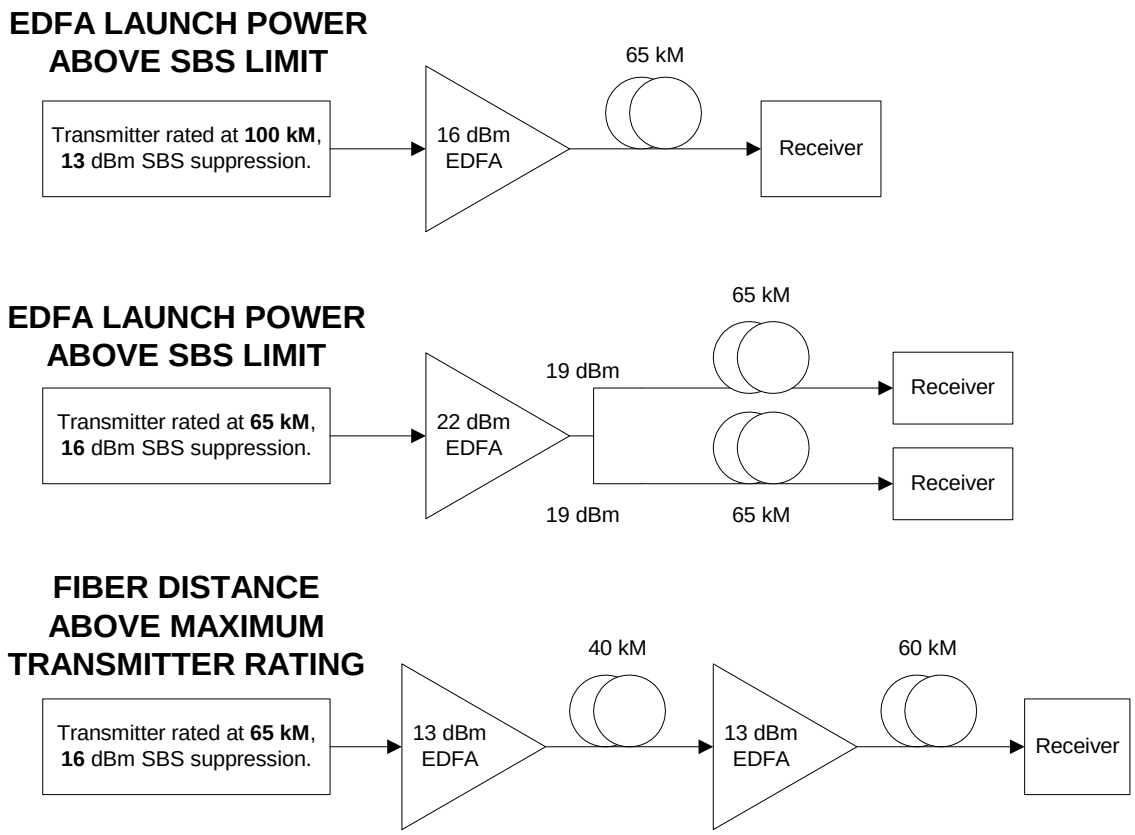
Incorrect Deployment of a Transmitter and EDFA System

When deploying a system, if the SBS suppression specifications or maximum fiber distance is not adhered to, the end of line performance will be degraded. If SBS suppression specifications are exceeded CNR, especially at lower channels, will be degraded. If the maximum fiber distance is exceeded the CSO at higher channels will be degraded. The results will vary from system to system and will change as the specification limits are exceeded by greater amounts.

Figure 4.0



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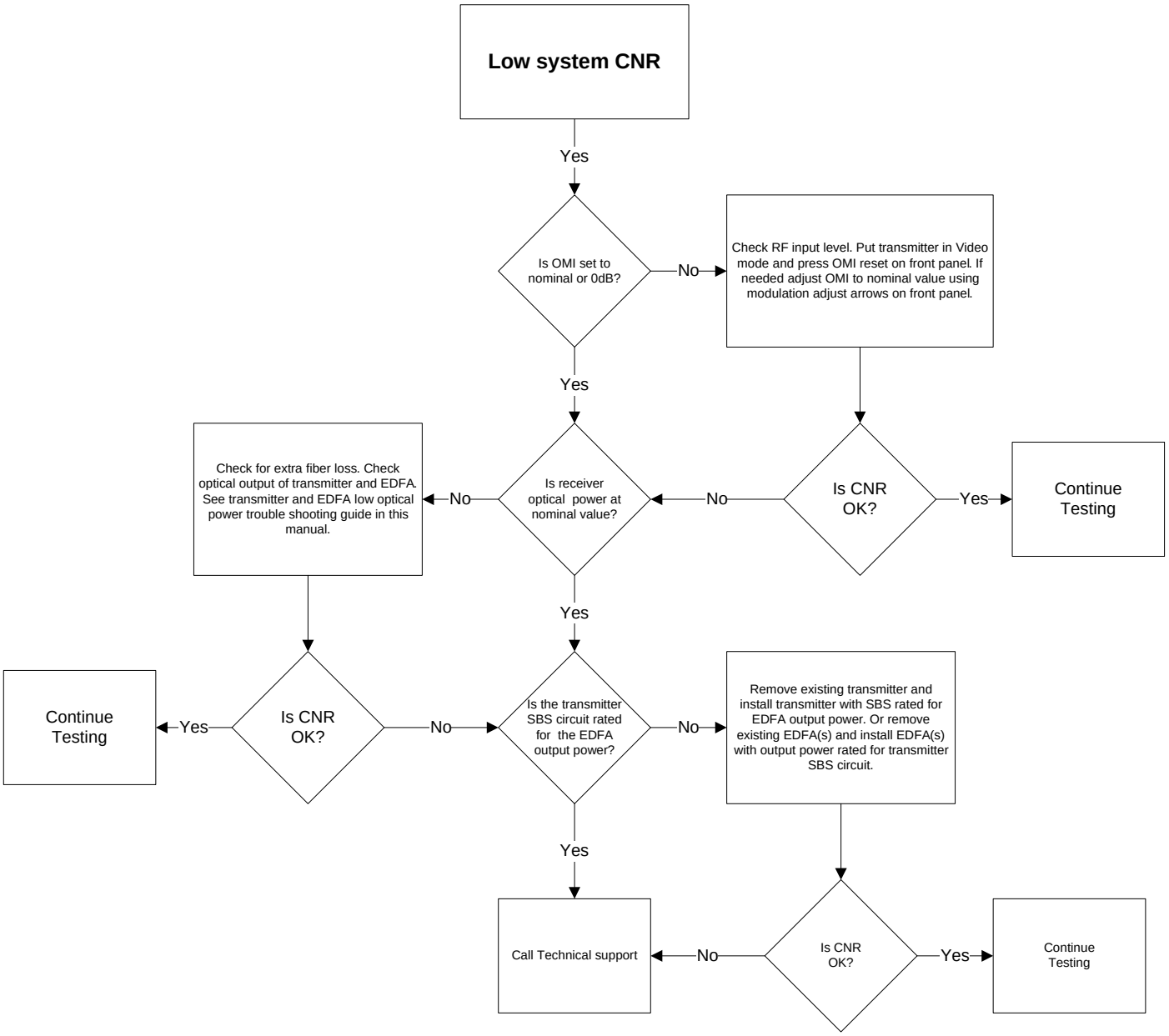
Troubleshooting

Low System CNR



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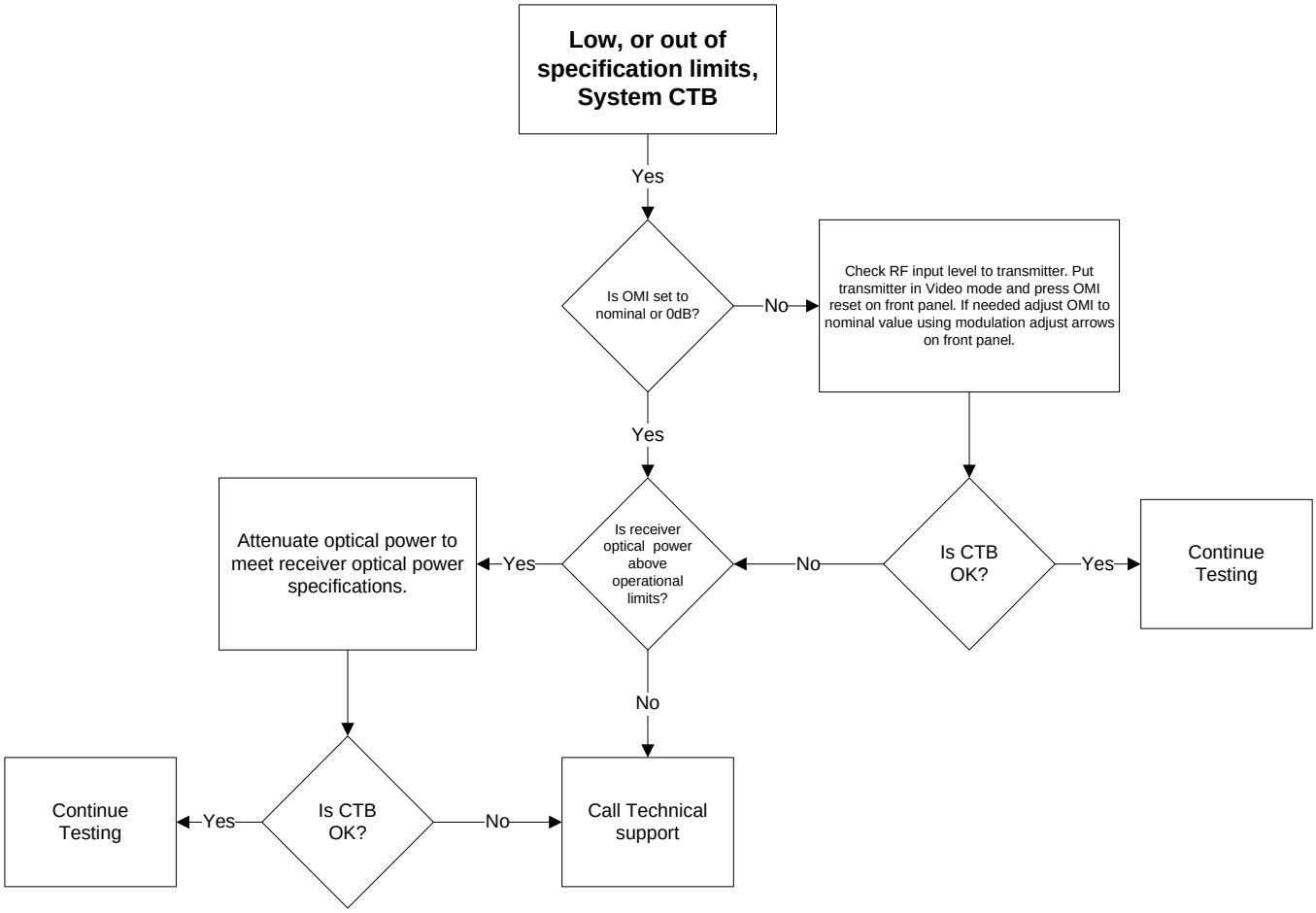
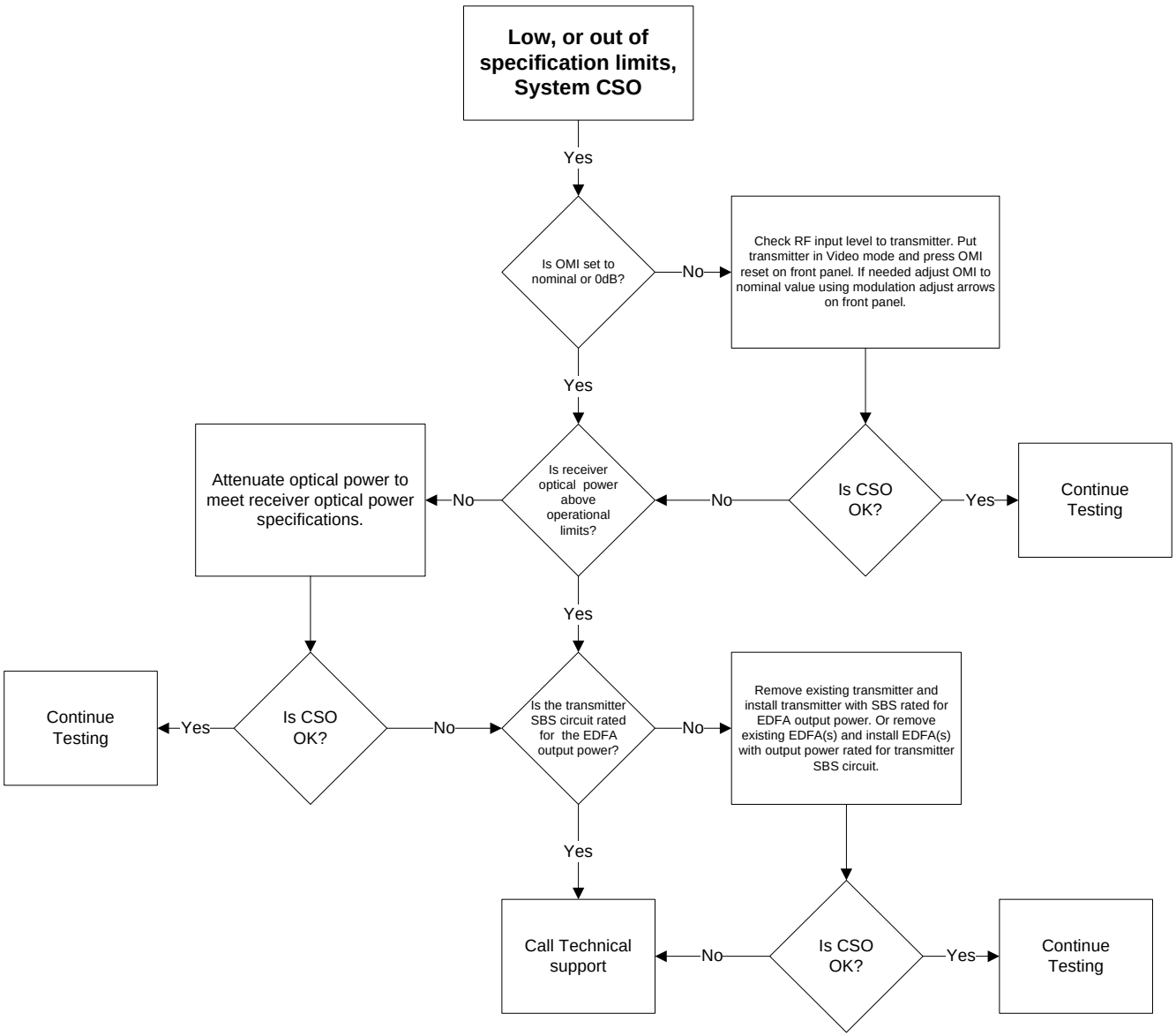
CTB Out of Specification



CSO out of specifications



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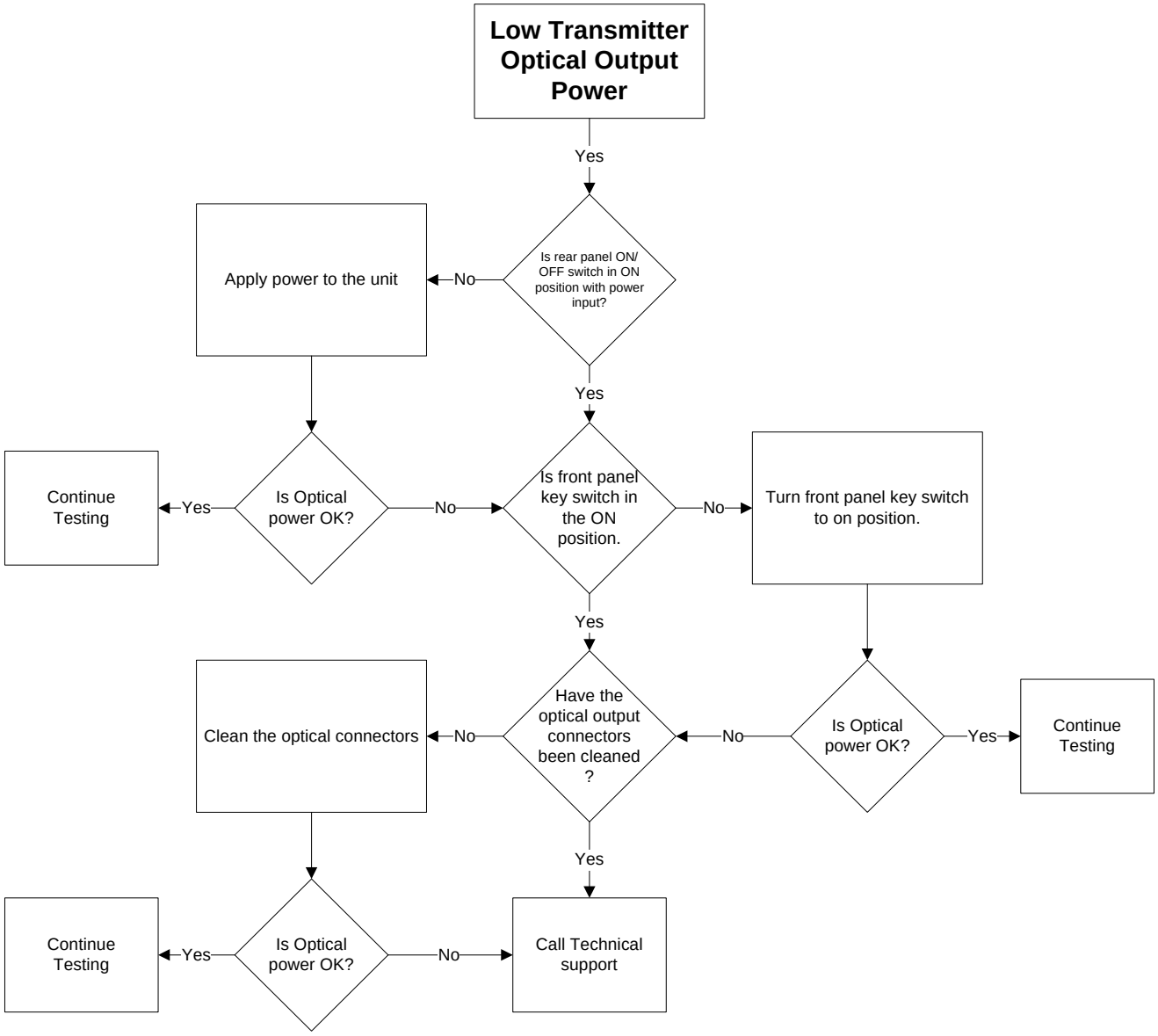
Transmitter Optical Output Low



Applicable Standards Compliance

EMI/EMC

EN61000-3-2 Harmonics
EN61000-3-3 Flicker
EN55022:2006 conducted and radiated emissions, information technology equipment

EN50083-2:2001: Cable Networks for television signals, sound signals, and interactive services part 2: electromagnetic compatibility for equipment
5.2.1 Radiation from Active Equipment
5.3.1 External Immunity to Electromagnetic Fields
5.3.1.1 Out of Band Immunity
5.3.1.2 In Band Immunity
61000-4-6, 150 KHz to 80 MHz
61000-4-3, 80 MHz to 3 GHz
5.3.2 Internal Immunity, -47 to 862 MHz
5.5 Electrostatic Discharge Immunity Test for Active Equipment
5.6 EFT/Burst Immunity for AC Power Ports

FCC Part 15 (CFR 47), subpart B, Class A, Plus ICES-003
15.107(b), AC Line Conducted Emissions
15.109(b), Radiated Emissions

AS/NZS 3548 Class A AC Line Conducted, Radiated Emissions
VCCI Class A (Japan AC Line Conducted, Radiated Emissions)

Safety

Laser FDA/CDRH Laser safety Governed by Code of Federal Regulations, Title 21, Volume 8, part 1040 ("Performance Standards for Light Emitting Products"), revised as of 4/1/06
EN60950-1 (multimedia)
Laser IEC 60825-1 and/or IEC 60825-2
EN50083-1:2006
EN60728-11

Handling / Packaging

Packaging

- The module shall be sealed in an anti-static bag.
- The product manual will be installed in an anti-static bag and shipped with the unit
- China RoHS Materials report will be included in the manual
- MIB's will be provided on a CD-ROM supplied with unit
- 2 Keys for the key lock are included with unit
- AC Power Cables(s) are included with units supporting AC power supply options

Handling

- Transportation Vibration per GR-2853-CORE requirements
- Transportation Shock per GR-2853-CORE requirements
- ESD/Surge per CE requirements

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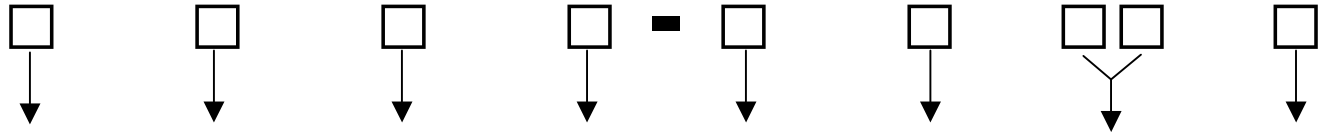
Model Number Information

6000 –



Logo & Customer Specific	*Link type*	*Pout (dBm min)* Note 1	*Loading Type*	*Optics*	*RF*	*Wavelength (nm)*	*Power Supply*
0 – Emcore Logo	**D** – 40 km	**0** – for D, H, and F types	**1** – NTSC (80-ch)	**1** – SC/APC, Rear	**1** – RF IN Rear, TP Front	**00** –1555+/-5.0nm	**1** – AC primary, no secondary
1 – no Logo	**S** – 65 km	**A** – 7.0/7.0 for S-type	**2** – PAL (60-ch)	**2** – FC/APC, Rear	**2** – RF IN Front, TP Front	**01** – 1550+/-5.0nm	**2** – DC primary, no secondary
	H – 80 km	**B** – 8.0/8.0 for S Type	**3** – NTSC (110-ch)	**3** – E2000/APC, Rear	**3** – RF IN Front, TP Rear	**xx** – ITU Channel +/-0.1nm Note 2	**3** – AC primary, AC secondary
	F – FTTx SBS 20 dBm	**C** – 10.0 for S Type	**4** – PAL (89-ch)	**4** – SC/APC, Front	**4** – RF IN Rear, TP Rear		**4** – AC primary, DC secondary
	L – 25 km	**D** – 10 / 10 for S L Type Note 4	**5** – NTSC (90-ch)	**5** – FC/APC, Front			**5** – DC primary, DC secondary
	N – 40 km	**E** – 8.5/8.5 for L Type	**6** – CENELEC (42-ch) Note 5	**6** – E2000/APC, Front			

Note 1: Options available for Indicated Types only.
Note 2: ITU grid wavelengths can be specified from channels 18 to 40.
Note 3: Not all configurations are available, contact factory.
Note 4: Available for S and L Links. CSO port 2 degraded by 1dB for Channel Loads 1 and 2, CSO port 2 degraded by 2dB for Channel Loads 3 and 4.
Note 5: Contact Factory for Model type availability.

Additional kits

Replaceable AC power supply modules
Replaceable DC power supply modules
Replaceable fans
Front mounting brackets for 23” rack

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