OTPN-MDN-870

Fiber Optic Mini Digital Node

54 to 870MHz Forward Bandwidth CATV Node

Accommodates up to 110 Channels

INSTRUCTION & OPERATION MANUAL

Phone: (209)-586-1022

(800) 545-1022

Fax: (209) 586-1026

E-Mail: salessupport@olsontech.com

www.olsontech.com

Installation Instructions

1.1 General Installation Requirements

The installation of these units is very simple. There are no special unpacking instructions, except that care should be taken to handle units gently. Fiber optic links are sensitive electronics devices that should be handled with care. The units are susceptible to ESD. Proper ESD techniques, such as wearing a wrist grounding strap, should be observed at all times when handling a unit. The units should not be dropped.

Do not install the equipment near sources of excessive heat, such as furnace outlets or above heat producing units, such as large power supplies and tube-type equipment. Observe temperature and relative humidity requirements limits.

1.2 Items Provided

The following is a list of items provided with each Model OTPN-MDN-870 Mini Digital Node:

Qty.	Mfr.	P/N	Description
AR	Olson Tech.	OTPN-MDN-870	Fiber Optic Mini Digital Node

1.3 Items Required

Qty.	Mfr.	P/N	Description
AR	Olson Tech.	OTOT-1000	*LaserLite* 1310nm 1,000MHz Forward Path Transmitter
1 per Rx	Olson Tech.	OTPS-12A-4W	Rx Power Supply, +12 Volts, 1.5A DC Power Supply, with 4-pin Weidmuller Power Connector
4 per unit	Any	Any	6-32 Pan head Mounting Screws with Lock Washers and Nuts (For Rx)
1	Any	Any	Screwdriver
AR	Any	Any	9/125 µm Single-mode Fiber

1.4 Inspection

Remove the unit from its shipping container. Any in-shipment damage that may have occurred should be visually apparent. Look for bent or damaged connectors or mounting brackets. Claims for damage incurred in shipment should be made directly to the transportation company in accordance with their instructions. Save the shipping cartons until installation and performance verification are completed.

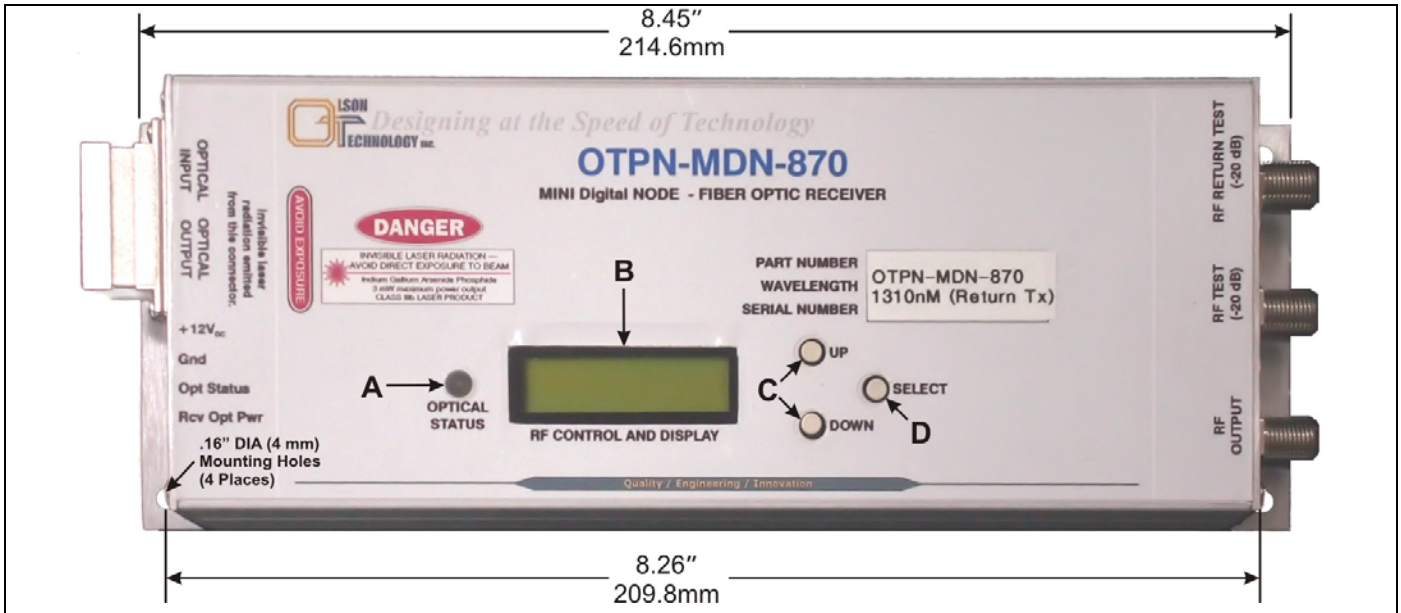
1.5 Module Placement

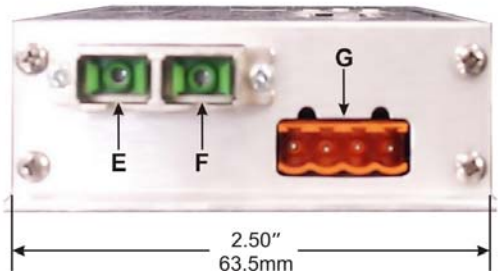
Units may be mounted in any orientation on most flat, dry surfaces. Secure pan head screws through mounting holes provided at the base of the module. If the unit is placed in a location where ambient temperatures may exceed +38°C (100°F), a good heat sink should be used. In that case, the use of silicone thermal pads is recommended between the module and the plate to maximize heat transfer. Units must have their chassis connected to a good earth ground.

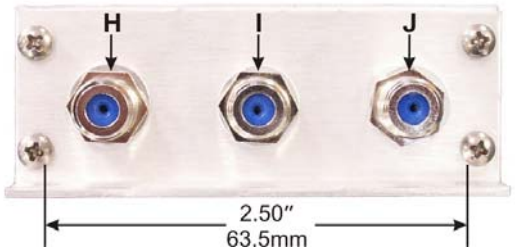
1.6 Connections

Connector Name	Connector Type	Connector Function	
Optical Input	SC/APC	Optical input to the unit.	
Optical Out		Optical output from the return path unit.	
	It is imperative that back reflections be controlled to very low levels for good performance. This product must be used only with angle physical contact (APC) connectors or fusion splices.		
Power	4-Pin Weidmuller Connector (See Figure 1.1 for location of pin 1)	Pin	Function
		1	+12 Volts DC
		2	Ground
		3	Optical Status Flag. This is an open drain output that can sink up to 10 mA at +12 Volts. An external pull-up resistor is required. This pin will be pulled low when the optical input is within optimal range
		4	Optical Input Power Meter Output. This is an analog voltage proportional to the amount of light reaching the detector. The response is 1 Volt per mW of input light.
RF Output	F Connector	RF output from the unit.	
RF Test	F Connector	RF Test (-20dB) output for receiver.	
RF Return Test	F Connector	RF Test (-20dB) output for return path module (if installed).	

1.7 Unit Physical Description







A. Optical Status (Tri-colored LED): Green indicates that the unit is receiving the optimum optical input power. If the optical power falls below the optimum level, the LED will turn yellow. If the optical power rises above the optimum level, the LED will turn red.

B. LCD Display: Displays the receiver optical input level, RF attenuator setting, and equalization setting. The RF levels may be adjusted by the user via the Up/Down/Select Buttons (items C and D). See Section 2.2 for details.

C. Up/Down Buttons: Allows the user to adjust the RF attenuator and equalization settings.

D. Select Button: Selects either RF attenuator or equalization setting for adjustment.

E. Optical Input (SC/APC): Optical input to the receiver.

F. Optical Output (SC/APC): Optional optical output from the return path module, when installed to the receiver.

WARNING

Invisible laser radiation emitted from the optical output connector and the connector that attaches to the receiver. Avoid direct eye contact with the beam

G. Power (4-Pin Weidmuller Connector): Supplies power to the receiver. See Section 1.6 for pin connections.

H. RF Output ("F" Connector): RF output from the receiver.

I. RF Test -20dB ("F" Connector): Allows the user to measure the receiver RF output levels 20dB down from the primary output.

J. RF Return Test -20dB ("F" Connector): Allows the user to measure the return path RF signal level 20dB down from the return path signal level.

Figure 1.1 - Model OTPN-MDN-870 Mini-Node CATV Receiver

1.8 Safety Precautions

The optical emission from the return path units are laser-based Class IIIb, and may present eye hazards if improperly used. **NEVER USE ANY KIND OF OPTICAL INSTRUMENT TO VIEW THE OPTICAL OUTPUT OF THE UNIT.** As always, be careful when working with optical fibers. Bare fibers can cause painful injury if they penetrate the skin.

1.8.1 Laser Safety Procedures

1) **ALWAYS** read the product data sheet and the laser safety label before powering the product. Note the operating wavelength, optical output power, and safety classification.
2) If safety goggles or other eye protection are used, be certain that the protection is effective at the wavelength(s) emitted by the device under test **BEFORE** applying power.
3) **ALWAYS** connect a fiber to the output of the device **BEFORE** power is applied. Power should never be applied without an attached fiber output. If the device has a connector output, a connector should be attached that is connected to a fiber. This ensures that all light is confined within the fiber waveguide, virtually eliminating all potential hazard.
4) **NEVER** look in the end of a fiber to see if light is coming out. **NEVER!** Most fiber optic laser wavelengths (1310 nm and 1550 nm) are totally invisible to the unaided eye and will cause permanent damage. Shorter wavelength lasers (e.g. 780 nm) are visible and are very damaging. Always use instruments, such as an optical power meter, to verify light output.
5) **NEVER NEVER NEVER** look into the end of a fiber on a powered device with **ANY** sort of magnifying device. This includes microscopes, eye loupes, and magnifying glasses. This **WILL** cause a permanent, irreversible burn on your retina. Always double check that power is disconnected before using such devices. If possible, completely disconnect the unit from any power source.

1.9 Shipping and Handling Precautions

The units are, in general, very rugged and can withstand the stresses of most shipping and handling circumstances. However, the following precautions should be taken:

1) When the units are shipped they should be wrapped in a protective material, such as bubble wrap, to protect against excessive jarring and to prevent damage to the external finish of the units. Always use packing material to separate multiple units that are packaged together.
2) Care should be taken not to drop or strike the units in any way, especially around the optical connectors.
3) The units should never be submersed in any liquid. SHOCK HAZARD!

1.10 Storing the Unit

If a unit is to be out of use for an extended period of time, the following steps should be taken to ensure the preservation of the unit:

1) The storage temperature range is -20°C to +70°C.
2) A low humidity environment is preferable for long term storage.
3) All connectors should be covered with active device receptacle caps.

Operating Instructions

2.1 Power-up and Operation

1) Install the links as described in earlier in Section 1.
2) Measure the RF level BEFORE making any connections to the transmitter. This measurement is described in Section 2.4.
3) Clean the optical connectors. See Section 2.6 for cleaning instructions. Be sure all optical connections are APC type.
4) Connect the optical fiber to the transmitter and the receiver. Be sure that the fiber has continuity and less than the maximum allowable optical loss. Also be certain that the fiber is the proper size. This product can only be used with single-mode fiber. The optical input power to the Rx must be greater than -8.0dBm and less than +2.0dBm.
5) Connect the RF source (VCR, camcorder, cable television, etc.) to the RF input on the transmitter.
6) Connect the RF output on the receiver to the monitor input. The monitor input should present a 75Ω impedance.
7) Connect the AC power cord to the transmitter, and connect the OTPS-12A-4W wall-mount power supply to the receiver.

WARNING
OPTICAL LASER RADIATION IS PRESENT AT THE OPTICAL CONNECTOR WHEN THE UNIT IS ACTIVATED. AVOID DIRECT EYE EXPOSURE TO THE BEAM

8) The unit is now fully operational. Verify the proper operation of the link by following the steps in Section 2.5. RF attenuation and RF equalization may be adjusted by the user. See Section 2.2 for details on making these adjustments. See Section 2.6 for instructions on maintaining and cleaning the link. See Section 2.7 for information on troubleshooting.

2.2 Operation of the LCD Display

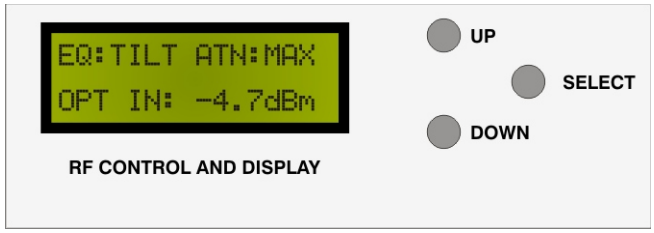
The top of the OTPN-MDN-870 Digital Mini-node contains a 16 character x 2 line LCD display with backlight. This LCD is used to display receiver optical input power, the current status of the internal RF equalizer and the status of the internal digital RF attenuator. The UP/DOWN/SELECT buttons are used to display and/or configure parameters for the receiver. (See Section 2.3.1 for details on operating the push buttons.) A typical display is shown below:

The RF equalizer text (EQ) has two possible states, TILT and FLAT.

OR

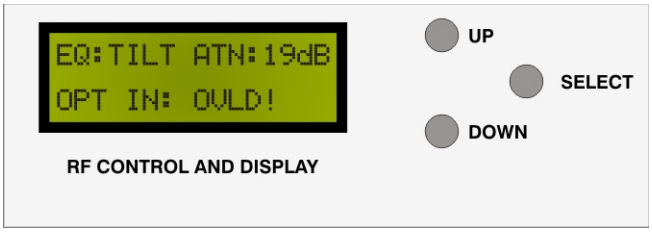
The RF attenuator (ATN:) will display values ranging from 0-31dB, for example:

As the UP button is pushed repeatedly, the attenuation will increase to 31dB. The display will show MAX as shown below:



As the DOWN button is pushed repeatedly, the attenuation will decrease to 0dB. The display will show MIN as shown below:

The optical input text (OPT IN:) will show one of the following. If the optical input is greater than + 4.5dBm, the display will show OVLD!.



If the optical input is less than -12.0dBm, the display will show LOW!.

If the light level is greater than or equal to -12.0dBm and less than or equal to +3.0dBm, the display will show the actual input level with a resolution of 0.1dB and an absolute accuracy of ±0.6dBm.

When the display select button is pushed three (3) times, the display will become that shown below. This is also the temporary display at power up:

2.2.1 Control Button Operation

When no button has been pushed for 20 seconds or more, the display will revert to idle mode. In idle mode, the UP and DOWN buttons are ignored. In order to change the setup of the OTPN-MDN-870 Mini Digital Node, push the SELECT button. This will cause the unit to enter the equalization update mode. The EQ: text on the display will flash. Hitting the SELECT button again will cause the unit to enter the attenuation update mode. The ATN: text on the display will flash. Hitting the SELECT button additional times will cause the unit to toggle between the equalization update mode and the attenuation update mode. Again, if no button is pressed for 20 seconds or more, the unit will revert to the idle display mode.

2.2.2 RF Equalization Update Mode

When the unit is in the equalization update mode (the EQ: text will be flashing once per second), the UP and DOWN push buttons will toggle the unit between the FLAT and TILT modes. In FLAT mode, the RF output will be flat versus frequency (assuming that the RF into the optical transmitter was flat). In the TILT mode, the RF output will be tilted upward by 10dB over the full receiver bandwidth (again, assuming that the RF into the optical transmitter was flat).

2.2.3 RF Attenuation Adjust Mode

When the unit is in attenuation adjust mode (the ATN: text will flash once per second), the UP and DOWN push buttons are used to adjust the internal digital RF attenuation. It may range from 0dB to 31dB. Each push of the UP and DOWN push buttons will increment or decrement the numerical value by one. Once a value of 0dB is reached, further pushes of the DOWN button will cause the display to show MIN for two seconds. Once a value of 31dB is reached, further pushes of the UP button will cause the display to show MAX for two seconds.

2.3 Optical Status LED

The optical status LED indicates the general status of the OTPN-MDN-870 Mini Digital Node. The presence of any color light indicates that the unit is powered. If the light into the OTPN-MDN-870 Mini Digital Node exceeds +4.5dBm, the LED will turn red, indicating that excessive optical power is being applied to the optical input. If the light into the OTPN-MDN-870 Mini Digital Node is less than -8.0dBm, the LED will turn yellow indicating that insufficient light is being applied to the optical input. If the light into the OTPN-MDN-870 Mini Digital Node is greater than or equal to -8.0dBm and less than or equal to +4.5dBm, the LED will be green, indicating that the optical input is within the optimum range. Each transition has a hysteresis of 0.2dB.

2.4 Measuring RF Input Levels at the Transmitter

Excessive RF input to a fiber optic CATV transmitter ***WILL*** destroy the laser even if the unit is not powered. Lasers can be quickly destroyed by being overdriven. Therefore it is imperative that the RF level be within acceptable limits ***BEFORE*** the cable is attached to the transmitter. See the transmitter Data Sheet for the proper RF input level, and adjust as follows:

1) Using a spectrum analyzer, determine that the RF level input to the transmitter is within safety bounds.

2.5 Performance Verification

No user maintenance is required. The OTPN-MDN-870 Mini Digital Node CATV receiver contains no user-serviceable parts and requires no routine service. Contact the factory if the unit requires warranty repair work. Once the units have been installed, verify that the picture quality is good. If the picture quality is not good, there are several likely causes:

1) The optical fiber may have large back reflections. Use an OTDR to examine the fiber run.
2) There may be non-APC optical connectors somewhere in the system. These cause unacceptable levels of back reflection.
3) The RF input spectrum may not be flat. All Olson CATV products are designed to operate with a flat input spectrum.
4) There may be extraneous (i.e., non-video) signals in the input RF. Be sure to filter out all non-desirable signals.
5) The optical input power at the receiver may be too low. In this case, the optical status LED will be yellow. See the data sheet for the expected CNR versus the channel loading and received optical power.

2.6 Cleaning

If the units need to be cleaned, avoid the use of all solvents and use low-pressure clean air to remove loose dirt. Use low-pressure clean air to clear the connectors of any debris. Dirty or scratched connector end faces will greatly reduce the unit's performance. Foam-tipped swabs such as the 2.5mm Mini Foam Swab offered by Fiber Instrument Sales (P/N FI0005) may be saturated with denatured alcohol (see NOTE below) and inserted into the optical port for cleaning. DO NOT INSERT A DRY SWAB INTO THE OPTICAL PORT AS THIS MAY DAMAGE THE FIBER END FACE. Many fiber optic installations experience degraded performance due to dirty optical connector end faces. The following procedure should be used to properly clean the optical connector end faces.

2.6.1 Connector Cleaning

Required Cleaning Equipment:

- Kimwipes® or any lens-grade, lint-free tissue. The type sold for eyeglasses will work quite well.
- Denatured Alcohol.

NOTE

Use only industrial grade 99% pure isopropyl alcohol. Commercially available isopropyl alcohol is for medicinal use and is diluted with water and a light mineral oil. Industrial grade isopropyl alcohol should be used exclusively.

- 30X Microscope.
- Canned Dry Air.

Directions for Cleaning:

1) Fold the tissue twice so it is four layers thick.
2) Saturate the tissue with alcohol.
3) First clean the sides of the connector ferrule. Place the connector ferrule in the tissue, and apply pressure to the sides of the ferrule. Rotate the ferrule several times to remove all contamination from the ferrule sides.
4) Now move to a clean part of the tissue. Be sure it is still saturated with alcohol, and it is still four layers thick. Put the tissue against the end of the connector ferrule. Put your fingernail against the tissue so that it is directly over the ferrule. Now scrape the end of the connector until it squeaks. It will sound like a crystal glass that has been rubbed when it is wet.
5) Use the microscope to verify the quality of the cleaning. If it isn't completely clean repeat the steps with a clean tissue.
6) Mate the connector immediately! Don't let the connector lie around and collect dust before mating.
7) Air can be used to remove lint or loose dust from the port of the unit to be mated with the connector. Never insert any liquid into the ports.

2.6.2 Connector Handling

1) **NEVER TOUCH THE FIBER END FACE OF THE CONNECTOR.**
2) Connectors not in use should be covered over the ferrule by a plastic dust cap. It is important to note that inside of the ferrule dust caps contains a sticky gelatinous residue that is the by-product of the making of the dust cap. This residue will remain on the ferrule end after the cap is removed. Therefore it is critical that the ferrule end be cleaned thoroughly BEFORE it is mated to the intended unit.

2.7 Troubleshooting

Common problems include lack of continuity in the optical fiber, lack of power (or reversed power), or improper input levels. The units are designed to work with a 75Ω system. If problems persist, contact the factory.

Problem	Check	Comments
No optical power out of Tx.	Check Tx AC power connection.	If AC power is connected, check the primary AC power source to verify it is working. Contact Olson if no cause for this problem can be found.
No optical power at the Rx.	Check optical power output at the Tx.	If there is optical power at the Tx output, verify proper fiber is connected to the Rx. If the proper fiber is connected. Check the continuity of the fiber.
Signal out of Rx is noisy.	Check optical power at the Rx.	If the optical status LED is yellow, the optical input power is too low. Verify proper fiber is connected to the Rx. If the proper fiber is connected, measure the loss of the fiber. Be sure to ground the case of the Tx and Rx. Also verify that all optical connections in the optical path are APC type or fusion splices.
No signal out of Rx.	Verify the input signal at the Tx.	See the transmitter Data Sheet for the required input signal level.
Signal out of Rx is distorted.	Verify input signal at Tx.	The Tx input must be within the specs given in the transmitter Data Sheet. A larger signal will cause distortion.
	Verify fiber size.	Single-mode fiber must be used with this product.
	Verify RF output level.	If the internal RF attenuator is set too low, the RF output may be overdriven.