



**OTPN-2000**

**PREMISE NODE**

**INDOOR OPTICAL NODE**

**INSTRUCTION MANUAL**

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## SAFETY WARNINGS

### LASER RADIATION



The OTPT-300 laser transmitter emits invisible radiation that can cause permanent eye damage. ***AVOID DIRECT EXPOSURE TO BEAM.***



Operate the transmitter only with the proper optical fiber installed in the transmitter optical connector. Power to the OTPN-2000 should be turned-off or preferably, disconnected whenever the optical connector cover is opened and there is no installed fiber (as when the fiber connector is being installed or removed from the transmitter connector).

**NEVER USE ANY OPTICAL INSTRUMENT TO VIEW THE OUTPUT OF THE LASER TRANSMITTER. "OPTICAL INSTRUMENT" INCLUDES MAGNIFYING GLASSES, ETC.**

**NEVER LOOK INTO THE OUTPUT OF THE LASER TRANSMITTER**

**NEVER LOOK INTO THE OUTPUT OF A FIBER CONNECTED TO A LASER TRANSMITTER.**

**NEVER LOOK INTO OR USE ANY OPTICAL INSTRUMENT TO VIEW THE DISTANT END OF A FIBER THAT MAY BE CONNECTED DIRECTLY OR VIA AN OPTICAL SPLIT, TO A TRANSMITTER THAT MAY BE OPERATING. THIS SPECIFICALLY APPLIES TO FIBERS THAT ARE TO BE CONNECTED TO RECEIVERS (SUCH AS THE OTPN-2000) OR OTHER DEVICES AT ANY DISTANCE FROM THE LASER TRANSMITTER.**

### HIGH VOLTAGE

The power supply section (bottom section) of the OTPN-2000 contains no user serviceable parts. There is exposed high voltage inside this section. Only factory service technicians should open the power supply section.

### FIRE HAZARD

The AC line input fuse is contained in the IEC 320 power input connector. This fuse is a 3AG, 0.5A, slow blow fuse. To avoid a risk of fire, this fuse should be replaced only with an identically rated fuse.

### SHOCK HAZARD

The OTPN-2000 is designed for indoor use only. Direct exposure to moisture must be avoided.

## INTRODUCTION

The Olson Technology Inc. OTPN-2000 is a high quality, cost effective, bi-directional CATV node designed around the latest optical receiver technology. It is designed to operate and meet full specifications with optical input levels ranging from -6dBm to +3dBm. The receive RF path includes provisions for plug-in equalizers to provide for sloped output response as well as plug-in pads to set the forward and reverse RF gains. The OTPN-2000 is available with two different band splits.

Model	Reverse Band	Forward Band
OTPN-2000	5-42MHz	54-1,000MHz
OTPN-2000-PAL	5-65MHz	85-1,000MHz

The OTPN-2000 does not come with a reverse laser transmitter. The OTPT-300 return transmitter module must be field-installed in the OTPN-2000 node.

The OTPN-2000 has a universal power supply that allows operation from 90 to 240 V<sub>AC</sub> @ 50 or 60 Hz. With an installed OTPT-300 Return Laser Transmitter, it consumes less than 23 Watts of power. Positive cooling is provided by means of a small, high-MTBF fan, which may be replaced in the field without interrupting the operation of the node.

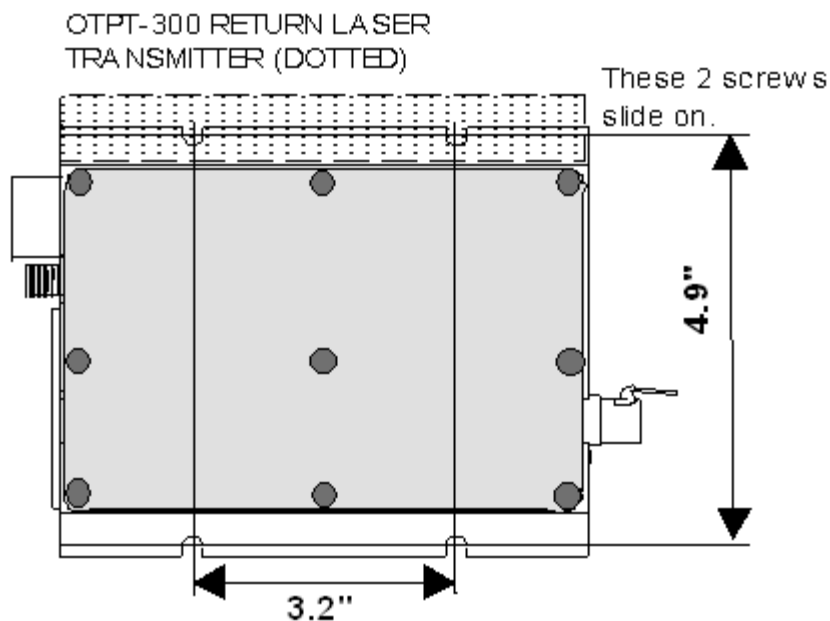
The OTPN-2000 has flanges on the bottom to allow mounting it to a flat surface. The available OTLL-RMKIT-2 will allow mounting up to three of these nodes in a standard 19" rack.

### INSTALLATION / ENVIRONMENTAL CONSIDERATIONS

The OTPN-2000 is specified to operate from -10°C to +55°C. It will probably not require an air-conditioned environment. It should be mounted in an adequately ventilated area. Like any other electronic equipment, it will probably have a longer life span if it is not operated at the upper limit of the temperature range. Installation in wet areas or areas of extremely high humidity should be avoided. Extremely dirty or dusty areas should be avoided if possible. Objects or debris should not be allowed to block the openings in the housing or the fan. The OTPN-2000 should not be installed in areas that are accessible to children.

The OTPN-2000 may be installed and operated in any position on a flat surface. The unit has four slots in the bottom plate to accommodate mounting hardware. The unit should be mounted by sliding over two screws and then tightening the other two screws. This is to accommodate current or future return lasers. If mounting requires a wood screw, use #6 or #8 (maximum) pan-head sheet metal screws. These are commonly available at hardware stores. If mounting with a machine screw (to tapped holes), use 6-32 pan-head screws. These specific screw sizes and head types must be used if the OTPN-2000 has an installed OTPT-300 return transmitter or if an OTPT-300 is likely to be installed later. This is due to limited clearance under the OTPT-300 that is above the mounting slots on one side. If the OTPN-2000 has an installed OTPT-300, mounting or dismounting the unit should not require the disconnection of the OTPT-300.

The fiber connector can be moved to the other end of the unit. Forward and reverse RF adjustments should be made before the OTPN-2000 is mounted to a rack mount kit.



**OTPN-2000 MOUNTING DIAGRAM**

### **OPTICAL CONNECTORS AND CLEANING**

The standard optical connector is an SC/APC. In order to use FC/APC connectors, you must order a conversion kit, OTLL-SCFCKIT. The standard optical connector location is on the opposite side from the RF connector. The connector can be moved to the other side by swapping it with a cover plate. No tools are required for this operation.

The fiber ends can be damaged by the insertion of contaminated connectors. Some types of customer damage to connectors are not covered under warranty. Fiber connectors should never be left uncovered. Prepackaged alcohol wipes are the most convenient means of cleaning optical connectors. Clean alcohol and lint free wipes or swabs may also be used.

## OPERATIONAL SETUP – RECEIVER (FORWARD PATH)

The OTPN-2000 optical receiver as the last component in a specific optical link will provide carrier-to-noise performance and an RF output level that is dependent on several parameters. The RF input level to the source optical transmitter and the optical input level to the OTPN-2000 basically determine the link performance.

Both the laser modulation and the receiver output level are basically limited by total power. The RF input level to any optical transmitter is dependent on the number of channels being transmitted. As the number of carried channels is lowered, the RF input level to the transmitter can be raised. This results in increased RF levels at the OTPN receiver. This improves the carrier-to-noise ratio over the link. Links should be designed and transmitters should be set up using values that represent the maximum number of channels likely to be carried.

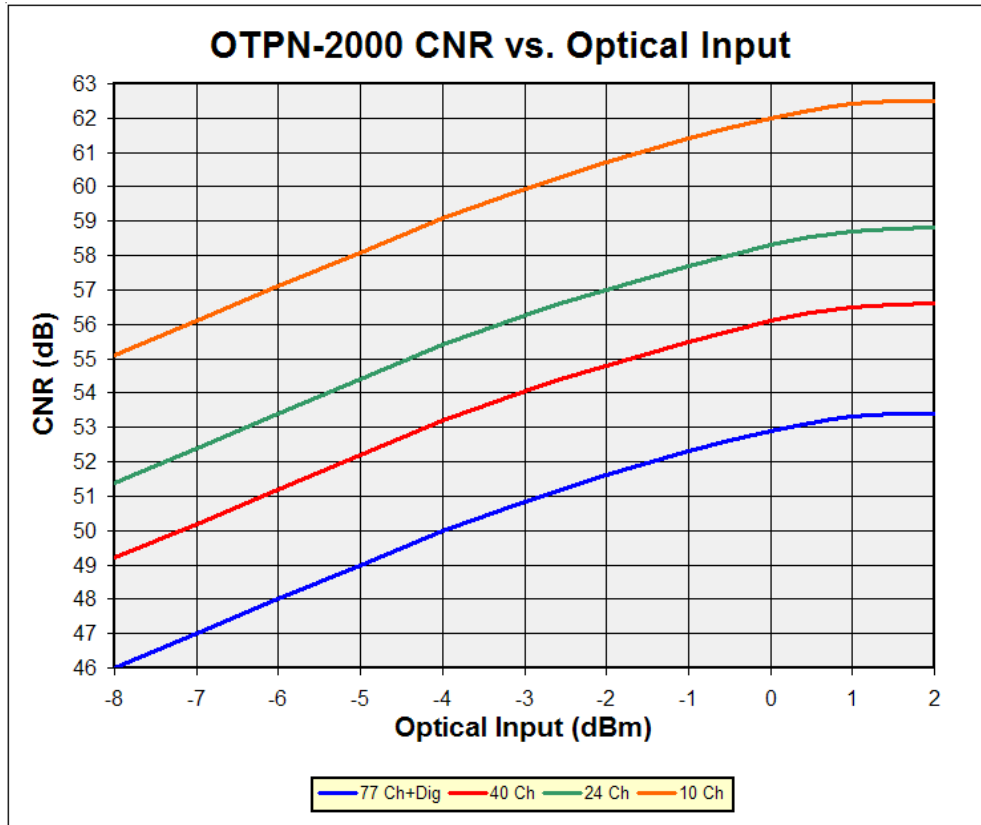
The receiver output power is also affected by the amount of equalization used. The use of a lower value equalizer will require reducing the output level as measured at the highest channel. This is because the attenuation of the lower channels is reduced.

The following chart assumes approximately 77 channels from 55MHz to 550MHz and digital loading from 550MHz to 1,000MHz at -6dB. The RF levels indicated are for an equivalent slope of 10dB with the actual levels measured at 547.25MHz.

OPTICAL INPUT	RECEIVED POWER T.P.	FORWARD PAD VALUE	FORWARD SLOPE EQUALIZER SLOPE/PART #	APPROX FWD T.P. LEVEL	APPROX RF OUTPUT LEVEL
-8dBm	0.16V	0 dB	15dB/OLEQ1G-15	+24dBmV	+44dBmV
-6dBm	0.25V	0dB	15dB/OLEQ1G-15	+26dBmV	+46dBmV
-4dBm	0.40V	4dB	15dB/OLEQ1G-15	+26dBmV	+46dBmV
-2dBm	0.63V	8dB	15dB/OLEQ1G-15	+26dBmV	+46dBmV
0dBm	1.00V	12dB	15dB/OLEQ1G-15	+26dBmV	+46dBmV
+2dBm	1.58V	16dB	15dB/OLEQ1G-15	+26dBmV	+46dBmV

Although the node will operate at optical input levels as high as +3dBm, there is little improvement in the C/N performance of the node at optical input levels above 0dBm. For optimum distortion performance it is recommended that the optical input to the node be kept at or below 0dBm. The Olson Technology model OTOA-xxx optical attenuators are ideal for this application. To lower the output level the value of the “Forward Pad” should be increased but a reduction below +43dBmV output at 547.25MHz by this method is not recommended. If lower output is desired, the unit should be set for +43dBmV and an inline pad added to the RF output to reduce the output level. This will maintain optimum C/N performance. This will also reduce the return gain if an OTPT-300 return transmitter is attached.

Unlike many optical nodes, the OTPN-2000 is designed to give full output performance at a typical input of -8dBm (-6dBm minimum). The following chart shows the approximate C/N performance at various input levels and channel loading. This performance can vary considerably depending upon fiber and laser performance so it is presented as a design aid only.

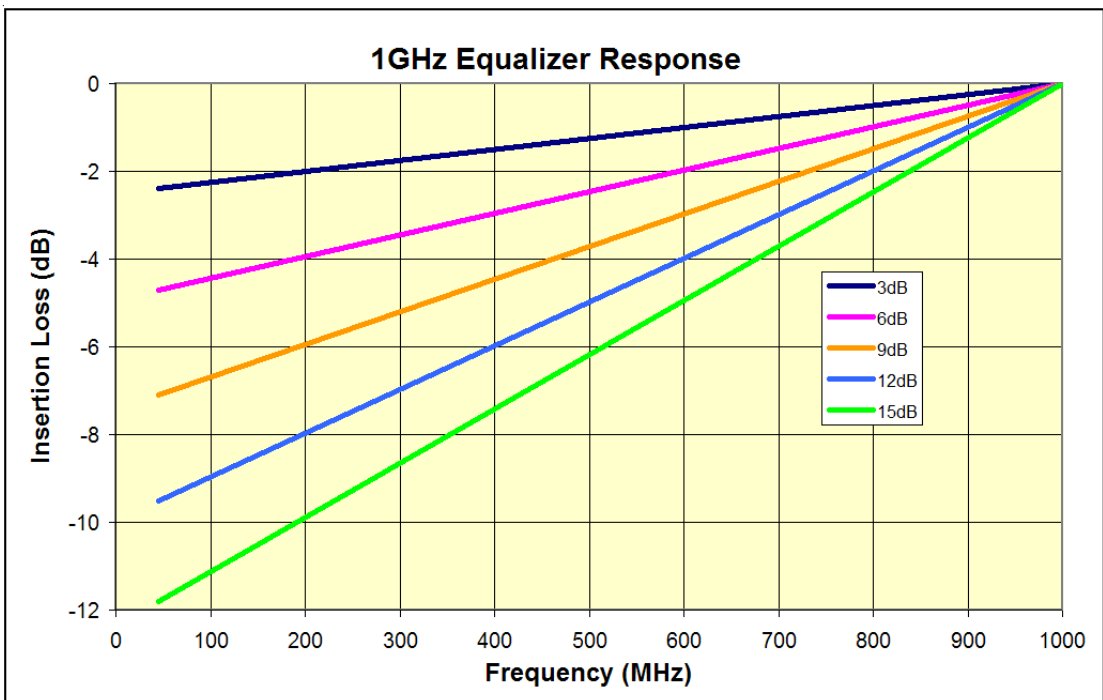
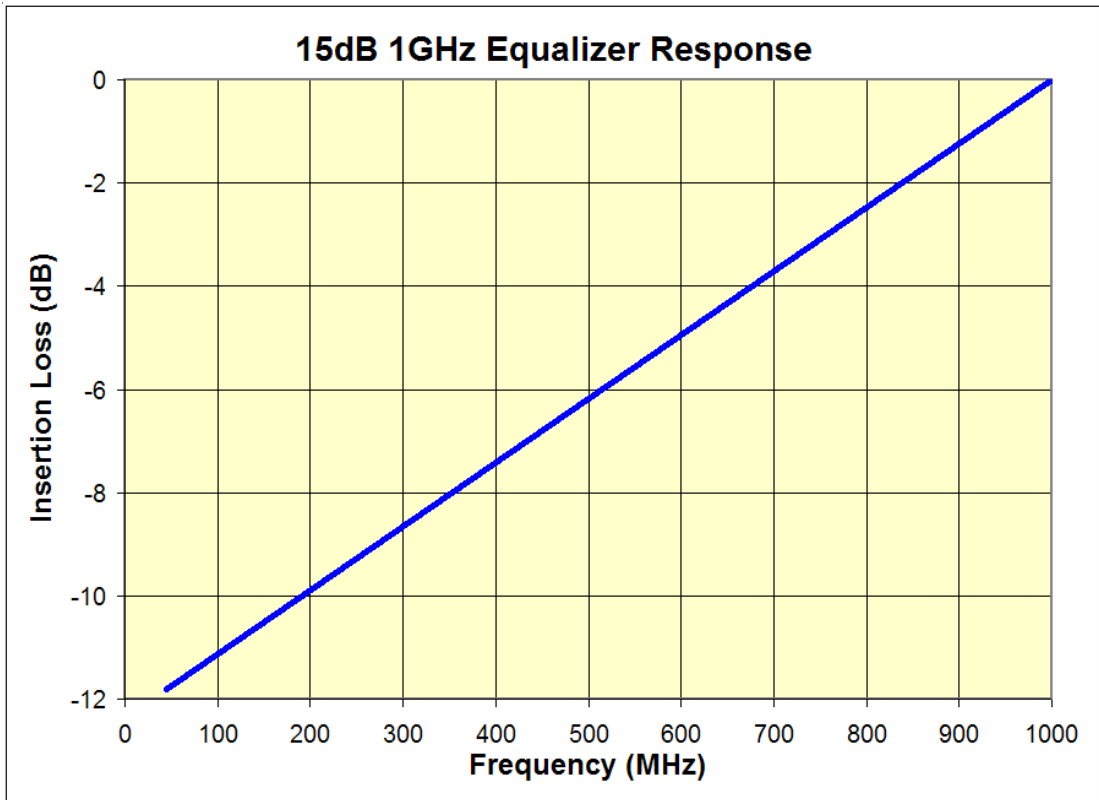


If a different 54-1,000MHz slope value is desired than the provided 15dB, different equalizer values are available. The following charts should help in determining your requirements.

FREQ RANGE	OLEQ1G-8 SLOPE dB	OLEQ1G-9 SLOPE dB	OLEQ1G-10 SLOPE dB	OLEQ1G-11 SLOPE dB	OLEQ1G-12 SLOPE dB
54-1,000MHz	-6.30	-7.10	-7.90	-8.70	-9.50
54-550MHz	-3.30	-3.72	-4.14	-4.56	-4.98

FREQ RANGE	OLEQ1G-13 SLOPE dB	OLEQ1G-14 SLOPE dB	OLEQ1G-15 SLOPE dB	OLEQ1G-16 SLOPE dB	OLEQ1G-17 SLOPE dB
54-1,000MHz	-10.20	-11.00	-11.80	-12.60	-13.40
54-550MHz	-5.35	-5.77	-6.19	-6.61	-7.03

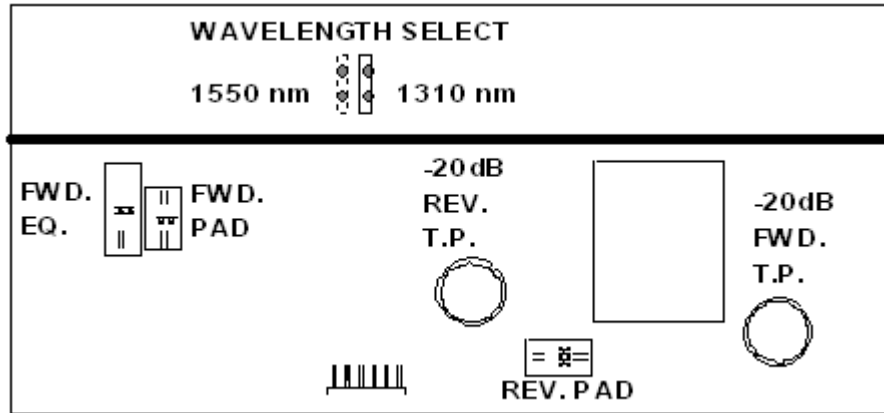
FREQ RANGE	OLEQ1G-18 SLOPE dB	OLEQ1G-19 SLOPE dB	OLEQ1G-20 SLOPE dB	OLEQ1G-11 SLOPE dB	
54-1,000MHz	-14.20	-15.00	-15.80	-16.50	
54-550MHz	-7.45	-7.86	-8.28	-8.65	



## INTERNAL TEST POINTS and ADJUSTMENTS

The OTPN-2000 receiver has an internal plug-in pad to allow the RF output level of the node to be adjusted. There is also a plug-in equalizer to compensate for cable slope. These adjustments are accessed by removing the nine thumbscrews that hold the top cover on. The unit should not be operated for extended periods with the top cover removed. This is because of RF ingress and potential thermal problems due to unchanneled air flow. When replacing the top cover, be sure to firmly tighten all thumbscrews. RF ingress or oscillation can be caused by loose screws.

The locations of the internal adjustments are shown in the following diagram.



The forward adjustments are at the left. The forward test point is at the right. The reverse pad and test point in the center are used only when an OTPT-300 is attached. The wavelength select jumper is used to compensate the received power test point for the changes in responsivity of the photodiode with wavelength.

## EXTERNAL TEST POINTS

The OTPN-2000 has one external test point. It should be measured with a high impedance voltmeter. The received power test point is calibrated at 1V per mW @ 1310 nm. This test point is for long term monitoring purposes. The optical power should be measured with a power meter at the time of installation.

The input test point is calibrated at the factory at 1310 nm. The value at 1550 nm may be off by 15% due to photodiode responsivity variations. The input test point reading will be considerably off if the input wavelength is 1550 nm and the internal jumper has not been changed.

## ACCESSORIES

MODEL	DESCRIPTION
OTPT-300	Reverse DFB Laser Transmitter
OTPT-300-FP	Reverse FP Laser Transmitter
PAD1G-xxx	Single 1GHz Pad (Forward or Reverse)
PAD1G-KIT-x	1GHz Pad Kits (Forward or Reverse)
OLEQ1Gxx	Single Forward Equalizer
OLEQ1G-KIT-x	Forward Equalizer Kit
OTLL-SCFKIT	SC/APC to DC/APC Optical Connector Adapter
OTLL-RMKIT-2	Rack Mount Kit (Holds 3 OTPN-1000's)
OTOA-1000	Optical Attenuator
OTLL-FANKIT	OTPN-1000 Replacement Fan Assembly