



OTPN-2000C
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-2000C 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-2000C) OR OTHER DEVICES AT ANY DISTANCE FROM THE LASER TRANSMITTER.

HIGH VOLTAGE

The power supply section (bottom section) of the OTPN-2000C 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-2000C is designed for indoor use only. Direct exposure to moisture must be avoided.

INTRODUCTION

The Olson Technology Inc. OTPN-2000C is a high-quality, cost-effective, bi-directional CATV node designed with the latest optical receiver technology. It operates 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-2000C is available with two different band splits.

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

The OTPN-2000C does not come with a reverse transmitter. The OTPT-300 return transmitter is field-installed in the OTPN-2000C node. The OTPN-2000C has a universal power supply that allows operation from 90-240 V_{AC} @ 50 or 6 Hz. It consumes less than 23 Watts of power including an OTPT-300 Transmitter. Positive cooling is provided by means of a small, high-MTBF fan, which may be replaced in the field without interrupting operation. The OTPN-2000C 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-2000C operates from -10°C to +55°C. An air-conditioned environment is usually not required. Mount in an adequately ventilated area. Like all electronic equipment, it will have a longer life span if it is not operated at higher temperatures. Do not install in wet areas or areas of extremely high humidity. Avoid extremely dirty or dusty areas. Do not block the openings in the housing or the fan. Do not install the OTPN-2000C in areas that are accessible to children. The OTPN-2000C 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. Mount with a #6 or #8 pan-head sheet metal screw, or a 6-32 pan-head machine screw. See Figure 1 for dimensions and mounting details. This is due to limited clearance under the OTPT-300 that is above some of the mounting slots. If the OTPN-2000C has an installed OTPT-300, mounting or dismounting the unit does not require the disconnection of the OTPT-300. The fiber connector can be moved to the other end of the unit. Make forward and reverse RF adjustments to the OTPN-2000C before mounting in a rack mount kit.

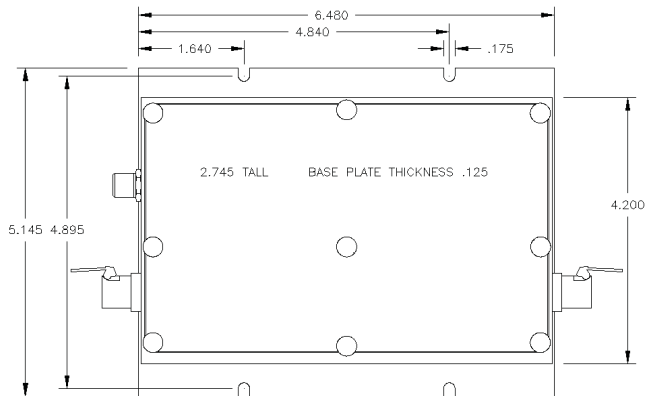


Figure 1 - OTPN-2000C Key Dimensions

OPTICAL CONNECTORS AND CLEANING

SC/APC is the standard optical connector. Order conversion kit OTLL-SCFCKIT for FC/APC connectors. The standard optical connector location is on the same side as the RF connector. Fiber ends can be damaged by the insertion of contaminated connectors. Some types of customer damage to connectors are not covered under warranty. Never leave fiber connectors uncovered. Pre-packaged alcohol wipes or clean alcohol and lint-free wipes, such as Kim-Wipe type 34155, can be used to clean optical connectors.

OPERATIONAL SETUP – RECEIVER (FORWARD PATH)

The OTPN-2000C 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 the RF input level to the source optical transmitter and the optical input level to the OTPN-2000C. The laser modulation and the receiver output level are limited by total optical 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. 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	RCVD PWR T.P.	FWD PAD	FWD EQUALIZER SLOPE/PART #	APPROX FWD T.P.	APPROX RF OUT
-8dBm	+0.16V	0dB	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 operates at optical input levels as high as +3dBm, there is little CNR improvement at levels above 0dBm. For optimum distortion performance keep the optical input at or below 0dBm. The Olson model OTOA-xxx optical attenuator is ideal for this application. To lower the output level, the value of the "Forward Pad" should be increased, but reducing output below +43dBmV at 547.25MHz by this method is not recommended. If lower output is desired, the unit should be set for +43dBmV and an in-line pad added to the RF output to reduce the output level. This maintains optimum CNR performance. This also reduces the return gain if an OTPT-300 transmitter is used.

Unlike many optical nodes, the OTPN-2000C is designed to give full output performance at a typical input of -8dBm (-6dBm minimum). Figure 2 shows the approximate CNR performance at various input levels and channel loading. Performance can vary 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 chart will help in determining your requirements. The slope is given for each equalizer for two frequency bands. Figure 3 shows this information graphically.

Freq Range	OLEQ1G-8	OLEQ1G-9	OLEQ1G-10	OLEQ1G-11	OLEQ1G-12	OLEQ1G-13	OLEQ1G-14
54-1000MHz	-6.30dB	-7.10dB	-7.90dB	-8.70dB	-9.50dB	-10.20dB	-11.00dB
54-550MHz	-3.30dB	-3.72dB	-4.14dB	-4.56dB	-4.98dB	-5.35dB	-5.77dB

Freq Range	OLEQ1G-15	OLEQ1G-16	OLEQ1G-17	OLEQ1G-18	OLEQ1G-19	OLEQ1G-20	OLEQ1G-21
54-1000MHz	-11.80dB	-12.60dB	-13.40dB	-14.20dB	-15.00dB	-15.80dB	-16.50dB
54-550MHz	-6.19dB	-6.61dB	-7.03dB	-7.45dB	-7.86dB	-8.28dB	-8.65dB

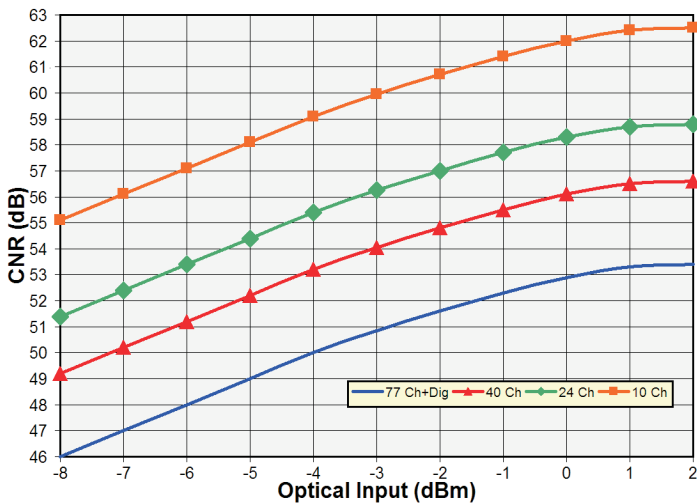


Figure 2 - OTPN-2000C CNR vs. Optical Input

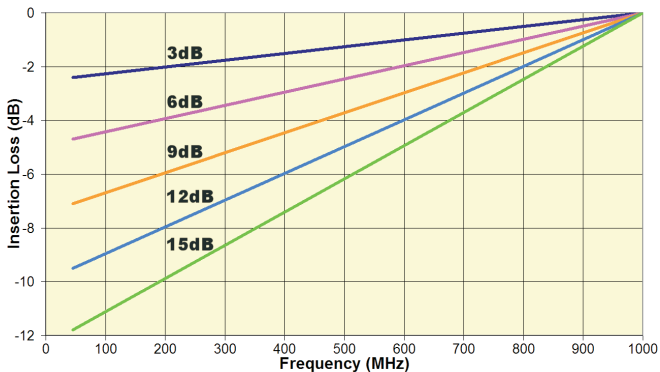
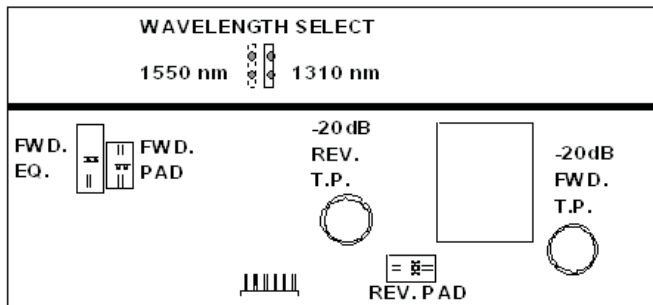


Figure 3 - Characteristics of Various Equalizers

INTERNAL TEST POINTS and ADJUSTMENTS

The OTPN-2000C 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-2000C 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 in error if the input wavelength is 1550 nm and the internal jumper has not been changed.

ACCESSORIES

MODEL	DESCRIPTION
PAD1G-xxx	Single 1GHz Pad (Forward or Reverse)
PAD1G-KIT-x	1GHz Pad Kits (Forward or Reverse)
OTLL-SCFCKIT	SC/APC to FC/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

RELATED OLSON TECHNOLOGY PRODUCTS

MODEL	DESCRIPTION
OTPN-2000C	Receive only wideband indoor node, 5-42MHz return band
OTPN-2000C-PAL	Receive only wideband indoor node, 5-65MHz return band
OTPN-2000C-SP1	Receive only wideband indoor node, 5-30MHz return band
OTOR-300	Indoor return band optical receiver

OTPT MODELS

OT MODEL#	OT PART #	RETURN LASER
OTPT-304A	037-000471	3mW, 1310nm, DFB
OTPT-305A	037-030471	2mW, 1550nm, DFB
OTPT-347A	037-040471	CWDM, 2mW, 1470nm DFB
OTPT-349A	037-050471	CWDM, 2mW, 1490nm DFB
OTPT-351A	037-060471	CWDM, 2mW, 1510nm DFB
OTPT-353A	037-070471	CWDM, 2mW, 1530nm DFB
OTPT-355A	037-080471	CWDM, 2mW, 1550nm DFB
OTPT-357A	037-090471	CWDM, 2mW, 1570nm DFB
OTPT-359A	037-100471	CWDM, 2mW, 1590nm DFB
OTPT-361A	037-110471	CWDM, 2mW, 1610nm DFB