LASER PLUS

OPERATING INSTRUCTIONS

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SAFETY WARNINGS

LASER RADIATION

The laser transmitters emit invisible radiation that can cause permanent eye damage. ***AVOID DIRECT EXPOSURE TO BEAM***. Operate only with the proper optical fiber installed in the transmitter optical connector. The laser transmitter should be disabled with the front panel switch whenever the optical connector is empty.

HIGH VOLTAGE

The AC input power supply contains no user serviceable parts. There is exposed high voltage inside the supply. The power supply housing should be opened only by factory service technicians.

FIRE HAZARD

The AC input rear power supply fuse is a 3AG, 3.25A, slow blow fuse. To avoid a risk of fire, this fuse should be replaced only with an identically rated fuse.

SHIPPING ALERT

The main chassis is **not** intended as a shipping container. Shipping the system with any module installed can cause severe physical damage.

SYSTEM OVERVIEW

DESCRIPTION	MODEL	PART NUMBER
MAIN CHASSIS	LP-CH	037-000403
95-240VAC POWER SUPPLY	LP-PS	037-000406
48VDC POWER SUPPLY	LP-PS-48	037-000451
LASER TX MODULE 6dBm	LP-OT-6	037-000400
LASER TX MODULE 8dBm	LP-OT-8	037-080433
LASER TX MODULE 9dBm	LP-OT-9	037-090433
LASER TX MODULE 10dBm	LP-OT-10	037-100433
LASER TX MODULE 12dBm	LP-OT-12	037-120433
LASER TX MODULE 14dBm	LP-OT-14	037-140433
LASER TX MODULE 15dBm	LP-OT-15	037-150433
TRIPLE RX MODULE	LP-OR-300	037-000401
RSM 1&3 w/o OPTICAL RX	LP-DC-212-NR	037-000454
RSM 1&3 w/ OPTICAL RX	LP-DC-212	037-000447
RSM 2&4 (req. LP-DC-212)	LP-DC-234	037-000448
SNMP STATUS INTERFACE	LP-SNMP	037-000461
MODULE EXTRACTOR	LP-EX	010-000930

A system can have a single power supply or 2 redundant supplies. With a single power supply, a fully populated system holds 15 RF/optical modules. With dual power supplies, a fully populated system holds 14 RF/optical modules. All modules can be hot swapped.

OPTICAL CONNECTORS AND CLEANING

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

The standard optical connector is an SC/APC. To specify an FC/APC connector, append **–FA** to the model name and consult the factory for part numbers. FC/APC connectors must be specified at time of order.

CHASSIS

The chassis is a 19" rack mount unit, 5.75" (3 RU) high. The chassis slots are numbered 1 to 16 from left to right as viewed from the front. **When viewed from the rear, slot 1 is on the right.** Slots 1-14 accept only RF/optical modules. Slot 16 accepts only a power supply module. Slot 15 accepts either an RF/optical module or a power supply module.

All module changes can be made from the front of the chassis through service loops in the RF and power cables. All RF connections are made from the rear of the rack. All optical connections are made from the front of the rack. There are access holes in the front sides of the chassis for fiber routing. There are fiber support slots in the top front of the chassis.

There are no connections or test points on the front of the chassis. The chassis status LED's are located on the power supply module. All LED's can be seen through a clear window in the front of the chassis. All normal indicators are green. Any red LED that is turned on denotes an abnormal condition.

The chassis rear has 4 long-life fans that can be changed from the outside. The OT P/N for the fan assembly is 037-000405. There is a DB-25M alarm connector at the center rear of the chassis. These isolated relay contacts, rated at 100mA @ 25VDC, provide a ground closure on any alarm, including power failure. Pins 1-15 monitor slots 1-15 respectively. Pin 17 is the chassis cooling alarm. Pin 24 is the summary alarm that alarms on any failure. Pin 25 is ground.

The small rectangular connector at the right rear of the chassis is for factory testing, the **Olson Technology** SNMP interface (LP-SNMP), or OEM status monitoring modules.

STATUS MONITORING

There are three types of status links built into this system.

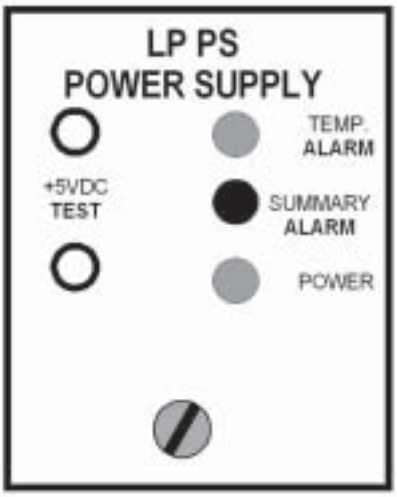
1) The rear panel DB25 connector provides isolated summary alarms of each module in the system. No computer is required.

2) The 10 pin connector located in the upper right rear of the main chassis, can be adapted to the printer (parallel) port of any windows 95 or 98 (ME, 2k, and XP will not work) based computer to monitor several critical module and chassis functions. This software is available from **Olson Technology Inc.**

3) The 10 pin connector will accept an OT-SNMP SNMP interface. One interface is required per chassis.

Please consult the factory for complete details on these features.

There are 3 LED's on the front of the power supply.



The temperature alarm LED is normally green. It changes to red if any fan is open, missing, or frozen. It also goes red if the unit's internal temperature is too high. **This LED is normally on for several seconds after power on while the fans start up.**

The red summary alarm LED is normally off. It lights on any module alarm or on a temperature alarm.

The power LED is normally green. If the power supply voltage is too high or too low, it will be red. This will also cause a temperature alarm.

The test points can be used to monitor the bus voltage.

POWER SUPPLIES

A single power supply mounts in the rightmost slot as viewed from the front. Dual supplies mount in the two rightmost slots. Changing from single to dual supplies does not require any chassis rewiring.

The AC supply automatically accepts 90-132VAC and 180-264VAC at 47-63Hz. The maximum input power is about 140 watts. The voltage supplied to the modules is approximately 5.25VDC.

The AC input is through an IEC connector on the rear of the power supply. The voltage selection jumper is not used; the unit will operate with the jumper in any position. If redundant supplies are used, we recommend plugging them into independently protected power strips.

The Laser Plus system also has a 48V DC input power supply for central office use. See the LP-PS-48V instruction manual, OT p/n 025-370451, for complete specifications.

OPTICAL TRANSMITTER MODULE

FUSE

The module has an internal miniature 3A SB fuse in a holder. The Littelfuse part number is 0454003. The Olson Technology P/N is 286-000009.

RF INPUT

The LP-OT-6 laser transmitter accepts a 77 channel flat RF input from +18dBmV to +22dBmV per channel (50-550 MHz). Digital signals can be added from 550MHz to 870MHz. The power in any 6MHz bandwidth should be at least 6dB below the picture carriers.

The LP-OT-8 to LP-OT-15 laser transmitter accepts a 77 channel flat RF input from +19dBmV to +23dBmv per channel (50-550 MHz). Digital signals can be added from 550MHz to 870MHz. The power in any 6MHz bandwidth should be at least 6dB below the picture carriers.

The front panel RF test point has been calibrated at 547.25MHz to read +10dBmV for optimum optical modulation with 83 channel loading. This level will change with channel loading.

With these frequency ranges, it is **extremely** important to account for coax cable loss and slope when making measurements and distributing signals.

OPTICAL OUTPUT

The cooled DFB laser outputs 4mW (+6dBm) minimum at 1310 nm. Laser performance has been optimized for this power level; there is no external adjustment for laser output power.

UNIT	OPTICAL OUTPUT	
LP-OT-6	4.00mW	6dBm
LP-OT-9	7.94mW	9dBm
LP-OT-8	6.30mW	8dBm
LP-OT-10	10.0mW	10dBm
LP-OT-12	15.70mW	12dBm
LP-OT-14	25.00mW	14dBm
LP-OT-15	31.60mW	15dBm

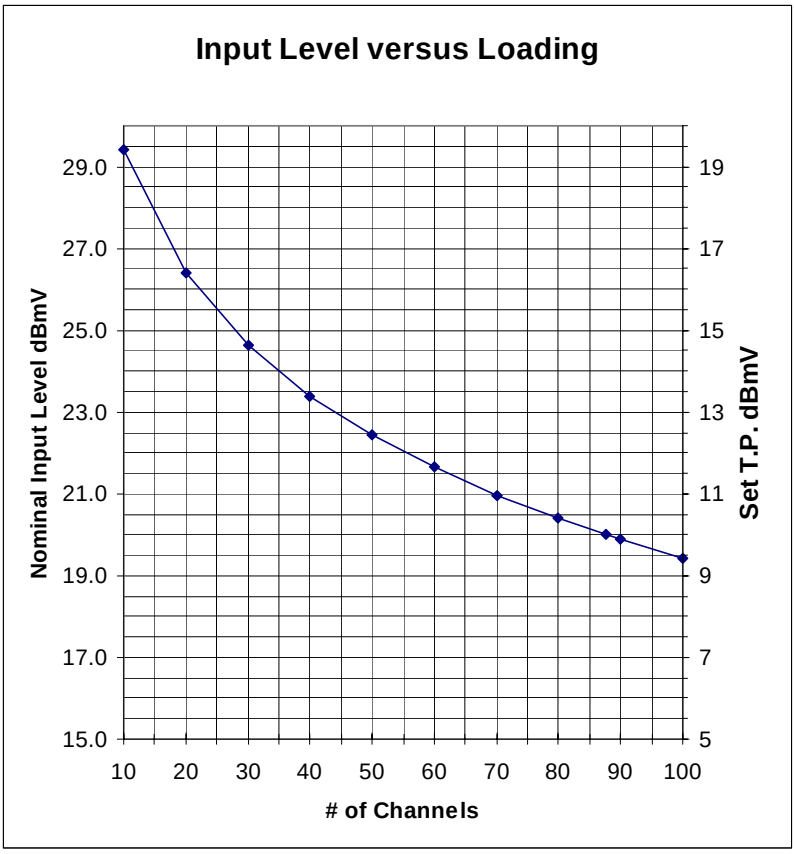
INPUT DRIVE vs. CHANNEL LOADING

The laser RF drive level is the primary determining factor of link distortion and S/N performance. The basic limitation on input drive is total input power. The following chart shows the approximate input levels versus channel loading. The left axis shows the nominal RF input level. The unit will work with levels within +/- 2dB of this value. The right axis shows the test point reading for optimum modulation.

Many systems run their digital channels at 6dB below the analog channels. This is a very convenient level for calculating loading. At 6dB down, merely divide the number of digital channels by 4 and add to the analog channels to get the total loading.

The factory test input is 77 analog channels with 42 digital channels at 6dB down. This is 77 + 42/4, which equals 87.5. This is the 87.5 ch / +20dBmV input point on the graph.

Some systems use an OMI meter to set laser modulation. The LP-OT-6 to LP-OT-15 have been individually adjusted for optimum performance. Setting all units for the same OMI, instead of using the test point, will result in reduced transmitter performance.



If the channel loading is less than 40, you may decide not to increase the levels by the maximum possible amount. This will provide improved distortion at the cost of S/N. The best rule of thumb is to use the maximum possible levels for long haul links, and lower drive levels as the links get shorter.

INDICATORS AND TEST POINTS FOR LP-OT-6

The laser transmitter has front panel test points for optical power and laser current. Only a high impedance voltmeter should be used. The meter common should be connected to the module ground test point, not to chassis ground.

The optical power alarm LED is normally green. It turns red on insufficient optical power. 4mW of optical output reads 4.0V at TP.

The laser current alarm LED is normally green. It turns red on excessive laser current. At a typical laser current of 30mA the TP will read 0.6V.

The cooler alarm LED is normally green. It turns red when the cooler cannot keep the laser at a constant temperature.

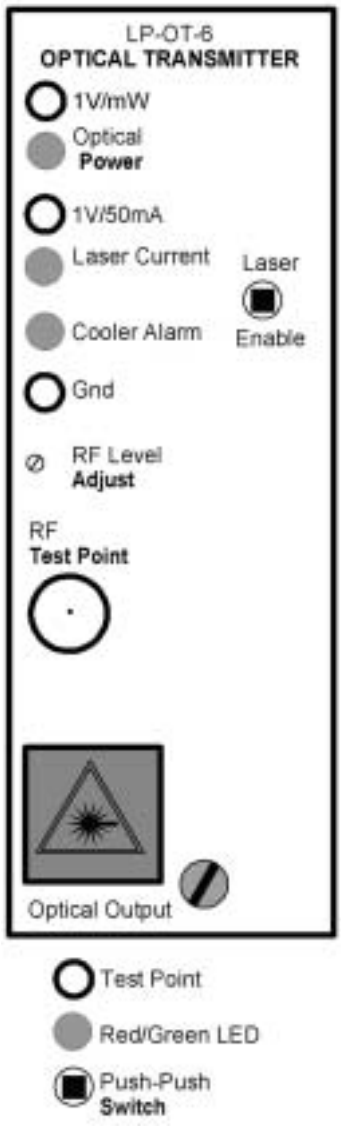
The RF level adjust control allows for a 4dB range of input level adjustment.

The RF test point is calibrated to read +10dBmV @ 547.25MHz for proper laser modulation with 83 channel loading. This level will change with channel loading. It does not require termination.

Push the laser enable switch with an alignment tool to enable or disable the laser. The laser should be disabled whenever there is no fiber connected. Disabling the laser will cause a local optical power alarm, but will not cause a remote module or chassis alarm. 'Teasing' this switch may cause very brief remote alarms.

The optical output connector is type SC/APC, with optional FC/APC connector available.

NOTE: The Laser Enable switch is no longer available on newer models.



INDICATORS AND TEST POINTS FOR LP-OT-8 TO LP-OT-15

The laser transmitter has front panel test points for optical power and laser current. Only a high impedance voltmeter should be used. The meter common should be connected to the module ground test point, not to chassis ground.

The optical power alarm LED is normally green. It turns red on insufficient optical power. Optical ouput reads as shown below:

UNIT	OUTPUT	TEST POINT VOLTAGE
LP-OT-8	6.30mW	0.63V
LP-OT-9	7.94mW	0.79V
LP-OT-10	10.00mW	1.00V
LP-OT-12	15.70mW	1.57V
LP-OT-14	25.00mW	2.5V
LP-OT-15	31.20mW	3.12V

The laser current alarm LED is normally green. It turns red on excessive laser current. At a typical laser current of 50mA the TP will read 1.0V.

The cooler alarm LED is normally green. It turns red when the cooler cannot keep the laser at a constant temperature.

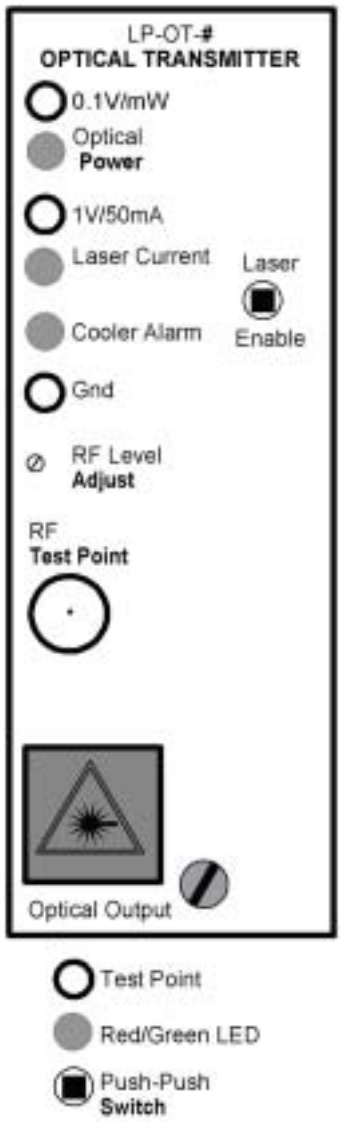
The RF level adjust control allows for a 4dB range of input level adjustment.

The RF test point is calibrated to read +10dBmV @ 547.25MHz for proper laser modulation with 83 channel loading. This level will change with channel loading. It does not require termination.

Push the laser enable switch with an alignment tool to enable or disable the laser. The laser should be disabled whenever there is no fiber connected. Disabling the laser will cause a local optical power alarm, but will not cause a remote module or chassis alarm. 'Teasing' this switch may cause very brief remote alarms.

The optical output connector is type SC/APC, with optional FC/APC connector available.

NOTE: The Laser Enable switch is no longer available on newer models.



OPTICAL RECEIVER MODULE

DESCRIPTION

The LP-OR is a triple return band receiver in a single module. The receivers have an extended bandwidth of 200 MHz to allow the use of spectrum multiplication. Individual receivers in the module can be disabled if three inputs are not available.

FRONT PANEL

The 3 rectangular red/green status LED's monitor the receivers' optical inputs. They are normally green and change to red on a low or missing optical input. Any red LED causes a module alarm and a chassis summary alarm.

The 3 DC test points monitor the receivers' optical inputs. 1mW (0dBm) is 1V at the test point. Only high impedance meters should be used. Use the ground test point at the bottom of the module, not chassis ground.

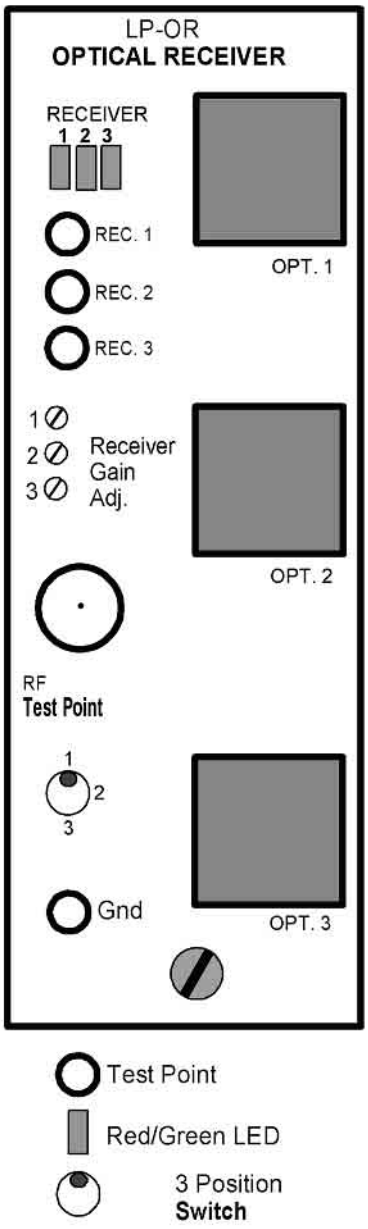
The 3 multi-turn potentiometers set the receivers' gains. Setting any gain control fully counter-clockwise will disable that receiver. The LED for a disabled receiver will always be green. A disabled receiver will never generate an alarm.

The –20dB RF test point monitors the RF output of any single receiver. It does not require termination.

The 3 position toggle switch selects which receiver's output appears at the test point. Insure that this switch is in the correct position before using the test point to set the RF gain.

The ground test point should be used when checking optical input levels.

The SC/APC optical input connectors are on the right of the front panel, with optional FC/APC connectors available.



REAR PANEL

The RF output connectors are on the rear of the unit. Receiver #1 is on the top. Receiver #3 is on the bottom.

INTERNAL ADJUSTMENTS

There are 3 jumpers that are accessible from the side that are used to set the receiver input range. The jumpers can be changed with tweezers or needle nosed pliers. The nominal level for changing jumper posistions is -3dBm.

FUSE

The module has an internal miniature 3A SB fuse in a holder. The Littelfuse part number is 0454003. The Olson Technology P/N is 286-000009.

OPTICAL INPUT CHART

The following chart shows the test point readings versus optical input levels.

T.P. Volts	Optical Input mW	Optical Input dBm
3.02	3.02	4.8
2.51	2.51	4
2.00	2.00	3
1.58	1.58	2
1.26	1.26	1
1.00	1.00	0
0.79	0.79	-1
0.63	0.63	-2
0.50	0.50	-3
0.40	0.40	-4
0.32	0.32	-5
0.25	0.25	-6
0.20	0.20	-7
0.16	0.16	-8
0.13	0.13	-9
0.10	0.10	-10
0.08	0.08	-11
0.06	0.06	-12
0.05	0.05	-13
0.04	0.04	-14
0.03	0.03	-15

RETURN FREQUENCY MULTIPLIERS

The Laser Plus system includes 3 receiver/ down converter modules that can be used as part of a return band frequency multiplier system. This system can quadruple the bandwidth of a new or existing return link. Olson Technology builds up converters to fit inside the nodes of several manufacturers. Consult the factory for the latest list of compatible nodes.

See the LPDC-212 / LPDC-234 instruction manual, OT # 025-370447, for more details.

Laser Plus Module Extraction Tool

Insert module puller and slide the notched end underneath the pull tab on the front of the inserted module as shown above. Then press down on the handle, this will lift the notched end thereby lifting the front of the module. Then proceed by pulling the unit out while pressing down on the handle.