LPOR-304
Dual Redundant Return Band Receiver

Operating Manual

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DESCRIPTION

The LP-OR-304 has dual, redundant return band receivers in a single module. The receivers have an extended bandwidth of 300 MHz to allow the use of spectrum multiplication. Individual receivers in the module can be disabled.

Front Panel

The two rectangular red/green status LEDs 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 two DC test points monitor the receivers' optical inputs. One (1) mW (0 dBm) is 1 V 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 two multi-turn potentiometers set the receivers' gains. Setting any gain control fully counter-clockwise will disable that receiver. 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 two position toggle switch selects which receiver's output appears at the test point. Ensure 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.

Figure 1 - LPOR-304 Front Panel

Rear Panel

The RF output connectors are on the rear of the unit. Receiver #1 is on the top. Receiver #2 is on the bottom.

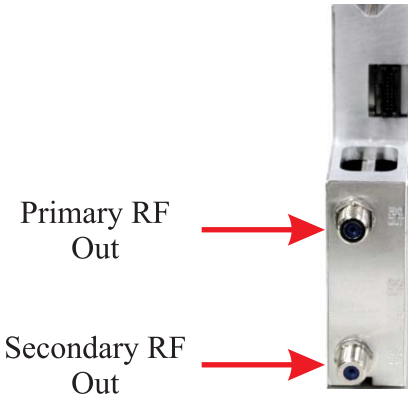

Figure 2 - LPOR-304 Rear Panel

Internal Adjustments

There are two 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 positions is -3 dBm.

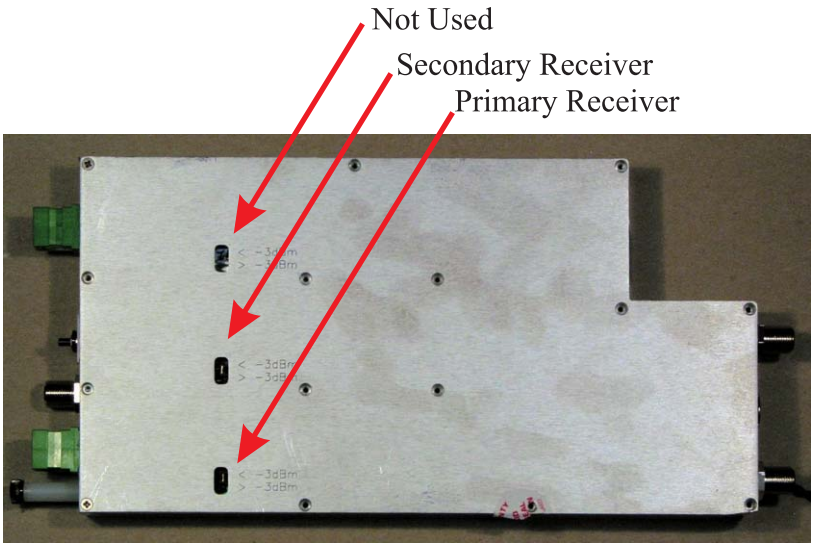

Figure 3 - Jumper Access Points

Control Board Layout

Figure 4 shows the locations of LPOR-304's primary and secondary responsivity trim pots, the programming DIP switch, and the fuse.

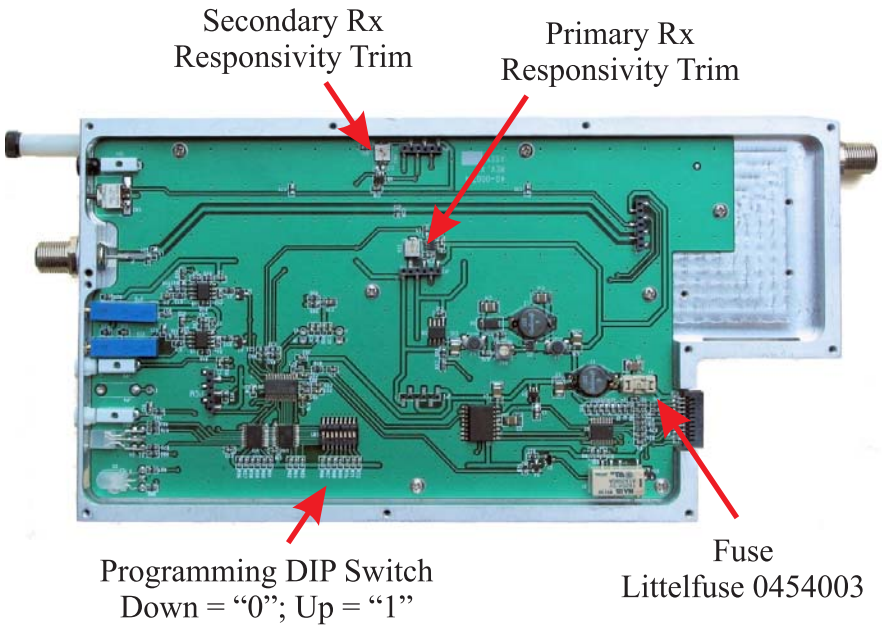

Figure 4 - Control Board Layout

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. See Figure 4, page 4 for fuse location.

Optical Input Chart

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

Table 1 - Optical Input Chart

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

LPOR-304 OPERATION OVERVIEW

The LPOR-304 redundant receiver consists of two receiver boards, a switch board, and a status/ control board. The upper three LEDs are tri-color ones. The redundancy mode LED is visible through a vent hole next to the Rx status LEDs. The unit can function as a redundant receiver or as dual independent receivers.

A single pushbutton switch and an 8-position DIP switch control the major functions. See Figure 4, page 4 for the switch location. The receiver gain controls will disable their receiver if fully turned CCW.

The status board has a microprocessor and two ADCs to monitor the optical input levels. The microprocessor stores different responsivities for 1310 nm operation and 1550 nm operation. The voltage read will be proportional to the optical power in mW. The microprocessor performs a $10*LOG_{10}$ function to convert the mW value to dBm. All alarms and transfer decisions are based upon dBm levels. An 8-position DIP switch, which is accessed by removing the left cover, sets all configurable parameters. All alarm and display logic would be handled by the microprocessor. The user can select one of eight optical switching thresholds via the DIP switch.

The microprocessor switches from the PRIMARY to the SECONDARY receiver in 50 ms or less when the primary receiver indicates that it has insufficient light. The microprocessor also drives two analog test points on the front panel via PWM outputs.

In the redundant mode, Rx1 is the PRIMARY receiver and Rx2 is the SECONDARY or BACKUP receiver. In order to swap the fiber priority, the user must swap the input fibers.

INSTALLATION

The user must first set the DIP switches (SW1 on the 714 board) for the specific application (see Figure 4, page 4 for location). The default factory shipping position for all switches is *OFF*. These switches are read at least twice per second and updated when changes are sensed. The eight switches function as follows:

Table 2 - DIP Switch Settings

Switch Number	FUNCTION	OFF	ON
1	Unit Mode	Redundant	Independent
2	Primary Input Wavelength	1310 nm	1550 nm
3	Secondary Input Wavelength	1310 nm	1550 nm
4	Optical Level Hysteresis	Loose (3dB)	Tight (1dB)
5	Restore Delay	Instantaneous	Delayed (60 Seconds)
6	Sets the Optical Switching Threshold in the High to Low Direction	000 = -19 dBm	100 = -10 dBm
7		001 = -17 dBm	101 = -7 dBm
8		010 = -15 dBm	110 = -4 dBm
		011 = -13 dBm	111 = -1 dBm

OPTICAL BEHAVIOR

Six of the eight DIP switches (2, 3, 4, 6, 7, and 8) control the optical behavior of the unit. Switches 2 and 3 are used to set the wavelength of the two receivers. The user can select either 1310 nm or 1550 nm independently for each channel. Switches 4, 6, 7, and 8 determine the optical input levels where the receiver alarms switch. See Table 3 for details.

Table 3 - Optical Thresholds

Switch 6	Switch 7	Switch 8	Switch 4	Green to Red Threshold	Red to Green Threshold
OFF	OFF	OFF	OFF	-19 dBm	-16 dBm
OFF	OFF	OFF	ON	-19 dBm	-18 dBm
OFF	OFF	ON	OFF	-17 dBm	-14 dBm
OFF	OFF	ON	ON	-17 dBm	-16 dBm
OFF	ON	OFF	OFF	-15 dBm	-12 dBm
OFF	ON	OFF	ON	-15 dBm	-14 dBm
OFF	ON	ON	OFF	-13 dBm	-10 dBm
OFF	ON	ON	ON	-13 dBm	-12 dBm
ON	OFF	OFF	OFF	-10 dBm	-7 dBm
ON	OFF	OFF	ON	-10 dBm	-9 dBm
ON	OFF	ON	OFF	-7 dBm	-4 dBm
ON	OFF	ON	ON	-7 dBm	-6 dBm
ON	ON	OFF	OFF	-4 dBm	-1 dBm
ON	ON	OFF	ON	-4 dBm	-3 dBm
ON	ON	ON	OFF	-1 dBm	+2 dBm
ON	ON	ON	ON	-1 dBm	0 dBm

Function Switch

The pushbutton cycles through the following states by holding the button down for 0.5 second or more:

- Automatic Mode (Redundant with Automatic Switchover)
- Force PRIMARY Rx Active
- Force SECONDARY Rx Active
  (then cycle back to Automatic Mode*)*

The current state of the unit is stored in E^2PROM in case of power failure. If power does fail, the last valid state will be restored when power is restored.

INDEPENDENT MODE DETAILED OPERATION

Rx1 and Rx2 LEDs (Independent)

In the independent mode, the individual receiver LEDs have three display states. They will never be orange.

Table 4 - Independent Rx1 and Rx2 LED Conditions

DISPLAY	CONDITION
OFF	Rx disabled
GREEN	Rx input OK. Unit output from this Rx.
RED	Rx input fault (Optical input is below preset threshold)

Mode LED (Independent)

In the independent mode, the mode LED blinks green for 0.25 second every 3 seconds to give an indication that the unit is powered.

REDUNDANT MODE DETAILED OPERATION

Rx1 and Rx2 LEDs (Redundant)

The individual receiver LEDs have four display states. They blink to indicate an unacknowledged fault on that input.

Table 5 - Redundant Rx1 and Rx2 LED Conditions

DISPLAY	CONDITION
Off	Rx Disabled via gain control (Will never blink)
Green	Rx input Ok. Unit output from this Rx.
Orange	Rx input Ok. Unit output from other Rx.
Red	Rx input fault (Optical input is below preset threshold)

Mode LED (Redundant)

When operating as a redundant receiver, the mode LED has three display states. It is never turned off.

Table 6 - Redundant Rx Mode LED Conditions

DISPLAY	CONDITION	NOTES
Green	Primary Rx Input OK. Redundant Operation Enabled.	Both receivers must be enabled. This state is independent of the presence of backup optical input.
Orange	Redundant Operation Disabled	This can be from one of two causes: Either one or both receivers disabled with gain control. Non-redundant operation selected with function switch.
Red	Redundant Operation Enabled	Automatic transfer has occurred. Output of unit is backup input whether or not optical signal is present on this input.

OPTICAL POWER TEST POINTS

The unit has two analog test points on the front panel, labeled REC.1 (TP1) and REC.2 (TP2). These voltages are generated by PWM outputs of the microprocessor. The scale factor is such that the test points give 1 Volt/mW of input light. Note that the microprocessor takes into account the wavelength in generating these voltages. The wavelength causes the responsivity to vary, changing the internal scaling factor. Also note that these test points are in mW where other optical measurements mentioned herein are in dBm. The step size for these outputs is approximately 33 µW.

TEST POINT SELECT SWITCH

This switch selects the RF monitor test point directly, not through the microprocessor. This switch does not affect the output source of the unit. It has the same effect in redundant and independent modes.

Table 7 - Test Point Select Switch Settings

POSITION	TEST POINT SOURCE
UP	Rx1 (primary)
DOWN	Rx2 (secondary)

I^2C DISABLE LINES

There are two input lines from the I^2C alarm circuit that are read at least twice per second. The inputs and their function are as follows;

1) *Alarm5* - This input (P2.2) determines if the Primary receiver is enabled. If *Alarm5* is “OFF”, then the Primary receiver is enabled. If *Alarm5* is “1”, then the Primary receiver is disabled and the Rx1 LED (D3) is turned off.
2) *Alarm6* - This input (P2.3) determines if the Secondary receiver is enabled. If *Alarm6* is “OFF”, then the Secondary receiver is enabled. If *Alarm6* is “1”, then the Secondary receiver is disabled and the Rx2 LED (D4) is turned off.

SUMMARY ALARM RELAY

The P2.0 output of the microprocessor is used to drive a Summary Alarm Relay. When there are no alarms and no receivers are disabled, this output should be a “OFF”. When there are any alarms and or either receiver is disabled, this output should be a “1”.

Figure 5, page 10, shows a block diagram of all the microprocessor functions.

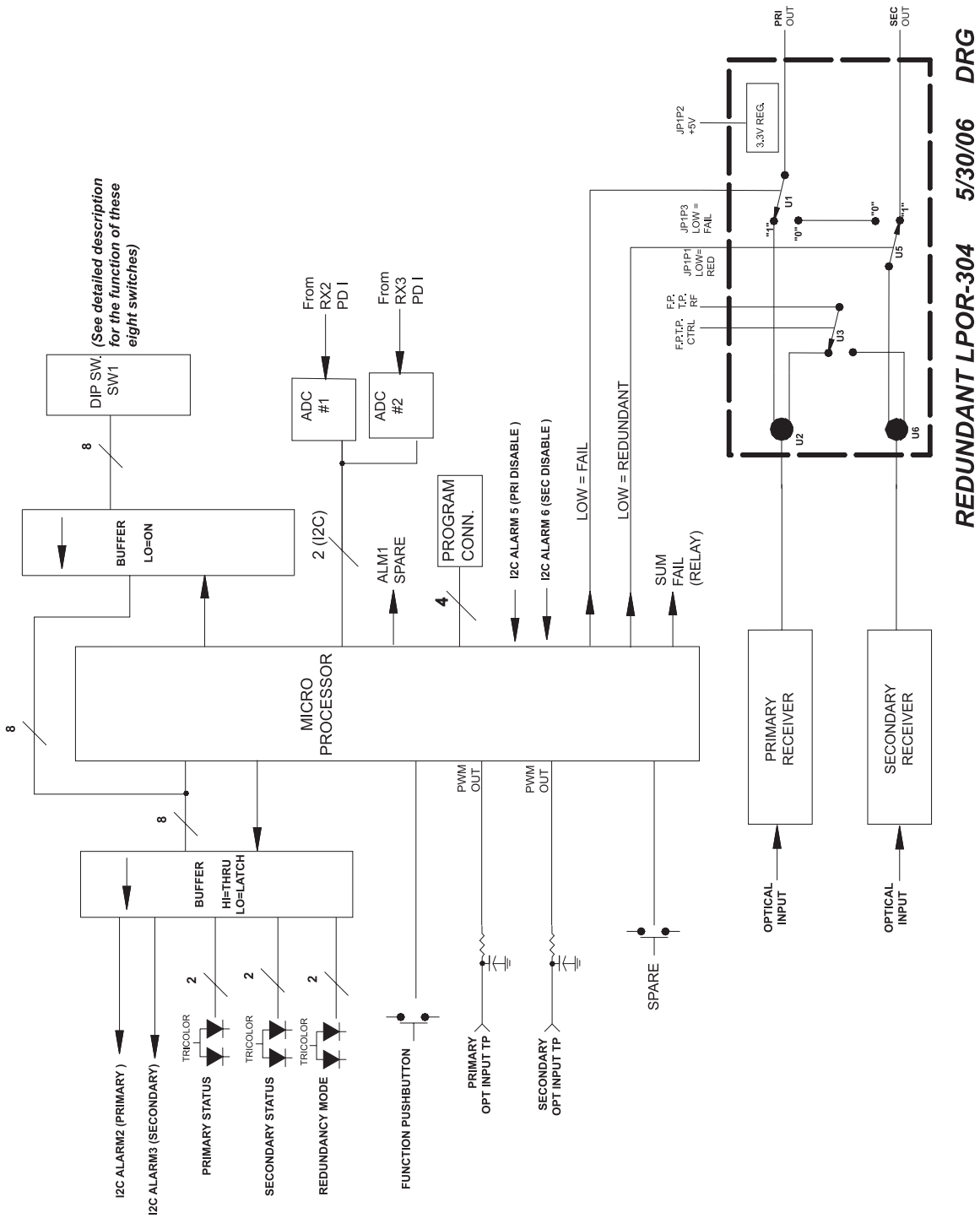

Figure 5 - Microprocessor Block Diagram

END OF OPERATING MANUAL