




CATV OPTICAL RECEIVER

Operation Manual

Ver. A1



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Chapter 1 Introduction

Overview

The CATV fiber optic receiver uses a high linear InGaAs PIN diode as light detector, converting the optical signal from transmitter into RF signals. The RF signals are then distributed to the end users. There are two front-end optical receivers in the units, and share the same RF signal amplifier, two receivers could provide redundancy function in network. The main applications are as follows :

- Head-end broadcasting
- Head-end to head-end program exchange
- Transmission of video and sound through Hybrid Fiber Coaxial (HFC) networks

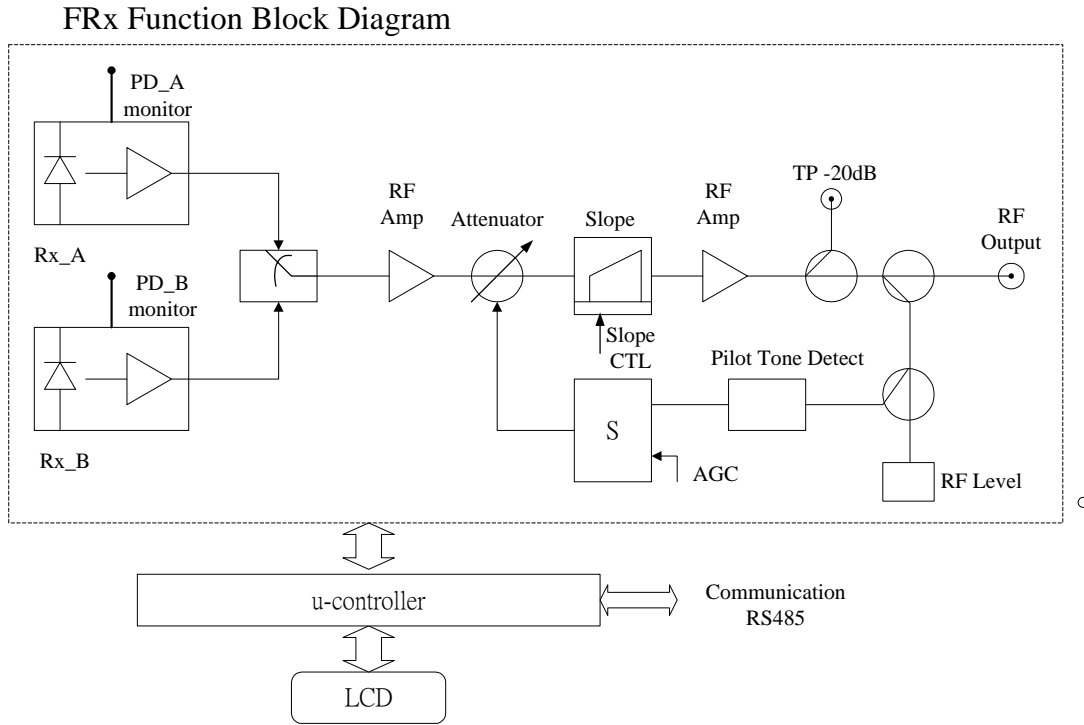
In order to achieve maximum performance and confidence by the customer, we detail the characteristics, applications, and operating instructions in the following chapters. We expect to satisfy the needs of the customer and provide quality service.

Features

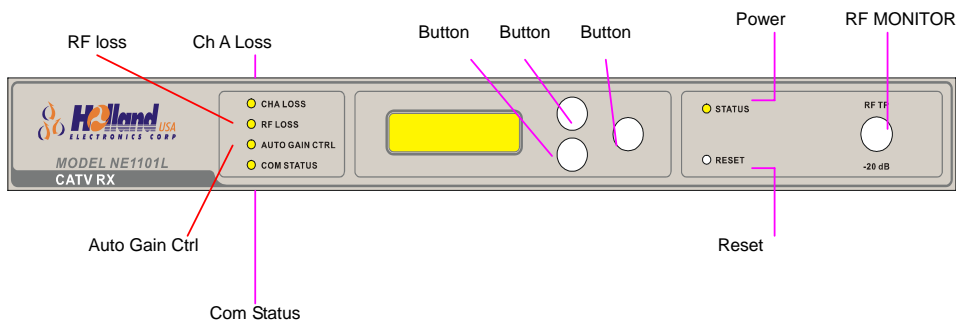
- 19" 1U height standard enclosure, front LCD display
- 45 ~750/860 MHz bandwidth
- Redundancy A/B switch receiver
- Automatic Gain Control / Manual Gain Control
- Microprocessor control & Monitoring
- RS232/RS485 control interface
- High performance value
- +1dB ~-3dB Range Adjustable Slope

Product Description

FRx Block Diagram

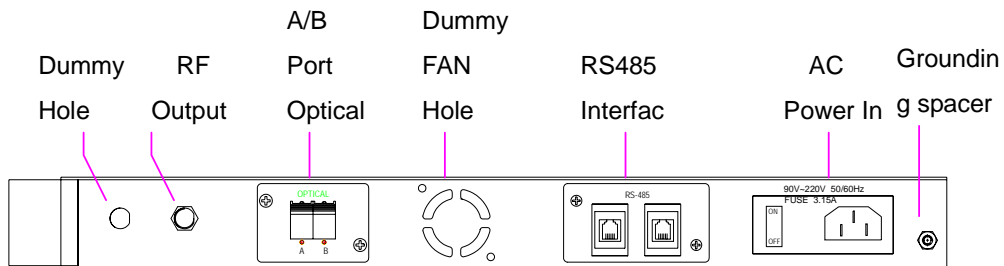


Front Panel



Indicator/Control	Description
Power	Main power indicator Green – AC Power On OFF -- AC Power OFF
Ch A Loss	Ch A Optical Power OFF – Optical input power > Channel A optical power low threshold RED Flashing – A port Optical input < Channel A optical power low threshold
RF Loss	RF signal power less than RF power threshold.
Auto Gain Ctrl	Displays status of the gain control mode GREEN – AGC mode OFF – MGC mode
Com Status	Displays status of RS485 or RS232 connection GREEN – Data transmit or received
Button Rest	Reset System, Note: it will restart all system.
Button UP	Scroll up
Button DN	Scroll up
Button ENT	Select highlighted item on LCD display
RF MONITOR -20dB	F-type female connector, Monitoring output port signal, Measured value is 20 dB below actual value. Accuracy to ± 1 dB.

Rear Panel



Connector/Control	Description
AC Power In (ON/OFF Switch, Plug, Fuse)	AC power plug and main power switch. Fuse is rated 250V · 3.15A. For inspection or replacement, press down on the fuse cap and turn to loosen.
RS-485 Interface	Provides connection to an external computer through RS-485 for monitoring and configuration setup purposes
Dummy FAN Hole	Dummy: Not used in this type
A/B Port Optical Input	Optical Input connectors are SC/APC type. For connection, use

	same type of connector.
RF Output	RF signal Output Port; 75Ω F type female connector
Dummy Hole	Dummy: Not used in this type



RS-485 Interface Pin Definition

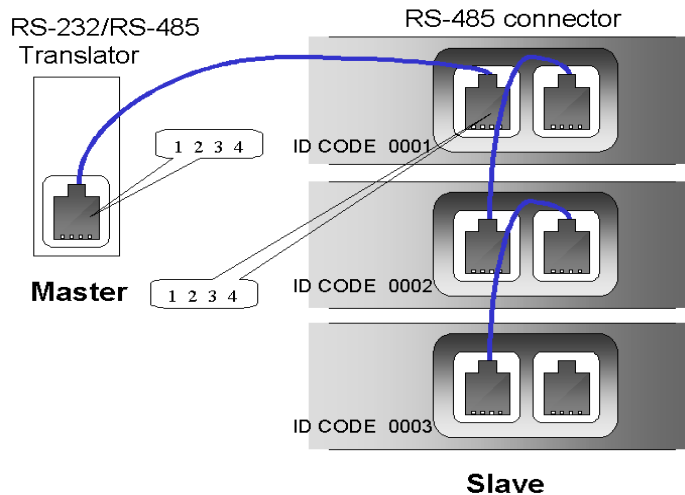
This RS-485 is full duplex type, so master and slave pin assignment is not the same. The connector definition should be as following.

- **Master : (PC side)**

- 1、 Receive+
- 2、 Receive-
- 3、 Transmit-
- 4、 Transmit+

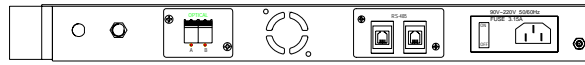
- **Slave : (TX side)**

- 1、 Transmit+
- 2、 Transmit-
- 3、 Receive-
- 4、 Receive+

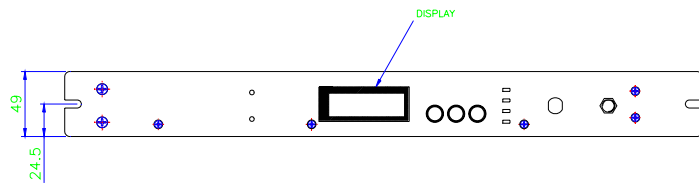
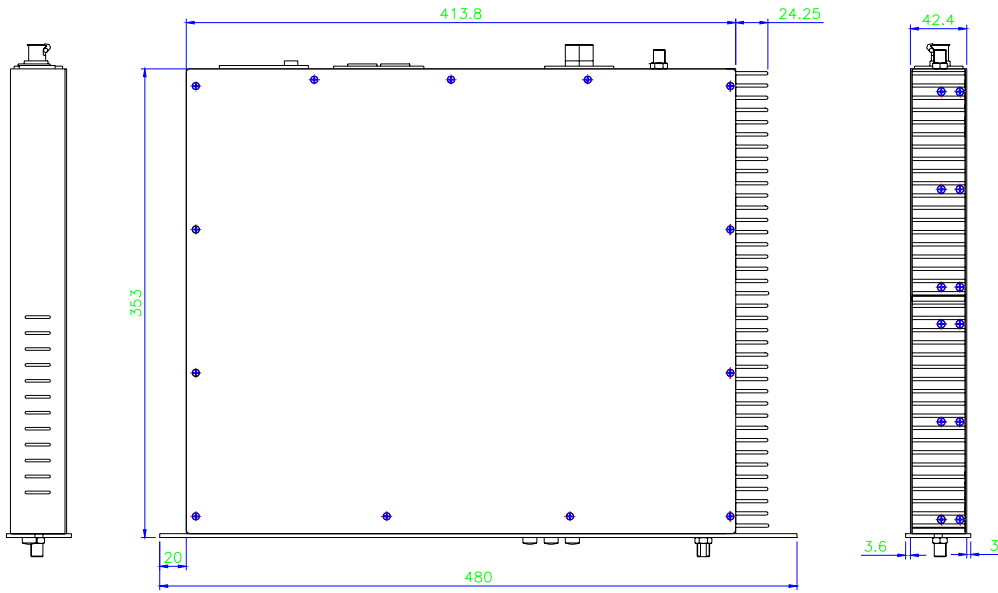


Please make sure AC power is off when replacing new fuse.

Mechanical Information



BACK VIEW



Chapter 2 Installation Procedure

Checklist

Parts	Qty
Hanger	1 set
AC power cord	1

Installation

The following are procedures to be followed in the installation of Rack Mount Forward Receiver(called as FRx in the following description) :

1. Before installing the FRx, check to make sure that enough space is provided for air circulation especially in the Heat Sink portion of the FRx.
2. Check the power plug of the supply and proper grounding to avoid damage to the FRx.
3. Connect the AC power cord.
4. Connect the 「RF Output」 coaxial cable.
5. Lift the eye-safety shutter from the rear panel「Optical Input」fiber connector, and connect the jumper optical fiber. Before connection, clean the connector and make sure that the connector type is SC/APC.
6. Ch A Port of Optical input port is recommended as the Main loop. And use the Ch B Port as Backup loop.



Caution: Direct eye exposure to laser beam may cause physical damage,

Cleaning Fiber Connectors

1. Use a **lint-free cloth** (3 cm x 3 cm)
2. Moisten one-half of the lint-free cloth with >90% pure ethyl or alcohol, and gently wipe the connector end face
3. Use the other half of the lint-free cloth to gently wipe the connector end face, then rapidly shake the connector
4. Wait until dry to insert connector into the adapter
5. Caution: do not use any compressed air to directly blow onto the connector end face to avoid damage by dust particles



Caution: Direct eye exposure to laser beam may cause physical damage.

Chapter 3 Operation Procedure

The following are procedures for the normal operation of the FRx:

- 1) Switch the AC Power switch located on the rear panel to the ON position; the LED indicator for [POWER] on the front panel will light up to indicate AC Power is connected.
- 2) Inspect the front panel [Ch A Loss] LED indicator.
 - Operation range of optical input power is from -6dBm to $+3\text{dBm}$, when the optical power large than -3dBm , the Output RF level could reach the default output level 96dBuV per channel when 77 channel load and $\text{OMI}=3.6\%$.
 - Under normal conditions, the LED should be off.
 - A flashing red light indicated abnormal Optical operation that can be caused by:
 - a)Ch A Optical Input Power lower than optical loss threshold.
 - b)Receiver module inside of the FRx work abnormally.
- 3) Inspect the [RF Loss] LED indicator.
 - Under normal conditions, the LED should be off.
 - A flashing red light indicates abnormal RF Output conditions, usually low output signal level.
- 4) Inspect the [Auto Gain Ctrl] LED indicator.
 - OFF: Operating in MGC Mode
 - Green: Operating in AGC Mode



Note: 1. There is two modes on AGC operation, one is detect Pilot signal, and other is composite RF power feedback control. Before operation, please select the AGC mode on “SETTING” menu.
 2. Pilot tone mode used with Pilot Tone $10.7\text{MHz} \pm 100\text{KHz}$ coming from the Transmitter. If there is no this feature in transmitter, please select RF AGC or MGC control mode.

- 5) Check Optical Input Power in the LCD panel, 0 dBm is recommended.
- 6) Adjust the RF output level by using the front panel [SETTING] page. RF power operate in 96dBuV per channel when 77 channel which have flat frequency response , if Channel number is higher , user could operate lower RF level per channel .Keep the total composite power to maintain the distortion performance .



Note: RF output adjusting please refer the following page [LCD/LED Display User Interface].

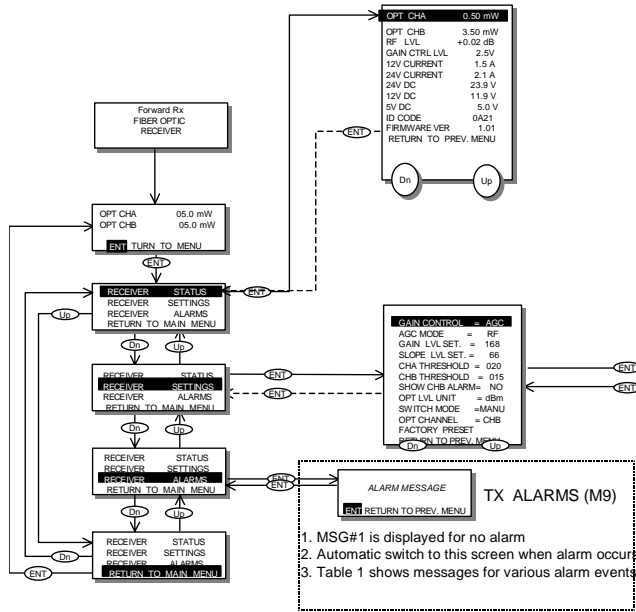
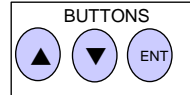
- 7) Adjust RF output slope to compensate the network loss in higher frequency.

Chapter 4 LCD Display and Operation Procedure

LCD/LED Display User Interface

(LCD: Scrolling Menu)

Forward Rx



1. MSG#1 is displayed for no alarm
2. Automatic switch to this screen when alarm occurs
3. Table 1 shows messages for various alarm events

Please note:
 due to space constraint of LCD screen, some words are abbreviated.
 Such as: LVL – LEVEL , VER – VERSION , PREV – PREVIOUS ,SET. – SETTING
 OPT – OPTICAL , CHA - CHANNEL A , CHB - CHANNEL B

AGC MGC	RF LEVEL PILOT LEVEL	GAIN CONTROL	AGC MODE
▲▼ SELECT ENT RETURN	▲▼ SELECT ENT RETURN		
(AGC MODE) GAIN LVL SET. = 168		GAIN LEVEL SETTING (RANGE= 0 – 255)	(AGC MODE OR MGC MODE)
▲▼ ADJUST ENT RETURN			
SLOPE LVL SET. = 66		SLOPE LEVEL SETTING (RANGE= 0 – 255)	(AGC MODE OR MGC MODE)
▲▼ ADJUST ENT RETURN			
CHA THRESHOLD = 015		CHA THRESHOLD SETTING (RANGE= 0 – 255)	
▲▼ ADJUST ENT RETURN			
CHB THRESHOLD = 015		CHB THRESHOLD SETTING (RANGE= 0 – 255)	
▲▼ ADJUST ENT RETURN			
YES NO		CONTROL CHB ALARM SETTING	
▲▼ SELECT ENT RETURN			
mW dBm		SETTING OPTICAL POWER UNIT	
▲▼ SELECT ENT RETURN			
AUTO MANUAL		SWITCHING MODE	
▲▼ SELECT ENT RETURN			
CHA CHB		OPTICAL CHANNEL SELECT	(APPEAR ONLY IF A/B SW. MODE IS IN 'MANUAL' MODE)
▲▼ SELECT ENT RETURN			
ALL SETTINGS TO FACTORY PRESET	NO YES	FACTORY PRESET	
▲▼ SELECT ENT RETURN			

LCD Display Contents & Operation

1 · Main Screen

When the Receiver Power on, it will be on the main screen. During system operation, the displayed information will be renewed continuously, to get more detailed information press ENT to access the MAIN MENU.

Display Item	Description
Optical Ch A xxmW	Receiver A input optical power
Optical Ch B xxmW	Receiver B input optical power

2 · Main Selection Screen

At the main screen press the ENT key to enter into the [MAIN MENU], then use the UP/DOWN keys to select the following options:

Option	Description
STATUS	Present status of the Receiver
SETTINGS	Settings screen
ALARMS	Alarms screen
Return to Main Menu	Return to main screen

3. STATUS selection screen

Selection	Description
Optical A	Receiver A input optical power
Optical B	Receiver B input optical power
RF level	Displays RF output level that relative to reference level.
Gain control level	Displays Voltage control attenuator voltage, the upper bond would be 9.5V. The Voltage higher means attenuation loss is lower.
Power Supply	Displays 12VDC supply, +5VDC current supply and –5VDC current supply
Operating Information	Displays software version and other reference information

4. SETTINGS selection screen

Selection	Function	Description
------------------	-----------------	--------------------

Gain Control	Gain Control	Select AGC or MGC
AGC mode	Select RF AGC or Pilot tone AGC	There are two AGC mode could be selected, one is pilot tone AGC, it could detect the 10.7MHz pilot signal from transmitter, and feedback control attenuator, other is RF AGC, it detect composite power of output RF signal feedback control.
AGC Level	Automatic Gain Control Level	Adjust AGC reference level
MGC Level	Manual Gain Control	Adjust MGC reference level
Slope level	RF response slope control	Adjust Slope from -1dB to +3dB.
CH A threshold	CH A optical power low threshold setting	Adjust CH A optical power threshold. If optical power lower than setting value, it would trigger alarm and A/B switch select B channel, if A/B switch active.
CH B threshold	CH B optical power low threshold setting	Adjust CH B optical power threshold. If optical power lower than setting value, it would trigger alarm.
Show CH B alarm	CH B optical power alarm active	Enable CH B optical power alarm trigger active. If there is no optical Connect to Channel B, select "No".
LD PWR UNIT	OPTICAL POWER UNIT SELECT	mW or dBm
Switch mode	A/B switch mode	Select A/B switch is automatic switch or manual switch, if Automatic switch, it would detect Channel A optical power, if the power lower than threshold, the switch would be selected to Channel B.
FACTORY PRESET	SETTING TO FACTORY PRESET	YES or NO

Note:

Factory preset will recall all original setting value, like AGC /MGC, in memory.

5. ALARMS selection screen

Selection	Description
ALARM MESSAGE	When there is an alarm, the LCD display will automatically display this selection. If there is no alarm, the display will show the message "NO ALARM"

TABLE 1

MSG#	ALARM MESSAGE
1	NO ALARM
2	CHA LOSS OF OPTICAL POWER
3	CHB LOSS OF OPTICAL POWER
4	LOSS OF RF SIGNAL
5	LOSS OF PILOT TONE
6	24VDC VOLTAGE ALARM
7	12VDC VOLTAGE ALARM
8	5VDC VOLTAGE ALARM

TABLE 2

LED#	COLOR	FUNCTION	LED ON WHEN...
1	OFF/RED_FLASH	● RF IN ALARM	See TABLE 3
2	OFF/RED_FLASH	● CHA LOSS	See TABLE 3
3	GREEN/RED	● AUTO GAIN CTRL	AGC – GREEN , MGC – RED
4	GREEN/OFF	● COM PORT	Transmitting Data via RS232/RS485 Port
5	GREEN/RED	● STATUS	See TABLE 3

TABLE 3

When any of the following alarm event occurs, the LCD display switch immediately to the M9 screen

Event	Condition	MSG#	LED#
NO ALARM		1	
CHA LOSS OF OPTICAL POWER	X< MIN_OPTICAL_LEVEL	2	2
CHB LOSS OF OPTICAL POWER	X< MIN_OPTICAL_LEVEL	3	5
LOSS OF RF SIGNAL	X<MIN_RF_LEVEL	4	1
LOSS OF PILOT TONE	X<MIN_PILOT_LEVEL	5	5
24VDC VOLTAGE ALARM	X< MIN_24VDC OR X>MAX_24VDC	6	5
12VDC VOLTAGE ALARM	X< MIN_12VDC OR X>MAX_12VDC	7	5
5VDC VOLTAGE ALARM	X< MIN_5VDC OR X>MAX_5VDC	8	5

Chapter 5 Status monitoring and communication interface

RS-485/RS-232 Commands

Table 1 below summarizes the commands available through the serial interface, and specifies the command message formats. The responses to different commands from the unit are given in the tables 2 through 5.

Please note that commands must be issued in **CAPITAL LETTERS**.

Command Type	Command Description	To unit	From unit
S	Return Status in LCD display format	AT: xxxx0S (See note)	See Table 2
A	Return Alarm Information In LCD display format	AT: xxxx0A	See Table 3
B	Return Status in binary format	AT: xxxx0B	See Table 4
C	Return Alarm Information In binary format	AT: xxxx0C	See Table 5

Note: The notation “xxxx” is the unit’s ID expressed in four hexadecimal characters. The MSB comes first and LSB follows last. In case when the ID is not known, “FFFF” can be used in its place. Since any unit would respond to this kind of “address-all” message, it is necessary to limit the reach of this address-all command to one and only one unit. The “xxxx” is followed by a zero and command type character.

The whole command string should be terminated with a Carry-Return code (0x0D in hexadecimal).

TABLE 1: Command List

The following table defines the response S format.

Each line is ended with one set of <Carriage Return> and <Line Feed>. The whole message block is terminated with TWO sets of <CR> and <LF> characters.

Line #	Heading (Column 1 – 16)	Alarm Indicator (note*) (column 17-19)	Value Display Format (column 20-30)	Unit (column 31-33)
1	OPT CHA		dd.d	mW and dBm
2	OPT CHB		dd.d	mW and dBm
3	RF LVL		+dd.d	dB
4	GAIN CTRL LVL		dd.d	V
5	12V CURRENT		dd.d	A
6	24V CURRENT		dd.d	A
7	24V DC		dd.d	V
8	12V DC		dd.d	V
9	5V DC		dd.d	V
10	ID CODE		FFFF	
11	FIRMWARE VER		d.dd	
12	<CR><LF><CR><LF>			

Note1: In normal condition, the alarm indicator field should remain blank.

Any “A” in the field indicates the associated value is in alarm condition.

Note2: In shutdown mode, the data in line 1 through 9 are invalid.

And for a single pump model, all pump2 entries are skipped.

Note3: ID CODE display FFFF for Hexadecimal.

TABLE 2: Response to Command S

The following table defines all types of alarm message used in the response A. One line of alarm text will be returned for each type of existing alarm(s) in the unit. Each line is ended with one set of <Carriage Return> and <Line Feed>, and the whole message block is terminated with TWO set of <CR><LF>.

Alarm #	Alarm Text (column 1-50)	Remark
1	NO ALARM	
2	CHA LOSS OF OPTICAL POWER	
3	CHB LOSS OF OPTICAL POWER	
4	LOSS OF RF SIGNAL	
5	LOSS OF PILOT TONE	
6	24VDC VOLTAGE ALARM	
7	12VDC VOLTAGE ALARM	
8	5VDC VOLTAGE ALARM	
9	24VDC CURRENT ALARM	
10	12VDC CURRENT ALARM	

TABLE 3: Response to Command A

The following table defines the response B format.

Byte #	Content	Translation formula	Remark
0	<C0>		Leading marker (C0 in hexadecimal)
1	OPT CHA	1 = 0.02 mW	Range: 0 – 255
2	OPT CHB	1 = 0.02 mW	Range: 0 – 255
3	RF LVL	Scalar 1=0.1dB	Range: (nagtive99) to 99
4	GAIN CTRL LVL	128 = 10 V	Range: 0 – 255

5	12V CURRENT	255 = 10A	Range: 0 – 255
6	24V CURRENT	255 = 10A	Range: 0 – 255
7	24V DC	102 = 24V	Range: 0 – 255
8	12V DC	102 = 12 V	Range: 0 – 255
9	5V DC	102 = 5 V	Range: 0 – 255
10	Firmware version, major	Binary (0-255)	Major revision number (equivalent to the first digit in display format)
11	Firmware version, minor	Binary (0-255)	Minor revision number (equivalent to the last two digits in display format)
12– 17	(reserved)		
18	<C1>		Trailing Marker (C1 in Hexadecimal)

TABLE 4: Response to Command B

The following table defines the response D format.

Byte #	Description	Bit Definition (note)	Remark
0	<C0>		Leading Marker, in hexadecimal
1	Channel A Optical Level status	B0: Loss channel A optical level alarm	
2	Channel B Optical Level status	B0: Loss channel A optical level alarm	
3	RF level Status	B0: Loss RF signal alarm	
4	Pilot Tone Status	B0: Loss Pilot alarm	
5	24V DC Supply Status	B0: 24V DC Voltage alarm	
6	12V DC Supply Status	B0:12V DC Voltage alarm	
7	5V DC Supply Status	B0: 5V DC Voltage alarm	
8	CURRENT (24V)	B0: 24V Current alarm	
9	CURRENT (12V)	B0: 12V Current alarm	
10-17	(reserved)		
18	<C1>		Trailing Marker, in hexadecimal

Note: 1. B0 = bit 0 (the LSB), B1 = bit 1, B2 = bit 2

2. Bit set = alarm, bit clear = no alarm

TABLE 5: Response for Command C

Chapter 6 Maintenance and Repair

Problem	Repair Procedure
POWER LED does not light, and the receiver does not work	<ol style="list-style-type: none"> 1) Inspect the rear panel AC POWER switch, make sure the switch is set to the [ON] position. 2) Inspect the physical condition of the AC POWER socket 3) Inspect the AC power cord, replace with new cord if damaged. 4) Inspect the AC fuse, if necessary replace with a new fuse with rating of 250V/3.15A. Do not use fuse with any other rating.
Output power level too low	<ol style="list-style-type: none"> 1) Inspect the connector; be sure to use the same type of connector (SC/APC or SC/PC). 2) Clean carefully the end face of the connector. 3) Check the AC supply voltage. If below 90 VAC, then the output power level will be below preset value 4) Open the connector panel; remove the internal connector, carefully clean the end face, then reinstall into the connector panel.
Displayed video signal deteriorates, excessive noise present	As above, handle fibers with care.
AGC function not work	1) Check the Pilot tone level, if the pilot is lower than normal, select MGC or RF AGC mode