OPERATION AND MAINTENANCE MANUAL
UPLINK POWER CONTROLLER
Model UPC-100-X/F
LNR Part Number 017389

Consisting of:
Model UPC-100M Microcontroller Unit *P/N 017253*
and
Model IF-70-ATT *and/or* IF-140-ATT IF Attenuator *P/N 015687*

LNR TrexCom

70 SUFFOLK COURT, HAUPPAUGE, NY 11788-3714 • TEL: 516-273-7111 • FAX: 516-761-5454
TECHNICAL SUPPORT: 1-888-567-7858

6/23/98

SAFETY REQUIREMENTS

Safety Precautions

Do not subject chassis to rain or moisture.

Inspect line cord and chassis for damage - If evident, repair before applying AC Power.

Do not remove top cover or attempt any servicing of this unit except

- By qualified trained personnel only.
- After reading service manual and schematics of AC Power distribution and wiring.

For electric shock protection, the AC cord plug should only be inserted into a power outlet that has a 3 wire protective ground contact.

Dangerous voltages are present at the power supply modules, the circuit breaker (on-off switch) terminals and at designated terminal strip TB1. Special caution should be observed when working in these areas.

Safeguards

Connect a ground strap from the equipment rack to the ground terminal at the rear of the chassis BEFORE the line cord is plugged in.

Do not connect the AC neutral or return to the chassis. This unit is designed for the AC power to be isolated from the chassis.

Unplug the AC line cord before covers are removed for servicing.

If on-off circuit breaker trips to off position, wait for 2 minutes before resetting (thermal delay). If the circuit breaker trips 2 times, remove the chassis for servicing.

IT Power Systems: Neutral may not be disconnected by switching power off. Unplug equipment prior to servicing.

TOLL-FREE NUMBER FOR LNR TECHNICAL SUPPORT

LNR TrexCom's US and Canadian customers can call a toll-free number for immediate technical support on all LNR products and systems.

1 888 LNR 7858
(1 888 567 7858)

Knowledgeable technicians and engineers will answer questions from 8am to 9pm weekdays Eastern US time. Outside of these hours messages will be taken for prompt attention the next business day. Overseas customers can get the same service by calling (1) 516 761 5567.

LNR TrexCom

70 SUFFOLK COURT   HAUPPAUGE, NY 11788-3714

TEL: 516-273-7111   FAX: 516-761-5454

TECHNICAL SUPPORT: 1-888-567-7858

Table of Contents

Table of Figures

Table of Tables

This section provides an overview of the UPC-100-X/F uplink power controller system consisting of a UPC-100M Uplink Power Controller and one to eight IF-70-ATT/IF-140-ATT IF Attenuators.

1.1 Overview

The UPC-100-X/F Power Controller System provides the capability of automatic control of transmit signal levels to compensate for rain fade and other local atmospheric conditions which may affect transmission.

The UPC-100-X/F Power Controller System consists of a The UPC-100M Microcontroller unit and one to eight IF Attenuator units. The IF Attenuator units can be either model number IF-70-ATT or model number IF-140-ATT which operate at 70 MHz or 140 MHz respectively. The UPC-100-X/F model number is used to identify the system configuration where the X refers to the number of attenuators and F refers to the frequency of operation of the attenuators. Example: A UPC-100-2/140 is a system with two IF attenuator model number IF-140-ATT with a UPC-100M controller.

In the automatic attenuation mode, the UPC-100-X/F's standard fade correction algorithm is open loop. In this mode, the unit receives an input voltage which corresponds to the downlink rain attenuation of a pilot signal. This analog input is converted to a digital signal, which interfaces to an internal microprocessor. The microprocessor processes the information via an application specific software algorithm and calculates an attenuation value which is output as a parallel binary data control word to an external attenuator in the uplink signal path. This process of adjustment of the attenuator allows uplink EIRP control in 0.25 dB steps. The UPC-100M can independently control up to eight attenuators with different transmit and receive frequencies.

The system can also be used in the manual attenuation mode. In this case, each attenuator can be set independently in 0.25 dB steps from 0 to 15.0 dB.

On the UPC-100M a port is available on the rear panel for monitor and control. In addition, a Form C relay contact closure is available as a summary alarm

indicator for fail safe operations on both the UPC-100M and the IF-70-ATT/IF-140-ATT.

There are several safety features built into the Uplink Power Microcontroller Unit in the Automatic mode. If the Beacon Receiver indicates to the UPC-100M that it has lost lock, the UPC-100M will set all eight attenuators to the clear sky attenuation value. To prevent rapid signal changes that are not due to rain fade such as antenna motion due to wind gusts, the UPC-100M will freeze the attenuation value if the input changes more than 2 dB in a one second period until further normal changes are detected at the input. (The maximum expected rate of change due to rain fade is 1dB/sec.) In addition, if a change of more than 1 dB occurs at the input during a one second period, the UPC-100M will slowly vary the attenuation values over several time periods until the system stabilizes.

1.2 Specifications

Table 1-1 lists the operating specifications of the Uplink Power Controller Model Number UPC-100M.

Table 1-2 lists the operating specifications of the UPC IF Attenuator Model Number IF-70-ATT / IF-140-ATT.

Table 1-1. UPLINK POWER CONTROLLER MODEL NUMBER UPC-100M SPECIFICATIONS

General	
Beacon Receiver Input	0 to 10 Volts
Programmable Beacon Slope	0.01 to 0.99 V/dB in 0.01 steps
Programmable Linearity	Linear
	Piecewise Linear, 3 slopes
Control modes	Manual
	Automatic Open Loop
	Automatic Closed Loop, optional
Remote M&C Port	
Interface	RS232 or RS485
Alarms	
Form C relay contact closure	Summary
Front Panel Status	Summary
Front Panel Display	+ 5V, +12V
Chassis	
Prime Power	85 to 264 VAC, 47 – 63 Hz, 40 W
Size	19.0" x 1.75" x 14.0"
Weight	6.5 lbs
Operating	
Temperature	0 to +40°C
Humidity	Up to 95% non-condensing
Storage	
Temperature	-18 to +50°C
Humidity	Up to 95% non-condensing

Figure 1-1:.The UPC-100M uplink power control controller unit

Figure 1-1. UPC-100M

**TABLE 1-2. UPC IF ATTENUATOR
MODEL NUMBERS IF-70-ATT and IF-140-ATT SPECIFICATIONS**

General	
Operating Frequencies	70 ±20 MHz 140 ±36 MHz
Attenuation Range	0 to 15 dB
Resolution	0.25 dB
Accuracy	±1.0 dB
Flatness	±0.10 dB
Insertion Loss	0 dB nominal
Intercept Point IP3	+8 dBm
Impedance In/Out	75 ohms
Return Loss In/Out(J2/J3)	20 dB
Attenuator Default Range	0-15 dB in 0.25 dB steps via front panel settings
ENVIRONMENT	
Operating Temperature	0° to 40° C
Relative Humidity	0% to 95% non-condensing
Storage Temperature	-30° to +80° C
Relative Humidity	0% to 100%
GENERAL	
Input Voltage	115/230 VAC ±10%
Line Power	50 Watts Max.
Frequency	47-63 Hz
Size	19" Wide x 9.5" Deep x 1.75" High
Weight	5 lbs.

The UPC-100 –X/F is designed to be installed in any standard 19 inch equipment cabinet or rack and requires 1RU (1.75 inches) mounting space vertically for each device in the system. Including cabling, a minimum of 17 inches of rack depth is required. The rear panel of the UPC-100M is designed to have AC power enter from the left when viewed from the rear of the unit. The units can be placed on a table or any other suitable surface if required.

> ❖ **WARNING:** There are no user configurable settings located inside the UPC-100M and IF Attenuator chassis. There is a potential shock hazard internally at the power supply module. **DO NOT** open the UPC-100-X/F chassis under any circumstances.

2.1 Unpacking

The UPC-100-X/F was carefully packaged to avoid damage and should arrive fully assembled from the factory. The package includes the following items for proper installation:

1. UPC-100M Unit and X number of IF Attenuators.
2. Installation and Operation Manual
3. 6 foot Power Cords with applicable connector

Carefully unpack the unit and ensure that all of the above items are in the carton. If the Prime AC power available at the installation site requires a different power cord/AC connector, then arrangements to receive the proper AC cord will be necessary before proceeding with the installation. The power supply of the UPC-100M is designed for universal applications (95 to 230 VAC). The prime power of the IF-70-ATT/IF-140-ATT is factory set and the applicable line cords should be used.

2.2 Installation

After unpacking the UPC-100-X/F, install it as follows:

1. Mount the UPC-100-X/F chassis in the assigned position of the equipment rack keeping the following considerations in mind:
    - Maintain ambient temperature between 10 and 40° C.
    - Provide adequate ventilation to the unit.
    - Keep units away from direct contact with rain, snow, wind or sun.
2. Connect the cables to the proper locations on the rear panel. Refer to Section 2.3 for connector pinouts and functions.
3. Connect the primary power cables to the power source. Review the front panel operation in Section 3 before turning the power switches on the unit on.

2.3 System Interconnections

The typical system interconnection is shown in Figure 2-1

FIGURE 2-1 UPC-100-X/F INTERCONNECT DIAGRAM

* NOTE: For single attenuator connection cable SK5692 may be substituted. Use of cable SK5692 limits the control capabilty of UPC-100M to one attenuator per connector on J1,J2, J3 and J4.
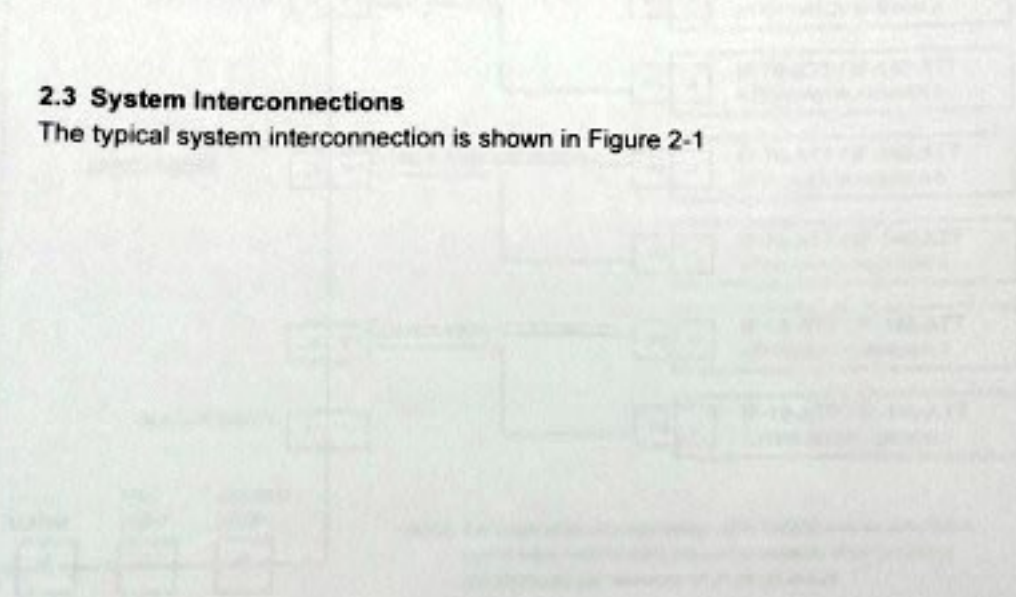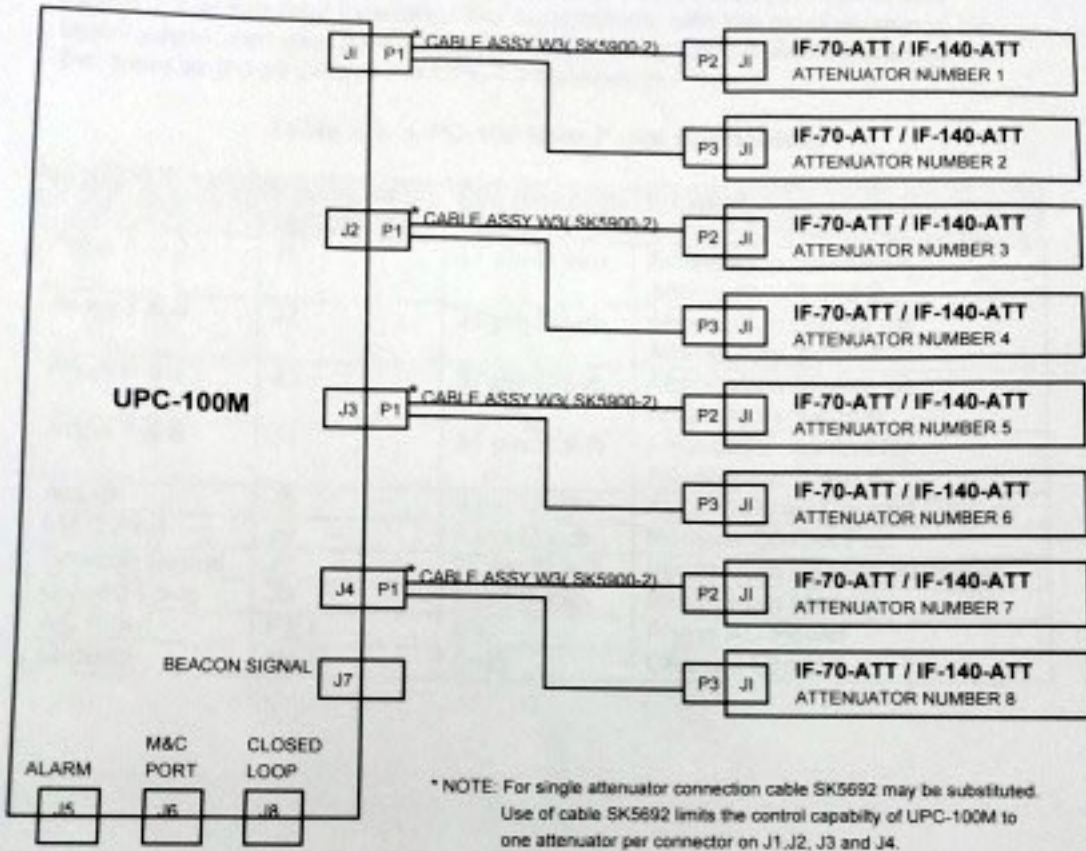
Figure 2-1 Interconnect Drawing UPC-100 System

M205017389

2.4 UPC-100M Connections

The rear panel connectors provide all necessary external connections between the UPC-100M and other equipment. Table 2-1 lists these connectors and Figure 2-2 shows their locations. For compatibility with the older version of the uplink power controller (UPC-70), the pinouts of the UPC-100M connectors are the same as the pinouts of the UPC-70 connectors.

Table 2-1. UPC-100 Rear Panel Connectors

Name	Reference Designation	Connector Type	Function
Atten 1 & 2	J1	37 pin D sub	Attenuation control for Attenuators 1 and 2
Atten 3 & 4	J2	37 pin D sub	Attenuation control for Attenuators 3 and 4
Atten 5 & 6	J3	37 pin D sub	Attenuation control for Attenuators 5 and 6
Atten 7 & 8	J4	37 pin D sub	Attenuation control for Attenuators 7 and 8
Alarm	J5	9 pin D sub	Form C Relay Contact Closure
M&C Port	J6	9 pin D sub	Remote Control Port
Beacon Signal	J7	25 pin D sub	Inputs from Beacon Receiver
Closed Loop	J8	9 pin D sub	Inputs from Modem
AC Input	PE1	IEC	Prime AC Power
Ground	None	Stud	Chassis Ground
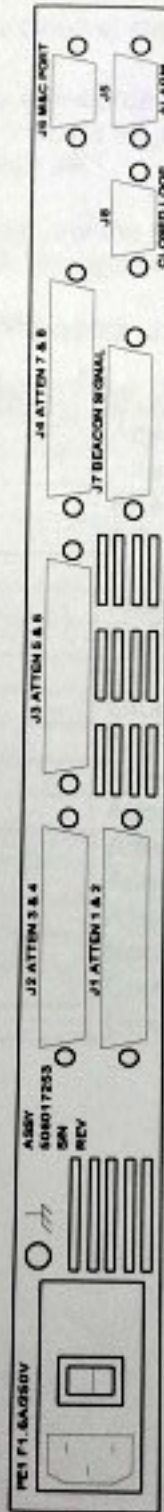
Figure 2-2. UPC-100M Rear Panel

2.4.1 UPC-100M Attenuator Control Connectors, J1, J2, J3 and J4

Each of the attenuator control connectors interfaces with up to two external attenuator units. The connectors are 37 pin female D subs. Tables 2-2 through 2-5 list the pinouts of J1 through J4.

A closure between the common and the normally closed pins indicates a "no-fault" status of the UPC-100M. An open indicates a fault condition.

Table 2-2. UPC-100M J1, Atten 1 & 2 Pinouts

Pin Number	Signal
10	Atten 1, 8.0 dB step
9	Atten 1, 4.0 dB step
8	Atten 1, 2.0 dB step
7	Atten 1, 1.0 dB step
6	Atten 1, 0.5 dB step
5	Atten 1, 0.25 dB step
20	Normally closed
18	Common
4	Ground
27	Atten 2, 8.0 dB step
26	Atten 2, 4.0 dB step
25	Atten 2, 2.0 dB step
24	Atten 2, 1.0 dB step
23	Atten 2, 0.5 dB step
22	Atten 2, 0.25 dB step
31	Normally closed
32	Common
21	Ground

Table 2-3. UPC-100M J2, Atten 3 & 4 Pinouts

Pin Number	Signal
10	Atten 3, 8.0 dB step
9	Atten 3, 4.0 dB step
8	Atten 3, 2.0 dB step
7	Atten 3, 1.0 dB step
6	Atten 3, 0.5 dB step
5	Atten 3, 0.25 dB step
20	Normally closed
18	Common
4	Ground
27	Atten 4, 8.0 dB step
26	Atten 4, 4.0 dB step
25	Atten 4, 2.0 dB step
24	Atten 4, 1.0 dB step
23	Atten 4, 0.5 dB step
22	Atten 4, 0.25 dB step
31	Normally closed
32	Common
21	Ground

Table 2-4. UPC-100M J3, Atten 5 & 6 Pinouts

Pin Number	Signal
10	Atten 5, 8.0 dB step
9	Atten 5, 4.0 dB step
8	Atten 5, 2.0 dB step
7	Atten 5, 1.0 dB step
6	Atten 5, 0.5 dB step
5	Atten 5, 0.25 dB step
20	Normally closed
18	Common
4	Ground
27	Atten 6, 8.0 dB step
26	Atten 6, 4.0 dB step
25	Atten 6, 2.0 dB step
24	Atten 6, 1.0 dB step
23	Atten 6, 0.5 dB step
22	Atten 6, 0.25 dB step
31	Normally closed
32	Common
21	Ground

Table 2-5. UPC-100M J4, Atten 7 & 8 Pinouts

Pin Number	Signal
10	Atten 7, 8.0 dB step
9	Atten 7, 4.0 dB step
8	Atten 7, 2.0 dB step
7	Atten 7, 1.0 dB step
6	Atten 7, 0.5 dB step
5	Atten 7, 0.25 dB step
20	Normally closed
18	Common
4	Ground
27	Atten 8, 8.0 dB step
26	Atten 8, 4.0 dB step
25	Atten 8, 2.0 dB step
24	Atten 8, 1.0 dB step
23	Atten 8, 0.5 dB step
22	Atten 8, 0.25 dB step
31	Normally closed
32	Common
21	Ground

2.4.2 UPC-100M Alarm Connector, J5

The alarm connector provides a summary Form C contact closure for fault reporting. The alarm connector is a 9 pin female D sub connector. A summary alarm is caused by a fault on either the +5 V or the +12 V power supplies. Table 2-6 indicates J5's pinouts.

Table 2-6. UPC-100M J5, Alarm Connector Pinouts

Pin Number	Signal
1	Common
3	Normally Open
7	Normally Closed

Note: A closure between the common and normally open contacts indicates no fault. A closure between the common and normally closed contacts indicates a fault.

2.4.3 UPC-100M M&C Port Connector, J6

The remote Monitor and Control (M&C) connector is a female 9 pin D sub. It is used as the interface between the UPC-100M and an external controller such as an M&C computer. Refer to Appendix A for a description of the remote protocol. Refer to Table 2-7 for the pinout information.

Table 2-7. UPC-100M J6, M&C Port Connector Pinouts

Pin Number	Signal, RS-232 Option	Signal, RS-485 Option
3	-	RX+
9	-	RX-
4	-	TX+
6	-	TX-
2	Tx	-
3	Rx	-
5	Ground	-

2.4.4 UPC-100M Beacon Signal Connector, J7

J7 is a 25 pin female D sub connector. It is the interface to the beacon receiver. Table 2-8 lists the pinouts for J7.

Table 2-8. J7, Beacon Signal Connector Pinouts

Pin Number	Signal
1	Beacon Ground
3	Beacon Voltage
5	Beacon Lock
7	+5V
9	Ground

Beacon Voltage is the signal that is proportional to the strength of the beacon signal from the satellite.

Beacon Ground is the ground return from the beacon receiver.

Beacon Lock indicates if the beacon receiver is locked on the satellite's beacon signal. A low on this pin shows that the beacon receiver is locked. A high or an open indicates that it is not locked and that the Beacon Voltage signal is not valid.

+5V and Ground are available from the UPC-100M.

2.4.5 UPC-100M Closed Loop Receiver Connector, J8, Optional

J8 is the optional interface to a modem for closed loop operation.

2.4.6 UPC-100M AC Input, PE1

A standard detachable, non-locking, three prong power cord (IEC plug) supplies the Alternating Current (AC) power to the UPC-100M. The normal input voltage range is 95 to 230 VAC, 50 to 60 Hz. The UPC-100M automatically switches between voltages in the range. Maximum power consumption is less than 40W.

2.4.7 UPC-100M Ground Connector

A stud on the rear panel of the UPC-100M is used for connecting a common chassis ground among all equipment.

2.5 IF-70-ATT/IF-140-ATT Connections

The rear panel connectors provide all necessary external connections between the IF-70-ATT/IF-140-ATT and other equipment. Table 2-9 lists these connectors and Figure 2-3 shows their locations.

Table 2-9. IF-70-ATT/IF-140-ATT Rear Panel Connectors

| Name	Reference Designation	Connector Type	Function
Control	J1	9 pin D sub	Attenuation control
IF Input	J2	BNC Female	IF signal input
IF Output	J3	BNC Female	IF signal output
Fault 1	J5	9 pin D sub	Form C Relay Contact Closure
Fault 2	J6	9 pin D sub	Form C Relay Contact Closure
AC Input		IEC	Prime AC Power
Ground	None	Stud	Chassis Ground

Figure 2-3. IF-70-ATT / IF-140-ATT Rear Panel

2.5.1 IF-70-ATT/ IF-140-ATT , Remote Control Interface Connector, J1

The remote control interface connector monitors a summary alarm contact closure for readiness/fault reporting of the UPC-100M in addition to providing external attenuation setting control. Table 2-10 indicates J1 pinouts.

Table 2-10. IF-70-ATT/IF-140-ATT
J1, Remote Control Interface Connector

Pin Number	Signal
1	Atten Step, 8.0 dB step (5V Atten. In, 0V Atten. Out)
2	Atten Step, 4.0 dB step (5V Atten. In, 0V Atten. Out)
3	Atten Step, 2.0 dB step (5V Atten. In, 0V Atten. Out)
4	Atten Step, 1.0 dB step (5V Atten. In, 0V Atten. Out)
5	Atten Step, 0.5 dB step (5V Atten. In, 0V Atten. Out)
6	Atten Step, 0.25 dB step (5V Atten. In, 0V Atten. Out)
7	Contact closure between pins 7 and 8 indicate No-
8	Fault status of UPC-100M to attenuator.
9	Ground

2.5.2 IF-70-ATT/ IF-140-ATT Alarm Connectors, J5 and J6

The alarm connector provides a summary Form C contact closure for fault reporting. The alarm connectors are 9 pin female D sub connector. A summary alarm is caused by a fault on the power supply. Table 2-11 indicates J5's and J6's pinouts.

Table 2-11. IF-70-ATT/IF-140-ATT
J5 and J6, Fault Interface Connectors

Pin Number	Signal
1	Common
2	Normally Closed
3	Normally Open

UPC-100M OPERATION

Operation of the UPC-100M consists of controlling the unit operating parameters and monitoring status responses via either the front panel or the remote M&C port. This section describes the front panel operation of the UPC-100M. Refer to Appendix A for remote control operation.

3.1 Front Panel

The UPC-100M front panel (Figure 3-1) enables the user to control the UPC-100M configuration parameters and displays the status via a keypad, an LCD display and status LEDs.
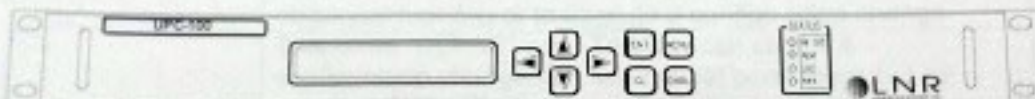
Figure 3-1. UPC-100M Front Panel

3.1.1 Front Panel LCD Display

The front panel display is a 2 line by 24 character display. The function on the top row of the display will be preceded by a flashing cursor. To change a parameter for that function, press ENT. An arrow next to the parameter to be changed will replace the flashing cursor. Use the [←] and the [→] to scroll to either the parameter to be changed or the value decimal place to be changed. Use the [↑] and the [↓] keys to change values or scroll through selections. Press ENT to enable the new selection or press CL or MENU to return the previous selection.

3.1.2 Front Panel Keypad

The front panel keypad permits local operation of the UPC-100M. The keypad consists of eight keys. (See Figure 3-2.)
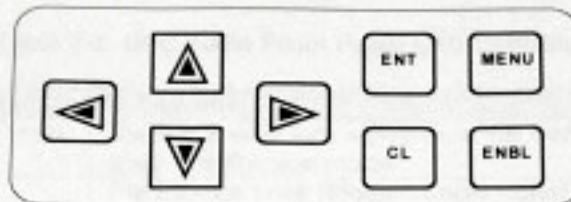
Figure 3-2. Keypad

Each key provides one or more logical functions. These functions are defined in Table 3-1.

Table 3-1. Keypad Functions

ENT	This is the "ENTER" key. This key is used to select a displayed function or to execute a configuration change.
CL	This is the "CLEAR" key. This key can cancel a configuration change that has not yet been executed by pressing ENT. CL is also used to go back to the previous menu.
MENU	The MENU key has the same functions as the CL key.
ENBL	Not used at this time.
Left and Right Arrow keys	These keys are used to move the cursor under the parameter value or to move to the next parameter on the line. **NOTE:** Throughout this section, [←] and [→] indicate the left and right arrow keys respectively.
Up and Down Arrow keys	These keys are used to scroll through the menus. They are also used to cycle through parameter selections and to increment and decrement parameter values. **NOTE:** Throughout this section, [↑] and [↓] indicate the up and the down arrow keys respectively.

3.1.3 Front Panel LED Indicators

There are four LEDs on the front panel to indicate the status of the UPC-100M operation. The condition of a LED (ON or OFF) and the color implies a specific meaning as defined in Table 3-2.

Table 3-2. UPC-100M Front Panel LED Definitions

Name	Status	Definition
RxSIG	On, Green	There is a valid lock signal from the Beacon Receiver when in automatic mode.
	Off	The Beacon Lock (Modem Lock) signal is not valid.
ALM	On, Red	There is a summary alarm in the unit. The actual fault can be viewed via the LCD display under the alarm menu.
	Off	The unit has no known faults.
LOC	On, Green	Indicates that the unit can be configured through the local front panel.
	Off	Indicates that the unit can be configured through the remote M&C port.
PWR	On, Green	Indicates the UPC-100M power is on.
	Off	Indicates the unit is off.

3.2 Menu System

On power up, the menu system displays the turn on message. The first line is the title of the unit and the second line is the version number of the firmware. The turn on message stays on the screen for a few seconds. The screen then displays either the automatic mode menu or the manual mode menu depending on the last mode that the unit was in when it was powered down.

Press [↑] or [↓] to scroll through the functions. To change a parameter setting, scroll the display until the function is on line 1 then press ENT to begin the change process. Press [←] or [→] to position the cursor under the parameter to be changed. Press [↑] or [↓] to change the parameter. After the display shows the correct parameter value, press ENT to execute the change. This action initiates the necessary programming by the UPC-100. To undo a parameter change before execution, press either the CL or the MENU keys.

To step back to the previous menu, press CL or MENU.

Figure 3-3 shows the menu tree organization for the automatic attenuation mode and Figure 3-4 shows the manual attenuation mode.
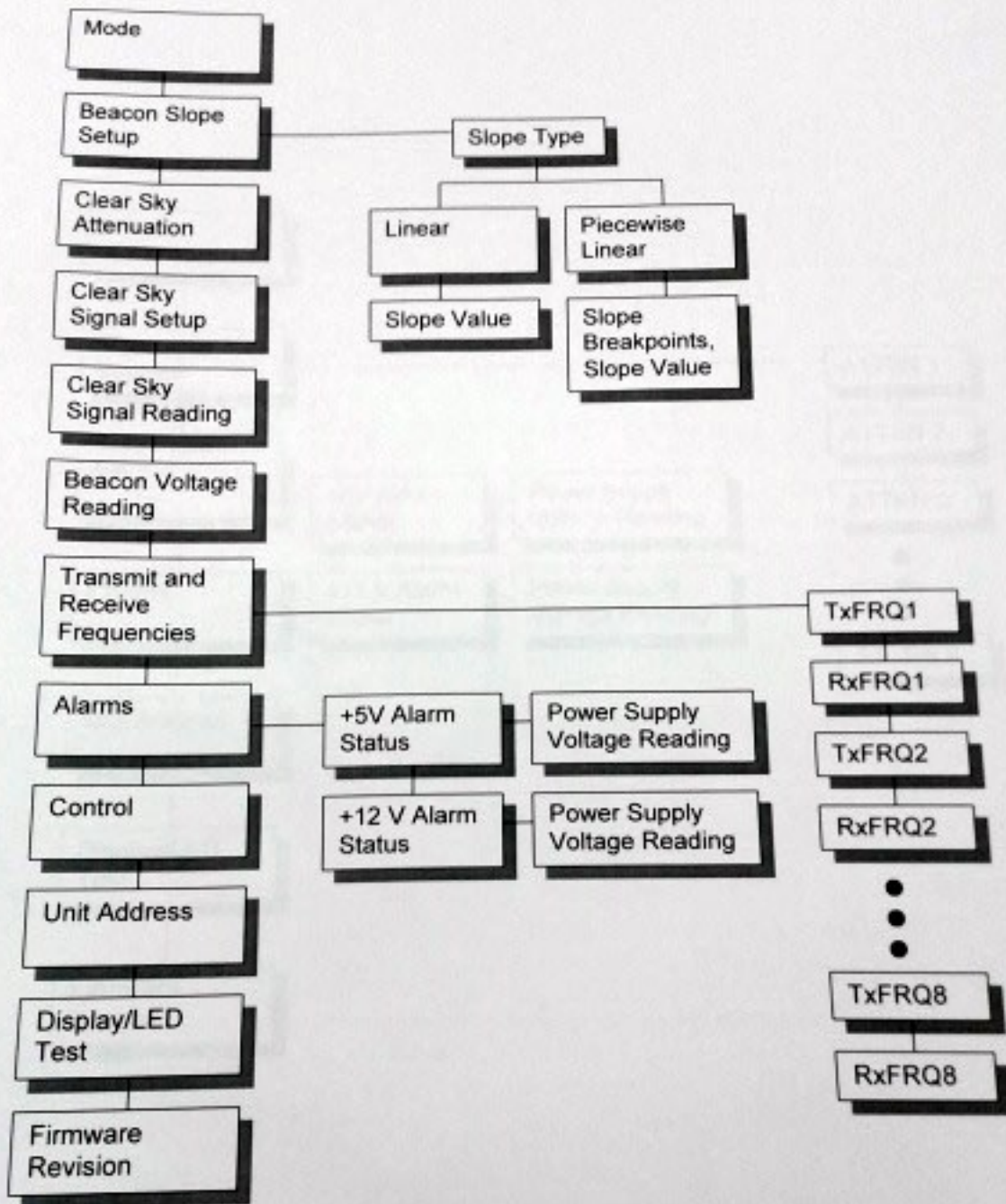
**Figure 3-3. Automatic Attenuation Mode Menu Tree**
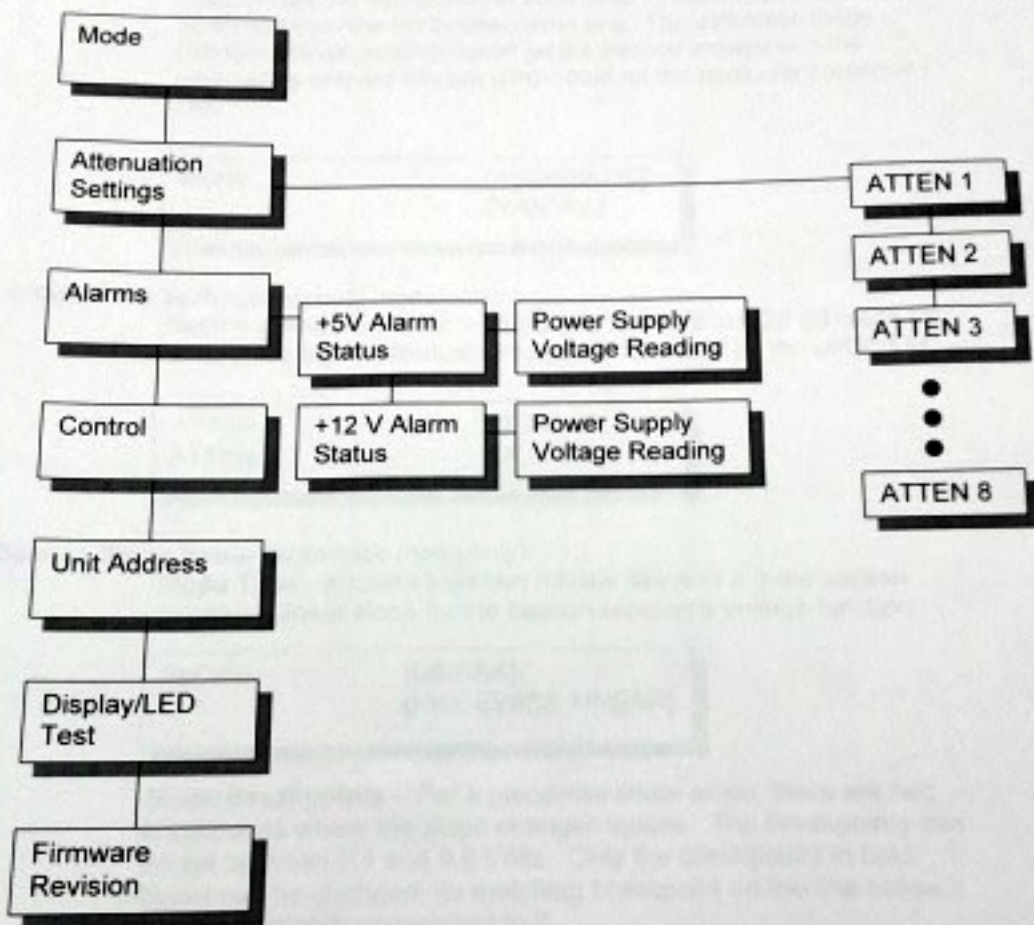
Figure 3-4. Manual Attenuation Mode Menu Tree

3.2.1 Functions

Mode:

> There are two modes of operation in the UPC-100M. The manual mode allows the attenuation of each of up to eight attenuators to be controlled from the front panel of the unit. The automatic mode changes the attenuation based on the beacon voltage and the parameters entered into the UPC-100M for the particular customer site.

MODE	{AUTOMATIC}
	{MANUAL}

Attenuation Settings (Manual mode only):

> Set the attenuation value from 0.00 to 15.00 dB in 0.25 dB steps for each of the eight individual attenuators controlled by the UPC-100M.

ATTEN 1	XX.XX dB
ATTEN 2	XX.XX dB

Beacon Slope Setup (Automatic mode only):

> **Slope Type** – Choose between a linear slope or a three section piecewise linear slope for the beacon receiver's voltage function.

SLOPE	{LINEAR}
	{PIECEWISE LINEAR}

> **Slope Breakpoints** – For a piecewise linear slope, there are two breakpoints where the slope changes values. The breakpoints can be set between 0.1 and 9.9 Volts. Only the breakpoints in bold below can be changed. Its matching breakpoint on the line below it will automatically correspond to it.

0.0 – $X.X$ Volts	0.10 V/dB
$X.X$ – $Y.Y$ Volts	0.50 V/dB
$Y.Y$ – 10.0 Volts	0.15 V/dB

> **Slope Value** – The actual value of the slope can be changed from 0.01 to 0.99 V/dB.

```
0.0 – 10.0 V                          0.XX V/dB
```

Clear Sky Attenuation (Automatic mode only):
   This is the setting for the attenuators when the beacon voltage is at
   its clear sky value. The range is 0.00 to 15.00 dB in 0.25 dB steps.

```
CLR SKY ATTN                 XX.XX dB
```

Clear Sky Signal Setup (Automatic mode only):
   Sets the clear sky voltage equal to the beacon voltage signal that is
   present on J7, pin 3 on the rear panel at the time ENT is pressed.

```
SET BEACON VOLT TO CLR SKY
VALUE.  PRESS ENT.
```

Clear Sky Signal Reading (Automatic mode only):
   Displays the value of the clear sky voltage on the front panel
   display. Status only.

```
CLR SKY SIG                  XX.X V
```

Beacon Voltage Reading (Automatic mode only):
   Displays the value of the beacon voltage on J7, pin 3. When the
   Beacon Lock signal indicates a failure, the front panel beacon
   voltage will be dashed. Status only.

```
BEACON VOLTAGE               XX.X V
```

Transmit and Receive Frequencies (Automatic mode only):
   The RF signal path frequencies are used in the fade correction
   algorithm to calculate the attenuation. The UPC-100M will accept
   frequencies from 3,400.000 to 30,500.000 MHz in 125 KHz steps.
   Each frequency pair corresponds to its attenuator; i.e. TxFRQ1 and

RxFRQ1 are used to calculate the attenuation value for attenuator 1. In most cases, the receive frequency will be the beacon frequency.

```
TxFRQ1              XX.XXX.XXX MHz
RxFRQ1              XX.XXX.XXX MHz
```

Alarms:

Displays the status of the individual alarms: +5V and +12V. To see the actual power supply voltages, scroll either one of the power supply status lines to the top line on the display and press ENT. Status only.

```
+ 5 Volt                    {PASS, FAIL}
+12 Volt                    {PASS, FAIL}
```

```
+5 Volt                        XX.XX V
+12 Volt                       XX.XX V
```

Control:

Enter the control mode, either local (front panel) or remote (M&C port).

```
Control                     {LOCAL}
                            {REMOTE}
```

Unit Address:

Enter the address of the chassis. The address can be between 0 and 255.

```
Unit Address                   XXX
```

Display/LED Test:

Press ENT to test the front panel display and the four status LEDs. All LEDs will light and all characters in the display will be written to in a series of screens of alternating "#"s and "•"s.

```
# # # # # # # # # # # #
# # # # # # # # # # # #
```

```
• • • • • • • • • • • •
• • • • • • • • • • • •
```

Firmware Revision:

Shows the firmware revision of the PROM in the UPC-100M. Status only.

```
Firmware Rev.                          X.XXX
```

4.1 Attenuator Operation

The LNR Model IF-70-ATT/ IF-140-ATT Attenuator is the accompanying attenuator for the LNR Model UPC-100M Uplink Power Controller. The unit accepts a 6 bit parallel binary control word from the UPC-100M and converts it into an analog voltage. This analog voltage is conditioned and linearized and is finally used to control a pin attenuator which provides the appropriate amount of attenuation.

The unit also accepts a contact closure from the UPC-100M to indicate fault status of the UPC-100M. If a fault is detected from the UPC-100M, the attenuator will default to the front panel settings. If the attenuator develops an internal fault, the unit will present a large amount of attenuation and effectively disable the link. Both the controller and attenuation status is displayed on the front panel for ease of use. See Figure 4-5, Front Panel Layout.

Two rear panel Form-C relay contact closures are provided to allow the unit to be taken off-line in case of a catastrophic failure as a summary alarm indicator for operation. See Section **4.1.2** Front Panel LED Indicators.

4.1.1 Front Panel Attenuation Switch Settings

While the IF-70-ATT/ IF-140-ATT Attenuator is connected to the UPC-100M the front panel manual attenuation switches are disabled. If the UPC-100M is not connected (or the UPC-100M is turned off) the IF-70-ATT/ IF-140-ATT Attenuator front panel attenuation switches are active. The switches allow the indicated attenuation value to be added or subtracted (IN or OUT respectively) from the IF signal path.

4.1.2 Front Panel LED Indicators

There are two LEDs on the front panel to indicate the status of the IF-70-ATT/ IF-140-ATT. The condition of a LED (ON or OFF) and the color implies a specific meaning as defined in Table 4-1.

Table 4-1. IF-70-ATT/ IF-140-ATT Front Panel LED Definitions

| Name	Status	Definition
Controller Status	Green	The UPC-100M is connected, functioning properly and has attenuator control.
	Red	The UPC-100M control is at fault and attenuation value is controlled via attenuator front panel switches.
Attenuator Status	Red	There is a summary alarm in the attenuator unit. The attenuation value has defaulted to maximum.
	Green	The attenuator is functioning within normal parameters.
A.C.PWR	On, Green	Indicates the IF Attenuator power is on.
	Off	Indicates the unit is off.
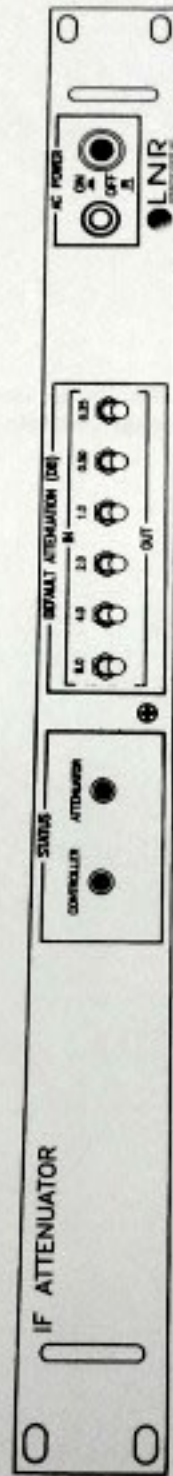
Figure 4-1. IF-70-ATT / IF-140-ATT Front Panel

SECTION 5.0

MAINTENANCE

The UPC-100-X/F components do not require scheduled field maintenance except to periodically check the blower intake and exhaust ports for blockage due to dust collection.

APPENDIX A

REMOTE CONTROL OPERATION

A.1 Description

An external Monitor and Control System can be used to remotely control the UPC-100M through the rear panel M&C port connector, J6. The remote interface accepts serial data according to RS-422A/RS485 standards (or optionally RS-232), checks the data for conformance to the protocol and parity definitions and commands the UPC-100M's microcontroller to perform the commands listed in section A.3. In addition, the remote interface confirms the execution of the commands by answering with the proper information requested.

A.1.1 Local/Remote Control Mode

The local or remote mode of operation is selectable from the front panel keypad/display. In local mode, all front panel operations are available while the remote interface has monitoring capability only. In the remote mode, the parameters that can be changed from the remote interface will not be controllable from the front panel. The front panel display will retain monitoring capability for these parameters.

A.1.2 Baud Rate

The baud rate of the UPC-100M is 9600.

A.1.3 Address Settings

The unit address of the UPC-100M can be set from the front panel. The address is an 8 bit binary number from 0 to 255.

A.1.4 Serial Data Character Format

The remote interface is designed to send and receive frame oriented serial data stream communications consisting of an 11 bit frame character block format. This serial data character format is illustrated below.
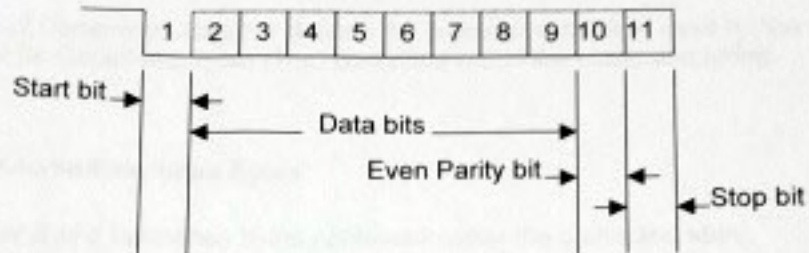
A.2 Protocol Structure

This protocol specification defines the character and message format that must be followed for control and monitoring of the UPC-100M.

All command strings issued by the Monitor & Control System are defined as follows:

Command Header	Address	Protocol Command	Command Byte 1	···	Command Byte n	LRC Byte
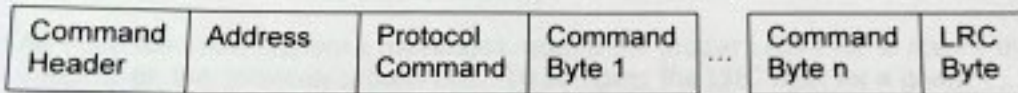
All response strings issued by the UPC-100M are defined as follows:

Response Header	Address	Protocol Command	Response Byte 1	···	Response Byte n	LRC Byte
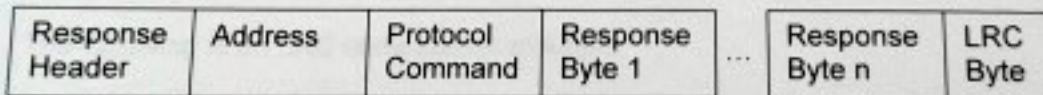
The following sections describe the character byte oriented protocol implemented within the UPC-100M's internal remote control firmware.

A.2.1 Command/Response Headers

Each command issued by the station controller must begin with a 01(Hex) Command Header character (CH) to signify the beginning of a command string. If the Device Address, Parity and LRC checks are valid, the UPC-100M will

immediately produce a response message string beginning with a 02 (Hex) Response Header character (RH).

A.2.2 Protocol Command Byte

The Protocol Command character defines the processing method used by the UPC-100M for Command Bytes (1- n) contained within the command string.

A.2.3 Command/Response Bytes

The Command and Response bytes contained within the command string provide the data required to carry out the command. These bytes vary in number depending on the respective command and are described in detail within the commands definition section.

A.2.4 LRC Byte

The parity and LRC (Longitudinal Redundancy Check) consistency checks are performed on all command messages received by the UPC-100M, and proper parity and LRC information is included in all messages it issues.

All command and response messages require the proper LRC byte to insure data integrity on the communications bus. To compute the LRC byte for a given command or response message simply *exclusive or* (XOR) each byte in the command or response message and assign the result as the last byte in the message string.

The following is an LRC computation example:

CH	AD	31	LRC

01	01	31

LRC byte = 01 (XOR) 01 (XOR) 31
LRC byte = 31

01	01	31	31

A.3 Configuration Commands/Response

The following protocol descriptions define the external communications bus commands that are issued by the operator's Monitor & Control System. These commands are validated and processed by the UPC-100M. The appropriate response will then be directed to the Monitor & Control System.

A.3.1 Switch Modes

This command switches the UPC-100M between the automatic and manual attenuation modes if the UPC-100M is in remote control.

Command Message:

CH	AD	53	MODE	LRC

MODE =	00	Automatic Attenuation
	01	Manual Attenuation

Response Message:

RH	AD	53	ACK	MODE	LRC

ACK =	00	Command valid
	FB	Invalid mode byte
	FD	Unit in local control mode

If the mode byte is invalid, the response message will contain −1 (in twos complement binary i.e. 1111,1111) in place of the mode byte.

A.3.2 Set Manual Attenuation

This command will store and set any one of the eight attenuations. The command is only valid when the unit is in manual attenuation mode and in remote control.

Command Message:

CH	AD	54	N1 N2	A1 A2	A3 A4	LRC

N1 N2 =	Attenuator number, 1 through 8, in binary coded decimal
A1 A2, A3 A4 =	Attenuation value in binary coded decimal

For example, to set Attenuator 4 to 7.75 dB, send the following:

CH	AD	54	04	07	75	LRC

Response Message:

RH	AD	54	ACK	N1 N2	A1 A2	A3 A4	LRC

ACK =

00	Command valid
FC	Unit in automatic attenuation mode
FD	Unit in local control mode
FE	Invalid attenuation value
FF	Invalid attenuator number

A.3.3 Read Automatic Attenuation, Alarms Status

This command reads the last automatic attenuation setting for the attenuator requested. It also provides information on the status of the individual alarms and the attenuation mode.

Command Message:

CH	AD	55	N1 N2	LRC

N1 N2 =   Attenuator number, 1 through 8, in binary coded decimal

Response Message:

RH	AD	55	ACK	STATUS	N1 N2	A1 A2	A3 A4	LRC

ACK =

00	Command valid
FF	Invalid attenuator number

A1 A2, A3 A4 =   Attenuation value in binary coded decimal
STATUS byte defined as follows:

Bit Position	"1"	"0"	Example
0	Summary Alarm	No Summary Alarm	0000,0001
1	+5 V Alarm	No +5 V Alarm	0000,0010
2	+12 V Alarm	No +12 V Alarm	0000,0100
3	Not used	Not used	-
4	Not used	Not used	-
5	Beacon locked	Beacon not locked	0010,0000
6	Not used	Not used	-
7	Manual Attenuation Mode	Automatic Attenuation Mode	1000,0000

A.3.4 Read Manual Attenuation, Alarms Status

This command reads the last manual attenuation setting for the attenuator requested. It also provides information on the status of the individual alarms and the attenuation mode.

Command Message:

CH	AD	56	N1 N2	LRC

N1 N2 =   Attenuator number, 1 through 8, in binary coded decimal

Response Message:

RH	AD	56	ACK	STATUS	N1 N2	A1 A2	A3 A4	LRC

ACK =   00   Command valid
               FF   Invalid attenuator number

A1 A2, A3 A4 =   Attenuation value in binary coded decimal

STATUS byte defined as follows:

Bit Position	"1"	"0"	Example
0	Summary Alarm	No Summary Alarm	0000,0001
1	+5 V Alarm	No +5 V Alarm	0000,0010
2	+12 V Alarm	No +12 V Alarm	0000,0100
3	Not used	Not used	-
4	Not used	Not used	-
5	Beacon locked	Beacon not locked	0010,0000
6	Not used	Not used	-
7	Manual Attenuation Mode	Automatic Attenuation Mode	1000,0000

APPENDIX B

CABLE DRAWINGS

B.1 Description

This appendix contains the information required to construct the UPC-100-X/F interconnecting cables P/N SK5692 and SK5900.

DASH NO.	APPLICATION			REVISIONS			
	NEXT ASSY	USED ON	LTR	DESCRIPTION		DATE	APPROVED
			A	Revised as of ECN 7503		5-19-96	F.F.

THIS DRAWING
INCOMPLETE
WITHOUT ECN'S

LTR																														
SHEET																														
LTR																														
SHEET	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
LTR	A	A																													
SHEET	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

ALL PAGES ARE OF
ORIGINAL ISSUE (A)
EXCEPT AS NOTED.

CONTR NO. 4010
PREP BY _____ 5/15
CHK BY
REVIEW
ENGR (PROJ)
1 S Avery 9/11
APPROVAL (PROJ)
APPROVAL (GOVT)

LNR COMMUNICATIONS, INC.

IF ATTENUATOR
"Y" CABLE ASSY.

SIZE **A**

CODE IDENT NO.

SK5900-X

SCALE

SHEET 1 OF 3

LENGTH TO BE SPECIFIED WITH PART NO.

	5	4	3	2	1	PART NO.	NOM/DESCRIPTION	SPEC/MTL	REF. DES.	PART #.	ITEM =.
				1	1		Label		W#P3		9
				1	1		Label		W#P2		8
				1	1		Label		W#P1		7
				AR	AR		Shrink Sleeve				6
				AR	AR	9540	Cable	Belden			5
				1	1	3357-9237	Junction Shell	3M			4
				2	2	3357-9202	Junction Shell	3M			3
				1	1	DCMA-37P	Conn 37 Pin Male	Cannon	P1		2
				2	2	DEMA-9P	Conn 9 Pin Male	Cannon	P2, P3		1
				X	–	SK5900-2	Cable Assy		W3		
					X	SK5900-1	Cable Assy		W19		--
	5	4	3	2	1	PART NO.	NOM/DESCRIPTION	SPEC/MTL	REF. DES.	PART #.	ITEM =.

LNR Communications Inc. 180 Marcus Blvd. Hauppauge. NY 11787	SIZE A	CODE IDENT NO. 51029	SK5900-X
	SCALE		SHEET 2 REV A

WIRE RUN LIST

FROM	TO	SIZE	WIRE COLOR	TYPE	FUNCTION/REMARKS
P1-4	P2-9	BLK			GND
P1-5	P2-6	BLUE			.25 dB
P1-6	P2-5	RED			.5 dB
P1-7	P2-4	GRN			1.0 dB
P1-8	P2-3	YEL			2.0 dB
P1-9	P2-2	BRN			4.0 B
P1-10	P2-1	VIO			8.0 dB
P1-18	P2-7	WHT			COM
P1-20	P2-8	GRY			N.C.
P1-21	P3-9	W/BLK			GND
P1-22	P3-6	W/BLU			.25 dB
P1-23	P3-5	W/RED			.50 dB
P1-24	P3-4	W/GRN			1.0 dB
P1-25	P3-3	W/YEL			2.0 dB
P1-26	P3-2	W/BRN			4.0 dB
P1-27	P3-1	W/VIO			8.0 dB
P1-31	P3-8	W/GRY			N.C.
P1-32	P3-7	W/ORG			COM

LNR Communications Inc. 180 Marcus Blvd. Hauppauge. NY 11787	SIZE A	CODE IDENT NO. 51029	SK5900-X
	SCALE		SHEET 3 REV A

DASH NO.	APPLICATION			REVISIONS				
	NEXT ASSY	USED ON	LTR	DESCRIPTION			DATE	APPROVED

THIS DRAWING
INCOMPLETE
WITHOUT ECN'S

LTR																													
SHEET																													
LTR																													
SHEET	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
LTR																													
SHEET	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

ALL PAGES ARE OF ORIGINAL ISSUE (A) EXCEPT AS NOTED.

CONTR NO. 3300
PREP BY PALMERI 9/93
CHK BY
REVIEW
ENGR (PROJ)
APPROVAL (PROJ)
APPROVAL (GOVT)

LNR COMMUNICATIONS, INC.

CABLE ASSY

MOBILE DATA AQUISITION UNIT, W20

SIZE	CODE IDENT NO.			
A			SK5692	
SCALE			SHEET 1 OF 3	

						PART NO.	NOM/DESCRIPTION	SPEC/MTL	REF.DES	PART NO.	ITEM #
				1			LABEL		W2002		12
				1			LABEL		W20P1		11
											10
					½	RNF100-1/2B	TUBING, SHRINK				9
					½	2172-1/2	NYLON JACKET				8
					½	24 ANG	WIRE				7
					2	D20419-16	SCREW LOCK ASSY	CANNON			6
					2	D20419-21	SCREW LOCK ASSY	CANNON			5
					1	DE 24657	CLAMP	CANNON			4
					1	DC 24660	CLAMP	CANNON			3
					1	DEMA-9P	9 PIN CONN MALE	CANNON	P2		2
					1	DCMA-37P	37 PIN CONN, MALE	CANNON	P1		1
				X		SK5692	CABLE ASSY				—

SIZE	CODE IDENT NO.			
A	51029	SK5692		
SCALE			SHEET 2	REV

LNR
COMMUNICATIONS, INC.
180 MARCUS BLVD.
HAUPPAUGE, N.Y. 11787

WIRE RUN LIST

FROM	TO	WIRE SIZE	WIRE COLOR	TYPE	FUNCTION/REMARKS
P1-4	P2-9	24 AWG			GND
P1-5	P2-6	24 AWG			.25 dB
P1-6	P2-5	24 AWG	-		.50 dB
P1-7	P2-4	24 AWG			1.0 dB
P1-8	P2-3	24 AWG			2.0 dB
P1-9	P2-2	24 AWG			4.0 dB
P1-10	P2-1	24 AWG			8.0 dB
P1-19	P2-7	24 AWG			COM.
P1-20	P2-8	24 AWG			N.C.

SIZE	CODE IDENT NO.		
A	51029		SK5692
SCALE			SHEET 3	REV