

UPLINK POWER CONTROL SYSTEM

SECTION 1

INTRODUCTION

1.1 GENERAL DESCRIPTION

1.1.1 PHYSICAL

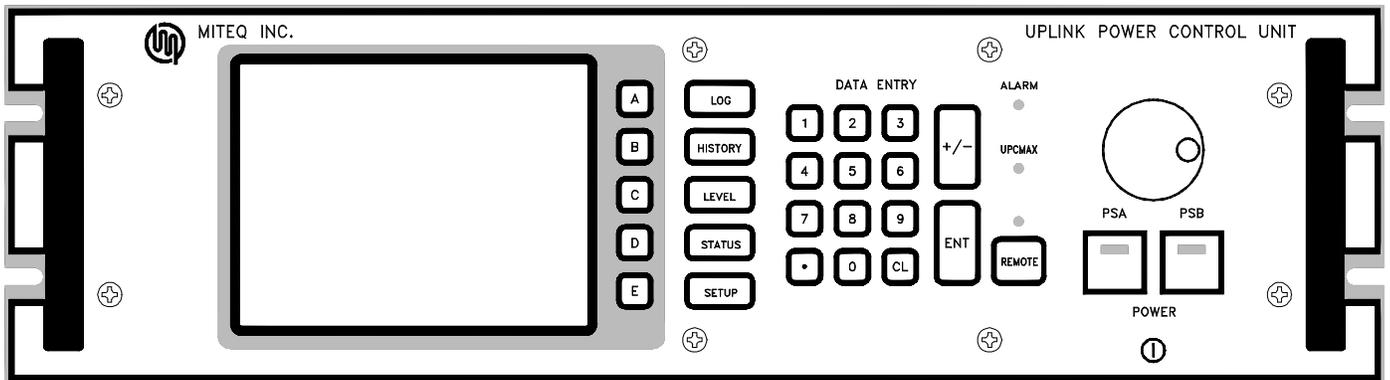


Figure 1-1. Front Panel, Uplink Power Control Unit

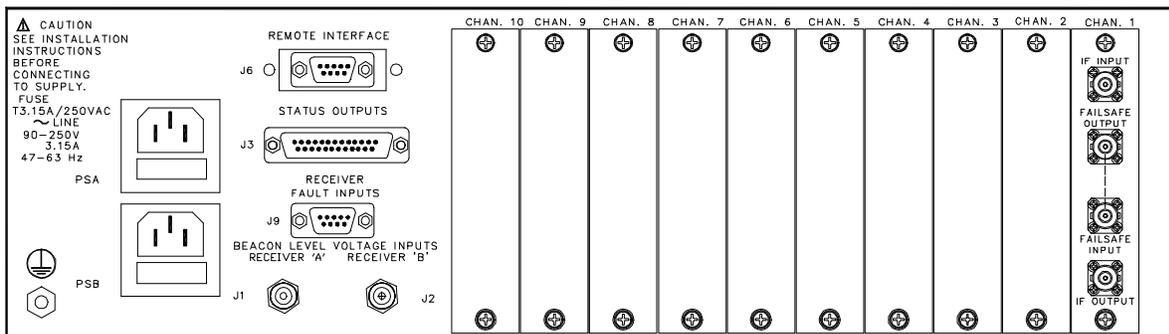


Figure 1-2. Rear Panel, Uplink Power Control Unit

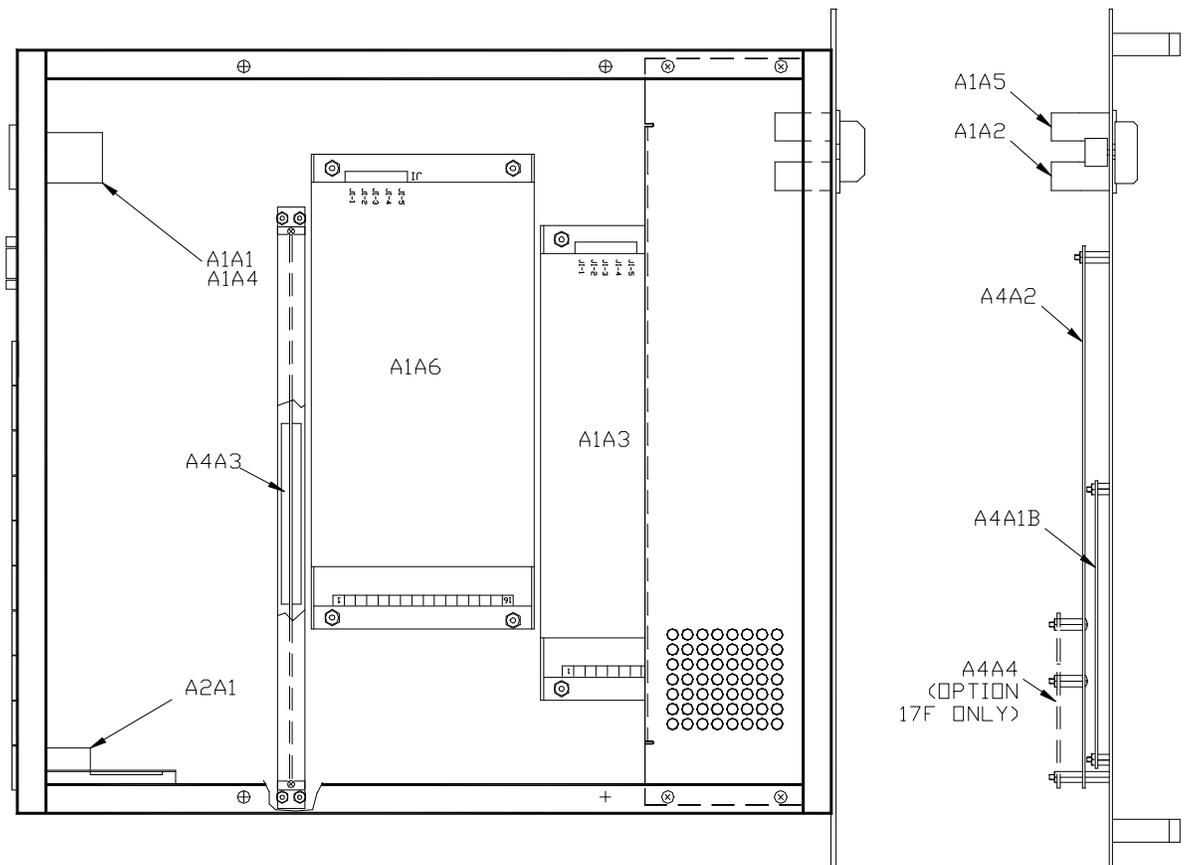


Figure 1-3. Interior View, Uplink Power Control Unit

1.1.2 FUNCTIONAL

The Uplink Power Control System (UPC) is a self-contained, rack-mountable unit designed for geostationary satellite communications systems. It adjusts the strength of uplink signals to compensate for varying weather conditions. The UPC can be set up completely from the front panel or over a remote bus via a host computer. All of the monitor and control functions are accessible at the front panel as well as over the remote bus.

An uplink signal transmitted from an RF terminal is subject to weather conditions that will affect signal strength received at the satellite. The UPC is designed to adjust uplink signal strength in order to minimize weather induced variations in signal strength received by geostationary satellites.

A customer-supplied external voltage proportional to the Downlink Signal Strength is used by the UPC to adjust the signal levels at the input of the RF terminal uplink. It is important to understand that the RF terminal uplink design should provide for linear operation throughout the adjustment range of the UPC. The external voltage is typically provided to the UPC from a Beacon Receiver. The received signal(s) can be either a telemetry beacon generated onboard the spacecraft or a carrier transmitted from the RF terminal and looped back from the satellite. An uplink and downlink at the same earth station are subject to the same weather. The

variation of the Downlink Signal Strength is monitored. The atmospheric effects on the uplink signal strength are then calculated and correction is applied.

A variable attenuator, located in the UPC, is used to adjust the uplink signal strength. A total of ten attenuator modules, each capable of providing up to 20 dB of uplink power correction, can be installed into the rear panel of the UPC. In the event of an attenuator fault or power loss to an attenuator the uplink signal will be switched to a fail-safe path with fixed attenuation.

1.2 EQUIPMENT CHARACTERISTICS

1.2.1 PHYSICAL

Weight.....	25 pounds nominal
Overall Dimensions	19" x 20" x 5.25" panel height
Signal path connectors	
UPC-A	BNC female
UPC-B	SMA female
Beacon level voltage inputs (J1, J2).....	BNC female
Receiver fault inputs (J9).....	DE-9P
Status outputs (J3)	DB-25P
Remote interface connector (J6)	
RS485, RS422	DE-9S
RS232	DE-9S
IEEE-488	IEEE-488 receptacle
Primary power input.....	IEC320

1.2.2 FUNCTIONAL

MODEL:	UPC-A	UPC-B
Frequency	50-180 MHz	950-1450 MHz
Insertion Loss at Minimum Attenuation	1.5 dB maximum	3.5 dB maximum
Attenuation Range	20 dB in 0.2 dB steps	20 dB in 0.2 dB steps
Amplitude Response -		
50-90 MHz	± 0.2 dB	N/A
100-180 MHz	± 0.25 dB	N/A
950-1450 MHz	N/A	± 0.5 dB
Input Return Loss	20 dB minimum	15 dB minimum
Output Return Loss	20 dB minimum	15 dB minimum
Input/Output Impedance	75 ohms (50 ohms optional)	50 ohms
Input Third Order Intercept Point	+28 dBm minimum	+28 dBm minimum
Power Output at 1 dB Compression Point	+18 dBm minimum	+18 dBm minimum
Failsafe Path Insertion Loss	1 dB maximum	2.5 dB maximum
Status Outputs	Contact closure for attenuator channel status and summary fault	
Remote Interface	User selectable RS485 or RS422.	
Beacon Level Voltage Input	0 to +10VDC or 0 to -10VDC	
Primary Power	90-250VAC	
Fuse	T3.15A (5 x 20mm)	

Status outputs connector, J3, pin designations are indicated in the table below.

STATUS OUTPUTS (J3)					
ATTENUATOR CHANNEL	PINS	STANDARD		OPTION 2	
		NORMAL	FAULT	NORMAL	FAULT
1	1, 14	CLOSED	OPEN	OPEN	CLOSED
2	2, 15	CLOSED	OPEN	OPEN	CLOSED
3	3, 16	CLOSED	OPEN	OPEN	CLOSED
4	4, 17	CLOSED	OPEN	OPEN	CLOSED
5	5, 18	CLOSED	OPEN	OPEN	CLOSED
6	6, 19	CLOSED	OPEN	OPEN	CLOSED
7	7, 20	CLOSED	OPEN	OPEN	CLOSED
8	8, 21	CLOSED	OPEN	OPEN	CLOSED
9	9, 22	CLOSED	OPEN	OPEN	CLOSED
10	10, 23	CLOSED	OPEN	OPEN	CLOSED
SUMMARY	12, 25	CLOSED	OPEN	CLOSED	OPEN
SUMMARY	13, 25	OPEN	CLOSED	OPEN	CLOSED

Remote Interface connector, J6, pin designations are indicated in the table below.

For RS485 two-wire party line operation, DATA IN + must be externally wired to DATA OUT +, and DATA IN - externally wired to DATA OUT -.

Units equipped with RS232 (Option 17C) are shipped with a jumper connecting RTS and CTS. See Figure 3-2 for the location of the jumper.

RS485 AND RS422 (J6)	
PIN	DESIGNATION
1	Ground
3	Data Out -
5	Data In -
7	Data Out +
9	Data In +

RS232 (J6)	
PIN	DESIGNATION
2	RCV Data
3	Tx Data
5	Ground
7	RTS
8	CTS

Receiver fault input connector, J9, pin designations are indicated in the table below.

The input fault indication is user-configurable as either a contact closure or a contact open.

RECEIVER FAULT INPUT CONNECTOR (J9)		
RECEIVER "A"		
FAULT	PINS	NOTE
CLOSURE	1, 3	DEFAULT
OPEN	1, 3	CONFIGURATION OPTION
RECEIVER "B"		
FAULT	PINS	NOTE
CLOSURE	4, 5	DEFAULT
OPEN	4, 5	CONFIGURATION OPTION

SECTION 2

PRINCIPLES OF OPERATION

2.1 DEFINITION OF TERMS

The terms and phrases below are used throughout the following discussion. Their use in this context is defined here for clarity.

Uplink Power Correction – Adjustments in transmitted signal strength made to compensate signal strength variations due to weather and to maintain a constant signal strength at the satellite. Variable attenuators are used in the UPC to provide *Uplink Power Correction*. When weather has little or no effect on signal strength, the UPC applies the greatest attenuation to uplink signals. As inclement weather reduces signal strength, the uplink attenuation applied by the UPC is reduced, compensating for the effects of the weather.

Attenuator Channel – A variable attenuator which is digitally controlled. The attenuator has a range of 20 dB adjustable in 0.2 dB increments. In the case of an attenuator fault or a power failure a fail-safe path provides fixed attenuation to avoid interruption of the uplink signal.

Downlink Signal Strength – The amplitude of a received beacon or a looped-back carrier. A DC voltage proportional to *Downlink Signal Strength* is output from a customer-supplied receiver and applied as an input to the UPC. The UPC always reports the *Downlink Signal Strength* relative to the Clear Sky Condition. For reference the UPC stores the last twenty-four hours of recorded receiver activity by averaging the data and saving the overall mean once every five minutes. This data can be viewed in the history screen or retrieved over the remote bus.

Clear Sky Condition – Occurs when weather conditions are such that 0 dB of Uplink Power Correction is required. The *Clear Sky Condition* is defined for each receiver based on Downlink Signal Strength. The *Clear Sky Condition* is selected from one of the calibrated Downlink Signal Strengths during the initial setup of the UPC. Each receiver enabled must have a *Clear Sky Condition* selected from the receiver calibration curve.

Clear Sky Attenuation – The maximum operating attenuation. An Attenuator Channel will apply *Clear Sky Attenuation* to provide 0 dB of Uplink Power Correction. This attenuation is applied when the Clear Sky Condition prevails. The *Clear Sky Attenuation* is adjustable for each Attenuator Channel. This also represents the total amount of Uplink Power Correction that can be applied by that channel. In other words, an Attenuator Channel with a *Clear Sky Attenuation* set at 10 dB can reduce the attenuation by up to 10 dB to correct uplink signal strength.

Maximum Attenuator Step Size – A limit to the change in attenuation that can occur as the result of each uplink power correction calculation per sample time.

Uplink Power Correction Algorithm – A technique used to calculate Uplink Power Correction based on measured Downlink Signal Strength. The UPC is equipped with three *Uplink Power Correction Algorithms*. They are Open-loop, Closed-loop, and Comparison. One of the three algorithms is chosen to determine the Uplink Power Correction for all of the Attenuator Channels.

Uplink Channel Power Ratio - The ratio of the uplink power correction to downlink signal strength attenuation experienced through a given atmosphere. The effects of atmospheric absorption, scintillation, rain rates, and the physical properties of precipitation will effect the uplink and downlink frequency bands differently. The calculation of an Uplink Power Correction is based on measured Downlink Signal Strength and a user-programmable *Uplink Channel Power Ratio*.

Attenuator Channel Operating Mode - Each Attenuator Channel must be placed into one of three operating modes. **Off-line** is the mode for Attenuator Channels not present or being serviced. **Manual** mode provides the operator with full control of the attenuation applied by an Attenuator Channel. **Automatic** mode places the UPC in control of the applied attenuation for a given Attenuator Channel.

Channel Impedance - The characteristic impedance of the Attenuator Channel input and output ports.

Open-loop Algorithm - An open loop technique of Uplink Power Correction for which the measured Downlink Signal Strength is not subject to the Uplink Power Corrections. Typically, a beacon from the spacecraft is monitored at the downlink. Uplink Power Correction is based on changes in the Downlink Signal Strength and the relationship between the uplink and downlink frequency bands.

Closed-loop Algorithm - A closed-loop technique for which the measured Downlink Signal Strength is subject to Uplink Power Corrections. Usually, a carrier is generated at the earth station, transmitted at the uplink, looped-back from the satellite, and monitored at the downlink. Uplink Power Correction is based on the looped-back carrier Downlink Signal Strength and the frequency relationship between the uplink and downlink bands.

Comparison Algorithm - This Uplink Power Correction Algorithm can be used when both a beacon and a looped-back carrier can be monitored. Uplink Power Correction is based on the difference between the Downlink Signal Strengths of the beacon and the looped-back carrier.

Closed-loop Feedback Attenuator Channel – Refers to the Attenuator Channel which includes the carrier that is corrected and looped-back to the uplink.

UPC MAX – Occurs when the Uplink Power Correction required by any Attenuator Channel has exceeded the correction capability of that channel. The *UPC MAX* LED on the front panel will light when any of the Attenuator Channels is in *UPC MAX*.

Sample Time - The time over which the Downlink Signal Strength measurements are averaged. This time period can range from 1 second to 10 seconds. *Sample Time* allows smoothing of measured Downlink Signal Strength data. A series of measurements is averaged and the Attenuator Channels are updated after every *Sample Time* period.

Idle Time Interval – Relevant to the Closed-loop algorithm, the *Idle Time Interval* is the minimum time period that will elapse between applying an Uplink Power Correction and initiating the next measurement of Downlink Signal Strength. This interval is intended to guarantee that any applied correction will be realized at the downlink prior to measuring the Downlink Signal Strength again. The *Idle Time Interval* is adjustable from 0.3 to 3.0 seconds in 0.1-second intervals.

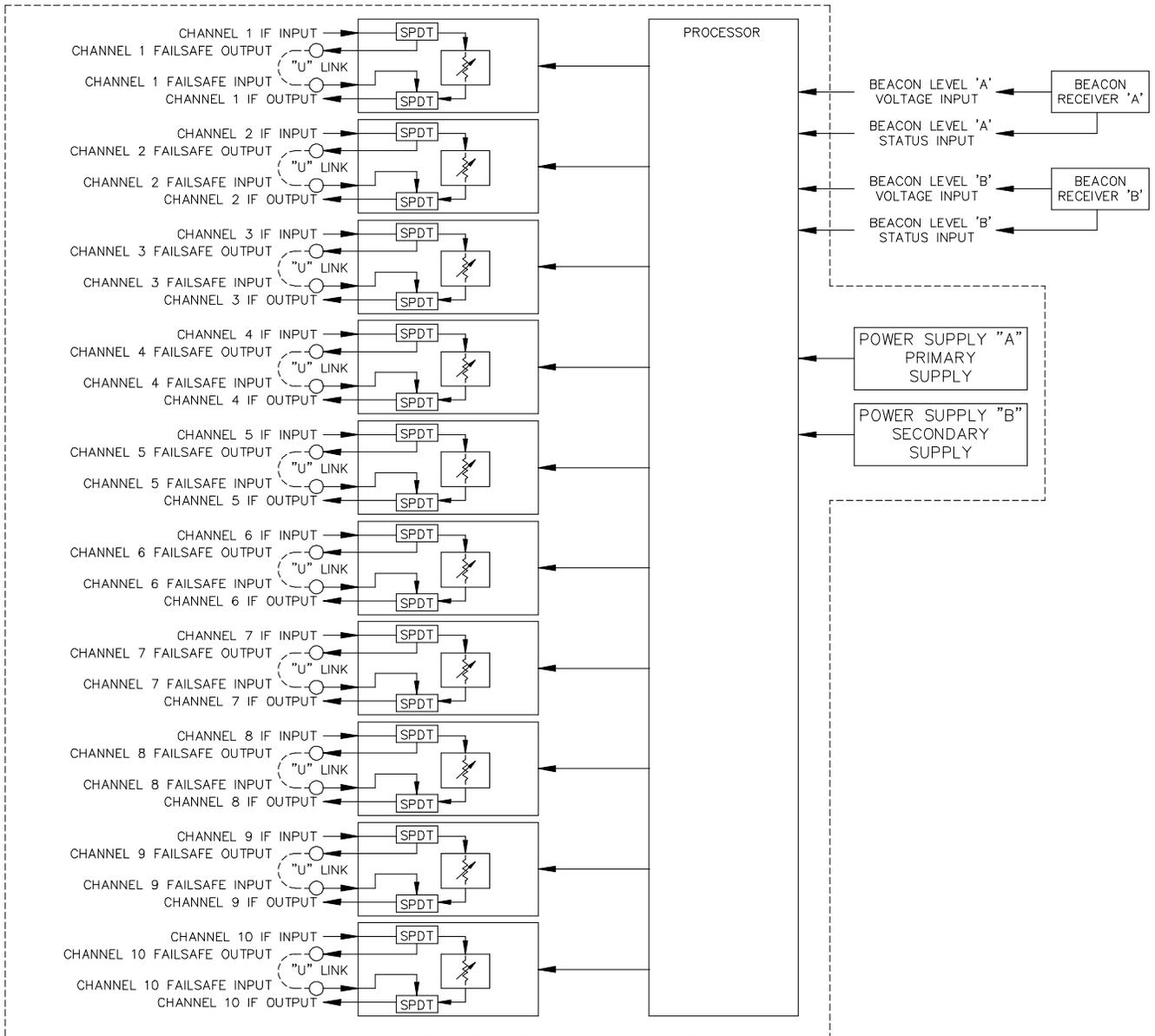


Figure 2-1. Functional Block Diagram

2.2 UPC PRINCIPLES OF OPERATION

Figure 2-1 depicts a simplified functional block diagram of the UPC. The receiver(s) may be either a beacon receiver or a downlink receiver tuned to a looped-back carrier. Some uplink stations may be equipped with more than one receiver. The UPC is supplied with two inputs — Beacon Level 'A' Voltage Input and Beacon Level 'B' Voltage Input — to monitor up to two downlink signals simultaneously. The input voltage range is selectable from either 0 to +10 volts or from 0 to -10 volts.

Calibration data for each receiver must be entered during the initial setup of the UPC. This data correlates the voltage output of the receiver to the Downlink Signal Strength in dB. The UPC monitors the DC voltage output of the receiver to determine Downlink Signal Strength. The Clear Sky Condition is user-selected from one of the calibrated points and represents the Downlink Signal Strength with minimum atmospheric attenuation. The Downlink Signal Strength is reported with reference to the Clear Sky Condition. When a Clear Sky Condition prevails, the Downlink Signal Strength will be reported as 0 dB. When the receiver output voltage indicates reduced signal strength, the UPC will report this as a negative number. For example, if the Downlink Signal Strength drops by 3 dB, the UPC will report the Downlink Signal Strength as -3 dB. If a situation occurs such that the receiver outputs a voltage that indicates Downlink Signal Strength greater than the Clear Sky Condition, the UPC will report this as a positive number. However, the correction applied will be the Clear Sky Condition value of 0 dB. By applying a selected algorithm, the required Uplink Power Correction is determined. The power levels of the Inputs are then corrected with the variable attenuators.

Depending on the application and the downlink signal(s) available, one of three Uplink Power Correction Algorithms can be selected: Open-loop, Closed-loop, or Comparison Algorithm. Each algorithm determines Uplink Power Correction based on measured Downlink Signal Strength. Below is a description of each.

2.3 OPEN-LOOP ALGORITHM PRINCIPLES OF OPERATION

The Open-loop Algorithm is an open-loop method of correction — that is, the Uplink Power Correction applied does not effect the measured Downlink Signal Strength. Downlink Signal Strength measurements are averaged and reported once every Sample Time period.

The user can select a Sample Time period from 1 to 10 seconds in 0.1-second intervals. The Sample Time allows smoothing of measured Downlink Signal Strength by averaging a series of measurement results before applying correction to each of the Attenuator Channels.

Uplink Power Corrections are made based on changes in the Downlink Signal Strength and the frequency relationship between the uplink and downlink frequency bands. The Open-loop Algorithm multiplies the measured Downlink Signal Strength by a programmable Uplink Channel Power Ratio once every Sample Time. The result is the Uplink Power Correction applied by an Attenuator Channel.

Uplink Channel Power Ratio = (Uplink Power Correction (dB)) / (Downlink Signal Strength (dB))

Uplink Power Correction (dB) = (Downlink Signal Strength (dB))*(Uplink Channel Power Ratio)

Channel Attenuation (dB) = Clear Sky Attenuation (dB) + Uplink Power Correction (dB)

2.4 CLOSED-LOOP ALGORITHM PRINCIPLES OF OPERATION

The Closed-loop Algorithm is a closed-loop method of correction. A carrier is transmitted at an uplink and looped back from the satellite to a downlink receiver at the same earth station. The signal measured at the downlink has been degraded twice, once on the uplink and again on the downlink. The result is aggregate signal strength consisting of uplink and downlink contributions. Although they experience the same atmosphere, the uplink and downlink frequencies themselves are not the same and therefore yield unequal contributions to aggregate signal strength measured at the downlink. The uplink correction is, therefore, based on the Downlink Signal Strength and the uplink and downlink frequencies.

In order to provide a closed loop, the carrier must experience the Uplink Power Correction applied to one of the Attenuator Channels. This Attenuator Channel is referred to as the Closed-loop Feedback Attenuator Channel. The user can select from any of the ten Attenuator Channels. The remaining Attenuator Channels are slaved to the performance of the Closed-loop Feedback Attenuator Channel.

Below are some definitions and the equation used to calculate Uplink Power Correction.

U is the Uplink Channel Power Ratio.

D is 1 minus the Uplink Channel Power Ratio.

U + D = 1, Hence **D = 1 - U**

R_{CS} is the Downlink Signal Strength (0 dB) during the Clear Sky Condition.

R_{DSS} represents the prevailing Downlink Signal Strength.

n is the Attenuator Channel number.

A_{CSn} is the Clear Sky Attenuation for the selected Attenuator Channel.

A_n is the prevailing attenuation applied by the selected Attenuator Channel.

C_n is the Uplink Power Correction to be applied to the selected Attenuator Channel.

$$C_n = U * (R_{CS} - R_{DSS}) + D * (A_{CSn} - A_n)$$

Following each uplink adjustment, the received level is not measured until a user-programmable time interval has expired. This period, referred to as the Idle Time Interval, can be set from 0.3 to 3.0 seconds in 0.1-second intervals. In order for the algorithm to be effective, the Idle Time Interval must meet or exceed the round-trip propagation time for the carrier. This ensures that, at the time of any sample, the previous correction is already realized at the downlink. After the Idle Time Interval has expired, the receiver output is measured repeatedly throughout the Sample Time.

The user can select a Sample Time from one to ten seconds in one-second intervals. This allows for averaging of the Downlink Signal Strength measurements.

2.5 COMPARISON ALGORITHM PRINCIPLES OF OPERATION

The Comparison Algorithm is superior to the Open-loop and Closed-loop algorithms for a number of reasons. The variations in IF-to-RF gains, which occur when uplink chains are switched, will be canceled out. The Open-loop and Closed-loop algorithms use a constant to represent uplink-to-downlink effects of atmospheric propagation. The ratio actually varies with rainfall rate and the nature of the precipitation. This error is canceled when using the Comparison Algorithm.

The Comparison Algorithm can be used when both a beacon and a looped-back carrier can be

monitored. The comparison is between two open-loop scenarios. In this case the looped-back carrier is not corrected and fed back to the uplink. Because the beacon is subject only to the downlink effects while the looped-back carrier is subject to both the uplink and the downlink, the difference in Downlink Signal Strengths can be attributed to the uplink. Uplink Power Corrections are based on differences between the Downlink Signal Strengths.

Receiver 'A' is allocated to the beacon.

Receiver 'B' is allocated to the looped-back carrier.

The Downlink Signal Strength of a telemetry beacon and a looped-back carrier are measured and averaged over a period of time. This period is referred to as the Sample Time and is programmable from 1 to 10 seconds in 0.1-second intervals.

2.6 RECEIVER REQUIREMENTS AND OPERATION WITH THE UPC

The UPC is supplied with two inputs — Beacon Level 'A' Voltage Input and Beacon Level 'B' Voltage Input — to monitor up to two downlink signals simultaneously. The UPC monitors the DC voltage output of a receiver to determine Downlink Signal Strength. Calibration data for each receiver must be entered during the initial setup of the UPC. This data correlates the voltage output of the receiver to the Downlink Signal Strength. The Clear Sky Condition is then selected from one of the calibrated points. This data can be entered directly from the front panel or over the remote bus. It is recommended that each system be setup by placing a step attenuator in series with the receiver and calibrating the inputs from maximum Downlink Signal Strength to 30 dB below maximum in 1 dB steps. The UPC will linearly interpolate between calibrated points. A negative or positive calibration slope is acceptable. However, the calibration data must be monotonic — that is, the input voltage must always increase or decrease as the Downlink Signal Strength decreases.

The input voltage range is selectable from either 0 to +10 volts or from 0 to -10 volts. It is advisable that the entire voltage range not be used at initial setup of the UPC to allow for other system variations, i.e., receiver temperature variation, antenna positioning, transmitter aging, or orbital changes of the satellite.

Contact closure status outputs from the receiver are monitored to determine receiver fault status. The fault detection is user-selectable as either closure-for-fault or open-for-fault.

The UPC is capable of monitoring two receivers simultaneously. The Open-loop and Closed-loop algorithms require only one receiver to provide Uplink Power Correction. For the Comparison Algorithm two receivers are required.

Each receiver must be placed into one of three receiver modes: **Active**, **Standby**, or **Off**. **Active** indicates that the receiver is being monitored to determine Uplink Power Correction. **Standby** indicates that the receiver is being monitored but is not being used to determine Uplink Power Correction. **Off** indicates that the receiver input is being ignored. Both receiver Inputs must be in **Active** mode when the Comparison Algorithm is selected. In Open-loop or Closed-loop operation, only one receiver Input can be in **Active** mode. In this case, if a second receiver is available, the second receiver can be placed in **Standby** mode to serve as a redundant receiver.

If a fault is detected on the **Active** receiver the UPC will automatically switch to the **Standby** receiver. If there is no second receiver the attenuation applied by each Attenuator Channel will remain unchanged.

A receiver that is not used should be set to **Off**. The table below shows the possible selections.

Correction Algorithm	Receiver 'A' Voltage Input	Receiver 'B' Voltage Input
Open-loop	Active / Standby / Off (Beacon)	Active / Standby / Off (Beacon)
Closed-loop	Active / Standby / Off (Carrier)	Active / Standby / Off (Carrier)
Comparison	Active Beacon	Active Looped-back Carrier

SECTION 3

INSTALLATION

3.1 UNPACKING, STORAGE, RESHIPMENT

Carefully open the shipping container and remove the equipment. Inspect the equipment thoroughly and report any damage.

If the equipment is to be stored, it should be wrapped in plastic and kept in a clean, dry place.

If the equipment is to be reshipped for any reason, wrap in heavy plastic and ship in a heavy (275 lb. test) double wall carton. At least three inches of a solid packing material should be used on all sides of the unit. The carton should be marked to indicate that it contains fragile electronic equipment.

3.2 MOUNTING

THIS EQUIPMENT IS NOT FOR USE IN A DOMESTIC ENVIRONMENT.

THIS EQUIPMENT IS INTENDED FOR RACK MOUNTING.

OPERATOR INJURY MAY OCCUR IF UNIT IS NOT PROPERLY MOUNTED.

THIS EQUIPMENT MUST BE SECURELY MOUNTED.

Slides are provided for mounting in a standard 19" equipment rack.

3.3 TURN-ON PROCEDURE

After mounting, make all external connections per Table 3-1.

Apply power to the equipment by depressing the front panel power On/Off switch(es).

System is now operational.

Table 3-1. External Connections

DESIGNATION	DESCRIPTION
Ground Lug	Connect the Ground Lug on the rear panel of the equipment to the Protective Earth connection of the building.
Power Cords	Attach power cords to the rear panel AC power inlets marked "PSA" and "PSB". Connect the other end to the power source. Refer to national wiring standards for the correct connection to the power source.
Beacon Level "A" Voltage Input Connectors (J1)	Connect the Beacon "A" DC voltage output J1. The UPC must be supplied with a voltage input from either Beacon Level "A" or Beacon Level "B" for the UPC to function. If the Comparison Algorithm is used, both Beacon Level "A" and Beacon Level "B" must be supplied.
Beacon Level "B" Voltage Input Connectors (J2)	Connect the Beacon "B" DC voltage output J2. The UPC must be supplied with a voltage input from either Beacon Level "A" or Beacon Level "B" for the UPC to function. If the Comparison Algorithm is used, both Beacon Level "A" and Beacon Level "B" must be supplied.
Receiver Fault Inputs Connector (J9)	The Receiver Fault Input connector is connected to the contact closure status outputs from the receiver. See Paragraph 1.2.2 for wiring information.
Status Outputs Connector (J3)	The Status output connector is a contact closure status output indicating the status of the Attenuator Channels and provides a summary alarm output for the UPC. See Paragraph 1.2.2 for wiring information.
Remote Interface Connector (J6)	The Remote Interface connector is an optional connection. This allows the operator to monitor and control the equipment from a remote location. See Paragraph 1.2.2 for wiring information.
Input Signal Connectors	Connect the input signal to the rear panel Input connector.
Output Signal Connectors	Connect the output signal to the rear panel Output connector.

SECTION 4

CONFIGURATION AND SETUP OF THE UPC

4.1 CONFIGURING THE UPC

The UPC must be configured to accommodate the intended application. It is recommended that the steps outlined in this section be followed to configure the unit properly.

First, the date and time should be set properly. The Uplink Power Correction Algorithm must then be selected. Next, the receivers must be set properly and calibrated. Each of the Attenuator Channels must then be configured. Finally the remote communications parameters must be setup.

The configuration of the UPC can be done from the front panel via the Setup Screen as outlined below. If the UPC is to be configured remotely, set the remote parameters first then use the remote commands corresponding to the steps below.

4.2 SETUP SCREEN

The Setup Screen provides information and allows data entry for the initial setup and maintenance of the UPC. A brief summary of the setup is displayed on the setup screen. Each of the soft-keys, labeled "A" through "E", provides access to a group of related settings presented in a subscreen. It is from these subscreens that the setup parameters can be changed. These settings can also be changed over the remote bus.

To display the Setup Screen, press the "SETUP" key.

JAN 20 1998 16:16						SETUP SCREEN		SYSTEM SETTINGS	A
CORRECTION ALGORITHM: OPEN-LOOP									
SAMPLE TIME: 1.0 SECONDS									
RECEIVER INPUTS								RCVR 'A' INPUT	B
RECEIVER 'A' ACTIVE CAL'D JAN 10 1998									
RECEIVER 'B' STANDBY CAL'D JAN 10 1998									
ATTENUATOR CHANNELS								RCVR 'B' INPUT	C
CHANNEL	1	2	3	4	5				
OPER. MODE	AUTO	AUTO	MAN	MAN	MAN				
POWER RATIO	1.6	1.6	1.4	1.4	1.6				
CLEAR SKY	15.0	13.5	15.0	15.0	15.0				
CHANNEL	6	7	8	9	10			ATTENUATOR CONFIG.	D
OPER. MODE	OFF	OFF	OFF	OFF	OFF				
POWER RATIO									
CLEAR SKY									
REMOTE								REMOTE COMMUN	E
BUS: RS485									
ADDRESS: 65						ROTATE SCROLL-KNOB TO ADJUST VIEWING ANGLE			
BAUD RATE: 9600									
PARITY: ODD									

4.2.1 SYSTEM SETTINGS

The System Settings Subscreen allows the operator to set the date and time, select the Uplink Power Correction Algorithm, and set the relevant variables to accommodate the Uplink Power Correction Algorithm.

To display the System Settings Subscreen, from the Setup Screen, press the “A” soft-key.

JAN 20 1998 16:16		DATE & TIME	A
SYSTEM SETTINGS			
CORRECTION ALGORITHM:	CLOSED-LOOP	UPLINK POWER CORRECTION ALGORITHM	B
SAMPLE TIME:	1.0 SECONDS	SAMPLE TIME	C
IDLE TIME INTERVAL:	0.3 SECONDS	IDLE TIME INTERVAL	D
CLOSED LOOP CHANNEL:	1	CLOSED LOOPED CHANNEL	E

4.2.1.1 Date and Time

To set the date or time from the System Settings Subscreen, press the “A” soft-key. The month field will be highlighted in the upper left corner of the screen. Turn the scroll-knob until the proper month is displayed and press the “A” soft-key to set the month; the highlight will move to the day-of-the-month field. Continue through each field, then press “ENT” to set the date and time. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.1.2 Correction Algorithm

To change the Uplink Power Correction Algorithm, from the System Settings Subscreen, press the “B” soft-key and the algorithm field will become highlighted. Use the scroll-knob to scroll through the list of available Uplink Power Correction Algorithms. Press “ENT” when the desired setting is displayed. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.1.3 Sample Time

To change the Sample Time, from the System Settings Subscreen, press the “C” soft-key and the Sample Time will become highlighted. Use the scroll-knob to adjust the displayed Sample Time. Press “ENT” when the desired setting is displayed. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.1.4 Idle Time Interval (Closed-loop Algorithm Only)

To change the Idle Time Interval, from the System Settings Subscreen, press the “D” soft-key and the Idle Time Interval field will become highlighted. Use the scroll-knob to adjust the displayed value. Press “ENT” to save the displayed setting. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.1.5 Closed-loop Channel (Closed-loop Algorithm Only)

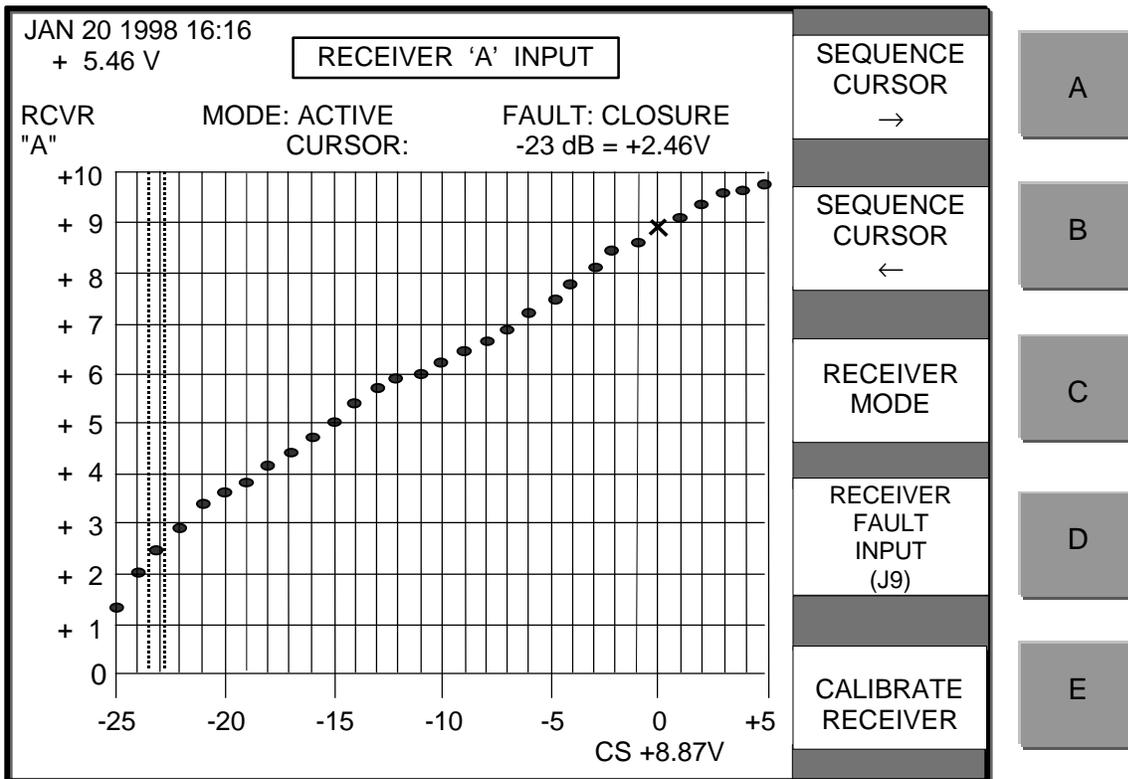
To select an Attenuator Channel as the Closed-loop Feedback Attenuator Channel, from the System Settings Subscreen, press the “E” soft-key; the Closed-loop Feedback Attenuator Channel field will become highlighted. Use the scroll-knob to adjust the displayed value. Press “ENT” to save the displayed setting. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.2 RECEIVER SETTINGS

The Receiver 'A' Input Subscreen and the Receiver 'B' Input Subscreen both operate in the same fashion. Both Receiver Input Subscreens provide the operator access to the setup and calibration of the Receiver Voltage Inputs. The Receiver Mode and Fault Input Configuration are displayed directly below the screen title. The calibration data is presented as a graph of signal strength versus the voltage (V) applied to the Receiver Voltage Input. The selected voltage range is the vertical axis of the graph. The actual voltage from the receiver is measured and displayed directly below the date and time. The receiver input can be calibrated over a range of 30 dB. The Clear Sky Condition is reported below the graph. If the Clear Sky Condition is selected from one of the calibrated points, this point will be identified with an "X" on the graph. The Receiver Input Subscreen is illustrated and described below.

4.2.2.1 Receiver Input

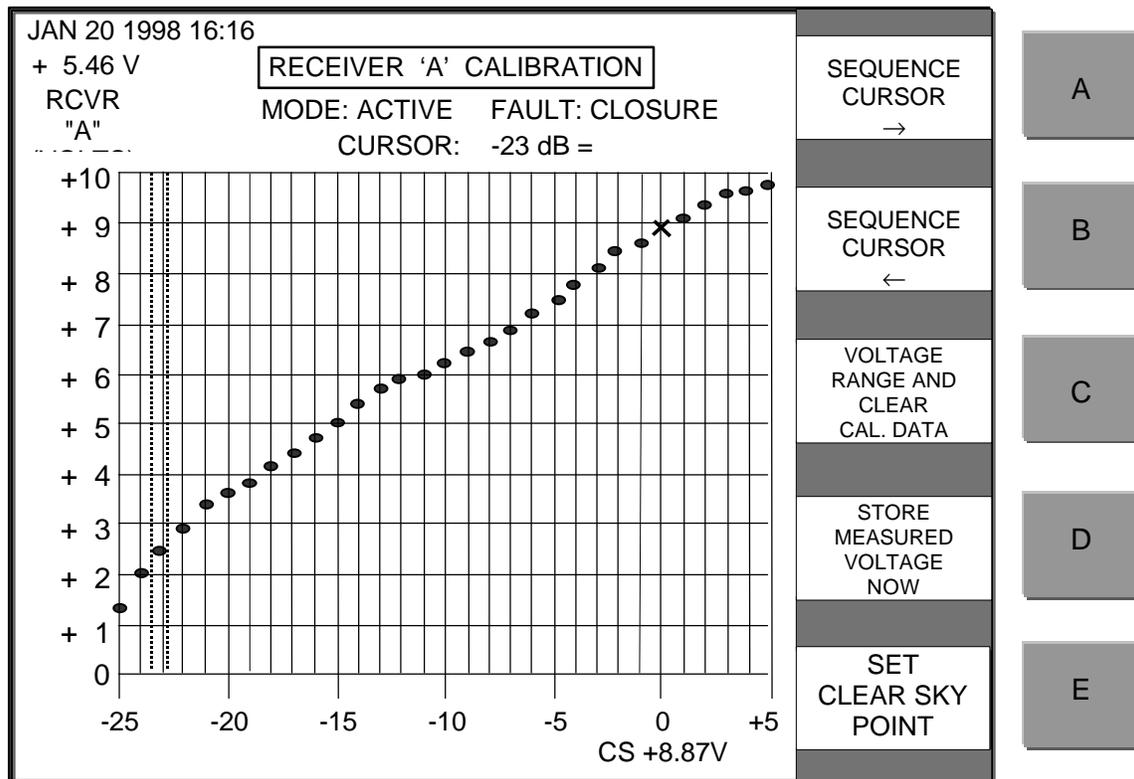
To display the Receiver 'A' Input Subscreen, from the SETUP Screen, press "B" soft-key. To display the Receiver 'B' Input Subscreen, from the SETUP Screen, press "C" soft-key.



The "A" and "B" soft-keys will sequence the vertical cursor to the right and left respectively throughout the Downlink Signal Strength range in 1 dB increments. The Downlink Signal Strength and voltage associated with the cursor position appear directly above the graph.

4.2.2.1.1 Receiver Calibration

The Receiver Calibration Subscreens provide the operator with access to the calibration data of the Receiver Voltage Inputs. The data is presented as a graph of signal strength versus the voltage (V) applied to the Receiver Voltage Input. The Receiver Voltage Input can operate from 0 to +10 Volts or from 0 to -10 Volts. The actual voltage from the receiver is measured and displayed directly below the date and time. The receiver input can be calibrated over a range of 30 dB. The calibration data is arranged in a series of points from minimum to maximum Downlink Signal Strength in 1 dB increments. One of the thirty-one points is user-selected as the Clear Sky Condition. It is recommended that all thirty-one points are calibrated, however, this is not necessary. The prevailing Downlink Signal Strength is calculated by linearly interpolating between calibrated points. Calibrated steps are denoted as a point on the graph. The Clear Sky Condition is reported below the graph. If the Clear Sky Condition is selected from one of the calibrated points, this point will be identified with an "X" on the graph. The calibration curve must be monotonic (the calibrated points must be continuously increasing or decreasing). The Receiver Calibration Subscreen is illustrated and described below.



4.2.2.1.1.1 Entering A New Receiver Calibration Curve

When entering a new calibration curve, the existing data is cleared.

To enter a new calibration curve for the Receiver Voltage Input press the "E" soft-key to access the Receiver Calibration Subscreen and proceed as follows:

1. Place a 30 dB step attenuator in line with the receiver. It is recommended that the calibration data be measured with a 30 dB step attenuator in line with the receiver. However, if the data is known, it can be entered numerically and this step can be

- skipped.
2. Press the “C” soft-key. The following warning will appear: “WARNING – selecting a voltage range will also erase all existing calibration data.”
 3. Rotate the Scroll-knob until the desired voltage range is highlighted
 4. Press “ENT” to select the voltage range and to clear the current calibration data from memory. The cursor will now be in the maximum Downlink Signal Strength position.
 5. If the Receiver Input Voltage associated with the cursor position is unknown it must be measured and saved. To measure the voltage, step the attenuator to apply the proper signal strength to the receiver. Then press the “D” soft-key and the measured input voltage, displayed below the date and time, will be saved and the cursor will move to the next position.
 6. If the Receiver Input Voltage associated with the cursor position is known then it can be entered numerically and saved. To enter the voltage numerically, rotate the scroll-knob until the desired voltage is displayed above the graph. Press the “ENT” key to save it and the cursor will move to the next position.
 7. Repeat steps 5 or 6 until all points have been calibrated.
 8. Use the “A” or “B” soft-key to position the cursor on the Downlink Strength that represents the Clear Sky Condition.
 9. Press the “E” soft-key. The following message will appear: “PRESS ‘ENT’ TO SET CLEAR SKY”
 10. Press “ENT” to save the Clear Sky Condition. If the “ENT” key is not pressed within ten seconds, the message will expire, an error tone will sound, and the Clear Sky Condition will remain unchanged.
 11. The receiver calibration is now completed. The Receiver Mode is set to OFF. To change the Receiver Mode see Paragraph 4.2.2.1.2.

4.2.2.1.1.2 Adjusting A Calibration Point

The voltage associated with a specific Downlink Signal Strength can be adjusted by either entering the voltage numerically or by measuring and recording the voltage applied at the input.

To adjust a point on the receiver calibration curve:

1. From the Receiver Calibration subscreen: Position the cursor at the Downlink Signal Strength to be adjusted by using the “A” or “B” soft-key.
2. To enter the voltage numerically, rotate the scroll-knob until the desired voltage is displayed and press the “ENT” key to save it.
3. To measure the voltage, press the “D” soft-key and the measured input voltage, displayed directly beneath the date and time, will be saved for that Downlink Signal Strength.
4. To clear a data point, press the “CL” key and then press “ENT”.

4.2.2.1.1.3 Adjusting The Clear Sky Condition

To change the Clear Sky Condition:

1. From the Receiver Calibration subscreen: Use the “A” or “B” soft-key to position the cursor on the Downlink Strength that represents the Clear Sky Condition.
2. Press the “E” soft-key. The following message will appear: “PRESS ‘ENT’ TO SET

CLEAR SKY = CURSOR”.

3. Press “ENT” to save the Clear Sky Condition. If the “ENT” key is not pressed within ten seconds, the message will expire, an error tone will sound, and the Clear Sky Condition will be unchanged.

4.2.2.1.2 Receiver Mode

To select the Receiver Mode, from the Receiver Input Subscreen, press the “C” soft-key. This will highlight the Receiver Mode field. Rotate the scroll knob until the desired setting is displayed. Press “ENT” to save the setting. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.2.1.3 Receiver Fault Configuration

To select the Receiver Fault Configuration, from the Receiver Input Subscreen press the “D” soft-key. This will highlight the Receiver Fault Configuration field. Rotate the scroll knob until the desired setting is displayed. Press “ENT” to save the setting. If “ENT” is not pressed the screen will timeout after ten seconds and revert to the current settings.

4.2.3 ATTENUATOR CHANNEL CONFIGURATION SETTINGS

Attenuator Channel Configuration settings determine whether the user or the selected Uplink Power Correction Algorithm is controlling each Attenuator Channel and, when the UPC is controlling an Attenuator Channel, how Uplink Power Correction is provided.

To display the Attenuator Configuration Subscreen, from the Setup Screen, press the “D” soft-key.

JAN 20 1998 16:16						SELECT CHANNEL →	A
ATTENUATOR CONFIGURATION							
CHANNEL	1	2	3	4	5		
OPER. MODE	AUTO	AUTO	MAN	MAN	MAN		
ATTENUATION	----	----	10.0	12.2	10.0	SELECT CHANNEL ←	B
IMPEDANCE	75Ω	75Ω	50Ω	50Ω	75Ω		
POWER RATIO	1.6	1.6	1.4	1.4	1.6		
CLEAR SKY	15.0	13.5	15.0	15.0	15.0		
MAX STEP SIZE	0.6	0.4	0.4	0.2	0.4	OPERATING MODE	C
CHANNEL	6	7	8	9	10	MANUAL ATTEN.	D
OPER. MODE	OFF	OFF	OFF	OFF	OFF		
ATTENUATION							
IMPEDANCE							
POWER RATIO						ATTENUATOR CONSTANTS	E
CLEAR SKY							
MAX STEP SIZE							

4.2.3.1 Attenuator Operating Mode

From the Attenuator Configuration Subscreen, press the “A” or “B” soft-key until the desired channel is highlighted. Press the “C” soft-key to change the Attenuator Channel Operating Mode of the highlighted channel. Use the Scroll-knob to cycle through the available Attenuator Channel Operating Modes until the desired setting is displayed. Then press “ENT” to save the selection.

When an Attenuator Channel is switched from Automatic to Manual mode, the attenuation will remain unchanged until the operator changes it. Placing an existing Attenuator Channel Off-line will switch that Attenuator Channel to the fail-safe path.

4.2.3.2 Attenuator Channel Attenuation - Manual Mode

To manually vary the attenuation of an Attenuator Channel it must be in the Manual Operating mode. Refer to Paragraph 4.2.3.1 to change the operating mode of an Attenuator Channel. From the Attenuator Configuration Subscreen, highlight the channel using the “A” or “B” soft-key, press the “D” soft-key to highlight the attenuation field, then turn the scroll knob to vary the attenuation.

4.2.3.3 Attenuator Constants

From the Attenuator Configuration Subscreen, press the “E” soft-key to access the Attenuator Constants Subscreen.

The Attenuator Constants Subscreen provides local control of the Attenuator Channels and the Constants relating to the selected Uplink Power Correction Algorithm.

JAN 20 1998 16:16						SELECT CHANNEL →	A
ATTENUATOR CONSTANTS							
CHANNEL	1	2	3	4	5		
OPER. MODE	AUTO	AUTO	MAN	MAN	MAN	SELECT CHANNEL ←	B
ATTENUATION	13.6	12.2	10.0	12.2	10.0		
IMPEDANCE	75Ω	75Ω	50Ω	50Ω	75Ω		
POWER RATIO	1.6	1.6	1.4	1.4	1.6	POWER RATIO	C
CLEAR SKY	15.0	13.6	15.0	15.0	15.0		
MAX STEP SIZE	0.6	0.4	0.4	0.2	0.4		
CHANNEL	6	7	8	9	10		
OPER. MODE	OFF	OFF	OFF	OFF	OFF	CLEAR SKY	D
ATTENUATION							
IMPEDANCE							
POWER RATIO							
CLEAR SKY						MAXIMUM STEP SIZE	E
MAX STEP SIZE							

To change the setting for an Attenuator Channel, press the “A” or “B” soft-key until the desired channel is highlighted.

4.2.3.3.1 Power Ratio

From the Attenuator Constants Subscreen, press the “C” soft-key to change the Attenuator Channel Power Ratio of the highlighted channel and use the Scroll-knob to display the desired power ratio. Press “ENT” to save the selection.

For Open-loop operation the Attenuator Channel Power Ratio can be set from 0.1 to 9.9 in steps of 0.1. The default setting is 1.6.

For Closed-loop operation the Attenuator Channel Power Ratio can be set from 0.01 to 0.99 in steps of 0.1. The default setting is 0.65.

For the Comparison Algorithm the Attenuator Channel Power Ratio is fixed at 1.0 and cannot be changed.

4.2.3.3.2 Clear Sky

From the Attenuator Constants Subscreen, press the “D” soft-key to change the Clear Sky Attenuation of the highlighted Attenuator Channel. Use the Scroll-knob to display the desired Clear Sky Attenuation and then press “ENT” to save the selection. The Clear Sky Attenuation can be set from 0.2 to 20 dB in steps of 0.2 dB. The default is 20 dB.

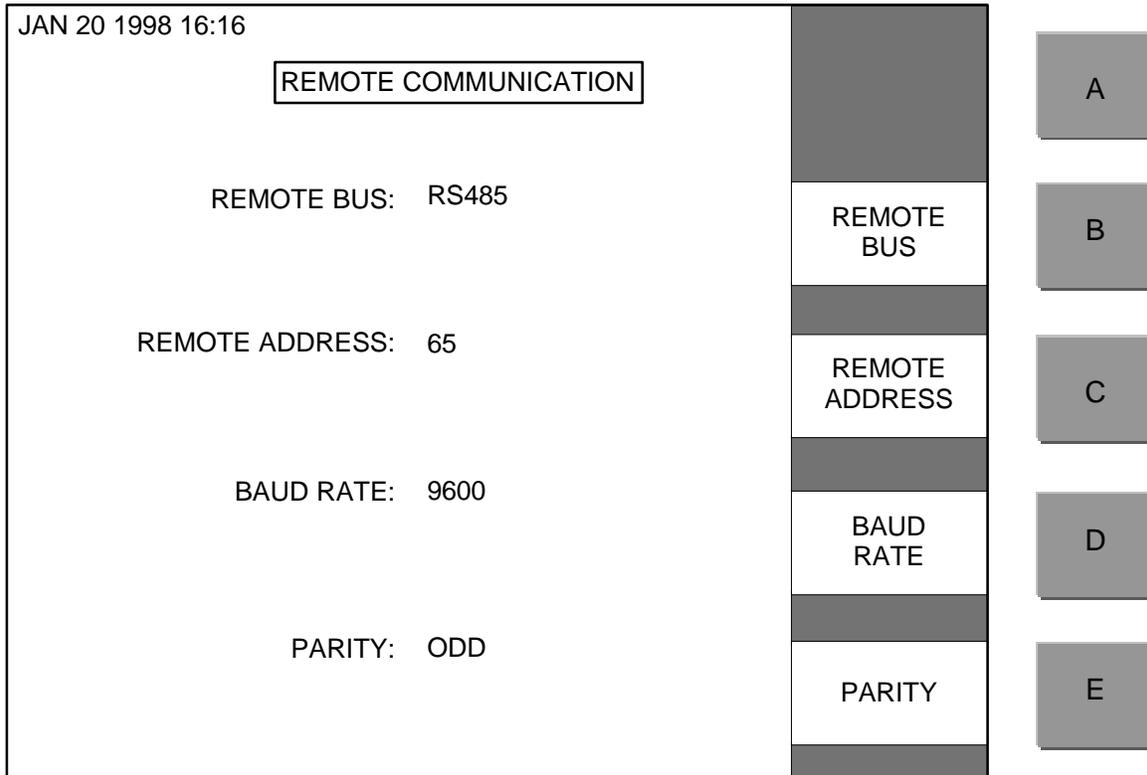
4.2.3.3.3 Maximum Step Size

From the Attenuator Constants Subscreen, Press the “E” soft-key to change the Maximum Attenuator Step Size of the highlighted Attenuator Channel. Use the Scroll-knob to display the desired setting and then press “ENT” to save the selection. The Maximum Attenuator Step Size can be set from 0.2 to 20 dB in steps of 0.2 dB for any Attenuator Channel. The default is 1.0 dB.

4.2.4 REMOTE COMMUNICATION SETTINGS

The Remote Communication Subscreen allows the operator to configure the remote operation of the UPC.

From the Setup Screen: Press the “E” soft-key to display the Remote Communication Screen.



4.2.4.1 Remote Bus (IEEE SRQ) Selection

The standard configuration of the UPC offers a selection of either RS485 or RS422 as the remote bus. To change the remote bus, from the Remote Communication Subscreen, press the “B” soft-key and use the scroll-knob to display the appropriate remote bus. Press “ENT” to save the selection.

If the UPC is configured for the RS232 remote bus, pressing the “B” soft key will result in an error tone.

For units equipped with IEEE-488 the “B” soft-key is used to toggle the service request (SRQ) between enabled and disabled. Press “ENT” to save the selection.

4.2.4.2 Address

To change the UPC remote address, from the Remote Communication Subscreen, press the “C” soft-key and use the scroll-knob to display the desired address. Press “ENT” to save the selection. Addresses 64-95 Decimal are valid for a serial bus and addresses 00-31 Decimal are acceptable for the IEEE-488 bus.

4.2.4.3 Baud Rate

To change the Baud rate, from the Remote Communication Subscreen, press the “D” soft-key. Use the scroll-knob to display the desired Baud rate and press “ENT” to save the selection. Baud rates of 300, 600, 1200, 2400, 4800, 9600 and 19200 are valid. Baud rates do not apply to the IEEE-488 option.

4.2.4.4 Parity

To change the Parity, from the Remote Communication Subscreen, press the “E” soft-key. Use the scroll-knob to cycle through the selections ODD, EVEN, or NONE. Save the desired setting by pressing “ENT”. Parity does not apply to the IEEE-488 option.

SECTION 5

OPERATION

5.1 CONTROLS

5.1.1 EXTERNAL CONTROLS

For a description of the front panel keys and select switches see Paragraph 5.2.1.

AC Power

Use the “PSA” and “PSB” power on/off switches to control AC power to the unit.

Fuses

There is a separate fuse for both the “PSA” and “PSB” AC power inlets. The AC power cord must be removed to access the fuse that is located in the AC inlet assembly.

5.1.2 INTERNAL CONTROLS

Power Supply Output Voltage Adjustment

Power supply output voltages are adjusted from potentiometers located on the power supplies. See Figure 1-3 for location of these adjustments. Any adjustment should be made using an insulated tuning tool. There is no adjustment for the $-15V$ supply. Voltage tolerances for the other two outputs are $+5.3 \pm 0.2V$ and $+20.3 \pm 0.2V$.

RS485/RS422 Bus Termination

A jumper selectable, 120 ohm termination resistor is connected across the DATA + and DATA - terminals. The resistor is installed by connecting a jumper across J15 that is located on the printed circuit board directly behind the front panel. Use Figure 1-3 to locate the Control Board and the position of the jumper.

RS232 RTS/CTS Jumper (Option 17C Only)

When the unit is equipped with an RS232 remote bus, the RTS output and the CTS input signals are internally connected together with a jumper on J15 position E which is located on the printed circuit board directly behind the front panel. This jumper must be removed if it is necessary to use the RTS/CTS protocol. Use Figure 1-3 to locate the Control Board and the position of the jumper.

5.2 FRONT PANEL OPERATIONS

A graphical liquid crystal display (LCD) and light emitting diode (LED) indicators have been organized such that important information is available at a glance. The keyboard is divided into functional groups to allow an operator to easily change any parameter from the front panel. **Once the unit is completely setup, if the front panel keys are left idle for five minutes, the LCD will blank into a screen saver mode.** If at least one receiver is not ACTIVE or at least one attenuator channel is left in the MANUAL mode the screen will not blank. This provides a visual indication that the unit is not completely setup. When using the comparison method of uplink power correction, both receivers must be in the active mode for the screen saver to become active. Press any key to recover from the screen saver mode.

See Figure 1-1 for the physical layout of the front panel.

A green LED on each of the AC power switches indicates when power is on. The LED is lit when the respective power supply is on.

A green “REMOTE” LED is lit when the UPC is under remote control, and is off while the UPC is under local control.

A red “ALARM” LED is on when a hardware failure is detected on the UPC itself. This LED does not light when a receiver fault is sensed at the contact closure inputs to the UPC. Individual alarm status is reported in the Status Screen.

A yellow “UPC MAX” LED will light when the required Uplink Power Correction exceeds the correction capability of one or more of the Attenuator Channels.

5.2.1 KEYPAD OPERATION

The keypad is divided into five functional groups (Power, Screen-select-keys, Soft-keys, Data Entry and Local/Remote Select). A beeper will sound to acknowledge a key press. An error tone will sound and, in some cases, a warning message will be displayed for illegal entries.

Screen-Select-Keys

The Screen-select-keys, labeled “LOG”, “HISTORY”, “LEVEL”, “STATUS” and “SETUP” are located to the right of the display area. They allow the operator to switch the context of the LCD between the five screens with ease. Pressing one of the five Screen-select-keys, provides instant access to pertinent data. These keys are operative in both Local and Remote modes.

Soft-Keys

The five soft-keys, adjacent to the display, are labeled “A”, “B”, “C”, “D” and “E.” The context of these keys is screen dependent. A brief definition is presented, on the active screen, adjacent to the soft-keys. Pressing undefined soft-keys will cause an error tone to sound.

Data Entry Keys

The Data Entry keys, along with the Scroll-knob, allow the operator to enter specific data into an active field. Data is entered using the numbered keys or Scroll-knob then pressing the “ENT” key. Invalid entries will be ignored and cause an error tone to sound. An entry can be re-initiated with the “CL” key. Any data entry not terminated by pressing the “ENT” key will expire after ten seconds: an error tone will sound, and the display will be restored to its prior setting.

While in Remote mode, local data entry is prohibited. However, all system parameters can be examined.

Local/Remote Mode Selection

The front panel “REMOTE” key selects either Local (LED off) or Remote mode (LED on). The mode alternates with each key press. On units equipped with the IEEE-488 remote bus this key puts the unit into Local mode only.

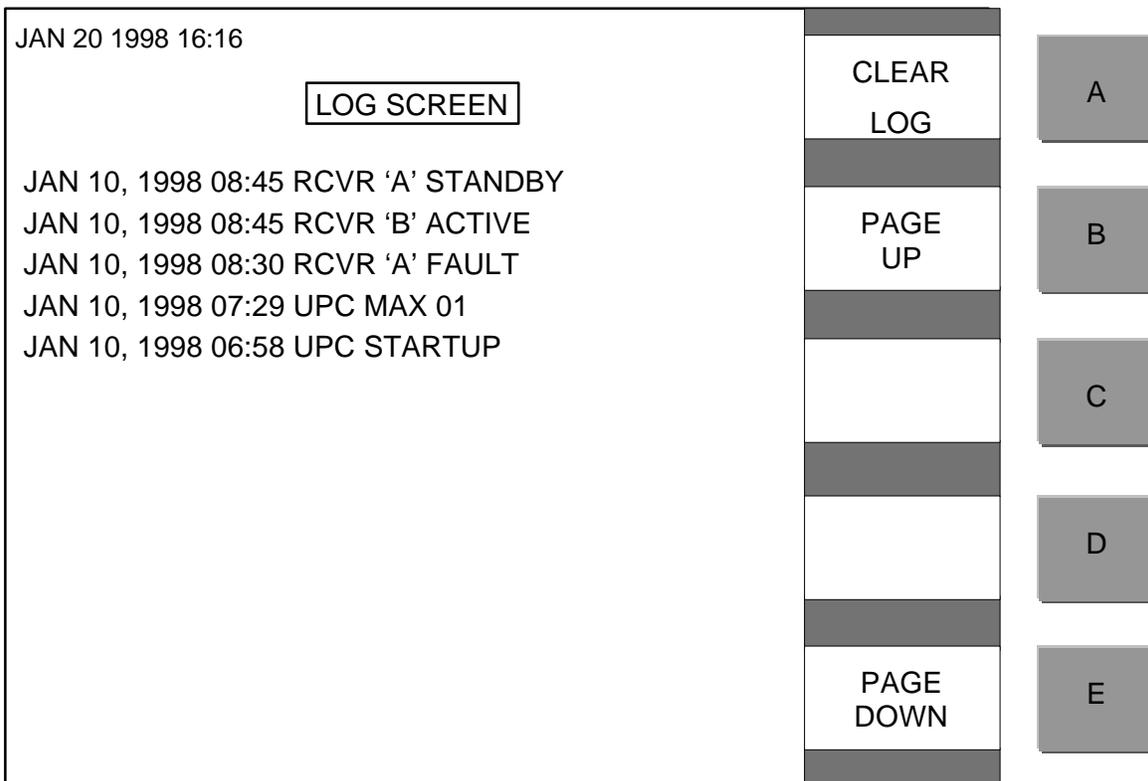
In Local mode, settings can be changed using the front panel controls. All of the status

information can be monitored over the remote bus. Remote attempts to alter the settings will be ignored.

In Remote mode, the system parameters can be observed locally. Efforts to alter the settings from the front panel will be ignored and cause an error tone to sound.

5.2.2 LOG SCREEN

The Log Screen displays the significant events of the unit. The entries include a brief description of the event and the date and time of occurrence. The log will retain up to thirty-two of the most recent events. Once the log is full, the oldest events will be overwritten as more recent events occur. Events are displayed in chronological order, most recent first. Sixteen events can be displayed at any one time and the remainder of the log can be examined by using the soft-key "B" for page-up and soft-key "E" for page-down.



The "A" soft-key allows the user to clear the contents of the log. Press the "A" soft-key and the following warning will appear "WARNING – Pressing 'ENT' will clear the contents of the LOG." The user can then press "ENT" to clear the log or any key to return to the LOG Screen.

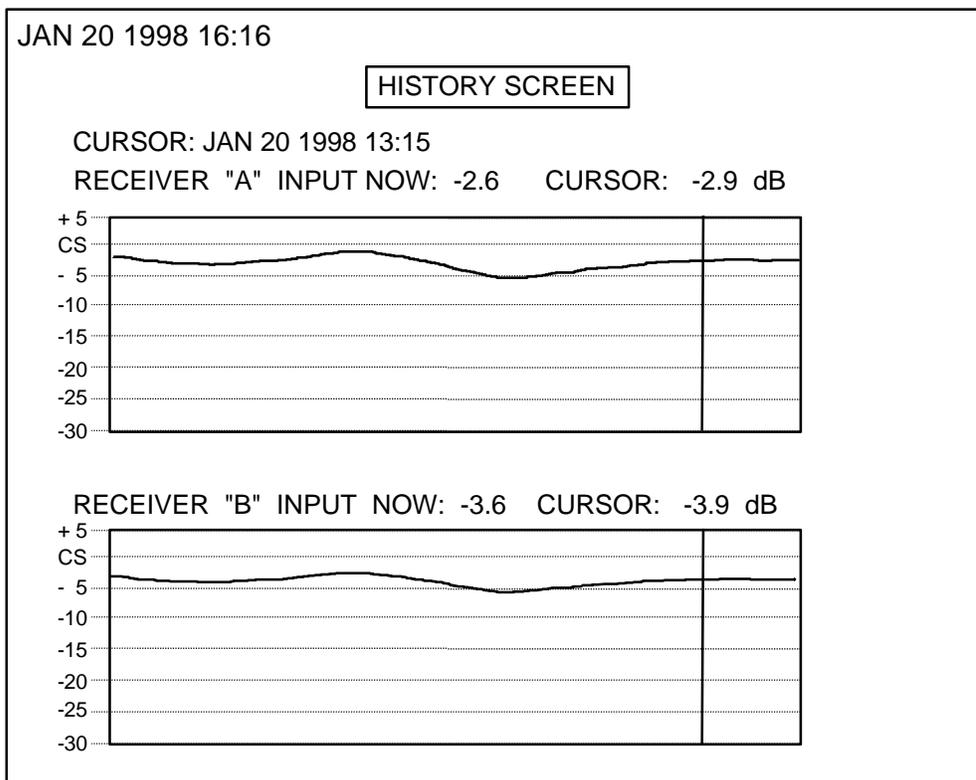
The following are the events collected in the LOG:

- Startup of the UPC
- Power Supply rail fault activated/cleared
- Attenuator Channel fault activated/cleared
- Attenuator Channel UPC MAX activated/cleared
- Receiver A fault activated/cleared
- Receiver B fault activated/cleared
- Receiver B Operating mode changed Active/Standby/Off
- Receiver A Operating mode changed Active/Standby/Off

5.2.3 HISTORY SCREEN

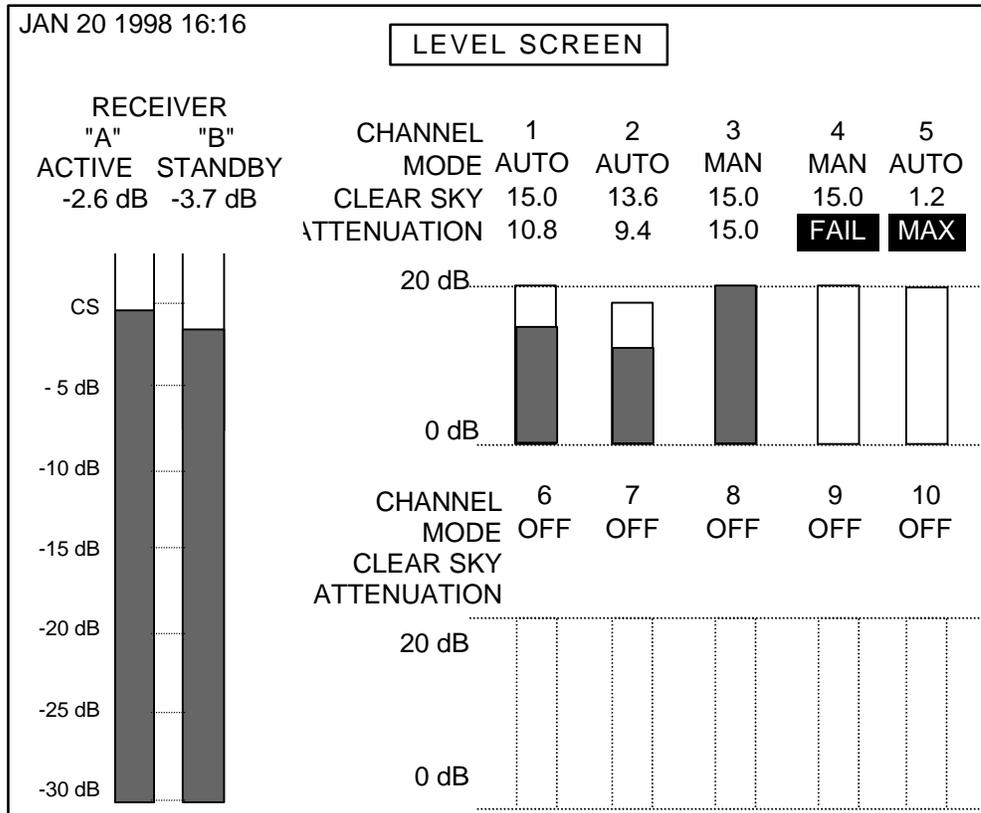
The History Screen provides a graphical representation of the measured Downlink Signal Strength recorded over the previous twenty-four hours. The history is stored in five-minute increments.

There is a vertical cursor present in each of the graphical displays. Rotating the Scroll-knob will move the cursor horizontally through the last twenty-four hours of data. The instantaneous values associated with the cursor position along with the associated date and time will be displayed.



5.2.4 LEVEL SCREEN

The Level Screen provides a graphical display of the instantaneous Downlink Signal Strength as well as the prevailing settings of each Attenuator Channel. The Downlink Signal Strength is reported for each receiver. The Clear Sky Attenuation, Attenuator Channel Operating Mode and applied attenuation are reported for each channel. If a fault exists in an Attenuator Channel, "FAIL" will appear in reverse video and blink in the attenuation field. If an Attenuator is in a UPC MAX condition, "MAX" will appear in reverse video in the attenuation field. Channel 4 is shown with a fault and Channel 5 is shown in a UPC MAX state below.



5.2.5 STATUS SCREEN

The Status Screen provides status on the power supplies, Attenuator Channels, and the Receivers. A fault is indicated with the word "FAIL" appearing in reverse video and blinking. If an Attenuator Channel is in a UPC MAX condition the word "MAX" appears in reverse video.

JAN 20 1998 16:16	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">STATUS</div>	
POWER SUPPLIES:	ATTENUATOR CHANNELS:
+20VDC 'A' +20.1V PASS	1 AUTO PASS
+5VDC 'A' + 5.0V PASS	2 AUTO PASS
-15VDC 'A' -15.1V PASS	3 MAN PASS
+20VDC 'B' +20.1V PASS	4 FAIL
+5VDC 'B' + 5.0V PASS	5 MAX
-15VDC 'B' -15.1V PASS	6 OFF
	7 OFF
RECEIVERS:	8 OFF
RCVR 'A' ACTIVE -4.42V	9 OFF
RCVR 'B' STANDBY -2.30V	10 OFF
CORRECTION ALGORITHM: CLOSED-LOOP	

5.2.6 SETUP SCREEN

The Setup Screen provides information and allows data entry for the initial setup and maintenance of the UPC. A brief summary of the setup is displayed on the setup screen. Each of the soft-keys, labeled "A" through "E", provide access to a group of related settings presented in a subscreen. It is from these subscreens that the setup parameters can be changed. Refer to the Section 4 titled "Configuration and Setup of the UPC" for details on the Setup Screen.

JAN 20 1998 16:16							
SETUP SCREEN							
CORRECTION ALGORITHM: OPEN-LOOP						SYSTEM	A
SAMPLE TIME: 5.0 IDLE TIME: 1 SECONDS						SETTINGS	
<u>RECEIVER INPUTS</u>							
RECEIVER "A" ACTIVE		CAL'D JAN 10 1998 07:29				RCVR "A"	B
RECEIVER "B" STANDBY		CAL'D JAN 10 1998 07:15				INPUT	
<u>ATTENUATOR CHANNELS</u>							
CHANNEL	1	2	3	4	5	RCVR "B"	C
OPER. MODE	AUTO	AUTO	MAN	MAN	MAN	INPUT	
POWER RATIO	1.6	1.6	1.4	1.4	1.6		
CLEAR SKY	15.0	13.5	15.0	15.0	15.0		
CHANNEL	6	7	8	9	10	ATTENUATOR	D
OPER. MODE	OFF	OFF	OFF	OFF	OFF	CONFIG.	
POWER RATIO							
CLEAR SKY							
<u>REMOTE</u>							
BUS: RS485		ROTATE SCROLL-KNOB				REMOTE	E
ADDRESS: 65	TO ADJUST				COMMUN		
BAUD RATE: 9600	VIEWING ANGLE						
PARITY: ODD							

5.3 REMOTE OPERATIONS

The equipment is supplied with an RS485/RS422 bus or can, as an option, be supplied with RS232 or IEEE-488. The command structures for the serial buses are identical. The IEEE-488 format is similar with the exception that no header, address, trailer, or checksum bytes are included in the structures.

5.4 SERIAL REMOTE PROTOCOL (RS485/RS422/RS232)

The command structures for the serial buses RS485, RS422, and RS232 are identical. All transmissions are multi-byte sequences beginning with a header byte and ending with a trailer byte and checksum byte. The transmitted bytes are all ASCII printable characters in the range of 20H to 7EH.

Serial data format is a 10-bit sequence consisting of 1 Start, 7 Data, 1 Parity, and 1 Stop bit. All characters, including the checksum character, are checked for parity. If any character in a command message contains an error (parity, framing, or overrun) or the checksum is incorrect, the command is ignored and no response is made. The remote parameters Address, Baud Rate, and Parity, are programmable from the front panel. The response time from command to acknowledge is 100 ms. maximum.

All messages addressed to the equipment are acknowledged with a response message. The unit continually monitors the communication bus and will accept commands, addressed to it, even in Local mode. When in Local mode, receipt of any SET commands (commands beginning with "\$") will be ignored and the unit will respond with an error code.

The response time from command to acknowledge is 100 ms. maximum. Since all bytes are ASCII printable characters, a compatible terminal may be used to control the equipment or monitor traffic on the communication bus.

5.4.1 SERIAL MESSAGE FORMAT

The serial message format is as follows:

HEADER - ADDRESS - COMMAND/ERROR CODE - PARAMETERS -
TRAILER - CHECKSUM

The Header byte is 7BH, ASCII character "{".

The address may take on the values from 64 to 95 decimal (40H to 5FH).

Commands are three ASCII characters preceded by an ASCII "?" or "\$". Commands preceded by "?" are QUERY commands and those preceded by "\$" are SET commands. Query commands are used to examine system parameters while SET commands are intended to modify system parameters.

Parameters are all ASCII printable characters in the range of 20H to 7EH. Numeric parameters are sent MSD first, LSD last. Values which do not adhere to the command format, or are beyond the allowable range, will be rejected and cause the unit to respond with an error code.

The Trailer byte is 7DH, ASCII character "}".

The checksum byte is the sum modulo 95 of all message characters beginning with the header byte up to and including the trailer byte. The value 32 is subtracted from each character value before taking the modulo 95 sum. The value 32 is added to the final sum to obtain the checksum value. All values are in decimal.

$$\text{Checksum} = \text{MOD} [(\text{character value} - 32), 95] + 32$$

Below is a program, written in the 'C' programming language that illustrates the checksum calculation.

```
char check_sum(char*,char);

char check_sum(array,mes_len)
/* return the checksum character for the message in array */
/* subtract 32 from each character before taking modulo 95 sum */
/* add 32 to the final sum */
/* mes_len = message length */
char array[32],mes_len;

{
char i,sum;
    sum = 0;
    for ( i = 0; i < mes_len; i++ ) {
        sum = sum + ( array[i] - 32 );
        if ( sum >= 95 ) sum = sum - 95;
    }
    return(sum + 32);
}
```

5.5 IEEE-488 MESSAGE PROTOCOL

The equipment performs the basic Talker and Listener functions as specified in the IEEE-488 standard. It is also capable of sending a Service Request to the active IEEE-488 controller and will respond with a status word when the Serial Poll Enable message is received.

The messages to and from the unit are ASCII character strings terminated with CR, LF and EOI. The response time from command to acknowledge is 100 ms. maximum.

5.5.1 MESSAGE PROTOCOL

The IEEE-488 message format is as follows:

COMMAND CODE - PARAMETERS

Commands are three ASCII characters preceded by an ASCII "?" or "\$". Commands preceded by "?" are QUERY commands and those preceded by "\$" are SET commands. QUERY commands are used to examine system parameters while SET commands are intended to modify system parameters.

SET commands do not affect the unit's response when it is addressed to talk by the IEEE-488

controller.

QUERY commands determine the unit's response when it is addressed to talk by the IEEE-488 controller. The context of the unit's response remains in effect until another QUERY command is received. The response to the Alarm Status Query command (?ALR) is in effect at power up as the default format.

Parameters are all ASCII printable characters in the range of 20H to 7EH. Numeric parameters are sent MSD first, LSD last. Values that do not adhere to the command format, or are beyond the allowable range, will be ignored.

5.6 COMMAND CODE SUMMARY

The following paragraphs describe each of the command codes. Commands preceded by “?” are QUERY commands and those preceded by “\$” are SET commands. QUERY commands are used to examine system parameters while SET commands are intended to modify system parameters.

5.6.1 COMMAND CODES

ASCII Character String	Function
CLK	Internal Calendar/Clock
ALG	Uplink Power Correction Algorithm
SAM	Sample Time
IDL	Idle Time Interval
CFC	Closed-loop Feedback Attenuator Channel
RCV	Receiver Mode
CAL	Receiver Calibration Data
CSK	Clear Sky Condition Calibration Data
ATT	Attenuator Channel Configurations
DSS	Downlink Signal Strength
ALR	Alarm Status
HIS	History Data
LOG	UPC Event Log Entries
VLT	System Voltages
STA	UPCA Status

5.6.2 ERROR CODES (Serial Protocol Only)

ASCII Character	Function
a	Command not recognized
b	Illegal parameter or parameter out of range
c	Unit in Local mode
d	Busy

5.6.3 INTERNAL CALENDAR/CLOCK = CLK

The SET command requires a twenty-character parameter that sets the date and time of the Internal Calendar/Clock.

Remote Command Sequence: \$CLKYyyyMmmDddHhhNnnSss

Response: \$CLK

The QUERY command requires no parameters.

Remote Command Sequence: ?CLK

Response: ?CLKYyyyMmmDddHhhNnnSss

Y: Year indicator

yyyy: Year, 4-digit ASCII numeric characters, MSD transmitted first, LSD last.

M: Month indicator

mm: Month, 2-digit ASCII numeric characters

D: Day indicator

dd: Day, 2-digit ASCII numeric characters

H: Hour indicator

hh: Hour, 2-digit ASCII numeric characters

N: Minute indicator

nn: Minute, 2-digit ASCII numeric characters

S: Second indicator

ss: Second, 2-digit ASCII numeric characters

5.6.4 UPLINK POWER CORRECTION ALGORITHM = ALG

The SET command requires a one-digit parameter that selects the Uplink Power Correction Algorithm to be used. The Uplink Power Correction Algorithm controls the attenuation applied by Attenuator Channels that are in Automatic Mode.

Remote Command Sequence: \$ALGa

Response: \$ALG

The QUERY command requires no parameters.

Remote Command Sequence: ?ALG

Response: ?ALGa

a: 1-digit ASCII numeric character

'0' = Open-loop algorithm

'1' = Closed-loop algorithm

'2' = Comparison algorithm

5.6.5 SAMPLE TIME = SAM

The SET command requires a four-digit parameter to set the Sample Time in seconds. The acceptable range is from 1 to 10 seconds, in 0.1-second steps. This command is valid for all of the Uplink Power Correction Algorithms.

Remote Command Sequence: \$SAMtt.t
Response: \$SAM

The QUERY command requires no parameters.

Remote Command Sequence: ?SAM
Response: ?SAMtt.t

tt.t: Four-digit ASCII numeric characters, MSD transmitted first, LSD last.

5.6.6 IDLE TIME INTERVAL = IDL

The SET command requires a three-digit parameter that sets the Idle Time Interval when the Closed-loop Uplink Power Correction Algorithm is active. This command is invalid if another Uplink Power Correction Algorithm is selected. The acceptable range is from 0.3 to 3.0 seconds in 0.1-second steps. The decimal point is included in the command sequence.

Remote Command Sequence: \$IDLt.t
Response: \$IDL

The QUERY command requires no parameters.

Remote Command Sequence: ?IDL
Response: ?IDLt.t

t.t: Three-digit ASCII characters, MSD transmitted first, LSD last.

5.6.7 CLOSED-LOOP FEEDBACK ATTENUATOR CHANNEL = CFC

The SET command requires a two-digit parameter that selects the Closed-loop Feedback Attenuator Channel. This command is only valid when the Closed-loop Uplink Power Correction Algorithm is active. This command is invalid if another Uplink Power Correction Algorithm is selected. The acceptable range is from '01' to '10'.

Remote Command Sequence: \$CFCcc
Response: \$CFC

The QUERY command requires no parameters.

Remote Command Sequence: ?CFC
Response: ?CFCcc

cc: Two-digit ASCII characters, MSD transmitted first, LSD last.

5.6.8 RECEIVER ACTIVE/STANDBY/OFF = RCV

The SET command includes two one-digit parameters for each receiver. The first parameter represents the mode of the receiver input, the second parameter is optional for each receiver input. The second parameter selects the receiver input voltage range and clears the calibration data for that receiver input. As a minimum both receiver operating modes must be included in this command.

Remote Command Sequence: \$RCVAa(Vv)Bb(Vv)
Response: \$RCV

The QUERY command requires no parameters.

Remote Command Sequence: ?RCV
Response: ?RCVAaVvBbVv

A: Receiver 'A' indicator

a: One-digit ASCII numeric character: '0' = Off, '1' = Standby, '2' = Active

B: Receiver 'B' indicator

b: One-digit ASCII numeric character: '0' = Off, '1' = Standby, '2' = Active

V: Voltage range indicator

v: One-digit ASCII numeric character: '-' = -10 to 0 Volts, '+' = 0 to +10 Volts

When included in the SET command this will clear the receiver calibration data.

5.6.9 RECEIVER CALIBRATION DATA = CAL

The SET command requires a one-digit parameter, a two-digit parameter and an optional six-character parameter including a sign character and a decimal point. The first parameter indicates which receiver input the data is associated with. The second parameter indicates which calibration point the data is associated with. There are thirty-one calibration points from 0 to 30, 1 dB apart. Each point represents a Downlink Signal Strength and associated input voltage. The minimum Downlink Signal Strength is represented by '00' and the maximum Downlink Signal Strength is represented by '30'. The third parameter represents the voltage associated with the Downlink Signal Strength in 00.01-volt steps. The decimal point is included between the second and third digits of the voltage parameter in the command sequence. The valid voltage range depends on the voltage range selected for that receiver input. If the third parameter (voltage) is not included in the SET command string, the UPC measures and stores the voltage applied at the respective receiver input.

Remote Command Sequence: \$CALrPpp(Vsvv.vv)
Response: \$CAL

The QUERY command requires a one-digit parameter and a two-digit parameter. The first parameter indicates the Receiver Voltage Input. The second parameter indicates the Downlink Signal Strength from 0 (minimum) to 30 (maximum) in 1 dB steps.

Remote Command Sequence: ?CALrPpp

Response: ?CALrPppVsvv.vv

r: One-digit ASCII numeric character indicating Receiver Voltage Input

‘A’ = Receiver Voltage Input ‘A’

‘B’ = Receiver Voltage Input ‘B’

P: Calibration point indicator

A lower case ‘p’ in this position for the QUERY command indicates that this is not a calibrated point and that the voltage is based on linear interpolation of surrounding points.

pp: Two-digit ASCII numeric characters indicating the calibration point; MSD transmitted first, LSD last. ‘00’ (minimum) to ‘30’ (maximum).

V: Voltage indicator

s: ASCII ‘+’ or ‘-’ indicating sign

vv.vv: Five-character ASCII numeric characters including decimal point indicating input voltage; MSD transmitted first, LSD last.

Sending ??.?? as the SET voltage parameter will clear the data point.

5.6.10 CLEAR SKY CONDITION CALIBRATION DATA = CSK

The SET command requires a one-digit parameter and a two-digit parameter. The first parameter indicates which receiver input the data is associated with. There are thirty-one calibration points from 0 to 30, 1 dB apart. The second parameter indicates which of these points represents the Clear Sky Condition. Each point represents a Downlink Signal Strength and associated input voltage. The number ‘30’ represents the maximum Downlink Signal Strength; ‘00’ represents the minimum Downlink Signal Strength.

Remote Command Sequence: \$CSKrPpp

Response: \$CSK

The QUERY command requires a one-digit parameter that indicates the Receiver Voltage Input.

Remote Command Sequence: ?CSKr

Response: ?CSKrPppVsvv.vv

r: One-digit ASCII numeric character indicating Receiver Voltage Input

‘A’ = Receiver Voltage Input ‘A’

‘B’ = Receiver Voltage Input ‘B’

P: Calibration point indicator

A lower case ‘p’ in this position for the QUERY command indicates that this is not a calibrated point and that the voltage is based on linear interpolation of surrounding points.

pp: Two-digit ASCII numeric characters indicating the calibration point prescribed as the Clear Sky Condition; MSD transmitted first, LSD last. ‘00’ (minimum) to ‘30’ (maximum).

V: Voltage indicator

s: ASCII ‘+’ or ‘-’

vv.vv: Five-digit ASCII numeric characters indicating input voltage; MSD transmitted

first, LSD last.

5.6.11 ATTENUATOR CHANNEL CONFIGURATIONS = ATT

The SET command can include a combination of up to five parameters. A two-digit parameter indicating the Attenuator Channel must be included. At least one of the remaining four optional parameters must be included. A one-digit parameter selects the Attenuator Channel Operating Mode. A three-digit parameter sets the Clear Sky Attenuation. A four-digit parameter sets the Uplink Channel Power Ratio. A three-digit parameter sets the attenuation if the channel is in Manual mode. A three-digit parameter sets the maximum step size. Any of the optional parameters that are included must appear in the order shown below.

Remote Command Sequence: \$ATTnn(Mm)(Cccc)(Rrrrr)(Tttt)(Ssss)
Response: \$ATT

The QUERY command requires a two-digit parameter that indicates the attenuator channel to be queried. If an alarm condition exists for a channel then three question marks will be returned for the attenuation field.

Remote Command Sequence: ?ATTnn
Response: ?ATTnnMmCcccRrrrrTtttSsssliliiXxFf

nn: Two-digit ASCII numeric character indicating Attenuator Channel '01' through '10'

M: Attenuator Channel Operating Mode indicator

m: One-digit ASCII numeric characters indicating the operating mode of the given channel

'0' = Off line – fail-safe fixed attenuation or not present

'1' = Manual – operator control

'2' = Automatic – algorithmic control

C: Clear Sky Attenuation indicator

ccc: Three-digit ASCII numeric characters indicating Clear Sky Attenuation; MSD transmitted first, LSD last. A decimal point is understood between the second and

third digits. The acceptable range is from '002' to '200' (0.2 to 20.0 dB).

R: Uplink Channel Power Ratio indicator

rrrr: Three-digit ASCII numeric characters and decimal point indicating the Uplink Channel Power Ratio; MSD transmitted first, LSD last. The decimal point must be included in the message. The acceptable range depends on the active Uplink Power Correction Algorithm.

Open-loop: '0.10' to '9.90' in steps of 0.10

Closed-loop: '0.01' to '0.90' in steps of 0.01

Comparison: '1.00'

T: Attenuation indicator

ttt: Three-digit ASCII numeric characters indicating current attenuation; MSD transmitted first, LSD last. A decimal point is understood between the second and third digits. The acceptable range is from '000' to '200'.

S: Maximum step size indicator

sss: Three-digit ASCII numeric characters indicating maximum step size; MSD transmitted first, LSD last. A decimal point is understood between the second and third digits. The acceptable range is from '002' to '200'.

I: Attenuator Channel Impedance indicator

ii: Two-digit ASCII numeric characters indicating the operating impedance of the given channel

'50' = 50 ohm impedance

'75' = 75 ohm impedance

X: UPCMAX indicator

x: One-digit ASCII numeric character indicating whether a UPCMAX condition exists for the given channel

'0' = Normal

'1' = UPCMAX condition

F: Fault indicator

f: One-digit ASCII numeric character indicating whether a hardware fault condition exists for the given channel

'0' = Normal

'1' = Fault

5.6.12 DOWNLINK SIGNAL STRENGTH = DSS

There is no SET command.

The QUERY command requires a one-digit parameter that indicates the receiver to be queried. If an alarm condition exists for the receiver then three question marks will be returned for the Downlink Signal Strength. The parameter returned indicates the prevailing Downlink Signal Strength with respect to the Clear Sky Condition. A decimal point is included between the second and third digits.

Remote Command Sequence: ?DSSr

Response: ?DSSrFsff.f

r: One-digit ASCII numeric character indicating Receiver Voltage Input

'A' = Receiver Voltage Input 'A'

'B' = Receiver Voltage Input 'B'

F: Downlink Signal Strength indicator

s: ASCII '+' or '-'

ff.f: Three-digit ASCII numeric characters indicating Downlink Signal Strength; MSD transmitted first, LSD last.

5.6.13 ALARM STATUS = ALR

There is no SET command. The QUERY command requires no parameters.

Remote Command Sequence: ?ALR

Response: ?ALRabcdefghijklmn

'a' through 'f' are ASCII '0' or '1' and represent the Alarm Status of the following:

a: Receiver input 'A' Alarm; '0' = normal, '1' = fault

b: Receiver Input 'B' Alarm; '0' = normal, '1' = fault

c through l: Attenuator Channel 1 through 10 ; '0' = normal, '1' = UPC MAX, '2' = fault

m: Power Supply 'A' Alarm; '0' = normal, '1' = fault

n: Power Supply 'B' Alarm; '0' = normal, '1' = fault

5.6.14 HISTORY DATA = HIS

There is no SET command.

The QUERY command returns the five-minute averaged Downlink Signal Strength. It requires a four-digit parameter that references the time of day in hours and minutes. The minutes must be evenly divisible by five. If no data is stored for the time of day queried, question marks will be returned in the Downlink Signal Strength field of the response.

Remote Command Sequence: ?HISHhhNnn

Response: ?HISHhhNnnAsaa.aBsbb.b

H: Hour indicator

hh: Two-digit ASCII numeric characters that represent hour; MSD transmitted first, LSD last.

hh = '00' to '23'

M: Minute indicator (five-minute increments)

mm: Two-digit ASCII numeric characters that represent minute; MSD transmitted first, LSD last.

mm = '00' to '55'

A: Receiver 'A' Downlink Signal Strength indicator

s: ASCII '+' or '-'

aa.a: Three-digit ASCII numeric characters and decimal point that represent the Downlink Signal Strength recorded at "hh" hour and "mm" minute during the most recent twenty-four hour period; MSD transmitted first, LSD last. If the Downlink Signal Strength was unknown during the time interval, three question marks will be returned.

B: Receiver 'B' Downlink Signal Strength indicator

s: ASCII '+' or '-'

bb.b: Three-digit ASCII numeric characters and decimal point that represent the Downlink Signal Strength recorded at "hh" hour and "mm" minute during the most recent twenty-four hour period; MSD transmitted first, LSD last. If the Downlink Signal Strength was unknown during the time interval, three question marks will be returned.

5.6.15 UPC EVENT LOG ENTRIES = LOG

The only SET command clears the UPC event log of its contents.

Remote Command Sequence: \$LOG00

Response: \$LOG

The QUERY command requires a two-digit parameter indicating the log entry to be examined. If entry 00 is selected, the unit returns the number of log entries currently in the log, otherwise the unit responds with the date, time, and a code indicating the event which has occurred. Events 24 through 27, which are channel specific, include a parameter indicating the Attenuator Channel.

Remote Command Sequence: ?LOGnn

Response: ?LOGnnCyyyymmddhhnnEee(Ccc)

nn: Two-digit ASCII numeric characters indicating the log entry queried; MSD transmitted first, LSD last. (If '00' was sent to the UPC then '00' through '32' is returned indicating the number of log entries that are stored.)

C: Calendar/Clock indicator

yyyy: Year, 4-digit ASCII numeric characters; MSD transmitted first, LSD last.

mm: Month, 2-digit ASCII numeric characters

dd: Day, 2-digit ASCII numeric characters

hh: Hour, 2-digit ASCII numeric characters

nn: Minute, 2-digit ASCII numeric characters

E: Event indicator

ee: Event Code '01' to '32' represents the events listed below

C: Attenuator Channel

cc: Attenuator Channel '01' to '10'

5.6.15 UPC EVENT LOG ENTRIES = LOG (Continued)

Event Indicator	Event
01	UPC startup
02	+20V 'A' power supply fault
03	+20V 'A' power supply fault recovery
04	+5V 'A' power supply fault
05	+5V 'A' power supply fault recovery
06	-15V 'A' power supply fault
07	-15V 'A' power supply fault recovery
08	+20V 'B' power supply fault
09	+20V 'B' power supply fault recovery
10	+5V 'B' power supply fault
11	+5V 'B' power supply fault recovery
12	-15V 'B' power supply fault
13	-15V 'B' power supply fault recovery
14	Receiver 'A' fault
15	Receiver 'A' fault recovery
16	Receiver 'B' fault
17	Receiver 'B' fault recovery
18	Receiver 'A' Switched to Active
19	Receiver 'A' Switched to Standby
20	Receiver 'A' Switched to Off
21	Receiver 'B' Switched to Active
22	Receiver 'B' Switched to Standby
23	Receiver 'B' Switched to Off
24	Attenuator Channel fault
25	Attenuator Channel fault recovery
26	Attenuator Channel UPCMAX
27	Attenuator Channel UPCMAX recovery

Note: Event Indicators 28 through 32 reserved for future use.

5.6.16 SYSTEM VOLTAGES = VLT

There is no SET command.

The QUERY command requires a one-digit parameter indicating the voltage to be reported.

Remote Command Sequence: ?VLTp

Response: ?VLTpsvv.vv

p: "a" through "h" indicating the particular voltage to be reported

s: "+" or "-" indicating sign

vv.vv: Four-digit ASCII characters indicating the measured voltage in Volts

a: Receiver 'A' Voltage Input

b: Receiver 'B' Voltage Input

c: +20.00 Volt 'A' Supply Rail

d: +5.00 Volt 'A' Supply Rail

e: -15.00 Volt 'A' Supply Rail

f: +20.00 Volt 'B' Supply Rail

g: +5.00 Volt 'B' Supply Rail

h: -15.00 Volt 'B' Supply Rail

5.6.17 UPCA STATUS = STA

There is no SET command.

The QUERY command requires no parameters.

Remote Command Sequence: ?STA

Response: ?STALiGgRr?a

L: Local / Remote mode indicator

l: One-digit ASCII numeric characters indicating the control mode of the UPCA

'0' = Local

'1' = Remote

G: Algorithm indicator

g: One-digit ASCII numeric characters indicating the control mode of the UPCA

'0' = Open-loop

'1' = Closed-loop

'2' = Comparison

R: Active receiver indicator
 r: Active receiver indicator

- '0' = None
- 'A' = Receiver 'A'
- 'B' = Receiver 'B'
- '2' = Both Receiver 'A' and Receiver 'B' (Comparison algorithm)

?: Summary alarm indicator
 a: One-digit ASCII numeric characters indicating the control mode of the UPCA

- '0' = No UPCA alarms (does not report receiver alarms)
- '1' = At least one UPCA alarm is active

5.6.18 EXAMPLES

The following are typical commands and responses showing the ASCII printable characters. The address is 41H (ASCII code 'A') for these examples.

A. Calibrate the Receiver 'A' Voltage Input. Set the voltage associated with maximum Downlink Signal Strength to +8.2 V.

<u>Controller Command</u>	<u>Response</u>
{A\$CALAP30V+08.20}@	{A\$CAL}P

B. Return the settings of Attenuator Channel 2. The reply indicates that Attenuator Channel 2 is in Auto mode, 5.0 dB is the Clear Sky Attenuation, the Uplink Power Channel Ratio is 1.6, The Channel Impedance is 50 ohms, 0.0 dB is the applied attenuation, a UPC MAX condition exists and no faults are associated with this channel.

<u>Controller Command</u>	<u>Response</u>
{A?ATT02}G	{A?ATT02M2C050R160I50T000X1F0}>

5.6.19 IEEE-488 SERVICE REQUEST

The unit will issue a Service Request (activate the SRQ line) if the SRQ is enabled and one of the status alarms indicate a failure. The IEEE-488 controller then performs a serial poll addressing the unit to talk. The following bits are reported back to the controller:

Bit Number							
7	6	5	4	3	2	1	0
0	1	0	0	0	S2	S1	S0

The S"n" bits indicate in binary code which component fault line caused the service request (a = 0, b = 1, c = 2, etc.). In the case of multiple faults, the lowest fault value will be reported.

The IEEE-488 controller may perform a serial poll without a service request being generated by the unit (a request may have been generated by another device on the bus). In this case, the message will have the same format with the exception that bit 6 will be a "0."

6.1 REMOVING/INSTALLING ATTENUATOR CHANNELS

To remove an existing attenuator channel, follow these steps:

1. Turn on PSA and PSB if they are not already on.
2. If the UPC is in Remote mode, place it into Local mode by pressing the front panel "REMOTE" key. The green REMOTE LED should be extinguished.
3. Press the "SETUP" Key to view the SETUP Screen.
4. Press "D" to view the Attenuator Configuration Subscreen.
5. Press the "A" soft-key until the desired Attenuator Channel is highlighted.
6. Press the "C" soft-key and use the scroll-knob to select Off-line (OFF) as the Channel Operating Mode for that Attenuator Channel. Press "ENT" to save the setting.
7. Locate the slot in the rear panel associated with the Attenuator Channel to be removed.
8. Remove the hardware that secures the attenuator to the chassis and detach the interface cable from the attenuator module connector J1.
9. Physically remove the attenuator module from the rear panel slot
10. Connect the cable to a blank cover for the slot opening.
11. Secure cover to the chassis with the mounting hardware.
12. Verify proper operation of the UPC.

To install an additional attenuator channel, follow these steps:

1. Locate the slot in the rear panel associated with the Attenuator Channel to be added. The slot position denotes the channel number that the attenuator will occupy.
2. Remove the hardware that secures the blank cover to the chassis and detach the interface cable from the blank cover.
3. Connect the interface cable to the connector J1 of the attenuator module to be added.
4. Carefully insert the attenuator module into the rear panel slot.
5. Turn on PSA and PSB if they are not already on.
6. If the UPC is in Remote mode place it into Local mode by pressing the front panel "REMOTE" key. The green REMOTE LED should be extinguished.
7. Press the "SETUP" Key to view the SETUP Screen.
8. Press the "D" soft-key to view the Attenuator Configuration Subscreen.
9. See Paragraph 4.2.3 for the configuration of the attenuator channel.

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