

EPOCH-S02 USER MANUAL

Version 1.1



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1. Installation Guide for Epoch-S02

1.1 Environmental requirements

1.1.1 Antenna Separation / Isolation

Separation between antennas is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually reenters, due to the lack of separation between the input and output antennas. In other words, the signal is being fed back into the system. This creates a constant amplification of the same signal. As a result, the noise level rises above the signal level.

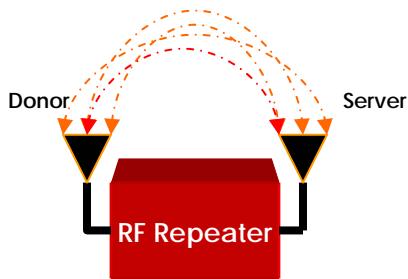


Figure 1.1.1 RF Repeater Oscillation

To prevent feedback, the donor and server antennas must be separated an appropriate distance to provide sufficient isolation. Isolation is attained by separating antennas a sufficient distance so that the output of one antenna does not reach the input of the other. This distance is dependent on the gains of the repeater and the antennas.

A sufficient isolation value is $13 \sim 15$ dB greater than the maximum gain of the repeater. For example, if the gain of the repeater is 50 dB, then an isolation of $63 \sim 65$ dB or greater is required. In the same manner, because the Epoch-S02 has a maximum gain of 90 dB, it requires an isolation of at least $103 \sim 105$ dB.

1.1.2 Line of Sight

The donor antenna pointing toward the base station has a narrow beam antenna pattern. As a result, a slight deviation away from the direction of the BTS can lead to less than optimum results. In addition, obstacles between the repeater and BTS may impair the repeater from obtaining any BTS signal. As a result, the repeater cannot transmit signal to the coverage area. Therefore, a direct line of sight to the BTS for the Donor Antenna is vital to the function of a repeater. For the same reason, placing the coverage antenna in direct line of sight of the coverage area is also necessary.

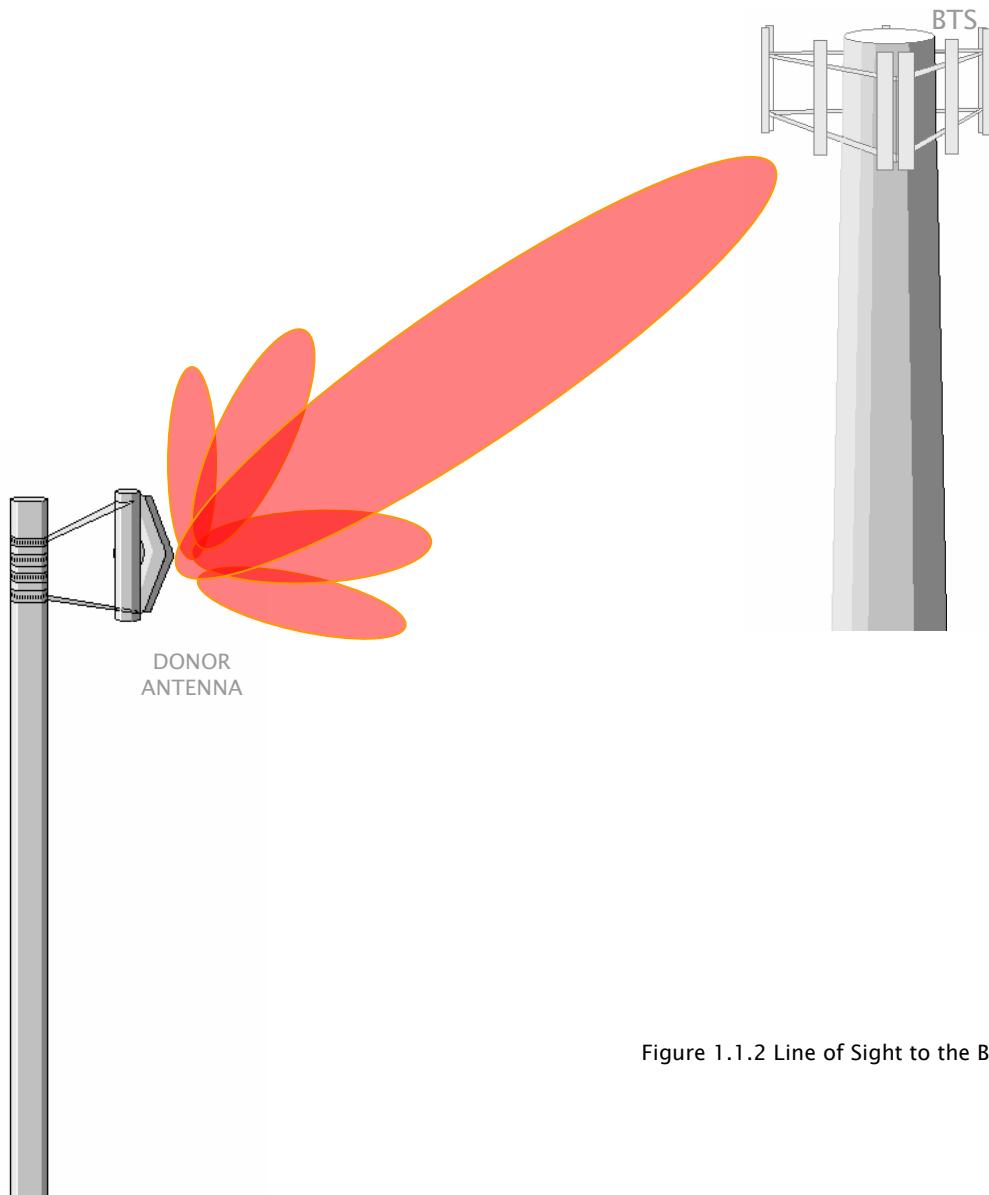


Figure 1.1.2 Line of Sight to the BTS

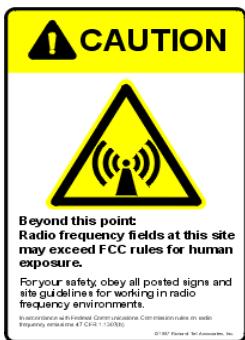
1.2 Warnings and Hazards

**WARNING! ELECTRIC SHOCK**

Tampering with the modules within the Epoch-S02 Repeater exposes the user to electric shock and the risk of damaging the unit. DO NOT TAMPER with modules within the unit. Opening or tampering with any modules inside the Epoch-S02 will void all warranties.

**WARNING! HIGH VOLTAGE**

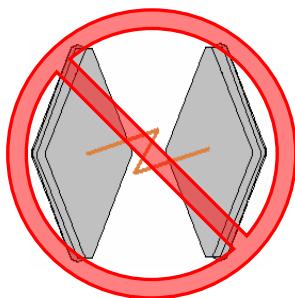
In installing donor or server antennas, avoid close proximity to overhead power lines or high power components. Contact with high power components will severely damage the repeater and may cause serious injury and/or death to the user. Exercise extreme caution when installing antennas near high power lines.

**WARNING! EXPOSURE TO RF**

Working with the repeater while in operation, may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure. Visit the FCC website at www.fcc.gov/oet/rfsafety to learn more about the effects of exposure to RF electromagnetic fields.

MPE WARNING!

Please maintain a safe distance of 27 cm while operating near the donor and the server antennas (Assuming the maximum gain of either of the antennas do not exceed 15 dBi).



WARNING!

Operating the Epoch-S02 with antennas in very close proximity facing each other could lead to severe damage to the repeater.

1.3 Tools and Recommendations for Installation

The following may be necessary (not required) for installation of the repeater:

1. Crescent Wrench or drill with drill bit attachment of ...
2. Philips Screw Driver
3. Lift, Ladder, or boom truck
4. Spectrum Analyzer
5. Sweep Tester
6. Signal Generator
7. Pilot Scanner
8. RF Power Meter
9. Voltmeter
10. Coaxial cables
11. Compass
12. Laptop or PC with an RS-232 serial port (with Epoch-S02 OMS V4.01 Software installed)

The list above may vary depending on if brackets are used to install the repeater. Bring additional tools that may be useful in installation. It is recommended that two people install the Epoch-S02 Repeater system.

1.4 Epoch-S02 Parts List

The Epoch-S02 Repeater System includes:

| | <u>PART ID</u> | <u>QUANTITY</u> |
|--------------------------------------|----------------|-----------------|
| 1. Epoch-S02 Unit | EPOCHSO201 | 1 |
| 2. Repeater I-Bracket (Added Option) | ISRB01 | 1 |
| 3. Nuts and Bolts | BLTS01 | 4 |
| 4. Screws (Added Option) | SC01 | 8 |
| 5. Epoch-S02 OMS V4.01 | SO2OMS V4.0101 | 1 |
| 6. Ground Stud | GNDSTD01 | 1 |
| 7. Keys | KEYS01 | 4 |

1.5 Step by Step Instructions for Installation

1.5.1 Repeater Setup

1. Mount the Repeater Bracket (Option)

Position the I-shape repeater bracket (ISRB01) at the desired location. Using the 8 screws (SC01) provided, fasten the bracket securely.

2. Attach Repeater to the Mounting Bracket (Option)

Using the 4 bolts (BLTS01) provided, fasten the repeater (Epoch-S02) to the bracket.

3. Open the Epoch-S02

Open the front door of the repeater cabinet by using the key (KEYS01) provided. There are two locks integrated into the door latches. One key works for both locks.

*** Please keep the cabinet door open fully during the installation until you are instructed to close the cabinet. When opening the door, wait until the latch clicks to prevent inadvertent closure of the door.*

4. Connect the Power Source and Ground Wire

Make sure that the power switch inside the repeater is off before connecting the power cable. Connect the power cable to the power source. Connect the ground wire (GNDSTD01) to the ground connector.

*** Before connecting the power cable to the power source, make sure that the voltage source is 110 V.*

5. Connect the Donor Antenna

Connect one end of the cable to the Donor Antenna and the other end to the repeater **Donor** on the bottom of the Epoch-S02.

6. Connect the Server Antenna

Connect one end of the cable to the Server Antenna and connect the other end to the repeater **Server** on the bottom of the Epoch-S02.

7. Initialize the Epoch-S02

Using RS232 straight through serial cable, connect one end of the cable to the Epoch-S02's NMS port located on the bottom of the repeater and the other end to the laptop's serial port.

8. Turn the Epoch-S02 on

Make sure that the Donor and Server antennas and the power cable are securely connected to the correct ports. Turn the power switch on, located inside the repeater.

9. Start the Epoch-S02 OMS V4.01 Program

Open the Epoch-S02 OMS V4.01 program. You will see the *Main Status Window*.

***** For more detailed information on the Epoch-S02 OMS V4.01, please refer to section 2.***

10. Select your Com port

From the Main Status Window of the OMS V4.01, select the correct Com port setting at the lower right hand side of the window.

***** Please make sure that both communication status lights, the TX and the RX on the bottom of the window, are blinking periodically. A green blinking TX light indicates that the data is being transmitted from the laptop/PC to the Epoch-S02. A green blinking RX light indicates that the data is being retrieved from the Epoch-S02 to the laptop/PC.***

***** If either the TX or the RX status light is not blinking, check the Com port setting of your laptop and choose the port to which serial port is assigned. For more information, refer to section 4, "Troubleshooting."***

***** Before proceeding to the next step, please close the cabinet door (don't lock) at this time in order to avoid inadvertent RF feedback going inside the repeater."***

11. Go to the Install Menu

Now with the blinking TX and RX status lights, go to the *Install* menu. You will see the following window:

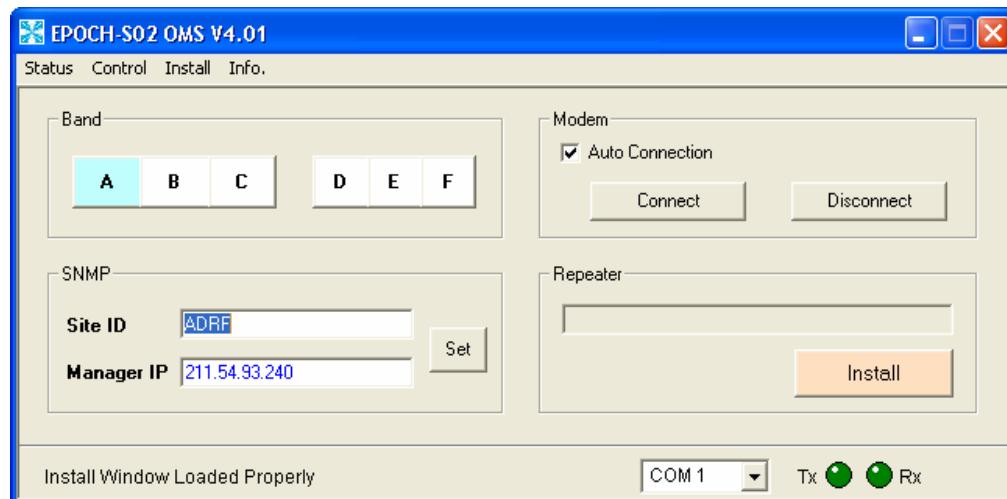


Figure 1.5.1 Installation Window of the Epoch-S02 OMS V4.01

12. Select the desired band or bands

Select the desired band or bands by clicking the appropriate buttons. You can deselect the undesired band or bands by clicking the button again. You can select among 15 band combinations; A, B, C, D, E, F, AD, AE, AF, BD, BE, BF, CD, CE and EF. Neither two 5 MHz bands, e.g., DE nor two 15 MHz bands, e.g., AB, are allowed. The default band is A.

| Control Item | Action | Setting Value |
|--------------|----------------|---------------|
| 15 MHz Band | Band Selection | A/B/C |
| 5 MHz Band | Band Selection | D/E/F |

Table 1.5.1 15 MHz and 5 MHz Band Options

NOTE: Only one 5 MHz band and one 15 MHz band can be chosen simultaneously (i.e. A and D, B and E, etc.; **not** A and B, E and F, etc.).

13. Provide SNMP Information

Type in the Site ID and the Manager IP address as given to you by Sprint PCS. Once both the parameters are typed in, you must click "Set" for it to be executed.

14. Check the Modem Connection

Check the "Auto Connection" box and then click on "Connect."

15. Click on Install

After the first three steps, click on "Install." This installation process will take a few minutes.

16. Check the Front LED Panel

Check that the Power LED is on (green) and neither Soft Fail LED (yellow) nor Hard Fail LED is on (red).

*** In the case where either soft fail or hard fail is on, refer to Section 2.3.*

*** You can go to the Status Window of the OMS V4.01 program to view the basic parameters of the repeater once the repeater has installed successfully.*

17. Lock the Epoch-S02 Door

Now you can lock the door using the key provided.

CONGRATULATIONS!! The Epoch-S02 Installation process is complete. The Epoch-S02 is now extending coverage!

2 User Manual V1.1 using OMS V4.01

2.1 Menu Structure

2.1.1 Main Window Overview

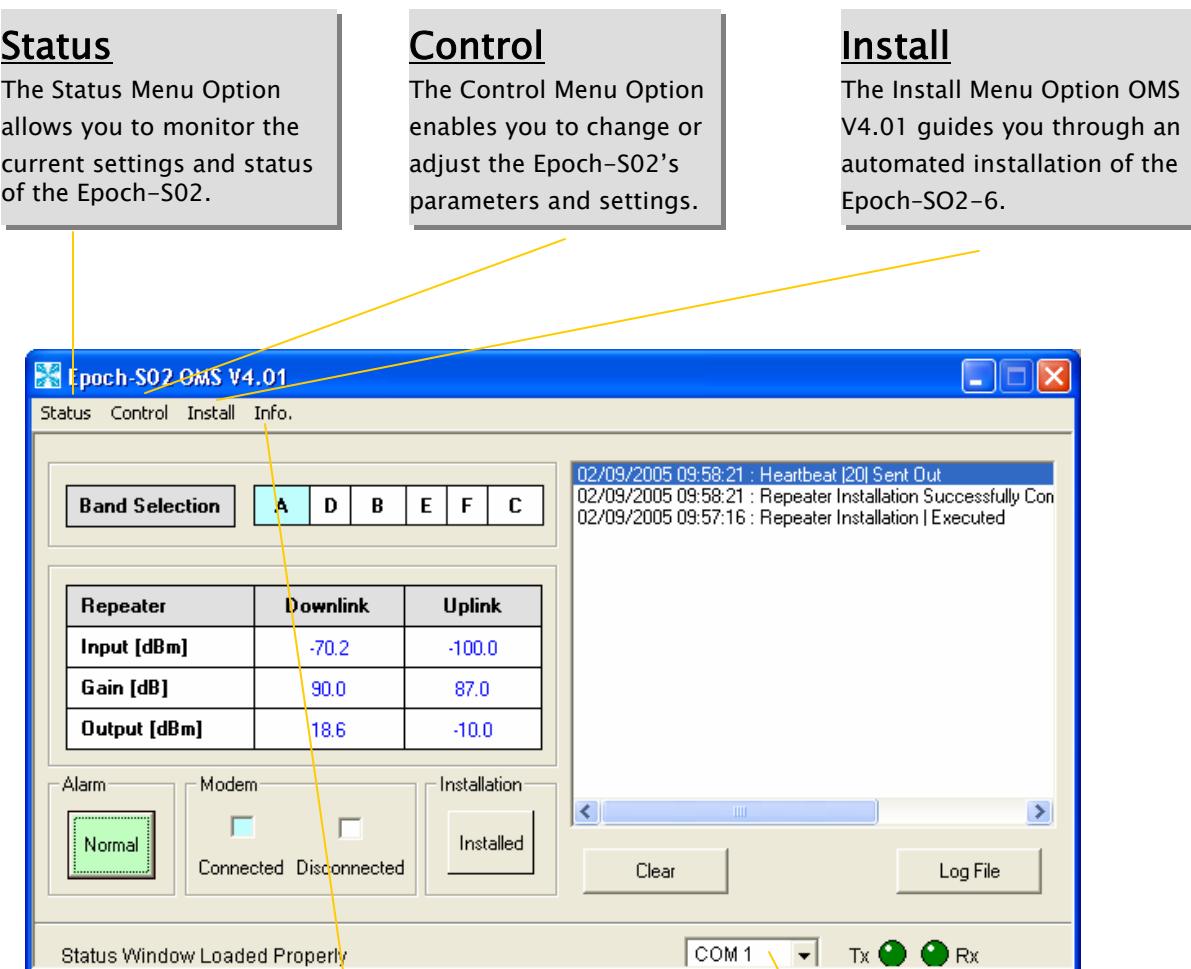


Figure 2.1.1 Main Status Window of the Epoch-S02 OMS V4.01

System Info

For Information about the Epoch-S02, choose the System Info option. Information such as Serial Number and Model Number of the repeater are included here.

Com Port Selection

To select the appropriate COM Port, click the small downward arrow. A pull-down options list will appear with a number of COM Port options.

2.1.2 Status Menu

The Status Menu is the monitoring window of the Epoch-S02 OMS V4.01. This window enables the user to monitor the status and settings of the Epoch-S02. In other words, no parameters can be changed in the Status Window. To change parameters, use the Control Menu Option.

Repeater Input

Indicates Input Signal Strength of the Repeater after being amplified by the donor antenna [dBm].

Repeater Gain

Indicates the gain of the repeater expressed [in dB].

Repeater Output

The output of the repeater [in dBm] before being radiated by the server or coverage antenna.

Alarm (Button)

The Alarm Button changes color to the corresponding status of the repeater: **green** for Normal Operation; **yellow** for Soft Failure; and **red** for Hard Failure. **Click on the Alarm button for detailed information.**

Band Selection

Currently selected bands are highlighted.

White Screen

In this window, the USER will be able to see heartbeat messages which are sent out periodically. Additionally, the USER will also be able to see any alarms that are generated along with messages once the alarms are cleared as well.

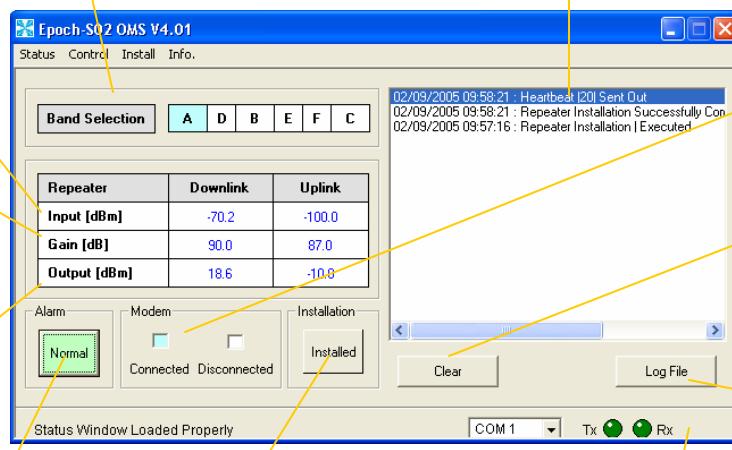


Figure 2.1.2 Main Status Window of the Epoch-S02 OMS V4.01

Installed

Lets you know if the repeater is properly installed or not.

Modem Connection

PPP connection of the modem

Clear

Will clear the White Screen

Log File

Text File for the heartbeat messages and alarm status of the repeater

Status Bar

Displays the status of the repeater (Status Response Success), transmit (TX) and receive (RX) communication lights, and Com port (COM1). The Com Port may be changed by clicking on the arrow next to the COM selection window.

2.1.3 Control Menu

2.1.3.1 Gain Setting

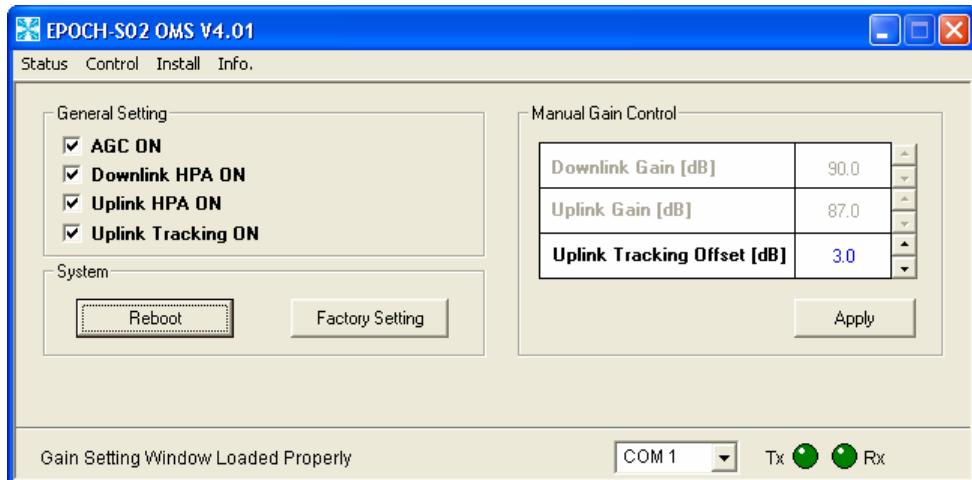


Figure 2.1.3.1 Gain Setting Window of the Epoch-S02 OMS V4.01

AGC Mode

AGC (Auto Gain Control) adjusts the variable gain of the repeater to ensure a constant specified output power of 24 dBm. The functionality of the AGC feature is assured under the condition that the input BTS signal is within the specified AGC range (-45 to -85 dBm) and that sufficient isolation exists between antennas (≥ 103 dB). By default, the AGC ON box is enabled.

Downlink/Uplink HPA Mode

HPA (High Power Amplifier) is an essential component of the Epoch-S02. The HPA is the final stage of amplification in the Epoch-S02. The HPA Mode enables the user to turn the HPA ON or OFF. If the HPA is OFF on either link, the Epoch-S02 will not operate properly. Both HPAs need to be ON. By default, the Downlink/Uplink HPA ON box is enabled.

Uplink Tracking/Offset Modes

Uplink Tracking Mode enables or disables the Uplink Tracking feature that sets the gain in the uplink equaling to the gain in the downlink. The Tracking Gain Offset is the difference in the uplink and downlink gains. For example, if the downlink gain is 80 dB, the Uplink Tracking Offset is set ON, and the Tracking Gain Offset is set to 3 dB, the uplink gain would be 77 dB.

By default, the Uplink Tracking ON box is enabled and the Uplink Tracking Offset is set to 0 dB, meaning the uplink gain will always equal the downlink gain.

| Control Item | Action | Setting Value |
|----------------------|--------------------------|---------------------------|
| Uplink Tracking Mode | Set Uplink Tracking Mode | ON/OFF |
| Tracking Gain Offset | Set Tracking Gain Offset | 0 ~ +25 dB @ 0.5 dB Steps |

Table 2.1.3.1 Uplink Tracking Mode and Tracking Gain Offset Range

Downlink/Uplink Gain

The gain of the Epoch-S02 is the ratio of the input signal to the output signal. The gain may be set in both links.

NOTE: The manual gain option is disabled when the AGC Mode is set ON.

System Reboot

Clicking the “System Reboot” button will execute any awaiting actions immediately that were taken using the OMS program. The changes are reflected in the status window. Also, clicking on the button will load the repeater with last saved configurations.

System Factory Setting

The “Factory Setting” button resets the settings of the repeater to the original default factory settings as noted in the “Default Control Settings” in Section 2.4.

2.1.3.2 Alarm Setting

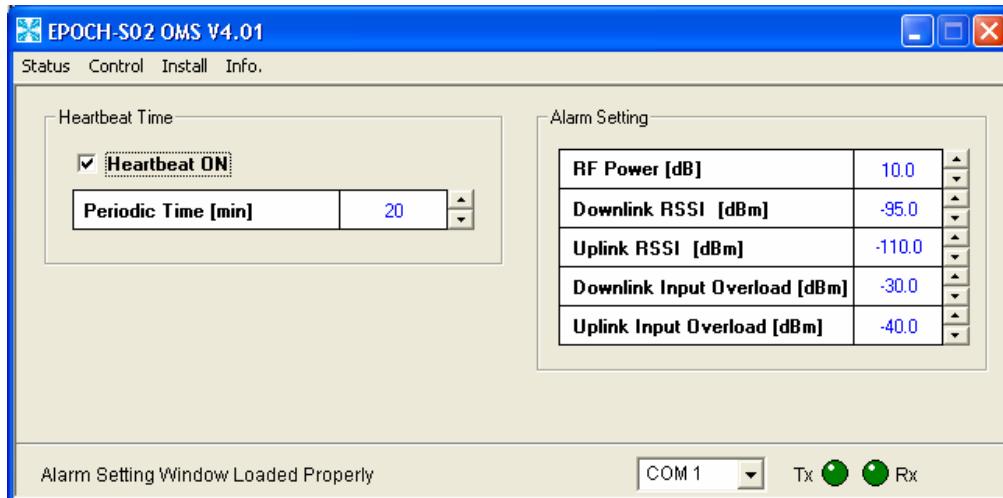


Figure 2.1.3.2 Alarm Setting Window of the Epoch-S02 OMS V4.01

| Control Item | Action | Downlink | Uplink |
|----------------|---------------------------------|----------------|----------------|
| RF Power | Sets Alarm Level | 3 ~ 40 dB | -- |
| RSSI | Sets Low RSSI Alarm Level | -120 ~ -30 dBm | -120 ~ -30 dBm |
| Input Overload | Sets Donor Input Overload Level | -90 ~ -20 dBm | -90 ~ -20 dBm |

Table 2.1.3.2 Alarm Threshold Values

Downlink RF Power

The RF Power Alarm is the pilot power difference between the reference pilot power measured from the embedded modem when the repeater is installed initially and the current pilot power measured value from the embedded modem when the repeater is operating (HPA ON). If the difference exceeds the RF Power value, the alarm will turn on.

RSSI

The RSSI Alarm value is the minimum RSSI value that the Epoch-S02 requires to ensure optimal coverage. The RSSI Alarm value will turn on when the RSSI is lower than the threshold value (refer to the RSSI value in the Alarm Setting window).

Input Overload

An Input Overload Alarm occurs when the input signal strength to the Epoch-S02 exceeds the threshold value (refer to the Uplink/Downlink Input Overload values in the Alarm Setting window).

Heartbeat

Heartbeat is a periodic message sent out to Sprint PCS' NOC.

| | | |
|------------------|--------------------|--------------------------|
| Heartbeat On/Off | Set Heartbeat Mode | ON/OFF |
| Heartbeat Time | Set Heartbeat Time | 1 ~ 60 min @ 1 min Steps |

Table 2.1.3.3 Heartbeat Mode and Time Range

Heartbeat Mode

The Heartbeat ON box is enabled by default.

Periodic Time

The Periodic Time is the time interval between Heartbeats. The default time is 20 minutes.

2.1.4 Install Menu

At the time of installation, the installer/technician needs to open the Install Menu of the Epoch-S02 OMS V4.01. The Install Menu will guide the installer/technician through a step by step process to properly install the Epoch-S02 Repeater.

For setup or installation of a repeater, click "Install" on the menu bar of the Main Window.

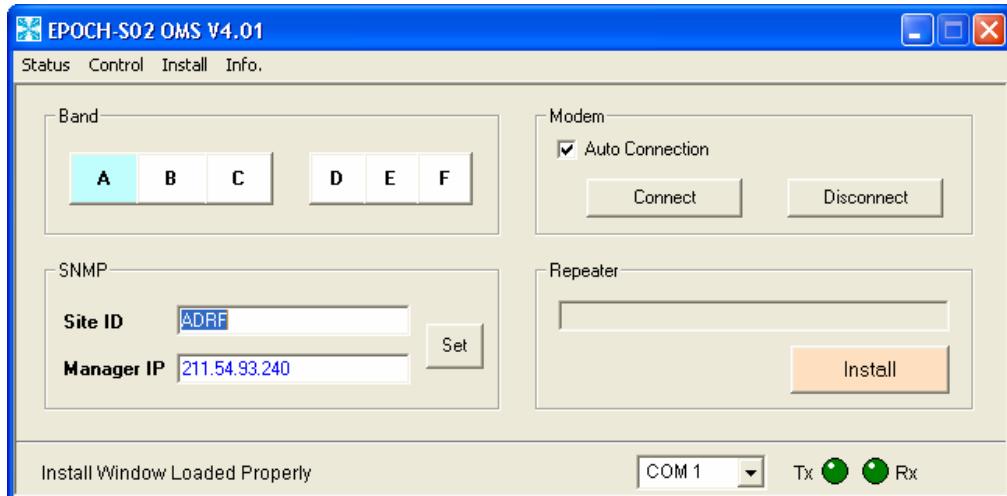


Figure 2.1.4 Install Window of the Epoch-S02 OMS V4.01

Band

Select the desired band or bands by clicking the appropriate buttons. You can deselect the undesired band or bands by clicking the button again. You can select among total 15 band combinations; A, B, C, D, E, F, AD, AE, AF, BD, BE, BF, CD, CE and EF. Neither two 5 MHz bands nor two 15 MHz bands can be selected at any given time.

SNMP**1. Site ID**

The “Site ID” is a unique ID for each site and will be provided by Sprint PCS.

2. Manager IP

The “Manager IP” address will be provided by Sprint PCS. The repeater will send alarms to the Sprint PCS’ NOC via the Manager IP address.

Modem

The “Auto Connection” box needs to be checked when the modem is installed inside the repeater. A 3G wireless modem is used in order to send the alarms and the heartbeat over the air to Sprint PCS’s NOC.

Repeater

Click the “Install” button and the repeater will setup automatically.

2.1.4.1 Pre-Installation

Prior to the Epoch-S02 Installation, ensure that:

1. The correct Com port is selected.
2. The donor and server antennas are in place.
3. The TX and RX communication status lights are operating.

The TX status light should blink every 3 seconds. A blinking RX (red) status light indicates that the laptop/PC is retrieving data from the repeater (Epoch-S02). Similarly, a blinking TX (green) light indicates that the laptop/PC is transmitting data to the Epoch-S02.

If neither of the lights is blinking, check the Com port setting of your laptop/pc by choosing the port to which the serial port is assigned.

2.1.4 Installation

For information regarding the use of the Epoch-S02 OMS V4.01 in Installation, refer to Section 1.5.1, "Repeater Installation" (Starting at number 9).

2.1.5 System Information

The System Information Menu Option displays the Model Number, Serial Number, Firmware Version, Manufacturing Date, and Repeater Installation Date/Time. Contact information is included along with a link to Advanced RF Technologies, Inc.'s URL.

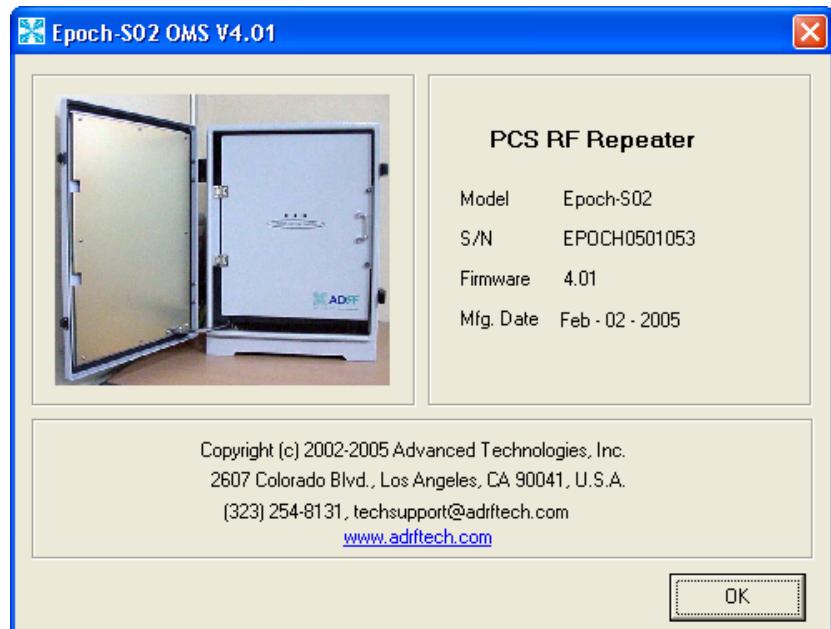


Figure 2.1.5 Info. Window of the Epoch-S02 OMS V4.01

2.2 Using the Epoch-S02 OMS V4.01

2.2.1 Changing Parameters

In changing the parameters of the repeater via use of the Epoch-S02 OMS V4.01, note that the values entered into the OMS V4.01 are limited to the ranges and modes specified in the Menu Structure section.

The Organizational Chart below shows (alphabetically) the parameters that can be changed and the location of each parameter in the menu

structure. The asterisk “*” denotes parameters that apply to both uplink and downlink.

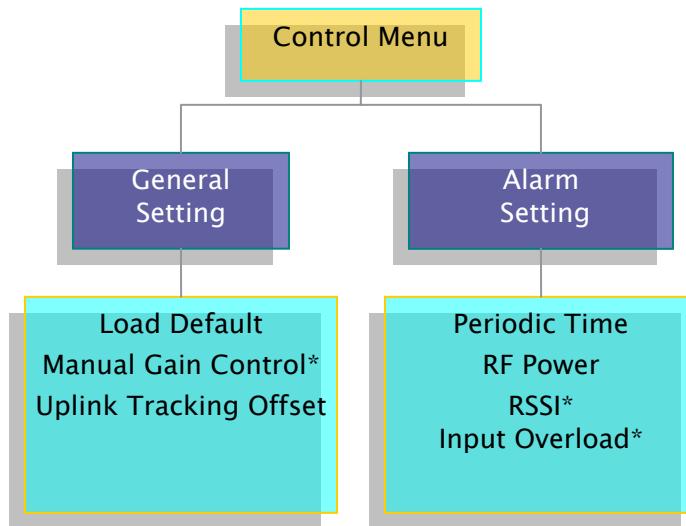


Figure 2.2.1 Variable Parameters in the Epoch-S02 OMS V4.01

2.3 Alarms

The screen shot of the Alarms Window below, can be viewed by clicking the *Alarm* button on the “Main Status Window.” If a soft fail should occur, the alarm of concern would be highlighted in yellow. In the same manner, the corresponding hard fail alarm would be highlighted in red. In order to find out what is causing the alarm(s), simply place the mouse cursor over the highlighted yellow or red alarm box and a pop up window will appear, displaying the threshold value and the current measured value. To update the Alarm window, click the “Refresh” button.

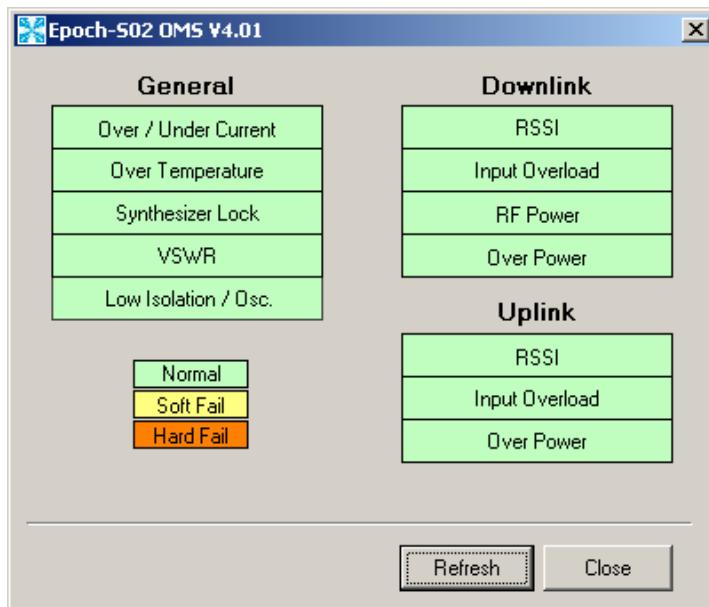


Figure 2.3 All Alarm Parameters from the Main Status Window of the Epoch-S02 OMS V2.0

In the event of a Hard Failure, the control board will shutdown the HPA for 30 seconds and then turns on the HPA to check for a repeated Hard Fail occurrence. If the next two occurrences sense a Hard Fail, the control boards will shutdown the HPA for 1 hour (total of three consecutive hard fails). After 1 hour, the HPA will automatically come back alive and the control board will check if the Hard Fail alarm has cleared or not. If it has not, the same process will continue as mentioned above.

2.3.1 General (Fixed Parameter) Alarms

| Alarm List | Soft Fail | Hard Fail | Comments |
|--------------------|-----------|-----------|---|
| Over/Under Current | ○ | ○ | Soft Fail: Less than 1 A @ under current Hard Fail: More than 6 A @ over current |
| Over Temperature | ○ | ○ | Soft Fail: < 158 ~ 185 °F Hard Fail: > 185 °F |
| Synthesizer Lock | - | ○ | Synthesizer Unlock |
| VSWR | - | ○ | > 1.5:1 |
| Low Isolation/Osc. | - | ○ | Repeater oscillation |

Table 2.3.1 General (Fixed Parameter) Alarms of the OMS V4.01

2.3.2 Downlink/Uplink Alarms

| | Alarm List | Soft Fail | Hard Fail | Remark |
|-----------------------|----------------------|-----------|-----------|--|
| Downlink (Forward) | RSSI | ○ | – | Alarms will turn on if the value is not within operable limit specified in the parameters set in the Control Alarm Setting Menu. |
| | Input Power Overload | ○ | – | |
| | Over Power* | ○ | ○ | |
| | RF Power | ○ | – | |
| Uplink (Reverse) | RSSI | ○ | – | |
| | Input Power Overload | ○ | – | |
| | Over Power* | ○ | ○ | |

Table 2.3.2 Adjustable Alarm Settings of the OMS V4.01

* The example below distinguishes the difference between an Over Power Soft Failure and an Over Power Hard Failure.

If the threshold value for the Downlink Over Power parameter was set to 23.0 dBm, a Hard Fail alarm would occur if the Downlink Over Power value was greater than 24.0 dBm (23.0 +1). Similarly, a Soft Fail alarm would occur if the Downlink Over Power value was greater than 23.0 dBm but less than 24.0 dBm. The same example also applies to the Uplink direction.

2.4 Default Control Settings

2.4.1 Default General Setting

| Control Item | Setting Value |
|--------------------------|---------------|
| AGC Mode | ON |
| Downlink/Uplink HPA Mode | ON |
| Uplink Tracking Mode | ON |
| Downlink/Uplink Gain | 80 dB |
| Tracking Gain Offset | 0 dB |

Table 2.3.3 Adjustable Alarm Settings of the OMS V4.01

1. When Uplink Tracking Mode is set ON, by default, the Tracking Gain Offset is 0 dB.

2.4.2 Default Alarm Setting

| Control Item | Setting Value | |
|----------------|---------------|----------|
| | Downlink | Uplink |
| RF Total Power | 10 dB | -- |
| RSSI | -95 dBm | -110 dBm |
| Input Overload | -30 dBm | -30 dBm |

| | |
|------------------|------------|
| Heartbeat On/Off | ON |
| Heartbeat Time | 20 minutes |

Table 2.4.2 Default Alarm Parameter Values of the
Epoch-S02 OMS V4.01

3 Maintenance Guide for Epoch-S02 OMS V4.01

3.1 Periodic Inspection Checklist

- 1. Ensure that the door is closed and locked before inspection.
- 2. Check for loose connections to the repeater and antennas. If connections are loose, make sure that all connections are tightly fastened properly.
- 3. Cables and Connectors are in good condition.
- 4. Open the Repeater door to check that the Repeater is on.
- 5. Check that all components inside are intact with no unusual wear (e.g., rust, dirt, etc.).
- 6. Ensure that the Repeater brackets (if used) are in good condition and that the Repeater is securely fastened.

3.2 Preventive Measures for Optimal Operation

3.2.1 Recommendations

- Perform the Periodic Inspection Checklist quarterly or semiannually.
- Always lock the door to the repeater to prevent unauthorized access.
- Tune the Repeater so that amplification is only within the band selected. In other words, no amplification of unwanted signal(s) outside the selected band.

3.2.2 Precautions

- Do not operate the repeater with the antennas in extremely close proximity as this may cause damage to the repeater.
- Do not shut down the repeater unless absolutely necessary (in the case where the repeater is a hazard to safety).
- Do not change parameters unless instructed to do so by an authorized supervisor.
- Do not move the repeater unless instructed to do so by an authorized supervisor.
- Do not detach any cables to the repeater unless repair of respective components are necessary.

4 Troubleshooting

4.1 Epoch-S02 OMS V4.01 Scenarios

| Tx | Rx | Explanation |
|----------------|----------------|--|
| RED | RED | The COM Port can not send or receive data. Check the COM port connection to the computer and the Repeater. Ensure that the Repeater is on and that the connection to the repeater is secure. |
| Blinking GREEN | RED | The Repeater is not receiving any commands from the OMS software. Ensure that the Repeater is on. |
| Blinking GREEN | GREEN | The Repeater is not receiving any commands from the OMS software. Ensure that the Repeater is on and that the connection to the repeater is secure. |
| Blinking GREEN | Blinking GREEN | Successful Connection. The OMS V4.01 and the Repeater are communicating successfully. |

Table 4.1 Tx and Rx LEDs

Note: The Tx/Rx LEDs will blink periodically only on the main status window.

4.2 Heartbeat Scenarios

If the Heartbeat of the Epoch-S02 is not being received by the NOC, it may be necessary to send a technician to visit the Epoch-S02 site. Scenarios for no

heartbeats being sent include consistent Hard Failure (as mentioned in the “Alarms” Section 2.3) in the following areas:

1. Over Current
2. Over Power
3. Over Temperature

Over Current

The “Over Current” Alarm occurs when the input current from the power source exceeds 6 Amps. In order to lessen the amount of Amperes drawn by the Epoch-S02, the control board will shut off components that draw current (i.e. the HPA).

Over Power

The “Over Power” limits for uplink and downlink are set by the user in the Alarm Setting Window in the Control Menu. A Hard Failure “Over Power” Alarm occurs when the output of the Epoch-S02 exceeds the limits entered into the Alarm Parameter Settings (Over Power limit +1 dBm).

Over Temperature

A temperature inside the box greater than 185° F will cause the Epoch-S02’s control board to shut down the HPA in an attempt to lower the temperature inside. Though the Epoch-S02 is equipped with a heat sink to dissipate heat, extreme conditions, such as very hot temperature, are dealt with by shutting down heat-generating components (i.e. HPA).

1. Prior to visiting the site, know the temperature of the Epoch-S02 site on the day that the heartbeat stopped being sent.
2. Observe the ambient temperature surrounding the Epoch-S02 site. If the weather is hot, it is safe to assume that the outdoor temperature caused the “Over Temperature” Failure.
3. If the outdoor temperature was or is fairly cool, one can assume too much heat is being generated within the Epoch-S02.
4. Since the HPAs have been shutdown to dissipate heat, it is safe to evaluate the repeater by unlocking and opening the front door.
5. Evaluate the inside of the Epoch-S02 and check to see that no unusual wear exists (e.g. burned, blackened areas, etc.). If you detect these areas, contact Advanced RF Technologies, Inc. in the “Warranty and Contact Information” section, Section 5.

5 Warranty and Repair Policy

5.1 General Warranty

Advanced RF Technologies, Inc. warrants to the original purchaser all standard products sold by Advanced RF Technologies, Inc. to be free of defects in material and workmanship for the duration of the warranty period of one (1) year from date of shipment from Advanced RF Technologies, Inc. During the warranty period, at our option, is limited to repair or replacement of any product that Advanced RF Technologies, Inc. proves to be defective. This warranty does not apply to any product, which has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

5.2 Specific Product Warranty Instructions

All Advanced RF Technologies, Inc. repeaters are manufactured to high quality standards and are warranted against defects in workmanship, materials and construction, and to no further extent. Any claim for repair or replacement of a device found to be defective on incoming inspection by a customer must be made within 30 days of receipt of the shipment, or within 30 days of discovery of a defect within the warranty period.

This warranty is the only warranty made by Advanced RF Technologies, Inc. and is in lieu of all other warranties, expressed or implied, except as to title, and can be amended only by a written instrument signed by an officer of Advanced RF Technologies, Inc. Advanced RF Technologies, Inc. customer support representatives are not authorized to make commitments on warranty returns.

In the event that it is necessary to return any product against the above warranty, please contact the Customer Support Department via e-mail @ customersupport@adrftech.com or by calling (323) 254-8131.

Note: Advanced RF Technologies, Inc. test reports or data indication mean-time-between failure or other reliability data are design guides and are not intended to imply that individual products or samples of products will achieve the same results. These numbers are to be used as management and engineering tools, and are not necessarily indicative of expected field operation. These numbers assume a mature design, good parts, and no degradation of reliability due to manufacturing procedures and processes.

Appendix A: Epoch-S02 OMS V4.01 Installation and Requirements

A.1 Minimum Requirements

Hardware

PC Platform

CPU: 200 MHz
Memory: 32 MByte
Hard Disk: 6 MByte (free space)
Serial Port: 1 Port (RS-232)
CD-ROM Drive

Compatible Operating System

Microsoft Windows 98SE, ME, 2000 (preferred), XP

A.2 Epoch-S02 OMS V4.01 Installation/Startup

Installing the Epoch-S02 OMS V4.01

1. Insert the CD into the CD-ROM drive.
2. On the Desktop, click on *My Computer*.
3. In the *My Computer* window, click on your CD-ROM drive, usually labeled (D:).
4. Double-click the file labeled *setup.exe*.
5. The Installation Wizard will guide you to the conclusion of the OMS V4.01 installation process.

Initial OMS V4.01 Startup

1. Attach the PC serial (RS-232) port to the repeater's (DB9 NMS) port with the cable (straight through) provided.
2. Open the Epoch-S02 OMS V4.01 software
3. In the Status Window, choose your connection to the repeater: COM1, COM2, COM3, or COM4 (The default setting is COM1). Refer to section 4.6.1 for additional information.
4. Click *Status* to update the Status Window.

Appendix B: Specifications

B.1 Repeater Specifications

ELECTRICAL SPECIFICATIONS

| PARAMETERS | | SPECIFICATIONS | COMMENTS |
|------------------------------------|----|--------------------------|--|
| Frequency Range | FL | 1930 to 1990 MHz | |
| | RL | 1850 to 1910 MHz | |
| Sub Band Filtering | | 5 MHz, 15 MHz, or 20 MHz | A, D, B, E, F, C, AD, AE, AF, DB, DC, BE, BF, EC or FC |
| Operating Frequency | | Programmable | |
| Frequency Error | | $\leq +/ - 0.1$ ppm | |
| System Delay | | ≤ 5 usec | Each Direction |
| Receiver Dynamic Range | | -85 to -45 dBm | |
| Maximum Adjacent Band Signal Level | | -45 dBm | @ Isotropic Antenna |
| Repeater Gain | | 50 to 90 dB | |
| Maximum FL and RL Output Power | | +24 dBm | Composite |
| FL AGC Range | | 40 dB | |
| RL AGC Range | | 40 dB | |
| AGC Step Size | | 0.5 dB | |
| Gain Linearity | | $\leq +/ - 1.0$ dB | |
| Gain Flatness | | ≤ 2.5 dB | |
| Total PA Power Variance | | $\leq +/ - 0.5$ dB | |
| In Band Noise | | ≤ -45 dBc | @ Fc $+/- 885$ KHz |
| | | ≤ -50 dBc | @ Fc $+/- 1.98$ MHz |
| Spurious Emission | | < -13 dBm | @ Fc $+/- 2.25$ MHz |
| Rho Factor | | ≥ 0.912 | |
| Noise Figure | | Typical 4 dB | @ Maximum Gain |
| VSWR | | $\leq 1.5:1$ | |

MECHANICAL SPECIFICATIONS

| PARAMETERS | | SPECIFICATIONS | COMMENTS |
|--------------------|--------------|-----------------------------|-----------|
| Cabinet Size | | 15.75 x 17.72 x 7.85 inches | W x H x D |
| Cabinet Weight | | ≤ 50 lbs | |
| Cabinet Mount Type | | Utility Pole Mount | |
| Connector Type | Antenna | N-Type (F) | |
| | Coupling | SMA (F) | 30 dB |
| | Frame Ground | Hex Nut (M6) | |
| | Control | DB9 (M) | |
| Cooling | | Convection | |
| Weatherproofing | | NEMA 4, IP65 | |

POWER SPECIFICATIONS

| PARAMETERS | | SPECIFICATIONS | COMMENTS |
|--------------------------|--------------------|------------------------|----------|
| Main AC Power | | 100 to 240 VAC | |
| AC Frequency | | 45 to 65 Hz | |
| Power Consumption | | ≤ 300 Watts | |
| AC Supply Protection | | Fuse | |
| Auxiliary Power (Option) | Output Voltage | 12.0 VDC | |
| | Endurance | ≥ 2 hour | |
| | Main to Auxiliary | Automatic | |
| | Auxiliary to Main | Automatic | |
| | Battery Protection | Internal Fuse | |
| Grounding | | External Threaded Stud | |

ENVIRONMENTAL SPECIFICATIONS

| PARAMETERS | | SPECIFICATIONS | COMMENTS |
|-----------------------|--|-------------------|----------|
| Operating Temperature | | -22 °F to +122 °F | |
| Storage Temperature | | -22 °F to +176 °F | |
| Humidity | | 10 to 85%, RH | |