EPOCH-M1P
USER MANUAL

Version 1.0

ADRF
ADVANCED RF TECHNOLOGIES

2607 Colorado Blvd.
Los Angeles, CA 90041
USA
Tel: 323-254-8131
Fax: 323-254-4928
www.adrftech.com

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Please send comments to:

E-Mail: info@adrftech.com

Phone: (323) 254-8131

Fax: (323) 254-4928

Address: Advanced RF Technologies, Inc.
             Attention: Technical Publications Department
             2607 Colorado Blvd., Suite 100
             Los Angeles, CA 90041
             USA
             www.adrftech.com

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1. Introduction of Epoch-M1P

   1.1 Overview

   Epoch-M1P series repeaters enhances in-building wireless coverage in the most effective and cost efficient way. For its intelligent design and versatility, Epoch-M1P series repeaters is the ideal choice for wireless coverage problems indoors. Epoch-M1P series repeaters can be used as a stand-alone repeater with passive antennas connected to it or it can also be used as a feeder repeater to a DAS (Distributed Antenna System).

   1.1.1 Highlights

   - 20 dBm Composite Output Power
   - 80 dB gain
   - 25 dB AGC Range @ 0.5 dB Step
   - Can Set AGC Output Power Level
   - Band/Channel Selectable via Software
   - Can Support Non-Contiguous Bands
   - Supports Embedded Wireless Modem
   - Supports Network Management Monitoring System via SNMP
   - Supports Auxiliary Alarming for a DAS or a Third-Party Repeater

   1.1.2 Special Features
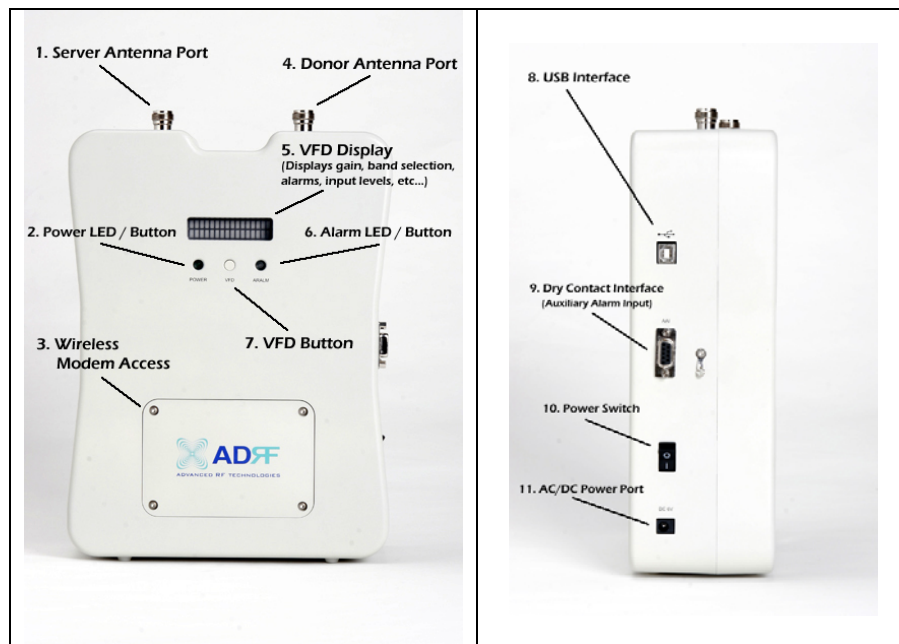
Figure 1 - Front & Right Side Views of the Repeater

1. Server Antenna Port
One end of the coax cable will connect to the "Server Antenna Port" of Epoch-M1P while the other end of the cable will connect to the server antenna which is pointing towards the intended coverage area.

2. Power LED / Button
The Power LED will be lit Green if the power is turned on and will be not lit if the power is turned off.

3. Wireless Modem Access
You can manually place or take off the wireless modem by taking of the four screws.

4. Donor Antenna Port
One end of the coax cable will connect to the "Donor Antenna Port" of Epoch-M1P while the other end of the cable will connect to the donor antenna which is pointing towards the BTS.

The coax cable coming in from the donor antenna (pointing towards the BTS)

5. VFD Display
In this display, you are able to view the repeater vitals in each link (e.g. RSS, Gain, Output Power & Alarms).

6. Alarm LED / Button
If there's an alarm, the Alarm LED will be lit Red and will not be lit if there isn't any alarm.

At the same time, by pressing the "Alarm LED" button, you can choose the desired operating band(s). By clicking on the "ALARM LED" button each time, you will be sliding the filter (5, 10 or 15 MHz - depending on the Epoch-M1P model) to the right side of the spectrum by an increment of 25 channel steps (1.25 MHz bandwidth).

*** Please refer to Appendix B for more detailed information on how the Alarm LED buttons operates.*

7. VFD

VFD stands for "Vacuum Fluorescent Display."

*** Please refer to Appendix B for more detailed information on how the VFD button operates.*

8. USB Interface

For management and troubleshooting purposes, you can connect your PC to Epoch-M1P via USB cable.

9. Dry Contact Interface (AAI)

AAI stands for Auxiliary Alarm Input. It acts as the interface between the two devices (Epoch-M1P & DAS or third-party repeater) so that it can pass alarming information from the third-party device to the Epoch-M1P. The following table illustrates the PIN assignment which can be customized according to the third-party device so that proper alarming parameters are passed to Epoch-M1P.

No.	NAME	Description
1	Cable Connection	Active Low
2	External Alarm 1	Active Low
3	External Alarm 2	Active Low
4	External Alarm 3	Active Low
5	External Alarm 4	Active Low
6	GND	GND
7	GND	GND
8	Open	Open
9	Open	Open

Table 1 – Pin Assignment for AAI

1.1.3   Available Models

Epoch-M1P is available in all 1900 MHz PCS band combinations. The following table illustrates the four standard models:

Product ID	Description
Epoch-M1P-05	RF repeater with 5 MHz sliding filter @ 0.5 dB step across the 60 MHz PCS spectrum
Epoch-M1P-10	RF repeater with 10 MHz sliding filter @ 0.5 dB step across the 60 MHz PCS spectrum
Epoch-M1P-15	RF repeater with 15 MHz sliding filter @ 0.5

	dB step across the 60 MHz PCS spectrum
* Epoch-M1P-XX	RF repeater with factory built fixed filters

Table 2 - Epoch-MIP Models

In certain markets, service providers may be operating in non-contiguous bands, e.g. D+E, A+C5, A3+D+C5, etc. In these special markets, we are able to offer custom fixed filters to the service providers.

1.2 Warnings and Hazards

WARNING! ELECTRIC SHOCK

Opening the Epoch-M1P could result in electric shock and may cause severe injury.
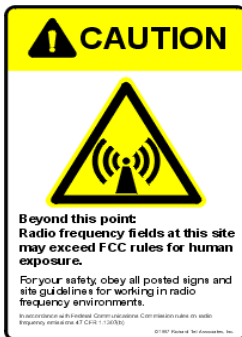
WARNING! EXPOSURE TO RF

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.
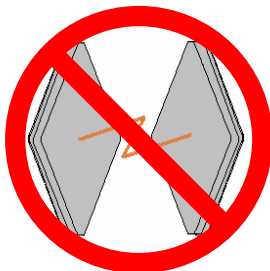
WARNING! DAMAGE TO REPEATER

Operating the Epoch-M1P with antennas in very close proximity facing each other could lead to severe damage to the repeater.

RF EXPOSURE & ANTENNA PLACEMENT Guidelines

Actual separation distance is determined upon gain of antenna used.

Please maintain a minimum safe distance of at least 20 cm while operating near the donor and the server antennas. Also, the donor antenna needs to be mounted outdoors on a permanent structure.

WARRANTY

Opening or tampering the Epoch-M1P will void all warranties.

1.3 Epoch-M1P Parts List

The Epoch-M1P repeater system includes:

	PART ID	QUANTITY
a. Epoch-M1P Repeater	EPOCHMIPXX	1
b. Screws	SC01	4
c. **CD	M100OMS V1.XX01	1
d. USB Cable	USB01	1
e. Power Cable	PWRC01	1

** CD includes: (1) Software; (2) User Manual; (3) M1P Setup Quick Start Guide; (4) USB Cable Setup Quick Start Guide; & (5) Software Setup Quick Start Guide.

1.4 Epoch-M1P Software Installation and Requirements

1.4.1 Minimum PCS Requirements

CPU:	200 MHz
Memory:	32 MB
Hard Disk:	10 MB (Free Space)
USB Port:	1 USB Port
CD-ROM Drive	

Compatible Operating System:
Microsoft Windows 2000 / XP

1.4.2 Epoch-M1P Software Installation

** Refer to the Software Setup Guide

1.4.3 Initial Startup of Epoch-M1P Software

a. Using the USB cable (USB01) that is provided, connect one end of the cable to the USB port to the PC and the other end to the repeater's USB port located on the right side of the repeater.
b. Open the Epoch-M1P Software.

** Refer to the USB Setup Guide

1.5 Pre-Installation using Epoch-M1P Software

Prior to the Epoch-M1P installation, ensure that:

a. The USB cable has been connected and proper communication has been established.
b. The donor and server antennas are in place.
c. The TX and RX communication status LEDs are lit green and blinking periodically on the Status Menu.

** The TX and RX LEDs should blink every 1 second only in the Status Menu. In the Status Menu, a blinking green RX LED indicates that the PC is retrieving data from the repeater (Epoch-M1P). Similarly, a blinking green TX LED indicates that the PC is transmitting data to the Epoch-M1P.

1.6 Step by Step Instructions for Installation

1.6.1   Repeater Setup
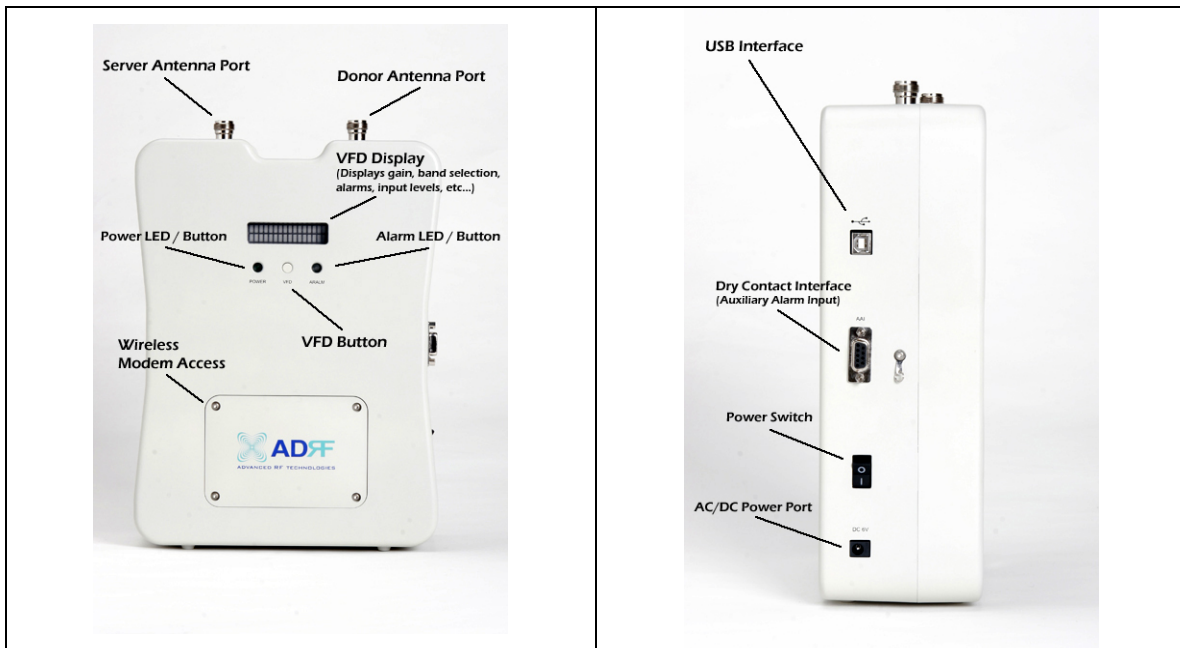
Figure 2 – Front & Right Side Views of the Repeater

1. Connect the Power Source

Make sure that the power switch on the right side of the repeater is turned off before connecting the power cable. Connect the power cable to the AC/DC Power Port as shown in Figure 3. Make sure not to turn the power on

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

2. Connect the Donor Antenna

Connect one end of the RF coaxial cable to the donor antenna and the other end to the repeater Donor Antenna Port located on the top of the Epoch–M1P as shown in Figure 2.

6. Connect the Server Antenna

Connect one end of the RF coaxial cable to the server antenna and connect the other end to the repeater Server Antenna Port located on the top of the Epoch–M1P as shown in Figure 2.

7. Connect the USB Cable

Using the USB cable (included in the box), connect one end of the cable to the Epoch-M1P's USB port located on the right side of the repeater and the other end to the PC's USB port as shown in Figure 2.

** Install the USB driver and the Epoch-M1P Manager Software prior to installation.

8. Turn On the Power for Epoch-M1P
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 on the right side of the repeater.

9. Launch the Epoch-M1P Software
Open the Epoch-M1P Software. You will see the Status Menu.

** For more detailed information on the Epoch-M1P Software, please refer to Section 2 on page 15.

** If only one or both of the LEDs are not blinking: (1) check the physical USB cable connection or (2) check if the repeater power is turned on.

10. Go to the Install Window
Now with the blinking TX and RX status LEDs on the Status Window, go to the Install Window. You will see the following:
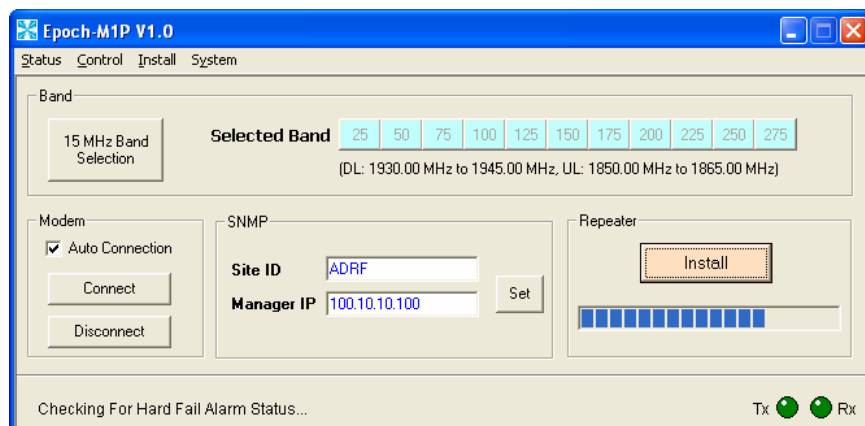
Figure 3 - Installation Window of the Epoch-M1P Software
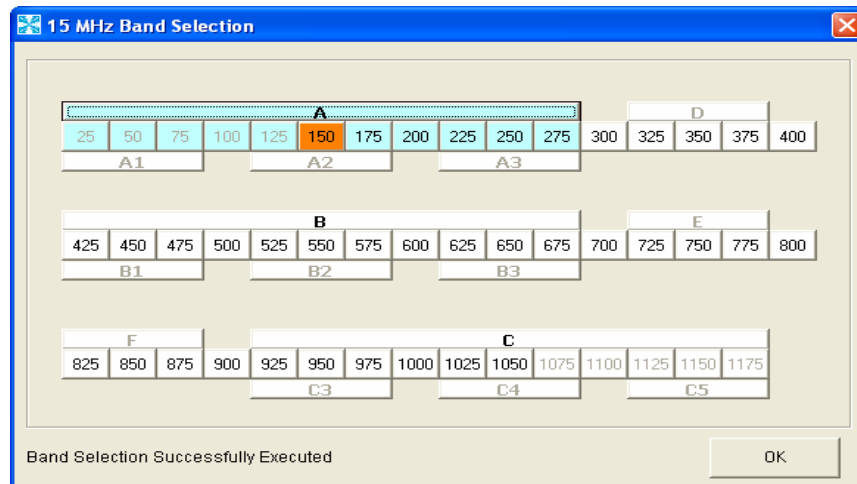
Figure 4 – Band Selection Window of the Epoch-M1P Software

11. Select the Desired Band(s)

From the Install Window (Figure 3), click on "XX MHz Band Selection" button and a new pop-up window will appear (Figure 4). Select the desired band(s) or center channel number(s) by clicking the appropriate buttons. You can deselect the undesired band(s) or channel number(s) by clicking the button again.

There are two ways of selecting the operating band(s): (1) you can click on the partial/full band itself (e.g. A1, B, E, etc.) or (2) you can click on the specific channel #'s (e.g. 100, 125, 325, etc.).

** Depending on which model of Epoch-M1P is being used, the band selection window will vary.

** If a wireless modem is not connected, skip steps 12 through 13 and proceed to step 14.

12. Provide SNMP Information

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

13. Check the Modem Connection

Verify that the *Auto Connection* box is checked.

14. Click on Install

After the first three steps, click on "Install." This installation process will normally take less than a minute.

*** Please refer to the "M1P Setup Guide" for any questions or problems that you may encounter during this installation process.*

If a modem is not connected to the repeater and you click the "Install" button, the following pop-up window will appear:
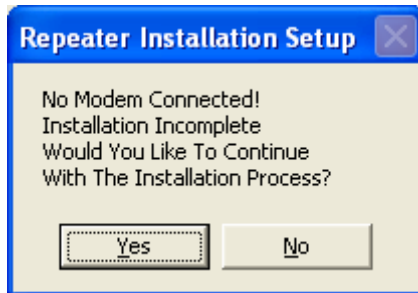
If you choose to continue with the RF portion only, simply click "Yes" and the installation process will resume again.

16. Check the Front LED Panel
Check that the Power LED is on (Green) and the Alarm LED (Red) is off.

*** If the Alarm LED is on, refer to Section 2.3 on page 25.*

*** You can go to the Status Menu of the Epoch–M1P Software to view the basic parameters of the repeater once the repeater has installed successfully.*

CONGRATULATIONS!!
The Epoch–M1P Installation Process is Complete.

2 User Manual V1.0 using Epoch-M1P Software

2.1 Menu Structure

2.1.1 Window Overview

Status

The Status Window allows you to monitor the current settings and status of the Epoch-M1P.

Control

The Control Window enables you to change or adjust the Epoch-M1P's parameters and settings.

Install

The Install Window guides you through an automated installation of the Epoch-M1P repeater.
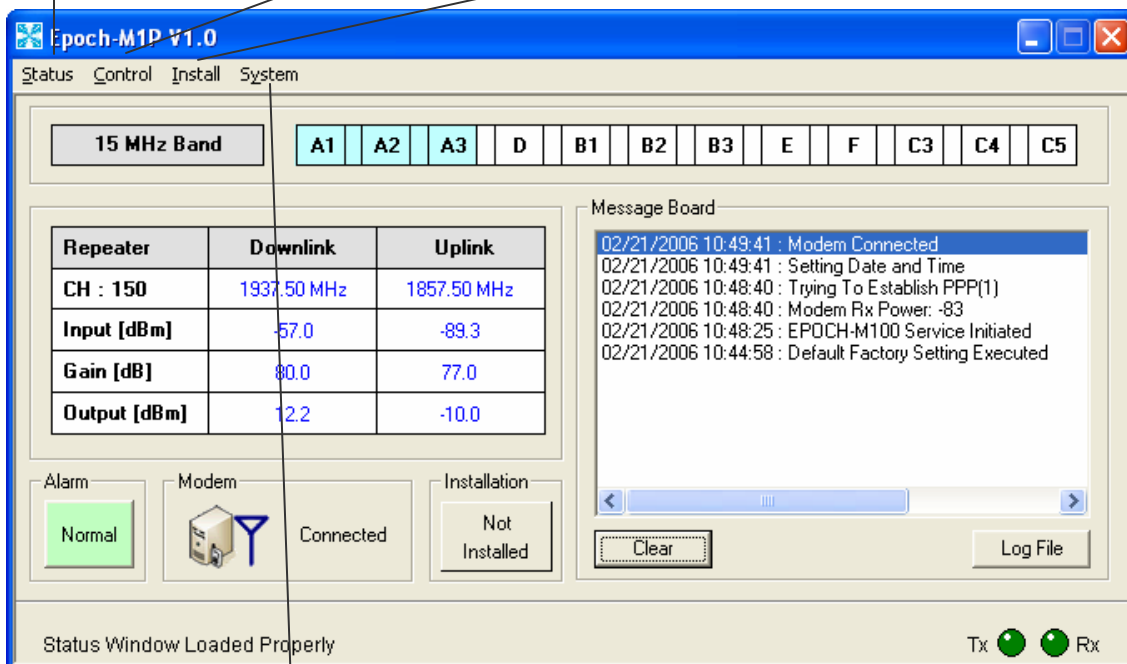
Figure 5 - Status Window of the Epoch-M1P Software

System Information

For more detailed system information, click on the Info. Menu. Information such as model number, serial number, firmware version and manufacturing date of the repeater are included here.

2.1.2   Status Window

The Status Window is the monitoring window of the Epoch-M1P Software. This window enables the user to monitor the status and settings of the Epoch-M1P. In other words, no parameters can be changed in the Status Window.   To change parameters, you will need to go to the Control Window.

Repeater Input
Indicates input signal strength of the repeater after the donor antenna [in dBm].

Center Channel Number
Indicates the center channel number of the selected band.

Band Selection
Currently selected band(s) are highlighted.

Message Board
The user will be able to see heartbeat messages which are sent out recently. In addition, the user will also be able to see any alarms that are generated along with messages once the alarms are cleared as well.

Modem Connection
If the modem has properly established a PPP session.

Repeater Gain
Indicates the gain of the repeater [in dB].

Clear
Will clear the Message Board.

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

Log File
History for the heartbeats and alarms generated from the repeater and can be saved as a text file.
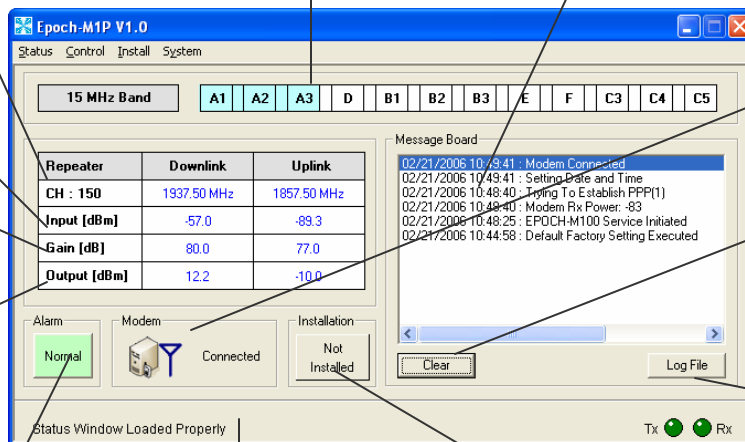
Figure 6 - Status Window of the Epoch-M1P Software

Alarm Button
The alarm button changes color to the corresponding status of the repeater: Green for normal operation; Yellow for soft fail alarm; and Red for hard fail alarm. Click on the alarm button for detailed alarm information.

Status Bar
Displays the status of the repeater (e.g. Status Window Loaded Properly, etc.), transmit (TX) and receive (RX) communication LEDs.

Installation
Will let you know if the repeater is properly installed.

2.1.3   Control Menu

2.1.3.1 General Setting Window
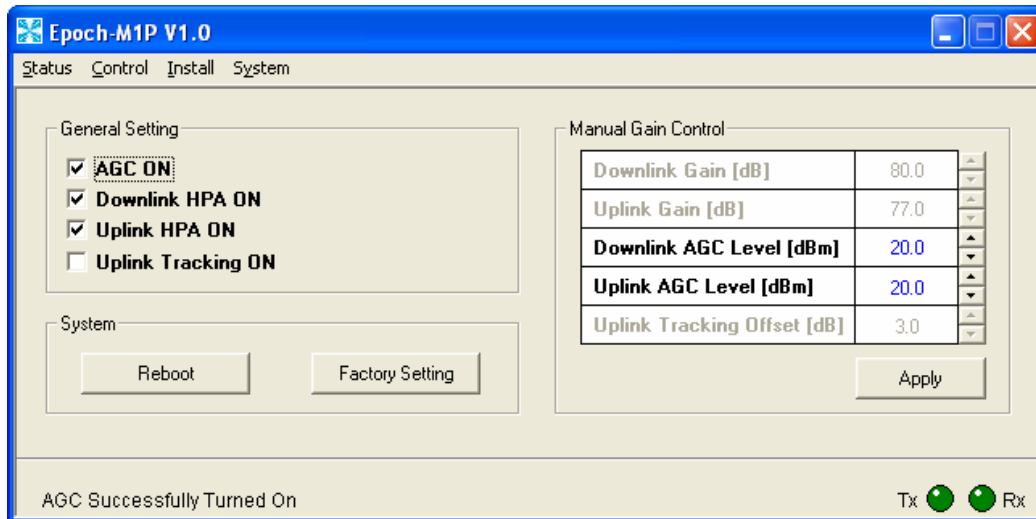
Figure 7 – General Setting Window of the Epoch-M1P Software

AGC Mode

AGC (Auto Gain Control) adjusts the variable gain of the repeater to ensure a constant specified output power of 20 dBm. The functionality of the AGC feature is assured under the condition that the input BTS signal is within the specified AGC range (-60 to -35 dBm => assuming AGC Level is set to 20 dBm) and that sufficient isolation exists between antennas ($\geq$ 93 dB).   By default, the *AGC ON* box is checked. To manually change the gains in both the links, *AGC ON* must be unchecked.

If *AGC ON* is checked and *Uplink Tracking ON* is unchecked, the user can specify the AGC level in the downlink and in the uplink respectively @ 0.5 dB step (0 to 20 dBm). By default, the AGC Level is set to 20 dBm in each link.

Downlink/Uplink HPA Mode

The HPA mode enables the user to turn the HPA on or off. If the HPA is turned off on either link, the Epoch-M1P will not operate properly. Both HPAs needs to be turned on for the RF portion of the repeater to work in both directions (downlink and uplink). By default, the *Downlink/Uplink HPA ON* box are checked.

Either or both HPAs can be turned off for troubleshooting purposes during an installation process.

Uplink Tracking/Offset Modes

Uplink tracking mode enables or disables the *Uplink Tracking ON* 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 ON* is checked, and the *Uplink Tracking Gain Offset* is set to 3 dB, the uplink gain would be 77 dB.

By default, the *Uplink Tracking ON* box is not checked. If it was checked, then the default *Uplink Tracking Offset* is set to 3 dB. This means that the uplink gain will track the down link gain and will be 3 dB less.

Control Item	Action	Setting Value
Uplink Tracking ON	Set Uplink Tracking Mode	ON or OFF
Uplink Tracking Offset	Set Tracking Gain Offset	0 ~ 10 dB @ 0.5 dB step

Table 3 – Uplink Tracking Mode and Tracking Gain Offset Range

Downlink/Uplink Gain
The gain of the Epoch–M1P is the ratio of the input signal to the output signal. The gain may be set in both links.

*** The manual gain option is disabled when the AGC ON box is checked.**

Reboot
By clicking the "Reboot" button, similar to how the operation works in a PC, the control board of the repeater will restart itself.

Factory Setting
Clicking on 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 on page 28.

*** You will lose your current saved settings once you click on Factory Setting.**

2.1.3.2 Alarm Setting Window
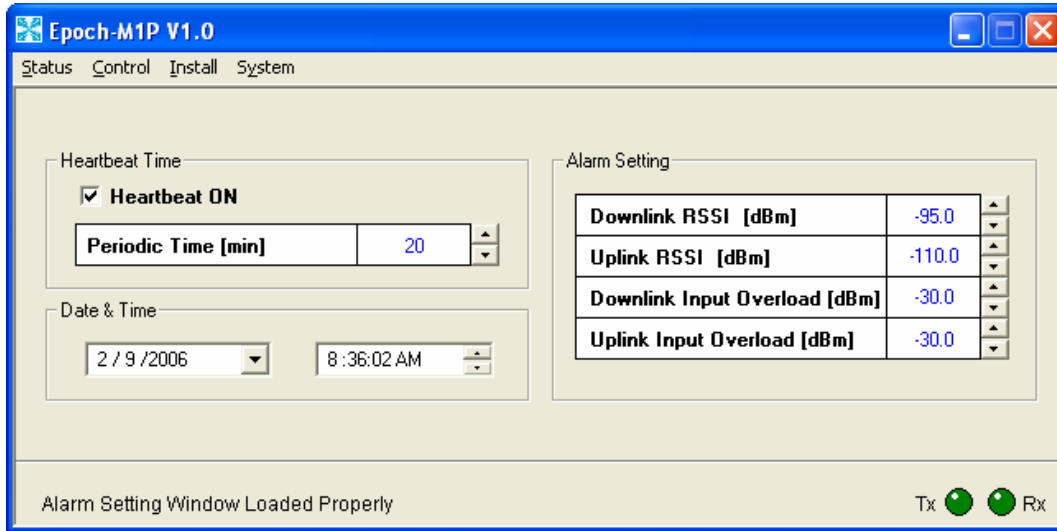
Figure 8 - Alarm Setting Window of the Epoch-M1P Software

Heartbeat

Heartbeat is a periodic message sent out to Wireless Provider's NOC *only if the repeater comes with a wireless modem*.

Control Item	Action	Setting Value
Heartbeat ON/OFF	Set Heartbeat Mode	ON/OFF
Periodic Time	Set Heartbeat Time	1 ~ 60 min @ 1 min step

Table 4 - Heartbeat Mode and Time Range

Heartbeat Mode

The Heartbeat ON box is checked by default. *The heartbeat feature is only available if the repeater has a wireless modem.*

Periodic Time

The *Periodic Time* is the time interval between Heartbeats *only if the repeater has a wireless modem connected to it*. The default periodic time is 20 minutes. The periodic time can be adjusted manually between 1 to 60 minutes.

Date & Time

If the repeater doesn't come have a wireless modem, you need to set the date and time manually in order for the Log File to reflect accurate information in terms of when the data was generated.

If there's a modem inside the repeater, you don't need to set the date and time manually.

Alarm Setting

RSSI
The RSSI alarm is the minimum RSSI value that the Epoch–M1P requires to ensure optimal coverage. The RSSI alarm will go off when the RSSI is lower than the threshold value (refer to the RSSI value in the Alarm Setting Window). The threshold RSSI value can also be adjusted manually @ 0.5 dB step (range is shown in Table 5 on page 20).

Input Overload
A Downlink/Uplink Input Overload alarm occurs when the input signal strength to the Epoch–M1P exceeds the threshold value (refer to the Uplink/Downlink Input Overload values in the Alarm Setting window).

Control Item	Action	Downlink	Uplink
Downlink/Uplink RSSI	Sets Low RSSI Alarm Level	–110 ~ –80 dBm	–110 ~ –80 dBm
Downlink/Uplink Input Overload	Sets Input Overload Level	–45 ~ –20 dBm	–45 ~ –20 dBm

Table 5 – Alarm Threshold Values

2.1.4 Install Window

At the time of installation, the installer needs to go to the Install Window of the Epoch–M1P Software. The Install Window will guide the installer through a step by step process to properly install the Epoch–M1P repeater.

For setup or installation of Epoch–M1P, go to the Install Window.
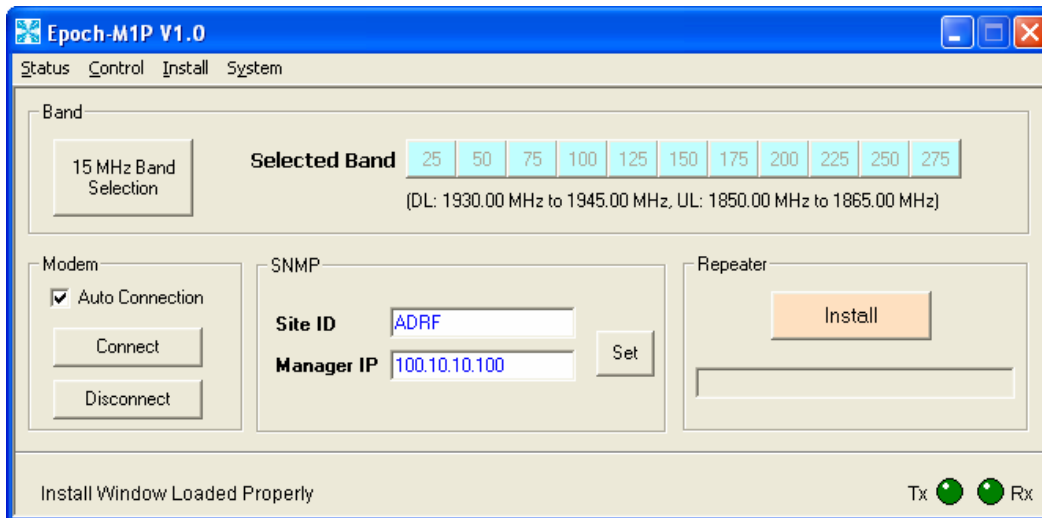
Figure 9 - Install Window of the Epoch-M1P Software

Band

As shown on Figure 9, click on "Band Selection" button and a new pop-up window will appear as shown in Figure 5. Select the desired band(s) or channel number(s) by clicking the appropriate buttons. You can deselect the undesired band(s) or channel number(s) by clicking the button again.

There are two ways of selecting the operating band(s): (1) you can click on the partial/full band itself (e.g. A1, B, E, etc.) or (2) you can click on the specific channel number (e.g. 100, 125, 325, etc.).

The following Table 5 illustrates the channel numbers associated with each partial/full band. For example, if the Epoch-M1P-05 model which uses the 5 MHz sliding filter is being used, then in order to choose the B2 band, you would have to click on the center channel number from the chart below, which is channel number 550.

Similarly, if the Epoch-M1P-15 model which uses the 15 MHz sliding filter is being used, then in order to select C band, you would have to click on the channel number 1050 which is the center channel number of the C band. The following table illustrates the channel numbers assigned to the partial PCS bands.

Band	Partial Band (5 MHz each)	Channel Numbers
A	A1	25, 50 & 75
	A2	125, 150 & 175
	A3	225, 250 & 275

D	–	325, 350 & 375
B	B1	425, 450 & 475
	B2	525, 550 & 575
	B3	625, 650 & 675
E	–	725, 750 & 775
F	–	825, 850 & 875
C	C3	925, 950 & 975
	C4	1025, 1050 & 1075
	C5	1125, 1150 & 1175

Table 6 – Channel Number Assignment

SNMP *(only applicable if a wireless modem is connected to the repeater)*
  a. Site ID
      The *Site ID* is a unique ID for each site and will be provided by the Wireless Provider.

  b. Manager IP
      The *Manager IP* address will be provided by the Wireless Provider. The repeater will send alarms to the Wireless Provider's NOC to the assigned Manager IP address.

Modem *(only applicable if a wireless modem is connected to the repeater)*
      The *Auto Connection* box needs to be checked when the wireless modem is installed inside the repeater. A wireless modem is used in order to send the alarms and the heartbeat over the air to the Wireless Provider's NOC.

Repeater
      Click the "Install" button and the repeater will setup automatically.

For information regarding the use of the Epoch-M1P Software during installation, refer to Section 1.7.1 on page 11, "Repeater Installation" (starting at number 9).

2.1.5   System Menu

2.1.5.1 Info. Window

The Info. Window displays the Model Number, Serial Number and Firmware Version of the Epoch-M1P repeater.   Contact information is included along with a link to Advanced RF Technologies, Inc.'s URL.

Figure 10 – Info. Window of the Epoch-M1P Software

2.1.5.2 Upgrade Window

In order to download the latest repeater firmware, click on the Upgrade Window. The firmware file will be provided by the technical support group from Advanced RF Technologies, Inc. Once the firmware file has been saved on the PC, you would connect the Epoch-M1P repeater to the PC via the USB cable provided. Click on "Open" and locate the firmware file and click on 'Download."
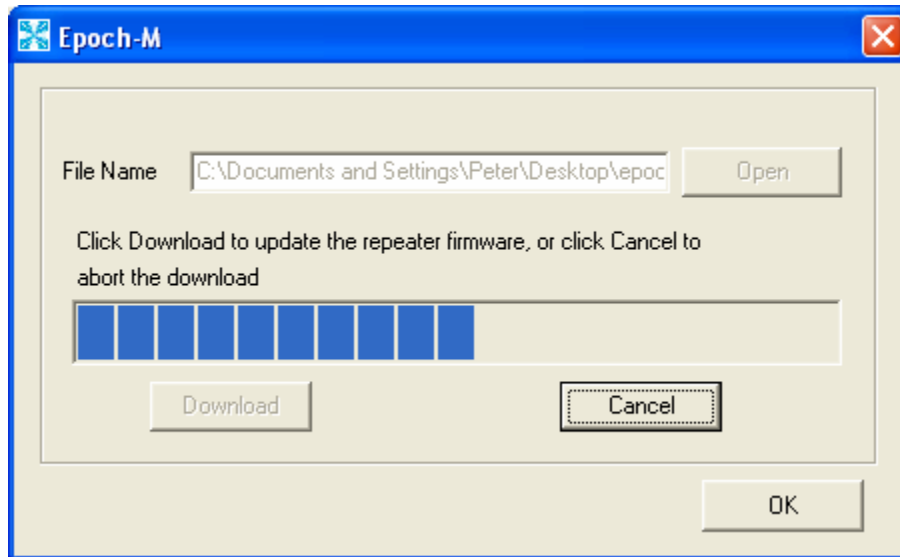
Figure11 – Upgrade Window of the Epoch-M1P Software

Once the firmware has been downloaded successfully, the following pop-up window will appear.
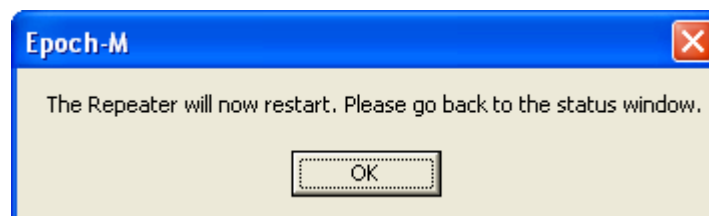
2.2 Using the Epoch–M1P Software

2.2.1   Changing Parameters

In changing the parameters of the repeater using the Epoch–M1P Software, note that the values entered into the Epoch–M1P Software are limited to the ranges and modes specified in the Menu Structure section as explained in Section 2.1 on page 15.

The chart below shows the parameters that can be changed and the location of each parameter in the Control Menu Structure. The asterisk "*" denotes parameters that apply to both uplink and downlink.
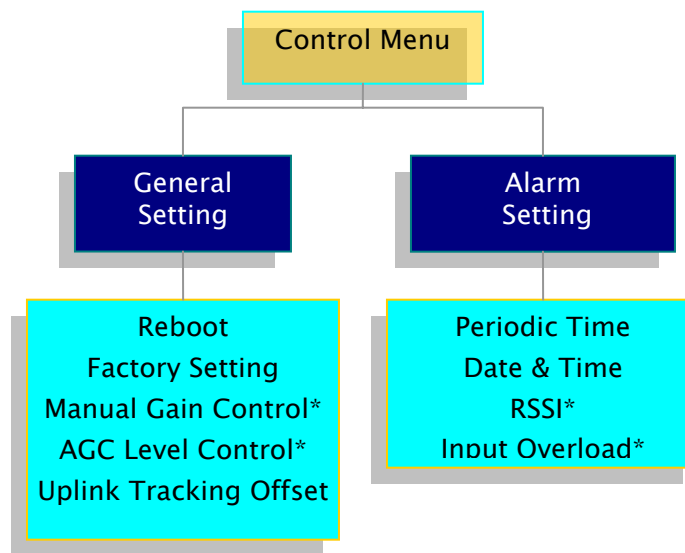
Figure 12 – Variable Parameters in the Epoch–M1P Software

2.3 Alarms

All the various alarms that are supported by Epoch–M1P can be viewed by clicking the "Alarm" button on the Status Window.   If a soft or hard fail alarm should occur, the corresponding alarm box would be highlighted in yellow or in red respectively. In order to find out what is causing the alarm(s), simply place the mouse cursor over the highlighted yellow or red alarm box *(Note: only applicable to some of the alarms)* and a message will appear, displaying the threshold value and the current measured value. To update the window, click the "Refresh" button.
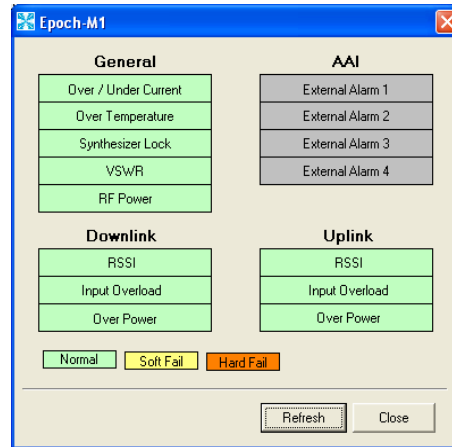
Figure 13 – All Alarm Parameters Supported by Epoch-M1P

In the event of a hard fail alarm, the control board will shutdown the HPA (both uplink & downlink) for 30 seconds and then turns on the HPA to check for a repeated hard fail occurrence. If the hard fail alarm is persisting up to four consecutive occurrences, the control board will shutdown the HPA for 20 minutes (total of five consecutive hard fails). After 20 minutes, the HPA will automatically come back alive and the control board will check if the Hard Fail alarm has cleared. If it has not, the same process will continue as mentioned above.

*** The alarms can also be viewed on the front panel of the repeater by clicking the VFD button. Please refer to Appendix B for more detailed information.*

*** Epoch-M1P also supports AAI (Auxiliary Alarm Input). Please refer to Section 1.1.2 on Page 6.*

2.3.1 General (Fixed Parameter) Alarms

Alarm List	Soft Fail	Hard Fail	Comments
Over/Under Current	O	O	Soft Fail: Less than 0.5 A @ under current Hard Fail: More than 4.7 A @ over current
Over Temperature	O	O	Soft Fail: 158 ~ 185 °F Hard Fail: > 185 °F
Synthesizer Lock	–	O	Band selection will not work properly
VSWR	–	O	> 1.5:1
RF Power	–	O	Will occur in the event of any Hard Fail alarm

Table 7 - General (Fixed Parameter) Alarms of the Epoch-M1P Software

2.3.2   Downlink/Uplink Alarms

	Alarm List	Soft Fail	Hard Fail	Remark
Downlink (Forward)	RSSI	O	–	Alarms will turn on if the value is not within operable limits specified in the Control Alarm Setting Window.

Note: The Over Power parameter is fixed and cannot be modified by the user. |
	Input Power Overload	O	–	
	Over Power*	O	O	
Uplink (Reverse)	RSSI	O	–	
	Input Power Overload	O	–	
	Over Power*	O	O	

Table 8 – List of Alarm Settings of the Epoch–M1P Software

The example below distinguishes the difference between an over power soft failure and an over power hard failure:

The threshold value for the downlink over power parameter is set to 22.0 dBm (factory set value), a Hard Fail alarm would occur if the downlink over power value was greater than 22.0 dBm (20 dBm is the maximum composite power allowable). Similarly, a Soft Fail alarm would occur if the downlink over power value was greater than 21.0 dBm but less than 22.0 dBm. Vice versa, the same example is also applicable in the uplink side.

2.4 Default Control Settings
  2.4.1   Default General Settings

Control Item	Setting Value
AGC Mode	ON
Downlink/Uplink HPA Mode	ON
Uplink Tracking Mode	ON
Downlink/Uplink Gain	70 dB
Downlink/Uplink AGC Level	20 dBm
Tracking Gain Offset	3 dB

Table 9 – Adjustable Alarm Settings of the Epoch–M1P Epoch–M1P

a.   When *Uplink Tracking ON* mode is enabled, the *Tracking Gain Offset* is set to 3 dB.
b. When *AGC ON* mode is enabled, by default, the *Downlink/Uplink AGC Level* is set to 20 dBm.

2.4.2   Default Alarm Setting

Control Item	Setting Value	
	Downlink	Uplink
RSSI	–95 dBm	–110 dBm
Input Overload	–35 dBm	–35 dBm
Heartbeat On/Off	ON	
Heartbeat Time	20 minutes	

Table 10 – Default Alarm Parameter Values of the Epoch–M1P Software

3   Maintenance Guide for Epoch-M1P

3.1 Periodic Inspection Checklist

☐ a.   Check for loose connections to the repeater and antennas. If connections are loose, make sure that all connections are tightly fastened properly.

☐ b.   Cables and connectors are in good condition.

☐ c.   Ensure that the repeater brackets 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.

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 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 Tx & Rx LEDs

Tx	Rx	Explanation
Blinking GREEN	Blinking GREEN	Successful Connection. The Epoch–M1P Software and the repeater are communicating successfully.
Blinking GREEN	Solid GREEN	The repeater is not receiving any commands from the software. In this state, the repeater is either processing or executing a command. Wait for a few seconds for the Rx LED to blink periodically.
Blinking GREEN	RED	The repeater is not receiving any commands from the software. Ensure that the repeater is tuned on and check for proper USB port connection.
RED	RED	The USB port can not send or receive data. Check if the USB driver has been installed and also verify if the physical connection on both ends of the USB cable is secure. Ensure that the repeater is turned on.

Table 11 – Tx and Rx LEDs

** The Tx/Rx LEDs will blink periodically only on the Status Window.

4.2 Common Installation Problems

Problem	Possible Solution
USB port is not being recognized	You would need to install the driver for the USB cable which can be found with the CD that comes with the repeater.

Regardless if you have already installed the USB driver once, if are connecting the USB cable to a new USB port on the PC for the very first time, you will need to install the USB driver again. |
| The power green LED on the front panel is not lit. | Check if the power switch is turned on. Also verify if the power cord is securely connected to the repeater.   Make sure there's no power outage. |
| GUI Software & Laptop – No Communication | The very first time during installation, once you connect the USB cable to the repeater and the laptop, the PC will automatically detect a new hardware has been added in the system and will prompt you to install the driver which can be found in the CD.   The driver needs to be installed only once. |
| Status Window – Weak Signal or Donor RSS | Check that the donor and server antennas are connected to the proper antenna ports on the repeater.

Reposition or rotate the donor antenna around until a stronger signal is received. |
| Low Isolation or Oscillation | Increase the separation between the donor and server antennas by moving the antennas around or by rotating them. |
| Downlink/Uplink VSWR Alarm | Check the cabling because RF signals maybe leaking and also verify that the connectors are tightly secured. |
| Downlink/Uplink Input Power Overload Alarm | Add an attenuator after the donor/server antenna to reduce the strong donor/server signal coming into the repeater.

If the repeater is connected to a DAS, there's a good chance the DAS system could cause a strong signal to come in on the uplink side of the repeater, causing an *Uplink Input Power Overload* alarm. If this happens, add an attenuator on the uplink side of the repeater or control the signal coming in from the DAS.

Try to reduce the AGC Power Level using the GUI software.

An oscillation in the system could cause this alarm. Check if there is sufficient separation between the donor and the server antennas. |
| Downlink/Uplink Over Power Alarm | Add an attenuator after the donor/server antenna to reduce the strong donor/server signal coming into the repeater.

An oscillation in the system could cause this alarm. Check if there is sufficient separation between the donor and the server antennas. |

Table 12 – Troubleshooting Tips

5   Warranty and Repair Policy
5.1 General Warranty

The Epoch-M1P carries a Standard Warranty period of two (2) years unless indicated otherwise on the package or in the acknowledgment of the purchase order.

5.2 Limitations of Warranty

Your exclusive remedy for any defective product is limited to the repair or replacement of the defective product. Advanced RF Technologies, Inc. may elect which remedy or combination of remedies to provide in its sole discretion. Advanced RF Technologies, Inc. shall have a reasonable time after determining that a defective product exists to repair or replace the problem unit. Advanced RF Technologies, Inc. warranty applies to repaired or replaced products for the balance of the applicable period of the original warranty or ninety days from the date of shipment of a repaired or replaced product, whichever is longer.

5.3 Limitation of Damages

The liability for any defective product shall in no event exceed the purchase price for the defective product.

5.4 No Consequential Damages

Advanced RF Technologies, Inc. has no liability for general, consequential, incidental or special damages.

5.5 Additional Limitation on Warranty

Advanced RF Technologies, Inc. standard warranty does not cover products which have been received improperly packaged, altered, or physically damaged. For example, broken warranty seal, labels exhibiting tampering, physically abused enclosure, broken pins on connectors, any modifications made without Advanced RF Technologies, Inc. authorization, will void all warranty.

5.6 Return Material Authorization (RMA)

No product may be returned directly to Advanced RF Technologies, Inc. without first getting an approval from Advanced RF Technologies, Inc. If it is determined that the product may be defective, you will be given an RMA number and instructions in how to return the product. An unauthorized return, i.e., one for which an RMA number has not been issued, will be returned to you at your expense. Authorized returns are to be shipped to the address on the RMA in an approved shipping container. You will be given our courier information. It is suggested that the original box and packaging materials should be kept if an occasion arises where a defective product needs to be shipped back to Advanced RF Technologies, Inc. To request an RMA, please call (323) 254−8131 or send an email to techsupport@adrftech.com.

Appendix A: Specifications

ELECTRICAL SPECIFICATIONS

PARAMETERS		SPECIFICATIONS	COMMENTS
Frequency Range	DL	1930 to 1990 MHz	
	UL	1850 to 1910 MHz	
Sub Band Filtering		One 5 MHz Sliding Block	Model 1
Sub Band Filtering		One 10 MHz Sliding Block	Model 2
Sub Band Filtering		One 15 MHz Sliding Block	Model 3
Sub Band Filtering		Special Custom Band(s)	Model 4
Operating Frequency		Programmable	Freq. Step: 10 KHz
Frequency Error		$\leq$ +/- 0.1 ppm	
Delay		$\leq$ 5 usec	Each Direction
Input Dynamic Range		-35 to -60 dBm	
Repeater Gain		55 to 80 dB	
Maximum DL&UL Output Power		+20 dBm	Composite
DL AGC Range		25 dB /0.5 dB Step	
UL AGC Range		25 dB /0.5 dB Step	
Gain Flatness		+/- 2.5 dB	
In Band Noise		$\leq$ -45 dBc	@ Fc +/- 885 KHz
		$\leq$ -50 dBc	@ Fc +/- 1.98 MHz
Spurious Emission		< -13 dBm	@ Fc +/- 2.25 MHz
Rho Factor		$\geq$ 0.912	
Noise Figure		$\leq$ 8 dB	
VSWR		$\leq$ 1.5:1	

MECHANICAL SPECIFICATIONS

PARAMETERS		SPECIFICATIONS	COMMENTS
Housing (W x H x D)		8.27 x 11.03 x 3.57 inches	
Housing Material		Aluminum & Plastic	
Weight		≤ 13.22 lbs	
Connector Type	Antenna	N-Type (Female)	
	Dry Contact	RS-232 (Female)	
	NMS Control	USB / RS-232 (Female)	
Cooling		External Convection	

POWER SPECIFICATIONS

PARAMETERS	SPECIFICATIONS	COMMENTS
Main AC Power	100 to 240 VAC	Power Adapter shall comply with UL & CE
AC Frequency	45 to 65 Hz	
Adaptor Voltage & Current	6 VDC / 4.5 A	
Power Consumption	≤ 30 Watts	

ENVIRONMENTAL SPECIFICATIONS

PARAMETERS	SPECIFICATIONS	COMMENTS
Operating Temperature	+41 ˚F to +113 ˚F	
Storage Temperature	+23 ˚F to +176 ˚F	
Humidity	10 to 85%, RH	
MTBF	75,000 hours	

Appendix B: Button Operation

Normal Operation

Normal Operation

Power Off

POWER (off) VFD ALARM (off)

Power On

16 sec
Booting Time

Initializing....

6 sec

POWER (Green) VFD ALARM (Red)

Display Cycle*

The VFD display will be disappeared 30 minutes later since the VFD button is touched.

POWER (Green) VFD ALARM (off)

If the VFD button is clicked, the display will be come up again.

POWER (Green) VFD ALARM (off)

Display Cycle

Downlink

DL: IN	GAIN	OUT
-102	80.0	-10

4 sec

POWER (Green) VFD ALARM (off)

Uplink

UL: IN	GAIN	OUT
-102	77.0	-10

4 sec

POWER (Green) VFD ALARM (off)

Band & Channel

BW	CH.	MODEM
15M	150	CON

4 sec

POWER (Green) VFD ALARM (off)

Install Status

STATUS
INSTALLED

4 sec

If there is no modem hardware, the display will be blank. If modem is there, but not connected, the display will be 'DIS'.

If repeater is not installed, message will be
STATUS
NOT INSTALLED

POWER (Green) VFD ALARM (off)

Soft Fail Alarm Operation

Soft Alarm Operation

Power Off

Power On

16 sec
Booting Time

POWER
(off)

VFD

ALARM
(off)

Initializing....

6 sec

POWER
(Green)

VFD

ALARM
(Red)

Display Cycle*

4 sec

4 sec
Until the
condition
cleared

POWER
(Green)

VFD

ALARM
(Red)

SOFT FAIL ALARM
DOWNLINK RSSI

POWER
(Green)

VFD

ALARM
(Red)

The VFD display will
be disappeared 30
minutes later since
the VFD button is
touched.

If the VFD button
is clicked, the
display will be
come up again.

POWER
(Green)

VFD

ALARM
(Red)

Hard Fail Alarm Operation

Hard Alarm Operation

```
┌─────────────────────────────────┐
│  SYSTEM                          │
│  ALARM CHECKING                  │
│   [Green] POWER  [ ] VFD  [Red] ALARM
│   (Green)        VFD      (Red)  │
│                                  │
│  SYSTEM                          │
│  HALT                            │
│   [Green] POWER  [ ] VFD  [Red] ALARM
│   (Green)        VFD      (Red)  │
│                                  │
│  HARD FAIL ALARM                 │
│  VSWR                            │
│   [Green] POWER  [ ] VFD  [Red] ALARM
│   (Green)        VFD      (Red)  │
│                                  │
│  HARD FAIL ALARM                 │
│  CLEARED                         │
│   [Green] POWER  [ ] VFD  [ ] ALARM
│   (Green)        VFD      (off)  │
└─────────────────────────────────┘
```

20 min

4 sec

No

Alarm
Cleared?

Yes

Power Off

Power On

16 sec
Booting Time

[ ] POWER (off)   [ ] VFD   [ ] ALARM (off)

Initializing....

6 sec

[Green] POWER (Green)   [ ] VFD   [Red] ALARM (Red)

Right away

Display Cycle*

[Green] POWER (Green)   [ ] VFD   [ ] ALARM (off)

4 sec

The VFD display will be disappeared 30 minutes later since the VFD button is touched.

If the VFD button is clicked, the display will be come up again.

[Green] POWER (Green)   [ ] VFD   [ ] ALARM (off)

Frequency Change

Frequency Change

```
┌──────────────────────────┐
│                          │◄────┐◄┐
│                          │     │ │
└──────────────────────────┘     │ │
   ■        □        □           │ │
 POWER     VFD     ALARM         │ │
 (Green)           (off)         │ │
                                 │ │
   Hold the                  10 sec│
   VFD Button                    │ │
   for 5 sec                     │ │
┌──────────────────────────┐     │ │
│       CHANNEL            │     │ │
│   SELECTION MODE         │     │ │
└──────────────────────────┘     │ │
   ■        □        □           │ │
 POWER     VFD     ALARM         │ │
 (Green)           (off)         │ │
                                 │ │
   Push the                  10 sec│
   ALARM                         │ │
   Button                        │ │
┌──────────────────────────┐     │ │
│      CHANNEL UP          │     │ │
│      150 to 175          │     │ │
└──────────────────────────┘     │ │
   ■        □        □           │ │
 POWER     VFD     ALARM         │ │
 (Green)           (off)         │ │
                                 │ │
   Push the              10 sec or│ │
   ALARM                 Hold the │
   Button                VFD Button
┌──────────────────────────┐  for 5 Sec
│      CHANNEL UP          │
│      175 to 200          │
└──────────────────────────┘
   ■        □        □
 POWER     VFD     ALARM
 (Green)           (off)
```