Eko-Mini™ Manual

Description

The Eko-Mini is a band selective, bi-directional amplifier unit and was designed to provide enhanced RF coverage for wireless systems in small facilities. Usage includes providing coverage in retail stores, offices, warehouses, restaurants, homes, etc.

The Mini is housed in an indoors mountable enclosure, and is powered with a regulated wall mountable power supply.

The Mini supports most system protocols including CDMA, GSM/PCS1900 and TDMA and is available in models that cover all licensed 1.9 GHz PCS bands A through F, ESMR/SMR 806-866 MHz and Cellular 821 to 894 MHz. Band selective filtering in both uplink and downlink signal paths is accomplished with down conversion to an intermediate frequency and SAW filtering to provide maximum selectivity from out of band carriers.

The Mini features Auto set-up, lightweight compact enclosure, optional remote alarming, excellent electrical specifications, high reliability and cost effective pricing.

Functionality

The Mini is capable of automatically adjusting its own signal gain levels up to the maximum output power levels. The Mini detects the downlink output power and adjusts the level for 20-dBm composite output power and continues to monitor and reset the gain as required for proper system performance. For example, when CDMA protocol system is being amplified, there could be an error in set up initially resulting from only pilot sync, and paging Walsh codes being present on the RF carrier. The Mini will reduce the system gain until no signal is received that will exceed the output power setting. This prevents the Mini from setting up to a higher in power level than actually desired if all of the Walsh codes were present. The gain does not continually change to maintain an output power of 20 dBm (AGC) since this would defeat and fight the benefits of power control in the system. The user may reduce or limit the power output level by adjusting the peak power limit as described below. The user peak power switches will set the unit's output power up to 14 dB below the maximum power output of 20 dBm the user interface to control this feature is the peak power switches.

The Mini has 30 dB of gain control in the uplink and downlink signal paths. This gain is controlled by two methods. Up to 14 dB can be controlled by adjusting the user peak limit switches located behind an access plate on the side of the unit to limit the maximum output power level. The uplink and downlink attenuators are controlled by the internal microprocessor to adjust the maximum gain of the unit for both paths. The uplink and dowlink signal paths are adjusted to the same setting by the microprocessor unless the user offsets, reduces the gain in the uplink signal path. The user has control to reduce the uplink gain by 6 dB, this can be used to balance the uplink and downlink paths as well as reduce contribution of noise to the base station receivers.

Downlink Peak Power Limit

	Switches		
Power Limit (dBm)	Six	Seven	Eight
20	off	off	off
18	on	off	off
16	off	on	off
14	on	on	off
12	off	off	on
10	on	off	on
8	off	on	on
6	on	on	on

Uplink Gain Offset, reduces uplink gain

Gain Offset (dBm)	One	Two
0	off	off
-2	on	off
-4	off	on
-6	on	on

If a unit is moved from one location to another pressing the reset switch will restart the automatic set up feature. If the peak limit and uplink gain offset switches are preset when the unit is installed the mini will first attempt to set itself up to the full RF output power of 20 dBm and then reduce power as instructed by the peak limit and uplink gain offset switches.

The Mini has a total of 30 dB of gain control in the uplink and downlink signal paths which is controlled by the microprocessor. The microprocessor monitors the up link and down link detected signal levels and adjusts the gain to prevent overdriving the linear power amplifier circuits.

The mini monitors the downlink detected signal and adjusts the gain to achieve rated output power, 20 dBm. The uplink attenuation is adjusted by the microprocessor to the same gain level. Path loss is normally equal in both directions. The microprocessor continues to monitor the detected output power on both paths to prevent overdrive. Should the downlink detected power increase above the desired level, the processor will reduce the gain in both up link and down link paths. A subscriber unit getting very close to the rerad antenna, may causes uplink signal overdrive. The processor will temporarily reduce the gain in the up link (reverse) path when uplink signal overdrive is sensed, which will reduce the coverage during this condition. Proper placement of the rerad antenna will reduce the occurrence of this condition.

The output power level setting and the maximum detected level, along with date and time, are recorded in the history log file.

Protocol Selection

To insure proper RF power output the proper protocol must be selected this insures the software will properly distinguish the detected RF power level. CDMA is the only protocol that requires a different look up table/RF calibration.

Protocol Selection	Switch Five
CDMA	On
All Other*	Off

*All other protocols include; AMPS, GSM, PCS 1900, CDMA, IDEN, ESMR, TDMA

Band Selection

The Mini is available in two models, a 15 Mhz bandwidth unit and a 5 Mhz bandwidth unit. Selection of the proper operating band A, B, or C with the 15 Mhz unit and D, E, or F with the 5 Mhz model is user selectable with two dip switches as follows:

Band Selection	Band Width	Switch 3	Switch 4
A	15	off	off
B	15	on	off
C	15	off	on
D	5	off	off
E	5	on	off
F	5	off	on

If the switches are improperly set (On/On), the unit will not function. This fault will be indicated by the DC power on LED Indicator flashing green.

Note: If the band selection switch is changed after the unit is powered up the unit will not change frequency until the (1) power is cycled or (2) the reset switch is pressed, (Activating the reset switch will make the unit go through the set up cycle).

Remote Alarming

Remote alarming is accomplished with a factory install modem and software option. The Mini microprocessor will detect the modem and initialize the required software. By dialing into the unit, it may now be programmed to the desired response numbers and alarm codes. Access to programming mode requires entering a user selected 5-digit password.

1.	Telephone Number	20 digits, maximum Include required access codes such as 9 If required by a PBX. A comma is used to insert a delay.

	Pin	10 digits
	Alarm Code	20 numeric digits
2.	Telephone Number	20 digits, maximum Include required access codes such as 9 if required by a PBX. A comma is used to insert a delay.
	Pin	10 digits
	Alarm Code	20 numeric digits
	Delay	3 numeric digits, 0 to 999 minutes
3.	Telephone Number	20 digits, maximum Include required access codes such as 9 if required by a PBX. A comma is used to insert a delay.
	Pin	10 digits
	Alarm Code	20 numeric digits
	Delay	3 numeric digits, 0 to 999 minutes

A factory default password is preprogrammed into the unit as 10000. The user may change this in the program mode of operation. There is also a factory access password.

Up to three numbers and alarm codes or paging pin numbers can be sent. The unit will send an alarm to the first number when an alarm occurs. (The alarm is not sent during the red flashing alert period. It is delayed 5 minutes to be certain the alarm will not clear itself). Each additional number and alarm, which has a programmed sequence, will be sent after the programmed delay. The delay, which is set, is a time measurement from initially sending the first telephone call and alarm.

Should an alarm condition clear, the Mini will send an Alarm Clear alert to the same number or numbers that were alerted previously. As an example the alarm condition could occur if the base station was turned off for maintenance.

The unit will record time, date and cause of the last 25 reportable (alarms present after 5 minute alert delay) alarms. The user may download these via the modem connection or factory personnel may also review them. Retrieving log history requires entering the password.

Command, Clear Log File, is accessible only with the factory password.

Alarms

All alarms are considered major since there is no field replaceable modules in the unit. All alarms are indicated locally immediately by the Alarm LED indicator blinking red. Once the Alarm State has existed for 5 minutes, the Alarm LED will have a constant red indication. Certain problems will result in the unit automatically shutting down after 5 minutes of sensed failure. This is done by disabling the RF output stages in both the up link and down link

signal paths. Removing DC power from the unit for a period of 30 seconds or longer will reset the auto shut down.

Failure	Action	Alarm Code
Alarm Cleared		0
Synthesizer Lock, Uplink	Auto Shut Down	1
Synthesizer Lock, Downlink	Auto Shut Down	2
Downlink RF Overdrive	Auto Shut Down	3
Uplink RF Overdrive	Auto Shut Down	4
No Downlink RF Detected*	Alarm Only	5
Internal Voltage Failure	Alarm Only	6
Low Current Draw	Alarm Only	7
Keep Alive[(1)]	Auto Shut Down	8

*Minimum detectable RF level is approximately –10dBm. Unit will alarm below this level.
[(1)]Not applicable unless equipped with remote alarms. On units with remote alarms it must be activated when the remote messaging is set up.

Keep Alive

The Mini Keep Alive feature can only be activated once the modem has been installed. Once activated by the user in the program mode, this feature requires the Mini, or a remote computer, to have contact at least once daily. If no contact is completed, the Mini will shut down and activate an alarm.

The Mini can be programmed requiring a Keep Alive activation from as often as the user desires, but at least once daily. The factory default requires one daily activation and is set to occur between 3:00 and 4:00 AM.

Indicators

The Mini is equipped with three LED indicators on the end of the unit which provide the following information:

Indicator	State	Description
On/Alarm	Off	No DC Input Power Applied
	Green	DC Power on, normal function
	Green Flashing	DC Power on, Set up fault-Band Selection
Red Flashing	Fault Conditon	5 Minute Warning (See list of alarms)
	Red	Alarm

Uplink RF	>-10 dBm >-5 dBm > 0 dBm >5 dBm >10 dBm >15 dBm >20 dBm Over Drive
Downlink RF	>-10 dBm >-5 dBm > 0 dBm >5 dBm >10 dBm >15 dBm >20 dBm Over Drive

*No RF Uplink Detected; this is a normal state for the uplink RF path. The normal levels of RF received and amplified from the subscriber unit may be below the –10 dBm detectable level. A quick check can be made by getting within a few feet of the Rerad Antenna, while watching the Uplink RF indicator.

Primary Power

The Mini Unit operates on 9 VDC input power @ 6 Amps. This is supplied with a regulated wall mount supply, which is UL, and CSA listed. These are available to operate on AC input voltages of 90 to 260 VAC.

Donor Antenna

This input/output is connected to an antenna, which is directed at the desired cell site.

Rerad Antenna

This input/output is connected to an antenna, which is mounted in the desired area to be covered. The antenna should be mounted at a location where adequate coverage is provided for the area desired while minimizing the potential of subscriber units normally operating close enough to overdrive the unit.

Serial Number

Each unit has a unique electronic serial number. This number is displayed on the decal on the unit and is also displayed with the history log when using the modem interconnect.

Installation:

Note 1: qualified technicians should only perform Installation and system set up. The user is cautioned that modification or changes to this device not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note 2: Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dBm, especially where the output signal is re-radiated and can cause interference to the adjacent band users. This power reduction is to be determined by means of input power or gain reduction and not by an attenuator at the output device.

Note 3: This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

Introduction

Eko-Mini is quick and easy to install, using a minimum set of common tools. This section will provide the basic steps to performing the installation of EkoCel™ -Mini. *Please read complete instructions before beginning assembly.*

Getting Started*:*

Unpack all of the boxes and insure all of the material is included for your installation requirements and undamaged in shipment.

QTY	***Description***
1	EkoCel™ -Mini
1	+9 VDC Power Module
1	AC Power Cord
4	Mounting Screws and wall inserts
1	Manual
1	Test Data, Factory
1	Optional, Telephone cable 6 ft.

Mounting the Hardware:

-Mount the Mini Unit with the four mounting screws provided.
-Connect coaxial cables the Donor and Rerad ports.
-Connect primary power module to AC source and connect 9 VDC output to Mini DC Input.
-Optional connect telephone line to RJ11 jack.

Refer to attached drawing for any clarification.

Select Mounting location of Donor directional antenna and orientated toward the base station to maximize signal level. For best performance this should be line of sight between the Donor antenna and the base station antenna.

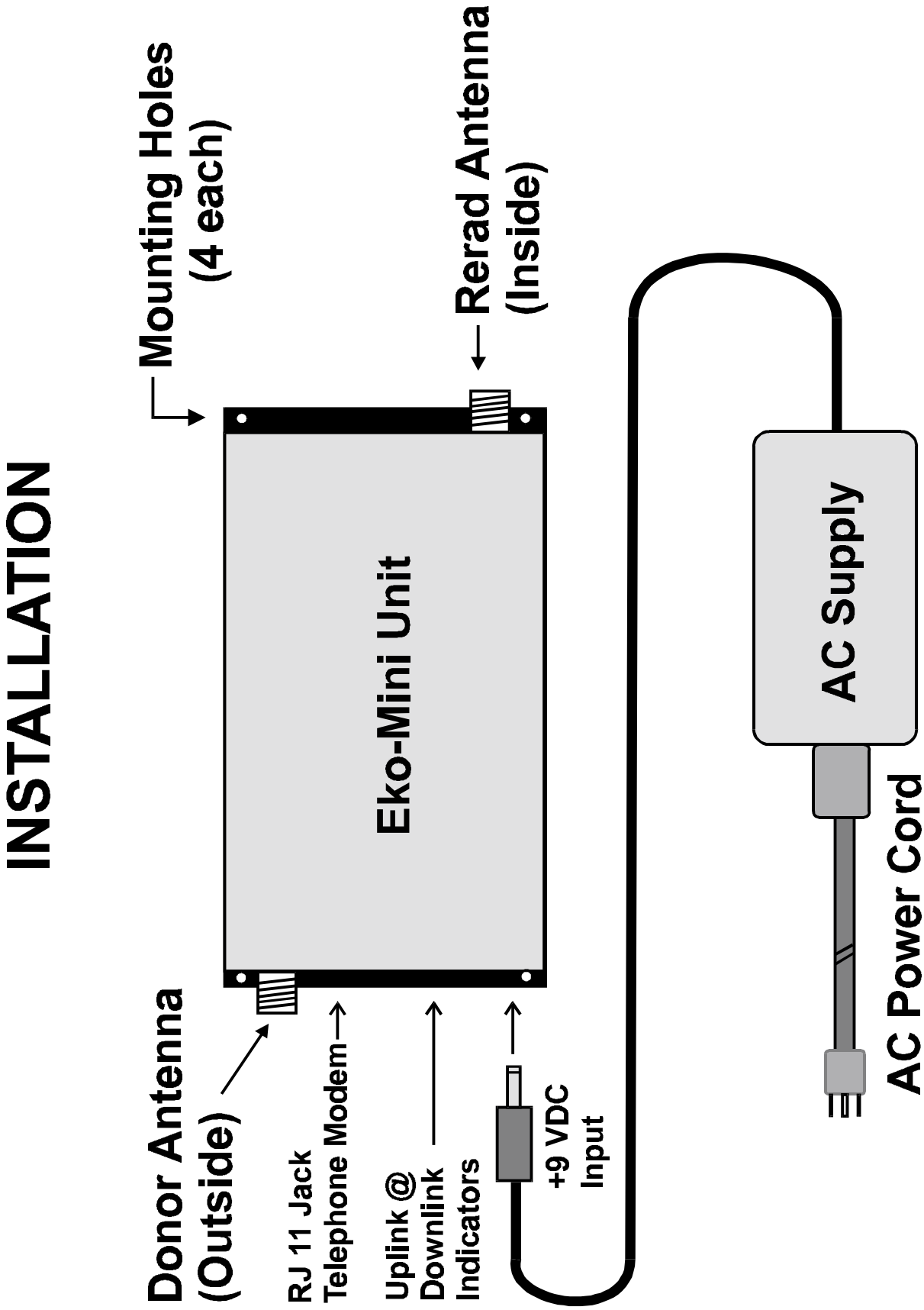
Select mounting location of Rerad antenna to provide maximum coverage while maintaining at least 20 feet from normal usage if possible to reduce the possibility of overdrive.

IMPORTANT: Before performing maintenance on any module, make sure power is **OFF**.

System Set Up Instructions:

-Apply Power after setting user switches and unit will automatically set up.
-Set Band Switches to desired Band (Preset at Factory to A or D depending on the Models BW 15 or 5 Mhz)
-Set UL gain offset as desired (Preset to 4 dB offset)
-Set DL RF Output Power to desired maximum Level (Factory Preset to full Power, 20 dBm Composite)
-Set Protocol selection Switch (Factory Preset to All Other, SW 5-OFF)

-For set up of optional remote alarming refer to software set up instructions.


INSTALLATION
Mounting Holes
(4 each)
Rerad Antenna
(Inside)
Eko-Mini Unit
AC Supply
AC Power Cord
Donor Antenna
(Outside)
RJ 11 Jack
Telephone Modem
Uplink @
Downlink
Indicators
+9 VDC
Input

Trouble Shooting:

The Eko-Mini has no field replaceable parts; repair is down to improper set up or software programming, installation or defective units.

Problem	Check	Corrective Action
No Power	Power Source	Reconnect or repair
	Power Source OK	Replace Unit
Alarm Indication	No RF Downlink Indication	Check RF Input Source
	No Uplink RF Indication	Check RF Antenna Input
	Recycle AC Power	No Change
	Reset Switch	No Change
		Replace Unit
Remote Alarms inoperable	Generate Alarm, remove RF input	Program Software
	Software OK,	Check Telephone line
	Telephone Line OK	Replace Unit
No RF DownLink Power	Check Band Switches	Set Switches & recycle Power
	Switches Set properly	Replace unit
Low DownLink RF Power	Check Input Power Level	Relocate Donor Antenna, improve signal strength Increase Donor Antenna Gain Shorten Coaxial Cable length
	Signal Strength Good	Reset Switch, Start new system set up
	Low RF Output Power	Replace Unit

Parameters

MINI-19	Forward	Reverse
Operating Frequency, (MHz)	1930 to 1990	1850 to 1910
Band Selective A, B, or C, (MHz), 1 dB Bw	14.75	14.75
Band Selective, D, E, or F, (MHz), 1 dB Bw	4.75	4.75
Gain, (dB), Adjustable in 2 dB steps	40 to 70	40 to 70
Peak Limiting adjustable, (dB)	14	14
Gain Flatness, (dB)	+1/-2	+1/-2
Noise Figure, (dB)	≤8	≤8
Return Loss (dB)	15	15
Composite Power, User Selectable, (dBm) (Up Link tracks down link setting)	6 to 20	6 to 20
Group Delay, (usec)	≤4	≤4
Spurious Emissions,		
Out of Band, (dBm)	≤13	≤13
Input RF Signal, (dBm)	<-20	<-20
Operating Temperature, (°C)	+5 to +45	+5 to +45
Primary Power, (VAC)	90 to 260	
Current Draw, (Amps)	.5	
Enclosure Dimensions, HxWxD, (Inches)	2.25x7x14.5	
Weight, (lbs.)	6.5	
MTBF, (hours)	75,000	
RF Connectors, Donor, Rerad (2)	N/Female	
Alarms,		
Power On		
Forward Signal,		
No RF Detected/ RF Detected / Overdrive		
Current		
Reverse Signal,		
RF Detect / Overdrive		
Optional Remote Alarms	Telephone Modem	