iDEN Repeater

MW-CSR-ESMR-25W90 Series

Product and Installation Manual

Revision 1.0

ABOUT THIS MANUAL

This Product Manual provides the following information:

- A description of the iDEN Repeater
- A functional description of the Repeater
- A description of its main modules
- Procedures for setup, configuration and checking the proper functioning of the iDEN Repeater
- Maintenance and troubleshooting procedures

TO WHOM IT IS INTENDED:

This Product Manual is intended for experienced technicians and engineers. It is assumed that the customers installing, operating, and maintaining Dekolink iDEN Repeaters are familiar with the basic functionality of repeaters.

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 Publication No.: 307-2005 Rev. 1.0

SAFETY WARNINGS AND ADMONISHMENTS

Throughout this manual, important safety warnings and admonishments are included to warn of possible hazards to persons or equipment. A safety warning identifies a possible hazard and then describes what may happen if the hazard is not avoided. The safety warnings – in the form of Dangers, Warnings and Cautions must be followed at all times. These warnings are flagged by the use of a warning icon, usually the triangular alert icon seen below. The exclamation point within the triangular alert icon is intended to warn the operator or service personnel of operation and maintenance from factors elating to the product and its operating environment, which could pose a safety hazard.

GENERAL SAFETY WARNINGS CONCERNING USE OF THIS SYSTEM

Always observe standard safety precautions during installation, operation and maintenance of this product. Only a qualified and authorized personnel should carry out adjustment, maintenance or repairs to the components of this equipment.

Danger: Electrical Shock

This equipment is usually installed outdoors. Wet conditions increase the potential for receiving an electric shock when installing or using electrically powered equipment. To prevent electrical shock when installing or modifying the system power wiring, disconnect the wiring at the power source before working with uninsulated wires or terminals.

Caution: RF Exposure

Installation of an antenna must comply with the FCC RF exposure requirements. Refer to paragraph 4.2.

GLOSSARY

The following is a list of abbreviations and terms used throughout this document.

Abbreviation/Term	Definition
AGC	Automatic Gain Control
ALC	Automatic Level Control
ATR	Acceptance Test Report
DAS	Distributed Antenna System
DL	Downlink
Downlink	The path covered from the Base Transceiver Station (BTS) to the subscribers/service area via the repeater
ESD	Electro-Static Discharge
iDEN	Integrated Digital Enhanced Network
IF	Intermediate Frequency
IP3	Third order Intercept Point
MN	Model Number
NMT	Network Management Tool
PLL	Phased Locked Loop
POTS	Plain Old Telephone System
RF	Radio Frequency
RMT	Repeater Management Tool
SALC	Smart-ALC (Automatic Level Control)
SQE	Signal Quality Estimate
UL	Uplink
Uplink	The path covered from the subscribers/service area to the Base Transceiver Station (BTS) via the repeater
VSWR	Voltage Standing Wave Ratio

CONTENTS

1. INTRODUCTION

1.1 GENERAL

Dekolink's iDEN Repeaters are frequency range selective amplifiers that amplify signals bi-directionally between mobile phones and base stations, in cellular and other wireless mobile telephone systems. The iDEN Repeaters can be monitored locally or remotely via Dekolink's Windows-based Network Management System - RMT software (Refer to the RMT Software User's Guide for more information).

1.2 APPLICATIONS

Dekolink's iDEN Repeaters help solve area coverage problems:

- Extended coverage for rural and isolated areas
- Improved in-building coverage
- Hole filler application whenever there is no coverage of a particular spot in the cell site (due to terrain topography or urban structures that shadow areas)
- Cell extension to improve the coverage of an existing cell

1.3 FEATURES

Some of the of the Dekolink iDEN Repeaters' features are listed below:

- 4W composite output power
- 90 dB RF gain
- Flexible, software controlled, bandpass filter center frequency (for partial bandwidth models)
- High spectral purity
- Local and remote monitor and control (software enabled)
- Relatively small dimensions

1.4 MODELS AND FREQUENCIES

Dekolink's iDEN Repeater can be provided in several models, as per customer requirements. The frequency range is defined as follows:

Repeater Type	Model Number	Downlink (MHz)	Uplink (MHz)
iDEN Fixed Frequency Range	MW-CSR-ESMR-25W90-XXX-YY Series where: (1) XXX =Uplink Low Frequency (MHz) (2) YY = Bandwidth	851-869	806-824
iDEN Variable Center Frequency	MW-CSR-ESMR-25W90-YY Series where: (1) YY = Frequency Range Bandwidth	851-869	806-824

1.5 SPECIFICATIONS

1.5.1 General

This paragraph provides the electrical, mechanical and environmental specifications of the iDEN Repeater.

Note

Specifications are subject to change without notice.

1.5.2 Electrical Specifications

Parameters	Downlink	Uplink
Frequency Range	851 – 869 MHz	806 – 824MHz
Pass band Gain @Min attenuation	90 dB typical	90 dB typical
Operating Bandwidth	18 MHz	18 MHz
Propagation Delay	5 µsec.	5 µsec.
Band Ripple	± 2 dB max	± 2 dB max
1 dB Bandwidth Channel Rejection	18 MHz	18 MHz
20 dB Bandwidth	22 MHz	22 MHz
Noise Figure @max gain	7.0 dB	7.0 dB
Gain Control Setting (by RMT software) – User Defined	30 dB @1 dB/step	30 dB @1 dB/step
3rd Order Output Intercept Point (IP3 out)	+56 dBm typical	+45 dBm typical
Composite Output Power	+36 dBm +1/-0 dB	+24 dBm +1/-0 dB
Impedance Level	50 ohms	50 ohms
V.S.W.R In/Out	1.5: 1 max	1.5: 1 max
LO Leakage	-13 dBm max.	-13 dBm max.
Spurious in band	-45 dBc typical	-45 dBc typical
Spurious out of band	-13 dBm max.	-13 dBm max.

Power Supply	110 to 220 VAC
Maximum Consuming Power	150 W

1.5.3 Mechanical Specifications

The following table provides the mechanical specifications of the iDEN Repeater.

Element	Value
Size H x W x D	400 x 400 x 260 mm (16 x 16 x 10.3 inch)
Weight	Approximately 25 kg. (55 lbs.)

1.5.4 Connectors

The Repeater interfaces with a Base antenna port and a Mobile antenna port. It includes four external connectors in its bottom panel, as described below.

Connector	Type
RF Connectors: BASE / MOBILE	N-type, Female
AC	Circular, 3-pin
Alarms	Circular, 8-pin

1.5.5 Environmental Specifications

Dekolink's iDEN Repeaters meet the European IP65 and American NEMA4 weatherproof standards. The Repeater is designed to operate properly under the following environmental conditions.

Condition	Value
Operating temperature	- 30° C to + 50°C
Storage temperature	- 50° C to + 80°C

1.6 UNPACKING AND INSPECTION

This section provides information for unpacking, inspection and preparation for installation.

Examine the shipping container for damage before unpacking the unit. Perform a visual inspection to reveal any physical damage to the equipment.

Verify that the equipment is complete, as listed below and under a packing slip. Contact Dekolink Wireless Ltd if any of this equipment is missing.

Your Dekolink iDEN Repeater comes with the following equipment:

- iDEN Repeater
- Key (used to lock the repeater case)
- AC cable [6 ft.]
- Alarm cable [6 ft.]
- RS232 cable [6 ft.]
- RMT Software Installation CD
- RMT Software User's Guide and iDEN Repeater Product and Installation Manual (CD and hardcopies)
- Acceptance Test Report (A.T.R.)
- Packaging Box

Please contact Dekolink if you want to order the following optional equipment:

- AC Cable [30 ft.] – Long cable for AC power
- Alarm Cable [30 ft.] – Long cable for External Alarms Input
- Kit for the iR1200 Modem - Mechanical adaptor for the iR1200 modem installation

2. FUNCTIONAL DESCRIPTION

2.1 GENERAL

This repeater is designed to help improve communications signal by extending the coverage of a base station. The Donor (Base) antenna receives the signal from a base station and conveys it to the iDEN Repeater. The Repeater amplifies the signal. After amplification, the signal is passed through to the Mobile antennas. Conversely, signals from handsets are amplified and retransmitted by the Repeater to the base station.

2.2 FUNCTIONAL DESCRIPTION

The incoming signal processing in the iDEN Repeater is processed similarly for both the Uplink and Downlink paths. Figure 1 provides a functional block diagram of the iDEN Repeater.

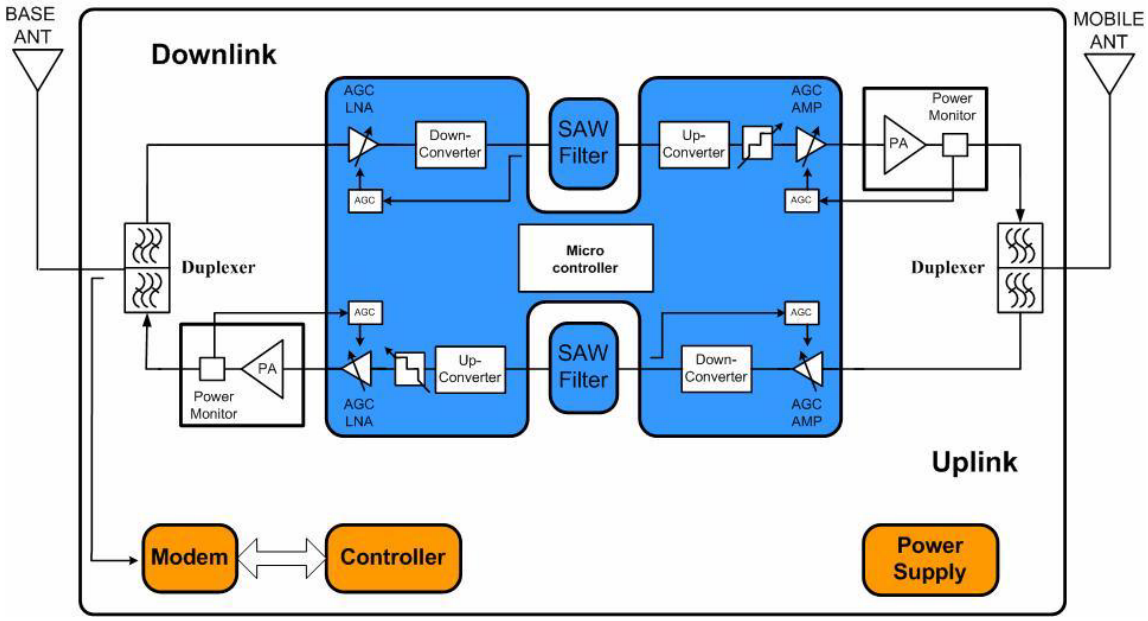


Figure 1: iDEN Repeater - Block Diagram

The block diagram showed in Figure 1 illustrates the overall functionality of the iDEN Repeater. Dekolink's programmable iDEN Repeaters employ advanced up/down conversion Intermediate Frequency (IF) Surface Acoustic Waves (SAW) filtering architecture. This new technology offers distinct advantages over conventional repeaters, when high adjacent selectivity and spectrum purity is required.

The Channeler Module (center unit) consists of dual Radio Frequency Up/Down Converter sub-modules for Downlink and Uplink paths. The Channeler amplifies the received RF signals and converts them into an intermediate frequency (IF). The IF outputs are connected to a SAW Filter. The IF outputs are converted back to the original RF frequencies.

The cellular modem is an option for remote monitoring and repeater parameters control.

3. DESCRIPTION

3.1 MAIN COMPONENTS LOCATION

Figure 2 provides the location of the main components of the Repeater. A list identifying these components is provided below.

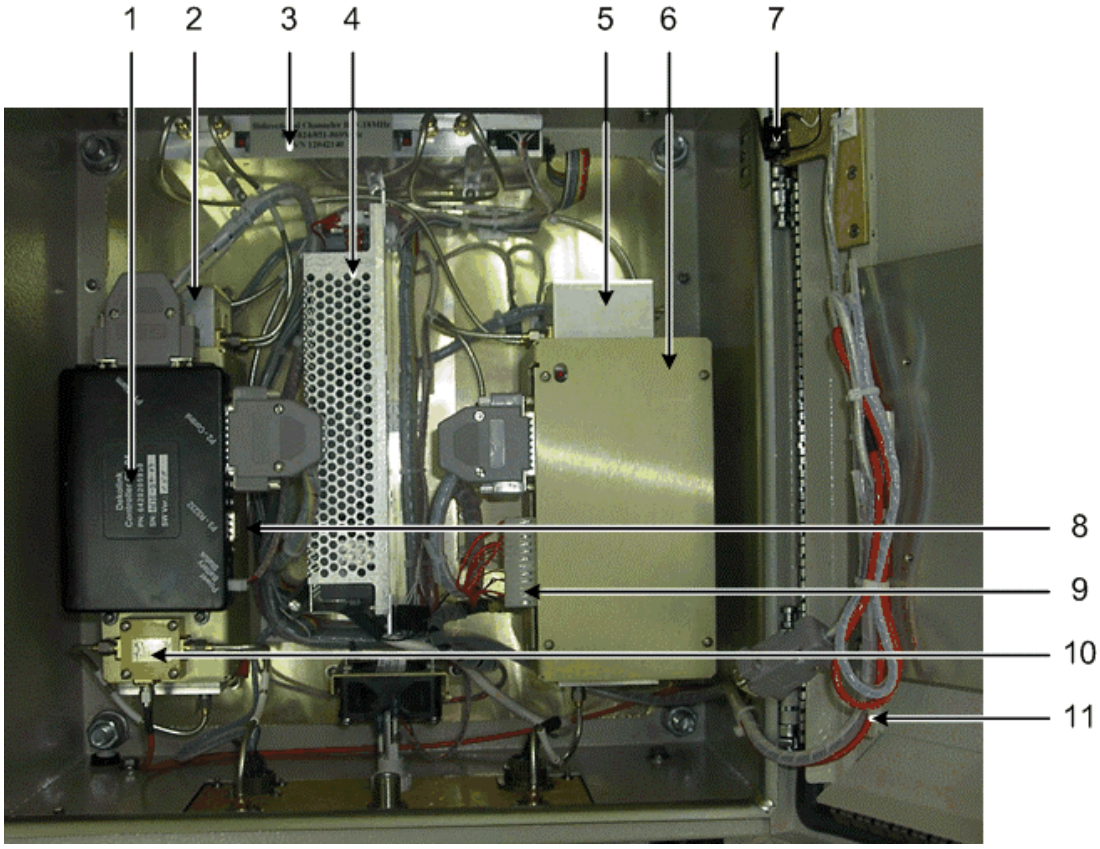


Figure 2: iDEN Repeater - Main Components

1. Controller (Control Box - CB) (includes a status LED)
2. Duplexer to Base Antenna (low power)
3. Channeler (Dual Up/Down Converter for Uplink and Downlink Paths)
4. Power Supply
5. Duplexer to Mobile Antenna (high power)
6. Monitor Module
7. Door Alarm Switch
8. Uplink Power Amplifier
9. Downlink Power Amplifier
10. Coupler for Modem Antenna
11. Wireless/Wireline iDEN Modem Unit – Location

3.2 COMPONENTS GENERAL DESCRIPTION

A description of the main components of the iDEN Repeater follows.

3.2.1 Channeler

The Channeler Module consists of dual Radio Frequency (RF) Up/Down Converter sub- modules for Downlink and Uplink paths. The Channeler amplifies the received RF signals and converts them into an intermediate frequency (IF). The IF outputs are connected to a SAW Filter. The IF outputs are converted back to the original RF frequencies. The Channeler also has controllable attenuators (32 dB range in steps of 1dB)and a pre-amplifier for each path.

3.2.2 Monitor Module

The Monitor Module measures the current of the following elements of the Repeater: Up/Down Converter, Uplink Power Amplifier, and Power Supply. It also senses the Downlink output power. If a module fails, an appropriate report is sent to the Control Box and the Summarized alarm red LED lights up.

3.2.3 Controller

The Controller (also called Control Box) controls and monitors the parameters in all modules of the Repeater. It provides local or remote connection to a PC (See Dekolink's RMT User's Guide for more information.).

For a more detailed description of the module, refer to paragraph 3.3.

3.2.4 Power Supply

The Power Supply module allows a wide range of input power from different sources: 90 to 260 VAC, maximum power consumption - 150W.

The output power provided to the Repeater internal modules is:

28 VDC, 15VDC and 9 VDC.

3.2.5 Duplexers

The duplexers isolate the transmit path from the receive path. The pass bandwidth of the duplexer is the entire width of the Uplink band and the Downlink band respectively.

3.2.6 Power Amplifier

The power amplifier is the final stage of both the Downlink and Uplink paths. The iDEN Repeater includes Power Amplifiers with relatively high Third Order Intercept Point (IP3) figures, thus allowing high output power while preserving high linearity of the output signals.

3.3 REPEATER FEATURES

3.3.1 Controller

The integrated Controller Module (Control Box) has three main functions:

1. Detects faults in the repeater and issues an alarm indication.
2. Controls the active components in the Repeater and enables the main parameters setting :
   - Max Power
   - RF Gain,
   - Power On/Off,
   - AGC On/Off
   - SALC On/Off
3. Monitors key operating functions:
   - DC supply voltage
   - Downlink output power
   - Heatsink temperature.

Two modes of monitoring and control are available:

- External PC - through the serial interface connector in the Control Box.
- Remote control - via a modem connected to the Control Box serial interface. A standard or cellular modem can be installed inside the Repeater enclosure, refer to Appendix D.

The Repeater's Alarm, Control and Monitor functions are performed by Dekolink's RMT software. For more information, see the RMT User's Guide.

The Controller transmits in two modes: Polling and Burst. When operating in Burst Alarm mode, the Controller generates a burst alarm and reports the faults to the local or remote connection. The Controller software handles the alarm reporting and parameters transmission to the Repeater's outside world.

3.4 SMART-ALC FUNCTION

3.4.1 SALC Description

The Smart Automatic Level Control (Smart-ALC) is an innovative solution for automatic repeater gain adjustment. Combined with advanced control algorithms, SALC can perform gradual learning of traffic load characteristics and adjust the Repeater RF Gain to the desired value.

This automatic operation practically removes the need to make initial settings for maximal traffic load conditions and eliminates the need for numerous site visits to take care of Gain adjustment.

SALC also reduces isolation problems and maintains Uplink/Downlink balance.

3.4.2 ALC Function

The Repeater includes the Automatic Level Control (ALC) function on both the Uplink and Downlink power amplifiers to prevent output power from exceeding maximum allowed output power.

The amplifier includes a directional coupler and a detector that monitor the output power. The ALC mechanism samples the output power, and decouples and rectifies it. The ALC mechanism sends a feedback signal to a voltage variable attenuator (VVA) that, whenever a high input signal is received, attenuates the signal level so that the output power of the amplifier does not exceed the preset limit.

The ALC is factory preset to ON state.

3.4.3 RF Gain Setting

The gain range should be set via the RMT in accordance with the input signal power at the Donor antenna, and the required Downlink output power. Special care should be taken not to exceed the isolation limit. It is recommended to set the Downlink path gain to a maximum value that is 12 dB below the isolation between the Base antenna and the Mobile antenna.

The gain range is 59-90 dB. Use the Max Gain field for Downlink GAIN setting and the Gain Delta field to determine the GAIN difference between Uplink and Downlink path (Uplink GAIN follows Downlink GAIN by “Delta” dB)..

Refer to Section 5.5

Note

When you set the gain to 60 dB the Maximum Output Power will degrade due to overload input power. The maximum input power you can inject is –25 dBm.

4. INSTALLATION

4.1 SAFETY INSTRUCTIONS

Before installing the repeater, review the following safety information:

- Follow all local safety regulations when installing the repeaters.
- Only qualified personnel are authorized to install and maintain the repeater.
- When operating the repeater, it is recommended to keep its cover closed while the power is on. Some maintenance tasks may require the repeater door to be opened while the power is on. In such cases, perform the required tasks carefully and remember to close the repeater cover/door when finished.
- Use a suitable mounting surface, such as a rigid wall.
- Follow Electro-Static Discharge (ESD) precautions.
- Before closing the repeater cover, make sure no wires are in the way.
- Install the repeater close to the service area to maintain the output power and noise figure.
- Use low loss cables to connect the antennas to the repeater.
- Install the repeater in a shielded, ventilated, and easy-to-reach area.

4.2 RF EXPOSURE WARNING

4.2.1 General

In order to satisfy the FCC RF exposure requirements, it must be ensured that the installation complies with the following requirements.

4.2.2 Donor Antenna requirements

The Donor antenna connected to the BASE port in the Repeater is usually installed outdoor. This antenna (Yagi type or similar) has a 12-20 dBi gain, and features a very sharp beam pointed to the BTS. Cable and jumper loss is at least 2dB.

The Donor antenna must be installed to provide a minimum separation distance of 0.5 m from any personnel within the area.

4.2.3 Mobile Antenna requirements

The second antenna is connected to the MOBILE port in the Repeater. This interface serves either an Outdoor antenna or an Indoor antennas array, in accordance with the application.

In case of Outdoor application, the antenna type is omnidirectional (isotropic) with 0 to 2 dBi typical gain, or wide beam with up to 10 dBi gain. This antenna is installed on a mast to cover a shadowed outdoor area. Cable and jumper loss is at least 2dB. Installation of this antenna must provide a minimum separation distance of 1 m from any personnel within the area.

In case of Indoor coverage, the output power is split into several, omni directional antenna with 0 to 2 dBi typical gain, and distributed to different indoor areas (in building floors, tunnels, basements, parking lots, shopping centers etc.). At least 5 such antennas must be connected to the Repeater with cables and splitters.

In this application, the maximum EIRP from each antenna shall not exceed 3W. Consequently, the minimum required separation distance from any personnel within the area is 30 cm. Less separation is needed if the power is divided into more than 5 antennas covering many floors or areas.

4.3 REPEATER INSTALLATION SITE VERIFICATION

4.3.1 General

This section provides the required procedures for the verification of the operating environment of the iDEN Repeater, to be performed before connecting the unit and before its operation.

4.3.2 Verifying the Link Between the BTS and the Repeater

This test checks the signal strength from the BTS antenna to the iDEN Repeater.

Proceed as follows:

- Using Spectrum analyzer, measure the received signal from BTS at the Donor antenna port near the repeater
- Adjust the Donor antenna direction to receive the maximum signal strength.
- Compare with the calculated signal strength from the design phase
- In case of mismatch, check for cause:

  - Antenna out of direction

  - Antenna tuned to side lobe instead of main lobe

  - Antenna connector or antenna cable faulty

  - Line of sight problem (obstruction), etc.
- Register the signal strength of the downlink channel for the system operation phase.

4.3.3 Verifying the Antenna Isolation

The isolation between the Base/Donor and Mobile/Service antennas is critical especially for high gain, outdoor applications.

For proper operation of the iDEN Repeater, Dekolink recommends that the isolation between the Donor and Service antennas be at least 12 dB higher than the repeater set gain.

Note

Lower isolation can lead to high in-band ripple, oscillations and low Signal Quality Estimate (SQE) measurements.

To measure the isolation, proceed as follows:

- Inject a known signal from a signal generator into one antenna (preferably the Donor antenna)

- Measure the coupled output from the Service antenna, using the Spectrum analyzer and LNA if applicable
- Perform this procedure across the frequency range of the Uplink bands
- Perform this procedure across the frequency range of the Downlink bands
- Register the lower result for system operation.

4.4 MECHANICAL INSTALLATION

4.4.1 General

The iDEN Repeater enclosure is a cabinet-like unit, made of heavy metal. It is 40 cm wide, 40 cm high, 26 cm deep (16 x 16 x 10.2 inches). It weighs approximately 25 Kg (55 pounds)..

4.4.2 Types of Installation

There are two basis types of installation for the Repeater:

- Wall mount installation – preferred
- Tower mount installation

The wall mount installation is the preferred method of installation for the Repeater. The installation procedures for both types are provided below.

WARNING

The Repeater must always be installed vertically and top-down, to allow free-flow of cooling air. Horizontal installation on a bench for long time may cause damage to the Repeater due to over-heating.

4.4.3 Wall Mount Installation

Determine the location of the Repeater on the wall. The location should be at normal eye level height, above ground.

Make sure to allow a depth distance of approximately one meter (around three feet) to allow the door to swing completely open, and to enable easy access to the Repeater for maintenance and on-site inspection. The Repeater should be installed in a ventilated and easy-to-reach area (see Figure 4).

Proceed as follows:

- Determine the location of the Repeater on the wall
- Mark the four drilling holes on the surface of the wall based on the mounting holes on the Repeater chassis – see Figure 3
- Drill the appropriate four holes in the wall
- Align the housing so that the mounting brackets fit into the holes in the wall
- Use tire bolts, hex-head bolts, and M8 washers to secure the enclosure firmly to the wall.

Note

Bolts and washers are not supplied with the Repeater

4.4.4 Tower Mount Installation

A tower mount adapter should be attached to the antenna tower prior to mounting the Repeater. The location on the tower and choice of fasteners is governed by local practice.

Proceed as with the wall mount installation procedure, refer to paragraph 4.4.3.

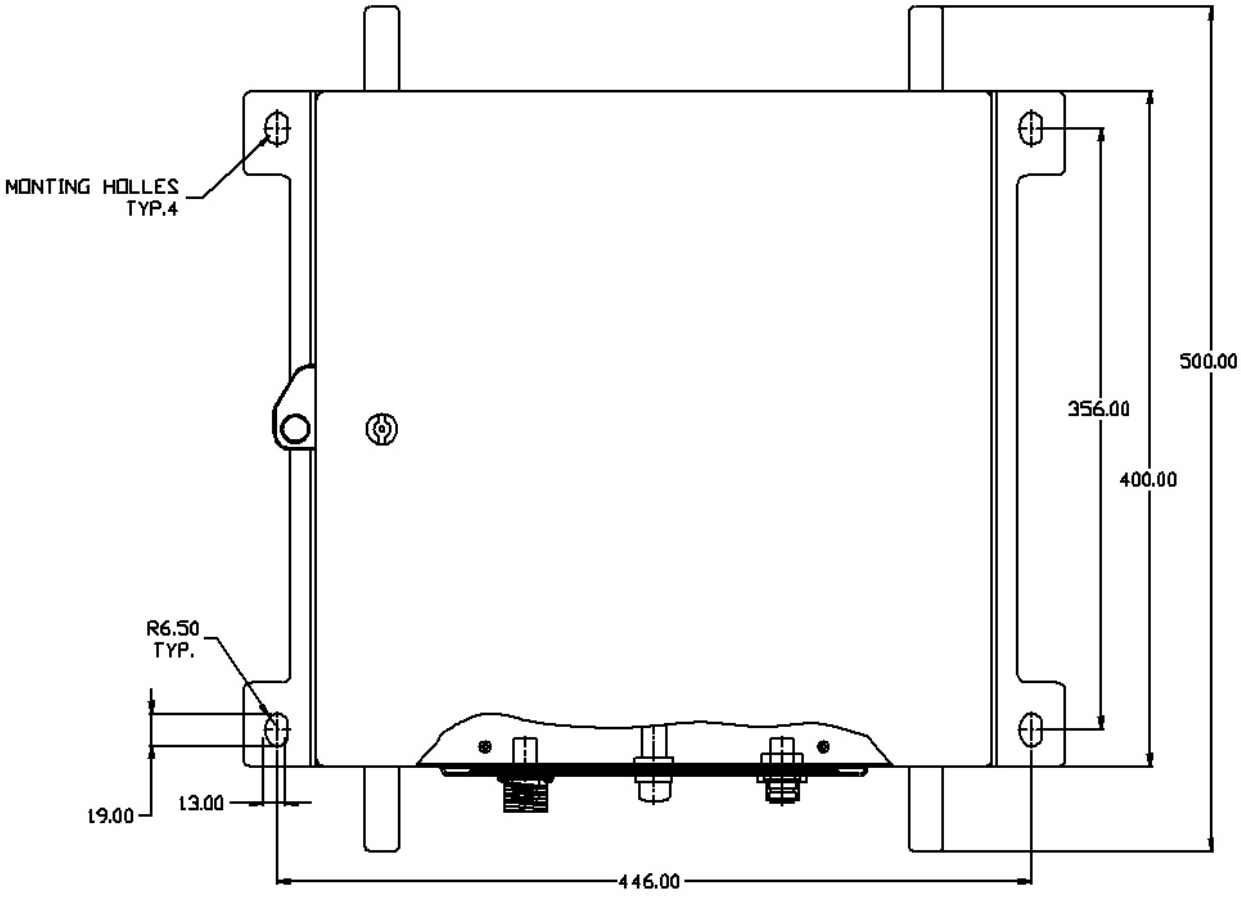


Figure 3: iDEN Repeater - Dimensions

Figure 45: iDEN Repeater – Typical Outdoor Installation

4.5 CABLES CONNECTION

4.5.1 General

Once the Repeater is installed, you are required to connect the cables from the antennas and to plug to the power supply.

4.5.2 RF Cables Deployment

The RF interface between the Repeater and the antennas is supported by one (donor and service) pair of N-type female connectors mounted on the Repeater bottom panel.

CAUTION

We recommend NOT to connect the antenna cables to the Repeater at this stage. They shall be connected with RF Coaxial Jumpers at the activation step.

See Section 5.6.

Use the following procedures to connect the coaxial cables to the Repeater:

- Connect the Donor antenna to the BASE port (N-type female connector) in the Repeater lower connectors' panel (see Figure 5)
- Connect the Service antenna to the MOBILE port (N-type female connector) in the Repeater lower connectors' panel
- Dress the exterior coaxial cables with insulation and holding tape (Type 3M Rubber splicing tape) for environmental protection and to ensure longer lifetime.

Note

The recommended coaxial cables are weather-resistant type, and therefore this procedure is not necessary.

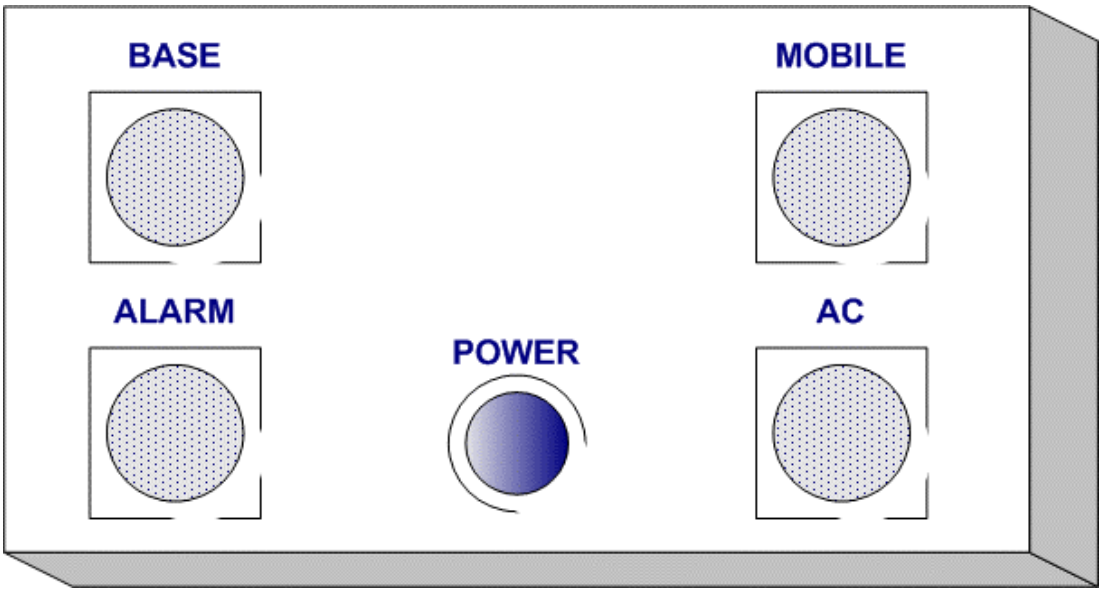


Figure 5: iDEN Repeater – Bottom Panel

4.5.3 Power Cable Connection

The repeater operates from a power source of 110V/220 VAC. The maximum consumption power is 150W.

Danger: Electrical Shock

This equipment is usually installed outdoors. Wet conditions increase the potential for receiving an electric shock when installing or using electrically powered equipment. To prevent electrical shock when installing or modifying the system power wiring, disconnect the wiring at the power source before working with uninsulated wires or terminals.

CAUTION

Take all the necessary precautions against Electro-Static Discharge (ESD).

Proceed as follows:

- Locate the AC power outlet, with at least a 6A slow blow fuse
- Connect the AC power cable from the AC power outlet to the POWER connector in the Repeater. The repeater automatically turns on (see Figure 5).
- The green Led at the Repeater front panel turns on as an indication of power supply on (there is no On/Off switch).

5. OPERATING INSTRUCTIONS

5.1 GENERAL

This section provides the operating instructions for the Digital Repeater. The operating instructions require the use of the Repeater Management Tool (RMT) software.

5.2 REPEATER MANAGEMENT TOOL (RMT)

5.2.1 General

The Repeater Management Tool (RMT) software supplied with the iDEN Repeater provides full access to all control settings and monitoring capabilities. The RMT software can be installed on Windows 95, Windows 98, Windows 2000, and Windows XP operating systems.

This software tool is used to manage, monitor and control the repeater locally via a serial connection or remotely through a modem. See the RMT User's Guide for more information.

5.2.2 Software Installation

The RMT is activated by the RMT software package.

- Install the RMT Software from the supplied CD to your laptop. For detailed instructions, refer to the Repeater Management Tool User's Guide P/N: 300MB40080.
- The Repeater Management Tool icon will appear on your desktop.

5.3 LAPTOP LOCAL CONNECTION

To set up a local connection to a Laptop:

- Open the Repeater door and identify the Controller.
- Connect the Repeater to the Mains (if not already done) and wait for the power LED on the Controller to begin flashing rapidly.
- Connect an external serial cable (RS232) from the Laptop to the Controller P3 (RS232) connector (see Figure 6). Make sure that the status led on the Controller is blinking before you connect the cable.

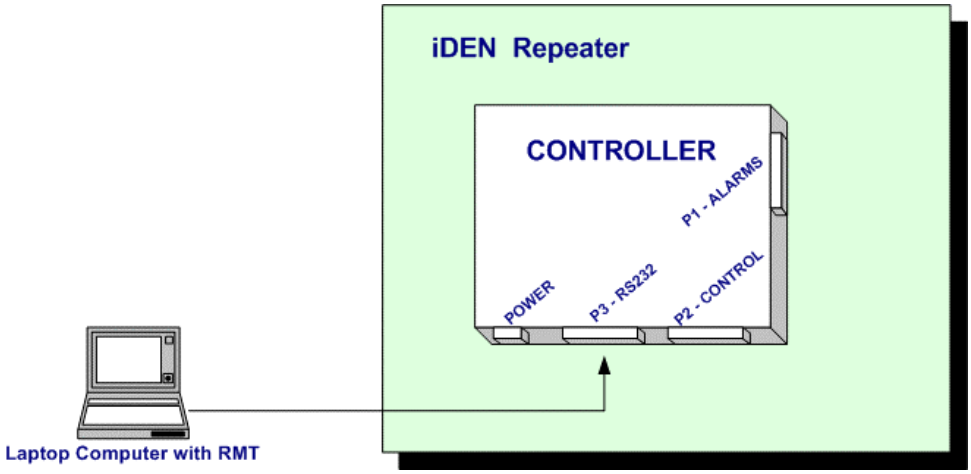


Figure 6: iDEN Repeater - Local Monitoring with Laptop

5.4 PC REMOTE CONNECTION

To set up a remote connection to a PC (see Figure 7):

1. Install a modem in the iDEN Repeater and connect it to the Controller P3 (RS232) connector *or*
2. Connect a wireless external modem to the Controller P3 (RS232) connector

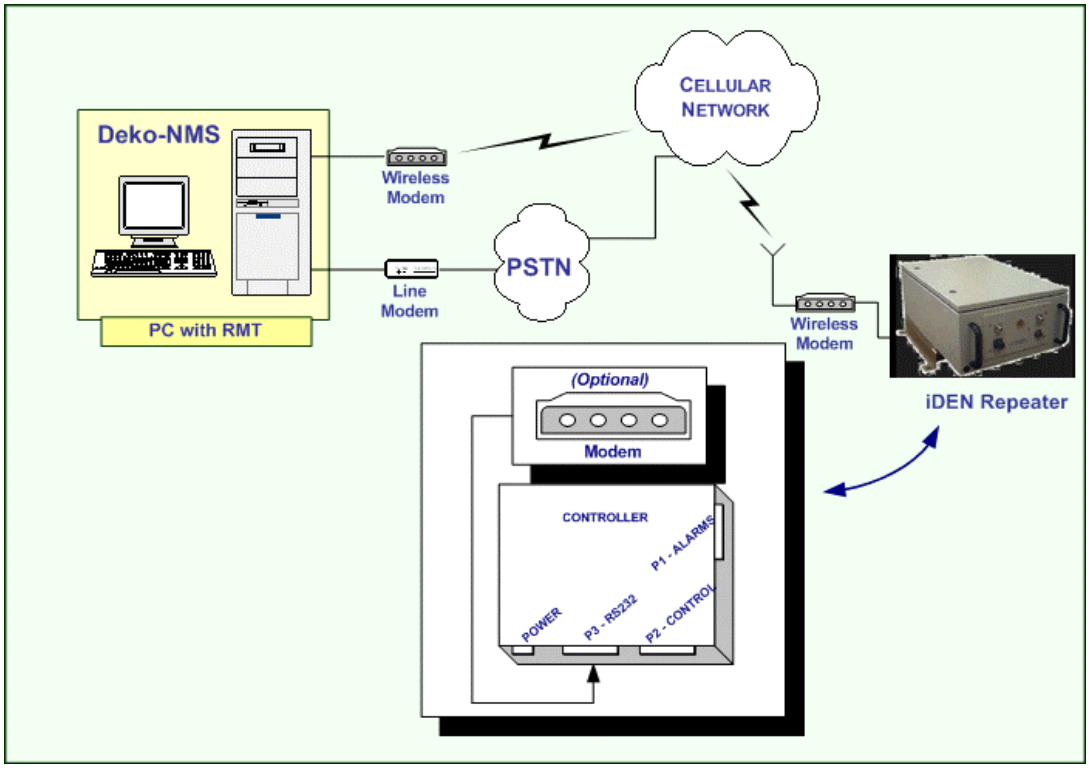


Figure 7: iDEN Repeater - Remote Monitoring and Control Connection Diagram

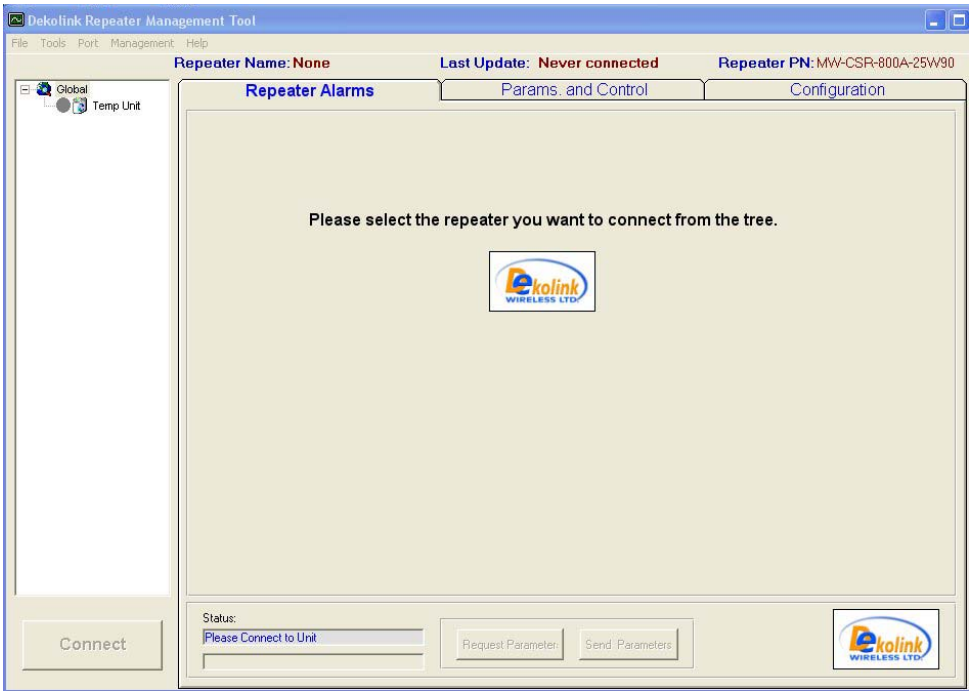
See Appendix D: Modem Installation for further installation procedures.

5.5 REPEATER INITIALIZATION PROCEDURES

To initialize and setup the iDEN Repeater parameters, proceed as follows:

3. Turn on the Laptop or the PC (for remote configuration)
4. Activate the RMT from the Start menu or by double clicking the Repeater Management icon on your desktop

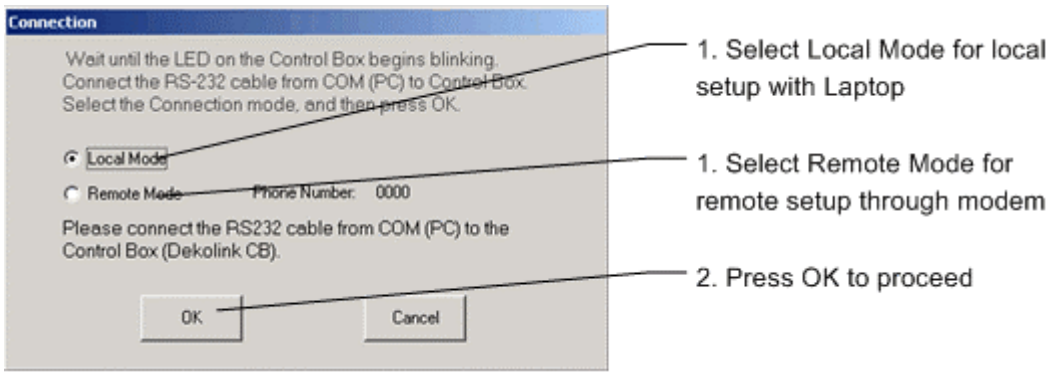
1. The following startup screen is displayed.



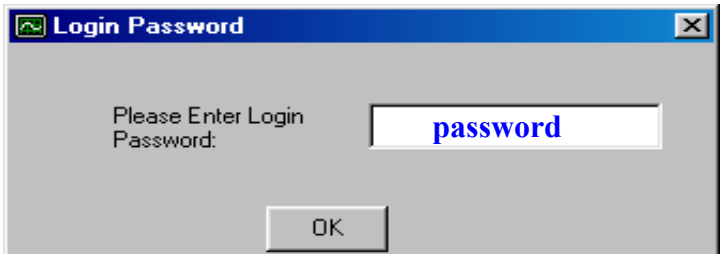
2. Click on the **Temp Unit** button as follows. Make sure that the “Repeater PN" is correct (Please refer to the RMT User's manual to set the required PN).

3. Click on the **Connect** button as follows.

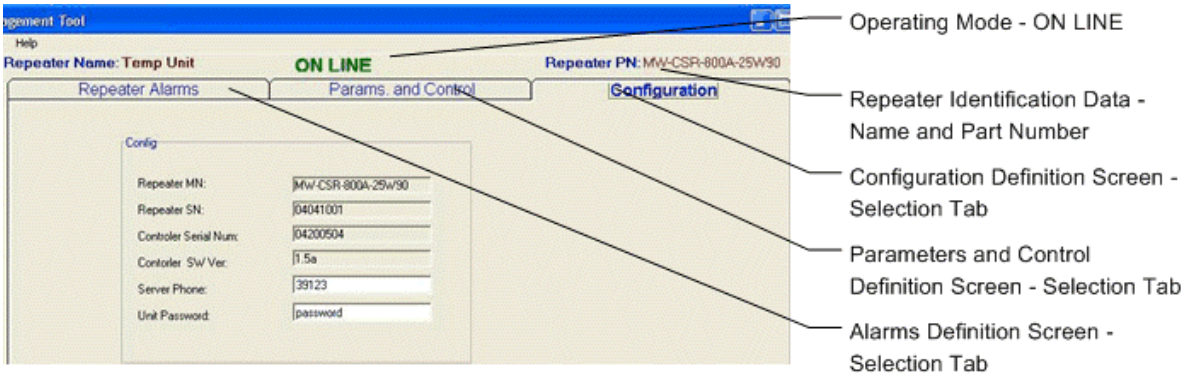
4. The following **Connection** screen is displayed. To select the mode of operation for configuration, proceed as follows:



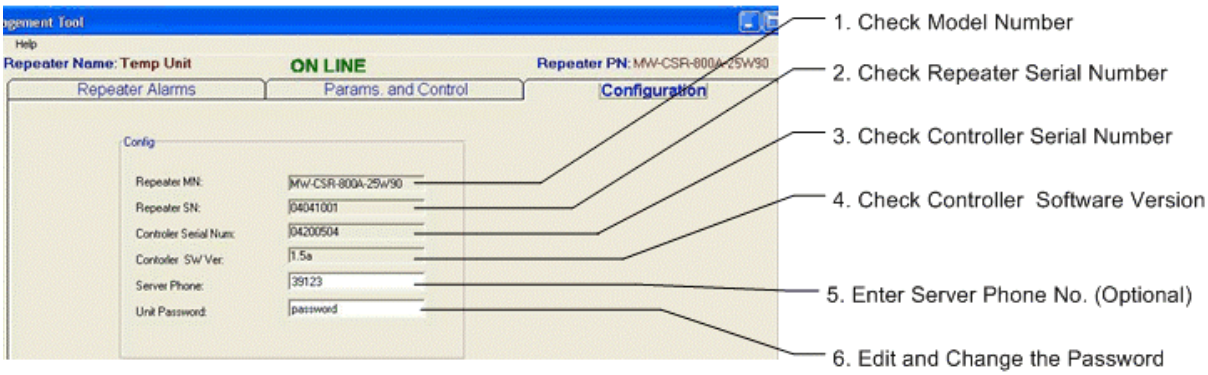
5. After accessing the Repeater, the Password window appears. Enter the Repeater's password (the default password for the repeater is "password". Click **OK**.



6. The main setup screen is displayed. It consists of three sub-screens accessible by clicking on the appropriate tab: **Repeater Alarms** / **Params and Control** / **Configuration**. The Repeater **PN** is provided on the right-most upper area for identification of the Repeater.



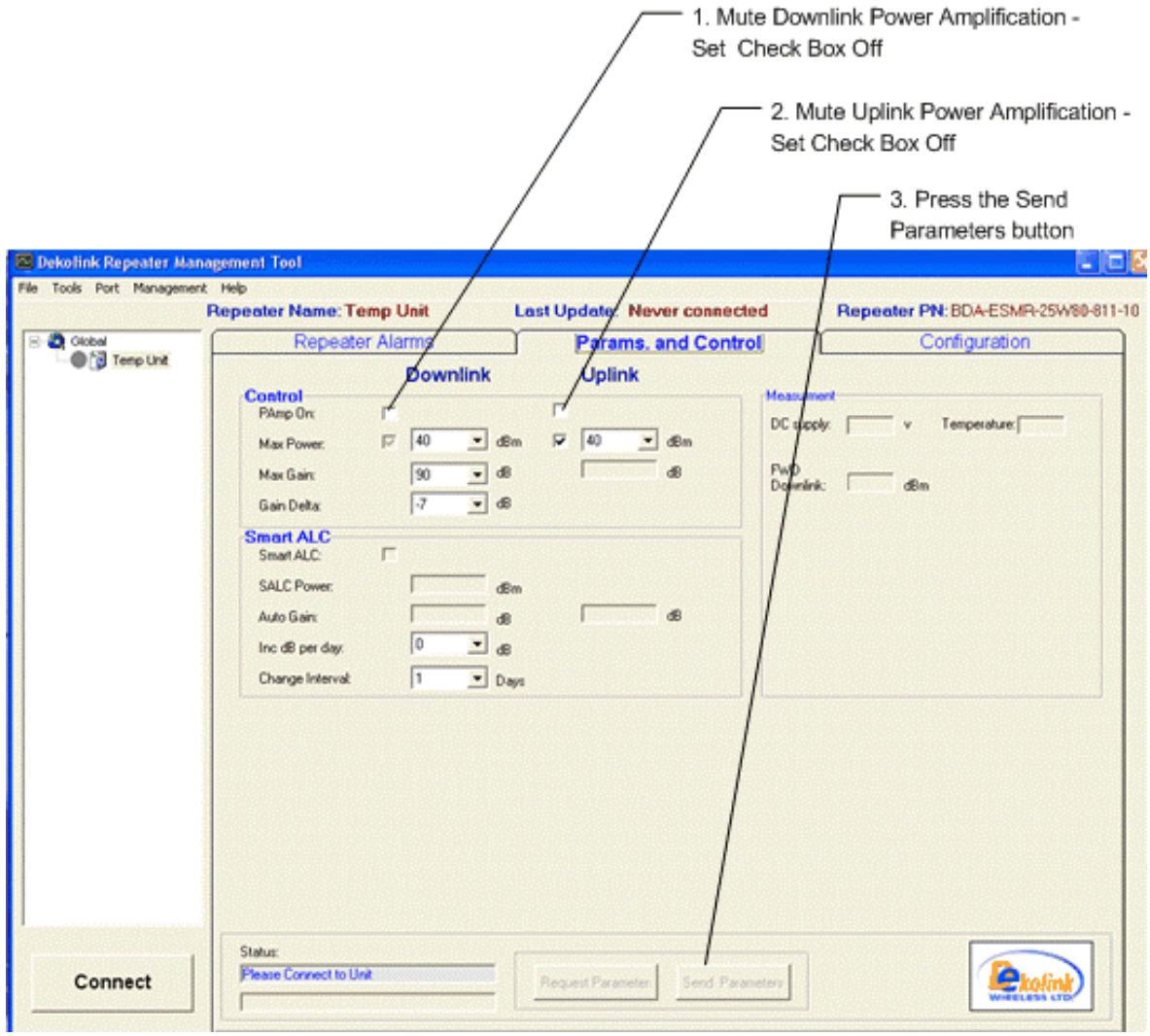
7. First verify the Repeater identification data in the **Configuration** screen as shown below. Confirm that the data is correct. Enter the **Server Phone** number and change **Unit Password** if necessary.

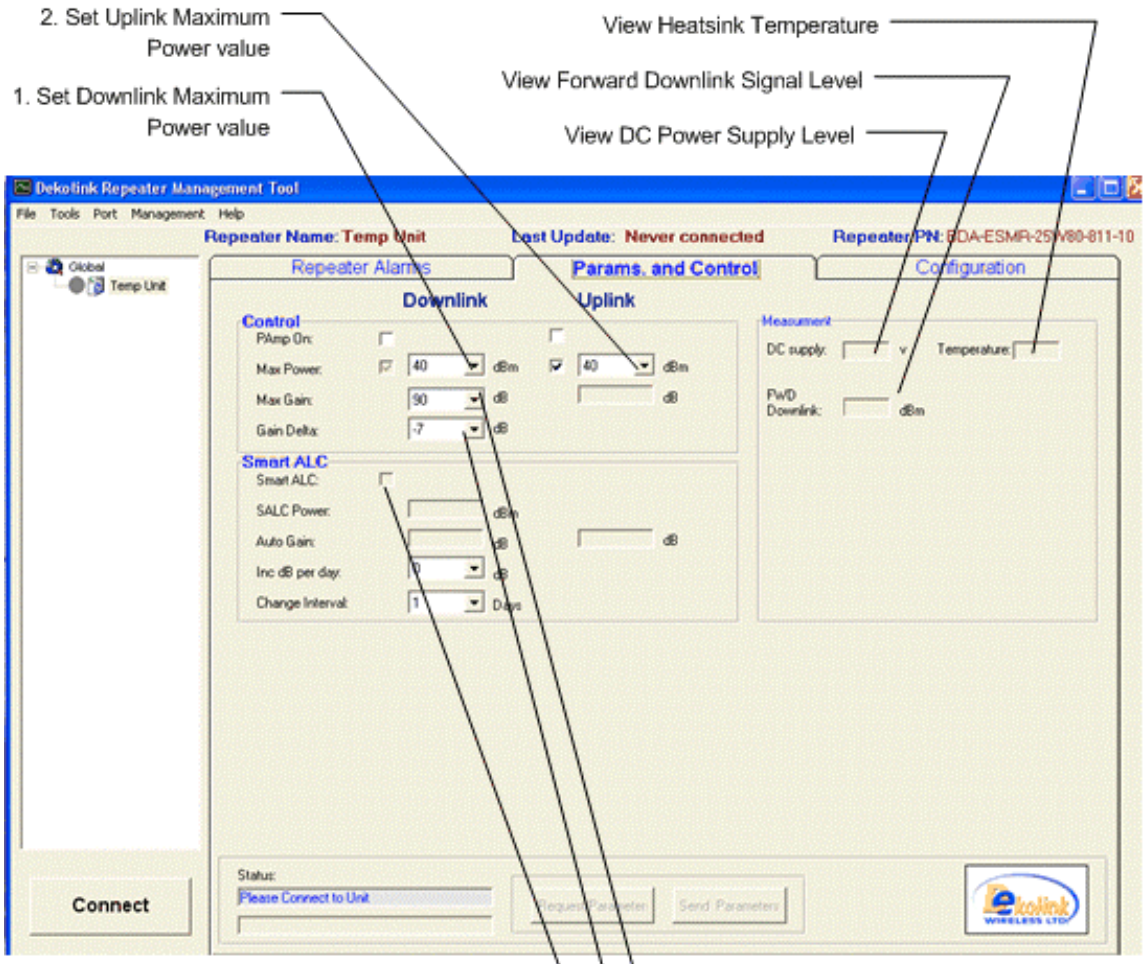


Note

The changed parameter are colored in red. They turn black after updating.

8. Click the **Send Parameters** button (not shown above) to update the data.
9. Continue the definition procedure by clicking on the **Params. And Control** tab. Set the options and check data in two steps as described below.





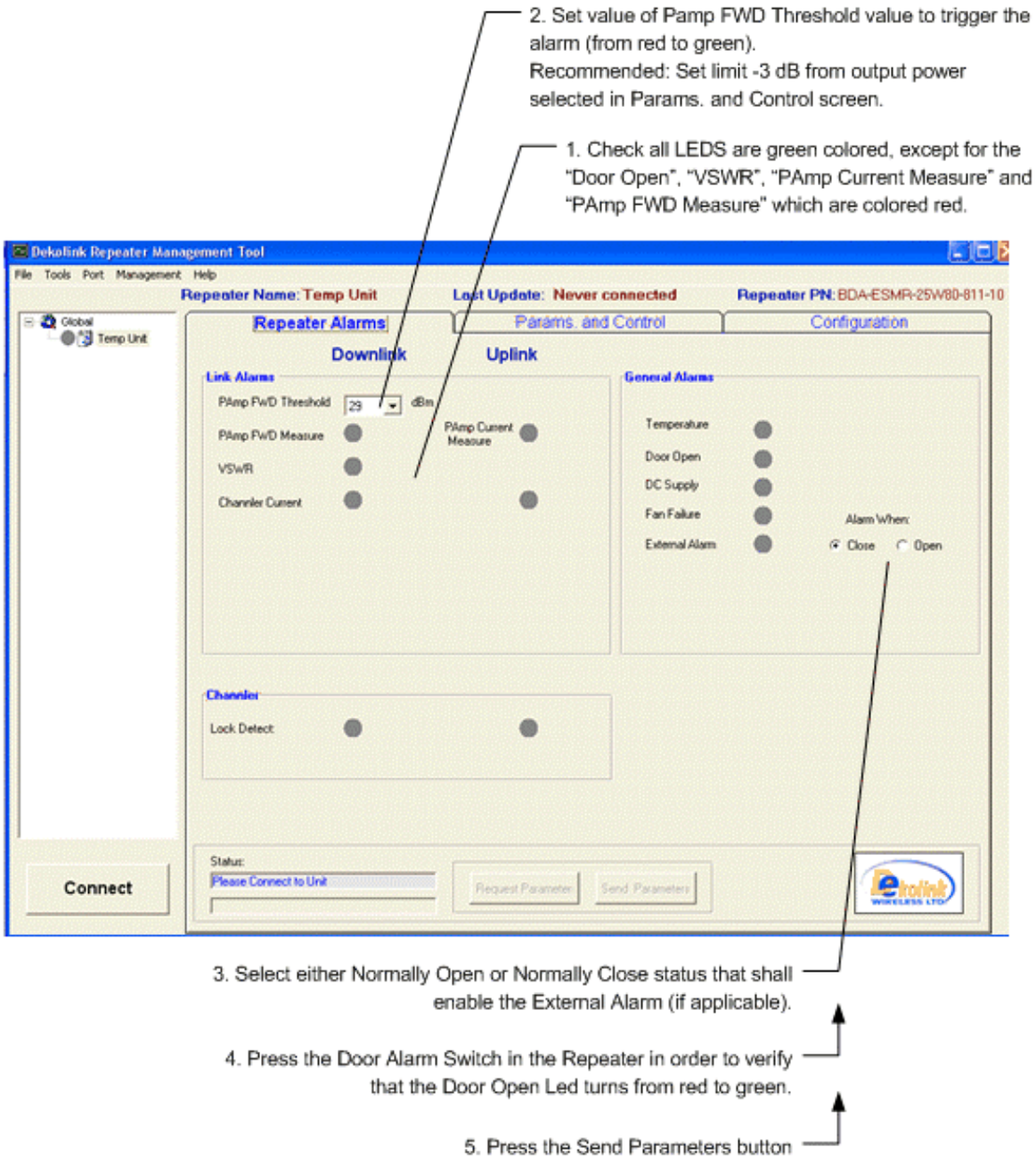
3. Set Downlink Maximum Gain
Recommended value: 12 dB less than isolation between Donor and Service Antennas

4. Set the Gain Delta. The Uplink Gain is automatically adjusted = Downlink Max. Gain minus Gain Delta

5. Set the Smart ALC check box On.
Dekolink recommends working with the SALC ON. While using the SALC feature, the actual repeater output power will be degraded by 2 dB from the Max Power. The SALC will make the repeater integrate much more seamlessly in the IDEN network, and will protect the repeater from oscillations.

6. Press the Send Parameters button

10. Proceed with the definition procedure by clicking on the **Repeater Alarms** tab. Perform as described below.

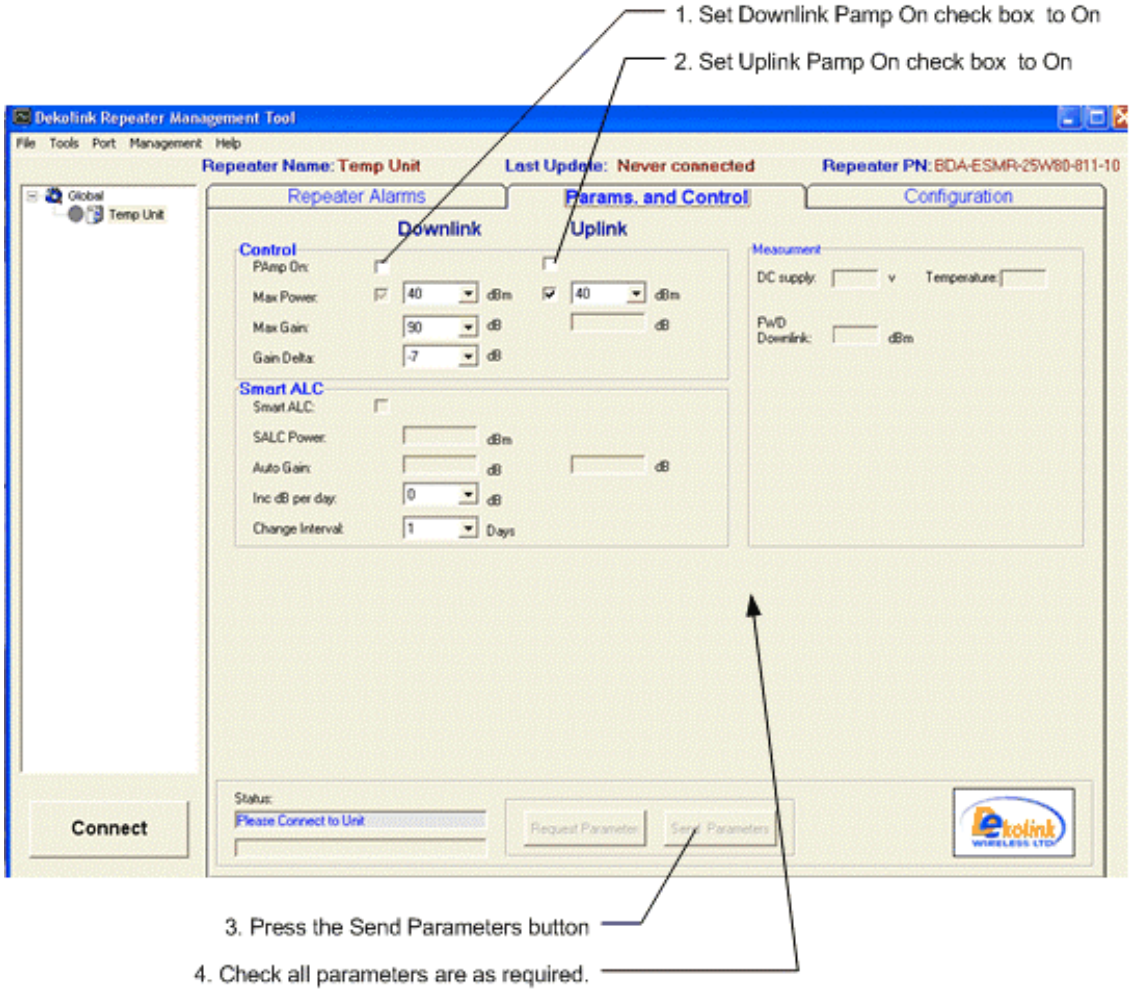


The iDEN Repeater is now loaded with its own configuration.

5.6 REPEATER ACTIVATION PROCEDURES

To activate the iDEN Repeater parameters, proceed as follows:

1. Use the following procedures to connect the coaxial cables to the Repeater:
   - Connect the Donor antenna to the BASE port (N-type female connector) in the Repeater lower connectors panel (see Figure 5)
   - Connect the Service antenna to the MOBILE port (N-type female connector) in the Repeater lower connectors panel
2. Click on the **Params. And Control** tab. Set the options and check data as described below.



3. Click on the **Repeater Alarms** tab. Check the status of the Leds - All Leds should be colored green except the "Door Open" in red.
4. Test the performance of the system in the coverage area (drive test)
5. Disconnect the RS-232 cable from the Repeater and close the door with the supplied key.

The Repeater is up and running.

6. MAINTENANCE AND TROUBLESHOOTING

6.1 GENERAL

This section provides the maintenance and troubleshooting procedures for the iDEN Repeater.

6.2 PERIODIC MAINTENANCE

There is no periodic maintenance required for the iDEN Repeater. As long as it is installed in a shaded area and not subject to extreme temperatures, it will provide long term, carefree operation.

6.3 VISUAL INSPECTION

During normal operation, the POWER lamp is on. If the POWER lamp is off, check the Mains power supply.

6.4 ALARMS AND TROUBLESHOOTING

6.4.1 Alarms

In case of general failure, the Repeater issues an alarm to warn for malfunction. This alarm is issued from the Alarms connector (Open for alarm indication).

To display the Repeater Alarms screen:

1. Connect the Repeater to a Laptop – refer to paragraph 5.3 or
2. Connect the Repeater to a remote PC – refer to paragraph 5.4
3. Display the Repeater Alarms screen – refer to paragraph 5.5
4. In accordance with the lit LED, perform the troubleshooting procedures as described below – refer to paragraph 6.4.2.

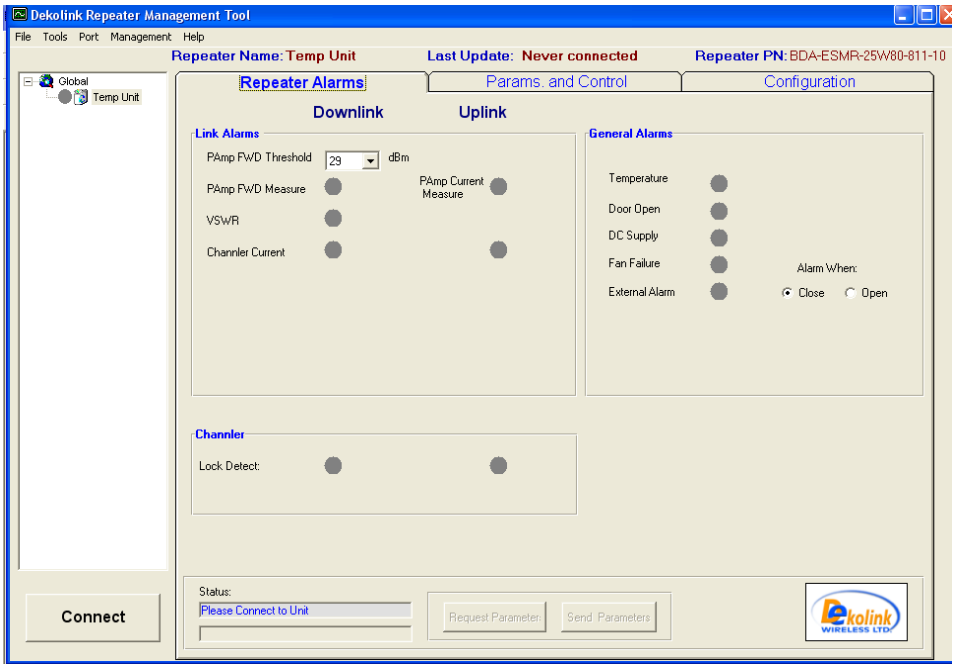


Figure 8: iDEN Repeater - Repeater Alarms Screen

6.4.2 Troubleshooting

The following table summarizes various error/warning alarms and indications (see Figure 8), their possible cause, and a course of action to correct the problem.

Alarm Indication	Probable Cause	Recommended Action
Downlink Power Amplifier FWD Measurement (this is not a fault)	Composite output power is below the threshold value	- Check the Donor antenna connection. - Check that the Donor antenna alignment is in line of sight with the Base station. - Increase the RF Gain.
Uplink Power Amplifier Uplink Current Measurement	Power Amplifier Fault	- Mute the Uplink Power amplifier. Turn it back on (*).
Downlink VSWR [Return Power]	High Voltage Standing Wave Ratio (VSWR) at the Mobile port	- Check the antenna and cable connection at the Mobile port. - Replace the antenna if necessary.
Downlink / Uplink Channeler Current	Channeler failed	- Check if a temperature alarm is active. If so, see the Temperature alarm below. - Check if the Lock Detect alarm is active. If so, see the Lock Detect alarm below. - Decrease the gain of the Repeater to minimum, check the alarm, and turn it back to Maximum Gain (*).
Temperature	Indicates an inner temperature over 60ºC. The power supply shutdowns the Repeater when the temperature reaches 70ºC	- Verify that the repeater is mounted correctly, with the Repeater gland plate facing the floor. - Increase ventilation.
Door Open	Indicates that the Repeater door is open	- Close the Repeater door. - Check the connection of the door switch.

Alarm Indication	Probable Cause	Recommended Action
Fan Failure	Fan Failed	- Check power supply - Check fan.
External Alarm	Connectivity	- Check connection to Alarms connector.
Downlink/Uplink Lock Detect alarm	Faulty status of the Phased Locked Loop (PLL) in the Channeler unit	- Reboot the Repeater. - Check the connection between the Controller and the Channeler (*).

(*) If the indication remains after the Recommended action procedure, replace the Repeater.

The following troubleshooting procedures refer to communication failures, and are not shown in the Repeater Alarms screen.

Failure	Probable Cause	Recommended Action
Connection to the Controller failed in the local connection	Communication failure	- Check the physical connection between the PC COM1 and the Controller RS232 interface. - Verify that the LED of the controller is blinking rapidly. - Reboot the Repeater. - Restart the PC. - Re-install the Controller software
Connection with the Repeater failed in the remote connection	Communication failure	- Check that the modem is physically connected to the controller serial input. - Verify that the modem local port baud rate is 57,600 bps. - Verify that the Controller LED is blinking. - Verify that the modem is connected to the antenna cable via the RF coupler. - Restart the PC. - Reinstall the Controller software.

APPENDIX A: MECHANICAL OUTLINE

This appendix contains the mechanical outline of the Repeater.

iDEN Repeater - Mechanical Outline

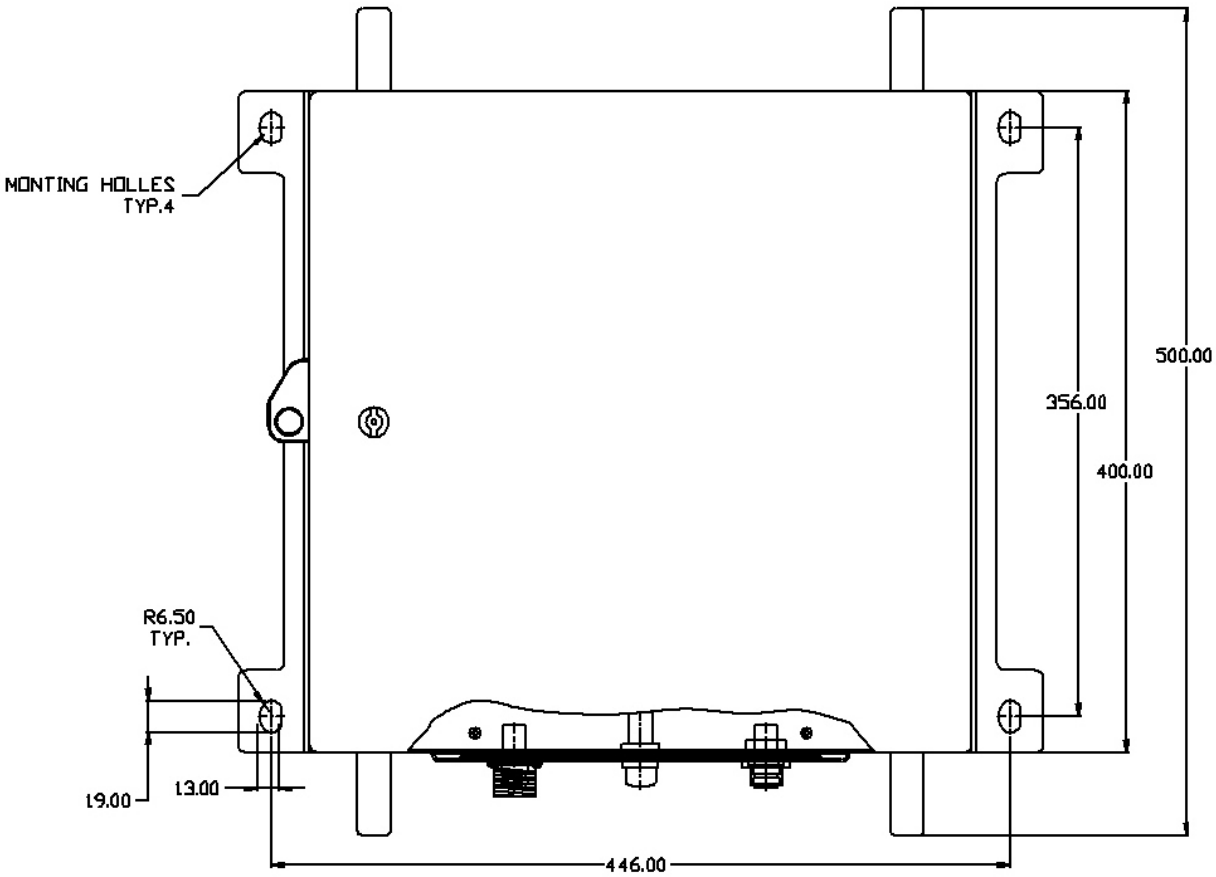


Figure 9: iDEN Repeater – Mechanical Outline

iDEN Repeater – Connectors Panel Mechanical Outline

The following figure shows the connectors panel layout for Repeater Model Number: MW-CSR-ESMR-25W90

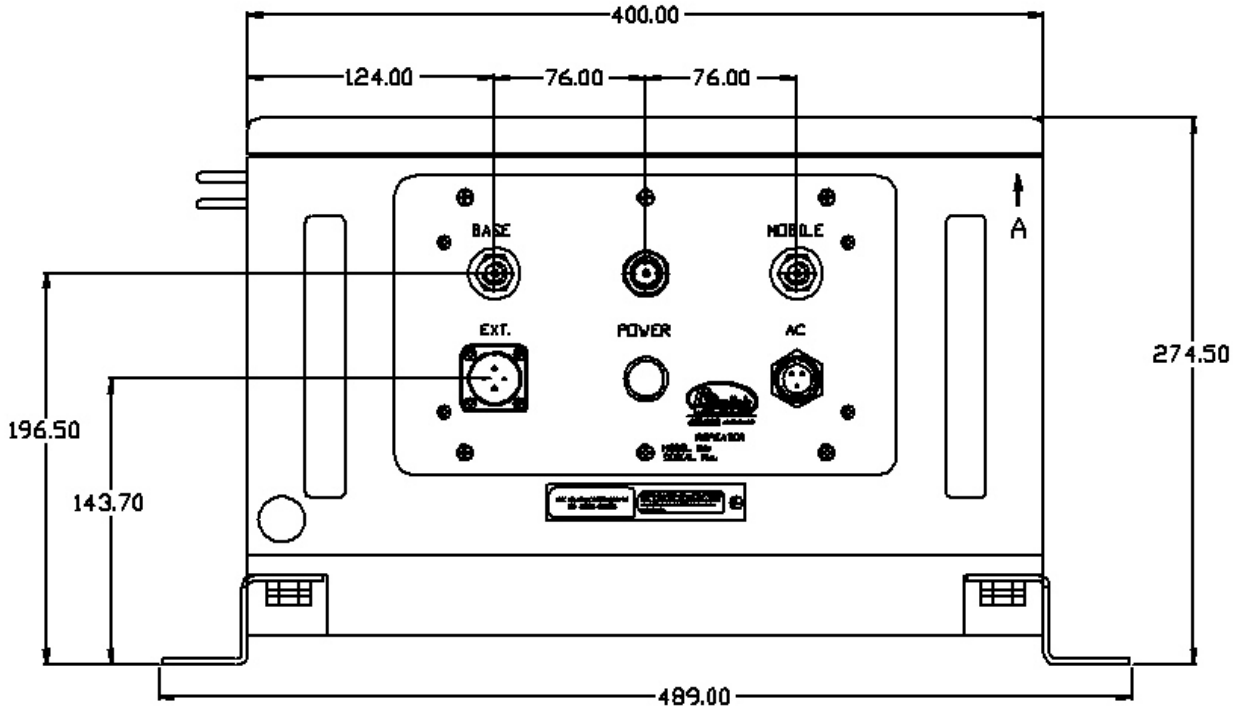


Figure 10: iDEN Repeater – Connectors Panel Layout

APPENDIX B: EXTERNAL ALARMS CONNECTOR PINOUT DEFINITION

The following table details the pinout definition of the ALARMS connector located in the gland plate of the repeater.

Letter	Description	Color Code
A	External Alarm Input (1)	White
B	N/C	N/C
C	N/C	N/C
D	Summarized Alarm Dry Contact	Red
E	Summarized Alarm Dry Contact	Green
F	N/C	N/C
G	N/C	N/C
H	External Alarm Input (2)	Black

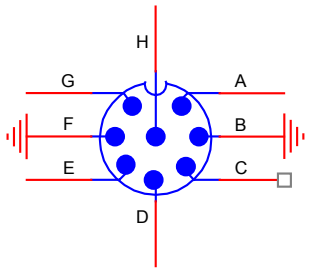


Figure 11: Alarms Connector – Pinout

APPENDIX D: MODEM INSTALLATION (OPTION)

General

The iDEN Repeater is ready for connection of a serial, Hayes Compatible, AT Command type modem with a phone number to allow connection in a circuit switched network.

If you are using a modem with a SIM card, special settings (network or terminal definitions) may be needed to allow data transmission.

Modem Installation

Perform the following steps to install a standard modem:

- Connect the modem to the power supply.
- Install the modem with a straight serial cable. This cable is usually supplied with the modem. (See the tables below for the pinout description.)
- Use a PC with the same terminal mode and bit rate as the default modem baud rate. For example, 57,600, 19,200, 14,400 bps or other baud rate depending on the modem default configuration.

Use the following commands:

- AT S0=0 <ENTER>
- AT+IPR=57600 <ENTER>
- Change terminal baud rate to 57,600 bps if necessary.
- Use the PC in terminal mode to save the new baud rate settings.

Use the following commands:

- D AT&W1 <ENTER> (For some modems)
- AT&W0 <ENTER> (For other modems)
- Disconnect the serial cable from the PC and connect it to the Controller in the Repeater.
- Connect the antenna cable to the modem antenna port. (When testing the unit in a laboratory, connect the modem to an external antenna) Refer to Appendix C for more information.
- Connect the modem to a Power Supply unit terminal.
- Turn the Repeater AC power on.
- Use a PC with a wireless or Plain Old Telephone System (POTS) modem and the Dekolink RMT software to monitor the repeater.
- Refer to the RMT User's Guide for more information on how to establish remote connection with a repeater.

Connector Pin-out

Serial Cable Pin-out for Local Communication between the PC and the Controller:

PC Pinout	CB Pinout
2	3
3	2
5	5
D-Type 9 Pin female	D-Type 9 Pin female

Serial Cable Pinout for Remote Communication between the Modem and the Controller:

DCE Modem	DTE Controller
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
D-Type 9 Pin female	D-Type 9 Pin male

APPENDIX E: DEKOLINK WIRELESS LIMITED WARRANTY

Dekolink Wireless [Ltd.] ("Dekolink"), manufacturer of this product (the "Product") warrants to the original purchaser ("Purchaser") that the Product is free from defects in materials and workmanship for a term that ends on the earlier of twelve (12) months from the date of activation of the Product or fifteen (15) months from the date of shipment of the Product by Dekolink. The obligations of Dekolink under this warranty shall be limited solely to the repair or exchange or giving credit for, at the option of Dekolink, any Product that may prove defective in accordance with evidence satisfactory to Dekolink. Any repair or replacement of the Product by Dekolink shall not extend the original warranty period. This warranty is exclusive to the original Purchaser and is not assignable.

This warranty applies only upon the condition that the Product has been installed, maintained and operated under conditions of normal use. The provisions of this warranty shall not apply if, in Dekolink's judgment, the Product has been subject to misuse or neglect, damaged in an accident or by act of vandalism, or repaired or altered in any way that adversely affects its performance or reliability.

To obtain warranty service, Purchaser may, upon the prior written authorization of Dekolink or its authorized service representative, return the defective Product to Dekolink's authorized service center. All shipping and insurance charges are the sole responsibility of Purchaser and are not included in this warranty.

Dekolink expressly excludes and disclaims all other warranties, including but not limited to any warranties of merchantability or fitness for a particular purpose.

Dekolink shall in no event be liable for any special, indirect, incidental, consequential or punitive damages or for loss, damage, or expense, including loss of use, profits, revenue, or goodwill, directly or indirectly arising from purchaser's use or inability to use the merchandise, or for loss or destruction of other property or from any other cause, even if Dekolink has been advised of the possibility of such damage. Some states do not allow the exclusion or limitation of incidental or consequential damages so these limitations may not apply under certain circumstances.

The liability of Dekolink shall in no event exceed an amount equivalent to the purchase price paid by the purchaser for the defective product.

This warranty shall not be extended, altered or varied except by a written instrument duly signed by Dekolink.