High Selectivity Mini-Repeater

Product Manual

STANDALONE

DEK02119

PCS Mini-Repeater

with SAW Switcher

Rev. 2.01

ABOUT THIS MANUAL

This Product Manual provides the following information:

- Description of the Mini-Repeater
- Procedures for setup, configuration and checking the proper operation of the Mini-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 Mini-Repeaters are familiar with the basic functionality of Repeaters.

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Publication No.: 313-2006 Rev. 2.01S

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 intended to be installed indoor. 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. See paragraph 4.9.

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
AMP (P_amp)	Amplifier (power amplifier)
ATR	Acceptance Test Results
BTS	Base Transceiver Station
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
IF	Intermediate Frequency
MN	Model Number
NMT	Network Management Tool
PCS	Personal Communications Service
PLL	Phased Locked Loop
RF	Radio Frequency
RMS	Repeater Management System
SALC	Smart-ALC (Automatic Level Control)
SIM	Subscriber Identification Module
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

Mini-Repeater Deko2119 is a PCS Block Selective RF Mini-Repeater that amplifies signals bi-directionally between base stations and mobile handsets, in cellular and other wireless systems (see Figure 1).

Deko2119 provides high selectivity capability by employing an advanced up/down conversion and Intermediate Frequency (IF) SAW filtering architecture.

This product features the Smart ALC algorithm that provides "plug-and-play" capability for fast response and immediate solution to your coverage needs, while preventing degradation in network performance. This repeater is provided with a SAW Switcher that can be configured with pre-determined different frequency blocks so as to enable complex frequency plans, as well as providing two units in one Repeater.

Mini-Repeater Deko2119 is provided with 80 dB gain as default. Some units are configured with 70 dB gain only. This manual is valid for both configurations.

In addition, Deko2119 features a special configuration for dual-band coverage using a Combiner. It enables interconnecting with another Mini-Repeater, such as Deko2408, to provide coverage in the Deko2119 bandwidth as well as for CDMA by Deko2408. The dual-band combination supports a single Distribution Antenna System to provide coverage by different providers.

Deko2119 fully meets the FCC standard requirements.

1.2 APPLICATIONS

Dekolink's Mini-Repeaters are suitable for deployment in dense urban environments, tunnels and other areas where physical structures cause low cellular coverage.

The Mini-Repeater introduces new system capabilities that enable a wide variety of applications particularly when adjacent band selectivity and/or very high spectral purity are required. This repeater provides a solution to situations in which flexible, high quality and high resolution filtering methods are necessary.

Dekolink's Mini-Repeaters help improve in-building coverage, as the driver for a single antenna for spot coverage or a distributed antenna system (DAS) for larger coverage areas.

1.3 MAIN FEATURES

Some of the Deko2119 PCS Mini-Repeater features are listed below:

- 1/8 W (+21 dBm) Uplink and Downlink composite power
- 82 dB RF gain
- Highly linear amplification
- Excellent out-of-band interference prevention
- Tunable sharp cutoff IF SAW filters
- High spectral purity
- SAW Switcher capability
- Unique microprocessor controlled features:
    - Remote or local control and alarms (software enabled) option
    - Smart ALC, for in-network transparent operation
    - Built-in power measurement and RSSI indication.
- Excellent power to volume ratio
- Boasts a stylish design for indoor installation, and can be easily installed on a wall or on a pole.

1.4 DESCRIPTION

1.4.1 General

This paragraph provides a brief description of key functional capabilities of Mini-Repeater Deko2119.

1.4.2 Switchable Bandwidth

The internal SAW Switcher enables to implement the Switchable Bandwidth option. This function enables more efficient and better adaptability of the Repeater to your needs. This capability enables you to install the Repeater in different operation environments or adapt it to the evolving operating environment.

In standard configuration, the Switchable Bandwidth function provides the capability to set up to three pre-determined different frequency blocks of 5, 10 and 15 MHz bandwidth respectively, as per requirement. The operating center frequency is user-adjustable anywhere within the PCS band.

This capability ensures that in case of bandwidth evolution at the installation site, you are not required to replace the installed Repeater, just set the second bandwidth.

1.4.3 Smart-ALC

The downlink path includes Dekolink's Smart Automatic Level Control (Smart-ALC) control algorithm to ensure linear operation of the Repeater. This feature automatically adjusts the Repeater gain, reducing it in case of over the limit power output, or boosting it to maintain maximum gain utilization.

The Smart-ALC automatically maintains downlink and uplink gain balance. This capability keeps system transparency at all times and enables "cell

shrinking" whenever applicable. This algorithm is intended to prevent oscillation in case of insufficient isolation.

In CDMA and UMTS networks, this optimum gain setting ensures the repeater is transparent in the network and allows the repeater coverage area to “breathe” along with the main cell coverage.

1.4.4 Operating Modes

Mini-Repeater Deko2119 can be operated in two modes:

- Manually, by a power control selector and LED indicators.
- Software control, via RS-232

1.4.5 Dual-Band Configuration

The Deko2119 can be operated in a dual-band configuration with a DEKO2408 Mini-Repeater. This configuration supports a single Distribution Antenna System (DAS) to enable dual coverage of the PCS range (by Deko2119) and the Cellular range by Deko2408.

Deko2119 includes a special purpose diplexer at the input and output interfaces to enable the dual-band interconnection.

1.5 CONTROLS AND INDICATORS

The Block Selective Mini-Repeater includes one power adjustment selector and three status LEDs in its front panel (see Figure 2).

1.5.1 Power Selector

The power selector enables to set the maximum output power in accordance with the coverage design requirements, during the setup and during troubleshooting of the Repeater.

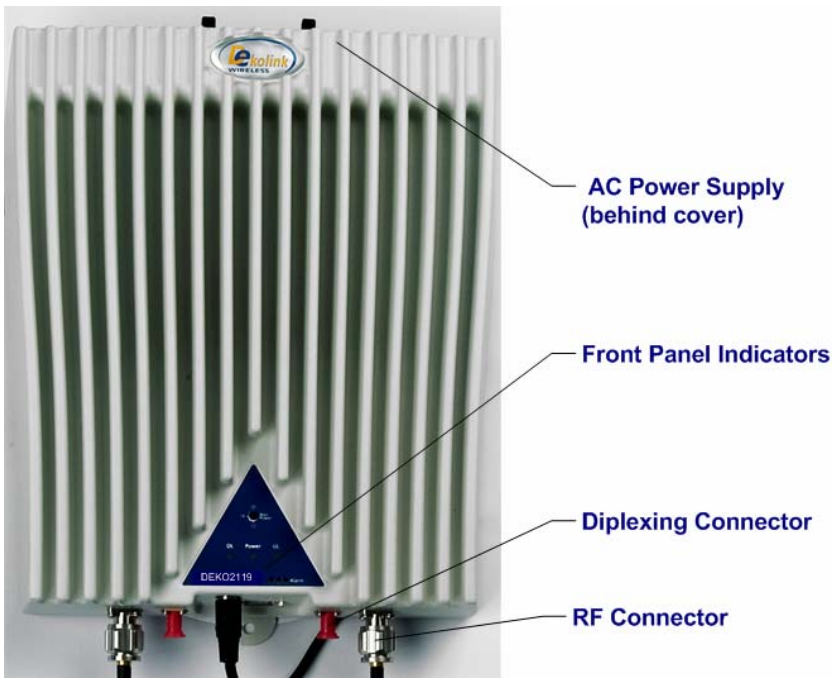


Figure 1: Mini-Repeater Deko2119

1.5.2 Status LEDS

The status LEDs provide indication on the Repeater operation (see Figure 2 and refer to Table 1):

At turn on, the LEDs show the built-in test procedures: the LEDs turn from orange to red to green.

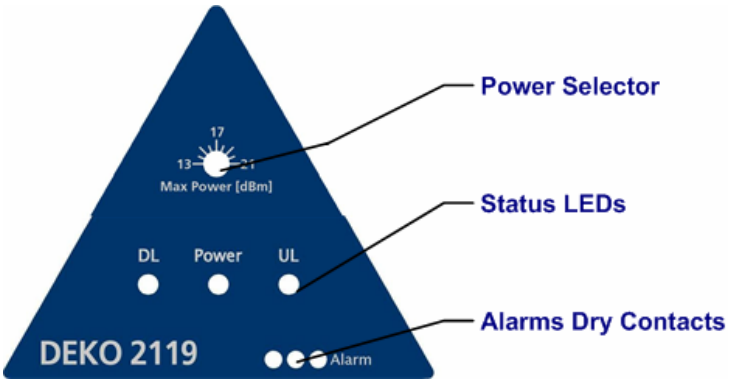


Figure 2: Mini-Repeater Indicators Panel

Table 1 – Mini-Repeater LEDs Function

LED	DESCRIPTION	FUNCTION	FUNCTIONAL DISPLAY			
			Green	**Red**	**Orange**	**Blinking Green**
DL	Downlink	Downlink path status indication	Normal operation	Major malfunction	High input power	Low power transmission
Power		Power \ Major alarms status indication	Normal operation	Major malfunction	(Blinking) Panel Mask *	---
UL	Uplink	Uplink path status indication	Normal operation	Major malfunction	High input power	---

* Power Selector disabled

Refer to Chapter 8 for a description of the alarms and their interpretation.

1.6 MODEL AND FREQUENCIES

Dekolink's Block Selective Mini-Repeater can be provided in several models, as listed below.

The operating frequency ranges depend on the type and model, as follows:

Standard configuration, single block: MW-CCSR-PCS-1W80-5-10-15

PCS Mini-Repeater Deko2119 can also be provided in a variety of configurations, with up to three non contiguous blocks, as described in the following examples. In these cases, the Model Number includes the following information:

MW-CCSR-PCS-1W80-xx-Sxy-yy-Syz-zz

Where:

MW-CCSR-PCS-1W80 represents the PCS Mini-Repeater Deko2119, and

xx is the first block
yy is the second block
xy is the separation between the first two blocks and
yz is the separation between the second block and the third one
All values are in MHz, unnecessary values are omitted

For example:

Deko2119 with D and E blocks shall be designated as:
MW-CCSR-PCS-1W80-05-S15-05.

Deko2119 with A and E blocks shall be designated as:
MW-CCSR-PCS-1W80-15-S20-05.

Older versions are provided with 70 dB gain. Their Model number is:

MW-CCSR-PCS-1W70-xx-Sxy-yy-Syz-zz for its different configurations.

1.7 UNPACKING AND INSPECTION

This section provides information for unpacking and inspection:

- 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. Contact Dekolink Wireless Ltd if any of this equipment is missing.

Your Mini-Repeater comes with the following equipment:

- Mini-Repeater
- AC cable [6 ft.]
- RS232 Female to Female cable
- Mini-Repeater Product Manual
- RMS Software Installation CD
- Acceptance Test Results (A.T.R.)
- Packaging Box

2. FUNCTIONAL DESCRIPTION

2.1 GENERAL

The Block Selective Mini-Repeater functional operation is based on a duplexed path configuration. In each path, the signal is down-converted to an Intermediate Frequency (IF); filtered by a Surface Acoustic Wave (SAW) filter and up-converted back. This configuration gives sharp out of band attenuation for improved system performance.

2.2 FUNCTIONAL DESCRIPTION

2.2.1 Signal Path

The following process is performed in both the Uplink and Downlink paths of the Repeater (see Figure 3).

The incoming RF signal from either the Base antenna (from the BTS) or from the Mobile antenna (from the mobile handset) enters the Repeater through a diplexer that enables dual-band support. The signal is filtered by the Duplexer, followed by an Automatic Gain Control (AGC) amplifier (AMP). The signal is then down-converted to an Intermediate Frequency (IF).

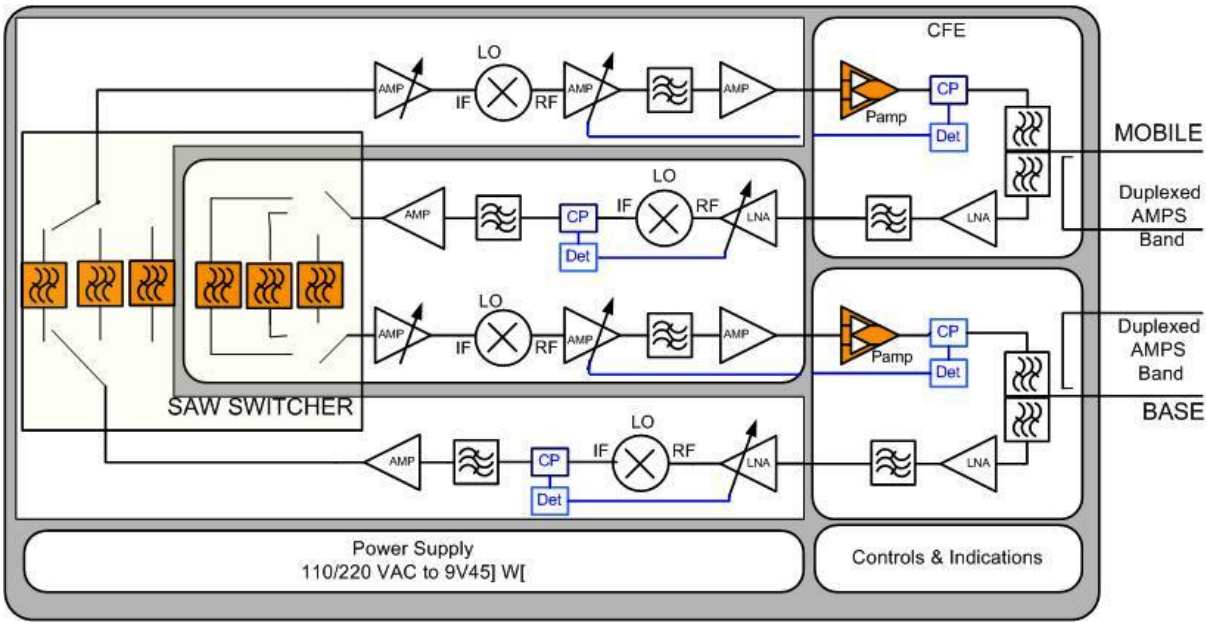


Figure 3: Mini-Repeater - Block Diagram

The IF signal is further filtered by a Surface Acoustic Wave (SAW) filter. The Mini-Repeater includes three selectable SAW filters. However, a single filter can be activated at any time. The IF signal is then converted back to RF signal by the Up-Converter. This processing path provides sharp out-of-band attenuation that improves the isolation between the receiving and transmitting paths.

The output RF signal is amplified by a power amplifier, combined by the Duplexer and output from the diplexer that enables dual-band (Cellular and PCS) signal output.

2.2.2 Power Monitoring - Smart-ALC

The Smart Automatic Level Control (Smart-ALC) is an innovative algorithm 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.

The Smart-ALC maintains the Uplink/Downlink gain balance for system transparency. This algorithm also adjusts the gain of the Repeater paths in case of oscillations that may occur due to insufficient isolation, thus preventing oscillations while maintaining the gain in a linear range operation. Smart-ALC effectively reduces isolation problems.

To reset the Repeater to its highest set gain value, it is sufficient to simply disconnect the Repeater power cable for several seconds and reconnect anew.

In addition, the power amplifier includes power-monitoring circuits with Automatic Level Control (ALC). The ALC prevents excessive output power while maintaining the power amplifier linearity.

2.2.3 SAW Switcher

The SAW switcher enables to select one or two PCS operational blocks along the PCS band. The desired pair of frequency blocks can be tuned anywhere in the available band. The selection is software enabled.

2.2.4 Control and Monitoring

The Mini-Repeater operation is controlled by a microprocessor. The processor monitors the Repeater function and controls the alarm LEDs located on the Mini-Repeater front panel.

2.2.5 Protection

The Mini-Repeater includes protection against high V.S.W.R.

An auto recovery mechanism returns the unit to normal operation, after power or other failures.

3. SPECIFICATIONS

3.1 GENERAL

This section provides the electrical, mechanical and environmental specifications of the Deko2119 Mini-Repeater.

Note

Specifications are subject to change without notice.

3.2 ELECTRICAL SPECIFICATIONS

Parameter	Downlink	Uplink
Frequency Range (full PCS range)	1930-1990 MHz	1850-1910 MHz
Filter bandwidth (that the Repeater can handle. However, one at a time)	5, 10 & 15 MHz	5, 10 & 15 MHz
Passband Gain	82 ±2 dB	82 ±2 dB
Gain Attenuation Range	0 to 30 dB (in 1 dB steps)	0 to 30 dB (in 1 dB steps)
Average Output Power (Composite Power)	1/8 W (+21 dBm)	1/8 W (+21 dBm)
Noise Figure @ Max. Gain	5 dB Typical	5 dB Typical
Propagation Delay	<5 µsec	<5 µsec
Conformance Standard	FCC	

3.3 GENERAL SPECIFICATIONS

Parameter	Range
Power Supply	220/110 VAC, Optional: 9VDC
Power Consumption	35 W
Total RF Input Power (no damage)	+10 dBm
Impedance Level	50 Ohm
V.S.W.R.	1.7:1

3.4 MECHANICAL SPECIFICATIONS

Element	Value
Size H x W x D	310 x 270 x 70 mm (12.2 x 10.6 x 2.8 inch)
Weight	Approximately 6 kg (13.2 lbs)

3.5 ENVIRONMENTAL SPECIFICATIONS

The Mini-Repeater is designed for indoor installation. It meets the European IP54 standard for indoor equipment.

Condition	Value
Operating temperature	-20 °C to +50 °C
Storage temperature	-30 °C to +80 °C

3.6 CONNECTORS

The Mini-Repeater Deko2119 interfaces with a Base antenna port and a Mobile antenna port (see Figure 4). It includes seven external connectors in its bottom panel, as described below.

Connector	Type
RF Connectors: BASE / MOBILE	N-type, Female
DC Power (9 V)	Circular, 4-pin
Communications	RS-232 male, D-Type 9 pins
Coupling Connectors (-20 dB): Base / Mobile	SMA female
Alarms	Dry Contacts- 3 pins; Normally close (NC), Common, Normally Open (NO)

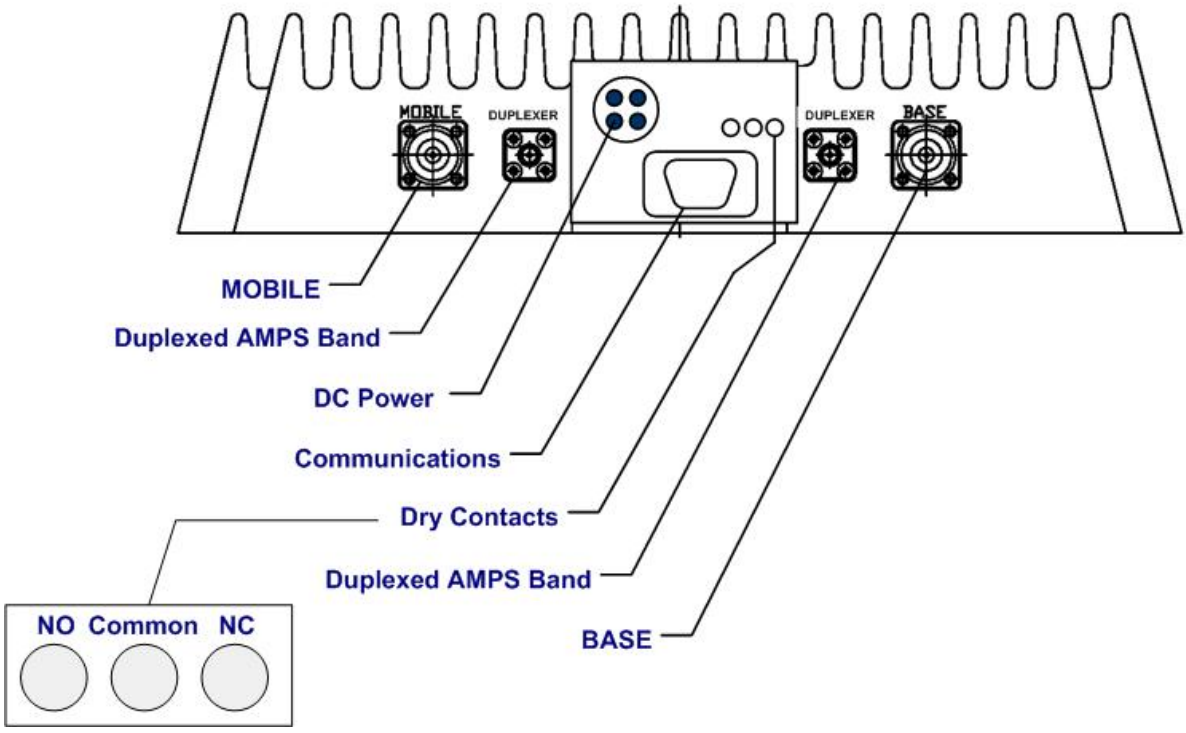


Figure 4: Mini-Repeater – Connectors Panel

4. INSTALLATION AND OPERATION

4.1 GENERAL

The small, lightweight Mini-Repeater Deko2119 is easy-to-install. Measurement tools are most always never needed.

4.2 SAFETY INSTRUCTIONS

Before installing the Repeater, review the following safety information:

- Follow all local safety regulations when installing the Repeater
- Only qualified personnel are authorized to install and maintain the Repeater
- Follow Electro-Static Discharge (ESD) precautions.

4.3 INSTALLATION SITE CONSIDERATIONS

The Mini-Repeater Deko2119 is provided with back panel flanges for easy installation on any surface (see Figure 5). It is recommended to install the Mini-Repeater on a flat rigid surface. The installation site for the Mini-Repeater should take into consideration the following conditions:

- The Repeater should be installed in a ventilated and easy-to-reach area
- The Repeater is convection cooled so the area should be unblocked to ensure airflow.

4.4 TOOLS AND MATERIALS

Measurement tools are most always never needed. No special tools are necessary. However, a standard, professional, tool box is required for the installation procedures.

4.5 INSTALLATION PROCEDURES

The wall mount installation is the preferred method of installation for the Repeater. Determine the location of the Repeater on the wall. The location should be at normal eye level height, above ground.

Proceed as follows:

- Mark the three drilling holes on the surface of the wall based on the mounting holes on the Repeater chassis – see Figure 5
- Drill the appropriate three (3) holes in the wall. Recommend the screw sizes to use, such as: “It is recommended to use No. 8 screws”.
- Align the housing so that the mounting brackets fit into the holes in the wall
- Use hex-head screws or bolts, and washers to secure the enclosure firmly to the wall. Recommend the screw sizes to use, such as: “It is recommended to use No. 8 screws. The mounting screws should not be smaller than no. 6.”

Note

Bolts and washers are not supplied with the Repeater

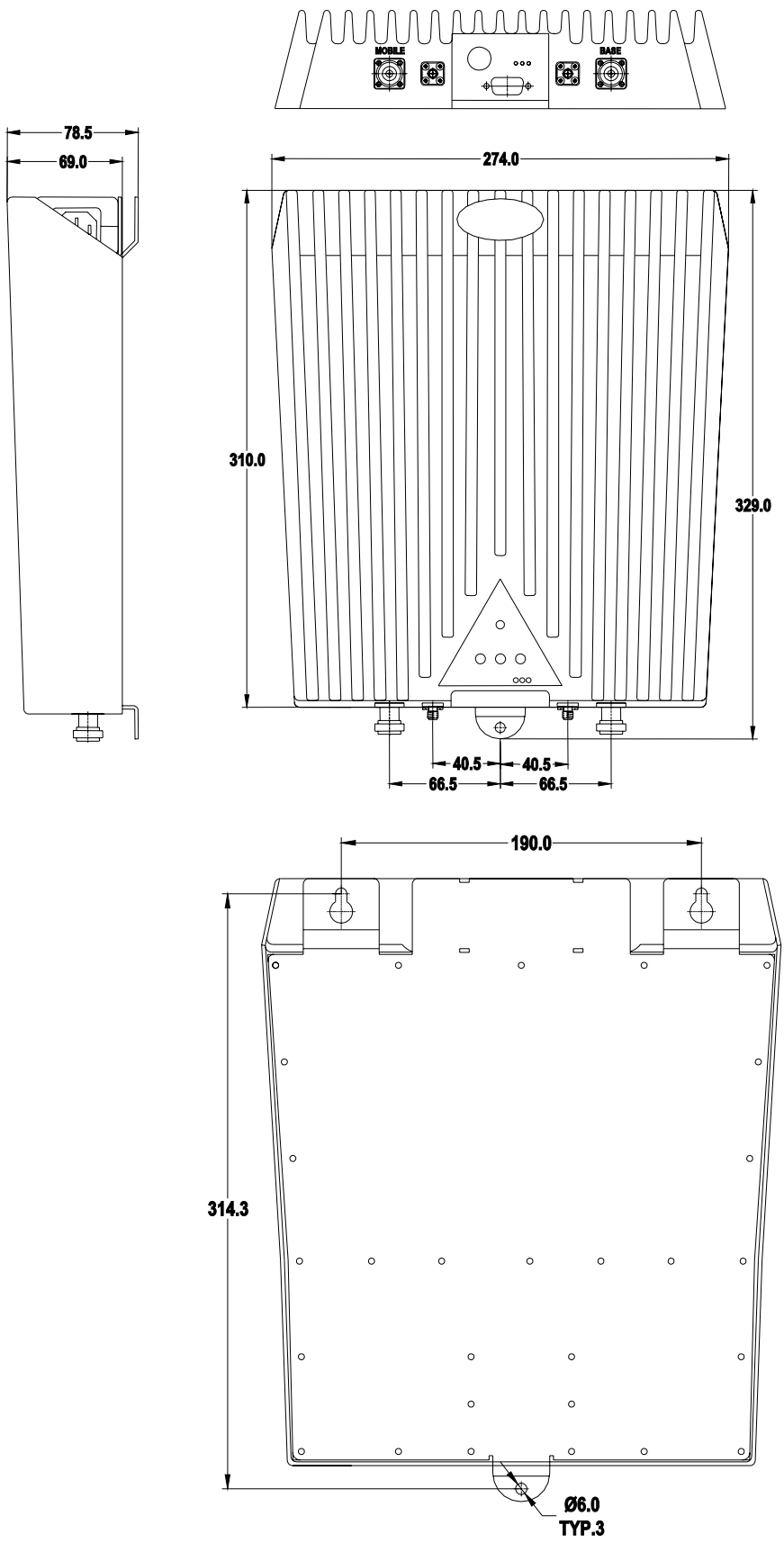


Figure 5: Mini—Repeater Deko2119 – Dimensions

4.6 ANTENNA INSTALLATION SITE – CONSIDERATIONS

4.6.1 Base/Donor Antenna Installation Site Selection

The Base/Donor antenna installation is usually a directional antenna such as a Yagi or Panel antenna with 8 to 13 dB gain. The location of the Donor antenna must have line-of-sight with the base station. Proceed as follows:

- Point the antenna to the base station to receive maximum input power.
- Make sure the antenna is in line of sight with the base site. You can raise the antenna higher if necessary.

4.6.2 Remote/Mobile Antenna Installation Site Selection

Note

Before installing the Remote/Mobile antenna, see the FCC regulations for information regarding recommended distances between the antennas and population centers. Refer to paragraph 5.4.

The Remote/Mobile antenna is connected to the Mini-Repeater mobile port. This type of antenna is usually omni directional (isotropic), or wide beam, with 0 to 2 dBi typical gain. This type of antenna is typically deployed within a Distributed Antenna System (DAS). This antenna, in the context of the DAS, serves to distribute signals indoors (in-buildings, tunnels, basements, parking lots, shopping centers, etc.).

4.6.3 Antenna Isolation

For proper Repeater operation, Dekolink recommends that the isolation between the Base/Donor and the Mobile/Service antennas be 8 dB, in contrast with the 15 dB isolation required by conventional repeaters. Lower isolation can lead to high in-band ripple, oscillations and low Signal Quality.

However, in case of poor isolation, the Smart ALC (SALC) comes into operation, and ensures no-oscillation operation of the Block Selective Mini-Repeater. Whenever the isolation drops, the Repeater automatically reduces the gain to keep away from oscillations. Once the isolation problems are solved, the Repeater automatically raises the gain anew.

To measure the isolation, prior to connecting the antenna to the repeater, proceed as follows:

- Inject a known signal into one antenna
- Measure the coupled output from the opposite antenna
- Perform this procedure across the frequency range of both Uplink and Downlink bands.

4.7 CONNECTION TO ANTENNAS AND TO POWER

Perform the following connection procedures (see Figure 4 for connectors' location):

1. Connect the Donor antenna cable to the BASE connector

2. Connect the Service antenna cable to the MOBILE connector
3. Verify that the DC power supply unit cable is connected to the POWER connector.

Note

The DC power supply unit is located at the top of the unit, behind the front panel (see Figure 1).

4.8 OPERATING PROCEDURES

To operate the Mini-Repeater Deko2119, proceed as follows:

WARNING

Do not operate the Repeater without terminating the antenna connections with actual antennas or proper dummy loads.

Note

The Block Selective Mini-Repeater is factory set to maximum gain and maximum output power.

1. Verify that the RF cables are connected to the proper BASE and MOBILE connectors
2. Connect the AC connector of the DC power supply unit to the Mains (110V/220 VAC). The Repeater is turned on

Note

Maximum power consumption: 35W.

3. When the unit is powered on, the front panel shows the built-in test procedures: the LEDs (DL, Power, UL) turn from Orange to Red to Green (see Figure 6)
4. If all the functions operate properly, all three LEDs are green after the initial test procedures are completed.
5. If your coverage design requires a total RF output power at maximum traffic that is lower than the factory set maximum, insert a flat screwdriver in the upper knob (Max Power - Selector) on the front panel and set to the required output value.

Whenever the LEDs are lit differently, they indicate a malfunction. Refer to Section 8 for troubleshooting.

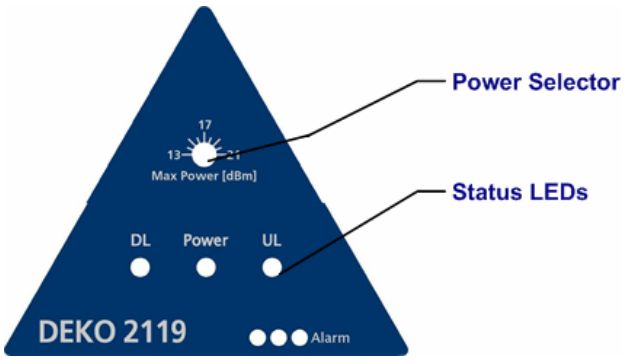


Figure 6: Mini-Repeater – Indicators Panel

4.9 DONOR ANTENNA ALIGNMENT

4.9.1 General

The DL LED in the front panel can be used as an RSSI level indicator without recurring to measurement equipment, and enables to align the Donor antenna for optimum operation.

4.9.2 DL LED Status vs. Downlink Signal

The following table provides the corrective steps for the Donor antenna installation to obtain maximum gain in accordance with the DL LED status.

No.	DL LED Status	Most Probable Cause	Recommended Corrective Action
1	Steady Green	Good operational status	No action
2	Blinking Green	Low input power signal at Donor antenna, as provided by: Input power < [Required output power – Gain] *Note*: The Mini-Repeater is currently operating properly, providing coverage, but not at maximum capability.	Rotate or relocate the Donor antenna until the DL LED is lit in steady green.
3	Blinking Orange	Two causes are probable: 1. Too strong input signal from Donor antenna 2. Poor isolation between the Donor antenna and the Mobile antenna	1. Insert a attenuator of 10 dB between the BASE port and donor antenna. Turn the Mini-Repeater off, then on. Check the DL LED is lit in steady green. If status repeats, perform procedures again. 2. Relocate the Donor at a further distance. Turn the Mini-Repeater off, then on. Check the DL LED is lit in steady green. If status repeats, perform procedures again.

4.9.3 Additional Tool

In case the Mini-Repeater is connected locally to a laptop with the proper RMS software (refer to Section 6), the Controls and Parameters screen includes a Measurement window (see Figure 19).

You can check the FWD Downlink (dBm) value while relocating the Donor antenna until you obtain a maximum input signal from the antenna.

4.10 RF EXPOSURE WARNING

4.10.1 General

In order to finish the installation procedures, you must ensure that the installation satisfies with the FCC RF exposure requirements and complies with the following instructions.

4.10.2 Donor Antenna Exposure Warning

The Donor antenna should be connected to the BASE port in the Repeater with a cable with typical 1~10 dB attenuation (in accordance with the length of the cable). This antenna is installed outdoor and has very sharp beam (Yagi type or panel) pointed to the BTS. This type of antenna has about 10 dBi gain.

The Donor antenna typical specifications are:

- Gain: 8 dBd (-10.1 dBi)
- VSWR: Better than 1.5:1
- Impedance: 50 Ohm

The outdoor antenna must be installed to provide a minimum separation distance of 30 cm (11.7 in.) from any personnel within the area.

4.10.3 Service Antenna Exposure Warning

The second antenna is connected to the MOBILE port in the Repeater via a cable with typical 1~10 dB attenuation (in accordance with the length of the cable). This type of antenna is omni (isotropic) or wide beam with 0 to 2 dBi typical gain. This type of antenna is installed for distribution to different indoor areas (in-building floors, tunnels, basements, parking lots, shopping centers etc.).

The Service antenna typical specifications are:

- Gain: 2 dBi
- VSWR: Better than 2:1
- Impedance: 50 Ohm

The Service antenna shall be installed to provide a minimum separation distance of 20 cm (7.8 in.) from any personnel within the area.

5. DUAL-BAND MINI-REPEATERS CONFIGURATION

Deko2119 Combiner enables to set a dual-band configuration to support both Cellular and PCS coverage over a single Distribution Antenna System (DAS).

Two Mini-Repeaters – Deko2119 Combiner and Deko2408 - are interconnected through the Cellular Band Diplexing Port (see Figure 4) in the Deko2119 and are connected to a single DAS. This setup provides support for dual-band coverage for different providers.

Figure 7 shows the connections of this dual-band configuration.

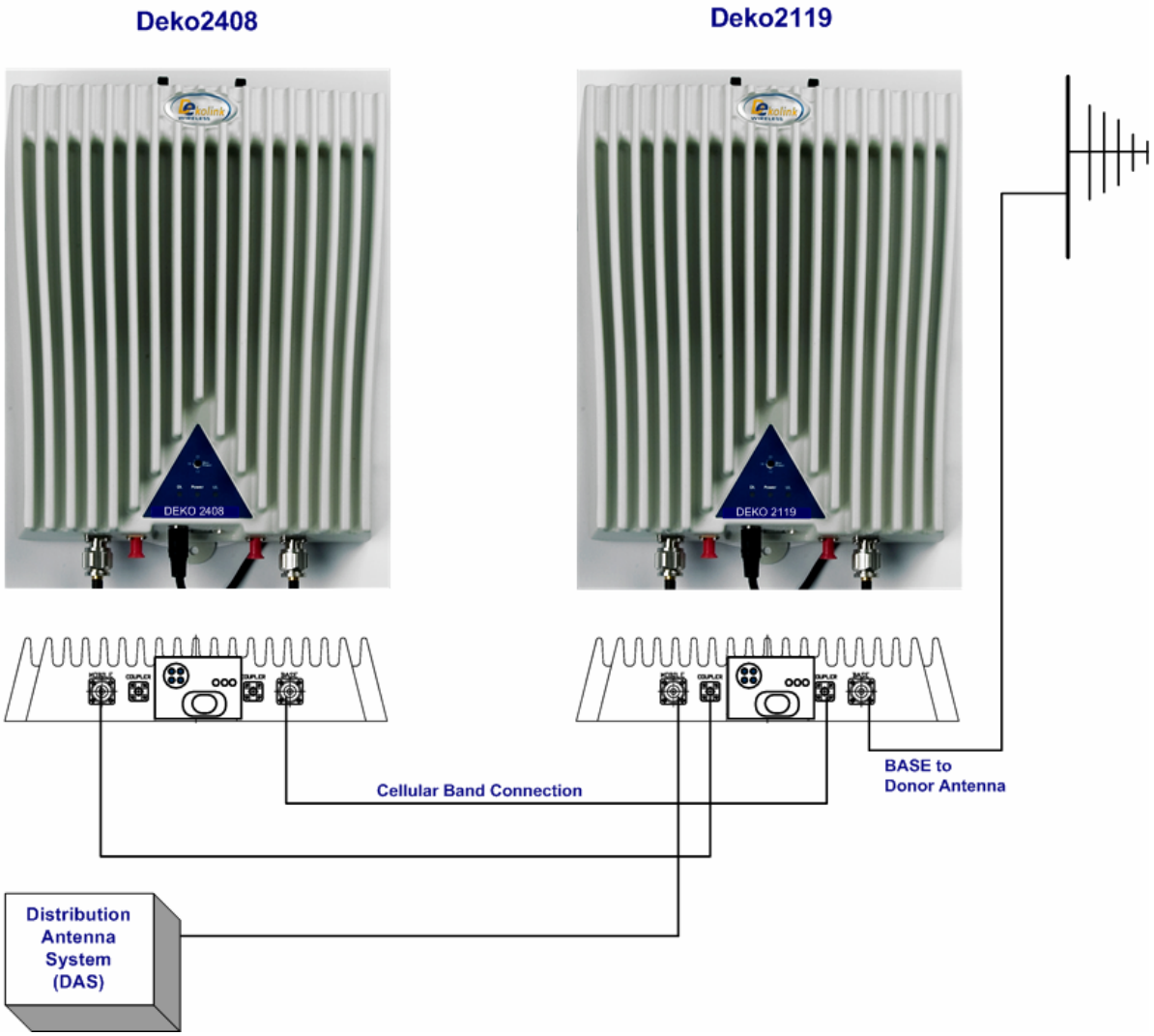


Figure 7: Two Mini-Repeaters in Dual-Band Configuration

6. DAISY-CHAINED DUAL-BAND MINI-REPEATERS

Several Mini-Repeaters in Dual-Band configuration can be daisy-chained to support a large in-building installation in different floors (such as a high-rise building), or separate areas using several repeater sets, all the while being connected to a single Donor antenna. An example is provided in Figure 8 which shows two dual-band mini-repeaters in a daisy-chain configuration.

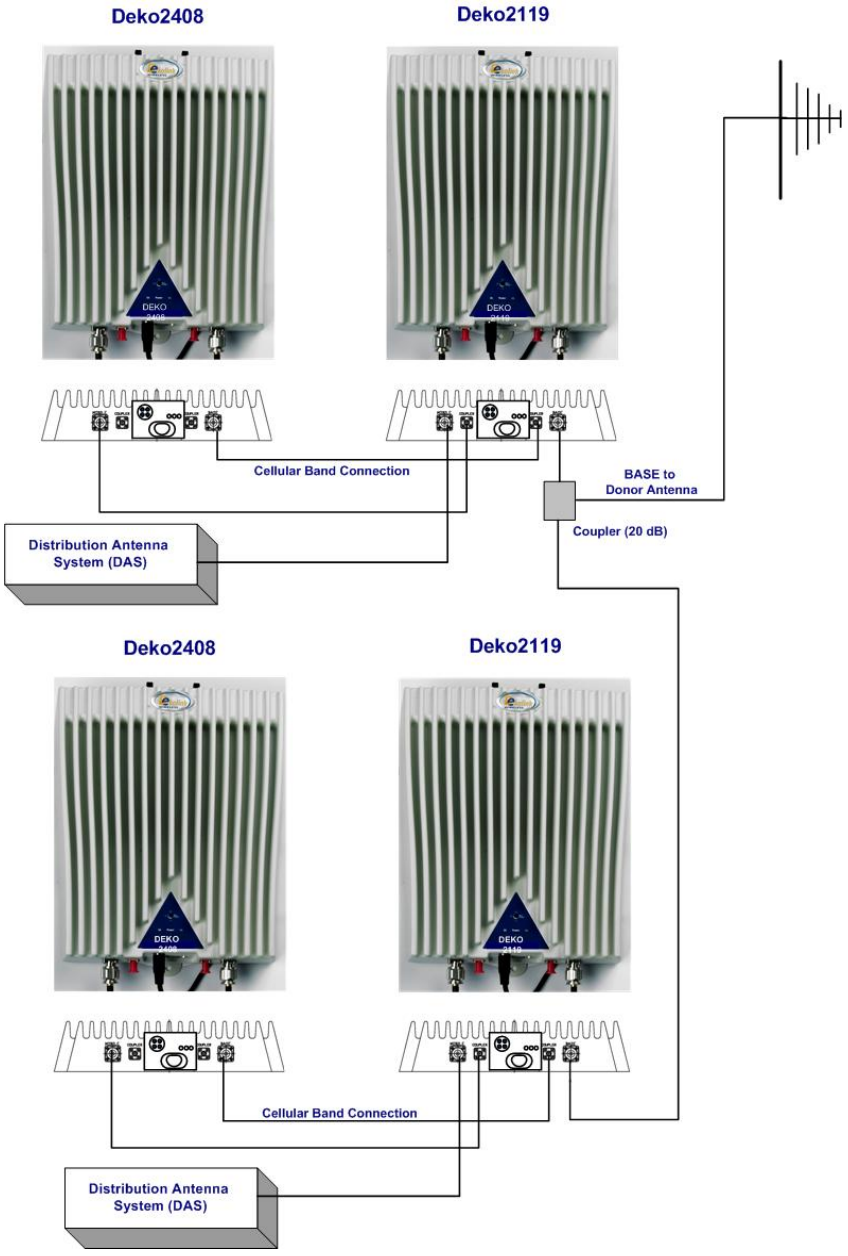


Figure 8: Two Dual-Band Mini-Repeaters Setup in Daisy Chain Configuration

7. SETUP (MONITORING AND CONTROL)

7.1 GENERAL

This section provides the setup procedures for Mini-Repeater Deko2119.

The Mini-Repeater is set for plug and play operation, and usually this is sufficient. However, you are probably required to set the channels (filters) bandwidths. This requires setup procedures described in this section. These procedures also provide the steps to obtain more information about the repeater such as monitoring and parameters setting, as well as alarms.

The setup is performed in a local (defined as automatic in the software) mode with the help of the RMS software installed on a host computer (usually, a laptop).

7.2 LOCAL MODE CONNECTION

To set up a local connection (see Figure 9):

- Turn on the Repeater and wait for the three LEDs on the front panel to turn on and show steady green
- Connect an external serial cable from a PC (COM interface) to the communications port in the bottom panel.

Note

The RS-232 cable connector should be DB-9 pin type, pins 2,3 crossed, and female-to-female terminated [supplied with the repeater].

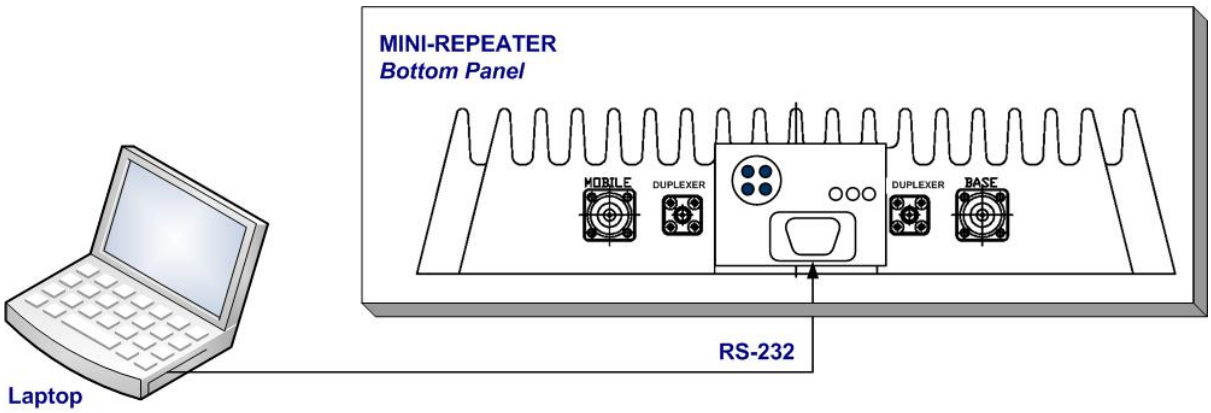


Figure 9: Mini-Repeater - Local Monitoring with Laptop

7.3 REPEATER MANAGEMENT SYSTEM (RMS)

7.3.1 General

The Repeater Management System (RMS) software enables defining the operational parameters values for the Deko2119 Mini-Repeater.

The RMS software is supplied with the Mini-Repeater. It provides full access to all control settings and monitoring capabilities. The RMS software should be installed and run on a host computer. The RMS software can be installed on Windows 9x/2000/XP operating systems.

The RMS allows a local connection for control of the Repeater. .

7.3.2 Software Installation

The RMS software is supplied with the Mini-Repeater Deko2119 on a CD.

To install the RMS Software, perform as follows:

1. Insert the CD in your PC CD driver
2. Select with Windows Explorer the following file in the CD: "RMS650_Setup_ddmmyy.exe" (where ddmmyy are day-month-year of the software version)
3. Double click on the file to run the program
4. The Install screen is displayed (see Figure 10)
5. Do NOT change the destination folder in the screen (see Figure 10)
6. Press the Install button

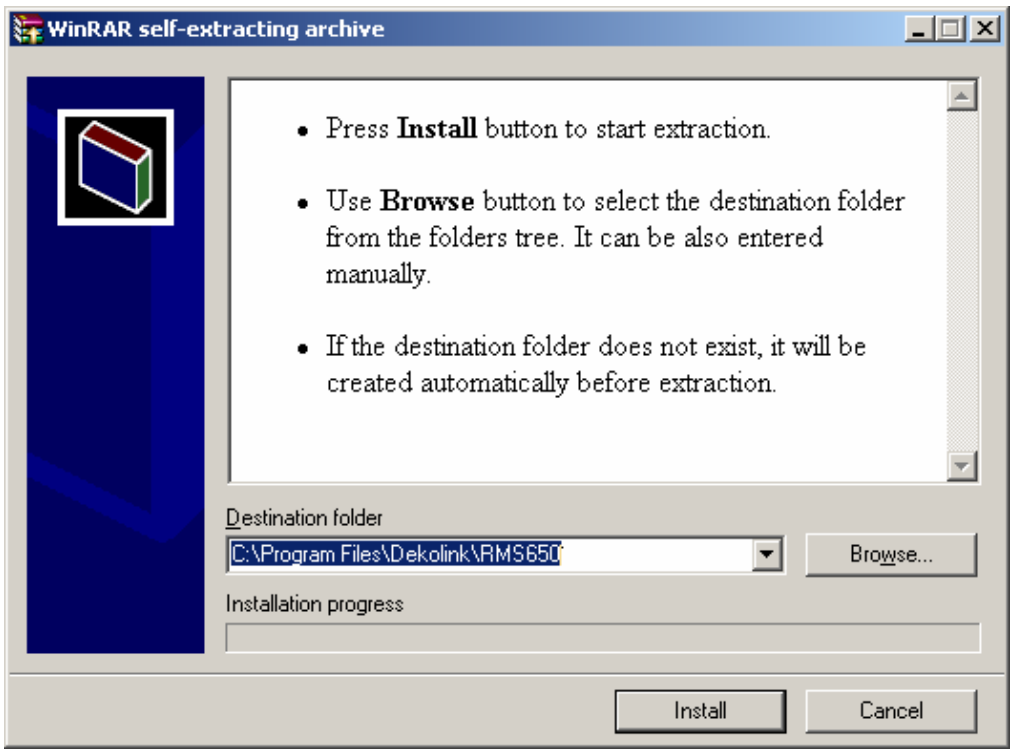


Figure 10: RMS Software – Install Command Screen

7. Once the program is installed, drag the software icon onto the Desktop screen from "c:\program_files\dekolink\rms650\c-RMS650-1C4"
8. Double click on the RMS650 icon on the screen (see Figure 11)

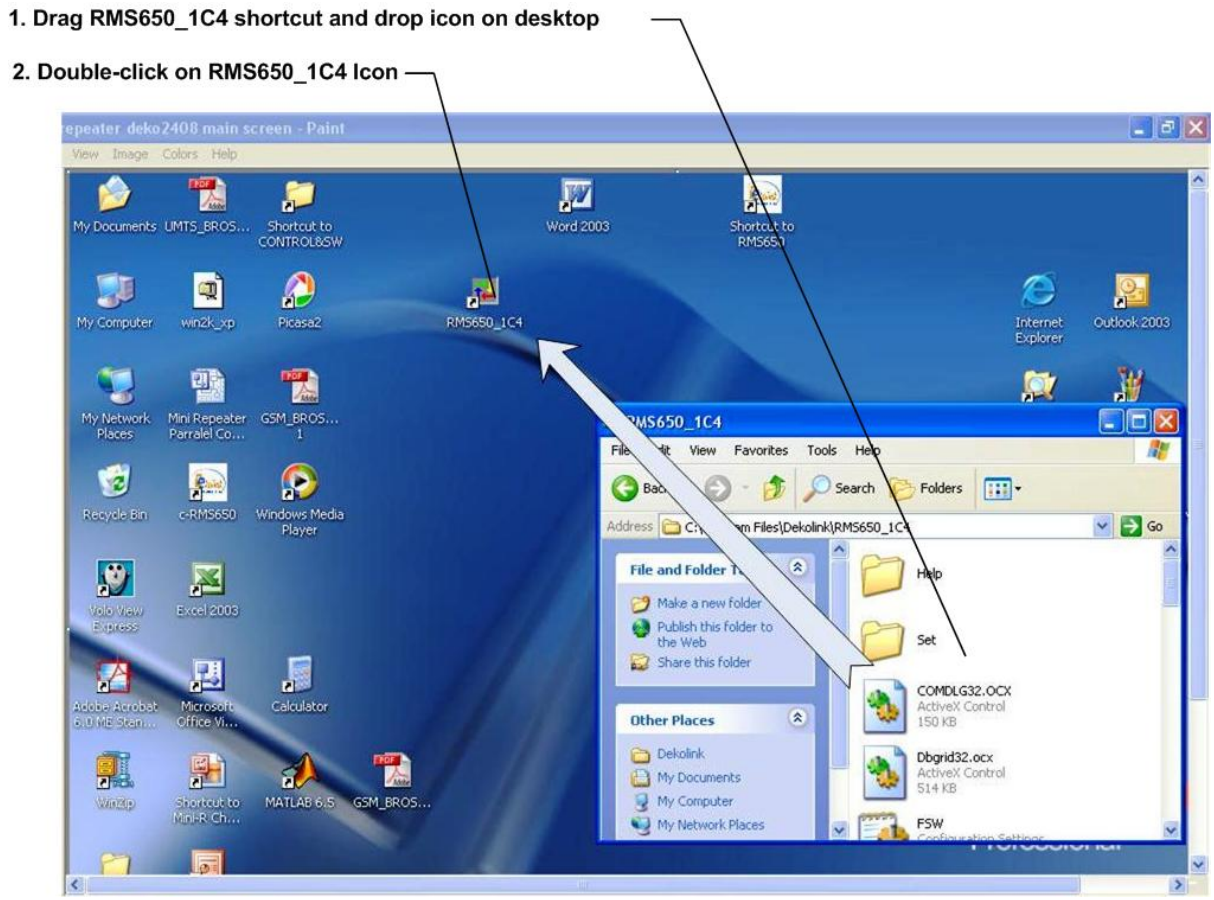


Figure 11: RMS Software – Install Command Screen

9. The Login screen is shown. Keep User Name as displayed and enter password "12345" for operator and press the OK button

Figure 12: RMS Software – Login Screen

7.4 RMS650 – MAIN SCREEN DESCRIPTION

The Main screen shown on the monitor at start-up is the main screen for the monitoring and control of Mini-Repeater Deko2119. It is divided into two areas:

- On the left, the RMS650 management tree in a separate window. For Mini-Repeater Deko2119, the management tree is not applicable
- On the right, the configuration and monitoring screens.

The monitoring screens consist of three panes, selected by clicking on three tabs;

- Configuration of the unit, and
- Control of its operation and setting Parameters,
- Alarms for status, troubleshooting and repair.

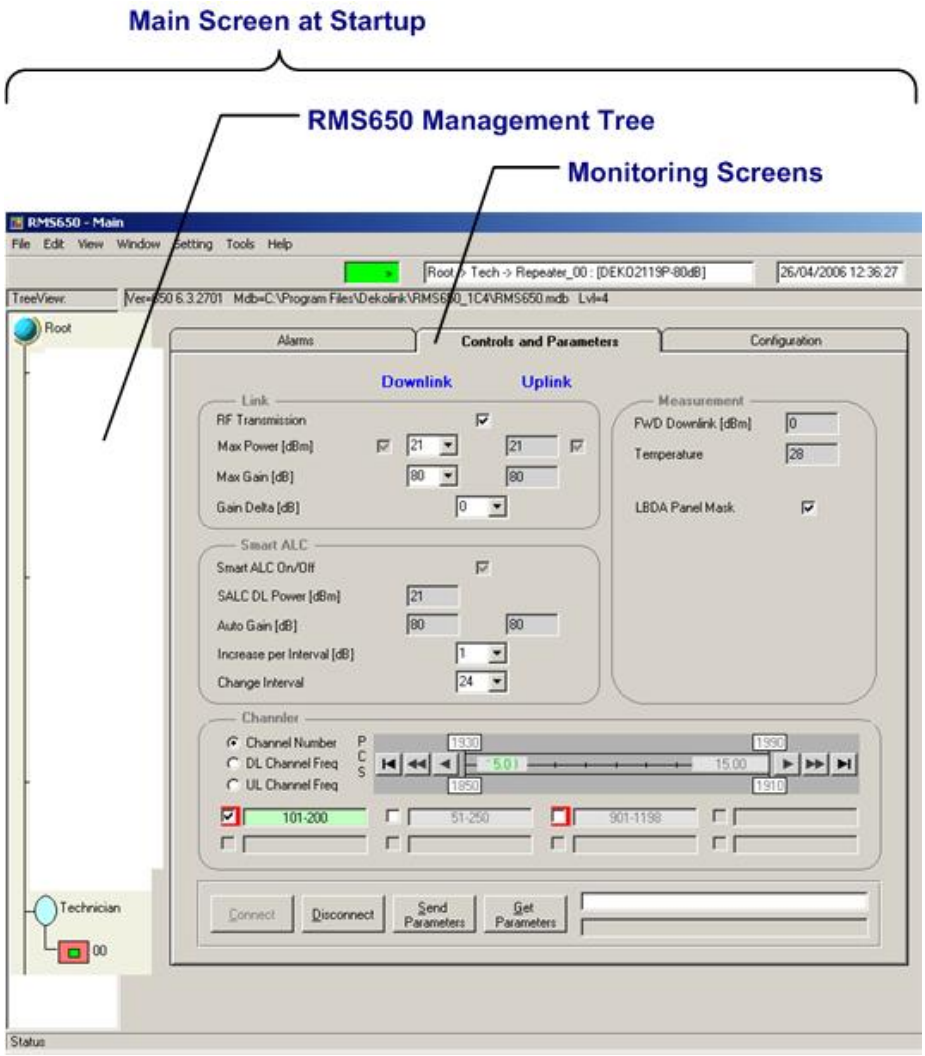


Figure 13: RMS650 Software – Main Screen

7.5 SELECTING DEKO2119

7.5.1 General

Once the main screen is loaded, you are required to enter the identification data of the Mini-Repeater and its default parameter values. The Mini-Repeater is set to download the data automatically when the PC connects to it, or you can select the unit manually and then connect to the Mini-Repeater.

The standard procedure is first to connect automatically (see paragraph 7.5.2), and if unsuccessful, selecting the Mini-Repeater manually (see paragraph 7.5.3). Proceed as follows:

7.5.2 Automatic Selection of Mini-Repeater

To connect initiate a local setup session (see fig 14):

1. Press the **Connect** button at the bottom of Controls and Parameters screen
2. The Deko-RMS software initiates a communication session with the Mini-Repeater
3. Watch the unit connection procedure. When the connection is reached the upper window rectangle in the main screen is colored green.
4. The identification window displays the name of the connected Mini-Repeater
5. The Mini-Repeater can now be setup from the Workstation.

Note

Establishing the connection may take up to 1 minute.

The Mini-Repeater will stay online until forced to disconnect by pressing the Disconnect button on its configuration screen.

Once you have finalized the connection procedures, you can operate the Deko2119. These procedures are provided in the next section.

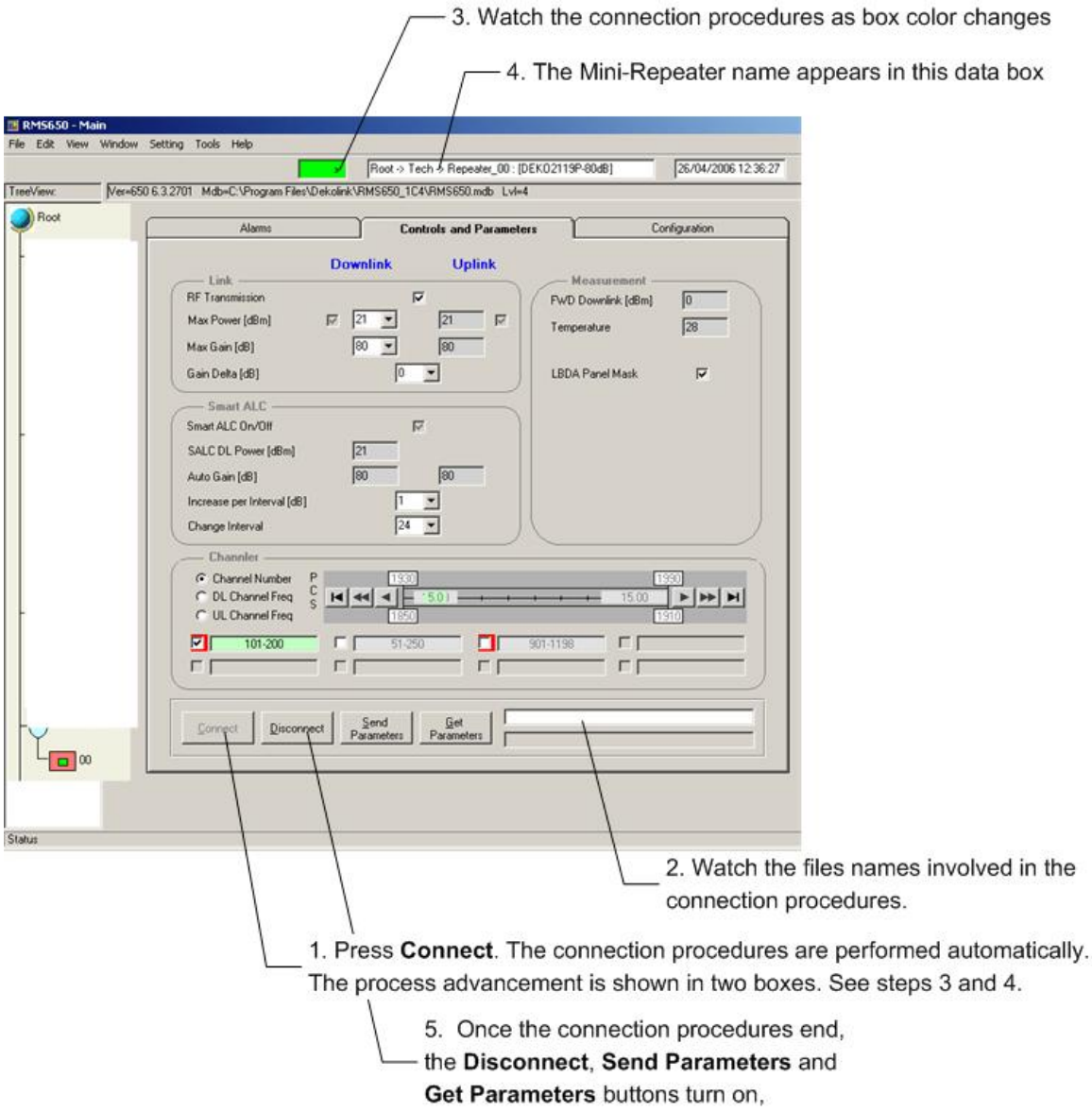


Figure 14: Connection Procedure

7.5.3 Manual Selection Procedures

You can manually select the Mini-Repeater out of a selection box. This enables you to select between the two Deko2119: with 80 dB Gain or with 70 dB Gain. To select the Mini-Repeater type, proceed as follows:

1. Drag the mouse tip to the Technician box (see Figure 15) in the Management Tree (at bottom) and right-click on it
2. The Configuration window of the Deko-RMB is displayed
3. Select the appropriate Mini-Repeater: either **Deko2119P-80dB** or **Deko2119P-70dB** in the **Communicator PN** combo box
4. In the Connection Mode field, select **Automatic**
5. Press **Save** when finished

6. Then press the **Connect** button at the bottom of Controls and Parameters screen
7. The Deko-RMS software initiates a communication session with the Mini-Repeater
8. Watch the unit connection procedure. When the connection is reached the upper window rectangle in the main screen is colored green (see Figure 14).
9. The Controls and Parameters screen of the Mini-Repeater is displayed.

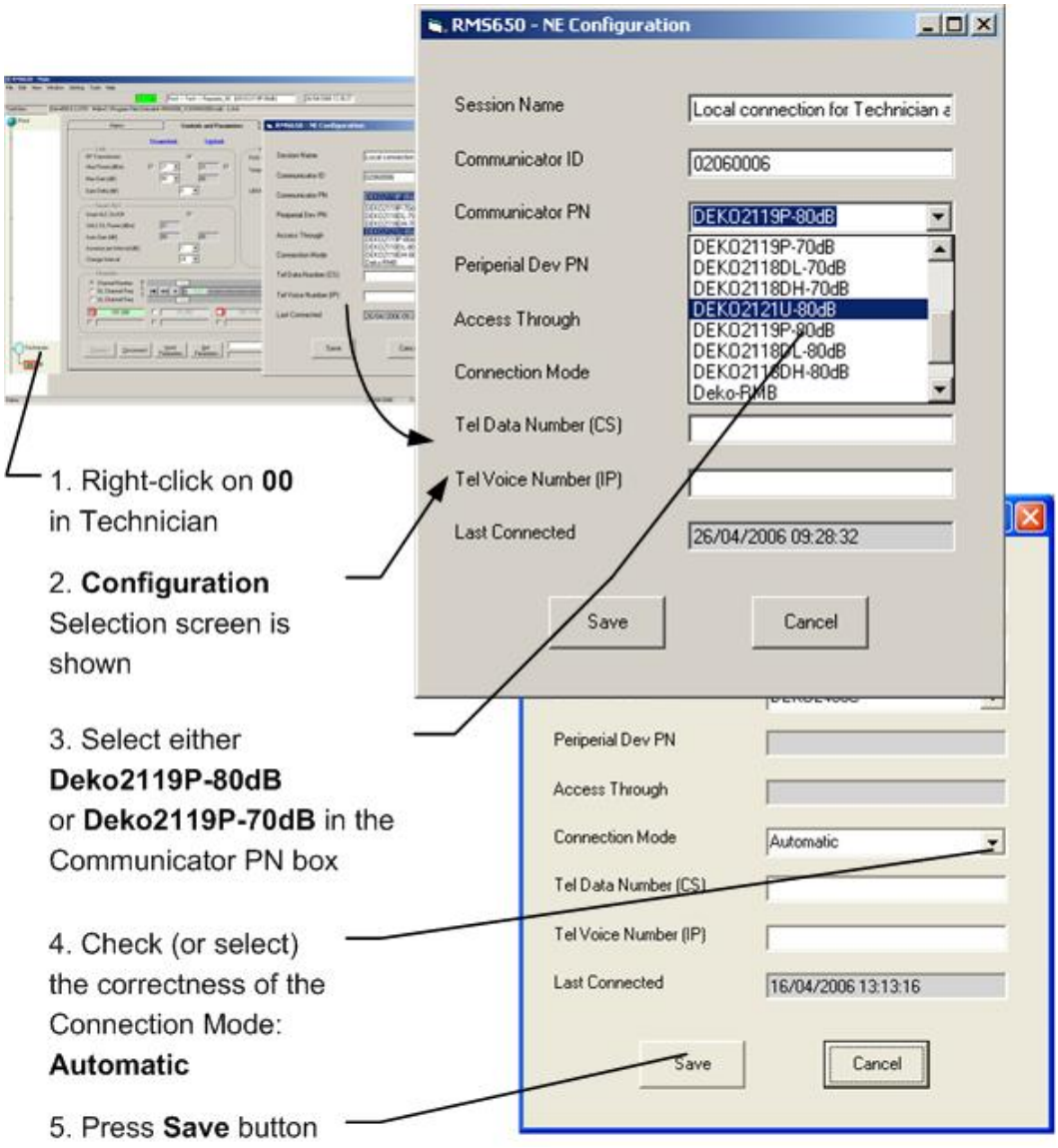


Figure 15: Deko2119 Mini-Repeater – Selection Procedures

7.6 RMS 650 SCREENS OPERATION

7.6.1 General

This section provides the operation procedure of the RMS650 for setting and monitoring Mini-Repeater Deko2119.

Operation of Mini-Repeater Deko2119 includes:

- Setting the Controls and Parameters fields
- Checking the Configuration data
- Verifying the Alarms status
- Verifying the operating parameters.

7.6.2 Setting the Controls and Parameters Fields

Proceed as follows:

1. Click on the **Controls and Parameters** tab (see Figure 16)
2. Check that the main operational boxes are on for proper operation (see Figure 17)
3. Optional - Press the Get Parameters button to pull out the parameters values from the Mini-Repeater (last setup values) – (see Figure 16)
4. Select and verify the values for the main parameters in the Link and Smart ALC data fields (see Figure 17 to Figure 19)
5. Check the values of the measured parameters as shown in the Measurement data fields, and determine the mode of selection for Downlink amplification (see Figure 19)
6. Press the Send Parameters button to enter and save the selected operational values in the Mini-Repeater

Note

Whenever you select a new value, its display turns red until you finalize all the procedures and the Mini-Repeater is set to the new values.

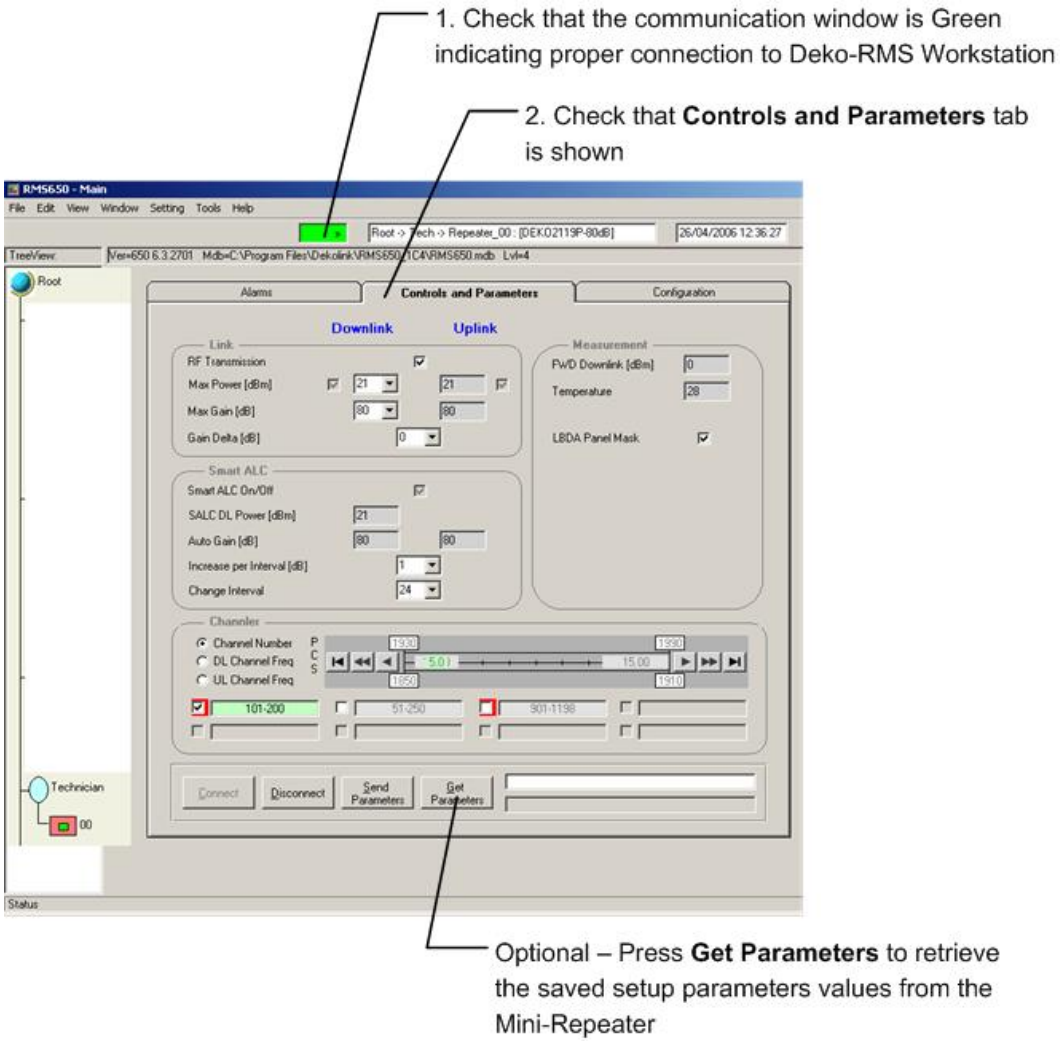


Figure 16: Displaying the Controls and Parameters Screen

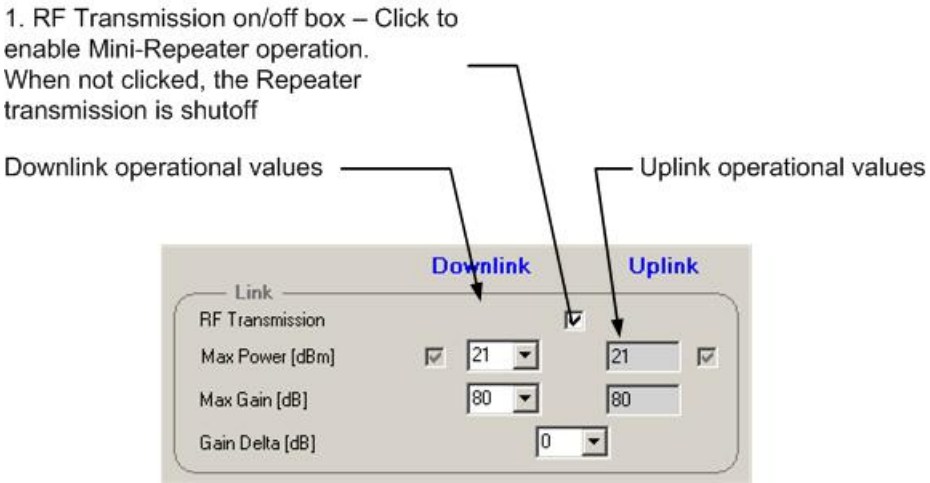


Figure 17: Link Main Fields in Controls and Parameters Screen

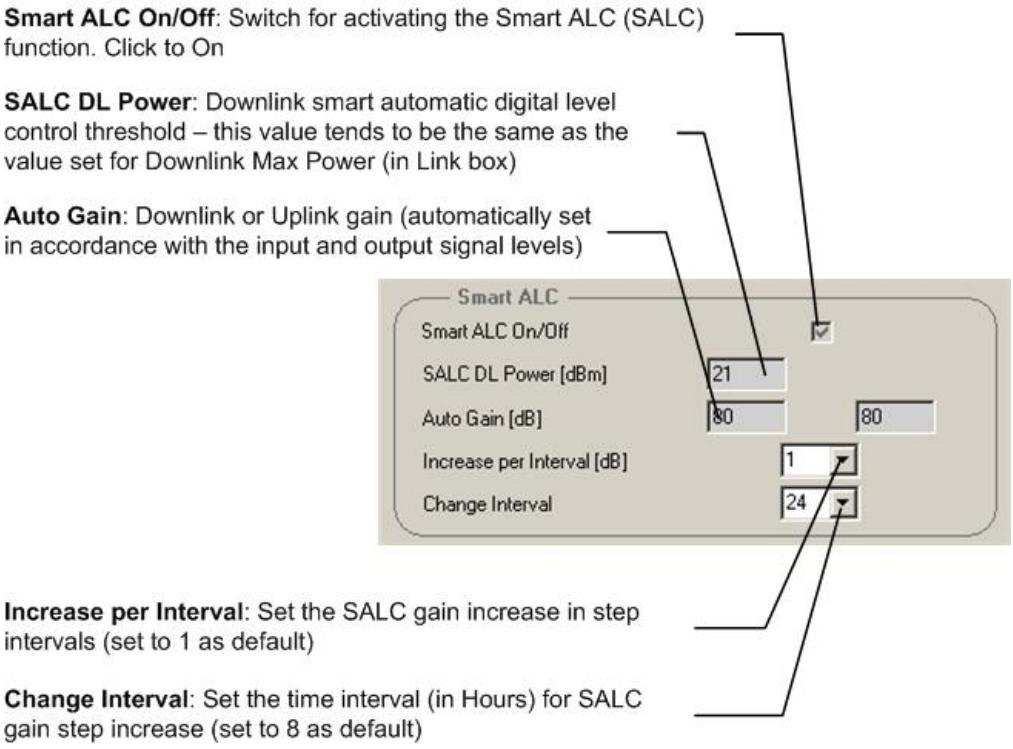


Figure 18: Link Fields Values in Controls and Parameters Screen

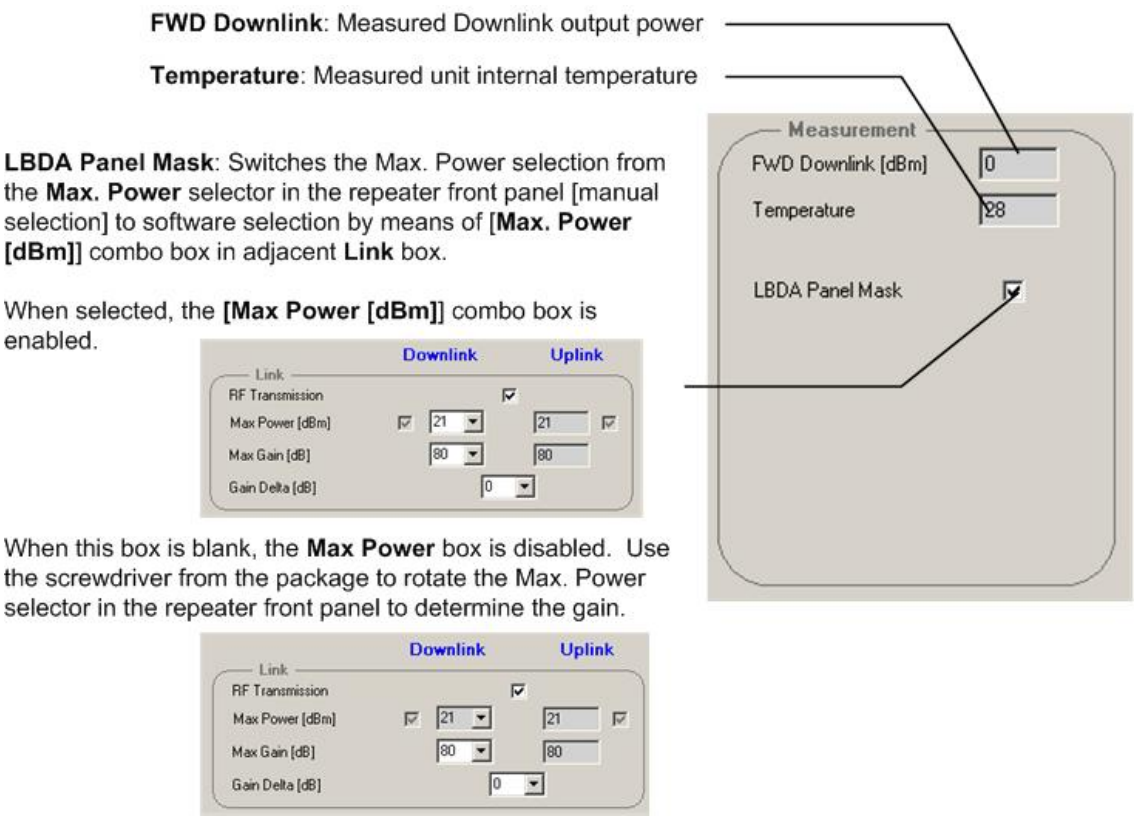


Figure 19: Measurement Fields in Controls and Parameters Screen

Note

All default settings are usually optimal, except the **Max. Power** and **Max. Gain** values (in the **Link** box) that are site dependent.

7.7 SELECTING THE OPERATING SUB-BANDS

The next step in the operation procedures consist of setting the Mini-Repeater bandwidth within its frequency range. These procedures are performed in the Channeler area in the lower part of the Controls and Parameters screen, as shown below.

7.7.1 Channeler Area - Main Fields and Tools

The main fields and tools in the Channeler area are provided in Figure 20.

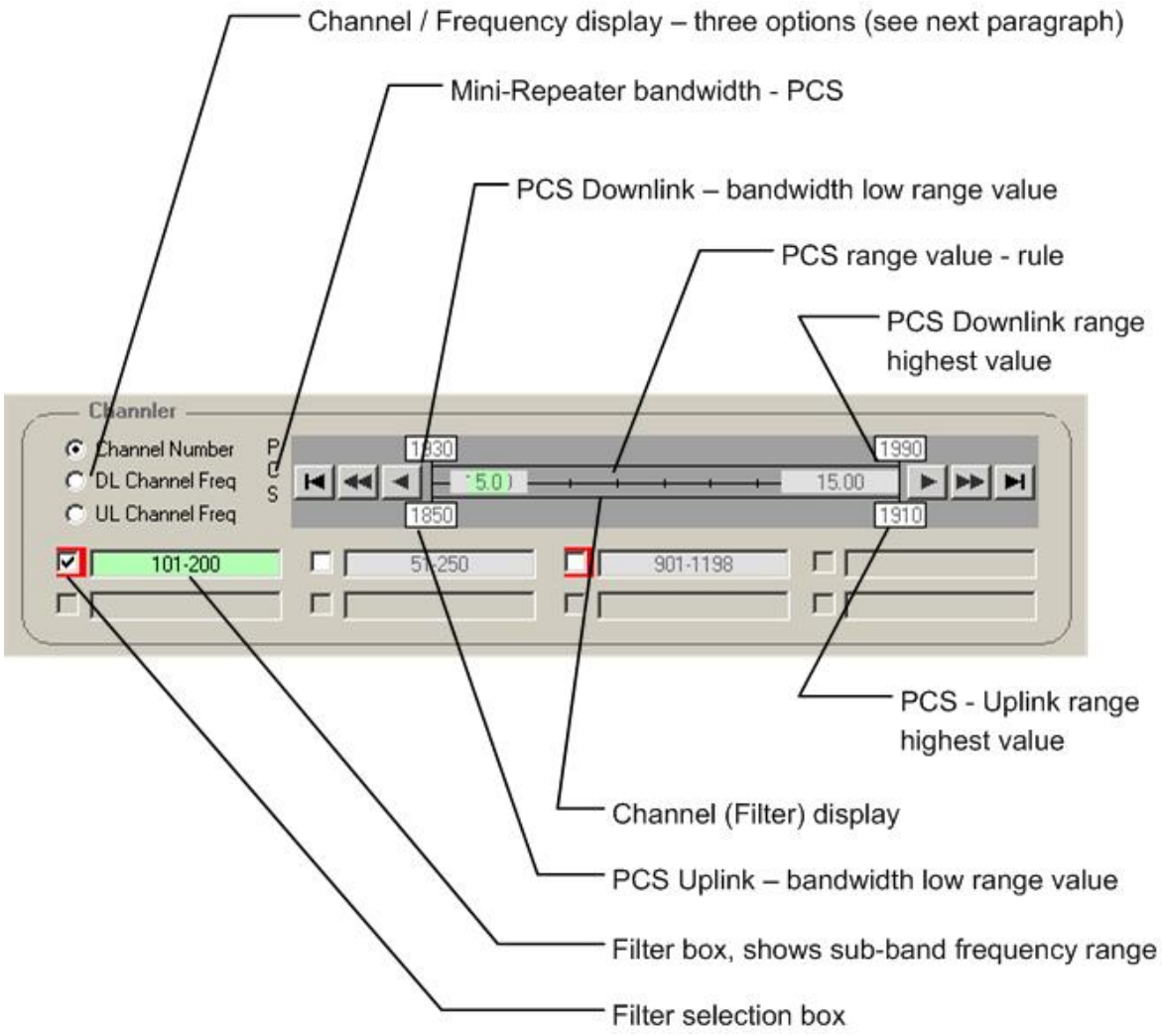


Figure 20: Channeler Sub-Screen – Main Fields and Tools

7.7.2 Channeler Area – Channels Display

The Channeler area provides three options to display the frequency range of the channels, as shown in Figure 21.

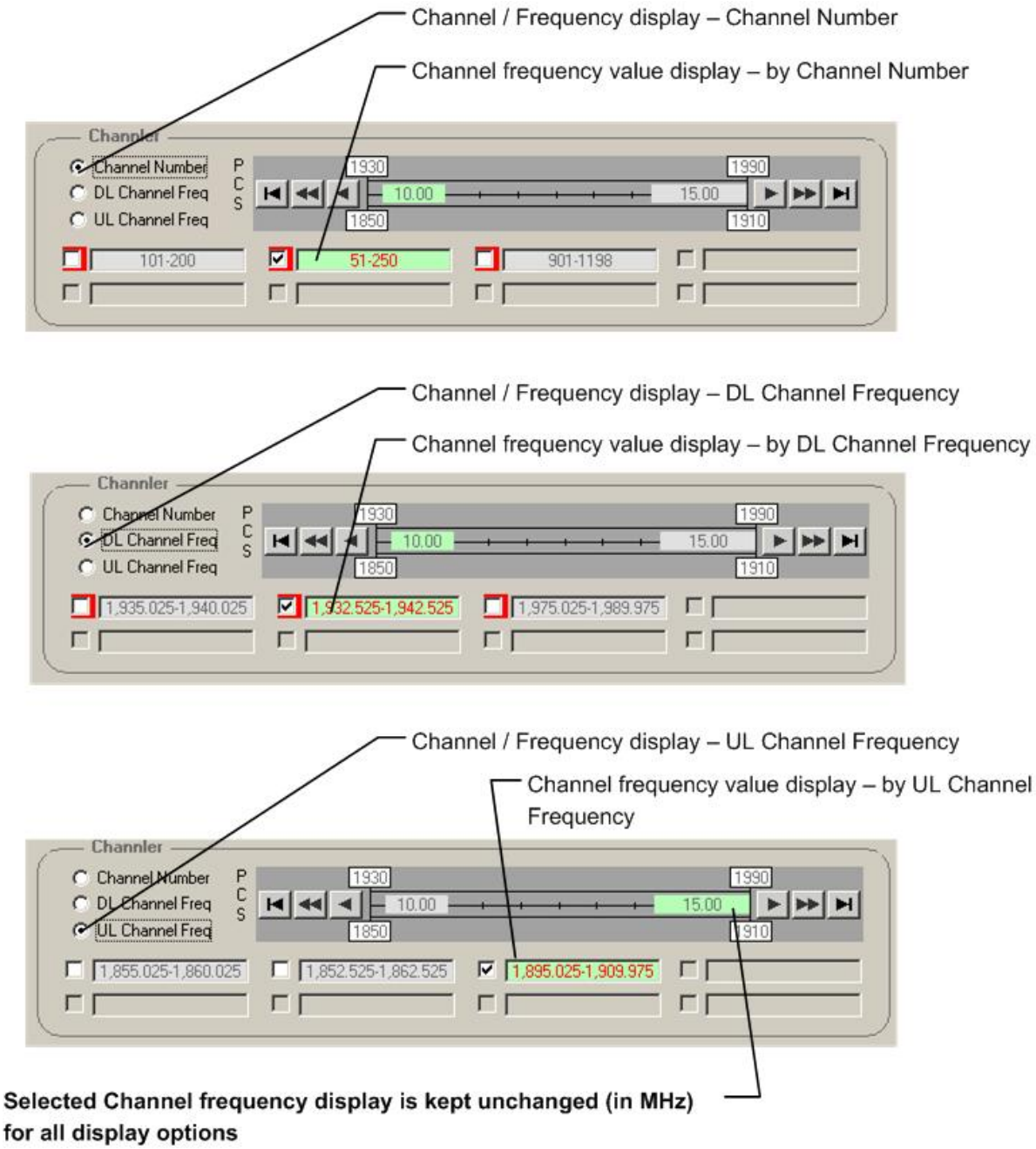


Figure 21: Channeler Sub-Screen – Frequency Range Displays

7.7.3 Channeler Area – Sub-Band (Filter) Selection

Mini-Repeater Deko2119 enables, by means of the SAW Switcher, to select *only* one out three sub-bands of 5 MHz, 10 MHz or 15 MHz (see Figure 22).

Note

In the current unit, the 5 MHz and 10 MHz channels are justapoxed, and therefore you can select either one of them but not both.

Mini-Repeater Deko2119 enables to slide the selected channel along the bandwidth range in order to set the selected frequency range. Proceed as follows:

1. Determine the sub-band - 5 MHz, 10 MHz or 15 MHz by clicking on the sub-band box to select it. If the sub-band is out of bounds (therefore not shown), click on the arrow buttons to bring it within the PCS band, then click on its box to select it
2. Click on the selected sub-band and slide it until you position it in the required range in the Mini-Repeater bandwidth. On the other hand, you can use the arrow buttons for delicate or fast sliding of the sub-band (see next paragraph).

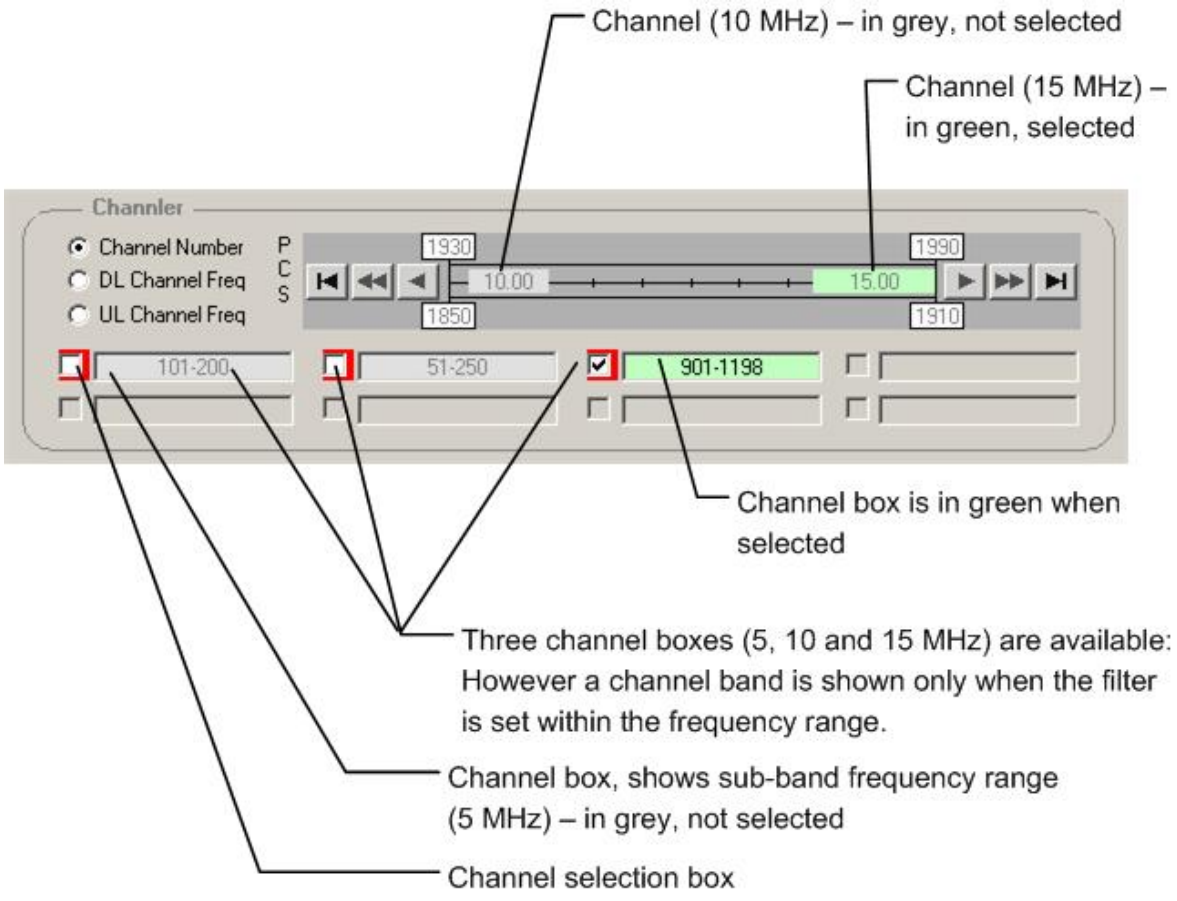


Figure 22: Channeler Sub-Screen – Sub-Band Selection

7.7.4 Locating and Moving a Sub-Band with Arrow Buttons

The Channeler area provides three slide buttons to slide and position the sub-bands along the frequency range of the Repeater, as shown in Figure 23.

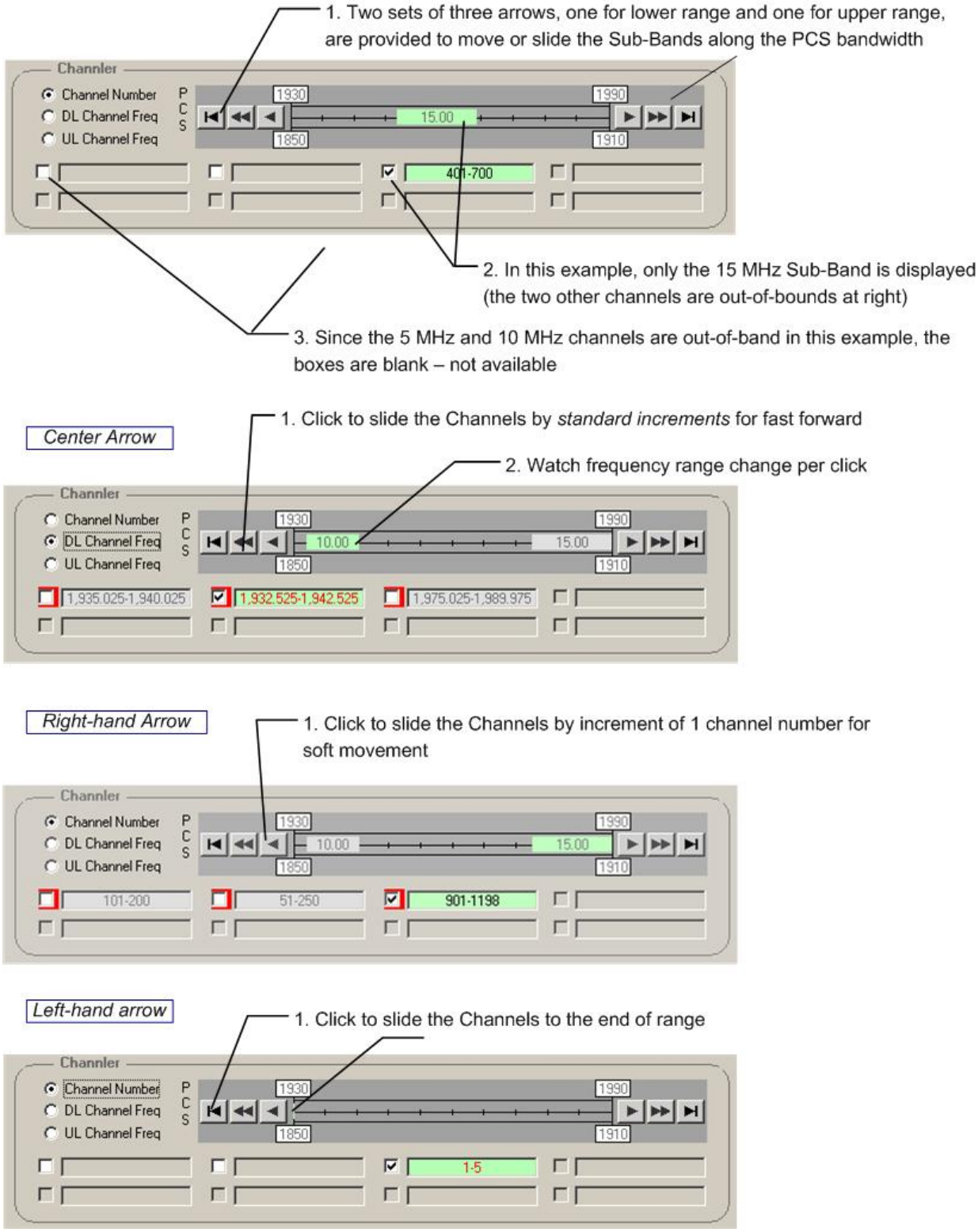


Figure 23: Channeler Sub-Screen – Sub-Band Frequency Range Setting

7.8 FINALIZING THE OPERATION PROCEDURES

To finalize the parameters selection procedures, proceed as follows:

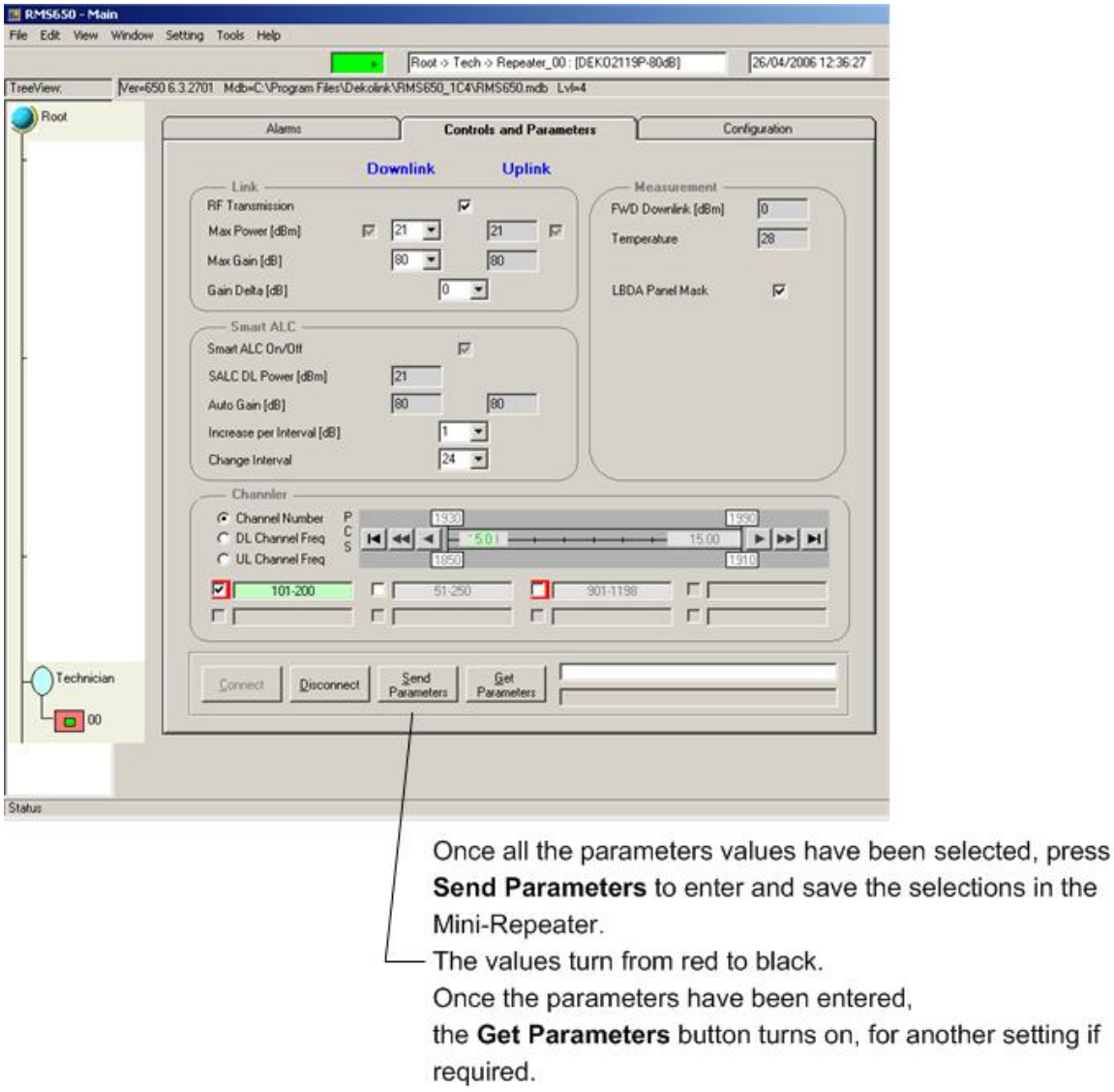


Figure 24: Deko2119 – Final Setting (Acceptance) Procedures

7.9 ALARMS SCREEN

The RMS650 software includes an Alarms page that displays the most probable cause of failure whenever the Mini-Repeater fails. The Alarms page is divided into three functional areas, each with status Leds of major features for fast troubleshooting. A green Led indicates proper operation, and it turns to red when the function/module fails.

Refer to Section 8.5 for a description of the alarms, their troubleshooting and the recommended action for repair.

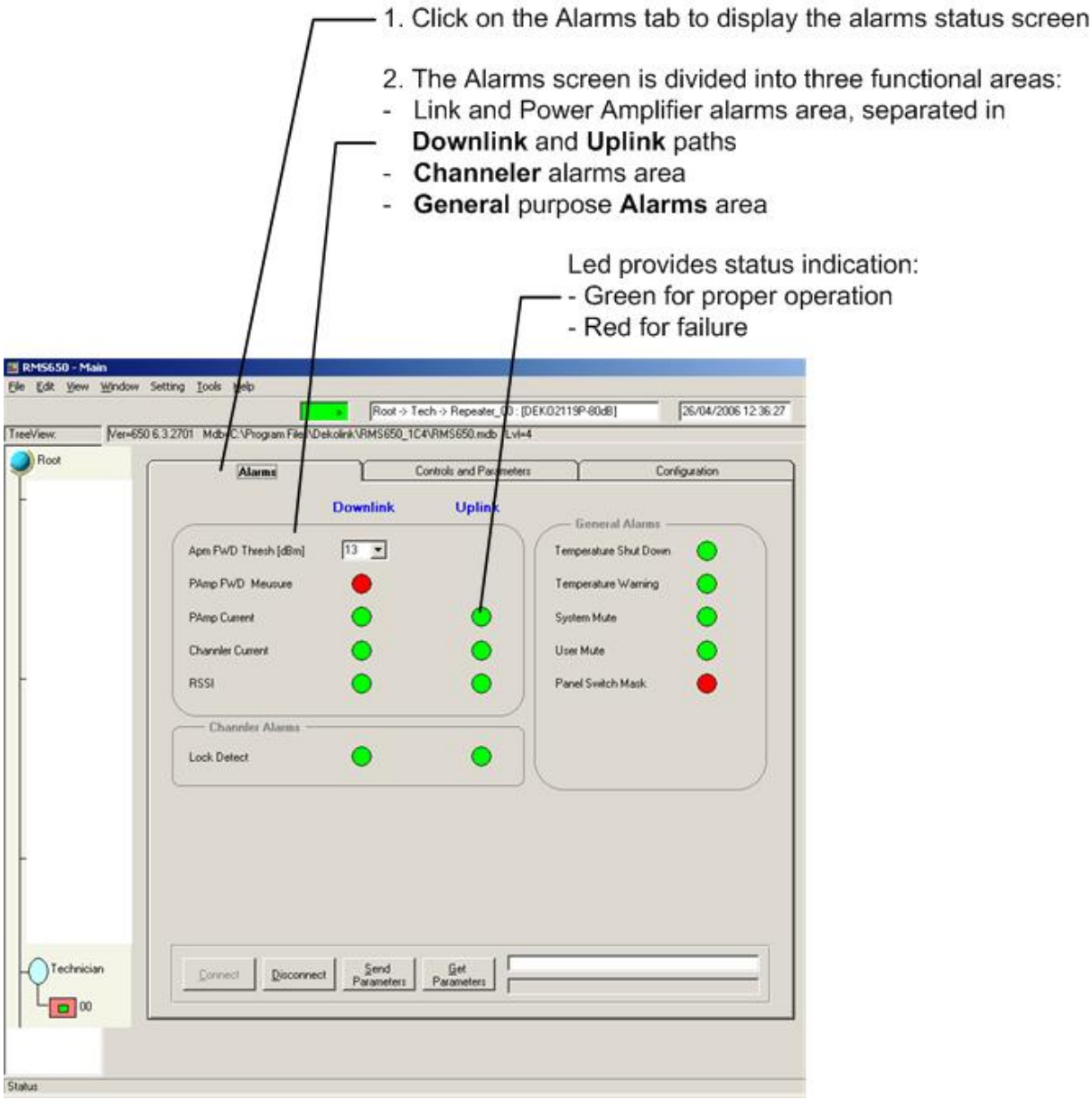


Figure 25: RMS Software – Alarms Selection Screen

7.10 CONFIGURATION SCREEN

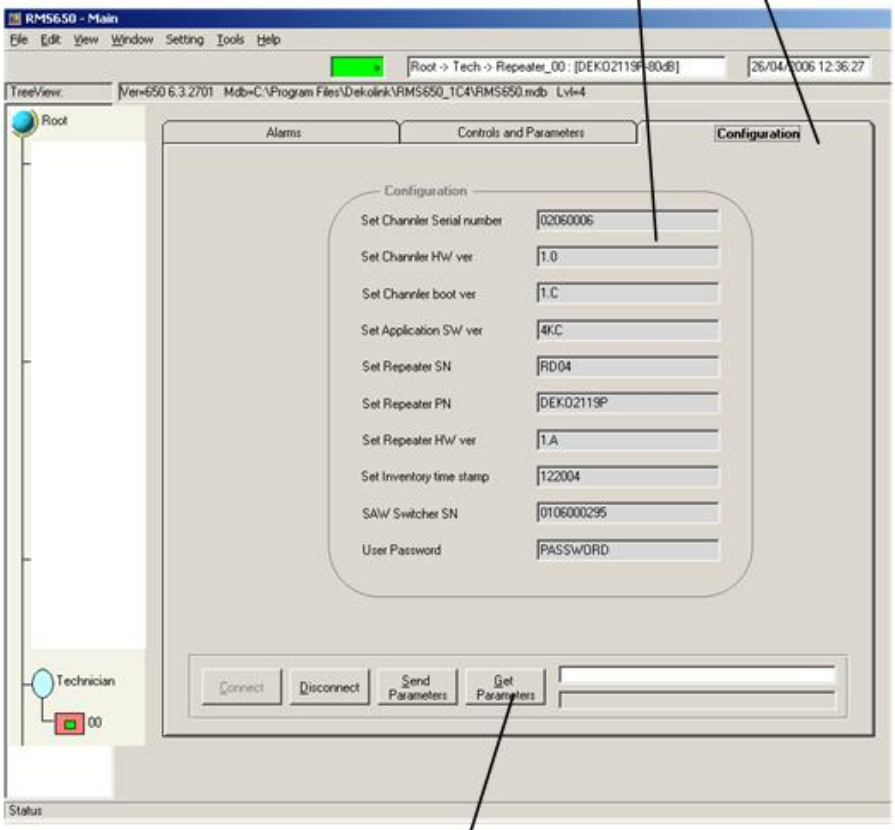
The RMS650 software provides the current configuration of the Mini-Repeater by clicking on the **Configuration** tab. The data are downloaded to the RMS software when you press the Get Parameters button, in any screen.

The comprehensive fields in this screen provide the full identification of the Mini-Repeater, and of its major components such as software versions and serial numbers of hardware items. These data are stored in the Mini-Repeater at the manufacturing process, and cannot be changed by the operator. They are provided for information only. It provides you the necessary identification data whenever you report on the repeater operation or during the repair process.

1. Click on the **Configuration** tab to display the alarms status screen

2. The Configuration screen provides comprehensive identification and configuration data:
- Hardware items Part Number and Serial Number
- Software components and version
- Operator password.

These data are for information only, and cannot be changed by you.



The Configuration data is inserted in the fields after you click on the **Get Parameters** button, from any tab page.

Figure 26: RMS Software – Configuration Screen

7.11 EXITING THE RMS SOFTWARE

The Repeater will stay online until forced to disconnect by:

- Pressing the Disconnect button on its configuration screen

To end the setup and to exit the RMS Software, proceed as follows:

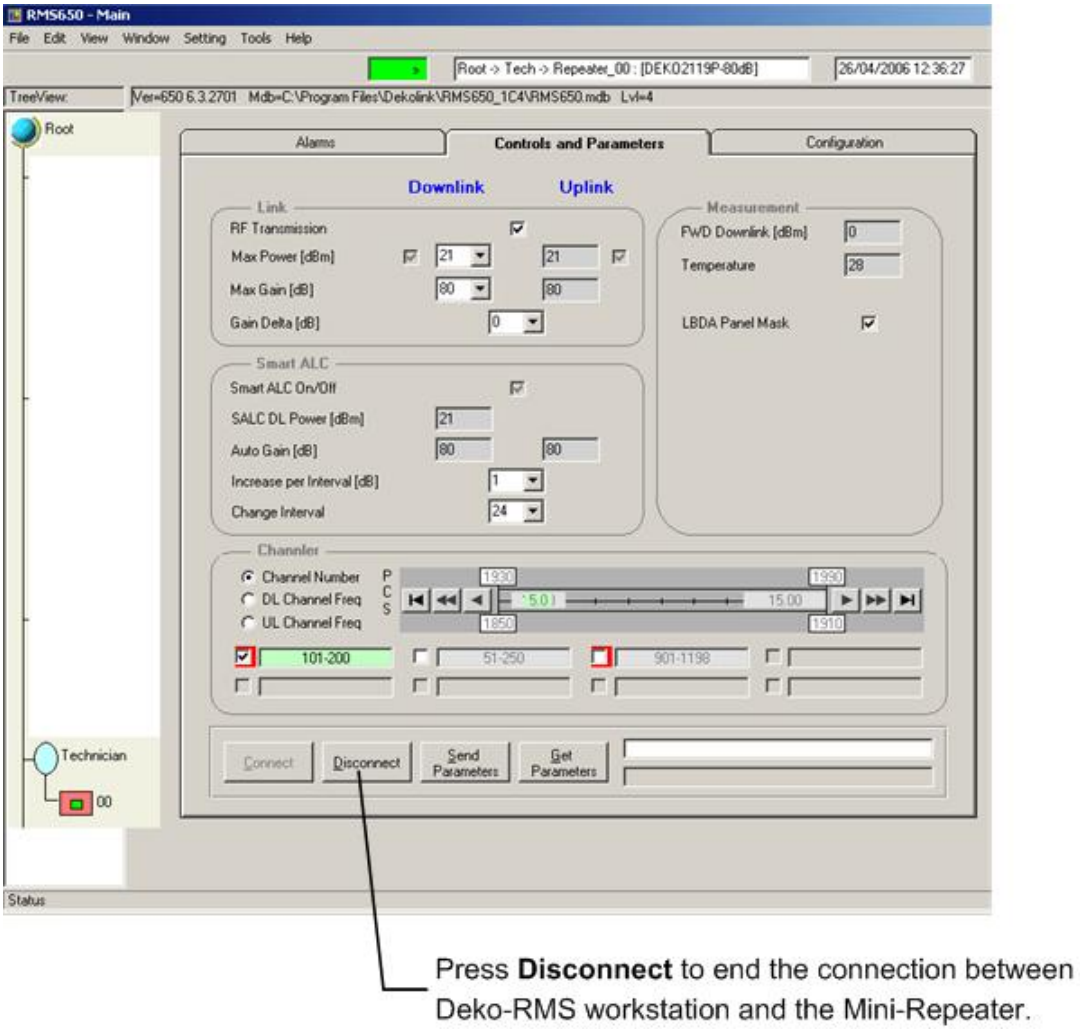


Figure 27: Mini-Repeater Setup – Exit Procedure

8. MAINTENANCE AND TROUBLESHOOTING

8.1 GENERAL

This section provides the maintenance and troubleshooting procedures for the Mini-Repeater.

8.2 PERIODIC MAINTENANCE

There is no periodic maintenance required for the Mini-Repeater. As long as it is installed in a shaded area not subject to extreme temperatures and with adequate ventilation, it will provide long term, problem-free operation.

8.3 FAILURE DISPLAY

Mini-Repeater Deko2119 provides two modes for failure display:

- Status Leds in Mini-Repeater
- Alarms screen in Deko-RMS Workstation

The following paragraphs provide first a description of the LED alarms in the Mini-Repeater, then a description of the Alarm functions in the Deko-RMS display.

8.4 STATUS LEDS TROUBLESHOOTING

8.4.1 Status LEDs Indications

The Mini-Repeater includes three LEDs (DL, Power, UL) on its front panel (see Figure 2). Check the following normal LEDs status on the front panel of the Repeater:

- At turn on, the LEDs show the built-in test procedures: the LEDs turn from Orange to Red to Green.
- During normal operation, all LEDs are green
- LEDs in Red signify major malfunction. Orange displays high input power. Blinking Green shows low power transmission.

Whenever the LEDs are lit differently after the startup test is completed, they indicate a malfunction. Refer to the following paragraph for troubleshooting.

8.4.2 DL LED Blinks Green

A blinking green DL LED indicates a low input signal at the Donor antenna. As a result, the Mini-Repeater cannot provide a sufficient power output.

Most probable cause: Low input signal at the Donor antenna.

Corrective action: Check the Donor antenna output power, and try aim it to obtain maximum signal from the BTS.

8.4.3 DL LED Is Constantly Lit In Orange

A constant orange DL LED indicates two optional operational statuses: Donor power input too high or low isolation in the system.

Most probable cause: Donor power input is too high.
Corrective action: Lower the input power by either setting the antenna to receive less power, or by adding an attenuator at the BASE connector.

CAUTION

Turn off (disconnect from mains) the repeater before connecting the attenuator. Once installed, turn the power on.

Second most probable cause: Isolation of the system, or internal problem. If the UL Led is also lit in Orange, the most probable cause is low isolation of the system.

Corrective actions: 1. Verify the isolation of the system.
2. If the isolation is satisfactory, the Repeater is faulty. Replace the unit.

8.4.4 DL LED Is Constantly Lit In Red

A red DL LED indicates a major malfunction.

Most probable cause: Repeater failure.

Corrective action: Replace the unit.

8.4.5 UL LED Is Constantly Lit In Orange

A constant orange UL LED indicates uplink signal saturation.

Most probable cause: Isolation of the system, or internal problem. If the DL Led is also lit in Orange, the most probable cause is low isolation of the system.

Corrective actions: 1. Verify the isolation of the system.
2. If the isolation is satisfactory, the Repeater is faulty. Replace the unit.

8.4.6 UL LED Is Constantly Lit In Red

A red UL LED indicates a major malfunction.

Most probable cause: Repeater failure.

Corrective action: Replace the unit.

8.4.7 Main LED Is Constantly Lit In Red

A red Main LED indicates a major malfunction.

Most probable cause: Power failure.

Corrective action: Turn off the Repeater (this action causes a reset of the function), and turn it on anew. If the fault resumes, replace the unit.

8.5 MINI-REPEATER ALARMS AND TROUBLESHOOTING

8.5.1 General

The Mini-Repeater alarms screen is displayed by clicking in the Alarms tab.

The Alarms are divided in three functional areas:

- Power amplification area
- Channeler area
- General function area

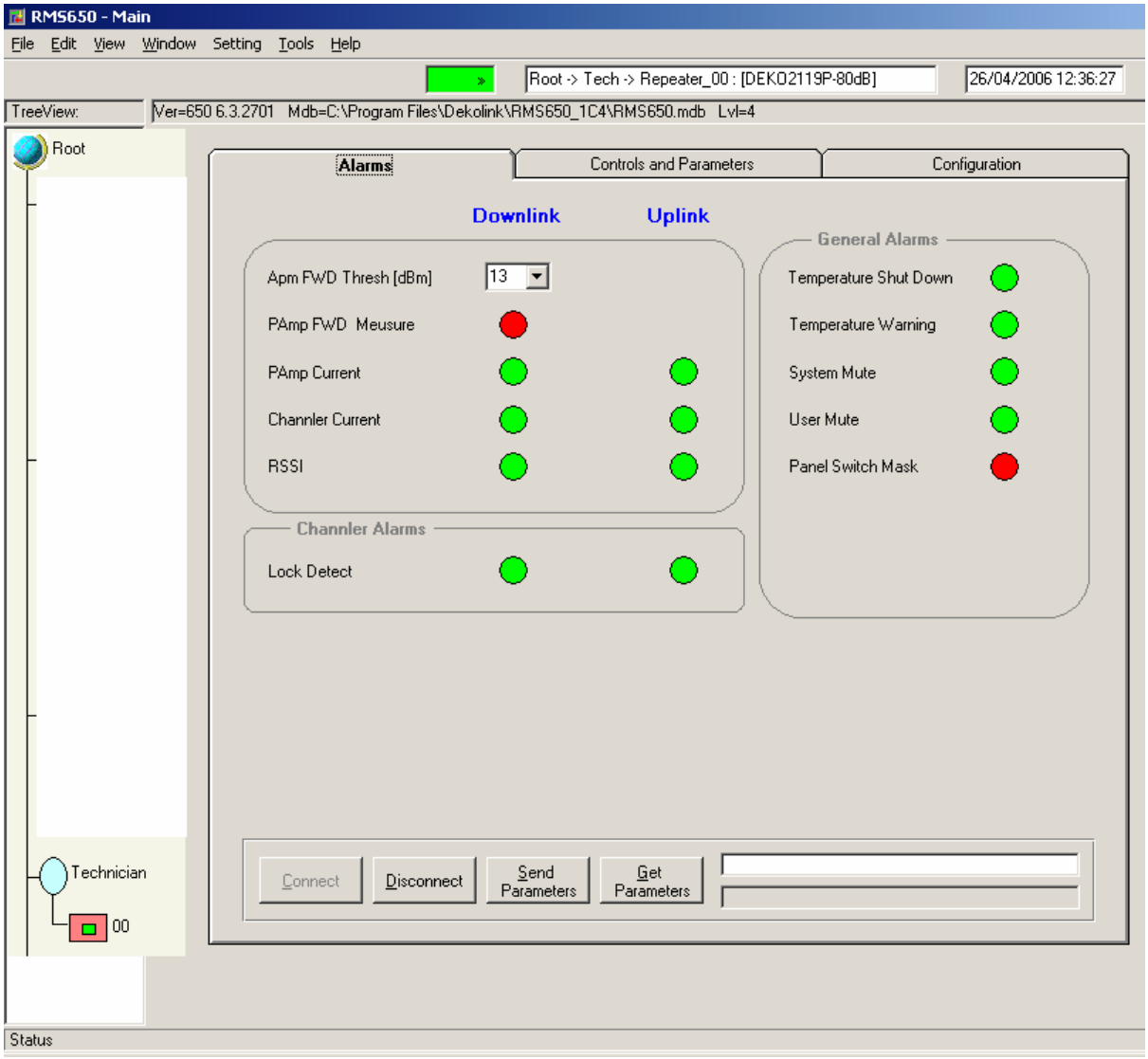


Figure 28: Mini-Repeater Alarms Screen

8.5.2 Link Alarms and Troubleshooting

The Power Amplification alarms are provided for the Downlink and the Uplink paths.

The troubleshooting procedures for these alarms follow.

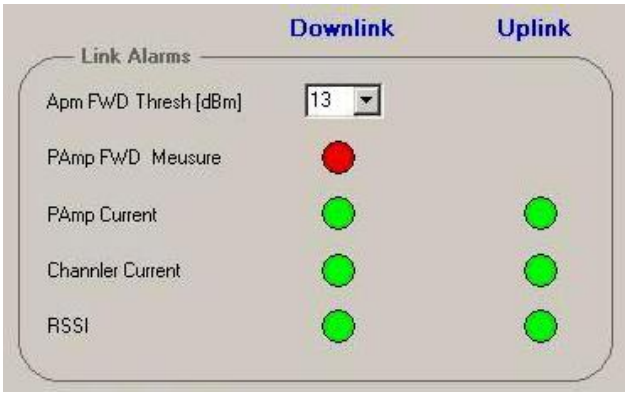


Figure 29: Mini-Repeater - Link Alarms

8.5.2.1 PAmp FWD Measure

This LED is linked with the upper Amp FWD (forward) Threshold combo box. This LED shows malfunction in the Downlink path (there is no Uplink malfunction linked to this feature).

Most probable cause: Output power is less than minimum threshold limit. .

Corrective action: Check the Max Power Value in the Controls and Parameters screen. If the value is lower than the value in the Amp FWD (forward) Threshold combo box in the Alarms screen, select a lower value in this screen.

8.5.2.2 PAmp Current

This LED shows malfunction similarly for the Downlink and Uplink paths.

Most probable cause: Downlink (Uplink) power amplifier module outputs a low current.

Corrective action: Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.2.3 Channeler Current

This LED shows malfunction similarly for the Downlink and Uplink paths.

Most probable cause: Downlink (Uplink) channeler module outputs a low current.

Corrective action: Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.2.4 RSSI

This LED shows malfunction similarly for the Downlink and Uplink paths.

Most probable cause: Downlink (Uplink) input signal is high.

Corrective action: Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.3 Channeler Alarms and Troubleshooting

The Channeler alarms are provided for the Downlink and the Uplink paths.

The troubleshooting procedures for these alarms follow.

Figure 30: Mini-Repeater - Channeler Alarms

8.5.3.1 Lock Detect

This LED shows malfunction similarly for the Downlink and Uplink paths.

Most probable cause: Downlink (Uplink) Channeler module lock-detect failure.

Corrective action: Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.4 General Purpose Alarms and Troubleshooting

The general purpose alarms are provided for the Mini-Repeater as a unit, and are not linked to the operation of the Downlink or Uplink paths.

The troubleshooting procedures for these alarms follow.

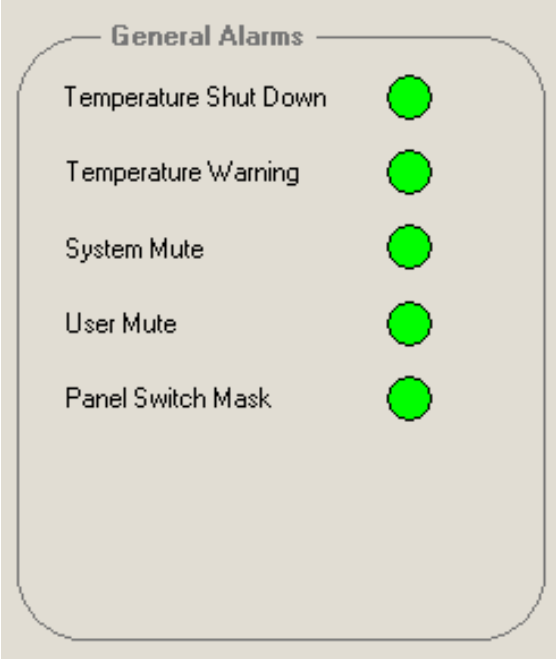


Figure 31: Mini-Repeater – General Purpose Alarms

8.5.4.1 Temperature Warning

Most probable cause: Unit temperature becomes high. .

Corrective action: Check the Repeater case for external causes (sun, hot environment, air flow is blocked). Eliminate the reason for excessive heat.

CAUTION

Do not cool with water

8.5.4.2 Temperature Shutdown

Most probable cause: Unit temperature is too high. Mini-Repeater ceases operation.

Corrective action: Check the Repeater case for external causes (sun, hot environment, air flow is blocked). Eliminate the reason for excessive heat. Let the unit cool, forced air cooling is possible.

CAUTION

Do not cool with water

8.5.4.3 System Mute

Most probable cause: Mini-Repeater amplification is muted (automatically). .

Corrective action: Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.4.4 User Mute

Most probable cause: Mini-Repeater amplification is muted (manually). .

Corrective action: This is the result of an operator action. Check RF Transmission box in Link area in the Controls and Parameters pane. The box should be empty. Click on it to change the LED status.

CAUTION

Check first the reason for the suppression of the function. Check that the Mini-Repeater is not checked out in the field.

Check the LEDs in the Mini-Repeater. See paragraph 8.4.

8.5.4.5 Panel Switch Mask

Most probable cause: Mini-Repeater front panel LEDs are disabled.

Corrective action: This is not a malfunction. Check the reason for the action.

8.6 DRY-CONTACT ALARMS

The Repeater includes three dry-contacts for alarm visual (see Figure 4). You can connect an external warning lamp and/or a loudspeaker in either NC or NO configuration that shall alert the maintenance team in case of failure.

Appendix A: 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.