



BDA-TDD-25-16-19-AA TDD Mini Repeater

General Installation & Operation Guide



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ABOUT THIS DOCUMENT

This document provides information about the installation and setup of the Cellvine repeaters.

The information consists of procedures for unpacking, inspection and preparation for the installation, and the actual installation and setup. It is important to install the repeater correctly at its working location. It is recommended that installation be performed by a certified radio technician.

The repeater installation consists of four basic steps:

1. Antenna installation
2. Repeater installation
3. Cable installation
4. Repeater parameters setup and tuning using the supplied dedicated application

TERMS AND ABBREVIATIONS

The terms, acronyms and abbreviations used in this manual are detailed in the following list:

Abbreviation	Description
AGC	Automatic Gain Control
BDA	Bi Directional Amplifier
BL	Bluetooth
Div	Diversity
DA	Donor Antenna Unit
LED	Light Emitting Diode
LNA	Low Noise Amplifier
NMS	Network Management System
PA	Power Amplifier
PSU	Power Supply Unit
REP	repeater
RF	Radio Frequency
RSSI	Received Signal Strength Indication
RU	Remote Unit
RX	Receiver
SC	Service Channel
TX	Transceiver Unit
SYMO	Synchronization Modem

GENERAL SAFETY WARNINGS

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



Danger: Electrical Shock

The power supply unit contains dangerous voltage that can cause electric shock. Disconnect the mains prior to any work in the repeater. Any local regulations are to be followed when servicing repeaters.

This equipment is usually installed indoors. 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 insulated wires or terminals.

Repeaters supplied from the mains must be connected to grounded outlets and in conformity with any local regulations.



Caution: High Ground

When working on a repeater on high ground, e.g. on a mast or pole, be careful not to drop parts or the entire repeater. Falling parts can cause serious personal injury.



Caution: Coax Cable Bending

Allow sufficient coax cable length to permit routing of patch cords or pigtailed without severe bends.



Caution: Static Electricity

Static electricity poses no risk of personal injury, but it can severely damage essential parts of the repeater, if not handled carefully.

Parts of the printed circuit board as well as other parts of the repeater are sensitive to electrostatic discharge.

Never touch the printed circuit board or annulated conductor surfaces unless absolutely necessary.

If you must handle the printed circuit board or uninsulated conductor surfaces, use ESD protective equipment, or first touch the repeater chassis with your hand and then do not move your feet on the floor.

Never let your clothes touch printed circuit boards or uninsulated conductor surfaces. Always store printed circuit boards in ESD-safe bags.




Maximum input power at Base Port is -40 dBm in AGC ON mode.



FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his expense. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

 **RF exposure warning!** In order to comply with FCC RF exposure regulations, you must ensure that the donor antenna is installed at a minimum distance of 0.2 m (7.8 inches) from persons who may be present in the area. For more information please see *Antenna Window Installation*, page 15.

1 SYSTEM DESCRIPTION

1.1 INTRODUCTION

The TDD Mini repeater system is designed to improve coverage for customers using TDD broadband 2500-2700 Mhz in medium size indoor areas.

The system implements BDA technology to enhance coverage in urban areas.

Repeaters are used to fill out uncovered areas in cellular mobile systems, such as base station fringe areas, road tunnels, business and industrial buildings, etc.

A repeater receives signals from a base station, amplifies the signals and retransmits them to mobile stations. It also receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously.

To be able to receive and transmit signals in both directions, the repeater is connected to a donor antenna directed towards the base station, and to a service antenna directed towards the area to be covered.

The repeaters are controlled through the Cellvine Operation Software Terminal, installed on desktop or laptop computers, which enables communication with the repeaters either locally using a communication cable, or remotely via a modem (optional)*.

Local communication can be also performed via a Bluetooth device (optional), which allows the user to control and monitor the repeater through the operation software over a distance of up to ~200 feet between the repeater and the monitor PC/laptop, eliminating the need for using a communication cable.

*In the future (depending on IP-Wireless network evolution and equipment testing), Cellvine will offer a Network Management System - NMS, which will allow multiple repeaters in a single network to be controlled from a central console, offering improved efficiency and responsiveness from enhanced cellular network coverage. The Cellvine NMS can be installed as a full application on a specific workstation at the client's network operations center (NOC) as SNMP packets, or implemented as a fully IP-based Web Interface over the Internet. Cellvine's NMS GUI enables technicians to tune repeater parameters during installation and during further optimization stages. Alerts can also be sent out via email, over the Internet or as SNMP packets, which can be picked up by the NMS and displayed on the NOC PC or any other browser-enabled device.

1.2 TDD REPEATER AND ANTENNA KIT

Description: TDD Repeater and Antenna Kit

Part number: BDA-TDD/ANT-KIT-AA

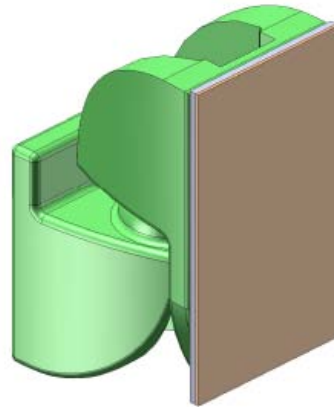
Vendor material no.: 43220000_EA

- TDD Mini Repeater, 16 dBm, 80 db Gain : BDA-TDD-25-16-19-AA
- Donor antenna: ANT-2527-10-19-AA
- Donor antenna front window mounting bracket
- Donor antenna Rear wall mounting bracket with 4X4m hardware
- Bracket for BDA-TDD-25-16-19-AA repeater with 4XUNC 6X32:1/2 inch hardware : BRK-TDD-19-AA
- Service In-Building multipurpose antenna :MPA-2300 (Customer furnished)
- Two flexible coaxial cables (10m): for donor and service antenna: CON0343
- Power supply 110VAC 7.5V 5A: PSL0025
- Local Communication cable USB to Mini USB: COMC-19-AA
- Software installation CD
- User manual/Installation guide

1.3 WHAT'S IN THE BOX - REPEATER ACCESSORIES



**Donor antenna
ANT-2527-10-19-AA**



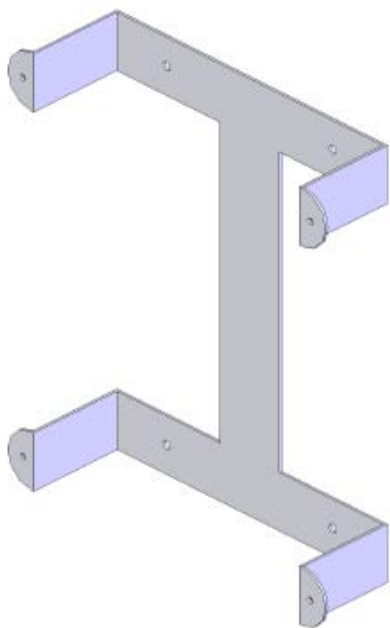
**Donor antenna front window
mounting bracket**



**Service In-Building multipurpose
antenna MPA-2300
(Not supplied by Cellvine)**



Donor antenna rear wall mounting bracket



Bracket for TDD repeater: BRK-TDD-19-AA



**Flexible coaxial cables (10m)
0- CON0343**

1.4 INDOOR REPEATER

Cellvine's indoor repeaters are intended for installation in indoor locations only.

Do not install in places where the repeater might be exposed to direct sunlight and rain/snow conditions, as this could result in the damage to the unit and other hazards. For normal operation, the environmental conditions should be as follows: Ambient temperature range: 23 °F to 122 °F, Maximum humidity: 90%.

1.5 PREPARATION FOR INSTALLATION

Determine the following before beginning the repeater installation:

- Base station location and receiving power (TX power in dBm)
- Location where the Base/Mobile antenna is to be installed
- Location where the repeater is to be installed
- Length and type of coaxial cable needed to connect from the outdoor antenna to the repeater unit
- Length and type of coaxial cable needed to connect from the repeater unit to the indoor antenna
- Estimation of the isolation between the donor and the coverage antenna/s

1.6 REPEATER UNIT RF SPECIFICATIONS

Parameter	Specifications
Frequency range	2500-2690 Mhz
Output composite power	UL : 16 dBm , DL : 16 dBm
System max gain	80 dB
Noise figure	Less than 7 dB
Pass band ripple	4 dB p-p in 10 Mhz bands
IF filter rejection	40 dB @ 1 Mhz
Band filter options	Center frequency –200 Khz steps BW OF : 10 Mhz,
Gain tuning range	23 dB in 1 dB steps
Switching time	Less than 2 μ sec
Absolute delay	Less than 4 μ sec
Protection	Overpower Programmable shut down
VSWR	2:1 MAX
Operating conditions	Indoor (-23 to +122 ⁰ F)
Indicators/Controls	Led : DC Power ,AGC, alarm Gain tuning knobs
Available software tuning	Full software control by local PC terminal
Sync method	IP -Wireless 3G broadband wireless modem TTL signal
Dimension	13.77" X 9.00" X 3.93"
Power requirements	7.5 VDC, 1.5A Max. from included power supplier

Table 1: Repeater technical specifications

1.7 REPEATER DIMENSIONS

(In inches)

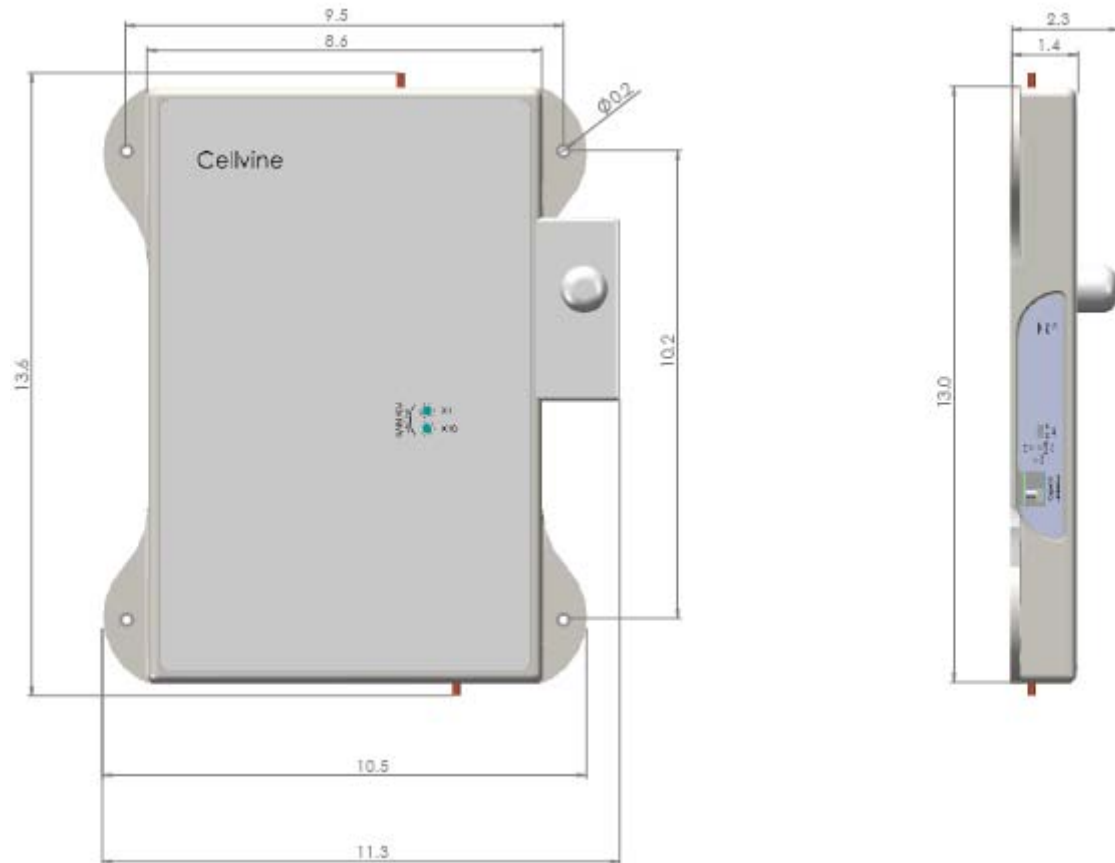


Figure 1: Repeater dimension

1.8 BRACKET DIMENSIONS

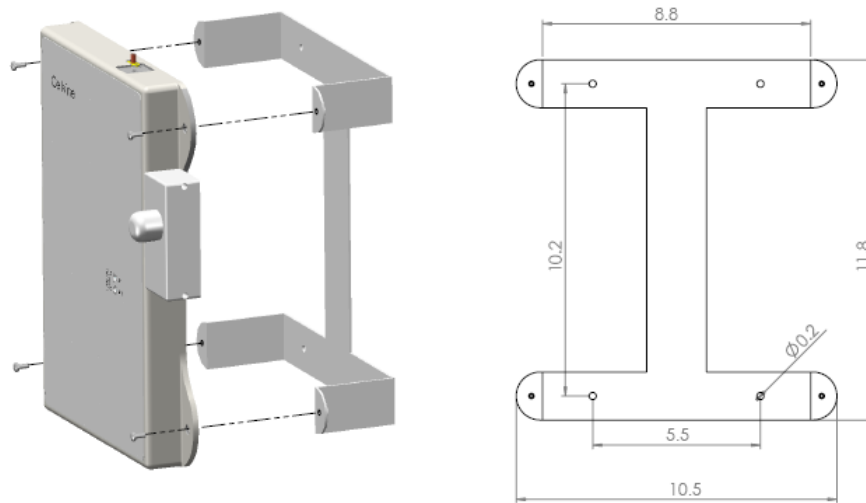


Figure 2: Bracket dimensions

1.9 REPEATER INTERFACES

Name	Type	Function
MOBILE	SMA Female connector	Connect to service antenna
BASE	SMA Female connector	Connect to donor antenna
POWER	Cross connector	Connect to power supply
Software Control	Mini USB-USB	Connect to maintenance and control software GUI

Table 2: Repeater interfaces

1.10 ANTENNAS

The system incorporates two antenna types:

- **Donor panel antenna:** Installed facing out the area to be covered
- **Coverage antenna(s):** One or more antennas installed at the area to be covered.

The donor antenna receives cellular signals (assuming sufficient coverage exists outside the building or near a window). The BDA amplifies the signals transmitted by the coverage antennas in the coverage areas. The mobile handset signals are received by the coverage antennas, amplified by the BDA, and transmitted through the donor antenna back to the cellular base station site. This enables cellular signals to be re-transmitted in some locations, in order to extend cellular coverage.

1.10.1 Donor Panel Antenna

Cellvine provides a unique, slim and well-designed donor antenna in the repeater kit, instead of a regular Yagi antenna. This antenna is designed to provide attractive appearance and smaller dimension when installed in private homes or public places. The solution is based on a panel antenna with a narrow beam pattern of 24°.

The advantages of this antenna are being aesthetically more appealing, lightweight, relatively small dimensions, and simple installation. Although this is a panel antenna, it performs much better than other panel antennas with similar dimensions, especially in the pattern beam width (see Figure 5). The antenna gain is 9 dBi.

The antenna is designed to be mounted on a glass window, using a window bracket that is attached to the window with two-sided adhesive tape. For the adhesive tape specifications, please see *Adhesive tape specifications*, page 13.

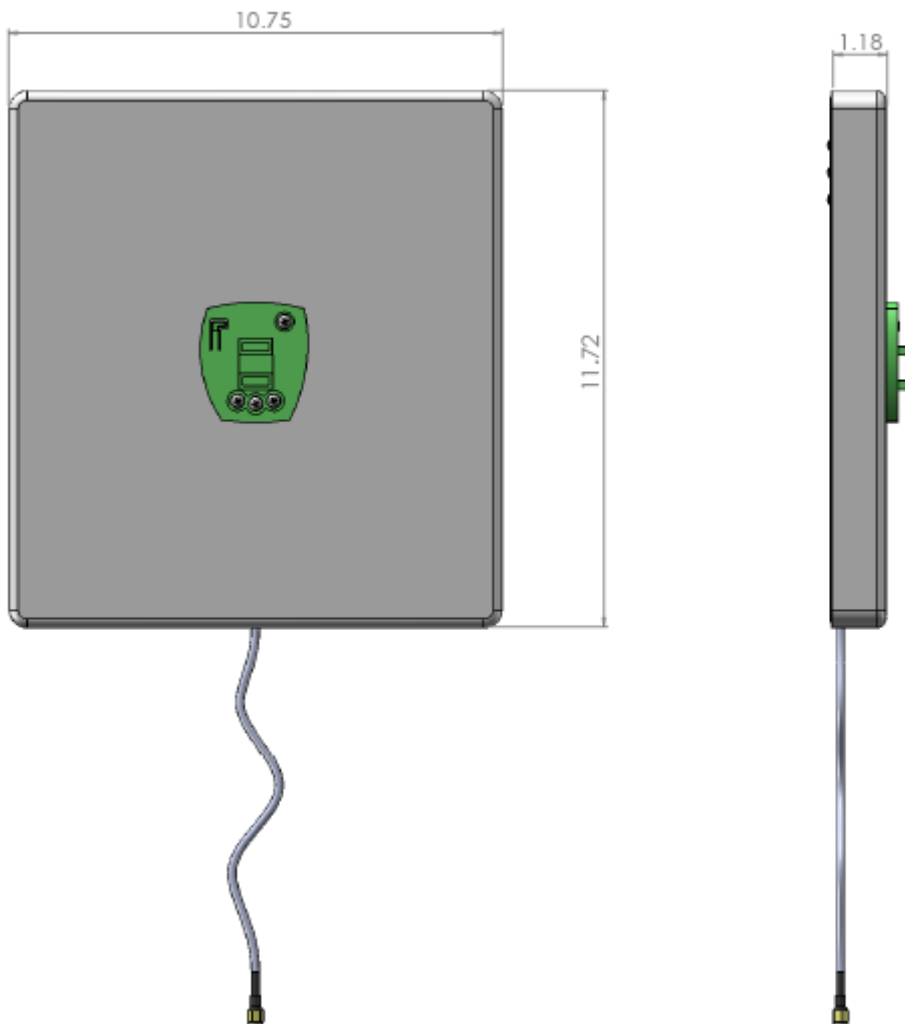


Figure 3: Donor panel antenna dimension in inches

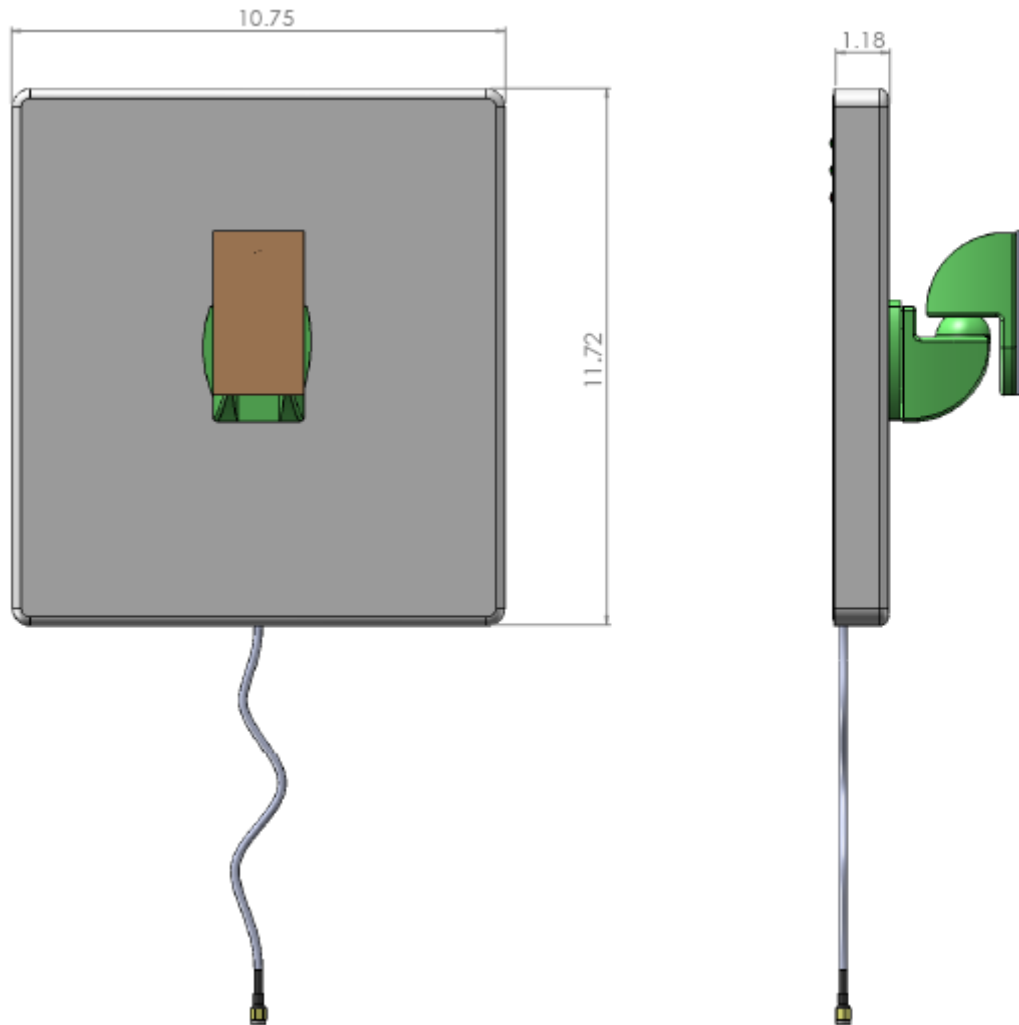


Figure 4: Donor panel antenna dimension in inches with front window bracket

Frequency range	2500-2700 MHz
Directivity	9 dBi
VSWR	1.8:1 (typical)
3 dB Beam width	24° X 24°
Polarization	Lineal
Input impedance	50 (ohm)
F/B ratio	20 dB (typical)
Input power	10W
Size	307X277X30mm
Weight	2 Kg

Table 3: Panel donor antenna unit specifications

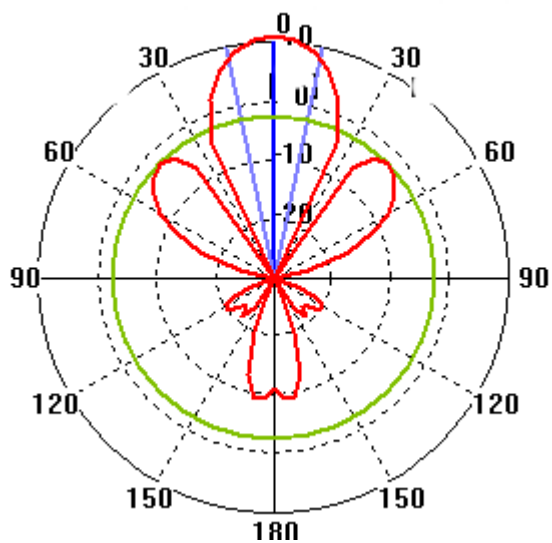


Figure 5: Donor antenna horizontal radiation pattern

1.11 DONOR SIGNAL STRENGTH MEASUREMENT TOOL

The donor panel antenna includes a signal level meter indicator (Figure 6) for measuring the RSSI signal level from the donor BTS in the neighboring area.

The measurement tool receives a signal from the repeater controller through the coax cable connected to the donor antenna. It measures the signal output level of the repeater output according to the signal received at the donor antenna from the BTS. This will help installing the donor antenna in the optimal direction and at the optimal angle, in order to achieve the highest RSSI level signal from the BTS.

For operation instructions, please refer to *Tuning Donor Antenna via Signal Level Indicator*, page 24.

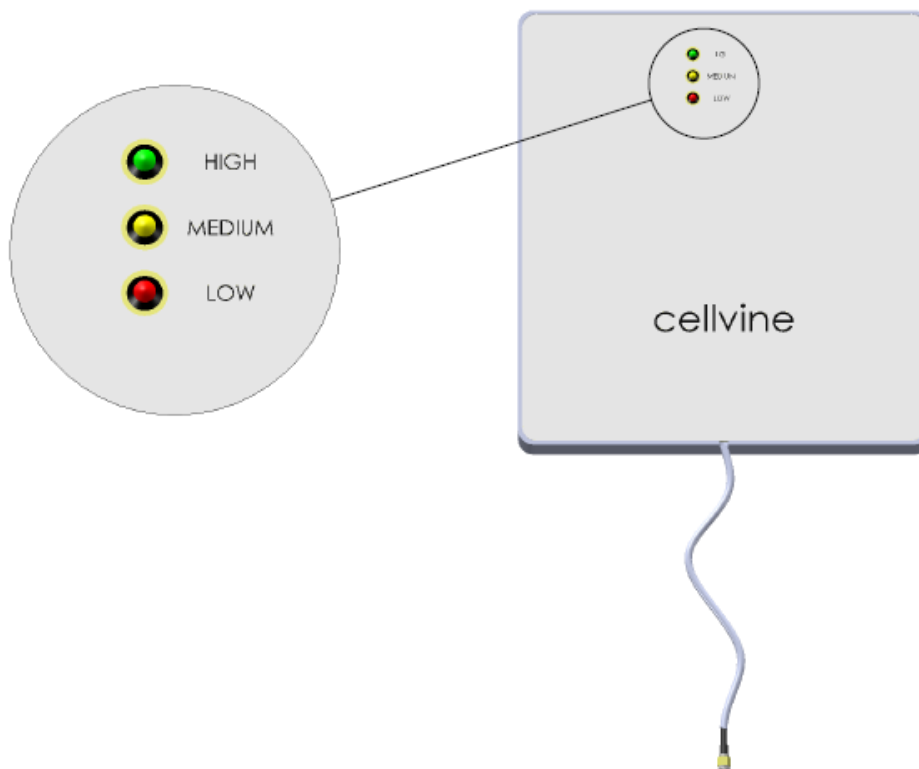


Figure 6 : Donor signal level measurement tool

1.11.1 Indoor Omni Coverage Antenna Specifications

Electrical Specifications	
Frequency Range	2300-2700MHz
VSWR	≤2.0
Input Impedance	50Ω
Gain	3dBi
Polarization	Vertical
Maximum Input Power	50W
Connector Type	SMA -Male
Lightning Protection	DC ground
Mechanical Specifications	
Height	105mm
Weight	62g
Cable Length	3m
Antenna Color	Black
Working Temperature	-40~140 °F

Table 4 : Indoor Omni coverage antenna specification

1.11.2 Adhesive tape specifications and installation recommendation for the antenna mounting bracket

After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive without on to the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

2 INSTALLATION

This section provides information about the installation and setup of the Cellvine repeaters. The information consists of procedures for unpacking, inspection and preparation for the installation, as well as the actual installation and setup. It is important to install the repeater correctly at its working location.

It is recommended that installation be performed by a certified radio technician.

The repeater installation consists of four basic steps:

5. Antenna installation
6. repeater installation
7. Cable installation
8. Repeater parameters setup and tuning with the control application.

2.1 UNPACKING AND INSPECTION

1. Examine the shipping package for damage before unpacking the unit. If the shipping package is damaged, try to unpack the equipment in the presence of the carrier's agent. If visual inspection reveals physical damage to the equipment, you should send it back for replacement.
2. Verify that the equipment includes all components, as listed in the packing slip. If components are missing, contact Cellvine Ltd.


2.2 ANTENNA INSTALLATION

Coverage (mobile) antenna – facing to the "no coverage" area. The most commonly used antennas for indoor applications are Omni or panel antennas. When multiple indoor areas should be covered, more than one antenna can be used. Indoor antennas are usually placed near the ceiling with decorative covers. Decisions as to where to locate the antenna take into account isolation issues, and the need to overcome interfering signals. For outdoor coverage, panel antennas are commonly used. The location of the antenna is determined by coverage and isolation matter.

Base (donor) antenna – installed behind a window glass, facing the donor BTS. The choice of donor cell site should take into consideration capacity, range and signal level in the outdoor antenna location. The location should be chosen so, that donor cell site reception will be at a higher level than all other adjacent cell sites. For this purpose, the outdoor antenna should have high directivity and high Gain. If possible, this antenna should directly face the nearest cellular site with a line-of-sight view. For further installation instructions, please refer to paragraph *Donor Antenna Installation*, page 15.

Isolation issue – to assure proper repeater operation, the isolation between the indoor (Mobile) and outdoor (Base) antennas should be at least 15 dB higher than the repeater's maximal gain.

This isolation parameter can be measured simply by transmitting a continuous, CW unmodulated pilot signal of 0 dBm at the repeater Base port (donor antenna), and measuring the received signal at the repeater Mobile port (service antenna port).

 **Note:** the isolation parameter should be measured between the coax cables that are connected to the Base and Mobile ports, without the repeater.

For example, if the measured isolation parameter between the Base and Mobile ports is 90 dB, the maximal repeater gain should not exceed 75 dB.

2.3 PRE-INSTALLATION INSPECTION

Before beginning the repeater installation, determine the following:

- Base station location and receiving power (TX power in dBm)
- Location where the Base/Mobile antenna is to be installed
- Location where the repeater is to be installed
- Length of coaxial cable needed to connect from the Donor antenna to the repeater unit
- Length of coaxial cable needed to connect from the repeater unit to the indoor antenna/s.
- Isolation estimation between the donor and the coverage antenna/s.


2.4 DONOR ANTENNA INSTALLATION

The panel donor antenna can be installed either attached to a window glass, using the front window mounting bracket, or on a wall or flat surface using the rear wall mounting bracket.

2.5 ANTENNA WINDOW INSTALLATION

To install the antenna attached to a window glass, perform the following steps:

1. Locate all the antenna's front bracket parts, as shown in Figure 7.
2. Attach the antenna holder to the antenna adaptor installed on the front of the antenna, as shown in Figure 8.
3. Glue the antenna holder to the most suitable spot on the window. Before gluing, clean and remove fat and dust from the gluing area. Note that the adapter should be glued onto the window vertically. The adapter must be glued pointing up, see Figure 8 and Figure 9.
4. Press the antenna and front bracket gently onto the window, and wait a few seconds to ensure that it is properly attached, as shown in Figure 9.

 **RF exposure warning!** In order to comply with FCC RF exposure regulations, you must ensure that the donor antenna is installed at a minimum distance of 0.2 m (7.8 inches) from persons who may be present in the area.

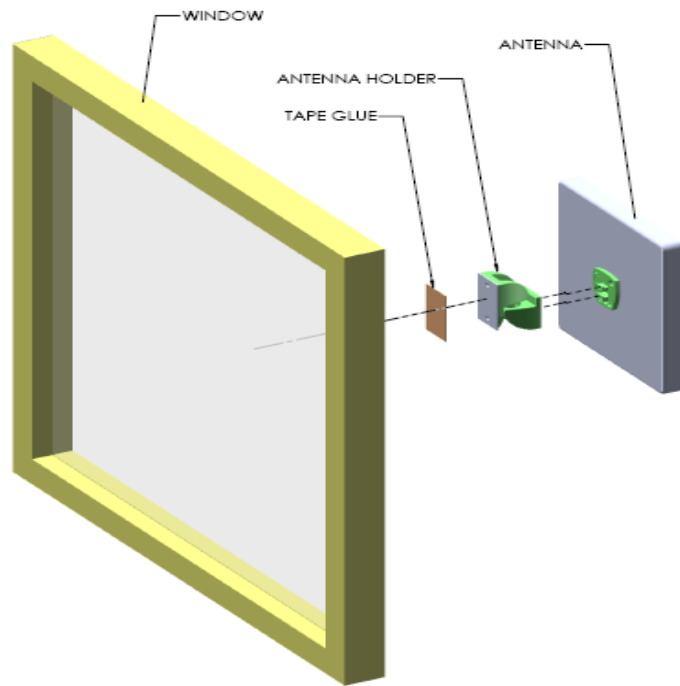


Figure 7: Installing donor antenna on window

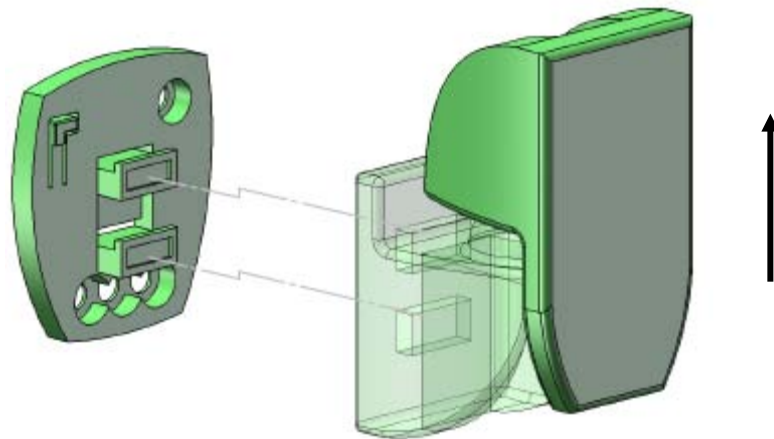


Figure 8: Connecting antenna holder to antenna adaptor

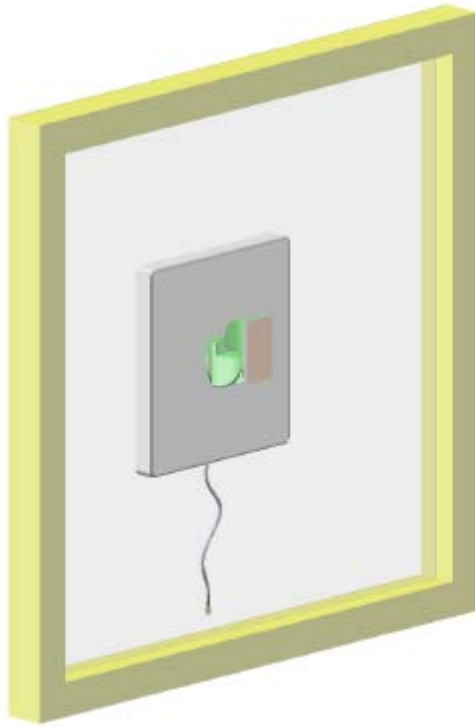


Figure 9: Front view of donor installation on window glass – Correct installation

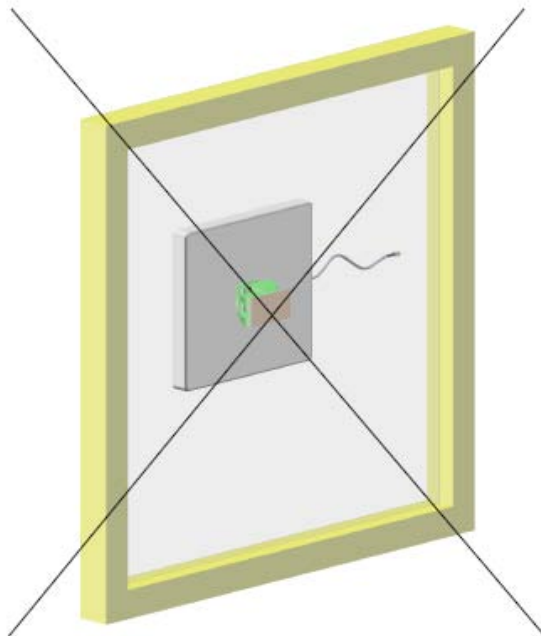


Figure 10: Wrong installation

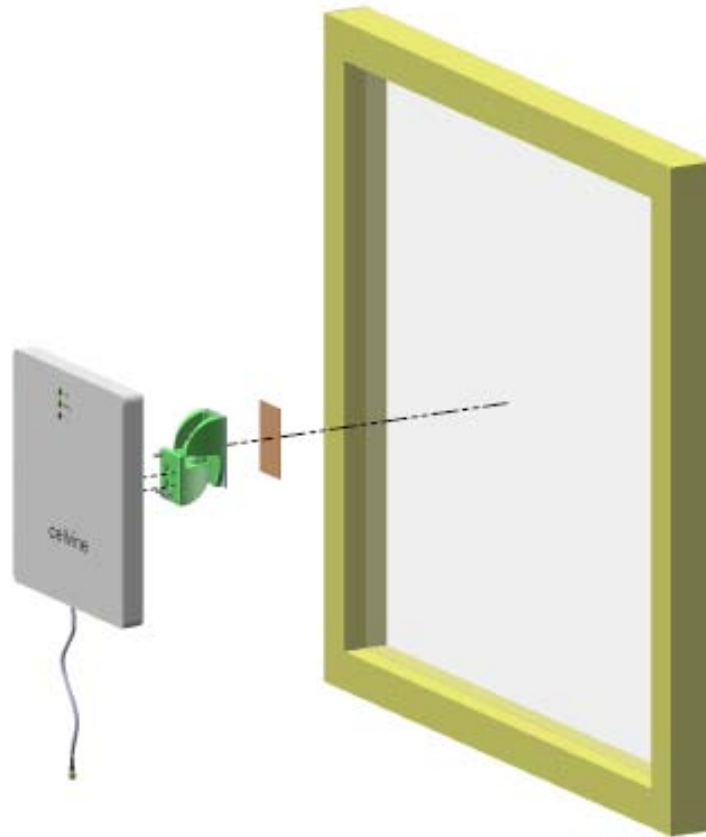


Figure 11: Rear view of donor antenna window installation

2.6 DONOR ANTENNA WALL INSTALLATION

To install the donor antenna attached to a wall or flat surface, connect the donor antenna to the wall bracket using the supplied bracket kit, as shown in Figure 10.

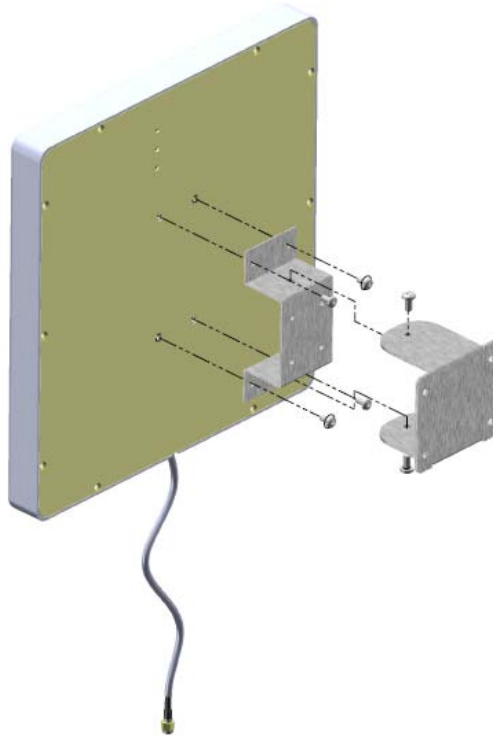


Figure 12: Donor Antenna Wall Bracket Assembly

For aesthetic reasons, a sticker is placed on the back panel, covering the screw holes. In order to locate the screw holes on the back of the panel and insert the screws:

1. Place the paper stencil, provided in the antenna kit, over the back of the antenna, and use a pencil or a pen to mark the position of the four holes on the back panel of the antenna.
2. Use a Stanley knife to make holes in the sticker on the back of the antenna at the marked points.

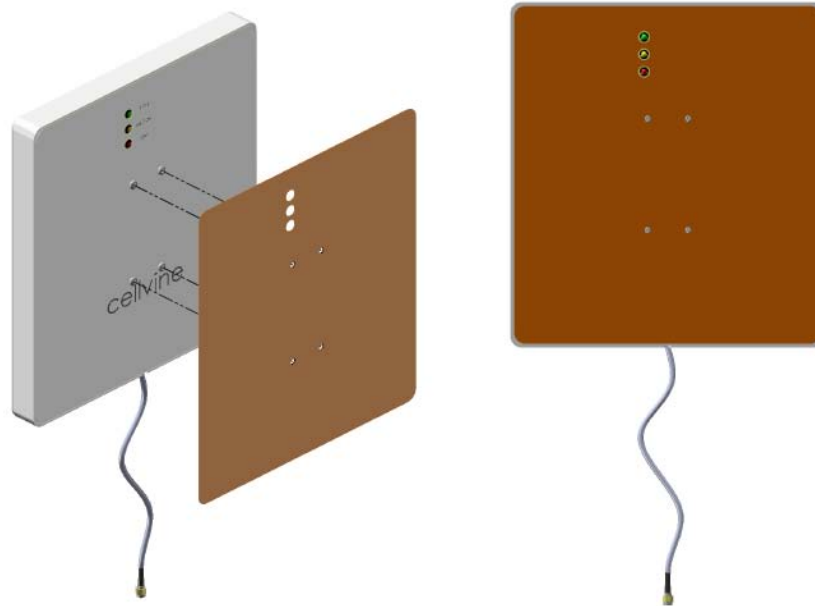


Figure 12: Making holes in back panel sticker for rear wall bracket installation

3. Use the supplied four screws to attach the appropriate bracket part to the back of the antenna, see Figure 12.
4. Attach the appropriate bracket part to the wall (no screws are supplied for this step. The required screw and masonry anchor type varies according to the wall type).
5. Connect the two bracket parts using the supplied screws.

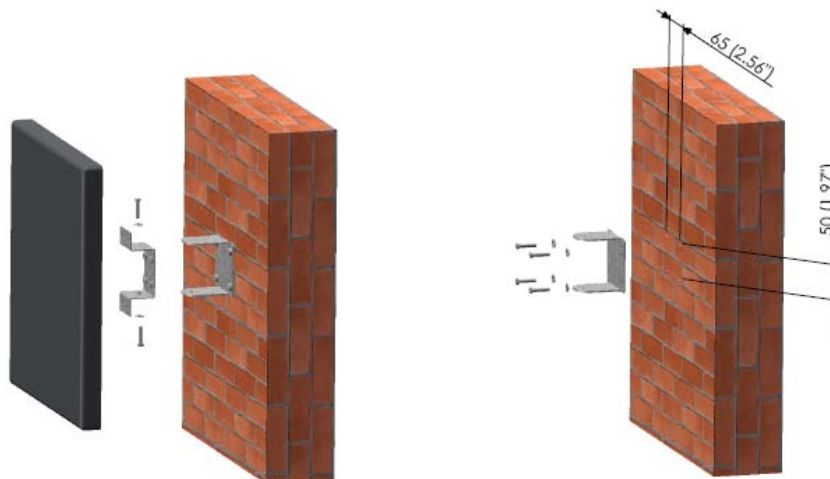


Figure 13 : Donor antenna wall installation

2.7 REPEATER UNIT MECHANICAL INSTALLATION

1. In order to install the repeater on a wall or a similar surface, use the mounting holes on the side of the repeater as shown in Figure 14: Repeater wall installation. Use four fixing $\varnothing 4$ screws, socket pan screws, plain washer, and a spring washer (not supplied).
2. Make sure that the antenna cable connectors and the repeater connectors are clean and dry.
3. Connect the donor antenna cable to the "base" RF connector.
4. The connection should be snug and tight.
5. Connect the "mobile" (coverage) antenna cable to the mobile RF connector. The connection should be snug and tight.
6. Ensure that the antenna cables have are not crimped, kinked, or otherwise damaged in the process.
7. Connect AC adaptor to the AC socket.

 **Note:** Always connect RF connectors to repeater before applying AC supply!



Figure 14: Repeater wall installation

2.8 CABLE AND MOUNTING INSTALLATION PRECAUTIONS



Danger of 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 insulated wires or terminals.



Make sure that the antenna connectors and the antenna cable connectors are clean and dry.



The RF cables must not be kinked, cut or damaged in any way.



Connect the RF cables to the antennas. Be careful not to strip the connectors. The connection should be snug and tight.



Seal the connectors with either a waterproof sealant, or the appropriate weather tight boot.



Make sure that the AC power is suitable for the repeater in use.



Make sure that all indoor repeaters are installed without direct sun radiation and rain protection.



Whenever loose cables are left on the ground, a clear sign must be added to warn passing pedestrians of the danger of entanglement.



Always connect RF connectors to repeater before applying AC supply!



Maximum input power at Base Port is -40 dBm in AGC ON mode.

2.9 SYNCHRONIZATION PCMCIA MODEM INSTALLATION

The Synchronization PCMCIA modem and the modem cover are assembled and ready for use in the repeater package.

If a modem replacement is needed, please perform the following steps:

1. Remove the modem cover by loosening the screws on the cover sides.
2. Disconnect the modem receiving signal cable from the modem socket.
3. Pull the modem back from the modem slot.
4. Replace the modem.
5. Insert the modem into the slot and slide the modem forward until it stops.
6. To make sure the modem is connected to the connector socket at the modem slot, tighten the modem gently towards the repeater.
7. Connect the modem receiving signal cable to the modem socket.
8. Replace the modem cover.



Figure 15: Synchronization modem installation

2.10 TUNING DONOR ANTENNA VIA SIGNAL LEVEL INDICATOR

Locate a potential site for installing the donor antenna with an accessible and comfortable working space. If possible, select one of the surrounding BTS's highest donor level signals. Deploy and connect a coax cable between the donor antenna and the repeater location (into the Base connector) and make sure the repeater is powered ON and the coverage antenna (Mobile) is connected.


To achieve the best signal reception quality at the donor antenna, rotate the antenna gently sideways, as shown in Figure 16.

While rotating the antenna, observe the signal level indicator LEDs on the back panel of the antenna, as follows:

Red LED – lowest level

Red and **Yellow** LED – medium level

Red, **Yellow** and **Green** LED – highest level

 **Note:** make sure the repeater is turned on and connected to the donor and service antennas while rotating the antenna.

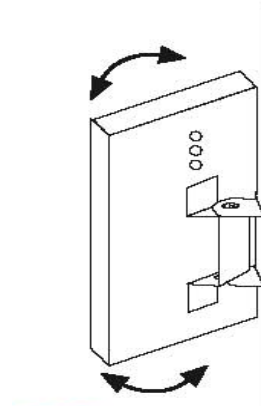


Figure 16: Antenna signal level indicator tuning

3 REPEATER COMMUNICATION, MONITORING AND CONTROL

Cellvine TDD Mini repeaters are equipped with a controller microprocessor and can be fully controlled and monitored through a local connection, or remotely using an optional modem, and a software utility.

3.1 LOCAL CABLE CONTROL MODE

To operate and control the repeater with a PC or laptop computer in local mode, connect the USB control cable between the computer and the Mini USB port located on the side panel of the repeater.

3.2 REPEATER MANUAL ADJUSTMENTS

The AGC ON/OFF switch and the Status LED are located on the side panel of the repeater. The Manuel GAIN ADJ variable rotation knobs (for AGC OFF mode) are located on the front panel.




Figure 17: Repeater control panel

3.3 REPEATER AGC ON - OPERATION MODE

By default, when setting the AGC switch to ON, the repeater should work in fully automatic mode. In this mode, the Gain of the repeater will be set automatically to ensure that the output power is equal to the maximal linear power of the repeater.

In instances where the signals exceed the linear level, an automatic attenuator will reduce the Gain.

If the signal in the input of the repeater increases, the repeater will reduce the Gain in order to achieve the AGC parameter value that was set. If the input signals from the BTS decrease after a while, the Gain of the repeater will increase again, by 1 dB.

 **Note:** the AGC ON mode can be set either manually from the side panel, or by using the control Software

3.4 AGC OFF-OPERATION MODE

In AGC OFF mode, the AGC mechanism is no longer in control of the increase or decrease of the repeater Gain. The Gain level in AGC OFF operation mode is fixed, and will not be changed automatically by the repeater. In light of this, it is important to measure and control the input level of the signal coming from the BTS.

Example: in AGC OFF mode, the Gain is fixed at 80 dB. The maximum output level allowed from the unit is 16 dBm, and the maximum input signal level from the BTS is therefore $16-80 = -64$ dBm. This means that if the input signal from the BTS is higher, e.g., -55 dBm, and the fixed Gain is 80 dB, the output level will be $-55+80= +25$ dBm.

This repeater model is designed for a maximum of + 16 dBm output power, and +25 dBm output power levels will damage the unit.

You can configure the output power in AGC OFF mode and set the repeater Gain manually, by using the two rotation knobs on the front panel. In AGC OFF mode, the knobs on the front panel are used as attenuators in order to reduce the maximum Gain of the repeater (80 dB), by up to 23 dB (in the range of 80-57 dB).

3.4.1 Using the Variable Rotation Knobs in AGC OFF Mode

To set the Gain parameters by using the variable knobs on the front panel, please follow these steps:

1. Set AGC to OFF mode by changing the switch on the repeater side panel to the OFF position.
2. Use a small flathead screwdriver to rotate the knob to the desired position.
3. Rotate the knob so that the blank edge is pointing to the desired digit, as shown in Figure 18.

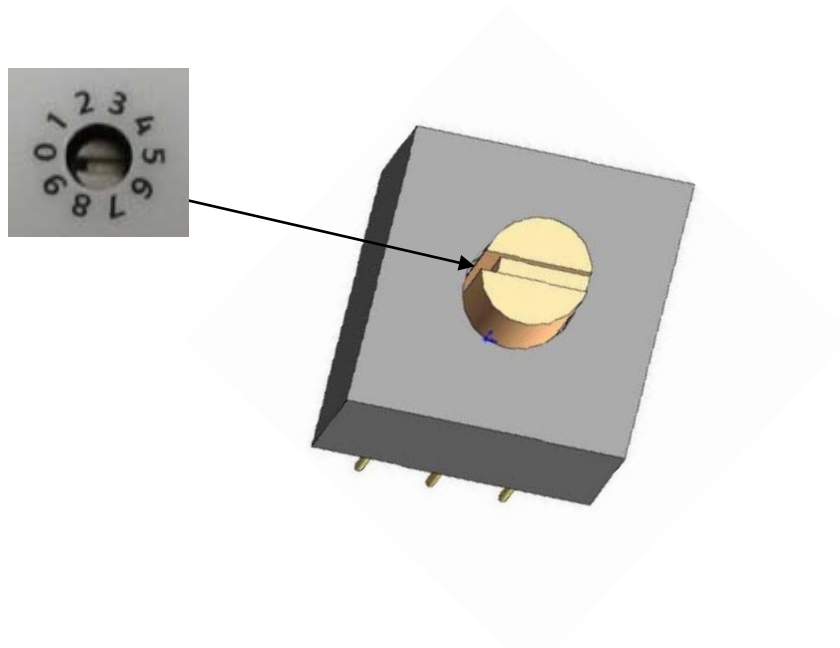


Figure 18: Rotate knob setup position

3.4.2 Setting the Gain in Manual Adjustment – AGC OFF Mode

To set the fixed Gain level in AGC OFF mode, use the variable rotation knob:

X 10; X 1

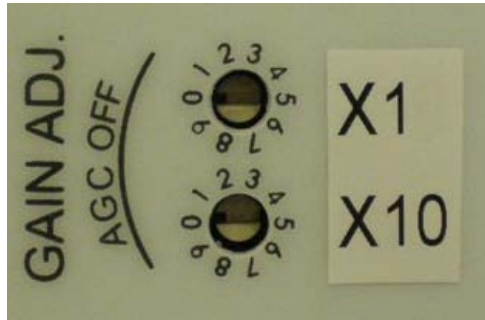


Figure 19: AGC OFF Gain attenuators variable rotation knob

Rotation Knobs position		Repeater Gain- dB
X1	X10	
0	0	80
1	0	79
2	0	78
3	0	77
4	0	76
5	0	75
6	0	74
7	0	73
8	0	72
9	0	71
0	1	70
1	1	69
2	1	68
3	1	67

Rotation Knobs position		Repeater Gain- dB
X1	X10	
4	1	66
5	1	65
6	1	64
7	1	63
8	1	62
9	1	61
0	2	60
1	2	59
2	2	58
3	2	57

Table 5: Setting the Gain in manual adjustment – AGC Off mode

3.5 LED STATUS

The system status is indicated by three LEDs.

- Green – PWR: Indicates system power ON/OFF
- RED-ALR: indicates various alarms
- Yellow-AGC: refers to AGC operation level

LED/STATUS	STEADY ON	BLINK	OFF
YELLOW	<i>Forward power at AGC level</i>	<i>Forward power is 3 dB below AGC level</i>	
RED	<i>Shutdown after overpower protection process</i>		
GREEN	<i>DC Power</i>		
YELLOW & RED		<i>Modem lost synchronization with BTS</i>	

Table 6: LED Status indications

4 SOFTWARE INSTALLATION

The provided software allows you to access, modify and configure the repeater parameters, receive alarms, and control the repeater locally.

The software provides various status indications and readouts.

The configurable parameters include Gain settings, power settings, alarm settings and more.

4.1 SYSTEM REQUIREMENTS

Windows 2000/XP OS.

4.2 INSTALLING THE SOFTWARE

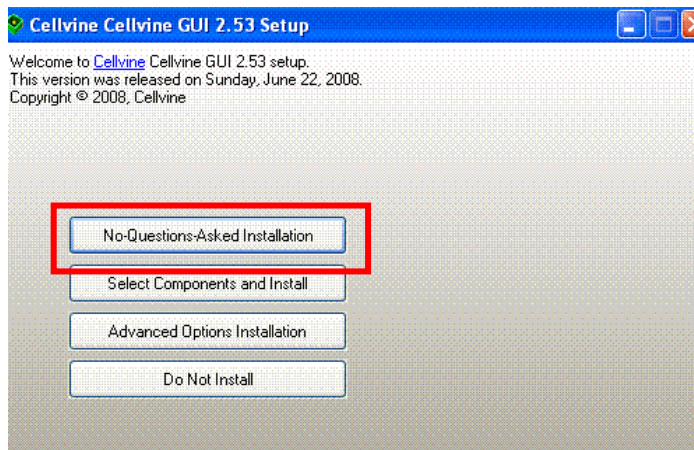
The software is provided on the CD supplied with the repeater.

1. Locate *Setup.exe* on the CD and start it.

Files Currently on the CD



2. Select "No-Questions-Asked Installation".



3. Wait for the installation to end and click "Thanks!" at the final installation screen.

4.3 USB DRIVER INSTALLATION

(Once per workstation)

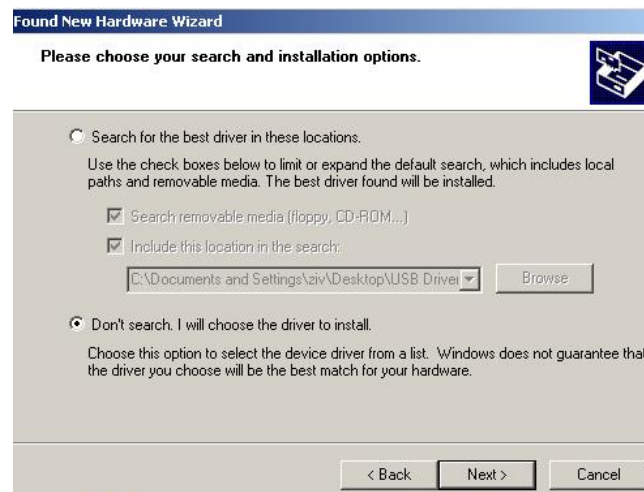
To control and monitor the repeater locally, USB drivers should be installed. This procedure should be performed only once per PC.

1. Insert the USB Cable into the PC and the repeater.
2. Turn the repeater on - make sure the RF input and output are connected to the antenna or to termination 50 Ohm.

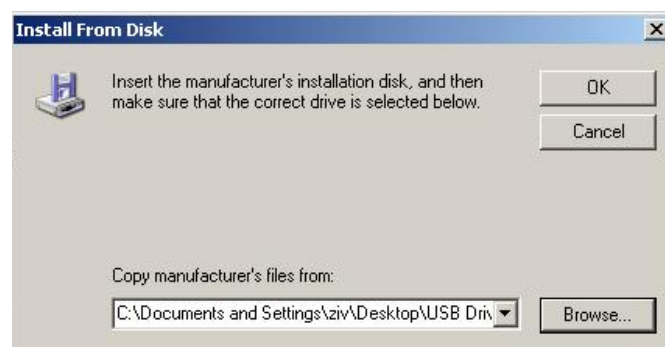
3. The New Hardware wizard opens. Click *Next*.



Select Don't search. I will choose the driver to install. and click *Next*.



Drivers are located on the CD in the USB Drivers directory. Click *OK*.



Click *Next*.



Click *Continue Anyway*.



At the last installation screen click *Finish*.



5 SOFTWARE OPERATION

1. Connect the USB cable to the repeater and the PC/LAPTOP.
2. Turn the repeater on. Make sure the RF input and output are connected to the antenna or to the 50 Ohm termination.
3. Open the control and management application: From the computer Start menu, select Programs → Cellvine GUI → Start _GUI.

Once the program recognizes the repeater, it will load the repeater data.

There are three setup screens:

1. Technician Setup
2. Unit Details
3. Communication Settings

5.1 TECHNICIAN SETUP SCREEN

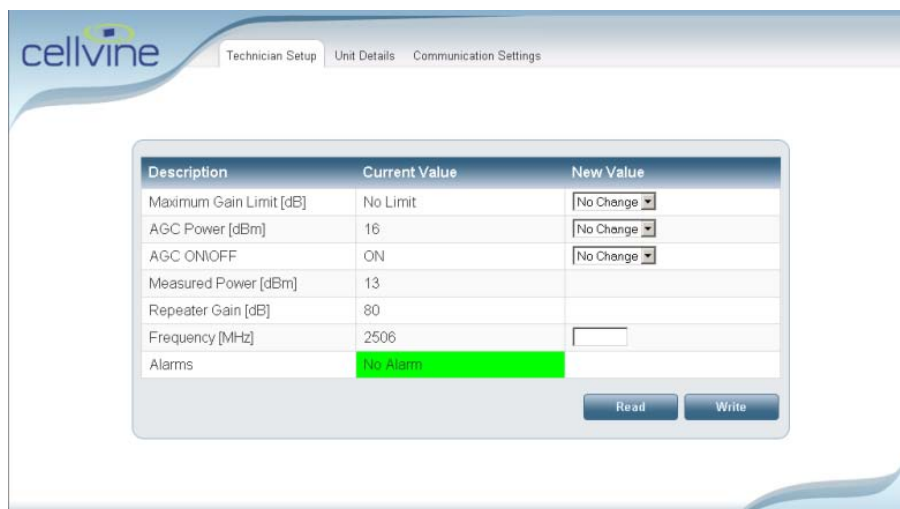


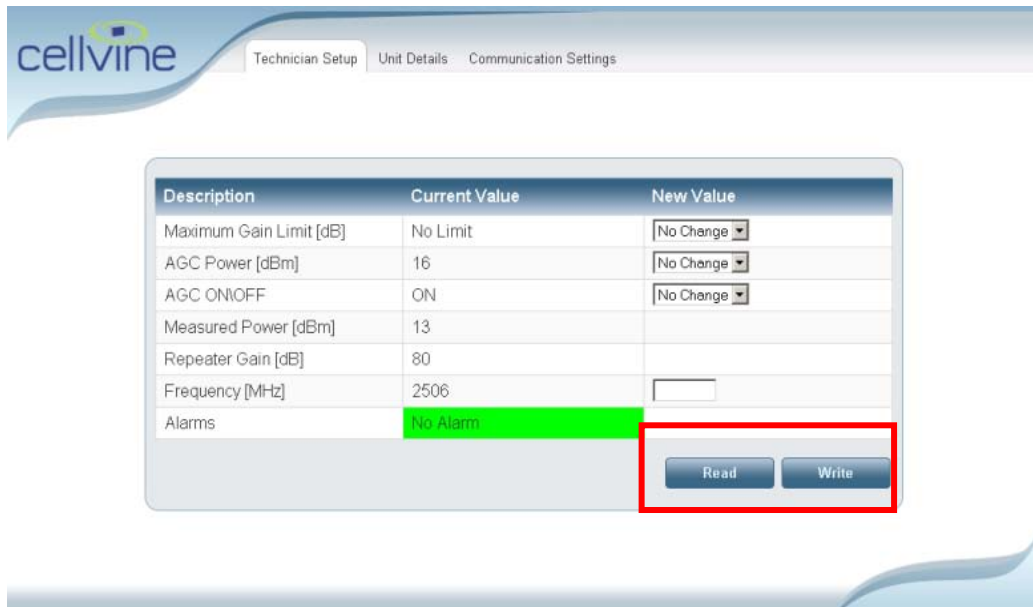
Figure 20: Technician Setup Screen

- Use the drop down menus to change values.
- After modifying a value, click on the *Write* button to send the new value to the repeater. Only one value can be changed at a time.
- **Read button** – reads current values from the repeater and updates the screen.
- **Write button** – writes the modified value to the repeater and updates the screen.

5.2 READ AND WRITE PARAMETERS

After configuring/modifying values, click on the *Write* button to apply the new values.

To display the current repeater parameter values, click on the *Read* button. The parameters are continually updating, but the new values are only displayed after you click the *Read* button.



The screenshot shows the CellVine Technician Setup screen. At the top, there is a navigation bar with the CellVine logo and three tabs: "Technician Setup", "Unit Details", and "Communication Settings". Below the navigation bar is a table with three columns: "Description", "Current Value", and "New Value". The table contains the following rows:

Description	Current Value	New Value
Maximum Gain Limit [dB]	No Limit	No Change ▾
AGC Power [dBm]	16	No Change ▾
AGC ON/OFF	ON	No Change ▾
Measured Power [dBm]	13	
Repeater Gain [dB]	80	
Frequency [MHz]	2506	<input type="text"/>
Alarms	No Alarm	

Below the table, there are two buttons: "Read" and "Write". The "Read" button is highlighted with a red box, and the "Write" button is also highlighted with a red box.

Figure 21: Technician Setup Screen – Read/Write buttons

5.3 TECHNICIEN SETUP - VARIABLE PARAMETER DESCRIPTION

The following parameter's values can be configurable:

- Maximum Gain limit
- AGC power
- AGC ON/OFF
- Frequency

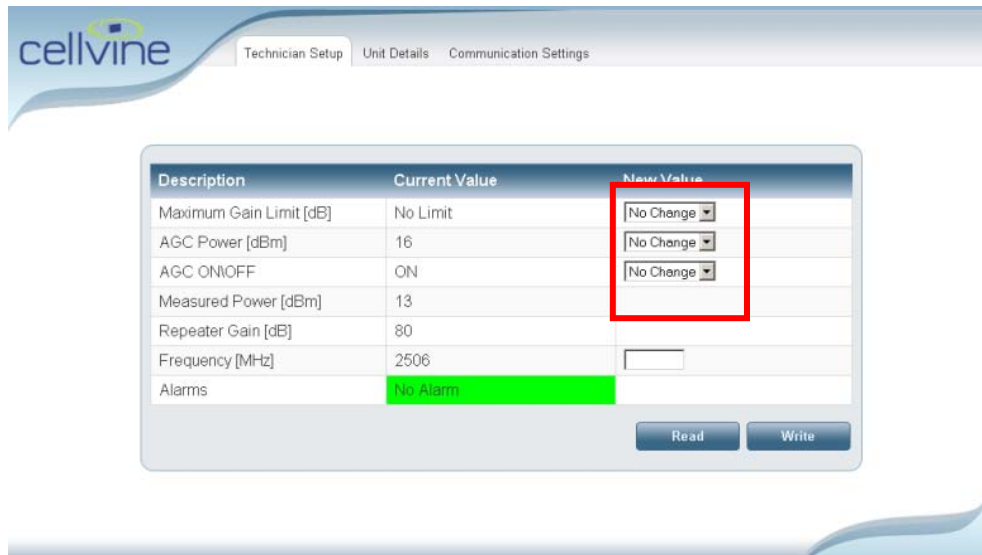



Figure 22: Technician Setup Screen –New Value fields

5.3.1 Maximum Gain Limit

 Can be set only in AGC ON mode

You can determine the maximum Gain level that the repeater will reach in the automatic Gain control. Usually, the default value is the maximum repeater Gain, taking into consideration the isolation between antennas.

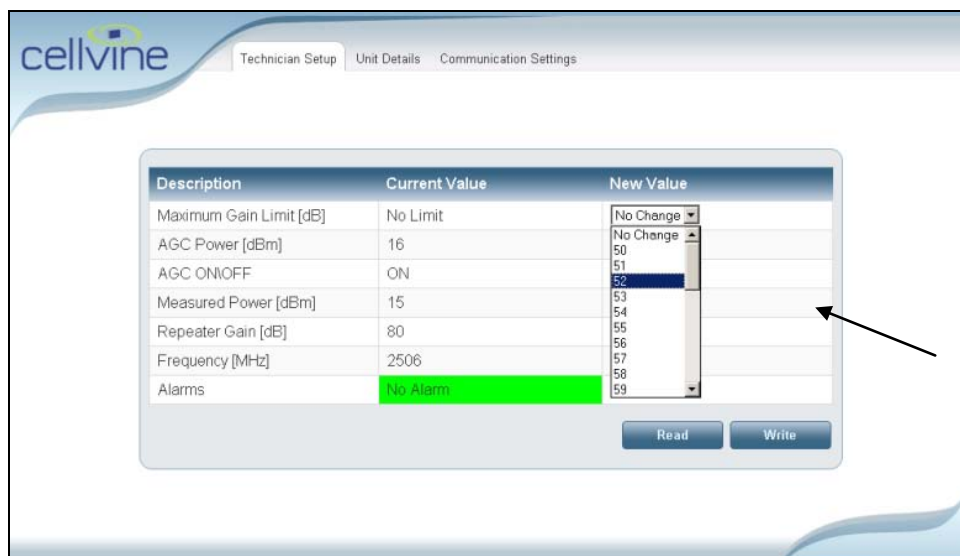



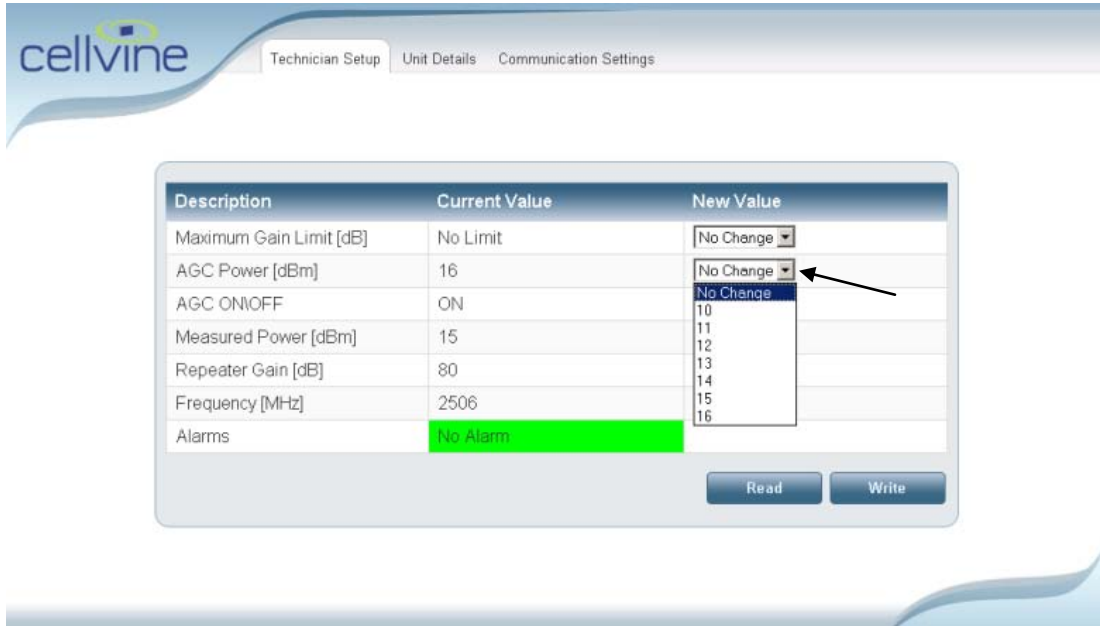
Figure 23: Technician Setup Screen – Gain Limit setup

5.3.2 AGC Power

 Can be set only in AGC ON mode

The AGC level is the power level that the automatic Gain control will try to achieve by changing the Gain of the repeater. This level is usually set to the repeater's maximal linear power. You can determine the level in dBm of the AGC automatic mechanism in the output power range of 10 dBm to 16 dBm.

Example: If 16 dBm is set in AGC ON mode, the repeater will increase or decrease the Gain in order to achieve a permanent output power of 16 dBm.



Description	Current Value	New Value
Maximum Gain Limit [dB]	No Limit	No Change
AGC Power [dBm]	16	No Change
AGC ON/OFF	ON	No Change
Measured Power [dBm]	15	10
Repeater Gain [dB]	80	11
Frequency [MHz]	2506	12
Alarms	No Alarm	13
		14
		15
		16

Read Write

Figure 24: Technician Setup Screen –AGC setup

5.3.3 AGC ON/OFF

Set the AGC ON/OFF mode. You can also control the AGC manually from the panel using the AGC ON/OFF switch. (Please refer to *AGC OFF-Operation Mode*, page 26).

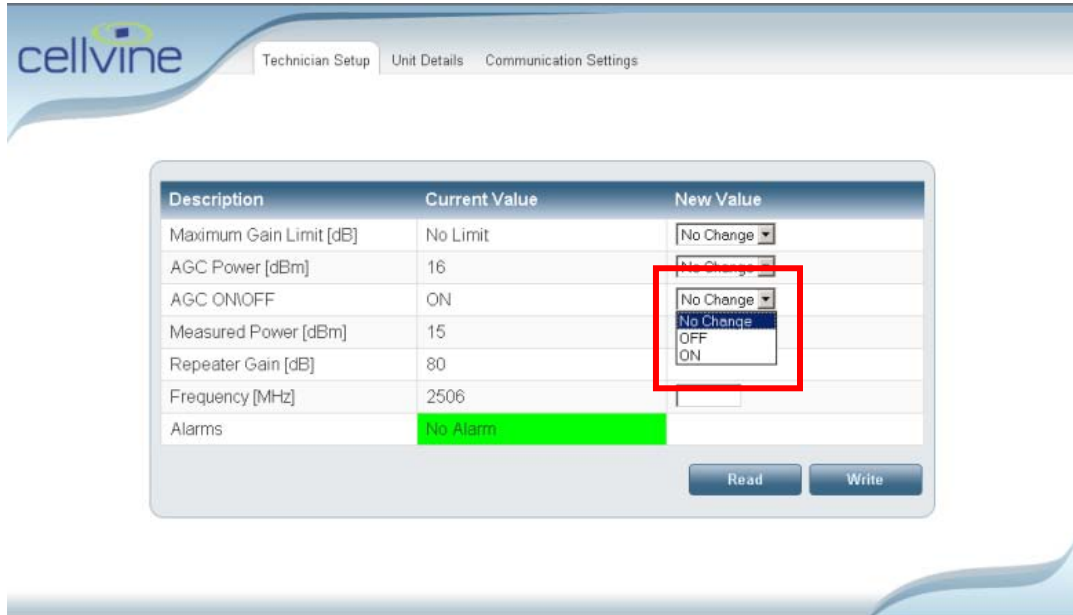


Figure 25: Technician Setup Screen –AGC On/Off setup

5.3.4 Repeater Gain

Can be set only in AGC OFF mode.

You can set a fixed level of the desired Gain in the Forward path link (downlink).

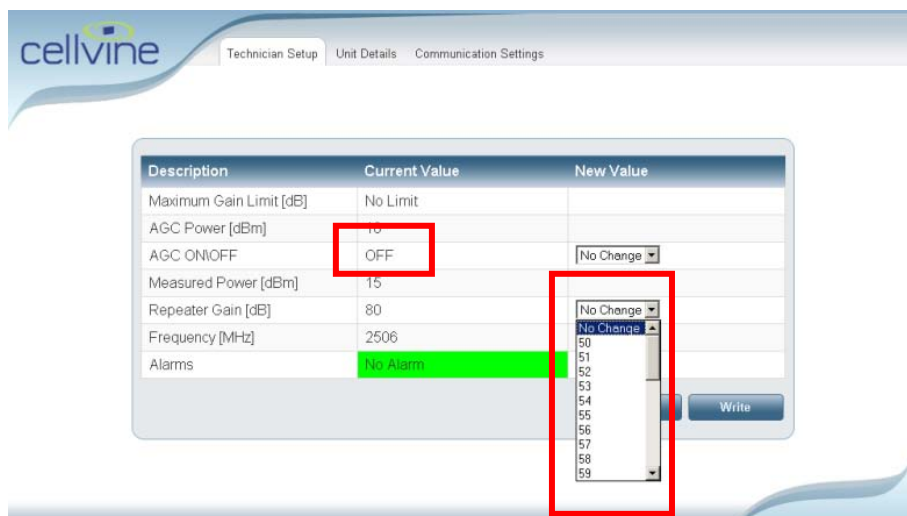
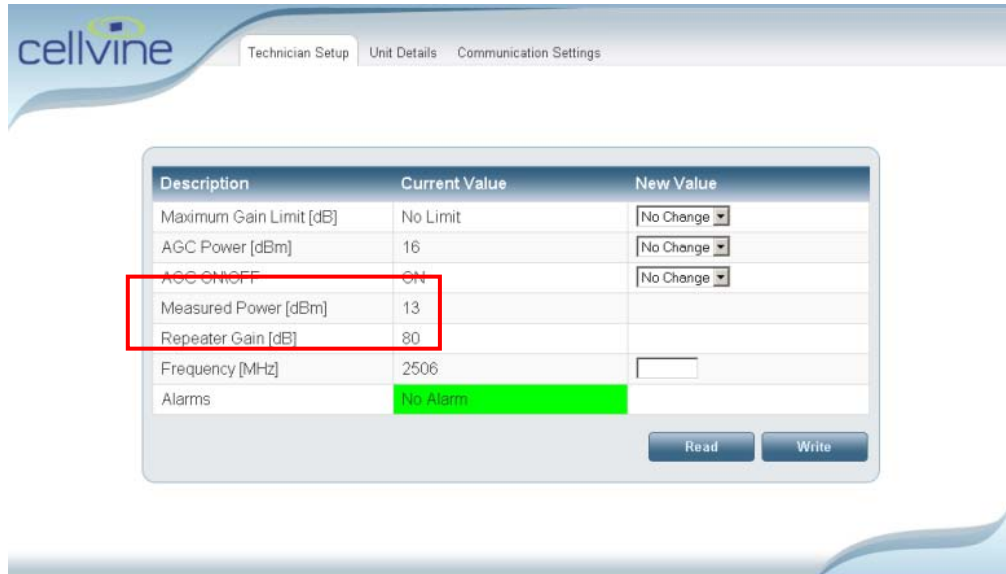


Figure 26: Technician Setup Screen –Fixed Gain setup

5.4 PARAMETER VALUE READOUTS

Measured Power dBm - The Power Parameters display the current forward output power of the repeater.

Repeater Gain – The repeater Gain Parameters display the current Gain of the repeater, and changes in Gain according to the AGC level.



The screenshot shows the 'cellvine' Technician Setup screen. The 'Parameter values' table is highlighted with a red box. The table has three columns: Description, Current Value, and New Value. The 'Measured Power [dBm]' and 'Repeater Gain [dB]' rows are highlighted with a red box. The 'Alarms' row is highlighted with a green background.

Description	Current Value	New Value
Maximum Gain Limit [dB]	No Limit	No Change
AGC Power [dBm]	16	No Change
AGC ON/OFF	ON	No Change
Measured Power [dBm]	13	
Repeater Gain [dB]	80	
Frequency [MHz]	2506	
Alarms	No Alarm	

Buttons: Read, Write

Figure 27: Technician Setup Screen – Parameter values

5.4.1 Filter center frequency location adjustment

One of Cellvine TDD repeater's most advanced features is the customization of the filter center location in the entire TDD band 2500-2690 MHz.

To set the filter center location:

1. Click the *Write* button.
2. Look at the *Current Value* column window and verify the current center Frequency

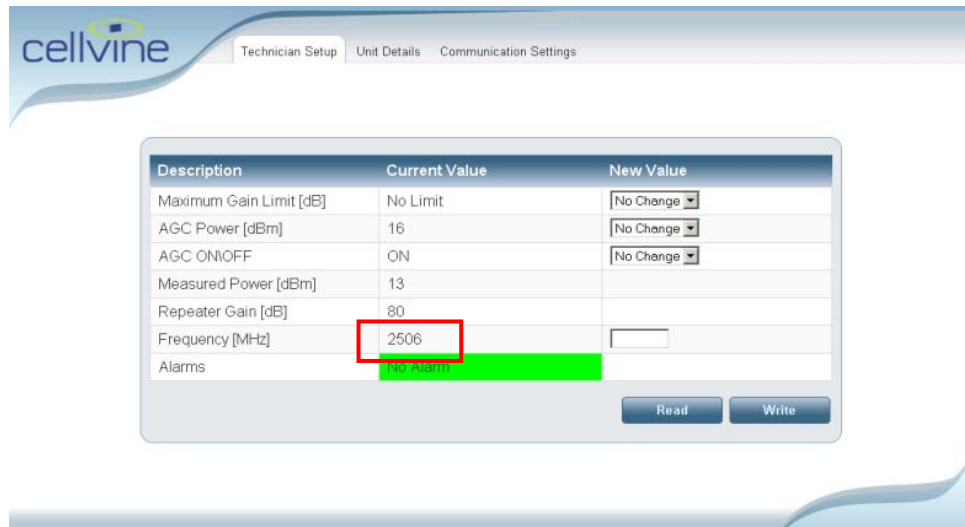


Figure 28: Technician Setup Screen – Frequency values

3. Enter the new center frequency in the New Value window in 200 Khz increments, and click *Write*.

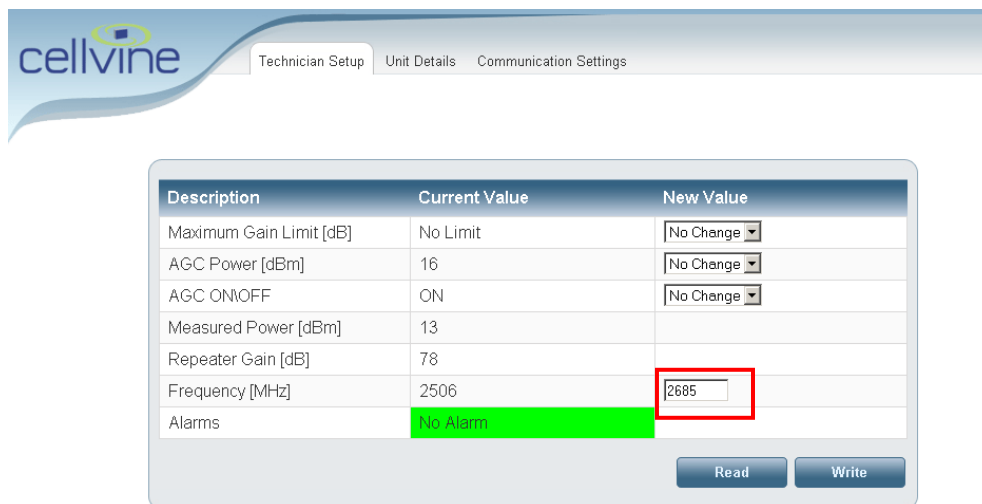
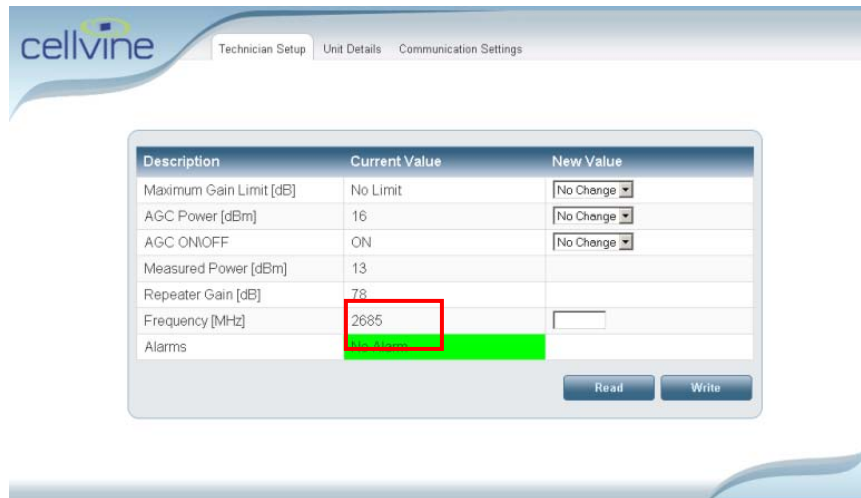


Figure 29: Technician Setup Screen – Adjusting frequency values



4. Make sure that the new frequency value has changed (in the *Current Value* column).



The screenshot shows the 'cellvine' Technician Setup screen. It features a table with three columns: 'Description', 'Current Value', and 'New Value'. The 'Frequency [MHz]' row is highlighted with a red box around the 'Current Value' of 2685. The 'New Value' column for this row is empty. Below the table are 'Read' and 'Write' buttons.

Description	Current Value	New Value
Maximum Gain Limit [dB]	No Limit	No Change ▾
AGC Power [dBm]	16	No Change ▾
AGC ON/OFF	ON	No Change ▾
Measured Power [dBm]	13	
Repeater Gain [dB]	78	
Frequency [MHz]	2685	
Alarms		

Figure 30: Technician Setup Screen – Frequency values

-
-  **Note:** The filter center location remains as it was at the last location setup, also after a power loss to the unit.
 -  The factory setting for the current Filter location is 2685 Mhz
-

5.5 UNIT DETAILS

This screen displays details of the repeater, such as repeater part number (model) and its serial number (optional).



Figure 31: Unit Details Screen

5.6 COMMUNICATION SETTINGS

This screen indicates serial port to which the repeater is connected, and allows switching to another device by clicking on the *New Device* button.

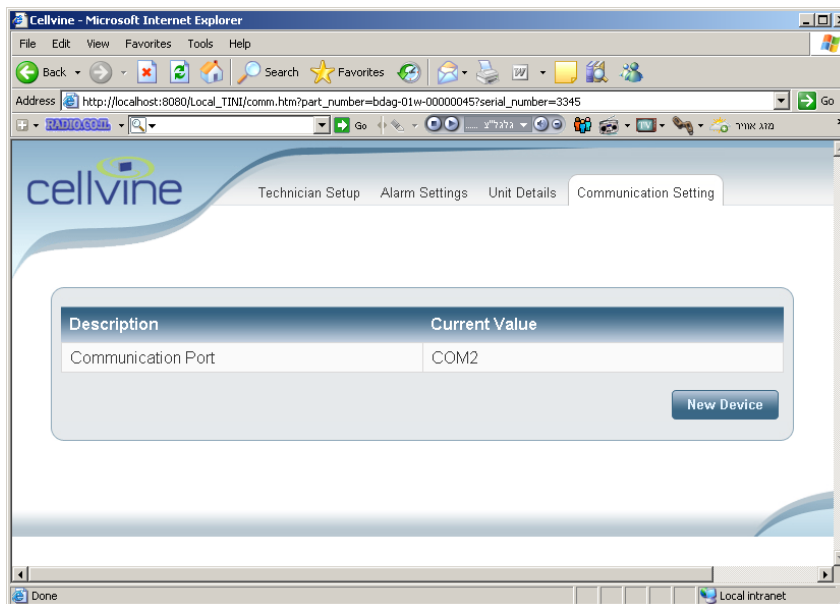


Figure 32: Communication Settings Screen

To switch to another device, click on the *New Device* button. The Technician Setup screen will be open, as shown in Figure 20.

6 ALARMS AND PROTECTION MECHANISMS

Cellvine TDD Mini repeater is equipped with several alarms and smart protection mechanisms that provide alerts, and protect the repeater and the cellular network.

This section describes the default alarms and protection mechanisms.

The alarms are indicated in two ways:

1. LED indication on the side panel of the repeater. For detailed description of LEDs alarm indications please see *Alarm LEDs indications*, page 45.
2. On the Cellvine application screen, in the Alarms Current Value column of the Technician Setup screen.

6.1 LOW SIGNAL ALARM

The Low Signal Alarm indicates that the incoming signal on the Forward path (from the BTS) is low, and the repeater is not performing at maximum efficiency. The alarm is triggered when the value of the forward power is 3 dBm lower than the AGC power parameter setup.

Example: The AGC power is set to 16 dBm and the Forward Power readout in the "Measured Power" parameter screens, is less the 13 dBm. A **"Low Signal"** alarm notification appears in the application window.

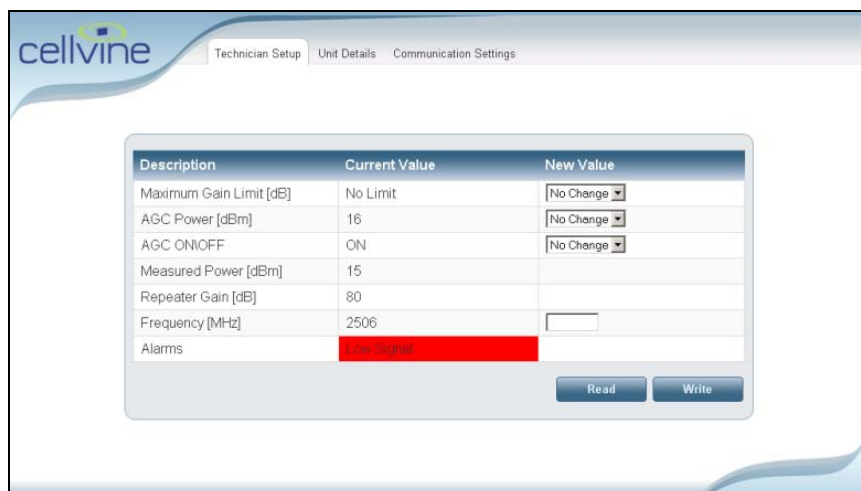


Figure 33: Low Signal alarm

6.2 OVER-POWER ALARM - HIGH SIGNAL PROTECTION

The Overpower mechanism and alarm protects the repeater from unexpected burst of high RF signal, avoiding damage to the repeater and the cellular network.

The alarm is triggered when a high signal is detected at the input of the repeater.

An automatic Gain attenuation will reduce the Gain with up to 30 dB.

If after the maximum Gain reduction is applied, the output power of the repeater is at least 1 dB higher than the "AGC Power" parameter, an "**Over Power**" alarm notification appears in the application window.

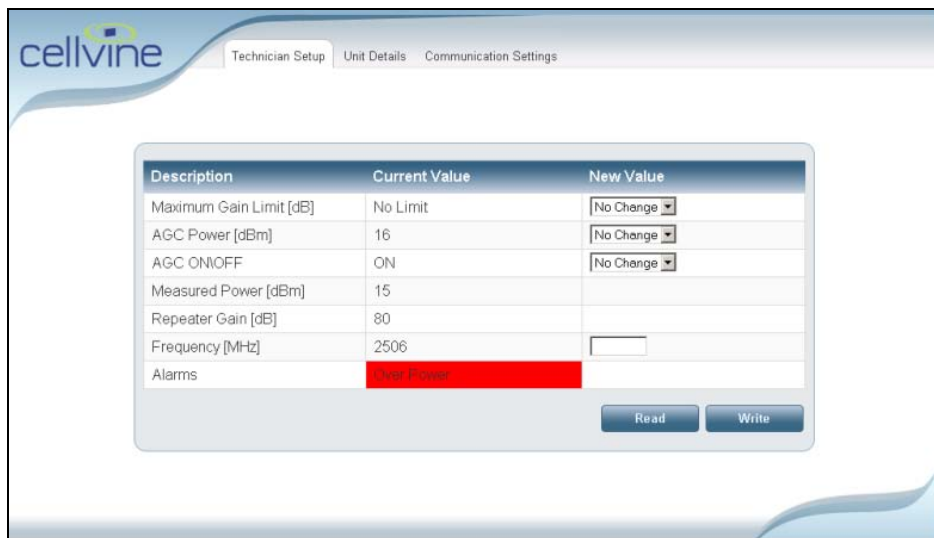



Figure 34: Overpower alarm

6.3 POWER AMPLIFIER SHUTDOWN PROTECTION

The repeater PA shuts down when the repeater automatic Gain control reduces the repeater Gain by 30 dB (maximum reduction), but the incoming signal is still very high and the output power is above the AGC Power parameter in 4 dB.

After a few seconds, the repeater controller shuts down the power amplifier.

The default setting for shutdown duration is 12 seconds, after which the PA will restart.

 **Note:** When Shutdown occurs, the continuous alarm reading is not displayed on the GUI screen, due to power loss.

6.4 SYNCHRONIZATION PCMCIA MODEM

To enhance the TDD Cellular network, the repeater modem must receive a synchronization signal from the Donor BTS at all times.

When the synchronization signal is lost, the repeater will stop enhancing the network until the synchronization signal is received again by the modem.

In this case, a "**Lost Sync**" alarm notification appears in the application window.

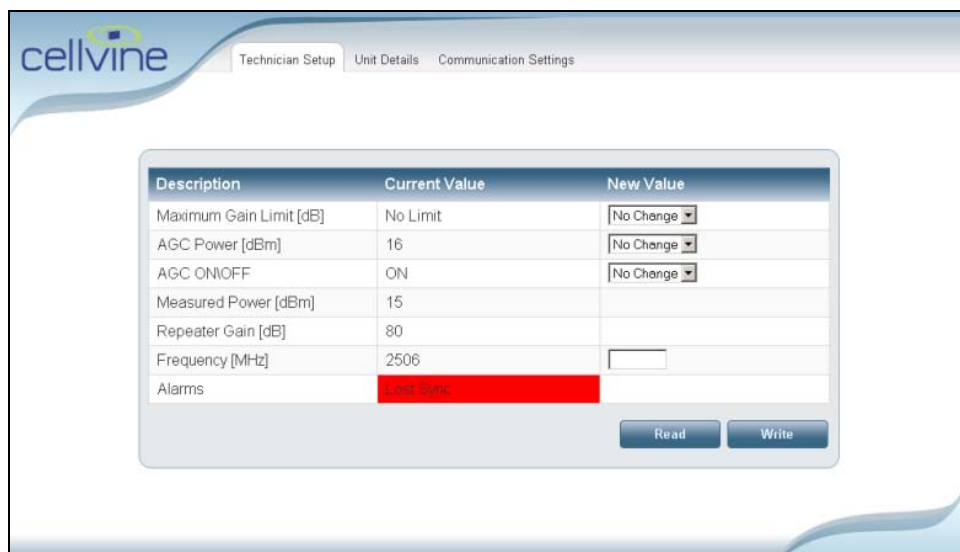


Figure 35: Lost Sync alarm

6.5 ALARM LEDS INDICATIONS









Alarm	LED Status	STEADY ON	BLINK	OFF
Normal Operation	YELLOW		* 	
	GREEN			
	RED			
Low signal	YELLOW			
	GREEN			
	RED			
Overpower	YELLOW			
	GREEN			
	RED			
Amplifier Shutdown	YELLOW			
	GREEN			
	RED			
lost Sync	YELLOW			
	GREEN			
	RED			

Table 7: Alarm LEDs indications

 **Note:** *  - in normal operation the yellow Led might blink if donor signal level will be lower then -67 dBm

6.6 EXITING THE PROGRAM

To exit the program, first close the Internet Explorer window, and then click the "X" button at the corner of the console window.

A message will be displayed, informing you that Windows cannot close the program.

Ignore the message; the program will close itself after a few seconds.