



# Wireless Repeater

## Installation Manual

For 15dBm RF Repeater

Model: Item #18-852

Copyright © 2009 SHIREEN Co. Ltd.

All Rights Reserved

Copyright of this guide belongs to SHIREEN. Co. Ltd.

Reproduction, distribution or revision of part or all of contents in this manual in any form without written permission of SHIREEN Co. Ltd. is prohibited.

The information in this guide is subject to change due to function improvement, design alteration, etc. without any prior notification.



## Cellular Amplifier Repeater

---

### **Safety First**

For your safety and to prevent injury to the installer or the operator, it is essential to read this manual carefully before your new unit is installed and operated.

Personal safety

- 1) This unit powered by small AC adaptor unit. Turn off the electricity supply if you have to do any rewiring or making alterations to wall sockets.
- 2) The equipment should be used only for amplifying mobile(cellular) phone signals and not for any other purpose.
- 3) Should the unit fail to operate, any repairs should be carried out by qualified personnel ONLY.
- 4) Before drilling make sure you know the location of existing electrical wiring to avoid contact with the wiring which could cause an electrical shock and severe the wiring.
- 5) If a ladder is required for install, make sure that the ladder feet are on a flat surface and the ladder is securely fixed. It is highly recommended that you have someone assist you while you are on a ladder.



## Table of Contents

1.	General .....	4
	1.1. Purpose.....	4
	1.2. Scope.....	4
	1.3. Responsibility .....	4
2.	Preparing to install Item # 18-852 .....	5
	2.1. Overview.....	5
	2.2. Check for signal strength .....	6
	2.3. Determine the Needed Coverage Area .....	6
	2.4. Location of Donor Antenna and Service Antenna.....	6
	2.5. Cable Requirements .....	7
	2.6. Power Requirements .....	7
	2.7. Installing Tools Needed .....	7
3.	Installing Item#18-852 .....	8
	3.1. Package Contents.....	8
	3.2. Installing the Donor Antenna.....	9
	3.3. Installing the Service Antenna.....	9
	3.4. Running the feeder cables to the Item#18-852 .....	9
	3.5. Mounting the Item#18-852 .....	9
	3.6. Operating the repeater.....	12
4.	Maintenance and Troubleshooting .....	16
	4.1. Normal Repeater Operation .....	16
	4.2. Abnormal Repeater Operation and Troubleshooting...16	
Appendix A	17	
	<b>Specifications .....</b>	<b>17</b>
Appendix B	19	
	<b>Block Diagram.....</b>	<b>19</b>



## 1. General

The Item#18-852 Cellular Repeater will improve RF coverage for areas in which low signal strength or no signal problem..

### 1.1 Purpose

The purpose of this document is to provide specific In-door Solutions methods and procedures for Field RF Engineering.

### 1.2 Scope

This document covers four (4) main areas :

- 1) Preparing to install the wireless repeater
- 2) Installing the wireless repeater
- 3) Operating the wireless repeater
- 4) Maintenance and Troubleshooting

### 1.3 Responsibility

Field RF Engineering shall be responsible for the subject matter contained here in. The document shall be reviewed on a regular basis to ensure accuracy.

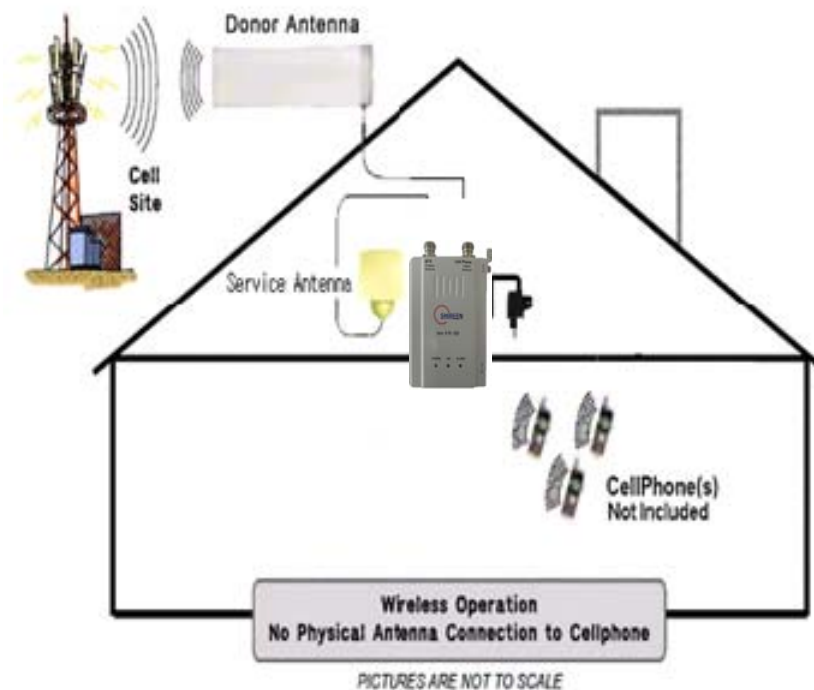


## Cellular Amplifier Repeater

### 2. Preparing to install Item # 18-852

#### 2.1 Overview

The first thing you need to do before installing wireless repeater is to find out where you want to install the repeater. Look at the diagram below for an idea of how the Cellular Repeater works.



- 1) The cellular signal is broadcast to/from the cell site.
- 2) The directional Donor Antenna collects the signal from the cell site.
- 3) The wireless repeater (Item#18-852) amplifies the signal and re-broadcasts it about your home/office.
- 4) Ideally, the Item#18-852 and Service Antenna should be placed central to your home/office in order to maximize coverage. The directional Donor Antenna should be outside your home/office, facing towards the closest cellular site as few obstructions (buildings, cars, trees etc) directly in front of it as possible – an elevated position often helps this.



## 2.2 Check for signal strength

Before installing *the* Item#18-852 in your home/office, make sure that you can place calls on the outside of your home/office or in the attic or at roof level where you install the Donor Antenna. The Item#18-852 can only bring cell phone signals into your home/office if cell phone signals are reaching the outside of your home/office, your attic or at roof level.

The best way to find the best cellular signal around your home/office is simply to walk around with your cell phone on. You should use a cell phone on the network/band whose signal you are trying to improve. The “Signal Strength” meter on your cell phone will tell you where the signal is strongest. The Cell Phone “Signal Strength” meter takes up to 6~10 seconds to update as you move from location to location, so make sure to take a nice long pause in every location you test. The place you choose should either be outside, or in the very least by a window.

If you can reliably make and receive calls outside your home/office, then Item#18-852 can bring the signal into your home/office. If only one signal bar is displayed on your cell phone, indoor coverage will be limited to one small room or area.



Caution :

Cell Phone Signal bars are approximate and vary for each model of phone. The number of bars can fluctuate widely, depending on the exact location of the phone, position or angle of the phone, weather, etc. Most cell phone signal meters updates every 6 to 10 seconds. An increase of only one bar typically indicates a 4x to 10x signal increase. The best indicator of coverage area is your ability to reliably place and receive calls.

## 2.3 Determine the Needed Coverage Area

Identify the location in your home/office where you need signal coverage the most.

The Item#18-852(basically, 15dBm ERP) can cover approximately 1000 ft<sup>2</sup> (coverage varies based on outdoor signal level, building construction, and general installation care). Walls, ceilings or floors will reduce the coverage area.

## 2.4 Location of Donor Antenna and Service Antenna

It is recommended that the Donor Antenna and Service Antenna have approximately 15 feet of vertical separation. If the antenna are too close together, the ISO LED on the Item#18-852 will be flash red indicating a problem(See Troubleshooting section). Place the Donor Antenna as high as possible to capture the best signal.



## 2.5 Cable Requirements

The coaxial cable should be needed to connect the Item#18-852 and antennas. For the best performance, cables must be low loss.

## 2.6 Power Requirements

The Item#18-852 can be plugged into a standard 2-prong 100~240VAC receptacle using the included AC/DC Power Adaptor. The Power Adaptor consumes less than 10W.



Warning

The Item#18-852 Must only be used with the provided power adaptor. Use of other power adaptors will void the warranty and may damage the repeater.

## 2.7 Installing Tools Needed

The following tools are needed to install Item#18-852:

1. #2 screwdriver
2. Cellular phone operation in the band supported by the Item#18-852
3. Drill

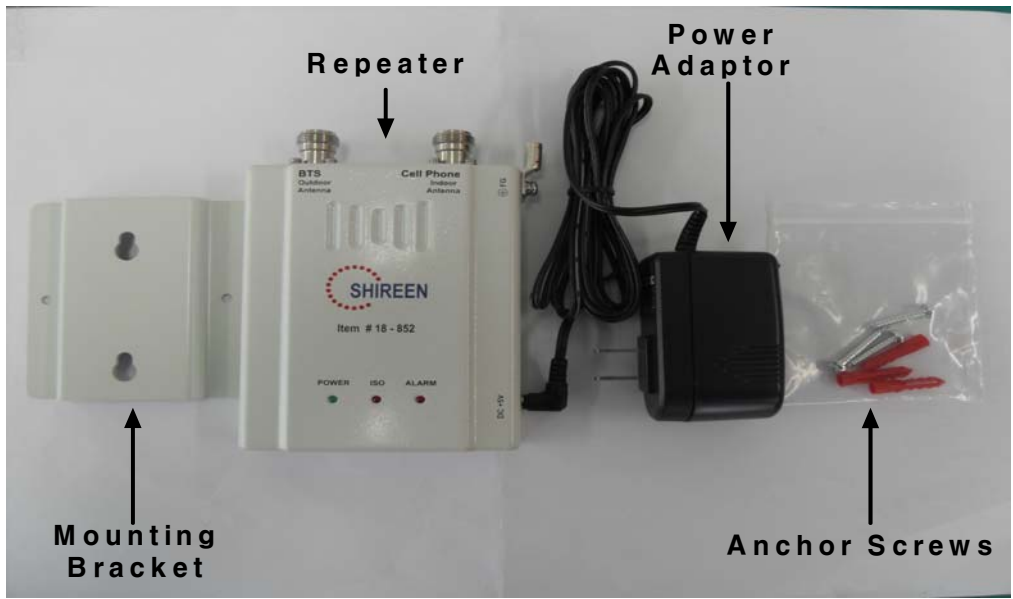


### 3. Installing Item#18-852

#### 3.1 Package Contents

Before you begin, make sure all of the following parts included in the box.

No	Quantity	Part#	Description
1	1	Item#18-852	Repeater (Cellular)
2	1	MB-0001	Mounting Bracket
3	1	SP1013A	AC/DC Power Adaptor
4	3	WP-0001	Wall plug - 2 for wall mount, 1 for reserve
5	3	SC-0001	Anchor Screw - 2 for wall mount, 1 for reserve
6	1	-	Quick Installation Guide



**Caution**

The Donor Antenna, Service Antenna, Feeder Cables and Bracket for antenna mounting should be prepared by regional RF Field Engineer for installing the Item#18-852.





### **3.2 Installing the Donor Antenna**

Follow the antenna installation procedures provided by SHIREEN

### **3.3 Installing the Service Antenna**

Follow the antenna installation procedures provided by SHIREEN

### **3.4 Running the feeder cables to the Item#18-852**

Follow the antenna installation procedures provided by SHIREEN

### **3.5 Mounting the Item#18-852**

The wireless repeater can be installed on a flat surface or wall at the location designated for installation. Use the anchor screws to install the repeater on a flat surface or the wall plugs to install the repeater on a wall.

#### 1) General Installation Guidelines

- The installation location should be within 3.0m of an AC power outlet
- The location should not be touched by animals and people easily to prevent any change of the repeater and performance of the repeater.
- The power adaptor should be fixed harder and tighter in order to prevent unplugged from the socket.
- The antenna port location should have enough space to connect feeder line easily.
- The location where wall's surface is easily broken and damaged should be avoid.

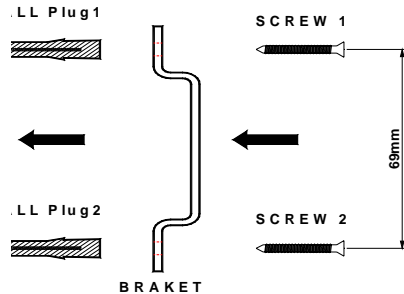
#### 2) Detail Installation Guidelines

Refer to the following illustration to install the repeater on the wall or flat vertical surface.  
Step 1) Bracket installation on the wall or surface



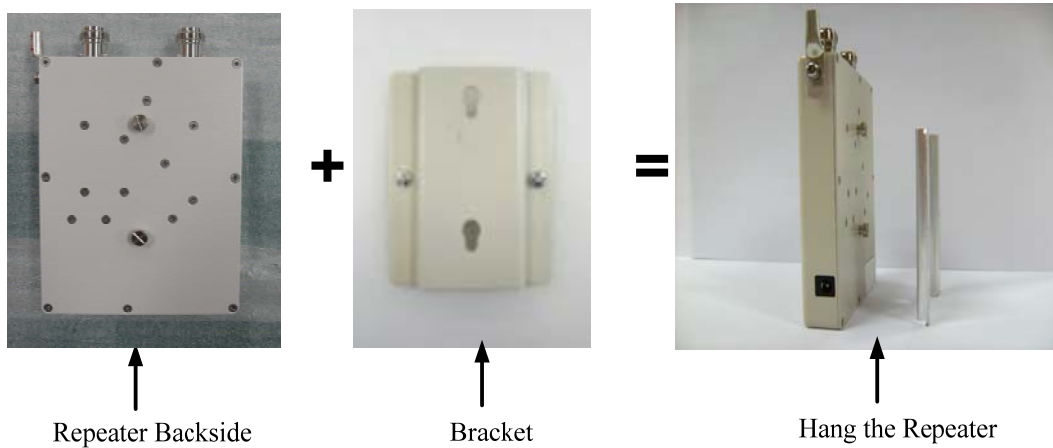
## Cellular Amplifier Repeater

First you should install bracket included. Use the anchor screws to install the repeater on a flat surface or the wall plugs to install the repeater on a wall.



Step 2) Hang the repeater body on the bracket

Using 2 pieces of screws on the back of the repeater body, hang the repeater to the bracket as below picture. And pulling out the opposite direction, the repeater is separated from the bracket.

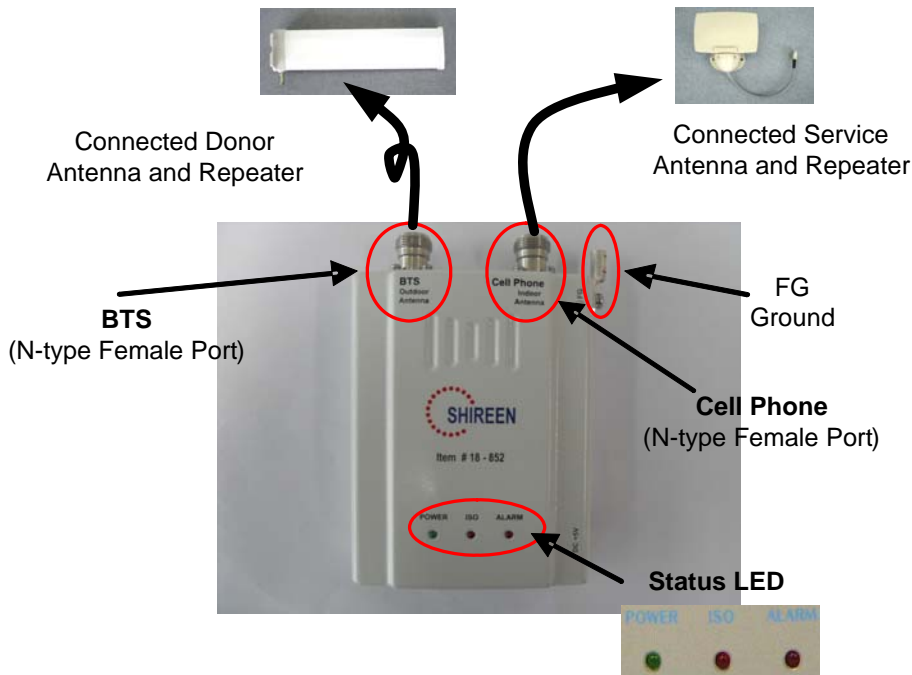


Step 3) Connect antenna feeders to the repeater

Connect the other end of the cable to the connector on the up side of the repeater (marked "BTS"). Finally, connect the service antenna to the connector on the up side of the repeater. (marked "Cell Phone")

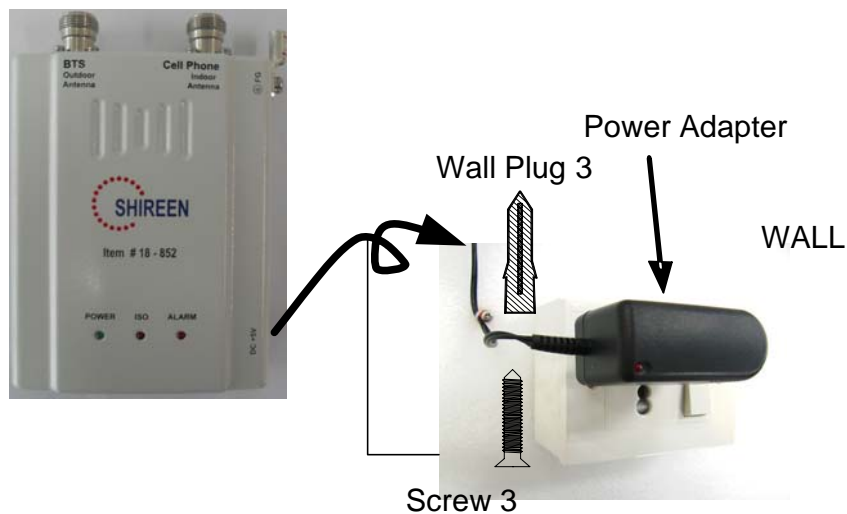


# Cellular Amplifier Repeater



Step 4) Connect the power adaptor tighten

After the repeater installation, connect Power Adaptor to AC outlet, and then make the power cable tough not to un-plugged.



**Warning :**

Make sure the **POWER ON AFTER INSTALLING** the donor and the service antenna.



## Cellular Amplifier Repeater

---

### Step 5) Power On

Plug the DC Power Adapter provided with the Item#18-852 into an electrical socket, and connect the other end to the “DC IN” plug on the side of the repeater. The repeater’s “POWER” light should turn green, signaling the unit is operating.

## 3.6 Operating the repeater

### Basic Concepts: RF Isolation Check

RF isolation is defined by the path loss or attenuation, between the donor and service antenna. It is important to ensure that the two antennas are sufficiently separated, such that the signal transmitted by one antenna is not received by the other. For optimal performance, the separation of the two antennas must provide a path loss of at least 12 dB greater than the gain of the repeater. Therefore, the Item#18-852 requires at least 57~ 72dB of attenuation between the antennas.

In most cases, isolation will be achieved by properly locating the donor and interior coverage antennas(service antenna),respectively. The optimal location for the donor antenna is high above the roof line, and exterior to the building.

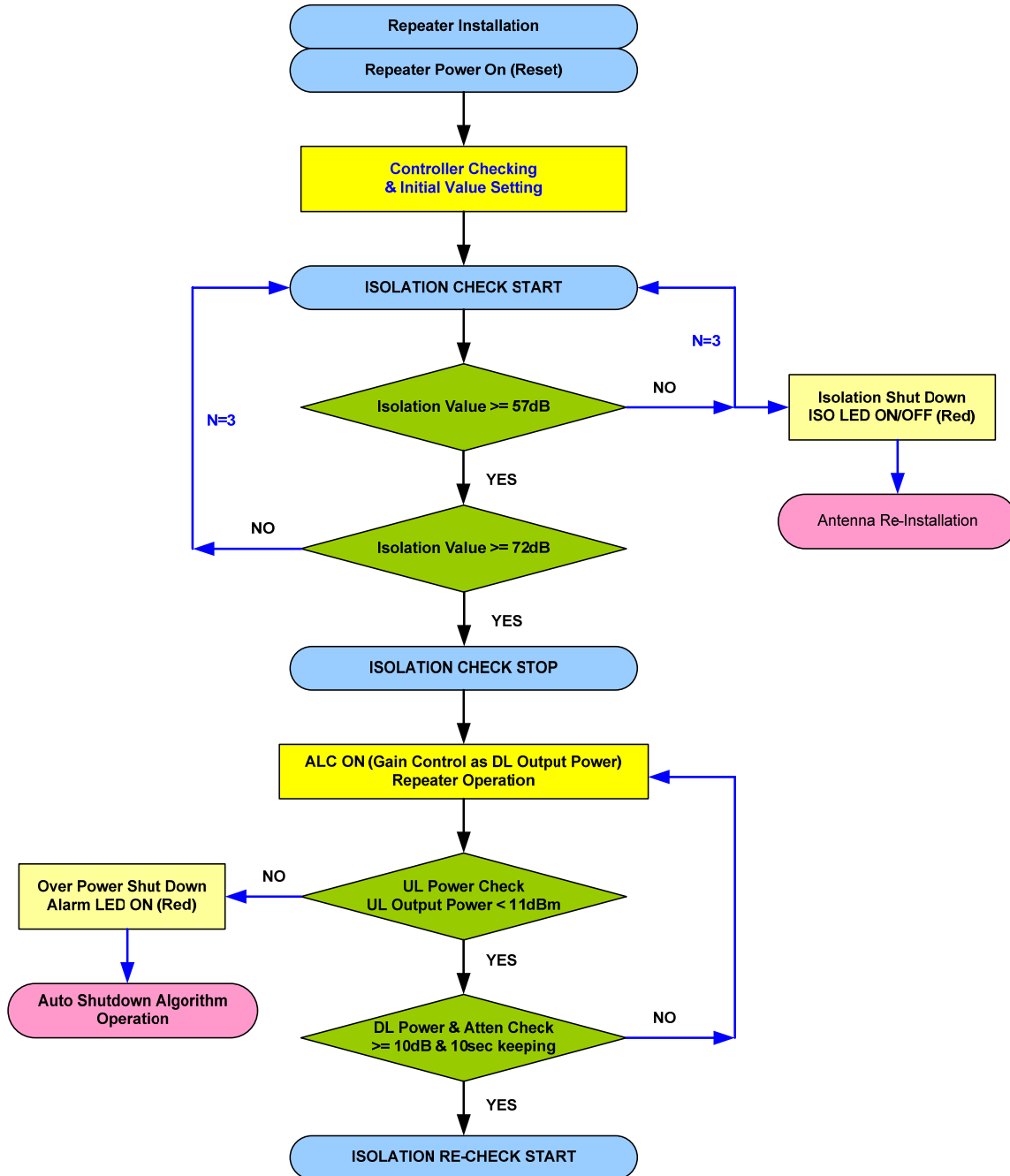
The interior coverage antenna (service antenna) should be installed inside, near or below the ceiling. Following these guidelines should ensure adequate isolation between antennas.

- Never mount the donor or coverage antenna near a window, where Signal can easily pass through the glass
- Mount the donor antenna as high as physically possible to the exterior of the building, maximizing the vertical separation between antennas and pointing away from the building, toward the base station site.
- Install the antennas taking advantage of any existing building structure. Such as brick walls, metal roofs, or multiple wall structures to additionally attenuate the path between them.
- When using directional antennas inside the building to cover corridors and hallways, point the interior antenna away from the donor antenna location.
- In extreme cases, the building configuration may not allow for such separation and isolation. If additional isolation is required, coaxial attenuation may be inserted between the donor antenna and the repeater , with the potential compromise to the coverage within the building
- The flowchart of the isolation check functionality for the Item#18-852 is as follows.



# Cellular Amplifier Repeater

## Repeater Install Flow Chart



Note :

The Item#18-852 is fully automatic. The POWER, ISO, ALARM lights on the repeater are not buttons. There are no buttons to press on the repeater.



## Cellular Amplifier Repeater

---

### Step1) Isolation Check Start

After “POWER ON” the repeater is checking the status automatically.

Be noted that Isolation Checking time is Max. 20secs and LED ISO and ALARM ON/OFF repeatedly.

### Step2) Internal Parameter Setup

It will be check the controller and set up initial parameters value.

DU & UL Power amplifier: OFF

ALC & Shut-down: OFF

### Step3) Isolation Value Check between donor and service antennas.

(a) No Service: After Isolation checking, isolation value has below 57dB, the donor antenna is needed to be reinstalled again to get enough Isolation value.

- When Isolation value is not enough, The LED displays as below;

LED Status: ISO (Isolation) → Red LED ON/OFF Repeatedly

ALARM → Red LED ON

(b) Limited Service: After Isolation checking, in case isolation value is over 57dB and below 72dB, the repeater gain has below formula:

$$\text{Repeater Set Gain} = \text{Isolation Value} - 12\text{dB}$$

(c) Full Service: After Isolation checking, in case isolation value is over 72dB, Repeater Gain is set 60dB.

\* Isolation vs Repeater Gain value is below Figure #1.

### Step4) Isolation Checking on operating

During operating, if the forward is maintained over 10dBm output power and over 10 second, isolation re-checking is operated.

During operating, if Attenuation changing is over 10dB and over 10 second, isolation re-check is operated.



## Cellular Amplifier Repeater

---

### Isolation Value vs Repeater Gain Setting (Figure #1)

Isolation Value (dB)	Repeater Gain (dB)	Service Status
Over 72	60	Full Service
71	59	Limited Service
70	58	“
69	57	“
68	56	“
67	55	“
66	54	“
65	53	“
64	52	“
63	51	“
62	50	“
61	49	“
60	48	“
59	47	“
58	46	“
57	45	“
56	-	No Service



## 4. Maintenance and Troubleshooting

In most cases, problems with the Item#18-852 can be diagnosed using the Repeater Unit & Power Adaptor's LED indicators

### 4.1 Normal Repeater Operation

- AC/DC Power Adaptor LED : Solid RED
- Repeater Unit LED :
  - POWER→Solid GREEN
  - ISO→Off RED
  - ALARM→Off RED

### 4.2 Abnormal Repeater Operation and Troubleshooting

AC/DC Power Adaptor LED	Repeater Unit LEDs			Condition/Troubleshooting
	POWER	ISO	ALARM	
Off or Blinking RED	x	x	x	Power Adaptor is Out Of Order
Solid RED	Solid GREEN	Blinking RED	Blinking RED	Normal condition at Power Up
Solid RED	Solid GREEN	Blinking RED	Solid RED	Insufficient distance (Isolation) exists between the Donor Antenna and Service Antenna. You should turn off power and re-install the donor and service antenna for right isolation distance.
Solid RED	Solid GREEN	Off RED	Solid RED	Signal received from cell tower is too strong. Relocate Donor Antenna to different location to reduce received signal. Remove power for 10 seconds and reconnect power to reset error.
Solid RED	Off or Blinking GREEN	Off RED	Off RED	Repeater Unit is Out Of Order. Contact Customer Service Center.
Solid RED	Solid GREEN	Off RED	Solid RED	Shutdown





# Cellular Amplifier Repeater

## Appendix A

### Specifications

#### 1) General Specification

Parameter		Specification	Note
Power Supply(AC/DC Adaptor)	Input	AC 110~220V +/- 20% only	
	Output	DC +5V/ 2A	
Operating temperature		- 5 °C ~ +55 °C	
Storage Temperature		- 20 °C ~ +70 °C	
Humidity		95%	
Consumption power		50W, max.	
RF connector		N-Type (F)	Link/service antenna port
Alarm LED		POWER (Green LED)	Normal Operating
		ISO (Red LED)	Oscillation Shutdown
		ALARM (Red LED)	Overpower Alarm
$\Delta T$		<20°C	
Size(WxHxT)		100x130x26mm	Unit: mm
Weight		1.0	Unit: Kg

#### 2) Electrical Specification

Parameter		Specification		Note
		Forward	Reverse	
Frequency Range		869~894MHz	824~849MHz	
Input Level		Min. -45dBm	Max. -50dBm	
Gain		60dB (Typ)	60dB (Typ)	Gain Stability $\pm$ 2dB
Gain Ripple		5dB	5dB	Peak to Peak
RF Output Level		Max. +15dBm	Max. +10dBm	4FA
Channel Bandwidth		1.23MHz		
ALC Range		15dB Min.		Both reverse/forward link
Noise Figure		Better 5dB max.		
Shut down Level		+17dBm	+12dBm	Stability : +2dB
In/Out V.S.W.R		2 : 1 max.		
Spurious Emission	Fc $\pm$ 750KHz	-45dBc, min @ 30KHz RBW		Tested at 1FA Tested at 4FA
	Fc $\pm$ 1.98MHz	-60dBc, min @ 30KHz RBW		
In Band Rejection		$\pm$ 12 MHz < -60dBc		Band edge
Group Delay		< 1us		
Waveform Quality Factor		>0.97		Forward



# Cellular Amplifier Repeater

## 3) Test Report

### SHIREEN # 18- 852 Test Report

Tested date	2010-04-09	Company	RFM WIRELESS
Tested by	JINI KIM	Serial No	C1510040421

No	Parameter	Specifications	Forward	Reverse
1	Gain Ripple	$\leq 5\text{dBp}_p$	2.25	3.18
2	Group Delay	$\leq 1\mu\text{s}$	0.09	0.06
3	In / Out VSWR	$\leq 2 : 1$	1.46    1.42	1.52    1.67
4	Waveform Quality Factor	$> 0.97$	1FA	0.99936
5	RF Output	Forward +15dBm (4FA) Reverse +10dBm (4FA)	15.09	10.37
6	Spurious Emission ACPR	$F_c \pm 750\text{KHz}$	- 56.76    - 58.85	- 68.55    - 68.18
		$F_c \pm 1.98\text{MHz}$	- 62.93    - 63.24	- 69.49    - 69.34
7	In Band Rejection	$F_c \pm 12\text{MHz}$	84.71    78.59	83.95    89.23
8	ALC Range	15dB MIN	Both Reverse / Forward	15.03    PASS
9	Shut down Level	Stability $\leq 2\text{dB}$	Forward +17dBm Reverse +12dBm	PASS    PASS
10	Noise Figure	5dB max		3.62
11	Isolation check	53    S/G Input : 50dBm    Shut down	PASS	PASS
		70    Gain 60 ± 1	PASS	PASS
		55    Gain 45 ± 1	PASS	PASS



# Cellular Amplifier Repeater

## Appendix B

### Block Diagram

