

## Home Booster



### HB-20

Home Booster 800 MHz

### INSTALLATION AND OPERATION MANUAL

5700 9004 050

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#### Proprietary Information

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## PREAMBLE

In cellular systems boosters / repeaters are used, to enhance the coverage of a Base station in a region where, due to topological conditions, poor field strengths disable communication. SHYAM is a leading manufacturer of boosters / repeaters. These boosters / repeaters provide excellent electrical characteristics, are lightweight and easy to install.

Any intervention has to be performed by authorized persons only. If you need technical assistance, please contact at the following address:

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Under consideration of all references given in this manual, the repeater should be taken into service without any complications and should operate trouble free for a long time.

However we have country wide after sales support network to assist you if required.

Please visit to our web site [www.shyamtelecom.com](http://www.shyamtelecom.com) for our country wide after sales support offices.

## About the manual

The “**Installation and Operation manual**” is intended to be used for SHYAM HB-20 Booster installation. It contains the general guidelines for the field engineers /technicians. Read carefully before starting the installation.

## 1.0 About the manual

The “Installation and Operation manual” is intended to be used for SHYAM HB-20 booster installation. It contains the general guidelines for the person installing the HB-20 booster. Read carefully before starting the HB-20 booster installation.

## 2.0 Important Safety Information

The HB-20 booster has been designed for maximum safety when installed and operated according to the instructions in this manual. Refer to all safety instructions as per the antenna installation instruction sheets.

Do not bypass any of the safety features with the equipment provided, nor operate the system in an inappropriate environment.

**WARNING!** Installation of antennas near power lines is dangerous. For your safety, follow all installation directions and keep safe distance from any high voltage power lines that could result in shock or loss of life.

**WARNING!** This equipment complies with FCC & IC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The signal booster with server antenna must be installed to provide minimum 20 cm separation distance between the server antenna to the body of user or near by person. The donor antenna used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 1.5 meters from all persons during normal operation.

Additional wiring required to install the HB-20 system should comply with national or local governing Electrical Codes. Indoor RF coaxial cable installations should comply with local Electrical Code requirements.

The HB-20 booster is designed for indoor application. The housing is not waterproof, so please keep it away from water, rain and any chemical liquid.

Do discharge the static before you touch the connectors of the booster.

Do not open the module inside the booster unless you are authorized.

The power supply unit in the HB-20 booster is supplied from the mains (primary AC power) that contains dangerous voltage level which will cause electric shock, Please turn off the mains before you install / uninstall the booster.

The primary AC power should be in the range of AC90-240V, 50/60Hz. Booster will be damaged if the primary AC power is out of the range.



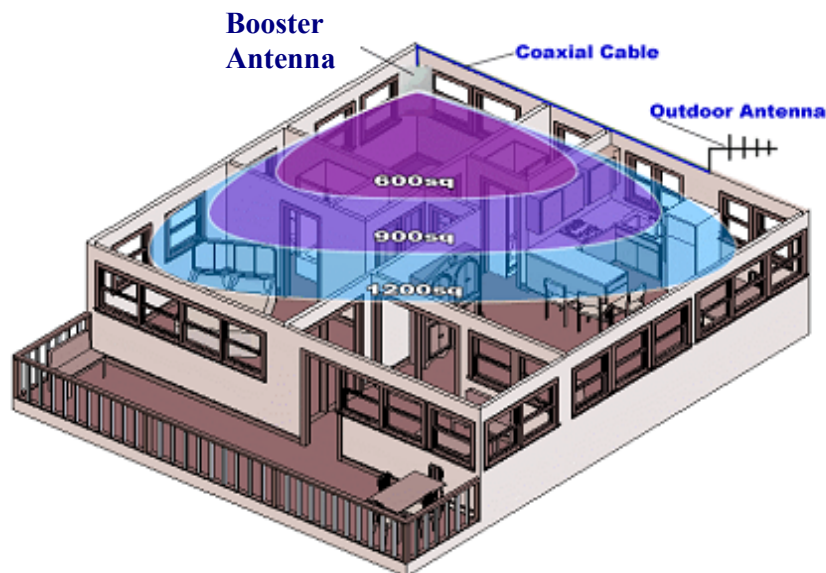
The RF electric performance of the HB-20 booster conforms to ETSI requirement of the inter modulation and spurious emission. It avoids the interference problem.

### 3.0 Introduction: Booster Theory / Background

In mobile cellular communication system, boosters provide the radio frequency (RF) coverage to areas, which either lack signal, or the required signal strength for adequate mobile phone performance. To the typical user, this translates to the inability to place or receive mobile phone calls in or out of the area, and in most cases will result in a dropped call while entering into the poor coverage area.

Insufficient wireless coverage can occur both indoors and outdoors, and may include indoor areas such as office buildings, parking garages, apartment buildings, shopping malls, and residential homes. Outdoor areas are degraded by geographic topologies such as mountains, valleys, dense foliage and high rising urban landscapes which can easily degrade or obstruct the cell site's signal from the mobile phone.

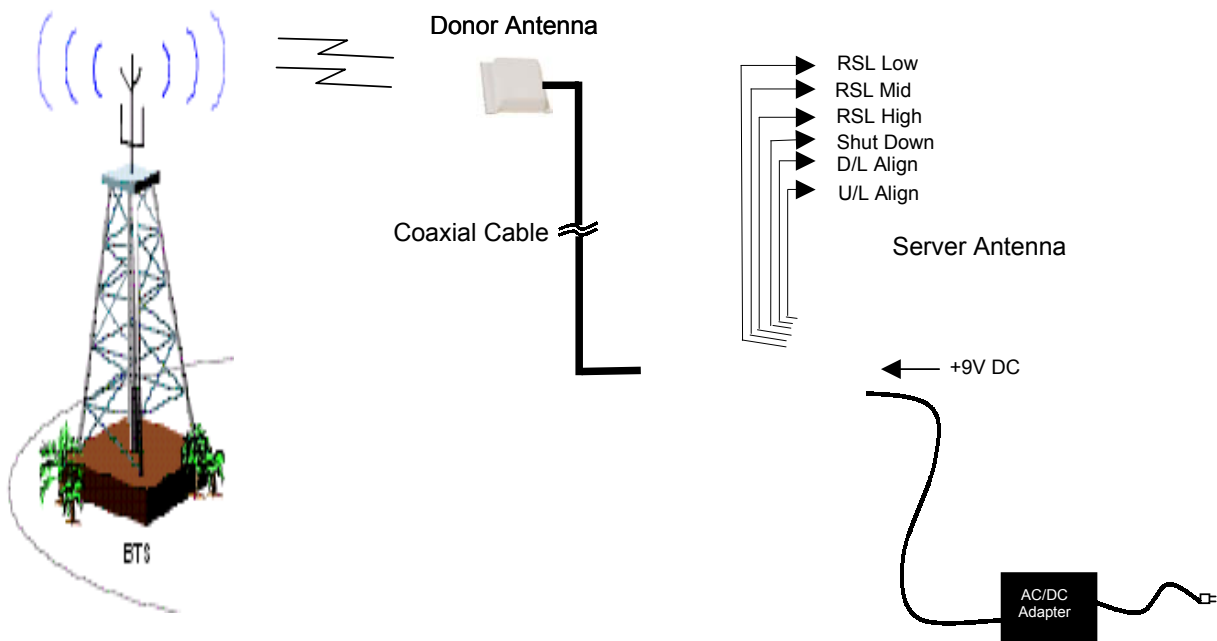
The weak coverage problem can be solved by installing an active booster system, designed for use in a multitude of installation configurations. Booster systems provide an effective solution by redirecting, filtering and amplifying the available signal at the donor antenna, into the weak coverage area, through a properly selected interior coverage antenna. The illumination of the weak coverage area allows the user's handset to operate as intended within the building or weak coverage area, while maintaining the user's call clarity and quality, which reduces service complaints and potential subscriber churn.



**Figure 1:** Typical Booster/Coverage Configuration

## 4.0 Description of HB-20 Booster installation Kit

The **HB-20 booster** system contains an automatic power control, bi-directional amplifier (BDA) supplied along with a **donor antenna** (highly directive outdoor antenna) and **server antenna** (indoor omni directional antenna), specifically designed for interior configurations. The donor antenna must be pointed toward the cell of the base station from where the signal is to be picked up and is usually mounted on the exterior of the building so as to receive the maximum forward signal level from the base station. The indoor antenna of HB-20 booster provides RF signal in all directions downward and outward from the installation point.. A adopter is supplied with HB-20, powered by universal 90/240 VAC mains supply. A standard length of 7 mm RF coaxial cable with connectors is supplied to connect the donor antenna and HB-20 booster. Any other RF coaxial cable length is also available optionally, on request.



**Figure 4.0 : Installation Diagram of Home Booster**

### List of Installation Kit

1. Donor Antenna – Patch Antenna (Optional 0 dbi)
2. Server Antenna - Whip Antenna. (Optional 7 dbi )
3. RF coaxial cable with SMA to SMA (M) connector. (Optional)
4. Booster HB-20.
5. AC/DC Adapter (9VDC/2.0 Amp.).
6. Mounting Kit.
7. Installation and Operational Manual

## 5.0 System Design and Setup

The HB-20 is designed to provide optimal coverage for areas of 500 Sq Meters (5,000 sq. ft) to 1,000 Sq Meters (10,000 sq. ft). However, performance also depends on the amount of in-building shadowing, and the available forward signal level at the donor antenna. Typical coverage is usually planned for relatively small areas such as large conference room or several adjacent rooms in smaller office areas. Indoor coverage varies greatly due to the nature of various building construction techniques and materials.

The system design is quite simple & straightforward. The signal from the base station (of the selected Operator) is picked up, preferably on the rooftop.

The built in receive signal level indicator in HB-20 booster helps in aligning the donor antenna towards the selected base station & it always shows the received signal level from the base station. It is imperative to monitor the received signal level from the base station, also called downlink signal. Downlink signal may change if some high building, trees or any other obstruction comes in the way of line of site (LOS) between the BTS & the Donor antenna. This may reduce the downlink received signal level & will result in poor service.

## 6.0 Installing the HB-20

### 6.1 Pre-installation considerations

1. Once the expected coverage area is determined, identify the installation location for the donor antenna and HB-20 booster. Ensure that the donor antenna has a direct line-of-site to the service provider's base station.
2. **HB-20 installation site location criterion**
  - i. A cool, dry location, away from other heat generating appliances or equipment.
  - ii. Accessibility to electric power point.
  - iii. Flat, structural mounting surface.
  - iv. Accommodation for the indoor antenna providing line-of-site coverage to as much of the coverage area as possible.

### 6.2 Installation Tools

You will only need the standard wrenches/hammer/screwdrivers/pliers set for installing the HB-20 booster and donor antenna.

### 6.3 Installation Procedure: Do It Yourself

To install HB-20 booster, follow the steps as mentioned below:

1. Locate weak signal areas by moving around with a mobile phone and the SIM card of the cellular operator, and check the signal level indicated by the number of bars on the mobile phone display.
2. **Similarly, locate donor (outdoor) antenna position by observing the maximum signal received from the base station.**
3. Unpack the equipment supplied and check as per the packing list.
4. Mount the donor (outdoor) antenna at the position selected (ref 2 above).
5. Mount the HB-20 booster in the area of weak signal (ref 1 above)
6. **Route the RF coaxial cable and interconnect it with the donor antenna and HB-20 booster, which is supplied in the installation kit.**
7. **Ensure that the three-pin power point has proper earthing connection, before switching on the power to booster.**

Please remember the following important points:

- i. **The RF cable must not be kinked, cut or damaged in any way.**
- ii. **Connect the RF cable to the donor antenna taking care to avoid cross threading or stripping. The RF connections should be snug and tight.**
- iii. **Seal the outdoor connectors with waterproof sealant (such as M-seal) or the appropriate weather tight boot.**

### 6.4 Power Startup / Alarm Checks / Coverage Testing

1. Plug in the AC/DC Power Adapter power cord to AC main and other side DC plug insert 9V DC socket in Home Booster.
2. When the booster is ON initially all the LED's will blink two times.
3. The system will automatically control the attenuation to keep the both uplink and downlink output power at a constant level of 10dBm. The system will insert or release the attenuation by 1dB step.

4. Alarm indication LED will glow red colour, After inserting all the attenuation the output power is greater than the desired level ( 10dBm ) the system will shutdown the PA for 30 seconds and restart . If so, refer annexure 2 for rectification or contact SHYAM technical support team on +91-11-25798544 or email at [repeater@shyamtelecom.com](mailto:repeater@shyamtelecom.com)
5. Review the intended coverage area according to the site installation plan. Using a mobile NOKIA handset loaded with NET engineering software and the SIM card of cellular operator, measure and monitor the signal level at various points within and around the perimeter of the coverage area.

## 6.5 Display Details of HB-20

|                                                                             |                                                                                     |                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U/L ALIGN                                                                   |    | <ul style="list-style-type: none"> <li>UL ALIGN LED will glow after DL ALIGN is completed.</li> </ul>                                                                                                 |
| D/L ALIGN                                                                   |    | <ul style="list-style-type: none"> <li>DL ALIGN LED will blink when the system is in the Downlink alignment mode. When the alignment is over the DL ALIGN LED will glow.</li> </ul>                   |
| SHUT DOWN                                                                   |  | <ul style="list-style-type: none"> <li>SHUT DOWN LED will glow when the downlink power is more than the desired level. The systems will shutdown the PA and then restart after 30 seconds.</li> </ul> |
| <b>Downlink RSSI is monitored continuously and display through 3 LED's.</b> |                                                                                     |                                                                                                                                                                                                       |
| RSL HIGH                                                                    |  | <ul style="list-style-type: none"> <li>When the RSSI is greater than -40, glow the RSL High LED.</li> </ul>                                                                                           |
| RSL MID                                                                     |  | <ul style="list-style-type: none"> <li>When the RSSI in between -60 &amp; -40, glow the RSL Mid LED.</li> </ul>                                                                                       |
| RSL LOW                                                                     |  | <ul style="list-style-type: none"> <li>When the RSSI is less than -60, glow the RSL Low LED.</li> </ul>                                                                                               |

**Annexure 1****Technical Specification: Boosters HB-20**

|                                                                               |                                                                                                                    |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Parameter                                                                     | HB-20 : <b>800 MHz</b>                                                                                             |
| Frequency Range                                                               | Uplink : 824-849 MHz<br>Downlink : 869-894 MHz                                                                     |
| Frequency Bandwidth (Ver. A)                                                  | Full band of 25 MHz                                                                                                |
| Frequency Bandwidth (Ver. B)                                                  | 6.2, 15, 20 or 25 MHz (other version available upon request)                                                       |
| Operator, State Selective<br>Version OSS                                      | *Specific models for different operators world-wide<br><b>Contact SHYAM with coverage area &amp; Operator name</b> |
| Nominal Gain                                                                  | 70 dB                                                                                                              |
| Nominal 20 db BW                                                              | 36 Mhz                                                                                                             |
| Automatic Gain adjustment                                                     | 31 dB steps of 1 dB                                                                                                |
| Auto Power Control range                                                      | 10 dB (from 6dBm to 16dBm)                                                                                         |
| DL Power Output                                                               | 16 dBm                                                                                                             |
| UL Power Output                                                               | 16 dBm                                                                                                             |
| Inter Modulation Products<br>(two tone method, +7 dBm per tone)               | $\leq -36\text{dBm @ } 9 \text{ KHz} - 1 \text{ GHz}$                                                              |
| Spurious Emission (ETS 300<br>609 4/GSM 11.26) and (ETS<br>300 577 GSM 05.05) | $< -36\text{dBm @ } 9 \text{ KHz} - 1 \text{ GHz}$                                                                 |
| Noise Figure                                                                  | 8dB Max.                                                                                                           |
| V.S.W.R                                                                       | 1.5 Max.                                                                                                           |
| Power adapter (9V DC, 2 Amp.)                                                 | AC90-240V, 50/60 Hz                                                                                                |
| RF Connector (Donor and<br>Server Antenna)                                    | SMA (F) TYPE                                                                                                       |
| Dimensions (HxWxD) approx.                                                    | 86 x 170 x 40 mm                                                                                                   |
| Weight Approx.                                                                | 0.8 Kg.                                                                                                            |
| Operating Temperature Range                                                   | -5° C ~ 55° C                                                                                                      |

## Annexure 2

### Trouble shooting procedure HB-20

| Conditions                                                                                            | Possible Reasons & Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. Initially all the LED's will blink two times</b>                                                | <ol style="list-style-type: none"> <li>1. Check the power cord and the AC power socket</li> <li>2. Please note that the AC main power has to be within the range 90~240VAC</li> <li>3. Verify the D.C Adapter output voltage is 9V.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>B. Signals are not amplified after completing the installation</b>                                 | <ol style="list-style-type: none"> <li>1. Check all the connectors of the repeater system for proper connections. The "BTS" connector has to be connected to donor antenna, and the "MS" connector has to be connected to server antenna.</li> <li>2. The poor isolation between donor and server antenna will cause system oscillation and it may damage the amplifier of the repeater. <b>It is to note that the repeater gain should be at least 10 db lower than the antenna isolation.</b></li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>C. The system performed well in the beginning but after few days the performance has degraded.</b> | <ol style="list-style-type: none"> <li>1. The received signal level from the base station might have degraded due to environmental changes such as new building construction and so on. If so, please follow the suggestions below:                         <ol style="list-style-type: none"> <li>a. Try to re-align the donor antenna towards the base station</li> <li>b. Adjust the gain attenuation of the Up or Down link direction</li> <li>c. Relocate the donor antenna to solve the problem</li> </ol> </li> <li>2. <b>RF Cable problem:</b> Check the RF cable for physical damage by rats etc. Also check for sharp bends or RF cable pressed. Under these conditions, RF signal losses could have increased. If so, replace RF cable.</li> <li>3. <b>Indoor structural change:</b> The signal level will vary according to the interiors. Look for any interior changes subsequent to the repeater installation or site survey. If so, adjust the gain of repeater or re-align the server antenna without affecting the existing coverage.</li> </ol> |
| <b>D. Alarm indication LED will glow in red colour.</b>                                               | <p>It indicates that the received signal level from BTS is high or forward / reverse gain of repeater is high. If alarm persists for a long time contact SHYAM technical support team.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## IC Statement

**1. Quality Norms :** The Testing of the equipment is carried out as the norms laid in IC standards.

**2. Labeling :** Home Booster model HB-20-800 when sold in Canada will have

- (a) The certification number, prefixed by the term "IC: ",  
i.e. IC: 5751A-HB20800
- (b) The manufacturer's name, trade name or brand name,  
i.e. SHYAM TELECOM
- (c) A model name or number, i.e. HB-20-800

### **3. External Control**

The Home Booster does not have any external controls accessible to the user for any adjustments, to operate in violation of the limits prescribed in this Standard. Furthermore, information on internal adjustments, reconfiguration or programmability of the device shall only be made available to service depots and agents of the equipment supplier and NOT to the public.

**4. Exposure of Humans to RF Field :** The equipment conform to RSS-102

**5. Multi carrier operation :** Rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3 to 3.5 dB. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

**For Customer Use Only .....**

— **SHYAM Telecom Ltd.**

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