Saankhya Labs

BROADCAST RADIO HEAD (40 W)

User Manual & Installation Guide

Ver 1.0

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FCC Regulatory Information

FCC ID : 2AUUC-YOGA40W00

§15.19

This device complies with part 15 of the FCC rules, Operation is subject to the following two conditions:
(1) This device may not cause harmful interference
(2) this device must accept any interference received, including interference that may cause undesired operation.

§15.105

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 own expense.

§15.21

Any changes or modifications not expressly approved by Saankhya Labs could void the user's authority to operate the equipment.

FCC RF Exposure

RF Exposure compliance will be determined during the site licensing process.

USA Contact Information

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| Equipment	Quantity
BRH Unit	1 Nos
Mounting Brackets (Pole mount) 1. Pole Mount Unit Clamp - 1 - YOGA BRH - 2 Nos 2. Pole Mount Unit Clamp - 3 - YOGA BRH - 2 Nos 3. M10X25 Hex Bolt, Fully threaded, Stainless Steel - 4 Nos 4. M10X140 Hex Bolt, Fully threaded, Stainless Steel - 4 Nos 5. NUT HEX SST M10 - 8 Nos 6. WASHER PLAIN M10 – 4 Nos 7. M10 SPLIT SPRING LOCK WASHER - 4 Nos	1 Set
Mounting Brackets (Wall mount) 1. Wall Mount Clamp - YOGA BRH - 2 Nos 2. M10X25 Hex Bolt, Fully threaded, Stainless Steel - 4 Nos	1 Set
Installation & Usage Manual	1 Nos
M6x10 Screws (Lightning Ground) - 2 Nos	1 Nos
IP65 RJ-45 Plug	1 Nos
IP65 Optical Fiber Connector Plug	1 Nos

Broadcast Radio Head (BRH) solution is a new paradigm for the Next Gen Digital Terrestrial Transmission (DTT). Deployed in a Low-Power Low Tower (LPLT) topology, it can create uniformly high signal strength to support Direct to Mobile (DTM) indoor reception.

LPLT enables efficient spectrum reuse and can also supplement conventional High-Power High Tower (HPHT) deployments.

The Low-Power Low Tower (LPLT) networks for which this BRH Sub-system has been developed to provide Broadcast services in High Population Density/Low Population Density Areas.

The BRH Unit operates in 470 MHz to 608 MHz band while avoiding interference to the other licensed operations.

BRH Deployment Diagram
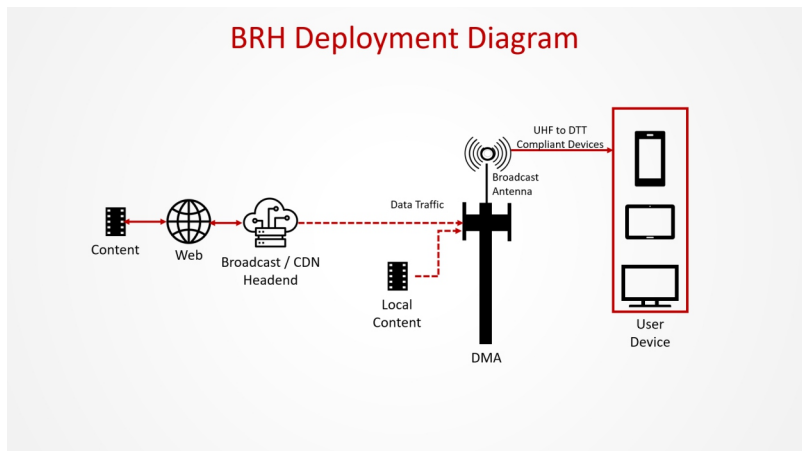
| Parameter	Specification
Operating Frequency Band (MHz)	Frequency 470 MHz to 608 MHz
Channel Bandwidth (MHz)	6 MHz per selected channel
Transmitter Average Output	46 dBm ± 1 dB
Input Voltage	-48 V
Maximum Power Consumption	300 W
Enclosure Grade	IP65 (To be certified)
Size and weight	580 x 300 x 150 mm (H x W x D), Weight 20 (+/- 1) Kg
Supported output modulation	ATSC 3.0
Operating Temperature Range	-40° C to +50° C
Input Signal	DVBS2 (L - band Frequency from 950 MHz - 1450 MHz) used to be encapsulate A324 Compliant STL and EMS connection on RJ45 Ethernet
	A324 Compliant STL stream over RJ-45 Ethernet with in-band EMS connection
	A324 Compliant STL stream over Optical Fiber and EMS connection on RJ45 Ethernet

| SL#	Connector Name	Label on Box	Connector type
1	GPS Input	GPS	N Type Female
2	Optical Fiber	OPTICAL	Duplex Single mode LC connector
3	DVB-S2 L-Band Input	DVB-S2	F type Female
4	Fuse	FUSE	-
5	8 Pin Power supply connector	POWER	AMPHENOL (C091 31C008 100 2) Power Supply Connector
6	Ethernet Plug	RJ45 INTERNET	RJ45
7	Antenna Output	RF OUT	7/16 DIN Female Type
8	Status LED	STATUS	-
9	Earth Terminal	Earthing Symbol	-
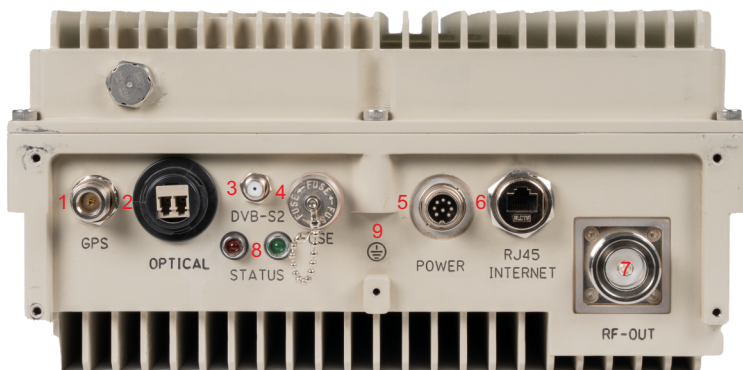
Below diagram describes the pin configuration for input power supply of +48V and -48V towards the Enclosure side.
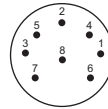
Yoga - Enclosure side

Below diagram shows the pin configuration for input power supply on the cable/connector side
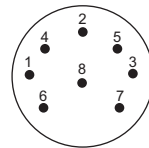
Yoga - Cable/Connector side

Power connections to be followed is according to the table,

| Pin Num	Signal When using -48V Supply	Signal When using +48V Supply
1	-48V	0V
2	-48V	0V
3	0V	+48V
4	-48V	0V
5	0V	+48V
6	-48V	0V
7	0V	+48V
8	0V	+48V

Caution: Please verify the voltage supply on the input connector plug to match above configuration before connecting to the BRH Unit.

Pole mounting provision for 60mm diameter to 150mm diameter poles (Vertical mounting)

1. Securely fasten all screws on the Mounting brackets of the BRH Unit
2. Metal Tie Wrap on all Mounting brackets should be securely fastened around the pole during Mounting
3. Connector side of BRH Unit must be facing down
4. All the connectors below should be plugged in first
       a. GPS Plug
       b. ATSC 3.0 Output with Antenna
       c. Earth Terminal
       d. Ethernet plug
       e. Satellite Input (Optional)
       f. SFP Optical Fiber (Optional)
5. Active Power plug with -48V input voltage with power capacity up to 300W should be connected to the BRH Unit
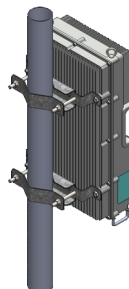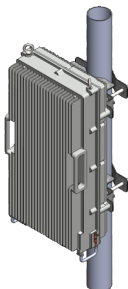
Autocad diagram showing Mounting brackets assembly on BRH unit
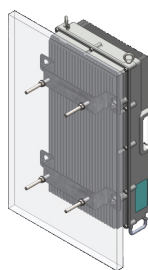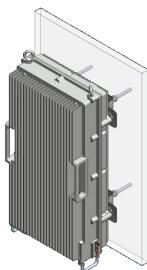
Autocad diagram showing Wall mounting brackets with BRH unit

EMS Provisioning

1. Please login to the EMS website
2. Refer to section, 'Provisioning' -> 'Devices' -> 'Add device'
3. The MAC Address of the Unit is available on the Unit for your reference
4. Once the Device is provisioned and shows up in the "BRH DEVICES" list EMS provisioning procedure is completed

Note: Refer to EMS User Manual for more details

1. Once the Unit is installed and provisioned in EMS, complete below steps before powering ON the Unit,

2.Check if the Ethernet plug being connected to the Unit has Internet access. Once verified, connect the RJ45 Ethernet plug,

3. Follow one of the below sub-steps based on the source of STL/Content delivery to the BRH Unit,

    a. RJ45/Ethernet – Step-2 has addressed required connections,
    b. SFP/Optical Fiber – Connect the SFP connector into the SFP plug present on the BRH Unit
    c. DVBS2/Satellite – Connect the F-type plug from the LNB receiver antenna to the BRH Unit. The receive frequency for DVBS2 signal needs to be updated under EMS Device Configuration

4. Connect the N-type plug to GPS Receiver Antenna

5. Connect the Output N-type plug to Transmission Antenna

6. Verify that the Power Connector output gives -48V

7. Unit boots up in ~5mins after which the Unit should show up as active on the EMS login for the assigned Operator and statistics sent by the Unit should be visible on the EMS

8. An active unit would start transmitting once GPS lock is achieved and according to configured settings on the EMS

Below table describes the behavior of the LED(s) on the Enclosure and their meaning:

Status Indication	LED indication on RED LED	LED indication on GREEN LED
Firmware is booting on the Unit	LED turns ON and OFF two times every second (fast blinking)	LED is OFF
Firmware booting is complete	LED is ON without any blinking	LED is OFF
Unit is booted completely and RF output at antenna port is ON	LED is ON without any blinking	LED is ON without any blinking
Unit is booted completely and RF output at antenna port is OFF	LED is ON without any blinking	LED is OFF
Unit is in the process of shutting down	LED turns ON and OFF two times every second	LED is OFF
Unit is completely shutdown	LED is OFF	LED is OFF
Unit is booted completely, but is in error state	LED turns ON and OFF once every second (slow blinking)	LED is OFF

Do's

1. All connectors should be plugged in only after the BRH Unit is securely mounted on the pole/wall

2. After complete installation of all components, LNB Antenna, BRH Unit, etc all should have a common ground

3. Make sure -48V (300W capacity) is provided to Power supply connector according to the provided pin diagram

4. Make sure transmitter antenna is properly connected to the BRH Unit before connecting the power supply. Not doing so may reflect the Transmitted signal power and may potentially damage the internal circuitry

5. During active operation of the BRH Unit, the transmitter antenna radiates RF energy. Do not stand in front or touch the antenna during active operation. Operators are required to follow FCC mandated safety precautions during handling of the equipment

6. Please use a low-loss/high-power handling cable with minimal length between BRH Unit and Antenna systems

7. Power plug should be connected at the very last during the installation of BRH unit

8. BRH Unit should have access to EMS over connected RJ45 Ethernet as noted in the "Power up Procedure" section

9. MAC ID of the BRH Unit should be registered on the Network and IP address should be assigned using an active DHCP server

10. For any maintenance of the BRH Unit, EMS 'Shutdown' command should be used. After BRH unit goes offline on the EMS, wait until Red LED goes off before removing the Power plug

11. BRH Unit should be powered on and then unit should be provisioned in EMS

Don't

1. Don't Power ON the BRH Unit without checking common ground of complete BRH system

2. Under lab conditions, do not power ON the BRH Unit without connecting proper high power attenuators and antenna on the transmission port. Not doing so will damage the electronics in the BRH Unit

3. The BRH Unit should not be opened. Warranty will be void if done so.

Device is unreachable on the network

Possible Cause	Steps to Verify	Steps to Resolve
Equipment is Powered Off	Verify if BRH Unit is drawing at least 300 mA to 400 mA	1. Remove the power plug from the BRH Unit 2. Connect the power plug to BRH Unit again 3. Unit takes around 4 minutes to boot up completely and connect to EMS
DHCP Server failed to assign IP address	Verify if MAC ID of the BRH Unit is recognized by the DHCP server	1. IT team should add the MAC ID of BRH Unit to their list of recognized devices 2. [Good to have] DHCP Server should have MAC ID to IP binding 3. Once done, remove the Ethernet plug and connect it back to BRH Unit 4. Ping the IP address of the BRH Unit after a couple of minutes
Power plug on BRH Unit was removed and connected back immediately	LED is ON without any blinking	1. Remove the power plug from the BRH Unit 2. Wait for 10 seconds and connect the power plug to BRH Unit again 3. Unit takes around 4 minutes to boot up completely and connect to EMS

BRH Unit is not transmitting after "Power On"

Possible Cause	Steps to Verify	Steps to Resolve
BRH Unit is not provisioned on EMS	Check if the device is provisioned on EMS with MAC ID	1. Follow EMS Guide and provision the device with MAC ID of the device 2. Select proper configuration during provisioning of the device
BRH Unit is provisioned but EMS is still showing the unit is down	Check if the Unit, 1. Is powered on, 2. Is connected to EMS on the network	Refer to troubleshooting on 'Device is Unreachable on Network'
Content Source is selected as DVBS2 and EMS shows DVB-S2 Signal has not locked on the box	Check if BRH Unit is in *Green* state on EMS and if *Statistics → Backhaul link → DVBS2 link → lock status* is *true*	1. Configure the value of backhaul frequency, MPE PID value and symbol rate in EMSs 'Device configuration' as per values configured in the DVBS2 backhaul source. 2. Reboot the BRH unit from EMS to pick the EMS configurations as per configured in the above step, 3. Verify that the lock status is showing *true* which should solve the issue
Frequency and other configuration are correct, but still DVB-S2 Signal has not locked on the box	Shutdown the BRH Unit from EMS, remove the power plug from the unit and check the following, 1. Connections of LNB Antenna	Check whether antenna connected for backhaul input is tightened properly.

Possible Cause	Steps to Verify	Steps to Resolve
DVB-S2 Signal is shown as locked, my unit is still not transmitting	Verify if following fields are showing non-zero values, Statistics → Fronthaul Link → Pipeline Scheduler → (STL Out rate, Emission Rate and Buffered Jitter Rate)	1. If the field values are zero, check if the PID value carried by stream is matching the value on the EMS configuration 2. Update the PID value on the configuration 3. Reboot the BRH Unit from EMS 4. Check if RF transmission is ON in the EMS 'Runtime configuration'. If RF is OFF, then turn ON the RF transmission.
Mentioned fields on Pipeline Scheduler in EMS is showing non-zero values, my unit is still not transmitting	Unit is configured to Transmit only when GPS lock is achieved. Verify if Statistics→GPS Status→Lock status is *true*	1. Check the GPS antenna connections on the BRH Unit 2. Check if the GPS receiver antenna is working using independent tests
If Content Source is selected as Ethernet and EMS Transmitter status as OFF	Check if 'No STL data from ethernet alarm' is generated in EMS. If yes, check the boot time configurations to check whether Source ip, multicast ip and group ip are mentioned proper.	1. Login to EMS and find out the BOOT configuration from Provisioning → Device → Provisioned-BRH 2. Correct the setting on the selected Boot configuration under 'Configuration → Device → Selected-Config'
Source IP address and Multicast Group address settings are correct and BRH is online, but BRH is still not actively transmitting	Check the items below to trouble shoot the issue. 1. Check whether Transmitter ID/Group id configured in gateway is matching with value configured for BRH. 2. Check 'Runtime configurations' in EMS whether RF transmission is muted in EMS. If yes, unmute the RF.	1. Login to EMS, click on the Devices option in Provisioning. Click on Edit option to check the TX id/group id configured. Set the same Tx id and group id in gateway and BRH. 2. Go to the Actions option and click on the runtime configuration. Check if RF Transmission status is OFF. If yes, turn ON the RF transmission.
The address settings are verified, the BRH is still not actively transmitting	Go to the statistics being reported by the green BRH unit EMS, 'Statistics → Fronthaul Link → Pipeline Scheduler → (STL Out rate / Emission Rate / Buffered Jitter Rate)' report zero or non zero values	1. If the mentioned statistics are reported as zero, then the content is not reaching the Unit and this needs to be verified onsite on the BRH Unit. Contact Saankhya Labs support for further instructions 2. If any of the mentioned statistics are reported as non-zero, then content is reaching the Unit and processing of the content has started. Confirm if the 'Statistics → GPS status → Lock status' is seen as true. If this is false, then the unit is still waiting for the GPS lock. Confirm that the GPS antenna and the plug is connected securely 3. Once the connections are confirmed, then the GPS lock may sometimes take anywhere from 5 – 10 min after which the Transmission will start automatically

Possible Cause	Steps to Verify	Steps to Resolve
If Content Source is selected as SFP/Optical and EMS Transmitter status as OFF	Check if 'No STL data from ethernet alarm' is generated in EMS. If yes, check the boot time configurations to check whether Source ip, multicast ip and group ip are mentioned proper.	1. Login to EMS and find out the BOOT configuration from Provisioning → Device → Provisioned-BRH 2. Correct the setting on the selected Boot configuration under 'Configuration → Device → Selected-Config'
Source IP address and Multicast Group address settings are correct and BRH is online, but BRH is still not actively transmitting	Check the items below to trouble shoot the issue: 1. Check whether Transmitter ID/Group id configured in gateway is matching with value configured for BRH. 2. Check 'Runtime configurations' in EMS whether RF transmission is muted in EMS. If yes, unmute the RF.	1. Login to EMS, click on the Devices option in Provisioning. Click on Edit option to check the TX id/group id configured. Set the same Tx id and group id in gateway and BRH. 2. Go to the Actions option and click on the runtime configuration. Check if RF Transmission status is OFF. If yes, turn ON the RF transmission.

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