Appendix 10. User Manual

Technical Manual

RF Broad Band Repeater

(MBR801A)

Contents

HEALTH AND SAFETY WARNINGS

Installer Warning:

Any over the air radiated use of this product is intended to be used with either Roof Top (Building-mount) or Pole Mounted (Non-building-mount) Antennas.

Antenna installation must conform within the following guidelines to meet FCC RF exposure limits, otherwise a environmental evaluation is required if:

Broadband PCS (subpart E): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10m Radio (Part 24) and total power of all channels > 2000 W ERP (3280 W EIRP).

Building-mounted antennas: Total power of all channels > 2000 W ERP (3280 W EIRP).

Cellular Radiotelephone Service (Part 22, subpart H): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10m Radio (Part 22) and total power of all channels > 1000 W ERP (1640 W EIRP).

Building-mounted antennas: Total power of all channels > 1000 W ERP (1640 W EIRP).

Private Land Mobile Radio\Specialized Mobile Radio (Part 90): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10m Radio (Part 90) and total power of all channels > 1000 W ERP (1640 W EIRP).

Building-mounted antennas: Total power of all channels > 1000 W ERP (1640 W EIRP).

For any clarification, please refer to FCC rules, 47 CFR ch. I, part 1.1307

1. General Description of RF Broad Band Repeater(Outdoor)

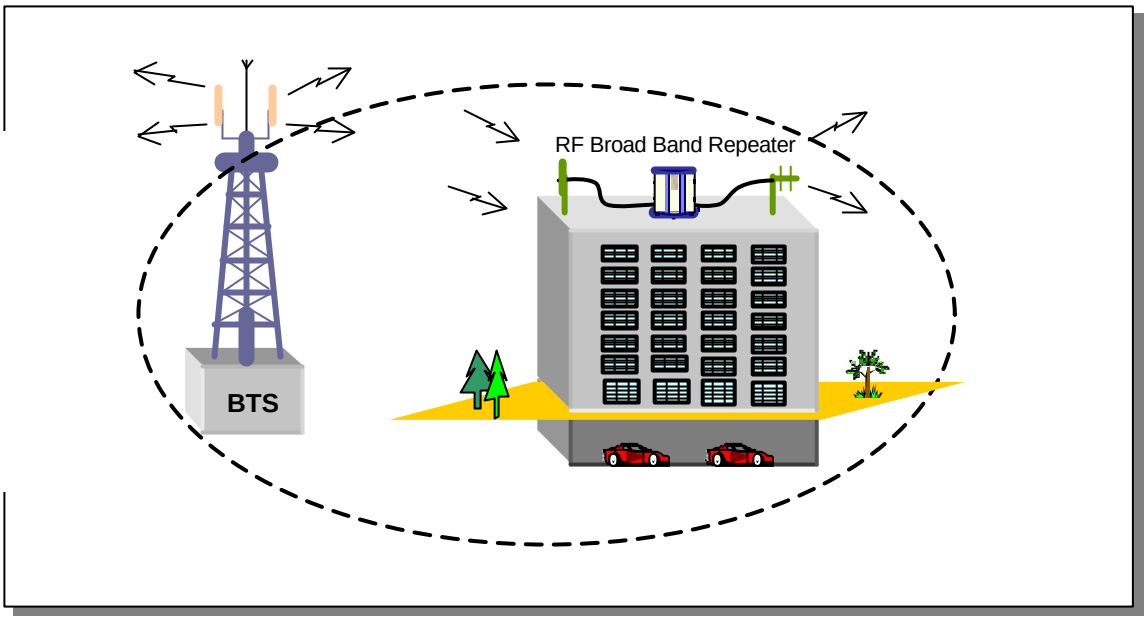
1.1. System Overview

RF Broad Band Repeater(Outdoor) is designed for increasing both coverage and capacity in cellular systems. It receive CDMA signal from BTS and emits RF signal where the coverage is required.
RF Broad Band Repeater(Outdoor) receives CDMA signal from BTS via directional antenna and filters out the signal through BPF(Band Pass Filter) then amplifies CDMA signal to proper level through LNA(Low Noise Amplifier). The signal passes through middle amplifier and is amplified to proper level through HPA(High Power Amplifier). Then the repeater emits RF signal to blank area via antenna.

Also RF Broad Band Repeater(Outdoor) receives the RF signal from mobile station. After filtering out the signal through BPF(Band Pass Filter), the repeater amplifies the signal using LNA(Low Noise Amplifier). The signal passes though middle amplifier and is amplified to proper level through HPA(High Power Amplifier) then emits CDMA signal to BTS via antenna.

The repeater is projected to make BTS coverage wide cost-effectively. Optional features of the products include modified frequency ranges and bandwidths, non-standard connectors and design flexibilities to satisfy the most stringent requirements.

The over the air radiated use of this repeater is intended to be used with either Roof Top or Pole Mounted Antennas. To provide coverage in a indoor application one must mount the antennas on or outside the building structure that is occupied. This must be done in a matter that conforms to the FCC RF exposure (See health and Saftey section of this manual).



【 Figure 1. Operational Concept of RF Broad Band Repeater 】

1.2. Special Features

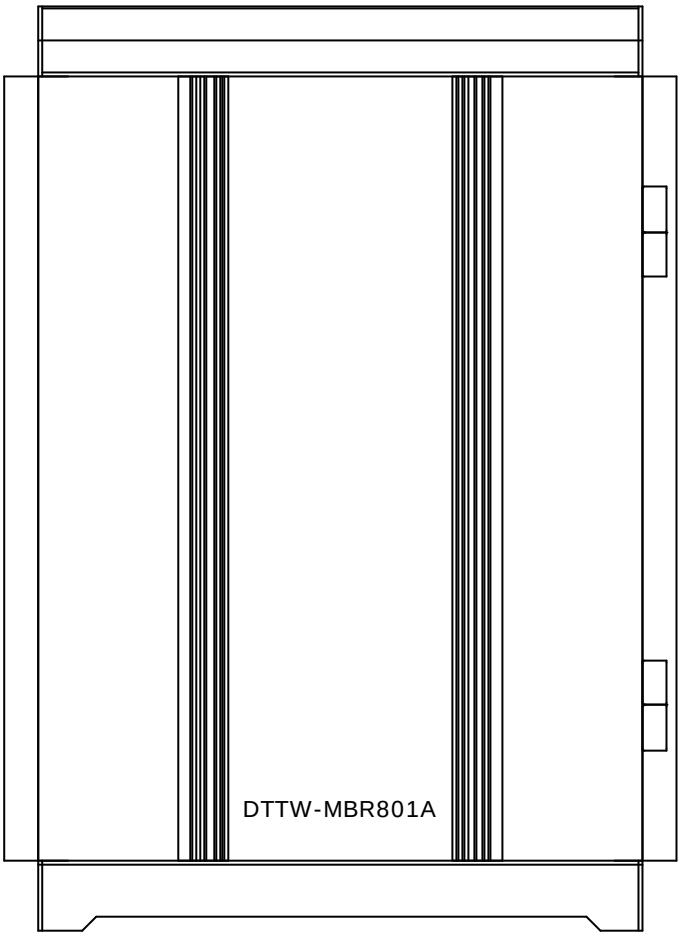
- The number of FA can be increased up to 7
- Maximum transmit output power can be up to +40dBm/FA
- Straight RF amplification: minimize degradation of CDMA signal quality and stabilize the signal
- Remote control and monitoring through SMS(Short Message System)
- Supervision of automatic gain and output levels
- Low power consumption
- Status monitoring
  - Power supply
  - Power Amplifier failure
  - HPA enable/disable
  - ALC
- Automatic output level adjustment; ALC(auto level control), Weatherproof enclosures: the equipment can be deployed outdoors. It is self-contained in outdoors rated weather-resistant aluminum enclosures.The surface of the enclosure is applied with anti-corrosion material and painting.

1.3. System Structure

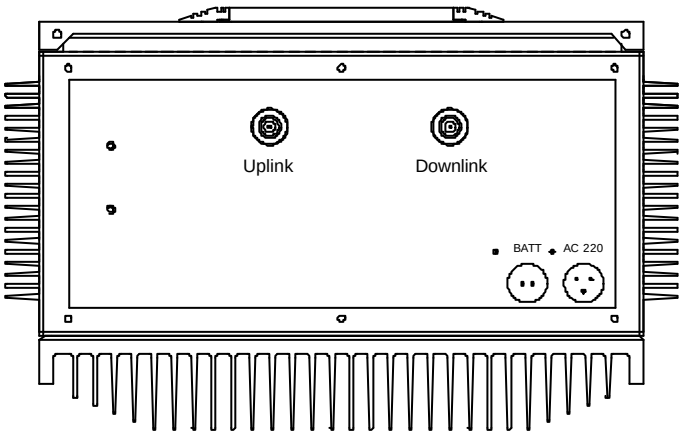
NO	Item	Spec.	Quantity	Remarks
1	HPA	5W (RX)	1 Set	Reverse Path Output Power Amp.
2	HPA	16W (TX)	1 Set	Forward Path Output Power Amp.
3	Controller	SMS	1 Set	Control & Monitor the repeater
4	TX Drive AMP	G: 13dB	1 Set	TX path middle amplification
5	RX Drive AMP	G: 7dB	1 Set	RX path middle amplification
6	TX LNA	G: 40dB	1 Set	TX path front LNA
7	RX LNA	G: 40dB	1 Set	Rx path front LNA
8	Duplexer	10MHz BW	2 Set	Transmitting/receiving
9	TX BPF	10MHz BW	1 Set	TX path reject filter
10	RX BPF	10MHz BW	1 Set	RX path reject filter
11	Power Detector	SMA to SMA	1 Set	Output Power Monotor
12	Arrester	N to N	2 Set	Lightning protection
13	Power Supply	In: AC220V Out: DC 27V/15A DC 12V/6A	1 Set	Repeater power supply

1.4. Configuration of repeater

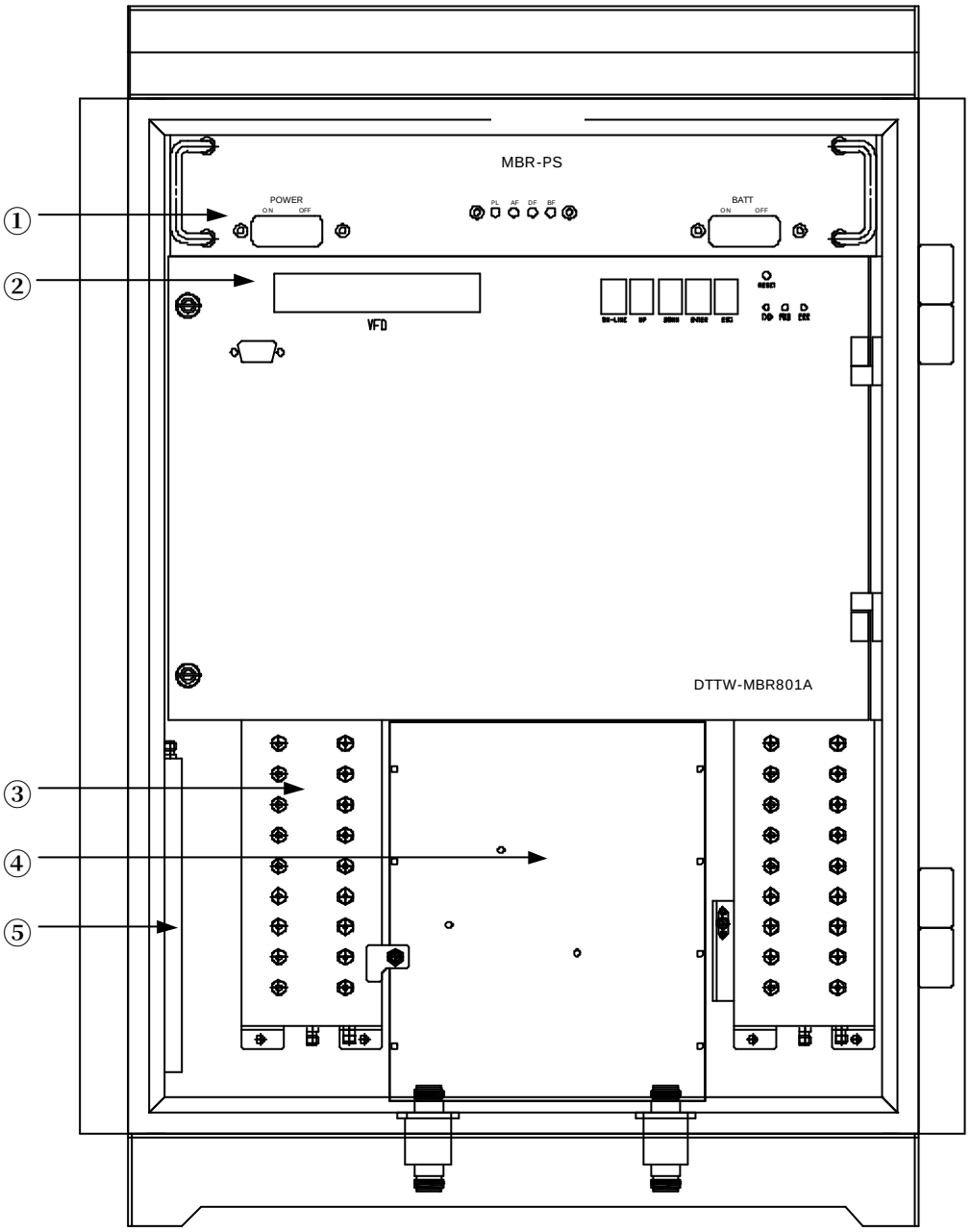
1.4.1. Front view of repeater



1.4.2. Bottom view of repeater



1.5. Functional Description of System



① Power Supply:

- Receive AC 220V from BTS and convert it into required voltage(DC+27V, DC+12V)
- Battery back-up
- Data port for monitoring the repeater status

- Description of each part

- ✓ PL: Light indicating AC voltage
  - Green: activating
- ✓ AF: Light indicating AC voltage
  - Red: error
- ✓ DF: Light showing the status of voltage
  - Red: error
- ✓ BF: Light showing the status of battery
  - Red: error
- ✓ BATT Switch: switch for selecting battery back up on/off
- ✓ Power Switch: N.F.B(No Fuse Breaker) for turning on/off AC and DC power

② Controller:

- ➢ Gain adjustment
- ➢ Monitoring and controlling the condition of power supply, voltage power, inside temperature, output power
- ➢ Collect all alarms and display the status on VFD
- ➢ Monitoring and controlling the status with VFD and Keypad built-in repeater
- ➢ Data downloadable through RS-232 port for connect to notebook PC

<u>- Description of each part</u>

- ✓ VFD: monitor for controlling and monitoring repeater
- ✓ Key pad
  - On/Off: key to turn on & off the system for control & monitor
  - UP: key to change menu / raise the factors
  - DOWN: key to change menu / lower the factors
  - ENTER: key to select the items in need / move to lower table
  - ECS: key to stop the operation of table / move to higher table
- ✓ LED: showing the status
  - TXD: light when data is transmitted
  - RXD: light when data is received
  - ERROR: light when there's some problem with data communication
  - RESET: key to use reset the controller
- ✓ RS-232:
  - Port for setting and controlling TX/RX gain, voltage power, output power of repeater connecting to computer.

③ Duplexer:

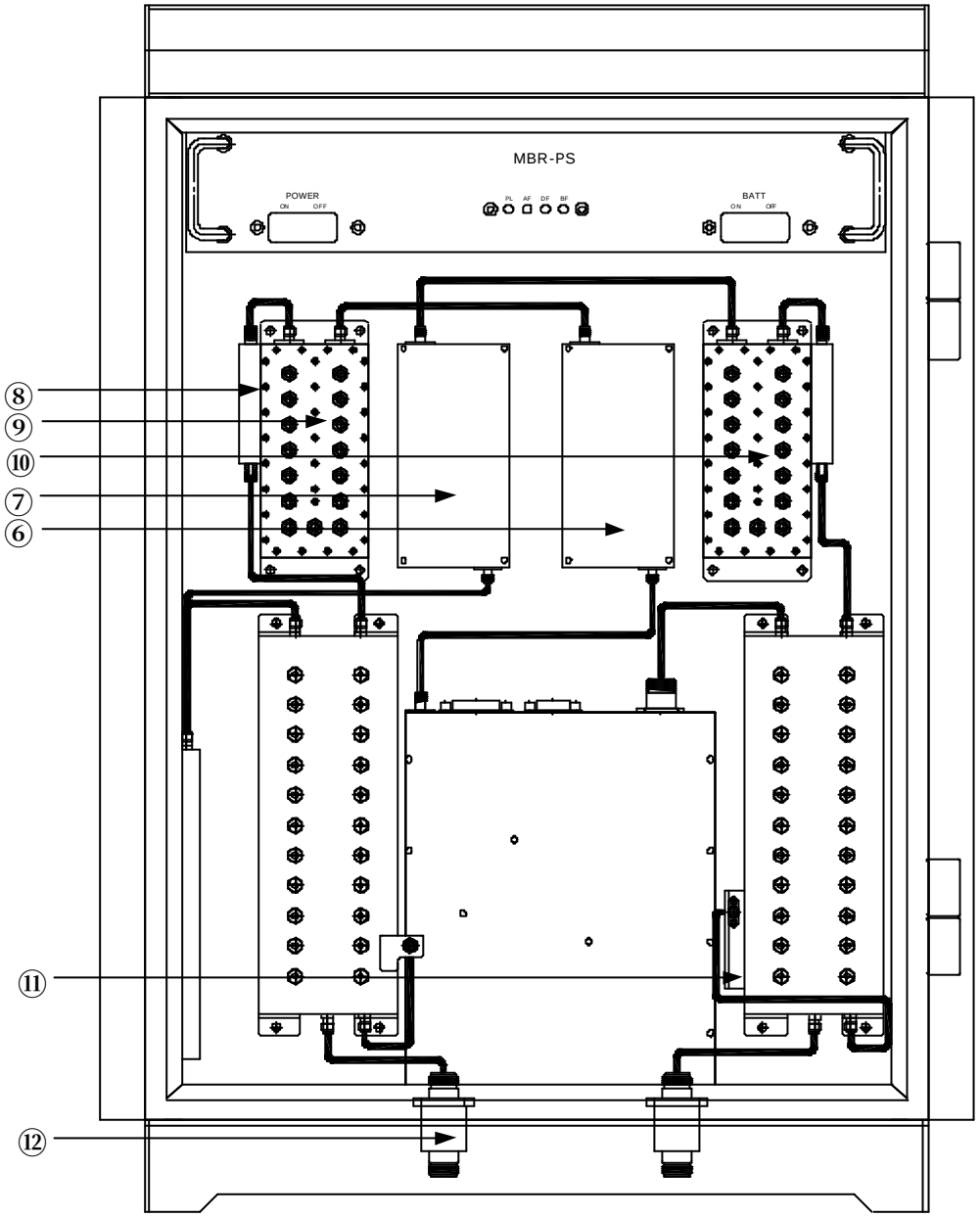
- ➢ 10MHz BW Duplexer
- ➢ Build in Notch Filter
- ➢ Efficient noise cancellation function
- ➢ High isolation between TX and RX path – it combines two paths into one path and sends the combined signal with one antenna

④ HPA(High Power AMP)

- Maximum output power is 16W.
- Operation with DC +27V
- TX final amplifier
- 54dB gain
- Controlled and monitored through control board

⑤ HPA(High Power AMP)

- Maximum output power is 5W.
- Operation with DC +27V
- RX final amplifier
- 54dB gain
- Controlled and monitored through control board



[Figure 3. Structure diagram inside the repeater-2]

⑥ TX Drive AMP

- Amplifier for TX path front amplification
- Gain: 13dB
- Amplify input level so that HPA emits proper output
- Adjust output level with ATT. built-in AMP

⑦ RX Drive AMP

- Amplifier for RX path front amplification
- Gain: 7dB
- Adjust input level so that HPA emits proper output
- Adjust output level with ATT. built-in AMP

⑧ LNA(Low Noise AMP)
- Efficient Noise figure function
- AMP for Front amplification of system(TX and RX)
- Gain: 40dB
- Controlled and monitored through control board

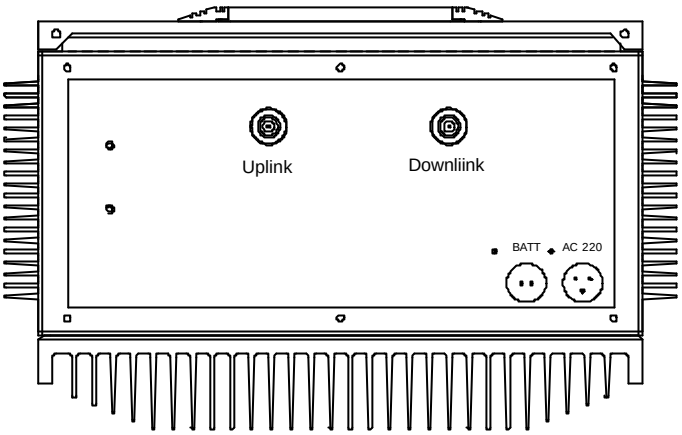
⑨ TX BPF(Band Pass Filter)
- 10MHz BW Filter of TX path
- Build in Notch Filter
- Efficient noise cancellation function
- Minimize out-of-band interference of signal

⑩ RX BPF(Band Pass Filter)
- 10MHz BW Filter of RX path
- Build in Notch Filter
- Efficient noise cancellation function
- Minimize out-of-band interference of signal

⑪ Power Detector
- Detect TX final output power and transmit data to controller
- Minimize error of actual output factor by using efficient element in Single and Multi FA

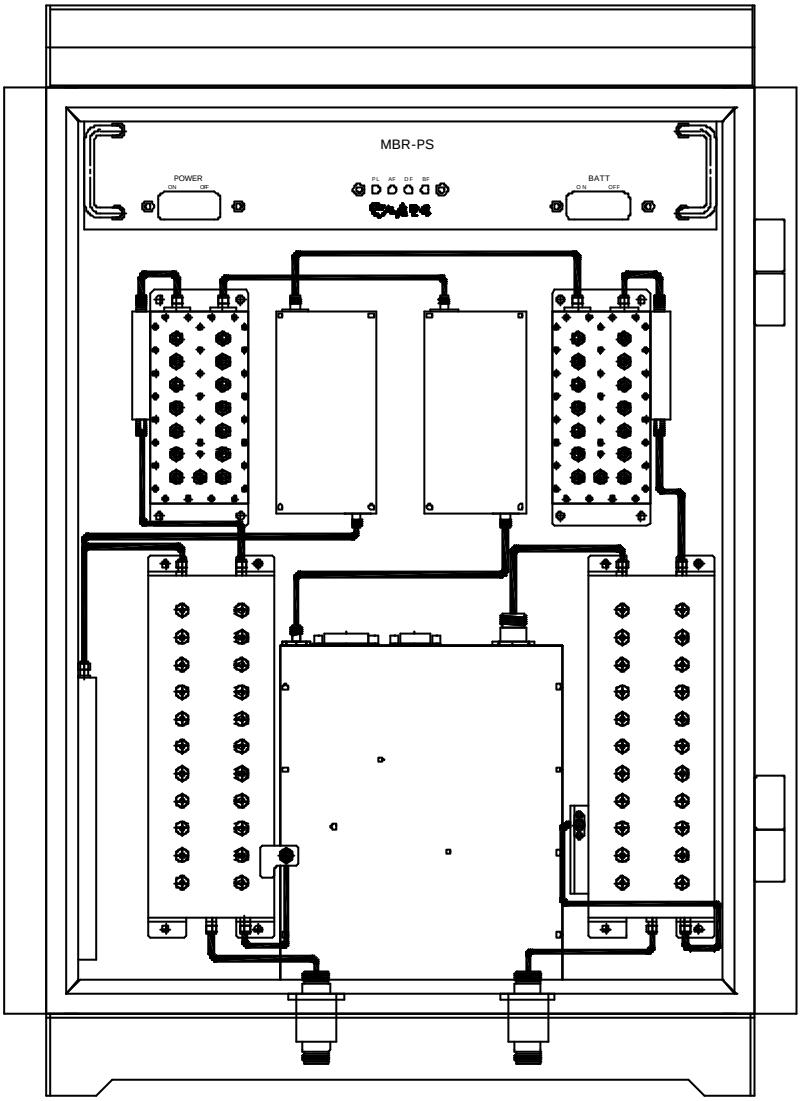
⑫ Arrester
- Output port of TX and RX
- Protection from lightning
- Efficient input VSWR
- Minimal insertion loss

⑬ Bottom view of repeater



- Up link: Cable connector of Uplink (N Female)
- Down link: Cable connector of Downlink (N Female)
- AC 220V: 3 Pin power connector for supplying AC Power
- BATT: 2 Pin power connector for battery backup
- GND: Terminal port for ground

1.6. Cable connection diagram



1.7. Technical Specification

1.7.1. Technical specification of the repeater system

No	Parameter		Specification	
			Downlink	Uplink
1	Frequency range		870 ~ 880MHz	825 ~ 835MHz
2	Input power range		-60~-40dBm	-120~-60dBm
3	Gain (Max.)		100dB ± 3dB	94dB ± 3dB
4	Output power (Max.)		$+40dBm\ ^{-0dB}_{+2dB}$	$+34dBm\ ^{-0dB}_{+2dB}$
5	ALC		≤+42dBm or Auto Shut Down	≤+36dBm or Auto Shut Down
6	Gain adjustment range		30dB/1dB Step	30dB/1dB Step
7	Noise figure		≤ 5dB	
8	3^{rd} Intermodulation	In band	= -15dBm/30KHz	
9		Out band	9KHz~1GHz: = -36dBm/30KHz	
10			1GHz~12.75GHz: = -30dBm/30KHz	
11	Spurious Emission	In band per channel	Fc±750KHz: = -45dBc/30KHz	Fc±900KHz: = -42dBc/30KHz
			Fc±1.98MHz: = -59dBc/30KHz	Fc±1.98MHz: = -59dBc/30KHz
		In band	=-22dBm/30KHz	
		Out band	9KHz~150KHz: =-36dBm/1KHz	
			150KHz~30MHz: =-36dBm/10KHz	
			30MHz~1GHz: =-36dBm/100KHz (Excluding 885MHz~915MHz and 930MHz~960MHz)	
			1GHz~12.75GHz: =-30dBm/1MHz (Excluding 1.8GHz~1.92GHz and 3.4GHz~3.53GHz)	
			885MHz~915MHz: =-47dBm/100KHz	
			930MHz~960MHz: =-47dBm/100KHz	
			1.8GHz~1.92GHz: =-47dBm/100KHz	
			3.4GHz~3.53GHz: =-47dBm/100KHz	
12	Out band spurious emission		≥2.5MHz Offset at operating band edge: =-40dB or =-13dBm/30KHz	
			≥10MHz Offset at operating band edge: =-60dB or =-33dBm/30KHz	
13	Waveform quality factor		p>0.950	p>0.960

14	Gain flatness		<3dBp-p
15	Adjustable linearity	-10dB	±1.0dB
		-20dB	±1.0dB
		-30dB	±1.5dB
16	VSWR		<1.4 : 1
17	Impedance		50Ω
18	TX/RX Isolation		>115dB
19	Time delay		<1.5μs
20	Power supply		AC: 220V/50Hz, Range 176~264V, 45~65Hz; DC: Support +24V DC Input
21	RF connector		N Type Female
22	Operating temperature		-25°C ~ +55°C
23	Humidity		5 ~ 95%
24	Dimension		478(W) x 660(H) x 307(D)
25	Weight		50 Kg

1.7.2. Technical specification of each module

1) HPA (TX)

NO	Parameter	Specification	Remarks

1	Frequency range	870MHz ~ 880MHz	
2	Output power (Max.)	+42dBm	
3	Gain (Max.)	54dB±1dB	
4	Gain flatness	10MHz band: ±0.5dB	
		1.23MHz band: ±0.1dB	
5	Gain variation	±1dB	
6	3rd Intermodulation	< -19dBm/30KHz	+42dBm@2Tone 1.23MHz Spacing
7	Spurious emission	Fc±750KHz : > 45dB/30KHz	
		Fc±1980KHz : > 66dB/30KHz	
8	2nd, 3rd Harmonic	> 45dBc	
9	VSWR	< 1.5:1	
10	Impedance	50Ω	
11	Input/Output connector	SMA Female/ N Female	
12	Power supply	DC 27±1V	
13	Power consumption	< 10A	@Po=16W
14	Dimension	170(W) x 151(H) x 26(D)	
15	Alarm	Over power, High temperature, Device fail	

2) HPA (RX)

NO	Parameter	Specification	Remarks

1	Frequency range	825MHz ~ 835MHz	
2	Output power (Max.)	+36dBm	
3	Gain (Max.)	54dB±0.5dB	
4	Gain flatness	±0.5dB	
5	Gain variation	±0.5dB	
6	3rd Intermodulation	< -20dBm	+36dBm@2Tone
7	Spurious emission	Fc±900KHz : > 42dB/30KHz	+36dBm@1FA
		Fc±1980KHz : > 59dB/30KHz	
8	2nd, 3rd Harmonic	> 60dBc	+36dBm@1CW
9	VSWR	< 1.5:1	
10	Impedance	50Ω	
11	Input/Output connector	SMA Female	
12	Power supply	DC 27±1V	
13	Power consumption	< 2.5A	
14	Dimension	160(W) x 170(H) x 22(D)	
15	Alarm	Over power, High temperature	

3) RX Drive AMP

NO	Parameter	Specification	Remarks

1	Frequency range	825MHz ~ 835MHz	
2	Gain (Max.)	7dB ± 0.5dB	
3	Gain flatness	< 0.5dB	
4	Gain adjustable range	40dB/1dB step	
5	IP3	> 30dBm	0dBm @2Tone
6	IMD	> 60dBc	0dBm @2Tone
7	VSWR	< 1.2: 1	
8	Impedance	50Ω	
9	Input/Output connector	SMA Female	
10	Power supply	DC 12±1V	
11	Power consumption	350mA	
12	Dimension	122(W) x 61(H) x 34(D)	mm
13	Operating temperature	-20℃ ~ +60℃	
14	Humidity	10 ~90%	
15	Alarm	Low: Normal / High: Fail	Device Fail Alarm

4) TX Drive AMP

NO	Parameter	Specification	Remarks
1	Frequency range	870MHz ~ 880MHz	

2	Gain (Max.)	13dB ± 0.5dB	
3	Gain flatness	< 0.5dB	
4	Gain adjustable range	40dB/1dB step	
5	IP3	> 30dBm	0dBm @2Tone
6	IMD	> 60dBc	0dBm @2Tone
7	VSWR	< 1.2: 1	
8	Impedance	50Ω	
9	Input/Output connector	SMA Female	
10	Power supply	DC 12±1V	
11	Power consumption	350mA	
12	Dimension	122(W) x 61(H) x 34(D)	mm
13	Operating temperature	-20℃ ~ +60℃	
14	Humidity	10 ~90%	
15	Alarm	Low: Normal / High: Fail	Device Fail Alarm

5) Duplexer (10MHz BW)

NO	Parameter	Specification		Remarks
		TX	RX	

1	Frequency range		870 ~ 880MHz	825 ~ 835MHz	10MHz BW
2	Coupling value		30dB±1dB	15dB±1dB	
3	Insertion loss		1.5dB (Max.)		
4	Pass band ripple		0.7dB (Max.)		
5	Return Loss		20dB (Min.)		
6	Attenuation	890MHz	> 55dB		
7	Impedance		50Ω		
8	Isolation		> 95dBc		
9	In/Out connector		ANT: SMA Female RX, TX: SMA Female CPL: SMA Female		
10	Dimension		207(W) x 76(H) x 60(D)		mm
11	Operating temperature		-20℃ ~ 60℃		

6) LNA

NO	Parameter	Specification	Remarks

1	Frequency range	830~880MHz	
2	Gain (Max.)	44dB±0.5dB	
3	Gain flatness	< 0.5dB	
4	Noise figure	< 1.0dB (TYP 0.8)	
5	IP3	> 35dBm	
6	VSWR	< 1.3 : 1	
7	Impedance	50Ω	
8	In/Out connector	SMA Female	
9	Power supply	DC 12V	
10	Power consumption	250mA	
11	Dimension	66(W) x 44(H) x 12(D)	mm
12	Operating temperature	-20℃ ~ 60℃	
13	Alarm	Device fail	TTL

7) TX BPF

NO	Parameter	Specification	Remarks

1	Frequency range		870 ~ 880 MHz	
2	Insertion loss		< 3.0dB	
3	Pass band ripple		< 1.7dB	
4	Return loss		> 20dB	
5	Attenuation	@867.5MHz	> 34dBc	
		@882.5MHz	> 34dBc	
6	Input power(Max.)		1W	Avg.
7	Impedance		50Ω	
8	In/Out connector		SMA Female	
9	Dimension		117(W) x 59(H) x 63(D)	Exclude connector
10	Operating temperature		-20℃ ~ 60℃	

8) RX BPF

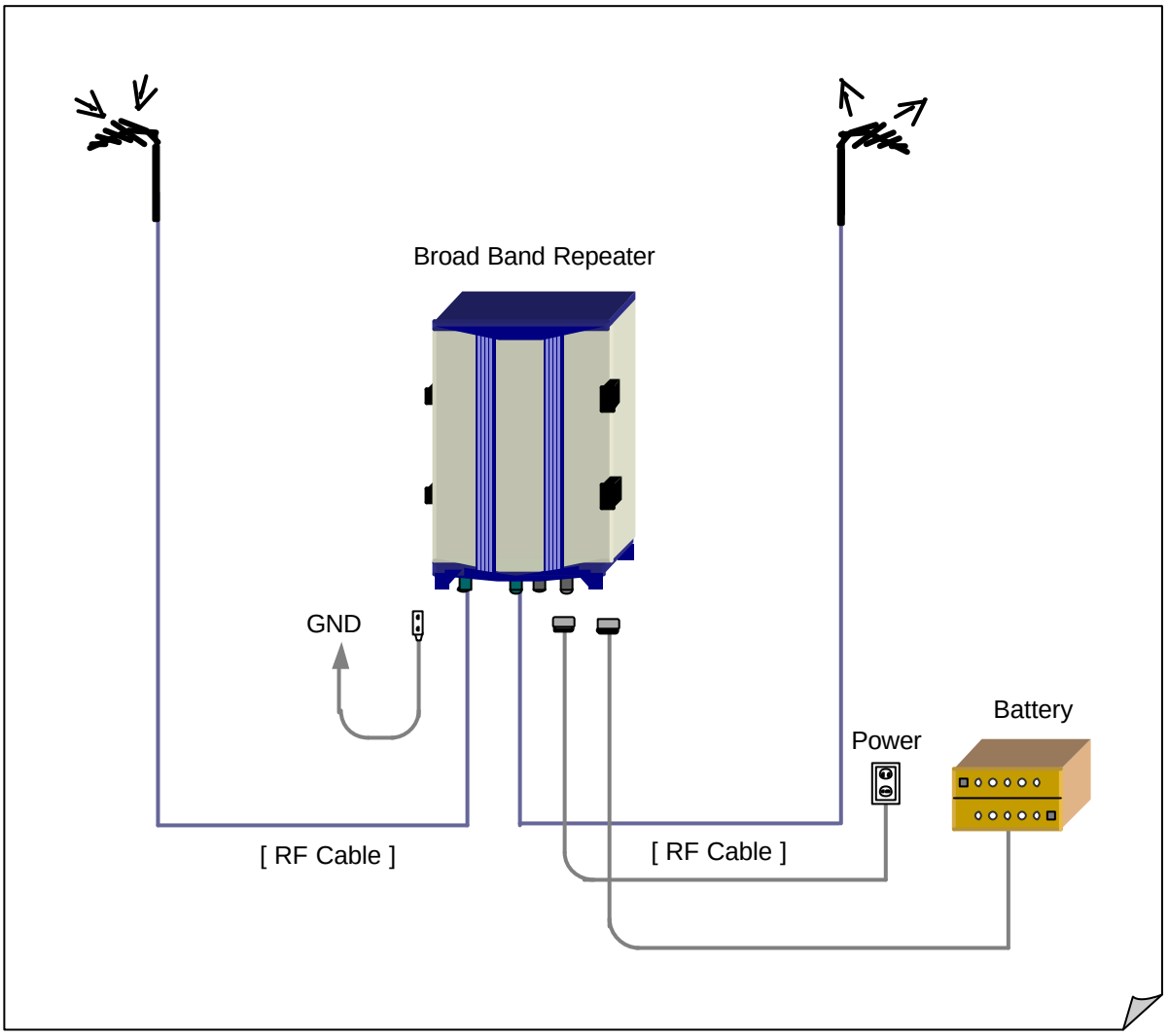
NO	Parameter		Specification	Remarks
1	Frequency range		870 ~ 880 MHz	
2	Insertion loss		< 3.0dB	
3	Pass band ripple		< 1.7dB	
4	Return loss		> 20dB	
5	Attenuation	@867.5MHz	> 34dBc	
		@882.5MHz	> 34dBc	
6	Input power(Max.)		1W	Avg.
7	Impedance		50Ω	
8	In/Out connector		SMA Female	
9	Dimension		117(W) x 59(H) x 63(D)	Exclude connector
10	Operating temperature		-20℃ ~ 60℃	

2. Installation

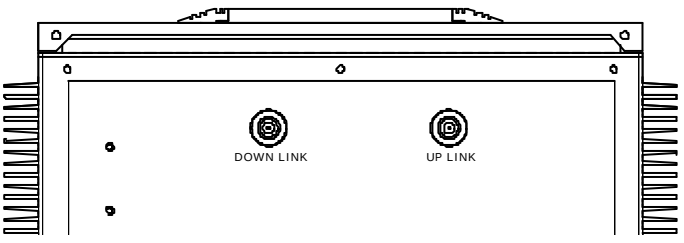
2.1. Installation Procedure

Caution

Do not open the door if the equipment if you are not an authorized specialist. This equipment consists of lots of electric devices with the standard electric power.



[Figure 4. Installation Diagram]



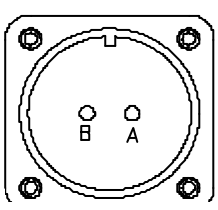
Uplink Downlink

[Figure 5. Bottom view of repeater]

1) Fix the enclosure of the Broad Band Repeater on proper place
2) Set up directional antenna so as to receive CDMA signal from BTS and connect feeder cable from antenna to proper connector then link to [UP LINK] port.
3) Install antenna so as to receive CDMA signal from mobile station and link feeder cable from antenna to proper connector then link to [DOWN LINK] port.
4) After linking power cable to power connector according to connection diagram, supply Donor with mains voltage AC 220V.

★ Attention: when connecting power connector, Pin number should not be changed.

5) Ground the enclosure



A : DC -27 V Battery
B : DC -27 V Ballery

[

[Figure 6. Connection diagram of Power connector]

2.2. Operational Test

Measurement equipment

1) Spectrum Analyzer: measure Spurious, Waveform quality and Input/Output level.
2) Signal Generator: measure Gain.
3) RF Power Meter: measure Output power
4) Site Master: measure VSWR of antenna and cable
5) Multi Tester: measure AC input voltage

2.2.1. RX path setting

1) Turn on the repeater after all installation is completed.
2) Measure input level of BTS
   - Measure TX path input level from BTS with Channel Power of Spectrum Analyzer connected to antenna receiving port.
   ★ When measuring the input level, designate accurate 'offset factor' at Spectrum analyzer considering cable loss.
3) Measure Path Loss between BTS and Repeater with output level of BTS and input level of repeater.
   - If output level of BTS is +34dBm and input level of repeater is -60dBm, pass loss gets 94dB (34dBm+60dBm).
4) Set RX path gain of repeater connecting Spectrum Analyzer to Uplink port of

repeater.

- Set gain 10dB less than pass loss between BTS and the repeater. If path loss is 94dB, set gain 84dB.
- When setting input of Signal Generator connected to Downlink port -80dBm, output level of Uplink port should be +4dBm.
- Adjust RX path gain, connecting notebook PC to RS-232 Port or Keypad.

2.2.2. TX Path Setting

1) Measure input level of TX path with Total Power of Spectrum Analyzer connected to Uplink Port of repeater and verify if input level is -60dBm~-45dBm.
2) Measure TX output level connecting Spectrum Analyzer to Downlink port of repeater. Adjust output level by controlling ATT with Key pad or notebook PC.
3) Make sure if spurious meets specification.
   - If spurious do not meet specification(±1.98MHz, ±750MHz), adjust forward Down ATT again.
3) Make sure if forward output level is 120mW(21dBm), connecting Spectrum Analyzer to Up link port.

※ Attenuation:

- Do not take on the repeater in the state of opening antenna cable.
- Take on the repeater in the state of increasing TX ATT factor and set output level by decreasing ATT factor.

3. Maintenance and Repair

Measurement equipment

1) Spectrum Analyzer: measure Spurious, Waveform quality and Input/Output level.
2) Signal Generator: measure Gain.
3) RF Power Meter: measure Output power
4) Site Master: measure VSWR of antenna and cable
5) Multi Tester: measure AC input voltage

3.1. Simple adjustment Tool

If the problem is not serious, adjust the equipment using the remote control and check the problem.

1) Check output power, connecting Spectrum Analyzer or Power Meter to output port. In the case of deviating rated output power, reset output level with ATT.
2) Verify connection status of connector and tighten or disassemble optic connector, then remove dirt.
3) When it is hard to restore damaged parts, require A/S and take measures.

3.2. Emergency measure tool

3.2.1 Fall of output level

1) Condition: receiving level of handset is fallen and service coverage is reduced.
2) Measuring tool
   ① Fall of BTS input level: verify if input signal level of Uplink port is -60~ -45dBm(total power). In case of deviating the level, check path from BTS to repeater.
   ② Degradation of TX path AMP
      - Verify gain of front LNA and in case gain is low, change LNA.
      - Set TX ATT of Drive AMP 0dB and verify if gain is 13dB. In case of deviating the range, change Drive AMP.
      - Although all system is normal, if output power is lack, change HPA.

3.2.2. Degradation of output power spurious

1) Condition: decrease of call quality
2) Measuring tool

- Degradation of BTS input spurious: measure input signal spurious at [Up Link] Port and make sure if it meets specification. If not so, check path from BTS to repeater.
- Fall of BTS input level: verify if input level at [Up Link] Port is -60~ -40dBm(total power). In the case of deviating the level, check path from BTS to repeater.
- Degradation of TX Drive AMP: set output power of TX drive AMP -10dBm then measure spurious. If it does not meet specification, change TX drive AMP.
- Failure of HPA: Although all system is normal, if output power is lack, change HPA.

3.2.3. Lack of RX Path Gain

1) Condition: fail of call setup, call failure, increase of adjust factor and increase of call setup time
2) Measuring tool
   - Check output power of front LNA and gain(40dB) connecting Signal Generator to Downlink input port.
   - Failure of RX Drive AMP: verify gain of Rx Drive AMP and if it is poor, change RX Drive AMP.
   - Although all system is normal, if output power is lack, change HPA.

3.2.4. Discord between actual output power and output power on NMS

1) Condition: impossibility of monitoring actual output power factor of repeater, error of output level control
2) Measuring tool:
   - Failure of Power Detector: because it is impossible to know actual output power factor exactly, change Power Detector.
   - Failure of Detector Table: download Detector table with notebook PC again

3.2.5. HPA OFF

1) Condition: instability of call quality
2) Measuring tool:

- Output power factor on NMS is monitored higher(lower) than actual output power: if ALC is normal, download RF Power Detector Table factor again.

3.2.6 DC Fail of Power Supply

- Failure of Power Supply: if output power voltage(+27V) decrease to 10% or less, DC Fail is occurred. Change Power Supply.
- Failure of RF Module: check each module

4. Operational Description of Control Board

4.1. General Function

Control board is designed to control and display the data communication of

Repeater system through NMS and SMS.

4.2. VFD(Vacuum Fluorescent Display)

It display functional status and control of all system. [System On Line] is displayed initially with power-on.

4.3. Functional description of key pad

- On-Line: (Key to turn on & off the system)

  The red LED indicates [System On Line]. The red LED turns off when the key is pressed and it lights up when the key is pressed again.

  Status monitoring and controlling is undertook with [System Off Line].

- UP: (Key to change menu / raise the factors with [System Off Line])
  - The key is used to move to other table.
  - The key is used to raise factors.

- DOWN: (Key to change menu / lower the factors with [System Off Line])
  - The key is used to move to other table.
  - The key is used to lower factors.

- ENTER: (key to select the items in need with [System Off Line])
  - The key is used to activate all selection

- ECS: (key to select the items in need with [System Off Line])
  - The key is used to cancel the selection

- RS-232: The port to connect laptop to Repeater and it is used for program download.

4.4. Operational description of VFD and Key pad

4.4.1. Main mode and items

1. Display Mode >		ESC ⟷ ENTER	
U P ↕ DOWN	Downlink >>	- Total Power	[ ]dBm
		- TX ATT	[ ]dB
		- HPA Status	Normal/Fail
		- HPA Over Power	Normal/Fail
		- HPA Hi Temp	Normal/Fail
		- Total Power Over	Normal/Fail
		- Total Power Under	Normal/Fail
		- Total Power Hi Limit	[ ]dBm
		- Total Power Lo Limit	[ ]dBm
		- TX LNA	Normal/Fail
		- TX Amp	Normal/Fail
		- Total Power Offset	[ ]dB
		- Power Limit Mode	On/Off
		- User SD Mode	On/Off
	Uplink >>	- RX ATT	[ ]dB
		- HPA Status	Normal/Fail
		- HPA Over Power	Normal/Fail
		- HPA Hi Temp	Normal/Fail
		- RX LNA	Normal/Fail
		- RX Amp	Normal/Fail
		- HPA ST Mode	On/Off

1. Display Mode >	ESC ⟷ ENTER		
UP ↕ DOWN	Common >>	- AC Status	Normal/Fail
		- DC Status	Normal/ Fail
		- Battery Status	Normal/ Fail
		- Door Status	Close/Open
		- Temperature	[ ]℃
		- Temp High Limit	[ ]℃
		- Temp Low Limit	[ ]℃
		- Temp Over	Normal/Fail
		- Temp Under	Normal/Fail

2. Control Mode >	ESC ⟷ ENTER		
UP ↕ DOWN	Downlink >>	HPA On/Off	ON/OFF
		ATT Gain	[ ]dB
	Uplink >>	HPA On/Off	ON/OFF
		ATT Gain	[ ]dB

3. Set up Mode >	ESC ⟷ ENTER		
UP ↕ DOWN	Downlink >>	Power Limit On/Off	ON/OFF
		Total Power Hi Limit	[ ]dBm
		Total Power Lo Limit	[ ]dBm
		Total Power Offset	[ ]dB
		Power Limit Mode	[On/Off]
		User SD Mode	[On/Off]
	Uplink >>	HPA ST Mode	[On/Off]
	Common >>	Temp High Limit	[ ]℃
		Temp Low Limit	[ ]℃
		TEMP Autodown	ON/OFF