1 Introduction

1.1 System description

This manual provides installation instructions and guidelines on how to run the Comprod 700/800MHz tower top amplifier (TTA) system.

The TTA system is designed to be modular, so common building blocks can be set up in different configurations. This is to allow system to achieve:

- Amplifier redundancy with switching option
- 8, 16 or 32 outputs
- Stand Alone (SA) radios
- Extra output for testing

The TTA system includes two main components: a Tower Top Amplifier (TTA) unit, Base Transceiver Station (BTS) unit which include a Control Unit (CU) and Distribution Unit (DU) as below.

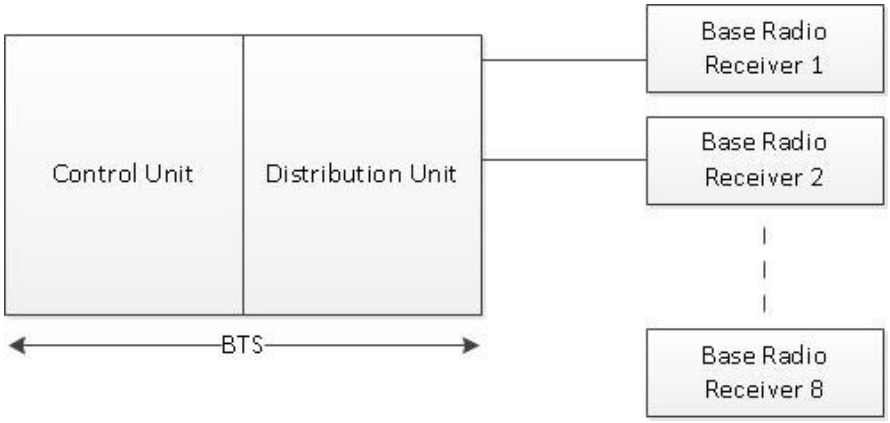


Fig.1 8-way BTS with Control and Distribution Unit

Tower Top Amplifier

The TTA consists of:

- Quadrature Low Noise Amplifier (LNA) A and B with SMA connectors.
- Band Pass Filter (BPF) with N-female connectors.
- Lightning protectors with N-female connectors.
- Grounding studs.
- Stainless steel enclosure with a minimum spacing between connectors to facilitate connections and weather proofing.

Additionally, a mounting bracket kit is required. Power is fed from the CU to the TTA unit via a feedline.

BTS Control and Distribution Unit (C&DU)

The BTS C&DU unit has a -48 V DC power supply and supplies power to the TTA unit. A 110 V AC to -48 V DC (AC/DC) adapter is provided to allow unit to be powered from the mains. Configuration with 8-way C&DU – with power supply redundancy.

1.2 Definitions

1.2.1 GUI

GUI (Graphic User Interface) refers to user friendly webpages/software accessible from the BTS C&DU that allow user to control the unit via ethernet port, if this method of configuration is preferred over setting the controls with help of the front panel.

1.2.2 Base Radio Channel

It is a conventional single Radio Frequency (RF) channel base radio with individual connections to all base radio receiver. This hardware type is employed with a TTA system control unit that has the Rx distribution block included within it as shown in Fig. 1.

1.2.3 Auto Failure Mode

In the event of a power supply failure, the relay will default to the bypass condition. This feature allows the system to always remain operational. The bypass circuit uses a redundant amplifier. If the primary amplifier fails, the alternative amplifier is activated in the circuit. In the event of a redundant amplifier failure, which is unlikely, both inoperable amplifiers will be bypassed with help of a switch.

1.2.4 High-power Alarm

In the event of an abnormal high-current power detected at the output of the unit, the high-power alarm is triggered. The threshold of the detection is nominally -35 dBm at the output of the distribution unit.

1.2.5 Lightning Protection

All feed connectors come equipped with surge arrestors to prevent failure of the unit from lightning strikes. The TTA Unit was successfully tested by an independent laboratory with up to 26 kA lightning strikes. There are two types of surge protectors in the TTA unit. The first type blocks all high-power signals deployed in the Tower Top Amplifier Unit. The other one allows the Direct Current (DC) to pass to feed the amplifiers inside to the TTA unit.

2 Module Description

This section provides details on the building blocks which form the TTA system.

2.1 Tower Top Amplifier Unit

The Comprod high-performance compact TTA is shown in Fig. 2 below. The unit is supplied with:

- N female bulkhead connectors

- Mounting brackets

A block diagram of the RF section of tower top unit is shown in Fig. 3 below.

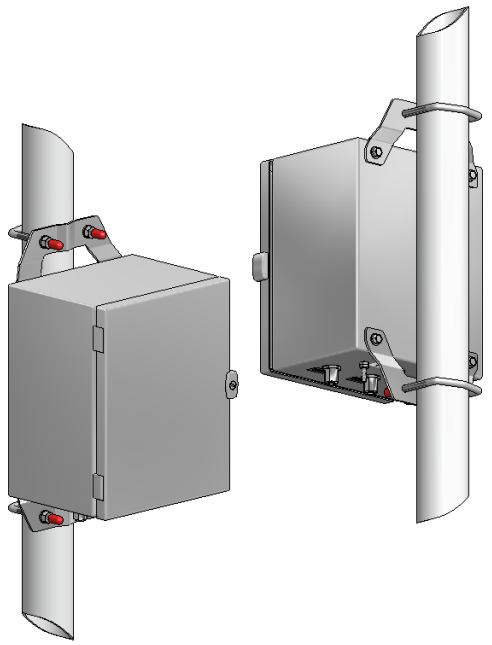


Fig. 2 TTA Compact Unit

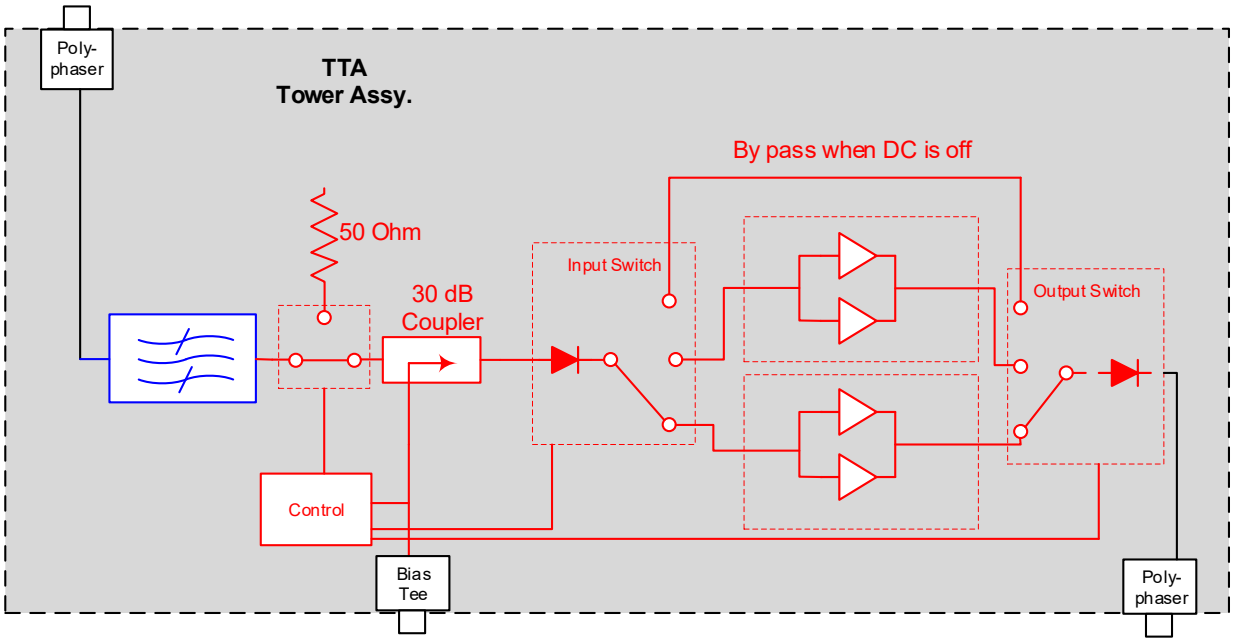


Fig. 3 Block Diagram of the RF Section of the Tower Top Amplifier Unit

The RF blocks cover filtering supporting >110 dB rejection of signals in the Tx bands below:

- 764 to 776 MHz
- 851 to 869 MHz

DC power and control signals are supplied to the TTA unit via the feed line of the RF output. A test port line is included with 30 dB nominal directional coupling into the RF line.

Bracketry allows the units to be tower mounted and is provided with the unit.

2.2 TTA Control and Distribution Units

2.2.1 Overview

This is a BTS C&DU that is intended to be connected to base radios. It is housed in a 1U 19-inch rack enclosure with 8-way multicouplers on their outputs to feed up to 8 base radios.

Front and rear panel of the BTS C&DU are shown in Fig. 4 below.

(a)

(b)

Fig. 4 Front and Rear Panel of the BTS Control and Distribution Units (a) Front Panel (b) Rear Panel

The block diagram of the RF section of the unit is shown in Fig. 5

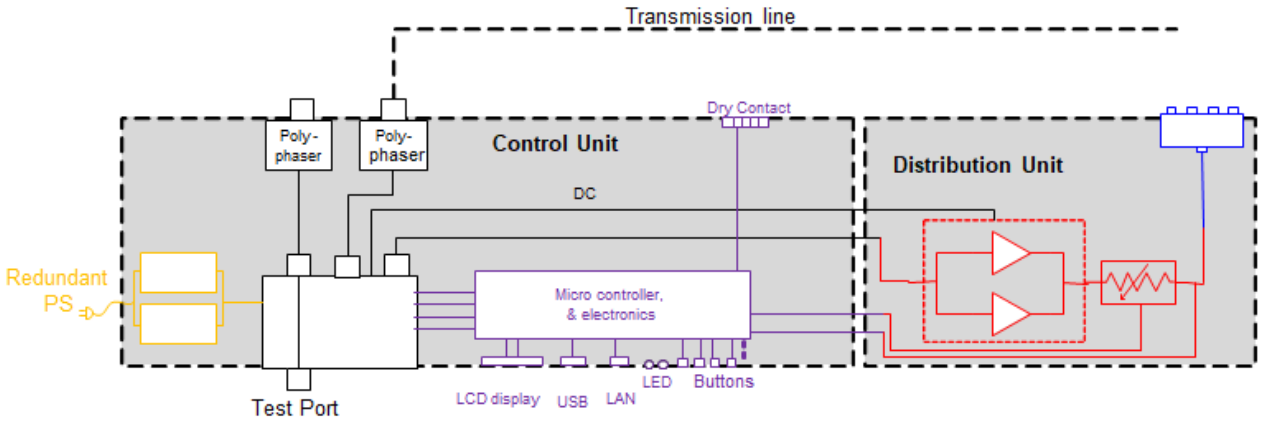


Fig. 5 Block Diagram of the BTS Control and Distribution Unit

The RF input of the BTS C&DU is connected to the RF output of the TTA unit via the feedline running down the tower.

The functions of the BTS C&DU allow for:

- The amplification signal to be set at the desired level, so that radio receivers are not overloaded.
- The signal from the test port to be routed to the radio, or a signal to be injected to the test port.
- The output signal to be amplified and split to feed up to 8, 16 or 32 radios.
- An alarm circuit to detect high-power signals.
- A communication with the TTA unit and supply of its power.

The BTS C&DU can be either controlled by a Graphical User Interface (GUI) via ethernet port, or by setting the controls on the front panel that displays the information and input data on an LCD screen. Any fault conditions or alarm in the unit are also indicated on front panel LEDs.

The BTS C&DU is powered by -48 V DC supply. Two power supply inputs feed two separate internal power supplies, providing internal power supply redundancy. A separate external 110 V to -48 V AC/DC adapter is available.

2.2.2 Description of the Front Panel

The Front Panel is shown in Fig. 4 (a).

- Power LED: green indicates the unit is powered up.
- Status LED: indicates the unit status as shown below in Table 1.

Table 1 C&DU Statues LED

Status LED Color	Unit State
Green	Normal operation
Yellow in flashing mode	Unit is in test mode
Red	Fault/alarm raised

Fig. 6 BTS C&DU configuration via Front Panel

Functions of the BTS C&DU can be navigated and adjusted using the front panel and buttons, as shown in Fig. 6 above.

Other features:

- USB port: currently, this port is not used, but it is available for future expansion.
- Ethernet port: It allows the unit to be controlled via GUI and it allows for SNMP messaging.
- Test port: this is the front panel's connector that allows access the unit's test port.

2.2.3 Description of the Rear Panel

Rear panel ports are shown in Fig. 4(b) above.

Test port: this port is connected to the test port on the TTA unit.

RF IN port: this port is connected to the feed port on the TTA unit and drives the amplified output from to the BTS C&DU, as well as feeds the power supply and establishes a communication to the TTA unit.

NOTE: DC power is present on this connector port.

EXT Filter Ports: These ports are routinely coupled by a BNC link. In exceptional cases, an external filter may be added to the system - in this case the link can be removed, and the filter can be inserted in the RX path.

SA EXP Port: This an expansion port that allows up to an additional16 outputs to be provided to the TTA system via a connected expansion unit. A 50 Ω load must be plugged into this port when not in use. This load is supplied with the BST Unit.

-48 V Power Supply Ports: These ports allow the BST Unit to be powered from a -48 V DC power supply. There are two -48 V ports. The unit can be plugged in either individually via each port or via both ports, to achieve a power supply redundancy.

The Power Supply port connections are shown in Fig. 7 and Table 2 below.

Alarm Port: This port is attached to a relay inside the BST Unit, and it is used to indicate a presence of the condition that triggered an alarm. More information regarding the cause of the alarm can be obtained through the GUI, or in the Front Panel.

The Alarm Port Connector is shown in Fig. 7 and table 2.

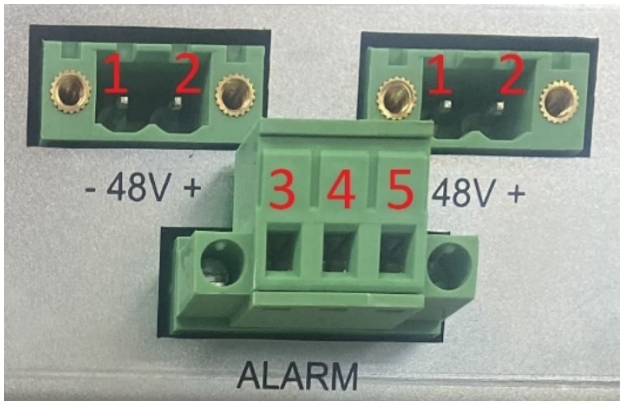


Fig. 7 Power Supply and Alarm Port Connectors

Table 2 Power Supply and Alarm Port description

Pin	Function
1	DC input (-)
2	DC input (+)
3	Fault connected when alarm not present
4	Common
5	Fault connected when alarm present

2.3 8- to 32-Way Control and Distribution Units Expansion Kit

This is a 8-way passive power splitter to be used with 8-way units to support up to 32 radios. It can be fed from the RF expansion port. It is housed in a 1U 19-inch rack and supplied with a cable.

2.4 AC/DC Adapter

This is a separate external 110 V to -48 V AC/DC Adapter that allows the BTS C&DU to be powered from the mains. Two of these AC/DC Adapters can be employed to grant power supply redundancy.

2.5 Lightning Surge Protector

This is one of the two types of Surge Protectors used to protect the BTS C&DU from induced lightning currents. It has a DC pass through, and it can be used both on the Test port Line or the Feedline to supply the amplifier on the tower top unit.

2.6 Optional Narrowband Filter

It is expected that the rejection of 110 dB in TX bands from Tower Top Unit will be sufficient in most cases. If more rejection is required, the optional bandpass filter can be added. The bandpass filter is connected to the external filter ports of the BTS C&DU and can be mounted in a slot on a 1U 19-inch rack.

The center frequency can be set up anywhere within the RX band. If optional bandpass filter is required, please contact Comprod and the specific frequency requirement will be included in the filter design and the filter tuned accordingly.

The Optional Narrowband Filter is shown in Fig. 7 below.

Fig. 7 Optional Narrowband Filter

3 System Configurations

A block diagram of the 8-way configuration is shown in Fig. 8 below. The 32-way configuration is similar to the 8-way, but it contains additional expansion kits.

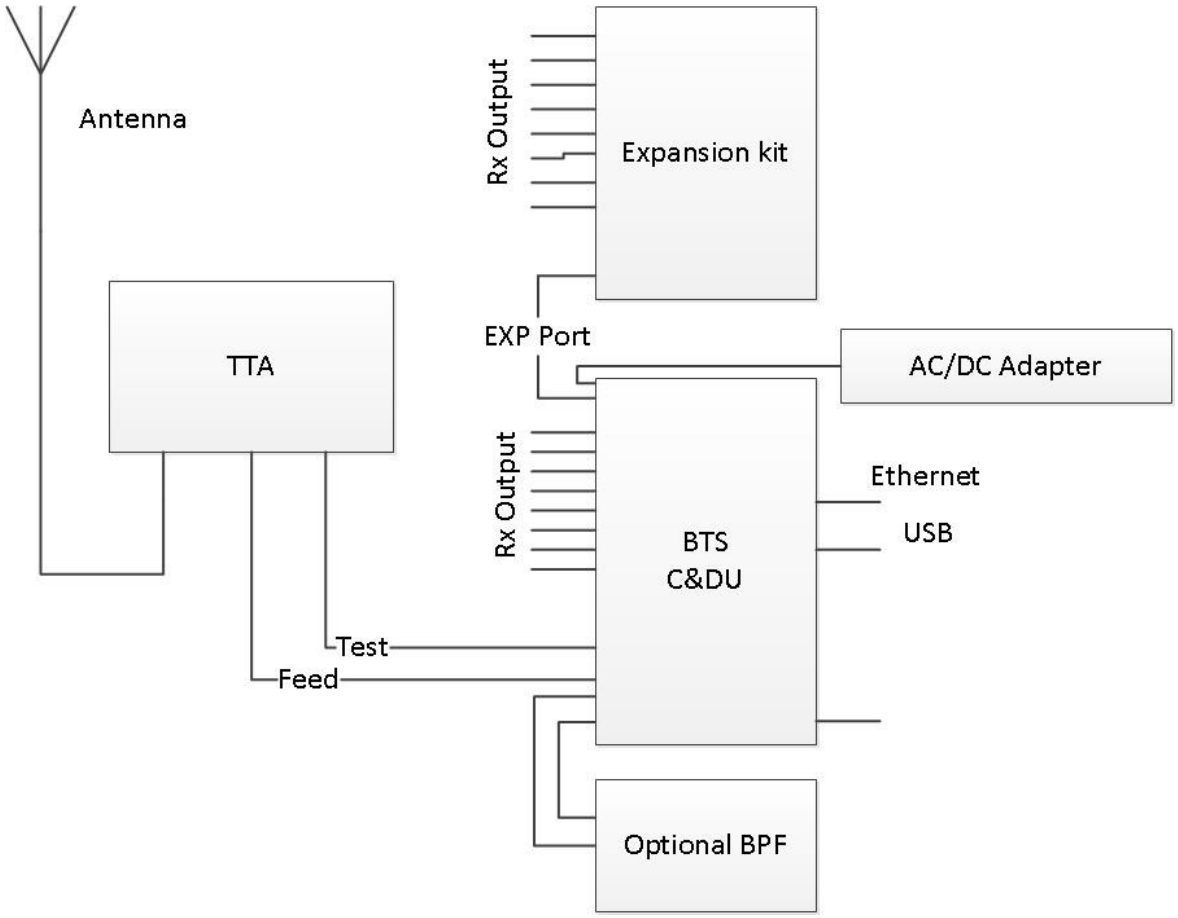


Fig.8 Block Diagram of the 8-Way Configuration

Notes

- The BTS C&DU has internal DC power supply redundancy and, accordingly, they has two -48 V supply connectors. These connectors can be feed from two sperate AC/DC adapters to allow the unit to be powered from mains and provide AC power supply redundancy.
- The 8-way power splitter is mounted in a separate 1U 19-inch rack enclosure. It is supplied with the necessary cables to be connected to the RF expansion port of the BTS C&DU.

The information required for modeling RF Site inbound coverage is shown in Table 3 below. Single Branch Redundant Amplifier TTA system is depicted.
All control unit parameters are specified with user defined attenuation set to 0 dB.

Table 3 TTA-SR-32 Modeling RF Site Inbound Coverage

Parameter	Worst case (Overall temperature and frequency)	Typical

TTA Gain	28 dB	29 dB
TTA Noise Figure	1.8 dB	1.5 dB
TTA IIP3	14.3 dBm	17.7 dBm
BTS C&DU Gain	- 5 dB	- 4.6 dB
BTS C&DU Noise Figure	2.9 dB	2.8 dB
BTS C&DU IIP3	33 dBm	33.1 dBm

4 Installation

Note

Power should not be applied to units until all cabling is completed.

4.1 System Installation

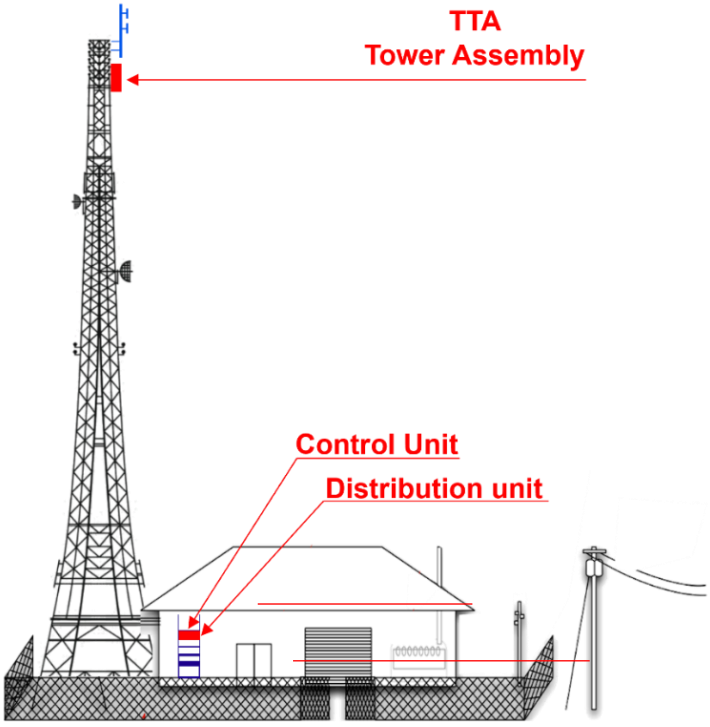


Fig. 9 TTA system installation scheme

A typical installation of the TTA system is shown in Fig. 9 above. Lightning Protectors are placed to protect the system up to 26 kA lightning strikes. The Feed port Lightning Protector allows DC signals to pass through to the Tower Top Amplifier to supply the LNAs.

4.2 TTA Mounting Kits

Tower Top Unit's mounting is shown in Fig. 10 below.

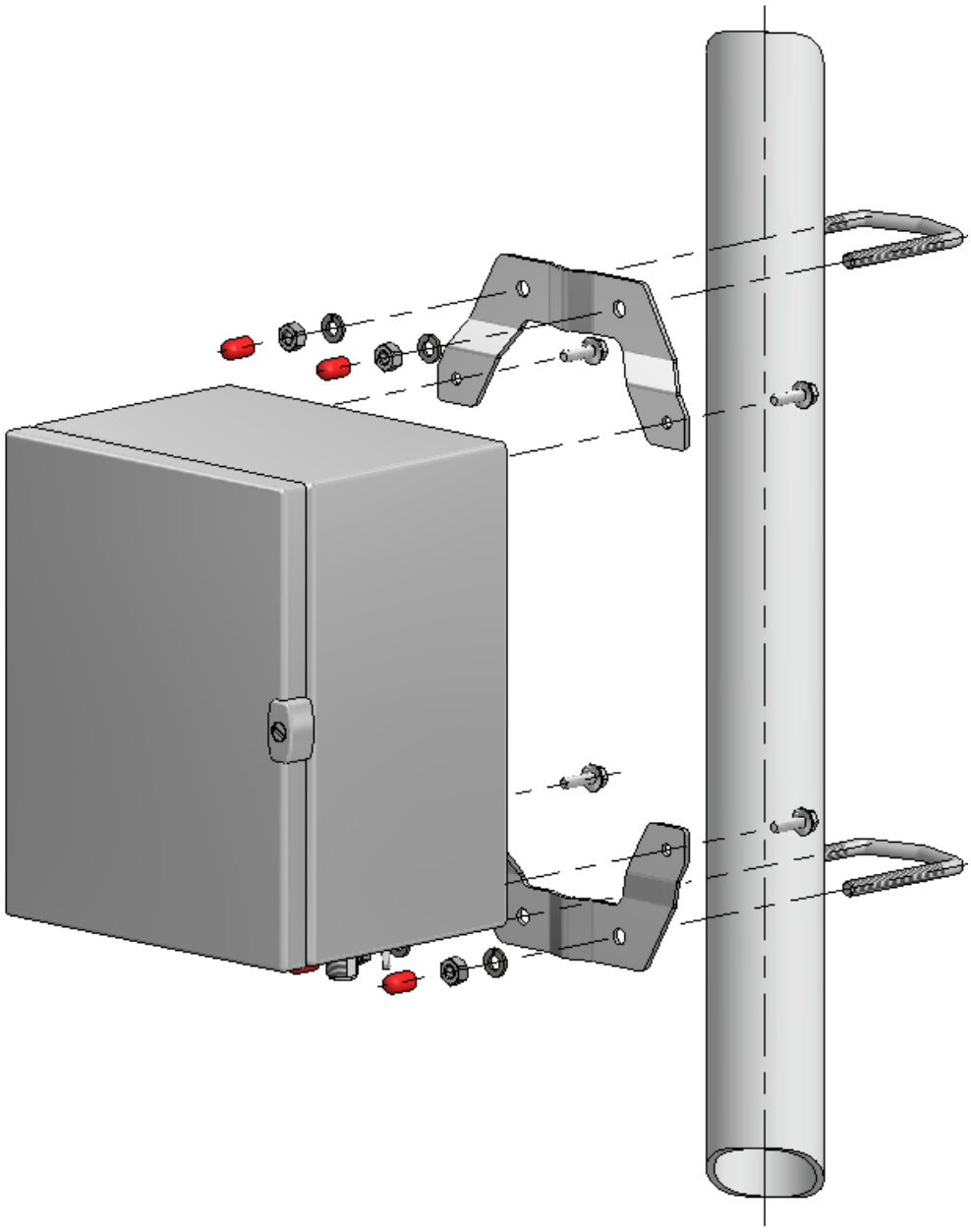


Fig. 10 TTA system installation scheme

4.3 TTA Installation

The hardware provided with the TTA includes Band Clamps, Bolts and U bolts. Installation and mounting can depend on specific site in which case the hardware may have to be supplied by the customer or their installation contractor. The TTA should be mounted with connectors downward to avoid any long-term risk of water entering unit via connector ports.

RF Connections from the TTA are displayed in Table 4 below.

Table 4 Connections from a TTA unit

Port	**Connects To**
ANT	Antenna output
TEST	Rear TEST PORT on BTS C&DU – via a Lightning Surge Protector
FEED	RF IN on BTS C&DU – via a Lightning Surge Protector

Once coaxial cables are connected to the TTA unit, its recommended to seal them with tape. This tape should cover the last 3 inches of the cable, cover the cable connector, and goes over the connector on the unit. The TTA unit should be grounded to a suitable grounding point next to the tower.

4.4 Control Unit Installation

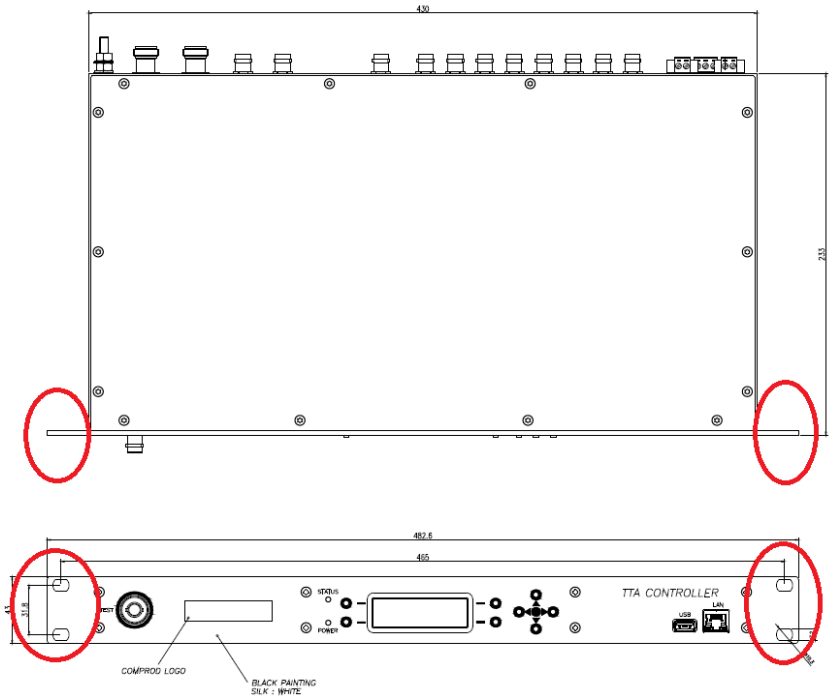


Fig. 11 BTS C&DU outline drawing

The BTS C&DU is designed to fit into a 1U 19-inch rack. It can be fixed into the rack using the 4 mounting holes circled in red above. Ideally, washers should be used under these screw heads to avoid damage to the Front Panel label.

The RF IN Port should be connected to the TTA FEED connector via a Lightning Protector at the entrance point to the equipment room.

The TEST Port Rear Panel connector should be connected to the TTA TEST connector via a Lightning Protector at the entrance point to the equipment room.

8-Way Base Radio Option

The 8 RF OUTPUTS on the BTS C&DU should be connected to each base radio. The EXP PORT should be fitted with N type 50 Ω load. Ideally, any unused RF OUTPUTS should be terminated in 50 Ω BNC loads.

32-Way Base Radio Option

The expansion unit should be mounted in the rack close to the BTS C&DU. It also has a pair of M6 studs with ¾" spacing. These should be used to ground the unit.

The EXP Port on the BTS C&DU should be connected to the EXP Port on the expansion units.

The RF OUTPUTS on both the BTS C&DU and expansion units should be connected to the base radios.

Power Supply

The control unit is powered by a -48 V DC supply. This is fed into the unit via a connector on the rear of the unit as shown on Fig. 7 and table 2 above (section 2).

Either or both power supply ports can be connected. If both supplies are connected, the power supply redundancy is achieved.

Form C Contacts – Alarm Connector

A relay is included inside the unit which is used to indicate that an alarm condition has been triggered. The pinouts of this connector are shown in Fig. 7 and table 2 above (section 2).

Note

All the equipment in the TTA system should be grounded.

All ports that are not connected should be terminated in 50 Ω BNC loads.

5 Commissioning using GUI

5.1 Connecting to TTA system and GUI Overview

Turn On the BTS Control & Distribution Unit

Connectors should be plugged into a ±48 V DC supply terminals on the rear of the unit.

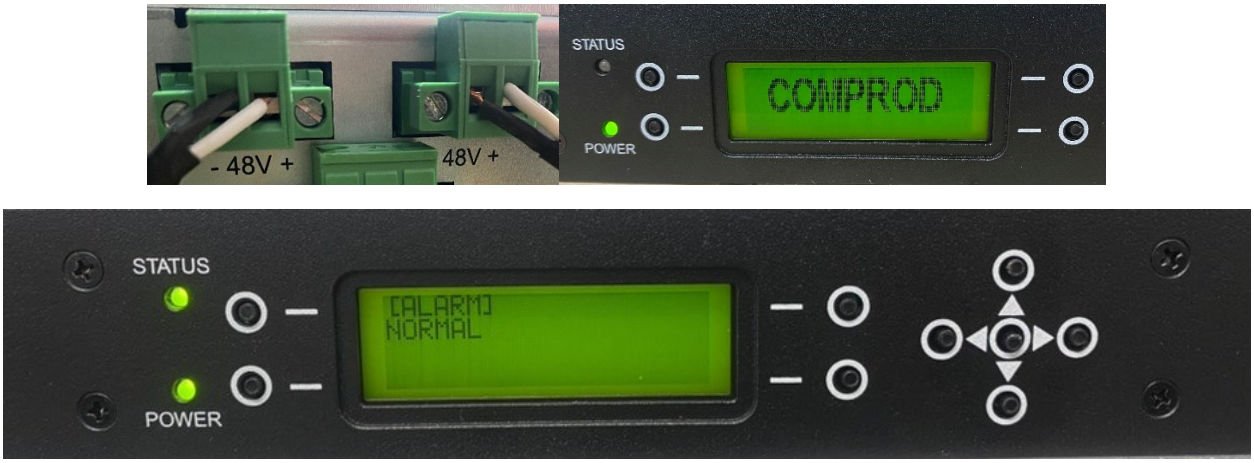


Fig. 12 TTA system power on procedure

Once the unit is powered on, the POWER LED turns green and the LCD screen displays the Comprod Logo. Seconds later, both POWER and STATUS LEDs turn green and the LCD screen should show NORMAL [ALARM] as in the fig. 12 above.

The GUI can be accessed by connecting the Control Unit to a PC via the Ethernet Port.

To connect to the BTS C&DU, it is necessary to set the computer that is being used to connect the unit to the same subnet.

Connect to web browser

1. Connect the Ethernet cable from the Laptop to the BTS Control & Distribution Unit on the front of the unit.

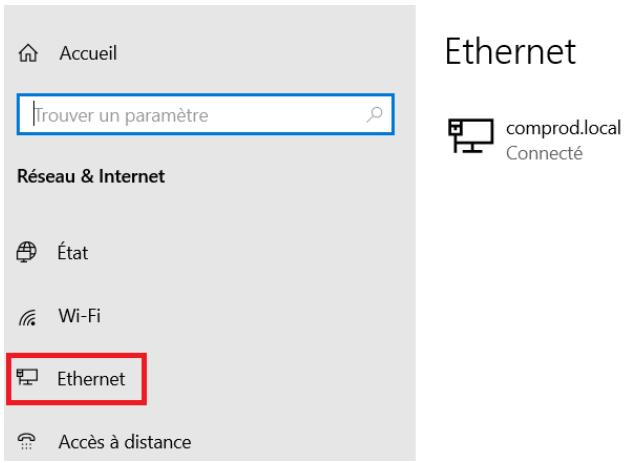
Select Ethernet as marked in red below, then select the Ethernet network that is connected to the device as marked in Fig. 13 (a) in red below.

Edit the IP settings as below in Fig. 13 (b) by clicking on Edit.

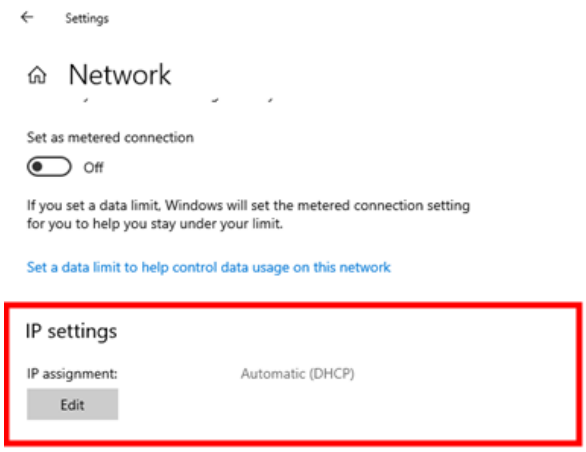
The unit default IP address is: 192.168.1.100

2. Static IP address should be configured to communicate with the unit, manual IPv4 setting as in Fig. 13 (c) (Windows 10):

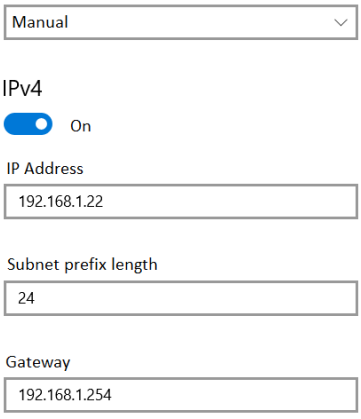
- IP address: **192.168.1.22**
- Subnet prefix length: **24**
- Gateway: **192.168.1.254**
- Leave IPv6 set to Off



(a)



(b)

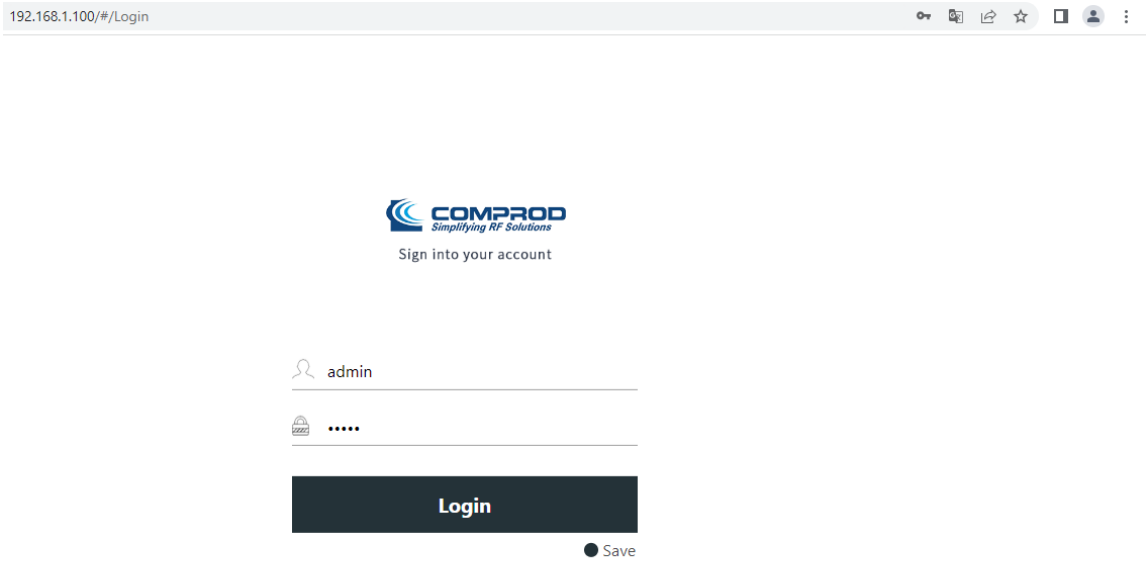


(c)

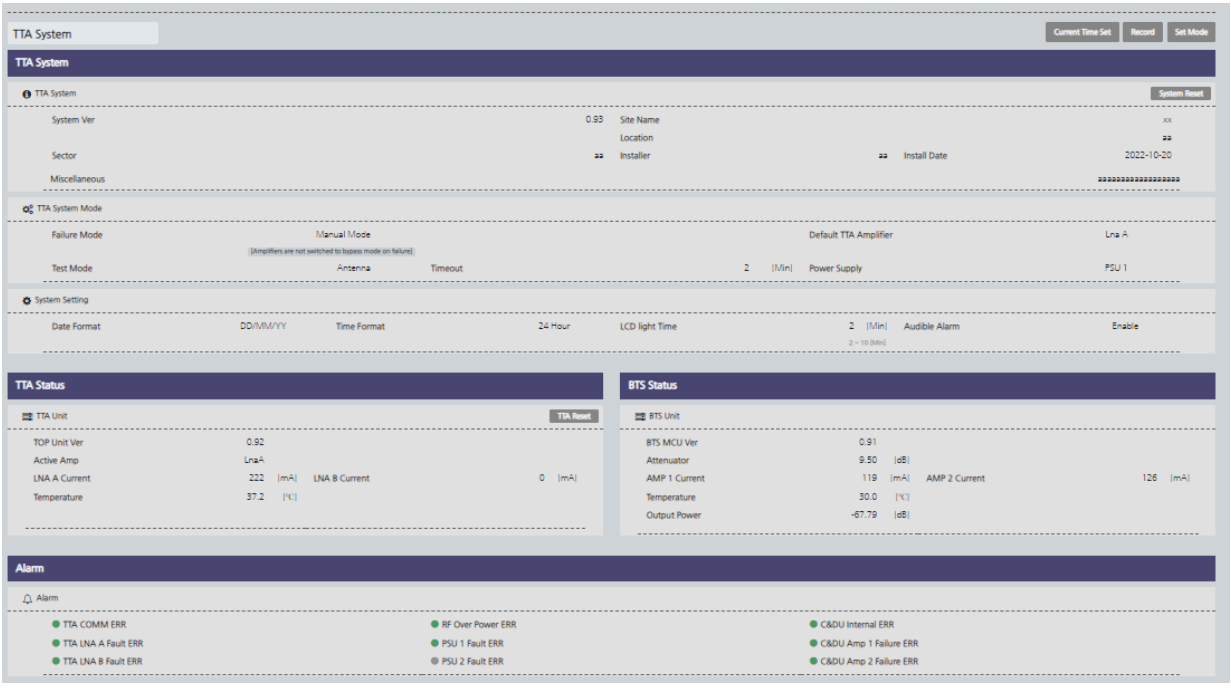
Fig. 13 IP setting configuration (a) Selecting Ethernet (b) Editing the IP Settings (c) IP configuration

3. Enter the unit IP into the Internet browser address bar: http://192.168.1.100

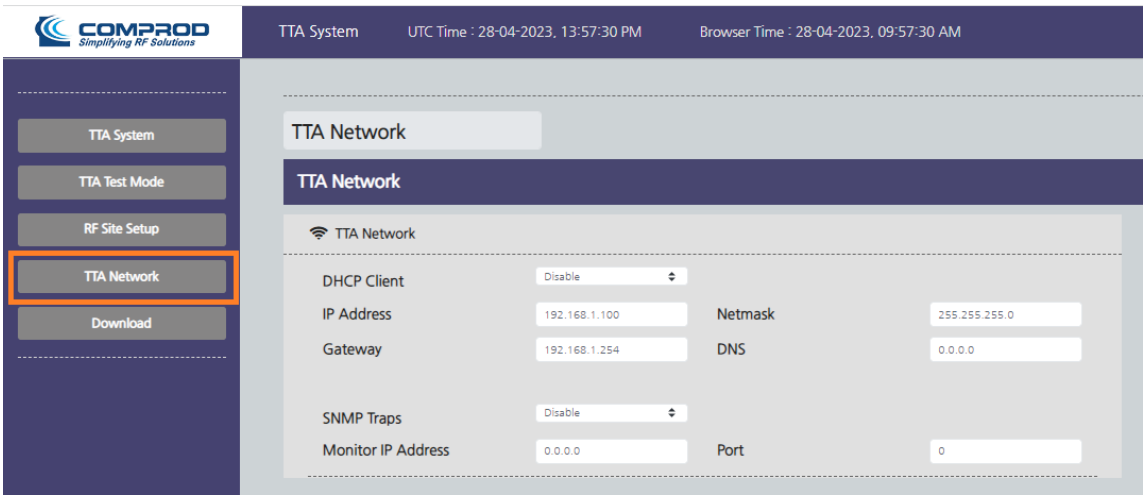
Login page: ID: **admin** / Password: **admin**
Password can be changed after login.



(a)



(b)



(c)

Fig. 14 BTS C&DU Webpage (a) Log in page (b) Summary webpage (c) TTA network

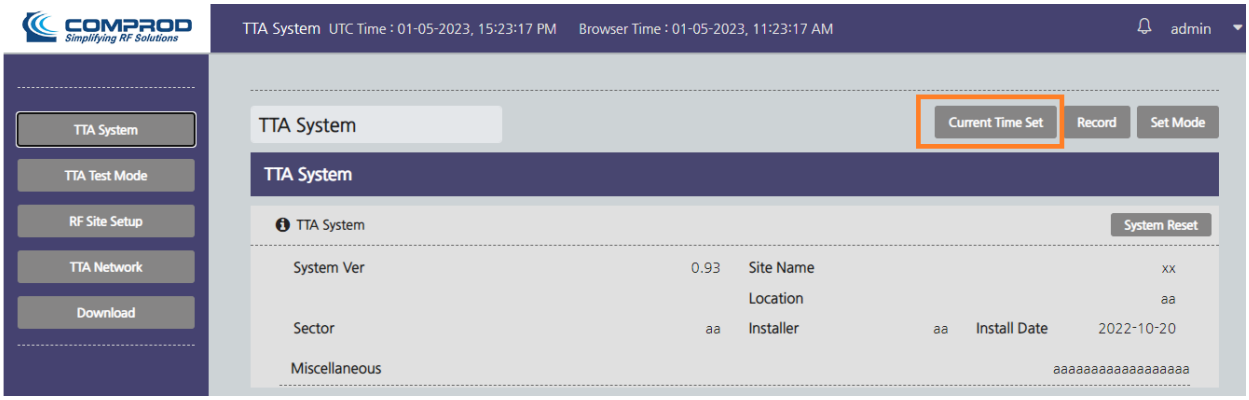
If more BTS C&DUs are to be connected – it is recommended that the IP address is changed from the default address. This can be done from the Network Set Up menu. It can be found by clicking on TTA Network button, then selecting System- Network Set Up, see Fig. 14 for reference.

Note

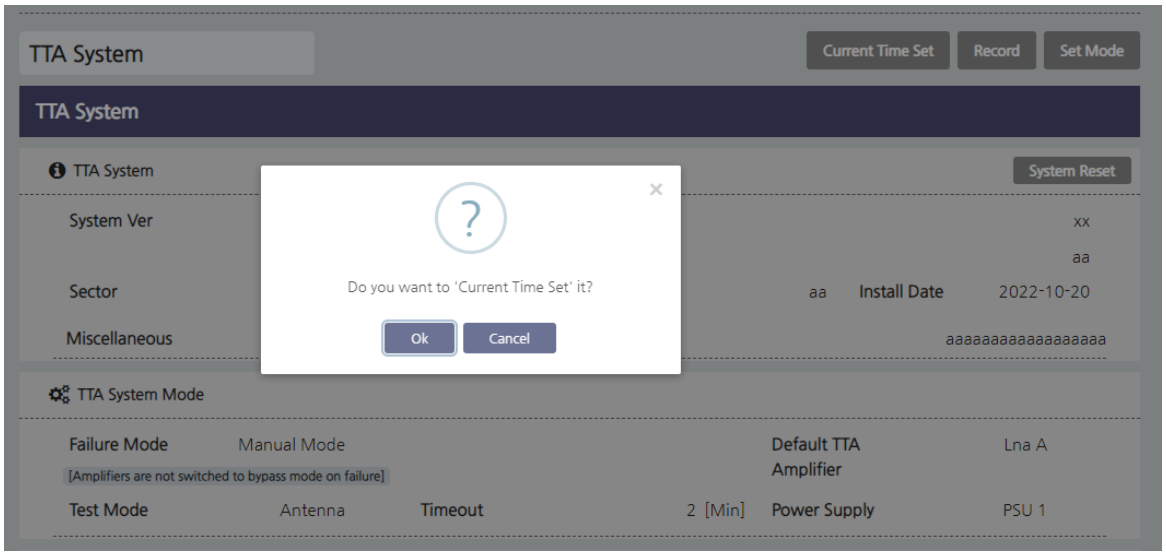
If the IP address is changed the new address must be entered in the browser address bar to continue the set up.

5.2 Setting Time and Date

It is recommended to set date and time during the setup procedure – so that the TTA system is set to local time. The date and time can be edited by clicking on the button Current Time Set as shown in Fig. 15 (a).



(a)



(b)

Fig. 15 Setting Date and Time (a) option set up access (b) Confirm Configuration

5.3 TTA System summary performances

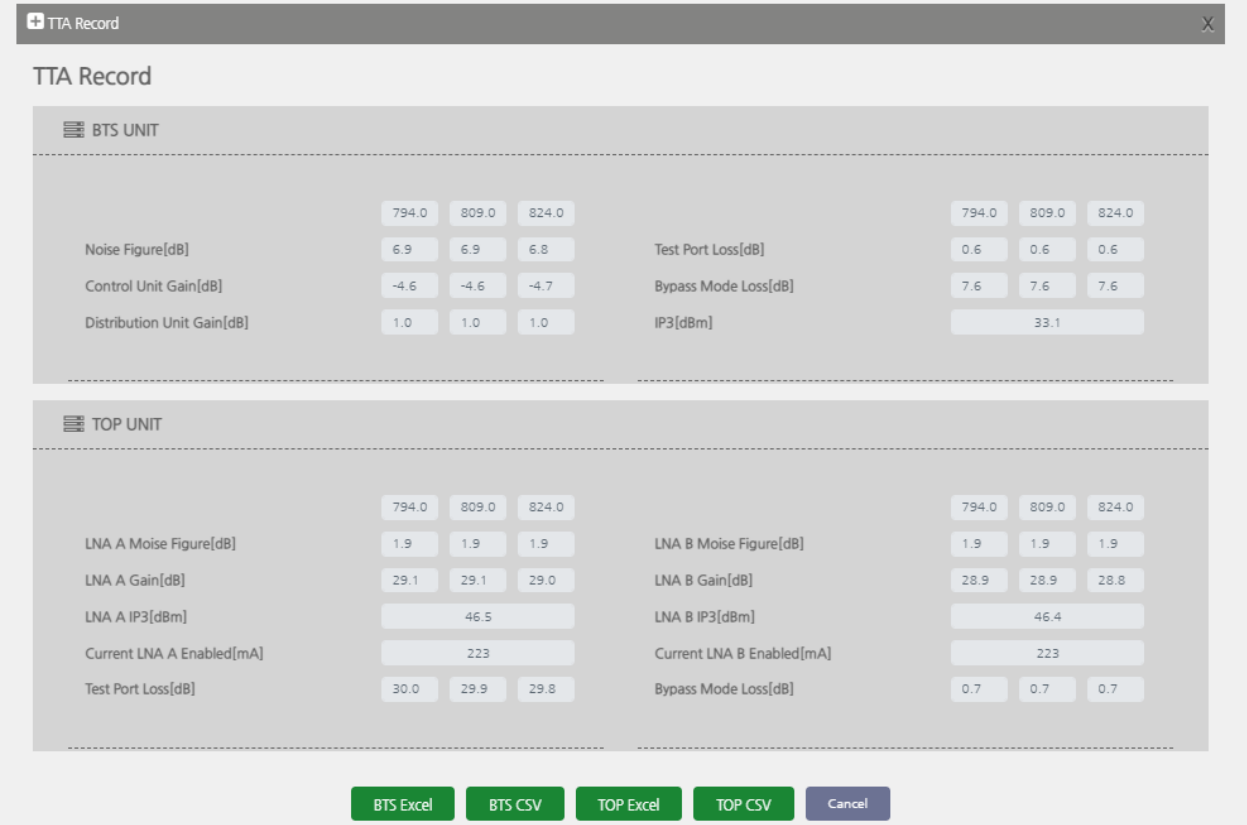


Fig. 16 TTA System performances

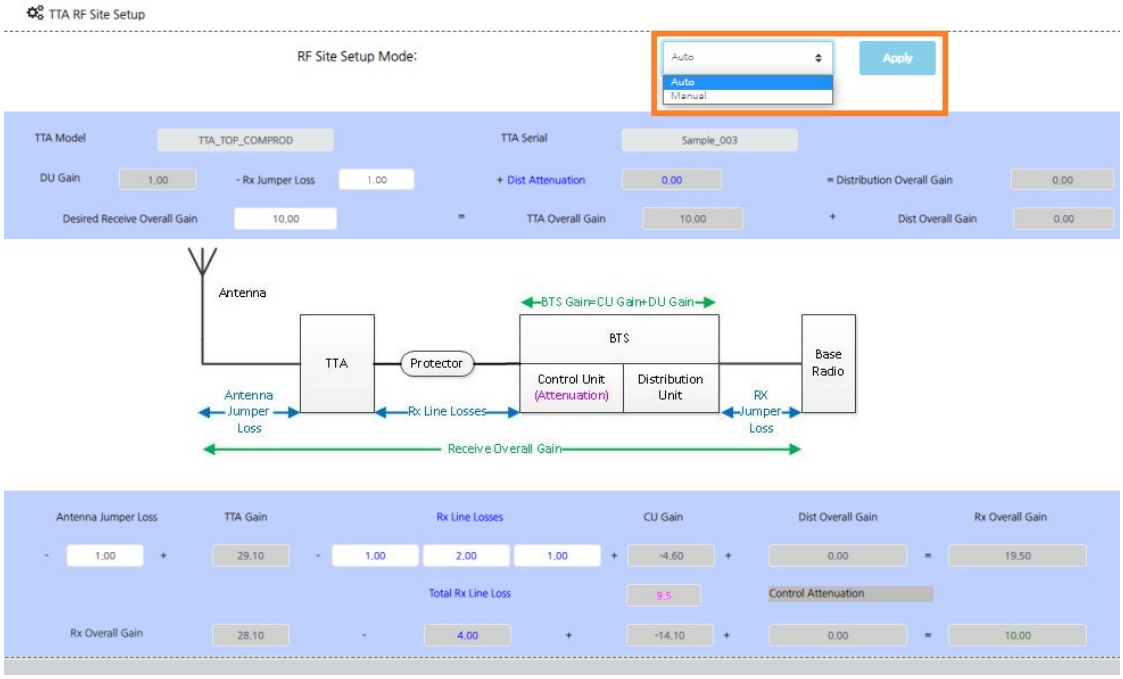
Click on Record button on the web page in the top-right corner, as shown in Fig. 14 (b). The tower top unit and the BTS C&DU performance is shown in Fig. 16 above.

5.4 TTA RF Site Setup

5.4.1 Manual Mode

1. Select RF Site Setup from the left menu bar.
2. Select the Manual Site Setup Mode

The information that is required is shown in Fig. 17 (b) below. Once the required Control Attenuation figure is found, it can be set up by pressing the apply button. This will set the Attenuation at the required level.



(a)

(b)

Fig. 17 TTA RF Site Setup (a) Manual option selection (b) RF Site Configuration

5.4.2 Automatic Mode

Enter TTA RF Site Automatic Setup Mode by clicking on the Apply button as shown in Fig. 18.

The Control Attenuation will be set to the correct level to give the “Desired Receive Overall Gain”, and unit will return to the Summary menu.

Gray cells contain fixed results. **Rx Jumper Loss**, **Desired Receive Overall Gain**, **Antenna Jumper Loss,** and **Rx Line Losses** must be entered into the white cells. In this example, it is determined that 11 dB of user Control Attenuation is required to meet the RF site goal of 10 dB Rx Overall Gain.

Fig.18 TTA Site Set Up Automatic Mode

5.5 TTA Test Mode

As part of “Site Performance Verification Procedure” it is mandatory to terminate the Antenna port of the BTS C&DU in a 50 Ω load. This can also be done from the Test Mode page, by selecting from Antenna drop-down menu in the top right corner: Internal Termination Test Mode (LNA A) or Internal Termination Test Mode (LNA B). and, thereafter, clicking on the Enable button as shown in Fig. 19.

That will terminate the amplifier in the internal 50 Ω load for a determined period (in minutes) that can be provided in the Test Mode Timeout input box, marked in orange in Fig. 19.

When the amplifier is terminated by the 50 Ω load, the Status LED on the Front Panel will flash faster. When the amplifier returns to a normal operation the LED changes back to slower green flash. If it is necessary to put the amplifier back into Test Mode, the Enable button must be clicked on.

To enable the Test Mode:

1. Select TTA Test mode from the left menu bar.
2. Set the Timeout, select the antenna on the Test Mode bar and click on the Enable button: Test Mode is executed, and the settings are deactivated. When Test Mode ends, the interface will change back to the active window.
3. White cells must be entered: -65.5 dB of signal generator level is calculated in the example below.

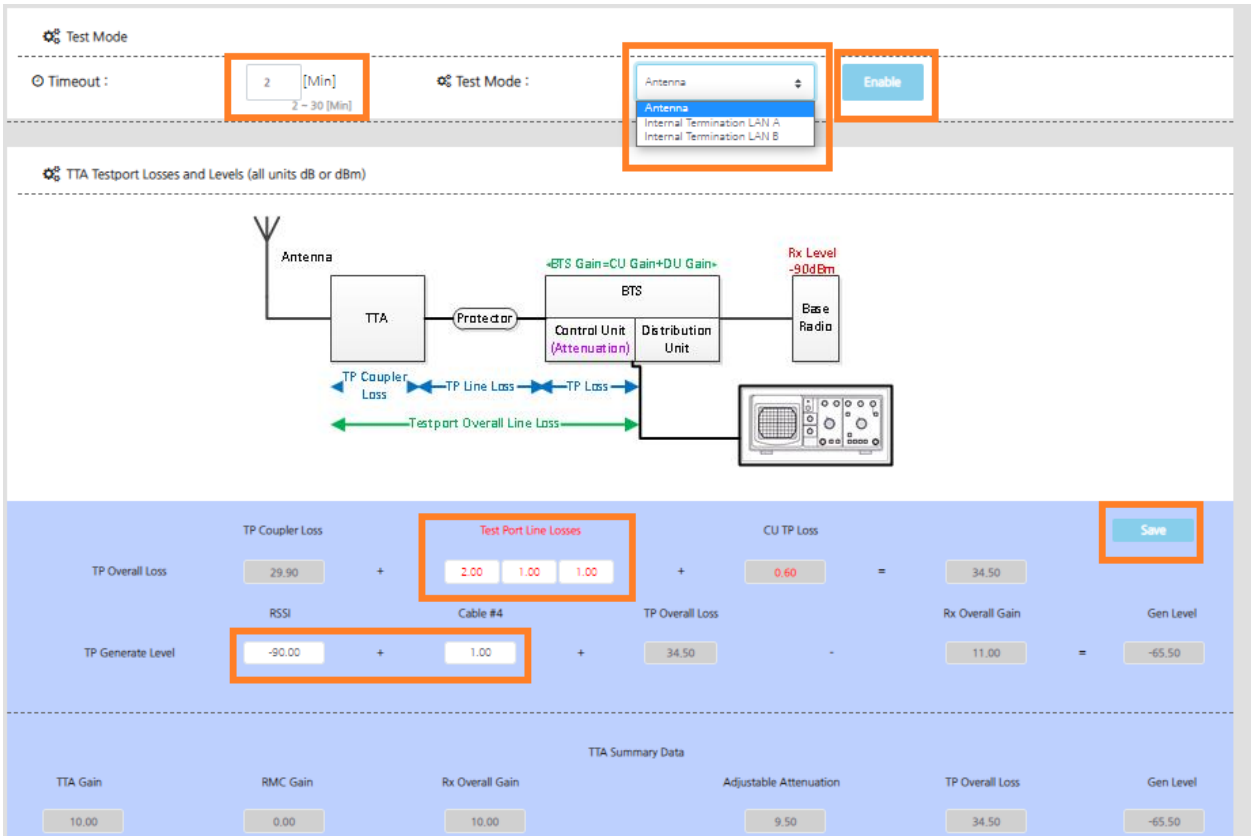


Fig. 19 Test Mode Web Page

5.6 Failure Mode Configuration

Failure Mode Configuration allows for a selection of the default Tower Top Unit amplifier, and it also allows to select different modes (failure modes) of operation that would control the amplifier if fault is detected by monitoring of the device currents, see Fig. 20 below.

Default Amplifier: allows the default amplifier in TTA to be selected. For simplicity in description below it is considered that this is Amplifier A.

5.6.1 Standard Auto

TTA

If a fault is detected in the TTA amplifier A, the unit will switch to the TTA amplifier B.

If a fault with the TTA amplifier B is detected, the unit will switch to the TTA Bypass Mode.

Control and Distribution Unit

If a fault is detected in C&DU Unit, it will change to the Bypass Mode.

5.6.2 Intelligent Auto

TTA

If a fault is detected in the TTA amplifier A, the unit will switch to the TTA amplifier B.

If a fault with the TTA amplifier B is detected, the unit it will switch back to the operational half-of-quadrature coupled the TTA amplifier A.

If a fault with half of the TTA amplifier A used above is detected, the unit will switch back to the operational half-of-quadrature coupled the TTA amplifier B.

If a fault with half the TTA amplifier B used above is detected, the unit will switch to the TTA Bypass Mode.

Control and Distribution Unit

If a fault is detected in Control Unit, the unit will switch to the Bypass Mode.

5.6.3 Constant Gain

The Constant Gain function is similar to the Intelligent Auto with the exception that is half amplifiers in the TTA are deployed, the unit will then attempt to change the attenuator setting to maintain the desired gain.

5.6.4 Manual Mode

There is no automatic switching of amplifiers under failure conditions.

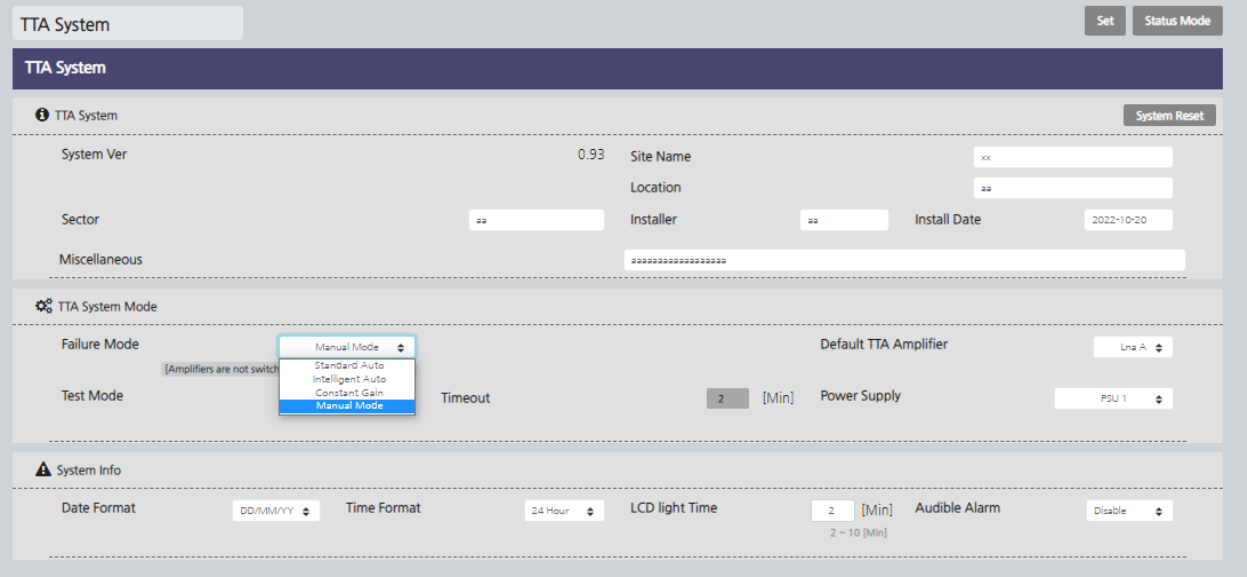


Fig. 20 Test Mode Web Page

5.7 Audible Alarm Setup

Audible Alarm menu allows the audible alarm to be enabled/disabled under fault alarm. The desired state: Disable or Enable must be selected in the bottom right corner and the and the Apply button clicked on as shown in Fig. 21 below.

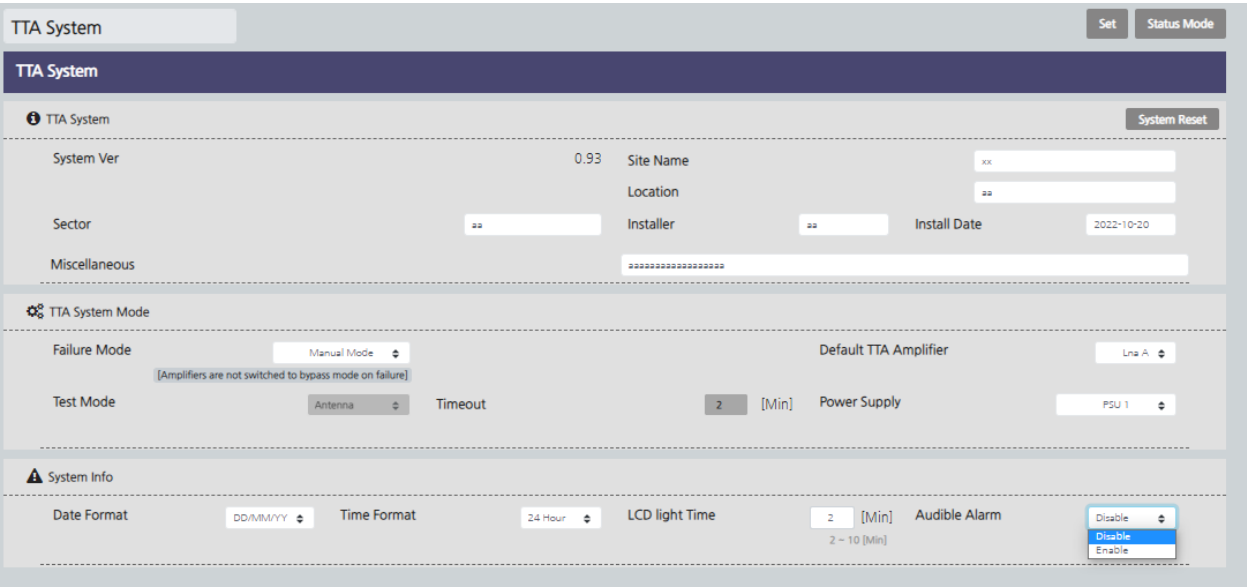


Fig. 21 Audible Alarm Setup

5.8 PSU Setup

PSU Setup allows configuration of power supplies within the BTS C&DU. In normal circumstances the PSU is set at the factory.

In a unit with power supply redundancy that has two DC inputs, the PSU will be set as: PSU 1 and PSU 2 as shown in Fig. 22.

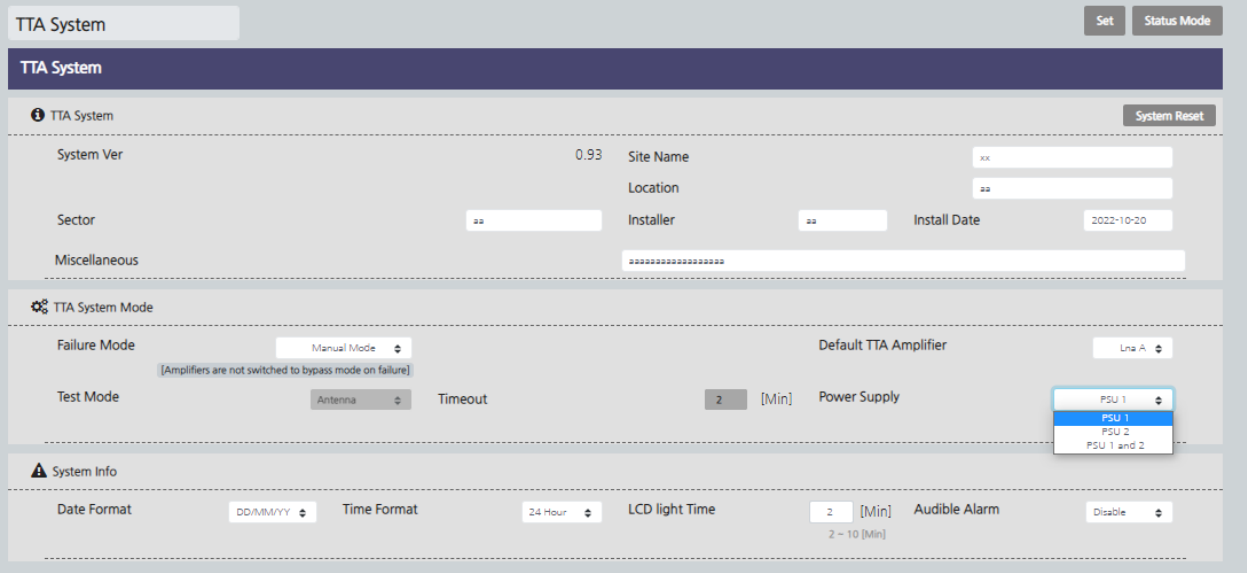


Fig. 22 Power Supply Unit Setup

5.9 Security

The Security Menu allows the unit username and password to be changed. New password entered in the password input box, confirmed in the box below and set using apply, Fig. 23 below.

Note: If password is forgotten, the unit can be reset to a factory default password setup from the Front Panel as described in Section 6. The password will be restored to ‘admin’ which is the default password for the unit.

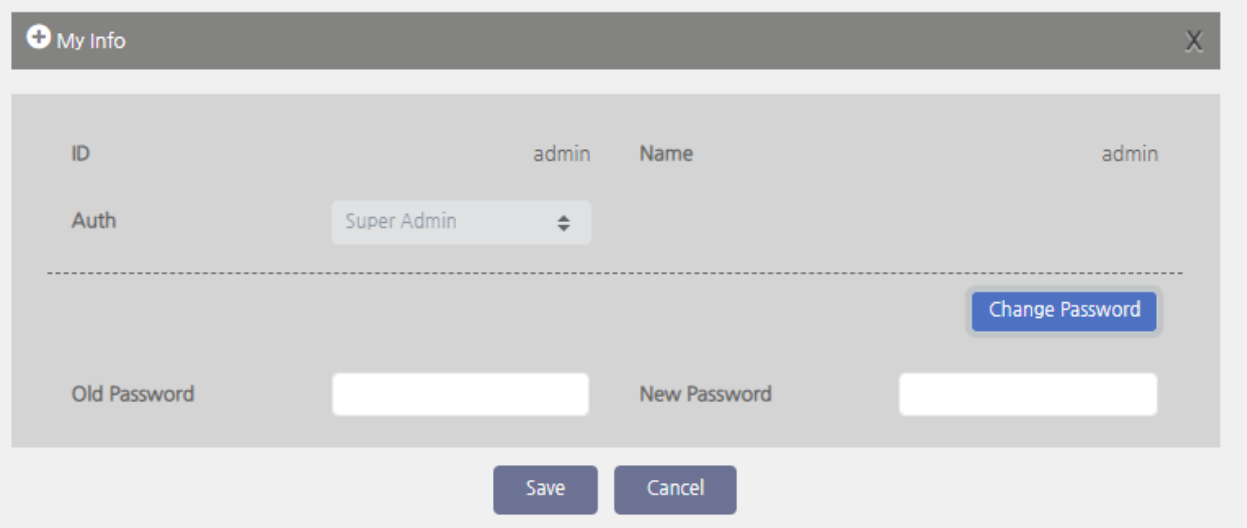


Fig. 23 Power Supply Unit Setup

5.10 System reset

Clicking on the TTA Reset button (highlighted in orange in Fig24 below), allows the TTA system to be reset to its default parameters, as shown in Fig. 24 below.

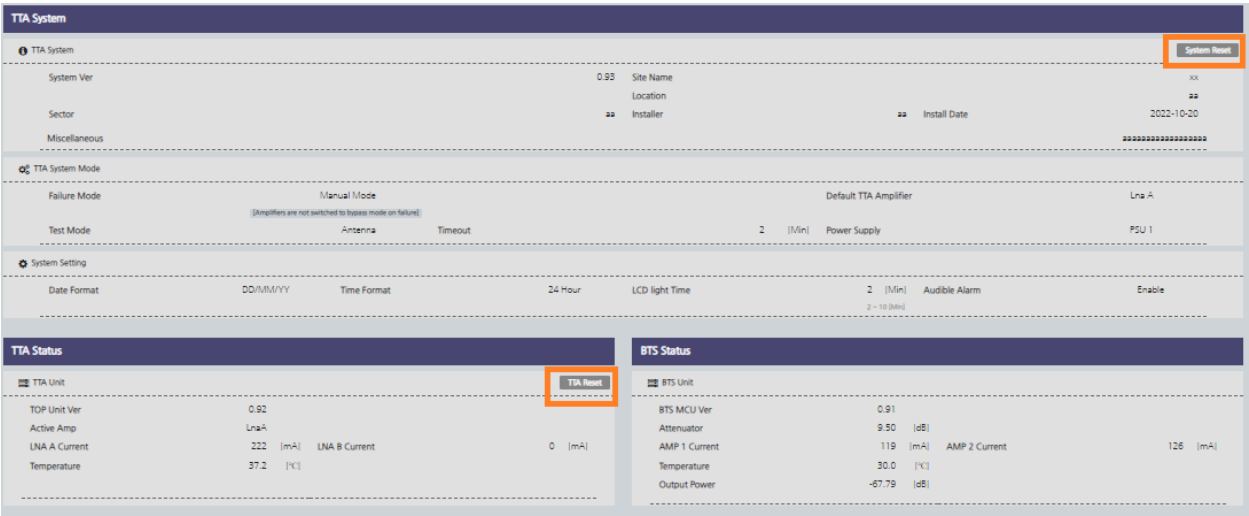


Fig. 24 Power supply unit set up

5.11 Downloads

Downloads can be accessed from Main Menu, and access documentation downloads such as: EMS files and TTA firmware, as shown in Fig. 25 below.

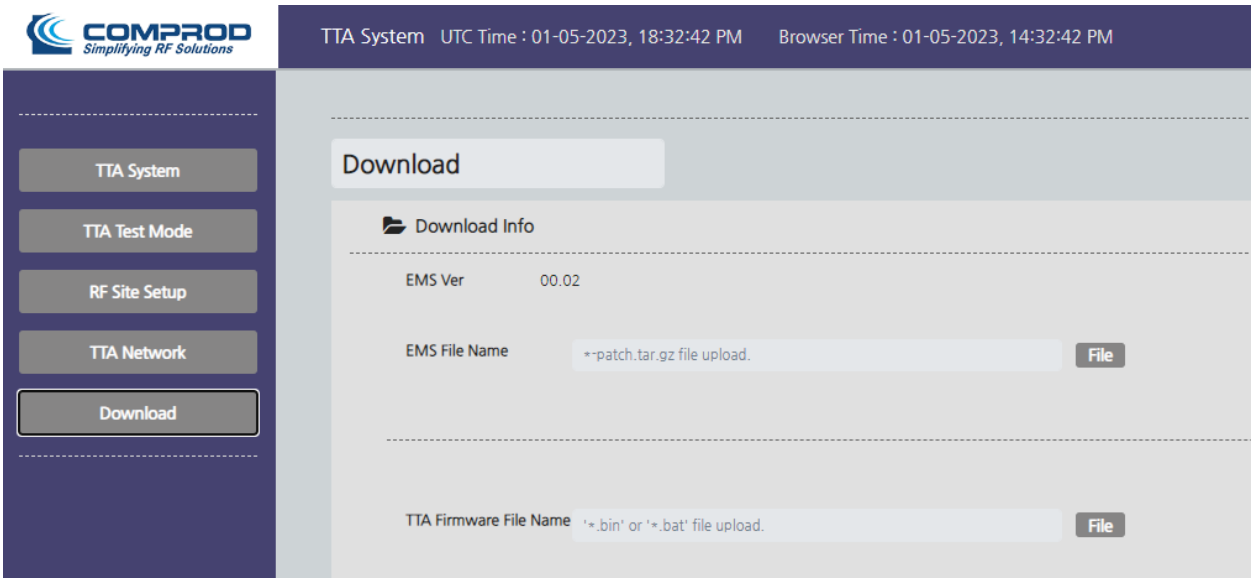


Fig. 25 TTA unit download feature

6 Commissioning using Front Panel

6.1 Front Panel Overview and Navigation

The Front Panel of the BTS C&DU contains an LCD display, 2 green LEDs and 9 buttons. Once the unit is turned on, the Power LED will turn green. After the unit has booted up, the Status LED will also light up. The Status LED has 3 modes:

- Slow flashing Green: Unit Functioning
- Fast flashing Green: Unit is in Test Mode
- Flashing Red: Alarm/fault

The BTS C&DU can be configured using the Front Panel with the LCD display and buttons. To maximize the longevity of the display, LCD display turns off after a period of inactivity. The display can be activated by pressing any of the buttons.

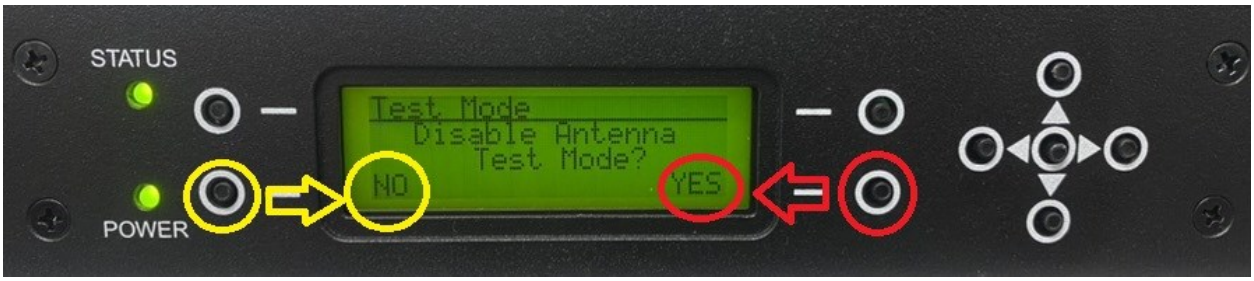
If the display is not within one of the menus, it cycles through several displays showing unit's information.

The main menu of the unit can be accessed by pressing any button a second time.

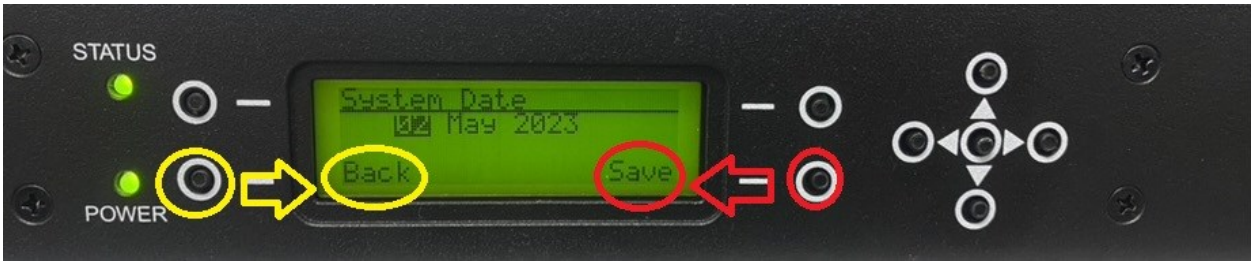
It is possible to navigate around the menus of the device using the 4 buttons as shown in Fig. 26 below.

Fig. 26 Navigating around the Menus of the Device

The four remaining buttons surrounding the LCD screen are to be used to select: Test Mode, System Date, as shown in Fig. 27 below. In these examples the buttons circled in red selects “YES” or “Save” and the buttons circled in yellow selects” NO” or “Back”.



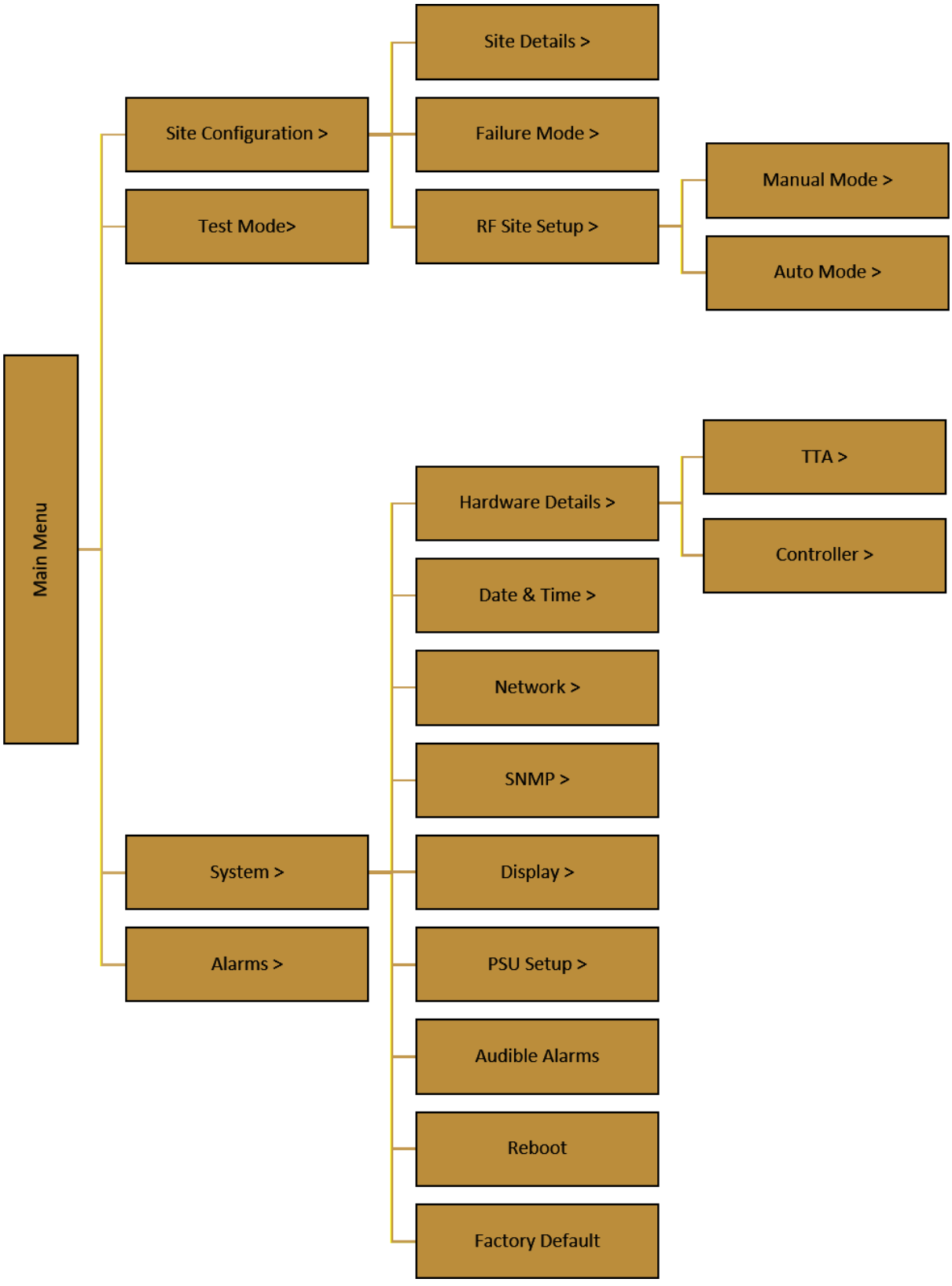
(a)



(b)

Fig. 27 Navigating in the Corners of the Display (a) Yes/No options (b) Save/Back options

A diagram showing menu structure is shown below.


Main Menu
Site Configuration >
Test Mode>
Site Details >
Failure Mode >
RF Site Setup >
Manual Mode >
Auto Mode >
System >
Alarms >
Hardware Details >
Date & Time >
Network >
SNMP >
Display >
PSU Setup >
Audible Alarms
Reboot
Factory Default
TTA >
Controller >

6.2 Using Front Panel to Configure the TTA System

6.2.1 Setting Time and Date

From Main Menu scroll down to SYSTEM option as shown in Fig. 28 (a) below. Then select Date & Time option, see Fig. 28 (b). Once in the Date & Time window select Date as shown in Fig. 28 (c) and saved it as shown in Fig. 28 (d).

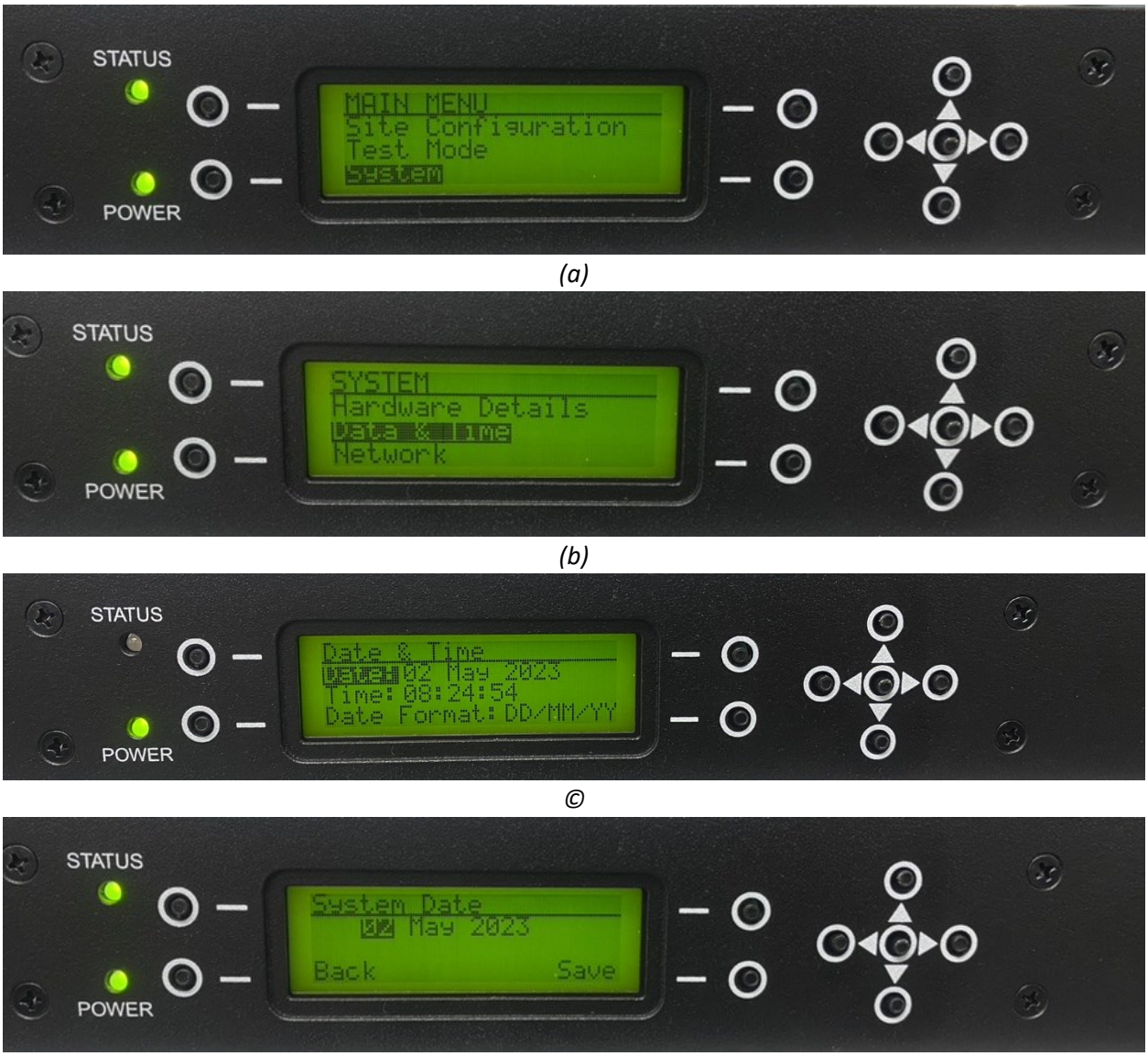


Fig. 28 Setting Date & Time (a) Main Menu selection (b) Date & Time options (c) Date Setup (d) Save settings

After Date has been saved, the LCD display will return to the DATE and TIME setting. The time can be set following the same logic.

6.2.2 TTA/Controller Hardware Details

From Main Menu scroll down to SYSTEM option as in Fig. 29 (a) below. Select Hardware Details, as shown in Fig. 29 (b) below. Once in Hardware Details, elect TTA or Controller as shown in Fig. 29 (c). Once selected, the Hardware Details will be displayed as shown in Fig. 29 (d).

(a)

(b)

(c)

(d)

Fig. 29 Hardware Details (a) Main Menu selection (b) Hardware Details Menu (c) TTA Details Menu (d) TTA details

Controller Details can be selected following the same steps as for the Hardware Details.

6.2.3 TTA System Gain and Attenuation

(a)

(b)

(c)

(d)

(e)

Fig. 30 RF Site Setup (a) Main Menu selection (b) RF Site Setup menu (c) Manual Mode (d) TTA Attenuation and Ga(e) BTS Control and distribution units Gain

The following information is registered by the BTS C&DU: TTA Gain, Control Unit Gain (CU gain), Distribution Unit Gain (DU Gain) and TTA Attenuation.

This information can be found in the TTA RF Site Setup Menu under the Site Configuration option. From Main Menu, select the Site Configuration menu, see Fig. 30 (a) above. From Site Configuration menu, select RF Site Setup, see Fig. 30 (b). In the RF Site Setup menu, select Manual Mode, see Fig. 30 (c). Auto Setup will be discussed in further sections. The TTA Gain and Attenuation will be displayed once the Manual Mode has been selected as shown in Fig. 30 (d). Scroll down further the display to see the Control Unit Gain and Distribution Unit Gain as shown in Fi©30 (e) above.

Once the required attenuation has been determined, it can be set up into the BTS C&DU by scrolling up to the Attenuator setting as shown in Fig. 30 (d) above. The Attenuation can be set and saved as presented in Fig. 31 below. Scroll up or down to increase or decrease the value.

Fig. 31 Setting the Attenuator Value

6.2.4 Testport Set Up

From the Main Menu, select Test Mode as in Fig. 32 (a). Scroll down further to see the TP Coupler Loss and CU TP Loss, see Fig. 32 (b) below.

The additional information required to fill in the TTA Test Port Losses and Levels, section of the Site Verification Test sheet (Fig. 19 in section 5 above) are the Test port Line losses, which are not part of the TTA.

In a final stage of the “Site Performance Verification Procedure” it is necessary to terminate the Antenna port of the TTA in a 50 Ω load. This can be achieved from the Test Mode Menu. From the Main Menu,

select the Test Mode see Fig. 32 (a) below. Once in the Test Mode menu, scroll down using button to highlight either Enable LNA A Internal Test Mode or Enable LNA B Internal Test Mode as shown in Fig. 32 (b). This allows to terminate the input of LNA A or LNA B with a 50 Ω load.

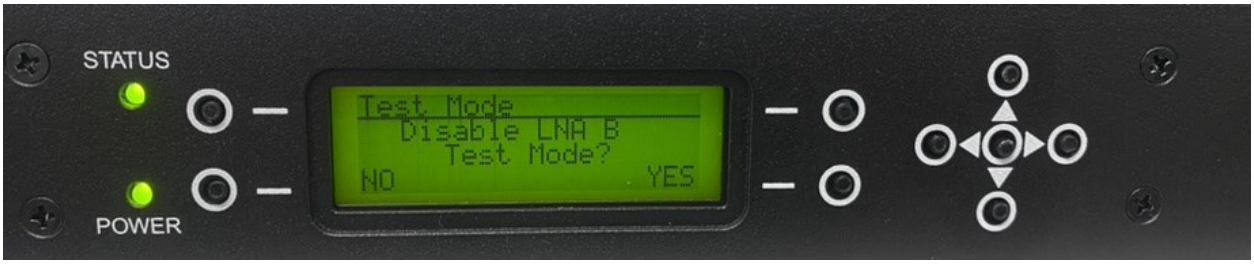
If the select button is pressed when either Enable LNA A Internal Test Mode or Enable LNA B Internal Test Mode is highlighted, it will terminate LNA A or LNA B in a 50 Ω load for the duration specified in Timeout, after which the unit will return to a normal operation. The Back button allows to disable immediately the LNA A or LNA B Test Mode as shown in Fig. 32 (c) and (d) below.

During the time that LNA A or B is terminated in a 50 Ω load, the status LED will flash faster green. the flash will change back to slower green when the unit returns to a normal operation.

©

(b)

(c)



(d)

Fig. 32 TTA Test Mode (a) Main Menu (b) Test Mode Menu (c) TTA Test Port Coupler Loss and Control Unit Port Loss

Enable Internal Test Mode (a) Mode Enabled (b) Mode Disabled

6.3 Front Panel TTA RF Site Set Up Auto Mode

This option allows the BTS C&DU to automatically calculate and set the attenuator value. From Main Menu select Site Configuration menu then RF site Setup and again select Auto Setup as shown in Fig. 30 (a), (b) and (c) above. Once in Auto Mode, select Antenna Jumper Loss by choosing Antenna Jumper Loss as in Fig. 33 (a) below. The Antenna Jumper Loss can be set as in Fig. 33 (b).

(a)

(b)

Fig. 33 Auto Rf Site Setup (a) Antenna Jumper Loss (b) Setting the Antenna Jumper Loss

In a similar manner we can set the following parameter in the Auto RF Site Setup:

- Antenna Feedline Loss
- Antenna Feedline Protector Loss
- Inside Jumper Loss
- RX Jumper Loss
- Desired RX Overall Gain.

Then by scrolling down further the following information can be viewed:

- TTA Overall Gain
- CU Gain
- DU Gain

- Control Attenuation
- RX Overall Gain

6.4 Test Mode Signal Level Calculator

This additional feature is not available from the Front Panel, but only from the GUI.

6.5 Alarm

If an Alarm is raised within the BTS C&DU, the status LED turns red, and the LCD screen will display the alarm as in Fig. 34 below.

Fig. 34 Alarm raised

6.6 Other Panel Features

6.6.1 Main Menu

The Main Menu allows to access our submenus: Site Configuration, Test Mode, System and Alarms These are shown in Fig. 35 below.

(a)

(b)

Fig. 35 Main Menu (a) Up list (b) Down list

6.6.2 Site Configuration Menu

The Site Configuration Menu allows access to Site Details, Failure Mode, and RF Site Setup menus, as in Fig. 35 (a) and Fig. 36 (a).

6.6.2.1 Site Details

The Site Details Menu is an option for storing information about the site e.g.: Site Name Location, Sector, Installer and Date. These parameters can be selected as in Fig. 36 (a) below. The Stored information can be modified as shown below.

(a)

(b)

(c)

(d)

(e)

Fig. 36 Site Configuration (a) Site Configuration submenu (b) Site Details (c) Site name edit (d) Site name change from xx to xxx (e) New site name confirmation

6.6.2.2 Failure Mode Menu

Failure Mode Menu allows for a selection of the default TTA amplifier and a choice of different modes of switching in amplifiers- if fault is detected by monitoring the device's currents. Access the menu by scrolling up/down to select the failure mode and the A or B amplifier as in Fig. 37 below.

A description of each of the four failure modes is given below.

(a)

(b)

(c)

(d)

Fig. 37 Failure Mode Setup (a) Failure Mode menu selection (b) & (c) Failure Mode selection (d) Amplifier selection

Standard Auto

- TTA

If a fault is detected in the TTA amplifier A, the unit will switch to the TTA amplifier B.

If a fault with the TTA amplifier B is detected, the unit will switch to the TTA Bypass Mode.

- BTS Control and Distribution Unit

If a fault is detected in the BTS C&DU, the unit will switch to the Bypass Mode.

Intelligent Auto

- TTA

If a fault is detected in the TTA amplifier A, the unit will switch to the TTA amplifier B.

If a fault with the TTA amplifier B is detected, the unit will switch back to the operational half-of-quadrature coupled the TTA amplifier A.

If a fault with half of the TTA amplifier A used above is detected, the unit will switch back to the operational half-of-quadrature coupled the TTA amplifier B.

If a fault with half the TTA amplifier B used above is detected, the unit will switch to the Bypass Mode.

- BTS Control and Distribution Unit

If a fault is detected in the Control Unit, it will switch to the Bypass Mode.

Constant Gain

Constant Gain function is like the Intelligent Auto with the exception that is half amplifiers in TTA are deployed, the unit will then attempt to change the attenuator setting to maintain the desired gain.

Manual Mode

There is no automatic switching of amplifiers under failure conditions.

6.6.2.3 TTA RF Site Set Up Menu

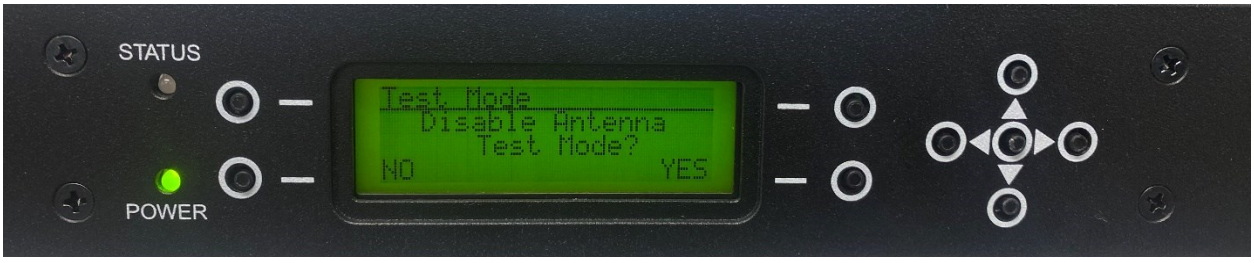
This has been described in Section 6.2.3 (Manual) and Section 6.3 (Auto).

6.6.3 Test Mode Menu

This has been described in Section 6.2.4 except from the Antenna Test Mode. Enabling the Antenna Test Mode sets the unit into test condition where the TTA is bypassed, and the Rx Antenna is connected to the BTS Control Unit Front Test Port connector, see Fig. 38 (a). Back button allows to enable the mode immediately as shown in Fig. 38 (b).

The unit will stay in this mode for a period set by the adjustable Timeout time. After this Timeout the unit will return to a normal operation. During the time that the Antenna Test Mode is active the status LED will flash green faster. When unit returns to a normal operation this LED changes back to a slower green flash.

(a)



(b)

Fig. 38 Antenna Test Mode (a) Mode Enabled (b) Disabling the Test Mode

6.6.4 System Menu

Select this by selecting System from the Main Menu as in Fig. 39 below.

This allows access the following features:

- Hardware Details
- Date and Time

- Network
- SNMP
- Display
- PSU System
- Audible Alarm
- Reboot
- Factory Defaults

Fig. 39 System Menu

6.6.4.1 Hardware Details

This allows access Hardware submenu details, as indicated in Fig. 40 below.

Fig. 40 Hardware Details

The Hardware Details Menu (see Fig. 41) has submenus for:

- TTA
- Controller

The TTA menu can be selected by pressing button once the required hardware detail has been selected, see Fig. 41 below.

Fig. 41 TTA Menu

The TTA/Controller menu as below can be scrolled down for additional details.

(a)

(b)

Fig. 42 Hardware Details (a) TTA Details (b) Controller Details

Network window displays details on TTA/Controller Firmware, TTA Serial Number, Model Number as shown in Fig. 42 (a) and (b).

6.6.4.2 Date and Time

This function allows the Date and Time to be adjusted as described in Section 6.2.1.

6.6.4.3 Network Setup

This menu allows to retrieve Network Settings (if they have been changed from default) to allow the GUI to be used.

Also, Network Settings can be adjusted. Select Network submenu as shown in Fig. 43 below.

Fig. 43 Selecting Network Set Up

The following Network Settings can be modified: DHCP, IP address, Sub Net Mask, Default Gateway, and DNS Server as shown in Fig. 44.

If a required setting is selected, it can further be modified as shown in Fig. 45 below.

(a)

(b)

Fig. 44 Network Settings (a) Network submenu part 1 (b) Network submenu part 2

(a)

(b)

Fig. 45 Modifying Network Settings (a) Network submenu (b) IP address change

6.6.4.4 SNMP Settings

SNMP Settings can be retrieved by selecting SNMP option from the System Menu as in Fig. 46 below. The following features and options can be set:

- SNMP Enabled
- SNMP Server IP address
- SNMP Port

These features can be adjusted following the same logic as when Network Settings are selected.

(a)

(b)

Fig. 46 SNMP Settings (a) Selecting SNMP (b) SNMP submenu

6.6.4.5 Display

It can be retrieved by selecting Display option undeform the System Menu as shown in Fig. 47 below.

This allows the Backlight Timeout of the Front Panel display to be adjusted.

(a)

(b)

Fig. 47 Display Setting (a) Selecting Display (b) Display Time

6.6.4.6 PSU Setup

(a)

(b)

Fig. 48 Power Supply Setting (a) Selecting PSU (b) PSU Setup

PSU information can be retrieved by selecting PSU option from the System Menu as shown in Fig. 48 (a).

This allows setting up the power supplies within the BTS C&DU. PSU is set at the factory. Selected option will be highlighted with star on the side as above in Fig. 48 (b).

6.6.4.7 Audible Alarm

This allows the audible Overpower Alarm to be either enabled or disabled as shown in Fig. 49 below.

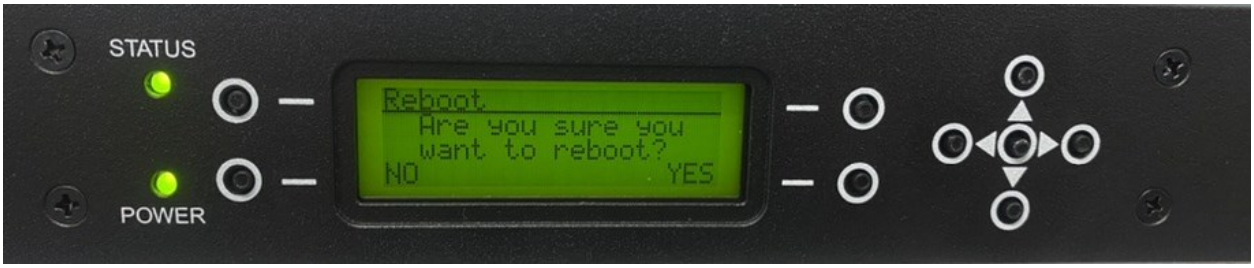
(a)

(b)

Fig. 49 Audible Alarm (a) Selecting Audible Alarm (b) Enable/Disable option

6.6.4.8 Reboot

(a)



(b)

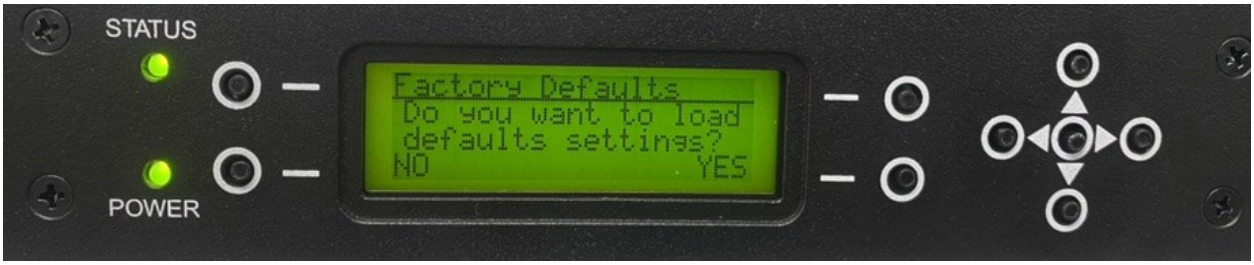
Fig. 50 Reboot setting (a) Selecting Reboot (b) Reboot

This allows to reboot the system as in Fig. 50 above.

6.6.4.9 Factory Settings

This function will reset webpage password to its factory default setting 'admin' as shown in Fig. 51 below. This is useful in the case that the webpage password has been lost or forgotten. In addition, any information manually setup in the BTS C&DU will be erased.

(a)



(b)

Fig. 51 Factory setting (a) Selecting option (b) Executing option

6.6.5 Alarms

The Alarms window allow to access to the Alarm submenu. Any active alarms will be displayed as below in Fig. 52 (c). If no alarms are raised, 'Normal'' status will be displayed as in Fig. 52 (b)

(a)

(b)

(c)

Fig. 52 Alarm setting (a) Alarm menu (b) Alarm shows ''Normal'' (c) Alarm Raised ''TTA Comms''

7 SNMP Communication

SNMP Communication can be enabled, and address set up from Network Setup section as shown in Fig. 53 below. The SNMP Communication can be is found in the System Menu on the webpage GUI.

Alternatively, these settings can be accessed from the Front Panel in the SNMP in the System Menu as in Fig. 46 above.

Information about the codes is sent when an SNMP alarm is raised and it is also available in MIB files in the Downloads section of the webpage GUI as in Fig. 54, below.

Description of errors and codes can be found below in section 8.

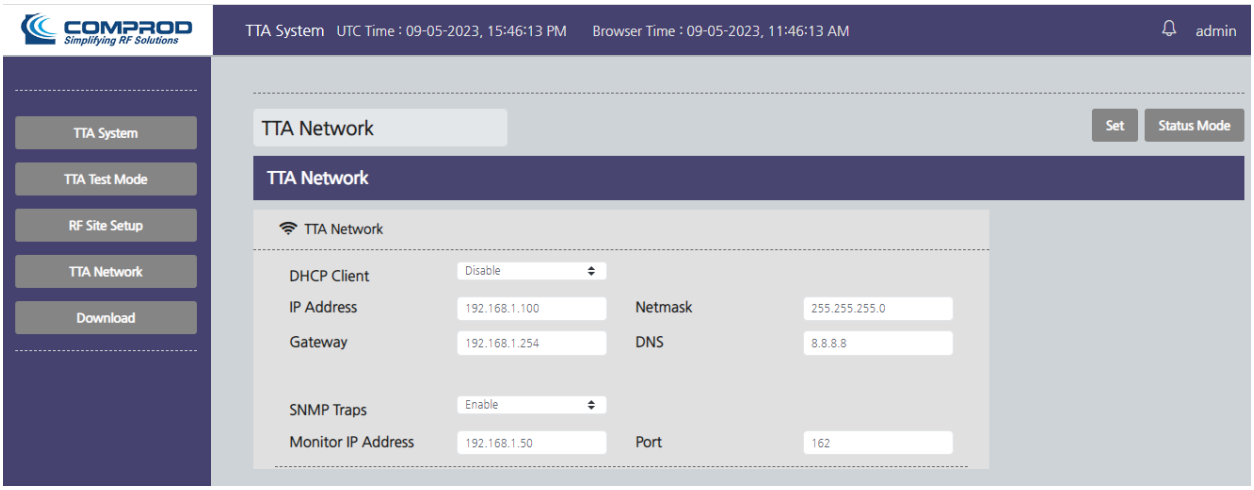


Fig.53 Network Setup

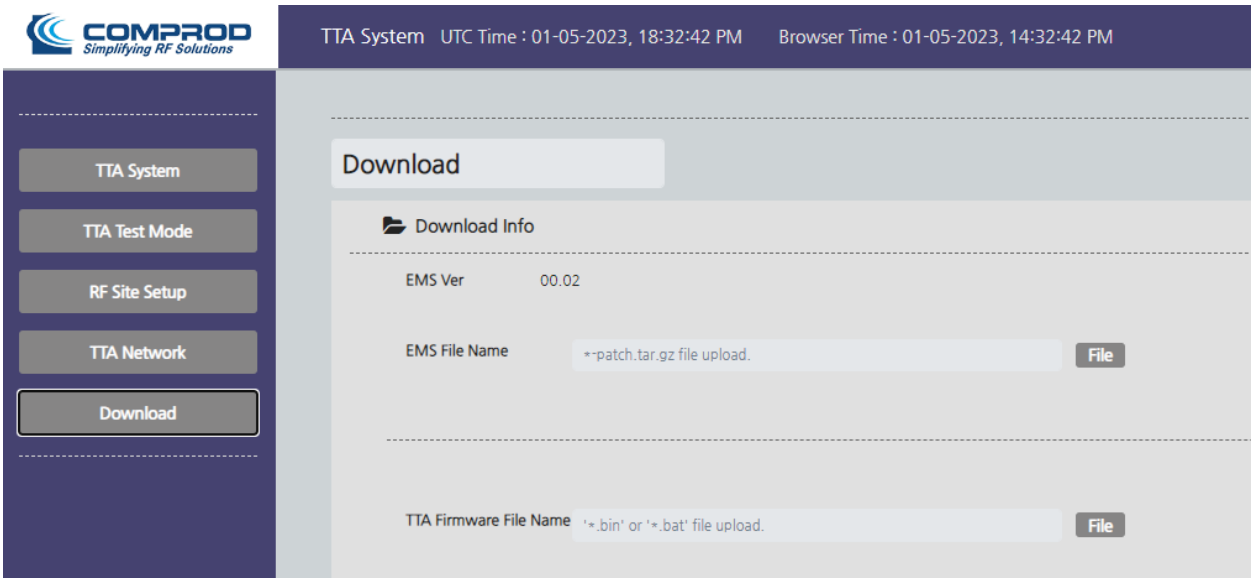


Fig. 54 MIB Files

8 Alarm information

Alarms description that can be displayed by the C&DU appears in the Table 6.

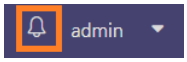
Alarm history display is sorted by alarm occurrence time, and it can be retrieved from the GUI, see Fig. 55. It is possible to know whether an alarm has been triggered or not, and the time of occurrence/cancellation is indicated.

Appendix A gives more details regarding all aspect of SNMP communication within the TTA system.

Table 6. Alarm List

TTA COMM ERR	BTS unit cannot communicate with the TTA unit.
TTA LNA A Fault ERR	The DC current consumption in the LNA A amplifier within the TTA unit is outside of its normal operating range.
TTA LNA B Fault ERR	The DC current consumption in the LNA B amplifier within the TTA unit is outside of its normal operating range.
RF Over Power ERR	A high-power signal was detected by the High-Level Carrier monitor within the BTS Control and Distribution Unit.
PSU 1 Fault Err	This indicates a fault on internal power supply unit 1.
PSU 2 Fault Err	This indicates a fault on internal power supply unit 2.
C&DU Internal Err	This is triggered by a malfunction of the control board within the BTS unit.

C&DU Amp 1 Failure ERR	The DC current consumption in the quadrature amplifier 1 within the BTS unit is outside of its normal operating range.
C&DU Amp 2 Failure ERR	The DC current consumption in the quadrature amplifier 2 within the BTS unit is outside of its normal operating range.

Click the bell at the top of the main screen. 

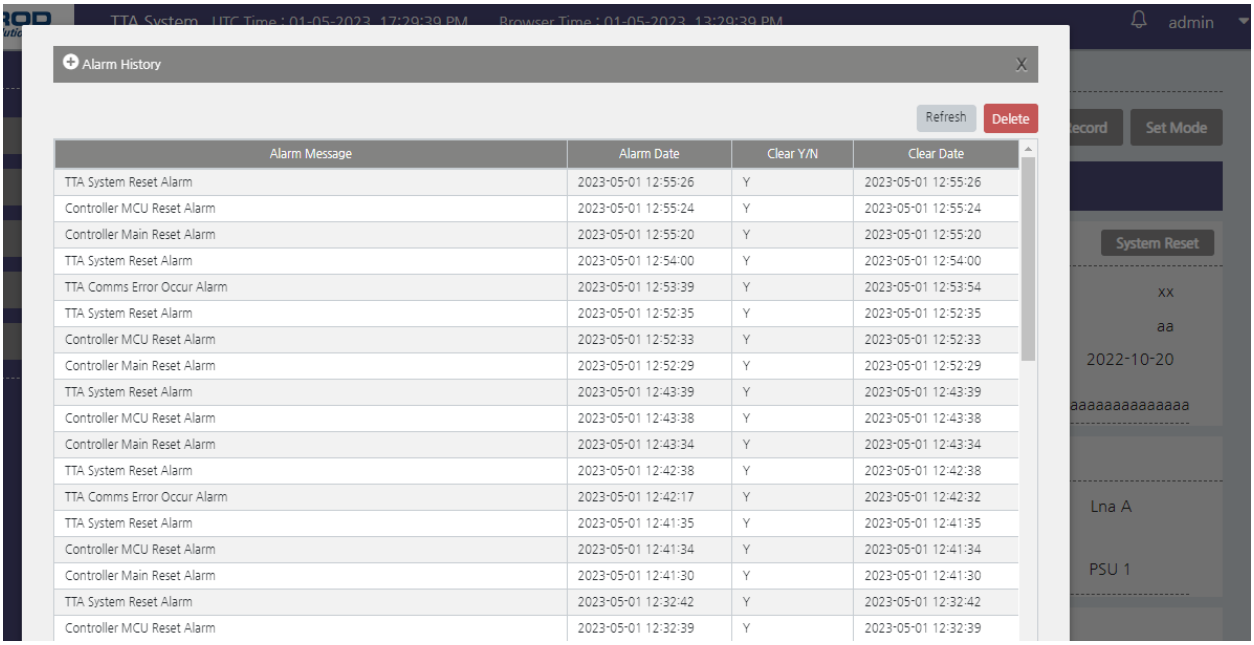


Fig. 55 Alarm history from the GUI

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