Chapter 8

Site Controller

The following figures show the front and the rear view of the site controller.

Figure 165: Site Controller Front View

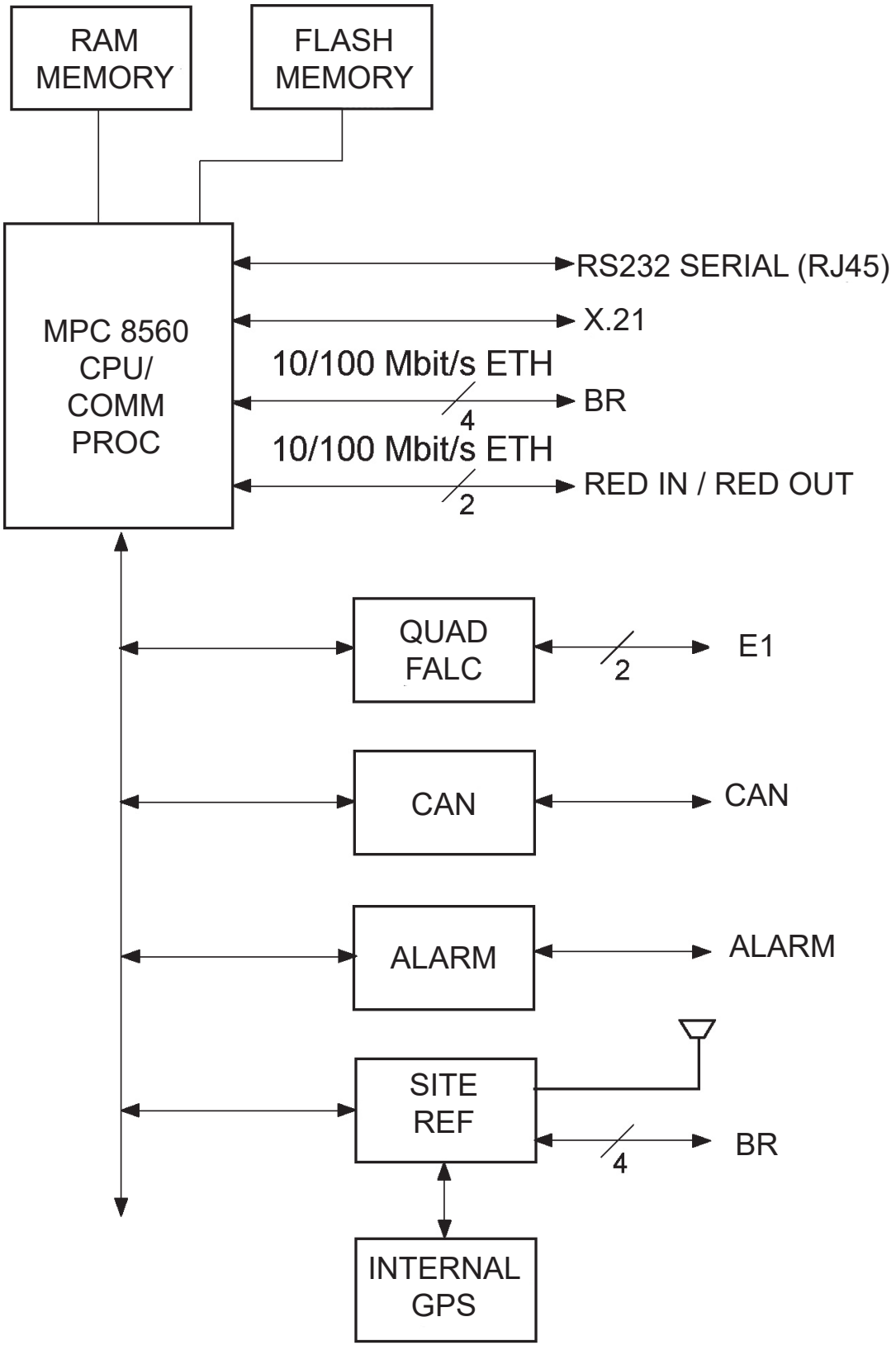
Figure 166: Site Controller Rear View

8.1
Site Controller – Theory of Operation

The Site Controller controls resources within the MTS, including assignment of frequencies and slots to mobile stations. The Site Controller incorporates a Global Positioning System (GPS) module. The GPS module provides a high precision timing signal used as reference for the Base Radio receive and transmit functionality.

See Site Controller Specifications on page 437 for Site Controller hardware specifications.

Figure 167: Site Controller - Functional Block Diagram



8.2
Site Controller – Indicators, Switches, and Connectors

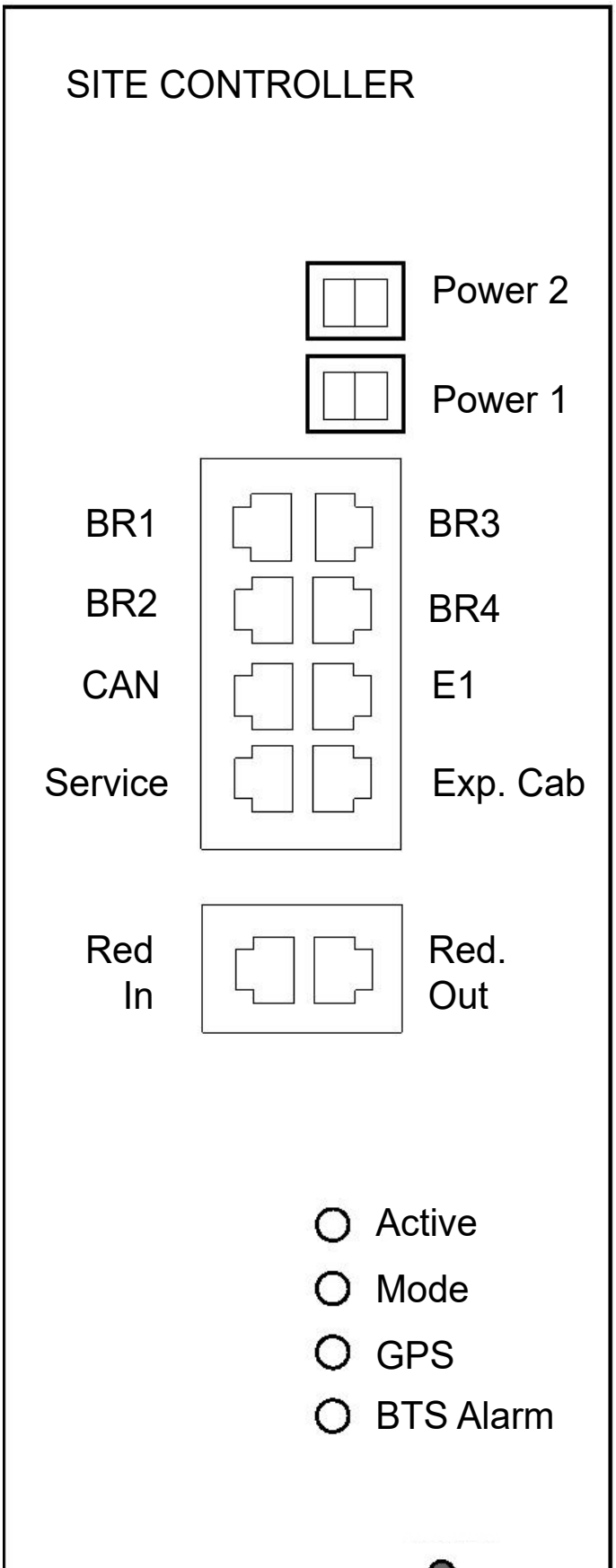
This section contains information on indicators, switches, and connectors of the Site Controller.

8.2.1

Site Controller – Front Panel

BTSQ108SSR_MTS2and4_dr_SCCaptiveScrews_A

Figure 168: Site Controller - Front Panel



8.2.1.1

Site Controller – Front Panel Indicators (LED)

Figure 169: Site Controller - Front Panel LEDs Position

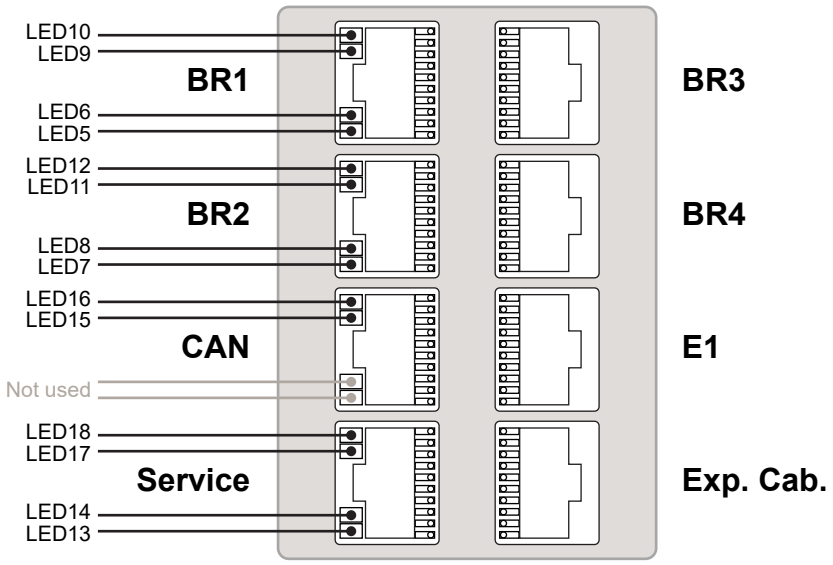


Table 85: Site Controller - Front Panel Indicators (LED)

LED	LED/Port Name	Position	Controlled by	Indication
LED1	Active	Front Panel	SW	Site Controller is active or standby: • OFF: Site Controller main application not running. • GREEN: E1/X.21 relay energized. • AMBER: E1/X.21 relay not energized. • RED: Failed Site Controller, replace FRU.
LED2	Mode	Front Panel	SW	Trunking status: • OFF: Boot up/No trunking/ Standby. • GREEN: Wide area trunking. • AMBER: Local site trunking.
LED3	GPS	Front Panel	SW	**Automatic Synchronized Configuration (ASC) Mode**: • OFF: Application is not running. • GREEN: BTS synchronized to GPS.

LED	LED/Port Name	Position	Controlled by	Indication
				• GREEN/AMBER Blinking: BTS synchronized to a standby SC. • AMBER Blinking: In training. • AMBER: GPS Free run mode synchronized (ETSI spec). • RED: NTP, NTP malfunction. • RED Blinking: Calibration is required. • GREEN/RED Blinking: Frequency lock is required, pull in. **Forced Non-Synchronized Configuration (FNC) Mode**: • OFF: Application is not running, free run or NTP. • GREEN: BTS synchronized to GPS. • GREEN/AMBER Blinking: BTS synchronized to a standby SC. • AMBER Blinking: In training. • RED Blinking: Calibration is required. • GREEN/RED Blinking: Frequency lock is required, pull in.
LED4	BTS Alarm	Front Panel	SW	• OFF: No alarms. • GREEN: Not used. • AMBER: CAN Bus problems. • RED: External alarms (major Alarm), Major/critical alarm, for details see Table 104: Site Controller LED Fault Indications on page 373.
			SW	3 LEDs blinking together: R (red) RRR->Y (yellow) YYY->G (green) GGG – LED test just after BTS reset or power up
			SW	RRRR blinking – replace the FRU
			SW	RRR blinking – replace the FRU
			SW	R->RR->RRR->RRRR->R->RR->RRR->RRRR-> ... – initializing file system (do not turn off and wait a few minutes, then application and configuration will have to be downloaded after initialization).

LED	LED/Port Name	Position	Controlled by	Indication
LED5	BR1	Port 1 LED1	HW, Enet switch	• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED6		Port 1 LED2	HW, Enet switch	• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.
LED7	BR2	Port 2 LED1	HW, Enet switch	• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED8		Port 2 LED2	HW, Enet switch	• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.
LED9	BR3	Port 3 LED1	HW, Enet switch	• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED10		Port 3 LED2	HW, Enet switch	• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.
LED11	BR4	Port 4 LED1	HW, Enet switch	• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED12		Port 4 LED2	HW, Enet switch	• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.
LED13	Service	Port 5 LED1	HW, Enet switch	• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED14		Port 5 LED2	HW, Enet switch	• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.
	CAN	Port 6 LED1		Not used.
		Port 6 LED2		Not used.
LED15	E1	Port 7 LED1		• OFF: Primary E1 not configured.

LED	LED/Port Name	Position	Controlled by	Indication
				• GREEN: Primary E1 OK (no LOS (Loss Of Signal)). • AMBER: Errors FE, CRC, BPV, PD. • RED: Primary E1 failure LOS.
LED16		Port 7 LED2		• OFF: Secondary E1 not configured. • GREEN: Secondary E1 OK (no LOS (Loss Of Signal)). • AMBER: Errors FE, CRC, BPV, PD. • RED: Secondary E1 failure LOS.
LED17	Exp.Cab.	Port 8 LED1		• OFF: Ethernet link not present. • GREEN: Ethernet link present.
LED18		Port 8 LED2		• OFF: Ethernet activity not present. • YELLOW: Ethernet activity present.

8.2.1.2
Site Controller – Front Panel Switches

Table 86: Site Controller - Front Panel Switches

Switch Name	Switch Function
Reset	The front-panel switch can be used to either generate an interrupt to the processor or to initiate a Hard Reset. • Push and hold (1 second) to generate interrupt. • Push and hold (>3 seconds) for Hard Reset.

8.2.1.3
Site Controller – Front Panel Connectors

Table 87: Site Controller - Front Panel Connectors

Connector Name	Connector Type	To/From	Comment
POWER SUPPLY	MOLEX (2 Pin)	PSU	28.5 VDC
BR	RJ45	BR	Ethernet
CAN	RJ45	BR	CAN Bus connection

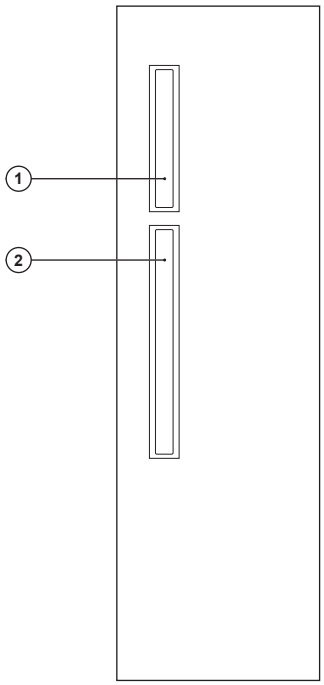
Connector Name	Connector Type	To/From	Comment
E1	RJ45	Junction Panel	Pin connections on the Site Controller are different from the ones on the Junction Panel connector.
Service	RJ45	Service Terminal	Provides service access. See Table 88: Site Controller - Service Cable Pinouts on page 326 for service cable pinout information. (Service Cable PN: 3066565B)
Exp.Cab.	RJ45	XHUB in MTS 4 Expansion Cabinet	Only in configurations with MTS 4 Expansion Cabinet
Red In / Red Out	RJ45	Redundant Site Controller	Ethernet
GPS Antenna (for Site Controller with internal GPS receiver)	QMA	Junction Panel	GPS antenna input. +5VDC bias for active antenna.

Table 88: Site Controller - Service Cable Pinouts

RJ45 PIN	D-SUB 9 FEMALE PIN	Description
1		
2		
3		
4	3	Rx
5	5	GND
6		
7	2	Tx
8	5	GND
9		

8.2.2
Site Controller Rear Panel

Figure 170: Site Controller Rear Panel



1 — X21/Remote GPS
2 — Alarms/Control

8.2.2.1
Site Controller – Rear Panel Connectors

Table 89: Site Controller - Rear Panel Connectors

Connector Name	Connector Type	To/From	Comment
Remote GPS/ X.21	IDE 26pin	Junction Panel	Connects to remote GPS/ X.21
Alarms/Control	IDE 34pin	Junction Panel	Provides Alarm/Control interface

8.3
Site Controller CAN Bus

The CAN Bus provides a common communication bus between RFDS equipment, Power Supply Unit (PSU) and the Site Controller. The CAN Bus connects to the Site Controller, PSU, DPM, and ATCC. The modules on the CAN Bus are assigned an address for the CAN Bus. When there are more than one modules of the same type, assigned a functionality in MTS to each node. Mapping between the track number, CAN ID, and function relies on the fact that the unique track number is available from each unit.

At initialization of the MTS, the factory configures the Site Controller with a relation between track number and the function of the node. You can modify this configuration in a service situation.

If a node is removed or is defective, the Site Controller knows the track number of a non-responding FRU and therefore it can make a proper service report which tells exactly what FRU to replace. When the service is carried out, replace the track number of the defective FRU with the new track number in the mapping list, that way the new track number is mapped to the function of the replaced FRU.

Figure 171: Site Controller - CAN Bus

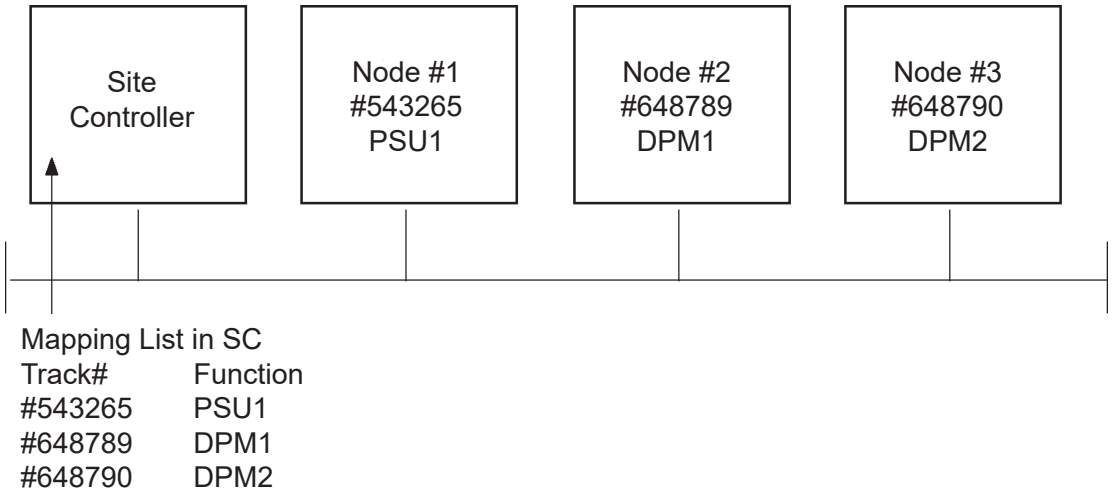


Table 90: Site Controller - CAN Bus Functionality

Unit	Function
PSU	Monitoring: • PSU temperature: -30 °C to +100 °C, tolerance: 2 °C. • Battery current: -20 A to +10 A, tolerance: ±1%. • Battery voltage: 30 V to 60 V, tolerance: ±1%. • Battery temperature: -30 °C to +100 °C, tolerance: 2 °C. • 7 V output voltage: 0 V to 10 V, tolerance: ±2%. • 7 V output current: 0 A to 10 A, tolerance: ±2%. • 28.5 V output voltage: 0 V to 30 V, tolerance: ±2%. • 28.5 V output current: 0 A to 10 A, tolerance: ±2%. • PSU output power: 0 W to 1100 W, tolerance: ±2%. • Fan output voltage: 0 V to 30 V, tolerance: ±2%. • PSU input air temp.: -30 °C to +100 °C, tolerance: ±2 °C.
	Alarms: • DC Source Fail: Indicating DC input voltage outside limits (below 43 V). • DC Out Fail: DC output voltages out of limits. • AC Source Fail: Early warning, indicating that the AC input is interrupted and the PSU starts to operate from DC input source in 15 ms. (if a backup source is present).

Unit	Function
	• Software Fail: Indicating software is corrupted or unable to initialize. • Over Temperature: Indicating over temperature detected 5 °C to 10 °C before shutdown. • Fan 1 alarm: Fan 1 not operating (fan has stopped or its running speed is below specification), PSU has received a high signal (open collector) from fan tray 1 through fan connector 1. • Fan 2 alarm: Fan 2 not operating (fan has stopped or its running speed is below specification), PSU has received a high signal (open collector) from fan tray 2 through fan connector 2. • Fan 3 alarm: Fan 3 not operating (fan has stopped or its running speed is below specification), PSU has received a high signal (open collector) from fan tray 3 through fan connector 3.
	Controls: • FORCE DC: Controls the PSU to force the usage of the DC input if usable, disregard presence of AC. If DC is outside the usable range for the PSU, the PSU shall indicate an alarm using the DC-fail output. If DC input voltage comes below 43 V ±2% and if AC is usable the PSU shall take the input power from AC, disregarding a Force-DC control input. **NOTICE:** Force DC operation on a bad DC supply PSU or Battery: Bad DC supply is defined as a DC source where the voltage drops below 43 V for a few milliseconds when the PSU is forced to operate on DC. In case of a force DC command and bad DC supply the 28.5 V output voltage is allowed to drop down to 27 V for a maximum of 5 second, while the PSU automatically switches back to AC mode and the 28.5 V rises from 27 V to 28.5 V. During this sequence the DC out alarm is suppressed. • Fan supply output voltage is also controlled by the CAN Bus in 5 steps from 24 V to 12 V. The highest value is set by CAN Bus or automatically. • DC operation only: Prevents AC fail alarms (and associated LED) from the PSU on CAN Bus when the PSU is supplied from DC only. If the AC supply becomes present during DC operation, the AC Source Fail alarm circuit is automatically be reactivated. • AC operation only: Prevents DC fail alarms (and associated LED) from the PSU on CAN Bus when the PSU is supplied from AC only. If the DC supply becomes present during AC operation, the DC-Fail alarm circuit is automatically reactivated. • No Fan 1: Prevents Fan 1 alarm (and associated LED) when no fan 1 is connected. If the Fan1 becomes present during operation, the Fan1 alarm circuit is automatically reactivated. • No Fan 2: Prevents Fan 2 alarm (and associated LED) when no fan 2 is connected. If the Fan2 becomes present during operation, the Fan2 alarm circuit is automatically reactivated. • No Fan 3: Prevents Fan 3 alarm (and associated LED) when no fan 3 is connected. If the Fan3 becomes present during operation, the Fan3 alarm circuit is automatically reactivated.

Unit	Function
	NOTICE: See the *MMI Commands* manual for additional information on commands and parameters.
ATCC	Monitoring: • Cavity status. • ATCC Heartbeat signal: heart beat signal is repeated every 30 s. Alarms: • Software corrupted. • Distance between two channels below 150 kHz. • Cavity VSWR alarm. • Master Slave communication error. • Motor alarm. • Cavity tuning error alarms together. • VSWR exceeded the specified value. • Unable to park cavity. • Cavity unable to tune to the current frequency in 3 attempts. Controls: • Cavity tune timeout: establishes a timeout period between a fine-tuning of the cavities. All cavities must be fine-tuned at the timeout. • Park a cavity: instructs the ATCC to park the specified cavity. This involves adjusting the cavity resonance to a frequency outside of the Tx band. If RF power is present, the cavity parks and then re-tunes to the input frequency. • VSWR Alarm Threshold: establishes a threshold for enabling a VSWR Alarm. Valid threshold values are in the range 1.00 to 10.00 where 1.00 means **No VSWR**. Recommended values for each MTS configuration are: - **400 MHz:** 3.00 - **260 MHz:** 3.00 - **800 MHz:** 4.00
DPM (Duplexer, Post Filter)	Monitoring: • Forward power on a digital power monitor: the input power range is from 0 W to 150 W. • Reverse power on a digital power monitor: the input power range is from 0 W to 40 W. • VSWR from a DPM. • DPM temperature. • DPM Heartbeat signal. Alarms: • SW is corrupted or unable to initialize.

Unit	Function
	• VSWR alarm. Controls: • VSWR Alarm Threshold: establishes a threshold for enabling a VSWR Alarm. Valid threshold values are in the range 1.00 to 10.00 where 1.00 means **No VSWR**. Recommended values for each MTS configuration are: - **400 MHz:** 3.00 - **260 MHz:** 3.00 - **800 MHz:** 4.00

8.3.1

Updating CAN Bus TrackID Mapping List

When and where to use:
Perform this procedure to update the Mapping List with the New Unit TrackID.

Procedure:

1 Log on to the Site Controller.

2 To view the mapping list, type `can check_mapping`.

See example below:

```
SC> can check_mapping
Units are present:
Device Track ID
DPM 1 JTH0500101
PSU 1 JTH0500200
Units are not present:
DPM 2 JTH0500105
Track ID not mapped:
JTH0500102
```

3 On the list, locate the unit that you have removed and that is indicated as `Units are not present`.

4 Delete old CAN Bus unit from the CAN Bus unit mapping list. Type `can remove_mapping <Device>`, where <Device> is the old unit name. See example below:

```
SC> can remove_mapping dpm 2
```

5 Add new CAN Bus unit to the CAN Bus unit mapping list.

NOTICE: The new unit Track ID is present on the replaced unit label and indicated as `Track ID not mapped` in the list shown in step 2.

Use `can add_mapping <Device> <TrackID>`, where< TrackID> is a TrackID of the new unit and <Device> is the new unit name. Units have the following names: psu X, dpm X, atcc X, where X denotes a digit between 0 and 3. See example below:

```
SC> can add_mapping dpm 2 JTH0500102
```

6 View the updated mapping list using the `can check_mapping` command and check that there are no units labeled as `Track ID not mapped` or `Units are not present`.

8.4 Site Controller – GPS Module

The GPS module generates a highly accurate timing reference signal within the Base Station. The integrated GPS module tracks both GPS and Glonass satellites. At least 1 GPS satellite needs to be traced to provide time reference for the SC. Remote GPS module currently supports GPS and Beidou GNSS. GLONASS on the remote GPS module will be supported in the future. A proper GPS signal must be provided to the QMA input connector on the Site Controller. The Site Controller provides a +5 V DC supply voltage on the QMA connector. It provides a voltage supply for active antennas.

NOTICE:
See Hardware Installation on page 89 for description of external GPS.

See respective restoration manual (DIPS/DIPC/X Core systems) or *Service Manual* (DIPM system) for procedures on how to verify the internal and external GPS module.

8.5 Site Controller – Lithium Battery

This section contains procedures on how to check if the lithium battery needs changing and how to correctly replace it.

8.5.1 Resetting the RTC Battery Status

This procedure describes how to reset the status of the RTC battery. Perform this procedure after each RTC battery replacement.

Procedure:

1. In TETRA Application, enter: `hw rtc reset batteryStatus`

   The following message appears:

   ```
   reset RealTimeClock battery status
     - Status: OK
   ```

2. Set the date and time on the device manually by performing the following actions:
   a. Ensure that the GPS cable is disconnected.
   b. Log on to the device with a factory account and enter the current date and time in the following format: `SC# .date` ***<dd/mm/yyyy> <hh:mm:ss>***

      Step example: `SC# .date 02/03/2020 12:23:15`

   c. Restart MTS.
   d. Connect the GPS cable and wait until the device is synchronized.

8.5.2 Checking if the Site Controller Lithium Battery Needs Changing

Procedure:

1. Perform Resetting the RTC Battery Status on page 332.
2. Power down and then Power up the MTS.
3. Use the Site Controller Test Application to check the RTC alarm by typing `alarms -ofault_hndlr` and press **Enter**.
4.

- If the battery is OK there should be no RTC related alarms reported. There is no need to change the Site Controller Lithium Battery.
- If the battery still reports RTC related alarms, the battery is not working properly or not working at all. Proceed to Replacing the Site Controller Lithium Battery on page 333.

8.5.3
Replacing the Site Controller Lithium Battery

CAUTION: Danger of explosion if battery is replaced incorrectly. Replace battery only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturers instructions.

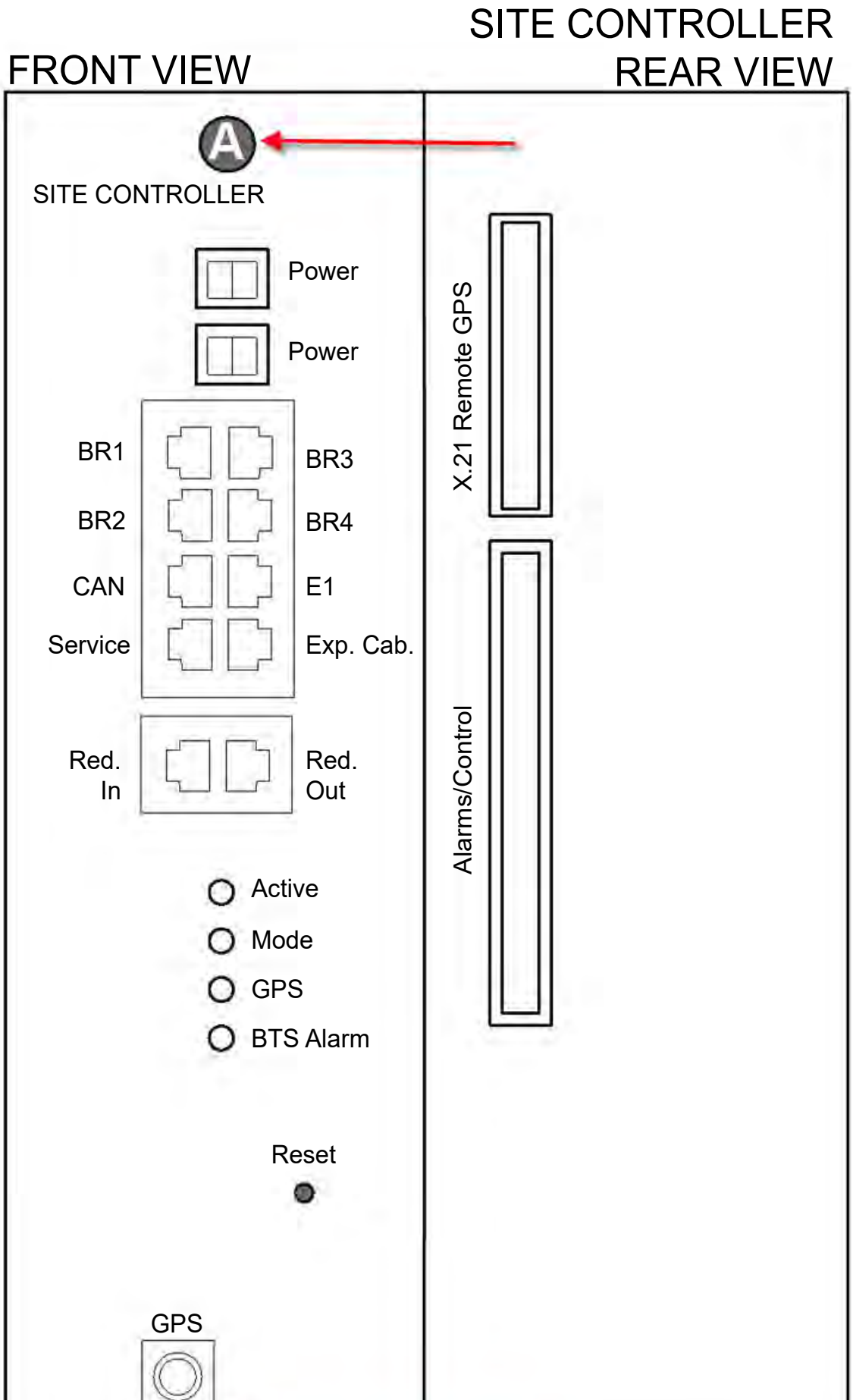
Procedure:

1. Examine the contents of the flash filling system using the monitor command `SC> attrib`. Record the file attributes for each of the files.
2. **WARNING:** Shock Hazard. The MTS contains dangerous voltages which can cause electrical shock or damage to equipment. Turn off the MTS and remove the power cabling before servicing this equipment. Make sure that all power is off to prevent accidental contact with high energy and injury to personnel.

   Switch the MTS Power Supply Unit OFF.

   IMPORTANT: If two PSUs are present, switch off the supplying the Site Controller being replaced. Do not power down the MTS. In configuration with non-redundant power connection, the MTS Power Supply Unit can be switched off as an alternative to removing the cables.
3. Wear an ESD strap and connect its cable to a verified good ground. This strap must be worn to prevent ESD damage to any components.
4. Tag and disconnect any cabling from the Site Controller.
5. Loosen the two M4X10 captive screws securing the Site Controller to the chassis.

Figure 172: Site Controller - Captive Screws



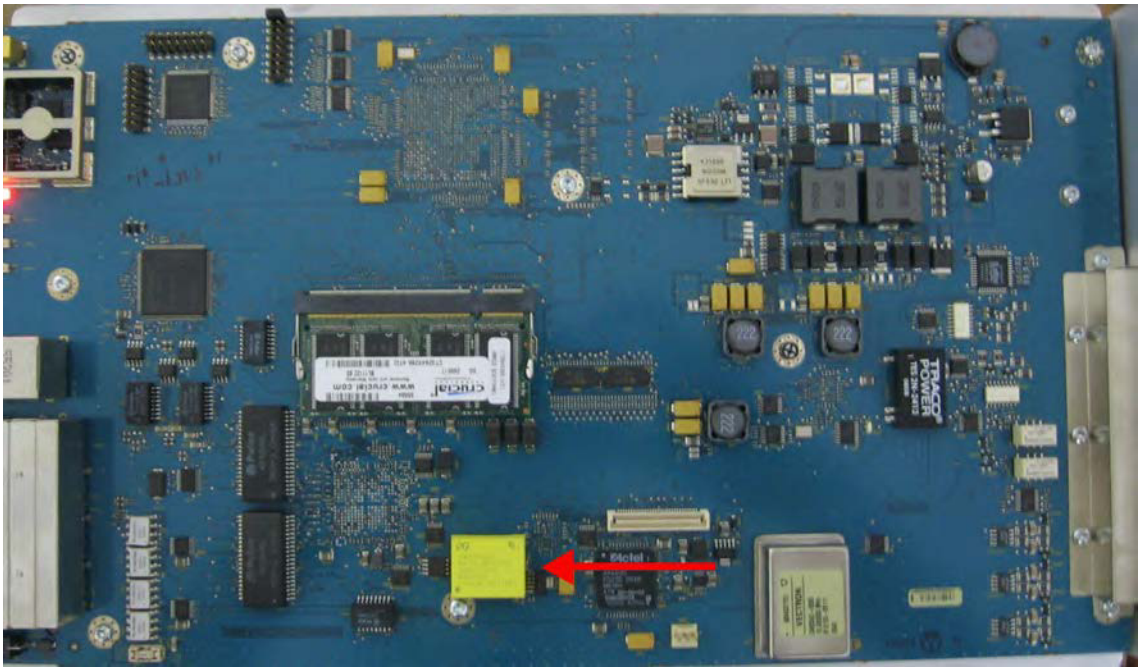
6 Use the handle, and gently slide the Site Controller from the slot, removing it from the chassis.

IMPORTANT: There are cables connected at the rear of the Site Controller. Slide out the Site Controller carefully, tag and disconnect ribbon cables at the rear.

7 Remove the Site Controller cover. Unscrew 19 screws securing the cover and slide it off gently to avoid damage to components installed on the board (the cover can harm the springs on the RJ45 connectors (front side connectors), when the cover has been slid nearly completely off).

8 Remove the old battery from the socket on the board.

Figure 173: Site Controller - Lithium Battery Location



9 Install a replacement battery (Motorola p/n 5185151Y02) in its socket on the board.

IMPORTANT: Dispose or recycle the used battery according to local regulations.

10 Slide the cover gently on and secure it with 19 screws.

11 Install the Site Controller into the MTS. Use the handle to slide the unit into the chassis.

IMPORTANT: Connect the ribbon cables at the rear before sliding the unit into the chassis.

12 Secure the Site Controller in the chassis with the captive screws.

13 Except the power cables, reconnect all other cabling to the unit as tagged during the removal.

14 Power up the Site Controller:

- **a** Reconnect the power cables to the MTS Power Supply Units.
- **b** Set the power switch to the ON position.

15 Perform Resetting the RTC Battery Status on page 332.