Tecore, Inc.

MilSec-RDS UMTS Hardware Reference Manual

Reference Manual

TUD-RDSUMTSHDWR-0

Revision 0.2

THE CONTENTS OF THIS DOCUMENT SHOULD NOT BE VIEWED OR COPIED WITHOUT THE WRITTEN CONSENT OF TECORE, INC.

Tecore and iCore are registered trademarks of Tecore, Inc.

Users of this document must verify that it is CURRENT prior to use.

Table of Contents

Users of this document must verify that it is CURRENT prior to use.

Table of Figures

Table of Tables

Users of this document must verify that it is CURRENT prior to use.

1.0 INTRODUCTION

This document provides the specifications and instructions related to the hardware platform provided with the Military Secured Rapid Deployment System for Universal Mobile Telecommunications Systems (MilSec-RDS UMTS).

The MilSec-RDS UMTS is a transportable UMTS solution leveraging the multi-technology baseline of the iCore to deliver voice and data 3G services to mobile users. The Tecore MilSec-RDS UMTS solution comes fully integrated with MSC/VLR, HLR, AuC, RNC, SMS, GGSN, SGSN, and NodeB capabilities in a small compact enclosure.

This document includes information on the following MilSec-RDS UMTS hardware topics:

- High-level description of the hardware architecture

- Technical data (physical and operating)

- Description of the controls, indicators, and connectors

- Installation instructions

- Startup and Shutdown procedures

- Maintenance information

Users of this document must verify that it is CURRENT prior to use.

2.0   MILSEC-RDS UMTS HARDWARE ARCHITECTURE

The standard MilSec-RDS UMTS platform consists of a Dual Node Control Unit and a Dual Node RF Unit. These two components are mountable in a standard 19 inch rack and may be mounted in a military grade 5U transportable enclosure.   The optional 10U military grade enclosure includes additional rack-mount space allowing the user to install ancillary equipment if desired.

- MilSec-RDS UMTS Control Unit
- MilSec-RDS UTMS RF Unit

Figure 1 – MilSec-RDS UMTS Control and RF Units
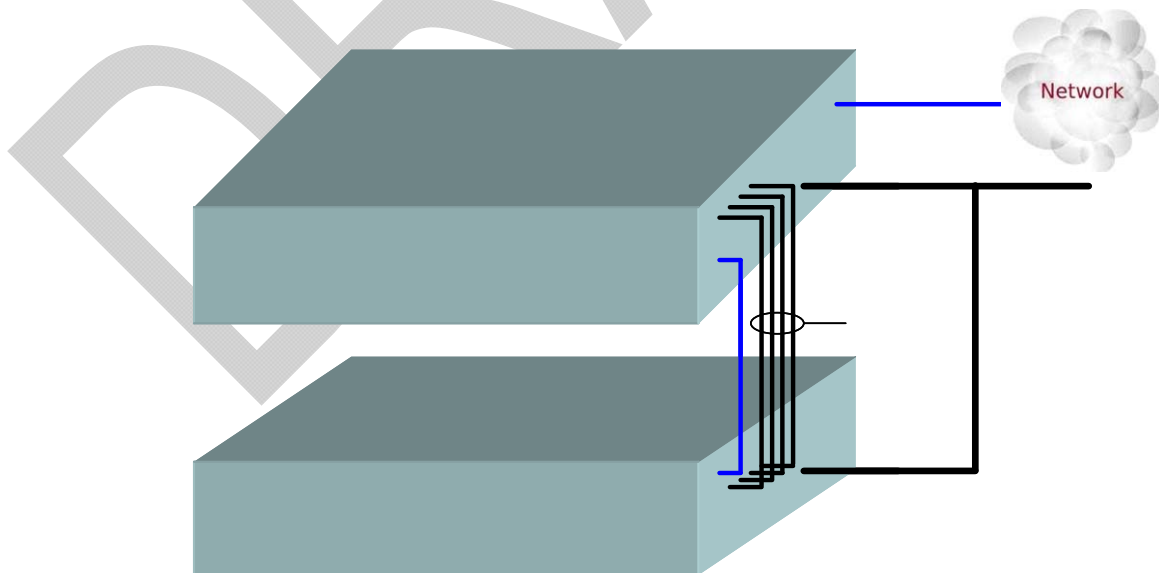
Figure 2 – MilSec-RDS UMTS Control and RF Unit Logical Interface Diagram

2.1 MILSEC-RDS UMTS CONTROL UNIT

The following modules are housed within the MilSec-RDS UMTS Control Unit and the functional diagram of the unit is shown in Figure 3 below:

- iCore processor module provides the iCore core network functions including UMSC/VLR, HSS/HLR, SMSC, SGSN/GGSN, and RNC
- Auxiliary Processor module for future applications
- Dual NodeB modules providing the transmit and receive UMTS radio access functions
- Ethernet Switch module providing an internal LAN as well as external access for Operations and Maintenance functions using standard RJ45 Ethernet ports
- AC to DC power module providing internal DC power for the MilSec-RDS UMTS control unit modules
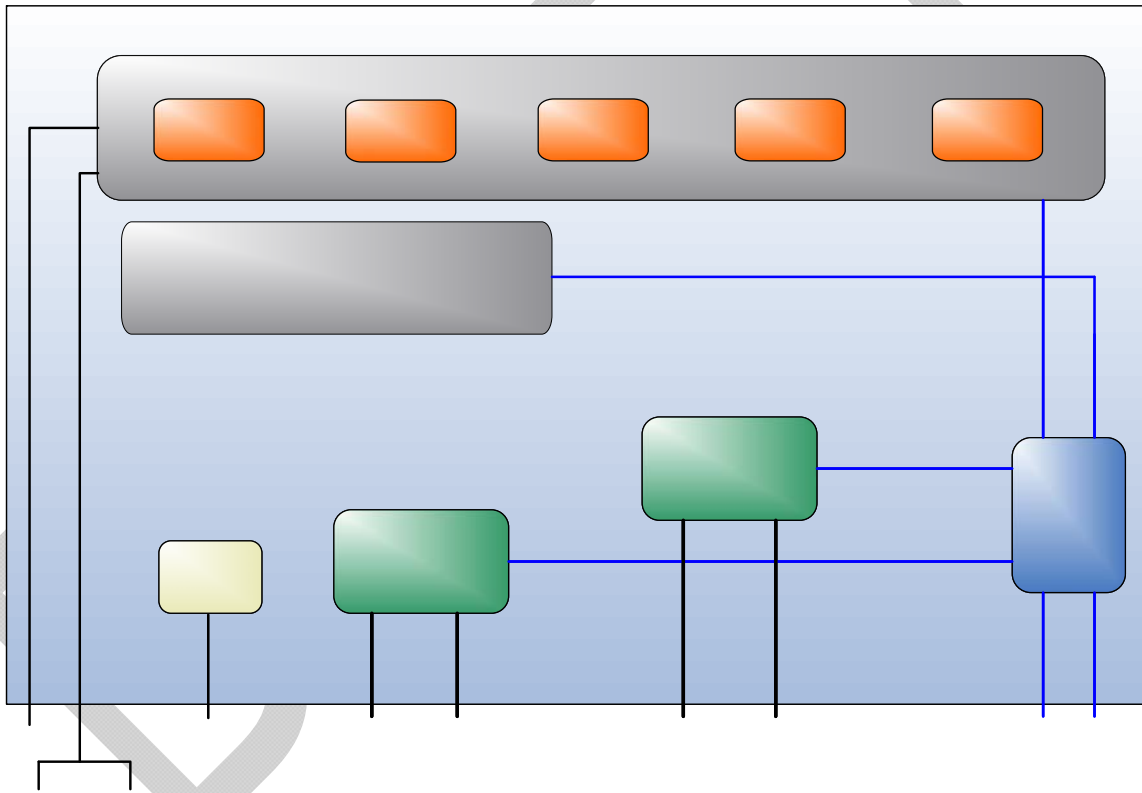
Figure 3 – MilSec-RDS UMTS Control Unit Functional Diagram

iCore Processor Module
UMSC / VLR   **HSS/HLR**

UMSC / VLR   **HSS/HLR**

Optional – Auxiliary Processor Module

Users of this document must verify that it is CURRENT prior to use.

2.2 MILSEC-RDS UMTS RF UNIT

The following modules are housed within the MilSec-RDS UMTS RF Unit, and a functional diagram of the unit is shown in Figure 4 below:

- Embedded Single Board Computer (SBC) processor module providing RF control and external access for Operations and Maintenance functions using standard RJ-45 Ethernet ports
- High Power Amplifier (HPA) module providing 20 watts of power.
- Dual Low Noise Amplifiers (LNA) providing low noise amplification of received signals.
- Duplex filter providing a single duplex antenna connector for transmit and receive signals as well as a receive diversity antenna connector; also providing receive and transmit signal out-of-band filtering.
- DC Injectors/Lightning Arrestors providing lighting and surge protection for antenna connectors and DC power for optional tower mounted amplifiers (TMAs).
- AC to DC power module providing internal DC power for the RF Unit modules
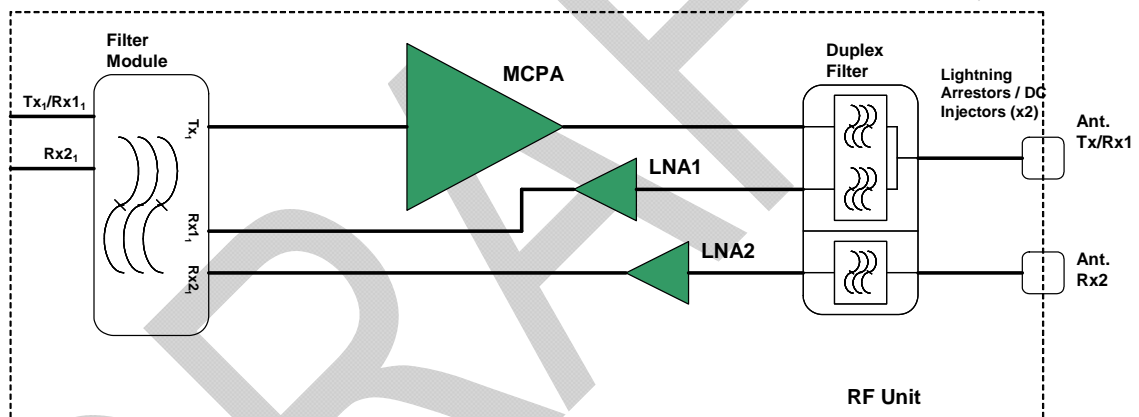
Figure 4 – MilSec-RDS UMTS RF Unit Functional Diagram

CAUTION – Changes or modifications not expressly approved by Tecore Networks could void the user's authority to operate the equipment

Caution

Users of this document must verify that it is CURRENT prior to use.

MILSEC-RDS UMTS TECHNICAL DATA

2.3   MILSEC-RDS UMTS CONTROL UNIT

The specifications for the MilSec-RDS UMTS Control Unit are defined in the following table:

Specification	Description
Processor Module	
CPU Type	Intel Quad-Core i7-2720QM
CPU Clock	2.2 GHz
RAM	4Gb DDR3
HDD	80Gb Solid State Drive
OS	Linux 64 bit
NodeB Module	
Frequency Band	UMTS Band V DL 869 – 894 MHz UL 824– 849 MHz
RF Output Power	250 mw
RX Sensitivity	-110 dBm
Electrical	
Input Voltage	85 - 264 VAC 47 – 63 Hz
Power Consumption	630 watts
Physical	
Size	
Rack Height Units	3
Height	5.0 inches
Width	16.93 inches
Depth	24.0 inches
Weight	
Total	40.0 lbs
Environmental	
Temperature	Storage: -45°C to 85°C Operating: -25°C to 50°C
Relative Humidity	Storage: 8% to 100% (non-condensing and condensing) Operating: 5% to 95% (non-condensing and condensing)

Table 1 – MilSec-RDS UMTS Control Unit Technical Data

Users of this document must verify that it is CURRENT prior to use.

2.4 MILSEC-RDS UMTS RF UNIT

The specifications for the MilSec-RDS UMTS RF Unit are defined in the following table:

Specification	Description
Processor Module	
CPU Type	PIC18F6680
I/O	Ethernet, RS232, 12 Analog inputs, 32 Digital I/Os
MCPA Module	
Total Output Power	20 watts
Range	Up to 10 Kilometers
Frequency Band	UMTS Band V – 869 – 894 MHz
LNA Module	
Frequency Band	UMTS Band V – 824 – 849 MHz
RF Input Power	+13 dBm (max.)
Noise Figure	1.9 dB (max.)
Electrical	
Input Voltage	85 – 264 VAC 47 – 63 Hz
Power Consumption	330 watts
Physical	
Size	
Rack Height Units	2
Height	3.37 inches
Width	16.93 inches
Depth	24.0 inches
Weight	
Total	28.0 lbs
Environmental	
Temperature	Storage: -45°C to 85°C Operating: -25°C to 50°C
Relative Humidity	Storage: 8% to 100% (non-condensing and condensing) Operating: 5% to 95% (non-condensing and condensing)

Table 2 – MilSec-RDS UMTS RF Unit Technical Data

Users of this document must verify that it is CURRENT prior to use.

3.0 MILSEC-RDS UMTS COMPONENTS

3.1 MILSEC-RDS UMTS CONTROL UNIT

The MilSec-RDS UMTS Control Unit as shown in Figure 5 below is a 3U height chassis horizontally mountable in a standard 19 inch rack. The unit provides the computing platform for the core network functional applications (iCore) and the radio access network functions for the NodeBs.
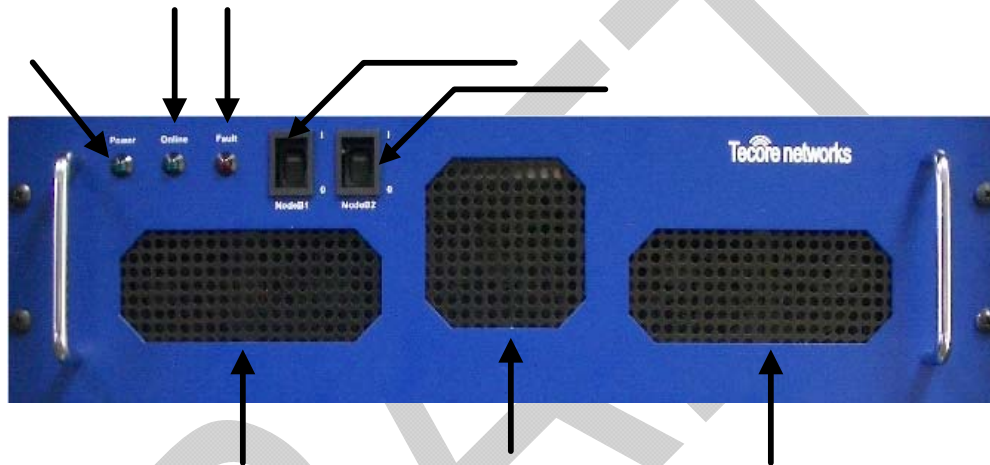

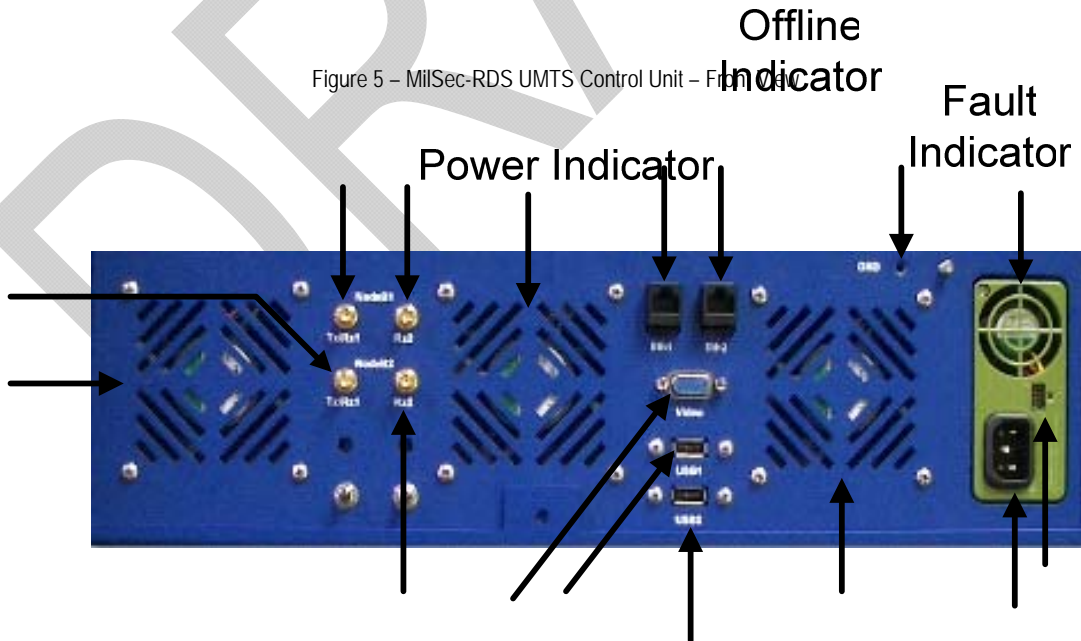Figure 5 – MilSec-RDS UMTS Control Unit – Front View

Figure 6 – MilSec-RDS UMTS Control Unit – Rear View

Users of this document must verify that it is CURRENT prior to use.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

The controls and I/O for the MilSec-RDS UMTS Control Unit are defined in the following table:

Control & I/O	Description
Front Panel	
Indicators	
Power	LED Indicator illuminates green when the power to the Control Unit is in the "on" state
Offline	LED Indicator illuminates green when the Control Unit is in the "offline" state
Fault	LED Indicator illuminates red when the Control Unit detects a fault condition. Possible Control Unit fault conditions are: • System high temperature • Fan failure • Hardware fault
Node B1	Toggle switch to turn the power of the NodeB1 to the On (1) or Off (0) position
NodeB2	Toggle switch to turn the power of the NodeB2 to the On (1) or Off (0) position
Rear Panel	
Power	
AC Power	85 – 264 VAC 47 – 63 Hz
J2 Connector	For factory use only
Input / Output Ports	
NodeB1 – Tx/Rx1	SMA Female connector
NodeB1 – Rx2	SMA Female connector
NodeB2 – Tx/Rx1	SMA Female connector
NodeB2 – Rx2	SMA Female connector
USB1	USB 2.0 Port

Users of this document must verify that it is CURRENT prior to use.

USB2	USB 2.0 Port
Video	VGA 15-pin Female connector
Eth1	RJ-45 100 Base-T Ethernet Port
Eth2	RJ-45 100 Base-T Ethernet Port

Table 3 – MilSec-RDS UMTS Control Unit Controls & I/O

Users of this document must verify that it is CURRENT prior to use.

3.2   MILSEC-RDS UMTS RF UNIT

The MilSec-RDS UMTS RF Unit, as shown in Figure 7 and Figure 8 below, is a 2U height chassis horizontally mountable in a standard 19 inch rack.   The unit interfaces to the MilSec-RDS UMTS Control Unit and provides the UMTS RF radio functions for the dual NodeBs.
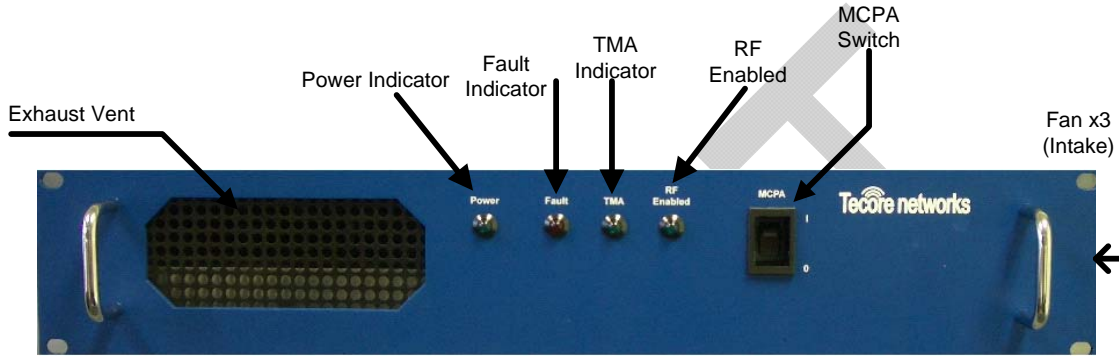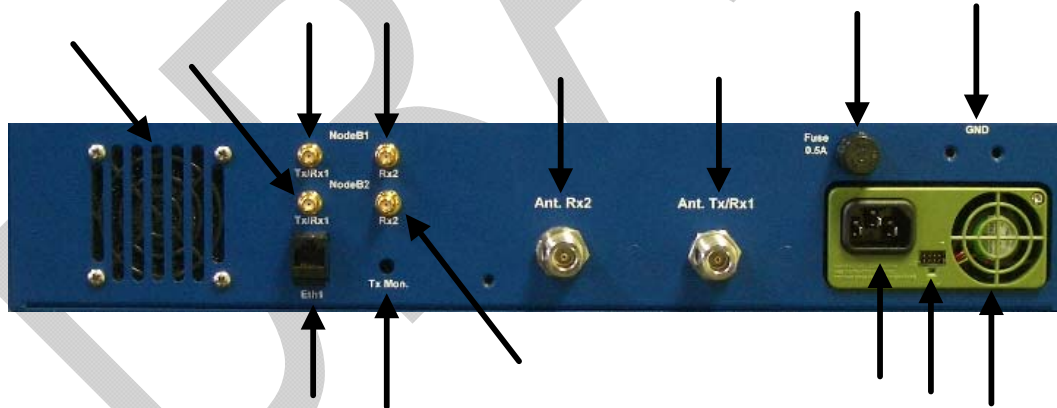
Figure 7 – MilSec-RDS UMTS RF Unit – Front View

Figure 8 – MilSec-RDS UMTS RF Unit – Rear View

Users of this document must verify that it is CURRENT prior to use.

The controls and I/O for the MilSec-RDS UMTS RF Unit are defined in the following table:

Controls & I/O	Description
Front Panel	
Power	LED Indicator illuminates green when the power to the RF Unit is in the "on" state
Fault	LED Indicator illuminates red when the RF Unit detects a fault condition. Possible RF Unit fault conditions are: • MCPA high temperature • MCPA device failure • MCPA VSWR (Voltage Standing Wave Ratio) fault • MCPA ALC alarm • MCPA low gain (Loop Fail) • MCPA DC fail • MCPA over power
TMA (Tower Mounted Amplifier)	LED Indicator illuminates green when TMA is provided and in the enabled state
RF Enabled	LED Indicator illuminates green when RF is in the enabled state
MCPA	Toggle switch to turn the power of the Multi-Channel Power Amplifier (MCPA) to the On (1) or Off (0) position
Rear Panel	
Power	
AC Power	85 – 264 VAC 47 – 63 Hz
J2 Connector	For factory use only
Input / Output Ports	
NodeB1 – Tx/Rx1	SMA Female connector
NodeB1 – Rx2	SMA Female connector
NodeB2 – Tx/Rx1	SMA Female connector
NodeB2 – Rx2	SMA Female connector
Eth1	RJ-45 100 Base-T Ethernet Port
Ant. Tx/Rx1	N-type Female antenna connector (TX/RX and RX Diversity)
Ant. Rx2	N-type Female antenna connector (TX/RX and RX Diversity)
Tx Mon	For factory future use only

Table 4 – MilSec-RDS UMTS RF Unit Controls & I/O

Users of this document must verify that it is CURRENT prior to use.

4.0 MILSEC-RDS UMTS INSTALLATION INSTRUCTIONS

4.1 UNPACKING THE MILSEC-RDS UMTS

The MilSec-RDS UMTS system is shipped fully assembled.

Warning

WARNING – The MilSec-RDS UMTS package is heavy (approximately 110 lbs. - 50 kgs.) At least two people are required to lift the package. Safe lifting and moving techniques should be exercised.

a. Inspect the package for signs of damage. If damage is found, immediately notify the carrier that delivered the package.

b. Place the package containing the MilSec-RDS UMTS system upright in an area with several feet of clearance on all sides.

c. Carefully remove the MilSec-RDS UMTS from the package.

d. Move remnants of the package out of the work area.

4.2 GROUND CONNECTIONS

Proper grounding is recommended to ensure good RF performance in addition to personnel safety. Antenna systems should also be suitably grounded for good RF performance. Grounding connection points on the Control and RF chassis are identified by **Gnd** on the rear panel. Each unit should be grounded using a crimp-style double stud and minimum 10 AWG wire to the appropriate installation ground.

4.3 MILSEC-RDS UMTS CONTROL UNIT CONNECTIONS

a. Connect a video cable from a monitor to the Video connector on the rear panel of the Control Unit.

b. Connect an Ethernet cable from an Ethernet switch to Eth1 port on the rear panel of the Control Unit.

c. Connect a USB mouse cable to the USB1 port on the rear panel of the Control Unit.

d. Connect a USB keyboard cable to the USB2 port on the rear panel of the Control Unit.

e. Connect the AC power cable from an AC power source to the AC Power connector on the rear panel of the Control Unit.

4.4 MILSEC-RDS UMTS RF UNIT CONNECTIONS

a. Connect an antenna cable from an antenna to the Ant. Rx2 input connector on the rear panel of the RF Unit.

Users of this document must verify that it is CURRENT prior to use.

b. Connect an antenna cable from an antenna to the Ant. Tx/Rx1 input/output connector on the rear panel of the RF Unit.

c. Connect an Ethernet cable from an Ethernet switch to the Eth1 connector on the rear panel of the RF Unit.

d. Connect the AC power cable from an AC power source to the AC Power connector on the rear panel of the RF unit.

4.5 INTER-CONNECTIONS BETWEEN THE MILSEC-RDS UMTS CONTROL AND RF UNIT

a. Connect an SMA antenna cable between the NodeB1 Tx/Rx1 SMA connector on the control unit to the NodeB1 Tx/Rx1 SMA connector on the RF unit.

b. Connect an SMA antenna cable between the NodeB1 Rx2 SMA connector on the control unit to the NodeB1 Rx2 SMA connector on the RF unit.

c. Connect an SMA antenna cable between the NodeB2 Tx/Rx1 SMA connector on the control unit to the NodeB1 Tx/Rx1 SMA connector on the RF unit.

d. Connect an SMA antenna cable between the NodeB2 Rx2 SMA connector on the control unit to the NodeB1 Rx2 SMA connector on the RF unit.

4.6 MILSEC-RDS UMTS CONTROL UNIT WIRING DIAGRAM

Users of this document must verify that it is CURRENT prior to use.

5.0 MILSEC-RDS UMTS START-UP INSTRUCTIONS

5.1 POWERING UP THE CONTROL UNIT

To turn on the Control Unit, perform the following steps:

1. Flip the **NodeB1** toggle switch on the front panel of the Control Unit to the "On" (1) position.

2. Flip the **NodeB2** toggle switch on the front panel of the Control Unit to the "On" (1) position.

3. Ensure the **Power** LED indicator on the front panel of the Control Unit illuminates green.

4. Ensure the **Offline** LED indicator on the front panel of the Control Unit illuminates green.

5.2 POWERING UP THE RF UNIT

To turn on the RF Unit, perform the following steps:

1. Flip the **MCPA** toggle switch on the front panel of the RF Unit to the "On" (1) position.

2. Ensure the **Power** LED indicator on the front panel of the RF Unit illuminates green.

3. Ensure the **TMA** LED indicator on the front panel of the RF Unit illuminates green.

4. Ensure the **RF Enabled** LED indicator on the front panel of the RF Unit illuminates green.

5.3 STARTING THE MILSEC-RDS UMTS APPLICATIONS

5.3.1 Automatic Startup

The MilSec-RDS UMTS has AutoStart functionality which is configured on the system prior to shipment. With the AutoStart option enabled, the CoreAccess Server and all the application software required for proper operation will be loaded and executed without additional operator intervention.

All administration and configuration of the MilSec-RDS UMTS is performed through the CoreAccess Console. To initiate a CoreAccess client session, perform the following steps:

1. From a terminal window (Applications>Accessories>Terminal), or a remote computer with the CoreAccess Client software installed, start the CoreAccess Console for iCore from the /opt/tecore/uiclient/bin directory by entering the following command:

   ```
   cd /opt/tecore/uiclient/bin (Press Enter)

   ./CoreAccess.sh
   ```

2. From the "CoreAccess Console for iCore" window as shown in Figure 9 below, log in using a valid username and password.

Users of this document must verify that it is CURRENT prior to use.

Figure 9 – CoreAccess Console Login Screen

3. From the menu bar on the main CoreAccess Console screen as shown in Figure 10 below, select Network>Map Connect.
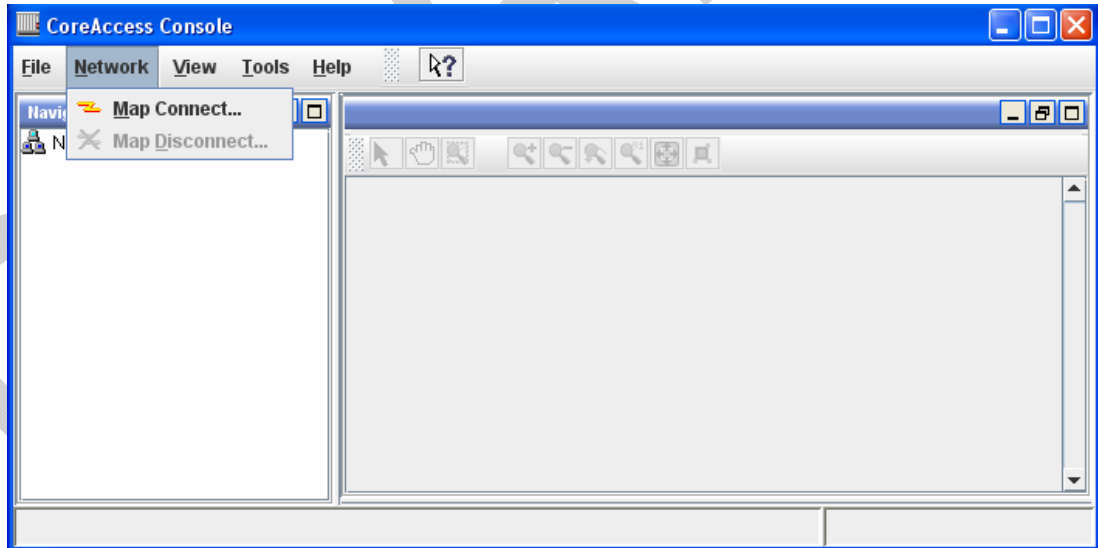

Figure 10 – CoreAccess Console Main Screen

4. From the iCore Login screen as shown in Figure 11 below, enter a Username and Password, and then press the "OK" button.
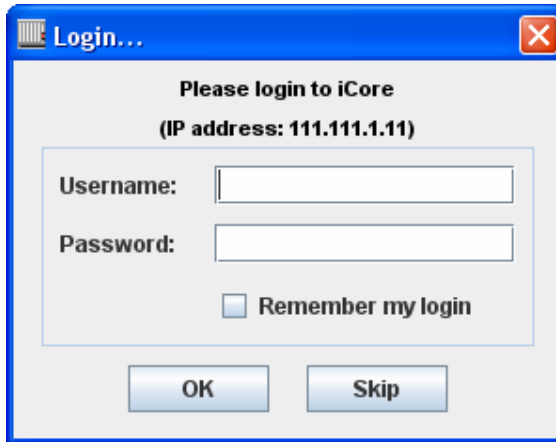
Figure 11 – iCore Login Screen

All provisioning, configuration, system administrative/security, and reporting necessary to manage the MilSec-RDS UMTS system can now be performed by selecting the desired node in the Navigation Panel which is located in the left-hand pane of the CoreAccess Console. For detailed information regarding each node in the Navigation Panel, please refer to the on-line Help by selecting Help>Help Topics from the Main Menu, or by referring to the appropriate iCore Reference Manual provided with the system.

5.3.2 Manual Startup

If the AutoStart option has been disabled, perform the following steps to start the MilSec-RDS applications:

1. Open a terminal window by selecting Applications>Accessories>Terminal from the desktop toolbar (upper left-hand panel of screen).

2. Login with valid username and password.

3. Start the CoreAccess Server from the /opt/tecore/icore/bin directory using the following command:

   `cd /opt/tecore/icore/bin` (Press Enter)

   `./caserver`

4. A System Controller window will appear as shown in Figure 12 below. From the Server tab, press the "Start" button. Upon successful Server start-up operation, the iCore Server status will indicate "Server Operational" and a green Server icon ▥ will appear in the upper panel of the desktop.

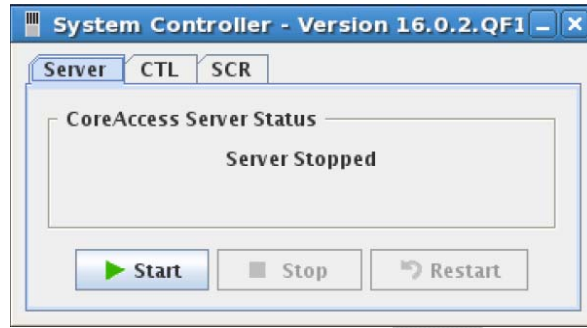Users of this document must verify that it is CURRENT prior to use.

Figure 12 – System Controller Screen

5. From a terminal window (Applications>Accessories>Terminal), or a remote computer with the CoreAccess Client software installed, start the CoreAccess Console from the /opt/tecore/uiclient/bin directory by entering the following command:

```
cd /opt/tecore/uiclient/bin (Press Enter)

./CoreAccess.sh
```

6. From the "CoreAccess Console for iCore" window as shown in Figure 13 below, log in using a valid username and password.
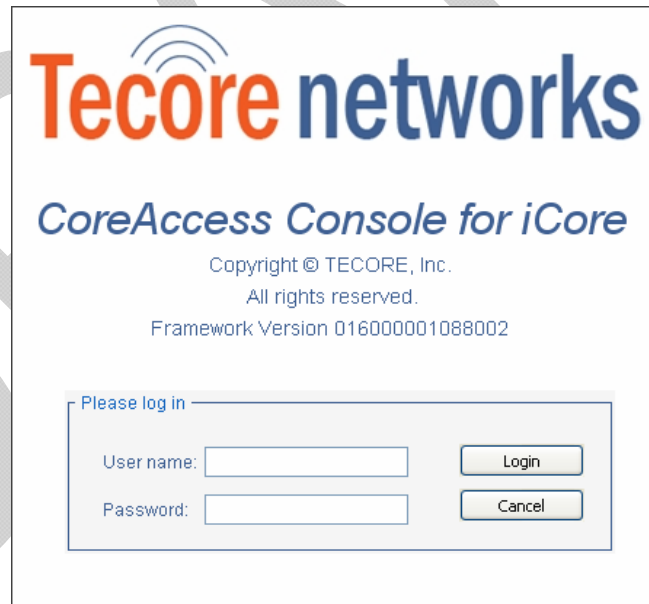

Figure 13 – CoreAccess Console Login Screen

7. From the menu bar on the main CoreAccess Console screen as shown in Figure 14 below, select Network>Map Connect.
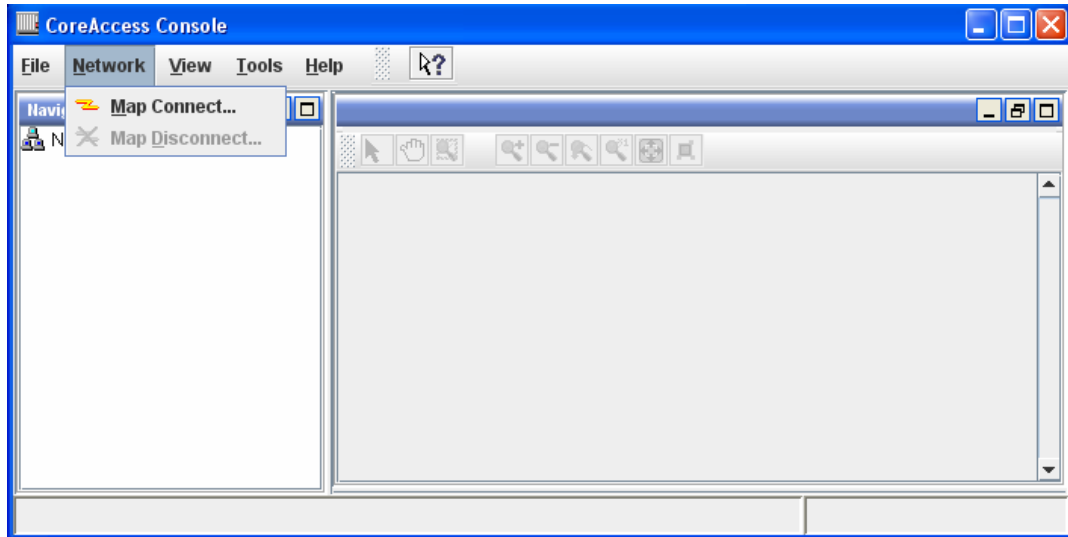
Figure 14 – CoreAccess Console Main Screen

8. From the iCore Login screen as shown in Figure 15 below, enter a Username and Password, and then press the "OK" button.
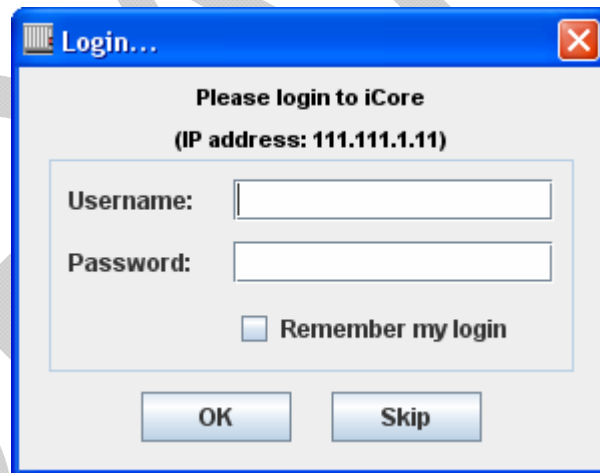
Figure 15 – iCore Login Screen

9. Start the iCore by right clicking on the Red iCore icon in the CoreAccess Navigator Panel and then select "Start iCore" from the menu. The iCore icon will illuminate Green to indicate the iCore has started successfully.

10. Start the RNC by right clicking on the RNC node in the CoreAccess Navigator Panel and selecting "Start RNC" from the menu.

11. Monitor all the subsystems from the Alarms/IP Status window. Ensure all subsystems are in normal service. Navigate to the Trunk Maintenance screen (Shelf>Board>Span) and make sure all configured spans are in service. Finally make related test calls to conclude successful system operation.

Users of this document must verify that it is CURRENT prior to use.

12. Launch the SGSN GUI using the following steps:

a) From a terminal window (Applications>Accessories>Terminal) log in as root user (su), then cd to the /var/sgsn3g/bin directory

b) Enter the following command:

```
./sgsnoam &
```

13. Start the SGSN from the Actions tab

14. Launch the GGSN GUI using the following steps:

a) From a terminal window (Applications>Accessories>Terminal) log in as root user (su), then cd to the /var/gsn/bin directory

b) Enter the following command:

```
./gsnoam &
```

15. Start the SGSN from the Actions tab

6.0 MILSEC-RDS UMTS SHUTDOWN INSTRUCTIONS

6.1 SHUTTING DOWN THE MILSEC-RDS UMTS APPLICATION

a. Open a terminal window by selecting Applications>Accessories>Terminal from the desktop toolbar (upper left-hand panel of screen).

b. Login with valid username and password.

c. From the /opt/tecore/icore/bin directory, perform a backup of the iCore using the following command:

```
cd /opt/tecore/icore/bin (Press Enter)

./Backup.sh
```

> **NOTE –** Backup of the iCore software should be performed on a regular basis to ensure efficient recovery in the event of an unanticipated or catastrophic failure. Performing an iCore backup as stated in the step above is not mandatory but highly recommended to supplement the normal backup routine.

d. Stop the iCore and RNC, disconnect and exit from the CoreAccess Client, Stop and exit the CAServer by following the steps outlined below:

1) Stop the iCore: from the CoreAccess Client Navigator Panel, right click on the iCore node and select "Stop iCore" from the menu. Answer "Yes" to the Confirmation Required prompt. Answer "OK" to the Message from Server: RNC prompt. Select "OK" to the Message from server: iCore prompt. The iCore icon will indicate red when the iCore has successfully stopped.

2) Stop the RNC: from the CoreAccess Client Navigator Panel, right click on the RNC node and select "Stop RNC" from the menu. Answer "Yes" to the Confirmation Required prompt. Answer "OK" to the Message from Server: RNC prompt. Select "OK" to the Message from server: iCore prompt.

3) Select **"Network"** from the CoreAccess Client toolbar, and then select **"Map Disconnect"** from the menu.

4) Close the CoreAccess Client window by selecting **File>Exit** from the menu bar.

5) From the upper right panel on the CoreAccess Server desktop, right click on the Server (Green) icon. Select **"Stop"**. An **"Enter Password"** window will appear, enter the correct username and password and then select **"OK"**. The Server icon will indicate red when the Server has successfully stopped.

6) Right click on the Server (Red) icon, and select **"Exit"**.

7) Shut down the SGSN by navigating to the Actions tab and enabling the "forced" option.

8) Exit from the SGSN GUI (File>Exit).

9) Shut down the GGSN by navigating to the Actions tab and enabling the "forced" option.

Users of this document must verify that it is CURRENT prior to use.

10) Exit from the GGSN GUI (File>Exit).

6.2 POWERING OFF THE RF UNIT

To turn off the RF Unit, perform the following steps:

a. Flip the MCPA toggle switch on the front panel of the RF Unit to the "Off" (0) position.

b. Ensure the Power LED indicator on the front panel of the RF Unit is not illuminated.

c. Ensure the TMA LED indicator on the front panel of the RF Unit is not illuminated.

d. Ensure the RF Enabled LED indicator on the front panel of the RF Unit is not illuminated.

6.3 POWERING OFF THE CONTROL UNIT

To turn off the Control Unit, perform the following steps:

a. Flip the NodeB1 toggle switch on the front panel of the Control Unit to the "Off" (0) position.

b. Flip the NodeB2 toggle switch on the front panel of the Control Unit to the "Off" (0) position.

c. Ensure the Power LED indicator on the front panel of the Control Unit is not illuminated.

d. Ensure the Offline LED indicator on the front panel of the Control Unit is not illuminated.

Users of this document must verify that it is CURRENT prior to use.

7.0   MILSEC-RDS UMTS MAINTENANCE AND REPAIR

7.1   MAINTENANCE

The MilSec-RDS UMTS is a maintenance-free system. However, periodic cleaning of each component's intake and exhaust vents using an ESD Safe Vacuum is recommended to ensure unrestricted air flow.

7.2   FIELD REPLACEABLE UNITS (FRUS)

⚠️ Caution

CAUTION – Tecore Networks does not take responsibility for any damage to personnel or equipment, or loss of operability due to the use or installation of unauthorized parts.

Repair consists of removing a component found to be defective during troubleshooting and installing the repaired or replacement component. Complete disassembly of the MilSec-RDS UMTS is not authorized and will void any warranty or maintenance contract.

The MilSec-RDS UMTS platform contains two field replaceable units (FRUs) which can be ordered as individual spare items, as listed in the table below.

Tecore Part Number	Description
900-10051-210	MilSec-RDS UMTS Control Unit
900-10052-210	MilSec-RDS UMTS RF Unit

Table 5 – MilSec-RDS UMTS Hardware Spares

If either of these components has an issue that requires the removal of cover panels, the unit must be returned to Tecore Networks for repair.

⚠️ Caution

CAUTION – Spare parts should be stored in the protective packaging, as received. Use this packaging to return replaced part to Tecore Networks. Parts can sustain damage during shipment to the site or other location if not packaged properly. When requesting an RMA, please indicate to the Customer Response Center (+1-410-872-6300) if packing materials are needed.

Users of this document must verify that it is CURRENT prior to use.

[This Page Intentionally Left Blank]

TECORE, Inc.

7061 Columbia Gateway Drive

Columbia, MD 21046-2139