

Global Customer Documentation

DIMETRA™ System Documentation

Dimetra IP

**MTS 1 Installation, Configuration and
Basic Service Manual**



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Disclosure table

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件	×	○	×	×	○	○
电路模块	×	○	×	×	○	○
电缆及电缆组件	×	○	×	×	○	○
塑料和聚合物部件	○	○	○	○	○	×

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。
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Contact details:are:

Email: ESSC@motorolasolutions.com

List of Telephone numbers:

Country	In Country Number to Dial
AUSTRIA	01206091087
DENMARK	043682114
FRANCE	0157323434
GERMANY	06950070204
ITALY	0291483230
LITHUANIA	880 030 828
NETHERLANDS	0202061404
NORWAY	24159815
PORTUGAL	0217616160
RUSSIA	810 800 228 41044 (Alternative 810 800 120 1011)
SAUDI ARABIA	800 844 5345
SOUTH AFRICA	0800981900
SPAIN	0912754787
UNITED KINGDOM	02030 277499
All Other Countries	+44 2030 277499

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Motorola GmbH, European Systems Component Centre, Am Borsigturm 130,13507 Berlin, Germany

Contact details:

E-Mail: ESCC.admin@motorola.com

Telephone: +49 (0) 30 66861555

Telefax: +49 (0) 30 66861426

Monday - Friday 08:00 am to 06:00 pm (CET)

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MTS 1 Installation, Configuration and Basic Service Manual

This manual provides an overview of the small one-Base-Radio Motorola TETRA Station (MTS) - MTS 1 - for the Dimetra IP System.

What Is Covered In This Manual?

This manual covers the basics of installation, configuration and service of the MTS 1 base station.

Helpful Background Information

This manual is intended for use by the following audiences within the user community:

- Operations Group - This group is responsible for the day-to-day system operation and comprises system administrators and communication specialists, usually under the supervision of an operations manager.
- Field Technicians / Engineers - Responsible for installation, configuration, support of customer systems, and FRU replacement.

It is assumed that the reader is familiar with the operating principles of Motorola Dimetra IP trunked radio equipment or similar.

Related Information

Users of this manual should also refer to:

- *Motorola TETRA Stations* manual
- *Motorola Standards and Guidelines for Communications Sites, R56*, Document Part Number: 68P81089E50.
- *MTS MMI Commands Manual*, Document Part Number: 6866600D04
- *Tetra EBTS Service Software (TESS) User Guide*, Document Part Number: 6802700U57

Icon Conventions

The document set is designed to give the reader more visual cues. The following graphic icons are used throughout the documentation set. These icons and their associated meanings are described below.



SUGGESTION

A Suggestion implies a recommendation or tip from Motorola, which does not require to be followed, but may be helpful. There is no warning level associated with a Suggestion.



NOTE

Notes contain information that is more important than the surrounding text, such as exceptions or preconditions. Also, refer the reader elsewhere for additional information, remind the reader how to complete an action (when it is not part of the current procedure, for instance), or tell the reader where information is located on the screen. There is no warning level associated with a Note.



IMPORTANT

An Important icon indicates information that is crucial to the discussion at hand, but which is not a Caution or a Warning. There is no warning level associated with the Important icon.



CAUTION

The Caution icon implies information that must be carried out in a certain manner to avoid problems, procedures that may or may not be necessary as determined by the reader's system configuration, and so on. Although no damage occurs if the reader does not heed the caution, some steps may need repeating.

**WARNING**

The Warning icon implies potential system damage if the instructions or procedures are not carried out exactly, or if the warning is not heeded.

**DANGER**

The Danger icon implies information that, if disregarded, may result in severe injury or death of personnel. This is the highest level of warning.

Regulatory CE Marking Compliance

MTS 1 is compliant with the essential requirements in article 3 of the E.U. Directive, 1999/5/EC, “Radio Equipment and Telecommunications Terminal Equipment and the Mutual Recognition of their Conformity (R&TTE)”. This includes:

Article 3.1a: Safety, of the R&TTE directive: Verification tests performed according to the harmonized European standard:

- EN 60950-1 Safety of information technology equipment; Part 1: General requirements.

Article 3.1b: EMC, of the R&TTE directive: Verification tests performed according to the harmonized European standards:

- ETSI EN 301 489-1 EMC standard for radio equipment and services; Part 1: Common technical requirements.
- ETSI EN 301 489-18 EMC standard for radio equipment and services; Part 18: Specific conditions for Terrestrial Trunked Radio (TETRA) equipment.
- EN 61000-3-2 standard for Electromagnetic compatibility (EMC) -- Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)
- EN 61000-3-3 standard for Electromagnetic compatibility (EMC) -- Part 3-3 Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not in subject to conditional connection.

Article 3.2: Radio spectrum use, of the R&TTE directive: Verification tests performed according to the harmonized European standards:

- ETSI EN 303 035-1 Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE directive; Part 1: Voice plus Data (V+D)
- ETSI EN 300 394-1 TETRA conformance testing specification; Part 1: Radio.
- ETSI EN 302 561 Radio equipment using constant or non-constant envelope modulation operating in a channel bandwidth of 25 kHz, 50 kHz, 100 kHz or 150 kHz; Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive.

MTS 1 Overview

This chapter provides an overview of the smallest Motorola TETRA Station (MTS) - MTS 1. This should give you an overview of what an MTS 1 is, what it does, and the modules that it is comprised of.

The MTS 1 is a Base Station that can be used in a Dimetra IP communication system. A Base Station serves as the Radio Frequency (RF) interface between the system infrastructure and the mobile stations. Base Stations in a trunked system have three primary interfaces:

- A receiver to pick up the RF signal from the mobile stations
- A transmitter to send RF signals to the mobile stations
- A wireline interface to send audio and control traffic to the system infrastructure

Strategically placed base stations allow users to communicate with one another, dispatch operators or telephone users using the Dimetra IP system.

The MTS 1 can be in-door mounted for near building coverage as well as outdoor mast-mounted.

MTS 1 Platform

The MTS 1 provides the interface between the mobile stations within the Dimetra IP system and the rest of the system infrastructure. The main functions of the MTS 1 are:

- Integrated One Base Radio TETRA base station
- Dual MTS 1 configurations for additional capacity and resilience
- Indoor or outdoor mounting on wall, pole and mast
- Radio link formatting, coding, timing, framing, and error control
- Timing control supervision to mobile stations
- Radio link quality measurements
- Site to site frame synchronization
- Interface translation - radio link to network equipment
- Air Interface Encryption
- Local Site Trunking
- Operation, maintenance, and administration agent

The MTS 1 is the smallest of the MTSs and supports one Base Radio in single MTS 1 configurations and it support two Base Radios in dual MTS 1 configurations. It is built up by:

- a Cover assembly, and
- a Base Radio (BR) assembly

The Cover assembly consists of the molded cover, the Site Controller, the RF Filter Module and the Power Supply Unit. The Site Controller and the Power Supply Unit are mounted inside the front of the cover and the RF Filter Module is mounted at the bottom of the cover.

The Base Radio assembly consists of the Base Radio and a Heatsink for cooling purposes.

The MTS 1 is managed by the system infrastructure's Network Management (NM) applications. Communication between the MTS 1 and the NM applications takes place through an Ethernet link. Through this link, the NM applications can download new configuration files to the MTS 1 and receive alarm/event and performance statistics from them.

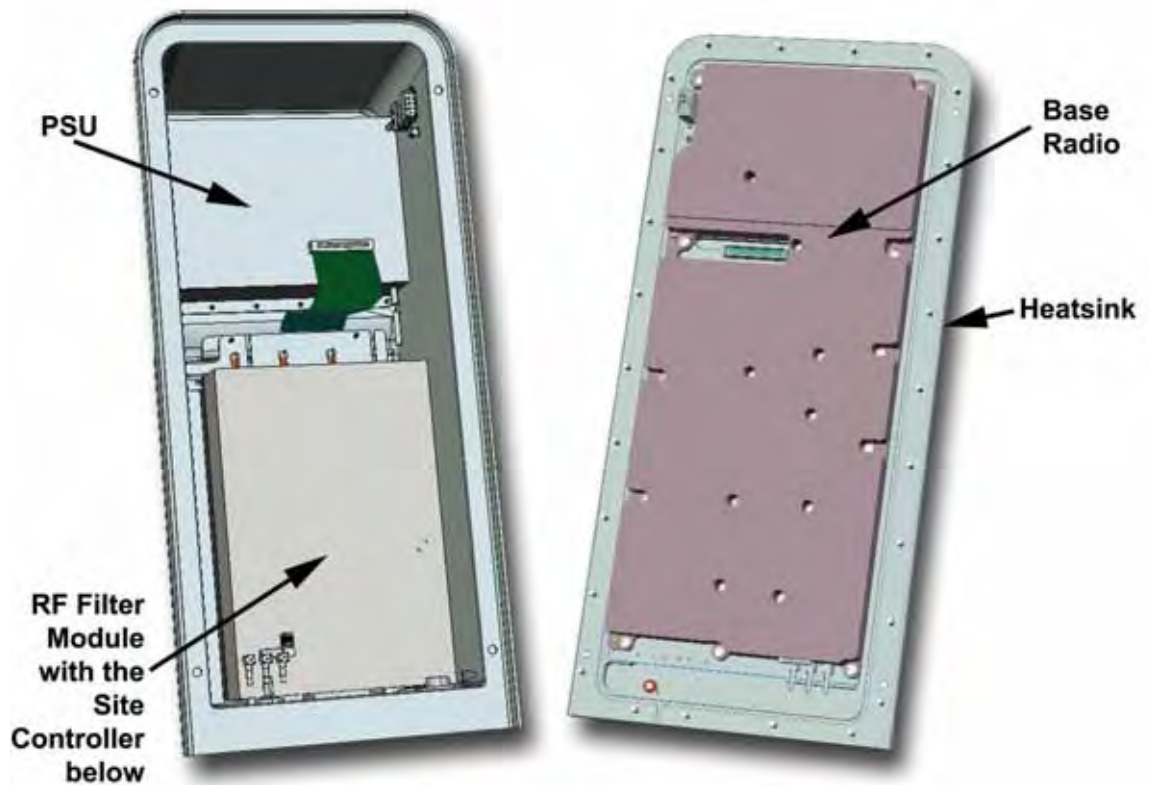
For information regarding network management configuration of the MTS 1, please refer to the *MTS Site Object* sections of the *Zone Configuration Manager* manual and Online Help.

MTS 1 Components

The MTS 1 is comprised of the following components:

- MTS 1 housing
- MTS 1 mounting bracket
- A Cover assembly
- A Base Radio (BR) assembly
- Internal modules
- Interface cabling
- Optional Ground box (Standard or Wall mounted)
- Optional solar shield
- Optional cable seal box

Figure 1-1 MTS 1 Components



The modules that comprise the MTS 1 Cover assembly for a standard configuration includes the following:

- Power Supply Unit
- Site Controller
- RF Filter Module

The MTS 1 Base Radio (BR) assembly is comprised of the following for a standard configuration:

- Base Radio
- Heatsink

For a complete description of each module, refer to the appropriate chapter. Each chapter provides the theory of operation and a description of connectors. Configuration and testing, and troubleshooting for MTS 1 are provided in separate chapters.

MTS 1 Modules

Each MTS 1 comprises a number of modules. Some of these modules in turn are comprised of subcomponents. This section provides an overview of each of the available modules and their subcomponents.

RF Filter Module

The RF Filter Module is a Duplexer and a Preselector integrated into the same body. The Duplexer conditions the transmit and main receive signals. The Preselector conditions the diversity receive signal..

The duplex spacing between a transmit frequency and the corresponding receive frequency is 10 MHz, with the transmit frequency highest. This leaves a 5 MHz spacing between the lowest possible transmit frequency and the highest possible receive frequency.

Site Controller

The Site Controller (SC) controls resources within the base station, including assignment of frequencies and slots to mobile stations. The Site Controller incorporates a Global Positioning System (GPS), which receives signals that are used to develop high-precision system timing signals.

The Site Controller communicates with the Base Radio through a ribbon cable. It also communicates with the network through an Ethernet link.

Base Radio

The transceiver provides the BR's transmission, receiving, signal processing, and modulation functions. To do this, the transceiver incorporates a Base Radio Controller (BRC), Receiver (RCV), and Exciter (EXC).

The BRC serves as the main controller of the Base Radio. The BRC provides signal processing and operational control for the transceiver circuits.

The Power Amplifier (PA), in conjunction with the Exciter, provides the transmitter functions for the Base Radio. The PA accepts the low-level modulated RF signal from the exciter and amplifies the signal for transmission through the RF output connector.

Power Supply Unit

The MTS 1 is equipped with one AC Power Supply Unit (PSU) supporting voltages between 110-230V.

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General Safety

This chapter summarizes the safety related information that you should both understand and observe when working with MTS 1. In addition to the information contained in this chapter, additional safety related information can be found in other parts of the document.



IMPORTANT

This is not an exhaustive list of all the precautions and safety measures that should be observed. Please ensure that all local and site safety measures are implemented before carrying out any task with the MTS 1 or associated equipment.



NOTE

For full instructions and guidelines, please always refer to Motorola Standards and Guidelines for Communications Sites, R56, document.

General Safety

This section contains general information related to safety when working with, or operating MTS 1.



IMPORTANT

The MTS 1 is intended to be installed in restricted access locations, as defined in EN/IEC 60950-1, and only to be used by service personnel, or by users with appropriate technical experience and training.



IMPORTANT

The MTS1 is intended to be powered from the normal building installation wiring, and therefore over-voltage category II, as defined in EN/IEC 60950-22 is sufficient.



IMPORTANT

The MTS 1 is connected to earth and powered from a 110 V/230 VAC primary power source.



CAUTION

It is important that all antenna cables are grounded at the point that they enter the building.



CAUTION

Antenna design is the customer's responsibility. All aspects of antenna design must comply with the relevant local regulations.



CAUTION

You must be familiar with Man-Machine Interface (MMI) commands and their usage prior to performing procedures in this documentation. Improperly applying MMI commands can result in equipment damage.



CAUTION

Do not attempt to make a resistance check of the GPS antenna. Damage to the active devices within the antenna element may result.

**CAUTION**

Do not transmit to an antenna under any circumstance unless those frequencies are licensed.

**CAUTION**

Do not key any Base Radio with the Signal Generator directly connected to a Tx antenna port. Damage to generator will result.

**CAUTION**

Some commands executed during Conformance Testing will bypass normally available alarms and protection associated with the normal MTS operation. Therefore, it is imperative to adhere to all cautionary information and follow instructions exactly as in the procedures.

**CAUTION**

The MTS site must meet certain specifications for adequate protection from lightning induced transients. Proper ground installation methods are outlined in the Motorola Standards and Guidelines for Communications Sites, R56 manual. Refer to Quality Standards in Chapter 1 - Overview for information on obtaining the R56 manual.

**WARNING**

During thunder storms do not service any base station or infrastructure items.

**WARNING**

Always use appropriate equipment and number of personnel whenever moving an MTS 1 Base Station to reduce the risk of injury.

**WARNING**

This MTS Service Manual is intended for trained technicians experienced with Motorola Base Radio equipment or similar types of equipment.

**WARNING**

Use extreme caution when wearing a conductive wrist strap near sources of high voltage. The low impedance provided by the wrist strap also increases the danger of lethal shock should accidental contact with high voltage sources occur.

**WARNING**

Make sure that all power to the power supply equipment is off to prevent accidental contact with high energy and injury to personnel.

**WARNING**

RF energy burn hazard. Disconnect power in the MTS 1 to prevent injury while disconnecting and connecting antennas.

**WARNING**

Ensure a good connection between the electrical system ground and site ground to prevent excessive voltage potential between the two ground systems during lightning strikes.

Mains Safety

This section contains information specifically related to mains safety when working with, or operating MTS 1.



WARNING

Hazardous mains voltages exist within the power supply of the MTS. This module is not designed for field service. Depot servicing must include appropriate precautions when fault finding this switch-mode power supply.

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Site Preparation

Site Planning

Proper planning helps to prevent potential on-site and off-site interference from other RF systems, and helps maximize system performance. Site layouts should always be planned to minimize the cabling lengths between RF equipment.



NOTE

For full instructions and guidelines, please refer always to Motorola Standards and Guidelines for Communications Sites, R56.

Site Survey

The site must be carefully inspected or surveyed using appropriate site survey forms before orders are placed for the equipment.

A technical representative from both the customer and the site owner should preferably be in attendance for total concurrence at a single given time.

In order to minimize any misunderstandings, which may arise in the future, the survey report should be approved by all the attendees at the site survey. The site survey should address all relevant issues involving the MTS site installation. All involved parties should be in agreement on all of the issues before any work commences.

The site survey issues typically include the following items:

- The potential location of the MTS 1, and the access to it.
- The amount of sun exposure if mounted out-door.
- The mounting height if mounted on a mast.
- Identifying the shaded wall if mounted on an out-door wall.
- The power requirements for the site.

- A check of the history of local voltage and frequency variations together with the possibility of interruptions of the supply to the site.
- The stand-by power requirements for the site.
- The location of the mains power distribution.
- The location of the network terminating unit (NTU) for the Ethernet leased line.
- The location of telephone connections.
- The location of the building earth and the tower earth.
- Inspection/Test of the building and tower earth.
- The suitability, space availability, and location of the cable entry point into the equipment room.
- The suitability and location of the existing lightning arrestors.
- The suitability, space availability, and location of the existing cable tray or ladder rack between the equipment room and the antenna tower or the antenna system support structure.
- Checking the cable access route into the equipment room.
- Identifying the type of tower and the type of structure on which the GPS antenna will be mounted.

Motorola recommends the following considerations when selecting a site:

- Allow approximately 20 cm for access below and above the MTS 1.
- Check the storage room door dimensions to ensure that the MTS 1 can pass through.
- The operating temperature of the MTS is -30 °C to +55 °C. Therefore the site interior temperature must be maintained within these limits. Maintaining a stable, moderate site temperature is the best approach for long term reliability of the equipment.
- It is suggested that a mains socket outlet is available adjacent to the MTS for the powering of test equipment. This mains outlet must be on the same electrical phase as the MTS supply.
- If sited close to a railway track, the MTS must be installed at least 3m from the center of the track.



NOTE

Proper surge protection should be installed on Ethernet site links, all antennas, and power inputs to prevent potential damage to the MTS. Please refer to "[Surge Arrestors for Site Link](#)" section in [Appendix A](#) for more information.

For full instructions and guidelines, please refer always to Motorola Standards and Guidelines for Communications Sites, R56.

Base Station Considerations

The MTS 1 dimensions are: 263 mm (width)/206 mm (depth)/597 mm (height). It can be installed on a wall, on a mast or on a pole and the following minimal distances must be retained:

- approximately 175 mm below the MTS 1 if a Sealing Box is to be installed
- approximately 105 mm below the MTS 1 if a Sealing Box is not to be installed

The total weight of the MTS 1 is approximately 20.5 kg.

Antenna Considerations

Antenna considerations describe the following topics:

- "RF Antenna"
- "GPS Antenna"
- "Surge Arrestors"



NOTE

For full instructions and guidelines, please refer always to Motorola Standards and Guidelines for Communications Sites, R56.

RF Antenna

Existing cable tray or ladder rack for RF cabling should be near to the MTS equipment.

GPS Antenna

For systems in the northern hemisphere, the GPS antenna should be mounted so that a clear view of the southern sky is maintained.

For systems in the southern hemisphere, the GPS antenna should be mounted so that a clear view of the northern sky is maintained.



NOTE

For more information about GPS antenna installation and cabling, refer to "[Integrated GPS Antenna Connection](#)" section in [Chapter 4, "Hardware Installation"](#).
The GPS antenna has to be installed below the tallest point on the tower, pole or roof.

Surge Arrestors

Proper surge protection should be installed on all antennas to prevent potential damage to the MTS 1. Please refer to "[Surge Arrestors for Site Link](#)" section in [Appendix A](#) for more information.



IMPORTANT

Lightning arrestors should be installed to transport lightning strikes away from the equipment.



NOTE

Install a lightning rod on a tower leg other than the leg to which you mount the antenna.

Network Interface Considerations

Per any local regulations, a surge arrestor may be required at the Ethernet or service entrance. The arrestor should be designed for operation with a Ethernet circuit. The arrestor typically is only installed on the customer side of the Ethernet service entrance. It should be wired per manufacturer instructions. Please refer to "[Surge Arrestors for Site Link](#)" section in [Appendix A](#) for more information.

Special Considerations

Special considerations cover the following topics:

- "Electrical Service Access"
- "Hazardous Materials and Equipment"
- "Seismic Active Areas"

Electrical Service Access

Adhere to the local electrical codes and regulations regarding clearance for electrical service access.

Hazardous Materials and Equipment

Compliance with all local and any other regulations concerning the handling and use of hazardous materials and equipment is the sole responsibility of the customer and associated agents.

Seismic Active Areas

MTSs operating in seismic active areas may require additional bracing of the Base Station.



NOTE

This manual does not contain specific procedures related to seismic bracing.

Environmental Considerations

Environmental considerations cover the following topics:

- "Indoor"
- "Outdoor"

Indoor

Temperature

The environment in which the MTS operates is an important consideration. The temperature should be regulated to ensure trouble-free operation. Excessive temperatures result in generated heat that may reduce the life-span of the electronic equipment, and could cause permanent damage.

It is recommended that the ambient temperature does not exceed 55 °C in normal operating conditions.

Corrosive Environment

The equipment should not be directly exposed to corrosive environments. If the equipment site is located in a coastal environment, proper air filtration for the site should be in place to protect the equipment from salt mist contamination.

Air Quality

For cabinet-mounted equipment operating in an area, which is not environmentally controlled, the airborne particulates level must not exceed concentration defined in ETSI norm EN300 019 1-3 Class 3.

Salt mist like sea salt and road salt excluded and shall always be avoided.

Outdoor

Temperature

The environment in which the MTS operates is an important consideration. Excessive temperatures may reduce the life-span of the electronic equipment, and could cause permanent damage.

It is recommended that the ambient temperature does not exceed 55 °C in normal operating conditions.

For areas where extreme temperatures may occur (both heat and cold) a special solar shield may be required. The solar shield is also required if the MTS 1 is exposed to solar radiation and Radiative cooling (open sky cooling).

Humidity

For humidity, MTS complies with IEC 60529: IP66 (Dust protected, powerful water jets).

Air Quality

For cabinet-mounted equipment operating in an area, which is not environmentally controlled, the airborne particulates level must not exceed concentration defined in ETSI norm EN300 019 1-3 Class 3.



NOTE

With a Sealing box, requirement for No Particles is not applicable/required.

Salt mist like sea salt and road salt excluded and shall always be avoided.

Electrical Requirements



CAUTION

All electrical wiring for the MTS site must meet the requirements of any and all applicable local codes and regulations.



CAUTION

Any device (that is power supply) providing isolation between the AC mains and the MTS must provide reinforced insulation to hazardous voltages.

Applicable Codes and Practices

The following list of codes and practices (small selection only) shall be adhered where applicable:

- Motorola R56 2000 Manual.
- UK - RPSG Installation Manual, System Quality Standard, specification number 2200 and part number. 68P02200F01.
- UK - Institution of Engineering and Technology (IET) - BS 7671:2001 16th Edition Wiring Regulations (Appendix 12, —Cable Capacities of Conduit and Trunking| |).
- UK - Antenna System Installation Practice, issued by The Directorate of Telecommunications of the UK Home Office.
- UK - Details of Earthing Requirements for Masts, Aerial Feeder Cables, and Radio Equipment Rooms, issued by The Directorate of Telecommunications of the UK Home Office.
- GERMANY - VDE0100 Errichten von Starkstromanlagen bis 1000 Volt.
- GERMANY - VDE0185 Blitzschutzanlagen.
- GERMANY - VDE0510 Akkumulatoren und Batterieanlagen.
- GERMANY - VDE0855 Antennenanlagen, Errichtung und Betrieb.



CAUTION

If other codes and practices are beneficial please refer to your local standards.

AC Power Supply

The MTS 1 is equipped with a high efficiency switch mode Power Supply Unit (PSU). Operating modes is as follow:

- AC only operation (within 90 VAC to 264 VAC; 45 Hz to 66 Hz)

Service Current Rating

The normal load of a typical power system is provided in [Table 3-1, "Typical Power Loads and Heat Dissipation Values,"](#) on page 3-11.

Table 3-1 Typical Power Loads and Heat Dissipation Values

MTS 1 Configuration	AC (W)	Heat AC (W)	Comment
TETRA TX 10 W @230 VAC	95	85	
TETRA TX 10 W @110 VAC	97	87	
TETRA TX 2.5 W @230 VAC	78	75.5	
TETRA TX 2.5 W @110 VAC	79	76.5	
TETRA TX 1 W @230 VAC	73	72	
TETRA TX 1 W @110 VAC	75	74	

Surge Arrestors

Proper surge protection should be installed on all antennas to prevent potential damage to the MTS 1. Surge arrestors should also be installed on Data connectors.

Please refer to "[Surge Arrestors for Site Link](#)" section in [Appendix A](#) for more information.



IMPORTANT

Lightning arrestors should be installed to transport lightning strikes away from the equipment.



NOTE

Install a lightning rod on a tower leg other than the leg to which you mount the antenna.

Power Panel

Motorola recommends that all sites where an MTS will be installed use a standardized power panel including circuit breaker layout. Vacant space should be left to allow for future requirements.

Alarms

The MTS in all configurations has the following alarm inputs:

- Internal intrusion alarm - connected internally in the MTS 1.
- 2 external alarm inputs - used for door switches or other, connected in Ground Box.

Grounding Requirements



NOTE

The methods and standards cited in the following paragraphs are typical. Local codes, statutes, regulations, and/or standards shall supersede any information provided herein, as applicable.



WARNING

The MTS site must meet certain specifications for adequate protection from lightning induced transients. Proper ground installation methods are outlined in the Motorola Standards and Guidelines for Communications Sites, R56. The references cited earlier in this chapter shall also be followed.

Base Station grounding wires may have been installed prior to MTS 1 installation. If so, follow the instructions below.

Single-point ground method (where each Base Station is grounded to master ground using its own ground wire) shall be used. The MTS 1 shall use green (or green-yellow) insulated wire with a minimum size of 16 mm² CSA (6 AWG) for ground wire.



NOTE

The MTS 1 is wired to positive earth but the Power Supply Unit inside has a floating ground concept. Different wire colors may be used according the local standards. If the specified wire size is not available, use the next-larger available wire size. During the installation of MTS 1 ground wires, be sure to check any factory installed internal ground connections for tightness.

Mounting Kits and Optional Accessories

There is one mounting kit delivered with MTS 1 and it can be used for both wall mounting and mast mounting.

Figure 3-1 MTS 1 Mounting Bracket



When an MTS 1 is mounted outdoor, or if special protection is needed indoors, an MTS connection sealing box is used.

Figure 3-2 MTS 1 Sealing Box



For outdoor mounting, an optional Solar Shield can also be used in order to limit the heat radiation from the sun. The Solar Shield is mounted on the MTS 1 mounting kit.

Figure 3-3 MTS 1 with Solar Shield



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Hardware Installation

This chapter covers the following topics:

- "Installation Overview"
- "Pre-Installation Checklist"
- "Base Station Transportation"
- "Base Station Installation"
- "Electrical Connections"
- "RF Antenna Connections"
- "GPS Connections"
- "Site Link Cabling"
- "Dual MTS 1 Connections"
- "Final Check-out"
- "Recommended Tools, Parts, and Test Equipment for Installation"

Installation Overview

The MTS 1 can be mounted in two ways:

- On a Indoor wall using a mounting plate
- On a Outdoor mast using a mounting plate

If service of MTS 1 is required, it must be dismantled and repaired in a repair shop. Bottom access is required for connecting the external services.

The procedures described in this chapter assume the field technician or installer has knowledge of the installation techniques contained in the Motorola Standards and Guidelines for Communications Sites, R56 manual.

**NOTE**

For full instructions and guidelines, please always refer to Motorola Standards and Guidelines for Communications Sites, R56 manual.
Prior to performing the installation procedures, the site has to be prepared with all associated antennas, communications lines, and other related site equipment.

Personnel Considerations

The following personnel are typically required to install an MTS site:

- An installation supervisor.
- A minimum of two installers per MTS site. (Two installers could include the supervisor, provided there are a minimum of two persons on each MTS site at all times.)
- A commissioning engineer (attends only during the commissioning stage).

Inspection of the MTS equipment must be performed as soon as all equipment is unpacked. Check the MTS equipment against the itemized packing list to ensure that all equipment was received. If available, check the sales order with the packing list to account for all equipment ordered. Contact your Motorola representative to report the missing items and for additional information.

**NOTE**

If obvious damage has occurred to the shipping containers before unpacking, contact the shipping agent and ask that a representative of their company be present while the equipment is unpacked. Then your Motorola representative should be informed.

- Check for loose or damaged equipment
- Check all sides of the Base Station for dents, scratches, or other damage
- Verify that ground straps are secure

If any equipment is damaged, contact the shipping company immediately, and then your Motorola representative.

Pre-Installation Checklist

Proper installation ensures the best possible performance and reliability of the MTS station. Preinstallation planning is required. This includes considering the mounting location of the MTS 1 in relation to input power, antennas, and site link interfaces. Also, consider the site environment conditions, the particular mounting method, and required tools and equipment.

The installation shall only be carried out after the following activities are completed:

- Antenna installation (including GPS antenna)
- New building earth (if required)
- The installation of the Ethernet link (to the control centre) by the site link service provider
- The installation of the cable tray in the equipment room
- The increase in the capacity of the mains power supply (if required)
- The increase in the capacity of the stand-by mains power supply (if required)
- The completion of any civil works on the site (for example, new or modified accommodation, new access road, and so on)
- The position in which each piece of equipment will be placed has been marked and agreed
- Reinforcement of site floor to accommodate load of site equipment (if required)
- All the equipment has been delivered to site and placed in their final positions by the transportation company



NOTE

Proper surge protection should be installed on Ethernet site links, all antennas, and power inputs to prevent potential damage to the MTS. For full instructions and guidelines, please always refer to Motorola Standards and Guidelines for Communications Sites, R56 manual.

Base Station Transportation

It is recommended that to move and locate all the equipments to the final outdoor position, a transportation company specializing in the moving of heavy electronic equipment should be used.

Safety Considerations

**WARNING**

Crush hazard could result in personal injury or equipment damage. MTS 1 Base Station, excluding packaging, can weigh up to 21 kg. Follow instructions below when moving the MTS 1.

Equipment racks should only be lifted without the use of lifting equipment when there are sufficient personnel available to ensure that regulations covering Health and Safety are not breached. Motorola recommends the use of appropriate powered mechanical lifting apparatus for moving and lifting the equipment racks. In addition to these points, refer to and comply with any local regulations that govern the use of lifting equipment.

Moving the MTS 1 Base Station

For MTS 1 Base Station, Motorola recommends the use of a sack trolley for longer transportation or appropriate lifting by using the MTS 1 handle for shorter transportation.

**WARNING**

A sack trolley will generally be used to move the MTS 1 with the MTS lying on its back. Protective padding or cardboard should be placed between the MTS and the sack trolley to prevent equipment damage.

**WARNING**

When the Sealing Box is mounted, the MTS 1 must NOT be placed leaning on the Sealing Box.

Base Station Installation

This section provides procedures for mounting the MTS 1 within a site.

Base Station Bracing Considerations

In seismological active areas, additional bracing of the MTS 1 could be required. However, the bracing hardware must be locally procured.



NOTE

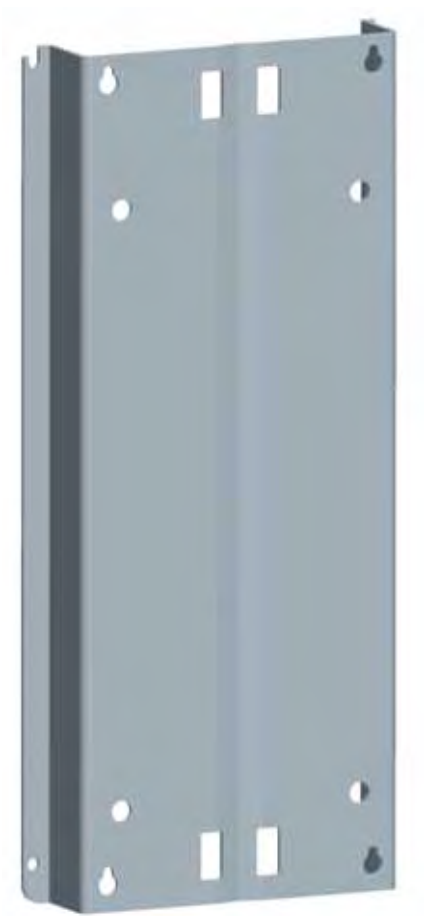
There are no specific procedures within this manual for bracing MTS 1s in active seismic areas.

Base Station Railway Application Installation Requirements

- The unit must be installed outside the 3m range of the tracks
- The DC mains cable and User Alarm/Control interface cables must be shorter 30m
- User Alarm/Control interface cables must not be connected to cables inside the 3m range
- Shielded cables must be used for all telecommunication lines
- The shields of any coax cables have to be grounded in a distance of 2m from the base station
- All the coax cable shall be protected with surge arrestors as mentioned in the installation manual
- The RGPS antenna line is protected by a Surge arrestor Polyphaser IX-3L2DC48 (E02389) close to the grounding at the entrance of the building
- The TX/RX antenna line is protected by a Surge arrestor, Polyphaser IS-B50HD, close to the grounding at the entrance of the building

Mounting the MTS 1

The MTS 1 mounting kit is used for mounting the MTS 1 Base Station onto a wall or onto a mast.

Figure 4-1 MTS 1 Mounting Bracket

The MTS 1 mounting kit consists of a mounting plate and 4 lock screws. It also comes with a secure bolt. Clamps for mast mount and bolts for wall mount must be ordered separately.

**NOTE**

If a secure bolt is needed, it must be mounted in one of the two lower holes.
Do not place the secure bolt in the top holes.

When mounted onto a mast, the mast diameter must be minimum 33 mm and maximum 130 mm.

Figure 4-2 Mounting the MTS 1

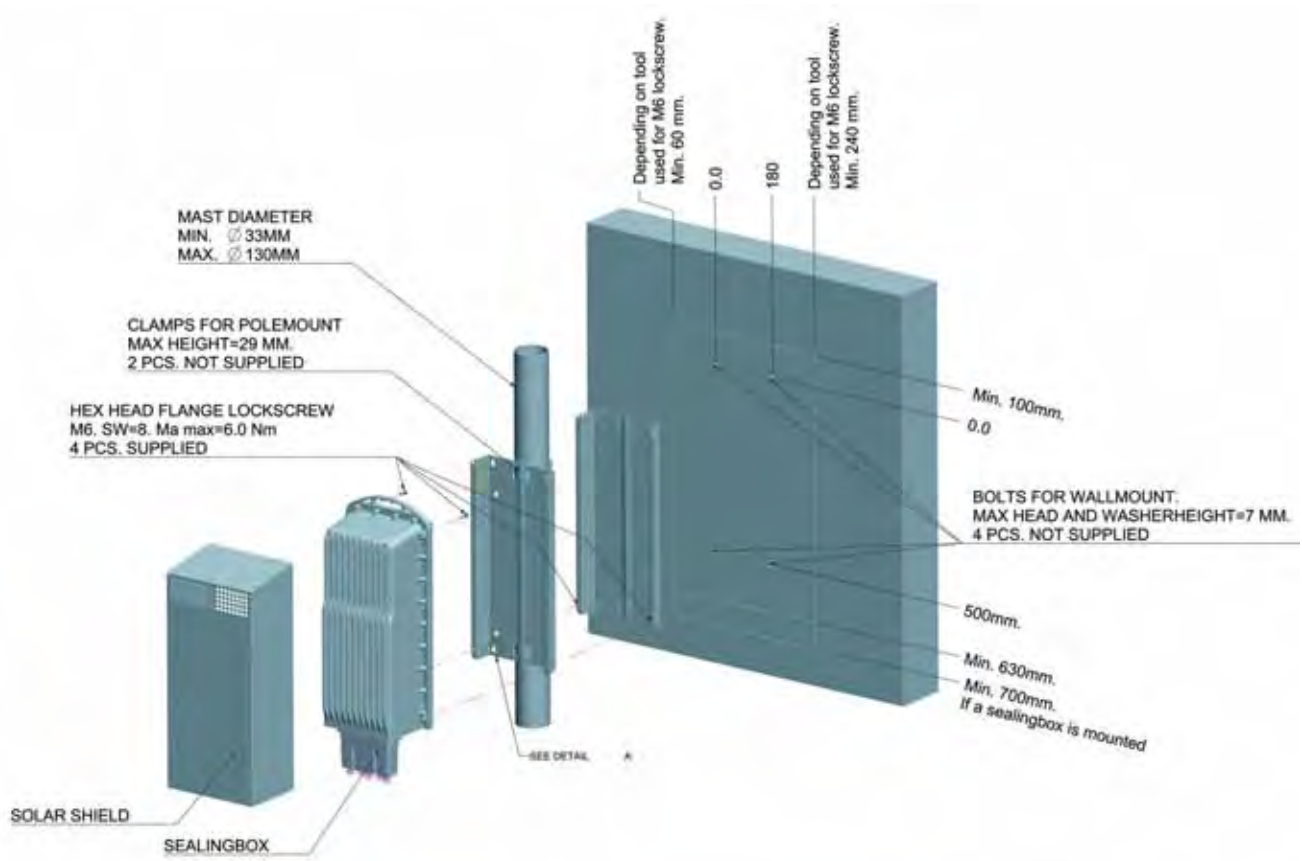
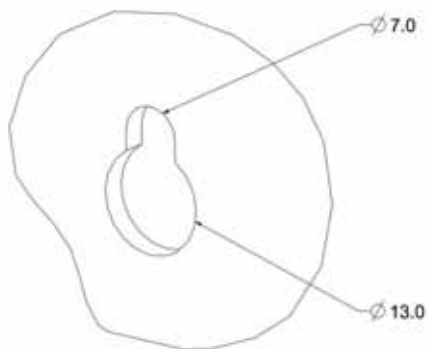



Figure 4-3 Mounting the MTS 1 - Detail A



Indoor Wall Mounting Instructions

To mount the base station onto a wall using the mounting plate, follow the procedure below.

Procedure 4-1 How to Wall Mount the MTS 1

1	Use the mounting plate as drilling template or mark the wall according to the dimensions described here: The holes should be 180 mm apart (width) and 500 mm apart (height).
	 <div style="display: inline-block; background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold; margin-left: 10px;">NOTE</div> <p>Make sure that there is enough room below the bottom-most pair of holes to be drilled. MTS 1 requires at least 105 mm of space below the bottom-most pair of holes. If a sealing box is used MTS 1 requires at least 175 mm of space below the bottom-most pair of holes. If a solar shield is used, additional space is required above the top-most holes to be drilled.</p>
2	Drill the holes in the wall using a drill.
3	Place the mounting plate on the wall and fasten it with four (4) bolts. Maximum head and washer height of the bolts is 7 mm and maximum bolt head diameter is 13.5 mm.
4	Screw in the two upper Hex head flange lock screws approx. 6 mm into MTS 1.
5	Hang MTS 1 onto the mounting plate.
6	Screw in the two Hex head flange lower lock screws.
7	Tighten all four Hex head flange lock screws. Use maximum 6 Nm.

Outdoor Mast Mounting Instructions

To mast mount the MTS 1, follow the procedure below.



The mast diameter on which the MTS 1 is to be mounted can be minimum 33 mm and maximum 130 mm.

Procedure 4-2 How to Mast Mount the MTS 1

1	Place the mounting plate on the mast and fasten it with 2 clamps (maximum height 29 mm).
2	Screw in the two upper Hex head flange lock screws approx. 6 mm into MTS 1.
3	Hang MTS 1 onto the mounting plate
4	Screw in the two Hex head flange lower lock screws.
5	If applicable, mount the Solar Shield. See " Solar Shield Installation (Optional) ".
6	Tighten all four Hex head flange lock screws. Use maximum 6 Nm.

Solar Shield Installation (Optional)

The optional solar shield is to be used in areas where extreme weather conditions exist to protect the MTS 1 from solar radiation as well as protecting the MTS 1 from extreme cold.

The following are Motorola recommendations:

- If the MTS 1 is exposed to direct sun light and the maximum temperature exceeds 40°C (any given time of the day), the solar shield is needed
- If temperature is below -10°C, the solar shield is needed

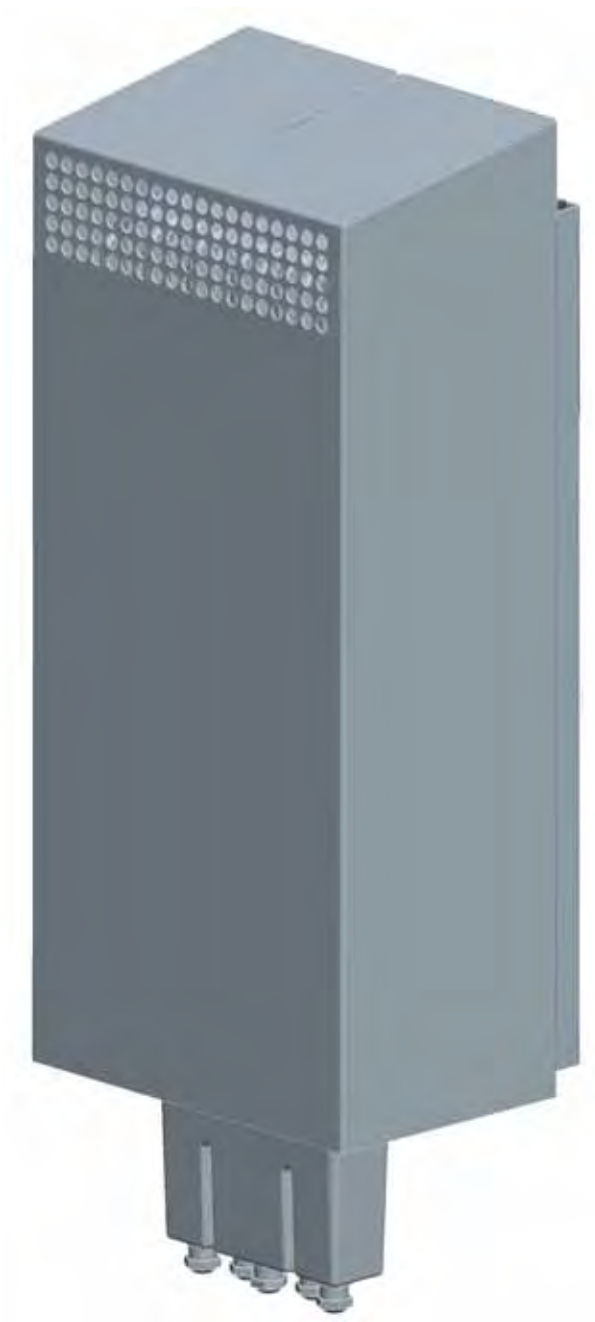
The Solar Shield is simply placed onto the MTS 1 Cover assembly by hand. No screws are needed to fit the Solar Shield onto the MTS 1.

Sealing Box Installation (Optional)


For outdoor use, the MTS 1 must have a sealing box mounted to protect the cable connections located at the bottom of the MTS 1 from moisture and dirt.

The Sealing box is not needed for indoor clean environments but it can still be used in such environment to provide increased protection for accidental disconnection if the access to the installation is less restricted.

Figure 4-4 MTS 1 with Sealing Box Installed



Procedure 4-3 How to Mount the Sealing Box

1	Slide the cable gland (p/n 32015004001) over the cable. Cables used must have a braided shield, not foil. Cable diameter must be within 5.0 mm and 8.0 mm. Shield must not be less than 3.5 mm in diameter.
	 <div style="display: inline-block; background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold; margin-left: 10px;">NOTE</div> <p style="margin-left: 40px;">For RGPS, cable gland p/n 32015005001 should be used.</p>
2	Attach the RJ45 connector to the cable.
3	Exactly 330 mm from the connector's head, remove 8 mm of insulation from the cable. Ensure that the braided shield must not be damaged.
4	Repeat Step 1 through Step 3 for all cables.
5	Mount the cable glands into the sealing box using max torque 6.25 Nm (minimum 5.0 Nm).
6	Mount the ventilation plug to the sealing box using torque 0.6 - 0.8 Nm.
7	Mount a blind plug in all unused sealing box cable openings. Use max torque 6.25 Nm (minimum 5.0 Nm).
8	Move the cables so the area where the insulation was removed (see step 3) touches the coil in the cable gland. Tighten the seal/coil. The torque depends on the cables used but should never exceed 8 Nm.
9	Fit the cables in place inside the sealing box. Do not use cable ties.
10	Connect the RJ45 connectors to the MTS 1 Cover Connectors and mount the sealing box using four screws. Hand tighten the four screws then firmly tighten to 2.7 Nm.

Ground Box Installation (Optional)

**NOTE**

- This manual only describes the two Ground Box types provided by Motorola.
- For more information regarding the Motorola provided Ground Boxes, see "[Ground Box](#)" on [page A-3](#).


There are two types of Ground Boxes provided by Motorola:

- Standard Ground Box (GMHN4652A)
- Wall Mounted Ground Box (GMHN4651A)

**NOTE**

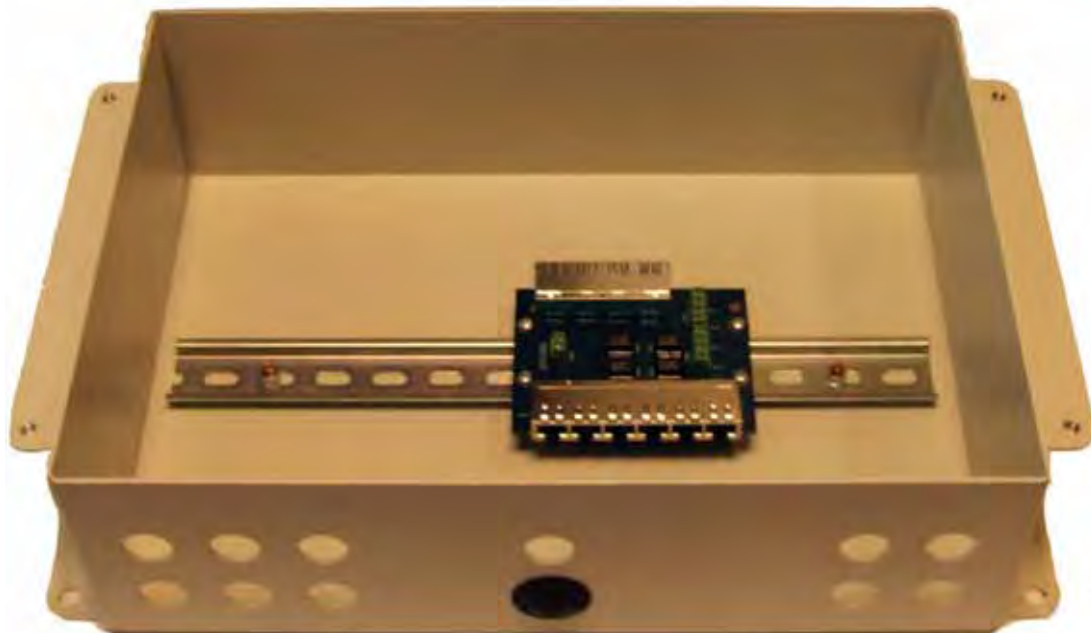
The Junction Panel which may be installed in the Ground Boxes must be ordered separately (Motorola P/N: GMLN5087A)


Figure 4-5 Standard Ground Box with Junction Panel**Procedure 4-4** How to Install the Standard Ground Box (GMHN4652A)

1	Drill two (2) holes on the mounting plate at the desired position.
2	Using the two screws provided with the Ground Box kit, mount the DIN rail to the mounting plate and mount it in the box.
3	Click the Ground Box Junction Panel into place on the DIN rail.
4	Mount the AC Power Switch onto the DIN rail.
	NOTE
	Due to different local restrictions and regulations the AC Power Switch is not included in the Ground Box kit and must be locally procured.
5	If required, mount the optional surge arrestor and ground it properly.
6	If required mount the optional door alarm kit (WALN5075A). <ol style="list-style-type: none"> 1. Mount the actuator on the bracket supplied with the Ground Box kit. Mount it on the upper right corner of the door. 2. Mount the sensor inside the box and position it to be approx. 1 mm from the actuator (when the door is closed). 3. Connect the sensor to the desired alarm input, e.g. AL1 on the Junction Panel.
7	Drill holes for the cables in the separate bottom plate of the Ground Box.

Procedure 4-4 How to Install the Standard Ground Box (GMHN4652A) (Continued)

8	Mount the cable glands onto the cables (up to 12). When done, mount the bottom plate to the Ground Box.
9	Connect the cables from the MTS 1 to the Junction Panel and the AC Power switch through the holes on the Ground Box enclosure.
10	Tighten the cable glands firmly.
11	Close the Ground Box door and lock it with the key provided with the Ground Box kit.

Figure 4-6 Wall Mounted Ground Box with Junction Panel**Procedure 4-5** How to Install the Wall Mounted Ground Box (GMHN4651A)

1	Click the Ground Box Junction Panel into place on the pre-mounted DIN rail.
2	Mount the AC Power Switch onto the DIN rail.
	 <div style="background-color: #00AEEF; color: white; padding: 2px 5px; display: inline-block; margin-left: 10px;">NOTE</div> <p style="margin-left: 40px;">Due to different local restrictions and regulations the AC Power Switch is not included in the Ground Box kit and must be locally procured.</p>
3	If required, mount the optional surge arrestor and ground it properly.
4	Mount the cable glands onto the cables (up to 12). Mount Blind Plugs on the unused holes.
5	Connect the cables from the MTS 1 to the Junction Panel and the AC Power switch through the holes on the Ground Box enclosure.
6	Tighten the cable glands firmly.
7	Close the Ground Box enclosure and fasten the screws provided with the Ground Box kit.

Electrical Connections

After the station equipment has been mechanically installed, electrical connections must be made. This involves making the following connections to:

- Grounding Cables
- Power Supply Cables
- Antenna Cables
- GPS Cables
 - Remote GPS Receiver Cable
 - Internal GPS Cable
- Site Link Cables



NOTE

Proper surge protection should be installed on Ethernet site links, all antennas and power inputs to prevent potential damage to the MTS. For more information, please refer to "[Surge Arrestors for Site Link](#)" in [Appendix A](#).

For full instructions and guidelines, please refer always to Motorola Standards and Guidelines for Communications Sites, R56.

Grounding Connection

Various cabling from the Base Station to external equipment is made through the MTS 1 cover connectors, located at the bottom of the MTS 1.



NOTE

Depending on system configuration, not all connector locations on the MTS 1 are populated.

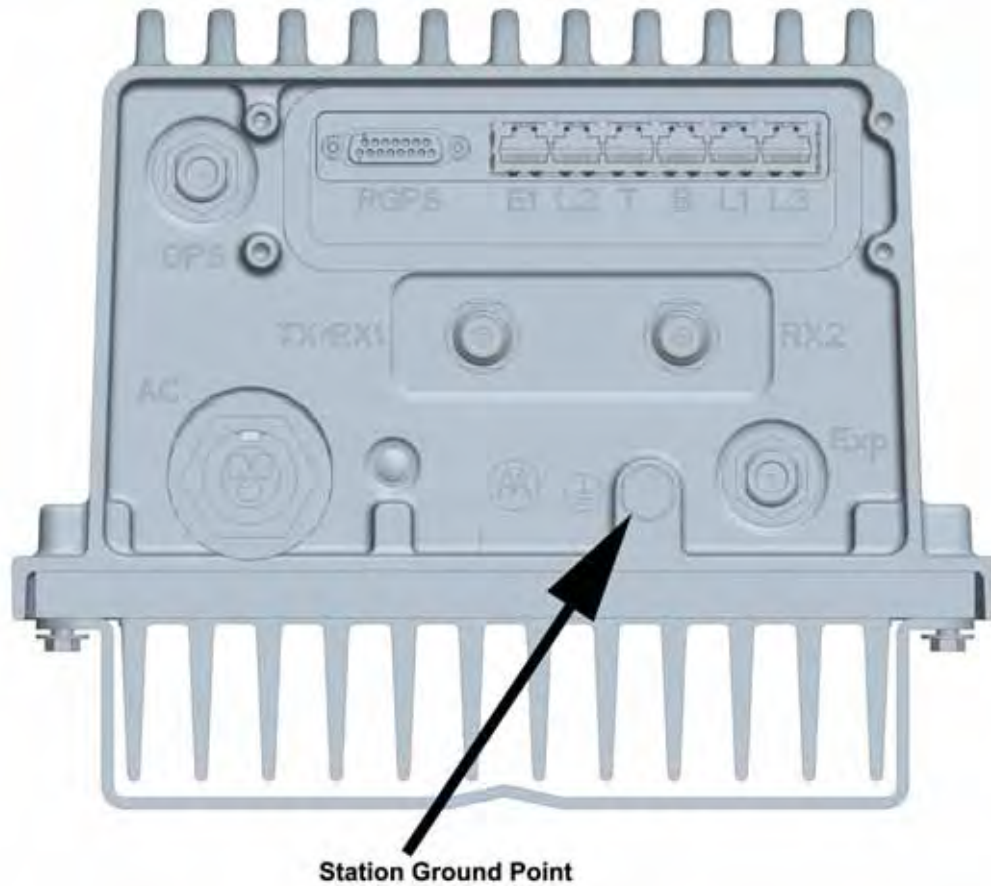
Base Station grounding wires may have been installed prior to the MST1 installation. If so, follow the instructions below.

If grounding wires have not yet been installed, refer to "[Grounding Requirements](#)" in [Chapter 3, "Site Preparation"](#).

Single-point ground method (where each MTS 1 is grounded to master ground using its own ground wire) shall be used. The MTS 1 shall use green (or green-yellow) insulated wire with a minimum size of 10 mm² CSA (#2 AWG) for ground wire.

The MTS is connected to the site ground through the M8 station ground point located on the MTS 1 cover connectors, see [Figure 4-7](#).

Figure 4-7 Station Ground Point on the MTS 1



If the specified wire size is not available, use the next-larger available wire size. During the installation of MTS 1 ground wires, ensure to check any factory-installed internal ground connections for tightness.

Procedure 4-6 How to Provide Grounding Connection to the MTS 1 Base Station

1	Strip the end of the wire to be connected to the station ground point in the MTS 1 cover connectors.
2	Using an appropriate tool, attach a crimp lug onto the Base Station ground wire. Ensure that the lug is securely fastened to wire.
3	Use a star type and a regular lock washer, which should be placed between the screw and the lug. The regular lock washer must be placed above the lug. The lug must have direct contact to the surface of the Base Station (no washer of any kind between the lug and the surface to which it contacts).
4	Using the M8 bolt and two star washers provided, secure the Base Station ground wire to the M8 nut located on the MTS 1 cover connectors.
5	Ground connections should be checked after installation. Please refer to " Recommended Torque " on page 4-37 for information about the torque.

Ground Connections Check

Perform the following procedure to ensure adequacy of cabinet-to-facility ground (earth) connections.

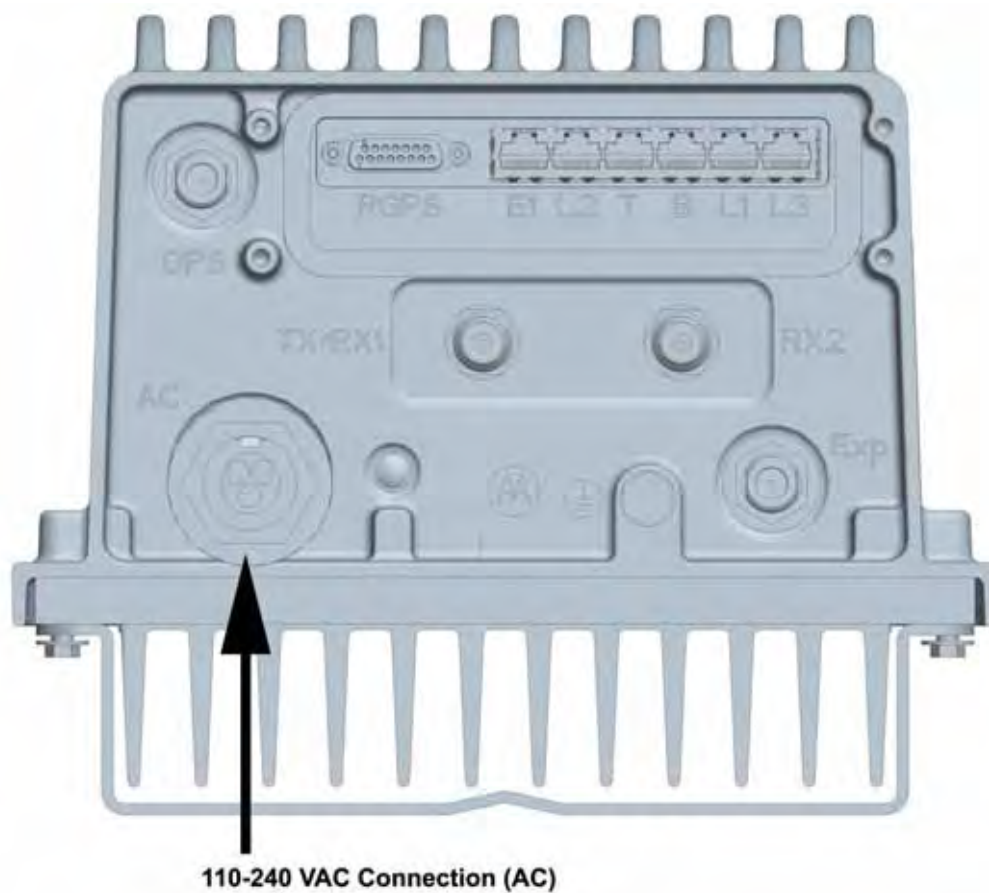
Procedure 4-7 How to Ensure Adequacy of Cabinet - to - Facility Ground Connections

1	Install the earth cable between the building earth and the earth point on the MTS 1.
2	With a Milliohm meter, check that the earth connection between the MTS 1 and the building earth in the room is $< 0.1 \Omega$.

110 VAC - 240 VAC Input Power Supply Connections

The power supply connection for the MTS 1 located on the cover connectors is an AC In - within 110 VAC to 240 VAC (nominal values).

Figure 4-8 110-240 VAC Connection on the MTS 1 Cover Connectors






WARNING

Make sure all power to the Power Supply Unit is switched off to prevent accidental contact with high energy and injury to personnel.

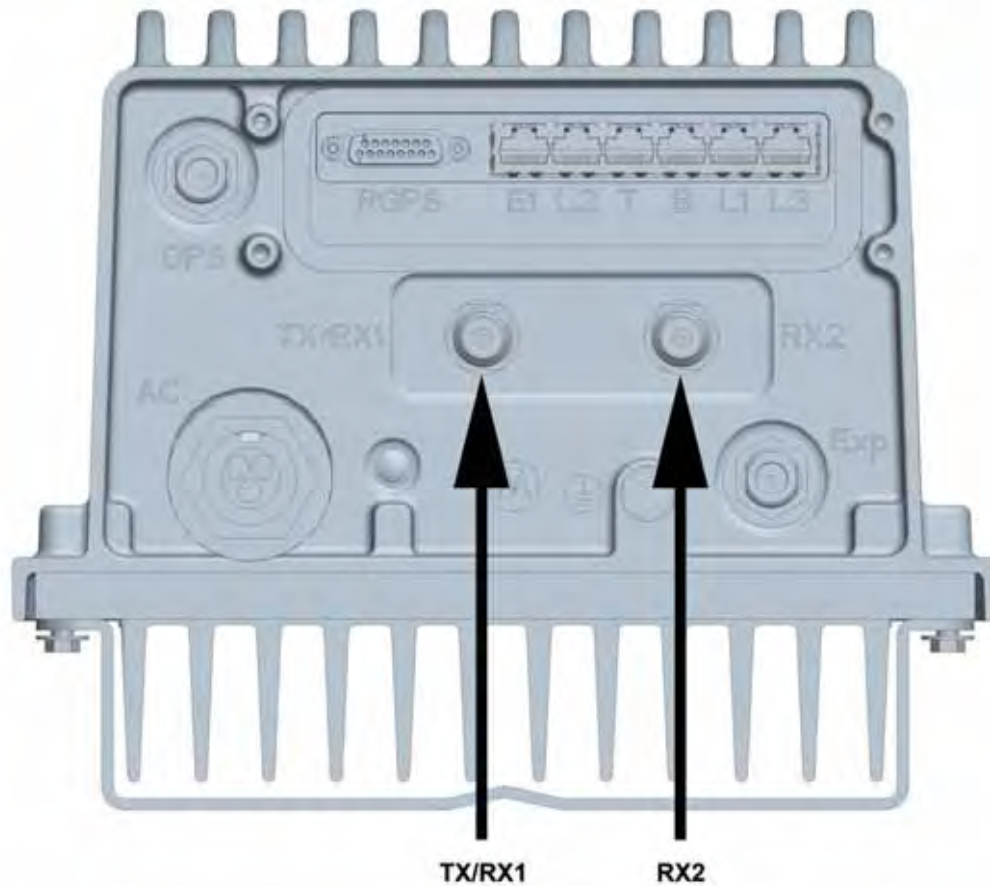
Procedure 4-8 How to Connect 110 - 240 VAC Power Source to MTS 1

1	Connect the AC cable to the AC socket (Motorola P/N 09015008001 for 10-14 mm cable and Motorola P/N 09015008002 for 6-10 mm cable), which is provided with the MTS. The cores in the cable used should be 1.5 mm ² .
2	<p>Insert the AC socket into the AC input connector on the MTS 1.</p> <p>Figure 4-9 MTS 1 AC Connected</p> 
3	Connect the other end of the AC cable to the AC outlet (for example in the Ground Box, see " Ground Box Installation (Optional) " on page 4-11).

RF Antenna Connections

In the MTS 1, the RF antenna connectors are placed at the bottom of the MTS 1, see [Figure 4-10](#).

Figure 4-10 RF Antenna Connections on MTS 1 Bottom



NOTE

Proper surge protection should be installed on RF inputs to prevent potential damage to the MTS. Please refer to "[Surge Arrestors for Site Link](#)" in [Appendix A](#), "[Accessories and Spare Parts](#)" for more information.

The antenna connectors are DIN 7-16. The center connector is usually silver coated, the outer body is usually aluminum or silver. It is recommended that mating antenna feed connectors match metal plating correspondingly.

The screens of the antenna cables have to be grounded near to the MTS in accordance with the R56 guidelines and national standards.

GPS Connections

The MTS 1 Site Controller has an integrated GPS module and an option for a remote GPS module. The selection is done by configuring MTS 1 using the BTS Service Software (TESS).

The main purpose of the GPS module is to allow accurate absolute timing of less than $\frac{1}{2}$ of a symbol between adjacent base stations and to supply UTC (Universal Time Coordinate). Dimetra does not need the functionality of measuring the cable delay at start-up. The Site Controller calculates the delay, no manual calculation, or configuration is required, and supports connection to a remote GPS receiver that is 600 m away or less. The cable delay if any will be configured by BTS Service Software (TESS). Default will be 0 ns.

The antenna/receiver must have a sufficiently clear view of the sky (10° above the horizon in all directions without any obstructions) to be able to locate and track at least four satellites during initial power-up. The four satellites (approx. 20183 km above earth) are used to establish a three dimensional fix (latitude, longitude, and altitude) for the site. This process can take up to 30 minutes, but typically is completed in less than 5 minutes.

Once the position of the site has been established, the corresponding data is stored in memory and normal operation resumes.

Site Reference Operation Modes

The ETSI standard allows two modes of operation of adjacent cells: Synchronized and Non-Synchronized relative to the serving cell. The MTS uses GPS to synchronize to the same time reference. For an adjacent cell to be indicated to be synchronized requires that both the serving MTS and the adjacent cell are synchronized to GPS.

MTS can be configured through the BTS Service Software for two different operating configurations, which control the synchronization mode:

- "Automatic Synchronized Configuration (ASC)"
- "Forced Non-Synchronized Configuration (FNC)"
- "NSC mode"
- "Non-GPS / Non-Synchronized mode"

Automatic Synchronized Configuration (ASC)

This configuration is used to specify that the MTS should operate in synchronized mode relative to GPS; however if the GPS reference is lost, the MTS continues to operate in synchronized mode for a configurable period (free run time - no upper limit). It should be noted that setting this value greater than the recommended values above may mean the BTS is unable to maintain synchronisation and can result in call failures and erratic network performance. If the GPS reference is not recovered in this time period, the MTS switches to the non-synchronized mode. If an MTS is started when no GPS reference is available, it operates in the non-synchronized mode.

Non-synchronized mode will not have optimized hand over performance. When operating in non-synchronized mode, all the adjacent cells will be indicated as non-synchronized with the MTS. By default the re-synchronization of MTS running non-synchronized is done automatically whenever there is valid GPS reference signal and the site does not handle traffic. Prolonged operation in non-synchronized mode will eventually lead to critical alarms and the frequency accuracy of the MTS will no longer be guaranteed.

To maintain the frequency accuracy, it is necessary that the oscillator within the MTS is periodically recalibrated. The periodic recalibration happens automatically when a GPS reference is present. The critical alarms indicate that recalibration is due and should be performed without delay.

Forced Non-Synchronized Configuration (FNC)

FNC is not recommended for System Release D6.0. In this configuration, the MTS will always operate non-synchronized to GPS. The failure or lack of GPS will not be reported as an alarm. The sets of events that are reported in ASC and FNC modes are the same, however the events reported in ASC mode with Minor severity, in FNC mode are reported with lower - Normal severity.

The MTS starts up in non-synchronized mode regardless of the presence of a GPS signal. However if GPS is present, the site reference is trained accordingly. Prolonged operation in this configuration without GPS eventually leads to critical alarms and the frequency accuracy of the MTS is no longer guaranteed. Frequency accuracy is expected to be maintained for 4 to 8 years.

To maintain the frequency accuracy, it is necessary that the oscillator within the MTS is periodically recalibrated (every 8th year). The periodic recalibration happens automatically when a GPS reference is present. If no GPS reference is present, it is necessary to ship the Site Controller for calibration at a repair center. The critical alarms indicate that recalibration is due and should be performed without delay.

It is possible to change configuration with BTS Service Software. The new configuration will only be active after an MTS reset.

NSC mode

This mode can be configured (for example, through TESS) for compatibility reasons but will be treated as ASC.

Non-GPS / Non-Synchronized mode

The Non-GPS / Non-Synchronized mode introduced in System Release D6.1 guarantees frequency accuracy of the site reference and the introduction of a Network Time Server (NTS) using Network Time Protocol (NTM) allows the MTS to operate in non-synchronized mode without being characterized as a malfunction and with accurate frequency and Network time.

When the BTS is GPS non-synchronized and without GPS and if a NTS is available the NTP time shall be used to maintain and adjust frequency stability, network time for UTD and timestamps for BTS log.

If GPS is not available and NTS are configured with IP address(es) the time derived from NTP shall be used for UTD and time stamping of BTS logs.

Only if the selected NTS are of sufficient accuracy and the BTS is configured for "Allow NTS frequency locking" shall the NTS be used for frequency locking of the OCXO. The usability of the NTS shall be based on NTS alarm condition, Stratum, Precision, root distance, reference ID and reference time.

If GPS is not available and NTS is configured and allowed for locking and the BTS cannot establish the connection to the NTS or the NTS is not usable for a period of more than a NTS_Free_Run_Timer the operator shall be informed the NTS is failing.

Tracking Criteria

To allow a system to successfully initialize for the first time at a new location, the Position Dilution Of Position (PDOP) must be less than 2.0. A low PDOP value indicates a low error (higher accuracy) in the position calculated by the GPS receiver.

PDOP is an accuracy factor, which is a function of the relative positions of the satellites. If the satellites being tracked by the GPS receiver are within close relative proximity to each other, the resulting PDOP will be poor. Conversely, if the satellites are relatively far from each other, PDOP will be improved. Because any error in position results in a timing error in the BR transmission, the BR is not allowed to key until the position error is acceptably low. Therefore, a site with a large PDOP value may incur a delay when the site is first initialized.

Excessive PDOP values may be the result of the GPS receiver not having an adequate —view|| of the sky to initially determine its position. Motorola recommends locating the antenna(s) such that there are no PDOP values that exceed 10.0 for periods of more than 15 minutes. To maintain a maximum reliability, four satellites should be tracked at all times.

The system must be capable of the following:

- Tracking a minimum of four satellites during initial start-up
- Sustaining PDOP less than 10
- Working in 3D fix mode for the most of the time

GPS Start Up

The times given below are from applying power to the system until GPS is fully operational. GPS startup is the significant contributing factor in determining system start up times.

Initial Start

This is the first time an MTS is powered on or after the almanac or position information has been erased from non volatile memory (NVM). The site needs to locate 4 satellites and then train the reference oscillator from an unknown state.

Warm Start

The MTS has been previously powered up and the non volatile memory contains valid almanac and position information and the reference oscillator was trained prior to starting the site. The times quoted are for a power-off restart. A software restart will be slightly faster.

Soft Restart

This is an MTS restart, where power is maintained during the reset, for example, the remote MTS restart after software upgrade. The GPS receiver will continue to track satellites during the MTS restart, thus eliminating the ‘_search for satellites’ phase of start-up.

Table 4-1 GPS Start-up Time

Initial Start		Normal Start		Soft Restart	
Typical	Maximum	Typical	Maximum	Typical	Maximum
10 min.	30 min.	4 min.	10 min.	90 sec.	8 min.

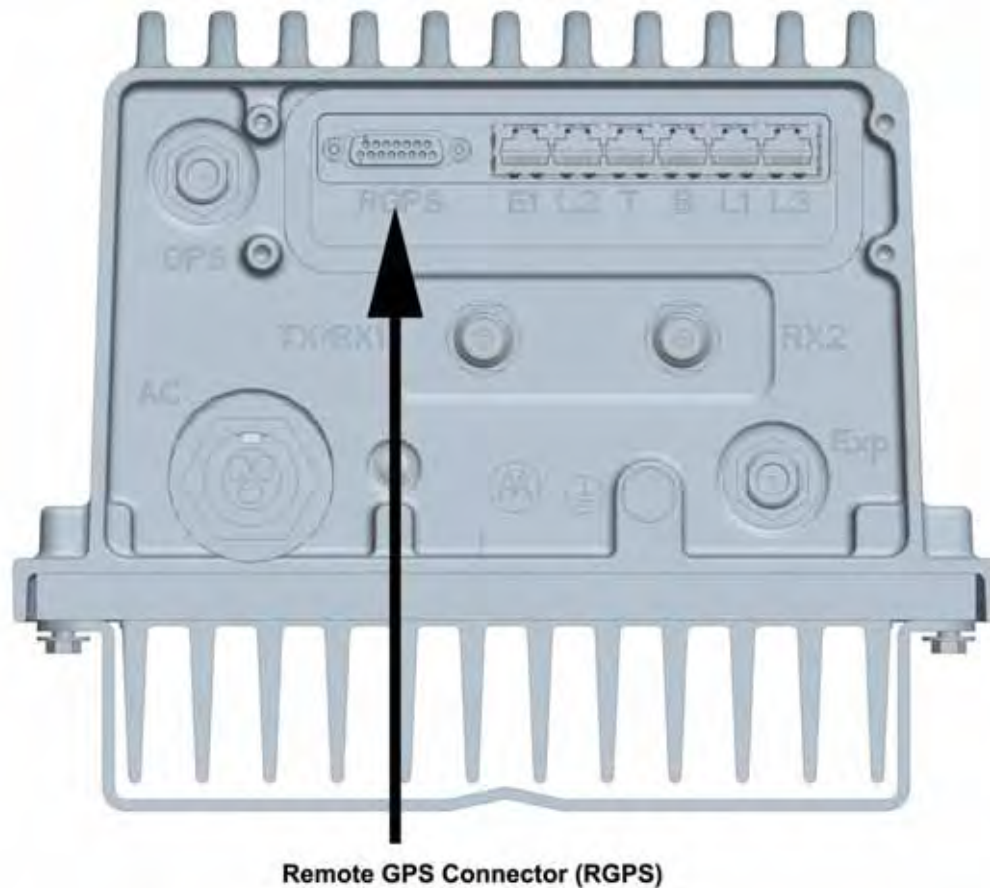


NOTE

If these start-up times are exceeded, then follow the procedures for GPS Site Controller fault indications section.

Remote GPS Antenna/Receiver Connection

The remote GPS receiver connectors of DB15 type are placed at the bottom of the MTS 1, see [Figure 4-11](#).

Figure 4-11 Remote GPS Receiver Connection

Remote GPS Receiver Requirements

The antenna must be mounted high enough to clear the peak of the MTS site roof. For systems in the northern hemisphere, the remote GPS receiver should be mounted so that a clear view of the southern sky is maintained. For systems in the southern hemisphere, the remote GPS receiver should be mounted so that a clear view of the northern sky is maintained. The recommendation is to have view to the entire sky if possible (10° above the horizon in all directions without any obstructions).

Isolate the remote GPS receiver from RF interference by mounting the antenna at least 3.7 m (12 in.) horizontally from other transmitting antennas. For mounting and physical installation, see instructions enclosed with the external GPS receiver head.

Remote GPS Receiver Cabling

The remote GPS (RGPS) receiver is connected to the bottom of the MTS 1 using one of the three standardized cables or a customer provided alternative. Standardized cables are terminated with a Deutsch connector (remote GPS receiver site) and a metal shell 15-pin SubD connector (MTS site). The cable is supplied with an additional SubD connector insert to allow the cable to be shortened and re-terminated where required.



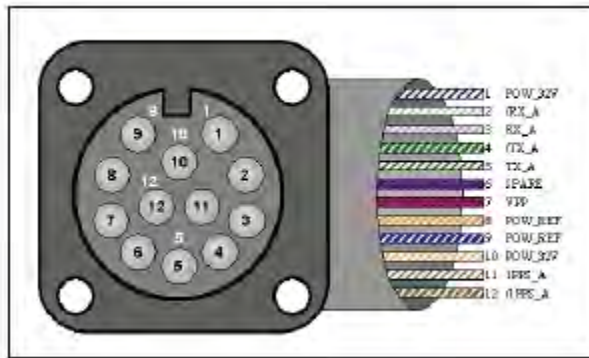
NOTE

The RGPS receiver cable has to be a shielded cable. The screen has to be grounded through the metal shell of the D type connector. However, it is required for the cable screen to be connected also to the site ground where the cable enters the building. This is similar to the grounding that is applied to the RF cables. Please refer to R56 Guidelines and National Standards.

Table 4-2 RGPS Cables

Pos.	Length	Kit Number
1	40 m	3066564B01
2	150 m	3066564B02
3	600 m	3066564B03

Figure 4-12 Connector Pin-outs and Color code of Deutsch Connector



NOTE

A modular data surge protector (Part Number: GMDN0889A) should be used for remote GPS cable, see [Figure 4-13](#). The surge arrester must be installed on a grounding plate, or a ground connection stud added to the side of the box.

Figure 4-13 RGPS Modular Data Surge Protector

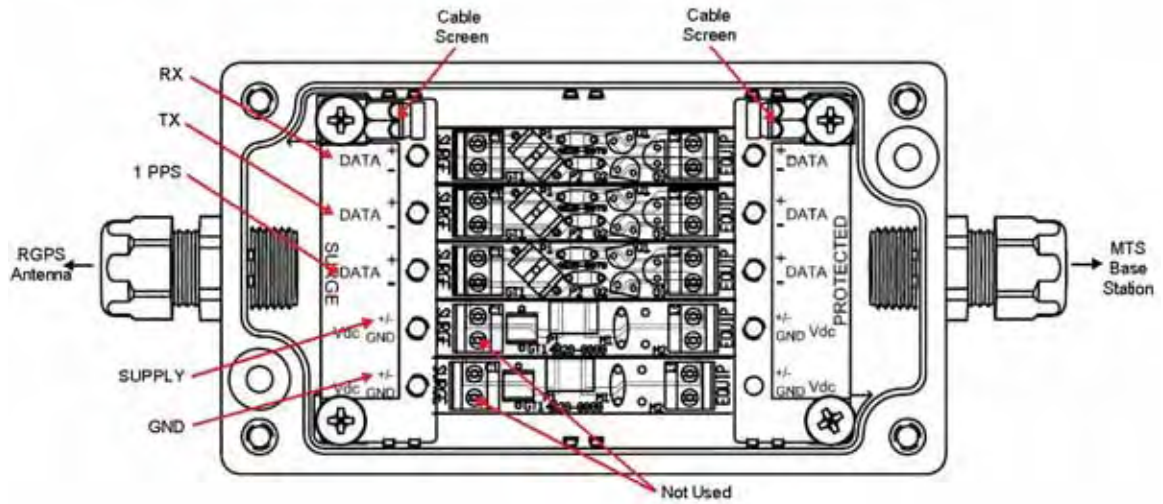


Figure 4-14 RGPS Connector Pinout

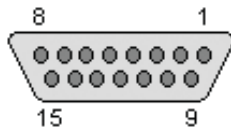


Table 4-3 RGPS Connector

MTS Site (15-pin SubD connector)		GPS Site (12-pin Deutsch connector)			
Pin No.	Description	Description	Surge Protection	Color	Pin No.
11	Supply	TWISTED PAIR	GMDN0889A	White/Blue stripe	1
3	GND		GMDN0889A	Blue/White stripe	9
4	Rx (RXD_N)	TWISTED PAIR	GMDN0889A	Green/White stripe	4
12	Rx (RXD_P)		GMDN0889A	White/Green stripe	5
5	Tx (TXD_N)	TWISTED PAIR	GMDN0889A	White/Grey stripe	2
13	Tx (TXD_P)		GMDN0889A	Grey/White stripe	3
2	GND		GMDN0889A	Orange/White stripe	8
10	Supply	TWISTED PAIR	GMDN0889A	White/Orange stripe	10
14	1 pps (PPS_P)	TWISTED PAIR	GMDN0889A	White/Brown stripe	11
6	1 pps (PPS_N)		GMDN0889A	Brown/White stripe	12

Table 4-3 RGPS Connector (Continued)

MTS Site (15-pin SubD connector)		GPS Site (12-pin Deutsch connector)			
Pin No.	Description	Description	Surge Protection	Color	Pin No.
NC	N/A	TWISTED	GMDN0889A	Blue/Red stripe	6
NC	N/A	PAIR	GMDN0889A	Red/Blue stripe	7
1, 7, 8, 9, 15	Not Connected				

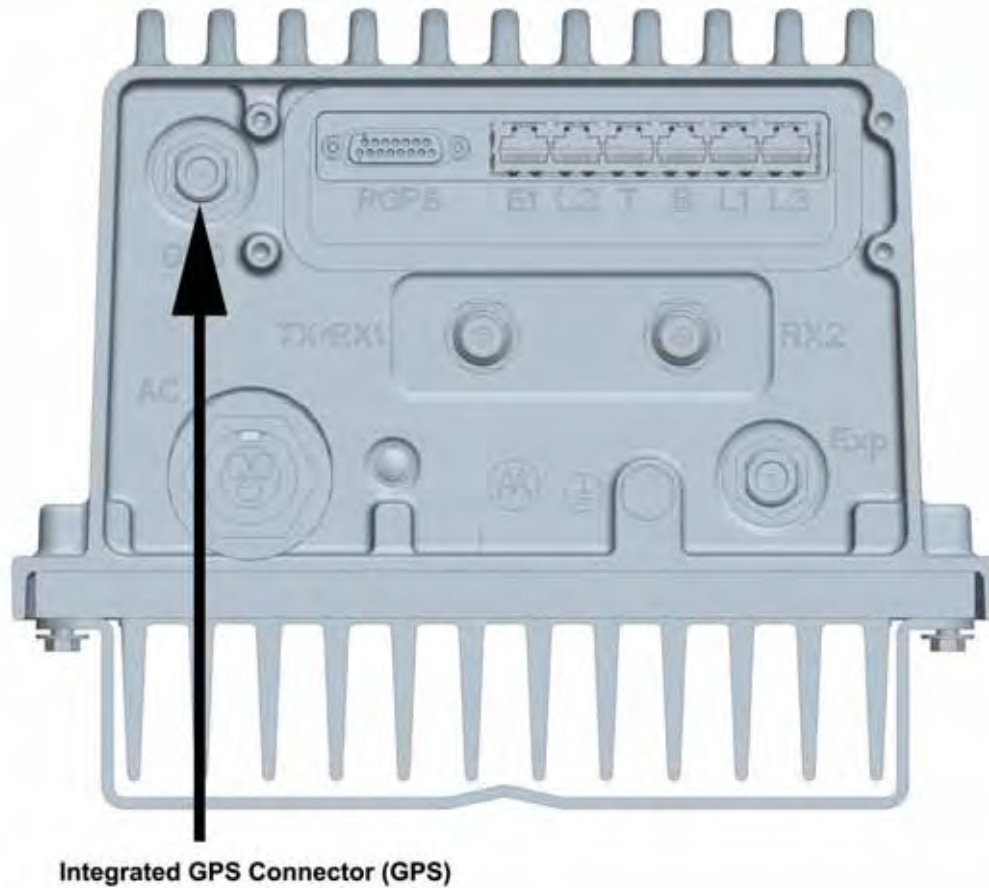


NOTE

The duplicated Supply and GND connections should be joined together at the surge protector.

Integrated GPS Antenna Connection

The integrated GPS antenna connector of N type, are placed at the bottom of the MTS 1, see [Figure 4-15](#).

Figure 4-15 GPS Antenna Connection**NOTE**

GPS Antenna must be protected by a grounded surge arrester of the type that allows DC to pass through. Please refer to "[Surge Arrestors for Site Link](#)" in [Appendix A](#), "[Accessories and Spare Parts](#)" for more information.

GPS Antenna Line Loss

The maximum allowable line attenuation between the antenna and the Site Controller GPS Receiver input is 6 dB. There is an additional 4 dB of attenuation for foliage. In a typical MTS installation using 1/2 inch low density foam coaxial cable (or equivalent), the length of the cable run should never exceed 46 m. This is sufficient for most installations.

When considering the use of longer cables, calculate the cable lengths allowing 4.5 dB of loss at 1.5 GHz (the GPS receiver frequency). The remaining 1.5 dB of attenuation is provided by interior site cabling and connectors.

Avoiding GPS Interference

High frequency radio waves, such as those broadcast by the GPS system behave like light (straight lines) therefore it is likely that any long term interference will be ground based. Two strategies have been successfully employed to mitigate against jamming signals:

- If possible, determine a location where adequate GPS signals are available using a hand held receiver and move the Base station GPS antenna to this location.
- Construct a shield (Cardboard & Foil is adequate) to exclude the jamming signal. The shield should be approximately 6 cm from the antenna body and should be connected to an earth point.

Dual MTS 1 Connections

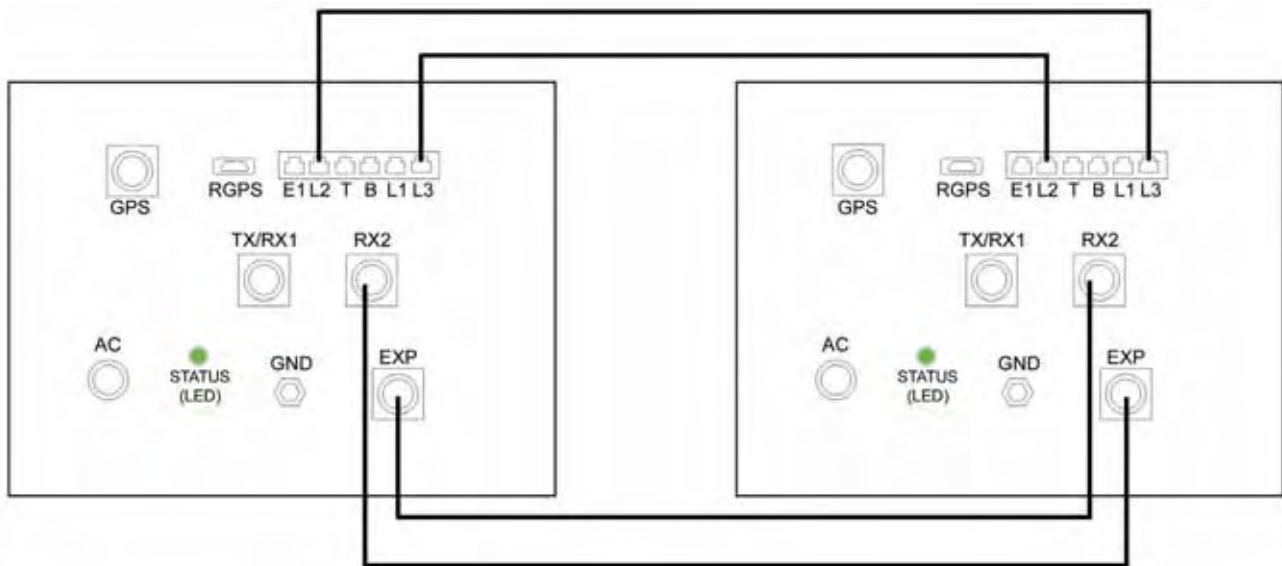
Dual MTS 1 Interconnection

The MTS 1 offers dual MTS 1 configuration as depicted in the Figure below. The L2 connector of MTS 1A connects to the L3 connector of MTS 1B, and the L3 connector of MTS 1A connects to the L2 connector of MTS 1B.

The EXP connector of each MTS 1 connects to RX2 on the other MTS 1.

Connections to the Ground Box are described in [Chapter 5, "MTS 1 to Ground Box Cabling"](#).

Figure 4-20 Dual MTS 1 Interconnection



Dual MTS 1 GPS Connections

In a dual MTS 1 configuration at least one of the MTS 1 must be connected to either an RF GPS antenna or a remote GPS receiver. In order to benefit from GPS synchronization resilience, both MTS 1s should be connected to a GPS antenna.

Final Check-out

The final check-out procedure consists of:

- "Final Check-out Setup"
- "MTS 1 Power-up"

Final Check-out Setup

After the completion of the MTS installation, perform Procedure below. This final check-out procedure ensures the proper operation of the MTS.

Procedure 4-9 How to Perform the Base Station Final Check-out Setup

1	Make sure the MTS 1 is switched OFF.
2	Verify that the connections on MTS 1 Bottom and on the Ground Box junction panel are secure and make good contact. Make any necessary adjustments.

MTS 1 Power-up



CAUTION

MTS 1 power-up procedure is arranged to prevent MTS damage in the case of an equipment or installation defect. Make certain the power switch in the Ground Box is switched OFF before proceeding. Turn switch to ON only when directed in below procedure.

Procedure 4-10 How to Power Up MTS 1

1	Check the power connections on power switch in Ground Box and on AC connector on MTS 1 bottom.
2	Set the power switch in Ground Box to ON position.
3	Watch the Status LED indicator on MTS 1 bottom to monitor the startup procedure.

Recommended Tools, Parts, and Test Equipment for Installation

The sections below list the tools, test equipment, and locally procured parts that are required for the installation procedure. The model numbers listed are recommended, but equivalent tools and equipment made by other manufacturers are acceptable.

Recommended Tools



WARNING

When selecting tools and equipment, always choose those which have insulated grips and handles. This helps prevent potential injury resulting from electrical shock. When screwing in a stainless steel screw, no force must be applied to the screw.

Table 4-6 Recommended Tools for Installation

Tool	Model/Type	Supplier	Description
Electronics Technician Tool Kit		Locally procured	Miscellaneous tools
Sack trolley		Locally procured	Ensure that fork size is compatible with MTS
Wrist strap		Locally procured	Ensure this regulatory tested
Torx30 screwdriver		Locally procured	For mounting the mounting plate
SW8, allen wrench, HEX		Locally procured	For fixing the base station to the mounting plate

Recommended Test Equipment

The table below lists the recommended test equipment for installation. These are not included as part of the MTS shipment and must be procured locally. All model numbers are Motorola part numbers, unless noted otherwise.

Table 4-7 Recommended Test Equipment for Installation

Tool	Model/Type	Supplier	Description
Digital Multimeter (only 1 required)	Fluke 77	Fluke	AC/DC measurements. Equivalent instrument is acceptable
Time Domain Reflectometer (TDR)		Locally procured	Possibly needed by Field Installation team
Ground Resistance Ohmmeter	AEMC 3700 clamp-on ground tester	Locally procured	Possibly needed by Field Installation team
Service Computer		Locally procured	Local service terminal
Service Connector Box	p/n: 0166502N05	Motorola	Used for measuring receiver sensitivity
Basic Service Cable	p/n: 3066565B01	Motorola	
TETRA Signal Generator	Rhode & Schwarz: SMU200A + SMX-K8	Rhode & Schwarz	Used for checking receive operation
TETRA Analyzer	Agilent E4443A		Used for checking transmit operation
RF Attenuator, 250 W, 40 dB	Weinschel 404043		Protection for HP89441A
RF Attenuator, 10 dB	minimum 100 W	Motorola	Protection for HP89441A
RF Adapter	33 QMA-N-50-1/133 NE	Huber & Suhner	“N” female to “QMA” male
RF Adapter	31 N-QMA-50-1/1-- NE	Huber & Suhner	“N” female to “QMA” male
RF Adapter	33_716-N-50-1/---_UE	Huber & Suhner	

Recommended Parts

The table below lists the recommended parts for installation. These are not included as part of the MTS shipment and must be procured locally. All model numbers are Motorola part numbers, unless noted otherwise.

Table 4-8 Recommended Parts for Installation

Tool	Model/Type	Supplier	Description	
Cover or blanket		Locally procured	Protection of Base Station from dust while drilling	
AC Power Cable	Core Size	Locally procured	Mains supply wiring	
				min. 1.0 mm ² max 1.5 mm ²
	Outer diameter			min. 6 mm max. 14 mm
	Current rating	min. 13A		
110-240 VAC Connector	Motorola p/n 09015008001 for outer cable diameter 10–14 mm	Wieland	AC Mains Connector. Both connectors supplied with MTS 1.	
	Motorola p/n 09015008002 for outer cable diameter 6–10 mm			

Recommended Torque

The table below lists the recommended torque for RF connectors, screws, nuts, and bolts.

Table 4-9 Recommended Torque for RF Connectors, Screws, and Nuts

Item	Torque Nm	Torque lbf in
“N” Coupling Nuts	0.68 - 1.13	6.02 - 10
“SMA” Coupling Nuts	1.0	9
Screws up to M 3.5	0.6	5.31
Nuts up to M 3.5	1.2 for class 80 steel, 0.9 for class 70 steel, and 0.4 for class 50 steel	11 for class 80 steel, 8 for class 70 steel, and 3.5 for class 50 steel
Screws from M4 (Torx 20)	2.7	24
Screws M6 (Torx 30)	4.5	40
Nuts from M4 to M6	4.5	40
M8 screw	15	130
M 10 screw	6.8	60
Glands on Sealing Box	5.0	44
Vent on Sealing Box	0.6-0.8	5.3-7.1

Screws

The screws used for mounting MTS 1 are listed in the table below.

Table 4-10 Recommended Screws for Installation

Item	Screws/Washers	Supplier	Tool
Bolts for wallmount	4 pcs, Max head and washer height = 7 mm, Max head diameter = 13.5 mm	Locally procured	
Lock screws for mounting Cover Assembly to Mounting Plate	4 pcs M6X16, captivated star washer	Supplied with MTS	Torx 30
Screws for mounting Sealing Box	2 pcs M4X10, captivated star washer	Supplied with Sealing Box	Torx 20

MTS 1 to Ground Box Cabling

This chapter covers the following topics:

- "MTS 1 Connector Overview"
- "AC Power Cabling"
- "Site Link Cabling"
- "Ethernet Site Link Cabling"

MTS 1 Connector Overview

The MTS 1 connectors are located on the bottom side of the Base Station and are directly integrated onto the MTS 1 Site Controller and the MTS 1 RF Filter Module.

Figure 5-1 MTS 1 Connectors

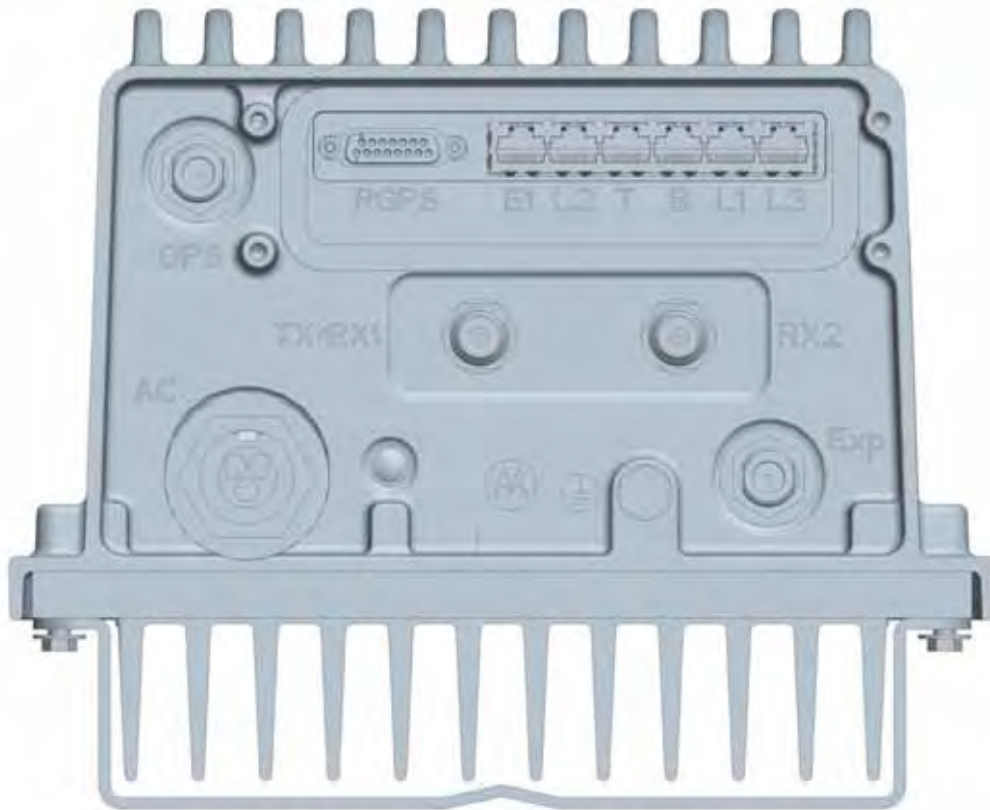


Table 5-1 MTS 1 Connectors

Connector Name	Connector Type	Comment
TX/RX1	N, female	Transmit and Receive antenna
RX2	N, female	Diversity Receive antenna
EXP	N, female	Diversity Receive expansion port for dual MTS 1 configuration
GPS	N, female	RF GPS active antenna, 5V
RGPS	15pin SubD, female	Remote GPS interface
L1	RJ45	Dual Ethernet link with two alarm signals superimposed.
L2	RJ45	Ethernet + CP3 interface. Either Not Connected, Connected to Ground Box, or to dual MTS 1.
L3	RJ45	Ethernet + CP3 interface. Either Not Connected, Connected to Ground Box, or to dual MTS 1.

Table 5-1 MTS 1 Connectors (Continued)

Connector Name	Connector Type	Comment
T	RJ45	MTS 1 Site Controller RS232 and Ethernet service interface
B	RJ45	MTS 1 Base Radio RS232 and Ethernet service interface, as well as test signals used for e.g. sensitivity measurements.
AC	Wieland RST20i3 male	AC Supply input
GND	M10 Gnd stud	M10 ground stud for proper electrical grounding
STATUS	LED	See Table 8-1, "MTS 1 LED Indicator Behavior," on page 8-3 for LED color descriptions.

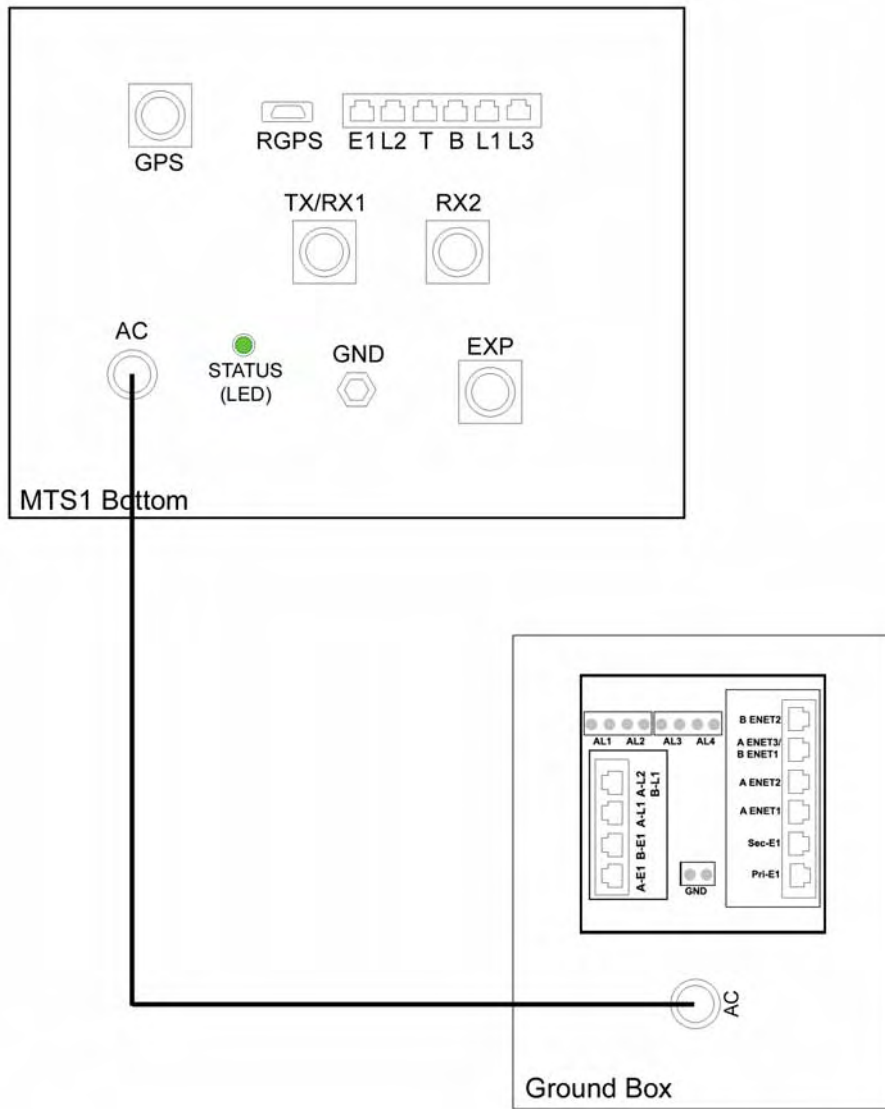
AC Power Cabling

AC power cabling refers to the connection between the Power Switch in the Ground Box and the Power Supply Unit connector on the MTS 1 bottom.

Table 5-2 AC Power Cabling MTS 1

Index	From Unit	To Unit	Notes
1	Ground Box/ AC	MTS 1/ AC In	Locally Procured cable. Min. cable core size: 1 mm ² Max. cable core size: 1.5mm ²

Figure 5-2 AC Power Cabling MTS 1



NOTE

In dual MTS 1 configurations, a second AC switch is required in the Ground Box.

Ethernet Site Link Cabling

Ethernet site link cabling refers to the cabling between L connectors on MTS 1 bottom and L connectors on the Ground Box Junction Panel. In dual MTS 1 configurations, it also refers to cabling between L2 and L3 connectors on MTS 1A bottom and L2 and L3 connectors on MTS 1B bottom.

The following Ethernet Site Link Cabling configurations exist:

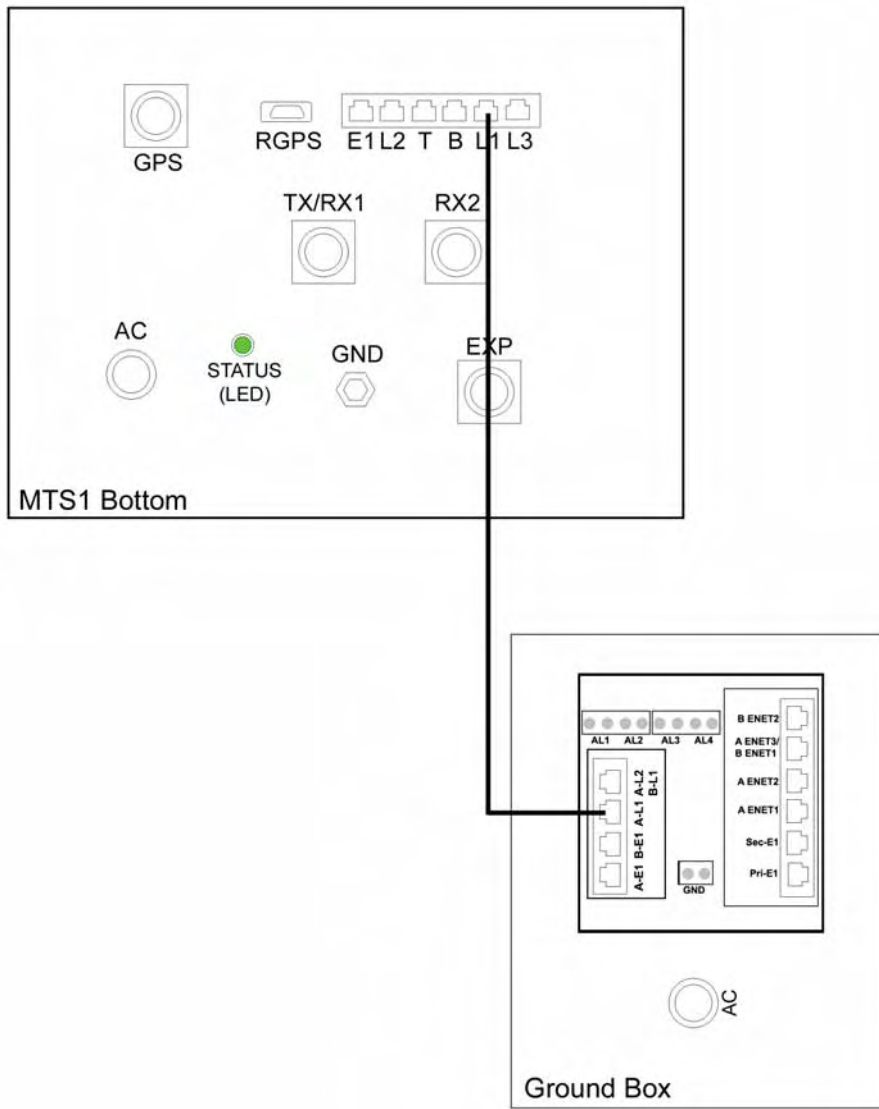
- "Single MTS 1, Single Ethernet Site Link"
- "Single MTS 1, Dual Ethernet Site Link"
- "Dual MTS 1, Single Ethernet Site Link"
- "Dual MTS 1, Dual Ethernet Site Link"

Single MTS 1, Single Ethernet Site Link

Table 5-7 Ethernet Site Link Cabling - Single MTS 1, Single Site Link

Index	From Unit	To Unit	Notes
1	Ground Box/ A-L1	MTS 1/ L1	Standard Ethernet cable. Locally Procured.

Figure 5-6 Ethernet Site Link Cabling - Single MTS 1, Single Site Link

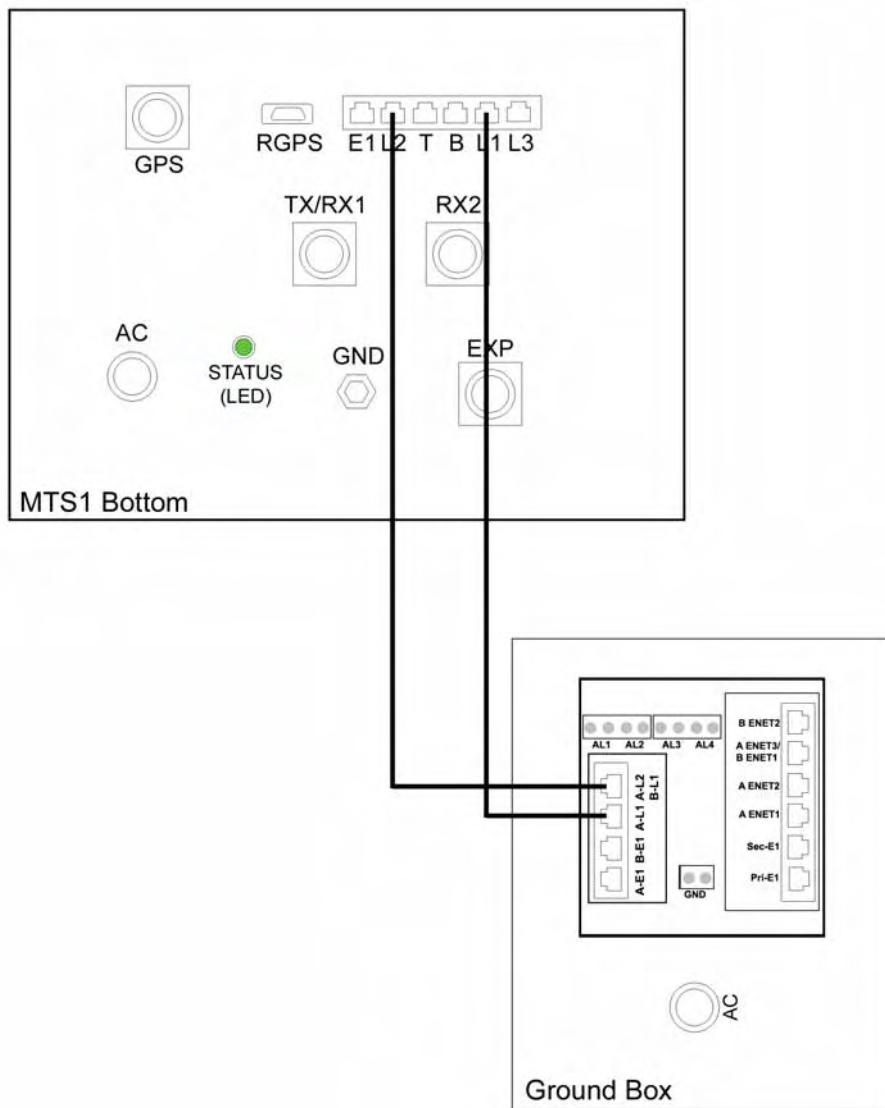


Single MTS 1, Dual Ethernet Site Link

Table 5-8 Ethernet Site Link Cabling - Single MTS 1, Dual Site Link

Index	From Unit	To Unit	Notes
1	Ground Box/ A-L1	MTS 1/ L1	Standard Ethernet cable. Locally Procured.
2	Ground Box/ A-L2/ B-L1	MTS 1/ L2	Standard Ethernet cable. Locally Procured.

Figure 5-7 Ethernet Site Link Cabling - Single MTS 1, Dual Site Link

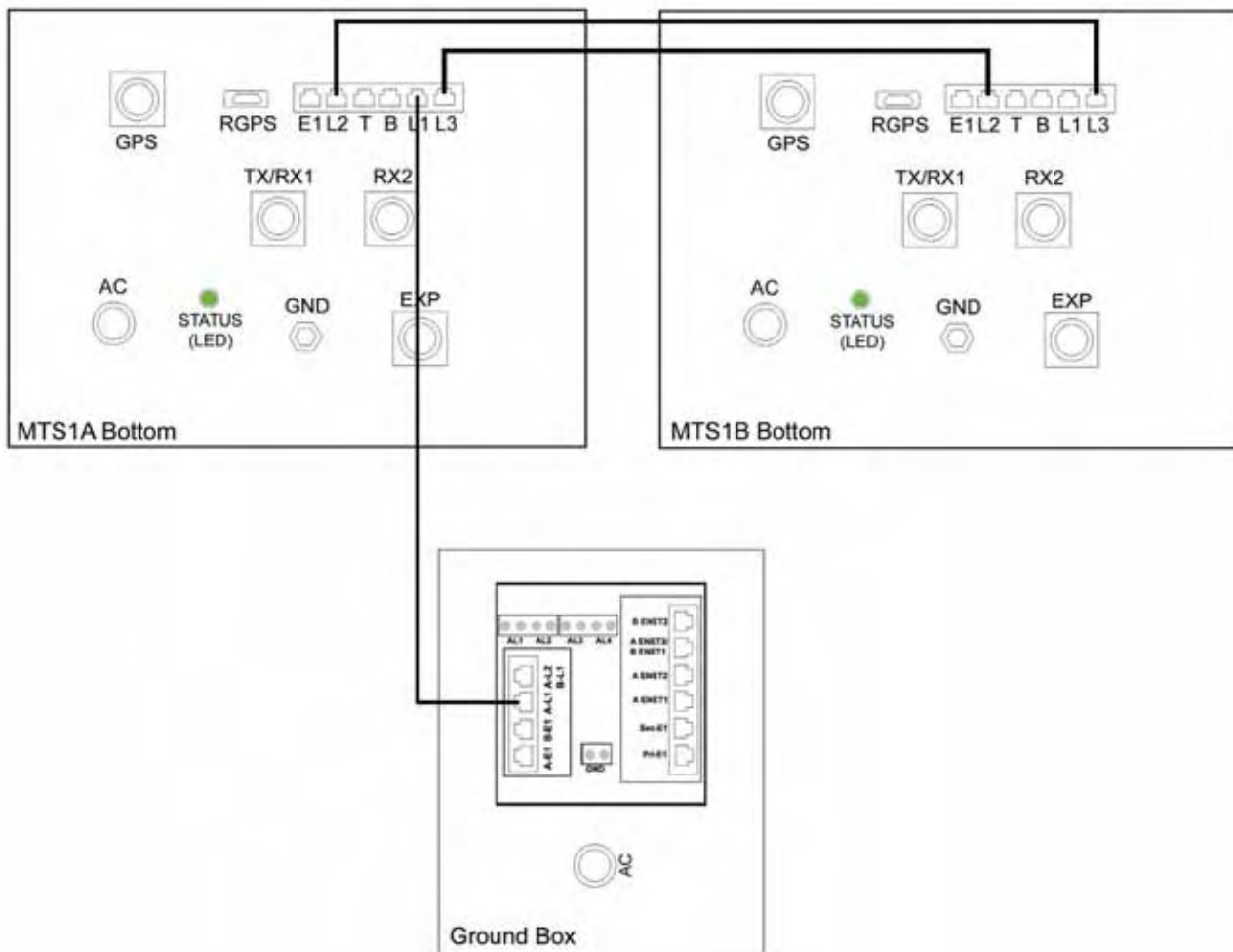


Dual MTS 1, Single Ethernet Site Link

Table 5-9 Ethernet Site Link Cabling - Dual MTS 1, Single Site Link

Index	From Unit	To Unit	Notes
1	MTS 1A/ L2	MTS 1B/ L3	Standard Ethernet cable. Locally Procured.
2	MTS 1A/ L3	MTS 1B/ L2	Standard Ethernet cable. Locally Procured.
3	Ground Box/ A-L1	MTS 1A/ L1	Standard Ethernet cable. Locally Procured.

Figure 5-8 Ethernet Site Link Cabling - Dual MTS 1, Single Site Link

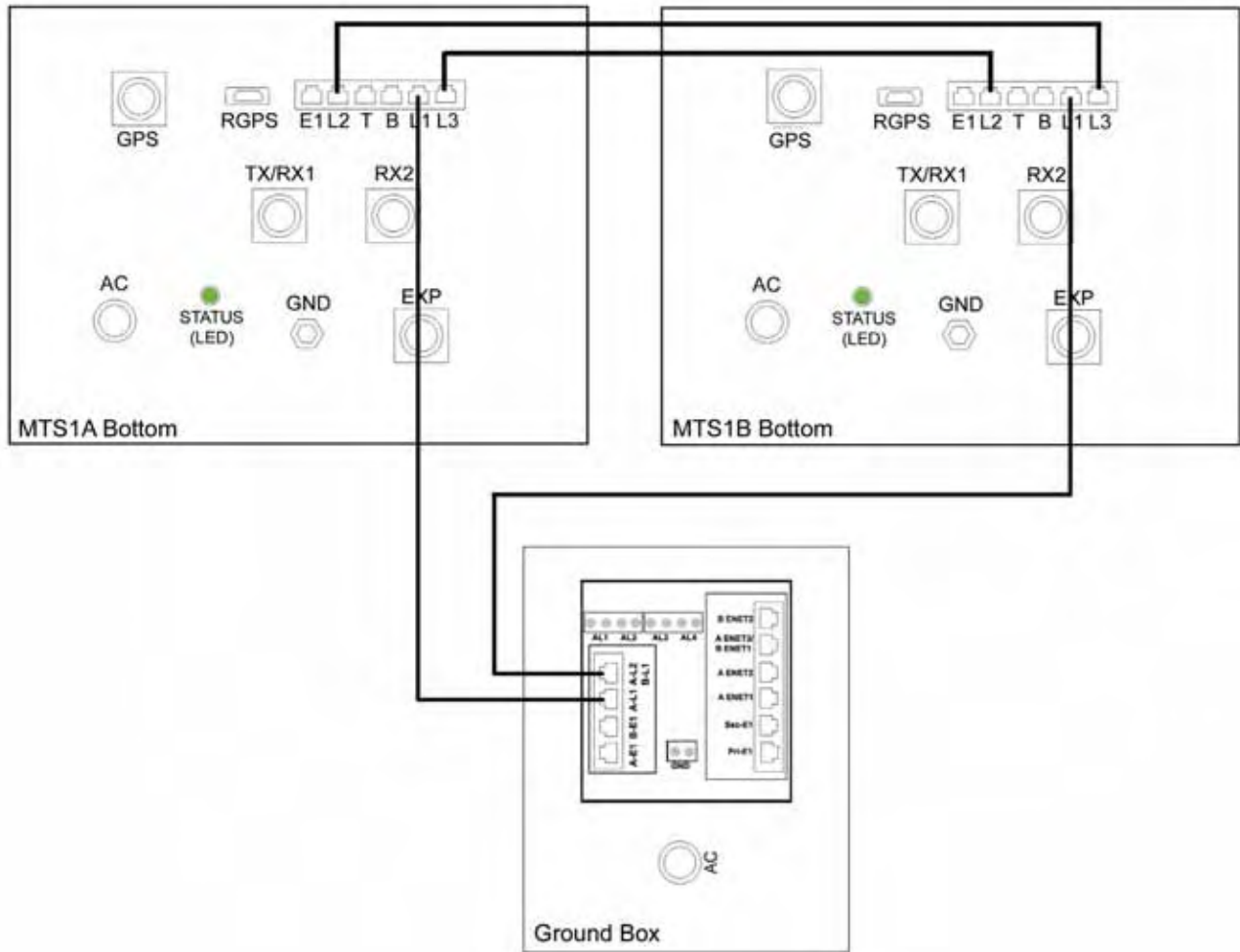


Dual MTS 1, Dual Ethernet Site Link

Table 5-10 Ethernet Site Link Cabling - Dual MTS 1, Dual Site Link

Index	From Unit	To Unit	Notes
1	MTS 1A/ L2	MTS 1B/ L3	Standard Ethernet cable. Locally Procured.
2	MTS 1A/ L3	MTS 1B/ L2	Standard Ethernet cable. Locally Procured.
3	Ground Box/ A-L1	MTS 1A/ L1	Standard Ethernet cable. Locally Procured.
4	Ground Box/ AL2/B-L1	MTS 1B/ L1	Standard Ethernet cable. Locally Procured.

Figure 5-9 Ethernet Site Link Cabling - Dual MTS 1, Dual Site Link



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Configuration and Testing

The setup and testing procedures covered in this manual are intended to be used in conjunction with the information provided in [Chapter 11, "MTS 1 Troubleshooting"](#) and "MTS MMI Commands Manual".

Together, the troubleshooting solutions and testing procedures, provide the necessary information to isolate failures to a Field Replaceable Unit (FRU) or replaceable part. This helps to keep the system down time to a minimum by quickly returning the site to normal operation.



NOTE

All suspected faulty MTS 1s should be shipped to a Motorola depot facility for servicing or repair.

Setup and Testing Overview

The setup and test procedures in this manual are used to test the functionality of the MTS and help isolate failures to the module level.

The setup and testing procedures are divided into the following sections:

- "Preparation"
- "Site Controller Configuration and Verification"
- "Base Radio Configuration and Verification"

Preparation

Please carefully go through preparation section before proceeding with configuration and testing.

Process 6-1 Preparation Procedures

1	"MMI Commands and MTS Modes of Operation" - briefly describes the usage of Man Machine Interface Commands.
2	"Test Equipment" - Identifies all recommended test equipment for the Site Controller and Base Radio Verification.
3	"Service Terminal Setup" - Describes how to connect a service terminal.

MMI Commands and MTS Modes of Operation



CAUTION

You must be familiar with Man-Machine Interface (MMI) commands and their usage prior to performing procedures in this chapter. Improperly applying MMI commands can cause damage to the equipment.



NOTE

The "MTS MMI Commands" manual serves as an introduction and reference for using the software commands. If you are not totally familiar with using the commands, read the "MTS MMI Commands" manual before proceeding.

Service technicians can communicate with the MTS through the use of MMI commands and a service terminal (laptop). MMI commands provide testing capabilities with access to alarm log files and various diagnostic tests. MMI commands also provide a means to configure the site controller and base radio(s) for intended operation, and to enable various system tests.

The testing of the MTS by using the MMI can be done in Test Application Mode or with sets of commands available for Site Controller and Base Radio.

A selected number of MMI commands are used in the procedures within this chapter. The complete set of MMI commands, including both Site Controller and base radio commands, is defined in the "MTS MMI Commands" manual.

The MTS Site Controller has the following modes of operation:

- **BOOT1** - to access this mode, interrupt the booting process by pressing the **ESC** key or **Ctrl+C** combination when the appropriate message appears. A password may be required to enter this mode.
- **Test Application** - to access this mode, type the **testapp** command when in the BOOT1 mode. To return to the normal Site Controller Application, type **reset -oplatform** command. This action reboots and resumes the normal operation.
- **Site Controller Application** - if the boot process is not interrupted, this is the default mode of operation.

The MTS Base Radio has the following modes of operation:

- **BOOT1** - to access this mode, interrupt the booting process by pressing the **ESC** key or **Ctrl+C** combination when appropriate message appears. A password may be required to enter this mode.
- **Test Application** - to access this mode, type the **testapp** command when in BOOT1 mode. To return to the normal Base Radio Application, type **reset -oplatform** command. This action reboots and resumes the normal operation.
- **Base Radio Application** - if the boot process is not interrupted, this is the default mode of operation.

Each of these modes contains a different set of Man Machine Interface Commands, which are described in the “MTS MMI Commands” manual.

**WARNING**

The Test Application mode is a powerful mode. Inappropriate use of the Test Application MMI can lead to a permanent hardware failure. Please proceed with extreme caution.

Test Equipment

Table 6-1 lists the recommended test equipment for the Equipment Cabinet procedures. Equivalent equipment is acceptable.

**WARNING**

Ensure that the test equipment is connected to the same ground system as the equipment under test before any other connections are made to the test equipment.

Table 6-1 Equipment for Cabinet Testing

Equipment	Model/Type	Manufacturer	Description
Service Terminal		Locally Procured	Used to access and interface with Site Controller and BR MMI
Service Connector Box	0166502N05	Motorola	Used for measuring receiver sensitivity
Basic Service Cable	3066565B01	Motorola	
Coaxial Directional Coupler	3041-20	Narda	Used for receive test signal injection into duplex TX/RX antenna port
Circulator, 360 MHz- 405 MHz	9C30-41	Ferocom	
Load	375 BNM	Narda	
RF Attenuator, 10dB	minimum 100 W	Motorola	Used to attenuate transmit signals for testing
RF Adapter	33 QMA-N-50- 1/133 NE	Huber & Suhner	“N” female to “QMA” male
RF Adapter	31 N-QMA- 1/1-- NE	Huber & Suhner	“N” female to “QMA” female
RF Adapter	33_716-N-50-1/---_UE	Huber & Suhner	“N” female to DIN 7-16 male
Rubidium Frequency Standard	PRFS (or 2008)	Ball/Efratom (UCT)	Used as a frequency standard for receive test
TETRA Signal Generator	Rhode & Schwarz: SMU200A + SMX-K8		Used for checking receive and transmit operation
TETRA Analyzer (optional)	Agilent E4443A		Used for checking receive and transmit operation
Miscellaneous Cabling and Connectors		Locally Procured	Used to connect the signal generator to the antenna ports

Service Cable and Connector Box Description

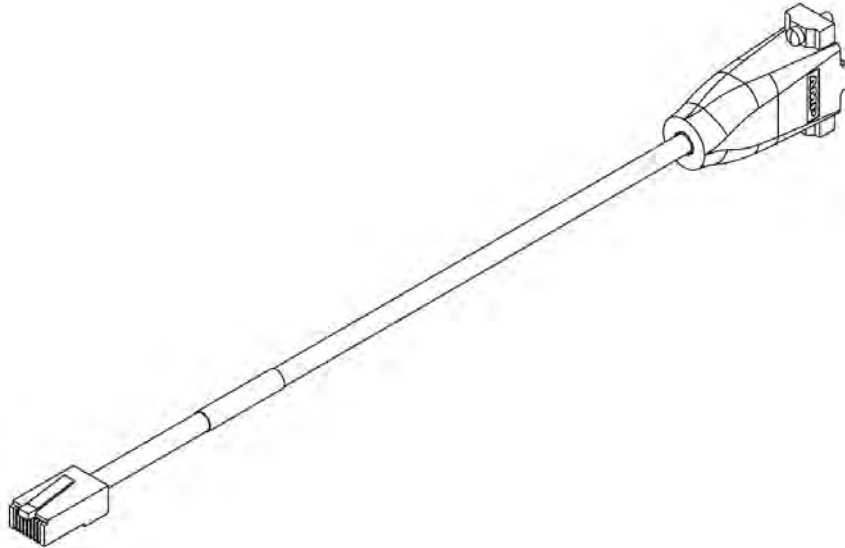
The **Basic Service Cable** (3066565B01) is used to connect the Service Terminal RS-232 port (DB9M) to the Site Controller or Base Radio RJ45 Service Port to run the MMI commands.

The TESS MTS configuration application must be connected to the Site Controller using an Ethernet patch cord between the Service Terminal network port and the Site Controller service port through a telnet session.

The **Basic Service cable** can be used with a DB9M to DB9M gender changer for the loading of infrastructure keys (Ki) from a Key Variable Loader (KVL) into Site Controllers and Base Radios of encrypted MTSs.

A specially crafted Service Connector Box is used for measuring receiver sensitivity; see [Figure 6-2](#) and [Figure 6-3](#). This box has two additional trigger connectors that allow the MTS to connect to a TETRA Test set and requires a standard RS-232 DB9M to DB9F cable to connect it to the Service Terminal.

Figure 6-1 Basic Service Cable



NOTE

Only the D-SUB 9 Female PINs that are connected are presented in the table below. The rest are not connected (NC).

Table 6-2 Basic Service Cable Pinout

RJ45 PIN	D-SUB 9 Female PIN	Description
1 (NC)		
2 (NC)		
3 (NC)		
4	3	RX
5	5	GND
6 (NC)		
7	2	TX
8	5	GND

The **Service Connector Box** (0166502N05) is used for connecting a PC to the Base Radio. It has additional functionality for measuring receiver sensitivity, see [Figure 6-3](#).

Figure 6-2 Service Connector Box



Figure 6-3 Service Connector Box Pinout

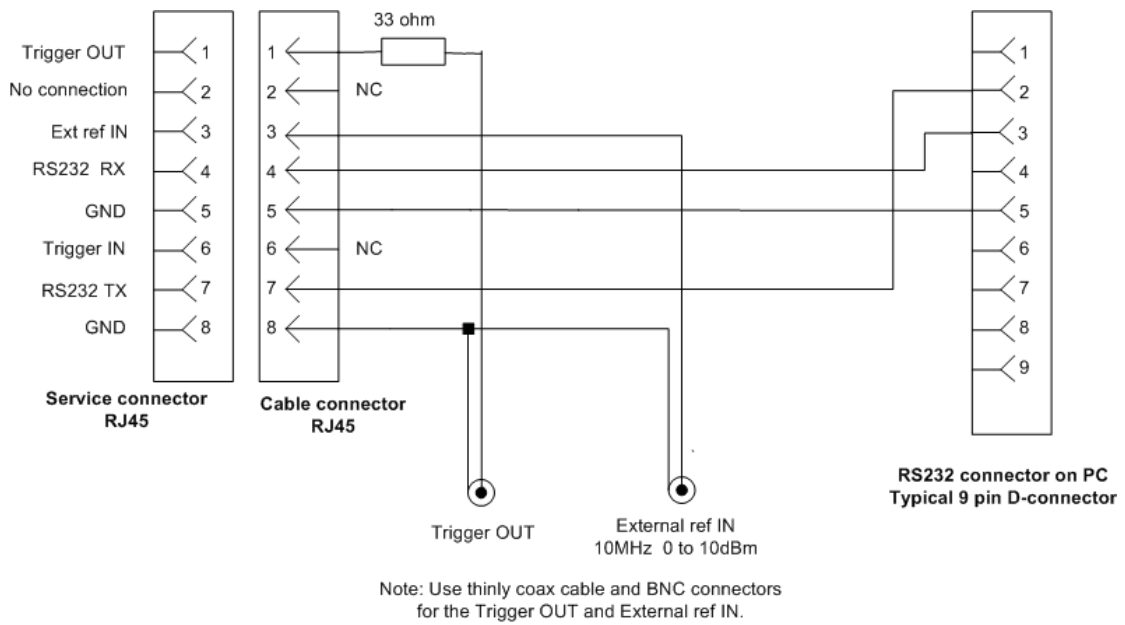


Table 6-3 Site Controller Service Port Pinout

RJ45 PIN	Description
1	FE Rx+
2	FE Rx-
3	FE Tx+
4	RxD
5	NC
6	FE Tx-
7	TxD
8	GND

Service Terminal Setup

In the following procedures, whenever there is an instruction to enter software commands, the commands are presented in **bold**. Type all the commands exactly as they appear. The command prompt precedes the command, as in the following example:

Example: SC> **help**

1. Configure the service terminal's RS-232 port with the parameters listed in [Table 6-4](#).
2. Connect an RS-232 cable from the serial port on the service terminal to the RJ45 Site Controller service port (T) at the bottom of MTS 1.

Table 6-4 RS-232 Port Configuration

Description	Setting
Baud Rate	19200
Parity Bit	none
Data Bits	8
Stop Bits	1

Base Radio Configuration and Verification

For the Base Radio, there are a number of procedures that you must follow to ensure that it is up and running.

All module specific information is programmed in the factory prior to shipment. Base Radio specific parameters (for example, receive and transmit frequencies) are downloaded to the Base Radio from the network/Site Controller.

Process 6-3 Base Radio Configuration

1	<p>"Selecting Base Radio Position and Receivers" :</p> <ul style="list-style-type: none"> • "Setting and Accessing Base Radio Position" - setting the position of the BRC in the Cabinet. • "Setting Base Radio IP".
2	<p>"Station Verification Procedures":</p> <ul style="list-style-type: none"> • "Base Radio Software Revision Verification" • "Transmitter Verification" • "Receiver Verification"
3	<p>"Displaying Base Radio Alarms"</p>

Selecting Base Radio Position and Receivers

The new Base Radio needs to be assigned a position identifier and is performed from the Base Radio Service port (B) at the bottom of MTS 1.

MMI commands are used to:

- Set the position identifier of the Base Radio within the MTS 1.
- Set the number of active receivers (diversity) of the new Base Radio.

These operations are described in the following procedures. Use the MMI commands as outlined in the "MTS MMI Commands" manual for detailed information on using the MMI commands

Setting and Accessing Base Radio Position

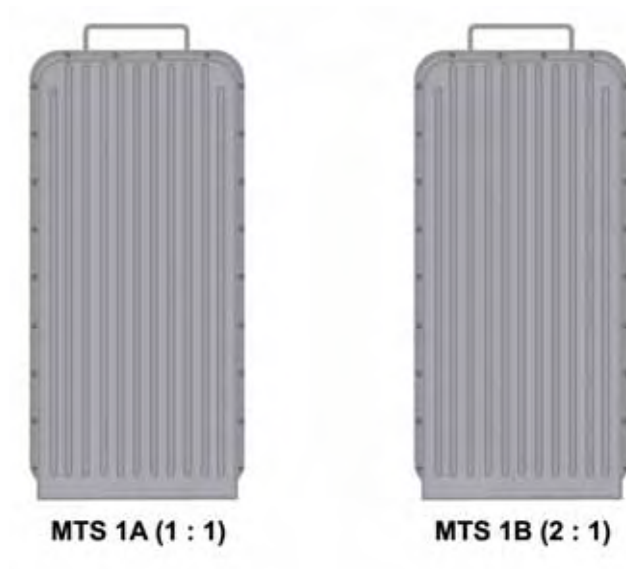
Motorola recommends the following Cabinet ID and Position ID for MTS 1 configurations:

- Single MTS 1: 1 : 1
- Dual MTS 1: 2 : 1

Figure 6-4 Single MTS 1 Configuration



Figure 6-5 Dual MTS 1 Configuration



Setting and Accessing Base Radio Position Using Test Application

In order to configure BR cabinet id in the Test Application, use the following command at the command prompt:

```
ci -oplatform -c<n>
```

where <n> is a number between 1 and 8 corresponding to the cabinet id of the Base Radio.



NOTE

For MTS 1 in single mode as well as for MTS 1A in dual mode it is recommended to use Cabinet ID 1. For MTS 1B in dual mode it is recommended to use Cabinet ID 2.

In order to configure BR position id in the Test Application, use the following command at the command prompt:

```
pi -oplatform -p<n>
```

where <p> is a number between 1 and 8 corresponding to the position id of the Base Radio.



NOTE

For MTS 1 in both single and dual mode, it is recommended to use Position ID 1.

Setting and Accessing Base Radio Position Using Boot1

The `spw br_id "cabinet:X position:Y"` command programs the position number of where a Base Radio is mounted within a selected cabinet.

To get current BR Position ID and BR Cabinet ID by using BRC Boot1:

```
boot1>
spr br_id
"br_id="cabinet:1 position:1"
```



NOTE

For MTS 1B in dual mode it is recommended to use Cabinet ID 2.

To set BR Position ID for MTS 1 in single mode by using BRC Boot1, follow the example below:

```
boot1>
spw br_id "cabinet:1 position:1"
```

To set BR Position ID for MTS 1 in dual mode by using BRC Boot1, follow the example below:

```
boot1>
spw br_id "cabinet:2 position:1"
```

Setting Base Radio IP

To get at read-out of current IP configuration of the Base radios using Boot1:

```
boot1> spr inet/if/eth0
boot1> spr inet/if/eth1
```



SUGGESTION

Note down the Ethernet configuration displayed for later use.

To configure the IP address of the Base Radio in the Test Application, use one of the following commands:

- `cpp -olan1 -i<IP>`
- `cpp -olan2 -i<IP>`



IMPORTANT

It is **not** allowed to change the original MAC addresses of the Base Radio.



NOTE

The `<IP>` in commands above is the new IP address (for example `10.0.253.11`)

To change and update IP configuration of the Base radio(s) by using Boot1:

```
boot1> spw inet/if/eth0 "dhcp:no addr:10.0.253.[XY] mask:255.255.255.0
dev_name:FCCEETH dev_unit:1 ethaddr: yy:yy:yy:yy:yy:yy mtu:1500"
where [X = Cabinet number; Y = Position number] and yy:yy:yy:yy:yy:yy is the
MAC or Ethernet address of eth0.
```



NOTE

In the command line above, there is **one** space between the `ethaddr:` and `yy:yy:yy:yy:yy:yy`.

To change and update IP configuration of the Base radio(s) by using Boot1:

```
boot1> spw inet/if/eth1 "dhcp:no addr:10.0.254.[XY] mask:255.255.255.0
dev_name:FCCEETH dev_unit:2 ethaddr: yy:yy:yy:yy:yy:yy mtu:1500"
where [X = Cabinet number; Y = Position number] and yy:yy:yy:yy:yy:yy is the
MAC or Ethernet address of eth1.
```



NOTE

In the command line above, there is **one** space between the `ethaddr:` and `yy:yy:yy:yy:yy:yy`.

Base Radio Receiver Configuration

The procedure below can be done locally as well as remotely. The commands to check and change the BR parameters require the use of BRC Application MMI.

Procedure 6-2 How to Verify Base Radio Parameters

1	Log in to the Base Radio in application mode.
2	Type fc p -opa1 -pdekey_limit and press Enter . Result: The correct setting should be 6.
3	Type fc p -orxch1 -prx_dc_inj_us1 and press Enter . Result: The correct setting should be 2.5.
4	Type fc p -orxch1 -prx_dc_inj_ls1 and press Enter . Result: The correct setting should be 0.
5	Type fc p -orxch1 -pad1_scaling6 and press Enter . Result: The correct setting should be 28.9.
6	Type fc p -orxch1 -prx_fru_config and press Enter . Result: The setting will depend on the receiver diversity required for the site.

Station Verification Procedures


Station Verification Procedures cover methods to verify transmit and receive operations after a Base Radio module has been installed or replaced. Each section contains the equipment setup and the procedure.

Base Radio Software Revision Verification

Procedure 6-3 How to Verify the Base Radio Software Version Number

1	Connect one end of the console cable to the service computer.
2	Connect the other end of the console cable to the Base Radio Service Access port (B), located at the bottom of MTS 1.
3	In normal application mode, login and enter command ver - to display Application Software version, Boot0 version and Boot1 version.
4	Enter the test application mode: <ol style="list-style-type: none"> 1. Reset the BR. When resetting the Base Radio, press the ESC key when prompted to interrupt the start up sequence. 2. Type testapp and press Enter. 3. Log on by typing login -ufactory and press Enter. When prompted, enter factory for password.



Procedure 6-3 How to Verify the Base Radio Software Version Number (Continued)

5	Collect revision numbers from the BR by typing: fv -oplatform . Note down the test application software version and then please refer to the System Software Release Note for correct software version number.
	NOTE
	If software version number does not match, perform " Base Radio Test Application Software Upgrade (optional) " on page 6-16 after completion of this procedure.
6	To exit BR Test Application mode, reset the BR, by using the following command from the MMI: reset -oplatform

Base Radio Test Application Software Upgrade (optional)**IMPORTANT**

It is important to make sure that this procedure never is used to downgrade the Test Application.

Procedure 6-4 How to Upgrade to Latest Test Application Software

1	Point 3COM server to the folder containing the BRC Test App software.
2	Connect a RJ45 cable to the serial port of the PC and the Base Radio Service port (B) at the bottom of MTS 1.
3	Connect a crossed Ethernet cable to the PC and the L1 port at the bottom of MTS 1.
4	Reset BR and enter boot1 mode.
	NOTE
	Do not enter testapp mode from here
5	Type ferase 0x10100000 4M and press Enter .
6	When prompt returns type ifconfig eth0 address 10.0.253.<CAB><POS> and press Enter .
7	When prompt returns type finstall testapp /tftp/10.0.253.100/R064020ROM.srec and press Enter .
	NOTE
	R064020ROM.srec in command above is used as an example. Please indicate latest released file when entering command.
	Result: BRC will reset itself at the end
8	Enter boot1 mode and then enter test app mode.
9	Login as factory user in test app mode, type fv -oplatform and press Enter . On the last line of the output check that the version is R064020 or which ever version was upgraded to in step 7 .

Procedure 6-4 How to Upgrade to Latest Test Application Software (Continued)

10	Reset the BR by typing reset -oplatform and press Enter .
11	Disconnect the service cable from the B port and reconnect the Ethernet cable to LAN 1.
12	Rerun Procedure 6-3, "How to Verify the Base Radio Software Version Number," on page 6-15 to verify that the latest versions have been installed correctly.

Transmitter Verification



The transmitter verification procedure verifies the transmitter operation and the integrity of the transmit path. This verification procedure is recommended after replacing the Base Radio module.

**NOTE**

The following procedure requires the MTS to be out of service. Unless it is already out of service, Motorola recommends performing this procedure during off-peak hours. This minimizes or eliminates disruption of service to system users.

This procedure provides commands and responses to verify proper operation of the transmit path for the Power Amplifier.

Procedure 6-5 How to Verify the Transmitter

1	Connect the Service Cable between the service terminal and the Service port (B). Log in to the Base Radio.
	 NOTE Contact your local Motorola representative or Technical Support to obtain password.
2	At the prompt, type power -otxch1 -a0 . This command dekeys the transmitter.
3	 NOTE The following commands, keys the transmitter. Make sure that transmission only occurs on licensed frequencies or into an RF dummy load. To ask for the current transmitter frequency, type: freq -otxch1 . To change the transmit frequency, type: vco -otx_all -fXXX.XXXX . For example, to set the transmit frequency to 410.0125 MHz, type: vco -otx_all -f410.0125 . To key the transmitter with a T2 type channel type these three commands: <ul style="list-style-type: none"> • enable -otx_all -son • ptm -orx_all -mTx_T2 -s15 -tNo_Trigger -d0 • power -otxch1 -aXX These commands set the transmitter to a specified power (in Watts) without altering any programmed parameters. For example, to key the Power Amplifier to 36W, type power -otxch1 -a36 .

Procedure 6-5 How to Verify the Transmitter (Continued)



NOTE

To transmit a TCH 7.2 channel type, type: **ptm -orx_all -mTCH_72 -s15 -tNo_Trigger -d0.**



NOTE

The measurement equipment setting for MCC, MNC and BCC:**0.**
Burst Type: **NCDB.**

4	At the prompt, type these three commands: <ul style="list-style-type: none"> • meter -opa1 -mpa_pwr_fwd. This command returns the current value of forward power from the RF Power Amplifier. • At the prompt, type: meter -opa1 -mpa_pwr_rev. This command returns the current value of reflected power from the RF Power Amplifier. • At the prompt, type: meter -opa1 -mpa_vswr. This command calculates the current Voltage Standing Wave Ratio (VSWR) from the RF Power Amplifier.
5	At the prompt, type: alarms -ofault_hndlr. This command returns all active alarms of the Base Radio.
6	At the prompt, type: power -otxch1 -a0. This command stops all transmitter activity.
7	Connect the test cable to the MTS 1 TX connector and connect a 40 dB attenuator to the other end of the cable.
8	From the attenuator, connect a cable to the RF IN/OUT connector on the TETRA Analyzer.
9	Switch off the TETRA Analyzer. Connect the Rubidium Frequency Standard to a 10 dB attenuator. Switch on the TETRA Analyzer.
10	Connect the other end of 10 dB attenuator to the 10 MHz REFERENCE OSCILLATOR IN/OUT connector on TETRA Analyzer.
11	Set the TETRA Analyzer to the EXT REF mode. Set TETRA Analyzer to ON and to the proper channel type.

Table 6-5 Transmitter Verification Specifications

Parameter		Lower Side Limit	Typical	Upper Side Limit
MTS 1 low power, RMS power out on Antenna port	W	10	13	
	dbm	40	41	
EVM, RMS average	%			10
EVM, Peak confidence	%			30
Carrier feed through / Residual carrier	%			5
TX frequency error	Hz	-80		80

Receiver Verification

The receiver verification procedure sends a known test signal to the Base Radio to verify the receive path. This verification procedure is recommended after replacing a Base Radio.



NOTE

The following procedure requires the Base Radio to be out of service. Unless the Base Radio is currently out of service, Motorola recommends performing this procedure during off-peak hours. This minimizes or eliminates disruption of service to system users.

Equipment Setup for Receiver Verification

To set up the equipment, use the following procedure.




Procedure 6-6 How to set up the Equipment for Receiver Verification

1	Switch the MTS 1 OFF.
2	Connect one end of the Service cable to the service computer.
3	Connect the other end of the Service cable to the BR Service Access port (B) located at the bottom of the MTS 1.
4	Connect a test cable to the TX and RX connectors on the MTS 1 bottom.
5	Connect the other end of the test cable to the RF output on a TETRA Signal Generator.
6	Connect Frequency Standard 10 MHz OUTPUT to a 10 dB attenuator.
7	Connect other end of the attenuator to the 10 MHz REFERENCE OSCILLATOR IN/OUT connector on the TETRA Signal Generator.
8	Connect the Trigger Output connector on the Service Port Cable to the External Trigger Input on the TETRA Signal Generator.
9	Set the TETRA Signal Generator to EXT REF mode.
10	Set TETRA Signal Generator to ON.
11	Set the TETRA Signal Generator to the receive frequency of the Base Radio under test. (All receivers within a single Base Radio have the same receive frequency.)
12	Configure the generator for a TCH 7.2 TETRA channel.
13	Set the TETRA Signal Generator to generate the test signal at an output level of -110 dBm.

Receiver Verification Procedure

This procedure provides commands and responses to verify proper operation of the Base Radio receive path. The Bit Error Rate (BER) measurement meets specifications at less than 0.01% (1.0e-02%) to pass the process.

Procedure 6-7 How to Verify the Receiver

1	Switch the MTS 1 ON.
2	<p>Enter the Test Application mode and login.</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p>Contact your local Motorola representative or Technical Support to obtain password.</p>
3	<p>At the prompt, type: freq -orxch1. This command displays the receive frequency for the current Base Radio. Record the result.</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p>To set the receive frequency, use the command freq -orx_all -fXXX.XXXX. For example, to set the receive frequency to 401.0125MHz, type freq -orx_all -f401.0125.</p>
4	<p>Use following commands to change TX and RX frequency if necessary. If you read the frequency you want to use in the previous step, skip this step:</p> <ul style="list-style-type: none"> • freq -otx_all -f394.0125 • freq -orx_all -f384.0125
5	Type sge -orx_all -son and press Enter to enable system gain alignment.
6	<p>At the prompt, type: ptm -orx_all -mTCH_72 -s15 -tMulti_Frame_Trigger -d-6.</p> <p>For Stabilock 4031/4032 use single slot only and delay 0: ptm -orx_all -mTCH_72 -s8 -tFrame_Trigger -d0</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p>It may be necessary to adjust the trigger delay set by the -d option.</p>
7	At the prompt, type: enable -orxch1 -dbr1 -son . This command enables the receiver branch under test and should enable br1, br2, or br3 respectively depending on the branches that you are testing.
8	Set the signal generator to generate a T1 signal and inject to the relevant antenna port.

Procedure 6-7 How to Verify the Receiver (Continued)

9	<p>Type <code>ppr -orxch1 -a1000 -r1</code> to analyze the received RF signal quality of the Base Radio. Record the results. Example readout is below with expected results/ specifications:</p> <pre>Receiver Number = 1 2 3 SGC Attenuation (dB) = 4 4 4 Sync Location (1/10 symb)= 50 42 27 Sync. Amplitude (dB) = -83 -94 -104 Total Bits/Msgs = 4320 4320 4320 Bits/Msgs in Error = 4 1965 1904 BER/MER (%) = 1.593 45.486 44.074 RSSI (dBm) = -117 -121 -131</pre> <p>BER value is below 4% and RSSI is within the acceptable range.</p>
10	Type <code>ppr -orxch1 -a1 -r200</code> to check for small peaks of interference. Record the results.
11	Repeat the two previous steps for all receiver branches.
12	Disconnect the equipment.
13	Repeat procedure for all remaining Base Radios.

Displaying Base Radio Alarms

In the Site Controller procedures, the base radios were connected to the Site Controller and received downloaded test software through the BR-Site Controller Ethernet link. If necessary, reset the base radio to obtain the password prompt, or enter the Test Application mode of the BR.

Procedure 6-8 Display Outstanding Base Radio Alarm Conditions

1	When prompted, type the proper password. After entering the correct password, the prompt is displayed on the service terminal.
2	<p>Use either BR Application or Test Application to display Base Radio alarms:</p> <ul style="list-style-type: none"> • BR Application: Type <code>get alarms</code> This command displays all alarms for this Base Radio together with its current states (active/inactive). • BR Test Application: Type <code>alarms -ofault_hdlr</code> This command displays all the all active alarms on the Base Radio.

**NOTE**

When using Test Application, the fault management engine can be disabled. In such case **no** alarms will be visible.

- To display current FM state:
`dev> fme -ofault_hdlr`
- To enable FM:
`dev> fme -ofault_hdlr -son`
- To disable FM:
`dev> fme -ofault_hdlr -soff`

Viewing the Transmit Spectrum (optional)

The transmit spectrum can be viewed on the Spectrum Analyzer. Perform the following procedure to view the transmitted signal spectrum.

**CAUTION**

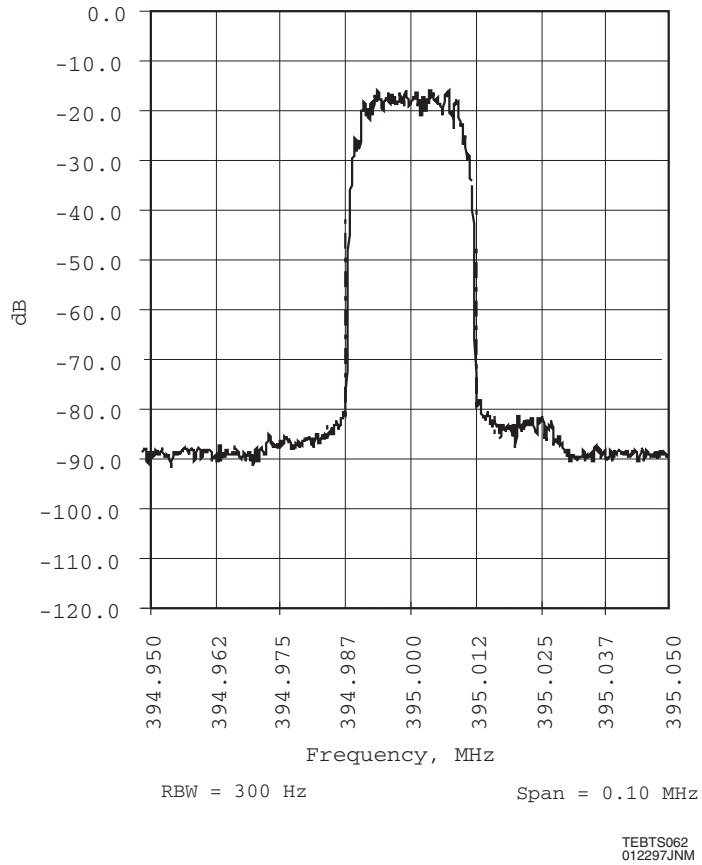
The following command keys the transmitter. Make sure that transmission only occurs on licensed frequencies or into a dummy load.

At the Test Application prompt, type: `power -otxch1 -a35`

This command sets the transmitter output to maximum rated output.

Figure 6-6 shows the transmitted signal on the Spectrum Analyzer.

Figure 6-6 Spectrum Analyzer Display of Transmitted Signal



At the prompt, type: **power -otxchl -a0**

This command stops RF transmission

Repeat this procedure for each base radio.

Synchronizing Non-Volatile Memory (NVM) Regions

After introducing major changes in the Non-Volatile Memory (NVM) settings it is recommended to synchronize NVM regions using the commands described below. Each physical NVM object has two copies of its contents called the working region and the default region. The working region is used for normal operation, while the default region is a backup from where the settings are recovered in case of a memory fault (incorrect checksum) detected in the working region.

In order to synchronize the default region with the working region, use the following commands at the command prompt:

- `sfcpl -ocontrol -sworking -ddefault`
- `sfcpl -oexl -sworking -ddefault`
- `sfcpl -opal -sworking -ddefault`
- `sfcpl -orxchl -sworking -ddefault`

Technical Specifications

This chapter is organized in the following way:

- "Environmental and Standards Specifications"
- "MTS 1 Base Station Specifications"

Environmental and Standards Specifications

This section presents the Environmental Specifications and the Standards Specifications.

Environmental Specifications

Table 12-1 MTS 1 Environmental Specifications

Environmental Specifications	Description
Operating temperature	-40 to 55 °C
Storage temperature	-40 to 85 °C
Operational altitude	-300 to 3000 m
Environmental protection	IEC 60529: IP66 (Dust protected, powerful water jets)
Storage	EN 300 019-2-1 : T1.2
Transportation	EN 300 019-2-2 : T2.3
Operation	EN 300 019-2-3 : T3.2, extended temp -30 to 55 °C
Operation Outdoor	EN 300 019-2-4 : T4.1, non weather protected -30 to 55 °C including solar shield
Vibration Outdoor	EN 300 019-2-4 : T4.1

Standards Specifications

Table 12-2 MTS 1 Standards Specifications

Standards Specifications	Description
Harmonized EN for TETRA	EN 302 561: TERrestrial TRunked RAdio (TETRA)
Air-interface	EN 300 392-2
Conformance test	EN 300 394-1
EU directives	R&TTE - Radio and Telecommunications Terminal Equipment Directive 1999/5/EC WEEE - Waste Electrical and Electronic Equipment Directive 2002/96/EC RoHS - Restriction of Hazardous Substances Directive 2002/95/EC
Safety	EN60950 - 1:2006: Harmonized Safety Standard
	R56: Motorola international installation standard
EMC	EN 301 489-1: Common Technical Requirements
	EN 301 489-18: Specific Requirements for TETRA
	EN 50121-4 : Railway applications EMC
Mains connect	EN 61000-3-2: Harmonic Current Emissions
	EN 61000-3-3: Voltage Fluctuations and Flicker
Earthquake	EN 300 019-2-3: Clause 4
Vibration	EN 300 019-2-3: T3.2

MTS 1 Base Station Specifications

This section contains the dimensions and the technical specifications for the MTS 1 Base Station.

MTS 1 Dimensions

Table 12-3 Dimensions of MTS 1

Physical Dimensions	Description
Depth	206 mm
Height	597 mm
Width	263 mm
Weight	20.5 kg

RF Specifications

Table 12-4 MTS 1 RF Specifications

Physical Dimensions	Description	Value or Range
Frequency	High 400 MHz band (TETRA and TEDS)	380-470 MHz
	Duplex spacing	10 MHz
	Bandwidth	5 MHz
	Channel spacing	25 kHz (Raster in 6.25 kHz)
Transmit Power	10 W	
	Adjustable down to 0.6 W	



NOTE

ETSI Compliance Notice: The Base Radio is only ETSI-compliant when used in conjunction with a Motorola-supplied RF Filter Module. The Base Radio shall not be used without a Motorola-approved RF Filter Module.

Receiver Specifications

Table 12-5 MTS 1 Receiver Specifications

Receiver Specifications	Value or Range
Sensitivity (normal conditions, unprotected T1, static, 4% BER):	
population mean:	-119 dBm
spec limit:	-117.5 dBm
Sensitivity (normal conditions, faded, TU50, 4% BER):	
population mean:	-112.5 dBm
spec limit:	-111 dBm
Antenna Dual Diversity Gain dB	3-5 dB (Highly dependent on antenna configuration)
Co-channel interference	19 dB C/I_c (EN 300 392-2)
Adjacent channel interference	-45 dB C/I_a (EN 300 392-2)
Spurious rejection	-45 dBm (EN 300 392-1)
Blocking	-25 dBm >500kHz (EN 300 392-2)
Intermodulation	-47 dBm (EN 300 392-2)
Noisefigure	4.5 dB (5.5 dB guaranteed)

Internal GPS Module Input Specifications

Table 12-6 MTS 1 Internal GPS Module Input Specifications

Internal GPS Module Input Specifications	Description
Sensitivity	TIFF (Time to First Fix) = 120 s @ -133 dBm
Max input power level	-40 dBm
GPS antenna bias voltage	+5.0 V
Maximum output current	30 mA

Power Supply Unit Specifications

Table 12-7 MTS 1 PSU Specifications

PSU Specifications	Description
Safety	EN 60950-1/2006 with CB test certificate UL60950-1, CSA C22.2 No. 60950-1, class 1 Designed to meet UL and cUL requirements. DC outputs designed as Safety Extra Low Voltages (SELV).
EMC	Immunity: EN 55024 EN 61000-4-3, EN 61000-4-2, EN 61000-4-6, EN 61000-4-5, EN 61000-4-4, EN 61000-4-11 Emission: EN 55022 class B EN 61000-3-3, EN 61000-3-2

Site Link Specifications

Table 12-8 MTS 1 Site Link Specifications

Site Link Specifications
2 x Ethernet RJ45 100 Base-T

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MTS 1 Restoration

Figure 13-1 MTS 1



Table 13-1 MTS 1 - Restoration References

Action	References
Replacing the MTS 1	<ul style="list-style-type: none"> • "MTS 1 - Restoration Prerequisites" on page 13-2 • "MTS 1 - FRU" on page 13-7 • "MTS 1 - Restoration Impact" on page 13-8 • "MTS 1 - Configuration Backup" on page 13-9 • "MTS 1 - Restoration Procedures" on page 13-11 • "MTS 1 - Post-restoration Checks" on page 13-31

MTS 1 - Restoration Prerequisites



IMPORTANT

Check for any new Technical Information Bulletins (TIB) before starting the restoration procedures.

Table 13-2 MTS 1 - Restoration Prerequisites

Type	Description
Software	TESS
Hardware	Field Replaceable Units. See Table 13-2, "MTS 1 - Restoration Prerequisites," on page 13-2.
Hardware tools	Toolkit
	Digital Multimeter



WARNING

Ensure that the test equipment is connected to the same ground system as the equipment under test before any other connections are made to the test equipment.

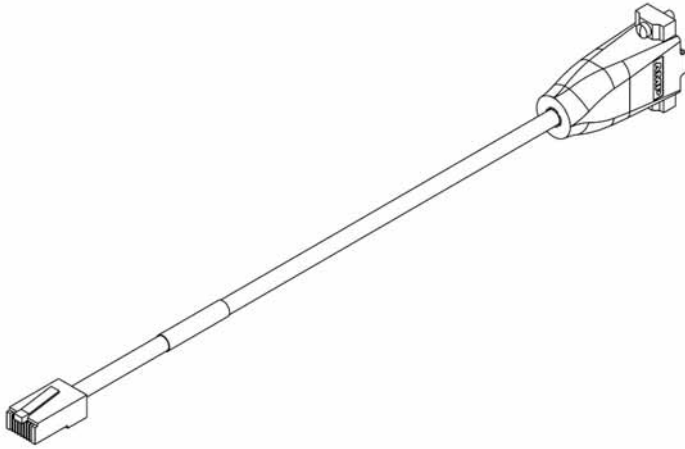
Table 13-3 Recommended Test Equipment for Installation

Tool	Model/Type	Supplier	Description
Digital Multimeter (only 1 required)	Fluke 77	Fluke	AC/DC measurements. Equivalent instrument is acceptable
Time Domain Reflectometer (TDR)		Locally procured	Possibly needed by Field Installation team
Ground Resistance Ohmmeter	AEMC 3700 clamp-on ground tester	Locally procured	Possibly needed by Field Installation team
Service Computer		Locally procured	Local service terminal
Service Connector Box	p/n: 0166502N05	Motorola	Used for measuring receiver sensitivity
Basic Service Cable	p/n: 3066565B01	Motorola	
TETRA Signal Generator	Rhode & Schwarz: SMU200A + SMX-K8	Rhode & Schwarz	Used for checking receive and transmit operation
TETRA Analyzer	Agilent E4443A		Used for checking receive and transmit operation
RF Attenuator, 250 W, 40 dB	Weinschel 404043		Protection for HP89441A
RF Attenuator, 10 dB	minimum 100 W	Motorola	Protection for HP89441A
RF Adapter	33 QMA-N-50-1/133 NE	Huber & Suhner	“N” female to “QMA” male
RF Adapter	31 N-QMA-50-1/1--NE	Huber & Suhner	“N” female to “QMA” male
RF Adapter	33_716-N-50-1/--_UE	Huber & Suhner	“N” female to DIN 7-16 male

MTS 1 - Service Cable

The **Service Cable** (3066565B01) is used to connect the Service Terminal RS-232 port (DB9M) to the Site Controller RJ45 Service Port (**T** connector on MTS 1 bottom) or the Base Radio RJ45 Service Port (**B** connector on MTS 1 Bottom) to run the MMI commands. The **Service Cable** is specially crafted for measuring sensitivity. It can also be used for connecting a computer. A simple **Service Cable** without the trigger wires is also sufficient to connect to the Site Controller or the Base Radio to use MMI Commands.

Figure 13-2 Basic Service Cable



NOTE

Only the D-SUB 9 Female PINs that are connected are presented in the table below. The rest are not connected (NC).

Table 13-4 Basic Service Cable Pinout

RJ45 PIN	D-SUB 9 Female PIN	Description
1 (NC)		
2 (NC)		
3 (NC)		
4	3	RX
5	5	GND
6 (NC)		
7	2	TX
8	5	GND

The **Service Connector Box** (0166502N05) is used for connecting a PC to the Base Radio. It has additional functionality for measuring receiver sensitivity, see [Figure 13-4](#).

Figure 13-3 Base Radio (B) Service Connector Box



Figure 13-4 B Service Connector Box Pinout

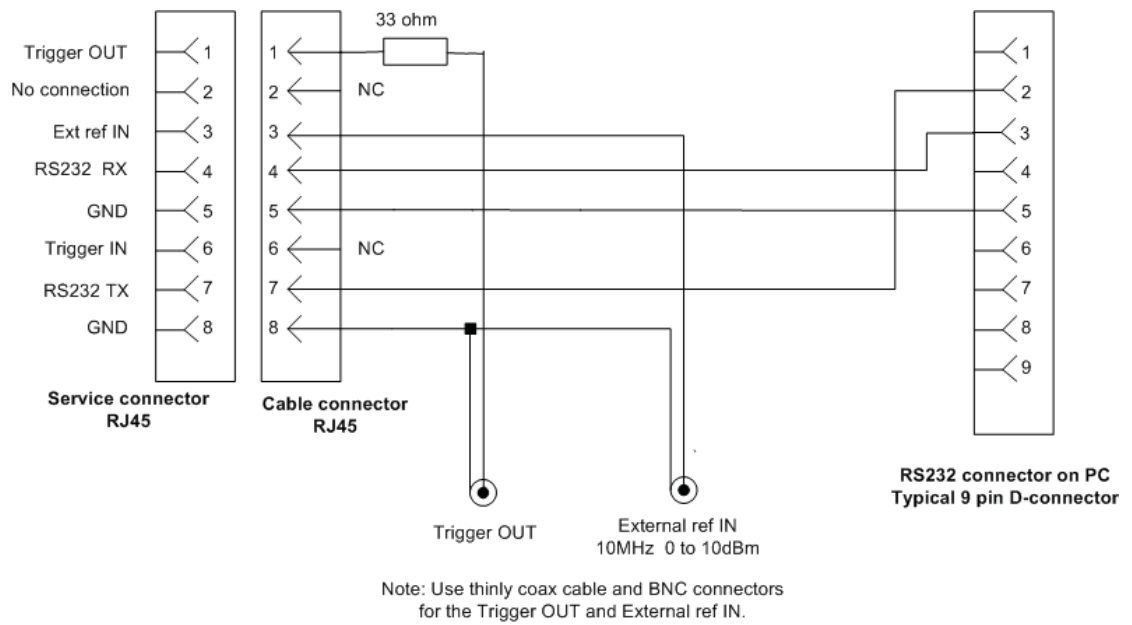


Table 13-5 Site Controller Service Port (T) Pinout

RJ45 PIN	Description
1	FE Rx+
2	FE Rx-

Table 13-5 Site Controller Service Port (T) Pinout (Continued)

RJ45 PIN	Description
3	FE Tx+
4	RxD
5	NC
6	FE Tx-
7	TxD
8	GND

Configure the service terminals's RS-232 port with the following parameters:

- Baud Rate: 19200
- Parity Bit: none
- Data Bits: 8
- Stop Bits: 1

Connect an RS-232 cable from the serial port on the service terminal to the Site Controller RJ45 service port (**T**) at the bottom of the MTS 1.

MTS 1 - FRU

Table 13-6 MTS 1 - Available FRU

Part number	Description
SQM12SUM0010A	MTS1 400 MHz Base Station

Table 13-7 MTS 1 - Accessories Available from After Market Operations

Part number	Description
GMKN4764A	MTS1 RF Interconnect kit
GMKN4765A	MTS1 Com Interconnect kit
GMLN5086A	Sealing Box
GMLN5087A	Junction Panel, DIN rail mounted
GMLN5093A	Secure Bolt kit
GMLN5094A	Cable Gland EMC PG11 RJ45
GMLN5095A	Cable Gland EMC PG11 RGPS
GMLN5096A	Blind Plug PG11
GMHN4651A	Wall Mount Ground Box
GMHN4652A	Standard Ground Box
GMHN4654A	Solar Shield (Outdoor)
WALN5075A	Door Alarm Kit (for Ground Box)
GMDN1172A	Remote GPS Antenna
3066564B01	Remote GPS Cable, 40 m
3066564B02	Remote GPS Cable, 150 m
3066564B03	Remote GPS Cable, 600 m

MTS 1 - Restoration Impact

Table 13-8 MTS 1 - Restoration Impact

Action	Service Affected	Service Downtime
Replacing MTS 1	<p>Site will be off air, radios have to find service on other site.</p> <div data-bbox="625 583 695 661" style="display: inline-block; vertical-align: middle;"> </div> <div data-bbox="716 600 889 636" style="display: inline-block; vertical-align: middle; background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold; margin-left: 10px;">NOTE</div> <p style="margin-left: 40px;">If the site is a dual SC site (i.e. dual MTS 1 configuration) a switchover of SC would cause outage of approximately 2 minutes. A switch back to the newly replaced SC for testing could also introduce outage of approximately 2 minutes.</p>	<p>Approximately one hour. Does not include Ki'ing of site because this depends on if the KVL has to be driven back to the Switch site where the AuC is located.</p>

MTS 1 - Configuration Backup

Process 13-1 MTS 1 - Configuration Backup

- | | |
|---|---|
| 1 | Set up a terminal and TESS application. Connect to MTS. See Procedure 13-1, "MTS 1 - How to Set Up a Terminal," on page 13-9. |
| 2 | Back up SC configuration. See Procedure 13-2, "MTS 1 - How to Back Up Current MTS Configuration to PC," on page 13-10. |
| 3 | If necessary, view and edit configuration file. See Procedure 13-3, "MTS 1 - How to View and Edit the Configuration File," on page 13-10. |

MTS 1 - Setting Up a Terminal

Procedure 13-1 MTS 1 - How to Set Up a Terminal

- | | |
|---|---|
| 1 | Load appropriate version of MTS Service Software onto PC by double clicking on setup.exe and following installation instructions until installation is complete. |
| 2 | Open MTS Service Software (TESS) application and when login screen is displayed, check that the release version is correct. |
| 3 | Enter password. |
| 4 | Connect a Straight Through Ethernet cable between the LAN port on PC and the Service Access port (T) at the bottom of MTS 1. Change your PC IP address to 10.0.253.100, mask 255.255.255.0, gateway 10.0.253.1. |



NOTE

In case of dual MTS 1 configuration where second SC is active will use subnet .254.

- | | |
|---|--|
| 5 | In main window, select Connection and select Connect Telnet New....
Result: The Telnet Connection Settings window is opened. |
| 6 | Specify connection settings of 10 . 0 . 253 . 1 in the 'Site IP' box and click OK to establish a connection. |
| 7 | Press Enter and at the User Name prompt, enter any user name consisting of at least three characters. |
| 8 | Enter the field password when prompted.
Result: You should see an SC> prompt. |



NOTE

The higher level engineering password may also be used and will return an **SC>** prompt.

Procedure 13-1 MTS 1 - How to Set Up a Terminal (Continued)

9	Continue to Procedure 13-2 , "MTS 1 - How to Back Up Current MTS Configuration to PC," on page 13-10.
----------	---

MTS 1 - Backing Up SC Configuration

Procedure 13-2 MTS 1 - How to Back Up Current MTS Configuration to PC

1	Select Upload Configuration in TESS application. Result: Window opens showing SC configuration files for upload.
2	Ensure that the file that is set to current and next (as indicated by + +) is highlighted in blue and click OK . <div style="display: flex; align-items: center;"> <div style="background-color: #00a0e3; color: white; padding: 2px 10px; border-radius: 3px;">NOTE</div> </div> <p style="text-align: center; margin-top: 5px;">You may choose to upload the non-current file by selecting it.</p>
3	Observe SC and BR file transfer and when complete, confirm the window showing transfer status displays <i>Transferred No Errors</i> for all files transferred then click OK .
4	When prompted to save the uploaded configuration file, use an appropriate name and click OK to save the configuration file in the default folder. <div style="display: flex; align-items: center;"> <div style="background-color: #00a0e3; color: white; padding: 2px 10px; border-radius: 3px;">NOTE</div> </div> <p style="text-align: center; margin-top: 5px;">You may use the browser to save the config file to a specific folder if preferred.</p>

MTS 1 - Viewing and Editing Configuration File

Procedure 13-3 MTS 1 - How to View and Edit the Configuration File

1	To view the previously uploaded configuration file, select Close Connection and observe that your chosen file name is displayed at the top of the menu window.
2	Select Personality menu, select Modify and fill out the Site Title and Version boxes as applicable (optional).
3	Enter the various config file fields to view the MTS parameters and make any appropriate changes. Click OK .
4	Under the File menu, select Save .

MTS 1 - Base Radio Configuration

MTS 1 - Selecting Base Radio Positions and Receivers

The new Base Radio needs to be assigned a position identifier and is performed from the Service port.

MMI commands are used to:

- Set the position identifier of the Base Radio within the MTS 1.
- Set the number of active receivers (diversity) of the new Base Radio.

These operations are described in the following procedures. Use the MMI commands as outlined in the “MTS MMI Commands” manual for detailed information on using the MMI commands

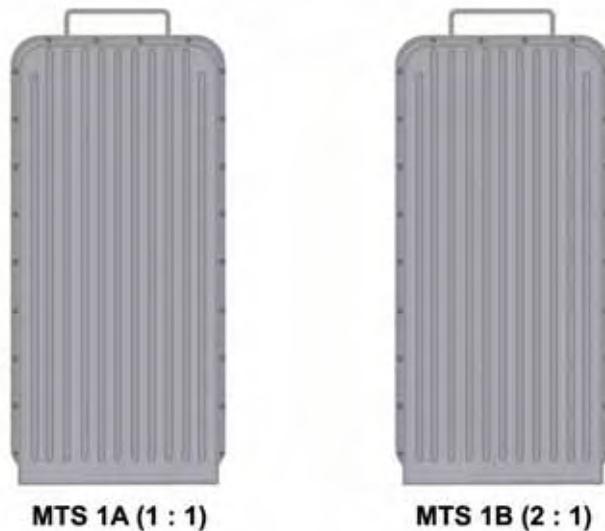
MTS 1 - Setting and Accessing Base Radio Position

Motorola recommends the following Cabinet ID and Position ID for MTS 1 configurations:

- Single MTS 1: 1 : 1
- Dual MTS 1: 2 : 1

Figure 13-5 Single MTS 1 Configuration



Figure 13-6 Dual MTS 1 Configuration

Setting and Accessing Base Radio Position Using Test Application

In order to configure BR cabinet id in the Test Application, use the following command at the command prompt:

```
ci -oplatform -c<n>
```

where **<n>** is a number between 1 and 8 corresponding to the cabinet id of the Base Radio.



NOTE

For MTS 1 in single mode as well as for MTS 1A in dual mode it is recommended to use Cabinet ID 1. For MTS 1B in dual mode it is recommended to use Cabinet ID 2.

In order to configure BR position id in the Test Application, use the following command at the command prompt:

```
pi -oplatform -p<n>
```

where **<p>** is a number between 1 and 8 corresponding to the position id of the Base Radio.



NOTE

For MTS 1 in both single and dual mode, it is recommended to use Position ID 1.

Setting and Accessing Base Radio Position Using Boot1

The **spw br_id "cabinet:X position:Y"** command programs the position number of where a Base Radio is mounted within a selected cabinet.

To get current BR Position ID and BR Cabinet ID by using BRC Boot1:

```
boot1>
```

```
spr br_id
"br_id="cabinet:1 position:1
```



NOTE

For MTS 1 in single mode as well as for MTS 1A in dual mode it is recommended to use Cabinet ID 1. For MTS 1B in dual mode it is recommended to use Cabinet ID 2.

To set BR Position ID for MTS 1 in single mode by using BRC Boot1, follow the example below:

```
boot1>
spw br_id "cabinet:1 position:1"
```

To set BR Position ID for MTS 1 in dual mode by using BRC Boot1, follow the example below:

```
boot1>
spw br_id "cabinet:2 position:1"
```

MTS 1 - Setting Base Radio IP

To get at read-out of current IP configuration of the Base radios using Boot1:

```
boot1> spr inet/if/eth0
boot1> spr inet/if/eth1
```



SUGGESTION

Note down the Ethernet configuration displayed for later use.

To configure the IP address of the Base Radio in the Test Application, use one of the following commands:

- `cpp -olan1 -i<IP>`
- `cpp -olan2 -i<IP>`



IMPORTANT

It is **not** allowed to change the original MAC addresses of the Base Radio.



NOTE

The <IP> in commands above is the new IP address (for example `10.0.253.11`)

To change and update IP configuration of the Base radio(s) by using Boot1:

```
boot1> spw inet/if/eth0 "dhcp:no addr:10.0.253.[XY] mask:255.255.255.0
dev_name:FCCETH dev_unit:1 ethaddr: yy:yy:yy:yy:yy:yy mtu:1500"
where [X = Cabinet number; Y = Position number] and yy:yy:yy:yy:yy:yy is the
MAC or Ethernet address of eth0.
```



NOTE

In the command line above, there is **one** space between the `ethaddr:` and `yy:yy:yy:yy:yy:yy`.

To change and update IP configuration of the Base radio(s) by using Boot1:
 boot1> **spw inet/if/eth1 "dhcp:no addr:10.0.254.[XY] mask:255.255.255.0
 dev_name:FCETH dev_unit:2 ethaddr: yy:yy:yy:yy:yy:yy mtu:1500"**
 where [X = Cabinet number; Y = Position number] and yy:yy:yy:yy:yy:yy is the
 MAC or Ethernet address of eth1.



NOTE

In the command line above, there is **one** space between the **ethaddr:**
 and **yy:yy:yy:yy:yy:yy**.

MTS 1 - Base Radio Receiver Configuration

The procedure below requires a remote telnet connection to the MTS, typically from an NMT via TESS. The commands to check and change the BR parameters require the use of BRC Application MMI.

Procedure 13-11 MTS 1 - How to Login to the Base Radio

1	Using TESS, select Connection .
2	Select Connect Direct .
3	At the command prompt, login using any username and the password motorola .

Procedure 13-12 How to Verify Base Radio Parameters

1	Log in to the Base Radio in application mode.
2	Type fcv -opa1 -pdekey_limit and press Enter . Result: The correct setting should be 6.
3	Type fcv -orxch1 -prx_dc_inj_us1 and press Enter . Result: The correct setting should be 2.5.
4	Type fcv -orxch1 -prx_dc_inj_ls1 and press Enter . Result: The correct setting should be 0.
5	Type fcv -orxch1 -pad1_scaling6 and press Enter . Result: The correct setting should be 28.9.
6	Type fcv -orxch1 -prx_fru_config and press Enter . Result: The setting will depend on the receiver diversity required for the site.

MTS 1 - Loading Ki's Into MTS

Process 13-4 MTS 1 - Loading Ki's Into MTS

1	Refresh Ki's. See " MTS 1 - Refreshing Ki's for the MTS " on page 13-26.
2	Connect KVL to the AuC. See " MTS 1 - Connecting KVL to the AuC " on page 13-26.
3	Download Ki's from AuC to KVL. Use local or remote connection. See: <ul style="list-style-type: none"> • "MTS 1 - Downloading Ki's from the AuC to KVL (Locally)" on page 13-27. • "MTS 1 - Downloading Ki's from the AuC to KVL (Remotely Using GSM)" on page 13-27.
4	Check the Inventory in KVL. See " MTS 1 - Checking the Inventory in KVL ".
5	Download Ki's from KVL to Site Controller/BRC. See " MTS 1 - Downloading Ki's from KVL to the Site Controller/BRC " on page 13-28.
6	Upload site receipts (locally or remotely). See <ul style="list-style-type: none"> • "MTS 1 - Uploading the Site Receipts (Locally)" on page 13-29 • "MTS 1 - Uploading the Site Receipts (Remotely using GSM)" on page 13-30

MTS 1 - Refreshing Ki's for the MTS

Procedure 13-13 MTS 1 - How to Refresh Ki's for the MTS

1	On AuC open AuC Client and select Devices tab.
2	Find the relevant zone and site, select to highlight it. This shows that the CCK, AuC and Zone KEK as not current.
3	Right-click the site and select Refresh Ki . Result: The following message box appears:Operator must now upload the Ki to a KVL and then proceed to refresh site controller 1 and 2 for this site. Subsequently ACK information...
4	Click OK .
5	Continue to " MTS 1 - Connecting KVL to the AuC " on page 13-26 to connect KVL to AuC.

MTS 1 - Connecting KVL to the AuC

Procedure 13-14 MTS 1 - How to Connect KVL to the AuC

1	Verify that the AuC and KVL both have the correct baud rate setting. When connecting either locally or remotely ensure that it is set for 19200 . When connecting remotely the GSM cell phone will only negotiate at 9600 but the KVL will auto negotiate the link speed.
2	Check the baud rate of the KVL login to the KVL, scroll until CONFIG is displayed on the screen. Select CONFIG then scroll until BAUDR is displayed. Select BAUDR and change to 19200 .


Procedure 13-14 MTS 1 - How to Connect KVL to the AuC (Continued)

3	<p>If this is the first time the KVL has been connected to a Zone then CLEAR LIST in the KVL to ensure that there will be no cross contamination of Zone receipts and that the receipt list is empty and therefore capable of receiving more Ki's:</p> <ul style="list-style-type: none"> • Log into the KVL at admin level. • Select LIST from the display and then CLEAR. • You are prompted for verification.
4	Once the LIST is cleared you can connect the KVL to the AuC using either local or remote connectivity.
5	<p>Depending on method you want to use, continue to:</p> <ul style="list-style-type: none"> • "MTS 1 - Downloading Ki's from the AuC to KVL (Locally)" on page 13-27 • "MTS 1 - Downloading Ki's from the AuC to KVL (Remotely Using GSM)" on page 13-27

MTS 1 - Downloading Ki's from the AuC to KVL (Locally)**Procedure 13-15** MTS 1 - How to Download Locally Ki's from the AuC to KVL

1	On the AuC Client, select SYSTEM > PREFERENCES > PORTSETTINGS and then verify the port configurations are set to local and 19200.
2	Using a null modem cable from the AuC COM port 1 to the KVL device select Au/Prc from the KVL main menu, then DIRECT , then RS232 .
3	<p>The AuC event log will display successful connection from the KVL before allowing the upload/download process to start.</p> <p>Result: The KVL will collect the Ki's from the AuC. Allow approximately one minute for the process to complete.</p>
4	Upon completion the AuC event log will display a success message and the KVL will also acknowledge successful download by emitting an alternating hi/low tone and displaying message Download Completed Successfully..
5	Press OK on KVL.
6	Continue to "MTS 1 - Checking the Inventory in KVL" on page 13-28.

MTS 1 - Downloading Ki's from the AuC to KVL (Remotely Using GSM)**Procedure 13-16** MTS 1 - How to Download Ki's from the AuC to KVL (Remotely using GSM)

1	Contact the on site switch engineer and verify that the AuC is set for remote access.
	<div style="display: flex; align-items: center;">  <div style="background-color: #00AEEF; color: white; padding: 5px; margin-left: 10px;">NOTE</div> </div> <p>This is carried out by going to the AuC Client select SYSTEM > SETTINGS and then verify the port configurations are set to MODEM and 9600.</p>

Procedure 13-16 MTS 1 - How to Download Ki's from the AuC to KVL (Remotely using GSM)
(Continued)

2	Connect GSM to KVL through modified adapter (Motorola phones only).
3	Contact the switch site and verify the telephone number needed to access the AuC.
4	On the KVL select Au/Prc from the main menu, then MODEM , then RS232 .
5	At this point there will be a telephone number displayed. Edit this number as appropriate for the Cluster Site you require, once the number is correct select ENTER and then DIAL .
6	If there is someone at the switch site then they can verify that the KVL connects to the AuC correctly by monitoring the event log.
7	The KVL will collect the Ki's from the AuC. The time taken will depend on the number of sites assigned to the Zone and can take up to 3 minutes for a full zone.
8	Upon completion the AuC event log will display a success message and the KVL will also acknowledge successful download by emitting an alternating hi/low tone. The call on the cell phone will be dropped before this success tone is emitted.
9	Continue to "MTS 1 - Checking the Inventory in KVL" on page 13-28.

MTS 1 - Checking the Inventory in KVL

Procedure 13-17 MTS 1 - How to Check the Inventory in KVL to Ensure Correct Information is Downloaded

1	On KVL select LIST , then VIEW . This information will show the sites than need Ki to be uploaded.
2	If connecting the KVL locally to the AuC then disconnect and travel to site.
3	If connecting remotely to AuC then once the call has been dropped and the KVL displays a successful download disconnect the KVL from the GSM.
4	Continue to "MTS 1 - Downloading Ki's from KVL to the Site Controller/BRC" on page 13-28.

MTS 1 - Downloading Ki's from KVL to the Site Controller/BRC





NOTE

Remember to Ki redundant Site Controller as well as active. Only new/replaced BR should be Ki'd.

Procedure 13-18 MTS 1 - How to Download Ki's from KVL to Site Controller/BRC

1	Connect to the Site Controller and log in as normal (Field).
2	Switch on the KVL.
3	Verify the BAUDR is set to 19200 by scrolling along to CONFIG > BAUDR and ensure it is set to 19200.
4	On the SC type the command KVL and press Enter key.

Procedure 13-18 MTS 1 - How to Download Ki's from KVL to Site Controller/BRC (Continued)

5	 <div style="background-color: #00AEEF; color: white; padding: 2px 5px; display: inline-block; margin-left: 10px;">NOTE</div> <p style="margin-left: 40px;">Both: step 5 and step 6 have to be completed within 60 seconds. Disconnect the PC from the Site Controller and connect the KVL to the Site Controller.</p>
6	On the KVL, select UPDATE > SwMI > Ki .
7	The KVL will display UPDATING TARGET UNIT, followed by UPDATE WAS SUCCESSFULLY COMPLETED.
8	If the KVL displays TARGET UPDATE FAILURE then this could be due to the site ID being different to that in the KVL, incorrect BAUDR settings or cable problems (check all).
9	Disconnect the KVL and connect the serial cable to the PC.
10	Remove the lead from the Site Controller and plug into the new BRC.
11	Log in to the new BRC as Motorola and type the command KVL .
12	Within 60 seconds disconnect the test lead from the PC and plug into the KVL device and repeat step 6 through step 9 .
13	Upon completion of downloading Ki's to new BRC's, reconnect PC to the Site Controller and enter reset to reset the Site Controller.
14	Check if the MTS is in correct security class. Login to the Site Controller, and then enter status sec and status keys commands.
	 <div style="background-color: #00AEEF; color: white; padding: 2px 5px; display: inline-block; margin-left: 10px;">NOTE</div> <p style="margin-left: 40px;">If a base station is not supporting the correct security class (2 or 3) reset the Site Controller and repeat this step.</p>
15	Check MTS returns to Wide Area Trunking and that no alarms are active.
16	Upload the site receipts. Depending on method you want to use, continue to: <ul style="list-style-type: none"> • "MTS 1 - Uploading the Site Receipts (Locally)" on page 13-29 • "MTS 1 - Uploading the Site Receipts (Remotely using GSM)" on page 13-30

MTS 1 - Uploading the Site Receipts (Locally)

Procedure 13-19 MTS 1 - How to Upload the Site Receipts (Locally)

1	If no GSM connectivity is available then disconnect equipment and travel to switch site.
2	Using a null modem cable from the AuC COM port 1 to the KVL device select Au/Prc from the KVL main menu, then DIRECT , then RS232 . Result: The AuC event log will display successful connection from the KVL before allowing the upload/download process to start.
3	The KVL will both send the Site Ki receipts to the AuC automatically.
4	Allow approximately one minute for the process to complete.

Procedure 13-19 MTS 1 - How to Upload the Site Receipts (Locally) (Continued)

5	Upon completion the AuC event log will display a success message and the KVL will also acknowledge successful download by emitting an alternating hi/low tone and displaying message Download Successfully Completed..
6	Press OK button on KVL.
7	Check on KVL that site is no longer listed by selecting List and then View .
8	Check on AuC that icon for site is now green and no errors are reported in the event window for the site.

MTS 1 - Uploading the Site Receipts (Remotely using GSM)**Procedure 13-20** MTS 1 - How to Upload the Site Receipts (Remotely Using GSM)

1	If GSM connectivity is available then log in to KVL device.
2	Connect GSM to KVL through modified adapter (Motorola phones only).
3	On the KVL select Au/PrC from the main menu, then MODEM , then RS232 .
4	At this point there will be a telephone number displayed. Edit this number as appropriate for the Cluster Site you require, once the number is correct select ENTER and then DIAL .
5	If there is someone at the switch site then they can verify that the KVL connects to the AuC correctly by monitoring the event log.
6	Allow approximately one minute for the process to complete.
7	Upon completion the AuC event log will display a success message and the KVL will also acknowledge successful download by emitting an alternating hi/low tone. The call on the cell phone will be dropped before this success tone is emitted.
8	Check on AuC that icon for site is now green and no errors are reported in the event window for the site.
9	Check on KVL that site is no longer listed by selecting List and then View .

MTS 1 - Post-restoration Checks

MTS 1 - Base Radio Post-Restoration Checks

Process 13-5 MTS 1 - Checking Base Radio

1	Verify Base Radio Software. See "MTS 1 - Base Radio Software Revision Verification" on page 13-31. If applicable, upgrade to the latest Test Application software. See "MTS 1 Base Radio Test Application Software Upgrade (optional)" on page 13-32.
2	Verify Base Radio transmitter. See "MTS 1 - Base Radio Transmitter Verification" on page 13-33.
3	View Base Radio Transmit Spectrum. See "MTS 1 - Viewing Base Radio Transmit Spectrum (optional)".
4	Verify Base Radio receiver. See "MTS 1 - Base Radio Receiver Verification Process" on page 13-36.
5	Check if any alarms are reported. See "MTS 1 - Displaying Alarms" on page 13-38.

MTS 1 - Base Radio Software Revision Verification

Procedure 13-21 MTS 1 - How to Verify the Base Radio Software Revision

1	Connect one end of the console cable to the service computer.
2	Connect the other end of the console cable to the BR Service Access port (B), located at the bottom of MTS 1.
3	In normal application mode, login and enter command ver - to display Application Software version, Boot0 version and Boot1 version.
4	Enter the test application mode: <ol style="list-style-type: none"> 1. Reset the BR. When resetting the Base Radio, press the ESC key when prompted to interrupt the start up sequence. 2. Type testapp and press Enter. 3. Log on by typing rlogin -ufactory and press Enter. When prompted, enter factory for password.

Procedure 13-21 MTS 1 - How to Verify the Base Radio Software Revision (Continued)

5	<p>Collect revision numbers from the BR by typing: fv -oplatform. Note down the test application software version and then please refer to the System Software Release Note for correct software version number.</p> <div style="display: flex; align-items: center;"> <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p>If software version number does not match, perform "MTS 1 Base Radio Test Application Software Upgrade (optional)" on page 13-32 after completion of this procedure.</p>
6	<p>To exit BR Test Application mode, reset the BR, by using the following command from the MMI:reset -oplatform</p>

MTS 1 Base Radio Test Application Software Upgrade (optional)



IMPORTANT

It is important to make sure that this procedure never is used to downgrade the Test Application.

Procedure 13-22 MTS 1 - How to Upgrade to Latest Test Application Software

1	Point 3COM server to the folder containing the BRC Test App software.
2	Connect a RJ45 cable to the serial port of the PC and the BR Service port (B) at the bottom of MTS 1.
3	Connect a crossed Ethernet cable to the PC and the L1 port at the bottom of MTS 1.
4	<p>Reset BR and enter boot1 mode.</p> <div style="display: flex; align-items: center;"> <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p style="text-align: center;">Do not enter testapp mode from here</p>
5	Type ferase 0x10100000 4M and press Enter .
6	When prompt returns type ifconfig eth0 address 10.0.253.<CAB><POS> and press Enter .
7	<p>When prompt returns type finstall testapp /tftp/10.0.253.100/R064020ROM.srec and press Enter.</p> <div style="display: flex; align-items: center;"> <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p style="text-align: center;">R064020ROM.srec in command above is used as an example. Please indicate latest released file when entering command.</p> <p>Result: BRC will reset itself at the end</p>
8	Enter boot1 mode and then enter test app mode.



Procedure 13-22 MTS 1 - How to Upgrade to Latest Test Application Software (Continued)

9	Login as factory user in test app mode, type fv -oplatform and press Enter . On the last line of the output check that the version is R064020 or which ever version was upgraded to in step 7 .
10	Reset the BR by typing reset -oplatform and press Enter .
11	Disconnect the service cable from the BR Service Port (B) and reconnect the Ethernet cable to LAN 1.
12	Rerun to Procedure 13-21 , "MTS 1 - How to Verify the Base Radio Software Revision," on page 13-31 to verify that the latest versions have been installed correctly.

MTS 1 - Base Radio Transmitter Verification**NOTE**

The following procedure requires the MTS 1 to be out of service. Unless it is already out of service, Motorola recommends performing this procedure during off-peak hours. This minimizes or eliminates disruption of service to system users.

Procedure 13-23 MTS 1 - How to Verify Base Radio Transmitter

1	Connect the Service Cable between the service terminal and the Service port. Log in to the Base Radio.
	 NOTE Contact your local Motorola representative or Technical Support to obtain password.
2	At the prompt, type power -otxch1 -a0 . This command dekeys the transmitter.
3	 NOTE The following commands, keys the transmitter. Make sure that transmission only occurs on licensed frequencies or into an RF dummy load. To ask for the current transmitter frequency, type: freq -otxch1 . To change the transmit frequency, type: vco -otx_all -fXXX.XXXX . For example, to set the transmit frequency to 410.0125 MHz, type: vco -otx_all -f410.0125 . To key the transmitter with a T2 type channel type these three commands: <ul style="list-style-type: none"> • enable -otx_all -son • ptm -orx_all -mTx_T2 -s15 -tNo_Trigger -d0 • power -otxch1 -aXX These commands set the transmitter to a specified power (in Watts) without altering any programmed parameters. For example, to key the Power Amplifier to 36W, type power -otxch1 -a36 .

Procedure 13-23 MTS 1 - How to Verify Base Radio Transmitter (Continued)



NOTE

To transmit a TCH 7.2 channel type, type: **ptm -orx_all -mTCH_72 -s15 -tNo_Trigger -d0.**



NOTE

The measurement equipment setting for MCC, MNC and BCC:0.
Burst Type: **NCDB.**

4	At the prompt, type these three commands: <ul style="list-style-type: none"> • meter -opa1 -mpa_pwr_fwd. This command returns the current value of forward power from the RF Power Amplifier. • At the prompt, type: meter -opa1 -mpa_pwr_rev. This command returns the current value of reflected power from the RF Power Amplifier. • At the prompt, type: meter -opa1 -mpa_vswr. This command calculates the current Voltage Standing Wave Ratio (VSWR) from the RF Power Amplifier.
5	At the prompt, type: alarms -ofault_hdlr. This command returns all active alarms of the Base Radio.
6	At the prompt, type: power -otxch1 -a0. This command stops all transmitter activity.
7	Connect a test cable to the TX connector at the bottom of MTS 1. Connect a 40 dB attenuator to the other end of the cable.
8	From the attenuator, connect a cable to the RF IN/OUT connector on the TETRA Analyzer.
9	Switch off the TETRA Analyzer. Connect the Rubidium Frequency Standard to a 10 dB attenuator. Switch on the TETRA Analyzer.
10	Connect the other end of 10 dB attenuator to the 10 MHz REFERENCE OSCILLATOR IN/OUT connector on TETRA Analyzer.
11	Set the TETRA Analyzer to the EXT REF mode. Set TETRA Analyzer to ON and to the proper channel type.

Table 13-10 Transmitter Verification Specifications

Parameter		Lower Side Limit	Typical	Upper Side Limit
MTS 1 low power, RMS power out on Antenna port	W	10	13	
	dbm	40	41	
EVM, RMS average	%			10
EVM, Peak confidence	%			30
Carrier feed through / Residual carrier	%			5
TX frequency error	Hz	-80		80

MTS 1 - Viewing Base Radio Transmit Spectrum (optional)

Procedure 13-24 MTS 1 - How to View Base Radio Transmit Spectrum (optional)

- 1 Key the transmitter and set the transmitter output to maximum rated output. At the Test Application prompt, type: **power -otxch1 -a35**



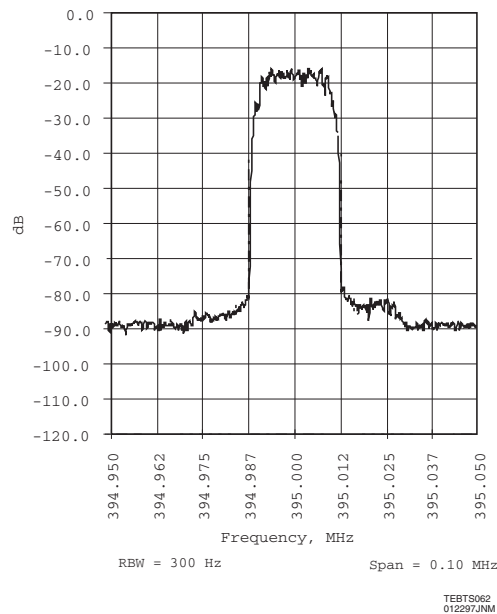
CAUTION

Make sure that transmission only occurs on licensed frequencies or into a dummy load.

- 2 View the transmit spectrum on the Spectrum Analyzer.

Result: Figure 13-7 shows an example of Spectrum Analyzer output.

Figure 13-7 MTS - Spectrum Analyzer Display of Transmitted Signal



Procedure 13-24 MTS 1 - How to View Base Radio Transmit Spectrum (optional) (Continued)

3	At the prompt, type: <code>power -otxch1 -a0</code> This command stops RF transmission.
4	Repeat this procedure for each base radio.

MTS 1 - Base Radio Receiver Verification Process

Process 13-6 MTS 1 - Verifying Base Radio Receiver

1	Setup test equipment for Base Radio receiver verification. See " MTS 1 - Equipment Setup for Base Radio Receiver Verification ".
2	Test Base Radio receiver. See " MTS 1 - Base Radio Receiver Verification ".




MTS 1 - Equipment Setup for Base Radio Receiver Verification

Procedure 13-25 MTS 1 - How to Set Up Equipment for Receiver Verification

1	Switch the MTS 1 OFF.
2	Connect one end of the Service cable to the service computer.
3	Connect the other end of the Service cable to the BR Service Access port (B) located at the bottom of MTS 1.
4	Connect a test cable to the TX and RX connectors at the bottom of MTS 1..
5	Connect the other end of the test cable to the RF output on a TETRA Signal Generator.
6	Connect Frequency Standard 10 MHz OUTPUT to a 10 dB attenuator.
7	Connect other end of the attenuator to the 10 MHz REFERENCE OSCILLATOR IN/OUTconnector on the TETRA Signal Generator.
8	Connect the Trigger Output connector on the Service Port Cable to the External Trigger Input on the TETRA Signal Generator.
9	Set the TETRA Signal Generator to EXT REF mode.
10	Set TETRA Signal Generator to ON.
11	Set the TETRA Signal Generator to the receive frequency of the Base Radio under test. (Allreceivers within a single Base Radio have the same receive frequency.)
12	Configure the generator for a TCH 7.2 Tetra channel.
13	Set the TETRA Signal Generator to generate the test signal at an output level of -110 dBm.

MTS 1 - Base Radio Receiver Verification

Procedure 13-26 MTS 1 - How to Verify Base Radio Receiver

1	Switch ON the power of the MTS 1.
2	<p>Enter the Test Application mode and login.</p> <p> NOTE</p> <p>Contact your local Motorola representative or Technical Support to obtain password.</p>
3	<p>At the prompt, type: freq -orxch1. This command displays the receive frequency for the current Base Radio. Record the result.</p> <p> NOTE</p> <p>To set the receive frequency, use the command vco -orx_all -fXXX.XXXX. For example, to set the receive frequency to 401.0125MHz, type vco -orx_all -f401.0125.</p>
4	<p>Use following commands to change TX and RX frequency if necessary. If you read the frequency you want to use in the previous step, skip this step:</p> <ul style="list-style-type: none"> • freq -otx_all -f394.0125 • freq -orx_all -f384.0125
5	Type sgc -orx_all -son and press Enter to enable system gain alignment.
6	<p>At the prompt, type: ptm -orx_all -mTCH_72 -s15 -tMulti_Frame_Trigger -d-6.</p> <p>For Stabilock 4031/4032 use single slot only and delay 0:</p> <p>ptm -orx_all -mTCH_72 -s8 -tFrame_Trigger -d0</p> <p> NOTE</p> <p>It may be necessary to adjust the trigger delay set by the -d option.</p>
7	At the prompt, type: enable -orxch1 -dbr1 -son . This command enables the receiver branch under test and should enable br1, br2, or br3 respectively depending on the branches that you are testing.
8	Set the signal generator to generate a T1 signal and inject to the relevant antenna port.
9	<p>Type ppr -orxch1 -a1000 -r1 to analyze the received RF signal quality of the Base Radio. Record the results. Example readout is below with expected results/ specifications:</p> <pre>Receiver Number = 1 2 3 SGC Attenuation (dB) = 4 4 4 Sync Location(1/10 symb) = 50 42 27 Sync. Amplitude (dB) = -83 -94 -104 Total Bits/Msgs = 4320 4320 4320 Bits/Msgs in Error = 4 1965 1904 BER/MER (%) = 1.593 45.486 44.074 RSSI (dBm) = -117 -121 -131</pre> <p>BER value is below 4% and RSSI is within the acceptable range.</p>

Procedure 13-26 MTS 1 - How to Verify Base Radio Receiver (Continued)

10	Type <code>ppr -orxch1 -a1 -r200</code> to check for small peaks of interference. Record the results.
11	Repeat the two previous steps for all receiver branches.
12	Disconnect the equipment.
13	Repeat procedure for all remaining Base Radios.

MTS 1 - Displaying Alarms**Procedure 13-27** MTS 1 - How to Display Alarms

1	If necessary, reset the base radio to obtain the password prompt, or enter the configuration mode of the BR.
2	When prompted, type the proper password. After entering the correct password, the prompt is displayed on the service terminal.
3	<ul style="list-style-type: none"> • BR Application: Type <code>get alarms</code> This command displays all alarms for this Base Radio together with its current states (active/inactive). • BR Test Application: Type <code>alarms -ofault_hdlr</code> This command displays all the all active alarms on the Base Radio.



**NOTE**

When using Test Application, the fault management engine can be disabled. In such case **no** alarms will be visible.

- To display current FM state:
`dev> fme -ofault_hdlr`
- To enable FM:
`dev> fme -ofault_hdlr -son`
- To disable FM:
`dev> fme -ofault_hdlr -soff`

MTS 1 - Uploading Configuration Files





Procedure 13-30 MTS 1 - How to Upload Configuration File

1	<p>Start the Software Download (SWDL) Manager on the NM Client and select zone 1, right clicking the mouse and choosing the reserve option.</p> <p>Result: A list of the sites on that zone will be displayed in the right hand window.</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p>An analysis will start on all BTS sites in the cluster. This may take some time depending on the number of sites.</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p style="text-align: center;">Do not proceed until the Analysis is complete.</p>
2	Select zone 1 by ticking its corresponding Select box. This will automatically select all sites in the zone.
3	Press the Upload Configuration... button.
4	Select the configuration version, you want to upload; either the running configuration version or the alternative version and press the Next button.
5	<p>Type a name or description of the operation that is to be made in the Operation description text field and schedule the upload and press the Next button.</p> <p>Result: A Summary window appears.</p>
6	<p>Check that the information is correct and press the Finish button.</p> <p>Result: The upload is initiated. The operation can be monitored in the Download Manager pane and in the Status View pane. The configuration files are stored in: C:\Program Files\Motorola\Collector\backup\bts.</p>


MTS 1 - Upgrade

MTS 1 - Downloading the Application to the BTS/MTS Sites

Procedure 13-31 MTS 1 - How to Download the Application to the BTS/MTS Sites

1	<p>Insert the correct BTS/MTS CD (Clear, TEA-1, TEA-2, or TEA-3) into the CD-drive of the NM Client PC.</p>
2	<p>Start the Software Download (SWDL) Manager on the NM Client and select zone 1, right clicking the mouse and choosing the reserve option.</p> <p>Result: A list of the sites on that zone will be displayed in the right hand window.</p> <p> NOTE</p> <p>An analysis will start on all BTS sites in the cluster. This may take some time depending on the number of sites.</p> <p> NOTE</p> <p>Do not proceed until the Analysis is complete.</p> <p>Select zone 1 by ticking its corresponding Select box. This will automatically select all sites in the zone.</p> <p> IMPORTANT</p> <p>Ensure that any site not due to be upgraded is un-ticked.</p> <p> NOTE</p> <p>Only 4 transfers at once (to 4 BTSs) are supported from SWDL Manager.</p>
3	<p>Verify that no processes are ongoing in the Activity column for each BTS site.</p>
4	<p>Select Download to Sites button from bottom menu.</p> <p>Result: The Download splash screen will appear.</p>
5	<p>Select the Application Download.</p> <p>Result: The BTS application version will appear.</p>
6	<p>Highlight the correct version and click Next.</p>
7	<p>Enter a description for the task you want to carry out, select Now and click Next.</p> <p>Result: A window showing a summary of the operations selected in the previous steps appears.</p>

Procedure 13-31 MTS 1 - How to Download the Application to the BTS/MTS Sites (Continued)

8	<p>Verify that all operations are correct. If you made a mistake use the Prev button to go back and modify as required.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="background-color: #00AEEF; color: white; padding: 2px 5px; font-weight: bold; font-size: 0.8em;">NOTE</div> </div> <p style="text-align: center; margin-top: 10px;">This is the last opportunity to make any changes.</p>
9	<p>Click Finish.</p>

Procedure 13-32 MTS 1 - How to Verify the Application Download

1	<p>Check the ongoing process by clicking the Status View tab.</p>
2	<p>Select the operation you want to monitor and click on the Job View tab.</p>
3	<p>Select the BTS you want to monitor and click on the Transaction View tab.</p>
4	<p>When download is completed, move back to main tab and select View from the toolbar (second from left) and click Alternate Application Version.</p>
5	<p>Verify that the Alternate column shows correct BTS application version.</p>
6	<p>Check until all BTSs show the expected results.</p>
7	<p>If the download succeeded, then proceed with "MTS 1 - Updating BTS Configurations Using RCUT" on page 13-45.</p>
8	<p>If SWDL Manager operations are failing, then check the error message:</p> <ol style="list-style-type: none"> 1. In the SWDLM click the Status View tabbed pane 2. Double click on the failed operation 3. Double click on the failed job 4. Double click on the failed transaction
9	<p>If the error message is as follows, then the below modification should be applied to the SWDL Manager.</p> <pre>Transaction has failed. Possible reason: Target reports transfer incomplete - case: TFTP: Error, Timeout. Received error code: 9</pre>
10	<p>The SWDL Manager needs to be updated like this. Begin by closing the SWDL Manager.</p>
11	<p>Locate the applparams.cfg file in C:\Program Files\Motorola\PNM\DMNM-R17.XX.XX.XX\Network Mgmt\swdl</p>
12	<p>Ensure that the applparams.cfg file is not read only:</p> <ol style="list-style-type: none"> 1. Right click applparams.cfg file 2. Select Properties 3. Ensure that the Read-only check box is <i>not</i> marked 4. Click ok
13	<p>Open the applparams.cfg file in Notepad</p>
14	<p>Add the following line to applparams.cfg to the end of the file: TftpRetries = 250</p>
15	<p>Save applparams.cfg</p>

Procedure 13-32 MTS 1 - How to Verify the Application Download (Continued)

16	Start the SWDL Manager and retry the operation.
-----------	---

MTS 1 - Updating BTS Configurations Using RCUT



NOTE

This task will take up to 30 minutes to complete (5-10 minutes per site)



NOTE

Ensure that the NCT tool is not running on the NM Client as this will prevent the TFTP Server for the Software Download application to work.



IMPORTANT

This is only valid for systems with an Authentication Centre. For systems without authentication, skip the RCUT process and go straight to "[MTS 1 - Setting "Next" Flags on Customer Sites](#)" on page 13-48

Procedure 13-33 MTS 1 - How to Prepare the RCUT Tools



NOTE

A list of sites (upgrade list) that is referred by this procedure shall be provided / agreed with customer and must be available before this procedure is started and should not be changed between tasks described in this document.

1	Verify that zone 1 is still reserved in the SWDL Manager. If not, reserve it by highlighting zone 1, right clicking the mouse and choosing the reserve option. Result: A list of the sites on that zone will be displayed in the right hand window.
2	Ensure the correct BTS/MTS CD is still present in the CD-drive of the NM Client.
3	In the BTS software CD, locate file named R0632XX.txt (for EBTS PR3) or file R0642XX.txt (for MTS) under \swdl\tools\convert\PR3 or MTS. XX are two version-specific digits. Copy the correct file from the BTS software CD to the following directory:C:\Program Files\Motorola\Rcut\
4	If the directory Rcut does not exist, you must create it.

Procedure 13-33 MTS 1 - How to Prepare the RCUT Tools (Continued)

5	<p>Modify the copied file using Wordpad so that the last few lines look like below (everything above the dotted line must stay as it is). Ensure that the first column starts with oldEbtsZoneId. If there is an Authentication Center in the system, its IP address should be added.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="background-color: #800040; color: white; padding: 2px 5px; font-weight: bold;">IMPORTANT</div> </div> <p style="text-align: center; margin-top: 10px;">Only the two bold lines below can be left uncommented (without # sign in the beginning of the line) and the text is case sensitive.. All other lines must be commented. Failure to do so will cause the RCUT procedure to fail.</p> <pre style="font-family: monospace; font-size: 0.9em;"> ***** , , # , , # Start of upgrade data , , # , , # , , # PARAMETER DEFINITIONS (ONLY USE THE NAMES ABOVE) , , # , , oldEbtsZoneId,oldEbtsSiteId,swdIMgrTrapDestIpAddress,AuclpAddress # , , *,*,0,10.0.1.219 </pre>
6	<p>Save the changes.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p style="margin-top: 10px;">Do not change the filename. If a warning appears stating that the filename already exists, you must rename the original file copied from the BTS software CD to something else.</p>

NOTE

The version label will be applied to every converted configuration file. Individual filenames will not be kept. You shall download configuration to one site at a time if you wish to maintain individual filenames. In this case ensure that all other sites are unchecked.




IMPORTANT

Verify that the currently selected BTSs are the BTSs which should be worked on.

Procedure 13-34 MTS 1 - How to Perform RCUT and Download Configuration

- | | |
|----------|--|
| 1 | <p>Verify that zone 1 is still reserved in the SWDL Manager. If not, reserve it by highlighting zone 1, right clicking the mouse and choosing the reserve option.</p> <p>Result: A list of the sites on that zone will be displayed in the right hand window</p> |
| 2 | <p>Verify that SWDL Manager is enabled and sites from upgrade list are selected. If so you may proceed to step 6, otherwise perform steps below.</p> |
| 3 | <p>Ensure the correct BTS/MTS CD is still present in the CD-drive of the NM Client.</p> |

Procedure 13-34 MTS 1 - How to Perform RCUT and Download Configuration (Continued)

4	<p>Start the SWDL Manager and reserve zone 1, right clicking the mouse and choosing the reserve option.</p> <p>Result: A list of the sites on that zone will be displayed in the right hand window</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold; font-size: 0.9em;">NOTE</div> </div> <p>An analysis will start on all BTS sites in the cluster. This may take some time depending on the number of sites. Do not proceed until the Analysis is complete.</p>
5	Select zone 1 by left-clicking on it and put ticks in the Select box for sites from upgrade list.
6	Verify that no processes are ongoing in the Activity column for each BTS site
7	<p>Select Download to Sites button from bottom menu.</p> <p>Result: The Download Splash Screen appears.</p>
8	Select the Configuration Download . Make sure the Upload from running, modify, download to alternate option is chosen by default. If this is not the case then select this option.
9	Ensure that Save modified configuration files locally is selected.
10	Ensure that Use downloaded versions after reset is <i>not</i> selected.
11	<p>Enter a version label (for example R3).</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold; font-size: 0.9em;">NOTE</div> </div> <p>In the window Select Configuration Modification Script, the current software version will be read from the CD and displayed. Press Next.</p>
12	In the Description and Start time enter a description and click Now . Press Next .
13	<p>Confirm the settings in the Summary window.</p> <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold; font-size: 0.9em;">NOTE</div> </div> <p>This is the last opportunity to go back and make changes. Click Finish.</p>

Procedure 13-35 MTS 1 - How to Monitor the Download Progress

1	Monitor progress in the SWDL Manager. Select the Status View tab, then Operation View tab. Double click the running task to monitor the progress.
2	From the toolbar, select View (second from left) and click Alternate Application version.
3	Back in the main window , verify that the column BTS application Version shows the correct version in the Alternate column.
4	When task is complete, remove the CD from the CD-drive.

MTS 1 - Setting "Next" Flags on Customer Sites

This is a preparation step before site resets.



IMPORTANT

End users in area served by this particular BTS will be out of service for about 5 minutes.

Procedure 13-36 MTS 1 - How to set Flags on all Selected BTS/MTS Sites





NOTE

Any accidental site reset after the flags are altered will cause site to boot using the new software application and configuration.




IMPORTANT

Verify that the currently selected BTSs are the BTSs which should be worked on.

1	If the SWDL manager is not already running, repeat Procedure 13-38, "MTS 1 - How to Reset BTS/MTS Sites using the SWDL Method," on page 13-49.
2	Verify that each selected site displays the new software application and configuration in Alternate Bank loaded earlier.
3	Click on the Set NextBank/Reset... button from bottom menu.
4	Select the BTS Application version to use after reset button. This will enable the two buttons in the panel. Select the button next to the new SW version (alternate).
5	Select the BTS Configuration version to use after reset button. This will enable the two buttons in the panel. Select the button next to the new configuration you want to run after the upgrade. <div style="margin-top: 10px;">  <p>IMPORTANT</p> <p>For systems without Authentication DO NOT select the BTS Configuration version to use after reset button. Only step 4 should be performed.</p>  <p>NOTE</p> <p>Do not select Reset.</p> </div>
6	Click Next .
7	Enter the task label (for example: Upgrade) and select Now . Then click Next . Result: A window showing the summary of the operations selected in the previous steps appears.

Procedure 13-36 MTS 1 - How to set Flags on all Selected BTS/MTS Sites (Continued)

8	Verify if all operations are correct. If you made a mistake use the Prev button to go back and modify as required. Press Next button.
	NOTE
	This is the last opportunity to change anything. Click Finish .
9	To monitor progress in the SWDL Manager, select the Status View window, Operation View , then double click on the running Task to monitor progress.
10	When task is complete, return to Download Manager .

Procedure 13-37 MTS 1 - How to Verify that Flags are Set on all Selected BTS/MTS Sites



Verify that the currently selected BTSs are the BTSs which should be worked on.

1	From the toolbar, select View and click Next Application Version .
2	If it applies, from the toolbar, select View and click Next Configuration Version .
3	Back in the main window verify that the column BTS application Version shows the correct version in the Next column.
4	Check until all BTSs show the expected results.

MTS 1 - Sites Reset

There are two methods to reset sites. SWDL is the preferred one, as it is more convenient when resetting multiple sites. [Procedure 13-40, "MTS 1 - How to Verify that BTS Sites Have Been Reset," on page 13-51](#), describes verification method using ZoneWatch.

During this task customer sites will be reset in order to bring the upgraded application and configuration up.




End users in area served by this particular BTS will be out of service for about 5 minutes.

Procedure 13-38 MTS 1 - How to Reset BTS/MTS Sites using the SWDL Method

1	From the NM client, launch the SWDL manager .
2	Select your cluster and right click, then select Reserve .
3	Tick to select your reserved cluster. In the field Cluster View select the field All BTSs . Result: All BTSs in will be shown.
4	Verify that no processes are ongoing for any BTS in the Activity column.

Procedure 13-38 MTS 1 - How to Reset BTS/MTS Sites using the SWDL Method (Continued)

5	In the Select column, select all BTSs from the list. Tick/un-tick as required.
6	Verify that the selected BTSs match the reset table before proceeding.
7	Click on the Set Next Bank/Reset... button.
8	Tick the box next to Reset , then click Next .
9	Enter a description for the task you want to carry out and choose a time or select Now , then click Next . Result: A window showing a summary of the operations selected in the previous steps appears.
10	Verify if all operations are correct. If you made a mistake use the Prev button to go back and modify as required. In the field Affected BTSs , verify that the number of BTSs matches the number in the list agreed with the customer. <div style="display: flex; align-items: center;">  <div style="background-color: #00a0e3; color: white; padding: 2px 5px; font-weight: bold;">NOTE</div> </div> <p style="margin-left: 40px;">This is the last opportunity to change anything! Click on Finish.</p>
11	To check the ongoing process, click on the Status View tab.
12	Select the operation you want to monitor and click on the tab Job View .
13	Select the BTS you want to monitor and click on the tab Transaction View .
14	Once the resets are initiated, click on the Download Manager tab.
15	The columns BTS Application version and BTS Configuration version should both report Not responding in all columns as the BTSs are resetting and have no connection to the network.
16	Monitor the window and make sure that all sites come back. Once the network connectivity is restored, the fields will populate with the appropriate information.
17	Verify that the Running columns show the new software application and the configuration as expected.
18	Once all selected BTSs are in Wide Area Trunking again, proceed to the next group of BTSs to be reset.

Procedure 13-39 MTS 1 - How to Reset BTS/MTS Sites using the Zone Manager Method



Once the flags have been set, the Sites will require a reset to take the new Software and/or Configuration; this can be done from the Manager.

1	From the NM Client launch the Zone Configuration Manager .
2	Select EBTS Site or MTS Site from the left window.
3	In the right window select the BTS, right-click and select Diagnostics .
4	Select Site Reset .
5	Click Apply .

Procedure 13-40 MTS 1 - How to Verify that BTS Sites Have Been Reset

1	From the NM Client launch the Zone Watch and Software Download applications.
2	Monitor Zone Watch to confirm that each BTS transitions back into Wide Area Trunking.
3	Monitor the SWDL Manager window and make sure that all sites come back. Once the network connectivity is restored, the fields will populate with the appropriate information.
4	Verify that the Running columns show the new software application and the configuration as expected.

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Accessories and Spare Parts

This appendix covers the following accessories and spare parts:

- "Sealing Box"
- "Ground Box"
- "Solar Shield"
- "Surge Arrestors for Site Link"

Table A-1 MTS 1 - Accessories and Spare Parts

Part number	Description
GMKN4764A	MTS 1 RF Interconnect kit
GMKN4765A	MTS 1 COM Interconnect kit
GMLN5086A	Sealing Box
GMLN5087A	Junction Panel DIN Rail Mounted (for Ground Box)
GMLN5093A	Secure Bolt Kit (for Mounting Kit)
GMLN5094A	Cable Gland EMC PG11 RJ45 Kit
GMLN5095A	Cable Gland EMC PG11 RGPS Kit
GMLN5096A	Blind Plug PG11 Kit
GMHN4652A	Ground Box (Wall Mounted)
GMHN4651A	Ground Box (Standard)
GMHN4654A	Solar Shield
WALN5075A	Door Alarm Kit

Sealing Box

Figure A-1 MTS 1 Cable Connection Seal



The optional MTS 1 Sealing Box is designed to work as a cable seal for outdoor use for data cable connections at the bottom of the MTS 1.

It is mounted to the bottom of the MTS 1 with four screws and is equipped with a Vent to prevent moisture to be built up inside.

The Sealing box is not needed for indoor clean environments but it can still be used in such environment to provide increased protection for accidental disconnection if the access to the installation is less restricted.

Sealing Box References

- "Sealing Box Installation (Optional)" on page 4-9

Ground Box

The Ground Box is optional and is used for terminal equipment, modems, etc. It can be bought from Motorola or manufactured by the customer themselves.



NOTE

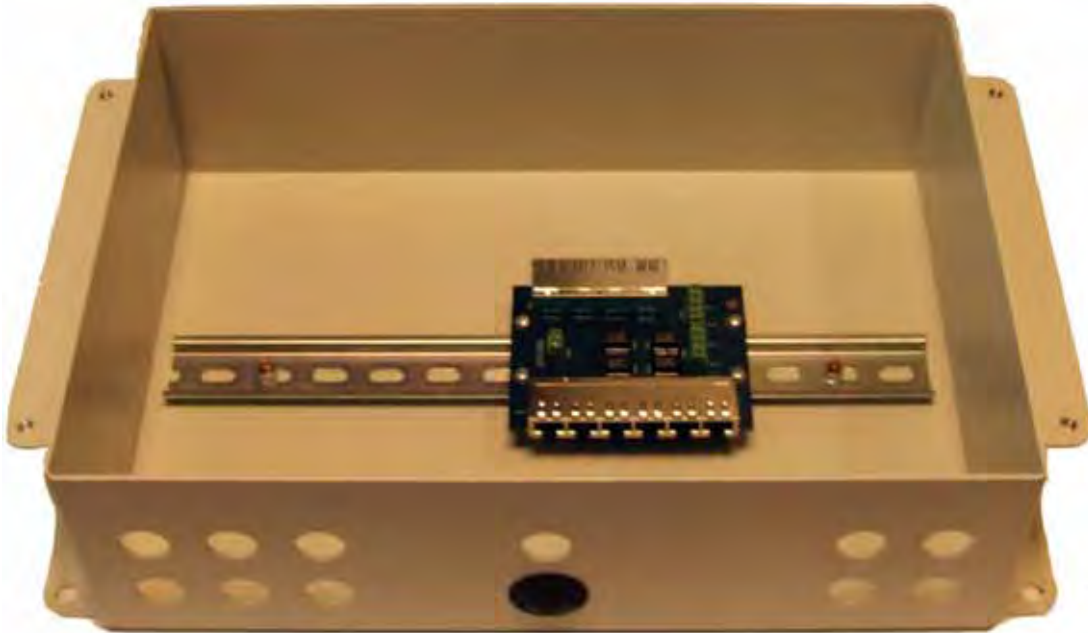
The Ground Boxes described in this manual are the Ground Boxes orderable from Motorola. Motorola is not liable for customer made Ground Boxes.

There are two types of Ground Boxes provided by Motorola:

- GMHN4652A - Standard Ground Box
- GMHN4651A - Wall Mounted Ground Box

Figure A-2 Standard Ground Box from Motorola with Junction Panel



Figure A-3 Wall Mounted Ground Box from Motorola with Junction Panel

The following items are included in a Ground Box ordered from Motorola:

- Ground Box enclosure
- DIN rail with 2 screws (pre-mounted in the Wall Mounted Ground Box)

Optional Ground Box accessories recommended by Motorola:

- Surge Arrestor (depending on configuration: 1 or 2), e.g. BYX-RJ45

**NOTE**

Power switches are not included due to different local restrictions and regulations. These must be locally procured.

Stand-alone orderable for customer made Ground Box:

- MTS 1 Junction Panel (GMLN5087A), see "[MTS 1 Junction Panel](#)" on page A-5

**NOTE**

For Dual MTS 1, the cable length between the MTS 1 and the Y-splitter must not exceed 1.5 meter.

- Cable glands (GMLN5094A)
- Cable glands (GMLN5095A)
- Blind plugs (GMLN5096A)

The MTS 1 and the Ground Box are connected with cables with glands through holes in the Ground Box enclosure. The Ground Box Junction panel is mounted on the DIN rail provided.

The Ground Box can be placed in a separate room or building or on the mast at ground level, depending on the configuration.

An intrusion alarm can be connected inside the Ground box and will be sensed by the MTS 1 when activated (i.e. Ground Box is opened).

MTS 1 Junction Panel

The Junction Panel (GMLN5087A) is used in a Ground Box to interface the data traffic of one or two MTS 1s to the land lines. Ethernet can be connected whereas the power is connected separately in the Ground Box. 4 alarms may be connected to the MTS1's via the Junction Panel. The Junction Panel is purely passive and is clipped on to a DIN rail in the Ground Box.

Figure A-4 MTS 1 Junction Panel



Figure A-5 Junction Panel Connectors

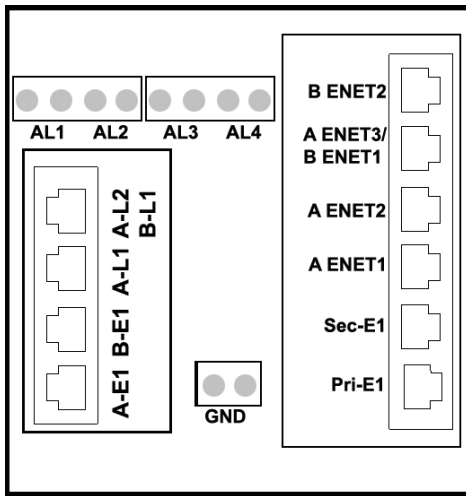
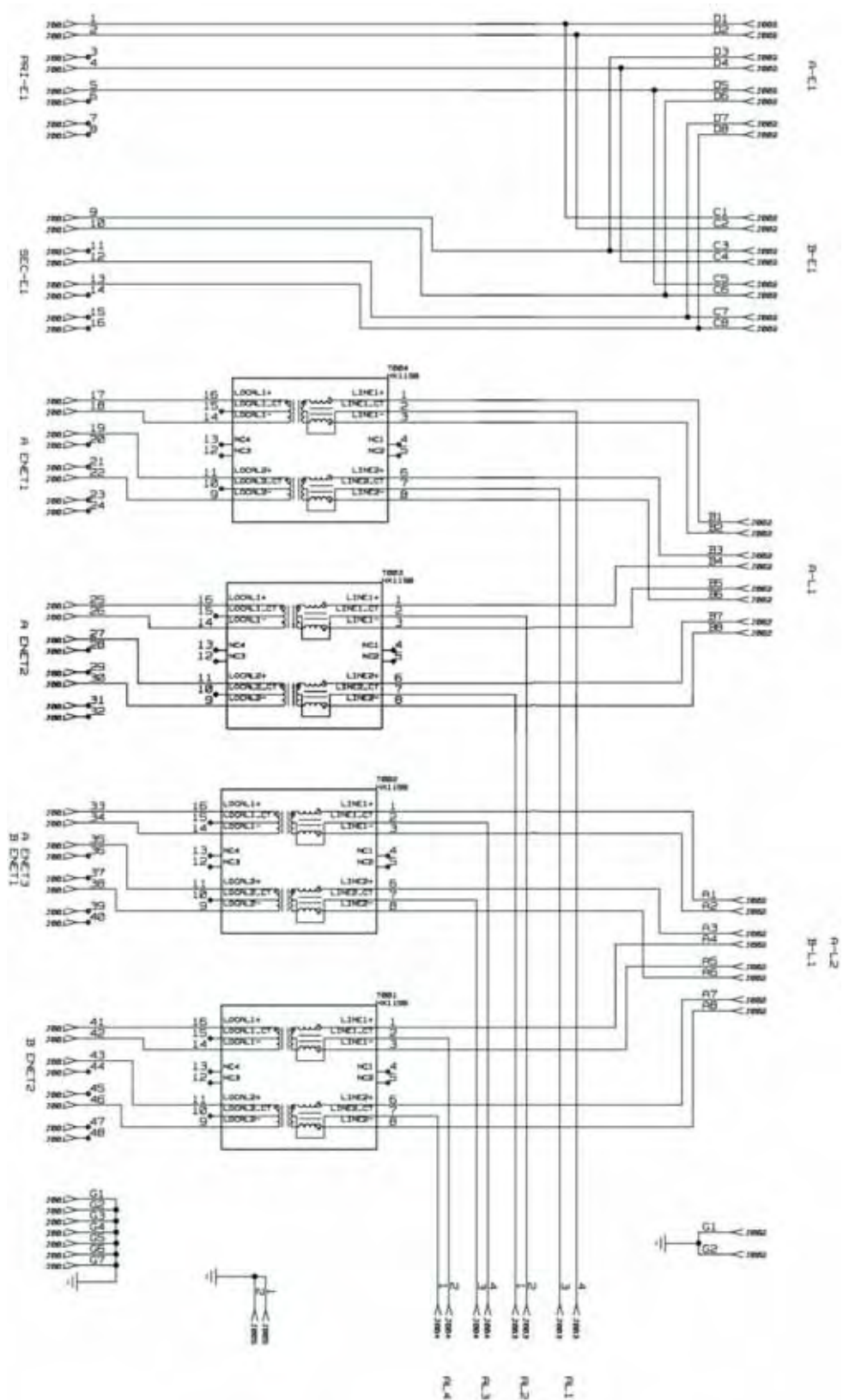


Table A-2 Junction Panel Connections Description

Connector	Description
Connectors IN	
A-E1	
B-E1	
A-L1	Ethernet connection to MTS 1
A-L2 / B-L1	Ethernet connection to MTS 1
Connectors OUT	
PRI-E1	Primary Land line connection
SEC-E1	Secondary Land line connection
A ENET1	Ethernet connection to Land line
A ENET2	Ethernet service port
A ENET3 B ENET1	Ethernet connection to Land line
B ENET2	Ethernet service port
Alarm Connectors	
AL1	Alarm input 1 MTS 1A
AL2	Alarm input 2 MTS 1A
AL3	Alarm input 1 MTS 1B
AL4	Alarm input 2 MTS 1B

Figure A-6 MTS 1 Junction Panel Schematics



Ground Box and Junction Panel References

- "Ground Box Installation (Optional)" on page 4-11
- Chapter 5, "MTS 1 to Ground Box Cabling"

Solar Shield

In order to reduce MTS 1 surface temperature and limit the heat radiation from the sun, a solar shield may be required for outdoor use. It is designed to create a chimney effect around the MTS 1 and is mounted onto the mounting brackets. It is also used to protect the MTS 1 from radiative heat loss to the atmosphere when it is installed in a location where the ambient temperature is very low.

The following are Motorola recommendations:

- If the MTS 1 is exposed to direct sun light and the maximum temperature exceeds 40°C (any given time of the day), the solar shield is needed
- If temperature is below -10°C, the solar shield is needed

Figure A-7 MTS 1 with Solar Shield



Solar Shield References

- "Solar Shield Installation (Optional)" on page 4-9

Surge Arrestors for Site Link

Surge arrestors shall be locally procured. The selected items should be specifically designed for the application and meet all local regulations.

POLYPHASER, INC.
PO Box 9000
Minden, NV 89423
North & Latin America:
Toll free: 800-325-7170
Telephone: + 775-782-2511
Telefax: + 775-782-4476
Internet: <http://www.polyphaser.com>

The following models are recommended:

MTS antenna - IS-B50HN-C2 (Motorola P/N RRX4027)
GPS Antenna - DGXZ + 06NFNF-A (Motorola P/N GMDN0782A)
Remote GPS Antenna - IX-3L2DC48/W (Motorola P/N GMDN0889A)
E1/Ethernet - DSTSJ100BT

E1/Ethernet for DIN-mount - BYX-RJ45A, from more vendors.

Supplier addresses:

DITHA
Suedfeldtrasse 7
D - 30453 Hannover
Germany
Telephone: +49 (0)511 - 21260
Telefax: +49 (0)511 - 2108302

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