**Technical Practices**

# MainStreet Broadband Wireless

RELEASE 1.1

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# Mandatory regulations

This chapter outlines the mandatory regulations for the installation and operation of the MainStreet Broadband Wireless system. Adherence to these regulations is necessary to comply with regulatory requirements.

## General requirements

The sections that follow outline the mandatory regulations governing the installation and operation of the MainStreet Broadband Wireless system. Adherence to these instructions is necessary to make sure regulatory compliance requirements are met.

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**Warning**

The MainStreet Broadband Wireless system T-ARIC cards, 28110 and 28120 MainStreet CE Plus Ethernet NIUs, OTRUs, OTUs and ORUs contain no user-serviceable parts. Contact Newbridge for repair and servicing.

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**Caution**

To prevent accidental electrical shorting of cards or modules, the cards or modules must be correctly aligned between the card guides before insertion.

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## Local regulations

All BTS and CPE installations must meet all local, national and civil electrical/safety regulations of the area where they are installed.

## Wireless safety compliance in the United States of America

It is the responsibility of the wireless licence holder to ensure that the requirements of OET Bulletin 65 are met in the USA.

## Wireless safety compliance in Canada

It is the responsibility of the wireless licence holder to ensure that the requirements of Safety Code 6 are met in Canada.

## Placement of transmitting equipment

To prevent exposure to non-ionizing radiation, the OTU and OTRU should always be mounted to a minimum of 3 m (10 ft) above ground level or roof-top level. If in the case of a wall-mount OTRU, the unit should be mounted three meters away from any point of exposure such as windows, balconies or doors.

## OTU and OTRU service and repair safety precautions

Only authorized personnel should service OTU and OTRU units.

---

### Danger

Never touch the OTU or OTRU antennas while they are in operation. Do not stand in front of OTU and OTRU antennas, and never pass closer than 1 m from the front of an operating OTU or OTRU.

The OTU and OTRU should be deactivated prior to being installed or serviced.

Service and repair preparation activities should be made as close to the base of an elevated OTU or OTRU as possible, as the risk of exposure to non-ionizing radiation increases as you move further from the base toward the area that is serviced by the transmitter.

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## Equipment interconnection points

All card faceplate connectors are SELV.

Connect SELV circuits on this equipment only to other circuits that comply with the requirements of SELV circuits as defined in IEC 60950.

## External power supply

The dc source for the wireless antenna must meet the requirements of a SELV source in accordance with IEC 60950 based standards and limit the output to 100VA.

---

### Warning 1

BTS equipment is intended for use when powered by an appropriate external -48 V power supply or rack mount shelf approved by Newbridge. The use of any other power supply may invalidate regulatory approvals of this unit.

### Warning 2

The 0VR connector on the -48 V power supply that supplies power to the OTU and ORU must be grounded to the same ground used by the MainStreetXpress 36170 system that connects to the BTS equipment.

---

## Prevention of access to the user

Only authorized personnel should have access to the equipment. Install the equipment in a restricted-access location or similar environment, and post appropriate warning signs to indicate safety concerns. Failure to prevent unauthorized user access will invalidate any approvals given to this equipment.

## Regulatory symbols

The following sections show examples of regulatory approval symbols generally used. They may be used on product markings such as approval labels. These symbols are described in IEC 417.

### Power on

This symbol indicates the on position of the main on/off switch.

**Figure 1: On position symbol for on/off switch**

9715

### Power off

This symbol indicates the off (O) position of the main on/off switch.

**Figure 2: Off position symbol for on/off switch**

9716

### Protective grounding terminal

These symbols indicate a terminal that must be connected to earth ground prior to making any other connections to the equipment.

**Figure 3: Supply wire protective earth**

9717

**Figure 4: Protective earth**

9718

### Dangerous voltage

The lightning flash with an arrowhead symbol, within an equilateral triangle, indicates the presence of uninsulated "dangerous voltage" within the product's enclosure that could cause electric shock. Labels bearing this symbol are installed on the outside of the product enclosure.

**Figure 5: Dangerous voltage symbol**

9719

### Instructions

The exclamation point within a triangle indicates the existence of important operating and maintenance (servicing) instructions in the product documentation.

**Figure 6: Important instructions symbol**

9720

### Elevated non-ionizing radiation levels

This symbol identifies equipment that emits elevated levels of non-ionizing radiation. Do not approach equipment that is marked with this symbol unless power to the device is disconnected. Labels bearing this symbol are installed on the outside casing of transmitter devices.

**Figure 7: Elevated non-ionizing radiation levels symbol**

13111

# International EMC compliance

The EMC compliance of these products relies on following the installation processes correctly.

Failure to follow the correct installation processes may result in a non-compliance to the EMC standards against which these products have been assessed.

## 28110 and 28120 CE Plus Ethernet NIU EMC compliance

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

## T-ARIC card EMC compliance

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

# Industry Canada regulations

The Industry Canada (formerly known as the Department of Communications) label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the Terminal Equipment Technical Requirements document(s). Industry Canada does not guarantee that the equipment will operate to the user's satisfaction.

Before installing this equipment, get permission to connect to the facilities of the local telecommunications company. Install the equipment using an acceptable method of connection. Compliance with the above conditions may not prevent degradation of service in some situations.

The standard connecting arrangement codes for the MainStreet Broadband Wireless system are CA11A, CA21A, CA48C, CA81A, CA2EA, CA2FA, CA2GA, CA2HA and CA-A11.

In some cases, the company's inside wiring for single-line individual service may be extended by means of a certified telephone extension cord. Compliance with these conditions may not prevent degradation of service in some situations.

Repairs to certified equipment must be made by an authorized Canadian maintenance facility designated by the supplier. If the user repairs or alters this equipment, or if the equipment malfunctions, the telecommunications company may request that the equipment be disconnected.

Make sure that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution is especially important in rural areas.

**Caution**

Do not attempt to make electrical ground connections. Contact the electrical inspection authority or an electrician.

## Safety approval for dc systems

The dc source for the MainStreet Broadband Wireless system must meet the requirements of a SELV source in accordance with CSA C22.2 No. 950. These systems are intended for use with a SELV secondary source that is electrically isolated from the ac source and that is reliably connected to earth.

# 1. Overview

The MainStreet Broadband Wireless system provides all the advantages of ATM. These advantages include the convergence of voice, data and video; scalability; and maintenance and control of quality of service to the customer site using cost-effective microwave transmissions.

## 1.1 Broadband wireless system overview

Figure 1-1 shows an example of a broadband wireless system.

**Figure 1-1: MainStreet Broadband Wireless system**
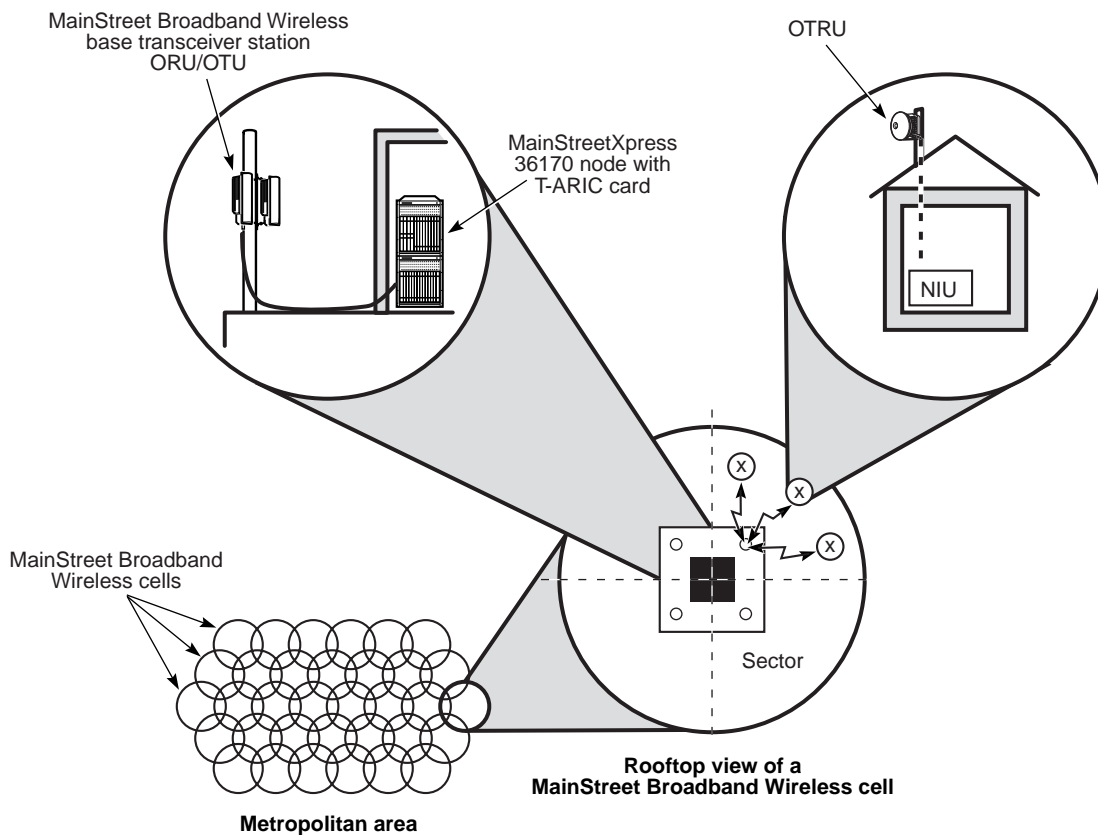
Table 1-1 describes major components of a broadband wireless system.

**Table 1-1: Components of the wireless system**

| Term | Description |
|------|-------------|
| ATM backbone | The ATM backbone system is used for switching intercell traffic and connecting multiple BTSs. |
| BTS | The Base Transceiver Station is the linking point between customers in the coverage area of the BTS and the backbone network. The BTS is a hub that collects and delivers all traffic to and from subscribers within the coverage area. |
| Cell | The cell is the geographical area that is within range of the transmit and receive antennas at the BTS. |
| NIU | The Network Interface Unit provides the linking point between the customer equipment and the air interface at the customer site. The MainStreet Broadband Wireless system includes the 28110 and 28120 MainStreet CE Plus Ethernet NIUs. |
| OTU | The OTU is the transmit radio for the BTS. |
| ORU | The ORU is the receive radio for the BTS. |
| Sector | A sector is the smallest geographical area which has access to the entire Tx and Rx RF spectrum used in a wireless system. A sector can be a division of a cell, or an entire cell. A cell is often divided into sectors to simplify network and node management, and to take advantage of antenna profiles. |
| T-ARIC card | The Time Division Multiple Access - ATM Radio Interface Card resides in a MainStreetXpress 36170 shelf, and provides a cell relay modem interface between the BTS and one or more NIUs. |
| T-ARIC group | A T-ARIC group is two or more T-ARIC cards configured to use the same OTU/ORU. This allows for an increase in CPE density within the cell. |
| OTRU | An OTRU is a transceiver installed at a CPE site that connects to an NIU, providing RF connectivity between the NIU and the OTU/ORU. |

Most of the air interface configuration is performed through the T-ARIC card; configuration of the NIUs is primarily related to TDM functionality. ATM functionality is provided by other cards in the MainStreetXpress 36170 shelf.

Table 1-2 describes the network management support available for the MainStreet Broadband Wireless system.

**Table 1-2: MainStreet Broadband Wireless network management**

| Term | Description |
|------|-------------|
| MainStreetXpress 45020 | The MainStreetXpress 45020 Element Manager provides remote SNMP management of the NIUs. |
| MainStreetXpress 46020 | The MainStreetXpress 46020 Network Manager provides remote management of the T-ARIC cards. |
| NMTI | The NMTI is a user interface for local management of the T-ARICs and NIUs. Remote access is configured through the PSTN. |

## 1.2 Frequency and bandwidth utilization

Figure 1-2 shows the signal flow between the T-ARIC card located at the BTS and an NIU located at a CPE site. The signals between the T-ARIC card and the OTU/ORU use IF. Signals between the OTU, ORU and the OTRU transceiver use RF. Signals between the OTRU transceiver and the NIU also use IF.

**Figure 1-2:  Signal flow**
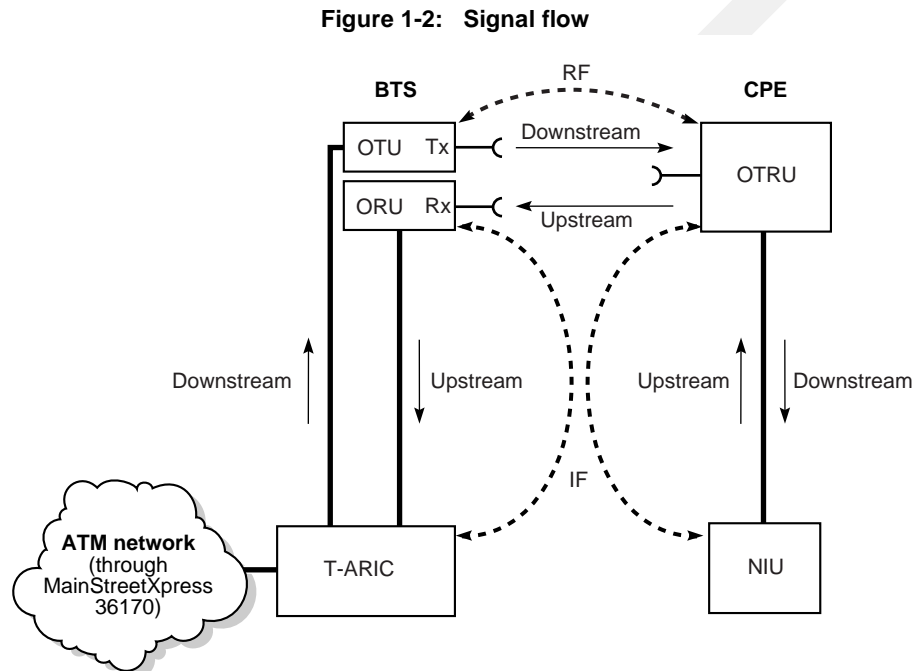


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The term downstream always refers to the communication flow from the T-ARIC card to the NIU. Upstream always refers to communication flow from the NIU to the T-ARIC card.

The MainStreet Broadband Wireless system supports wireless communications in the 20 to 40 GHz frequency range. The actual frequencies used are country-dependent.

Bandwidth between the T-ARIC card and the OTU and ORU is in the IF range. The range is 400 to 900 MHz upstream, and 950 to 2050 MHz downstream. Bandwidth between the NIU and the transceiver is also in the IF range. The relationship between IF and RF frequencies is determined by the specific radios that are used in the OTU and ORU and the transceiver.

Figure 1-3 shows details of data flow on an upstream and a downstream channel.

The downstream channel is broadcast to all NIUs configured to be in the same T-ARIC group as the broadcasting T-ARIC card.

The MainStreet Broadband Wireless system uses TDMA to allow multiple NIUs to use a single upstream channel. In Figure 1-3, two NIUs are broadcasting on a single channel. The channel is divided into timeslots. These timeslots are allocated to the NIUs by system resources, not by manual configuration. The number of timeslots allocated to an NIU depends on the configured TDM traffic.

**Figure 1-3:  Upstream and downstream channels**

| Downstream channel | Packet n | CTL | 1 | 2 | 3 | 4 (a) | Downstream bandwidth |
|---|---|---|---|---|---|---|---|
| | Packet n+1 | CTL | 4 (b) | 5 | 6 | 7 | 18 MHz (273 ATM cells) |
| | MPEG -2 | (7 ATM cells per 2-packet sequence) | | | | | 36 MHz (553 ATM cells) |

**Upstream channel**

Single NIU

Timeslots | 0 | 1 | 2 | | | | | | | | | | | 132

Timeslot allocation handled by system resources

Dual NIU

OTU  Tx

ORU  Rx

OTRU

Upstream channel accommodates multiple NIUs on a single 9-MHz channel

Downstream

Upstream

OTRU

**ATM network** (through MainStreetXpress 36170)

T -ARIC

Dual NIU

Single NIU
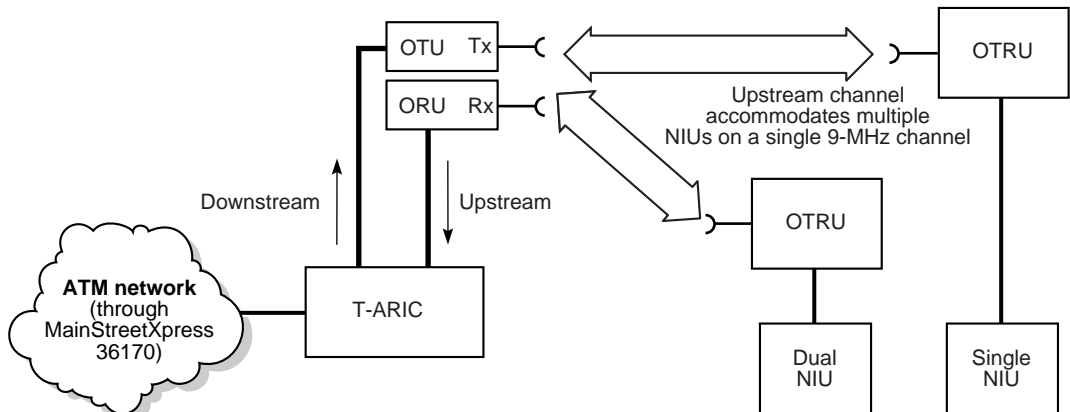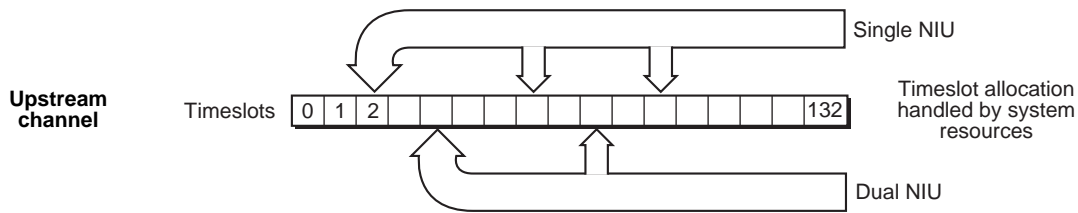
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# 2. Equipment overview

This chapter describes the physical components of the MainStreet Broadband Wireless system.

## 2.1 Equipment list

Tables 2-1 and 2-2 list the physical components and part numbers of the MainStreet Broadband Wireless system. These tables do not include the MainStreetXpress 36170 shelves, power supplies and cables.

**Table 2-1: BTS equipment list**

| Name | Part number |
|------|-------------|
| 12:2 Combiner/Splitter | 90-6659-01 |
| 2:1 Combiner/Splitter | 90-6734-01 |
| Lightning arrester | 90-6517-01 |
| OTU | 90-4568-02/05 |
| ORU | 90-4567-02/05 |
| Antennas | 90-4563-02/05 (horizontal polarization) |
| | 90-4564-02/05 (vertical polarization) |
| RS-422 lightning arrester | 90-6519-01 |
| Surge protector | 90-6739-01 |
| Bias-T | 90-6516-01 |
| Bias-T power cable | 90-6518-01 |
| MAU | 90-6474-01 |
| T-ARIC card | 90-6206-01 |

**Table 2-2:  CPE equipment list**

| Name | Part number |
| --- | --- |
| 2:1 Combiner/Splitter | 90-6524-01 |
| 28110 MainStreet T1 CE Plus Ethernet NIU | 90-6210-01 (120 V) |
| | 90-6210-02 (240 V) |
| 28120 MainStreet E1 CE Plus Ethernet NIU | 90-6210-04 (120 $\Omega$) |
| Lightning arrester | 90-6522-01 |
| OTRU | 90-6626 |

## 2.2  T-ARIC card

The T-ARIC card is a double-width card that is installed in any two adjacent slots of the MainStreetXpress 36170 Peripheral Shelf. The T-ARIC card provides a cell relay modem interface from the BTS to the NIUs.

Figure 2-1 shows the T-ARIC card faceplate. The following four LEDs can be seen on the T-ARIC card faceplate. Refer to chapter 25 for information about LED activity.

- Status
- Activity
- Link
- Alarm

**Figure 2-1: T-ARIC card faceplate**
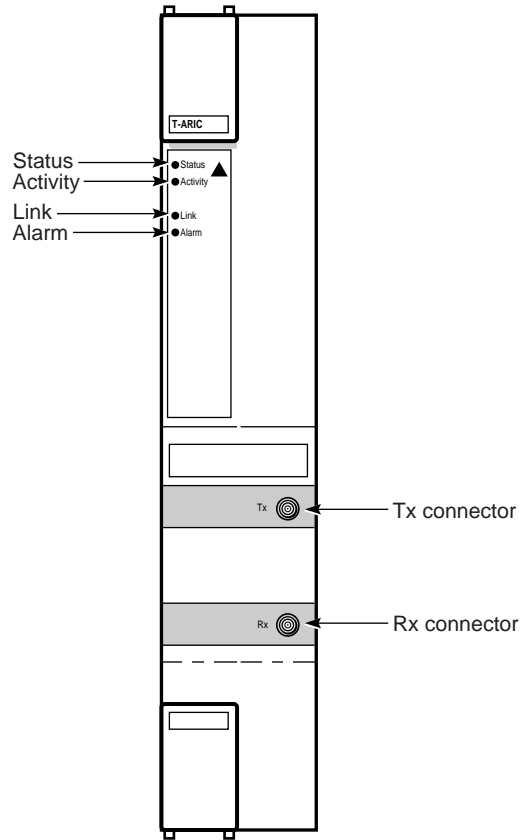


11310

## Connectors

Table 2-3 describes the T-ARIC card faceplate connectors.

**Table 2-3: T-ARIC card faceplate connectors**

| Name | Type | Purpose |
|------|--------|-----------------------------------------------|
| Rx | SMA(F) | Carries Rx signal from ORU to the T-ARIC card |
| Tx | SMA(F) | Carries Tx signal from T-ARIC card to OTU |

## 2.3 MAU

The MAU is used to connect RS-422 cables between the T-ARIC card and the OTU and ORU. The MAU installs on the backplane behind each T-ARIC card. Figure 2-2 shows the front of the MAU and the location of the MAU connectors. Table 2-4 describes the MAU connectors.

**Figure 2-2: Front view of MAU**
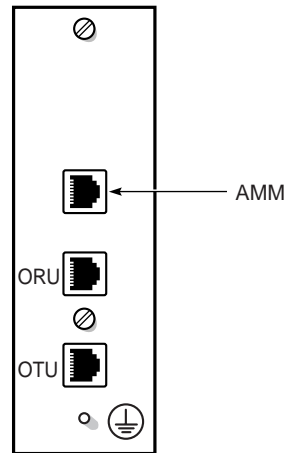


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**Table 2-4: MAU connectors**

| Name | Type | Location | Purpose |
|---|---|---|---|
| ORU | RS-422 | Front of MAU | Connects to the ORU RS-422 connector via intermediate cabling and lightning arresters |
| OTU | RS-422 | Front of MAU | Connects to the OTU RS-422 connector via intermediate cabling and lightning arresters |
| MAU interface | DSUB | Back of MAU | Connects to the T-ARIC card DSUB connector |
| AMM | RS-232 | Front of MAU | Used for software downloading to the AMM by Newbridge personnel |

## 2.4 12:2 Combiner/Splitters

12:2 Combiner/Splitters connect up to 12 T-ARIC cards to the OTU and ORU. A typical application uses one 12:2 Combiner/Splitter to connect T-ARIC cards to the OTU, and one Combiner/Splitter to connect T-ARIC cards to the ORU.

The OTU 12:2 Combiner/Splitter combines outgoing Tx signals from each T-ARIC card into a single Tx signal to the connected OTU.

The ORU 12:2 Combiner/Splitter splits the incoming ORU Rx signals into separate Rx signals for each T-ARIC card.

Figure 2-3 shows the 12:2 Combiner/Splitter. Table 2-5 lists and describes the connectors.

**Figure 2-3: 12:2 Combiner/Splitter**

To Bias-Ts
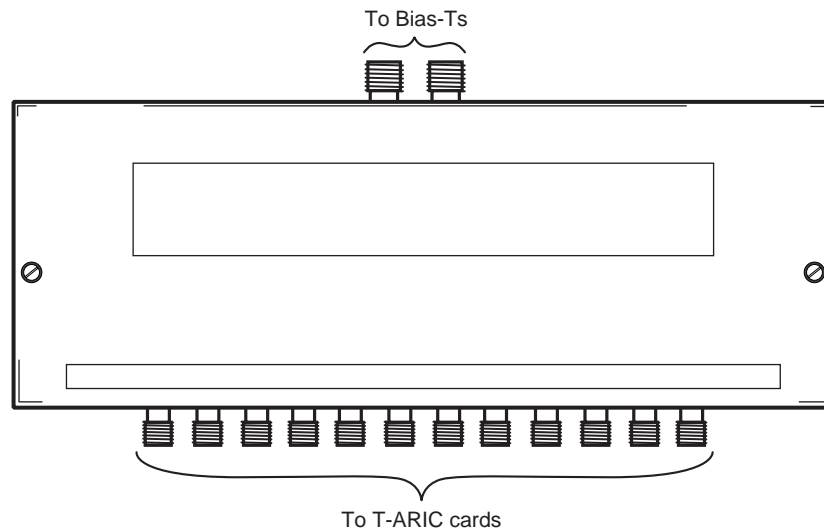
To T-ARIC cards

12687

**Table 2-5: BTS 12:1 Combiner/Splitter connectors**

| Name | Type | Purpose |
|------|------|---------|
| T-ARIC connectors | SMA(F) | Connect to T-ARIC card through SMA cables |
| Bias-T connectors | F(F) | Connect to Bias-Ts |

## 2.5        2:1 Combiner/Splitters

There are two types of 2:1 Combiner/Splitters used in the MainStreet Broadband Wireless system:

- CPE 2:1 Combiner/Splitter
- BTS 2:1 Combiner/Splitter

### CPE 2:1 Combiner/Splitter

The CPE 2:1 Combiner/Splitter is used to connect two NIUs to a single OTRU in a dual NIU CPE configuration. Figure 2-4 shows a CPE 2:1 Combiner/Splitter. Table 2-6 lists and describes the connectors.

**Figure 2-4:  CPE 2:1 Combiner/Splitter**
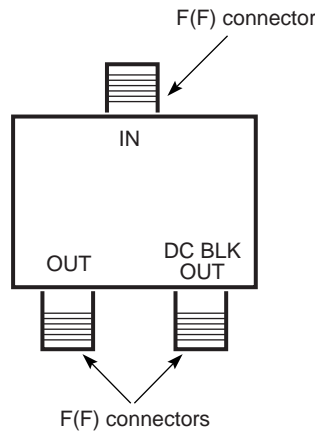


13098

**Table 2-6:  CPE 2:1 Combiner/Splitter connectors**

| Name | Type | Purpose |
|------|------|---------|
| IN | F(F) | Connects to the OTRU via intermediate cabling and lightning arresters |
| OUT | F(F) | Connects to one of two NIUs |
| DC BLK OUT | F(F) | Connects to one of two NIUs |

### BTS 2:1 Combiner/Splitter

The BTS 2:1 Combiner/Splitter is used to connect the synchronization reference cable to OTUs and ORUs in an OTU/ORU redundant configuration. Figure 2-5 shows a BTS 2:1 Combiner/Splitter. Table 2-7 lists and describes the connectors.

**Figure 2-5:  BTS 2:1 Combiner/Splitter**

N(F) connector

1

2      3
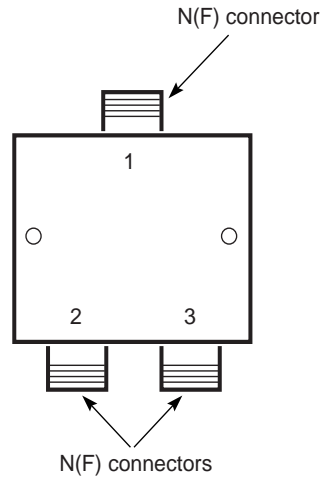
N(F) connectors

13120

**Table 2-7:  BTS 2:1 Combiner/Splitter connectors**

| Name | Type | Purpose |
|------|------|---------|
| 1 | N(F) | Connects to the synchronization reference cable |
| 2 | N(F) | Connects to an OTU/ORU 100 MHz reference connector |
| 3 | N(F) | Connects to an OTU/ORU 100 MHz reference connector |

## 2.6      28110 and 28120 MainStreet CE Plus Ethernet NIUs

The 28110 MainStreet CE Plus Ethernet T1 NIU provides a single T1 interface and a single Ethernet interface. The 28120 MainStreet CE Plus Ethernet E1 NIU provides a single E1 interface and a single Ethernet interface.

NIUs have an internal Modem module that is similar to the one used in the T-ARIC card. The Modem module converts a digital ATM signal to an analog IF signal for transmission, and conversely, converts a received analog IF signal to a digital ATM signal.

Figure 2-6 shows the faceplate and back panel of a 28110 MainStreet CE Plus Ethernet T1 NIU. The 28120 MainStreet CE Plus Ethernet E1 NIU has similar panels.

The following eight LEDs can be seen on a 28110 or 28120 MainStreet NIU faceplate. Refer to chapter 25 for information about LED activity.

- Status
- Network Connect
- Tx Data
- Rx Data
- T1/E1 Signal
- T1/E1 Alarm
- Ethernet Link
- Ethernet Activity

**Figure 2-6:  28110 MainStreet T1 NIU**

**Front**
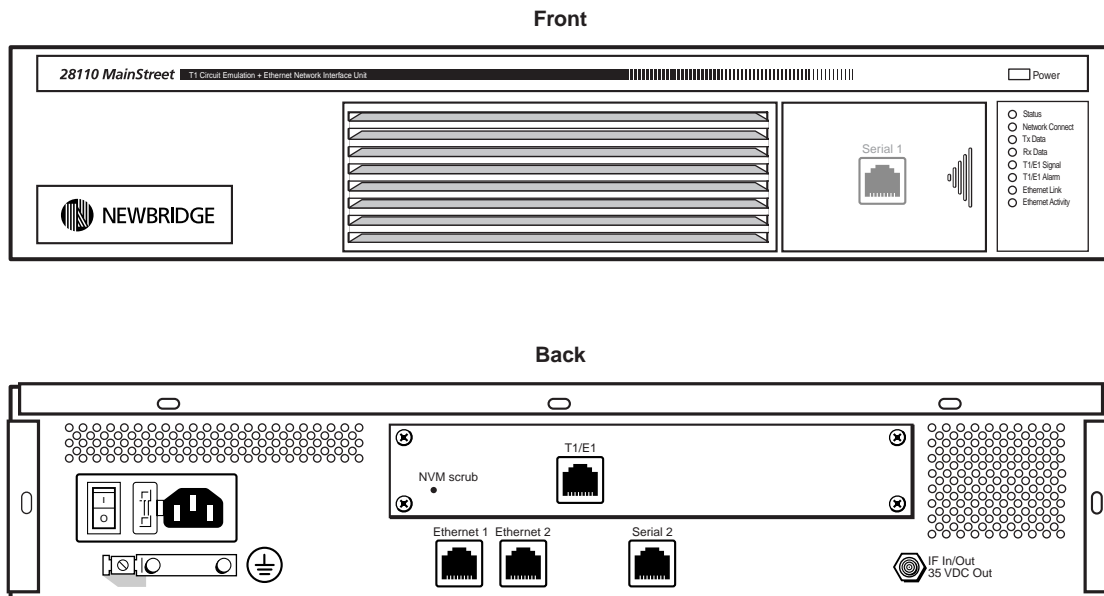


**Back**



13003

## Connectors

Table 2-8 describes the 28110 and 28120 MainStreet NIU connectors.

**Table 2-8: NIU connectors**

| Name | Type | Location | Purpose |
|---|---|---|---|
| T1/E1 | RJ48C | Back panel | Connects to customer TDM equipment |
| IF In/Out and 35 VDC Out | F(F) | Back panel | Provides IF connectivity between NIU and the OTRU, and power to the OTRU |
| Serial port 1 | RJ45 | Front panel | Local NMTI access |
| Serial port 2 | RJ45 | Back panel | Software downloading to the NIU gateway |
| Ethernet 1 | RJ45 | Back panel | Unused |
| Ethernet 2 | RJ45 | Back panel | Connects to customer Ethernet devices |

## 2.7 Lightning arresters

Lightning arresters provide protection against lightning strikes to an OTRU, OTU or ORU. Each lightning arrester contains a gas discharge tube that shunts equipment-damaging lightning to ground. The gas discharge tubes should be replaced on a regular basis as recommended by the manufacturer.

The MainStreet Broadband Wireless system uses three types of lightning arresters:

- Type F (used at the CPE)
- Type N (used at the BTS)
- RS-422 (used at BTS)

Lightning arresters connect to ground either by a direct connection to a bulkhead, or by mounting brackets. It is recommended to ground lightning arresters through mounting brackets that are connected to a copper plate bolted to a grounded entry point.

Figure 2-7 shows a Type F lightning arrester installed in a mounting bracket.

Figure 2-8 shows a Type N lightning arrester installed in a mounting bracket, and the profile of the bulkhead interface required for the Type N lightning arrester.

**Figure 2-7: Type F lightning arrester**
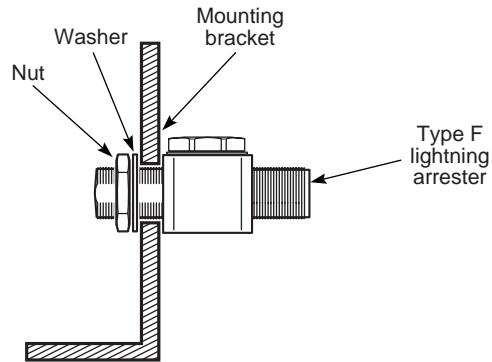


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**Figure 2-8: Type N lightning arrester**
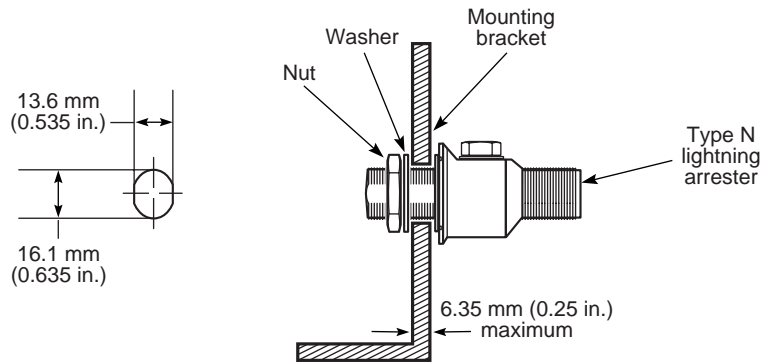


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Figure 2-9 shows an RS-422 lightning arrester, used at the BTS site. Table 2-9 lists the RS-422 lightning arrester physical connections.

**Figure 2-9: RS-422 lightning arrester**
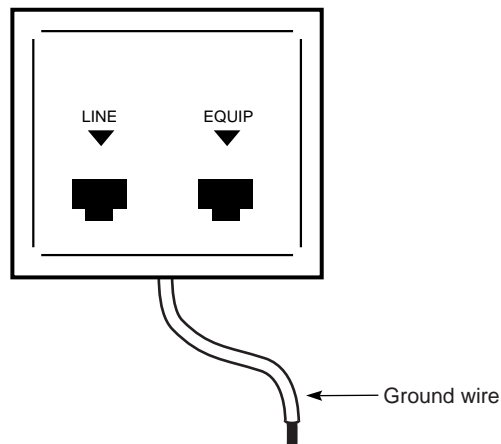


13110

**Table 2-9: RS-422 lightning arrester physical connections**

| Name | Type | Purpose |
|------|------|---------|
| LINE | RS-422 | Connects to the MAU RS-422 cable |
| EQUIP | RS-422 | Connects to the OTU or ORU RS-422 cable |
| Ground wire | Insulated copper wire | Connects to a ground source |

## 2.8 Surge protectors

Surge protectors filter power surges from the power supply, protecting the T-ARIC card, OTU and ORUs from damage. Surge protectors connect directly to each Bias-T via a BNC connector, and contain a gas discharge tube that must be replaced regularly. Figure 2-10 shows a surge protector. Table 2-10 lists and describes the connectors.

**Figure 2-10: Surge protector**
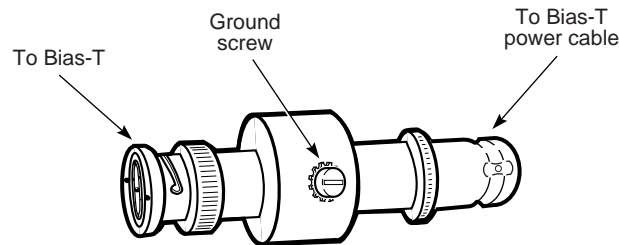


13060

**Table 2-10: Surge protector connectors**

| Name | Type | Purpose |
|------|------|---------|
| Bias-T | BNC | Connects to the MAU RS-422 cable |
| Bias-T power cable | BNC | Connects to the OTRU RS-422 cable |
| Ground screw | Slot-head screw to surge protector body | Connects to a ground source |

## 2.9    OTU and ORU

The OTU is a transmitter radio that connects to an antenna. The OTU receives an IF channel from a T-ARIC card, converts the signal to RF, and sends the signal to the transmit antenna.

The ORU is a receiver radio that connects to an antenna. The ORU receives an RF signal from one or more NIU transceivers, converts the signal to IF, and sends the signal to the T-ARIC card.

Figure 2-11 shows the OTU and ORU connected to antennas.

**Figure 2-11:  OTU, ORU and antennas**

OTU

Tx LED

RS-422 data
LEMO connector

IF and -48 V
connector

100 MHz reference
cable connector

ORU

RS-422 data
LEMO connector

IF and -48 V
connector

100 MHz reference
cable connector
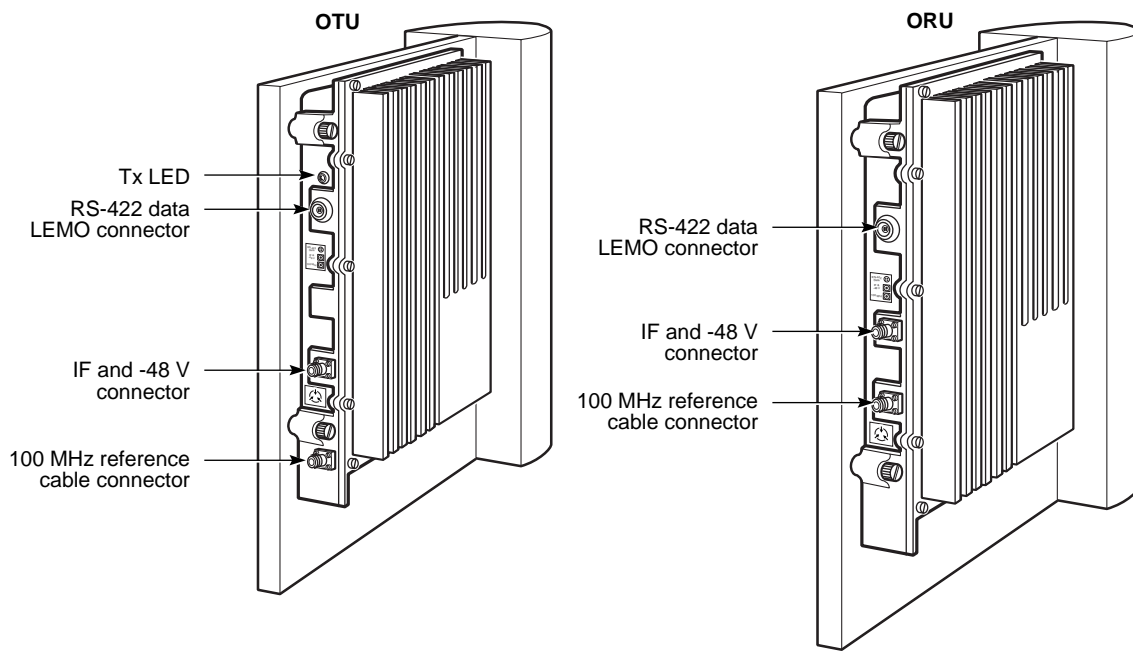
12694

### Connectors

Table 2-11 describes the OTU and ORU connectors.

**Table 2-11:  OTU and ORU connectors**

| Name | Type | Location | Purpose |
|------|------|----------|---------|
| RS-422 Data | RS-422 LEMO | OTU and ORU faceplates | Connects to the T-ARIC card MAU |
| IF and -48V | N(F) coaxial | OTU and ORU faceplates | Connects to Tx broadband coaxial cable (OTU)<br>Connects to Rx broadband coaxial cable (ORU) |
| 100 Mhz REF | N(F) coaxial | OTU and ORU faceplates | Connects to a synchronization reference cable that connects to and synchronizes the OTU and ORU |

## 2.10    Bias-T

The Bias-T provides -48 V power to the OTU and ORU at the BTS site. Figure 2-12 shows the Bias-T. Table 2-12 describes the connectors on the Bias-T.

**Figure 2-12:  Bias-T**



DC OUT

DC IN

RF IN
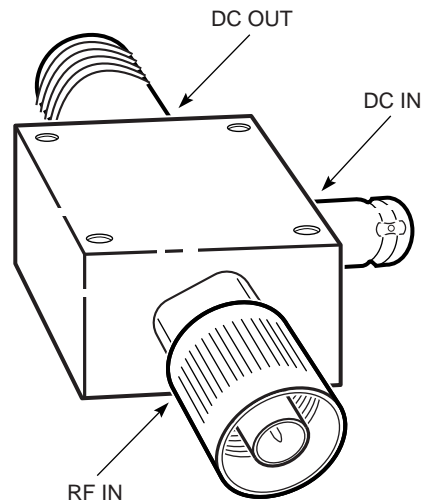
12908

**Table 2-12:  Bias-T connectors**

| Name | Type | Purpose |
|------|------|---------|
| DC IN | BNC(M) | Connects to the power cable via an intermediate surge arrester to provide a -48 V power input |
| DC OUT | N(F) coaxial | Connects to OTU or ORU to provide both -48 V power and an RF signal connection |
| RF IN | N(M) coaxial | Connects to a Combiner/Splitter to provide RF signal connection |

## 2.11 OTRU

In the downstream direction, the OTRU receives RF communications from the OTU, converts the signal to IF, and sends the signal to the NIU. In the upstream direction, the transceiver takes an IF signal from the NIU, converts the signal to RF, and transmits the signal to the ORU.

---

**Note**

There are two types of OTRU transceivers: side-mount and back-mount. Both OTRUs have the same part number, and are shipped according to availability.

---

Figure 2-13 shows a side-mount OTRU transceiver. Figure 2-14 shows a back-mount OTRU transceiver.

**Figure 2-13:  Side-mount OTRU**
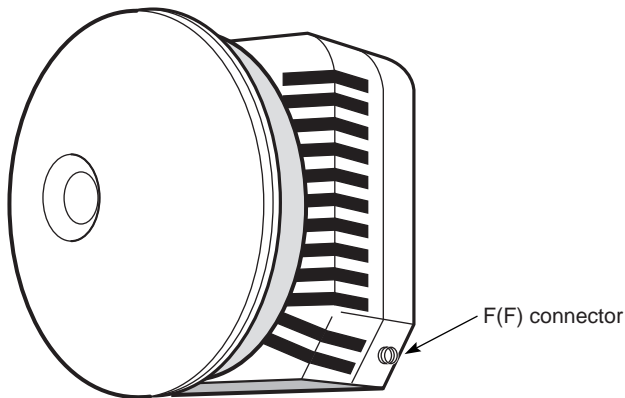
F(F) connector

12695

**Figure 2-14:  Back-mount OTRU**
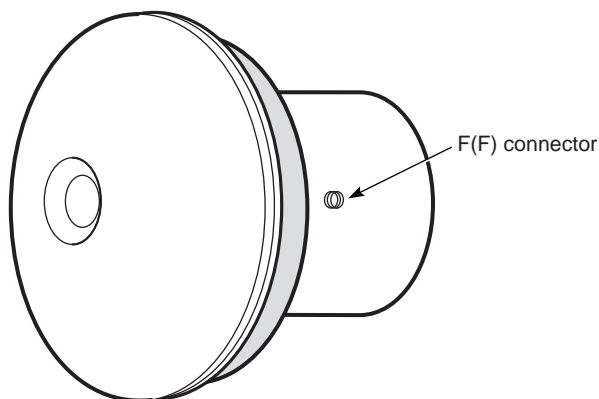
F(F) connector

13109

Both OTRUs have a single F(F) connector that is used to connect the OTRU to the NIU via an intermediate lightning arrester.

# 3. Installing the base transceiver station components

This chapter describes how to install the base transceiver station components.

## 3.1    BTS installation overview

BTS components and cables should be installed by qualified RF equipment installers.

### Siting

The MainStreet Broadband Wireless requires line -of-sight access between BTS OTU/ORU equipment and CPE OTRUs. Each installation must be planned by qualified RF engineers to optimize cell placement and minimize line-of-sight BTS to CPE blockage by doing appropriate RF site planning, and using appropriate equipment and procedures.

### Customer-supplied equipment

Customers installing a BTS will need to supply:

- attenuators
- coaxial cable that runs from the 12:2 Combiner/Splitters to the outdoor radios
- RS-422 cable that runs from the MAU to the OTU and ORU
- a grounded entry point
- ground wires and connectors
- weatherproof cable entry panel(s)
- poles or towers for ORU, OTU and OTRU mounting
- miscellaneous supplies (such as butyl electrical tape, cable cutter, wire stripper and crimping tool)

### Broadband cables

Because many factors are associated with choosing a suitable coaxial cable, customers will be advised by Newbridge of the manufacturers and manufacturer part numbers recommended for each cable assembly.

The cable path from the T-ARIC card to the OTU or ORU must provide a fixed common loss. The losses are:

- downstream: 27 ±1 dB at 2050 MHz
- upstream: 24 ±1 dB at 900 MHz

If the total loss falls short of these values, attenuators must be installed.

### Grounded entry point

Each BTS requires a grounded entry point in order to ground BTS components and cables. Refer to local electrical code requirements when choosing a grounded entry point for the BTS.

### OTU and ORU radios

The OTU and ORU radios are designed to be installed on antenna tower(s), masts, buildings or other appropriate fixtures. The MainStreet Broadband Wireless system supports both simplex and redundant OTU and ORU configurations.

The distance between the T-ARIC card and the outdoor transmitter and receiver can be over 200 m (656 ft) with the use of high-quality, low-loss coaxial cable. This allows the RF equipment to be located on a tower or on a building while the T-ARIC card and MainStreetXpress 36170 shelves are installed indoors.

## 3.2      Installing BTS components

Figure 3-1 shows a diagram of a typical simplex BTS configuration. Figure 3-2 shows a diagram of a redundant BTS configuration. Grounding, surge protection and power connection are similar to the simplex system. Table 3-1 lists the BTS components and part numbers. For information on how to connect synchronization reference cables to redundant OTU/ORUs, see chapter 9.

**Figure 3-1:  Simplex BTS components and cables**
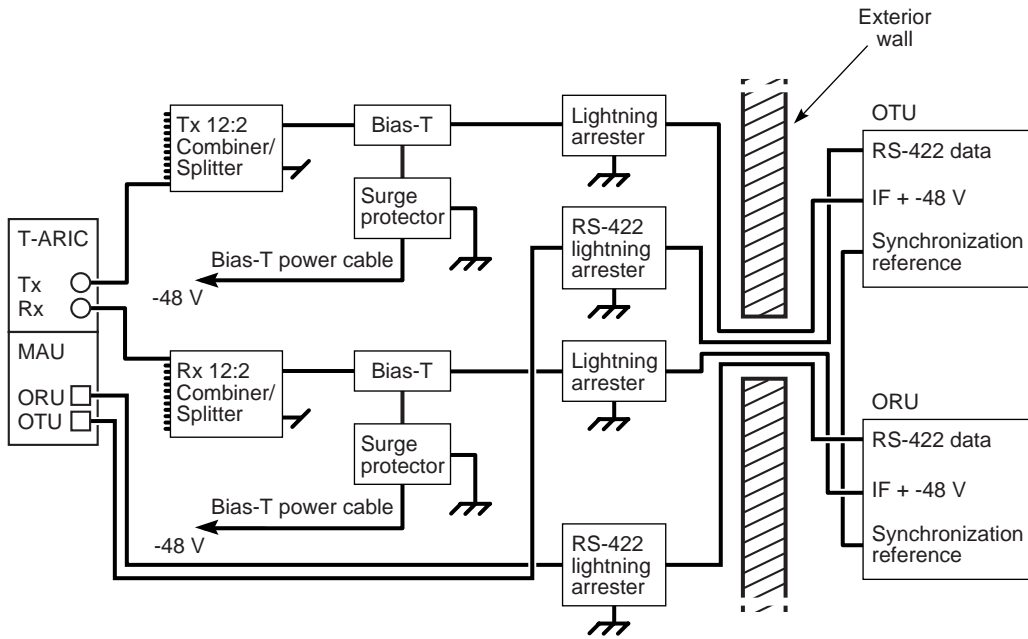


**Figure 3-2:  Redundant BTS components and cables**
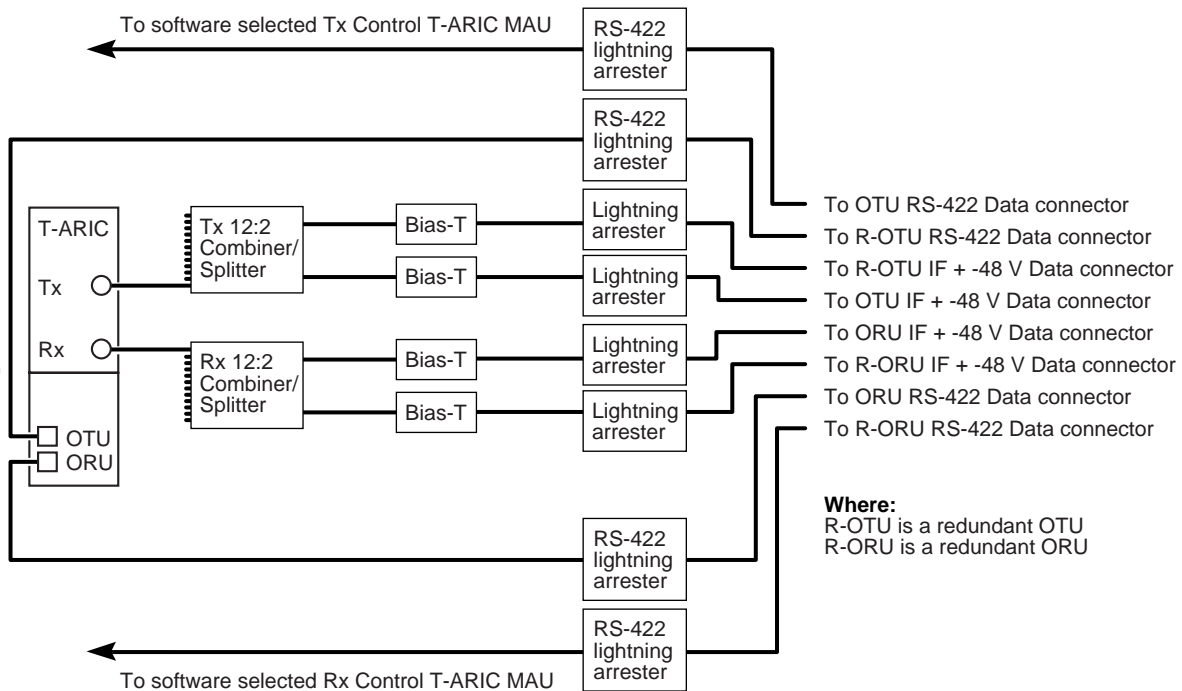
**Table 3-1: BTS equipment summary (per sector)**

| Item | Number for simplex OTU/ORU system | Number for redundant OTU/ORU system | Part number |
|---|---|---|---|
| 12:2 Combiner/Splitter | 2 | 2 | 90-6659-01 |
| 2:1 Combiner/Splitter | 0 | 2 | 90-6734-01 |
| Lightning arrester | 2 | 4 | 90-6517-01 |
| OTU | 1 | 2 | 90-4568 |
| ORU | 1 | 2 | 90-4567 |
| Antennas | 1<br>1 | 2<br>2 | 90-4563-01 (horizontal polarization)<br>90-4564-01 (vertical polarization) |
| RS-422 lightning arrester | 2 | 4 | 90-6519-01 |
| Surge protector | 2 | 4 | 90-6739-01 |
| Bias-T | 2 | 4 | 90-6516-01 |
| Bias-T power cable | 2 | 4 | 90-6518-01 |
| MAU | 1 to 12 | 1 to 12 | 90-6474-01 |
| T-ARIC card | 1 to 12 | 1 to 12 | 90-6206-01 |

## 3.3 BTS installation tasks

Perform the following installation tasks to install the BTS:

- install the MAU
- attach the antenna to the OTU/ORU
- attach the ORU and OTU to the pole assembly
- mount the lightning arresters
- connect the surge protectors to the Bias-Ts
- connect the Bias-Ts to the 12:2 Combiner/Splitter
- connect the BTS cables

# 4.     Installing the MAU

This chapter describes how to install the MAU on the MainStreetXpress 36170 shelf.

## 4.1     To install the MAU

The MAU is installed on the back of the MainStreetXpress 36170 shelf, directly behind each T-ARIC card. Because a T-ARIC card uses two slots, two slot connector locations are available for the MAU. Always install the MAU in the even-numbered slot.

1.     Locate the slot pair for the T-ARIC card, and align the MAU for attachment behind the even-numbered slot of the slot pair, as shown in Figure 4-1. If the T-ARIC card is already installed in the slot, ensure that the DSUB connector on the back of the MAU aligns correctly with the connector on the T-ARIC card.

**Figure 4-1:  MAU location on the MainStreetXpress 36170 shelf**
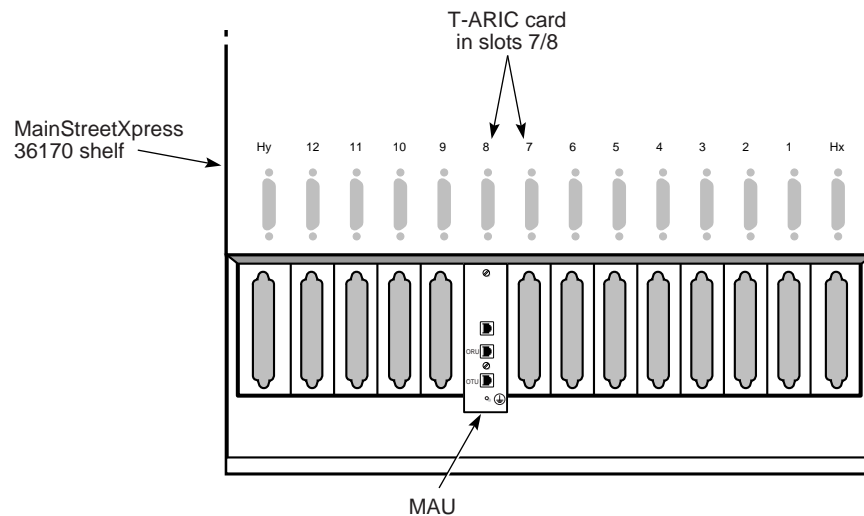


2.     Tighten the two MAU captive screws, as shown in Figure 4-2.

**Figure 4-2:  Tightening the MAU captive screws**
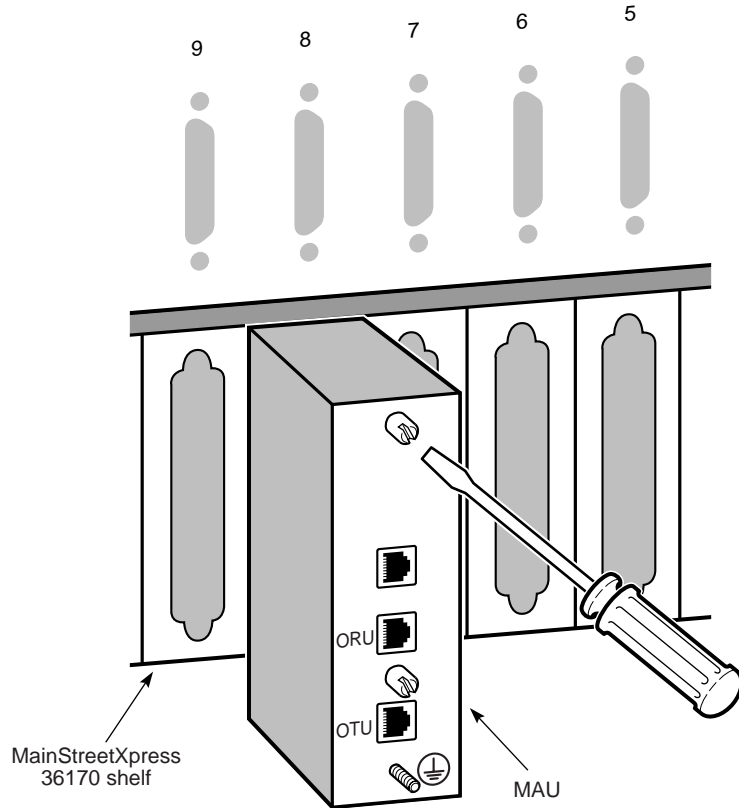
# 5. Attaching an OTU or ORU to an antenna

Each OTU or ORU should be connected to an antenna before the antenna is mounted on the BTS pole assembly.

If the OTU or ORU is being installed on an antenna that is already mounted and aligned on a pole, do not remove the antenna from the pole. Install the OTU or ORU directly on the mounted antenna.

---

**Note 1**

All procedures should be performed in a clean indoor lab environment, on a workbench suitable for electronic assembly.

**Note 2**

Do not remove the shipping caps from the coaxial and RS-442 connectors on the OTU and ORU until the BTS cables are ready for attachment.

---

## 5.1 Attaching the OTU or ORU to an antenna

1. Remove the RF channel cover from the OTU or ORU and remove the RF channel plug from the antenna . Figure 5-1 shows the locations of the plug and the cover.

**Figure 5-1: Removing the plugs and covers**
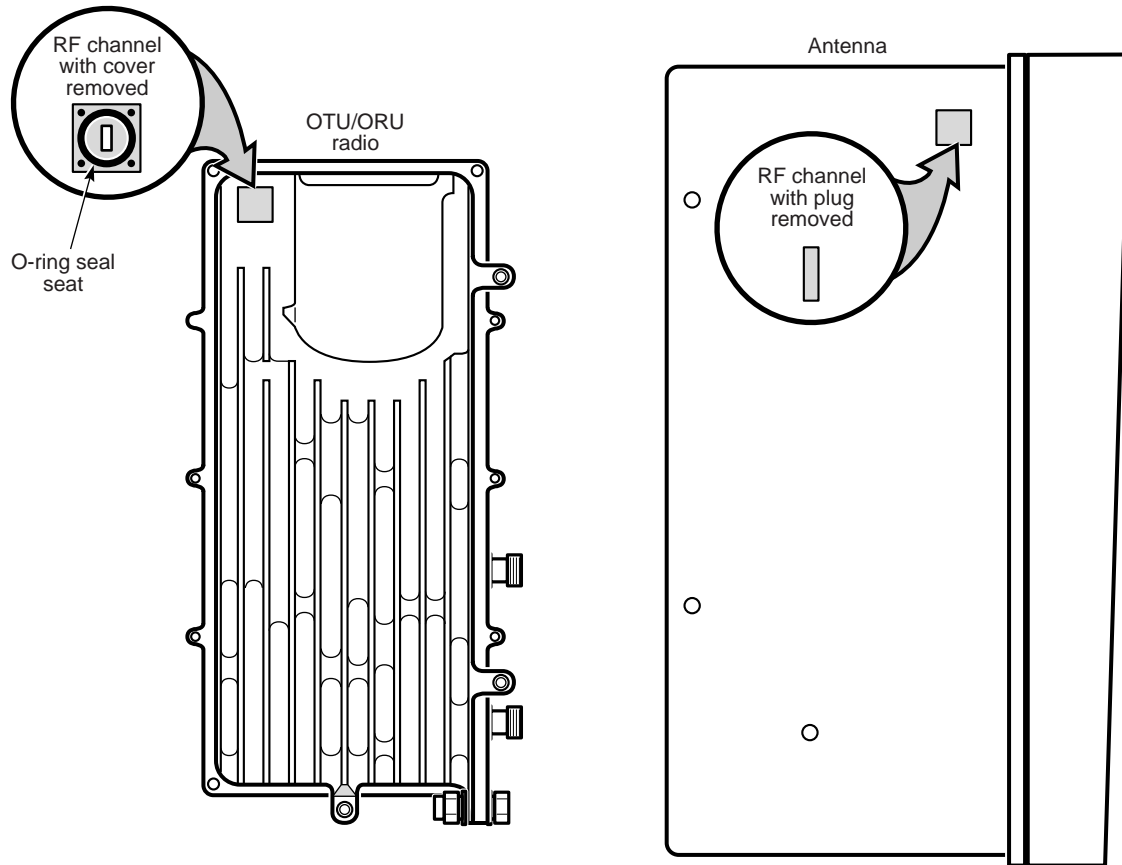


13005

2.   Place the antenna on a flat surface.

3.   Place the provided O-ring on the O-ring seal seat around the OTU or ORU RF channel. Ensure that the O-ring remains in place during the entire procedure.

4.   Place the radio on the antenna as indicated in Figure 5-2. Turn each captive screw until there is only a small gap between the radio and the antenna. This gap must be small enough that the O-ring does not move.

**Figure 5-2: Tightening the captive screws**
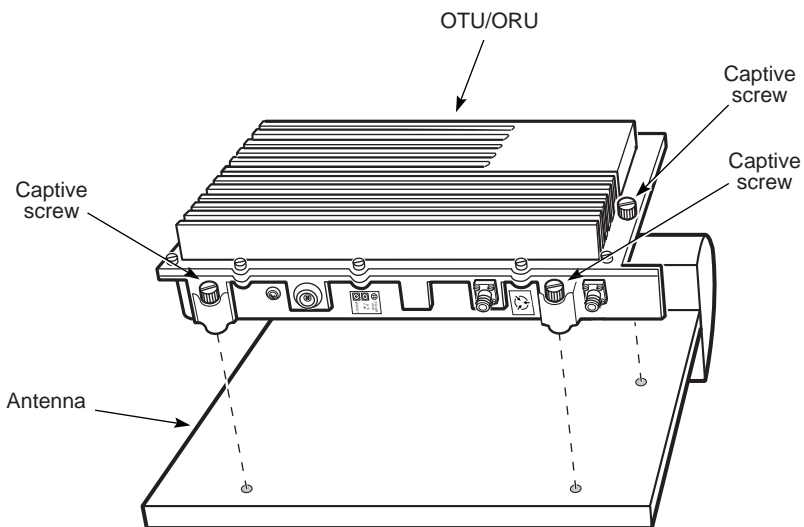


13006

5.  Turn over the OTU or ORU and antenna as shown in Figure 5-3, and ensure that the weight of the antenna is put entirely on the radio. Insert and tighten the four RF channel screws as shown in the diagram.

**Figure 5-3: RF channel screws**
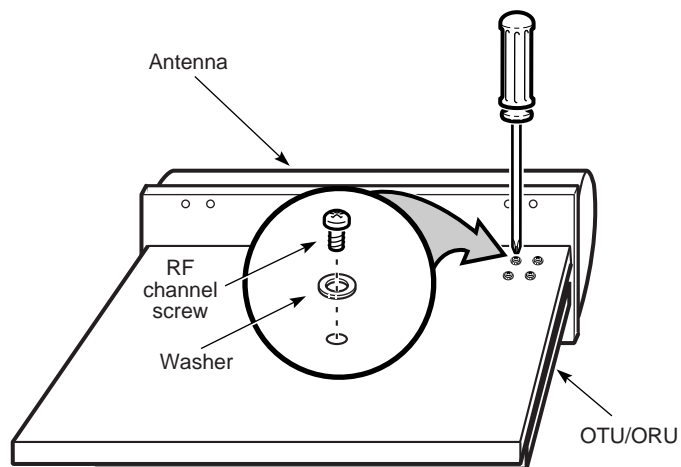


13007

6.  Turn the OTU/ORU and antenna assembly over, and tighten each of the three captive screws on the radio.

7.  Ensure that each of the RF channel screws is tight.

# 6. Installing the BTS antenna assembly

This chapter describes how to:

- attach the BTS antenna mounting hardware to a pole
- connect the antenna and OTU/ORU assembly to the mounting hardware
- connect a ground strap between the OTU/ORU and the mounting hardware

## 6.1 Installing the BTS mounting hardware

The BTS mounting hardware is composed of two assemblies: the top support arm bracket assembly, and the bottom support arm bracket assembly.

1. Attach the top support arm bracket assembly as shown in Figure 6-1.

**Figure 6-1: Attaching the top support arm bracket assembly**
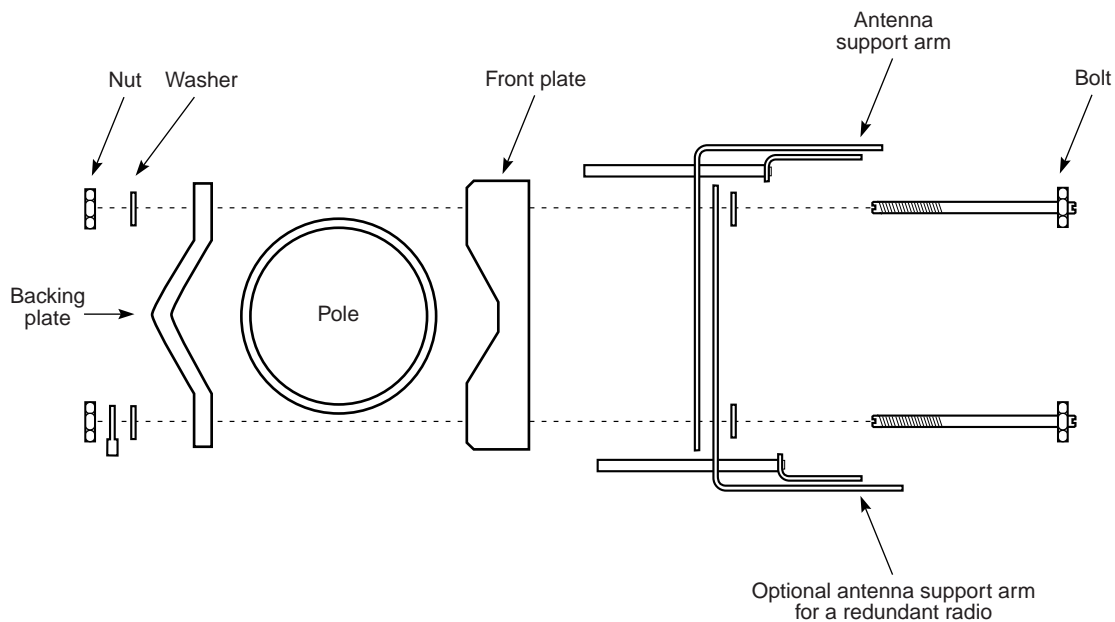
**2.** Install the bottom support-arm bracket assembly as shown in Figure 6-2. The ground strap used must conform to local grounding and electrical safety guidelines.

**Figure 6-2: Attaching the bottom support arm bracket assembly and ground strap**
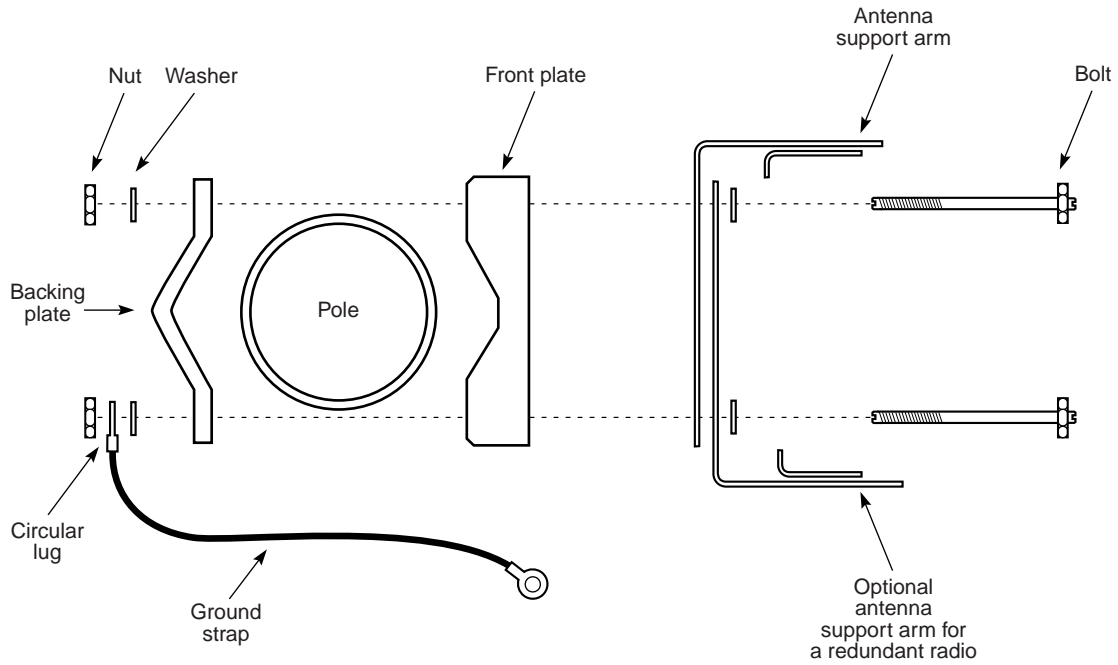
3. Attach the OTU/ORU and antenna assembly to the top and bottom support arm assembly as shown in Figure 6-3.

**Figure 6-3: Connecting the OTU/ORU, antenna and ground strap**
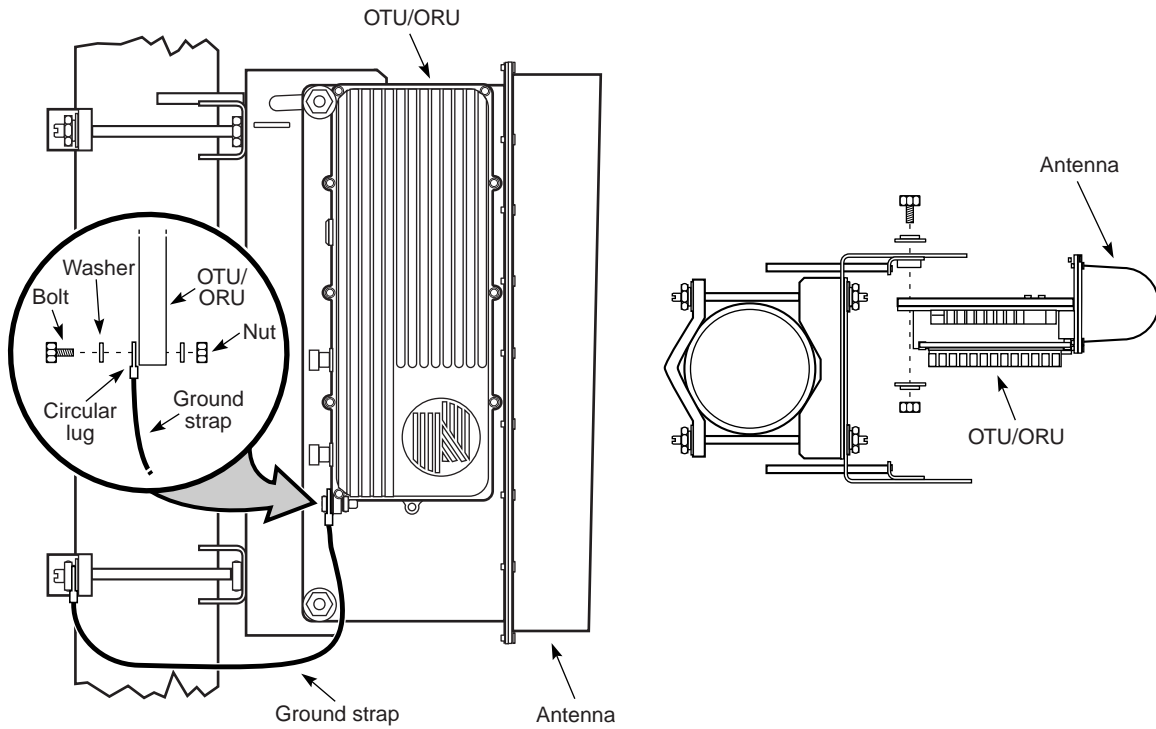


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# 7. Installing Bias-Ts and surge protectors

This chapter describes how to:

- connect the surge protector to the Bias-T
- connect the Bias-T to the 12:2 Combiner/Splitter
- connect the surge protector ground wire

---

**Note**

A surge protector must be installed on every Bias-T.

---

## 7.1 Connecting the surge protector to the Bias-T

To correctly connect a surge protector to a Bias-T, connect the male BNC connector on the surge protector to the DC IN connector on the Bias-T as shown in Figure 7-1.

**Figure 7-1: Connecting the surge protector**
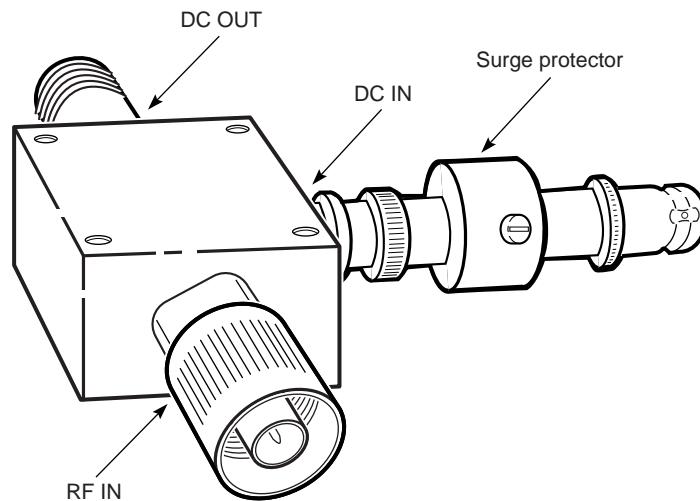
## 7.2    Connecting the Bias-T to the 12:2 Combiner/Splitter

**1.**    Position the Bias-T RF IN connector to one of the two Combiner/Splitter Bias-T connectors, as shown in Figure 7-2 (surge protector positioned at a right angle to the 12:2 Combiner/Splitter).

**Figure 7-2:  Connecting the Bias-T to the Combiner/Splitter**
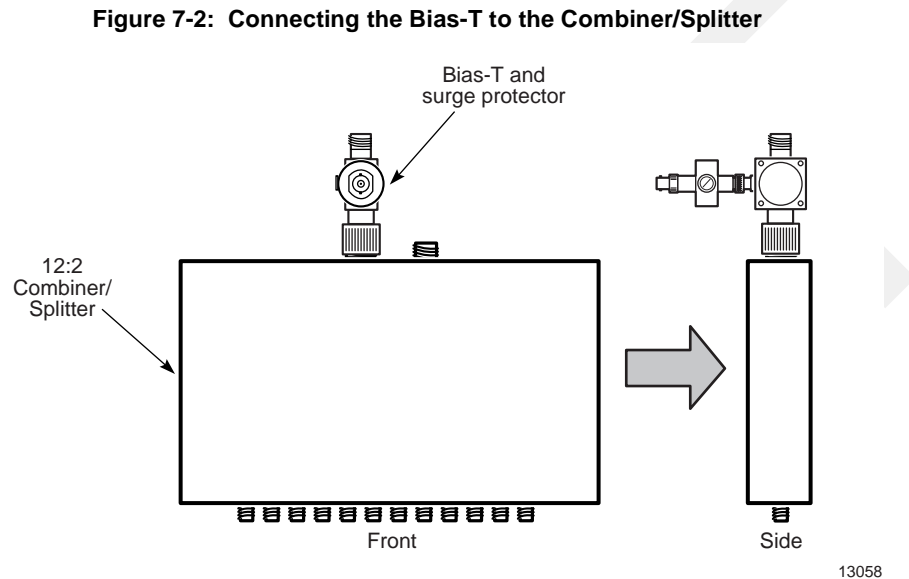


**2.**    Tighten the coupling on the RF IN connector until the Bias-T is firmly connected and does not rotate.

**3.**    Install a 50 Ω terminator on the second 12:2 Combiner/Splitter connector if it is not used for a redundant OTU or ORU Bias-T.

## 7.3    Connecting the surge protector ground wire

**1.**    Place the 12:2 Combiner/Splitter assembly in a permanent location at the MainStreetXpress 36170 shelf. If the 12:2 Combiner/Splitter is moved after the surge protector ground wire is connected, a new ground wire may need to be used if the previous wire is not long enough to run to the new 12:2 Combiner/Splitter location.

**2.**    Measure a length of insulated copper wire that is long enough to run from the closest safety ground to the surge protector.

**3.**    Add a ring lug to one end of the ground wire, and connect it to the surge protector as shown in Figure 7-3.

**Figure 7-3:  Surge protector ground connection**



Washer

Ring
lug

Surge
protector

Ground
screw
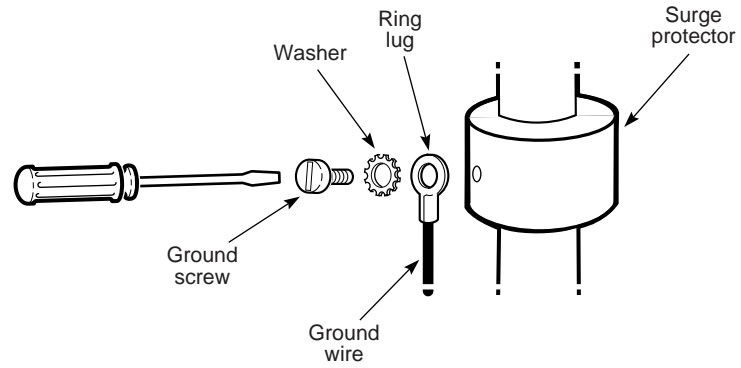
Ground
wire

13062

**4.**     Connect the other end of the ground wire to the building ground.

# 8. Installing broadband cable lightning arresters

This chapter describes how to connect BTS broadband cable lightning arresters to a grounded entry point. To correctly install a lightning arrester:

- connect the lightning arrester mounting brackets to the BTS grounding plate
- install the lightning arresters in the mounting brackets

## 8.1 Connecting the mounting bracket to the BTS grounding plate

Lightning arresters must be secured to a copper BTS grounding plate using mounting brackets. Connect a mounting bracket to the copper plate for each lightning arrester used in the system, as shown in Figure 8-1.

**Figure 8-1: Connecting the mounting brackets to the grounding plate**

3/8 in.
bronze bolt

Type N
mounting bracket

Copper
grounding plate

Bronze
lockwasher

Copper
washer

3/8 in.
bronze nut
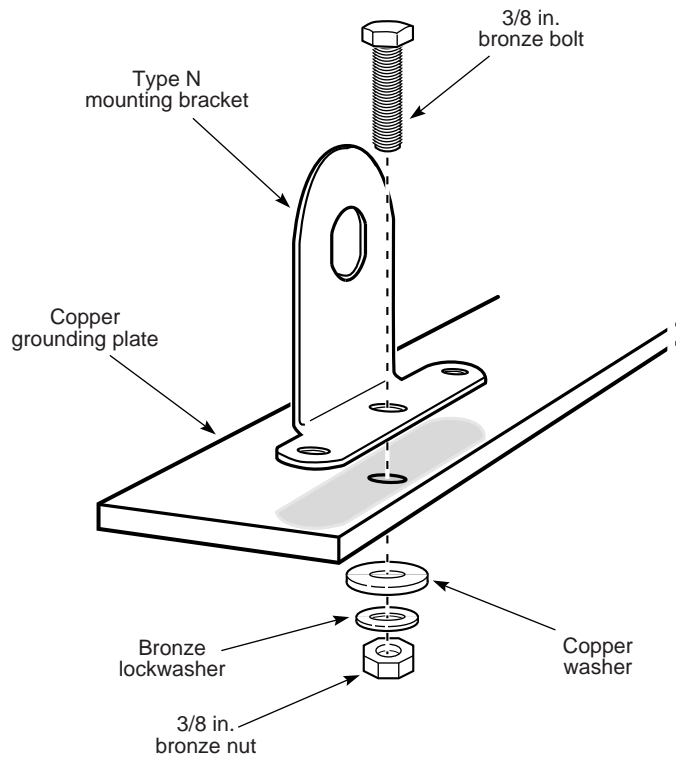
12990

## 8.2 Installing the lightning arrester in the adapter bracket

Before cables are connected to the lightning arrester, install each lightning arrester in the mounting brackets, as shown in Figures 8-2 and 8-3. Figure 8-3 shows the lightning arresters with cables connected.

**Figure 8-2: Connecting the lightning arrester to the adapter bracket**
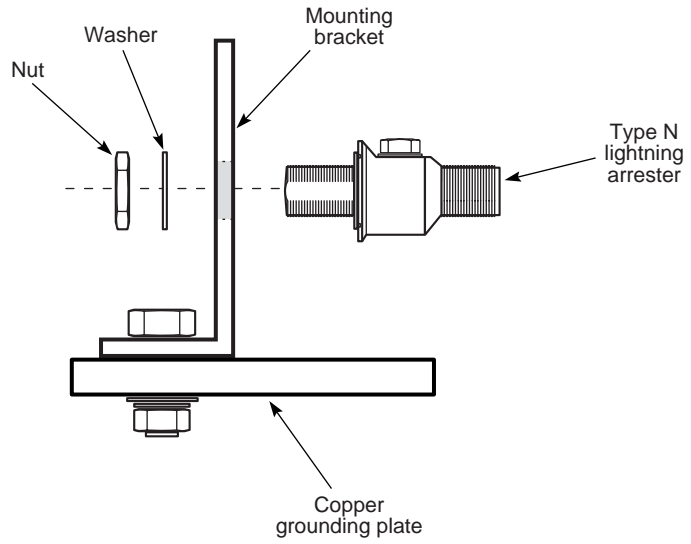


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**Figure 8-3: Installed and connected lightning arrester**
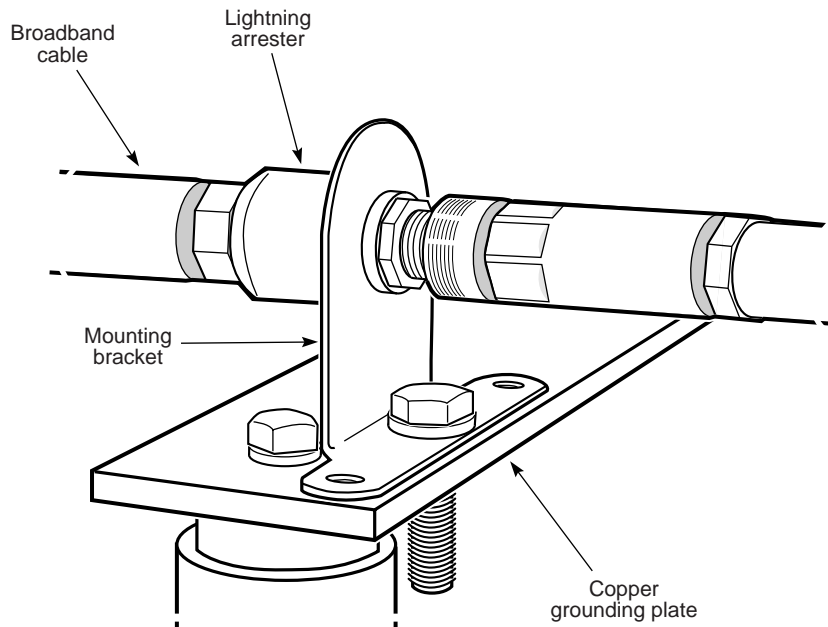


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# 9. BTS cable connections

This procedure describes how to select cable types, and how to connect cables between BTS components.

---

**Note**

All outdoor cable connections should be wrapped in butyl electrical tape to protect against moisture.

---

## 9.1 BTS cables

Figure 9-1 shows a simplex OTU/ORU BTS configuration. Figure 9-2 shows a redundant OTU/ORU BTS configuration. The cables shown in the diagram must be connected between the components.

**Figure 9-1: Simplex OTU/ORU BTS components and cables**
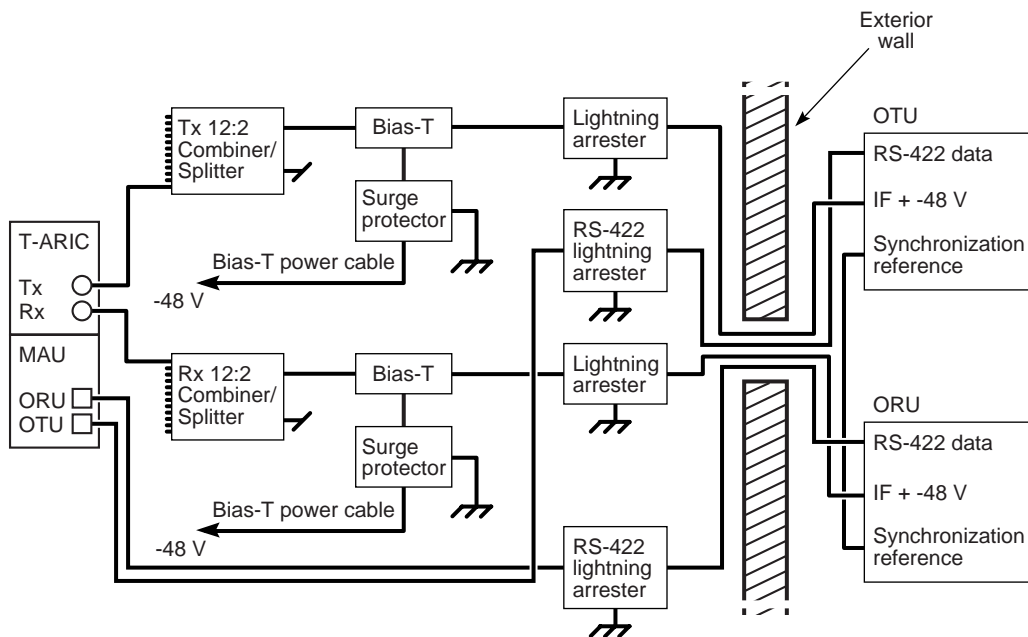
**Figure 9-2: Redundant OTU/ORU BTS components and cables**
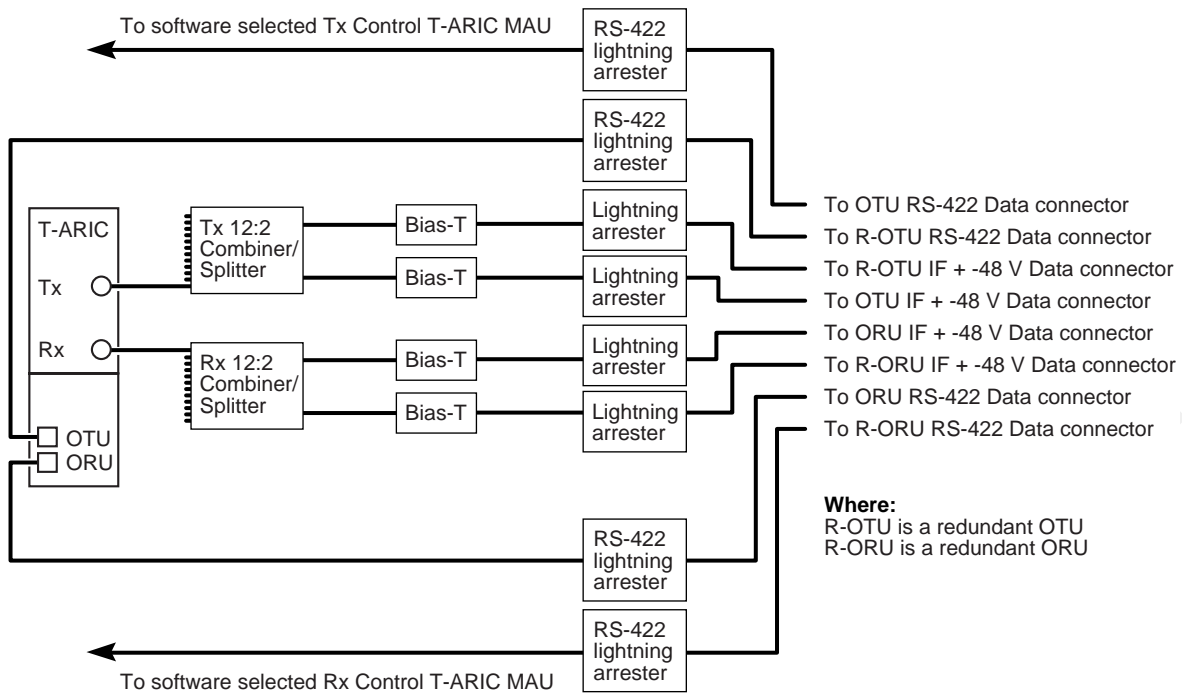


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Table 9-1 lists the cables used to connect the OTU, ORU and the T-ARIC card.
Table 9-2 lists the part numbers for the BTS cable connectors.

**Table 9-1: BTS cables**

| Physical path | Intermediate cables | Connectors | Recommended cable specification |
|---|---|---|---|
| OTU IF and -48 V to 12:2 Combiner/Splitter | OTU to lightning arrester<br>Lightning arrester to Bias-T | N(M) - N(M)<br>N(M) - N(M) | LDF4-50A<br>LDF5-50A<br>LDF6-50A<br>CR 50-540-PE<br>CR-50-1070-PE<br>CR-50-1873-PE |
| ORU IF and -48 V to 12:2 Combiner/Splitter | ORU to lightning arrester<br>Lightning arrester to Bias-T | N(M) - N(M)<br>N(M) - N(M) | LDF4-50A<br>LDF5-50A<br>LDF6-50A<br>CR 50-540-PE<br>CR-50-1070-PE<br>CR-50-1873-PE |
| 12:2 Combiner/Splitter to T-ARIC Tx connector | n/a | N(M) - SMA(M) | 90-6656-01 (3 m [10 ft])<br>90-6656-02 (6 m [20 ft]) |
| 12:2 Combiner/Splitter to T-ARIC Rx connector | n/a | N(M) - SMA(M) | 90-6656-01 (3 m [10 ft])<br>90-6656-02 (6 m [20 ft]) |

| Physical path | Intermediate cables | Connectors | Recommended cable specification |
|---|---|---|---|
| OTU RS-422 connector to T-ARIC MAU Tx connector | OTU to RS-422 lightning arrester<br><br>RS-422 lightning arrester to MAU OTU connector | LEMO - RJ45<br><br>RJ45 - RJ45 | Delco 398087P |
| ORU RS-422 connector to T-ARIC MAU Rx connector | ORU to RS-422 lightning arrester<br><br>RS-422 lightning arrester to MAU ORU connector | LEMO - RJ45<br><br>RJ45 - RJ45 | Delco 398087P |
| ORU to OTU | 100 MHz reference cable | N(M) - N(M) | LDF4-50A<br><br>CR-50-540 PE |
| Bias-T power cable | n/a | BNC(M) - lug connectors | 90-6516-01 |

**Table 9-2:  BTS cable connectors**

| Connector | Part number |
|---|---|
| N(M) | 90-6657-01 (1 connector)<br><br>90-6657-02 (25 connectors) |
| LEMO | 90-6816-01 |
| RJ-45 | 90-6815-01 |

## 9.2    Connecting BTS broadband cables

**Note**

Outdoor BTS broadband cables should be grounded via the outer conductor every 15 m (50 ft).

BTS cables, connectors and equipment must provide a fixed decibel loss in both the upstream and downstream directions. The downstream losses must total 27 dB at 2050 MHz, ± 1 dB. The upstream losses must total 24 dB at 900 MHz, ± 1 dB. If the total loss is less than the required value, attenuators are installed between SMA cables and the 12:2 Combiner/Splitters.

In order to maintain a fixed cable loss, different cable types are selected depending on the distance between the T-ARIC card and the OTU and ORU.

Table 9-3 shows the recommended cable types for specific distances. Tables 9-4 through 9-9 show how the fixed loss is calculated for each type of cable.

**Table 9-3:  Cable lengths and types**

| Distance | Cable type | Supplier | Loss calculations |
|---|---|---|---|
| 60 m (196 ft) | LDF4-50A | Andrew | Table 9-4 |
| 120 m (394 ft) | LDF5-50A | Andrew | Table 9-5 |
| 150 m (492 ft) | LDF6-50A | Andrew | Table 9-6 |
| 70 m (230 ft) | CR50-540-PE | CommScope | Table 9-7 |
| 120 m (394 ft) | CR50-1070-PE | CommScope | Table 9-8 |
| 200 m (656 ft) | CR50-1873-PE | CommScope | Table 9-9 |

**Table 9-4:  LDF4-50A cable (60 m [196 ft]) decibel loss calculations**

| BTS item | Max VSWR ($x$:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3 m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × OTU 12.2 Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × ORU 12:2 Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable LDF4-50A (60 m [196 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

**Table 9-5:  LDF5-50A cable (120 m [394 ft]) decibel loss calculations**

| BTS item | Max VSWR (*x*:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3 m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × 12:2 OTU Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × 12:2 ORU Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable LDF5-50A (120 m [394 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

**Table 9-6:  LDF6-50A cable (150 m [492 ft]) decibel loss calculations**

| BTS item | Max VSWR (*x*:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × 12:2 OTU Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × 12:2 ORU Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable LDF6-50A (150 m [492 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

**Table 9-7: CR50-540-PE cable (70 m [230 ft]) decibel loss calculations**

| BTS item | Max VSWR (*x*:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × 12:2 OTU Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × 12:2 ORU Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable CR50-540-PE (70 m [230 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

**Table 9-8: CR50-1070-PE cable (120 m [394 ft]) decibel loss calculations**

| BTS item | Max VSWR ($x$:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × 12:2 OTU Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × 12:2 ORU Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable CR50-1070-PE (120 m [394 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

**Table 9-9:  CR50-1873-PE cable (200 m [656 ft]) decibel loss calculations**

| BTS item | Max VSWR ($x$:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (900 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (900 MHz) (dB) | Downstream VSWR corrected loss (2050 MHz) (dB) | Upstream VSWR corrected loss (900 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × T-ARIC SMA cable (3m [10 ft]) | 1.35 | 0.467 | .333 | 1.40 | 1.00 | 1.46 | 1.05 |
| 1 × 12:2 OTU Combiner/Splitter | 1.30 | 3.000 | 0.000 | 14.00 | 0.00 | 17.10 | 0.00 |
| 1 × 12:2 ORU Combiner/Splitter | 1.30 | 0.000 | 2.500 | 0.00 | 14.00 | 0.00 | 16.59 |
| 1 × Bias-T | 1.30 | 1.000 | 1.000 | 1.00 | 1.00 | 1.03 | 1.03 |
| 1 × surge protector | 1.10 | 0.200 | 0.200 | 0.20 | 0.20 | 0.20 | 0.20 |
| 1 × cable CR50-1873-PE (200 m [656 ft]) | 1.20 | 0.065 | 0.040 | 7.75 | 4.80 | 7.88 | 4.88 |
| 4 × cable connectors | 1.20 | 0.200 | 0.200 | 0.80 | 0.80 | 0.94 | 0.94 |
| Total loss | — | — | — | 25.15 | 21.80 | 28.63 | 24.69 |

## Connecting the broadband cables

1. Determine the cable length required for the distance between the OTU/ORU assembly and the T-ARIC card.

2. Use Table 9-3 to select a cable type based on the required length. If non-Newbridge components are used, use Tables 9-4 to 9-9 to ensure that the fixed dB loss is maintained.

3. Secure the OTU and ORU broadband cables to the respective poles or towers with a cable tie, leaving enough length to connect the cables to the elevated OTU and ORU positions.

4. Feed the cables through the weatherproof access panel to the grounded entry point where the lightning arresters are installed. Secure the cables to the grounded entry point, and continue to feed the cables to the location of the 12:2 Combiner/Splitters.

5. Secure the end of the cables to a location near the 12:2 Combiner/Splitters, after ensuring that the cables are long enough to reach and connect to the 12:2 Combiner/Splitters.

6. At the grounded entry point, cut each cable to a length sufficient to allow the ends of both cables to connect to the lightning arresters.

7. Install the N(M) connectors on the cables, and mate the cables to the lightning arresters, as indicated in Figures 9-1 or 9-2.

**8.** At the OTU, install an N(M) connector on the end of the broadband cable, and connect the cable to the IF and -48 V connector on the OTU.

**9.** At the ORU, install an N(M) connector on the end of the broadband cable, and connect the cable to the IF and -48 V connector on the ORU.

**10.** At the 12:2 Combiner/Splitters, install N(M) connectors on the ends of the broadband cables, and connect the broadband cables to their respective 12:2 Combiner/Splitter connectors.

## 9.3    Connecting the synchronization reference cable

Each OTU and ORU pair are connected by a synchronization reference cable. In a redundant configuration, the synchronization reference signal must be split by 2:1 Combiner/Splitters that distribute the signal to both the control and the redundant ORU/OTU.

Table 9-10 describes the requirements for both simplex and redundant OTU/ORU synchronization reference cable configurations.

**Table 9-10:  Synchronization reference cable configuration requirements**

| Configuration | Requirements |
|---|---|
| Non-redundant ORU and OTU | • A single cable between the ORU reference output and the OTU reference input |
| Redundant ORU and redundant OTU | • Two cables from ORUs to 2:1 Combiner/Splitter<br><br>• Two cables from OTUs to 2:1 Combiner/Splitter<br><br>• One cable from the OTU/R-OTU 2:1 Combiner/Splitter to the ORU/R-ORU 2:1 Combiner/Splitter |

Figure 9-3 shows a redundant OTU/ORU synchronization reference cable configuration.

**Figure 9-3: Reference cables for redundant OTU/ORU configurations**
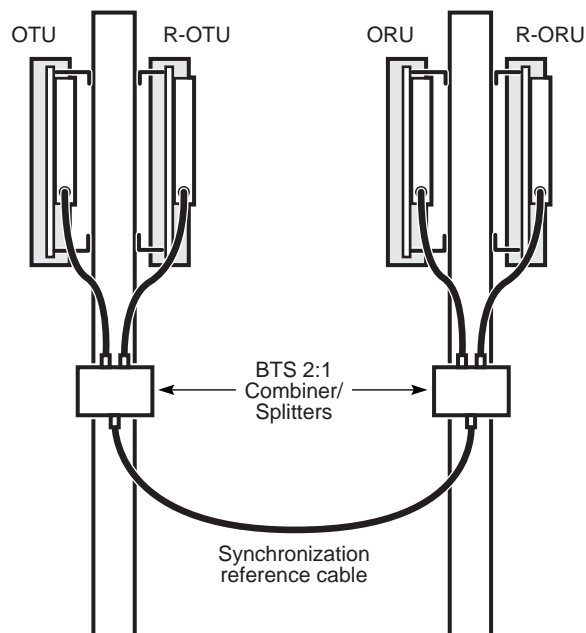


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## Connecting synchronization reference cables (simplex OTU/ORU)

1.  Measure and cut a length of cable that runs between the OTU and ORU, including the distance required to run up each pole to the OTU and ORU connectors.

2.  Install N(M) connectors on each end of the cable.

3.  Run the cable between the OTU and ORU.

4.  Connect the cable connectors to the 100 MHz reference connectors on the OTU and ORU.

5.  Secure the cable to the pole every 1 m (3 ft) with plastic ties.

## Connecting synchronization reference cables (redundant OTU/ORU)

1.  Using a metal hose clamp, attach a 2:1 Combiner/Splitter to the OTU pole, just beneath the OTU/R-OTU pair.

2.  Using a metal hose clamp, attach a 2:1 Combiner/Splitter to the ORU pole, just beneath the ORU/R-ORU pair.

3.  Measure and cut four lengths of cable that are long enough to run from the 2:1 Combiner/Splitter to each of the OTUs or ORUs mounted above the 2:1 combiner splitter.

4.  Install N(M) connectors on each of the lengths of cable.

5.  Connect the cable connectors to the OTUs and ORUs as shown in Figure 9-3.

6.  Measure and cut a length of cable long enough to run between the OTU/R-OTU 2:1 Combiner/Splitter and the ORU/R-ORU 2:1 Combiner/Splitter, including the distance required to run up each pole to the 2:1 Combiner/Splitter connectors.

7.  Install N(M) connectors on each end of the cable.

8.  Run the cable between the 2:1 Combiner/Splitters.

9.  Connect the cable connectors to 2:1 Combiner/Splitters connectors on the OTU and ORU, as shown in Figure 9-3.

10. Secure the cable to the pole with plastic ties every 1 m (3 ft).

## 9.4  Connecting the RS-422 cables

In a simplex OTU/ORU system, RS-422 cables connect the MAU associated with the first T-ARIC card in a T-ARIC group to the OTU and ORU.

In a redundant OTU/ORU system, additional RS-422 cables connect:

*   the redundant OTU to the MAU of the configured Tx control T-ARIC card
*   the redundant ORU to the MAU of the configured Rx control T-ARIC card

Each RS-422 cable is composed of two intermediate cables. Table 9-1 lists the intermediate cables, and the connectors required to connect them between the MAU and the OTU/ORU.

### To connect a BTS RS-422 cable

For each OTU and ORU:

1.  Determine the cable length required for the distance between the OTU/ORU and the T-ARIC card MAU.

2.  Secure the cable to the pole or tower with cable ties, leaving enough length to connect the cables to the elevated OTU or ORU positions.

3.  Feed the cable through the weatherproof access panel to the grounded entry point where the RS-422 lightning arrester is installed. Secure the cables to the grounded entry point with cable ties, and continue to feed the cables to the location of the MAU.

4.  Secure the end of the cable to a location near the MAU with cable ties, after ensuring that the cable is long enough to connect to the MAU connector.

5.  At the grounded entry point, cut each cable to a length sufficient to allow both ends of the cable to connect to the RS-422 lightning arresters.

6.   Install the RJ45 connectors on the cables, and connect:

   •   the cable from the OTU or ORU to the lightning arrester EQUIP connector
   •   the cable to the MAU to the lightning arrester LINE connector

7.   At the OTU or ORU, install a LEMO connector on the end of the cable, and
     connect the cable to the RS-422 data connector on the OTU or ORU. Use Table
     9-11 to connect the LEMO connector pins and signals to the RJ45 connector pins
     and signals.

**Table 9-11:  LEMO to RS-422 connector pins and signals**

| LEMO pin | RJ45 pin | Function |
|----------|----------|----------|
| 1        | 2        | Tx+      |
| 2        | 7        | Rx+      |
| 3        | 1        | Tx-      |
| 4        | 8        | Rx-      |

8.   At the MAU, install an RJ45 connector on the end of the broadband cable, and
     connect the cable to the appropriate MAU connector (OTU cable to MAU OTU
     connector, ORU cable to ORU MAU connector).

## 9.5      Connecting SMA cables

T-ARIC cards are connected to 12:2 Combiner/Splitters by pairs of SMA cables. If
multiple T-ARIC cards are used, multiple pairs of SMA cables are used.

**Note**

The number of T-ARIC cards connected to the 12:2 Combiner/Splitters may be
limited by the ORU/OTU hardware. Consult Newbridge for the maximum number
of T-ARIC cards that can be connected to an OTU/ORU through a 12:2
Combiner/Splitter.

1.   Connect the SMA(M) connector on the SMA cable to the Tx connector on the
     T-ARIC card faceplate.

2.   Connect the N(M) connector on the same SMA cable to connector 1 on the Tx
     Combiner/Splitter.

3.   Connect the SMA(M) connector on the SMA cable to the Rx connector on the
     T-ARIC card faceplate.

4.   Connect the N(M) connector on the same SMA cable to connector 1 on the Rx
     Combiner/Splitter.

5. Connect the Tx and Rx connectors from the other T-ARIC cards (cards 2 through 12) to Tx and Rx Combiner/Splitter connectors 2 to 12, as indicated in Figure 9-4.

6. Install 50 Ω terminators on all unused 12:2 Combiner/Splitter connectors.

**Figure 9-4: SMA cable connections**
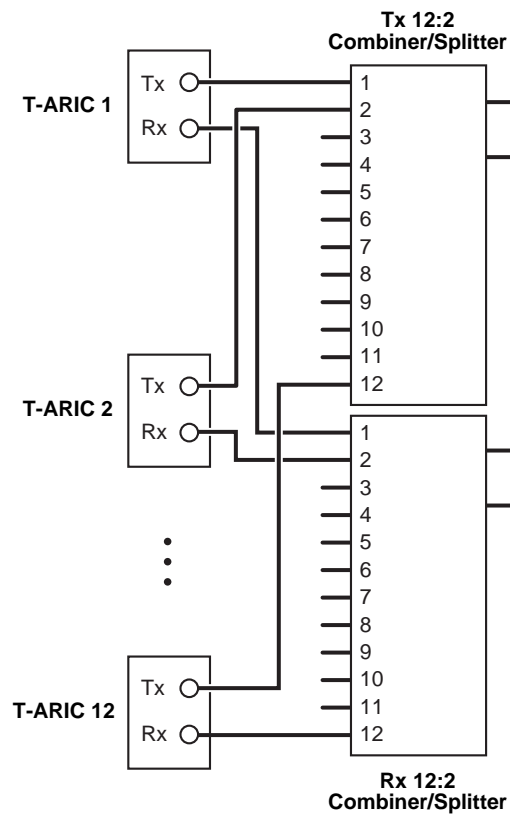


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## 9.6 Connecting the Bias-T power cable

The Bias-T power cable connects between the Bias-T surge protector and the -48 V power supply.

1. Connect the Bias-T power cable BNC(M) connector to the surge protector.

2. On the Bias-T power cable, connect the lug connector on the red wire to the -48 V power supply -48 V connector, and connect the lug connector on the black wire to the power supply 0VR connector.

# 10. Installing the customer premises equipment

This chapter provides an overview on how to install the customer premises equipment.

## 10.1 Customer premises equipment

The combined transmitter and receiver functions are provided by the OTRU. Similar to the OTU and ORU, the OTRU is designed to be installed on an antenna mast or building roof top at the subscriber site. If two OTRUs are installed at the same customer site, they must be installed 1 m (3 ft) apart (horizontal or vertical), to avoid blocking line-of-sight access to the BTS. Figure 10-1 shows typical single NIU and dual NIU equipment.

**Figure 10-1: CPE overview**
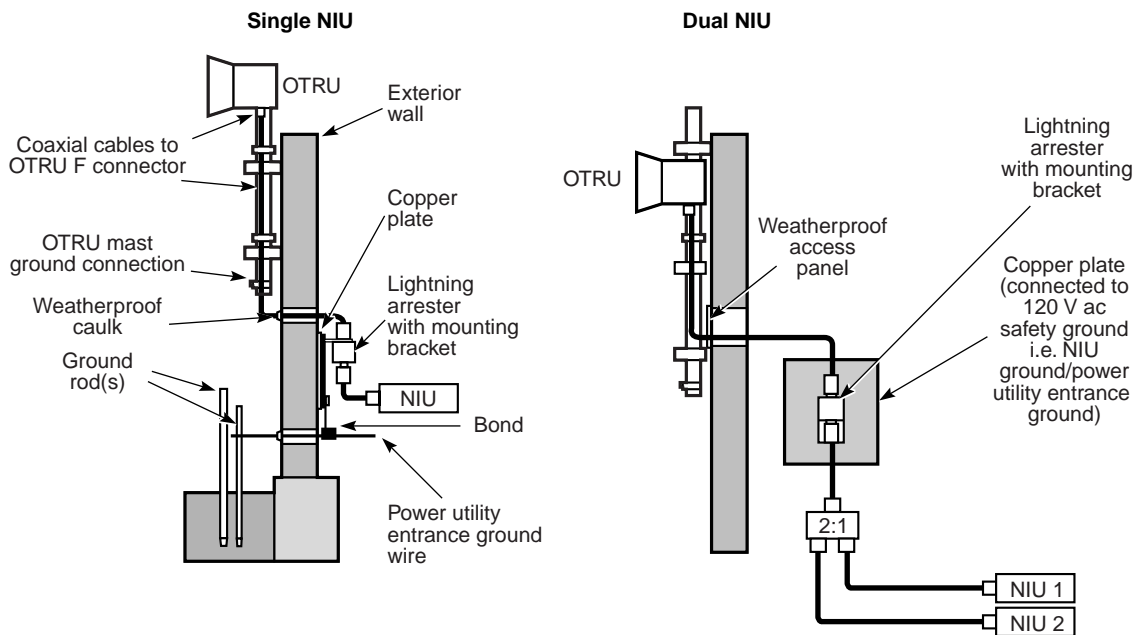
## Cable loss

The CPE passive components, in all installations, are designed to provide a fixed common loss. The losses are:

- downstream: maximum 16 dB at 2050 MHz
- upstream: 8 ±1 dB at 700 MHz

If the total loss of the installed passive components falls short of these values, do not insert attenuators to make up the difference. Use a specific cable length to make up the loss.

## Passive components

Passive components for the CPE consist of a single coaxial cable from the NIU to the OTRU. Figure 10-2 shows a typical single NIU and dual NIU passive component configuration. Power for the radio is duplexed onto the line by the NIU; hence, no external power supply is required.

Properly grounded lightning arresters are highly recommended at the building entry point. Every customer site is different. Therefore, cable runs on the inside and outside of the premises will vary from site to site. As with the BTS, Newbridge can recommend the cable type and specifications for customers wishing to optimize their CPE sites by running their own cable. Because there are many factors associated with choosing a suitable coaxial cable, customers will be advised by Newbridge of the manufacturers and manufacturers part numbers recommended for these cable assemblies.

To interconnect two NIUs to one CPE OTRU, a 2:1 Combiner/Splitter is required.

**Figure 10-2: Passive component interconnections**
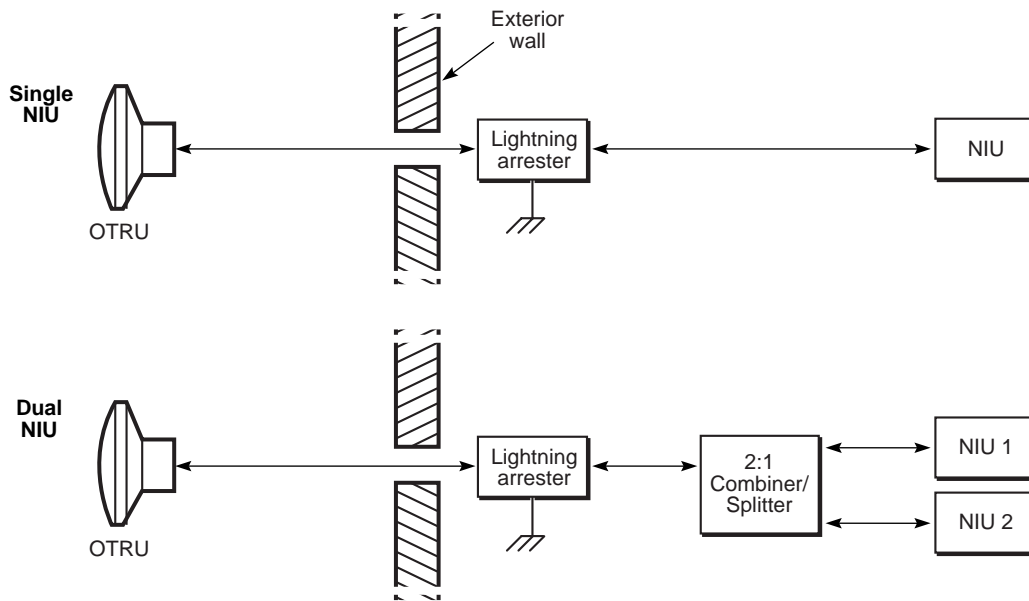


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## 10.2      CPE installation tasks

Perform the following installation tasks to install the CPE:

- attach the OTRU to the pole assembly
- install the lightning arresters
- connect the CPE cables

# 11. Installing the CPE OTRU

This chapter describes how to install the back-mount or side-mount OTRU on a pole.

---

**Note**

There are two types of OTRU transceivers: side-mount and back-mount. Both OTRUs have the same part number, and are shipped according to availability.

---

## 11.1 Mounting the OTRUs

1.  Assemble the OTRU mounting hardware according to Figures 11-1 or 11-2. If the backing plate is pre-installed, remove it.

2.  Connect the mounting hardware to the pole.

    i.  Position the mounting hardware against the pole as shown in Figures 11-1 or 11-2; attach the backing plate with the four nuts.

    ii.  Secure the mounting hardware to the pole by tightening the four backing plate bolts until the mounting hardware does not rotate freely by hand.

3.  Connect the OTRU to the mounting hardware.

    i.  Align the OTRU as shown in Figures 11-1 or 11-2. Make sure that the polarization indicator arrow on the rim of the OTRU antenna points sideways for horizontal polarization installations, or that the polarization indicator arrow on the rim of the OTRU antenna points down for vertical polarization installations.

    ii.  Insert and tighten the four bolts that attach the OTRU to the mounting hardware.

4.  Install the provided plug into the drain hole on the side of the OTRU antenna housing. Ensure that the second drain hole (located at the bottom of the OTRU antenna housing) is clear of obstructions.

**Figure 11-1:  Side-mount OTRU**
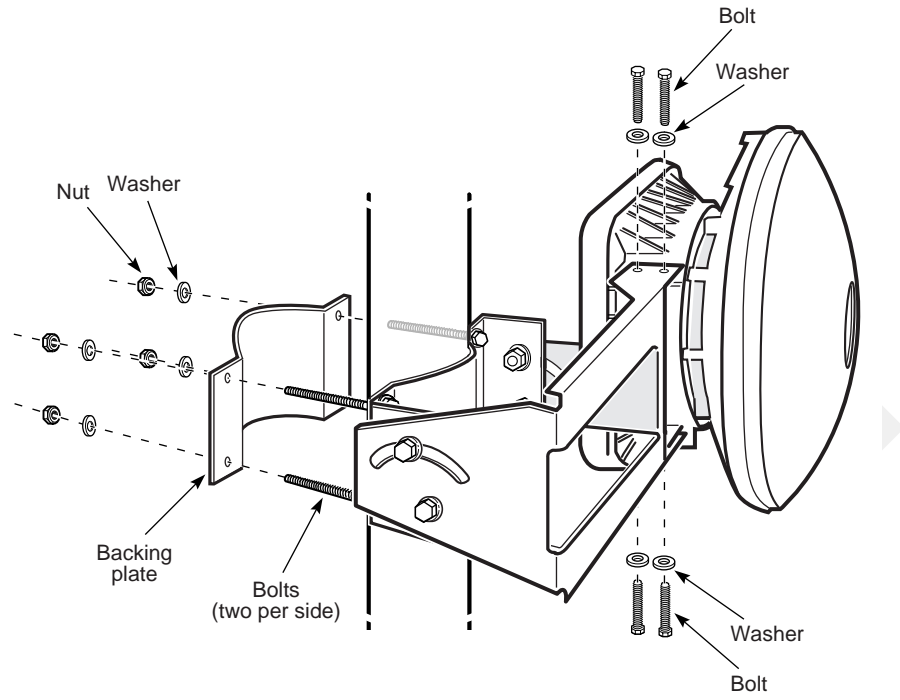
**Figure 11-2: Back-mount OTRU**
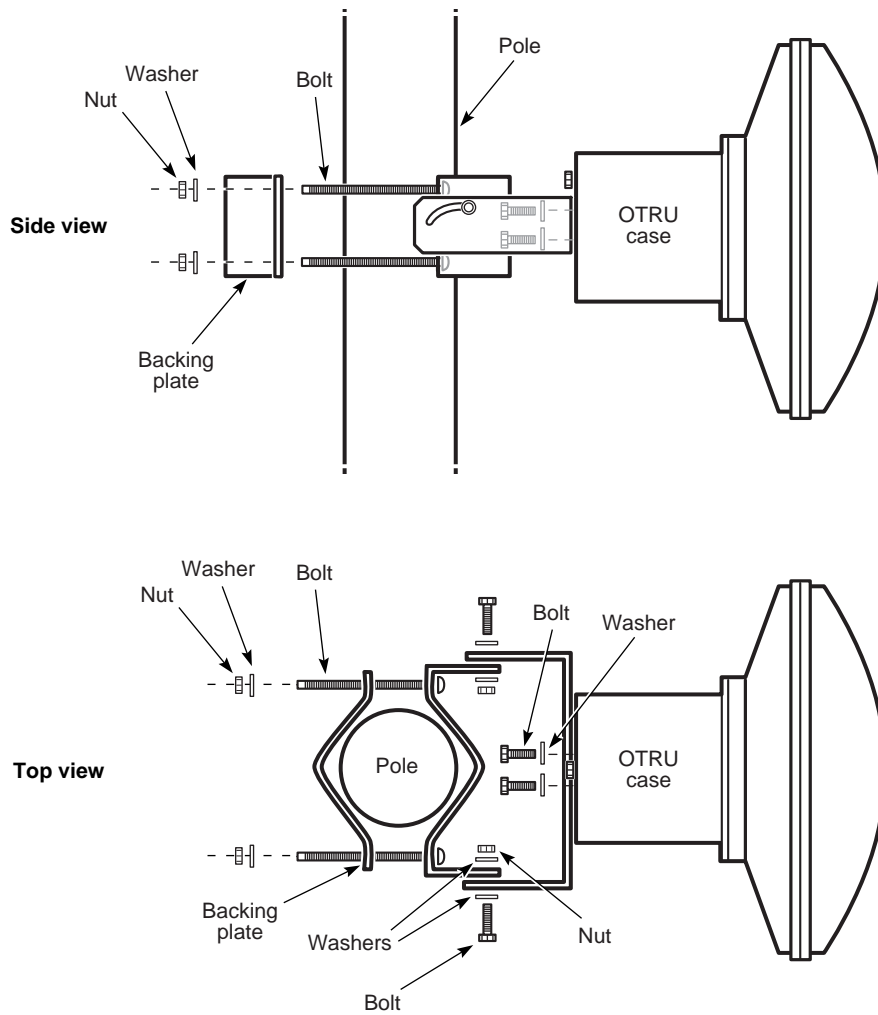


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# 12. Installing CPE lightning arresters

This chapter describes how to connect CPE lightning arresters to a grounded entry point. To correctly install a lightning arrester:

- connect the mounting bracket to the CPE grounding plate
- install the lightning arresters in the mounting brackets

## 12.1 Connecting the mounting bracket and lightning arrester to the CPE grounding plate

Lightning arresters must be secured to a copper CPE grounding plate using mounting brackets. Connect the mounting brackets and lightning arresters as shown in Figure 12-1.

**Figure 12-1:  Connecting the mounting brackets to the grounding plate**
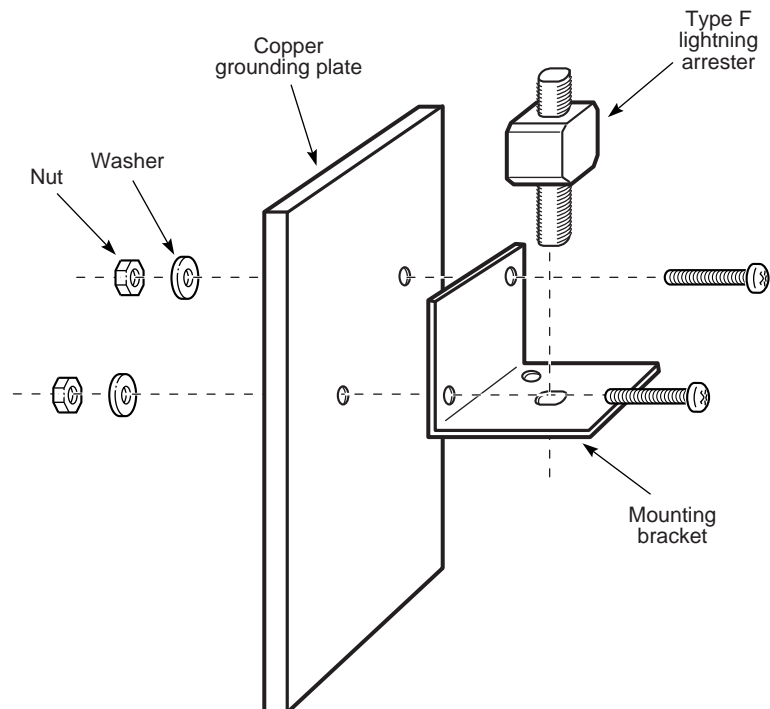


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Figure 12-2 shows a lightning arrester installed on a grounding plate, and connected to broadband cables.

**Figure 12-2:  Connected lightning arrester**

Copper
grounding plate

To NIU or 2:1
Combiner/
Splitter

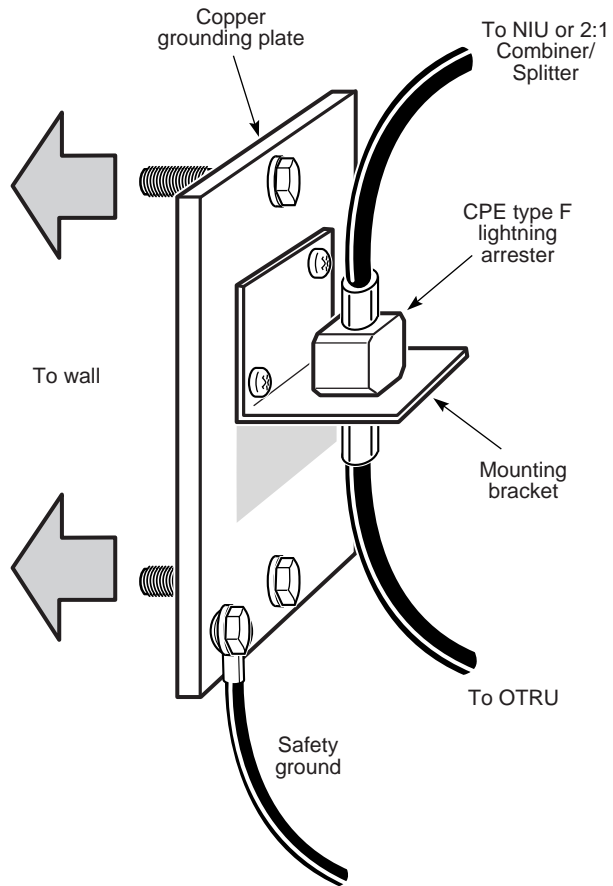CPE type F
lightning
arrester

To wall

Mounting
bracket

To OTRU

Safety
ground

13101

# 13. CPE cable connections

This procedure describes how to select cable types, and how to connect RG-11 cables between the CPE components.

## 13.1 OTRU configurations

The CPE RG-11 cable connects the OTRU transceiver to either one or two NIUs at the customer premises. A configuration using one NIU is called a single NIU configuration. A configuration using two NIUs is called a dual NIU configuration. Figure 13-1 shows an example of single and dual NIU configurations. Table 13-1 lists and describes CPE cables and connectors.

**Figure 13-1: CPE single and dual NIU configurations**
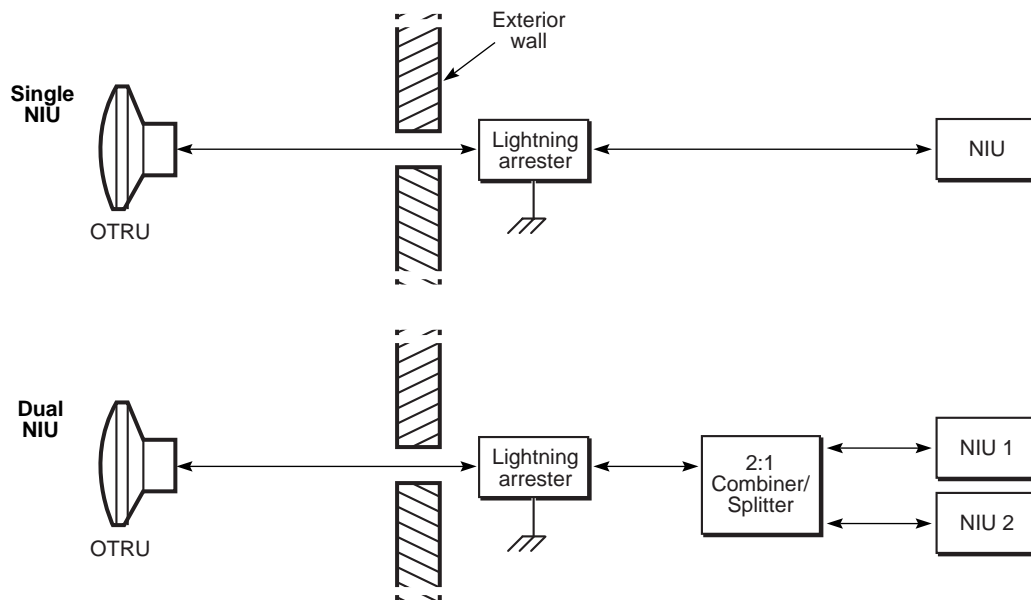


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**Table 13-1:  CPE cables**

| NIU configuration | Physical path | Intermediate cables | Connectors |
|---|---|---|---|
| Single NIU | OTRU to NIU | OTRU to lightning arrester | F(M) - F(M) |
| | | Lightning arrester to NIU | F(M) - F(M) |
| Dual NIU | OTRU to NIU | OTRU to lightning arrester | F(M) - F(M) |
| | | Lightning arrester to 2:1 Combiner/Splitter | F(M) - F(M) |
| | | 2:1 Combiner/Splitter to each NIU | F(M) - F(M) |

## 13.2    Decibel loss calculations

The CPE cable, connectors and equipment must provide a fixed decibel loss in both the upstream and downstream directions. The downstream losses must not exceed 16 dB at 2050 MHz. The upstream losses must total 8 dB at 700 MHz, ± 1 dB. If the total loss does not equal the recommended values, reduce or increase cable length accordingly.

Single and dual NIU configurations require different cable lengths to achieve the desired cable loss. Figure 13-2 shows the cable lengths used in single and dual NIU configurations.

**Figure 13-2:  Single and dual NIU cable lengths**
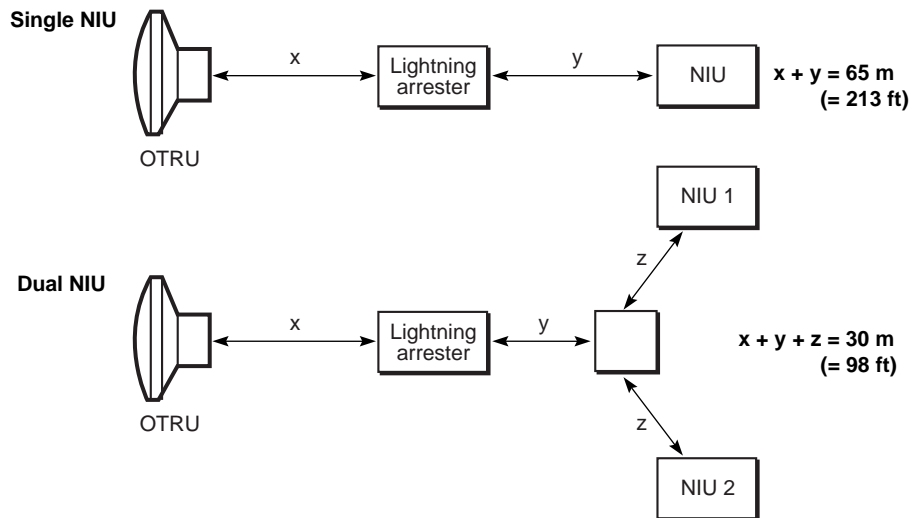


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Table 13-2 shows the loss characteristics of the single NIU components and the cable length (65 m [213 ft]) required to achieve the fixed decibel losses.

**Table 13-2: Single NIU RG-11 cable (65 m [212 ft]) decibel loss calculations**

| Single NIU CPE components | Max VSWR (*x*:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (700 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (700 MHz) (dB) | Downstream VSWR corrected transmission loss (2050 MHz) (dB) | Upstream VSWR corrected transmission loss (700 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| Surge protector | 1.40 | 0.200 | 0.200 | 0.20 | 0.20 | 0.21 | 0.21 |
| 1 × RG-11 cable (65 m [212 ft]) | 1.20 | 0.150 | 0.105 | 9.75 | 6.83 | 9.91 | 6.95 |
| 4 × F-type connectors | 1.40 | 0.200 | 0.200 | 0.80 | 0.80 | 0.97 | 0.97 |
| Total loss | — | — | — | 10.75 | 7.83 | 11.09 | 8.12 |

Table 13-3 shows the loss characteristics of the dual NIU components and the cable lengths required to achieve the required fixed decibel losses.

**Table 13-3: Dual NIU RG-11 cable (30 m [98 ft]) decibel loss calculations**

| Dual NIU CPE components | Max VSWR (*x*:1) | Downstream loss (2050 MHz) (dB) | Upstream loss (700 MHz) (dB) | Downstream insertion and coupling loss (2050 MHz) (dB) | Upstream insertion and coupling loss (700 MHz) (dB) | Downstream VSWR corrected transmission loss (2050 MHz) (dB) | Upstream VSWR corrected transmission loss (700 MHz) (dB) |
|---|---|---|---|---|---|---|---|
| 1 × RG-11 jumper | 1.20 | 0.150 | 0.105 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 × 2:1 Combiner/ Splitter | 1.200 | 0.500 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 × surge protector | 1.40 | 0.200 | 0.200 | 0.20 | 0.20 | 0.21 | 0.21 |
| 1 × RG-11 cable (30 m [98 ft]) | 1.20 | 0.150 | 0.105 | 4.50 | 3.15 | 4.58 | 3.21 |
| 6 × F-type connectors | 1.40 | 0.200 | 0.200 | 1.20 | 1.20 | 1.61 | 1.61 |
| Total loss | — | — | — | 9.05 | 7.66 | 10.75 | 8.64 |

## 13.3        Connecting single NIU cables

**1.**    Cut a 65 m (212 ft) length of RG-11 cable into two lengths, as follows.

- The first length must be long enough to run from the OTRU F(F) connector to the lightning arrester.
- The second length must be long enough to run from the lightning arrester to the NIU IF In/Out and 35 VDC Out connector.

**2.**    Install F(M) connectors on the ends of both cables.

**3.**    Connect the first length of cable between the OTRU F(J) connector and one of the lightning arrester connectors.

**4.**    Connect the second length of cable between the second lightning arrester connector and the NIU IF Input/Output and 35 VDC connector.

**5.**    If the cable run between the OTRU and the NIU is less than 65 m (212 ft), one or both of the two lengths of cable will be longer than is necessary to reach between the connected devices. Do not cut off this extra cable length. If necessary, coil the cable and put the cable in an area that does not impede access to any CPE components.

## 13.4        Connecting dual NIU cables

**Note**

The total cable length between the OTRU and an NIU must be 30 m (98 ft).

**1.**    Cut a 30 m (98 ft) length of RG-11 cable into three lengths, as follows.

- The first length must be long enough to run between the OTRU and the lightning arrester.
- The second length must be long enough to run between the lightning arrester and the 2:1 Combiner/Splitter.
- The third length of cable must be long enough to run between the 2:1 Combiner/Splitter and the NIU that is farthest (in terms of the length of cable required) from the 2:1 Combiner/Splitter.

**2.**    Cut a fourth length of cable equal in length to the third length of cable.

**3.**    Install F(M) connectors on all the cable ends.

**4.**    Connect the first length of cable between the OTRU F(F) connector and one of the lightning arrester connectors.

**5.**    Connect the second length of cable between the second lightning arrester connector and the 2:1 Combiner/Splitter IN connector.

**6.** Connect the third length of cable between either of the remaining 2:1 Combiner/Splitter connectors and the IF In/Out and 35 VDC Out connector on the first NIU.

**7.** Connect the fourth length of cable between the remaining 2:1 Combiner/Splitter connector and the IF Input/Output and 35 VDC connector on the second NIU.

**8.** If the cable run between the OTRU and either NIU is less than 30 m (98 ft), one or more of the lengths of cable will be longer than is necessary to reach between the connected devices. Do not cut off this extra cable length. If necessary, coil the cable and put the cable in an area that does not impede access to any CPE components.

# 14. OTRU alignment

This chapter describes how to align an OTRU by adjusting the azimuth, elevation and vertical angle of an OTRU. This procedure requires a minimum distance of 300 m (900 ft) between the BTS and the OTRU. If the distance is less, contact Newbridge for information.

## 14.1 Test equipment and parts

A spectrum analyzer or power meter is required for this procedure.

Table 14-1 lists the components and cables required to align the OTRU.

**Table 14-1: Components and cables required**

| Equipment | Supplier |
|-----------|----------|
| Bias-T | Newbridge (part number 90-6516-01) Pulsar (BT-D6-411NM) |
| F(F) to N(M) adapter | Gilbert Engineering (NS-2873-1) |
| BNC(M) to F(F) adapter | Gilbert Engineering (G-BNCF-MF) |
| N(F) to N(F) adapter | Narda Model 77 |
| RF cable, F(M), 1 m (3 ft) in length minimum | any |
| RF cable, N(M), 1 m (3 ft) in length minimum | any |

## 14.2　　Aligning the OTRU

An OTRU must be aligned to point directly toward the BTS in order to receive a reliable signal. Figure 14-1 shows the mounting hardware bolts used to adjust the azimuth, elevation and vertical angle of an OTRU in relation to the BTS.

In order to align the OTRU to the BTS signal, adjust the OTRU mounting hardware to find a position that provides the highest possible power readings. Acceptable peak power readings are based on RF planning and analysis activities that should be done before an OTRU is installed.
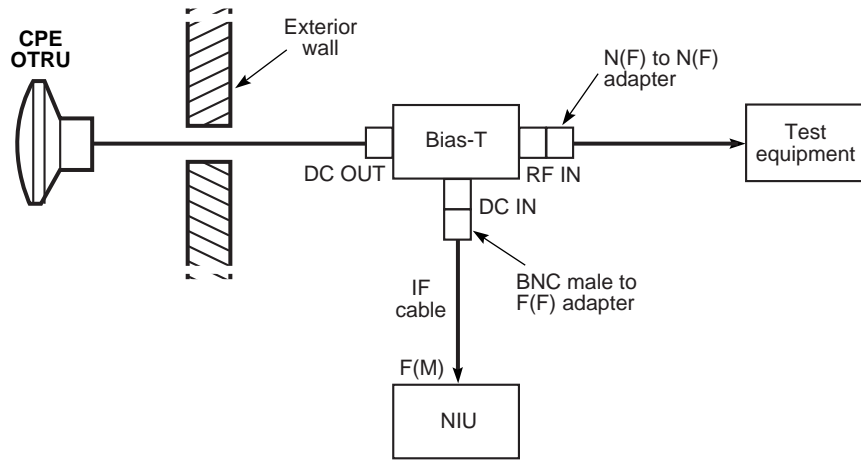
**Figure 14-1:　OTRU alignment adjustment hardware**

Vertical angle
adjustment
bolts

Elevation
and azimuth
adjustment
bolts
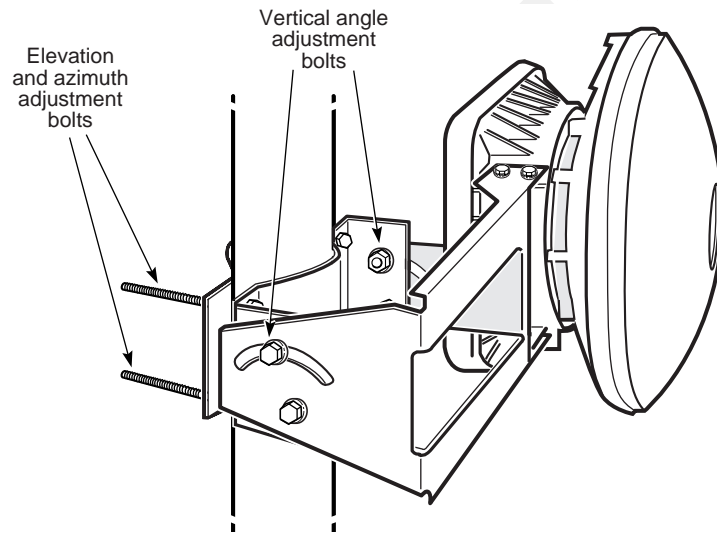
12973

**1.**　Switch off the NIU, and connect the test equipment as shown in Figure 14-2.

**Figure 14-2: Test equipment configuration**



13089

2. Ensure that the BTS is transmitting a signal in the CPE sector.

3. Adjust the bolts identified in Figure 14-1 until the OTRU mounting hardware is sufficiently snug to hold the unit on the mast, but is loose enough to allow easy rotation of the unit by hand. Set the azimuth, elevation and rotation of the antenna to point at the approximate location of the BTS.

4. Switch the NIU on.

5. Prepare the test equipment to make the measurements.

   a. If measurements are made using a power meter, set AVERAGING to a low figure (for example, 2).

   b. If a spectrum analyzer is used, set CENTER FREQUENCY to a value that is 200 MHz higher than the tone frequency at the BTS, and set BANDWIDTH to 100 MHz.

6. Observe and record the measurement on the test equipment, and adjust the azimuth of the OTRU to provide a peak power reading.

7. Observe and record the measurement on the test equipment, and adjust the elevation of the OTRU to provide a peak reading.

8. Observe and record the measurement on the test equipment, and adjust the vertical angle of the OTRU to provide a peak reading.

9. Tighten the mounting hardware and verify the measurements previously made to ensure that the OTRU is still aligned to provide a peak reading on the test equipment.

10. Switch the NIU off, disconnect the test equipment and reconnect the outdoor cable to the OTRU. Switch the NIU on.

# 15.  Node management

This chapter describes:

- node management through the NMTI
- the main menu

## 15.1  Node management overview

### NMTI user interface

The NMTI is a user-interface software program that resides in the PROM module on the NIUs and the MainStreetXpress 36170 Control card. It allows you to have a node management session through an attached ASCII (VT100-compatible) terminal.

The 28110 and 28120 MainStreet NIUs have their own NMTIs, which are used to set up, operate, monitor and maintain the NIUs.

Although the T-ARIC card does not have its own NMTI, it can be configured through an NMTI session with the MainStreetXpress 36170 Control card.

For information on initiating a node management session with the MainStreetXpress 36170 Control card, see the *MainStreetXpress 36170 Technical Practices.* For information on softkey conventions used in this manual, see "Softkeys" in section 15.2.

### To initiate a node management session with an NIU

The following steps describe the logon procedure for the first NMTI session. Users logging on later may find that some steps are not necessary, are slightly different or are skipped because previous users have changed the configuration. If the node management equipment is used regularly, steps 1 to 3 may not be necessary.

1.  Switch on the NIU. The power switch is on the back panel.

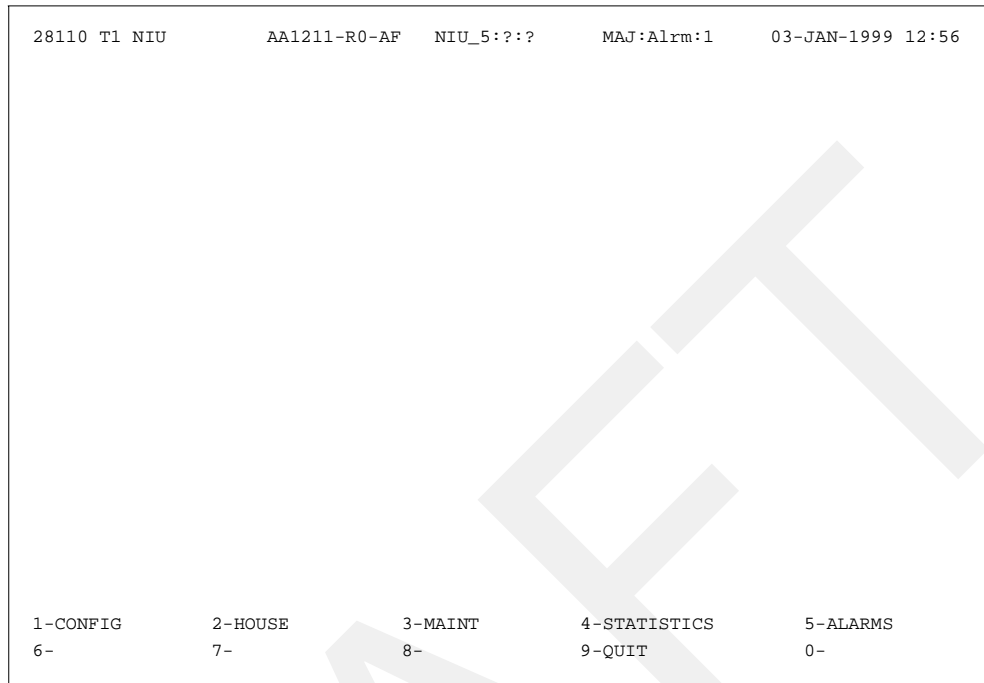    The LED display runs through a predetermined pattern, while self-diagnostics are performed.

2.  Ensure the terminal is connected to the front panel serial port of the NIU and switch on the terminal.

**3.** Verify that the terminal is set up for the following:

- eight data bits
- one stop bit
- no parity
- no local echo
- baud rate of 9600 b/s

**4.** Press the ↵ key on the terminal at approximately one second intervals until a startup message appears on the terminal, and you are prompted for an access level.

**5.** Enter your access level number.

**a.** If this is the first NMTI session, enter a <5> and press ↵. Level 5 users have read and write access to all areas required to configure the system.

**b.** If this is not the first NMTI session and you have been assigned an access level (between 0 and 5), enter your level number and press ↵.

The NMTI prompts you for the password (unless you enter an access level of 0, which allows read-only access). The default password is <mainstreet>.

**6.** If you are not a level 0 user, enter the password.

**a.** If this is the first NMTI session, type <mainstreet> (lower case) and press ↵. The default password for all levels is <mainstreet> and is not displayed on the screen.

**b.** If this is not the first NMTI session, enter the password assigned to your access level.

The NMTI displays the main menu screen, as shown in Figure 15-1.

**Figure 15-1: NIU Main Menu Screen**

```
28110 T1 NIU        AA1211-R0-AF   NIU_5:?:?      MAJ:Alrm:1    03-JAN-1999 12:56




















1-CONFIG        2-HOUSE         3-MAINT         4-STATISTICS    5-ALARMS
6-              7-              8-              9-QUIT          0-
```

## Setting the password and level zero

When you initiate a node management session you can change your password and enable or disable level 0 access. In the following softkey menus, an asterisk (*) indicates the default setting.

## To change the password

HOUSE — CHNG_PSSWD <*level_5_password*> ↵

| | | | | |
LEVEL_1     LEVEL_2     LEVEL_3     LEVEL_4     LEVEL_5*

SK000231

## To enable or disable level zero access

HOUSE — LEVEL_0/NO_LEVEL_0*

## Screen display

The NMTI screen display has 24 lines; each line is 78 characters wide. The screen is arranged in the following five functional areas, which are described in Table 15-1:

- header line
- data area
- command line
- diagnostics line
- softkey area

The screen refreshes when you select softkeys or make keyboard entries.

**Table 15-1:  Description of NMTI screen areas**

| Area | Description |
|------|-------------|
| Header line | Specifies:<br><br>• product name<br><br>• software generic and revision number<br><br>• node name (a blank space if a node name has not been assigned)<br><br>• the number of alarms in the major alarm queue<br><br>• date [1]<br><br>• time |
| Data area | Occupies 18 lines<br>Displays information associated with the current menu |
| Command line | Displays the softkey selections and keyboard entries as they are entered |
| Diagnostics line | Displays:<br><br>• prompts<br><br>• warnings<br><br>• error messages<br><br>• valid ranges for numeric parameters<br><br>• NIU ID number |
| Softkey area | Occupies the bottom two lines of the screen<br>Line 1 indicates the softkeys associated with keyboard keys 1 through 5<br>Line 2 indicates the softkeys associated with keyboard keys 6 through 0 |

Note

1.    "01-JAN-1970" appears in the header line until the BTS sends the date.

## 15.2      Main menu

The group of softkeys that first appears when you log on to an NIU is called the main menu (see Figure 15-1) and provides access to the following main functions:

- CONFIG
- HOUSE
- MAINT
- STATISTICS
- ALARMS

Table 15-2 lists the functions of each main menu softkey.

**Table 15-2:  Description of main menu softkeys**

| Main menu softkey | function |
|---|---|
| CONFIG | Configuring system parameters<br>Defining connections |
| HOUSE | Specifying the node name<br>Configuring the system serial ports<br>Defining the parameters for access to the NMTI |
| MAINT | Performing system diagnostics<br>Monitoring status<br>Performing loopbacks |
| STATISTICS | Monitoring and clearing use and performance statistics<br>Setting refresh modes |
| ALARMS | Monitoring the system for abnormal conditions and significant events continuously and listing them in queues that can be viewed and edited<br>Assigning a classification to each alarm type<br>Selecting the method of logging alarms |

### Softkeys

The term softkey means both a numbered key (on the keyboard) and the function associated with it. The softkey area shows each available keyboard key and its current function. Functions change each time a softkey is selected.

Table 15-3 shows the softkey conventions used in this manual.

**Table 15-3:  Softkey conventions**

| Convention | Example |
|---|---|
| Softkeys are written as they appear on the screen, in upper case. | CIRCUIT |
| Some softkeys have underscores. | NVM_DATA |
| Some softkeys have hyphens. | END-TO-END |
| Some softkeys are marked with an asterisk (*) to indicate that they are default settings. | 30_MIN* |
| Some softkeys have an oblique, which indicates that they are toggle softkeys with two states.The state or function that is not in effect is shown next to the softkey number. | SHORT/LONG* |
| The PROCEED softkey executes an instruction; it is not included in the procedures unless selecting it has effects in addition to executing the instruction. | PROCEED |

## Selecting softkeys

Select softkeys by pressing a number key (0 through 9) on the keyboard or number pad. For example, to select HOUSE from the main menu, press <2>. The exception is when the NMTI prompts for a numeric entry and you want to select a display softkey, such as CANCEL or QUIT. First press <Esc>, then press the softkey number. If you do not press <Esc> first, the NMTI interprets your softkey selection as a numeric entry.

Selecting a softkey updates the data area, changes the softkey selection or adds text to the command line.

Most softkeys add their function to the command line. Exceptions are MORE, CANCEL, QUIT, PROCEED and display softkeys.

## Softkey functions

Table 15-4 describes softkey functions.

**Table 15-4:  Softkey functions**

| Softkey | Functions | Format |
|---|---|---|
| PREVIOUS | Displays the previous screen of data, if one exists. | Always associated with the 1 key. |
| NEXT | Displays the next screen of data, if one exists. | Always associated with the 2 key. |
| MORE | Displays additional menu selections, where they exist. | Always associated with the 7 key. |
| CANCEL | Cancels the last part of the instruction being entered. Returns to the previous menu. Cancels the command. | Always associated with the 8 key. [1] |
| QUIT | Logs you off the node when selected from the main menu. Displays the main menu when selected from any other menu. | Always associated with the 9 key. [1] |

| Softkey | Functions | Format |
|---------|-----------|--------|
| PROCEED [2] | Executes the instruction. | Always associated with the 0 key. [1] |

Notes

1. You may need to press <Esc> to access this softkey if the node management session is expecting a text or number string.

2. PROCEED appears in the softkey area only when required: The NMTI prompts you with the message "Press PROCEED to confirm change". Only the CANCEL, QUIT and PROCEED softkeys appear. If you select PROCEED, all softkeys disappear briefly and a message indicates the instruction is being executed. Then the softkeys for the next operation appear.

**Note**

Some softkeys described in this manual may not appear on your screen. The softkeys available depend on your access level, the system configuration, and the software generic you are using.

## Keyboard entries

Use the keyboard to type text or number strings when the NMTI prompts you for an entry.

Examples of keyboard entries are:

- passwords
- node names
- dates
- alarm numbers

The display indicates that the node management session expects a keyboard entry by:

- displaying "??-??" or "..." on the command line
- displaying a prompt on the diagnostics line
- removing all softkeys except CANCEL, QUIT and display softkeys

In many cases, the diagnostics line prompts you for a valid range or required entry format. If the format includes a hyphen (-) or a slash (/), it must be typed as part of the entry.

## Keyboard conventions

Some keys are assigned names, for example, Return and Esc. Table 15-5 shows keyboard entry conventions used in this manual.

**Table 15-5: Keyboard entry conventions**

| Convention | Example |
|---|---|
| Keyboard entries are indicated by italicized text enclosed in angle brackets | *<shelf-slot>* |
| A key with a name is indicated by the name of the key with the first letter capitalized, and enclosed by angle brackets | <Esc> |
| The Return key appears in the procedures where required, because the display does not prompt for it | ↵ |

## Keyboard entry formats

Keyboard entries require specific formats and appear on the diagnostics line. The format can be a mixture of specific letters and variable information, for example:

<CG*group*>

In this example, CG must be typed and *group* represents variable information.

## Keyboard entry functions

Table 15-6 shows the functions associated with keyboard entries.

**Table 15-6: Keyboard entry functions**

| Key(s) | Function |
|---|---|
| ↵ | Completes and executes a keyboard entry. |
| <Esc> <R> | Refreshes the screen in the following situations:<br>• when a database verification is in progress<br>• when monitoring system alarms to update the displayed information<br>• when a transmission error or some other event corrupts the displayed information<br>• when monitoring statistics to update displayed information |
| <Delete> or <Backspace> | Deletes a keyboard error. |
| <Esc> *<softkey number>* | Lets you select a softkey when the node management session expects a number or text string keyboard entry. |

# 16. Restrictions of Release 1.1

This chapter describes the software and hardware restrictions of the MainStreet Broadband Wireless system.

## 16.1 BTS restrictions

Table 16-1 lists the BTS restrictions.

**Table 16-1:  BTS restrictions**

| Name | Limit | Level |
|------|-------|-------|
| CPSS links | 300 | System |
| Downlink timeslots per port | 350 (at 18 MHz) 700 (at 36 MHz) | T-ARIC card |
| NIUs (E1 per port, fully configured without cell padding) | 8 | T-ARIC card |
| Managed NIUs per BTS | 299 | NIU |
| NIUs per BTS | 3300 | NIU |
| NIUs per port | 300 | T-ARIC card |
| NIUs (T1 per port, fully configured without cell padding) | 10 | T-ARIC card |
| T-ARIC card ports per BTS | 94 | T-ARIC card |
| Uplink timeslots per port | 266 | T-ARIC card |

## 16.2      ATM restrictions

Table 16-2 lists the ATM restrictions.

**Table 16-2:  ATM restrictions**

| Name | Limit |
|---|---|
| Connections per T-ARIC port | 4096 |
| CPSS over RF | Not supported |
| EPD (early packet discard) over RF | Not supported |
| PPD (partial packet discard) over RF | Not supported |
| Service categories supported | CBR, UBR, VBR |
| VCI range | 1 to 511 |
| VPI limitations | 255 - reserved<br>254 - reserved<br>253 - reserved for ATM control messaging<br>252 - reserved (provides date and time information to NIUs)<br>251 - reserved<br>250 - reserved<br>0 to 249 - used for data connections |
| VPIs per NIU | 1 (The same VPI can be used by multiple NIUs that are using the same T-ARIC card, providing the VCIs are unique, and are within the acceptable range.) |

# 17. Configurable features summary

This chapter summarizes the configurable features for the T-ARIC card and the NIUs.

## 17.1 NIU configurable options

Tables 17-1 to 17-5 describe the features, configurable options and default settings for NIUs. The Reference column indicates where configuration information can be found.

**Table 17-1: NIU channel group features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| Add/delete channel or range | channel (or channel range) from 1 to 31<br>no defaults | 18.1 |
| Channel group name | up to 16 characters<br>no default | 18.1 |
| Playout buffer | 0 to 6 ms (increments of 0.5 ms)<br>default: 3 ms | 19.1 |
| Trunk conditioning data pattern [1] | 0x00 to 0xFF, IDLE (0xEF) or SEIZED (0x1A)<br>default: 0xFF | 18.5 |
| Trunk conditioning signaling pattern 1 [1] | 0x00 to 0xFF<br>default: 0x00 | 18.5 |
| Trunk conditioning signaling pattern 2 [1] | 0x00 to 0xFF<br>default: 0x00 | 18.5 |
| User data octets per cell | 1 to 46, or all<br>default: all | 19.1 |

Note
1. Can be configured on a channel, channel group or channel range.

**Table 17-2: NIU SNMP features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| SNMP access privileges | none, read or read/write<br>configurable for each of the 10 communities<br>default: read | 20.1 |
| SNMP community name | up to 16 characters<br>configurable for each of the 10 communities<br>no default | 20.1 |

| Feature | Configurable options and default | Reference |
|---|---|---|
| SNMP element manager IP address | xxx.xxx.xxx.xxx format<br>configurable for each of the 10 communities<br>no default | 20.1 |
| SNMP trap community name | up to 16 characters<br>configurable for each of the 10 trap communities<br>no default | 20.2 |
| SNMP trap element manager IP address | xxx.xxx.xxx.xxx format<br>configurable for each of the 10  trap communities<br>no default | 20.2 |
| SNMP trap status | enabled or disabled<br>default: disabled | 20.2 |

**Table 17-3:  NIU modem features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| Add channel frequency | channel frequency: 27500 to 28600 (increments of 1 MHz)<br>channel bandwidth: 36 MHz<br>no defaults | 21.10 |
| Tx LO offset | 17000 MHz to 40000 Mhz<br>default: 26000 MHz | 21.10 |
| Rx LO offset | 17000 MHz to 40000 Mhz<br>default: 26000 MHz | 21.10 |
| RF band start frequency | 20000 MHz to 40000 MHz<br>default: 27500 MHz | 21.10 |
| RF band end frequency | 20000 MHz to 40000 MHz<br>default: 28600 MHz | 21.10 |
| IF band start frequency | 950 MHz to 2050 MHz<br>default: 950 MHz | 21.10 |
| Channel bandwidth | See Addchannel frequency | 21.10 |
| Channel frequency | See Addchannel frequency | 21.10 |
| Channels (number of) | See Addchannel frequency | 21.10 |
| Downlink frequency offset | -320 to 320 Mhz<br>default: 0 Mhz | 21.2 |
| Power level (maximum) after network entry | 60 to -10 dBm<br>default: -10 Mhz | 21.10 |
| Power level (minimum) after network entry | 60 to -10 dBm<br>default: -40 MHz | 21.10 |
| Power level (maximum) before network entry | 60 to -10 dBm<br>default: -10 MHz | 21.10 |
| Power level (maximum) before network entry | 60 to -10 dBm<br>default: -40 MHz | 21.10 |

**Table 17-4:  28120 MainStreet E1 NIU port features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| AAL service type | SDT_BASIC, SDT_CAS, UDT or UDT_PERFMON<br>default: UDT | 19.1 |
| LOF alarm clearing | 1 to 30 s (increments of 0.1 s)<br>default: 10 s | 18.2 |
| LOF alarm declaration | 1 to 30 s (increments of 0.1 s)<br>default: 0.8 s | 18.2 |
| Output timing | ACR, SRTS, or network<br>default: synchronous | 18.2 |
| Padding octet value | 0 to FF<br>default: FF | 18.2 |
| Port name | up to 15 characters<br>no default | 18.2 |
| CRC framing | on or off<br>default: on | 18.2 |
| signaling | 31 channel or CAS<br>default: CAS | 18.2 |

**Table 17-5: 28110 MainStreet T1 NIU port features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| AAL service type | SDT_BASIC, SDT_CAS, UDT or UDT_PERFMON<br>default: UDT | 19.1 |
| CRC framing | on or off<br>default: on | 18.2 |
| DS1 build-out | 0, -7.5, -15 or -22 dB<br>0 dB | 18.2 |
| DSX-1 line length | 0 to 132, 133 to 265, 266 to 398, 399 to 532, 533 to 654 ft<br>default: 0 to 132 ft | 18.2 |
| Framing | SF (D4) or ESF<br>default: ESF | 18.2 |
| LOF alarm clearing | 1 to 30 s (increments of 0.1 s)<br>default: 10 s | 18.2 |
| LOF alarm declaration | 1 to 30 s (increments of 0.1 s)<br>default: 0.8 s | 18.2 |
| Output timing | ACR, SRTS or network<br>default: network | 18.2 |
| Port name | up to 15 characters<br>no default | 18.2 |
| Red alarm indication alarm clearing | on LOF clear, or on resynch<br>default: on LOF clear | 18.2 |
| Zero suppression | B8ZS or JB7<br>default: B8ZS | 18.2 |

## 17.2    T-ARIC configurable options

Tables 17-6 to 17-10 list the T-ARIC card features, configurable options and default settings.

You must configure the following T-ARIC card features:

- downstream channel frequency
- downstream IF start
- group number
- Rx RF frequency upstream end
- Rx RF frequency upstream start
- Tx RF frequency downstream end
- Tx RF frequency downstream start
- upstream IF start

**Table 17-6: T-ARIC card NIU features**

| Feature | Configurable options and default | Reference |
|---------|----------------------------------|-----------|
| NIU ID | 100 to 3399<br>no default | 21.14 |
| NIU serial number | 19 characters<br>no default | 21.14 |
| NIU type | CE | 21.14 |
| NIU user data VPI | 0 to 249<br>default: 0 | 19.2 |

**Table 17-7: T-ARIC card modem features**

| Feature | Configurable options and default | Reference |
|---------|----------------------------------|-----------|
| Add NIU | NIU ID: 100 to 3399<br>no default | 21.13 |
| Demodulator | enabled or disabled<br>default: disabled | 21.13 |
| Downstream channel frequency | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default | 21.12 |
| Timeslots reserved for NIU contention | 2 to 133 (minus the number of polling slots minus the number of guard slots)<br>default: 2 | 21.13 |
| Timeslots reserved for NIU UBR connections | 0 to 133 (minus the number of polling slots minus the number of guard slots)<br>default: 0 | 21.13 |
| Timeslots reserved for guard slots | 1 to 3<br>default: 2 | 21.13 |
| Tx power level | -22 to +8 dB (in increments of 2 dB)<br>default: -22 dB | 21.12 |
| Tx power level status | auto enable or auto disable<br>default: auto disable | 21.12 |
| Upstream channel frequency | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default | 21.13 |

**Table 17-8: T-ARIC card group features**

| Feature | Configurable options and default | Reference |
|---------|----------------------------------|-----------|
| Downstream IF start | disabled, 400 to 900 MHz<br>(in increments of 1 MHz)<br>no default | 21.11 |
| Group number | 1 to 64<br>no default | 21.11 |
| Rx control | enabled or disabled<br>default: disabled | 21.11 |

| Feature | Configurable options and default | Reference |
|---|---|---|
| Rx RF upstream frequency end | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default<br>this parameter must be configured | 21.11 |
| Rx RF upstream frequency start | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default | 21.11 |
| Tx control | enabled or disabled<br>default: disabled | 21.11 |
| Tx interface power level | disabled, -22 to +8 dBm (in increments of 2 dBm)<br>-22 dBm (the upconverter is disabled until the Tx RF is specified for the T-ARIC group) | 21.11 |
| Tx RF downstream frequency end | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default | 21.11 |
| Tx RF downstream frequency start | 20000 to 40000 MHz (in increments of 1 MHz)<br>no default | 21.11 |
| Upstream IF start | disabled, 400 to 900 MHz (in increments of 1 MHz)<br>no default | 21.11 |
| Upstream IF frequency offset | -500 to 0 MHz (in increments of 1 MHz)<br>no default | 21.11 |

**Table 17-9: T-ARIC card port features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| Downstream channel width | 18 MHz<br>default: 18 MHz | 21.12 |
| Port name | 15 characters<br>no default | 21.15 |

**Table 17-10: T-ARIC card slot features**

| Feature | Configurable options and default | Reference |
|---|---|---|
| Slot name | 15 characters<br>no default | 21.16 |

# 18. NIU TDM configuration options

This chapter describes how to configure the TDM options. The options supported by the 28110 and 28120 MainStreet NIUs include:

- channel groups
- ports
- robbed bit signaling (forthe 28110 MainStreet T1 NIU only)
- serial ports
- trunk conditioning

## 18.1 Channel group configuration

Channel group configuration includes:

- adding channels to a channel group
- assigning the channel group name
- deleting channels from a channel group

**Note**

Channel groups can only be configured if the NIU port has an AAL service type of SDT_BASIC or SDT_CAS.

### Restrictions on channel group configuration

The following restrictions apply.

- A channel can belong to only one channel group at a time.
- A channel group must be identified by the lowest number channel that is a part of the group. For example, CG3 must contain channel 3 and not channel 1 or channel 2.
- Channel 31 corresponds to timeslot 16 on an E1 port; if you configure channel 31 as part of a channel group, the system treats channel 31 as though it is timeslot 16. For example, a channel group containing channels 16, 20 and 31 is identified as CG31 because the timeslot that corresponds to channel 31 (timeslot 16) comes before the timeslot that corresponds to channel 16 (timeslot 17) on an E1 port.

## To add channels to a channel group

CONFIG — CHANNELGROUP — <CG*group*> ↵ — ADD_CHANNEL — <*channel*> or <*start-end*> ↵

where

*group* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for NIUs

*channel* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for NIUs

*start* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*end* is an integer from 2 to 24 for T1 NIUS, or 2 to 31 for E1 NIUs, and *end* must be greater than *start*

---

**Note**

You can add single channels and ranges of channels at the same time by separating the channel numbers or range of channel numbers with a comma. For example, to add channel 2, channel 4, and channels 5 to 7, enter <2,4,5-7>.

---

## To assign a channel group name

CONFIG — CHANNELGROUP — <CG*group*> ↵ — NAME — <*groupname*> ↵

where

*group* is an integer from to 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*groupname* is up to 15 characters excluding spaces, tabs, question marks and percent signs

## To delete channels and channel groups

To delete the entire channel group, enter ↵.

CONFIG — CHANNELGROUP — <CG*group*> ↵ — DEL_CHANNEL

```
                      ┌──────────────┬──────────────┐
                 <channel> ↵    <start-end> ↵      ↵
```
SK002364

where

*group* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*channel* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*start* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*end* is an integer from 2 to 24 for T1 NIUs, or 2 to 31 for E1 NIUs, and *end* must be greater than *start*

---

## 18.2    Port configuration

Port options include:

- CRC framing
- DS1 build-out (T1 NIUs only)
- DSX-1 line length (T1 NIUs only)
- framing (T1 NIUs only)
- LOF alarm clearing
- LOF alarm declaration

- output timing
- port name
- RAI alarm clearing (T1 NIUs only)
- signaling (E1 NIUs only)
- zero suppression (T1 NIUs only)
- RBS

### To configure CRC framing

---

**Note**

You cannot configure CRC framing for a T1 NIU port if you have configured the port for SF(D4) framing.

---

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — CRC_FRAMING

ON        OFF

SK002315
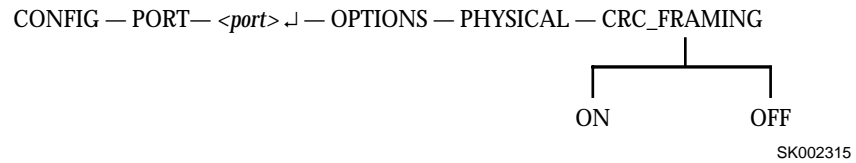
where *port* is 1

### To configure DS1 build-out

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — DS1

0_dB        -7.5dB        -15dB        -22dB

SK002314
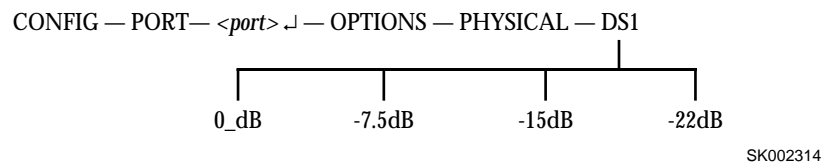
where *port* is 1

## To configure DSX-1 line length

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — DSX1

| 0_132_ft | 133_265_ft | 266_398_ft | 399_532_ft | 533_654_ft |

SK002313
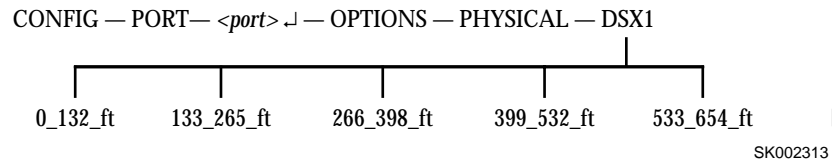
where *port* is 1

## To configure the framing method

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — FRAMING

| ESF | D4(SF) |

SK002312
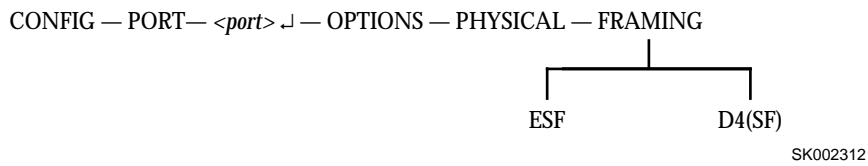
where *port* is 1

## To configure the RAI clearing method and LOF alarm declare/clear time

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — ALARM_TIM

| DECLARE | CLEAR | RAI_CLEAR |

*<time>* ↵        *<time>* ↵

| ON_LOF_CLEAR | ON_RESYNCH |

SK002311
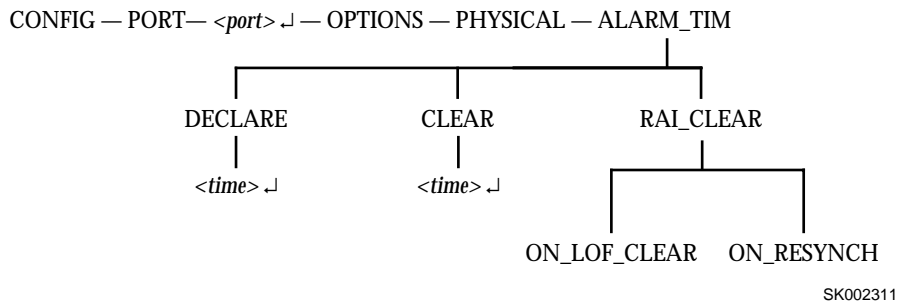
where
*port* is 1
*time* is an integer from 1 to 300 in increments of 0.1 s

## To configure the output timing

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — SYNCHRONIZE

| NETWORK | SRTS | ACR |

SK002309
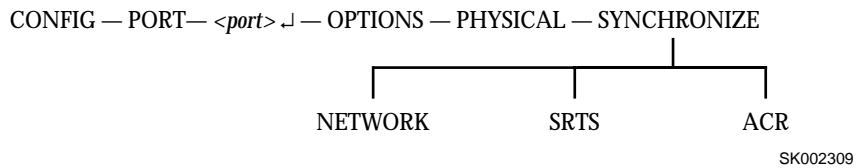
where *port* is 1

## To configure the port name

CONFIG — PORT — *&lt;port&gt;* ↵ — NAME — *&lt;port_name&gt;* ↵

where

*port* is 1

*port_name* is up to 15 characters excluding spaces, tabs, question marks and percent signs

## To configure the signaling method

CONFIG — PORT— *&lt;port&gt;* ↵ — OPTIONS — PHYSICAL — SIGNALING

CAS          31-CHANNEL
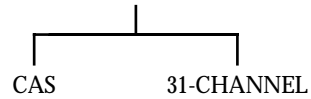
SK002310

where *port* is 1

## To configure the zero suppression method

CONFIG — PORT — *&lt;port&gt;* ↵ — OPTIONS — PHYSICAL — MORE — ZERO — SUPPRESS

B8ZS          JB7
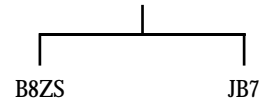
SK002307

where *port* is 1

## 18.3     Robbed bit signaling configuration

RBS is supported by the 28110 MainStreet T1 NIU only.

### To configure RBS

CONFIG — PORT— *<port>* ↵ — OPTIONS — PHYSICAL — MORE — RBS

*<channel>* ↵     *<start-end>* ↵     *<CGgroup>* ↵

ON     OFF
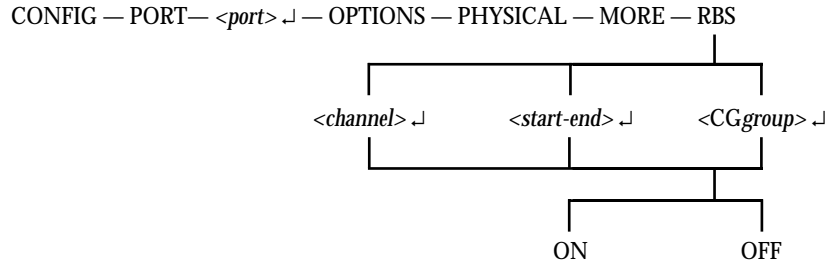
SK002308

where

*port* is 1

*channel* is an integer from 1 to 24

*start* is an integer from 1 to 24

*end* is an integer from 2 to 24, and *end* must be greater than *start*

*group* is an integer from 1 to 24

## 18.4     Serial port configuration

This section describes how to configure the serial port baud rate.

### To configure the serial port baud rate

HOUSE — SER_PORT — BAUD_RATE

1200    2400    4800    9600    19200    38400
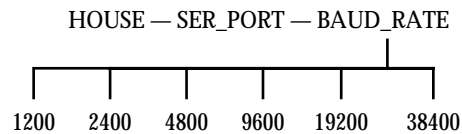
SK002306

# 18.5 Trunk conditioning configuration

This section describes how to:

- enable and disable trunk conditioning
- configure the NIU to use either the idle or seized fault codes
- configure the data and signaling fault codes

## To configure trunk conditioning

CONFIG — PORT— *<port>* ↵ — TRUNK_COND

*<channel>* ↵          *<start-end>* ↵          *<CGgroup>* ↵

ENABLE*/          IDLE          SEIZED
DISABLE
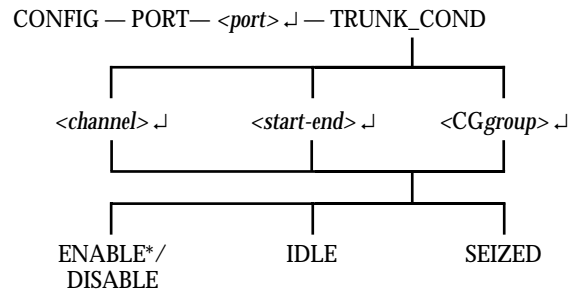
SK002304

where

*port* is 1

*channel* is an integer from 1 to 24

*start* is an integer from 1 to 24

*end* is an integer from 2 to 24, and *end* must be greater than *start*

*group* is an integer from 1 to 24

## To configure the trunk conditioning data and signaling patterns
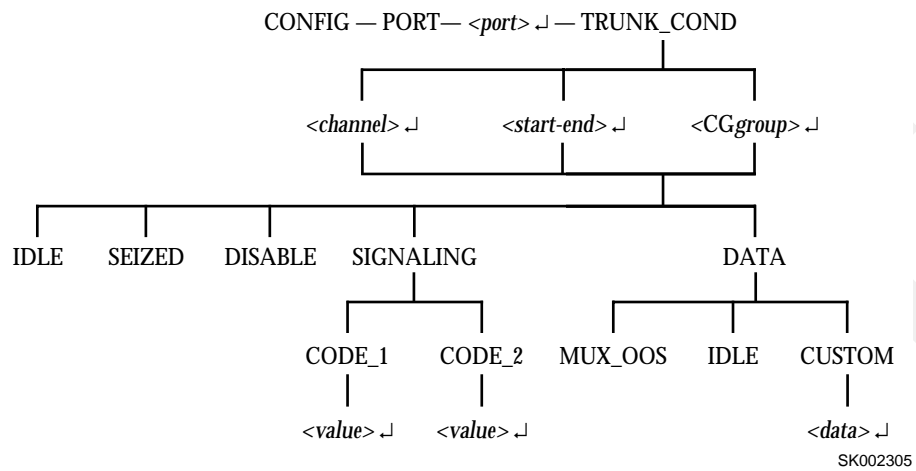
CONFIG — PORT— *<port>* ↵ — TRUNK_COND

*<channel>* ↵          *<start-end>* ↵          *<CGgroup>* ↵

IDLE     SEIZED     DISABLE     SIGNALING                    DATA

CODE_1     CODE_2          MUX_OOS     IDLE     CUSTOM

*<value>* ↵     *<value>* ↵                                   *<data>* ↵

SK002305

where

*port* is 1

*channel* is an integer from 1 to 24

*start* is an integer from 1 to 24

*end* is an integer from 2 to 24, and *end* must be greater than *start*

*group* is an integer from 1 to 24

*value* is a hexadecimal number from 0 to F

*data* is a hexadecimal number from 00 to FF

# 19.   ATM configuration options

This chapter describes how to configure the ATM options for the MainStreet Broadband Wireless system.

The NIU ATM configuration options are:

- AAL service type
- padding octet value
- playout buffer
- user data octets per cell

The only T-ARIC card ATM configuration option is NIU user data VPI.

## 19.1   NIU ATM configuration options

### AAL service type

Each port is configured to provide either structured or unstructured data transfer.

When a structured data mode is selected (SDT_BASIC and SDT_CAS), framing is passed or inserted. SDT_CAS mode passes signaling bits on each of the contained channel groups, while SDT_BASIC removes signaling bits.

When an unstructured data mode is selected (UDT and UDT_PERFMON), framing is not passed or inserted. UDT_PERFMON allows performance monitoring statistics to be collected from the port. UDT mode blocks the collection of performance monitoring statistics.

**Caution**

Selection of any of the UDT or SDT keys removes all configured channel groups and connections on the port.

**Note 1**

CAS cannot be selected on E1 ports that are configured for 31-channel framing.

**Note 2**

RBS and zero suppression options are available only for SDT_BASIC, SDT_CAS and UDT_PERFMON mode.

## To configure the AAL service type

From the NIU NMTI, enter:

CONFIG — PORT — *<port>* ↵ — OPTIONS — AAL_SERVICE

SDT_BASIC    SDT_CAS    UDT    UDT_PERFMON

SK002301

where *port* is 1

## Padding octet value

When valid user data does not occupy all the available octets in an ATM cell, pad characters are inserted into empty octets by the NIU to maintain a fixed cell size.

The specified pad character is inserted in each unused octet on every connected channel group.

## To configure the padding octet value

From the NIU NMTI, enter:

CONFIG — SYSTEM — PAD_OCTET_VAL — *<octet_value>* ↵

where *octet_value* is from 00 to FF

## Playout buffer

The playout buffer for each VC has a configurable fill level threshold that provides buffer underrun protection. Adjust the playout buffer fill level threshold to balance larger playout buffer delay requirements against greater underrun protection, to suit the particular network conditions or application. The default fill level provides 3 ms of underrun protection.

## To configure the playout buffer threshold

From the NIU NMTI, enter:

CONFIG — PORT — *<port>* ↵ — OPTIONS — AAL_SERVICE — OPTIONS —
PLAYOUT_BUFF — *<threshold>* ↵

where

*port* is 1

*threshold* is from 0 to 6 s in increments of 0.5 s

## User data octets per cell

For each channel group, the number of octets per cell that are reserved for user data
can be configured as a number from 1 to 46.

To configure the maximum value of 46, select ALL.

## To configure the user data octets per cell

From the NIU NMTI, enter:

CONFIG — CHANNELGROUP— *<CGgroup>* ↵ — OPTIONS — NUM_DATA_OCT

ALL          *<octet-count>* ↵

SK002303

where

*group* is an integer from 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*octet_count* is an integer from 1 to 46

## 19.2 T-ARIC card ATM configuration options

### NIU user data VPI

User data connections to a specific NIU are made through a VPI that is unique to that NIU. Each NIU must be configured for a unique VPI before the NIU can communicate with the BTS.

### To configure the NIU user data VPI

From the MainStreetXpress 36170 NMTI, enter:

CONFIG — MORE — BTS — NIU — <*NIU_id*> ↵ — DATA_VPI — <*vpi_number*> ↵

where
*NIU_id* is an integer from 100 to 3299

*vpi_number* is an integer from 0 to 249

# 20. SNMP configuration options

This chapter describes how to configure the SNMP options supported by the NIUs.

## 20.1　SNMP access communities

This section describes how to:

- configure access community privileges
- configure a community name
- configure an element manager IP address
- delete access communities

### To configure access privileges, name and IP address
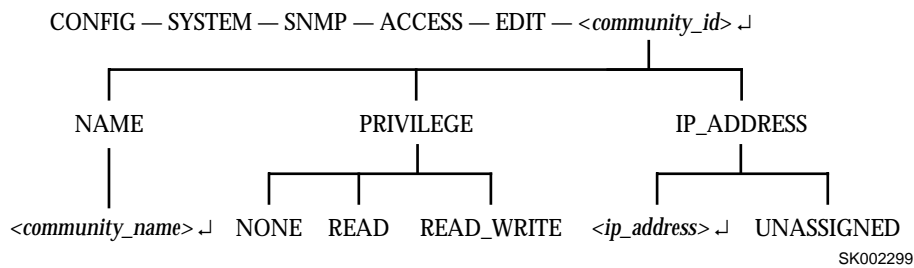
```
CONFIG — SYSTEM — SNMP — ACCESS — EDIT — <community_id> ↵

         NAME              PRIVILEGE                 IP_ADDRESS

<community_name> ↵   NONE  READ  READ_WRITE    <ip_address> ↵  UNASSIGNED
```
SK002299

where

*community_id* is an integer from 1 to 10

*community_name* is a string of up to 16 characters excluding spaces, tabs, question marks and percent signs

*ip_address* is in the decimal format #.#.#.#, where # is an integer from 0 to 255

## To delete access communities

CONFIG — SYSTEM — SNMP — ACCESS

```
                                    |
                    ┌───────────────┴───────────────┐
                 DELETE                          DELETE_ALL
                    |
            <community_id> ↵
```

SK002300

where *community_id* is an integer from 1 to 10

## 20.2    SNMP trap communities

This section describes how to:

- enable or disable a trap community
- configure a trap community name
- configure an element manager IP address
- delete a trap community

## To enable or disable a trap community

CONFIG — SYSTEM — SNMP — TRAPS — EDIT — *<community_id>* ↵ —
ENABLE/DISABLE*

where *community_id* is an integer from 1 to 10

## To configure a trap community name

CONFIG — SYSTEM — SNMP — TRAPS — EDIT — *<community_id>* ↵ — NAME —
*<community_name>* ↵

where

*community_id* is an integer from 1 to 10

*community_name* is a string of up to 16 characters excluding spaces, tabs, question marks and percent signs

## To configure an element manager IP address

CONFIG — SYSTEM — SNMP — TRAPS — EDIT — *<community_id>* ↵ — IP_ADDRESS —
*<ip_address>* ↵

where

*community_id* is an integer from 1 to 10

*ip_address* is in the decimal format #.#.#.#, where # is an integer from 0 to 255

## To delete trap communities

```
CONFIG — SYSTEM — SNMP — TRAPS

        DELETE              DELETE_ALL

     <community_id> ↵
```
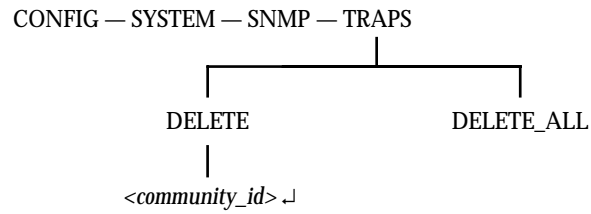
SK002297

where *community_id* is an integer from 1 to 10

# 21. Air interface configuration

This chapter describes the functionality and configuration of the T-ARIC card and NIU air interface parameters.

## 21.1 Air interface-related parameters

Table 21-1 and 21-2 lists the air interface parameters and provides references to explanations of the functionality and configuration.

**Table 21-1: T-ARIC card air interface parameters**

| Parameter | Functionality description | Configuration procedure |
|---|---|---|
| Add NIU | 21.5 | 21.13 |
| Card type | 21.8 | 21.16 |
| Contention timeslots | 21.9 | 21.13 |
| Demodulator | 21.9 | 21.13 |
| Downstream channel frequency | 21.3 | 21.12 |
| Downstream channel width | 21.3 | 21.12 |
| Downstream IF start | 21.3 | 21.11 |
| Group number | 21.4 | 21.11 |
| NIU ID | 21.5 | 21.14 |
| Guard timeslots – see Timeslots reserved for guard timeslots | 21.9 | 21.13 |
| NIU serial number | 21.5 | 21.14 |
| NIU type | 21.5 | 21.14 |
| Polling timeslots – see Timeslots reserved for polling slots | 21.9 | 21.13 |
| Port name | 21.15 | 21.15 |
| Reference point | 3.7.7 | 21.15 |
| Reserved timeslots – see Timeslots reserved for DBA NIU connections | 21.9 | 21.13 |
| Rx control | 21.7 | 21.11 |
| Rx LO offset | 21.2 | 21.11 |
| Rx RF upstream frequency end | 21.3 | 21.11 |
| Rx RF upstream frequency start | 21.3 | 21.11 |
| Slot name | 21.8 | 21.16 |
| Timeslots reserved for guard slots | 21.9 | 21.13 |

| Parameter | Functionality description | Configuration procedure |
|---|---|---|
| Timeslots reserved for NIU contention (for E1 and T1 NIUs) | 21.9 | 21.13 |
| Timeslots reserved for polling slots | 21.9 | 21.13 |
| Timeslots reserved for DBA NIU connections | 21.9 | 21.13 |
| Tx control | 21.7 | 21.11 |
| Tx default power level | 21.6 | 21.12 |
| Tx power level | 21.6 | 21.12 |
| Tx power level status | 21.6 | 21.12 |
| Tx RF downstream frequency end | 21.3 | 21.11 |
| Tx RF downstream frequency start | 21.3 | 21.11 |
| Upstream channel frequency | 21.3 | 21.13 |
| Upstream IF start | 21.3 | 21.11 |
| Upstream IF frequency offset | 21.3 | 21.11 |

**Table 21-2:  NIU air interface parameters**

| Parameter | Functionality description | Configuration procedure |
|---|---|---|
| Add frequency | 21.3 | 21.10 |
| Channel bandwidth, frequency and number of channels | 21.3 | 21.10 |
| Downstream frequency offset | 21.2 | 21.10 |
| Power level (maximum) after network entry | 21.6 | 21.10 |
| Power level (maximum) before network entry | 21.6 | 21.10 |
| Power level (minimum) after network entry | 21.6 | 21.10 |
| Power level (minimum) before network entry | 21.6 | 21.10 |
| Tx LO offset | 21.2 | 21.10 |
| Rx LO offset | 21.2 | 21.10 |
| RF band start frequency | 21.2 | 21.10 |
| RF band end frequency | 21.2 | 21.10 |
| IF band start frequency | 21.2 | 21.10 |

## 21.2 Frequency offsets

This section describes the functions of:

- downstream frequency offset for the NIUs
- Rx LO offset for the T-ARIC card

### Downstream frequency offset

There is a fixed RF range for which the transceiver radio can receive signals over the air. Likewise, there is a fixed IF range for which the transceiver radio can transmit to the NIU modem. Radios that are supplied by different manufacturers do not necessarily support the same IF range, even though the radios support the same RF range.

The downstream frequency offset provides a method of compensating for differences between the modem and transceiver IF spectrums. The value configured as the downstream frequency offset is the difference between the modem IF range and the transceiver IF range.

For Release 1.1, keep the downstream frequency offset at the default value (0).

### Rx LO offset

There is a fixed RF range for which the BTS Rx radio can receive signals over the air. Likewise, there is a fixed IF range for which the BTS OTU can transmit to the T-ARIC modem. Ideally, the IF spectrum should be the same for the OTU, ORU and modem.

The Rx LO offset compensates for differences between the modem and the Rx radio IF spectrums. The value configured as the Rx LO offset is the difference between the modem IF range and the ORU IF range.

For Release 1.1, keep the Rx LO offset at the default value (150).

## 21.3      Frequency utilization

This section describes:

- add frequency
  - channel bandwidth
  - channel frequency
  - number of channels
- downstream channel frequency and bandwidth
- downstream IF start frequency
- Rx RF upstream frequency start and end
- Tx RF downstream frequency start and end
- upstream channel frequency
- upstream IF start frequency

Figure 21-1 shows two T-ARIC cards and two NIUs. The T-ARIC cards and NIUs are part of the same sector. Other T-ARIC cards and NIUs in the sector are not shown.

**Figure 21-1: RF frequency utilization**

Downstream RF

To other NIUs in the sector
To NIU 1
To NIU 2

Tx NIU 1 Rx

From NIU 1
From NIU 2
From other NIUs in the sector

OTU Tx
ORU Rx

Tx NIU 2 Rx

Upstream RF

D1 Up1 Up2
T-ARIC #1 Port 1

D1 Up1 Up2
T-ARIC #2 Port 1

**NIU #1 configuration**

① Tx downstream RF start
② Tx downstream RF end
⑦ Rx upstream RF start
⑧ Rx upstream RF end
③ Downstream channel centre frequency
④ Downstream channel width
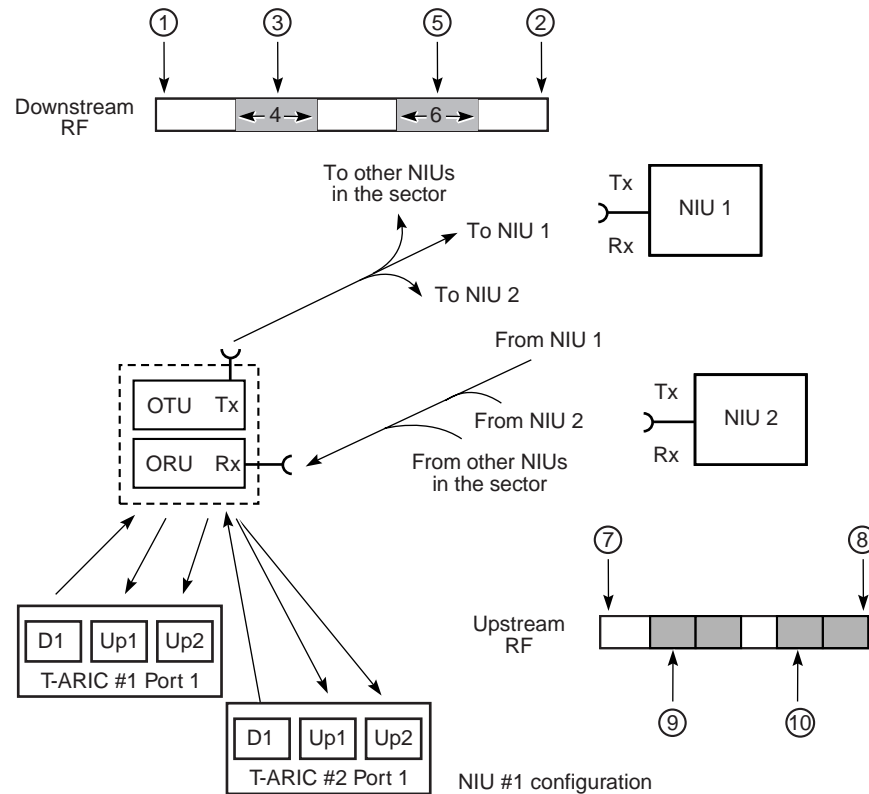
**Port level (T-ARIC #1)**

③ Downstream channel centre frequency
④ Downstream channel width
⑨ Upstream 1 channel centre frequency

**T-ARIC configuration group level**

① Tx downstream RF start
② Tx downstream RF end
⑦ Rx upstream RF start
⑧ Rx upstream RF end

**Port level (T-ARIC #2)**

⑤ Downstream channel centre frequency
⑥ Downstream channel width
⑩ Upstream 1 channel centre frequency

11444

# Channel bandwidth, frequency and number of channels

Each T-ARIC card in the T-ARIC group transmits downstream on a different frequency range, called the downstream RF channel (see 3 and 4 in Figure 21-1). An RF channel is defined by the channel frequency and the channel bandwidth. You must configure each NIU to receive in the appropriate RF channel. The add frequency feature allows you to create a list of channels; the NIU attempts to connect to each channel in turn until a connection is established.

When you add a channel to a list of channels, specify the channel frequency and the channel bandwidth. The channel frequency, or the center of the RF channel, is fixed at 18 MHz.

You can create multiple RF channels simultaneously by specifying the lowest center RF, the channel bandwidth and the number of channels you want to create. The channels run consecutively.

The system assigns a unique channel identifier in the range 1 to 30 for each channel.

# Downstream channel frequency and bandwidth

Each T-ARIC card in a T-ARIC group transmits downstream on a different frequency range, called the downstream RF channel. An RF channel is defined by the channel frequency and the channel bandwidth. You must specify a channel bandwidth and a channel frequency for each T-ARIC card in a T-ARIC group (see 3 and 4 in Figure 21-1). The channels cannot overlap.

The channel frequency, or the center of the RF channel, is fixed at 18 MHz.

Although it is not strictly necessary, it is good practice to configure all RF channels to use contiguous bandwidth.

# Downstream IF start frequency

Communication between a Modem module located on a T-ARIC card and an ORU or OTU are in the IF spectrum. Each T-ARIC card in a T-ARIC group uses a different downstream IF frequency range. You must specify the start (that is, the lowest) downstream IF frequency. The other IF ranges are determined by the T-ARIC card and are not user-configurable.

# Rx upstream frequency start and end

Each T-ARIC card in the T-ARIC group receives upstream on a different frequency range, called the upstream RF channel. An RF channel is defined by the channel frequency and the channel bandwidth. At the T-ARIC group level, you must configure the upstream RF start and end frequency (see 7 and 8 in Figure 21-1).

The upstream RF frequency start is the lower limit of the lowest upstream RF channel. The upstream RF frequency end is the higher limit of the highest RF upstream channel.

## Tx downstream frequency start and end

Each T-ARIC card in a T-ARIC group transmits downstream on a different frequency range, called the downstream RF channel. An RF channel is defined by the channel frequency and the channel bandwidth. At a T-ARIC group level, you must configure the downstream RF start frequency and end frequency (see 1 and 2 in Figure 21-1).

The downstream RF frequency start is the lower limit of the lowest downstream RF channel. The downstream RF frequency end is the higher limit of the highest RF downstream channel.

## Upstream channel frequency

Each T-ARIC card in a T-ARIC group receives upstream on a different frequency range, called the upstream RF channel. An RF channel is defined by the channel frequency and the channel bandwidth. The upstream channel width is fixed at 9 MHz. You must specify a channel frequency for each T-ARIC card in a T-ARIC group (see 9 and 10 in Figure 21-1). The channels cannot overlap.

The channel frequency is the center of the RF channel; the channel width is 9 MHz. For example, if you specify a channel frequency of 27 355 MHz, the channel itself begins at 27 350.5 MHz and ends at 27 359.5 MHz.

Although a T-ARIC card receives on two separate RF channels, specify the channel frequency for one channel only. If you configure the upstream channel frequency for upstream 1, then the channel frequency for upstream 2 is automatically set to the channel frequency for upstream 1 plus 9 MHz. If you configure the upstream channel frequency for upstream 2, then the channel frequency for upstream 1 is automatically set to the channel frequency for upstream 2 minus 9 MHz.

Although it is not strictly necessary, it is good practice to configure all RF channels to use contiguous bandwidth.

## Upstream IF start frequency

Communications between a Modem module located on a T-ARIC card and an OTU/ORU are in the IF spectrum. Each T-ARIC card in a T-ARIC group uses a different upstream IF frequency range. You must configure the start (that is, the lowest) upstream IF frequency. The other IF ranges are determined by a T-ARIC card and are not user-configurable.

## Upstream frequency offset

The T-ARIC card must know the beginning of the NIU Tx IF band in order to communicate with the NIU. The upstream frequency offset is used by the BTS to calculate the NIU Tx IF band. The frequency offset is defined as the CPE IF start frequency minus the BTS IF start frequency. Therefore, if the BTS IF start frequency is 400 MHz, and the CPE IF start frequency is 550 MHz, configure the upstream frequency offset as -150 MHz. This will allow the BTS to communicate with the NIU on the appropriate IF frequency.

## 21.4    Groups

You can connect up to 12 T-ARIC cards and configure them to use the same OTU/ORU. Some configurable parameters can be common to each of the T-ARIC cards in the group.

Note that even single T-ARIC cards must belong to a group; in this case, the group has only one T-ARIC card.

## 21.5    NIU

The following parameters are configurable on a T-ARIC card:

- add NIU
- NIU ID
- NIU serial number
- NIU type

### Add NIU

Before the system can establish any communication over the air interface, you must configure each T-ARIC card with the NIU ID of each NIU that a T-ARIC card is to communicate with. This procedure consists of adding each NIU to one of the two demodulators on a T-ARIC card.

### NIU ID and NIU serial number

Each NIU is physically configured at the time of manufacture with a unique NIU serial number of up to 19 characters.

You must configure the NIU with an NIU ID in the range 100 to 3299. The NIU ID must be unique within a BTS, but the same NIU ID can be used in more than one BTS.

During configuration of the T-ARIC card, you must associate each NIU with one of the two T-ARIC card upstreams, by programming the T-ARIC card upstream with the NIU ID.

### NIU type

The MainStreet Broadband Wireless system supports only CE NIUs.

## 21.6      Power level

This section describes the functions of:

- maximum power level after network entry
- maximum power level before network entry
- minimum power level after network entry
- power level before network entry
- Tx power level
- Tx power level status

### NIU power level functions

For each NIU, configure the maximum and minimum power levels that the NIU will operate at, both before and after the NIU enters the network. The process of entering the network is called network registration.

Figure 21-2 shows relative values for the minimum and maximum NIU transmit values before and after network entry.

**Figure 21-2:  NIU power levels before and after network entry**

Transmit power level

Before network
entry

After network
entry

Maximum

Maximum

Minimum

Minimum

0
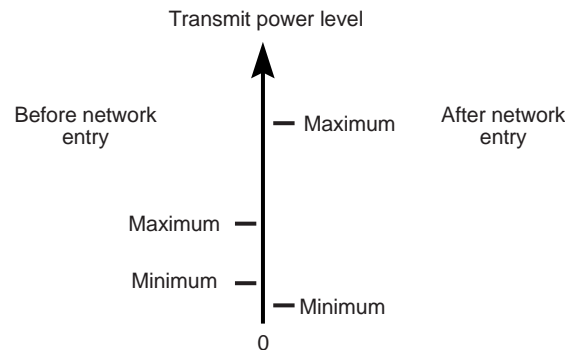
11440

The minimum and maximum transmit power levels used before network entry are a subset of the transmit values that are used after network entry. The BTS is able to receive from the NIU at the minimum transmit power level in normal operating conditions. If the BTS does not respond, the NIU increases the transmit power until the maximum transmit power level is reached.

The purpose of configuring a maximum power level before network entry is to prevent the NIU from interfering with other equipment. If an NIU transceiver is not aligned with a BTS, and if there were no maximum transmit limit, the NIU would continue to increase the transmit power and ultimately cause interference with other network equipment.

After the NIU has registered with the network, the NIU adjusts the transmit power level in response to the power level received from the BTS. If the receive power level increases, the NIU lowers the transmit power level; if the receive power level decreases, the NIU increases the transmit power level.

You should configure the minimum power level used after network entry at a level that the BTS can always receive.

The minimum power level used after network entry ensures that the NIU cannot reduce the transmit power level to a level that cannot be received by the BTS. The maximum power level used after network entry ensures that the NIU does not increase the transmit power level to a level that interferes with other network equipment.

The maximum power level used after network entry can be set higher than the maximum power level used before network entry, because until the NIU has registered you cannot be certain that the NIU and the BTS are aligned.

The overall intent of providing configurable transmit levels for each NIU is to try to ensure that the receive power at the BTS is consistent. NIUs that are close to the BTS have lower transmit power levels than NIUs that are farther away.

## 21.7 Rx and Tx redundancy

This section describes the functions of:

- Rx control
- Tx control

The MainStreet Broadband wireless system supports redundancy only for the OTUs and ORUs. Rx and Tx redundancy is supported at the T-ARIC group level; you can configure each T-ARIC card in the T-ARIC group to control one receiver and/or one transmitter.

Figure 21-3 shows a T-ARIC group with two T-ARIC cards. T-ARIC 1 is connected to an OTU and an ORU. T-ARIC 2 is connected to an OTU, but not to an ORU. If the active transmitter connected to T-ARIC 1 fails, the inactive transmitter connected to T-ARIC 2 becomes active.

**Figure 21-3: Tx redundancy**
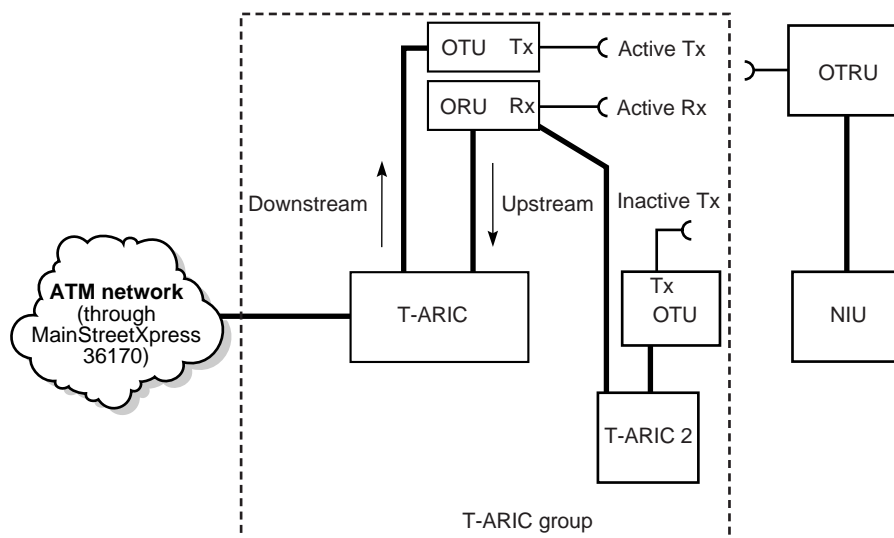


11438

The Rx and Tx control functions provide a method of independently enabling (or disabling) a receiver and/or a transmitter for each T-ARIC card. A single T-ARIC card cannot support redundant receivers or transmitters.

## 21.8 Slot parameters

This section describes the:

- card type
- slot name

### Card type

You must configure the T-ARIC slot card type as T-ARIC.

### Slot name

You can assign each T-ARIC card slot a name of up to 15 characters.

## 21.9 Upstream timeslot utilization

This section describes the parameters:

- contention timeslots
- demodulator status
- guard timeslots
- polling timeslots
- reserved DBA timeslots

You configure these parameters independently for each upstream channel. Figure 21-4 shows an example of timeslot utilization on an upstream channel.

**Figure 21-4: Timeslot utilization on an upstream channel**
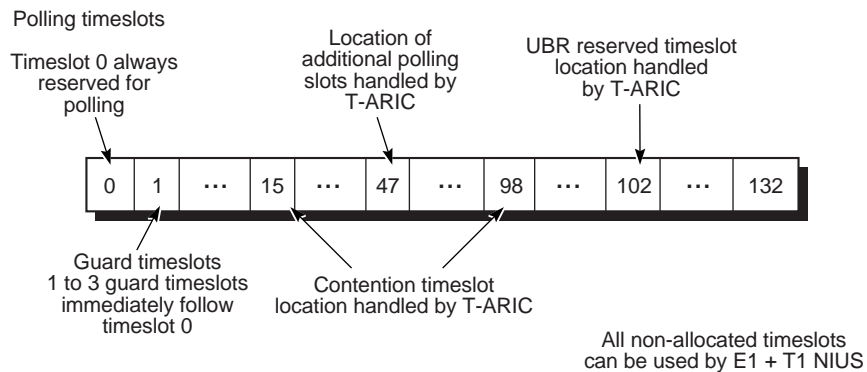


### Contention timeslots

The E1 and T1 NIUs use contention timeslots to communicate with the T-ARIC card. These timeslots do not carry user data. You configure the number of contention timeslots independently for each of the two upstream demodulators on the T-ARIC card.

All NIUs connected to the upstream demodulator share access to the contention timeslots, but a contention timeslot can only be used by a single NIU at a time. If no contention timeslots are available and the NIU needs to communicate with the T-ARIC card, the NIU must make successive attempts until a contention timeslot becomes available.

At least one timeslot must be reserved for contention. The T-ARIC card determines the location of the contention timeslots within the upstream channel.

## Guard and polling timeslots

During the process of network entry, the NIU attempts to communicate with the T-ARIC card on an assigned polling slot. Timeslot 0 is called a polling timeslot. Because the NIUs may not be synchronized with the BTS during the network entry process, it is possible that the message from the NIU might overflow into the next timeslot.

Guard slots are timeslots that do not carry user data. Guard slots immediately follow the polling slot and guarantee that timeslots used for user data are not interfered with by NIUs attempting to enter the network. At least one timeslot must be reserved as a guard timeslot, which is why polling timeslots used for network entry are followed by guard timeslots.

The T-ARIC card continues to poll the NIUs after the NIUs have entered the network. To prevent congestion on timeslot 0 you can configure additional polling slots. These polling slots are used only by NIUs that have entered the network, so guard timeslots are not needed. The T-ARIC card determines the location of any additional polling timeslots. You only configure the number of polling timeslots.

## Reserved DBA timeslots

You configure the number of timeslots that are available for use for bandwidth-on-demand by NIUs. These timeslots are used for the Ethernet port, MAC messages and management data.

If no DBA timeslots are reserved, NIU CBR connections might use all available bandwidth. All NIU connections are CBR.

The T-ARIC card determines the location of the reserved DBA timeslots. You only configure the number of reserved DBA timeslots.

## 21.10    NIU configuration

This section describes how to configure the following options:

- add frequency
  - channel bandwidth
  - channel frequency
  - number of channels
- delete channel
- maximum power level after network entry
- maximum power level before network entry
- maximum power level after network entry
- maximum power level before network entry
- Tx LO offset
- Rx LO offset
- RF band start frequency
- RF band end frequency
- IF band start frequency

### To add frequencies

CONFIG — SYSTEM — MODEM — MORE — ADD_FREQ

*<center_frequency, bandwidth, roll-off, number>* ↵

*<bandwidth, center_frequency, number>* ↵

SK002330

where

*bandwidth* is 18 MHz

*center_frequency* is the center frequency of the downstream channel from 20000 to 40000

*roll-off* is 0.35

*number* is an integer from 1 to 30

---

**Note**

The NIU verifies that the new parameters do not overlap any existing entries. If the new parameters do overlap any existing entries, the screen displays an error message.

---

## To delete channels

---

**Note**

The system assigns the channel identifiers that are referred to in this procedure. The channel identifiers are displayed on the NMTI screen.

---

CONFIG — SYSTEM — MODEM — MORE — DEL_FREQ

*<channel>* ↵          *<start-end>* ↵          *<list>* ↵

SK002331

where

*channel* is the channel number to delete

*start* is the first channel number in the range

*end* is the last channel number in the range, and *end* must be greater that *start*

*list* is at least two channel numbers separated by a comma

## To configure the maximum power level after network entry

CONFIG — SYSTEM — MODEM — MAX_POWER_AFT — *<power>* ↵

where *power* is –10 to –60 dB in increments of 40 dB

## To configure the maximum power level before network entry

CONFIG — SYSTEM — MODEM — MAX_POWER_BEF — *<power>* ↵

where *power* is –10 to –60 dB in increments of 40 dB

## To configure the minimum power level before network entry

CONFIG — SYSTEM — MODEM — MIN_POWER_BEF — *<power>* ↵

where *power* is –10 to –60 dB in increments of 40 dB

## To configure the minimum power level after network entry

CONFIG — SYSTEM — MODEM — MIN_POWER_AFT — <*power*> ↵

where *power* is –10 to –60 dB in increments of 40 dB

## To configure the Tx LO and Rx LO frequency offsets

CONFIG — SYSTEM — MODEM — LO — <*tx_LO, rx_LO*> ↵

where
*tx_LO* is from 17000 to 40000 Mhz
*rx_LO* is from 17000 to 40000 Mhz

## To configure the RF band start and end frequency and IF band start frequency

CONFIG — SYSTEM — MODEM — FREQ — <*RF_start, RF_end, IF_start*> ↵

where
*RF_start* is 20000 to 40000 MHz
*RF_end* is 20000 to 40000 MHz
*IF_start* is 950 to 2050 MHz

## 21.11    T-ARIC group configuration

This section describes how to add or remove a T-ARIC card from a group, and how to configure the following options:

- downstream IF start frequency
- Rx and Tx control
- Rx RF upstream frequency start and end
- Tx RF upstream frequency start and end
- upstream IF start frequency
- upstream frequency offset

For a T-ARIC card to function, it must be configured as part of a T-ARIC group, even if it is the only card in the group.

## To add or remove a T-ARIC card to or from a T-ARIC group

CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵

```
                        ┌─────────────┬─────────────┐
                     ADD_CARD       RMV_CARD
                        └─────────────┴─────────────┘
                               │
                        <shelf-slot-1> ↵
```
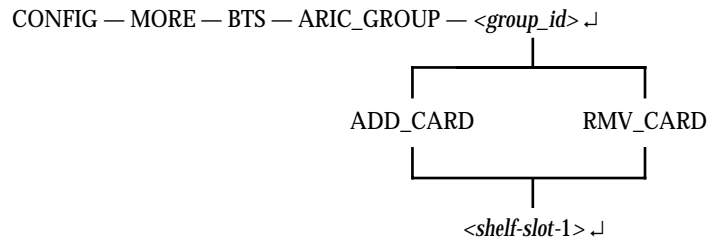
SK002332

where
*group_id* is an integer from 1 to 64
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

.

## To configure the downstream IF start frequency

CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵ — DOWNSTREAM —
IF_START — *<start_if>* ↵

where
*group_id* is an integer from 1 to 64
*start_if* is an integer from 950 to 2050

## To configure Rx and Tx control

CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵

```
                        ┌─────────────┬─────────────┐
                      TX_CTL         RX_CTL
                        └─────────────┴─────────────┘
                               │
                        ENABLE/DISABLE
```
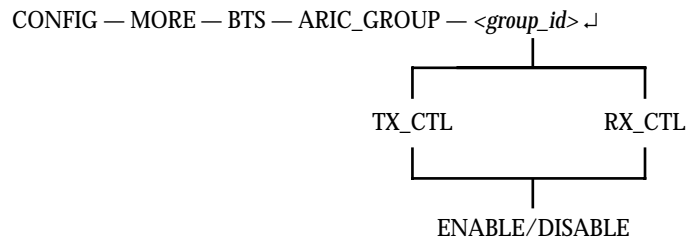
SK002333

where *group_id* is an integer from 1 to 64

## To configure the Rx upstream start and end frequency
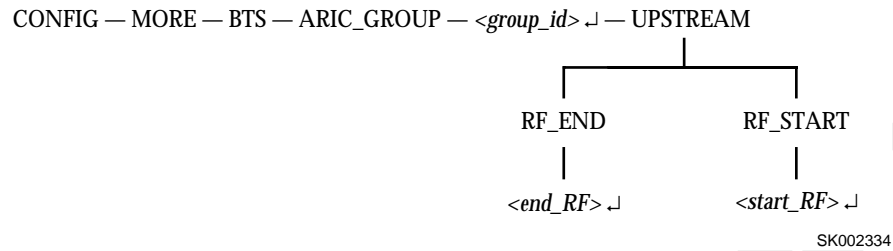
CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵ — UPSTREAM

|— RF_END —— RF_START

RF_END | *<end_RF>* ↵

RF_START | *<start_RF>* ↵

SK002334

where
*group_id* is an integer from 1 to 64
*end_RF* is an integer from 20000 to 40000
*start_RF* is an integer from 20000 to 40000

## To configure the Tx downstream start and end frequency
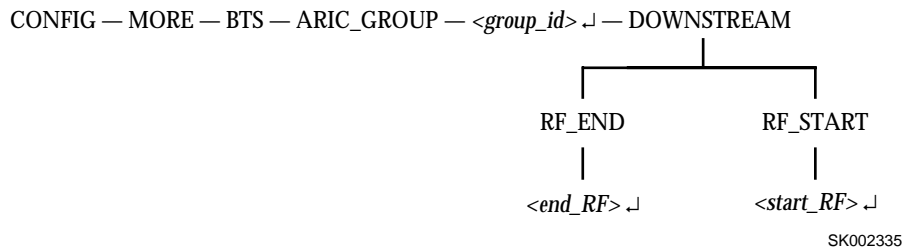
CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵ — DOWNSTREAM

RF_END | *<end_RF>* ↵

RF_START | *<start_RF>* ↵

SK002335

where
*group_id* is an integer from 1 to 64
*end_RF* is an integer from 20000 to 40000
*start_RF* is an integer from 20000 to 40000

## To configure the upstream IF start frequency

CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵ — UPSTREAM — IFSTART
| *<start_if>* ↵

SK002336
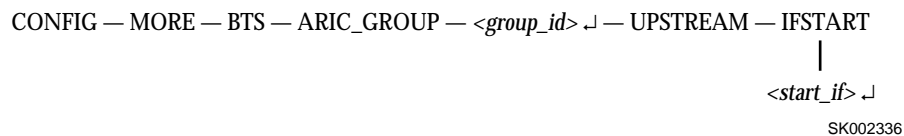
where
*group_id* is an integer from 1 to 64
*start_if* is an integer from 400 to 900

**To configure the upstream frequency offset**

CONFIG — MORE — BTS — ARIC_GROUP — *<group_id>* ↵ — UPSTREAM —
FREQ_OFFSET — *<offset>* ↵

where

*group_id* is an integer from 1 to 64

*offset* is an integer from -500 to 0

## 21.12 Downstream T-ARIC modem configuration

This section describes how to configure:

- downstream channel frequency
- downstream channel bandwidth
- Tx default power level

**To configure the downstream channel frequency**

CONFIG — OBJECT — PORT — *<shelf-slot-*1*>* ↵ — MODEM — DOWNSTREAM —
CHANL_FREQ — *<center_frequency>* ↵

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*center_frequency* is an integer from 20000 to 40000

**To configure the downstream channel width**

CONFIG — OBJECT — PORT — *<shelf-slot-*1*>* ↵

18_MHZ          36_MHZ
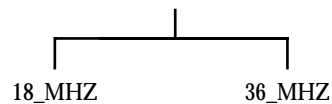
SK002337

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

## To configure the Tx default power level

CONFIG — OBJECT — PORT — *<shelf-slot*-1*>* ↵ — MODEM — DOWNSTREAM — IF_POWER — DEF_POWER

*<power>* ↵

SK002341

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*power* is an integer from –22 to 8 in increments of 2

## 21.13     Upstream T-ARIC modem configuration

This section describes how to add or remove NIUs, and how to configure:

- NIU association
- contention timeslots
- demodulator operation
- guard timeslots

- polling timeslots
- reserved NIU DBA timeslots
- upstream channel frequency

## To add or remove an NIU

CONFIG — OBJECT — PORT — *<shelf-slot*-1*>* ↵

UPSTREAM_1          UPSTREAM_2

ADD_NIU          REMOVE_NIU

*<niu_id>* ↵
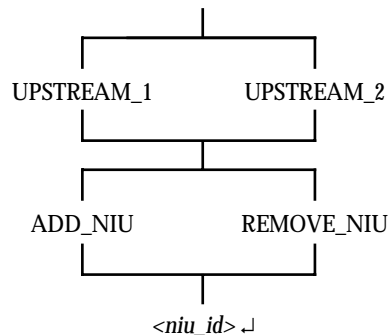
SK002343

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*niu_id* is an integer from 100 to 3299

## To configure the number of contention timeslots

CONFIG — OBJECT — PORT — *<shelf-slot-1>* ↵

UPSTREAM_1          UPSTREAM_2

TS_POOLS

CONTENTION

*<contention_timeslots>* ↵
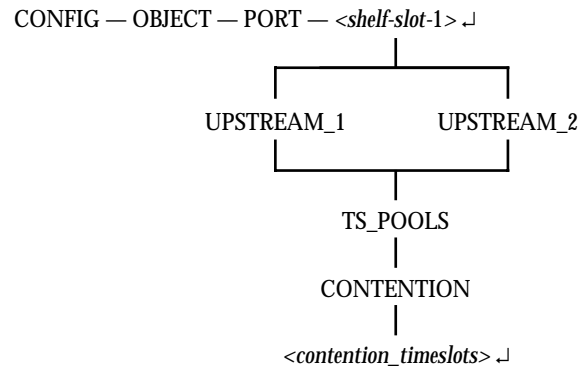
SK002344

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*contention_timeslots* is an integer from 2 to (133 minus the number of configured polling slots, minus the number of configured guard slots)

## To configure the demodulator operational status

CONFIG — OBJECT — PORT — *<shelf-slot-1>* ↵

UPSTREAM_1          UPSTREAM_2

ENABLE/
DISABLE
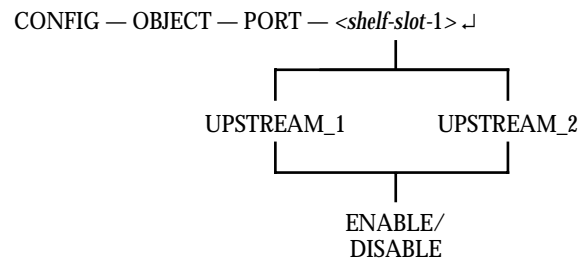
SK002345

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

## To configure the number of guard timeslots

CONFIG — OBJECT — PORT — *<shelf-slot-*1*>* ↵

UPSTREAM_1        UPSTREAM_2

TS_POOLS

GUARD

*<guard_timeslots>* ↵
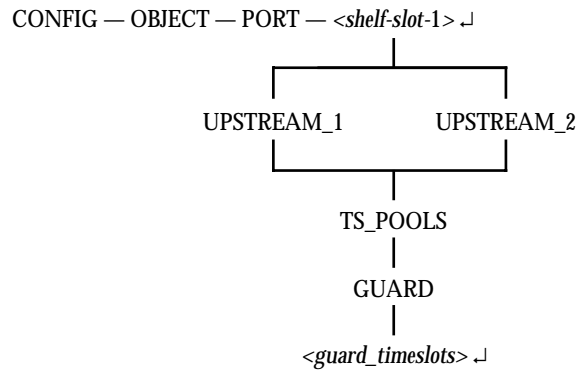
SK002346

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*guard_timeslots* is an integer from 1 to 3

## To configure the number of polling timeslots

CONFIG — OBJECT — PORT — *<shelf-slot-*1*>* ↵

UPSTREAM_1        UPSTREAM_2

TS_POOLS

POLLING

*<poll_timeslots>* ↵
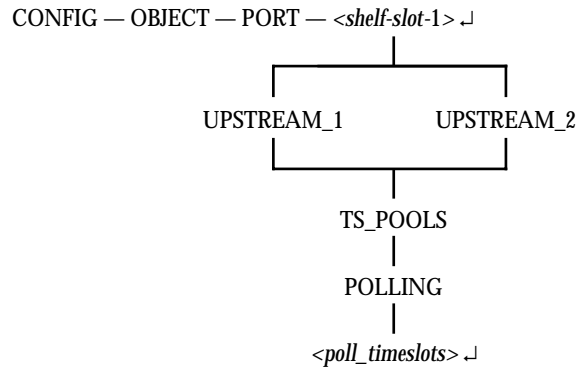
SK002347

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*poll_timeslots* is an integer from 1 to 16

# To configure the number of reserved DBA timeslots

CONFIG — OBJECT — PORT — *<shelf-slot-*1*>* ↵

UPSTREAM_1            UPSTREAM_2

TS_POOLS

UBR

*<UBR_timeslots>* ↵
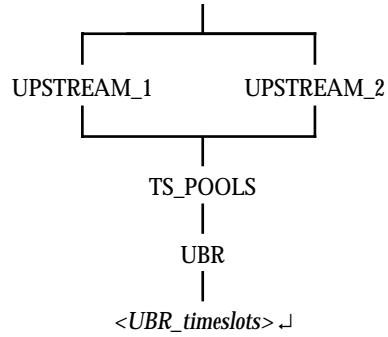
SK002348

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*UBR_timeslots* is an integer from 0 to (133, minus the number of configured polling slots, minus the number of configured guard slots)

## To configure the upstream channel frequency

---

**Note**

Although the T-ARIC card receives on two separate RF channels, you specify the channel frequency for one of the two channels, but not for both. If you configure the upstream channel frequency for upstream 1, then the channel frequency for upstream 2 is automatically set to the channel frequency for upstream 1 plus 9 MHz. If you configure the upstream channel frequency for upstream 2, then the channel frequency for upstream 1 is automatically set to the channel frequency for upstream 2 minus 9 MHz.

---

CONFIG — OBJECT — PORT — *<shelf-slot-1>* ↵

UPSTREAM_1     UPSTREAM_2

CHAN_FREQ

*<center_frequency>* ↵
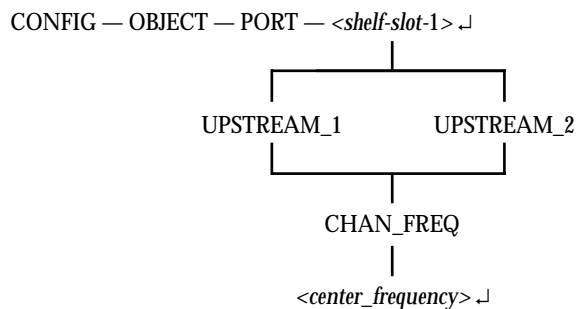
SK002349

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*center_frequency* is the center frequency of the upstream channel from 20000 to 40000

---

## 21.14     T-ARIC card NIU configuration

This section describes:

- NIU serial number
- NIU type

## To configure the NIU serial number

CONFIG — MORE — BTS — NIU — *<niu_id>* ↵ — SERIAL_NUM — *<serial_number>* ↵

where

*niu_id* is an integer from 100 to 3299

*serial_number* is up to 19 characters

**To configure the NIU type**

CONFIG — MORE — BTS — NIU — <*niu_id*> ↵ — CE

where *niu_id* is an integer from 100 to 3299

## 21.15 T-ARIC card port configuration

This section describes how to configure the T_ARIC port name.

**To configure the T-ARIC card port name**

CONFIG — OBJECT — PORT — <*shelf-slot*-1> ↵ — NAME — <*port_name*> ↵

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11
*port_name* is up to 20 characters

## 21.16 T-ARIC card slot configuration

This section describes how to configure:

- card type
- slot name

**To configure the T-ARIC card type**

CONFIG — OBJECT — PORT — <*shelf-slot*-1> ↵ — TYPE — CELL_RELAY — WIRELESS — ARIC_T

where *shelf* is P1 to P16

*slot* is an integer from 1 to 11

## To configure the T-ARIC card slot name

CONFIG — OBJECT — PORT — <*shelf*-*slot*-1> ↵ — NAME — <*slot_name*> ↵

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

*slot_name* is up to 20 characters

# 22. Status information

This chapter describes status information that can be viewed on NIUs and T-ARIC cards.

## 22.1 Status information

Table 22-1 describes the individual status fields. The fields shown are status fields only; these fields do not show information about any of the configured parameters.

**Table 22-1:  Status information**

| Field | Status |
| --- | --- |
| E1 port | AIS<br>LOF<br>LOS<br>Ok<br>RAI |
| NIU network connectivity | Hunting<br>Modem not configured<br>Network entered |
| NIU modem | OK<br>Fault |
| NIU modem housekeeper link | OK<br>Link down |
| NIU status | Active (the NIU has been configured, has been associated with a T-ARIC card port, and has entered the network)<br>Config (the NIU has been configured, but has not been associated with a T-ARIC card port)<br>Pooled (the NIU has been configured and has been associated with a T-ARIC card port, but has not completed network entry) |
| T1 port | AIS<br>LOF<br>LOS<br>Ok<br>RAI<br>TS16 AIS<br>TS16 multiframe<br>TS16 RAI |

| Field | Status |
|---|---|
| T-ARIC card port | Alarm (at least one alarm is logged against this port) |
| | AllIn (all NIUs associated with this port have completed network entry) |
| | Idle (there are no NIUs associated with this port) |
| | ModemLinkDown (the communication link with the modem is down) |
| | NoneIn (none of the NIUs associated with this port have completed network entry) |
| | SomeIn (at least one, but not all, of the NIUs associated with this port have completed network entry) |
| | TunerLinkDown (the communication link with the tuner module is down) |
| T-ARIC card slot | RxDown (the receiver controlled by this T-ARIC card is down) |
| | RxLinkDown (the communication link with the receiver is down) |
| | TxDown (the transmitter controlled by this T-ARIC card is down) |
| | TxLinkDown (the communication link with the transmitter is down) |
| | TxRxDown (the transmitter and receiver devices controlled by this T-ARIC card are both down) |

## To view NIU T1 or E1 port status

From the NIU NMTI, enter:

CONFIG — PORT — <*port*> ↵

where *port* is 1

## To view base network, NIU modem and housekeeping link status

From the NIU NMTI, enter:

MAINT— SYSTEM — MODEM

## To view NIU status

From the MainStreetXpress 36170 NMTI, enter:

CONFIG — OBJECT — BTS — <*niu_id*> ↵

where *niu_id* is an integer from 100 to 3299

## To view T-ARIC card port status

From the MainStreetXpress 36170 NMTI, enter:

CONFIG — OBJECT — PORT — <*shelf-slot*-1> ↵

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

## To view T-ARIC card slot status

From the MainStreetXpress 36170 NMTI, enter:

CONFIG — OBJECT — SLOT — <*shelf-slot*-1> ↵

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

# 23. T-ARIC card statistics

This chapter describes the T-ARIC card statistics supported on the MainStreet Broadband Wireless system.

## 23.1 Statistics

Table 23-1 describes all supported statistics.

**Table 23-1: Description of supported statistics**

| Statistic | Description | Endpoint or port | Egress or ingress |
|---|---|---|---|
| Cells Discarded by UPC (CLP 0) | Displays the number of valid cells that have CLP=0 and which have been discarded at ingress by the ingress traffic policing<br>This number includes cells with corrected header errors | Endpoint | Ingress |
| Cells Discarded by UPC (CLP 0+1) | Displays the number of valid cells that have CLP=0 or CLP=1, and which have been discarded at ingress by the ingress traffic policing<br>This number includes cells with corrected header errors | Endpoint | Ingress |
| Cells Tagged by UPC | Displays the number of valid cells with CLP=0 admitted at ingress and which had CLP set to 1 by the ingress traffic policing<br>This number includes cells with corrected header errors | Endpoint | Ingress |
| Cells Transmitted | Displays the number of valid cells that have been transmitted at egress | Port | Egress |
| Cells Transmitted (CLP 0) | Displays the number of valid cells that have been transmitted at egress with CLP=0 | Endpoint | Egress |
| Cells Transmitted (CLP 0+1) | Displays the number of valid cells that have been transmitted at egress with CLP=0 or with CLP=1 | Endpoint | Egress |
| Valid Cells Received | Displays the number of valid cells admitted at ingress | Port | Ingress |
| Valid Cells Received (CLP 0) | Displays the number of valid cells with CLP=0 that have been admitted at ingress<br>This number includes cells with corrected header errors | Endpoint | Ingress |
| Valid Cells Received (CLP 0+1) | Displays the number of valid cells with CLP=0 or CLP=1, that have been admitted at ingress<br>This number includes cells with corrected header errors | Endpoint | Ingress |

## To view ATM endpoint statistics

From the MainStreetXpress 36170 NMTI, enter:

STATS — OBJECT — ENDPOINT — *<shelf-slot-*1;*vpi_id/ vci_id>* ↵ — ATM
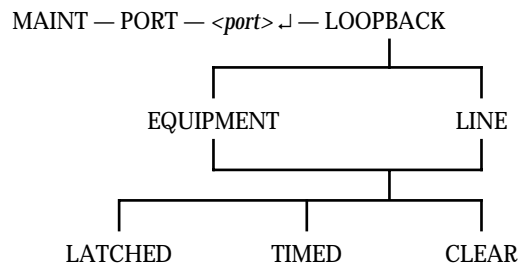
where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11
*vpi_id* is an integer from 0 to 249
*vci_id* is an integer from 32 to 511

## To view T-ARIC card port statistics

From the MainStreetXpress 36170 NMTI, enter:

STATS — OBJECT — PORT — *<shelf-slot-*1> ↵ — ATM

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

## To refresh statistics

From the MainStreetXpress 36170 NMTI, enter:

<Esc> <R>

# 24. NIU statistics

This chapter describes the statistics supported by the NIUs.

## 24.1    NIU port AAL1 statistics

The NIUs provide performance monitoring statistics for each connection at the AAL layer as required by the ATM Forum B-ICI specification. All statistics are available in SDT and UDT modes except for AAL1 pointer parity errors and pointer reframes, which are available only in SDT mode.

Statistics can be viewed for:

- the current 15-minute interval and the 96 previous 15-minute intervals
- previous 24-hour intervals.

Figure 24-1 shows an NIU port AAL1 statistics NMTI display. Table 24-1 lists the AAL1 statistics supported on the NIU port. AAL1 statistics are only available in UDT mode.

**Figure 24-1:   NIU port AAL1 statistics NMTI display**

```
 28110 T1 NIU          AA1211-R0-AF   NIU7:?:?     MAJ:Alrm:1    03-JAN-1999 12:56




 AAL1 Statistics                 Valid :CURRENT                Worst Interval
                                   00:12:58                          -
  Reassembled Cells               1000                              -
  AAL1 Header Errors              2                                 -
  Lost Cells                      5                                 -
  Buffer Overflows                3                                 -
  Buffer Starvation/Under flows   3                                 -
  AAL1 Underflow Seconds          3                                 -
  Valid 15-minute intervals       31         (current day)




 STATS PORT 1 AAL1 15_MINUTE


 1-              2-PREV_INTVL    3-NEXT_INTVL    4-CURRENT       5-INTERVAL_ID
 6-TEMP_CLEAR    7-              8-CANCEL        9-QUIT          0-
```

**Table 24-1: NIU port AAL1 statistics**

| Statistic | Description |
|---|---|
| AAL1 Reassembled Cells | The number of cells played out to the DS1/E1 service interface, excluding cells that were discarded |
| AAL1 Uncorrectable Header Errors | The number of uncorrectable AAL1 header errors detected |
| AAL1 Lost cells | The approximate number of cells lost due to SN continuity errors |
| AAL1 Buffer Overflows | The number of Rx buffer overflows<br>This counter cannot increment more than once every 100 ms |
| AAL1 Buffer Starvation/Underflow | The number of Rx buffer underflows<br>This counter cannot increment more than once every 100 ms |
| AAL1 Underflow Seconds | The number of seconds during which there was an Rx buffer underflow |
| AAL1 Pointer Parity Errors | The number of SDT pointer parity errors<br>This counter cannot increment more than once every 100 ms |
| AAL1 Pointer Reframes | The number of times that the AAL1 reassembler found that an SDT pointer was not where it was expected<br>A pointer must be re-acquired |

## To view NIU port AAL1 statistics

STATS — PORT— *<port_id>* ↵ — PHYSICAL

15_MINUTE                    24_HOUR

TEMP_CLEAR    PREV_INTVL    NEXT_INTVL    CURRENT    INTERVAL_ID

*<interval_id>* ↵

SK002318

where

*port_id* is 1

*interval_id* is a number from 1 to 96

## To view NIU channel group AAL1 statistics

```
STATS — CHANNEL_GROUP— <group_id> ↵ — AALI
                    │
        ┌───────────┴───────────┐
   15_MINUTE                24_HOUR
        │                        │
 ┌──────┼──────┬──────────┬──────────┐
PREV_INTVL  NEXT_INTVL  CURRENT  INTERVAL_ID  TEMP_CLEAR
                                    │
                              <interval_id> ↵
                                    │
                      ┌─────────────┼─────────────┐
                 PREV_INTVL      CURRENT      TEMP_CLEAR
```

SK002320
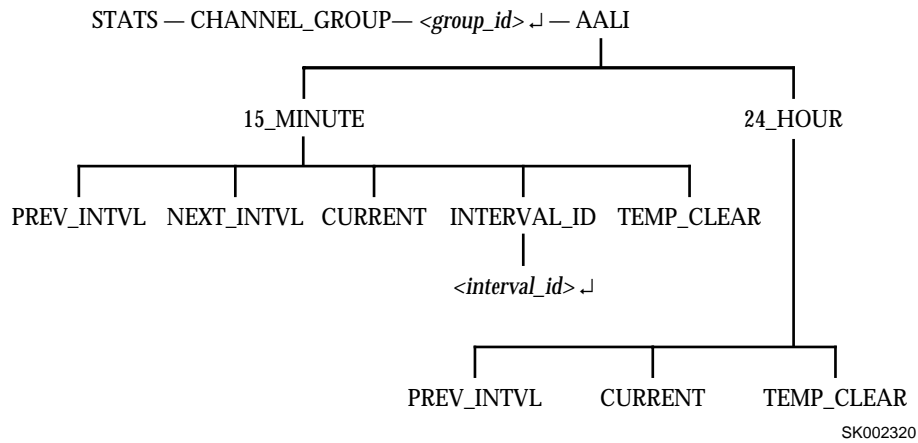
where

*group_*id is an integer in the range 1 to 24 for T1 NIUs, or 1 to 31 for E1 NIUs

*interval_id* is a number from 1 to 96

## 24.2 T1 and E1 statistics

The NIUs collect T1 and E1 statistics that are available for viewing through NMTI. The 28110 MainStreet T1 NIU collects T1 statistics. The 28120 MainStreet E1 NIU collects E1 statistics. Statistics can be viewed for the current 15-minute interval and the 96 previous 15-minute intervals for the T1 and E1 physical statistics.

Figure 24-2 shows T1 statistics for the 28110 MainStreet T1 NIU port. Table 24-2 lists the T1 statistics supported on the NIU port.

**Figure 24-2: T1 port statistics NMTI display**

```
 28110 T1 NIU          AA1211-R0-AF   NIU7:?:?    MAJ:Alrm:1   03-JAN-1999 12:56


 #        Type          Status       Name
 1        T1_CE          -

 Statistics               Valid  :CURRENT                    Worst Interval
                                  00:02:11                        (02)
  Errored Seconds              65                                  67
  Severely Errored Seconds     10                                  12
  Unavailable Seconds          10                                  11
  Bursty Errored Seconds       65                                  65
  Loss of Frame Counts          2                                   6


  Valid 15-minute Intervals    44



 STATS PORT 1 PHYSICAL 15_MINUTE


 1-             2-PREV_INTVL    3-NEXT_INTVL    4-CURRENT        5-INTERVAL_ID
 6-TEMP_CLEAR   7-              8-CANCEL        9-QUIT           0-
```

**Table 24-2: T1 port statistics**

| Statistic | Description | AAL1 mode supported | Framing mode supported |
|---|---|---|---|
| Errored Seconds | The number of seconds during which the average BER was greater than 0 but less than $1\times10^{-3}$, and a loss of synchronization was not detected | UDT/SDT | SF(D4) / ESF |
| Severely Errored Seconds | The number of seconds during which the average BER was greater than $1\times10^{-3}$ or where a loss of synchronization was detected | UDT/SDT | SF(D4)/ESF |
| Unavailable Seconds | The number of seconds in the selected interval where the link was in the unavailable state, not including the 10 severely errored seconds preceding the unavailable state | UDT[1]/SDT | SF(D4)/ESF |
| Bursty Errored Seconds | The number of seconds in the selected interval that contained more than one CRC error (in ESF framing mode) or more than one LCV error (in D4 framing mode) | UDT[1]/SDT | SF(D4)/ESF |
| Loss of Frame Count | The number of LOF errors that occurred in the selected interval | UDT[1]/SDT | SF(D4)/ESF |
| Valid 15-minute Intervals | The number of valid 15-minute intervals recorded | UDT/SDT | SF(D4)/ESF |

Note

1. Parameters are supported for UDT only if is in the monitored mode.

The 28120 MainStreet E1 NIU displays G.821 and line error statistics.

Figure 24-3 shows an example of a port G.821 statistics NMTI display for an 28120 MainStreet E1 NIU. Table 24-3 lists the G.821 statistics supported on the NIU port.

**Figure 24-3: E1 port G.821 statistics NMTI display**

```
 28120 E1 NIU        AA1211-R0-AF   NIU7:?:?     MAJ:Alrm:1    03-JAN-1999 12:56


 #        Type         Status       Name
 1        E1_CE120     -

 Statistics              Interval:CURRENT                      Worst Interval
                            00:02:11                              (02)
 Errored Seconds             65                                    87
 Severely Errored Seconds    10                                    12
 Unavailable Seconds         10                                    11
 Bursty Errored Seconds      65                                    65
 Loss of Frame Count         65                                    65


 Valid 15-minute Intervals    66



 STATS PORT 1 PHYSICAL G_821 15_MINUTE


 1-            2-PREV_INTVL    3-NEXT_INTVL    4-CURRENT       5-INTERVAL_ID
 6-TEMP_CLEAR  7-             8-CANCEL        9-QUIT          0-
```

**Table 24-3: E1 port G.821 statistics**

| Statistic | Description | AAL1 mode supported | Framing mode supported |
|---|---|---|---|
| Errored Seconds | The number of seconds during which the average BER was greater than 0 but less than $1\times10^{-3}$, and a loss of synchronization was not detected | UDT/SDT | G.704 |
| Severely Errored Seconds | The number of seconds during which the average BER was greater than $1\times10^{-3}$, or where a loss of synchronization was detected | UDT/SDT | G.704 |
| Unavailable Seconds | The number of seconds in the selected interval where the link was in the unavailable state, not including the 10 severely errored seconds preceding the unavailable state | UDT/SDT | G.704 |
| Bursty Errored Seconds | The number of seconds with more than one CRC error when CRC is enabled and more than one LCV error when CRC is disabled | UDT/SDT | G.704 |
| Loss of Frame Count | The number of LOF errors that occurred in the selected interval | UDT/SDT | G.704 |
| Valid 15-minute Intervals | The number of valid 15-minute intervals recorded | UDT/SDT | G.704 |

Figure 24-4 shows an example of a port line error statistics NMTI display for a 28120 MainStreet E1 NIU. Table 24-4 lists the line error statistics supported on the NIU port.

**Figure 24-4: E1 port line error statistics NMTI display**

```
 28120 E1 NIU         AA1211-R0-AF   NIU7:?:?      MAJ:Alrm:1    03-JAN-1999 12:56



 #        Type          Status        Name
 1        E1_CE120      -

  Statistics                Interval:CURRENT                      Worst Interval
                                 00:02:11                              (02)
  Line Code Violations          65                                     87
  Far End Block Errors          10                                     12
  Frame Alignment Signal Errs  10                                     11
  CRC4 Errors                   65                                     65




 Valid 15-minute Intervals    66



 STATS PORT 1 PHYSICAL LINE_ERROR 15_MINUTE

 1-             2-PREV_INTVL    3-NEXT_INTVL    4-CURRENT      5-INTERVAL_ID
 6-TEMP_CLEAR   7-              8-CANCEL        9-QUIT         0-
```

**Table 24-4: E1 port line error statistics**

| Statistic | Description | AAL1 mode supported | Framing mode supported |
|---|---|---|---|
| Line Code Violations | The number of BPV or EXZ error events that occurred during the selected interval | UDT/SDT | G.704 |
| Far End Block Errors | The number of ES or SES error events that occurred at the far end of the path during the selected interval | UDT/SDT | G.704 |
| Frame Alignment Signal Errors | The number of consecutive errored FAS that occurred during the selected interval | UDT/SDT | G.704 |
| CRC4 Errors | The number of CRC-4 errors that occurred during the selected interval | UDT/SDT | G.704 |

## To view NIU T1 port statistics

STATS — PORT— *<port_id>* ↵ — PHYSICAL

    15_MINUTE                24_HOUR

TEMP_CLEAR   PREV_INTVL   NEXT_INTVL   CURRENT   INTERVAL_ID

*<interval_id>* ↵

SK002318
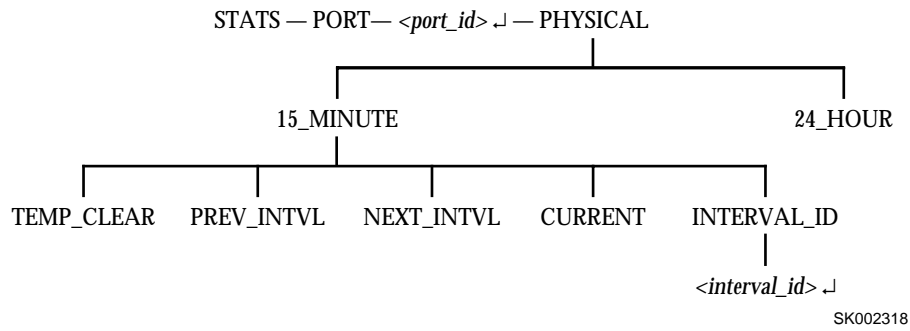
where
*port_id* is 1
*interval_id* is a number from 1 to 96

## To view NIU E1 port G.821 statistics

STATS — PORT— *<port_id>* ↵ — PHYSICAL — G_821

    15_MINUTE                24_HOUR

TEMP_CLEAR   PREV_INTVL   NEXT_INTVL   CURRENT   INTERVAL_ID

*<interval_id>* ↵

SK002317
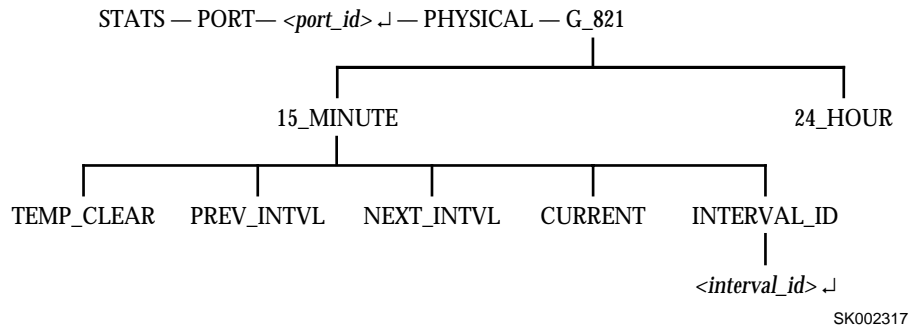
where
*port_id* is 1
*interval_id* is a number from 1 to 96

## To view NIU E1 port line error statistics

STATS — PORT— *<port_id>* ↵ — PHYSICAL — LINE_ERROR

15_MINUTE          24_HOUR

TEMP_CLEAR    PREV_INTVL    NEXT_INTVL    CURRENT    INTERVAL_ID

*<interval_id>* ↵

SK002316
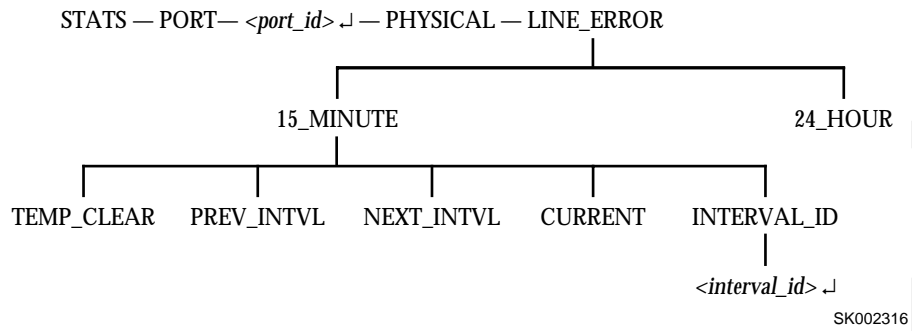
where
*port_id* is 1
*interval_id* is a number from 1 to 96

## To refresh statistics

<Esc> <R>

# 25. LED activity

This chapter describes T-ARIC card and NIU LED activity.

## 25.1 LED activity

This section describes the LED activity on both the T-ARIC card and on NIUs.

### NIU LED activity

Table 25-1 describes NIU LED activity.

**Table 25-1: NIU LED activity**

| LED | Color/activity | Description |
|-----|----------------|-------------|
| ATM egress data | Green/flashing | Valid user egress data is detected. The LED lights for 20 ms for each cell that is detected. |
| ATM ingress data | Green/flashing | Valid user ingress data is detected. The LED lights for 20 ms for each cell that is detected. |
| Basestation connectivity | Green/continuous | The NIU has locked on to the downlink frequency. |
| | Green/flashing | The NIU is hunting for the downlink frequency. |
| | Red/continuous | No downlink frequencies have been programmed on the NIU. |
| E1/T1 alarm | Off | No local or remote alarms are detected on the port. |
| | Red/continuous | The port is in a local alarm state. One of the following alarms has occurred: AIS, LIS, LOF, OOF, TS16 AIS or TS16 LOF. |
| | Yellow/continuous | The port is in a remote alarm state. One of the following alarms has occurred: RDI or TS16 RDI. |
| E1/T1 signal | Green/continuous | The port is receiving a signal other than AIS, LIS, or TS16 AIS. |
| | Off | The port has not been enabled. |
| | Red/continuous | The port is receiving an LIS. |
| | Yellow/continuous | The port is receiving AIS or TS16 AIS. |
| Ethernet Link | Green/continuous | A connection to other Ethernet equipment is detected. |
| Ethernet Activity | Green/continuous | Ethernet frames are being received. |
| Power | Green/continuous | +5 V is present. |
| Status | Green/continuous | There are no critical or major alarms on the NIU. |
| | Red/continuous | There is at least one critical or major alarm on the NIU. |

# T-ARIC card LED activity

Table 25-2 describes the T-ARIC card LED activity.

**Table 25-2:  T-ARIC card LED activity**

| LED | Color/activity | Description |
|---|---|---|
| Active | Green/continuous | The card is functioning. |
| | Green/flashing | The card is not using the preferred fabric. |
| | Red/continuous | The card is malfunctioning. |
| Alarm | Off | Currently, there are no critical or major alarms on the T-ARIC card. |
| | Red/continuous | There is at least one critical or major alarm on the T-ARIC card. |
| Link | Green/continuous | All NIUs associated with this T-ARIC card have completed network entry. |
| | Green/flashing | At least one NIU has completed network entry, and at least one NIU has not completed network entry. |
| | Off | There are no NIUs associated with the T-ARIC card. |
| | Yellow/continuous | None of the NIUs associated with this T-ARIC card have completed network entry. |
| Status | Green/continuous | The card is in service. |
| | Green/flashing | The card has not been recognized by the Control card. |
| | Green and red/flashing | The card installed in the slot does not match the slot configuration. |
| | Off | The card is not powered up, or the LED has failed. |
| | Red/continuous | The card is in a failed state. An alarm is generated to indicate the nature of the card failure. |

# 26. Loopbacks

This chapter describes the loopbacks supported by the T-ARIC card and the 28110 and 28120 MainStreet NIUs.

## 26.1 T-ARIC card loopbacks

The T-ARIC card supports segment and end-to-end OAM loopbacks.

Prior to initiating an OAM loopback:

- each node on the path must be configured with a unique CPSS address
- each port on the path must be configured with an appropriate port reference point type
- each endpoint on the path must be configured with an appropriate OAM segment type

### To configure the T-ARIC card port reference point

CONFIG — OBJECT — PORT — *<shelf-slot-1>* ↵ — OPTIONS
|
REFERENCE_PT
|
B-ICI   B-ISSI   UNI
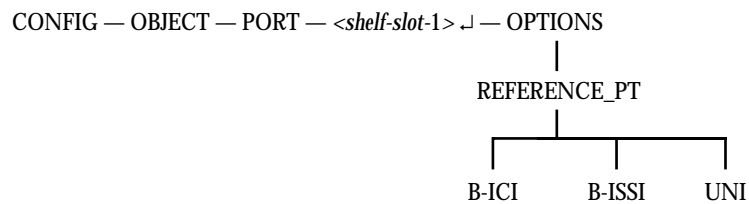
SK002351

where

*shelf* is P1 to P16

*slot* is an integer from 1 to 11

## To configure the OAM segment type

CONFIG — OBJECT — PORT — *<shelf-slot-*1*/ vpi_id;vci_id>* ↵ — OPTIONS
|
OAM_SEGMENT

INTERMEDIATE          TERMINATION
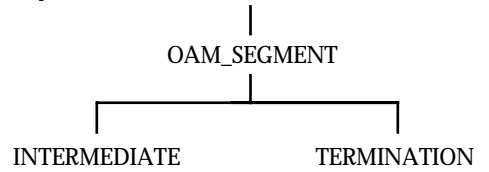
SK002352

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11
*vpi_id* is an integer from 0 to 249
*vci_id* is an integer from 32 to 511

## To initiate an OAM loopback

MAINT — OBJECT — ENDPOINT — *<shelf-slot-*1*/ vpi_id;vci_id>* ↵ — LPB — CELL — TEST

INTERMEDIATE          END-TO-END
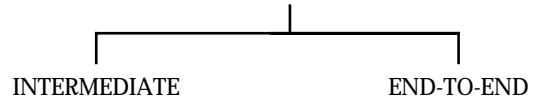
SK002353

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11
*vpi_id* is an integer from 0 to 249
*vci_id* is an integer from 32 to 511

## 26.2      28110 and 28120 MainStreet NIU loopbacks

The NIUs support line and equipment loopbacks.

### To initiate, clear or reset an NIU loopback

MAINT — PORT — *<port>* ↵ — LOOPBACK

EQUIPMENT               LINE

LATCHED        TIMED        CLEAR

SK002354

where *port* is 1

# 27.         Alarms

This chapter describes all alarms supported by the T-ARIC card and the NIUs, and describes how to:

- acknowledge alarms
- clear alarms
- configure remote alarm logging over CPSS (available only for the T-ARIC card)
- configure remote alarm logging over SNMP
- configure the alarm queue overflow method
- configure the remote alarm queue overflow method
- delete alarms
- filter the alarm display
- view alarms in a specific queue
- view an alarm summary

---

**Note**

Uncleared diagnostic alarms are never counted in any of the outstanding alarms fields.

---

## 27.1       Alarm descriptions

Table 27-1 summarizes NIU alarms. Table 27-2 summarizes T-ARIC card alarms.

**Table 27-1:  NIU alarm descriptions**

| Alarm | Raised by | Queue | Description |
|---|---|---|---|
| AIS | 28110 and 28120 MainStreet NIUs | Minor | The monitored port is receiving an AIS indication. |
| Buffer Overrun | 28110 and 28120 MainStreet NIUs | Major | The egress AAL-1 buffer has overflowed. alarm clear time: 12.5 s alarm declare time: 0 s |
| Buffer Starvation | 28110 and 28120 MainStreet NIUs | Major | The egress AAL-1 buffer has entered the starvation state. alarm clear time: 12.5 s alarm declare time: 2.5 s |
| Line Loopback Activated | 28110 MainStreet NIU | Major | A loopback has been raised as a result of in-band signaling that has been received from the far end. |
| LOF | 28110 and 28120 MainStreet NIUs | Major | The monitored port has either lost framing, or framing cannot be detected. |
| LOS | 28110 and 28120 MainStreet NIUs | Major | The received signal does not contain sufficient ones density. |

| Alarm | Raised by | Queue | Description |
|---|---|---|---|
| Modem Configuration Fault | 28110 and 28120 MainStreet NIUs | Major | The modem is incorrectly configured. |
| Modem Device Alarm | 28110 and 28120 MainStreet NIUs | Critical | There is a problem with the modem physical layer, or the modem has lost communication with the basestation. |
| Over Temperature Alarm | 28110 and 28120 MainStreet NIUs | Major | The temperature of the NIU has exceeded 50°C (122°F). |
| RAI | 28110 and 28120 MainStreet NIUs | Minor | The monitored port is receiving an RAI notification. |
| System Restart | 28110 and 28120 MainStreet NIUs | Major | The housekeeper processor has restarted. There is no associated clearing alarm. |
| TS16 AIS | 28120 MainStreet NIU | Major | The monitored port is receiving an AIS indication in timeslot 16. |
| TS16 Multiframe | 28120 MainStreet NIU | Major | The monitored port is detecting a loss of multiframe in timeslot 16. |
| TS16 RAI | 28120 MainStreet NIU | Major | The monitored port is receiving an RAI indication in timeslot 16. |

**Table 27-2: T-ARIC card alarm descriptions**

| Alarm | Queue | Description |
|---|---|---|
| Downconverter LO Not Locked | Major | The specified downconverter is not locked to the programmed operating frequency. |
| NIU Entered Network | Diagnostic | An NIU (identified by the NIU ID) has established communications with the T-ARIC. |
| NIU Left Network | Diagnostic | An NIU (identified by the NIU ID) has lost communications with the T-ARIC. |
| Rx LO Not Locked | Major | The T-ARIC Rx LO is not locked to the programmed operating frequency. |
| Tx LO Not Locked | Major | The T-ARIC Tx LO is not locked to the programmed operating frequency. |
| Upconverter LO Not Locked | Major | The T-ARIC is not locked to the programmed operating frequency. |

## To acknowledge alarms

```
                    ALARMS — OUTSTANDING
        ┌──────────┬──────────┬──────────┬──────────┐
    CRITICAL     MAJOR      MINOR    DIAGNOSTIC  ALL_ALARMS
        └──────────┴──────────┴──────────┴──────────┘
                          ┌──────────┐
                        ACK        ACK_ALL
                   ┌──────────┐
          <alarm_id> ↵        <alarm1_id-alarm2_id> ↵
```
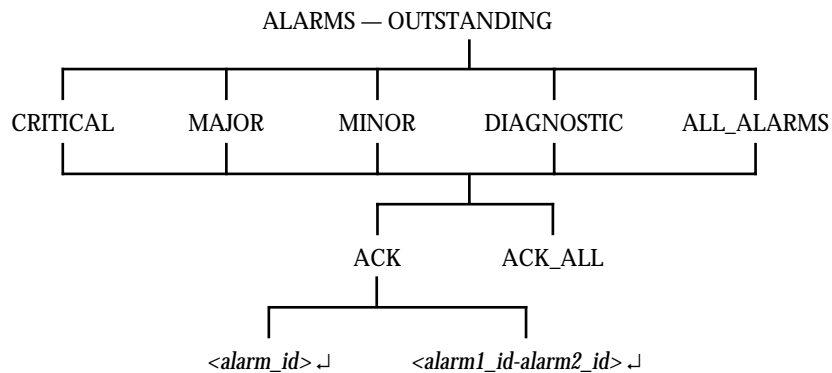
SK002355

where

*alarm_id* is the alarm number listed under the #### column on the screen

*alarm1_id* is the alarm number (under the #### column) of the first alarm in the range

*alarm2_id* is the alarm number (under the #### column) of the last alarm in the range

## To clear alarms

```
                    ALARMS — OUTSTANDING
        ┌──────────┬──────────┬──────────┬──────────┐
    CRITICAL     MAJOR      MINOR    DIAGNOSTIC  ALL_ALARMS
        └──────────┴──────────┴──────────┴──────────┘
                          MORE
                   ┌──────────┐
                 CLEAR      CLEAR_ALL
            ┌──────────┐
   <alarm_id> ↵        <alarm1_id-alarm2_id> ↵
```
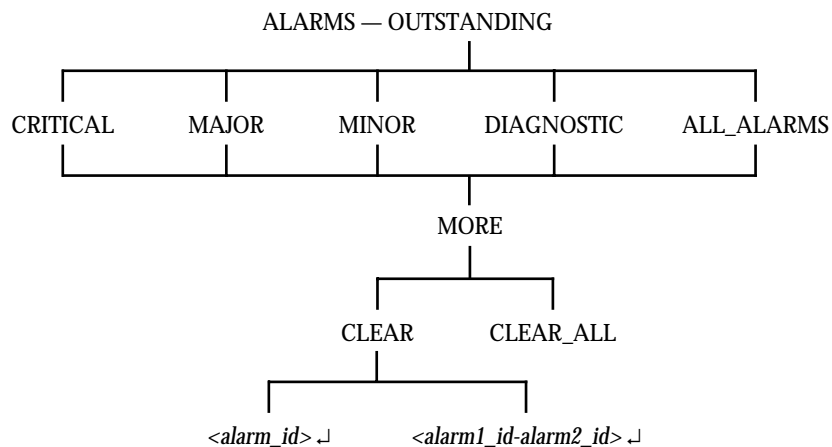
SK002356

where

*alarm_id* is the alarm number listed under the #### column on the screen

*alarm1_id* is the alarm number (under the #### column) of the first alarm in the range

*alarm2_id* is the alarm number (under the #### column) of the last alarm in the range

## To configure remote alarm logging over CPSS

---

**Note**

This feature is available only for the T-ARIC card.

---

```
                    ALARMS — LOGGING
                            |
        ┌───────────┬───────┴──────┬──────────────┐
     CRITICAL     MAJOR         MINOR         DIAGNOSTIC
        └───────────┴───────┬──────┴──────────────┘
                            |
              REMOTE_ON*/REMOTE_OFF
```
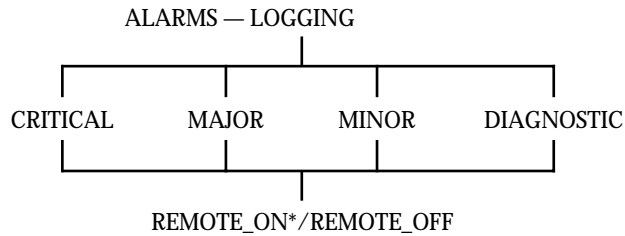
SK002357

## To configure remote alarm logging over SNMP

```
                  ALARMS — LOGGING
                          |
        ┌──────────┬──────┴──────┬──────────┐
     CRITICAL    MAJOR        MINOR     DIAGNOSTIC
        └──────────┴──────┬──────┴──────────┘
                          |
               SNMP_ON*/SNMP_OFF
```
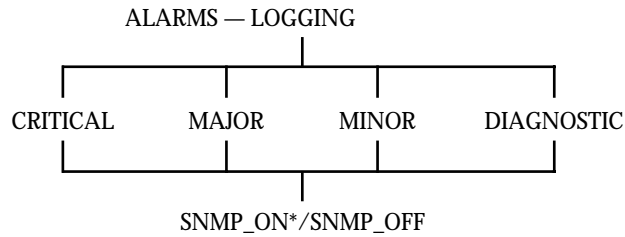
SK002358

## To configure the alarm queue overflow method

```
                ALARMS — CONFIG — QUEUE
                          |
        ┌──────────┬──────┴──────┬──────────┐
     CRITICAL    MAJOR        MINOR     DIAGNOSTIC
        └──────────┴──────┬──────┴──────────┘
                 ┌────────┴────────┐
               FIXED            CIRCULAR
```
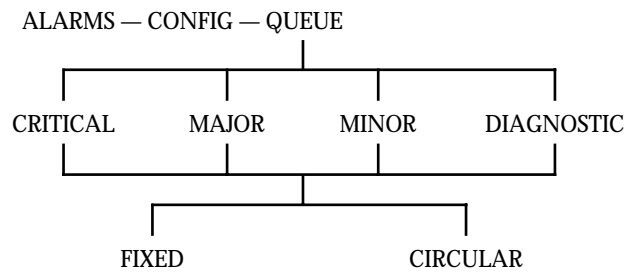
SK002359

## To configure the remote alarm queue overflow method

ALARMS — CONFIG — LOG_QUEUE

CRITICAL    MAJOR    MINOR    DIAGNOSTIC

FIXED              CIRCULAR
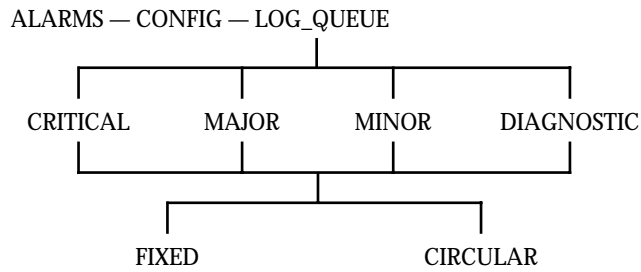
SK002360

## To delete alarms

ALARMS — OUTSTANDING

CRITICAL    MAJOR    MINOR    DIAGNOSTIC    ALL_ALARMS

DELETE    DELETE_ALL

*\<alarm_id\>* ↵          *\<alarm_id1-alarm_id2\>* ↵
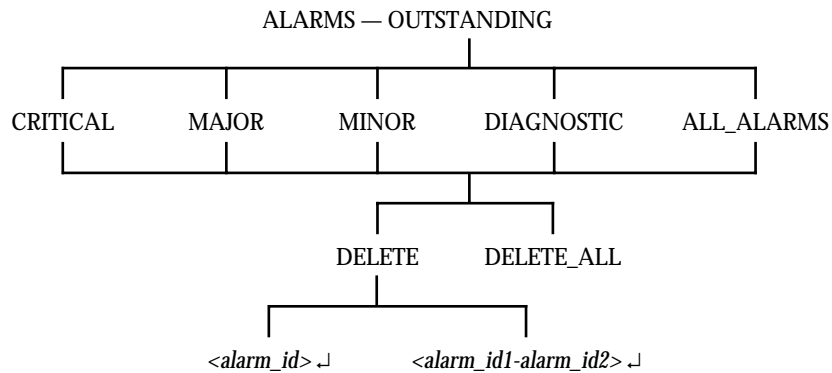
SK002361

where

*alarm_id* is the alarm number listed under the #### column on the screen

*alarm1_id* is the alarm number (under the #### column) of the first alarm in the range

*alarm2_id* is the alarm number (under the #### column) of the last alarm in the range

## To filter the alarm display

The alarm display can be filtered to display outstanding, cleared or all alarms. To view alarms that have lower alarm numbers, select PAGE_UP. To view alarms that have higher alarm numbers, select PAGE_DOWN.

```
                    ALARMS — OUTSTANDING
        ┌──────────┬──────────┬──────────┬──────────┐
     CRITICAL    MAJOR      MINOR    DIAGNOSTIC  ALL_ALARMS
        └──────────┴──────────┴──────────┴──────────┘
                          MORE

                         SUBSET
             ┌────────────┬────────────┐
        OUTSTANDING    CLEARED       ALL
             └────────────┴────────────┘
                  ┌──────────────┐
              PAGE_UP        PAGE_DOWN
```
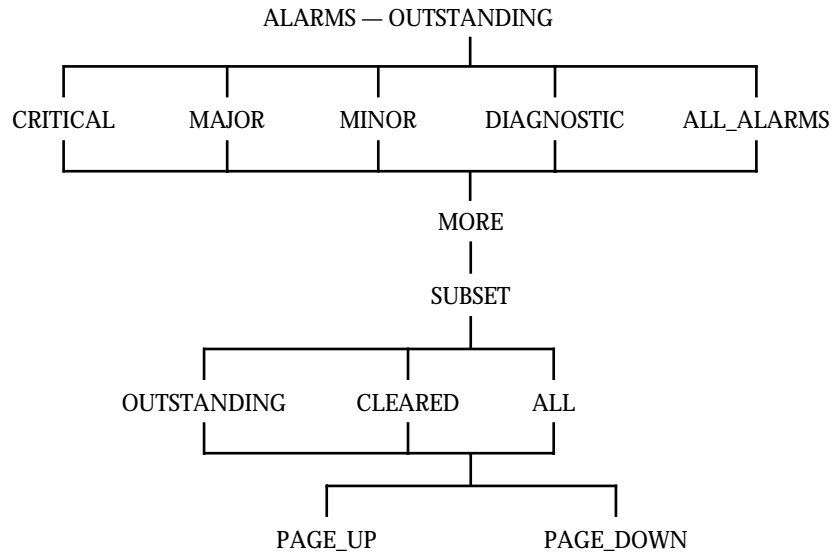
SK002362

## To view alarms in a specific queue

To view alarms that have lower alarm numbers, select PAGE_UP. To view alarms that have higher alarm numbers, select PAGE_DOWN.

```
                    ALARMS — OUTSTANDING
        ┌──────────┬──────────┬──────────┬──────────┐
     CRITICAL    MAJOR      MINOR    DIAGNOSTIC  ALL_ALARMS
        └──────────┴──────────┴──────────┴──────────┘
                  ┌──────────────┐
              PAGE_UP        PAGE_DOWN
```
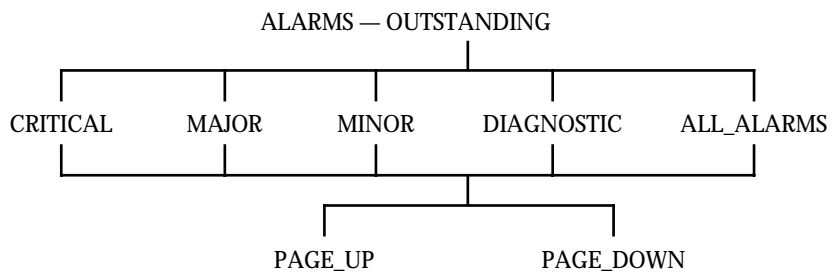
SK002363

## To view an alarm summary

Select:

ALARMS

The alarm summary display appears, listing the number of alarms in each of the alarm queues. For each queue, the display shows the number of outstanding alarms and the number of total alarms; the alarm total includes cleared alarms and outstanding alarms.

# 28. Resetting the T-ARIC cards and NIUs

This chapter describes how to reset the following:

- T-ARIC cards and card ports
- 28110 and 28120 MainStreet NIUs and NIU modems

## 28.1 Resetting a T-ARIC card or port

You can reset both the T-ARIC card and the T-ARIC port.

### To reset the T-ARIC card

MAINT — SLOT — <*shelf-slot*-1> ↵ — RESET_CARD

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

### To reset the T-ARIC card port

MAINT — PORT — <*shelf-slot*-1> ↵ — RESET_PORT

where
*shelf* is P1 to P16
*slot* is an integer from 1 to 11

## 28.2 Resetting the NIU or NIU modem

You can reset both the 28110 and 28120 MainStreet NIU and the modem.

### To reset the NIU

MAINT — SYSTEM — RESET_CARD

## To reset the NIU modem

MAINT — SYSTEM — MODEM — RESET_MODEM

# Glossary

| | |
|---|---|
| **0VR** | zero volts return |
| **AAL** | ATM-adaptation layer |
| **AIS** | alarm indication signal |
| **ATM** | asynchronous transfer mode |
| **BTS** | base transceiver station |
| **BNC** | bayonet-locking connector |
| **CBR** | constant bit rate |
| **CAC** | connection admission control |
| **CE** | circuit emulation |
| **CPE** | customer premises equipment |
| **CPSS** | control packet switching system |
| **CRC** | cyclic redundancy check |
| **DS1** | digital signal, level 1 |
| **DSX-1** | digital signal cross-connect, level 1 |
| **EMC** | electromagnetic compatibility |
| **EN** | european norm |
| **ESF** | extended superframe format |
| **F(F)** | Type F connector, female end |
| **F(M)** | Type F connector, male end |
| **IF** | intermediate frequency |
| **LED** | light emitting diode |
| **LIS** | loss of incoming signal |
| **LO** | local oscillator |
| **LOF** | loss of frame |
| **LOS** | loss of signal |
| **MAU** | media attachment unit |
| **N(F)** | Type N connector, female end |
| **N(M)** | Type N connector, male end |

| | |
|---|---|
| **NIU** | network interface unit |
| **NMTI** | node management terminal interface |
| **OAM** | operations, administration and maintenance |
| **OTU** | outdoor transmitter unit |
| **OTRU** | outdoor transmitting and receiving unit |
| **ORU** | outdoor receiver unit |
| **PSTN** | public switched telephone network |
| **PVC** | permanent virtual connection |
| **QoS** | quality of service |
| **RAI** | remote alarm indication |
| **RBS** | robbed bit signaling |
| **RF** | radio frequency |
| **Rx** | receive |
| **SNMP** | simple network management protocol |
| **T-ARIC card** | Time Division Multiple Access ATM Radio Interface card |
| **TDM** | time division multiplexing |
| **Tx** | transmit |
| **VCI** | virtual channel identifier |
| **VPI** | virtual path identifier |

# Index

**NEWBRIDGE**