ASTRO® 25
Trunked Integrated Voice and Data System Release 6.9/7.2

Single Transmit Site, Multiple Receiver Voting Subsystem
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The European Union’s WEEE directive requires that products sold into EU countries must have the crossed out trashbin label on the product (or the package in some cases).

As defined by the WEEE directive, this cross-out trashbin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end-users in EU countries should contact their local equipment supplier representative or service centre for information about the waste collection system in their country.
Document History

<table>
<thead>
<tr>
<th>Edition</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Release</td>
<td>Original release of Single Transmitter Receiver</td>
<td>December 2006</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
# Table of Contents

## Single Transmit Site, Multiple Receiver Voting Subsystem

### Chapter 1: Single Transmitter Receiver Voting (STRV) Description
- STRV Introduction ........................................ 1-1
- STRV Characteristics ....................................... 1-1

### Chapter 2: Single Transmitter Receiver Voting (STRV) Technical Overview
- STRV Prime Site ......................................... 2-1
  - Prime Site Components .................................... 2-2
    - Prime Site — MTC 9600 Prime Site Controller ....... 2-2
- STRV Transmit Remote Sites ................................... 2-3
- STRV Receive Only Remote Sites ............................ 2-3
  - Receive Only Remote Sites — QUANTAR Satellite Receiver ........ 2-4
  - Receive Only Remote Sites — ASTRO-TAC Receiver ........ 2-5
- STRV Subsystem — Data Capability Characteristics ............................ 2-5

### Chapter 3: Single Transmitter Receiver Voting (STRV) Configuration/Optimization
- STRV Configuration ........................................ 3-1
- Software Download Considerations for Subsystems with Receive Only Sites 3-3
- Receive Only Remote Site — Map to Transmit Site .................. 3-3
  - Receive Only Remote Sites — Using CSS to Configure the Comparator .......... 3-4
- Handling ASTRO-TAC Receiver Subsites in a Multisite Subsystem (SWDL) .... 3-5
  - Disabling/Enabling the ASTRO-TAC Subsite Checking Feature ............. 3-7

### Chapter 4: Single Transmitter Receiver Voting (STRV) Operation
- STRV Operation Introduction .................................. 4-1
- STRV Operation — Wide Area Trunking ......................... 4-2
- STRV Operation — Site Trunking ................................ 4-2
- STRV Operation — Failsoft ................................... 4-2

### Chapter 5: Single Transmitter Receiver Voting (STRV) Troubleshooting
- STRV Troubleshooting ......................................... 5-1
This page intentionally left blank.
List of Figures

Figure 2-1: Receive Only Remote Site .................................................. 2- 4
Figure 2-2: QUANTAR Satellite Receiver, UHF Version - Front View ........ 2- 4
Figure 3-1: CSS — ASTRO-TAC 9600, SubSite Configuration Tab. ............ 3- 5
This page intentionally left blank.
### List of Procedures

Procedure 3-1: How to Handle ASTRO-TAC Receiver Subsites in a Multisite Subsystem .......................... 3- 6
Procedure 3-2: How to Disable/Enable the ASTRO-TAC Subsite Checking Feature .............................. 3- 7
This page intentionally left blank.
List of Processes

Process 3-1: Configuring a Single Transmitter Receiver Voting Subsystem
This page intentionally left blank.
Single Transmit Site, Multiple Receiver Voting Subsystem

What Is Covered In This Booklet?

Chapter 1, "Single Transmitter Receiver Voting (STRV) Description".
Chapter 2, "Single Transmitter Receiver Voting (STRV) Technical Overview".
Chapter 3, "Single Transmitter Receiver Voting (STRV) Configuration/Optimization".
Chapter 4, "Single Transmitter Receiver Voting (STRV) Operation".
Chapter 5, "Single Transmitter Receiver Voting (STRV) Troubleshooting".

Helpful Background Information

The Motorola technical training team offers a variety of courses designed to assist you in learning about your system. For a complete list of available courses and schedules, go to http://www.motorola-wls.com.

Related Information

Refer to the following documents for associated information about the radio system.
<table>
<thead>
<tr>
<th>Related Information</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Standards and Guidelines for Communication Sites (68P81089E50)</em></td>
<td>Provides standards and guidelines that should be followed when setting up a Motorola communications site. Also known as R56 manual.</td>
</tr>
<tr>
<td><em>ASTRO® 25 System Overview</em></td>
<td>Provides the overall description and theory of operation for the system. It consists of two sections, a general view of the system that is suitable for non-technical personnel, and a technical view that can provide maintenance personnel with a detailed description of the system and its components. It also includes the ASTRO® 25 system diagrams and glossary, as well as customer documentation descriptions and a port configurations reference for ASTRO® 25 SE systems.</td>
</tr>
</tbody>
</table>
Single Transmitter Receiver Voting (STRV) Description

This chapter contains the following sections:

- "STRV Introduction" on page 1-1.
- "STRV Characteristics" on page 1-1.

STRV Introduction

A Single Transmitter Receiver Voting (STRV) subsystem covers a single geographic area with a single transmitter (in contrast with Simulcast which includes multiple transmitter sites). This topology maximizes frequency and cost efficiency in those areas that can be covered by a single, high-powered transmit site.

An STRV subsystem is considered part of a multisite subsystem where the prime site is the central control location for all other sites in the subsystem.

STRV Characteristics

An STRV subsystem has the following characteristics:

- Provides radio communication support in the VHF/UHF frequency bands.
  (Does not support 700/800 MHz bands.)
• Contains many of the same components found in a Simulcast subsystem except for site reference devices. (Time launching of signals from multiple transmitters is not required on a single-transmitter system.)
• Can have a maximum of 30 RF channels.
• All remote sites have the same number of channels — variable density is not supported.
• Audio is transported in digital format only.

An STRV subsystem consists of the following:

• One prime site with or without a collocated remote site and with the same components as a Simulcast prime site except for the site reference device.
• One collocated or remote transmit site with transmit and receive functionality in UHF/VHF bands.
• One or more receive only remote sites that extend the talkback range in UHF/VHF bands.

An STRV subsystem can be configured to handle data.
Single Transmitter Receiver Voting (STRV) Technical Overview

This chapter contains the following sections:

• "STRV Prime Site" on page 2-1.
• "STRV Transmit Remote Sites" on page 2-3.
• "STRV Receive Only Remote Sites" on page 2-3.
• "STRV Subsystem — Data Capability Characteristics" on page 2-5.

STRV Prime Site

The Single Transmitter Receiver Voting (STRV) prime site provides an interface between the zone master site and the STRV remote sites through the prime site router. A second, optional prime site router can be used to ensure redundancy.

An STRV prime site has the following characteristics:

• Can support a collocated remote site (that is, the remote site can be situated within the same physical location as the prime site). The collocated remote site can be a transmit site or a receive only site, but not both.
• Contains the same components as the Simulcast prime site except the TRAK 9100 Site Reference. Since only one transmitter is used, the system does not need reference signals to transmit simultaneously from multiple transmitters.
• Features a T1 link between the prime site and the zone master site that employs IP over Frame Relay. This link transports Frame Relay packets containing voice, site control information, and network management information.
• The ASTRO-TAC comparators at the prime site interface with the remote site base stations using V.24 links for voice and control information. These comparators encapsulate the V.24 audio into Ethernet packets and send them to the prime site router for encapsulation as Frame Relay packets.
• Ethernet links are used for network management information.
Prime Site Components

An STRV prime site has the following components:

- **MTC 9600 site controllers** — two are included for redundancy.
- **ASTRO–TAC 9600 comparators** — one for each channel in the subsystem, each configured with information about subsites that are transmit remote sites and those that are receive only remote sites.
- **Prime site LAN switches** — two 24 port Ethernet switches.
- **Prime site router** — one is required, and a second, optional router can be used to ensure site link redundancy.
- **Prime site channel bank** — a channel bank for the WAN interface with the zone master site and a V.24 (LDSRU cards) interface with the ASTRO–TAC comparators.
- **MOSCAD** — optional.

If a remote transmit site is collocated with an STRV prime site, the following additional component is included:

- **QUANTAR® base station** — A non-linear, C4FM base station operating in the VHF/UHF frequency range providing transmitter and receiver functionality, does not use time launching information sent by a comparator since only one transmitter is used.

If a receive only remote site collocated with the prime site, the following components are included:

- **Satellite receiver** — A QUANTAR® satellite receiver (VHF/UHF with Ethernet interface) or an ASTRO–TAC satellite receiver (VHF/UHF with no Ethernet interface).
- **MOSCAD** — required when the ASTRO-TAC receiver is used to support software download operations.

Prime Site — MTC 9600 Prime Site Controller

The MTC 9600 prime site controller is designed for use in an ASTRO 25 STRV prime site using a 9600 bps control channel. The MTC 9600 site controller provides call processing support for STRV remote sites by communicating with the zone’s master site zone controller. This controller is capable of supporting up to 15 subsites and up to 30 channels per subsite.

Two (redundant) MTC 9600 prime site controllers are required at the STRV prime site, one is active and the other is standby. The standby controller takes over site link and control operations if the active controller fails. Both controllers have an Ethernet link through the Ethernet switch to support redundant operations. The active and standby site controllers keep their channel status information in sync to ensure channel capability information is continually sent to the zone controller.

The MTC 9600 prime site controller at the STRV prime site performs the following functions:

- Generates the Outbound Signaling Packet (OSP).
- Processes inbound and outbound data requests at the prime site by requesting new data channels from the master site zone controller and routing data between the channels and the Radio Network Gateway (RNG).
- Provides support for explicit Other Band Trunking (OBT).
- Supports Integrated Voice and Data (IV&D).
**STRV Transmit Remote Sites**

The STRV transmit remote site has transmit and receive functionality in the VHF/UHF band.

An STRV transmit remote site has the following components:

- QUANTAR® base station — A non-linear, C4FM base station operating in the VHF/UHF frequency range, providing transmit and receive functionality
- Remote site router — Motorola Network Management (MNR) S2500
- Remote site Ethernet LAN switch
- Remote site channel bank
- MOSCAD — optional

**STRV Receive Only Remote Sites**

The STRV receive only remote sites operate in the VHF/UHF bands. They extend the talkback range and help balance the talk-in coverage with the talk-out coverage for the subsystem. An STRV receive only remote site may be supported by STRV subsystems or Simulcast subsystems with receive only remote sites.

An STRV receive only remote site includes the following components:

- Satellite receiver — A QUANTAR® satellite receiver (VHF/UHF with Ethernet interface) or an ASTRO-TAC satellite receiver (VHF/UHF with no Ethernet interface)
- Channel bank — Provides a V.24 interface connection to each receiver and a WAN interface for T1 transport to the Simulcast prime site for receiver voting
- MOSCAD — Monitors and reports operating system status (Optional with the QUANTAR® receiver, but required with the ASTRO-TAC receiver for software download)
- Receiver multicoupler — specified and/or provided by the field engineer

*Figure 2-1* shows a receive only site that can be used in multisite subsystems.
Receive Only Remote Sites — QUANTAR Satellite Receiver

The QUANTAR® satellite receiver (VHF/UHF with Ethernet Interface) used at a receive only remote site is a QUANTAR® station without the transmitter (that is, it does not have power amplifier or exciter modules).
Receive Only Remote Sites — ASTRO-TAC Receiver

The ASTRO-TAC receiver is one of the components at a receive only remote site supported by an STRV subsystem. This receiver operates in the VHF/UHF bands and has no Ethernet interface.

STRV Subsystem — Data Capability Characteristics

The STRV subsystem is a data-capable subsystem when the following conditions exist:

- The subsystem is in wide area trunking mode.
- The Radio Network Gateway (RNG) at the zone master site is linked with the Digital Cross-connect Switch (DCS).
- Both MTC 9600 Prime Site Controllers are on the same Virtual Local Area Network (VLAN).
- Both MTC 9600 Prime Site Controllers are configured with the RNG IP address, the maximum number of users per data channel, a page wait timer, and a voice grant filter to activate data-capability.

When an STRV subsystem is data-capable, the zone controller at the master site determines how many channels can be used for data and coordinates channel preemption. When data capability is enabled, disabled, or reset, alarms are automatically sent to FullVision INM.
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Single Transmitter Receiver Voting (STRV) Configuration/Optimization

This chapter includes the following sections:

- "STRV Configuration" on page 3-1.
- "Software Download Considerations for Subsystems with Receive Only Sites" on page 3-3.
- "Receive Only Remote Site — Map to Transmit Site" on page 3-3.
- "Handling ASTRO-TAC Receiver Subsites in a Multisite Subsystem (SWDL)" on page 3-5.

STRV Configuration

A Single Transmitter Receiver Voting (STRV) subsystem is configured using Zone Configuration Manager (ZCM). The ZCM application categorizes an STRV subsystem as part of a multisite subsystem. Therefore, you will be using the ZCM Multisite Subsystem object to configure the STRV subsystem.

Process 3-1 describes the steps to configure an STRV subsystem in the ZCM.

**Process 3-1 Configuring a Single Transmitter Receiver Voting Subsystem**

1. Add a multisite subsystem record. For specific procedures, see the "Configuring a Single Transmitter Receiver Voting Subsystem" section of the Zone Configuration Manager documentation.
Process 3-1  Configuring a Single Transmitter Receiver Voting Subsystem (Continued)

1. Be sure to select *Single Transmitter Receiver Voting* as the value in the *System Topology* field.

2. Add channels to the subsystem.

   A comparator record is added automatically for each newly created channel.

3. Add wireline card records for each comparator.

4. Add the transmitter site.

   Be sure to set the *Subsite Type* field to *Transmit and Receive*.

   You must add the transmitter site before you add receiver sites.

5. Add the receiver sites.

   Use the following guidelines when completing the procedure:

   - Be sure to set the *Subsite Type* field to *Receive Only*.
   - Select a value for the *Base Radio Type* field. This value indicates the type of receiver used at the site.
   - Select or enter a value in the *Map to Transmit Site ID* field. A receive site can only be mapped to a transmit site within the same subsystem.
**Process 3-1** Configuring a Single Transmitter Receiver Voting Subsystem (Continued)

A base radio record is added automatically for each newly created remote site. New exciter, power amplifier, and receiver records are also added automatically.

Add site control paths.

---

**Software Download Considerations for Subsystems with Receive Only Sites**

Software download functionality for receive only remote sites is different depending on the type of receiver used at the site.

The Software Download (SWDL) Manager application centralizes the transfer and restart of new ASTRO® 25 digital Simulcast subsystem software. The application is a standalone utility that you can launch from the PRNM Application Launcher.

**IMPORTANT**

Before you download software to an MTC 9600 prime site controller in an STRV subsystem, you must de-configure the receive only sites, perform the software upgrade using the SWDL manager application, then re-configure the receive only sites.

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**Receive Only Remote Site — Map to Transmit Site**

Receive only remote sites used in an STRV subsystem must be mapped to a transmitter site in their respective subsystems to support comparator equipment at the subsystems’ prime site.

Using ZCM to set up zone infrastructure for a multisite subsystem involves the following:

- Selecting a subsystem topology (simulcast, simulcast with receive only remote sites, or STRV)
Establishing a subsystem name (alias) and identification number (multisite subsystem ID), and
Establishing configuration parameters for the remote sites objects associated with the subsystem

The following configuration parameters must be established when establishing configuration parameters for receive only remote sites:

- **Subsite type** – Receive only
- **Base radio type** – QUANTAR® receiver or ASTRO-TAC receiver
- **Map to transmit site ID** – Remote site ID number of a remote site with a transmitter

**Receive Only Remote Sites — Using CSS to Configure the Comparator**

In addition to using ZCM to set up the zone infrastructure, the Configuration Service Software (CSS) must be used to configure the ASTRO-TAC 9600 comparator (a subsystem’s prime site component) by mapping receive only remote sites to a transmit site for a given subsystem.

After CSS is successfully connected to the comparator (for example, connecting a laptop running CSS to the comparator) and after successfully reading the configuration file, the comparator supporting subsystems with receive only remote sites can be configured to map the receive only remote sites to a transmit site ID (site with a transmitter).

See Figure 3-1. Use CSS to map the receive only remote sites to a transmit site ID (site with a transmitter) for the comparator. To do this, select the ASTRO-TAC 9600 Configuration object, then select the SubSite Configuration tab to access a table with the following columns:

- **SubSite Number** – a list of the remote sites
- **SubSite Type** – a drop-down list for selecting the type of remote site (Tx/Rx, Rx Only, Disabled)
- **Associated TX Site ID** – a drop-down list for selecting the remote transmit site ID number to be associated with the Rx Only remote site
For any SubSite Type field associated with an Rx Only value, select the appropriate transmit site ID from the Associated TX Site ID drop-down list.

Handling ASTRO-TAC Receiver Subsites in a Multisite Subsystem (SWDL)

A multisite subsystem can have multisite subsites that are comprised entirely of ASTRO-TAC receivers. ASTRO-TAC receivers are not capable of Internet Protocol (IP) communication and thus cannot be upgraded using the SWDL Manager. The SWDL Manager cannot distinguish between subsites that are SWDL-capable but are not IP communicating and ASTRO-TAC receiver subsites. Therefore, it is necessary to remove the ASTRO-TAC receiver subsites from the list of targeted subsites prior to a SWDL transfer or install operation.

At the start of a Transfer and/or Install operation, the SWDL Manager polls (that is, by IP query) each subsite. If all subsites respond, the SWDL Manager determines that there are no ASTRO-TAC receiver subsites in the multisite subsystem and the operation proceeds. If any given subsite does not respond, it means that it is either an ASTRO-TAC receiver subsite or it has a device communication failure.

The SWDL Manager cannot determine the source of the failure to respond. If all of the non-responding subsites are ASTRO-TAC receivers, then you can continue with the transfer or install operation and the non-response sites are automatically removed from the list of SWDL target subsites.
Do not select to continue the operation if any of the subsites are not ASTRO-TAC receiver subsites, since subsites that should be SWDL targets will be skipped causing those subsites to be out of sync with the rest of the subsites in the subsystem.

Follow Procedure 3-1 to handle ASTRO-TAC receiver subsites in a multisite subsystem.

**Procedure 3-1  How to Handle ASTRO-TAC Receiver Subsites in a Multisite Subsystem**

1. Click **Start Operation**.
   
   **Result:** The following message window appears momentarily until the site controller is contacted.

   ![Message Window](image)

   The Multisite Subsite Verification window then opens.

   ![Multisite Subsite Verification Window](image)

   This window provides status on the IP communication check for each subsite that is not de-configured in the site controller. Following are descriptions of the content of the window that can open during the IP communication check.

2. Monitor the Communication Status column and take the following action:

   **IF the Communication Status column displays...**

   **THEN...**

<table>
<thead>
<tr>
<th>Pending and Success (At least one Pending)</th>
<th>The system is checking subsites for IP communication.</th>
</tr>
</thead>
</table>
   | Failed and Success (At least one Failed and one Success) | At least one subsite is not IP communicating.  
   **Reason:** For each subsite listed as 'Failed', the device in the subsite may be an ASTRO-TAC Receiver, or it may be another device that is expected to be IP communicating.  
   **Recommended User Action:** If all of the 'Failed' subsites are ASTRO-TAC Receiver subsites, click **Continue**. Otherwise click **Abort Operation**. |
**Procedure 3-1** How to Handle ASTRO-TAC Receiver Subsites in a Multisite Subsystem

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
<th>Recommended User Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The system is checking subsites for IP communication. All subsites have been determined to be IP communicating.</td>
<td>The operation will now continue automatically.</td>
<td></td>
</tr>
<tr>
<td>Failed</td>
<td>All subsites have 'Failed'.</td>
<td>The operation cannot continue. Click <strong>Abort Operation</strong> to end the operation.</td>
<td></td>
</tr>
</tbody>
</table>

**Disabling/Enabling the ASTRO-TAC Subsite Checking Feature**

To disable/enable the ASTRO-TAC Subsite Checking Feature at SWDL Manager application startup, you must modify the applparams.cfg file parameters.

Follow **Procedure 3-2** to disable/enable the ASTRO-TAC Subsite Checking feature.

**Procedure 3-2** How to Disable/Enable the ASTRO-TAC Subsite Checking Feature

<table>
<thead>
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<th>Step</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On the desktop, right-click the Start menu, then select <strong>Explore</strong>.</td>
<td>The Explorer dialog box appears.</td>
</tr>
</tbody>
</table>
| 2    | Locate the applparams.cfg file by doing one of the following:  
  - If you are using a network management client, find the applparams.cfg file at path  
    `C:\Program Files\Motorola\Network Mgmt\Swdl`  
  - If you are using a PC with Configuration/Service Software (CSS), find the applparams.cfg file at path  
    `C:\Program Files\Motorola\Swdl` |  
  > **NOTE**  
  The paths listed are default locations of the applparams.cfg file. Depending on your computer configuration, the path may vary. |
| 3    | Double-click the applparams.cfg file. | A prompt appears requesting that an application be identified to open the applparams.cfg file. |
| 4    | From the list box, select **Notepad** and click **OK**. | The applparams.cfg file opens in the text editor. |
**Procedure 3-2  How to Disable/Enable the ASTRO-TAC Subsite Checking Feature (Continued)**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Scroll to the bottom of the text and change the <code>AstroTacSubsiteCheck</code> parameter from <code>true</code> to <code>false</code> or from <code>false</code> to <code>true</code>. <strong>NOTE</strong> This parameter is set to <code>true</code> by default. If your Multisite subsystem has no ASTRO-TAC receiver subsites, you can set it to <code>false</code> to turn the feature off.</td>
</tr>
<tr>
<td>6</td>
<td>Select <strong>File</strong>, then select <strong>Save</strong> from the text editor menu bar. <strong>Result:</strong> The <code>applparams.cfg</code> file is saved with the new parameters.</td>
</tr>
<tr>
<td>7</td>
<td>Select <strong>File</strong>, then select <strong>Exit</strong> to close the text editor. <strong>Result:</strong> The text editor closes.</td>
</tr>
</tbody>
</table>
Single Transmitter Receiver Voting (STRV) Operation

This chapter contains the following sections:

• "STRV Operation Introduction" on page 4-1.
• "STRV Operation — Wide Area Trunking" on page 4-2.
• "STRV Operation — Site Trunking" on page 4-2.
• "STRV Operation — Failsoft" on page 4-2.

STRV Operation Introduction

A Single Transmitter Receiver Voting (STRV) subsystem features the following modes of operation:

• Wide area trunking
• Site trunking
• Failsoft

The operating modes of the STRV subsystem are similar to those for the digital simulcast subsystem.
STRV Operation — Wide Area Trunking

The normal operating state of an STRV subsystem is wide area trunking. The basic criteria for wide area trunking include an active RF site control path between the zone controller and the site, an enabled audio rendezvous point in the zone, a control channel, and a voice channel at the site.

When an STRV system is in wide area trunking mode, remote sites receive call processing instructions from the master site zone controller. A radio subscriber registered at a site can now communicate with any other radio subscribers in the system.

STRV Operation — Site Trunking

When an STRV subsystem loses communication with the master site zone controller, the subsystem continues to trunk its channel resources within its boundaries and is in the site trunking state.

STRV Operation — Failsoft

An STRV subsystem enters a failsoft mode of operation under the following conditions:

- When the site controllers are not available to provide trunking operations
- When all control channels are disabled or malfunctioning
- When only one control channel is enabled
This chapter contains information regarding troubleshooting Single Transmitter Receiver Voting (STRV).

For detailed information on STRV troubleshooting, refer to the various product manuals listed below:

- QUANTAR® Digital Capable Station for Conventional, SECURENET, ASTRO, 6809 Trunking, and IntelliRepeater Systems
- QUANTAR® and QUANTRO RSS Manual
- ASTRO® 25 Trunked Integrated Voice and Data System Simulcast Subsystem
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## Index

**A**

<table>
<thead>
<tr>
<th>ASTRO-TAC receiver</th>
<th>ASTRO-TAC subsite feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>multisite subsystem</td>
<td>disabling/enabling</td>
</tr>
<tr>
<td>receive only remote site</td>
<td>3-5</td>
</tr>
</tbody>
</table>

**C**

<table>
<thead>
<tr>
<th>characteristics</th>
<th>configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>prime site</td>
<td>parameters</td>
</tr>
<tr>
<td>components</td>
<td></td>
</tr>
<tr>
<td>prime site</td>
<td>receive only remote site</td>
</tr>
<tr>
<td>receive only remote site</td>
<td>2-2</td>
</tr>
<tr>
<td>transmit remote site</td>
<td>2-3</td>
</tr>
</tbody>
</table>

**D**

<table>
<thead>
<tr>
<th>data-capable subsystem</th>
<th>disable/enable feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>conditions</td>
<td></td>
</tr>
<tr>
<td>2-5</td>
<td>3-7</td>
</tr>
</tbody>
</table>

**F**

<table>
<thead>
<tr>
<th>failsoft</th>
<th>functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>operation</td>
<td>prime site</td>
</tr>
<tr>
<td>feature</td>
<td>4-2</td>
</tr>
<tr>
<td>disable/enable</td>
<td>3-7</td>
</tr>
</tbody>
</table>

**I**

<table>
<thead>
<tr>
<th>introduction</th>
<th>STRV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-1</td>
</tr>
</tbody>
</table>

**M**

<table>
<thead>
<tr>
<th>map</th>
<th>MTC 9600 prime site controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>receive only remote sites</td>
<td>3-4</td>
</tr>
<tr>
<td>modes</td>
<td>Multisite Subsite Verification</td>
</tr>
<tr>
<td>operation</td>
<td>window</td>
</tr>
<tr>
<td></td>
<td>multisite subsystem</td>
</tr>
</tbody>
</table>

**O**

<table>
<thead>
<tr>
<th>operation</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
## Index

**operation (contd.)**
- modes ........................................ 4- 1

**P**

- parameters
  - configuration
  - receive only remote site ............. 3- 4
- prime site
  - additional component
  - collocated ............................. 2- 2

**prime site (contd.)**
- characteristics .......................... 2- 1
- components .............................. 2- 2
- functions .................................. 2- 2
- MTC 9600 prime site controller ........ 2- 2
- STRV ...................................... 2- 1

**Q**

- QUANTAR station
  - receive only remote site ............. 2- 4

**R**

- receive only remote site .............. 2- 3
- ASTRO-TAC receiver ..................... 2- 5
- components ................................ 2- 3
- configuration
  - parameters ............................. 3- 4
- configuring comparator
  - using css .............................. 3- 4

**receive only remote site (contd.)**
- QUANTAR station .......................... 2- 4
- receive only site
- software download considerations .... 3- 3
- remote site
  - receive only ........................... 2- 3
  - transmit .............................. 2- 3

**S**

- Single Transmitter Receiver Voting (STRV) ... 1- 1
- site trunking
  - operation ................................ 4- 2
- Software Download (SWDL) ............... 3- 3
- standby controller ...................... 2- 2
- STRV
  - characteristics ........................ 1- 1
  - configuration .......................... 3- 1
  - data-capable subsystem ................. 2- 5
  - description ........................... 1- 1

**STRV (contd.)**
- introduction ................................ 1- 1
- operation .................................. 4- 1
- failsoft .................................. 4- 2
- site trunking ................................ 4- 2
- wide area trunking ....................... 4- 2
- prime site .................................. 2- 1
- receive only remote site
- map to transmit site ..................... 3- 3
- troubleshooting .......................... 5- 1

**T**

- transmit remote site ..................... 2- 3
- troubleshooting
- STRV ...................................... 5- 1

**W**

- wide area trunking
  - operation ................................ 4- 2
- window
<table>
<thead>
<tr>
<th>Window (contd.)</th>
<th>Multisite Subsite Verification... 3-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCM</td>
<td>Zone Configuration Manager (ZCM)... 3-1</td>
</tr>
<tr>
<td>STRV subsystem</td>
<td>Zone infrastructure... 3-3</td>
</tr>
<tr>
<td>configuration</td>
<td></td>
</tr>
</tbody>
</table>