MOTOROLA

TEST EQUIPMENT

R-2670 FDMA Digital Communications System Analyzer Motorola Analog Trunking Option

OPERATOR'S MANUAL

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Section I

INTRODUCTION

1-1 INTRODUCTION

The Motorola R-2670 FDMA Digital Communications System Analyzer tests the unique requirements of Motorola's trunked mobile and portable radios. All R-2600 Series capabilities are retained with the trunked test sequences accessed via the LCD display, numeric keypad, screen-defined softkeys, cursor movement keys, and the optical tuning knob. The trunking option functions may also be accessed via the remote control interface port.

The trunking option simulates the functions of a central controller of a trunked radio system by providing control channel and voice channel signaling protocols. Testing with the trunked radio option provides dynamic call processing and direction to a voice channel. Once on the voice channel, the general purpose RF test capabilities of the analyzer can be used to measure the radio performance. Trunk option testing provides proof of basic inbound and outbound signaling and displays specification compliance data.

Throughout this manual, the "system" refers to the fixed-end central controller. Thus, a system initiated call is the analyzer simulating the central controller calling the radio under test.

1-2 CAPABILITIES

The trunking option has the following capabilities:

Dynamic Call Processing

Test Motorola trunked mobile and portable radios under actual signaling conditions by simulating the function of the central controller. The trunking analyzer provides separate screens for inbound (radio initiated) and outbound (system initiated) calling modes.

Closed Cover Measurements

The analyzer measures and displays transmitter power, frequency error, and frequency deviation while in the dynamic calling mode. While the radio is on the voice channel, the operator can make additional measurements using other functions of the analyzer.

Radio ID Decoding

The ISW data received from the radio is decoded and displayed on the analyzer. The following defines the data that is decoded and displayed.

Trunk I and Trunk I EP II	Trunk II
Fleet	
Subfleet	Talkgroup
Unit	Unit
Call Type	Call Type

Manual Mode

The trunking analyzer supports a mode where the operator can exit from the trunking screens and access standard displays of the analyzer while the test sequence is in progress.

Storage of Ten Fleet Maps

For Type 1 systems, the trunking analyzer allows for the storage of 10 unique System ID's and Fleet Maps.

Radios with Message Trunking

The trunking analyzer supports the testing of message trunked radios.

Radios with Message Trunking and PTT ID Enabled

The trunking analyzer supports the testing of message trunked radios with PTT-ID enabled.

Transmission Trunked Radios

The trunking analyzer testing of transmission trunked radios is somewhat limited due to the nature of the radio. Test sequences can be performed on transmission trunked radios by pressing the PTT of the radio and keeping the radio keyed while switching to other display screens to make measurements and observe waveforms. Once the PTT button on the radio is released, the transmission trunked radio returns to the control channel and the test must be re-started in order to rekey the radio.

Dispatch Call

The analyzer supports dispatch call processing where the radio, or the system, initiates the call sequence. The dispatch type call is where one radio is communicating through a repeater with several other radios assigned to the same group.

Phone Interconnect Call

The trunking analyzer supports the testing of phone interconnect call service. The trunking analyzer simulates the signaling required for the radio to initiate, and to receive a phone interconnect call. Phone Interconnect service is where the radio can initiate or receive calls over the local phone system.

Call Alert

The analyzer supports the testing of call alert service. The analyzer simulates the signaling for the radio to initiate, or to receive a call alert.

Failsoft

The analyzer simulates an inoperative central controller by not transmitting OSWs on the control channel, and sending the failsoft word on the failsoft channel.

NOTE

The trunking analyzer is not signaling compatible with non-Motorola Trunking systems.

1-3 WHAT IS TRUNKING?

Trunking is the automatic sharing of a few communication paths (trunks) among many users. Its most important asset is the ability to increase channel capacity and reduce channel waiting times compared to the waiting times in conventional systems. Trunked systems efficiently distribute the message traffic equally among the available channels because

- the percentage of times a user requires the communications link is small.
- the probability that many users will require a channel at the same instant is extremely small.

Two-way radio systems use the same techniques of trunking that are used in telephone applications. In a trunked radio system, the mobile radios and fixed equipment operate under the control of a central controller.

The trunked system usually has a single centralized site instead of multiple sites or cells. Trunked systems are usually used for dispatch operations where one dispatcher is

communicating with many users. The sharing of channels is a more efficient way to gain spectrum efficiency and provide better service.

The central controller directs operation of the trunked radio system and manages the flow of communications including selection and assignment of voice channels among the system users. The central controller ensures privacy and eliminates interference by assigning only one group to a voice channel at one time. This results in reliable, simple and automatic two-way radio communications.

The central controller assigns a communications path through a repeater to the party that initiates the transmission. If all channels are busy, the radio gives a busy tone. When a channel becomes available, the central controller automatically assigns the radio to that channel and sends a talk permit tone.

When the conversation ends, the channel is free for assignment to other users. This automatic sharing of frequencies through the use of multiple repeaters and a central controller is the heart of a trunked system. Trunked systems offer other advantages including elimination of frequency selection, squelch controls, and channel monitoring.

The main purpose of trunked radio systems is to improve efficiency be sharing resources among many users. Although telephone companies have used trunking for years, Motorola has pioneered its use in the two-way industry.

1-3.1 Trunk Signaling Types

. Trunk I (Type I)

Trunk I was the first signaling defined for trunked radios. The individual radio units contain preprogrammed fleet, subfleet, and unit ID information. The code plug of each radio in a particular system contains this pre-programmed information. Also included in the code plug are the RF channel identifiers and various system constants.

When a Trunk I radio requests service from the controller, it sends an ISW on the control channel. The central controller receives the request and directs the requesting radio along with other radios in that fleet or subfleet to move to a voice (traffic) channel. Through a process of high speed and low speed handshaking on the voice channel, the central controller determines that the radio has indeed switched, and keeps that voice channel reserved for the duration of the call. When the call is completed, the central controller releases the channel to be used by other groups of radios.

. Trunk I EP II (Type I EP II)

The reference to Trunk I signaling throughout this manual also apply to Trunk I EP II Signaling, except where noted. Trunk I EP II differs from Trunk I in that the high speed handshake sequence on the voice channel is eliminated. When the radio is assigned to the voice channel by the controller the radio switches and starts transmitting immediately.

. Trunk II (Type II)

Trunk II signaling breaks away from the fleet/subfleet format used in Trunk I. As a result, fleet maps and size codes are eliminated. Each radio on a given system has a unique unit ID and can belong to one or more talk groups. Trunk II signaling also has eliminated the high speed handshake sequence on the voice channel.

Some Trunk II radios have an automatic affiliation option. Auto affiliation allows a radio to automatically register on a system. Radios with auto affiliation enabled will find a control channel and execute a handshake sequence that identifies the radio and its talk group to the central controller.

Section II

OPERATING INSTRUCTIONS

CAUTION

When testing a radio, the analyzer generates a control channel signal. Take care to prevent this signal from unintentionally capturing other radios in the area. Observe the following precautions:

- ***Do not** use an antenna on the analyzer for over-the-air testing.*
- ***Use** double-shielded cables on the analyzer to carry signals to and from the radio.*
- ***Locate** the analyzer at least thirty five feet from the antenna of a unit that is working in the same system that the analyzer is testing.*
- ***Adjust** the squelch to where the led indicator for squelch just turns off or is closed. When the signal from the radio is present, the squelch LED will illuminate indicating that squelch has been detected and there is a signal present. **When testing Type 1 radios, it is advisable to set the squelch control to the open position (fully counter clockwise with squelch LED illuminated).***

2-1 INTRODUCTION

The R-2670 FDMA Digital Communications System Analyzer is an enhancement of the R-2600 Series Communications System Analyzer. Refer to sections 1, 2, and 3 of the R-2600 Series Communications System Analyzer Operator's Manual (68-P80386B72) for general installation information, a description of the control functions, and general operational information. The following sections of this manual contain information on how to connect trunked radios under test to the analyzer and how to set controls and indicators to obtain the correct screen display.

Error/Warning Messages

Refer to Appendix A for a listing and description of setup and radio error messages. Messages common to all the R-2600 Series equipment are detailed in paragraph 3-4 of the R-2600 Series Communications System Analyzer Operators Manual (68-P80386B72).

2-2 TEST SETUP

2-2.1 Connecting a Radio

Use a 50 ohm BNC cable and an N to BNC adaptor to connect from the RF I/O port of the trunking analyzer to the antenna port of the radio as shown in figure 2-1.

CAUTION

Observe the input power ratings and warnings of the analyzer to insure that no damage occurs to the analyzer.

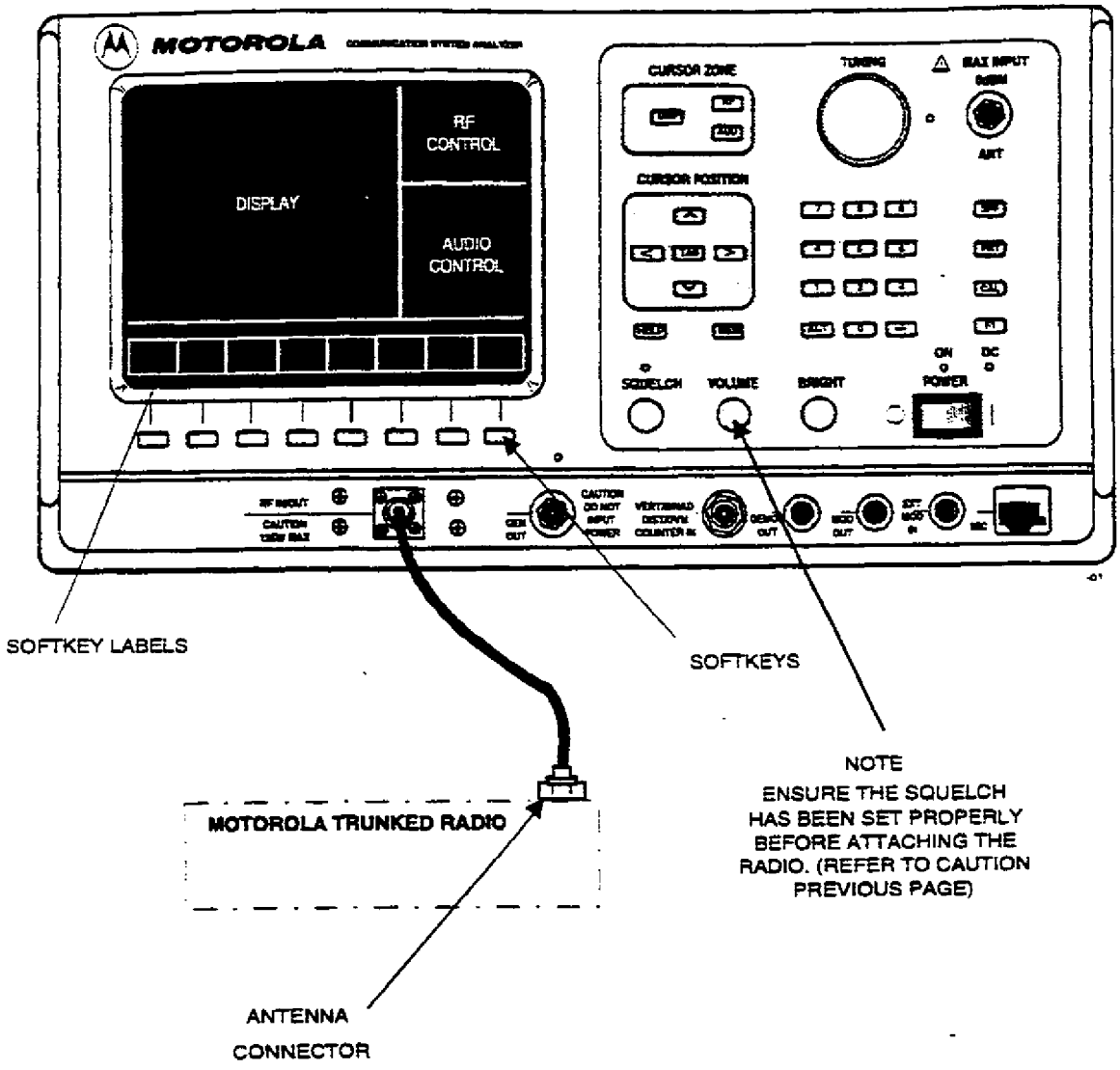

Figure 2-1. Trunked Radio Test Setup

2-3 TRUNKING ANALYZER SOFTWARE VERSION SCREEN

To confirm installation of the Trunking Option, press the **SPF** hard key, move the cursor to "VERSION", and select the display table softkey. This will configure the trunking analyzer to generate a screen that displays the standard and option platform screens. Move the cursor to the FDMA DIGITAL position and select the display table softkey. A screen similar to figure 2-2 will be displayed if the analyzer contains the R-2670 Trunking Option.

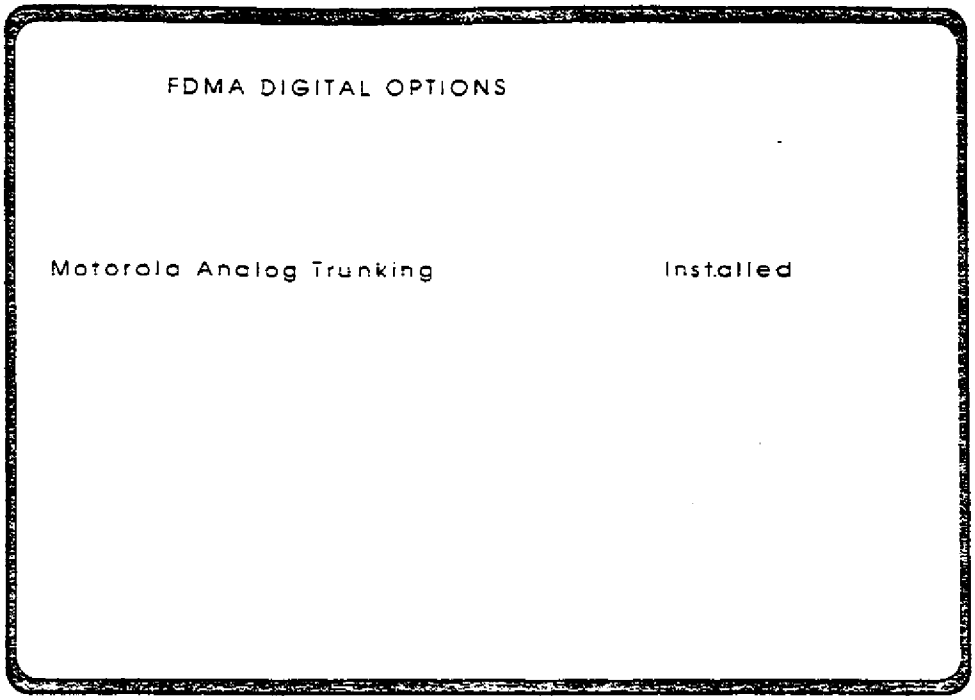

Figure 2-2. Trunking Analyzer Option Screen

2-4 GENERAL OPERATION

The display screen is divided into three major zones, The Display Zone, the RF Zone, and the Audio Zone. The top portion of display zone displays the status and selections for the current test sequence. The bottom portion of the Display Zone displays the data about the radio under test. The RF Zone is used for the selection of trunking frequency bands, for control and voice channels, and port selections. The audio section is unchanged from the standard system.

A status thermometer is displayed in the Display Zone during the performance of the test. Appendix B identifies all of the signaling events identified in the status thermometer display.

2-4.1 Access to Standard System Test Screens During Trunking Testing

The analyzer must remain in the main trunking test screen during the initial call processing sequence. Once this has been completed and the radio under test is on the voice channel, other standard system screens may be entered from the "Meter:" position of the Display zone. Simply press the more softkey to cycle through the available menus and make the selection accordingly. To end the test it is necessary to return to the trunking test screen from which the test was initiated.

2-4.2 Spectrum Analyzer Dispersion Limit while in Trunked Test Mode

While the trunked test mode is active, the spectrum analyzer maximum dispersion is limited to 1 MHz per division. To use the higher dispersion selections of 2, 5 and 10 MHz per division, it is necessary to set the "Mode:" field of the Display zone to STANDARD.

2-4.3 Remote Operation

All R-2600 Series Communications System Analyzers are equipped with a standard RS-232 interface. Optionally, the R-2670 is equipped with an IEEE 488 interface. Either of these interfaces may be used to remotely control the analyzer using a set of commands, queries, and responses that are defined in the Motorola R-2600 Series Communications System Analyzer Programming Reference Manual (68-P80309E55).

2-5 ACCESSING TRUNK MODE

Select the Trunk mode by placing the cursor in the "Mode:" field in the Display Zone located at the top of the screen. Use the **TRUNK** softkey to select the trunk mode. The "Meter:" field must be set to a trunking test. Use the "more" softkey to access the Trunking selections. After selecting **RADIO INIT**, a screen similar to figure 2-3 appears.

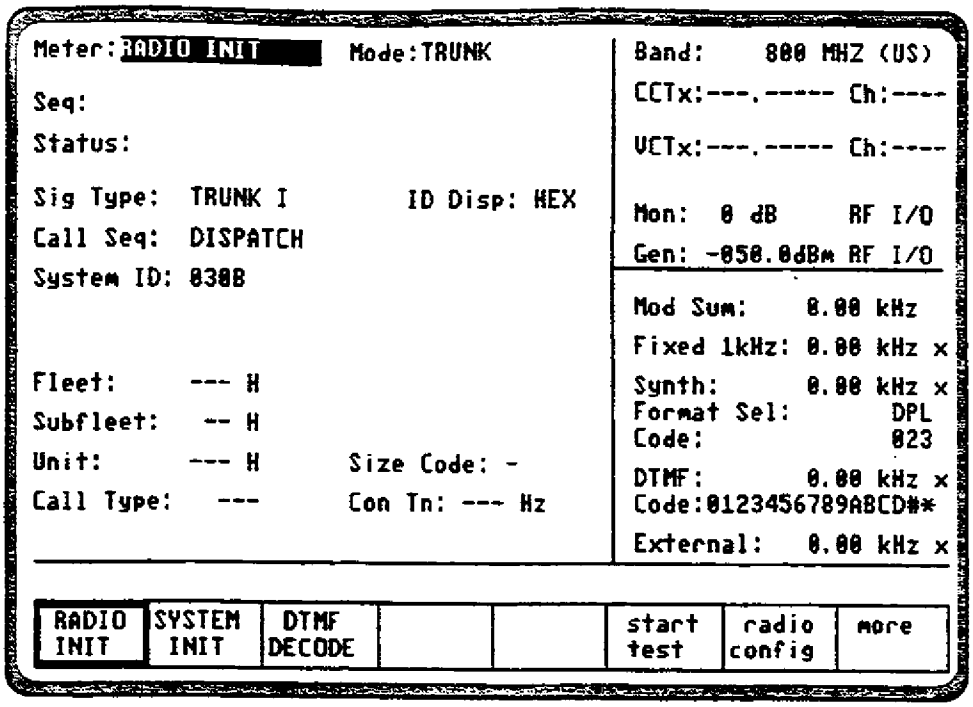

Figure 2-3. Trunk Mode Screen – Radio Initiated Trunk I

2-6 RADIO INITIATED TRUNKING

The **RADIO INIT** softkey configures the analyzer to display the current data and test status for the radio initiated trunked test sequence. When the test is started, the analyzer will blank out decoded ISW data from the previous test sequence and generate idle channel signaling on the control channel. The analyzer will wait for the operator to initiate a transmission from the radio. When a transmission from the radio is detected, the analyzer will execute the test sequence defined by the parameters on the trunking screen.

In the following subsections, the call sequence selected is Dispatch. For details on testing Radio Initiated Phone Interconnect and Call Alert call sequences, refer to Section III, Applications, in this manual.

2-6.1 Radio Initiated Dispatch Trunk I Testing

The radio receives the channel assignment and switches to the voice channel. The analyzer sends a high speed data word on the voice channel transmit and monitors the voice channel receive for a high speed acknowledge tone from the radio. Once the high speed acknowledge is detected, the trunking analyzer transmits low speed data on the voice channel. When the radio detects the low speed data from the analyzer, it sends a connect tone and voice on the voice channel. Once the connect tone from the radio is measured and displayed, the analyzer enables it's modulation and unmutes it's speaker. A status thermometer in the Display zone shows the major signaling events based on the metering selection, the signaling type, and the call sequence. Refer to Appendix B

for a description of the status thermometer signaling events for each test sequence.

To set up testing, select the Trunk mode by placing the cursor in the "Mode:" field in the Display Zone, and selecting the **TRUNK** softkey. Within the Display zone, place the cursor in the "Meter:" field and press the softkey **RADIO INIT** to view current data and test status for a radio initiated trunked test sequence. Within the Display zone, place the cursor in the "Sig Type:" field and press the softkey **TRUNK I** to select Trunk I signaling. A screen similar to figure 2-4 appears.

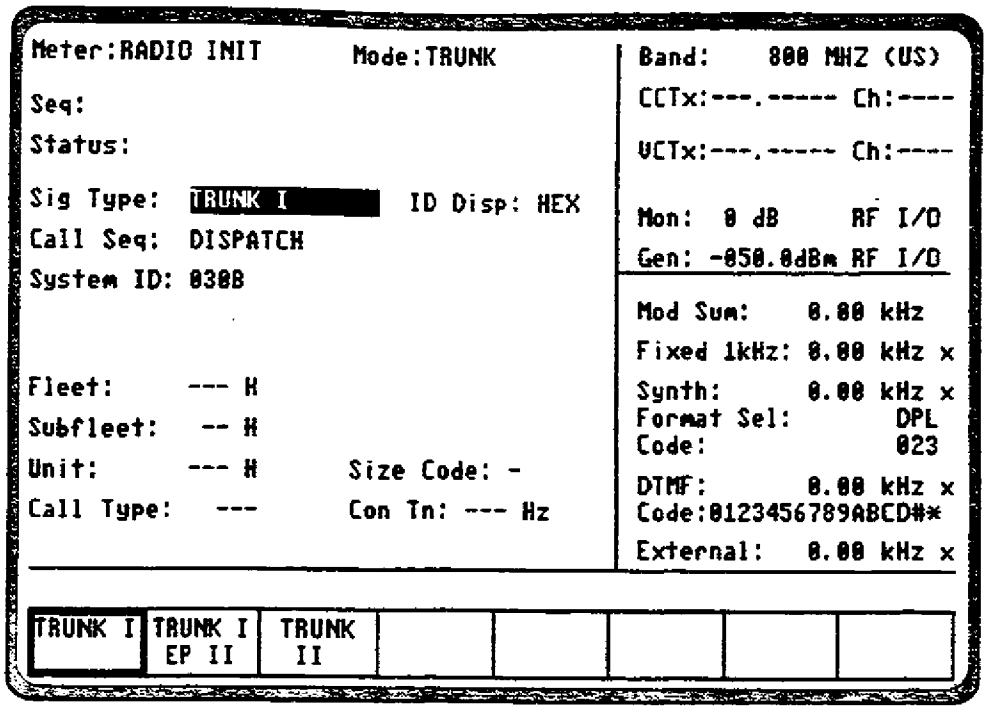

Figure 2-4. Dispatch Test Screen – Radio Initiated Trunk I Signaling

With the above screen displayed, use the cursor control keys to position the cursor, and the softkeys to select the following parameters:

ID Disp

ID Display is entered with the softkeys. ID Display selects the format of the ISW data that is decoded. The format of the decoded ISW data is either hexadecimal or decimal format.

For Radio Initiated Trunk I and Trunk I EP II test sequences with ID DISP set for DEC, the six digit unit ID decoded from the ISW is the personality ID of the radio and NOT the unit ID. When ID DISP is set for HEX, the unit ID is displayed in hexadecimal format. The Fleet and Subfleet IDs are always displayed in hexadecimal independent of the ID DISP selection.

For System Initiated Trunk I and Trunk I EP II test sequences with ID DISP set for DEC, the six digit unit ID field is used to enter the decimal version of the unit ID only.

Call Seq:

Call Sequence configures the trunking analyzer with the test sequence to be executed. Dispatch, Phone Interconnect, Call Alert, and Failsoft call sequences are supported.

System ID:

Enter the system ID as a four-digit hexadecimal number. Use the numeric keypad, the soft keys or tuning knob to make this entry. If the screen already displays a system ID and it requires a change, enter the new system ID over the old.

NOTE

The System ID must match one of the system ID's in the Radio Configuration screen in order to decode the radio's information. Refer to paragraph 2-8.

Call Type

Move the cursor to the "Call Type" field and enter Fleet or Subfleet.

Fleet

Subfleet

Unit

If a radio initiated dispatch test has been executed prior to the system initiated test, the fleet, subfleet, and unit ID decoded from the ISW will be displayed.

RF ZONE

Band:

Band selects the frequency channel plan for the analyzer. Enter the Frequency Band with softkeys.

800 MHz (US)

Selection of the 800 MHz (US) band configures the analyzer for the frequency and channel plan described in table 2-1. This table shows the analyzer's transmit frequency ranges.

800 MHz (Int'l)

Selection of the 800 MHz (Int'l) band configures the trunking analyzer for the frequency and channel plan described in table 2-2. This table shows the analyzer's transmit frequency.

JSMR

Selection of the JSMR band configures the trunking analyzer for the frequency and channel plan described in table 2-3. This table shows the analyzer's transmit frequency.

900 MHz

Selection of the 900 MHz band configures the analyzer for the frequency and channel plan described in table 2-4. This table shows the analyzer's transmit frequency.

Table 2-1. Available Transmit Frequency Ranges and Channel Plans (800 MHz Selection)

	Frequency Range (MHz)	Channel Range	Channel Spacing (kHz)	Xmit/Rcv Offset (MHz)
800 MHz (US) Standard	851.01250 - 865.98750	000 - 599	25	+45
800 MHz (US) Splinter	851.00000 - 865.97500	000 - 599	25	+45
800 MHz (US) Block 1	866.01250 - 868.98750	600 - 719	25	+45
800 MHz (US) Block 2	866.00000 - 866.97500	720 - 759	25	+45
800 MHz (US) Block 3	867.00000 - 867.40000	815 - 831	25	+45
800 MHz (US) Block 4	867.42500 - 868.97500	961 - 1022	25	+45
800 MHz (US) Block 5	868.97500	958	25	+45

Table 2-2. Available Transmit Frequency Ranges and Channel Plans, 800 MHz (Int'l)

	Frequency Range (MHz)	Channel Range	Channel Spacing (kHz)	Xmit/Rcv Offset (MHz)
800 MHz (Int'l) Standard	851.01250 - 869.98750	000 - 759	25	+45
800 MHz (Int'l) Splinter	851.00000 - 869.97500	000 - 759	25	+45

Table 2-3. Available Transmit Frequency Ranges and Channel Plans, 800 MHz (JSMR)

	Frequency Range (MHz)	Channel Range	Channel Spacing (kHz)	Xmit/Rcv Offset (MHz)
JSMR	850.01250 - 859.98750	001 - 400	25	–55
	850.01875 - 859.96875	001 - 399	25	–55
	850.02500 - 859.97500	001 - 399	25	–55
	850.03125 - 859.98125	001 - 399	25	–55

Table 2-4. Available Transmit Frequency Ranges and Channel Plans (900 MHz Selection)

	Frequency Range (MHz)	Channel Range	Channel Spacing (kHz)	Xmit/Rcv Offset (MHz)
900 MHz	935.01250 - 940.98750	000 - 479	12.5	+39

VHF/UHF

Selection of the VHF/UHF band configures the trunking analyzer for the VHF or UHF frequency band. The operator enters the frequency and channel configuration of the radio to be tested from the Trunk II Radio Configuration screen. The VHF/UHF band does not have a constant offset between the transmit and receive pairs as found in other trunking bands. The operator must enter the Transmit and Receive frequencies for both the control channel and the voice channel.

CCTx:

CCTx is the control channel transmit frequency of the analyzer. The control channel frequency can be changed by moving the cursor into the CCTx cursor field and changing the value with the keypad or with the tuning knob. When the control channel frequency is changed, the corresponding channel number is also updated. If the frequency selected is out of range of the frequency channel plan, the corresponding channel number will be dashed out.

As a convenience, the control channel can also be entered by moving the cursor to the associated channel position on the display and selecting a channel number with the keypad or tuning knob. When the channel number is changed, the corresponding frequency value is changed. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

CCRx:

The cursor position for CCRx appears only when the band selection is VHF/UHF. CCRx sets the control channel frequency of the analyzer to receive control channel signaling from the radio. The control channel frequency can be changed by moving the cursor into the CCRx cursor field and changing the value with the keypad or with the tuning knob. When the control channel frequency is changed, the corresponding channel number is also updated. If the frequency selected is out of range of the frequency channel plan, the corresponding channel number will be dashed out.

The control channel can also be changed by moving the cursor to the associated channel position on the display and selecting a channel number by the keypad or tuning knob. When the channel number is changed, the corresponding frequency value is changed. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

VCTx:

VCTx sets the voice channel transmit frequency of the analyzer. The voice channel frequency can be changed by moving the cursor into the VCTx cursor field and changing the value with the keypad or with the tuning knob. When the voice channel frequency is changed, the corresponding channel number is also updated. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

As a convenience, the voice channel can also be entered by moving the cursor to the associated channel position on the display and selecting a channel number by the keypad or tuning knob. When the channel number is changed, the corresponding frequency

value is changed. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

VCRx:

The cursor position for VCRx appears only when the band selection is VHF/UHF. VCRx lets the operator set the voice channel frequency for the reception of signaling from the radio. The voice channel frequency can be changed by moving the cursor into the VCRx cursor field and changing the value with the keypad or with the tuning knob. When the control channel frequency is changed, the corresponding channel number is also updated. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

The voice channel can also be changed by moving the cursor to the associated channel position on the display and selecting a channel number by the keypad or tuning knob. When the channel number is changed, the corresponding frequency value is changed. If the channel number selected is out of range of the frequency channel plan, the corresponding frequency will be dashed out.

Mon:

Enter the monitor input attenuation value with softkeys. The operator has the option of selecting 0, 20, or 40 dB attenuation.

Monitor Port

Enter the port selection with softkeys. In most cases, the operator will select the monitor port to **RF/IO**.

CAUTION:

Do not input RF power into the antenna port of the analyzer. Damage to the analyzer may result.

Gen:

Enter the generator output level with the keypad or the tuning knob.

Generator Port

Enter the generator port selection with softkeys. In most cases, the operator will select the port to **RF/IO**.

Audio Zone

At the start of the test sequence, all audio sources within the Audio zone are automatically reset to the "off" condition so as not to interfere with the call signaling. Once the call has been processed and the radio is on the voice channel, audio tones may be activated for audio testing.

CAUTION

If the radio is being tested in a noisy area it is possible that noise pickup by the radio's microphone can interfere with the call processing and result in Connect Tone measurement errors. If this occurs, simply covering the radio's microphone during call processing should correct the problem.

2-6.2 Radio Initiated Dispatch Trunk I EP II Testing

At the same time that channel grants are being sent on the control channel, the analyzer is sending low speed data on the voice channel. The radio receives the channel assignment and switches to the voice channel and transmits connect tone and voice. Once the connect tone from the radio is measured and displayed, the analyzer enables it's modulation and unmutes it's speaker. Throughout the handshaking sequence, the trunking analyzer updates the status thermometer at the appropriate time. Refer to Appendix B for a description of the status

thermometer signaling events for each test sequence.

To set up testing, select the Trunk mode by placing the cursor in the "Mode:" field in the Display Zone. and selecting the **TRUNK** softkey. Place the cursor in the "Meter:" field and press the softkey **RADIO INIT** to view current data and test status for a radio initiated trunked test sequence. Place the cursor in the "Sig Type:" field and press the softkey **TRUNK I EP II** to select Trunk I EP II signaling. A screen similar to figure 2-5 appears.

Parameter selection is the same as Radio Init Dispatch Trunk I described in paragraph 2-6.1.

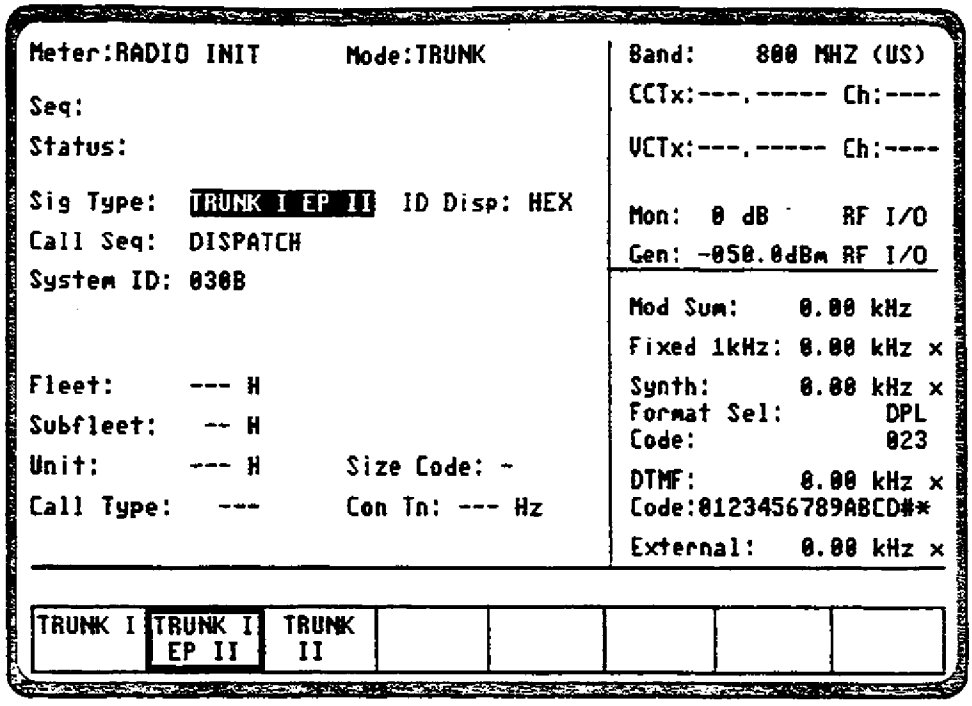

Figure 2-5. Dispatch Test Screen – Radio Initiated Trunk I EP II Signaling

2-6.3 Radio Initiated Dispatch Trunk II Testing

The Trunking Analyzer performs an ISW decode sequence on the control channel that provides talkgroup and unit ID information instead of fleet and subfleet information. Once the ISW data is decoded, the trunking analyzer sends channel grant OSWs on the control channel and low speed data on the voice channel. The radio detects the channel grant OSWs, switches to the voice channel, and begins transmitting connect tone and voice. The trunking analyzer detects the connect tone and enables it's modulation and unmutes it's speaker. Throughout the handshaking sequence, the trunking analyzer updates the status thermometer at the appropriate time. Refer to Appendix B for a description of the status thermometer signaling events for each test sequence.

In addition to the information already on the screen, the trunking analyzer calculates and displays the connect tone frequency. After the analyzer displays the connect tone frequency, it remains unchanged for the rest of the test sequence.

The thermometer display progresses rapidly through the signaling events and stops after the Connect Tone Received on VC step. At this point, the radio has sent a connect tone on the voice

channel. The connect tone stays on the voice channel as long as the radio is keyed.

In testing a radio from Type II hybrid systems where one signaling type is actually employed while the radio ID information is mapped over to the other signaling type's ID format, the trunking analyzer will always display the ID information per the signaling type selected. EXAMPLE: If the radio is actually signaled with Trunk II, yet it's ID is defined in terms is Trunk I, it must be tested as a Trunk II radio and the displayed ID information will be in the Trunk II format. For such hybrid radio's, verification of the mapped identify may be done via Radio Service Software testing or by manual conversion.

To set up testing, select the Trunk mode by placing the cursor in the "Mode:" field in the Display Zone, and selecting the **TRUNK** softkey. Place the cursor in the "Meter:" field and press the softkey **RADIO INIT** to view current data and test status for a radio initiated trunked test sequence. Within the Display zone, place the cursor in the "Sig Type:" field and press the softkey **TRUNK II** to select Trunk II signaling. A screen similar to figure 2-6 appears.

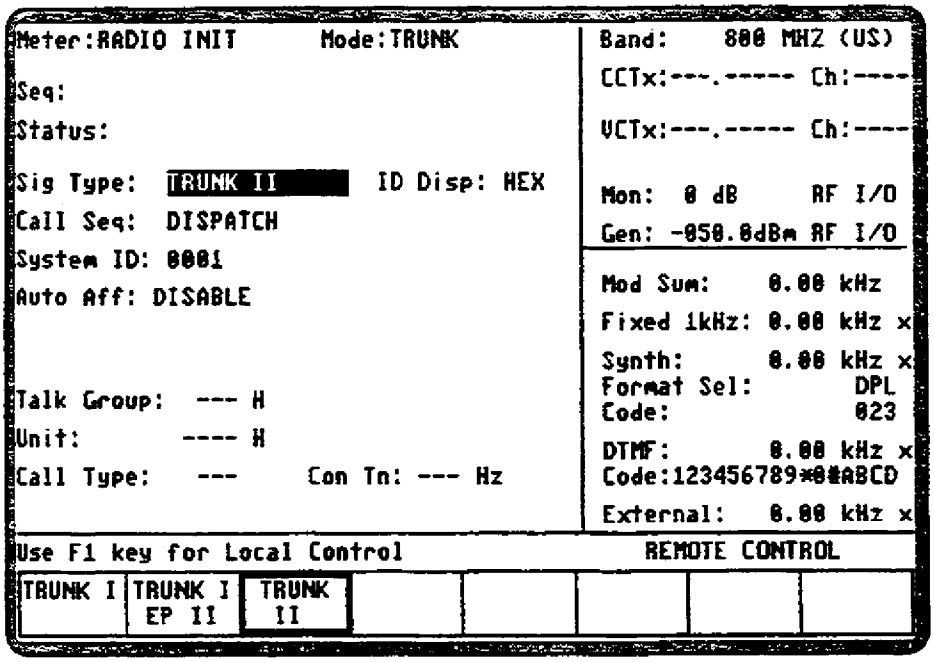

Figure 2-6. Dispatch Test Screen – Radio Init Trunk II Signaling

Parameter selection is similar to Radio Initiated Dispatch Trunk I described in paragraph 2-6.1, with the addition of the following parameter:

Auto Aff

The Auto Aff: selection on the analyzer configures the analyzer to respond to the SMARTZONE registration sequence. The Auto Aff: selection is only available when Trunk II signaling has been selected. The operator has the option of disabling the auto affiliation sequence, or selecting the SMARTZONE affiliation sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED. If auto affiliation is disabled, the analyzer transmits idle data on the control channel until the radio initiates the test sequence.

Testing the Auto Affiliation Feature

After setting up the test conditions, with the radio turned "off", press the start test softkey to activate control channel signaling. Turn the radio "on" when the prompt message appears so it can lock to the control channel and register. Successful registration will be indicated by seeing the squelch indicator LED flash briefly followed by the presence of decoded radio ID parameters. The call type M1 should be displayed to indicate that an auto affiliation sequence has been received. At this time, the radio may be keyed to proceed with the radio initiated calling sequence. The radio will remain registered as long as it remains powered up and there have been no changes in basic test configuration. Stopping and re-starting the test requires re-registration as long as SMARTZONE is selected at the "Auto Aff:" field on the screen.

NOTE

If changes to the test setup entries are made after a test has been started, even though theses changes appear on the screen, they will not be entered as part of the test until the test is ended and restarted. Similarly, if invalid entries are made for frequency or other parameters, they may be accepted until a final validity check is done by the system at the time the "start test" softkey is pressed.

2-7 SYSTEM INITIATED TRUNKING

The **SYSTEM INIT** softkey in the "Meter:" field configures the analyzer to display the current data and test status for the system initiated trunked test sequence. The analyzer simulates the central controller (the "system") calling the radio under test.

In the following subsections, the call sequence selected in Dispatch. For details on testing System Initiated Phone Interconnect, Call Alert, and Failsoft call sequences, refer to Section III, Applications, in this manual.

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

When the test is started, the analyzer generates an idle OSW pattern on the control channel selected for a short period of time so the radio can acquire the control channel. After the time has elapsed, the analyzer directs the radio to the voice channel and provides the voice channel handshake signaling required by the type of Trunk Signaling used. Throughout the signaling process the status thermometer is updated at the appropriate time.

2-7.1 System Initiated Dispatch Trunk I Signaling

The radio receives the control channel message to move to a voice channel and switches to that channel. When the radio detects the high speed data word and low speed data word, the radio unmutes and stays on the voice channel until the test is terminated.

To set up testing, select the Trunk mode by placing the cursor in the "Mode:" field in the Display Zone, and selecting the **TRUNK** softkey. Place the cursor in the "Meter:" field and press the softkey **SYSTEM INIT** to view current data and test status for a system initiated trunked test sequence. Within the Display zone, place the cursor in the "Sig Type:" field and press the softkey **TRUNK I** to select Trunk I signaling. A screen similar to figure 2-7 appears.

Parameter selection is similar to Radio Init Dispatch Trunk I described in paragraph 2-6.1.

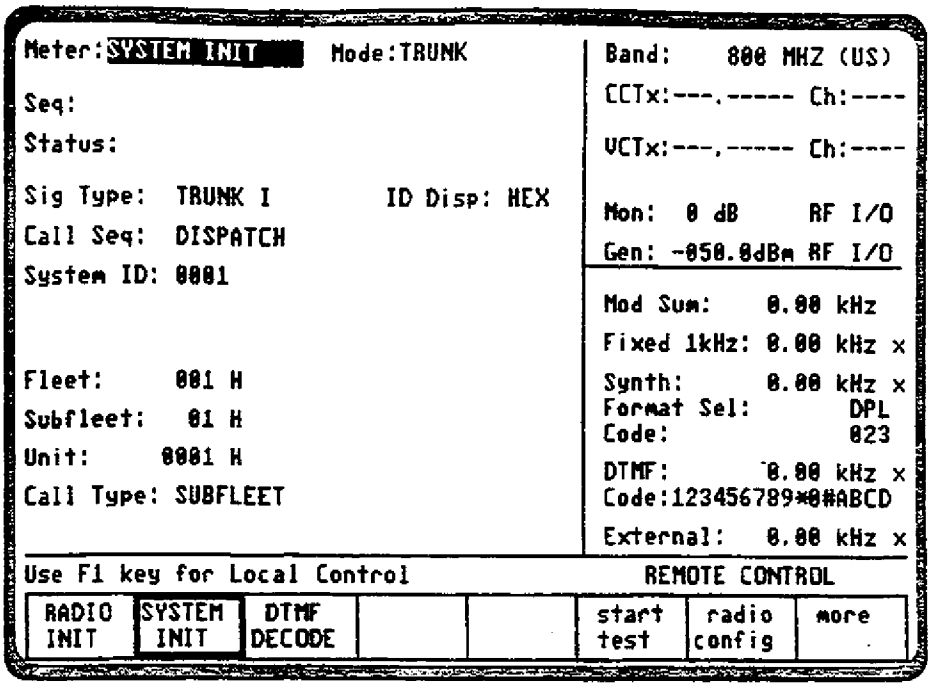

Figure 2-7. Dispatch Test Screen – System Init Trunk I and Trunk I EP II Signaling

2-7.2 System Initiated Dispatch Trunk I EP II Signaling

The radio receives the control channel message to move to a voice channel, and switches to that voice channel. When the radio detects the low speed data word, the radio unmutes and stays on the voice channel until the test is terminated.

To set up testing, activate the Trunk mode per paragraph 2-5, place the cursor in the "Meter:" field and press the softkey **SYSTEM INIT** to view current data and test status for a system initiated trunked test sequence. Within the Display zone, place the cursor in the "Sig Type:" field and press the softkey **TRUNK I EP II** to select Trunk I EP II signaling. A screen similar to figure 2-7 appears.

Parameter selection is similar to Radio Initiated Dispatch Trunk I described in paragraph 2-6.1.

2-7.3 System Initiated Dispatch Trunk II Signaling

The trunking analyzer sends a low speed data word on the voice channel frequency. The radio receives the control channel message to move to the voice channel and switches to that voice channel. When the radio detects the low speed data word, the radio unmutes and stays on the voice channel until the test is terminated.

To setup testing, activate the Trunk mode per paragraph 2-5, place the cursor in the "Meter:" field and press the softkey **SYSTEM INIT** to view current data and test status for a system initiated trunked test sequence. Within the Display zone, place the cursor in the "Sig Type:" field and press the softkey **TRUNK II** to select Trunk II signaling. A screen similar to figure 2-8 appears.

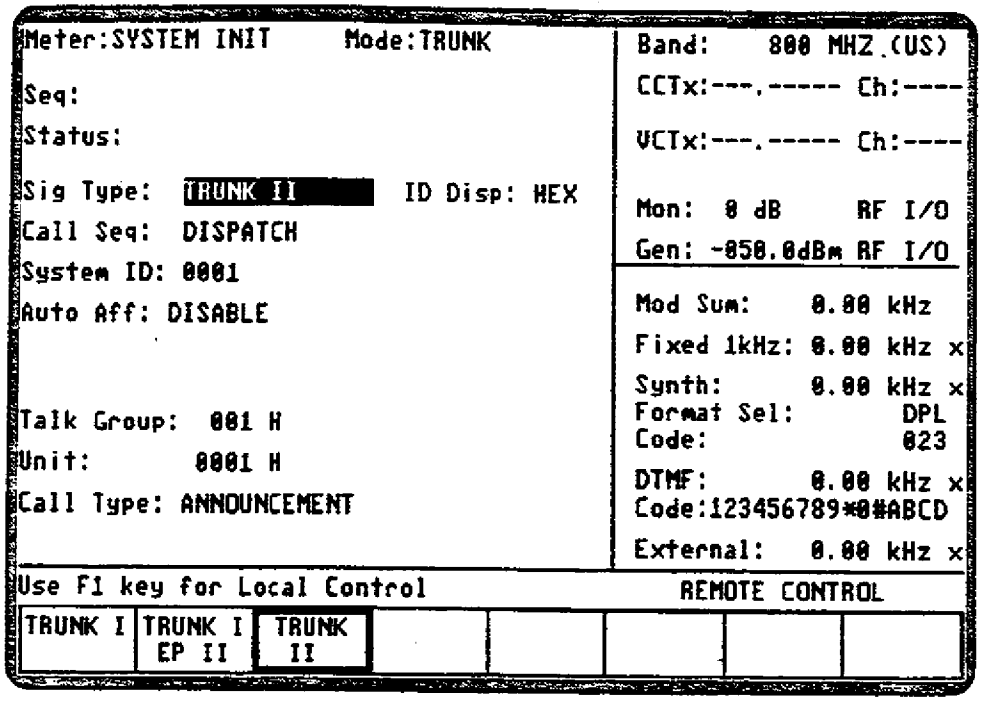

Figure 2-8. Dispatch Test Screen – System Init Trunk II Signaling

Parameter selection is similar to Radio Initiated Dispatch Trunk I described in paragraph 2-6.3, with the addition of the following parameter:

Call Type

Radios in Trunk II systems monitor an announcement talk group in addition to their own talk group. If the operator is making an announcement call to the radio, the announcement talk group must be entered.

Move the cursor to the "Call Type:" location and select **ANNOUNCEMENT** for announcement calls, and **TALK GROUP** for standard talk group calls.

NOTE

SMARTZONE Auto Affiliation may be tested in the system initiated call by selecting SMARTZONE at the "Auto Aff:" field. This will require power cycling the radio at the start of each test as described in paragraph 2-6.3.

2-8 RADIO CONFIGURATION

Data displayed on the Radio Configuration screen depends on the signaling type. The values for Control Channel Transmit Deviation, the SMARTZONE Connect Tone, and the Trunk I, Trunk I EP II fleet maps are entered through this screen.

2-8.1 Radio Configuration Trunk I and Trunk I EP II

The Trunk I and Trunk I EP II Radio Configuration Screen allows the fleet map of the radio being tested and the transmit deviation level for the control channel to be entered. Ten system/fleet map configurations can be stored in the analyzer.

With the Trunk mode activated per paragraph 2-5, place the cursor in the "Sig Type:" field and press the softkey **TRUNK I** (or **TRUNK I EP II**) to select the desired signaling. Place the cursor in the "Meter:" field and press the softkey **RADIO CONFIG**. A screen similar to figure 2-9 appears.

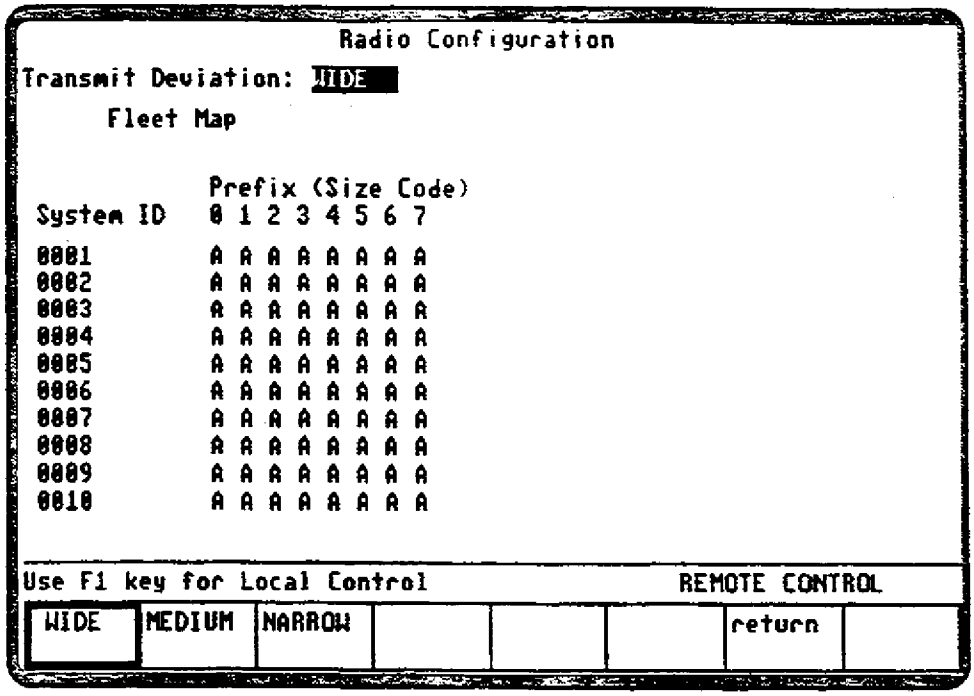

Figure 2-9. Radio Configuration Screen – Trunk I and Trunk I EP II

With the above screen displayed, use the cursor control keys to position the cursor, and the softkeys to select the following parameters:

Transmit Deviation:

The Transmit Deviation selection allows for the selection of either wide, medium, or narrow FM deviation selections per table 2-5.

Table 2-5. Transmit Deviation Selections

Selection	Range	Frequency Band	Channel Range
Wide	3.125 kHz ± 375 Hz	800 MHz (US)	0 through 599
Medium	2.4 kHz ± 300 Hz	800 MHz (US)	600 through 1022
Narrow	1.2 kHz ± 300 Hz	900 MHz	900 MHz

Fleet Map

The radio configuration screen allows for the entry and storage of ten system/fleet map configurations. The fleet map is a plan of how the radio defines the data that is passed between the radio and the central controller. The fleet map is made up of prefixes and size codes. Each fleet map can have up to eight size codes. The value of the prefix field is an index into the fleet map to the size code. A single letter designates each size code.

NOTE

Fleet Map information should be obtained from the System Manager. It also should be resident within either the Motorola or customer maintained data base for each system.

To enter information in the Radio Configuration screen, first obtain the system ID from the 10-digit hexadecimal number on the user label. Then, determine the size code configuration of the system from the system manager. Enter the system ID and then the size code letters to the right of the system ID.

Enter the system configuration information before beginning a test to decode fleet, subfleet, and unit ID information.

The system ID and size codes of the radio being tested make up a fleet map. The fleet map must be entered accurately in order for the analyzer to decode the ISW transmitted by the radio.

Example of a Trunk I Fleet Map

The first entered item is the system ID. The radio should have a user label that contains a 10-digit hexadecimal number. The first four numbers are the system ID, the next three are the fleet ID, and the last three the radio's ID, (Unit ID).

For example, suppose the user label has the following hexadecimal number:

0A09400001

This represents:

System ID	Fleet ID	Individual ID
0A09	400	001

The fleet prefix is the first number of the three digit hexadecimal fleet ID. The value of the prefix field is an index into the fleet map of a given system for looking up the size code value.

Each trunked fleet map contains a set of eight size codes that is indexed by the prefix value. A single letter designates each size code.

Determine the system configuration information from the system manager for each system. This information is usually not listed on any of the labels on the radio.

Enter the size codes to the right of the system ID on the System Configuration Screen.

If the size codes are unavailable or incorrect, some tests run, but the decoded radio ID information is not correct. The fleet map and radio programming can be verified by comparing the 10 digit hexadecimal number from the user label on the radio against the radio ID data decoded on the analyzer test screen.

Suppose the user label 10-digit hexadecimal number is:

0C08300001

Determine the system ID, fleet ID, fleet prefix, and individual ID in this number.

System ID:	0C08
Fleet ID:	300
Fleet prefix:	3
Individual ID:	001

First, enter the system ID number in the left-hand column under System ID. If the system has size codes AABBCCDD, Enter these to the right of their corresponding system ID.

	Prefix (Size Code)							
System ID	0	1	2	3	4	5	6	7
0C08	A	A	B	B	C	C	D	D

NOTE

If the system configuration contains "fill" type size codes such as Z or X, the size code A should be entered in their piace for best results.

2-8.2 Radio Configuration Trunk II

The Trunk II Radio Configuration screen allows for the entry of transmit deviation, and SMARTZONE Connect Tone into the analyzer.

With the Trunk mode activated per paragraph 2-5, place the cursor in the "Sig Type:" field and press the softkey **TRUNK II** to select the desired signaling. Place the cursor in the "Meter:" field and press the softkey **RADIO CONFIG.** A screen similar to figure 2-10 appears.

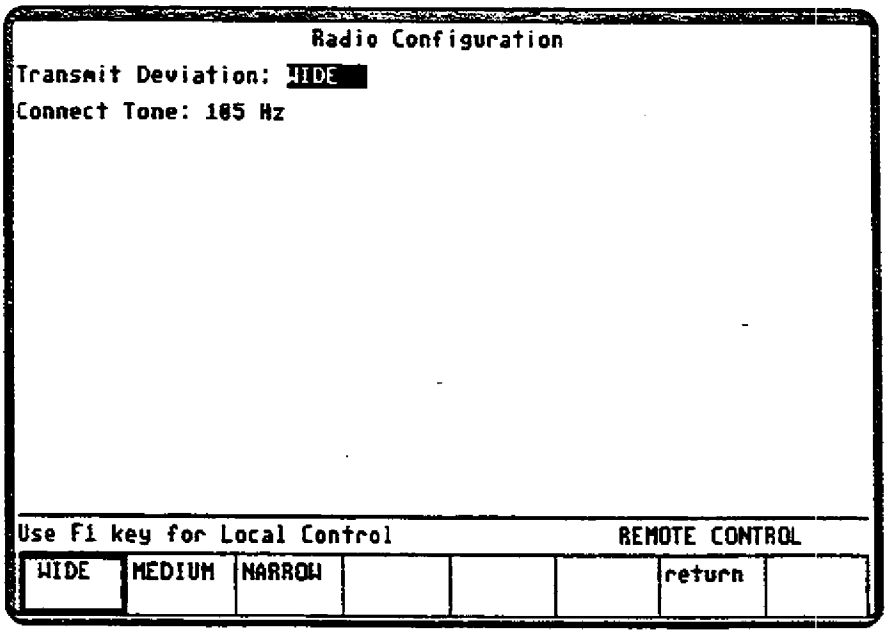

Figure 2-10. Radio Configuration Screen – Trunk II

With the above screen displayed, use the cursor control keys to position the cursor, and the softkeys to select the following parameters:

Transmit Deviation

The Transmit Deviation selection allows for the selection of either wide, medium, or narrow FM deviation selections per table 2-4.

Connect Tone

The Connect Tone selects the connect tone value that will be sent to the test radio during the SMARTZONE auto registration. The value sent is used by the radio while registered on the system. The operator can verify that the SMARTZONE radio is properly registered by comparing the connect tone sent by the radio to the connect tone selected here.

The Trunk II VHF/UHF configuration screen allows for the entry of transmit deviation, connect tone, and VHF/UHF frequency blocks into the analyzer, as described in the next subsection, paragraph 2-8.2.1.

2-8.2.1 Trunk II VHF/UHF Radio Configuration

The radio configuration screen allows for the entry and storage of VHF or UHF frequency blocks. To select the Radio Configuration screen, move the cursor to "Meter:" and select the **RADIO CONFIG** softkey with the "Sig Type:" set for **TRUNK II**, and the "Band:" set for **VHF/UHF**.

The data entered into the VHF/UHF radio configuration screen defines the frequency and channel relationships which are unique for each system in the VHF or UHF band. Calls cannot be completed without correct entry of this data. The data is obtained from the system manager. It exists within the Code Management Data Base for each individual system in Motorola's TCMS, or the customer's local assignment system. The data can also be retrieved from the individual test radio's code plug.

Rx and Tx Blocks:

Operating frequencies are organized into a maximum of three blocks numbered one to three. **The number of channels in the three blocks must total 380.**

IMPORTANT

The transmit and receive blocks are from the radio's perspective.

1-UUT Rx lets the operator enter the start frequency of the receive block, the end frequency of the receive block, and the channel spacing of the receive block. The channel numbers for this block are calculated with the following equation:

Channel Number = (Selected Frequency – Start Frequency)/ Channel Spacing + Block Base Chan No.

To manually change the start or end frequency value, position the cursor and change the value with the keypad, or the tuning knob.

1-UUT Tx lets the operator enter the start frequency of the transmit block, the end frequency of the transmit block, and the channel spacing of the transmit block. The channel numbers for this block are calculated with the following equation:

Channel Number = (Selected Frequency – Start Frequency)/ Channel Spacing + Block Base Chan No.

The other transmit and receive blocks are entered in a similar manner as described for the first transmit and receive block.

Example:

The radio service software (RSS) for a UHF radio system is used to read the system data from a UHF radio. The following information is obtained from the radio (see Table 2-6):

Table 2-6 – Trunking Frequency Information Example

Control Channels (MHz)		Channel Ranges			Chan Spacing (kHz)
Receive	Transmit		Start	End	25.00
1-408.00000	413.00000	1-Rx	406.02500	409.00000	25.00
2-410.00000	415.00000	Tx	406.02500	414.00000	25.00
3-415.00000	420.00000				
4-408.50000	413.50000	2-Rx	409.02500	412.02500	25.00
		Tx	414.02500	417.02500	25.00
		3-Rx	412.05000	415.50000	25.00
		Tx	417.05000	420.50000	25.00

On the Trunk II Radio Configuration Screen, the above data should be entered as shown in Figure 2-11.

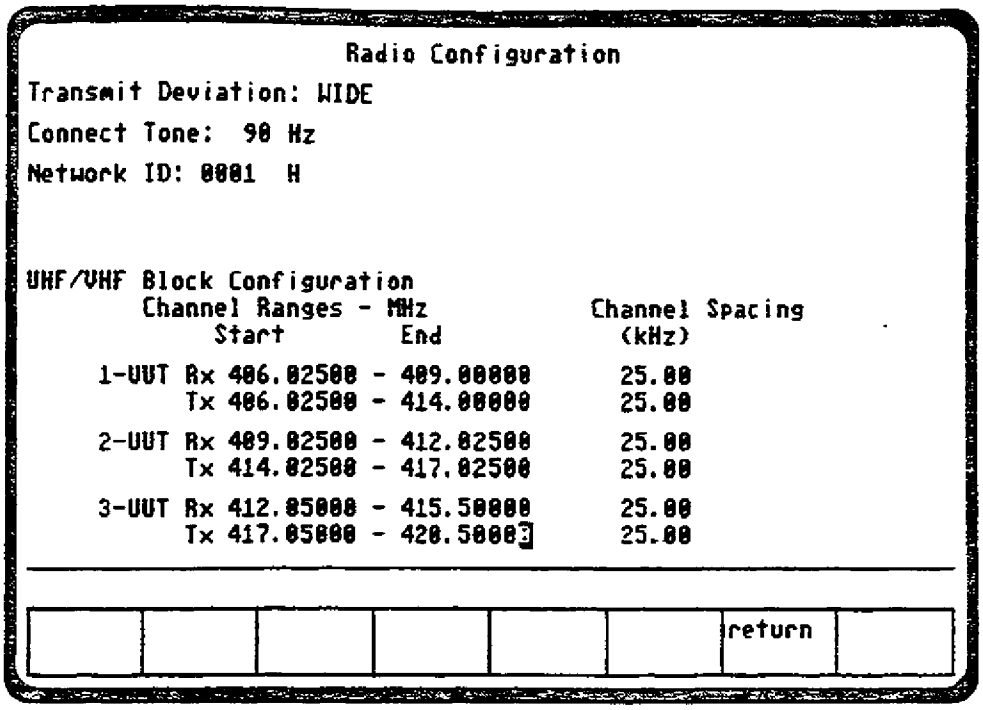

Figure 2-11. Radio Configuration Screen – Trunk II VHF/UHF Example

Rx Block 1 covers the channels from 0 through 119
(End Freq – Start Freq)/Channel Spacing + block base channel number
(409.00000 MHz – 406.02500 MHz)/25 kHz + 0

Rx Block 2 covers the channels 120 through 240
(412.02500 MHz – 409.02500 MHz)/25 kHz + 120

Rx Block 3 covers the channels 241 through 379
(415.50000 MHz – 412.05000 MHz)/25 kHz + 241

Section III

APPLICATIONS

3-1 BASIC TRUNKED RADIO TESTING

This section of the manual contains information on typical test setups to perform some of the more common trunked radio tests using the R-2670 FDMA Digital Communications System Analyzer with Trunking Option.

The start test softkey initiates the test sequence defined by the parameters selected on the trunking screen. If the parameters selected are not valid, the test sequence is terminated and an error message is displayed. If the parameters selected are valid when the start test softkey is pressed, the start test softkey is replaced with the stop test softkey. For a list of error and warning messages, refer to Appendix A.

3-2 DISPATCH TESTING

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

3-2.1 Radio Initiated Dispatch Test Sequence, Trunk I and Trunk I EP II Signaling

1. Enter the following parameters:

Sig Type:	Trunk I or Trunk I EP II
ID Disp:	HEX or DEC
Call Seq:	DISPATCH

NOTE

For test sequences with ID Disp set for DEC, the six digit unit ID decoded from the ISW is the personality ID of the radio and not the unit ID. When ID Disp is set for HEX, the unit ID is displayed in hexadecimal. The Fleet and Subfleet IDs are always displayed in hexadecimal independent of the ID Disp selection.

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

7. The status thermometer displays the major signaling events that occur during a radio initiated Dispatch test. Refer to table 3-1 (Trunk I signaling) or table 3-2 (Trunk I EP II signaling).

8. Press the stop test softkey to terminate the test sequence.

Table 3-1. Trunk I Signaling Events
Radio Initiated Dispatch Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
R	HS Data Sent On VC	At the same time as the Channel Grant, the trunking analyzer is sending high speed data on the voice channel.
S	HS ACK Received on VC	The radio is sending high speed acknowledge tone on the voice channel indicating that it has received the high speed data from the trunking analyzer.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
V	Connect Tone Received on VC	The trunking analyzer has decoded the connect tone, sent by the radio.
W	Disconnect Tone Received on VC	The radio has sent a disconnect tone, indicating that it has de-keyed. Disconnect Tone Received on VC verifies the receipt of proper disconnect signaling.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

Table 3-2. Trunk I EP II Signaling Events
Radio Initiated Dispatch Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
V	Connect Tone Received on VC	The trunking analyzer has decoded the connect tone, sent by the radio.
W	Disconnect Tone Received on VC	The radio has sent a disconnect tone, indicating that it has de-keyed. Disconnect Tone Received on VC verifies the receipt of proper disconnect signaling.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

3-2.2 Radio Initiated Dispatch Test Sequence, Trunk II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

Sig Type:	Trunk II
ID Disp:	HEX or DEC
Call Seq:	DISPATCH

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

NOTE

If SMARTZONE auto affiliation has been selected, the operator is prompted to apply power to the radio. Once the test radio is turned on, it begins to search for a control channel. When the radio finds the control channel, it performs an auto registration sequence with the analyzer, and the registration data is displayed.

7. The status thermometer displays the major signaling events that occur during a radio initiated Dispatch test. Refer to table 3-3 (Trunk II auto affiliation disabled), or table 3-4 (Trunk II with auto affiliation).

8. Press the stop test softkey to terminate testing.

Table 3-3. Trunk II Signaling Events
Radio Initiated Dispatch Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
K	Talk Group OSW Sent	The trunking analyzer is sending talk group OSWs on the control channel. Talk Group OSWs tell the radio to affiliate by sending a dual word ISW that contains the talk group ID and the unit ID of the radio.
L	Dual ISW Received	The trunking analyzer has received a dual word ISW from the radio.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
V	Connect Tone Received on VC	The trunking analyzer has decoded the connect tone, sent by the radio.
W	Disconnect Tone Received on VC	The radio has sent a disconnect tone, indicating that it has de-keyed. Disconnect Tone Received on VC verifies the receipt of proper disconnect signaling.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

Table 3-4. Trunk II Signaling Events
Radio Initiated Dispatch Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
K	Talk Group OSW Sent	The trunking analyzer is sending talk group OSWs on the control channel. Talk Group OSWs tell the radio to affiliate by sending a dual word ISW that contains the talk group ID and the unit ID of the radio.
L	Dual ISW Received	The trunking analyzer has received a dual word ISW from the radio.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
V	Connect Tone Received on VC	The trunking analyzer has decoded the connect tone, sent by the radio.
W	Disconnect Tone Received on VC	The radio has sent a disconnect tone, indicating that it has de-keyed. Disconnect Tone Received on VC verifies the receipt of proper disconnect signaling.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

3-2.3 System Initiated Dispatch Test Sequence, Trunk I and Trunk I EP II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

1. Enter the following parameters:

Sig Type:	Trunk I or Trunk I EP II
ID Disp:	HEX or DEC
Call Seq:	DISPATCH

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter Fleet, Subfleet, and unit ID.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

8. The status thermometer displays the major signaling events that occur during a system initiated Dispatch test. Refer to table 3-5 (Trunk I signaling) or table 3-6 (Trunk I EP II signaling).

9. Press the stop test softkey to terminate testing.

Table 3-5. Trunk I Signaling Events
System Initiated Dispatch Testing

SIGNALING EVENT		DESCRIPTION
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
R	HS Data Sent On VC	At the same time as the Channel Grant, the trunking analyzer is sending high speed data on the voice channel.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

Table 3-6. Trunk I EP II Signaling Events
System Initiated Dispatch Testing

SIGNALING EVENT		DESCRIPTION
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

3-2.4 System Initiated Dispatch Test Sequence, Trunk II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

Sig Type:	Trunk II
ID Disp:	HEX or DEC
Call Seq:	DISPATCH

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio configuration screen in order to decode the radio's ID information.

3. Enter talk group, call type, and unit ID.

NOTE

If an announcement call type is selected, the operator must also set the talk group to the announcement talk group monitored by the radio.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

8. The status thermometer displays the major signaling events that occur during a system initiated Dispatch test. Refer to table 3-7 (Trunk II auto affiliation disabled), or table 3-8 (Trunk II with auto affiliation).

Table 3-7. Trunk II Signaling Events
System Initiated Dispatch Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

Table 3-8. Trunk II Signaling Events
System Initiated Dispatch Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OSWs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent on VC	The trunking analyzer is sending a low speed data word on the voice channel.
X	Disconnect Sent	The trunking analyzer has sent a disconnect word on the voice channel to end the call. The radio will return to monitor the control channel.

3-3 PHONE INTERCONNECT TESTING

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

3-3.1 Radio Initiated Phone Interconnect Test Sequence, Trunk I and Trunk I EP II Signaling

1. Enter the following parameters:

   Sig Type: Trunk I or Trunk I EP II

   ID Disp: HEX or DEC

   Call Seq: PHONE INTERCONNECT

NOTE

For test sequences with ID Disp set for DEC, the six digit unit ID decoded from the ISW is the personality ID of the radio and not the unit ID. When ID Disp is set for HEX, the unit ID is displayed in hexadecimal. The Fleet and Subfleet IDs are always displayed in hexadecimal independent of the ID Disp selection.

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

   The trunking analyzer generates an idle background pattern on the control channel and prompts the operator to key the transmitter. The operator keys the transmitter of the radio by sending a phone interconnect request. The request is received by the analyzer, and the data is displayed. The radio is then directed to a voice channel where the appropriate Trunk I or Trunk I EP II signaling is accomplished.

7. The status thermometer displays the major signaling events that occur during a radio initiated phone interconnect test. Refer to table 3-9 (Trunk I), table 3-10 (Trunk I EP II), table 3-11 (Trunk II auto affiliation disabled) or table 3-12 (Trunk II with auto affiliation).

   The trunking analyzer continues to transmit data to keep the radio on the voice channel.

   When the radio is on the voice channel, the operator can test the DTMF capability of the radio by selecting the **DTMF DECODE** softkey from the "Meter:" cursor position. The DTMF decode screen is used to display DTMF tones from the radio.

   While the radio is being held on the voice channel, the operator has the option to select other display screens by moving the cursor to "Meter:" and selecting the desired metering function. For example the operator can switch the analyzer to the RF Display screen and rekey the radio to measure frequency error, RF transmitter power, and frequency deviation.

8. From the "Meter:" cursor position, the operator completes the test sequence by pressing the **hangup** softkey.

The trunking analyzer prompts the operator to "hangup" the radio. The trunking analyzer receives the message from the radio, updates the display, and prompts the user that the test is ended.

Table 3-9. Trunk I Signaling Events
Radio Initiated Phone Interconnect Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
R	HS Data Sent On VC	At the same time as the Channel Grant, the trunking analyzer is sending high speed data on the voice channel.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

Table 3-10. Trunk I EP II Signaling Events
Radio Initiated Phone Interconnect Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

3-3.2 Radio Initiated Phone Interconnect Test Sequence, Trunk II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

   Sig Type: Trunk II

   ID Disp: HEX or DEC

   Call Seq: PHONE INTERCONNECT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

NOTE

If SMARTZONE auto affiliation has been selected, the operator is prompted to apply power to the radio. Once the test radio is turned on, it begins to search for a control channel. When the radio finds the control channel, it performs an auto registration sequence with the analyzer, and the registration data is displayed.

7. The status thermometer displays the major signaling events that occur during a radio initiated phone interconnect test. Refer to table 3-11 (Trunk II auto affiliation disabled), or table 3-12 (Trunk II with auto affiliation).

8. Press the stop test softkey to terminate testing.

Table 3-11. Trunk II Signaling Events
Radio Initiated Phone Interconnect Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

Table 3-12. Trunk II Signaling Events
Radio Initiated Phone Interconnect Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
A	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel for the radio to lock onto.
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

3-3.3 System Initiated Phone Interconnect Test Sequence, Trunk I and Trunk I EP II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

1. Enter the following parameters:

Sig Type:	Trunk I or Trunk I EP II
ID Disp:	HEX or DEC
Call Seq:	PHONE INTERCONNECT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter Fleet, Subfleet, and unit ID.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

   The trunking analyzer generates an idle OSW pattern for the radio to lock to. After a short period of time, the analyzer will send a message to the radio instructing it to ring. The radio sends a message to the analyzer when the call has been answered. At that time, the analyzer directs the radio to a voice channel and provides the appropriate Trunk I or Trunk I EP II handshake.

8. The status thermometer displays the major signaling events that occur during a system initiated phone interconnect test. Refer to table 3-13 (Trunk I signaling) or table 3-14 (Trunk I EP II signaling).

   Once on the voice channel, the operator can modulate the carrier with tones, or voice, and select other displays.

9. To complete the last step on the status thermometer and end the test sequence, the operator must return to the System Init selection. From the "Meter:" cursor position, the operator completes the test sequence by pressing the **hangup** softkey.

   The trunking analyzer prompts the user to hang up the phone. When the analyzer detects that the phone has been hung up, the status thermometer is updated, the ISW decode field is updated, and the test ended message is displayed on the screen.

Table 3-13. Trunk I Signaling Events
System Initiated Phone Interconnect Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
G	Transpond OSW Sent	The trunking analyzer has sent the Transpond OSW to the radio.
H	Transpond OSW Received	The trunking analyzer has detected the Transpond ISW from the radio.
I	Ring OSW Sent	The trunking analyzer has sent the Ring OSW to the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
R	HS Data Sent On VC	At the same time as the Channel Grant, the trunking analyzer is sending high speed data on the voice channel.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

Table 3-14. Trunk I EP II Signaling Events
System Initiated Phone Interconnect Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
G	Transpond OSW Sent	The trunking analyzer has sent the Transpond OSW to the radio.
H	Transpond OSW Received	The trunking analyzer has detected the Transpond ISW from the radio.
I	Ring OSW Sent	The trunking analyzer has sent the Ring OSW to the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

3-3.4 System Initiated Phone Interconnect Test Sequence, Trunk II

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

   Sig Type: Trunk II

   ID Disp: HEX or DEC

   Call Seq: PHONE INTERCONNECT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio configuration screen in order to decode the radio's ID information.

3. Enter talk group, call type, and unit ID.

NOTE

If an announcement call type is selected, the operator must also set the talk group to the announcement talk group monitored by the radio.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

8. The status thermometer displays the major signaling events that occur during a system initiated Phone Interconnect test. Refer to table 3-15 (Trunk II auto affiliation disabled), or table 3-16 (Trunk II with auto affiliation).

Table 3-15. Trunk II Signaling Events
System Initiated Phone Interconnect Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
G	Transpond OSW Sent	The trunking analyzer has sent the Transpond OSW to the radio.
H	Transpond OSW Received	The trunking analyzer has detected the Transpond ISW from the radio.
I	Ring OSW Sent	The trunking analyzer has sent the Ring OSW to the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
V	Connect Tone Received On VC	The trunking analyzer has decoded the connect tone, sent by the radio.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

Table 3-16. Trunk II Signaling Events
System Initiated Phone Interconnect Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
A	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel for the radio to lock onto.
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
G	Transpond OSW Sent	The trunking analyzer has sent the Transpond OSW to the radio.
H	Transpond OSW Received	The trunking analyzer has detected the Transpond ISW from the radio.
I	Ring OSW Sent	The trunking analyzer has sent the Ring OSW to the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
Q	Channel Grant OSW Sent	The trunking analyzer is sending channel grant OWSs on the control channel. Channel grants direct the radio to the voice channel to use.
U	LS Word Sent On VC	The trunking analyzer is sending a low speed data word on the voice channel.
V	Connect Tone Received On VC	The trunking analyzer has decoded the connect tone, sent by the radio.
Y	Hangup Received	The trunking analyzer has decoded the Hangup ISW from the radio.

3-4 CALL ALERT TESTING

3-4.1 Radio Initiated Call Alert Test Sequence, Trunk I and Trunk I EP II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

1. Enter the following parameters:

   Sig Type: Trunk I or Trunk I EP II

   ID Disp: HEX or DEC

   Call Seq: CALL ALERT

NOTE

For test sequences with ID Disp set for DEC, the six digit unit ID decoded from the ISW is the personality ID of the radio and not the unit ID. When ID Disp is set for HEX, the unit ID is displayed in hexadecimal. The Fleet and Subfleet IDs are always displayed in hexadecimal independent of the ID Disp selection.

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

7. The status thermometer displays the major signaling events that occur during a radio initiated Call Alert test. Refer to table 3-17.

8. Press the stop test softkey to terminate the test sequence.

Table 3-17. Trunk I and Trunk I EP II Signal Events
Radio Initiated Call Alert Testing

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel indicating that the radio has been keyed.
P	Call Alert Ack OSW	The trunking analyzer is sending a call alert acknowledge OSW to the radio simulating that the target radio has received the call alert signal.

3-4.2 Radio Initiated Call Alert Test Sequence, Trunk II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and Radio Initiated Testing (paragraph 2-6).

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

Sig Type:	Trunk II
ID Disp:	HEX or DEC
Call Seq:	CALL ALERT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen in order to decode the radio's ID information.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

4. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

5. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

6. Press the start test softkey.

NOTE

If SMARTZONE auto affiliation has been selected, the operator is prompted to apply power to the radio. Once the test radio is turned on, it begins to search for a control channel. When the radio finds the control channel, it performs an auto registration sequence with the analyzer, and the registration data is displayed.

7. The status thermometer displays the major signaling events that occur during a radio initiated Call Alert test. Refer to table 3-18 (Trunk II auto affiliation disabled), or table 3-19 (Trunk II with auto affiliation).

   The trunking analyzer generates an idle pattern on the control channel and prompts the operator to key the transmitter. When the radio sends an ISW, the analyzer decodes it and displays it. If the ISW call type is a call alert, the analyzer will wait a short period of time and send an acknowledgment to the raido that the call alert has been received. and the test is termianted. During the execution of the test sequence, the status thermometer is appropriately updated.

8. Press the stop test softkey to terminate testing.

Table 3-18. Trunk II Signaling Events
Radio Initiated Call Alert Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
L	Dual ISW Received	The trunking analyzer has received a dual word ISW from the radio.
M	Call Alert Ring OSW	The trunking analyzer is sending a call alert ring OSW to the target radio.
O	Call Alert Ring Ack OSW	The trunking analyzer is sending call alert ring acknowledge OSW to simulate the system sending an acknowledge to the requesting radio.

Table 3-19. Trunk II Signaling Events
Radio Initiated Call Alert Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
A	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel for the radio to lock onto.
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
L	Dual ISW Received	The trunking analyzer has received a dual word ISW from the radio.
M	Call Alert Ring OSW	The trunking analyzer is sending a call alert ring OSW to the target radio.
O	Call Alert Ring Ack OSW	The trunking analyzer is sending call alert ring acknowledge OSW to simulate the system sending an acknowledge to the requesting radio.

3-4.3 System Initiated Call Alert Test Sequence, Trunk I and Trunk I EP II Signaling

NOTE

A radio initiated dispatch test (see paragraph 3-2) should be performed prior to a system initiated call alert.

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

1. Enter the following parameters:

Sig Type:	Trunk I or Trunk I EP II
ID Disp:	HEX or DEC
Call Seq:	CALL ALERT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio Configuration screen.

NOTE

*The system ID entered **must** match the system ID of the radio. Otherwise the radio will not lock onto the control channel. See paragraph 2-8, Radio Configuration.*

3. Enter Target Fleet, Target Subfleet, and Unit ID.

   For the System Initiated Call Alert, the Target Fleet, Subfleet, and Unit are the values for the radio under test. If a radio initiated dispatch, phone interconnect, or call alert test has been executed prior to the system initiated test, the target fleet, target subfleet, and unit ID decoded from the ISW will be displayed. If the operator wants to change a target fleet, target subfleet, or unit ID, move the cursor to the appropriate position and enter the new number.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

8. The status thermometer displays the major signaling events that occur during a system initiated Call Alert test. Refer to table 3-20 (Trunk I and Trunk I EP II signaling).

9. Press the stop test softkey to terminate testing.

Table 3-20. Trunk I and Trunk I EP II Signaling Events
System Initiated Call Alert Testing

F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
J	ISW Received	The radio has sent an Inbound Signaling Word (ISW) on the control channel to indicate that the radio has been keyed.
P	Call Alert Ack OSW	The trunking analyzer is sending a call alert acknowledge OSW to the radio simulating that the target radio has received the call alert signal.

3-4.4 System Initiated Call Alert Test Sequence, Trunk II Signaling

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

NOTE

Fleet, Subfleet, and Unit ID information must be entered before the execution of a System Initiated test. If a Radio Initiated test is executed prior to the System Initiated test, these fields are automatically updated. If required, refer to paragraph 2-8.1 for information related to entry and storage of system/fleet map configurations.

NOTE

SMARTZONE configures the analyzer to perform a SMARTZONE affiliation sequence prior to executing the dispatch test sequence. If the radio is not capable of SMARTZONE auto affiliation, the selection should be set to DISABLED.

1. Enter the following parameters:

   Sig Type: Trunk II

   ID Disp: HEX or DEC

   Call Seq: CALL ALERT

2. Set the System ID to match the radio system ID and one of the system IDs in the Radio configuration screen in order to decode the radio's ID information.

3. Target Unit, Calling Unit
   If a radio initiated dispatch, phone interconnect, or call alert test has been executed prior to the system initiated test, the target unit ID and calling unit ID decoded from the ISW will be displayed. If the operator wants to change the target unit ID or calling unit ID, simply move the cursor to the appropriate position and enter the new number.

   In the system initiated test sequence, the target unit ID contains the data for the test radio while the calling unit ID contains the data for the "other radio" that is trying to call alert the target unit.

4. Enter the CCTx or Control Channel number. Enter the VCTx or voice channel number.

NOTE

Splinter channels can only be entered by frequency. Standard channels can be entered by frequency or channel number (channel numbers only map to standard channel frequencies).

5. Set the monitor attenuation and port selection. Suggested port selection is RF I/O with 20 dB attenuation.

6. Set the generator attenuation and port selection. Suggested port selection is RF I/O with -50 dB for the level setting.

7. Press the start test softkey.

   The trunking analyzer generates an idle pattern on the control channel. After a short period of time the analyzer sends a call alert message to the radio. When the radio receives the call alert, it issues an acknowledgment to the analyzer and an audible call alert tone is generated by the radio. The analyzer terminates the test sequence and displays the test ended message when the acknowledgment is received.

8. The status thermometer displays the major signaling events that occur during a system initiated Call Alert test. Refer to table 3-21 (Trunk II auto affiliation disabled), or table 3-22 (Trunk II with auto affiliation).

Table 3-21. Trunk II Signaling Events
System Initiated Call Alert Testing Without Auto Affiliation

SIGNALING EVENT		DESCRIPTION
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
M	Call Alert Ring OSW	The trunking analyzer is sending a call alert ring OSW to the target radio.
N	Call Alert Ring Ack ISW	The radio is sending a call alert ring ack ISW to indicate that the radio has received the call alert.
O	Call Alert Ring Ack OSW	The trunking analyzer is sending call alert ring acknowledge OSW to simulate the system sending an acknowledge to the requesting radio.

Table 3-22. Trunk II Signaling Events
System Initiated Call Alert Testing With Auto Affiliation

SIGNALING EVENT		DESCRIPTION
A	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel for the radio to lock onto.
D	Affiliate ISW Received	The trunking analyzer has received the Affiliate ISW from the radio.
E	Affiliate OSW Sent	The trunking analyzer is sending Affiliate OSWs on the control channel. The Affiliate OSW acknowledges that the radio is registered on the system, and also tells the radio which connect tone to use.
F	Control Channel Idle	The trunking analyzer outputs a background pattern on the control channel to lock the radio.
M	Call Alert Ring OSW	The trunking analyzer is sending a call alert ring OSW to the target radio.
N	Call Alert Ring Ack ISW	The radio is sending a call alert ring ack ISW to indicate that the radio has received the call alert.
O	Call Alert Ring Ack OSW	The trunking analyzer is sending call alert ring acknowledge OSW to simulate the system sending an acknowledge to the requesting radio.

3-5 FAILSOFT TESTING

3-5.1 System Initiated Failsoft Test Sequence

Configure the analyzer for trunk mode (paragraph 2-5) and System Initiated Testing (paragraph 2-7).

1. Enter the following parameters:

   Sig Type: SYSTEM INIT

   ID Disp:

   Call Seq: FAILSOFT

2. Enter the
   FSTx or channel number
   FSRx or channel number (if VHF/UHF)

3. Enter the Port selection and monitor attenuation. In most cases the port selection should be RF I/O with 20 dB attenuation.

4. Enter the generator Port selection. In most cases the port selection should be RF I/O.

5. Press the **start test** softkey. If the parameters selected are not valid, the test sequence is terminated and an error message is displayed. When the **start test** softkey is pressed, it is replaced with the **stop test** softkey. For a list of error and warning messages, refer to Appendix A.

   The trunking transmits the failsoft word on the failsoft channel, and nothing on the control channel. When the radio cannot detect a control channel, it looks at its failsoft channel. When the radio decodes the failsoft word it will unmute and conventional radio operation is possible. After the radio has locked on the failsoft channel, the operator can transmit modulation from the trunking analyzer to the radio.

6. Press the **stop test** softkey to terminate testing.

APPENDIX A

ERROR AND WARNING MESSAGES

A-1 ERRORS

If an error occurs during a test, the test ends. To run the test again, correct the mistake and restart the test. Errors fall into three categories: setup errors, radio errors and trunking analyzer test set errors. A summary of setup and radio error messages follows.

A-1.1 Setup Error Messages

The following errors occur when data entered by the user is incorrect. Note that these errors are detected after the Start Test softkey is pressed, and prevent the test from starting. The user must enter the correct data and press the start button again.

Invalid System ID Entered

CC Tx Frequency Out of Range

CC Rx Frequency Out of Range

VC Tx Frequency Out of Range

VC Rx Frequency Out of Range

CC Tx Channel Number Out of Range

CC Rx Channel Number Out of Range

VC TxChannel Number Out of Range

VC RxChannel Number Out of Range

CC Tx to VC Rx Offset Out of Range

CC Tx to CC Rx Offset Out of Range

Prefix Out of Range

Fleet ID Out of Range

Subfleet ID Out of Range

Unit ID Out of Range

A-1.2 Radio Error Messages

ISW Timeout

The trunking analyzer did not receive a response from the radio in the time allowed. This could indicate a radio problem or an incorrect test type entered by the user.

Connect Tone Timeout

The trunking analyzer did not receive the connect tone in the time allowed. This could indicate a radio problem or an incorrect test type entered by the user.

Test Terminated by User

The user has halted the test prior to completion by pressing the Stop Test softkey, or by changing the mode of the trunking analyzer (e.g., entering calibration or standard mode).

Invalid ISW Call Type Received

The trunking analyzer did not receive the ISW call type expected for the selected test sequence. This could indicate a radio problem or incorrect input from the user such as test type, Fleet ID, etc.

High-Speed ACK Timeout

The trunking analyzer did not receive the High Speed Acknowledge tone in the time allowed (Trunk I signaling only.) This could indicate a radio problem or an incorrect test type entered by the user.

A-1.3 Trunking Analyzer Error Messages

The following errors are internal to the trunking analyzer, and require servicing by a trained field representative.

Invalid Opcode

Current Function Not Implemented

Unexpected ISW Type Received

Invalid Test Type

APPENDIX B

ISW CALL TYPE DESCRIPTION

B-1 TRUNK I SIGNALING TYPES

Code	Description
G1	5 Channel Subfleet Call Request
I1	20 Channel Level 1 Private Call Request
G2	20 Channel Subfleet Call Request
P2	Consolette Interconnect Request for Subfleet Call
P3	Centralized Phone Interconnect Request for Subfleet Call
Z1	Reserved for Data Channel Request
Z2	Reserved for SECURENET Channel request
E2	20 Channel Emergency Call Request
X	1st word code for Dual ISW Format
I2	Private Call Level II Request: 2nd word of Dual ISW
Y1	Dynamic Regrouping Request Command: 2nd word of Dual ISW
Y2	Reserved for additional messages: 2nd word of Dual ISW
P1	Individual Interconnect Request or Response
S	System Wide Request
Z3	Res. - Sys. Definable Call Type
R	Interconnect Reject Request
M0	Status or Message 0
M1	Status or Message 1
M2	Status or Message 2
M3	Status or Message 3
M4	Status or Message 4
M5	Status or Message 5
M6	Status or Message 6
M7	Status or Message 7
A	Individual Call Alert Command or Acknowledge
E1	Emergency Alarm Message or Acknowledge
M10	Status or Message 10
M11	Status or Message 11
M12	Status or Message 12
M13	Status or Message 13
M14	Status or Message 14
M15	Status or Message 15

B-2 TRUNK II SIGNALING CALL TYPES

Code	Description
G1	Steered Call Request (Reserved)
P1	Individual Interconnect Request
G2	20 Channel (affiliated) Group Call Request
P2	Centralized Interconnect Request For: Group_To_Land Call (reserved)
P3	Centralized Interconnect Request for: Subfleet Call
P4	Individual Interconnect; Mobile_Transpond Response
R	Interconnect Reject Request
Z7	2nd FIRST WORD CODE FOR DUAL ISWS Will be used to Multiplex Existing $08 Dual Words
X1	First Word Code for Dual ISW Format
I2	Private Call II Channel Request: 2nd word of Dual ISW
Y1	Dynamic Regrouping Command: 2nd word of Dual ISW
X2	Extended Function Command: 2nd word of Dual ISW
G3	Un-affiliated Group Call Request: 2nd word of Dual ISW
X3	Talk Group Association for Emergency Alarm
S1	DVP Enhanced PCII: 2nd word of Dual ISW
P5	Mobile_To_Land Subfleet Interconnect: 2nd word of Dual ISW
M1	Automatic Unit Affiliation: 2nd word of Dual ISW
Z2	Type II Messages
S2	DVP Individual Interconnect
S3	DVP (SBLT) Land-to-Mobile Interconnect (ICU comm.) (reserved)
S4	DVP Secure (SBLT) (affiliated): single word request
S5	DVP PC-II Enhanced Ring: 2nd word of Dual ISW
S6	Not Assigned
I1	PC II Enhanced Ring: 2nd word of Dual ISW
I3	PC II Enhanced Ring Acknowledge: 2nd word of Dual ISW
A1	Call Alert II - Enhanced Ring: 2nd word of Dual ISW
A2	Call Alert II - Enhanced Ring Acknowledge: 2nd word of Dual ISW
Z4	LINKNET Radio Registration: 2nd word of Dual ISW
Z5	Dispatcher Interrupt Ring: 2nd word of Dual ISW
Z6	Not Assigned
Z1	Super Word Identifier (used for variable id info): 2nd word of Dual ISW
Z3	Variable ID Registration: 2nd word of Dual ISW

B-2 TRUNK II SIGNALING CALL TYPES (cont)

Code	Description
TS1	Status 1
TS2	Status 2
TS3	Status 3
TS4	Status 4
TS5	Status 5
TS6	Status 6
TS7	Status 7
TS8	Status 8
TE1	Emergency Alarm
TDR	Dynamic reprogram request
TDI	ACK Dynamic ID assignment
X2	ACK Announcement talkgroup assignment.
CE	Clear-Voice Emergency Talkgroup
CP1	Clear-Voice Patched Talkgroups
CD	Unused, (Use to be Clear Data Talk Groups)
CEA	Clear-Voice Emergency Announcement Group
CP2	Clear-Voice Paging or AVL group
CVM	Clear-Voice MSEL group
SM	Coded Message Trunked Talkgroups
SA	Coded Announcement Talkgroups
SE	Coded Emergency
SP1	Coded Patched Talkgroups
SD	Unused (Use to be Secure-Voice Data)
SEA	Coded Emergency Announcement Group
SP2	Reserved for Coded Paging or AVL group
SVM	Coded MSEL group

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