



Radio Test Set IFR 2975

SmartNet™ /SmartZone™ Option Manual

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Issue-4

OPERATION MANUAL

SMARTNET™/SMARTZONE™ OPTION

IFR 2975

PUBLISHED BY
Aeroflex

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10200 West York / Wichita, Kansas 67215 U.S.A. / (316) 522-4981 / FAX (316) 524-2623

PREFACE

SCOPE

This manual contains information to install and operate information for the IFR 2975 SmartNet™/SmartZone™ Option. This manual is provided as an addition to the IFR 2975 Operation Manual.

Refer to the IFR 2975 Operation Manual for operational descriptions of items other than SmartNet™/SmartZone™.

ORGANIZATION

The SmartNet™/ SmartZone™ Option Manual is composed of the following sections:

SECTION 1 - DESCRIPTION

Contains general information regarding the 2975 SmartNet™/SmartZone™ functions, capabilities and descriptions.

SECTION 2 - OPERATION

Contains function descriptions explaining how to operate the 2975 SmartNet™/SmartZone™ Option.

SECTION 3 - APPLICATIONS

Contains procedures and descriptions for using the 2975 SmartNet™/SmartZone™ Option.

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SECTION 1 - DESCRIPTION

1-1 FUNCTIONS AND CAPABILITIES

The 2975 SmartNet™/SmartZone™ option provides powerful test features for SmartNet™/SmartZone™ radios and systems.

Included within the SmartNet™/SmartZone™ option is:

- the ability to emulate a repeater station operation (not locked to a specific "test sequence" for the radio);
- the ability to "find" and monitor a SmartNet™/SmartZone™ control channel and then "follow" the channel, the group or the individual unit;
- the ability to perform full analog (FM) parametric tests.

1-2 SMARTNET™/SMARTZONE™ SYSTEMS OVERVIEW

SMARTNET™

The SmartNet™ Systems are two-way trunked radio systems that are marketed by Motorola under the ASTRO name. The SmartZone™ Systems are simply a number of SmartNet™ Systems tied together allowing a larger system deployment.

Encrypted SmartNet™ systems are known as SecureNet Systems. All of these systems operate in a 25 kHz Channel BW (Conventional) or a 12.5 kHz BW (Narrowband).

The Motorola Type I Systems refer to the original Motorola Systems that were based on Fleets and Sub-Fleets. The Motorola Type I Systems are not scalable because they limit the amount of IDs any Fleet or Sub-Fleet can support.

The Motorola Type II Systems refer to the second generation Motorola Trunking Systems that replaced the Fleets and Sub-Fleets with the concept of talk groups and individual radio IDs. There are no dependencies on Fleet maps; therefore there are no limitations to the number of radio IDs that can participate on a talk group.

The Motorola Hybrid Systems have "blocks" of the system that are Type I Fleets / Sub-Fleets and Type II Talk Groups.

The following are characteristics of a Type II SmartNet™ System:

- Up to 28 System Channels
- Up to 65535 Unique Radio IDs
- Up to 4000 Talk Groups
- APCO 16 Compliant

SMARTZONE™

The SmartZone™ Systems are SmartNet™ Type II Systems that are networked together via a Microwave or Land-Line to provide multi-site wide area communications. Radios affiliate with a particular site and also affiliate with a talk group. This allows a radio to talk on a talk group with other radios at other sites.

Many large public safety and state agencies use the SmartZone™ System for wide area communications.

The following are characteristics of a Motorola SmartZone™ System:

- Up to 28 Channels per Site
- Up to 65535 Unique Radio IDs
- Up to 48 Sites
- Analog and/or Digital Voice Traffic Channels
- APCO 16 Compliant

OMNILINK

The SmartZone™ OmniLink provides a broad range of system features and utilizes a distributed call processing architecture that links up to four multi-site SmartZone™ Systems together into one network, supporting up to 192 sites.

ASTRO

ASTRO is the trademark name for Motorola's Digital Communications Solution. The original Motorola ASTRO implementation has a SmartZone™ 3600-baud data channel, and the digital voice solution is based on a proprietary vocoder (voice coder/decoder). There are other variants of the ASTRO system, including ASTRO-25.

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SECTION 2 - OPERATION

The 2975 SmartNet™/SmartZone™ Option operates within the 2975 to provide new protocol and test capabilities.

Refer to the 2975 Operation Manual for details regarding general operation of the 2975.

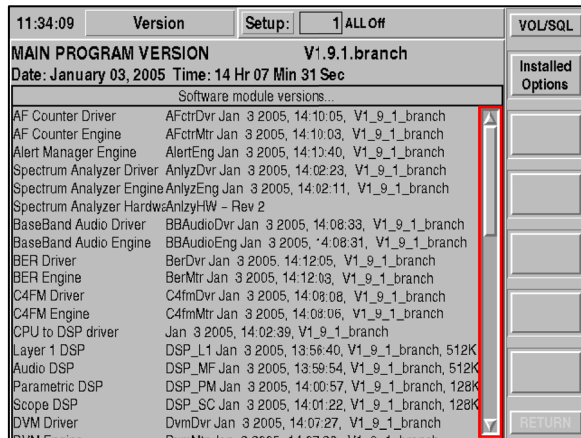
2-1 SMARTNET™/SMARTZONE™ OPTION SETUP

CHECKING SMARTNET™/SMARTZONE™ OPTION INSTALLATION

The 2975 Option Control System permits addition of new software options and for checking the status of the installed options.

The SmartNet™/SmartZone™ Option may be installed at the factory, or it may be customer-installed in the 2975 only with Software Versions 1.4.0 and on.

To check whether the SmartNet™/SmartZone™ Option is installed in the 2975, select the **VERSION** screen [**MODE**], [**7**], [**3**]) and then press the **Installed Options** Soft Key to go to the **Installed Options** screen.



Version	Setup:	1 ALL OFF	VOL/SQL
MAIN PROGRAM VERSION V1.9.1.branch			
Date: January 03, 2005 Time: 14 Hr 07 Min 31 Sec			
Software module versions...			
AF Counter Driver	AFctrDvr Jan 3 2005, 14:10:05, V1_9_1_branch		
AF Counter Engine	AFctrMtr Jan 3 2005, 14:10:03, V1_9_1_branch		
Alert Manager Engine	AlertEng Jan 3 2005, 14:13:40, V1_9_1_branch		
Spectrum Analyzer Driver	AnlyzDvr Jan 3 2005, 14:02:23, V1_9_1_branch		
Spectrum Analyzer Engine	AnlyzEng Jan 3 2005, 14:02:11, V1_9_1_branch		
Spectrum Analyzer Hardware	AnlyzHW - Rev 2		
BaseBand Audio Driver	BBAudioDvr Jan 3 2005, 14:08:33, V1_9_1_branch		
BaseBand Audio Engine	BBAudioEng Jan 3 2005, 14:08:31, V1_9_1_branch		
BER Driver	BerDvr Jan 3 2005, 14:12:05, V1_9_1_branch		
BER Engine	BerMtr Jan 3 2005, 14:12:03, V1_9_1_branch		
C4FM Driver	C4fmDvr Jan 3 2005, 14:08:08, V1_9_1_branch		
C4FM Engine	C4fmMtr Jan 3 2005, 14:08:06, V1_9_1_branch		
CPU to DSP driver	Jan 3 2005, 14:02:39, V1_9_1_branch		
Layer 1 DSP	DSP_L1 Jan 3 2005, 13:56:40, V1_9_1_branch, 512K		
Audio DSP	DSP_MF Jan 3 2005, 13:59:54, V1_9_1_branch, 512K		
Parametric DSP	DSP_PM Jan 3 2005, 14:00:57, V1_9_1_branch, 128K		
Scope DSP	DSP_SC Jan 3 2005, 14:01:22, V1_9_1_branch, 128K		
DVM Driver	DvmDvr Jan 3 2005, 14:07:27, V1_9_1_branch		
DVM Engine	DvmMtr Jan 3 2005, 14:07:25, V1_9_1_branch		

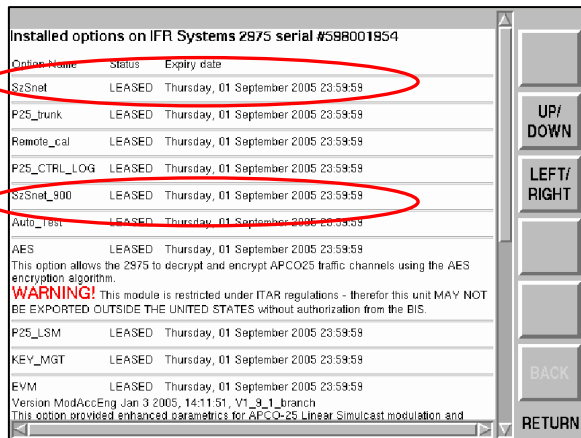
The **Installed Options** screen shows the 2975 serial number and the options that are installed.

If the SmartNet™/SmartZone™ Option Status displays **ENABLED** or **LEASED**, the option is installed and the 2975 is set up and ready to use.

If the SmartNet™/SmartZone™ Option (**SzSnet**) is **NOT** listed or is **NOT** shown as **ENABLED**, the option is not installed.

To install the SmartNet™/SmartZone™ Option, proceed to the next section, "INSTALLING SMARTNET™/ SMARTZONE™ OPTION."

If you wish to purchase the SmartNet™/SmartZone™ Option, contact information is shown in **APPENDIX B**.



Option Name	Status	Expiry date
SzSnet	LEASED	Thursday, 01 September 2005 23:59:59
P25_trunk	LEASED	Thursday, 01 September 2005 23:59:59
Remote_cal	LEASED	Thursday, 01 September 2005 23:59:59
P25_CTRL_LOG	LEASED	Thursday, 01 September 2005 23:59:59
SzSnet_800	LEASED	Thursday, 01 September 2005 23:59:59
Auto_Test	LEASED	Thursday, 01 September 2005 23:59:59
AES	LEASED	Thursday, 01 September 2005 23:59:59
WARNING! This module is restricted under ITAR regulations - therefore this unit MAY NOT BE EXPORTED OUTSIDE THE UNITED STATES without authorization from the BIS.		
P25_LSM	LEASED	Thursday, 01 September 2005 23:59:59
KEY_MGT	LEASED	Thursday, 01 September 2005 23:59:59
EVM	LEASED	Thursday, 01 September 2005 23:59:59
Version ModAccEng Jan 3 2005, 14:11:51, V1_9_1_branch		
This option provided enhanced parameters for APCO-25 Linear Simulcast modulation and		

INSTALLING SMARTNET™/SMARTZONE™ OPTION

If you have received the SmartNet™/SmartZone™ Option from Aeroflex, you will need to install the option into the 2975 before it is accessible.

If the SmartNet™/SmartZone™ Option is already installed, you may skip this section.

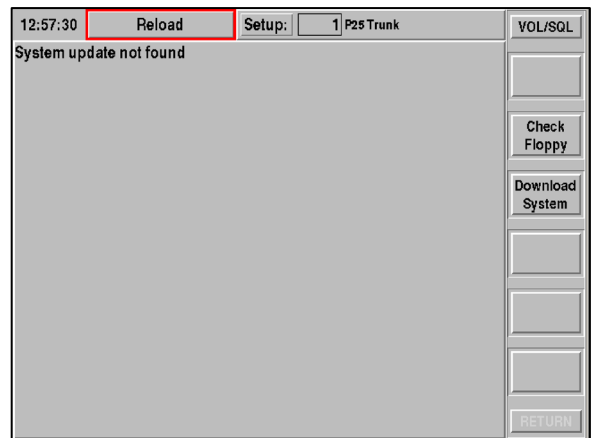
For customers who have 2975 Software Version 1.4.0 and on, the 2975 SmartNet™/ SmartZone™ Option File ("options.new") is distributed by Aeroflex via email, floppy disk or CD-ROM.

The SmartNet™/SmartZone™ Option File ("options.new") must be placed onto a blank, formatted floppy disk (if received by email or CD-ROM) for installation into the 2975. Use a PC to copy the file onto a blank floppy disk.

The SmartNet™/SmartZone™ Option File ("options.new") is 2975 serial number specific, so label the disk (if not already labeled) for the particular 9-digit serial number for which it is made and **KEEP IT IN A SAFE PLACE.**

OPTION INSTALLATION:

1. Power ON the 2975.
2. After the 2975 has booted, press **[MODE]**, **[7]** and **[4]** to display the RELOAD screen.
3. Insert the SmartNet™/SmartZone™ Option floppy disk for this 2975 (serial number specific) into the floppy drive.
4. Press the **CHECK FLOPPY** Soft Key.
5. The floppy disk is accessed and the **INSTALL OPTION FILE** Soft Key appears. Press the **INSTALL OPTION FILE** Soft Key.
6. When the red warning screen appears, press the **START INSTALL** Soft Key.
7. When installation is completed and the 2975 has been rebooted, go to the **VERSION** screen (**[MODE]**, **[7]** and **[3]**) to verify the SmartNet™/ SmartZone™ Option is installed. Press the **INSTALLED OPTIONS** Soft Key to verify the SmartNet™/SmartZone™ Option is **ENABLED**.



Installation of the SmartNet™/SmartZone™ Option is only required once - it does not need to be reinstalled each time the system is upgrade with a new software.

2-2 SMARTNET™/SMARTZONE™ OPERATION MODES

SELECTING SMARTNET™/SMARTZONE™ OPTION

The SmartNet™/SmartZone™ Option is accessed on the 2975 Duplex screen ([MODE] and [3]) or User screen ([MODE] and [0]).

The Duplex Option selections show the SmartNet™/SmartZone™ Options:

SN/SZ Repeater Sim

SmartNet™/SmartZone™ Repeater Simulator

SN/SZ Scanner

Intelligent SmartNet™/SmartZone™ Scanner

The screenshot shows the 'Duplex' screen at 11:58:22. The 'Options' menu is open, displaying a list of functions such as 'Accept Options', 'Oscilloscope', 'Spectrum Analyzer', 'SINAD', 'Distortion', 'AF Counter', 'DVM', 'Modulation Meter', 'Power', 'RSSI', 'RF Error', 'BER Meter', 'Meter Panel', 'Function Generators', 'P 25 Uplink Data', 'RETURN', 'P 25 Downlink Data', 'Tone Signal Decode', 'Audio Analyzer', 'P 25 Repeater Sim', 'P 25 Logger', 'SN/SZ Repeater Sim', 'SN/SZ Scanner', 'I-Q Plot', 'EVM Data', 'LTR Repeater Sim', 'LTR Radio Sim', 'LTR Monitor', 'PASSPORT Repeater Sim', 'PASSPORT Radio Sim', and 'Escape'. The 'SN/SZ Scanner' option is highlighted with a red box. The 'FREQ' field shows 806.318750 MHz, and the 'REC'D' field shows 806.318750 MHz. The 'INPUT' field is set to T/R, and the 'DEMOM' field is set to P25. The 'RF GEN' field is set to ON, and the 'AUDIO' field is set to AUDIO. The 'SN/SZ CONTROL CHANNEL' field is set to OFF. The 'BAND' field is set to 800, and the 'CC' field is set to 2. The 'VC' field is set to 50. The 'CONNECT TONE' field is set to 105, and the 'TX DEVIATION' field is set to 3200 Hz. The 'SYSTEM ID' field is set to 734, and the 'GROUP ID' field is set to 0. The 'UNIT ID' field is set to 0, and the 'HEX' field is set to 0. The 'VOICE CHANNEL' field is set to ACTIVE, and the 'CHN' field is set to 50. The 'LSD' field is set to 0, and the 'IND ID' field is set to 0. The 'BAUD' field is set to 0, and the 'TBITS (bin)' field is set to 0000. The 'INPUT PORT' field is set to RETURN.

Each SmartNet™/SmartZone™ screen tile occupies one-fourth of the total screen space.

This permits one or two of SmartNet™/SmartZone™ functions to be on-screen simultaneously, as the Duplex screen always has the Receiver (Tx Test) and Generator (Rx Test) screens present.

The screenshot shows the 'Duplex' screen at 11:56:43. The 'Options' menu is open, displaying a list of functions such as 'Accept Options', 'Oscilloscope', 'Spectrum Analyzer', 'SINAD', 'Distortion', 'AF Counter', 'DVM', 'Modulation Meter', 'Power', 'RSSI', 'RF Error', 'BER Meter', 'Meter Panel', 'Function Generators', 'P 25 Uplink Data', 'RETURN', 'P 25 Downlink Data', 'Tone Signal Decode', 'Audio Analyzer', 'P 25 Repeater Sim', 'P 25 Logger', 'SN/SZ Repeater Sim', 'SN/SZ Scanner', 'I-Q Plot', 'EVM Data', 'LTR Repeater Sim', 'LTR Radio Sim', 'LTR Monitor', 'PASSPORT Repeater Sim', 'PASSPORT Radio Sim', and 'Escape'. The 'SN/SZ Scanner' option is highlighted with a red box. The 'FREQ' field shows 806.318750 MHz, and the 'REC'D' field shows 806.318750 MHz. The 'INPUT' field is set to T/R, and the 'DEMOM' field is set to P25. The 'RF GEN' field is set to ON, and the 'AUDIO' field is set to AUDIO. The 'SN/SZ CONTROL CHANNEL' field is set to OFF. The 'BAND' field is set to 800, and the 'CC' field is set to 2. The 'VC' field is set to 50. The 'CONNECT TONE' field is set to 105, and the 'TX DEVIATION' field is set to 3200 Hz. The 'SYSTEM ID' field is set to 734, and the 'GROUP ID' field is set to 0. The 'UNIT ID' field is set to 0, and the 'HEX' field is set to 0. The 'VOICE CHANNEL' field is set to ACTIVE, and the 'CHN' field is set to 50. The 'LSD' field is set to 0, and the 'IND ID' field is set to 0. The 'BAUD' field is set to 0, and the 'TBITS (bin)' field is set to 0000. The 'INPUT PORT' field is set to RETURN.

SMARTNET™/SMARTZONE™ REPEATER SIMULATOR

The SmartNet™/SmartZone™ Repeater Simulator screen displays current Control Channel parameters, and permits these parameters to be changed for the specific radio system being tested.

The 2975 uses these settings and controls while simulating the base station repeater.

SN/SZ CONTROL CHANNEL OFF

BAND 800 PTT OFF

CC 2 851.0625 MHz PTT REC

VC 50 852.2625 MHz AFF REC

ANALOG

CONNECT TONE 105 AFFIL

TX DEVIATION 3200 Hz WIDE

SYSTEM ID GROUP ID UNIT ID

734 0 0 HEX

FIELD DEFINITIONS

ON/OFF

This toggle button selects and displays the **ON / OFF** state of the repeater simulation.

BAND

This button selects and displays the user defined SmartNet™ /SmartZone™ frequency band of operation. Available selections are **800 MHz**, **800 MHz Splinter**, **900 MHz**, **VHF / UHF**, or **USER**.

PTT ON/OFF

This button is the push-to-talk **ON/OFF** used to start/stop a system initiated call during voice channel repeater simulation. This button is disabled during mobile initiated calls. The PTT button on the optional microphone may also be used.

PTT REC

When the push-to-talk button on the radio is pressed the Simulator receives a request for voice channel message from the mobile. During this process this indicator turns **GREEN** and remains **GREEN** until the radio's push-to-talk button is released. This button is **GRAY** for Simulator initiated calls or when the Simulator is idle.

AFF REC

This indicator turns **GREEN** when the Simulator receives a mobile affiliated call. After 5 seconds the indicator changes back to **GRAY**.

ANALOG / DIGITAL

This button selects the **ANALOG** (SmartNet™/SmartZone™) or **DIGITAL** (P25) choice of voice traffic channels for the Simulator. The fields displayed on the user screen change depending on the voice channel mode selected.

CONNECT TONE

This button displays the connect tone for the voice channel. User may select a value from the drop-down menu to select the frequency value of the analog voice channel connect tone. This field is not displayed when digital voice channel mode is selected. The received connect tone value is displayed in the field next to the right.

TX DEVIATION

This button displays the transmit deviation of the control channel. User may edit field to define this value. The following three bands are available:

- **NARROW** 900 to 1500 Hz
- **MEDIUM** 2100 to 2700 Hz
- **WIDE** 2750 to 3500 Hz

NAC

This field displays the NAC value decoded from the last Uplink message received from the mobile. The user can click on the **SET DOWNLINK DATA** button to set the downlink digital channel NAC field. This field is only displayed when digital voice channel mode is selected.

MFID

This field displays the MFID value decoded from the last Uplink message received from the mobile. The user can click on the **SET DOWNLINK DATA** button to set the downlink digital channel MFID field. This field is only displayed when digital voice channel mode is selected.

SN/SZ CONTROL CHANNEL		ON
BAND	VHF/UHF	CONFIG
CCTx	380	403.0000 MHz
CCRx	0	404.0000 MHz
VCTx	390	403.2500 MHz
VCRx	10	404.2500 MHz
NAC	000	MFID 00
SET DOWNLINK DATA		AFFIL <input type="checkbox"/>
SYSTEM ID	GROUP ID	UNIT ID
734	0	1
HEX		

SET DOWNLINK DATA

Sets the Downlink digital voice channel NAC and MFID to the NAC and MFID currently being displayed in these fields. This field is only displayed when digital voice channel mode is selected.

CC

This field indicates the Control Channel selected by user for the repeater simulation. The frequency that corresponds to the selected Control Channel's transmit frequency is shown in the display only field located next to the CC field. This field is only displayed when 800 or 900 MHz bands are selected.

CCTx

This field displays the transmit control channel number of the Simulator. The user can enter a value into this field to define the transmit control channel. The display only field located to the right of the CCTx field indicates the frequency value of the channel number. This field is only displayed when VHF / UHF band is selected.

CCRx

This field displays the receive control channel number of the Simulator. The user can enter a value into this field to define the receive control channel. The display only field located to the right of the CCRx field indicates the frequency value of the channel number. This field is only displayed when VHF / UHF band is selected.

VC

This field indicates the Voice Channel selected by the user for the repeater simulation. The frequency that corresponds to the selected Voice Channel's transmit frequency is shown in the display only field located next to the VC field. This field is only displayed when 800 or 900 MHz bands are selected.

VCTx

This field displays the transmit voice channel number of the Simulator. The user can enter a value into this field to define the destination transmit voice channel. The display only field located to the right of the VCTx field indicates the frequency value of the channel number. This field is only displayed when VHF / UHF band is selected.

VCRx

This field displays the receive voice channel number of the Simulator. The user can enter a value into this field to define the destination receive voice channel. The display only field located to the right of the VCRx field indicates the frequency value of the channel number. This field is only displayed when VHF / UHF band is selected.

AFFIL

This toggle button enables the affiliation bit in the 2975's transmitted outbound status word. The affiliation bit instructs the radio to send an affiliated request when it is first turned on and locates the control channel.

GREEN indicates that the affiliation request mode of the control channel is ON. Some radios may require this bit to be set in order to affiliate. **GREY** indicates that the affiliation request mode of the control channel is OFF.

SYSTEM ID

This field sets the System Identification Number used by the repeater simulator to establish a call. The value is displayed in decimal or hexadecimal format as selected with the HEX / DEC toggle button.

GROUP ID

This field indicates the Group Identification Number used by the Simulator analog control channel and the TGID value for the digital voice channel data stream. This field also displays the Group Identification Number from an affiliation or radio initiated call. User may edit field to define this value. The field is updated when the Simulator receives a mobile initiated call.

UNIT ID

This field indicates the Unit Identification Number for the Simulator analog control channel. This field also displays the Unit Identification Number from an affiliation or radio initiated call. User may edit field to define this value. The field is updated when the Simulator receives a mobile initiated call.

HEX / DEC

This toggle button selects **HEX** (hexadecimal) or **DEC** (decimal) for the SYSTEM ID, GROUP ID or UNIT ID fields.

CONFIG

The **CONFIG** button opens the **VHF / UHF CONFIGURATION** screen, enabling the user to configure the START, STOP and SPACE of the VHF / UHF frequency table. This button is only available when **VHF / UHF** band has been selected.

The screenshot shows a control interface with the following elements:

- SN/SZ CONTROL CHANNEL**: A toggle button set to **OFF**.
- BAND**: A dropdown menu showing **800**.
- CC**: A text input field containing **2**, which is highlighted with a red rectangle. To its right is a frequency display showing **851.0625 MHz**.
- VC**: A text input field containing **50**. To its right is a frequency display showing **852.2625 MHz**.
- PTT OFF**, **PTT REC**, and **AFF REC**: Three buttons stacked vertically on the right side.
- ANALOG**: A button located below the VC frequency display.
- CONNECT TONE**: A dropdown menu showing **105**.
- AFFIL**: A checkbox that is currently unchecked.
- TX DEVIATION**: A dropdown menu showing **3200**.
- Hz** and **WIDE**: Two buttons located below the TX DEVIATION dropdown.
- SYSTEM ID**, **GROUP ID**, and **UNIT ID**: Three text input fields. The first contains **734**, the second contains **0**, and the third contains **0**.
- HEX**: A toggle button located to the right of the UNIT ID field.

SMARTNET™/SMARTZONE™ SCANNER

The SmartNet™/SmartZone™ Scanner is a powerful tool used for finding and tracing radio traffic in the radio system. The SmartNet™/SmartZone™ Scanner is set up with channel and system values which then starts to scan according to the setup values. Whenever radio traffic occurs, the Scanner follows the radio traffic as it is assigned and transferred within the system.

The radio traffic audio is available at the speaker for monitoring purposes.

FIELD DEFINITIONS

ON/OFF

This toggle button is the master ON / OFF control for the Scanner function.

FOLLOW

This field displays the FOLLOW mode of the scanner. Available FOLLOW modes are:

CONTROL CHANNEL follows any conversation.

GROUP ID only follows conversations for the specified Group ID.

UNIT ID only follows conversations for the specified radio.

BAND

This field displays the Scanner's trunking system frequency band setting. User selections are **800 MHz**, **800 MHz Splinter** and **VHF / UHF**.

CONFIG

The **CONFIG** button opens the VHF / UHF CONFIGURATION screen, enabling the user to configure the START, STOP and SPACE of the VHF / UHF frequency table. This button is only available when VHF / UHF band has been selected.

LIST

This button displays a list of control channels identified during a FIND procedure. "NONE" is displayed when no control channels are found. The field to the right of the **LIST** button indicates the Scanner's current control channel setting. Users may select a control channel from the list or enter a value in the field to define the control channel. This field is only present with CONTROL CHANNEL FOLLOW mode is selected.

SYS ID

This field displays the System Identification Number used by the Scanner. The field is always displayed in hexadecimal and can not be edited by user. This field is only present with CONTROL CHANNEL FOLLOW mode is selected.

GRP ID

Displays the current Group ID used by Scanner to monitor voice channel activity. User may edit field to define this value. This field is only present when GROUP ID FOLLOW mode is selected.

UNIT ID

This field displays the present Unit ID used by Scanner to monitor voice channel activity. User may edit field to define this value. This field is only present when UNIT ID FOLLOW mode is selected.

CLEAR

This button **CLEAR**S the Scanner List (reset) of control channels. This field is only present with **CONTROL CHANNEL FOLLOW** mode is selected.

FIND

This toggle button activates the **FIND** feature that **STARTS / STOPS** the scanning for control channels. Control channels identified during the **FIND** procedure are added to the **LIST** menu. This field is only present with **CONTROL CHANNEL FOLLOW** mode is selected.

START

This field displays the **START** channel number used for scanning by the **FIND** procedure. User may edit field to define this value. This field is only present with **CONTROL CHANNEL FOLLOW** mode is selected.

STOP

This field displays the **STOP** channel number used for scanning by the **FIND** procedure. User may edit field to define this value. This field is only present with **CONTROL CHANNEL FOLLOW** mode is selected.

VOICE CHANNEL ACTIVE

This indicator turns **GREEN** whenever a Voice channel is active (transmitting) during the Follow process.

CHAN

This field is the Voice **CHANNEL** number currently being monitored.

LSD

This field is the Low Speed Data value of the current channel being monitored.

BAUD

This field is the baud rate for the current channel being monitored.

TALK GRP

This field is the Talk Group Identification of the current channel being monitored.

IND ID

This field is the individual ID of the radio under test. Also known as Unit ID.

T-BITS

This field shows the T-Bits that are used in the **OSW** to select the site's connect tone and wide/narrow information or to convey other information depending on the **OSW's** command code.

VHF / UHF CONTROL CHANNEL CONFIGURATION

The VHF / UHF Configuration screen allows users to configure the frequency START, STOP and SPACE values to create a channel / frequency table.

FIELD DEFINITIONS

UUT Rx START

This field displays the start receive frequency for the channel / frequency table. User may edit field to define this value.

UUT Rx STOP

This field displays the stop receive frequency for the channel / frequency table. User may edit field to define this value.

UUT Rx SPACE

This field displays the receive frequency spacing for the channel / frequency table. User may edit field to define this value.

UUT Tx START

This field displays the start transmit frequency for the channel / frequency table. User may edit field to define this value.

UUT Tx STOP

This field displays the stop transmit frequency for the channel / frequency table. User may edit field to define this value.

UUT Tx SPACE

This field displays the transmit frequency spacing for the channel / frequency table. User may edit field to define this value.

RESTORE DEFAULTS

Selecting this button sets configuration values for all channels back to their predefined values.

CLOSE

Selecting this button closes the VHF / UHF Configuration screen and returns to the SN/SZ Control Channel screen.

SN/SZ CONTROL CHANNEL ☐ ON

BAND **VHF/UHF** CONFIG ☐ PTT OFF

CCTx MHz PTT REC

CCRx MHz AFF REC

VCTx MHz DIGITAL

VCRx MHz

NAC MFID AFFIL ☐

SYSTEM ID GROUP ID UNIT ID

		CHANNELS		
BLOCK		START (MHz)	STOP (MHz)	SPACE (KHz)
1	UUT Rx	403.0000	406.1500	25.0000
	UUT Tx	404.0000	407.1500	25.0000
2	UUT Rx	406.1750	409.3250	25.0000
	UUT Tx	407.1750	410.3250	25.0000
3	UUT Rx	409.3500	412.4750	25.0000
	UUT Tx	410.3500	413.4750	25.0000
RESTORE DEFAULTS		CLOSE		

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SECTION 3 - APPLICATIONS

This section shows a few of the many ways to use the 2975 SmartNet™/SmartZone™ Option.

3-1 CONTROL AND VOICE CHANNELS

To begin testing SmartNet™/SmartZone™ Systems the control and voice channel must first be configured.

To enable the Repeater Simulator, click the **OPTION** key or press the **[SHIFT]** and **[MODE]** Keys and then select **SN/SZ Repeater Sim.**

This particular selection allows user to enter valid control and voice channel parameters. If these parameters are not known, find the control channel for a particular area by monitoring it off the air with the **SN/SZ Scanner**, and then use the information retrieved from system found.

11:58:22 Duplex Options Setup: 99 Fast Def VOL/SOL

FREQ 806.318750 M

REC'D 806.318750 M

INPUT T/R ATTN

DEMOM P25 IF BW

RF GEN ON AUDIO

SN/SZ CONTROL CHANNEL

BAND 800

CC 2 851.0625 MHz

VC 50 852.2625 MHz

CONNECT TONE 105 AFFIL

TX DEVIATION 3200 Hz WIDE

SYSTEM ID GROUP ID UNIT ID

734 0 0 HEX

Accept Options RETURN P 25 Downlink Data 14

Oscilloscope 00 Tone Signal Decode 15

Spectrum Analyzer 01 Audio Analyzer 16

SINAD 02 P 25 Repeater Sim 17

Distortion 03 P 25 Logger 18

AF Counter 04 SN/SZ Repeater Sim 19

DVM 05 SN/SZ Scanner 20

Modulation Meter 06 I-Q Plot 21

Power 07 EVM Data 22

RSSI 08 LTR Repeater Sim 23

RF Error 09 LTR Radio Sim 24

BER Meter 10 LTR Monitor 25

Meter Panel 11 PASSPORT Repeater Sim 26

Function Generators 12 PASSPORT Radio Sim 27

P 25 Uplink Data 13 Escape ESC

LIST 2 SYS ID CLEAR

FIND START 300 STOP 400

VOICE CHANNEL ACTIVE

CHAN 50 TALK GRP 0

LSD 0 IND ID 0

BAUD 0 TBITS (bin) 0000

RETURN

Next, set up the proper control and voice channel numbers.

For **800 MHz** or **800 MHz Splinter** band operation, the channels are defined with a set frequency assignment. The duplex offset is also standard at 45 MHz. Enter the proper channel number or frequency in the **CC** (Control Channel) and **VC** (Voice Channel) data fields.

For **VHF / UHF** band operation, the Transmit and Receive parameters must be defined. This utilizes a concept of an "open" band. This band can be configured to any frequency.

The only restriction is that the Rx channel (down link) always starts at 380 and goes up to 759. The corresponding Tx channels range from 0 to 379. The offset is entirely user defined. The screen to the right shows the **VHF / UHF** control channel screen enabled.

02:56:15 Duplex Options Setup: 1 STD 511 VOL/SOL

FREQ 404.000000 MHz SQU

REC'D 403.803079 MHz

INPUT T/R ATTN 0 dB

DEMOM FM IF BW 60kHz

NO FILTER

RF GEN ON AUDIO ROUTE

SN/SZ CONTROL CHANNEL ON

BAND VHF/UHF CONFIG PTT OFF

CCTX 380 403.00000 MHz PTT REC

CCRx 0 404.00000 MHz AFF REC

VCTX 390 403.25000 MHz ANALOG

VCRx 10 404.25000 MHz

CONNECT TONE 105 AFFIL

TX DEVIATION 3200 Hz WIDE

SYSTEM ID GROUP ID UNIT ID

734 1 1 HEX

RETURN

RF FREQ

RF LEVEL

MOD TYPE

M1 OFF

M2 OFF

MIC OFF RX: OFF

AUDIO OFF AUDIO ROUTE

dBm ANLZR SPAN 50 kHz

20.0

10.0

0.0

-10.0

-20.0

-30.0

-40.0

-50.0

-60.0

The screen to the right shows the Channel configuration settings for three particular frequency blocks. Selecting the **CONFIG** Button on the VHF / UHF Repeater screen, when the band selected is VHF / UHF, calls up this screen.

With this screen, users may set up the channel start and stop frequencies for the various blocks within the allocated spectrum. Not all blocks need to be used. Three blocks are provided so the user may have split bands. These settings must match the channel programming of the radio under test.

Control and voice channels are designated within the defined frequency ranges. Once this configuration is setup, the appropriate control and voice channel information may be entered.

For both analog and digital operation, a valid system ID and appropriate group ID for the network that the mobile is accessing are required.

This is the minimum configuration for testing the mobile unit. The 2975 automatically decodes the Group ID from the mobile when a radio affiliates with the 2975, but user must provide the System ID. Additionally, user can add the mobile unit ID, however this is not required. This information can be entered in either hexadecimal or decimal.

Before performing a radio initiated call in the ANALOG Mode, the **CONNECT TONE** must be set up for analog operation. The **CONNECT TONE** is the low frequency tone that is broadcast by the radio during a radio initiated call.

Once the mobile verifies the **LSD** and the repeater sees the **CONNECT TONE**, the repeater and the mobile can carry on a conversation.

Another feature is the Affiliation Enable Mode.

By enabling the affiliation button (enabled by clicking on the box next to **AFFIL**, which turns **GREEN**), the mobile is requested to affiliate with the 2975.

The 2975 sets the affiliation status bit in the control channel information being sent to the mobile. When the mobile first accesses the control channel, whether because it was just turned on or because it just located the control channel, it sends a two word **ISW** that includes the individual ID and Talk Group ID and information.

The 2975 responds to the mobile with the same information (acknowledge), along with **CONNECT TONE** select information supplied in the T-Bit portion of the Response message.

When the control channel is configured, the control channel may be enabled by selecting the **ON / OFF** Button on the Repeater Simulator screen.

CHANNELS			
BLOCK		START (MHz)	STOP (MHz)
1	UUT Rx	403.0000	406.1500
	UUT Tx	404.0000	407.1500
2	UUT Rx	406.1750	409.3250
	UUT Tx	407.1750	410.3250
3	UUT Rx	409.3500	412.4750
	UUT Tx	410.3500	413.4750

RESTORE DEFAULTS CLOSE

SN/SZ CONTROL CHANNEL		ON
BAND	VHF/UHF	CONFIG
CCTx	380	403.0000 MHz
CCRx	0	404.0000 MHz
VCTx	390	403.2500 MHz
VCRx	10	404.2500 MHz
CONNECT TONE	105	AFFIL
TX DEVIATION	105 0	WIDE
SYSTEM ID	GR 76 1	NIT ID 0 HEX

SN/SZ CONTROL CHANNEL		ON
BAND	VHF/UHF	CONFIG
CCTx	380	403.0000 MHz
CCRx	0	404.0000 MHz
VCTx	390	403.2500 MHz
VCRx	10	404.2500 MHz
CONNECT TONE	105	AFFIL
TX DEVIATION	3200 Hz	WIDE
SYSTEM ID	GROUP ID	UNIT ID
734	0	0 HEX

The 2975 provides the ability to set the TX deviation of the control channel for either analog or digital mode. The 2975 allows for complete user control of the deviation; however only three modes are shown:

- **NARROW:** 900 to 1500 Hz
- **MEDIUM:** 2100 to 2700 Hz
- **WIDE:** 2750 to 3500 Hz

To access the deviation setting, select the analog mode of operation. The TX Deviation field is displayed. The TX Deviation button is used to select between **DEFAULT** (3125 Hz) and **Escape**, which keeps the entered deviation in the field when using the 2975.

The screenshot shows the 2975 control interface. The 'TX DEVIATION' field is set to 3200 Hz. The 'MODE' field is set to ANALOG. A red arrow points to the 'TX DEVIATION' field.

The 2975 generates a control channel with the **System ID** and **Group ID** information. The voice channel is configured with the **Group ID** or **Unit ID** in the LSD.

A mobile-originated call or a repeater-originated (user or dispatch originated) call may be accomplished.

To perform mobile radio transmitter tests, simply key the mobile unit and the 2975 automatically assigns the unit to the proper voice channel for performing parametric measurements.

The screenshot shows the 2975 control interface. The 'TX DEVIATION' field is set to 3200 Hz. The 'MODE' field is set to ANALOG. A red circle highlights the 'TX DEVIATION' field.

The 2975 SmartNet™/SmartZone™ option also allows for **800 MHz** band operation.

As with **VHF/UHF** operation, the proper **System ID** and **Group ID** need to be entered before the unit can operate with the 2975.

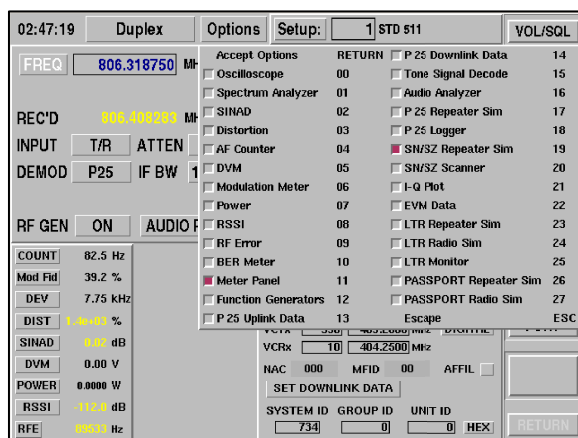
The **800 MHz** band is easier to set up, since the offset and channels are already associated by definition.

The screenshot shows the 2975 control interface. The 'TX DEVIATION' field is set to 3125 Hz. The 'MODE' field is set to ANALOG. A red circle highlights the 'TX DEVIATION' field.

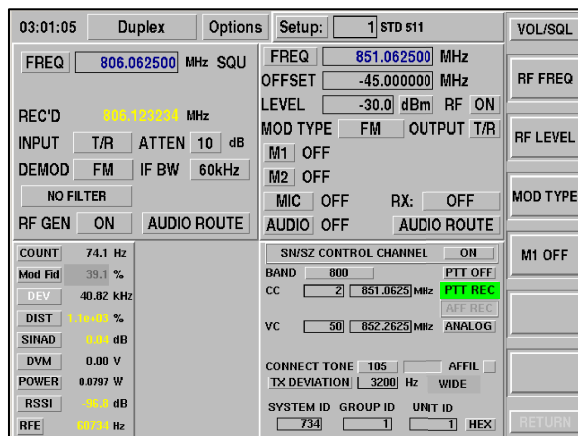
Once the control channel is set up and running, and the mobile is communicating with the 2975, any number of functions may be selected to run in conjunction with the simulator. This includes the Oscilloscope, Spectrum Analyzer, Meter Panel, Power Meter, RSSI Meter and other instruments.

For example, to review transmitter performance, select **Receiver (Tx Test)** mode and enable the Spectrum Analyzer, Modulation Meter, Power Meter, RF Frequency Error Meter and Function Generators from the **Receiver (Tx Test) Options** menu.

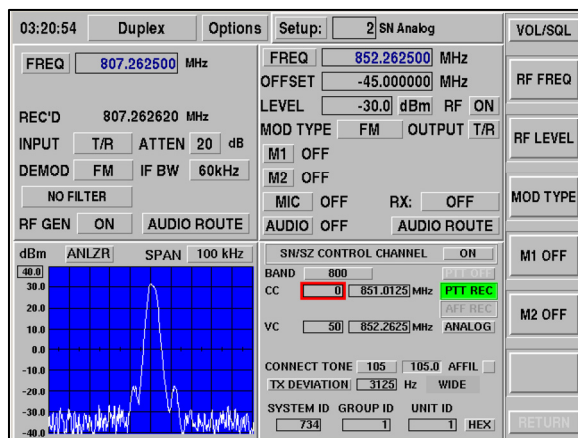
To enable these functions, select the **OPTIONS** Button or select **[SHIFT]**, **[MODE]** and select the desired instruments from the menu.



Enable the **METER PANEL** to view multiple instruments simultaneously. Other combinations of displays, such as Spectrum Analyzer operation may be used as well.



To perform mobile receiver measurements, enable the system initiated mode by selecting the **PTT** Button on the SN/SZ Control Channel screen or use the PTT button on the optional microphone if it is being used. This action causes a repeater originated call request to be sent to the mobile and the mobile is assigned to a voice channel in a "listen" (receive) mode, permitting additional tests to be performed. If desired, use the **OPTIONS** menu to enable the Spectrum Analyzer as shown in the example screen to the right.



3-2 SMARTNET™/SMARTZONE™ - P25 TRAFFIC CHANNEL INTEROPERATION

The 2975 permits unique tests for SmartNet™/SmartZone™ systems that allow P25 Traffic Channel Interoperation with conventional FM SmartNet™/SmartZone™ systems.

Included within the SmartNet™/SmartZone™ Option is the ability to select the digital (P25) voice traffic channel. Be aware that a valid **System ID** is required.

A test unique to P25 is the Mod Fidelity Meter and the use of speech patterns for P25 digital mode. The Mod Fidelity Meter shows the FSK error of the desired C4FM signal.

The 2975 receiver requires a few additional setup parameters.

The two setup parameters that the mobile requires to support the call are the **NAC** (Network Access Code) and the **MFID** (Manufacturer ID).

If you do not know the **NAC** and **MFID**, then you can use the 2975 to display these parameters easily. Simply key the mobile and the 2975 decodes this information from the mobile.

When the P25 downlink screen is active, a unique receiver sensitivity test called the **SPEECH** mode may be used.

The speech mode is a special electronic voice that provides prerecorded voice to allow user to determine the receiver's sensitivity. This is accomplished by listening to the prerecorded audio voice patterns and then reducing the RF Level until the voice starts to break up or sounds slurred.

03:22:24 Duplex Options Setup: 3 SN Digital VOL/SOL

FREQ 807.262500 MHz FREQ 852.262500 MHz RF FREQ

REC'D 807.262637 MHz OFFSET -45.000000 MHz RF LEVEL

INPUT T/R ATTEN 10 dB MOD TYPE P25 OUTPUT T/R RF LEVEL

DEMOD P25 IF BW 12.5kHz PATTERN SPEECH MOD TYPE

RF GEN ON AUDIO ROUTE AUDIO ROUTE

Mod Fid 10 PH 4.8 % P25 PATTERN

SN/SZ CONTROL CHANNEL ON

BAND 800 CC 0 851.0125 MHz PTT REC

VC 50 852.2625 MHz DIGITAL

NAC 340 MFID 90 AFFIL

SET DOWNLINK DATA

SYSTEM ID GROUP ID UNIT ID

734 2 1 HEX RETURN

03:24:41 Duplex Options Setup: 3 VOL/SOL

FREQ 806.012500 MHz SQU FREQ 851.012500 MHz RF FREQ

REC'D 806.012500 MHz OFFSET -45.000000 MHz RF LEVEL

INPUT T/R ATTEN 0 dB MOD TYPE FM OUTPUT T/R RF LEVEL

DEMOD FM IF BW 60kHz M1 OFF M2 OFF MOD TYPE

NO FILTER MIC OFF RX: OFF M1 OFF

RF GEN ON AUDIO ROUTE AUDIO OFF AUDIO ROUTE

DOWNLINK DATA SEND HDR KEY SN/SZ CONTROL CHANNEL ON

NAC 000 ALGID 0 Unknown CC 0 851.0125 MHz PTT REC

LCO 00 P 0 SF 0 SEND VC 50 852.2625 MHz DIGITAL

Grp Voice Chan User NAC 000 MFID 00 AFFIL

MFID 00 EMG 0 SET DOWNLINK DATA

TGID 0002 SID 000000 SYSTEM ID GROUP ID UNIT ID

734 2 1 HEX RETURN

STATUS 0 Unknown,TalkAround

03:25:13 Duplex Options Setup: 3 VOL/SOL

FREQ 807.262500 MHz FREQ 852.262500 MHz RF FREQ

REC'D 807.262670 MHz OFFSET -45.000000 MHz RF LEVEL

INPUT T/R ATTEN 0 dB MOD TYPE P25 OUTPUT T/R RF LEVEL

DEMOD P25 IF BW 12.5kHz PATTERN SPEECH MOD TYPE

RF GEN ON AUDIO ROUTE AUDIO ROUTE

DOWNLINK DATA SEND HDR KEY SN/SZ CONTROL CHANNEL ON

NAC 340 ALGID 0 Unknown CC 0 851.0125 MHz PTT REC

LCO 00 P 0 SF 0 SEND VC 50 852.2625 MHz DIGITAL

Grp Voice Chan User NAC 340 MFID 90 AFFIL

MFID 90 EMG 0 SET DOWNLINK DATA

TGID 0002 SID 000000 SYSTEM ID GROUP ID UNIT ID

734 2 1 HEX RETURN

STATUS 0 Unknown,TalkAround

3-3 SMARTNET™/SMARTZONE™ SCANNER

If the SmartNet™/SmartZone™ control channel information is not known, the 2975 provides a unique function for tracking and monitoring the control channels.

With the scanner function, the user can monitor off-the-air control channels and track the channel number and **System ID**.

Once a control channel has been located, the 2975 can lock onto and follow the control channel, the **Group ID** or the **Unit ID**.

This feature allows system managers the ability to monitor traffic, and also allows verification that a particular mobile is on the network.

To find a control channel, the user simply enters the band and the channel number range to find the control channel.

Turning on the scanner and then selecting **FIND** starts the search for a control channel. (Reminder; use the antenna input for best sensitivity.)

Once found, the 2975 **FOLLOWS** valid control channels.

11:58:22 Duplex Options Setup: 99 Fact Def VOL/SQL

FREQ 806.318750 MHz SQU

REC'D 806.318750 MHz

INPUT T/R ATTN 0 dB

DEMOM P25 IF BW 12.5kHz

RF GEN ON AUDIO ROUTE

SN/SZ CONTROL CHANNEL OFF

BAND 800

CC 2 851.0625 MHz PTT REC

VC 50 852.2625 MHz ANALOG

CONNECT TONE 105 Hz AFFIL

TX DEVIATION 3200 Hz WDE

SYSTEM ID GROUP ID UNIT ID

734 0 0 HEX

FREQ 851.318750 MHz

OFFSET -45.000000 MHz

LEVEL -118.0 dBm RF ON

MOD TYPE P25 OUTPUT T/R

PATTERN SPEECH

AUDIO ROUTE

SN/SZ SCANNER OFF

FOLLOW CONTROL CHANNEL

BAND

LIST

CONTROL CHANNEL 0

GROUP ID 1 AR

UNIT ID 2 400

FIND

VOICE CHANNEL ACTIVE

CHAN 50 TALK GRP 0

LSD 0 IND ID 0

BAUD 0 TBITS (bin) 0000

RETURN

11:58:22 Duplex Options Setup: 99 Fact Def VOL/SQL

FREQ 806.318750 MHz SQU

REC'D 806.318750 MHz

INPUT T/R ATTN 0 dB

DEMOM P25 IF BW 12.5kHz

RF GEN ON AUDIO ROUTE

SN/SZ CONTROL CHANNEL OFF

BAND 800

CC 2 851.0625 MHz PTT REC

VC 50 852.2625 MHz ANALOG

CONNECT TONE 105 Hz AFFIL

TX DEVIATION 3200 Hz WDE

SYSTEM ID GROUP ID UNIT ID

734 0 0 HEX

FREQ 851.318750 MHz

OFFSET -45.000000 MHz

LEVEL -118.0 dBm RF ON

MOD TYPE P25 OUTPUT T/R

PATTERN SPEECH

AUDIO ROUTE

SN/SZ SCANNER ON

FOLLOW CONTROL CHANNEL

BAND 800

LIST

CONTROL CHANNEL 0

GROUP ID 1 STOP 400

UNIT ID 2

FIND

VOICE CHANNEL ACTIVE

CHAN 50 TALK GRP 0

LSD 0 IND ID 0

BAUD 0 TBITS (bin) 0000

RETURN

APPENDIX A - TERMS / ACRONYMS

AFF	Affiliate
ALGID	Algorithm Identification
BW	Bandwidth
C4FM	Compatible 4-Level FM
CC	Control Channel
DEC	Decimal
EMG	Emergency
FM	Frequency Modulation
FSK	Frequency Shift Keying
HEX	Hexadecimal
ID	Identification
ISW	Inbound Status Word
LCO	Link Control Op-Code
LSD	Low Speed Data
MFID	Manufacturer Identification
ms	Milliseconds
NAC	Network Access Code
OSW	Outbound Status Work
P25	Project 25 (APCO-25 Digital Trunking System)
PTT	Push-to-Talk
Rx	Receive
SF	State Flag
SID	System Identification
SN/SZ	SmartNet™/SmartZone™
SYS	System
TGID	Talk Group Identification
Tx	Transmit
UHF	Ultra-High Frequency
UUT	Unit Under Test
VC	Voice Channel
VHF	Very High Frequency

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APPENDIX B - AEROFLEX CONTACT INFORMATION

For issues relating to **Software or Option Loading**, contact our Sales Support Department:

CONTACT: Aeroflex
Sales Support Department
10200 West York Street
Wichita, Kansas 67215

Telephone: (800) 835-2352 (Dial Option 4)
FAX: (316) 524-2623
Email: techsupport@aeroflex.com

For issues related to **Hardware Problems or General Issues**, contact our Customer Service Department:

CONTACT: Aeroflex
Customer Service Department
10200 West York Street
Wichita, Kansas 67215

Telephone: (800) 835-2350
FAX: (316) 524-2623
Email: service@aeroflex.com

On-Line Return Authorization: <http://www.aeroflex.com/services/rma.htm>

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FRANCE	Tel: [+33] 1 60 79 96 00	Fax: [+33] 1 60 0177 69 22
HONG KONG	Tel: [+852] 2832 7988	Fax: [+852] 2834 5364
SCANDINAVIA	Tel: [+45] 9614 0045	Fax: [+45] 9614 0047
SPAIN	Tel: [+34] (91) 640 11 34	Fax: [+34] (91) 640 06 40
UNITED KINGDOM	Tel: [+44] (0) 1438 742200	Fax: [+44] (0) 1438 7276
	Toll Free: 0800 282388 (UK only)	
USA	Tel: [+1] (316) 522 4981	Fax: [+1] (316) 522 1360
	Toll Free: 800 835 2352 (US only)	

The Aeroflex logo features a stylized 'A' icon composed of two overlapping curved lines, followed by the word 'AEROFLEX' in a bold, sans-serif typeface.

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven, customer-focused.