MOTOROLA

TEST EQUIPMENT

R-2670 FDMA Digital
R2625 ASTRO 25
Communications System Analyzer
ASTRO 25 Trunking Option

OPERATOR'S MANUAL

Motorola Test Equipment Products
P.O. Box 1417
Scottsdale, Arizona
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Pub #68-P48495M Rev. (A)

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Project 25 is the creation of the Association of Public Safety Communications Officials (APCO). Project 25 brings together representatives of federal, state, and local government agencies. These agencies and other user organizations evaluate basic technologies in advanced land mobile radio to find solutions that best serve the needs of the public safety marketplace. The committee has encouraged participation by many international public safety organizations. The National Association of State Telecommunications Directors (NASTD), National Communications Systems (NCS), National Telecommunications & Information Agency (NTIA) and the Department of Defense (DOD) are all actively involved in the development of these user-driven standards.

Section I

INTRODUCTION

1-1 INTRODUCTION

This manual contains information for using the R-2670 FDMA Digital Communications System Analyzer with the ASTRO 25 Trunking Option and the R2625 ASTRO 25 Communications System Analyzer with the ASTRO 25 Trunking Option. The analyzer provides unique testing features for Project 25 trunking based communications equipment. All R-2600 series capabilities are retained with the Astro 25 trunking tests accessed via the LCD display, numeric keypad, screened defined softkeys, cursor movement keys and the optical tuning knob.

1-2 CAPABILITIES

The ASTRO 25 Trunking Option is capable of generating and receiving a Project 25 signal. An ASTRO 25 signal relates to the Association of Public-Safety Communications Officials International (APCO) Project 25 digital standard Common Air Interface (CAI) signaling scheme in which a serial bit stream is encoded, mapped into one of four corresponding amplitudes, filtered digitally, and then modulated onto an RF carrier.

The ASTRO 25 Trunking Option simulates the functions of a Project 25 central controller by providing control channel and voice channel protocols to perform various tests. Features incorporated in this option include:

Registration/Call Alert

Registration/Call Alert tests the radio's ability to acquire and interpret the control channel being transmitted by the R-2670 or R2625. ID parameters are entered in the R-2670 or R2625 to match the radio's configuration. Successful registration verifies the radio's receiver as well as the configuration.

Dispatch Voice

Dispatch voice capability allows the user to verify the radio's transition from the control channel to the voice channel. In addition, receive and transmit voice capability can be verified.

Call State Update

Call sequence status is displayed in the form of a thermometer with numbers 1 through 12 representing the various call states. A textual message is also displayed below the thermometer to give an indication of call status.

Baseband Audio Scope Display

The display provides a clear graphic image of the audio baseband signal. The baseband signal is selectable at either the vocoder input in generate mode or the vocoder output in monitor mode.

1-3 ABOUT THIS MANUAL

Section II, Operating Instructions, describe the various screens (displays) related to a Project 25 trunking test, and the cursor locations and fields within those screens. The operator is given instructions on setting up the screens for various tests, in order to become familiar with the inputs, outputs, and selections.

Section III, Applications, describe step by step instructions for the various tests supported by the analyzer.

Appendix A lists error and warning messages that may be encountered while performing tests.

2-4 ASTRO 25 TRUNK MODE

Select the ASTRO 25 TRUNK mode by placing the cursor in the "Mode:" field in the Display Zone located at the top of the screen. Use the **ASTRO 25 TRK** softkey to select the ASTRO mode. A screen similar to Figure 2.4 appears.

When the display zone "Mode:" is set to ASTRO 25 TRK, the R-2670 or R2625 will configure itself to generate and monitor Project 25 trunking signals.

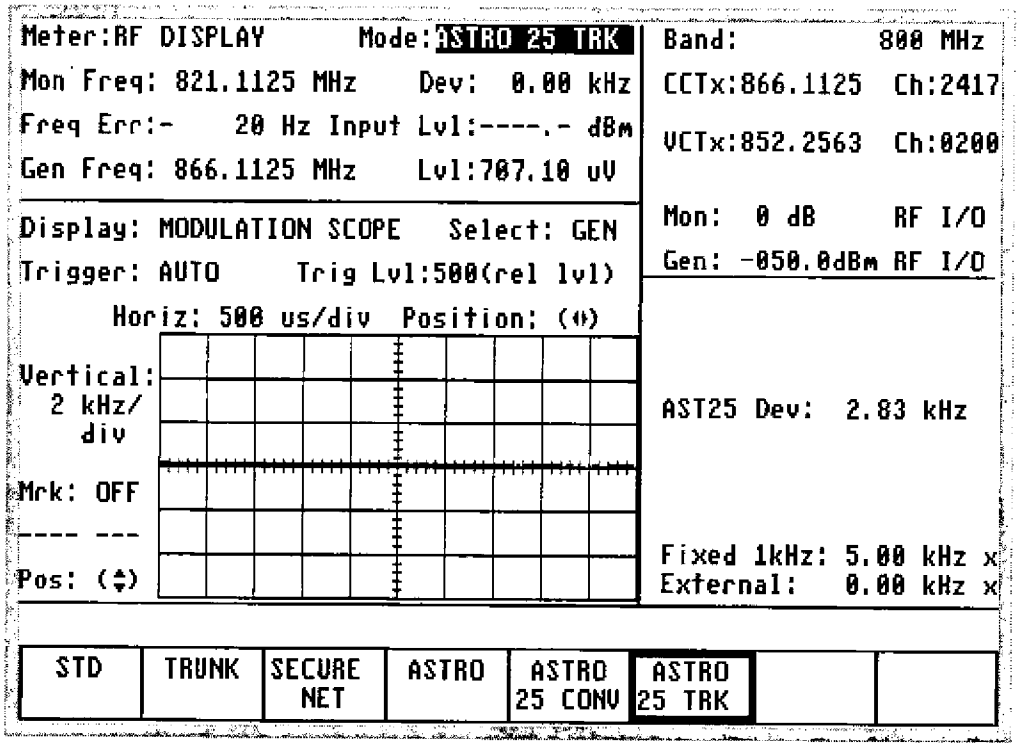

Figure 2-4 Astro 25 Mode Screen

Upon selection of the ASTRO 25 Trunk mode, specific tests are accessed by pressing the **more** softkey in the "Meter" field. Two softkey selections are available in this field: **REG/CAL ALERT** (registration call alert) and **DISPTCH VOICE** (dispatch voice) See Figure 2-5. A description of each of the tests as well as the screens associated with the tests is included in the following sections.

2-4.1 Registration Call Alert

This test verifies that the radio under test is capable of registering and receiving a call alert from the R-2670 or R2625 that is simulating fixed site base station.

2-4.2 Dispatch Voice

This test verifies control channel to voice channel transitions as well as transmit and receive voice capabilities.

Softkey selection of the test is available once the ASTRO 25 Trunk mode has been entered. See Figure 2-5. In order to execute a test, various parameters specific to the radio under test must be entered. A screen description, including parameter definitions is contained in Section 2-4.

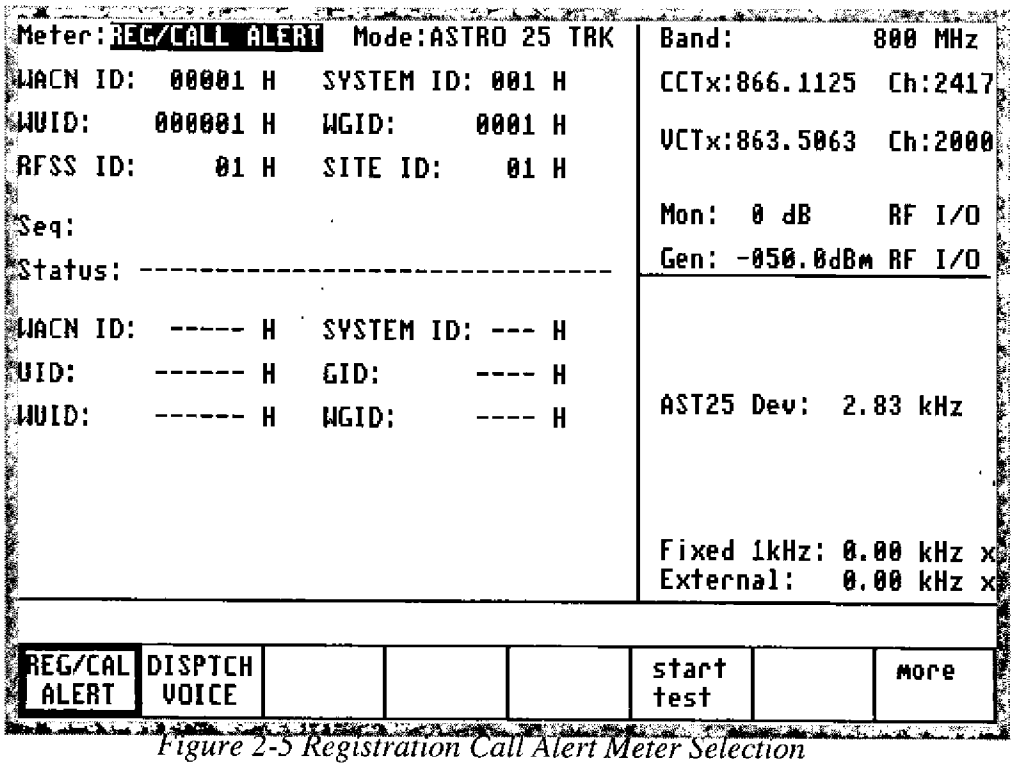

Figure 2-5 Registration Call Alert Meter Selection

2-4.3 Astro 25 Trunking Screens

Upon selection of REG/CAL ALERT or DISPATCH VOICE, the screen zones defined in Section 2-3 will display parameters associated with Project 25 trunking. Parameters associated with REG/CAL ALERT and DISPTCH VOICE are identical, therefore the screens look identical until the **start test** softkey is pressed. Upon test initiation, the screens differ for each test only in the call sequence diagram and message prompts. The following sections define the Project 25 parameters associated with each display zone

2-4.3.1 *Display Zone*

The display zone consists of two main sections User Input Parameter Section and the Result Section. The User Input Section consists of various Ids that must be entered by the user. These Ids match the Ids contained within the radio so that a communication link can be established between the R-2670 or R2625 and the radio. The result section consists of parameters received from the radio under test. Some of the parameter definitions are identical to those in the Input Parameter Section.

The User Input section of the display zone consists of various parameters that must be entered by the user. These parameters must match the configuration set in radio codeplug. The radio codeplug is read using Radio Service Software (RSS). The parameters are defined below.

WACN ID – Wide Area Communication Network ID

SYSTEM ID – System ID

WUID – Working Unit IDentity

WGID – Working Group IDentity

RFSS ID – RF Sub-System ID

SITE ID – Site ID

The middle of the display zone contains a field named SEQ. This area of the display, also known as a thermometer will update the user as to the state of the call sequence. Refer to Appendix A for a description of the status thermometer signaling events for each test sequence.

The bottom portion of the display zone contains those parameters received from the radio under test. The parameters received from the radio are defined below.

WACN ID – Wide Area Communication Network ID

SYSTEM ID – System ID

WUID – Working Unit ID

WGID Working Group ID

UID

GID

2-4.3.2 RF Zone

This zone contains general RF information specifically related to the Astro 25 trunk mode of operation. Channel selection for both the control channel and the voice channel is made in this zone. The RF zone provides for user selection of the channels and frequencies. A description of each of the fields contained within the RF Zone is included below.

Band – This entry allows the user to select the RF Band for a particular test.

CCTx –Control Channel Generate Frequency

This parameter allows the user to enter the control channel frequency in MHz.

Ch Control Channel Number

This parameter allows the user to enter the control channel number. The 800 MHz band allows for channel numbers 0 to 4095

which correspond to a frequency range of 851.0063 to 876.5938 MHz respectively.

VCTx – Voice Channel Generate Frequency

This parameter allows the user to enter the voice channel generate frequency in MHz.

Ch Voice Channel Number

This parameter allows the user to enter the voice channel number. The 800 MHz band allows for channels 0 to 4095 which correspond to a frequency range of 851.0063 to 876.5938 respectively.

Mon

This field allows the user to select the attenuation and port for the received signal. Attenuation is softkey selectable and can be set to 0, 20, or 40dB. The port is softkey selectable to RF I/O or ANT.

Gen

This field allows output level setting and generate port selection. The output level can be entered using the keypad or the tuning knob. The port is softkey selectable to Gen Out or ANT. The output level varies based on the generate port selection as follows:

Gen out 0 - -80dB

RF/IO -50 – 130dB

2-4.3.3 *Audio Zone*

This zone contains baseband audio controls and level setting.

AST25 Dev – This field allows the user to set the Astro 25 generate signal deviation. The deviation range is 0 – 5kHz.

Fixed 1kHz – This field allows a fixed 1KHz to be enabled and the amount of modulation, measured in kHz deviation, to be adjusted.

External – This field allows an external input to be enabled and the amount of modulation, measured in kHz deviation, to be adjusted. The external input selection includes both the BNC labeled: EXT MOD IN and the MIC (microphone input).

2-5 TEST SETUP

Connecting a Radio

Use a 50 ohm BNC cable and an N to BNC adapter to connect from the RF I/O port of the R-2670 or R2625 analyzer to the antenna port of the radio as shown in Figure 2-6.

CAUTION

When in Monitor mode, 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.CAUTION

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

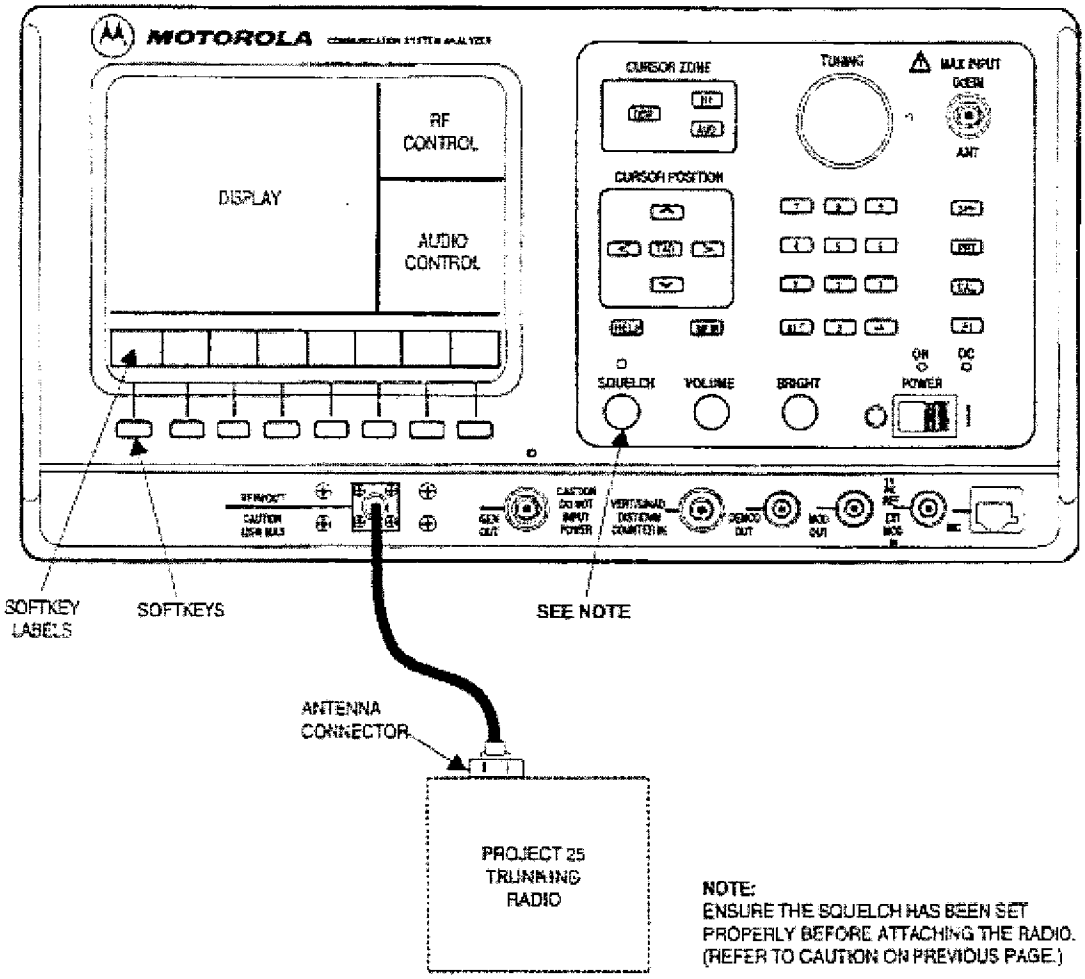

Figure 2-6. Test Setup

Section III

APPLICATIONS

3-1 PROJECT 25 TRUNK RADIO TESTING

This section of the manual contains information on testing of Project 25 trunked radio using the R-2670 FDMA Digital Communications System Analyzer or R2625 with the Astro 25 Trunk option. Two types of tests are defined: Registration/Call Alert and Dispatch Voice.

3-1.1 Registration/Call Alert

Select the ASTRO 25 TRUNK mode by placing the cursor in the "Mode" field in the Display Zone located at the top of the screen. Use the **ASTRO 25 TRK** softkey to select the mode.

Move the cursor to the "Meter" field by pressing the **TAB** key. Press the **REG/CAL ALERT** softkey to select the Registration Call Alert test.

Enter the parameters listed below. If the parameters are not known, the radio codeplug must be read using Radio Service Software (RSS). Note that WACN ID and SYSTEM ID are required for communication with the radio under test. The remaining parameters are optional unless the radio has been configured for specific modes of operation.

WACN ID

SYSTEM ID

WUID

WGID

RFSS ID

SITE ID

Press the **RF** Cursor Zone hardkey to move to the RF zone. Press the **800 MHz** softkey to select the 800 MHz band. Move the cursor to the "CCTX" field and enter either the control channel transmit frequency or the channel number.

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

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

Press the **AUD** Cursor Zone hardkey to move the Audio zone.

Set the ASTRO 25 deviation. The default and suggested deviation is 2.83 kHz.

Connect the radio under test to the RF I/O port as shown in Figure 2-6.

Press the **DISP** Cursor Zone hardkey to move to the Display zone. Move the cursor to the "Meter" field and press the **start test** softkey to begin the test.

Observe the user prompts displayed above the row of softkeys. Turn radio on as directed by the prompt.

Follow the call sequence by looking at the sequence thermometer in the middle of the screen. The status below the sequence thermometer gives a textual description of the Call State. For a description of all call states, refer to Appendix A.

If the call is successful, the thermometer will reach 8 and the test is completed. The bottom portion of the Display Zone will exhibit those parameters received from the radio.

3-1.2 Dispatch Voice

Select the ASTRO 25 TRUNK mode by placing the cursor in the "Mode" field in the Display Zone located

at the top of the screen. Press the **ASTRO 25 TRK** softkey to select the mode.

Move the cursor to the "Meter" field by pressing the **TAB** key. Press the **DISPTCH VOICE** softkey to select the Dispatch Voice test.

Enter the parameters listed below. If the parameters are not known, the radio codeplug must be read using Radio Service Software (RSS). Note that WACN ID and SYSTEM ID are required for communication with the radio under test. The remaining parameters are optional unless the radio has been configured for specific modes of operation.

WACN ID

SYSTEM ID

WUID

WGID

RFSS ID

SITE ID

Press the **RF** Cursor Zone hardkey to move to the RF zone. Press the **800 MHz** softkey to select the 800 MHz band. Move the cursor to the "CCTx" field and enter either the control channel transmit frequency or the channel number. Move the cursor to the "VCTx" field and enter either the voice channel transmit frequency or the channel number

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

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

Connect the radio under test to the RF I/O port as shown in Figure 2-6.

Press the **AUD** Cursor Zone hardkey to move the Audio zone.

Set the ASTRO 25 deviation. The default and suggested deviation is 2.83 kHz.

Move the cursor to the "external" field. Set the deviation. Press the **TAB** key to move to the switch selection. Press the **CONT** softkey to turn on the external port (microphone).

Press the **DISP** Cursor Zone hardkey to move to the Display zone. Move the cursor to the "Meter" field and press the **start test** softkey to begin the test.

Observe the user prompts displayed above the row of softkeys. Turn radio on as directed by the prompt. Perform actions specified by user prompts throughout the remainder of the test.

Follow the call sequence by looking at the sequence thermometer in the middle of the screen. The status below the sequence thermometer gives a textual description of the Call State. For a description of all call states, refer to Appendix A.

Upon completion of the test, the sequence thermometer will reach 11. Press the **stop test** softkey to complete the test (state 12). The bottom portion of the Display Zone will exhibit those parameters received from the radio.

APPENDIX A

Sequence Descriptions

Test Sequence Code Description for Registration/Call Alert Test

Code	Call Status
1	Idle Control Channel
2	Registration Request Received
3	Registration Response Sent
4	Grp. Affiliation. Request Received
5	Grp. Affiliation. Response Transmitted
6	Call Alert Request Transmitted
7	Call Alert Response Received
8	Test Complete

Test Sequence Code Description for Dispatch Voice Test

Code	Call Status
1	Idle Control Channel
2	Registration Request Received
3	Registration Response Sent
4	Grp. Aff. Request Received
5	Grp. Aff. Response Transmitted
6	Group Voice Request Received
7	Group Voice Channel Grant Sent
8	Receive Voice Data
9	Transmit Voice Mic Off
10	Transmit Voice Mic On
11	Transmit Voice Mic Off (On)
12	Test Complete
13	

Registration Call Alert/Dispatch Voice Error Messages

Error
Test Terminated by User
Timeout – Test Halted

APPENDIX B

800MHZ Band Details

Channel Type	Frequency Range	Channel Number	Frequency Offset
Control Channel/Voice Channel	851.0063 – 876.6000	0 - 4095	45 MHz

MOTOROLA

TEST EQUIPMENT

R-2670 FDMA Digital Communications System Analyzer SECURENET Option

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P.O. Box 1417
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MOTOROLA TEST EQUIPMENT PRODUCTS

LIMITED WARRANTY

(EXCLUDES EXPORT SHIPMENTS)

Motorola Test Equipment Products (herein the "product") that are manufactured or distributed by Motorola Communications Group Parts Department are warranted by Motorola for a period of one (1) year from date of shipment against defects in material and workmanship.

This express warranty is extended to the original purchaser only. In the event of a defect, malfunction, or failure during the period of warranty, Motorola, at its option, will either repair, or replace the product providing Motorola receives written notice specifying the nature of the defect during the period of warranty, and the defective product is returned to Motorola at 1313 East Algonquin Road, Schaumburg, IL 60196 transportation prepaid. Proof of purchase and evidence of date of shipment (packing list or invoice) must accompany the return of the defective product. Transportation charges for the return of the product to Purchaser shall be prepaid by Motorola.

This warranty is void, as determined in the reasonable judgment of Motorola, if:

(a) The product has not been operated in accordance with the procedures described in the operating instruction;

(b) The seals on non-user serviceable components or modules are broken;

(c) The product has been subject to misuse, abuse, damage, accident, negligence, repair or alteration.

In no event shall Motorola be liable for any special, incidental, or consequential damages.

In the event Motorola elects to repair a defective product by replacing a module or subassembly, Motorola, at its option, may replace such defective module or subassembly with a new or reconditioned replacement module or subassembly. Only the unexpired warranty of the warranty product will remain in force on the replacement module or subassembly. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, ARE EXCLUDED.**

COMPUTER SOFTWARE COPYRIGHTS

Section 1
INTRODUCTION

1-1 INTRODUCTION

This manual contains information for using the R-2670 FDMA Digital Communications System Analyzer with SECURENET Options. The SECURENET Option provides unique testing features for communications equipment using SECURENET encoding and modulation principles. Standard R-2670 capabilities are retained. The additional SECURENET test sequences are accessed via the LCD display, screen-defined softkeys, numeric keypad, cursor movement keys, and optical tuning knob. The SECURENET Option functions may also be accessed via the remote control interface port.

1-2 CAPABILITIES

The SECURENET Option gives the R-2670 the capability of monitoring and generating SECURENET signals. A SECURENET signal relates to a Motorola proprietary signaling scheme in which a 12 kbps serial bit stream is mapped into one of two corresponding amplitudes, filtered digitally, and then modulated onto an RF carrier. Most of the SECURENET user interface operates exactly like that of the standard R-2670. Several new features were added to test the unique requirements of user SECURENET equipment.

Voice Mode System Testing

Voice mode provides SECURENET-compatible modulation and demodulation with vocoding. The SECURENET Option generate and monitor modes support actual functional voice testing in encrypted mode using either a test key or an operator key loaded from a separate compatible keyloader.

Bit Error Rate (BER) Testing

A BER test pattern can be selected to modulate the R-2670 generator section. A BER test pattern can likewise be decoded by the R-2670 in monitor mode. BER tests can also be conducted in duplex mode for loop testing.

Dedicated Test Screens

Dedicated test screens can be setup as a start-up default condition or as a programmable test set-up. Dedicated SECURENET test screens are zoned with RF and Audio Modulation control screens to simultaneously display test results along with their test conditions.

Baseband Audio Scope Display

The display provides a graphic image of the audio baseband signal. This baseband signal is selectable at either the vocoder input in generate mode or the vocoder output in monitor mode.

1-3 SERVICE

Motorola Test Equipment Service Centers service all test equipment supplied by the Motorola Communications Sector. Refer to Section 1 of the R-2600 Series Communications System Analyzer Operator's Manual for service information.

1-4 REPLACEMENT PARTS ORDERS

Send orders for replacement parts to the nearest Motorola Test Equipment Service Center. Refer to Section 1 of the R-2600 Series Communications System Analyzer Operator's Manual for replacement parts ordering information.

1-5 SECURENET OPTION HOUSING

1-5.1 Description

The SECURENET Option housing (Figure 1-1) is an external module containing circuitry and connectors to support SECURENET functions. The SECURENET Option housing attaches to the rear of the R-2670 analyzer. In some instances the Option housing may be attached along with another option housing or in conjunction with the R-2670 battery pack (optional). The battery pack, if used, mounts on the back of the final option housing.

1-5.2 Connectors

The SECURENET Option housing has two connectors as shown in Figure 1-1. Both connectors are located on the side of the housing. The KVL connector provides a receptacle for loading an external encryption key or for programming a radio with a test key. The other connector is an interface port.

KEY VARIABLE LOADER (KVL) PORT

The KVL port allows the analyzer to be preloaded with a user-selected encryption key from any compatible keyloader (key inserter). The port is also used with an optional cable to transfer test keys from the analyzer to a radio being tested. The R-2670 with SECURENET Option is compatible with the following Motorola key inserters: T3010DX, T3011DX, T3012DX, T3013DX, and T3014DX.

SERIAL PORT (25 PIN)

The serial interface port is multiplexed to provide the future addition of an HDLC wireline serial data interface or an RS-232 interface for data communications.

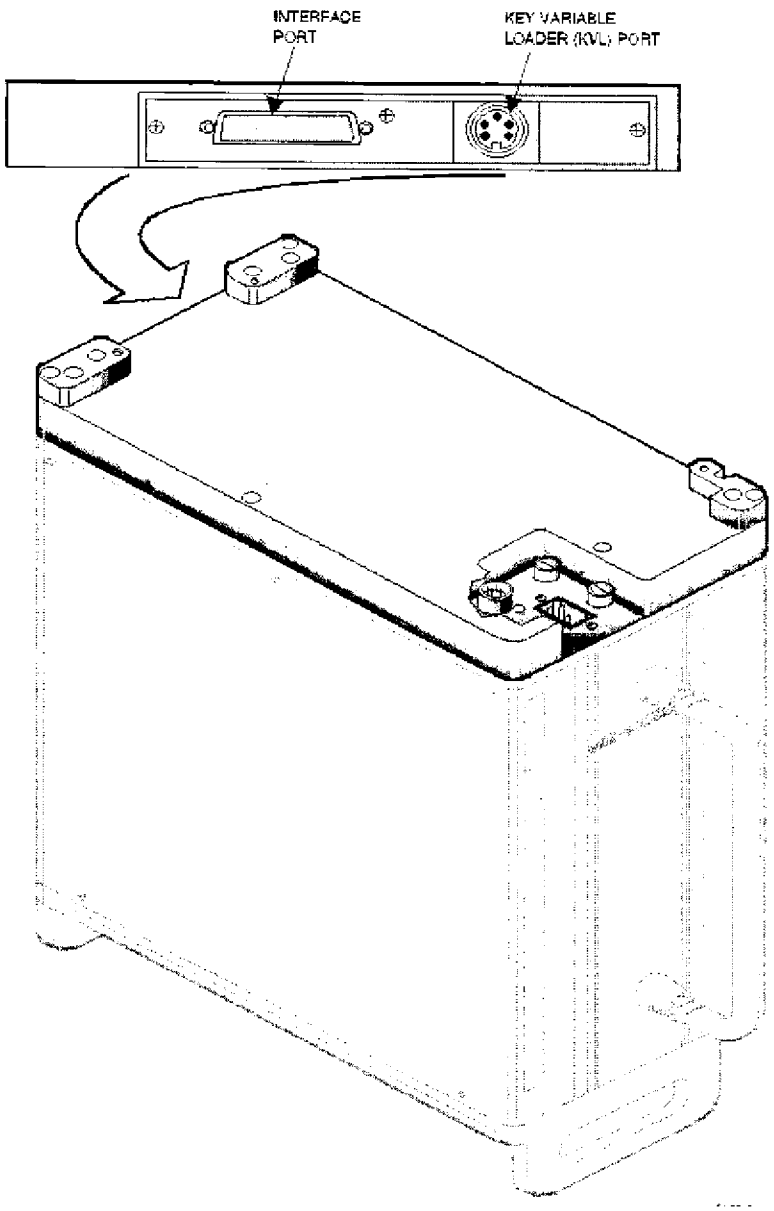

Figure 1-1. Bottom of 2-2670

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Section 2

DESCRIPTION

2-1 INTRODUCTION

The SECURENET Option extends the standard functions of the R-2670 to provide an all-in-one servicing instrument for communications equipment that uses SECURENET voice protection.

2-2 BASIC OPERATION

The R-2670 with SECURENET Option can emulate the same digital environment used by SECURENET radios in private mode. This capability allows the analyzer to interoperate with conventional SECURENET user equipment. Standard test equipment is unable to decipher private audio transmissions from SECURENET radios because the audio signals are converted from their native analog format to a digital, ciphered representation prior to transmission.

Some radios in the SECURENET system have both clear and privacy modes available. When operated in privacy mode, the radio scrambles communications prior to their transmission. Only intended subscribers, with compatible hardware plus matching security keys, can decipher the message. In this way, users of a system can be partitioned into groups, each with their own security key. The R-2670 with SECURENET Option will accept an external operating key from any compatible key loader. Alternately, the user can select one of the Option's own internal test keys to program the radio under test.

In its SECURENET mode, the R-2670 provides display screens for monitoring bit error rate characteristics of a radio under test and also generates bit error rate test patterns to support this mode of operation.

The R-2670 with SECURENET Option. provides a clear scope display of baseband signals, either the input to the vocoder (generate mode) or the output from the vocoder (monitor mode).

2-3 TEST CONSIDERATIONS

Systems using encrypted communications have a need to maintain even higher standards on RF signal quality than normal FM radio systems. Encryption subjects the SECURENET signals to additional processing. In order to work reliably, the radios must be tuned to preserve critical factors such as operating frequency response and transmitter deviation. Individual test meters and generators compound the effects of multiple RF paths and wirelines in the test environment, resulting in degraded signals and less accurate measurements.

Operating in secure or standard mode, the R-2670 with SECURENET Option bundles a wide assortment of sophisticated test features in a single instrument.

2-4 SPECIAL TERMS

The following list contains brief definitions of special terms that are used in association with SECURENET radios and test equipment:

algorithm - In secure systems, an algorithm is a distinct method for translating clear information (input) to a secure version of the information (output). The same algorithm is used to interpret

the message. SECURENET systems use the following algorithms:

- DVP
- DVP-XL
- DES and DES-XL
- DVI-XL

BER test - In generate mode, the analyzer modulates the RF carrier with Bit Error Rate test pattern to test the radio receiver. This BER test pattern consists of a free running, pseudo-random bit pattern. In monitor mode, the analyzer monitors the BER test pattern input and provides a metering display of bits received, number of bits expected, and bit error rate percentage.

cipher - to convert information to a seemingly random pattern for transmission or wireline delivery in order to protect sensitive information. Ciphered voice and data can only be understood by means of a special key.

CVSD modulation - Continuously-Variable-Slope Delta technique used in SECURENET radios and test equipment to digitize analog signals before transmission and to reconstruct analog signals on the receiving end.

decryption - process of converting cipher text to plain text

encryption - process of converting plain text to cipher text

EOM Signal - A short signal burst identifying the End-Of-Message. SECURENET radios transmit (or receive) an EOM signal at the end of all private mode transmissions. The signal burst lasts for at least 140 milliseconds.

key - a sequence of bits stored electronically in the encryption and decryption modules. Once the key has been loaded, it trains the internal encryption/decryption circuits.

key inserter - a device used to load an electronic encryption key into a radio or other device. Also called a keyloader.

Section 3

OPERATING INSTRUCTIONS

CAUTION

When testing a radio, 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.*

3-1 INTRODUCTION

The R-2670 FDMA Digital Communications System Analyzer with SECURENET Option 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 SECURENET radios under test to the analyzer and how to set controls and indicators to obtain the correct screen display.

Error/Warning Messages

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

3-2 SOFTWARE VERSION SCREEN

To view the software version of the R-2670 Analyzer. turn power on and wait for the display to appear on the screen. Press the **SPF** hard key, and move the cursor to "VERSION". Select the **display table** softkey. This will configure the analyzer to generate a screen that displays the SECURENET software version (figure 3-1).

Move the cursor to the SECURENET position and select the **view options** softkey. A screen similar to figure 3-2 will be displayed and indicates the analyzer options installed and encryption algorithms available.

Select **return** softkey twice to return to the SECURENET mode screen.

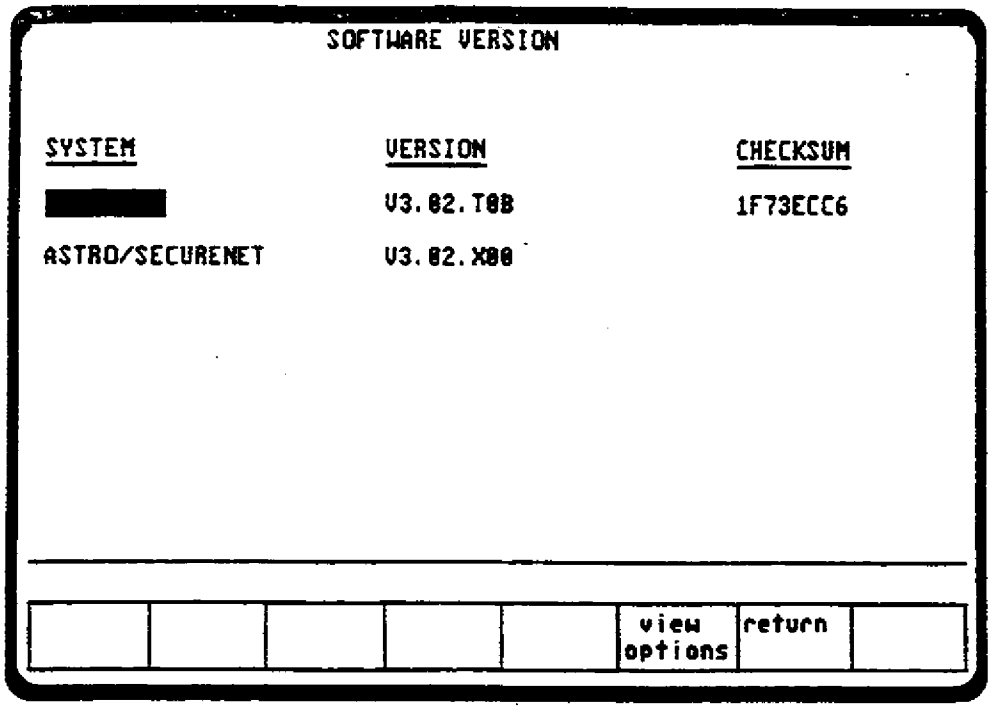
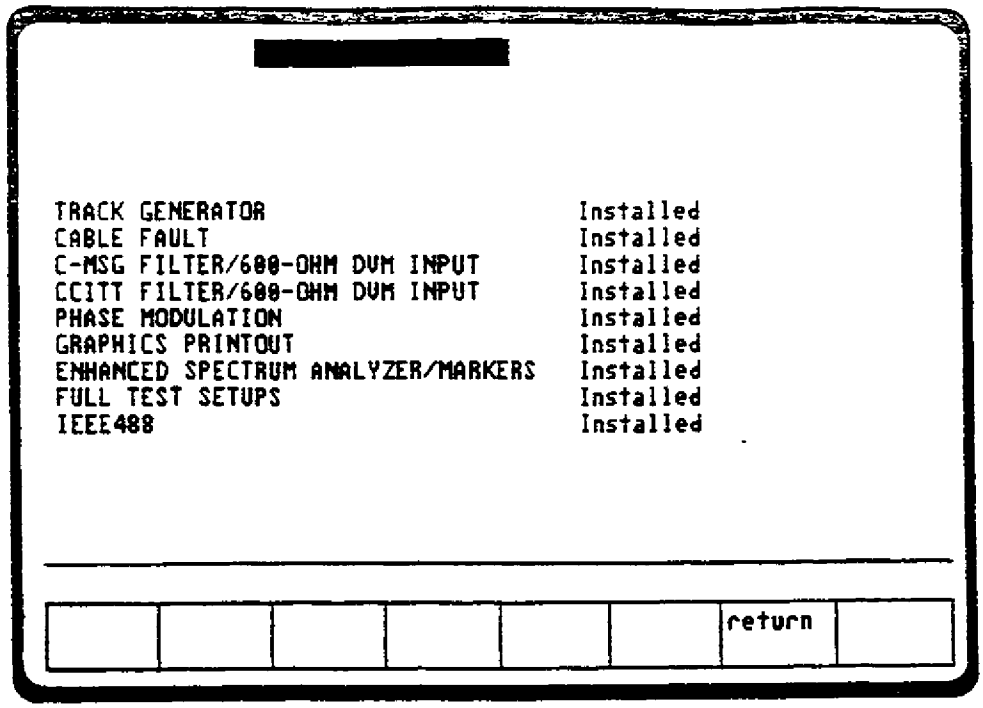


Figure 3-1. SECURENET Version Screen



(these are Standard options)

Figure 3-2. SECURENET Options Screen

3-3 BASIC OPERATION

Control of the unit and selection of data to be displayed are done through the use of three main windows which simultaneously appear on the screen: the Display Zone, the RF Zone, and the Audio Zone. These three zones are shown in figure 3-3. 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 selection of RF mode, for selection of frequency band, for port selection and for control of RF signal level at the input/output port. The audio section is unchanged from the standard system except that, in SECURENET mode, modulation options are limited.

3-3.1 Display Screens

The three main windows, or cursor zones, are accessed through a cluster of three CURSOR ZONE keys at the top center of the unit. The location where the cursor rests within each zone is called a cursor field. To control the unit and enter data, all operator inputs are made at highlighted cursor fields (brighter-face type).

Below the screen are softkeys. These softkeys, with customized on-screen labels, interact with the screen to provide a unique menu of entry options for each cursor field. This greatly reduces the number of keys and eliminates having to search through unrelated controls to find the one that's needed.

3-3.2 Manual Operation

To control the cursor location and input information by (manual control):

- Use the CURSOR ZONE keys to move the cursor among the three zones.
- Use the CURSOR POSITION keys to move the cursor from field to field within a zone.
- Once at the desired field, use either the TUNING knob or the numeric keys to enter numeric information. Use the softkeys for other menu selections.

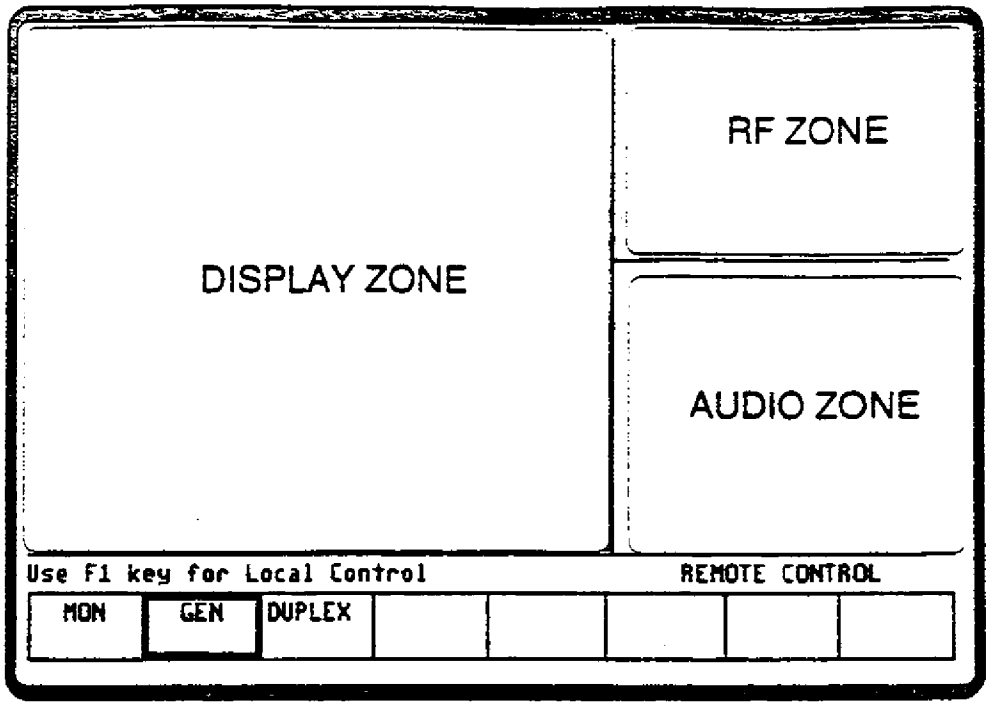


Figure 3-3. Screen Zone Arrangement

3-3.3 Expanded Display

Some fields have the ability to expand their contents and overwrite other display areas. These consist of the following:

- Spectrum analyzer, scope waveforms, bar-graph displays
- Decode tables
- Encode tables
- Dedicated keys

3-3.4 Dedicated Keys

Refer to the Other Functions portion of the R-2600 Series Communications System Analyzer Operator's Manual (paragraph 3-8) for an explanation of expanded screens in the HELP, MEM, SPF, and CAL modes.

3-3.5 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 (68-80309E55).

3-3.6 HELP

The analyzer provides on-screen operating instructions via the dedicated HELP key. Help screens are organized such that each display area has an associated help screen pertaining to that area of the screen. System help is available via a softkey within each help screen. Use the **return** softkey to return to the function in progress.

3-4 ENCRYPTION CAPABILITIES

Hardware encryption is always enabled when the R-2670 is in SECURENET mode. SECURENET equipment converts normal speech patterns to their digital equivalent and then uses an encryption algorithm to encrypt data for transmission. A receiving radio, using the same algorithm and a matching key, automatically reverses the process so you can hear a normal audio message.

A set of either U.S. or International encryption algorithms are available with the SECURENET Option. Algorithms include Data-Encryption System (DES) - a U.S. Federal Government encryption standard, Digital Voice Protection (DVP) - a Motorola Proprietary encryption algorithm, and DVI - a Motorola Proprietary encryption algorithm for international use only. Within a set, each algorithm is individually selectable:

Domestic: DES, DES-XL, DVP, DVP-XL

International: DVI-XL, DVP, DVP-XL

3-5 TEST SETUP

Connecting a Radio

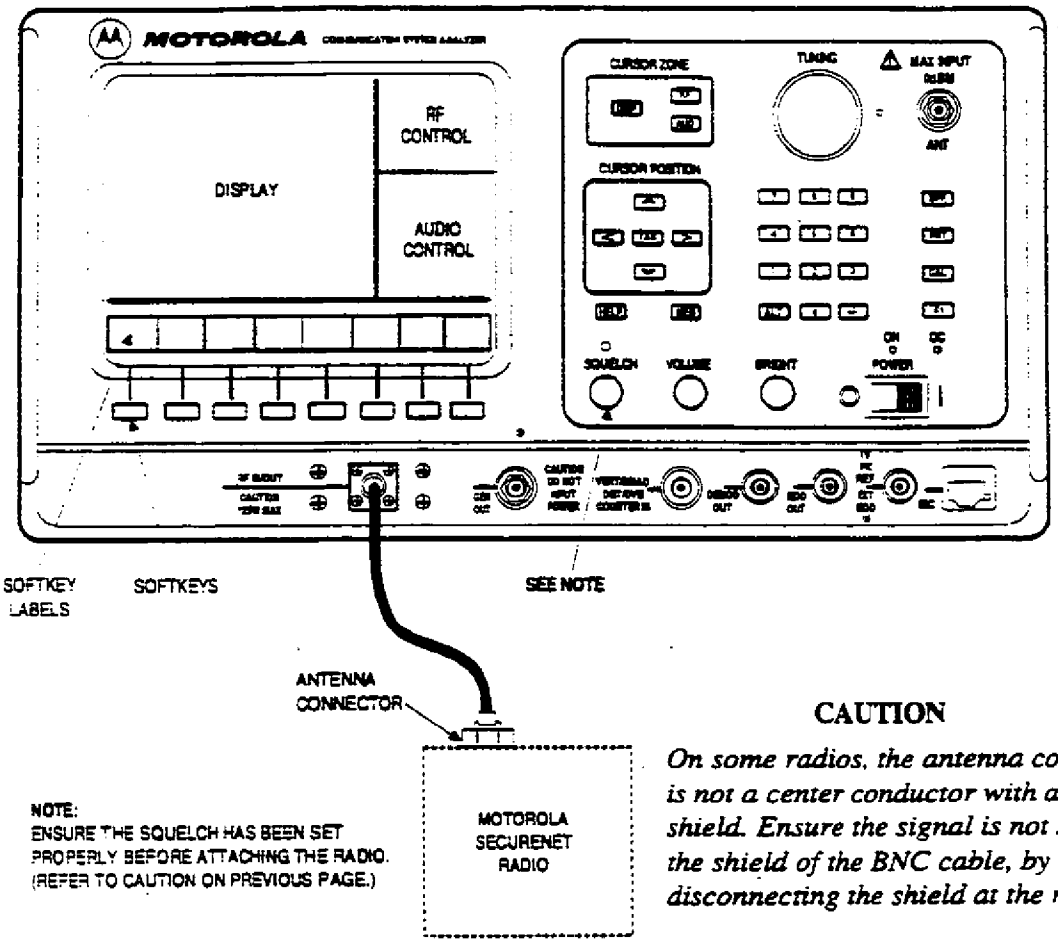
Use a 50 ohm BNC cable and an N to BNC adapter to connect from the RF I/O port of the R-2670 analyzer to the antenna port of the radio as shown in figure 3-4.

CAUTION

When in Monitor mode, 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.

CAUTION

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



CAUTION

On some radios, the antenna connector is not a center conductor with an outer shield. Ensure the signal is not shorted to the shield of the BNC cable, by disconnecting the shield at the radio end.

Figure 3-4. Radio to Analyzer Test Setup

3-6 ACCESSING SECURENET MODE

Select the SECURENET mode by placing the cursor in the "Mode:" field in the Display Zone located at the top of the screen. Use the SECURENET softkey to select the SECURENET mode. A screen similar to figure 3-5 appears.

When the display zone "Mode:" is set to SECURENET, the R-2670 will configure itself to generate and monitor SECURENET signals.

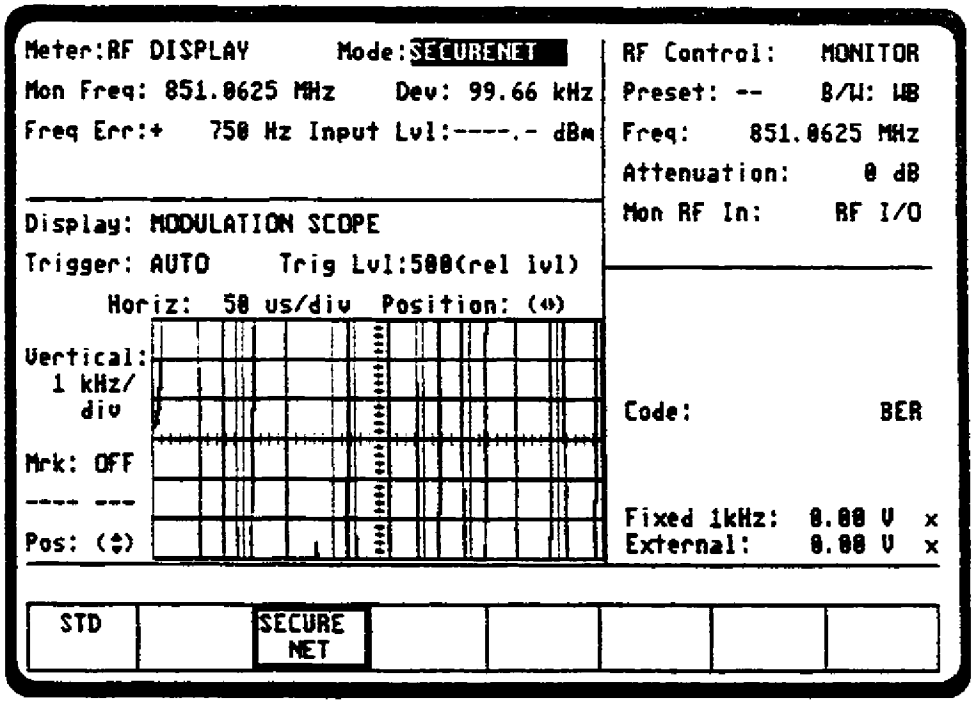


Figure 3-5. SECURENET Mode Screen

3-7 SECURENET ENCRYPTION SET UP

3-7.1 SET UP Encryption Display

The SET UP display places the analyzer in encryption setup mode and allows the operator to select the desired algorithm. The SET UP display is accessed from the Display Zone. To use SET UP display, move the cursor to the "Display:" field and select SET UP using the **SET UP** softkey. The Display Zone will show a menu of SET UP options as shown in figure 3-6.

3-7.1.1 Algorithm Select

Within the SET UP display, the first option field is Algorithm Select. Algorithm is a term that describes the method of coding data or audio so that only equipment having the same algorithm selected, and the same key, are able to exchange intelligible information. The analyzer includes several algorithms recognized by radios using SECURENET. You will need to select one of these algorithms to use for processing messages.

In the Display Zone, move the cursor to the "Algorithm Sel:" field as shown in figure 3-7. The softkeys will provide a menu of the available algorithms. Select the algorithm that corresponds to the radio being tested. Menu choices depend on which SECURENET option was purchased. Refer to para 3-4 for a description of the U.S. and International encryption algorithms.

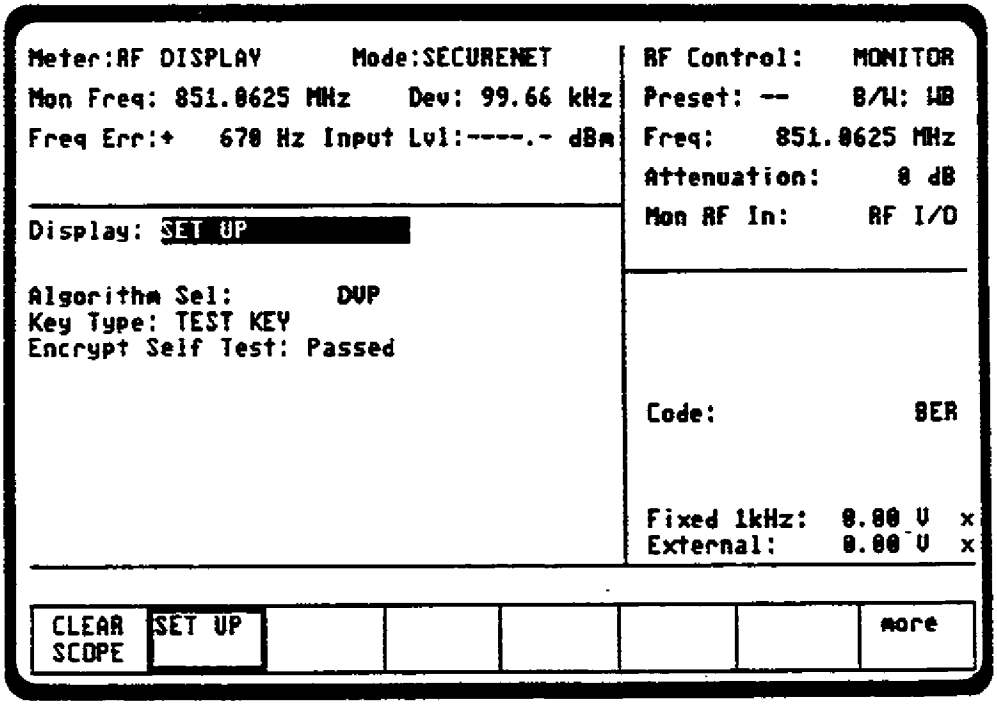


Figure 3-6. SET UP Display Screen

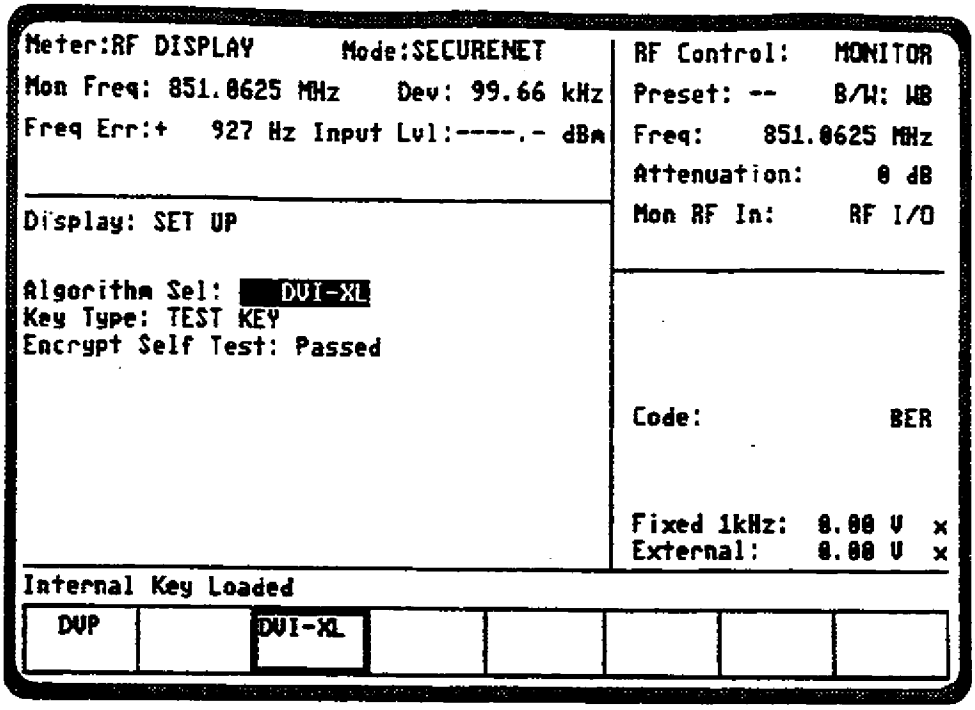


Figure 3-7. Algorithm Select Display

3-7.1.2 Key Type

Each algorithm is associated with one particular key type: either a Test Key or an External Key. Test Key is the default and is used to support most SECURENET testing. The Test Key is a dummy key which is programmed into the radio and the analyzer for maintenance purposes only. The test key should never be used for sending private radio communications. Its security is compromised (all SECURENET Option analyzers use the same test key). The analyzer provides these softkey selections:

TEST KEY

This softkey selects the Test Key saved in the analyzer's key storage memory. The Test Key will then be used for testing.

EXT KEY

This softkey selects the External Key saved in the analyzer's key storage memory.

erase ext key

This softkey erases from the analyzer's key storage memory any External Key saved for the current algorithm.

load ext key

This softkey starts the sequence of programming the analyzer with an external key for the algorithm selected from a key inserter. This procedure requires a key loading cable and a key inserter (KVL).

key load radio

This softkey starts the automatic sequence of programming the attached radio with a test key for the algorithm selected. This procedure requires a key loading cable.

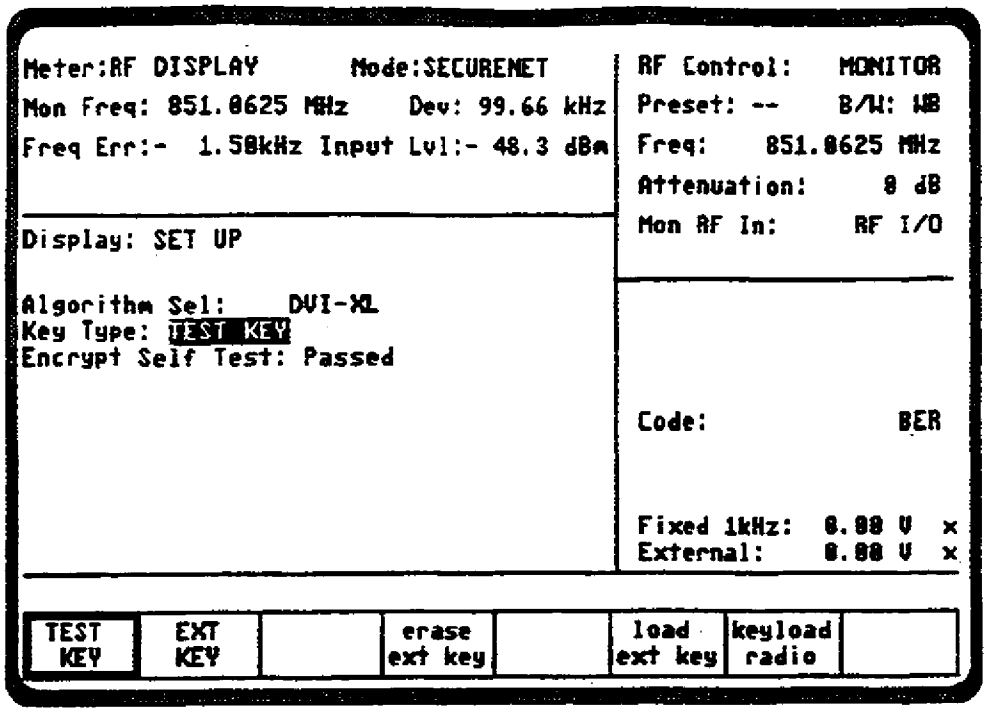


Figure 3-8. Test Key Programming Display

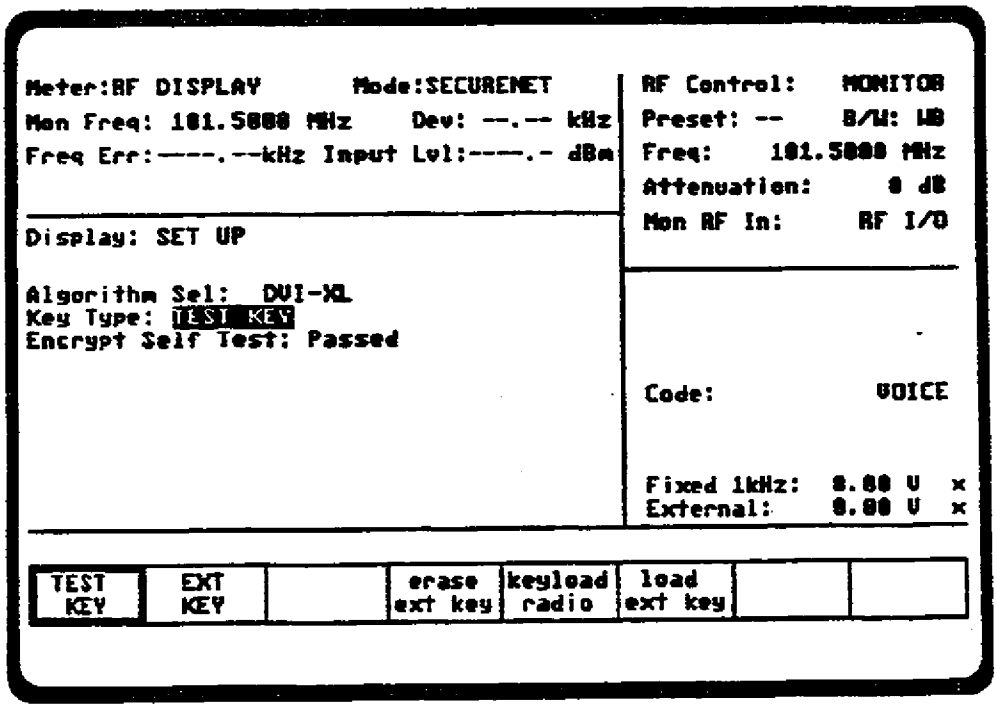


Figure 3-9. External Key Programming Display

3-7.1.3 Encrypt Self Test

A self test of the encryption functions is performed at power up. The "Encrypt Self Test:" field in the SET UP display (figure 3-6) indicates the results of the self test, passed or failed.

3-7.2 Programming with Test Key

Connect the proper key loading cable between the Key Variable Loader port of the analyzer (figure 1-1) and the programming port on the radio (refer to radio operator's manual).

To program the radio with a test key, place the cursor in "Display:" field in the Display Zone. Select SET UP using the **SET UP** softkey. This will access the SET UP display screen (figure 3-6).

Move cursor to "Algorithm Sel:" field and select desired algorithm using softkeys (figure 3-7).

Move cursor to "Key Type:" field.

Apply power to the radio, if not already on.

Select **key load radio** softkey. This will exercise the Key Variable Loader feature of the R-2670 and start an automatic transfer of the test key from the analyzer to the radio. The R-2670 will display "Radio key load complete." To verify that a key has been loaded into the radio, disconnect the key loading cable, turn the radio off then back on. If the key load was unsuccessful, the radio will display key fail if it has a visual readout or will make an audio sound to indicate key fail.

CAUTION

Disconnect the key loading cable before continuing. Testing the radio with the key loading cable still connected could result in loss of the key.

To test the radio with the analyzer, be sure TEST KEY is displayed in the "Key Type:" field. This completes test key loading. It is all right to exit the SET UP screen.

3-7.3 Programming with External Key

You can use a customer key to program the analyzer and operate in private mode with a keyed radio. The customer (external) key, once loaded, is saved in memory by the analyzer until the operator erases it. The key is stored in non-volatile memory and will be retained even if power to the analyzer is turned off.

3-7.3.1 Connecting the Key Inserter

The key inserter plugs into the Key Variable Loader (KVL) port (figure 1-1) on the side of the analyzer opposite the carrying handle. Connect the key inserter to the analyzer and then use the following instructions to load the external key.

CAUTION

*Use DX key loaders only. Other types of key loaders (AX, BX or CX) may cause the encryption hardware to malfunction. To recover, press the **encrypt reset** softkey under the "Special Functions" (SPF) menu.*

3-7.3.2 Loading External Key

To initiate loading an external key, place cursor in "Display:" field in the Display Zone and select SET UP mode display using the **SET UP** softkey.

Move cursor to "Algorithm Sel:" field and select desired algorithm using softkeys (figure 3-7).

Move cursor to "Key Type:" field.

Press the **load ext key** softkey to initiate the key load sequence.

Push the switch on the key inserter to begin loading. This activates the programming function. When programming is complete, the key inserter displays "pass" if the key load procedure was successful. The analyzer displays a message Ext key passed". If the key load procedure was unsuccessful, the key inserter displays "fail".

If key load procedure was successful, disconnect the key inserter. Be sure to press the **EXT KEY** softkey after loading an external key from the key inserter to transfer the external key into the analyzer's key storage memory. This completes external key loading. It is all right to exit the SET UP screen.

3-7.3.3 Erasing External Key

To erase an external key, place cursor in "Display:" field in the Display Zone and select **SET UP** softkey. This will access the SET UP display screen (figure 3-6).

Move cursor to "Algorithm Sel:" field. Using softkey, select the algorithm associated with the external key you want to erase.

Move cursor to "Key Type:" field and press **erase ext key** softkey (figure 3-9). The analyzer will erase the stored external key and display "key erased" in the message area.

3-8 SECURENET RF OPERATING MODES

Select the RF operating mode by placing the cursor in the "RF Control:" field in the RF Zone. Use the desired softkey to select MONITOR, GENERATE, or DUPLEX.

3-8.1 MONITOR Mode

The Monitor mode (figure 3-10) provides the analyzer's test receiver function which is used in the testing of radio transmitters. In SECURENET Monitor mode, the RF Zone is similar to the RF Zone in standard mode. It is capable of setting up the analyzer to monitor RF input through its antenna or a direct connection to the transmitter.

The RF Zone in Monitor mode contains fields for choosing the monitor bandwidth, frequency, attenuation, and source of the SECURENET RF signal. All of these fields operate as described in the R-2600 Series Operator's Manual except the Modulation Type field is not required.

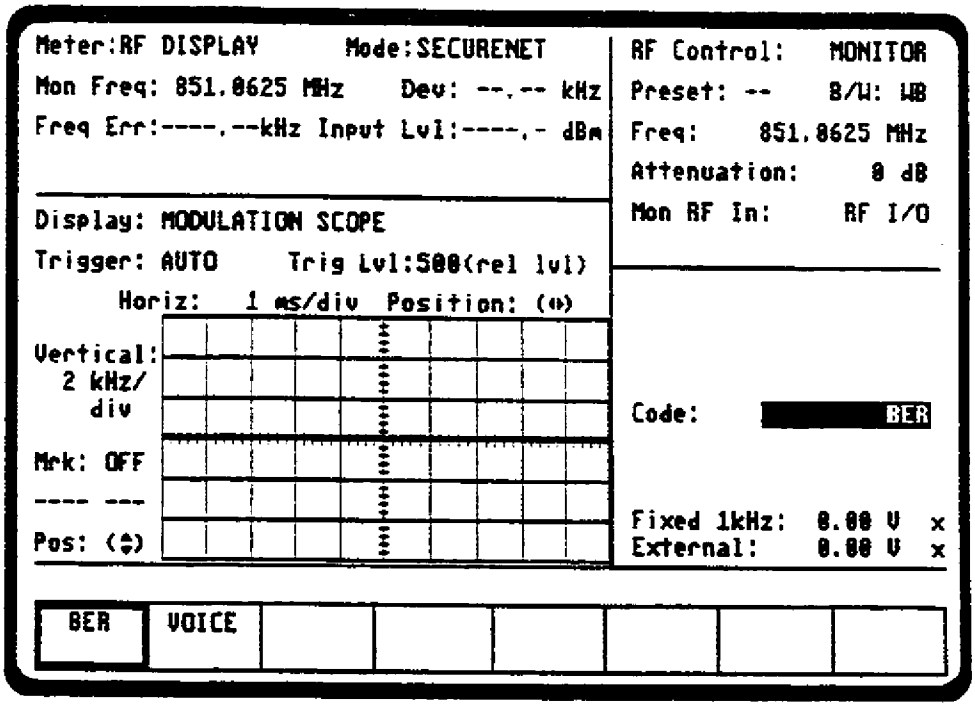


Figure 3-10. Monitor Mode - RF Zone

The specific entry fields are as follows.

Preset

The preset entry field provides a convenient way to enter a bandwidth, frequency, and other information for the unit by recalling preset data from nonvolatile memory. If a preset is not to be used, enter the desired information at each of the fields.

NOTE

If a preset had been selected and changes are made to any of the preset values, the "Preset:" field will have dashes through it, indicating the preset is no longer selected.

B/W

Selects either wide or narrow IF bandwidth of the unit via softkey selection.

Freq

Enter the desired monitor frequency using keypad or TUNING knob.

Attenuation

Selects the amount of attenuation at the RF input to the monitor receiver using softkeys. Selectable input attenuation is useful in adjusting displays for a wide range of input levels, as well as for use in high RF field environments where intermodulation may cause desensitization of the receiver.

Mon RF In

Selects the RF input port via softkeys. The RF I/O port contains an RF load and should be used for direct connection to the radio under test. The ANT port accesses the unit's sensitive receiver and should be used with an antenna for "off-the-air" reception. Selection of the ANT port is indicated by a red LED next to the ANT connector.

CAUTION

Do not apply input power to the ANT input port. In the event RF power is inadvertently applied, the port is protected by an in-line RF fuse. This fuse may be accessed by unscrewing the front of the BNC connector out of the front panel. Refer to paragraph 2-2.4.1 in the R-2600 Series Operator's Manual for additional detail.

3-8.2 GENERATE Mode

The GENERATE mode (figure 3-11) configures the Analyzer to generate an RF signal at a controlled output level. The GENERATE mode thus provides for a wide range of radio receiver testing. In SECURENET Generate mode, the RF Zone is similar to the RF Zone in standard mode. It is capable of setting up the analyzer to generate RF output through its RF I/O port or through the Generator Output (GEN OUT) port.

The RF Zone contains fields for choosing the generator bandwidth, frequency, output level, and output connector of the SECURENET RF signal. All of these fields operate as described in the R-2600 Series Operator's Manual except the Modulation Type field is not required.

Specific controls which further configure the GENERATE mode are located within the RF Control Zone when GENERATE is first selected.

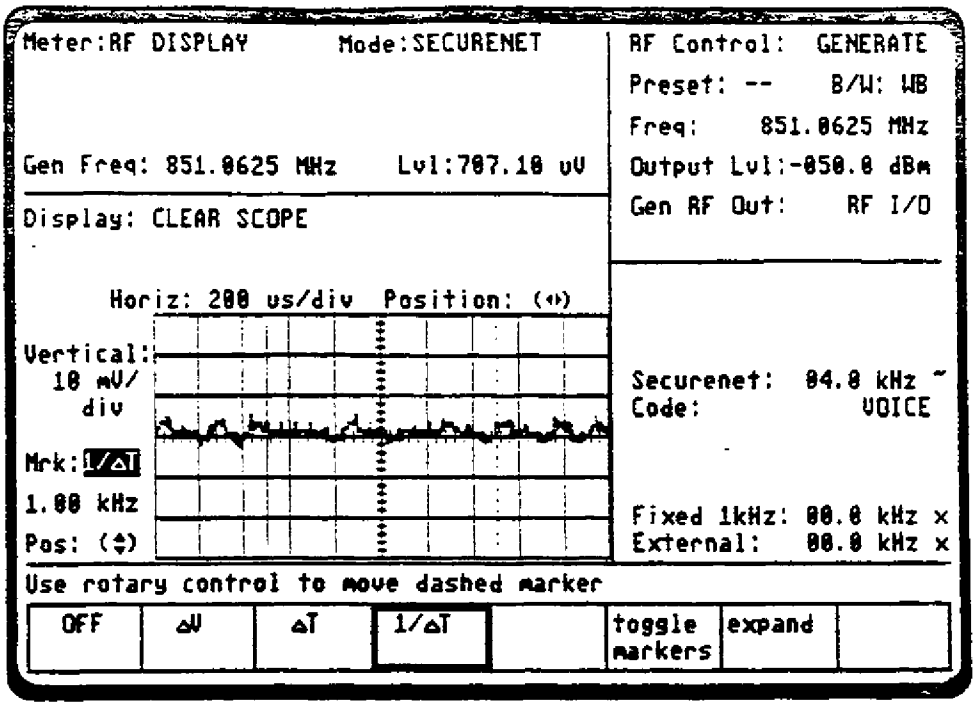


Figure 3-11. Generate Mode - RF Zone

The specific entry fields are as follows:

Preset

The preset function is the same as in the MONITOR mode.

B/W

Selects either wide or narrow bandwidth of the unit via softkey selection.

Freq

Enter the desired generate RF frequency using keypad or TUNING knob.

Output Lvl

Selects generator output level in 0.1 dBm steps over the range of -130 dBm to 0 dBm. An alternate display of generate level in microvolts is available in the "Meter:" area of the Display Zone. Output level is available in two ranges depending upon which output port is selected:

- The range of -80 dBm to 0 dBm is available when the high level GEN OUT port is selected.
- The range of -130 dBm to -50 dBm is available when the RF I/O output port is selected.

Gen RF Out

Selects the RF output port via softkeys. The RF I/O port is recommended for most applications. GEN and MON ports are combined for a single connection to the radio under test. The GEN port is recommended where higher levels are needed. Selection of the GEN port is indicated by a red LED adjacent to the GEN OUT connector.

CAUTION

Do not apply input power to the GEN OUT port. In the event RF power is inadvertently applied, the port is protected by an in-line RF fuse. This fuse may be accessed by unscrewing the front of the BNC connector out of the front panel.

3-8.3 DUPLEX Mode

The DUPLEX Mode (figure 3-12) provides a simultaneous RF generator BER pattern output that is offset in frequency from the monitor center frequency and fully adjustable in output level.

This capability provides for servicing full duplex radio equipment as well as repeaters and radios operating with offset transmit and receive frequencies. The Display zone provides softkey selections for Generated or Monitor clear baseband signal as shown in figure 3-12.

Specific controls which further configure the DUPLEX mode are located within the RF Control Zone when DUPLEX is first selected.

The specific entry fields are as follows:

Preset

The preset function is the same as in the MONITOR mode.

B/W

Selects either wide or narrow bandwidth of the unit via softkey selection.

Mon Freq

Enter the desired monitor frequency using keypad or tuning knob.

Offset

Enter the generator frequency offset relative to the monitor frequency entered. Offset frequencies of + or -0 to 55 MHz are allowed. The offset frequency is set in 5 kHz steps.

Mon

This field actually contains two separate fields, one for monitor input attenuation and one for monitor port selection. Refer to the MONITOR mode description for further details.

Gen

This field actually contains two separate fields, one for generate output level and one for generate output port selection. Refer to the GENERATE mode description for further details.

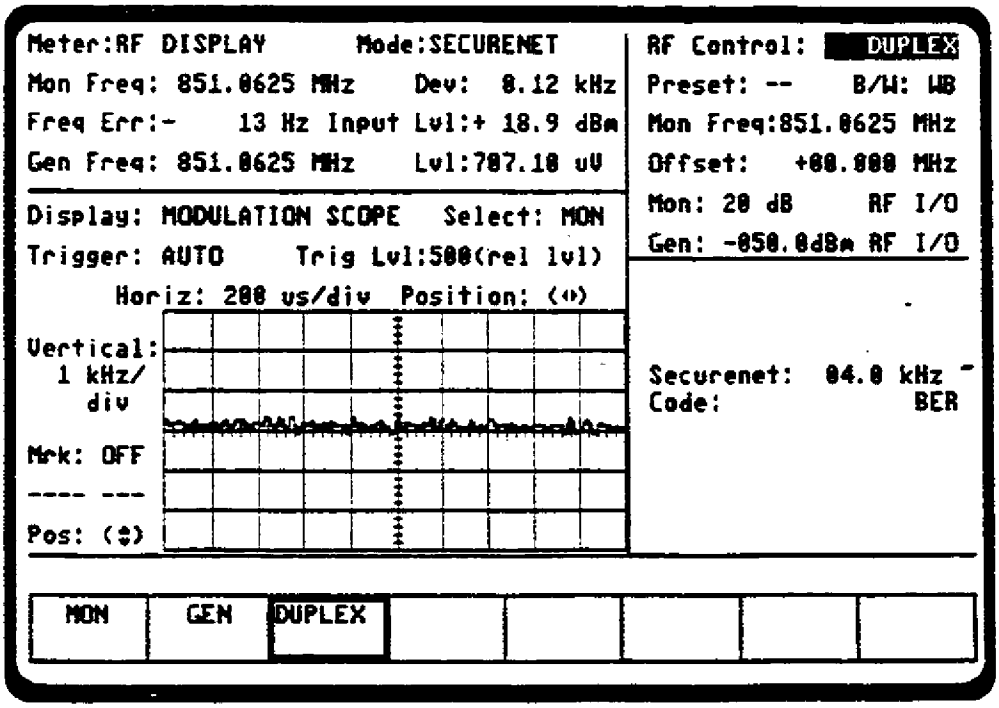


Figure 3-12. Duplex Mode - Display Zone

3-9 SECURENET AUDIO/ MODULATION CONTROL

The Audio Zone located at the lower right of the screen (figure 3-13) is used to control the multi-purpose audio synthesizer section of the R-2670. Signals generated by the audio synthesizer are coupled internally to the generator modulation input as well as to the MOD OUT connector on front panel. The main categories of modulation in SECURENET mode are Voice and Bit Error Rate (BER). Many of the features available in standard mode are not available in SECURENET mode. The Audio Zone has been changed accordingly to simplify testing of SECURENET radios and equipment.

Each modulation signal has a cursor field for entering its desired level. Use the keypad or TUNING knob to enter the desired level.

An additional cursor field, adjacent to each level entry, is used to switch each selection on and off using softkeys. This field is located at the extreme right side of the zone. There are two possible conditions for this softkey selection.

- CONT activates continuous ON condition, or continuous cycling if a sequence has been selected. A "~" symbol is indicated at the extreme right, adjacent to the level to indicate continuous ON.
- OFF switches off the modulation source. Off is indicated by an "X" at the extreme right, adjacent to the level.

3-9.1 Modulation Sources

There are two modulation sources selectable in the Audio Zone, Fixed 1 kHz and External.

3-9.1.1 Fixed 1 kHz

The analyzer produces a fixed 1 kHz modulation source, which can be selected independently from the other audio synthesizers. Level control and on-off selection is described above.

3-9.1.2 External

External modulation can be applied to the external modulation input (EXT MOD IN) connector on the front panel. When external modulation source is selected, this external modulation input is summed with the microphone (voice) input. Level control and on-off selection for an external modulation source are selectable via softkey or the TUNING knob.

3-9.2 Voice Encode

The Audio Zone provides controls for both signal level and frequency deviation of Voice baseband signal that is used to modulate the SECURENET RF transmissions.

3-9.2.1 Monitor Mode

The analyzer can monitor SECURENET voice patterns when placed in the Monitor mode. The SECURENET signal is decrypted with one of the hardware algorithms.

Be sure Monitor is selected in the RF Control Zone in the upper right section of display. Move cursor to the Audio Zone and place the cursor in the "Code:" field. Select Voice modulation using the **VOICE** softkey. Selection of Monitor Voice allows for the addition of the following audio sources:

- External + microphone, or
- 1 kHz tone.

These inputs are selected by using the off and continuous switches and the level is adjusted using the keypad or tuning knob. The level range varies depending on whether the bandwidth (in the RF Zone) is set to narrow or wide.

BW Setting	Audio level Range
Narrow	0.000 to 0.795 volt maximum, in 0.001 volt increments
Wide	0.00 to 7.95 volt maximum, in 0.01 volt increments

3-9.2.2 Generate Mode

The analyzer can generate SECURENET voice patterns when placed in the Generate mode. The SECURENET signal is encrypted with one of the hardware algorithms.

Be sure GENERATE is selected in the RF Control Zone in the upper right section of display. Move cursor to the Audio Zone and place the cursor in the "Code:" field. Select Voice modulation using the **VOICE** softkey.

When code Voice is selected in the Audio Zone (figure 3-13), the analyzer allows audio inputs to the modulator to be selected from two sources:

- External + microphone, or
- 1 kHz tone.

Controls for each modulating input consist of a switch with values of Off and Continuous. Move cursor to the appropriate switch field and turn the modulating input on "~" or off "X" using the softkeys.

The audio inputs also include a level control for precisely setting the audio input to the modulator. Use the keypad or TUNING knob to enter the desired level. The level range varies depending on whether the bandwidth (in the RF Zone) is set to narrow or wide.

BW Setting	Audio Level Range
Narrow	0.00 to 9.95 kHz maximum, in 0.01 kHz increments
Wide	00.0 to 99.5 kHz maximum, in 0.1 kHz increments

In Generate mode, Deviation control is available in the Audio Zone consisting of a switch with values of Off and Continuous, and a level control. Move cursor to the switch field and turn deviation on "~" or off "X" using the softkeys.

Use the keypad or TUNING knob to enter the desired deviation. The deviation range varies depending on whether the bandwidth (in the RF Zone) is set to narrow or wide.

BW Setting	Deviation Range
Narrow	0.00 to 5.00 kHz maximum, in 0.01 kHz increments
Wide	00.0 to 50.0 kHz maximum, in 0.10 kHz increments

The baseband signal of the generated Voice pattern is available at the MOD OUT connector on the front panel.

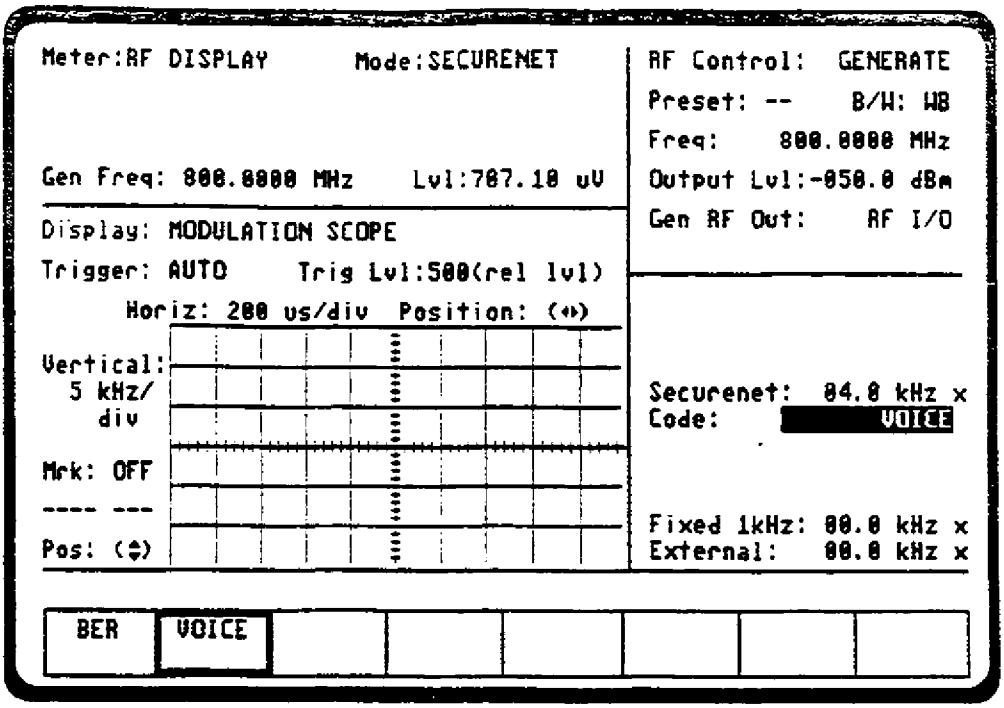


Figure 3-13. SECURENET Audio Zone - Voice Generate Mode

3-9.3 BER Encode

The Audio Zone provides controls for both signal level and frequency deviation of BER baseband signal that is used to modulate the SECURENET RF transmissions.

3-9.3.1 Monitor Mode

When Monitor is selected in the RF Control Zone and code BER is selected in the Audio Zone, the analyzer is configured to receive a BER pattern. The received BER pattern can be displayed in the Display tri-sector and measured in the Metering Zone.

3-9.3.2 Generate Mode

The analyzer can generate SECURENET BER patterns when placed in the Generate mode. The Audio Zone provides the "Code:" field to select BER generation.

When code BER is selected in the Audio Zone (figure 3-14), the R-2670 modulates BER on the carrier at either of two output ports:

- RF I/O port, or
- GEN OUT port.

In Generate mode, modulation deviation is controlled in the Audio Zone by a switch with values of Off and Continuous, and a level control. Move cursor to the switch field and turn deviation on "~" or off "X" using the softkeys.

Use the keypad or TUNING knob to enter the desired deviation. The deviation range varies depending on whether the bandwidth (in the RF Zone) is set to narrow or wide.

BW Setting	Deviation Range
Narrow	0.50 to 5.00 kHz maximum, in 0.05 kHz increments
Wide	05.0 to 50.0 kHz maximum, in 0.50 kHz increments

The baseband signal of the generated BER pattern is available at the MOD OUT connector on the front panel.

3-9.3.3 Duplex Mode

The analyzer can generate SECURENET BER patterns when placed in the Duplex mode. The Audio Zone user interface is the same as in Generate mode.

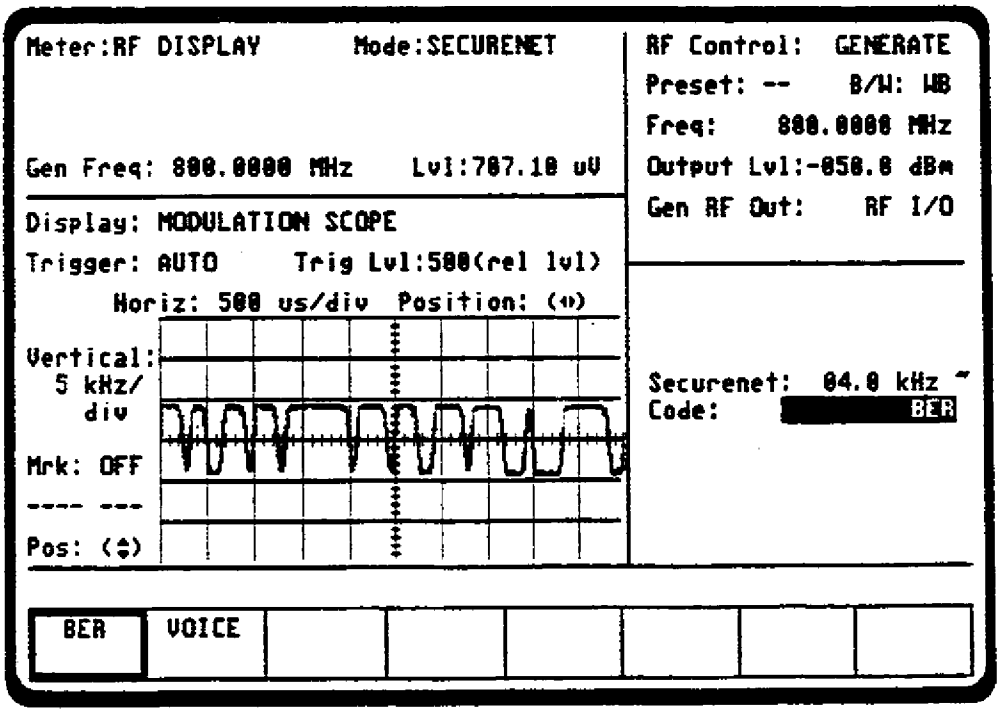


Figure 3-14. SECURENET Audio Zone - BER Generate Mode

3-10 SECURENET METER AND DISPLAY CONTROL

SECURENET meter and display zone is similar to the standard mode. Many of the softkey selections are available, however, some of the selections will return a "not available in SECURENET mode" message. See para 3-7 in the R-2600 Series Operator's Manual for a description of the functionality of meter and display zone selections that are still available in SECURENET mode. The Display Zone is slightly modified to accommodate testing of SECURENET radio equipment. A BER Meter is added to the metering functions in the Display Zone. CLEAR SCOPE and SET UP display functions have also been added to the Display Zone. VOICE FRAME display function is not applicable to Securenet mode. The message "Voice Frame Decode Disabled in the Mode: will be appear on the screen if the **VOICE FRAME** softkey is selected. Functions that have been added are described in the following paragraphs. Description of the other displays can be found in para 3-7.2 of the R-2600 Series Operator's Manual.

3-10.1 SECURENET BER Meter

The BER Meter is available only during BER Monitor or Duplex Testing. This BER monitor test verifies the integrity of test signals generated by SECURENET radios. The BER Meter provides digital readout of bit error rate, frequency error and input power level as well as monitor frequency and deviation. An example of the BER Meter is shown in figure 3-15.

Test setup for the BER Meter test is the same as figure 3-4. To activate the BER Meter test, set controls in the RF Zone as follows:

RF Control:	Monitor (or Duplex)
Frequency:	Same as radio transmit frequency
Attenuation:	0 dB
Mon RF In:	RF I/O

The BER Meter is accessed by placing the cursor in the Display Zone's "Meter:" field and pressing the **more** softkey until the **BER** softkey is presented. Select the **BER** softkey to access the BER Meter (figure 3-15).

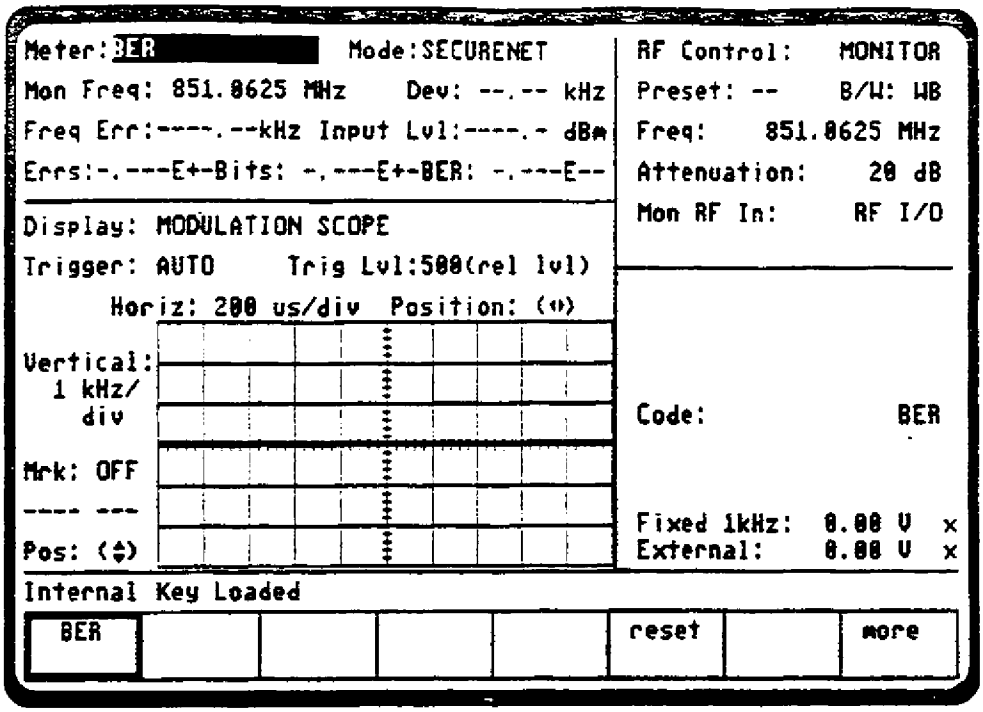


Figure 3-15. SECURENET BER Meter

Mon Freq

Display of the actual monitored frequency.

Dev

Display of the frequency deviation in kHz.

Freq Err

The acquisition frequency error range is ±1500 Hz as described for the RF Display.

Input Lvl

(Recall that Input Lvl is a short term average not affected by the value selected for **Slots.**)

Errs

Display of the bit error count detected during the test.

Bits

Display of the bit count during the test.

BER

Display of the ratio of bit errors to total bits counted during the test. **BER** is displayed as a percentage. The BER for one error in one thousand bits is 00.1000%.

NOTE

BER Meter measurement is accurate up to 20 percent bit errors.

Enabling the BER Test

The BER test begins when BER meter is selected in the Display Zone "Meter:" field.

Resetting the BER Test

To reset the BER test, move cursor to the "Meter:" field in the Display Zone and press more until reset is displayed. Press reset and the BER count is started over from zero.

3-10.2 CLEAR SCOPE Display

The CLEAR SCOPE display shows either the received audio signal after it has been converted to analog or the analog transmit signal before it is digitized. To activate the CLEAR SCOPE, place the analyzer in SECURENET mode. The selection of either Monitor or Generate in the RF Zone determines which signal will be displayed on the screen. Press the DISP hardkey, place the cursor in "Display:" field, and select the **CLEAR SCOPE** softkey. The Display area of the screen will indicate CLEAR SCOPE with the input signal displayed in a time-versus-amplitude graph. Figure 3-16 shows the display, cursor and associated softkey used for the CLEAR SCOPE.

The operator can adjust the horizontal scale by placing the cursor in "Horiz:" field and selecting the appropriate value from the softkey selections.

To change the vertical scale, go to the "Vert:" field and select the appropriate value from the softkey selections.

3-10.2.1 Monitor Mode

In Monitor mode, the CLEAR SCOPE display shows the recovered analog audio signal. The CLEAR SCOPE operational controls are similar to the Standard version MOD SCOPE except the vertical scope is mv/div instead of kHz/div.

To change horizontal position, horizontal range, vertical position, or vertical range, use the cursor control keys to highlight the appropriate cursor fields as follows:

Horiz

Press the desired softkey to select the Horizontal Sweep rate (20 µs to 1 sec/div). Since all ranges cannot be shown on one screen, press the **more** softkey for additional selections.

NOTE

If horizontal sweep rates of greater than 10 msec/div are selected, the update rate will slow down. A good overall setting for most applications is 200 µsec per division.

Horizontal Position

Adjust the horizontal position through the (◀▶) cursor field either by using the desired softkey (MOVE LEFT, MOVE RIGHT) or by using the rotary TUNING knob.

Vertical Sensitivity

Press the desired softkey to select the Vertical Sensitivity (10 mV to 10 V per division). When all ranges cannot be shown on one screen, press the **more** softkey for additional selections.

Vertical Position

Adjust the vertical position through the (▲▼) cursor field either by using the desired softkey (MOVE UP, MOVE DOWN) or by using the rotary TUNING knob.

Press the **expand** softkey from any field in the scope display window to enlarge the display for more detailed analysis. Use the **return** softkey to get back to the normal size display.

Marker

Select marker operation by moving the cursor to the "Mrk:" field, then pressing the desired *delta* softkey (ΔV, ΔT, or 1/ΔT). Selection provides two markers on the CLEAR SCOPE screen (refer to figure 3-17). Press the **toggle marker** softkey to alternate between markers and use TUNING knob to position markers.

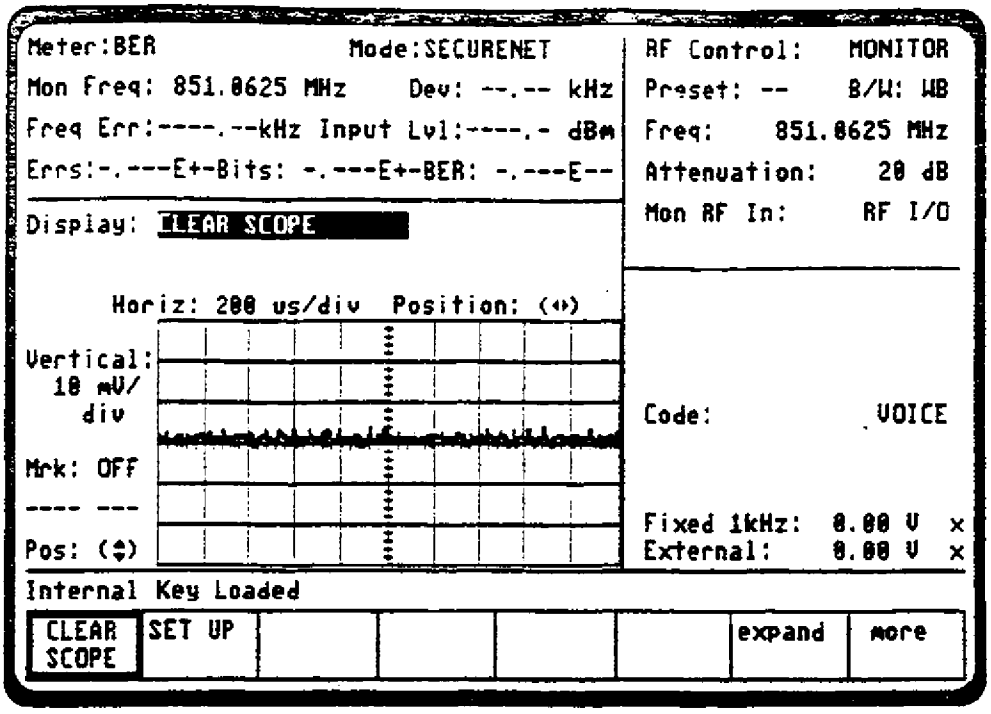


Figure 3-16. SECURENET CLEAR SCOPE Display

ΔV

This softkey selection provides markers that are *horizontally located* to permit relative readings along the scope vertical axis. The display adjacent to the "Mrk:" field shows the relative voltage difference between the two marker positions.

ΔT

This key selection provides markers that are horizontally located to permit relative readings along the scope *vertical axis*. The display adjacent to the "Mrk:" field shows the relative horizontal deflection between the two marker positions in units of time.

1/ΔT

This softkey selection provides markers that are also *vertically located* to permit relative readings along the scope horizontal axis. This selection inverts the time reading to display the relative difference in terms of frequency.

3-10.2.2. Generate Mode

In Generate mode, the CLEAR SCOPE disp[illegible] shows the generated analog audio signal. T[illegible] CLEAR SCOPE operational controls are similar to the Standard version MOD SCOPE, however the vertical scale is different as listed above for Monitor mode.

3-10.2.3 Duplex Mode

In Duplex mode, the softkeys provide selection of either the recovered analog audio signal or the generated analog audio signal. Otherwise, the CLEAR SCOPE display is the same as in para 3-10.2.1 above.

In DUPLEX mode, select either generate or monitor CLEAR SCOPE display by first moving the cursor to the "Select:" field within the Display area, then pressing the desired softkey **GEN** or **MON**.

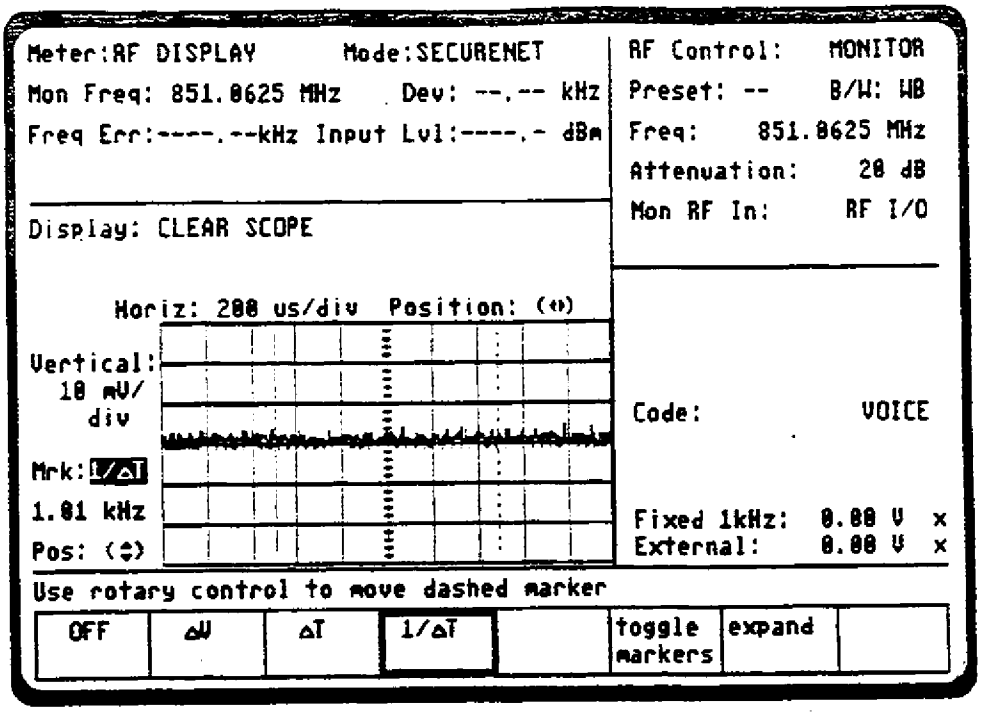


Figure 3-17. CLEAR SCOPE Markers

3-10.3 EOM Signaling Tone

The SECURENET Option generates an End-of-Message signaling tone at the end of encrypted transmissions. In Generate mode, this tests the decoding circuit in the radio being tested.

In Monitor mode, the SECURENET option detects the End-Of-Message (EOM) signaling tone from the radio under test. The EOM signaling tone is a 6 kHz uncoded sine wave appended to encrypted transmissions by the transmitting unit. The range of tone frequencies detected is 6 kHz +/- 300 Hz. The EOM signaling tone tells the receiving unit that the transmitted signal is finished and squelch should be applied. An "EOM indication" is displayed on the analyzer screen (figure 3-18) as a message whenever the unit being tested furnishes proper EOM signaling as it terminates transmission. The message remains on the display screen for approximately three seconds.

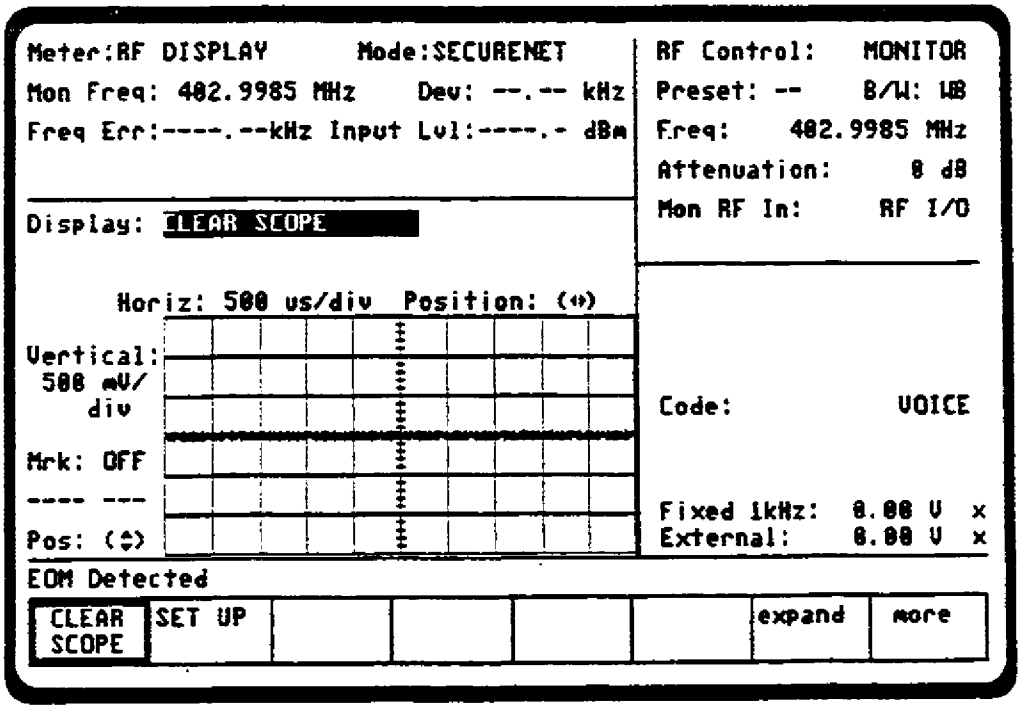


Figure 3-18. EOM Received Message

Section 4

APPLICATIONS

CAUTION

When testing a radio, 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.*

4-1 BASIC SECURENET RADIO TESTING

This section of the manual contains information on how to connect equipment under test to the R-2670 Analyzer. It is a supplement to sections 3 and 4 of the R-2600 Operator's Manual.

4-1.1 Setting the Deviation Level

The deviation of the radio can be set with greater accuracy by configuring the R-2670 Analyzer in the following manner:

Display Zone

- Mode: SECURENET
- Display: BAR GRAPHS

RF Zone

- RF Control: MONITOR
- B/W: WB

Both the digital display and the bar graph results are improved by a smoothing algorithm over many samples for accurate average peak deviation measurements. The bar graphs display both the positive and negative modulation peaks of the radio signal. Note that instantaneous deviation measurements can be obtained by changing the Mode Cursor to STD.

The deviation level of the R-2670 Analyzer is calibrated during system calibration for both narrow and wide band. Internal adjustments are made during calibration for all levels including 4 kHz so no operator manual tuning is necessary.

4-1.2 Monitor Mode Testing

To setup for Monitor mode testing, put the analyzer in SECURENET mode, and in the RF Zone select Monitor mode. Select the desired settings for each cursor position in the RF Zone. Select the corresponding softkey for the Mon RF In cursor location. There are two choices: ANT and RF I/O port. The ANT port accesses the analyzer's sensitive receiver and should be used strictly for "off the air" measurements. If ANT is used, attach the supplied antenna to the ANT port. The RF I/O port should be used for direct connection to the radio under test. If RF I/O port is used, connect a coaxial cable from

the analyzer's input port to the radio's output port.

Select the desired meter and display needed to perform the test. See the R-2600 Series Operator's Manual and other sections in this manual for more details about the analyzer's Monitor functions.

NOTE

Do not directly apply excessive input power to the ANT port. In the event that excessive RF power is inadvertently applied, the port is protected by in-line RF fuse. This fuse may be accessed by unscrewing the front of the BNC connector out of the front panel. Refer to section 2-2.4 in the R-2600 Series Operator's Manual for more details.

4-1.3 Generate Mode Testing

To setup for Generate mode testing, put the analyzer in SECURENET mode, and in the RF Zone select Generate mode. Select the desired settings for each cursor position in the RF Zone. Also select the desired levels in the Audio Zone for the summed modulating signal and SECURENET deviation. Remember to enable the switches. To transmit anything other than BER, the Generate code in the Audio Zone must be set to voice.

In the RF Zone, select the appropriate softkey for the Gen RF Out cursor location. There are two choices: GEN and RF I/O port. The RF I/O port is recommended for most applications where GEN and MON ports are combined for a single connection to the radio under test. The GEN port is recommended where higher levels of output signal are needed. Connect a coaxial cable from the selected output port to the input of the radio. See the R-2600 Series Operator's Manual and other sections in this manual for more details about the analyzer's Generate functions.

NOTE

Do not apply input power to the GEN output port. In the event RF power is inadvertently applied, the port is protected by in-line RF fuse. This fuse may be accessed by unscrewing the front of the BNC connector out of the front panel. Refer to section 2-2.4 in the R-2600 Series Operator's Manual for more details.

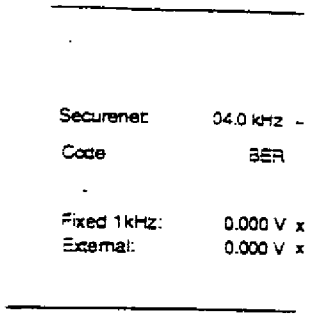
4-2 BER TESTING THE RADIO RECEIVER (Generate Mode)

4-2.1 Radio in BER Test Mode

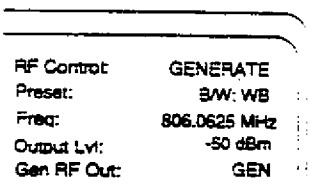
This application example describes the receiver test for radios that have BER test capability. The receiver must have the capability of receiving an unencrypted V.52 BER test pattern. Performance of this test requires the analyzer to operate in Generate BER Test mode. In this mode the analyzer generates a test signal and the radio monitors the signal. When testing the receiver, the radio under test measures the BER of the received signal and displays the result to the operator. The output level of the analyzer is reduced until the radio BER threshold is determined. Consult the radio maintenance manual to determine the BER threshold percentage to be used in testing.

Test frequencies may be specified for BER test of your equipment. Consult the radio maintenance manual.

1. Connect the RF Input port of the radio under test to the GEN OUT port of the analyzer. Consult the radio maintenance manual to determine the appropriate test port.
2. Select the SECURENET BER Test mode by placing the cursor in the "Code:" field in the Audio Zone (Figure 4-1). With the cursor in the "Code:" field, select the **BER** softkey.
3. Set controls in the Audio Zone as follows.



4. Place the cursor within the RF Zone and configure the analyzer as follows:



5. Configure the radio under test to BER Test mode. Consult your radio maintenance manual for specific instructions. Reset the analyzer frequency to the BER Test frequency of the radio.
6. Monitor the radio's received BER. Reduce the analyzer's output level until the radio measures a BER corresponding to sensitivity threshold.

Consult your radio maintenance manual for the receiver sensitivity specification.

4-3 BER TESTING THE RADIO TRANSMITTER (Monitor mode)

4-3.1 Radio in BER Test Mode

This application example describes the transmitter test for radios that have BER test capability. The transmitter must have the capability of transmitting an unencrypted V.52 BER test pattern. Performance of this test requires the analyzer to operate in monitor or duplex mode, and monitoring a test signal transmitted by the radio under test.

When testing the transmitter, the radio generates a test signal. The analyzer measures the transmitted BER, frequency error, and power level of the signal transmitted by the radio.

Consult the radio maintenance manual, as specific test frequencies may be specified for BER test of your equipment.

1. Connect the RF input/output of the radio under test to the RF I/O port of the analyzer as shown in Figure 3-4. Consult the radio maintenance manual to determine the appropriate test port.

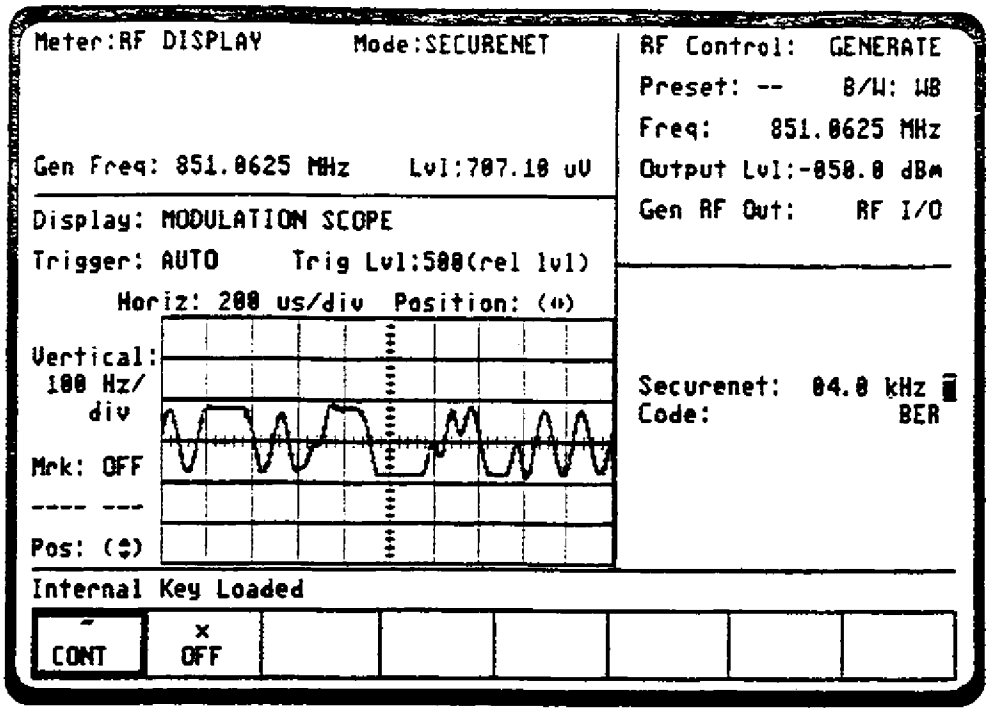


Figure 4-1. Radio (BER Test Mode) Audio Zone

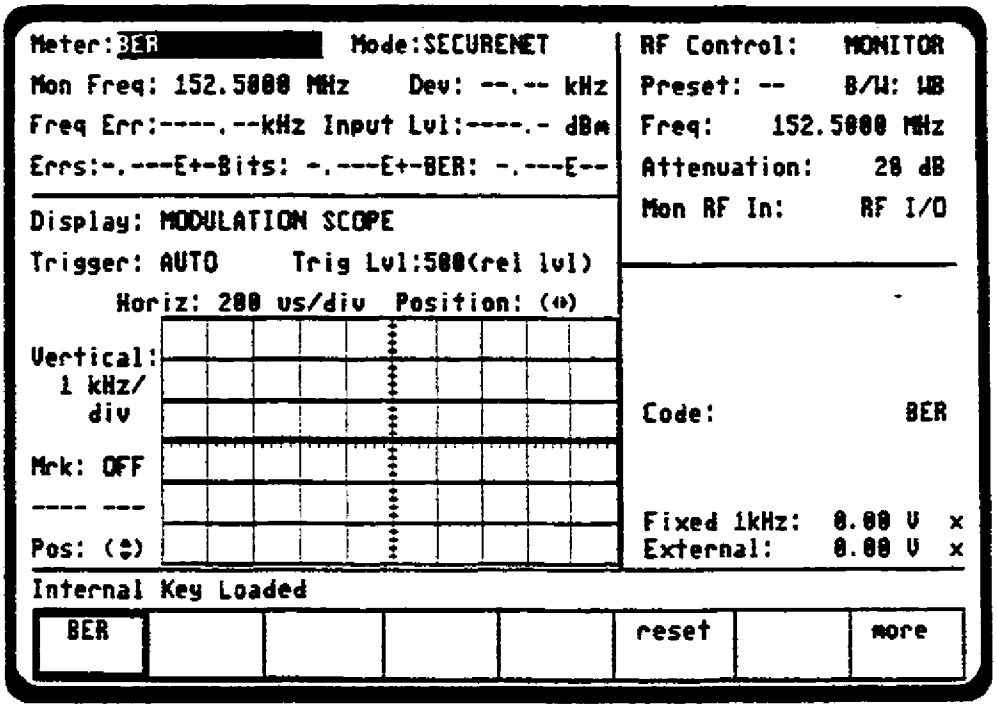


Figure 4-2. Radio (BER Test Mode) BER Meter Sample

2. Place the cursor within the RF Zone and configure the analyzer as follows:

RF Control:	MONITOR
Preset:	B/W: WB
Freq:	806.0625 MHz
Attenuation:	0 dB
Mon RF In	RF I/O

3. Configure the radio under test to BER Test mode. Consult your radio maintenance manual for specific instructions. Reset the frequency of the analyzer to appropriate BER test frequency.
4. Turn on the transmitter of the radio. Consult your radio maintenance manual for instructions.
5. Access the BER Meter by placing the cursor in the Display Zone's "Meter:" field and pressing the **more** softkey until the **BER** softkey is presented. Select BER via the softkey to display the BER Meter. A screen similar to figure 4-2 appears.
6. BER measurements will be terminated at end of transmission or when switching out of BER Monitor Mode.

4-4 BER TESTING USING DUPLEX MODE

The analyzer can perform BER testing using RF or Baseband. The analyzer generates a CCITT V.52 standard BER pattern.

Figures 4-3 and 4-4 show where the analyzer BER test pattern is inserted and sampled in the transmit and receive paths.

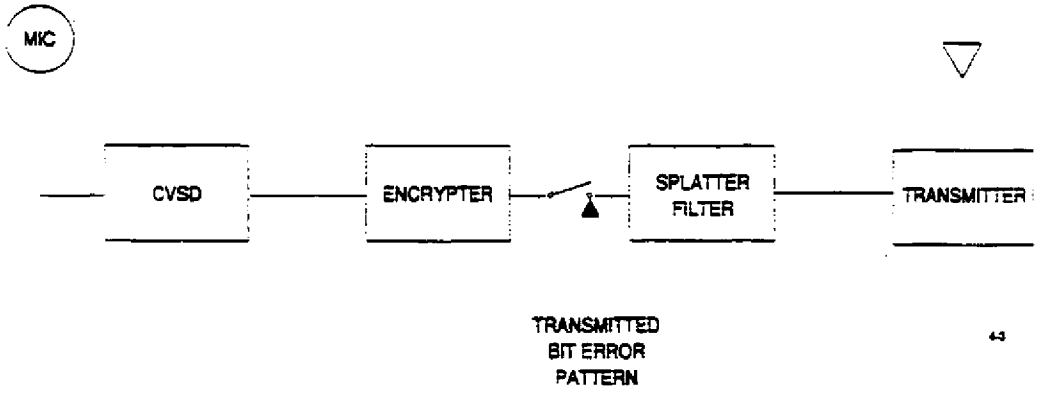


Figure 4-3. Transmit BER

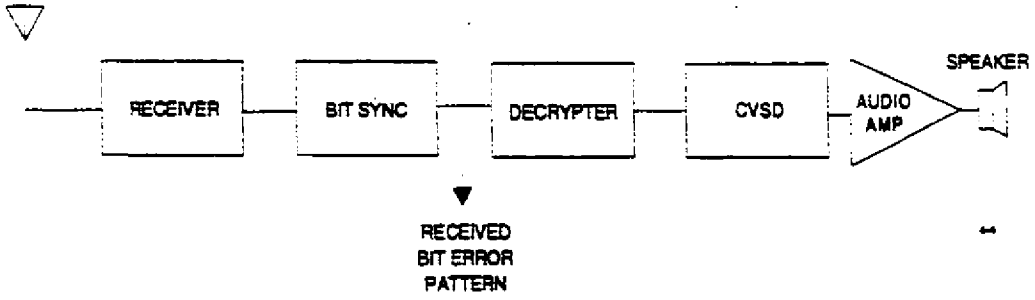


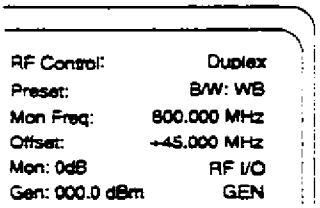
Figure 4-4. Receive BER

4-4.1 Radios without BER Test Capability

Radio receivers can be tested using the analyzer in the Duplex BER mode. The test is performed by outputting an RF test pattern from the analyzer and feeding back the received baseband digital test pattern from the radio. The received digital bit stream can be monitoring for bit errors. This test requires that the receiving radio be opened to provide access to the digital data at a point before it enters the decrypter. (Consult the radio maintenance manual to determine this point.)

To set up the analyzer for the Duplex BER test, perform the following sequence:

1. Connect the RF input port of the radio under test to the GEN OUT port of the analyzer.
2. Place the cursor in the RF Zone and configure the analyzer as shown below. Set the monitor frequency of the radio to be tested. The default offset frequency is +45 MHz, but is unimportant because the signal being returned from the radio is baseband.



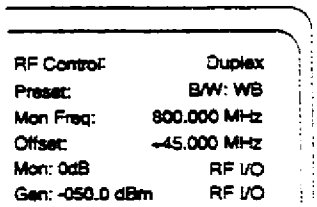
3. Set the controls in the Audio Zone as follows:
   - Securenet: 4.0 kHz
   - Code: BER
4. Press the **SPF** hardkey to access the special functions screen and select External Input under "Decoding." Press the **return** softkey to return to the main screen.
5. With the cursor on RF Display, press the **more** softkey and select BER. The BER metering will appear in the top left corner of the screen.
6. Place the cursor on Display and select Ext Scope.
7. Turn on the radio. Connect a probe to the VERT input on the analyzer and sample the digital data at the point indicated above.

The BER metering screen will indicate the BER. The digital bit pattern is also viewable on the analyzer Ext Scope. Due to the features of digital scopes, the generated eye pattern may be seen more clearly by connecting the MOD OUT on the analyzer front panel to a conventional oscilloscope. The monitored eye pattern can be seen at the DEMOD OUT port.

4-4.2 Radios with BER Test Capability and Repeaters

Radios with BER capability and repeaters can be tested by the analyzer using the V.52 BER test pattern. In RF mode, the operation of both the radio receiver and transmitter can be evaluated. To set up the analyzer for the BER test, use the following sequence:

1. Connect the RF IN/OUT port of the analyzer to the RF port of the radio under test.
2. Place the cursor in the RF Zone and configure the analyzer as shown below. Set the monitor frequency of the analyzer at the generate frequency of the radio to be tested, and set the analyzer offset frequency to correspond to that of the radio.



3. Set the controls in the Audio Zone as follows:
   - Securenet: 4.0 kHz
   - Code: BER
4. With the cursor on RF Display, press the **more** softkey and select BER. The BER

metering will appear in the top left corner of the screen.

5. Press the reset softkey to reset the BER measurements.

The monitored or generated BIT pattern can be observed by selecting MODULATION SCOPE in the Display Zone.

Remote repeaters, modems or other devices using a 600-ohm balanced line can be tested by the analyzer using baseband mode. To set up the analyzer for baseband operation, refer to paragraphs 4-10 and 4-11.

4-5 VOICE PATTERN TESTING IN GENERATE MODE

This section contains the basic test setup for FM receivers. Testing procedures are contained in Section 4 of the R-2600 Series Operating Manual.

The analyzer's DVM input is unbalanced (ground referenced). Use an appropriate interface to measure balanced circuits, such as certain receiver audio outputs or telephone lines.

Refer to figure 4-3. Connect the analyzer's RF I/O port to the radio antenna connector. Connect the radio audio output to VERT/SINAD port of the analyzer.

CAUTION

With some radios, grounding the speaker leads will damage the audio circuitry. Use isolation techniques on these radios.

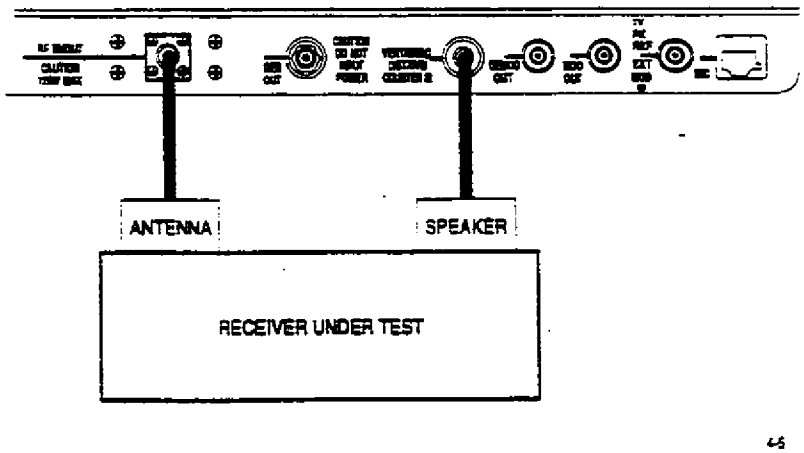


Figure 4-5. Basic FM Receiver Testing Setup

4-6 VOICE PATTERN TESTING IN MONITOR MODE

This section contains basic test setup for FM transmitters. Testing procedures are contained in Section 4 of the R-2600 Series Operator's Manual.

CAUTION

*For transmit power output measurements, connect the transmitter under test only to the analyzer's RF I/O port. **Do not** connect it to the ANT port. The ANT Port is used with an antenna for over-the air-testing.*

*The built-in RF load dissipates up to 50 W for three minutes and up to 125 W for one minute. If a high-power transmitter is keyed into the analyzer long enough to threaten overheating the power measuring circuitry, the analyzer's audible alarm sounds and the display changes to the **RF LOAD OVERTEMPERATURE** warning, signaling the operator to unkey.*

Refer to Figure 4-4. Connect the analyzer's RF I/O port to the RF output of the transmitter under test. Connect the analyzer's MOD OUT jack to the mic audio input of the transmitter under test.

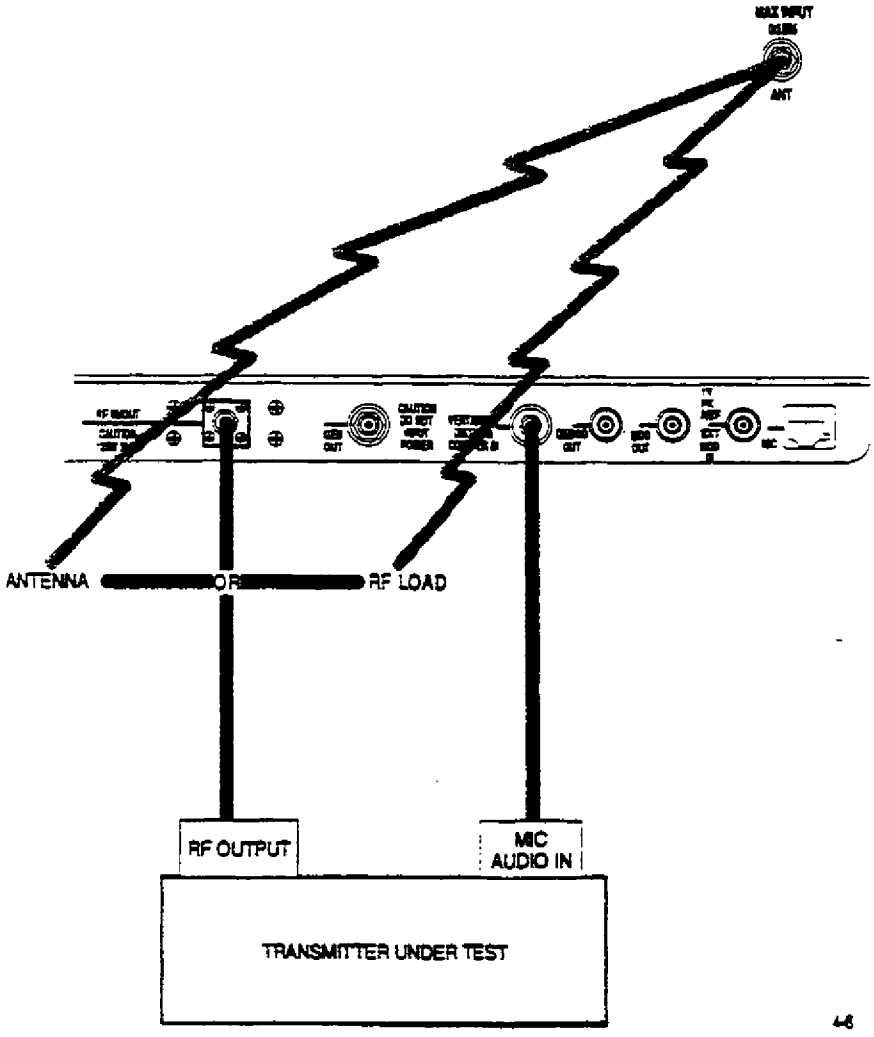


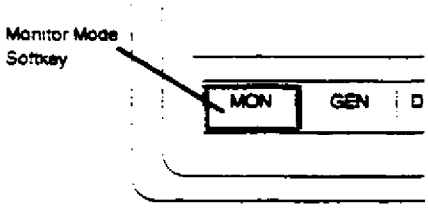
Figure 4-6. Basic FM Transmitter Testing Setup

4-7 MONITORING RECEIVED AUDIO WITH CLEAR SCOPE

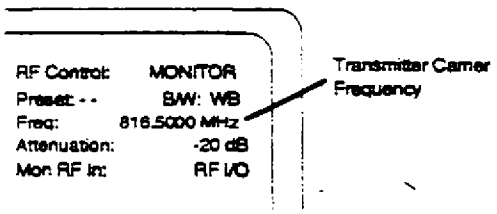
This section of the manual contains information on using the Clear Scope function to monitor an audio signal that has been transmitted by SECURENET radio and then recovered by the analyzer.

Connect the analyzer's RF I/O port to the RF output of the transmitter under test.

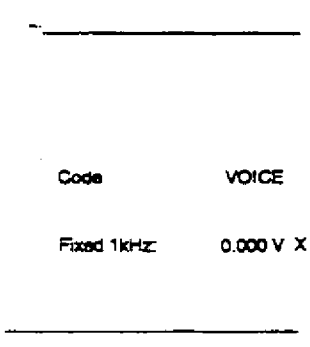
1. Place the analyzer in Securenet mode. Place the cursor within the RF Zone in "RF Control:" field. Press the **MON** softkey to place the analyzer into its Monitor mode of operation.



2. Within the RF Zone, set as follows:



3. Set the SQUELCH control on analyzer to threshold.
4. Press **AUD** hardkey and select voice.



5. Press **DISP** hardkey to move the cursor to the Display Zone.
6. Place cursor in the "Display:" field and press **CLEAR SCOPE** softkey. The CLEAR SCOPE screen should appear similar to Figure 4-5. No waveform is present until the transmitter is turned on.
7. Key up the transmitter in Secure mode.

CAUTION

The analyzer's built-in RF load dissipates up to 50 W for three minutes and up to 125 W for one minute. If a high-power transmitter is keyed into the analyzer for a time long enough to threaten overheating the power measuring circuitry, the analyzer's audible alarm sounds and the display changes to the ***RF LOAD OVERTEMPERATURE*** *warning, signaling the operator to unkey.*

8. Move the cursor to Horiz: field and select the appropriate scale.
9. Move the cursor to Vert: field and select the appropriate scale.
10. Move the cursor to Vert Position: field. Use **move up/move down** softkeys or rotary control to position the recovered audio waveform on a convenient graticule.
11. Move the cursor to Horiz Position: field. Use **move left/move right** softkeys or rotary control to position the recovered audio waveform on a convenient graticule.
12. Move the cursor to Mrk: field.

- Press **ΔV** softkey to display movable markers that measure voltage differential (Vp-p).
- Press **ΔT** softkey to display movable markers that measure time differential (sec).
- Press **Δ1/T** softkey to display movable markers that measure reciprocal time differential (in Hz).

13. Position the markers as desired using TUNING knob (press **toggle marker** softkey to select marker). The movable marker is indicated by a dashed line. Observe digital readout of marked values below Mrk: field.

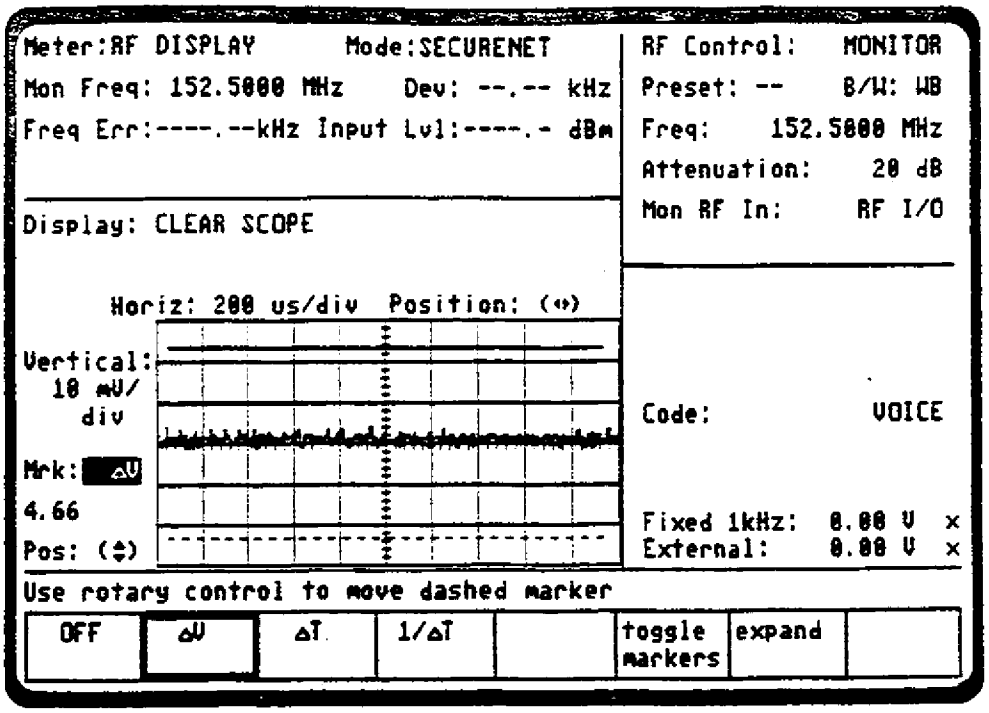


Figure 4-7. SECURENET CLEAR SCOPE Display of Recovered Audio

4-8 MONITORING TRANSMITTED AUDIO WITH CLEAR SCOPE

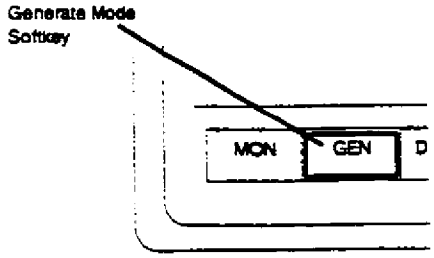
This section of the manual contains information on using the Clear Scope function to analyze the R-2000's raw modulation signal (1 kHz) in SECURENET generate mode. This analog signal is viewed prior to being digitized and encrypted.

Refer to Figure 4-3. Connect the analyzer's RF I/O port to the radio's antenna connector.

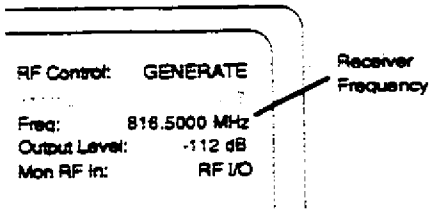
NOTE

It is not necessary to connect the analyzer's DVM port for this application.

1. Place the analyzer in Securenet mode. Place the cursor within the RF Zone in "RF Control:" field. Press the **GEN** softkey to place the analyzer into its Generate mode of operation.



2. Within the RF Zone, set as follows:



NOTE

For setup and distortion measurements, set output level to at least 30 dB above sensitivity threshold (-80 dBm recommended).

3. Use the CURSOR ZONE keys to move the cursor to the Audio Zone. Within the Audio Zone, move the cursor to Fixed 1 kHz controls field. Select 1 kHz audio source as the modulating signal (also available from the MOD OUT connector on the front panel) by turning 1 kHz on "~". Set 1 kHz voltage level to 0.4 volt.

Securenet	04.0 kHz ~
Code	VOICE
Fixed 1kHz:	0.400 V ~
External:	0.000 V x

4. Turn on the SECURENET receiver and tune receiver and analyzer to the same frequency. Verify receiver locks onto test signal and transitions to Private mode.

5. Use the CURSOR ZONE keys on analyzer front panel and move the cursor to the Display Zone.
6. Place cursor in the "Display:" field and press **CLEAR SCOPE** softkey. The CLEAR SCOPE screen should appear similar to Figure 4-6.
8. Move the cursor to Horiz: field and press **200 us** softkey.
9. Move the cursor to Vert: field and press **200 mv** softkey.
10. Move the cursor to Vert Position: field. Use **move up/move down** softkeys or rotary control to position the modulating 1 kHz waveform on a convenient graticule.
11. Move the cursor to Horiz Position: field. Use **move left/move right** softkeys or rotary control to position the modulating 1 kHz waveform on a convenient graticule.
12. Move the cursor to Mrk: field.
- Press **ΔV** softkey to display movable markers that measure voltage differential (Vp-p).
- Press **ΔT** softkey to display movable markers that measure time differential (sec).
- Press **Δ1/T** softkey to display movable markers that measure reciprocal time differential (in Hz).

13. Position the markers as desired using TUNING knob (press **toggle marker** softkey to select marker). The movable marker is indicated by a dashed line. Observe digital readout of marked values below Mrk: field.

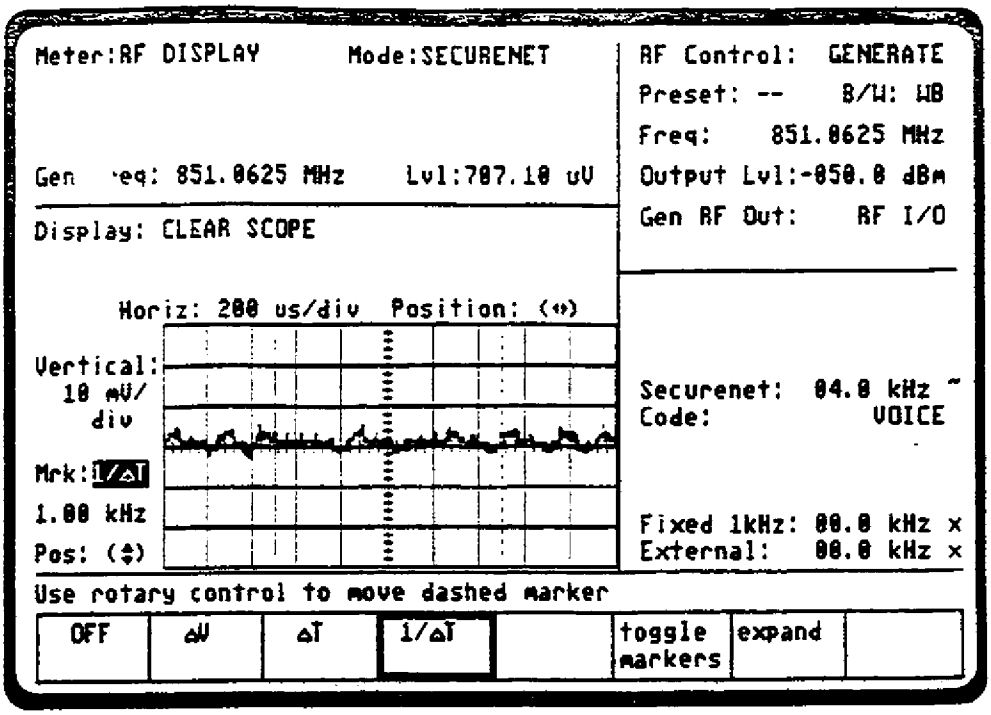


Figure 4-8. SECURENET CLEAR SCOPE Display of Output Modulation

4-9 AUDIO/BER BASEBAND INPUT MONITORING

The analyzer is capable of monitoring SECURENET baseband signals which are transmitted over a 600-ohm balanced line. Connect the baseband input signal to the analyzer as shown in figure 4-9, using isolation transformer part number 01-80302E83.

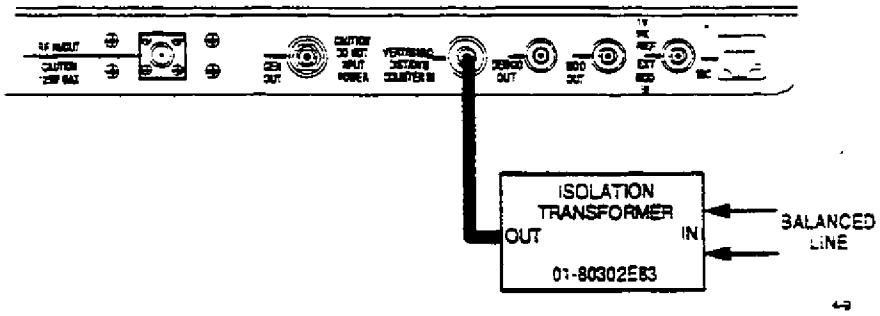


Figure 4-9. Audio/BER Baseband Input Monitoring

To configure the analyzer to receive a baseband signal, go to the special functions screen by pressing the **SPF** hardkey. Move the cursor to "Decoding" and select Ext. Input.

Return to the main screen and select Monitor in the "RF Control:" zone. Set the appropriate frequency and observe the baseband signal by selecting "Ext Scope" in the Display Zone.

4-10 AUDIO/BER BASEBAND OUTPUT GENERATION

The baseband output is available at the MOD OUT connector during normal SECURENET audio transmission. Use isolation transformer 01-P80302E82 to connect from the MOD OUT connector to a 600-ohm balanced line. Make the connections as shown in figure 4-10.

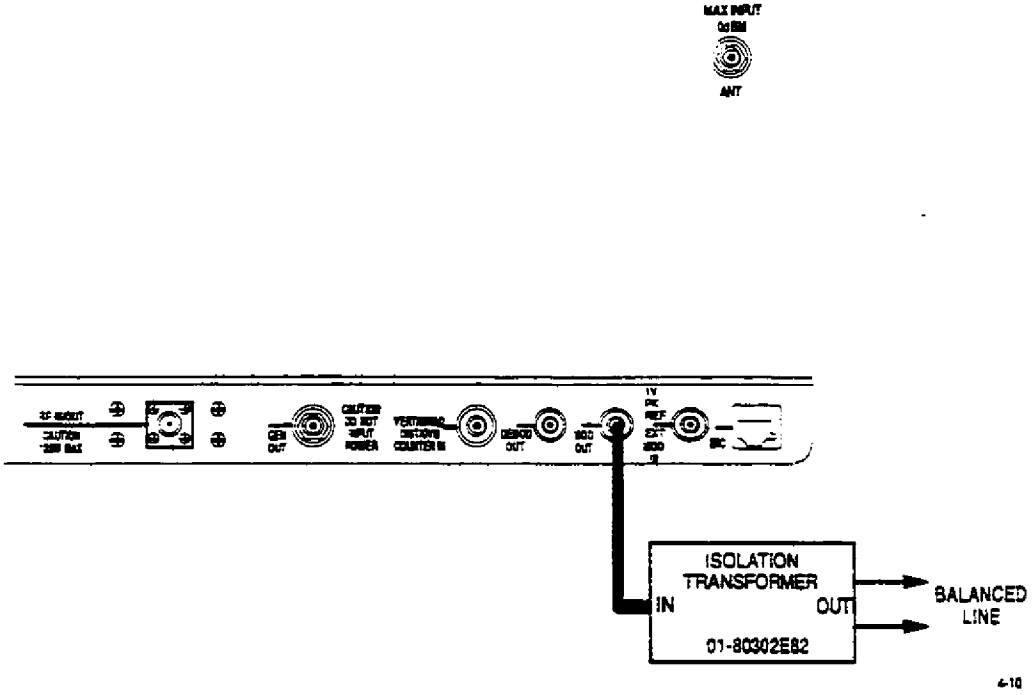


Figure 4-10. Audio/BER Baseband Output Generation

APPENDIX

ERROR AND WARNING MESSAGES

1 ERRORS

SECURENET errors fall into two categories: EMC/Encryption Key Errors and SECURENET Option Errors. Error messages are defined as: "Messages displayed to alert the user to failures which affect system or test functionality." A summary of EMC/Encryption Key and SECURENET Option Errors follows.

1.1 EMC/Encryption Error Messages

The following errors occur when there has been an error or failure that prevents encryption decode or encode from operating correctly. The probable cause for the error, along with a recommended solution is presented.

(qwdId: quick, what do I do ?)

KG Hardware Not Installed

KG EMC module not installed on HighTier board.

qwdId:

Verify that the Encryption Option has been purchased. If so, contact sales representative.

Encryption Hardware Failure

This message means that one of the following failures has occurred:

- EMC Temperature Violation
- EMC Voltage Violation
- SPI Failure
- SCI Failure
- EMC Internal Critical Failure
- Irrecoverable Password Failure
- ASTRO Transmit Security Test Failure
- SECURENET CFB Transmit Security Test Failure
- SECURENET XL Transmit Security Test Failure

qwdId:

Perform encrypt reset from Special Functions window, then perform action again. If problem continues, contact local service representative.

Warning - External Key Lost

This message is displayed when an EMC Powerup Configuration Failure has occurred. This is most likely due to a Password Validation Failure and the EMC has erased any previously stored keys and passwords as part of the recovery.

qwdId:

If an External key is required, it must be reloaded.

UUT Test Key Load Failed

An attempt to load a UUT Test Key has failed.

qwdId:

Make sure Radio is attached, correct algorithm is selected, then retry keyload. If keyload still fails, perform encrypt reset from the Special Functions page, and retry.

External Key Load Failed

An attempt to load an External Key has failed.

qwdId:

Make sure KVL key loader is attached, correct algorithm is selected, retry keyload. If keyload still fails, perform

encrypt reset from the Special Functions page, and retry.

1.2 SECURENET Option Error Messages

The following messages are very similar. They are all related to a severe failure of the SECURENET Option. A general discussion of the cause follows, along with a general recommended solution. This solution is basically to reset the R2600 and restart the powerup sequence.

- SECURENET Failed, Notify Local Service Rep
- SECURENET Option Timed Out
- SECURENET Option - Illegal CP Request
- SECURENET Option - Bad CP Opcode
- SECURENET Option Error
- SECURENET Option - Illegal CP Request
- SECURENET Option - Illegal CP Request

The Option Software is not responding to the R-2600.

qwdId:

Verify that SECURENET is installed, and at least one encryption algorithm type is installed. This can be done by inspecting the Installed Options window from the Special Functions page.

If the options are installed, press the encrypt reset - key from the system functions line on the Special Functions window. This will reset the R2600. Retry the test or procedure. If the message is redisplayed, perform an nvm clear from the system functions line (note: this will erase all parameters previously input). Retry the test. If the message is redisplayed, contact your local service representative.

2 WARNINGS

SECURENET Warnings also fall into two categories Informational Warnings and User Prompt Warnings. Informational warnings provide feedback to the user, informing the user of results of actions. User prompt warnings prompt the user to perform some action to continue.

2.1 SECURENET Informational Warning Messages

The following Informational Warning Messages occur as the result of some user or system action.

EOM Detected

End Of Message detected. This message appears after the release of PTT, confirming the release.

qwdId:

nothing, informational only.

Internal Key Loaded

This message means that an internal key selected has been successfully loaded. This message will remain displayed until another message is loaded or erased. This message continues to be displayed to remind the user what type of key is loaded while other Display Screens are selected (i.e. Modulation Scope displayed).

qwdId:

nothing, informational only.

Warning - SECURENET Mode Error

This message is displayed when the EMC failed to enter SECURENET Mode. This is typically caused by NO key or a bad key internally loaded.

qwdId:

Select TEST KEY or EXT KEY from the SET UP display select cursor to reload the desired key type.

External Key Load Passed

An External key has been successfully loaded into the EMC.

qwdId:

nothing. informational only.

Keyload In Progress

A keyload has been initiated and is in progress.

qwdId:

nothing, informational only.

2.2 SECURENET User Prompt Warnings

Radio Keyload Complete - Press PTT

Radio keyload has been successfully done and the user may start the radio test by pressing the PTT on the radio.

qwdId:

Press PTT to start test.

Select RF Display to Decode B-Band Voice

Baseband Voice Decode is input thru the DVM/EN, VERT/SINAD port on the front panel when RF Display is selected as the Metering function. Other Metering selections use this port for different inputs and may change the attenuation on the input signal.

qwdId:

When decoding Baseband Voice select RF Display as the metering function.

Press KVL PTT to start Keyload

The EMC is prepared to load an external key via a KVL key loader. The keyload is initiated vi a PTT.

qwdId:

Attach a KVL key loader and load an external key, or press the cancel keyload softkey.