AEROFLEX

3900 Series
Digital Radio Test Set

Operation Manual

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3900 Series

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Operation Manual

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Preface

About this Manual

This manual explains how to use Tests Sets found in the 3900 Digital Radio Test Set Series. This Series currently includes the 3901 and 3902 Models. Unless otherwise indicated, information in this manual applies to the 3901 and 3902 Digital Radio Test Sets.

Electromagnetic Compatibility

Double shielded and properly terminated external interface cables must be used with this equipment when interfacing with the RS-232 and IEEE-488.

For continued EMC compliance, all external cables must be shielded and 3 meters or less in length.

Nomenclature Statement

The 3901 and 3902 Digital Radio Test Set is the official nomenclature for the test sets currently included in the 3900 Digital Radio Test Set Series. In this manual, 3900, unit or Test Set, refers to the 3901 and 3902 Digital Radio Test Sets unless otherwise indicated.

NOTE

Some screen shots may reference frequencies above 1 GHz, which are only applicable to the 3902.

Intended Audience

This manual is intended for personnel familiar with radio test systems and associated equipment.

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Service Upon Receipt of Material

Unpacking

Special design packing material inside the shipping container provide maximum protection for the Test Set. Avoid damaging the shipping container and packing material when unpacking equipment; if necessary the shipping container and packing material can be reused to ship the Test Set.

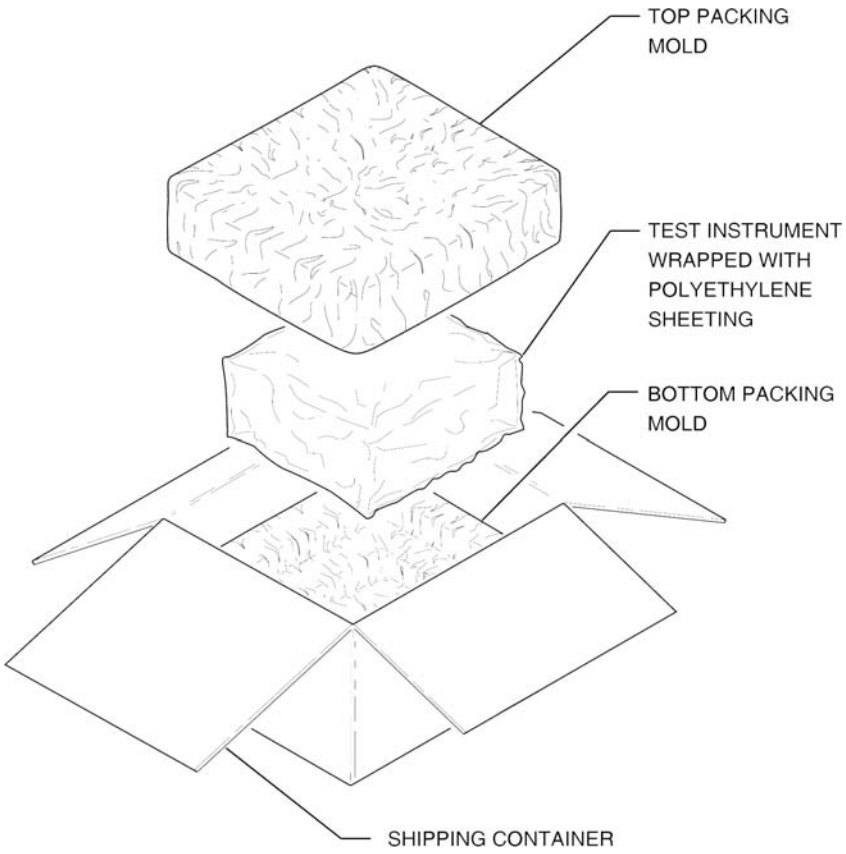
CAUTION

To prevent personal injury or damage to the Test Set, Aeroflex recommends two people unpack the Test Set.

Use the following steps to unpack the Test Set:

STEP PROCEDURE

1. Cut and remove sealing tape on top of the shipping container. Open shipping container and remove top packing mold.
2. Grasp Test Set firmly while restraining the shipping container. Lift the equipment and packing material vertically out of the shipping container.
3. Place Test Set and end cap packing on a flat, clean and dry surface.
4. Remove protective plastic bag from the Test Set.
5. Place protective plastic bag and end cap packing materials inside shipping container.
6. Store shipping container for possible future use.



Repacking Procedure

Checking Unpacked Equipment

Inspect equipment for possible damage incurred during shipment. If Test Set had been damaged, report the damage to Aeroflex Customer Service.

Review packing slip to verify shipment is complete. Packing slip identifies the following standard items as well as purchased options. Report all discrepancies to Aeroflex.

CONTACT:

Aeroflex

Customer Service Dept.
10200 West York Street
Wichita, Kansas 67215

Telephone: (800) 835-2350
FAX: (316) 529-5330
email: americas.service@aeroflex.com

Description	Part Number	QTY
Test Set Ship Unit	9001-4402-200 (3901) 9001-4402-100 (3902)	1
Cover, Lid	1414-4452-900	1
Kit, 390X Power Cords	7001-4444-800	1
Accessory Kit, RTS	7001-4247-400	1
3900 Series Getting Started Manual	1002-4400-8P0	1
3900 Series Operation Manual (CD-ROM)	1002-4400-2C0	1
Warranty Packet, 2 Year	1007-0001-000	1

Precautions

SAFETY FIRST - TO ALL OPERATIONS PERSONNEL

General Conditions of Use

This product is designed and tested to comply with the requirements of IEC/EN61010-1 'Safety requirements for electrical equipment for measurement, control and laboratory use' for Class I portable equipment and is for use in a pollution degree 2 environment. The equipment is designed to operate from installation supply Category II.

Equipment should be protected from liquids such as spills, leaks, etc. and precipitation such as rain, snow, etc. When moving the equipment from a cold to hot environment, allow the temperature of the equipment to stabilize before it is connected to the supply to avoid condensation forming. The equipment must only be operated within the environmental conditions specified in the performance data.

This product is not approved for use in hazardous atmospheres or medical applications. If the equipment is to be used in a safety-related application, such as avionics or military applications, the suitability of the product must be assessed and approved for use by a competent person.

Refer all servicing of unit to Qualified Technical Personnel. This unit contains no operator serviceable parts.

WARNING

Using this equipment in a manner not specified by the accompanying documentation may impair the safety protection provided by the equipment.

Case, Cover or Panel Removal

Opening the Case Assembly exposes the operator to electrical hazards that may result in electrical shock or equipment damage. Do not operate this Test Set with the Case Assembly open.

Safety Identification in Technical Manual

This manual uses the following terms to draw attention to possible safety hazards that may exist when operating or servicing this equipment.

CAUTION — Identifies conditions or activities that, if ignored, can result in equipment or property damage, e.g., Fire.

WARNING — Identifies conditions or activities that, if ignored, can result in personal injury or death.

Safety Symbols in Manuals and on Units

	**CAUTION**: Refer to accompanying documents. (This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.)
	Indicates a Toxic hazard.
	Indicates item is static sensitive.
	**AC TERMINAL:** Terminal that may supply or be supplied with AC or alternating voltage.

SAFETY FIRST - TO ALL OPERATIONS PERSONNEL (cont)

Equipment Grounding Protection

Improper grounding of equipment can result in electrical shock. Refer to Chapter 2, Installation for information on properly grounding the Test Set.

Use of Probes

Check the 3900 Platform Specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

Power Cords

Power cords must be in good working condition. Power cords must not be frayed or broken, nor expose bare wiring when operating this equipment.

Use Recommended Fuses Only

Use only fuses specifically recommended for the equipment at the specified current and voltage ratings. Refer to Chapter 2, Installation and the 3900 Platform Specifications for information on fuse requirements and specifications.

Internal Battery

This unit contains a Lithium Ion Battery, serviceable only by a qualified technician.

CAUTION

Signal Generators can be a source of Electromagnetic Interference (EMI) to communication receivers. Some transmitted signals can cause disruption and interference to communication service out to a distance of several miles. User of this equipment should scrutinize any operation that results in radiation of a signal (directly or indirectly) and should take necessary precautions to avoid potential communication interference problems.

Electrical Hazards (AC supply voltage)

WARNING

This equipment is provided with a protective grounding lead that conforms with IEC Safety Class I. To maintain this protection the supply lead must always be connected to the source of supply via a socket with a grounded contact.

Be aware that the supply filter contains capacitors that may remain charged after the equipment is disconnected from the supply. Although the stored energy is within the approved safety requirements, a slight shock may be felt if the plug pins are touched immediately after removal.

Do not remove instrument covers as this may result in personal injury. There are no user-serviceable parts inside.

Refer all servicing to qualified personnel. See the list of Aeroflex offices on the back of the manual.

Fuses

Note that the internal supply fuse is in series with the live conductor of the supply lead. If connection is made to a 2-pin unpolarized supply socket, it is possible for the fuse to become transposed to the neutral conductor, in which case, parts of the equipment could remain at supply potential even after the fuse has ruptured.

Definition of Installation Categories (ref IEC 664-1):

CAT I	Circuits that are protected by devices limiting transient overvoltages to a low level, e.g., electronic circuits protected by filters.
CAT II	Circuits that are supply circuits for domestic or digital devices that may include transient overvoltages with an average value, e.g., power supply for household appliances and portable tools.
CAT III	Circuits that are supply circuits for power equipment that may include large transient overvoltages, e.g., power supply for industrial machines or equipment.
CAT IV	Circuits that may include very high transient overvoltages, e.g., supply distribution from power lines.

Fire Hazard

WARNING

Make sure that only fuses of the correct rating and type are used for replacement. If an integrally fused plug is used on the supply lead, ensure that the fuse rating is commensurate with the current requirements of this equipment. Refer to 'Platform Performance Data' in Part 1 for power requirements.

Toxic Hazards

WARNING

Some of the components used in this equipment may include resins and other materials which give off toxic fumes if incinerated. Take appropriate precautions, therefore, in the disposal of these items.

Beryllia

WARNING

Beryllia (beryllium oxide) is used in the construction of some of the components in this equipment.

This material, when in the form of fine dust or vapor and inhaled into the lungs, can cause a respiratory disease. In its solid form, as used here, it can be handled safely, however, avoid handling conditions which promote dust formation by surface abrasion.

Use care when removing and disposing of these components. Do not put them in the general industrial or domestic waste or dispatch them by post. They should be separately and securely packed and clearly identified to show the nature of the hazard and then disposed of in a safe manner by an authorized toxic waste contractor.

Beryllium Copper

WARNING

Some mechanical components within this instrument are manufactured from beryllium copper. This is an alloy with a beryllium content of approximately 5%. It represents no risk in normal use.

The material should not be machined, welded or subjected to any process where heat is involved.

It must be disposed of as "special waste."

It must NOT be disposed of by incineration.

Lithium

WARNING

A Lithium battery is used in this equipment.

Lithium is a toxic substance so the battery should in no circumstances be crushed, incinerated or disposed of in normal waste.

Do not attempt to recharge this type of battery. Do not short circuit or force discharge since this might cause the battery to vent, overheat or explode.

Tilt Feature

WARNING

Do not stack other instruments on top of unit when instrument is in the tilt position.

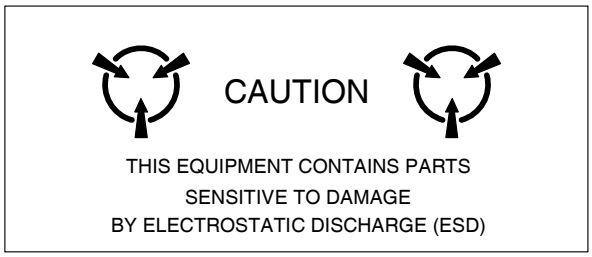
Input Overload

CAUTION

On the RF N-type connector, the input power should not exceed 125 W (+51 dBm).
On the RF TNC connector, the input power should not exceed 10 mW (+10 dBm).

Static Sensitive Components

CAUTION



This equipment contains components sensitive to damage by Electrostatic Discharge (ESD). All personnel performing maintenance or calibration procedures should have knowledge of accepted ESD practices and/or be ESD certified.

NOTE

To comply with EMC requirements, double shielded cables should be used for making connections to all input and output connectors.

Suitability for Use

CAUTION

This equipment has been designed and manufactured by Aeroflex to generate, receive and analyze RF/audio signals.

If the equipment is not used in a manner specified by Aeroflex, the protection provided by the equipment may be impaired.

Aeroflex has no control over the use of this equipment and cannot be held responsible for events arising from its use other than for its intended purpose.

Table of Contents

Chapter 3

Test Set Operation . . . . . 3 - 1

Chapter 4

Acceptance Test

Chapter 5

AutoTest System Operation . . . . . 5 - 1

Chapter 6

AutoTest II System Operation . . . . . 6 - 1

Chapter 7

Radio Test Instruments. . . . . 7 - 1

Chapter 8

Analog Duplex System . . . . . 8 - 1

Appendix A

Shipping Test Set

Chapter 1

General Information

Introduction

The 3900 Series of Test Sets provides a platform for testing Mobile and Fixed Radio Communications equipment. Optional systems are available to meet specific test requirements.

Fig. 1-1 3900 Digital Radio Test Set

Test Set Features

The 3900 contains the following features:

- Frequency Reference input or output connection allows the Test Set to use an external frequency standard or to serve as a frequency standard for other test equipment.
- Parallel measuring methods contribute to fast operation.
- Audible and visual warning system with automatic disconnection provides protection against RF input overload and RF Generator excessive reverse power.
- Full color display with a maximize - minimize tile display for customized screen configurations.
- Memory function to store instrument settings, test results and other data.
- 3.5 inch disk drive and USB version 1.1 memory stick/jump drive connector for transferring data into and out of the on-board memory.
- Printer ports to enable screen captures and AutoTest results to be printed.
- Output from the signal analyzer at 10.7 MHz from the IF output BNC connection.
- 9 pin VGA video output connector which allows use of an external monitor.
- Bail Arm handle for multi-position bench support.

Optional Systems

The 3900 Series provides various optional test systems that allow users to configure the Test Set to meet a variety of testing requirements. Optional systems currently available for the 3900 Series are listed below. Refer to Appendix F, Optional Systems for detailed description of these options.

Audio Analyzer

AutoTest II Systems:

- AutoTest II Analog
- AutoTest II TETRA
- AutoTest II P25
- AutoTest II HPD

HPD® Testing Option

HPD® Advanced Analysis Package

IQ Gen Option

P25 Conventional

TETRA Systems:

- TETRA BS
- TETRA BS T1
- TETRA DM
- TETRA Economy Mode
- TETRA MS
- TETRA MS T1

Vocoder Option

Site Monitoring (Sensitivity Search)

Remote and Automatic Control

IEEE Std 488

The 3900 may be operated remotely via an interface conforming to IEEE Std 488.1-1987. This standard defines the electrical, mechanical and low-level protocol characteristics of the bus structure, the GPIB (General Purpose Interface Bus).

Several SCPI features have been implemented in the 3900 to facilitate system integration. These features include the extended status reporting structure, the error numbering scheme, the command mnemonic derivation rules (long and short form) and many of the frequently used commands. Many of the SCPI features included in the 3900 are not defined by the SCPI standard, therefore, the 3900 is not fully compliant with SCPI (Standard Commands for Programmable Instruments) requirements. Refer to SCPI 1997 for details.

Refer to Chapter 3, section titled Remote Tile for information on configuring the Test Set for Remote Operation.

Refer to the 3900 Series Remote Programming Manual for list of valid remote commands.

Test Setup

The 3900 is suitable for performing radio system measurements on high performance equipment in research and development environments as well as in production and maintenance facilities. Refer to Chapter 2, Installation Requirements, for power requirements and control system information and peripheral equipment connections. The picture below shows an example of a typical test setup.

Digital Radio System

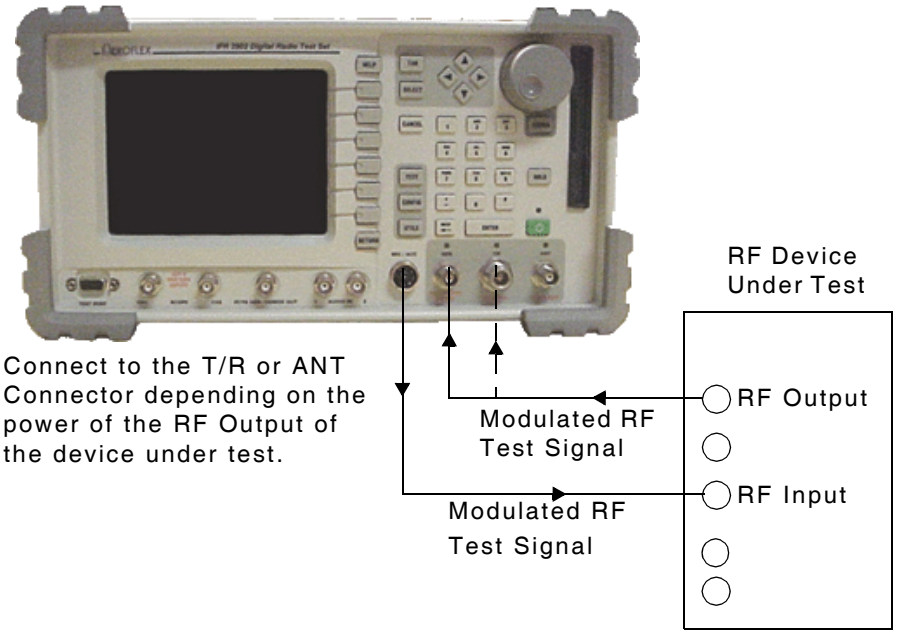


Fig. 1-2 Basic Test Setup

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Chapter 2

Installation

Introduction

This chapter describes the following:

- Preparing the 3900 for first time use.
- Checking the 3900 when it has been used under unknown conditions, for example, when a Test Set is used by several technicians.
- Interconnections to various control connectors, printer connectors and other input and output connectors.

Initial Visual Inspection

Unpack the Test Set according to the section titled Service Upon Receipt of Material located in the front section of this manual and inspect unit for signs of damage.

Installation Requirements

CAUTION

Ventilation

The 3900 is force air-cooled by three fans that draw air through vents in the sides of the case. Do not obstruct the air vents while the instrument is in use. Avoid standing the instrument on or close to other equipment that is hot.

Connecting to AC Power Supply

The 3900 is a Safety Class 1 test instrument which must be grounded before use. The power cord supplied with the Test Set, or an appropriate replacement, should be used to connect the Test Set to a grounded AC supply outlet. Ensure that the power cord is properly connected to the AC Power Connector on the rear panel of the Test Set prior to connecting unit to an AC supply outlet.

The 3900's PSU automatically selects the appropriate power supply range when the Test Set is connected to an AC power supply source which is within the ranges specified in the 3900 Platform Specifications.

Disconnecting from AC Power Supply

The detachable AC power cord is the Test Set's disconnecting device. If the instrument is integrated into a rack or test system, an external power switch or circuit breaker may be required. The Test Set's disconnecting device should be easily reached and accessible at all times.

AC Power Fuse

A 3 A, 250 V, Type F, 20 mm cartridge fuse (F3AL250V) is included in the unit's supply current path to the Power Supply Module. The AC Power Fuse is located in the fuse carrier located on the rear of the Test Set. Refer to Appendix C, Fuse Replacement Instructions and Appendix B, 3900 Platform Specifications for additional information.

Power Requirements

Class I Power Cords (3-core)

General

To connect the Test Set to a Class II (ungrounded) 2-terminal socket outlet, fit the power cord with either a 3-pin Class I plug used in conjunction with an adapter incorporating a ground wire, or fit the power cord with a Class II plug containing an integral ground wire. The ground wire must be securely fastened to ground; grounding one terminal on a 2-terminal socket does not provide adequate protection.

A 3-wire (grounded) power cord containing a molded IEC 320 connector is included with the 3900. The cable must be fitted with an approved plug which, when plugged into an appropriate 3-terminal socket outlet, grounds the case of the Test Set.

Failure to ground the Test Set or using a damaged power cord may expose the operator to hazardous voltage levels. Replacement power cords are available from Aeroflex.

Wired Ended

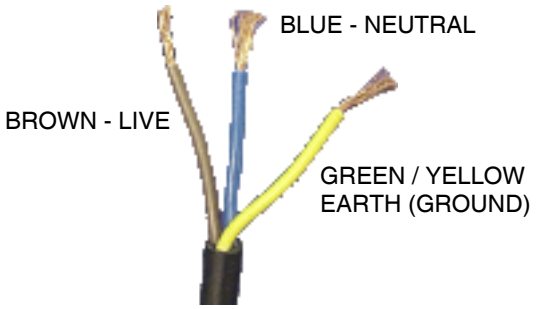


Fig. 2-1 Wire-Ended Class I Power Cord

Country	IEX 320 Plug Type	Aeroflex PN
Universal	Straight through	23424/158
Universal	Right angled	23424/159

	North America	Harmonized
Line (live)	Black	Brown
Neutral	White	Blue
Ground (Earth)	Green	Green/Yellow

NOTE

Color coding of the wires varies according to destination country.

British

The UK lead is fitted with an ASTA approved molded plug conforming to BS 1363.

A replaceable 13 A fuse conforming to BS 1362 is contained within the plug. This fuse is only designed to protect the lead assembly. Do not use the plug if the fuse cover is damaged or removed from the fuse holder.

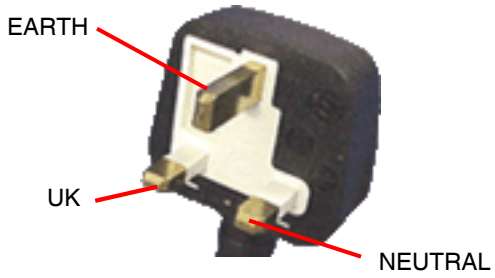


Fig. 2-2 British Class I Power Cord

Country	IEX 320 Plug Type	Aeroflex PN
United Kingdom	Straight through	23422/001
United Kingdom	Right angled	23422/002

North American

The North American lead is fitted with a NEMA 5-15P (Canadian CS22.2 No 42) plug and carries approvals from UL and CSA for use in the USA and Canada.

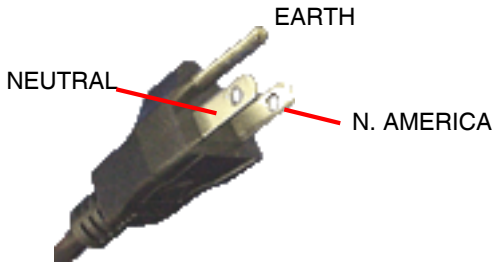


Fig. 2-3 North American Class I Power Cord

Country	IEX 320 Plug Type	Aeroflex PN
North America	Straight through	23422/004
North America	**Right angled**	**23422/005**

Continental Europe

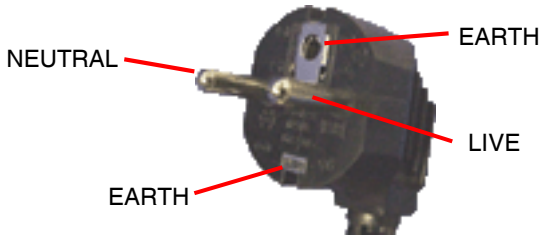


Fig. 2-4 Continental Europe Class I Power Cord

Country	IEX 320 Plug Type	Aeroflex PN
Europe	Straight through	23422/006
Europe	Right angled	23422/007

English

The Continental European lead is fitted with a right angle IEC83 standard C4 plug (CEE 7/7) which allow the lead to be used in sockets with either a male earth pin (standard C 3b) or side earth clips (standard C 2b), which are commonly called the German ‘Schuko’ plug. This plug is not polarized when fitted into a Schuko socket. The lead carries approvals for use in Austria, Belgium, Finland, France, Germany, Holland, Italy, Norway and Sweden. This plug does not fit Italian standard CEI 23-16 outlets and should not be used in Denmark because a grounded connection is not established.

Français

Le câble d'alimentation d'Europe Continentale est muni d'un connecteur mâle à angle droit type CEI83, standard C4 (CEE 7/7), qui peut être utilisé dans une prise femelle à ergot de terre (standard C 3b) ou à clips latéraux (standard C 2b), cette dernière étant communément appelée prise “Schuko” allemande. De la même façon que les autres connecteurs de type Schuko, celui-ci n'est pas polarisé lorsqu'il s'adapte à une prise femelle Schuko. Ce câble d'alimentation est homologué en Allemagne, Autriche, Belgique, Finlande, France, Hollande, Italie, Norvège et Suède. A noter que ce connecteur n'est pas compatible avec les prises de courant italiennes au standard CEI 23-16. Ce câble ne doit pas être utilisé au Danemark à cause du défaut de connexion de masse.

Deutsch

Das kontinentaleuropäische Netzkabel ist mit einem rechtwinkeligen Stecker nach IEC83 C4 (CEE7/7) Standard versehen, welcher sowohl in Steckdosen mit Erde-Stift (Standard C 3b) oder seitlichen Erdeklemmen, im allgemeinen “Schukosteckdose” genannt, paßt. Üblicherweise ist der Schukostecker bei Verwendung in Schukosteckdosen nicht gepolt. Dieses Netzkabel besitzt Zulassung für Österreich, Belgien, Finnland, Frankreich, Deutschland, Holland, Italien, Norwegen und Schweden.

Hinweis: Dieser Schukostecker paßt nicht in die italienischen Standardsteckdosen nach CEI 23-16 Norm. Dieses Netzkabel sollte nicht in Dänemark verwendet werden, da hier keine Erdeverbindung hergestellt wird.

Español

El cable de alimentación tipo Europeo Continental dispone de una clavija C4 normalizada IEC83 (CEE 7/7) que permite su utilización tanto en bases de enchufe con toma de tierra macho (tipo C 3b) o con toma de tierra mediante contactos laterales (tipo C 2b) que, en este último caso, suele denominarse “Schuko”. Al igual que cualquier otra clavija tipo Schuko, las conexiones a red no están polarizadas cuando se conectan a una base tipo Schuko. El cable lleva autorización para su uso en Austria, Bélgica, Finlandia, Francia, Alemania, Holanda, Italia, Noruega y Suecia. Observe que este cable no se adapta a la norma italiana CEI 23-16. El cable no debe utilizarse en Dinamarca en el caso de no efectuarse conexión a tierra.

Italiano

I cavi d'alimentazione per l'Europa continentale vengono forniti terminati con una spina ad angolo retto del tipo C4 secondo lo standard IEC83 (CEE 7/7) che può essere usato in prese in cui la terra può essere fornita o tramite connettore maschio (C 3b) o tramite clips laterali (C 2b), quest'ultima comunemente detta di tipo tedesca “Schuko”. Questa spina, quando collegata ad una presa Schuko, non è polarizzata.

Il cavo può essere usato in Austria, Belgio, Finlandia, Francia, Germania, Olanda, Norvegia, Svezia ed Italia. E' da notare che per l'Italia questo non risponde allo standard CEI 23-16.

Questa spina non dovrebbe invece essere usata in Danimarca in quanto non realizza il collegamento di terra.

Powering Down

The Test Set should always be powered down using the On/Standby Key which initiates a power-down sequence that stores all current settings and results in the Test Set’s internal memory.

If the Test Set is to be left in an unused state for an extended period of time, press the On/Standby Key to power down the Test Set. After the unit has stored settings and is in the OFF state, isolate the Test Set by switching the AC Power Supply Switch to the OFF position. When the Test Set is next powered on it is restored to the last saved settings state.

Floppy Disk Drive

When powering down, check that the floppy disk drive does not contain a disk. If there is a disk in the drive at power up the Test Set may display irrelevant error messages. If this occurs remove the disk and restart the Test Set.

Accessory Connectors

MIC/ACC Connector

The MIC/ACC Connector is an 8 pin DIN connection with ring-lock.

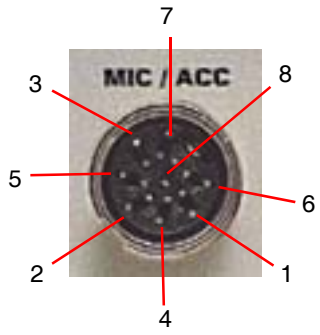


Fig. 2-5 MIC/ACC Pin Locations

MIC/ACC Connector pin functions are as follows:

Pin Number	Signal Name	Signal Type	I/O
1	MIC Switch (PTT)	TTL	Out
2	MIC Audio	Audio	In
3	Demod Audio	Audio	Out
4		No Connection	
5		10-15 Vdc, 500 mA	
6		No Connection	
7	MIC Switch (PTT)	TTL	In
8	GND	Instrument ground	

See also MIC/ACC Connector in Chapter 3, Test Set Operation.

GPIB Connector

The GPIB Connector contains a standard socket mounted on the rear panel of the Test Set. Refer to Fig. 2-6 for pin locations. The cable assemblies have male-female connectors at both ends to allow devices to be interconnected in star or linear arrangements. Cable length restrictions for a network are defined in the GPIB/IEEE 488/2 specification.

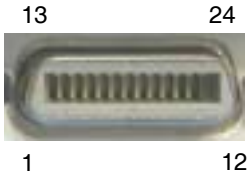


Fig. 2-6 GPIB Connector Pin Locations

GPIB Connector pin functions are as follows:

Pin Number	Function	Pin Number	Function
1	Data I/O 1	13	Data I/O 5
2	Data I/O 2	14	Data I/O 6
3	Data I/O 3	15	Data I/O 7
4	Data I/O 4	16	Data I/O 8
5	EOI	17	REN
6	DAV	18	Pair with 6
7	NRFD	19	Pair with 7
8	NDAC	20	Pair with 8
9	IFC	21	Pair with 9
10	SRQ	22	Pair with 10
11	ATN	23	Pair with 11
12	Ground Shield	24	Logic Ground

See also GPIB/IEEE-488 Interface Connection in Chapter 3, Test Set Operation.

Stacked Connectors

When stacking connectors to make multiple connections, ensure that excessive strain is not placed on the GPIB socket; strain can damage the GPIB Connector, resulting in intermittent or faulty connections.

Serial Connector

The Serial Connector is an RS-232 Data Terminal Equipment (DTE) with a 9-way D-type plug mounted on the rear panel. Refer to Fig. 2-7 for pin locations. Software to support specific radios is planned for future software releases.

Fig. 2-7 Serial Connector Pin Locations

Serial Connector pin functions are as follows:

Pin Number	Function	Pin Number	Function
1	DCD	6	DSR
2	Rx Data In	7	RTS
3	Tx Data Out	8	CTS
4	DTR	9	RI
5	Ground		

Functions DTR on contact 4 and RTS on contact 7 are held at logic 1. When connecting the Test Set to another DTE device, such as a PC, a NULL MODEM cable is required. Hard handshaking is not implemented.

See also Serial Connector in Chapter 3, Test Set Operation.

Parallel Connector

The Parallel Connector has a 25-way D-type socket mounted on the rear panel. Refer to Fig. 2-8 for pin locations.

Fig. 2-8 Parallel Connector Pin Locations

Parallel Connector pin functions are as follows:

Pin Number	Function	Pin Number	Function
1	Strobe	10	ACK
2	Data 0	11	BUSY
3	Data 1	12	PE
4	Data 2	13	SLCT
5	Data 3	14	AUTOFD
6	Data 4	15	ERROR
7	Data 5	16	INIT
8	Data 6	17	SLCT IN
9	Data 7	18 to 25	Ground

See also Parallel Printer Output Connector in Chapter 3, Test Set Operation.

Aux IF Input

This connector is reserved for future development.

VGA Monitor Output

The VGA Output is a 15-way 'D' type connector on the rear panel. Refer to Fig. 2-9 for pin locations.

Fig. 2-9 VGA Monitor Output Pin Locations

VGA Monitor Output pin functions are as follows:

Pin Number	Function	Pin Number	Function
1	Red Video	9	No Connection
2	Green Video	10	Sync Return
3	**Blue Video**	**11**	**Monitor ID 0**
4	**Monitor ID 2**	**12**	**Monitor ID 1**
5	**Ground**	**13**	**Horizontal Sync**
6	Red Return	14	Vertical Sync
7	Green Return	15	Monitor ID 3
8	Blue Return		

See also VGA Monitor Output Connector in Chapter 3, Test Set Operation.

Ethernet and USB Connectors

The Ethernet and USB connections provide a standard Base T RJ45 and two standard USB connectors. The USB connections allow the use of USB Version 1.1 devices.

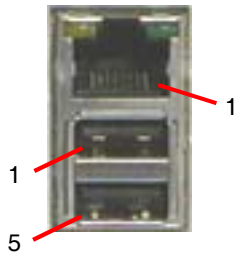


Fig. 2-10 Ethernet and USB Connector Pin Locations

Ethernet Connector pin functions are as follows:

Pin Number	Signal Type	Signal Name	I/O
1	DATA	Tx (+)	OUT
2	DATA	Tx (-)	OUT
3	DATA	Rx (+)	IN
4	DATA	Rx (-)	IN
5	GND	GND	GND
6	GND	GND	GND
7	GND	GND	GND
8	GND	GND	GND

See also Ethernet Connector in Chapter 3, Test Set Operation.

USB Connector

The USB Connector is a twin USB standard connection.

Pin Number	Signal Type	Signal Name	I/O
1	PWR	VCC	
2	DATA	(-) DATA	I/O
3	DATA	(+) DATA	I/O
4	PWR	GND	
5	PWR	VCC	
6	DATA	(-) DATA	I/O
7	DATA	(+) DATA	I/O
8	PWR	GND	

USB Slave Connector

Connector is reserved for future development.

PS/2 Interface Connectors

The pin-outs for the dual PS/2 mouse and keyboard connectors are shown in Fig. 2-11. The keyboard can only be connected to the lower PS/2 connector.

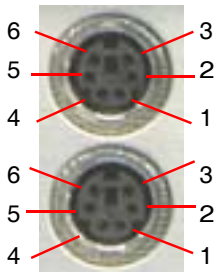


Fig. 2-11 PS/2 Connector Pin Locations

PS/2 Pin-Out Connector

Pin Number	Signal Type	Signal Name	Description
1	Bi-directional	DATA	Data
2	No Connection		
3	Power	GND	GND
4	Power	+5 V	Supply Voltage
5	Bi-directional	CLK	Clock
6	No Connection		
Shell	Earth Ground		Chassis Ground

See also PS/2 Interface Connector in Chapter 3, Test Set Operation.

Test Connector

The Test Connector on the front panel is used for programming radios through a data connection. The Test Connector consists of 4 digital input and 4 digital output (open collector) lines. The Connector also provides a 0 to 12 V, 50 mA, programmable source. Refer to Fig. 2-12 for pin locations.

Software to support specific radios is planned for future software releases.

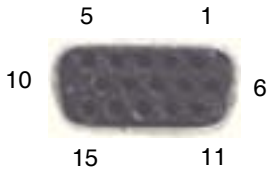


Fig. 2-12 Test Connector Pin Locations

Test Connector pin types are as follows:

Pin Number	Signal Type	Pin Number	Signal Type
1	Digital In 1	9	Digital Out 1
2	Digital In 2	10	Digital Out 2
3	Digital In 3	11	Digital Out 3
4	Digital In 4	12	Digital Out 4
5	Digital In 5	13	Serial Out
6	No Connection	14	No Connection
7	Ground	15	Ground
8	PGM V+ Out		

Routine Safety Testing and Inspection

The following electrical tests and inspection information is provided for guidance purposes only. These tests involve the use of voltages and currents that can cause injury and should only be performed by qualified personnel familiar with ESD and electrical safety precautions.

Prior to carrying out any inspection or test procedure, disconnect all external equipment from the Test Set and disconnect the Test Set from the AC Power Supply. All tests should include the instrument's own supply lead, all covers must be fitted and the 3900 AC Power Supply Switch must be in the ON position.

Recommended tests and inspection should be carried out in the following sequence:

- Visual Inspection
- Earth (Ground) Bonding Tests
- Insulation Resistance Test

Visual Inspection

Visual inspections should be performed periodically depending on operating environment, maintenance and use.

As a guide, visual inspection should include the following when appropriate:

- Verify Test Set has been installed in accordance with the instructions provided (e.g., that ventilation is adequate, supply isolators are accessible, supply wiring is adequate and properly routed).
- Ensure that AC Power Cord and supply connector(s) are in good condition.
- Verify the correct rating and type of supply fuses are used.
- Examine the stability and condition of covers and handles.
- Check the presence and condition of all warning labels and markings and supplied safety information.
- Check the wiring in re-wireable plugs and appliance connectors.
- Check the cleanliness and condition of any ventilation fan filters.
- Ensure that the AC Power Supply Switch isolates the equipment from the AC Power Supply.
- Check the supply indicator functions (if fitted).

Any noted defects should be corrected before proceeding with the following electrical tests.

Earth Bonding Tests

Earth bonding tests should be performed using a 25 A (12 V maximum open circuit voltage) DC source. Tests should be limited to a maximum duration of 5 seconds and have a pass limit of 0.1 Ω after allowing for the resistance of the supply lead. Exceeding the 5 second test duration can damage the Test Set. The tests should be carried out between the supply earth and exposed case metalwork. No attempt should be made to perform the tests on functional earths (e.g., signal carrying connector shells or screen connections) as this damages the Test Set.

Insulation Tests

A 500 V DC test should be applied between the protective earth connection and combined live and neutral supply connections while the 3900 AC Power Supply Switch is in the ON position. To avoid switching the live and neutral poles on the Test Set, establish the live/neutral links on the appliance tester or its connector. The test voltage should be applied for 5 seconds before taking the measurement.

Aeroflex uses reinforced insulation in the construction of the 3900 and, therefore a minimum pass limit of 7 MΩ should be achieved during this test.

When a DC power adapter is provided with the equipment, the adapter must pass the 7 MΩ test limit.

Aeroflex does not recommend dielectric flash testing during routine safety tests. Most portable appliance testers use AC for the dielectric strength test which can damage the supply input filter capacitors.

Record Maintenance

Aeroflex recommends that test results be recorded and reviewed as part of each test inspection. Significant differences between previous readings and measured values should be investigated.

If any failure is detected during visual inspection or electrical tests, the equipment should be disabled and evaluated by a qualified service technician.

Safety critical components should only be replaced with comparable parts, using techniques and procedures recommended by Aeroflex.

The above information is provided for guidance purposes only. Aeroflex designs and manufactures its products in accordance with International Safety Standards so that when used in accordance with recommend guidelines, they represent no hazard to the operator. Aeroflex reserves the right to amend the above information in the course of its continuing commitment to product safety.

External Cleaning

The following procedure contains routine instructions for cleaning the outside of the 3900.

- Clean front panel buttons and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and a mild liquid detergent.
- Remove grease, fungus and ground-in dirt from surfaces with soft lint-free cloth dampened (not soaked) with isopropyl alcohol.
- Remove dust and dirt from connectors with soft-bristled brush.
- Cover connectors, not in use, with suitable dust cover to prevent tarnishing of connector contacts.
- Clean cables with soft lint-free cloth.
- Paint exposed metal surface to avoid corrosion.

Carry Handle and Bench Support

The Test Set is fitted with a Bail Arm carry handle and bench support. The handle is attached to the Test Set with hubs that allow full handle rotation with 12 locking positions. To rotate the Bail Arm, stand the Test Set on the rear feet and pull both handle hubs outward, away from the case assembly. Rotate the handle and release hubs to lock handle position.

Chapter 3

Test Set Operation

Introduction

Unless specifically mentioned, this chapter refers to local operation of a 3900 configured with factory default settings. New Test Sets are configured to start in the factory default setting. Before using Test Set, review power requirements and powering up procedure described in Chapter 2, Installation. This chapter describes the following:

- Identification and operation of 3900 connectors and power inputs.
- Screen layout, Tile navigation and selecting and entering data.
- Use soft keys and their associated menus.

Powering On

To power on the Test Set:

1. Complete installation instructions as defined in Chapter 2, Installation.
2. Connect the Test Set to the AC Power Supply.
3. Turn the AC Power Supply Switch on the rear panel to the ON position. The LED above the On/Standby Key turns RED. Press the On/Standby Key to power on the Test Set.
4. Verify no error messages appear on the display during power-up process. The Factory Default Screen (refer to Fig. 3-1) should appear at initial start-up; this screen is not displayed again during the power-up process unless the Restore Factory Defaults procedure is completed (refer to Restoring Factory Default State).

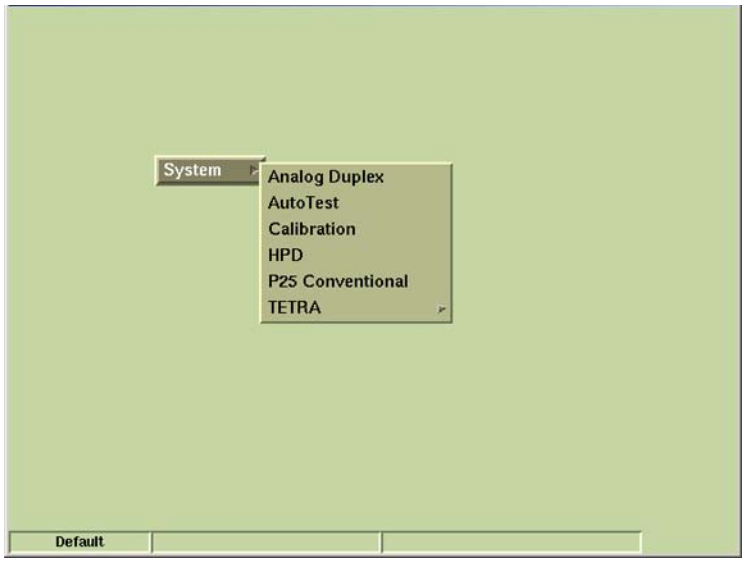


Fig. 3-1 Factory Default Tile

NOTE

System menu contents vary according to the options installed in the Test Set.

Front Panel Controls and Connectors

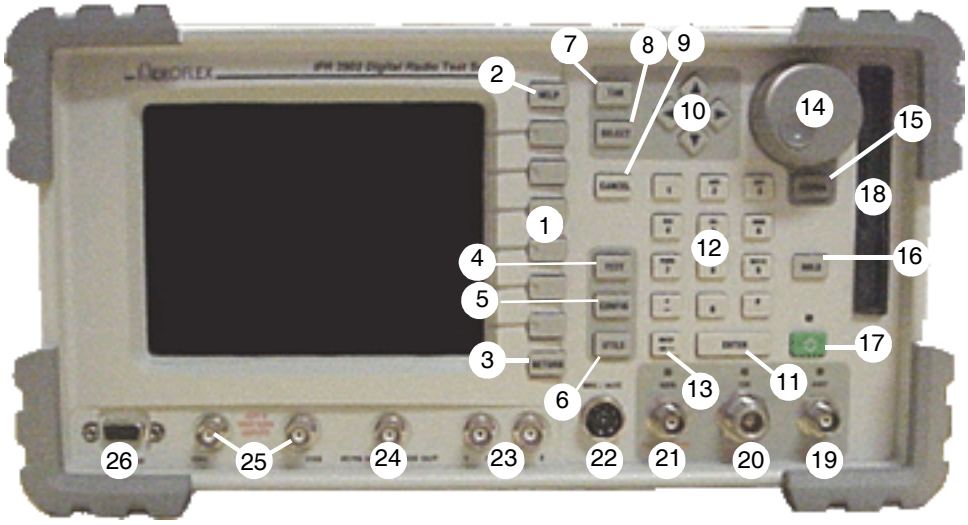


Fig. 3-2 3901/3902 Front Panel Connectors

Numerical references are indicated in parenthesis (nn). Refer to Numerical Reference Charts for connector cross-reference.

Numerical Reference Charts

Front Panel Connectors

Numerical Reference	Front Panel Connectors	Page
1	Soft Keys	3 - 3
2	HELP Key	3 - 3
3	Return Key	3 - 4
4	TEST Key	3 - 4
5	CONFIG Key	3 - 4
6	UTILS Key	3 - 4
7	TAB Key	3 - 4
8	SELECT Key	3 - 5
9	CANCEL Key	3 - 5
10	Cursor Keys	3 - 5
11	ENTER Key	3 - 5
12	Data Entry Input Keys	3 - 5
13	BKSP (Backspace) Key	3 - 6
14	Rotary Control Knob	3 - 6
15	ASSIGN Key	3 - 6
16	Display HOLD Key	3 - 7
17	On/Standby Key	3 - 7
18	3.5 inch Floppy Disk Drive	3 - 7
19	ANT (Antenna) Connector	3 - 8
20	T/R Connector	3 - 8
21	GEN (Generator) Connector	3 - 8
22	MIC/ACC Connector	3 - 9
23	Audio 1/2 In Connectors	3 - 9
24	FCTN GEN/DEMOD Connector	3 - 9
25	Scope CH1/CH2 Connectors	3 - 9
26	Test Connector	3 - 9
27	USB Connector	3 - 9

Soft Keys

The 3900 contains six soft keys that are active when a label is displayed on the screen to the left of the soft key. The text on the label identifies the key, the outline and background color provide information about the purpose, state and type of action the key initiates. Refer to the section titled Navigating Display Tiles for more information on soft keys.

HELP Key

Accesses operational description for Test Set fields and functions.

RETURN Key

Returns the soft key menu back one level from a soft key sub-menu. Each press of the RETURN key moves back through one level.

Function Keys

The 3900 contains three function keys: TEST, CONFIG (Configuration) and UTILS (Utilities). Selecting one of these keys accesses the corresponding function. When a specific function has been selected, pressing the same function key again displays the floating menu associated with that function. For example, when the TEST function has been selected, pressing the TEST key again displays the TEST floating menu.

Mouse Option

When a mouse is connected to the Test Set USB Connector, pressing the right mouse button displays a pop-up menu that contains entries for the TEST, CONFIG (Configuration) and UTILS (Utilities) functions. Selecting the function from the menu has the same effect as pressing the key on the front panel.

TEST Key

Selects the TEST function. When the TEST function is selected, pressing the TEST key displays the TEST floating menu. Menu contents are dependent on the requirements of the System currently operating. All test and measurement facilities of the currently selected system are accessed via the TEST function.

CONFIG Key

Selects the CONFIG (Configuration) function of the current operating system which provides access to configuration settings for the currently selected system. When a configuration tile is displayed on the Test Set display, pressing the CONFIG Key opens the CONFIG floating menu. The CONFIG floating menu access the Systems menu and the Configuration Tile menu.

The Systems menu allows the user to select from the Test Set's available systems. The contents of this menu vary based on the options installed in the Test Set.

The Configuration menu lists Configuration Tiles that allow user to define Test Set parameters for the current operating system. The contents of the Configuration menu change according to the requirements of the System currently operating.

UTILS Key

This key selects the UTILS (Utilities) function. When the UTILS (Utilities) function is selected, pressing the UTILS key displays the Utilities floating menu. The UTILS (Utilities) function provides access to general Test Set features which are not system specific.

TAB Key

When the TEST function is selected and the display Tiles are minimized, each press of the TAB key sequentially moves the focus to a different Tile.

When the TEST function is selected and one of the display Tiles is maximized, pressing the TAB key displays a menu listing the Tiles currently active on the minimized display. Selecting from the menu displays the requested Tile in maximized view.

SELECT Key

When a menu item is highlighted, indicated by white text on a raised effect title, pressing SELECT activates that item.

When a settings box is highlighted, indicated by a **RED** outline to the box, pressing SELECT selects the box for editing, indicated by a gold background.

When a settings box has been edited using the data input keys, the cursor keys or the rotary control, pressing SELECT prevents further editing, indicated by a white background.

When a button is selected, indicated by a **RED** outline to the button, pressing SELECT changes the state of the button.

CANCEL Key

When data input keys are used to select a Numeric Entry Box or Text Entry Box for editing this key cancels any changes that have been made and restores the original setting as long as the ENTER Key or the RETURN Key has not been pressed. CANCEL does not restore a value to a previous setting if the setting has been changed using the Cursor Keys or Rotary Control Knob.

While a menu is displayed, pressing CANCEL closes the menu without activating the highlighted menu item.

Cursor Keys

The Test Set contains four directional cursor keys.

When a menu is selected, the < and > cursor keys navigate the focus to the left or right between menu levels; the ∧ or ∨ cursor keys navigate the focus up or down the menu. The highlighted item is then activated by pressing the SELECT Key.

When a menu is not selected, the < and > cursor keys select, in sequence, the fields, boxes and buttons on the current Tile or page, the ^ and v cursor keys select fields, boxes and buttons that are above or below an item that is selected. The highlighted item is then activated with the SELECT Key.

When a Numeric Entry box is selected, pressing the < or > cursor keys decreases or increases the level of significant digits incremented or decremented. The ^ or v cursor keys increment or decrement the highlighted value.

ENTER Key

Enables the values that have been entered using the data input keys. New values are not effective until this key or the SELECT Key has been pressed. The background on a selected Numeric Input Box or Text Entry Box remains gold while the box is in the edit state.

Data Entry Input Keys

Numeric/Alphabetic Keys

Data entry keys enter numeric values or text into a selected data entry box. Numerals are entered into numeric data fields by a single press of the key. Text is entered into a data entry box using the keys with the appropriate characters.

Most keys have several characters assigned, called out by rapid repeat presses. As an example, to enter a ‘C’ into a text box, press the ABC/2 key six times. To enter a ‘2’ press the ABC/2 key seven times. All sequences repeat when more than the required key presses are used.

Signage Keys

- (minus)

. (decimal point)

* (star/asterik)

(hash)

BKSP (BACKSPACE) Key

When a numeric entry box or a text box is selected for editing, this key deletes the character or digit to the left of the position indicator.

The characters assigned to each Numeric/Alphabetic key are as follows: repeating sequences are shaded gray.

Key Label	1st Press	2nd Press	3rd Press	4th Press	5th Press	6th Press	7th Press	8th Press	9th Press
1	.	‘	(	)	1	.	‘	(	)
ABC / 2	a	b	c	A	B	C	2	a	b
DEF / 3	d	e	f	D	E	F	3	d	e
GHI / 4	g	h	i	G	H	I	4	g	h
JKL / 5	j	k	l	J	K	L	5	j	k
MNO / 6	m	n	o	M	N	O	6	m	n
PQRS / 7	p	q	r	s	P	Q	R	S	7
TUV / 8	t	u	v	T	U	V	8	t	u
WXYZ / 9	w	x	y	z	W	X	Y	Z	9
* / -	-	+	=	-	&	!	-	+	=
0	(space)	O	(space)	O	(space)	O	(space)	O	(space)
# / .	(.)	#	@	&	[	]	(.)	#	@

Rotary Control Knob

The Rotary Control Knob can be used to used to navigate between fields of a selected Tile, select data from drop-down menus, edit numerical content in data fields and to adjust various Test Set settings.

Navigating Fields

When a Tile is selected, the Rotary Control Knob moves the cursor from field to field. When the desired field is reached, press the SELECT Key to edit the field.

Editing Numeric Entry Boxes

When a numeric entry box is selected for editing, turning the rotary control increases or decreases the numeric setting. Adjusting the level of significant digits accelerates the response of the Rotary Control Knob.

Menu Item Selection

When a floating menu or a drop-down menu from a combination settings box is displayed, turning the Rotary Control Knob scrolls through the active list.

Assigned Functions

The Rotary Control Knob changes settings of functions that are enabled when the ASSIGN Key is pressed.

ASSIGN Key

Functions such as loudspeaker volume, squelch level and display brightness are adjusted by assigning the functions to the Rotary Control Knob. Pressing the ASSIGN Key displays soft keys for functions applicable to the current operating system. Pressing one of these soft key assigns the associated function to the Rotary Control Knob. The assignment remains active for a short time. A bar graph showing the current level as a percentage is displayed on the information bar. Pressing the ASSIGN Key at any time reinstates the last assigned function.

Display HOLD Key

The Hold Key freezes the display to allow the user to capture and save the current screen display. Refer to the section titled Display Hold Tile for use of this feature.

On/Standby Key

The Power Supply On/Standby key is referred to as the On/Standby key. The Test Set should always be powered down using the On/Standby Key before disconnecting the AC Power Supply from the Test Set. This key is active when the associated LED is illuminated.

If the On/Standby Key LED is not illuminated, the Test Set is OFF. Place the AC Power Supply Switch on the rear panel to the ON position to place the Test Set in STANDBY mode.

If the On/Standby LED is ORANGE, the Test Set is in STANDBY mode. Pressing the On/Standby Key initiates the Power-up sequence, returning the Test Set to the operating state it was in when unit was last powered down.

During the Power-up sequence, pressing the On/Standby Key when the LED is BLUE stops the Power-up sequence and returns the Test Set to Standby mode.

When the Test Set is operating the On/Standby LED is GREEN.

Pressing the On/Standby Key displays a dialog box (shown in Fig. 3-3) requesting confirmation to shut down Test Set. Selecting YES or pressing the On/Standby Key again initiates the Power-down sequence, saving all current settings and results and placing the Test Set in Standby mode. Selecting NO aborts the Power-down sequence and the Test Set continues operating and any ongoing testing is unaffected.

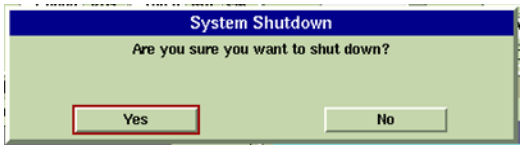


Fig. 3-3 System Shut-Down Prompt Dialog Box

The AC Power Supply Switch isolates the Test Set from the AC power supply. Disconnect the power supply cable from the AC power supply to remove the Test Set from AC power supply.

3.5 inch Floppy Disk Drive

The Floppy Disk Drive is only available on the 3901 and 3902.

The 3.5 inch floppy disk drive provides an interface to the Test Set for downloading data, settings and captured display files. Stored settings and data can also be loaded into the Test Set. These features are controlled through the Store/Recall Tile which is accessed by pressing the UTILS Key.

Powering Up

Before powering up the Test Set, check that the floppy disk drive does not contain a disk. If there is a disk in the drive at power up the Test Set may display irrelevant error messages. If this occurs, remove the disk and restart the Test Set.

RF Input and Output Connectors

The routing of signals within the Test Set to and from the RF input and output connectors is controlled from the selected Test System. There is an LED above each connector that indicates when a connector has been selected; the LED does not indicate when the connector is ON. More information about selecting the RF input and output connectors is provided later in this chapter.

Good quality, correctly fitted cables should be used to establish RF output connections. Worn connectors and damaged or kinked cables may cause high levels of reflected power, resulting in misleading results and possible damage to the transmitter.

Refer to the 3900 Platform Specifications for additional information.

Audible and Visual Overload Warning

If the RF Signal applied to the ANT (Antenna) Connector exceeds the safe maximum level, an audible and visual warning is triggered. The overload warning is also triggered if excessive reverse power is applied to the GEN (Generator) Connector. The Overload Warning is reset on the User Calibration Tile Tile and Operational Status Tile Tile.

CAUTION

If the Audible warning triggers, reduce power immediately. Do not power down the Test Set as this does not remove the overload power from the connection.

WARNING

Do not disconnect the RF cable from the Test Set as this may cause burns to the hands.

ANT (Antenna) Connector

The RF analyzer input is a 50 Ω TNC input, providing maximum sensitivity input to the RF analyzer of the Test Set.

CAUTION

The rated maximum input level for the ANT Connector is +10 dBm. Refer to the 3900 Platform Specifications for additional information.

T/R Connector

The combined (Duplexed) RF Gen output and high power RF analyzer input is a 50 N type connector which provides an RF Gen output connection and an RF analyzer input and broadband power meter connection. The RF Gen maximum output level and the RF analyzer sensitivity are lower than when using the separate GEN (Generator) Connector and ANT (Antenna) Connector.

CAUTION

The rated maximum input power level for the T/R Connector is 125 W. Refer to the 3900 Platform Specifications for additional information.

GEN (Generator) Connector

The RF Gen output is a 50 TNC output, providing the maximum RF output level from the RF Gen. The RF GEN Connector is reverse power protected to a level of +10 dBm.

MIC/ACC Connector

The Microphone and accessory connector is an 8 pin DIN connection with ring-lock.

This connector provides EXT MOD input (alternative to AUDIO IN 2/EXT MOD BNC) and DEMOD OUT (analog system). This connector can be used to connect a microphone, headset, or speaker. The Connector accepts a PTT (Press To Talk) microphone for testing simplex trunked radios.

There is provision to enable/disable the EXT MOD input by an external switching circuit.

Audio 1 and 2 IN Connectors

AUDIO IN 1 and 2 are the primary AF input and external modulation input connectors. The Connectors can be configured as high impedance or 600 Ω unbalanced.

AUDIO IN 1 and AUDIO IN 2 can be jointly configured as 600 Ω balanced for AF IN only, in which case AUDIO IN 2 is not available for EXT MOD. The MIC/ACC Connector can be used for EXT MOD IN if required.

FCTN GEN/DEMOD Connector

(Function Generator and Demodulated Signal Output)

This is the primary AF GEN output. The Connector can be configured as DEMOD OUT, as an alternative to MIC/ACC Demod out. When this arrangement is used the audio generators are unavailable. The Connector can also be used for Demod Audio, Audio 1, Audio 2 or MIC.

NOTE

Changing configuration to DEMOD OUT while still connected to the MIC/AF Input of a radio under test may create a feedback loop.

Scope CH1/CH2 Connectors

The Scope CH1 and CH2 connectors are the signal input connectors for the Oscilloscope function. The Source selection drop-down menu on the Vertical Settings Tile of the Oscilloscope controls the routing of signals from these connectors.

The Scope CH1 and CH2 connectors are the dedicated inputs to the dual-trace oscilloscope providing a maximum input rating of 100 Vpeak. Depending on the System selected, the oscilloscope also obtains input from the audio input or demodulated signals without using the dedicated inputs.

Test Connector

Reserved for future development.

CAUTION

Do not connect a VGA monitor to this connector.

USB Connector

This connector is a USB standard connection that allows connection of USB 1.1 devices (e.g. a USB memory stick or Network connectors). The Front Panel USB X2 Connector is only found on the 3920 Test Set.

Rear Panel Controls and Connectors

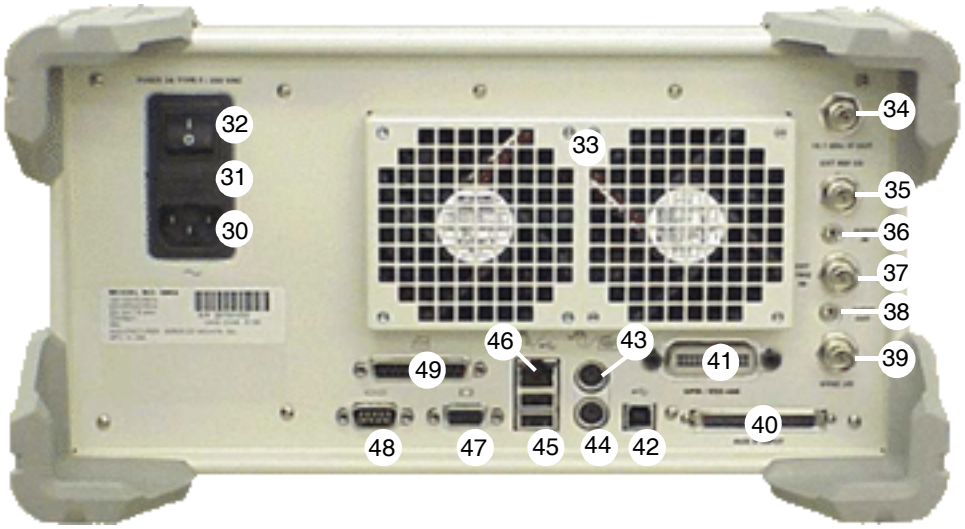


Fig. 3-4 3900 Series Rear Panel Connectors

Numerical references are shown in parenthesis (nn).

Rear Panel Connectors

Numerical Reference	Rear Panel Connectors	Page
30	AC Power Connector	3 - 11
31	AC Power Fuse	3 - 11
32	AC Power Supply Switch	3 - 11
33	Rear Cooling Outlets	3 - 11
34	IF Output Signal Connector	3 - 11
35	Ext Ref I/O External Interface	3 - 11
36	Audio Input Connectors	3 - 11
37	External Trigger Source Input	3 - 11
38	Audio Output Connector	3 - 11
39	Sync Signal I/O Connector	3 - 12
40	Auxiliary IF Input Connector	3 - 12
41	GPIB/IEEE-488 Interface Connector	3 - 12
42	Standard USB Client Connector	3 - 12
43	PS/2 Mouse Interface Connector	3 - 12
44	Keyboard Interface Connector	3 - 12
45	USB Connector	3 - 12
46	Ethernet Connector	3 - 12
47	VGA Monitor Output Connector	3 - 13
48	RS-232 Serial Connector	3 - 13
49	Parallel Printer Output Connector	3 - 13

AC Power Connector

The AC Power Connector accepts an IEC 320 connector. Refer to Appendix B, 3900 Platform Specifications for the required supply voltage, frequency and power consumption specifications. Also refer to the section titled Installation Requirements in Chapter 2, Installation.

AC Power Fuse

Fuses are accessed from the rear panel by removing the fuse cover located above the AC Power Refer to Appendix C, Fuse Replacement Instructions, for complete fuse replacement instructions.

AC Power Supply Switch

The AC Power Supply Switch disconnects the 3900 from the AC power supply. When the Test Set is to be left unused for extended period of time, power down the Test Set using the On/Standby Key, then turn the AC Power Supply Switch to the OFF position. Refer to section titled On/Standby Key for additional information.

The AC Power Supply Switch should not be used for powering down the Test Set because all settings and test results are lost. The On/Standby Key should be used for routine powering down. The On/Standby Key initiates the power-down procedure, ensuring all settings and test results are saved.

Rear Cooling Outlets

Refer to the section titled Installation Requirements in Chapter 2 for ventilation requirements.

IF Output Signal Connector

The IF Output Signal is available at this BNC connector. The 10.7 MHz IF Output is the RF signal received and down-converted by the Test Set RF Analyzer.

The output level is -10 dBm typical at 10.7 MHz (50 Ω nominal).

NOTE

The 10.7 MHz IF OUT signal is spectrally inverted. An RF signal received by the Test Set, down-converted to 10.7 MHz, then output on this socket has the property that a frequency increase or a phase advance at RF is output as a frequency reduction or phase retardation at IF. Take this into account if using this output for work with any type of FSK/PSK signaling.

Ext Ref I/O External Interface

The External Reference I/O Connector is a BNC connection used to connect the Test Set to an external frequency standard, or to output the internal frequency standard from the Test Set to other equipment. Refer to 3900 Platform Specifications for Input/Output specifications.

Audio Input Connector

The auxiliary I/O Audio Connector is internally connected and ready for future development. Do not make any external connection to this connector.

External Trigger Signal Input Connector

The External Trigger Signal Input is the external trigger input for the Oscilloscope.

This BNC connection has an Input impedance 10 kΩ. Refer to the Oscilloscope specifications in the 3900 Platform Specifications for details of the required signal.

Audio Output Connector

This auxiliary I/O Audio Connector is internally connected and ready for future development. Do not make any external connection to this connector.

Synchronization Signal Input or Output Connector

This BNC connection is used with the TETRA Base Station Test System for base station receivers generating a sync output signal. The 3900 Series Digital Radio Test Set TETRA Option Manual explains how the synchronization signal is used.

Auxiliary IF Input Connector

Reserved for future development.

GPIB/IEEE-488 Interface Connection

This connector is provided for interconnection to a GPIB/IEEE-488 interface bus. Refer to the 3900 Series Digital Radio Test Set Remote Programming Manual for information pertaining to Remote Control of the Test Set.

A VISA Plug and Play driver is available for use with National Instruments LabWindows/CVI. Support files are also available for use with other development systems such as National Instruments LabVIEW and Microsoft Visual Basic.

Refer to section titled Remote Tile for information on configuring the Test Set for GPIB operation.

Standard USB Client Connector

Reserved for future development.

PS/2 Interface Connector

The PS/2 Interface Connector is a standard PS/2 connection. PS/2 mouse support is not enabled at this time.

NOTE

A USB mouse can be connected at the USB Connector and used as an alternative to the Front Panel Cursor Keys.

Keyboard Interface Connector

The Keyboard Interface Connector is a standard PS/2 connection. A Standard PS/2 keyboard can be used as an alternative to the front panel data entry keys.

NOTE

A USB keyboard may be connected to the USB Connector.

USB Connector

This connector is a double USB standard connection that allows connection of USB 1.1 devices (e.g. a USB memory stick or Network connectors).

Ethernet Connector

The Ethernet Connector is a standard Base T RJ45 connection.

Applications for this connection include:

- Field upgrades of the firmware via Ethernet connection back to Aeroflex web site.
- Remote operation using VNC Viewer.

Refer to section titled Remote Tile for information on configuring the Test Set for Ethernet operation.

VGA Monitor Output Connector

This connector is a standard VGA style, 15 way, D-type connection that allows a VGA monitor or video projector to duplicate the Test Set's screen display.

NOTE

The VGA Monitor must be connected before the Test Set is turned on.

RS-232 Serial Connector

Standard 9 way, D-type connection.

Reserved for future development.

Parallel Printer Output Connector

The Parallel Printer Output Connector is a standard 25 way, D-type printer connection. Refer to the section titled Print Screen Tile for information on configuring printer setup.

Display Layout

Display layout is defined by the current operating system and shows either a single Tile of fixed size, or a Tile or group of Tiles that can be minimized or maximized. The area on the right of the display shows any soft keys applicable to the active Tile. Analog Duplex System Tiles are provided as examples.

The example in Fig. 3-5 shows the 3900 display configured with Analog Duplex selected; and the Generators, Analyzers, Meters and Channel Analyzers Tiles displayed in minimized view. In this example the Generators Tile is selected and the associated soft keys are shown on the right of the screen.

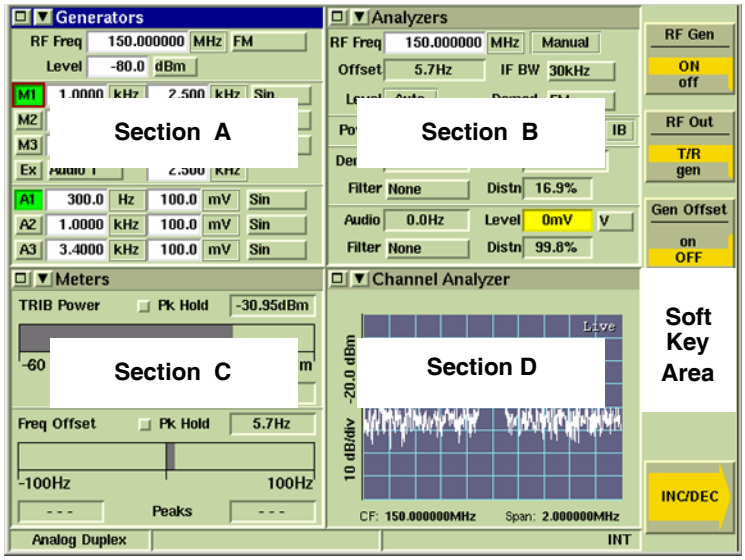


Fig. 3-5 Analog Duplex System Display - Minimized View

- Section A can be configured to display the Generators, Meters, Oscilloscope, Audio Analyzer or Channel Analyzer.
- Section B can be configured to display the Analyzers, Meters, Oscilloscope, Audio Analyzer or Channel Analyzer Tiles.
- Section C and D can be configured to display the Meters, Oscilloscope, Audio Analyzer or Channel Analyzer Tiles.
- The Information Bar located at the bottom of the Tile display the operating system title, RF status, and additional operating information.
- A specific measurement can be displayed in more than one section of the display if required. For example, the Meters Tile may be selected for Section C and D so that all of the meters are visible in minimized view (3 meters in each section).

This section describes the following:

Maximized and Minimized Views

Navigating Display Tiles

Floating Menus

Configuring Screens

Soft Keys

TEST, CONFIG (Configuration) and UTILS (Utilities) functions.

Maximized and Minimized Views

Select the Maximize/Minimize symbol on the Tile's menu bar to maximize or minimize a Tile. To change the maximize/minimize state of the active Tile, navigate to the maximize/minimize button and press the SELECT Key.

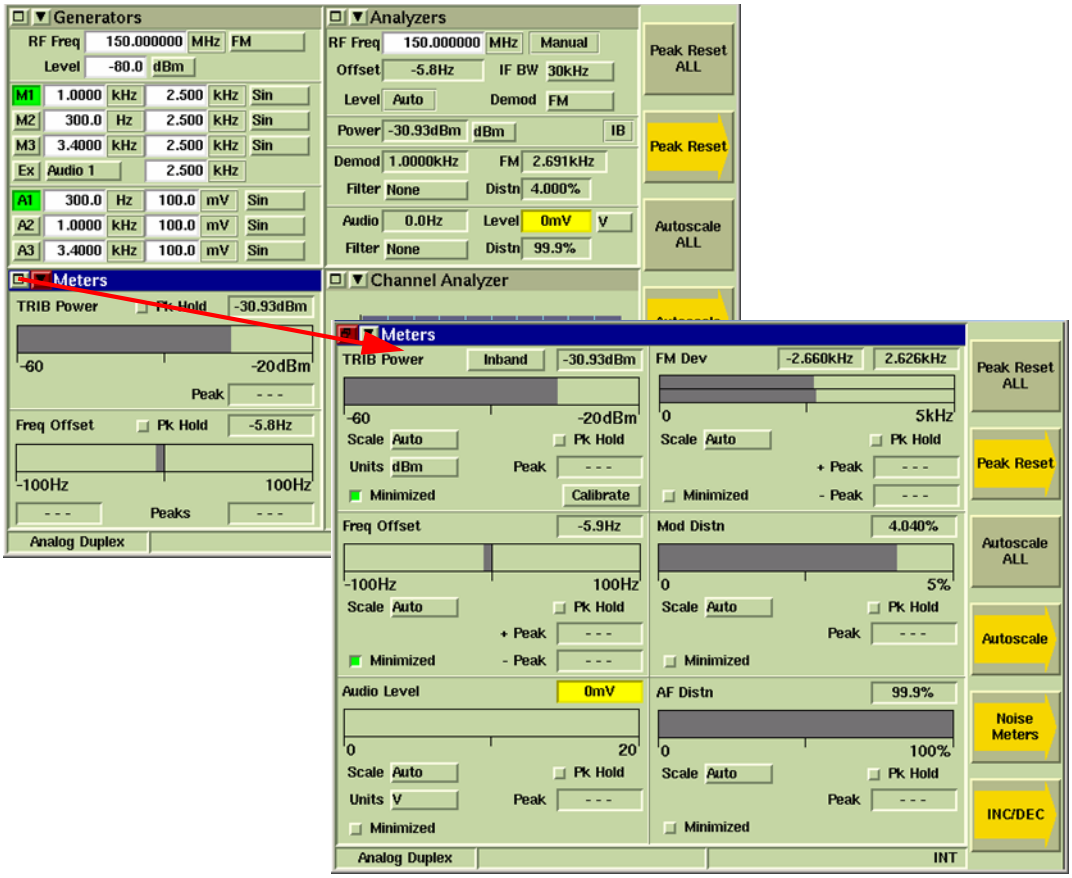


Fig. 3-6 Minimized - Maximized Viewing Options

Navigating Display Tiles

When a Tile is minimized, press the TAB Key to navigate from Tile to Tile. The title bar of each Tile changes to **BLUE** as the TAB key moves focus from Tile to Tile. When a Tile is selected, the Cursor Keys or Rotary Control Knob can be used to navigate from field to field within the selected Tile. Each field or button on the screen is highlighted by a **RED** outline when it is reached. When the desired field or button is active, press the SELECT Key to edit or enable the item.

To navigate to a menu item on a drop-down menu, use the ∧ or ∨ Cursor Keys or Rotary Control Knob to move up or down the menu. When the required item is highlighted, press the SELECT Key.

Floating Menus

Floating menus are displayed by using the TEST Key, CONFIG Key and UTILS Key, or by right clicking with a mouse on the display field. The floating menu associated with the current function opens when one of these actions is performed. For example, if the CONFIG Key is pressed while the Test Tiles are displayed, the last viewed Configuration Tile opens.

When a display Tile is maximized, pressing the TAB Key opens a floating menu that lists the Test Tiles that are currently active in minimized view. Selecting a function from the TAB floating menu displays the Tile in maximized view. Fig. 3-7 shows a maximized view of the Channel Analyzer Tile with the TAB floating menu that lists the Tiles that are active when the Tile is minimized as shown in Fig. 3-8.

To navigate to an item on a floating menu, use the ∧ or the ∨ Cursor Keys to ascend or descend the menu; use the > or the < Cursor Keys to cross between upper and lower menus. When a menu is displayed, scroll through the menu items by using the Rotary Control Knob. Press the SELECT Key to enable the selected item.

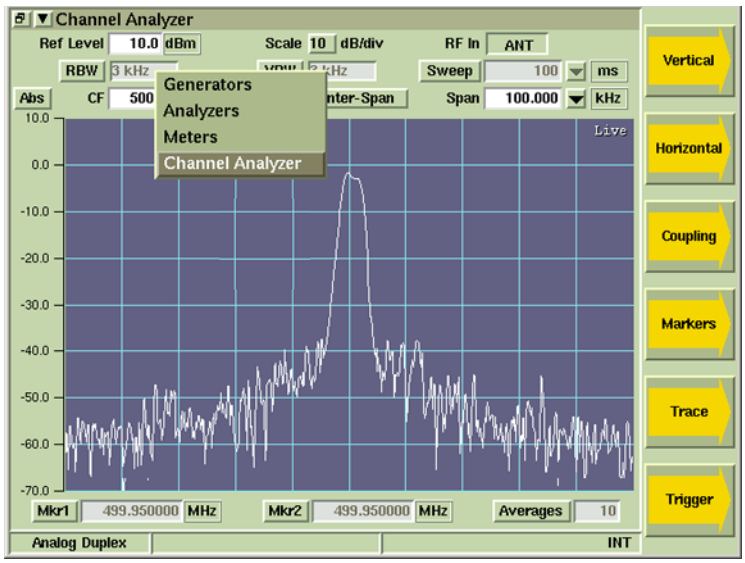


Fig. 3-7 Channel Analyzer Maximized - TAB Floating Menu

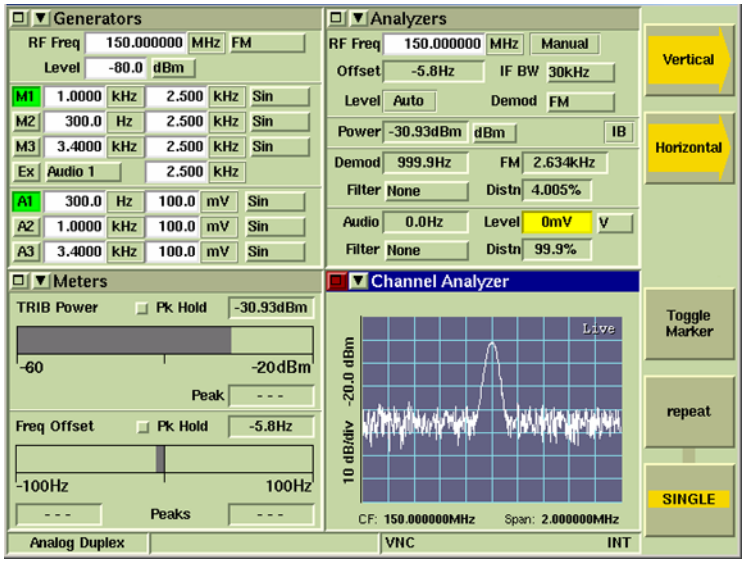


Fig. 3-8 Analog Duplex Active Tiles - Tiles Minimized

Configuring Screens

There are various configuration functions that must be defined when using the Test Set. These functions are accessed by using the CONFIG Key to open the Configuration menu. When operating in TEST or UTILS Mode, press the CONFIG Key twice to open the Configuration Menu. If Configuration Mode is already selected, press the CONFIG Key once to open the Configuration Menu.

The configuration screens always occupy the entire screen. Details about configuration requirements are explained throughout this manual.

Configuring Data Fields

The data fields present on the 3900 display Tiles vary bases on the selected system. However, field functionality is consistent throughout the Test Set.

Numeric Entry

Numeric entry fields are used for setting fluctuating values. The value is changed using any of the following methods:

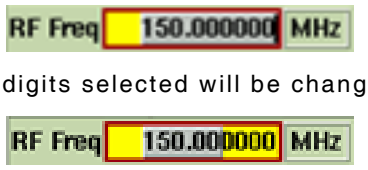
- The value is keyed in using the Data Entry Input Keys.
- The value is incremented or decremented using the ∧ or ∨ Cursor Keys.
- The value is incremented or decremented by using the Rotary Control Knob.

To change the displayed value:

1. Navigate to the box to be edited using the cursor keys or mouse.
2. Press SELECT. If using a mouse, double click to select a field. Box background changes from white to gold and text changes to black on a white background.
3. Enter new value using keypad or rotary knob.
4. Press ENTER, or if applicable, a soft key terminator (i.e., unit of measurement) to enter the value.

Significant Digit Selecting and Adjustment Acceleration

The number of significant digits to be incremented or decremented can be selected by user. Pressing the < or > key increases or decreases the number of digits selected, one digit per press. Only selected digits are changed. When the new value is correct, press the ENTER Key.



All digits selected will be changed

Only highlighted digits will be changed

Fig. 3-9 Numeric Entry - Selected Edit States

Drop-down Menus

Drop-down menus are used to select from a list of items.

To change the displayed value, navigate to the desired data field. Press the SELECT Key to display the drop-down menu. A scroll bar is displayed when there is a long list of selections. Use the ∧ or ∨ Cursor Keys, or the Rotary Control Knob, to select the required value, then press either the ENTER Key or the SELECT Key to enable the selection.

Tick Boxes

Tick boxes are used to enable or disable various parametric options. When a tick appears in the box the option is enabled, if the box is empty it is disabled. The state is changed by focusing on the box and pressing the SELECT Key, or by clicking on the tick box with a mouse.

An example is the Analog Duplex Generators Tile, where Tick boxes are used to enable the required Modulation and Audio Generators. The options are Mod Generators 1, 2 and 3, the External Modulation Input and AF 1, 2 and 3. The selection is made by focusing on the button and pressing the SELECT Key.

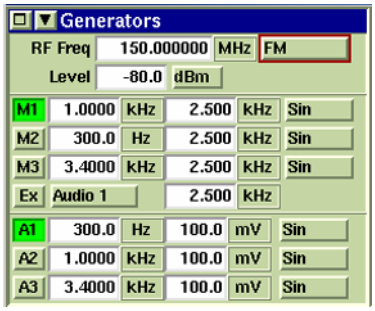


Fig. 3-10 TIck Buttons - Enable/Disable Mod Generators

Option Buttons

Option buttons select from a one of two possible states. For example, the Analog Duplex Meters Tile, contains an option button to set the Power measurement function to Inband or Broadband. To change the current state set of an option button, focus on the button and press the SELECT Key.

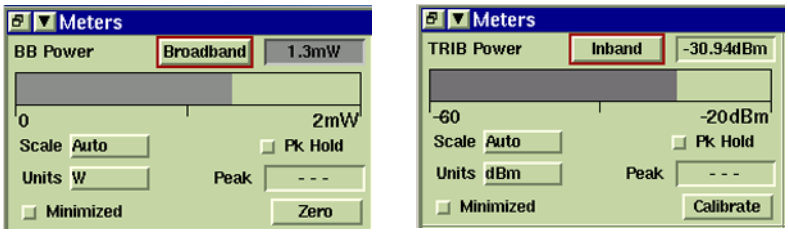


Fig. 3-11 Option (Toggle) Buttons

Radio Buttons

Radio buttons select one option from two or more available options, such as measurement results on a Tile. The examples in Fig. 3-12 show where Radio Buttons are used to select the result (e.g. Average, Max, Min) that is to be displayed when the Tile is minimized.

The selection is made by highlighting the button and pressing the SELECT Key or clicking on the button if using the Mouse Option.

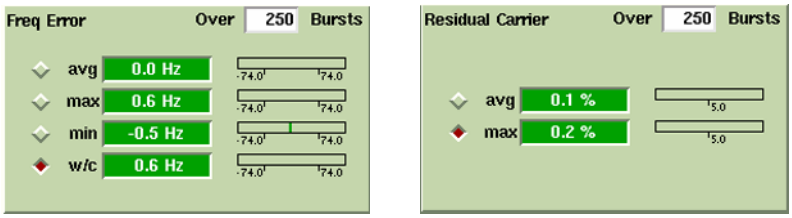


Fig. 3-12 Radio Buttons - Measurement Results Selection

Data Fields Background Color

The background color of the data field provides information relating to the state of the measurement.

Limits Disabled

The following background colors apply to measurements that do not have upper and lower limits applied:

0mV	Indicates field is SETTLING.
2.77kHz	Indicates reading is VALID.
1.0mW	Indicates reading is INVALID.

Limits Enabled

The following background colors apply to measurements that have upper and lower limits applied:

-5.9Hz	Indicates ACQUIRED reading is within set limits. Indicates PASS in Pass/Fail conditions.
-5.8Hz	Indicates ACQUIRED reading is ABOVE set upper limit. Indicates FAIL in Pass/Fail condition.
-30.77dBm	Indicates ACQUIRED reading is BELOW set lower limit.

Pass or Fail Indicators

When the results of a test have no single value, such as Digital Radio burst profiles, the result is shown simply as Pass or Fail with a **GREEN** or **RED** background respectively.

Fig. 3-13 Pass/Fail Indicators

Numeric Output Field

The annotated illustration in Fig. 3-14 provides an example of a numeric output field on a TETRA MS System Tile. In this example, the measurement title is shown to the left of the numeric output field. The measurement value and the units of measurement are displayed inside the field.

When test limits have been set, an alarm symbol '!' appears to the right of the field when a measurement is outside the set limits.

A measurement value that is within specified limits is shown in white on a **GREEN** ground.

A measurement value that is above an upper set limit is shown in white on a **RED** ground, with an alarm symbol '!' shown to the right of the field.

A measurement value that is below a set lower limit is shown in white on a **BLUE** ground, with an alarm symbol '!' shown to the right of the field.

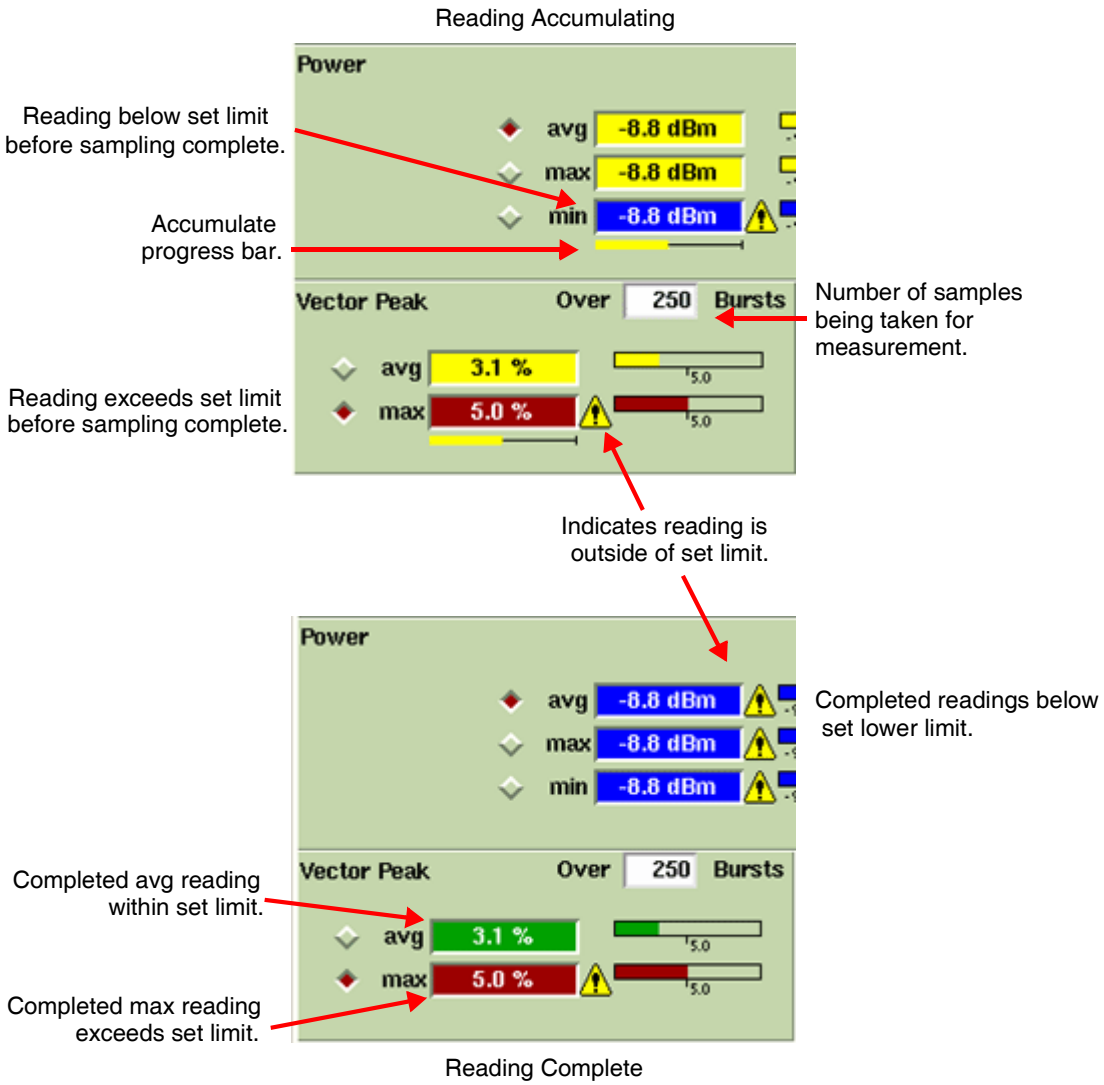


Fig. 3-14 Numeric Output and Limit Settings Readouts

A progress bar is shown below the results during data accumulation. For some measurements a bar graph also shows the result relative to the pass or fail limit or to the upper and lower limits as appropriate. A radio button is displayed next to some measurements so the measurement can be selected for display when the Tile is minimized.

Soft Keys

There are six soft keys located on the front panel of the 3900. A soft key is active only when a label is shown adjacent to it. The text on the label identifies the soft key, while the outline and background color of the key provide information about the purpose, state and type of action the soft key initiates.

Action Soft Keys

Action keys initiate immediate actions when pressed.

For example, the [Peak Reset ALL] soft key resets peak values for all measurements on the associated screen.

Next Level Soft Keys

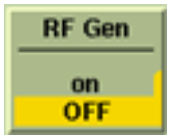
Next Level soft keys have a arrow shaped gold background. Pressing one of these types of soft keys leads to a soft key sub-menu. In some cases there is more than one sub-menu level.

Pressing this soft key displays a sub-menu of related soft keys. In this example, the soft key sub-menu relates to the RF Output Frequency incremental change value.

The RETURN prompt appears at the bottom of the soft key area when a sub-menu choice of soft keys is displayed. This prompt is to remind users to use the RETURN key to move back to the previous menu level.

Toggle Soft Keys

Toggle Soft Keys offer a choice of two, three or four options.



The RF Gen toggle soft key offers the option of ON or OFF. In this example the RF Gen is OFF; pressing the RF Gen soft key turns the RF Gen ON.

Grouped Soft Keys

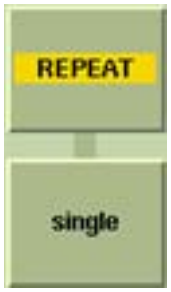
Some soft keys are grouped together and function interdependently. A dark vertical bar between two soft keys indicates that they are linked. When one of a pair of linked soft keys is selected the text on the selected soft key appears capitalized and the text background of the selected key changes to a gold bar.

The soft keys in the following are linked:

Example A

As shown here, the [SINGLE] soft key is active, indicated by the title shown in upper case with a gold background stripe. In the particular application, the action to make a single measurement lasts for a finite time, then reverts to the inactive, standby state as shown in Example A.

Example B



As shown here, the [REPEAT] soft key is active, indicated by the title shown in upper case with a gold background stripe. In the particular application, the action to repeat a measurements continues until terminated by pressing the [Single] soft key. The [REPEAT] soft key then reverts to the inactive, standby state as shown in Example A.

TEST, CONFIG and UTILS Functions

The 3900 has three primary functional modes of operation: Test, Configuration and Utilities. These functions are selected by pressing the desired function key on the front panel.

When the Test Set is in TEST Mode, the selected System is available for use and is controlled through the user interface.

When the Test Set is in CONFIG Mode, the Configuration menu and functions of the selected System are accessed through the user interface. The first level of the Configuration menu has a Systems option that allows users to select any of the systems installed on the Test Set.

When the Test Set is in the UTILS Mode, the Utilities functions are accessible through the user interface. The Utilities functions are not system defined.

TEST

The Test Set must be in TEST Mode to access TEST Tiles via the user interface. The operation of the Test function is explained in chapters specific to each System.

CONFIG (Configuration)

System Selection

The Systems menu is opened by pressing the CONFIG Key. A menu similar to that shown below is displayed. The desired system is selected from the Systems menu.

As an example, to open Analog Duplex:

1. Select **Systems** from the CONFIG menu.
2. Select **Analog** Duplex from the Systems menu.
3. The Analog Duplex system loads and the Test Set is now ready for Analog Duplex mode of operation.

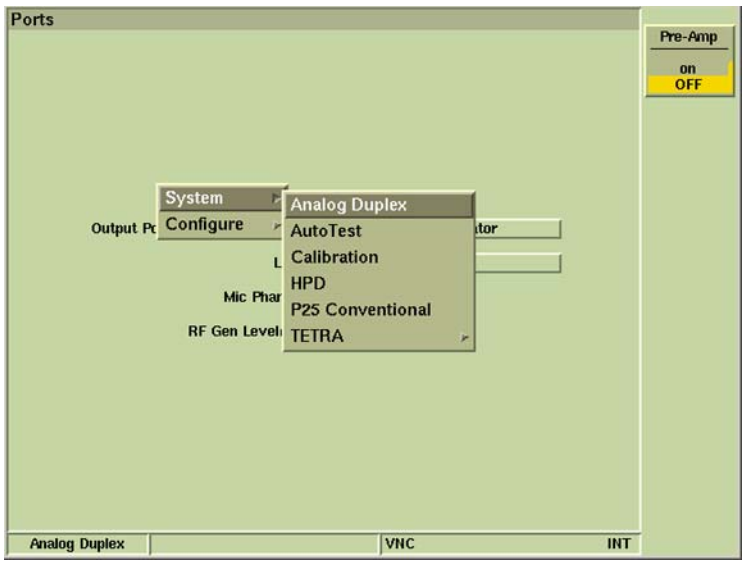


Fig. 3-15 Analog Duplex Configuration Floating Menu

Configuring the Display

When the Test Set is in CONFIG Mode, parameters and functions are accessed and configured from the user interface. To open a system Configuration Menu, press the CONFIG Key. The Configuration menu lists the configuration screens applicable to the current operating system.

Fig. 3-16 shows the Configuration menu for the Analog Duplex System, with the Offsets Configuration Tile highlighted. When the SELECT Key is pressed, the Analog Duplex Offsets Configuration Tile is displayed as shown in Fig. 3-17.

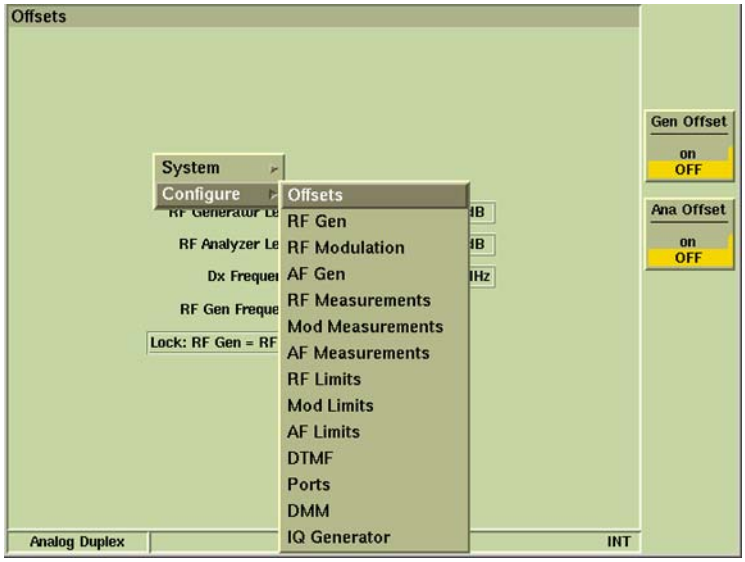


Fig. 3-16 Analog Duplex Configuration Floating Menu

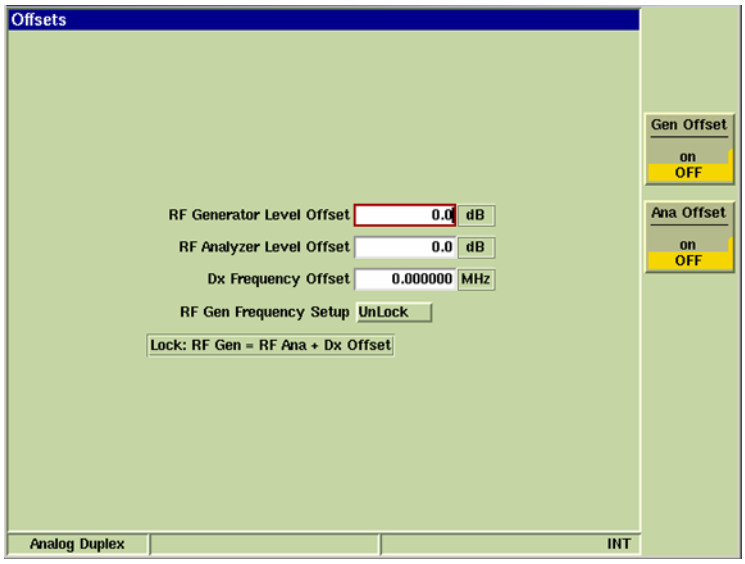


Fig. 3-17 Analog Duplex Offsets Configuration Tile

UTILS (Utilities)

The Utilities function provides access to general Test Set functions. These functions are not specific to a particular system. When operating in TEST or CONFIG Mode, press the UTILS Key twice to open the Configuration Menu. If Utilities Mode is already selected, press the UTILS Key once to open the Utilities Menu.

Accessing UTILS Mode

To access the Utilities mode, press the UTILS Key. The last used UTILS Tile opens. From this screen, press the UTILS Key again to access the Utilities floating menu. Select the desired Utilities function from the UTILS floating menu. Fig. 3-18 shows Hardware Settings selected with the expanded Hardware Settings menu.

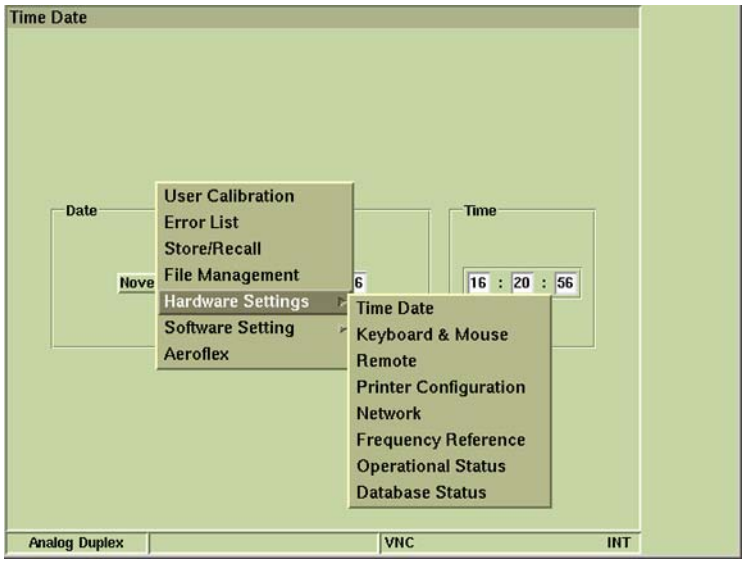


Fig. 3-18 UTILS Floating Menu - Hardware Settings Selected

User Calibration Tile

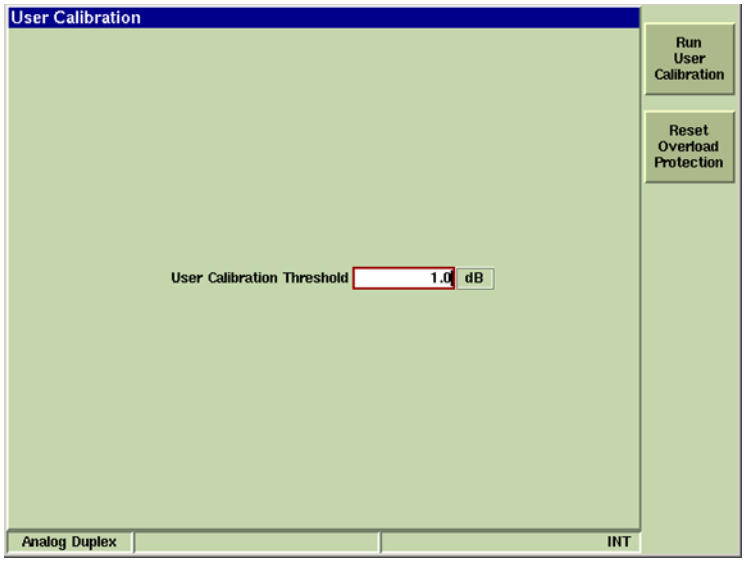


Fig. 3-19 UTILS User Calibration Tile

Field/Soft Key Definitions

User Calibration Threshold

Indicates the tolerated amount of error due to temperature drift. For example, if the threshold value is set to 1 dB, the Test Set generates an error message when the accuracy of measured power readings is greater than 1 dB.

Run User Calibration

Pressing this soft key initiates the User Calibration Procedure. The User Calibration Procedure should be performed when the calibration indicator appears at the bottom of the display tile.

Reset Overload Protection

Resets the Test Set's input overload relay. When input exceeds maximum levels, the Test Set generates an audible alarm tone. The alarm tone stops when the overload input is disconnected from the Test Set, however, this soft key must be pressed to reset the Test Set's overload warning system. Refer to 3900 Platform Specifications for maximum input levels.

Run User Calibration Procedure

1. Disconnect any leads from the front panel.
2. Press the UTILS Key to access the Utilities menu.
3. Select **Hardware Settings**, **User Calibration** from the Utilities menu.
4. Select **[Run User Calibration]** soft key on the User Calibration Tile Tile.
5. When User Cal has completed, press the TEST Key to return to the previous operating system.

Error List Tile

Screen displays a list of the last received errors. Refer to Appendix F for a description of error messages.

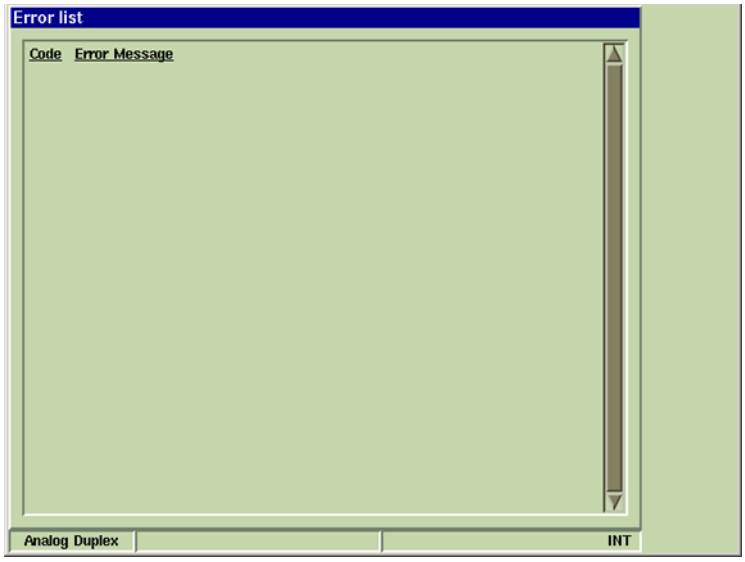


Fig. 3-20 UTILS Error List Tile

Store/Recall Tile

The Store/Recall function saves the Test Set's current settings in a file that can be recalled for later use. The Store/Recall Tile is accessed from the UTILS menu or from the TEST Floating Menu as shown below.

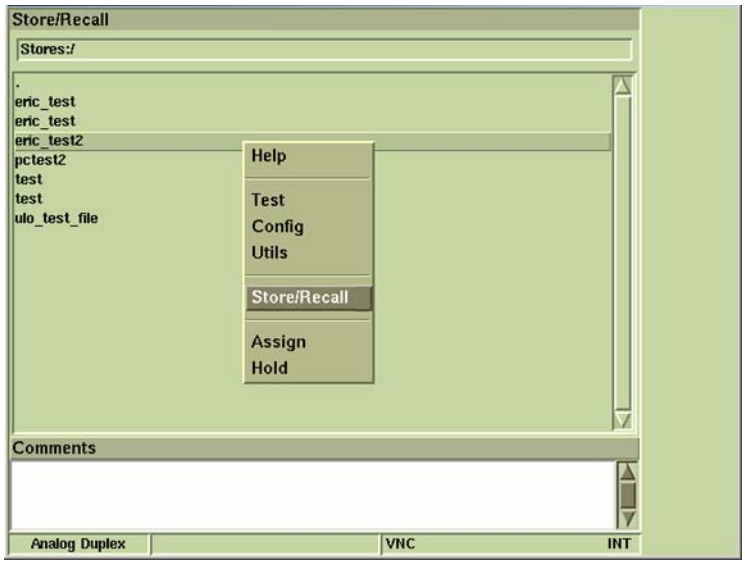


Fig. 3-21 Accessing Store/Recall Tile

Soft key options vary according to the number of files that are saved on the Test Set. Fig. 3-22 shows the soft keys associated with the main Save/Recall Tile.

- The Directory Title bar displays the selected directory.
- The Information Display Tile displays the files and any sub-directories located in the selected directory.
- The Comments Field displays comments with the selected file.

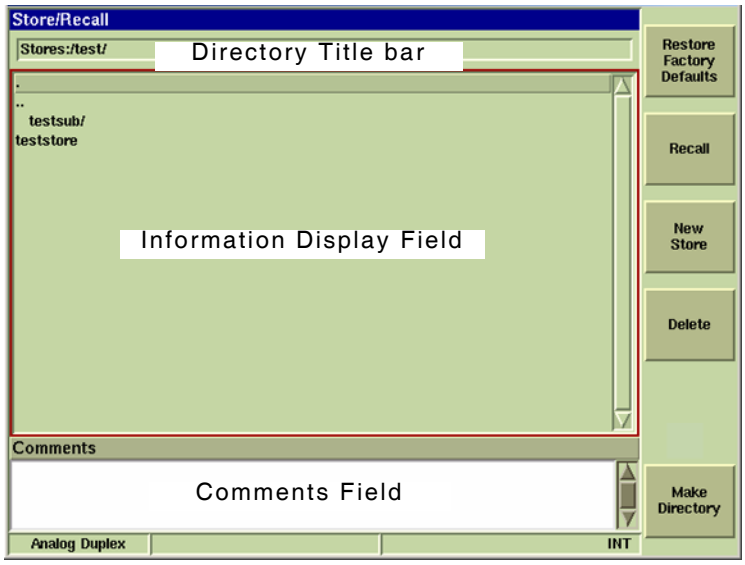


Fig. 3-22 Save/Recall Tile

Soft Key Definitions

[Restore Factory Defaults] Soft Key

Recalls the factory defaults for all parameters and settings for all Test Set systems.

[Recall] Soft Key

Recalls settings for selected file. File may also be recalled by double-clicking on a file name when using a USB mouse. Refer to the section titled Recalling Settings for additional information on use of the Recall feature.

[New Store] Soft Key

Opens the Store/Recall - New Store Tile as explained in the section titled Creating a Settings File.

[Delete] Soft Key

Deletes selected file from Test Set's internal memory. The action is protected by a second level of soft keys asking user to [Confirm] or [Cancel] the action.

[Make Directory] Soft Key

Allows user to create a new directory (sub-directory). Refer to section Creating New Directory for information on creating a new directory.

[Accept] Soft Key

Soft key is displayed when creating a new settings file. Used to accept defined file parameters when creating a new file.

[Clear Comment] Soft Key

Clears any text present in the Comments field then the field is selected.

[Cancel] Soft Key

Cancels current action. Soft key is accessed when [New Store] Soft Key, [Make Directory] and [Delete] Soft Key are pressed.

[Store] Soft Key

Saves new file to Test Set's internal memory. Soft key is accessed when [New Store] Soft Key is pressed.

[Overwrite] Soft Key

This soft key serves as a protective step when saving a settings file. When a file is being saved that has the same name as an existing file, pressing [Overwrite] Soft Key saves file over existing file. When [Overwrite] Soft Key is pressed the existing file is replaced by the new file and can not be retrieved.

Managing Files

Creating a Settings File

1. Select **Store/Recall** from the UTILS menu.
2. Select [New Store] Soft Key.
3. Enter the filename in Title bar and comments (if desired) in Comment field.
4. If no comments are to be entered, press the [Store] Soft Key to save the file.
5. If comments have been entered, press the [Accept] Soft Key to save the file.

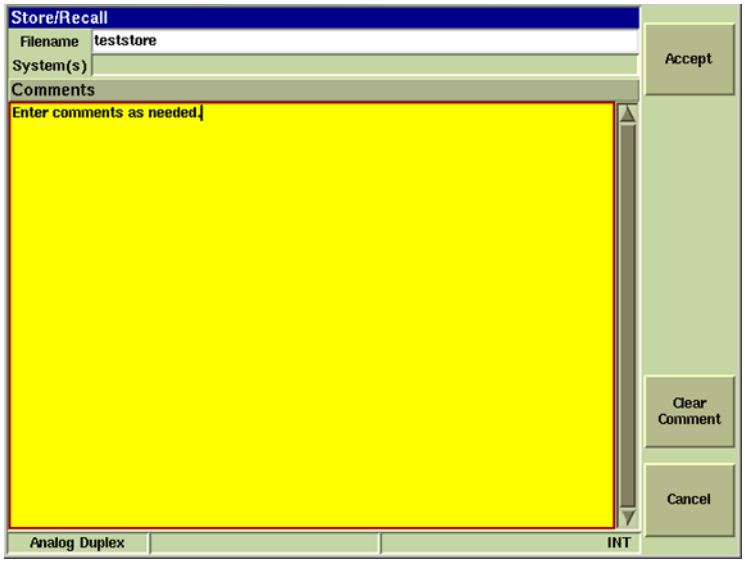


Fig. 3-23 Creating a Settings File

6. File now appears in the list on the Save/Recall Tile.

Recalling Settings

To recall a stored settings file:

1. Select **Store/Recall** from the UTILS menu.
2. Select desired file from list and press [Recall] Soft Key to initiate recall procedure. During the recall process a message is displayed as shown in the example below. When the file is loaded, all of the Systems in the Test Set are loaded with the Settings contained in the file.

NOTE

If using a USB Mouse, double click the desired file to recall the settings.

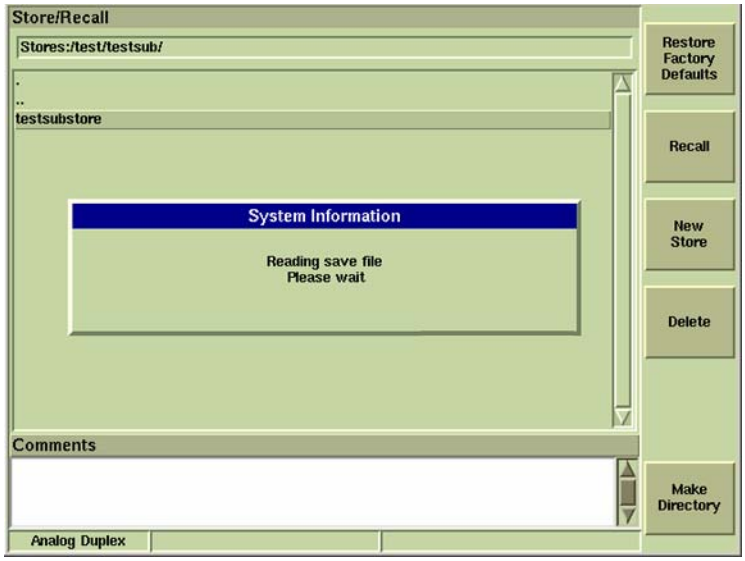


Fig. 3-24 Store / Recall Dialog Box

Creating New Directory

1. Select **Store/Recall** from the UTILS menu.
2. Select [Make Directory] Soft Key.
3. Enter directory name in title field and press [Make Directory] Soft Key.

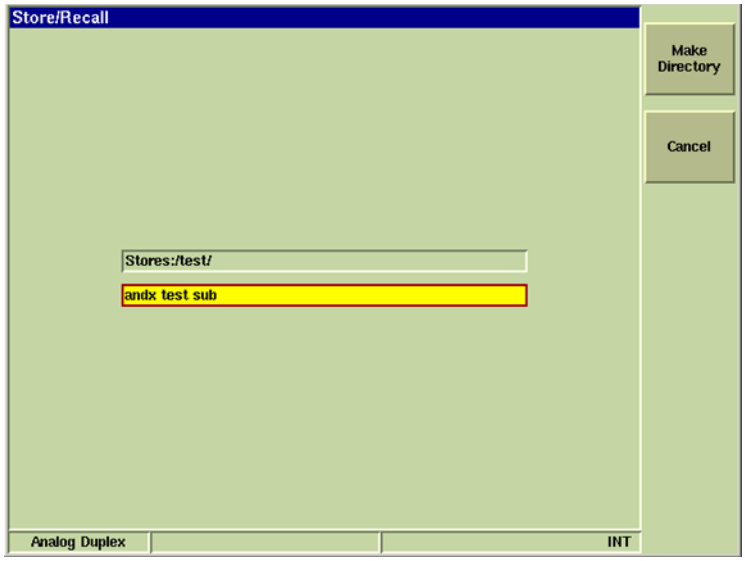


Fig. 3-25 Creating New Directory

File Management Tile

The File Management Tile allows users to:

- Export files from Test Set to a USB memory stick (jump drive) or floppy drive.
- Import files from a USB memory stick (jump drive) or floppy drive to the Test Set.
- See directory listings of Test Set files.

The structure within the file management function is shown below. The following are selected from the drop-down menu at the top of the File Management Tile.

AutoTest and AutoTest 2

The File Management - AutoTest and AutoTest 2 provides access to any Script files that are available for use on the Test Set and to any test results that have been stored in the unit. The AutoTest and AutoTest II drive locations are only available when the options have been installed in the Test Set.

Screens

The File Management - Tile area provides access to any files that may have been saved by using the screen capture function associated with the Display HOLD Key. Refer to Miscellaneous Functions; Display HOLD Key for information on use of the Capture function.

Stores

The File Management - Stores area provides access to any Settings files that may have been saved by using the Store/Recall Tile.

TETRA Channel Plan

The File Management - TETRA Channel Plan provides access to Channel Plan files that are common to all TETRA Systems.

TETRA MS / MST1 / BS / BST1 / DM Data Display

The File Management for specific TETRA Systems provides access to saved Data Display files that have been saved within the selected TETRA System.

AiqFiles

The File Management for AiqFiles provides access to ***IQCreator®*** waveform files that have been downloaded and stored in the Test Set. This drive location is only available when the IQ Gen Option (390XOPT054) has been installed in Test Set.

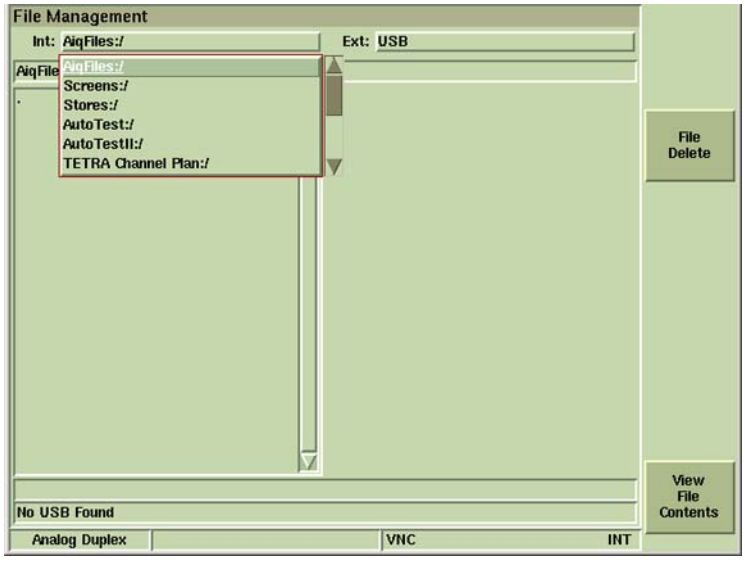


Fig. 3-26 File Management Tile

File Management Tile Layout and Navigation

The File Management Tile is divided into two sections: the left side of the Tile displays Internal Drive data; the right side of the Tile displays External Drive data. Navigate using the Cursor Keys, TAB Key or by clicking on a field when using a mouse. When the desired field is selected, press the SELECT Key to edit the field.

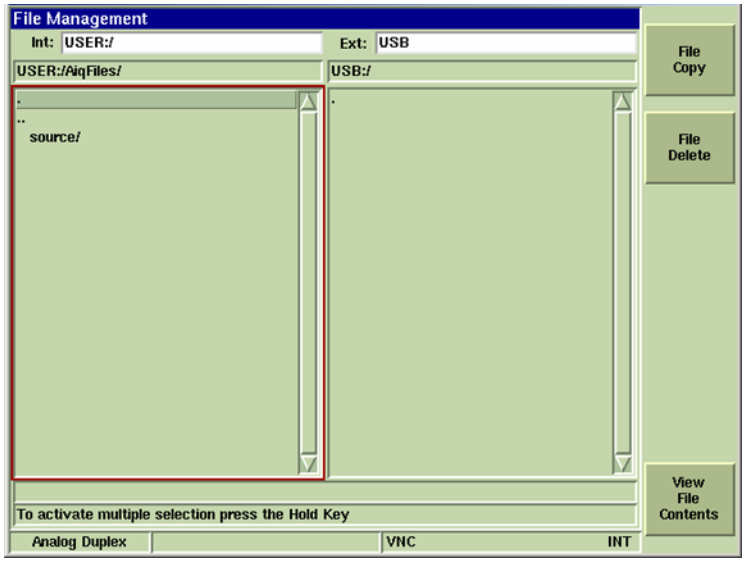


Fig. 3-27 File Management Tile Layout

Multiple File Selection

Multiple fields can be selected (as shown in Fig. 3-28) to be copied or deleted by pressing the Display HOLD Key and selecting the desired files.

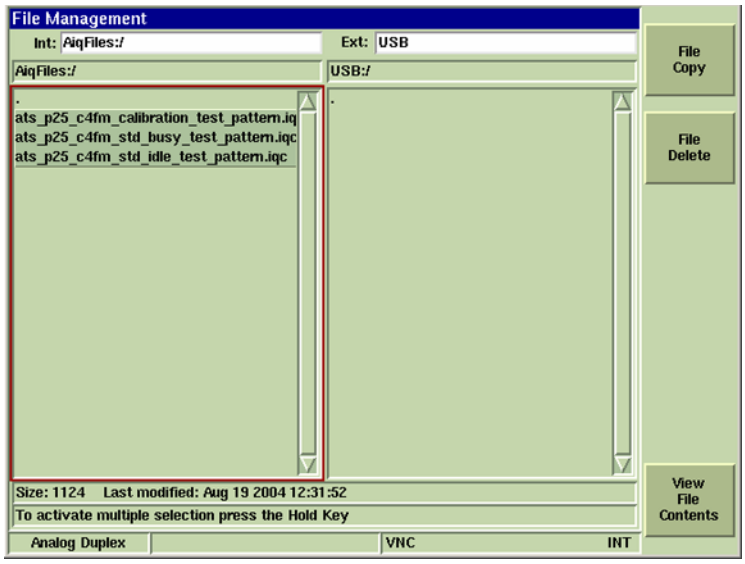


Fig. 3-28 File Management - Multiple Files Selected

Field / Soft Key Definitions

Drive Directory

The information bar located under the Internal and External Drive drop-down menu fields display the directory heading of the file currently selected.

Internal / External Data Field

The Internal and External Data Fields display contents of the selected drive. Periods(.) are used to indicate the directory level of the selected file. The top level directory is indicated by one period. Press the CANCEL Key to exit a selected Data Field.

[File Delete] Soft Key

Pressing this key deletes selected file(s). A prompt dialog box as shown in Fig. 3-29 requests user confirm file deletion.

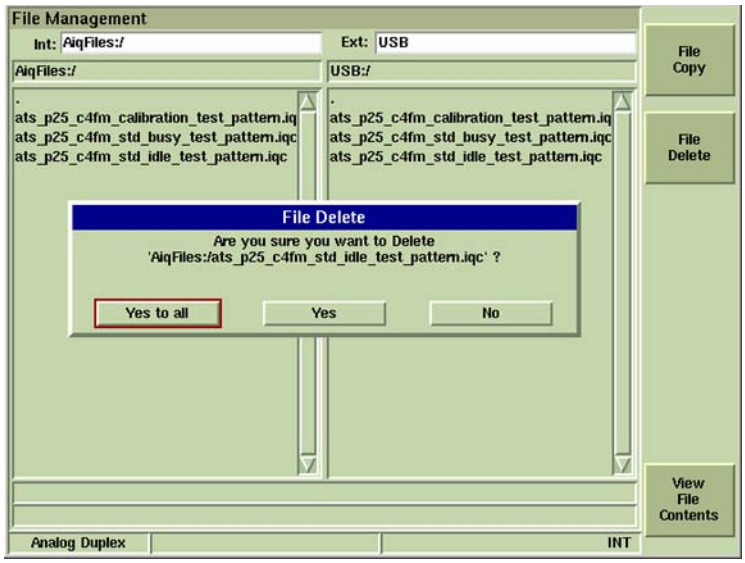


Fig. 3-29 File Management - File Delete Confirmation Prompt

[File Copy] Soft Key

Copies selected file(s) from USB device to Test Set and vice versa.

[View File Contents] Soft Key

Displays contents of selected file. Only one file can be selected for viewing. Valid file types are:

- Autotest and AutoTest 2 script files and test results
- Stored Screen captures
- IQCreator® waveform files

Managing Files

Copying Files to Test Set

To import a file to the Test Set:

1. Power on Test Set.
2. Press UTILS Key to access the UTILS Floating Menu.
3. Select **File Management** from the UTILS Floating Menu.
4. Connect memory device (example uses USB device) to Test Set USB Connector.
5. Select internal drive to copy file(s) to: Internal Drive: drop-down menu (example uses AiqFiles).
6. Select external drive to copy file(s) from: External drive: drop-down menu (example uses USB).

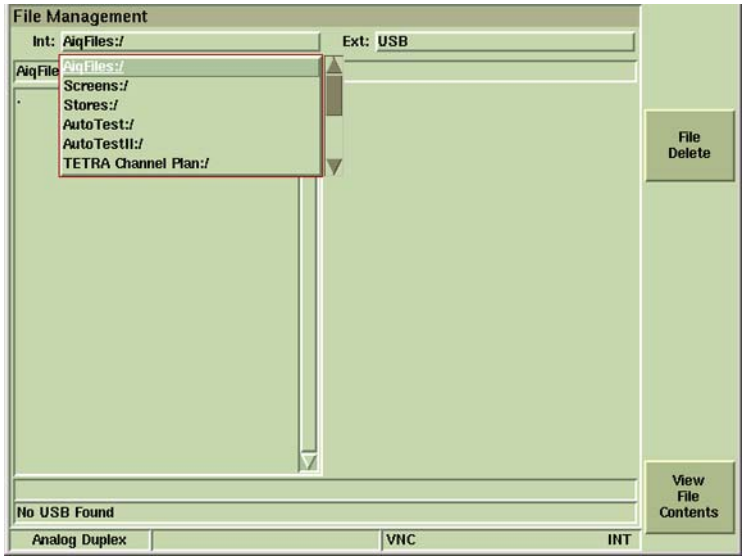


Fig. 3-30 File Management - Selecting File

7. The File Management Tile opens for the selected file type. The data field on the left is empty if no files have been imported to this drive directory. The field to the right displays the file to be copied from the USB to the Test set.

8. Select file(s) to be copied from USB and press [File Copy] Soft Key.

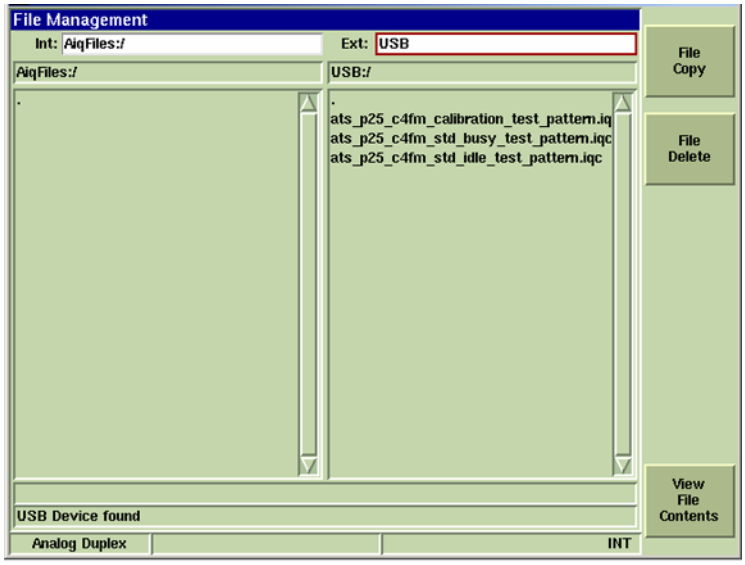


Fig. 3-31 File Management Tile - File Selected to Copy

9. Imported file(s) now appears in data field (refer to Fig. 3-32).

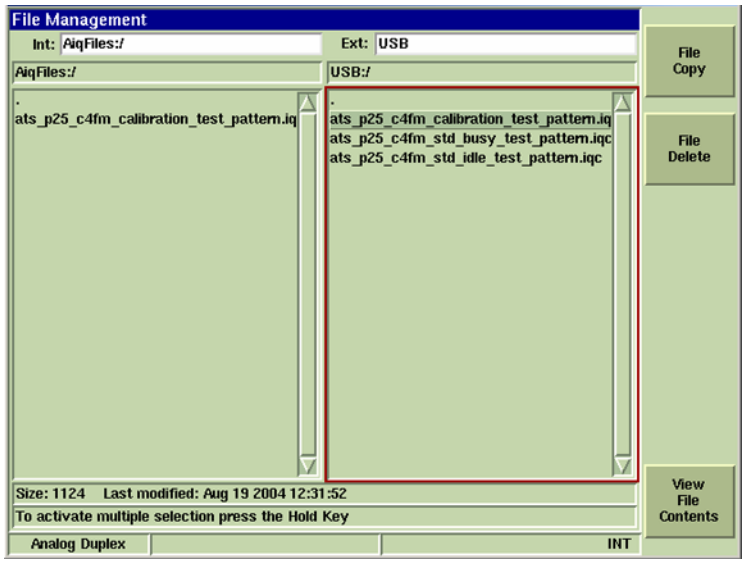


Fig. 3-32 File Management Tile - Copy Complete

Copying Files from Test Set

To copy files from Test Set:

1. Power on Test Set.
2. Press UTILS Key to access the UTILS Floating Menu.
3. Select **File Management** from the UTILS Floating Menu.
4. Connect memory device (example uses USB device) to Test Set USB Connector.
5. Select internal drive to copy file(s) from: Internal Drive: drop-down menu (example uses AiqFiles).

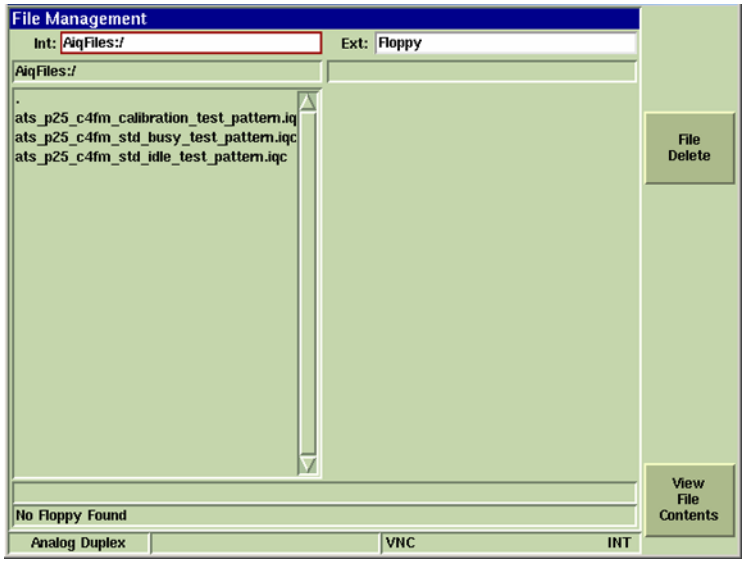


Fig. 3-33 Select Internal Drive

6. Select drive to copy file(s) to from the External Drive: drop-down menu (example uses USB).

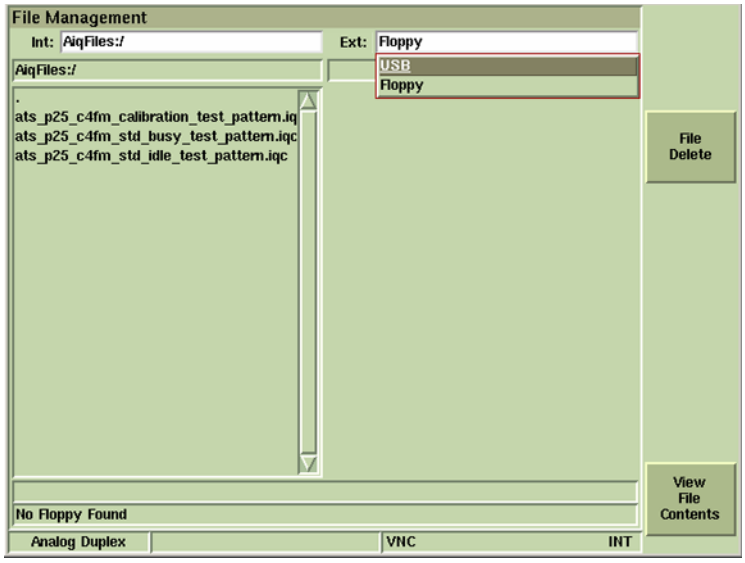


Fig. 3-34 Select External Drive

7. Select file to be copied from Test Set to USB device and press the [File Copy] Soft Key. File appears under the USB:/ Directory when copy is complete (refer to Fig. 3-32).

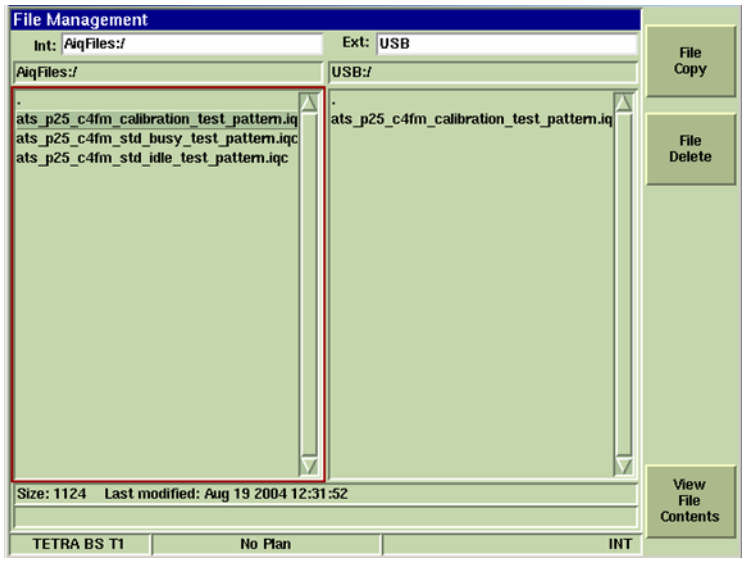


Fig. 3-35 File Management - File Selected

Time & Date Tile

Settings files created in the Test Set are date and time stamped using the values from the Test Set's internal clock. The Time & Date Tile allows users to set the clock in the Test Set. The Month and Date settings boxes have drop-down menus. The Numeric Day setting and the Year have data entry boxes.

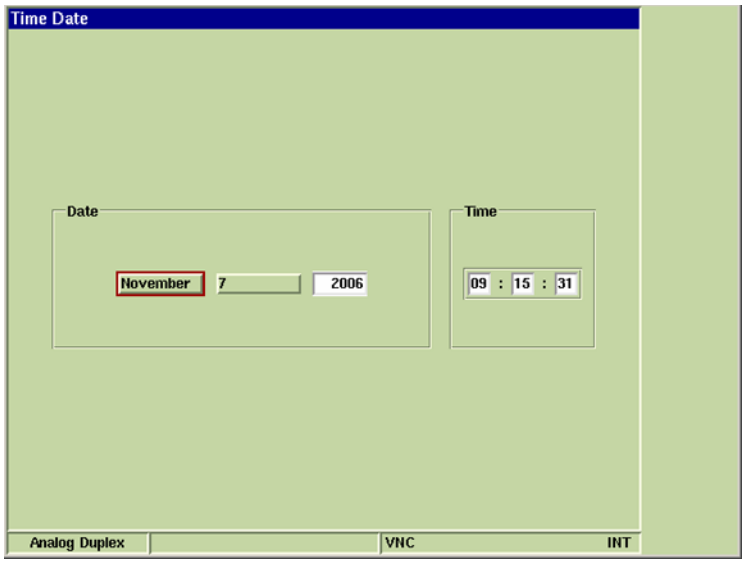


Fig. 3-36 UTILS Time and Date Tile

Keyboard & Mouse Tile

The Keyboard & Mouse Tile allows users to customize performance of a keyboard and/or mouse that is connected to the Test Set.

Refer to section titled USB Connector and Keyboard Interface Connector for information on using a Mouse with the Test Set.

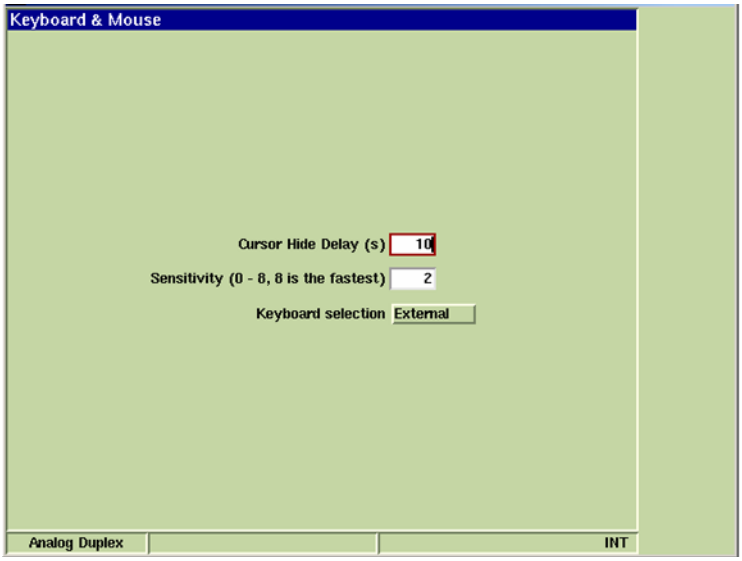


Fig. 3-37 UTILS Keyboard & Mouse Tile

Field Definitions

Cursor Hide Delay

Sets how long (in seconds) mouse can remain inactive before cursor disappears. Moving mouse reactivates cursor.

Sensitivity

Sets how fast cursor moves across display tile.

Keyboard Selection

Internal setting uses multi-press alpha/numeric functionality on the Test Set and USB keyboard numeric keypad.

External setting de-activates the multi-press alpha/numeric functionality of the Test Set and the USB numeric keyboard.

Remote Tile

The Remote Tile allows users to set the remote source for accessing the Test Set using an external controller.

NOTE

If Test Set is operating behind a network fire wall, Ports 5800 and 5900 must be opened for proper VNC operation. Contact your IT Department for proper network configuration.

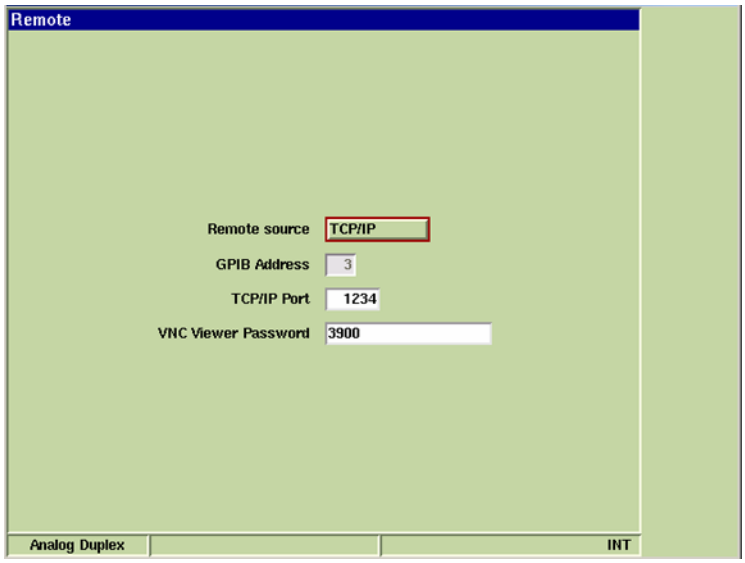


Fig. 3-38 UTILS Remote Tile

Access Test Set via Internet Browser (GUI Operation)

To access Test Set via Internet browser:

1. Configure Test Set for network access (refer to Network Tile).
2. Define VNC Viewer Password field on Remote Tile.
3. Open Internet browser and enter Test Set's IP address, followed by :5800 (e.g. http://12.345.678.910:5800).
4. Enter password (as defined in VNC Viewer Password field) at prompt.

Access Test Set via VNC Connection (GUI Operation)

To access Test Set via VNC Connection:

1. Configure Test Set for network access (refer to Network Tile).
2. Define VNC Viewer Password field on Remote Tile.
3. Open VNC Client and enter Test Set IP Address (as configured on Network Tile).
4. Enter password (as defined in VNC Viewer Password field) at prompt.

For more information, including downloading a VNC client see http://www.realvnc.com/ or http://www.tightvnc.com/.

Access Test Set via GPIB Connection (RCI Operation)

To access Test Set via GPIB Connection:

1. Set Remote Source field on Remote Tile to GPIB.
2. Set GPIB Address on Test Set.

Access Test Set via Ethernet Connection (RCI Operation)

To access Test Set via Ethernet Connection:

1. Configure Test Set for network access (refer to Network Tile).
2. Set Remote Source field on Remote Tile to TCP/IP.
3. Set TCP/IP Port field on Remote Tile to match your Network Configuration (see your IT Department for this information).
4. The Test Set can now be accessed using desired application. For example, open a command window and enter telnet Test Set's IP Address TCP/IP Port. Refer to Fig. 3-39 which shows an open command window connected to Test Set IP Address 10.200.144.74 on port 1234.

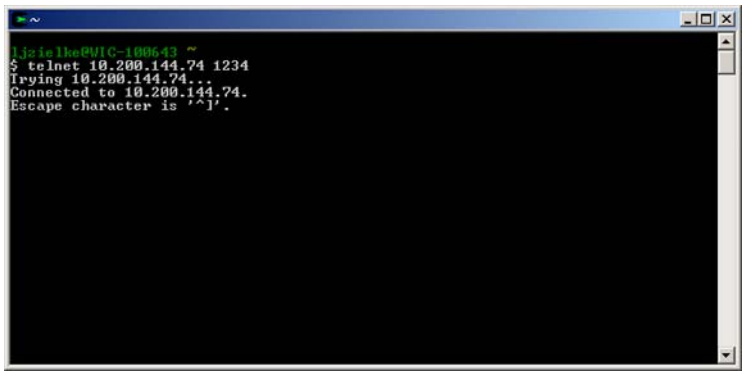


Fig. 3-39 Command Window Example

Field Definitions

Remote Source

GPIB

Enables GPIB remote operation. Selecting GPIB requires an address to be set in the GPIB Address field.

TCP/IP

Enables remote operation over an ethernet connection. When TCP/IP is selected, a value must be defined in the TCP/IP Port field. Use of TCP/IP also requires network access (refer to Network Tile).

GPIB Address

Sets Test Set primary GPIB address for use with GPIB remote operation.

TCP/IP Port

Sets Test Set port for use with TCP/IP remote operation.

VNC Viewer Password

Sets password required for VNC client to access the Test Set via the ethernet.

Printer Configuration Tile

The 3900 Test Set supports a large selection of laser, ink jet and dot matrix printers. Use the Printer Configuration Tile drop-down menus to select the make and model of printer.

The printer can be connected to either the Parallel Printer Connector or to one of the USB ports. A drop-down menu provides this selection.

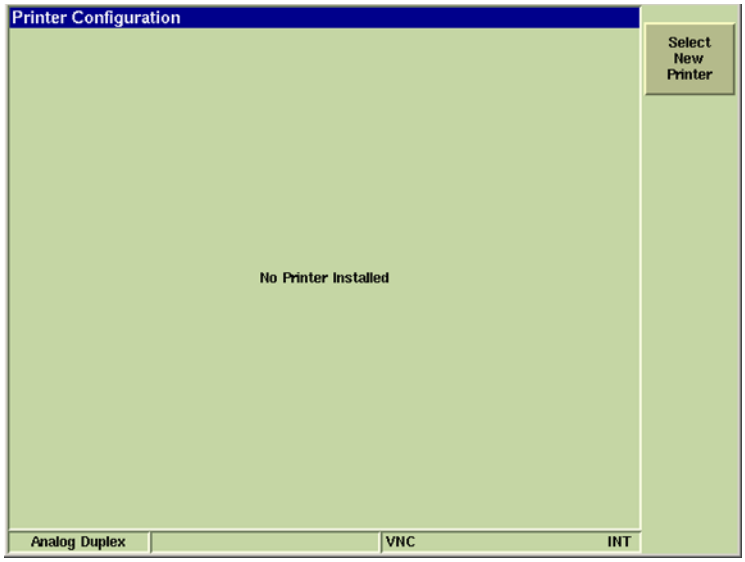


Fig. 3-40 UTILS Printer Configuration Tile - Main Tile

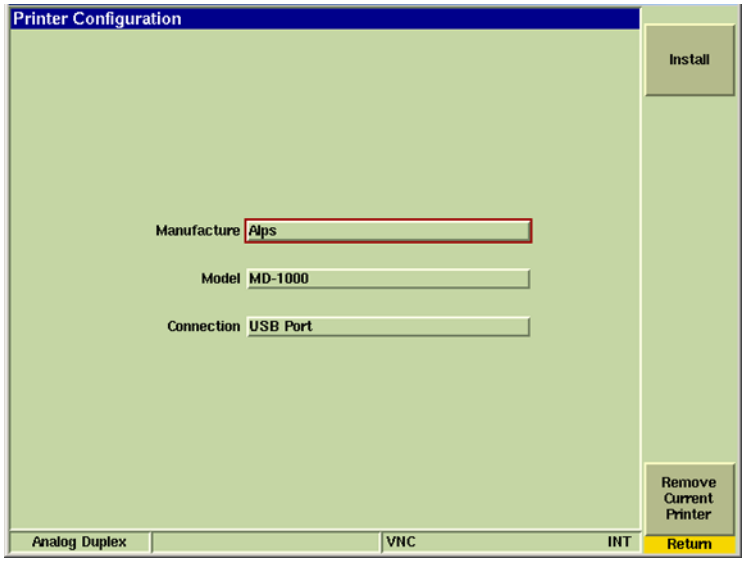


Fig. 3-41 UTILS Printer Configuration - New Printer Install Tile

Network Tile

The Network Tile allows various operating parameters to be set which are required to connect the Test Set to a network (LAN). The Test Set can be configured to obtain all its parameters from a DHCP (Dynamic Host Configuration Profile) server running on the network, otherwise the required information must be entered manually.

CAUTION

If you are unfamiliar with the terminology used on this Tile, seek technical assistance from your IT department. A configuration error may cause serious trouble on your Intranet!

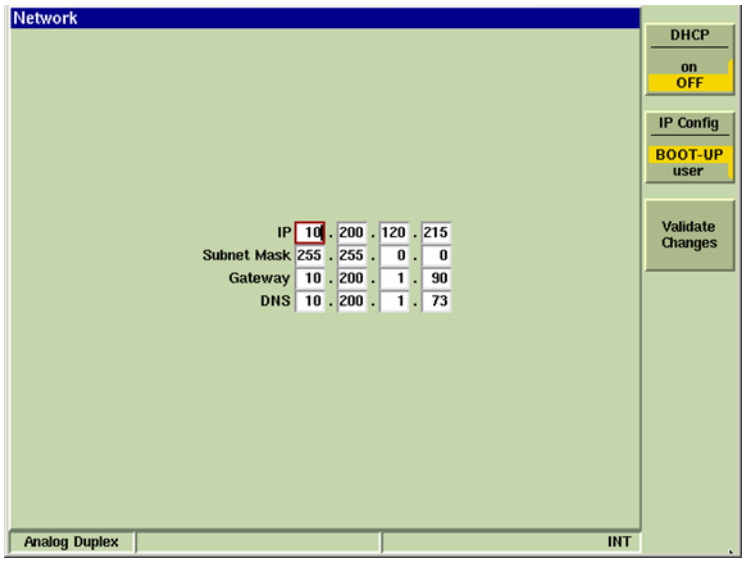


Fig. 3-42 UTILS Network Tile

Soft Key Definitions

[DHCP] Soft Key

Selects manner in which the network access is configured. Typical configurations are as follows:

Static Configuration (DHCP OFF)

If Static configuration is selected:

1. Configure IP, subnet mask, Gateway and DNS values.
2. Choose whether the Test Set is to be configured on boot up or upon user request.
3. Select **Validate Configuration**.
4. The Test Set then queries on the network for a DHCP server and updates the IP, subnet mask, Gateway and DNS (Domain Name Server) fields upon completion of the transaction with the server.

Automatic Configuration (DHCP ON)

If Automatic configuration is selected:

1. Choose whether the Test Set is to be configured on BOOT UP or upon USER request.
2. Select **Validate Configuration**.
3. The Test Set then queries on the network for a DHCP server and updates the IP, subnet mask, Gateway and DNS (Domain Name Server) fields upon completion of the transaction with the server.

[IP Config] Soft Key

Selects when Network connection is established. BOOT-UP establishes network connection when Test Set is powered on. USER requires manual IP configuration. When USER is selected, you must press the [Validate Changes] Soft Key to reconfigure the network connection.

[Validate Changes] Soft Key

Accepts current network configuration and re-establishes (restarts) network operation.

Frequency Reference Tile

Allows the Test Set to be locked to the internal frequency standard or to use an external signal from the Ext Ref I/O connection. When Internal is selected the internal frequency standard signal is available at the Ext Ref I/O External Interface.

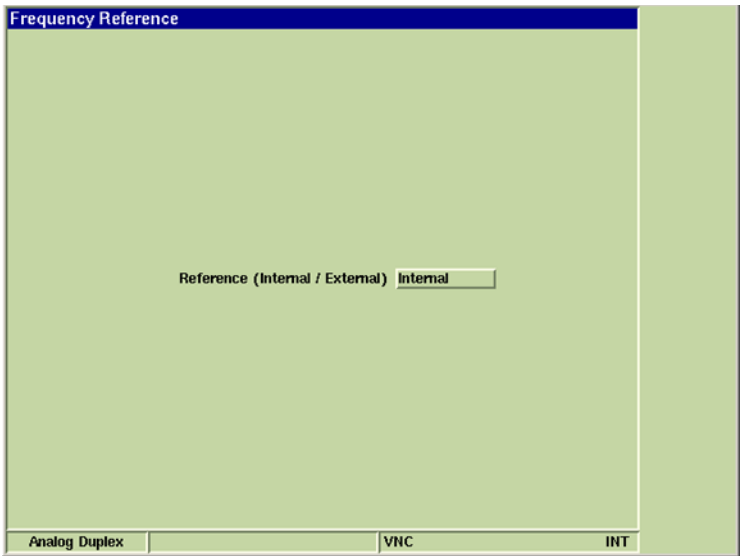


Fig. 3-43 UTILS Frequency Reference Tile

Operational Status Tile

The Operational Status Tile displays the Test Set's operational parameters.

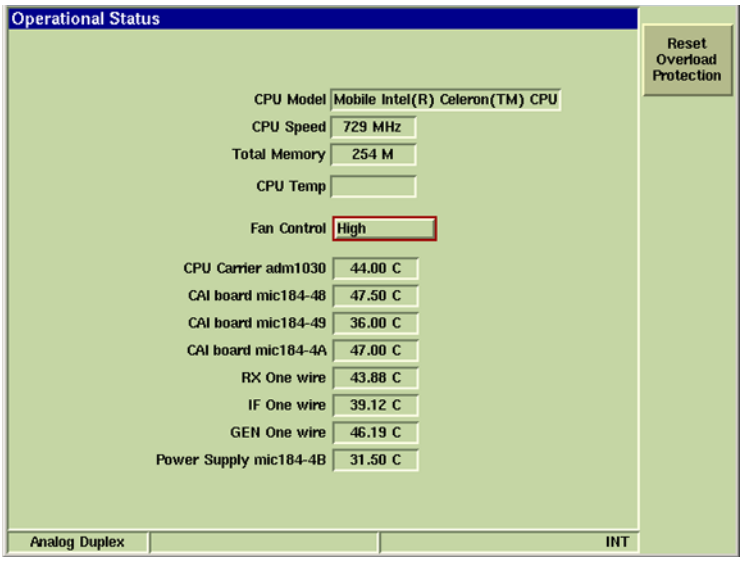


Fig. 3-44 Operational Status Tile

NOTE

CPU Temp is not currently available: field appears empty.

Field/Soft Key Definitions

Fan Control

Setting controls the fan speed of the 3900's internal cooling fans. Fan speed should be set to correspond to the external environment in which the Test Set is being used. For example, a High fan setting is recommended if the equipment is used in a rack system environment where it is surrounded by other heat-generating equipment.

Reset Overload Protection

Resets the Test Set's input overload relay. When input exceeds maximum levels, the Test Set generates an audible alarm tone. The alarm tone stops when the overload input is disconnected from the Test Set, however, this soft key must be pressed to reset the Test Set's overload warning system. Refer to 3900 Platform Specifications for maximum input levels.

Database Status Tile

The Database Status Tile provides users with the ability to maintain 3900 database files.

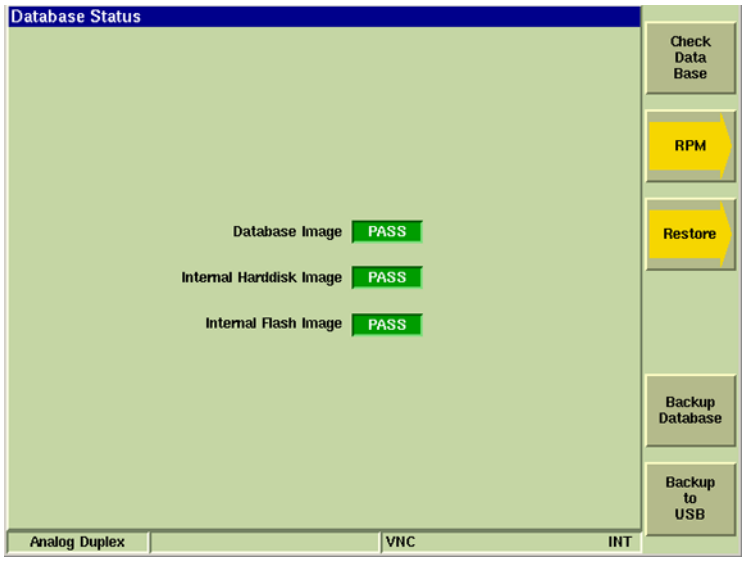


Fig. 3-45 Database Status Tile

Soft Key Definitions

[Check Data Base] Soft Key

Compares the calibration database to the hard drive image and flash image. PASS/FAIL status is indicated in the Database Image, Internal Harddisk Image and Internal Flash Image fields.

If Database Image FAIL(s), press the [Restore] Soft Key to restore calibration.

If Internal Harddisk Image and/or Internal Flash Image FAIL, press [Backup Database] Soft Key.

[RPM] Soft Key

Opens soft key sub-menu that contains the following soft keys:

[Clear RPM Drive] Soft Key deletes rpm files from the 3900's hard drive.

[Rebuild RPM Database] Soft Key rebuilds the 3900's version database for rpm package.

[Restore] Soft Key

Opens soft key sub-menu that contains the following soft keys to Restore Calibration:

[Restore From Harddisk] Soft Key restores calibration from data stored on 3900's hard drive.

[Restore From Flash] Soft Key restores calibration from data on 3900's internal flash drive.

[Restore From USB] Soft Key restores calibration from data on USB flash drive.

[Backup Database] Soft Key

Backs up 3900 database to the hard drive.

[Backup to USB] Soft Key

Backs up the 3900 database to USB device. USB device must be attached to USB connector before pressing soft key.

Software Upgrade Tile

The Software Upgrade Tile allows the firmware in the Test Set to be upgraded by direct connection to the Internet, using either a USB memory stick, or a USB CDROM.

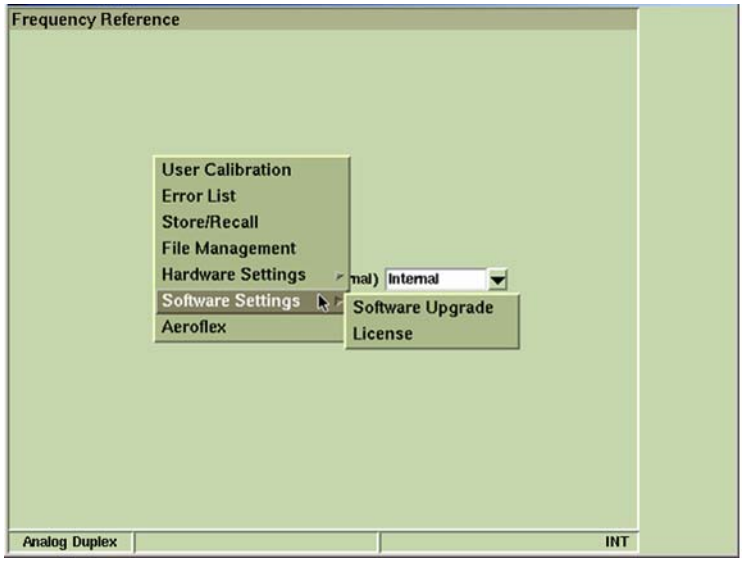


Fig. 3-46 Accessing Software Upgrade Functions

Soft Key Definitions

[Proceed] Soft Key

Advances to next Software Upgrade Tile.

[Check for Upgrades] Soft Key

Test Set queries software upgrade source to determine is there are any available upgrades for the software currently licensed on the Test Set. When this soft key is pressed, user must select the source of the software download from an enabled group of soft keys (CDROM, Internet or USB Memory).

[CDROM Upgrade] Soft Key

Selects CDROM as the source of software upgrade (refer to CDROM Upgrade Procedure).

[Internet Upgrade] Soft Key

Reserved for future development.

[USB Memory Upgrade] Soft Key

Selects a USB memory device as the source of the software upgrade (refer to USB Upgrade Procedure).

[Upgrade All] Soft Key

When Check for Upgrades query is completed, available upgrade versions are identified on the Software Upgrade Tile (refer to Fig. 3-49 for an example). Pressing [Upgrade All] upgrades the Test Set with all available upgrade versions.

[Description] Soft Key

Displays technical information about the selected software.

[Expand/Collapse] Soft Key

Selecting [Expand] opens a sub-level of components for the selected software branch. [Collapse] closes and expanded sub-level. Fig. 3-47 shows an example with the Base Config branch expanded.

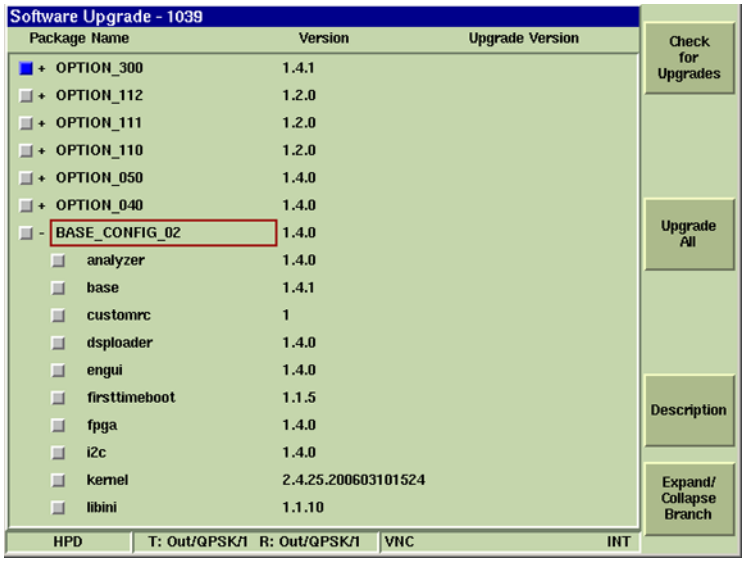


Fig. 3-47 Expanded Software Branch

Upgrade Procedures

USB Upgrade Procedure

To perform USB upgrade:

1. Go to http://www.aeroflex.com/tetra/3900.cfm and select 3900 Radio Test Set from the products listed, or go to http://www.aeroflex.com/products/commtest/pmrparametric/rts.cfm and select 3900 TETRA Test.
2. Select the **Software** link on the right hand side of the screen.
3. Click on the desired file to download file to a USB memory stick.
4. Uncompress file to USB memory stick. Uncompressed files are placed in root directory named Aeroflex, subdirectory named 3900. Do not place the Aeroflex directory in a subdirectory or the software upgrade fails.
5. Power on Test Set and connect the USB memory stick to USB Connector on Test Set.
6. Press UTILS Key twice to access Utilities floating menu.
7. Select **Software Settings, Software Upgrade** from the Utilities floating menu.

8. Select the [Proceed] Soft Key to continue. Test Set displays a “Querying System” dialog box while the Test Set performs a series of system checks.

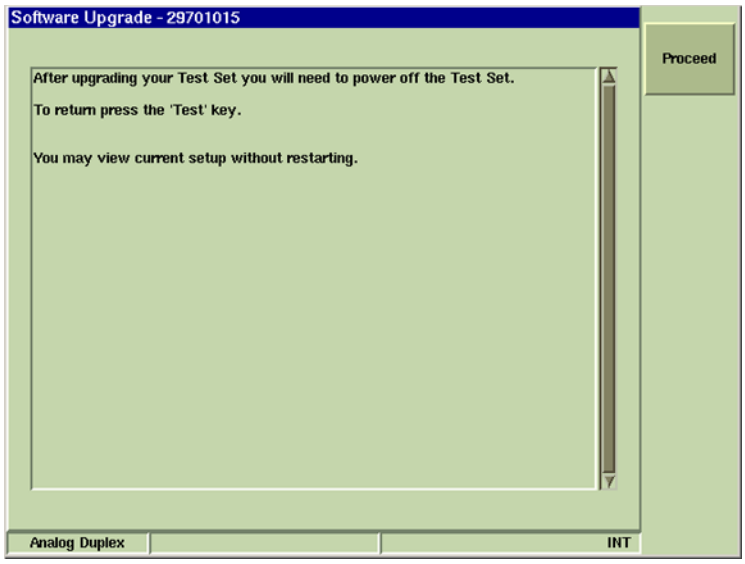


Fig. 3-48 Software Upgrade - Proceed

9. The screen displays a list of installed options with the version and version date of each option.
10. Select the [Check for Upgrades] Soft Key.

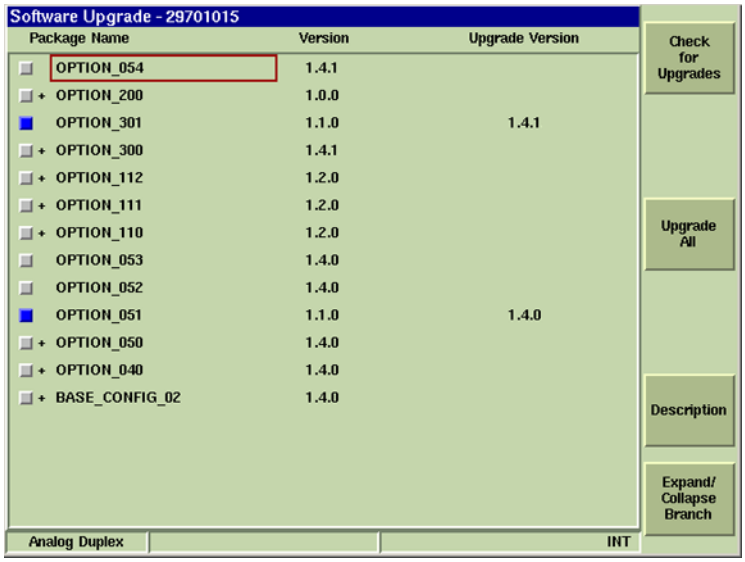


Fig. 3-49 Software Upgrade - Upgrade Options Soft Keys

11. Select the [USB Memory Upgrade] Soft Key.

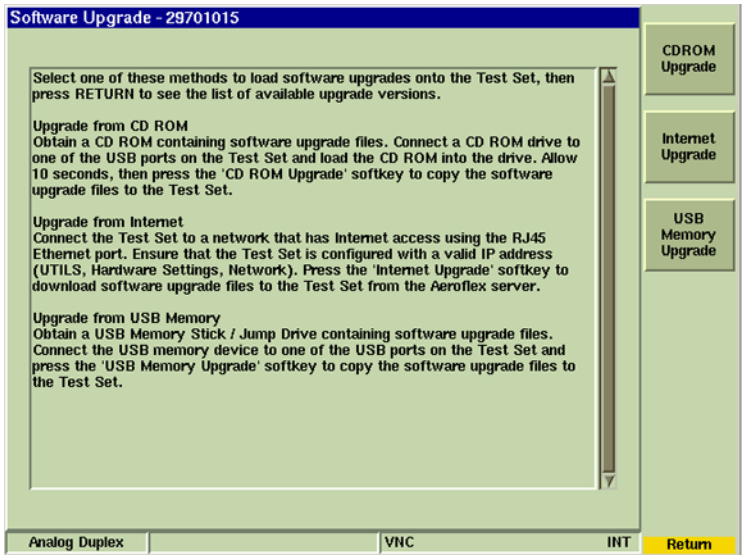


Fig. 3-50 Software Upgrade - Source Options Soft Keys

12. Wait while the Test Set auto-copies files from the USB memory stick to the Test Set. This step takes a few minutes to complete.
13. After the Test Set has copied all files from USB memory stick, “ALL DONE” message appears on the screen. Select **[RETURN]** to go back to the Software Upgrade Screen. The Software Upgrade Tile now lists upgrades versions that are available for the installed option.

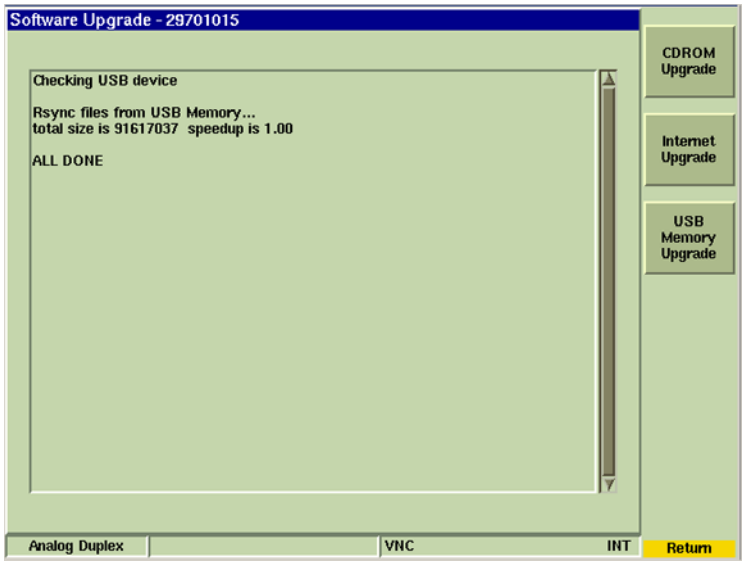


Fig. 3-51 Software Upgrade - ALL DONE Message

14. Select the [Upgrade All] Soft Key. The Test Set displays different status messages during the upgrade process.
15. When the software upgrade is complete, a prompt appears requesting confirmation to shut down the Test Set. Select **OK** to power down the Test Set and complete the upgrade procedure. The Test Set can now be powered on for use.

CDROM Upgrade Procedure

Refer to figures in USB Upgrade Procedure as needed to perform CDROM upgrade.

1. Go to http://www.aeroflex.com/tetra/3900.cfm and select 3900 Radio Test Set from the products listed, or go to http://www.aeroflex.com/products/commtest/pmrparametric/rts.cfm and select 3900 TETRA Test.
2. Select the **Software** link on the right hand side of the screen.
3. Download the desired software file to a PC. The file are placed in root directory named Aeroflex, subdirectory named 3900. Do not place the Aeroflex directory in a subdirectory or the upgrade fails.
4. Burn the saved software file to a CD.
5. Connect a stand-alone CDROM device to the USB Connector on the Test Set and insert the CD in the device.
6. Press the UTILS Key twice to access the Utilities floating menu.
7. Select **Software Settings, Software Upgrade** from the Utilities floating menu.
8. Select [Proceed] Soft Key to continue. Test Set displays a “Querying System” dialog box while the Test Set performs system checks.
9. Select the [Check for Upgrades] Soft Key.
10. Select the [CDROM Upgrade] Soft Key.
11. Wait while the Test Set auto-copies files from the CD to the Test Set. This step takes a few minutes to complete.
12. After the Test Set has copied all files from CD, “ALL DONE” message appears on the screen. Select **[RETURN]** to go back to the Software Upgrade Screen. The Software Upgrade Screen now lists upgrades versions that are available for the installed option.
13. Select the [Upgrade All] Soft Key. The Test Set displays different status messages during the upgrade process.
14. When the software upgrade is complete, a prompt appears requesting confirmation to shut down the Test Set. Select **OK** to power down the Test Set and complete the upgrade procedure.

The Test Set can now be powered on for use.

License Tile

The License screen displays the enabled options and turns on new features in the Test Set. The Test Set's serial number is shown in the screen heading.

When a new software option is purchased for a specific Test Set, Aeroflex emails a new license file containing information necessary to load the software. The license file (called options.new) must be placed on a floppy disk or USB memory device in the 3900 folder within the Aeroflex\3900 directory to install the options file.

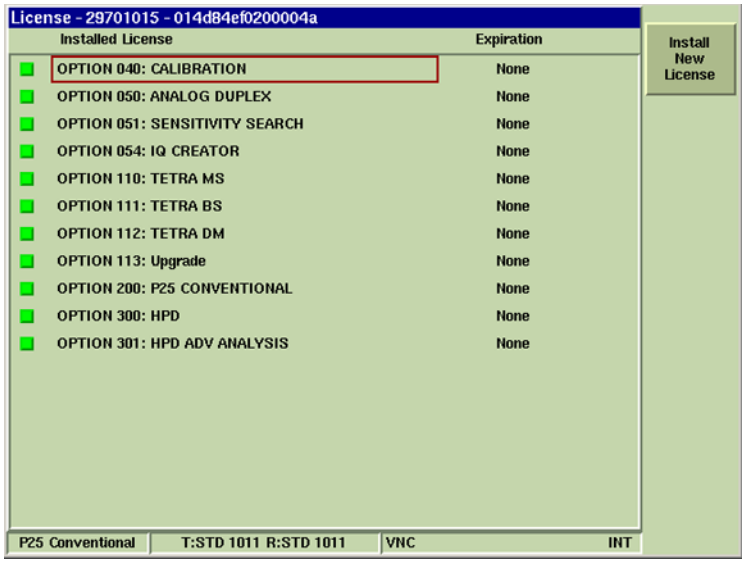


Fig. 3-52 UTILS Software License TIle

Preliminary Steps

Before installing options.new file in Test Set, perform the following:

- Create Aeroflex\3900 directory on USB memory device or Floppy Disk. Place options.new file in 3900 folder. Refer to Fig. 3-53 for an example of directory formatted on a USB memory device.

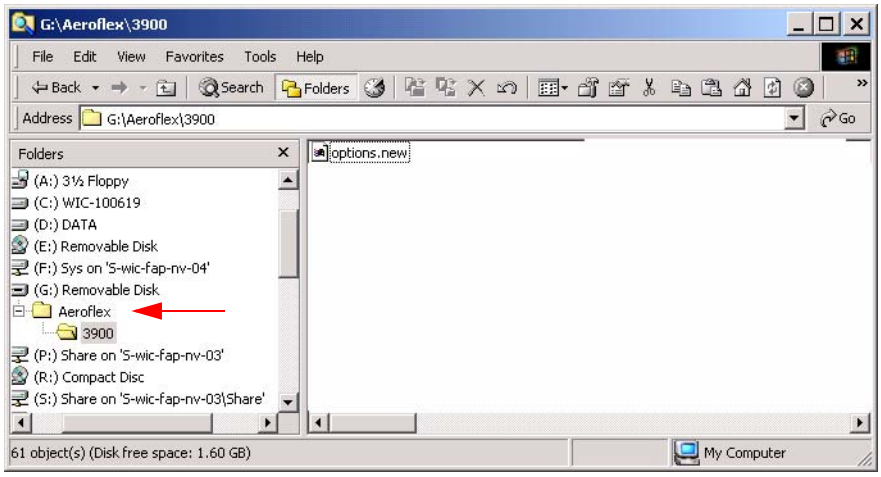


Fig. 3-53 Directory Format for License Installation

- Verify License file is being installed in the Test Set for which it was purchased. An attempt to load a license file into a Test Set other than the one for which the license is issued generates an error message and causes the License Installation to fail.

Install New License (Option) File

To install a new license file:

1. Power on Test Set. Press UTILS Key to access the Utilities floating menu.
2. Select **Software Upgrade**, **License** from UTILS floating menu.
3. Press **[Install New License]** Soft Key on License Tile. Display changes to a screen similar to the one shown in Fig. 3-54.

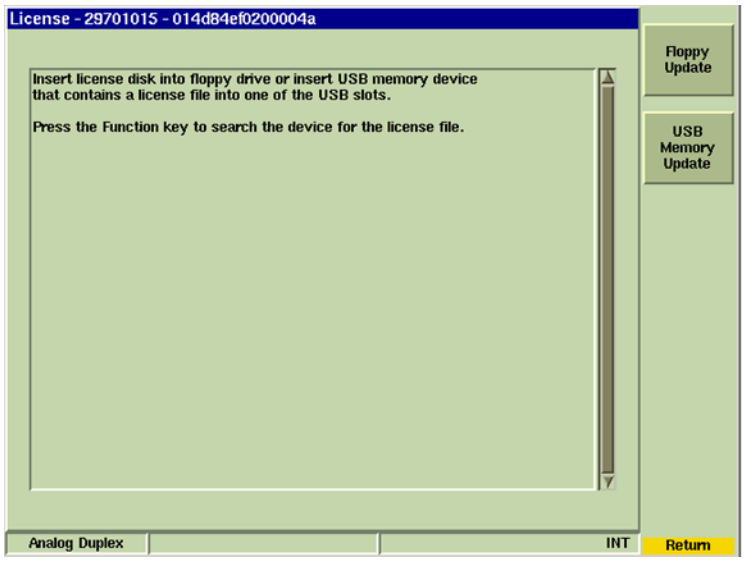


Fig. 3-54 Install License Tile

4. Insert Floppy Disk or USB memory device in Test Set. Press the **[Floppy Update]** or **[USB Memory Update]** Soft Key as appropriate.
5. Wait while Test Set performs sequence of automated processes. A series of messages are displayed throughout processes.
6. At prompt, press [**Shutdown] Soft Key** and reboot Test Set. Proceed to Software Upgrade Procedure to enable new option(s). Refer to the section titled Software Upgrade Tile for instructions on upgrading the Test Set.

Display Hold Tile

The HOLD key freezes the current display to allow the image to be saved as a full color graphics file or to be printed to a suitable printer. Fig. 3-55 shows a screen from the Channel Analyzer when the HOLD key has been pressed. After the HOLD key is pressed, the soft key menu changes to show the [Print Screen] and [Save Screen As] soft keys.

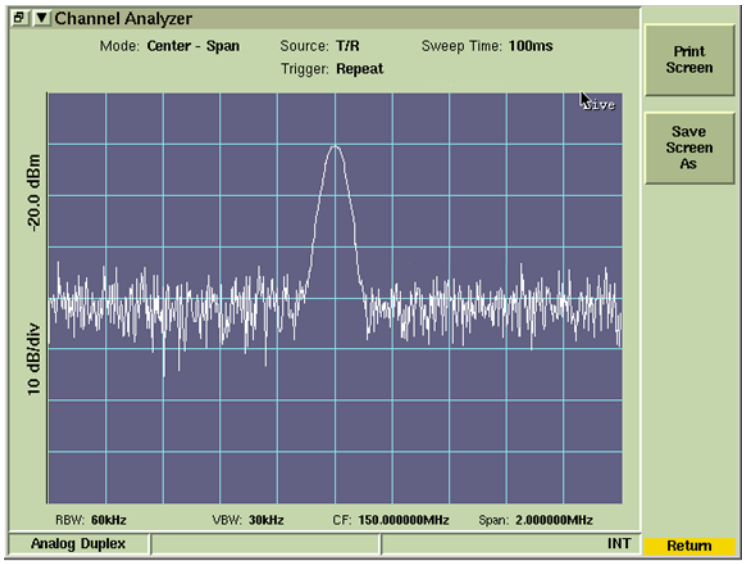


Fig. 3-55 HOLD Display TIle

Print Screen Tile

To print a hard copy of the screen image, select the [Print Screen] soft key. A suitable printer must be connected to the Test Set and properly configured to print screen images (refer to Printer Configuration Tile).

Save Screen As

To save the screen image as a file:

1. Select the **[Save Screen As]** soft key. A Save dialog box is displayed as shown in Fig. 3-56.
2. Select the desired graphic format from the Filter drop-down menu. Graphic format options are JPEG files (*.jpg), bmp files (*.bmp) and png files (*.png).
3. Saved files are organized using the File Management Tile function to move them to different directories within the Test Set or to be exported to a floppy disk or USB memory stick.

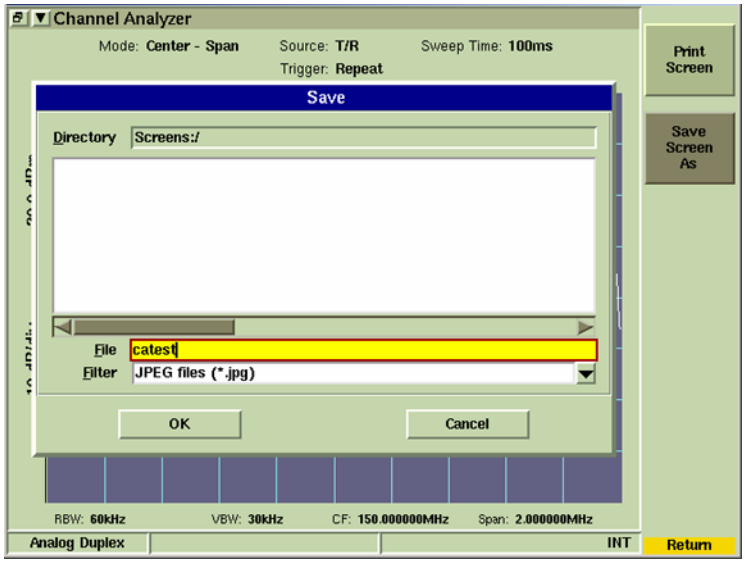


Fig. 3-56 Save Screen As Dialog Box

Receiver and Transmitter Testing

To test a 'Stand alone' receiver or transmitter, use the RF IN/OUT soft key(s) to select the Connector best suited to the specification of the equipment under test. The desired RF input and output connectors are selected from the Test System. For transmitter testing, the RF Gen output may need to be disabled.

There are four possible arrangements described in this section.

Overload Warning

If the RF Signal applied to the ANT (Antenna) Connector exceeds the safe maximum level, an audible and visual warning is triggered. The overload warning is also triggered if excessive reverse power is applied to the GEN (Generator) Connector.

One Port Duplex

The One Port Duplex arrangement uses the T/R Connector for RF input and RF output. This arrangement is typically used for testing mobile radios via a single direct connection to the radio's antenna connection. This arrangement can also be used for off air testing of radios when only a single antenna is available, or for testing Base stations that use a combined Rx/Tx antenna system.

RF Out = T/R
RF In = T/R

Fig. 3-57 One Port Duplex Test Setup

Two Port Duplex

There are three types of Two Port Duplex setups which can be used for measuring RF Gen output and RF Analyzer input.

GEN/ANT

This Two Port Duplex arrangement provides the highest level of RF Gen output and the most sensitive RF Analyzer input. This setup is useful for 'Off Air' testing of radios with separate antennas.

RF Out = GEN
RF In = ANT

Fig. 3-58 GEN/ANT Two Port Duplex Test Setup

GEN/TR

This Two Port Duplex arrangement provides the highest level of RF Gen output and accepts the highest signal level at the RF Analyzer input. This setup is useful for testing Base Stations that use separate Rx and Tx antenna systems.

RF Out = GEN
RF In = T/R

Fig. 3-59 GEN/TR Two Port Duplex Test Setup

TR/ANT

This Two Port Duplex arrangement provides the lowest level of RF Gen output and the most sensitive RF Analyzer input.

RF Out = T/R
RF In = ANT

Fig. 3-60 TR/ANT Two Port Duplex Test Setup

Chapter 4

Acceptance Test

Introduction

The following Acceptance Test procedure applies to a new Test Set. When a 3900 is powered on, each internal component runs a series of internal integrity checks. The acceptance procedure consists of powering-up the Test Set in its Factory Default State, and verifying that no error messages appear during (a) initialization and (b) system loading.

Initial Start-up in Factory Default State

1. Connect the Test Set to the AC Power Supply.
2. Turn the AC Power Supply Switch on the rear panel to the **ON** position. The LED above the On/Standby Key should change to **RED**.
3. Press the On/Standby Key. Verify that no error messages appear on the display when the Test Set powers on. After a few seconds, the Factory Default Tile is displayed.
4. Using the Cursor Keys (or a mouse), select one of the systems from the System menu.
5. Verify no error messages appear while the selected system loads.
6. Test Set should now operate in accordance with the 3900 Series Operation Manual and applicable option manual(s).

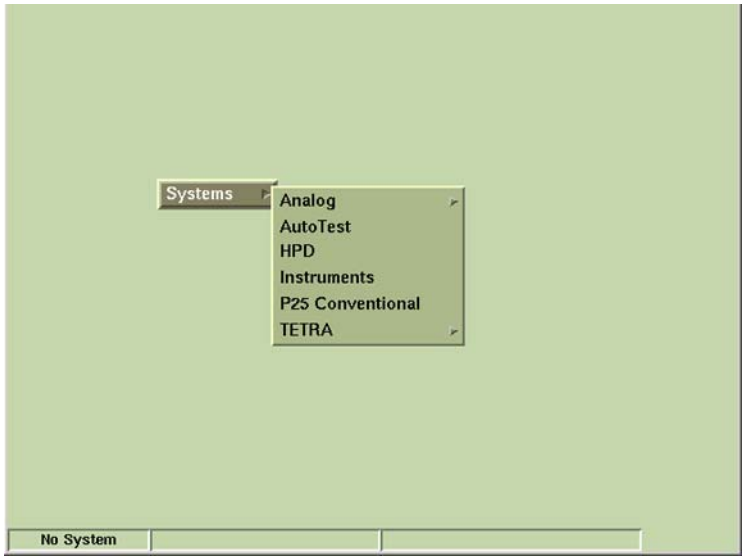


Fig. 4-1 Factory Default Display Tile

Run User Calibration Procedure

To run User Calibration:

1. Disconnect any leads from the front panel.
2. Press the UTILS Key twice to access the Utilities menu.
3. Select **User Calibration** from the Utilities menu.
4. Select **[Run User Calibration]** soft key on the User Calibration Tile Tile.
5. When User Cal has completed, press the TEST Key to return to the previous operating system.

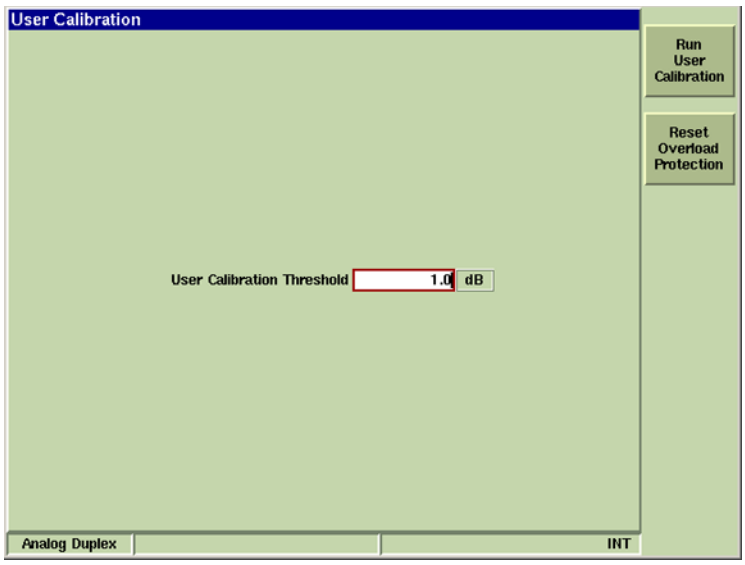


Fig. 4-2 User Calibration Tile

Restoring Factory Default State

If the Test Set has been used, or if there is any possibility that values have been changed, perform the following steps to restore the Test Set to factory default settings:

1. Connect the Test Set to an AC Power Supply.
2. Turn the AC Power Supply Switch on the rear panel to the **ON** position. The LED above the On/Standby Key should change to **RED**.
3. Press the On/Standby Key and wait for the Test Set to restore the condition it was in when last powered down.
4. Press the UTILS Key twice to access the Utilities menu.
5. Select **Store/Recall** from the Utilities menu.
6. Select the **[Restore Factory Defaults]** soft key.
7. A warning prompt appears indicating that all settings will be changed to factory default values. Press the SELECT Key to continue. After a short delay, the Factory Default Startup Screen appears (refer to Fig. 4-1).
8. Power down the Test Set by pressing the On/Standby Key.
9. At the screen prompt, press SELECT Key to initiate power-down procedure.

Chapter 5

AutoTest System Operation

Introduction

The 3900 AutoTest function allows users to create and run automated test sequences for 3900 Operating Systems. This chapter provides an instructional description of the following:

- Selecting AutoTest
- Creating an AutoTest Script
- Running an AutoTest Script
- Storing Results
- Importing Results Files

The chapter also contains example scripts as well as commonly used test commands.

Selecting AutoTest

To select AutoTest:

1. Press CONFIG Key to access the CONFIG Floating menu.
2. Select **Systems, AutoTest** from the CONFIG Floating Menu.
3. After AutoTest loads the display appears as shown in example below. The name of the last run AutoTest script is shown at the top of the Tile; all other data fields appear empty.

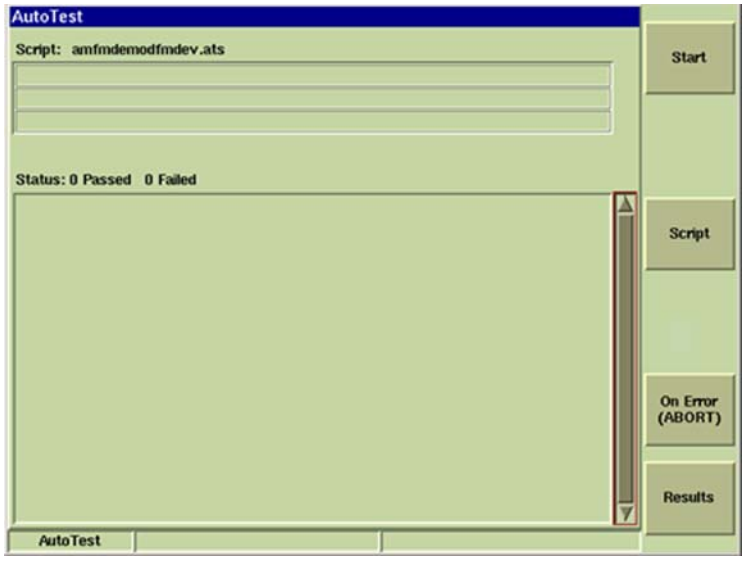


Fig. 5-1 AutoTest Main Tile

NOTE

Analog AutoTest is an optional system (390XOPT052). AutoTest scripts can only be run for Analog Duplex, Analog AF or Analog RF Systems when the Analog AutoTest option is installed in the Test Set.

Soft Key Definitions

[Start] Soft Key

Initiates selected AutoTest Script. An AutoTest script is selected by pressing the [Script] Soft Key. Refer to section titled Running an AutoTest Script for information on using this feature

[Script] Soft Key

Opens soft key sub-menu that allows user to load AutoTest script files. Refer to section titled Running an AutoTest Script for information on using this feature.

[Load] Soft Key

Loads selected script file.

[On Error (ABORT)] Soft Key

Allows user to define AutoTest behaves if a test fails. Behavior options are:

- Ignore (i.e. the fail is counted and displayed, but the run continues),
- Abort (i.e. the run halts), or
- Pause (the operator can decide whether or not to continue).

NOTE

Setting should be defined before starting AutoTest script.

[Results] Soft Key

Opens a soft key sub-menu that provides user with the ability to Print, Save, Recall or Delete test results. Refer to section titled Storing Results for information on saving test results.

Creating an AutoTest Script

AutoTest allows users to transfer unformatted script text files to the 3900 from a USB memory stick or floppy disk.

A formatted script file is imported into the Test Set via the following UTILS, File Management Tile feature. Use the following key sequence to import a data file:

UTILS/File Management/AutoTest/Scripts/Import

NOTE

Do not apply any formatting (such as font selection) to file.

The Test Set requires that AutoTest script files end with *.ats.

Refer to the following sections for additional information on creating AutoTest Scripts and AutoTest Script content:

Common Script Elements

Script Structure

Sample Script

(System) Command Elements

Running an AutoTest Script

To run an AutoTest script:

1. Load AutoTest System.
2. Select the [Script] Soft Key, then the [Load] Soft Key.
3. Highlight and select the desired script and press **OK**.

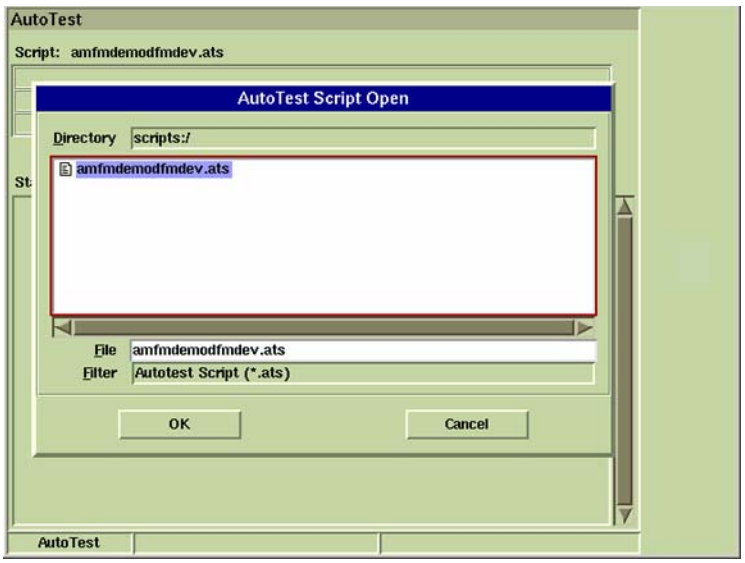


Fig. 5-2 AutoTest Load Dialog Box

4. After screen loads, press [Script] Soft Key to begin test. Fig. 5-3 shows an example of the AutoTest Tile with a test in progress.

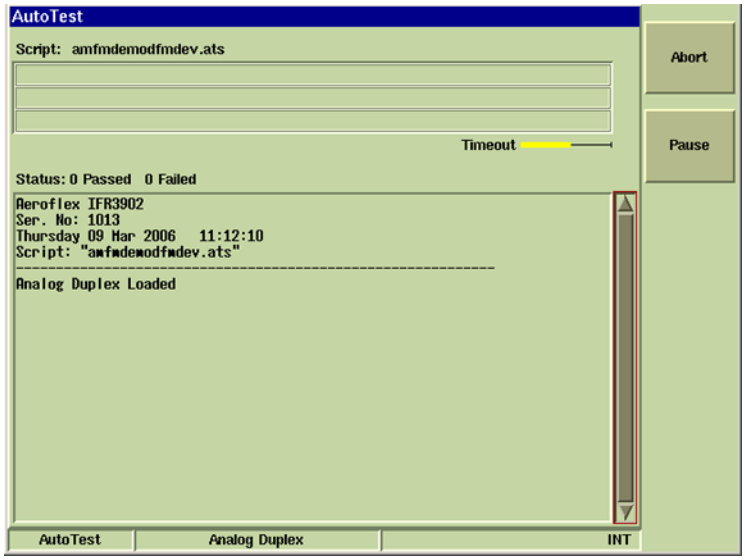


Fig. 5-3 AutoTest - Test in Progress

5. When a test is completed, soft keys appear that offer the user the ability to Print, Save or Cancel the test file.

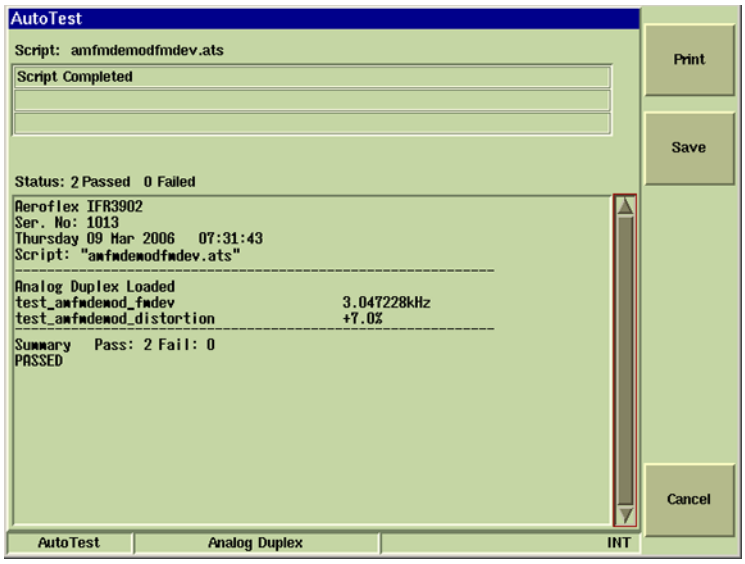


Fig. 5-4 AutoTest - Complete

Soft Keys Definitions

[Abort] Soft Key

Pressing [Abort] stops the test and deletes all test data. Aborted test data can not be retrieved.

[Pause] Soft Key

Pressing [Pause] opens a soft key sub-menu that provides the user with the option to Abort, Continue, Step or Repeat the Test.

[Continue] Soft Key

Resumes test at last completed command.

[Step] Soft Key

When [Step] is selected, AutoTest runs one procedure at a time (single step), not as a continuous, automated procedure.

[Repeat] Soft Key

Repeats the last selected function. For example, if the test is being run in Step sequence, pressing [Repeat] runs the last step again.

[Print] Soft Key

Pressing this soft key sends test results to a printer. Test Set must be configured with printer setup to use this feature. Refer to Chapter 3, Test Set Operation for information on printer configuration.

[Save] Soft Key

Pressing this soft key allows user to save completed test results. Refer to the section titled Storing Results on use of this feature.

[Cancel] Soft Key

Pressing this soft key deletes completed test results.

Storing Results

To store test results:

1. When test is complete, select [Save] Soft Key.
2. When dialog box opens, enter file name in the File field.
3. Press **OK** to save file.

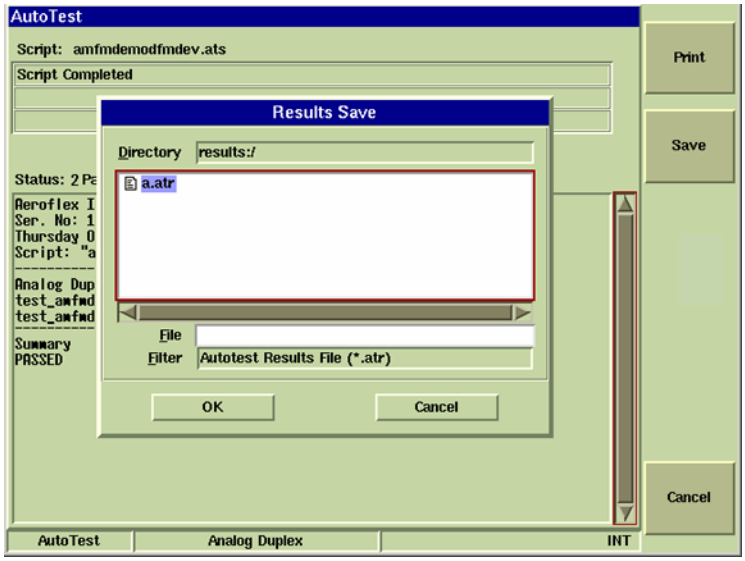


Fig. 5-5 AutoTest - Results Save As Dialog Box

Stored results are exported to USB memory or floppy disk via UTILS/File Management/AutoTest/ Results. A PC reads these files using Microsoft ® WordPad or Word. If read by Microsoft ® Notepad, the line terminators can confuse the presentation.

Importing Results Files

AutoTest results files can be imported to the Test Set from a USB memory device or floppy disk. To import results files use the following key sequence:

UTILS/File Management/AutoTest/Results

Result Files are displayed in AutoTest by pressing the [Results] soft key.

AutoTest Config Tile

The AutoTest Configuration Tile contains data fields that allow the user to enter information that appears in completed test data. These parameters should be defined prior to running the script.

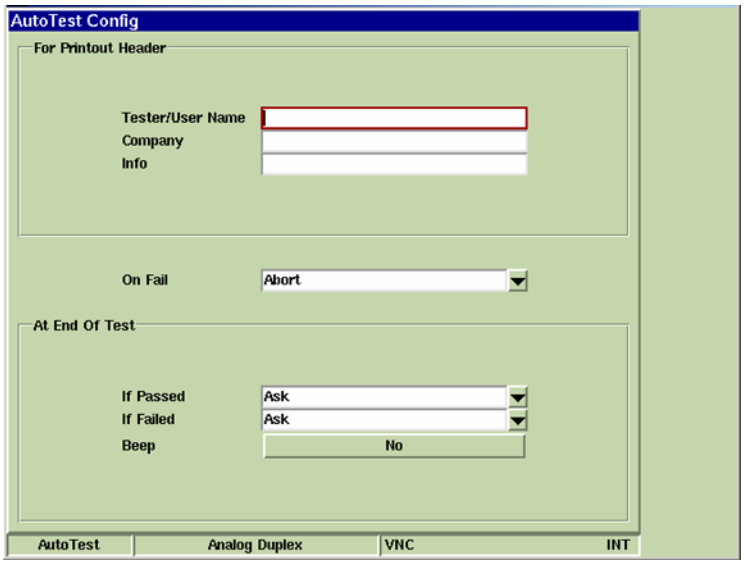


Fig. 5-6 AutoTest - Configuration Tile

For Printout Header Section

Information entered in this section of the AutoTest configuration Tile appears on the header of printed test data. These are not required data fields.

On Fail

Defines the action the Test Set performs when a portion of a test sequence fails. Options are Pause, Abort or Ignore.

At End of Test Section

If Passed

Defines the action the Test Set performs when a completed test passes defined criteria.

If Failed

Defines the action the Test Set performs when a completed test fails defined criteria.

Beep Button

Enables/Disables audible beep that indicates when a test is complete.

Script Structure

Scripts

An AutoTest script is made up of commands that allow the following:

- The appropriate system to be loaded into AutoTest (refer to the chart titled Sample Script, **system system_name**).
- System parameters to be set up.
- Functional and parametric testing against programmable limits.

Script/GUI elements are grouped into two categories; Common (generic) Script Elements and (System) Command Elements.

NOTE

Use a pure text editor (i.e., Microsoft Notepad) to create AutoTest Scripts. Using text other than pure text may cause formatting error when the script is imported into the Test Set.

Common (Generic) Script Elements

These are items such as comment lines, flow control commands, tests, system changing, waits and print commands.

(System) Command Elements

These are system specific commands such as setting parameters, measurement tests, protocol actions and protocol tests.

Sample Script

The following sample script illustrates the flow of a typical test sequence (register, place call, perform parametric tests, end call), and the control commands available within the AutoTest scripting language.

AutoTest Script Statements	Comment	Generic (G) /System Specific (S)
# Simple AutoTest program.	Comment statement, starts with "#".	G
system "TETRA MS" default System name should be entered as it appears in the System Menu. (i.e., Analog Duplex)	Load the TETRA MS system, using default values.	G
set_channel_plan "TETRA 410-430 +12.5" set_control_channel 964 : :	Set parameters that vary from the default values.	S S : :
test_registration test_	Register (TT Test Mode needed for BER/ RBER tests)	S
if pass result_print "Registered!" else result_print "Failed to register!" end	Add line to results window depending upon outcome of preceding test.	G G G G G
test_testset_call phone	Enter into conversation (call mobile from test set).	S
repeat 3 set_rf_gen_level {-70} {-80} {-90} test_power_level_avg end	Test power level from mobile at three sig gen levels: -70, -80 and -90 dBm.	G S S G
wait 5 "Showing the 'wait' facility"	Wait (5 sec); reason for the wait is shown on screen for information.	G
repeat 2 test_rx_meas_ber {-115} {-125} end	Test BER performance at two sig gen levels: -115 and -125 dBm.	G S G
# Parametric tests complete, end call.	Another comment statement.	G
test_testset_clear	Close the conversation (from the Test Set).	S

Common Script Elements

#	Comment, rest of line ignored.
repeat n	Repeat commands (. . .) n times.
. . . (commands)	
end	
if pass | fail	Tests flag set by the preceding 'test' (that can supply a pass/fail).
. . . (commands)	
[else]	
. . . (commands)	
end	
NOTE	
1. repeat...end and if...else...end structures may be freely nested.	
2. The command break n is used to break out of this (or n outer level) loops.	
system system_name	On the first line after selecting the script, the named system is loaded in AutoTest default state.
	On subsequent runs, the system is not be reloaded. Note that defaults are only set when the system is actually loaded (i.e. on the first run) not whenever the line is executed.
	Defaults are only set when the system is actually loaded, not whenever the line is executed.
	If the system_name contains spaces, it must be enclosed in double quotes as in: system "TETRA MS".
system system_name default	Loads named system (if enabled), in factory default state, each time statement is executed.
system system_name	Loads named system (if enabled), in the state the system was in when last used outside AutoTest each time statement is executed.
wait n ["reason string"]	Wait n seconds.
	Indications on screen = wait n seconds, reason string and wait time-out bar.
result_print "string"	Print a string to results area.
result_separator	Print a separator line to the results area.
At start of script:	Results and Info windows are cleared and the report header is displayed. For example:
	Aeroflex IFR390x Digital Radio Test Set
	Ser. No: xxxxxx/xxx
	Friday 18 Oct 2002 14:25:33
	Script: "script_name"
	Tester, Company, Info
On reaching end of script	
A result summary:	Prints report summary.
	In the Results area:
	Summary Pass: 123 Fail: 1
	FAILED Repeats: 3
And finally:	In the Test Info/Feedback area:
	Script completed.
And if enabled:	an audible 'beep'

* None of the above commands, nor the system-implemented set_ or inc_ commands, are step/repeat/pause points. Only test_commands can be paused.

(System) Command Elements

Commands in this group are system specific but adhere to the following guidelines. Refer to the TETRA Option Manual for details on each TETRA System's AUTOTEST commands.

Setting Values

set_parameter_name value1 [value_x ...]

Sets specified parameter to the value(s). Values may be numeric or strings.

set_parameter_name
{ value1 [value_x ...] } { value1 [value_x ...] } { value1 [value_x ...] } . . .

Sets specified parameter to the value(s) within the { } specified by the n value of repeat n. Values may be numeric or strings. If nth value(s) not in list, use last value(s).

Tests: of protocol, measurements, . . .

test_test_name [parameter_value(s) ...]

Performs the named test using the supplied parameter(s) (if necessary). Returns a pass | fail flag.

Common Commands

The following is a list of Common Commands used throughout the 3900 AutoTest System.

NOTE

Do not include brackets ([ ]) in command script.

send_date_time

Sends "HPW_TOD DD/MM/YYYY hh:mm:ss" of the 3900 at the time the command is sent to the radio.

where:

DD = Day

MM = Month

YYYY = Year

hh = Hour (in 24 hour format)

mm = Minutes

ss = seconds

sw_pause

Pauses script. Requires user prompt to Abort or Continue test script.

set_analog_timeout

Sets Test Set's analog timeout setting.

Format: Integer value in seconds.

set_ptt_out

Enables/Disables PTT function.

Valid states are:

0 = Disabled

1 = Enabled

set_rfgen_freq [frequency in MHz]

Sets generator frequency and sends the **rfgen setfreq** command to generator sub-system.

Format: Decimal frequency value in MHz

Common Commands (cont)

set_amfmmod_modstate [state 0 - 7]

Sets modulation type and sends **amfmmod modstate** command to amfmmod sub-system.

Valid states are:

0 = OFF (default)

1 = AM

2 = FM

3 = FM 50 us

4 = FM 75 us

5 = FM 750 us

6 = AM USB

7 = AM LSB

set_rfrec_freq [frequency in MHz]

Sets receiver frequency and sends **receiver freq** commands to receiver sub-system.

Format: Decimal frequency value in MHz

set_amfmdemod_demodbw [state 0 - 5]

Sets demodulation bandwidth limits and sends **amfmdemod bandwidth** command to amfmdemod sub-system.

Valid states for AM:

0 = 6.25 kHz

1 = 8.33 kHz

2 = 10 kHz

3 = 12.5 kHz

4 = 25 kHz

5 = 30 kHz (Default)

Valid states for FM:

0 = 6.25 kHz

1 = 10 kHz

2 = 12.5 kHz

3 = 25 kHz

4 = 30 kHz (Default)

5 = 100 kHz

6 = 300 kHz

NOTE

AM USB and AM LSB are always system defined as 4 kHz.

Common Commands (cont)

set_amfmdemod_demodstate [state 0 - 6]

Sets demodulation type and sends **amfmdemod demodstate** command to amfmdemod sub-system. Valid states are:

0 = AM

1 = FM

2 = FM 50 us

3 = FM 75 us

4 = FM 750 us

5 = AM USB

6 = AM LSB

set_rfgen_level [level in dBm]

Sets generator level in dBm and sends **rfgen level** command to generator sub-system.

Format: Decimal level values in dBm

set_rfgen_port [port 0/1]

Sets generator port and sends **rfgen port** command to generator sub-system.

Valid states are:

0 = T/R

1 = GEN

set_rfgen_enable [state 0/1]

Enables/Disables generator and sends **rfgen enable** command to generator sub-system.

Valid states are:

0 = Disabled

1 = Enabled

set_rfgen_offseten [state 0/1]

Turns generator offset ON/OFF and sends **rfgen leveloffseten** command to the generator sub-system.

Valid states are:

0 = OFF

1 = ON

set_rfrec_port [port 0/1]

Sets receiver port and sends **receiver port** command to receiver sub-system.

Valid ports are:

0 = T/R

1 = ANT

set_rfrec_offseten [state 0/1]

Turns analyzer Top of Scale offset ON/OFF and sends **analyzer offseten** to analyzer sub-system.

Valid states are:

0 = OFF

1 = ON

Common Commands (cont)

set_agclevel_mode [state 0/1]

Sets AGC Level mode of operation.

Valid states are:

0 = Manual

1 = Auto

set_agclevel_value

Sets AGC level when mode is set to Manual.

Format: Decimal value in dBm

Audio Frequency / Level / Distortion Test

This test performs the following functions:

- Verifies Audio Meter Frequency, Level and Distortion.
- Validates the function generator plus audio routing.

NOTE

Do not include brackets ([ ]) in command script.

Time-out for the following Test Commands is 80 seconds.

Test Commands

test_audio_distortion

Tests audio distortion meter for operation within specified limits.

test_audio_level

Tests audio level meter for operation within specified limits.

test_audio_freq

Tests audio frequency meter for operation within specified limits.

test_audio_hn

Tests audio hum and noise meter for operation within specified limits.

test_audio_sinad

Tests audio sinad meter for operation within specified limits.

test_audio_snr

Tests audio signal to noise ratio meter for operation within specified limits.

Set Commands

set_fgen_ch0_freq [freq in Hz]

Sets AF Generator 1 frequency.

Format: Frequency in Hz as parameter

set_fgen_ch0_level [level in Vrms]

Sets AF Generator 1 level.

Format: Decimal level value in Vrms

set_fgen_ch0_enable [state 0/1]

Turns AF Generator 1 ON or OFF.

Valid states are:

0 = OFF

1 = ON

set_fgen_ch0_type [shape 0]

Sets AF Generator 1 waveform shape.

Valid shapes are:

0 = Sine

set_fgen_ch1_freq [freq in Hz]

Sets AF Generator 2 frequency.

Format: Frequency in Hz as parameter

set_fgen_ch1_level [level in Vrms]

Sets AF Generator 2 level.

Format: Decimal level value in Vrms

Set Commands (cont)

set_fgen_ch1_enable [state 0/1]

Turns AF Generator 2 ON or OFF.

Valid states are:

0 = OFF

1 = ON

set_fgen_ch1_type [shape 0]

Sets AF Generator 2 waveform shape.

Valid shapes are:

0 = Sine

set_fgen_ch2_freq [freq in Hz]

Sets AF Generator 3 frequency.

Format: Frequency in Hz as parameter

set_fgen_ch2_level [level in Vrms]

Sets AF Generator 3 level.

Format: Decimal level value in Vrms

set_fgen_ch2_enable [state 0/1]

Turns AF Generator 3 ON or OFF.

Valid states are:

0 = OFF

1 = ON

set_fgen_ch2_type [shape 0]

Sets AF Generator 3 waveform shape.

Valid shapes are:

0 = Sine

set_audio_filter [type 0 - 7]

Sets Audio input filter type.

Valid types are:

0 = None

1 = PSOPH

2 = 300 Hz LP

3 = 5 kHz LP

4 = 20 kHz LP

5 = 0.3 - 3.4 kHz

6 = 0.3 - 5 kHz

7 = 0.3 - 20 kHz

8 = 300 Hz HP

set_audio_freq_ulimit [limit Hz]

Sets upper limit for audio frequency measurements.

Format: Decimal limit value in Hz

Set Commands (cont)

set_audio_freq_ulen [state 0/1]

Enables/Disables the upper limit check on audio frequency measurements.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_freq_llimit [limit Hz]

Sets lower limit for audio frequency measurements.

Format: Decimal limit value in Hz

set_audio_freq_llen [state 0/1]

Enables/Disables lower limit check on audio frequency measurements.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_port [type 0 - 6]

Sets fgen/demod output port to various types.

Valid types are:

0 = Function Generator

1 = Audio In

2 = Audio In Filtered

3 = Demod

4 = Demod De-emphasis

5 = Demod Filtered

6 = Demod De-emphasis Filtered

set_audio_impedance [load 0/1]

Sets audio input impedance.

Valid values are:

0 = Hi Z

1 = 600 Ohms

set_audio_source [source 0 - 3]

Sets audio input source.

Valid sources are:

0 = Audio 1

1 = Audio 2

2 = Balanced

3 = MIC

set_audio_psoph_filter [type 0/1]

Sets audio psoph filter type to CMESS or CCITT.

Valid sources are:

0 = CMESS

1 = CCITT

Config Commands

set_audio_freq_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

set_audio_level_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

set_audio_level_ulimit [limit Vrms]

Sets upper limit for aflevel meter.

Format: Decimal limit value in Vrms

set_audio_level_ulen [state 0/1]

Enables/Disables the upper limit check on aflevel meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_level_llimit [limit Vrms]

Sets lower limit for aflevel meter.

Format: Decimal limit value in Vrms

set_audio_level_llen [state 0/1]

Enables/Disables lower limit check on aflevel meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_distortion_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

set_audio_distortion_ulimit [limit %]

Sets upper limit for afdistortion meter.

Format: Decimal limit value as a percent

set_audio_distortion_ulen [state 0/1]

Enables/Disables upper limit check on afdistortion meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_sinad_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

Config Commands (cont)

set_audio_sinad_llimit [limit dB]

Sets lower limit for afsinad meter.

Format: Decimal limit value in dB

set_audio_sinad_llen [state 0/1]

Enables/Disables lower limit check on afsinad meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_hn_llimit [limit dB]

Sets lower limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in dB

set_audio_hn_llen [state 0/1]

Enables/Disables the lower limit check on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_hn_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_audio_hn_lockref [state 0/1]

Enables/Disables the reference lock on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_snr_llimit [limit dB]

Sets lower limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in dB

set_audio_snr_llen [state 0/1]

Enables/Disables the lower limit check on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_audio_snr_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_audio_snr_mode [state 0/1]

Sets type of SNR measurement to be performed.

Valid states are:

0 = Hum and Noise

1 = Normal Signal to Noise Ratio

Demod Frequency / Level / Distortion Test

This set of tests performs the following functions:

- Verifies the demod frequency, level and distortion.
- Validates the modulation/demodulation plus audio routing.

NOTE

Do not include brackets ([ ]) in command script.

Time-out for the following Test Commands is 80 seconds.

Test Commands

test_amfmdemod_amlevel

Tests am depth meter for operation within specified limits.

test_amfmdemod_fmdev

Tests fm deviation meter with deviation type peak for operation within specified limits.

test_amfmdemod_fmrms

Tests fm deviation meter with deviation type rms for operation within specified limits.

test_amfmdemod_freq

Tests demod frequency meter for operation within specified limits.

test_amfmmod_distortion

Tests mod distortion meter for operation within specified limits.

test_amfmmod_hn

Tests amfm modulation hum and noise meter for operation within specified limits.

test_amfmmod_sinad

Tests mod sinad meter for operation within specified limits.

test_amfmmod_snr

Tests amfm modulation signal to noise ratio meter for operation within specified limits.

Set Commands

set_amfmmod_mod0_freq [freq in kHz]

Sets Modulator 1 frequency.

Format: Decimal frequency in kHz

Range: 0.001 to 20 kHz

set_amfmmod_mod0_devper [kHz or %]

Sets level/amplitude for Modulator 1.

FM:

Level/Amplitude is displayed in kHz

Range: 0.001 to 150 kHz

AM:

Level/Amplitude is displayed as %

Range: 0.1 to 100%

AM USB:

Level/Amplitude is displayed as %

Range: 0.1 to 100%

AM LSB:

Level/Amplitude is displayed as %

Range: 0.1 to 100%

Format: Decimal values

set_amfmmod_mod0_type [0 = Sine]

Sets waveform shape for Modulator 1.

Default is 0 = Sine.

set_amfmmod_mod0_enable [0/1]

Turns modulation source for Modulator 1 ON/OFF.

Valid values are:

0 = OFF

1 = ON

set_amfmmod_mod1_freq [freq in kHz]

Sets Modulator 2 frequency.

Format: Decimal frequency value in kHz

Range: 0.001 to 20 kHz

Set Commands (cont)

set_amfmmod_mod1_devper [kHz or %]

Sets level/amplitude for Modulator 2.

FM:

Level/Amplitude is displayed in kHz

Range: 0.001 to 150 kHz

AM:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

AM USB:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

AM LSB:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

Format: Decimal values

set_amfmmod_mod1_type [0 = Sine]

Sets waveform shape for Modulator 2.

Default is 0 = Sine.

set_amfmmod_mod1_enable [0/1]

Turns modulation source for Modulator 2 ON/OFF.

Valid values are:

0 = OFF

1 = ON

set_amfmmod_mod2_freq [freq in kHz]

Sets Modulator 3 frequency.

Format: Decimal frequency value in kHz

Range: 0.001 to 20 kHz

set_amfmmod_mod2_devper [kHz or %]

Sets level/amplitude for Modulator 3.

FM:

Level/Amplitude is displayed in kHz

Range: 0.001 to 150 kHz

AM:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

AM USB:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

AM LSB:

Level/Amplitude is displayed as percent

Range: 0.1 to 100%

Format: Decimal values

Set Commands (cont)

set_amfmmod_mod2_type [0 = Sine]

Sets waveform shape for Modulator 3.

Default is 0 = Sine.

set_amfmmod_mod2_enable [0/1]

Turns modulation source for Modulator 3 ON/OFF.

Valid values are:

0 = OFF

1 = ON

set_amfmdemod_filter [0 - 7]

Sets demod filter.

Valid types are:

0 = None

1 = PSOPH

2 = 300 Hz

3 = 5 kHz

4 = 20 kHz

5 = 0.3 to 3.4 kHz

6 = 0.3 to 5 kHz

7 = 0.3 to 20 kHz

8 = 300 Hz HP

set_amfmdemod_psoph_filter [type 0/1]

Sets psoph filter type.

Valid types are:

0 = CMESS

1 = CCITT

set_amfmdemod_fm_devtype [type 0 /1]

Sets demod deviation type to RMS or peak.

Valid types are:

0 = Peak

1 = RMS

set_amfmdemod_freq_ulimit [limit Hz]

Sets upper limit for demod frequency measurements.

Format: Decimal limit value in Hz

set_amfmdemod_freq_ulen [state 0/1]

Enables/Disables the upper limit check on demod frequency measurements.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_freq_llimit [limit Hz]

Sets lower limit for demod frequency measurements.

Format: Decimal limit value in Hz

Set Commands (cont)

set_amfmdemod_freq_llen [state 0/1]

Enables/Disables lower limit check on demod frequency measurements.

Valid states are:

0 = Disabled

1 = Enabled

Config Commands

set_amfmdemod_freq_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

set_amfmdemod_fm_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

Range: 1 to 250

set_amfmdemod_fmrms_ulimit [limit kHz]

Sets upper limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in kHz

set_amfmdemod_fmrms_ulen [state 0/1]

Enables/Disables the upper limit check on fm deviation meter with rms deviation type.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_fmrms_llimit [limit kHz]

Sets lower limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in kHz

set_amfmdemod_fmrms_llen [state 0/1]

Enables/Disables the lower limit check on fm deviation meter with rms deviation type.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_fmdev_ulimit [limit kHz]

Sets upper limit on fm deviation meter with peak deviation type.

Format: Decimal limit value in kHz

set_amfmdemod_fmdev_ulen [state 0/1]

Enables/Disables the upper limit check on fm deviation meter with peak deviation type.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_fmdev_llimit [limit kHz]

Sets lower limit on fm deviation meter with peak deviation type.

Format: Decimal limit value in kHz

Config Commands (cont)

set_amfmdemod_fmdev_llen [state 0/1]

Enables/Disables the lower limit check on fm deviation meter with peak deviation type.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_am_average

Sets number of averages used to calculate measurement.

Format: Whole numbers

set_amfmdemod_amdepth_ulimit [limit %]

Sets upper limit on am depth meter.

Format: Decimal limit value as a percent

set_amfmdemod_amdepth_ulen [state 0/1]

Enables/Disables the upper limit check on am depth meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmdemod_amdepth_llimit [limit %]

Sets lower limit on am depth meter.

Format: Decimal limit value as a percent

set_amfmdemod_amdepth_llen [state 0/1]

Enables/Disables the lower limit check on am depth meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_distortion_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_amfmmod_distortion_ulimit [limit %]

Sets upper limit on mod distortion meter.

Format: Decimal limit value as a percent

set_amfmmod_distortion_ulen [state 0/1]

Enables/Disables the upper limit check on mod distortion meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_sinad_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250\

Config Commands (cont)

set_amfmmod_sinad_llimit [limit dB]

Sets lower limit on mod sinad meter.

Format: Decimal limit value in dB

set_amfmmod_sinad_llen [state 0/1]

Enables/Disables the lower limit check on mod sinad meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_hn_llimit [limit dB]

Sets lower limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in dB

set_amfmmod_hn_llen [state 0/1]

Enables/Disables the lower limit check on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_hn_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_amfmmod_hn_lockref [state 0/1]

Enables/Disables the reference lock on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_snr_llimit [limit dB]

Sets lower limit on fm deviation meter with rms deviation type.

Format: Decimal limit value in dB

set_amfmmod_snr_llen [state 0/1]

Enables/Disables the lower limit check on hum and noise meter.

Valid states are:

0 = Disabled

1 = Enabled

set_amfmmod_snr_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_amfmmod_snr_mode [state 0/1]

Sets type of SNR measurement to be performed.

Valid states are:

0 = Hum and Noise

1 = Normal Signal to Noise Ratio

Channel / Spectrum Analyzer Test

This set of tests verifies functionality of the Channel Analyzer and Spectrum Analyzer.

NOTE

Do not include brackets ([ ]) in command script.

Time-out for the following Test Commands is 80 seconds.

Test Commands

test_analyzer_marker1

Tests to verify Marker 1 is within specified limits.

test_analyzer_marker2

Tests to verify Marker 2 is within specified limits.

Set Commands

set_analyzer_tos [scale in dB]

Sets Analyzer Top of Scale value.

Format: Decimal value in dB

set_analyzer_vdiv [state 0 to 3]

Sets scaling dB/div.

Valid states are:

0 = 1 dB/div

1 = 2 dB/div

2 = 5 dB/div

3 = 10 dB/div

set_analyzer_horiz_mode [state 0 to 2]

Sets horizontal mode of analyzer.

Valid states are:

0 = Center - Span

1 = Start - Stop

2 = Zero - Span

set_analyzer_center_freq [value in MHz]

Sets analyzer center frequency.

Format: Decimal value in MHz

set_analyzer_span [value in MHz]

Sets analyzer span in MHz

Format: Decimal value in MHz

set_analyzer_rbw [value in Hz]

Sets analyzer resolution bandwidth.

Format: Whole number in Hz

set_analyzer_videobw [value in HZ]

Sets analyzer video bandwidth.

Format: Whole number in Hz

set_analyzer_sweep [value in ms]

Sets analyzer sweep time.

Format: Whole number in ms

Set Commands (cont)

set_analyzer_rbwauto [state 0/1]

Sets resolution bandwidth setting.

Valid states are:

0 = Manual

1 = Auto

set_analyzer_vbwauto [state 0/1]

Sets video bandwidth setting.

Valid states are:

0 = Manual

1 = Auto

set_analyzer_sweepauto [state 0/1]

Sets sweep setting.

Valid states are:

0 = Manual

1 = Auto

set_analyzer_peakenable [state 0/1]

Enables/Disables peak trace measurement.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_avgenable [state 0/1]

Enables/Disables average trace measurement.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_avgsize

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_analyzer_trigger [state 0/1]

Enables/Disables sweep trigger.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_sweepsingle [state 0]

Sets sweep mode to Single.

0 = Single

set_analyzer_sweepcont [state 0]

Sets sweep mode to Continuous.

Valid states are:

0 = Single

Set Commands (cont)

set_analyzer_startfreq [freq MHz]

Sets analyzer Start frequency when in Start - Stop mode.

Format: Decimal value in MHz

set_analyzer_stopfreq [freq MHz]

Sets analyzer Stop frequency when in Start - Stop mode.

Format: Decimal value in MHz

set_analyzer_centerrel [freq MHz]

Sets Center frequency relative to analyzer.

Format: Decimal value in MHz

set_analyzer_startrel [freq MHz]

Sets Start frequency relative to analyzer.

Format: Decimal value in MHz

set_analyzer_stoprel [freq MHz]

Sets Stop frequency relative to analyzer.

Format: Decimal value in MHz

set_analyzer_mode [state 0/1]

Sets analyzer span mode.

Valid states are:

0 = Channel

1 = Full

Must include a 10 s wait command after this command.

set_analyzer_source [state 0/1]

Selects analyzer trace source.

Valid states are:

0 = T/R

1 = ANT

set_analyzer_preamp_enable [state 0/1]

Enables/Disables Pre-Amp feature.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker1enable [state 0/1]

Enables/Disables Marker at set position.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker1position [value in MHz]

Sets marker position.

Format: Decimal value in MHz

Set Commands (cont)

set_analyzer_marker1topeak

Moves marker to peak point on trace.

NOTE

Must insert a 1 s wait command when this command follows the **set_analyzer_marker1enable** command or **set_analyzer_marker1position** command.

set_analyzer_marker1tomin

Moves marker to lowest point on trace.

set_analyzer_marker1setscf

Sets Center Frequency to frequency at defined marker position.

set_analyzer_marker1setsref

Sets Reference Level to level at defined marker position.

set_analyzer_marker1setsright

Moves marker right to next peak point on trace.

set_analyzer_marker1setsleft

Moves marker left to next peak point on trace.

set_analyzer_marker1_ulimit [limit dBm]

Sets analyzer marker upper limit.

Format: Decimal limit value in dBm

set_analyzer_marker1_ulen [state 0/1]

Enables/Disables the upper limit check on Marker 1.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker1_llimit [limit dBm]

Sets analyzer marker lower limit.

Format: Decimal limit value in dBm

set_analyzer_marker1_llen [state 0/1]

Enables/Disables the lower limit check on Marker 1.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker2enable [state 0/1]

Enables/Disables Marker at set position.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker2position [value in MHz]

Sets marker position.

Format: Decimal value in MHz

Set Commands (cont)

set_analyzer_marker2topeak

Moves marker to peak point on trace.

NOTE

Must insert a 1 s wait command when this command follows the **set_analyzer_marker1enable** command or **set_analyzer_marker1position** command.

set_analyzer_marker2tomin

Moves marker to lowest point on trace.

set_analyzer_marker2setscf

Sets Center Frequency to frequency at defined marker position.

set_analyzer_marker2setsref

Sets Reference Level to level at defined marker position.

set_analyzer_marker2setsright

Moves marker right to next peak on trace.

set_analyzer_marker2setsleft

Moves marker to left to next peak on trace.

set_analyzer_marker2_ulimit [limit dBm]

Sets analyzer marker upper limit.

Format: Decimal limit value in dBm

set_analyzer_marker2_ulen [state 0/1]

Enables/Disables the upper limit check on Marker 2.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker2_llimit [limit dBm]

Sets analyzer marker lower limit.

Format: Decimal limit value in dBm

set_analyzer_marker2_llen [state 0/1]

Enables/Disables the lower limit check on Marker 2.

Valid states are:

0 = Disabled

1 = Enabled

set_analyzer_marker_lockmode [state 0/1]

Lock/Unlock markers when both are enabled.

Valid states are:

0 = Unlocked

1 = Locked

Oscilloscope Test

This set of tests verifies functionality of the Oscilloscope.

NOTE

Do not include brackets ([ ]) in command script.

Test Commands

test_scope_marker1

Tests to verify Marker 1 is within specified limits.

test_scope_marker2

Tests to verify Marker 2 is within specified limits.

Set Commands

set_scope_traceasource [state 0 to 6]

Selects Trace A source

Valid states are:

0 = Off
1 = Channel1
2 = Channel2
3 = Audio
4 = Audio Filtered
5 = Demod,
6 = Demod Filtered.

set_scope_tracealevel [state 0 to 12]

Trace A source <5 [state 0 to 12]

0 = 2 mV
1 = 5 mV
2 = 10 mV
3 = 20 mV
4 = 50 mV
5 = 100 mV
6 = 200 mV
7 = 500 mV
8 = 1 V
9 = 2 V
10 = 5 V
11 = 10 V
12 = 20 V

FM (Demod/Demod filtered): [state 0 to 6]

0 = 500 Hz
1 = 1 kHz
2 = 2 kHz
3 = 5 kHz
4 = 10 kHz
5 = 20 kHz
6 = 50 kHz

AM (Demod/Demod filtered): [state 0 to 3]

0 = 5%
1 = 10%
2 = 20%
3 = 50%

Set Commands (cont)

set_scope_traceacoupling [state 0 to 2]

Sets Scope Trace A coupling.

Valid states are:

0 = DC

1 = AC

2 = GND

set_scope_traceaposition [value in divisons]

Sets Trace A vertical position.

Valid states are ±8 divisions.

set_scope_tracebsource [state 0 to 6]

Selects Trace B source

Valid states are:

0 = Off

1 = Channel1

2 = Channel2

3 = Audio

4 = Audio Filtered

5 = Demod

6 = Demod Filtered

set_scope_traceblevel

Trace B source <5 [state 0 to 12]

0 = 2 mV	7 = 500 mV
1 = 5 mV	8 = 1 V
2 = 10 mV	9 = 2 V
3 = 20 mV	10 = 5 V
4 = 50 mV	11 = 10 V
5 = 100 mV	12 = 20 V
6 = 200 mV	

FM (Demod/Demod filtered): [state 0 to 6]

0 = 500 Hz

1 = 1 kHz

2 = 2 kHz

3 = 5 kHz

4 = 10 kHz

5 = 20 kHz

6 = 50 kHz

AM (Demod/Demod filtered): [state 0 to 3]

0 = 5%

1 = 10%

2 = 20%

3 = 50%

Set Commands (cont)

set_scope_tracebcoupling [state 0 to 2]

Sets Scope Trace B coupling.

Valid states are:

0 = DC
1 = AC
2 = GND

set_scope_tracebposition [value in divisons]

Sets Trace B vertical position.

Valid states are ±8 divisions.

set_scope_sweeprate [state 0 to 18]

Sets Scope sweep rate.

Valid states are:

0 = 1us	7 = 200 us	14 = 50 ms
1 = 2 us	8 = 500 us	15 = 100 ms
2 = 5 us	9 = 1 ms	16 = 200 ms
3 = 10 us	10 = 2 ms	17 = 500 ms
4 = 20 us	11 = 5 ms	18 = 1 s
5 = 50 us us	12 = 10 ms	
6 = 100 us	13 = 20 ms	

set_scope_trigmode [state 0/1]

Sets Scope Trigger mode.

Valid states are:

0 = Auto
1 = Normal

set_scope_trigedge [state 0/1]

Sets Scope trigger edge.

Valid states are:

0 = Rise
1 = Fall

set_scope_trigsource [state 0 to 2]

Sets Scope Trigger source.

Valid states are:

0 = TRA
1 = TRB
2 = EXT

Set Commands (cont)

set_scope_triglevel [level in mV / V / % / kHz / Hz]

Sets Scope Trigger level.

Units of measurement are as follows based on selected trigger source:

CH1, CH2 or Audio trigger source:

Parameter is mV when Vertical level on 1 triggering trace is ≤200 mV

Parameter is V when Vertical Level on 1 triggering is >200 mV

FM Demod trigger source:

Parameters is Hz when Vertical level on 1 triggering trace is ≤500 Hz

Parameter is kHz when Vertical Level on 1 triggering is >500 Hz

AM Demod trigger source:

Parameter in %

set_scope_trigfilter [state 0 to 2]

Selects Scope Trigger filter.

Valid states are:

0 = No Reject

1 = Noise Reject

2 = HF Reject

set_scope_marker1_source [state 0/1]

Selects Marker 1 source.

Valid states are:

0 = TRACE A

1 = TRACE B

set_scope_marker2_source [state 0/1]

Selects Marker 2 source.

Valid states are:

0 = TRACE A

1 = TRACE B

set_scope_marker1enable [state 0/1]

Enables/Disables Marker 1.

Valid states are:

0 = Disabled

1 = Enabled

set_scope_marker1position [value in us]

Sets Marker 1 position.

Format: Decimal value in us

set_scope_marker2enable [state 0/1]

Enables/Disables Marker 1.

Valid states are:

0 = Disabled

1 = Enabled

set_scope_marker2position [value in us]

Sets Marker 2 position.

Format: Decimal value in us

Set Commands (cont)

set_scope_markermode [state 0/1]

Lock/Unlock markers when both are enabled.

Valid states are:

0 = Unlocked

1 = Locked

set_scope_marker1ulimit

Sets scope marker upper limit.

Format: Decimal limit value as follows based on Marker source:

Source CH1, CH2 or Audio:

Parameter is mV when Vertical Level ≤200 mV

Parameter is V when Vertical Level >200 V

Source FM Demod:

Parameter is Hz when Vertical Level is 500 Hz, otherwise kHz

Source AM Demod:

Parameter is a %

set_scope_marker1ulen [state 0/1]

Enables/Disables the upper limit check on the Oscilloscope

Valid states are:

0 = Disabled

1 = Enabled

set_scope_marker1llimit

Sets scope marker lower limit.

Format: Decimal limit value as follows based on Marker source:

Source CH1, CH2 or Audio:

Parameter is mV when Vertical Level ≤200 mV

Parameter is V when Vertical Level >200 V

Source FM Demod:

Parameter is Hz when Vertical Level is 500 Hz, otherwise kHz

Source AM Demod:

Parameter is a %

set_scope_marker1llen [state 0/1]

Enables/Disables the lower limit check on the Oscilloscope.

Valid states are:

0 = Disabled

1 = Enabled

Set Commands (cont)

set_scope_marker2ulimit

Sets scope marker upper limit.

Format: Decimal limit value as follows based on Marker source:

Source CH1, CH2 or Audio:

Parameter is mV when Vertical Level ≤200 mV

Parameter is V when Vertical Level >200 V

Source FM Demod:

Parameter is Hz when Vertical Level is 500 Hz, otherwise kHz

Source AM Demod:

Parameter is a %

set_scope_marker2ulen [state 0/1]

Enables/Disables the upper limit check on the Oscilloscope

Valid states are:

0 = Disabled

1 = Enabled

set_scope_marker2llimit

Sets scope marker lower limit.

Format: Decimal limit value as follows based on Marker source:

Source CH1, CH2 or Audio:

Parameter is mV when Vertical Level ≤200 mV

Parameter is V when Vertical Level >200 V

Source FM Demod:

Parameter is Hz when Vertical Level is 500 Hz, otherwise kHz

Source AM Demod:

Parameter is a %

set_scope_marker2llen

Enables/Disables the upper limit check on the Oscilloscope

Valid states are:

0 = Disabled

1 = Enabled

Power Measurements Test

This test performs the following functions:

- Exercises the power meter.
- Checks the power level both for inband and broadband power measurements.

NOTE

Do not include brackets ([ ]) in command script.

Time-out for the following Test Commands is 80 seconds.

Test Commands

test_bb_power

Tests TR broadband power meter for operation within specified limits.

test_trib_power

Tests TR inband power meter for operation within specified limits.

test_antib_power

Tests ANT inband power meter for operation within specified limits. The **set_rfrec_port 1** command must be issued prior to **test_antib_power** command.

Config Commands

set_trbbpower_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_trbbpower_ulimit [limit W]

Sets TR broadband power meter upper limit.

Format: Decimal limit value in W

set_trbbpower_ulen [state 0/1]

Enables/Disables the upper limit check on TR broadband power meter.

Valid states are:

0 = Disabled

1 = Enabled

set_trbbpower_llimit [limit W]

Sets TR broadband power meter lower limit.

Format: Decimal limit value in W

set_trbbpower_llen [state 0/1]

Enables/Disables the lower limit check on TR broadband power meter.

Valid states are:

0 = Disabled

1 = Enabled

set_trbbpower_zero

Zeros the broadband power meter. Not valid if power is being applied to the T/R Connector.

set_tribpower_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

Config Commands (cont)

set_tribpower_ulimit [limit dBm]

Sets TR inband power meter upper limit.

Format: Decimal limit value in dBm

set_tribpower_ulen [state 0/1]

Enables/Disables the upper limit check on TR inband power meter.

Valid states are:

0 = Disabled

1 = Enabled

set_tribpower_llimit [limit dBm]

Sets TR inband power meter lower limit.

Format: Decimal limit value in dBm

set_tribpower_llen [state 0/1]

Enables /Disables the lower limit check on TR inband power meter.

Valid states are:

0 = Disabled

1 = Enabled

set_tribpower_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_antibpower_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_antibpower_ulimit [limit dBm]

Sets ANT inband power meter upper limit.

Format: Decimal limit value in dBm

set_antibpower_ulen [state 0/1]

Enables/Disables the upper limit check on ANT inband power meter.

Valid states are:

0 = Disabled

1 = Enabled

set_antibpower_llimit [limit dBm]

Sets ANT inband power meter lower limit.

Format: Decimal limit value in dBm

set_antibpower_llen [state 0/1]

Enables /Disables the lower limit check on ANT inband power meter.

Valid states are:

0 = Disabled

1 = Enabled

RF Frequency Error Test

This test performs the following functions:

- Exercises the frequency error meter.
- Verifies that frequency error is within specified limits.

NOTE

Do not include brackets ([ ]) in command script.

Time-out for the following Test Commands is 80 seconds.

Test Commands

test_freq_error

Tests RF Frequency Counter.

Set Commands

set_rferror_resolution [res 0/1]

Sets RF Error frequency resolution to 1 or 10 Hz.

Valid resolutions are:

0 = 1 Hz

1 = 10 Hz

Config Commands

set_rferror_freqoff_average

Sets number of averages used to calculate measurement.

Format: Whole number

Range: 1 to 250

set_rferror_freqoff_ulimit [Hz]

Sets frequency offsets upper limit for RF Error.

Format: Decimal limit value in Hz

set_rferror_freqoff_ulen [state 0/1]

Enables/Disables the frequency offsets upper limit for RF Error.

Valid states are:

0 = Disabled

1 = Enabled

termination_usb_to_serial

Sets the termination character for write and query commands.

Format: The Integer equivalent of the ASCII value

USB to Serial Interface

This test provides the functionality for RS232 communication using a usb-to-serial converter. This test is a “silent” test that serves only to set parameters: it does not return test data. Use the usb_to_serial_debug commands to obtain visual results from the test.

NOTE

Do not include brackets ([ ]) in command script.

Must run **close_usb_to_serial** command at the end of the test.

Test Commands

write_usb_to_serial [string]

Writes the given string parameter to the serial port opened using **open_usb_to_serial** command. Use a delay between consecutive write and read commands.

read_usb_to_serial [int 1]

Reads data from the serial interface. This is a non-blocking read and returns immediately if there is no data to be read. Use a delay between consecutive write and read commands.

query_usb_to_serial [string]

Writes the string to the RS232 interface and waits the amount of time defined by the timeout_usb_to_serial command for a read response from the other end. The read is a blocking read which expects a return for the written command.

Set Commands

open_usb_to_serial [int port 0 -15]

Opens specified serial port /dev/usb/ttyUSB0 through 15 for RS232 communication.

NOTE

Must set configuration parameters (i.e., baud, parity, charsize) before open_usb_to_serial command is run.

close_usb_to_serial [int port 0 -15]

Closes specified serial port /dev/usb/ttyUSB0 through 15 for RS232 communication.

reset_usb_to_serial [int 0/1]

Resets RS232 communication cable to CLEAR state. This command is helpful when running a query or write command.

Config Commands

baud_usb_to_serial [int 0 - 9]

Sets baud rate for serial port. Parameter 0-9 represents 300baud, 1200baud, 2400baud, 4800baud, 9600baud, 19200baud, 38400baud, 57600baud, 115200baud and 230400baud.

timeout_usb_to_serial [int microseconds]

Sets time-out values for the read to time-out when in blocking mode and the time between write and read inside the query command.

Format: microseconds

wait_usb_to_serial [int microseconds]

Sets time-out values for the interleaving a time-out between any two commands. (e.g., between write and read commands).

charsize_usb_to_serial [int 0/1]

Sets the character size to CS7 or CS8.

0 = CS7

1 = CS8 (Default)

parity_usb_to_serial [int 0 - 3]

Sets the parity for RS232 communications.

0 = No Parity (Default)

1 = Even Parity

2 = Odd Parity

3 = Space Parity

hwflowcontrol_usb_to_serial [int 0/1]

Enables/Disable hardware flow control.

0 = Disable

1 = Enable

swflowcontrol_usb_to_serial [int 0/1]

Enables/Disable software flow control.

0 = Disable

1 = Enable

termination_usb_to_serial

Sets the termination character for write and query commands.

Format: The Integer equivalent of the ASCII value (Default is 13)

USB to Serial Interface (Debug Commands)

This test provides the functionality for RS232 communication using a usb-to-serial converter. This test provides visual results in response to tests performed.

NOTE

Do not include brackets ([ ]) in command script.

Must run **close_usb_to_serial** command at the end of the test.

Test Commands

write_usb_to_serial_debug [string]

Writes the given string parameter to the serial port opened using **open_usb_to_serial** command. Use a delay between consecutive write and read commands.

read_usb_to_serial_debug [int 1]

Reads data from the serial interface. This is a non-blocking read and returns immediately if there is no data to be read. Use a delay between consecutive write and read commands.

query_usb_to_serial_debug [string]

Writes the string to the RS232 interface and waits the amount of time defined by the timeout_usb_to_serial command for a read response from the other end. The read is a blocking read which expects a return for the written command.

Set Commands

open_usb_to_serial_debug [int port 0 -15]

Opens specified serial port /dev/usb/ttyUSB0 through 15 for RS232 communication.

close_usb_to_serial_debug [int port 0 -15]

Closes specified serial port /dev/usb/ttyUSB0 through 15 for RS232 communication.

reset_usb_to_serial_debug [int 0/1]

Resets RS232 communication cable to CLEAR state. This command is helpful when running a query or write command.

Config Commands

baud_usb_to_serial_debug [int 0 - 9]

Sets baud rate for serial port. Parameter 0-9 represents 300baud, 1200baud, 2400baud, 4800baud, 9600baud, 19200baud, 38400baud, 57600baud, 115200baud and 230400baud.

timeout_usb_to_serial_debug [int microseconds]

Sets time-out values for the read to time-out when in blocking mode and the time between write and read inside the query command.

Format: microseconds

wait_usb_to_serial_debug [int microseconds]

Sets time-out values for the interleaving a time-out between any two commands. (e.g., between write and read commands).

charsize_usb_to_serial_debug [int 0/1]

Sets the character size to CS7 or CS8.

0 = CS7

1 = CS8 (Default)

parity_usb_to_serial_debug [int 0 - 3]

Sets the parity for RS232 communications.

0 = No Parity (Default)

1 = Even Parity

2 = Odd Parity

3 = Space Parity

hwflowcontrol_usb_to_serial_debug [int 0/1]

Enables/Disable hardware flow control.

0 = Disable

1 = Enable

swflowcontrol_usb_to_serial_debug [int 0/1]

Enables/Disable software flow control.

0 = Disable

1 = Enable

termination_usb_to_serial

Sets the termination character for write and query commands.

Format: The Integer equivalent of the ASCII value (Default is 13)

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Chapter 6

AutoTest II System Operation

Introduction

AutoTest II builds upon the 3900's remote command structure, expanding and simplifying the functionality of the AutoTest System. 3900 AutoTest II Systems uses a Tcl interpreter to create an interface between the Test Set's autotest and remote command functions. AutoTest II command structure includes the use of 3900 remote commands variables and conventional Tcl commands.

AutoTest II Command Structure

TCL Commands and Programming Structure

Tcl (Tool Command Language) is an open-source, interpreted programming language that provides common facilities such as variables, procedures and control structures for creating command scripts. AutoTest II also allows the user to use the TK Tool set to build custom user screens. Users must be familiar with Tcl /TK programming command structure to use the AutoTest II System.

Sources for information about Tcl/TK:

For information on Tcl commands, refer to http://tmml.sourceforge.net/doc/tcl/index.html.

For information on Tcl/TK programming, refer to http://tmml.sourceforge.net/doc/tk/.

Technical Application Note: Tcl Basics (located on 3900 Series Operation CD)

3900 Remote Commands

3900 Remote Programming Commands are documented in the 3900 Series Remote Programming Manual and associated Option(s) Remote Programming Manuals. Refer to the appropriate remote programming manual for programming structure and commands.

To utilize remote programming commands in AutoTest II, begin command lines with the Tcl procedure command rc. Refer to Fig. 6-1 for an example.

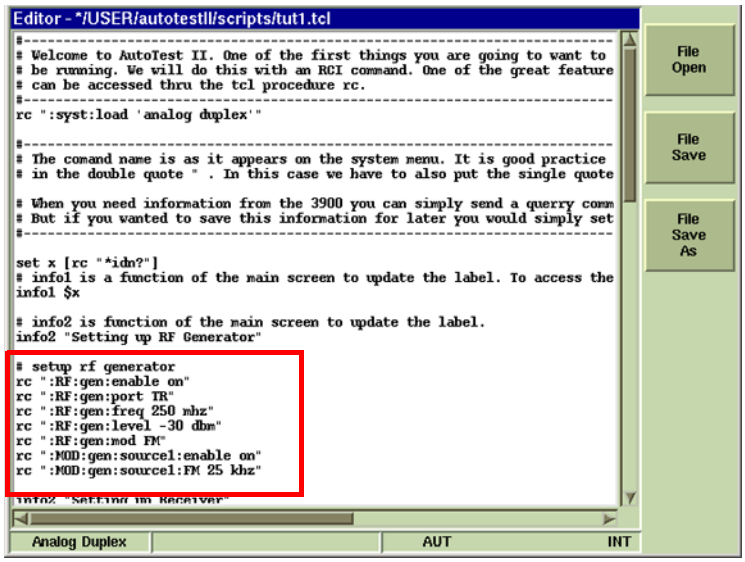

Fig. 6-1 Use of rc in AutoTest II Script

Selecting AutoTest II

AutoTest II Systems are only available when the necessary option is installed in the Test Set. To select AutoTest II:

1. Press CONFIG Key to access the CONFIG Floating menu.
2. Select **Systems, AutoTest II** from the CONFIG Floating Menu.
3. After AutoTest II loads the display appears as shown in example below. The name of the last ran script is shown at the top of the Tile; all other data fields appear empty.

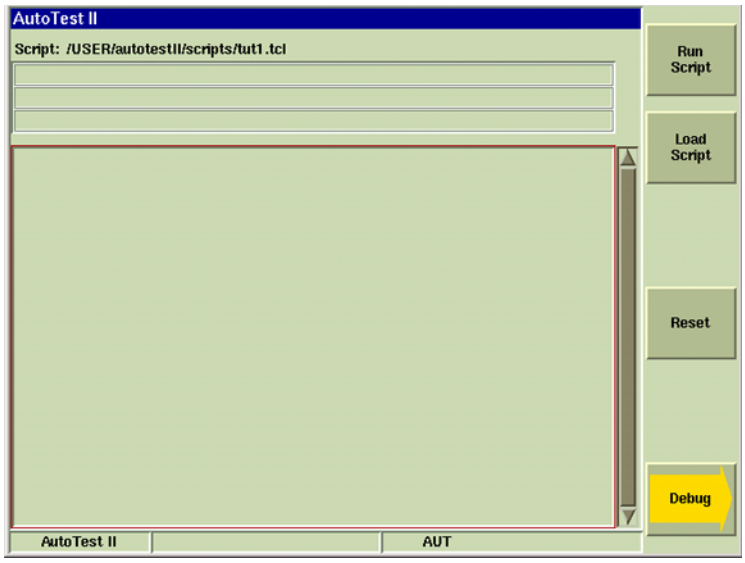

Fig. 6-2 AutoTest II Main Tile

AutoTest II is only available when the corresponding System AutoTest II Option is installed in the Test Set. AutoTest II Options are:

- AutoTest II Analog (390XOPT059)
- AutoTest II TETRA (390XOPT115)
- AutoTest II P25 (390XOPT218)
- AutoTest II HPD (390XOPT303)

Exiting AutoTest II

AutoTest II does not currently support remote command functionality to switch from AutoTest II to a different operating system. AutoTest II can only be exited by locally selecting a different system from the CONFIG, Systems menu.

To exit AutoTest II:

1. Press CONFIG Key.
2. Select the desired operating system from the Systems menu.

AutoTest II File Name Format

AutoTest II supports test scripts with .tcl file extension. Do not include spaces in AutoTest II file names.

AutoTest II Tile Layout

The AutoTest II Tile contains the Script title bar, three information bars, the results display area and the soft key area.

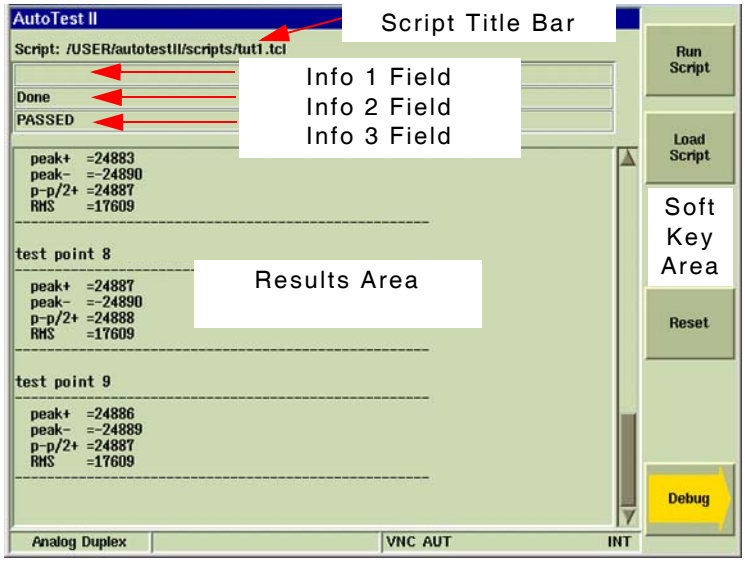

Fig. 6-3 AutoTest II Tile Layout

Field/Soft Key Definitions

Script Title Bar

The title bar lists the last loaded script file. A script file does not need to be reloaded to run the last loaded test script. If the desired test script is already loaded, press [Run Script] Soft Key to run the script.

Information Fields

The Information fields display various status messages before, during and after a test script is run. Fields are referred to in command structure as 'info1', 'info2', 'info3'.

Results Display Area

This area shows results of completed tests as well as any user prompts (refer to Fig. 6-10) that are included in a test script. The Results Display Area is referred to in command structure as 'results'.

[Run Script] Soft Key

Runs loaded AutoTest II script.

[Load Script] Soft Key

Loads selected AutoTest II script.

[Reset] Soft Key

Clears data from Main AutoTest II screen. Clears data from User Screen or Debug screen.

[Continue] Soft Key

Advances to next step in AutoTest script.

[Debug] Soft Key

The [Debug] Soft Key opens a 'work area' where users can test and validate tcl commands or run remote commands to review the type of data that is returned. The Debug feature provides feedback when tcl or remote commands are invalid.

NOTE

Use the 'print' command to display information on the Debug Screen; do not use the 'puts' command as this command is reserved for file access.

Fig. 6-4 shows an error message that was received when the remote command :CONF:MOD:ANAL:AM:AVER was entered. The command was invalid because it did not end with a query indicator (:CONF:MOD:ANAL:AM:AVER?) or value (:CONF:MOD:ANAL:AM:AVER 10).

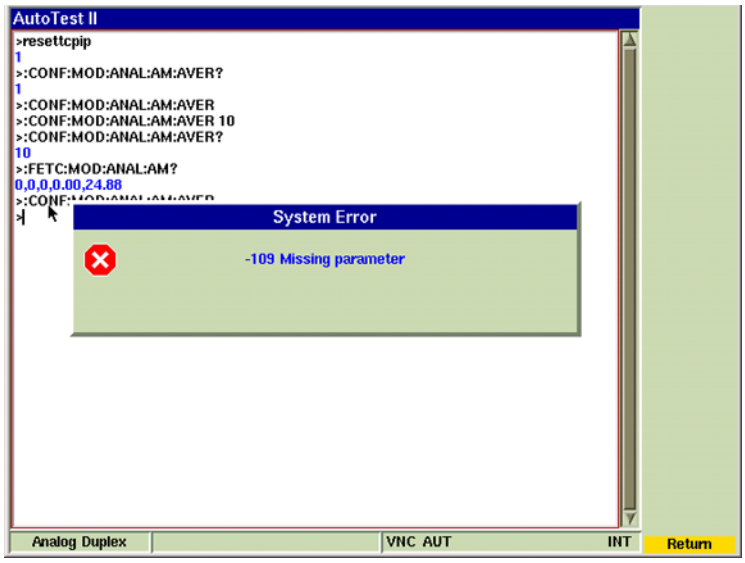

Fig. 6-4 Remote Command Validation

[Abort] Soft Key

Abort cancels the current action.

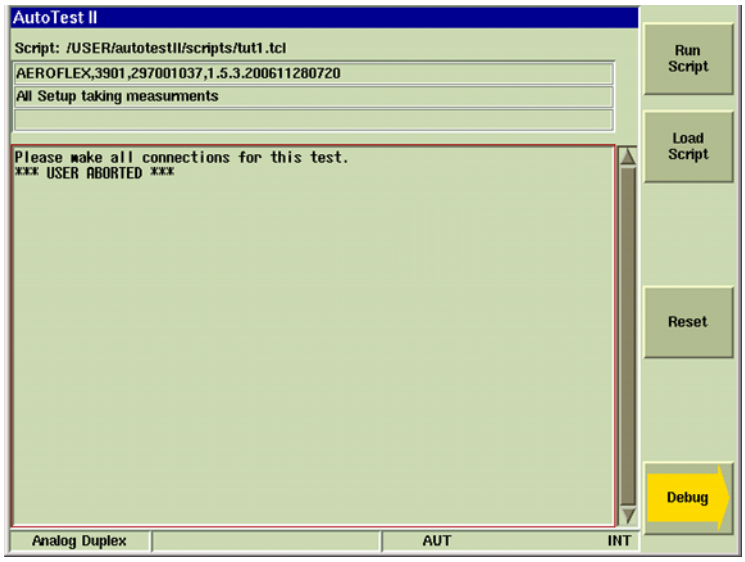

Fig. 6-5 Example Abort Error Message

AutoTest II Tutorials

AutoTest II contains several tutorial test scripts that provide guidelines on creating test scripts. Tutorial scripts are accessed using Editor Mode (refer to section titled Editor Mode).

tut1.tcl (Tutorial 1)

Includes examples of the following:

- Loading a 3900 system
- Setting up RF Generator
- Setting up Receiver
- Saving results to a file

tut2.tcl (Tutorial 2)

Using displayuserentry and displaypicscreen.

tut3.tcl (Tutorial 3)

Using Function Keys and User Message Screen.

tut4.tcl (Tutorial 4)

Using test_audio_level, test_audio_distortion and associated variables.

tut5.tcl (Tutorial 5)

Using test_demod_fm, test_demod_distortion and associated variables.

Editor Mode

AutoTest II contains an editing mode that allows the user to review and make minor changes to an imported Test Script. Editor Mode has been developed primarily as a viewing application within AutoTest II Systems, however, the tool does function as a basic editing tool.

Edited script files can be saved over existing files or renamed with a new file name. Edited files can be exported using the File Management feature. Refer to Chapter 3, section titled File Management Tile for information on using this feature.

NOTE

- Editor Mode requires use of an external keyboard;
- Editor Mode does not support advanced keyboard functionality (i.e., using the Ctrl+Alt+c key combination to copy text);
- Use of a USB mouse is recommended when using Editor Mode.

To access Editor Mode:

1. Press Alt+T on external keyboard or press TEST key on Test Set.
2. Select **Editor** from floating menu.

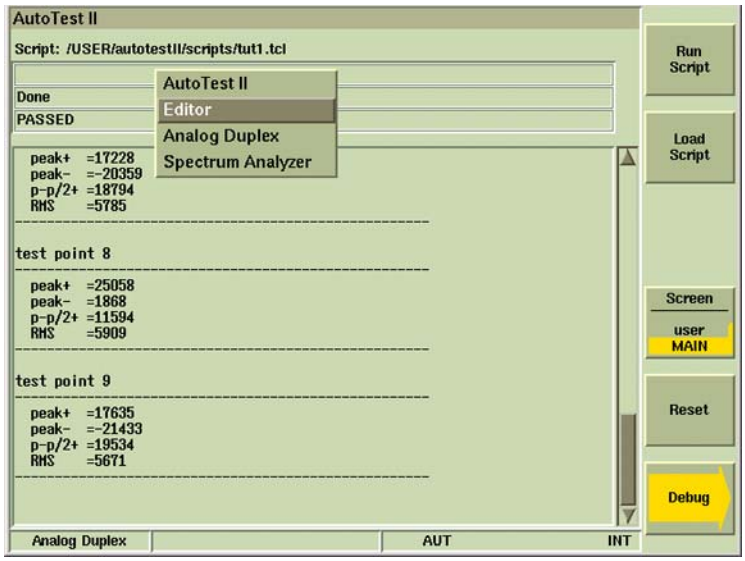

Fig. 6-6 Accessing AutoTest II Editor Tool

3. The last viewed file is displayed when Editor Mode is selected. Press [File Open] Soft Key.
4. When File Open dialog box opens, open the results/ or scripts/ directory and select desired file.
5. Verify the selected file name appears in the File field and press the [OK] Soft Key.

6. The screen displays contents of selected file as shown in Fig. 6-7.

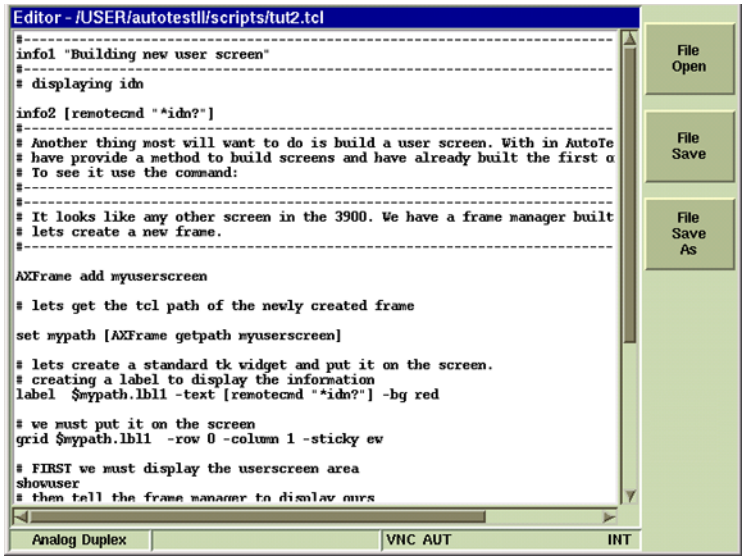

Fig. 6-7 Script File in Editor Mode

Running an AutoTest Script

To run an AutoTest II script:

1. Load AutoTest II System. Wait while system loads.
2. Press the [Load Script] Soft Key.
3. Select the desired directory and test script. Verify the file name appears in File field (example uses file tut1.tcl).
4. Select Filter type appropriate for script format. Press [OK] Soft Key.

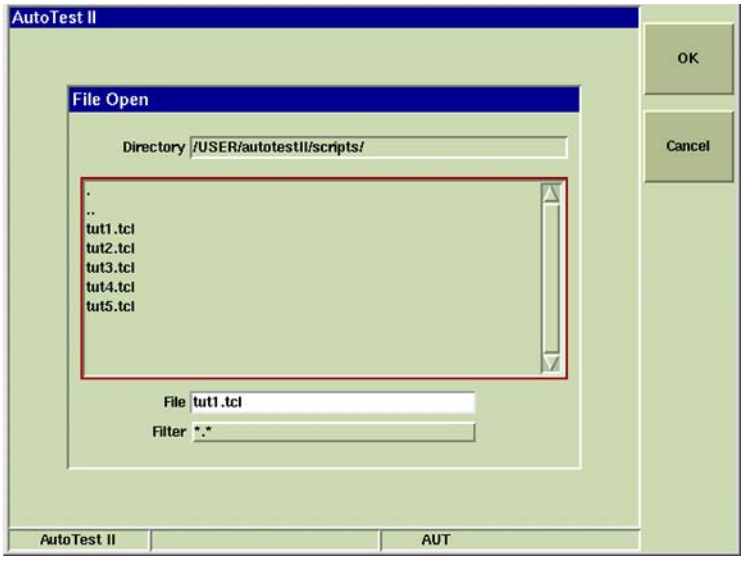

Fig. 6-8 AutoTest Load Dialog Box

5. The script's file name appears at the top of the display tile after the script has loaded. After the file has loaded press [Run Script] Soft Key.

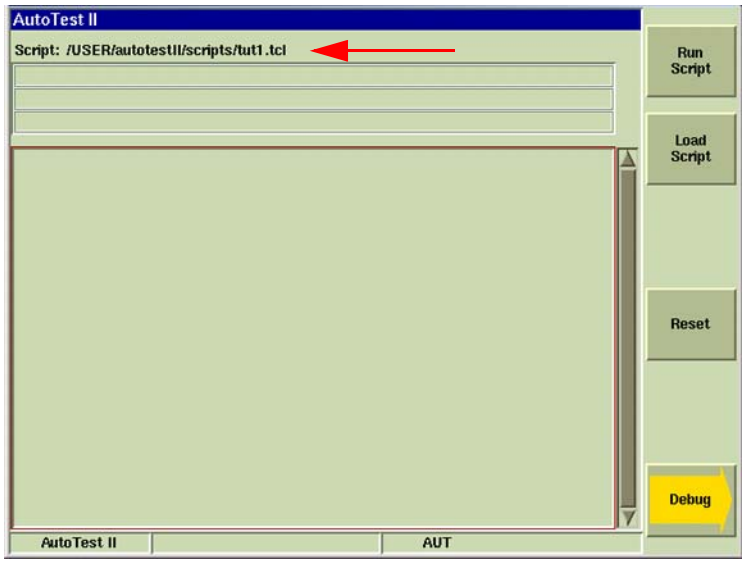

Fig. 6-9 Loaded Script File

6. AutoTest II Tile appearance and data displayed varies throughout a test script depending on the actions the script writing had included in the test script. Fig. 5-3 shows an example where a prompt has been included to notify the user to make necessary connections to continue with the test.

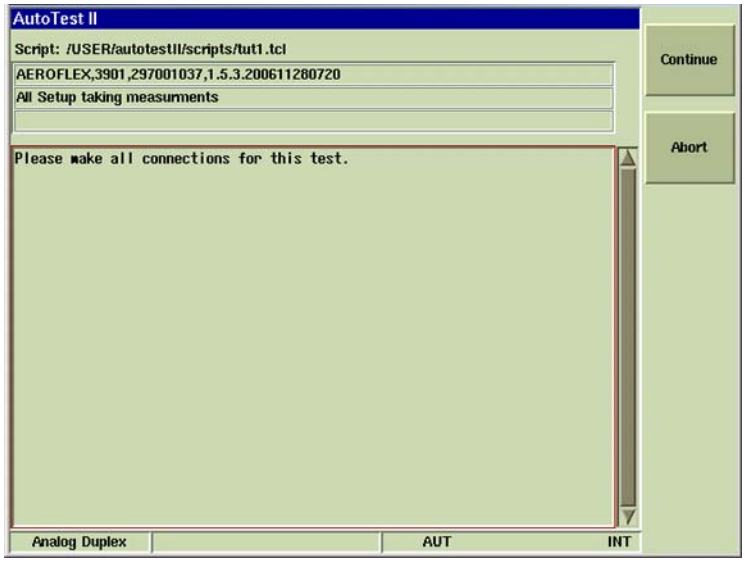

Fig. 6-10 AutoTest - Test in Progress

7. Data displayed at the completion of a test script is also dependent on the commands included in the script. Fig. 6-11 shows the screen configured to display Done in the second information field and test status (PASSED) in the third information field.

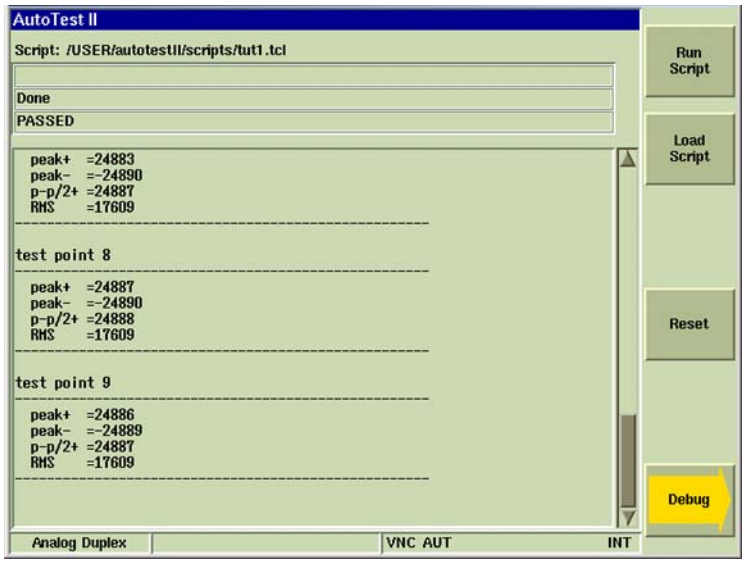

Fig. 6-11 AutoTest - Complete

Storing Results

AutoTest II stores results directly to the Test Set's internal hard drive. Saved test results can then be exported from the Test Set to a USB device using the File Management feature. Refer to Chapter 3, section titled File Management Tile for information on using this feature.

AutoTest II Commands

The following are AutoTest II commands developed to be used with the 3900:

AX

AX is a global variable that allows the user to include various functions in a test script

::AX(scriptpath)

Holds the script path /USER/autotestII/scripts

::AX(functionkey)

Holds the function key that was pressed (1 - 6)

Tutorial 3 (tut3.tcl) provides information on using function keys.

::AX(abortproc)

Holds the name of the user abort procedure; the command is executed when [Abort] Soft Key is pressed during script execution.

::AX(debug)

1 or 0; if set to '0', debugstep statements are activated

delay "time - in milliseconds" "usrmsg - string"

Pauses execution of script for 1 seconds and displays user message in title bar Information area.

Limited to 24 characters in length.

Example:

delay 1000 "waiting for reading"

print "string"

Prints "The Test has Passed" in the Results area when test is complete and has passed requirements.

Example:

print 'The Test has Passed'

beep

Makes Test Set generate a short audio tone. Command usage would be to indicate the end of a test script or to indicate when user action is required.

rc "string"

Remote command access: must be included in front of RCI command when remote commands are used in test script.

Example:

rc "*idn?"

Reads Test Set information: Manufacturer, model, serial number, software issue number

AEROFLEX,3901,297001018,1.6.0

Example:

print [rc "CONF:MOD:ANA:FREQ:AVER?"]

Prints value returned from the :CONF:MOD:ANA:FREQ:AVER? command in the results area.

set reply [rc "*idn?"]

Includes value returned from the *idn? command in the variable reply.

clearresults

Clears Results Area on display tile.

clearscreen

Clears all data on display tile, including data in the Info 1, 2 and 3 fields as well as the Results Area.

info1, info2, info3

Commands insert text into the corresponding data field on the display tile.

Example:

```
info1 “Setting up RF Generator”
info2 “ “
info3 “ “
```

abort

Stops execution of the script and returns to the main test screen.

openprintfile

Opens designated file in the results directory for editing purposes.

Example:

```
openprintfile “tut1results.rts”
```

writeprintfile

Writes data to the file and prints it to the results area.

Example:

```
writeprintfile “test point $x”
writeprintfile “------------------------------------------------------------”
writeprintfile “  peak+  = [lindex $templist 4]”
writeprintfile “  peak-  = [lindex $templist 5]”
writeprintfile “  p-p/2+  = [lindex $templist 3]”
writeprintfile “  RMS  =[lindex $templist 6]”
writeprintfile “------------------------------------------------------------”
writeprintfile “ ”
```

closeprintfile

Closes previously opened file.

printfile

Sends file to printer. Must have printer configured (UTILS function) to use this command.

Example:

```
printfile “tut1results.rts”
```

resettcpip

Resets the tcpip server and opens a new network socket for RCI communications.

readch

Reads the tcpip socket for results.

showmain

Shows the AutoTest II Main Tile.

showuser

Shows the AutoTest II User Tile

setcustom

Configures soft keys used throughout test script.

Example:

```
setcustom 1 “Custom 1”
setcustom 2 “Custom 2”
setcustom 3 “Custom 3”
setcustom 4 “Custom 4”
setcustom 5 “Custom 5”
setcustom 6 “Custom 6”
```

showcustom

Displays a set of custom soft keys and pauses script while waiting for user to make soft key selection. Script resumes running when soft key is pressed.

::AX(functionkey) variable command indicates the soft key that was pressed.

Example:

```
if { $::AX(functionkey)  == 1 }  {
    print “Key 1 was pressed”
}
```

clearcustom

Clears all configuration for custom soft key set.

pause

Pauses script and displays soft key set:

1 - Continue (allows script to continue)

2 - Abort (stops script and returns to AutoTest II Main Tile)

pauseFRA

Pauses script and displays soft key set. Script returns which soft key was pressed.

1 - Fail

2 - Retry

3 - Abort (stops script and returns to AutoTest II Main Tile)

Example:

```
set temp [pauseFRA]
if { $temp ==1 } {
    print “Fail was pressed”
} elseif { $temp == 2 }
    print “Retry was pressed”
}
```

pauseYN

Pauses script and displays soft key set:

1 - Yes

2 - No

Example:

```
set temp [pauseYN]
if { $temp ==1 } {
    print “Yes was pressed”
} else {
    print “No was pressed”
}
```

addusermsg “string”

Displays message on User Screen.

NOTE

Tutorial 3 (tut3.tcl) provides information on using User Message Screen.

clearusermsg

Clears custom message area.

displayusermsg

Displays User Screen.

Example:

```
clearusermsg
addusermsg “User Instruction”
addusermsg “ “
addusermsg “Pause command example”
displayusermsg

pause

showmain (You must use the showmain command to return to the Main Screen)
```

NOTE

Tutorial 3 (tut3.tcl) provides information on using User Message Screen.

displayuserentry “string”

Displays the screen with an entry for the user to enter text and the message “string.”

Example:

```
displayuserentry “Enter the user Data”
```

NOTE

Tutorial 2 (tut2.tcl) provides information on using displayuserentry.

displaypicscreen “string” “file name”

Displays a screen containing an .xbm or .gif image and text at the bottom.

Example:

displaypicscreen ”This is a TEST” [file join $::AX(scriptpath) test.gif]

NOTE

Tutorial 2 (tut2.tcl) provides information on using displaypicscreen.

debug “mode” “string”

Debugs AutoTest II test scripts.

::AX(debug) 1

Turns debug statements in test script on (executes debug “mode” “string”).

Prints debug command and stops script.

::AX(debug) 0

Turns debug statements in test script off. Prints debug command and continues script.

NOTE

Use the ‘print’ command to display information on the Debug Screen; do not use the ‘puts’ command as this command is reserved for file access.

Example:

set a “TEST”

puts $1 <- invalid AutoTest II command

print $2 <- valid AutoTest II command

AutoTest to Tcl Command

The following table provides a conversion guide for replacing AutoTest commands with Tcl Commands.

AutoTest Command	Tcl Command
IF	IF
repeat	for/next loop
result_print	print
wait	delay

Test Functions and Variables

This section lists Meter test functions and the variables associated with each function.

test_demod_am

demod_am(avgcnt)
demod_am(average)
demod_am(units)
demod_am(ulimit)
demod_am(llimit)
demod_am(passfail)

test_demod_fm

demod_fm(avgcnt)
demod_fm(average)
demod_fm(rms)
demod_fm(units)
demod_fm(ulimit)
demod_fm(llimit)
demod_fm(passfail)

test_demod_frequency

demod_freq(avgcnt)
demod_freq(average)
demod_freq(units)
demod_freq(ulimit)
demod_freq(llimit)
demod_freq(passfail)

test_demod_distortion

demod_dist(avgcnt)
demod_dist(average)
demod_dist(units)
demod_dist(ulimit)
demod_dist(passfail)

test_demod_hn

demod_hn(avgcnt)
demod_hn(average)
demod_hn(units)
demod_hn(llimit)
demod_hn(passfail)

test_demod_sinad

demod_sinad(avgcnt)
demod_sinad(average)
demod_sinad(units)
demod_sinad(llimit)
demod_sinad(passfail)

test_demod_snr

demod_snr(avgcnt)
demod_snr(average)
demod_snr(units)
demod_snr(llimit)
demod_snr(passfail)

test_aib_power

aib_pwr(avgcnt)
aib_pwr(average)
aib_pwr(units)
aib_pwr(ulimit)
aib_pwr(llimit)
aib_pwr(passfail)

test_audio_frequency

audio_freq(avgcnt)
audio_freq(average)
audio_freq(units)
audio_freq(ulimit)
audio_freq(llimit)
audio_freq(passfail)

test_audio_distortion

audio_dist(avgcnt)
audio_dist(average)
audio_dist(units)
audio_dist(ulimit)
audio_dist(passfail)

test_audio_hn

audio_hn(avgcnt)
audio_hn(average)
audio_hn(units)
audio_hn(llimit)
audio_hn(passfail)

test_audio_level

audio_level(avgcnt)
audio_level(average)
audio_level(units)
audio_level(ulimit)
audio_level(llimit)
audio_level(passfail)

test_audio_sinad

audio_sinad(avgcnt)
audio_sinad(average)
audio_sinad(units)
audio_sinad(llimit)
audio_sinad(passfail)

test_audio_snr

audio_snr(avgcnt)
audio_snr(average)
audio_snr(units)
audio_snr(llimit)
audio_snr(passfail)

test_trbb_power

trbb_pwr(avgcnt)
trbb_pwr(average)
trbb_pwr(units)
trbb_pwr(ulimit)
trbb_pwr(llimit)
trbb_pwr(passfail)

test_freq_error

rf_err(avgcnt)
rf_err(average)
rf_err(res)
rf_err(units)
rf_err(ulimit)
rf_err(passfail)

test_trib_power

trib_pwr(avgcnt)
trib_pwr(average)
trib_pwr(units)
trib_pwr(ulimit)
trib_pwr(llimit)
trib_pwr(passfail)

Using Variables

There are several variables associated with each meter test function. This section describes the function of each variable.

avgcnt variables

These variables set the average count of the meter being read. If the user does not set the avgcnt variable, it defaults to 1.

demod_am(avgcnt)
demod_fm(avgcnt)
demod_freq(avgcnt)
demod_dist(avgcnt)
demod_hn(avgcnt)
demod_sinad(avgcnt)
demod_snr(avgcnt)
aib_pwr(avgcnt)
audio_freq(avgcnt)
audio_dist(avgcnt)
audio_hn(avgcnt)
audio_level(avgcnt)
audio_sinad(avgcnt)
audio_snr(avgcnt)
trbb_pwr(avgcnt)
rf_err(avgcnt)
trib_pwr(avgcnt)

Example:

```
# set number of averages for demod sinad meter to 10
set demod_sinad(avgcnt) 10
```

average variables

These variables are set by the corresponding test function. These variables hold the meter reading measured in the test function.

aib_pwr(average)
audio_freq(average)
audio_dist(average)
audio_hn(average)
audio_level(average)
audio_sinad(average)
audio_snr(average)
demod_am(average)
demod_fm(average)
demod_freq(average)
demod_dist(average)
demod_hn(average)
demod_sinad(average)
demod_snr(average)
rf_err(average)
trbb_pwr(average)
trib_pwr(average)

Example

```
# Show the meter reading
puts “The sinad meter reading was: $demod_sinad(average)”
```

units variables

User defined variable allows the user to set the units of the meter being tested. Some meters (e.g. the Distortion Meter) have fixed units and will not be modified.

demod_am(units)
demod_fm(units)
demod_freq(units)
demod_dist(units)
demod_hn(units)
demod_sinad(units)
demod_snr(units)
aib_pwr(units)
audio_freq(units)
audio_dist(units)
audio_hn(units)
audio_level(units)
audio_sinad(units)
audio_snr(units)
trbb_pwr(units)
rf_err(units)
trib_pwr(units)

Example:

```
# For the next meter test, set the TR inband power meter units to dBm
set trib_pwr(units) “dBm”
```

ulimit variables

User defined variable allows the user to set the upper limit of the meter being tested.

aib_pwr(ulimit)
audio_freq(ulimit)
audio_dist(ulimit)
audio_level(ulimit)
demod_am(ulimit)
demod_fm(ulimit)
demod_freq(ulimit)
demod_dist(ulimit)
rf_err(ulimit)
trbb_pwr(ulimit)
trib_pwr(ulimit)

Example:

```
# Set the TR inband power meter upper limit to -10.0
set trib_pwr(ulimit) -10.0
```

llimit variables

User defined variable allows the user to set the lower limit of the meter being tested.

aib_pwr(llimit)
audio_freq(llimit)
audio_hn(llimit)
audio_level(llimit)
audio_sinad(llimit)
audio_snr(llimit)
demod_am(llimit)
demod_fm(llimit)
demod_freq(llimit)
demod_hn(llimit)
demod_sinad(llimit)
demod_snr(llimit)
rf_err(llimit)
trbb_pwr(llimit)
trib_pwr(llimit)

Example:

```
# Set the TR inband power meter lower limit to -20.0
set trib_pwr(llimit) -20.0
```

passfail variables

These variables are set by the corresponding test function. The test function compares the meter reading (stored in the average variables) to the limits (stored in the ulimit, and llimit variables), and sets the passfail variable to either the string " PASS ", or the string "*FAIL*".

NOTE

After returning from the test function the user must provide the necessary code to handle the pass/fail conditions. Refer to the AutoTestII tutorials for examples of defining pass/fail conditions.

aib_pwr(passfail)
audio_freq(passfail)
audio_dist(passfail)
audio_hn(passfail)
audio_level(passfail)
audio_sinad(passfail)
audio_snr(passfail)
demod_am(passfail)
demod_fm(passfail)
demod_freq(passfail)
demod_dist(passfail)
demod_hn(passfail)
demod_sinad(passfail)
demod_snr(passfail)
rf_err(passfail)
trbb_pwr(passfail)
trib_pwr(passfail)

Example:

```
# Print the result of the TR inband power meter test
if { $trib_pwr(passfail) == " PASS " } {
    puts "The last power meter test passed!"
} else {
    puts "The last power meter test failed!"
}
```

AutoTest II Command Conversion Chart

The following table provides a guide to convert AutoTest Commands that are used in existing AutoTest scripts to commands that are used by AutoTest II System. Updates must be made manually.

AutoTest Command	AutoTest II Command
baud_usb_to_serial	USBTOSER:BAUD
charsize_usb_to_serial	USBTOSER:CHAR
close_usb_to_serial	USBTOSER:CLOSE
hwflowcontrol_usb_to_serial	USBTOSER:HWFL
open_usb_to_serial	USBTOSER:OPEN
parity_usb_to_serial	USBTOSER:PARI
query_usb_to_serial	USBTOSER:QUER?
read_usb_to_serial	USBTOSER:READ?
set_agclevel_mode	RF:ANAL:AGC:MODE
set_agclevel_value	RF:ANAL:AGC:LEV
set_amfmdemod_am_average	CONF:MOD:ANAL:AM:AVER
set_amfmdemod_amdepth_llen	LIM:MOD:AM:LOW:ENAB
set_amfmdemod_amdepth_llimit	LIM:MOD:AM:LOW:VAL
set_amfmdemod_amdepth_ulen	LIM:MOD:AM:UPP:ENAB
set_amfmdemod_amdepth_ulimit	LIM:MOD:AM:UPP:VAL
set_amfmdemod_demodbw	RF:ANAL:FMIF, RF:ANAL:AMIF
set_amfmdemod_demodstate	RF:ANAL:MOD
set_amfmdemod_filter	MOD:ANAL:MFIL
set_amfmdemod_fm_average	CONF:MOD:ANAL:FM:AVER
set_amfmdemod_fm_devtype	CONF:MOD:ANAL:FM:MTYP
set_amfmdemod_fmdev_llen	LIM:MOD:FM:LOW:ENAB
set_amfmdemod_fmdev_llimit	LIM:MOD:FM:LOW:VAL
set_amfmdemod_fmdev_ulen	LIM:MOD:FM:UPP:ENAB
set_amfmdemod_fmdev_ulimit	LIM:MOD:FM:UPP:VAL
set_amfmdemod_fmrms_llen	LIM:MOD:FMRMS:LOW:ENAB
set_amfmdemod_fmrms_llimit	LIM:MOD:FMRMS:LOW:VAL
set_amfmdemod_fmrms_ulen	LIM:MOD:FMRMS:UPP:ENAB
set_amfmdemod_fmrms_ulimit	LIM:MOD:FMRMS:UPP:VAL
set_amfmdemod_freq_average	CONF:MOD:ANAL:FREQ:AVER
set_amfmdemod_psoph_filter	CHANGING TO CONF:MOD:MFIL:TYP
set_amfmmod_distortion_average	CONF:MOD:ANAL:DIST:AVER
set_amfmmod_distortion_ulen	LIM:MOD:DIST:UPP:ENAB
set_amfmmod_distortion_ulimit	LIM:MOD:DIST:UPP:VAL
set_amfmmod_hn_average	CONF:MOD:ANAL:HN:AVER
set_amfmmod_hn_llen	LIM:MOD:HN:LOW:ENAB
set_amfmmod_hn_llimit	LIM:MOD:HN:LOW:VAL
set_amfmmod_hn_lockref	CONF:MOD:ANAL:HN:REF
set_amfmmod_hn_ulen	LIM:MOD:HN:UPP:ENAB
set_amfmmod_hn_ulimit	LIM:MOD:HN:UPP:VAL
set_amfmmod_mod0_devper	MOD:GEN:SOUR1:FM, MOD:GEN:SOUR1:AM
set_amfmmod_mod0_enable	MOD:GEN:SOUR1:ENAB

AutoTest Command	AutoTest II Command
set_amfmmod_mod0_freq	MOD:GEN:SOUR1:SINE:FREQ, MOD:GEN:SOUR1:SQU:FREQ
set_amfmmod_mod0_type	MOD:GEN:SOUR1:SHAP
set_amfmmod_mod1_devper	MOD:GEN:SOUR2:FM, MOD:GEN:SOUR2:AM
set_amfmmod_mod1_enable	MOD:GEN:SOUR2:ENAB
set_amfmmod_mod1_freq	MOD:GEN:SOUR2:SINE:FREQ, MOD:GEN:SOUR2:SQU:FREQ
set_amfmmod_mod1_type	MOD:GEN:SOUR2:SHAP
set_amfmmod_mod2_devper	MOD:GEN:SOUR3:FM, MOD:GEN:SOUR3:AM
set_amfmmod_mod2_enable	MOD:GEN:SOUR3:ENAB
set_amfmmod_mod2_freq	MOD:GEN:SOUR3:SINE:FREQ, MOD:GEN:SOUR3:SQU:FREQ
set_amfmmod_mod2_type	MOD:GEN:SOUR3:SHAP
set_amfmmod_modstate	RF:GEN:MOD
set_amfmmod_sinad_average	CONF:MOD:ANAL:SIN:AVER
set_amfmmod_sinad_llen	LIM:MOD:SIN:LOW:ENAB
set_amfmmod_sinad_llimit	LIM:MOD:SIN:LOW:VAL
set_amfmmod_snr_average	CONF:MOD:ANAL:SNR:AVER
set_amfmmod_snr_llen	LIM:MOD:SNR:LOW:ENAB
set_amfmmod_snr_llimit	LIM:MOD:SNR:LOW:VAL
set_amfmmod_snr_ulen	LIM:MOD:SNR:UPP:ENAB
set_amfmmod_snr_ulimit	LIM:MOD:SNR:UPP:VAL
set_analog_timeout	N/A
set_analyzer_avgenable	CA:TRAC:AVER:ENAB, SA:TRAC:AVER:ENAB
set_analyzer_avgsize	CA:TRAC:AVER:VAL, SA:TRAC:AVER:VAL
set_analyzer_center_freq	CA:HOR:FREQ:CENT, SA:HOR:FREQ:CENT
set_analyzer_centerrel	CA:HOR:FREQ:CENT:REL
set_analyzer_horiz_mode	CA:HOR:MODE, SA:HOR:MODE
set_analyzer_marker_lockmode	CA:MARK:MODE LOCK, SA:MARK:MODE LOCK, CA:MARK:MODE UNL, SA:MARK:MODE UNL
set_analyzer_marker1enable	CA:MARK:MKR1:ENAB, SA:MARK:MKR1:ENAB
set_analyzer_marker1position	CA:MARK:MKR1:POS, SA:MARK:MKR1:POS
set_analyzer_marker1setscf	CA:MARK:MKR1:SCF, SA:MARK:MKR1:SCF
set_analyzer_marker1setsleft	CA:MARK:MKR1:LEFT, SA:MARK:MKR1:LEFT
set_analyzer_marker1setsref	CA:MARK:MKR1:SREF, SA:MARK:MKR1:SREF
set_analyzer_marker1setsright	CA:MARK:MKR1:RIGHT, SA:MARK:MKR1:RIGHT
set_analyzer_marker1tomin	CA:MARK:MKR1:MIN, SA:MARK:MKR1:MIN

AutoTest Command	AutoTest II Command
set_analyzer_marker1topeak	CA:MARK:MKR1:PEAK, SA:MARK:MKR1:PEAK
set_analyzer_marker2enable	CA:MARK:MKR2:ENAB, SA:MARK:MKR2:ENAB
set_analyzer_marker2position	CA:MARK:MKR2:POS, SA:MARK:MKR2:POS
set_analyzer_marker2setscf	CA:MARK:MKR2:SCF, SA:MARK:MKR2:SCF
set_analyzer_marker2setsleft	CA:MARK:MKR2:LEFT, SA:MARK:MKR2:LEFT
set_analyzer_marker2setsref	CA:MARK:MKR2:SREF, SA:MARK:MKR2:SREF
set_analyzer_marker2setsright	CA:MARK:MKR2:RIGHT, SA:MARK:MKR2:RIGHT
set_analyzer_marker2tomin	CA:MARK:MKR2:MIN, SA:MARK:MKR2:MIN
set_analyzer_marker2topeak	CA:MARK:MKR2:PEAK, SA:MARK:MKR2:PEAK
set_analyzer_mode	SA:MODE
set_analyzer_peakenable	CA:TRAC:PEAK:ENAB, SA:TRAC:PEAK:ENAB
set_analyzer_preamp_enable	RF:ANAL:REC:AMP
set_analyzer_rbw	CA:COUP:RBW:VAL, SA:COUP:RBW:VAL
set_analyzer_rbwauto	CA:COUP:RBW:AUTO, SA:COUP:RBW:AUTO
set_analyzer_source	CA:SOUR, SA:SOUR
set_analyzer_span	CA:HOR:FREQ:SPAN, SA:HOR:FREQ:SPAN
set_analyzer_startfreq	CA:HOR:FREQ:START, SA:HOR:FREQ:START
set_analyzer_startrel	CA:HOR:FREQ:START:REL
set_analyzer_stopfreq	CA:HOR:FREQ:STOP, SA:HOR:FREQ:STOP
set_analyzer_stoprel	CA:HOR:FREQ:STOP:REL
set_analyzer_sweep	CA:COUP:SWE:VAL, SA:COUP:SWE:VAL
set_analyzer_sweepauto	CA:COUP:SWE:AUTO, SA:COUP:SWE:AUTO
set_analyzer_sweepcont	INIT:CONT:CA, INIT:CONT:SA
set_analyzer_sweepsingle	INIT:IMM:CA, INIT:IMM:SA
set_analyzer_tos	CA:VERT:LEV, SA:VERT:LEV
set_analyzer_vbwauto	CA:COUP:VBW:AUTO, SA:COUP:VBW:AUTO
set_analyzer_vdiv	CA:VERT:VDIV, SA:VERT:VDIV
set_analyzer_videobw	CA:COUP:VBW:VAL, SA:COUP:VBW:VAL
set_antibpower_average	CONF:RF:ANAL:AIP:AVER
set_antibpower_llen	LIM:RF:AIP:LOW:ENAB
set_antibpower_llimit	LIM:RF:AIP:LOW:VAL
set_antibpower_ulen	LIM:RF:AIP:UPP:ENAB
set_antibpower_ulimit	LIM:RF:AIP:UPP:VAL

AutoTest Command	AutoTest II Command
set_audio_distortion_average	CONF:AF:ANAL:DIST:AVER
set_audio_distortion_ulen	LIM:AF:DIST:UPP:ENAB
set_audio_distortion_ulimit	LIM:AF:DIST:UPP:VAL
set_audio_filter	AF:ANAL:MFIL
set_audio_freq_average	CONF:AF:ANAL:FREQ:AVER
set_audio_hn_average	CONF:AF:ANAL:HN:AVER
set_audio_hn_llen	LIM:AF:HN:LOW:ENAB
set_audio_hn_llimit	LIM:AF:HN:LOW:VAL
set_audio_hn_lockref	CONF:AF:ANAL:HN:REF
set_audio_hn_ulen	LIM:AF:HN:UPP:ENAB
set_audio_hn_ulimit	LIM:AF:HN:UPP:VAL
set_audio_impedance	CONF:AF:ANAL:SOUR:LOAD
set_audio_level_average	CONF:AF:ANAL:LEV:AVER
set_audio_level_llen	LIM:AF:LEV:LOW:ENAB
set_audio_level_llimit	LIM:AF:LEV:LOW:VAL
set_audio_level_ulen	LIM:AF:LEV:UPP:ENAB
set_audio_level_ulimit	LIM:AF:LEV:UPP:VAL
set_audio_port	CONF:PORT:FGEN
set_audio_psoph_filter	CONF:AF:MFIL:TYP
set_audio_sinad_average	CONF:AF:ANAL:SIN:AVER
set_audio_sinad_llen	LIM:AF:SIN:LOW:ENAB
set_audio_sinad_llimit	LIM:AF:SIN:LOW:VAL
set_audio_snr_average	CONF:AF:ANAL:SNR:AVER
set_audio_snr_llen	LIM:AF:SNR:LOW:ENAB
set_audio_snr_llimit	LIM:AF:SNR:LOW:VAL
set_audio_snr_mode	CONF:AF:ANAL:SNR
set_audio_snr_ulen	LIM:AF:SNR:UPP:ENAB
set_audio_snr_ulimit	LIM:AF:SNR:UPP:VAL
set_audio_source	CONF:AF:ANAL:SOUR
set_fgen_ch0_enable	AF:GEN:SOUR1:ENAB
set_fgen_ch0_freq	AF:GEN:SOUR1:SINE:FREQ, AF:GEN:SOUR1:SQU:FREQ
set_fgen_ch0_level	AF:GEN:SOUR1:LEV
set_fgen_ch0_type	AF:GEN:SOUR1:SHAP
set_fgen_ch1_enable	AF:GEN:SOUR2:ENAB
set_fgen_ch1_freq	AF:GEN:SOUR2:SINE:FREQ, AF:GEN:SOUR1:SQU:FREQ
set_fgen_ch1_level	AF:GEN:SOUR2:LEV
set_fgen_ch1_type	AF:GEN:SOUR2:SHAP
set_fgen_ch2_enable	AF:GEN:SOUR3:ENAB
set_fgen_ch2_freq	AF:GEN:SOUR3:SINE:FREQ, AF:GEN:SOUR1:SQU:FREQ
set_fgen_ch2_level	AF:GEN:SOUR3:LEV
set_fgen_ch2_type	AF:GEN:SOUR3:SHAP
set_ptt_out	CONF:RF:GEN:PTTOUT
set_rferror_freqoff_average	CONF:RF:ANAL:FOFF:AVER
set_rferror_freqoff_ulen	LIM:RF:FOFF:UPP:ENAB

AutoTest Command	AutoTest II Command
set_rferror_freqoff_ulimit	LIM:RF:FOFF:UPP:VAL
set_rferror_resolution	CONF:RF:ANAL:FRES
set_rfgen_enable	RF:GEN:ENAB
set_rfgen_freq	RF:GEN:FREQ
set_rfgen_level	RF:GEN:LEV
set_rfgen_offseten	CONF:OFFS:GEN:ENAB
set_rfgen_port	RF:GEN:PORT
set_rfrec_freq	RF:ANAL:FREQ
set_rfrec_offseten	CONF:OFFS:ANAL:ENAB
set_rfrec_port	RF:ANAL:PORT
set_scope_marker1enable	SCOP:MKR1:ENAB
set_scope_marker2enable	SCOP:MKR2:ENAB
set_scope_sweeprate	SCOP:HDIV
set_scope_traceacoupling	SCOP:ATR:COUP
set_scope_tracealevel	SCOP:ATR:VDIV
set_scope_traceaposition	SCOP:ATR:VPOS
set_scope_traceasource	SCOP:ATR:SOUR
set_scope_tracebcoupling	SCOP:BTR:COUP
set_scope_traceblevel	SCOP:BTR:VDIV
set_scope_tracebposition	SCOP:BTR:VPOS
set_scope_tracebsource	SCOP:BTR:SOUR
set_scope_trigedge	SCOP:TRIG:EDGE
set_scope_trigfilter	SCOP:TRIG:FILT
set_scope_triglevel	SCOP:TRIG:LEV
set_scope_trigmode	SCOP:TRIG:MODE
set_scope_trigsource	SCOP:TRIG:SOUR
set_trbbpower_average	CONF:RF:ANAL:TRBP:AVER
set_trbbpower_llen	LIM:RF:TRBP:LOW:ENAB
set_trbbpower_llimit	LIM:RF:TRBP:LOW:VAL
set_trbbpower_ulen	LIM:RF:TRBP:UPP:ENAB
set_trbbpower_ulimit	LIM:RF:TRBP:UPP:VAL
set_trbbpower_zero	RF:POWER:DETECTOR:ZERO
set_tribpower_average	CONF:RF:ANAL:TRIP:AVER
set_tribpower_llen	LIM:RF:TRIP:LOW:ENAB
set_tribpower_llimit	LIM:RF:TRIP:LOW:VAL
set_tribpower_ulen	LIM:RF:TRIP:UPP:ENAB
set_tribpower_ulimit	LIM:RF:TRIP:UPP:VAL
sw_pause	PAUSE
swflowcontrol_usb_to_serial	USBTOSER:SWFL
termination_usb_to_serial	USBTOSER:TERM
test_amfmdemod_amlevel	test_demod_am
test_amfmdemod_fmdev	test_demod_fm 0
test_amfmdemod_fmrms	test_demod_fm 1
test_amfmmod_distortion	test_demod_dist
test_amfmmod_hn	test_demod_hn
test_amfmmod_sinad	test_demod_sinad
test_amfmmod_snr	test_demod_snr

AutoTest Command	AutoTest II Command
test_antib_power	test_aib_power
test_audio_distortion	test_audio_dist
test_audio_hn	test_audio_hn
test_audio_level	test_audio_level
test_audio_sinad	test_audio_sinad
test_audio_snr	test_audio_snr
test_bb_power	test_trbb_power
test_freq_error	test_freq_error
test_trib_power	test_trib_power
timeout_usb_to_serial	USBTOSER:TIMEOUT
write_usb_to_serial	USBTOSER:WRITE

Chapter 7

Radio Test Instruments

Introduction

This chapter explains the use of the 3900 Spectrum Analyzer, Channel Analyzer, Audio Analyzer and Oscilloscope Instruments. This chapter is intended for users familiar with the general principles and use of these instruments.

NOTE

The Audio Analyzer is an optional feature (390XOPT055) and is only available when option 390XOPT055 has been installed in the Test Set.

Channel Analyzer

The Channel Analyzer is an asynchronous, swept analyzer that displays the spectrum of the RF signal received by the Test Set over a 5 MHz bandwidth centered on the Rx frequency. The source of the signal for the Channel Analyzer is the receiver chain of the Test Set. Refer to Appendix B, 3900 Platform Specifications for the Channel Analyzer's operating parameters.

NOTE

The Channel Analyzer shares the RF path from the connector to the receiver. Therefore the Channel Analyzer is dependent on the receiver for connector selection, global attenuation and center frequency (within ±2.5 MHz of the received center frequency).

Basic Settings

The frequency span of the display must include the RF Frequency being examined. The Reference Level of the display must be set so that the RF signal level falls within the display area. The Channel Analyzer Tile can be used in minimized or maximized view.

Accessing the Channel Analyzer

The Channel Analyzer is accessed from the drop-down menus on System Test Measurements Tiles. Refer to Chapter 3, Test Set Operation for information on accessing system menus.

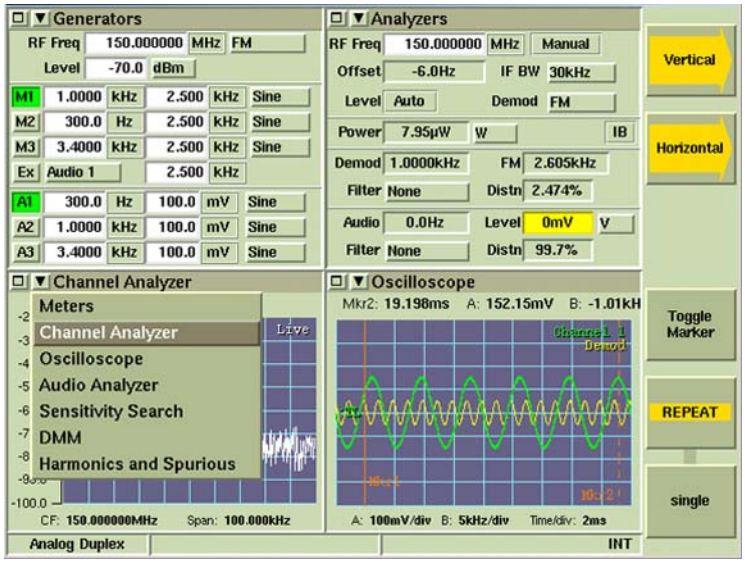

Fig. 7-1 Accessing the Channel Analyzer

Channel Analyzer Tile Layout

The Channel Analyzer can be viewed in minimized and maximized view. Fig. 7-2 the maximized view of the Channel Analyzer. Fig. 7-15 shows the Channel Analyzer when minimized. Soft Keys on the right side of the display provide access to settings not available on the main tile.

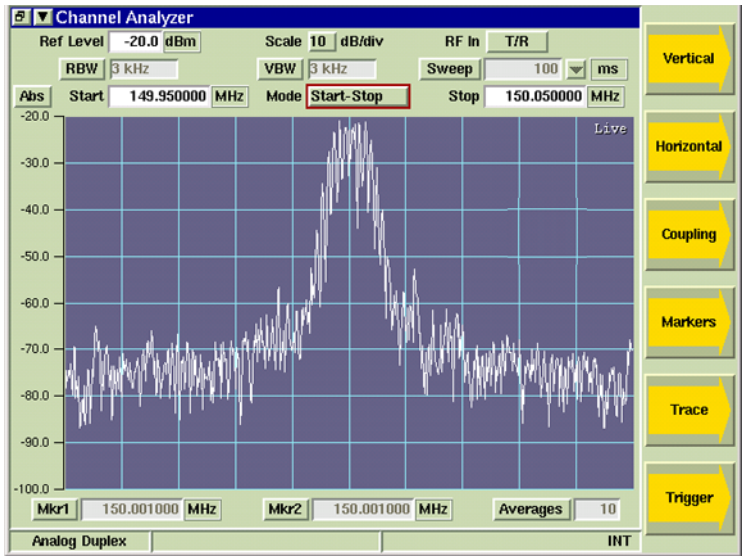

Fig. 7-2 Channel Analyzer Tile - Maximized View

Field/Soft Key Definitions

Reference Level

The Reference Level is the top value on the display grid. Power levels can be measured at any point on the trace in conjunction with the Scaling dB/div setting. The Reference Level can be set to any value within the specified range. The Reference Level is set by:

- Using the [Expand] and [Contract] Soft Keys to make step changes.
- Selecting the data field and using the Rotary Control Knob to adjust the level.
- Selecting the data field and using the Data Entry Input Keys to enter specific level.

Scaling dB/div

The Scaling drop-down menu selects from a range of 1, 2, 5, or 10. The scaling value (dB/div) can then be increased or decreased using the [Expand] or [Contract] Soft Keys.

RF In (Source)

Selects the RF In connector (T/R Connector or ANT (Antenna) Connector).

RBW (Resolution Bandwidth) Toggle Button

Selects RBW bandwidth mode of operation. When Auto is selected, RBW is system defined to a value appropriate to the signal type being displayed. When Manual is selected, a drop-down menu becomes accessible which allows user to select from three defined bandwidth settings. This toggle button is linked to the [Res BW] (Resolution Bandwidth) Soft Key which can also be used to define the RBW setting which functions in the same manner.

VBW (Video Bandwidth) Toggle Button

Selects VBW bandwidth mode of operation. When Auto is selected, VBW is system defined to a value appropriate to the signal type being displayed. When Manual is selected, a drop-down menu becomes accessible which allows user to select from a list of defined bandwidth settings. This toggle button is linked to the [Vid BW] (Video Bandwidth) Soft Key which can also be used to define the VBW setting which functions in the same manner.

Sweep Toggle Button

Selects Sweep Time mode of operation. When Auto is selected, the Sweep Time is system defined to a value appropriate to the signal type being displayed. When Manual is selected, a drop-down menu becomes accessible which allows user to select from a list of defined Sweep Time settings. This toggle button is linked to the [Sweep Time] Soft Key which can also be used to define the Sweep Time setting which functions in the same manner.

Mode

Drop-down menu selects the span mode used to define the displayed signal trace. Available options are Start-Stop Mode, Center-Span Mode and Zero-Span Mode.

Start - Stop

Start-Stop Span Mode uses the sweep Start and Stop frequencies to define the span. Fig. 7-3 shows an RF signal displayed from 149.950000 MHz to 150.050000 MHz as defined by the Start and Stop values.

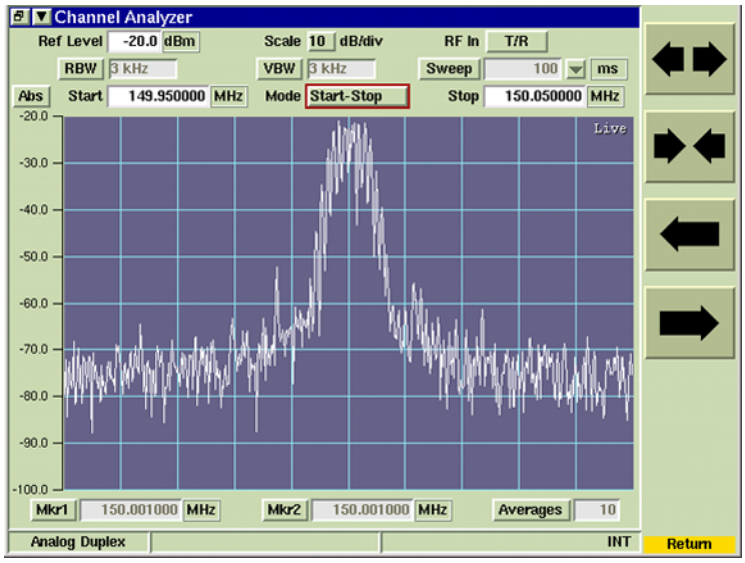

Fig. 7-3 Channel Analyzer Start and Stop Frequency Setting

Center - Span

Center-Span Mode uses the sweep Center frequency value and span setting to define the frequency span. The maximum span of the Channel Analyzer display is 5 MHz, which is equal to the channel width of the Test Set receiver. Fig. 7-4 shows the center frequency set to 150.000000 MHz, which is the frequency of the RF Channel to which the Test Set Receiver is tuned. The Span is set to 100.0 kHz.

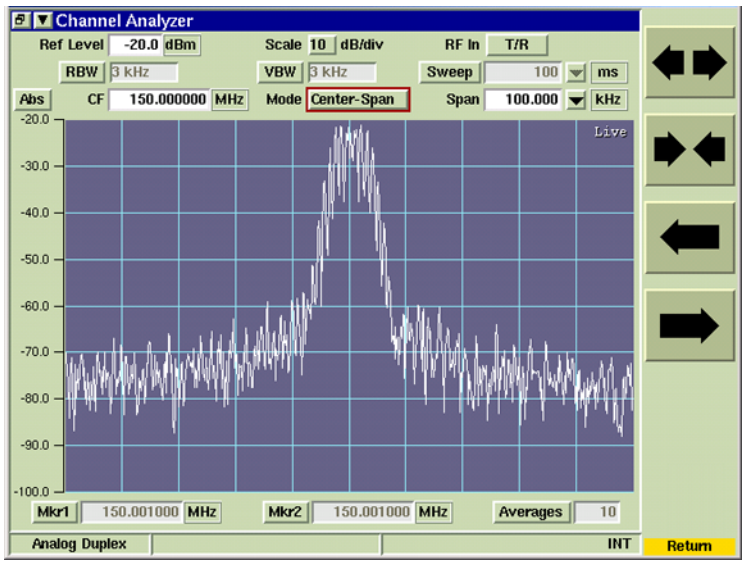

Fig. 7-4 Channel Analyzer Center Frequency and Span Setting

Zero - Span

In Zero Span Mode the Channel Analyzer does not perform a frequency sweep: it detects the power level at the set frequency. The trace shows detected power against time.

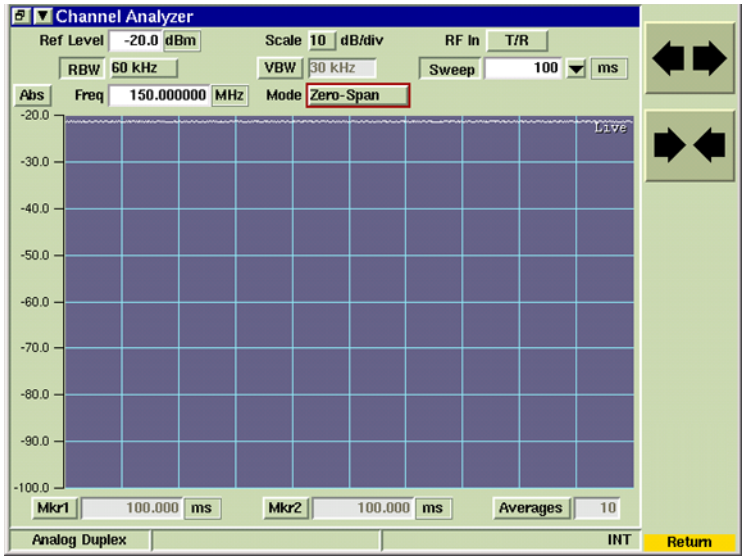

Fig. 7-5 Channel Analyzer Zero Span Example

ABS (Absolute)

When Abs is selected the value displayed in the CF field is the received frequency.

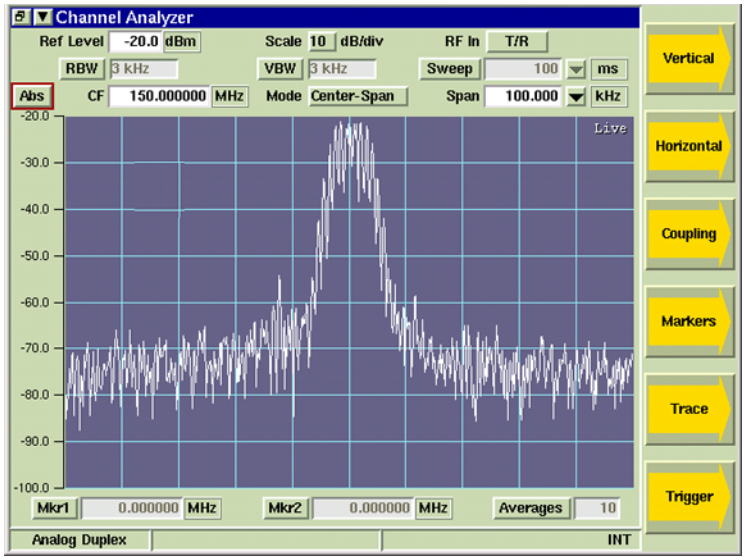

Fig. 7-6 Channel Analyzer Absolute Setting

Rel (Relative)

When Rel is selected the value displayed in the CF field is relative to the received frequency.

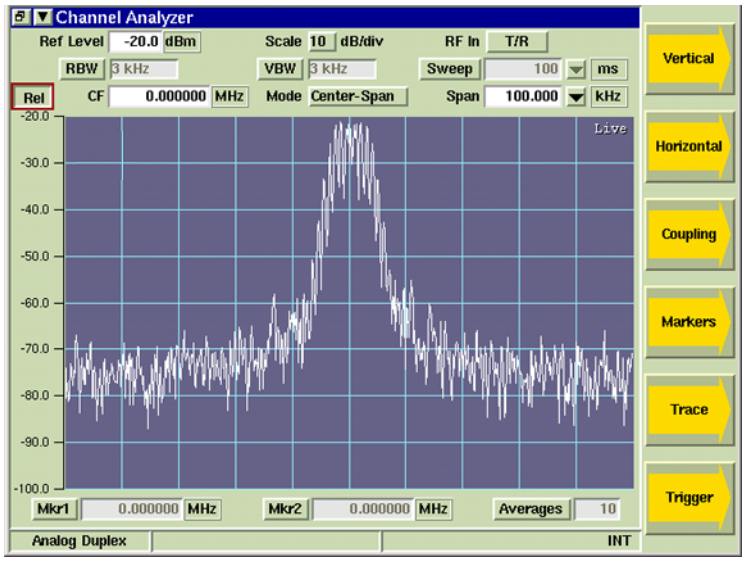

Fig. 7-7 Channel Analyzer Relative Setting

Span

When Center-Span Mode is selected, signal span can be adjusted by selecting a defined value from the Span drop-down menu or by selecting the Span data entry field and entering an arbitrary value. Span can also be adjusted using the [Expand/Contract] Soft Keys.

Mkr1 / Mkr2

The Mkr1 and Mkr2 toggle buttons enable Marker 1 and Marker 2. When Markers are enabled, marker data fields can be edited to define marker position. Refer to section titled [Markers] Soft Key for additional information on configuring markers.

Averages

Enables Average measurements. Refer to section titled [Trace] Soft Key for additional information on Average measurements.

[Vertical] Soft Key

The [Vertical] Soft Key accesses scaling and positioning controls that adjust the trace's position on the display. The up/down arrow keys move the signal trace up or down on the display, simultaneously adjusting the Reference Level. The [Expand/Contract] Soft Keys adjust the height of the signal trace, which can also be changed using the Scaling dB/div drop-down menu.

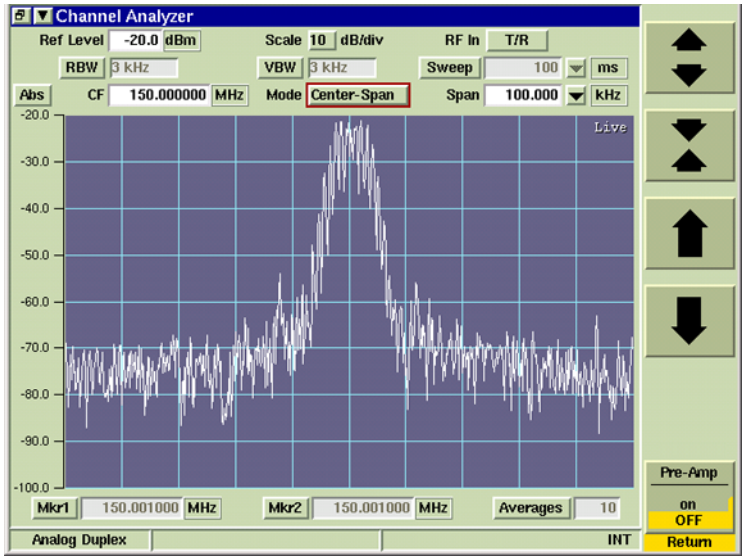

Fig. 7-8 Channel Analyzer - Ref Level and Scale Settings

[Horizontal] Soft Key

The [Horizontal] Soft Key accesses a group of soft keys that adjust the horizontal scaling and position of the signal. The left/right arrow keys move the trace right or left on the display field, which simultaneously adjusts the Center Frequency or Start/Stop Frequency, depending on selected span mode. The [Expand/Contract] Soft Keys adjust the span of the trace, which can also be adjusted by changing the Span setting.

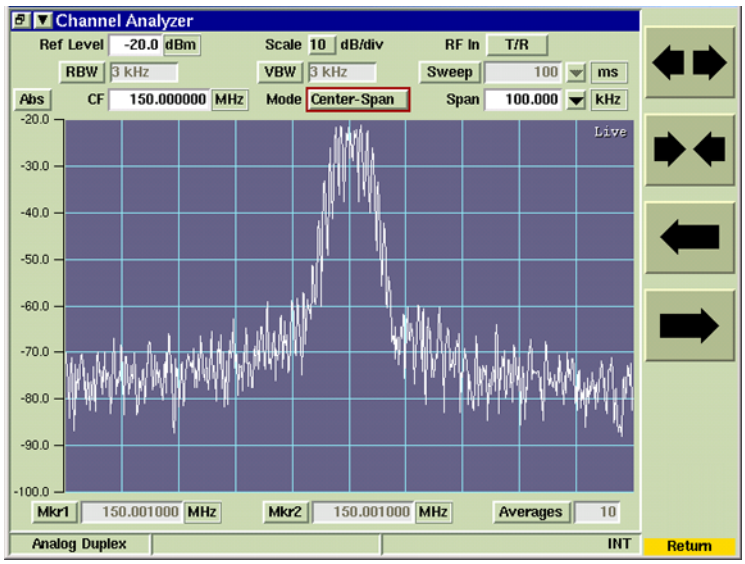

Fig. 7-9 Channel Analyzer Start and Stop Frequency Setting

[Coupling] Soft Key

Accesses a Soft Key sub-menu that allows user to define Resolution and Video Bandwidths as well as Sweep Time.

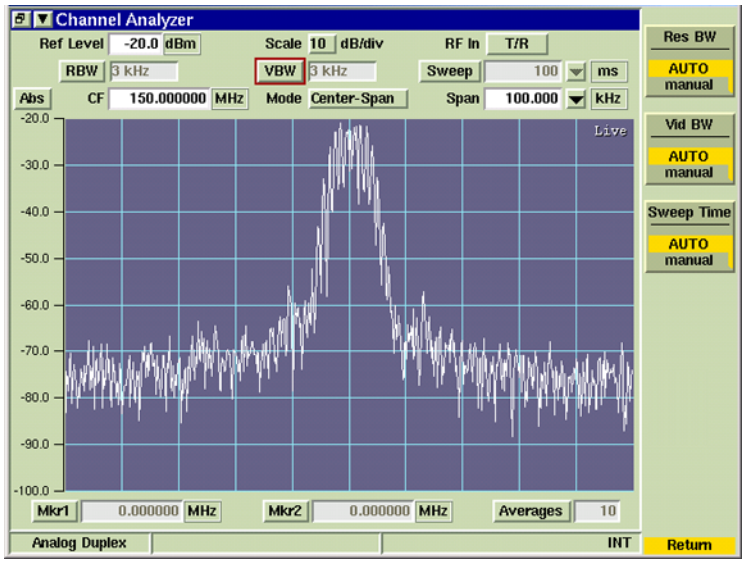

Fig. 7-10 Channel Analyzer Coupling Soft Key Menu

RBW, VBW and Sweep Time are all interdependent and govern the usefulness of a Channel Analyzer trace. These Soft Keys are controlled by inter-related action so that changing the value of one changes one or both of the others to optimize the display and prevent an invalid setting.

RBW, VBW and Sweep Time can be set to AUTO or MANUAL operation.

NOTE

For many applications, setting all three parameters to AUTO provides a useful representation of the signal to be examined. However, parameters can be set to specific requirements, allowing the Test Set to select the optimum setting for the other two parameters according to internal setup tables.

[Res BW] (Resolution Bandwidth) Soft Key

Sets the bandwidth of the IF filter. Resolution is the ability of the Channel Analyzer to discriminate between signals closely separated in frequency. For example, if two tones are analyzed, the Channel Analyzer is only able to discriminate between them if the resolution bandwidth selected is narrower than the tone separation. Filter selection becomes more critical if the tones are at different levels. Narrow resolution bandwidth also results in lower noise on the trace.

Power Measurement

When using the Channel Analyzer to perform power measurements, the Resolution Bandwidth must be set to a value equal or greater than the bandwidth of the signal being measured.

[Vid BW] (Video Bandwidth) Soft Key

To view signals close to the noise level, a low pass filter (called the video filter) is introduced after the detector. The Video Bandwidth is the high frequency cutoff point of the filter. The video filter reduces high frequency noise on the detected signal and enables low level signals to be identified that would otherwise be buried in the noise.

[Sweep Time] Soft Key

The Sweep Time setting defines how quickly trace data is acquired and updated to the display. This setting must be fast enough to provide quick measurement results, but slow enough to allow the power values at each point to be measured. When set to AUTO, the Test Set optimizes the Sweep Time. When set to MANUAL, a defined Sweep Time setting can be selected from the drop-down menu or an arbitrary value can be entered by selecting the Sweep Time data field.

When Sweep Time is set to 1 second or longer, a white progress bar is shown across the bottom of the graph field while the sweep is accumulating as shown in Fig. 7-11. The yellow progress bar at the upper right corner of the graph field is the average progress indicator.

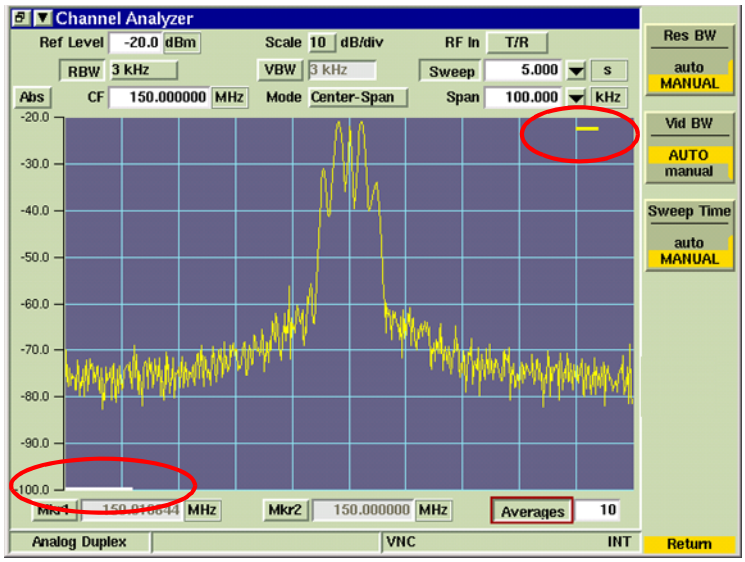

Fig. 7-11 Channel Analyzer Sweep and Averaging Progress Bars

[Markers] Soft Key

The [Markers] Soft Key accesses a group of soft keys that provide additional marker functions. Marker(s) must be enabled to use some of these functions. To define marker position:

1. Enable marker(s) using the Mkr1 / 2 toggle buttons or by pressing the [Marker1 / 2] Soft Key(s).
2. Select Mkr1 / 2 data field and adjust marker position using any of the following methods:
   - By focusing on the Mkr1 or Mkr2 field and entering a new value in the data field;
   - By focusing on the Mkr1 or Mkr2 field and using the Rotary Control Knob to move the selected marker to a new reference point. Setting three or four significant figures in the settings box makes adjusting the marker position easier when using the Rotary Control Knob. If the markers are locked, moving either marker moves the other marker.
   - (Mouse option) By focusing on the Mkr1 or Mkr2 field and using a mouse to click and drag the selected marker to the desired location on the display field.
   - [Mkr 1 / Mkr 2] Soft Keys access additional soft keys (refer to Fig. 7-12) that also adjust marker position on the display field.

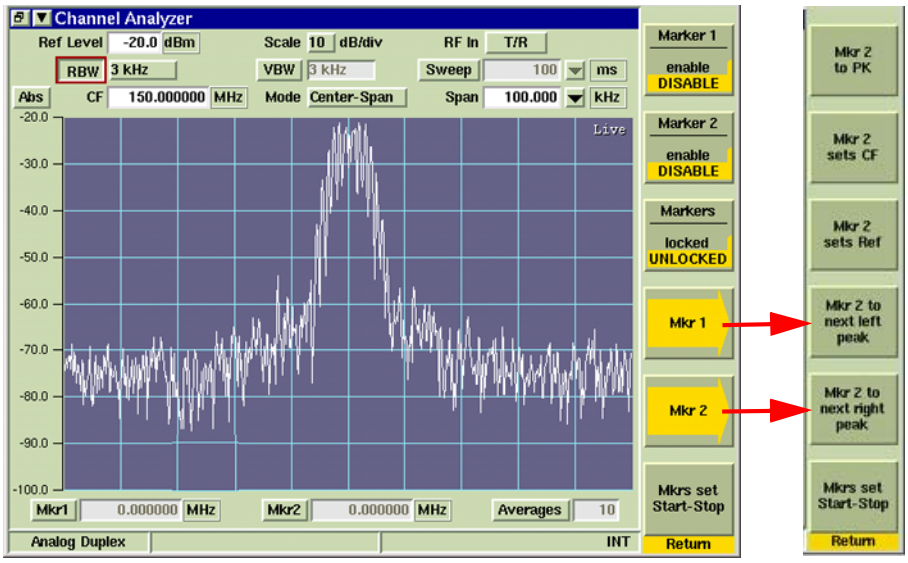

Fig. 7-12 Channel Analyzer Markers Soft Key Menu

[Marker 1/Marker 2] Soft Key

Enables or disables markers displayed on the Channel Analyzer graph. Markers can also be enabled using the Mkr1 / Mkr2 toggle buttons.

[Marker locked/unlocked] Soft Key

When Marker 1 and Marker 2 are both enabled, LOCKED sets the markers at the current frequency spacing. When the markers are LOCKED, moving either of the markers also moves the other marker while maintaining the current frequency spacing. Enable and define BOTH Markers prior to selecting LOCKED state since Markers maintain spacing that is defined when LOCKED is enabled. UNLOCKED removes the link between markers.

[Mkr 1 / Mkr 2] Soft Key

Opens a Soft Key sub-menu that provides automatic marker functions. Markers must be enabled to use automatic marker functions. This soft key is accessed by pressing the [Markers] Soft Key.

[Mkr 1 (or 2) to PK] Soft Key

Moves Marker 1 or 2 to the position of the peak value shown on the current trace. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) Sets CF] Soft Key

Sets the Center frequency to the reading at Marker 1 or Marker 2. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) Sets Ref] Soft Key

Sets the Ref Level to the value of Marker 1 or 2 level measurement, with no headroom or offset value. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) to Next Left Peak]

Moves Marker 1 or 2 to the next peak to the left of the present Marker 1 or 2 position. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) to Next Right Peak]

Moves Marker 1 or 2 to the next peak to the right of the present Marker 1 or 2 position. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkrs Set Start-Stop] Soft Key

Sets the left edge of the trace to the frequency value of Marker 1 and the right edge of the trace to the frequency value of Marker 2. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Trace] Soft Key

The [Trace] Soft Key accesses trace display control functions to allow users to obtain average and peak measurements and to capture traces being displayed on the Channel Analyzer Tile.

Trace Color

Trace types being displayed on the graph are listed in the upper right corner of the graph field. The traces are color-coded to identify trace types. Fig. 7-13 shows Average, Peak Hold and Captured traces displayed on the Channel Analyzer.

- Live traces are White.
- Peak hold traces are Red.
- Averaged traces are Yellow.
- Captured traces are Green.

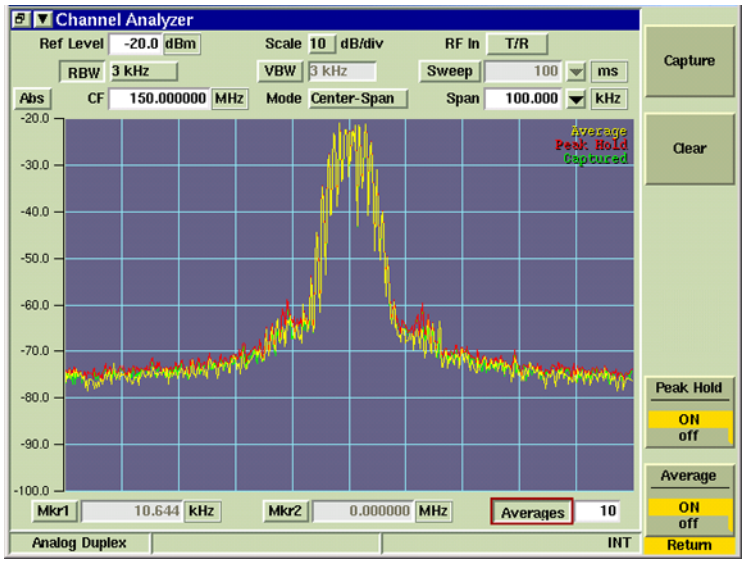

Fig. 7-13 Channel Analyzer Trace Soft Key

[Capture] Soft Key

When [Capture] is selected the current trace is held on the display. To resume normal sweep operation select the [Clear] Soft Key. The [Clear] Soft Key disappears until [Capture] is pressed again. This soft key is accessed by pressing the [Trace] Soft Key.

A captured trace can be saved by pressing the HOLD Key, then selecting the [Save As] Soft Key. Refer to Chapter 3, section titled Store/Recall Tile for additional information on saving and storing files.

[Clear] Soft Key

Clears the current captured trace and resumes display of Live trace. This Soft Key is only visible when a trace is in "Captured" state.

[Peak Hold] Soft Key

When [Peak Hold ON] is selected, the maximum value at each frequency point is displayed to produce the **RED** Max Hold trace (refer to Fig. 7-13). This trace is cleared by selecting [Peak Hold OFF]. Peak Hold must be reset (toggled ON/OFF) when Average readings are Enabled/ Disabled. The white Live trace is also displayed and can be averaged depending on the current setting. This soft key is accessed by pressing the [Trace] Soft Key.

[Average] Soft Key

When [Average ON] is selected, the trace is calculated by averaging the number of measurements defined in the Averages field. The calculated value is a rolling average or a one-shot average as defined on the Trigger Tile using the [Repeat] Soft Key and [Single] Soft Key. A yellow progress indicator is displayed in the upper right corner of the graph field while the average reading is accumulating (refer to Fig. 7-11). This soft key is accessed by pressing the [Trace] Soft Key.

[Trigger] Soft Key

The [Trigger] Soft Key accesses features to control how the trace is triggered. The Channel Analyzer trace is configured to free run repetitively.

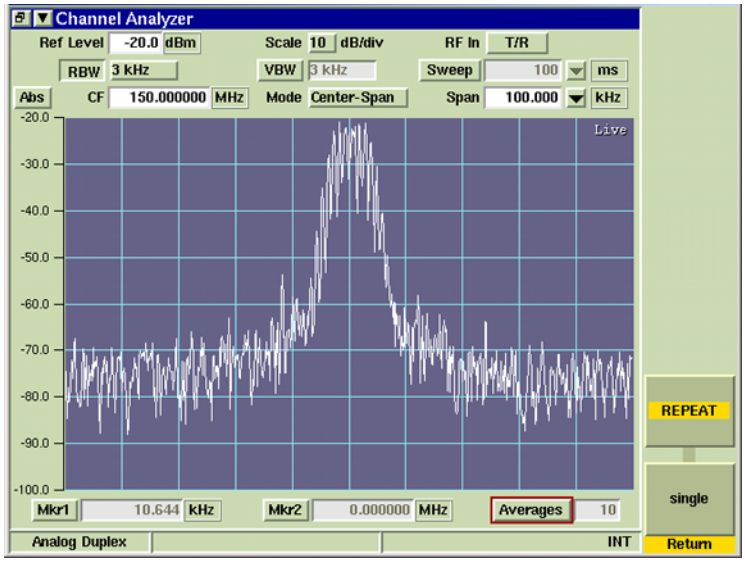

Fig. 7-14 Channel Analyzer with Trigger Soft Keys

[Repeat] Soft Key

When [Repeat] is selected the trace runs repeatedly. The [Repeat] and [Single] Soft Keys define the trace display averaging calculations.

When [Average] Soft Key is set to ON, pressing [Repeat] clears the last averaged trace and initiates a new averaged trace. This soft key is accessed by pressing the [Trigger] Soft Key.

[Single] Soft Key

Places the trace in Single Sweep Mode. If [Average] Soft Key on the Trace Display Tile is set to ON, and [Single] is selected, a single trace is initiated when the trigger conditions are met. This soft key is accessed by pressing the [Trigger] Soft Key.

Minimized View

The minimized view of the Channel Analyzer Tile is shown in Fig. 7-15. The [Toggle Marker] Soft Key is available when the Channel Analyzer is minimized.

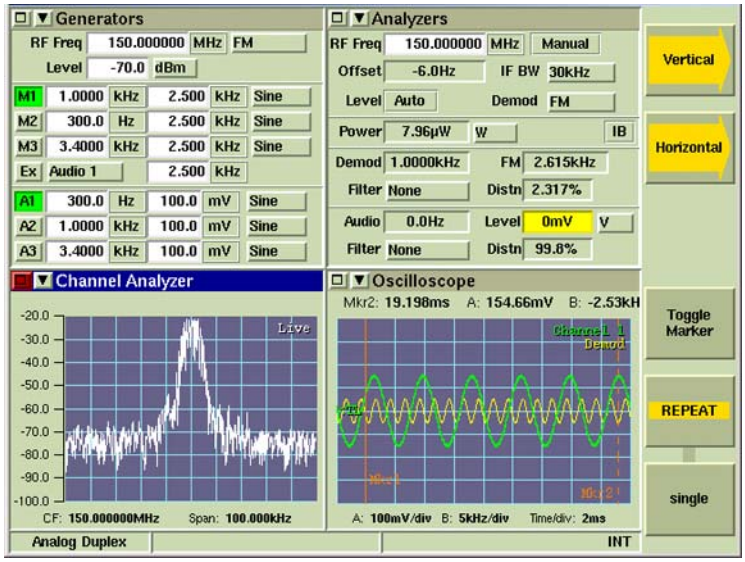

Fig. 7-15 Channel Analyzer Tile - Minimized View

[Toggle Marker] Soft Key

Controls the marker readings displayed at the top of the minimized Tile. Each press of this Soft Key changes the source of the measurements through Mkr1, Mkr2 and Delta readouts. Fig. 7-16 shows the marker data displayed on the Tile each time [Toggle Marker] is pressed. When the Channel Analyzer is minimized, press Toggle Marker once to change from Marker 1 to Marker 2 readings; press Toggle Marker again to display Marker Delta readings. Both markers must be defined to obtain measurements when this button is pressed.

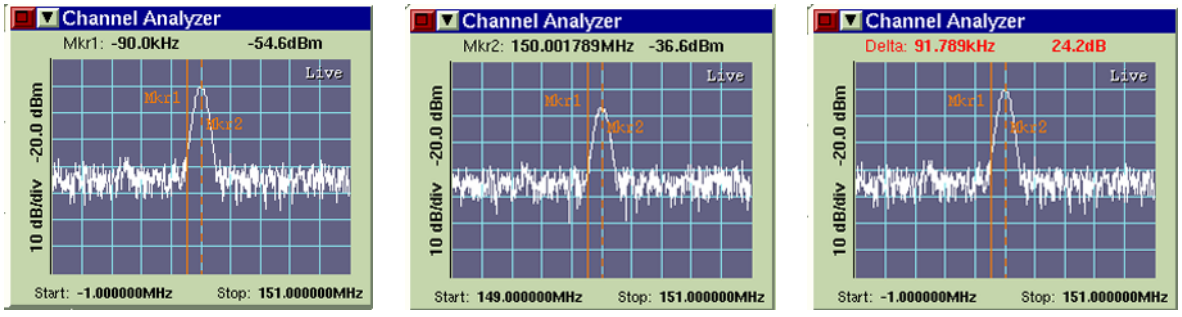

Fig. 7-16 Toggle Marker - Change in Displayed Data

Oscilloscope

The Oscilloscope provides a two channel oscilloscope for examining AF waveforms. Input signals can be routed from the CH1 and CH2 Connectors to either Trace A or Trace B trace options. Refer to the 3900 Platform Specifications for the Oscilloscope's operating parameters.

Basic Settings

The Oscilloscope can be viewed in minimized or maximized view when it is selected from a Test Measurement menu.

The Source and Coupling can be set differently for each trace. The second row of data at the top of the Tile shows the Trace Trigger settings. These settings are accessed by pressing the [Trigger] Soft Key. Auto or Normal modes of triggering can be selected and configured to respond to a rising or falling input voltage.

Accessing the Oscilloscope

The Oscilloscope is accessed from the drop-down menu on the System Test Measurements Tiles (refer to Fig. 7-17). Refer to Chapter 3, Test Set Operation for information on accessing system menus.

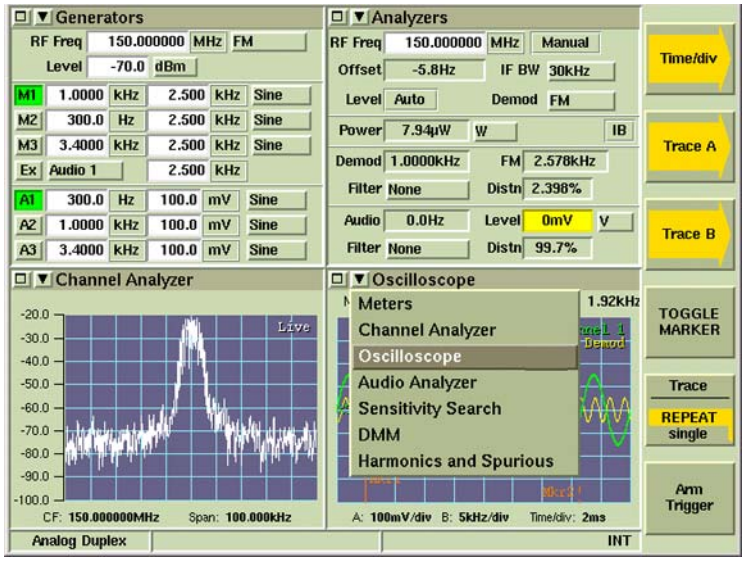

Fig. 7-17 Accessing the Oscilloscope

Oscilloscope Tile Layout

The Oscilloscope, referred to as the Scope, can be viewed in minimized and maximized view. Fig. 7-18 shows the maximized view of the Scope. Fig. 7-25 shows the Scope when minimized. Note that the Soft Keys change between maximized and minimized views.

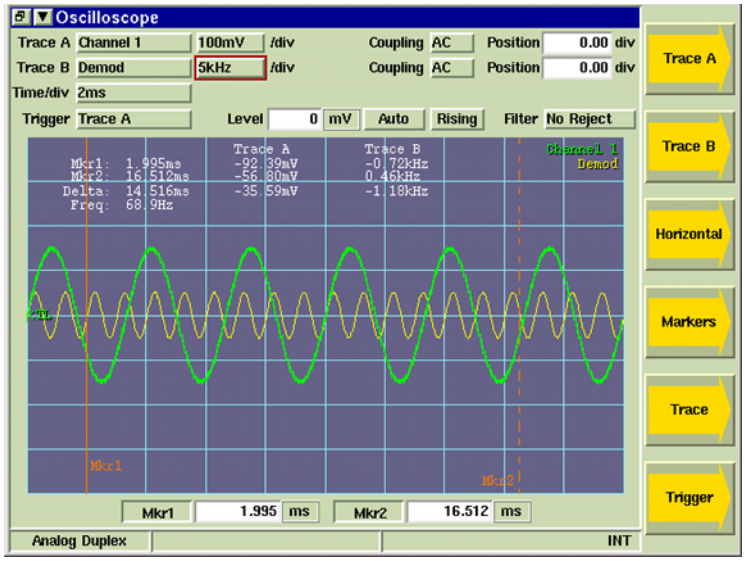

Fig. 7-18 Oscilloscope Tile - Maximized View

Field/Soft Key Definitions

Trace A / Trace B

These soft keys access additional soft keys that adjust scaling and positioning of Trace A and Trace B. The up/down arrow keys move the signal trace up or down on the display, simultaneously adjusting the Position value. The [Expand / Contract] Soft Keys adjust the height of the signal trace, which can also be changed using the n/div drop-down menu.

n/div

Drop-down menu selects the vertical scale of the trace. The scale can also be increased or decreased using the [Expand / Contract] Soft Keys. The scale unit of measurement changes according to type of measurement being performed (refer to Fig. 7-19).

Coupling

Selects how the signal is connected to the Test Set.

AC: Signal is connected to the Test Set through a capacitor that removes the CD component.

DC: Signal is connected directly to the Test Set.

GND: Signal is grounded; GND is typically used to set a reference.

Position

Adjusts vertical position of trace on the display field.

Time /div

The Time/div drop-down menu sets the Scope's timebase repetition. The timebase repetition rate setting can be increased or decreased by using the [Expand] or [Contract] Soft Keys.

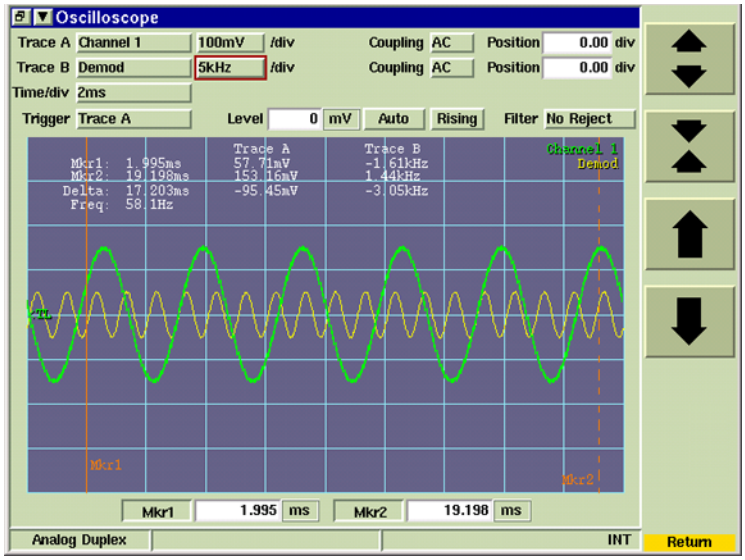

Fig. 7-19 Oscilloscope Tile - Vertical Settings

Trigger

Selects Trigger source as Trace A, Trace B or the External Trigger Signal Input Connector.

Level

Sets a voltage or percent value for the trace trigger level. The trigger level point is indicated by a green TL flag on the left of the display.

Auto/Normal

Selects the Trigger mode of operation. When NORMAL is selected the trace is triggered when the trace passes through the Trigger Level value. When AUTO is selected the trace 'free runs' at the rate determined by the Time /div setting.

Rising/Falling

When RISING is selected the trace triggers when the trace passes the trigger set level as it increases in value. When FALLING is selected the trace triggers when the traces passes the trigger set level as it decreases in value.

Filter

Selects amount of noise, if any, to be filtered from the trigger path.

No Reject: No noise is filtered from trigger path.

Noise Reject: Filters medium level noise from trigger path.

HF Reject: Filters High Frequency noise from trigger path.

Mkr1 / Mkr2

Toggle buttons enable Marker 1 and Marker 2. When Markers are enabled, marker data fields can be edited to define marker position. Refer to section titled [Markers] Soft Key for additional information on configuring markers.

[Horizontal] Soft Key

The [Horizontal] Soft Key accesses a set of soft keys that adjust the horizontal position of the trace on the display. The horizontal scale can be adjusted using the [Expand / Contract] Soft Keys or by changing the Time /div setting. When the [Expand / Contract] Soft Keys are pressed the Time/div value is simultaneously updated.

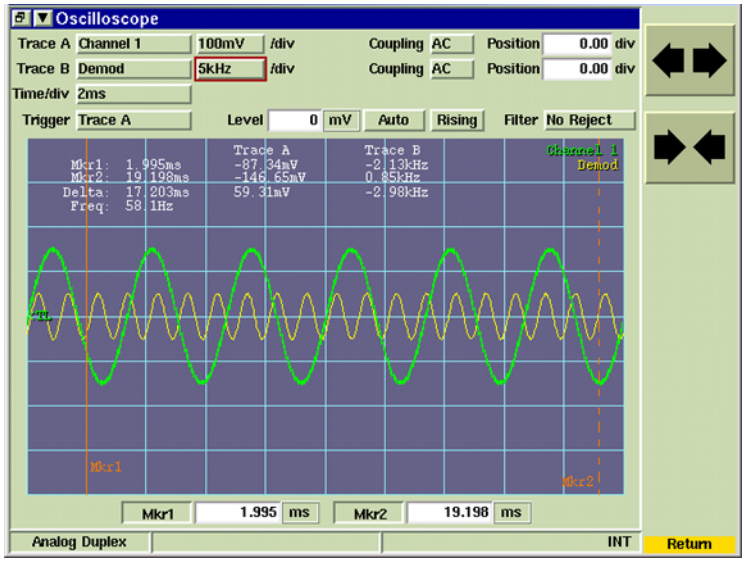

Fig. 7-20 Scope [Expand / Contract] Soft Keys

[Markers] Soft Key

The [Markers] Soft Key accesses a group of soft keys that provide additional marker functions. Marker(s) must be enabled to use some of these functions. To define marker position:

1. Enable marker(s) using the Mkr1 / 2 toggle buttons or by pressing the [Marker 1 / Marker 2] Soft Key(s).
2. Select Mkr1 / 2 data field and adjust marker position using any of the following methods:
   - By focusing on the Mkr1 or Mkr2 settings box and entering a new value in the data field;
   - By focusing on the Mkr1 or Mkr2 field and using the Rotary Control Knob to move the selected marker to a new reference point. Setting three or four significant figures in the settings box makes adjusting the marker position easier when using the Rotary Control Knob. If the markers are locked, moving either marker moves the other marker.
   - (Mouse option) By focusing on the Mkr1 or Mkr2 field and using a mouse to click and drag the selected marker to the desired location on the display field.

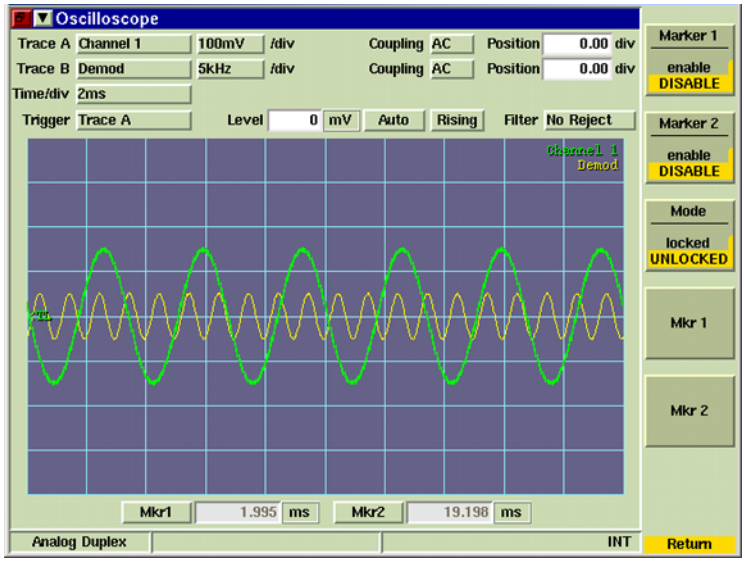

Fig. 7-21 Oscilloscope Marker Soft Keys

[Marker 1/Marker 2] Soft Key

Enables or disables markers displayed on the Oscilloscope graph. These soft keys are linked to the Mkr1 / Mkr2 toggle buttons.

[Mode] Soft Key

When Marker 1 and Marker 2 are both enabled, LOCKED sets the markers at the current frequency spacing. When the markers are LOCKED, moving either of the markers also moves the other marker while maintaining the current frequency spacing. Enable and define BOTH Markers prior to selecting LOCKED state since Markers maintain spacing that is defined when LOCKED is enabled. UNLOCKED removes the link between markers.

[Mkr 1 and Mkr 2] Soft Key

Pressing the [Mkr1] or [Mkr2] Soft Key(s) selects the corresponding marker data field which can then be edited. Marker(s) must be enabled to use this feature.

[Trace] Soft Key

The [Trace] Soft Key accesses the [Capture] Soft Key and [Accumulate] Soft Key as shown in Fig. 7-22.

Trace Color

Trace types being displayed on the graph are listed in the upper right corner of the graph field. The traces are color-coded to identify trace types. The in Fig. 7-22 shows Trace A (Green) and Trace B (Yellow).

- Live and Averaged Trace A are Green.
- Live and Averaged Trace B are Yellow.
- Captured Trace A is Blue.
- Captured Trace B is Purple.

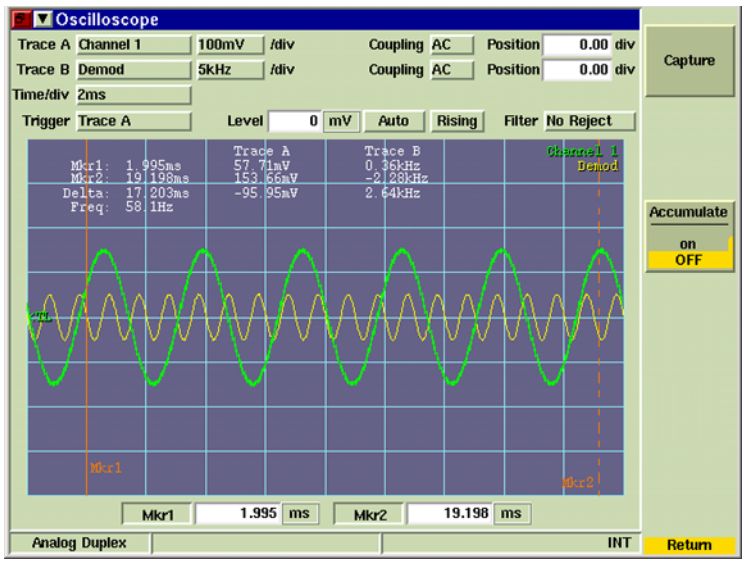

Fig. 7-22 Oscilloscope Trace Soft Keys

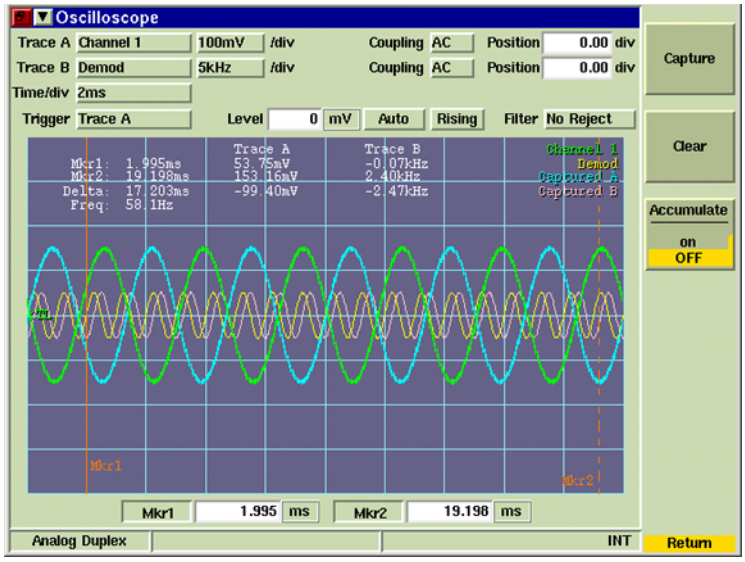

Fig. 7-23 Oscilloscope Captured Traces

[Capture] Soft Key

When [Capture] is selected the current trace is held on the display and the [Clear] Soft Key appears. To resume normal sweep operation select the [Clear] Soft Key. The [Clear] Soft Key disappears until [Capture] is pressed again. This soft key is accessed by pressing the [Trace] Soft Key.

A captured trace can be saved by pressing the HOLD Key, then selecting the [Save As] Soft Key. Refer to Chapter 3, section titled Store/Recall Tile for additional information on saving and storing files.

[Clear] Soft Key

Clears the current captured trace and resumes display of Live trace. This Soft Key is only visible when a trace is in “Captured” state.

[Accumulate] Soft Key

When [Accumulate] is ON, the trace is not cleared at the end of each sweep, showing each subsequent trace on the display. The accumulation continues until the [Accumulate] Soft Key is turned OFF. OFF clears the accumulated traces and resumes display of a single trace.This soft key is accessed by pressing the [Trace] Soft Key.

[Trigger] Soft Key

The [Trigger] Soft Key accesses Soft Keys that control the triggering of the trace.

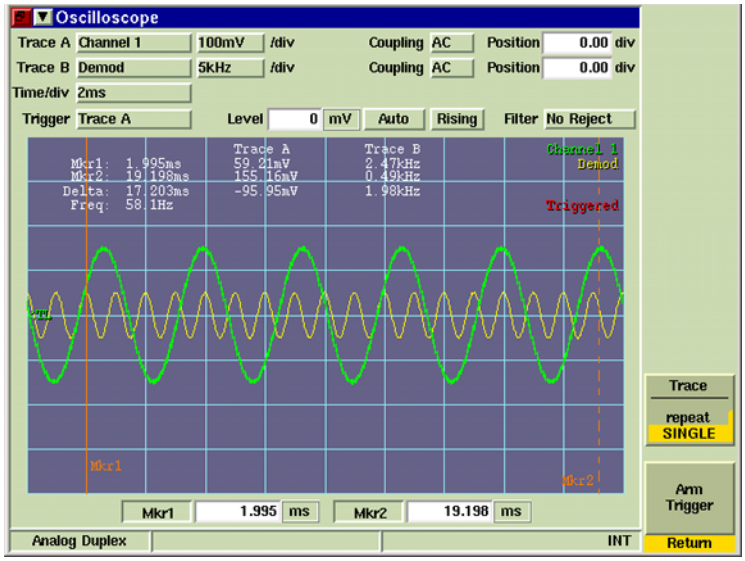

Fig. 7-24 Oscilloscope Trigger Soft Keys

[Trace] Soft Key

When the [Repeat] Soft Key is selected the trace sweeps continuously as long as trigger conditions are met.

When the [Single] Soft Key is selected the trace triggers a single sweep the next time trigger conditions are met.

This soft key is accessed by pressing the [Trigger] Soft Key.

[Arm - Trigger] Soft Key

When [Trace - Repeat/Single] is set to [SINGLE] and the [Arm - Trigger] Soft Key is pressed, the trace triggers a single sweep the next time trigger conditions are met. After the sweep is obtained, the Trigger state becomes inactive until the [Arm - Trigger] Soft Key is pressed again. This soft key is accessed by pressing the [Trigger] Soft Key.

Minimized View

The minimized view of the Oscilloscope Tile is shown in Fig. 7-25. The [Toggle Marker] Soft Key is available when the Oscilloscope is minimized.

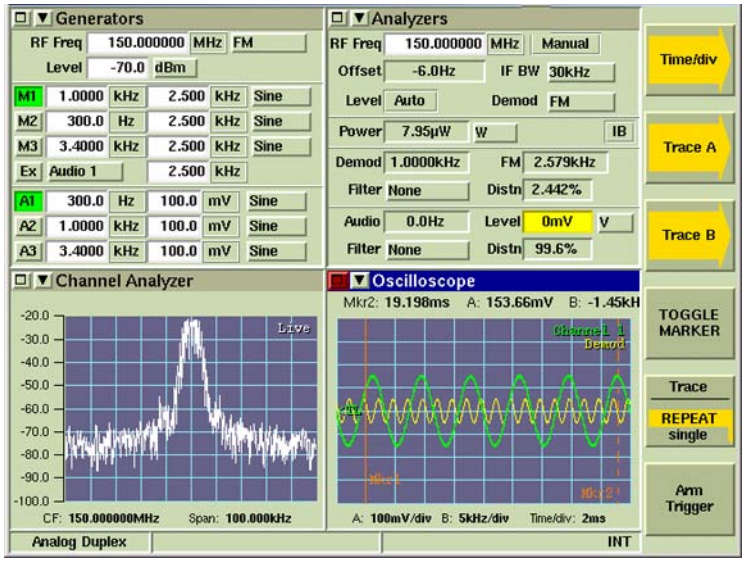

Fig. 7-25 Oscilloscope Tile - Minimized View

[Toggle Marker] Soft Key

Four marker readouts for either Trace A or Trace B are shown at the top of the minimized view of the Oscilloscope Tile when both markers are enabled. The [TOGGLE MARKER] Soft Key alternates the readings from Trace A or Trace B. The first readout is the value of the trace at Marker 1, the second readout is Marker 2 value, the third is the value difference between Marker1 and Marker 2 measurements and the fourth reading is the time difference between Marker1 and Marker 2.

Spectrum Analyzer

The Spectrum Analyzer is an asynchronous, swept analyzer that displays the RF spectrum of the RF Signal received by the Test Set. Refer to Appendix B, 3900 Platform Specifications for the Spectrum Analyzer's operating parameters.

NOTE

Screen captures shown throughout this section contain fields that are only available when the Tracking Generator Option (390XOPT061) is installed in the Test Set. These fields are identified as optional fields.

Basic Settings

When using the Spectrum Analyzer, the frequency span must include the RF Frequency being examined and the Reference Level must be set so the RF signal level falls within the display area.

Accessing the Spectrum Analyzer

The Spectrum Analyzer is accessed from the Test Floating menu of each 3900 Test System. Refer to Chapter 3, Test Set Operation for information on accessing system menus.

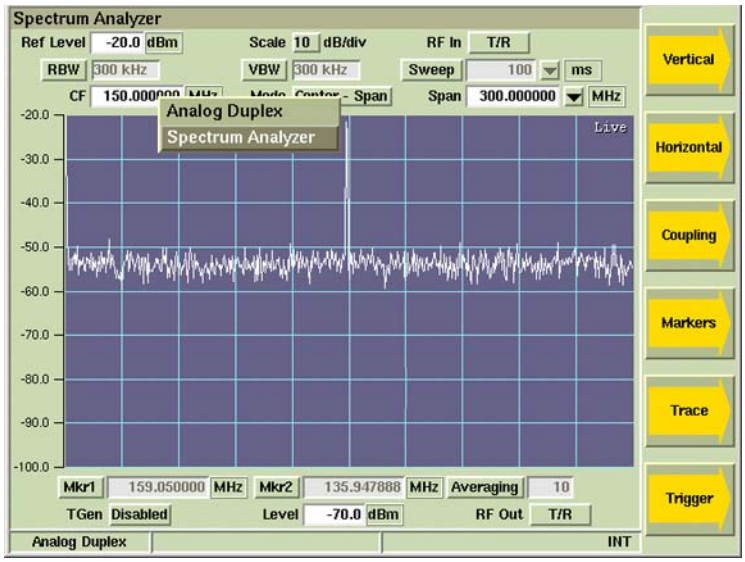

Fig. 7-26 Accessing Spectrum Analyzer - TEST Floating Menu

Spectrum Analyzer Tile Layout

The Spectrum Analyzer can only be viewed in maximized view as shown below. The soft keys on the right side of the display provide access to display settings not available on the main tile.

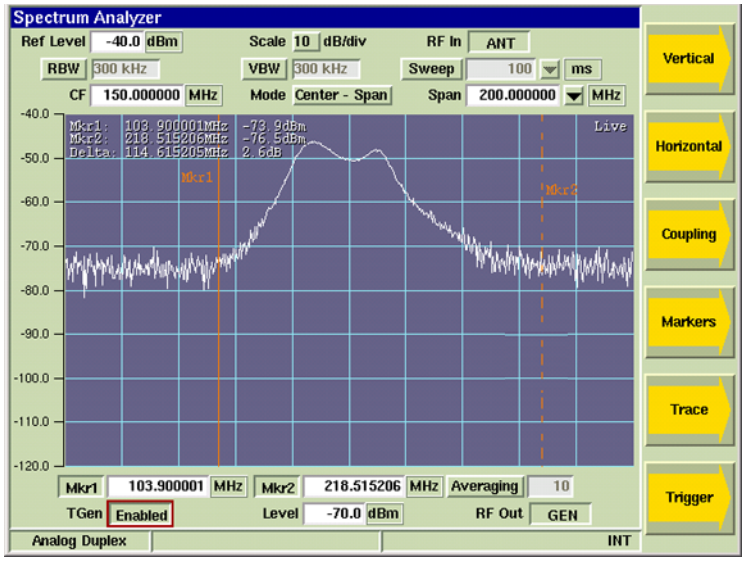

Fig. 7-27 Spectrum Analyzer Tile

Field/Soft Key Definitions

Reference Level

The Reference Level is the top value on the display grid. Power levels can be measured at any point on the trace in conjunction with the Scaling dB/div setting. The Reference Level can be set to any value within the specified range. The Reference Level is set by:

- Using the [Expand] and [Contract] Soft Keys to make step changes.
- By focusing on the data field and using the Rotary Control Knob to adjust the level.
- By focusing on the data field and using the Data Entry Input Keys to enter specific level.

Scaling dB/div

The Scaling drop-down menu selects from a range of 1, 2, 5, or 10. The scaling value (dB/div) can then be increased or decreased using the [Expand / Contract] Soft Keys.

RF In (Source)

Selects the T/R Connector or ANT (Antenna) Connector as signal source.

RBW (Resolution Bandwidth) Toggle Button

Selects RBW bandwidth mode of operation. When Auto is selected, RBW is system defined. When Manual is selected, a drop-down menu becomes accessible which allows user to select from three defined bandwidth settings. This toggle button is linked to the [Res BW] (Resolution Bandwidth) Soft Key which can also be used to define the RBW setting.

VBW (Video Bandwidth) Toggle Button

Selects VBW bandwidth mode of operation. When Auto is selected, VBW is system defined. When Manual is selected, a drop-down menu becomes accessible which allows user to select from a list of defined bandwidth settings. This toggle button is linked to the [Vid BW] (Video Bandwidth) Soft Key which can also be used to define the VBW setting.

Sweep Toggle Button

Selects Sweep TIme mode of operation. When Auto is selected, the sweep time is system defined value appropriate for the signal type being displayed. When Manual is selected, a drop-down menu becomes accessible which allows user to select from a list of defined sweep time settings. This toggle button is linked to the [Sweep Time] Soft Key which can also be used to define the sweep time setting.

Mode

Drop-down menu selects the span mode used to define the displayed signal trace. Available options are Start-Stop Mode, Center-Span Mode and Zero-Span Mode.

Start - Stop

Start-Stop Span Mode uses the sweep Start and Stop frequencies to define the frequency span. Fig. 7-28 shows the RF Spectrum from 149.950000 MHz to 150.050000 MHz as defined by the Start and Stop values.

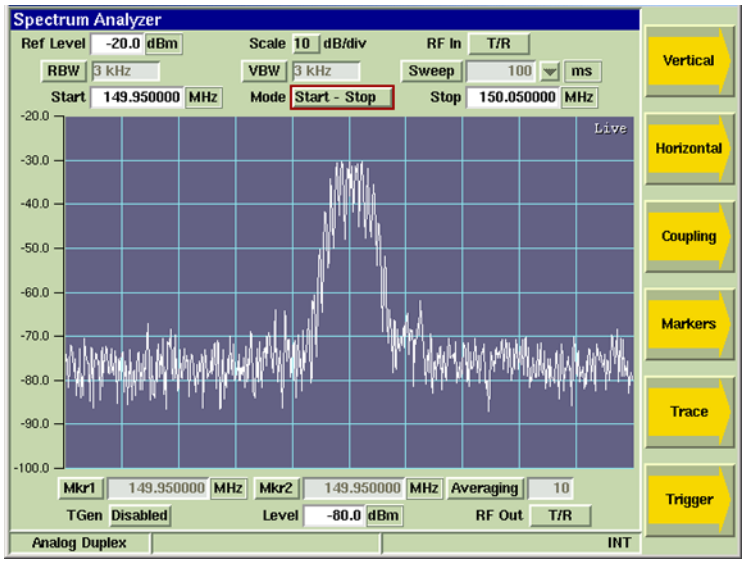

Fig. 7-28 Spectrum Analyzer Start and Stop Frequency Setting

Center - Span

Center-Span Mode uses the sweep Center frequency value and span setting to define the frequency span. Fig. 7-29 shows the RF Spectrum from 149.500000 MHz to 150.500000 MHz, as defined by the Center Frequency of 150.000000 MHz and a Span of 100.0 kHz.

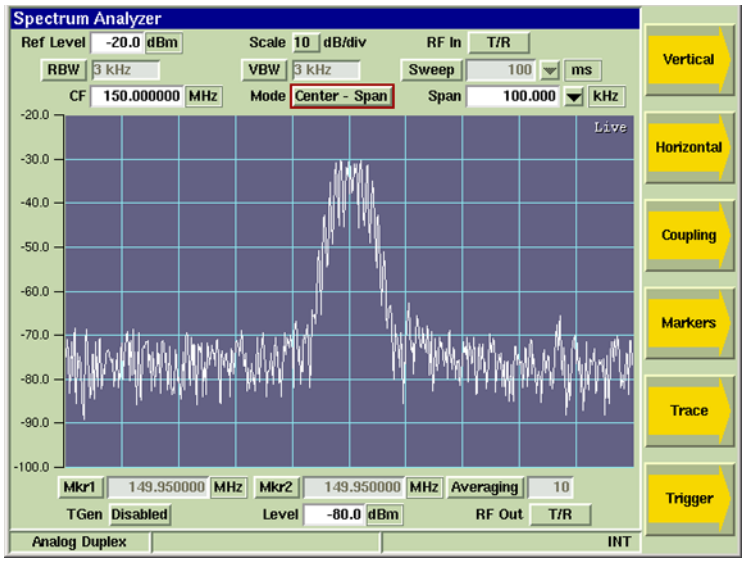

Fig. 7-29 Spectrum Analyzer Center Frequency and Span Setting

Zero Span

In Zero Span Mode the display timebase does not control a frequency sweep. The RF Input is the set frequency and the display shows the power level of the received signal against time.

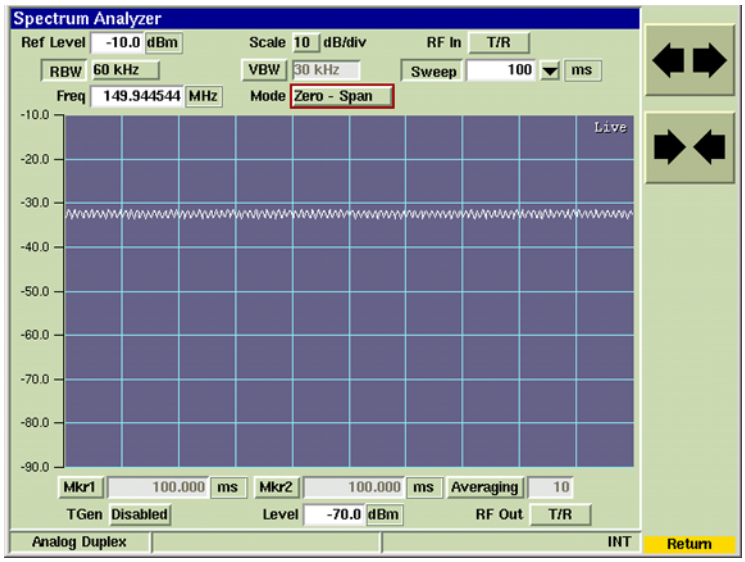

Fig. 7-30 Spectrum Analyzer Zero Span Example

Fig. 7-30 shows an Analog Duplex signal burst at a frequency of 149.944544 MHz, against a time base sweep of 100 ms.

Span

When Center-Span Mode is selected, signal span can be adjusted by selecting a defined value from the Span drop-down menu or by selecting the Span data entry field and entering an arbitrary value. Span can also be adjusted using the [Expand / Contract] Soft Keys.

Mkr1 / Mkr2

The Mkr1 and Mkr2 toggle buttons enable Marker 1 and Marker 2. When Markers are enabled, marker data fields can be edited to define marker position. Refer to section titled [Markers] Soft Key for additional information on configuring markers.

Averages

Enables Average measurements. Refer to section titled [Trace] Soft Key for additional information on Average measurements.

TGEN

Enables/Disables the Tracking Generator. The TGEN toggle button is only available on the Spectrum Analyzer Tile when the Tracking Generator Option (390XOPT061) is installed in the Test Set.

Level

Field provides quick access to set the Generator power level. This field is only available on the Spectrum Analyzer Tile when the Tracking Generator Option (390XOPT061) is installed in the Test Set.

RF Out

Selects the Generator RF out port. Toggle button is only available on the Spectrum Analyzer Tile when the Tracking Generator Option (390XOPT061) is installed in the Test Set.

[Vertical] Soft Key

The [Vertical] Soft Key accesses vertical scaling and positioning controls that adjust the trace's position on the display.

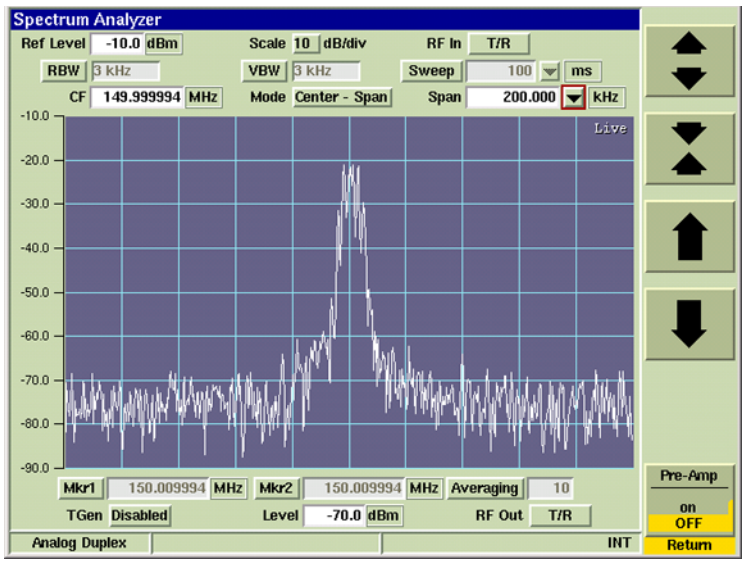

Fig. 7-31 Spectrum Analyzer Vertical Settings Tile

[Horizontal] Soft Key

The [Horizontal] Soft Key accesses a group of soft keys that adjust the horizontal scaling and position of the signal trace. The left/right arrow keys move the trace right or left on the display field, which simultaneously adjusts the Center and/or Start Frequency, depending on the span mode selected. The [Expand / Contract] Soft Keys adjust the span of the trace, which can also be adjusted by changing the Span setting.

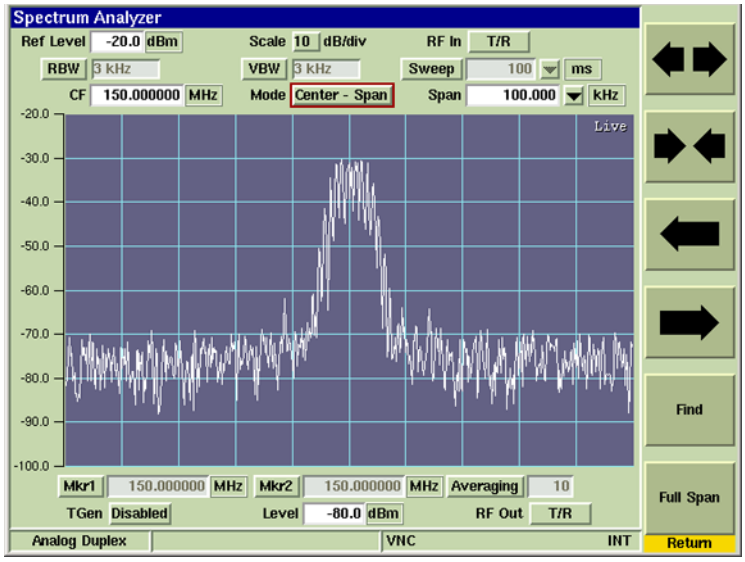

Fig. 7-32 Spectrum Analyzer Horizontal Soft Keys

[Find] Soft Key

This soft key is accessed by pressing the [Horizontal] Soft Key. Pressing [Find] sweeps the Test Set's available frequency range and sets Center Frequency to highest signal peak along frequency range.

[Full Span] Soft Key

This soft key is accessed by pressing the [Horizontal] Soft Key. Pressing [Full Span] sets the Start - Stop signal span to the Test Set's frequency range. Refer to Appendix B, 3900 Platform Specifications for the Spectrum Analyzer's operating parameters.

[Markers] Soft Key

The [Markers] Soft Key accesses a group of soft keys (refer to Fig. 7-33)that provide additional marker functions. Marker(s) must be enabled to use some of these functions. To define marker position:

1. Enable marker(s) using the Mkr1 / 2 toggle buttons or by pressing the [Marker1 / 2] Soft Key(s).
2. Select Mkr1 / 2 data field and adjust marker position using any of the following methods:
   - By focusing on the Mkr1 or Mkr2 field and entering a new value in the data field;
   - By focusing on the Mkr1 or Mkr2 field and using the Rotary Control Knob to move selected marker to a new reference point. Setting three or four significant figures in the settings box makes adjusting the marker position easier when using the Rotary Control Knob. If the markers are locked, moving either marker moves the other marker.
   - (Mouse option) By focusing on the Mkr1 or Mkr2 field and using a mouse to click and drag the selected marker to the desired location on the display field.
   - [Mkr 1 / Mkr 2] Soft Keys access additional soft keys (refer to Fig. 7-33) that also adjust marker position on the display field.

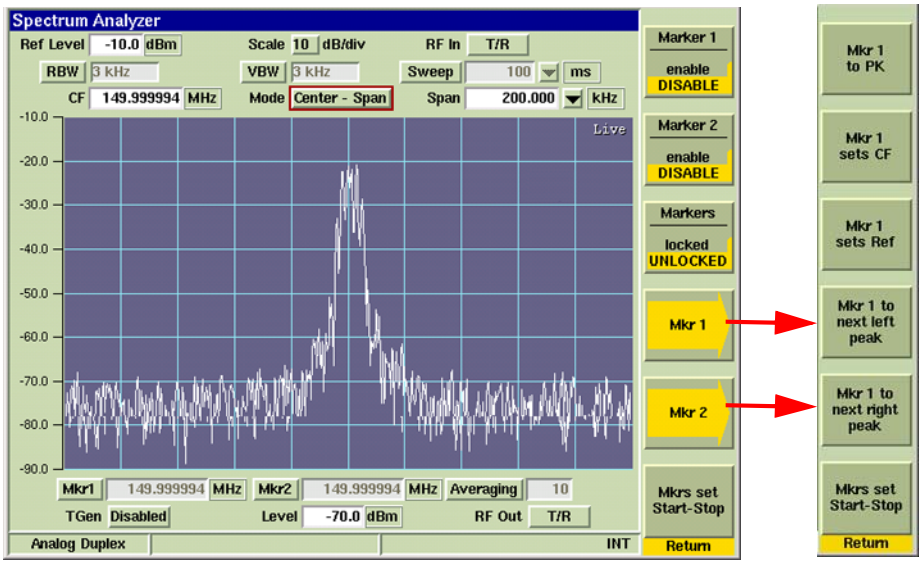

Fig. 7-33 Spectrum Analyzer Markers Soft Key Menu

[Marker 1/Marker 2] Soft Key

Enables or disables markers displayed on the Spectrum Analyzer graph. Markers can also be enables using the Mkr1 / Mkr2 toggle buttons.

[Marker Locked/Unlocked] Soft Key

When Marker 1 and Marker 2 are both enabled, LOCKED sets the markers at the current frequency spacing. When the markers are LOCKED, moving either of the markers also moves the other marker while maintaining the current frequency spacing. Enable and define BOTH Markers prior to selecting LOCKED state since Markers maintain spacing that is defined when LOCKED is enabled. UNLOCKED removes the link between markers.

[Mkr 1 / Mkr 2] Soft Key

Opens a Soft Key sub-menu that provides automatic marker functions. Markers must be enabled to use automatic marker functions.

[Mkr 1 (or 2) to PK] Soft Key

Moves Marker 1 or Marker 2 to the position of the peak value shown on the current trace. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) Sets CF] Soft Key

Sets the Center frequency to the reading at Marker 1 or Marker 2. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) Sets Ref] Soft Key

Sets the Reference Level to the value of Marker 1 or Marker 2 level measurement, with no headroom or offset value. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) to Next Left Peak] Soft Key

Moves Marker 1 or Marker 2 to the next peak to the left of the present Marker 1 or Marker 2 position. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkr 1 (or 2) to Next Right Peak] Soft Key

Moves Marker 1 or Marker 2 to the next peak to the right of the present Marker 1 or Marker 2 position. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Mkrs Set Start-Stop] Soft Key Soft Key

Sets the Mode of the Spectrum Analyzer to Start - Stop and sets the span of the trace to start at the frequency value of Marker 1 and to stop at the frequency value of Marker 2. This soft key is accessed by pressing the [Mkr 1 / Mkr 2] Soft Key.

[Coupling] Soft Key

Accesses a Soft Key sub-menu the allows user to define Resolution Bandwidth (RBW) and Video Bandwidth (VBW) as well as Sweep Time.

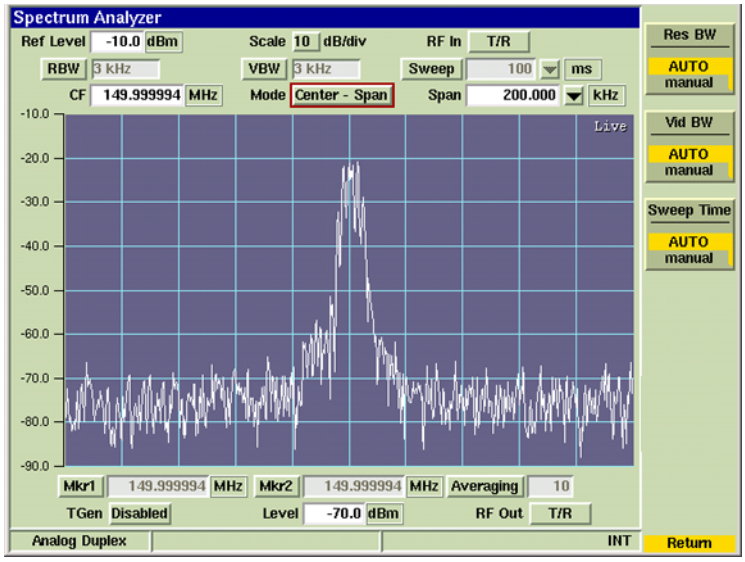

Fig. 7-34 Spectrum Analyzer Coupling Soft Key Menu

RBW, VBW and Sweep Time are interdependent settings that govern the usefulness of a Spectrum Analyzer trace. These Soft Keys are controlled by inter-related action so that changing the value of one changes one or both of the others to optimize the display and prevent an invalid setting. RBW, VBW and Sweep Time can be set to AUTO or MANUAL operation. Setting all three parameters to AUTO provides a useful representation of the signal to be examined. When any one of these parameters is set manually, the Test Set selects the optimum setting for the other two parameters according to internal setup tables.

[Res BW] (Resolution Bandwidth) Soft Key

Sets the bandwidth of the IF filter. Resolution is the ability of the Spectrum Analyzer to discriminate between signals closely separated in frequency. For example, if two tones are analyzed, the Spectrum Analyzer is only able to discriminate between them if the resolution bandwidth selected is narrower than the tone separation. Filter selection becomes more critical if the tones are at different levels. Narrow resolution bandwidth also results in lower noise on the trace.

Power Measurement

When using the Spectrum Analyzer to perform power measurements, the Resolution Bandwidth must be set to a value equal or greater than the bandwidth of the signal being measured.

[Vid BW] (Video Bandwidth) Soft Key

To view signals close to the noise level, a low pass filter (called the video filter) is introduced after the detector. The Video Bandwidth is the high frequency cutoff point of the filter. The video filter reduces high frequency noise on the detected signal and enables low level signals to be identified that would otherwise be buried in the noise.

[Sweep Time] Soft Key

The Sweep Time setting defines how quickly trace data is acquired and updated to the display. This setting must be fast enough to provide quick measurement results, but slow enough to allow the power values at each point to be measured. When set to AUTO, the Test Set optimizes the Sweep Time. When set to MANUAL, a defined Sweep Time setting can be selected from the drop-down menu or an arbitrary value can be entered by selecting the Sweep Time data field.

[Trace] Soft Key

The [Trace] Soft Key accesses trace display control functions to allow users to obtain average and peak measurements and to capture traces being displayed on the Spectrum Analyzer Tile.

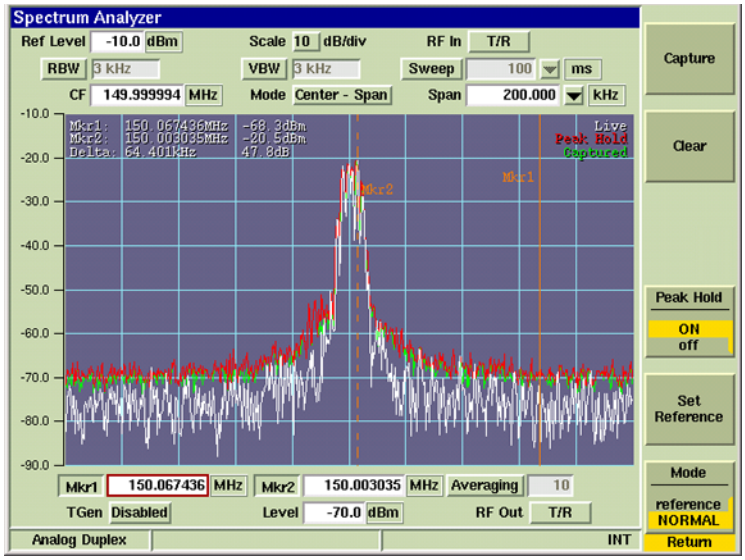

Fig. 7-35 Spectrum Analyzer with Live and Captured Traces

Trace Color

Trace types being displayed on the graph are listed in the upper right corner of the graph field. The traces are color-coded to identify trace types. Fig. 7-35 shows a screen shot with a Live, Peak and Captured trace being displayed.

- Live traces are White.
- Peak hold traces are Red.
- Averaged traces are Yellow.
- Captured traces are Green.

[Capture] Soft Key

Pressing [Capture] freezes trace as it appeared when key was pressed. Press [Clear] Soft Key to clear captured trace and resume display of live trace. THis soft key is accessed by pressing the [Trace] Soft Key.

[Clear] Soft Key

Pressing [Clear] resumes normal sweep operation when a trace has been captured. The [Clear] Soft Key appears only when the [Capture] Soft Key is pressed.

[Peak Hold] Soft Key

When [Peak Hold ON] is selected, the maximum value at each frequency point is displayed to produce the **RED** Max Hold trace (refer to Fig. 7-35). This trace is cleared by selecting [Peak Hold OFF]. Peak Hold must be reset (toggled ON/OFF) when Average readings are Enabled/ Disabled. The white live trace is also displayed and can be averaged depending on the current setting. This soft key is accessed by pressing the [Trace] Soft Key.

[Set Reference] Soft Key

When the [Set Reference] Soft Key is pressed, the Test Set stores current trace data which is used to establish a reference trace when Reference Mode is selected. This soft key is accessed by pressing the [Trace] Soft Key.

[Mode Normal/Reference] Soft Key

Selects Normal or Reference trace mode of operation for the analyzer trace. When Reference Mode is selected, the Test Set uses the last stored trace reference (refer to [Set Reference] Soft Key) to establish a frequency response of the characteristics of the cabling and test setup. This response is used as a reference for the active trace being displayed on the Spectrum Analyzer Tile. This soft key is accessed by pressing the [Trace] Soft Key.

[Trigger] Soft Key

The [Trigger] Soft Key accesses features to control how the trace is triggered.

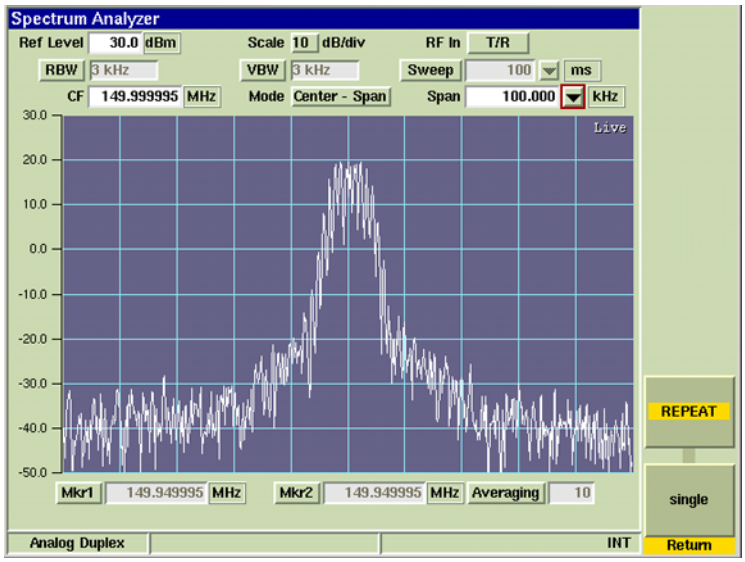

Fig. 7-36 Spectrum Analyzer with Live Trace

[Repeat] Soft Key

When [Repeat] is selected the trace runs repeatedly. When [Single] is selected, a single trace is selected. The [Repeat] and [Single] Soft Keys define the trace display averaging calculations. This soft key is accessed by pressing the [Trigger] Soft Key.

[Single] Soft Key

When [SINGLE] is selected the trace triggers a single sweep the next time trigger conditions are met. This soft key is accessed by pressing the [Trigger] Soft Key.

Tracking Generator Option

The Tracking Generator Option (390XOPT061) generates a carrier wave that sweeps synchronously with the Spectrum Analyzer RF Receiver. The carrier wave can be applied to components or systems, and the output analyzed to display the frequency response of the device under test.

Audio Analyzer

The Audio Analyzer is an optional feature (390XOPT055) that allows users to evaluate the audio frequency band of a demodulated or externally input signal. The Audio Analyzer is only available when the Audio Analyzer Option (390XOPT055) has been installed in the Test Set.

Basic Settings

The frequency span of the display must include the AF Frequency being examined. The Reference Level of the display must be set so that the AF signal level falls within the display area. The Audio Analyzer Tile can be used in maximized view as shown in Fig. 7-38, or in minimized view as shown in Fig. 7-43.

Accessing the Audio Analyzer

The Audio Analyzer is accessed from the drop-down menus on System Test Measurements Tiles.

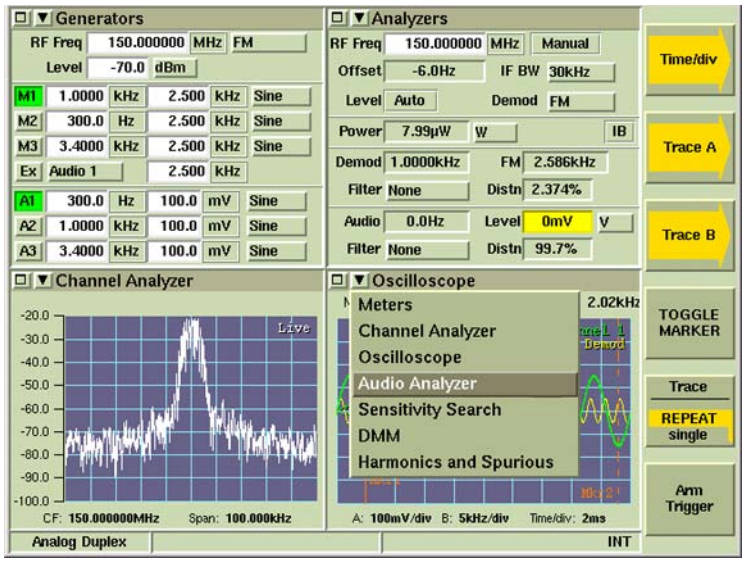

Fig. 7-37 Accessing Audio Analyzer

Audio Analyzer Tile Layout

The Audio Analyzer can be viewed in minimized and maximized view. Fig. 7-38 shows the maximized view of the Audio Analyzer. Fig. 7-43 shows the Audio Analyzer when minimized. Soft Keys on the right side of the display provide access to settings not available on the main tile.

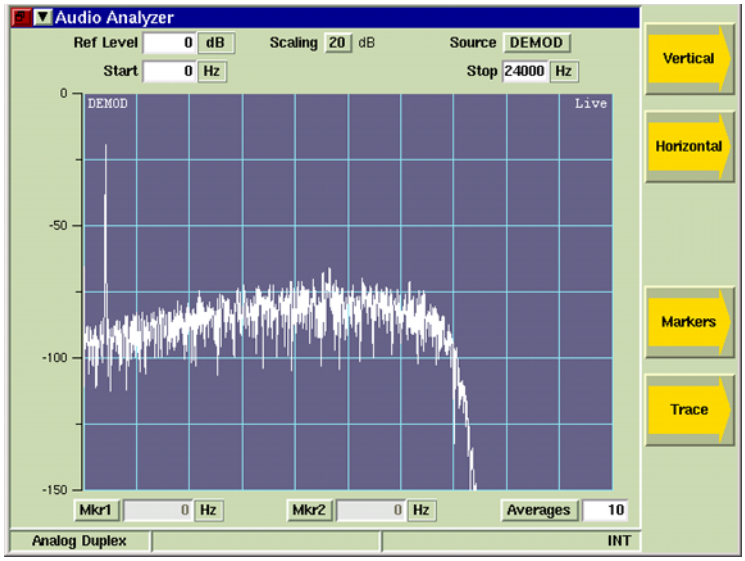

Fig. 7-38 Audio Analyzer Tile - Maximized View

Field/Soft Key Definitions

Reference Level

The Reference Level is the top value on the display grid. Power levels can be measured at any point on the trace in conjunction with the Scaling dB setting. The Reference Level can be set to any value within the specified range. The Reference Level is adjusted by:

- Using the up/down arrow soft keys to adjust the level.
- Selecting the data field and using the Rotary Control Knob to adjust the level.
- Selecting the data field and using the Data Entry Input Keys to enter specific level.

Scaling dB

The Scaling drop-down menu defines the graph's vertical scaling. The drop-down menu selects from defined values of 1, 2, 5, 10 ro 20.

Source

Selects Demod or Audio as the filtered signal source. When a filter is selected, the signal source is taken after the signal has been filtered. Filter selection is made on the Analyzers Tile of the active operating Analog system.

Start

Defines the start frequency of the frequency span. The maximum span is 0 to 24000 Hz; horizontal scale values must be within this range.

Stop

Defines the stop frequency of the frequency span. The maximum span is 0 to 24000 Hz; horizontal scale values must be within this range.

[Vertical] Soft Key

The [Vertical] Soft Key accesses scaling and positioning controls that adjust the trace's position on the display. The up/down arrow keys move the signal trace up or down on the display. The signal trace can also be adjusted by changing the Reference Level or Scaling dB values.

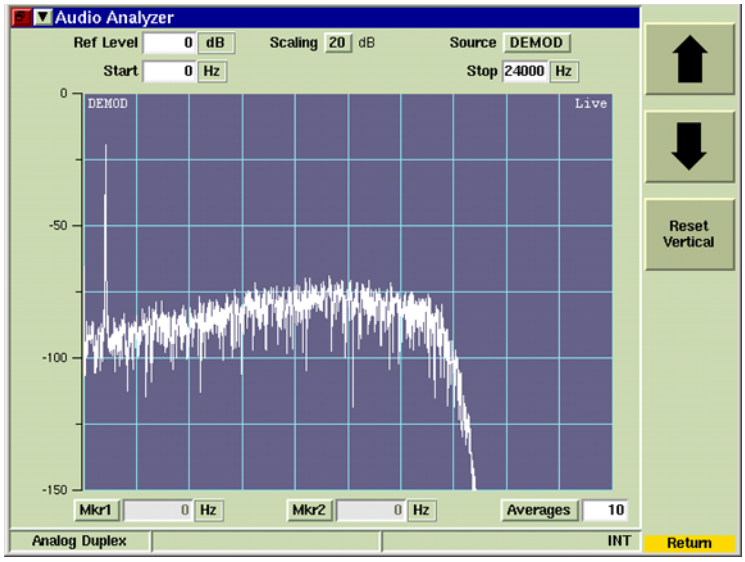

Fig. 7-39 Audio Analyzer - Ref Level and Scale Settings

[Horizontal] Soft Key

The [Horizontal] Soft Key accesses a group of soft keys that adjust the horizontal scaling and position of the signal. The left/right arrow soft keys move the trace left or right on the display field, which simultaneously adjusts the Start or Stop Frequency. The [Expand/Contract] Soft Keys adjust the span of the trace, which can also be adjusted by changing the Start and Stop frequencies.

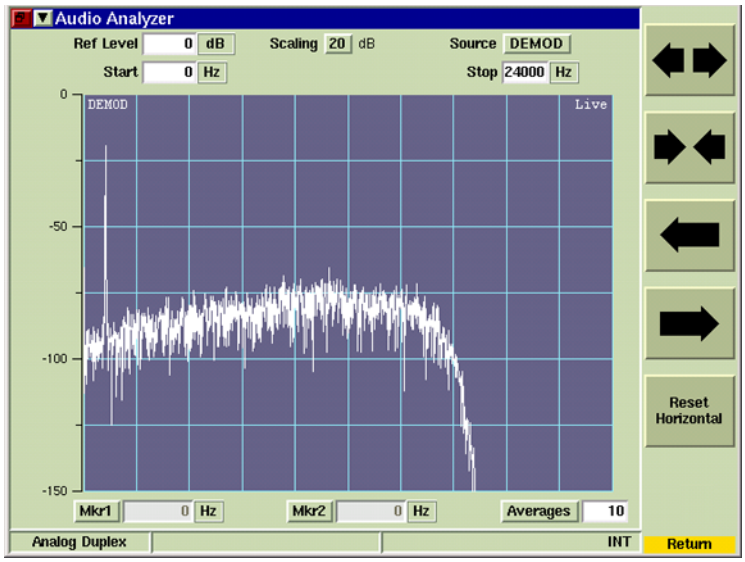

Fig. 7-40 Audio Analyzer Start and Stop Frequency Setting

[Reset Horizontal] Soft Key

Resets Start and Stop frequency values to frequency range of Test Set. Refer to Appendix B, 3900 Platform Specifications for Test Set operating parameters.

[Markers] Soft Key

The [Markers] soft key accesses the [Marker 1] and [Marker 2] Soft Keys as shown in Fig. 7-41. To define marker position:

1. Enable marker(s) using the Mkr1 / 2 toggle buttons or by pressing the [Marker1 / 2] Soft Key(s).
2. Select Mkr1 / 2 data field and adjust marker position using any of the following methods:
   - By focusing on the Mkr1 or Mkr2 field and entering a new value in the data field;
   - By focusing on the Mkr1 or Mkr2 field and using the Rotary Control Knob to move the selected marker to a new reference point. Setting three or four significant figures in the settings box makes adjusting the marker position easier when using the Rotary Control Knob. If the markers are locked, moving either marker moves the other marker.
   - (Mouse option) By focusing on the Mkr1 or Mkr2 field and using a mouse to click and drag the selected marker to the desired location on the display field.

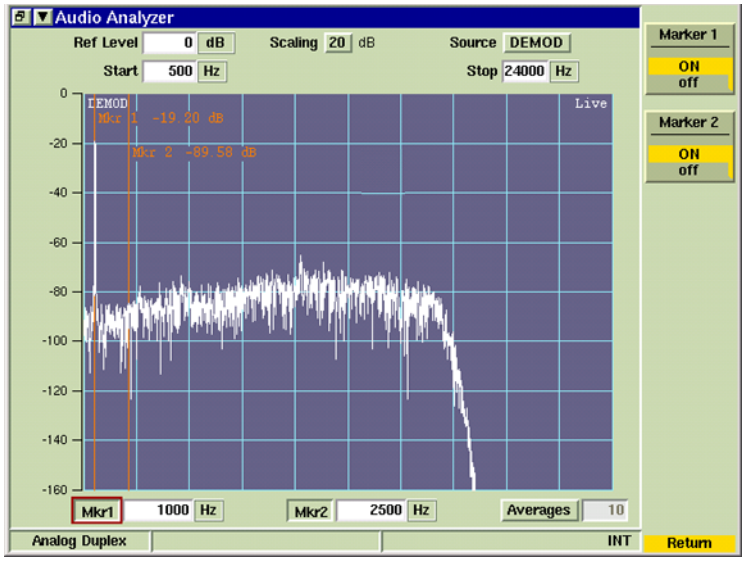

Fig. 7-41 Audio Analyzer Marker Soft Keys

[Trace] Soft Key

The [Trace] Soft Key accesses trace display control functions to allow users to obtain average and peak measurements and to capture traces being displayed on the Audio Analyzer Tile. Fig. 7-42 shows a Live trace, Peak trace and Captured trace displayed on the Audio Analyzer Tile.

Trace Color

Trace types being displayed on the graph are listed in the upper right corner of the graph field. The traces are color-coded to identify trace types. Fig. 6-6 shows a Live trace, Peak trace and Captured trace displayed on the Audio Analyzer.

- Live traces are White.
- Peak hold traces are Red.
- Averaged traces are Yellow.
- Captured traces are Green.

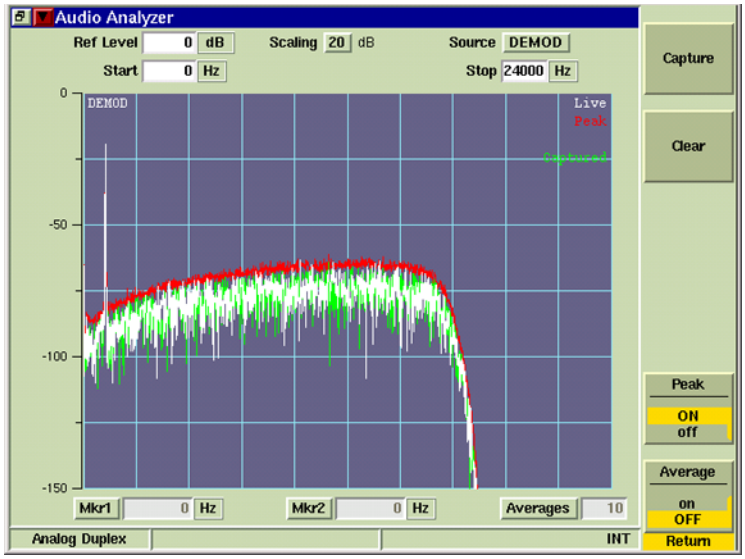

Fig. 7-42 Audio Analyzer Trace Soft Keys

[Capture] Soft Key

When [Capture] is selected the current trace is held on the display and the [Clear] soft key appears. To resume normal sweep operation select the [Clear] soft key. The [Clear] soft key disappears until [Capture] is pressed again. The [Capture] Soft Key is accessed by pressing the [Trace] Soft Key.

A captured trace can be saved by pressing the HOLD Key, then selecting the [Save As] Soft Key. Refer to Chapter 3, section titled Store/Recall Tile for additional information on saving and storing files.

[Clear] Soft Key

Clears the current captured trace and resumes display of Live trace. This soft key is only visible when a trace is in “Captured” state.

[Peak Hold] Soft Key

When [Peak Hold ON] is selected, the maximum value at each frequency point is displayed to produce the **RED** Max Hold trace (refer to Fig. 7-42). This trace is cleared by selecting [Peak Hold OFF]. Peak Hold must be reset (toggled ON/OFF) when Average readings are Enabled/ Disabled. The white Live trace is also displayed and can be averaged depending on the current setting. This soft key is accessed by pressing the [Trace] Soft Key.

[Average] Soft Key

When [Average ON] is selected, the trace is calculated by averaging the number of measurements defined in the Averages field. A yellow progress indicator is displayed in the upper right corner of the graph field while the average reading is accumulating. This soft key is accessed by pressing the [Trace] Soft Key.

Minimized View

The minimized view of the Audio Analyzer Tile is shown in Fig. 7-43. The [Toggle Marker] Soft Key is available when the Audio Analyzer is minimized.

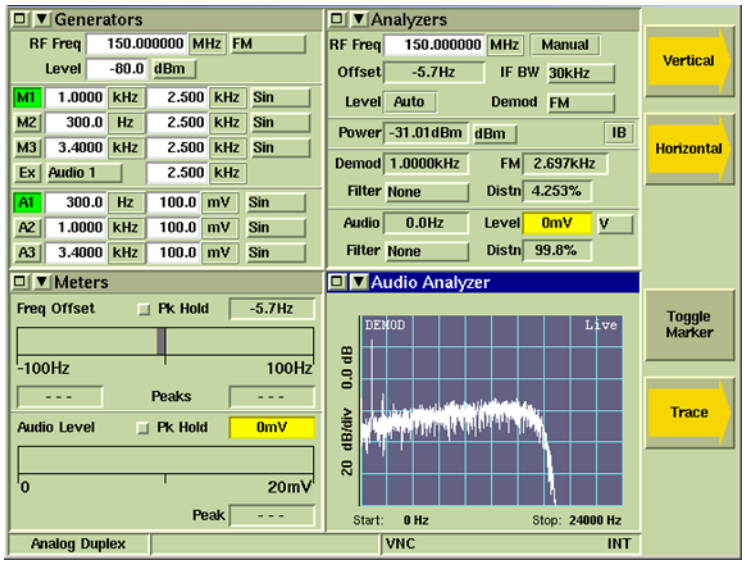

Fig. 7-43 Audio Analyzer Tile - Minimized View

[Toggle Marker] Soft Key

Controls the marker readings displayed at the top of the minimized Tile. Pressing Toggle Marker alternately displays readings for Marker 1 and Marker 2. Both Markers must be defined to obtain measurements for both markers when this soft key is pressed.

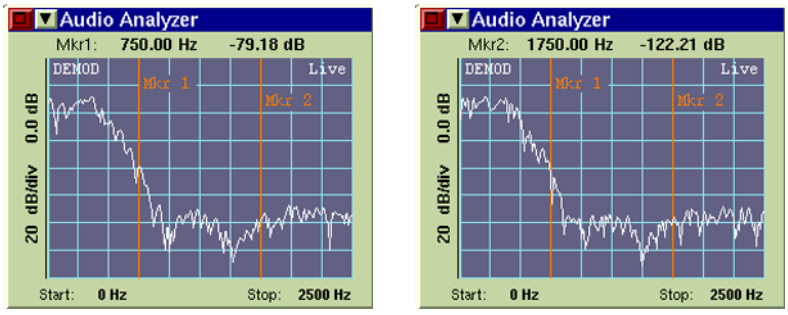

Fig. 7-44 Toggle Marker - Change in Displayed Data

Chapter 8

Analog Duplex System

Introduction

The 3900 Analog Duplex System tests mobile radio transmitters, receivers and transceivers. The tests can be simple functionality tests or more detailed tests such as testing transmitter power output, broad band and narrow band; receiver sensitivity; AM and FM modulation and demodulation performance; distortion level and SINAD.

The Analog Duplex System includes the following test functions:

- AM and FM Signal Generator
- RF Signal Analyzer
- Multiple AF Signal Generators
- Multiple AF Modulators
- AF Measurement
- Modulation Measurement
- Oscilloscope for examining external and internal signals
- Full Duplex operation
- Spectrum Analyzer, Channel Analyzer and Audio Analyzer.

This chapter explains how to use the Analog Duplex System. Refer to Chapter 3, Test Set Operation, for general operation of the Test Set. This chapter includes the following:

- Description of the Analog Duplex System and a diagram of a common test setup.
- Describes how to access the Analog Duplex System.
- Describes how to navigate Analog Duplex System Tiles.
- Describes the layout and information provided on Analog Duplex Tiles.
- Explains the TEST Tiles.

Accessing Analog Duplex System

To select the Analog Duplex System:

1. Select **Systems** from the CONFIG floating menu.
2. Select **Analog Duplex** from the Systems Menu.
3. Analog Duplex system loads, configured with the operating settings from when the system was last used. Analog Duplex is displayed on the information bar as shown in example below.

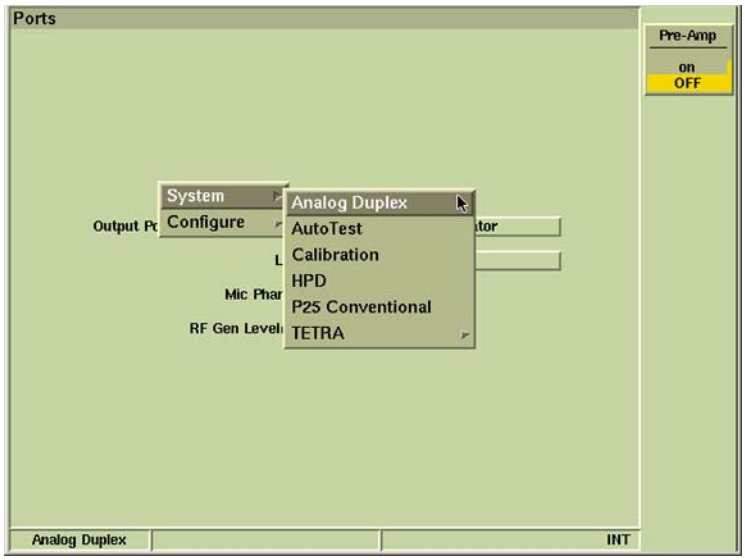

Fig. 8-1 Selecting Analog Duplex System

Analog Duplex Tile Layout

Analog Duplex System Tiles can be displayed in a Maximized or Minimized view. Specific sections of the Tile are used to display certain Measurement Tiles.

Fig. 8-2 shows the 3900 operating in Analog Duplex TEST (Mode) with display Tiles minimized. Focus is on the Tile in Section A, the Generators Tile. The Soft Keys displayed on the right are relevant to the Generators Tile.

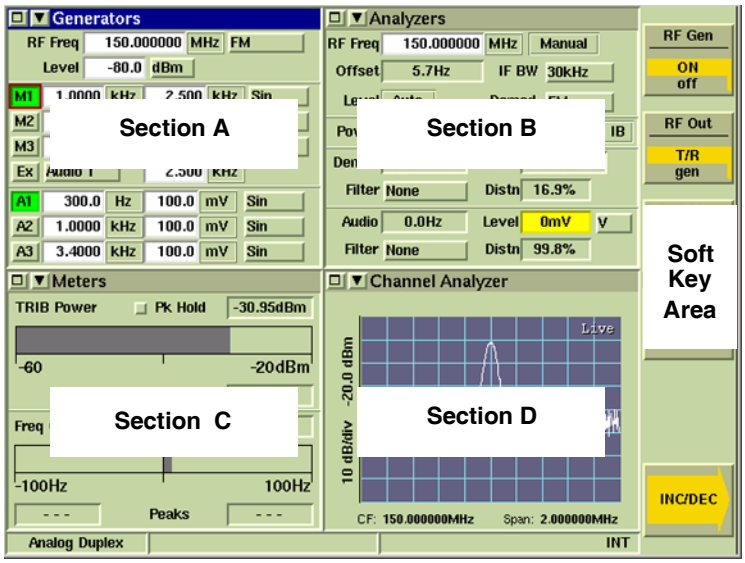

Fig. 8-2 Analog Duplex System - TEST Mode - Minimized Tiles

- Section A can be configured to display the Generators Tile, Meters Tile, Channel Analyzer, Audio Analyzer, or Oscilloscope Tiles.
- Section B can be configured to display the Analyzers Tile, Meters Tile, Channel Analyzer, Audio Analyzer or Oscilloscope Tiles.
- Section C and D can be configured to display various measurement tiles as well as the Channel Analyzer, Audio Analyzer or Oscilloscope Tiles. Measurement tile selection depends on the options installed in the Test Set.
- All sections can be configured to display Site Monitoring (Sensitivity Search) Option.
- The Information Bar located at the bottom of the Tile displays the operating System title and other information.
- A specific Tile can be displayed in more than one section if required. For example, the Meters Tile may be selected for Section C and D so that all of the meters are visible in minimized view (3 meters in each section).

Analog Duplex Configuration Tiles

The Analog Duplex Configuration Menu allows test parameters to be defined for customized user specifications. Analog Duplex consists of the following Configuration Tiles:

Offsets Configuration Tile

The Offsets Tile contains fields that define offset values for the level and frequency offsets for the RF Generator.

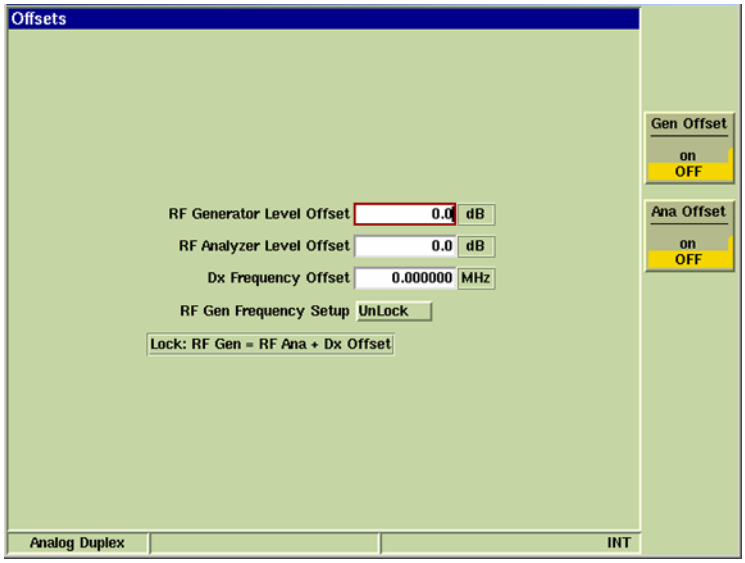

Fig. 8-3 Analog Duplex - Offsets Configuration Tile

Field/Soft Key Definitions

RF Generator Level Offset

The RF Generator Level Offset parameter accounts for a loss or gain to be inserted into the RF path between the 3900 generator output connector (GEN (Generator) Connector or T/R Connector) and the device under test.

The Offset value is indicated in +dB for positive (gain) values. When a positive value is entered, **Ext Gain** is displayed to the right of the RF Generator Level Offset value field.

The Offset value is indicated in -dB for negative (loss) values. When a negative value is entered, **Ext Loss** is displayed to the right of the RF Generator Level Offset value field.

When an offset is enabled, the ± warning symbol is shown beside the output level entry field on the Generator Tile.

NOTE

Level Offsets set in the Analog Duplex system are independent of any Level Offsets set in any other System on the Test Set.

RF Analyzers Level Offset

The RF Analyzer Level Offset parameter accounts for a loss or gain to be inserted into the RF path between the 3900 receiver input Connector (ANT (Antenna) Connector or T/R Connector).

The Offset value is indicated in +dB for positive (gain) values. When a positive value is entered, **Ext Gain** is displayed to the right of the RF Analyzers Level Offset value field.

The Offset value is indicated in -dB for negative (loss) values. When a negative value is entered, **Ext Loss** is displayed to the right of the RF Analyzers Level Offset value field.

When an offset is enabled, the  warning symbol is shown beside the power field on the Analyzers Tile and in the upper left hand corner of the Channel Analyzer Tile.

Dx Frequency Offset

Allows the frequency spacing between the RF Generator and the RF Analyzer to be set. A positive value sets the RF Generator to a higher frequency than the RF Analyzer setting. Value specified in MHz, kHz or Hz as defined by user.

When an offset is enabled, the warning symbol is shown beside the output level entry field on the Generators Tile.

RF Generator Frequency Setup

Locks or Unlocks the frequency spacing between the RF Generator setting and the RF Analyzer setting. With the setting set to Lock the RF Generator frequency follows any change to the RF Analyzer setting with a spacing equal to the Dx Frequency Offset value.

[Gen Offset]

Controls the use of the RF Generator Level Offset value.

ON inserts the defined RF Generator Level Offset into the RF Path between the selected 3900 generator output connector and the device under test.

OFF removes the defined RF Generator Level Offset from the RF Path between the selected 3900 generator output connector and the device under test.

[Ana Offset] Soft Key

Controls the use of the RF Analyzers Level Offset value.

ON inserts the defined RF Analyzers Level Offset into the RF Path between the selected 3900 receiver input connector and the device under test.

OFF removes the defined RF Analyzers Level Offset from the RF Path between the selected 3900 receiver input connector and the device under test.

RF Modulation Configuration Tile

The RF Modulation Configuration Tile allows the user to select the external modulation source.

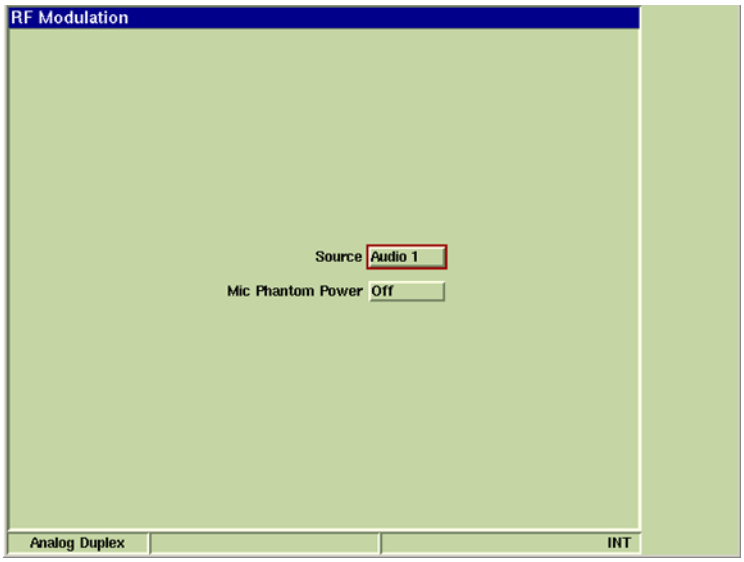

Fig. 8-4 Analog Duplex - Modulation Generator Configuration Tile

Field Definitions

Source

Selects the routing for an external modulation source. A signal applied to the selected Connector serves as a modulation source for the RF Generator when the Ext button is active on the Generators Tile.

MIC Phantom Power

The MIC/ACC Connector provides a power source for condenser microphones. This drop-down menu controls this feature.

AF Generator Configuration Tile

The AF Generator Tile allows the user to select the output connector for the AF Generator.

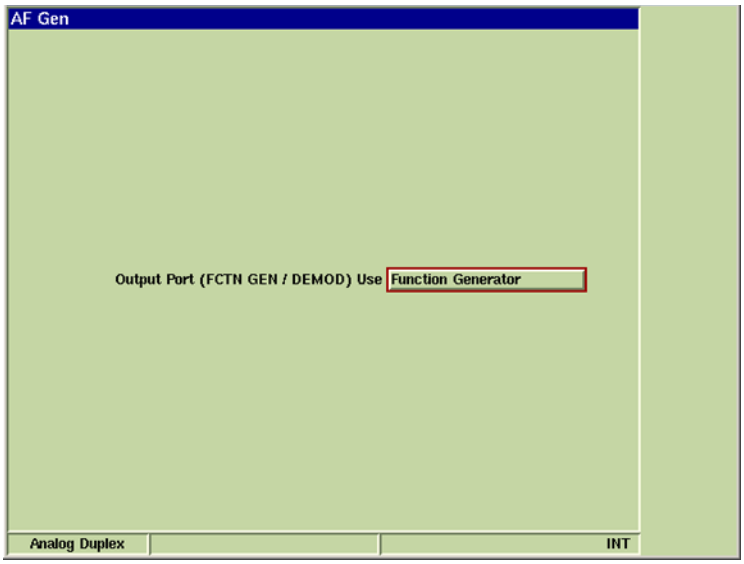

Fig. 8-5 Analog Duplex - AF Generator Configuration Tile

Field Definition

Output Port (FCTN GEN/DEMOD) Use

The output signal from the AF Generator is routed to the FCTN GEN/DEMOD Connector. The FCTN GEN/DEMOD Connector is also used for Demodulated Signal output. The Output Port is selected from this drop-down menu.

When a filtered output option is selected, the filter type is selected from the Psoph filter drop-down menu on the AF Measurements Configuration Tile or Modulation Measurements Configuration Tile.

NOTE

Changing configuration to Demod Out while still connected to the MIC/AF Input of a radio under test may create a feedback loop.

RF Generator Configuration Tile

The RF Generator Tile contains fields that define RF Generator parameters.

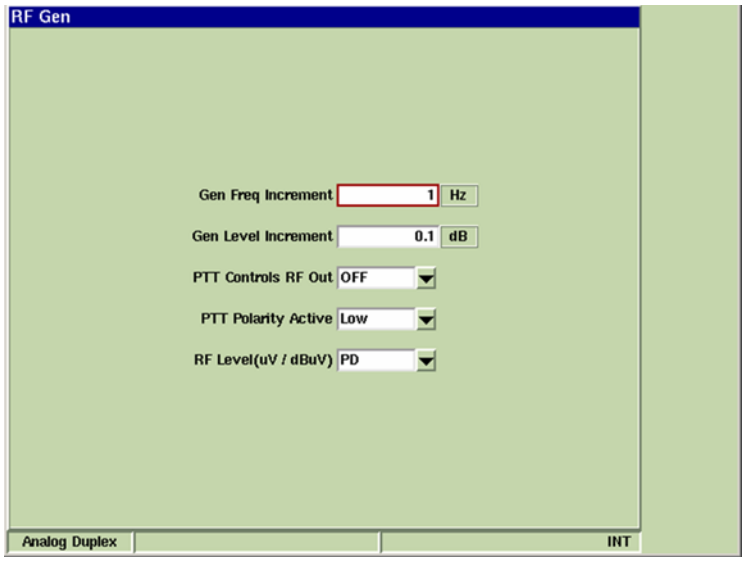

Fig. 8-6 Analog Duplex - RF Generator Configuration Tile

Field Definitions

Gen Frequency Increment

Sets the value the RF Output Frequency changes each time the [INC Gen Freq/DEC Gen Freq] Soft Keys are pressed. The [INC Gen Freq/DEC Gen Freq] Soft Keys are located on the Generators Tile, Analyzers Tile and Meters Tile. This soft key is accessed by pressing the [INC/DEC] soft key. Value is specified in MHz, kHz or Hz as defined by user.

Gen Level Increment

Sets the value in dB, that the RF Level changes each time the [INC Gen Level/DEC Gen Level] Soft Keys are pressed. The [INC Gen Level/DEC Gen Level] soft keys are located on the Generators Tile, Analyzers Tile and Meters Tile The soft key is accessed by pressing the [INC/DEC] soft key. Value is specified in MHz, kHz or Hz as defined by user. PTT Controls RF Out

This feature is only applicable when a microphone is connected to the 3900 MIC/ACC Connector. When ON is selected PTT must be pressed to utilize the RF Output.

PTT Polarity Active

This feature is only applicable when a microphone is connected to the 3900 MIC/ACC Connector. High or Low polarity is applied to the signal when PTT is pressed.

RF Level

Selects whether the RF Generator Output Level, when given in µV (micro Volt) is expressed in a PD or EMF reference system.

µV (PD) = micro Volts Potential Difference

This circuit is closed onto a matching load that is equal to the output impedance of the source. The PD reference system includes a voltage 1:2 divider at the load.

µV (EMF) = micro Volts Electromotive Force

This circuit is open, or closed onto an infinite load. The EMF reference system does not contain a voltage divider at the load, resulting in values two times larger than those in the PD reference system. For example, -120 dBm is equal to 0.225 µV (PD) or 0.45 µV (EMF).

RF Measurements Configuration Tile

The RF Measurements Tile defines the parameters used to perform RF Measurements.

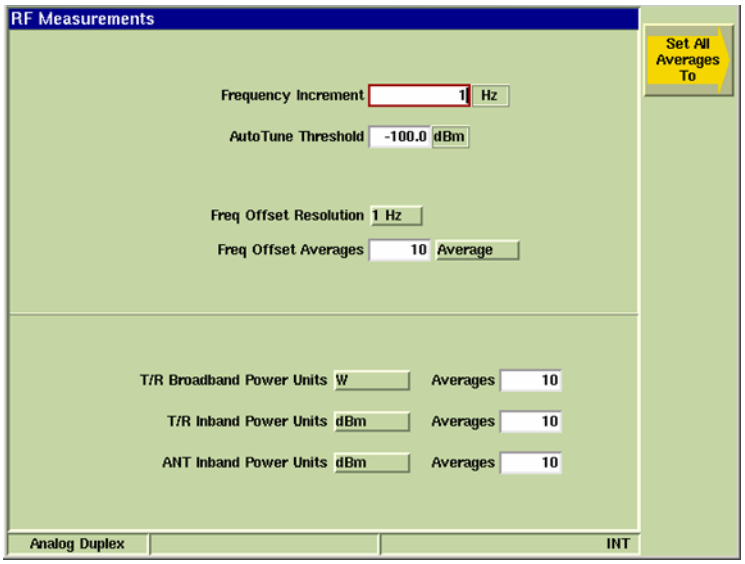

Fig. 8-7 Analog Duplex - RF Measurements Configuration Tile

Field/Soft Key Definitions

Frequency Increment

Sets the value the RF Input Frequency changes each time the [INC Ana Freq / DEC Ana Freq] Soft Keys are pressed. The [INC Ana Freq / DEC Ana Freq] Soft Keys are accessed from the [INC/DEC] soft key on the Generators Tile, Analyzers Tile and Meters Tile. Value is specified in MHz, kHz or Hz as defined by user.

AutoTune Threshold

When Autotune is selected the Test Set sets the RF Analyzer frequency to the strongest signal detected at the active RF Input connector. This reading defines an acceptable signal level in dBm's for successful detection on the ANT (Antenna) Connector. Default setting is -100 dBm on the ANT (Antenna) Connectorwhich reflects -60 dBm on the T/R Connector.

Freq Offset Resolution

Sets the RF Analyzer RF Frequency Measurement resolution. When set to 10 Hz the speed of measurement increases, however, the resolution is of poorer quality.

Freq Offset Averages

The Freq Offset Averages drop-down menu allows the selection of Averages or Worst Case readings.

When Average is selected, the range value field sets the number of readings averaged for the RF Offset Measurement. This field is not applicable when Worst Case is selected.

When Worst Case is selected from the drop-down menu, the RF Offset Measurement on the Analyzers Tile reflects the reading which most greatly exceeds the defined parameters.

T/R Broadband Power Units

Selects the unit of measurement for the T/R Broadband Power reading.

Averages

The adjacent Averages entry field enters the number of readings to be averaged for the T/R Broadband Power measurement.

T/R Inband Power Units

Selects the unit of measurement for the T/R Inband Power reading.

Averages

The adjacent Averages entry field enters the number of readings to be averaged for the T/R Inband Power measurement for this reading.

ANT Inband Power Units

Selects the unit of measurement for the ANT Inband Power reading.

Averages

The adjacent Averages entry field enters the number of readings to be averaged for the ANT Inband Power measurement for this reading.

[Set All Averages To] Soft Key

Opens a soft key sub-menu that selects the number used to calculate all RF Measurement averages.

Modulation Measurements Configuration Tile

The Modulation Measurements Configuration Tile defines parameters used to measure FM signals.

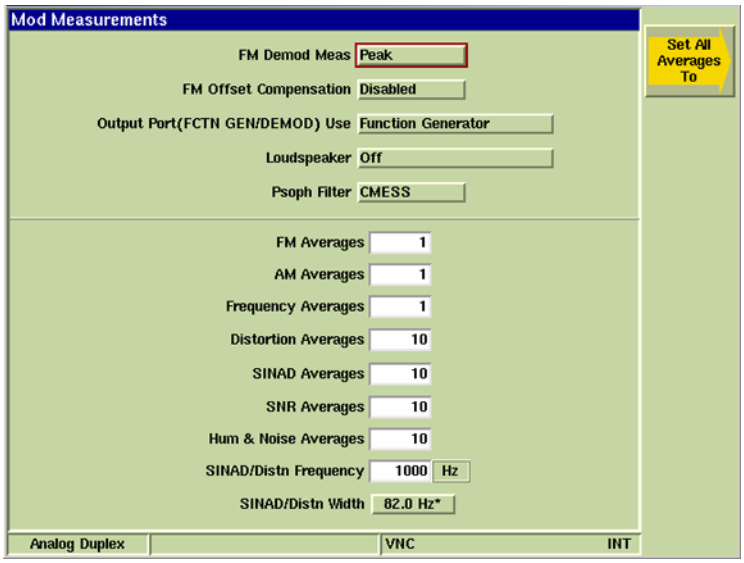

Fig. 8-8 Analog Duplex - Modulations Measurements Configuration Tile

Field/Soft Key Definitions

FM Demod Meas

Sets the FM Demodulation measurement that reads the RMS or Peak value. The selected option is shown beside the FM Deviation Level field on the Analyzers Tile.

Output Port (FCTN GEN/DEMOD) Use

Selects the output connector on the front panel. Demod options select the FCTN GEN/DEMOD Connector as the Demodulation Output. When a filtered output option is selected, the filter type is selected from the Psoph filter drop-down menu.

Audio In options select the FCTN GEN/DEMOD Connector as the AF Generator output.

NOTE

Changing configuration to Demod Out while still connected to the MIC/AF Input of a radio under test may create a feedback loop.

Loudspeaker

The Loudspeaker drop-down menu selects the source and routing of the signal applied to the loudspeaker within the Test Set.

Psoph Filter

Selects CMESS or CCITT Psophometric weighting filter when the Psoph filter is selected from any of the Filter selection drop-down menus. Psoph filters are typically used for SINAD measurements, either Demod or Audio.

Measurement Averages

Defines the number of readings averaged for the Modulation Measurements. Valid range values are 1 to 250.

SINAD/Distn Frequency

Sets frequency at which SINAD or Distortion is measured.

SINAD/Distn Width

Sets Bandwidth for SINAD or Distortion measurements.

[Set All Averages To] Soft Key

Opens a soft key sub-menu that selects the number used to calculate all RF Measurement averages.

AF Measurements Configuration Tile

The AF Measurements Configuration Tile defines parameters used to measure audio signals.

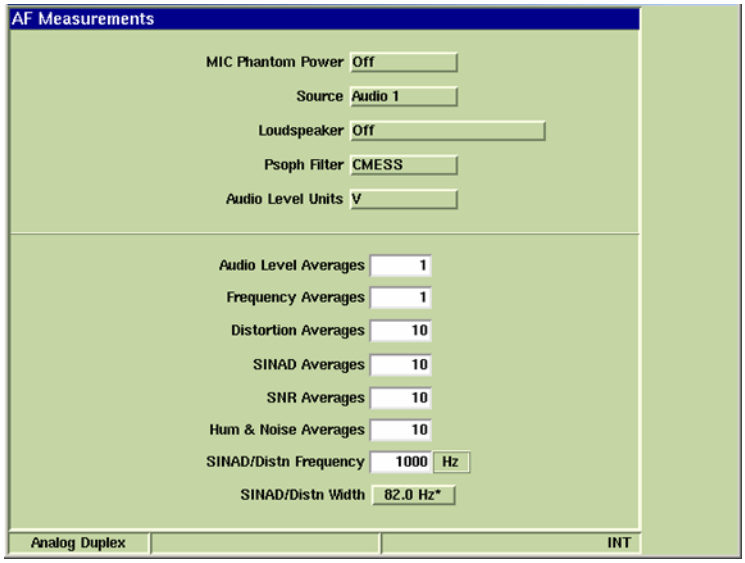

Fig. 8-9 Analog Duplex - AF Measurements Configuration Tile

Field/Soft Key Definitions

MIC Phantom Power

The MIC/ACC Connector provides a power source for condenser microphones. This drop-down menu controls this feature.

Source

Selects the source of the AF signal routed to the AF Analyzer.

Loudspeaker

Selects the signal sent to the internal loud speaker.

Psoph Filter

Selects whether the CMESS or the CCITT Psophometric weighting filter are used when the Psoph filter is selected from any of the Filter selection drop-down menus. Psoph filters are typically used for SINAD measurements, either Demod or Audio.

Audio Level Units

Sets the unit of measure for AF Level measurements to V, dBV or dBr. The dBr setting creates a zero reference point at the time the unit of measurement is changed.

For example, if the current audio level reading on the AF Meter is -12.47 (dBm) and the Level unit of measure is changed to dBr, the Audio level reading immediately updates to 0.00 dBm. Subsequently, if the input audio level drops to -13.47 dBm, the level on the AF Meter indicates -1.00 dBr, the difference between the reference level and current level. To reset the reference level, switch the unit of measurement to another value, then re-select dBr.

The available Unit of measurement is limited by the selected Source. For example, when Balanced is selected as the source option, V is not available as a unit of measurement.

Measurement Averages

The number of measurements taken to calculate the average values can be set individually using the Measurement Averages fields. Valid range values are from 1 to 250.

SINAD/Distn Frequency

Sets frequency at which SINAD and Distortion are measured.

SINAD/Distn Width

Sets Notch Filter bandwidth for SINAD and Distortion measurements.

RF Limits Configuration Tile

The RF Limits Configuration Tile sets Pass/Fail limit parameters for the RF Analyzer Frequency Offset measurements and the RF Power measurements.

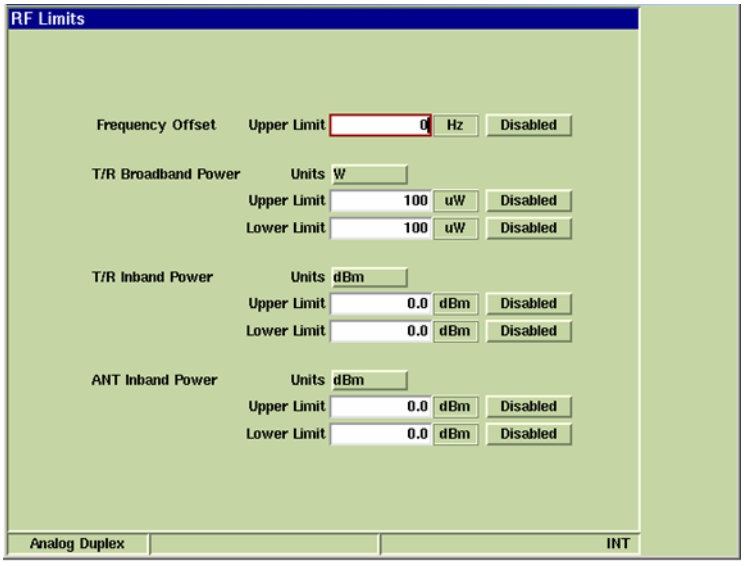

Fig. 8-10 Analog Duplex - RF Limits Configuration Tile

Modulation Measurements Limits Configuration Tile

The Mod Meas Limits Configuration Tile sets Pass/Fail limit parameters for RF Measurements.

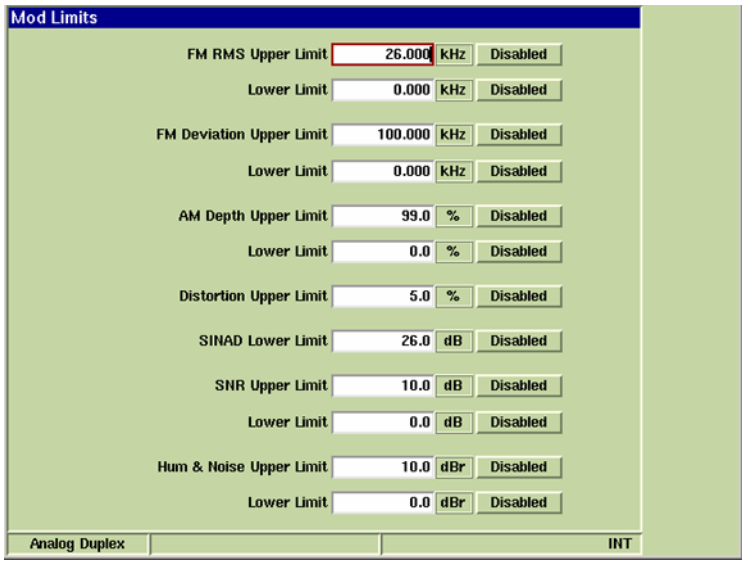

Fig. 8-11 Analog Duplex - Mod Meas Limits Configuration Tile

AF Limits Configuration Tile

The AF Limits Configuration Tile sets Pass/Fail limit parameters for AF Measurements. When a filtered output option is selected, the filter type is selected from the Psoph filter drop-down menu on the AF Measurements Configuration Tile or Modulation Measurements Configuration Tile.

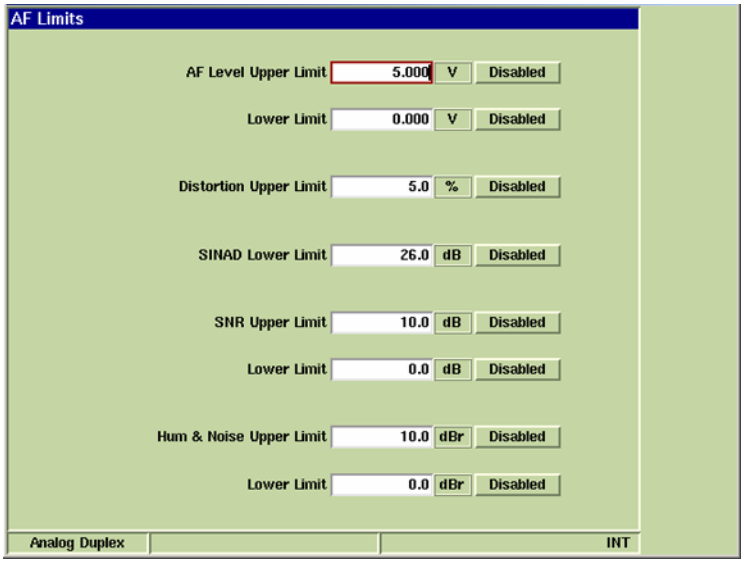

Fig. 8-12 Analog Duplex - AF Limits Configuration Tile

DTMF Configuration Tile

The DTMF Configuration Tile contains parameters that are used by the Test Set's Generators when sending DTMF tones. DTMF Waveform must be selected on the Generators Tile for parameters to apply.

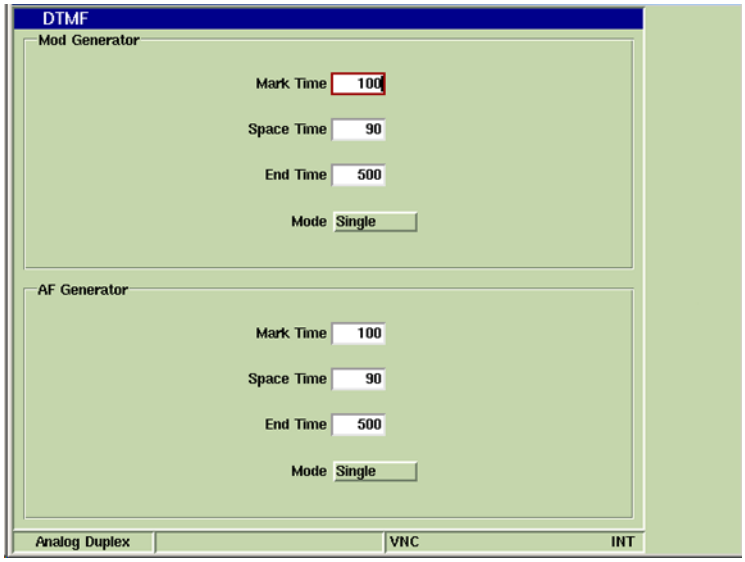

Fig. 8-13 DTMF Configuration Tile

Field/Soft Key Definitions

Mark Time

Sets time period in which the DTMF tone is ON. Defined in milliseconds.

Space Time

Sets dead time between DTMF tones of a sequence. Defined in milliseconds.

End Time

Sets dead time between complete DTMF sequences. This parameter is only valid when Continuous Mode of operation is selected.

Mode

Selects how many DTMF pulses are sent (Single or Continuous).

Ports Configuration Tile

The Ports Configuration Tile defines the Test Set's output parameters (refer to Fig. 8-36).

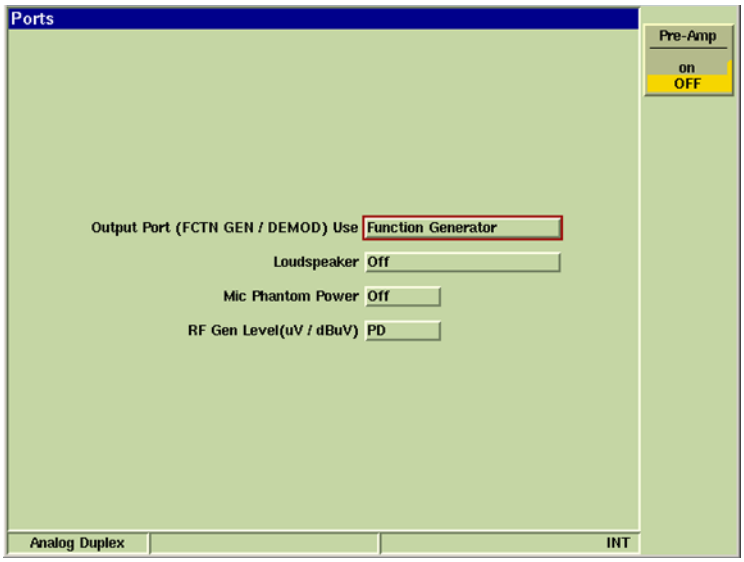

Fig. 8-14 Analog Duplex - Ports Configuration Tile

Field/Soft Key Definitions

Output Port (FCTN GEN/DEMOD) Use

Selects the output connector on the front panel. Demod options select the FCTN GEN/DEMOD Connector as the Demodulation Output.

Audio In options select the FCTN GEN/DEMOD Connector as the AF Generator output.

NOTE

Changing configuration to Demod Out while still connected to the MIC/AF Input of a radio under test may create a feedback loop.

When a filtered output option is selected, the filter type is selected from the Psoph filter drop-down menu on the AF Measurements Configuration Tile or Modulation Measurements Configuration Tile.

Loudspeaker

Selects the source and routing of the signal applied to the loudspeaker within the Test Set.

MIC Phantom Power

A power source for condenser microphones is provided from the MIC/ACC Connector. This drop-down menu controls this feature.

RF Gen Level

The RF output Level can be displayed as EMF or PD. The selected term is shown adjacent to the set level.

[Pre-Amp] Soft Key

The 3900 is equipped with an internal 15 dB broadband amplifier that affects the T/R and ANT Input Ports. When Pre-Amp is ON, the 3900 has a typical noise figure of -9 dB, resulting in a noise floor level around -140 dBm in the spectrum analyzer (RBW = 300 Hz) and around -126 dBm for the Inband power meter (IF = 6.25 kHz). Use of the Pre-Amp feature dramatically increases the sensitivity of the 3900.

NOTE

When Pre-Amp is used, special attention is required; it is a broadband amplifier and could lead to saturation or compression problems in the receiver chain if the signal of interest is very low, but a strong out of band signal is present.

Harmonics and Spurious Configuration Tile

The Harmonics and Spurious Configuration Tile sets sweep and Pass/Fail parameters for harmonics and spurious measurements. This Tile is only available when the Harmonics & Spurious Test Option (390XOPT060) is installed in the Test Set.

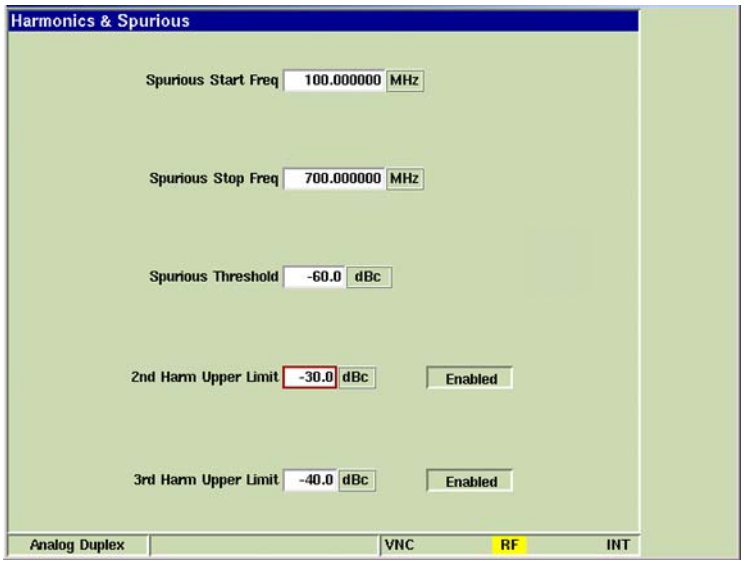

Fig. 8-15 Analog Duplex - Harm & Spur Limits Configuration Tile

Spurious Start Freq

Sets the lower frequency at which Spurious measurement sweeps begin.

Spurious Stop Freq

Sets the upper frequency at which Spurious measurement sweeps stop.

Spurious Threshold Level

Sets the level at which Spurious measurements are triggered. The Test Set records measurements of frequency spikes that exceed the defined threshold level.

2nd Harmonic Upper Limit

Sets upper limit value for 2nd Harmonic measurements.

3rd Harmonic Upper Limit

Sets upper limit value for 3rd Harmonic measurements.

Enabled/Disabled

Enables or disables defined limit.

Analog Duplex Test Tiles

Generators Tile

The Generators Tile controls the Test Set's RF and AF Signal Generators. The RF Signal Generator output source is defined by the user as the T/R Connector or GEN (Generator) Connector. The AF Signal Generators, AF 1, AF2 and AF3, are combined for output at the FCTN GEN/DEMOD Connector. The RF output can be modulated by the sum of the Modulators, Mod 1 and Mod 2, plus the External input (Audio In or Microphone).

Fig. 8-16 Generators Tile - Minimized View

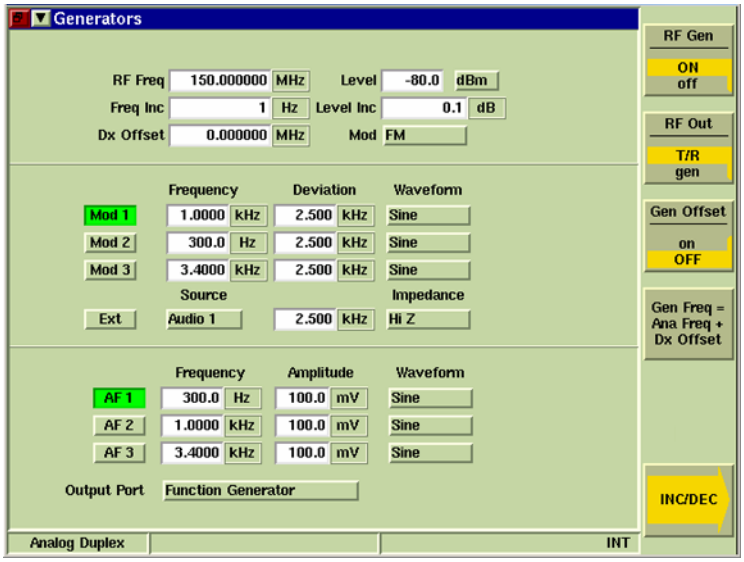

Fig. 8-17 Generators Tile - Maximized View

RF Generator Field Definitions

RF Freq

Sets the RF Output frequency of the Test Set RF Generator. Units of measure are GHz, MHz, kHz and Hz as defined by user.

Level

Sets the RF Generator Output Level. The selected RF Output level is dependent on the RF Output port selected. Refer to 3900 Platform Specifications for the correct output. The indicated RF output is modified if an RF Level Offset value is set. Units of measure are dBm, V and dBµV.

Freq Inc

Defines the RF Output Frequency incremental change value. This is the value by which the RF Output Frequency is changed when the [INC Gen Freq] / [DEC Gen Freq] soft keys are used. Units of measure are GHz, MHz, kHz and Hz as defined by user.

Level Inc

Defines the RF Output Level incremental change value in dB. This value is applied to the RF Output Level when the [INC Gen Level] / [DEC Gen Level] soft keys are pressed.

Dx Offset

Defines the Duplex Offset frequency value. The frequency value set here indicates the difference between the RF Generator output and the RF Analyzer input when the [Gen Freq = Ana Freq + Dx Offset] Soft Key soft key is active. Units of measure are MHz, kHz and Hz as defined by user.

Mod (Modulation)

Selects the type of modulation applied to the RF Output Signal.

Information Flags

EMF or PD

The RF Output Level unit of measurement is Volts, the value can be displayed as EMF or PD. EMF or PD is selected from the Ports Configuration Tile. The selected value is displayed adjacent to the set Level field on the Generators Tile (refer to Fig. 8-18).

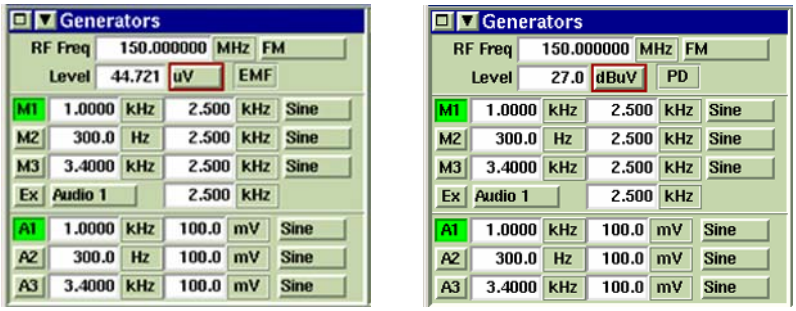

Fig. 8-18 EMF and PD Indicators

Offset Enabled

Offsets are enabled and disabled from the RF Limits Configuration Tile. When an offset is enabled, the  warning symbol is shown beside the measurement.

RF OFF

When the [RF Gen] Soft Key soft key is set to OFF, an RF OFF indicator is shown on the Generators Tile.

Modulation Generators Field Definitions

The 3900 contains three modulation generators which can be applied to the RF Generator in any combination. Each modulation generator is independently controlled by the settings fields in this section of the Generators Tile.

Frequency

Sets the frequency for each Modulation generator. Frequency can be specified in kHz or Hz as defined by user.

Deviation

Defines the deviation for each generator when FM Modulation is selected. Deviation can be specified in kHz or Hz as defined by user. This field is not available when Modulation is OFF.

Depth

Defines the depth for each generator when AM Modulation is selected. Depth is displayed as a percentage. This field is not available when Modulation is OFF.

Waveform

Defines the Waveform for each generator.

Tick Boxes

The buttons to the left of each Modulation Generator frequency settings field allows that generator to be turned on. Modulation can also be provided from an external source as selected from the MIC Input or the Audio 2 connector on the RF Modulation Configuration Tile.

External Modulation

A check box to the left of the Ext (External Modulation) Source drop-down menu allows the external source to be active.

Source

Sets the external modulation source for the Modulation Generators.

Impedance

External source can be set to un-terminated high impedance (Hi Z), or include a 600 Ω termination (600 Ohms).

Modulation Level Warning

A warning indicator is displayed if the sum of the active modulation source levels is set to exceed 99% AM or 150 kHz FM.

AF Generator Field Definitions

Frequency

Sets the frequency for each AF generator. Frequency can be specified in kHz or Hz as defined by user.

Amplitude

Defines the amplitude for each AF Generator. Deviation can be specified in V or mV as defined by user.

Waveform

Defines the Waveform for each AF Generator. The selected value (Sine or Square) is displayed on the minimized Tile beside the Amplitude field.

Radio Buttons

The buttons to the left of each AF Generator frequency settings field turns each generator ON when selected and OFF when un-selected.

Output Level Warning

A warning indicator is displayed if the sum of the active AF Generator levels exceeds 5 V.

Output Port

Setting the Output Port drop-down menu to AF Out routes the output from the AF Generators to the FCTN GEN/DEMOD Connector.

Setting the Output Port drop-down menu to Demod Out outputs a demodulated signal from the RF Analyzer. This drop-down menu is only accessible when the Tile is maximized.

Soft Key Definitions

[RF Gen] Soft Key

Enables or disables the RF Generator output from the Test Set and indicates the current state. When the generator is disabled, an RF OFF indicator is shown on the Tile.

[RF Out] Soft Key

Selects the T/R Connector or GEN (Generator) Connector as the RF Output port.

[RF Offset] Soft Key

Enables or disables the RF Level offset function. RF Level Offset value is defined in the Level field on the Generators Tile.

[Gen Freq = Ana Freq + Dx Offset] Soft Key

Sets the RF Generator frequency to a value spaced from the RF Analyzer frequency as set in the Dx Offset field on the Generators Tile.

[INC/DEC] Soft Key

Opens a soft key sub-menu that increments or decrement a specific setting. These sub-menu soft keys are:

[INC Gen Freq] / [DEC Gen Freq]

Each press of the soft key causes the RF Generator frequency to increment or decrement by the value set in the Freq Inc field on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Gen Level] / [DEC Gen Level]

Each press of the soft key causes the RF Generator level to increment or decrement by the value set in the Level Inc field. on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Ana Freq] / [DEC Ana Freq]

Each press of the soft key causes the RF Analyzer frequency to increment or decrement by the value set in the Freq Inc (Analyzers) field on the Analyzers Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[Return] Soft Key

Returns to the top level soft key functions for the RF Generators Tile.

Analyzers Tile

The Analyzers Tile interfaces the RF Analyzer, the RF Power Meters, the Modulation Analyzer and the AF Analyzer. Each section of the Analyzers Tile contains parameters that are used for measuring aspects of the RF signals being received from the equipment under test.

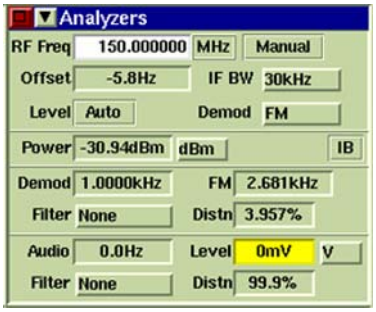

Fig. 8-19 Analyzers Tile - Minimized View

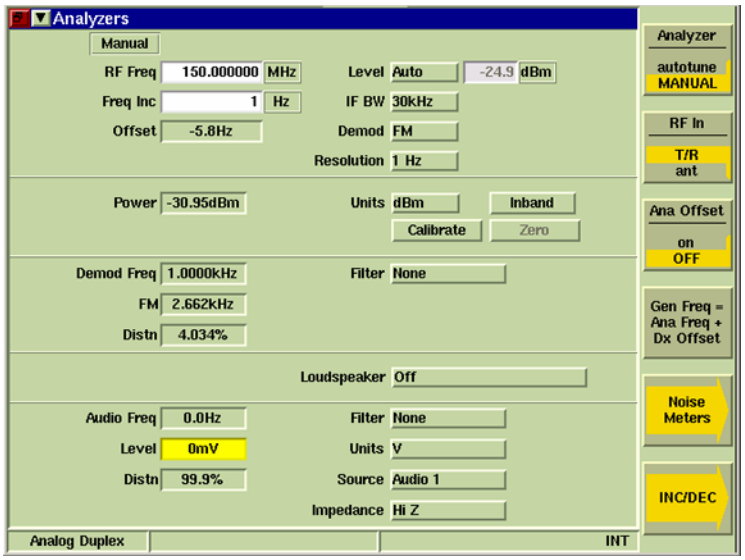

Fig. 8-20 Analyzers Tile - Maximized View

RF Analyzer Field Definitions

RF Freq

Indicates the selected RF Analyzer Input Frequency. This frequency is the center or reference frequency for measurements. Units of measure are GHz, MHz, kHz and Hz. Value must be set when Manual tuning is selected.

When Autotune is selected on the [Analyzer] Soft Key soft key, the RF Input Frequency is set by the Analyzer to the strongest received RF signal.

Level

With Auto is selected from the Level drop-down menu, the Automatic Gain Control (AGC) function optimizes the attenuation or gain.

With Manual is selected from the Level drop-down menu, the Level setting field must be set a value for the expected level of input signal.

Freq Inc (Analyzer)

Sets the value applied to the RF Analyzer Input Frequency when the [INC Ana Freq] / [DEC Ana Freq] Soft Key soft keys are pressed. Unit of measure for incremented value are MHz, kHz or Hz as defined by user.

IF BW

Selects the IF Bandwidth Filter included in the demodulation path. AM USB and LSB are limited to 4 kHz IF BW. IF BW options for AM and FM are:

AM (kHz)	FM (kHz)
6.25	6.25
8.33	10
10	12.5
12.5	25
25	30
30	100
	300

Offset

When Manual is selected as the method of setting RF input, this field specifies the difference between the RF input signal and the manually tuned analyzer frequency.

Demod

Selects the type of demodulation applied to the RF Input Signal.

Resolution

Sets the RF Input Signal's frequency resolution setting. Setting options are 1 Hz or 10 Hz.

Information Flags

Manual or Autotune

Indicates the Mode selected for setting the RF Frequency. When Autotune is selected the Offset value can not be defined.

Squelch

When the Incoming signal is suppressed by the Squelch filter, a Squelch flag indicator appears on the Analyzers Tile. When the tile is minimized, (**SQ**) is displayed; when the tile is maximized SQUELCH is displayed.

Power Meter Field Definitions

Power

Indicates the RF Power reading. The broadband power measurement function is only available when the T/R Connector is selected for the RF Input.

Units

Sets the unit of measurement for the RF Power reading.

Inband/Broadband

This button toggles between Inband and Broadband power measurements. The Inband Power measurement function is available when the ANT (Antenna) Connector or T/R Connector is selected for RF Input. The Broadband/Inband button is only active when the T/R Connector is selected.

Calibrate

When pressed, the Test Set compensates measurement variations resulting from temperature changes. This function is the same as running the UTILS mode procedure (refer to Chapter 3, section titled User Calibration Tile). This button is only available when Inband Power measurements are selected.

Zero

When pressed, the Test Set zeroes out any internal cable loss. This button is only available when Broadband Power measurements are selected.

Modulation Analyzer Field Definitions

Demod Freq

Displays the averaged frequency of the modulating signal.

FM/AM

Displays the measured Deviation or Modulation Depth of the signal.

Distn (Distortion)/SINAD

Displays the measured noise level on the demodulated signal, using the audio signal applied to the unit under test as the reference. The desired noise measurement (Distortion or SINAD) is selected from the [Noise Meters] Soft Key sub-menu.

Filter

Selects a measurement filter to include in the measurement path.

Demod Out sets the FCTN GEN/DEMOD Connector as the Demodulation Output.

AF Out sets the FCTN GEN/DEMOD Connector as the AF Generator Output.

NOTE

Changing configuration to Demod Out while still connected to the MIC/AF Input of a radio under test may create a feedback loop.

Loudspeaker

Selects the source and routing of the signal applied to the loudspeaker within the Test Set.

Audio Analyzer Field Definitions

Audio Freq

Displays the averaged frequency of the Audio input signal.

Level

Displays the averaged level of the Audio input signal. When V is selected from the Units drop-down menu, a scale indicator is displayed next to the Level reading.

Distn (Distortion)/SINAD

Displays the measured noise level on the audio signal, using the modulation applied to the Test Set RF Output Connector as the reference. The desired noise measurement (Distortion or SINAD) is selected from the [Noise Meters] Soft Key sub-menu.

Filter

Selects a measurement filter to include in the measurement path.

Units

Selects the unit of measure for the Level reading. Available value is limited by selected audio input Source. For example, the Balanced audio input Source can be set to either dBm or dBr: V is not available as an option. When V is selected, a scaling value indicator (mV) is displayed beside the Level reading field on the Generators Tile.

Source

Selects the Audio input source.

Impedance

External source can be set to un-terminated high impedance (Hi Z), or include a 600 termination (600 Ohms).

Soft Key Definitions

[Analyzer] Soft Key

Selects the method of setting the RF input level (Autotune or Manual). Refer to section in this chapter titled Level for information on using this feature.

[RF In] Soft Key

Selects the ANT (Antenna) Connector or T/R Connector as the RF Input to the RF Analyzer. The Input Level range and the Power Meter options are dependent on the connector selected.

[RF Offset] Soft Key

Applies or removes a level offset value to the analyzer input. With the Offset value ON the input power level readings are adjusted to include the offset value. This value is set on the Offsets Configuration Tile and Analyzers Tile.

[Noise Meters] Soft Key

Opens a soft key sub-menu that allows measurement option to be selected to be displayed on the Meters Tile for Modulation Distortion and AF Distortion measurement.

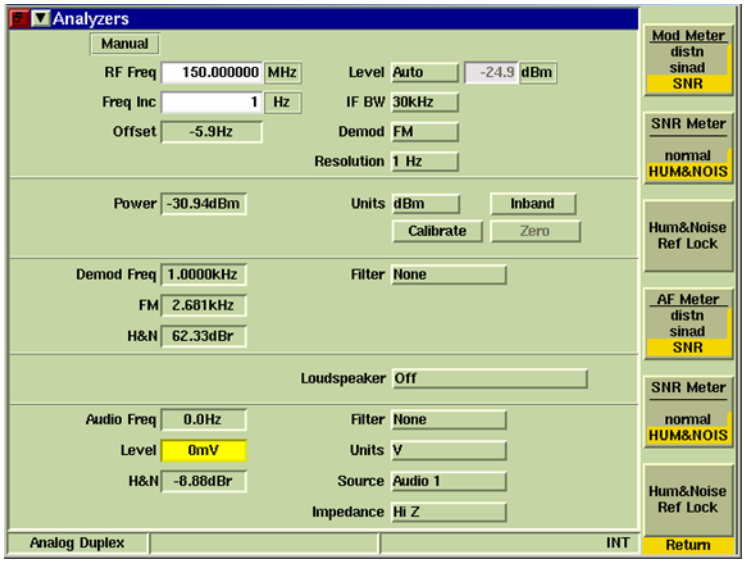

Fig. 8-21 Analyzers Tile - Noise Meters Soft Key Sub-menu

[Mod Meter] Soft Key

Selects type of measurement to be displayed in Modulation Meter. Selecting SNR (Signal to Noise Ratio) enables the [SNR Meter] Soft Key which allows user to select the type of SNR measurement to be performed (Normal SNR or Hum & Noise).

[SNR Meter] Soft Key (Mod)

Selects the type of Mod/AF SNR measurement to be performed, either Normal or Hum & Noise. The [SNR Meter] Soft Keys are only available when SNR is selected on the [Mod Meter] and/or [AF Meter] Soft Keys.

Mod SNR Normal

When the Normal Mod SNR Meter is selected, the Test Set transmits an audio signal to a radio under test in an ON/OFF cycle. The internal signal of the radio under test is modulated with the audio signal it receives from the Test Set. The desired audio generator must be enabled before the [SNR Meter] Soft Key is selected. The radio under test sends this modulated signal back to the Test Set. The Test Set receives and demodulates the signal received from the radio under test. The ratio of the level of the demod audio signal when the Mod Generator is ON versus the level when the Mod Generator is OFF is the SNR reading.

Mod SNR Hum & Noise

The Mod SNR Hum & Noise reading measures the transmitter of the radio under test. SNR Hum & Noise is a measurement of the level of the audio signal that is demodulated by the Test Set when the radio sends a modulated signal versus when the signal is not modulated.

To use the Mod SNR Meter to obtain Mod Hum & Noise measurements:

4. Connect the transmitter of the radio under test to the Test Set.
5. Add modulation at the desired level to the radio under test.
6. Press the [Hum & Noise Ref Lock] Soft Key to obtain a reference lock of the demodulated signal received by the Test Set.
7. Remove the modulation from the radio under test.
8. The Test Set displays the Mod SNR Hum & Noise measurement relative to the level of the demodulated received signal when the radio under test was being modulated.

[AF Meter] Soft Key

Selects the type of AF SNR measurement to be performed, either Normal or Hum & Noise. This soft key is only available when SNR is selected on the [AF Meter] Soft Key.

AF SNR Normal

When the Normal AF SNR Meter is selected the Test Set transmits a user defined, modulated RF signal to a radio under test. The Test Set transmits the signal, cycling the modulation ON and OFF while the signal is being transmitted. The desired modulated signal must be enabled before the [SNR Meter] Soft Key is selected. The radio under test demodulates the signal it receives from the Test Set and sends an audio signal back to the Test Set (via the Audio In connectors). The ratio of the level of the audio in the modulated signal versus the level of audio in the demodulated signal is the SNR reading.

AF SNR Hum & Noise

The AF SNR Hum & Noise reading measures the receiver of the radio under test. AF SNR Hum & Noise is a measurement of the level of the audio signal that is demodulated by the radio when the Test Set sends a modulated signal versus when the signal is not modulated.

To use the AF SNR Meter to obtain Hum & Noise measurements:

1. Connect the transmitter of the Test Set to the radio under test.
2. Connect the demodulated audio of the radio under test to on of the Test Set's Audio In Connectors.
3. Add modulation at the desired level to the Test Set.
4. Press the [Hum & Noise Ref Lock] Soft Key to obtain a reference lock of the audio in the signal received by the Test Set.
5. Remove the modulation from the Test Set's transmitted signal.
6. The Test Set displays the AF SNR Hum & Noise measurement relative to the level of the audio in the signal when the Test Set was being modulated.

[Hum & Noise Ref Lock] Soft Key

Sets a reference lock to the current Hum & Noise Meter reading. This soft key is only available when Hum & Noise SNR is selected on the [SNR Meter] or [AF Meter] Soft Key.

[Gen Freq = Ana Freq + Dx Offset] Soft Key

Sets the RF Generator frequency to a value spaced from the RF Analyzer frequency as set in the Dx Frequency Offset field on the Generators Tile.

[INC/DEC] Soft Key

Opens a soft key sub-menu that increments or decrement a specific setting. These sub-menu soft keys are:

[INC Gen Freq] / [DEC Gen Freq] Soft Key

Each press of the soft key causes the RF Generator frequency to increment or decrement by the value set in the Freq Inc field on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Gen Level] / [DEC Gen Level] Soft Key

Each press of the soft key causes the RF Generator level to increment or decrement by the value set in the Level Inc field on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Ana Freq] / [DEC Ana Freq] Soft Key

Each press of the soft key causes the RF Analyzer frequency to increment or decrement by the value set in the Freq Inc (Analyzer) field on the Analyzers Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[Return] Soft Key

Returns to the top level soft key functions for the Analyzers Tile.

Meters Tile

The Meters Tile displays the results of RF, AF and modulation measurements performed on signals from equipment under test. The fields present on the display vary according to the Demod setting selected on the Analyzers TileA. When maximized (example below) six meters are displayed: up to three of these meters can be selected for display on the minimized Tile. The example below shows the Frequency Offset and TRIB Power meters selected on the minimized Tile.

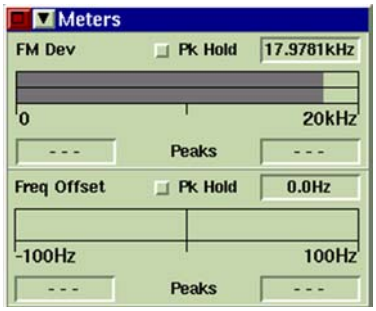

Fig. 8-22 Meters Tile - Minimized View - Freq Offset and TRIB Power Selected

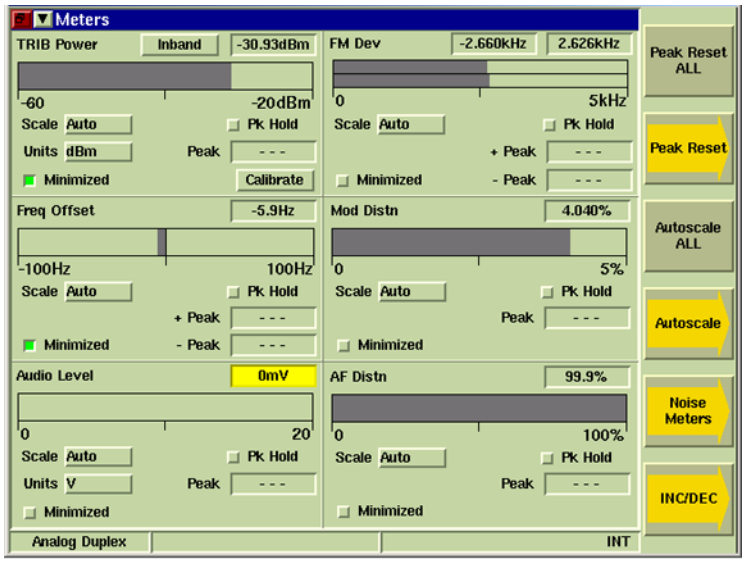

Fig. 8-23 Meters Tile - Maximized View

Common Features

Each meter on the Meter Tile contains similar data fields.

Measurement Digital Readout

The measurement results are displayed as a digital readout at the top right of the meter panel. For some measurements such as AM Depth, the positive and negative values of the measurements are given.

Bar Graphs

The bar graphs provide a graphic representation of the measurement. Measurements that have positive **and** negative values, such as AM Depth, display a double bar to provide a comparative reading. Measurements with positive **or** negative values, such as Frequency Offset, use a center-zero bar.

Scale

The scale of the bar graph is selected from the Scale drop-down menu. Available settings are Auto-ranging (Auto) or a fixed value. The selected scale value is displayed below the bar graph.

Peak (Pk) Hold

Selecting the Peak Hold button allows the peak value of measurements to be captured and updated as new peaks occur. The peak value is shown on the bar graph and in the Peak digital readout field.

Peak Digital Readout

Shows the peak value from the bursts measured. The peak reading can be reset by using either the [Peak Reset ALL] Soft Key, which resets all measurements or by using the [Peak Reset] Soft Key to reset an individual measurement selected from the soft key menu. The reset operation also resets the peak reading on the bar graph.

Minimize Button

This button selects the meter for display on the minimized Tile. Up to 3 meters can be displayed on the minimized display: a warning appearing if more that three are selected. The information shown on the minimized display for each measurement is reduced when multiple measurements are selected.

Field Definitions

Inband/Broadband Power

This button toggles between Inband and Broadband Power measurements. The Inband Power measurement function is available when either the ANT (Antenna) Connector or T/R Connector is selected for RF Input. The Inband/Broadband button is only active when the T/R Connector is selected.

AM Depth or FM Deviation

The meter displayed is dependent on the Demod setting on the Analyzers TileA. When Demod is set to FM, the FM Deviation Meter is displayed. When Demod is set to AM, the AM Depth Meter is displayed.

RF Frequency Offset (when not Autotuned)

When the Manual method of setting the RF input level is selected on the Analyzers TileA, this field indicates the difference between the RF input signal and the defined tuned analyzer frequency.

The Frequency offset bar graph has a center zero for positive or negative readings. The Scale drop-down menu selects setting.

Modulation Distortion or SINAD

The required noise measurement (Distortion or SINAD) is accessed by pressing the [Noise Meters] Soft Key soft key.

AF Distortion or SINAD

The required noise measurement (Distortion or SINAD) is accessed by pressing the [Noise Meters] Soft Key soft key.

Soft Key Definitions

[Peak Reset ALL] Soft Key

Resets all active peak hold levels to zero.

[Peak Reset] Soft Key

Displays a soft key sub-menu that resets the peak hold on a specific meter or meters.

[Autoscale ALL] Soft Key

Sets all meter bar graphs to Auto-ranging.

[Autoscale] Soft Key

Displays a soft key sub-menu containing soft keys that set the bar graph on a specific meter or meters to Auto-ranging.

[Noise Meters] Soft Key

Opens a soft key sub-menu that selects the measurement option to be used on the Meters Tile for Modulation Distortion and AF Distortion measurement.

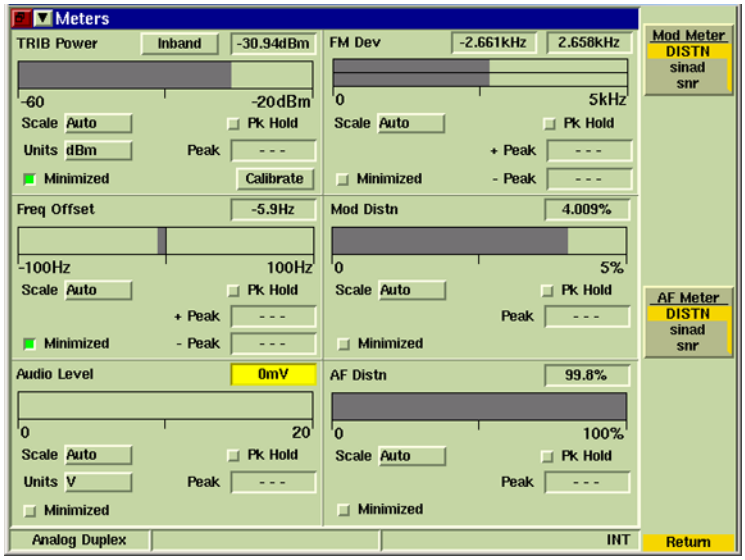

Fig. 8-24 Analog Duplex Meters Tile - SINAD Meters Selected

[Mod Meter] Soft Key

Selects type of measurement to be displayed in Modulation Meter. Selecting SNR (Signal to Noise Ratio) enables the [SNR Meter] Soft Key which allows user to select the type of SNR measurement to be performed (Normal SNR or Hum & Noise).

[SNR Meter] Soft Key

Selects the type of Mod SNR measurement to be performed, either Normal or Hum & Noise. This soft key is only available when SNR is selected on the [Mod Meter] Soft Key.

Mod SNR Normal

When the Normal Mod SNR Meter is selected, the Test Set transmits an audio signal to a radio under test in an ON/OFF cycle. The internal signal of the radio under test is modulated with the audio signal it receives from the Test Set. The radio under test sends this modulated signal back to the Test Set. The Test Set receives and demodulates the signal received from the radio under test. The ratio of the level of the demod audio signal when the Mod Generator is ON versus the level when the Mod Generator is OFF is the SNR reading.

Mod SNR Hum & Noise

The Mod SNR Hum & Noise reading measures the transmitter of the radio under test. SNR Hum & Noise is a measurement of the level of the audio signal that is demodulated by the Test Set when the radio sends a modulated signal versus when the signal is demodulated.

To use the Mod SNR Meter to obtain Mod Hum & Noise measurements:

1. Connect the transmitter of the radio under test to the Test Set.
2. Add modulation at the desired level to the radio under test.
3. Press the [Hum & Noise Ref Lock] Soft Key to obtain a reference lock of the demodulated signal received by the Test Set.
4. Remove the modulation from the radio under test.
5. The Test Set displays the Mod SNR Hum & Noise measurement relative to the level of the demodulated received signal when the radio under test was being modulated.

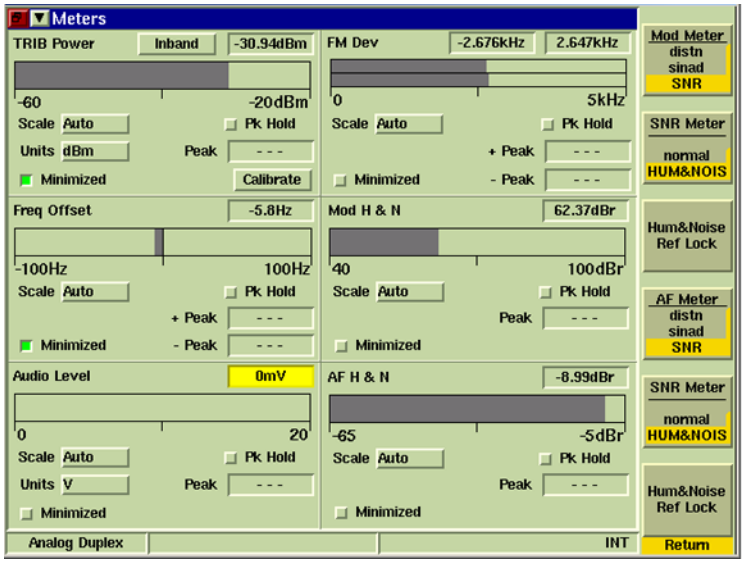

Fig. 8-25 Analog Duplex Meters Tile - Hum & Noise SNR Selected

[AF Meter] Soft Key

Selects the type of AF SNR measurement to be performed, either Normal or Hum & Noise. This soft key is only available when SNR is selected on the [AF Meter] Soft Key.

[SNR Meter] Soft Key

Selects the type of AF SNR measurement to be performed, either Normal or Hum & Noise. This soft key is only available when SNR is selected on the [AF Meter] Soft Key.

AF SNR Normal

When the Normal AF SNR Meter is selected the Test Set transmits a user defined, modulated RF signal to a radio under test. The Test Set transmits the signal, cycling the modulation ON and OFF while the signal is being transmitted. The radio under test demodulates the signal it receives from the Test Set and sends an audio signal back to the Test Set (via the Audio In connectors). The ratio of the level of the audio in the modulated signal versus the level of audio in the demodulated signal is the SNR reading.

AF SNR Hum & Noise

The AF SNR Hum & Noise reading measures the receiver of the radio under test. AF SNR Hum & Noise is a measurement of the level of the audio signal that is demodulated by the radio when the Test Set sends a modulated signal versus when the signal is not modulated.

To use the AF SNR Meter to obtain Hum & Noise measurements:

1. Connect the transmitter of the Test Set to the radio under test.
2. Connect the demodulated audio of the radio under test to on of the Test Set's Audio In Connectors.
3. Add modulation at the desired level to the Test Set.
4. Press the [Hum & Noise Ref Lock] Soft Key to obtain a reference lock of the audio in the signal received by the Test Set.
5. Remove the modulation from the Test Set's transmitted signal.
6. The Test Set displays the AF SNR Hum & Noise measurement relative to the level of the audio in the signal when the Test Set was being modulated.

[Hum & Noise Ref Lock] Soft Key

Sets a reference lock to the current Hum & Noise Meter reading. This soft key is only available when Hum & Noise SNR is selected on the [SNR Meter] or [AF Meter] Soft Key.

Sets a reference lock to the current Hum & Noise Meter reading. When the [Hum & Noise Ref Lock] Soft Key is pressed, it zeroes out the current reading on the corresponding Hum & Noise Meter. Fig. 8-26 shows the Mod H&N Meter after the SNR Meter [Hum & Noise Ref Lock] Soft Key was pressed.

This soft key is only available when Hum & Noise SNR is selected on the [SNR Meter] or [AF Meter] Soft Key.

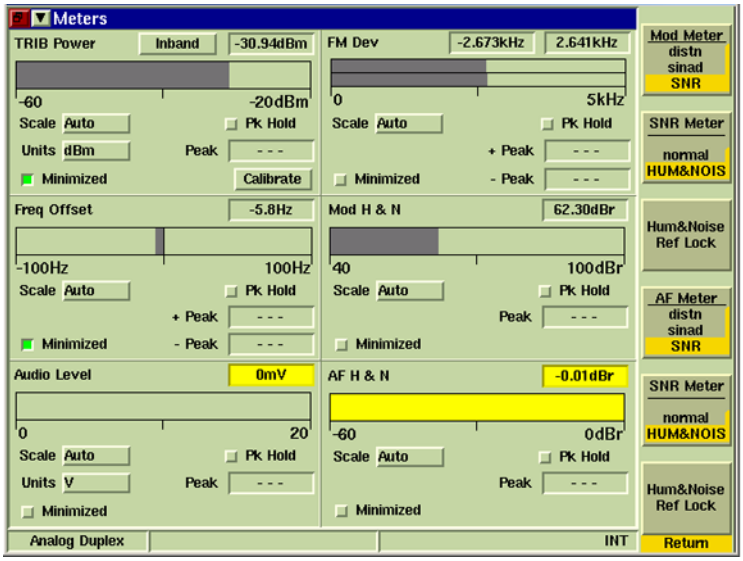

Fig. 8-26 Analog Duplex Meters Tile - Zeroing Hum & Noise Meter

[INC/DEC] Soft Key

Opens a soft key sub-menu that increments or decrements a specific setting.

[INC Gen Freq] / [DEC Gen Freq] Soft Key

Each press of the soft key causes the RF Generator frequency to increment or decrement by the value set in the Freq Inc field on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Gen Level] / [DEC Gen Level] Soft Key

Each press of the soft key causes the RF Generator level to increment or decrement by the value set in the Level Inc field on the Generators Tile. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[INC Ana Freq] / [DEC Ana Freq] Soft Key

Each press of the soft key causes the RF Analyzer frequency to increment or decrement by the value set in the Freq Inc (Analyzer) field on the Analyzers TileA. This soft key is accessed by pressing the [INC/DEC] Soft Key.

[Return] Soft Key

Returns to the top level soft key functions for the Meters Tile.

Site Monitoring (Sensitivity Search) Option

The Sensitivity Search Tile is used to log the Sinad measurement of an injected signal over time. Sensitivity Search is also used to log the spectrum trace of the RF signal. Sensitivity Search data files are referred to throughout this section as Data Log Files.

Refer to Application Note 46891/951, Using the Aeroflex 3900 Series for Remote Site Monitoring, for additional information on use of this option. A copy of this Application Note is included on the 3900 Operation CD and can also be found at www.aeroflex.com/products/commtest/pmr/appnotes/RemoteSiteMonitoring.pdf.

Accessing Site Monitoring

Sensitivity Search is selected from the Measurement drop-down menu on any of the minimized Analog Duplex System Tiles. The Sensitivity Search Tile is only available when the Site Monitoring option (390XOPT051) is installed in the Test Set.

Sensitivity Search Tile Layout

The main Sensitivity Search Tile contains parameters that must be defined to perform a Site Monitoring test. The Tile can be displayed in maximized or minimized view.

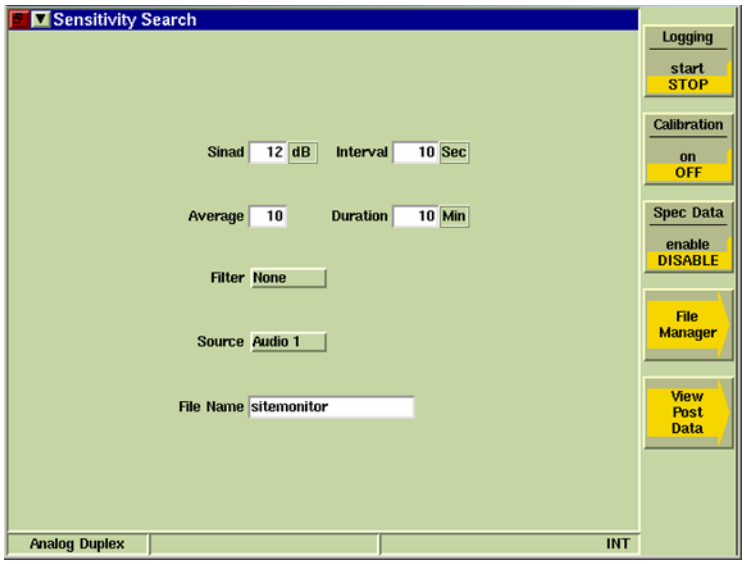

Fig. 8-27 Main Sensitivity Search Tile - Maximized View

Field/Soft Key Definitions

Sinad

Sets the reference point from which all readings are taken.

Interval

Defines how frequently readings are logged to the file for the duration of the search.

Average

Defines the number of readings to be averaged to calculate measurements.

Duration

Defines the length of time over which readings are taken.

Filter

Selects a measurement filter to include in the measurement path.

Source

Selects signal source.

File Name

Indicates the Data Log File currently running or being displayed on Sensitivity Search Tiles. The File name is limited to 18 characters and can not contain any blank spaces. The Test Set logs data to the last selected Data Log File until a new file name is assigned.

To add to an existing Data Log File:

1. Press [File Manager] Soft Key.
2. Select desired Data Log File from list and press [Set as Current] Soft Key.
3. Press Return, then [Logging} Soft Key to start logging data to the selected Data Log File.

To Create New Data Log File

1. Select File Name field on main Sensitivity Search Tile.
2. Enter desired file name in field.
3. Data is automatically saved under designated file name when [Logging] Soft Key is pressed.

[Logging Start/Stop] Soft Key

Starts and stops logging data. When Status is Running, the Sensitivity Search Tile appears as shown in Fig. 8-28. When logging is complete, display Tile defaults back to Main Sensitivity Search Tile (refer to Fig. 8-27).

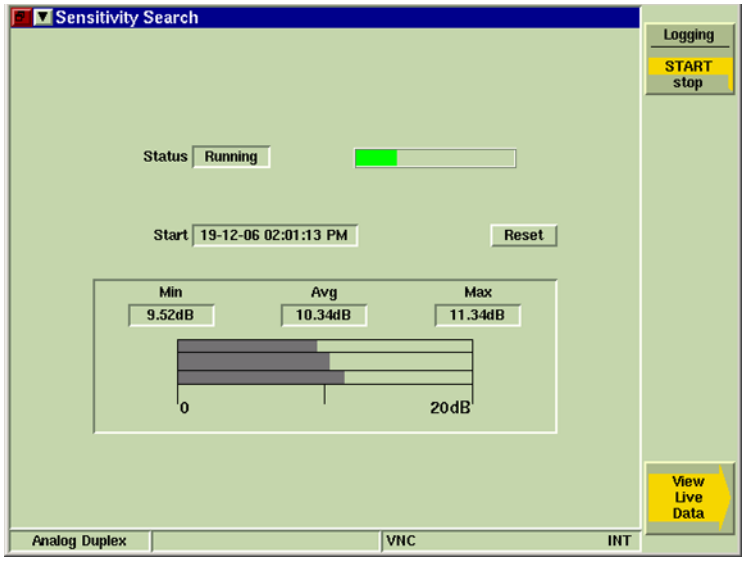

Fig. 8-28 Sensitivity Search Tile - Log Running

[View Live Data] Soft Key

Opens soft key sub-menu (refer to Fig. 8-29) that allows user to view data as if it acquired. This soft key is only available while data is being logged (Status field indicates Running).

[Logging] Soft Key

Displays log file as data is acquired. This soft key is accessed by pressing the [View Live Data] Soft Key while Data Log is running (refer to Fig. 8-29).

[Plot] Soft Key

Displays graph plot of data as it is acquired. This soft key is accessed by pressing the [View Live Data] Soft Key while data is being logged (refer to Fig. 8-29).

[Spectrum] Soft Key

Displays Spectrum Analyzer plot of data as it is acquired (refer to Fig. 8-29). This soft key is only available while data is being logged.

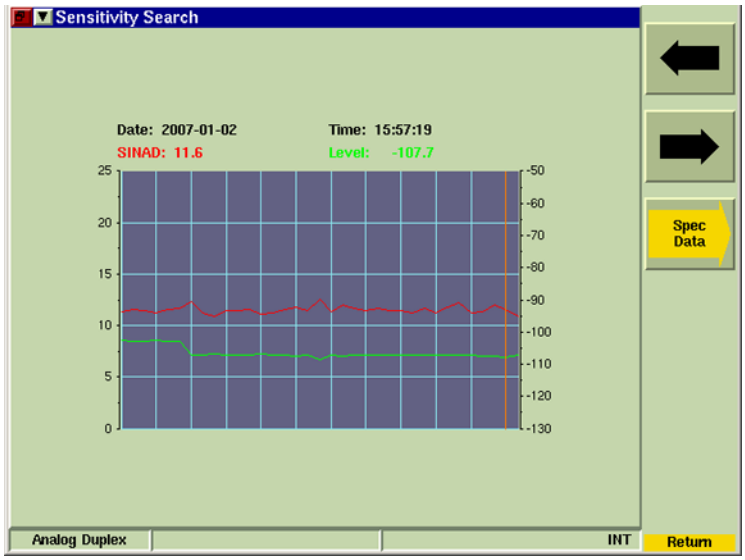

Fig. 8-29 [View Live Data] Soft Key Sub-menu

[Default] Soft Key

Displays Main Sensitivity Search Tile (refer to Fig. 8-27).

[View Post Data] Soft Key

Opens soft key sub-menu that allows user to review saved Data Log Files. This soft key is only available after data acquisition has stopped.

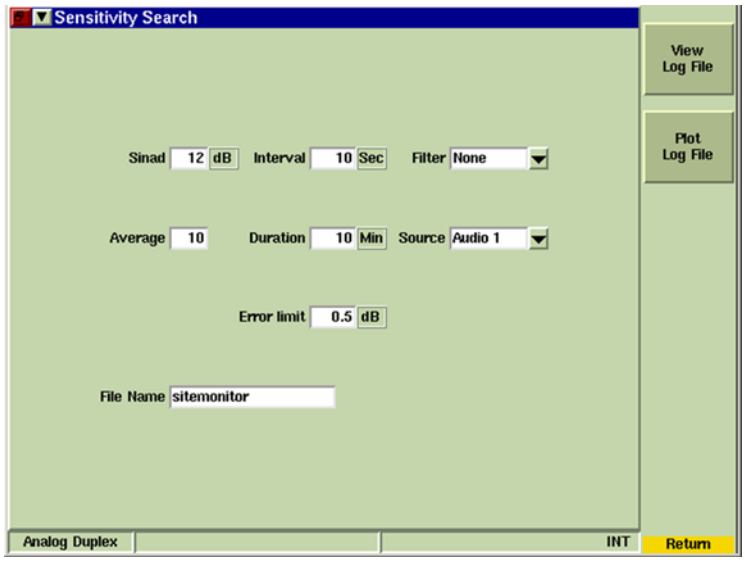

Fig. 8-30 Sensitivity Search - View/Post Data Tile

[Calibration] Soft Key

Initiates Sensitivity Search Calibration function. Unit under test must be configured and connected to Test Set prior to running calibration.

[Spec Data] Soft Key

Displays logged data on a Spectrum Analyzer plot field. Data can be viewed while data is being logged and after logging stops.

[File Manager] Soft Key

Opens a soft key sub-menu that allows user to navigate between or delete existing Data Log Files.

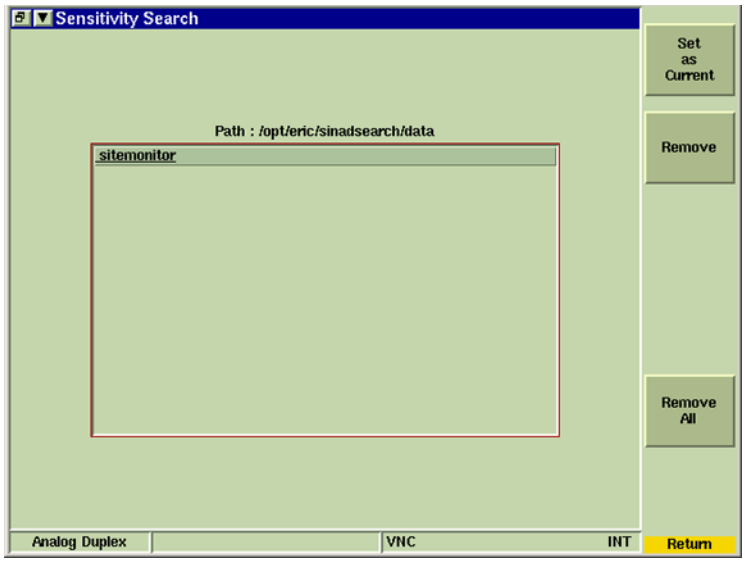

Fig. 8-31 Sensitivity Search - File Manager Tile

Open Existing Log File

To open an existing Data Log File:

1. Press [File Manager] Soft Key.
2. Select the desired file name from list.
3. Press [Set as Current] Soft Key.

Delete Log File

To delete existing Data Log File(s):

1. Press [File Manager] Soft Key.
2. Select the desired file name from list.
3. Press [Remove] Soft Key to remove selected Data Log File or press [Remove All] Soft Key to delete all Data Log Files.

[View Log File] Soft Key

Displays list of Data Log Files. Data Log Files include date and time of test, the Sinad reading and Power Level readings at each recorded interval (refer to Fig. 8-32). The [View Log] Soft Key is accessed by pressing the [View Post Data] Soft Key after data logging has stopped. [Scroll Up] and [Scroll Down] Soft Keys navigate through the data log when Mouse option is not being used.

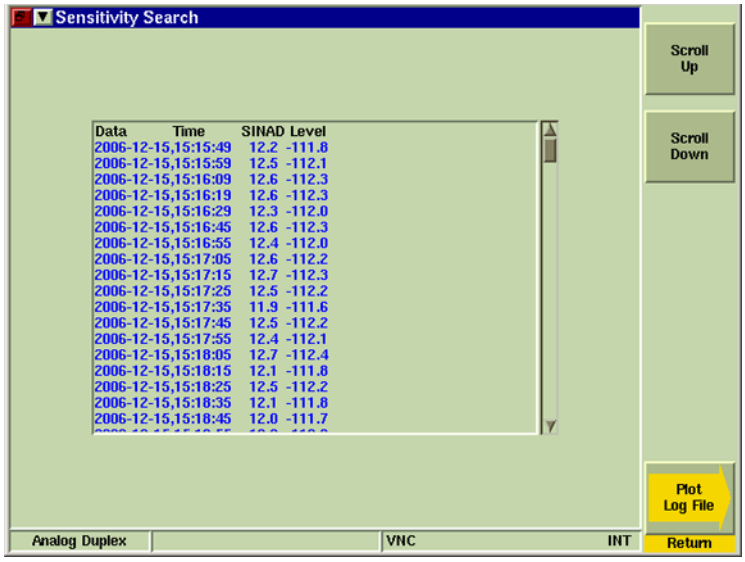

Fig. 8-32 Logged Data File

[Plot Log File] Soft Key

Displays logged data on a graph plot (refer to Fig. 8-33). Directional arrow soft keys allow user to navigate to points along the acquired signal.

[Spec Data] Soft Key

Displays logged data on a Spectrum Analyzer plot. Directional arrow soft keys allow user to navigate to points along the acquired signal. This soft key is accessed by pressing the [Plot Log File] Soft Key when logging has stopped.

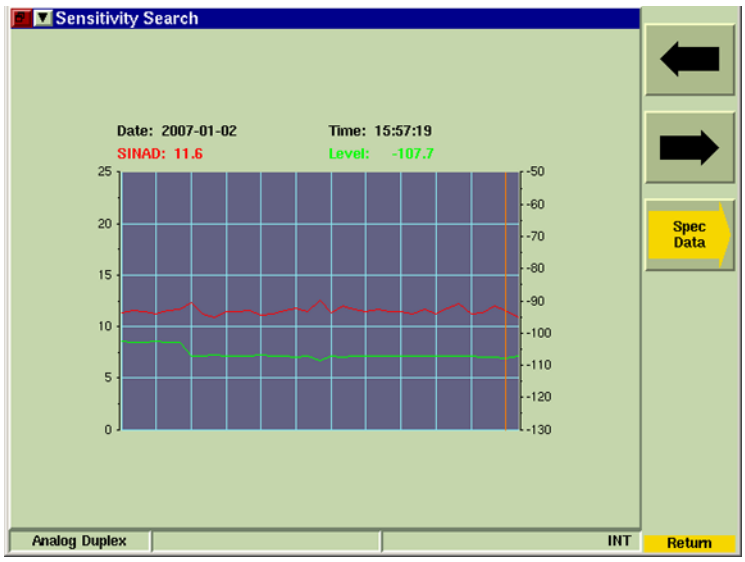

Fig. 8-33 Logged Data - Plot Log Soft Key Sub-menu

3900 Series IQ Gen Option

Introduction

IQ Gen (Generator) is an optional feature for the 3900 Series (390XOPT054). This option allows users to download ***IQCreator®*** waveform files to the 3900. This option only supports waveform files that have been created using IQCreator software. Refer to the IQCreator Getting Started Guide which is included on this CD for information on using ***IQCreator®***.

This section provides a description of the following:

- Accessing IQ Gen.
- Configuring the Test Set to run IQ Creator files.

Preliminary Procedures

IQCreator® waveform files must be imported to the Test Set prior to using the IQ Gen option. Refer to Refer to the section titled File Management Tile in Chapter 3 for information on use of the File Management function.

Accessing IQ Gen

The Analog Duplex System must be operating on the 3900 to utilize the IQ Gen. To select Analog Duplex:

1. Power on Test Set.
2. Press CONFIG Key twice to access CONFIG Floating Menu.
3. Select **System, Analog Duplex** from the Systems Menu. Wait while Analog Duplex loads.
4. After system loads, select **IQ Gen** from the CONFIG floating menu.
5. After the IQ Gen Configuration Tile opens, select the desired IQ File from the IQ File drop-down menu. After the file is selected, data fields on the IQ Gen Configuration Tile are filled with IQ File data information (refer to Fig. 8-34).

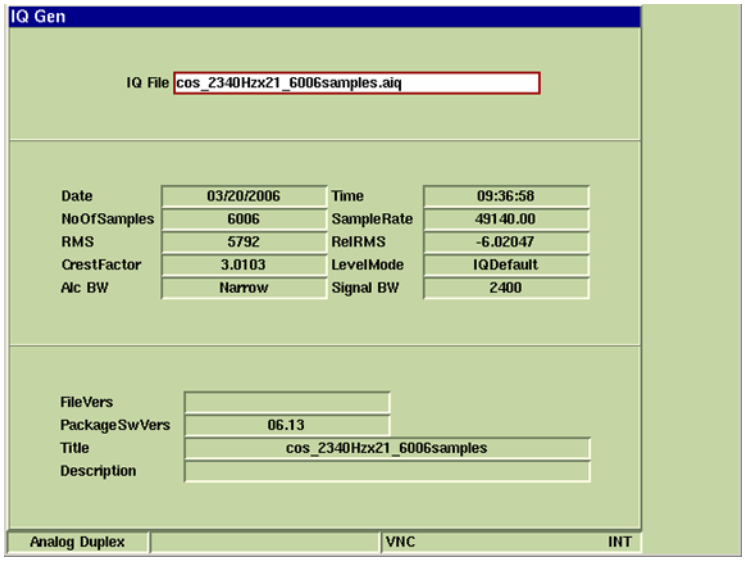

Fig. 8-34 IQ Gen Configuration Tile - File Data

6. Press TEST Key to return to the Analog Duplex Test Tiles.
7. Select **IQ Gen** from the Modulation drop-down menu on the Generators Tile. The Test Set now displays the selected IQ file.

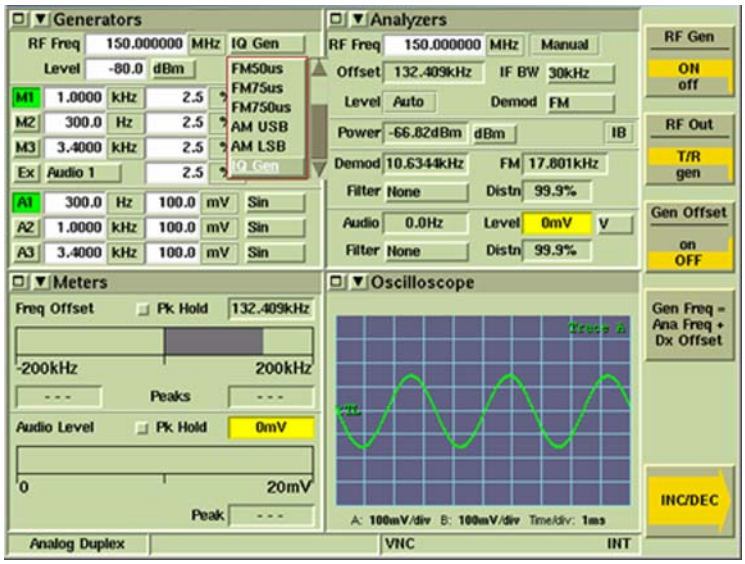

Fig. 8-35 IQ Gen Selection

Harmonics and Spurious Measurements Option Tile

The Harmonics and Spurious Test Option (390XOPT060) provides users with the ability to examine incremental readings at the 2nd and 3rd harmonics at a specified frequency and to obtain readings at the highest non-harmonic frequency spike over a defined frequency range. The Harmonics and Spurious Measurements Tile is only available when the Harmonics and Spurious Test Option (390XOPT060) is installed in the Test Set.

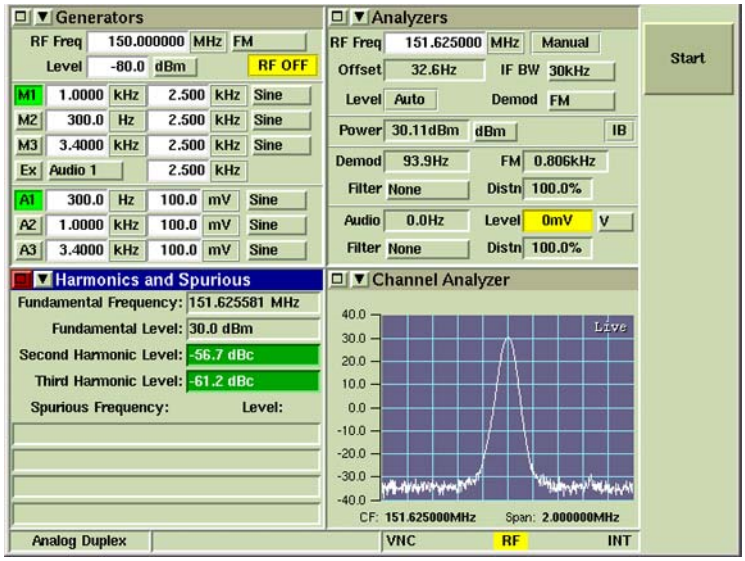

Fig. 8-36 Analog Duplex - Harmonics and Spurious Measurements Tile

Field/Soft Key Definitions

Fundamental Frequency

Sets the frequency at which Harmonic measurements are obtained.

Fundamental Level

Sets the unit of measurement for Harmonic measurements.

Second Harmonic Level

Indicates reading at second harmonic level.

Third Harmonic Level

Indicates reading at third harmonic level.

[Start] Soft Key

Starts harmonic and spurious measurement sweeps.

Spurious Measurements Field

Results area displays frequency at which non-harmonic frequency spikes are detected and the power level at that frequency (refer to Fig. 8-37). These fields are blank when no spurious measurements are detected above the Spurious Threshold level defined on the Harmonics and Spurious Configuration Tile.

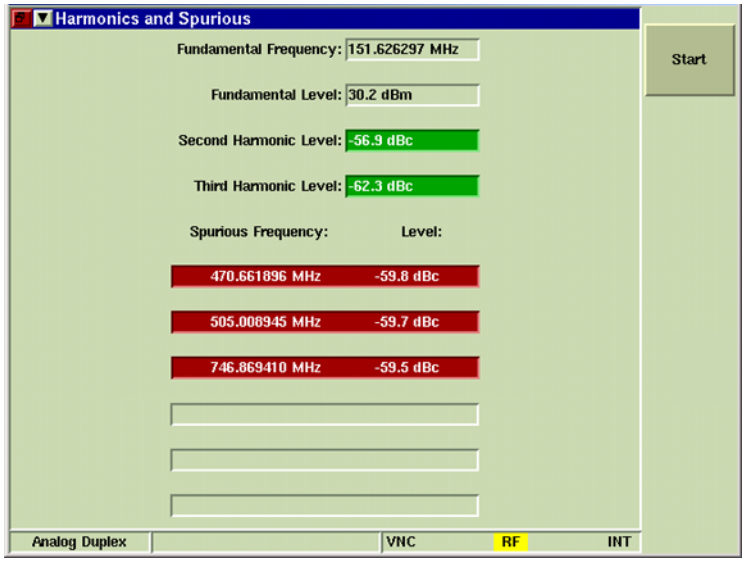

Fig. 8-37 Harmonics and Spurious Results

Oscilloscope

Refer to Chapter 7, Radio Test Instruments for information on the Oscilloscope.

Channel Analyzer

Refer to Chapter 7, Radio Test Instruments for information on the Channel Analyzer.

Audio Analyzer

Refer to Chapter 7, Radio Test Instruments for information on the Audio Analyzer.

Spectrum Analyzer

Refer to Chapter 7, Radio Test Instruments for information on the Spectrum Analyzer.

Appendix A

Shipping Test Set

Repacking for Shipping

Aeroflex Test Sets returned to factory for calibration, service or repair must be repackaged and shipped subject to the following conditions:

Return Authorization

Do not return any products to factory without authorization from Aeroflex Customer Service Department.

CONTACT:

Aeroflex

Customer Service Dept.
10200 West York Street
Wichita, Kansas 67215

Telephone: (800) 835-2350
FAX: (316) 529-5330
email: americas.service@aeroflex.com

Tagging Test Sets

All test sets must be tagged with:

- Owner's identification and address.
- Nature of service or repair required.
- Model No. and Serial No.

Shipping Containers

Test Sets must be repackaged in original shipping containers using Aeroflex packing materials. If original shipping containers and materials are not available, contact Aeroflex Customer Service Department for shipping instructions.

Freight Costs

All freight costs on non-warranty shipments are assumed by the customer. (See "Warranty Packet" for freight charge policy on warranty claims.

Repacking Procedure

1. Make sure bottom packing mold is seated on floor of shipping container.
2. Adjust handle to lay unlocked against Test Set as shown.
3. Place Elastic Retainer around Test Set to secure handle.
4. Carefully wrap Test Set with polyethylene sheeting.
5. Place Test Set into shipping container, making sure Test Set is securely seated in bottom packing mold.
6. Place top packing mold over top of Test Set and press down until mold rests solidly on bottom packing mold.
7. Close shipping container lids and seal with shipping tape or an industrial stapler. Tie all sides of container with break resistant rope, twine or equivalent.

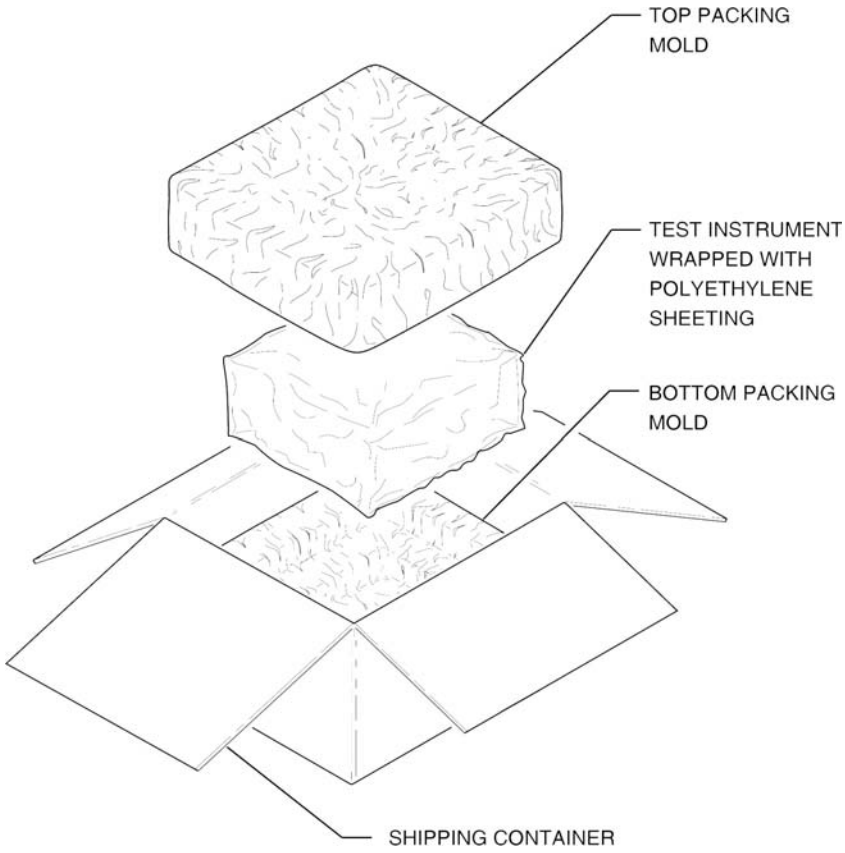

Fig. A-1 Repacking Procedure

Appendix B

3900 Platform Specifications

RF Signal Generator

Frequency

Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Resolution

1 Hz

Accuracy

Frequency Standard ± 1 count

Output Level

Range

T/R: -130.0 to -30.0 dBm

Duplex: -130.0 to +10.0 dBm (+10 dBm max for CW or FM; 0 dBm max for complex modulation)

Resolution

0.1 dB

Accuracy (for level > -110 dBm)

T/R: ±1.0 dB (Typical better than ±0.6 dB)

GEN: ±1.0 dB (Typical better than ±0.6 dB)

Spectral Purity

Residual FM

<15 Hz (300 Hz to 3 kHz bandwidth)

Residual AM

<0.1% RMS (300 Hz to 3 kHz bandwidth)

Harmonics

<-34 dBc (Typical -40 dBc, RF Level set at +10 dBm)

Non Harmonics

<-55 dBc (all frequencies except Crossovers)

<-35 dBc (Crossover frequency = 3411.4 MHz - Gen frequency)

Phase Noise

<-93 dBc/Hz (20 kHz offset, RF <1.05 GHz)

<-90 dBc/Hz (20 kHz offset, RF >1.05 to 2.7 GHz)

RF Signal Generator (cont)

Modulation

Internal FM

RF Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Deviation

±0.001 to ± 150 kHz, OFF

Accuracy

3% (From ±1 kHz to ±100 kHz deviation, 20 Hz to 15 kHz rate)

Resolution

1 Hz

Deviation Rate

20 Hz to 15 kHz

Waveform

Sine, Square, Triangle, Ramp, Digital Coded Squelch (DCS), DTMF

THD

<1% (1 kHz rate, 6 kHz deviation, 300 Hz to 3 kHz BW, Sine)

Internal AM

RF Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Modulation Range

0 to 100%

Accuracy

1% (Modulation from 10 to 90%)

Resolution

0.1%

Rate

20 Hz to 15 kHz

Waveform

Sine, Square, Triangle, Ramp, Digital Coded Squelch (DCS), DTMF

THD

<1% (1 kHz rate, 30 to 70% AM, 300 Hz to 3 kHz BW, Sine)

RF Signal Generator (cont)

Modulation

Internal Single-Sideband (SSB)

RF Range

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Modulation Selection

Upper-Sideband (USB) or Lower-Sideband (LSB)

Modulation Range

0 to 100%

Resolution

0.1%

Rate

300 Hz to 3 kHz

Waveform

Sine, Square, Triangle, Ramp, Digital Coded Squelch (DCS)

External AM/FM/SSB

Audio Inputs

With 1 Vrms, AM/FM/SSB have same characteristics as internal sources, ±10% of indicated setting. (Audio 1 or Audio 2 Input from 20 Hz to 15 kHz, (300 Hz to 3 kHz SSB), Unbalanced)

Microphone Input

With 50 mVrms, AM/FM/SSB have same characteristics as internal sources, ±10% of indicated setting. (MIC Input from 100 Hz to 15 kHz (300 Hz to 3 kHz SSB)

Internal I-Q (Option)

RF Range

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Modulation Selection

IQ Creator® file downloads for custom I-Q modulation

RF Receive Measurements

RF Receiver

Frequency

Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Sensitivity

Pre-Amp OFF

<-100 dBm (10 dB SINAD, FM, 25 kHz, 1 kHz rate, 6 kHz FM Deviation, 300 Hz to 3.4 kHz AF Filter)

Pre-Amp ON

<-113 dBm (10 dB SINAD, FM, 25 kHz, 1 kHz rate, 6 kHz FM Deviation, 300 Hz to 3.4 kHz AF Filter, Pre-Amp On)

Selectivity

IF Bandwidth

6.25, 8.33, 10, 12.5, 25, 30, 100, 300 kHz Filters

Demod Output Level

FM

2.5 Vrms ± 10% (for deviation ±1/2 of selected BW; 25 kHz BW same output level as 30 kHz BW)

AM

3.0 Vrms ±10% (for 100% AM)

RF Counter

Frequency

Range (Usable from 100 kHz, Autotune)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Resolution

1 Hz

Accuracy

Frequency Standard ± 1 count

Level (Range)

T/R: -10 to +50 dBm (Find level is selectable)

ANT: -60 to +10 dBm (Find level is selectable)

RF Receive Measurements (cont)

RF Power Meter (Broad band)

Frequency

Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Level

100 mW to 125 W (Usable from 10 mW)

Resolution

4 digits for W or 0.1 dB

Accuracy

10%, ±1 digit

Power Measurement Range

T/R: 100 mW to 125 W (25% on/off ratio) (Refer to section titled T/R (RF Input/Output).

RF Power Meter (In Band)

Frequency

Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Level

T/R: -60 to +51 dBm: Lowest reading is receiver BW dependent (Narrower bandwidths can measure lower levels).

ANT: -100 to +10 dBm: Lowest reading is receiver BW dependent (Narrower bandwidths can measure lower levels).

AM Filter BW

6.25, 8.33, 10, 12.5, 25 and 30 kHz

FM Filter BW

6.25, 10, 12.5, 25, 30, 100, and 300 kHz

Resolution

0.1 dB

Accuracy (after User Calibration)

±1 dB (Input Level above minimum for selected BW (display not yellow) typically better than ±0.6 dB).

RF Error Meter

Counter Range

0 to ±2.5 MHz from Receiver frequency (6 MHz IF BW)

Accuracy

Frequency Standard ± 1 count

Resolution

1 Hz

Level

T/R: -10 to +50 dBm

ANT: -60 to +10 dBm

RF Receive Measurements (cont)

Demodulation

Demod Counter

Frequency

Range

20 Hz to 20 kHz (1 to 100 kHz FM Deviation, IF BW set appropriately for the received modulation BW)

20 Hz to 10 kHz (30% to 90% AM, IF BW set appropriately for the received modulation BW).

Resolution

0.1 Hz

Accuracy

±50 ppm (±10 ppm Typical)

Input Waveform

Sine or Square

RF Characteristics

Input RF (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

RF Level

T/R: -10 to 50 dBm

ANT: -80 to +10 dBm

FM Deviation Meter

Range

0 to 150 kHz

Scales

1 to 200 kHz in a 1, 2, 5 sequence, plus Autoscale

Resolution

10 Hz

Accuracy

±3% plus source residual, ±1 count (1 to 150 kHz FM deviation, IF BW set appropriately for the received modulation BW)

FM

Rate

20 Hz to 20 kHz (IF BW set appropriately for the received modulation BW)

RF Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

RF Level

T/R: -10 to +50 dBm

ANT: -80 to +10 dBm

RF Receive Measurements (cont)

AM Meter

Range

0 to 100%

Scales

1 to 100% in a 1, 2, 5 sequence, plus Autoscale

Resolution

0.1%

Accuracy

±3% + source residual, ±1 count (30 to 90% AM, IF BW set appropriately for the received modulation BW)

AM

Rate

20 Hz to 15 kHz (IF BW set appropriately for the received modulation BW)

RF Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

RF Level

T/R: -10 to +50 dBm

ANT: -80 to +10 dBm

Audio Function Generator(s)

Up to 3 function generators can be combined into 1 Output signal

Waveshape

Sine, Square, Triangle, Ramp, Digital Coded Squelch (DCS)

Frequency

Range

Sine: 20 Hz to 40 kHz (usable 1 Hz to 40 kHz)

Square: 20 Hz to 4 kHz (usable 1 Hz to 4 kHz)

Resolution

0.1 Hz

Accuracy

±50 ppm, ±10 ppm Typical

Level (Sine)

Range

1 mV to 5 V RMS into a 10 kΩ load

Resolution

0.1 mV

Accuracy

±1% of setting (10 kΩ load)

Impedance

600 Ω nominal

Spectral Purity

<0.5% (1 kHz, 5 V rms, 80 kHz BW, 10 kΩ load, Sine)

<1.0% (Typical, 20 Hz to 40 kHz, 100 mV to 5 V rms, 80 kHz BW, 10 kΩ load, Sine)

Audio & Modulation Measurements

AF Counter

Range

20 Hz to 20 kHz (usable from 10 Hz)

Resolution

0.1 Hz

Accuracy

±50 ppm max, ±10 ppm Typical

Waveshape

Sine or Square

Signal Characteristics

Level

10 mV to 8 V rms (Audio 1 or Audio 2)

Impedance

600 Ω or Hi-Z (Hi-Z is ~10 kΩ)

600 Ω Balanced (Audio 1 and 2)

AF Level Meter

Input

Audio 1 or 2

Range

0 to 8 V rms

Resolution

1 mV (Unbalanced)

0.1 dB (600 Ω Balanced)

Scales

20 mV to 10 V in a 1, 2, 5 sequence, plus Autoscale

Frequency

20 Hz to 20 kHz

Accuracy

5% (Unbalanced, Hi-Z, 300 to 3 kHz, 0.1 to 8 V rms)

Audio & Modulation Measurements (cont)

SINAD Meter

Range

0 to 60 dB

Resolution

0.01 dB

Accuracy

±1 dB, ±1 count (SINAD >3 dB, ≤40 dB, 5 kHz LP AF Filter)

Signal Characteristics

Signal Frequency

300 Hz to 5 kHz

Signal Level

0.1 to 8 V rms

Audio 1 or 2 (600 Ω or Hi-Z)

Audio 1 and 2 (600 Ω Balanced)

Distortion Meter

Range

0.0% to 100.0%

Resolution

0.1%

Accuracy

<±0.5% (Distortion 1% to 10%, 5 kHz LP AF Filter)

<±1.0% (Distortion 10% to 20%, 5 kHz LP AF Filter)

Signal Characteristics

Signal Frequency

300 Hz to 5 kHz (Entry Range 0 to 24,000 Hz)

Signal Level

0.1 to 8 V rms

Audio 1 or 2 (600 Ω or Hi-Z)

Audio 1 and 2 (600 Ω Balanced)

Hum and Noise

Range

-100 dB to +100 dB

Resolution

0.01 dB

Accuracy

±1 dB, ±1 count (> -60 dB, ≤ -20 dB).

Signal Characteristics

RF Level (FM Demod)

T/R: - 10 to +50 dBm

ANT: -80 to +10 dBm

Audio & Modulation Measurements (cont)

Signal to Noise Ratio

Modes

Mode	Stimulus	Stimulus Port	Measurement Input	Measurement Port
1	RF Generator	T/R / GEN	AF Input	Audio In 1 / 2
2	AF Generator	Fctn Gen Out	RF Receiver	T/R / ANT

Meter Range

0 to 60 dB

Resolution

0.01 dB

Accuracy

±1 dB, ±1 count (>3 dB, ≤40 dB, 5 kHz LP AF Filter)

Signal Characteristics

Signal Frequency

300 Hz to 5 kHz (Entry range 0 to 24,000 Hz)

Audio Input Signal Level (Mode 1)

0.1 to 8 Vrms

Audio 1 or 2 (600 Ω or Hi-Z)

Audio 1 or 2 (600 Ω Balanced)

RF Level Input (Mode 2)

T/R: -10 to +50 dBm

ANT: -80 to +10 dBm

Audio Filters (Characteristic Response)

Filter	Type	Ripple	-1 dB	-60 dB
NONE	No Filter	< ± 0.2 dB, above 20 Hz	20 kHz	24 kHz
300 Hz	Low-Pass	< 0.2 dB, above 20 Hz	400 Hz	800 Hz
5 kHz	Low-Pass	< 0.2 dB, above 20 Hz	5 kHz	5.4 kHz
15 kHz	Low-Pass	< ± 0.2 dB, above 20 Hz	16.5 kHz	18 kHz
20 kHz	Low-Pass	< ± 0.2 dB, above 20 Hz	20 kHz	21 kHz
0.3 to 3.4 kHz	Band-Pass	< 0.2 dB	200 Hz / 3.7 kHz	80 Hz / 4.4 kHz
0.3 to 5 kHz	Band-Pass	< 0.2 dB	200 Hz / 5 kHz	80 Hz / 5.4 kHz
0.3 to 15 kHz	Band-Pass	< ± 0.2 dB	200 Hz / 16.5 kHz	80 Hz / 18 kHz
0.3 to 20 kHz	Band-Pass	< ± 0.2 dB	200 Hz / 20 kHz	80 Hz / 21 kHz
PSOPH C-MSG	Band-Pass	Per C-MSG Spec	Per C-MSG Spec	Per C-MSG Spec
PSOPH CCITT	Band-Pass	Per CCITT Spec	Per CCITT Spec	Per CCITT Spec
300 Hz	High-Pass	< 0.2 dB	200 Hz	80 Hz

RF Spectrum Analyzer

Frequency

Range (Usable from 100 kHz)

10 MHz to 1.05 GHz (3901)

10 MHz to 2.7 GHz (3902)

Resolution

1 Hz

Frequency Accuracy

Refer to Frequency Standard I/O Specifications

Span

Span Mode: Start/Stop, Center/Span, Zero Span

Span Width: 2 kHz to full span (4)

Display Accuracy

Span Accuracy + Freq Accuracy +50% of RBW

Span Range

Selection is 2 kHz to Full Span in a 1, 2, 5 sequence, plus Zero Span (Span may be entered numerically down to 1 Hz resolution)

Span Accuracy

±1% of span width

Marker Accuracy

±1% of span width

Level

Ref Level Range

T/R: -50 to +50 dBm

ANT: -90 to +10 dBm

Vertical Scales

1, 2, 5, 10 dB/division

Reference Level Resolution

0.1 dB

Ref Level Units

dBm, dBµV, dBmV

Dynamic Range

70 dB (Antenna, no attenuation, Ref Level -30 dBm, 30 kHz RBW)

Bandwidth Switching Error

±1 dB (After Normalize)

Log Linearity

±1 dB

Accuracy

±1 dB (Input signal -10 dB from Ref Level, Normalized, Pre-Amp OFF)

Attenuator Selections

0 to 50 dB of attenuation, controlled by changing the Ref Level.

RF Spectrum Analyzer (cont)

Level (cont)

3rd Order Intermodulation

-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)

Harmonic Spurious

-55 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)

Non-Harmonic Spurious

-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)

Displayed Average Noise Level (DANL)

-125 dBm (Typical, 300 Hz RBW, ANT Port terminated, 20 sweep average)

Resolution Bandwidth

RBW Selections

300 Hz, 3 kHz, 30 kHz, 60 kHz, 300 kHz, 6 MHz

RBW 60 dB/3 dB Filter Shape

>10:1

Selectivity - Filter Shape

60 dB/3 dB ratio better than 10:1

Accuracy

±10% of RBW for 3 kHz, 30 kHz, 60 kHz, 300 kHz

-10% / +25% of RBW for 6 MHz

±20% of RBW for 300 Hz

Bandwidth Switching Error

±1 dB

Video Bandwidth

10 Hz to 1 MHz in a 1, 3, 10 sequence, NONE

Sweep

Frequency Sweep Time

100 mS to 100 S in a 1, 2, 5 sequence

Zero Span Sweep Time

50 mS to 100 S in a 1, 2, 5 sequence

Sweep Trigger Source

Internal and External

Trigger Modes

Continuous (Repeat), Single (Single-shot)

Function/Feature

Display Modes

Live, Average, Max Hold

Averages

1 to 100

RF Spectrum Analyzer (cont)

Markers

Track

Frequencies (or time) and amplitudes

Number of Markers

2

Marker Functions

Marker to Peak
Marker to Next Right/Left
Marker to Minimum
Marker to Ref Level
Marker to Center Frequency
Marker sets Span
Marker sets Vertical Scale (Zero Span only)

Tracking Generator (Option)

Tracking Generator Output

Refer to RF Signal Generator section for:

- Frequency Range and Accuracy
- Output Level Range, Resolution and Accuracy
- Spectral Purity

Center Frequency, Span and Sweep TIme

Same as Spectrum Analyzer

Tracking Generator Controls

Output Port Selection, RF Level, Reference Call

Oscilloscope

Display

Traces

2

Trace Types

Live, Captured, Accumulated

Markers

2

Marker Functions

Time with Amplitude, deviation or %depth

Delta Marker (including 1/ $\Delta\tau$1, e.g. Hz)

Vertical

3 dB Bandwidth

16 MHz

Frequency Range

DC to 4 MHz (40 MS/s sampling rate)

Input Range

0 to 100 Vpeak

Scales

2 mV to 20 V/division in a 1, 2, 5 sequence (8(h) x 10 (w) graticule display)

Accuracy

5% of full scale (DC to 1 MHz)

10% of full scale (1 to 4 MHz)

Resolution

Better than 1% of full scale

Coupling

DC, AC, GND

Horizontal

Sweep Factors

1 µSec to 1 Sec/division in a 1, 2, 5 sequence

Accuracy

>1.5% of full scale

Resolution

>1% of full scale

Input Impedance

1 MΩ, 20 pF

Oscilloscope (cont)

Trigger

Trigger Source

Trace A, Trace B, EXT, (or Trace C with no CH1 or CH2 Input)

Trigger Edge

Rising/falling

Trigger Mode

Auto/Normal

Continuous/Single

External Trigger Level

Hi-Z BNC Input on the rear panel of the unit

Adjustable from -5 to +5 V

Frequency Standard I/O

Internal Frequency Standard Output (OCXO)

Frequency

10 MHz (nominal)

Output Level

1 Vpp (Nominal) into 50 Ω

Temperature Stability (0 to 50 degrees C)

±0.01 ppm

Aging Rate

±0.1 ppm/Year after 1 month continuous use.

Warm Up Time

Less than 5 min. to ± 0.02 ppm

External Frequency Input

Frequency

10 MHz

Input Level

1 to 5 Vpp for Sine waves

3.3/5 V TTL for Square waves

Connector

BNC socket (10 kΩ Input/50 Ω Output)

Audio Spectrum Analyzer (Option)

Frequency

Range

Start and Stop Frequency 0 to 24,000 Hz

Resolution

1 Hz

Accuracy

± 50 ppm, ± 10 ppm Typical

Span

2 kHz minimum to 24 kHz maximum

Level

Vertical Scales

1, 2, 5, 10, 20 dB per division

Reference Level

0 dB Full Scale (dBr)

Dynamic Range

Greater than 120 dB

Accuracy

± 1 dB from 300 Hz to 15 kHz

Markers

Number of Markers

2

Input/Output Connectors

ANT (RF Input)

Connector Type

TNC

Function

Receiver Input (Input port)

Impedance

50 Ω (nominal)

VSWR (with Attenuation ≥10 dB):

Better than 1.44:1 (RF freq. <1.05 GHz)

Better than 1.58:1 (RF freq. >1.05 GHz to <2.7 GHz)

Input Protection

10 W with warning above +17 dBm (Remove power immediately when alarm sounds).

T/R (RF Input/Output)

Connector Type

Type N

Function

RF Power Input, Generator low-level Output (Input/Output Connector)

Impedance

50 Ω (nominal)

VSWR

Better than 1.2:1 (RF freq. <1.05 GHz)

Better than 1.3:1 (RF freq. >1.05 GHz to <2.7 GHz)

Input Protection

T/R RF Input Power On/Off:

Peak RF Power	Maximum Time On	Minimum Time Off
≤50 W	Continuous	--
>50 W, ≤125 W	30 seconds	2 minutes

T/R RF Input Alarm Activation*:

Alarm	Temperature		Peak RF Power
ON	>100° C	*OR*	>125 W
OFF	<100° C	*AND*	<125 W

**Remove power from Test Set immediately if Overload Alarm triggers.*

Input/Output Connectors (cont)

GEN (RF Output)

Connector Type

TNC

Function

Generator high-level Output (Output Connector)

Impedance

50 Ω (nominal)

VSWR (with level < 0 dBm):

Better than 1.7:1 (RF freq. <1.05 GHz)

Better than 1.9:1 (RF freq. >1.05 GHz to <2.7 GHz)

Input Protection

10 W with warning above +23 dBm (Remove power immediately when alarm sounds).

GPIB

Connector Type

24 pin IEEE

Function

IEEE-488.1-1997

Ethernet

Connector Type

8 Position, RJ-45 100/10 Mbit/s

Function

10/100 Base-T Network Connection

RS-232 (Future)

Connector Type

9-Pin, D-sub Male

Baud Rates

300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Stop Bits

1 or 2

Parity

Odd, Even, None

Video

Connector Type

15-pin, D-sub, VGA

Function

VGA for external monitor

Input/Output Connectors (cont)

IF Output

Connector Type

BNC

Function

10.7 MHz Receiver IF

Output Level

Proportional to Receive Signal Level

MIC/Accessory

Connector Type

8 position, Female DIN

Function

Microphone connection, Modulation Input, Demod Output, PTT Operation

Parallel Port

Connector Type

25 position, Female D-sub

Function

Printer Interface

USB

Connector Type

Twin USB Standard connection

Function

USB Version 1.1 interface (Mouse enabled)

PS/2 Interfaces

Connector Type

Dual PS/2 Connectors

Function

Keyboard interface

Test Port

Connector Type

15 position, Female 3 Tier D-sub

Function

Programmable I/O and voltage Output (optional interface)

Auxiliary IF Input

Connector Type

High-density dual inline

Function

External digital receiver input (optional interface)

Power Requirements

AC

Voltage

100 V to 120 VAC @ 60 Hz

220 V to 240 VAC @ 50 Hz

Power Consumption

Nominally 120 W (200 W Max)

Mains Supply Voltage Fluctuations

≤10% of the nominal voltage

Fuse Requirements

3 A, 250 V, Type F

Environmental

Operating Temperature

0 to 50°C (Tested in accordance with MIL-PRF-28800F Class 3)

Warm-up Time

15 minutes

Storage Temperature

-40 to 71°C (Tested in accordance with MIL-PRF-28800F Class 3)

Relative Humidity

80% up to 31°C decreasingly linearly to 50% at 40°C

(Tested in accordance with MIL-PRF-28800F Class 3)

Altitude

4,000 m (13,123 ft) (Tested in accordance with MIL-PRF-28800F Class 3)

Shock and Vibrations

30 G Shock (Functional Shock)

5-500 Hz random vibrations

(Tested in accordance with MIL-PRF-28800F Class 3)

Use

Pollution Degree 2

Reliability

>8,000 hour calculated MTBF (MIL-HDBK-217F, Notice 2)

Safety Standards

3901/3902

UL 61010B-1

EN 61010-1

CSA C22.2 No. 61010-1

Dimensions and Weight

Height	Width	Depth
19.7 cm	35.6 cm	52.0 cm
7.75 in	14.0 in	20.5 in
Weight	16.5 kg (36.8 lbs)	

General Features

LCD Display

Screen Size

6.4 in. diagonal

Active Area

129.6 mm (h) x 97.44 mm (v)

Resolution

640 x 480 pixels

Disk Storage

3.5 inch Floppy Disk

Internal hard disk of 30 GB available for user storage

Appendix C

Fuse Replacement Instructions

Fuse Replacement Procedure

STEP PROCEDURE

1. Verify 3900 is OFF and AC Power is disconnected from Test Set.
2. Press inward on pressure clip to remove Fuse Carrier.

3. Remove Fuse Carrier from Test Set.

4. Replace fuse:

3 A, 250 V, Type F
20 mm cartridge fuse (F3AL250V)
Aeroflex P/N: 5106-0000-055

CAUTION

For continuous protection against fire, replace fuse with fuses of the specified voltage and current ratings.

5. Install Fuse Carrier by pressing into place.
6. Install Fuse Cover.

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Appendix D

Abbreviations

AC	Alternating Current
ACC	Accessory
AF	Audio Frequency
AGC	Automatic Gain Control
AM	Amplitude Modulation
Ana	Analog
ANT	Antenna
CH	Channel
CONFIG	Configuration
dB	decibel
dBm	decibel relative to 1 mW
dBr	decibel relative to arbitrary reference value
dBV	decibel relative to 1 Volt
dBW	decibel relative to 1 Watt
dBV	decibel relative to 1 Micro Volt
Dec	Decrements
Demod	Demodulated
Dx	Duplex
EMF	Electromotive Force
Ext	External
FCTN	Function
Fig.	Figure
FM	Frequency Modulation
Freq	Frequency
fW	Femto Watt
GEN	Generator
GHz	Giga Hertz
GND	Ground
GPIB	General Purpose Interface Bus
Hz	Hertz
IF	Intermediate Frequency
Inc	Increments
kHz	Kilo Hertz
kV	Kilo Volt
kW	Kilo Watt
MHz	Mega Hertz
MIC	Microphone
Mkr	Marker

Mod	Modulation
nW	Nano Watt
PD	Potential Difference
Pk	Peak
Psoph	Psophometric
PTT	Push to Talk
pW	Pico watt
RBW	Resolution Bandwidth
Res	Resolution
RF	Radio Frequency
RMS	Root Mean Square
Rx	Receive
S	Seconds
SQ	Squelch
T/R	Transmit/Receive
Tx	Transmit
UTILS	Utilities
V	Volts
VBW	Video Bandwidth
Vid	Video
W	Watt
µs	Micro Seconds
µV	Micro Volt

Appendix E

Common Features Quick Reference Guide

The chart below identifies the Tile location or soft key used to access common settings and functions.

Setting	System	Field / Function Location
AGC	Analog Duplex	Analyzers Tile (Level field)
	HPD®	RF Control Settings Tile
	P25	N/A
	TETRA Systems	RF Settings Tile or Control Tile
Calling Party SSI	TETRA Systems	Call Types Configuration Tile Messages Configuration Tile
Calling Party ESN	TETRA Systems	Call Types Configuration Tile
External Source	Analog Duplex	Generators Tile
Factory Defaults (Restore)	All Systems	Store/Recall Utility Tile
Fan Control	All Systems	Operational Status Utility Tile
Frequency Reference	All Systems	Frequency Reference Utility Tile
Impedance	Analog Duplex	Analyzers Tile Generators Tile
	HPD®	N/A
	P25	N/A
	TETRA Systems	Audio Tile
Loudspeaker	Analog Duplex	AF Measurements Configuration Tile Analyzers Tile Modulations Measurements Configuration Tile Ports Configuration Tile
	HPD®	N/A
	P25	N/A
	TETRA Systems	Audio Tile
Pre-Amp	All Systems	Channel Analyzer Spectrum Analyzer
	Analog Duplex	Ports Configuration Tile
	HPD®	RF Control Settings Tile
	P25	N/A
	TETRA Systems	RF Settings Tile or Control Tile
MIC Phantom Power	Analog Duplex Only	AF Measurements Configuration Tile Mod Gen Configuration Tile Ports Configuration Tile
Output Port (FCTN GEN / Demod) Use	Analog Duplex Only	Modulation Measurements Configuration Tile Generators Tile Ports Configuration Tile

PTT Controls RF Out	Analog Duplex Only	RF Gen Configuration Tile
PTT Polarity Active	Analog Duplex Only	RF Gen Configuration Tile
Psoph Filter / Filter	Analog Duplex	AF Measurements Configuration Tile Analyzers Tile Modulations Measurements Configuration Tile
	HPD®	N/A
	P25	N/A
	TETRA Systems	Audio Tile
Reset Overload Protection	All Systems	User Calibration Utility Tile Frequency Reference Utility Tile
Resolution (Frequency Counter)	Analog Duplex	Analyzers Tile
	HPD®	N/A
	P25	N/A
	TETRA Systems	Audio Tile
SINAD / Distortion Frequency	Analog Duplex Only	AF Measurements Configuration Tile
SINAD / Distortion Width	Analog Duplex Only	AF Measurements Configuration Tile Modulation Measurements Configuration Tile
Source (Signal)	Analog Duplex	AF Measurements Configuration Tile Analyzers Tile Mod Gen Configuration Tile
	HPD®	N/A
	P25	N/A
	TETRA Systems	Audio Tile

Appendix F

Optional Systems

The following are Optional Systems currently available for the 3900 Series:

System	Features Provided	Option #	Special Notes
TETRA MS	Provides features for testing most functions of TETRA Mobile Stations (hand sets).	390XOPT110	
TETRA MS T1	Provides features for testing RF aspects of TETRA Mobile Stations (hand sets) using the TETRA T1 Test facility.		Included with TETRA MS Option
TETRA BS	Provides features for testing TETRA Base Station transmitters.	390XOPT111	
TETRA BS T1	Provides features for testing RF aspects of TETRA Base Station transceivers using the TETRA T1 Test facility.		Included with TETRA BS T1 Option
TETRA DM	Provides features for testing TETRA Mobile Direct Mode call setup and parameters.	390XOPT112	
TETRA Energy Economy Mode	Provides features for selecting a specific energy economy mode to enable the Test Set to operate in a power saving capacity when communicating with a mobile.	390XOPT114	Requires TETRA MS Option (390XOPT110)
P25 Conventional	Provides the ability to transmit and receive P25 modulated signals and to perform RF and modulation measurements on P25 radios and systems.	390XOPT200	Includes Vocoder Option (390XOPT216)
Vocoder	Provides data and voice encryption/ decryption capabilities. The Vocoder option requires installation of additional hardware (factory installed only).	390XOPT216	All P25 Options and HPD® Options (e.g., 390XOPT200 or 390XOPT300)
HPD Testing Option	Provides the ability to transmit and receive Motorola HPD modulated signals and to perform RF and modulation measurements on Motorola HPD radios and systems.	390XOPT300	Only available through Motorola. Includes Vocoder Option (390XOPT216)
HPD Advanced Analysis Package	Provides the additional test and measurement capabilities for Motorola HPD modulated signals and additional data analysis operation.	390XOPT301	Requires HPD Testing Option (390XOPT300) Option available only through Motorola

System	Features Provided	Option #	Special Notes
Site Monitoring	Provides the ability to continuously monitor and log a radio system's receiver performance, including SINAD sensitivity and spectrum analysis.	390XOPT051	
IQ Gen	Provides users with the ability to download and modulate IQCreator® waveform files to the 3900.	390XOPT054	
Audio Analyzer	Provides the ability to evaluate the audio frequency band of a demodulated or externally input signal.	390XOPT055	
AutoTest II	The AutoTest II option provides and interface between the Test Set's AutoTest System and remote command functionality.		
	AutoTest II Analog	390XOPT059	
	AutoTest II TETRA	390XOPT115	
	AutoTest II P25	390XOPT218	
	AutoTest II HPD	390XOPT303	
Tracking Generator	The Tracking Generator generates a carrier wave that is applyied to components or systems, which allos the output to be analyzed to evaluate the frequency response of the device under test.	390XOPT061	

Index

C - E

F - H

I - M

N - P

R

S

T - V

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