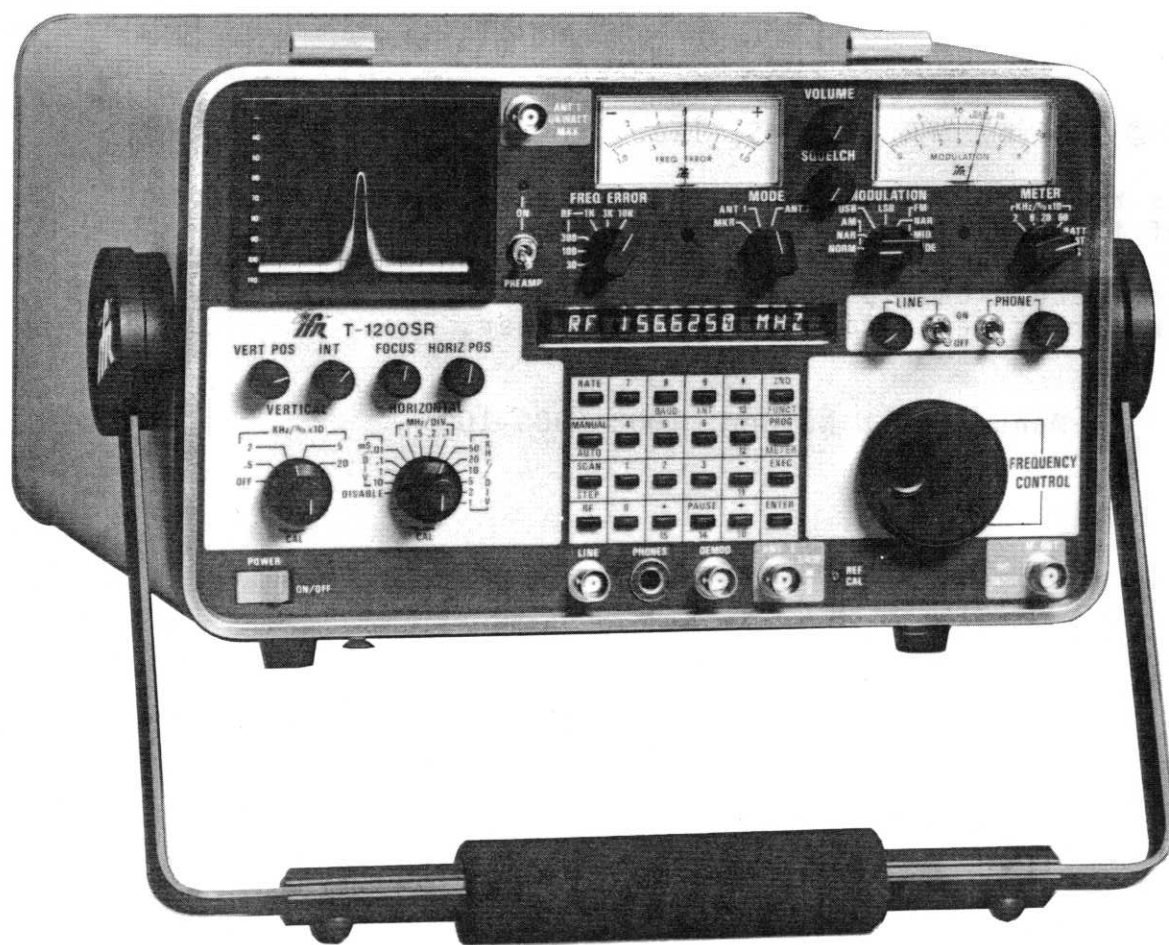




OPERATION MANUAL

T-1200SR SCANNING RECEIVER



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Manual Part Number: 1002-5900-100

WARNING:

HIGH VOLTAGE EQUIPMENT

THIS EQUIPMENT CONTAINS CERTAIN CIRCUITS AND/OR COMPONENTS OF EXTREMELY HIGH VOLTAGE POTENTIALS, CAPABLE OF CAUSING SERIOUS BODILY INJURY OR DEATH. WHEN PERFORMING ANY OF THE PROCEDURES CONTAINED IN THIS MANUAL, HEED ALL APPLICABLE SAFETY PRECAUTIONS.

RESCUE OF SHOCK VICTIMS

1. DO NOT ATTEMPT TO PULL OR GRAB THE VICTIM
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.
3. IF YOU CANNOT TURN OFF ELECTRICAL POWER, PUSH, PULL OR LIFT THE VICTIM TO SAFETY USING A WOODEN POLE, A ROPE OR SOME OTHER DRY INSULATING MATERIAL.

FIRST AID

1. AS SOON AS VICTIM IS FREE OF CONTACT WITH SOURCE OF ELECTRICAL SHOCK, MOVE VICTIM A SHORT DISTANCE AWAY FROM SHOCK HAZARD.
2. SEND FOR DOCTOR AND/OR AMBULANCE.
3. KEEP VICTIM WARM, QUIET AND FLAT ON HIS/HER BACK.
4. IF BREATHING HAS STOPPED , ADMINISTER ARTIFICIAL RESUSCITATION. STOP ALL SERIOUS BLEEDING.

CAUTION

INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FET'S, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, THE USE OF UNGROUNDED TOOLS, AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

1. BEFORE USING IN A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER EITHER BY THE USE OF VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.
2. WHEN REMOVING DEVICES FROM THEIR CONTAINERS, GROUND THE HAND BEING USED WITH A CONDUCTIVE WRISTBAND.
3. TIPS OF SOLDERING IRONS AND/OR ANY TOOLS USED MUST BE GROUNDED.
4. DEVICES MUST NEVER BE INSERTED INTO NOR REMOVED FROM CIRCUITS WITH POWER ON.
5. PC BOARD, WHEN TAKEN OUT OF THE SET, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG.

NOTE

Remove any built-in power source, such as a battery, before laying PC Boards on conductive mat or storing in conductive bag.

6. PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CONDUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING BOX.

THE USE OF SIGNAL GENERATORS FOR MAINTENANCE AND OTHER ACTIVITIES CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE TO COMMUNICATION RECEIVERS, WHICH CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICE OUT TO A DISTANCE OF SEVERAL MILES.

USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION WHICH RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND SHOULD TAKE NECESSARY PRECAUTIONS TO AVOID POTENTIAL COMMUNICATION INTERFERENCE PROBLEMS.

LIST OF EFFECTIVE PAGES

The manual pages listed below which are affected by a current change or revision, are so identified by a revision number and an asterisk.

Date of issue for original and changed pages are:

Original 00 May 31, 1986
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TOTAL NUMBER OF PAGES IN THIS MANUAL IS 74 CONSISTING OF
FOLLOWING:

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Caution Page 0	4-12 0
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PREFACE

SCOPE

This manual contains instructions for operating the T-1200SR Scanning Receiver. The instruction level of this manual is relatively basic and presupposes no previous experience on the part of the operator with a scanning receiver of this type. It is strongly recommended that operator be thoroughly familiar with Sections 1 through 3 of this manual before attempting to perform any operating procedures contained in Section 4.

ORGANIZATION

The operation manual is divided into the following major sections:

SECTION 1 - INTRODUCTION

Provides a brief introduction to the T-1200SR including purpose, functional capabilities and uses.

SECTION 2 - INSTALLATION

Provides a step-by-step procedure for setting up the T-1200SR for operation.

SECTION 3 - DESCRIPTION OF CONTROLS, CONNECTORS & INDICATORS

Identifies and functionally describes all T-1200SR controls, connectors and indicators.

NOTE

As an operating aid, Figure 3-1 (which locates and identifies all T-1200SR front panel controls) has been incorporated into a fold-out page. By extending the fold-out page, the operator can easily reference any front panel control while simultaneously performing any operating procedure contained elsewhere in this manual.

SECTION 4 - OPERATION

Contains instructions for operating the T-1200SR Keyboard, Frequency Change Control and VFD. Using the Keyboard, the operator can enter data into the T-1200SR in the following modes:

1. Direct Data Entry
2. Programmed Data Entry into Memory
3. Executed Data Entry from Memory

In addition to Keyboard operation, this section contains instructions for operating the T-1200SR using an RS-232 compatible external device, plus a selection of basic operating procedures pertaining to all major functions of the set.

SECTION 5 - MINIMUM PERFORMANCE CHECK

Contains a quick, qualitative, step-by-step check for assessing the performance of the T-1200SR.

Useful supplementary information relating to the operation of the T-1200SR is contained in appendices at rear of manual. (See Table of Contents for detailed list of manual contents.)

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SECTION 1 - INTRODUCTION

1-1 GENERAL

The T-1200SR is a microprocessor controlled, digitally synthesized scanning receiver, which integrates several functions of different instruments into a single, compact and portable unit. Utilizing such features as a keyboard entry system, a Vacuum Fluorescent Display for digital readout, processor controlled memory functions and a CRT capable of displaying spectrum analyzer inputs, the T-1200SR incorporates the functions of the following equipment:

- | | |
|---------------------------|--------------------------|
| 1. Communication Receiver | 4. Frequency Error Meter |
| 2. Spectrum Analyzer | 5. Modulation Meter |
| 3. Oscilloscope | 6. Signal Strength Meter |

The T-1200SR is a triple conversion, superheterodyne receiver, capable of monitoring communication signals within a range of 100 kHz to 999.9999 MHz, in 100 Hz steps. Signals may be received "off-the-air" using either the ANT 1 or ANT 2 connectors. Associated receiver monitoring circuits include a frequency error meter, modulation meter, spectrum analyzer and oscilloscope for demodulated signals.

1-2 DATA DISPLAY AND CONTROL FEATURES

Operator interaction with the T-1200SR is facilitated through the following primary data display and control features:

1. KEYBOARD

The Keyboard provides a means of entering data into the T-1200SR microprocessor, to control the operation of the RF Frequency function. The Keyboard is also used to address the T-1200SR programmable functions which utilize the automatic storage, retrieval and execution capabilities of the set. All Keyboard functions are described in detail in Section 3.

2. FREQUENCY CHANGE CONTROL

The Frequency Change Control provides an additional means of entering data into the T-1200SR microprocessor, to control the operation of the RF Frequency function. It facilitates a rapid frequency change capability.

3. VFD

The Vacuum Fluorescent Display (VFD) is used to display the current Keyboard operating frequencies associated with the T-1200SR RF Frequency function. The VFD displays the digital readout of the selected range of both the FREQ ERROR and MODULATION Meters.

SECTION 2 - INSTALLATION

2-1 GENERAL

Preparing the T-1200SR for operation is a simple procedure which consists of the following basic steps (Ref. Figures 2-1 and 2-2):

CAUTION

ANT 1 AND ANT 2 CONNECTORS ARE USED FOR "OFF-THE-AIR" RECEIVING ONLY. DO NOT CONNECT A TRANSMITTER TO THESE INPUTS.

DO NOT CONNECT ANY TRANSMITTER OUTPUT TO ANY FRONT PANEL CONNECTOR.

IF THE T-1200SR IS PLUGGED INTO A VEHICLE'S DC SUPPLY, DISCONNECT THE SET WHILE STARTING THE ENGINE.

REMOVE ANY POSSIBLE STATIC CHARGE FROM AN UNTERMINATED ANTENNA BEFORE CONNECTING TO THE T-1200SR ANT 1 AND ANT 2 CONNECTORS.

1. Set T-1200SR into a vertical or horizontal operation position, with lid removed.
2. Connect external antenna to either T-1200SR ANT 1 or ANT 2 Connectors, if "off-the-air" monitoring is desired.
3. Apply electrical power to T-1200SR as follows:

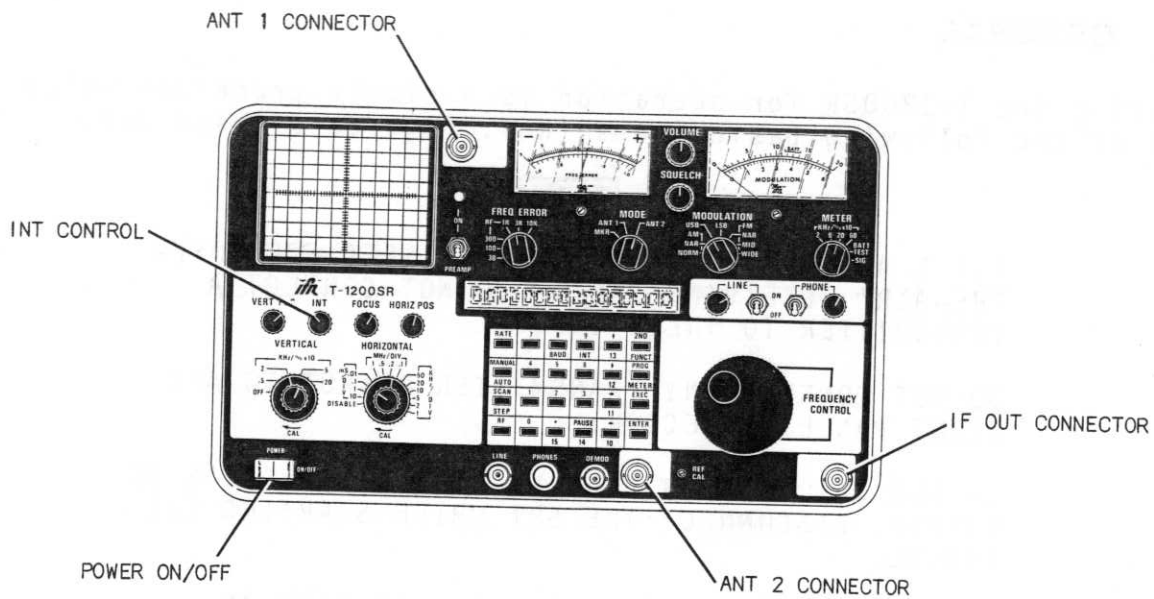


Figure 2-1 T-1200SR Front Panel

EXTERNAL AC Power

1. Ensure AC Power Select Switch on rear panel of T-1200SR is in appropriate 115 or 230 VAC position.
2. Connect furnished AC power cable between 115/230 VAC power source and AC Power Input Connector on rear panel of T-1200SR.
3. Place POWER ON/OFF Switch to "ON" position.

EXTERNAL DC Power

1. Connect supplied DC Power Cable between external 12 to 30 VDC power source and DC Power Input Connector on rear panel of T-1200SR.
2. Place POWER ON/OFF Switch to "ON" position.

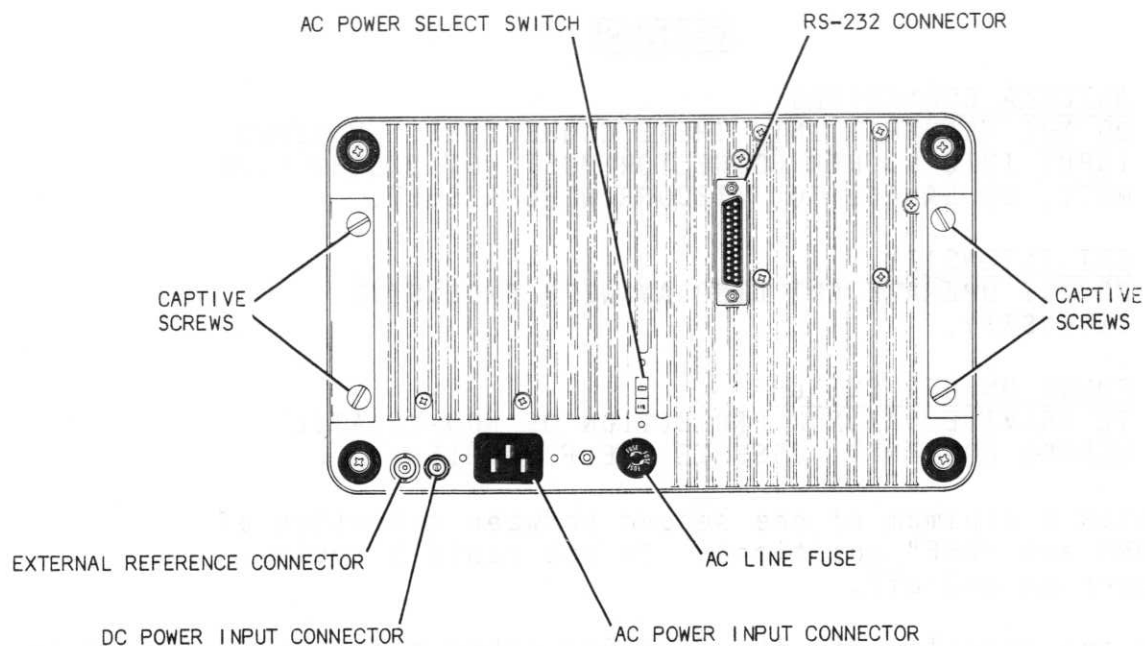


Figure 2-2 T-1200SR Rear Panel

INTERNAL Battery Operation:

1. Anytime a power interruption occurs, the T-1200SR will be powered by the internal battery, provided the optional battery is installed. The battery will provide power to the T-1200SR for a minimum of 30 minutes with a fully charged battery.

NOTE

The internal battery is charged whenever the set is connected to external AC or DC power, regardless of whether the POWER ON/OFF Switch is in either the "ON" or "OFF" position. Typical recharge time is 12 hours for a full charge. Minimum external DC input required for full charge is 15 VDC.

2-2 INSTALLATION AND OPERATING PRECAUTIONS

To prevent possible damage to T-1200SR, the following power input and general operating precautions should be observed at all times (Ref. Figure 2-1 for connector locations):

CAUTION

ANTENNA CONNECTORS

DO NOT TRANSMIT INTO THESE CONNECTORS. MAXIMUM INPUT INTO EITHER CONNECTOR MUST NOT EXCEED 0.25 WATT, OR DAMAGE TO T-1200SR WILL RESULT.

CRT INTENSITY

DO NOT OPERATE CRT DISPLAY WITH EXCESSIVE INTENSITY.

POWER ON/OFF SWITCH

TO PROVIDE MAXIMUM PROTECTION OF NON-VOLATILE MEMORY CONTENTS, OBSERVE THE FOLLOWING:

Allow a minimum of one second between selection of "ON" and "OFF" positions. Do not rapidly cycle power on and off.

Do not apply any signals into the T-1200SR other than those defined in the operating instructions. Other than the input power and operating restrictions described above, any combination of front panel control positions will not adversely affect the T-1200SR.

SECTION 3 - DESCRIPTION OF CONTROLS, CONNECTORS & INDICATORS

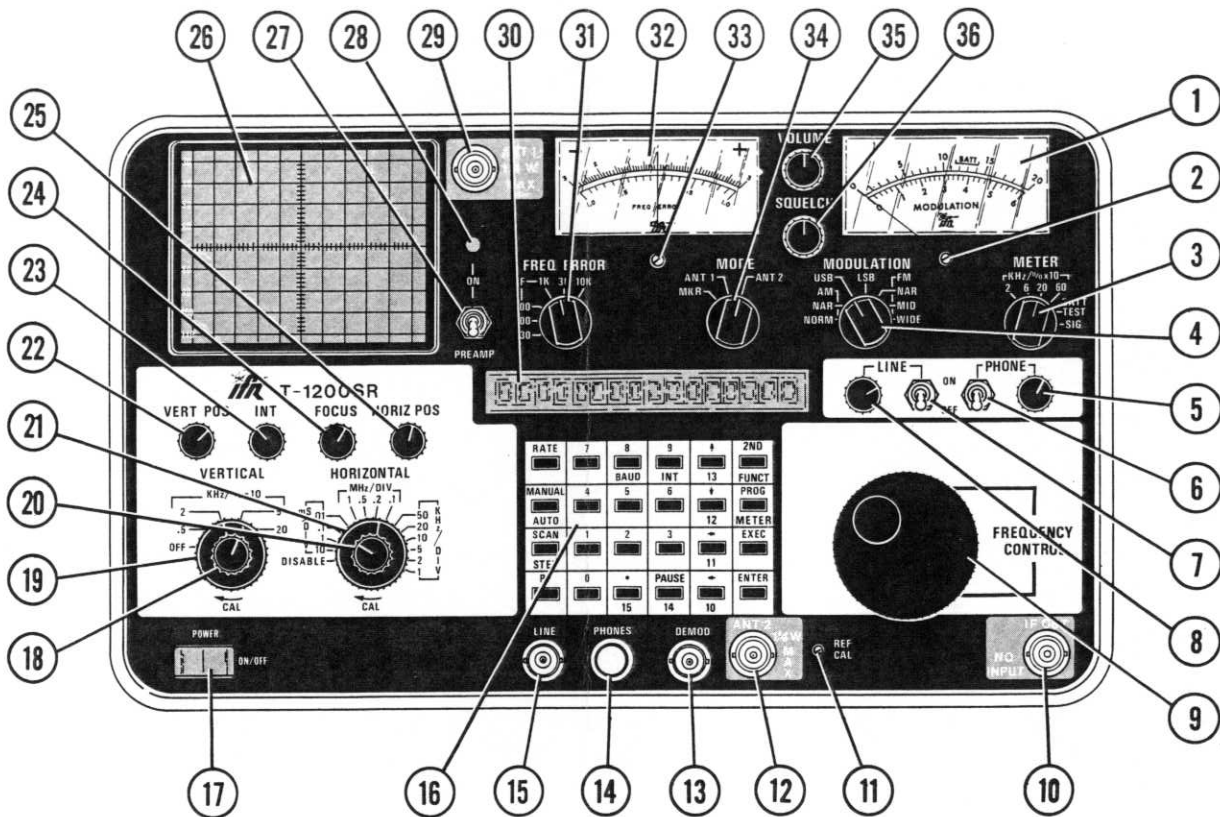


Figure 3-1 T-1200SR Front Panel Controls, Connectors & Indicators

- | | |
|-------------------------------------|--------------------------------------|
| 1. MODULATION METER | 19. VERTICAL Control |
| 2. MODULATION Meter Zero Adjustment | 20. HORIZONTAL Vernier Control |
| 3. Modulation METER Control | 21. HORIZONTAL Control |
| 4. MODULATION Select Control | 22. VERT POS Control |
| 5. PHONE Level Control | 23. INT Control |
| 6. PHONE ON/OFF Switch | 24. FOCUS Control |
| 7. LINE ON/OFF Switch | 25. HORIZ POS Control |
| 8. LINE Level Control | 26. CRT Display |
| 9. FREQUENCY Change Control | 27. PREAMP Switch |
| 10. IF OUT Connector | 28. PREAMP Indicator Lamp |
| 11. REF CAL Adjustment | 29. ANT 1 Connector |
| 12. ANT 2 Connector | 30. VFD Display |
| 13. DEMOD Connector | 31. FREQ ERROR Control |
| 14. PHONES Connector | 32. FREQ ERROR Meter |
| 15. LINE Connector | 33. FREQ ERROR Meter Zero Adjustment |
| 16. Keyboard | 34. MODE Control |
| 17. POWER ON/OFF Switch | 35. VOLUME Control |
| 18. VERTICAL Vernier Control | 36. SQUELCH Control |

3-1 T-1200SR FRONT PANEL (Reference Figure 3-1)

ITEM	NAME	DESCRIPTION
------	------	-------------

1. MODULATION Meter

Provides a visual display of modulation levels, relative signal strength and battery test voltage. (See Figure 3-2.)

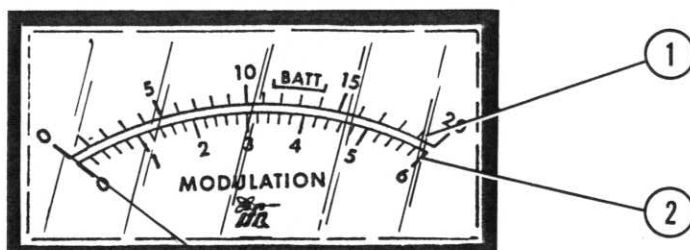


Figure 3-2 Modulation Meter Scales

2. Modulation Meter Zero Adjustment

Adjustment screw for mechanical zeroing of MODULATION Meter (1) when power to T-1200SR is "OFF".

3. Modulation METER Control

Selects inputs source for MODULATION Meter (1) as shown in Table 3-1 (Reference Figure 3-1).

MODULATION METER CONTROL POSITION	INPUT SOURCE	MODULATION METER RANGE	MODULATION METER SCALE (Ref. Fig. 3-2)
kHz/% X 10 (All Positions)	T-1200SR Demodulator	2 kHz DEV/20% AM (full scale) to 60 kHz DEV/600% AM (full scale)	1 & 2
BATT TEST	Internal Battery	0 to 20 VDC	1
SIG	ANT 1 and ANT 2 Connector	Relative Signal Strength (Not calibrated)	None (Observe relative deflection of meter needle)

Table 3-1 Modulation Meter Control Positions

ITEM	NAME	DESCRIPTION
------	------	-------------

4. MODULATION Select Control

Selects modulation and demodulation modes of T-1200SR receiver for FM, AM, SSB and their associated pre- and post-detection bandwidths as shown in Table 3-2.

MODULATION SELECT CONTROL POSITION		DEMODULATION MODE	PRE-DETECTION BANDWIDTH	POST-DETECTION BANDWIDTH
AM	NAR	AM	3 kHz	3.3 kHz
	NORM	AM	15 kHz	3.3 kHz
SSB	USB	SSB	2.5 kHz	3.3 kHz
	LSB	SSB	2.5 kHz	3.3 kHz
FM	NAR	FM	15 kHz	3.3 kHz
	MID	FM	170 kHz	3.3 kHz
	WIDE	FM	170 kHz	80 kHz

Table 3-2 Modulation Select Control Positions

5. PHONE Level Control

Controls level of phone output audio at PHONES Connector (14).

6. PHONE ON/OFF Switch

"ON" Position - Provides an audio output at PHONES Connector (14).

"OFF" Position - Inhibits audio signal at PHONES Connector (14).

7. LINE ON/OFF Switch

"ON" Position - Provides an audio output at LINE Connector (15).

"OFF" Position - Inhibits audio signal at LINE Connector (15).

8. LINE Level Control

Controls level of line output audio at LINE Connector (15).

9. FREQUENCY Change Control

Provides capability to rapidly change received frequencies.

10. IF OUT Connector

Provides an IF output frequency and level of 10.7 MHz @ -30 dBm (AGC Leveled).

11. REF CAL Adjustment

Provides adjustment of T-1200SR Master Oscillator (TCX0).

ITEM	NAME	DESCRIPTION
12.	<u>ANT 2 Connector</u>	External Antenna Input.

CAUTION

TO PREVENT DAMAGE TO T-1200SR INTERNAL COMPONENTS, MAXIMUM CONTINUOUS INPUT TO ANTENNA CONNECTORS (12 & 29) MUST NOT EXCEED 0.25 WATT.

13. DEMODO Connector
Allows external monitoring of the demodulated received audio signal.
14. PHONES Connector
Provides audio output for headphones when PHONE ON/OFF Switch (6) is positioned to "ON". Either monaural or stereo headphones may be used.
15. LINE Connector
Provides line audio output when LINE ON/OFF Switch is positioned to "ON".
16. Keyboard
Used for data entry and control of T-1200SR microprocessor as described in paragraph 3-3.
17. POWER ON/OFF Switch
Applies/interrupts power to T-1200SR as follows:
 - "ON" position - T-1200SR is powered by external AC or DC power source (this is a momentary spring-loaded switch to the "OFF" position).
 - "OFF" position - T-1200SR is "OFF".

- | ITEM | NAME | DESCRIPTION |
|------|-----------------------------------|--|
| 18. | <u>VERTICAL Vernier Control</u> | Provides adjustment of oscilloscope vertical attenuator rate (amplitude) by a factor of 10. |
| 19. | <u>VERTICAL Control</u> | Provides adjustment capability of vertical deflection factor of the oscilloscope. |
| | kHz/%x10 | - Allows selection of internal demod audio signal. |
| | OFF | - Removes power to Scope/Analyzer Display. |
| 20. | <u>HORIZONTAL Vernier Control</u> | Changes Horizontal Sweep rate by a factor of 10. |
| 21. | <u>HORIZONTAL Control</u> | Selects horizontal sweep rate of the oscilloscope or dispersion of Spectrum Analyzer. Dispersion Control functions as follows: |
| | DISABLE position | - Disables sweep to horizontal amplifier of oscilloscope. |
| | mS/DIV positions | - Represent oscilloscope sweep rate in milliseconds per division, when Scope Horizontal Sweep Vernier Control (20) is in CAL position (fully clockwise). |

NOTE

The Spectrum Analyzer operates in the kHz/DIV and MHz/DIV positions as shown in Table 3-3 below:

HORIZONTAL/DISPERSION	BANDWIDTH
1 MHz/DIV	30 kHz
500 kHz/DIV	30 kHz
200 kHz/DIV	30 kHz
100 kHz/DIV	30 kHz
50 kHz/DIV	30 kHz
20 kHz/DIV	3 kHz
10 kHz/DIV	3 kHz
5 kHz/DIV	3 kHz
2 kHz/DIV	300 kHz
1 kHz/DIV	300 kHz

Table 3-3 Horizontal Sweep Selector Control (Analyzer Dispersion Control) Settings

ITEM	NAME	DESCRIPTION
------	------	-------------

22. VERT POS Control

Controls vertical position of CRT trace in Oscilloscope and Spectrum Analyzer functions. Spectrum Analyzer function is attenuated and limits this control to nominal 1 division up or down.

23. INT Control

Controls intensity of CRT trace. Clockwise rotation of control increases trace intensity.

CAUTION

DO NOT OPERATE CRT DISPLAY (26) WITH EXCESSIVE TRACE INTENSITY. PROGRESSIVE DAMAGE TO CRT MAY RESULT.

24. FOCUS Control

Controls focus of CRT trace.

25. HORIZ POS Control

Controls horizontal position of CRT trace in Oscilloscope and Spectrum Analyzer functions. Spectrum Analyzer function is attenuated and limits this control to nominal 1 DIV left or right. Used also in conjunction with marker function to zero trace at a given dispersion.

26. CRT Display

Display screen for both Oscilloscope and Spectrum Analyzer functions.

27. PREAMP Switch

Controls RF preamp in or out of circuit.

28. Preamp Indicator Lamp

When lighted, indicates preamp is enabled.

29. ANT 1 Connector

External Antenna Input.

CAUTION

TO PREVENT DAMAGE TO T-1200SR INTERNAL COMPONENTS, MAXIMUM CONTINUOUS INPUT TO ANTENNA CONNECTORS (12 & 29) MUST NOT EXCEED 0.25 WATT.

30. VFD (Vacuum Fluorescent Display)

Provides display of selected Keyboard entries as described in paragraph 3-3.

ITEM	NAME	DESCRIPTION
31.	<u>FREQ ERROR Control</u>	Selects full scale sensitivity of FREQ ERROR Meter (32).
32.	<u>FREQ ERROR Meter</u>	Provides a visual display of the difference between received signal frequency and selected T-1200SR receiver frequency.
33.	<u>FREQ ERROR Meter Zero Adjustment</u>	Mechanical zero adjustment for FREQ ERROR Meter (32), when power to T-1200SR is "OFF".
34.	<u>MODE Control</u>	<p>"MKR" Position - Provides a means for calibrating the center frequency of the analyzer display, for the dispersion selected, using the Horiz Pos Control (25). MKR additionally zeros the FREQ ERROR Meter (32).</p> <p>"ANT 1" Position - Selects ANT 1 port (29) for receive monitoring.</p> <p>"ANT 2" Position - Selects ANT 2 port (12) for receive monitoring.</p>
35.	<u>VOLUME Control</u>	Controls volume of T-1200SR speaker only.
36.	<u>SQUELCH Control</u>	Controls receiver squelch threshold. Squelch disables audio output, freq error and modulation indicators when RF input at ANT 1 and ANT 2 Connectors (12 and 29) fall below squelch threshold.

3-2 T-1200SR REAR PANEL

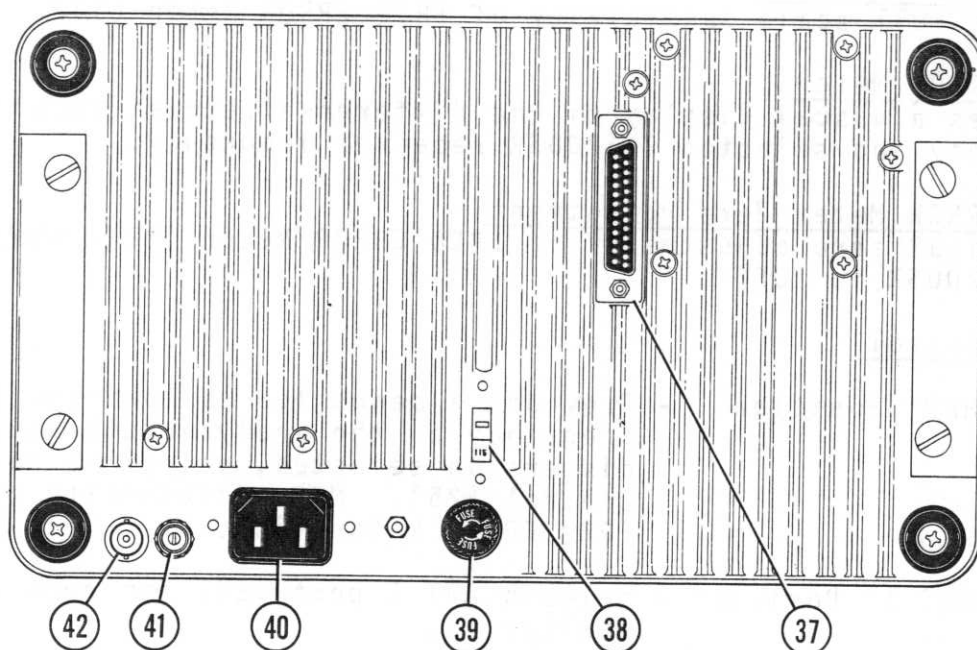


Figure 3-3 T-1200SR Rear Panel

- | | |
|----------------------------|----------------------------------|
| 37. RS-232 Connector | 40. AC Power Input Connector |
| 38. AC Power Select Switch | 41. DC Power Input Connector |
| 39. AC Line Fuse | 42. External Reference Connector |

ITEM	NAME	DESCRIPTION
37.	<u>RS232 Connector</u>	Female connector for interface with external RS232 compatible controller (Ref. appropriate Pin-Out Table in Appendix B).
38.	<u>AC Power Select Switch</u>	Allows for AC input of either 115 VAC or 230 VAC.
39.	<u>AC Line Fuse</u>	250 V 1 Amp Slo-Blo Fuse
40.	<u>AC Power Input Connector</u>	AC power input connector for 105-130 or 210-260 VAC supply at 50 to 400 Hz.
41.	<u>DC Power Input Connector</u>	DC power connector for 12 to 30 VDC supply.
42.	<u>External Reference Connector</u>	Allows monitoring of 10 MHz internal reference frequency or the application of an external 10 MHz reference frequency. The input and output are automatically switched.

NOTE

Automatic switching to the external source occurs when an external 10 MHz reference level of +5 dBm to +20 dBm is applied at External Reference Connector. DO NOT EXCEED $\frac{1}{4}$ WATT INPUT.

3-3 KEYBOARD AND VFD DESCRIPTION

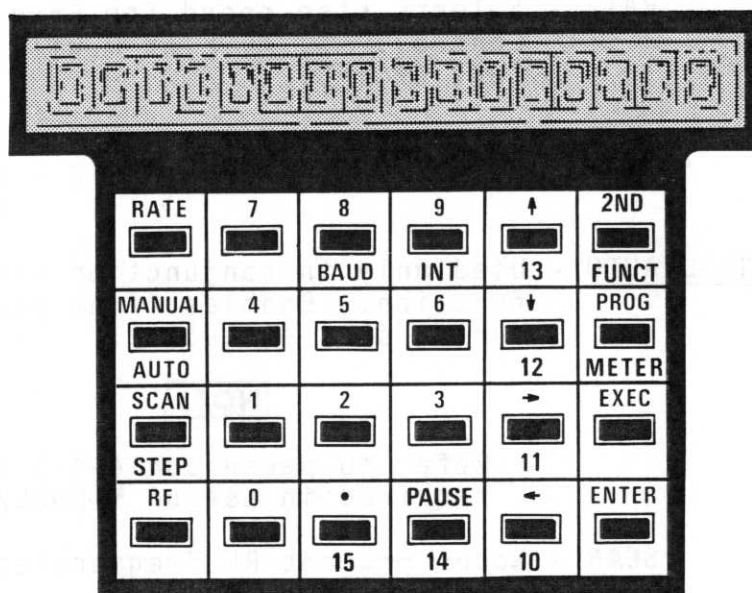


Figure 3-4 Keyboard and VFD Layout

The T-1200SR Keyboard with VFD (Vacuum Fluorescent Display) provides a means of entering data into the microprocessor to control the various operating parameters of the T-1200SR. Normal Keyboard operation involves the following three basic types of key entry sequences:

1. "DIRECT" MODE
Key entries allow simultaneous programming and execution.
2. PROGRAM MODE
PROG Key entries allow retrieval, edit and storage without the execution.
3. EXECUTE MODE
EXEC Key entries allow retrieval and automatic execution without edit capability.

The primary objective of this subsection is to familiarize the operator with the methods of making keyboard entries. A complete description of the Keyboard and VFD operation is located in SECTION 4.

3-3-1 FUNCTION KEYS

These keys determine what T-1200SR function is selected by the operator. Most keys have a dual function which will select either the 1st order functions or 2nd order functions.

1st ORDER FUNCTIONS (Black Lettering on Keyboard)

This function is used to set the operating parameters of:

RATE - Selects step speed for Frequency Change Control. S, M, F or D will be displayed in left of VFD.

S - 100 Hz/Step	F - 1 MHz/Step
M - 10,000 Hz/Step	D - Disables Change Control

MANUAL/AUTO - Used only in conjunction with step function. Enables front panel controls during step execution.

NOTE

Refer to paragraph 4-4-3 for key sequence required in use of MANUAL/AUTO function.

SCAN - Scans present RF frequencies

RF - Receiver frequencies

PAUSE - Stops scan or step function until depressed again; then resumes operation.

2nd ORDER FUNCTIONS (Blue Lettering on Keyboard)

All second order function keys must be preceded by the "2ND FUNCT" Key.

METER - Freq Error and Modulation Meter Indications

STEP - Used for programming and executing step function.

BAUD - Displays Baud Rate of RS-232 on VFD (30).

INT - VFD Intensity

3-3-2 INSTRUCTION KEYS

These keys instruct the T-1200SR processor to perform a specific operation or function to permit the execution of a key entry. Specific key functions are as follows:

2ND FUNCT Key - Conditions the T-1200SR processor for a 2nd order function entry; this key must precede the 2nd function entry. When this key is depressed, the VFD will display "2ND FUNCTION".

PROG Key - Allows entry into the programming parameters of the T-1200SR. All Keyboard entries are immediately displayed on the VFD but will not be executed by the processor.

EXEC Key - Retrieves stored data and automatically executes the data.

ENTER Key - Instructs processor that the preceding key-in sequence has been completed. Depress ENTER Key twice to exit from execute mode and return to the direct mode.

3-3-3 CURSOR CONTROL KEYS

The ← and → Keys will move the cursor laterally within the VFD viewing area for purposes of changing data values. To change a data value, the cursor must be positioned directly on the desired character position prior to making a value change. The ↑ and ↓ Keys are used to increment (↑) or decrement (↓) any value positioned in the cursor and any adjacent values which are affected by "carry" and "borrow" operations. In addition, the ↑ or ↓ keys are used to slew thru the stored memory fields.

3-3-4 DATA ENTRY KEYS

These keys include standard numerical value keys from 0 through 15.

Numerical keys 10 through 15 are used for selecting those memory locations only and must be preceded by the 2nd Function Key. In addition, there is a decimal point which is used to justify the fields.

3-3-5 FREQUENCY CHANGE CONTROL

The frequency change control is used in conjunction with the Direct Data entry mode. It allows for rapid change of RF frequencies. This function has an automatic default to memory location "0" should the operator need to go to Direct Mode immediately. The frequency change control can be programmed to change at the following rates:

1. FAST 1 MHz per step
2. MEDIUM 10,000 Hz per step
3. SLOW 100 Hz per step

The frequency change control may also be disabled by programmed entry (see Section 4).

SECTION 4 - OPERATION

4-1 GENERAL

On power-up, the T-1200SR initiates a memory check. If no error is indicated on VFD (30), the last RF Frequency is executed and displayed on VFD (30), indicating the monitor is ready for direct operation.

The T-1200SR has three modes of operation which are explained in the following paragraphs. The three modes of operation are:

1. Direct Data Entry
2. Programmed Data Entry into memory
3. Executed Data Entry from memory

4-1-1 Mini-Index of Contents Within This Section. (Refer to Table of Contents in Front of Manual for a Complete Listing).

Paragraph	Title	Page
KEYBOARD AND VFD OPERATION		
4-2	Direct Data Entry.....	4-2
4-3	Programmed Data Entry Into Memory.....	4-4
4-4	Executed Data Entry.....	4-12
BASIC OPERATING PROCEDURES		
4-5	Receiver Operation.....	4-15
4-6	Oscilloscope Operation.....	4-19
4-7	Spectrum Analyzer Operation.....	4-21
RS-232 OPERATION		
4-8	Basic RS-232 Operation.....	4-23

4-2 DIRECT DATA ENTRY

The following steps describe the methods of making direct keyboard entries to control the T-1200SR RF Frequency Function. Once a particular function key is depressed, the T-1200SR assumes a programming/edit and execution mode of operation. In this mode, the T-1200SR will execute each key entry, as it is selected, while allowing the operator the capability to edit programmed data indicated on the VFD (30).

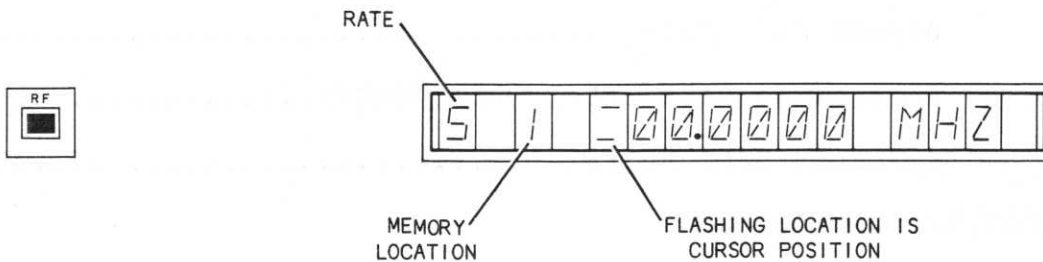
CAUTION

ANY CHANGES IN DATA WHEN OPERATING IN THE DIRECT MODE WILL CAUSE CHANGES TO THE PRE-PROGRAMMED MEMORY SETTINGS.

4-2-1 Direct RF Data Entry Using Keyboard (16)

KEY ENTRY

VFD (30) INDICATES



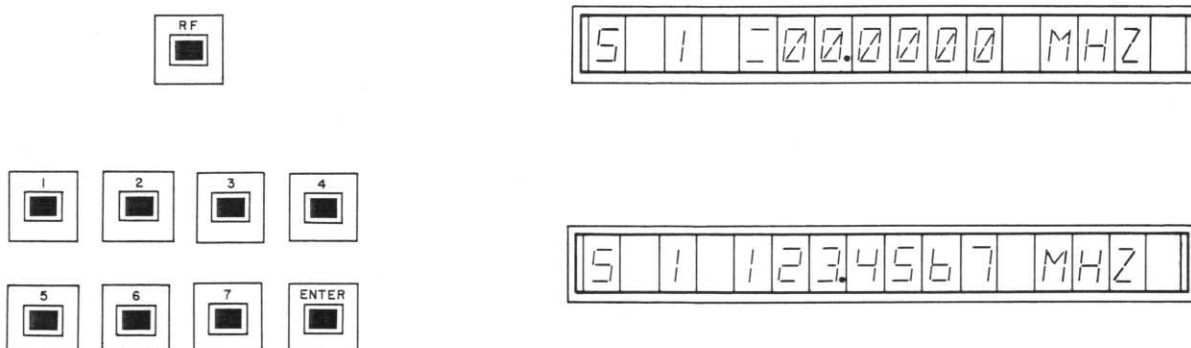
Directly enter the desired RF Frequency using the keyboard digits.

Depress  key.

EXAMPLE: Enter RF Frequency of 123.4567 MHz.

KEY ENTRY

VFD (30) INDICATES



4-2-2 Direct RF Data Entry Using Frequency Change Control (9).

KEY ENTRY



VFD (30) INDICATES

5 1 - 00.000000 MHZ



M 1 - 00.000000 MHZ

Depress Rate key as many times as necessary to set desired rate (refer to paragraph 3-3-5).

NOTE

Ensure rate displayed is not "D". This indicates Frequency Change Control is disabled and keyboard digits must be used to enter frequency desired.

Rotate Frequency Change Control (9) to set desired frequency. The memory location will default to "0" when control is turned.

4-2-3 Meter Function

VFD (30) will digitally indicate FREQ ERROR Meter (32) and MODULATION Meter (1) readings, as selected by FREQ ERROR Meter Control (31) and Modulation METER Control (3).

KEY ENTRY



VFD (30) INDICATES

2ND FUNCTION



FE+ 21.9 MD 00.00

SIGNAL

=

SG

BATTERY TEST

=

BT

MODULATION

=

MD

4-2-4 Set Intensity (VFD)

1st Order Numbers 0 thru 9 will change VFD intensity to a preset level corresponding to number depressed (0 = minimum and 9 = maximum). Depressing and holding + or + Keys will slew intensity from minimum to maximum in approximately 4 seconds.

KEY ENTRY

VFD (30) INDICATES



2ND FUNCTION



SET INTENSITY

4-3 PROGRAMMED DATA ENTRY INTO MEMORY

The "PROG" Key is used to program up to sixteen different memory locations in the T-1200SR. The following function can be programmed:

RF

The following functions can only be programmed for one set of frequencies:

STEP (RF)
SCAN

4-3-1 Programmed RF Memory

KEY ENTRY

VFD (30) INDICATES



PROGRAM ?



PROGRAM RF ?

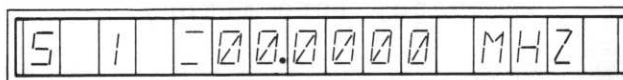
Program any one of the memory locations by selecting the number, letter, or symbol corresponding to that memory location as shown in Table 4-1.

Key	Memory Location	Key	Memory Location
0	= 0	2nd/10	= 10
1	= 1	2nd/11	= 11
2	= 2	2nd/12	= 12
3	= 3	2nd/13	= 13
4	= 4	2nd/14	= 14
5	= 5	2nd/15	= 15
6	= 6		
7	= 7		
8	= 8		
9	= 9		

Table 4-1 Program Memory Locations

KEY ENTRY

VFD (30) INDICATES



Enter desired frequency into memory.

Depress  key.

NOTE

To prevent loss of programmed data do not store in memory location "0" as this is used in conjunction with the Frequency Change Control.

EXAMPLE: Program Memory Location "10".

KEY ENTRY

VFD (30) INDICATES



PROGRAM 7



PROGRAM RF 7



2ND FUNCTION



510 - 0.00000 MHZ

Enter desired frequency into memory.

Depress  Key.

4-3-2 Programmed SCAN Memory

The SCAN Key is used in conjunction with the RF function. It provides a means of stepping the frequency at a pre-selected increment through a programmed frequency band. Prior to using the SCAN function, ensure Front Panel controls are set for desired antenna and modulation selection.

KEY ENTRY

VFD (30) INDICATES



PROGRAM 7



F1 - 0.00000 MHZ

START
FREQUENCY

Enter desired SCAN start frequency.

KEY ENTRY

VFD (30) INDICATES



F	2				-	0	0	.	0	0	0	0	0	M	H	Z
---	---	--	--	--	---	---	---	---	---	---	---	---	---	---	---	---

STOP
 FREQUENCY

Enter desired SCAN stop frequency.

KEY ENTRY

VFD (30) INDICATES



S	T	E	P	-	0	0	0	0	0	0	M	H	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---

Enter desired STEP frequency.

KEY ENTRY

VFD (30) INDICATES



	R	E	S	U	M	E			2	.	0		S	E	C	
--	---	---	---	---	---	---	--	--	---	---	---	--	---	---	---	--

Enter desired resume time.

NOTE

The SCAN will remain at any RF frequency for the programmed resume time, if squelch is broken.

The ↑ and ↓ Keys will scroll through the SCAN fields. The ↓ Key will scroll from F1 to RESUME and ↑ key will scroll from RESUME to F1.

EXAMPLE: Program a start frequency of 88.1 MHz, a stop freq of 108.1 MHz, with a resume time of 3.0 Sec in .2 MHz steps.

KEY ENTRY

VFD (30) INDICATES



PROGRAM 7



F1 00.0000 MHz



F1 88.1000 MHz



F2 00.0000 MHz



F2 108.1000 MHz



STEP 00.0000 MHz



STEP 0.2000 MHz



RESUME 0.0 SEC



RESUME 3.0 SEC



4-3-3 Programmed STEP Memory

Programs the selection of RF memory 0 thru 15.

NOTE

The desired RF frequency must be programmed into memory prior to executing the STEP function.

KEY ENTRY

VFD (30) INDICATES



PROGRAM 7



2ND FUNCTION



STEP 00 THRU 05

START
MEMORY
LOCATION

STOP
MEMORY
LOCATION

Enter desired start and stop RF memory locations.

NOTE

It is recommended that memory location "0" not be used in the STEP mode as movement of Frequency Change Control will change the frequency stored in location "0".

The program will step sequentially through the RF memory locations beginning with the start memory location entry and ending with the stop memory location. Upon reaching the programmed stop memory location, the step sequence automatically repeats, beginning at the programmed start memory location.

KEY ENTRY

VFD (30) INDICATES



RESUME 1.0 SEC

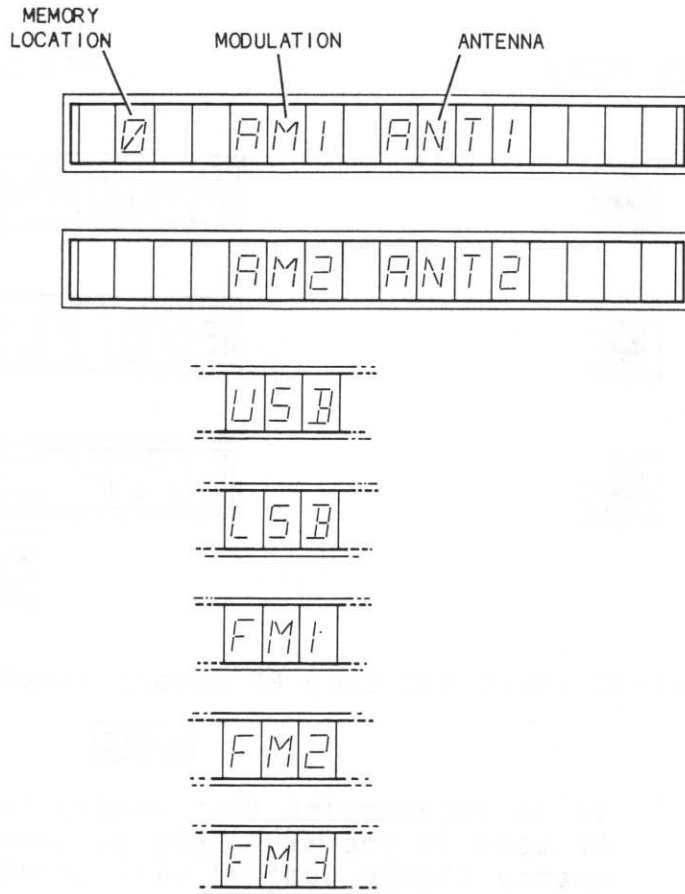
Enter desired resume time.

NOTE

The T-1200SR will lock on pre-programmed RF memory locations for the duration of the programmed resume time, if squelch is broken.

KEY ENTRY

VFD (30) INDICATES



NOTE

↑ or ↓ Keys are used to scroll through the memory locations only.

To select the desired modulation and antenna for the individual memory locations, refer to Table 4-2.

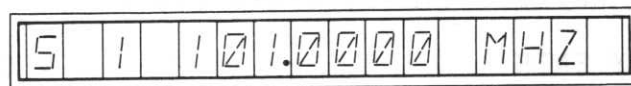
MODULATION FIELD		ANTENNA FIELD	
Key	Modulation	Key	Antenna
1	AM1	1	ANT1
2	AM2	2	ANT2
3	USB		
4	LSB		
5	FM1		
6	FM2		
7	FM3		

Table 4-2 Selecting Modulation and Antenna Fields

KEY ENTRY



VFD (30) INDICATES



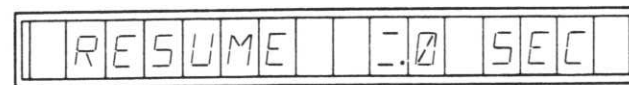
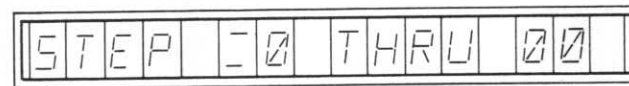
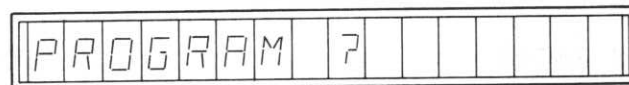
When Key is depressed, the RF frequency programmed into the memory fields will be displayed. Depress the ↑ or ↓ Keys to display what RF frequency was programmed into a particular memory location.

To exit this field, depress Key again. The monitor will return to the previous field, displaying memory location, modulation and antenna.

EXAMPLE: Program the STEP Function to step thru memory locations 01 thru 05, with a RESUME time of 3.0 Sec, selecting USB modulation and ANT2 for memory location 3.

KEY ENTRY

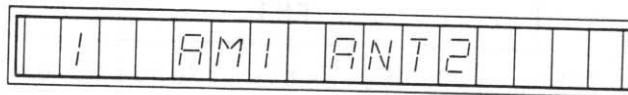
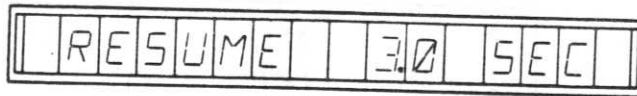
VFD (30) INDICATES



KEY ENTRY

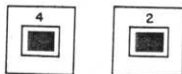


VFD (30) INDICATES

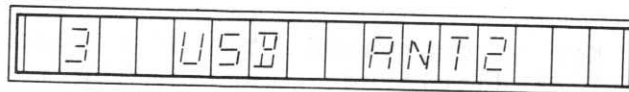


Depress ↑ Key two times, until VFD (30) displays memory location "3".

KEY ENTRY



VFD (30) INDICATES



Depress  Key.

4-4 EXECUTED DATA ENTRY

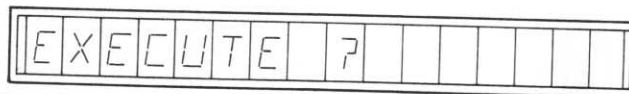
The "EXEC" Key retrieves and executes the programmed memory with no edit capability. To exit from this mode and return to the direct mode, depress ENTER Key twice.

4-4-1 EXECUTING RF Functions

KEY ENTRY



VFD (30) INDICATES



Select desired RF memory location (Ref. Table 4-1).

4-4-2 Executing SCAN Function

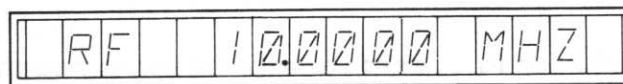
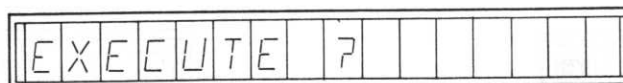
This function SCANS from F1 to F2 at the pre-programmed increment.

NOTE

To exit the scan mode, slightly rotate Frequency Change Control, except when Frequency Change Control has been previously disabled.

KEY ENTRY

VFD (30) INDICATES



The receiver will SCAN the programmed RF frequencies and will stop, for the programmed RESUME time, if squelch is broken. When finished with RESUME time or if squelch is not broken, it will add whatever STEP frequency is programmed and resume scanning.

NOTE

Depress  Key to stop SCAN and  Key to resume SCAN.

Reference paragraph 4-3-2 for a detailed explanation of the SCAN function.

4-4-3 Executing STEP Function

KEY ENTRY

VFD (30) INDICATES



EXECUTE ?



2ND FUNCTION







5 1 1 0 1 . 0 0 0 0 MHZ

The receiver will immediately step through the pre-programmed memory locations, and will stop at a location if squelch is broken.


When executing STEP function, the receiver is placed into remote operation and disables the front panel, FREQ ERROR Control (31), MODE Control (34), MODULATION Select Control (4) and Modulation METER Control (3).

NOTE

To stop STEP sequence at any time, depress  Key. To resume STEP sequence, depress  Key.

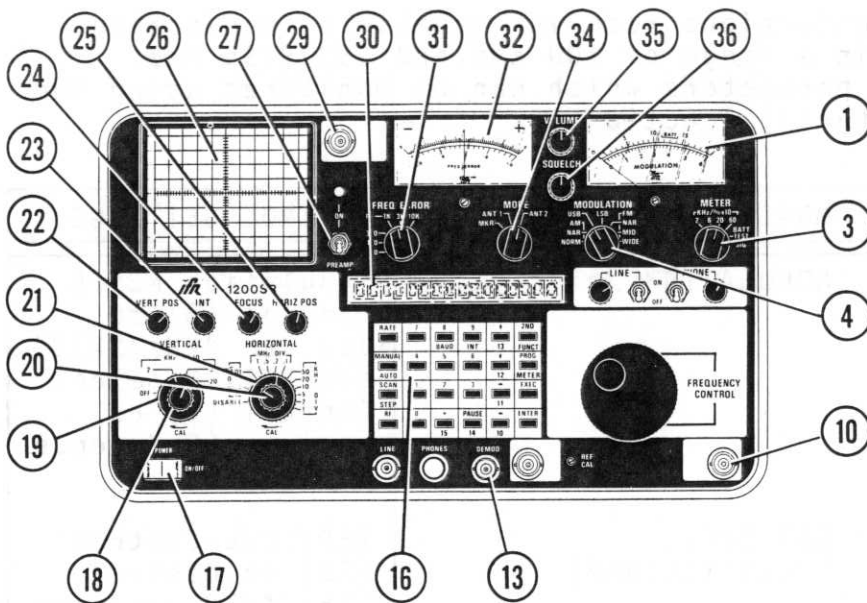
Depressing the  key after  causes the T-1200SR to exit the automatic STEP mode. It also enables the front panel, MODE, FREQ ERROR, MODULATION and METER controls.

To return to the STEP mode, depress  key returning it to a pause condition. Then depress  key and STEP mode will resume.

Another method to exit the STEP mode is by slightly rotating the Frequency Change Control, except when Frequency Change Control has been previously disabled. However, this will not enable the front panel controls. To return to STEP mode depress the  key.

During STEP mode, the preamp is on or off for all locations in the sequence. To change the preamp setting, reposition PREAMP Switch (27) and depress  key.

4-5 RECEIVER OPERATION



T-1200SR CONNECTORS AND INDICATORS APPLICABLE TO RECEIVER OPERATION:

- 1 MODULATION Meter
- 10 IF OUT Connector
- 13 DEMOD Connector
- 26 CRT Display
- 29 ANT 1 Connector
- 30 VFD
- 32 FREQ ERROR Meter

Figure 4-1 T-1200SR Front Panel Controls
Applicable to Receiver Operation

CONTROL	SETTING
3 Modulation METER Control	As req'd
4 MODULATION Select Control	As req'd
16 Keyboard	As req'd
17 POWER ON/OFF Switch	"ON"
18 VERTICAL Vernier Control	As req'd
19 VERTICAL Control	As req'd
20 HORIZONTAL Vernier Control	As req'd
21 HORIZONTAL Control	As req'd
22 VERT POS Control	As req'd
23 INT Control	As req'd
24 FOCUS Control	As req'd
25 HORIZ POS Control	As req'd
27 PREAMP Switch	As req'd
31 FREQ ERROR Control	As req'd
34 MODE Control	As req'd
35 VOLUME Control	As req'd
36 SQUELCH Control	As req'd

Table 4-3 T-1200SR Front Panel Controls
Applicable to Receiver Operation

4-5-1 GENERAL

The T-1200SR contains a communications receiver capable of monitoring AM, FM, and SSB signals within a range of 100 kHz and 999.9999 MHz. Table 4-4 defines the signal parameters which can be monitored using the receiver and associated monitoring functions.

SIGNAL CHARACTERISTIC(S):	MONITORING DEVICES	CONTROL SETTINGS:
Demodulated * AM, FM, or SSB	MODULATION Meter (1)*	Modulation METER Control (3) to desired "kHz/%X10". MODULATION Select Control (4) as req'd. (Reference Table 4-5)
	CRT (26) (Oscilloscope)	VERTICAL Control (19) to desired "kHz/%X10 position.
	VFD (30)	Depress "2nd FUNCT" and "METER" Keys (in that order).
	Speaker	Volume control (35) as req'd.
	FREQ ERROR Meter (32)*	FREQ ERROR Control (31) as req'd.
	VFD (30)	Depress "2nd FUNCT" and "METER" Keys (in that order).
RF	MODULATION Meter (1)*	Modulation METER Control (3) to "SIG".
	VFD (30)	Depress "2nd FUNCT" and "METER" keys (in that order)
* When the received signal input level is below the T-1200SR squelch threshold, these monitoring functions will be disabled.		

Table 4-4 Receiver Monitoring Capabilities

4-5-2 BASIC RECEIVER OPERATION

Basic operation of the T-1200SR receiver is as follows:

1. If signals are to be monitored "off-the-air", connect external antenna to ANT1 (29) or ANT2 (12) Connectors.
2. Using Keyboard (16), set T-1200SR to desired RF frequency.

4-5-3 RECEIVING AM OR FM SIGNALS (OFF-THE-AIR)

1. Perform "BASIC RECEIVER OPERATION" steps described in paragraph 4-5-2.
2. Place MODULATION Select Control (4) to:
 - a. "AM NORM" or "AM NAR" position, if receiving AM signals.
 - b. "FM WIDE", "FM MID" or "FM NAR" position, if receiving FM signals.
3. To aurally monitor received audio, adjust VOLUME Control (35) and SQUELCH Control (36) as required.
4. Use monitoring features outlined in Table 4-4 to monitor desired signal parameters.

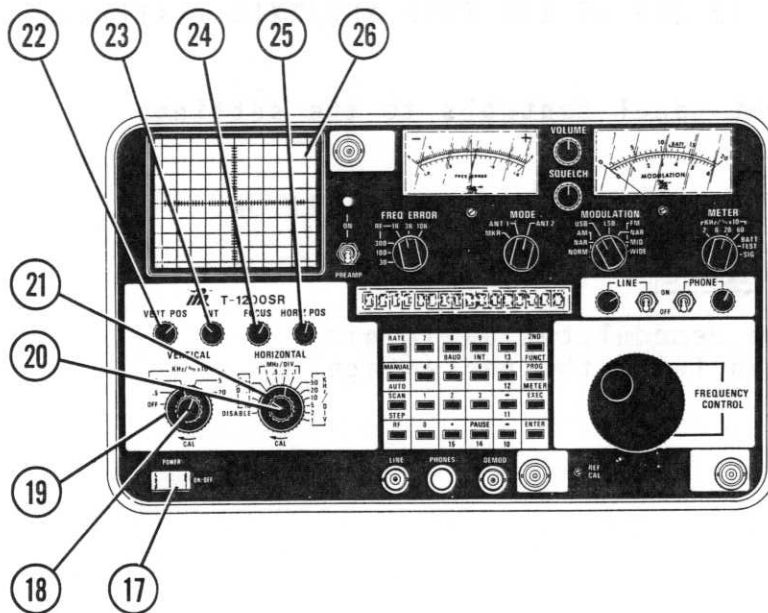
4-5-4 RECEIVING SSB SIGNALS (OFF-THE-AIR)

1. Perform "BASIC RECEIVER OPERATION" steps described in paragraph 4-5-2.
2. Place MODULATION Select Control (4) to "USB or LSB" position.
3. To aurally monitor audio, adjust VOLUME Control (35) and SQUELCH control (36) as required.
4. Use monitoring features outlined in Table 4-4 to monitor desired signal parameters.

MODULATION SELECT CONTROL POSITION	DEMODULATION MODE	PRE-DETECTION BANDWIDTH	POST-DETECTION BANDWIDTH
AM NAR NORM	AM AM	3 kHz 15 kHz	3.3 kHz 3.3 kHz
SSB USB LSB	SSB SSB	2.5 kHz 2.5 kHz	3.3 kHz 3.3 kHz
FM NAR MID WIDE	FM FM FM	15 kHz 170 kHz 170 kHz	3.3 kHz 3.3 kHz 80 kHz

Table 4-5 Modulation Select Control Positions

4-6 OSCILLOSCOPE OPERATION



T-1200SR CONNECTORS AND INDICATORS APPLICABLE TO OSCILLOSCOPE OPERATION:

26 CRT Display

Figure 4-2 T-1200SR Front Panel Controls
Applicable to Oscilloscope Operation

CONTROL	SETTING
17 POWER ON/OFF Switch	"ON"
18 VERTICAL Vernier Control	"CAL"
19 VERTICAL Control	As req'd
20 HORIZONTAL Vernier Control	"CAL"
21 HORIZONTAL Control	"1 mS/Div"
22 VERT POS Control	Ctr Trace
23 INT Control	As req'd
24 FOCUS Control	As req'd
25 HORIZ POS Control	Ctr Trace

Table 4-6 T-1200SR Front Panel Controls
Applicable to Oscilloscope Operation

4-6-1 GENERAL

Table 4-6 lists the front panel controls which are used in the Oscilloscope function of the T-1200SR. For oscilloscope operation, the HORIZONTAL Control (21) must be in "mS/Div" Position. The VERTICAL Control (19) "kHz/%X10" position is for internal demodulated audio. All other controls are similar to those found on most conventional oscilloscopes.

4-6-2 Internal Oscilloscope Operation

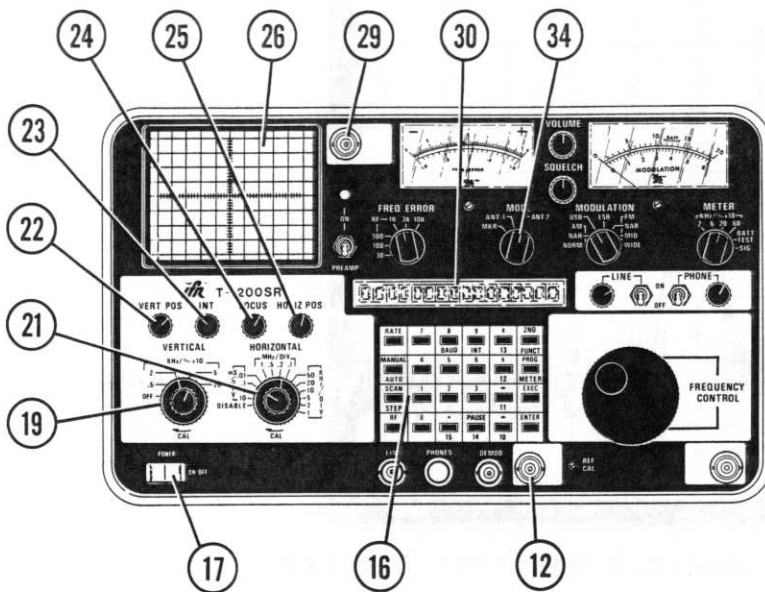
The VERTICAL Control (19) must be in one of the four kHz/%X10 Positions for oscilloscope operation.

1. Place the T-1200SR front panel controls to the settings listed in Table 4-2.
2. Set Vertical Control (19) to "2 kHz/%X10" Position.

NOTE

For AM modulation, the demodulated audio displayed on CRT will read twice the percentage of modulation.

4-7 SPECTRUM ANALYZER OPERATION



T-1200SR CONNECTORS AND INDICATORS APPLICABLE TO SPECTRUM ANALYZER OPERATION:

- 12 ANT 2 Connector
- 26 CRT Display
- 29 ANT 1 Connector
- 30 VFD

Figure 4-3 T-1200SR Front Panel Controls Applicable to Spectrum Analyzer Operation

CONTROL	SETTING
16 Keyboard	As req'd
17 POWER ON/OFF Switch	"ON"
19 VERTICAL Control	Any position except "OFF"
21 HORIZONTAL Control	"1 MHz/Div"
22 VERT POS Control	"Mid Range"
23 INT Control	As req'd
24 FOCUS Control	As req'd
25 HORIZ POS Control	"Mid Range"
34 MODE Control	As req'd

Table 4-7 T-1200SR Front Panel Controls Applicable to Spectrum Analyzer Operation

4-7-1 GENERAL

Table 4-7 lists the T-1200SR front panel controls applicable to the Spectrum Analyzer function. The T-1200SR Spectrum Analyzer is a general purpose analyzer capable of monitoring RF signals within a range of 100 kHz to 999.9999 MHz. The HORIZONTAL Control (21) must be in either one of the MHz/Div or kHz/Div positions for spectrum analyzer operation. The RF frequency displayed on VFD (30) is the spectrum analyzer center frequency. The spectrum analyzer bandwidth is automatically selected.

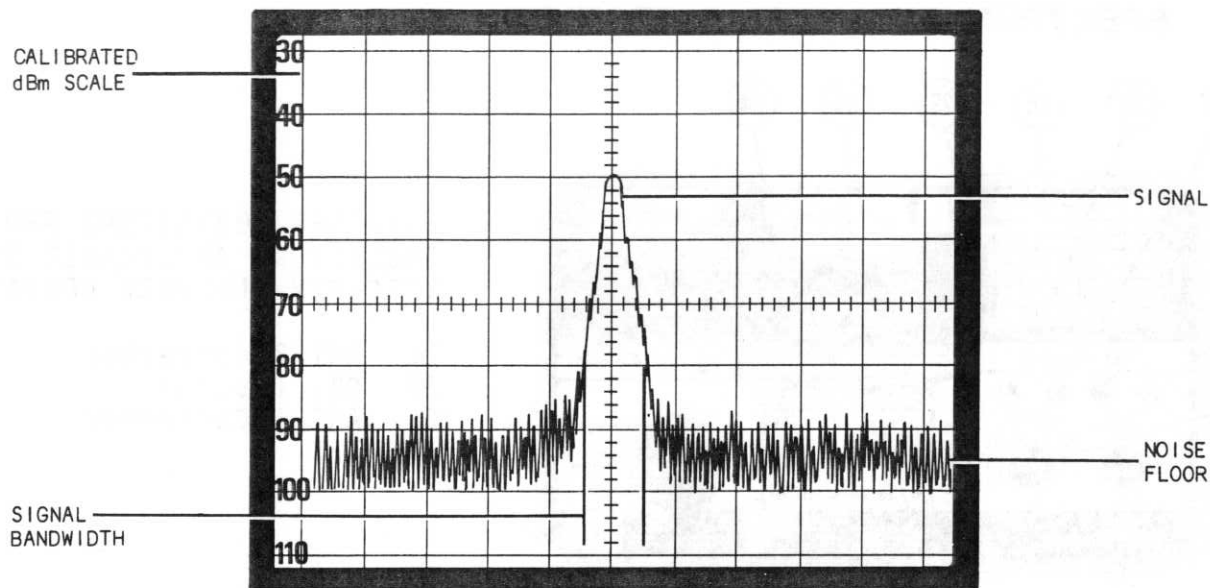


Figure 4-4 Typical Spectrum Analyzer Display

MODE Control (34)

Selects ANT 1, ANT 2, or Marker for display. In Marker, the HORIZ POS Control (25) is adjusted to center trace. This setting varies depending on HORIZONTAL Control (21) position. When Mode Control is returned to ANT 1 or ANT 2, center is as indicated on VFD (30).

VERT POS Control (22)

Controls Spectrum Analyzer vertical position and allows adjustment of reference level by one scale division over range of vertical axis.

HORIZ POS Control (25)

Controls horizontal position of Spectrum Analyzer and limits this control to one division left or right.

HORIZONTAL Control (21)

HORIZONTAL/DISPERSION	BANDWIDTH
1 kHz/DIV	300 Hz
2 kHz/DIV	300 Hz
5 kHz/DIV	3 kHz
10 kHz/DIV	3 kHz
20 kHz/DIV	3 kHz
50 kHz/DIV	30 kHz
.1 MHz/DIV	30 kHz
.2 MHz/DIV	30 kHz
.5 MHz/DIV	30 kHz
1 MHz/DIV	30 kHz

Table 4-8 Horizontal Control (Analyzer Dispersion Control) Settings

4-8 BASIC RS-232 OPERATION

This paragraph contains basic instructions for operating the T-1200SR using an RS-232 compatible external device. Using these instructions, the operator can select any available parameter of the T-1200SR Meter or RF functions.

NOTE



Whenever an invalid RS-232 command is entered, the T-1200SR VFD (30) will display "INVALID COMMAND" and two asterisks (**) will be transmitted over the RS-232 BUS.

4-8-1 T-1200SR INITIALIZATION




The initial communication between the T-1200SR and the external controller consists of BAUD Rate synchronization. The external controller can be set to any one of the following BAUD Rates:

KEY	RATE	KEY	RATE
1	300	5	4800
2	600	6	9600
3	1200	7	19200
4	2400		

Perform the following procedure to set or change the BAUD Rate:

Press   on keyboard (16), followed by the number corresponding to the desired BAUD Rate as shown above.

EXAMPLE: Set BAUD Rate to 4800

Press   
"Set BAUD RATE 5" will be displayed on VFD (30).

Use the following procedure to initialize T-1200SR for external control (RS-232 operation):

STEP

PROCEDURE

1. Connect external controlling device to T-1200SR at RS-232 Connector (37). (Refer to appropriate Pin-out Table in Appendix B).
2. Check T-1200SR Protocol (Appendix B).
3. Type any character (using external device keyboard). This action will allow T-1200SR processor to set its Baud Rate to the selected value. "RS-232 ENABLED" should now be displayed. This indicates that the Baud Rate of the T-1200SR is set to the Baud Rate of the external device.

NOTE

If T-1200SR VFD (30) displays anything other than "RS-232 ENABLED", check and verify RS-232 interface connection and Protocol, recycle power, then reaccomplish procedure beginning with Step 3.

4-8-2 RS-232 LOCAL COMMANDS

The T-1200SR functions, their RS-232 command equivalents and the command value field presently available for each during RS-232 communication, are listed in Table 4-9.

T-1200SR FUNCTION	RS-232 COMMAND	COMMAND VALUE FIELD
RF	RFF	000.0000 to 999.9999 (After the last character of the value field has been selected, any subsequent numerical character selection will assume the last character position of the value field.)
METER	MTR1	Places T-1200SR in the Meter mode and returns the current value of the FREQ ERROR Meter.*
	MTR2	Places T-1200SR in the Meter mode and returns the current value of the MODULATION Meter.*
RS 232	!	Allows up to 16 ASCII characters to be displayed on VFD (30). NOTE This command will not operate properly if a function that updates the VFD (30) is operating, such as METER, SCAN, etc.
* Value of returned meter reading is determined by position of Modulation METER Control (3) or FREQ ERROR Control (31).		

Table 4-9 Function, Command and Value Fields

4-8-3 ALLOWABLE COMMAND FORMATS

T-1200SR communication with an external controlling device requires use of the allowable RS-232 Command formats listed in Table 4-10.

COMMAND	DEFINITION
RFF (nn) (Colon, CR, LF or any combination)	Executes RF(nn) (nn) = 0 to 15
RFF = 50.0	Sets RF0 to 50 MHz and executes
RFF1 = 75	Programs RF1 to 75 MHz
RFF?	Returns RF0
RFF(n)?	Returns RF(n) (n = 0 - 15)
RFF(n)	Executes RF(n) (n = 0 - 15)

The information output by the T-1200SR is sent in ASCII format and is terminated with a CR and LF.

Linefeed (LF), Carriage Return (CR), colon or any combination terminates a command.

Table 4-10 Allowable RS-232 Command Formats

4-8-4 RS-232 REMOTE COMMANDS

In the remote mode, the following commands override the T-1200SR front panel controls and switches. RS-232 remote commands are listed in Table 4-11.

RS-232 REMOTE COMMANDS	DEFINITION
1. REM	Puts the 1200 in the remote mode allowing external control of the front panel switches.
2. LOC	Disables remote mode. Returns control of the switches to the front panel.
3. MKR	Place in marker.
4. AT 1	Selects antenna 1.
5. AT 2	Selects antenna 2.

Table 4-11 RS-232 Remote Commands

Table 4-11 (Continued)

RS-232 REMOTE COMMANDS	DEFINITION
6. RFE1	Sets the frequency error meter in range 1. (30 Hz RF)
7. RFE2	Sets the frequency error meter in range 2. (100 Hz RF)
8. RFE3	Sets the frequency error meter in range 3. (300 Hz RF)
9. RFE4	Sets the frequency error meter in range 4. (1000 Hz RF)
10. RFE5	Sets the frequency error meter in range 5. (3000 Hz RF)
11. RFE6	Sets the frequency error meter in range 6. (10 kHz RF)
12. R2	Enables the modulation meter to measure modulation on the 2 KHz F.S. or 20% F.S. depending upon the mode of modulation (FM or AM).
13. R6	Enables the modulation meter to measure modulation on the 6 kHz F.S. or 60% F.S. depending upon the mode of modulation (FM or AM).
14. R20	Enables the modulation meter to measure modulation on the 20 kHz F.S. or 200% F.S. depending upon the mode of modulation (FM or AM).
15. R60	Enables the modulation meter to measure modulation on the 60 kHz F.S. or 600% F.S. depending upon the mode of modulation (FM or AM).
16. SIG	Enables the modulation meter to measure signal strength.
17. BAT	Enables the modulation meter to measure battery voltage.

Table 4-11 RS-232 Remote Commands

Table 4-11 (Continued)

RS-232 REMOTE COMMANDS	DEFINITION																
18. MDS	Returns modulation setting (1-6). <table> <tr> <th><u>Setting</u></th><th><u>Modulation</u></th></tr> <tr><td>1</td><td>AM1</td></tr> <tr><td>2</td><td>AM2</td></tr> <tr><td>3</td><td>USB</td></tr> <tr><td>4</td><td>LSB</td></tr> <tr><td>5</td><td>FM1</td></tr> <tr><td>6</td><td>FM2</td></tr> <tr><td>7</td><td>FM3</td></tr> </table>	<u>Setting</u>	<u>Modulation</u>	1	AM1	2	AM2	3	USB	4	LSB	5	FM1	6	FM2	7	FM3
<u>Setting</u>	<u>Modulation</u>																
1	AM1																
2	AM2																
3	USB																
4	LSB																
5	FM1																
6	FM2																
7	FM3																
19. ANT	Returns antenna switch setting position (1 through 3). <table> <tr> <th><u>Setting</u></th><th><u>Mode</u></th></tr> <tr><td>1</td><td>MKR</td></tr> <tr><td>2</td><td>ANT 1</td></tr> <tr><td>3</td><td>ANT 2</td></tr> </table>	<u>Setting</u>	<u>Mode</u>	1	MKR	2	ANT 1	3	ANT 2								
<u>Setting</u>	<u>Mode</u>																
1	MKR																
2	ANT 1																
3	ANT 2																
20. AM1	Sets modulation switch to AM norm.																
21. AM2	Sets modulation switch to AM narrow.																
22. LSB	Sets modulation switch to lower side band.																
23. USB	Set modulation switch to upper side band.																
24. FM1	Sets modulation switch to FM narrow.																
25. FM2	Sets modulation switch to FM mid.																
26. FM3	Sets modulation switch to FM wide.																
27. PA0	Sets preamp switch off.																
28. PA1	Sets preamp switch on.																
29. PA?	Returns preamp switch setting. 1 = ON Ø = OFF																

Table 4-11 RS-232 Remote Commands

SECTION 5 - MINIMUM PERFORMANCE CHECK

5-1 GENERAL

This section contains a quick, qualitative, step-by-step check for assessing the performance of the T-1200SR. This check should be used when the operating condition of the set is in question. The check contained in this section is performed using the T-1200SR front panel controls and does not require the removal of the exterior case. This check can be performed within 4 to 6 minutes, while the set is operating on its own internal battery power. Only a two foot length of 50 Ω coaxial cable (with BNC connectors on each end) is required as accessory equipment to perform this check.

NOTE

If a determination is made that the T-1200SR is not performing properly as a result of this performance check, the operator/technician should perform a thorough laboratory or bench check before taking any corrective maintenance action.

5-1-1 PRECHECK CONSIDERATIONS

For maximum benefit of the performance check, it is strongly recommended that personnel:

1. Thoroughly read and understand all steps of the check prior to actual initiation.
2. Be familiar with the T-1200SR front and rear panel controls, indicators and connectors, as described in Section 3 of this manual. The performance check assumes the operator/technician is familiar with the set.

5-2 MINIMUM PERFORMANCE CHECK

SPECIAL ACCESSORY

EQUIPMENT REQ'D: One 2-foot length of 50 Ω coaxial cable w/BNC connectors on each end.

TEST SET-UP DIAGRAM:

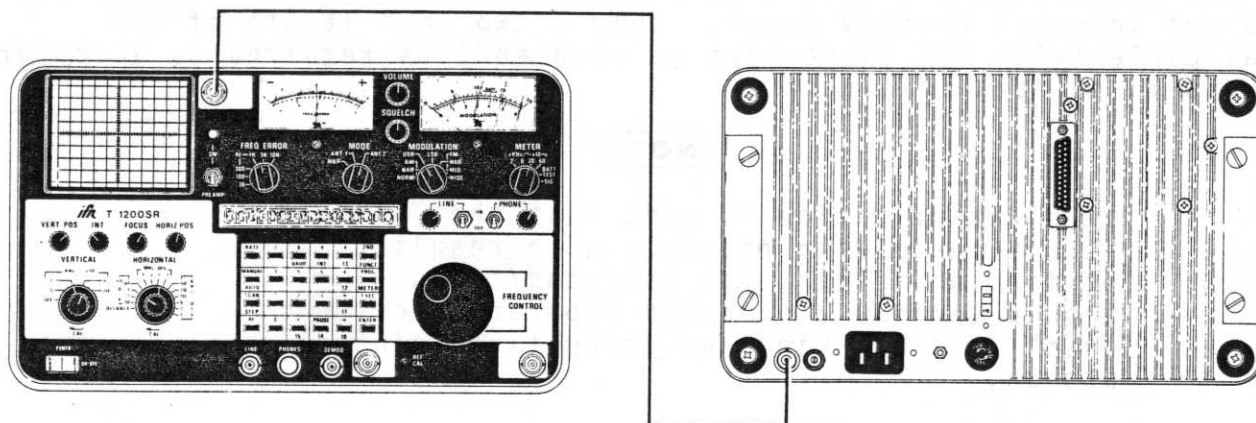


Figure 5-1 Performance Test Set-Up Diagram

CONTROL

- 3 Modulation METER Control
- 4 MODULATION Select Control
- 17 POWER ON/OFF Switch
- 19 VERTICAL Control
- 27 PREAMP Switch
- 31 FREQ ERROR Control
- 34 MODE Control

INITIAL SETTING

- "BATT TEST"
- "AM" - "NORMAL"
- "OFF"
- "OFF"
- "OFF"
- "10K"
- "ANT 1"

Table 5-1 Initial Control Settings

- | STEP | PROCEDURE |
|------|---|
| 1. | Set T-1200SR controls to initial settings described in Table 5-1. |
| 2. | Connect 2-foot length of 50 Ω coaxial cable between ANT 1 Connector (29) and External Reference Connector (40) as shown in Figure 5-1. |
| 3. | Place POWER ON/OFF Switch (17) to "ON" position and observe the following indications: |

STEP

PROCEDURE

8. Verify FREQ ERROR Meter (32) is centered.
9. Place FREQ ERROR Control (31) to the RF "1K" position.
10. Using Keyboard (16), slew last character of RF function up and down 5 units and verify deflection on FREQ ERROR Meter (32).

RECEIVING WWV TIME STANDARD TO CALIBRATE T-1200SR
MASTER OSCILLATOR (Off-The-Air)

1. Connect BNC Tee Connector to ANT 1 Connector (29).
2. Connect antenna to one side of Tee Connector.
3. Connect 2 foot length 50 Ω coax cable between the External Reference Connector (40) to other end of BNC Tee Connector.

NOTE

Loosely connect coax cable to BNC Tee Connector,
so as not to "swamp out" the received WWV signal.

4. Adjust REF CAL Adjustment (11) on T-1200SR front panel to obtain a suitable beat note (zero beat) from the T-1200SR speaker.

STEP

PROCEDURE

3. (Cont'd)

- a. "IFR SYSTEMS, INC" illuminated on VFD (30) for approximately two seconds, followed by "VERSION X.X.X. XX.XX", before the RF function appears.

NOTE

CHECKSUM ERROR followed by MEMORY RESET displayed on VFD (30), in place of the sequence described above, indicates the pre-programmed data may have been lost.

NOTE

If operating on internal battery power, place Modulation METER Control (3) to the "BATT TEST" position and verify MODULATION Meter (1) indicates within the BATT range. If battery is not sufficiently charged, apply appropriate external AC or DC power before continuing check.

4. Using Keyboard (16), select 10 MHz (RF function).
5. Place VERTICAL Control (19) to any position except "OFF" and wait for CRT to warm up (about 30 seconds).
6. Place HORIZONTAL Control (21) to desired position in Spectrum Analyzer range to observe 10 MHz.
7. Place Modulation METER Control (3) to "SIG" position and observe signal strength (relative deflection of meter).

APPENDICES

APPENDIX A - T-1200SR SPECIFICATIONS

A-1 RECEIVE/MONITOR

Frequency Range:	100 kHz to 999.9999 MHz in 100 Hz increments.																										
Sensitivity:	2 μ V (1 MHz to 1000 MHz, FM narrow) for 10 dB quieting.																										
Selectivity:	<table><thead><tr><th>MODE</th><th>MINIMUM RECEIVER 3 dB BANDWIDTH</th><th>AUDIO 3 dB BANDWIDTH</th></tr></thead><tbody><tr><td>FM WIDE</td><td>170 kHz</td><td>80 kHz</td></tr><tr><td>FM MID</td><td>170 kHz</td><td>3.3 kHz</td></tr><tr><td>FM NAR</td><td>15 kHz</td><td>3.3 kHz</td></tr><tr><td>USB</td><td>2.5 kHz</td><td>3.3 kHz</td></tr><tr><td>LSB</td><td>2.5 kHz</td><td>3.3 kHz</td></tr><tr><td>AM NAR</td><td>3 kHz</td><td>3.3 kHz</td></tr><tr><td>AM NORM</td><td>15 kHz</td><td>3.3 kHz</td></tr></tbody></table>	MODE	MINIMUM RECEIVER 3 dB BANDWIDTH	AUDIO 3 dB BANDWIDTH	FM WIDE	170 kHz	80 kHz	FM MID	170 kHz	3.3 kHz	FM NAR	15 kHz	3.3 kHz	USB	2.5 kHz	3.3 kHz	LSB	2.5 kHz	3.3 kHz	AM NAR	3 kHz	3.3 kHz	AM NORM	15 kHz	3.3 kHz		
MODE	MINIMUM RECEIVER 3 dB BANDWIDTH	AUDIO 3 dB BANDWIDTH																									
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LSB	2.5 kHz	3.3 kHz																									
AM NAR	3 kHz	3.3 kHz																									
AM NORM	15 kHz	3.3 kHz																									
Adjacent Channel Rejection:	<table><thead><tr><th>RECEIVER BANDWIDTH</th><th>GREATER THAN 40 dB DOWN</th></tr></thead><tbody><tr><td>170 kHz</td><td>± 220 kHz</td></tr><tr><td>15 kHz</td><td>± 15 kHz</td></tr><tr><td>3 kHz</td><td>± 3 kHz</td></tr><tr><td>2.5 kHz</td><td>± 2 kHz</td></tr></tbody></table>	RECEIVER BANDWIDTH	GREATER THAN 40 dB DOWN	170 kHz	± 220 kHz	15 kHz	± 15 kHz	3 kHz	± 3 kHz	2.5 kHz	± 2 kHz																
RECEIVER BANDWIDTH	GREATER THAN 40 dB DOWN																										
170 kHz	± 220 kHz																										
15 kHz	± 15 kHz																										
3 kHz	± 3 kHz																										
2.5 kHz	± 2 kHz																										
Third Order Intercept Point:	0 dBm typical	1-1000 MHz																									
Demodulation Output: Impedance:	600 Ohms																										
Output Level:	(Into an open circuit): FM: 60 mVRMS/kHz (nominal) AM: 5 mVRMS/% (nominal)																										
Receiver Antenna Ports:	Two switchable ports with a common switchable preamp (12 dB gain, nominal)																										
Receiver Antenna Ports: Input Protection:	0.25 WATT (maximum without damage)																										
Receiver IF Output:	10.7 MHz @ -30 dBm (± 10 dB) AGC Leveled																										
AGC Time Constant:	In SCAN/STEP 1 mSEC (Nominal) In Lock 100 mSec (Nominal)																										
SCAN/STEP Slew Rate:	50 mS per Channel																										

Audio Outputs:

Speaker: 8 ohm, 1 W max

Line: 600 ohm unbalanced
2.5 VRMS MIN at MAX Line control
setting

Phone: 8 Ω to 1000 Ω unbalanced
STEREO or MONO with phone loud-
ness control

A-2 FREQUENCY ERROR METER

RF Accuracy: \pm Master Oscillator, $\pm 3\%$ of full scale

RF Ranges: ± 10 kHz, ± 3 kHz, ± 1 kHz,
 ± 300 Hz, ± 100 Hz, ± 30 Hz full scale

A-3 FREQUENCY CHANGE

Control: Incremental Optical Shaft Encoder

Rate of Update: 100 Hz, 10 kHz, or 1 MHz per step
(selectable) in either direction.

Keyboard: Direct entry or up/down control keys
from 100 Hz to 100 MHz steps.

A-4 MODULATION METER

Type: Maximum of Positive or Negative Peak (AM and FM).

FM Deviation:

Accuracy: $\pm 5\%$ of reading, $\pm 3\%$ of full scale for a 1 kHz tone.

Ranges: 2 kHz, 6 kHz, 20 kHz, 60 kHz full scale.

AM% Modulation:

Accuracy: $\pm 5\%$ of reading, $\pm 3\%$ of full scale for a 1 kHz tone.

Ranges: 60%, 200% full scale.

A-5 DISPLAY OSCILLOSCOPE

Display Size: 2 inches X 2½ inches.

Horizontal Sweep Rate: 10 mSec, 1 mSec, 100 µSec, 10 µSec per division, with vernier in Cal position.

Vertical Deflection: kHz/%x10: .5, 2, 5, 20 per division, with vernier in Cal position.

A-6 SPECTRUM ANALYZER

Log Scale: From -30 dBm to -90 dBm indication.

Dynamic Range: 70 dB (-30 dBm to -100 dBm).

Modes:

SCAN WIDTH	BANDWIDTH
1 MHz/DIV	30 kHz
500 kHz/DIV	30 kHz
200 kHz/DIV	30 kHz
100 kHz/DIV	30 kHz
50 kHz/DIV	30 kHz
20 kHz/DIV	3 kHz
10 kHz/DIV	3 kHz
5 kHz/DIV	3 kHz
2 kHz/DIV	300 Hz
1 kHz/DIV	300 Hz

The receiver frequency is fixed on the center of display for monitoring while the analyzer scans as specified.

A-7 MASTER OSCILLATOR

Standard TCXO:

Accuracy: ±0.5 PPM (0 to 50°C)

Aging: 1 PPM per year

A-8 GENERAL CHARACTERISTICS

Dimensions: 33.3 cm (13.1") wide, 18.5 cm (7.3")
high, 44.5 cm (17.5") deep

Weight: 14.4 kg (32 lbs.) (without options)

Temperature Range: 0 to 50° C

A-9 POWER REQUIREMENTS

Line: 105 to 130/210 to 260 VAC
50 to 400 Hz at 65 WATTS typical.

Ext. DC: 12 to 30 VDC nominal
4 AMPS at 12 V typical
1.7 AMPS at 28 V typical

A-10 REMOTE CONTROL

Type: RS-232C Electrical Specification

Connector: 25 Pin "D" Sub Min. Female

Pins Used: 2 RXD
3 TXD
4 RTS
5 CTS
7 Common

Protocol: 8 Data Bits
1 Stop Bit
No Parity
Half Duplex
Data is 7 Bit ASCII Upper Case Only

A-11 OPTIONS

Rechargeable Battery: 12 V DC 5 A-H Option 04

A-12 ACCESSORY EQUIPMENT

T-1200 ID: Provides a means of interfacing up to five T-1200SRs with a computer. Used with direction finding and tape recording equipment, this configuration expands the electronic signal analysis and monitoring capabilities of the T-1200SR beyond current industry standards.

APPENDIX B - TABLE OF USER I/O PORTS/CONNECTOR PIN-OUT TABLES

B-1 TABLE OF I/O PORTS

CONNECTOR NAME	CONNECTOR TYPE	SIGNAL INPUT/OUTPUT	SIGNAL TYPE
IF OUT	BNC	Output	10.7 MHz @ -30dBm (AGC Leveled)
PHONE	Phone Jack	Output	Audio
ANT 2	BNC	Input	RF
DEM0D	BNC	Output	Audio
LINE	BNC	Output	Audio
ANT 1	BNC	Input	RF
RS-232	25 Pin, Type D	Input/Output	See Pin Out
External Reference	BNC	Input/Output	10 MHz RF

B-2 PIN-OUT TABLE FOR RS-232 CONNECTOR

RS-232 CONNECTOR PIN ASSIGNMENTS

(The T-1200SR is used as a terminal.)

Pin No.	Input/Output	Remarks
2 (RXD)	Commands ←	If low, T-1200SR can receive command. If high, T-1200SR is busy.
3 (TXD)	Info →	
4 (RTS)	→	
5 (CTS)	←	If low, terminal is not ready to receive. If not used, it must be tied high.
7 (Common Ground)		
1, 6 and 8 thru 25 not used		

NOTE

Special cable may have to be configured by the user to interface the RS-232 port to an external controller.

T-1200SR PROTOCOL

No Parity

Must Be Half Duplex

Must Be Upper Case

8 Data Bits Per Character

Bit 8 Must Be Zero (Most Significant Bit)

1 Stop Bit (End Of Character)

High Level = -12V

Low Level = +12V

APPENDIX C - LIST OF ABBREVIATIONS

A	- Ampere
AC or ac	- Alternating Current
Adj	- Adjustment
AGC	- Automatic Gain Control
AM	- Amplitude Modulation
Amp	- Ampere
ANALY DISP.	- Analyzer Dispersion
Assy	- Assembly
BATT	- Battery
BCD	- Binary Coded Decimal
BFO	- Beat Frequency Oscillator
°C	- Degrees Celsius
CAL	- Calibration
ccw	- Counterclockwise
CRT	- Cathode Ray Tube
cw	- Clockwise
CW	- Carrier Wave
DAC	- Digital to Analog Converter
dB	- decibels
dBc	- decibels above (or below) carrier level
dBm	- decibels above (or below) 1 milliwatt
DC or dc	- Direct Current
DCR	- Duty Cycle Regulator
DEFLEC AMP	- Deflection Amplifier
DEMODO	- Demodulation, demodulate or demodulated
DEV	- Deviation
DMM	- Digital Multimeter
DVM	- Digital Voltmeter
ECL	- Emitter Coupled Logic
EXT ACC	- External Accessory
EXT MOD	- External Modulation
EXT DC	- External Direct Current
°F	- Degrees Fahrenheit
FET	- Field Effect Transistor
FILT	- Filter
FM	- Frequency Modulation
FREQ	- Frequency
GEN	- Generate
GHz	- Gigahertz
GND	- Ground
HI LVL	- High Level
HORIZ	- Horizontal
Hz	- Hertz
IC	- Integrated Circuit
IF	- Intermediate Frequency
IMTS	- Improved Mobile Telephone Service
INT MOD	- Internal Modulation
IPC	- Illustrated Parts Catalog
Kg/cm ³	- Kilogram per cubic centimeter
kHz	- kilohertz

L/H	- Left-hand
LOG LIN	- Logarithmic Linearity
LO	- Local Oscillator
LSB	- Lower Sideband
mA	- Milliampere
MAX DISP	- Maximum Dispersion
Mech	- Mechanical
MHz	- Megahertz
MKR	- Marker
MON	- Monitor
μ s	- microsecond
μ V	- microvolt
ms or mSec	- millisecond
mV	- millivolt
mW	- milliwatt
MULT	- Multiplier
N/A	- Not Applicable
NORM	- Normal
OSC	- Oscillator
para	- paragraph
PC Bd	- Printed Circuit Board
PLL	- Phase Lock Loop
Preamp	- Preamplifier
psi	- pounds per square inch
PWR	- Power
PWR MON	- Power Monitor
RCVR	- Receiver
REF	- Reference
RF	- Radio Frequency
R/H	- Right-hand
RMS	- Root Mean Square
ROM	- Read Only Memory
sec	- Seconds
Scope Dev	- Oscilloscope Deviation
SIG	- Signal
SSB	- Single Sideband
SW	- Switch
TCXO	- Temperature Compensated Crystal Oscillator
TRANS	- Transmitter or Transceiver
TTL	- Transistor Transistor Logic
USB	- Upper Sideband
V	- Volts
Vp	- Volts Peak
Vp-p	- Volts Peak-to-Peak
VAC	- Volts Alternating Current
VCO	- Voltage Controlled Oscillator
VDC	- Volts Direct Current
VHF	- Very High Frequency
VOL	- Volume
VSWR	- Voltage Standing Wave Ratio
W	- Watts
XMTR	- Transmitter
XTAL	- Crystal

APPENDIX D - REPACKING FOR SHIPMENT

D-1 SHIPPING INFORMATION

IFR test sets returned to factory for calibration, service or repair must be repackaged and shipped subject to the following conditions:

Do not return any products to factory without first receiving authorization from IFR Customer Service Department.

CONTACT: Customer Service Dept.
IFR, Inc.
10200 West York Street
Wichita, Kansas 67215

Telephone: (800)-835-2350
TWX: 910-741-6952

All test sets must be tagged with:

- a. Owner's identification and address.
- b. Nature of service or repair required.
- c. Model No.
- d. Serial No.

Sets must be repackaged in original shipping containers using IFR packing models. If original shipping containers and materials are not available, contact IFR Customer Service Dept. for shipping instructions.

All freight costs on non-warranty shipments are assumed by customer. (See "Warranty Packet" for freight charge policy on warranty claims.)

D-2 REPACKING PROCEDURE (Reference - Figure D-1):

1. Make sure bottom packing mold is seated on floor of shipping container.
2. Carefully wrap test set with polyethylene sheeting to protect finish.
3. Place test set into shipping container, making sure set is securely seated in bottom packing mold.
4. Place top packing mold over top of set and press down until mold rests solidly on bottom packing mold.
5. 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.

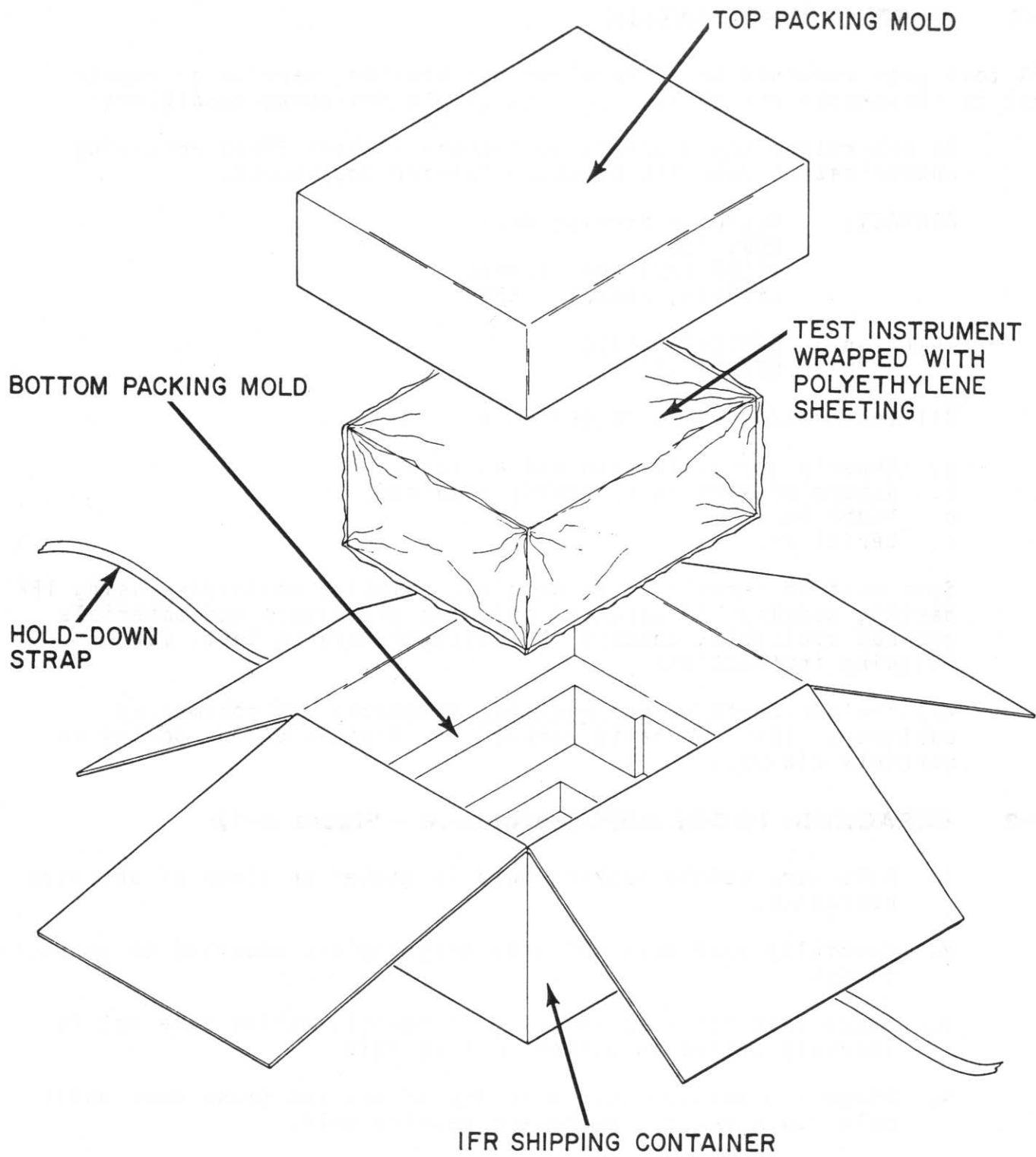


Figure D-1 Repacking For Shipment