

SECTION I
GENERAL DESCRIPTION

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1-1. SCOPE OF THE HANDBOOK.

1-2. The purpose of this handbook is to present information required for the operation of Radio Test Set AN/TRM-3, a portable test instrument manufactured by Transitron, Inc., Manchester, N.H. and Inland Electronics Corp., Aurora, Ill. A description of the physical and electrical characteristics of the equipment, as well as a brief explanation of its theory of operation, are included in section I of this publication. Procedures to be followed in operating the equipment are detailed in section II. Operational checks, adjustments, and directions for emergency operation are contained in sections III and IV.

1-3. PURPOSE OF THE EQUIPMENT.

1-4. Radio Test Set AN/TRM-3 is designed to provide low-power radio-frequency test signals in the frequency range of 15 to 400 megacycles per second, at a power level within the range of 0.1 microvolt to 100,000 microvolts (equivalent to a range of 7 to 127 db below one milliwatt) when terminated in a 50-ohm

load. The test set provides continuous-wave (c-w), amplitude modulated (a-m) and frequency modulated (f-m) signals having bandwidths from 600 kc to 160 mc, at center frequencies within the range of 15 to 400 mc. These output signals are used for testing, calibrating, aligning, and setting gain adjustments of i-f and r-f tuned circuits. The purpose of the oscilloscope section of the instrument is to display the bandpass curve of the equipment under test, when frequency modulated test signals are utilized. Internally generated marker pips are provided for calibrating the oscilloscope sweep trace line in terms of frequency.

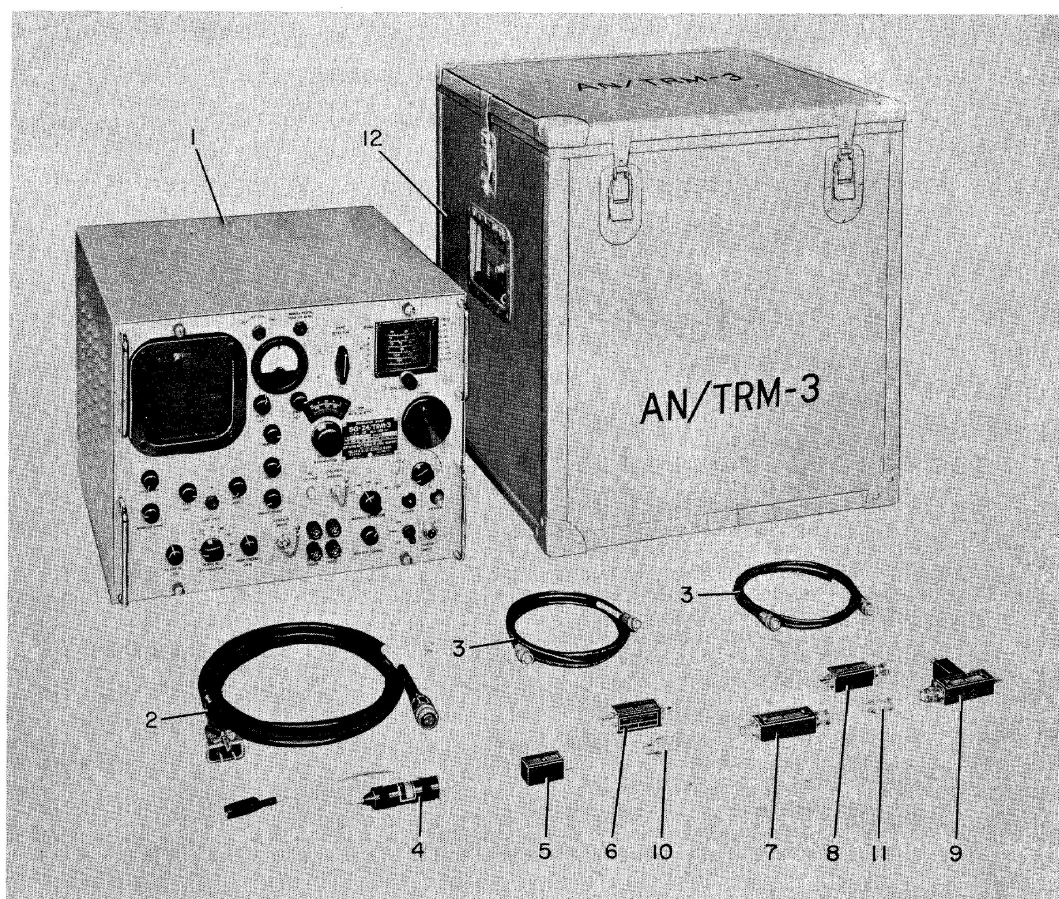
1-5. DESCRIPTION OF THE EQUIPMENT

1-6. MAJOR COMPONENTS. (See figure 1-1.) Radio Test Set AN/TRM-3 consists of Sweep Generator SG-24/TRM-3, Test Set Case CY-1941/TRM-3, with the accessory cables, cords, probes, terminations, and adapters illustrated in figure 1-1 and listed in table I. These components form an operating equipment. No auxiliary equipment is required.

TABLE I. EQUIPMENT SUPPLIED

Qty per Equip.	Name of Unit	Type Designation	Overall Dimensions			Volume	Weight
			Length	Width	Height		
1	Sweep Generator	SG-24/TRM-3	17	17	13-3/16	2.27 ft	66.5
1	Test Set Case	CY-1941/TRM-3	18-3/8	20-1/16	21	4.4 ft	35.0
1	Electrical Power Cable Assembly	CX-3277/U (8 ft 0 in.) (as supplied on Contract NOAs 54-803	96	-	-	-	0.53
	or						
1	Electrical Power Cable Assembly	CX-3135/U (8 ft 0 in.) (as supplied on Contracts N383-45300A) and N383 (19-MIS) 68173A	96	-	-	-	0.53
1	R-f Coupler Detector	CU-506/TRM-3, NOAs 54-803 (on other contracts)	4	3/4	3-1/2	10.5	0.29
			4	3/4	2-5/8	7.8	0.25
1	Impedance Matching Network	MX-1983/TRM-3	3-1/8	3/4	3/4	1.75	0.16
1	Electrical Dummy Load	DA-138/TRM-3	2-1/16	3/4	3/4	1.15	0.09
1	Fixed Attenuator	CN-374/TRM-3	3-3/8	3/4	3/4	1.9	0.16
1	Test Prod	MX-1981/TRM-3	4-11/16	3/4 dia	-	2.6	0.11
1	Test Adapter	MX-1982/TRM-3	4	3/4	3/4	2.25	0.16
2	Cord	CG-409A/U (5 ft 0 in.)	60	-	-	-	0.26
1	Connector Adapter	UG-201/U	1-9/16	3/4 dia	-	-	0.05
1	Connector Adapter	UG-491A/U	1-5/16	9/16 dia	-	-	0.05

Unless otherwise stated, dimensions are in inches, volume is in cubic inches, weight is in pounds.



Index No.	Description	Nomenclature
1	Sweep Generator	SG-24/TRM-3
2	Electrical Power Cable Assembly	CX-3277/U (8 ft 0 in.) as supplied on Contract NOas 54-803
	Electrical Power Cable Assembly	CX-3135/U (8 ft 0 in.) as supplied on Contracts N383-45300A and N383(19-MIS)68173A
3	Cords	CG-409A/U (5 ft 0 in.)
4	Test Prod	MX-1981/TRM-3
5	Electrical Dummy Load	DA-138/TRM-3
6	Impedance Matching Network	MX-1983/TRM-3
7	Test Adapter	MX-1982/TRM-3
8	Fixed Attenuator	CN-374/TRM-3
9	R-f Coupler-Detector	CU-506/TRM-3
10	Connector Adapter	UG-201/U
11	Connector Adapter	UG-491A/U
12	Test Set Case	CY-1941/TRM-3

Figure 1-1. Radio Test Set AN/TRM-3 Components

1-7. SWEEP GENERATOR SG-24/TRM-3. (See figure 1-2.) Sweep Generator SG-24/TRM-3 is a self-contained compact unit, supplied complete within its own aluminum instrument case, finished in gray enamel. The entire unit fits into, and may be carried in, the aluminum clad sandwiched material test set case CY-1941/TRM-3, which has a compartment at one side for storing the cable assemblies supplied. The other side of the test set case has a compartment for storing the handbooks. The lid of the test set case contains a tray, with a hinged lid, and a pad for stowage of the remaining accessories. Four guard-rail type handles on the front panel permit easy removal of the instrument from the test set case, and serve also to protect the front panel controls from damage. Ventilation is provided by louvers in the side and back surfaces of the instrument case. The chassis is removable from the instrument case by loosening the four captive screws on the front panel.

a. All operating controls, indicators, fuses, power and signal receptacles are located on the front panel and are marked with large black-filled engraved letters to identify their function or value. The signal connectors on the front panel are of the BNC type. The sweep generator contains a direct reading frequency dial, of the drum type, located in the upper right section of the panel. This dial is controlled over its entire range by a single control, designated TUNING. The full frequency range of the instrument is covered in six bands, with each band having a separate dial scale. The setting of the BAND SELECTOR control, located to the left of the dial scale, determines which band of frequencies is in operation. A mechanical dial corrector knob is located beneath the dial scales. This permits recalibration of the dial index against internally generated crystal-controlled signals or an external signal. The range of the dial corrector is ± 8.0 mc, when the sweep generator is producing the highest output signal of 400 mc.

b. A three-position function selector control, located in the lower right section of the panel, is provided to select the type of output signal desired. The output signal may be continuous wave, amplitude-modulated by internally generated sine waves at a fixed frequency of 400 cps, or frequency-modulated at a frequency of 25 cps ± 10 percent. Sweep deviation from ± 2 to ± 20 percent of the center frequency is obtained by rotating the function selector control further clockwise in its FM position.

c. The output test signal is available from a type BNC connector, labeled RF OUTPUT, for application to the equipment under test via one of the CG-409A/U cords supplied. The power level of the output signal can be varied from 7 to 127 decibels below one milliwatt (0.1 to 100,000 microvolts) by rotation of the OUTPUT ATTENUATOR control, which drives the piston-type waveguide-beyond-cutoff attenuator and dial. This dial is calibrated in both dbm and microvolts. The power reference level of one milliwatt is established by the PWR SET knob on the front panel, as indicated on the bottom scale of the combined power-monitoring and percentage-modulation meter. Power level readings are accurate to ± 2 dbm, when the sweep generator is working into its rated load of 50 ohms.

d. When utilizing amplitude-modulated test signals from Sweep Generator SG-24/TRM-3, the percentage modulation of the output signal can be varied from

zero to 50 percent by rotation of the MOD SET control. Percentage modulation indications are obtainable only when the MODULATION PUSH TO READ button switch, located at the upper center portion of the panel, is held in its depressed position. The percentage of modulation applied to the carrier wave is indicated by a pointer deflection on the top scale of the panel-mounted meter.

e. When utilizing frequency-modulated test signals from the sweep generator, a horizontal sweep trace from the internal sine wave generator is applied to the cathode-ray tube. A five-position MARKER SELECTOR, located in the lower right section of the front panel, permits selection of marker pips at intervals of 20, 5, 1, or 0.2 mc, on the horizontal trace. Provision is made for applying marker pips from an external source, if desired. The detected output of the equipment under measurement is applied via one of the CG-409A/U cords to the front panel BNC type VERTICAL INPUT jack.

1-8. TEST SET CASE CY-1941/TRM-3. (See figure 1-1.) A shock-resistant and waterproof test set case, of aluminum clad sandwiched material construction, is supplied for storing and shipment of the components of Radio Test Set AN/TRM-3. The test set case has a removable cover and two carrying handles, one at each side of the case. The cover is secured to the case by eight clamp fasteners. Compartments within the case are used for stowage of the accessory cables and handbooks supplied with Radio Test Set AN/TRM-3. The remaining accessories are housed within a hinged tray on the inner side of the cover.

1-9. ELECTRICAL POWER CABLE ASSEMBLY. (See 1, figure 1-3.) Input power for Sweep Generator SG-24/TRM-3 is applied from a 115-volt, 50 to 1000 cps, power source via a detachable eight-foot rubber-covered light-duty electrical power cable assembly CX-3277/U (8 ft 0 in.) (as supplied on Contract NOas 54-803), or CX-3135/U (8 ft 0 in.) (as supplied on other contracts). One termination is a standard AN type three-contact connector for mating the POWER INPUT receptacle on the sweep generator. The other termination is an AN type UP121M three-prong connector for mating a power source outlet with one of its terminals at ground potential. In the event that a three-contact power source outlet is not available, the ground prong on the connector shell may be rotated 180°; the spade lug at this end of the cable assembly should then be connected to a separate source of earth ground.

1-10. CORDS CG-409A/U. (See 2, figure 1-3.) Two 60-inch CG-409A/U cords, each fabricated from type RG-58A/U cable with BNC type UG-88/U connectors at each end, are provided for interconnecting Sweep Generator SG-24/TRM-3 to the equipment under test. One cord applies the output test signal from the front panel RF OUTPUT jack to the input of the equipment under test. The other cord applies the swept detected output signal from the equipment under test to the VERTICAL INPUT jack, for visual presentation on the cathode-ray tube screen.

modified BNC jack at the opposite end. The attenuator employs a pi-network resistive circuit, with a nominal impedance of 50 ohms and an insertion loss of 10 db.

f. R-F COUPLER-DETECTOR CU-506/TRM-3. (See 6, figure 1-4.) This is a low impedance r-f coupler-detector, 4 inches long by 3/4-inch wide by 3-1/2 inches high, as supplied on Contract NOas 54-803. (The height is 2-5/8 inches for equipment supplied under other contracts). The coupler is used when applying the output of low impedance circuits to the sweep generator oscilloscope circuit. When the r-f coupler-detector is inserted in a length of 50-ohm transmission line, the resultant VSWR produced is no greater than 1.5 db. A type K20 crystal diode is used within the coupler to detect a small portion of the r-f energy within the transmission line. The detected output is available, at the center BNC connector, for application through one of the CG-409A/U cords to the

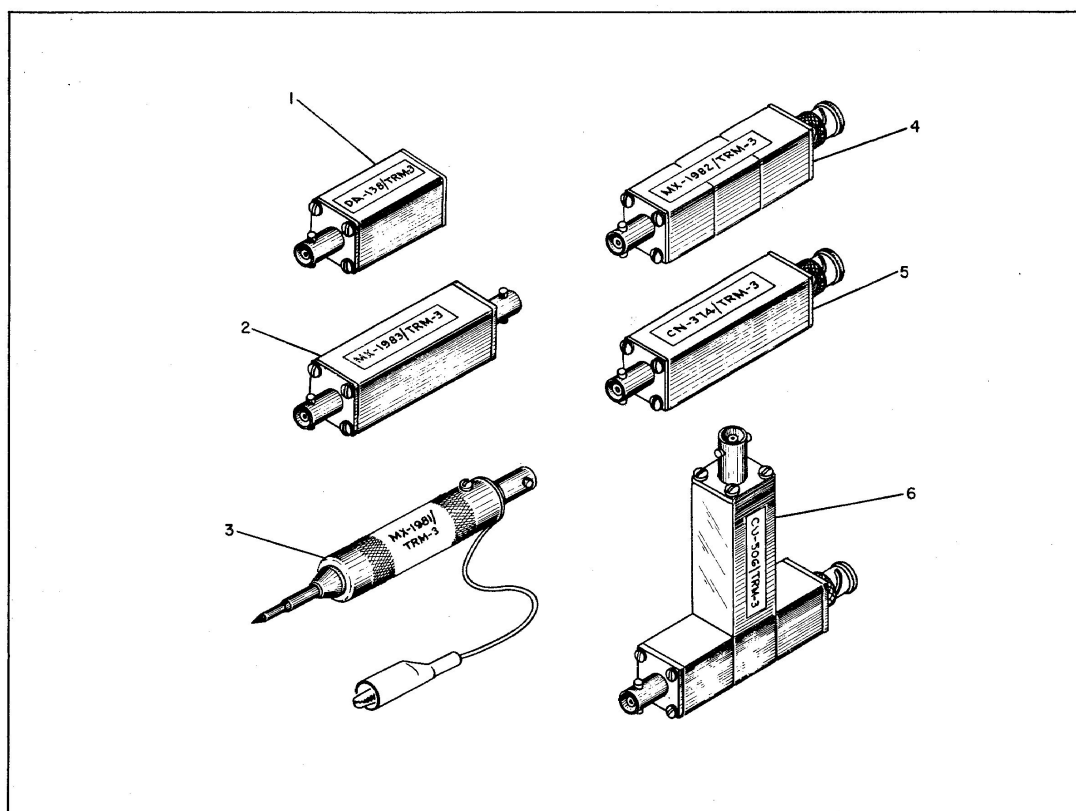
VERTICAL INPUT jack on the sweep generator.

g. UG-201/U CONNECTOR ADAPTER. (See figure 1-1.) A type UG-201/U connector adapter is supplied for mating a type N female cable connector to the type BNC male plug used on the CG-409A/U cords and accessories.

h. UG-491A/U CONNECTOR ADAPTER. (See figure 1-1.) A type UG-491A/U connector adapter is supplied for mating one female type BNC connector to another female type BNC connector, when required.

1-12. ELECTRON TUBE, FUSE, AND INDICATOR LAMP COMPLEMENT.

1-13. Table II lists in numerical order by reference symbol the types, quantities, and functions of the entire complement of electron tubes (including crystal diodes), fuses, and indicator lamps used in the equipment.



No.	Description	Nomenclature	No.	Description	Nomenclature
1	Electrical Dummy Load	DA-138/TRM-3	4	Test Adapter	MX-1982/TRM-3
2	Impedance Matching Network	MX-1983/TRM-3	5	Fixed Attenuator	CN-374/TRM-3
3	Test Prod	MX-1981/TRM-3	6	R-f Coupler Detector	CU-506/TRM-3

Figure 1-4. Accessories Supplied with Radio Test Set AN/TRM-3

TABLE II. TUBE, FUSE, AND INDICATOR LAMP COMPLEMENT

TUBES			
Ref. Symbol	Type	Qty	Function
V1, V30, V35	6X4W	3	V1, V30: Full wave rectifier. V35: Half wave rectifier.
V2, V8	OB2WA	2	V2: Voltage regulator. V8: Voltage reference.
V3	5R4WGA	1	Full wave rectifier.
V4	2X2A	1	Half wave rectifier.
V5, V6, V11, V33, V34	6005/6AQ5W	5	V5, V6, V11: Series regulator. V33, V34: Power amplifier.
V7, V12, V20, V21, V22, V23	5654/6AK5W	6	V7, V12: Voltage control. V20, V21, V22: Harmonic amplifier. V23: Buffer.
V9	6481 or 5767*	1	R-f oscillator.
V10	OA2WA	1	Voltage dropping.
V13, V14, V15, V16, V31, V32	12AT7WA	6	V13: 400 cycle oscillator. V14: Power set and feedback amplifier. V15: VTVM amplifier. V16: 200 kc oscillator. V31: Sweep generator. V32: Phase splitter
V17, V18, V19	5814A	3	V17A: 1 mc oscillator. V17B: 5 mc oscillator. V18: 20 mc oscillator. V19A: Mixer. V19B: Amplifier.
V24, V25, V27, V28, V29	12AX7	5	V24, V25: Vertical deflection amplifier. V27: Horizontal deflection amplifier. V28A: Phase splitter. V28B: Horizontal sweep amplifier. V29: Blanking generator.
V26	5UP1	1	Cathode-ray tube.
TOTAL		35	
CRYSTAL DIODES			
CR1	G7B (General Electric Co.) or 1N82*	1	R-f oscillator detector.
CR2	1N81 or 1N198*	1	VTVM amplifier detector.
CR3	K20 (Kemtron Products, Inc.) or 1N145*	1	R-f Coupler-Detector CU-506/TRM-3 rectifier.
CR4	1N69 or 1N198*	1	Test Prod MX-1981/TRM-3 rectifier.
TOTAL		4	
FUSES			
F1, F2, F3, F4	F02G3R00A	4	F1, F2: Line protection. F3, F4: Spares.
TOTAL		4	

*Used on Radio Test Sets manufactured under Contract N383(19-MIS)68173A.

TABLE II. TUBE, FUSE, AND INDICATOR LAMP COMPLEMENT (cont)

INDICATOR LAMPS			
Ref. Symbol	MIL Type	Qty	Function
DS1, DS2	47	2	DS1: Heater indicator. DS2: Power indicator.
TOTAL		2	

1-14. BRIEF THEORY OF OPERATION.

1-15. INTRODUCTION. Sweep Generator SG-24/TRM-3 consists essentially of an r-f oscillator assembly and transducer mechanism, both of which are housed within an aluminum casting; a self-contained sweep generator; a modulating circuit; a power-monitoring and voltage-stabilizing circuit; an oscilloscope section with vertical and horizontal deflection amplifiers; a marker generating circuit; and the necessary power supplies for developing the voltages required for the above. Paragraphs 1-16 through 1-18 describe the operating circuits in each position of the front panel function selector.

1-16. AM POSITION. In the AM position, the operating circuits consist of the r-f oscillator, the 400-cps modulating circuit, the power-monitoring and voltage stabilizing circuits, and the self-contained power supplies. The frequency of the output signal is determined by the position of two front panel controls. One control, designated BAND SELECTOR, has six positions and functions to connect one of six tuned inductances into the oscillator plate circuit. The other control, designated TUNING, permits continuous tuning of the variable capacitor connected in shunt with the tuned inductance in the r-f oscillator plate circuit for each band. A direct-reading calibrated attenuator, controlled by the OUTPUT ATTENUATOR knob, makes it possible to obtain calibrated readings from -7 to -127 dbm. The attenuated output amplitude-modulated test signal, fixed-modulated at 400 cps, is available at the front panel RF OUTPUT jack. The percentage modulation of this signal may be adjusted from zero to 50 percent by means of the MOD SET control. Indication of the modulation level is obtained by observing the meter pointer deflection when the MODULATION PUSH TO READ switch is held in its depressed position.

1-17. CW POSITION. In the CW position of the front panel function selector, operating power is removed from the 400-cps modulator. All other circuits described in paragraph 1-16 are in operation. The attenuated output continuous-wave test signal is available

at the front panel RF OUTPUT jack. As in AM operation, power output is variable from -7 to -127 dbm by means of the OUTPUT ATTENUATOR control.

1-18. FM POSITION. In the FM position of the front panel function selector, the following additional circuits become operative:

a. A sine-wave sweep generator, which produces output at approximately 25 cps. The output of this generator is used as driving voltage for the horizontal sweep circuits of the oscilloscope and for the power amplifiers of the electro-mechanical transducer.

b. A transducer, which translates electrical power fed to a voice coil into mechanical motion. Due to mechanical coupling of the voice coil to the frequency-determining TUNING capacitor, the motion of the voice coil varies the frequency of the r-f oscillator around the center frequency. The amount of drive to the voice coil within the transducer is determined by the setting of the % DEV control. At its extreme counterclockwise position, the frequency of the r-f signal deviates ± 2 percent from the setting of the front panel TUNING control. Continuous deviation up to ± 20 percent of the center frequency is provided by rotating the % DEV control to its extreme clockwise position.

c. A frequency identifying circuit, which provides marker pips on the oscilloscope horizontal trace. Four crystal oscillators are located on the marker chassis. Rotating the front panel MARKER SELECTOR to the .2 MC, 1 MC, 5 MC, or 20 MC position energizes the appropriate crystal oscillator stages, and produces marker pips at the indicated intervals on the scope trace line. Provision is included for applying frequency identifying marker pips from an external signal source via the front panel EXTERNAL MARKER jack.

1-19. GENERAL ELECTRICAL CHARACTERISTICS.

1-20. The general electrical characteristics, capabilities, and limitations of Sweep Generator SG-24/TRM-3 are given in table III.

TABLE III. GENERAL ELECTRICAL CHARACTERISTICS

Characteristic	Capability of Limitation
Frequency range	15 to 400 megacycles, covered in six bands.
Power requirements	103.5 to 126.5 volts rms ac, 50 to 1000 cps; 225 watts power consumption.
Sweep deviation, FM operation	± 2 percent to ± 20 percent of the center frequency.
Sweep rate, FM operation	25 cps, ± 10 percent.
Output level variation, FM operation	Less than ± 0.5 db from center frequency, at any deviation control setting.
Accuracy of frequency calibration, AM and CW operation	± 1 percent, with the dial corrector set at mid-position.
Dial corrector range	± 6.0 to ± 8.0 megacycles at 400 mc.
Amplitude modulation	400 cps ± 2 percent. Percent modulation continuously adjustable from zero to 50 percent; 30 percent modulation point indicated by red line on calibrated meter scale.
R-f output voltage	Continuously adjustable from 0.1 microvolt minimum to 100,000 microvolts (0.1 volt) maximum, when operated into rated load at 50 ohms.
Harmonic content	At output levels of 100 microvolts or more: At least 40 db below output level; At output levels of less than 100 microvolts: 20 db below output level.
Spurious amplitude modulation	0.5 percent maximum.
Spurious frequency modulation	0.01 percent maximum.
Output level calibration accuracy	Accuracy of attenuator dial ± 2 db or better when connected to rated load.
Rated load	Nominal 50 ohms resistive.
Output circuit standing wave ratio	The VSWR, measured at the output connector, less than 1.3 to 1 (SWR 2.5 db).
Frequency marker spacings	200 kc, 1 mc, 5 mc, and 20 mc, ± 0.02 percent.
Marker pip amplitude	From zero to at least $1/2$ inch total vertical displacement on cathode-ray tube screen.
Cathode-ray tube	5 inch screen, type 5UP1.
Vertical input attenuator	Step type, with seven ranges from zero to 60 db attenuation.
Bandwidth, oscilloscope vertical deflection amplifier	Maximum high-frequency response of 15 kc, at the 6 db points.

SECTION II
OPERATING PROCEDURES

2-1. GENERAL.

2-2. The complete step-by-step procedures for obtaining each of the types of output signals available from the sweep generator are given in paragraphs 2-9 through 2-14, below. The controls and connectors to which reference is made in the operating procedures are shown in figure 2-1; their functions are listed in table V.

2-3. POWER LEVEL CALIBRATION.

2-4. To assure satisfactory operation and accurate power level indications, be sure to follow the power level calibration procedure outlined in paragraph 2-10, prior to each use of the equipment.

2-5. SELECTING TYPE OF OPERATION.

2-6. Three basic types of operation (continuous-wave, amplitude-modulated, or frequency-modulated) are obtainable from Sweep Generator SG-24/TRM-3, as determined by front panel control settings. The tests to be performed on the equipment under measurement will indicate the type of sweep generator operation to be employed.

2-7. POWER CONNECTION.

2-8. Apply operating power to the sweep generator as directed in the following steps:

a. Connect nominal 115-volt, 50 to 1000 cps, power source to the POWER INPUT receptacle via the CX-3277/U or CX-3135/U electrical power cable assembly supplied. Be sure to connect the ground lug, at the power source end of the cable assembly, to a suitable earth ground in the event that a three-socket power source outlet (with one terminal grounded) is not available.

b. When the PWR ON-OFF switch is thrown to its OFF position, space heaters within the equipment are energized and dry out moisture condensation. It is recommended that the space heaters remain energized as long as possible when the equipment is not in use, under cold and humid climatic conditions.

2-9. TO OBTAIN CW OUTPUT TEST SIGNALS. (See figure 2-1.)

2-10. To obtain continuous-wave output test signals, proceed as directed in the following steps:

a. Set PWR ON-OFF switch to ON position, and rotate the function selector to the CW position.
b. Set RF OSC switch to ON.
c. Set the BAND SELECTOR to the desired frequency range, as shown in table IV.
d. Set the DIAL CORRECTOR knob so that the dial index pointer is at its mid-position.

TABLE IV. BAND SELECTOR FREQUENCY RANGES

Position	Frequency Range
A	15 - 25 mc
B	25 - 45 mc
C	45 - 75 mc
D	75 - 120 mc
E	120 - 215 mc
F	215 - 400 mc

e. Set the TUNING knob to the desired frequency, observing the proper dial scale as determined by the setting of the BAND SELECTOR.

f. Connect the test signal from the RF OUTPUT jack, via one of the CG-409A/U cords supplied, to the input of the equipment under test.

g. Set the RF OSC ON-OFF switch to its OFF position.

h. Adjust the ZERO SET knob to obtain a meter pointer deflection to ZERO SET (index line at extreme left end of meter scale).

i. Set the RF OSC ON-OFF switch to its ON position.

j. Adjust the PWR SET knob to obtain a meter pointer deflection of 0 dbm on the bottom meter scale (red line calibration mark), with the OUTPUT ATTENUATOR control set to -7 dbm. The sweep generator is now at the 200-microwatt power reference level for the frequency set in step e, above. Power output level may then be read directly from the calibrated OUTPUT ATTENUATOR dial.

k. Set the OUTPUT ATTENUATOR knob to the desired value of r-f signal level, within the range from -7 to -127 dbm (0.1 to 100,000 microvolts), as indicated on the calibrated attenuator dial.

l. Allow at least a 20-minute warm-up period for the sweep generator to reach operating stability. When the ambient temperature is below approximately 10° C (50°F), allow a longer warm-up period.

2-11. TO OBTAIN AM OUTPUT TEST SIGNALS.

2-12. To obtain amplitude-modulated output test signals, modulated at a fixed frequency of 400 cps, proceed as directed in the following steps:

a. After performing the steps outlined in paragraph 2-10, rotate the function selector counterclockwise to its AM position.

b. Hold the MODULATION PUSH TO READ button switch in its depressed position, and observe the pointer deflection on the top meter scale.

c. Adjust the MOD SET knob to obtain the desired percentage of modulation, within the range from approximately zero to 50 percent, as indicated by deflection of the meter pointer.

d. Recheck the power set level, with the function selector in its CW position, in order to maintain accuracy of r-f power calibration.



2-13. TO OBTAIN FM OUTPUT TEST SIGNALS.

2-14. To obtain frequency-modulated output test signals, at a deviation of ± 2 to ± 20 percent of the center frequency, proceed as directed in the following steps:

a. After performing the steps outlined in paragraph 2-10, rotate the function selector clockwise to its FM position.

b. Rotate the function selector knob further clockwise in its FM position to the desired percentage of deviation, as shown by the panel markings.

c. To set the SWEEP PHASE control, rotate the INTENSITY control clockwise until the sweep retrace is visible. Adjust the SWEEP PHASE control until markers on the forward and the retrace sweeps are coincident. Then rotate the INTENSITY control counterclockwise to eliminate the retrace, and re-focus.

2-15. OPERATING CONTROLS AND CONNECTORS.

2-16. Table V lists the panel designation, index numbers of figure 2-1, and the function of all operating controls and connectors located on the front panel.

TABLE V. OPERATING CONTROLS AND CONNECTORS
(See figure 2-1.)

Panel Designation	Index No.	Function
POWER INPUT receptacle and PWR ON-OFF switch	1	POWER INPUT receptacle connects sweep generator to 115-volt, 50 to 1000 cps, power source via power cable assembly supplied. Operating power is applied to test set space heaters and to HEATER pilot lamp with PWR switch in OFF position. Setting PWR ON-OFF switch to ON position disconnects power from space heaters and HEATER pilot lamp; power is applied to equipment power supply and POWER pilot lamp.
Function Selector	2	Permits selection of amplitude-modulated, continuous-wave, or frequency-modulated output test signals. Further clockwise rotation in FM position determines percentage deviation from center frequency of f-m output signal.
TUNING control and dial	3	Controls and indicates the operating frequency, within the frequency range determined by the setting of the BAND SELECTOR control.
DIAL CORRECTOR control	4	Permits mechanical recalibration of the tuning dial index against an accurate signal source.
BAND SELECTOR	5	Selects one of six frequency ranges, within the overall limits of 15 mc to 400 mc.
OUTPUT ATTENUATOR control and dial	6	Controls the r-f output level of the test signal available at RF OUTPUT jack. The dial is calibrated in decibels below one milliwatt, and in microvolts.
PWR SET control	7	With the RF OSC switch in its ON position, this control permits adjustment of plate voltage applied to the r-f oscillator. At a meter pointer deflection to the 0 DBM POWER SET mark, the power level of test signals can be read directly from the calibrated OUTPUT ATTENUATOR dial.
MODULATION PUSH TO READ switch	8	With the function selector set to its AM position, depressing this switch permits the percentage of amplitude modulation to be read on the top scale of the panel-mounted meter.
RF OSC ON-OFF switch	9	Removes operating power from the r-f oscillator when set to its OFF position, as required in initial power level calibration procedure.
ZERO SET control	10	Electrically sets the power-monitoring meter to zero, with the sweep generator in operation but with the RF OSC switch set to its OFF position.

2-13. TO OBTAIN FM OUTPUT TEST SIGNALS.

2-14. To obtain frequency-modulated output test signals, at a deviation of ± 2 to ± 20 percent of the center frequency, proceed as directed in the following steps:

a. After performing the steps outlined in paragraph 2-10, rotate the function selector clockwise to its FM position.

b. Rotate the function selector knob further clockwise in its FM position to the desired percentage of deviation, as shown by the panel markings.

c. To set the SWEEP PHASE control, rotate the INTENSITY control clockwise until the sweep retrace is visible. Adjust the SWEEP PHASE control until markers on the forward and the retrace sweeps are coincident. Then rotate the INTENSITY control counterclockwise to eliminate the retrace, and re-focus.

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(See figure 2-1.)

Panel Designation	Index No.	Function
POWER INPUT receptacle and PWR ON-OFF switch	1	POWER INPUT receptacle connects sweep generator to 115-volt, 50 to 1000 cps, power source via power cable assembly supplied. Operating power is applied to test set space heaters and to HEATER pilot lamp with PWR switch in OFF position. Setting PWR ON-OFF switch to ON position disconnects power from space heaters and HEATER pilot lamp; power is applied to equipment power supply and POWER pilot lamp.
Function Selector	2	Permits selection of amplitude-modulated, continuous-wave, or frequency-modulated output test signals. Further clockwise rotation in FM position determines percentage deviation from center frequency of f-m output signal.
TUNING control and dial	3	Controls and indicates the operating frequency, within the frequency range determined by the setting of the BAND SELECTOR control.
DIAL CORRECTOR control	4	Permits mechanical recalibration of the tuning dial index against an accurate signal source.
BAND SELECTOR	5	Selects one of six frequency ranges, within the overall limits of 15 mc to 400 mc.
OUTPUT ATTENUATOR control and dial	6	Controls the r-f output level of the test signal available at RF OUTPUT jack. The dial is calibrated in decibels below one milliwatt, and in microvolts.
PWR SET control	7	With the RF OSC switch in its ON position, this control permits adjustment of plate voltage applied to the r-f oscillator. At a meter pointer deflection to the 0 DBM POWER SET mark, the power level of test signals can be read directly from the calibrated OUTPUT ATTENUATOR dial.
MODULATION PUSH TO READ switch	8	With the function selector set to its AM position, depressing this switch permits the percentage of amplitude modulation to be read on the top scale of the panel-mounted meter.
RF OSC ON-OFF switch	9	Removes operating power from the r-f oscillator when set to its OFF position, as required in initial power level calibration procedure.
ZERO SET control	10	Electrically sets the power-monitoring meter to zero, with the sweep generator in operation but with the RF OSC switch set to its OFF position.

TABLE V. OPERATING CONTROLS AND CONNECTORS (cont)

Panel Designation	Index No.	Function
MOD SET control	11	Adjusts amplitude modulation percentage to the desired value from zero to 50 percent, as indicated on panel-mounted meter, with MODULATION PUSH TO READ switch held in its depressed position.
FOCUS control	12	Permits control over the sharpness of the trace on the scope screen.
INTENSITY control	13	Sets the general brightness level of the trace on the scope screen.
HOR POS control	14	Shifts the trace left or right on the scope screen.
VERT POS control	15	Shifts the trace up or down on the scope screen.
MARKER GAIN control	16	Adjusts the height of the marker pips on the scope screen when internally-generated, or externally applied, frequency identifying markers are used.
DEFL POL switch	17	Permits reversing the polarity of the displayed signal on the scope screen.
VERTICAL GAIN control	18	Permits fine control over the gain of the scope vertical amplifier.
VERTICAL ATTENUATOR switch	19	Permits step attenuation, at 10-db intervals, of the video signal applied to the scope vertical amplifier.
HORIZONTAL GAIN control	20	Permits control over the gain of the scope horizontal amplifier circuit.
SWEEP PHASE control	21	Varies the phase of the sine-wave sweep signal applied to the horizontal amplifier. Setting of this control causes the sweep voltage to be in-phase with the mechanical motion of the transducer, when using FM output test signals.
VERTICAL INPUT connector	22	Connects the video signal from the equipment under measurement to the input of the scope vertical amplifier.
RF OUTPUT connector	23	Connects the r-f test signal (a-m, c-w, or f-m, as desired) to the input of the equipment under measurement.
EXTERNAL MARKER connector	24	Connects the output of an external marker signal source to the input of the marker mixer amplifier.
MARKER SELECTOR	25	Selects one of four internally-generated frequency identifying markers for calibrating the scope trace in terms of frequency.
		OFF position of this switch disconnects operating power from all marker generators.
MARKER TUNING control	26	Permits shifting the distribution of the marker pip harmonics over the frequency spectrum displayed on the scope trace.

2-17. TO USE THE OSCILLOSCOPE.

2-18. The oscilloscope section of the sweep generator is in operation only when the function selector is rotated to its FM position.

- a. Apply the detected output of the equipment under measurement, through the CG-409A/U cord supplied, to the VERTICAL INPUT jack of the sweep generator.
- b. Adjust the INTENSITY and FOCUS controls to obtain the sharpest trace, and a suitable brightness.
- c. Vary the VERT POS and HOR POS position controls to center the display on the screen.
- d. Set the VERTICAL ATTENUATOR and VERTICAL GAIN controls to obtain a suitable height of signal, without saturating the screen.
- e. Place the DEFL POL switch in that position which produces a positive signal display, with respect to the sweep trace line.
- f. Adjust the SWEEP PHASE control to synchronize the end points of the displayed signal with the end points of the motion of the transducer.

2-19. TO USE THE FREQUENCY IDENTIFYING MARKER PIPS.

2-20. Frequency identifying marker pips are generated within the sweep generator, as a means of accurately calibrating the sweep trace in terms of frequency. Provision is made for applying marker signals from an external signal source to the input of the scope vertical amplifier. When internally-generated marker pips are desired, proceed as directed in the following steps:

- a. Rotate the MARKER SELECTOR to one of its four operating positions, as indicated by the front panel markings.
- b. Use that position of the MARKER SELECTOR which produces the most suitable spacing of marker pips for the frequency range employed. For example, when operating in band A (covering the frequency range of 15 to 25 mc) use the .2 MC or 1 MC markers. This position will produce marker pips at every 0.2

mc (or 1 mc) interval on the frequency spectrum being displayed. On the other hand, use of the 20 MC markers will be of no value when using the low frequency ranges, since the entire bandwidth displayed on the screen will be narrower than the interval between successive marker pips. As a second example, when operating in band F (covering the frequency range of 215 to 400 mc), use the 20 MC markers. This position of the MARKER SELECTOR will produce marker pips at every 20 mc interval on the wide frequency spectrum now displayed on the scope screen. Use of the 0.2 MC markers will be of no value, since these marker pips will be so close together on the frequency spectrum displayed that the interval between two successive pips cannot be distinguished.

- c. Rotate the MARKER GAIN control to obtain the desired height of marker pips on the sweep trace.
- d. Rotate the MARKER TUNING control to obtain uniform maximum amplitude of the marker pips over the frequency spectrum under observation.

2-21. TYPICAL APPLICATIONS OF THE EQUIPMENT.

2-22. Figures 2-2 through 2-5 illustrate typical applications of the sweep generator, when frequency-modulated test signals are used.

- a. Figure 2-2 illustrates the connections required for the alignment of a typical i-f amplifier, having a self-contained detector in its output circuit. For this application, assume that the i-f amplifier requires an extremely low-level input signal. Use one of the CG-409A/U cords to apply the test signal from the sweep generator to the input of the fixed attenuator CN-374/TRM-3; connect the output of the fixed attenuator to the input of the i-f amplifier. Use the second CG-409A/U cord to apply the swept detected output of the i-f amplifier to the VERTICAL INPUT connector of the sweep generator.

- b. Figure 2-3 illustrates the connections required for the alignment of a typical i-f amplifier that does not include a self-contained detector at its output. For

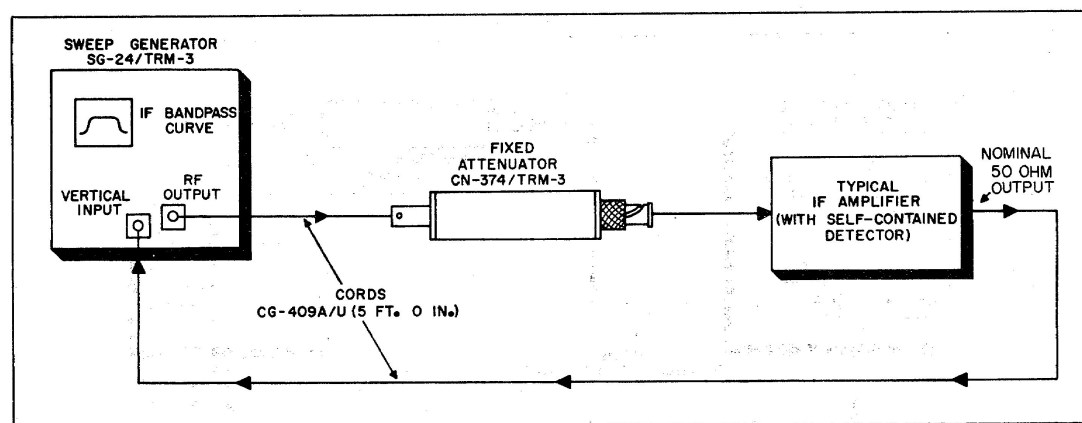


Figure 2-2. Typical Application for Fixed Attenuator CN-374/TRM-3 and Cords CG-409A/U

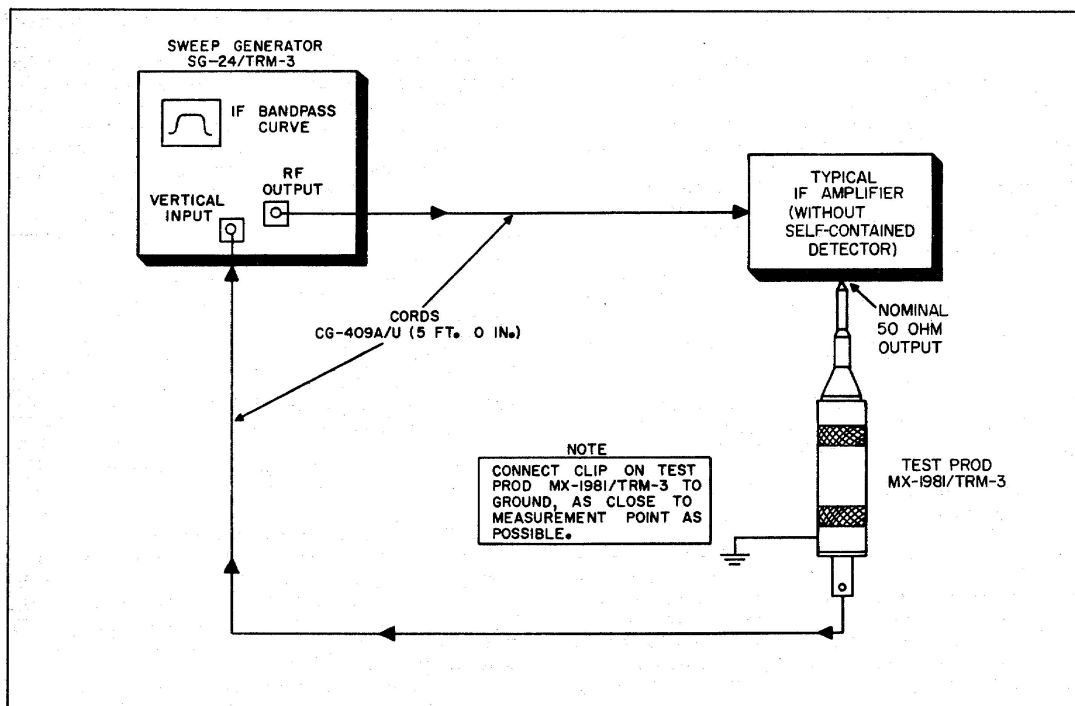


Figure 2-3. Typical Application for Test Prod MX-1981/TRM-3 and Cords CG-409A/U

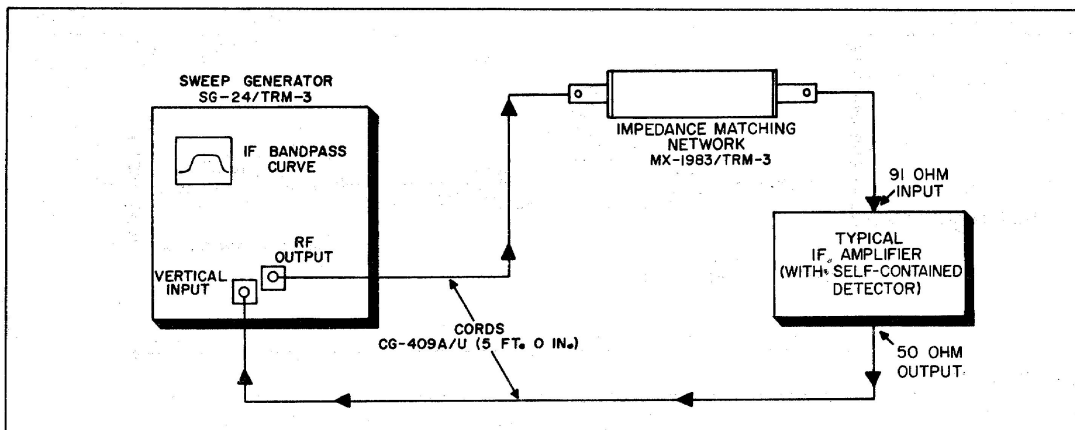


Figure 2-4. Typical Application for Impedance Matching Network MX-1983/TRM-3 and Cords CG-409A/U

this application, use one of the CG-409 A/U cords to apply the test signal from the sweep generator to the input of the i-f amplifier. Place the pointed tip of Test Prod MX-1982/TRM-3 on the circuit point under test. Be sure to connect the alligator clip of the test prod to chassis ground, as close to the circuit measurement point as possible. Use the second CG-409A/U cord to apply the output of the test prod to the VERTICAL INPUT connector of the sweep generator.

c. Figure 2-4 illustrates the connections required for the alignment of a typical i-f amplifier employing a self-contained detector at its output, but having a 91-ohm input impedance. For this application, use one of the CG-409A/U cords to apply the test signal from the sweep generator to the input of the Impedance Matching Network MX-1983/TRM-3. Connect the impedance matching network to the input of the i-f amplifier. Use the second CG-409A/U cord to apply the detected output of the i-f amplifier to the VERTICAL INPUT connector of the sweep generator.

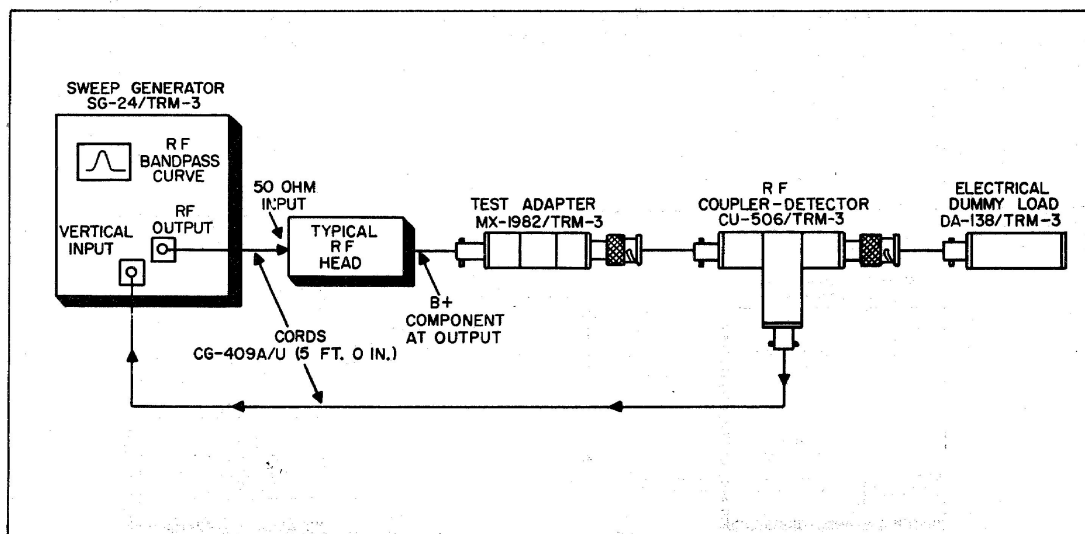
d. Figure 2-5 illustrates the connections required for the alignment of a typical r-f head, having a d-c component present at its output jack. For this application, use one of the CG-409A/U cords to apply the test signal from the sweep generator to the input of the equipment under measurement. Connect the female BNC jack of the Test Adapter MX-1982/TRM-3 to the output of the r-f head; connect the male BNC plug at the output termination of the Test Adapter MX-1982/TRM-3 to the mating jack on the R-f Coupler-

Detector CU-506/TRM-3. The capacitor mounted within the test adapter serves to block any d-c component present on the output signal from burning out the crystal diode within the r-f coupler-detector. Terminate the opposite end of the r-f coupler-detector with the Electrical Dummy Load DA-138/TRM-3. Apply the swept detected output signal, available at the center jack of the r-f coupler-detector to the VERTICAL INPUT jack on the sweep generator via the second CG-409A/U cord. The display appearing on the cathode-ray tube screen represents the response curve of the r-f head.

2-23. SHUTTING DOWN THE EQUIPMENT.

2-24. PARTIAL SHUT-OFF. To shut the instrument off while in any operating sequence, set the PWR ON-OFF switch to its OFF position. This action disconnects operating power from the power supply and all electron tubes, but leaves the space heaters and the HEATER pilot lamp energized. In humid climates, heater operation is desirable when the instrument is idle, to prevent excessive moisture condensation.

2-25. COMPLETE SHUT-OFF. To remove operating power from the equipment completely, disconnect the AN type connector at the sweep generator end of the power cable assembly from its mating POWER INPUT receptacle on the equipment front panel.



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Figure 2-5. Typical Application for Test Adapter MX-1982/TRM-3, R-f Coupler-Detector CU-506/TRM-3 and Electrical Dummy Load DA-138/TRM-3

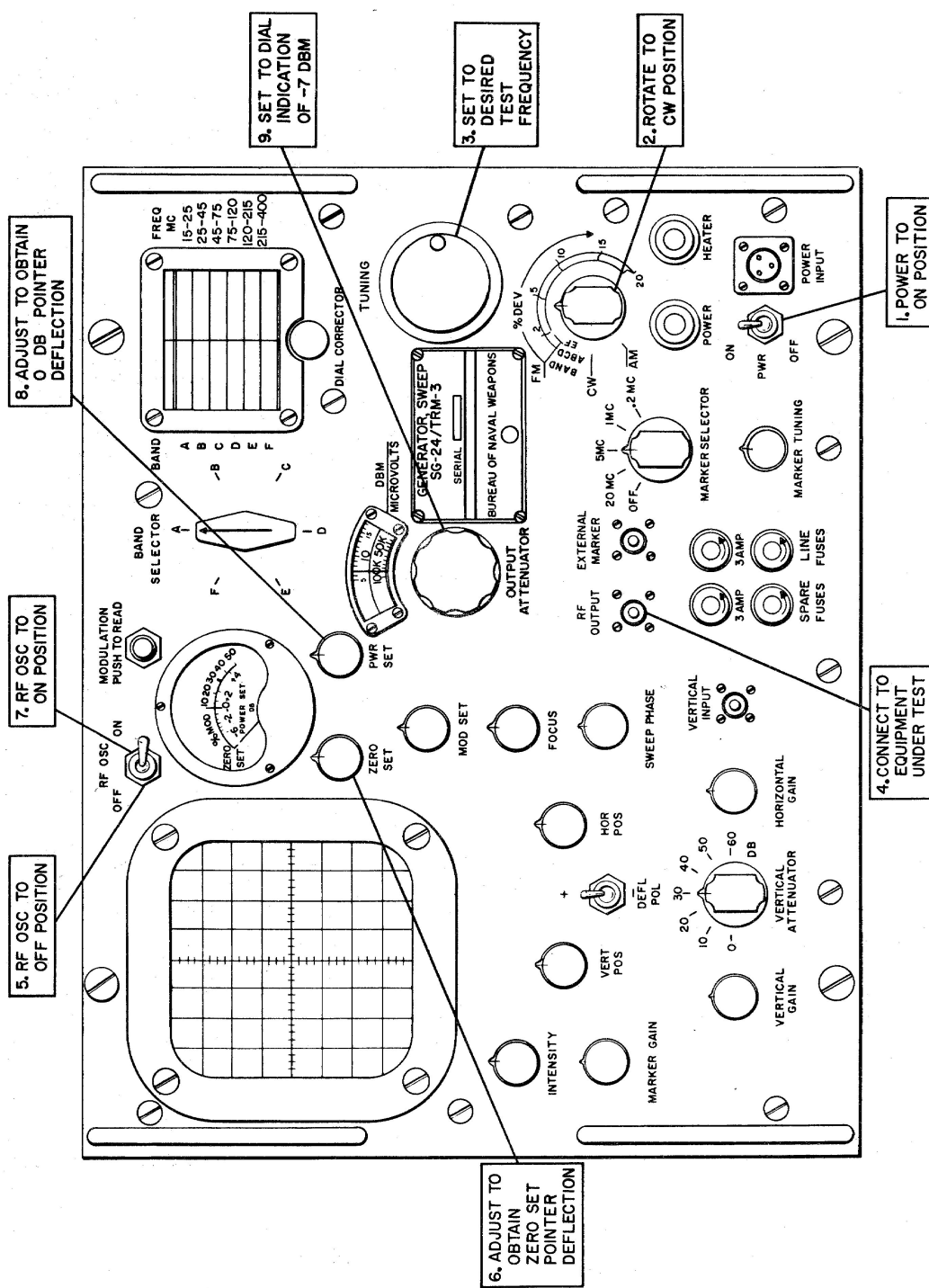


Figure 3-1. Operating Procedure for Calibrated Output Signal

