

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT
MAINTENANCE
RADIO TEST SET
AN/URM-113



HEADQUARTERS, DEPARTMENT OF THE ARMY
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TECHNICAL MANUAL

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RADIO TEST SET AN/URM-113

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CHAPTER 1

THEORY

Section I. BLOCK DIAGRAM

I. Scope

a. This manual covers field and depot maintenance for Radio Test Set AN/URM-113. It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, alining, and repairing the equipment.

It also lists tools, materials, and test equipment for third, fourth, and fifth echelon maintenance.

Detailed functions of the equipment are covered in this chapter.

b. The complete technical manual for this equipment includes two other publications:

TM 11-6625-206-12 (Radio Test Set AN/URM-113, Operation and Organizational Maintenance).

TM 11-6625-206-35P (Field and Depot Maintenance Repair Parts and Special Tools List for Radio Set AN/URM113).

c. Forward comments concerning this manual to the Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

Note. For applicable forms and records, see paragraph 2, TM 11-6625-206-12.

2. General

The test set provides three crystal-controlled test signals to check equipment under test. The test signals are selected by front panel controls and are applied to the equipment under test through internal driver stages. The output of the equipment being tested is monitored by a vacuum-tube voltmeter (vtvm) bridge circuit and is displayed on an indicating meter. The signal path for the test set is shown in the block diagram (fig. 1).

3. Block Diagram

Theory The block diagram theory of the test set is described in a through m below. For complete circuit details, refer to figure 26.

a. *Crystal Bank.* Crystals CR1, CR2, and CR3 are contained within the test set. FREQUENCY SELECTOR switch S1 selects the crystal to be used in oscillator stage V3A.

b. *Oscillator.* One-half of a 12AV7 dual-triode, V3A, is used in a crystal-controlled oscillator circuit. The frequency of oscillation is determined by the crystal switched into the feedback circuit by the FREQUENCY SELECTOR. The crystal may be selected from the internal crystal bank or may be a crystal inserted in the EXT XTAL socket. The output of the oscillator is the test signal that is fed to cathode follower V3B.

c. *Cathode Follower V3B.* Cathode follower V3B serves as a buffer for the oscillator and provides a low impedance driving source for the following stages. The output of the cathode follower is applied to the FUNCTION SELECTOR switch and to the radio-frequency (RF) level detector.

d. *RF Level Detector.* A detecting network consisting of CR6 and CR7 accepts the RF output of V3B. The RF is rectified and is applied to the FUNCTION SELECTOR switch S2. This voltage is applied to the vtvvm bridge and is indicated on meter M1 when the FUNCTION SELECTOR switch is in CAL LEVEL (position 3) or in EXT XTAL (position 9).

e. *Intermediate-Frequency Driver.* When the FUNCTION SELECTOR switch is at IF TEST, PULSE SW GEN TEST, or INT IF BAL (position 4, 5, or 7, fig. 1), the RF signal is applied to intermediate-frequency (IF) driver V1. The output of V1 is transformer coupled to the IF AMPL TEST SOCKET.

f. *IF AMPL TEST SOCKET.* The test socket provides the necessary operating voltages for the AM-427/U plug-in IF amplifier. The output of the IF amplifier under test is coupled from the test socket to IF limiter V2.

g. *IF Limiter.* The output of the IF amplifier under test drives limiter V2. A portion of the limiter grid voltage is fed to the vtm bridge through FUNCTION SELECTOR switch S2. The magnitude of this voltage indicates the condition of the IF amplifier under test.

h. *PULSE SW GEN TEST SOCKET.* This test socket accepts the 0-325/U for testing. When an AM-427/U is inserted into the IF AMPL TEST SOCKET, the output signal is applied to the PULSE SW GEN TEST SOCKET through limiter V2. When an 0-325/U is inserted into the PULSE SW GEN TEST SOCKET, the 0-325/U will oscillate. The magnitude of limiter grid voltage required to stop the 0325/U from oscillating is used as a measure of the condition of the unit under test.

i. *Discriminator Driver.* When the FUNCTION SELECTOR switch is at DISCR TEST or INT DISCR BAL (positions 6 or 8, fig. 1), the output of cathode follower V3B is applied to discriminator driver V4. The output signal from V4 is coupled to the DISCR TEST SOCKET and to internal discriminator balance detector CR4 and CR5.

j. *DISCR TEST SOCKET.* This socket accepts the TF-132/U and TF-204/U. The signal from V4 is detected by the discriminator under test and a portion of this voltage is fed to the vtm bridge through the FUNCTION SELECTOR switch.

k. *Internal Discriminator Balance Detector.* A detector consisting of CR4 and CR5 detects the output of V4 and applies this voltage to the vtm bridge through the FUNCTION SELECTOR switch. This voltage is used to check the alinement of the unit under test when the FUNCTION SELECTOR switch is set in DISCR TEST or INT DISCR BAL (positions 6 or 8, fig. 1).

l. *Vtm Bridge.* Meter M1 and a type 5814A tube V7 are used in a bridge circuit to indicate visually the results of all tests. The input to the bridge circuit is determined by FUNCTION SELECTOR switch S2.

m. *Power Supply.* The alternating-current (ac) input voltage is applied across power transformer T1. The secondary windings of the power transformer supply all the necessary ac voltages to the test set. A type 6X4WA tube V5, rectifies the high voltage as from T1. The +250-volt output is not regulated. A portion of the output of the rectifier is connected to two voltage regulators. A type OA2WA tube V6, provides a regulated 150 volts for all stages in the test set except the cathode follower stage. A type NE48 neon lamp V8 provides a regulated 65 volts. This voltage is used when testing IF amplifiers. Selenium rectifier CR8 is used in a full-wave bridge rectifier circuit that supplies 1.5 volts direct current (dc) to the filaments of the units under test.

Section II. CIRCUIT ANALYSIS

4. Oscillator

a. *General.* Oscillator stage V3A uses one triode section of a 12AV7 tube in a modified Pierce crystal oscillator circuit. It is designed to oscillate with any of the three internal crystals or with either the 1-megacycle (mc) or 2.15-mc crystal that may be inserted into the EXT XTAL socket.

b. *Operation* (fig. 2). FREQUENCY SELECTOR switch S1 selects the crystal that is placed between the grid and plate of V3A. Capacitor C15, and a trimmer capacitor (CX) selected by S1, and resistor R23, provide gridleak bias for the stage. Cathode bias is provided by resistor R25. The value of C15 and the trimmer capacitor affects the operating frequency. Capacitor C11 couples the plate to the crystal. Resistor R14 is the plate load for the oscillator and C5 is a plate decoupling capacitor. Capacitor C14, together with R56 are an ac

voltage divider that attenuates the feedback current at higher harmonics, thus reducing the possibility of oscillation at higher crystal modes. Resistor RX switched in by S1 and is used to adjust the oscillator level by varying the supply voltage to the plate of the oscillator. The oscillator output is connected through coupling capacitor C12 to the grid of cathode follower V3B.

5. FREQUENCY SELECTOR switch

(fig. 3)

FREQUENCY SELECTOR switch S1 is a two-deck, four-position wafer switch. Its function is to change the frequency of the oscillator by placing different crystals and trimmer capacitors into the plate-to-grid circuit (par. 4)

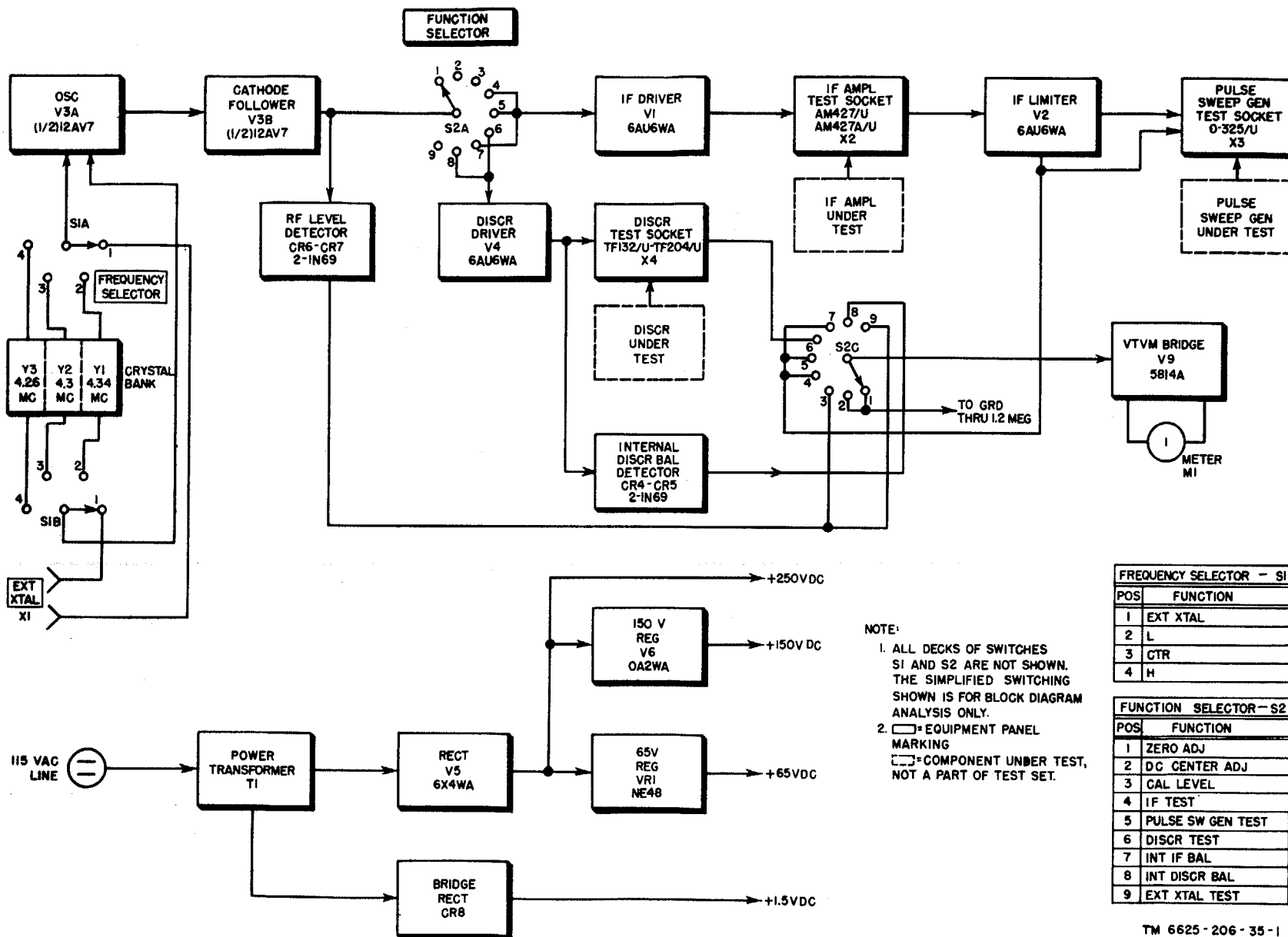


Figure 1. Block diagram.