TECHNICAL MANUAL

ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE MANUAL MONITOR, RADIO FREQUENCY R-2176/FRN (NSN 6625-01-098-2534)

HEADQUARTERS, DEPARTMENT OF THE ARMY

24 MARCH 1982

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING

HIGH VOLTAGE is used in the operation of this equipment. DEATH ON CONTACT may result if personnel fail to observe safety precautions. Learn the areas containing high voltage in each piece of equipment. Be careful not to contact high-voltage connections when installing or operating this equipment.

DON'T TAKE CHANCES!

TECHNICAL MANUAL
No. 11-5825-270-23

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *24 March 1982*

ORGANIZATIONAL AND DIRECT SUPPORT

MAINTENANCE MANUAL

MONITOR, RADIO FREQUENCY R-2176/FRN

(NSN 6625-01-098-2534)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual if you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

In either case, a reply will be furnished direct to you.

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

1-1. Scope

This technical manual contains organizational and direct support maintenance procedures for Monitor, Radio Frequency R-2176/FRN, hereinafter referred to as the monitor receiver. Topics covered include functioning, troubleshooting, removing and replacing, adjusting and testing of the monitor receiver.

1-2. Index of Technical Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-570, The Army Maintenance *Management System.*

b. Report of Packaging and Handling Deficiency. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/ NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C/ DLAR 4500.15.

1-4. Administrative Storage

Administrative storage of Monitor, Radio Frequency R-2176/FRN is from 1 to 45 days and may be accomplished as follows:

a. Storage Site. The equipment should be stored in an area specifically marked Administrative Storage. The area should be covered and protected from the elements.

b. Maintenance Services. Before storage, perform the next scheduled major preventive maintenance service (monthly).

c. Inspection. Inspect the equipment for proper operation before storage. Do not store inoperable equipment.

d. Protection. Protect the equipment by storing it in the boxes and packaging material in which it was shipped. Be sure to put a fresh desiccant bag in each package (NSN 6850-00-264-6572).

1-5. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-6. Reporting Equipment Improvement Recommendations (EIR)

If your Monitor, Radio Frequency R-2176/FRN needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

1-7. Description and Data

For an overall description and tabulated data pertaining to the monitor receiver, refer to the Operator's Manual, TM 11-5825-270-10.

CHAPTER 2

SERVICE UPON RECEIPT AND INSTALLATION

2-1. Unpacking

The monitor receiver is packed in a cardboard box; unpacking of the monitor receiver is straightforward and does not require any special instructions.

2-2. Checking Unpacked Equipment

a. Inspect the Monitor receiver for damage which may have occurred during shipment. If monitor receiver has been damaged, report the damage on SF 361.

b. Check the monitor receiver against the components of end item list (COEIL) in the Operator's Manual (TM 11-5825-270-10) and the packing slip to see if the equipment is complete. Report all discrepancies in accordance with paragraph 1-3. The monitor receiver should be placed in service even though a minor assembly or part that does not effect proper functioning is missing.

c. Check to see whether the monitor receiver has been modified (equipment which has been modified will have the MWO number on the front panel near the nomenclature plate). Check also to see whether all applicable MWO's have been applied (current MWO's applicable to the equipment are listed in DA PAM 310-4 as applicable).

2-3. Installation Instructions

Installation of the monitor receiver will be accomplished by a special installation team.

2-4. Post-Installation Adjustments

NOTE

The following adjustments must be made at the time of initial installation or whenever the monitor receiver or its assemblies are replaced.

a. Tools and Test Equipment Required The tools and test equipment required for post-installation adjustments of the monitor receiver are listed in table 2-1.

Table 2-1. Tools and Test Equipment Required

Item	Common Name
Electronic Counter Mainframe TD-1209/U	Frequency Counter
Multimeter AN/USM-223	Multimeter
Tool Kit, Electronic Equipment TK-105/G	Toolkit
Oscilloscope OS-261/U	Oscilloscope

b. Adjustment Procedures. Refer to figure 2-1 and proceed as follows:

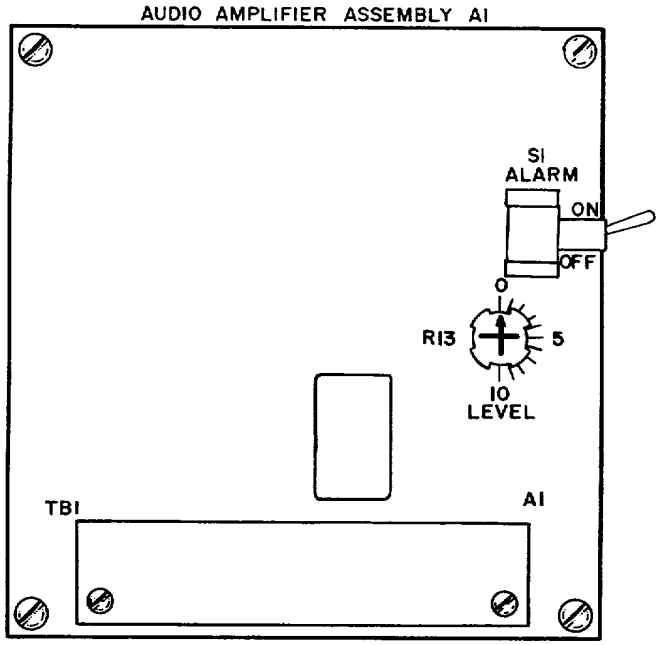

Figure 2-1 (1). Identification of Adjustments/Controls (Sheet 1 of 4).

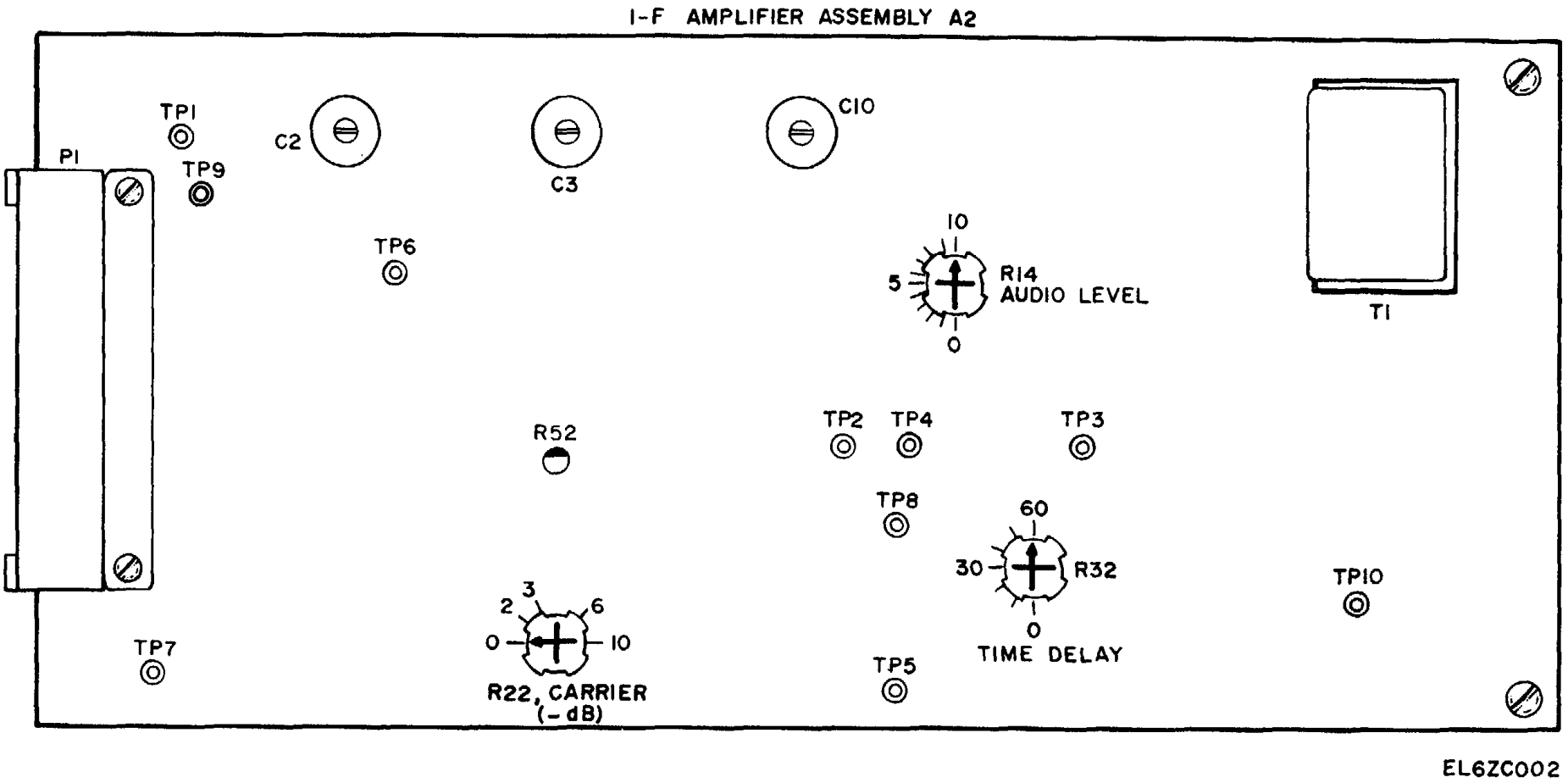

Figure 2-1(2). Identification of Adjustments/Controls (Sheet 2 of 4).

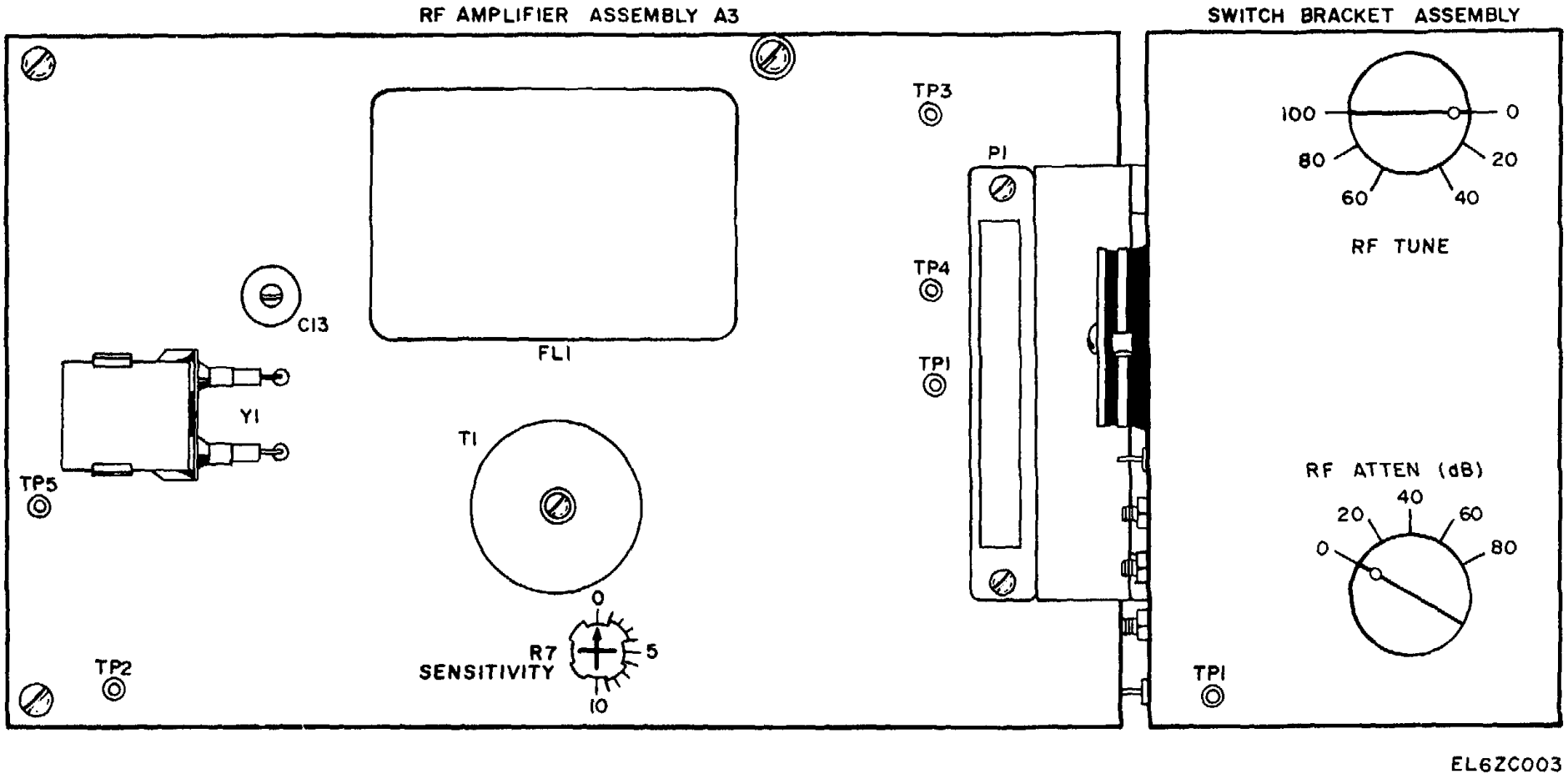

Figure 2-1(3). Identification of Adjustments/Controls (Sheet 3 of 4).

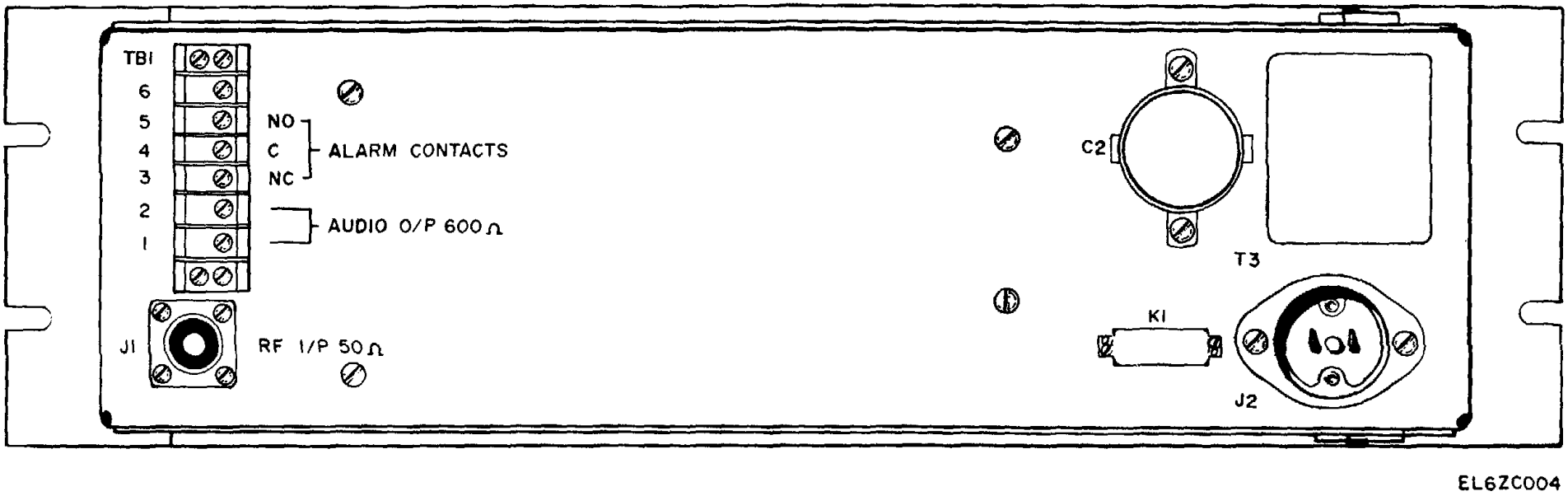

Figure 2-1(4). Identification of Adjustments/Controls (Sheet 4 of 4).

(1) See that the power cord is connected to the receiver, and plugged into a grounded ac outlet.

(2) See that the antenna cable connector is properly mated with J1 (RF 1/P 50 ohm) at the rear of the receiver.

(3) See that the remote alarm contact at TB1 (rear of unit) are properly wired for remote monitoring. Terminals TB1 (5-4) are normally open (NO) contacts and TB1 (4-3) normally closed (NC). If remote alarm indication is not required, do not use TB1 (3, 4, or 5).

(4) See that the 600-ohm audio line (if used) is connected to TB1 (1-2).

(5) Set power ON/OFF switch to OFF.

(6) Turn front panel latch and swing the front pane open to the left.

(7) Refer to figure 2-1 and determine the location of various adjustments and controls inside the receiver. Familiarity with the location of these adjustments and controls will be helpful when performing the following procedures.

(8) Locate the local oscillator crystal on the RF PCB and note its frequency, as marked on the crystal (it is not necessary to remove crystal from PCB to read the frequency marking). Add the frequency marked on the crystal to the frequency of the NDB transmitter and note the sum. If the sum of the two frequencies is 4.4000 MHz, proceed with (15) below. If the sum of the two frequencies is not 4.4000 MHz, proceed with (9) below.

(9) Determine the correct crystal frequency using the following formula:

Crystal Frequency = 4.4 MHz minus the transmitter frequency OR crystal frequency + transmitter frequency = 4.4 MHz.

(10) Install the correct crystal on the RF PCB.

(11) Connect a frequency counter to TP2 on the RF PCB, using TP5 as the ground.

(12) Set power ON/OFF switch to ON. If the audible alarm sounds, press ALARM SIL switch to silence the alarm.

(13) Observe the frequency counter reading; it must be the same as the crystal frequency ±10 Hz. If necessary, adjust trimmer capacitor C13 on the RF PCB until the frequency counter reading is within 10 Hz of the crystal frequency. Trimmer capacitor C13 permits up to ±200 Hz adjustment in the crystal frequency.

(14) Disconnect frequency counter from TP2, and set power ON/OFF switch to OFF.

(15) On switch bracket assembly, set RF ATTEN control to 80 dB position and RF TUNE control to the appropriate operating frequency as described in table 2-2.

(16) On RF PCB, turn SENSITIVITY control R7 fully clockwise (maximum sensitivity).

(17) On IF PCB, turn TIME DELAY control R32 to any desired setting between 0 to 60 seconds. The setting of R32 determines the delay (in seconds) after which an alarm condition will be indicated by the receiver. Note the 0 (zero) setting of R32 represents the minimum delay, approximately 100 mSEC. Typically, potentiometer R32 is set between 10 to 30 seconds. Note the delay setting.

NOTE

Insufficient delay time setting by potentiometer R32 may result in a false alarm condition. The minimum delay time must be greater then the time gap between normal keying sequence.

(18) Set power ON/OFF switch to ON. This may result in an alarm condition after the time delay. Press ALARM SIL switch to silence the aural alarm.

(19) On switch bracket assembly, rotate RF ATTEN switch counterclockwise, one step at a time, until the front panel CARRIER LEVEL meter shows a deflection. Do not turn RF ATTEN control any further.

(20) While observing the CARRIER LEVEL meter, slowly turn RF TUNE control for maximum deflection on the meter. Perform this step carefully so as not to miss the maximum deflection point.

(21) On RF PCB adjust SENSITIVITY control R7 to obtain a reading of 0 dB on the CARRIER LEVEL meter.

NOTE

In some cases it may be necessary to change the RF ATTEN setting by one step to obtain the 0 dB reading specified in(21) above.

(22) On IF PCB, set CARRIER control R22 to the required alarm trip level. For example, if the receiver is required to provide an alarm indication when the relative carrier level drops by 3 dB, set R22 to 3 dB position. Note the setting of R22.

(23) Check to see that the CARRIER LEVEL meter reads 0 dB. On RF PCB, adjust the SENSITIVITY control R7 to obtain a CARRIER LEVEL meter reading of 1 dB below that noted in (22) above. For example, if CARRIER control R22 in (22) above was set at -3 dB, set SENSITIVITY control R7 to obtain a reading of -4 dB on the CARRIER LEVEL meter.

(24) Check to see that the receiver generates an alarm condition after the set time delay (ALARM light on, NORM light off, and aural alarm on). Listen to the aural alarm level. If the volume of aural alarm is too high or too low, adjust potentiometer R13 on audio amplifier PCB for the desired tone volume. Do not adjust R13 if

the alarm volume is satisfactory.

(25) Silence aural alarm by momentarily pressing the ALARM SIL switch.

(26) Using the multimeter, check the state of alarm contacts at TB1 (at rear of the unit): Contacts 5-4 of TB1 must be open circuit and contacts 4-3 must be closed (shorted).

(27) Slowly turn SENSITIVITY control R7 clockwise until the CARRIER LEVEL meter reading is 1 dB greater than the trip level set in (22) above. Check to see that the receiver reverts back to normal operation (NORM light on and ALARM light off). Now adjust R7 for 0 dB reading on the CARRIER LEVEL meter.

NOTE

When performing (27) above note that receiver cannot revert back to normal operation during the pause between code transmissions. The SENSITIVITY control R7 should therefore be adjusted during the keying sequence.

(28) Connect a 600 ohm, 1W resistor across TB1 (1-2) and connect an rms voltmeter across the resistor. Check that meter reads 12.25 V rms (±0.1 V). If this reading is not correct, adjust AUDIO LEVEL potentiometer R14 on the IF PCB for 12.25 V rms (±0.1V) on the volt-meter.

NOTE

If TB1 (1-2) is terminated into a 600 ohm line, do not install the 600 ohm 1W resistor as specified in (28) above. The rms voltmeter may be connected directly across TB1 (1-2).

NOTE

The maximum output level at TB1 (1-2) is 250 mW. This equals 12.25 V rms into 600 ohms.

(29) Close the front panel and turn the latch so that it engages.

(30) Set power ON/OFF switch to OFF.

Table 2-2. Relationship Between RF Tune Control and Operating Frequency

FREQUENCY KHZ	DIAL SETTING	FREQUENCY KHZ	DIAL SETTING
190	10	360	81
200	20	370	82
210	29	380	83
220	38	390	84
230	43	400	85
240	47	410	86
250	51	420	87
260	55	430	88
270	58	440	89
280	62	450	90
290	66	460	91
300	69	470	92
310	72	480	93
320	74	500	94
330	76	520	95
340	78	535	96
350	80		

CHAPTER 3

FUNCTIONING OF EQUIPMENT

Section I. FUNCTIONAL DESCRIPTION

3-1. General

a. The monitor receiver is a flux-tuned, non directional beacon (NDB) monitor specifically designed to verify continuously the operational readiness of an associated NBD transmitter. The monitor receiver consists of an antenna assembly and a receiver assembly.

b. The antenna assembly comprises a one meter long whip antenna and a matching module. The signal transmittal by the NBD transmitter is picked up by the whip antenna and fed to the receiver through the matching module which transforms the antenna impedance to 50 ohms (nominal).

c. The receiver is a crystal-controlled, single conversion superheterodyne unit, providing high degree of selectivity and sensitivity. The receiver is fix-tuned to the same frequency as that of the associated NBD transmitter, over the range of 160 kHz to 535 kHz. In operation, the receiver continuously monitors the rf carrier level and keyed modulation of the NBD transmitter signal. As long as the amplitude of the rf carrier and modulation level of the signal being received are above a predetermined threshold and the keyed modulation is present, the operation is considered to be normal. However, if some abnormal operating conditions cause the transmitter carrier level and/or modulation to fall below the predetermined threshold or the keying becomes continuous, the monitor receiver generates the following alarm output

(1) Visual alarm (red light on front panel).

(2) Aural alarm (3 kHz tone from built-in loudspeaker).

(3) Alarm contacts (form-C contacts for remote monitoring).

3-2. Block Diagram Description

a. Figure 3-1 is a simplified block diagram of the monitor receiver. The rf signal from the NBD transmitter is picked up by the whip antenna and applied to the matching module which transforms the antenna impedance to approximately 50 ohms There is no signal gain in the matching module and its output is fed to the receiver through a coaxial cable.

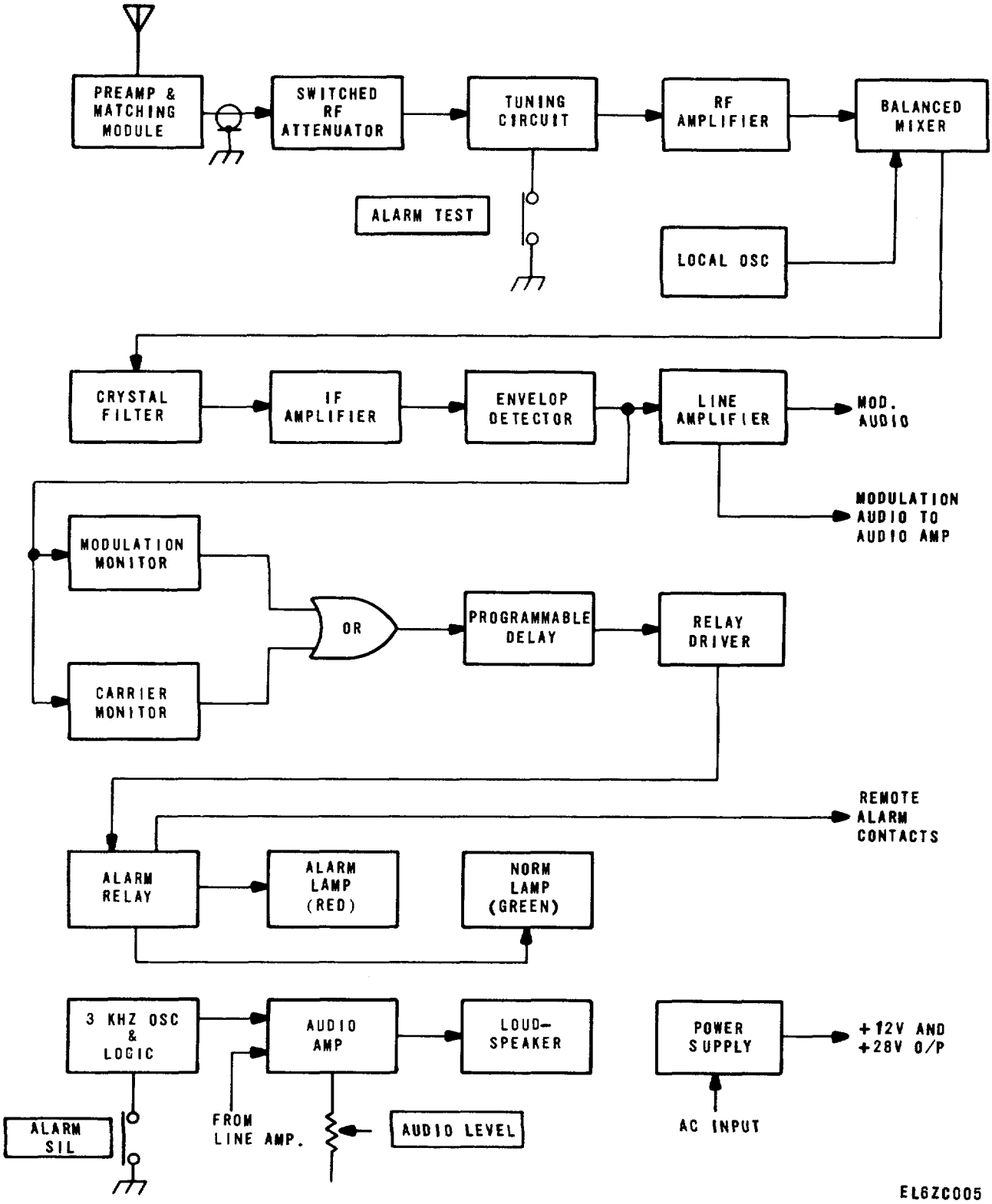

Figure 3-1. Block Diagram, Monitor Receiver.

b. In the receiver, the rf signal is fed to a switch-selectable attenuator capable of providing up to 80 dB of attenuation in 20 dB steps, i.e., the incoming signal may be subjected to 0, 20, 40, 60 or 80 dB attenuation. The attenuator setting, determined by the signal strength at the antenna, is carried out at the time of installation and need not be readjusted during normal operation.

c. The tuning circuit following the attenuator permits tuning of the receiver to the NBD transmitter frequency. This tuning is performed once at the time of installation and does not require readjustment during normal operation.

d. The output from the tuning circuit is amplified by a fixed gain rf amplifier and then mixed with a local oscillator signal in a balanced mixer. The local oscillator signal is generated by a crystal-controlled oscillator and its frequency is always 4.4 MHz minus the signal frequency. Thus, the output from the balanced mixer is always at 4.4 MHz, the receiver if.

e. From the balanced mixer, the if. signal is passed through a 4.4 MHz crystal filter which rejects all unwanted frequencies (image frequency, local oscillator, and the signal frequency) and produces an output of 4.4 MHz if. The amplitude of this if. signal is proportional to the signal strength at the antenna.

f. The if amplifier provides approximately 80 dB gain to the if. input and its output is fed to an envelope detector which produces a dc output proportional to the carrier level. Superimposed on this dc output is an ac component proportional to the modulation level of the received signal. The envelope detector output is applied to three circuits: the line amplifier circuit, modulation monitor circuit, and the carrier monitor circuit.

g. The line amplifier is an adjustable gain stage which provides a 600 ohm balanced output of the detected audio (modulation signal). The output from the line amplifier (250 mW max.) is normally sent to a remote monitoring site over a 600 ohm line. A second output from the line amplifier is used to drive the audio amplifier which presents the modulation tones on the loudspeaker. The volume of the modulation tones can be adjusted by the front panel AUDIO LEVEL control.

h. The carrier monitor circuit continuously checks the dc output from the envelope detector (indicative of carrier level). As long as this carrier-derived dc voltage is greater than a predetermined threshold, the carrier level is assumed to be acceptable. Similarly, the modulation monitor continuously checks the ac component at the output of the envelope detector (indicative of modulation presence), and the operation is considered to be normal as long as a keyed ac component is present.

i. In the event of carrier or keyed-modulation loss (or both), the or-gate triggers a delay circuit which can be preset between 0-60 seconds at the time of installation. The purpose of the delay is to prevent false alarm condition during the time gap between two successive code transmissions. If the malfunction (loss of carrier and/or modulation) dears itself within the duration of the preset delay, the delay circuit is automatically reset and the receiver does not produce an alarm condition. However, should the malfunction still be present at the end of the delay period, the following events are initiated to indicate an alarm condition:

(1) Front panel ALARM (red) light comes on and NORMAL (green) light goes off.

(2) A 3 kHz oscillator is activated and its output drives the loudspeaker through the power amplifier. The volume of this loud 3 kHz alarm tone cannot be controlled by the front panel AUDIO LEVEL control.

(3) The 3 kHz alarm tone may be silenced by the front panel ALARM SIL switch. However, the ALARM light will remain on as long as the alarm condition is present.

(4) The normally open and normally closed remote alarm contacts change state, providing alarm indication at the remote monitoring site.

j. When the malfunction is corrected (i.e., both carrier and modulation are present, the receiver automatically reverts to normal operation. Note that alarm delay is by passed when reverting to normal operation.

k. The power supply for the receiver generates +12 V and +28 V used by the receiver circuitry. Both outputs are regulated and overload protected.

Section II. THEORY OF OPERATION

3-3. Switch Bracket Assembly

(fig. 3-2 and fig. FO-3)

a. The switch bracket assembly houses a variable attenuator and a front-end tuning circuit for the receiver. The rf signal from the antenna matching module is coupled through C3 to the attenuator circuit formed by S1-a, S1-b and resistors R1 through R9. The amplitude of the incoming rf signal is proportional to the signal picked-up by the antenna and, under normal operation, remains constant. Depending upon the amplitude of the rf input, appropriate attenuation is introduced to the signal so as to establish a suitable reference signal level for the receiver.

b. The attenuator consists of two 20 dB pads and one 40 dB pad. Rotary switch S1 permits selection of one or more sections, permitting up to 80 dB of attenuation in 20 dB of attenuation in 20 dB steps.

NOTE

When RF ATTEN switch S1 is set to 0 dB position, the attenuator circuit is by passed.

c. Resistors R1, R2 and R3 form the first 20 dB pad while R4, R5 and R6 make up the second 20 dB pad. The 40 dB pad is formed by R7, R8 and R9. The input impedance and output impedance of the switched attenuator is 50 ohms.

d. The output from the switched attenuator is applied to a tuning circuit formed by T1, L2, T2 and C1. Transformer T1 is a step up transformer which raised the output impedance of switched attenuator from 50 ohms to 450 ohms. The secondary of transformer T1 feeds a series tuned circuit comprising L1, T2 and variable capacitor C1. The tuned circuit output is taken from T2 which also serves to restore the 50 ohm impedance. Note that stepping up of impedance by T1 is performed to permit use of a convenient value for tuning capacitor C1 (6.7 pF to 140 pF); if transformer T1 was not used for impedance transformation, the value of C1 would be impractically large.

e. Variable capacitor C1 is adjusted at the time of installation to tune the receiver to its operating frequency. The tuned circuit has a high Q, thus rejecting all unwanted signals that may be present at its input.

3-4. Power Supply

(fig. 3-3 and fig. FO-3)

a. The power supply operates from 115 Vac (or 230 Vac) input and provides +12 VDc and + 28 Vdc output for use by the receiver circuitry. The ac input is applied, through power ON/OFF switch S4 and fuse F1, to the primary of transformer T3. Two primary windings of T3 are connected in series for 230 Vac operation and in parallel when operation from 115 Vac input is required. The secondary of transformer T3 provides 24 V (rms) output which is full-wave rectified by a bridge comprising diodes CR1 thru CR4. Filtering is provided by C2, resulting in approximately 34 Vdc at the collector of Q1. The dc voltage at this point is unregulated and varies with the load current as well as the line voltage fluctuations.

b. The 28 Vdc regulator circuit is formed by Q1, Q2, CR5, C1, R1 and R2. The base of Q1 is held at a constant potential of 30 V by zener diode CR5. The voltage at the emitter of Q1 therefore equals the breakdown voltage of CR5 less the base emitter voltage drop of Q1. This voltage is constant (regulated) regardless of the load current and the Q1 collect voltage.

c. Transistor Q2, together with resistor R2, provide the current limit function for the +28 V output. If a malfunction within the receiver causes the current drain on the +28 V bus to exceed 0.5 amps, the voltage drop across R2 is sufficient to turn Q2 on. AS a result, the base drive current for Q1 is partially diverted to Q2 and the current through Q1 is limited to a safe value.

d. The regulated +28 V output from Q1 is used to operate relay K1, POWER lamp DS1, ALARM lamp DS3, NORM lamp DS2, if amplifier assembly A2, and the audio amplifier assembly A2. In addition, the +28 V output is fed to the +12 V regulator comprising Q3, Q4, CR6 and associated components. The +12 V regulator circuit operates as follows:

(1) The emitter of Q4 is held at a voltage of 6.2 Vdc by zener diode CR6. The base of Q4 senses the +12 V bus through divider R4 and R5.

(2) Any change in the +12 V bus causes a corresponding change in the collector current of Q4 and hence the base drive for Q3. The conduction of Q3 is therefore automatically controlled so as to produce constant + 12 Vdc output at its emitter.

(3) As the input to the +12 V regulator is the output of the 28 V regulator, the over-current protection provided by R2 and Q2 also safeguards the +12 V supply.

3-5. RF PCB Assembly

(fig. FO-1 and FO-3)

a. The RF PCB performs the following functions:

(1) Accepts rf input from the tuning circuit on

the switch bracket assembly and provides a gain of 20 dB.

(2) Up-coverts the rf input to the receiver if (4.4 MHz), using a crystal-controlled local oscillator.

b. The rf input from tuning circuit is applied, through P1-7 and C1, to the grounded base amplifier Q1. This amplifier provides a fixed gain of 20 dB and is followed by a low pass filter comprising C5, L2, and C6. The low pass filter rejects the induced if. and image signals.

c. Transistor Q2 is a common emitter amplifier and its output is taken through the SENSITIVITY control R7 which determines the signal level applied to the balanced mixer formed by Q3, Q4, T1, T2 and associated components. Note that capacitor C7 in the collector circuit of Q2 serves to block the dc and permits diode CR1 to provide a bias pedestal for transistors Q3 and Q4. For rf signal, capacitor C7 may be considered as a short circuit.

d. Transformer T1 is a 1:1 transformer which provides an out-of-phase rf signal at Q4 base, with respect to the signal at Q3 base. The emitters of Q3 and Q4 are fed with the out-of-phase local oscillator signal from transformer T2. At the output of the balanced mixer (the common collector point of Q3 and Q4), the sum as well as difference of the incoming frequencies are present. However, only the sum of the rf signal frequency and the local oscillator frequency is of interest and this frequency is selected by the crystal filter FL1. Note that local oscillator frequency is always 4.4 MHz minus the signal (carrier) frequency. Thus, the signal selected by FL1 is always at 4.4 MHz, the receiver if. All other signals, image as well as harmonic products, that may be present at the input of crystal filter FL1 are rejected.

e. Resistor R12 in the collector of Q4 defines the output impedance of the balanced mixer at 600 ohms. As the input impedance of crystal filter FL1 is also 600 ohms, the balanced mixer and FL1 are properly matched. The output impedance of FL1 (600 ohms) is stepped-down by transformer T3 with the result that the 4.4 MHz if output from RF PCB is at 50 ohms impedance.

f. The local oscillator circuit consists of a crystal-controlled oscillator (Q5, Y1 and associated components) and a driver stage Q6. The operating frequency of the local oscillator, determined by Y1, can be fine tuned by trimmer capacitor C13. The range of thisnfine tuning is limited to ±200 Hz of the nominal crystal frequency. Under normal operation, C13 requires slight readjustment only if crystal Y1 is replaced.

3-6. If. Amplifier Assembly
(fig. FO-2 and FO-3)

a. The if. amplifier assembly performs the following functions:

(1) Amplifies the 4.4 MHz if. input from the RF PCB assembly.

(2) Detects the amplified if. signal to extract the modulation and carrier level information.

(3) Provides a 600 ohm balanced output of the detected modulation (audio output).

(4) Continuously checks the carrier and modulation levels and triggers the alarm circuits if the carrier and/or modulation fall below a predetermined threshold.

(5) Generates and resets alarm conditions according to a predetermined logical sequence of events.

b. The 4.4 MHz if. signal from the RF PCB is applied, through P1-17 and C1, to a fixed gain if amplifier formed by Q1 through Q4 and associated components. Basically, the if. amplifier comprises four cascaded, low-noise, ground-base amplifiers, providing on overall gain of 80 dB. The gain of the first stage Q1 is determined by the Q of the tuned circuit, L1, C4 and C2. This tuned circuit has a Q of 10, therefore Q1 provides a gain of 20 dB. The subsequent stages of the if. amplifier, Q2 through Q4, operate in an identical manner, each providing a 20 dB gain.

c. The 4.4 MHz if. signal at the collector of Q4 is detected by CR2 and filtered by R10 and C16. As a result, the signal at the base of Q8 is a dc signal proportional to the if. signal (hence the carrier level). Superimposed on this dc signal is the keying signal (modulation audio).

d. The purpose of diode CR1 is to provide a dc pedestal of approximately 0.7 Vdc at the anode of CR2 and thus eliminates the threshold limit of CR2. As a result the detector circuit (CR2, R10, C16) can operate satisfactorily at very low input levels.

e. Transistor Q8 is an emitter follower. Therefore, the signal at Q8 emitter is identical to the signal at its base and contains both the carrier derived dc and the modulation audio. This signal is fed to the monitoring circuits and the line amplifier.

f. Transistors Q14 through Q17, transformer T1 and associated components form the line amplifier which provides a balanced 600 ohm output of the modulation audio from Q8. Input to the line amplifier is provided through potentiometer R14; capacitor C25 blocks the carrier derived dc.

g. The line amplifier has a gain of 25 dB; it is a class B, complementary push-pull amplifier accoupled

through C27 to the line transformer T1. The secondary of T1 provides a balanced and isolated output of the modulation audio for use by a remote monitoring facility. Connections from T1 secondary are made through pins 2-4 of P1 and terminals 1-2 of TB1 at rear of the unit. The maximum output from the line amplifier is 250 mW into 600 ohms.

h. Transistors Q9 and Q10 form an emitter coupled comparator serving as the carrier monitor. When the carrier derived dc voltage at Q9 base is greater than the threshold voltage at the wiper of R22, Q9 goes into saturation. In other words, during normal operation, Q9 is on and Q10 is off. In the event the carrier derived de voltage at Q9 base falls below the reference voltage at Q10 base, the comparator circuit changes state; Q9 turns off and Q10 switches on. This action switches on Q11 because its emitter voltage is now higher than its base voltage. At the instant Q11 switches on, the input of nand gate U2-A makes a low-to-high transition and its output at TP5 assumes a low (0, +0.5 Vdc) state. As long as TP5 is low, the output from U2-D is high (+12 V ±0.5 V) which results in a low output from U2-C; hence pin 6 of U3 goes low.

i. Integrated circuit U3 is a programmable timer, containing an oscillator and a 16-stage binary counter. The oscillator frequency is determined by C22, R31 and potentiometer R32. The counter is configured to provide a division of 65, 536 which, depending upon R32 setting corresponds to a delay between 0.1 second and 60 seconds (approximately). The counter output is taken from U3-8 which is normally high but goes low at the expiry of the count. Note that the oscillator and the counter are enabled only if the master reset at U3-6 is low; should U3-6 go high prior to expiry of the count, the counter is reset and U3-8 retains its normal high state.

j. To facilitate explanation of the carrier alarm detection, disregard the output of the modulation monitor circuit at TP8. Also, assume that the received carrier is below the threshold setting by R22. This means that U3-6 is low and both the oscillator and counter in U3 are enabled. At the end of the count, U3-8 goes low, causing Q12 to turn off. The alarm relay K1 (fig. FO-3), which is connected between the collector of Q12 and the 28 V bus, is therefore deenergized.

NOTE

The deenergized state of K1 represents an alarm condition.

k. When relay K1 deenergizes (fig. FO-3) contacts 4-8 close and 4-7 open. Thus, the alarm light DS3 is switched on and normal light DS2 is turned off. Relay K1 contacts (1, 2, and 5) are also brought to TB1 (3, 4, and 5) to provide remote alarm monitoring provisions.

l. The instant relay K1 deenergizes, P1-13 of the if. PCB (fig. FO-3) goes low from a normally high (+28 V) state. The high-to-low transition at P1-13 is taken through C23 to set the flip-flop formed by U1-A and U1-B. Under this condition, the output from U1-B is high and Q13 is turned on (TP6 low). This low is fed to the audio amplifier PCB (through P1-12) which generates the 3 kHz alarm tone and drives the loudspeaker.

m. The resetting of the aural alarm can be accomplished in one of two ways:

(1) If the operator presses the front panel ALARM SIL switch S3, pin 15 of the if. PCB (fig. FO-3) is momentarily grounded. This causes the flip-flop U1-A/U1-B to be reset with the result that U1-B output goes low and Q13 is turned off. With Q13 off, the alarm oscillator in the audio amplifier assembly is disabled and the aural alarm is terminated (silenced). Note that silencing of the aural alarm by ALARM SIL switch is completely independant of the actual alarm condition in that the ALARM light stays on, NORMAL light off, and relay K1 remains deenergized.

(2) The only other means of silencing the aural alarm is by removing the alarm condition itself i.e., resumption of normal operation. When this occurs, relay K1 is energized and P1-14 (fig. FO-2) goes low. This high-to-low transition is coupled through C24 to reset the flip-flop U1-A/U1-B. Transistor Q13 now switches off by the low from U1-B and the alarm oscillator is disabled. As normal operation is now restored, NORMAL light comes on, ALARM light goes off and relay K1 is energized.

n. The signal at Q8 emitter comprises the modulation audio and a dc voltage proportional to the carrier level. In the modulation monitor circuit, formed by Q5 through Q7 and associated components, only the modulation audio is of interest and the dc signal is blocked off by C15.

o. When modulation is not present, Q5 is forward biased through R11, R12 and R13; therefore, transistors Q6 and Q7 are off. At this time the input to U1-C is low resulting in a high at the output of U1-C. When modulation is present, the negative going peaks of the modulating tone cause the voltage at the base of Q5 to go lower than the voltage at the base of Q6, thus turning on Q6 and Q7. Q7 in turn charges C20. Under this condition, a high is applied to U1-C, causing it to produce an output. From the aforementioned, it can be seen that U1-C makes a high-to-low transition each time the modulation is applied and a low-to-high transition when the modulation is removed. The out-put from U1-C, is differentiated by C21/R25 and a positive-going

pulse is applied to U2-D each time the modulation is removed (end of keying).

p. As long as the carrier level is normal, TP5 is high. Thus, each time the modulation monitor circuit produces a positive pulse, the output of U2-D goes low, and master reset input of U3 goes high. Therefore, as long as the on/off sequence of the modulation takes place within the delay set by R32, pin 8 of U3 remains high and alarm condition is not produced. However, if a malfunction results in continuous modulation or total loss of modulation, pin 12 of U2-D assumes a steady low state. As a result the output from U2-D becomes high, and U3-6 goes low through U2-C. This means that oscillator and counter in U3 are enabled and an alarm condition is produced at the end of the preset delay.

3-7. Audio Amplifier Assembly

(fig. 3-4 and FO-3)

a. The audio amplifier performs the following functions.

(1) Generates a 3 kHz alarm tone upon detection of an alarm condition by the if. amplifier assembly.

(2) Drives the loudspeaker with modulation audio or the alarm tone.

b. The modulation signal to the audio amplifier is received at terminal 8 of TB2 (fig. 3-4). This input signal is taken from the primary of transformer T1 in the if. PCB assembly (fig. FO-2), routed through P1-1 and the front panel AUDIO LEVEL control R1. The audio amplifier operates from the +28 V bus and comprises Q1 through Q4 and associated components. Transistors Q1 and Q2 operate in class A, while Q3 and Q4 form a class B, push-pull complimentary output stage. The output (0.5 W minimum) is taken through C3 and fed to the loudspeaker.

c. The alarm oscillator consists of U1-A, U1-B, C4 and resistors R7 through R9. When an alarm condition is detected, terminal 7 of TB1 is grounded by the low from if. amplifier assembly, permitting the oscillator to operate at approximately 3 kHz. Gates U1-C and U1-D buffer the oscillator output which is fed to the audio amplifier section through R12, R13 and switch S1.

d. Potentiometer R13 provides means of setting the alarm tone output from the audio amplifier. It is normally set at the time of installation to the desired volume. Switch S1, when closed, allows the alarm tone to reach the audio amplifier. Switch S1 may be left in the off position in unmanned installations or during testing and troubleshooting.

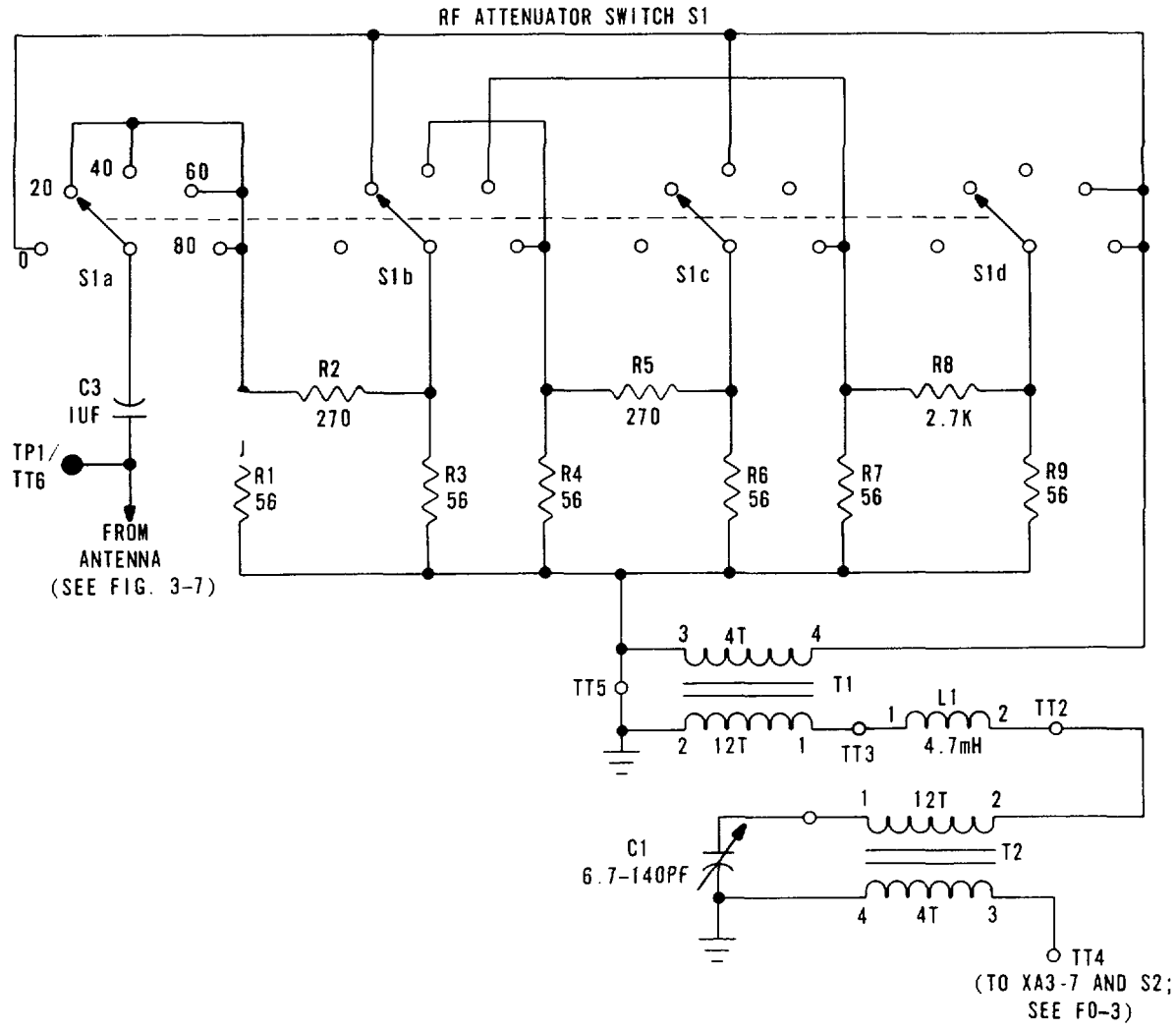

Figure 3-2. Schematic Diagram, Switch Bracket Assembly.

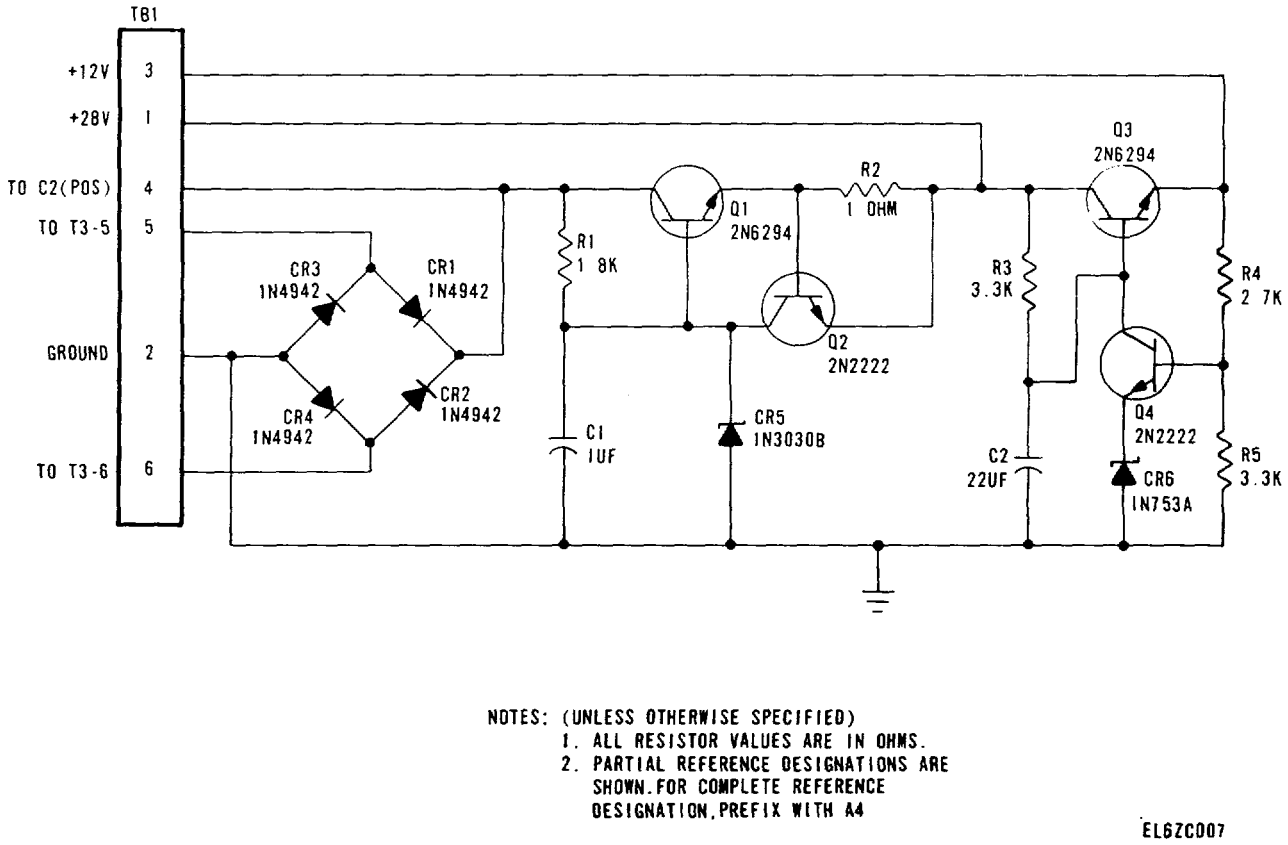

Figure 3-3. Schematic Diagram Power Supply Assembly A4.

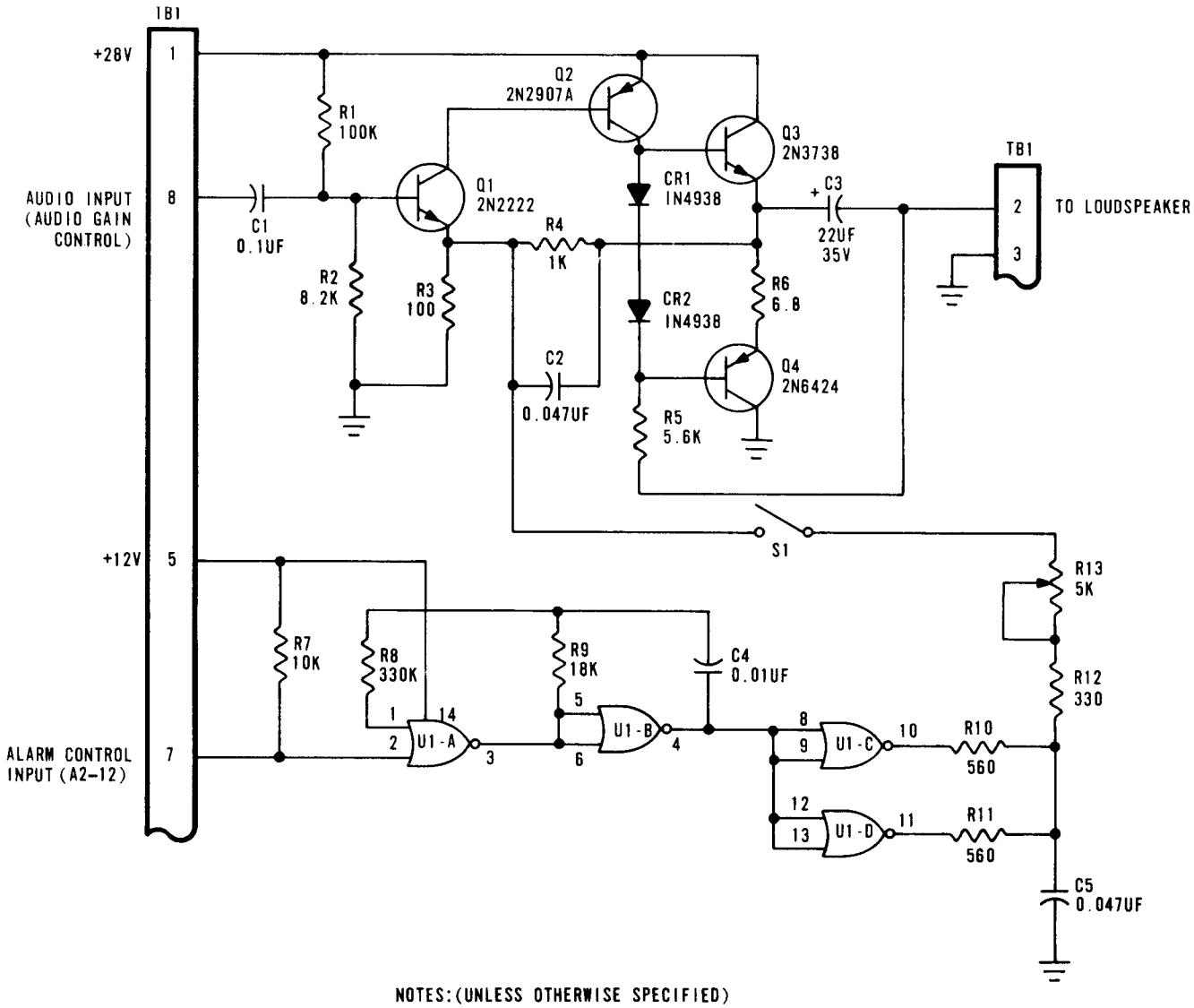

Figure 3-4. Schematic Diagram, Audio Amplifier Assembly A1.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Introduction

a. Organizational maintenance of the monitor receiver shall consist of removal and replacement of units, assembles, subassemblies, and certain chassis-mounted parts. Procedures are included in this chapter to make sure that the repair has been successfully completed.

NOTE
All organizational maintenance tasks shall be carried out at the monitor receiver site.

b. Organizational maintenance personnel are required to make the inspections and tests of the monitor receive on a semiannual basis. These inspections and tests are the same as the maintenance turn on procedure (table 4-2).

c. Repainting and/or refinishing of the monitor receiver is not authorized at the organizational maintenance level.

d. The monitor receiver does not require any lubrication, scheduled or periodic.

e. The PMCS for the monitor receiver are provided in the Operator's Manual (TM 11-5825-270-10); additional PMCS are not applicable.

4-2. Voltage Measurements

Overall voltage checks are not applicable to maintenance of the monitor receiver. Pertinent readings are given in the applicable procedures.

4-3. Resistance Measurements

Overall resistance maintenance checks are not applicable to maintenance of the monitor receiver.

4-4. Waveform Measurements

Pertinent waveforms are given in the figures and are referenced by the applicable procedures.

Section II. TOOLS AND TEST EQUIPMENT

4-5. General

Special tools, test equipment and other support equipment and accessories issued with or prescribed for use by organizational and direct support maintenance personnel are listed in table 4-1.

Table 4-1. Special Tools and Test Equipment

Item	Common Name
Electronic Counter Mainframe TD-1209/U	Frequency counter
Electronic Counter Module TD-1211/U	Plug-in unit
Multimeter AN/USM-223	Multimeter
Oscilloscope, OS-261	Oscilloscope
Test Set SG-1128/U	Signal generator
Tool Kit, Electronic Equipment TK-105/G	Toolkit

Section III. TROUBLESHOOTING

4-6. Introduction

a. This section contains the troubleshooting procedures which can be performed at the organizational level of maintenance. Troubleshooting procedures are designed to locate and correct malfunctions. Each listed malfunction is followed by a list of tests or inspections which will help to determine probable cause and corrective actions. Note that some of the corrective actions require direct support maintenance personnel (refer to para 5-4).

b. Troubleshooting tables are used for fault isolation. Follow through the troubleshooting tables in the order given in each table. Do not skip steps unless the procedures tell you to. Once a fault has been cleared, return the monitor receiver to its normal

operational condition.

4-7. Maintenance Turn On Procedure

a. A maintenance turn on procedure is provided (table 4-2) to assist in a systematic approach to isolating malfunctions. These procedures reference the applicable malfunction in troubleshooting table 4-3. Each step of the maintenance turn on procedure assumes that all previous tests were performed satisfactorily.

b. Troubleshooting procedures should be preceded by a thorough visual inspection and a check for burnt or discolored resistors, broken or disconnected wiring or other abnormalities that may indicate the circuit at fault.

c. The procedures in table 4-2 assume that input power to the monitor receiver is correct and that operator level troubleshooting has been performed (i.e., fuses and lamps have been checked and were either good or continuously blowing).

WARNING

Always turn the power off and remove the ac power cord from J2 at the back of the receiver before performing any of the replacement procedures.

NOTE

After a fault has been located and cleared, carry out all tests that are referenced in the replacement procedures.

Table 4-2. Maintenance Turn On-Procedure

Step	Procedure	Observation	Corrective Action
1	Examine all connections at rear of receiver.	All connections will be secure.	Tighten as required.
2	Verify that the NDB transmitter is operating satisfactorily.	None.	None.
3	Set POWER switch to ON, then momentarily press the ALARM SIL switch.	*a*. Indicating fuse will be off. *b*. POWER indicator will be on. *c*. NORM indicator will be on and ALARM indicator will be off. *d*. Remote alarm will be off. *e*. CARRIER LEVEL meter will read 01± dB.	*a*. Refer to table 4-3, malfunction 1. *b*. Refer to table 4-3, malfunction 2. *c*. If both indicators are off refer to table 4-3, malfunction 4. If NORM indicator is off and ALARM indicator is on, refer to table 4-3, malfunction 5. *d*. Refer to table 4-3, malfunction 6. *e*. Refer to table 4-3, malfunction 7.
4	Set AUDIO LEVEL control to approximately midposition.	Keying will be heard in the loud-speaker.	Refer to table 4-3, malfunction 8.
5	Turn front panel latch and swing the front panel door open.	None.	None.
6	During the keying sequence press the ALARM TEST switch and hold it pressed.	After the delay set by TIME DE-LAY control A2R32 (fig. 2-1) the NORM indicator will be on, the aural alarm will sound, and the remote alarm will be on.	*a.* If the delay is wrong refer to table 4-3, malfunction 9. *b.* If the receiver does not alarm refer to table 4-3, malfunction 10 *c.* If there is no aural alarm refer to table 4-3, malfunction 11. *d.* If the NORM and ALARM indicators are both off refer to table 4-3, malfunction 4.
7	Press the ALARM SIL switch.	The aural alarm will be off.	Refer to table 4-3, malfunction 12.
8	Release the ALARM TEST switch.	*a*. Norm indicator will be .on and ALARM indicator will be off. *b*. Remote alarm will be off. *c*. CARRIER LEVEL meter will read 0 ±dB.	*a.* If both indicators are off refer to table 4-3, malfunction 4. if NORM indicator is OFF and ALARM indicator is on refer to table 4-3 malfunction 13. *b.* Refer to table 4-3, malfunction 6. *c.* Refer to table 4-3, malfunction 7.

Table 4-2 Maintenance Turn-On Procedure-Continued

Step	Procedure	Observation	Corrective Action
9	During the keying sequence turn SENSITIVITY control A3R7 (fig. 2-1) counterclockwise to reduce the CARRIER LEVEL meter reading to the setting of CARRIER control A2R22 (fig. 2-1) plus 1 dB.	After the delay set by TIME DELAY control A2R32 the NORM indicator will be off, the ALARM indicator will be on, the aural alarm will sound, and the remote alarm will be on.	*a.* If the delay is wrong refer to table 4-3, malfunction 9. *b.* If the receiver does not alarm refer to table 4-3, malfunction 10. *c.* If there is no aural alarm refer to table 4-3, malfunction 11. *d.* If there is no remote alarm refer to table 4-3, malfunction 6. *e.* If the NORM and ALARM indicators are both off refer to table 4-3, malfunction 4.
10	During the keying sequence turn SENSITIVITY control A3R7 clockwise until the receiver reverts back to normal operation.	*a.* CARRIER LEVEL meter will read 0 dB ±1 dB. *b.* NORM indicator will be on and ALARM indicator will be off. *c.* Aural alarm will be off. *d.* Remote alarm will be off	*a.* Refer to table 4-3, malfunction 13. *b.* If both indicators are off refer to table 4-3, malfunction 4. If NORM indicator is off and ALARM indicator is on refer to table 4-3, malfunction 13. *c.* Refer to table 4-3, malfunction 11. *d.* Refer to table 4-3, malfunction 6.
11	Adjust SENSITIVITY control A3R7 for a CARRIER LEVEL meter reading of 0 dB.	None.	None.

Table 4-3. Monitor Receiver Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. INDICATING FUSE LIGHTED
   - Step 1. Replace the fuse.
     - *a.* If the indicating fuse is off go to table 4-2 and complete the maintenance turn on procedure.
     - *b.* If indicating fuse is on go to step 2.
   - Step 2. Disconnect the ac input at J2. Visually inspect the wiring at TB1 of the power supply, at transformer T3 and at fuse F1. Replace the fuse and go to step 3.
   - Step 3. Disconnect the leads at TB1 of the power supply. Use the multimeter to check for de isolation from ground for the leads from TB1-1, TB-3, TB-4, TB1-5, and TB-6.
     - *a.* If there is dc isolation go to step 4.
     - *b.* If there is no dc isolation for the leads from TB1-1 and TB1-3 check the wiring associated with TB 1-1 and TB 1-3 (fig. FO-3). Disconnect the if. amplifier PCB, rf PCB and audio amplifier PCB from their connectors to isolate the short to either the wiring harness or a PCB (fig. FO-3).
     - *c.* If there is no dc isolation for the lead from TB-4 replace capacitor C2.
     - *d.* If there is no dc isolation for the leads from TB1-5 and TB1-6 replace transformer T3. This procedure requires direct support maintenance personnel (refer to chapter 5).
   - Step 4. Check for a short between TB1-2 and TB1-5 and between TB1-2 and TB1-6 of the power supply.
     - a. If there is no short go to step 5.
     - *b.* If there is a short replace power supply assembly A4 para 4-17).
   - Step 5. Check for dc isolation from ground for terminals 1, 2, 3, and 4 of transformer T3.
     - *a.* If there is dc isolation go to step 6.
     - *b.* If there is no dc isolation replace transformer T3. This procedure requires direct support maintenance personnel (refer to chapter 5).
   - Step 6. Check the resistance of the primary windings of transformer T3; between terminals 1 and 2 and between terminals 3 and 4. The resistance will be about 25 ohms.
     - *a.* If resistance is correct go to step 7.
     - *b.* If resistance is zero replace transformer T3. This procedure requires direct support maintenance personnel (refer to chapter 5).
   - Step 7. Check for dc isolation between primary and secondary windings of transformer T3 (between terminals 1 and 5).
     - *a.* If there is isolation go to step 8.
     - *b.* If there is no dc isolation replace transformer T3. This procedure requires direct support maintenance personnel (refer to chapter 5).

Table 4-3. Monitor Receiver Troubleshooting-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. POWER INDICATOR OFF
   Step 1. Observe the NORM and ALARM indicators.
      a. If the NORM or ALARM indicators are on go to step 2.
      b. If the NORM and ALARM indicators are not on go to malfunction 3.
   Step 2. Check the POWER lamp.
      If the POWER lamp is correct remove the ac power from J2 and check the wiring between TB1-1 of the power supply and DS1 (fig. FO-3).
3. SUPPLY VOLTAGES INCORRECT
   Step 1. Check the voltage at TB1-1 and TB1-3 of the power supply. The voltage at TB1-1 will be +28 Vdc and the voltage at TB1-3 will be +12 Vdc.
      a. If the voltages a correct go to table 4-2 and perform the maintenance turn on procedure.
      b. If voltages are not correct go to step 2.
   Step 2. Check the voltage between TB1-5 and TB1-6 of the power supply. The voltage will be 34 Vac.
      a. If the voltage is correct go to step 4.
      b. If the voltage is not correct go to step 3.
   Step 3. Check the voltage between terminals 1 and 4 of transformer T3. The voltage will be 115 Vac (or 220 Vac).
      a. If the voltage is correct replace transformer T3. This procedure requires direct support maintenance personnel (refer to chapter 5).
      b. If the voltage is not correct remove the ac power from J2 and check the wiring between J2 and transformer T3 (fig. FO-3).
   Step 4. Remove the ac power at J2. Disconnect the leads at TB1-1 and TB1-3 of the power supply. Connect the ac power at J2. Check the voltages at TB1-1 and TB1-3 of the power supply. The voltage at TB1-1 will be +28 Vdc and the voltage at TB1-3 will be +12 Vdc.
      a. If the voltages are correct go to step 5.
      b. If the voltages are not correct replace power supply A4 (para 4-17).
   Step 5. Remove the power at J2 and connect the leads to TB1-5 and TB1-6 of the power supply. Connect the ac power to J2.
   Step 6. Remove the if. amplifier PCB, audio amplifier PCB, and rf PCB in turn, each time checking the voltages at TB1-1 and TB1-3 of the power supply. The voltage at TB 1-1 will be +28 Vdc and the voltage at TB 1-3 will be +12 Vdc.
      a. If the voltages are correct after one of the PCB's have been removed, the PCB just removed is at fault and must be replaced.
      b. If the voltages are not correct after the three PCB's have been removed, remove the ac power from J2 and check the wiring connecting to TB1-1 and TB1-3 of the power supply (fig. FO-3).
4. NORM AND ALARM INDICATORS OFF
   Step 1. Check the NORM and ALARM lamps.
      a. If lamps are correct go to step 2.
      b. If lamps are not correct replace the defective lamp and go to table 4-2 and perform the maintenance turn on procedure.
   Step 2. Set the POWER switch to OFF and check the dc continuity of contacts 4, 8 and 7 of relay K1 (fig. FO-3).
      a. If good continuity is present go to step 3.
      b. If good continuity is not present replace relay K1. This procedure requires direct support maintenance personnel (refer to chapter 5).
   Step 3. Check the wiring to K1-3 and K1-6 (fig. FO-3). If the wiring is correct go to malfunction 3.

CAUTION

When connecting signal generator to J1 of monitor receiver, connect a 1uF 25 V capacitor in series with the signal generator output. Make sure that positive side of the capacitor is connected to J1.

5. ANTENNA CHECK
   Step 1. Disconnect the antenna from J 1 of the monitor receiver and connect the signal generator to J1.
   Step 2. Set the signal generator frequency to the frequency of the monitor receiver. Set the signal generator output to 100 mV.
   Step 3. Carefully adjust the frequency of the signal generator to get a reading of at least 0 dB on the CARRIER LEVEL meter.
      a. If the reading is correct replace the antenna (para 4-10).
      b. If the reading is not correct go to step 4.
   Step 4. Disconnect the signal generator from J1 and connect the antenna to J1. Go to malfunction 13.
6. WRONG REMOTE ALARM INDICATION
   Step 1. Remove the external connections at TB1-3, TB1-4 and TB1-5 at the back of the monitor receiver.
   Step 2. Check for dc continuity between TB1-3 and TB1-4 and between TB-4 and TB-5. When the NORM indicator is on the resistance between TB1-4 and TB1-5 will be 0 ohm. When the POWER switch is set to OFF the resistance between TB1-4 and TB1-3 will be 0 ohm (fig. FO-3).
      a. If the resistance readings are correct go to table 4-2 and perform the maintenance turn on procedure.
      b. If the resistance readings are not correct replace relay K1. This task requires direct support maintenance personnel (refer to chapter 5).

Table 4-3. Monitor Receiver Troubleshooting-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

7. INCORRECT CARRIER LEVEL READINGS
   - Step 1. If the reading is below the threshold level and there is no alarm go to step 2. If the meter reading is low but above the threshold level go to step 3. If the reading is high go to step 3.
   - Step 2. Check the wiring to the meter (fig. FO-3). Check the resistance of the meter. Meter resistance should be approximately 50 ohms and the meter will deflect when the ohmmeter is placed across the meter (use the Rx100 or Rx10000 position on the ohmmeter to prevent damage to the CARRIER LEVEL meter).
     a. If the meter requires replacement it requires direct support maintenance personnel (refer to chapter 5).
     b. If no fault is found reperform the maintenance turn on procedure of table 4-2.
   - Step 3. Perform the test procedure in paragraph 4-22.

8. NO AUDIO
   - Step 1. Check that the AUDIO LEVEL control set to midposition.
   - Step 2. Monitor A2TP7 (fig. 2- 1) with the oscilloscope. Audio will be present.
     a. If correct go to step 4.
     b. If not correct go to step 3.
   - Step 3. Turn the POWER switch to OFF. Check for a short to ground at XA2-1.
     a. If there is no short to ground replace if. amplifier assembly A2 (para 4-16).
     b. If there is a short to ground check AUDIO LEVEL control R10 (fig. 2-1).
   - Step 4. Monitor terminal 1 of AUDIO LEVEL control R10 with the oscilloscope. Audio will be present.
     a. If correct go to step 5.
     b. If not correct check the wiring between XA2-1 and R10-1 fig. FO-3).
   - Step 5. Monitor terminal 2 of AUDIO LEVEL control R10 and rotate the AUDIO LEVEL control from MIN to MAX. The audio will vary from zero to a maximum.
     a. If correct go to step 6.
     b. If not correct replace AUDIO LEVEL control R10. This procedure requires direct support maintenance personnel (refer to chapter 5).
   - Step 6. Monitor TB-8 of audio amplifier assembly A1. Audio will be present.
     a. If correct go to step 7.
     b. If not correct check the wiring between terminal 2 of AUDIO LEVEL control R10 and TB1-8 of audio amplifier assembly A1 (fig. FO-3).
   - Step 7. Measure the dc voltage across the terminals of loudspeaker LS1.
     a. If a dc voltage is present replace loudspeaker LS1. Replacing the loudspeaker requires direct support maintenance personnel (refer to chapter 5).
     b. If the voltage is 0 Vac replace audio amplifier assembly A1 (para 4-15).

9. WRONG TIME DELAY
   - Step 1. Check the setting of TIME DELAY control A2R32 (fig. 2-1).
     a. If correct replace if. amplifier assembly A2 (para 4-16).
     b. If not correct go to step 2.
   - Step 2. Set TIME DELAY control A2R32 to the delay desired. Go to table 4-2 and perform the maintenance turn on procedure.

10. SYSTEM DOES NOT ALARM (VISUAL AND AURAL)
   - Step 1. Press the ALARM TEST switch. The CARRIER LEVEL meter reading will go to less than -10 dB.
     a. If correct go to step 2.
     b. If not correct go to step 3.
   - Step 2. Check the voltage at A2TP3 (fig. 2-1). The voltage will be +24 Vdc.
     a. If correct replace relay K1. This procedure requires direct support maintenance personnel (refer to chapter 5).
     b. If not correct replace if. amplifier assembly A2 (para 4-16).
   - Step 3. Set POWER switch to OFF. Measure the resistance to ground from A3TP1 (fig. 2-1) when the ALARM TEST switch is pressed. The resistance will be 0 ohm.
     a. If correct replace if. amplifier assembly A2 (para 4-16).
     b. If not correct check ALARM TEST switch S3 and the associated wiring (fig. FO-3).

11. NO AURAL ALARM
   - Step 1. Check that ALARM switch A1S1 fig. 2-1) is in the ON position.
     a. If correct go to step 2.
     b. If not correct set to the correct position and perform the maintenance turn on procedure in table 4-2.
   - Step 2. Measure the dc voltage across the terminals of loudspeaker LS1.
     a. If a dc voltage is present replace loudspeaker LS1. This procedure requires direct support maintenance personnel (refer to chapter 5).
     b. If not correct go to step 3.
   - Step 3. Check for 0 Vdc at A2TP6 (fig. 2-1).
     a. If correct replace audio amplifier assembly A1 (para 4-15) after checking the wiring between A2-12 and A1-7 (fig. FO-3).
     b. If not correct replace if. amplifier assembly A2 (para 4-16).

Table 4- Monitor Receiver Troubleshooting-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12. AURAL ALARM DOES NOT SILENCE
    Step 1. Set the POWER switch to OFF. Check the resistance to ground from XA2-15 (fig. FO-3) with ALARM SIL switch S2 pressed. The reading will be 0 ohm.
        a. If correct go to table 4-2 and recheck fault indications.
        b. If not correct cheek ALARM SIL switch S2 and the associated wiring (fig. FO-3.
13. ALARM INDICATION
    Step 1. Check the CARRIER LEVEL meter reading. The reading will be 0 dB.
        a. If correct go to step 3.
        b. If not correct go to step 2.
    Step 2. Set the POWER switch to OFF. Measure the resistance to ground from A3TP1 (fig. 2-1). The resistance will be an open circuit.
        a. If correct, set the POWER switch to ON and go to step 5.
        b. If not correct check the wiring associated with ALARM TEST switch S3 (fig. FO-3).
    Step 3. Check the voltage at A2TP3 (fig. 2-1). The voltage will be 0 Vdc.
        a. If correct go to step 4.
        b. If not correct replace if amplifier assembly A2 (para 4-16).
    Step 4. Check the voltage at A4TB1-1. The voltage will be +28 Vdc.
        a. If correct replace relay K1 after checking the wiring from A4TB1-1 to K1-6 (fig. FO-3). Replacing K1 requires direct support maintenance personnel (refer to chapter 5).
        b. If not correct go to malfunction 3.
    Step 5. Check the voltage at A4TB1-3. The voltage will be +12 Vdc.
        a. If correct go to step 6.
        b. If not correct go to malfunction 3.
    Step 6. Check the waveform at A2TP4 (fig. 2-1) using the oscilloscope. The waveform will be 4 V p-p (fig. 4-1).
        a. If correct check the wiring between A2-10 and meter M1 (fig. FO-3).
        b. If not correct go to step 7.
    Step 7. Check the waveform at A3TP2 (fig. 2-1) using the oscilloscope. The waveform will be 5 V p-p (fig. 4-1).
        a. If correct go to step 8.
        b. If not correct replace rf amplifier assembly A3 (para 4-16).

CAUTION

When connecting signal generator to J1 of the monitor receiver, connect a 1uF 25 V capacitor in series with the signal generator output. Make sure that positive side of the capacitor is connected to J1.

    Step 8. Disconnect the antenna from J1. Connect the signal generator to J1. Set the signal generator to the receiver frequency, with 1 kHz modulation and a 100 mV output. Go to step 9.
    Step 9. Set the RF ATTEN switch to 0 and rotate SENSITIVITY control A3R7 (fig. 2-1) fully clockwise. Go to step 10.
    Step 10. Check the waveform at TP1 of the switch bracket (fig. 2-1) using the oscilloscope. The waveform will be 0.4 V p-p (fig. 4-1).
        a. If correct go to step 11.
        b. If not correct check all wiring between TP1 and J1; replace the switch bracket if necessary. This procedure requires direct support maintenance personnel (refer to chapter 5).
    Step 11. Check the waveform at A3TP1 (fig. 2-1) using the oscilloscope. The waveform will be 0.3 V p-p (fig. 4-1).
        a. If correct go to step 12.
        b. If not correct rotate RF TUNE control to obtain the correct waveform.
            (1) If the waveform at A3TP1 is correct perform the procedures of paragraph 2-4.
            (2) If not correct replace the switch bracket. This procedure requires direct support maintenance personnel (refer to chapter 5).
    Step 12. Set the RF ATTEN control to 40. Go to step 13.
    Step 13. Check the waveforms at A3TP3 and A2TP1 (fig. 2-1) using the oscilloscope. Refer to figure 4-1 for waveforms.
        a. If both waveforms are correct replace if. amplifier assembly A2 (para 4-16).
        b. If the waveform at A3TP3 is correct and the waveform at A2TP1 is not correct check the wiring between A2-17 and A3-1 (fig. FO-1)
        c. If both waveforms are not correct replace if. amplifier assembly A2 (para 4-16).

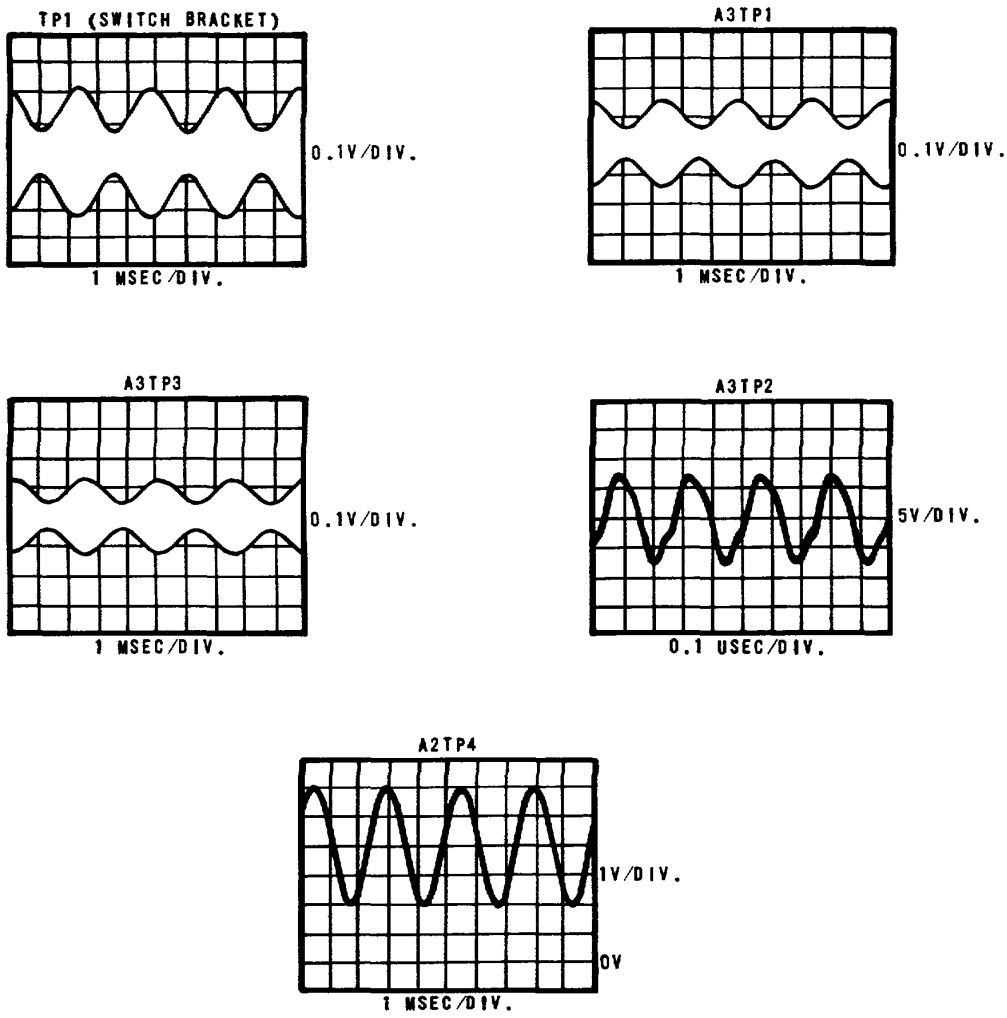

Figure 4-1. Waveforms.

Section IV. MAINTENANCE OF ANTENNA

4-8. General

a. This section provides instructions for performing the maintenance functions allocated to organizational maintenance for the antenna. At the organizational maintenance level the antenna is replaced in its entirety.

b. Following replacement of the antenna the maintenance turn on procedure of table 4-2 must be performed.

4-9. Tools and Test Equipment Required

There are no special tools or test equipment required to perform the replacement procedures.

4-10. Removal and Replacement of Antenna

a. Removal

(1) Remove the antenna cable from J1 at the rear of the monitor receiver.

(2) Remove the mounting hardware securing the antenna.

b. Replacement.

(1) Replace the antenna by reversing the procedures in *a* above.

(2) Perform the maintenance turn on procedure of table 4-2.

Section V. MAINTENANCE OF MONITOR RECEIVER

4-11. General

a. This section provides instructions for performing the maintenance functions allocated to organizational maintenance for the monitor receiver.

b. A supporting illustration is provided to aid in the performance of the procedures. The numbers in parentheses referenced in the text (e.g., (1), (2), etc.)) correspond to the item callouts in the illustration.

c. Following a replacement procedure, the appropriate test procedures of section VI must be performed to make sure that repair has been successfully accomplished. The applicable test procedures are referenced at the end of each replacement procedure. The order of the replacement procedures is:

(1) Monitor receiver.
(2) Audio amplifier PCB A1.
(3) If. amplifier PCB A2 and rf PCB A3.
(4) Power supply assembly A4.

4-12. Tools and Test Equipment Required

Refer to table 4-1 for special tools and equipment. There are no special tools required to perform the replacement procedures.

4-13. Precautions

Prior to performing any replacement procedure make sure that the POWER switch is in the OFF position and that the ac power cord is removed from J2.

4-14. Removal and Replacement of Monitor Receiver

(fig. 2-1)

a. Removal.

(1) Make sure the POWER switch is in the OFF position, then remove the ac power cord from J2.

(2) Disconnect the antenna from J1.

(3) Tag and disconnect all wires at TB1.

b. Replacement.

(1) Replace the monitor receiver by reversing the procedure in *a* above.

(2) Perform the procedure of paragraph 2-4.

4-15. Removal and Replacement of Audio Amplifier PCB

(fig. 4-2)

a. Removal

(1) Loosen, but do not remove, eight screws securing the fanning strip to A1TB1 (9).

(2) Remove four screws (2) securing the audio amplifier PCB (8).

b. Replacement.

(1) Replace the audio amplifier PCB by reversing the procedures in *a* above.

(2) Perform the test procedure of paragraph 4-25.

4-16. Removal and Replacement of RF and If. Amplifier PCB's

(fig. 4-2)

a. Removal

(1) Remove screws (2) holding the PCB (15 or 10) to the mounting posts (16). Note that RF PCB is secured by three screws (2) and If. PCB is secured by two screws (2).

(2) Pull the PCB straight out until the PCB connector (11) clears the frame connector (12).

b. Replacement.

(1) Replace the PCB by reversing the procedures in *a* above.

(2) If the rf amplifier was replaced perform the test procedures of paragraph 4-23. If the if. amplifier was replaced perform the test procedure of paragraph 4-24.

4-17. Removal and Replacement of Power Supply Assembly

(fig. 4-2)

a. Removal

(1) Tag all wires attached to A4TB1 (4).

(2) Loosen, do not remove, six screws securing the connections to A4TB1 (4).

(3) Remove four screws (2) securing the power supply assembly (3).

b. Replacement

(1) Replace the power supply assembly by reversing the procedures in *a* above.

(2) Perform the maintenance turn on procedure of table 4-2.

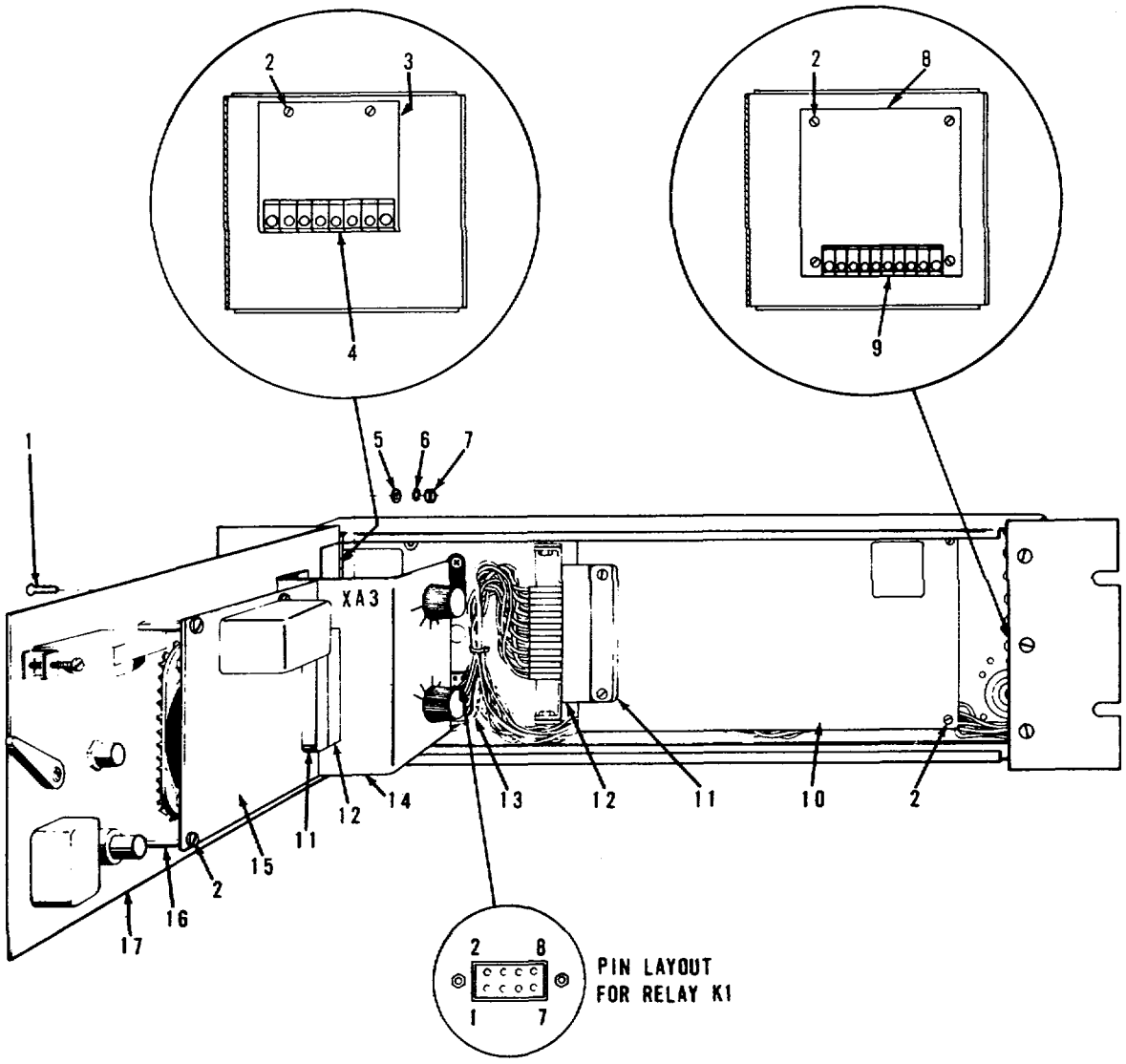

Figure 4-2. Assemblies Removal and Replacement.

Section VI. TESTING PROCEDURES

4-18. General

This section contains test procedures that determine whether the performance of the equipment is satisfactory. These tests are performed after an assembly has been replaced, following the replacement procedures in sections IV and V.

4-19. Test Equipment

The test equipment required for the testing procedures is listed in table 4-1.

4-20. Performance Testing

a. Each procedure is preceded by instructions for setting up and interconnecting the applicable test equipment to the equipment under test.

b. In performing the tests, follow the procedure steps in the order given and set all controls accurately.

c. At the end of testing set the POWER switch to OFF, disconnect all test equipment and restore the equipment to its normal operational configuration.

4-21. Monitor Receiver Test Procedures

The following list gives the test procedures required after replacement of a unit or assembly. The switch bracket test procedure is required for organizational level maintenance, but the switch bracket replacement is performed by direct support maintenance personnel (refer to chapter 5).

a. Monitor Receiver. Perform the post installation adjustment procedures in chapter 2.

b. Switch Bracket Assembly. Perform the procedure of paragraph 4-22.

c. RF Amplifier PC. Perform the procedure of paragraph 4-23.

d. If. Amplifier PCB. Perform the procedure of paragraph 4-24.

e. Audio Amplifier PCB. Perform the procedure of paragraph 4-25.

f. Power Supply Assembly. Perform the maintenance turn on procedure of table 4-2.

4-22. Switch Bracket Assembly Test Procedure

a. *Test Equipment and Material*. None.

b. *Test Connections and Conditions*. The equip ment should be connected in its operational condition, with the POWER switch set to OFF.

c. *Procedure*.

(1) Set RF ATTEN control (fig. 2-1) fully clockwise, SENSITIVITY control A3R7 (fig. 2-1) fully clockwise, TIME DELAY control A2R32 (fig. 2-1) to the desired delay, and the RF TUNE control (fig. 2-1) to the operating frequency (table 2-2).

(2) Set the POWER switch to ON, then momentarily press the ALARM SIL switch.

(3) Rotate the RF ATTEN control counterclockwise until a reading is obtained on the CARRIER LEVEL meter.

(4) Carefully adjust the RF TUNE control to get a maximum meter reading.

(5) Adjust SENSITIVITY control A3R7 counterclockwise to get a meter reading of 0 dB.

(6) Set CARRIER control A2R22 (fig. 2-1) to the desired threshold level. The receiver should now be in its normal state, with the NORM indicator on and the ALARM indicator off.

(7) Rotate SENSITIVITY control A3R7 counterclockwise to reduce the meter reading to 1 dB less than the setting of CARRIER control A2R22. After the delay set by A2R32 the NORM indicator will go off and the ALARM indicator will go on.

(8) Rotate SENSITIVITY control A3R7 clockwise to get a meter reading of 0 dB. The NORM indicator will be on and the ALARM indicator will be off.

(9) Perform the maintenance turn on procedure of table 4-2.

4-23. RF Amplifier PCB Test Procedure.

a. Test Equipment and Material.

(1) Electronic Counter Mainframe TD-1209U.

(2) Electronic Counter Module TD-1211/U.

b. Test Connections and Conditions.

(1) Connect the frequency counter to A3TP2 (fig. 2-1).

(2) The equipment should be connected in its operational condition, with the POWER switch set to OFF.

c. Procedure.

(1) Check that crystal Y1 (fig. 2-1) is the correct frequency. The crystal frequency equals 4.4 MHz minus the transmitter frequency. The crystal frequency is marked on the top of the crystal.

(2) Set the POWER switch to ON, then momentarily press the ALARM SIL switch.

(3) Adjust A3C13 (fig. 2-1) to provide the correct frequency ±10 Hz.

(4) Carefully adjust the RF TUNE control (fig. 2-1) to get a maximum reading on the CARRIER LEVEL meter.

(5) Adjust SENSITIVITY control A3R7 (fig. 2-1) to get a CARRIER LEVEL meter reading of 0 dB.

(6) Perform the maintenance turn on procedure of table 4-2.

4-24. If. Amplifier PCB Test Procedure

a. Test Equipment and Material.

(1) Multimeter AN/USM-223

(2) Test Set SG-1128/U

b. Test Connections and Conditions.

(1) Set the POWER switch to OFF.

(2) Connect the signal generator to J1 of the monitor receiver. Set the signal generator frequency to the receiver frequency with an unmodulated rf output of 100 mV.

(3) Check that TP2, TP5 and TP8 have the correct connections (fig. 2-1). For carrier alarm only connect TP5 to TP8. For carrier and modulation alarm only connect TP5 to TP8.

(4) The equipment should have all other connections as for its operational condition.

c. Procedure.

(1) Set the POWER switch to ON, then momentarily press the ALARM SIL switch.

(2) Set the RF ATTEN control (fig. 2-1) to 60.

(3) Adjust the signal generator frequency to get the maximum CARRIER LEVEL meter reading.

(4) Adjust SENSITIVITY control A3R7 (fig. 2-1) to get a reading of approximately 0 db on the CARRIER LEVEL meter.

(5) Adjust RF TUNE control (fig. 2-1) to get a maximum reading on the CARRIER LEVEL meter.

(6) Adjust A2C2, A2C3 and A2C10 (fig. 2-1) in turn, starting with C2, to maximize the CARRIER LEVEL meter reading. If the meter reading exceeds +10 dB adjust SENSITIVITY control A3R7 counterclockwise to get a reading of 0 dB, and complete the adjustment procedure of A2C2, A2C3 and A2C10.

(7) Set CARRIER control A2R22 (fig. 2-1) fully counterclockwise.

(8) Connect the oscilloscope between A2TP5 (+) and A2TP9 (-) (fig. 2-1). The voltage will be +12 Vdc.

(9) Adjust SENSITIVITY control A3R7 counterclockwise until the voltage at A2TP5 switches to 0 Vdc.

(10) Adjust SENSITIVITY control A3R7 clockwise or counterclockwise so that the voltage at A2TP5 switches to +12 Vdc. Adjust so that any further counterclockwise movement switches the voltage at A2TP5 to 0 Vdc.

(11) The CARRIER LEVEL meter should read 0 dB. If necessary, readjust SENSITIVITY control A3R7 for a 0 dB CARRIER LEVEL meter reading. Then adjust A2R52 (fig. 2-1) to get a +12 Vdc reading at A2TP5, to the point where any further counterclockwise movement of A2R52 switches the voltage at A2TP5 to 0 Vdc.

(12) Reduce the signal generator output level by the threshold set by CARRIER control A2R22 (-2 to -10 dB).

(13) The voltage at A2TP5 should be 0 Vdc. Adjust CARRIER control A2R22 clockwise until the voltage at A2TP5 switches to +12 Vdc. Then adjust clockwise or counterclockwise to the position where the voltage is 0 Vdc, but any further clockwise movement switches the voltage to +12 Vdc.

(14) Increase the signal generator output by 0.5 dB. The voltage at A2TP5 will switch to +12 Vdc.

(15) Set the signal generator output to 100 mV.

(16) Set TIME DELAY control A2R32 (fig. 2-1) to the delay required (0-60).

(17) Press the ALARM TEST switch. Within ±20% of the time set by TIME DELAY control A2R32, the ALARM indicator will go on and the NORM alarm will go off.

(18) Release the ALARM TEST switch. The ALARM indicator will go off and the NORM indicator will go on immediately.

(19) Set the signal generator to 15% modulation at 1 kHz.

(20) Simulate keying by switching the signal generator modulation control on and off. The period between key-off and key-on must be less than the time delay set by TIME DELAY control A2R32. The receiver will generate an alarm.

(21) Switch the signal generator modulation off. Within ±20% of the time set by TIME DELAY control A2R32, the ALARM indicator will go on and the NORM indicator will go off.

(22) Simulate keying by switching the signal generator modulation control on and off. The NORM indicator will come on and the ALARM indicator will go off.

(23) Set the signal generator modulation control to on. Within ±20% of the time set by TIME DELAY control A2R32, the ALARM indicator will go on and the NORM indicator will go off

(24) Carefully adjust the RF TUNE control to get a maximum reading on the CARRIER LEVEL meter.

(25) Adjust SENSITIVITY control A3R7 to get a CARRIER LEVEL meter reading of 0 dB.

(26) With TB1 terminals 1 and 2 at the back of the monitor receiver terminated in an external 600 ohm line or a 600 ohm, 1 watt resistor, connect the rms voltmeter between TB1 terminals 1 and 2. The voltmeter will read 12.25 V ±0.1 V. If the reading is not correct adjust AUDIO LEVEL control A2R14 (fig. 2-1) to get 12.25 V ±0.1 V.

(27) Perform the maintenance turn on procedures of table 4-2.

4-25. Audio Amplifier PCB Test Procedure

a. Test Equipment and Material. None.

b. Test Connections and Conditions. The receiver should be connected in its operational condition with the POWER switch set to ON.

c. Procedure.

(1) Check that ALARM switch A1S1 (fig. 2-1) is in the ON position.

(2) Press the ALARM TEST switch. If necessary, adjust LEVEL control A1R13 (fig. 2-1) to get the desired aural tone level.

(3) Perform the maintenance turn on procedure of table 4-2.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

5-1. Introduction

Direct support maintenance consists of replacement of the switch bracket assembly and certain chassis mounted components. Procedures are included in this chapter for replacement. Each replacement procedure references the test procedure of chapter 4 that must be performed to make sure that repair has been successfully accomplished.

5-2. Voltage, Resistance and Waveform Measurements

Voltage, resistance and waveform measurements shall be performed in accordance with paragraphs 4-2, 4-3, and 4-4.

5-3. Tools and Equipment

There are no special tools or equipment required to accomplish direct support maintenance tasks.

Section II. TROUBLESHOOTING

5-4. Troubleshooting Information

Troubleshooting procedures for direct support maintenance are included within the organizational maintenance troubleshooting procedure of chapter 4, section III. When a fault is isolated which requires direct support maintenance personnel to perform the replacement procedure, the procedures in section III of this chapter are required.

Section III. MAINTENANCE OF MONITOR RECEIVER

5-5. Maintenance Information

Maintenance procedures for direct support maintenance consist of changing certain chassis mounted parts of the monitor receiver. The replacement procedures refer to the test procedures of chapter 4 which are required to check that repair has been successfully completed. There are no direct support maintenance tasks for the antenna.

5-6. Removal and Replacement of Switch Bracket

(fig. 4-2)

a. Removal.

(1) Remove RF amplifier PCB A3. Refer to paragraph 4-16.

(2) Tag and unsolder the connections to XA3 (12).

(3) Tag and unsolder the connections (13) to the switch bracket (14).

(4) Remove two nuts (7), lockwashers (6) and flat washers (5) holding the switch bracket (14) to the front panel (7).

b. Replacement.

(1) Replace the switch bracket by reversing the procedure in *a* above.

(2) Perform the test procedure of paragraph 4-22.

5-7. Removal and Replacement of Chassis Mounted Parts

(fig. 4-2)

a. Removal

(1) Remove the wires to the part and tag the wires.

(2) Remove the nuts or screws holding the part to the chassis.

b. Replacement

(1) Replace the part by reversing the procedure in *a* above.

(2) Perform the maintenance turn on procedure of table 4-2.

APPENDIX A

REFERENCES

Following is a list of applicable references that are available to organizational and direct support maintenance personnel for the monitor receiver.

DA Pam 310-4	Index of Technical Publications.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army.
TM 11-5825-270-10	Operator's Manual: Monitor, Radio Frequency R-2176/FRN (NSN 6625-01-098-2534).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for the R-2176/FRN. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting straightening, facing remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in

column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific task identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew
O - Organizational
F - Direct Support
H - General Support
L - Specialized Repair Activity
D - Depot

NOTE

If the SRA in your geographical area does not have the capability for the "L" maintenance functions listed in the MAC, or if there is no SRA in your geographical area, utilize existing procedures for obtaining depot accomplishment of the "L" maintenance functions.

e. Column 5 Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test and support equipment required to perform the designated function.

f. Column 6 Remarks. Column 6 contains an alphabetic code which lads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. Tool and Test Equipment Requirements (Sect. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO stock Number This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. Remarks (Sect. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

(Next printed page is B-3)

SECTION II. MAINTENANCE ALLOCATION CHART FOR MONITOR, RADIO FREQUENCY R-2176/FRN

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
00	MONITOR ALARM RECEIVER R-2176/FRN	Inspect	0.1						A
		Service	0.1						A
		Test		0.1				1, 2, 3, 4 thru 6	B
		Adjust		0.1					
		Replace		0.1					
		Repair		0.1					E
		Repair			1.0				F
01	FRONT PANEL ASSEMBLY	Test		0.2				3, 6	D
		Replace		0.3					E
		Repair		0.3					
		Repair			0.5				F
0101	RF PCB	Test		0.2				1, 2, 3, 4 thru 6	D
		Replace		0.1					
		Adjust		0.1					
							1.0 (L)		C
0102	SWITCH BRACKET ASSEMBLY	Test		0.1				3, 6	C
		Replace		0.1				6	
02	IF. AMP/MONITOR PCB	Test		0.2				1, 2, 3, 4 thru 6	D
		Replace		0.1					
		Adjust		0.1					
							2.0 (L)		C
03	AUDIO AMP. PCB	Test		0.2				1, 2, 3, 6	D
		Replace		0.1					
		Adjust		0.1					
							0.5 (L)		C
04	POWER SUPPLY	Test		0.1				2, 3, 6	D
		Replace		0.1				2, 3, 6	
							0.5 (L)		C

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MONITOR, RADIO FREQUENCY R-2176/FRN

TOOL OR TEST EQUIPMENT REF. CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O, F	TEST SET SG-1128/U	6625-00-450-7590	
2	O, F	OSCILLOSCOPE 0S-261/U	6625-00-127-0079	
3	O, F	MULTIMETER AN/USM-223	6625-00-999-7465	
4	O, F	ELECTRONIC COUNTER MAINFRAME TD-1209/U	6625-00-024-7066	
5	O, F	ELECTRONIC COUNTER MODULE TD-1211/U	6625-00-298-9676	
6	O, F	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	

SECTION IV. REMARKS

REFERENCE CODES	REMARKS
A	VISUAL INSPECTION AND EXTERIOR CLEANING ONLY.
B	FAULT ISOLATE TO DEFECTIVE MODULE/PCB.
C	NO PARTS BREAKDOWN FOR PCBS TO BE PROVIDED. RETURN TO DEPOT/SRA FOR CONTRACTOR REPAIR AS REQUIRED.
D	MUST BE TESTED TOGETHER WITH THE RECEIVER ASSEMBLY.
E	LIMITED TO MODULE/PCB LAMPS, LENS, KNOBS, FUSE, AND SWITCH ASSEMBLY.
F	ALL OTHER REPAIR TO BE ACCOMPLISHED BY SRA/CONTACT TEAMS.
	AUTHORIZED SPECIAL REPAIR ACTIVITIES (SRA)
	1. AREA MAINTENANCE AND SUPPLY FACILITY, EUROPE, MANNHEIM, GERMANY.
	2. AREA MAINTENANCE AND SUPPLY FACILITY, OKINAWA, ZUKERAN, JAPAN.
	3. THE AIR TRAFFIC CONTROL AREA MAINTENANCE ACTIVITY, FORT RUCKER, ALABAMA.

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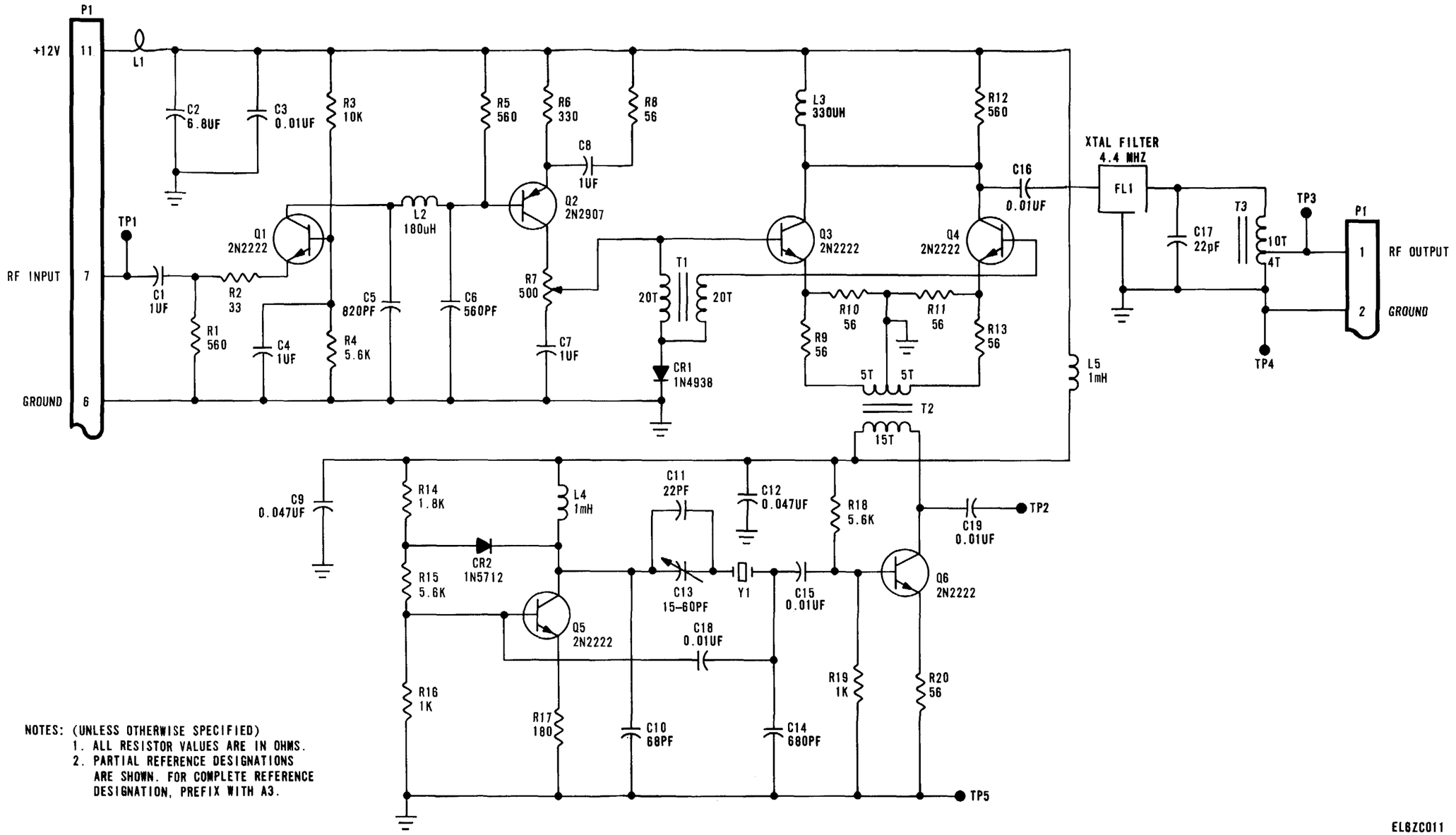
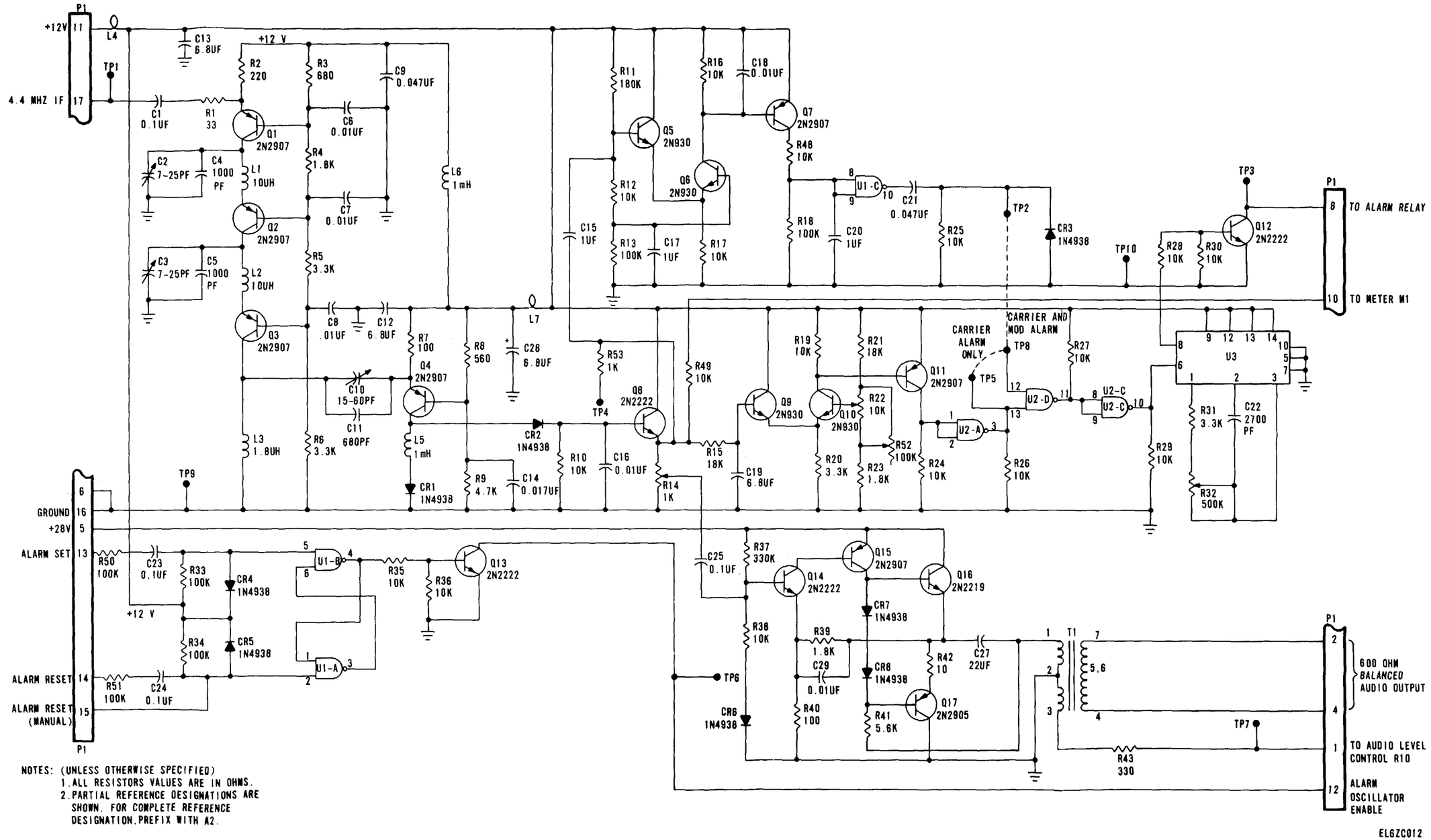


NOTES: (UNLESS OTHERWISE SPECIFIED)
1. ALL RESISTOR VALUES ARE IN OHMS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE REFERENCE DESIGNATION, PREFIX WITH A3.

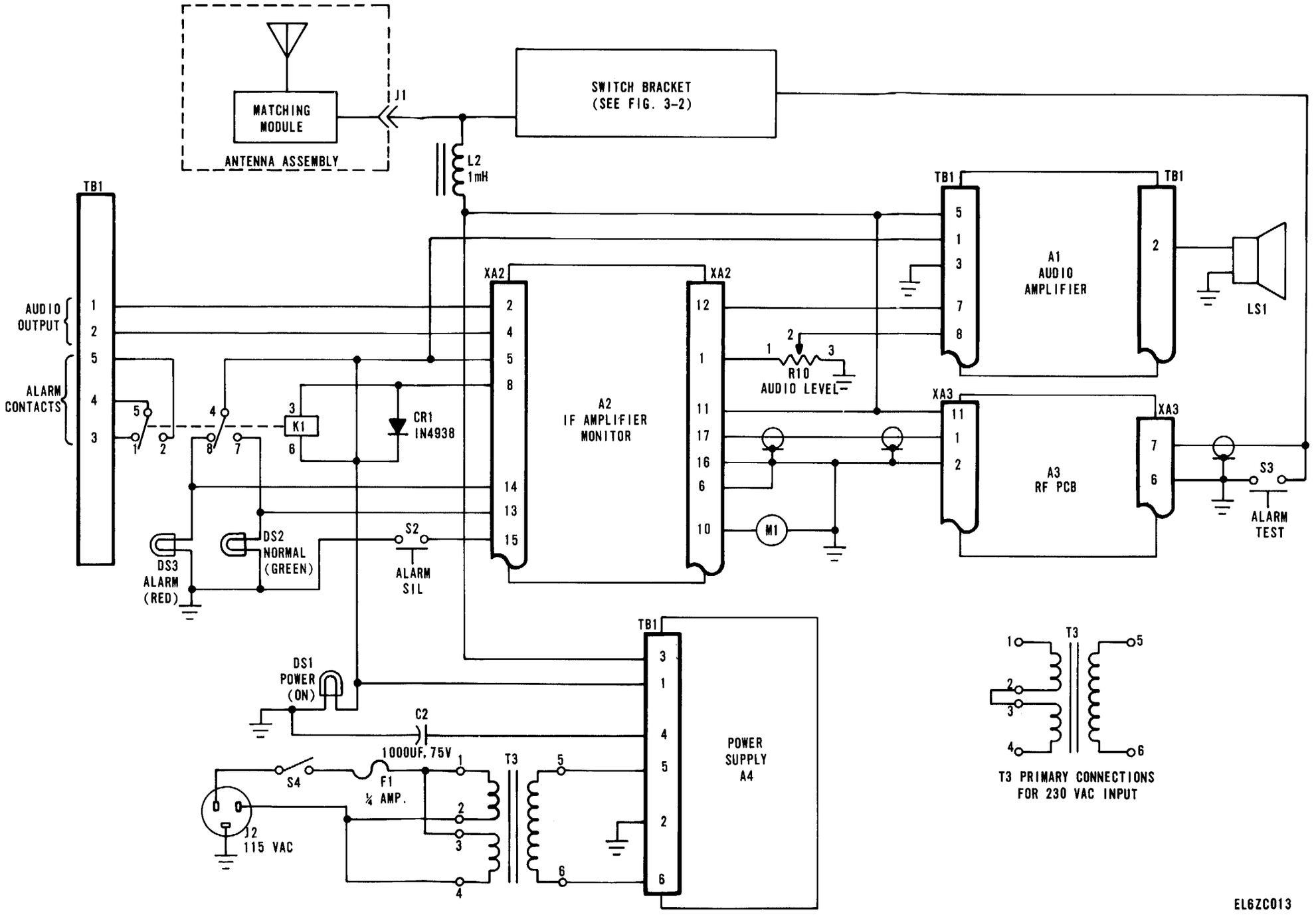
EL8ZC011

FO-1. Schematic Diagram, RF PCB Assembly A3.



NOTES: (UNLESS OTHERWISE SPECIFIED)
1. ALL RESISTORS VALUES ARE IN OHMS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE REFERENCE DESIGNATION, PREFIX WITH A2.

FO-2. Schematic Diagram, If. Amplifier Assembly A2.



FO-3. Interconnection Diagram, Monitor Receiver

By Order of the Secretary of the Army

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

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10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT. . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}.

REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure the the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5825-270-23	24 Mar 82	Monitor, Radio Frequency R-2176/FRN

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PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

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