TM 11-5820-566-35

TECHNICAL MANUAL

FOR

AMPLIFIER, RADIO FREQUENCY AM-4306/GRC

MANUFACTURED BY

AVCO ELECTRONICS DIVISION
CINCINNATI, OHIO 45241

U.S. ARMY ELECTRONICS COMMAND
MATERIEL READINESS DIRECTORATE
FORT MONMOUTH, NEW JERSEY 07703

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Prepared by

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2630 GLENDALE-MILFORD RD.
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WARNING

DANGEROUS VOLTAGES EXIST IN THE ANTENNA CIRCUITS AND AT THE ANTENNA TERMINALS.

BE CAREFUL WHEN WORKING AROUND THE ANTENNA CIRCUITS AND THE ANTENNA TERMINAL. RADIO FREQUENCY HIGH VOLTAGES EXIST IN THESE AREAS.

CAUTION

THIS EQUIPMENT IS TRANSISTORIZED. BEFORE CONNECTING TEST EQUIPMENT WITHIN THE EQUIPMENT, INSULATE TEST PRODS AND CLIPS WITH INSULATION TAPE OR SLEEVING. LEAVE AN ABSOLUTE MINIMUM OF EXPOSED METAL, AND BE EXTREMELY CAREFUL TO AVOID SHORT CIRCUITS; THEY MAY CAUSE EXTENSIVE DAMAGE. DO NOT MAKE RESISTANCE MEASUREMENTS UNLESS SPECIFICALLY DIRECTED TO DO SO.

AMPLIFIER MUST BE USED WITH ANTENNAS SPECIFIED IN THIS MANUAL.

BANDSWITCH ON AMPLIFIER MUST BE IN POSITION CORRESPONDING TO THE FREQUENCY OF SIGNAL BEING TRANSMITTED.

RF INPUT MUST NOT EXCEED 4 WATTS.

AMPLIFIER MUST NOT BE USED IN EXCESS OF 9:1 RECEIVE TO TRANSMIT RATIO (18 MIN OFF, 2 MIN ON) UNLESS ADEQUATE FORCED AIR COOLING IS PROVIDED.

IF OPERATED FROM A POWER SOURCE OTHER THAN BA-801, THE INPUT VOLTAGE MUST NOT EXCEED +24V DC UNDER ANY TRANSIENT OR STEADY-STATE CONDITION, AND ADEQUATE FORCED AIR COOLING MUST BE PROVIDED. (TERMINAL A: GROUND, B: +24 VOLTS, C: NO CONNECTION).

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Amplifier, Radio Frequency AM-4306/GRC

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

1-1. Scope

a. This manual covers general and direct support maintenance for Amplifier, Radio Frequency AM-4306/GRC. It includes instructions appropriate to general support and direct support troubleshooting, testing, aligning, and repair of the equipment. Detailed functions of the equipment are covered in Chapter 2.

b. The complete set of technical manuals for this equipment includes TM 11-5820-566-12 and TM 11-5820-566-35.

c. Forward all comments on this publication direct to: Commanding General, U.S. Army Electronics Command, Materiel Readiness Directorate, ATTN: AMSEL-MR-NMP-MEM, Fort Monmouth, New Jersey. DA Form 1958 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or a letter may be used.

1-2. Index of Publications

Refer to the latest issue of DA PAM 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. Department of the Army Pamphlet No. 310-4 is a current index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders that are available through publi-cations supply channels. The index lists the individual parts (-10, -12, -20, etc.) and the latest changes to and revisions of each equipment publication.

CHAPTER 2

FUNCTIONING OF AMPLIFIER, RADIO FREQUENCY AM-4306/GRC

Section I. SYSTEM THEORY

2-1. System Application

(fig. 2-1)

a. In man-pack operation the power source is a storage battery that provides the AM-4306/GRC with a nominal 24 volts. This operating voltage is then distributed throughout the unit. The battery also supplies the receiver-transmitter with the necessary operating voltage.

b. Voice modulation and audio received signals are controlled by the handset in man-pack operation. The handset keys the receiver-transmitter to transmit and the rf output power keys the AM-4306/GRC.

c. Transmitted and received signals are switched through two transmit-receive (T/R) relays that are controlled by the rf input signal to the AM-4306/GRC from the receiver-transmitter. The T/R relays energize in the transmit condition to insert the amplifying portion of the AM-4306/GRC and de-energize to remove it when no transmit signal is present to allow receive signals from the antenna to pass to the receiver-transmitter.

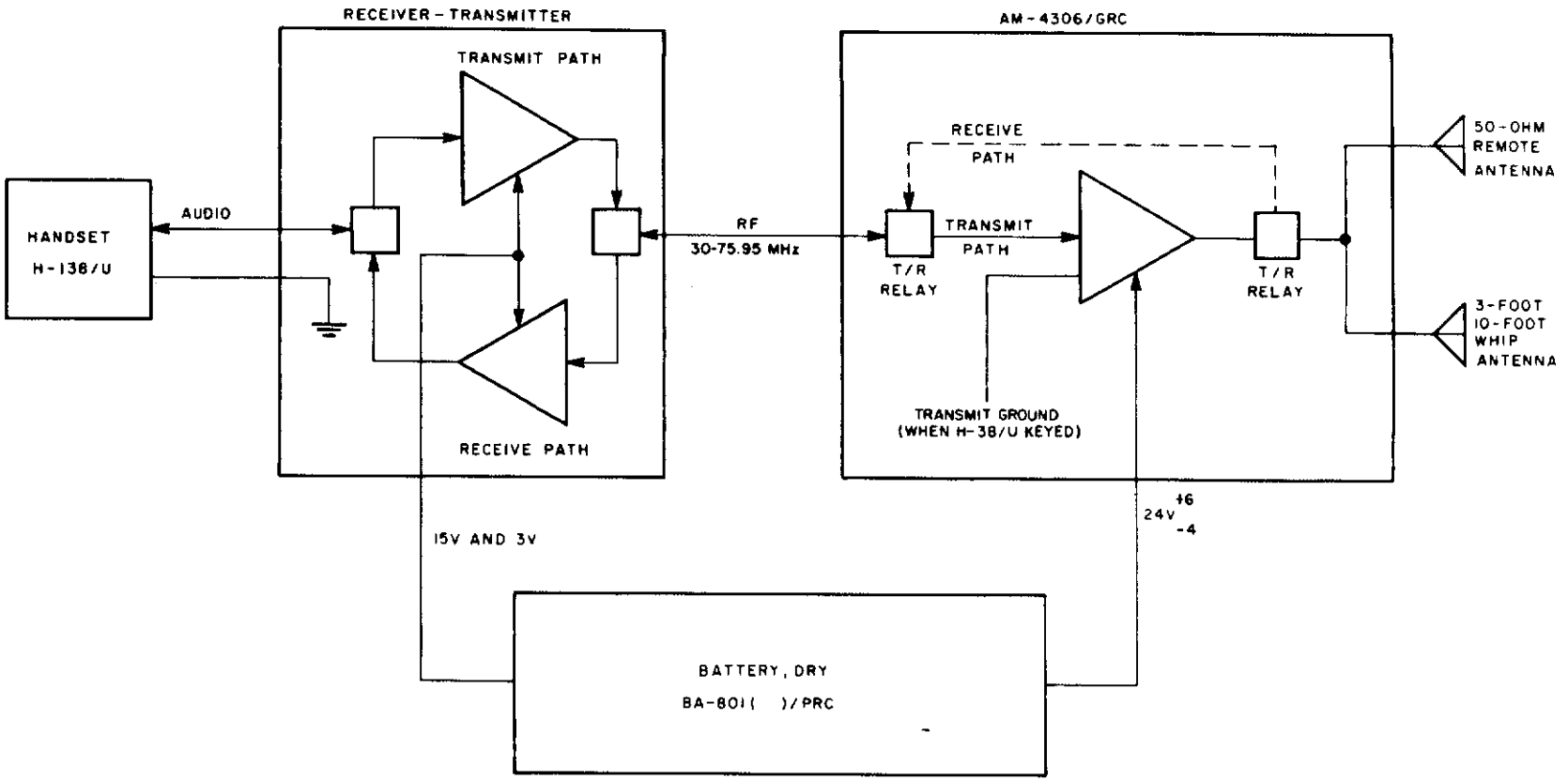

Figure 2-1. Man-pack configuration, block diagram

Section II. BLOCK DIAGRAM ANALYSIS

2-2. Transmit Signal Path

(fig. 2-2)

a. The rf power output from the receiver-transmitter is coupled to the AM-4306/GRC at the RF INPUT connector. The signal at the RF INPUT connector is coupled via a current sampling transformer to the rf keying circuit module A8. The rf keying circuit module A8 functions as a switch to provide a transmit ground (a near ground voltage) for the two T/R relays, and modules A10, A7 and A3 to complete their B+ circuits. If the AM-4306/GRC POWER switch is in the OFF position, the rf signal applied to the first T/R relay goes through de-energized contacts directly to the other T/R relay, through de-energized contacts to the directional wattmeter module A3; next the rf signal is fed to the antenna matching network module A4 and then to the 50-ohm remote ANT connector and the whip ANT connector. If the POWER switch is in ON position, the rf signal goes through energized contacts of the T/R relay to the automatic power attenuator (APA) module A10 that controls the rf power level and initial transient rf input to the input attenuator module A9. Module A9 is an adjustable attenuator that protects the automatic level control (ALC) module A7 from high power rf signal inputs.

b. The rf signal output of the input attenuator module A9 is fed directly to the ALC module A7, which protects the transistors in driver-final module A6 from damage by attenuating the rf input signal and also holds the output power con-

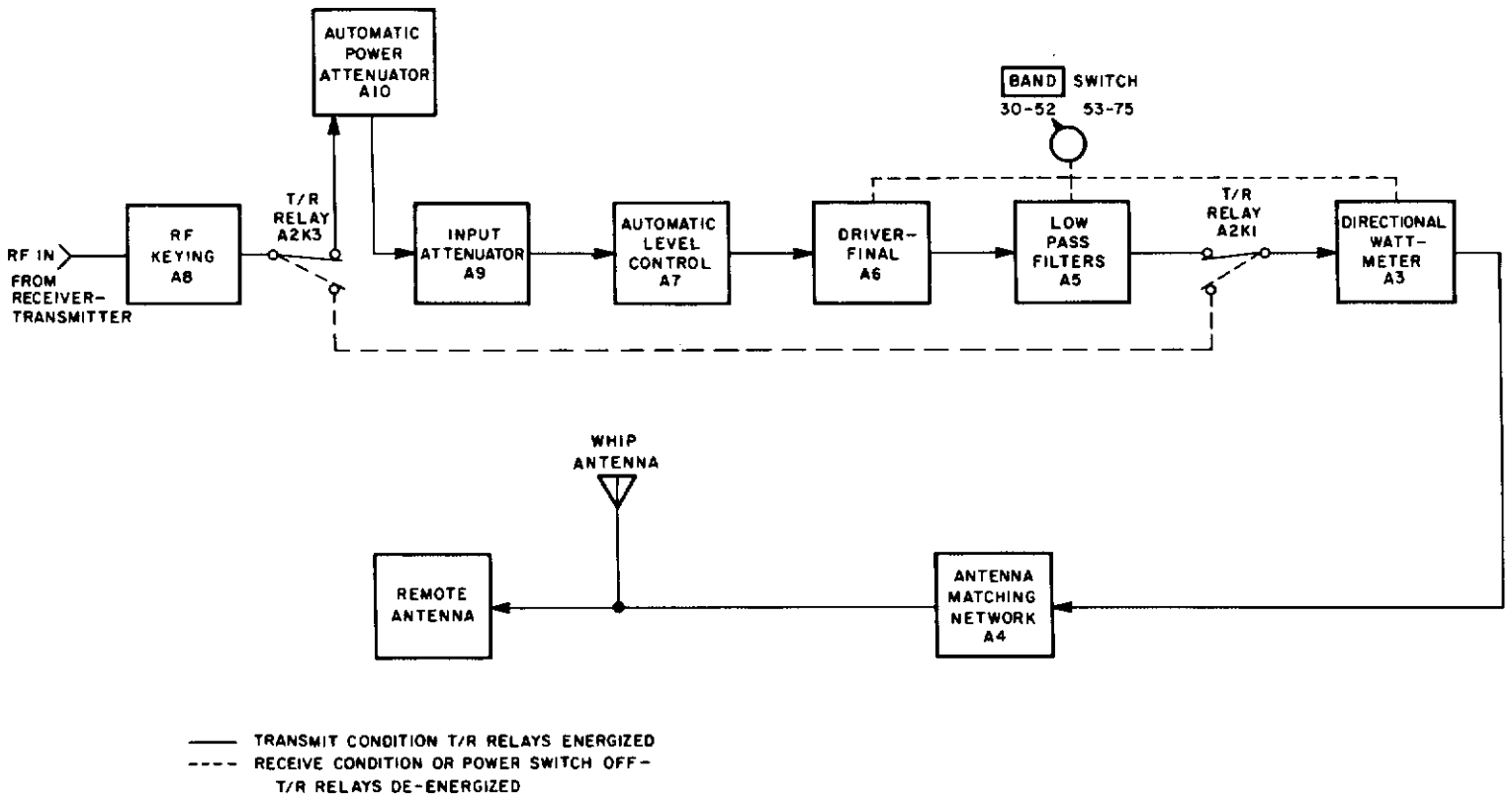

Figure 2-2. Transmit and receive signal paths, simplified block diagram

stant to prolong battery life. The rf signal is transformer coupled from the ALC module A7 to the driver-final module A6, consisting of a pre-driver, driver, and a final amplifier with transformer balanced interstage coupling for push-pull operation. The output of the driver-final module A6 is coupled to the low pass filter module A5 having filters for the low frequency band and for the high frequency band. The frequency band is selected by the BAND switch on the AM-4306/GRC front panel.

c. The filtered rf power is coupled through energized contacts of the second T/R relay to the directional wattmeter module A3, where a sample of forward and reflected power is taken to control the signal input to the driver-final module A6. Circuitry for the TUNE indicator is in the directional wattmeter module A3 which indicates the output power of the amplifier. The output is then coupled to the antenna matching network module A4 consisting of two primary parts, a variable inductor and a variable capacitor that are tuned by the AM-4306/GRC front panel WHIP TUNE control.

2-3. Receive Signal Path

(fig. 2-2)

The received signal passes through the antenna matching network module A4, directional wattmeter module A3, and two de-energized T/R relays. When a remote antenna is used, the received signal is coupled to the receiver-transmitter through the REMOTE antenna connector and then follows the same signal path. The signal is transferred to the receiver-transmitter with a nominal insertion loss of 0.5 db.

Section III. CIRCUIT ANALYSIS

2-4. Rf Keying Circuit Module A8

(fig. 2-3)

The rf keying circuit module A8 performs as a switch to provide both T/R relays and modules A10, A7, and A3 with a transmit ground; a small positive voltage, which is used to operate these circuits whenever an rf signal is present at the RF INPUT connector. The rf signal current in the transmission line is sampled by transformer A8T1 and rectified by the full-wave doubler rectifier A8CR1, A8CR2, A8C1, and A8C2. The rectified voltage is filtered by resistor A8R2 and capacitor A8C3 and applied to the base of amplifier A8Q1 through resistor A8R3, a temperature compensating device. Emitter to base resistor A8R4 is bypassed by capacitor A8C5. Diode A8CR3 provides protection against negative going pulses from the power supply. When A8Q1 conducts, the positive voltage developed across resistor A8R7 provides sufficient bias to saturate transistor A8Q2. When A8Q2 saturates it provides a near ground voltage that is distributed throughout the amplifier as transmit (XMIT or keyline) ground.

2-5. Automatic Power Attenuator Module A10

(fig. 2-4)

a. The automatic power attenuator (APA) module A10 performs as a variable attenuator in a pi configuration. The APA module A10 supplies the input attenuator module A9 with a con-

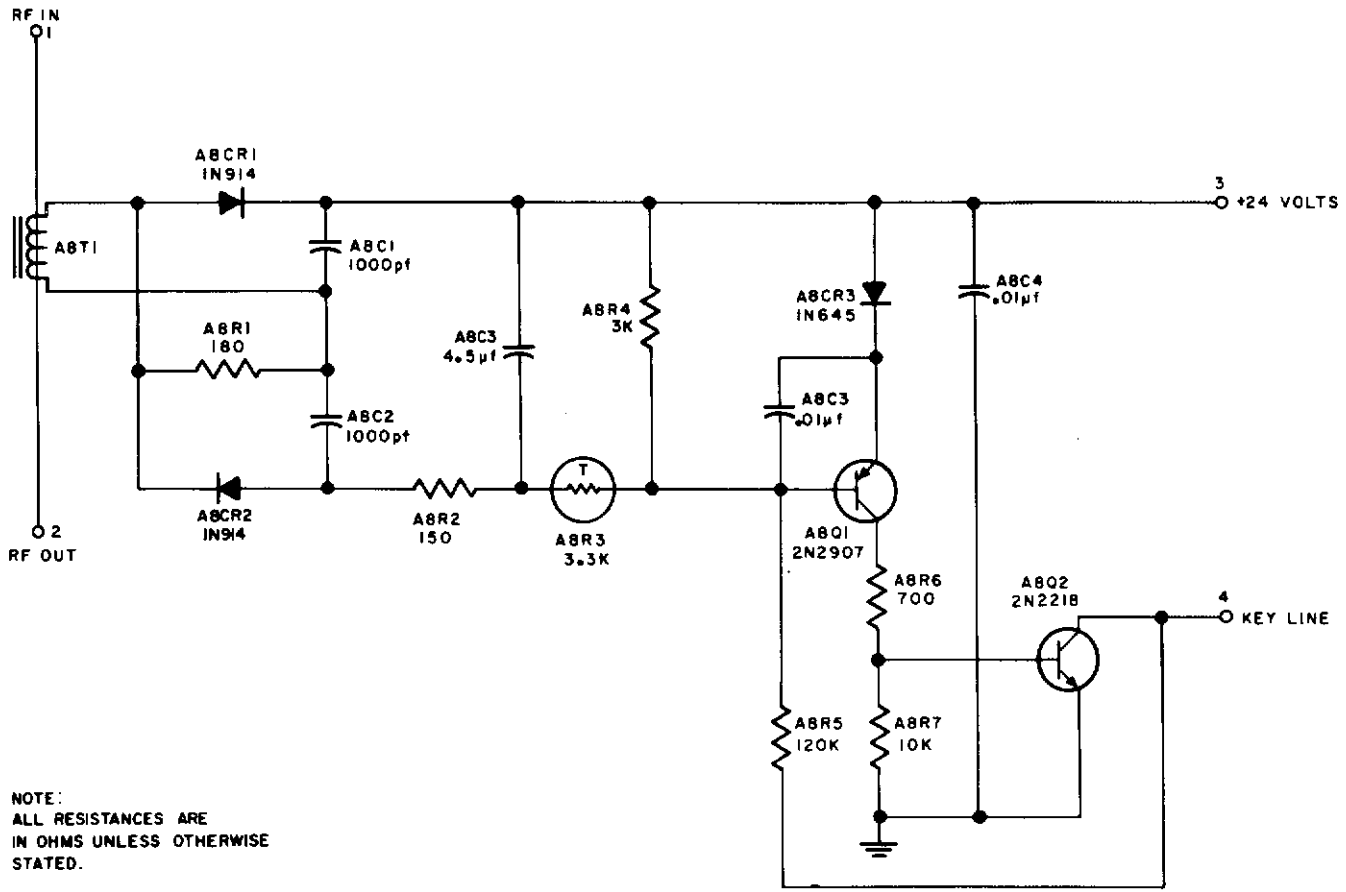

Figure 2-3. RF keying circuit module A8, schematic diagram

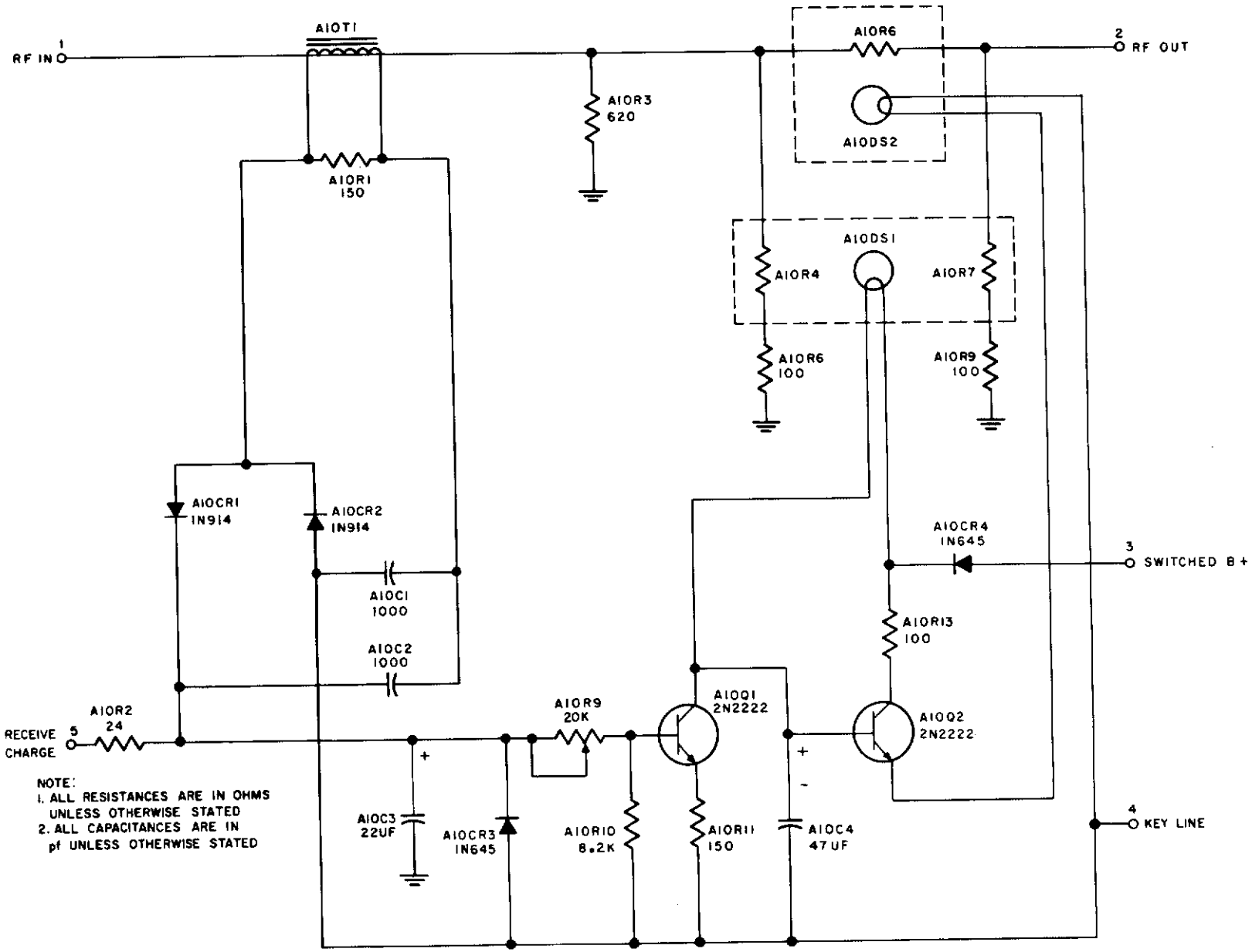

Figure 2-4. Automatic power attenuator module A10, schematic diagram

stant power level and also suppresses initial transient rf signals that could damage driver-final amplifier module A6.

b. The rf input to module A10 is from T/R relay A2K3-B2. Transformer A10T1 samples the rf signal input current and feeds it to a full-wave voltage doubler rectifier comprised of A10CR1, A10CR2, A10C1, and A10C2. The rectified rf voltage is fed to capacitor A10C3, charging it, and to the base of A10Q1 through variable resistor A10R9. This will cause A10Q1 to conduct thus drawing current through A10DS1. A10R4, and A10R7 comprise light-sensitive resistors in the shunt arms of the pi attenuator. As the current through the lamp A10DS1 is increased the brightness of the lamp is increased, thus lowering the resistance of A10R4 and A10R7. A10R6 is a light-sensitive resistor in the series arm, performing the same as A10R4 and A10R7. As the brightness of A10DS1 is increased the values of A10R4 and A10R7 are reduced thus shunting the rf input signal, lowering the rf input to module A9. The low collector voltage of A10Q1 is coupled to the base of emitter follower A10Q2 and will keep A10DS2 off thus A10R6 will be at a high value. When the rf input to module A10 is lowered the rectified rf voltage will cause A10Q1 to conduct less and consequently raising its collector voltage, thus decreasing the intensity of A10DS1 and increasing the values of A10R4 and A10R7. At the same time A10Q2 is allowed to conduct thus drawing current through A10DS2 and lowering the value of A10R6. The attenuation of the module will decrease as the value of A10R6 is decreased and the values of A10R4 and A10R7 are increased.

c. The protection from initial transient rf inputs is suppressed by applying 24 volts to A10CR3 to keep it charged when the POWER switch if OFF. When the POWER switch is turned ON and the transmitter is keyed the 24 volts to capacitor A10C3 will be removed and A10C3 will discharge through A10Q1 thus causing it to conduct heavily causing A10DS1 to be very bright, lowering the values of A10R4 and A10R7. This situation causes maximum attenuation and will protect the driver-final module A6 from initial spurious rf inputs. The threat of spurious rf inputs will be over before A10C3 can completely be discharged and the full-wave voltage doubler rectifier will take over control of the attenuator.

2-6. Input Attenuator Module A9

(fig. 2-5)

The input attenuator module A9 performs as a conventional "T" attenuator that limits the rf input signal to the automatic level control module A7. This protects the ALC module A7 from being overdriven and also it improves the VSWR at the lower frequencies. The input attenuator module A9 offers a maximum attenuation of nine db at 30 MHz and a minimum attenuation of 3 db at 76 MHz. The input attenuator module A9 consists of a 12 db resistive pad whose shunt leg is in series with a parallel resonant circuit. The resonant frequency of this circuit is approximately 76 MHz.

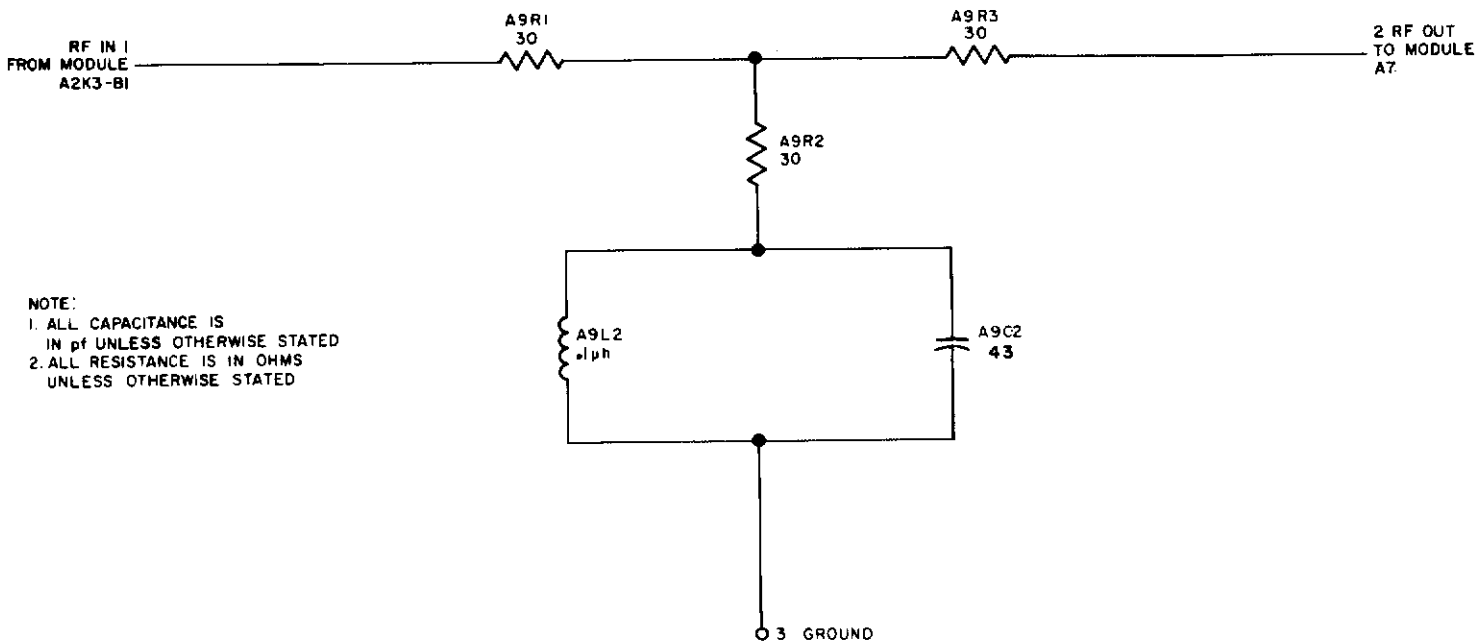

Figure 2-5. Input attenuator module A9, schematic diagram

2-7. Automatic Level Control Module A7

(fig. 2-6)

a. The primary function of the automatic level control (ALC) module A7 is to attenuate the input rf power from the receiver-transmitter. The rf power developed in the receiver-transmitter is coupled to the ALC module A7 through input attenuator module A9 and then applied to pin 1 of A7T1. The secondary of A7T1 in conjunction with A7R17, A7R16, and A7DS1 forms a bridge network that increases or decreases attenuation of the rf signal at that point. From the ALC module A7, the attenuated rf signal is fed to the driver-final module A6. The amount of rf signal attenuation is dependent upon the light intensity of lamp A7DS1, which controls light-sensitive resistor A7R16. The larger the current through A7DS1, the brighter the light. This decreases the resistance of A7R16 and thus brings its value closer to the fixed resistance value of A7R17, thereby increasing the attenuation of the rf input signal. When A7DS1 draws less current, the light is less intense. This increases the resistance value of A7R16 and creates a larger difference between the values of A7R16 and fixed resistor A7R17, decreasing the attenuation in the bridge network.

b. The current through A7DS1 is controlled by transistor A7Q4. Transistor A7Q4 is controlled in three ways as follows:

(1) Forward Power. A dc voltage proportional to forward power from the directional wattemter module A3 is fed to A7 on pin 3 through A7CR11, A7R22, and

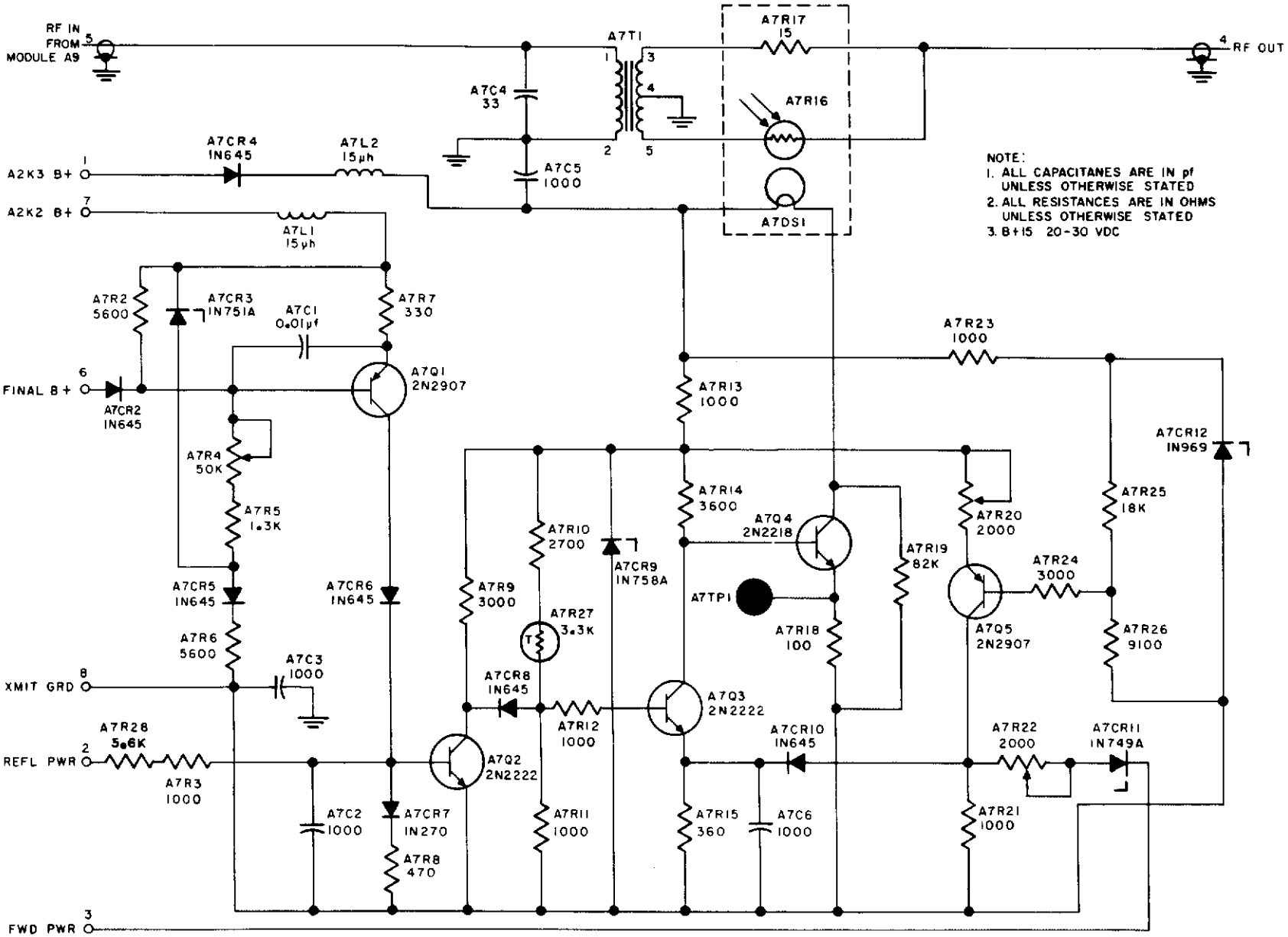

Figure 2-6. Automatic level control module A7, schematic diagram

A7CR10 to the emitter of A7Q3. Zener diode A7CR11 is rated for 4.3 volts and resistor A7R22 is adjusted to maintain a 22-watt threshold at 24 vdc. Temperature compensation of A7Q3 is provided by diode A7CR10. When the voltage drop across A7R15 increases, the base-to-emitter voltage of A7Q3 is changed. This causes A7Q3 to conduct, changing the base-to-emitter voltage of A7Q4 and causing A7Q4 to conduct more. When A7Q4 is conducting heavily, the current flow through A7DS1 increases, making the lamp brighter. This action increases the bridge attenuation and lowers the rf signal to the driver-final module A6, which in turn lowers the output power to the desired level. Transistor A7Q4 is cutoff when in the transmit condition with no rf signal present.

(2) Reflected Power. A dc voltage representing reflected power, from the directional wattmeter module A3, is fed in on terminal 2 of A7 through A7R28 and A7R3 to the base of A7Q2. When the base-to-emitter voltage of A7Q2 is increased, the transistor conducts more. The resulting decrease in A7Q2 collector voltage is applied at the base of A7Q3, through A7CR8 and A7R12, causing A7Q4 to conduct. Temperature compensation is provided by A7R27. The base

voltage of A7Q3 represents the reflected power, the emitter voltage of A7Q3 represents forward power, and the collector voltage represents the combination of the two, which is applied to the base of A7Q4. The change in base-to-emitter voltage of A7Q4 causes a change in the collector current, thereby controlling the intensity of A7DS1 and changing the attenuation of the bridge network.

(3) Final Amplifier B+. Resistor A2R2 (fig. 2-11) is in series with the final amplifier B+ and a rise in current flow through A2R2 above the value set by A7R4 causes a change in base-to-emitter voltage of A7Q1, allowing A7Q1 to conduct. The change in collector voltage of A7Q1 is applied at the base of A7Q2, causing increased conduction of A7Q2. This in turn causes A7Q3 to conduct heavier. Finally, A7Q4 conducts heavier, resulting in increased current through A7DS1 and a corresponding increase in bridge attenuation. The increased attenuation decreases the power input to the driver-final module A6. The value of A2R2 is 0.14 ohm to insure that no significant voltage drop of the battery will be incurred.

c. The circuitry of A7Q5 limits the power output of the final amplifier when the battery voltage is lower than 24 vdc.

Resistor A7R20 is adjusted to insure a 13-watt power output with a B+ of 20 vdc. This reduces the drain on the battery by adding attenuation to the rf input to limit the final amplifier current. The nominal 24V conduction level of A7Q5 is increased as B+ decreases from 24V. When the conduction level of A7Q5 is increased, the increase collector voltage is applied to the emitter of A7Q3 through A7CR10 and the increased collector voltage of A7Q3 causes A7Q4 to conduct, thus adding attenuation to the bridge network.

d. Zener diode A7CR12 is used in conjunction with transistor A7Q5 to insure proper ALC action when the supply voltage is more than 24 vdc. When the B+ voltage becomes greater than 24 vdc the output of voltage divider A7R25 and A7R26 remains constant causing the conduction level of A7Q5 to remain constant. As a result output power remains essentially constant as B+ is increased above 24 vdc.

e. Test point A7TP1 is used for measuring the amount of attenuation in the ALC module. This test point is only used at depot level maintenance.

f. Terminal 1 of module A7 is the point where B+ voltage is applied to the ALC module from the input T/R relay (A2K3). Coil A7L2 is an rf choke and diode A7CR4 prevents current flow in the receive mode. In the transmit mode the ground from the rf keying circuit module A8 is provided via terminal 8 of module A7.

2-8. Driver-Final Amplifier Module A6

(fig. 2-7)

The driver-final amplifier module A6 is a three-stage, all-transistor power amplifier. All interstage coupling is accomplished with broadband transformers to insure a flat frequency response over the usable frequency range. Circuitry of the three stages of the module A6 is as follows:

a. Pre-Driver Stage. The attenuated rf signal from the ALC module A7 is coupled to pin 2 of A6T1; pin 1 of A6T1 is grounded. Input impedance at A6T1 pin 2 is 100 ohms, nominal. Transistors A6Q1 and A6Q2 are connected as push-pull common-base stages and are biased through A6R3 and A6CR1 with A6C1 provided for ac ground. Terminal 2 of A6T2 is the pre-driver B+ connection of module A6. When in transmit with no signal present, there is a small current flow to the pre-drivers. When in the receive condition, there is no current flow. Resistors A6R1 and A6R2 are swamping resistors. The output from the collectors of A6Q1 and A6Q2 is fed to the primary winding of A6T2 (terminals 1 and 3, respectively).

b. Driver Stage. The input to the driver is taken from the secondary winding of A6T2 (terminals 4 and 6) through A6R4 and A6R5 to the bases of A6Q3 and A6Q4. Swamping resistors A6R4 and A6R5 are connected to terminals 4 and 6, respectively, of A6T2. Transistors A6Q3 and A6Q4 are connected push-pull with common-grounded emitters. Unless a signal is present at A6T2 there is no current flow in this stage in the transmit condition. The collector output of

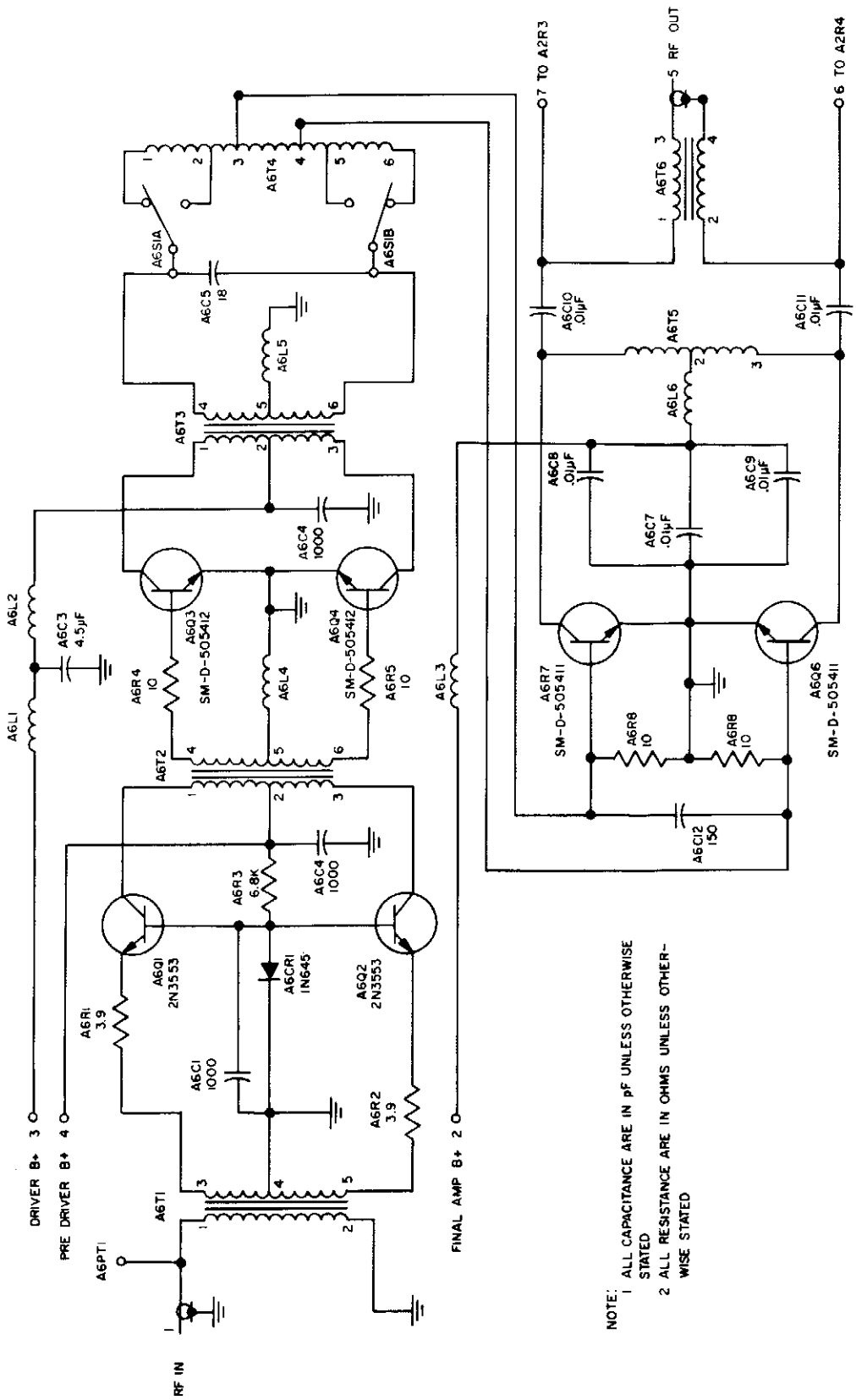

Figure 2-7. Driver-final amplifier module A6, schematic diagram

A6Q3 is connected to terminal 1 of A6T3 and collector output of A6Q4 is connected to terminal 3 of A6T3. Terminal 2 of A6T3 is the B+ connection for A6Q3 and A6Q4 with A6C4 provided for ac ground. The driver B+ is filtered through A6L1, A6C3, and A6L2.

c. Final Stage. The input to the final stage is taken from the secondary winding of A6T3 (terminals 4 and 6) through contacts of A6S1A and B, to A6T4. Capacitor A6C5 performs a tuning function to insure a flat frequency response across the band. The transformer tap switch A6S1A and B in the primary circuit winding of A6T4 insures that optimum frequency response is obtained in the 30-53 MHz frequency band and the 53-76 MHz frequency band. The transformer tap switch A6S1A and B is positioned by the BAND switch, which is positioned by the operator according to the transmit frequency. When using a frequency in the low band, terminals 1 and 6 of A6T4 are used; when using a high band frequency, terminals 2 and 5 are used. Transistors A6Q5 and A6Q6 are connected push-pull from terminals 3 and 4, respectively, of A6T4. Resistors A6R7 and A6R8 are swamping resistors. Transistors A6Q5 and A6Q6 are connected with common-grounded emitters; the B+ connection is through terminal 2 of A6T5. Capacitors A6C7, A6C8, and A6C9 are dc blocking capacitors to isolate the B+ from ground. The output at the collectors of A6Q5 and A6Q6 is fed to the primary winding of A6T5 (terminals 1 and 3). Dc blocking capacitor A6C10 is connected between terminal 1 of A6R5 and the primary winding

of A6T6. Dc blocking capacitor A6C11 is connected between terminal 3 of A6T5 and the secondary winding of A6T6. The purpose of A6T5 and A6T6 is to couple the balanced output of A6Q5 and A6Q6, at A6T5, to an unbalanced, single-ended output at A6T6. The secondary winding of A6T6 is grounded. The output of the driver-final module A6 is connected to the BAND switch A1S3B.

2-9. Low Pass Filter Module A5

(fig. 2-8)

The low pass filter module A5 consists of two parts, one for the low band of frequencies and the other for the high band of frequencies. The input to the filters is from the BAND switch A1S3B and the output is to a T/R relay through BAND switch A1S3A. The low pass filters suppress all harmonics.

a. The low band (30-53 MHz) input is at A5J1 and the output is on A5J3. The low band filter has three sections that give an acceptable output function (non-symmetrical type). Three inductors and 11 capacitors make up the filter.

b. The high band (53-76 MHz) input is at A5J2 and the output is on A5J4. The high band filter is a 5-section "M" derived type, 3 T-sections, and 2 end sections. Five capacitors and nine inductors make up the high band filter.

2-10. Directional Wattmeter Module A3

(fig. 2-9)

a. The directional wattmeter module A3 has two functions. It provides the ALC module A7 with two dc voltages represent-

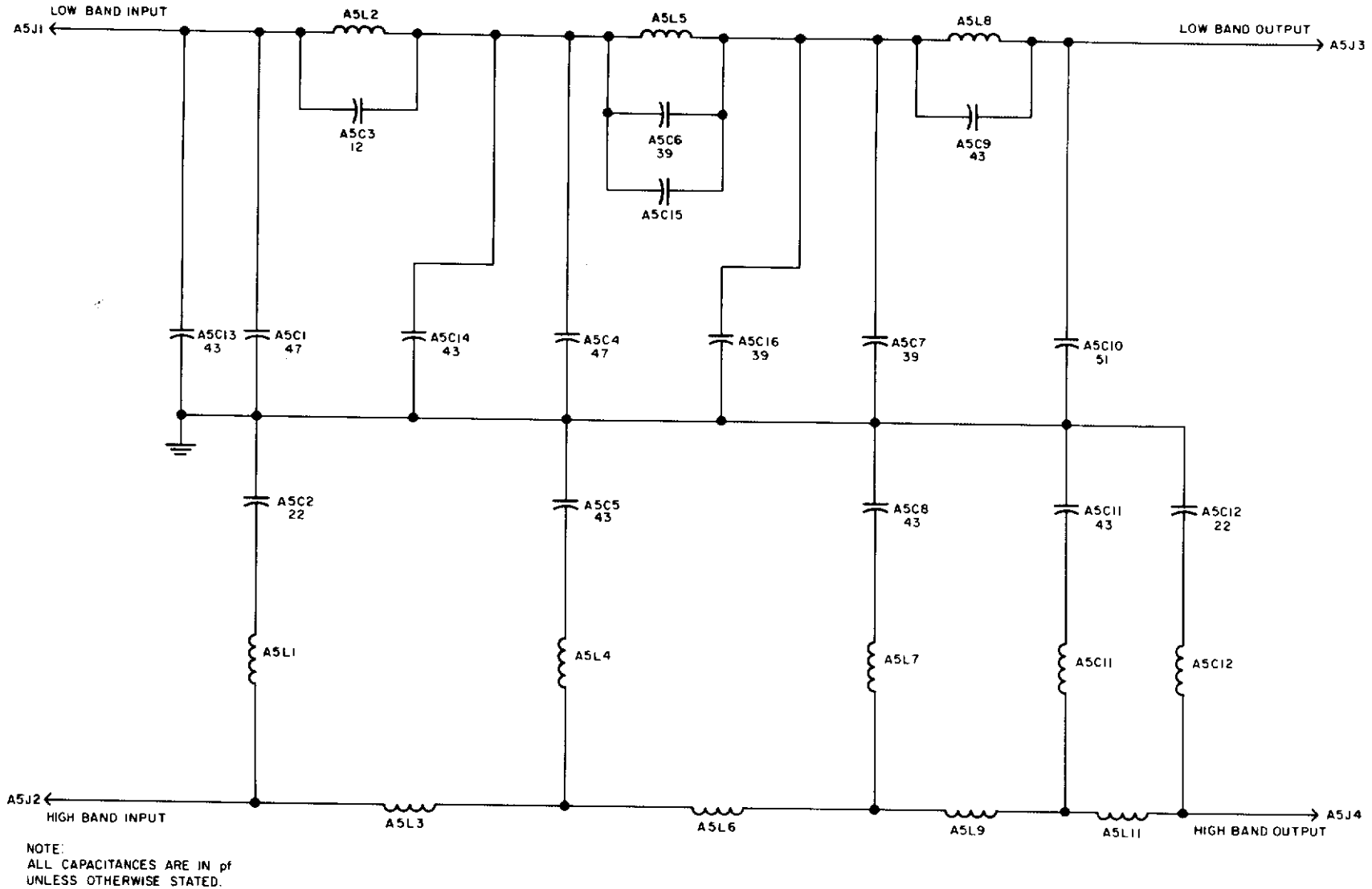

Figure 2-8. Low pass filter module A5, schematic diagram

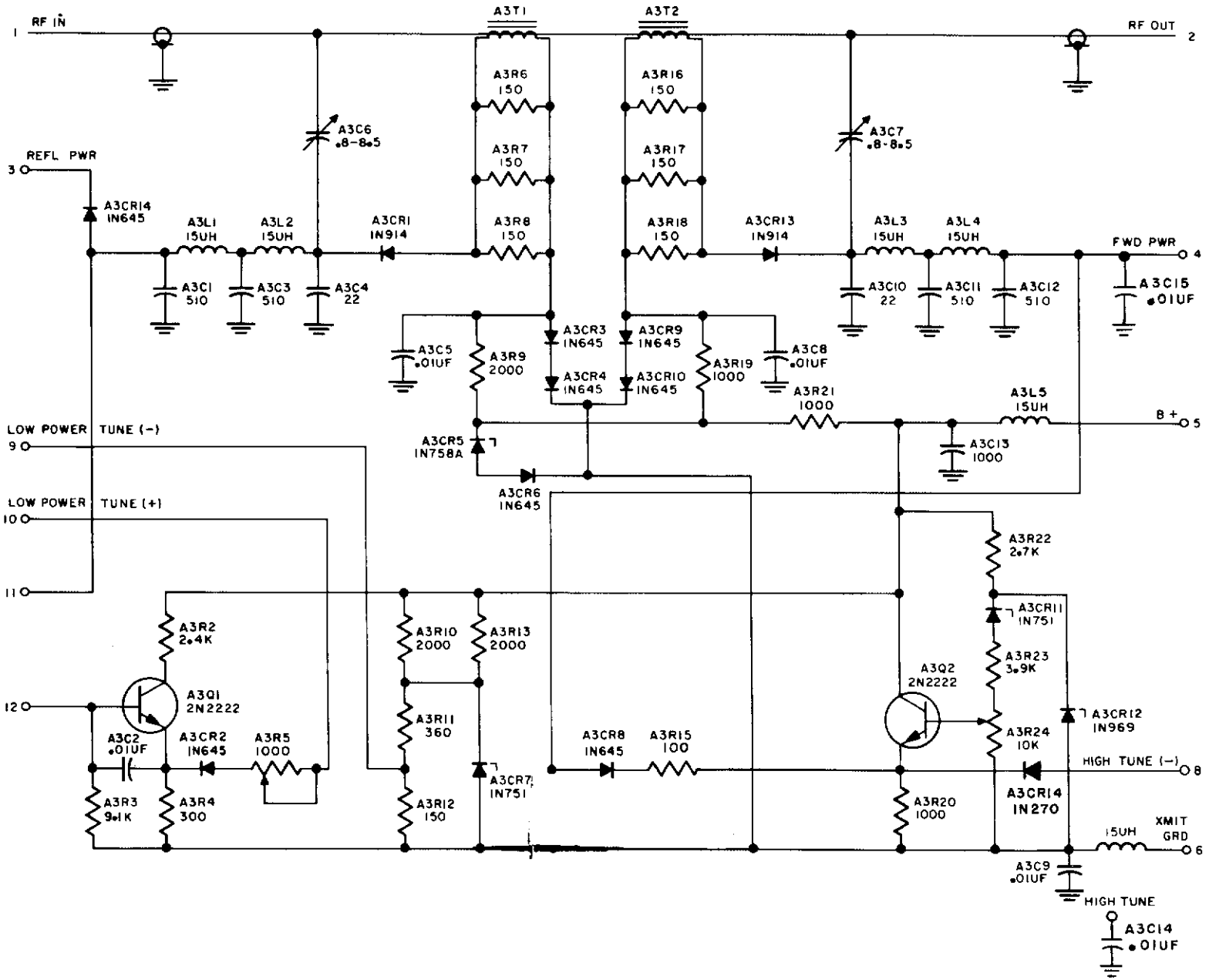

Figure 2-9. Directional wattmeter module A3, schematic diagram

ing forward and reflected power and also a dc voltage for the TUNE indicator. The rf power input to the directional wattmeter module A3 is from A5, through A2K3 and A2S3A, and the output rf is applied to module A4.

b. Separate sensing devices are used for forward and reflected power.

(1) The reflected power sensor is A3T1, with A3R6, A3R7, and A3R8 across the winding. Components A3C5, A3R8, A3CR1, and A3C4 form a peak detector. Capacitors A3C6 and A3C4 perform as a capacitive voltage divider. To insure a dc voltage output with a small rf voltage input, A3CR1 is forward biased using A3CR3 and A3CR4. The ac ground for A3T1 is through A3C5. The rectified rf voltage representing the reflected power is filtered through A3L2, A3C3, A3L1, and A3C1, and is then coupled to the ALC module through A3CR14. Also, this dc voltage is fed to A3Q1 in the meter circuitry through A3R2.

(2) The forward power circuitry is similar to the reflected power circuitry. The forward power sensor is A3T2 with A3R16, A3R17, and A3R18 across the winding. The peak detector consists of A3C10, A3R18, A3CR13, and A3C8. Capacitor A3C8 is the ac ground for A3T2. Capacitors A3C7 and A3C10 form the forward-power capacitive voltage divider. Diode A3CR13 is biased through A3CR9 and A3CR10.

Zener diode A3CR5 sets up the biasing level for both forward and reflected power circuits. Diode A3CR6, also common to both circuits, prevents reverse current flow. The rectified rf voltage (sample of forward power) is filtered through A3L3, A3C10, A3L4, and A3C12, and fed to the ALC module through terminal 4 of module A3. This voltage is also fed to A3Q1B in the meter circuitry through A3CR8.

c. The circuitry for the TUNE indicator A1M1, located on the front panel, consists of two circuits, one for low power (POWER switch OFF) and the other for high power (POWER switch ON). The selection of the circuitry used is controlled by the front panel located POWER switch A1S6.

(1) Low Power Circuitry. When the AM-4306/GRC POWER switch A1S6 is OFF and the receiver-transmitter is keyed the voltage proportional to the reflected power is coupled to the POWER switch from pin 11 of the module. This voltage is then fed back to the module at pin 12 to the base of emitter follower A3Q1. The purpose of the emitter follower application is to isolate the tuning meter circuitry from the reflected power sensor circuitry to prevent unnecessary loading of the sensor circuitry. The TUNE meter A1M1 is connected between pins 9 and 10 when the POWER switch is off. The deflection observed on the TUNE meter A1M1 is proportional

to the difference between the voltage representing reflected power and a reference voltage determined by Zener diode A3CR7 in conjunction with voltage divider A3R11 and A3R12. A3CR2 is utilized to prevent the TUNE meter from indicating a large reflected power voltage when it is larger than the reference voltage. This can occur when between tuning peaks during the tuning procedure.

(2) High Power Circuitry. When the AM-4306/GRC POWER switch is ON the TUNE meter is connected between pins 7 and 8. The voltage representing the forward power is fed through A3CR8 and through A3R15 to the TUNE meter. Zener diodes A3CR11 and A3CR12 in conjunction with A3R22 comprise a B+ compensating circuit. This circuit is provided so the TUNE meter will have approximately full scale deflection regardless of B+ voltage fluctuation. This B+ compensating circuit provides a reference voltage on the emitter of emitter follower Q2 that is a function of the B+ and is compared with the voltage representing forward power, thus the deflection on the TUNE meter is proportional to the difference of the two. A3CR8 is utilized to prevent the TUNE meter from indicating the reference voltage

when the voltage representing forward power is the lowest of the two. This can occur when between tuning peaks during the tuning procedure. A3R25 and A3CR14 provide meter compression for high power output levels.

d. The directional wattmeter module A3 operates regardless of the position of the power switch. If the power switch is off, the TUNE indicator shows the receiver-transmitter output power.

2-11. Antenna Matching Network Module A4

(fig. 2-10)

a. The antenna matching network module A4 is used to match the impedance of the antenna to the proper load line impedance for the amplifier. The output of the directional wattmeter module A3 is fed to the matching network at terminal 1 of A4.

b. The network consists of a fixed inductor A4L1, a variable inductor A4L2, and a variable capacitor A4C3. The Whip Tune knob on the front panel adjusts the variable elements so that a load of 50 ohms is presented to the low pass filter. This condition is noted by a maximum reading on the TUNE indicator.

c. The output of the antenna matching network is fed directly to the ANT connectors from terminal 2 of A4. In the receive mode, the network provides the maximum signal transfer to the receiver-transmitter if tuned to the receiver-transmitter frequency.

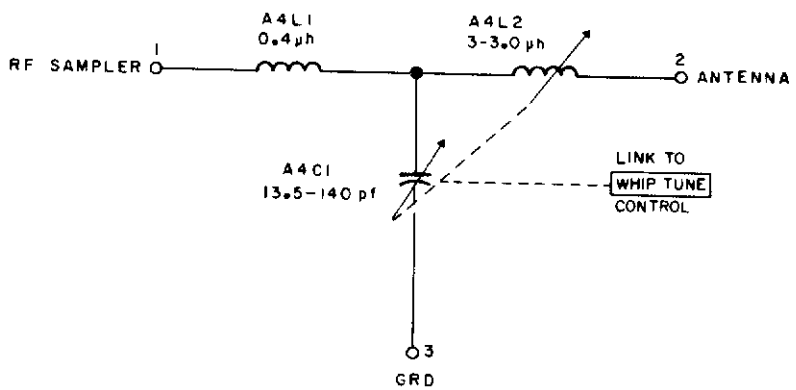

Figure 2-10. Antenna matching network module A4, schematic diagram

2-12. Power Distribution

(fig. 2-11)

The primary power source for the AM-4306/GRC is a Battery, Dry BA-801( )/PRC. The battery applies a nominal 24.0 vdc to power connector A2J1 on the rear of the unit, from which it is fed through fuse A2F1 to the POWER switch A1S6 located on the front panel. The directional wattmeter module A3 B+ connection is to the common point on the POWER switch; therefore, module A3 is operative at all times when the receiver-transmitter is transmitting. The B+ and T/R relay control voltages are connected through normally de-energized contacts of the over-heat relay A2K2 controlled by A1S5, a temperature sensitive switch. If the temperature of the front panel mounted thermostatic switch A1S5 rises to 185°F, a ground connection is completed through A1S5 to the coil of A2K2, causing it to energize and remove the B+ to all components except module A3. Under normal conditions, when the push-to-talk switch on the H-138/U Handset is de-pressed, a ground is picked up from the rf keying circuit module A8, completing the circuit to the coils of A2K1 and A2K3. The B+ is connected directly to the coil of A2K1, and the B+ to A2K3 is connected through energized contacts of A2K1. When there is no rf signal to the rf keying circuit module A8, the ground is removed from A2K1 and A2K3. Therefore, relay A2K3 de-energizes immediately; however, relay A2K1 does not de-energize until after a short delay due to capacitor A2C1 and resistor A2R1 in parallel with the coil.

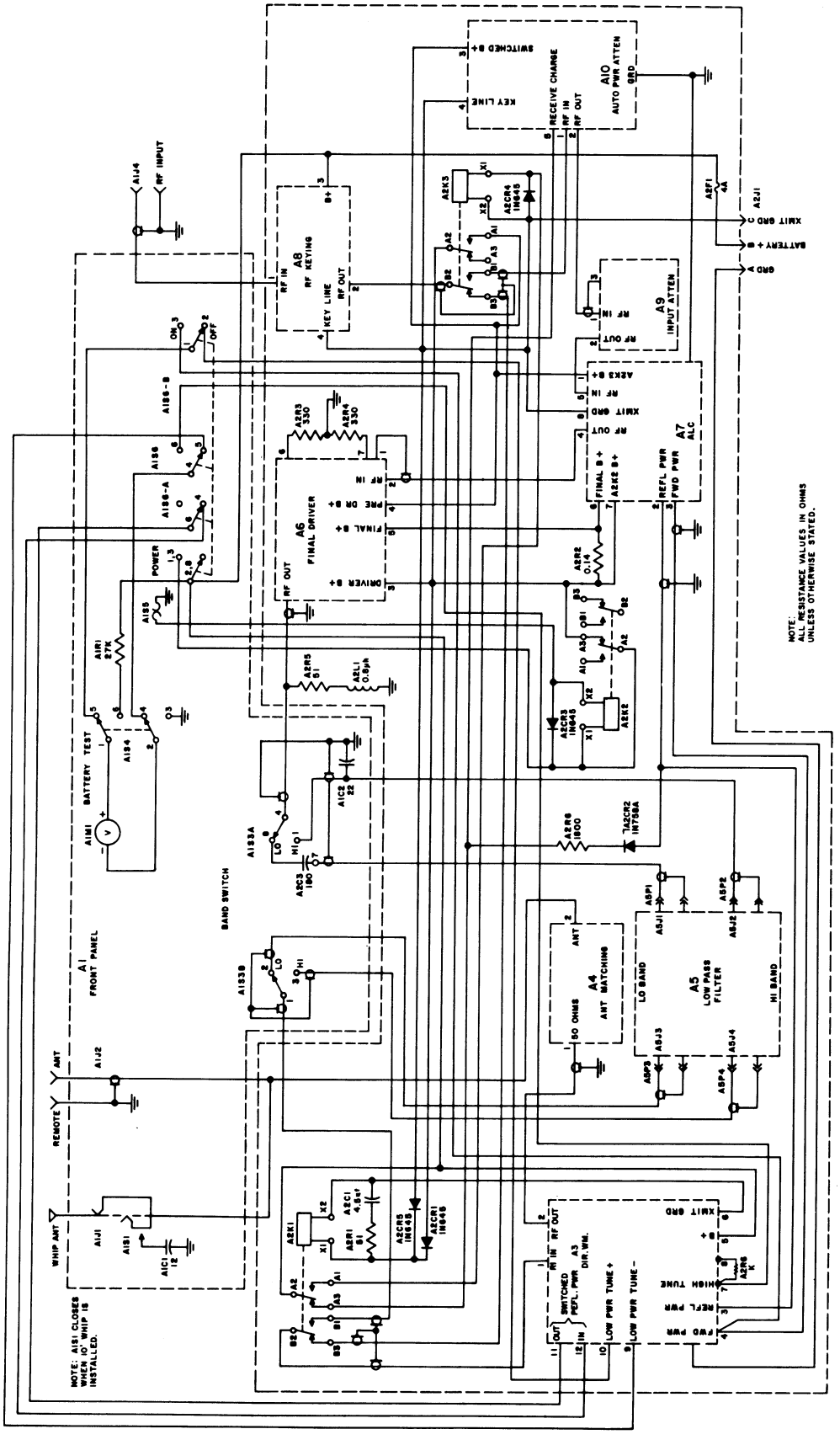

Figure 2-11. Front panel A1 and chassis A2 wiring schematic diagram

This arrangement insures that the rf input at A2K3 is removed before the rf load at A2K1 is removed. The rf load is applied before rf input by reason of interconnection of relay contacts.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE

Section I. GENERAL TROUBLESHOOTING PROCEDURES

3-1. Scope of Direct Support Maintenance

Direct support maintenance procedures (para 3-1 through 3-6) supplement maintenance procedures described in the manual for operator and organizational maintenance, TM 11-5820-566-12. Direct support maintenance includes detailed operational test (para 3-5c), troubleshooting (para 3-6), repair proced-ures (para 3-7 through 3-18), and lubrication procedures (para 3-18). The direct support maintenance man may replace any part of the AM-4306/GRC that does not require re-alignment of the set. This includes all components except the directional wattmeter, module A3, and the automatic level control module A7 which are to be replaced at general support level.

3-2. Organization of Direct Support Maintenance Procedures

a. General. The first step of direct support maintenance on a suspected faulty AM-4306/GRC is to perform the operational test (para 3-5c)while watching for a trouble symptom . If previous operational tests have indicated a trouble symptom, proceed directly to localizing the problem.

b. Localizing Troubles. After a trouble symptom has been observed in an operational test, proceed as follows:

(1) Visual inspection. A thorough visual inspection may often locate faults without further testing. Check the physical condition of all the wiring by looking for breaks, broken solder connections, and burnt components.

(2) Troubleshooting chart. The trouble indications listed in the troubleshooting chart (para 3-6c) will aid in locating trouble to the defective component.

(3) Voltage measurements. Some troubles may be located by voltage measurements. Voltage graphs, when used in conjunction with the troubleshooting chart procedure, will aid in determining the problem area. All voltage measurements are made to chassis (ground).

(4) Intermittent faults. Do not overlook the possibility of intermittent troubles. If this type of trouble is suspected, the problem can often be duplicated by tapping or jarring the unit slightly.

Caution: This equipment contains transistor circuits. If any test equipment item does not have an isolation transformer in its power supply circuits, connect one in the power input circuit. A suitable transformer is identified by FSN 5950-356-1779.

1. Never connect test equipment (other than multimeters and vtvm's) outputs directly to a transistor circuit; use a coupling capacitor.

2. Make test equipment connections with care so that shorts will not be caused by exposed test equipment connectors. Tape or sleeve (spaghetti) test prods or clips as necessary to leave as little exposed as needed to make contact to the circuit under test.

Caution: (cont)

3. The power supply PP-3940/U is recommended as the source of power when servicing the AM-4306/GRC. Observe the power supply polarity. The AM-4306/GRC and the receiver-transmitter circuitry could be damaged with reversed polarity.

4. The transistorized equipment must be turned off before switching the power supply on or off. The transient voltages, created by switching the power supply on or off, may exceed the "punch-through" rating of the transistors. Also, make sure that a normal load (such as an antenna, a 50-ohm terminal wattmeter, or a speaker in the case of the receiver) is connected to the transistorized equipment before applying power.

3-3. Test Equipment Required

The following chart lists the test equipment required for performing the operational test (para 3-5c) and/or the troubleshooting procedures (para 3-6). The associated technical manuals for the test equipment are also listed.

Item	Technical Manual
Power Supply PP-3940/U or equivalent (2 each) (to provide regulated, filtered, and metered voltage and current: 20v - 30vdc 0.5 -3.0 amperes)	TM 11-6130-247-15
Differential VTVM AN/USM-98A	
Wattmeter AN/URM-120 (2 each)	

Item	Technical Manual
Dummy Load DA-75 Multimeter ME-26B/U	TM 11-6625-200-12
RF Voltmeter HP 410B	
Receiver-Transmitter, Radio RT-505/PRC-25	TM 11-5820-398-12
Receiver-Transmitter RT-841(XE-1)/PRC-77	POMM 11-5820-667-35

3-4. Additional Equipment Required

The following chart lists the additional equipment required for performing the operational test (para 3-5c) and/or the troubleshooting procedures (para 3-6). The associated technical manuals are also listed. The asterisk (*) after an item indicates that the maintenance personnel must fabricate that item as shown in figure 3-1. Figure 3-1 illustrates the recommended method, but an equivalent substitute can be used.

Item	Technical Manual
Handset H-138/U	TM 11-5820-398-12
Test Cable No. 1*	(fig. 3-1)
Test Cable No. 2*	(fig. 3-1)
Test Cable No. 3*	(fig. 3-1)
Voltage divider*	(fig. 3-1)

3-5. Operational Test Procedure

a. General. The equipment operational check list is a detailed procedure to check the serviceability of the AM-4306/GRC. If the corrective measure does not locate

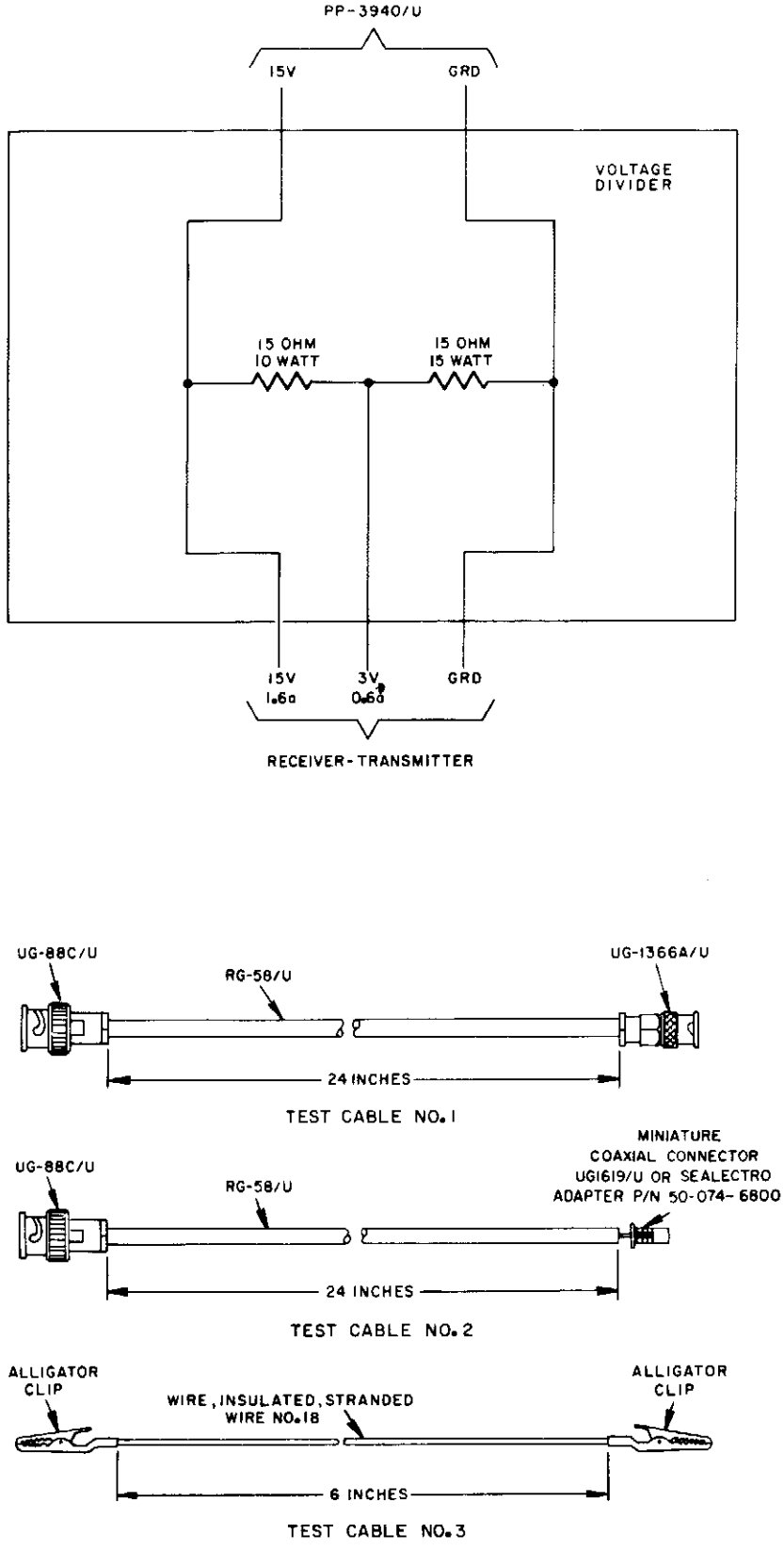

Figure 3-1. Additional equipment fabrication layout

the problem, refer to the troubleshooting chart, paragraph 3-6c, for further corrective measures.

b. Procedure. Check the operation of the equipment as shown in the checklist below in the order given. Set up the test equipment as shown in figure 3-2 and allow it to warm up for 10 minutes. It is important that the receiver-transmitter used as part of the test equipment is known to be serviceable.

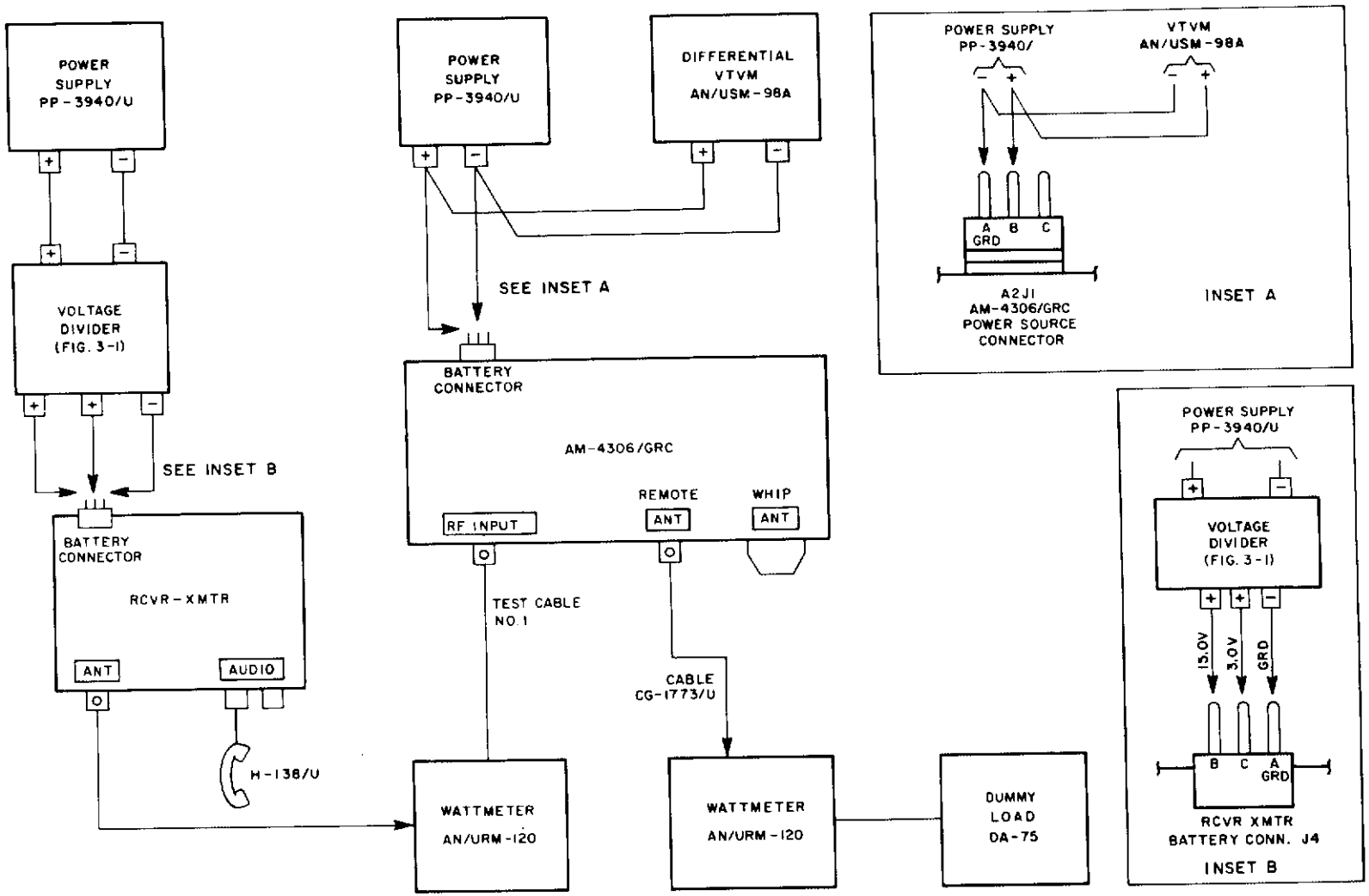

Figure 3-2. Operational test, block diagram

c. Operational Checklist for RF Amplifier AM-4306/GRC

Step	Action	Normal indication	Corrective measures
1	Position the AM-4306/GRC POWER switch to OFF.		
2	Position the receiver-transmitter FUNCTION switch to OFF.		
3	Adjust the PP-3940/U connected to the AM-4306/GRC to 24 vdc; adjust the PP-3940/U connected to the receiver-transmitter to 15 volts. Adjust the filament potentiometer for 3.0 volts at the center tap of the voltage divider.		
4	Depress the BAT TEST switch on the AM-4306/GRC front panel.	TUNE indicator reads on or above the 3/4 scale from the left. (In the middle of the green area)	Check cable connections. Check fuse 2AF1 Check the AM-4306/GRC internal wiring for continuity.

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
5	Position the AM-4306/GRC BAND switch to 30-52.		
6	Position the receiver-transmitter FUNCTION switch to ON; adjust the receiver-transmitter for a 30 MHz signal		
7	Depress the push-to-talk switch on the H-138/U and adjust the filament potentiometer so the AN/URM-120 connected to the AM-4306/GRC RF INPUT connector indicates Adjust the WHIP TUNE control for a maximum indication on the front panel tune meter.	The AN/URM-120 connected to the 50-ohm remote ANT connector indicates a minimum of 80% of the input AN/URM-120 connected to the AM-4306/GRC RF INPUT connector.	Check the continuity of the signal path for a "high resistance". (Maximum allowable resistance is 0.5 ohm)

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
8	Unkey the Receiver-Transmitter and position the AM-4306/GRC Power switch to on.		
9	Depress the push-to-talk switch on the H-138/U. Refine the WHIP TUNE setting for a maximum indication on the tune meter, if necessary. Release switch after obtaining reading.	The AN/URM-120 connected to the remote ANT connector indicates a minimum of 22 watts and maximum of 28 watts	Readjust WHIP TUNE control (para 4-3). Check test equipment cable connections. Check for 24 ± 0 vdc B+ Refer to the trouble-shooting chart (para 3-6c).
10	Adjust the receiver-transmitter to produce a 42 MHz signal.		

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
11	Depress the push-to-talk switch on the H-138/U. Adjust the filament potentiometer for a one watt reading on the input meter. Refine the amplifier tuning as necessary. Release switch after indication is obtained.	Same as Step 9	Same as Step 9
12	Repeat steps 10 and 11 using 52 MHz in step 10.	Same as step 9	Same as step 9
13	Position the AM-4306/GRC POWER switch to OFF.		
14	Position the AM-4306/GRC BAND switch to 53-75.		
15	Adjust the receiver-transmitter to produce a 53 MHz signal.		

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
16	Depress the push-to-talk switch on the H-138/U and adjust the filament potentiometer for 1.0 watt indicated on the AN/URM 120 connected to the AM-4306/GRC RF INPUT connector. Adjust the WHIP TUNE control for a maximum indication on the front panel meter. Release switch after obtaining reading.	The AN/URM-120 connected to the remote ANT connector indicates a minimum of 80% of the input power	Check continuity of the signal path for a "high resistance"
17	Position the AM-4306/GRC POWER switch to ON.		

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
18	Depress the push-to-talk switch on the H-138/U. Refine the WHIP TUNE setting for maximum indication on the tune meter, if necessary. Release switch after obtaining reading	The AN/URM-120 connected to the remote ANT connector indicates a minimum of 22 watts and maximum of 28 watts	Readjust WHIP TUNE control Check test equipment cable connections. Check for 24 ± 0 vdc B+. Refer to the trouble-shooting chart (para 3-6c).
19	Adjust the receiver-transmitter to produce a 65 MHz signal and then repeat step 16, 17 and 18	Same as step 16 and 18	Same as step 16 and 18
20	Adjust the receiver-transmitter to produce a 76 MHz signal and then repeat step 16, 17 and 18.	Same as step 16 and 18	Same as step 16 and 18

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
21	Position the AM-4306/GRC POWER switch to OFF		
22	Disconnect the AN/URM-120 on the AM-4306/GRC at the RF INPUT connector and attach a 3-foot whip antenna to the whip ANT connector.		
23	Set up a nearby receiver-transmitter (known to be good) to receive a 30 MHz test signal.		

c. Operational Checklist for RF Amplifier AM-4306/GRC (cont)

Step	Action	Normal indication	Corrective measures
24	Adjust the AM-4306/GRC under test and associated receiver-transmitter to transmit a 30 MHz voice test signal	Voice test signal is heard loud and clear at nearby receiver-transmitter	Check all cable and antenna connections. Readjust WHIP TUNE control Higher level maintenance required
25	Adjust the nearby receiver-transmitter to transmit a 30 MHz voice test signal	Voice test signal is heard loud and clear at the receiver-transmitter and the AM-4306/GRC under test	Same as step 24
26	Repeat steps 23, 24, and 25 in sequence for each of the following frequencies: 42 MHz, 52 MHz, 53 MHz, 65 MHz, and 76 MHz.	Same as step 24 for transmitting and step 25 for receiving	Same as step 24

3-6. Troubleshooting Procedure

a. General. The procedures outlined in the chart below will help to locate troubles in the AM-4306/GRC. This chart lists symptoms that the repairman observes while making an operational test (para 3-5). Once a trouble has been localized to a module, replace it and perform the operational check (para 3-5).

b. Use of the Chart. The troubleshooting chart is designed to supplement the operational check when a trouble symptom is observed.

CAUTION: - Disconnect all test equipment from amplifier before making continuity measurements.

c. Troubleshooting Chart for AM-4306 (XE-1)/GRC

Item	Indication	Probable trouble	Procedure
1	Fuse A2F1 blows when power is applied	a. Short circuit in internal wiring	a. Check for shorts in internal wiring
2	With PWR switch OFF, no rf power is indicated on the AN/URM-120 at the 50-ohm remote ANT connector when the receiver transmitter signal is applied	a. Set not tuned	a. Adjust WHIP TUNE
		b. Improper cable connections	b. Check all cable connections
		c. Short to ground.	c. Check continuity from ANT. connector A1J2 to ground. (Should read open)
		d. Open Circuit	d. Check continutiy from A1J4 (input connector) to ANT. connector A1J2. If no continuity proceed to e.

c. Troubleshooting Chart for AM-4306(XE-1)/GRC (cont.)

Item	Indication	Probable Trouble	Procedure
2		e. Relays A2K1 and/or A2K3 defective	e. Check continuity through relay contacts.
		f. A4 contact defective	f. Check continuity from A4 terminal to ANT connector A1J2.
		g. Open circuit in A3 module	g. Measure continuity from A2K1-B2 to A4 terminal 1. If module is defective higher maintenance level is required.
3	With PWR switch OFF, the rf output is less than 80% of the rf signal applied.	a. Set not tuned.	a. Adjust WHIP TUNE control

c. Troubleshooting Chart for AM-4306 (XE-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
3 (cont)		b. High resistance contacts in relays A2K1 and/or A2K3	b. Check continuity (contact resistance should be less than 0.5 ohm).
		c. High resistance in A4 module	c. Check continuity from A4 Terminal 1 to ANT connector A1J2. (0.5 ohm or less).
		d. Defective A3 module	d. Determine by the elimination of all of the above probable troubles. Removal or replacement of A3 module is authorized at General Support Level Maintenance or higher only.

c. Troubleshooting Chart for AM-4306 (X3-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
4	Set does not key with PWR switch ON and input applied	a. Defective A8 module	a. Check for one volt or less (dc) to ground from pin 8 of module A7
5	With PWR switch ON no rf output is indicated on the AN/URM-120 at the 50 ohm ANT connector when the receiver-transmitter test rf signal is applied; Bandswitch in either 30-52 or 53-75 position according to test frequency	a. Defective wiring between A5J3 or A5J4 and A1J2.	a. Disconnect A5J3 or A5J4 depending on the bandswitch position. Connect test cable No. 3 between A2J1 (pin c) and chassis ground. Connect the receiver-transmitter rf signal output to A5P3 or A5P4 using test cable No.2, depending on the bandswitch position. Check to see that the output is at least 80% as great as the input

c. Troubleshooting Chart for AM-4306 (X3-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
5 (cont)			a. (cont) (Set must be properly tuned).

NOTE:

If the AN/URM-120 indication is correct at the 50 ohm remote ANT connector in procedure a above, omit probable troubles b, c, d and e and continue with probable trouble f. If the URM-120 indication is incorrect at the 50 ohm remote ANT connector, continue with b below.

	b. Defective bandwidth A1S3A	b. Check continuity of A1S3A.
	c. Defective relay A2K1	c. Check continuity of A2K1
	d. Defective connector A1J2	d. Check continuity of A1J2
	e. Defective A3 module	e. Determined by elimination of all other possible troubles. Removal

c. Troubleshooting Chart for AM-4306(XE-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
5 (cont)			e. Cont. or replacement is authorized at General Support Level Maintenance or higher only.

NOTE:

Remove test cables No. 2 and No. 3 reconnect A5P3 and/or A5P4. Connect the receiver-transmitter as shown in figure 3-2.

	f. Defective relay A2K3	f. Check continuity of A2K3
	g. Defective A10 module.	g. Check A9 terminal 1 for signal voltage.
	h. Defective A9 module.	h. Check A9 terminal 2 for output voltage.

c. Troubleshooting Chart for AM-4306 (XE-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
5 (cont)		i. Defective A7 Module.	i. Check for signal voltage at input to A6 module. If defective, higher level maintenance required. Removal or replacement is authorized at General Support Level Maintenance, or higher only.

c. Troubleshooting Chart for AM-4306 (XE-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
5 (cont)		j. Defective filter	j. Check filter by substitution.
		k. Defective A6 Module	k. Check A6 module by substitution
6	With PWR switch on and input applied, output power is too high. (greater than 28 watts)	a. A7 module out of adjustment	a. Higher level maintenance required. Removal or replacement is authorized at General Support Level Maintenance or higher only.
7	With PWR switch ON and input applied output power is less than 22 watts but greater than 20 watts.	a. Low B+ to set	a. Check B+ 24.0 VDC with a VTVM between pin B of A2J1 and ground. (fig. 3-2).
		b. A7 module not adjusted properly	b. Higher Level maintenance required. Removal or replacement

c. Troubleshooting Chart for AM-4306 (XE-1)/GRC (cont)

Item	Indication	Probable Trouble	Procedure
7 (cont)			b. Cont. authorized at General Support Level Maintenance or higher only.
8	With PWR switch ON and adjust input applied set keys, but power output is very low.	a. Defective A6 module	a. See detailed procedure below:

Checkout of A6 module:

(1) Set the filament potentiometer in the test setup for zero (0) volts to the RT-505.

(2) Using Test Cable No. 2, connect the output wattmeter to A5P1 or A5P2 according to the bandswitch position.

(3) Use Test Cable No. 3 to ground A2J1-C (connect the jumper between pins C and A).

(4) Key the receiver-transmitter and gradually increase the filament voltage to normal value by changing the filament potentiometer setting, Monitor the output indication. If it is normal, the A6 module is good. If it still remains low, measure the input voltage to TP1 of the A6 module. voltage appears normal for the particular test frequency -

c. Troubleshooting Chart for AM-4306/GRC (cont)

Item	Indication	Probable trouble	Procedure
	(4) cont. the A6 module is determined to be good, refer to Item 5 for additional checks. Remove Test Cable No. 3.		
9	Front panel TUNE indicator needle does not deflect in a transmit condition; BAT TEST switch depressed indicator is correct.	a. WHIP TUNE control improperly adjusted. b. Defective directional wattmeter module A3.	a. Adjust WHIP TUNE control . b. Determined by elimination of all other probable troubles. If defective, higher level maintenance required. Remove or replacement is authorized by General Support Level Maintenance only.
10	Front panel TUNE indicator does not deflect when	a. Defective BAT TEST switch A1S4.	a. Check continuity of A1S4 normally open contacts.

c. Troubleshooting Chart for AM-4306/GRC (cont)

Item	Indication	Probable trouble	Procedure
10 (cont)	proper indication is obtained in the transmit condition.		
11	Front panel TUNE indicator needle does not deflect at all.	a. No 24 vdc power source.	a. Check connection of 24 vdc power source.
		b. Defective fuse A2F1.	b. Check continuity of A2F1.
		c. Defective BAT TEST switch A1S4.	c. Check continuity of A1S4.
		d. Defective directional wattmeter module A3.	d. Determined by elimination of all other probable troubles. If defective, higher level maintenance required. Replacement or removal

c. Troubleshooting Chart for AM-4306/GRC (cont)

Item	Indication	Probable Trouble	Procedure
11 (cont)			is authorized by General Support Level Maintenance only.
		e. Defective TUNE indicator meter A1M1	e. Check meter A1M1 by substitution (para 3-18).

Section II. DIRECT SUPPORT REPAIRS

3-7. Scope of Direct Support Repairs

a. The direct support repairman may remove and replace any component of the AM-4306/GRC that does not require re-alignment of the set. This includes all components except the directional wattmeter module A3, and the automatic level control module A7,, which are to be replaced at general support level.

b. Paragraphs 3-9 through 3-13 contain instructions for removing and replacing the modules of the AM-4306/GRC. Paragraphs 3-14 through 3-17 are instructions for the minor components that cannot be replaced using normal procedures. Figure 3-5 is the unit wiring diagram.

3-8. Moving the Front Panel A1 away from the Chassis A2

The compact nature of the AM-4306/GRC requires moving the front panel away from the chassis for ease of maintenance when certain modules are to be replaced. (fig. 3-3 and fig. 3-4).

a. Moving the Front Panel A1

(1) Turn the WHIP TUNE control fully clockwise (fig. 3-3).

(2) Loosen the socket-head set screws at the WHIP TUNE control shaft end of the right-angled drive shaft (fig. 3-3).

Note: Do not alter the position of the WHIP TUNE control shaft or the antenna matching network after removing the control knob.

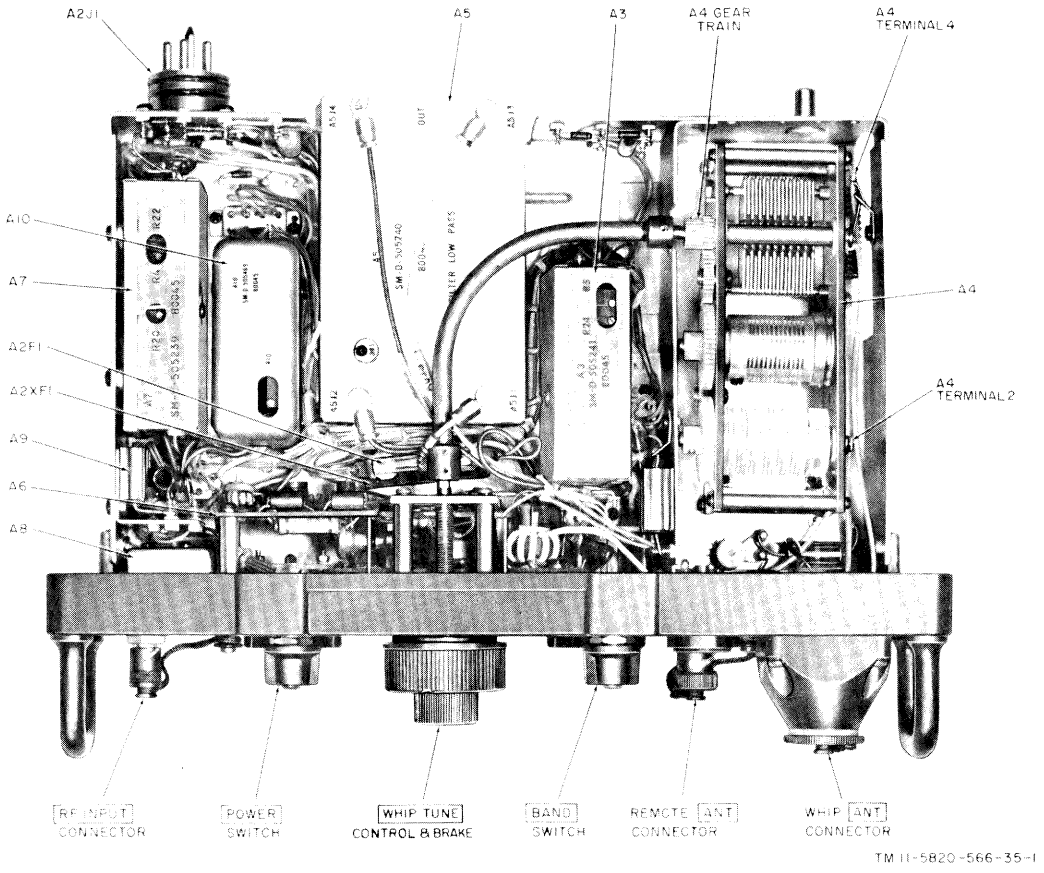

Figure 3-3. AM-4306/GRC parts location, top view.

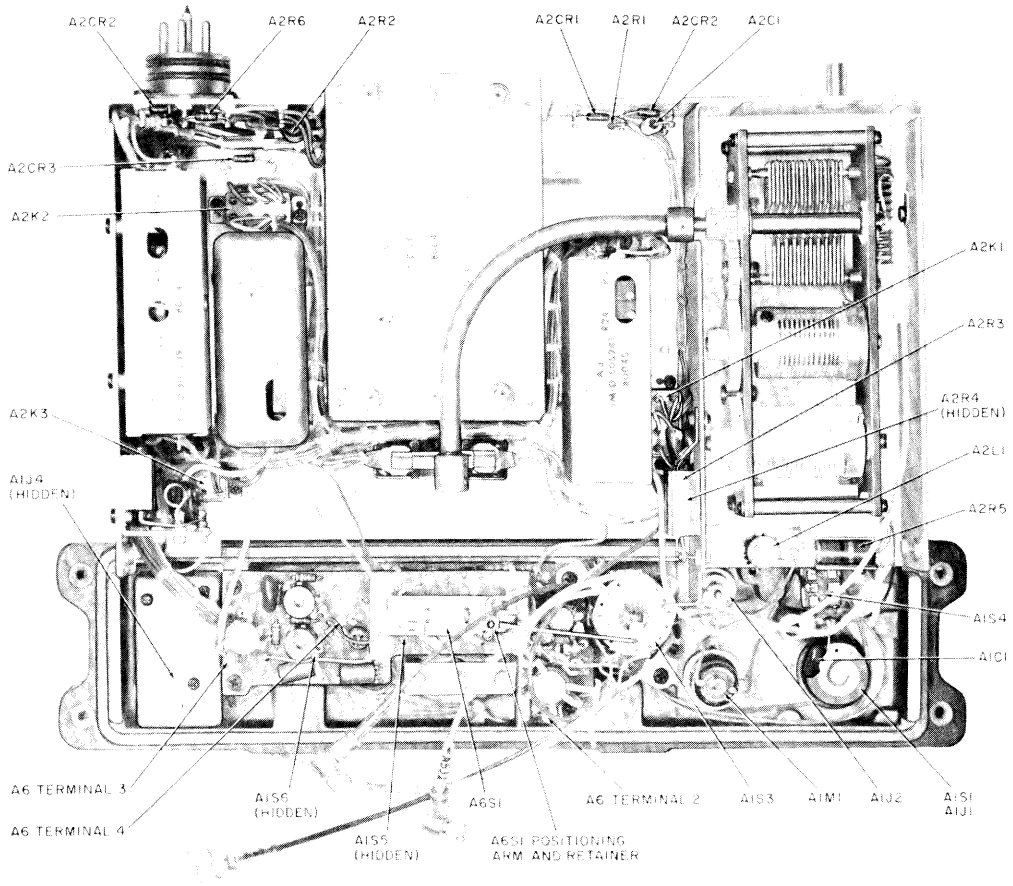

Figure 3-4. AM-4306/GRC parts location, top view, front panel moved.

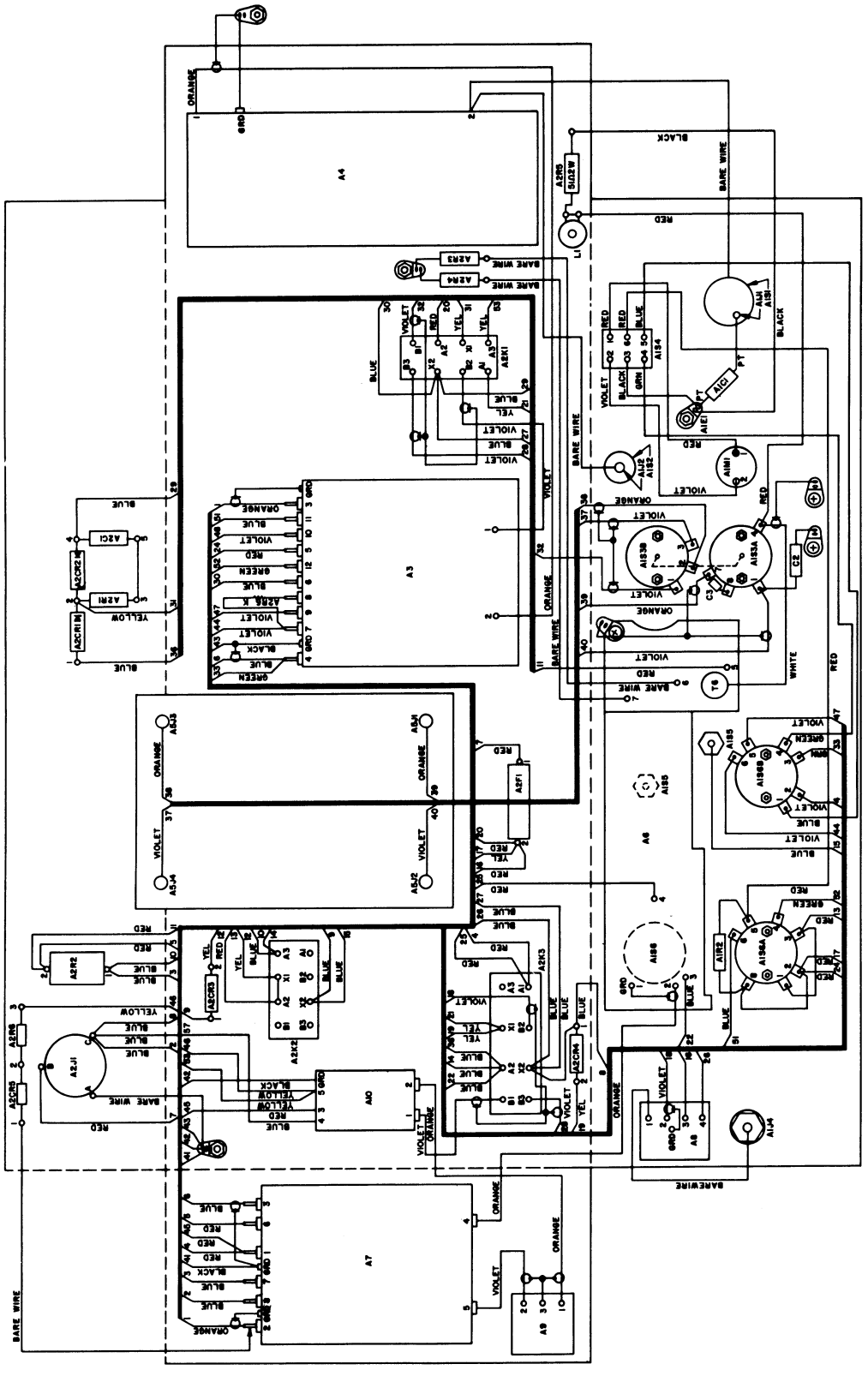

Figure 3-5. AM-4306/GRC wiring diagram

(3) Unsolder the wires connected to the antenna matching network module A4 terminal 2 (fig.3-3).

(4) Unsolder two wires from A2R3 and A2R4 and mark each wire.

(5) Disconnect four coaxial connectors from the low pass filter module A5 (fig. 3-3).

(6) Position the AM-4306/GRC on a pedestal about 2 inches in height so that just the chassis is resting on the pedestal.

(7) Remove four mounting screws that attach the front panel A1 to the chassis A2 (fig. 3-3).

(8) Remove shield tab mounting screw located between A1M1 and A1S3 inside set.

(9) Move the front panel by tilting the top of it out away from the chassis. Continue to tilt the front panel until the handles are resting on the table (fig. 3-4).

b. Repositioning of the Front Panel A1

(1) Carefully place the front panel in the normal position and at the same time guide the WHIP TUNE control shaft into the right-angled drive coupler.

(2) Replace four mounting screws securing the front panel to the chassis and shield tab screw.

(3) Connect four coaxial cable connectors to the low pass filter module A5.

(4) Solder the two wires to the antenna matching network module A4 terminal 2 (fig. 3-5).

(5) Solder two wires to A2R3 and A2E4 as marked in a (4) above.

(6) Tighten the socket-head set screws on the right-angled drive shaft (fig. 3-3).

3-9. Removal and Replacement of the RF Keying Circuit Module A8

(fig. 3-4)

a. Removal

(1) Move the front panel A1 away from the chassis as detailed in paragraph 3-8a.

(2) Remove three screws securing the module cover and remove the module cover.

(3) Unsolder one coaxial cable and shield and wires from terminals 3 and 4, and bare wire from terminal 2, tag each wire.

(4) Remove three mounting posts securing the module to the front panel.

b. Replacement

(1) Secure the module to the front panel with the three mounting posts.

(2) Resolder the coaxial cable and shield and the wires to terminals 3 and 4.

(3) Replace the module cover and secure it with the three screws.

(4) Replace the front panel A1 in the normal position as detailed in paragraph 3-8b.

3-10. Removal and Replacement of the Driver-Final Module A6 (fig. 3-4)

a. Removal

(1) Adjust the WHIP TUNE control fully clockwise.

(2) Remove the WHIP TUNE control knob.

(3) Remove four spanner nuts and seals securing A6Q3, A6Q4, A6Q5, and A6Q6 to the front panel.

(4) Move the front panel away from the chassis as outlined in paragraph 3-8d, omitting step 1 which has been accomplished already.

(5) Remove the retainer holding the positioning arm to the transformer tap switch A6S1 (fig. 3-4).

(6) Remove the positioning arm from A6S1 (fig. 3-4).

(7) Unsolder and tag three wires from module A6 terminals 2, 3, and 4 (fig. 3-4).

(8) Unsolder coaxial cable from terminal 1 and the coaxial cable shield from the ground terminal.

(9) Unsolder the coaxial cable from the BAND switch A1S3B pin 3 and its sheild from the ground lug (fig. 3-4).

(10) Remove four mounting screws securing the module to the front panel.

(11) Carefully lift the module up and away from the front panel.

b. Replacement

(1) Apply wakefield compound to studs and heat sinks.

(2) Insure that the transistor seals are positioned correctly.

(3) Carefully place the module in position on the front panel and align the mounting holes.

(4) Replace four mounting screws securing the module to the front panel.

(5) Resolder the three tagged wires to module A6 terminals 2, 3, and 4.

(6) Resolder the coaxial cable to terminal 1 and its shield to the ground terminal.

(7) Resolder the coaxial cable to the BAND switch A1S3B pin 3 and resolder its shield to the ground lug.

(8) Replace the positioning arm between A6S1 and the BAND switch A1S3.

(9) Replace the retainer securing the positioning arm to A6S1.

(10) Replace the front panel A1 in the normal position as detailed in paragraph 3-8b.

Note: Be sure not to turn transistors A6Q5, and A6Q6 while tightening the spanner nuts.

(11) Replace four spanner nuts and seals securing A6Q3, A6Q4, A6Q5, and A6Q6 to the front panel.

(12) Replace the WHIP TUNE control knob.

3-11. Removal and Replacement of the Low Pass Filter Module A5

(fig. 3-3)

a. Removal

(1) Disconnect four miniature coaxial connectors A5P1, A5P2, A5P3, and A5P4 from the module. Note color and location of connectors on A5 (fig. 3-5).

(2) Position the AM-4306/GRC on edge.

(3) From the under side of the chassis, remove four screws securing the module to the chassis.

(4) Slip the module out the rear of the chassis and tilt the trailing edge into the hole on the under side of the chassis so that A5J3 passes under the right-angled drive shaft.

b. Replacement

(1) Slide the new module in from the rear of the chassis and tilt it through the hole in the under side of the chassis so that A5J3 passes under the right-angled drive shaft.

(2) Replace the four screws through the under side of the chassis securing the module.

(3) Connect the four miniature coaxial connectors A5P1, A5P2, A5P3, and A5P4 to the module (fig. 3-5).

3-12. Removal and replacement of the Antenna Matching Network Module A4

(fig. 3-3 and 3-4)

a. Removal

(1) From the underside of the chassis, remove the four screws securing the module to the chassis.

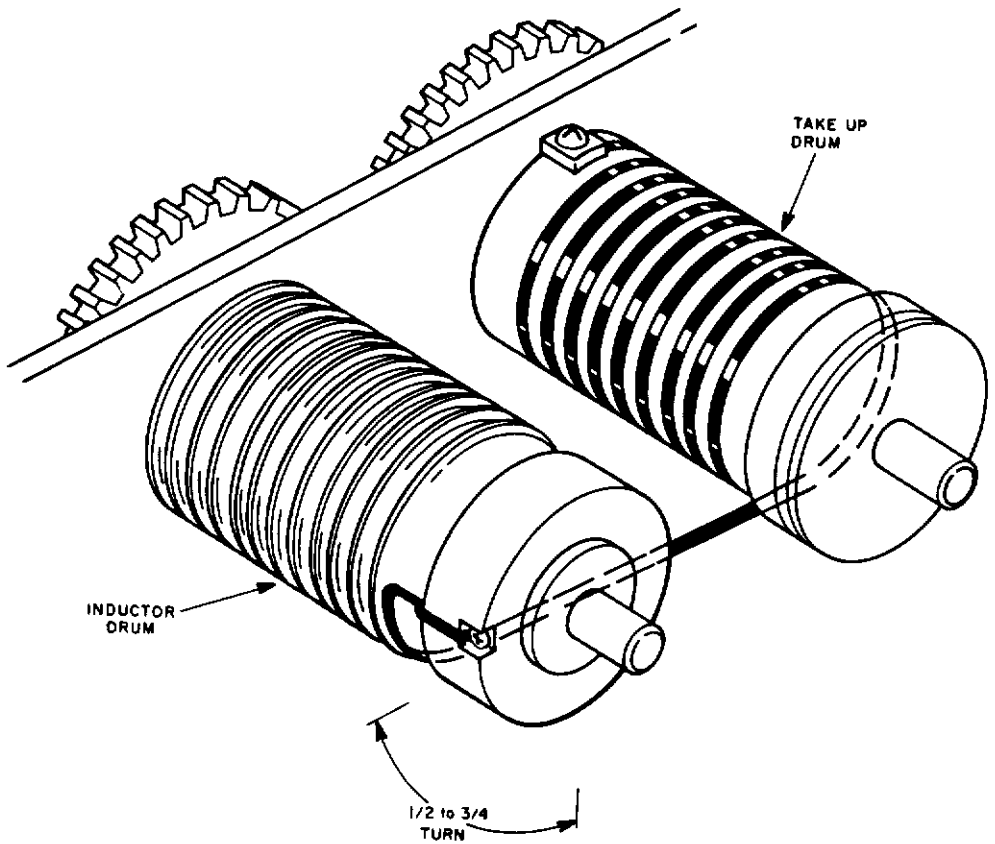

Figure 3-6. Antenna matching network module A4, inductor drum position upon installation

(2) Loosen the set screws at the module end of the right-angled drive shaft and remove the drive shaft (fig. 3-4).

(3) Unsolder bare wire attached to ground Lug.

(4) Lift the module partially out of the chassis so that terminal 1 of the module is accessible (fig. 3-4).

(5) Unsolder the coaxial cable from terminal 1 of the module, cable shield from the ground lug and wires, (2), attached to A4 terminal 2. (fig. 3-4).

(6) Completely remove the module from the chassis.

b. Replacement

Caution: The antenna matching network module A4 has no mechanical stops on the variable inductor A4L2 drums when it is not connected to the WHIP TUNE control knob. Be certain not to turn either drum too far in one direction; if the ribbon conductor is completely unwound from either drum, the conductor may break.

(1) Position the inductor drum so 1/2 of a turn of the conductor is on the drum (fig. 3-6).

(2) Place the module partially in the chassis, leaving terminal 1 of the module accessible.

(3) Solder the coaxial cable to terminal 1 of the module and solder the cable shield and bare wires to the ground lug.

(4) Rotate Front Panel WHIP TUNE Knob fully clockwise.

(5) Place the module completely in chassis.

(6) Solder wires, (2), to A4 terminal 2.

(7) Replace the right-angled drive shaft on module, rotating the A4 shaft slightly as necessary to align set screws and tighten the set screws. There should be a 1/2 ± 1/4 turn of the conductor on the drum.

(8) Replace four screws through the underside of the chassis to secure the module to the chassis.

3-13. Removal and Replacement of the Automatic Power Attenuator Module A10

a. Removal

(1) Remove four screws from the underside of the chassis securing module A10 to the chassis.

(2) Unsolder the five wires from the module terminal posts and tag the wires.

(3) Remove the two screws from the side of the chassis securing module A9 and move the module away from relay A2K3.

(4) Unsolder the coaxial cable and shield from module A9 and tag the cable.

(5) Unsolder the coaxial cable and shield from A2K3 and tag the cable.

(6) Remove module A10 from the chassis.

b. Replacement

(1) Position the module in the chassis.

(2) Solder the coaxial cable and shield to relay A2K3.

(3) Solder the coaxial cable and shield to module A9.

(4) Secure module A9 to the side of the chassis.

(5) Solder the five wires to the respective terminal posts on the module.

(6) Replace the four screws through the underside of the chassis securing the module.

3-14. Removal and Replacement of Relays A2K1 and A2K3 (fig. 3-4)

a. Removal of Relay A2K1

(1) From underneath chassis A2, remove two screws securing directional wattmeter module A3 to the chassis.

Caution: Do not cause any unnecessary stress or strain on the wires soldered to module A3; if necessary, cut the cable harness lacing to relieve any strain.

(2) Carefully lift module A3 up and away from A2K1.

(3) Proceed to remove relay A2K1 using normal methods.

b. Replacement of Relay A2K1

(1) Mount the relay and resolder all wires.

(2) Carefully replace module A3 in position and replace two screws through the chassis to secure it to the chassis.

(3) Replace any cable harness lacing that was cut in the removal procedure.

f Relay A2K3

the input attenuator module A9 as detailed
agraph 3-9a.
not cause any unnecessary stress or strain
module A7; if necessary, cut the cable
o relieve any strain.
d to remove relay using normal methods.

nt of Relay A2K3

e the relay in the chassis using normal
s.
tion the automatic level control module A7.
e the input attenuator module A9 as detailed
agraph 3-9b.
e any cable harness lacing that was cut in
moval procedure.
e two screws through the underside of chassis
ure module A7 to the chassis.

nd Replacement of Connectors
3-4)

nd replacement of A2J1. Remove and tag wires;
. Replace connector by reversing the procedures.
nd replacement of connector A1J1, A1J2, and
moving the front panel (para 3-8). After
is moved, normal methods are used to com-
s. Insure that no undue stress or strain
ring harness during the repairs. A1J4 also
of RF Keying Circuit A8.

c. Removal c

(1) Remove
in par

Caution: Do
on the wiring to
harness lacing t

(2) Proce

d. Replaceme

(1) Replac
method

(2) Reposi

(3) Replac
in par

(4) Replac
the re

(5) Replac
to sec

3-15. Removal a
(fig.

a. Removal a
remove connector

b. Removal a
A1J4 necessitate
the front panel
plete the repair
is put on the wi
requires removal

3-16. Removal and Replacement of Switches (fig. 3-4)

a. Switch A1S1 is an integral part of connector A1J1 and its repair is the same as for connector A1J1 (para 3-17b).

b. Removal and replacement of the thermal switch A1S5, and POWER switch A1S6 necessitate moving the front panel A11 (para 3-8) and removing the driver-final module A6 (para 3-11) to gain access to the parts so normal repair procedures may be used.

c. Removal and replacement of the BAT TEST switch A1S4 and the BAND switch A153 necessitates moving the front panel A1 (para 3-8) to gain access to the switch so normal repair procedures may be used.

3-17. Removal and Replacement of TUNE Indicator A1M1 (fig. 3-4)

Removal and replacement of TUNE indicator A1M1 necessitates moving the front panel A1 (para 3-8) to gain access to the indicator so normal repair procedures may be used.

3-18. Removal and Replacement of the Input Attenuator Module A9 (fig. 3-4)

a. Removal

(1) Unsolder and tag two coaxial cables and unsolder their shields from the ground terminal.

(2) Remove two screws from the side of the chassis securing the module.

b. Replacement

(1) Replace two screws through the side of the chassis securing the module to the chassis.

Section III. LUBRICATION

3-19. Scope of Lubrication

a. The lubrication of the AM-4306/GRC consists of applying lubricant to the WHIP TUNE control assembly, antenna matching network module A4 gear train, and all O-ring seals.

b. The WHIP TUNE control stop mechanism assembly requires yearly lubrication or whenever it is determined that the stop causes the WHIP TUNE control knob not to turn freely. One drop of lubricating oil, per MIL-L-6085A, on the threads of the assembly screw is all that is required (fig. 3-3). Use only enough oil to do the job; too much oil will cause a collection of dirt and dust.

c. The antenna matching network module A4 gear train needs to be lubricated yearly but only on the metal gears. One drop of lubricating oil, per MIL-L-6085A, is sufficient (fig. 3-3).

d. All of the O-ring seals should be coated with No. 55 grease, per MIL-L-4343, to aid in maintaining a waterproof seal. There is no set periodic interval for this task, but whenever maintenance is done that exposes O-rings, they should be checked to insure a thin coating of grease. The preformed O-rings between the battery box and the AM-4306/GRC receiver-transmitter combination and the O-rings on connector A2J1 will not need lubrication every time they are exposed; too much lubrication will only defeat the purpose intended.

CHAPTER 4

GENERAL SUPPORT MAINTENANCE

Section I. GENERAL SUPPORT MAINTENANCE

4-1. Scope of General Support Maintenance

General support maintenance includes those functions allocated to direct support maintenance (chapter 3). In addition, it includes removal, replacement, and alignment of the directional wattmeter module A3, and the automatic level control module A7.

4-2. Removal and Replacement of the Automatic Level Control Module A7

(fig. 3-4.)

Whenever an automatic level control module A7 is removed and a different one installed, the ALC alignment must be performed (para 4-5).

a. Removal

(1) From the underside of the chassis, remove two screws securing the module to the chassis (fig. 3-3).

(2) Unsolder the coaxial cables and the associated shields at terminals 1 and 2 of module A9, and terminals 1 and 6 of module A6 (fig. 3-5).

(3) Lift the module partially out of the chassis and unsolder the wires to the terminal posts and tag them (fig. 3-5).

(4) Completely remove the module.

b. Replacement

(1) Resolder the coaxial cables and the associated shields at terminals 1 and 2 of modules A9, and terminals 1 and 6 of module A6 (fig. 3-5).

(2) Resolder the tagged wires to the terminal posts on the module (fig. 3-5).

(3) Replace two screws from the underside of the chassis to secure the module to the chassis.

4-3. Removal and Replacement of the Directional Wattmeter Module A3

(fig. 3-4)

a. Removal

(1) From the underside of the chassis, remove the two screws securing the module to the chassis.

(2) Unsolder the wires from the module terminal posts and tag the wires (fig. 3-5).

(3) Unsolder coaxial cable from pin B or relay A2K1 (fig. 3-4) and unsolder the cable shield; tag the wires (fig. 3-5).

(4) Unsolder coaxial cable from A4 terminal 1 and unsolder the cable shield at the ground lug; tag the wires (fig. 3-5).

b. Replacement

(1) Solder coaxial cable to pin B2 of relay A2K1 and solder the shield.

(2) Solder coaxial cable to A4 terminal 1 and solder the cable shield to the ground lug.

(3) Reposition the front panel as outlined in paragraph 3-8b.

(4) Solder the wires to the terminal posts of the module.

(5) Replace two screws through the underside of the chassis securing the module to the chassis.

Section II. GENERAL SUPPORT ALIGNMENT

4-4. Scope of General Support Alignment

a. General support alignment consists of aligning the automatic level control module A7, and the directional wattmeter module A3. The A3 and A7 alignments should be performed whenever either module is replaced.

b. The test equipment required is the same as listed for the operational check in paragraphs 3-3 and 3-4 and the alignment setup is the same as in figure 3-2.

4-5. A7 and A3 Module Alignments

Note: Only use Receiver-Transmitter RT-505/PRC-25 for operational test.

b. Connect negative (-) point of Power Supply, PP-3940/U to pin C of A2J1 on unit being tested with Test Cable No. 3 (fig. 3-1).

c. Adjust the PP-3940/U connected to the receiver-transmitter to 15 volts; position the filament potentiometer for 3 volts at the center tap of the voltage divider.

d. Adjust the pP-3940/U connected to the AM-4306/GRC to 24.0 volts.

e. Adjust the receiver-transmitter to produce a 53 MHz signal.

f. Position AM-4306/GRC BAND switch in accordance with test frequency.

g. Turn power switch on amplifier to OFF.

h. Adjust A3R5 for a full scale indication of the tune meter.

i. Adjust the WHIP TUNE control for best peak on tune meter with the RT-505 keyed.

j. Unkey the RT-505 and adjust the filament potentiometer for zero volts.

Caution: In the following steps do not allow the output power to exceed 28 watts. If this output level is reached before the input power has reached 1 watt, reduce the output level by adjusting A7R22.

k. Position AM-4306/GRC POWER switch to ON. Slowly adjust the potentiometer until an output is observed on the AN/URM-120 connected to the ANT connector of the AM-4306/GRC. Continue to adjust the potentiometer until 1 watt is indicated on the AN/URM-120 at the input.

l. When the 1 watt input level is reached with a safe output level, adjust A7R22 so that the AN/URM-120, at the ANT connector, reads 24 watts with the PP-3940/U connected to the AM-4306/GRC at 24.0 vdc. Adjust A3R24 for full scale indication of the tune meter.

m. Readjust PP-3940/U connected to the AM-4306/GRC to 20.0 vdc.

n. Adjust A7R20 so that the AN/URM-120, at the ANT connector reads 15 watts.

o. Resistors A7R22 and A7R20 will interact; therefore, repeat steps l, m, and n, until the desired results are obtained.

p. Turn Amplifier power switch to OFF, disconnect Test Cable No. 3.

q. Set PP-3940/U connected to the AM-4306/GRC to 24.0 vdc.

r. Set R-T unit to 42 MHz, amplifier BAND switch to 30-52.

s. Set PP-3940/U connected to the R-T unit to 15 vdc. Adjust the filament potentiometer for 3 volts at the Voltage Divider Center Tap.

t. Key R-T unit, and tune AM-4306/GRC for maximum indication.

u. Turn AM-4306/GRC power switch ON and adjust A7R4 counterclockwsie until RF output power just starts to decrease.