TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE MANUAL

COUPLER ANTENNA CU-2064/GRC-193A (NSN 5985-01-050-4869)

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 JANUARY 1986

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

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

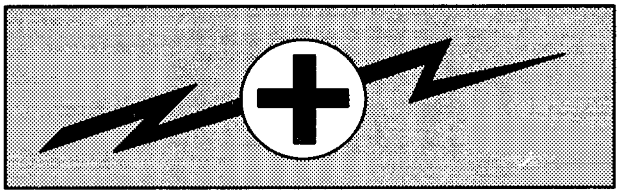
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

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

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technicians are aided by operators, they must be warned about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

Warning: Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause cleath under adverse conditions.

For Artificial Respiration, refer to FM 21–11.

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Unless specifically directed in this manual, do not replace components or make adjustments inside the equipment with any power supply turned on. Under certain conditions, dangerous potentials may exist in the power supplies when the power control is in the off position. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

FIRST AID

Each person engaged in electrical operations will be trained in first aid, particularly in the technique of mouth to mouth resuscitation and closed chest heart massage (FM 21-11).

The following warnings appear in this volume, and are repeated here for emphasis.

WARNING

A 3-wire (line, neutral, and safety ground) AC line power connections is required when operating the equipment. If a 3-wire safety grounded AC power receptacle is not available, a separate ground wire must be installed from the chassis ground to an earth ground. Without an adequate ground, the equipment chassis and frame will float to a dangerously high potential.

WARNING

Lethal voltage is used in the operational checkout of this unit. Death on contact may result if personnel fail to observe the following safety precautions. Remove watches and rings and exercise extreme caution when working inside the equipment throughout the remainder of this procedure.

WARNING

Prior to performing the following functions all electrical power is to be removed from the system. External power disconnected and a "MAINTENANCE IN PROGRESS" tag attached or power switches will be locked out to prevent inadvertent energizing of the system.

WARNING

Lifting heavy equipment incorrectly can cause serious injury. Do not try to lift more than 35 pounds by yourself. Get a helper. Bend legs while lifting. Don't support heavy weight with your back.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame, the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician.

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 psi and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.

SAFETY SUMMARY

Safety precautions for protection of personnel and equipment are included throughout this manual wherever a procedure or condition is described that requires special care. These precautions are listed below, as are the paragraph and page numbers of the procedures in which they are used.

WARNING

HIGH VOLTAGE is used in the operation of this equipment. DEATH ON CONTACT or severe electrical shock may result if personnel fail to observe safety precautions.

Learn the areas of high voltage in each piece of equipment. Be careful not to contact high voltage connections when installing or operating this equipment. (Page 3-5, para 3–10.)

CAUTION

The voltages at the antenna terminal J4 WHIP ANTENNA are very high during operation. Extreme caution must be taken to ensure that these terminals are at least 6 inches (15.24 cm) away from nearby objects such as cables, guy wires, brackets, or ground leads. (Page 1-10, para 1-30 and page 3-5, para 3-10.)

CAUTION

Be careful when moving assembly off its studs. Do not move assembly any further than is necessary to repair or replace a defective component, as excessive cable wire strain may damage the assembly or its component connections. (Page 3-11, para 3-22.)

CAUTION

Since the complete tuning cycle of the antenna coupler is dependent upon the error signals from the directional coupler and discriminators, adjustment of these circuits is critical. Maladjustment will result in loss of transmitting power through mistuning, and can result in damage to antenna coupler and transmitter. (Page 3-22, para 3-49.)

CAUTION

Do not use soldering guns on this equipment as they can induce damaging voltages into the components, and the very high temperatures they reach in a few seconds can damage the components and/or printed circuiit/wiring board. (Page 3-52, para 3–74.)

CAUTION

Be careful when moving board from its locating studs. Do not move board any further than is necessary to repair or replace a defective component, as excessive wire strain may damage the board components or connections. (Page 3-11, para 3-23.)

CAUTION

In the next step (setting servo home/and stop switch), do not rotate the spur gear past the end-stop switches. Damage to the switch actuator will occur is this is done. (Page 3-45, para 3-58.)

WARNING

Should mission requirements necessitate operation of the transmitter in the lower frequency range, it is possible to receive minor RF shocks and/or burns from the radio set case, handset, or CWtelegraph key, when keying the transmitter. Increasing the output power of Radio Frequency Amplifier AM-6874/PRC-104 above the specified 20 watt level may also result in RF shocks and/or burns. Adjustments to the amplifier gain are not authorized by the operator. In order to reduce the possibility of receiving RF shocks and/or burns, not the following and take appropriate action, as required:

- Avoid contact with exposed metal parts on the radio set case, or telegraph key, when keying the transmitter.
- Badly scratched surfaces and exposed edges should be painted (para 4-11, Corrosion Control). Painted surfaces are good insulators against shock.
- When the radio set must be operated for an extended period of time at a single location, use of a grounding rod or counterpoise is recommended as a means of reducing the possibility of RF shocks and/or burns and improving radio performance.
- The likelihood of receiving shocks is greater in a humid or wet environment and when the operator is in direct contact with ground.

Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 January 1992

General Support Maintenance Manual

COUPLER, ANTENNA CU-2064/GRC-193A (NSN 5985-0HJ50-4869) (EIC: N/A)

TM 11-598-373-40-1, 15 January 1986, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a bar adjacent to the illustration identification number or by a miniature pointing hand.

Remove pages	*Insert pages*
A and B	A and B
E/(F blank)	E and F
0-1 and 1-0	0-1 and 1-0
i and ii	i and ii
A-1/(A-2 blank)	A-1/(A-2 blank)

2. File this change sheet in front of the manual for reference purposes.

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GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
00686

Distribution:

To be distributed in accordance with DA Form 12-51-E, block 1832, Direct Support/General Support Maintenance requirements for TM 11-5985-373-40-1.

Technical Manual

No. 11-5985-373-40-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 January 1986

GENERAL SUPPORT MAINTENANCE MANUAL

COUPLER ANTENNA CU-2064/GRC-193A (NSN 5985-01-050-4869) (EIC: N/A)

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 back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007.

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

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CHAPTER 0

GENERAL

0-1. SCOPE

This manual rovers general support maintenance for Coupler Antenna CU-2064-GRC-193A. This manual provides instructions for general support maintenance repair personnel. Throughout this manual CU-2064/GRC-193 should be CU-2064/GRC-193A.

0-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

0-3. 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 DA Pam 738-750, as contained in Maintenance Management Update.

b. *Reporting of Item and Packaging Discrepancies.* Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

c. *Transpotion Discrepancy Report (TDR) (SF361).* Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/ DLAR 4500.15.

0-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your equipment 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 or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ED-PH, Fort Monmouth, New Jersey 07703-6007. We'll send you a reply.

0-5. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have Preventive Maintenance Checks and Services (PMCS) performed before storing. When removing the equipment from administrative storage, the PMCS checks should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraph 2-4.

0-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

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

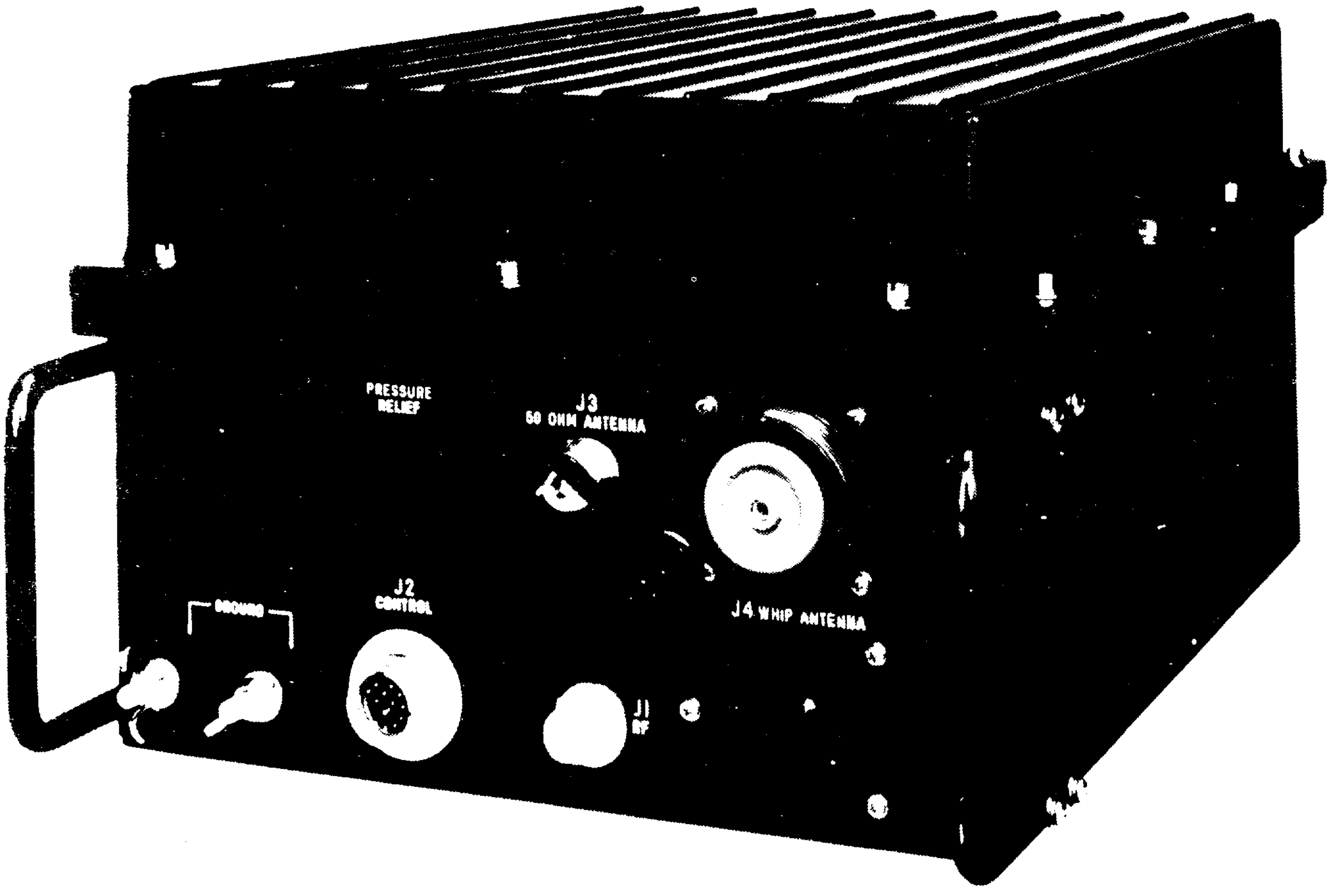


Figure 1–1. Antenna Coupler CU–2064/GRC-193

CHAPTER 1

GENERAL INSTRUCTIONS

SECTION 1

GENERAL DESCRIPTION AND SPECIFICATION DATA

1-1. INTRODUCTION

1-2. This manual provides intermediate maintenance instructions for Antenna Coupler CU-2064/GRC-193 (hereinafter called the coupler), procured under Contract N00039-75-C-0022 (see figure 1-1). Organizational maintenance for the coupler is covered in TM 11-5820-924-12. The coupler is part of Radio Set AN/GRC-193 and Radio Set AN/MRC-l38. Its relationship to other radio set components is shown in figures 1-2 and 1-3, and described in TM 11-5820-924-12.

1-3. FUNCTIONAL DESCRIPTION

1-4. The purpose of the coupler is to automatically match the impedance of a selected HF (high frequency) antenna to a 50-ohm transmission line, maintaining a VSWR (voltage standing wave ratio) of 1.4:1 or less over the frequency range of 2.0000 to 29.9999 MHz. The coupler will tune AT-1011 15- and 35-foot (4.6- and 10.67-meter) Whip Antennas, AS-2259 Antennas, and various doublet and long wire antennas. The coupler is a component of Radio Set AN/GRC-193 and Radio Set AN/MRC-138 and is used in conjunction with the components shown in figures 1-2 and 1-3.

l-5. PHYSICAL DESCRIPTION

1-6. The characteristics of the coupler are listed in table 1-1. Major assemblies and panel nomenclature are shown in figure 1-4.

1-7. The coupler is a single unit, approximately 7.75 inches (19.69 cm) high, 14.75 inches (34.47 cm) long, and 11.75 inches (29.85 cm) wide. The coupler tuning (impedance matching) elements, printed circuit or printed wiring boards, and subassemblies are plug-in types that mount directly to a single chassis. The chassis is mounted within the case. Front panel connectors facilitate RF (radio frequency) input (2AlJ1), control (2A1J2), antenna connection (2A1J3 or J4), and grounding connections to the coupler. Figure 1-5 identifies and shows the interconnection of the coupler components.

1-8. The coupler can be either vehicle-mounted (for example, as a component of the Radio Set AN/MRC-138) or used in a fixed site installation, as required. The coupler electronics compartment is watertight and submersible in fresh or salt water. The unit is equipped with a pressure relief valve and can be operated at altitudes up to 10,000 feet.

1-9. EQUIPMENT SUPPLIED

1-10. If the coupler has been issued as part of Radio Set AN/GRC- 193 or Radio Set AN/MRC- 138, the equipment supplied is as identified in figures 1-2 and 1-3.

1-11. SEMICONDUCTORS USED

1-12. Table 1-2 lists the semiconductors used in the various assemblies of the coupler.

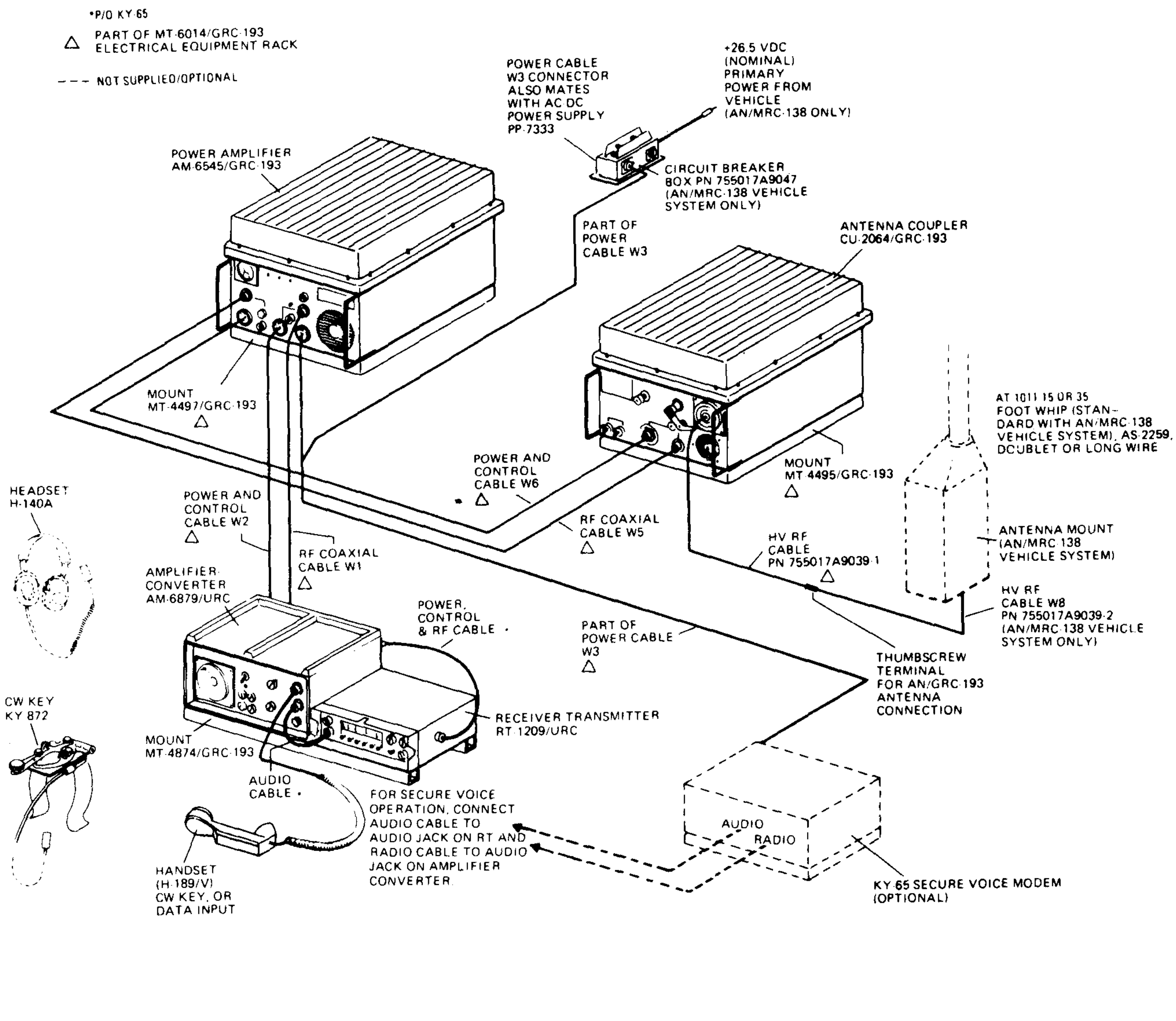


Figure 1-2. Radio Set AN/GRC-l93 and Radio Set AN/MRC-l38, Component and System Relationships

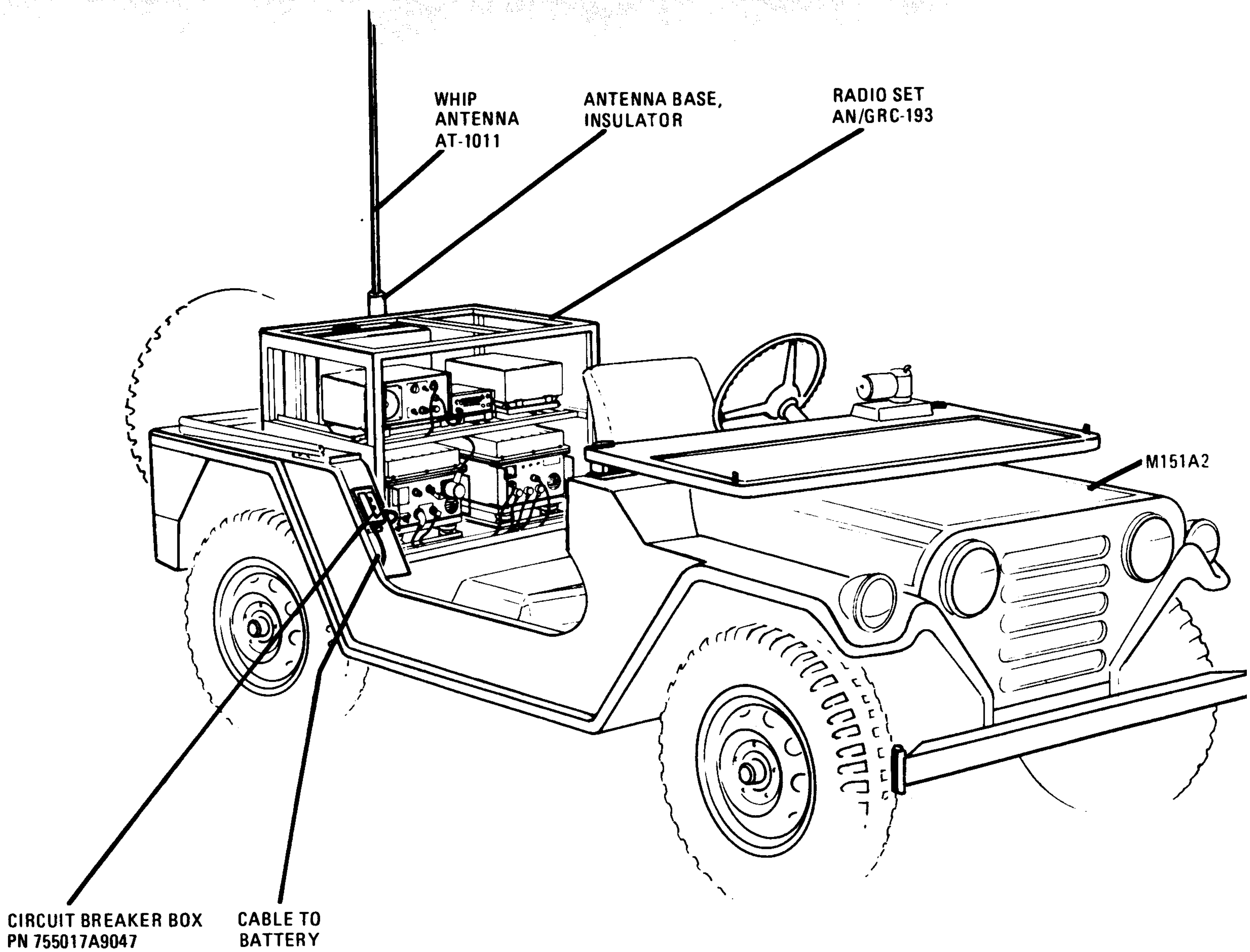


Figure 1-3. Radio Set AN/MRC-138 Component and System Relationships

TABLE 1-1. ANTENNA COUPLER CU-2064/GRC-193 CHARACTERISTICS

ITEM	CHARACTERISTIC
Dimensions	7.75 inches (19.69 cm)H x 14.75 inches (37.47 cm)L x 11.75 inches (29.85 cm)W
Weight	Approximately 41 lb (18.6 kg)
Primary power requirements	22 to 30 Vdc (26.5 Vdc nominal) 220 watts maximum (during tuning)
Frequency range	2.0000 to 29.9999 MHz
Input impedance	50 ohms
RF power handling capability	25 to 400 watts average and PEP
VSWR	1.4:1 maximum (when tuned)
Antenna type compatibility	AT-1011 15- to 35-foot (4.6- to 10.67-meter) Whip Antennas: AS-2259 Antennas; doublet and long wire antennas
Tuning time	Less than 5 seconds (2 to 3 seconds typical)
Operational mode	Fully automatic
Operating temperature range	-40°C (-40°F) to +55°C (+131°F)
Operating altitude	Up to 10,000 feet (contains an integral pressure relief valve)
Immersion operation	Three feet of water for 4 hours
Shock	20g’s for 11 milliseconds
Vibration	2.5g’s or .15 inch, double amplitude, 5 to 55 Hz
Cooling	By vaneaxial fan; forced air through an internal heat exchanger

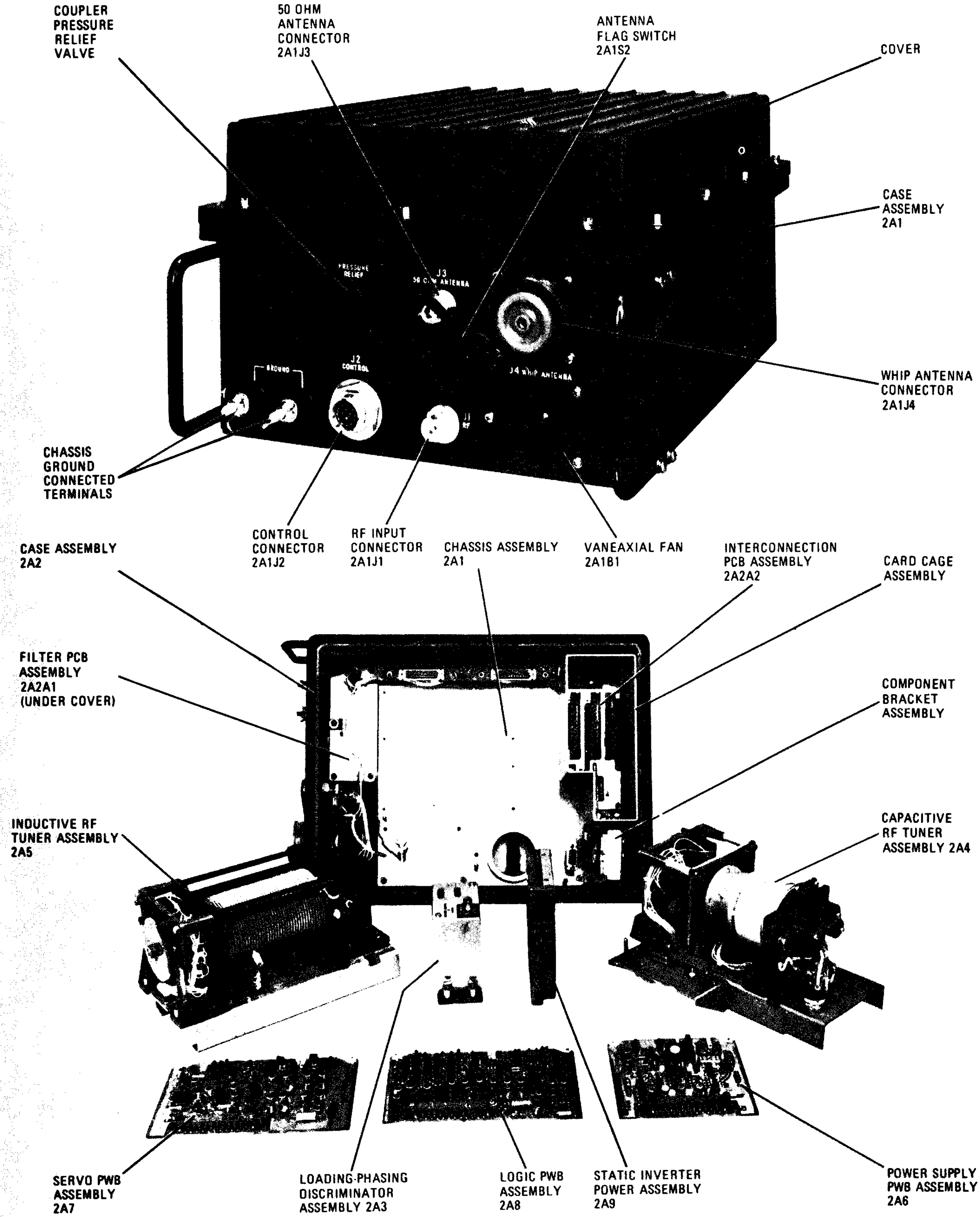


Figure 14. Antenna Coupler CU-2064/GRC-193, Major Assembly and Component Identification

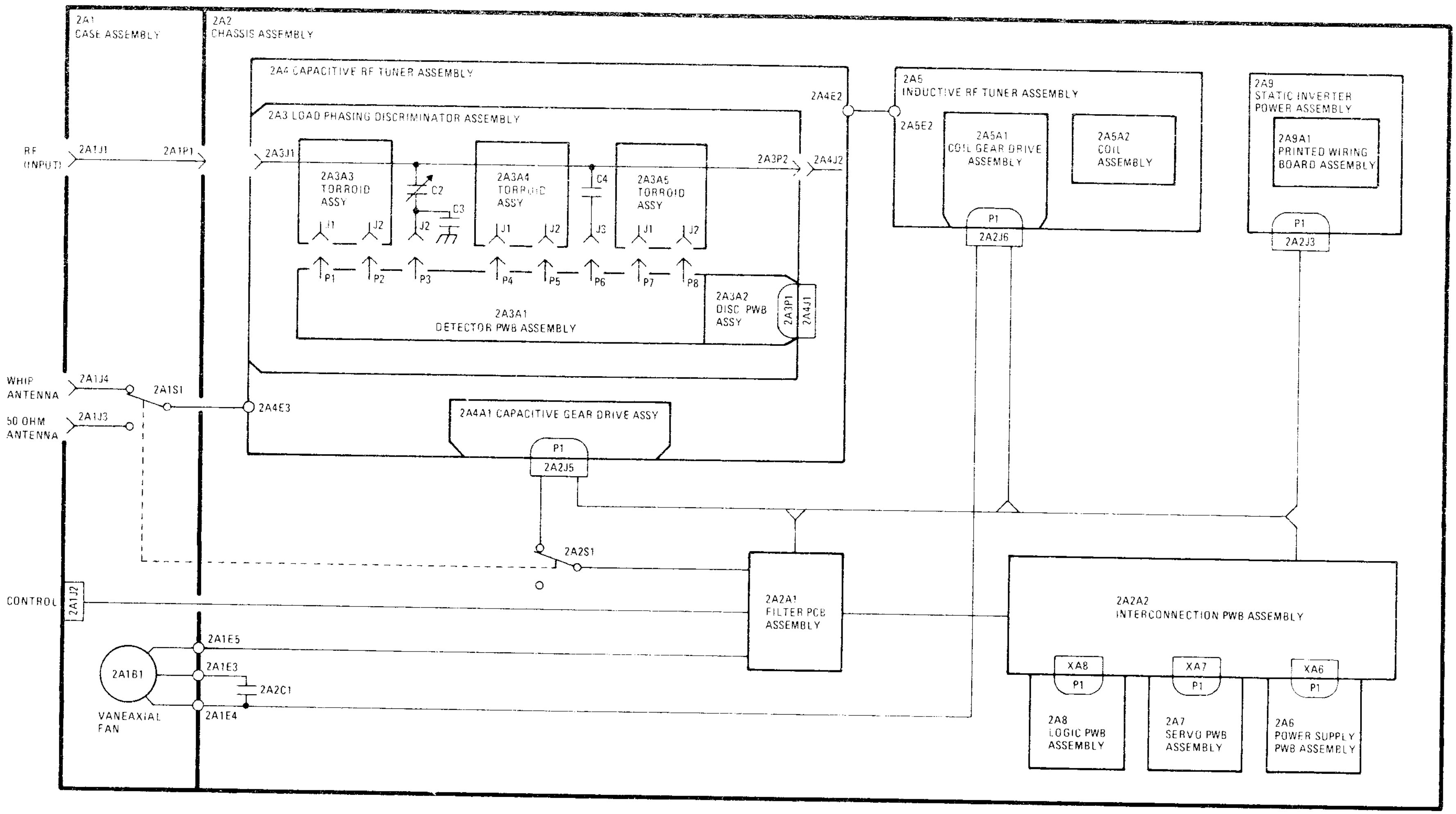


Figure 1-5. Antenna Coupler CU-2064/GRC-193 Component Interconnection and Identification

TABLE 1-2. ANTENNA COUPLER CU-2064/GRC-193 SEMICONDUCTORS

SEMICONDUCTORS	REFERENCE DESIGNATOR	TYPE
	CHASSIS ASSEMBLY 2A2	
Power Transistor	2A2Q1, Q2	JAN2N3055
	FILTER ASSEMBLY 2A2A1	
SiliconDiode	2A2A1CR1	JAN1N645
	DETECTOR ASSEMBLY 2A3A1	
Silicon Diode Integrated Circuit (Dual Op Amp)	2A3A1CR1 thru CR4; 2A3A1U1, U2	JAN 1N5711 CA747TV1-4
	DISCRIMINATOR ASSEMBLY 2A3A2	
Integrated Circuit (Dual Op Amp)	2A3A2U1, U2	CA747TV1-4
	CAPACITIVE RF ‘TUNER ASSEMBLY 2A4	
Silicon Diode	2A4CR1, CR2	JAN 1N645
	INDUCTIVE RF TUNER ASSEMBLY 2A5	
Silicon Diode	2A45CR1	JAN1N645
	POWER SUPPLY ASSEMBLY 2A6	
Silicon Diode	2A6CR1 thru CR10, CR16 thru CR20	JAN1N645
Silicon Diode	2A6CR11 thru CR15	JAN1N4245
NPN Transistor	2A6Q1, Q5, Q9	JAN2N2219A
PNP Transistor	2A6Q2, Q4, Q6, Q7	JAN2N2905A
Power Transistor	2A6Q3	2N5784
Thyristor	2A6Q8	JAN2N2323A
Silicon Diode	2A6VR1	JAN1N3028B
Silicon Diode	2A6VR2	JAN1N758A
Silicon Diode	2A6VR3	JAN1N3023B
Silicon Diode	2A6VR4, VR5	JAN1N750A

TABLE 1-2. ANTENNA COUPLER CU-2064/GRC-193 SEMICONDUCTORS (Continued)

SEMICONDUCTORS	REFERENCE DESIGNATOR	TYPE
	SERVO ASSEMBLY 2A7	
Silicon Diode	2A7CR1 thru CR9, CR16 thru CR19	JAN1N645
Silicon Diode	2A7CR10 thru CR15	JAN1N5550
NPN Transistor	2A7Q1, Q2, Q4, Q6, Q8, Q18, Q21	JAN2N2219A
PNP Transistor	2A7Q3, Q5, Q7, Q9, Q20	JAN2N2905A
Power Transistor	2A7Q10, Q12, Q14, Q16	2N5784
Power Transistor	2A7Q11, Q13, Q15, Q17	2N5781
PNP Transistor	2A7Q19	JAN2N4948
Integrated Circuit	2A7U1 thru U3	CA747TV1-4
	LOGIC ASSEMBLY 2A8	
Silicon Diode	2A8CR1 thru CR21	JAN1N645
NPN Transistor	2A8Q1 thru Q3, Q5, Q6, Q8 thru Q13	JAN2N2219A
PNP Transistor	2A8Q4, Q7, Q14	JAN2N2905A
Integrated Circuit (Quad Two-Input NAND Gates)	2A8U1, U9, U12	CD4011AF-4
Integrated Circuit (7 NPN Transistor Array)	2A8U2, U5	CA3082F-4
Integrated Circuit	2A8U3, U4, U6, U7, U8, U10, U11	CA4001AF-4
Silicon Diode	2A8VR1 , VR2	JAN1N750A
	PRINTED WIRING BOARD ASSEMBLY 2A9A1	
Silicon Diode	2A9A1CR1 thru CR4	JAN1N645
PNP Transistor	2A9A1Q1	JAN2N4948
NPN Transistor	2A9A1Q2, Q5 thru Q7, Q10, Q1l	JAN2N2219A
PNP Transistor	2A9A1Q3, Q4, Q8, Q9	JAN2N2905A
NPN Transistor	2A9A1Q12 thru Q15	JAN2N3055

SECTION II

PREPARATION FOR USE

1-13. SCOPE OF INSTRUCTIONS

1-14. This section contains or references all procedures necessary to prepare the coupler for use either as an individual component or as part of Radio Set AN/GRC-193 or Radio Set AN/MRC-138.

1-15. PREPARATION FOR USE AS A COMPONENT OF RADIO SET AN/MRC-138

1-16. Preparation for use procedures applicable to the coupler as a component of Radio Set AN/MRC-138 Radio Set AN/GRC-193 components rack mounted in an M151A2 ¼-ton truck are given in TM 11-5820-924-12, Systems Instructions for Radio Sets AN/GRC-193 and AN/MRC-138.

1-17. PREPARATION FOR USE AS A SEPARATE COMPONENT

1-18. The following paragraphs describe unloading, uncrating, unpacking, and installation procedures for the coupler.

1-19. HANDLING DURING UNLOADING

1-20. As the coupler contains accurately calibrated and adjusted electronic and mechanical components, avoid rough handling of the unit during unloading. No other special handling procedures apply.

1-21. UNCRATING

1-22. It is advisable to save and store the coupler crating material for possible coupler reshipment or relocation at a later time. Consequently, careful uncrating of the unit is suggested. Store crating material in a dry area. No other special uncrating procedures apply.

1-23. UNPACKING

1-24. Unpack the coupler as follows:

1. Remove inner box containing the coupler from the crating insulation material; place the inner box on a flat work surface.

2. If antenna coupler Mount MT-4495/GRC-193 (RF Part No. 7750 17A9005) and mating connectors (refer to table 1-3) were overpacked, place them on a flat work surface.

3. Carefully remove packing material from coupler, Do not remove plastic caps from J1 (RF), J2 (CONTROL), and J4 (WHIP ANTENNA) connectors until coupler is ready for installation.

4. If mating connectors and/or cables were purchased, tag and identify the components (refer to table 1-3).

5. Make sure that no packing material covers the coupler cooling intakes, outlet, or relief valve.

1-25. INSTALLATION AS A COMPONENT OF RADIO SET AN/MRC-138

1-26. When the coupler is supplied as a component of Radio Set AN/MRC-138 (AN/GRC-193 Radio Set Components rack mounted in a ¼-ton vehicle) it is installed and interconnected at the factory.

TABLE 1-3. ANTENNA COUPLER CU-2064/GRC-193
MATING CONNECTOR AND CABLE TYPE IDENTIFICATION DATA

COUPLER CONNECTOR NAME	MATING CONNECTOR NAME	MATING CONNECTOR PART NO.	CABLE TYPE	CABLE PART NO.
J1 RF (Input)	Type N Right Angle Connector Plug	RF Part No. 755017A9050	Coaxial	RG-142B/U
J2 Control	15-Terminal Right-Angle Quick Disconnect Electrical Conn.	RF Part No. 755017A9049	Multi-conductor, 19-conductor shielded cable	RF Part No. 755017A9062
J3 50 Ohm Antenna	Type N Connector Plug	Any Type N connector	Coaxial	RG-142B/U, RG-8/U
J4 Whip Antenna	Connector Assembly	Army Part No. SM-C-502912	Wire	CX-10171/U
Ground Terminals	Not Applicable	Not Applicable	See Note [1]	See Note [1]

Note [1]: Grounding cable used (suggested) should be 0.040-inch (0.10-cm) thick copper, AWG 36, 0.75-inch (1.9-cm) nominal flat width, per Federal Specification QQ-Q-343. Use Alpha Industries Part No. 1234 Cable, or equivalent.

1-27. INSTALLATION INSTRUCTIONS AS A SEPARATE COMPONENT

1-28. The following paragraphs describe the installation procedures for the coupler.

1-29. INSTALLATION CONSIDERATIONS

1-30. The following should be considered when determining the proper location of the coupler:

1. Best operating conditions.
2. Ease of maintenance, adjustment of equipment, and replacement and repair of defective parts or complete subassemblies,
3. The possibility of interaction between the coupler and other electronic equipment in the vicinity.
4. Critical cable length requirements.
5. Availability of adequate ground.

Note

Mount coupler and antenna at least 40 feet away from other transmitting antennas.

CAUTION

The voltages at the antenna terminals (J4, WHIP ANTENNA) are very high during operation. Extreme caution must be taken to ensure that these terminals are at least 6 inches (15.24 cm) away from nearby objects such as cables, guy wires, brackets, or ground leads.

1-31. COUPLER MOUNTING INSTRUCTIONS

1-32. The following instructions describe how to mount the coupler using antenna coupler Mount MT-4495/GRC-193. Refer to figures 1-6, 1-7, and 1-8 for coupler and mount dimensional details.

1. The exact method of mounting the coupler depends on the type of installation. Make sure that the surface selected allows room for coupler ventilation intakes and outtakes, and has proper clearance for cable interconnection.
2. Refer to Figure 1-7. Mark off the four mounting hole centers on the mounting surface.
3. Secure coupler mount to mounting surface using appropriate hardware. Hardware selected should be of the appropriate type for the 0.375-inch (0.95 cm) mounting holes. Use 5/16-18 bolts, nuts, washers, and lockwashers to secure the coupler.

1-33. CABLE ASSEMBLIES

1-34. Variations among installations will determine the lengths of the cables connecting the coupler to the system power amplifier and antenna. Refer to table 1-3 for the identification and types of cable and cable connectors required for use with the coupler. Figure 1-9 identifies the pin and functional designations of connector 2A1J2 (CONTROL) for cable fabrication reference.

1-35. PREOPERATIONAL SERVICING

1-36. No preoperational servicing procedures apply other than removal of the plastic connector caps prior to connecting cables to the coupler connectors. Keep plastic caps for future relocation and storage purposes.

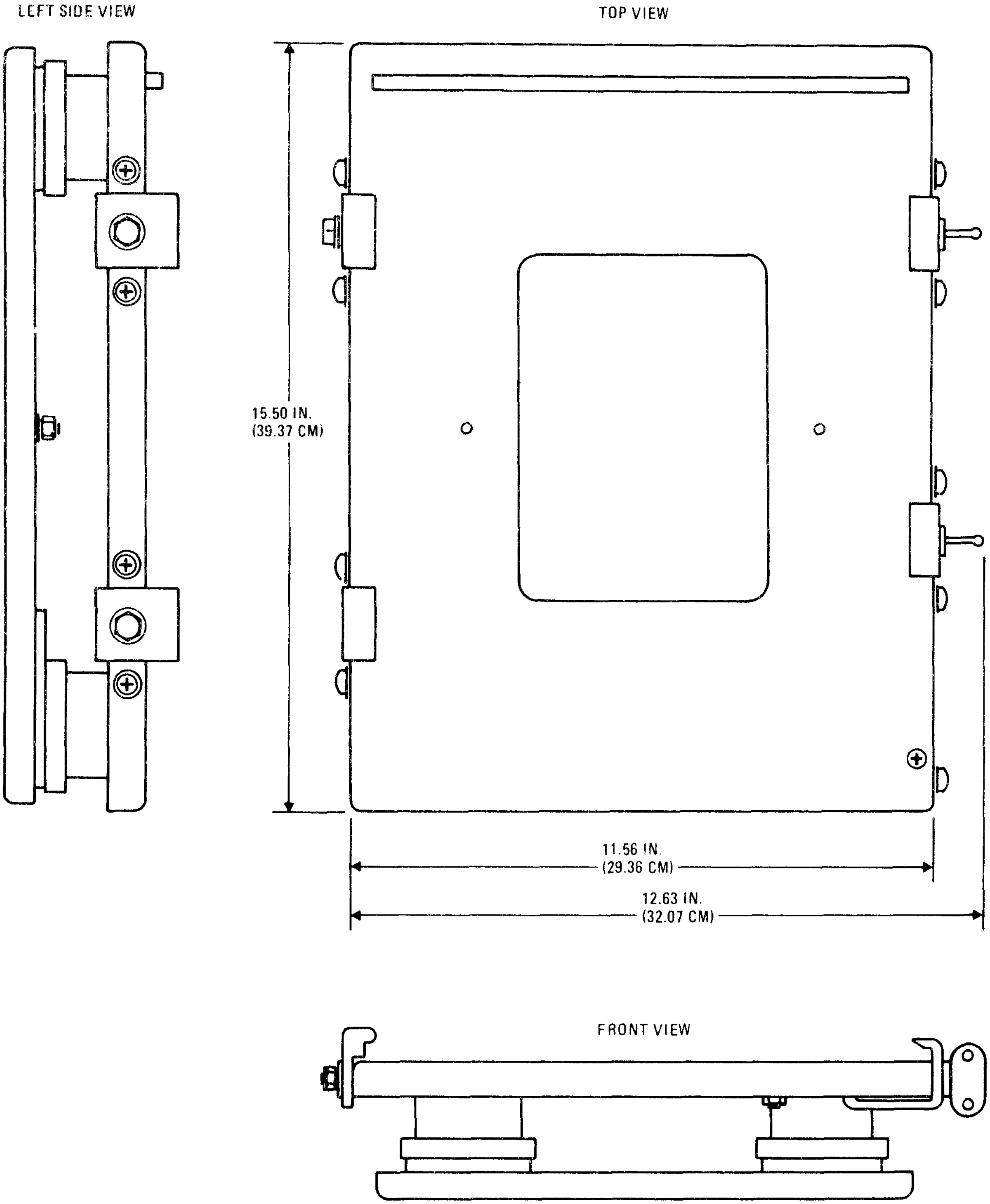


Figure 1-6. Antenna Coupler Mount MT4495/GRC-193 Detail Views

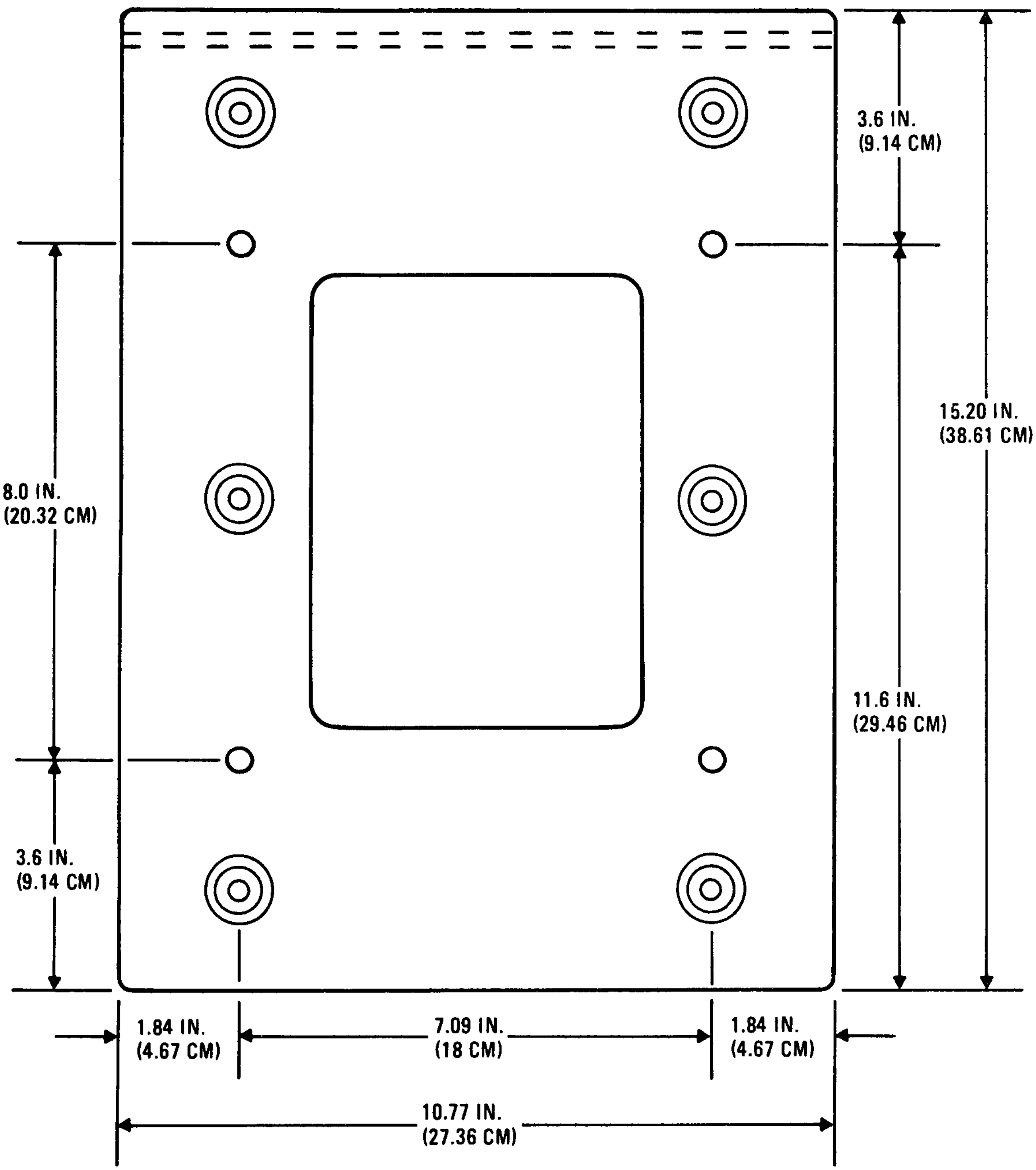


Figure 1-7, Antenna Coupler Mount MT-4495/GRC-193 Lower Tray Assembly Dimensional Data

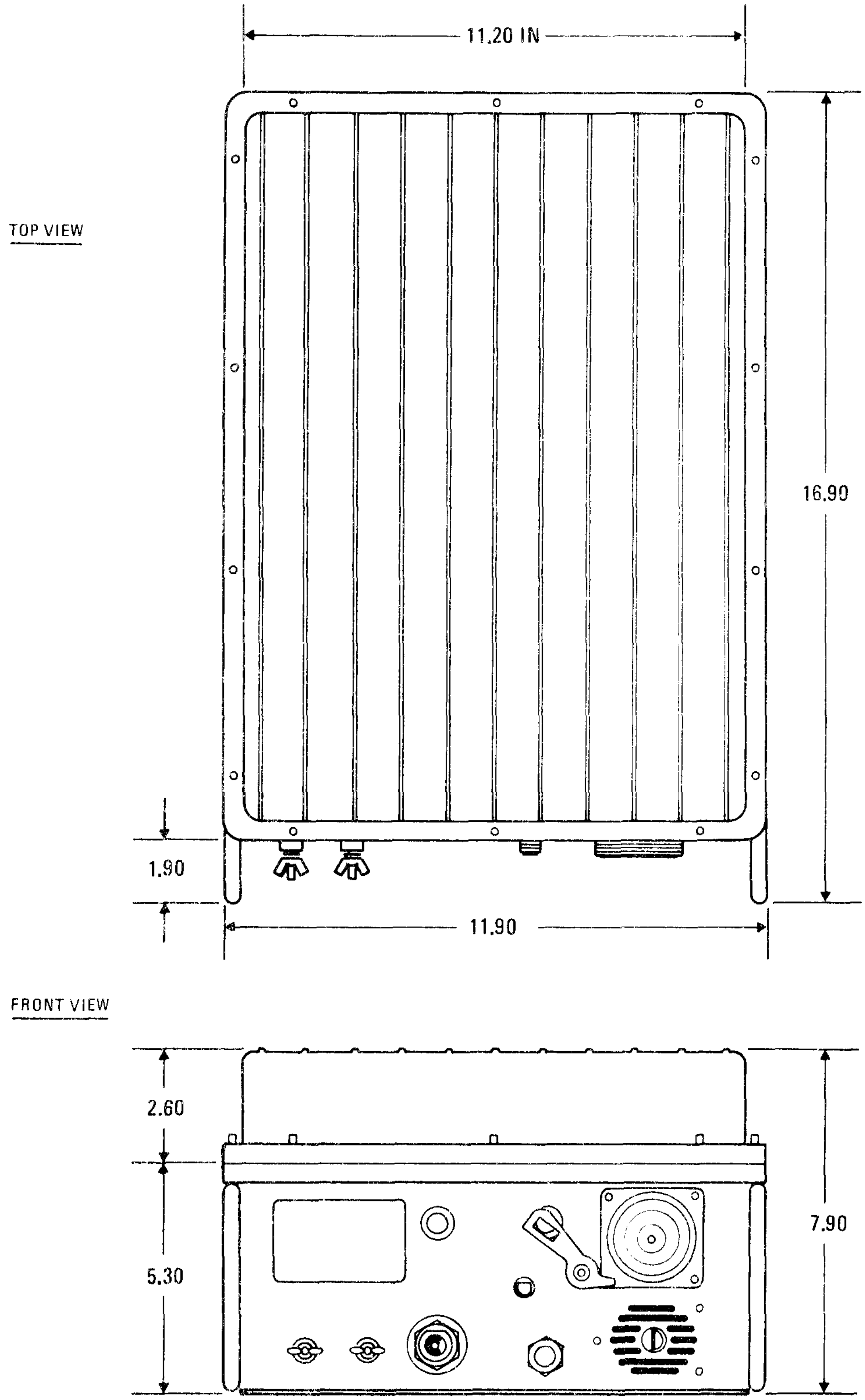


Figure 1-8. Antenna Coupler CU-2064/GRC-193 Dimensioned Views

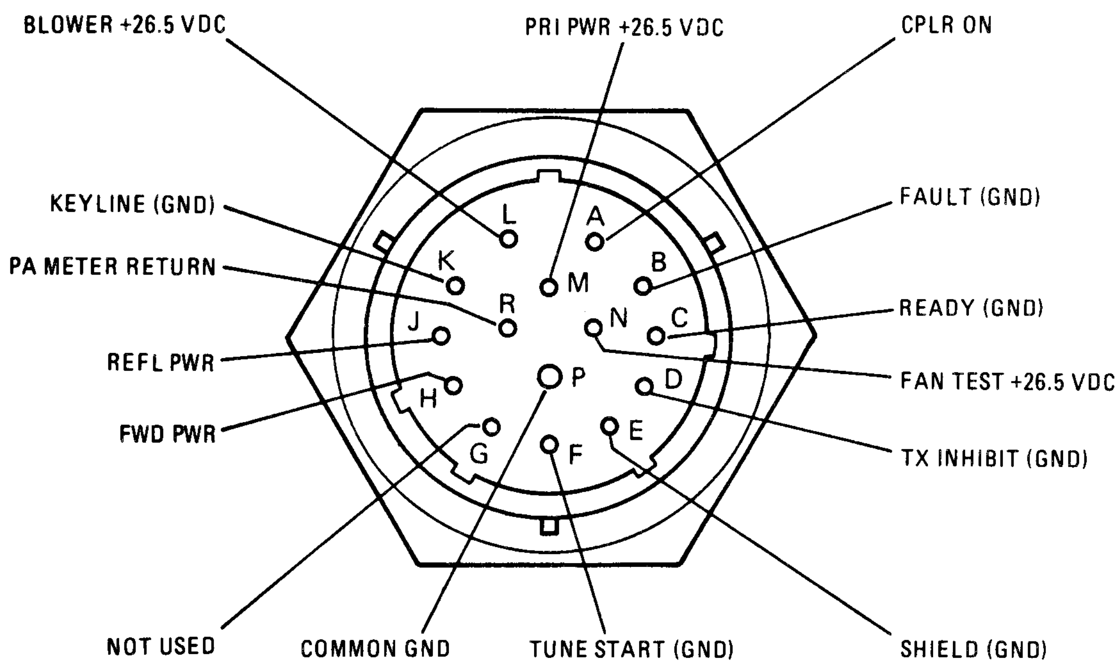


Figure 1-9. Connector 2A1J2 Pin/Functional Identification

1-37. INITIAL CHECKOUT AND ADJUSTMENT

1-38. Specific initial checkout and adjustment procedures for Antenna Coupler CU-2064/GRC-193 depend on the system with which it is being used. If the coupler is used with Radio Set AN/GRC-193 or Radio Set AN/MRC-138 Radio Set AN/GRC-193 components rack-mounted in an M151A2 jeep vehicle), refer to TM 11-5820-924-12. If not, refer to applicable system technical manual for these procedures.

1-39. In general, the following inspections should be performed prior to operating the equipment:

1. Make sure that the coupler cooling intakes and outlets are clear.
2. Make sure all electrical and ground cable connections are tight and secure.
3. Make sure that antenna is at least 6 inches (15.24 cm) away from nearby metal objects.
4. Make sure that connection points are free of dirt or other obstructions.
5. Make sure that applicable operational technical data is close at hand.

1-40. RELOCATION PROCEDURES

1-41. If the coupler is to be relocated, disconnect input and output cables and place plastic over the coupler (paragraph 1-42), and cable connectors. Remove coupler from mounting surface and move it to the new location.

1-42. PREPARATION FOR LIMITED STORAGE AND RESHIPMENT

1-43. Preparation procedures for limited storage and/or reshipment of the coupler are essentially the same as those described in paragraph 1-23 and are as follows:

1. Repack the coupler in its original shipping crate (inner box, insulation, and outer crating).
2. Make sure that origin and destination data, as required by local authorities and directives, are clearly marked as required.

SECTION III

DEMOLITION TO PREVENT ENEMY USE

1-44. GENERAL

1-45. When capture or abandonment of the coupler to an enemy is imminent, the responsible unit commander must make the decision to either destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction.

1-46. DEMOLITION TO RENDER COUPLER INOPERATIVE

1-47. To render the coupler inoperative, proceed as follows:

1. Disconnect cables and destroy their connectors by hammering them.
2. Remove coupler cover and remove the three pcb's(printed circuit boards) in the card cage assembly. Destroy pcb's.
3. If time is of the essence, remove coupler cover and destroy its internal components with a hammer or any blunt instrument.

CHAPTER 2

THEORY OF OPERATION

2-1. INTRODUCTION

2-2. This chapter describes overall, interelated, and individual functions and theory of the assemblies and circuitry that comprise the coupler. The theory of operation is presented in a logical functional sequence. Simplified schematic diagrams are used throughout to augment the descriptions.

2-3. OVERALL FUNCTIONAL DESCRIPTION

2-4. The coupler has three major functional areas: an impedance matching network; three separate discriminators and a directional coupler to monitor forward and reflected transmission line power; and logic circuits that automatically adjust the motor-driven impedance matching network, reducing the transmission line VSWR.

2-5. The impedance matching network consists of a torroid transformer, a motor-driven (tuned) variable inductor, and a motor-driven (tuned) variable vacuum capacitor. Fixed capacitors are automatically switched in series with the antenna to extend the tuning range of the variable elements.

2-6. The transmission line monitor consists of a directional coupler and three discriminators. It monitors forward and reflected power and provides error signals when the transmission line voltage and current are out of phase and resistance is not equal to 50 ohm resistive and when the antenna impedance is less than 50 ohms.

2-7. The logic circuits control the tuning of the impedance matching network in accordance with the error signals received from the transmission line monitor. The logic circuits also provide fault indications should the tuning cycle not follow the proper step sequence to completion. Transmitter inhibit logic circuits that control transmitter keying during the tuning cycle are also included.

2-8. COUPLER RF FLOW - GENERAL DESCRIPTION

2-9. Figures 2-1 and 2-2 are simplified RF flow and overall functional diagrams of the coupler. Refer to these during the following operational description.

2-10. The input RF signal (at RF connector 2A1J1) from the system power amplifier is monitored by Loading-Phasing Discriminator 2A3. The discriminator uses torroids and a capactive divider to monitor the transmission line. The discriminator circuits produce dc outputs proportional to transmission line condition. When tuning is incorrect, the discriminator circuits provide error signals that indicate that the transmission line impedance is other than 50 ohms resistive.

2-11. Four error signals (RF on, VSWR <2:1, VSWR <1.2:1, and Z <50) from the discriminator circuits are applied to logic circuits (Logic PWB 2A8) that control the servo amplifiers (Servo PWB 2A7) and switching relays (2A4K1, K2, and K3). The servo amplifiers, in turn, control servo motors (in capactive and inductive RF tuners 2A4 and 2A5, respectively) that are energized to retune the variable capacitor or inductor in the impedance matching network. The relay (2A4K3, figure 2-1) controls the insertion and removal of three fixed capacitors (2A4C2, C3, and C4) in the network. The resultant tuning of the variable elements

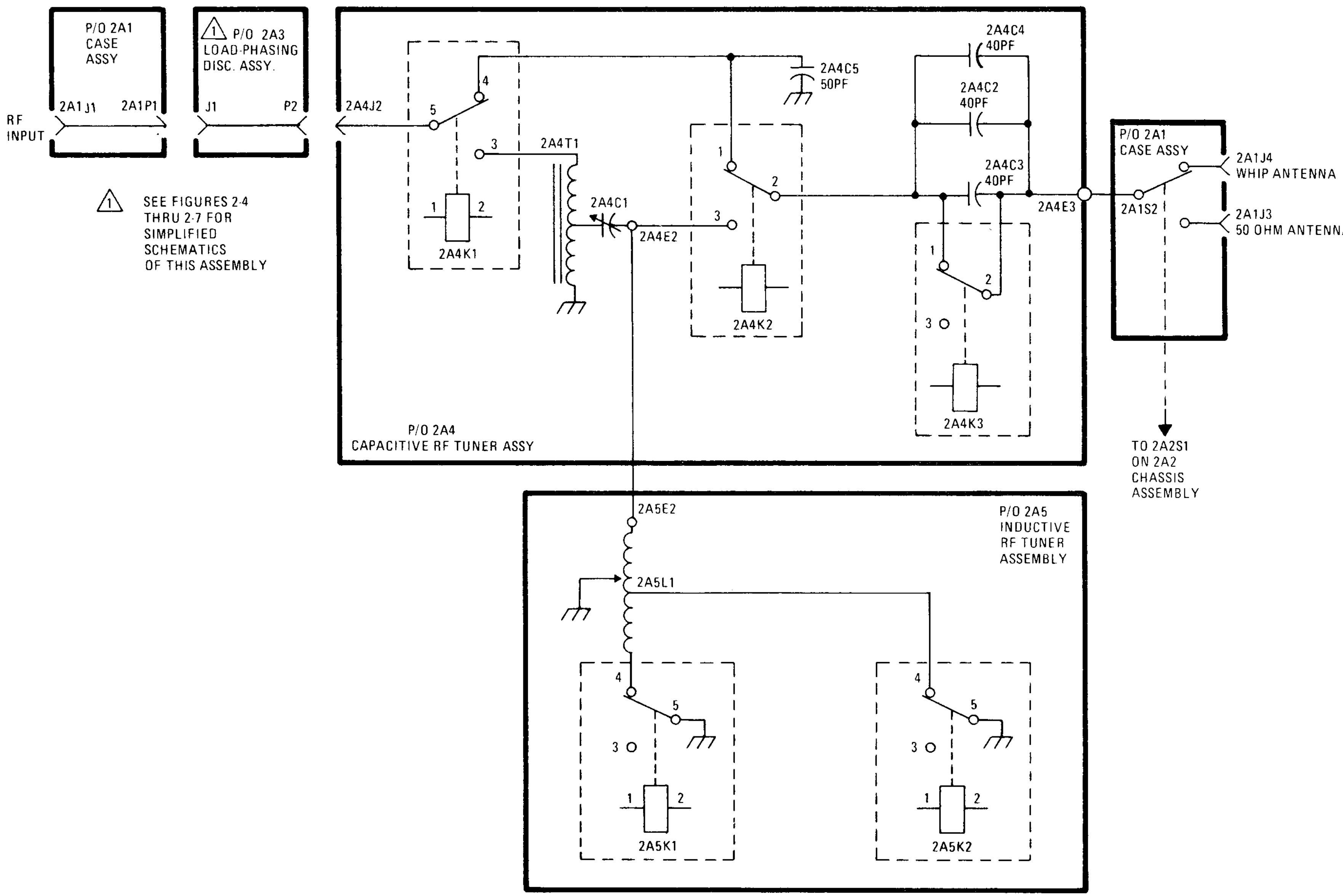


Figure 2-1. RF Flow Diagram

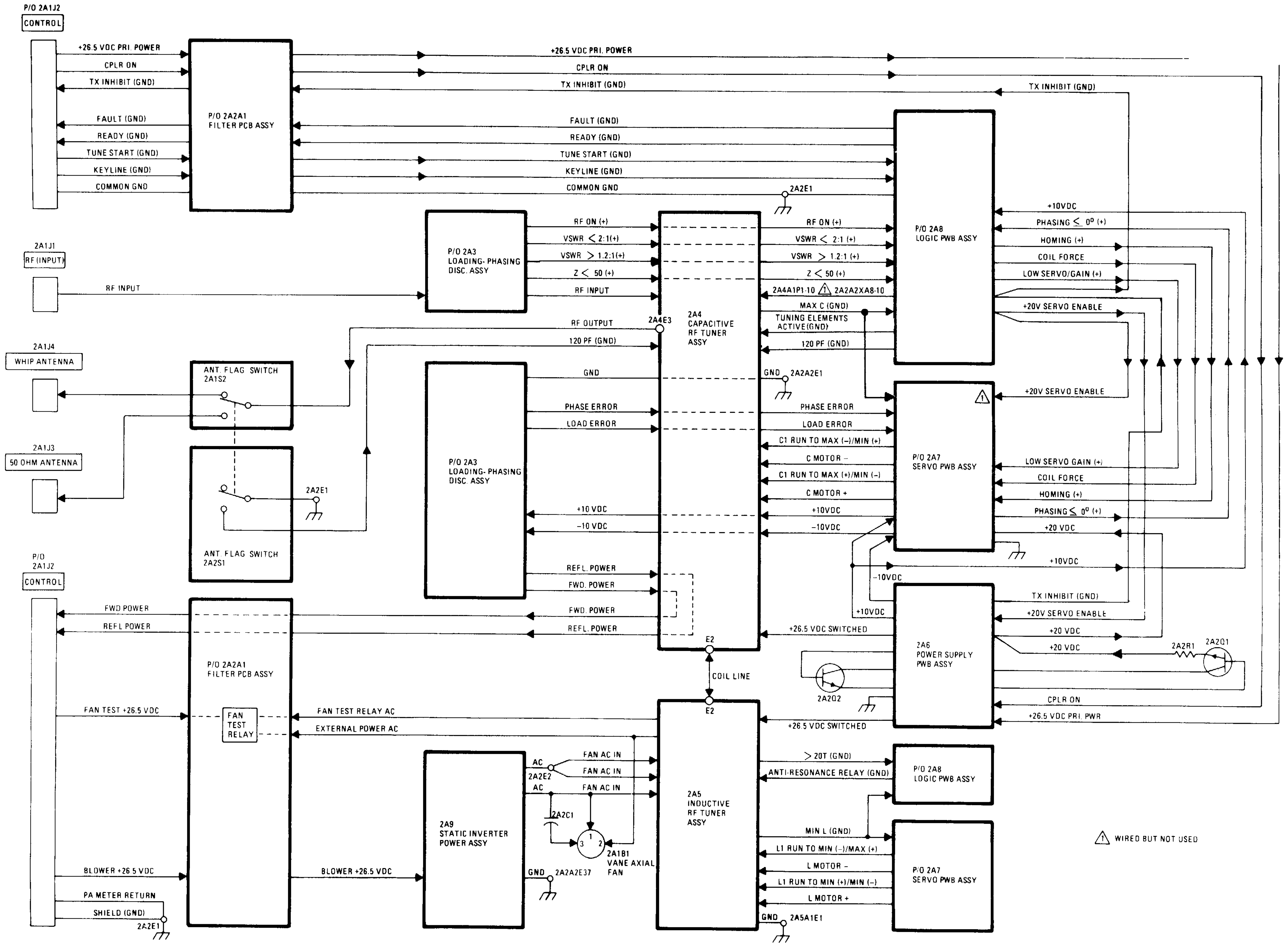


Figure 2-2. Overall Functional Interconnection Diagram

(2A4C1 and 2A5L1) and selection of the fixed elements correct the error so that the transmission line and antenna appear as the desired 50 ohm resistive load to the transmitter.

2-12. Once the antenna coupler is correctly tuned, the logic circuits prevent retuning when coupler input impedances are less than 1.2 to 1. This is done to prevent small mismatches, caused by minor antenna impedance changes, from constantly retuning the coupler.

2-13. COUPLER OPERATION SEQUENCE DURING TUNING

2-14. Figure 2-3 is an operation sequence/flow diagram that shows the sequence and logic of operational events that occur during coupler tuning. Study this diagram carefully. It provides a basis for thorough understanding of the theory of operation of the coupler functions.

2-15. Figure 2-3 is also a guide to the analysis of coupler operational performance. When used in conjunction with the information contained in chapter 3, it is an aid to the isolation of troubles in individual coupler circuits. Note that the references to individual circuit simplified schematics in figure 2-3 indicate the relationships between operational events and circuits.

2-16. LOADING-PHASING DISCRIMINATOR 2A3 CIRCUIT DESCRIPTION

Note

In paragraphs 2-17 through 2-38 following, prefix all reference designators with 2A3 unless otherwise specified.

2-17. Loading-Phasing Discriminator 2A3 comprises eight separate circuits that provide dc outputs representative of:

a. Reflected power

b. Forward power

c. Phase error

d. Load error

e. Impedance less than 50 ohms (Z <50 ohms)

f. VSWR greater than 1.2:1 (VSWR>1.2:1)

g. VSWR less than 2:1 (VSWR<2:1)

h. RF ON (+)

2-18. Refer to figures 2-4 and 3-39. Within the discriminator, the RF transmission line passes through the center of torroid transformers A3T1, A4T1, and A5T1, where it acts as a one-turn primary for each. RF voltage on this line causes a voltage representative of the transmission line current to be induced in the secondary of each transformer. This voltage is subsequently developed across load resistors A1R1 (for A3T1), A1R2 (for A4T1). and A1R5 (for A5T1). Voltage dividers C2-C3 and C4-A1R3-A1R4 provide separate reference voltages which are in phase and 90 degrees out of phase with the transmission line voltage.

2-19. A dc voltage representative of reflected power is produced from the output of transformer A4T1, and from voltage divider C2-C3. It is detected by diode A1CR13, added algebraically (A1L3 provides a dc return path), and filtered by inductor A1L4. The voltage is then applied to the input of operational amplifier A1U1-6, is amplified, filtered by capacitor C16, and applied to P1-5. The circuit is calibrated by variable capacitor C2.

2-20. A dc voltage representative of forward power is produced from the output of transformer A5T1, and from voltage divider C2-C3. It is detected by diode A1CR11, applied to operational amplifier input A1U2-4, is amplified, filtered by capacitor A1C14, and applied to P1-1.

2-21. The voltage representative of reflected power is applied to operational amplifier inputs A2U2-4 and -7. The voltage representative of forward power is also applied to operational amplifier inputs A2U2-3 and -6. These voltages are compared in the operational amplifier A2U2, and resultant digital voltages are applied to P1-8 and P1-7. The output at P1-8 represents a VSWR < (less than) 2:1; the output at P1-7 represents a VSWR > (greater than) 1.2:1. For example, if the voltage at P1-8 is positive, the VSWR <2:1. If the voltage is negative, the VSWR >2:1.

2-22. The voltage representative of forward power is also applied to operational amplifier input A2U1-6, amplified, and applied to output P1-4. The output at P1-4 represents an RF ON (+) condition.

2-23. LOADING-PHASING DISCRIMINATOR 2A3 CIRCUIT ANALYSIS

2-24. Refer to figure 2-1. Loading-Discriminator 2A3 monitors the 50-ohm impedance of the transmission line at the input of transformer 2A4T1 of Capacitive RF Tuner 2A4. Loading-Phasing Discriminator 2A3 consists of three separate sensing circuits:

a. Phasing discriminator circuit

b. Loading discriminator circuit

c. Z (impedance) discriminator circuit

2-25. Z (IMPEDANCE) DISCRIMINATOR CIRCUIT ANALYSIS

2-26. Refer to figures 2-5 and 3-39. The Z discriminator provides a digital dc output that indicates whether the antenna impedance is above or below 50 ohms at 8 MHz (see figure 2-4). The digital dc output is produced from the output of transformer A3T1 and voltage dividers C2-C3 and C4-A1R3-A1R4. The output of A3T1 is peak-detected by diode A1CR1 and capacitor A1C1. The detected output voltage is applied to resistor A1R6 and one end of potentiometer A1R7. The output of voltage divider C2-C3 is peak-detected by diode A1CR3 and capacitor A1C3. This output is applied to the other end of potentiometer A1R7. The output of voltage divider C4-A1R3-A1R4 is peak-detected by diodes A1CR2 and CR4 and capacitor A1C3. This output is also applied to resistor A1R8 and one-half of potentiometer A1R7, and varies the detection point impedance (50 ohms at 8 MHz). Inductor A1L3 provides a DC return for diode A1CR3. Resistors A1R3 and R4 provide a DC return for diodes A1CR3 and CR4. The vector sum of these voltages is applied to Operational Amplifier input A2U1-4, amplified, and applied to output P1-3 as an indication that the impedance is less than 50 ohms (a positive voltage) or that the impedance is greater than 50 ohms (a negative voltage) at 8 MHz.

Note

Impedance versus frequency data for other frequencies is shown in figure 2-5.

2-27. PHASING DISCRIMINATOR CIRCUIT ANALYSIS

2-28. Refer to figures 2-6 and 3-39. The phasing discriminator provides a dc output to the servo amplifier of Servo PWB 2A7 indicative of the reactive component of transmission line impedance. This dc output is zero when the reactive component is the desired 0 ohms, positive when the reactive component is capacitive, and negative when the reactive component is inductive.

Figure 2-3. Operation Sequence/Flow Diagram

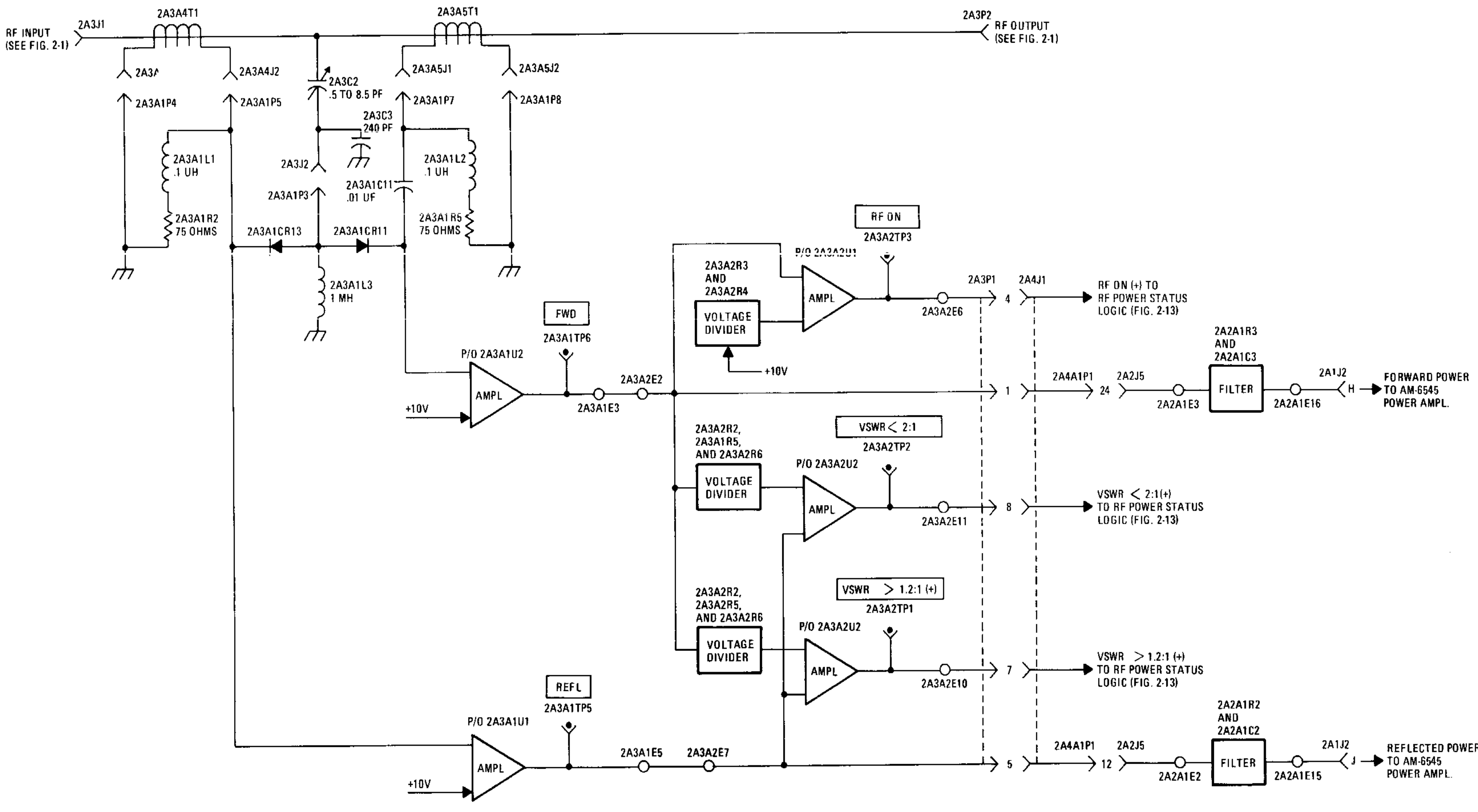


Figure 2-4. Simplified RF Power Discriminator Circuit Diagram

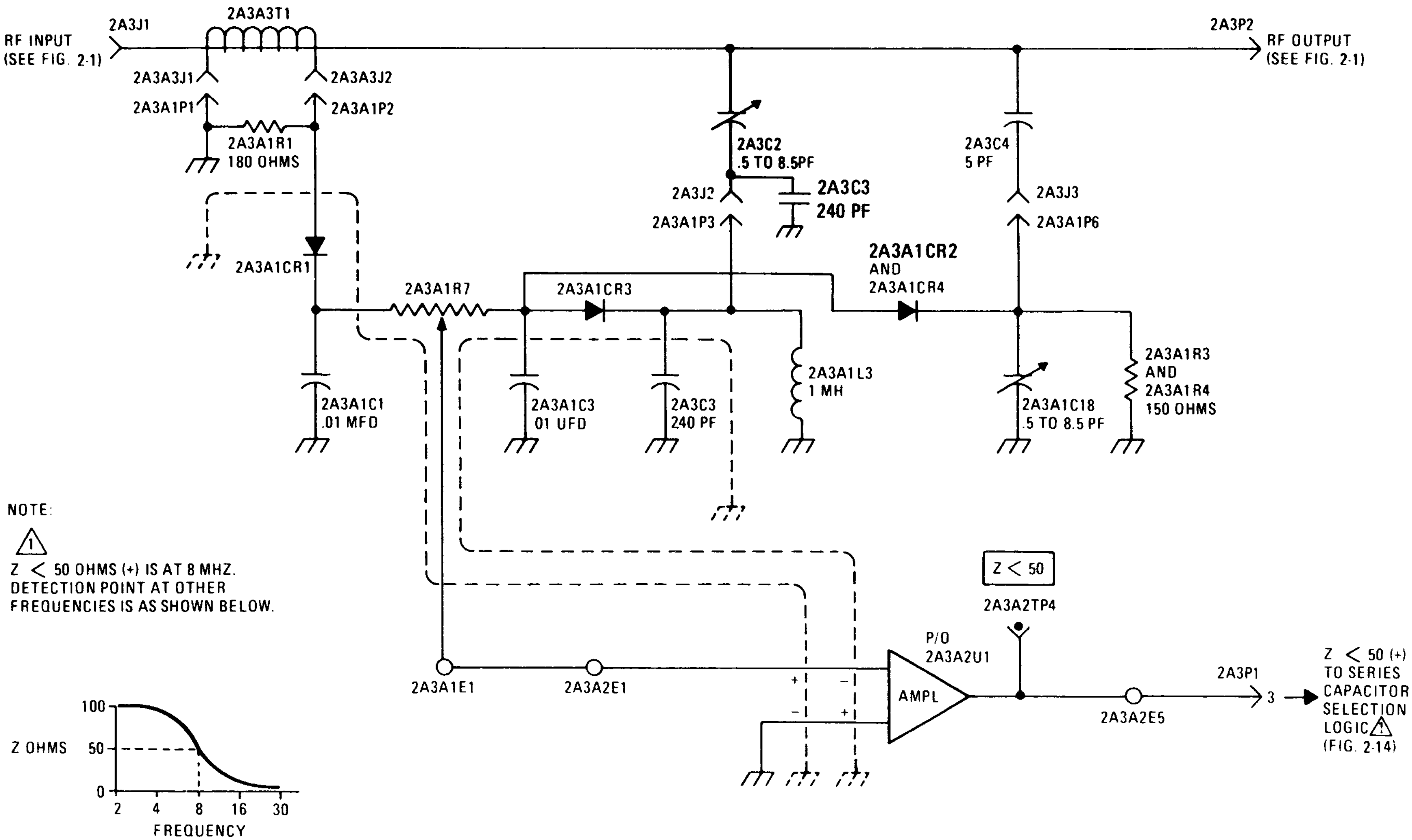


Figure 2-5. Simplified Z Discriminator Circuit Diagram

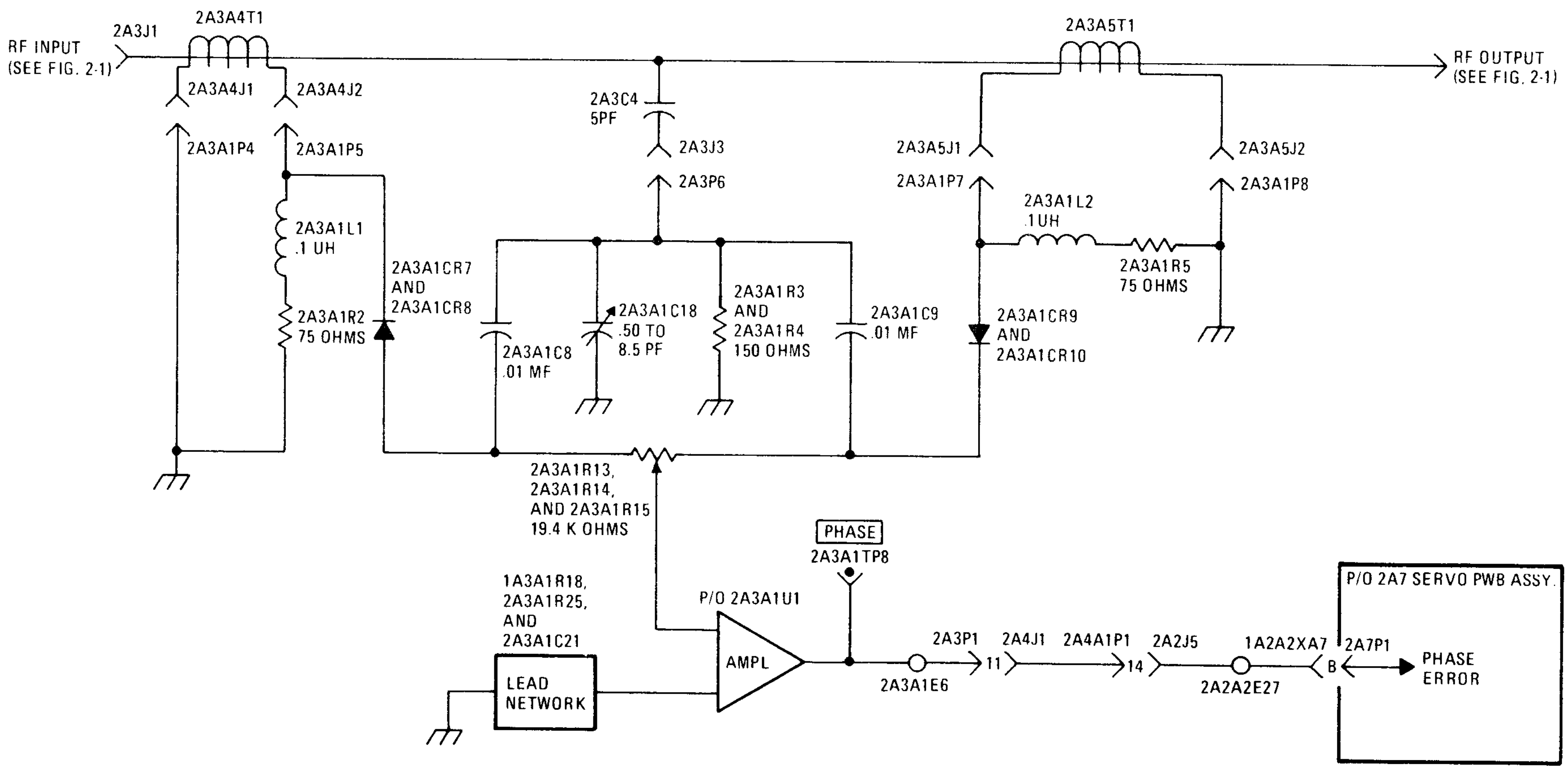


Figure 2-6. Simplified Phasing Discriminator Circuit Diagram

Note

When thephase error output at P1-11 is positive, variable vacuum capacitor 2A4C1 in Capacitive RF Tuner 2A4 is sent to its maximum capacitance position.

2-29. The transmission line current induces voltages that are in phase with the current in transformer A4T1 and 180 degrees out of phase with the current in A5T1. The transmission line voltage is sampled with a 90 degree phase shift by voltage divider C4-A1R3 and R4. The output of transformer A4T1 is detected by A1CR7 and CR8 and capacitor A1C8, and appears across one-half of potentiometer A1R13. The output of voltage divider C4-A1R3 and R4 is detected by diodes A1CR9 and CR10 and capacitor A1C9 and appears across resistor A1R14 and the other half of potentiometer A1R13. The algebraic difference between these two resultant voltages is the error signal output. Potentiometer A1R13 is adjusted such that when the transmission line current and voltage are in phase, the resultant voltages across resistors A1R12, R13, and R14 are equal and opposite; thus they cancel. The vector sum of the resultant voltages creates a dc error signal output proportional to the phase shift between the transmission line RF voltage and RF current. This voltage is applied to operational amplifier input A1U1-4, is amplified, and is applied to output P1-11.

2-30. The phase error output signal from P1-11 is applied to the differential amplifier input of the C servo amplifier in Servo PWB 2A7. (Refer to figure 3-43, 2A7P1-8.) If the reactive component of the transmission line impedance is other than zero, the line current and line voltage can not be in phase. Consequently, the resultant voltages across resistors A1R12, R13, and R14 are not equal. This results in a dc error signal, positive for capacitive reactance or negative for inductive reactance. The error signal is applied to the C servo amplifier of Servo PWB 2A7 to correct the adjustment of variable vacuum capacitor 2A4C1.

2-31. Since a differential amplifier responds only to differences in signal level between its two inputs, hum or noise signals present equally at both inputs will not be amplified. Potentiometer A1R13 has been factory adjusted to provide a zero dc output from the phasing discriminator when transmission line voltage and current are in phase (that is, a zero reactance component in the line impedance), thus compensating for any unbalance in the discriminator caused by component tolerances.

2-32. LOADING DISCRIMINATOR CIRCUIT ANALYSIS

2-33. Refer to figures 2-7 and 3-39. The loading discriminator provides a dc output to the inductive servo amplifier of Servo PWB 2A7 that indicates the resistive component of transmission line impedance. This dc output is zero when the resistive component is the desired 50 ohms, negative when the resistive component is less than 50 ohms, and positive when the resistive component is greater than 50 ohms.

Note

12.5 ohms resistance at the output of transformer 2A4T1 is representative of a transmission line resistive component of 50 ohms at the coupler input.

2-34. Capacitive divider C2-C3 produces an output across capacitor C3 that is in phase with and proportional with the transmission line voltage. This voltage is detected by diode A1CR5 and filtered by capacitor A1C4, producing a positive dc voltage, which is developed across resistor A1R9 and one-half of potentiometer A1R10.

2-35. The line current induces a voltage in transformer A4T1. The output of A4T1 is detected by diode A1CR6 and filtered by capacitor C6, producing a negative dc voltage, which is developed across resistor A1R11 and one-half of potentiometer AlR10. (Potentiometer A1R10 is adjusted for zero error at 30 MHz.

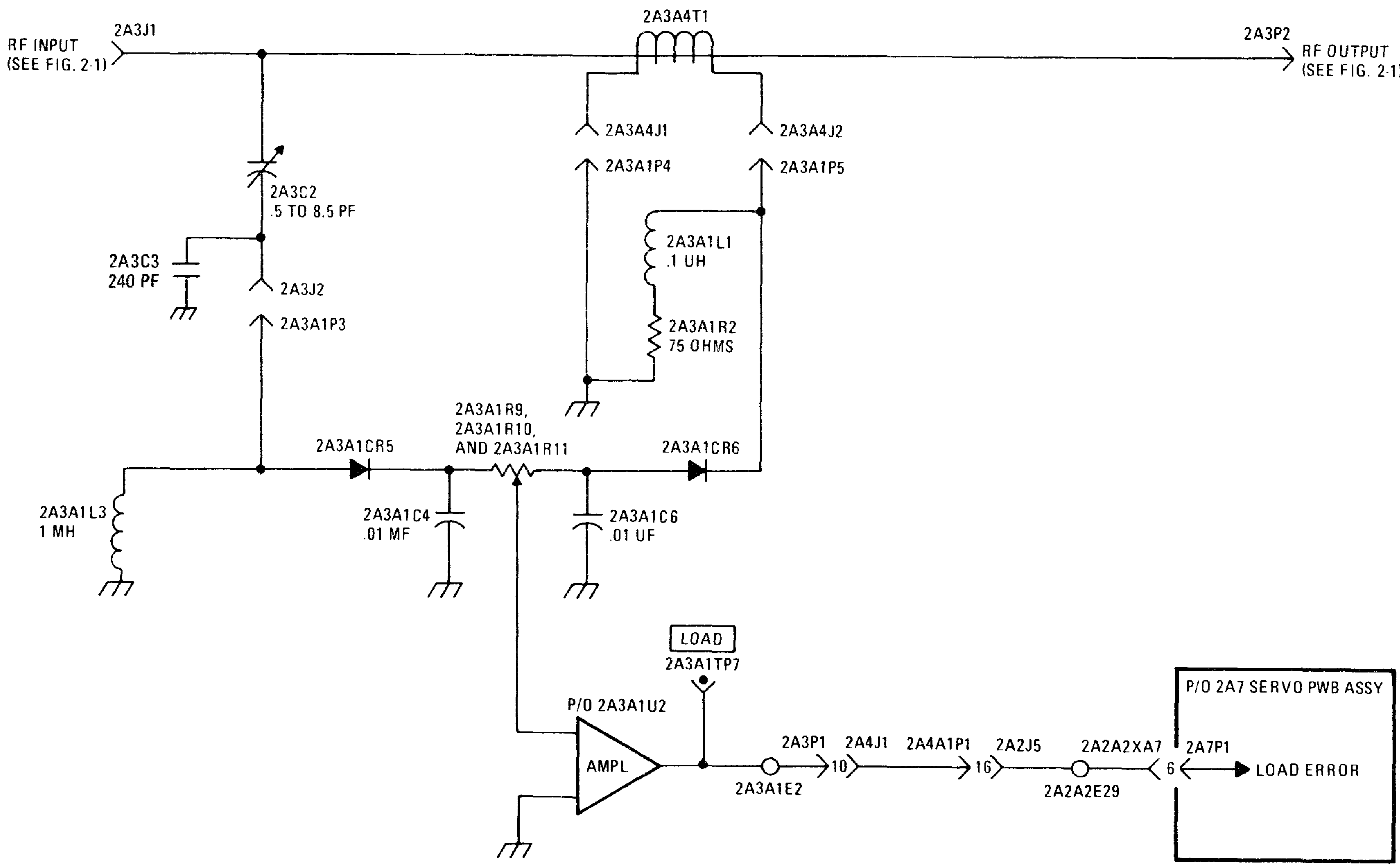


Figure 2-7. Simplified Loading Discriminator Circuit Diagram

The resultant voltage is applied to operational amplifier input A1U2-6, is amplified, and applied to P1-10 (load error output).

2-36. If the resistive component of the line impedance is 50 ohms, the sum of the two dc voltages is zero, as adjusted by A1R10, indicating that variable inductor 2A5L1 is correctly tuned. If the resistive component is other than 50 ohms, the voltage output of A1R10 is not zero. The voltage is positive if the line impedance is greater than 50 ohms or negative if the line impedance is less than 50 ohms. This error signal voltage is applied to the inductive servo amplifier in Servo PWB 2A7 to correct the adjustment of variable inductor 2A5L1.

2-37. MISCELLANEOUS LOADING - PHASING DISCRIMINATOR COMPONENT FUNCTIONS

2-38. Capacitors A1C2, C5 and C10 are RF bypass capacitors. Inductor A1L3 provides a dc return for detector diode A1CR5. Resistors A1R1, A1R2, and A1R5 are load resistors for transformers A3T1, A4T1, and A5T1, respectively.

2-39. LOGIC PWB 2A8 CIRCUIT DESCRIPTION

Note

In subsequent paragraphs 2-40 through 2-90, prefix all reference designators with 2A8 unless otherwise stated.

2-40. Logic PWB 2A8 comprises the circuits necessary to control automatic tuning of the coupler, to provide transmitter inhibit (TX INHIBIT) signals to the transmitter, and to protect the coupler by monitoring the tuning cycle and disabling the system under abnormal conditions. For descriptive purposes in this manual, the Logic PWB 2A8 circuitry has been divided into eleven functional groups. These are:

a. Reset logic
b. Homing logic
c. Servo enable logic
d. Transmit inhibit logic
e. RF power status logic
f. Series capacitance selection logic
g. Tuning elements active logic
h. Coil force logic
i. Anti-resonance relay logic
j. Fault logic
k. Ready logic

Note

Paragraphs 2-45 through 2-90 describe the logic functions in this sequence. Separate simplified schematic diagrams are provided for each description. A review of logic element representation and functions is given in paragraphs 2-41 through 2-44.

2-41. LOGIC ELEMENT REPRESENTATION AND FUNCTIONS

2-42. The following information, concerning the representation and functions of the logic elements used in Logic PWB 2A8, will be of use in understanding the operation of the circuits.

2-43. Each of the integrated circuits used in Logic PWB 2A8 comprises NAND or NOR gates, or portions of them. The representations of these circuit elements in the simplified logic diagrams (figures 2-9 through 2-19) do not always agree with those shown in the full schematic diagram (figure 3-35) or the unit. This is because a NAND gate (not AND) and a NOR gate (not OR) can be used interchangeably by inverting the inputs and outputs to the gate. The full schematic, figure 3-35, uses the type of gate representation that keeps the total number of gates to a minimum, whereas the simplified schematics, figure 2-9 through 2-19 use the type of gate representation that keeps the schematics simpler for ease of explanation.

2-44. The terms "high" and "low", used for describing signal levels, are relative indications of the signals present at the inputs and outputs of the circuit elements. The symbol diagrams and associated truth tables of figure 2-8 are applicable to the circuits of the Logic PWB 2A8.

2-45. RESET LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-46 through 2-49 with 2A8 unless otherwise specified.

2-46. The reset logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-9. The function of the reset logic circuit is to initiate a tune cycle in the coupler whenever the coupler is initially energized or when a tune start ground pulse is received from the transmitter due to a frequency change. The incoming pulse is of varying width, but will be regulated to 0.7 second by a "pulse stretcher" consisting of R4 and C12. The reset logic signals are applied as follows (figure 2-9):

a. Reset (+) is applied to homing logic, series capacitor selection logic, fault logic, ready logic and RF present logic.

b. Reset (GND) is applied to fault logic.

2-47. During normal operation, the inputs to NOR gate U7B are low, resulting in a high output. This high level is then applied to the inputs of NAND gate U1C, resulting in a low output which biases off U2B, maintaining a low level on the reset (+) line. The high level output from U7B is also applied to the reset (GND) line, maintaining a high level.

2-48. Refer to figure 3-44. At equipment turn on, or with a tune start ground pulse from the transmitter, the base of Q1 goes low and its output goes high. This places a high input on U7B-5 and 6, causing a low on the reset (GND) line and the inputs to U1C. The output of U1C goes high, biasing on U2B to provide a high level on the reset (+) line.

2-49. The tune start ground pulse from the transmitter lasts for approximately 30 milliseconds. The low level caused by equipment turn-on will last for the length of time required for C13 to charge.

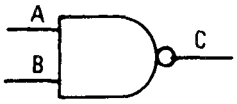
2-50. HOMING LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-51 through 2-54 with 2A8 unless otherwise specified.

NAND GATE

SCHEMATIC



TRUTH TABLE

A	B	C
1	1	0
1	0	1
0	1	1
0	0	1

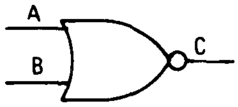
1 = HIGH
0 = LOW

COMMENTS:

OUTPUT WILL REMAIN HIGH UNLESS BOTH INPUTS ARE HIGH.

NOR GATE

SCHEMATIC



TRUTH TABLE

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

1 = HIGH
0 = LOW

COMMENTS:

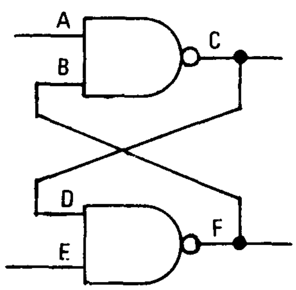
OUTPUT WILL REMAIN LOW UNLESS BOTH INPUTS ARE LOW.

NAND OR NOR GATES FUNCTIONING AS INVERTERS

OUTPUT LEVELS WILL BE THE OPPOSITE OF THE INPUT LEVELS

FLIP-FLOP (LATCHING CIRCUIT)

SCHEMATIC



FLIP-FLOP TRUTH TABLE USING NAND GATES (REVERSE '1s' AND '0s' WHEN USING NOR GATES)

	A	B	C	D	E	F
NORMAL STATUS	1	1	0	0	1	1
INPUT A PULSED	0	0	1	1	1	0
NEW STATUS	1	0	1	1	1	0
INPUT E PULSED	1	1	0	0	0	1
NORMAL STATUS	1	1	0	0	1	1

COMMENTS:

THE FLIP-FLOPS USED IN LOGIC PWB 2A8 COMPRISE TWO NAND OR TWO NOR GATES TIED TOGETHER SO THAT WHEN AN INPUT LEVEL SETS THE STATUS OF THE OUTPUT, THE GATES WILL HOLD THAT OUTPUT LEVEL UNTIL ANOTHER INPUT RESETS IT.

SIGNAL DEFINITIONS

SIGNAL (+): INDICATES THAT THE LINE LEVEL IS HIGH WHEN THE SIGNAL IS PRESENT, AND LOW WHEN THE SIGNAL IS NOT PRESENT (FOR EXAMPLE "RESET (+)")

SIGNAL (GND): INDICATES THAT THE LINE LEVEL IS LOW WHEN THE SIGNAL IS PRESENT AND HIGH WHEN THE SIGNAL IS NOT PRESENT (FOR EXAMPLE "RESET (GND)").

Figure 2-8. Logic Representations and Definitions - Logic PWB Assembly 2A8

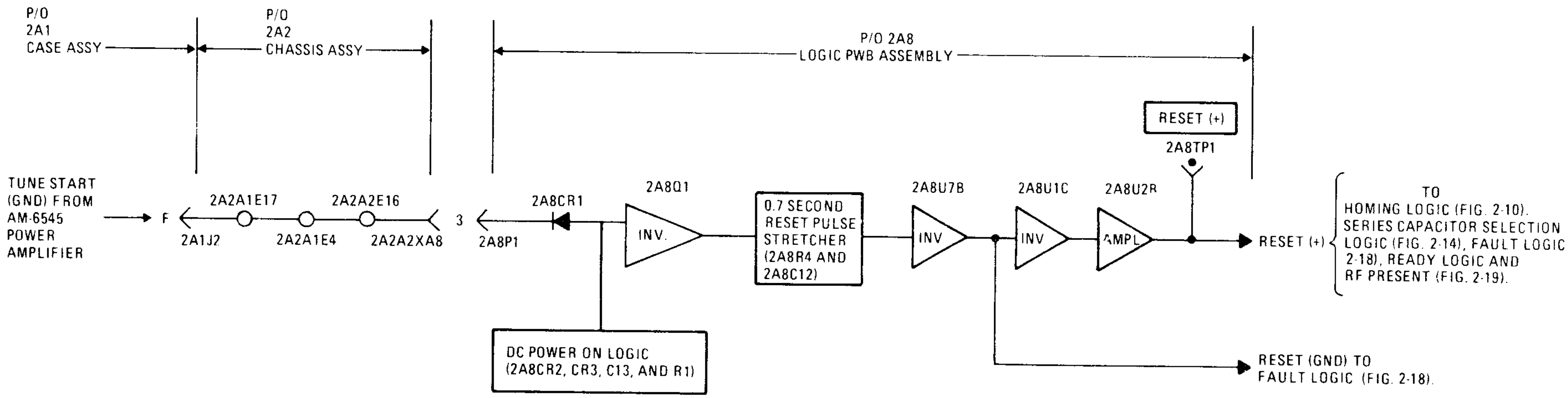


Figure 2-9. Simplified Reset Logic Diagram

2-51. The homing logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-10. The homing logic circuit provides the necessary logic levels to reset variable capacitor 2A4C1 (Capacitive RF Tuner 2A4) and variable inductor 2A5L1 (Inductive RF Tuner 2A5) to home, at the start of a tune cycle. The homing logic signals are applied as follows (figure 2-10):

Homing drive (+) is applied to servo enable logic, TX inhibit logic, and fault logic.

Homing drive (GND) is applied to anti-resonance relay logic.

Homing (+) is applied to P 1-13 on Servo PWB 2A7.

2-52. Normally, the signal level at U7A-3 (Q output, figure 3-44) is high, and when it is applied to the base of Q4, biases Q4 off. This condition is caused when an elements home (+) signal or a fault (+) signal is applied to U7C-9, resetting the flip-flop (U7A/U7C), and a low at U7A-2 from the reset (+) line.

2-53. When the flip-flop is pulsed by a reset (+) level at U7A-2, the Q output of U7A-3 goes low and the Q output of U7C-10 goes high. The low level from U7A-3 is applied to the homing drive (GND) line and to the base of Q4, biasing it on and causing a high level on the homing (+) line. The high level from U7C-10 is applied to the homing drive (+) line.

2-54. The homing (+) logic circuit causes 2A4C1 and 2A5L1 to run to the home end stop, actuating end-stop switches 2A4A1S2 and 2A5A1S1, and applying MAX C (GND) and MIN L (GND) signals to the inputs of U7D. The MAX C (GND) signal is also applied to coil-forcing logic at U4B-5. The low levels at the inputs of U7D cause a high elements home (+) signal to be applied to U7C-9, which causes a high level at U7A-3, biasing off Q4. A high level is applied to the homing drive (GND) line and a low level to the homing drive (+) line.

2-55. SERVO ENABLE LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-56 and 2-57 with 2A8 unless otherwise specified.

2-56. The servo enable logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-11. The function of the servo enable logic is to permit the servos to tune variable capacitor 2A4C1 and variable inductor 2A5L1 during the proper stage in the tuning cycle. This is accomplished by using error signals from the discriminators to provide a servo enable (+) signal to the servo amplifiers.

2-57. When the VSWR exceeds 1.2:1, a VSWR>1.2:1 (high signal is applied to U12A-2 (figure 3-43) causing the output to go low. This level is applied to U11C-9, causing the output to go high, if U11C-8 (series C complete (GND) signal) is also low. This high signal biases on U5G, placing a high level on the servo enable (+) line. This condition will exist until either the VSWR drops to less than 1.2:1 or the series C complete (GND) signal is removed. U5G may also be biased on, placing a high on the servo enable (+) line, by a high signal from the homing drive (+) logic circuit. (Refer to paragraph 2-50.)

2-58. TRANSMITTER INHIBIT (TX INHIBIT) LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-59 and 2-60 with 2A8 unless otherwise specified.

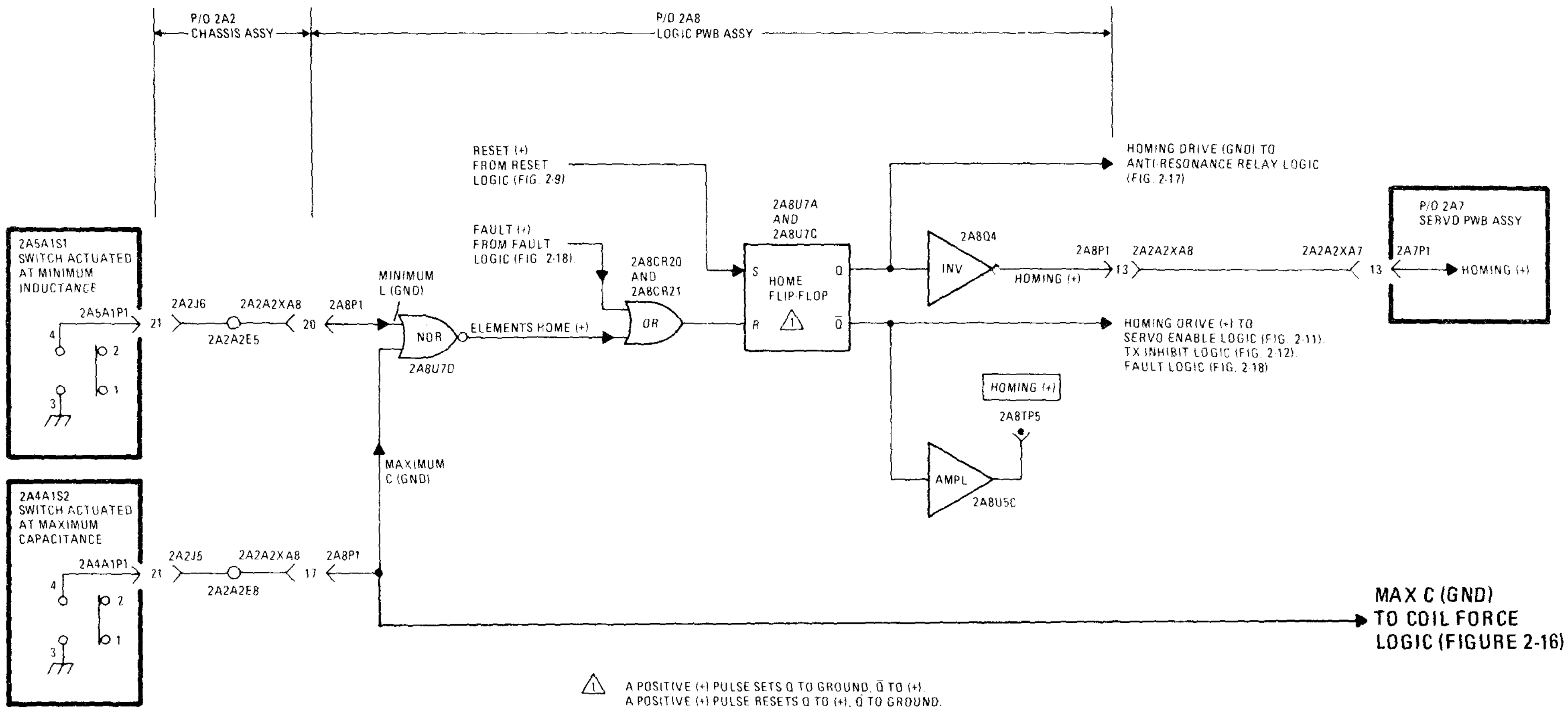


Figure 2-10. Simplified Homing Logic Diagram

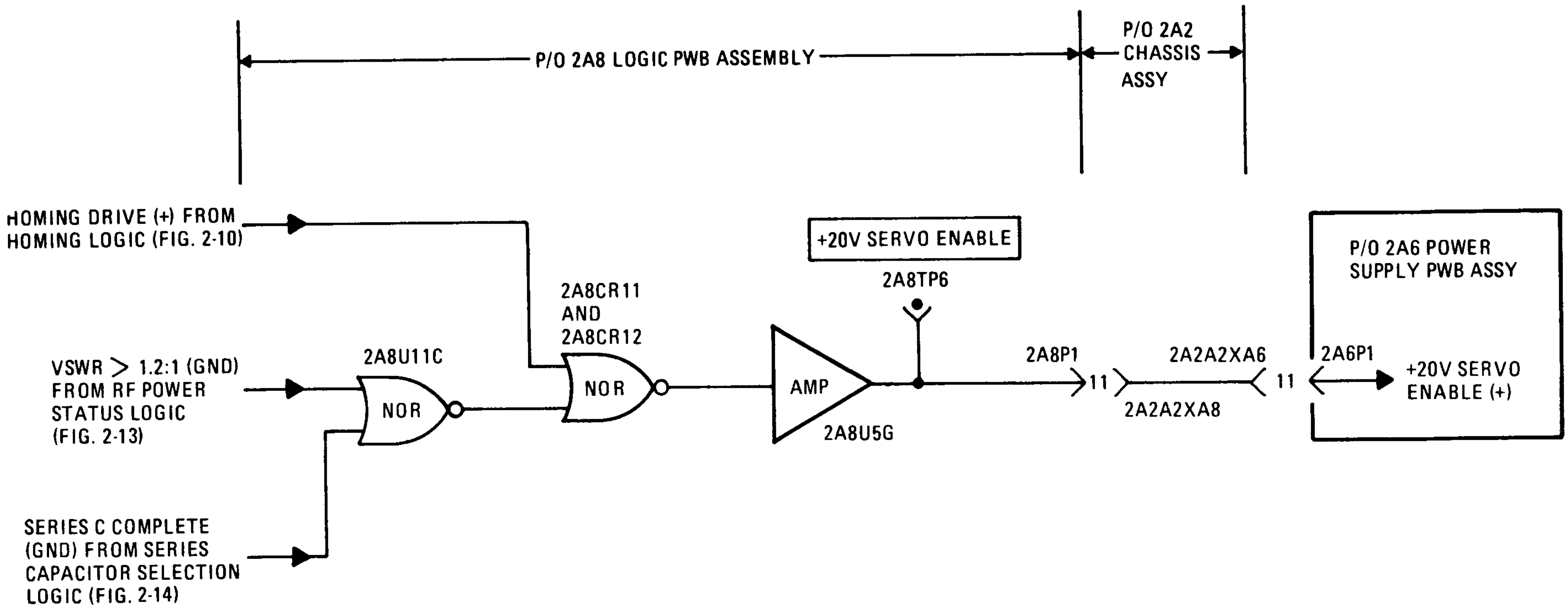


Figure 2-11. Simplified Servo Enable Logic Diagram

2-59. The transmitter inhibit logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-12. The function of the transmitter inhibit logic circuit is to provide the necessary logic levels to the transmitter to prevent RF transmission while variable capacitor 2A4C1 and variable inductor 2A5L1 are being reset to home position, or when a fault occurs. The transmitter inhibit signals are applied as follows (refer to figure 2-12):

a. Transmitter inhibit (+) is applied to the RF status logic circuit.

b. Transmitter inhibit (GND) is applied to Power Amplifier AM-6545/GRC-193 via control connector 2A2J2.

c. Transmittcr enable (GND) is applied to the RF power status logic circuit.

2-60. Refer to figures 2-12 and 3-35. The transmitter inhibit (+) transmitter enable (GND) line is normally grounded through R82, enabling the transmitter and placing a high on the RF present (+) line through U6A. If, however, the homing drive (+) or fault (+) line goes high, a transmitter inhibit (+) signal is applied to U6A-1, placing a low on the RF present (+) line. This high level also biases on U2C, which energizes TX INHIBIT LED (light emitting diode) DS2 and places a high on the base of Q11. Q11 is biased on, grounding the transmitter inhibit (GND) line, and inhibiting the transmitter. The transmitter inhibit (GND) line may also be grounded thorugh Power Supply PCB 2A6.

2-61. RF POWER STATUS LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-62 and 2-63 with 2AS unless otherwise specified.

2-62. The RF power status logic circuit comprises the circuit elements shown in the simplified logic diagram figure 2-13. The function of the RF power satus logic circuit is to provide an input to various logic circuits indicating when there is RF present on the transmission line, when the transmitter is keyed, and when the VSWR is less than 1.2:1. The sequence of operation of the RF power status logic circuit is as follows (refer to figure 2-13):

a. RF present (+) signal is applied to the series capacitor selection logic circuit and 2A8U12A-1 in the RF power status logic circuit.

b. VSWR <2:1 (GND) is applied to the ready logic circuit.

c. VSWR >2:1 (GND) is applied to the coil force logic circuit and the 2:1 VSWR overload logic circuit.

d. VSWR >1.2:1 (GND) is applied to servo enable logic circuit.

2-63. When the transmitter is keyed, the keyline (GND) line is low, biasing off Q2 and placing a high level keyed (+) signal on U12C-9 (figure 3-44). When RF is present on the transmission line, there is a high RF on (+) signal at U12C-8. These two high signals provide a low signal to the RF present (GND) line, which causes the VSWR >2:1 (GND) line to be grounded through R83, if there is no high on the VSWR <2:1 (+) line. The low level output from U12C10 is also applied to U6A-2, causing a high output if there is a transmitter enable (GND) signal at U6A-1, and sending the RF present (+) line high. This high is applied to U9D-12. A high on the VSWR <2:1 (+) line sends the VSWR >2:1 (GND) line high and is also applied to U9D-13. The two high inputs at U9D provide a low on the VSWR <2:1 (GND) line, which is applied to U6D-13. U124-3 is normally high, placing a high level on the VSWR >1.2:1 (GND) line; however, as soon as either the VSWR>1.2:1 line goes high at U12A-2, or the RF present (+) goes low at U12A-1, the output goes low, providing a low VSWR >1.2:1 (GND) signal on U11C-9.

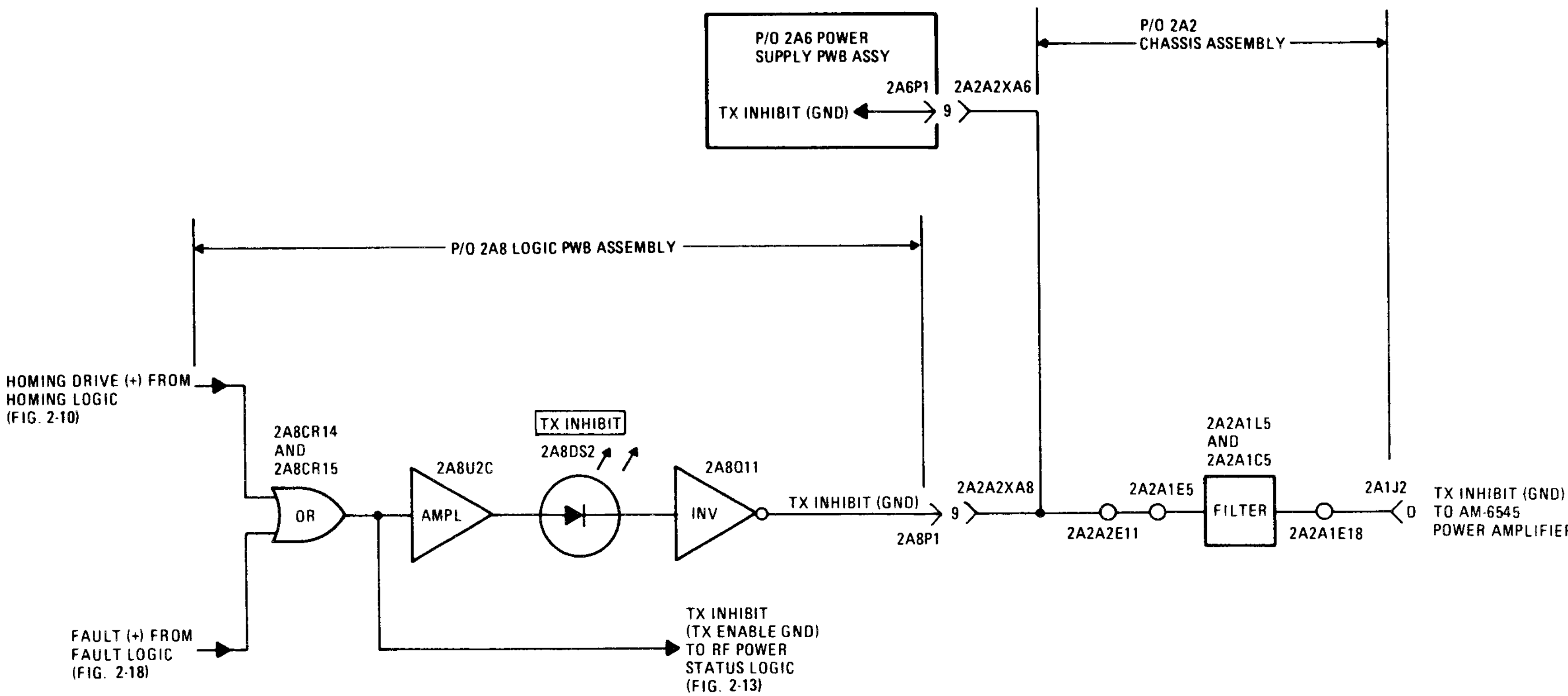


Figure 2-12. Simplified Transmitter Inhibit (TX Inhibit) Logic Diagram

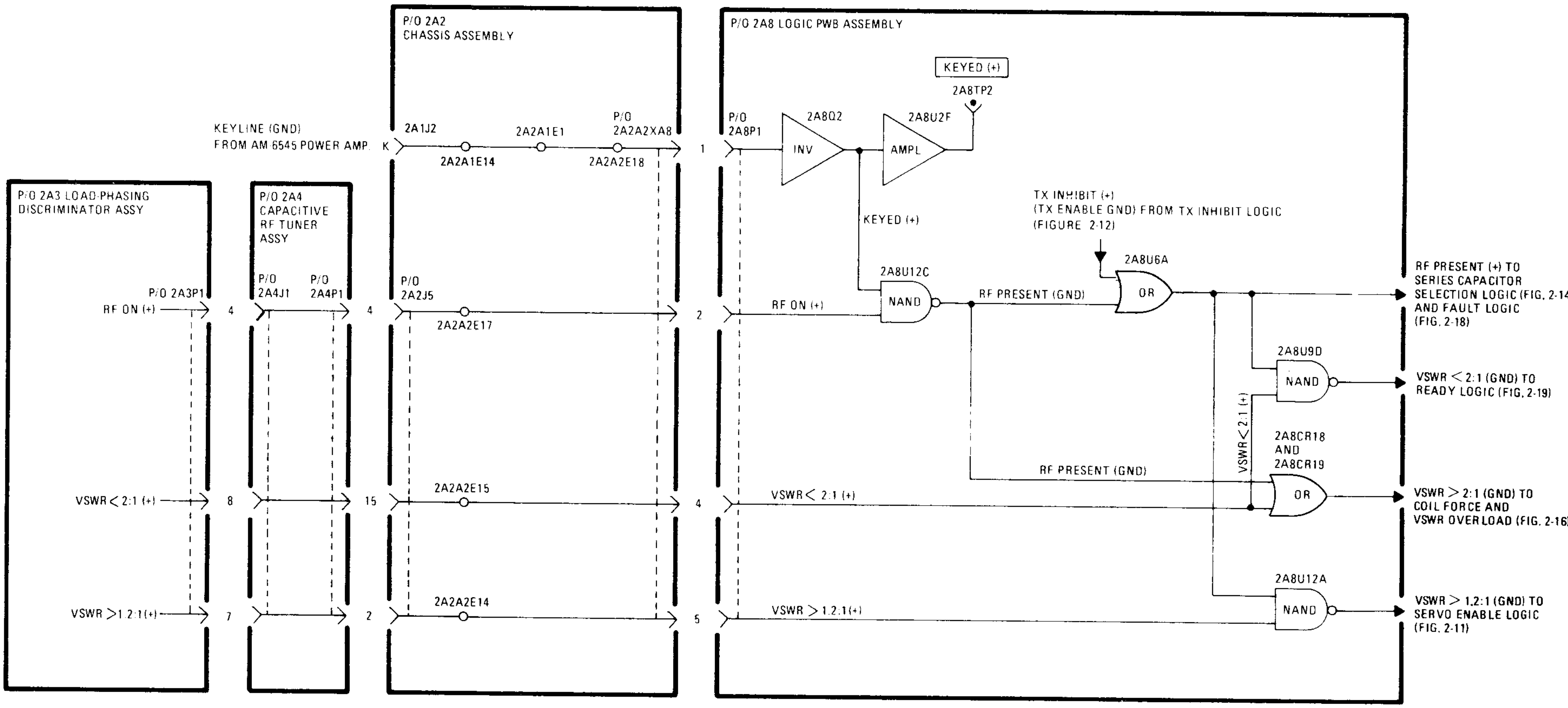


Figure 2-13. Simplified RF Power Status Logic Diagram

2-64. SERIES CAPACITOR SELECTION LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-65 through 2-69 with 2A8 unless otherwise specified.

2-65. The series capacitor selection logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-14. The function of the series capacitor selection logic is to control the relays that insert fixed capacitors 2A4C2, C3, and C4 in series with the transmission line. (Refer to figures 2-1, 2-14, and 3-35.) A series capacitor is required to bring the impedance of the antenna within the tuning range of variable vacuum capacitor 2A4C1 and variable inductor 2A5L1 when antenna impedance is less than 50 ohms, or when the phase is less than or equal to zero.

2-66. Relay 2A4K3 controls three fixed 40 picofarad capacitors in parallel (2A4C2, C3, and C4). This permits the option of switching 120 picofarads of capacitance into the transmission line. Relay 2A4K3 is controlled by a flip-flop which switches the relay to insert the capacitors in series with the antenna. The loading-phasing discriminator (which monitors the transmission line directly when 2A4C1 and 2A5L1 are bypassed) determines when the 120 picofarads capacitance is to be inserted in the transmission line, and provides the proper signal to the capacitor logic and the active tuning element logic to do so.

2-67. The signal is initially interrupted to remove any fixed capacitance from the transmission line at the start of the tune cycle; the delay circuits will not insert the fixed capacitors until 2A5L1 and 2A4C1 have been bypassed, the transmitter has been keyed, and RF is present.

2-68. With two high inputs at U9C, the output is low, and is applied to the phase $\leqslant 0^{\circ}$ (GND) line and U4C-9. If the transmission line impedance is correct, the Z <50 (+) line is low. This low is applied to U4C-8 The two inputs at U4C provide a high series C not required (+) level at U11D-13, driving the output low and setting series C complete flip-flop U12B/U12D. When the flip-flop is set, U12B-4 ($\overline{Q}$) is low, and U12D-11 (Q) is high. The high series C complete signal is applied to U6B-6, providing a low level output signal to U10B-5 and U4D-13. These signals place a low on the base of U5D and U5F, biasing them off. This causes a high level on the 120 (GND) line, thereby bypassing the series capacitors.

2-69. If the phase $\leqslant 0^{\circ}$ (+) line goes low or the Z <50 (+) line goes high, the output of U4C10 goes low, causing the output of U11D11 to go high and resetting series C complete flip-flop U12B/U12D. This places a low on the series C complete (+) line and a high on the series C complete (GND) line. The low level on the series C complete (+) line causes a high at the output of U6B4. The high on the series C complete (GND) line places a low on the servo enable (+). The high output from U6B is applied to the 120 picofarads select flip-flops, setting them. This places a low on the 120 picofarads (GND) line, pulling in relay 2A4K3, and placing 120 picofarads of capacitance in series with the transmission line.

2-70. TUNING ELEMENTS ACTIVE LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-71 through 2-73 with 2A8 unless otherwise specified.

2-71. The tuning elements active logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-15. The function of the tuning elements active logic circuit is to actuate relays that by-pass variable vacuum capacitor 2A4C1 and variable inductor 2A5L1 to permit the discriminator to monitor the antenna and to insert fixed series capacitors in the transmission line if needed (figure 2-1). The tuning elements active (GND) line is applied to tuning elements active relays 2A4K1 and 2A4K2.

2-72. See figure 3-44. Normally, U5E is biased on by a high at U5E-10 from the series C complete (+) line (paragraphs 2-64 through 2-69). This places a high on the base of Q9, which turns on TUNING ELEMENTS ACTIVE LED DS7 and biases Q9 on, placing a ground on the tuning elements active (GND) line. This allows 26.5 volts to energize relays 2A4K1 and 2A4K2, placing 2A4C1 and 2A5L1 in the transmission line.

2-73. With a low on U5E-10, however, Q9 is biased off, LED DS7 is off, the tuning elements active (GND) line is high, and relays 2A4K1 and 2A4K2 are deenergized, bypassing 2A4C1 and 2A5L1.

2-74. COIL FORCE LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-75 through 2-77 with 2A8 unless otherwise specified.

2-75. The coil force logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-16. The function of the coil force logic is to force variable inductor 2A5L1 to be tuned toward its maximum inductance when the VSWR is >2:1, variable vacuum capacitor 2A4C1 is at maximum capacitance, and the phase $\leqslant 0^{\circ}$.

2-76. Two low inputs at U4B cause a high output, which is applied to U1A-2. With a high at U1A-1, the two highs cause a low at U1A-3. This signal applied to U8C-9, concurrent with a low at U8C-8, places a high at the input of inverter U11A. This places a low on the base of Q14, biasing it on and providing a high to the coil force (+) line. The coil is forced toward maximum inductance, causing the discriminator to generate an error signal.

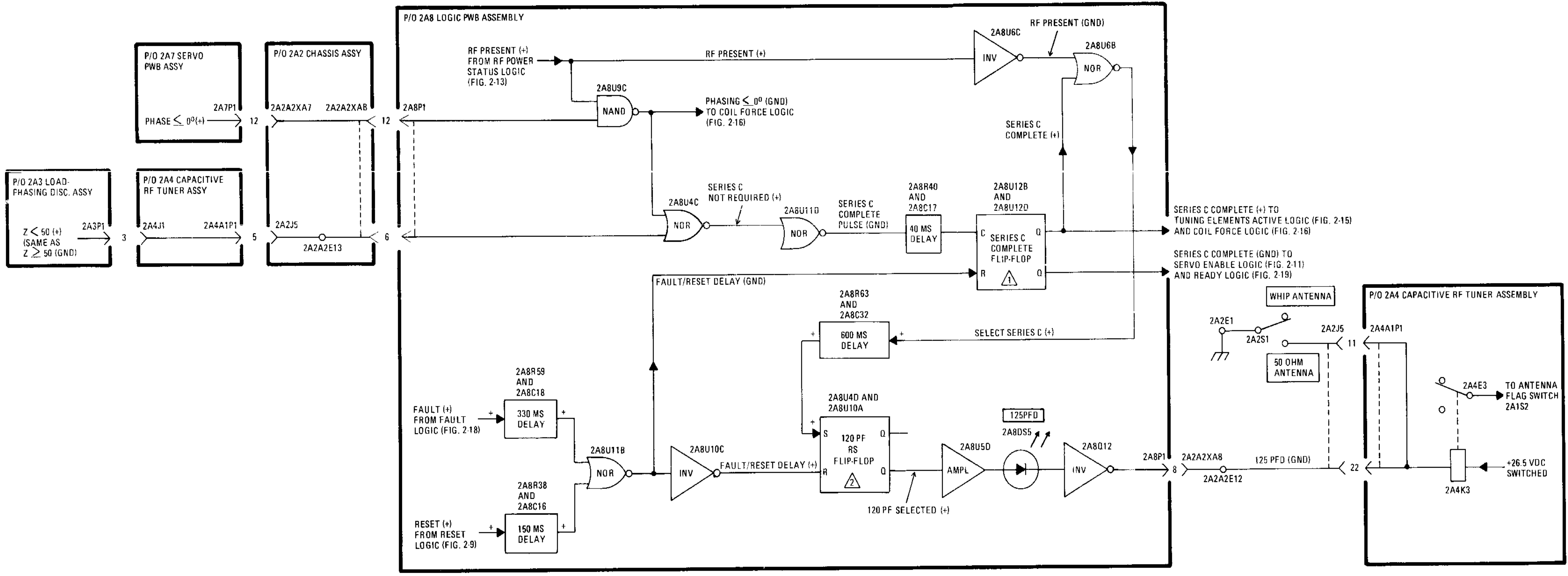
2-77. As variable vacuum capacitor 2A4C1 starts to tune, a high is applied to U4B-5, causing a low at U4B-4. This causes a high at U1A-3, a low at U8C-10, and a high at U11A-3, which biases off Q14 and places a low on the coil force (+) line. This condition will also result from a low at U9C-8 or U1A-1, or a high at U8C-8.

2-78. ANTI-RESONANCE RELAY LOGIC CIRCUIT ANALYSIS

Note

Prefix all component reference designations in subsequent paragraphs 2-79 through 2-81 with 2A8 unless otherwise specified.

2-79. The anti-resonance relay logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-17. The function of the anti-resonance relay logic is to prevent excessively high voltage on variable inductor 2A5L1 by shorting that portion of the inductor not in use.



⚠1 A GROUND PULSE SETS Q TO (+), Q̄ TO GROUND, A GROUND PULSE RESETS Q TO GROUND, Q̄ TO (+).

⚠2 A (+) PULSE SETS Q TO GROUND, Q̄ TO (+). A (+) PULSE RESETS Q̄ TO (+), Q TO GROUND.

Figure 2-14. Simplified Series Capacitor Selection Logic Diagram

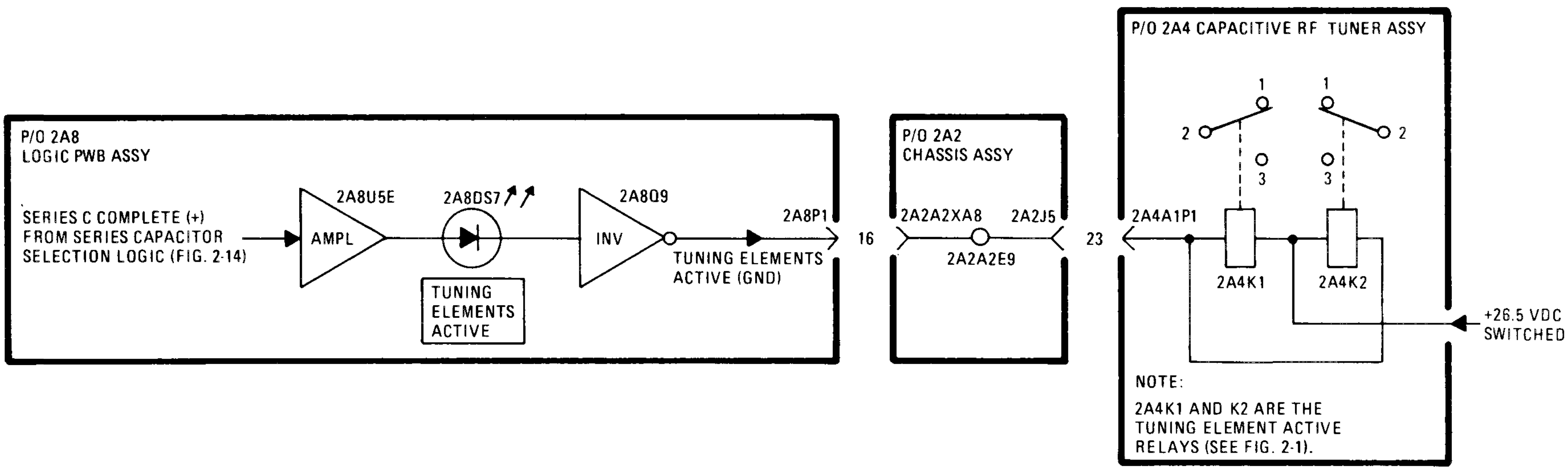


Figure 2-15. Simplified Tuning Elements Active Logic Diagram

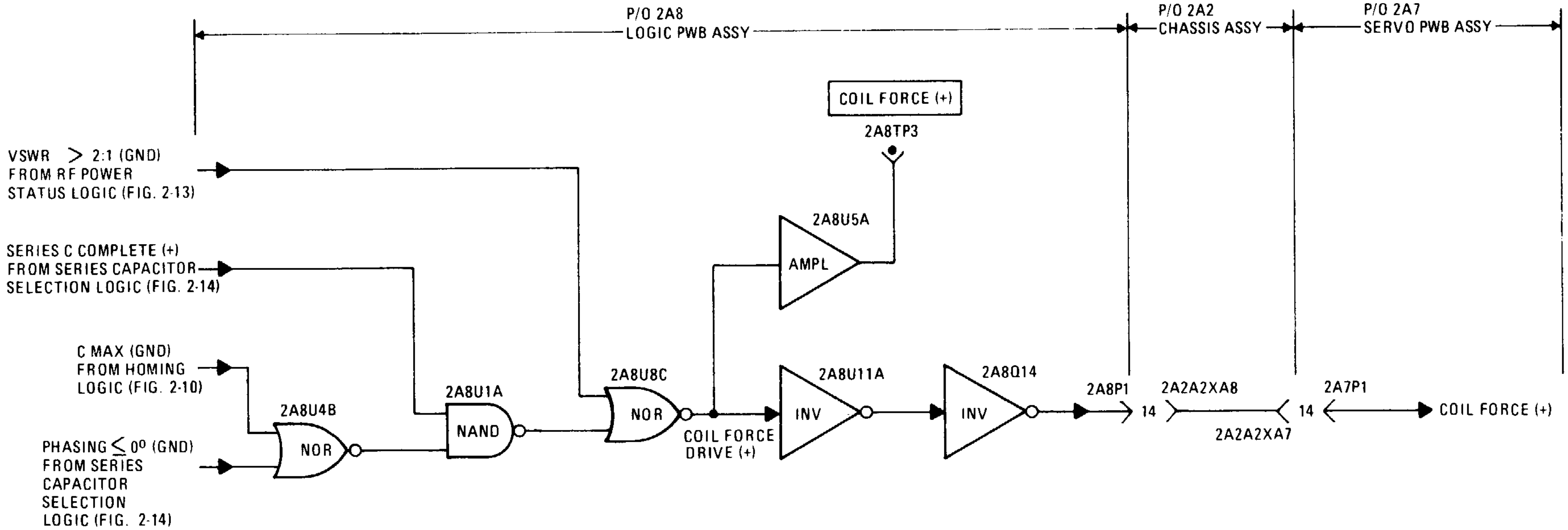


Figure 2-16. Simplified Coil Force Logic Diagram

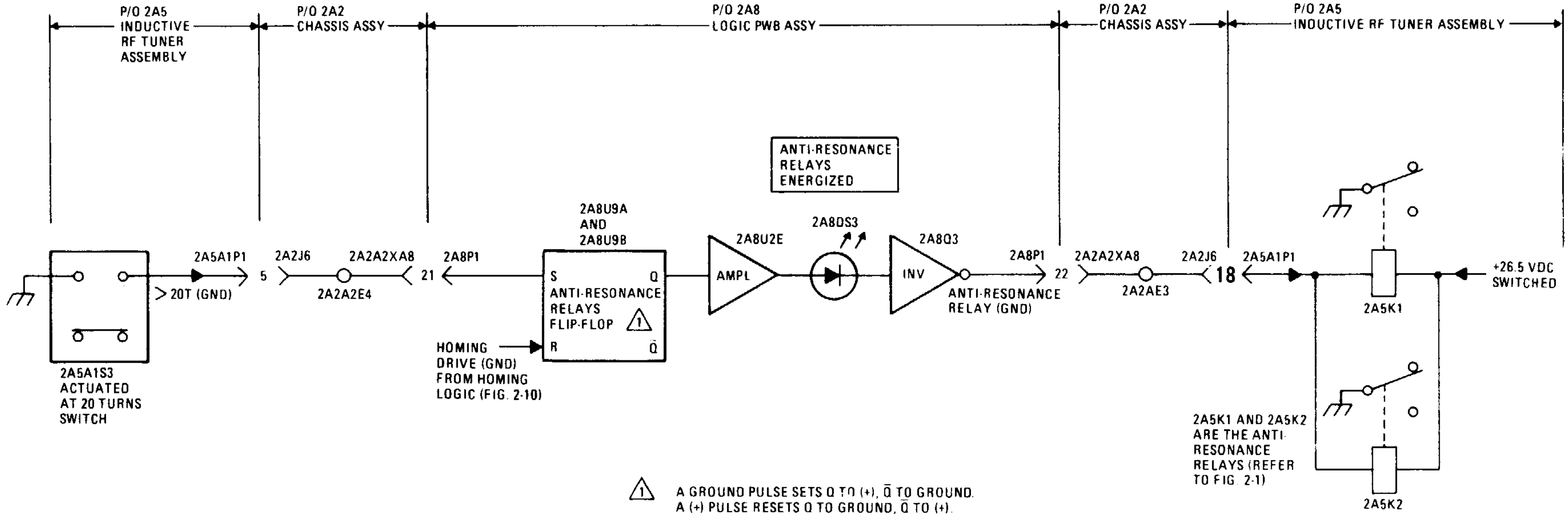


Figure 2-17. Simplified Anti-Resonance Relay Logic Diagram

2-80. When variable inductor 2A5L1 reaches the half-way point in its tuning cycle (approximately 20 turns), switch 2A5A1S3 closes, placing a ground on U9A-1 and setting anti-resonance relay flip-flop U9A/U9B. This places a high on the base of U2E, biasing it on and sending the output high. The high level from U2E biases on Q3, placing a ground on the anti-resonance (GND) line. This actuates relays 2A5K1 and K2, allowing the inductor to use its full length.

2-81. When the variable tap on the inductor is less than half-way through its travel, switch 2A5A1S3 is open, placing a high on U9A-1. This causes a low at U9A-3, biasing off U2E and Q3 and placing a high on the anti-resonance relay (GND) line. Relays 2A5K1 and 2A5K2 cannot energize, and half of 2A5L1 is shorted. This same condition will also result if the anti-resonance relay flip-flops are reset by a low homing drive (GND) signal at U9B-6.

2-82. FAULT LOGIC CIRCUIT ANALYSIS

Note

Prefix all reference designations in subsequent paragraphs 2-83 through 2-85 with 2A8 unless otherwise specified.

2-83. The fault logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-18. The function of the fault logic circuit is to provide a low level fault (GND) signal to Power Amplifier AM-6545/GRC-193 and a high level fault (+) signal to the homing logic, transmitter inhibit logic, and series capacitor selection logic circuits, in order to disable the system and prevent further RF transmission if the tuning cycle is not completed within 15 seconds.

2-84. When the coupler is tuned, a high level at U8A-1 sets RF present (+) flip-flop U8A/U8B. This places a ground on U8D-12, causing the output of U8D to go low. The signal at U4A-2 sends the output of U4A high which, acting through R45, R46, and Q6, disables 15-second timer, Q7 and Q8. This places a low on U3B-6, causing a high at U1D-13. The output of fault flip-flop U1D/U1B is low, biasing off U2D and Q10 and placing a high on the fault (GND) line.

2-85. With a high reset (+) signal at U8B-6, or high not ready (GND) signal at U8D-13, the output of U8D goes high. With a high at either pin 2 or pin 1 or both, of U4A, the output is low, which, acting through R45, R46, and Q6, places a high on Q7 and Q8 and enables the 15-second timer. If, at the end of 15 seconds, the timer enable signal has not been removed (as described), a high at U3B-6 places a low on U1D-13. This sets the fault flip-flop, placing a high on U2D-8, biasing it on, and energizing FAULT LED DS1. A high is placed on the base of Q 10, which places a ground on the fault (GND) line. A high VSWR overload (+) signal acting on U3B-5 also causes a ground on the fault (GND) line. A low level reset (GND) signal at U1B-6 resets the fault flip-flop, turning off FAULT LED DS1 and causing a high level on the fault (GND) line.

2-86. READY LOGIC CIRCUIT ANALYSIS

Note

Prefix all reference designations in subsequent paragraphs 2-87 through 2-90 with 2A8 unless otherwise specified.

2-87. The ready logic circuit comprises the circuit elements shown in the simplified logic diagram, figure 2-19. The functions of the ready logic circuit are to provide the necessary logic signals to indicate that the coupler is tuned; to reduce the gain on the servo amplifiers; and, if there is a VSWR overload, to provide a fault indication, disable the transmitter, and send coupler tuning elements to their home positions.

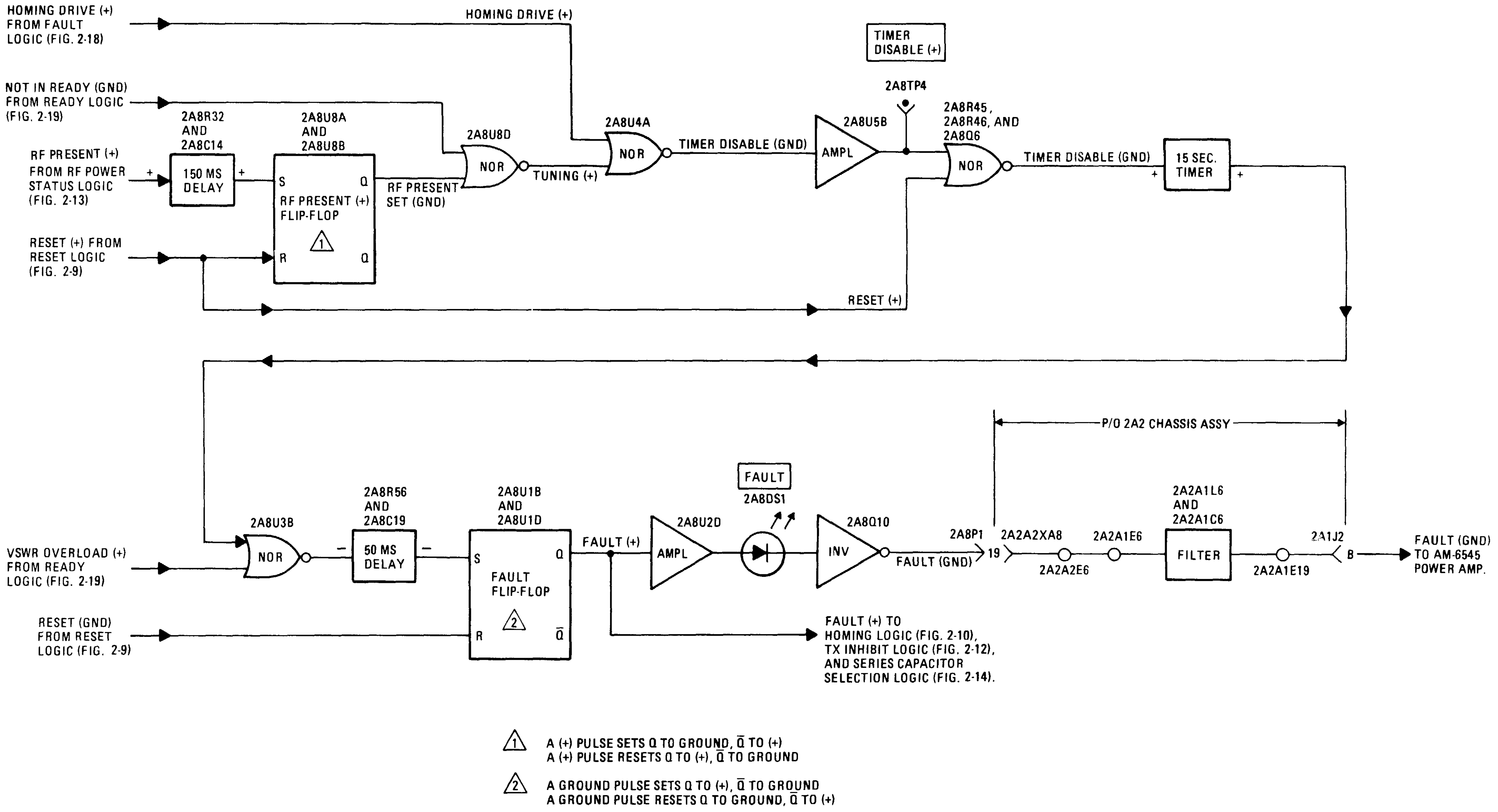


Figure 2-18. Simplified Fault Logic Diagram

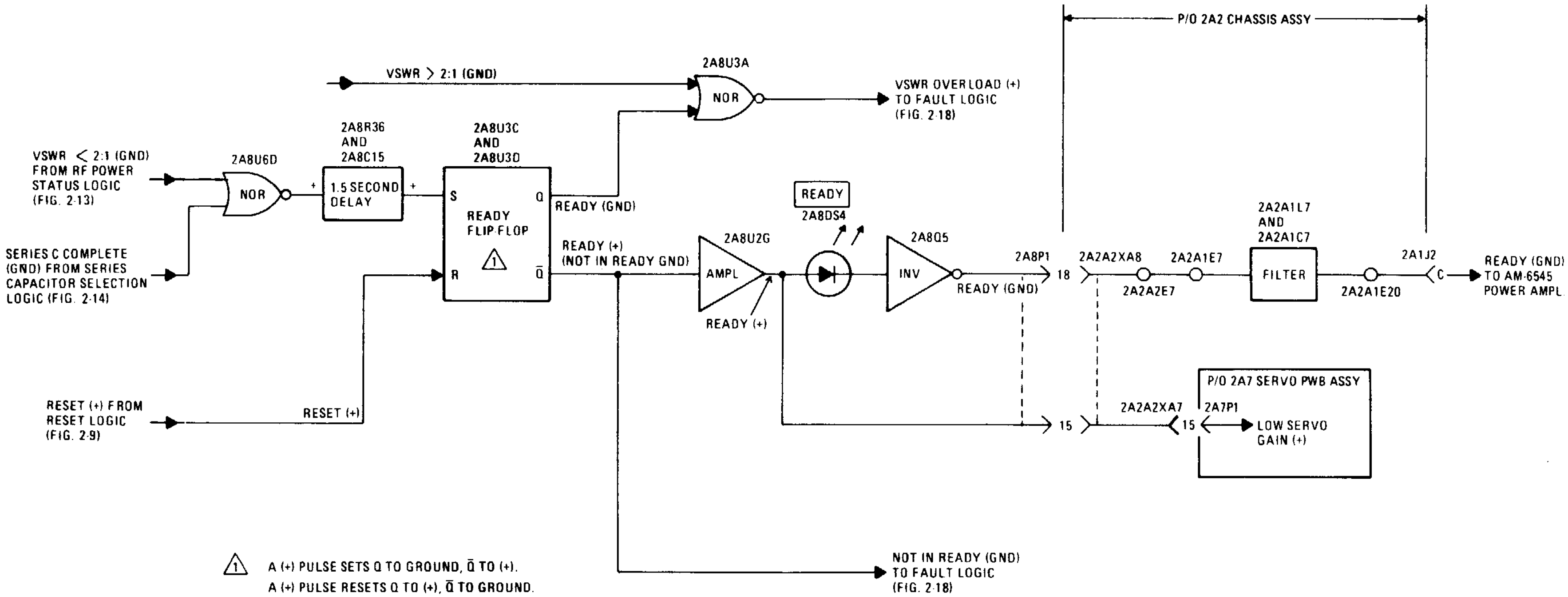


Figure 2-19. Simplified Ready Logic Diagram

2-88. When the coupler is tuned and the VSWR is <2:1, both inputs of U6D are low, sending its output high. This level, applied to U3D-13, sets ready flip-flop U3C/U3D. With the flip-flop set, a low signal is placed on U3A, placing a low on the VSWR overload line. A high is applied to U2G13, causing the low servo gain line to be high, READY LED DS4 to go on, and Q5 to be biased on. With Q5 on, the ready (GND) line is low.

2-89. If the VSWR becomes >2:1, a low at U3A-1 places a high on the VSWR overload line. This signal causes a fault indication, disables the transmitter, and sends the coupler tuning elements to their home positions.

2-90. A high level reset (+) signal at U3C-8 resets the ready flip-flop, causing a low on the low servo gain (+) line, de-energizes READY LED DS4, and places a high on the ready (GND) line.

2-91. POWER SUPPLY PWB 2A6 CIRCUIT DESCRIPTION

Note

In subsequent paragraphs 2-92 through 2-94, prefix all reference designators with 2A6 unless otherwise specified.

2-92. Power Supply PWB 2A6 provides regulated +20, +10, and – 10 Vdc as operating voltages for the coupler. The unit also provides overvoltage protection that removes primary power from the coupler and inhibits the transmitter. A simplified diagram of the power supply circuitry is shown in figure 2-20.

2-93. Primary power (+26.5 Vdc) is supplied from Power Amplifier AM-6545/GRC- 193 and applied through overvoltage relay K 1 to the +20 Vdc and +10 Vdc regulators. Relay K 1 is energized when both a coupler on (+) signal and an overvoltage sensor off (+) signal are present at the inputs of NAND gate Q 1. When energized, relay K 1 also provides a high transmitter inhibit (GND) signal to the transmitter inhibit logic to keep the transmitter energized. If either input to NAND gate Q 1 is removed, indicating an over-voltage condition or a turn-off from the power amplifier, K 1 de-energizes, removing power from the regulators and inhibiting the transmitter. The +20 Vdc regulator is separately turned on and off by the +20V servo enable (+) signal from the servo enable logic circuit (via inverter Q5); it automatically turns off if the servo enable signal goes low or a short circuit condition is sensed. The +20V regulator controls series regulating transistor Q 1.

2-94. The +10 Vdc regulator controls series regulating transistor Q2A dc-to-dc converter provides a separate -10 Vdc output. An SCR crowbar circuit senses any overvoltage condition on the +10V line and de-energizes relay K 1. It also provides overvoltage signal to NAND gate Q 1, causing K 1 to de-energize, removing primary power from both regulators and inhibiting the transmitter.

2-95. SERVO PWB 2A7 CIRCUIT DESCRIPTION

Note

In subsequent paragraphs 2-96 through 2-102, prefix all reference designators with 2A7 unless otherwise specified.

2-96. The function of the servo amplifiers of Servo PWB 2A7 is to convert logic discriminator error signals to servo motor control signals for use by the motors that tune variable vacuum capacitor 2A4C1 and variable inductor 2A5L1. The two components, with their separate motors, are controlled by separate servo amplifiers. A separate speed control circuit for each servo causes the amplifier outputs to be pulsed and controls pulse width. Pulse width, in turn, controls the time each motor is energized and thus the speed. Motor

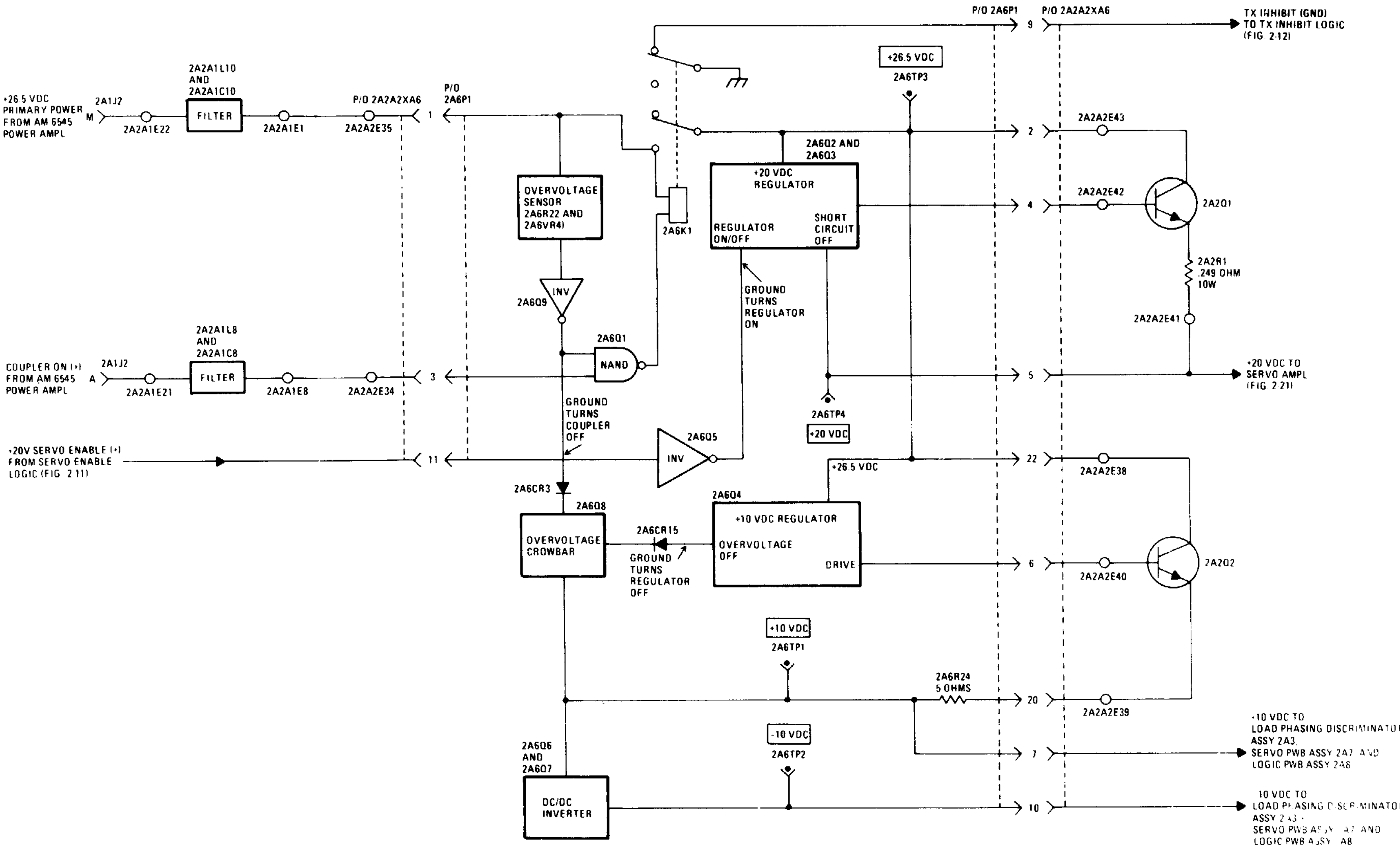


Figure 2-20. Simplified Power Supply PWB 2A6 Circuit Diagram

speed is adjusted to the magnitude of the error signal from the discriminator; fast when the error is great, slower when a tuned condition is approached. A simplified diagram of the Servo PWB 2A7 circuit is shown in figure 2-21.

2-97. The motor speed control contains a relaxation oscillator, which provides a sawtooth wave form signal to two of the inputs of U2 and U3 in the servo amplifiers. This signal pulses motor operation and controls motor speed through pulse width. Gate transistor Q19 functions as the relaxation oscillator. The rate of oscillation is controlled by R16 and C9. The output of the oscillator is applied through emitter follower Q20 to provide a low impedance input to one side of differential amplifiers U2 and U3 in the servo amplifiers.

2-98. Switch Q18 is normally biased to +5 Vdc by voltage divider R11-R27. When a tune cycle is completed, the servo gain control voltage (P1-15) is +10 Vdc, which forward biases Q18 to +9.5 Vdc through filter L4-C7. The increased bias voltage increases the sawtooth voltage applied to U2-U3, effectively reducing the servo gain.

2-99. Refer to figure 3-43, the schematic diagram of the servo control system. Control information for the variable vacuum capacitor (2A4C1) servo originates in the phase discriminator, as previously described. The control voltage at the capacitor (+) input to U2A can vary between a minus and a plus voltage as a function of the phase discriminator output. The phase input is applied to the non-inverting input of U2 and to the inverting input of U1A so that U2A and U1A will have equal but opposite output voltages.

2-100. Assuming that the U2A output voltage is positive and the U1A output voltage is negative, the variable capacitor is driven toward maximum as follows: The negative output voltage from U3A biases on PNP transistors Q9 and Q17, and the positive output voltage from U1A biases on NPN transistors Q6 and Q14. With this polarity voltage on the “C” servo drive motor, the variable capacitor is driven toward maximum. Note that maximum C corresponds to the home position, and that the home logic levels introduced through CR1 and CR17 also cause drive transistor bias conditions that drive the variable capacitor in this direction.

2-101. A phase discriminator output that causes the U2A output to be negative and the U3A output to be positive, biases on Q7, Q8, Q15, and Q16, and causes the variable capacitor to be driven toward minimum capacitance.

2-102. The inductor drive servo operates in the same way as the capacitor drive servo described in the previous paragraph, with the exception that the loading discriminator is used as the sensor and drive voltage source. The loading discriminator output varies between a minus and a plus voltage as a function of the untuned condition. This voltage causes the inductor drive servo to run either clockwise or counterclockwise until a tuned condition is reached, as indicated by zero volts or a null at the loading discriminator output. Note that the forcing logic (negative through Q1 to U2B and (+) through U1B to U3B) drives the inductor toward maximum inductance by biasing Q3, Q4, Q11 and Q12 on. These same conditions bias off Q2, Q5, Q10 and Q13. The servo signal, when tuning to eliminate discriminator errors, is in the form of a series of pulses, with the pulse width controlling motor speed. Motor speed is rapid during initial tuning, when discriminator error is great, and slower as the proper tuning point is approached and the error signal diminishes. Average tuning time is approximately 5 seconds.

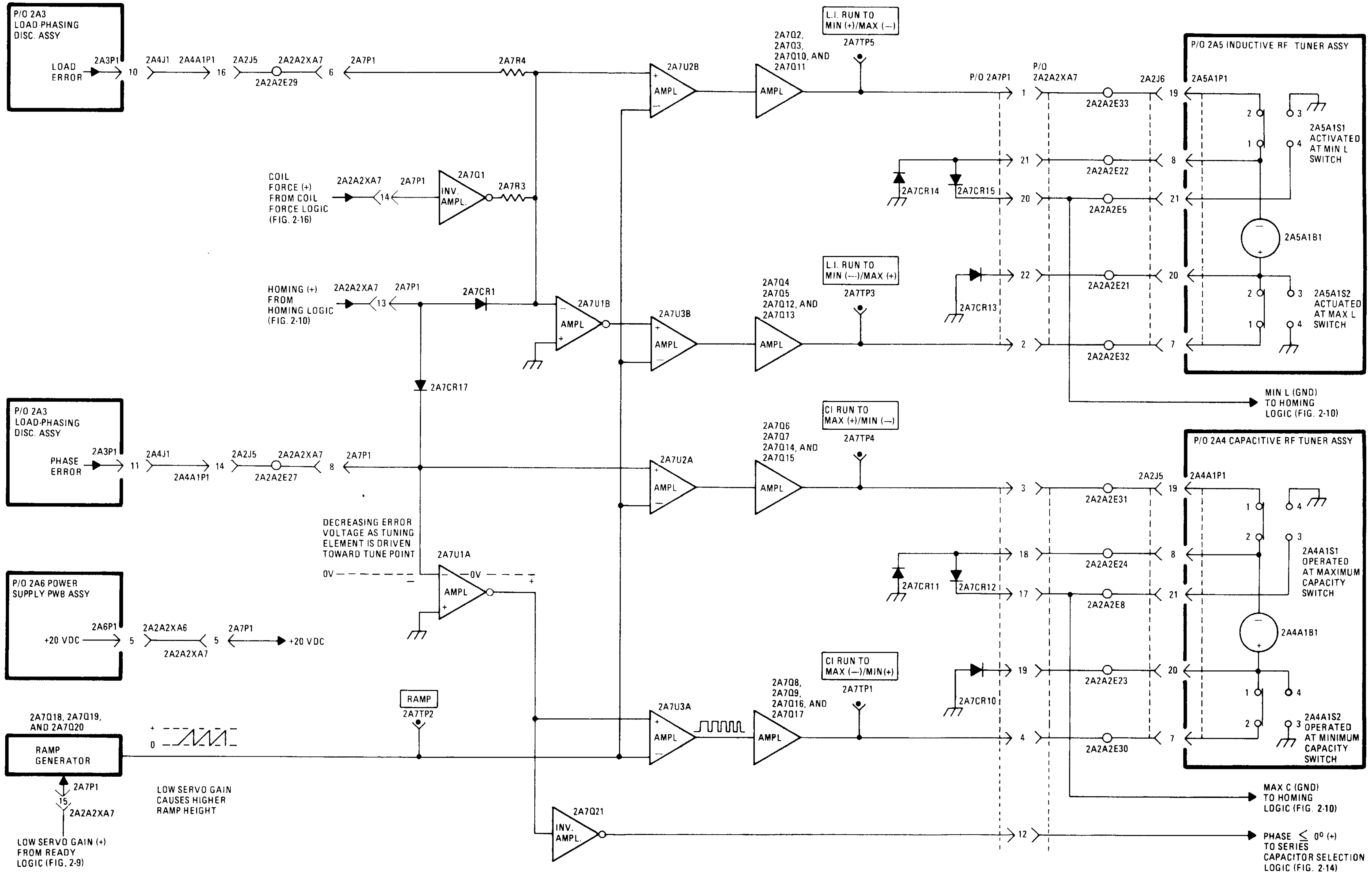


Figure 2-21. Simplified Servo PWB 2A7 Circuit Diagram

2.103. STATIC INVERTER POWER ASSEMBLY 2A9 CIRCUIT DESCRIPTION

Note

In subsequent paragraphs 2-104 through 2-107, prefix all reference designators with 2A9A1 unless otherwise specified.

2-104. The function of Static Inverter Power Assembly 2A9 is to convert the 26.5 Vdc (nominal) input voltage to a 400 Hz square wave output, in order to operate vaneaxial fans, 2A1B1 and 2A5B2 (figures 3-38 and 3-45). The assembly comprises three main circuit groups: a 400 Hz oscillator and two identical amplifier circuits.

2-105. Refer to figure 3-45. The 400 Hz oscillator consists of unijunction transistor Q1, timing resistor R2 and capacitor C1. This circuit produces an output (observable at TP1) of positive and negative spikes. The interval between any two spikes is 2.5 milliseconds nominal.

2-106. This remaining two circuits are identical amplifiers. These amplifiers receive a pulse from the 400 Hz oscillator; one of them is turned on while the other remains off. When the next pulse occurs, the amplifiers change state, that is, the amplifier that was on goes off and the amplifier that was off goes on.

2-107. The inverter output, observable at TP2 and TP3, is a 400 Hz square wave approximately 5 volts less than the 26.5 Vdc inverter input.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

SECTION I

INTRODUCTION

3-1. INTRODUCTION

3-2. This chapter contains intermediate maintenance instructions for Antenna Coupler CU-2064/GRC-193. Included are scheduled maintenance instructions, a list of tools and test equipment, restricted safety precautions, disassembly and assembly instructions, inspection instructions, and troubleshooting, alignment, and adjustment data for the coupler. Tabular data, illustrations, and references to the theoretical explanations in chapter 2 are included to aid the technician in a complete understanding of the procedures and equipment.

3-3. This chapter is arranged so that the troubleshooting and field maintenance instructions are integrated with one another. The maintenance procedures contained in this chapter require input and out put signals, external switching, and power sources provided by the various components of Radio Set AN/GRC-l93, of which Antenna Coupler CU-2064/GRC-l93 is a component. If it is desired to test the coupler not using Radio Set AN/GRC-l93 as a test standard, the inputs can be duplicated using a special test equipment setup. Refer to figure 3-1 for specific details.

3-4. SCHEDULED MAINTENANCE ACTION INDEX

3-5. Table 3-1 lists procedures, applicable paragraph references, and the frequency of performance for all maintenance instructions (inspection, repair, adjustments, etc.) contained in this chapter.

SECTION II

TOOLS AND EQUIPMENT

3-6. TOOLS, CLEANING SOLVENTS, LUBRICANTS, AND OTHER CONSUMABLE SUPPLIES

3-7. Tables 3-2 through 3-5 list the tools, cleaning solvents, lubricants, and consumable supplies needed for maintenance of the coupler.

Note

Maint Kit OA-9163/GRC-193A is used as a Maint Test Bed.

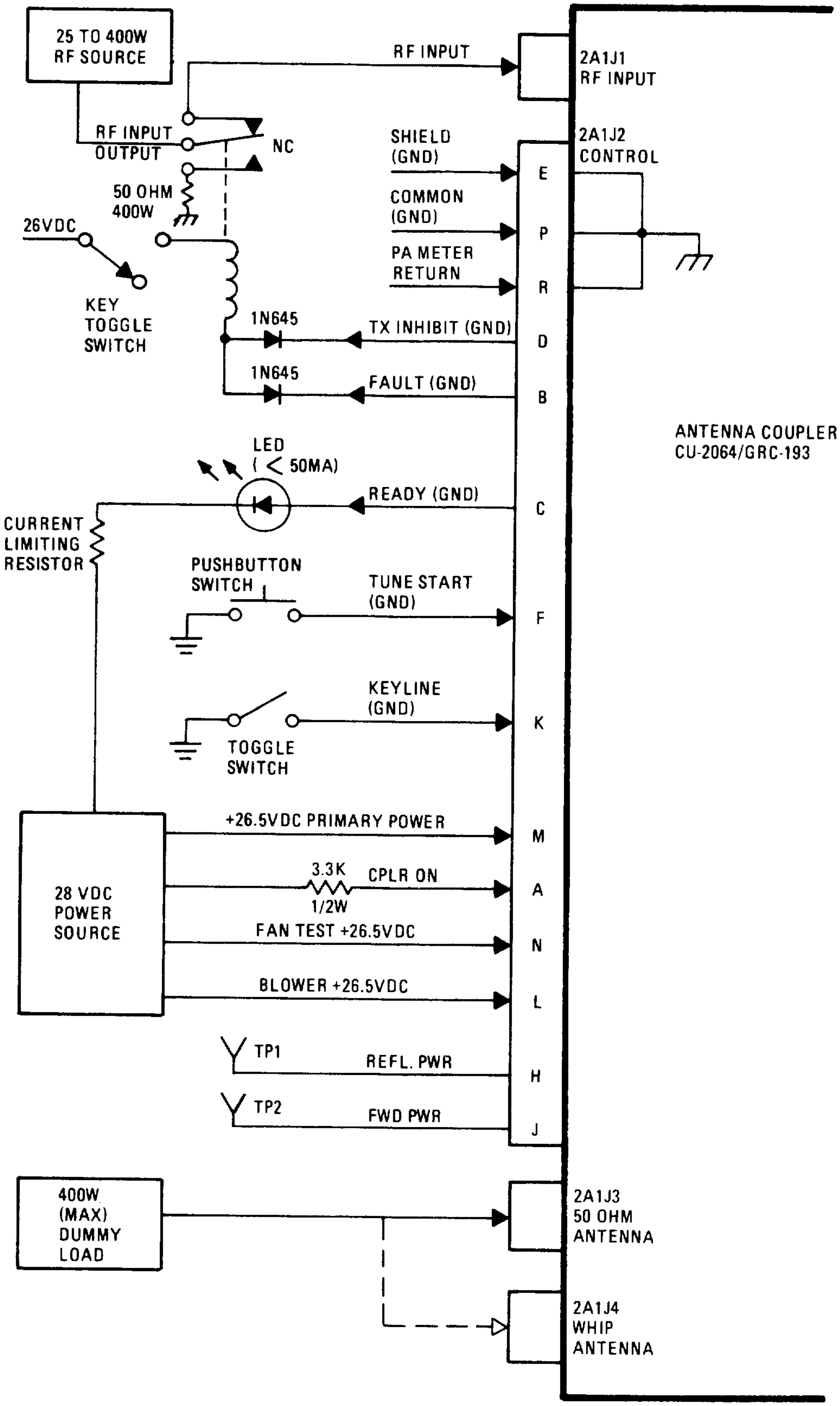


Figure 3-1. Special Test Setup for Testing Coupler

TABLE 3-1. ANTENNA COUPLER CU-2064/GRC-l93
SCHEDULED MAINTENANCE INSTRUCTION INDEX

PERIODICITY	MAINTENANCE INSTRUCTION	REFERENCE
Daily before operation	External inspection and cleaning	See TM 11-5820-924-12
Daily before operation	System test (operational)	See TM 11-5820-924-12
As required	Paint touch up	Para. 3-31
Only when unit is opened for trouble-shooting	Disassembly and reassembly	Para. 3-12 thru 3-27: Para. 3-89 and 3-90
Only when unit requires internal troubleshooting or re-pair	Parts replacement and repair	Para. 3-65 thru 3-86
Only when a malfunc-tion is encountered	Trouble analysis	Para. 3-32 thru 3-46
Following repair or when a malfunction indicates the need.	Adjustment and alignment	Para. 3-49 thru 3-64

TABLE 3-2. ANTENNA COUPLER CU-2064/GRC-193
MAINTENANCE TOOLS REQUIRED BUT NOT SUPPLIED

DESCRIPTION	USE
25 watt soldering iron	General maintenance
Flat blade screwdriver, 3/16 inch blade x 8 inches long; Vaco No. A316-8.	Coupler disassembly and reassembly (Par. 3-15, 3-16, 3-18, 3-21)
Flat balde screwdriver, 1/4 inch blade x 3 inches long; Xcelite No. R-3163.	Coupler disassembly and reassembly (Par. 3-17, 3-18)
Philips head screwdriver, No. 1, 3-1/2 inches long; Xcelite No. Xl01.	Coupler disassembly and reassembly (Par. 3-16, 3-23 3-24, 3-25, 3-26, 3-27, 3-31, 3-69, 3-70, 3-78, 3-84, 3-86
Philips head screwdriver, No. 8, 8 inches long; Xcelite No. Xl 08.	Coupler disassembly and reassembly (Par. 3-24, 3-26, 3-27)
Nut driver, 1/4 inch, 5-3/4 inches long; Xcelite No. L8.	Coupler disassembly and reassembly (Par. 3-14, 3-18)
Nut driver, No. 6.	Coupler disassembly and reassembly (Par. 3-22)
Four-fluted No. 8 Bristol wrench; Hunder No. 048,	Coupler disassembly and reassembly (Par. 3-16, 3-82)
13/16 inch open end wrench	Replacement of relays 2A4K2 and/or 2A4K3 (Par. 3-82)

TABLE 3-3. ANTENNA COUPLER CU-2064/GRC-l93
MAINTENANCE-CLEANING SOLVENTS REQUIRED BUT NOT SUPPLIED

DESCRIPTION AND SPECIFICATION	USE
Trichlorethylene, Fed. Spec. O-T-634	Cleaning metal parts (Par. 3-31)
or	
Methylethylketone (MEK), Fed. Spec. TT-M-261	Cleaning metal parts (Par. 3-31)
Technical Isopropyl Alcohol, Spec. MIL-I-10428	Cleaning case contours (Par. 3-31)

TABLE 3-4. ANTENNA COUPLER CU-2064/GRC-193
MAINTENANCE-LUBRICANTS REQUIRED BUT NOT SUPPLIED

DESCRIPTION AND SPECIFICATION	USE
Lubriplate Grease; RF Spec. No. 755017A8241	Used to lubricate the gears of the RF Tuner Assembly gears. (Par. 3-31)

TABLE 3-5. ANTENNA COUPLER CU-2064/GRC-l93
MAINTENANCE OTHER CONSUMABLE SUPPLIES REQUIRED BUT NOT SUPPLIED

DESCRIPTION AND SPECIFICATION	USE
Solder, Type AG1-5; Fed. Spec. QQ-S-571	General repair usage
Locktite sealant; RF Spec. No. 755017A8031	During reassembly of case assy bottom plate (Par. 3-90)
Heat sink compound; RF Spec. No. 755017A4412	During reassembly of Static Inverter Assy 2A9 (Par. 3-90)

SECTION III

PREVENTATIVE MAINTENANCE

3-8. MAINTENANCE RECORD AND REPORT FORMS

3-9. All record and report forms required by the current edition of DA Pam 738-750 shall be processed in accordance with that publication.

3-10. SAFETY PRECAUTIONS

3-11. Safety precautions for protection of personnel and equipment are included throughout this manual whenever a procedure or condition is described that requires special care. In most instances, the coupler has either been deenergized or removed from the system in which it has been operating. However, the following warnings and cautions apply in event that circumstances warrant them.

WARNING

Dangerously high radio frequency voltages are present on the antenna during transmission. Do not touch or stand near the antenna when the equipment is energized.

WARNING

Make sure power is off before performing any cleaning or inspection procedures.

Note

Be sure that coupler air inlet (front of unit) and exhaust port (rear of unit) are not obstructed before operating equipment to avoid overheating equipment and thus delaying procedures.

CAUTION

Align coupler whip antenna cable connector carefully before mating and fastening to avoid cross threading of connectors.

3-12. DISASSEMBLY INSTRUCTIONS

3-13. The disassembly procedures in paragraphs 3-14 through 3-27 are for all intermediate maintenance echelons. The procedures are presented so that the assemblies can be individually removed for appropriate maintenance in a minimum amount of time.

3-14. REMOVAL OF COUPLER COVER ASSEMBLY

1. Refer to detail A of figure 3-2. Use a 1/4-inch nut driver to loosen the 14 captive cover retaining screws.
2. Carefully lift coupler cover assembly away from case assembly.

3-15. REMOVAL OF LOADING-PHASING DISCRIMINATOR 2A3

1. Refer to detail B of figure 3-2. Disconnect connector 2A 1 P 1 from the discriminator by pressing inward and turning counterclockwise.

2, Use an 8-inch flat blade screwdriver to loosen the four retaining screws that secure the discriminator to Capacitive RF Tuner 2A5.

3. Remove the discriminator by rocking it gently while pulling it straight up.

3-16. REMOVAL OF CAPACITIVE RF TUNER 2A4

1. Refer to detail B of figure 3-2. Use a No. 1 Phillips screwdriver to loosen cable retainer screws one and two just enough to slide ends of capacitor-to-antenna rotor switch cable and capacitor-to-inductor cable away from tuner. Retighten screws.

2. Use an 8-inch flat blade screwdriver to loosen the four captive capacitive RF tuner retaining screws,

3. Remove tuner by grasping capacitive tuner frame and rocking it gently while pulling the tuner straight up.

4. Use a four-fluted No. 8 Bristol wrench to loosen the remaining end of the capacitor-to-antenna rotor switch cable. Remove cable.

3-17. REMOVAL OF INDUCTIVE RF TUNER 2A5

1. Refer to detail B of figure 3-2. Use a 3-inch flat blade screwdriver to loosen the four captive retaining screws.

2. Remove tuner by grasping frame and rocking it gently while pulling the tuner straight up,

3-18. REMOVAL OF STATIC INVERTER POWER ASSEMBLY 2A9

1. Refer to detail B of figure 3-2. Use either an 8-inch flat blade screwdriver or a 1/4-inch nut driver to loosen the two captive retaining screws.

2. Remove inverter by rocking it gently while pulling it straight up.

3-19. REMOVAL OF POWER SUPPLY PWB 2A6, SERVO PWB 2A7, AND LOGIC PWB 2A8

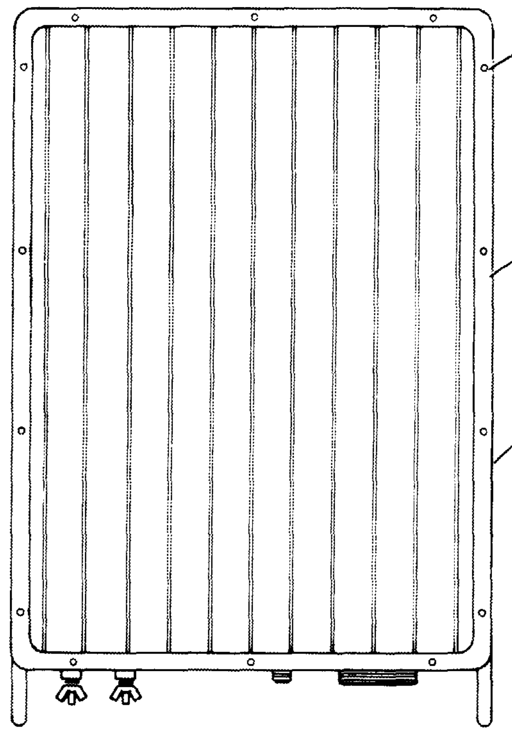
3-20. Refer to detail B of figure 3-2. Pull upwards on the inboard portions of the pc board extractors while lifting the boards straight up.

3-21. REMOVAL OF CARD CAGE ASSEMBLY PN 755017 A8405

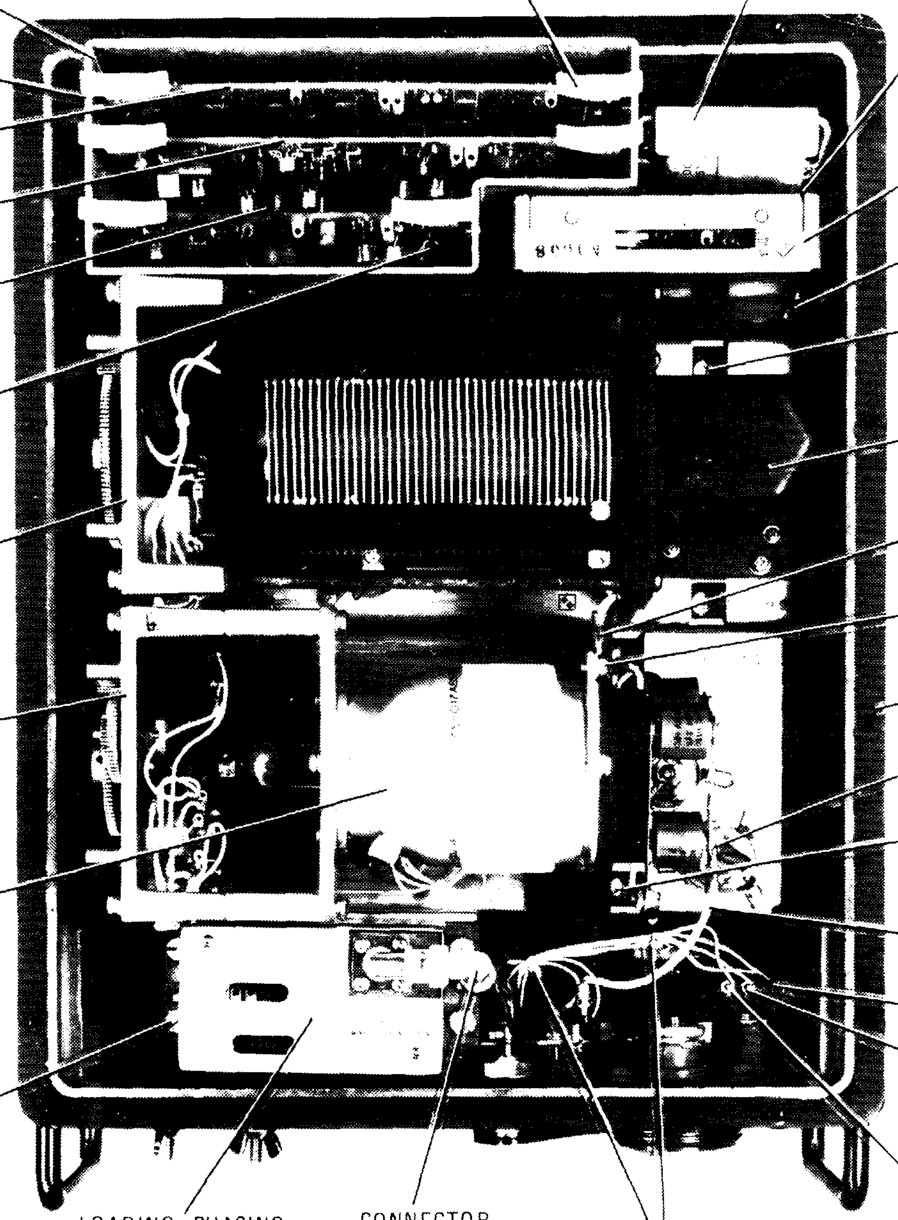
1. Refer to detail B of figure 3-2. Use an 8-inch flat blade screwdriver to loosen the four captive card cage retaining screws.

2. Make sure that the card cage base struts are clear of cable wires.

3. Remove card cage assembly by rocking it gently while pulling cage frame straight up.



DETAIL A



DETAIL B

Figure 3-2. Antenna Coupler CU-2064/GRC-193 Disassembly/Reassembly Details (Sheet 1 of 2)

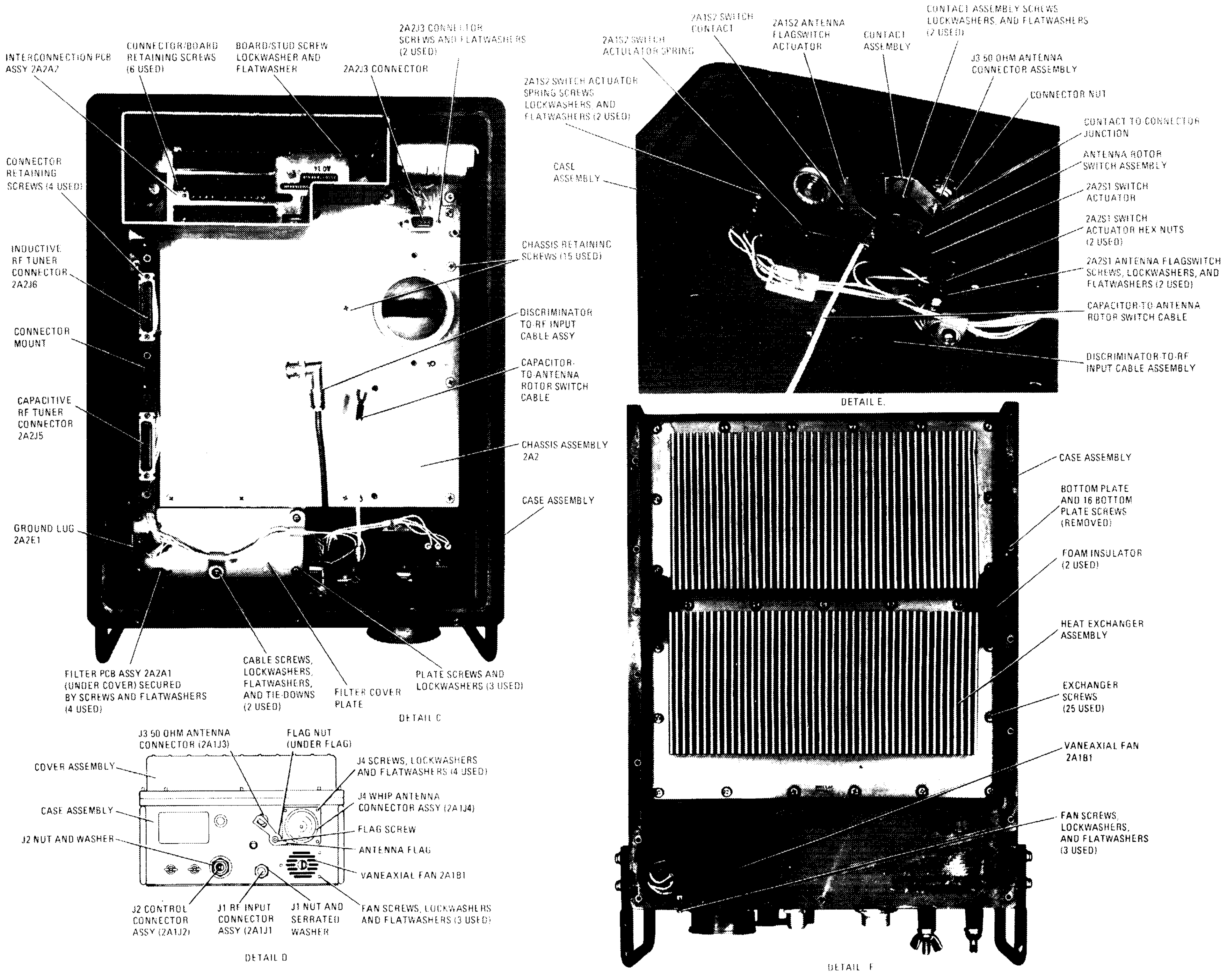


Figure 3-2. Antenna Coupler CU-2064/GRC-193 Disassenlbly/Reassembly Details (Sheet 2 of 2)

3-22. ACCESS TO AND/OR REMOVAL OF COMPONENT BRACKET ASSEMBLY PN 755017A8115

1. Refer to detail B of figure 3-2. Use a No. 6 nut driver to loosen the four hex nuts, lockwashers, and flat washers.

2. Carefully lift assembly off its threaded locating studs.

CAUTION

Be careful when removing assembly from studs. Do not move assembly any further than is necessary to repair or replace a defective component, as excessive cable wire strain may damage the assembly or its component connections.

3. If complete removal of the assembly is desired:

   a. Carefully unsolder and tag all cable wires connected to the assembly and its components.

   b. Remove assembly.

3-23. ACCESS TO AND/OR REMOVAL OF INTERCONNECTION PCB 2A2A2

1. Refer to detail C of figure 3-2, Use a No. 1 Phillips screwdriver to loosen the six retaining screws and board stud screw, lockwashers, and flat washer. Remove hardware.

2. Carefully lift board from its locating studs.

CAUTION

Be careful when lifting board from its locating studs. Do not move board any further than is necessary to repair or replace a defective component, as excessive cable wire strain may damage the board components or its connections.

3. If more working area is needed, use a No. 1 Phillips screwdriver to loosen 2A2J3 connector screws. Pull 2A2J3 connector away from its mounting studs.

4. If complete removal of the board is desired:

   a. Carefully unsolder and tag all cable wires connected to the board and its components, as required.

   b. Remove board.

3-24. ACCESS TO AND/OR REMOVAL OF FILTER PCB 2A2A1

1. Refer to detail C of figure 3-2. Use a No. 1 Phillips screwdriver to loosen the two cable screws, lockwashers, flatwashers, tie-downs, and ground lug 2A2E1. Remove hardware and tie-downs.

2. Carefully push cable wires out of the way just enough to allow removal of the filter cover plate.

3. Use a No. 1 Phillips screwdriver to loosen the three plate screws and lockwashers. Remove hardware and carefully slide filter cover plate away from cable and out of case assembly.

4. Use a No. 8 Phillips screwdriver to loosen the four screws, lockwashers, and flat washers that secure board to case assembly.

Carefully work board up and away from case assembly.

5. If complete removal of the board is necessary:

a. Carefully unsolder and tag all cable wires connected to the board and its components, as required.

b. Remove board.

3-25. ACCESS TO AND/OR REMOVAL OF CAPACITIVE RF TUNER CONNECTOR 2A2J5 AND INDUCTIVE RF TUNER CONNECTOR 2A2J6

1. Refer to detail C of figure 3-2, Use a No. 1 Phillips screwdriver to loosen the four connector retaining screws. Remove screws.

2. Move the connector(s) away from the connector mount for servicing.

3. If complete removal of the connectors is desired:

a. Carefully unsolder and tag all cable wires of each connector.

b. Remove connectors

3-26. REMOVAL OF ANTENNA FLAG SWITCH 2A2S1 AND CHASSIS ASSEMBLY 2A2

1. Refer to detail B of figure 3-2. Unsolder and tag the four cable wires attached to case terminals 2A1E3, E4, and E5, respectively. (Two wires are soldered to terminal E5).

2. Cut the two cable ties to free the wires.

3. Refer to detail E. Use a No. 1 Phillips screwdriver to loosen the two 2A2S1 antenna flagswitch screws, lockwashers, and flatwashers. Remove hardware.

4. Carefully move switch away from case assembly.

5. If required for replacement purposes, unsolder wires from switch.

6. Refer to detail C. Make sure that cable wires are free of filter cover plate, and the ground lug 2A2E1 has been disassembled from the case assembly.

7. Use a No. 8 Phillips screwdriver to loosen the 14 chassis retaining screws. Remove screws

8. Carefully lift Chassis Assembly 2A2 out of case assembly.

9. If required, the connector mounts for connectors 2A2J5 and J6 may be removed at this time by loosening and removing the three Phillips screws (from the underside of Chassis Assembly 2A2) that secure the mounts to the chassis.

3-27. REMOVAL OF COUPLER BOTTOM PLATE AND VANEAXIAL FAN 2A1B1

1. Refer to detail F of figure 3-2. Use a No. 8 Phillips screwdriver to loosen the 16 bottom plate screws. Remove screws and bottom plate.

2. Refer to details D and F. Use a No. 1 Phillips screwdriver to loosen the three fan screws, lock-washers, and flatwashers.

3. Carefully pull vaneaxial fan 2A1B1 away from case assembly.

4. Unsolder and tag the cable wires to the fan. Remove fan.

3-28. ANTENNA COUPLER CU-2064/GRC-193 ASSEMBLY/COMPONENT INSPECTION PROCEDURES

3-29. Antenna Coupler CU-2064/GRC-193 is a fully automotic unit, with solid state logic and control circuits. The unit can be expected to function for extended periods with minimum attention. However. a normal periodic preventive maintenoncc schedule of cleaning and inspection should be maintained. Table 3-6 lists the inspections applicable to the coupler and its components. Figures 3-21 through 3-37 (component location illustrations) can be used, as necessary, to locate specific components.

3-30. CORRECTIVE MAINTENANCE PROCEDURES

3-31. The following procedures describe maintenance actions to be taken as a result of the inspections described in table 3-6.

1. Dirt and/or residue on unit contours and components. Wipe surfaces with a lint-free cloth dampened with technical isopropyl alcohol (Spec. MIL-1-10428) to remove film and/or residue. If coupler case is muddy, wash it with detergent and water. Let unit air dry.

2. Clogged heat exchanger intakes or outtakes; clogged fan and/or relief valve outlet. Use a non-metallic brush or tool to remove foreign matter. If it is suspected that the heat exchangers vanes arc plugged, remove coupler bottom plate, as described in paragraph 3-27. Brush heat exchanger vanes and, if necessary, flush them with water. Dry exchanger.

3. Damaged connector threads; bent loose, or missing pins; corroded contacts. (If connector threads are severly galled or connector has bent or missing contacts, connector must be replaced.) Note any damaged case assembly connectors (J1, J2, J3, J4) and follow normal supply procedures for replacement. Other connectors can be replaced at intermediate maintenance facilities as described in paragraph 3-75. Remove light corrosion using a lint-free cloth dampened with technical isopropyl alcohol (Spec. MIL-I-10428). Excessively corroded connectors must be replaced, as previously described.

4. Improper antenna flagswitch mechanical operation. If antenna flagswitch 2A1S2 is loose, switch actuator spring (detail E of figure 3-2) may be fatigued or broken and must be replaced as described in paragraph 3-77.

5. Damage to painted surfaces. If post-cleaning examination or other inspections indicate that minor retouching of the case assembly, cover assembly, or yellow markings is required, proceed as follows:

a. Use a lint-free cloth and/or a small non-metallic brush dampened with Technical Isopropyl Alcohol (Spec. MIL-I-10428) to wipe or brush off area(s) to be retouched.

b. Apply Primer (Spec. TT-E-485) to the area(s) to be retouched.

c. Touch up green areas with Marine Corps Green, Color No. 23 (Spec. TT-E-485).

d. Touch up yellow nomenclated areas with Semigloss yellow, Color No. 23538 (Fed. Std. 585).

6. Missing or damaged hardware. Replace any missing or damaged hardware.

7. Structural cracks. If any structural cracks are noted, notify nearest intermediate maintenance facility for analysis and disposition of affected area.

8. Cable wire damage. Tighten and/or strap any loose cable wires. Replace frayed or abraded wires, and also any wires that show signs of excessive overheating. Restrip and reconnect broken wires if possible; otherwise, replace them.

9. Bent or broken 2A2S1 switch actuator. Replace switch actuator 2A2S1 as described in paragraph 3-79.

10. Seized vaneaxial fan 2A1B1 rotor. It rotor does not turn freely, replace fan. Refer to paragraph 3-27 for fan removal and reassembly procedures.

11. Loose Chassis Assembly 2A2 connectors (2A2J3, J5, and J6). Use a No. 1 Phillips screwdriver to tighten connector mounting hardware.

TABLE 3-6. ANTENNA COUPLER CU-2064/GRC-193
COMPONENT INSPECTION INSTRUCTIONS

MODULE, PCB/PWB, OR COMPONENT	INSPECT FOR
Antenna Coupler Unit (External), including J1 RF Input Connector (2A1J1), J2 CONTROL Connector (2A1J2), J3 50 OHM ANTENNA Connector (2A1J3) and J4 WHIP ANTENNA Connector (2A1J4)	Dirt and/or residue on unit contours; clogged heat exchanger intakes and outlets; clogged fan and/or relief valve outlet; damaged connector and/or ground connection threads; Bent, loose, or missing pins in the J2 CONTROL Connector; Connector: Proper mechanical operation of the antenna flagswitch (J3 to J4); Corroded connectors; Blurred or missing case markings; Scratched or gouged painted surfaces; Loose or missing handle hardware: Structural cracks (castings)
Antenna Coupler Unit (Internal; All Components Assembled; Cover Removed)	Loose, frayed, abraded, or broken wires; Disconnected wires and/or cold solder joints; Cracked or missing insulation; Evidence of overheated assemblies and wires; Bent or broken 2A2S1 Switch Actuator: Loose or missing hardware Foreign objects and/or disconnected parts; Structural cracks (casting)
Vaneaxial Fan 2A1B1	Loose, frayed, abraded, broken, or missing wires; Cold solder joints: Broken or missing solder lugs Dirt and/or corrosion; Seized fan rotor Fan case structural defects
Chassis Assy 2A2	Missing hardware; Cross threaded screws or captive screw retaining nuts/helicoils; Loose, frayed, abraded, broken, or missing wires and cable tie-downs; Loose connectors (2A2J3, J5, and J6)
Filter Pcb Assy 2A2A1	Overheated, cracked, or missing pc board components; Cracked or broken pc board; Loose. frayed, abraded, broken, or missing wires; Broken or missing solder terminals; Cold solder joints

TABLE 3-6. ANTENNA COUPLER CU-2064/GRC-193
COMPONENT INSPECTION INSTRUCTIONS (CONT)

MODULE, PCB/PWB, OR COMPONENT	INSPECT FOR
Interconnection Pcb Assy 2A2A2	Overheated, cracked, or missing pc board components; Cracked or broken pc board; Loose, frayed, abraded, broken, or missing wires; Loose, missing, or stripped mounting screws or mounting screw studs; Broken or missing solder terminals; Cold solder joints;
Loading-Phasing Discriminator Assy 2A3	Missing outer case or case hardware; Dirt and/or corrosion in or on RF Input Connector 2A3J1; Broken or fatigued captive mounting screw springs; Missing or stripped mounting screws or screw studs; Loose, bent or missing connector/receptacle pins; Overheated, cracked, or missing pc board components; Cracked or broken pc board; Bent or missing assembly locator pins; Loose, frayed, abraded, broken, or missing wires;
Capacitive RF Tuner Assy 2A4	Broken or fatigued captive mounting screw springs; Missing or stripped mounting screws or mounting screw studs; Bent or missing assembly locator pins; Loose, bent, or missing connector/receptacle pins; Dirty or excessively worn gears; Cracked or broken vacuum capacitor 2A4C1; Loose, frayed, abraded, broken, or missing wires; Disconnected switch wires; Cold solder joints; Overheated, cracked, or missing components; Broken or cracked relay (2A4K2, K3) glass; Cracked or defective external capacitors (2A4C2, C3, C4);
Inductive RF Tuner Assy 2A5	Broken or fatigued captive mounting screw springs; Missing or stripped mounting screws or mounting screw studs; Bent or missing assembly location pins; Loose, bent, or missing connector/receptacle pins; Dirty or excessively worn gears; Cracked or broken inductor housing; Loose, frayed, abraded, broken, or missing wires; Disconnected switch wires; Cold solder joints; Overheated, cracked, or missing components; Worn inductor rotor contacts;

TABLE 3-6. ANTENNA COUPLER CU-2064/GRC-193
COMPONENT INSPECTION INSTRUCTIONS (CONT)

MODULE, PCB/PWB OR COMPONENT	INSPECT FOR
Inductive RF Tuner Assy 2A5 (continued)	Clogged 2A5B2 Vaneaxial Fan Intake; Seized fan rotor Cracked (plastic) intake port (Inductor loose) Fan case structural defects
Power Supply Pwb Assy 2A6, Servo Pwb Assy, 2A7 and Logic Pwb Assy, 2A8	Loose, bent, or missing connector/receptacle pins; Overheated, cracked, or missing pcb components; Cracked or broken pc board; Dirty or corroded connections; Broken or missing pc board extractors; Bent locator slides (on card cage);
Static Inverter Power Assy 2A9	Corrosion or dirt on module case; Broken or fatigued captive mounting screw springs; Missing or stripped mounting screws or mounting studs; Bent or missing assembly locator pins; Loose, bent, or missing connector/receptacle pins; Overheated, cracked, or missing components; Cracked or broken pcb components
Component Bracket Assy PN 755017A8115	Overheated, cracked, or missing components; Loose or missing hardware; Corrosion or dirt; Loose, frayed, abraded, broken, or missing wires;

12. Overheated, cracked, or missing pcb/pwb components. Replace any overheated, cracked, or missing pcb/pwb component. Use standard soldering/unsoldering techniques when replacing these components.

13. Cracked or broken pcb's/pwb's, if it is deemed practical, can be repaired. Use standard repair techniques.

14. Cold solder joints. Reheat and/or resolder any cold solder joints found.

15. Broken or fatigued captive mounting screw springs; missing or stripped mounting screw studs. Send to nearest maintenance facility for rework/replacement.

16. Bent or missing assembly/module locator bias. Send to nearest maintenance facility for rework/replacement.

17. Dirty and/or excessively worn gears (capacitive and inductive RF Tuner Assemblies 2A4 and 2A5, respectively. If excessively worn gears are noted, send to nearest depot maintenance facility for replacements. If metallic gears are dirty, proceed as follows:

a. Use a non-metallic brush dampened with either Methylethylketone (MEK) (Federal Spec. TT-M-261) or Trichlorethylene (Federal Spec. O-T-634) to clean dirt from gears. Allow gears to dry thoroughly.

b. Lubricate gears at the points indicated in figure 3-3 with Lubriplate Grease (RF Spec. No. 755017A8241).

18. Cracked or broken capacitor or inductor housing. If cracks or broken housing pieces are noted, send to nearest maintenance facility for replacement.

19. Broken or cracked relay (2A4K2, K3) glass. If relay 2A4K2 or 2A4K3 is broken, replace it as described in paragraph 3-81.

20. Cracked or defective external capacitors 2A4C2, C3, C4. If any capacitors are found to be cracked or defective, replace them as described in paragraph 3-83.

21. Cracked or broken vacuum capacitor 2A4C1. If vacuum capacitor 2A4C1 is cracked or broken, send to nearest maintenance facility for replacement.

22. Worn inductor rotor contacts. If worn inductor rotor contacts are noted, send to nearest maintenance facility for replacement.

23. Seized vaneaxial fan 2A5B2 rotor. If rotor does not turn freely, fan must be replaced as described in paragraph 3-85.

SECTION IV

TROUBLESHOOTING – DIRECT SUPPORT INTERMEDIATE MAINTENANCE AND GENERAL SUPPORT INTERMEDIATE MAINTENANCE

3-32. INTRODUCTION

3-33. This section describes a logical approach to determining and resolving coupler faults and malfunctions applicable to the intermediate level of maintenance.

Note

Maint Kit OA-9163/GRC-193A is used as a Maint Test Bed.

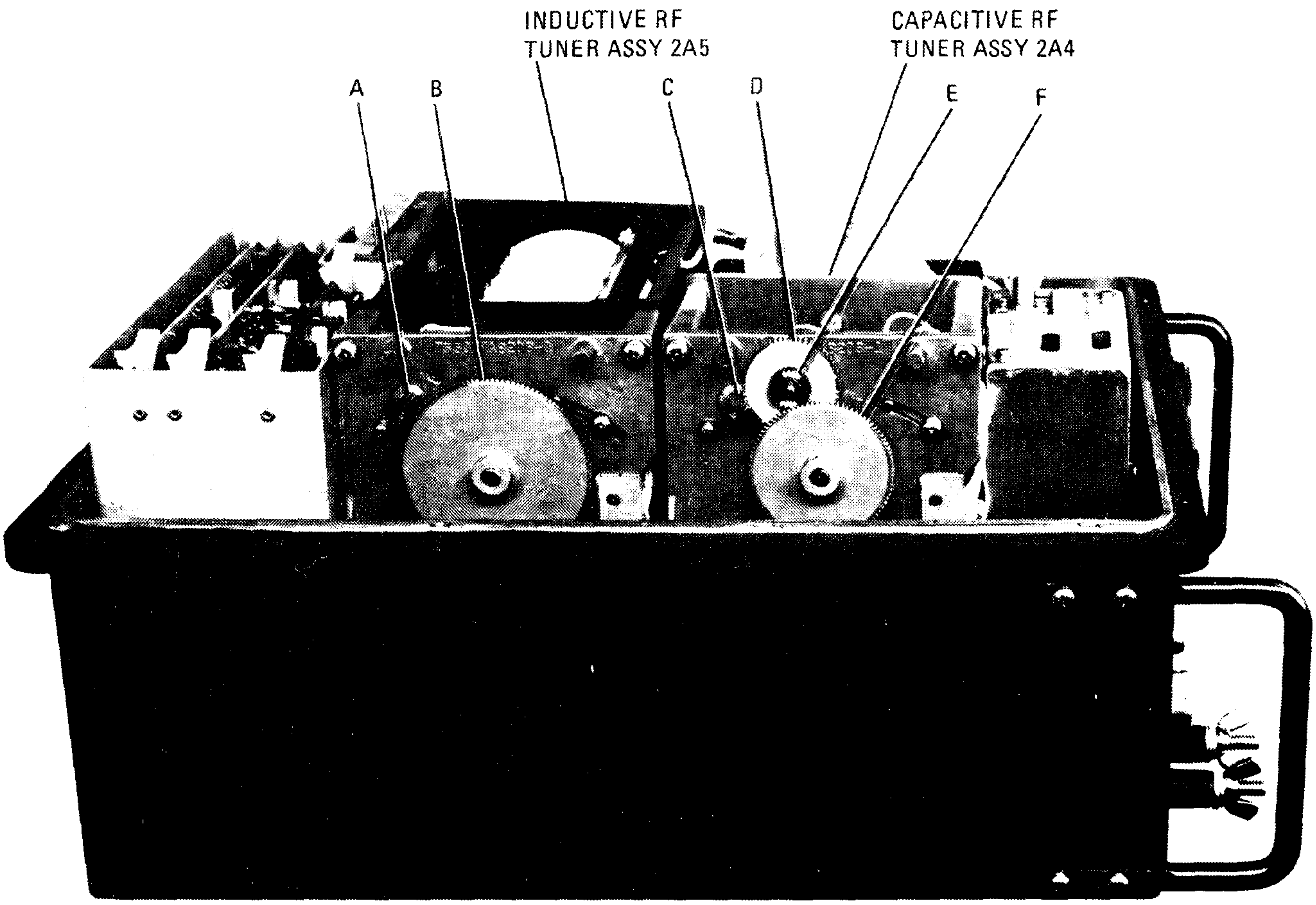


Figure 3-3. RF Tuner Assemblies Lubrication Points

3-34. Troubleshooting, as it applies to the intermediate level of maintenance consists of determining the possible sources and causes of coupler faults and malfunctions down to the module or pcb/pwb level, and performing the tests, adjustments, alignments or repairs authorized.

3-35. LOGICAL APPROACHES TO COUPLER TROUBLESHOOTING

3-36. The following six logical steps should be followed when troubleshooting the coupler:

1. Symptom recognition. Symptom recognition is based on complete knowledge and understanding of equipment operating characteristics. Not all equipment troubles are the direct result of component failure; therefore, a malfunction in the equipment is not always easy to recognize, as conditions of less than peak performance are not always apparent. Refer to and study figure 2-3, Overall Functional Interconnection Diagram. This diagram serves as a major aid to symptom recognition.

2. Symptom elaboration. After an equipment trouble has been recognized, use system front panel controls (refer to chapter 3 of TM 11-5820-924-12 and other built-in testing aids such as test meters, test points and indicators to verify the original symptom and to eliminate possible malfunctions in other system equipment as the cause.

3. Listing probable faults or malfunctions. The next step in logical troubleshooting is to list some logical causes, and their likely locations (module, pcb/pwb, or functional section). These logical choices will be based on knowledge of the equipment operation, identification of the trouble symptom, and information contained in this manual.

4. Localizing the source of faults or malfunctions. For best efficiency to localizing trouble, the logical choices should be checked in the order that will require the least time; therefore, a selection is required to determine which section to test first. The selection should be based on the validity of the logical choice and the time and difficulties involved in making the necessary tests. If the tests do not prove that a functional section is at fault, the next selection should be tested, and so on until the faulty functional section is located.

5. Localizing faults or malfunctions to a particular circuit. After the faulty functional module, pcb/pwb section has been isolated, it is often necessary to make additional logical choices as to which circuit(s) within the functional section is at fault. Again, familiarity with the equipment and an understanding of functional operation as explained in chapter 2 of this manual are important.

6. Fault/malfunction analysis. After the trouble has been located, but prior to corrective action, the procedures followed up to this point should be reviewed to determine why the fault affected the equipment as it did. This review is necessary to make certain that the fault discovered is actually the cause of the malfunction and not a result of it.

3-37. TROUBLESHOOTING INDEX

3-38. Table 3-7 is the coupler troubleshooting index. The table lists the major functional areas where troubles may occur, and references applicable troubleshooting procedures, diagrams and functional descriptions.

3-39. RELAY, INDICATOR LAMP, AND FUSE INDEXES

3-40. Tables 3-8 and 3-9 are the coupler relay and indicator lamp indexes, respectively. The coupler does not contain any fuses as such; however, overvoltage relay 2A6K1 will not be activated if (1) an overvoltage is present or (2) if the power supply circuit breaker of the associated power amplifier (Power Amplifier AM-6545/GRC-193, front panel ANT CPLR CB switch) is off or tripped.

TABLE 3-7. ANTENNA COUPLER CU-2064/GRC-193 TROUBLESHOOTING INDEX

FUNCTIONAL AREA	TROUBLESHOOTING DIAGRAM (FIG. NO.)	FUNCTIONAL DESCRIPTION PARAGRAPH
Dc Power	2-3 and 3-42	2-9 through 2-94
Vaneaxial Fan 2A5B2	2-3 and 3-41	2-104
Reset Circuit of Logic Pwb 2A8	2-3 and 3-44	2-45
Variable Inductor 2A5L1	2-3 and 3-41	2-8 through 2-15
Variable Vacuum Capacitor 2A4C1	2-3 and 3-40	2-8 through 2-15
Loding Phasing Disc. 2A3	2-3 and 3-39	2-16 through 2-38
Series Capacitors 2A4C2, C3, and C4	2-3 and 3-40	2-11
Switching Relays 2A4K2 and K3	2-3 and 3-40	2-11
Series Capacitance Selection Logic Circuit of Logic Pwb 2A8	2-3 and 3-44	2-64 through 2-69
Z Discriminator Circuit of Loading-Phasing Discriminator 2A3	2-3 and 3-39	2-25 and 2-26

TABLE 3-8. ANTENNA COUPLER CU-2064/GRC-193 RELAY INDEX

REFERENCE DESIGNATION	FUNCTIONAL NAME	ENERGIZING VOLTAGE	TROUBLESHOOTING DIAGRAM (FIG. NO.)
2A2A1K1	Fan Test Relay	26.5 Vdc	3-38
2A4K1, K2, and K3	Switching Relays (SPDT, Vacuum, No.)	26.5 Vdc	3-40
2A5K1 and K2	Switching Relay (SPDT, Vacuum, No.)	26.5 Vdc	3-41
2A6K1	Overvoltage Relay (DPDT)	26.5 Vdc	3-42

TABLE 3-9. ANTENNA COUPLER CU-2064/GRC-193 INDICATOR LAMP (LED) INDEX

REFERENCE DESIGNATION	FUNCTIONAL NAME	ENERGIZING VOLTAGE	TROUBLESHOOTING DIAGRAM (FIG. NO.)
2A8DS1	FAULT Indicator	3.0 Vdc, Max.	3-44
2A8DS2	TX INHIBIT Indicator	3.0 Vdc, Max.	3-44
2A8DS3	ANTI-RESONANCE RELAYS ENERGIZED Indicator	3.0 Vdc, Max.	3-44
2A8DS4	READY Indicator	3.0 Vdc, Max.	3-44
2A8DS5	125 PFD Indicator	3.0 Vdc, Max.	3-44
2A8DS6	50 PFD Indicator (Not used)	3.0 Vdc, Max.	3-44
2A8DS7	TUNING ELEMENTS ACTIVE Indicator	3.0 Vdc, Max.	3-44

3-41. MAINTENANCE TURN-ON PROCEDURE

3-42. Refer to chapter 3 of TM 11-5820-924-12 for applicable turn-on procedure.

3-43. TROUBLESHOOTING PROCEDURES

3-44. Table 3-10 is a listing, keyed to the coupler test and adjustment points and indicators, of both coupler normal and abnormal indications at various stages of operation. This table can be used with the operational sequence diagram (figure 2-3) and figures 3-5 through 3-12 to determine the cause of a particular fault or malfunction. Figure 3-4, shows the locations of all coupler test points and indicators.

3-45. FAULT LOGIC DIAGRAMS

3-46. Figures 3-5 through 3-12 are fault logic diagrams that apply to various coupler faults. The operation sequence/flow diagram (figure 2-3), adjustment and test point location illustration (figure 3-4), and test point/indicator/operation correlation table 3-10 should be referred to during fault logic analysis as aids to understanding the exact nature of the faults and their possible solutions.

SECTION V
INTERMEDIATE LEVEL FIELD MAINTENANCE

Note

Maint Kit OA-9163/GRC-193A is used as a Maint Test Bed.

3-47. INTRODUCTION

3-48. This section describes intermediate level field maintenance procedures applicable to the coupler. Included are adjustment, repair, disassembly, and applicable check/test procedures.

3-49. COUPLER ADJUSTMENTS AND ALIGNMENT

The only adjustments and alignments applicable to the coupler are the overvoltage trip adjustment on Power Supply PWB 2A6, the 400 Hz zero beat adjustment on Static Inverter Power Assembly 2A9, and the mechanical/electrical adjustment and alignment of the Capactive and Inductive RF Tuner Assemblies 2A4 and 2A5.

Note

Loading-Phasing Discriminator Assembly 2A3 contains a directional coupler assembly and discriminator assemblies that are passive devices which will not require maintenance or readjustment due to aging in the field. If repair to this assembly is indicated, based on data measured at its test points, do not perform field maintenance. Replace the defective assembly.

CAUTION

Since the complete tuning cycle of the antenna coupler is dependent upon the error signals from the directional coupler and discriminators, adjustment of these circuits is critical. Maladjustment will result in loss of transmitting power through mistuning, and can result in damage to antenna coupler and transmitter.

3-50. OVERVOLTAGE TRIP ADJUSTMENT--POWER SUPPLY PWB ASSEMBLY 2A6

3-51. If components of the overvoltage circuit in Power Supply PWB 2A6 have been replaced (for example, relay 2A6K1, potentiometer 2A6R22, etc.), the following overvoltage trip adjustment should be performed (refer to figures 3-13, 3-42, and 3-45):

TABLE 3-10. ANTENNA COUPLER CU-2064/GRC-193 TEST POINT/INDICATOR/OPERATION CORRELATION (Sheet 1 of 2)

ASSEMBLY NAME	TEST POINT OR INDICATOR REFERENCE DESIGNATION	TEST POINT NAME	ILLUSTRATION LOCATION REFERENCE (FIG. NO.)	INDICATION DURING COUPLER HOMING MODE	INDICATION WHEN COUPLER IS HOMED (SYSTEM NOT KEYED)	INDICATION WHEN FAULT OCCURS DURING HOMING MODE	INDICATION DURING TUNING MODE-SERIES CAPACITANCE SELECTION	INDICATION DURING TUNING MODE-VARIABLE ELEMENTS	INDICATION DURING TUNING MODE-WHEN FAULT OCCURS	INDICATION WHEN SYSTEM IS TUNED	INDICATION WHEN SYSTEM IS TUNED AND CHANGES (ANT. LOADING) OCCUR	INDICATION WHEN SYSTEM IS TUNED AND FAULT OCCURS
Loading-Phasing Discriminator 2A3	2A3A2TP1	VSWR >1.2:1 (+)	3-4 and 3-27	Not Significant	Not Significant	Not Significant	+	+ During Tuning 0 At Tune Point	Not Significant		+	Not Significant
	2A3A2TP2	VSWR < 2:1 (+)	3-4 and 3-27	Not Significant	Not Significant	Not Significant	–	0 During Tuning + At Tune Point	Not Significant	+	+	Not Significant
	2A3A2TP3	RF ON (+)	3-4 and 3-27	0	0	0	+	+	0	+ System Keyed 0 System Unkeyed	+	0
	2A3A2TP4	Z <50 (+)	3-4 and 3-27	Not Significant	Not Significant	Not Significant	Depends on Antenna Impedance	Depends on Antenna Impedance	Not Significant	Not Significant	Not Significant	Not Significant
	2A3A1TP5	REFL	3-4 and 3-28	0	0	0	Positive DC Voltage	+ DC Voltage During Tuning 0 Vdc at Tune Point	0	0 Vdc	Positive DC Voltage	0
	2A3A1TP6	FWD	3-4 and 3-28	0	0	0	Positve DC Voltage	Positive DC Voltage	0	Positive DC Voltage	Positive DC Voltage	0
	2A3A1TP7	LOAD (Error)	3-4 and 3-28	0	0	0	+ or – Depending on Antenna Impedance	+ or – Depending on Antenna Impedance	0	0	+ or – Depending on Antenna Impedance	0
	2A3A1TP8	PHASE (Error)	3-4 and 3-28	0	0	0	+ or – Depending on Antenna Impedance	+ or – Depending on Antenna Impedance	0	0	+ or – Depending on Antenna Impedance	0
Power Supply PWB 2A6	2A6TP1	+10 Vdc	3-4 and 3-33	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc	+8.5 to +9.5 Vdc
	2A6TP2	–10 Vdc	3-4 and 3-33	–7.7 to 8.7 Vdc	–7.7 to 8.7 Vdc	–7.7 to –8.7 Vdc	–7.7 to –8.7 Vdc	–7.7 to –8.7 Vdc	–7.7 to 8.7 Vdc	–7.7 to –8.7 Vdc	–7.7 to –8.7 Vdc	–7.7 to 8.7 Vdc
	2A6TP3	+26.5 Vdc	3-4 and 3-33	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc
	2A6TP4	+20 Vdc	3-4 and 3-33	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc	+19 to +22 Vdc
Servo PWB 2A7	2A7TP1	MAX C (–)	3-4 and 3-34	0	0	0	0	+ or 0	0	0	+ or 0 Depending on the direction of the Correction	0
	2A7TP2	RAMP (400 Hz)	3-4 and 3-34	3V Peak	3V Peak	3V Peak	3V Peak	3V Peak	3V Peak	6V Peak	6V Peak	6V Peak
	2A7TP3	MIN L (–)	3-4 and 3-34	0	0	0	0	+ or 0	0	0	+ or 0 Depending on the direction of the Correction	0
	2A7TP4	MAX C (+)	3-4 and 3-34	+	0	0	0	0 or +	0	0	0 or + Depending on the direction of the Correction	0
	2A7TP5	MIN L (+)	3-4 and 3-34	+	0	0	0	0 or +	0	0	0 or + Depending on the direction of the Correction	0

TABLE 3-10. ANTENNA COUPLER CU-2064/GRC-193 TEST POINT/INDICATOR/OPERATION CORRELATION (Sheet 2 of 2)

ASSEMBLY NAME	TEST POINT OR INDICATOR REFERENCE DESIGNATION	TEST POINT NAME	ILLUSTRATION LOCATION REFERENCE (FIG. NO.)	INDICATION DURING COUPLER HOMING MODE	INDICATION WHEN COUPLER IS HOMED (SYSTEM NOT KEYED)	INDICATION WHEN FAULT OCCURS DURINC HOMING MODE	INDICATION DURING TUNING MODE-SERIES CAPACITANCE SELECTION	INDICATION DURING TUNING MODE-VARIABLE ELEMENTS	INDICATION DURING TUNING MODE-WHEN FAULT OCCURS	INDICATION WHEN SYSTEM IS TUNED	INDICATION WHEN SYSTEM IS TUNED AND CHANGES (ANT. LOADING) OCCUR	INDICATION WHEN SYSTEM IS TUNED AND FAULT OCCURS
Logic PWB 2A8	2A8DS1	FAULT	3-4 and 3-35	Off	Off	On	Off	Off	On	Off	Off	On
	2A8DS2	TX INHIBIT	3-4 and 3-35	On	Off	On	Off	Off	On	Off	Off	On
	2A8DS3	ANTI-RESONANCE RELAYS ENERGIZED	3-4 and 3-35	Off	Off	Off	Off	Off - L To 20 Turns On - 20 Turns To Max L	Off - L To 20 Turns On - 20 Turns To Max L	Off - L To 20 Turns On - 20 Turns To Max L	Off - L To 20 Turns On - 20 Turns To Max L	Off - L To 20 Turns On - 20 Turns To Max L
	2A8DS4	RELAY	3-4 and 3-35	Off	Off	Off	Off	Off	Off	On	On	On
	2A8DS5	125 PFD	3-4 and 3-35	Off	Off	Off	Depends on Antenna Impedance	Depends on Antenna Impedance	Off	Depends on Antenna Impedance	Depends on Antenna Impedance	Off
	2A8DS6	50 PFD	Indications from this LED are not significant									
	2A8DS7	TUNING ELEMENTS ACTIVE	3-4 and 3-35	Off	Off	Off	Off	On	Off	On	On	On
	2A8TP1	RESET (+)	3-4 and 3-35	+ (Pulse)	0	0	0	0	0	0	0	0
	2A8TP2	KEYED (+)	3-4 and 3-35	0	0	0	+	+	+ When system is Keyed 0 When system is Unkeyed	+ When system is Keyed 0 When system is Unkeyed	+	+ When system is Keyed 0 When system is Unkeyed
	2A8TP3	Coil Force (+)	3-4 and 3-35	0	0	0	Depends on Antenna Impedance	Depends on Antenna Impedance	0	0	0	0
	2A8TP4	Timer Disable (+)	3-4 and 3-35	0	+	+	0	0	0	+	+	+
	2A8TP5	Homing (+)	3-4 and 3-35	+	0	0	0	0	0	0	0	0
	2A8TP6	+20V Servo Enable	3-4 and 3-35	+	0	0	0	+	0	0	+	0
Static Inverter Power Assembly 2A9	2A9A1TP1	INV IN	3-4 and 3-37	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc	+22 to +30 Vdc
	2A9A1TP2 2A9A1TP3	FAN AC OUT FAN AC OUT	3-4 and 3-37 3-4 and 3-37	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]	[21V to 25V, 400 Hz Square Wave]

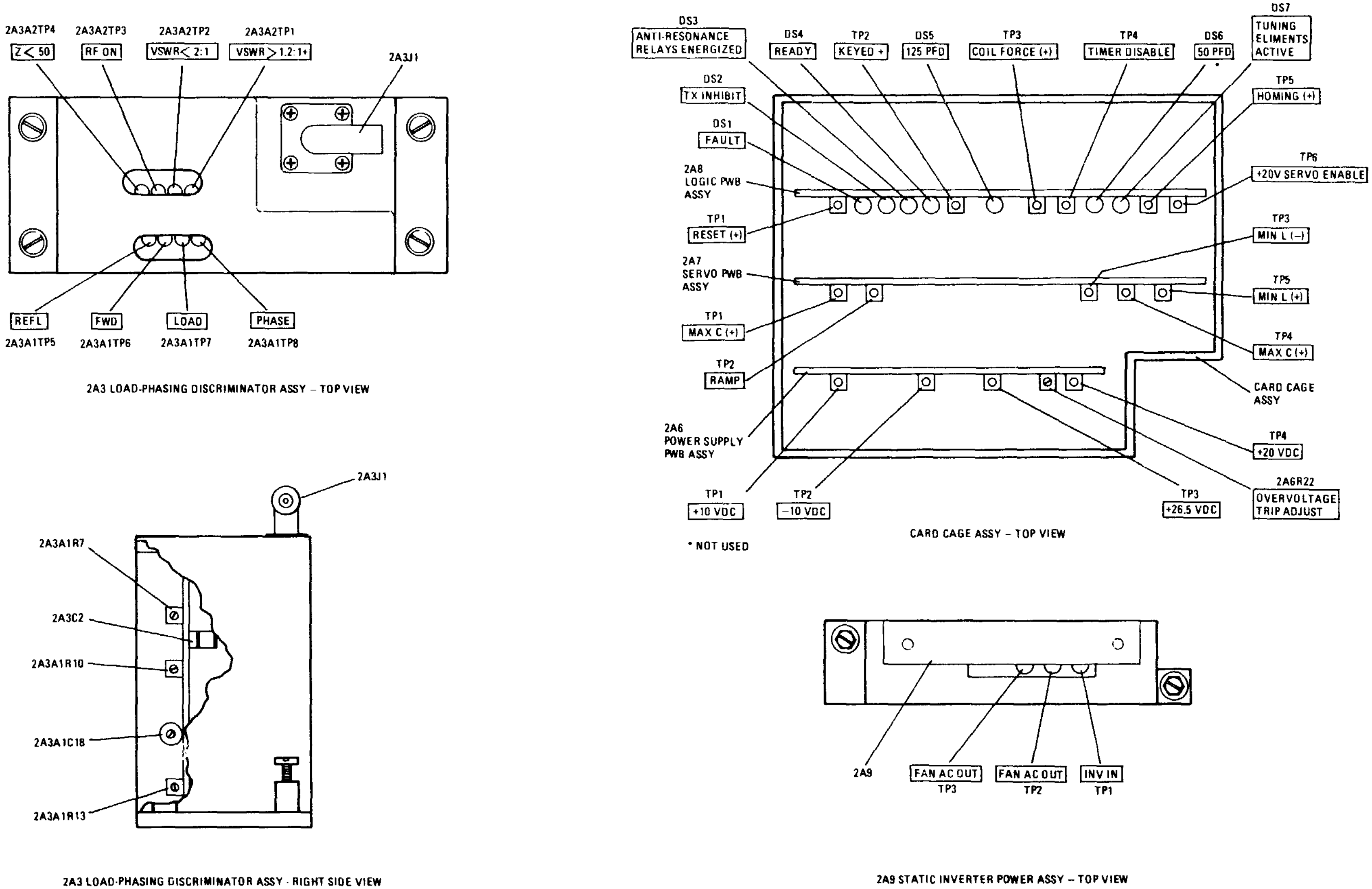


Figure 3-4. Antenna Coupler CU-2064/GRC-193 Adjustment and Test Point Locations and Identification

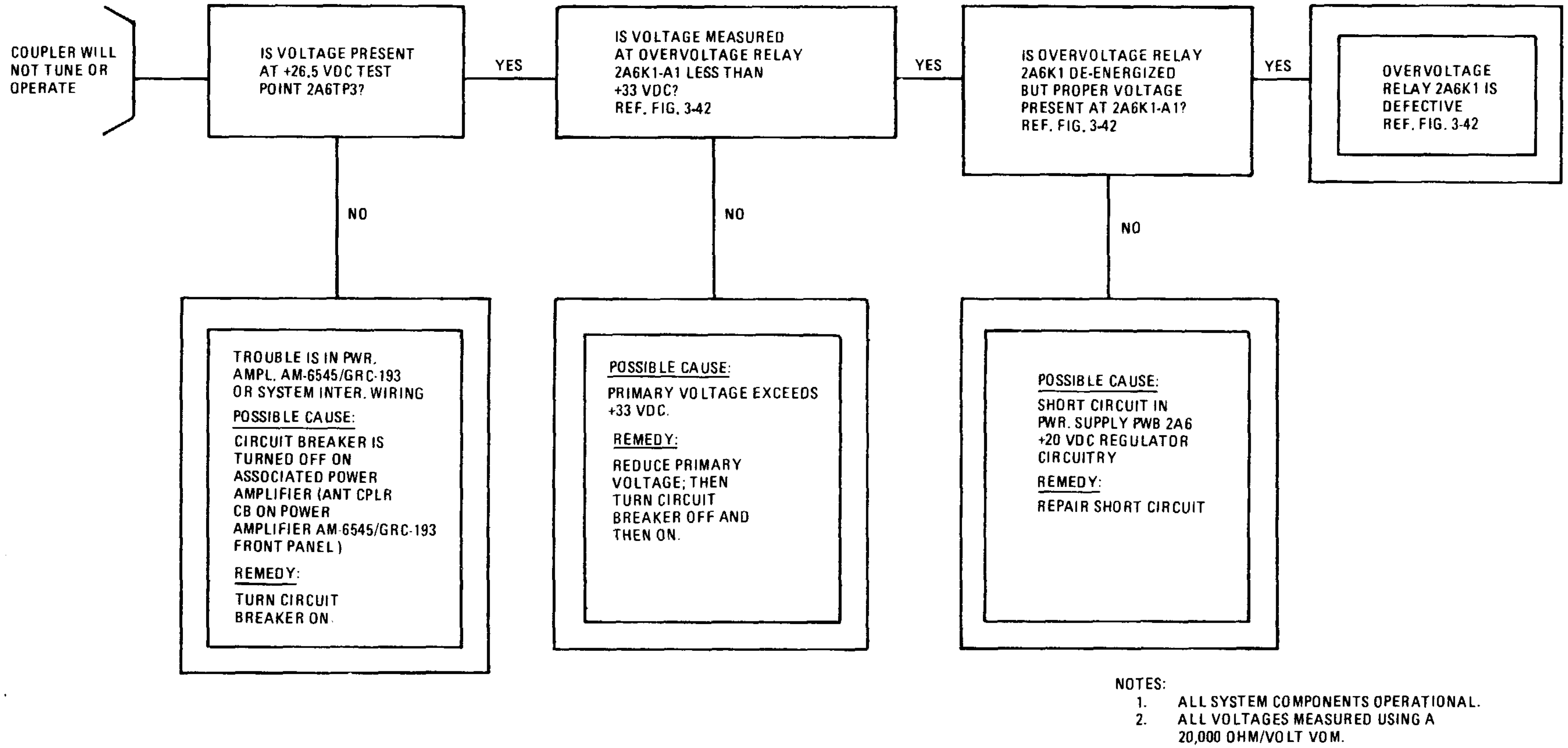
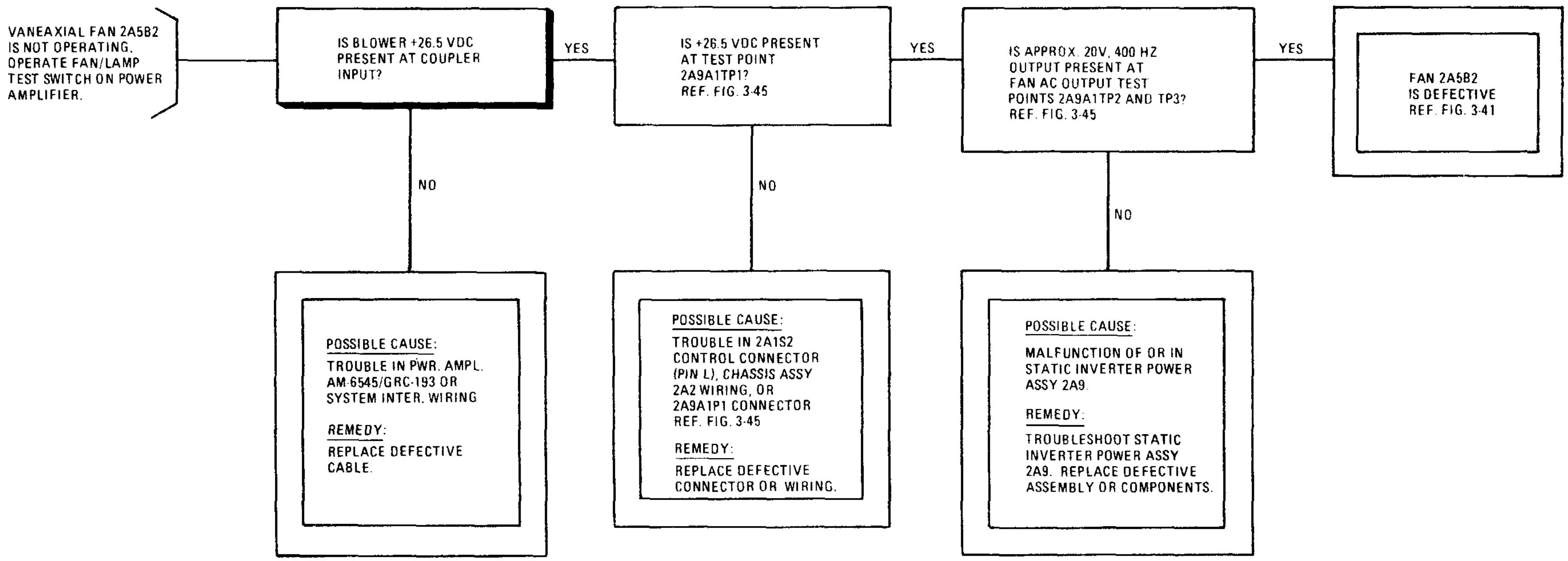
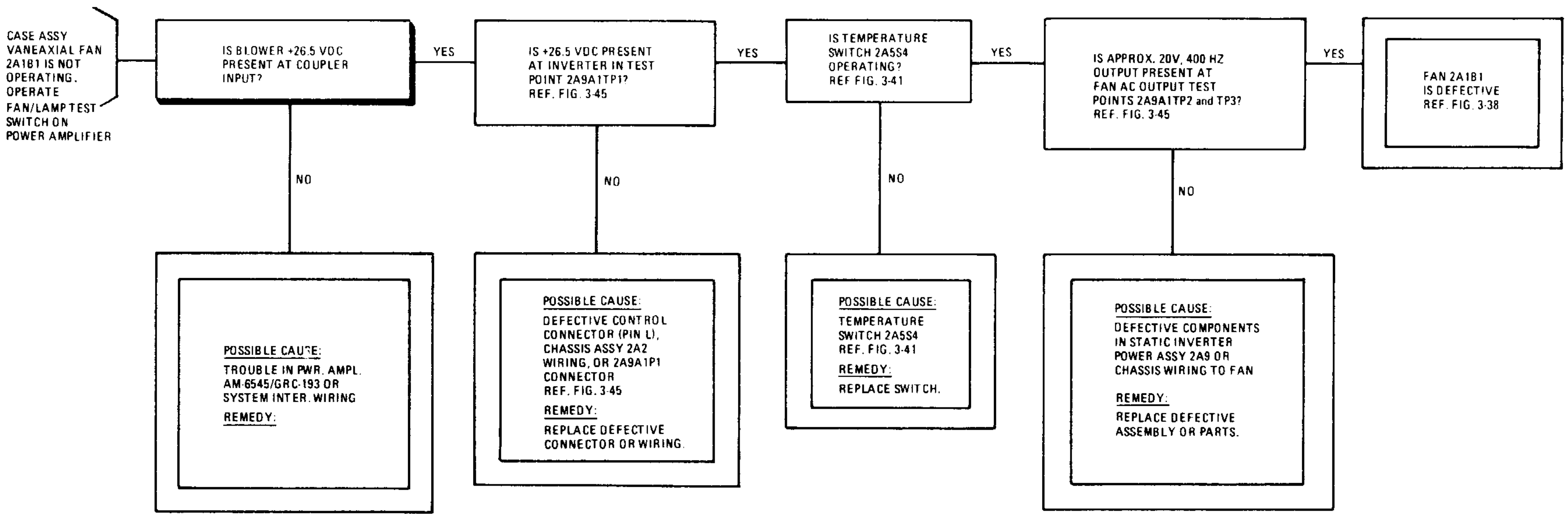


Figure 3-5. Dc Power Fault Logic Diagram



NOTES:
1. ALL SYSTEM COMPONENTS OPERATIONAL
2. ALL VOLTAGES MEASURED USING A 20,000 OHMS/VOLT VOM

Figure 3-6. Inductor Assembly Vaneaxial Fan 2A5B2 Fault Logic Diagram



NOTES:
1. ALL SYSTEM COMPONENTS OPERATIONAL
2. ALL VOLTAGES MEASURED USING A 20,000 OHMS/VOLT VOM

Figure 3-7. Case Assembly Vaneaxial Fan 2A1B1 Fault Logic Diagram

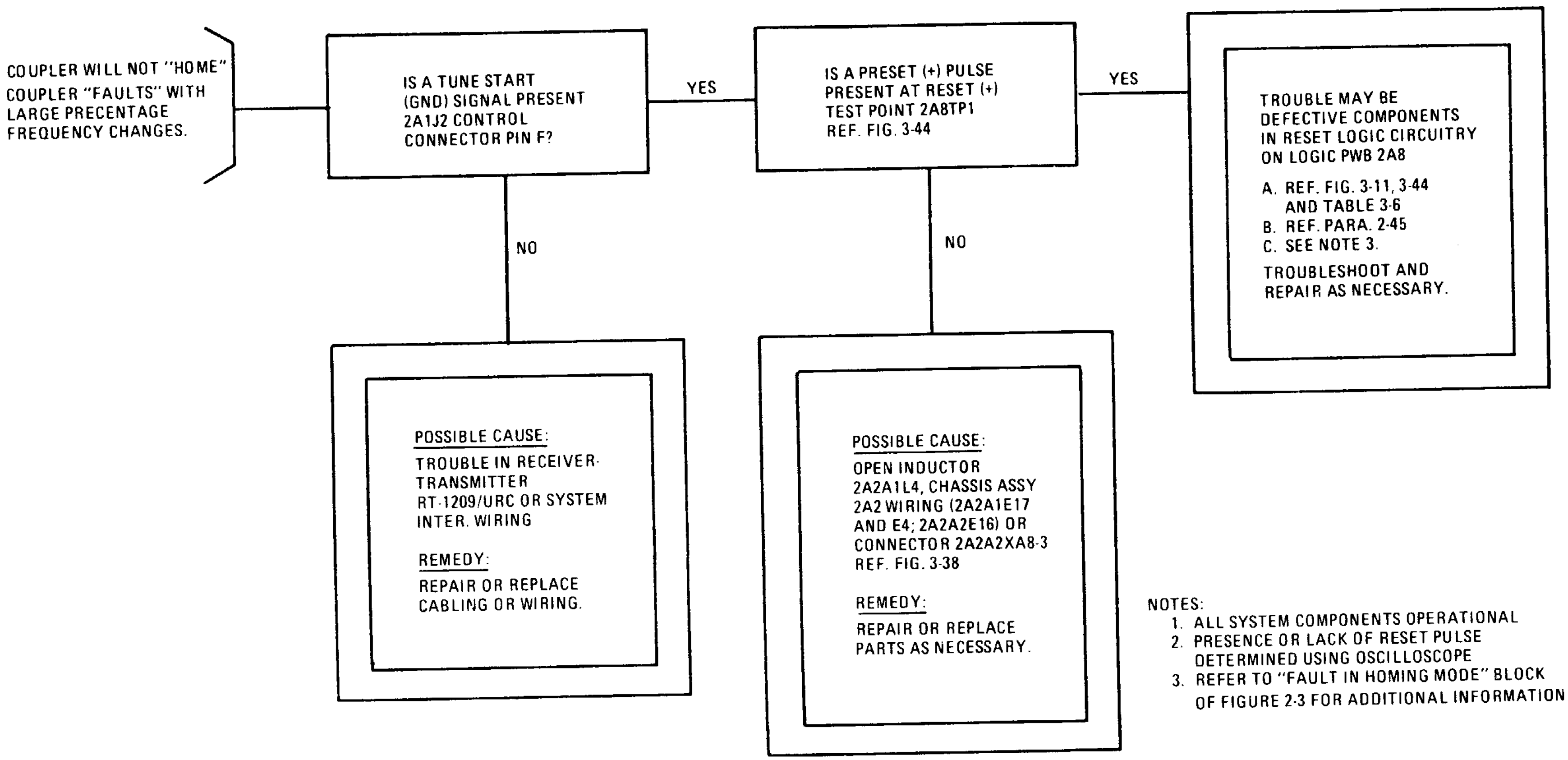
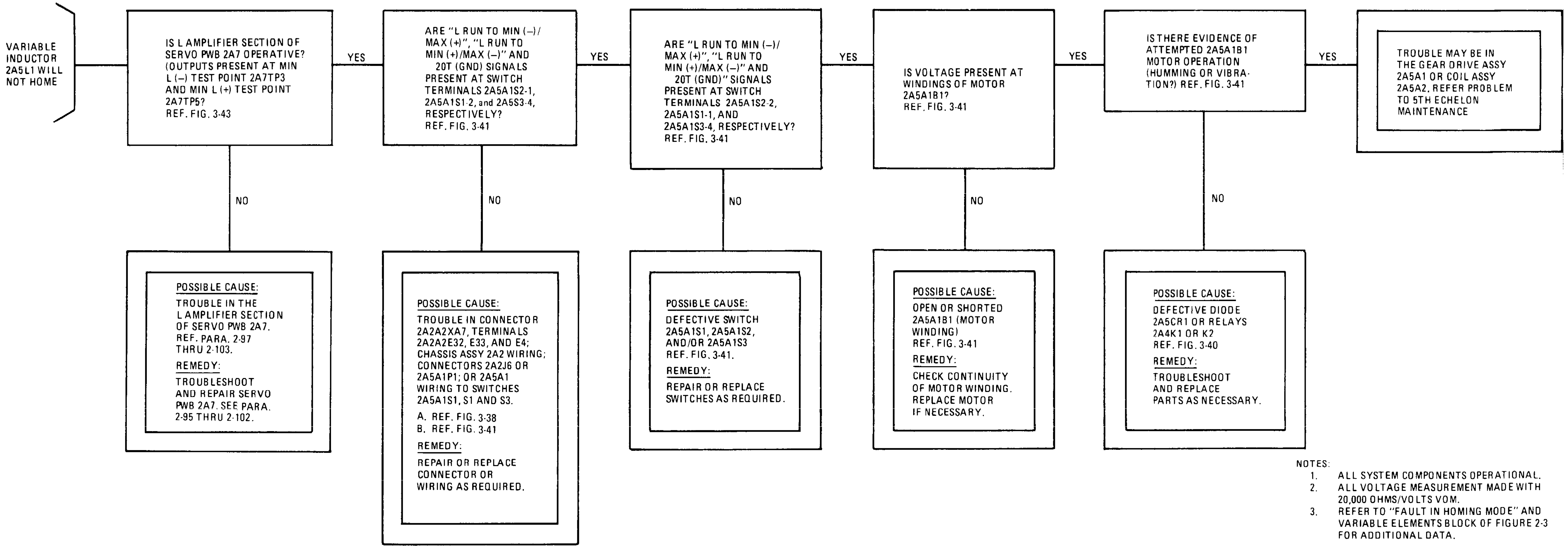
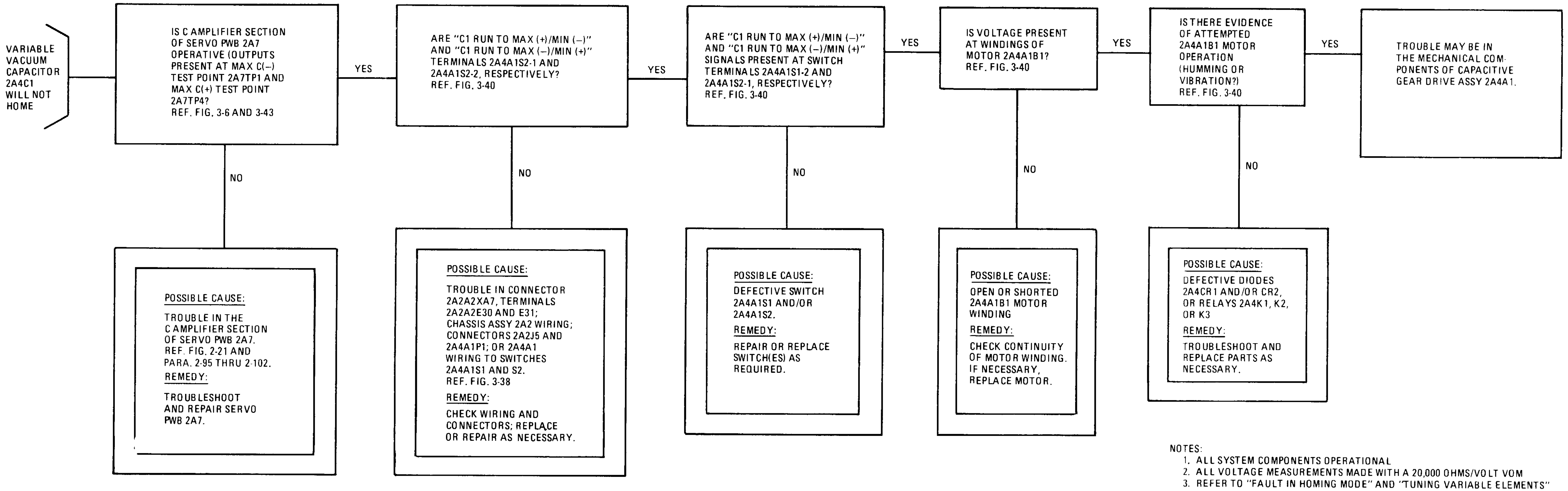


Figure 3-8. Coupler Tune Start/Reset Logic Fault Logic Diagram



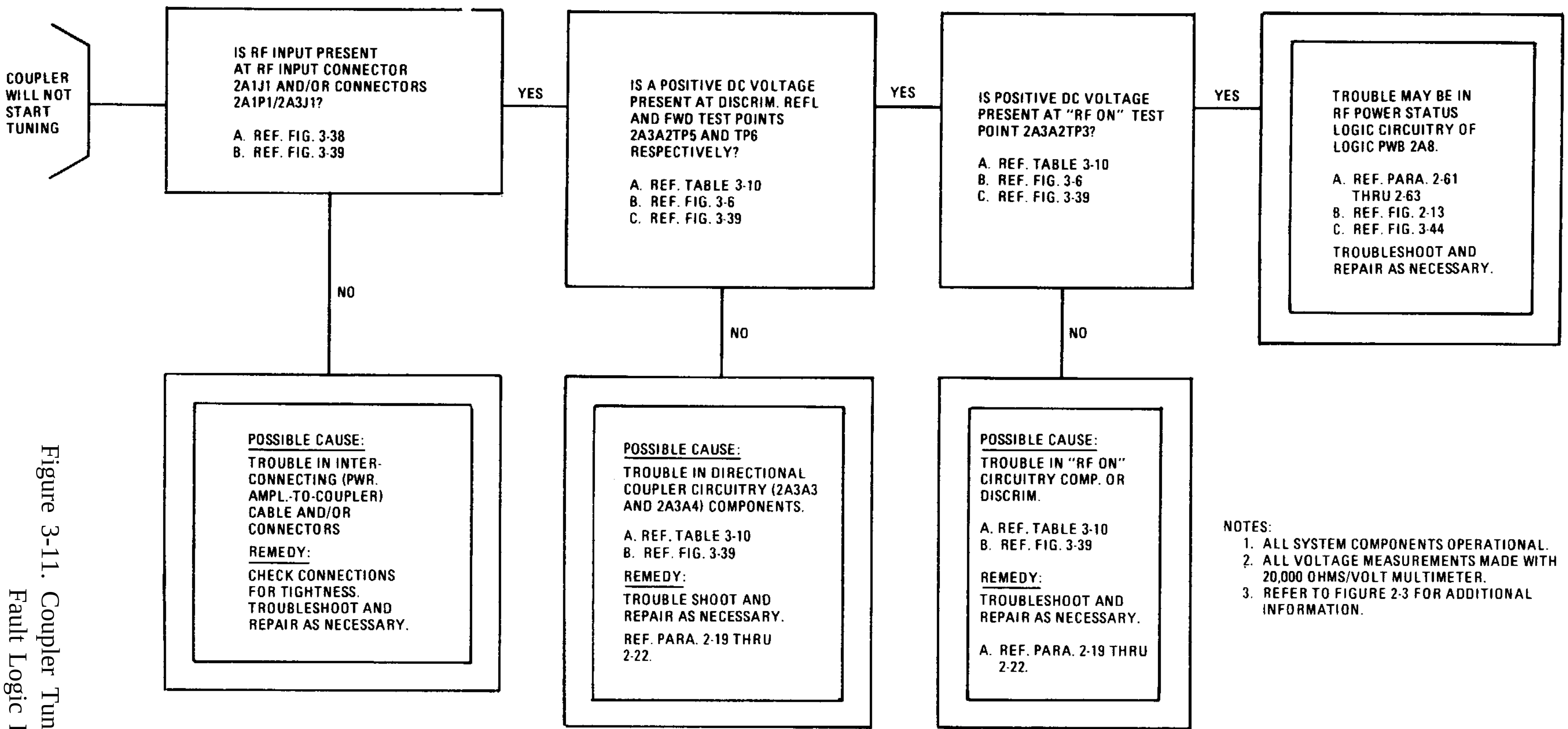
NOTES:
1. ALL SYSTEM COMPONENTS OPERATIONAL.
2. ALL VOLTAGE MEASUREMENT MADE WITH 20,000 OHMS/VOLTS VOM.
3. REFER TO "FAULT IN HOMING MODE" AND VARIABLE ELEMENTS BLOCK OF FIGURE 2-3 FOR ADDITIONAL DATA.

Figure 3-9. Variable Inductor 2A5L1 Home Mode Fault Logic Diagram



NOTES:
1. ALL SYSTEM COMPONENTS OPERATIONAL
2. ALL VOLTAGE MEASUREMENTS MADE WITH A 20,000 OHMS/VOLT VOM
3. REFER TO "FAULT IN HOMING MODE" AND "TUNING VARIABLE ELEMENTS" BLOCK OF FIGURE 2-3 FOR ADDITIONAL DATA.

Figure 3-10. Variable Vacuum Capacitor 2A4C1 Home Mode Fault Logic Diagram



NOTES:
1. ALL SYSTEM COMPONENTS OPERATIONAL.
2. ALL VOLTAGE MEASUREMENTS MADE WITH 20,000 OHMS/VOLT MULTIMETER.
3. REFER TO FIGURE 2-3 FOR ADDITIONAL INFORMATION.

Figure 3-11. Coupler Tune Start Fault-Fault Logic Diagram

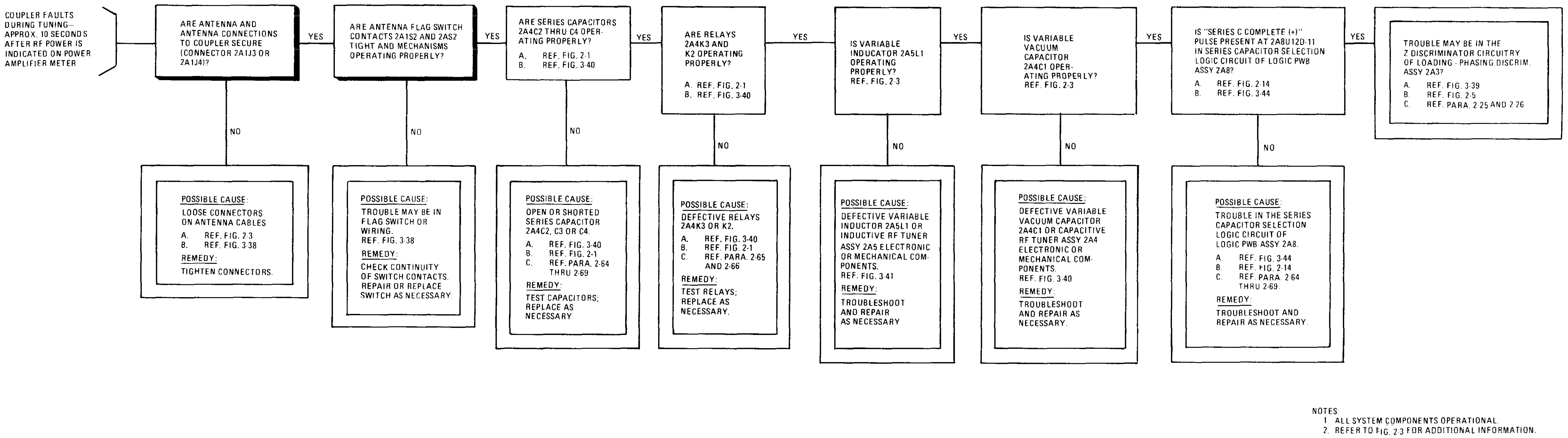


Figure 3-12. Coupler Tune Fault (After Start) Fault Logic Diagram

1. Establish the adjustment setup shown in figure 3-13.

2. Adjust OVERVOLTAGE TRIP ADJUST potentiometer 2A6R22 completely clockwise.

3. Energize power supply and adjust it to supply a +32 to +34 Vdc input,

4. Adjust OVERVOLTAGE TRIP ADJUST potentiometer 2A6R22 counterclockwise until a ground condition is indicated at the multimeter.

5. De-energize power supply and disconnect adjustment set up.

3-52. 400 HZ ZERO BEAT ADJUSTMENT – STATIC INVERTER POWER ASSEMBLY 2A9

3-53. If unijunction transistor 2A9A1Q1, potentiometer, 2A9A1R14 or capacitor 2A9AlC1 of Static Inverter Power Assembly 2A9 have been replaced, the following 400 Hz zero beat adjustment must be performed (refer to figures 3-14, 3-4, and 3-45):

1. Disassemble Static Inverter Power Assembly 2A9 as described in paragraph 3-70.

2. Establish adjustment setup shown in figure 3-14,

3. Carefully adjust potentiometer 2A9A1R14 to obtain a 2.5 millisecond interval between the 400 Hz spikes observed.

4. Reenergize equipment and disconnect adjustment setup.

3-54. CAPACTIVE RF TUNER ASSEMBLY 2A4 ADJUSTMENTS

3-55. Capacitive RF Tuner Assembly 2A4, with its associated servo motor (2A4AlB1) and end-stop switches (2A4A1S1 and S 2) will not require adjustment unless the assembly has been disassembled for repair or to replace a damaged part.

3-56. See figure 3-15. The function of the gear cam, servo off/end-stop switch 2A4A1S1, and home/end-stop switch 2A4A1S2 is to limit the number of mechanical turns of the variable vacuum capacitor 2A4C1 center shaft, thus preventing damage to the capacitor. The amount of travel between end-stop switches is the tuning range of the capacitor. The end-stop switches are not adjusted to actuate at any significant values of capacitance.

3-57. The following definitions and parameters apply to Capacitive RF Tuner Assembly 2A4:

1. The home end of the capacitor corresponds to its point of maximum capacitance. This point is reached when the capacitor lead screw is rotated maximum counter clockwise. Maximum counter clockwise rotation corresponds to the point where home/end stop switch 2A4A1S1 is actuated.

2. Rotating the capacitor lead screw clockwise will decrease capacitance. Maximum counter-clockwise rotation corresponds to the point where servo off/end-stop switch 2A4A1S2 actuated.

3. The maximum allowable rotation of the capacitor lead screw is approximately 18 revolutions from maximum counterclockwise.

4. The effective tuning range (the operating range between the end-stop switch actuations) corresponds to 16 revolutions of the capacitor lead screw. (The complete tuning range of the capacitor is not used.)

5. The maximum possible capacitive lead screw rotation (allowing for adjustment of the end-stop switches) is 16.9 revolutions.

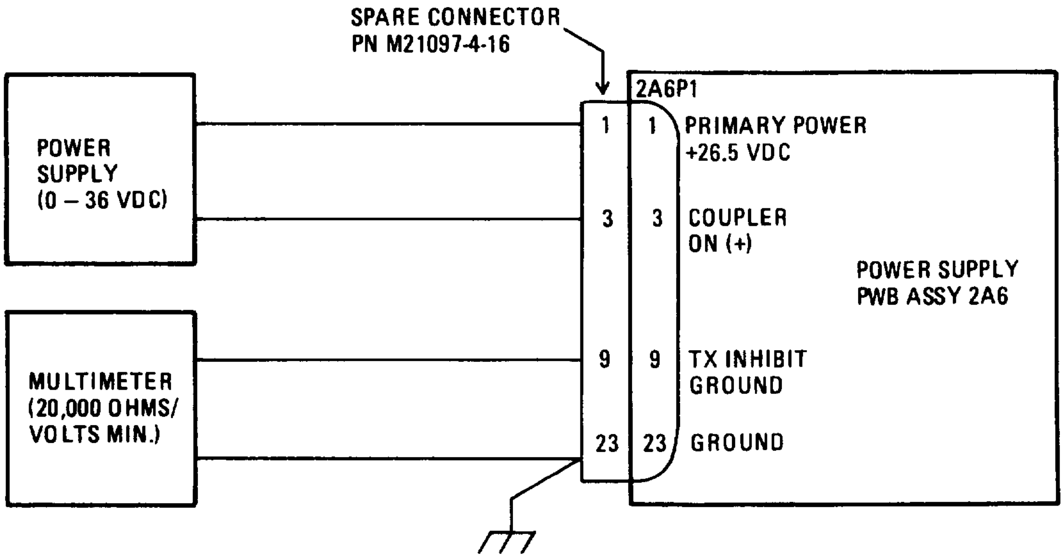


Figure 3-13. Overvoltage Trip Adjustment Setup - Power Supply Pwb Assembly 2A6

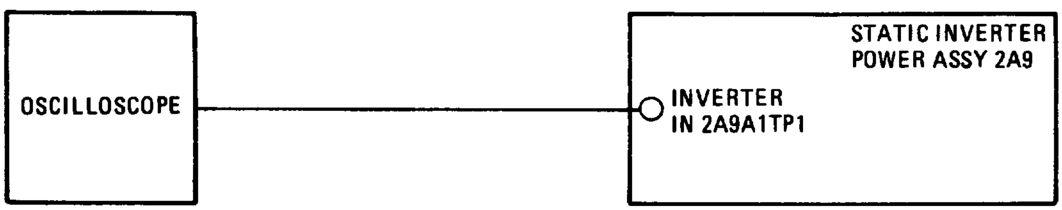


Figure 3-14. 400 Hz Zero Beat Adjustment Setup - Static Inverter Power Assembly 2A9

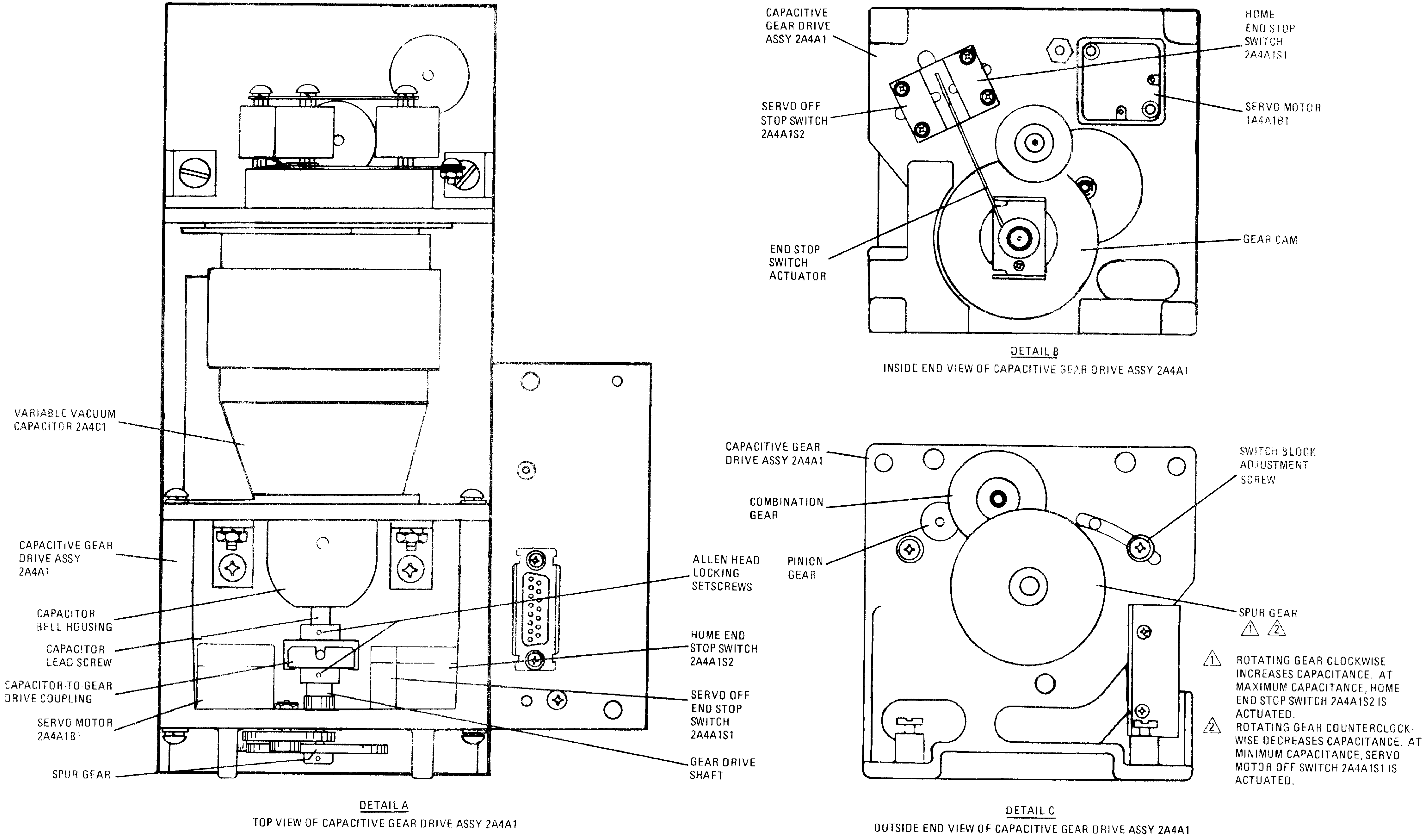


Figure 3-15. Capacitive RF Tuner Assembly 2A4 - Adjustment Detail Views

3-58. If the capacitor lead screw (figure 3-15), servo motor 2A4AlBl, servo off/end-stop switch 2A4AlSl, or home/end stop switch 2A4A1S2 have been replaced, reset the gear cam and end-stop switches (detail B, figure 3-1 5) as follows:

1. Refer to detail A of figure 3-15. Loosen the four Allen locking screws that secure the capacitor-to-gear drive coupling to the capacitor lead screw and gear drive shaft.

2. Refer to details B and C. Rotate spur gear counterclockwise (as viewed from the outside end of the assembly) to the point where home/end-stop switch 2A4A1S1 is just actuated. An audible click will be noted at the actuation point.

3. Rotate capacitor lead screw counterclockwise until it unlocks (finger tight) at maximum capacitance position. Note that capacitor bell housing (detail A) is loose and rotates freely at this point.

4. Rotate capacitor lead screw 1/4 turn clockwise. Note that capacitor bell housing is tight and will not turn.

5. Secure capacitor-to-gear drive coupling to capacitor lead screw and gear drive shaft by tightening the four Allen locking set screws.

CAUTION

In next step, don't rotate Spur Gear past the end-stop switches. Damage to switch actuator will occur if this is done.

6. Rotate spur gear back and forth several times to verify servo home/end-stop switch 2A4A1S1 actuation point.

Note

At this time, capacitor Gear Drive Assembly 2A4A1 and variable vacuum capacitor 2A4C1 are adjusted so that the home/end-stop switch 2A4A1S1 is actuated properly at capacitor maximum capacitance position. In operation, the switch will turn off the servo motor at this point.

7. Refer to detail C. Using a pencil or non-metallic marker, place a mark on the spur gear and combination gear faces at the point where they intermesh. This mark will be used as a convenient way to count revolutions of the spur gear in subsequent steps.

8. Refer to details B and C. Rotate spur gear clockwise (as viewed from the outside end of the assembly) 16 full revolutions. The home/end-stop switch 2A4A1S2 should be actuated at this point. An audible click will be noted at the actuation point.

3-59. INDUCTIVE RF TUNER ASSEMBLY 2A5 ADJUSTMENTS

3-60. Inductive RF Tuner Assembly 2A5, with its associated servo motor (2A5A1B1) and end-stop switches (2A5A1S1 and S2) will not require adjustment unless the assembly has been disassembled for repair or to replace a damaged part.

3-61. See figure 3-16, The primary function of the gear cam, home/end-stop switch 2A5A1S 1, and servo off/end-stop switch 2A5A1S2 is to limit the number of mechanical turns of the inductor rotor, to prevent the rotor from running off either end of the inductor coil. The gear cam is geared directly to servo motor 2A5A1B1 and actuates the end-stop switches (2A5A1S1 and S2), 20 turns from home switch 2A5A1S3.

3-62. The amount of rotor travel between the end-stop switches is the tuning range of the inductor. The switches also provide an indication to the logic circuits of Logic PWB 2A8 when either of them is actuated. The switches are adjusted for the proper mechanical stopping point of the inductor rotor, not for any significant values of inductance.

3-63. The following definitions and parameters apply to Inductive RF Tuner Assembly 2A5:

1. The home end of the inductor corresponds to the point of minimum inductance. This point is reached when the inductor rotor shaft is rotated maximum clockwise (rotor is at its furthest point away from Coil Gear Drive Assembly 2A5A1). Maximum clockwise rotation corresponds to the point where home/end-stop switch 2A5A1S1 is actuated.

2. Rotating the inductor rot or shaft counterclockwise will increase inductance. Maximum counter-clockwise rotation corresponds to the point where servo off/end-stop switch 2A5S2 is actuated.

3. The effective tuning range (the operating range between end stop switch actuations) corresponds to 38 revolutions of the inductor rotor shaft.

4. Shorting relays 2A5K2 and 2A5K1 (figure 3-4) is actuated to remove the short circuit from the coil when the inductor rotor is approximately 20 revolutions from the home end of the inductor travels. Relays remain actuated while the rotor travels between 20 and 38 revolutions away from the home position.

3-64. If the inductor rotor shaft (figure 3-16), servo motor 2A5A1B1, home/end-stop switch 2A5A1S1, or servo off/end-stop switch 2A5A1S2 have been replaced, reset the gear cam and end-stop switches (detail B, figure 3-16) as follows:

1. Refer to detail A of figure 3-16. Loosen the four Allen locking set screws that secure the inductor-to-gear drive coupling the inductor rotor shaft and gear drive shaft.

2. Refer to details B and C. Rotate spur gear clockwise (as viewed from the outside end of the assembly) to point where home/end-stop switch 2A5A1S1 is just actuated. An audible click will be noted at the actuation point.

3. Rotate inductor rotor shaft clockwise until it stops at the home end-rotor stop (minimum coil inductance position).

4. Rotate inductor rotor shaft seven-eights of a turn counterclockwise.

5. Secure inductor-to-gear drive coupling to inductor rotor shaft and gear drive shaft by tightening the four Allen locking set screws.

6. Rotate spur gear back and forth several times to verify home/end-stop switch 2A5A1S1 actuation point.

Note

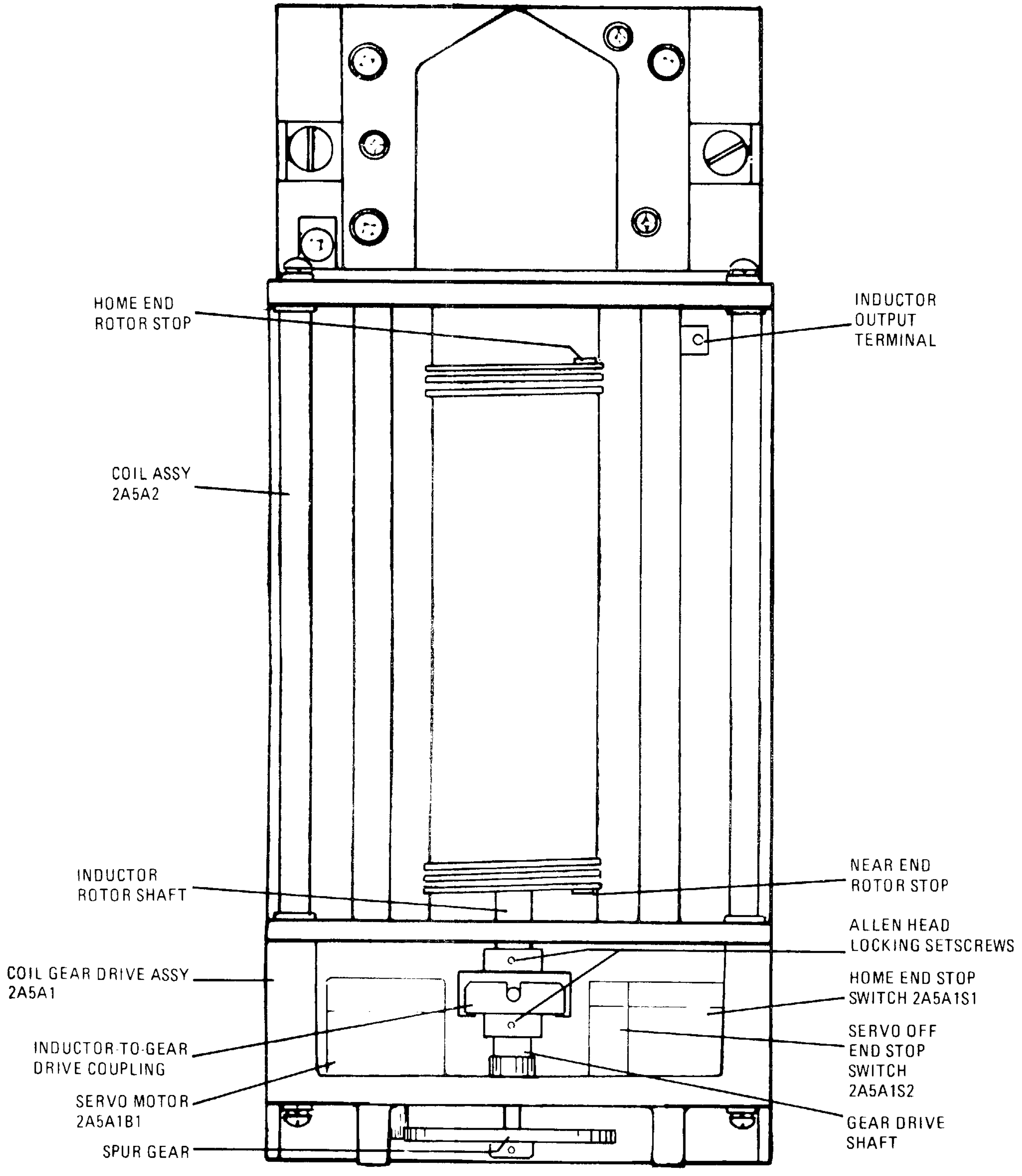
At this point, the rotor contact and 2A5A2E2 are a minimum distance apart.

Note

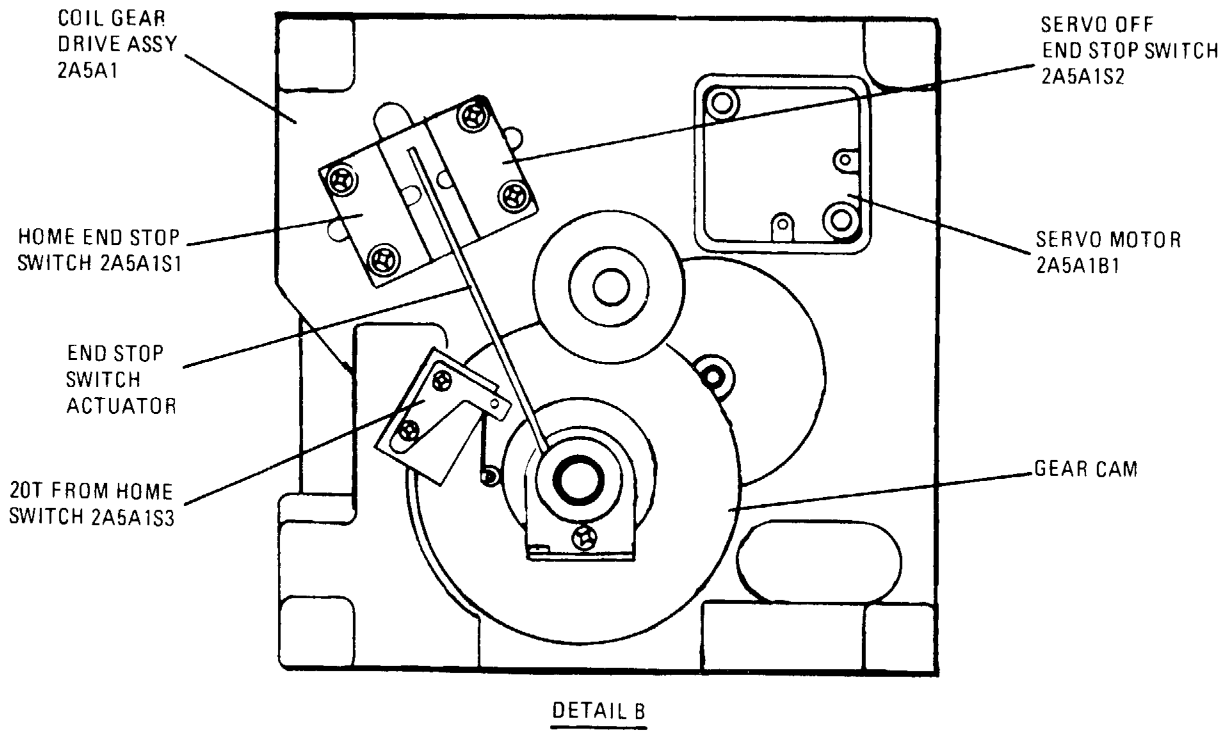
At this time, Coil Gear Drive Assembly 2A5A1 and Coil Assembly 2A5A2 are adjusted so that home/end-stop switch 2A5A1S1 is actuated properly at inductor minimum inductance position, In operation, the switch will turn off the servo motor at this point.

7. Refer to detail C. Using a pencil or non-metallic marker, place a mark on the spur gear and pinion gear faces at the point where they intermesh, This mark will be used as a convenient way to count revolutions of the spur gear in subsequent steps.

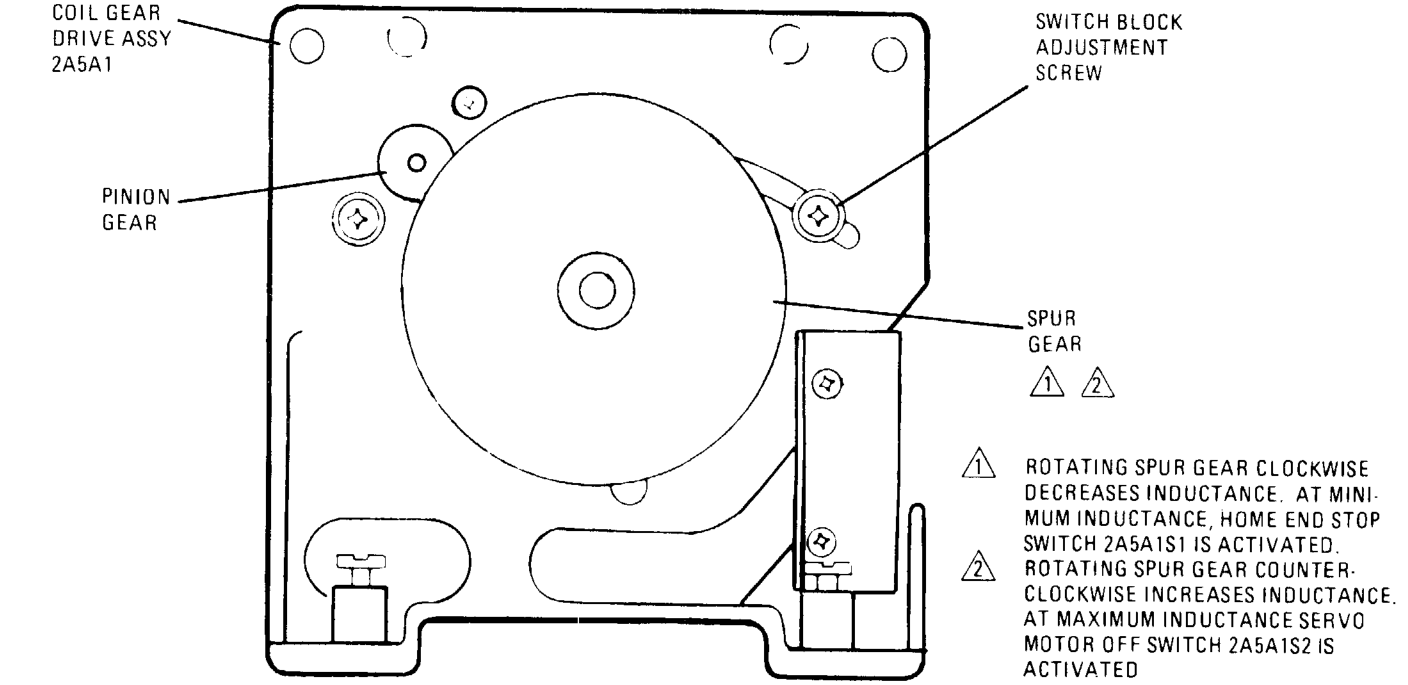
8. Refer to details B and C. Rotate spur gear counterclockwise (as viewed from the outside end of the assembly) 38 full revolutions. The servo off/end-stop switch 2A5A1S2 should be actuated at this point.



DETAIL A
TOP VIEW OF COIL GEAR DRIVE ASSY 2A5A1



DETAIL B
INSIDE END VIEW OF COIL GEAR DRIVE ASSY 2A5A1



DETAIL C
OUTSIDE END VIEW OF COIL GEAR DRIVE ASSY 2A5A1

Figure 3-16. Inductive RF Tuner Assembly 2A5 - Adjustment Detail Views

3-65. COUPLER REPAIR

3-66. Most coupler major assemblies and components are readily accessible for parts replacement. The removal and access instructions of paragraphs 3-12 through 3-27 apply to all major assemblies and components authorized for removal. The following is a list of standard good maintenance practices that should be followed at various repair steps:

1. Use the tools specified to prevent damage to hardware and components, and to ensure that hardware is properly tightened during reassembly.

2. Set hardware aside in the order of removal, so that the right sequence of screws, washers, and lockwashers is maintained at reassembly.

3. When removing cables, tag each lead for easy identification at reassembly.

4. When replacing components with several connections, sketch the component connections before hand.

3-67. COUPLER MAJOR ASSEMBLIES DISASSEMBLY INSTRUCTIONS

3-68. The following disassembly instructions apply to Loading-Phasing Discriminator 2A3 and Static Inverter Power Assembly 2A9, after their removal from the case assembly (refer to paragraphs 3-15 and 3-18), respectively). Disassembly of the Capacitive and Inductive RF Tuner Assemblies 2A4 and 2A5, respectively is not authorized for the intermediate maintenance level.

3-69. DISASSEMBLY OF LOADING-PHASING DISCRIMINATOR ASSEMBLY 2A3

1. Refer to detail A of figure 3-17. Use a No. 1 Phillips screwdriver to loosen the two cover retaining screws, lockwashers, and flatwashers. Remove hardware and cover.

2. Refer to details B and C of figure 3-17 and proceed as follows:

a. To remove Detector PWB 2A3A1, use a No. 1 Phillips screwdriver to loosen the four retaining screws, lockwashers, and flatwashers. Remove hardware and pull pwb away from frame.

b. To remove Discriminator PWB 2A3A2, use a No. 1 Phillips screwdriver to loosen the four retaining screws, lockwashers, and flatwashers. Remove hardware and pull pwb away from frame.

c. To remove connector 2A3P1, use a No. 1 Phillips screwdriver to loosen the two retaining screws, lockwashers, and hex nuts. Remove hardware and push connector away from frame.

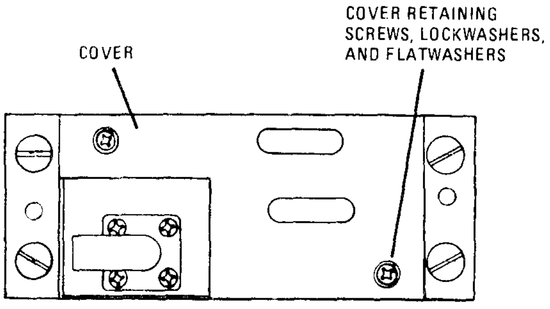
d. To remove connector 2A3J1, use a No. 1 Phillips screwdriver to loosen the four connector retaining screws, lockwashers, and hex nuts. Remove the hardware, unsolder the wire to the connector solder lug, and remove connector.

3-70. DISASSEMBLY OF STATIC INVERTER POWER ASSEMBLY 2A9

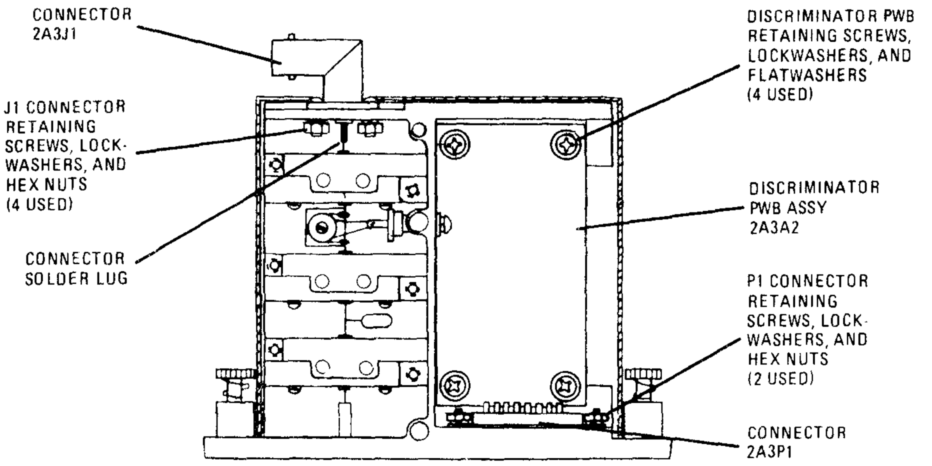
1. Refer to figure 3-18. Use a No. 1 Phillips screwdriver to loosen the two plate retaining screws. Remove screws and cover plate.

2. Use a No. 1 Phillips screwdriver to loosen the two retaining screws, lockwashers, and flatwashers. Also loosen the four plate retaimng screws, lockwashers, flatwashers, and hex nuts, and the two connector retaining screws, lockwashers, flatwashers, and hex nuts. Remove hardware.

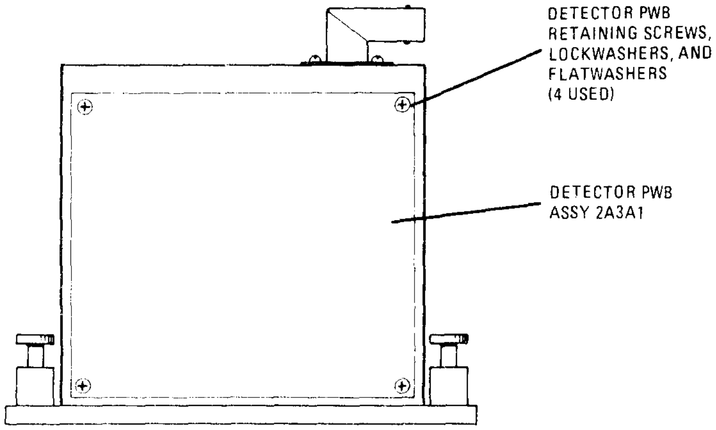
3. Carefully lift PWB Assembly 2A9A1 away from assembly frame.



DETAIL A



DETAIL B



DETAIL C

Figure 3-17. Loading-Phasing Discriminator Assembly 2A3 - Disassembly Details

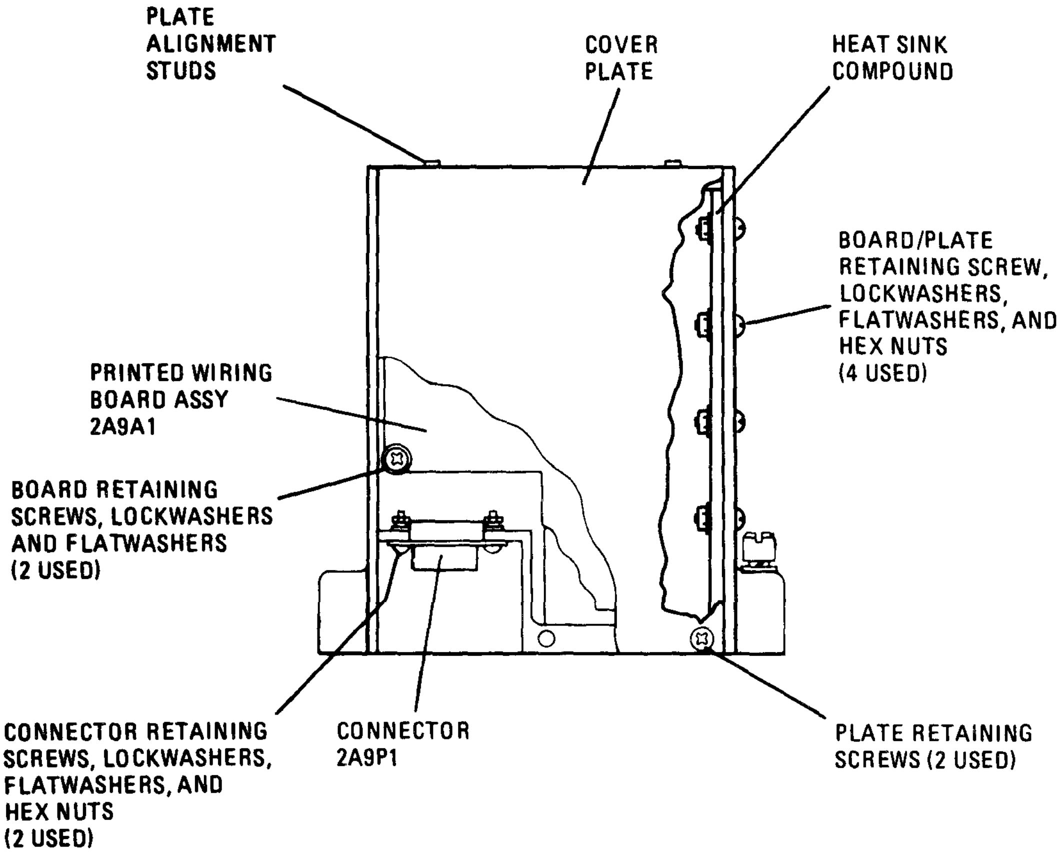


Figure 3-18. Static Inverter Power Assembly 2A9 - Disassembly Details

Note

Remove any traces of heat sink compound from board metal structure and frame. The compound will be replaced at reassembly.

3-71. COMPONENT LOCATION DRAWINGS

3-72. Figures 3-21 through 3-37, located at the end of this chapter, comprise the component location drawings applicable to all coupler assemblies and subassemblies. Refer to these, as necessary, for component location and orientation information.

3-73. PARTS REPAIR AND REPLACEMENT PROCEDURES

3-74. The following information and procedures comprise a list of good standard practices and approaches to be used when replacing components of or repairing pcb/pwb assemblies.

1. Use a pencil-type soldering iron with a 25 watt maximum capacity. If only ac-operated soldering irons are available, use an isolation transformer.

CAUTION

Do not use soldering guns on this equipment as they can induce damaging voltages into the components, and the very high temperatures they reach in a few seconds can damage the components and/or printed circuit/wiring board.

2. When soldering solid state devices, solder them quickly. Where space permits, use a heat sink (such as an alligator clip or needle-nose pliers) between the joint to be soldered and the replacement component lead.

3. Excessive heat or pressure can cause the pcb/pwb copper strip to lift from the board. If this should occur, re-cement the strip in place using a quick-drying acetate base cement or an epoxy resin having good electrical insulating properties.

4. A break in the copper or copper strip of a pcb/pwb can be repaired by soldering a short length of tinned copper wire across the break.

5. Use only high quality resin core solder when repairing printed circuit boards. Never use acid core solder or paste flux.

6. When removing components from a pcb/pwb, apply heat sparingly to the lead of the part to be replaced. Remove the part from the board as the soldering heats the lead. Use an awl to clean the component mounting holes prior to replacing component.

7. Tin the leads of the replacement part. Align the leads with the pcb/pwb holes and carefully insert the component. Bend the leads close to the pcb/pwb foil and cut them so that approximately one-sixteenth of an inch of lead protrudes below the board surface to be soldered. Hold the component against the board and quickly solder the leads.

3-75. REPLACEMENT OF CONNECTORS

3-76. Note any damaged case assembly connectors (J1, J2, J3, J4) and notify nearest depot maintenance facility of the need for their replacement. Other connectors can be replaced as follows:

1. Remove connectors from applicable mounting.

2. Unsolder and tag each connector wire. Discard defective connector.

3. Resolder wires to new connector.

4. Reassemble new connector to applicable mount.

3-77. REPLACEMENT OF ANTENNA FLAGSWITCH 2A1S2 SWITCH ACTUATOR SPRING

3-78. If antenna flagswitch 2A1S2 mechanical operation is loose, the switch actuator spring (detail E of figure 3-2) may be fatigued or broken. Proceed as follows:

1. Refer to detail E of figure 3-2. Use a No. 1 Phillips screwdriver to loosen the two screws, lockwashers, and flat washers. Remove hardware.

2. Lift 2A1S2 switch actuator spring from rotor contact and out of case assembly.

3. Position new spring in place and assemble hardware to secure spring.

3-79. REPLACEMENT OF ANTENNA FLAGSWITCH 2A2S1 SWITCH ACTUATOR

3-80. Replace switch actuator 2A2S1 as follows:

1. Refer to detail E of figure 3-2. Loosen the two switch actuator hex nuts. Remove nuts and switch actuator.

2. Assemble new switch actuator to switch and secure it with the two hex nuts.

3-81. REPLACEMENT OF VACUUM RELAYS 2A4K2 AND 2A4K3

3-82. Replace relay 2A4K2 or K3 as follows:

Note

Prior to performing the subsequent operations, sketch orientation of relay terminals and connecting wires.

1. Refer to detail A of figure 3-19. Use a four-fluted No. 8 Bristol wrench to loosen the three cable connections to relay 2A4K2 and/or the two cable connections to relay 2A4K3. Slip cables off relay terminals.

2. Refer to detail B of figure 3-19. Unsolder silicon diode 2A4CR1 and/or 2A4CR2 from relay 2A4K2 and/or 2A4K3, respectively. Unsolder and tag leads connected to the relays.

3. Use a 13/16-inch open end wrench to loosen the relay retaining flex nut and lockwasher. Remove hardware and relay(s).

4. Install new relay(s) in the reverse order of removal, making sure of proper relay orientation.

3-83. REPLACEMENT OF HIGH VOLTAGE CAPACITORS 2A4C2, C3, AND C4

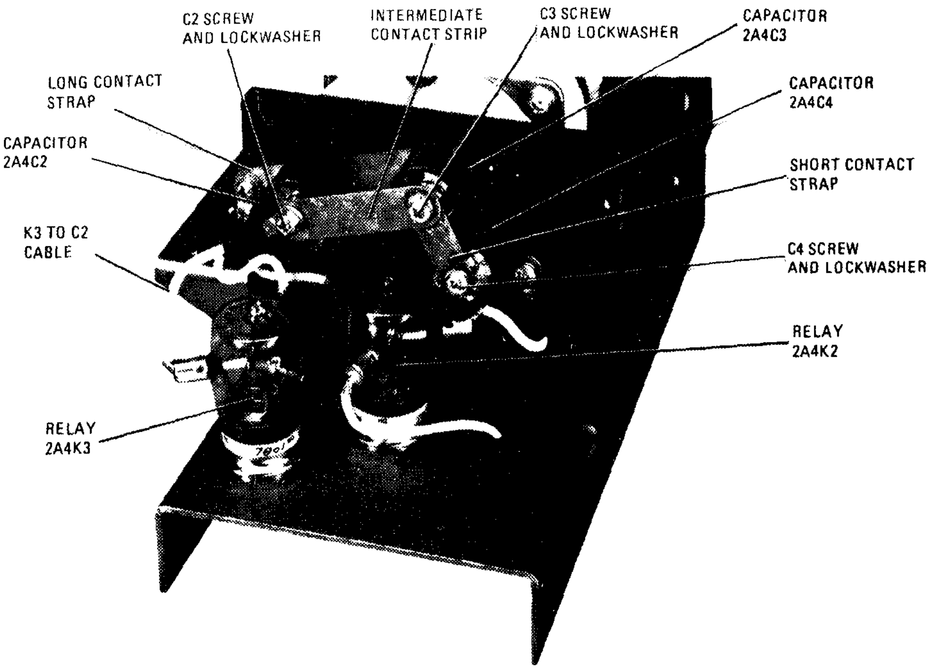
3-84. Replace high voltage capacitors 2A4C2, C3, and C4 as follows:

1. Refer to detail A of figure 3-19.

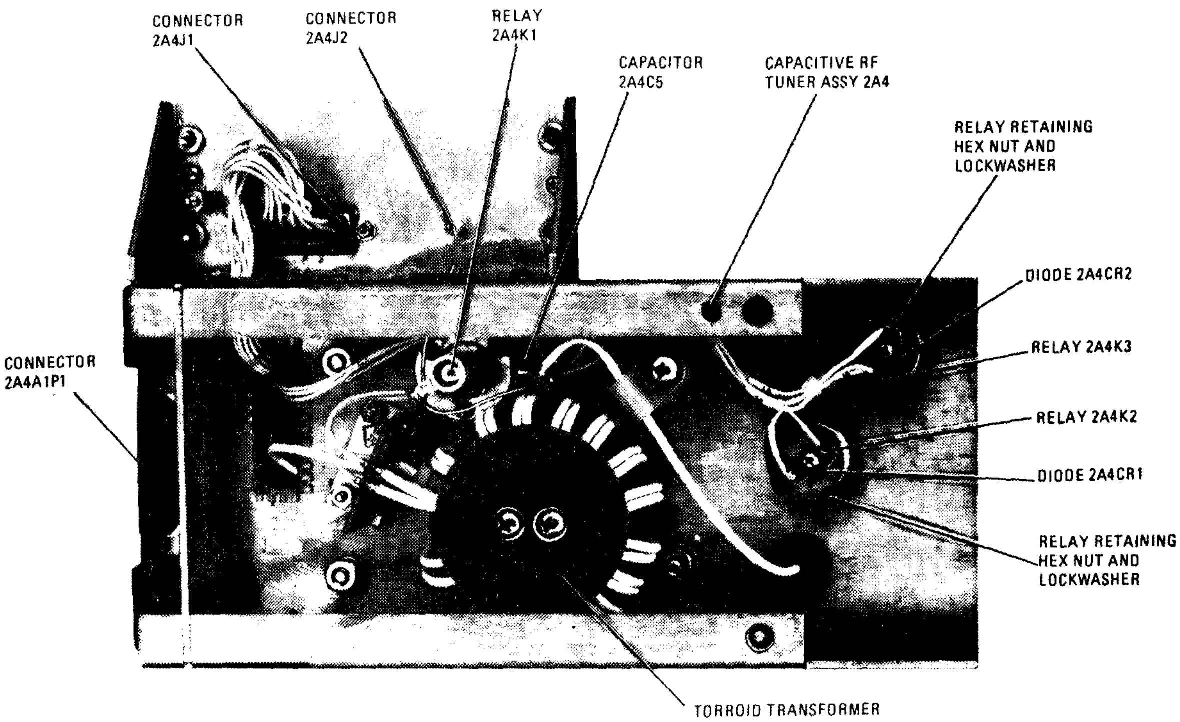
2. If capacitor 2A4C2 is to be replaced:

a. Use a No. 1 Phillips screwdriver to loosen retaining screw for 2A4C2. Remove screw, lockwasher, and cable.

b. Loosen C3 screw just enough to allow intermediate contact strap to be moved away from capacitor 2A4C2.



DETAIL A



DETAIL B

Figure 3-19. Capacitive RF Tuner Assembly 2A4 - Component Details

c. Unscrew capacitor 2A4C2 and replace with new capacitor.

d. Realign intermediate strap and K3-to-C2 cable with 2A4C2 capacitor. Secure cable and strap with screw and lockwasher.

e. Retighten C3 screw to secure intermediate contact strap and K3-to-C2 cable.

3. If capacitor 2A4C3 is to be replaced:

a. Use a No. 1 Phillips screwdriver to loosen C3 screw and lockwasher and intermediate and short contact straps. Remove screw and lockwasher.

b. Loosen C2 and C4 screws just enough to allow intermediate and short contact straps to be moved away from 2A4C3 capacitor.

c. Unscrew capacitor 2A4C3 and replace it with a new one.

d. Realign intermediate and short contact straps with capacitor 2A4C3. Secure straps with C3 screw and lockwasher.

e. Retighten C3 screw to secure intermediate contact strap.

4. If capacitor 2A4C4 is to be replaced:

a. Use a No. 1 Phillips head screwdriver to loosen C4 screw, lockwasher, and short contact strip. Remove screw and lockwasher.

b. Loosen C3 screw just enough to allow intermediate contact strap to be slid away from capacitor 2A4C4.

c. Unscrew 2A4C4 capacitor and replace it with a new one.

d. Realign short contact strap with 2A4C4 capacitor. Secure strap with C4 screw and lockwasher.

e. Retighten C3 screw to secure intermediate contact strap.

3-85. REPLACEMENT OF VANEAXIAL FAN 2A5B2

3-86. Replace vaneaxial fan 2A5B2 as follows:

1. Refer to detail A of figure 3-20. Use a No. 1 Phillips screwdriver to loosen the three screws, lock-washers, and flat washers. Remove hard ware.

2. Refer to detail B of figure 3-20. Carefully separate vaneaxial fan 2A5B2 from inductor chassis.

3. Unsolder and tag the three fan supply wires.

4. Solder tagged wires to new fan and reassemble it to the inductor chassis.

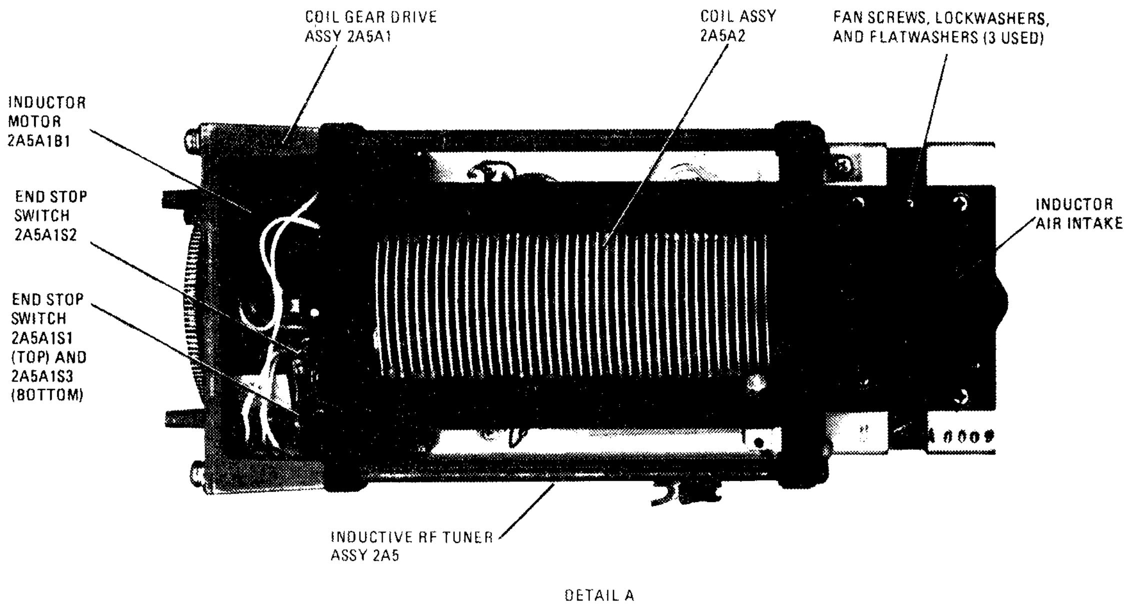
3-87. CLEANING PROCEDURES-REPLACED COMPONENTS

3-88. No special cleaning procedures apply to replaced components; however, make sure that adjoining areas on pcb/pwb assembly tracks, connectors, and cable wiring are not shorted by excess solder.

3-89. REASSEMBLY/REINSTALLATION INSTRUCTIONS

3-90. Replacement and reassembly of detailed parts or subassemblies are described in paragraphs 3-73 through 3-86. To reinstall any of the major assemblies in the coupler case, position the assembly carefully over its mounting location (see figure 3-2) so that connectors are properly aligned. Press downward until assembly is properly seated. Tighten the captive retaining screws with a 3-inch flat-bladed screwdriver. Reconnect the connectors removed in paragraphs 3-15 and 3-18, as applicable. For specific reassembly and reinstallation instructions that cover non-obvious steps in the reinstallation of assemblies 2A3, 2A4, 2A5, 2A7, 2A9, and the case assembly bottom plate, refer to the subparagraphs below.

1. General. Do not overtorque assembly captive or regular screws, as damage to their threads and/or bushings and nut threads may result.



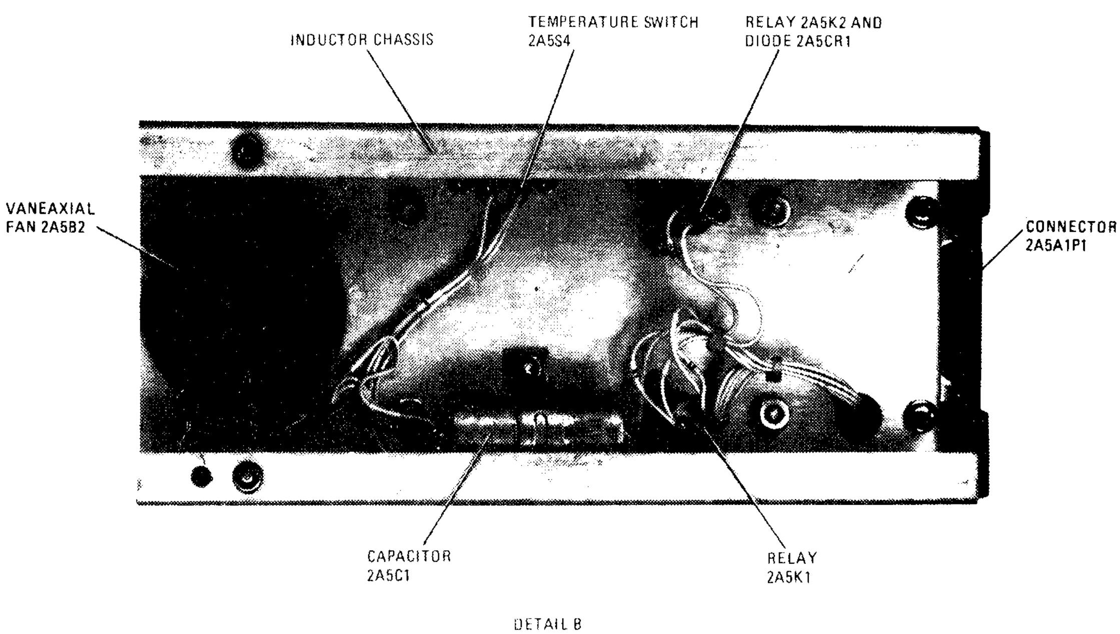


Figure 3-20. Inductive RF Tuner Assembly 2A5 - Component Details

2. Loading-Phasing Discriminator 2A3 (refer to paragraph 3-69). When reassembling the unit, assemble connector 2A3P1 to the unit first. This will minimize wire stress on the Detector and Discriminator PWB's 2A3A1 and 2A3A2, respectively. Also, make sure that the soldered connection to connector 2A3J1 (detail C of figure 3-17) contains just enough solder for good electrical continuity.

3. Capacitive and Inductive RF Tuner Assemblies 2A4 and 2A5. When reassembling these units to the Case Assembly, make sure they are first aligned properly with their locating studs, then push down firmly on the gear assembly ends of the units. This procedure will avoid possible damage to the connectors.

4. Power Supply PWB 2A6, Servo PWB 2A7, and Logic PWB 2A8. To replace these units in the card cage (refer to figure 3-2), first align each card with its respective locater slide, then push straight down on the pc board extractors.

5. Static Inverter Power Assembly 2A9. Refer to figure 3-18. Prior to mechanical reassembly, apply Heat Sink Compound (RF Spec. No. 755017A4412) to the surfaces indicated.

6. Case assembly bottom plate. Prior to securing the coupler bottom plate to the case assembly, apply a small amount of Locktite Sealant (RF Spec. No. 755017A8031) to each screw thread.

3-91. ANTENNA COUPLER CU-2064/GRC-193 OPERATIONAL CHECKOUT

3-92. Refer to chapter 3, of TM 11-5820-924-12 for applicable operational checkout.

3-93. COMPONENT LOCATION/SCHEMATIC DIAGRAM ILLUSTRATIONS

3-94. Figures 3-21 through 3-37 are component location illustrations for the coupler. Figures 3-38 through 3-45 are the coupler schematic diagram illustrations. Table 3-11 presents a cross-reference of coupler and subassembly component/schematic illustrations and their applicable reference designations and parts numbers.

SECTION VI

CARE AND PREPARATION FOR STORAGE

3-95. INTRODUCTION

3-96. Refer to chapter 1, paragraphs 1-42 through 1-45 for applicable care and preparation for storage data.

TABLE 3-11. COMPONENT LOCATION/SCHEMATIC DIAGRAM ILLUSTRATION CROSS-REFERENCE

NAME	PART NO. 755017A	REF. DESIG.	COMP. LOC. DWG. NO.	SCH. DWG. NO.	OTHER INFO. FIG. NO.
Antenna Coupler CU-2064/GRC-193	8000	2	3-21	3-38	------
Filter Pcb Assembly	8010	2A2A1	3-22	3-38	------
Component Bracket Assembly	8115	------	3-23	3-38	------
Component Bracket Assembly/Vaneaxial Fan (2A1B1) Comp Lead Identification	-----	------	----	----	3-24
Interconnection Pcb Assembly	8440	2A2A2	3-25	3-38	------
Loading-Phasing Discriminator Assy	8600	2A3	3-26	3-26	------
Detector Pwb Assembly	8620	2A3A1	3-27	3-39	------
Discriminator Pwb Assembly	8630	2A3A2	3-28	3-39	------
Torroid Assembly	8607	2A3A3	3-26	3-39	------
Torroid Assembly	8607	2A3A4	3-26	3-39	------
Torroid Assembly	8607	2A3A5	3-26	3-39	------
Capacitive RF Tuner Assembly	8300	2A4	3-29	3-40	------
Capacitive Gear Drive Assembly	8340	2A4A1	3-29	3-40	------
Capacitive RF Tuner Assembly 2A4 Comp. Lead Ident. Details	-----	------	----	----	3-30
Inductive RF Tuner Assembly	8200	2A5	3-31	3-41	------
Coil Gear Drive Assembly	8240	2A5A1	3-31	3-41	------
Coil Assembly	8230	2A5A2	3-31	3-41	------
Inductive RF Tuner Assembly 2A5 Comp. Lead Ident. Details	-----	------	----	----	3-32
Power Supply Pwb Assembly	8430	2A6	3-33	3-42	------
Servo Pwb Assembly	8420	2A7	3-34	3-43	------
Logic Pwb Assembly	8410	2A8	3-35	3-44	------
Static Inverter Power Assembly	4900	2A9	3-36	3-45	------
Printed Wiring Board Assembly	4910	2A9A1	3-37	3-45	------

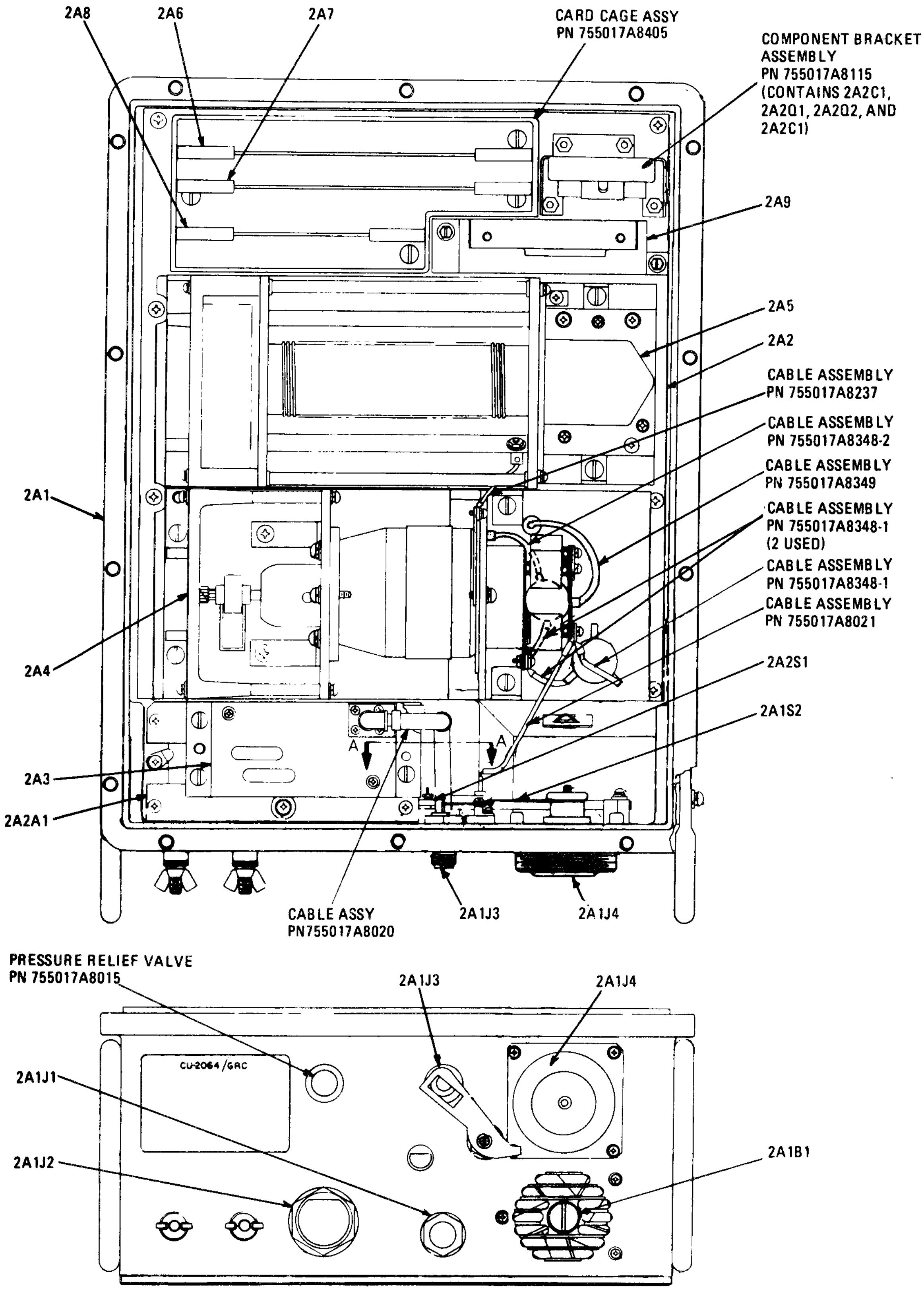
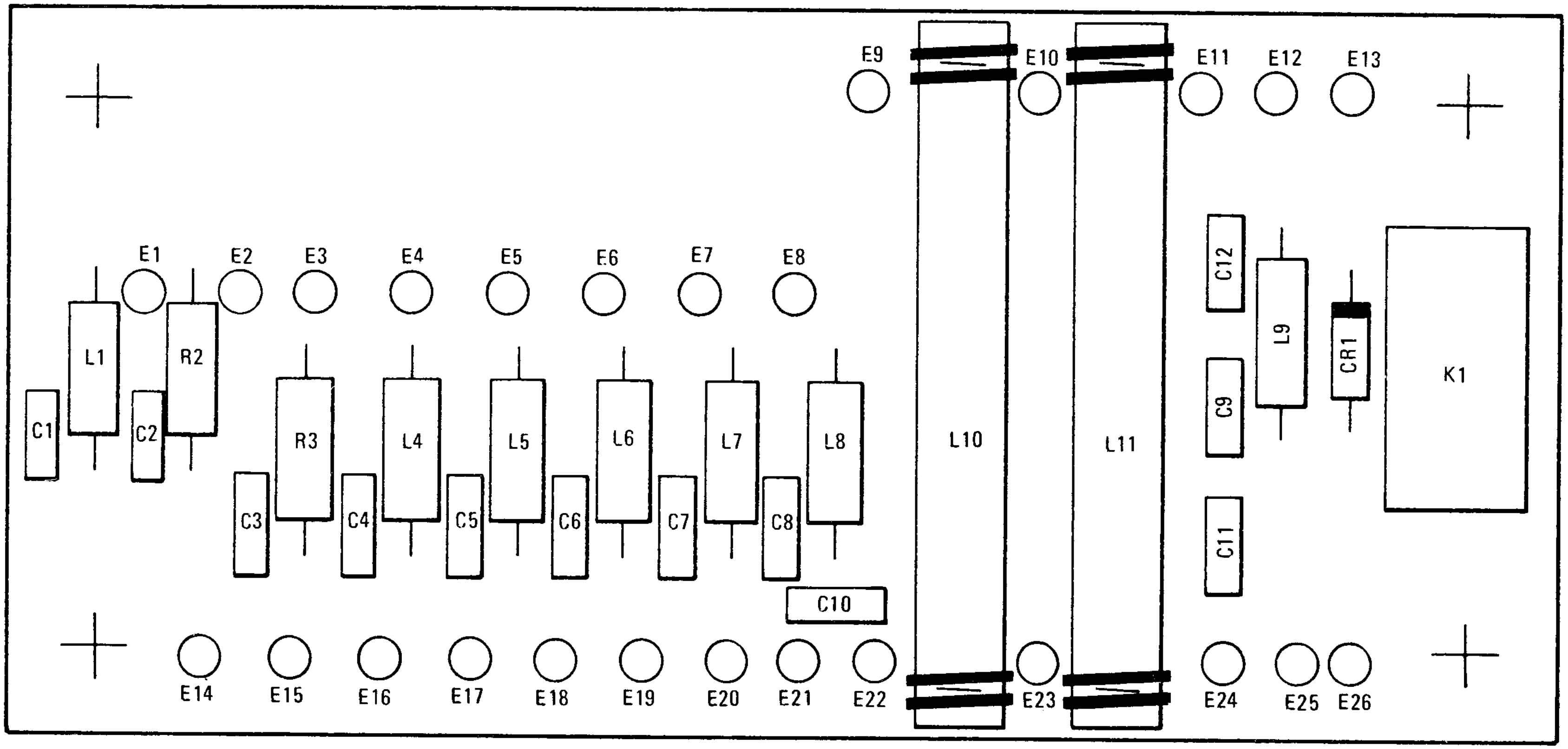


Figure 3-21. Antenna Coupler CU-2064/GRC-193 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A2A1.

Figure 3-22. Filter PCB Assembly 2A2A1 Component Locations

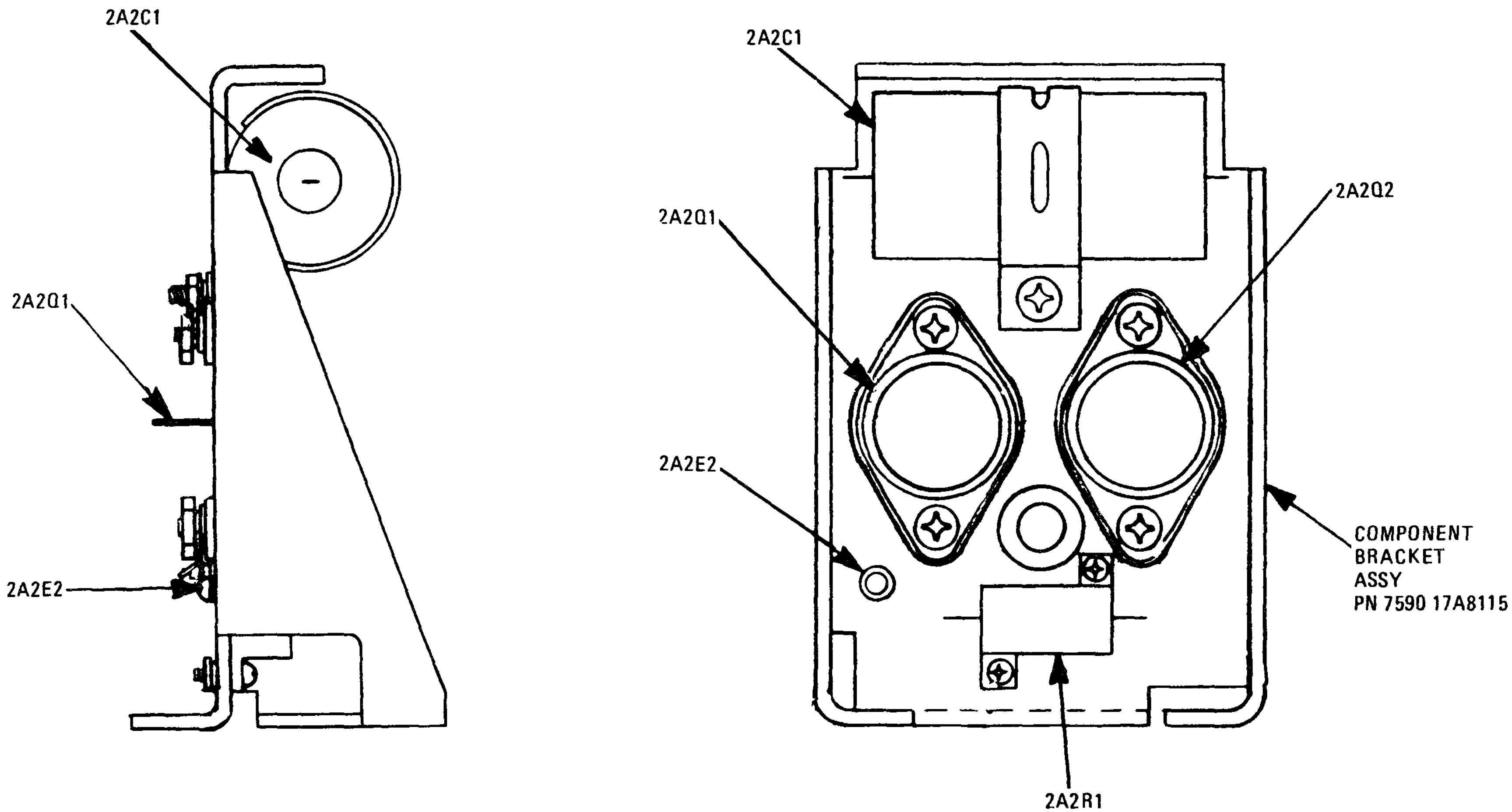


Figure 3-23. Component Bracket Assembly Part No. 755017A8115 Component Locations

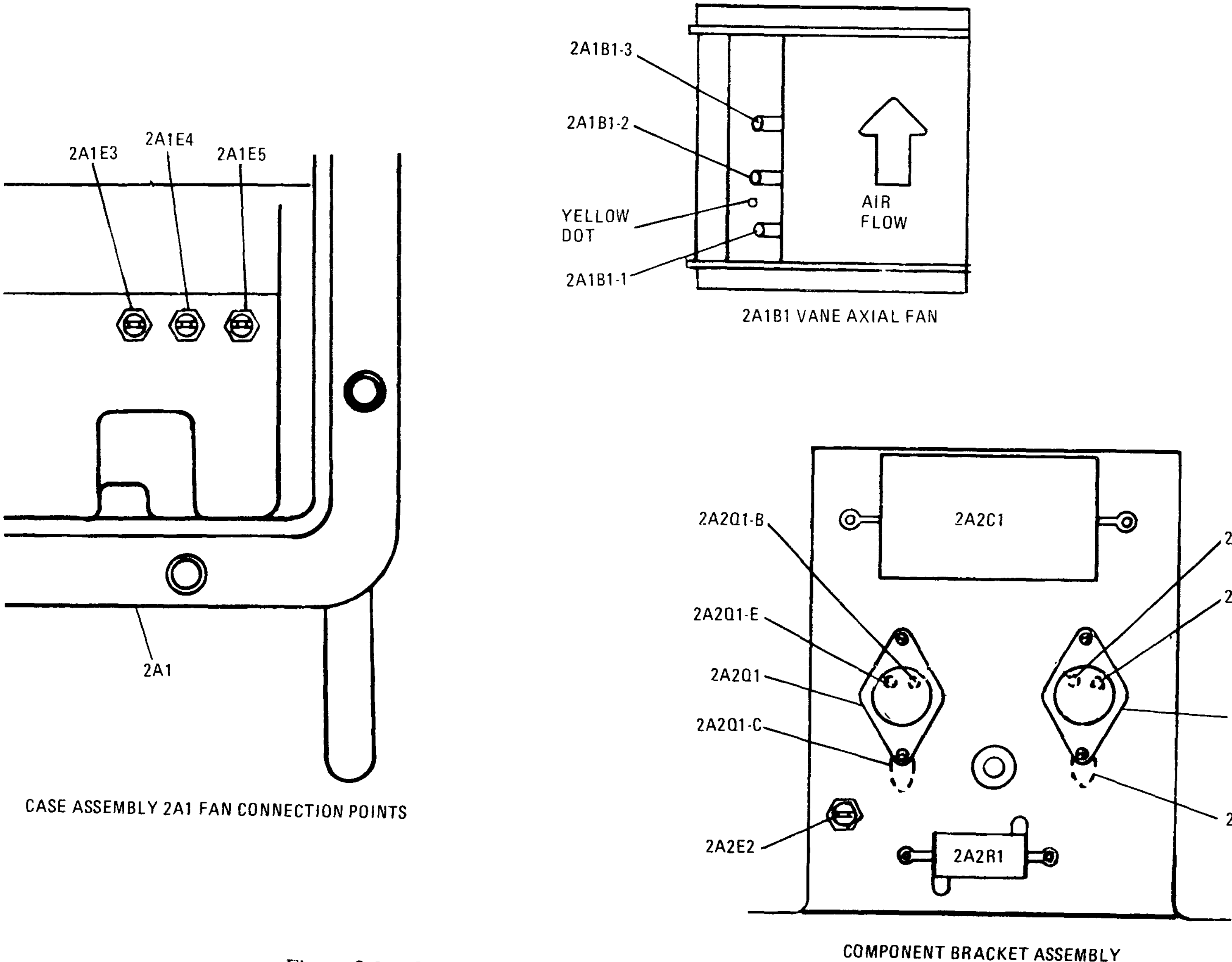
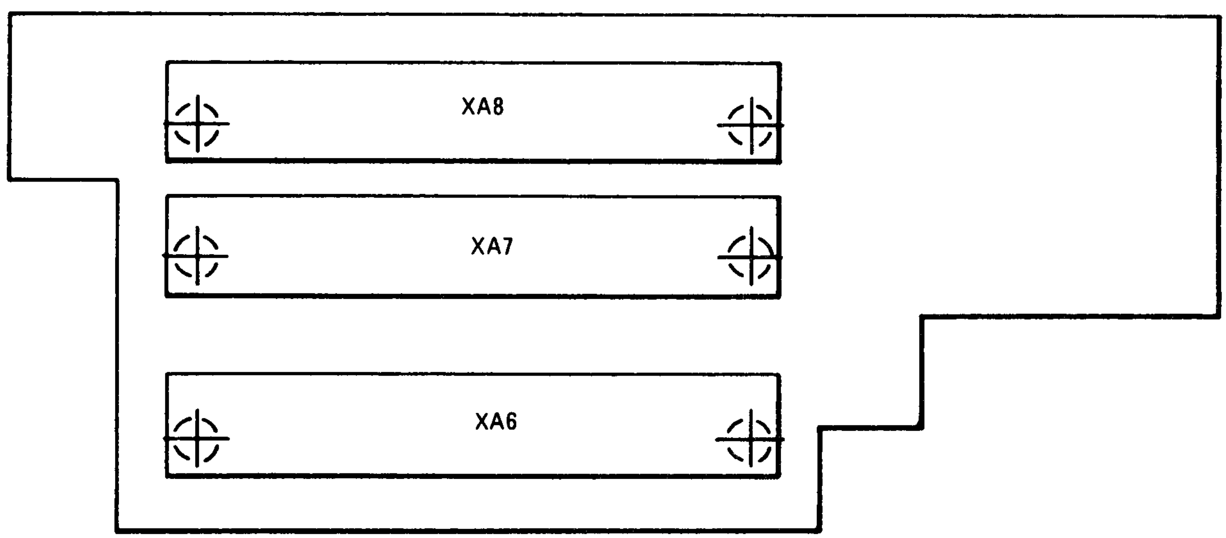


Figure 3-24. Component Bracket Assembly/Vaneaxial Fan (2A1B1) Component Lead Identification Details



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A2A2.

Figure 3-25. Interconnection Pcb Assembly 2A2A2 Component Locations

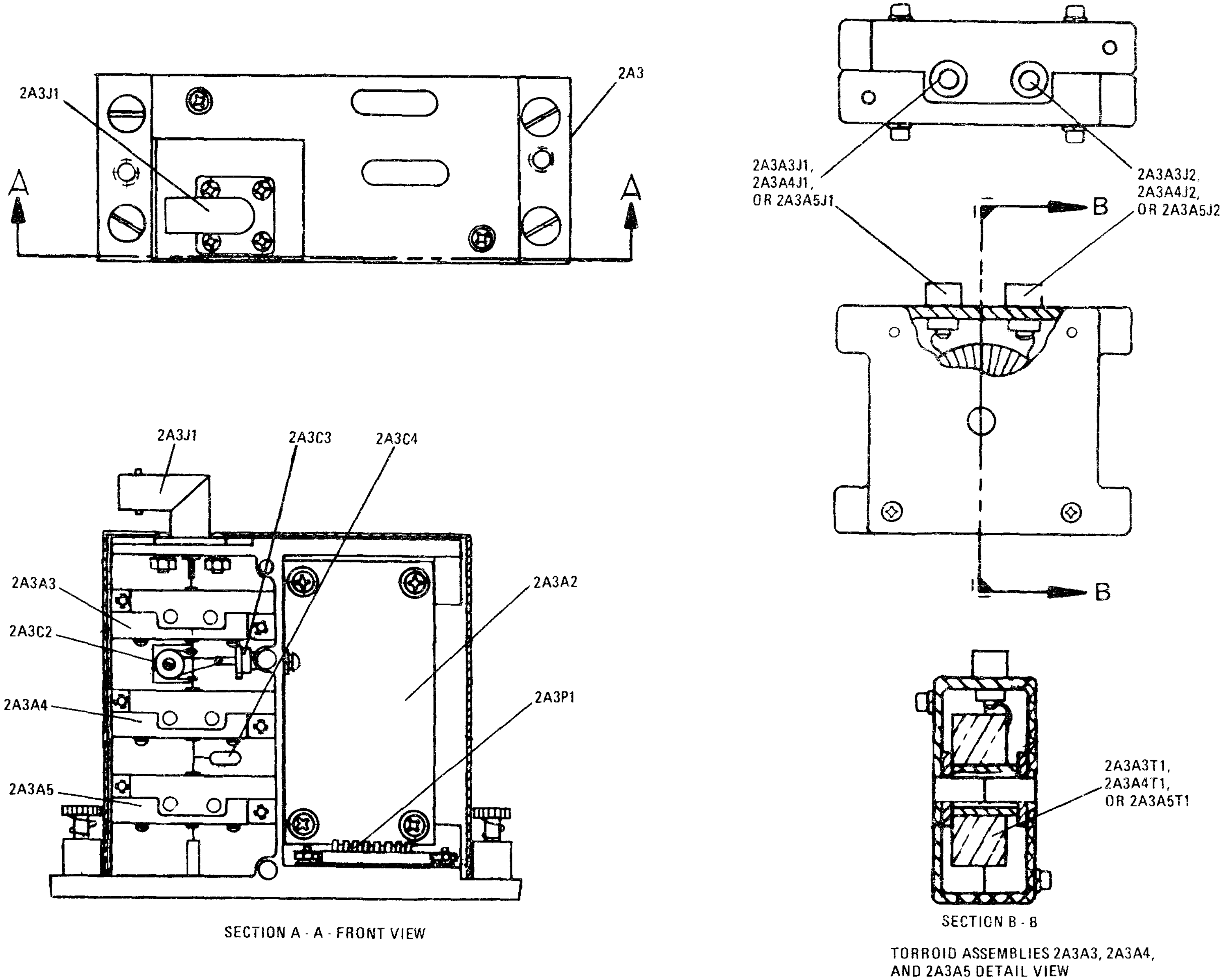
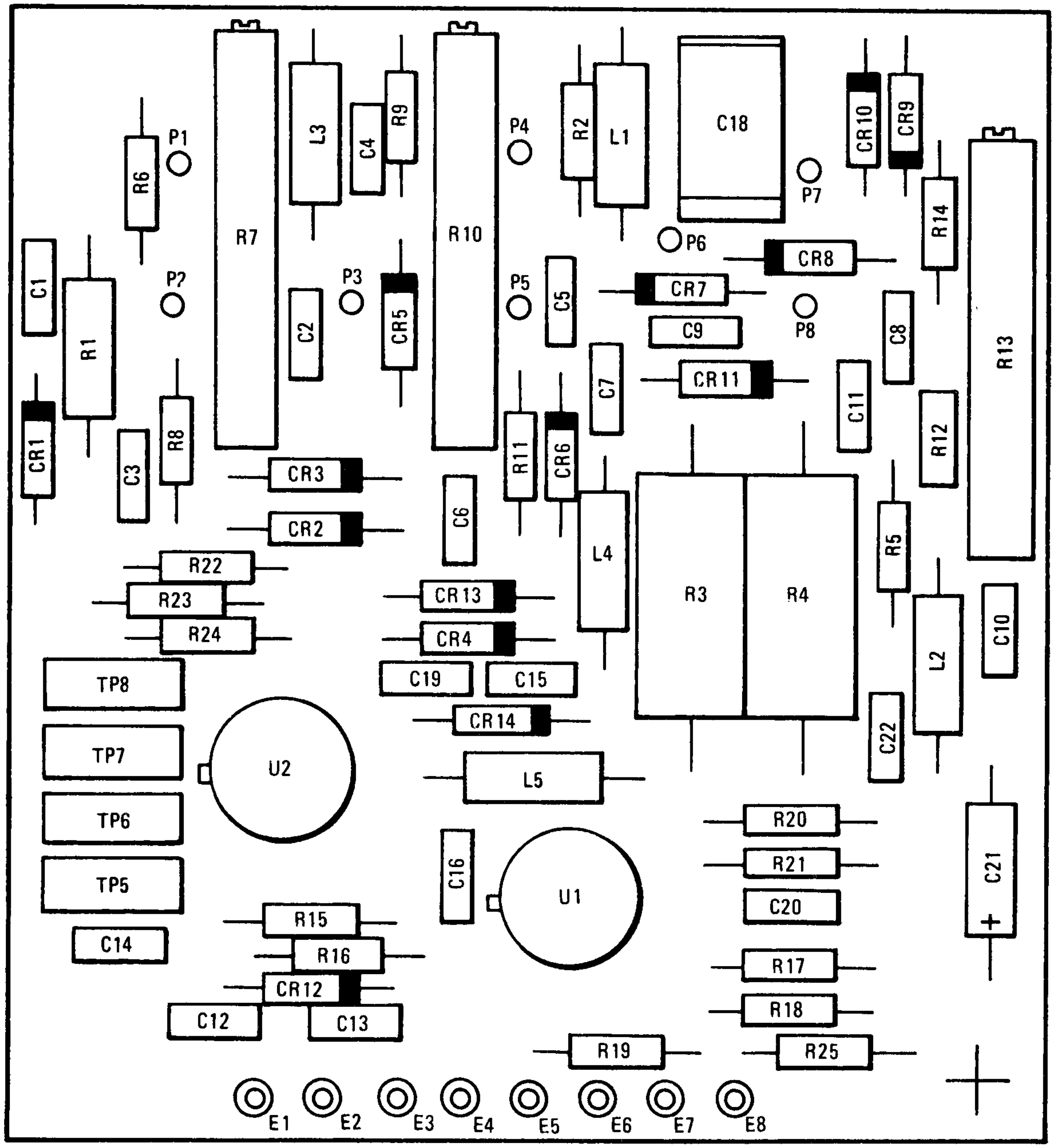
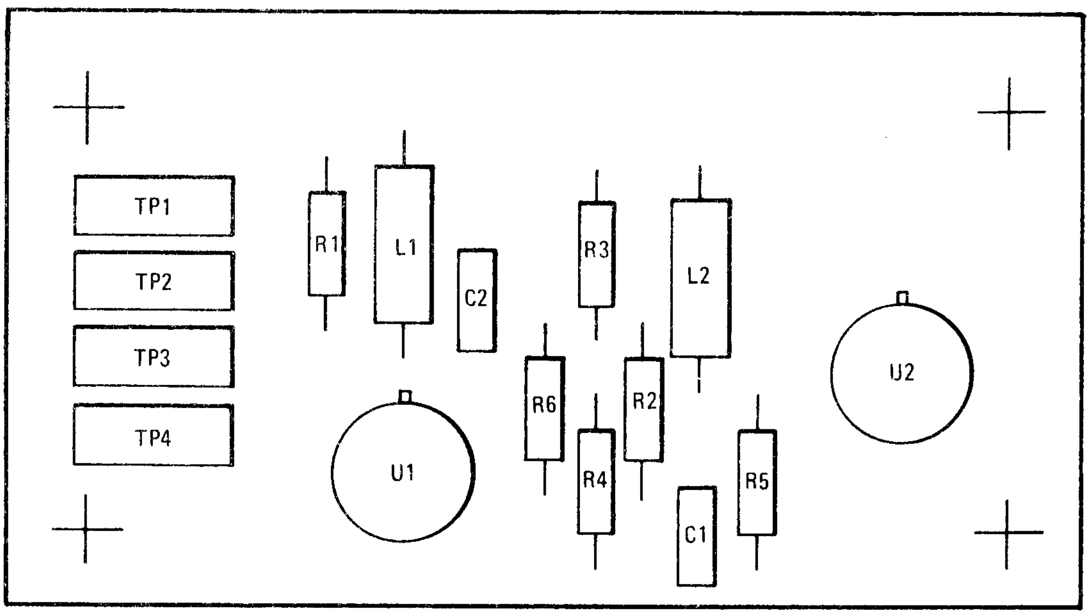


Figure 3-26. Loading-Phasing Discriminator Assembly 2A3 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A3A1.

Figure 3-27. Detector Pwb Assembly 2A3A1 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A3A2.

Figure 3-28. Discriminator Pwb Assembly 2A3A2 Component Locations

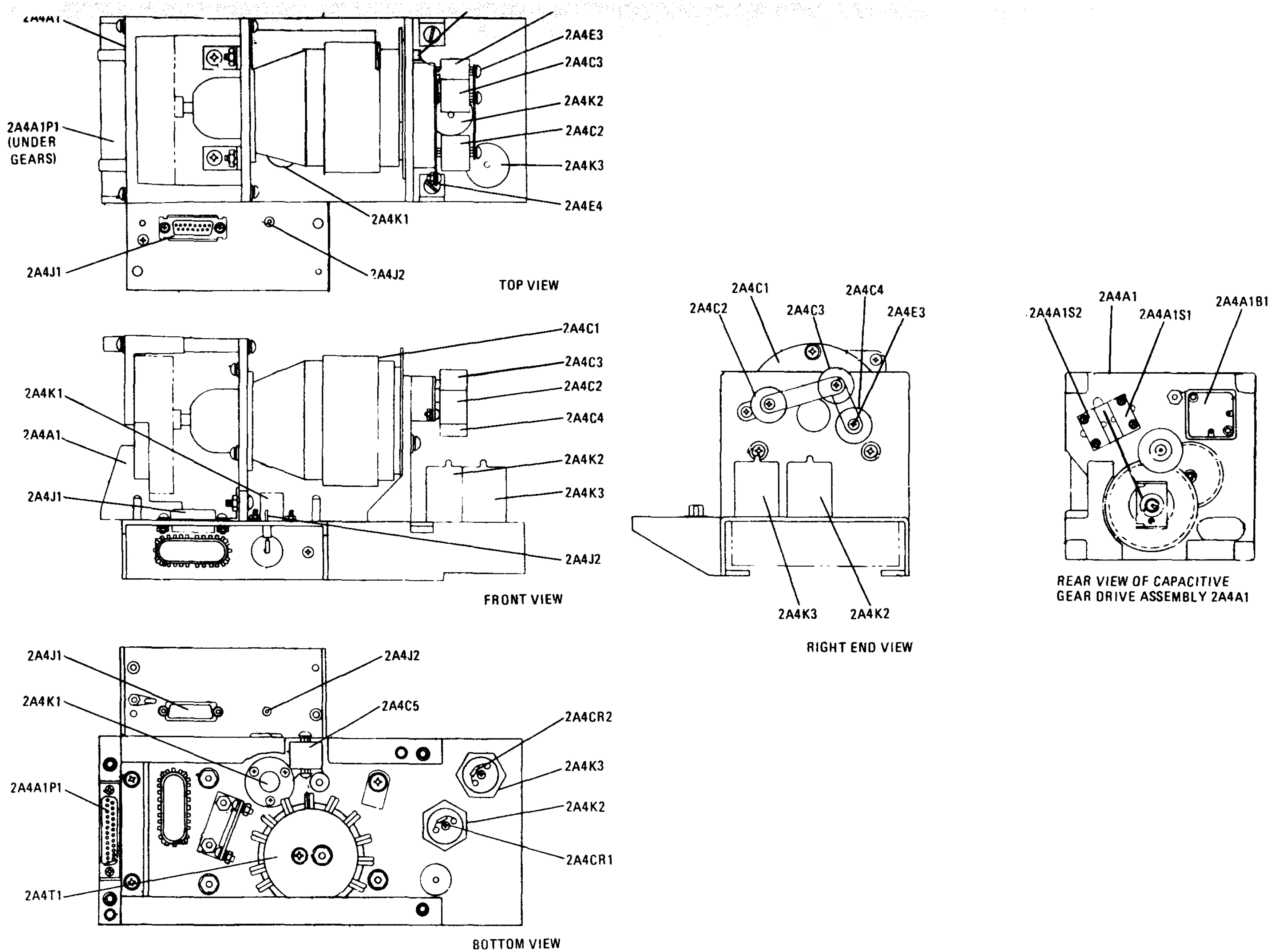


Figure 3-29. Capacitive RF Tuner Assembly 2A4 Component Locations

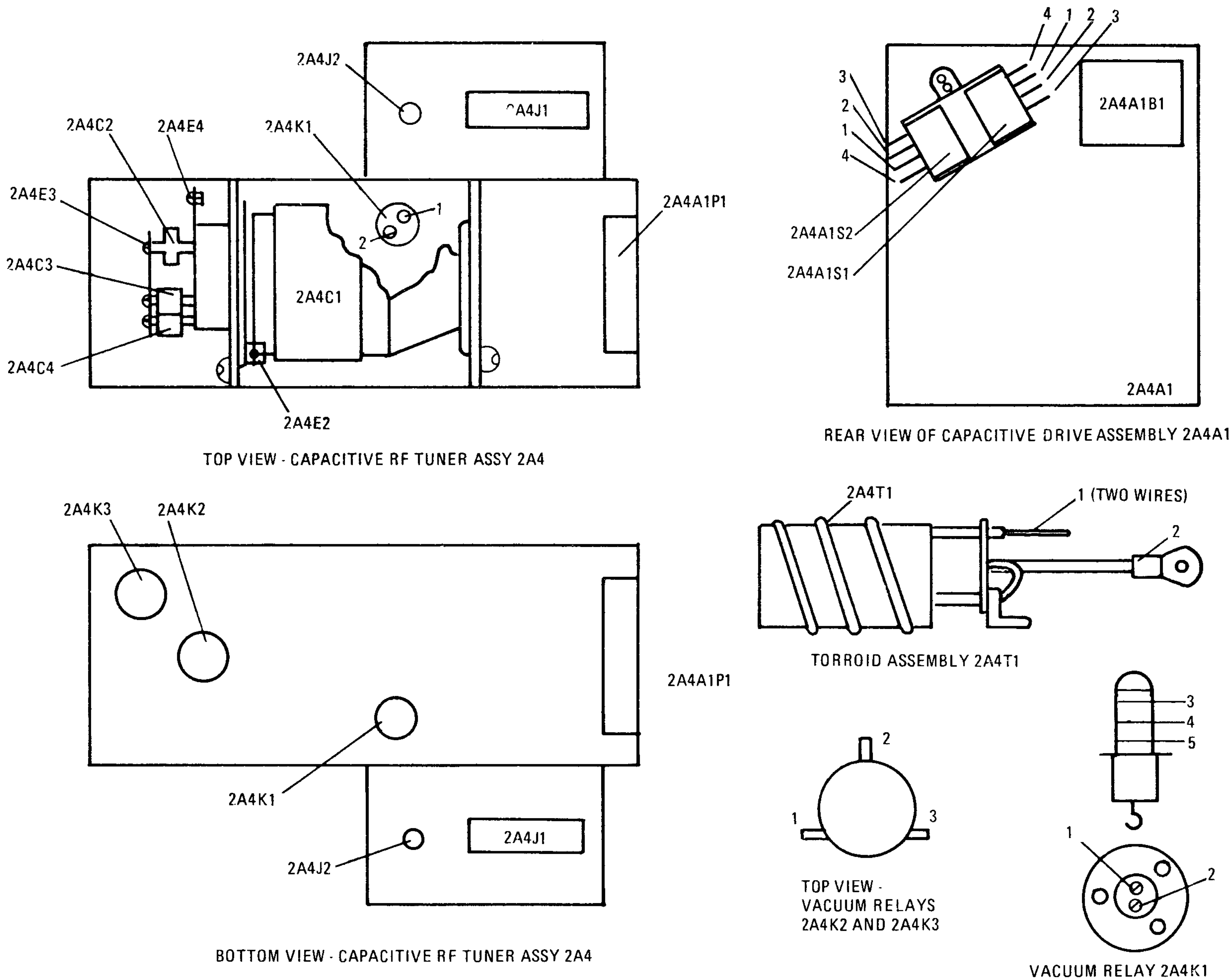


Figure 3-30. Capacitive RF Tuner Assembly 2A4 Component Lead Identification Details

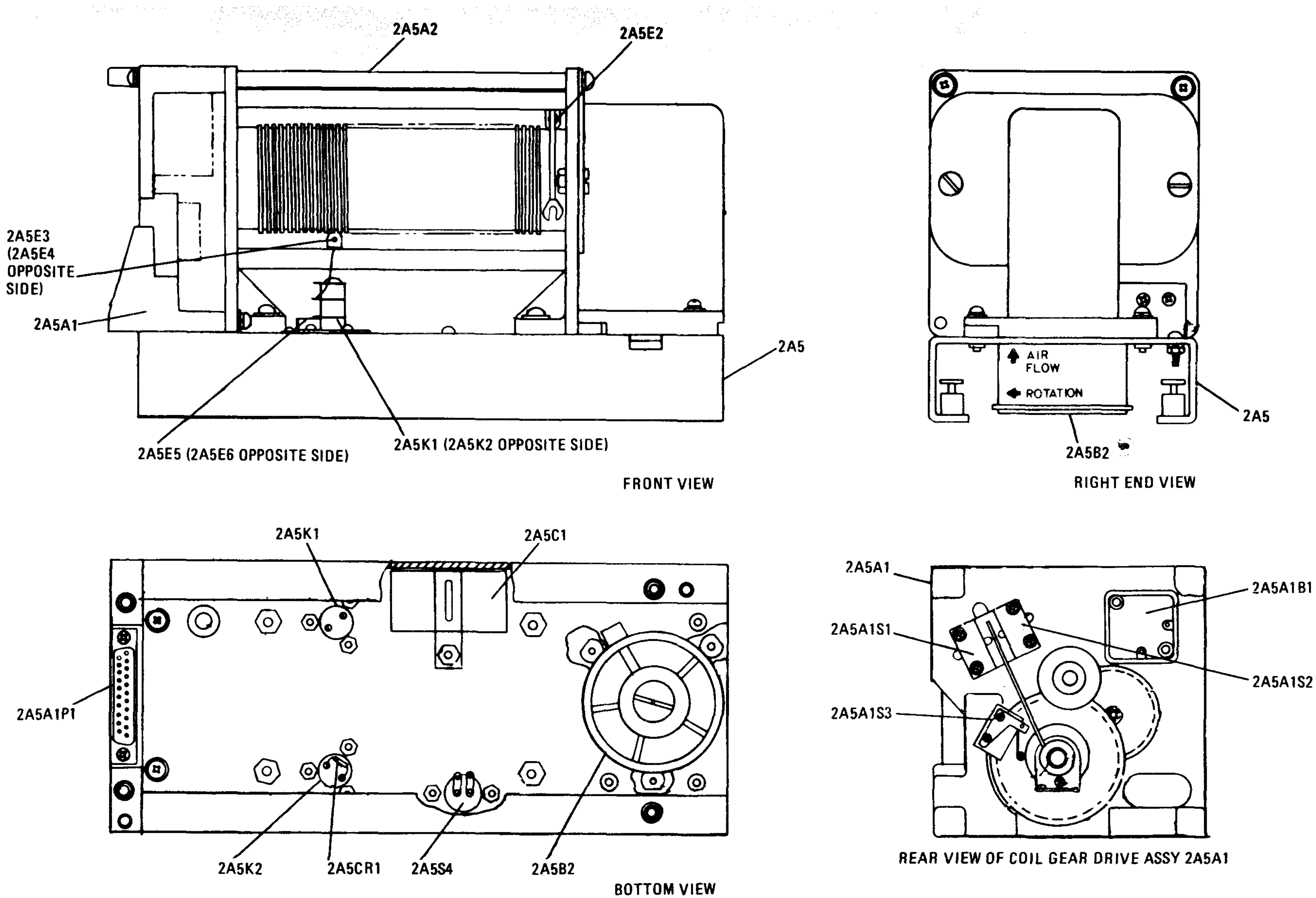


Figure 3-31. Inductive RF Tuner Assembly 2A5 Component Locations

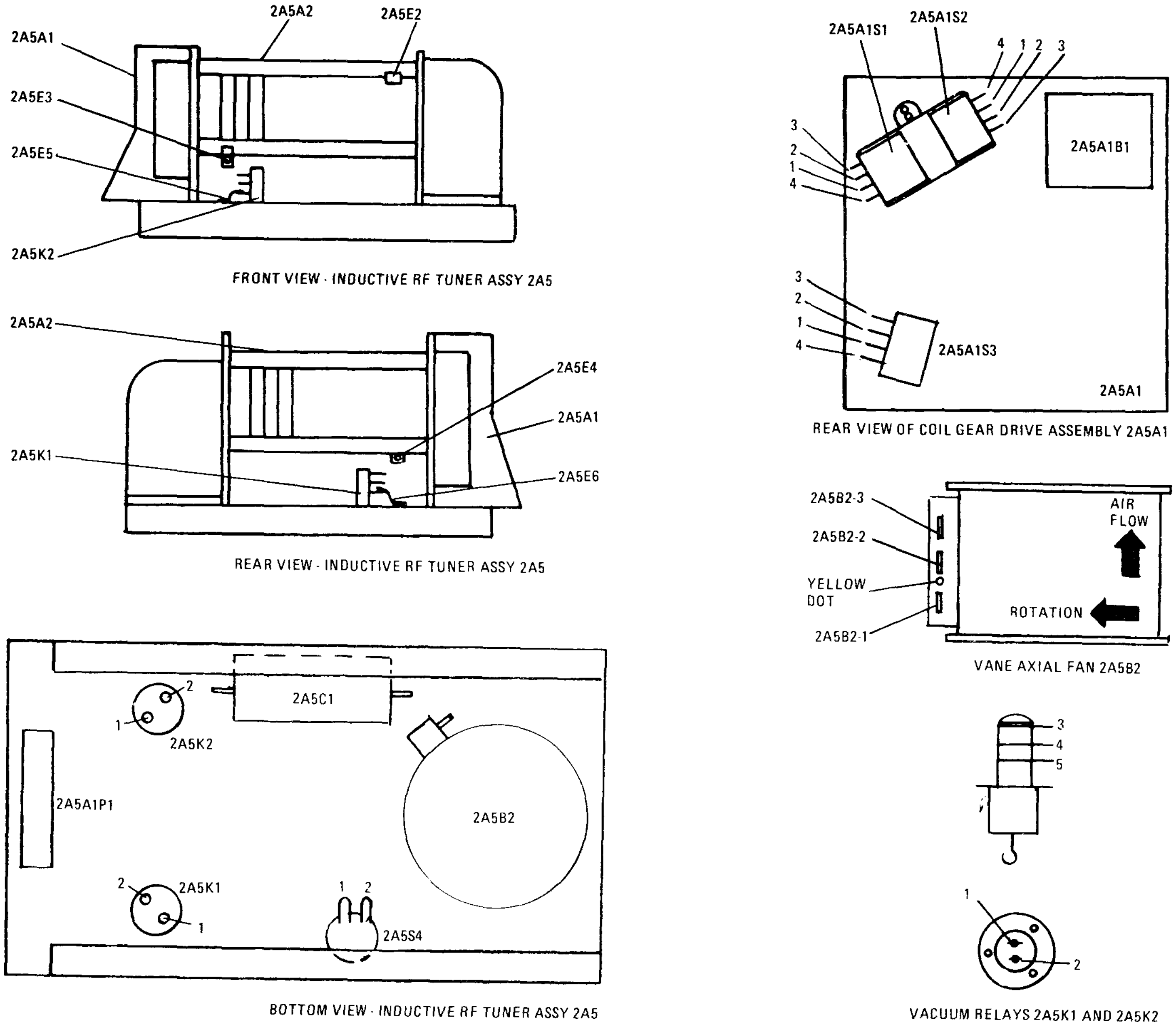
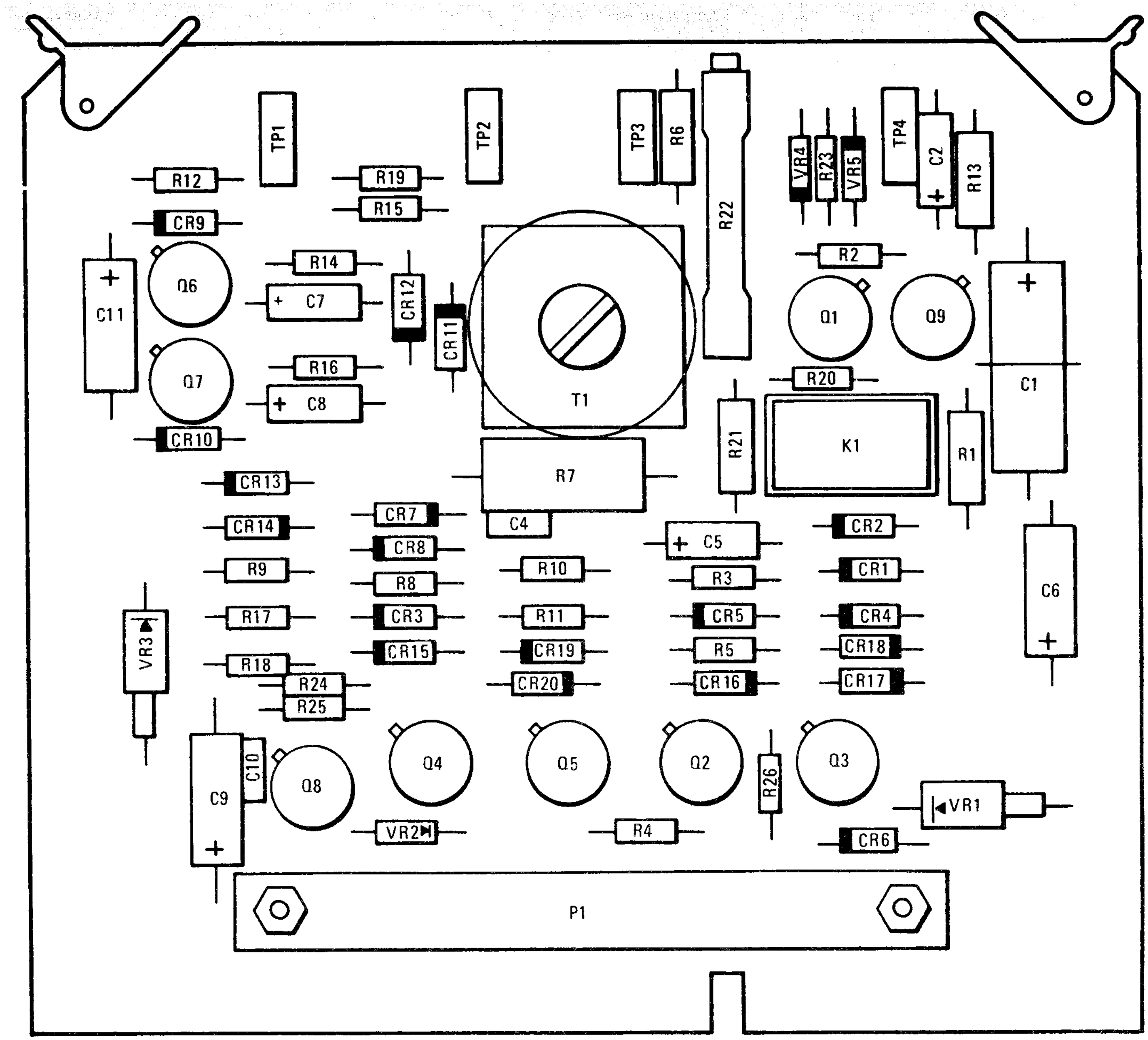
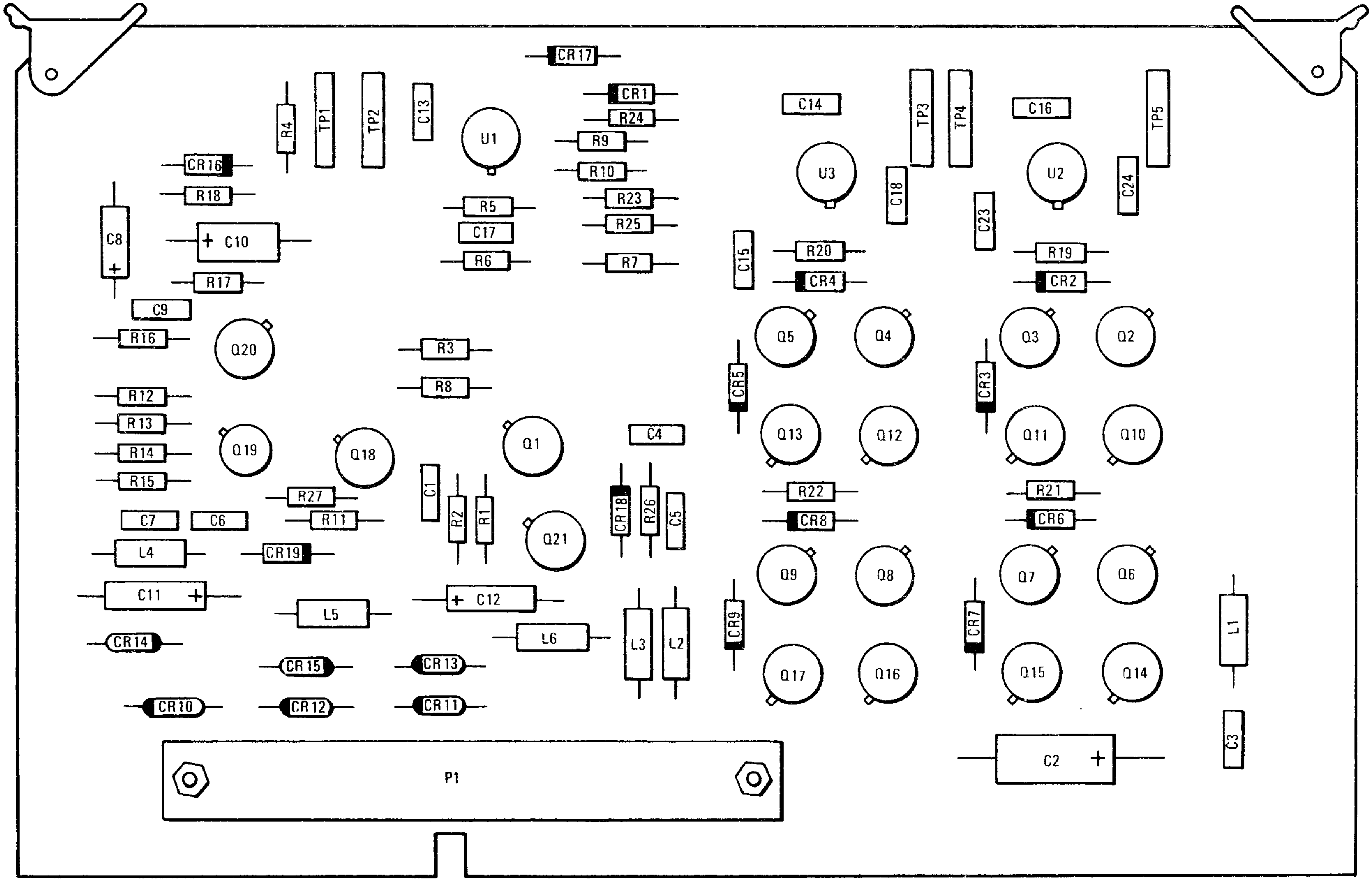


Figure 3-32. Inductive RF Tuner Assembly 2A5 Component Lead Identification Details



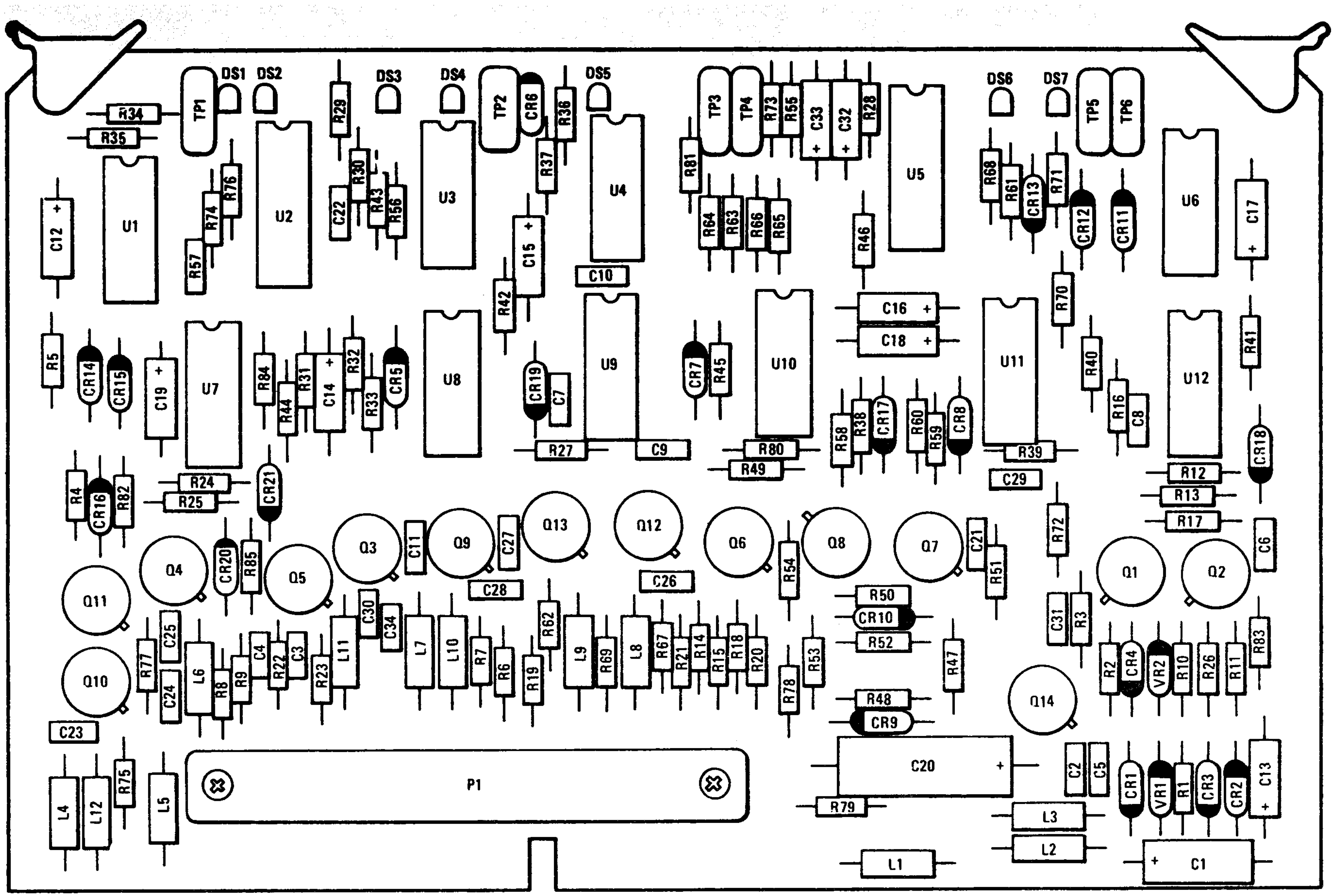
NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A6.

Figure 3-33. Power Supply Pwb Assembly 2A6 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A7.

Figure 3-34. Servo Pwb Assembly 2A7 Component Locations



NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A8.

Figure 3-35. Logic Pwb Assembly 2A8 Component Locations

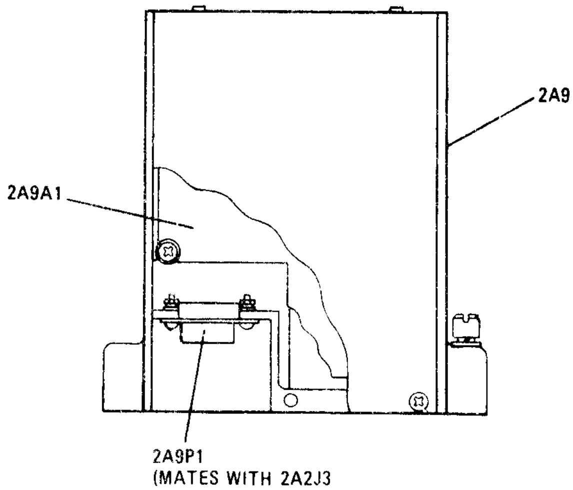
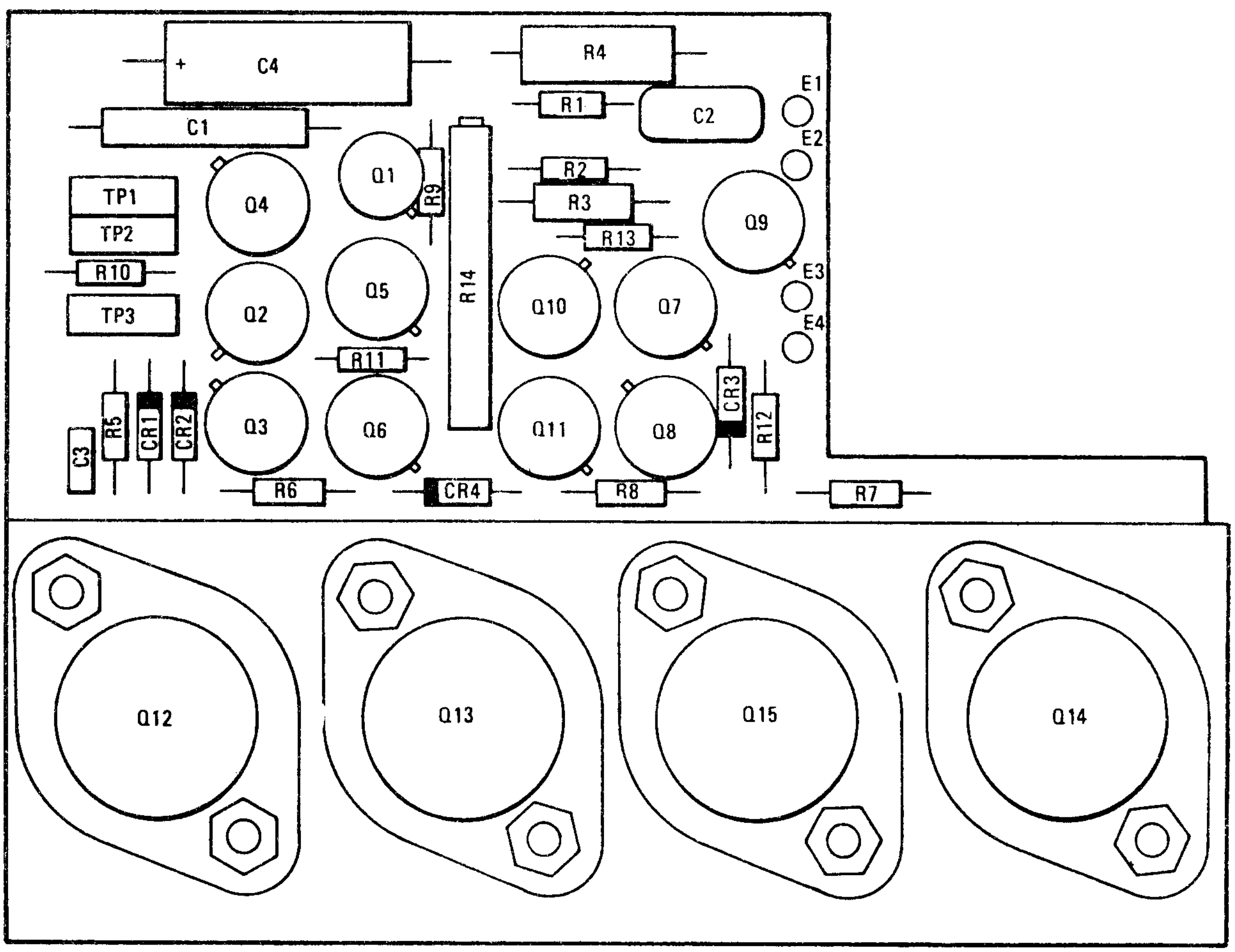
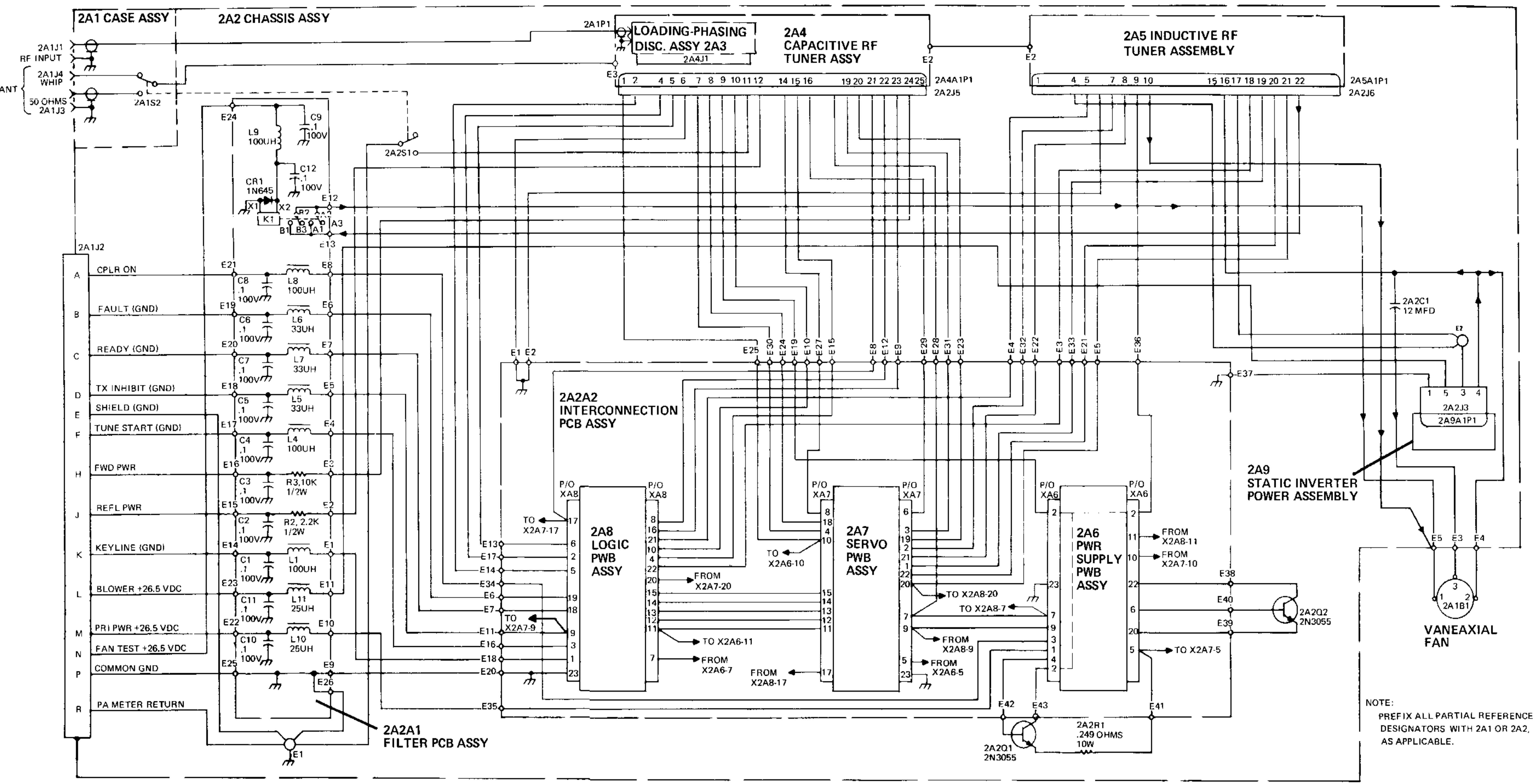


Figure 3-36. Static Inverter Power Assembly 2A9 Component Locations



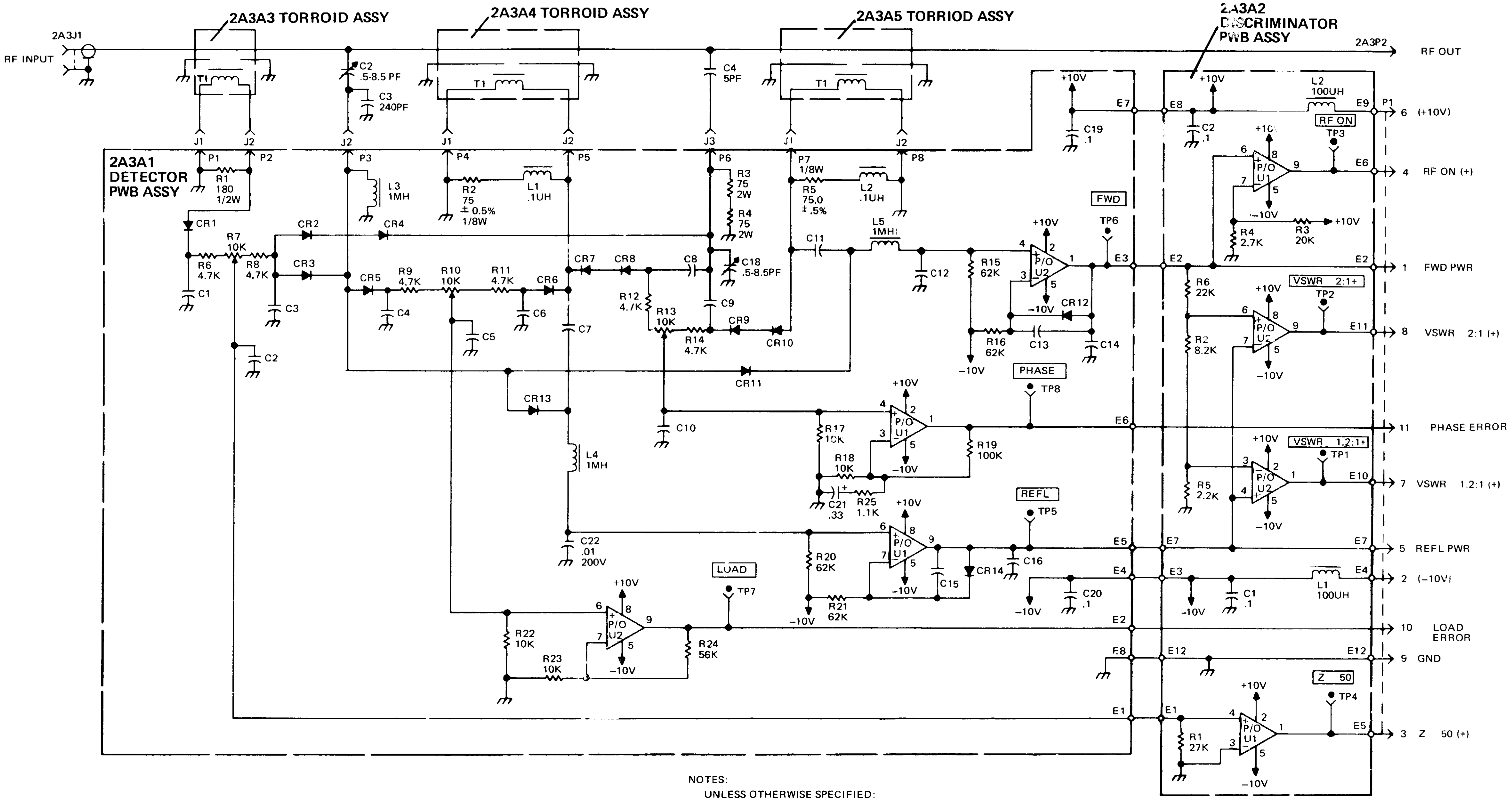
NOTE: PREFIX ALL REFERENCE DESIGNATORS WITH 2A9A1.

Figure 3-37. Printed Wiring Board Assembly 2A9A1 Component Locations



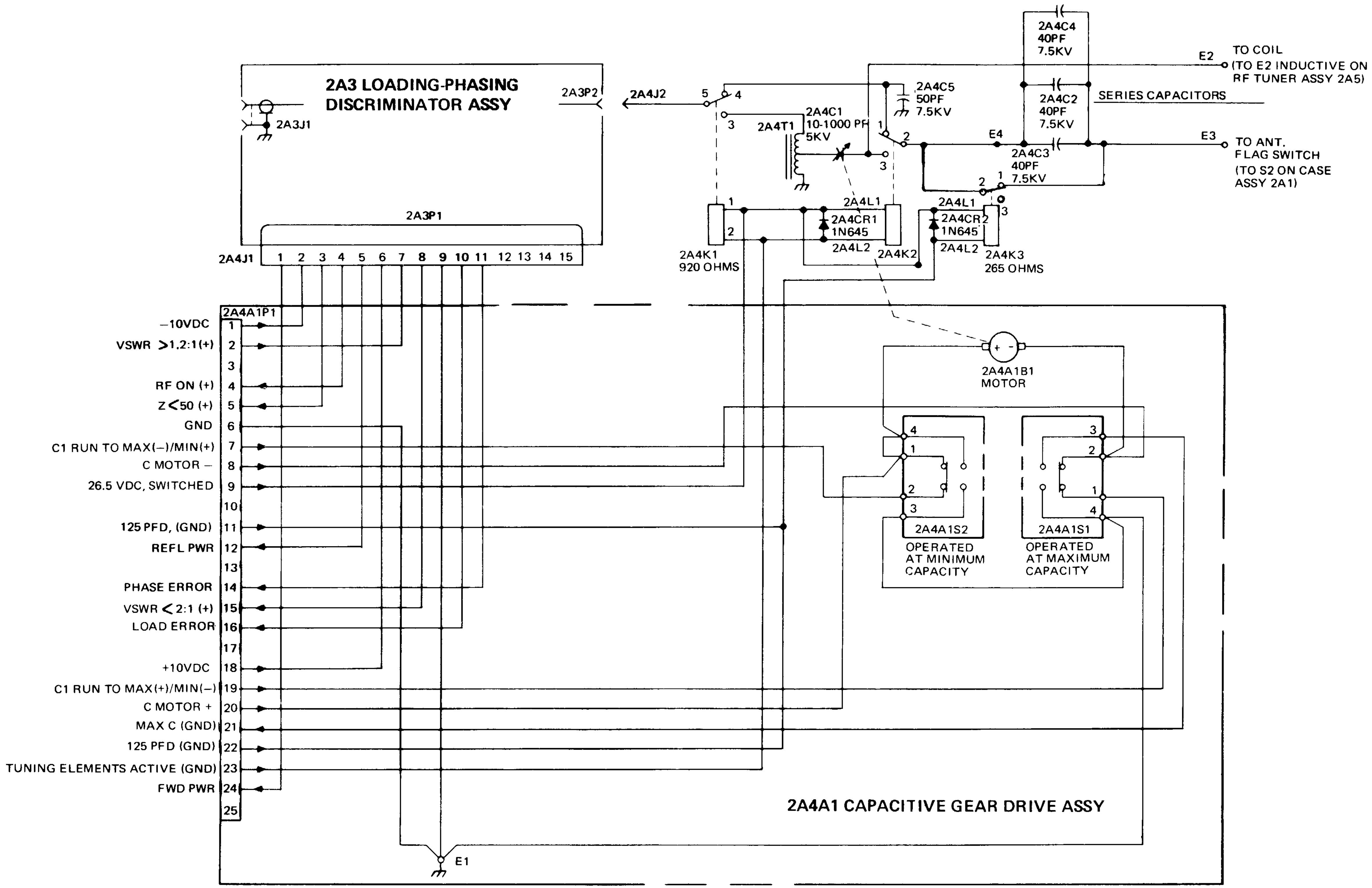
NOTE:
PREFIX ALL PARTIAL REFERENCE DESIGNATORS WITH 2A1 OR 2A2, AS APPLICABLE.

Figure 3-38. Antenna Coupler CU-2064/GRC-193 Chassis Schematic Diagram



NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. ALL DIODES ARE TYPE 1N5711.
4. CAPACITORS C1 THRU C16 IN A1 ARE .01 UF, 200V.
5. PREFIX ALL PARTIAL REFERENCE DESIGNATORS WITH 2A3.

Figure 3-39. Loading-Phasing Discriminator Assembly 2A3 Schematic Diagram



NOTE:
PREFIX ALL PARTIAL REFERENCE DESIGNATORS WITH 2A4 UNLESS OTHERWISE SPECIFIED.

Figure 3-40. Capacitive RF Tuner Assembly 2A4 Schematic Diagram

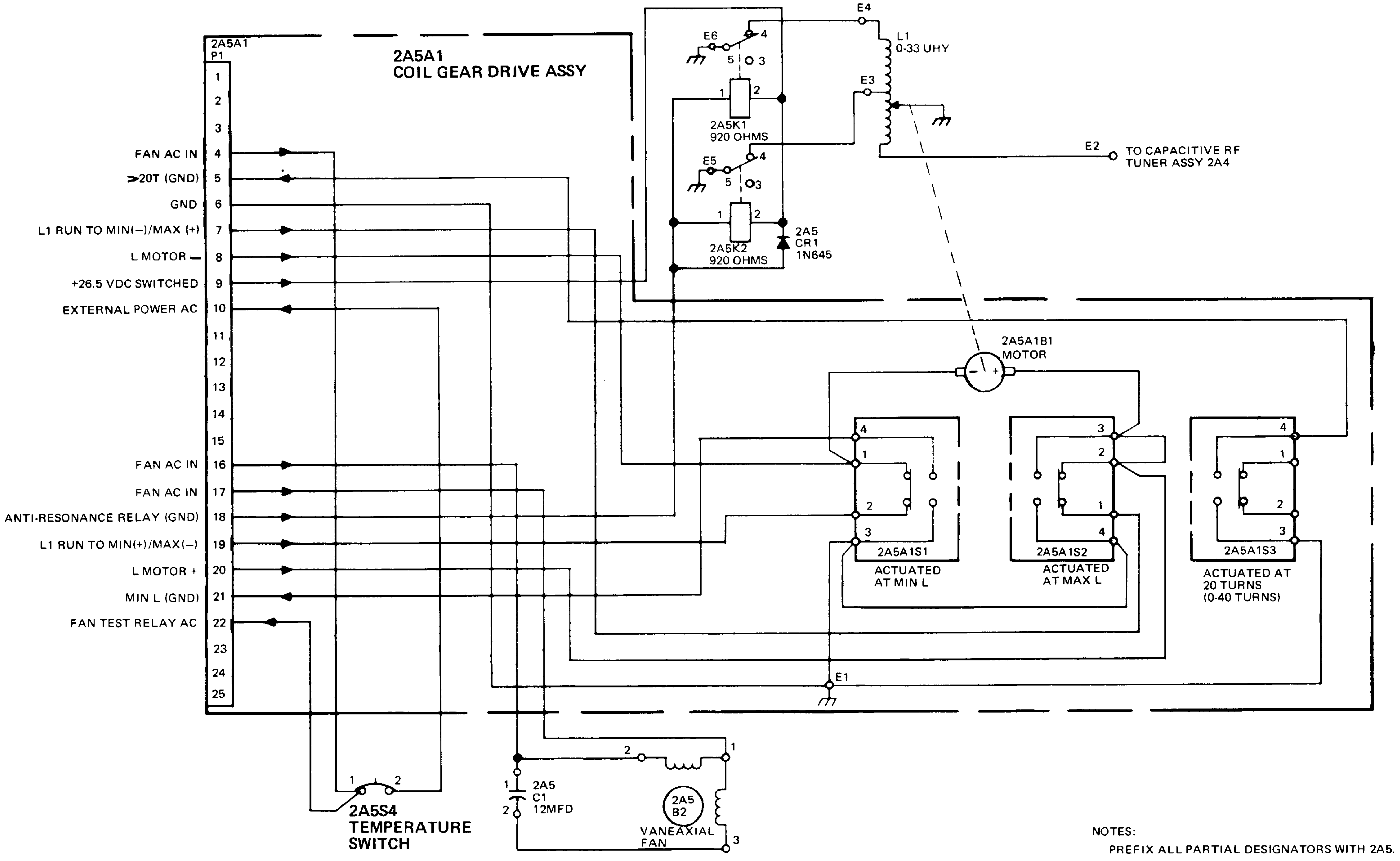
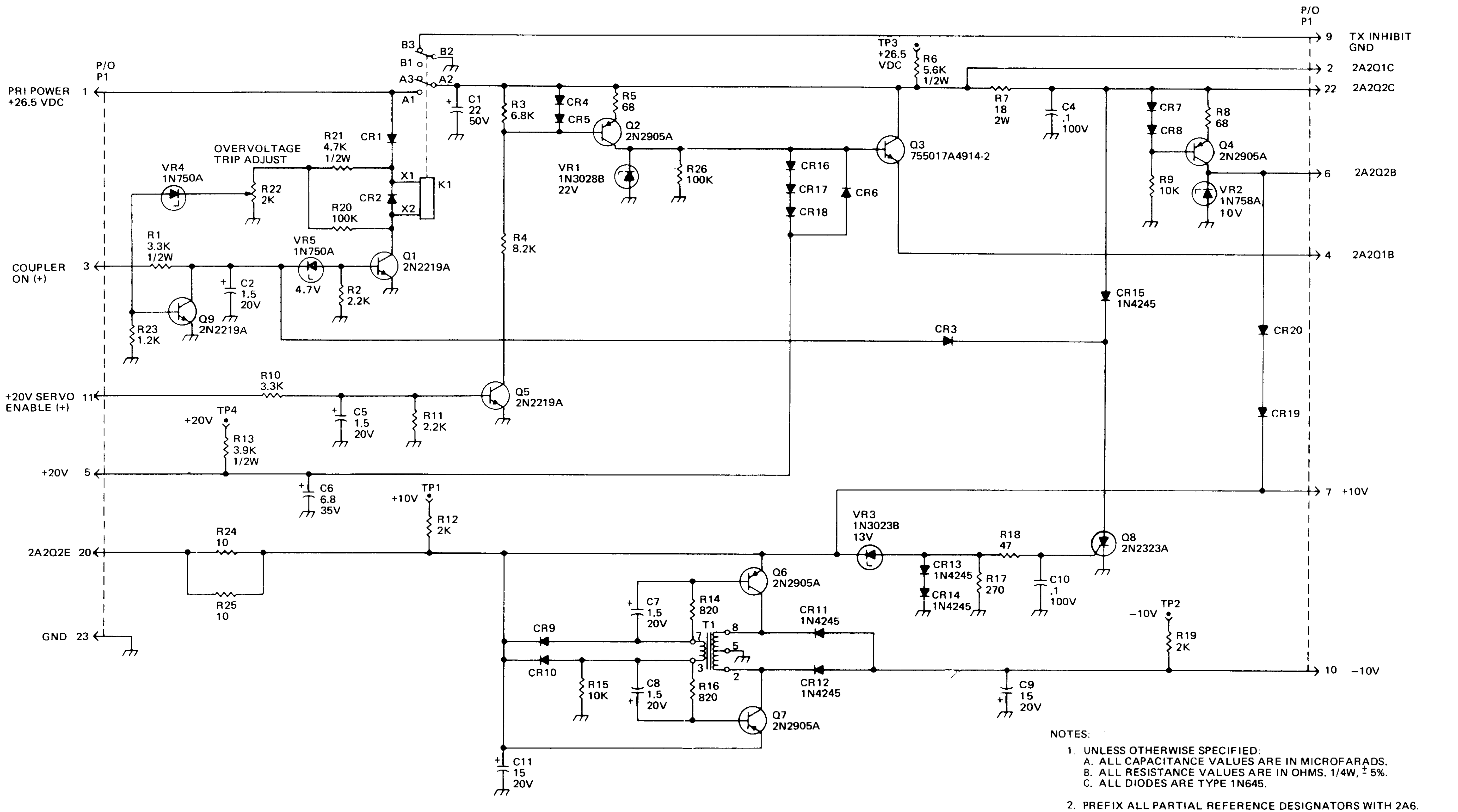


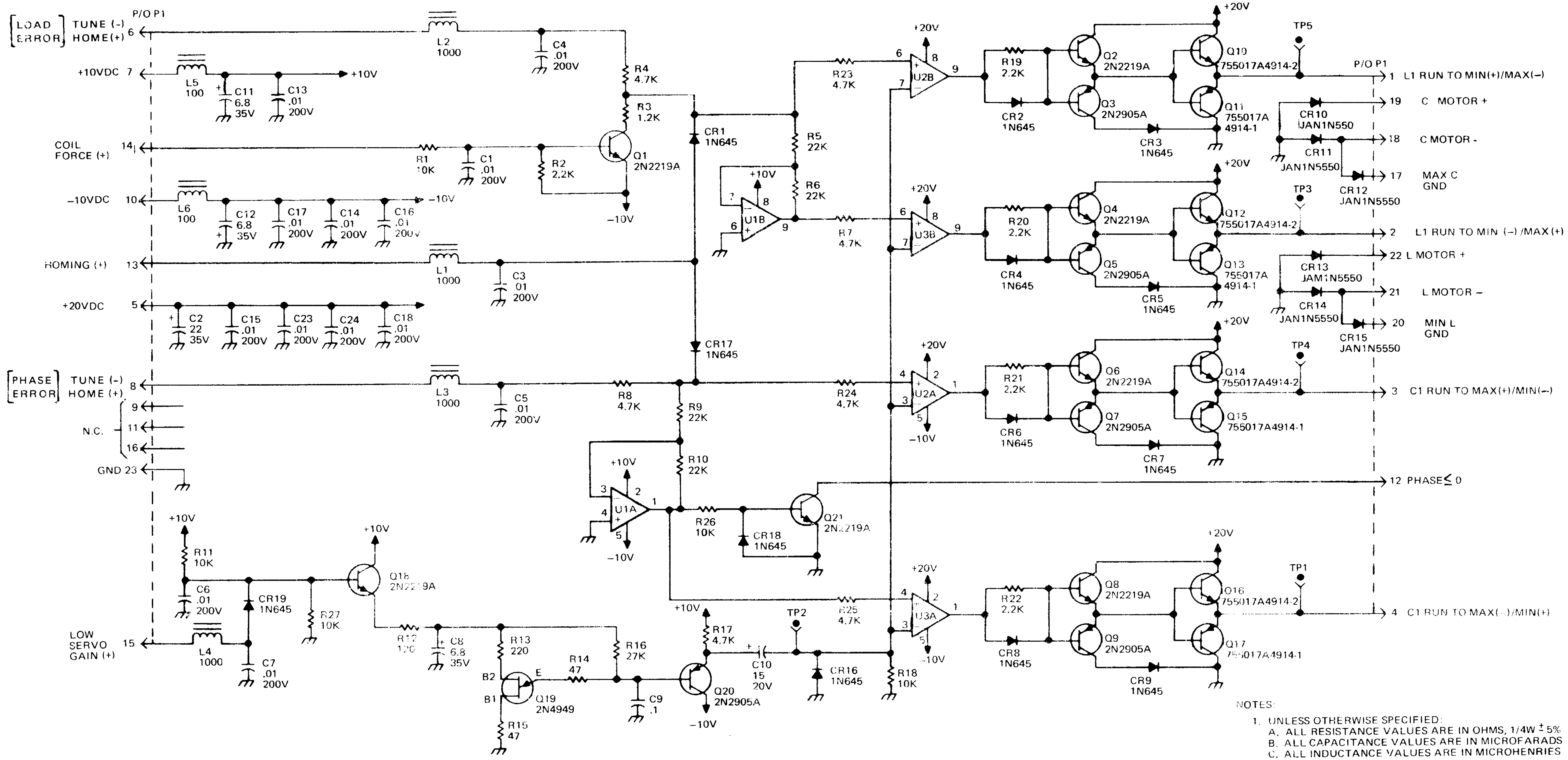
Figure 3-41. Inductive RF Tuner Assembly
2A5 Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
   B. ALL RESISTANCE VALUES ARE IN OHMS. 1/4W, ± 5%.
   C. ALL DIODES ARE TYPE 1N645.
2. PREFIX ALL PARTIAL REFERENCE DESIGNATORS WITH 2A6.

Figure 3-42. Power Supply Pwb Assembly 2A6 Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W ± 5%
   B. ALL CAPACITANCE VALUES ARE IN MICROFARADS
   C. ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. PREFIX ALL PARTIAL DESIGNATORS WITH 2A7.

Figure 3-43. Servo Pwb Assembly 2A7 Schematic Diagram

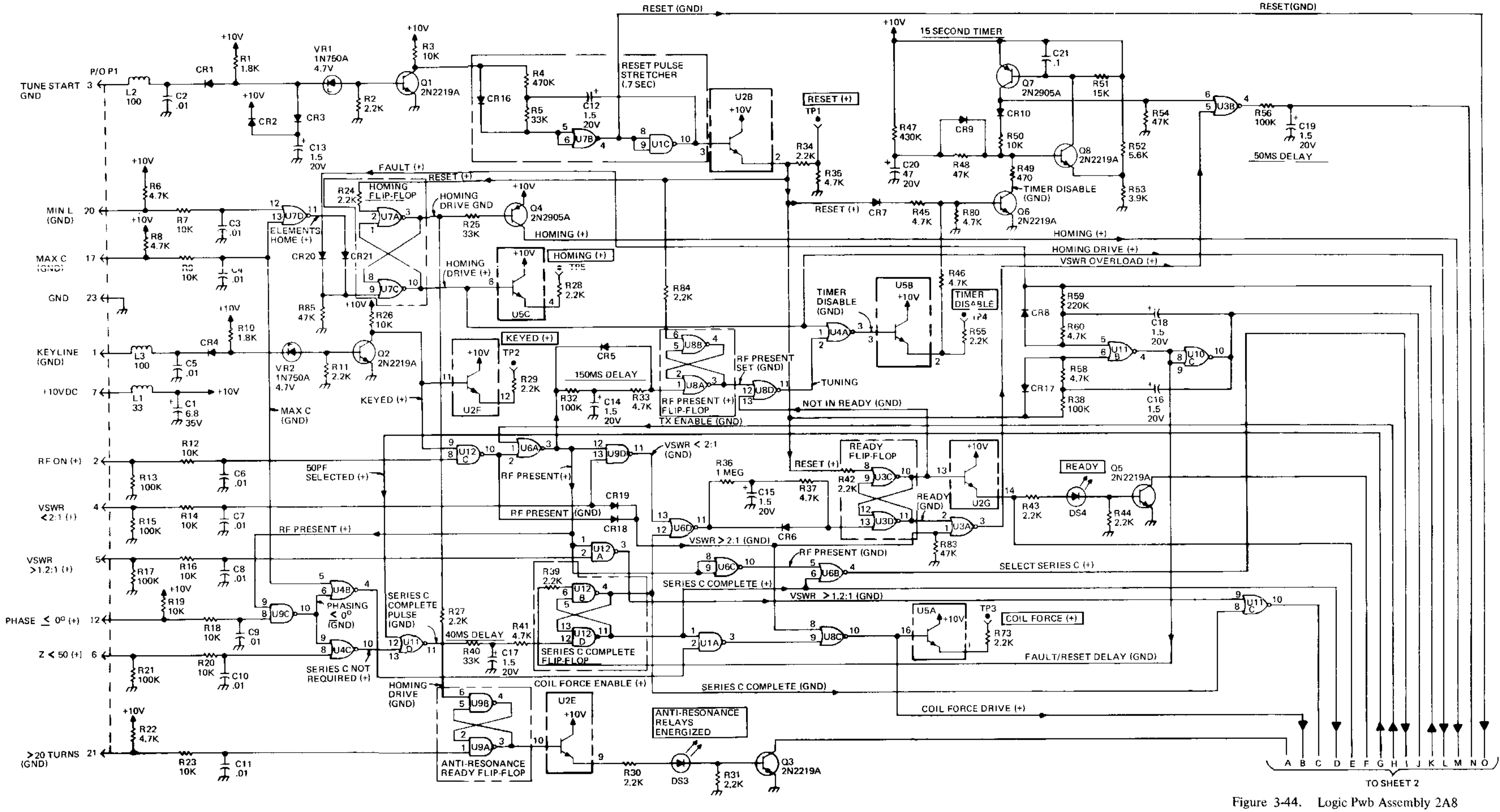
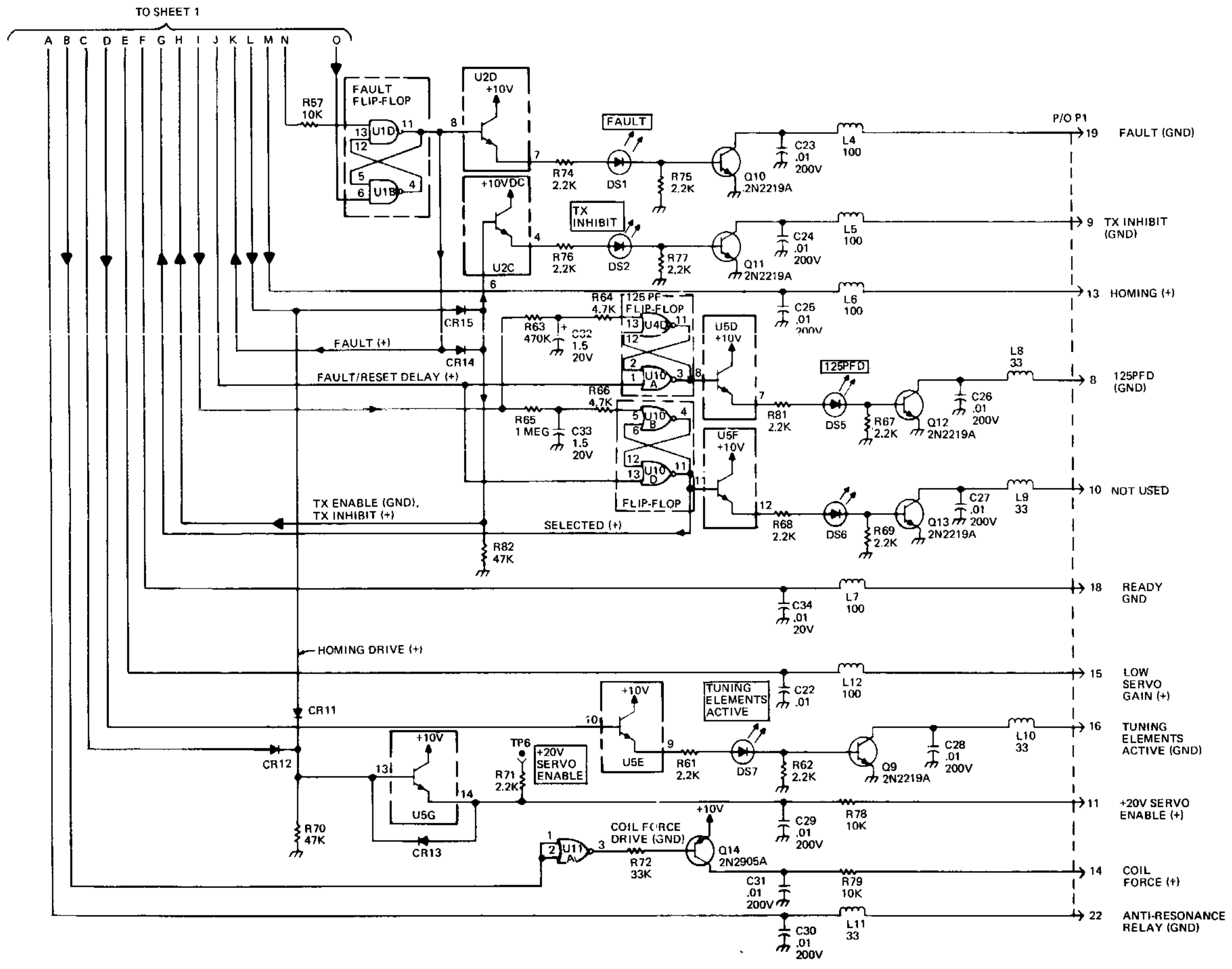
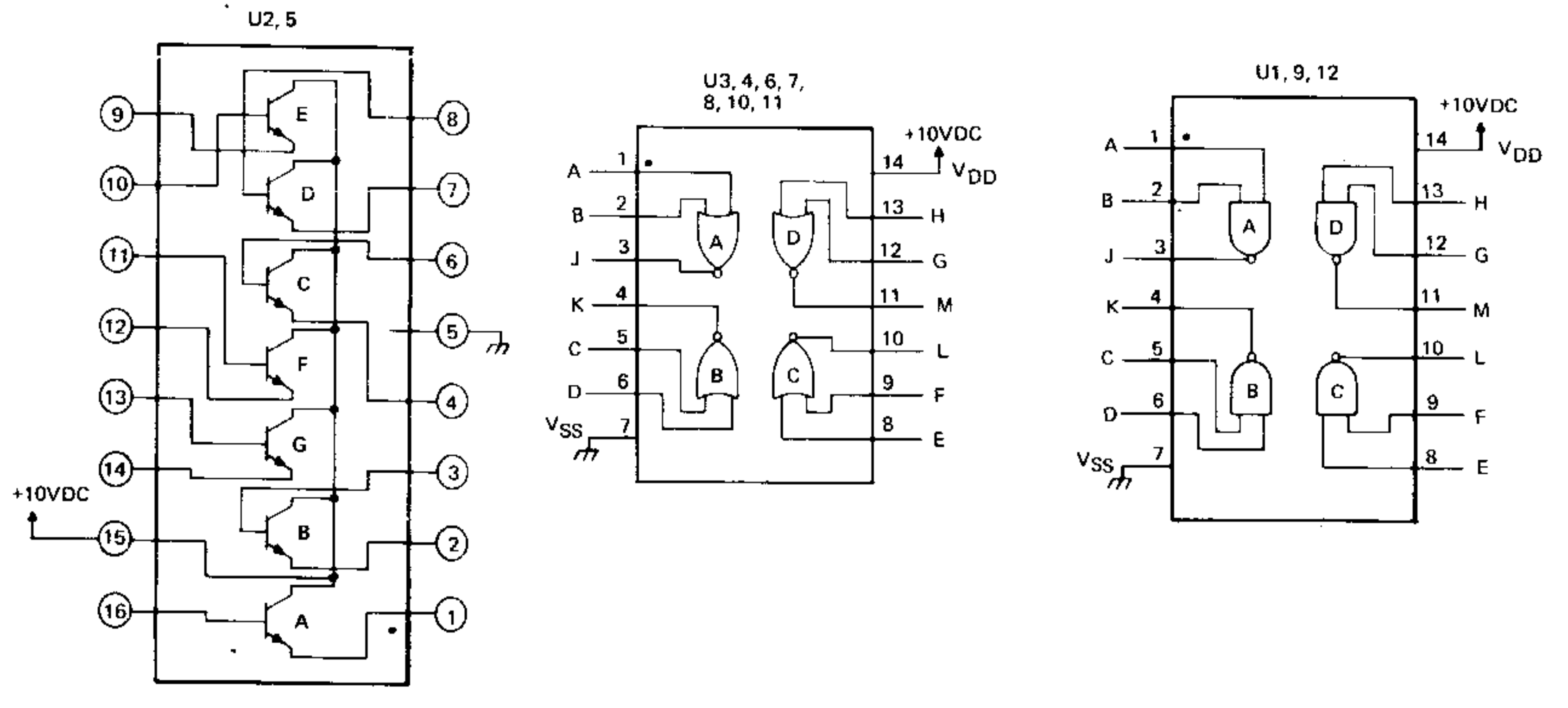


Figure 3-44. Logic Pwb Assembly 2A8 Schematic Diagram (1 of 2)





NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ± 5%
   B. ALL CAPACITANCE VALUES ARE IN MICROFARADS
   C. ALL INDUCTANCE VALUES ARE IN MICROHENRIES
   D. ALL DIODES ARE TYPE 1N645
2. PREFIX ALL PARTIAL DESIGNATORS WITH 2A8.

Figure 3-44. Logic Pwb Assembly 2A8 Schematic Diagram (2 of 2)

NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%.
3. PREFIX ALL PARTIAL REFERENCE DESIGNATORS WITH 2A9A1.

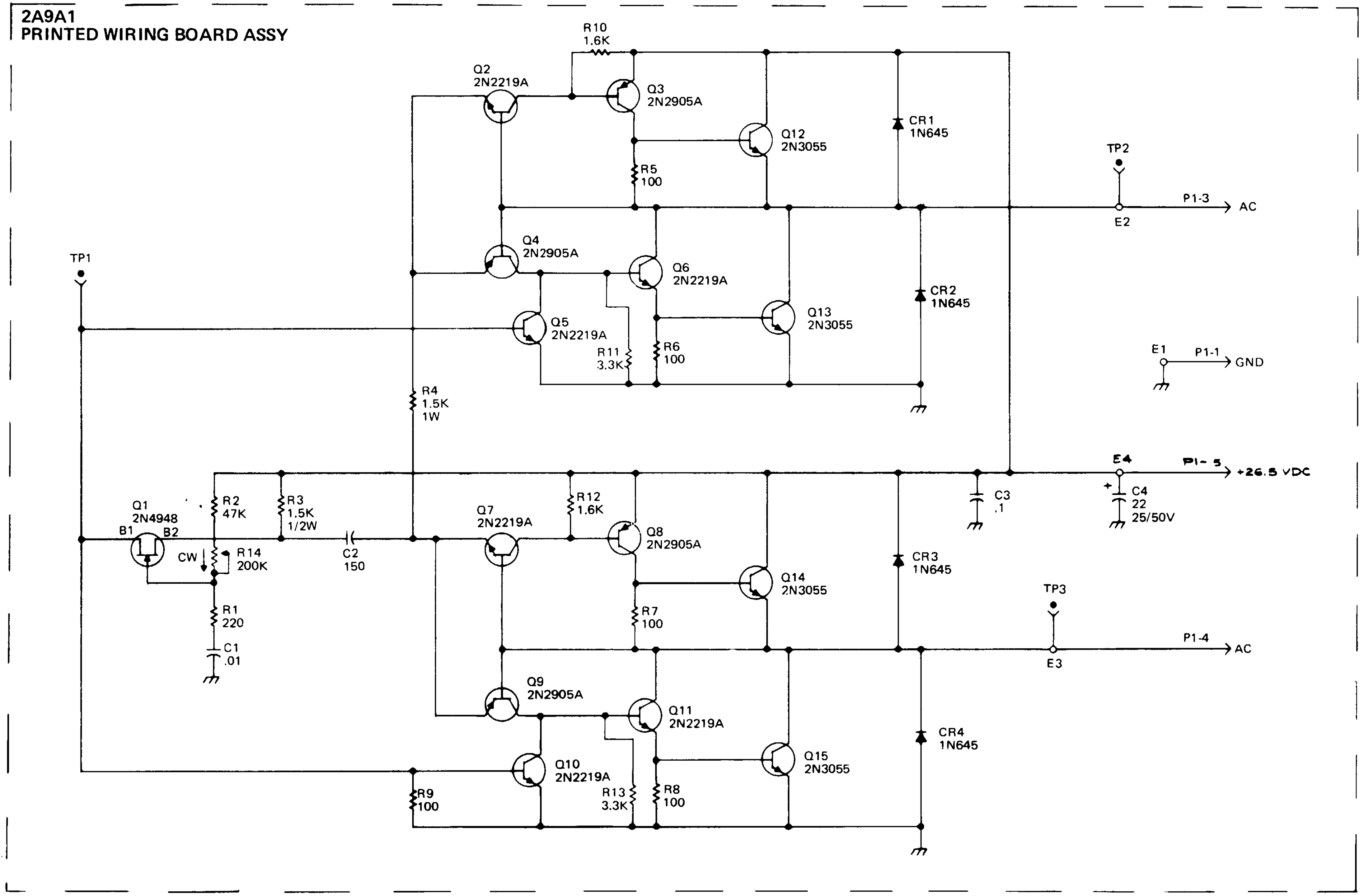


Figure 3-45. Static Inverter Power Assembly 2A9 Schematic Diagram

APPENDIX A
REFERENCES

AR 55-38	Transportation Discrepancy Report
AR 735-11–2	Reporting of Item and Packaging Discrepancies
DA Pam 25-30	Consolidated Index of Army Publications and Blank Forms
DA Pam 738-750	The Army Maintenance Management System (TAMMS)
TM 11-5820-924-12	Operator's and Organizational Maintenance Manual Radio Sets AN/GRC-193
TM 750-244-2	Procedures for Destruction of Army Electronics Materiel to Prevent Enemy Use (Electronics Command)

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Stateside Army Depot
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Stateside, N.J. 07703-5007

DATE SENT: 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	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° 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° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		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

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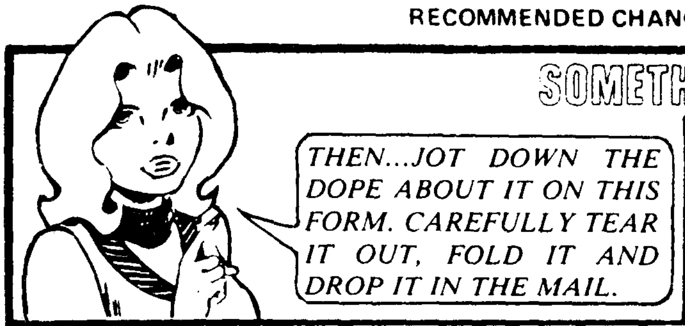

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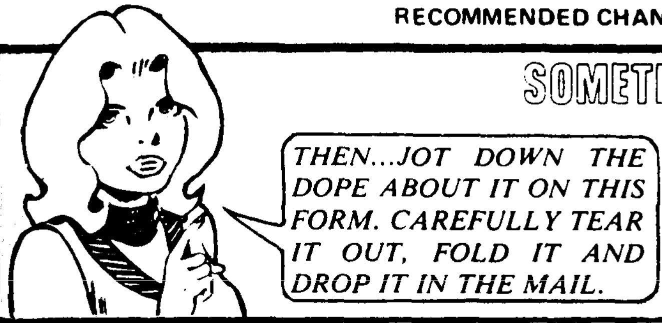

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