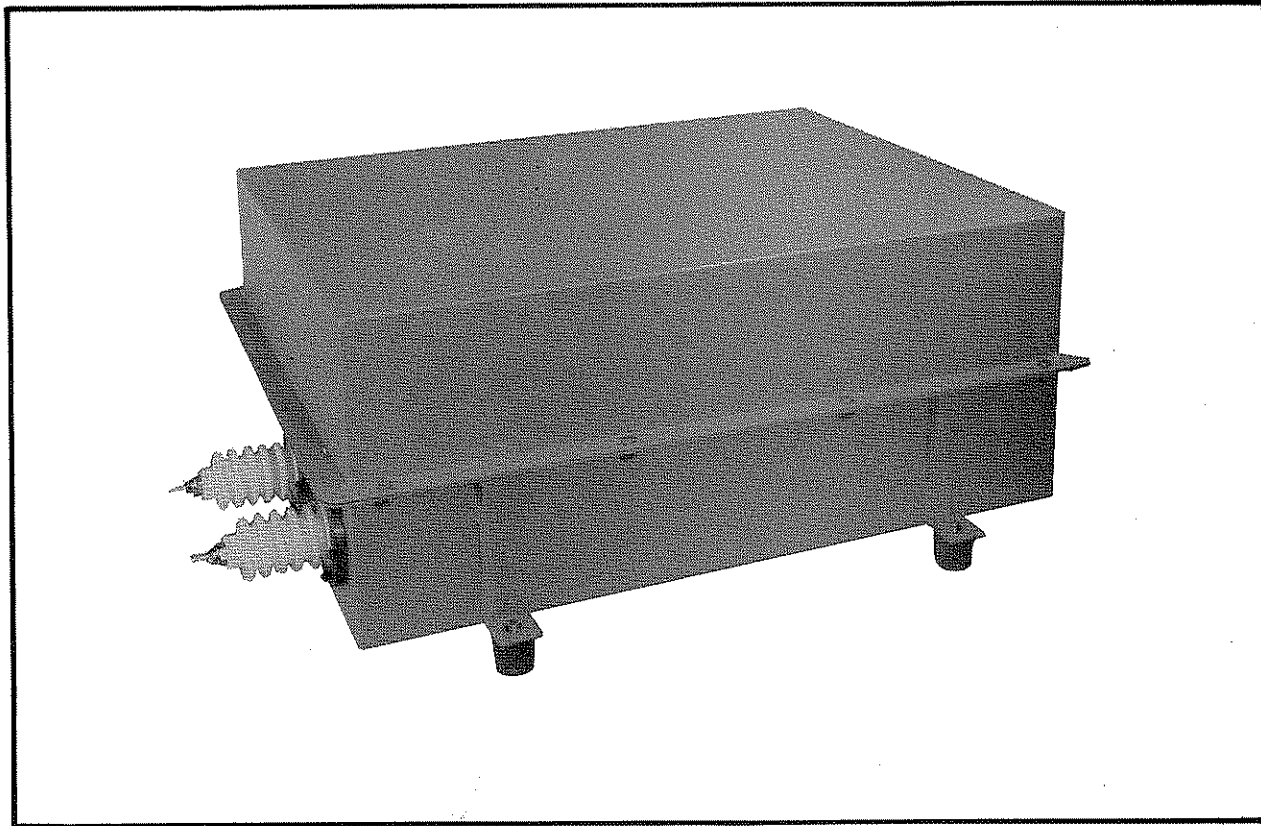




sunair electronics, inc.

3101 S. W. 3rd Avenue, Ft. Lauderdale, Florida 33315 USA



**OPERATION AND
MAINTENANCE MANUAL**

GCU-1935

**KILOWATT AUTOMATIC
ANTENNA COUPLER**

NOTICE

Important equipment information may be contained in the GSL-1900A Manual 6032000605.

THIRD EDITION 1 December, 1981
MANUAL PART NUMBER 6029000501

WARNING

WITH CERTAIN TYPES OF ANTENNAS, UP TO KILOVOLTS MAY BE PRESENT AT THE OUTPUT INSULATOR, E1, OF THE ANTENNA COUPLER WHEN TRANSMITTING. THE RADIO OPERATOR AND SERVICE TECHNICIAN SHOULD EXERCISE CAUTION NOT TO CONTACT E1 WHILE TRANSMITTING.

SUNAIR GCU-1935

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IN CASE OF DIFFICULTY

If your Sunair Electronics, Inc. equipment, develops a malfunction, please follow the steps outlined below to expedite your equipment repair.

1. Note all of the symptoms of the problem, i.e, when does it occur; how often; which modes of operation work, which do not; and anything else which might assist in problem solving.
2. Note model number and serial number.
3. When and from whom (dealer, representative or factory) equipment was acquired.
4. Note peripheral equipment being used in conjunction with the Sunair equipment. Is the peripheral equipment working properly?

After determining the answers to the above, contact your dealer or representative and discuss the problem with him, he may be able to fix the problem locally, avoiding shipping delays. If it becomes necessary to return the equipment to the factory, please follow the procedures outlined in Section II of this manual.

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SECTION I

GENERAL INFORMATION

1.1 PURPOSE OF INSTRUCTION BOOK

This instruction book describes the GCU-1935 automatically tuned antenna coupler and includes installation details, operating instructions and maintenance procedures. Information in this instruction book applies to all equipment configurations unless otherwise stated in the text or illustrations.

1.2 EQUIPMENT DESCRIPTION

1.2.1 PURPOSE OF EQUIPMENT

The purpose of the Sunair type GCU-1935 antenna coupler is to match a 50 ohm transmission line from an associated power amplifier (Sunair type GSL-1900A), to a 35 foot vertical or 50 to 150 foot long wire antennas. The operating frequency range is 1.6 to 30 MHz at a power rating of 1000 watts average. It is intended for continuous duty, unattended operation in fixed station ground radio communications systems.

1.2.2 PHYSICAL DESCRIPTION

Outline and mounting dimensions for the GCU-1935 antenna coupler are given in Figure 2-1. The antenna coupler normally is mounted with the antenna insulator at the top of the unit and the RF input and control connectors at the bottom. Access to the chassis is provided by removing the cover from the case.

1.2.3 ELECTRICAL DESCRIPTION

The GCU-1935 antenna coupler contains a network with wide-range tuning characteristics which will efficiently provide a 50 ohm input for an associated power amplifier when operated with 35 foot whip antennas and 50 to 150 foot long wire antennas. The coupler unit contains servo components, a high

power RF attenuator network, RF switches and RF sensors which provide error signals for tuning. Much of the tune cycle program is provided by the control circuit of the GSL-1900A linear power amplifier. Maximum tuning time for the GSL-1900A & GCU-1935 together is 10 seconds.

The system tunes at the 200 watt power level, but the GCU-1935 RF input attenuator provides 6DB loss, restricting the antenna power to 50 watts during tuning. The antenna coupler is also suitable for line-flattener service with most unbalanced high frequency antenna types. The antenna coupler contains a 24 volt D.C. power supply for relay power use during the tune cycle. The remainder of the power required for tuning is supplied by the GSL-1900A power amplifier. The servo amplifier assemblies and servo motors are identical in the GSL-1900A and GCU-1935.

1.3 ELECTRICAL SPECIFICATIONS

POWER HANDLING CAPABILITY: 1000 watts PEP or AVE.

DUTY CYCLE: Continuous.

ANTENNA MATCHING CAPABILITY: 35 foot vertical, 50 to 150 foot long wire types.

FREQUENCY RANGE: 1.6 to 30 MHz.

TUNING TIME: 10 seconds maximum. (Includes GSL-1900A power amplifier.)

TUNING ACCURACY: Less than 1.5:1 VSWR (Ref to 50 ohms).

REMOTE CAPABILITY: May be located up to 200 feet from the power amplifier.

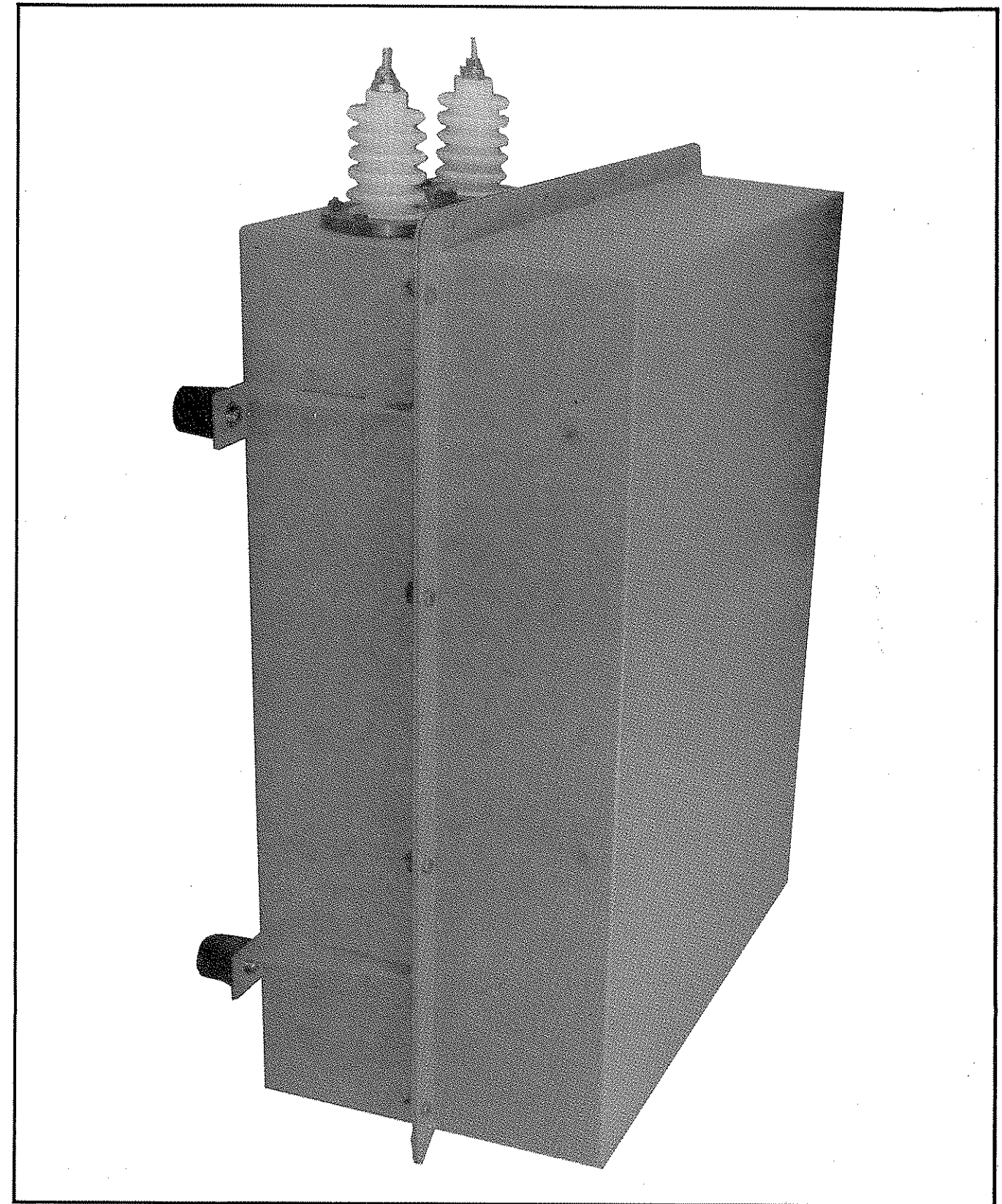


Figure 1-1. GCU-1935 KW Antenna Coupler

ENVIRONMENTAL:

AMBIENT TEMPERATURE: -30°C. to +65°C. to +50°C. 1000W continuous.

HUMIDITY: to 95% R.H.

ALTITUDE: To 5000 feet above sea-level.

SHOCK: MIL-STD-810B.

VIBRATION: MIL-STD-167.

MECHANICAL:

ENCLOSURE TYPE: Splashproof, for exposed locations.

DIMENSIONS:

LENGTH: 28 in. (71 cm).

WIDTH: 23 in (58.4 cm).

HEIGHT: 11 in (28 cm).

WEIGHT: 77 lbs (35 kg).

1.4 EQUIPMENT SUPPLIED

| | <u>Sunair Part No.</u> |
|--------------------------------------|-------------------------------------|
| 1.4.1 GCU-1935 KW Antenna Coupler | 6029001051 Grey 6029001094 Green |
| 1.4.2 Technical Manual | 6029000501 |
| 1.4.3 Connector, Kit | 6029000691 |
| Consists of: | |
| 1 ea. Bushing, Telescoping, .56 | 0700550054 |
| 1 ea. Bushing Telescoping, .62 | 0700550062 |
| 1 ea. Bushing, Telescoping, .75 | 0700550071 |
| 1 ea. Connector, RF, UHF PL-259 | 0742190005 |
| 1 ea. Connector, Power, 12 pin round | 0754020002 |
| 1 ea. Clamp, Cable, Connector | 0754570002 |

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1.5 EQUIPMENT REQUIRED, NOT SUPPLIED

| | | |
|-------|---------------------------------------|-------------------------------------|
| 1.5.1 | GSL-1900A, Linear Power Amplifier | 6032001059 Grey 6032001091 Green |
| 1.5.2 | Transceiver, 115/230VAC | Consult Sunair Sales Dept. |
| 1.5.3 | Coaxial Cable RG-8U | 0588640000 |
| 1.5.4 | Cable, Control, Transceiver/GSL-1900A | 0588680001 |
| 1.5.5 | Cable, Control, GSL-1900A/GCU-1935 | 0588810002 |
| 1.5.6 | Antenna System | Consult Sunair Sales Dept. |

1.6 OPTIONAL EQUIPMENT

| | | |
|-------|---------------------------|------------|
| 1.6.1 | Depot Spare Parts Kit | 6029090593 |
| 1.6.2 | Field Module Kit | 6029091298 |
| 1.6.3 | 35 Foot Fiberglass Whip | 0715850008 |
| 1.6.4 | KW Longwire Antenna Kit | 1003090010 |
| 1.6.5 | Gasket Service Kit | 6029091590 |
| 1.6.6 | High Voltage Antenna Wire | 0713100001 |

CAUTION

TO INSURE THAT CABLE HAS NOT BEEN DAMAGED DURING SHIPMENT, ALL CABLE ASSEMBLIES MUST BE CHECKED FOR CONTINUITY OR SHORTS, FROM PIN TO PIN, BETWEEN CONNECTORS BEFORE INITIAL RADIO OR SYSTEM POWER UP.

WARNING

CONNECTORS INSTALLED BY THE CUSTOMER MUST BE WIRED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED IN THE OPERATION AND MAINTENANCE MANUAL. THE CABLE MUST BE CONTINUITY CHECKED AFTER INSTALLATION AND PRIOR TO RADIO OR SYSTEM POWER UP.

SECTION 2

INSTALLATION

2.1 UNPACKING AND INSPECTION OF EQUIPMENT

The GCU-1935 antenna coupler is packed in a special container using double-wall construction. The packing material should be removed carefully and the contents inspected for physical damage. Any claims for shipping damage should be filed promptly with the transportation company. If it is found necessary to file such a claim, retain all packing material.

If possible, uncrate the antenna coupler as close as possible to the actual installation location. This will facilitate handling and reduce the possibility of damage while moving the unit.

Do not accept a shipment where there are visible signs of damage to the shipping container until a complete inspection is made. If there is a shortage or evidence of damage is noted, insist on a notation to that effect on the shipping papers BEFORE signing the receipt from the carrier.

A full report should also be forwarded to Sunair. Include the following:

- a. Order Number
- b. Model and Serial Number
- c. Name of transportation company

When this information is received by Sunair, arrangements will be made for repair or replacement.

2.2 RETURN OF EQUIPMENT TO FACTORY

The shipping container for the GCU-1935 has been carefully designed to protect the equipment during shipment. The container and its associated packing materials should be used to reship the unit.

When returning subassemblies or components for repair or replacement, be sure to pack each unit separately, using suitable cushioning material where necessary.

The shipment should be Air Freight consigned to:

SUNAIR ELECTRONICS, INC.
3101 SW Third Avenue
Fort Lauderdale, Florida 33315
U.S.A.

All mailing documents should be plainly marked in indelible ink as follows:

U.S. GOODS RETURNED FOR REPAIR
VALUE FOR CUSTOMS - \$100.00

Mark all sides of the package:

FRAGILE - ELECTRONIC EQUIPMENT

2.3 POWER REQUIREMENTS

All power necessary to operate the GCU-1935 antenna coupler is provided by its companion GSL-1900A power amplifier.

2.4 INSTALLATION PROCEDURE

The satisfactory operation of the equipment will depend on the care and thoroughness taken during the installation phase.

2.4.1 GENERAL INSTALLATION REQUIREMENTS

a. Carefully plan transmitter/coupler/antenna locations, observing the following requirements before starting installation work.

b. Provide the best possible RF ground for the system. Use flat copper strap at least 1" wide or #6 or larger copper wire and make connections to the ground terminal of all system components. Keep all ground leads direct and as short as possible.

SUNAIR GCU-1935

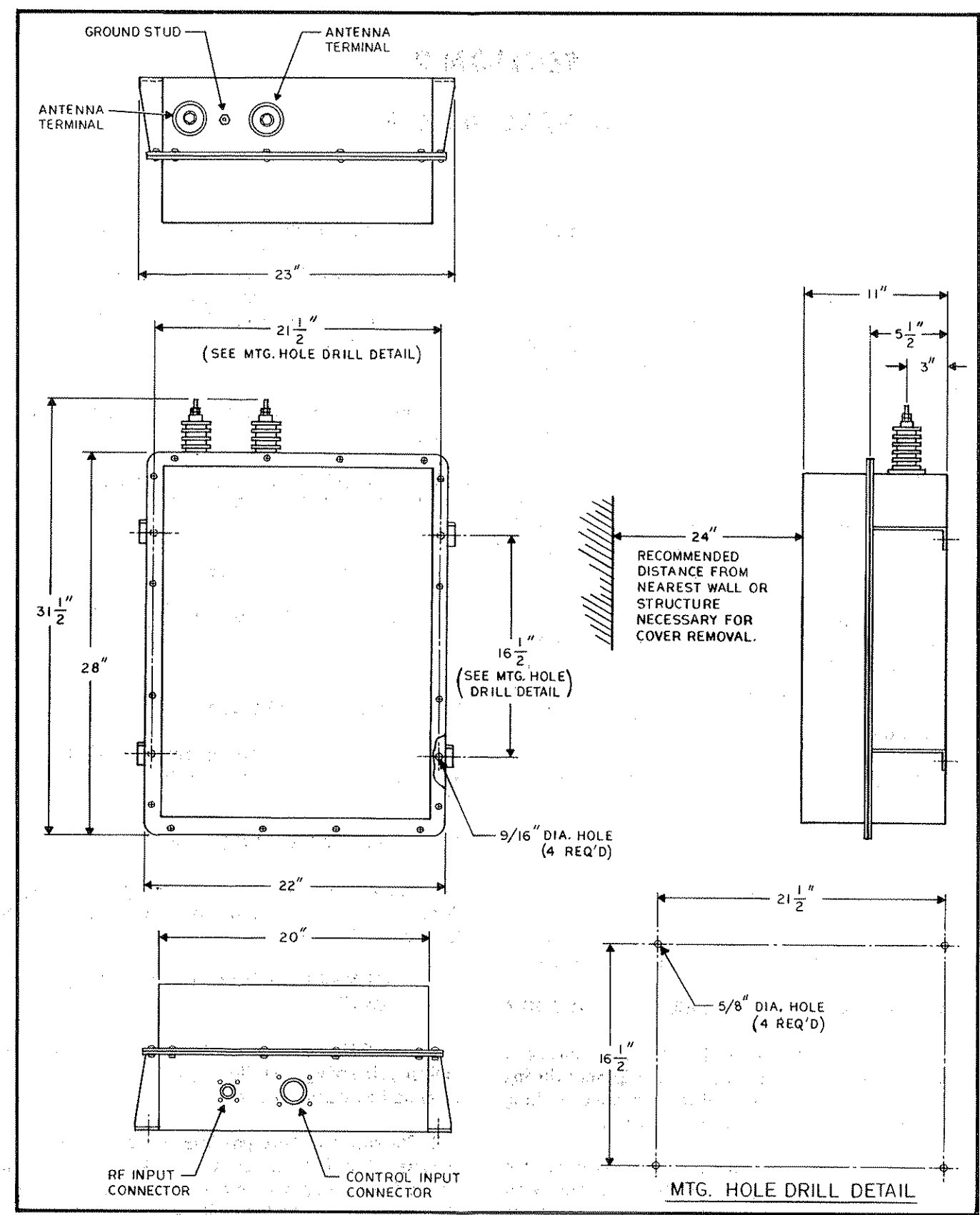


Figure 2-1. GCU-1935 Outline Configuration

SUNAIR GCU-1935

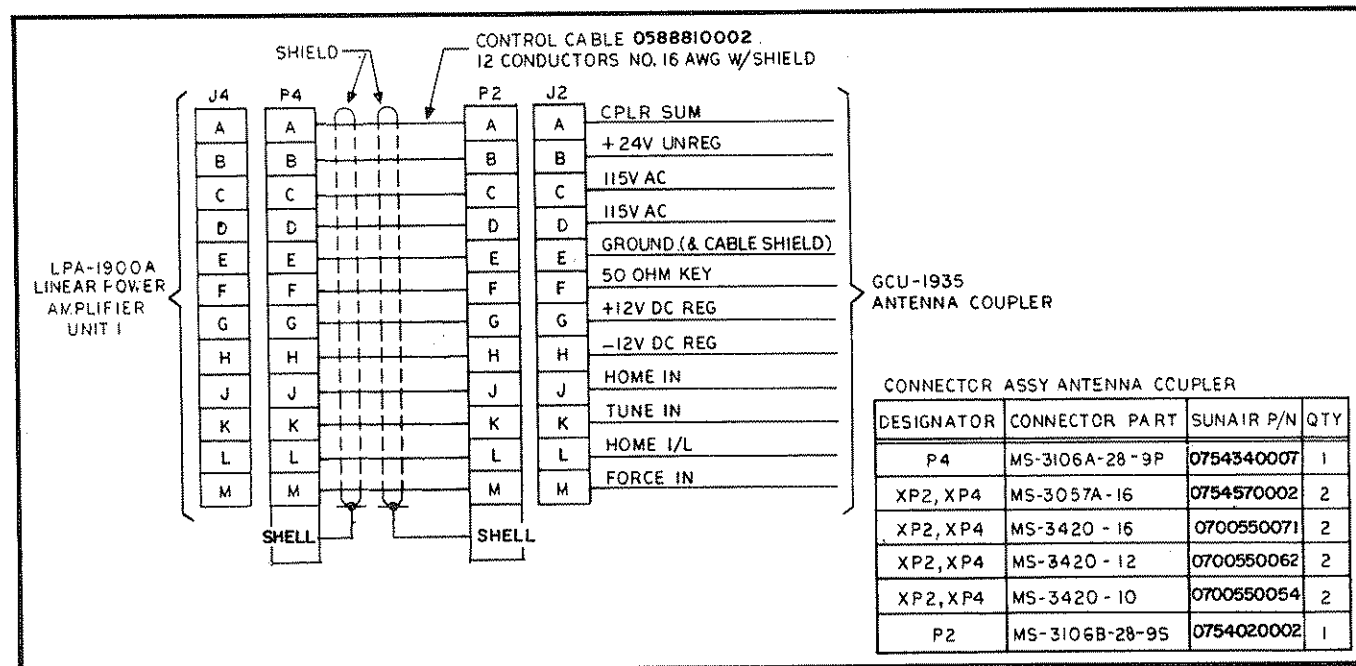


Figure 2-2. Inter-unit Cable GSL-1900A/GCU-1935

After the system grounds have been installed, connect the station ground system to the antenna coupler ground terminal. Bear in mind that the antenna ground lead is actually part of the antenna itself, and therefore will have a marked effect on the antenna input impedance. If a 35 foot vertical antenna is to be used, at least 12 separate 35 foot radials connected to a common ground stake, are recommended.

c. Provide the maximum possible separation between the coupler/antenna and the associated radio transmitter. 100 feet is the recommended minimum distance and up to 200 feet separation may be used.

d. The antenna lead from the antenna coupler RF output insulator must be insulated for at least 15kv potential. As an alternative, copper tubing with an outside diameter of at least 1/4" may be used, provided that it is routed to the antenna terminal so that it is spaced at least six inches from any metal objects in its vicinity. It is important to keep the length of this lead to an absolute minimum since it forms a part of the radiating portion of the antenna. Three (3) feet would be the maximum distance if antenna efficiency is not to be compromised.

e. Linear amplifiers with low level modulation such as is used in the transceiver will sometimes oscillate if the high level RF output is radiated or conducted into the low level stages. Evidence of this situation is erratic or excessive power output. This is caused by too close proximity of the antenna to the transceiver and/or a poor RF ground system. Carefully following the above procedures will prevent this problem.

2.4.2 MOUNTING CONSIDERATIONS

Refer to Figure 2-1 for coupler outline configurations.

The intended mounting position for the GCU-1935 is in the vertical plane with the high voltage antenna insulator at the top. The enclosure may also be mounted in the horizontal position, but will require that the control and coaxial connectors be sealed with a suitable compound such as Dow-Corning DC-5, to prevent water entrance.

Four mounting feet with .562 inch diameter holes are provided on the back of the enclosure. If it is necessary to mount the coupler on a wooden pole, simple angle-iron adapter brackets may easily be fabricated. Since the total weight of the unit is only

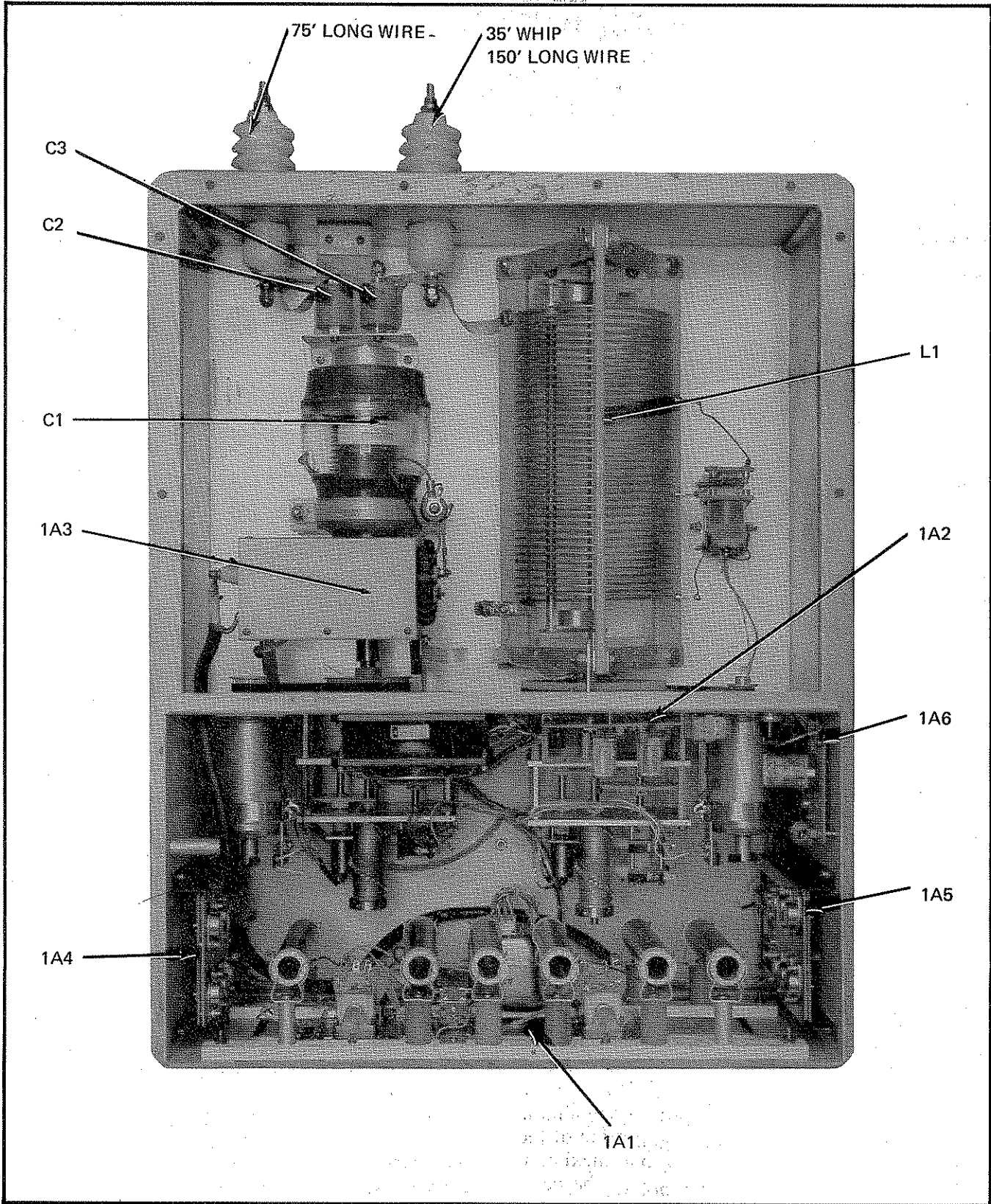


Figure 2-3. Major Assembly Locations, GCU-1935

77 pounds, two wooden 4x4's set in cement would provide dependable support.

2.4.3 INSTALLATION OF REMOTE CONTROL & RF CABLES

It is recommended that the remote control cable be procured from Sunair. However, if necessary, the cable may be made from individual No. 16 AWG stranded wire with an overall braided shield and PVC jacket.

Inter-connection cable details are given on Figure 2-2.

2.5 ANTENNA CONSIDERATIONS

2.5.1 GENERAL

The input impedance of an antenna is influenced by many factors some of which are imperfectly conducting earth, physical height above ground, effects of nearby conductors and dielectrics and antenna length to diameter ratio (wire size).

The GCU-1935 antenna coupler contains two 100pf high voltage capacitors which are mounted on the vacuum variable capacitor. Their designations are C2 & C3. These capacitors may be connected in series with the output lead to the antenna and will effectively reduce the maximum value of series capacity and/or shunt inductance that is required

to tune a given antenna across the band. See Figure 2-3.

2.5.2 INSTALLATION CHECKS

a. 35 foot whip antenna: The GCU-1935 will tune all known types of 35 foot vertical antennas. C2 and C3 are not required. (Additional antenna post is for 75 ft operation.)

The GCU-1935, as shipped from the factory, is connected for the 35 foot whip antenna operation on one antenna post and 75 foot long wire on the other.

b. 150 foot long wire antennas: The 150 foot long wire antenna requires that no capacitor be connected for operation at any frequency in the band.

c. 75 foot long wire antennas: C2 is connected for these antennas. Tuning should then be checked on each of the stations assigned frequencies. If the circuit is unable to tune at any frequency, a parallel capacitor should be used, C3. A second option would be to shorten or lengthen the antenna.

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SECTION 3 OPERATION

3.1 GENERAL

The GCU-1935 antenna coupler operates as a "slave" unit to the GSL-1900A power amplifier.

Refer to the GSL-1900A technical manual TM-6032000605, section 3 for operational considerations.

SECTION 4

THEORY OF OPERATION

4.1 INTRODUCTION

The GCU-1935 antenna coupler is designed to be used with the GSB-900 transceiver series and the GSL-1900A linear power amplifier. The transceiver/GSL-1900A/GCU-1935 system is fully automatic after the operator selects the desired operating frequency and then places the transceiver mode selector switch in the "KW TUNE" position.

4.2 ANTENNA TUNING NETWORK

4.2.1 GENERAL

The antenna tuning network consists of a simple "L" network with a series input capacitor and a shunt inductor at the output for the short antennas such as the 35 ft. whip. For the longwire antennas, a fixed capacitor is connected in series with the antenna terminal to form a "T" network which

effectively reduces the maximum capacity required at the input.

4.2.2 AUTOMATIC TUNING SYSTEM

Figure 4-1 is a functional block diagram of the GCU-1935 antenna coupler.

Four basic rules govern the tuning scheme for the coupler RF sensors and servo systems.

- a. For the phase detector, a capacitive load produces a negative output.
- b. A negative error signal increases capacity.
- c. For loading, an antenna less than 50 ohms produces a positive output.
- d. A positive error increases inductance.

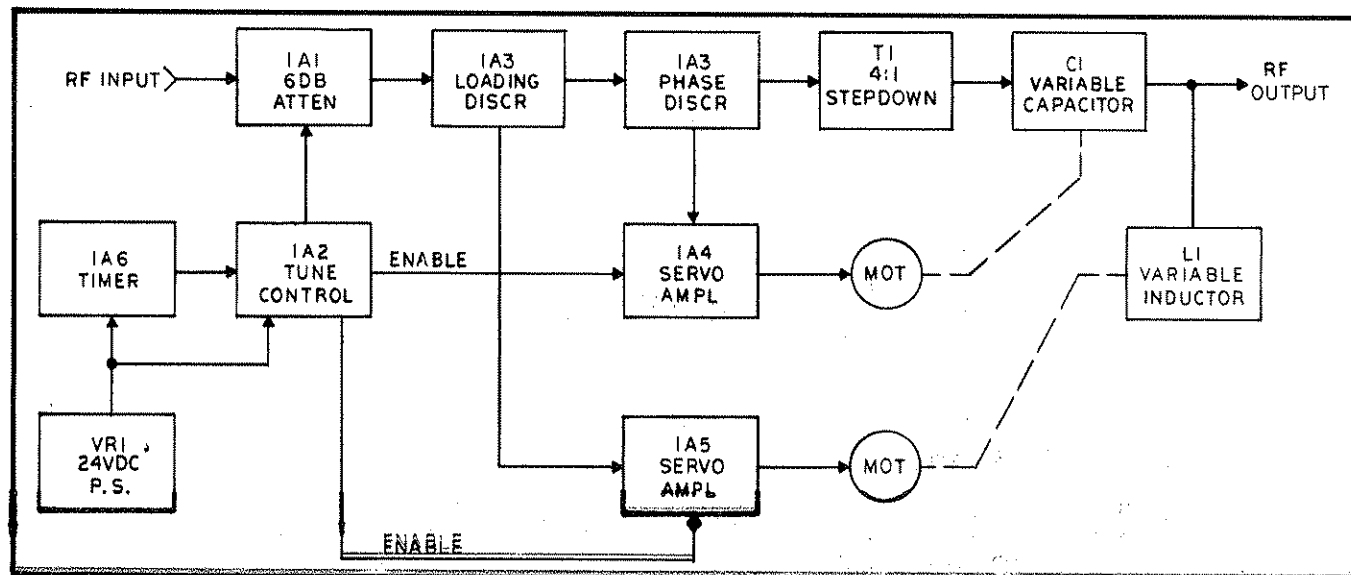


Figure 4-1. Functional Block Diagram, GCU-1935

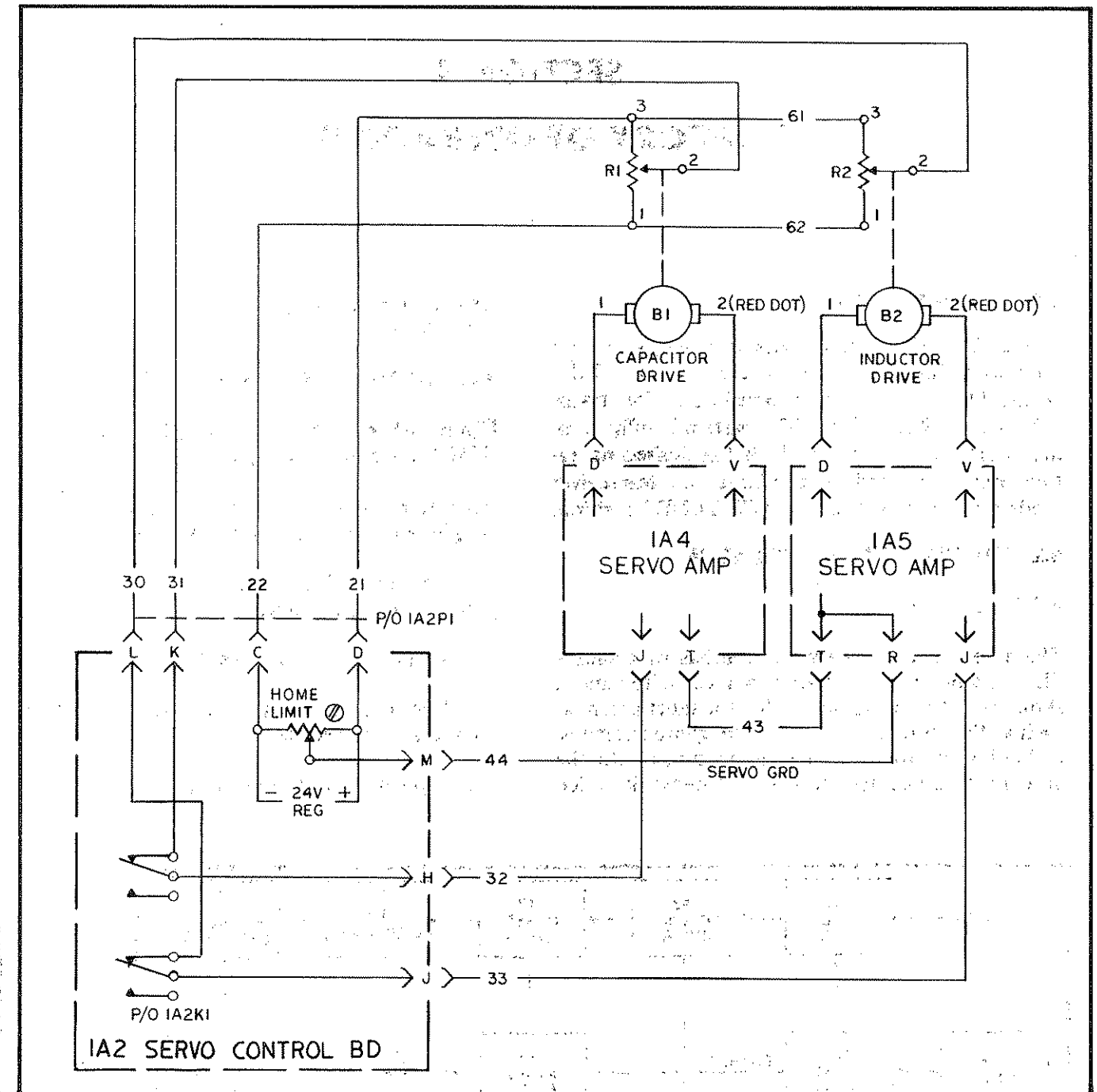


Figure 4-2. Home Position Bridge, GCU-1935

4.3 PHASE DISCRIMINATOR

The phase discriminator circuit is located in the RF sensor box IA3. The basic discriminator is a conventional quadrature phase detector. The quadrature signal is obtained from the voltage sample on the RC network consisting of C4 and R9. T2 pro-

vides a current sample which is 90° out of phase with the voltage inserted at the R4-R5 junction. R8 is adjusted to provide a null (zero output) when the sensor is terminated in 50 ohms. If the load is inductive a positive output results. If it is capacitive the output is negative.

4.4 LOADING DISCRIMINATOR

The loading error signal is obtained from a detector circuit which is also a part of the RF sensor 1A3. The RF transmission line voltage is sampled by the capacitive divider C3 and C10. L1 provides frequency compensation. The voltage vector developed across R1 is proportional to the transmission line current. The voltage vector is adjusted by varying C3 until there is no output produced at 1A3C7 by the diodes CR1 and CR2 when the line has a 50 ohm resistive termination. When the load resistance deviates from 50 ohms, the voltage and current ratio will change and produce a positive or negative error signal proportional to the load resistance. When the load is less than 50 ohms the error output is positive.

4.5 HOME FUNCTION

A conventional resistor positioning bridge is used to preposition the tuning elements prior to the application of the RF signal. A simplified schematic is shown in Figure 4-2. The tuning capacitor is homed to its maximum capacity setting and the inductor to minimum. These positions were chosen to avoid tuning lock-ups and to speed the over-all adjustment.

The home limit potentiometer 1A2R2, is adjusted so that the tuned elements are at the limits described previously. A floating 24 volt D.C. power source provides the error voltage for the bridge circuit. R1 and R2 are follow pots, driven by the tuning drive motors.

4.6 FORCE FUNCTION

When the capacitor is prepositioned to its maximum capacity at operating frequencies below about 6 MHz, its high series reactance in the "L" section inhibits current flow in the load. The RF sensors will have little or no current in the discriminator transformers and the circuits will have no output. To avoid this false indication, the inductor is "forced" toward maximum by an external voltage supplied by the **GSL-1900A band switch**. The voltage is applied at the RF sensor box through 1A3R10. Refer to Figure 4-3. The forcing voltage is fed to 1A3R10 through S2A which is closed only when the capacitor is at its home position. As the inductor is forced toward maximum, a positive phase error will develop which will drive the capacitor toward minimum and open S2A thereby terminat-

ing the force function. If the positive phase does not occur S6 will terminate the force function at maximum L.

4.6.1 INDUCTOR BACK-TURNS SHORT

The positive forcing voltage from the GSL-1900A is also used to turn on relay driver 1A6Q1 which energizes an auxiliary relay K1. K1 is connected to the tuning inductor L1, through normally closed contacts which short circuits part of the inductor turns. When tuning near 29 MHz, it is possible for the inductor unused turns to self resonate near the operating frequency. The arrangement through relay K1 breaks up this possible resonant circuit. When 1A6Q1 is fired by the forcing voltage, the short is removed, making the complete inductor available for tuning.

4.7 IMPEDANCE STEP-DOWN TRANSFORMER

A 4:1 impedance transformer is used before the "L" section tuning network to provide a wider tuning range with given capacitor and inductor values for tuning.

4.7.1 AUXILIARY INDUCTOR, L2

The tuning capacitor will position near its maximum capacity limit when the antenna resistance is near 50 ohms with an inductive reactance component. This will occur on most 35 foot verticals near 5.5 to 6 MHz. If the operating frequency is below 6 MHz, the forcing function as described in paragraph 4.6 is active. If the variable capacitor does not move from its home position, S2A will remain closed and the force function will not be removed from the inductor servo input. The inductor will then run to its maximum inductance end stop and a system tune fault will result.

The auxiliary inductor L2 provides a small amount of inductive reactance in series with the tuning capacitor. The tuning capacitor must then readjust to tune out the effect of L2. Since capacitive reactance is inversely proportional to capacity, the net circuit requirement will be for less capacity at resonance. The tuning capacitor will move off its maximum and discontinue the force function as required. The small value of inductance has negligible effect at other frequencies so that it can be connected permanently in the circuit.

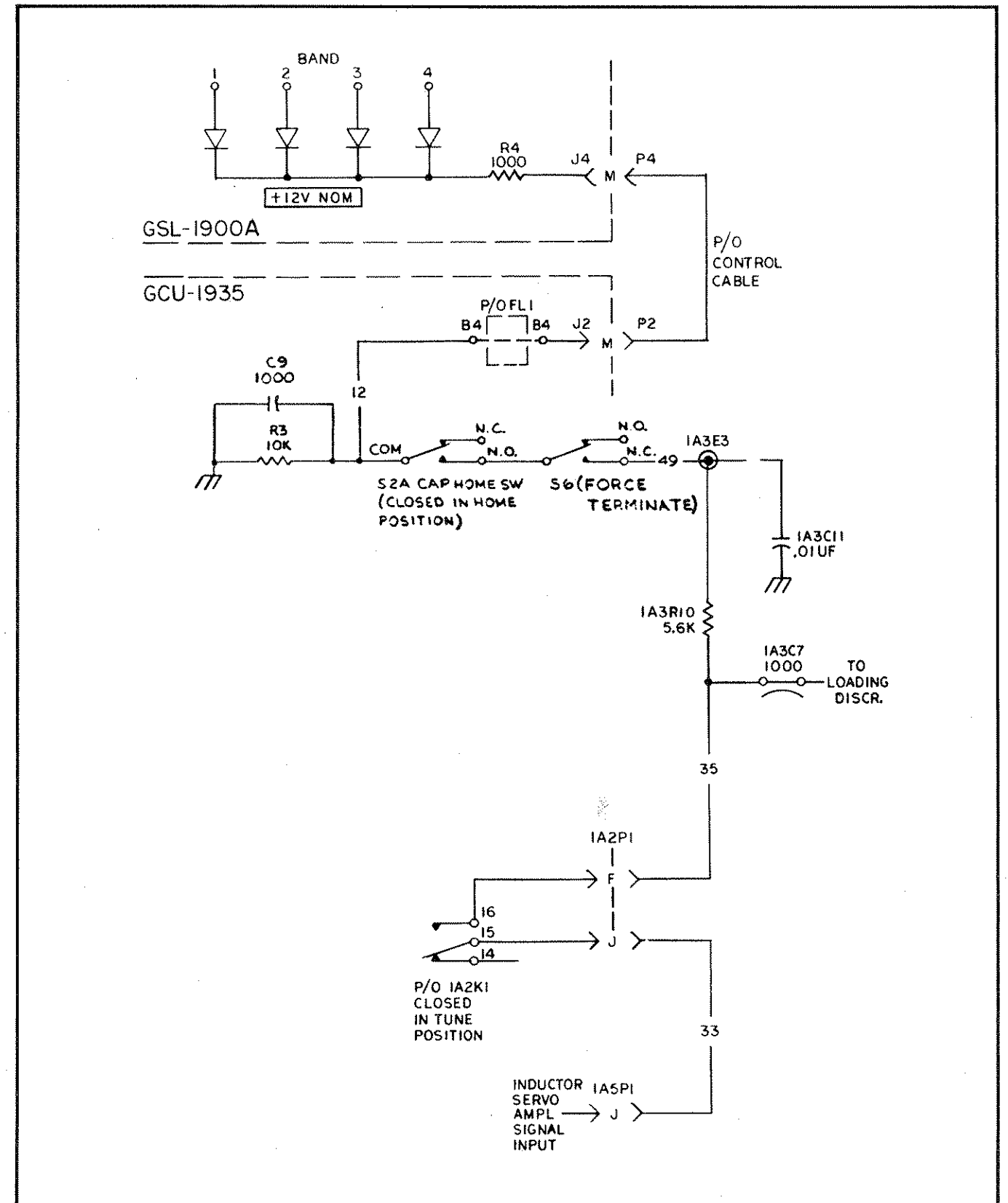


Figure 4-3. Coupler Force Function Simplified, GCU-1935

4.8 RF ATTENUATOR, 1A1

An RF attenuator is used ahead of the tuning network of the GCU-1935 to limit the impedance variations seen by the GSL-1900A during tuning. If the attenuator is not used, the VSWR trip circuit would activate under some load conditions and terminate the tune cycle.

The attenuator switching is capable of providing three states:

1. 6 DB attenuator
2. 50 ohm test load (switch in LPA)
3. Bypass (normal)

The attenuator is arranged as a "P1" section with two 75 ohm globars in series at the input and output and two in parallel as the series leg. For the 50 ohm load the output leg is parallel connected and the load removed.

The 75 ohm globar resistors have a 100 watt rating and the assembly will easily handle a kilowatt for short periods of 2 or 3 minutes.

Capacitors C1, C2 & C3 on assembly 1A1 and 1A3C12 provide frequency compensation.

4.9 D.C. SERVO AMPLIFIERS, 1A4, 1A5

Refer to the simplified schematic, Figure 4-4 and the servo amplifier schematic, Figure 5-9.

The servo amplifier used in the GCU-1935 antenna coupler is a solid-state, direct-coupled circuit with a bridge connected power output stage. Over-all feedback is used to reduce off-set drift and improve operation at low levels.

The amplifier is a combination printed circuit and hard wired assembly with integral heat-sink. The input stage is an operational amplifier, AR1, to provide a high input impedance to the error signal. Diodes, CR1 & CR2 are connected back-to-back across the input to avoid saturating and possible latch-up at large input signal levels. The output of the op-amp is coupled directly to positive and negative level sensors, Q2 & Q3. The servo enable transistor, Q1 is also connected to the same point. Q1 is normally in the conducting state because of the positive base bias supplied by the zener diode, VR1.

When the enable input is grounded, (J1-F), Q1 is shut off, resulting in a high impedance at the op-amp output junction. Either Q2 or Q3 will then conduct, depending on the polarity of the output signal. The positive error sensor, Q2 is coupled directly to the positive driver amplifier, Q5, while the negative error sensor is coupled to its driver, Q6 through an inverter stage Q4. The purpose of the inverter is to obtain symmetrical operation in the bridge power amplifier stage.

The output amplifier connections are shown in a simplified form on Figure 4-4. Assume that a positive error signal is being amplified. Driver transistor Q5 conducts, turning on the bridge pair, Q7/Q10. The dashed lines on the simplified schematic show the current path through the servo motor which results. A negative input will turn on the amplifier pair, Q8/Q9, reversing the current path through the motor. The servo motor is a D.C. permanent magnet type, which provides bi-directional rotation when the applied voltage across it is reversed in polarity.

In the GCU-1935 antenna coupler servo system, the two inputs labeled "+Forcing" & "-Forcing", (J1-E & N) are not used.

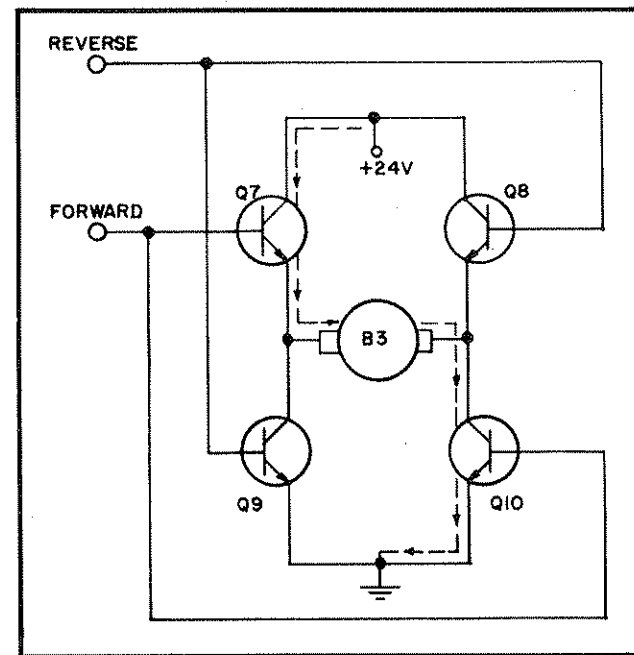


Figure 4-4. Servo Amplifier Output Bridge Simplified, GCU-1935

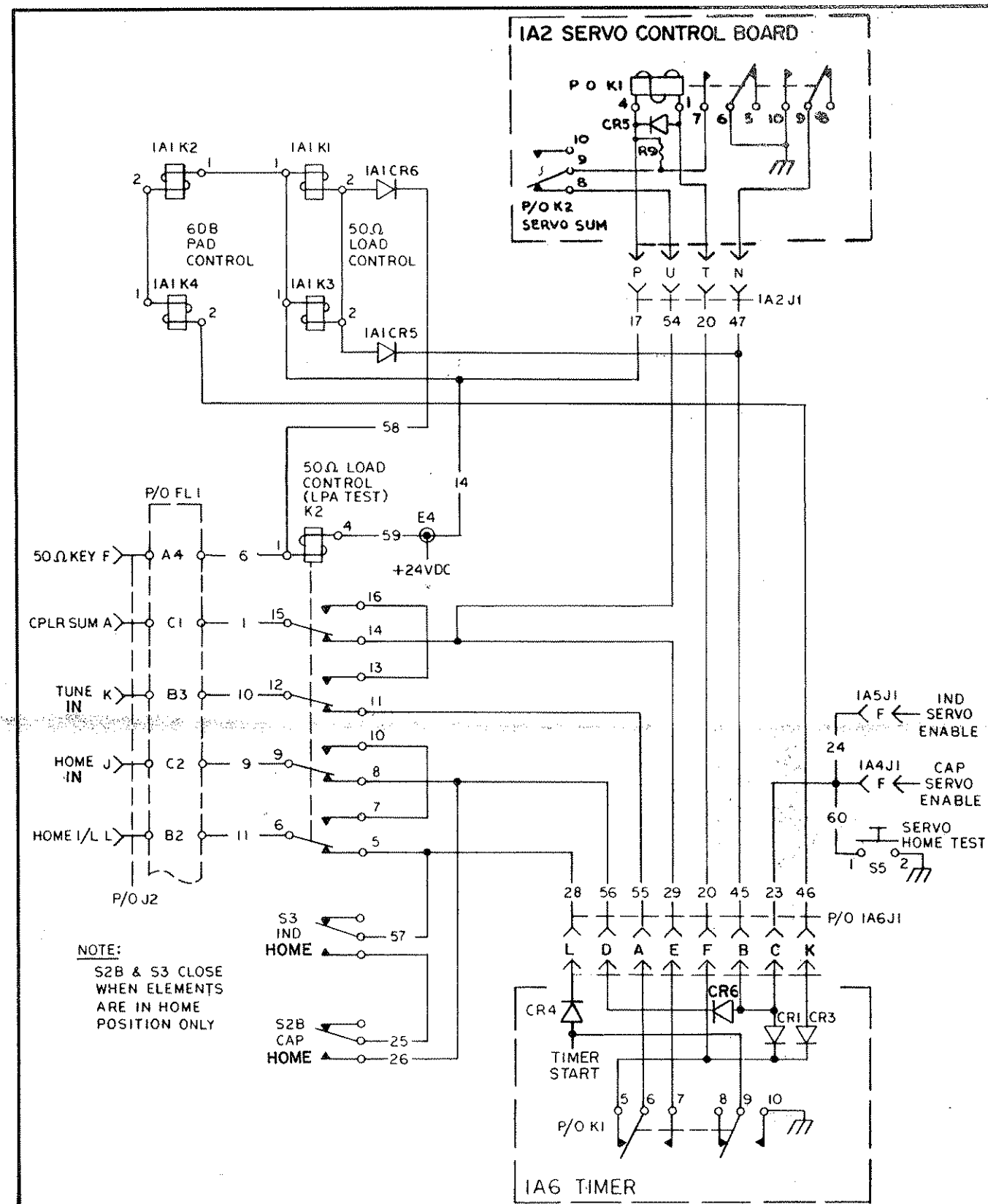


Figure 4-5. Coupler Control Circuit Simplified

4.10 KEYING AND ENABLE CIRCUITS

A simplified schematic of the coupler control function appears in Figure 4-5.

After the power amplifier has completed its preposition cycle a HOME ENABLE ground is transmitted to the GCU-1935 on J2-J.

The enable ground is applied to the servo amplifier enable inputs and in addition, is applied to the 50 ohm load control relays, 1A1K1 and 1A1K3. The attenuator resistors are then switched to the 50 ohm load configuration. The tuning elements run to their home positions. Upon reaching home the capacitor servo drive cam closes the limit switch, S2B, and the inductor drive closes its limit switch, S3. When S3 and S2B close the HOME ENABLE ground is connected to the HOME 1/L line at P2-L. The power amplifier is enabled by the HOME 1/L ground and fine tunes into the coupler 50 ohm load. When the GSL-1900A has obtained its normal tune power level of 200 watts, a ground appears at P2-K, the TUNE ENABLE line.

When the home limit switches first close, in addition to transmitting a ground to the HOME 1/L line, the presence of a ground at P2-L is used to trigger the internal timer 1A6U1. The purpose of 1A6U1 is to provide the power amplifier a preset length of time, typically 1-2 seconds, to fully complete its tuning and loading adjustment, since the appearance of 200 watts at the RF output does not assure

proper loading. The timers' associated relay 1A6K1 is used to hold off the coupler tune cycle for the timing period.

When the CPLR TUNE ENABLE appears at P2-K, it is also connected to the HOME ENABLE buss through 1A6CR1 when 1A6K1 is released by the timer, 1A6U1. The ground is therefore maintained on the 50 ohm load relays, 1A1K1 and 1A1K3. In addition, the ground is applied to the series combination of the 6DB pad relays 1A1K2 and 1A1K4 through diode 1A6CR3 and another ground path is provided to the tune control relay 1A2K1 which connects the RF sensor discriminators to their respective servo amplifier and the coupler is ready to tune.

4.10.1 MOTOR SUMMARY CIRCUIT

Each tuning motor has a permanent magnet attached to the shaft opposite its drive pulley. A proximity sensor is held close to the magnet by a bracket. When the motor shaft rotates, the sensor opens and closes as the magnet is turned through 360°. This function is used to chop a DC voltage which actuates 1A2Q1 through a capacitor charging circuit. Normally closed contacts on the summary relay, 1A2K2, connect the TUNE GROUND to the CPLR SUM line at P2-A. The GSL-1900A is again enabled and allowed to remain in an active tune condition until the tune fault timer in the GSL-1900A completes its ten second timing interval.

SECTION 5 MAINTENANCE AND REPAIR

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE GENERATION OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE (UP TO 10KV). OBSERVE SAFETY REGULATIONS AT ALL TIMES. DO NOT REMOVE THE COVER WITHOUT FIRST REMOVING THE RF INPUT CONNECTOR. DO NOT SERVICE ALONE.

5.1 PREVENTATIVE MAINTENANCE

In the normal service life of any piece of equipment, faults and breakdowns will develop. In order that the necessary repairs may be carried out in a reasonably short time, a logical testing routine must be followed. The maintenance technician should familiarize himself with the circuitry and the physical layout of the equipment PRIOR to the occurrence of trouble.

5.1.1 PERIODIC INSPECTIONS

The kilowatt antenna coupler GCU-1935 should be inspected regularly. Table 5-1 is a recommended

inspection schedule. Unusually severe environmental conditions may require more frequent attention.

5.1.2 LUBRICATION

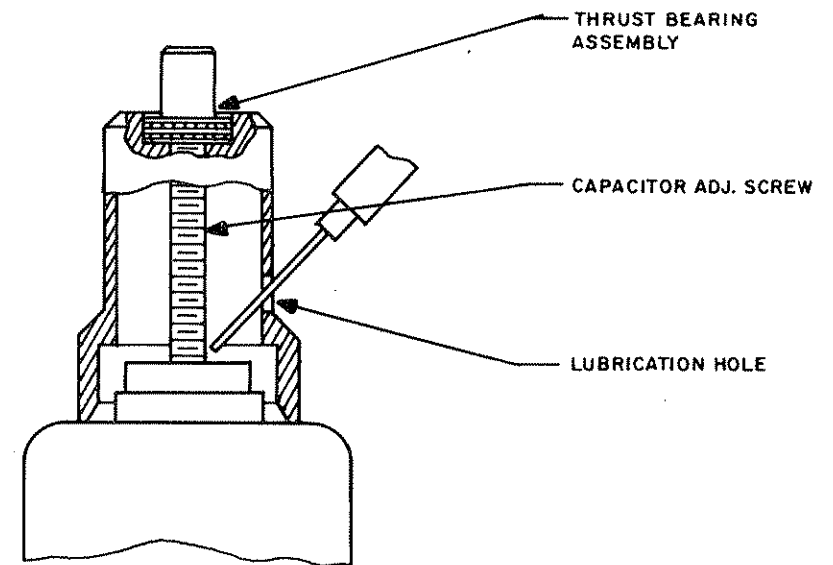
a. The cooling fan and the servo motors used in the GCU-1935 antenna coupler have sealed, permanently lubricated bearings. No lubrication service required.

b. The vacuum variable capacitor will not require relubrication in most cases. Under conditions of high humidity and temperature relubrication may become necessary. Manually rotate the capacitor servo drive to its maximum capacity limit stop. (Plates fully meshed.) Rotate the blue bearing shroud until the lubrication hole is in a convenient position. Lubricate according to the instructions on Figure 5-1.

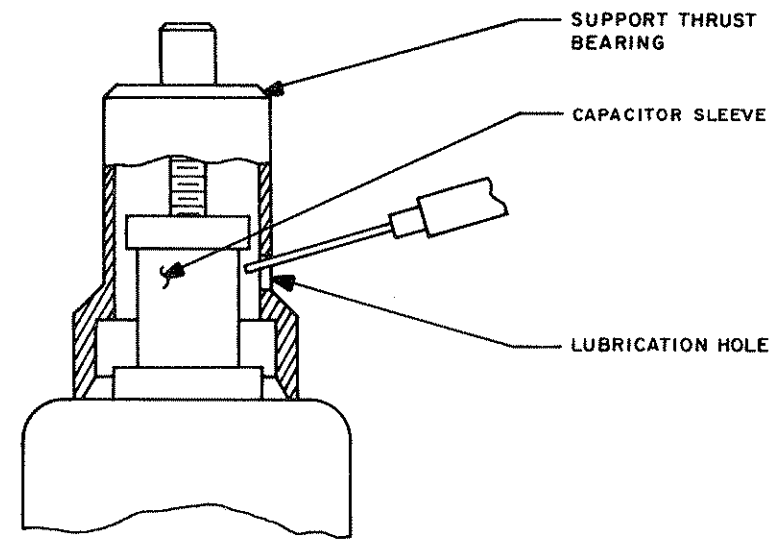
c. Apply a small amount of (anti-sieze lubricant, C5-A (Sunair P/N 0842210008)) to the variable inductor contact wheel axle. Manually rotate the inductor to distribute the lubricant evenly on the shaft. Wipe off all excess lubricate from insulators as it is highly conductive. Interval: Monthly.

| | |
|----|--|
| 1. | Inspect the unit for dust accumulation on the output insulator, loose electrical connections, evidence of overheating or arcing and proper operation of motors, fan, switches, etc. Interval: Monthly |
| 2. | Inspect the rubber cover gasket for deterioration and possible water leaks. Apply silicone spray lubricant. Interval: Every 6 months. |
| 3. | Inspect all open-type RF relays for dirty or pitted contacts. Burnish with crocus cloth, if necessary. Check relay action for free operation. Interval: Every 3 months. |
| 4. | Inspect tuning drive belts and adjust tension, if necessary. Belt deflection at the center should be ¼ to ½ inch. Loosen 4 motor mounting screws to adjust belt tension. Interval: Every 6 months. |

Table 5-1. GCU-1935 Inspection Schedule



1. UNIT CAPACITOR ADJUSTMENT SCREW AND THRUST BEARING ARE TO BE LUBRICATED WITH AERO LUBRIPLATE GREASE. (SUNAIR P/N 0841990000)
2. LUBRICATION OF SMALL AMOUNT SHOULD BE APPLIED EVERY FOUR MONTHS OR EVERY 2,500 CYCLES.



1. UNIT TO BE LUBRICATED WITH BENDIX # 10 OIL. (LIGHT MACHINE OIL)
2. LUBRICATION OF UNIT SHOULD BE PERFORMED EVERY FOUR MONTHS OR EVERY 2,500 CYCLES.

Figure 5-1. Variable Vacuum Capacitors Lubrication Points

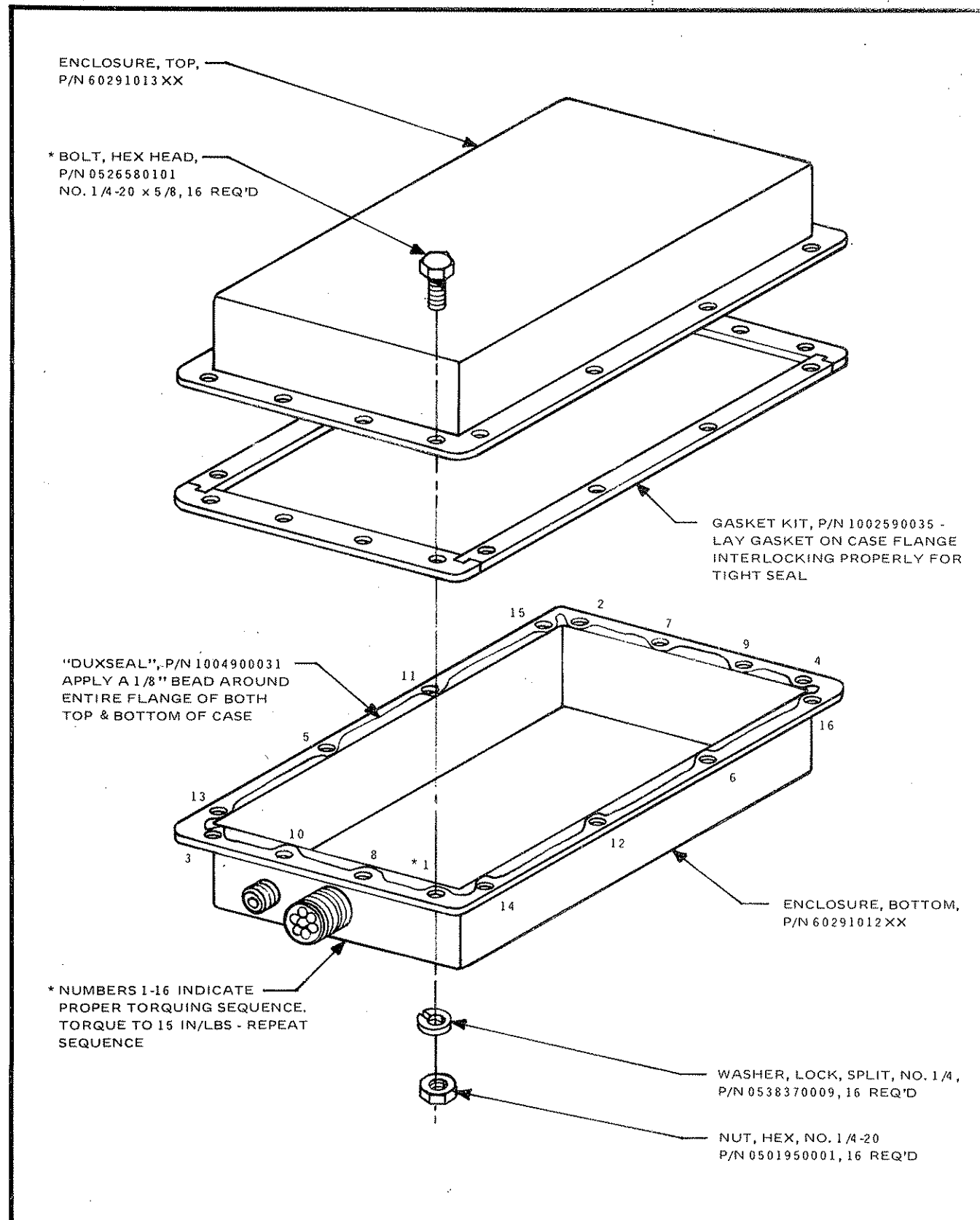


Figure 5-1.1 Installation Instructions Gasket Kit P/N 6029091590

5.2 CORRECTIVE MAINTENANCE

5.2.1 TEST EQUIPMENT REQUIRED

The following equipment or their equivalent is required to perform the specified tests.

- a. VOM Triplett Model 630.
- b. Coaxial load resistor, 2500 watts, 50 ohms Bird Model 8890.
- c. RF wattmeter, Bird thru-line Model 43 with 100 watt, 2-30 MHz element.

CAUTION

The GCU-1935 antenna coupler is extremely dangerous when the cover is removed. Observe the following safety precautions.

- a. NEVER touch the unit before checking to see that the transmitter is unkeyed.
- b. Keep bystanders well clear of the unit while it is in operation.
- c. Never leave the unit unattended while the transmitter is keyed and the cover removed.

5.2.2 DISCRIMINATOR ADJUSTMENT

The adjustment procedures for balancing the discriminators in the RF sensor assembly 1A3 are very important to the tuning accuracy of the antenna coupler unit. IT SHOULD NOT BE NECESSARY TO ADJUST THE DISCRIMINATORS UNLESS COMPONENTS HAVE BEEN REPLACED, OR THE RF SENSOR ADJUSTMENTS HAVE BEEN TAMPERED WITH.

5.2.3 PRELIMINARY SET-UP

- a. Disconnect the RF transformer, T1, from the RF sensor output connector 1A3E2.
- b. Connect a 50 ohm load to the output connector 1A3E2. (Load capable of dissipating at least 50 watts.) Use short leads to the coaxial cable.

c. Connect the transceiver directly to the coupler input. (Do not turn on the GSL-1900A plates.) Set frequency at 8 MHz and adjust the transceiver output level to 50 watts.

d. Connect a VOM, set to its low voltage range, from the loading discriminator output, 1A3C7, to chassis ground.

e. Remove the cover from 1A3, adjust 1A3C3 for a null on the VOM. Reverse meter leads, if necessary.

f. Repeat previous steps d and e for the phase discriminator metering 1A3C9 and adjust 1A3R8 for null.

g. If the phase discriminator transformer 1A3T2 has been replaced, it will be necessary to check the phasing of the new transformer. Connect a ceramic transmitting type capacitor of 50 to 100pf in series with the 50 ohm load connected previously as in step b. Apply RF to the coupler. The VOM at 1A3C9 should indicate a negative error voltage.

If the error is positive, reverse the transformer lead to 1A3R4 and R5. Recheck the null.

h. Reconnect the step-down transformer T1, to the sensor output, 1A3E2, and connect a Bird 2500 watt 50 ohm load between the coupler output connector E1 and ground.

i. Connect a VOM to the loading discriminator output 1A3C7. Run tune cycles at 29.9 MHz and observe the null off-set voltage. Obtain an average value from 3 to 4 tune cycles.

NOTE

The typical offset will be a very low voltage, on the order of 10 to 30 millivolts, but it could be zero.

j. Apply 50 watts to the coupler RF input and MANUALLY adjust the coupler tuning elements for the lowest possible value of reflected power. Set the voltage at 1A3C7 to the average value of step f with the null adjustment, 1A3C3.

k. Repeat steps f and g for the phase discriminator. (Connect meter to 1A3C9 and adjust 1A3R8.)

1. Disconnect test equipment and replace the cover of sensor assembly, 1A3.

5.2.4 HOME POSITION ADJUSTMENT

The position of the tuning elements at the home position is not critical. The only firm requirement is that the limit switches must be actuated when the elements are at home. (Capacitor at maximum, inductor at minimum.)

Refer to Figure 4-2, a simplified drawing of the home position bridge circuit. The bridge circuit is a closed-loop position servo system and its performance will serve as a convenient test vehicle for the servo amplifiers, their power supplies, servo motors and motor drive mechanisms.

To energize the home position bridge, turn on the GSL-1900A filament circuit and press the servo enable switch S5. (Location shown in Figure 5-2.) The elements will run to their home positions and stop. To test the servo action run the element away from their home limits by unbalancing the bridge with the command potentiometer, 1A2R2. Turn the potentiometer clockwise to move away from the mechanical limit stop. Note that the elements run smoothly when starting from rest and that the response is fast. (The elements should follow the position of the command potentiometer very closely.) The final position of the elements at home will be with the inductor contact wheel about 90° from the mechanical end stop. The capacitor drive will also be about 90° from its stop. The two cam wheels for the limit switches S2 and S3 should be positioned so that their actuator screws are fully engaged.

CAUTION

When adjusting the capacitor cam wheel, be sure that the switch remains closed when the capacitor drive is moved over the remaining distance from home to its maximum capacity limit stop. It is possible for the RF sensor error signal to be negative at lower frequencies, which will drive the capacitor against the limit stop. If S2 should open, the inductor forcing voltage would be disconnected before the phase detector output swings positive, a "no tune" condition.

5.3 CYCLE FAULT ANALYSIS

The GCU-1935 antenna coupler does not provide an indication of any discrete event in its tune cycle to the GSL-1900A control panel. If the GCU-1935 antenna coupler does not tune properly a VSWR fault will follow since the reflected power will exceed the 100 watt nominal trip setting.

The operator will quickly become familiar with the normal sound of a complete system tune cycle and deviations will become apparent. Obviously, if the coupler elements do not reach home, the tune cycle will not proceed since the home interlock will not be closed.

A logical fault isolation sequence would be as follows:

- a. Switch the RF attenuator to its "50 ohm load" position and check the GSL-1900A power amplifier tune cycle.
- b. Check the reflected power after step a. A very low value, less than 10 watts indicates the RF attenuator resistors and switching are functioning properly.
- c. If the LPA produces its normal tune power of 200 watts in step a, but does not when the coupler is active, the home interlock is not closing.
- d. If the LPA/CPLR combination produces 200 watts during the tune cycle, but a VSWR fault is indicated, check the RF sensor discriminator. Check continuity between the RF sensor outputs to the servo amplifier inputs through 1A2K1.
- e. If tune faults occur only below 6 MHz, and both elements remain at the home position, no force function is the probable fault.
- f. If the fault occurs only at the high end of the frequency range and the capacitor runs to its minimum limit, the loading discriminator circuit or its adjustment is suspect.
- g. If none of the previous symptoms are present, and the system does not tune, check the antenna and RF ground connections. Check for arcing in the antenna system, broken insulators, etc.

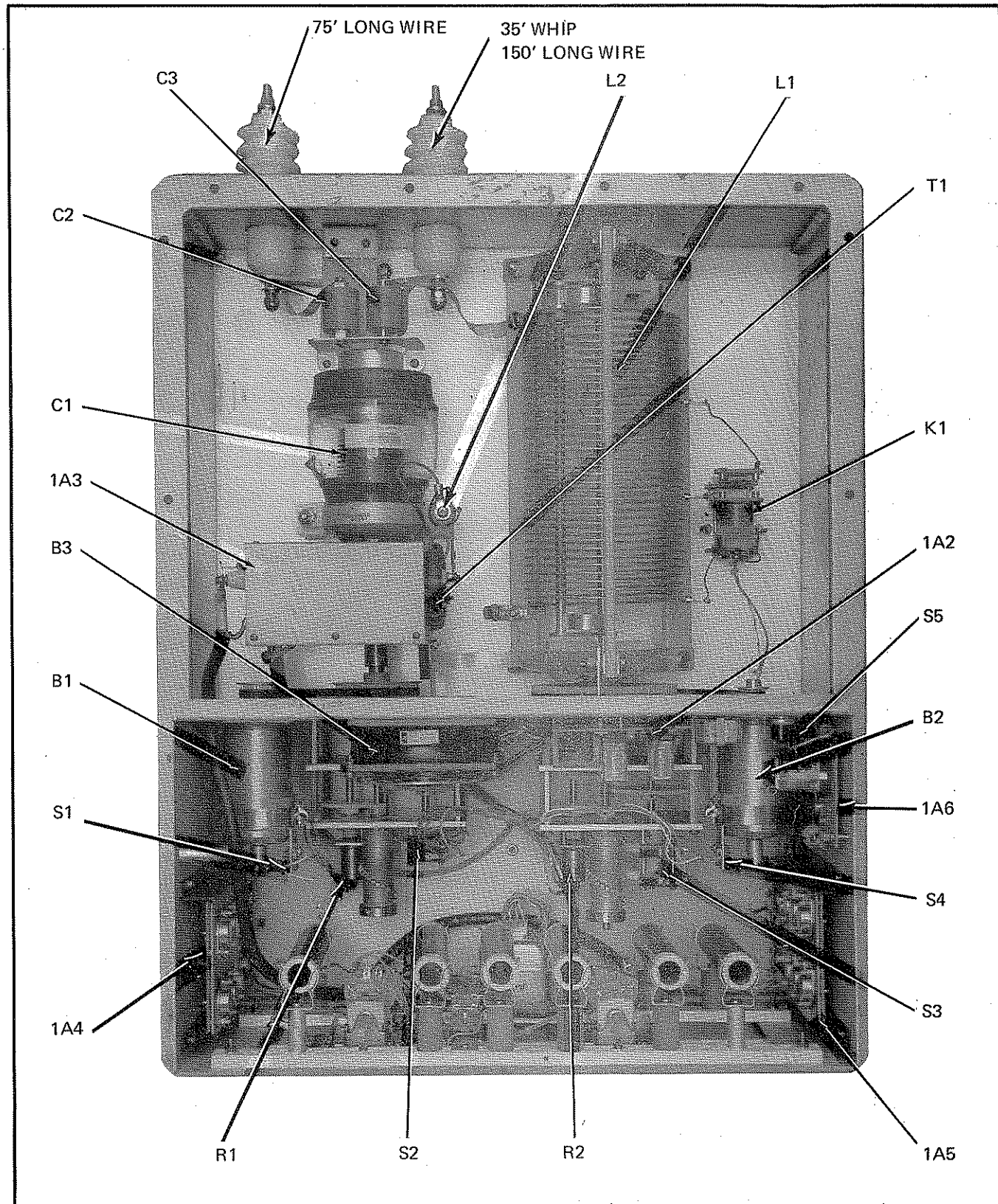


Figure 5-2. Major Assemblies and Component Locations

SUNAIR GCU-1935

| PIN | FUNCTION | VOLTAGE |
|-----|----------|---------|
| A | 115VAC | 115VAC |
| B | 115VAC | 115VAC |
| C | | |
| D | | |
| E | | |
| F | | |
| H | | |
| J | | |
| K | | |
| L | | |
| M | | |
| N | | |
| P | +24VDC | 24VDC |
| R | REED SW | 24V |
| S | REED SW | 24V |
| T | | |
| U | CPLR SUM | 0V |
| V | GRD | 0V |

All voltages ±10% referenced to chassis ground unless otherwise noted.

1. Transceiver mode switch in OFF position & unkeyed.
2. Filaments ON.
3. Plate ON.

NOTE: Measure Pin A to Pin B (115VAC).

Table 5-2. 1A2J1 Servo Control Board Connector Voltage Measurements

| PIN | FUNCTION | VOLTAGE |
|-----|------------|---------|
| A | +28V UNREG | 3/V |
| B | +28V UNREG | 3/V |
| C | MOTOR | 0V |
| D | MOTOR | 0V |
| E | +FORCE | 31V |
| F | ENABLE | 24V |
| H | +12VDC | 12V |
| J | SIGNAL | -.4V |
| K | GRD | 0V |
| L | RETURN | 0V |
| M | -12VDC | -12V |
| N | -FORCE | 32V |
| P | GRD | 0V |
| R | GRD | 0V |
| S | GRD | 0V |
| T | GRD | 0V |
| U | MOTOR | 0V |
| V | MOTOR | 0V |

All voltages ±10% referenced to chassis ground.

1. Transceiver mode switch in OFF position & unkeyed.
2. Filaments ON.
3. Plate ON.

Table 5-3. 1A4J1 & 1A5J1 Servo Amplifier Connector Voltage Measurements

| PIN | FUNCTION | VOLTAGE |
|-----|-----------|---------|
| A | | |
| B | | |
| C | | |
| D | | |
| E | | |
| F | | |
| H | GRD | 24V |
| J | +24VDC | 24V |
| K | | |
| L | | |
| M | | |
| N | COLLECTOR | 24V |
| P | BASE | 0V |
| R | | |
| S | | |
| T | | |
| U | GRD | 0V |
| V | - | 0V |

All voltages $\pm 10\%$ referenced to chassis ground.

1. Transceiver mode switch in OFF position & unkeyed.
2. Filaments ON.
3. Plate ON.

Table 5-4. 1A6J1 Timer Board Connector Voltage Measurements

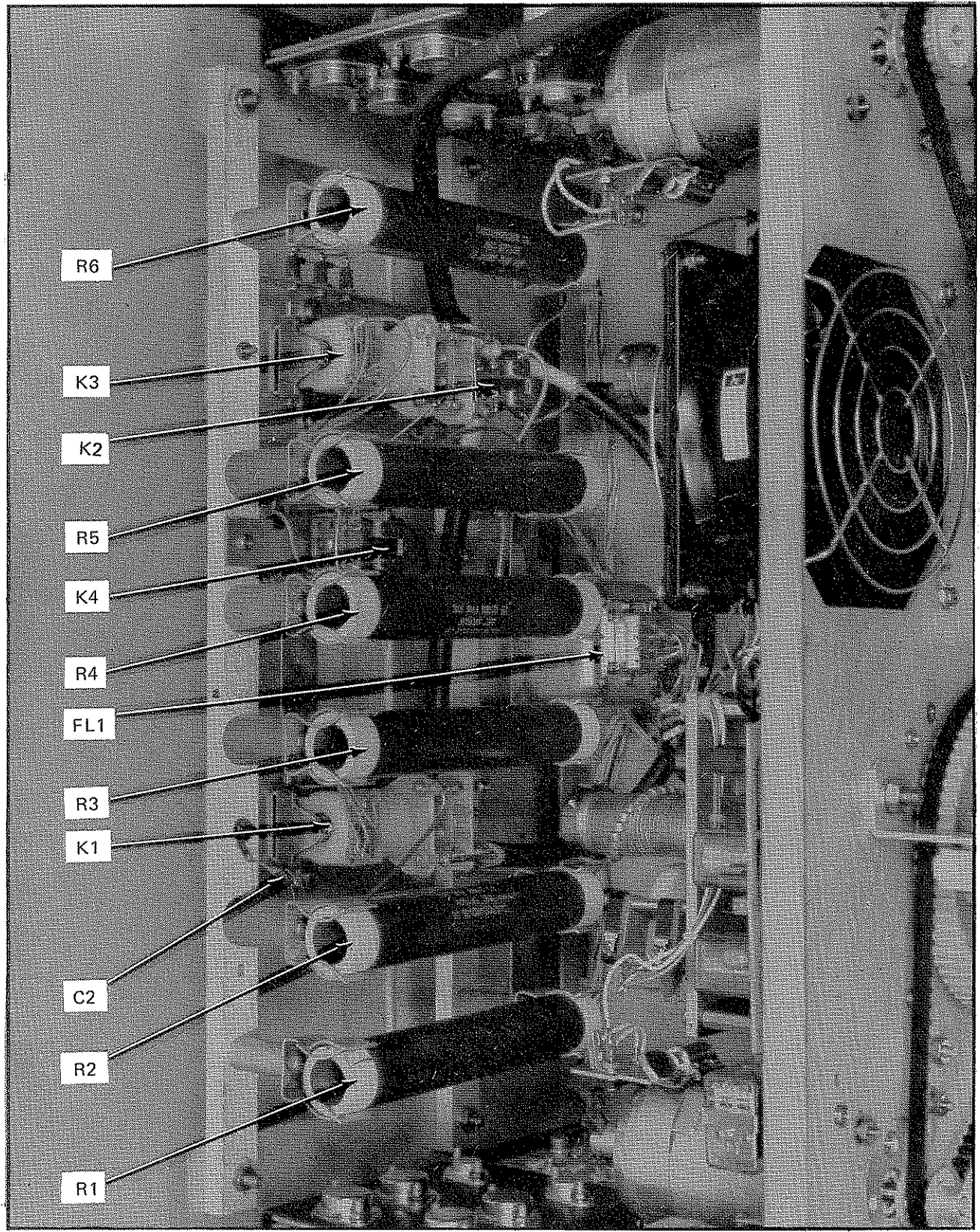


Figure 5-3. RF Attenuator (1A1) Component Locations

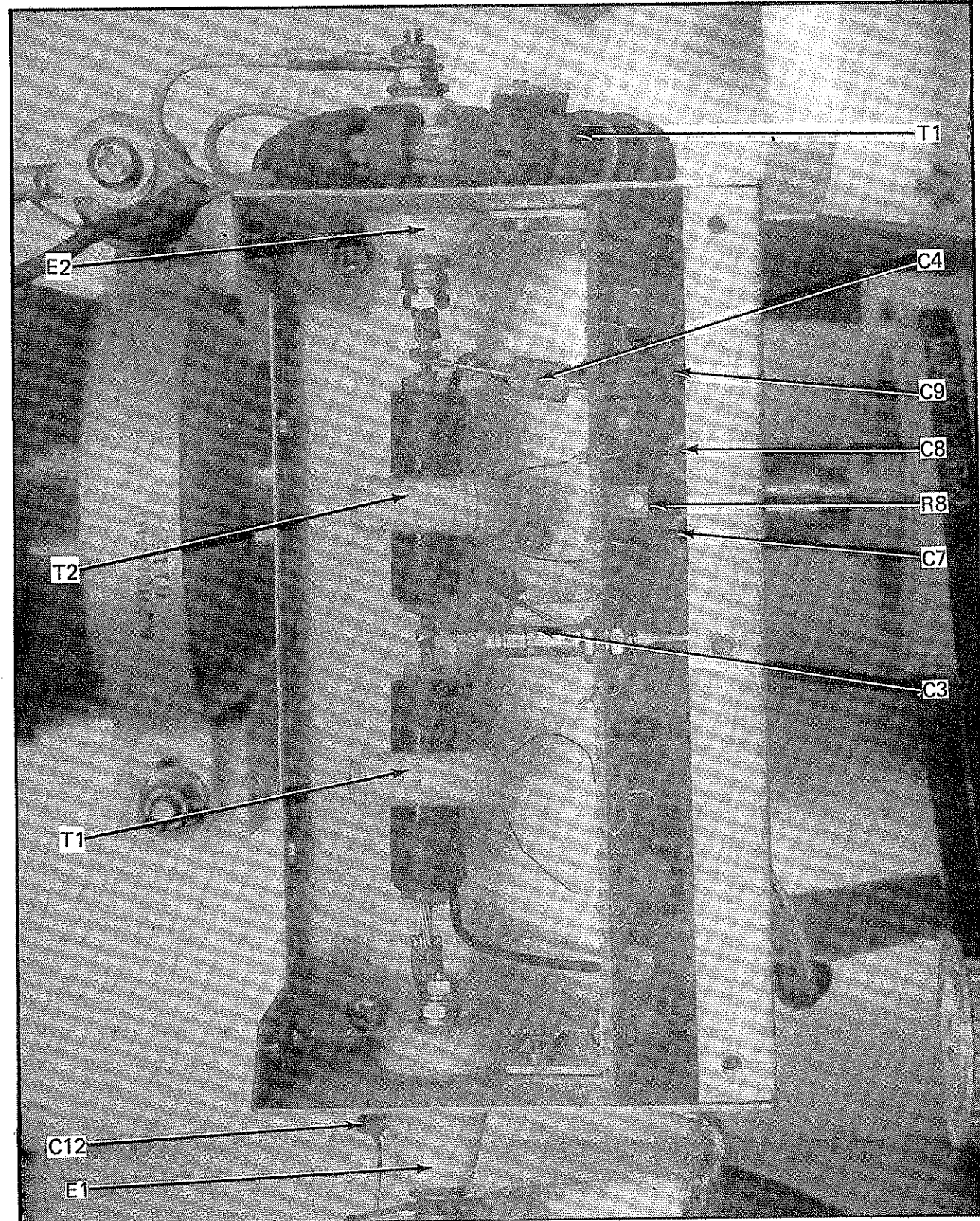


Figure 5-4. RF Sensor (1A3) Component Locations

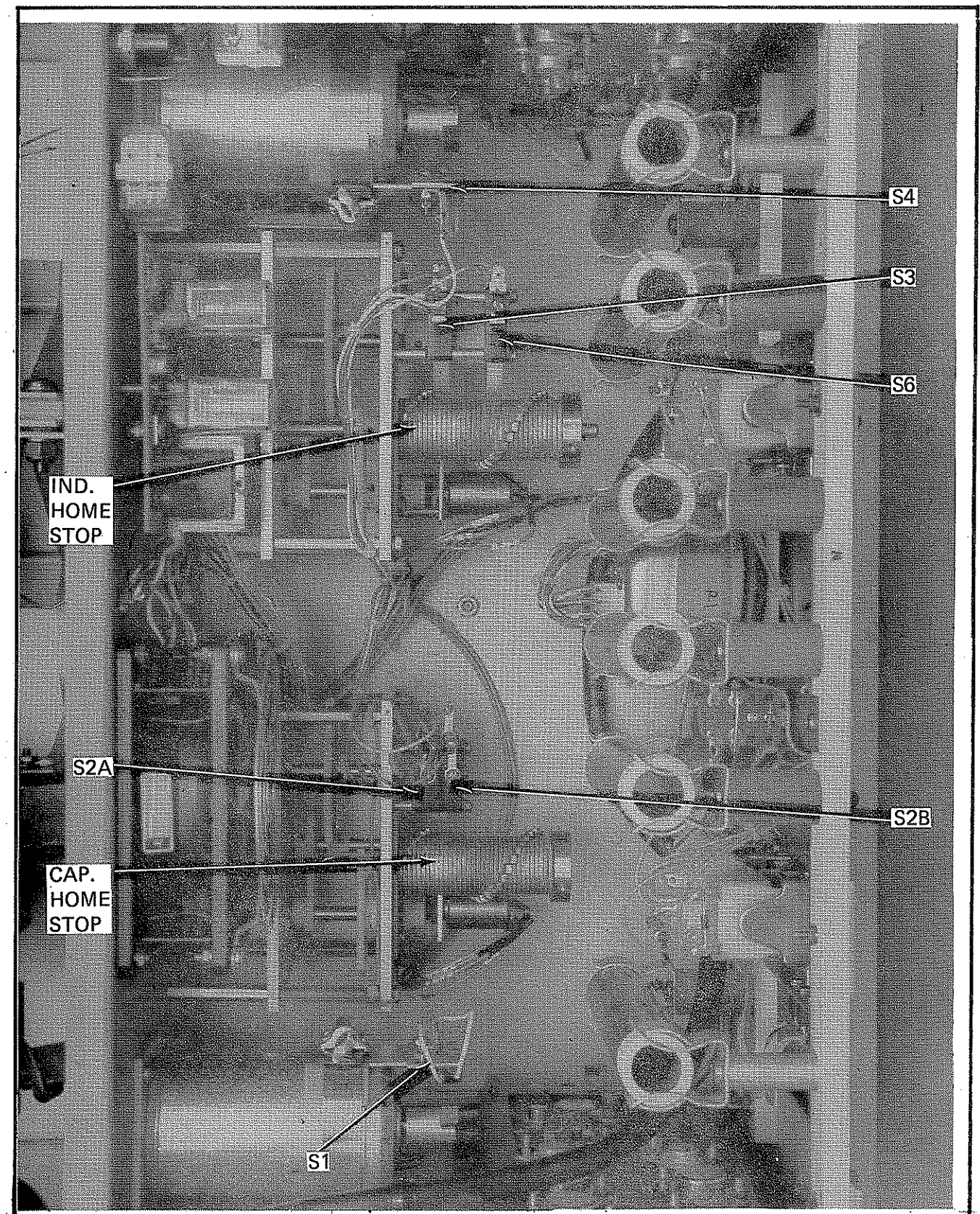


Figure 5-5. Capacitor & Inductor Gear Reduction Assy

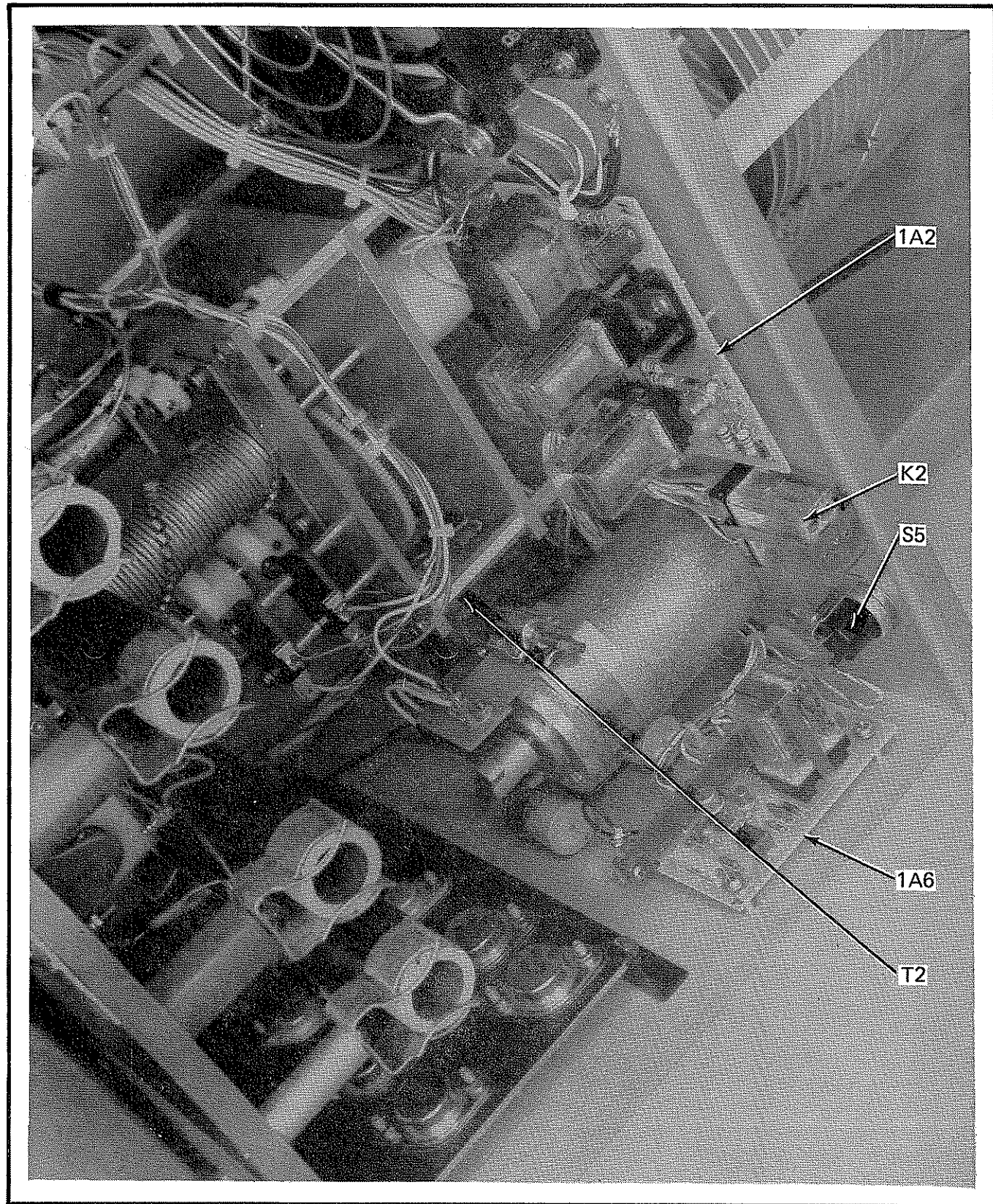


Figure 5.6. Additional Component Location

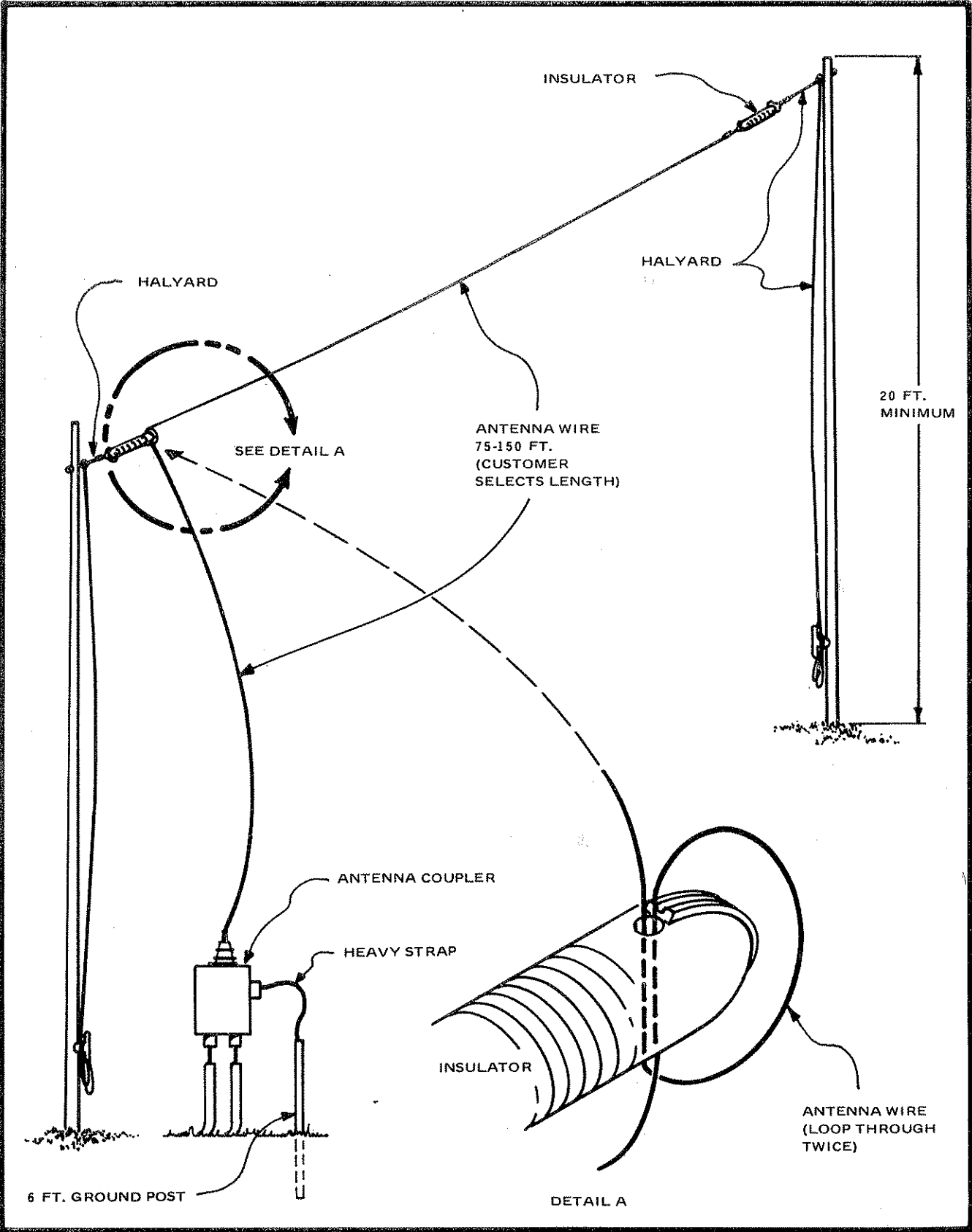


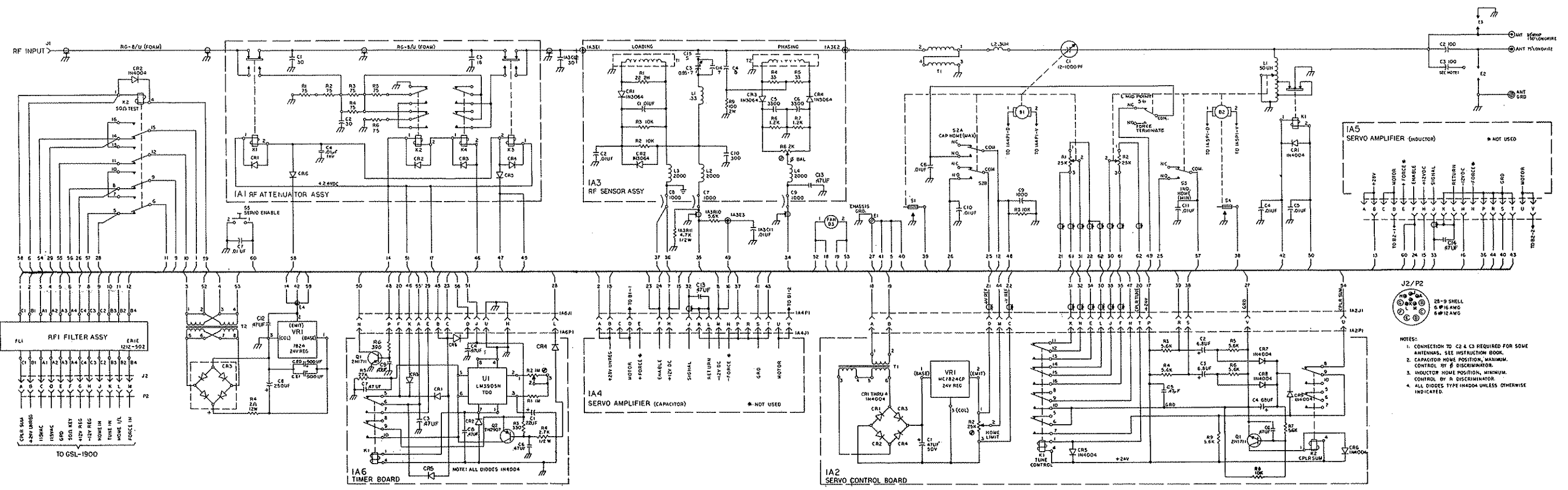
Figure 5-7. KW Long Wire Antenna Kit P/N 1003090010 INSTALLATION

5.4 SCHEMATIC DIAGRAMS

The following pages contain schematic diagrams, parts lists, and printed circuit board layouts for the GCU-1935.

GCU-1935 Main Schematic DiagramFigure 5-8
RF Attenuator Assembly (1A1)Figure 5-8
Servo Control (1A2) Figure 5-9 & 5-8
RF Sensor (1A3)Figure 5-10 & 5-8
DC Servo Amplifier (1A4, 1A5)Figure 5-11
Timer Board (1A6)Figure 5-12 & 5-8

6029015079 N



- J2/P2**
 28-9 SHELL
 5 #16 AWG
 6 #12 AWG
- NOTES:**
1. CONNECTION TO C2 & C3 REQUIRED FOR SOME ANTENNAS. SEE INSTRUCTION BOOK.
 2. CAPACITOR HOME POSITION, MAXIMUM CONTROL BY β DISCRIMINATOR.
 3. INDUCTOR HOME POSITION, MINIMUM CONTROL BY β DISCRIMINATOR.
 4. ALL DIODES TYPE 1N4004 UNLESS OTHERWISE INDICATED.

Figure 5.8. Main Schematic Diagram

SUNAIR GCU-1935

6029010093AF CHASSIS ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|--|-----------------|
| | CHASSIS ASSY. GCU-1935 | 6029010093 |
| B1 | Motor 24 VDC | 5026012302 |
| B2 | Motor 24 VDC | 5026012302 |
| B3 | Fan, 115 VAC 50/60 Cycle | 6029071009 |
| C1 | Not used | |
| C2 | Not used | |
| C3 | Not used | |
| C4 | Not used | |
| C5 | Not used | |
| C6 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| C7 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| C8 | Capacitor, 250 UF, 50 V, Br | 0272920002 |
| C9 | Capacitor, 0.001 UF, 1000 V, X5 F, 20% | 0256840008 |
| C10 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| C11 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| C12 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C13 | Not used | |
| C14 | Not used | |
| C15 | Not used | |
| C16 | Not used | |
| C17 | Not used | |
| C18 | Not used | |
| C19 | Not used | |
| C20 | Capacitor, 500 UF, 50 V, Br | 0289230004 |
| C21 | Capacitor, 500 UF, 50 V, Br | 0289230004 |
| CR3 | Diode, Bridge VS447TT | 0405420005 |
| E4 | Terminal, Insul. 4-40 Female | 0506390004 |
| E5 | Terminal, Insul. 4-40 Female | 0506390004 |
| K2 | Relay, 4 PDT, 24 V, Plug-in 2A | 0667930001 |
| R3 | Resistor, 10K, 10%, 1/2W | 0167240005 |
| R4 | Resistor, 2, 5%, 12W | 0197250009 |
| S5 | Switch, Push Button, SPST N.O. | 0346220009 |
| T2 | Transformer 24 V 1 Amp. | 6032071707 |
| VR1 | IC Linear MC7824 CT | 0448480000 |
| XB3 | Finger Guard 4 1/8 Fan | 0850520002 |
| | Pulley, Timing, 11 Groves | 0841430004 |
| | Pulley, Gear | 0841900001 |
| | Magnet 1/4 X 1/4 X 1 lg. | 0850120004 |

6029002058AH FINAL ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|---------------------------------------|-----------------|
| | FINAL ASSY. GCU-1935 | 6029002058 |
| C1 | Capacitor, Var. Vacuum 12-1000 PF | 6029071203 |
| C2 | Capacitor, 100PF, 15KV, N750 | 0275470008 |
| C3 | Capacitor, 100PF, 15KV, N750 | 0275470008 |
| C4 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| C5 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| CR1 | Diode, Rectifier 1N4004 | 0405180004 |
| K1 | Relay, SPDT, 24 V, HV 200 MA | 6029071301 |
| L1 | Var. Inductor Assy. GCU-1935 | 6029050095 |
| L2 | Inductor, Air Wound, 0.3UH | 6029060309 |
| R1 | Resistor, 75, 10%, 100W | 6029071505 |
| R2 | Resistor, 75, 10%, 100W | 6029071505 |
| R3 | Resistor, 75, 10%, 100W | 6029071505 |
| R4 | Resistor, 75, 10%, 100W | 6029071505 |
| R5 | Resistor, 75, 10%, 100W | 6029071505 |
| R6 | Resistor, 75, 10%, 100W | 6029071505 |
| T1 | Transformer, RF | 6029060104 |
| | Belt, Timing, 16 In. P.L. | 0841800006 |
| | Belt, Timing, 19 In. P.L. | 0841880000 |
| | Pulley, Gear | 0841920001 |
| E1 | Insulator, Sleeve, RF | 6029102303 |
| | Ring, Retainer | 6029102401 |
| | Conductor, RF | 6029102508 |
| | Clamp, Toriod | 6029102605 |
| | Bracket | 6029102702 |
| | Support, Insulator | 6029102800 |
| | Plate, Nut | 6029102907 |
| E2 | Plate, Spark Gap | 5026030602 |
| | Cover, Gasket | 1002590035 |

6029015095P MAIN HARNESS

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|-------------------------------------|-----------------|
| | HARNESS, MAIN GCU-1935 | 6029015095 |
| 1A2 | Connector, PC, 18 Pin Female | 0749720000 |
| 1A3 | Not used | |
| 1A4 | Connector, PC 18 Pin Female | 0749720000 |
| 1A5 | Connector, PC 18 Pin Female | 0749720000 |
| 1A6 | Connector, PC 18 Pin Female | 0749720000 |
| C13 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C14 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| CR6 | Diode, Rectifier 1N4004 | 0405180004 |
| FL1 | Filter, EMI Suppression | 6029071106 |
| J1 | Connector, PC 18 Pin Female | 0749720000 |
| | Connector, Power, 12 Pin Pnl Mt | 6029000705 |

6029021095M GEAR REDUCER IND. ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|----------------------------------|-----------------|
| | GEAR REDUCER IND. ASSY. GCU-1935 | 6029021095 |
| R2 | Pot. 25K, 3W, 10 Turns | 0318650002 |
| S3 | Switch, Micro, SPDT | 0346190002 |
| S6 | Switch, Micro, SPDT | 0346190002 |
| | Gear, Spur | 0841960003 |
| | Gear, Spur | 0841980004 |
| | End Cap, Limit Stop | 5026050301 |
| | Input Disc | 5026050603 |
| | Cam Wheel Mod. | 6029020404 |
| | Gear, Spur 26 T | 6029020501 |
| | Gear, Spur 30 T | 6029020706 |

6029022091K GEAR REDUCER CAP. ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|----------------------------------|-----------------|
| | GEAR REDUCER CAP. ASSY. GCU-1935 | 6029022091 |
| R1 | Pot. 25K, 3W, 10 Turns | 0318650002 |
| S2A | Switch, Micro, SPDT | 0346640008 |
| S2A | Switch, Micro, SPDT | 0346640008 |
| XS2A | Actuator, Roller Leaf | 0346660009 |
| XS2B | Actuator, Roller Leaf | 0346660009 |
| | Gear, Spur | 0841960003 |
| | Gear, Spur | 0841980004 |
| | End Cap, Limit Stop. | 5026050301 |
| | Input Disc | 5026050603 |
| | Cam Wheel Mod. | 6029020404 |
| | Gear, Spur 26 T | 6029020501 |
| | Gear, Spur 30 T | 6029020706 |

6029035096N ATTENUATOR ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|---------------------------------------|-----------------|
| | ATTENUATOR ASSY. 1A1 GCU-1935 | 6029035096 |
| C1 | Capacitor, 30 PF, 3K0 V NPO | 0259450006 |
| C2 | Capacitor, 30 PF, 3K0 V NPO | 0259450006 |
| C3 | Capacitor, 18 PF, 3KV, NPO | 0288440005 |
| C4 | Capacitor, 0.01 UF, 1000 V, Z5 U, 20% | 0243550006 |
| 1A1CR1 | Diode, Rectifier 1N4004 | 0405180004 |
| 1A1CR2 | Diode, Rectifier 1N4004 | 0405180004 |
| 1A1CR3 | Diode, Rectifier 1N4004 | 0405180004 |
| 1A1CR4 | Diode, Rectifier 1N4004 | 0405180004 |
| 1A1CR5 | Diode, Rectifier 1N4004 | 0405180004 |
| 1A1CR6 | Diode, Rectifier 1N4004 | 0405180004 |
| J1 | Connector, RF, UHF S0-239 | 0741920000 |
| K1 | Relay, SPDT, 24 V, HV 200 MA | 6029071301 |
| K2 | Relay, DPDT, 12 V, Antenna 5 A | 0667310002 |
| K3 | Relay, SPDT, 24 V, HV 200 MA | 6029071301 |
| K4 | Relay, DPDT, 12 V, Antenna 5 A | 0667310002 |
| | Cable, Coax RG R/U Type | 0588860000 |

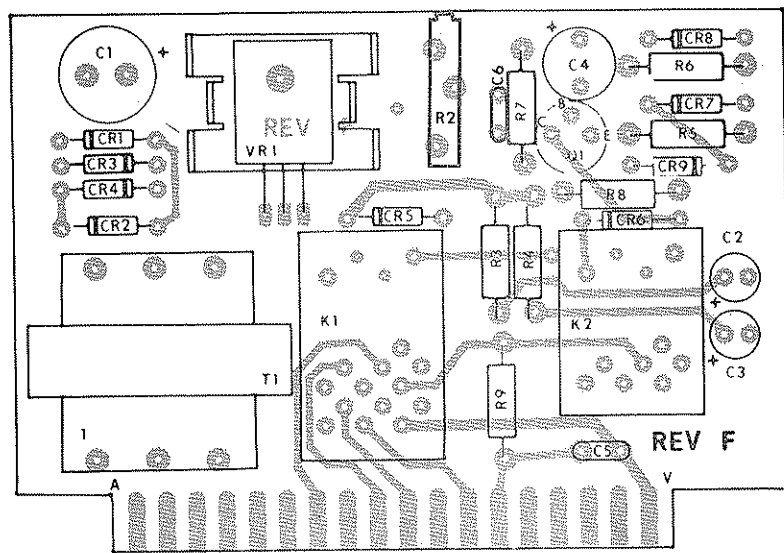
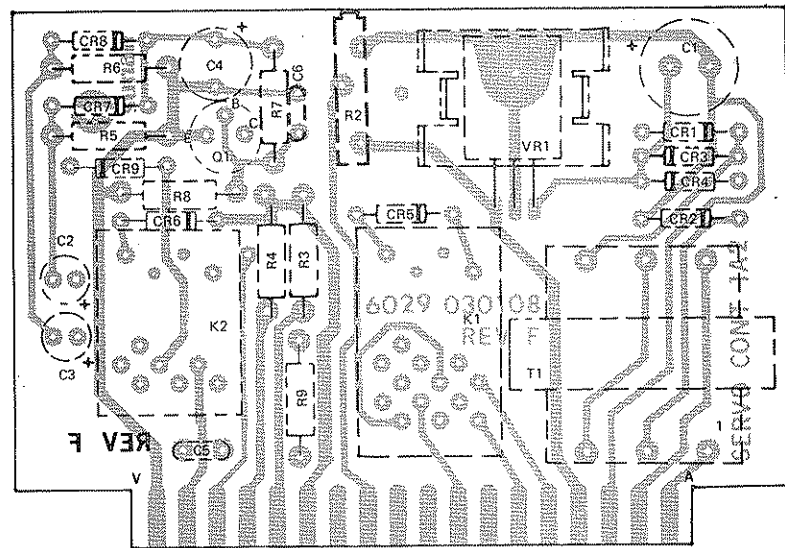


Figure 9. PCB Servo Control Board (1A2)

SUNAIR GCU-1935

6029030094H SERVO CONT. 1A2 ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|-------------------------------------|-----------------|
| | PC ASSY SERVO CONT. 1A2 GCU-1935 | 6029030094 |
| 1A2 C1 | Capacitor, 47 UF, 50 V | 0246160004 |
| C1 | Not used | |
| C2 | Capacitor, 6.8 UF, 20 V, T368 | 0296780006 |
| C3 | Capacitor, 6.8 UF, 20 V, T368 | 0296780006 |
| C4 | Capacitor, 68 UF, 15 V, T368 | 0296540005 |
| C5 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C6 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| CR1 | Diode, Rectifier 1N4004 | 0405180004 |
| CR2 | Diode, Rectifier 1N4004 | 0404180004 |
| CR3 | Diode, Rectifier 1N4004 | 0405180004 |
| CR4 | Diode, Rectifier 1N4004 | 0405180004 |
| CR5 | Diode, Rectifier 1N4004 | 0405180004 |
| CR6 | Diode, Rectifier 1N4004 | 0405180004 |
| CR7 | Diode, Rectifier 1N4004 | 0405180004 |
| CR8 | Diode, Rectifier 1N4004 | 0405180004 |
| CR9 | Diode, Rectifier 1N4004 | 0405180004 |
| K1 | Relay, 4PDT, 24 V, Plug-in 2 A | 0667930001 |
| K2 | Relay DPDT, 24 V, Plug-in 3 A | 0667430008 |
| Q1 | Transistor, NPN, Si. 2N1711 | 0448380005 |
| R1 | Not used | |
| R2 | Pot. 25 K, 10%, 3/4W, 15 Turns | 0338490094 |
| R3 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| R4 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| R5 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| R6 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| R7 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| R8 | Resistor, 10 K, 10%, 1/2W | 0617240005 |
| R9 | Resistor, 5.6 K, 10%, 1/2W | 0185880002 |
| T1 | Transformer, PS, AC, PC Mtg | 0491680007 |
| VR1 | IC Linear MC7824 CT | 0448480000 |

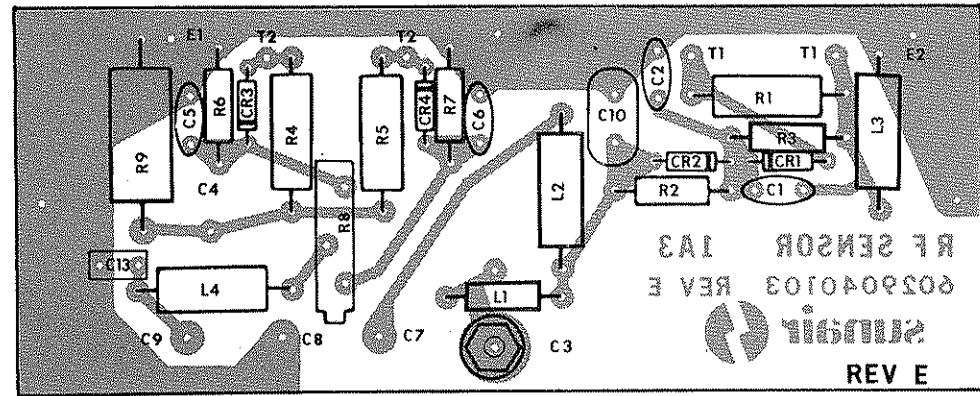


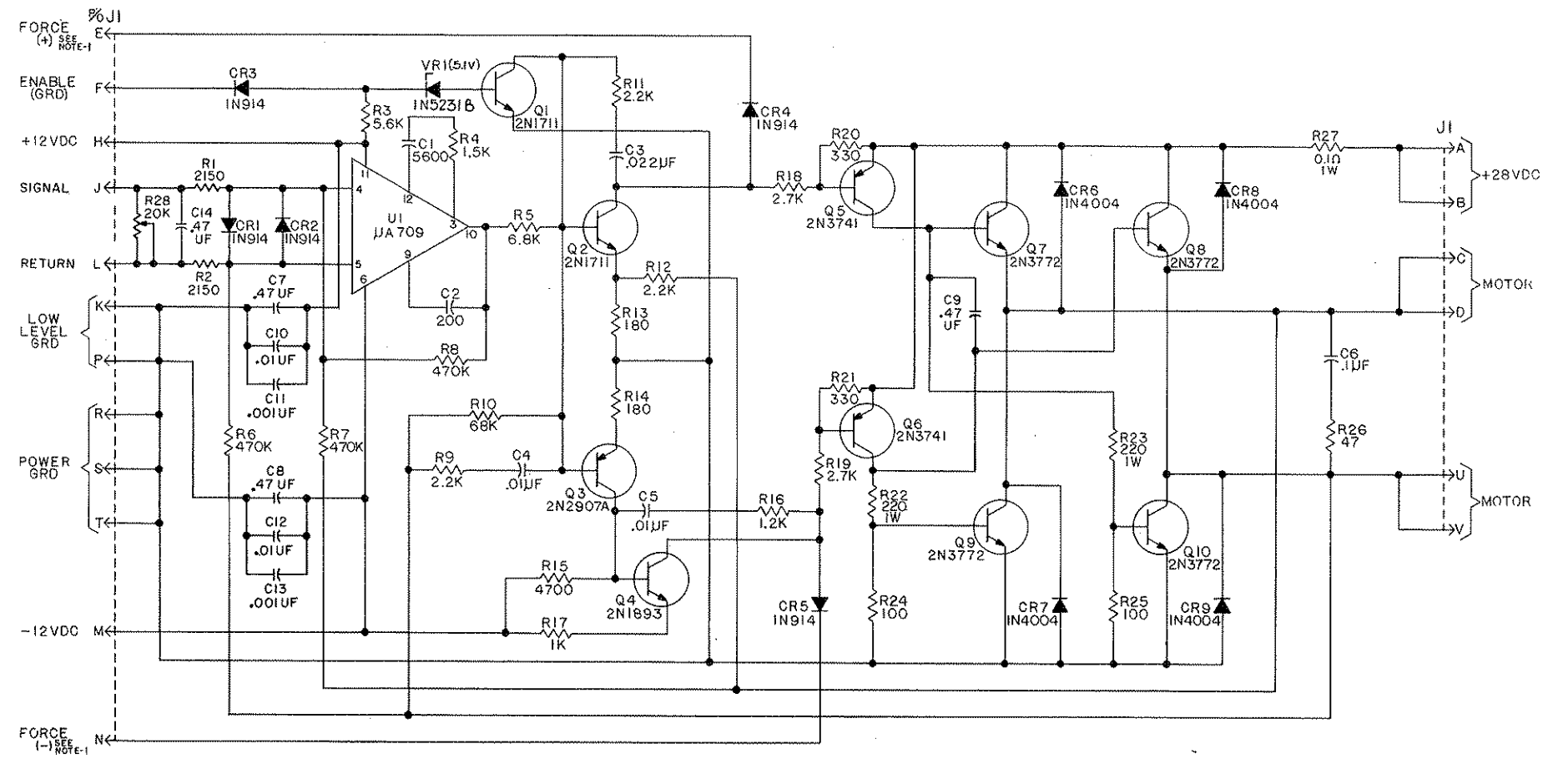
Figure 5-10. PCB RF Sensor (1A3)

SUNAIR GCU-1935

6029040090K RF SENSOR 1A3 ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|--------------------------------------|-----------------|
| | PC ASSY RF SENSOR 1A3 GCU-1935 | 6029040090 |
| 1A3C1 | Capacitor, 0.01UF, 100 V, Z5V | 0273210009 |
| 1A3C2 | Capacitor, 0.01UF, 100 V, Z5V | 0273210009 |
| C1 | Not used | |
| C2 | Not used | |
| C3 | Capacitor, .85-7 PF, 1500 V | 0282050001 |
| C4 | Capacitor, 5PF, 5KV, NPO | 1004710003 |
| C5 | Capacitor, 0.0033UF, 100 V, X5F, 10% | 0282580000 |
| C6 | Capacitor, 0.0033UF, 100 V, X5F, 10% | 0282580000 |
| C7 | Capacitor, 1000PF, 500 V | 0286270005 |
| C8 | Capacitor, 1000PF, 500 V | 0286270005 |
| C9 | Capacitor, 1000PF, 500 V | 0286270005 |
| C10 | Capacitor, 300PF, 500 V, DM15, 5% | 0276320000 |
| C11 | Capacitor, 0.01UF, 1000 V, Z5U, 20% | 0243550006 |
| C12 | Capacitor, 30PF, 3K0 V, NPO | 0259450006 |
| C13 | Capacitor, 0.47UF, 50 V, X5V, 20% | 0283370009 |
| C14 | Capacitor, 7PF, 500 V, N1500 | 0295250003 |
| C15 | Capacitor, 5PF, 5KV, NPO | 1004710003 |
| 1A3CD1 | Diode, Signal, Sil. 1N3064 | 0405460007 |
| 1A3CD2 | Diode, Signal, Sil. 1N3064 | 0405460007 |
| 1A3CD3 | Diode, Signal, Sil. 1N3064 | 0405460007 |
| 1A3CD4 | Diode, Signal, Sil. 1N3064 | 0405460007 |
| E1 | Insulator, Antenna | 0712840001 |
| E2 | Insulator, Antenna | 0712840001 |
| E3 | Terminal, Insul. 4-40 Female | 0506390004 |
| L1 | Inductor, Molded, 0.33UH, 20% | 0659600005 |
| L2 | Inductor, Molded, 2000UH, 5% | 0653590008 |
| L3 | Inductor, Molded, 2000UH, 5% | 0653590008 |
| L4 | Inductor, Molded, 2000UH, 5% | 0653590008 |
| R1 | Resistor, 22, 10%, 2W | 0169940004 |
| R2 | Resistor, 10K, 10%, 1/2W | 0167240005 |
| R3 | Resistor, 10K, 10%, 1/2W | 0167240005 |
| R4 | Resistor, 33, 10%, 1W | 0165660007 |
| R5 | Resistor, 33, 10%, 1W | 0165660007 |
| R6 | Resistor, 1.2K, 5%, 1/2W | 0175960003 |
| R7 | Resistor, 1.2K, 5%, 1/2W | 0175960003 |
| R8 | Pot., 2K, 10%, 3/4W, 15 Turns | 0338490060 |
| R9 | Resistor, 100, 10%, 2W | 0163600007 |
| R10 | Resistor, 5.6K, 10%, 1/2W | 0185880002 |
| 1A3R11 | Resistor, 4.7K, 10%, 1/2W | 0169200001 |
| 1A3T1 | Transformer, Current | 6029040201 |
| 1A3T2 | Transformer, Current | 6029040201 |

6029080075 B



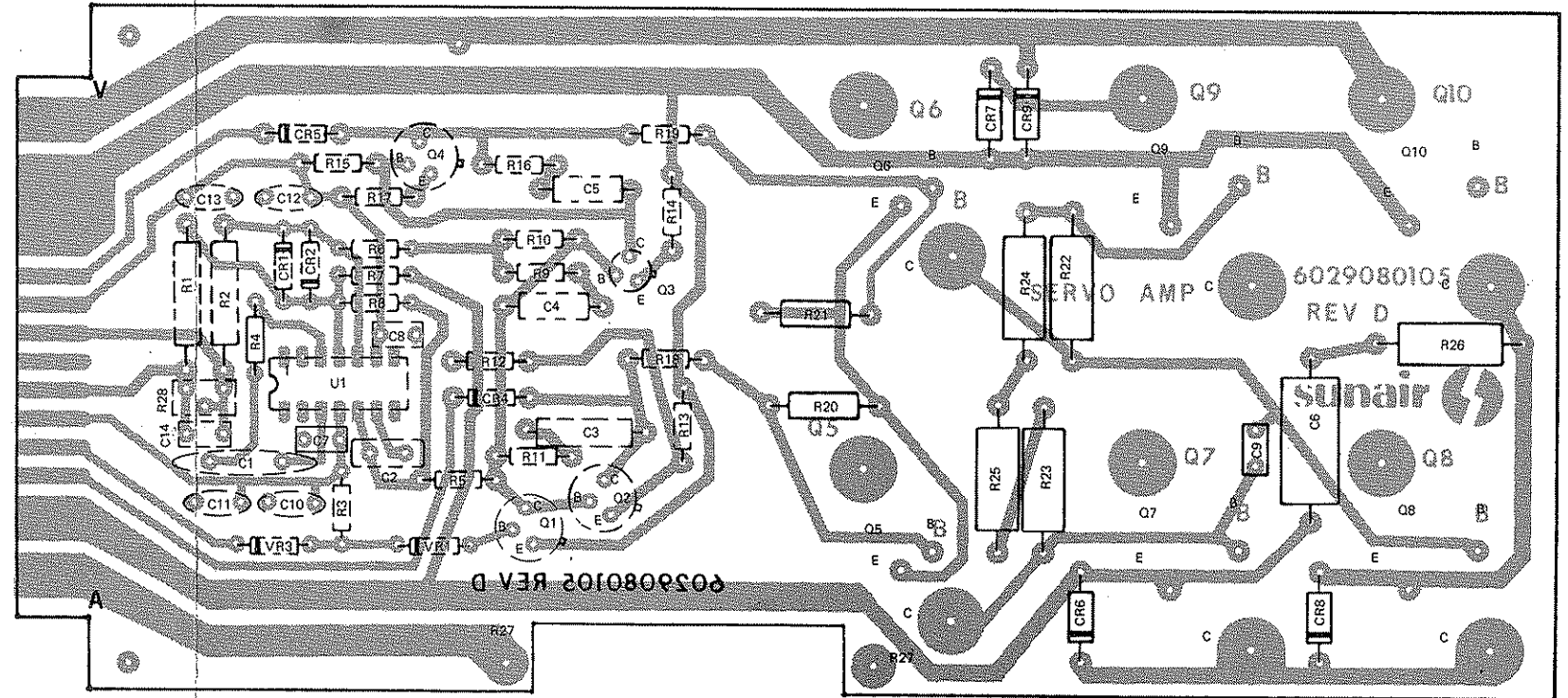
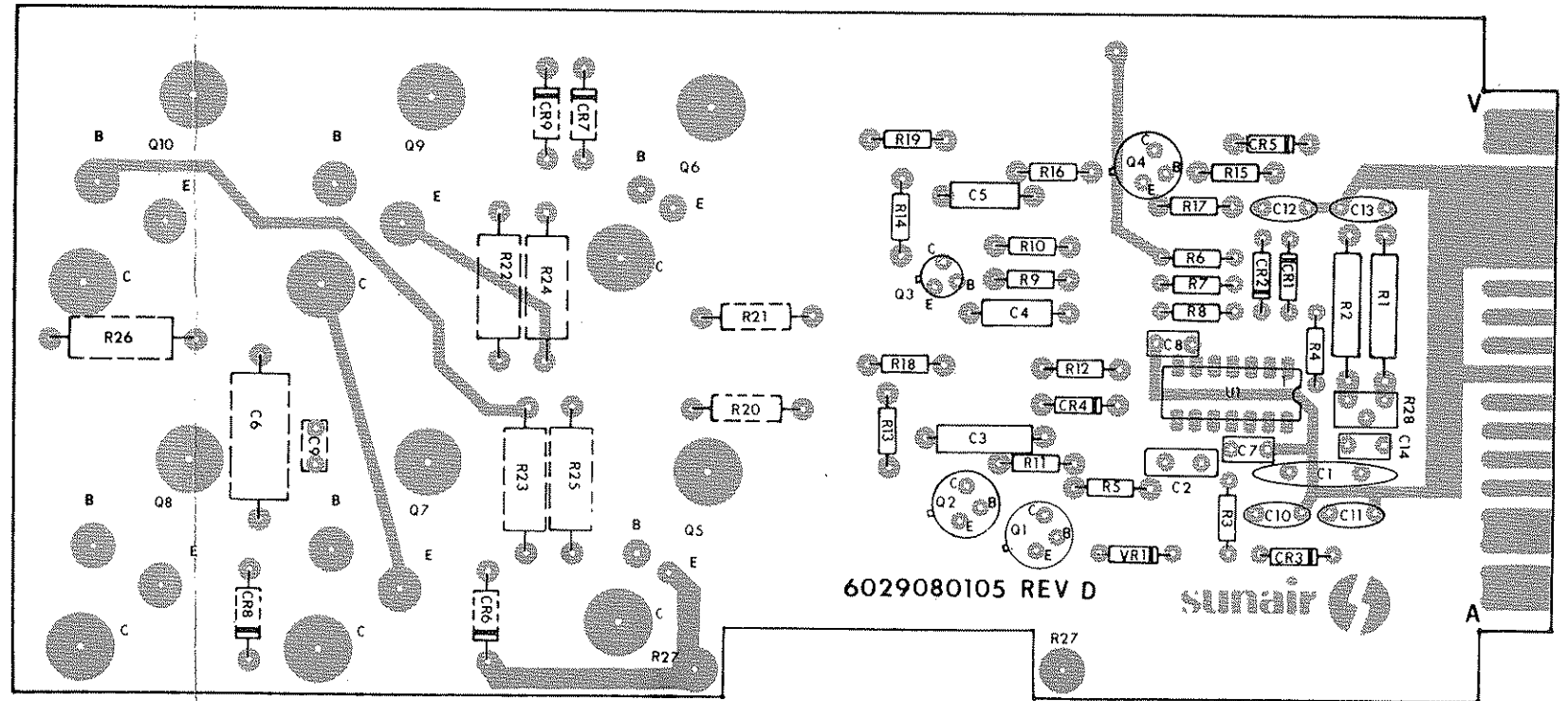
NOTES:
 1- REMOVE ENABLE GRD WHEN USING + OR - FORCING. DO NOT GRD BOTH FORCING INPUTS AT THE SAME TIME.
 2- UNLESS OTHERWISE INDICATED ALL RESISTOR VALUES ARE IN OHMS ALL CAPACITOR VALUES IN PICO FARADS AND ALL INDUCTANCE VALUES IN MICROHENRIES

Figure 5-11. Servo Amplifier (1A4 & 1A5)

6029080091L SERVO AMP 1A4, 1A5 ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|---------------------------------------|-----------------|
| | PC ASSY SERVO AMP. 1A4, 1A5 | 6029080091 |
| 1A1 | PCB, Servo Amplifier W/Hdw. | 6029080199 |
| 1A8 | PCB, Servo Amplifier W/Hdw. | 6029080199 |
| C1 | Cap., 0.0056 UF, 100 V, X5 R, 10% | 0282720006 |
| C2 | Cap. 200PF, 500 V, DM10, 5% | 0293050007 |
| C3 | Capacitor, .022 UF, 50 V, Mylar | 0297070001 |
| C4 | Capacitor, 0.01 UF, 200 V, Mylar | 0271870001 |
| C5 | Capacitor, 0.01 UF, 200 V, Mylar | 0271870001 |
| C6 | Capacitor, 0.10 UF, 100 V, Mylar | 0272160008 |
| C7 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C8 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C8 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C9 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| C10 | Capacitor, 0.01 UF, 25 V, X5S | 0281620008 |
| C11 | Capacitor, 0.001 UF, 100 V, X5 E, 10% | 0282080007 |
| C12 | Capacitor, 0.01 UF, 25 V, X5S | 0281620008 |
| C13 | Capacitor, 0.001 UF, 100 V, X5 E, 10% | 0282080007 |
| C14 | Capacitor, 0.47 UF, 50 V, X5 V, 20% | 0283370009 |
| CR1 | Diode, Signal, Si. 1N914 | 0442900007 |
| CR2 | Diode, Signal, Si. 1N914 | 0442900007 |
| CR3 | Diode, Signal, Si. 1N914 | 0442900007 |
| CR4 | Diode, Signal, Si. 1N914 | 0442900007 |
| CR5 | Diode, Signal, Si. 1N914 | 0442900007 |
| CR6 | Diode, Rectifier 1N4004 | 0405180004 |
| CR7 | Diode, Rectifier 1N4004 | 0405180004 |
| CR8 | Diode, Rectifier 1N4004 | 0405180004 |
| CR9 | Diode, Rectifier 1N4004 | 0405180004 |
| Q1 | Transistor, NPN, Si. 2N1711 | 0448380005 |
| Q2 | Transistor, NPN, Si. 2N1711 | 0448380005 |
| Q3 | Transistor, PNP, Si. 2N2907 A | 0448390001 |
| Q4 | Transistor, NPN, Si. 2N1893 | 0448350009 |
| Q5 | Transistor, PNP, Si. 2N3741 | 0448360004 |
| Q6 | Transistor, PNP, si. 2N3741 | 0448360004 |
| Q7 | Transistor, NPN, Si. 2N3772 | 0448370000 |
| Q8 | Transistor, NPN, Si. 2N3772 | 0448370000 |
| Q9 | Transistor, NPN, Si. 2N3772 | 0448370000 |
| Q10 | Transistor, NPN, Si. 2N3772 | 0448370000 |
| R1 | Resistor 2150, 1%, 1/2W | 0193480000 |
| R2 | Resistor 2150, 1%, 1/2W | 0193480000 |
| R3 | Resistor, 5.6K, 10%, 1/4W | 0183060008 |
| R4 | Resistor, 1.5K, 10%, 1/4W | 0172470005 |
| R5 | Resistor, 6.8K, 5%, 1/4W | 0174810008 |
| R6 | Resistor, 470K, 10%, 1/4W | 0180570005 |
| R7 | Resistor, 470K, 10%, 1/4W | 0180570005 |
| R8 | Resistor, 470K, 10%, 1/4W | 0180570005 |
| R9 | Resistor, 2.2K, 5%, 1/4W | 0178070009 |
| R10 | Resistor, 68K, 10%, 1/4W | 0175320006 |
| R11 | Resistor, 2.2K, 5%, 1/4W | 0178070009 |
| R12 | Resistor, 2.2K, 5%, 1/4W | 0178070009 |
| R13 | Resistor, 180, 10%, 1/4W | 0175220000 |
| R14 | Resistor, 180, 10%, 1/4W | 0175220000 |
| R15 | Resistor, 4.7K, 5%, 1/4W | 0170770001 |
| R16 | Resistor, 1.2K, 10%, 1/4W | 0181860007 |
| R17 | Resistor, 1K, 10%, 1/4W | 0171560001 |
| R18 | Resistor, 2.7K, 10%, 1/4W | 0186670001 |
| R19 | Resistor, 2.7K, 10%, 1/4W | 0186670001 |
| R20 | Resistor, 330, 10%, 1/2W | 0173380000 |
| R21 | Resistor, 330, 10%, 1/2W | 0173380000 |
| R22 | Resistor, 220, 10%, 1W | 0197190006 |
| R23 | Resistor, 220, 10%, 1W | 0197190006 |
| R24 | Resistor, 100, 10%, 1W | 0165540001 |
| R25 | Resistor, 100, 10%, 1W | 0165540001 |
| R26 | Resistor, 47, 10%, 1W | 0164490003 |
| R27 | Resistor, 0.1, 10%, 15W | 0193360004 |
| R28 | Pot. 20K, 10%, 1/4W 12 Turns | 1002840015 |
| U1 | IC Linear, Op. Amp. UA709 DC | 0447330004 |
| VR1 | Diode, Zener 1N5231B | 0405390009 |
| | Jack, PCB, Press-in | 0754100006 |
| | Jack, PCB, Press-in | 0754300009 |

SUNAIR GCU-1935



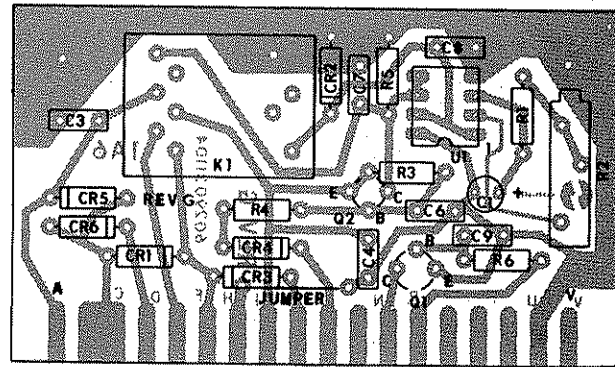


Figure 5-13. PCB Timer Board (1A6)

SUNAIR GCU-1935

6029031091L TIMER 1A6 ASSY.

| REF SYMBOL | DESCRIPTION | SUNAIR PART NO. |
|------------|----------------------------------|-----------------|
| | PC ASSY TIMER 1A6 GCU-1935 | 6029031091 |
| C1 | Capacitor, 2.2UF, 15V, T368 | 0296420000 |
| C2 | Not used | |
| C3 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| C4 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| C5 | Not used | |
| C6 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| C7 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| C8 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| C9 | Capacitor, 0.47UF, 50V, X5V, 20% | 0283370009 |
| CR1 | Diode, Rectifier 1N4004 | 0405180004 |
| CR2 | Diode, Rectifier 1N4004 | 0405180004 |
| CR3 | Diode, Rectifier 1N4004 | 0405180004 |
| CR4 | Diode, Rectifier 1N4004 | 0405180004 |
| CR5 | Diode, Rectifier 1N4004 | 0405180004 |
| CR6 | Diode, Rectifier 1N4004 | 0405180004 |
| K1 | Relay, DPDT, 24V, Plug-in 3A | 0667430008 |
| R1 | Resistor, 1M, 10%, 1/4W | 0170650006 |
| R2 | Pot. 1M, 10%, 3/4W, 15 Turns | 0338490116 |
| R3 | Resistor, 330, 5%, 1/4W | 0170910008 |
| R4 | Resistor, 2.7K, 10%, 1/4W | 0186670001 |
| R5 | Resistor, 27K, 10%, 1/4W | 0171200004 |
| R6 | Resistor, 390, 10%, 1/4W | 0178330001 |
| Q1 | Transistor, NPN, Si. 2N1711 | 0448380005 |
| Q2 | Transistor, PNP, Si. 2N2907A | 0448390001 |
| U1 | IC Linear LM3905N | 0448470004 |