CHAPTER 5

TROUBLESHOOTING AND REPAIR

5-1. GENERAL INFORMATION.

This section contains over-all troubleshooting, functional section troubleshooting, and maintenance information for Antenna Coupler Group AN/SRA-22. When performing troubleshooting outlined in this section, refer to the following schematic diagrams:

Figure 5-7. Coupler Control C-2698/SRA-22, Schematic Diagram.
Figure 5-8. Antenna Coupler CU-714/SRA-22, Schematic Diagram.
Figure 7-3. Interconnecting Diagram of Antenna Coupler Group AN/SRA-22 with Radio Set AN/XXX.
Figure 7-4. Interconnecting Diagram of Antenna Coupler Group AN/SRA-22 for Use as Separate Unit.

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

Table 5-1 lists the test equipment required. All special test assemblies required to test Antenna Coupler Group AN/SRA-22 are listed in table 5-2.

TABLE 5-1. TEST EQUIPMENT REQUIRED

NAME	JAN TYPE DESIGNATION	ALTERNATE	USE
Multimeter	AN/PSM-4	Simpson 260	Voltage and resistance measurement
Electronic Voltmeter	AN/USM-143	Hewlett-Packard 400H	R-f volts measurement
R-f Load	DA-91A/U	DA-88A/U	Non-reactive transmitter load

TABLE 5-2. SPECIAL TEST ASSEMBLIES

BUSHIPS DRAWING	NOMENCLATURE	APPLICATION
RE66C2145	Antenna Simulator (35-ft whip)	Non-radiating antenna substitute
	Radio Set AN/XXX	Power and control testing

5-3. OVER-ALL TROUBLESHOOTING.

a. PRELIMINARY CHECK. - The following sensory observations should be made as the first step in localizing the cause of trouble.

(1) Check fuse on Coupler Control C-2698/SRA-22 front panel. Refer to figure 2-2 for fuse location and table 2-3 for symptoms of probable fuse failure.

(2) Inspect plugs to connectors 2J1 through 2J6 on rear of coupler control for proper contact to connectors.

(3) Inspect plugs to connectors 1J7 and 1J8 on antenna coupler for proper contact to connectors.

(4) Inspect terminal board TB-5 for loose or poor connections.

(5) Inspect connection from antenna to antenna coupler terminal.

(6) Look for any physical damage to cables or equipment.

b. CONTROL SETTINGS. - All controls on the front panel of Coupler Control C-2698/SRA-22 should be set to the "home" positions indicated in paragraph 2-3b(1).

c. TYPICAL MALFUNCTIONS. - Before performing troubleshooting checks on the AN/SRA-22, some initial tests should be made to ascertain whether the difficulty lies in the antenna coupler or in related equipments and cables. Typical malfunctions, and diagnostic checks to isolate the cause, are outlined below:

(1) High VSWR indicated on reflected power meter; AN/SRA-22 cannot reduce.

(a) If high VSWR persists while on dummy load, check:

1. Coaxial connector 2P12 and cable for shorts and opens.
2. LOAD-ANT switch 2S1 for operation, defective contacts.

(b) If VSWR is low in LOAD position but remains high in ANT position, check:

1. Coaxial connector 2J3 and cable for shorts and opens.
2. Antenna transfer relay 2K3 proper switching contacts and coaxial connections.
3. Antenna, antenna insulator, and antenna lead from coupler to antenna.
4. Ground strap to CU-714/SRA-22 case and grounding spring (36) to metallic drum (see figure 6-1).

(2) AN/SRA-22 inoperative; COIL, TAP, and CAPACITOR drives do not work.

(a) If fuse 2F1 is good, check:

1. Ac power being supplied by associated transmitter (low voltage power supply turned on).
2. Plugs 2P5 and 2P6 making proper contact in rear of coupler control (115 volts ac between terminals 13 and 24 on TB-5).

(b) If fuse 2F1 blows repeatedly, check:

1. If fuse blows immediately, pull plug 2P5 free. If this clears fuse trouble, look for defective blower or shorted internal and external cables of antenna coupler. Otherwise, trouble is in the coupler control.
2. If fuse blows on operating TUNE-OPERATE switch 2S6 to TUNE position (plug 2P5 in place), trouble is indicated in COIL, TAP, or CAPACITOR drive circuits, or cable to antenna coupler.

5-4. FUNCTIONAL SECTION TROUBLESHOOTING.

a. ANTENNA COUPLER GROUP AN/SRA-22. - A malfunction exists either in Antenna Coupler Group AN/SRA-22 or in the antenna when a high VSWR persists, as indicated on the reflected r-f power meter, which the antenna coupler group cannot reduce. When it is determined that a malfunction exists in the antenna coupler group, the next step is to localize the trouble to a functional section. The functional sections of the antenna coupler group are the indicating sections, motor control sections, r-f power section, and low voltage power supply section. However, since the functional sections are distributed between the coupler control unit and the antenna coupler unit, it is simpler to make sure that the trouble is not in the coupler control unit before depressurizing and dismantling the antenna coupler unit.

To localize the faulty functional section, apply power to Antenna Coupler Group AN/SRA-22 by energizing the associated transmitter low voltage supply.

b. INDICATING CIRCUITS. - On Coupler Control Unit C-2698/SRA-22, hold the TUNE-OPERATE switch in the TUNE position and operate the COIL COARSE TUNE switch in the COARSE TUNE MAX position. The meter should swing from right deflection to left deflection to indicate coil movement. If the meter remains centered, power supply trouble is indicated. First verify that the primary is satisfactory by checking fuse 2F1, then operating CAPACITOR 12-position switch and noting that CAPACITOR run lamp lights. Further isolate the trouble by checking with a multimeter for the following dc voltages on terminal board TB-5 between terminal 12 (ground) and the indicated terminals.

Note

On all units fitted with terminal board TB-5, remove the protective cover to make measurements. Pin 1 of plug P5 corresponds to terminal 1 of TB-5, and so on.

CAUTION

This terminal board (TB-5) has 115 volts ac applied.

TERMINAL	INDICATION	PROBABLE CAUSE IF INDICATION IS ABSENT
5	+24 volts dc	Bad +24 volts dc rectifier (check 2CR1, 2CR2, 2R7, 2R3, and 2C12 in coupler control). Also check for grounds on cable and plugs.
9	+12 volts dc	If high, check coil receiving potentiometer 2R1; if low, check tap receiving potentiometer 2R2 in coupler control. If absent (and terminal 5 is all right), check for grounds on cable and plugs.
10	0 to +12 volts dc, varied by COIL COARSE TUNE switch	If voltage is not varied by COIL TUNE controls, trouble is indicated in the coil drive circuits in the coupler control. If voltage is absent (and terminal 5 is all right), trouble is indicated in coil transmitting potentiometer 1R6 in antenna coupler unit.
11	+12 to +24 volts dc, varied by TAP COARSE TUNE switch	If voltage is not varied by TAP TUNE controls, trouble is indicated in tap drive circuits in the coupler control. If voltage is absent (and terminal 5 is all right), trouble is indicated in tap transmitting potentiometer 1R7 in antenna coupler unit.

If the above checks are normal and the meter (one or both) remains centered, check the meter itself for an open, and the overload protective diodes 2CR3 through 2CR6 in the coupler control. If the meter remains fully deflected, try centering with the receiving potentiometer in the coupler control. A sudden "flop-over" indicates an open receiving potentiometer. Centering at a receiving potentiometer extremity indicates a possible open transmitting potentiometer in the antenna coupler.

c. MOTOR CONTROL CIRCUITS. - On Coupler Control C-2698/SRA-22, hold TUNE-OPERATE switch in TUNE position and set COIL COARSE TUNE-FINE TUNE switch to COARSE TUNE MAX position. The coil meter should swing from right deflection to left deflection to indicate coil movement. If no deflection is obtained and both the primary power supply and indicating circuits are satisfactory, check for 115 volts ac between terminal 24 (ac common) and the following terminals of terminal board TB-5.

TERMINAL	INDICATION	PROBABLE CAUSE IF INDICATION IS ABSENT
22 and 23	115 volts ac	If voltage is absent, check coil switch 2S3, relay 2K2, switch 2S6, and fuse 2F1. If voltage is present, check connector 1J7 and cable between TB-5 and antenna coupler. If cable is all right, check switch 1S12, capacitor 1C9, and meter 1B2. If trouble still exists, check for excessive mechanical friction or damage in gear train.
22 and 23	Pulsed 115 volts ac when COIL COARSE TUNE-FINE TUNE switch is in FINE TUNE position.	If voltage is absent, check capacitor 2C3, relays 2K1 and 2K2, and the components listed in the previous step.
20 and 21	115 volts ac when TAP COARSE TUNE-FINE TUNE switch is in COARSE TUNE position.	If voltage is absent, check tap switch 2S4, relay 2K2, switch 2S6, and fuse 2F1. If voltage is present, check connector 1J7 and cable between TB-5 and antenna coupler. If cable is all right, check switches 1S13 and 1S14, capacitor 1C8, and motor 1E3. If trouble still exists, check for excessive mechanical friction or damage in gear train.

TERMINAL	INDICATION	PROBABLE CAUSE IF INDICATION IS ABSENT
20 and 21	Pulsed 115 volts ac when TAP COARSE TUNE-FINE TUNE switch is in COARSE TUNE position.	If voltage is absent, check capacitor 2C3, relays 2K1 and 2K2, and the components listed in the previous step.

Consecutively operate the 12-position CAPACITOR switch 2S2 on the coupler control to each position, holding the TUNE-OPERATE switch in the TUNE position. Measure the control voltage between terminal 24 (ac common) and each of the following terminal board TB-5 terminals:

TERMINAL	INDICATION	PROBABLE CAUSE IF INDICATION IS ABSENT
	CAPACITOR RUN light should momentarily light at each position and the control voltage should measure 115 volts ac:	If voltage is present on some terminals but not on others, check switch 2S2 contacts. If voltage is absent on all terminals, check switch 2S6 and fuse 2F1. If voltage is normal, check switches 1S9, 1S10, 1S11, capacitor 1C5, and motor 1B4. If trouble still exists, check for excessive mechanical friction or damage in gear train.
2, 3	2S2 in position 1	
1, 2	2S2 in position 2	
1, 4	2S2 in position 3	
3	2S2 in position 4	
2	2S2 in position 5	
1	2S2 in position 6	
4	2S2 in position 7	
3, 4	2S2 in position 8	
2, 3, 4	2S2 in position 9	
1, 2, 3	2S2 in position 10	
1, 2, 4	2S2 in position 11	
1, 3, 4	2S2 in position 12	

d. R-F POWER SECTION. - The r-f power section consists of directional coupler subassembly 2A1, VSWR protector subassembly 2A2, r-f power meter 2M3, antenna switch 2S1, antenna transfer relay 2K3, coil 1L1, and switch 1S9.

(1) DIRECTIONAL COUPLER SUBASSEMBLY 2A1 AND R-F POWER METER 2M3. - Energize the equipment as described in the operating procedures, paragraph 2-3(b). Key the transmitter and observe the r-f power meter indication. With the transmitter unkeyed, reverse the cable to 2J1 and 2J2 on the coupler control. Hold TUNE-OPERATE switch in TUNE position. Key the transmitter and observe that the r-f power meter indication is the same as before. This indicates that the directional coupler and metering circuits are balanced and functioning properly. If the indication is not the same, remove directional coupler subassembly 2A1, check components, and replace ones defective. If no indication is obtained on the r-f power meter, check diodes 2A1CR1, 2A1CR2, REFLECTED-FORWARD switch 2S7, and r-f power meter 2M3.

(2) VSWR PROTECTIVE SUBASSEMBLY 2A2. - With the transmitter unkeyed, remove coaxial connector 2J3. Decrease the transmitter power output by minimizing the R-F EXCITER drive. Place the REFLECTED-FORWARD switch to 100 REFLECTED. Key the transmitter and slowly increase the R-F EXCITER drive until the system is automatically disabled.

CAUTION

DO NOT EXCEED 40 WATTS REFLECTED POWER.

The VSWR protective device should trip approximately 30 watts ±10 watts reflected power. The CAPACITOR run light should blink. If the system is not automatically disabled when a maximum of 40 watts reflected power is applied, check for proper operation of relay 2A2K1. If relay 2A2K1 is not energized, check for +28 volts dc between terminal 1 of relay 2A2K1 and ground. If absent, check relay coil 2A2K1, TUNE-OPERATE switch 2S6, and the 28 volts dc power supply. If the +28 volts dc between terminal 1 of relay 2A2K1 and ground is present, check for -0.5 volt dc across resistor 2A2R4. If this voltage is present, check rectifier 2A2CR4, resistor 2A2R5, and capacitor 2A2C1. If the -0.5 voltage is absent, check resistors 2A2R1 through

2A2R4, thermistor 2A2RT1, Zener diode 2A2CR2, and diode 2A2CR1. If relay 2A2K1 is energized and the system is not disabled, or the CAPACITOR run light does not blink, check contacts of relay 2A2K1.

(3) ANTENNA SWITCH 2S1, ANTENNA TRANSFER RELAY 2K3, COIL 1L1, AND SERIES-SHUNT SWITCH 1S9. - If a high VSWR is encountered when switching from the dummy load to the antenna that the antenna coupler cannot reduce, check for proper operation of relay 2K3 and its contacts. If relay 2K3 is functioning normally, check for continuity between plugs 2P11 and 2P12 with LOAD-ANT switch 2S1 in the ANT position. If an open or high resistance exists, replace switch 2S1. Check coil 1L1 and the transmission line between the coupler control and the antenna coupler by making a resistance check between the center conductor of the transmission line at plug 2P3 and ground. Vary the coil from maximum to minimum. If an open or high resistance exists, trouble is indicated in the transmission line or coil 1L1. If a large variation in resistance occurs as the coil is varied from maximum to minimum, trouble is indicated in coil 1L1. Check switch 1S9 and the antenna by making a resistance check between the antenna and ground. A ground should be indicated when the SERIES-SHUNT switch on the coupler control is in the SHUNT position. An open should be indicated when the SERIES-SHUNT switch is operated to the SERIES position. If a ground exists at both switch positions, disconnect the antenna at jack 1J10 and check the antenna for a ground. If an open exists at both switch positions, check switch 1S9.

5-5. CHECKOUT AND ALIGNMENT PROCEDURE.

a. INTRODUCTION. - This procedure is intended to provide the technician with a detailed, step-by-step procedure in checking the mechanical alignment and performing mechanical and electrical adjustments on Antenna Coupler Group AN/SRA-22.

At first glance, the gearing and drive mechanism of the antenna coupler group appears complex. However, the average technician can effect repairs and perform the necessary alignment of components if a few simple rules are observed.

1- READ INSTRUCTIONS CAREFULLY: Read and re-read pertinent instructions until you understand what is to be accomplished and how to go about it.

2- FOLLOW INSTRUCTIONS CAREFULLY: Use a systematic procedure one step at a time. DO NOT ATTEMPT SHORT CUTS!

3- WORK CAREFULLY: Take your time. Do not force any gears, as they are easily stripped.

b. PROCEDURE. - The alignment of the TAP and COIL receiving potentiometers is the only alignment procedure necessary in Coupler Control C-2698/SRA-22. Run the COIL and TAP potentiometers in the coupler control unit to their counterclockwise end stop. If the COIL and TAP dials on the front panel do not read zero, loosen the setscrews on the dials and, being careful not to turn the potentiometer shafts, set the dials to zero and tighten the setscrews.

After components have been replaced in Antenna Coupler CU-714/SRA-22, or if misalignment is suspected, the technician should perform the following steps.

(1) PRELIMINARY STEPS.

(a) Remove coupler from its case and place it in a cleared work space.

(b) Remove all black plastic shrouds from coupler to permit view and access to all moving parts.

(c) Turn to figure 6-1. Use this exploded view for locating and identifying components as directed in the following steps.

WARNING

IF NEW COIL OR TAP ASSEMBLIES ARE BEING INSTALLED, LEAVE POTENTIOMETER COUPLINGS LOOSE UNTIL STOPS ARE SET. OTHERWISE, THE POTENTIOMETER MAY BE INADVERTENTLY RUN THROUGH ITS OWN STOPS AND DAMAGED.

Note

When removing screws or setscrews, a 100-watt soldering iron should be used to apply heat to the sealant until it becomes soft. The screws can then be removed (while part is still hot) without stripping the threads or breaking the screw head.

(2) COIL STOP ADJUSTMENT.

(a) Manually rotate the coil until maximum ribbon is wound on the metallic drum. The coil stop should engage with approximately one-third turn left on the ceramic drum.

(b) If the coil stop is not set properly, as noted in step (a), it must be adjusted as follows.

1. Operate coil drums until coil stop cam (258) is clear of coil stop actuator (261).

2. Loosen two setscrews (260) in coil stop actuator (261). Adjust stop arm (282) so that stop pin (103) attached to gear (102) will miss stop mechanism on both sides as coil is rotated.

3. Carefully retighten setscrews (260) on coil stop actuator (261), making sure that coil stop assembly (282) remains as positioned in step 2.

4. Loosen setscrews (505) on coil stop cam (258).

5. Wind coil until exactly 1-1/2 turns of ribbon are left on ceramic drum.

6. Position coil stop cam (258) counterclockwise as viewed from rear of tuner until leading edge of cam (258) barely touches pin on coil stop actuator (261). See figure 5-1. Retighten setscrews (505) in coil stop cam (258).

7. Verify that coil stop action is positive by winding ribbon onto metallic drum and checking that coil comes to a stop with approximately 1/3 turn of ribbon left on ceramic drum.

8. Now wind coil onto ceramic drum and verify that coil stop engages with approximately 1/2 turn of ribbon remaining on metallic drum.

9. If coil stop action is not correct at each end of ribbon, repeat steps 5, 6, 7, and 8 until coil stop cam (258) is correctly positioned.

(c) Alignment of coil stop cam (258) also positions electrical limit switch 1S12 (506). It is necessary only to verify that the limit switch is functioning properly.

1. With an ohmmeter connected to the two terminals of switch 1S12 front (red wire and white-red-orange wire), wind ribbon onto ceramic drum. The contacts of switch 1S12 should open approximately 1/4 turn before the mechanical stop is reached.

2. With an ohmmeter connected to the two terminals of switch 1S12 rear (orange wire and white-green-brown wire), wind ribbon onto metallic drum. The contacts should open approximately 1/4 turn before the mechanical stop is reached.

(3) TAP STOP ADJUSTMENT.

(a) Rotate the coil until approximately 10 turns of ribbon are on the ceramic drum.

(b) Rotate the tap assembly until the tap approaches the point where the ribbon leaves the ceramic drum. The tap should stop within 1/3 turn from the point where the ribbon leaves the ceramic drum. The tap should never ride on the ribbon beyond the point where the ribbon leaves the ceramic drum as this might break or permanently damage the silver ribbon.

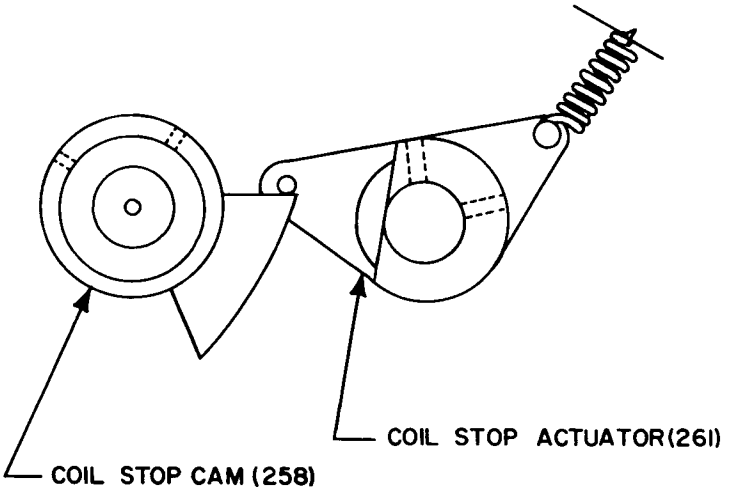


Figure 5-1. Coil Stop Cam Positioning

(c) If the tap stop does not function properly as noted in step (b), adjust the tap stop as follows.

1. Back off tap assembly until tap is approximately two turns from the point where ribbon leaves ceramic drum.

2. Remove the switch plate assembly (490) containing switches 1S13 and 1S14 by removing four screws (83 and 492) and sliding switch 1S13 carefully forward off shaft (356).

3. Loosen setscrews (355) on gear (359) and pull shaft (356) forward out of gear, being careful not to rotate gear.

4. Carefully disengage gear (359) from gear train and rotate it one tooth at a time clockwise or counterclockwise as necessary to properly set the stop. Reinsert shaft into gear (359) after each increment of adjustment and verify tap lower stop adjustment. Continue this procedure until tap stop is properly set.

5. Replace electrical limit switch plate assembly by sliding switch 1S13 carefully over flat portion of shaft (356) and secure switch plate (490) with four screws (83 and 492). Do not tighten setscrews (355) until electrical limit switches have been set.

(4) TAP ELECTRICAL LIMIT SWITCH ADJUSTMENT.

(a) Check that tap mechanical stop is functioning properly as described in step (3)(b) above. Setscrews (355) on gear (359) should be loose. Tap electrical lower limit switch 1S13 is set as follows.

1. Move tap 3/4 inch from the mechanical stop point checked in step (3)(b) above. With an ohmmeter or similar indicator connected to contacts of rotary switch 1S13, rotate switch shaft (356) until switch just opens, as indicated by ohmmeter. Tighten setscrew (355).

2. Verify adjustment by moving tap away from lower limit point, then back toward limit. Watch ohmmeter; when it just opens, the tap slider (129) should be 1/2 to 3/4 inch away from the point where the tap mechanical stop engages. If not correct, repeat adjustments until electrical limit switch functions properly. Tighten setscrews (355).

(b) Tap upper limit switch 1S14 is set in the following manner.

1. Connect an ohmmeter between contacts 3 and 4 on microswitch 1S14. Run the tap assembly against switch 1S14, using tap drive pinion (81). Switch 1S14 should open at a point where there is approximately 1/4 turn of ribbon left before the mechanical stop engages.

2. If upper limit switch 1S14 setting is wrong, adjust screw in microswitch arm (496) until setting is correct.

(5) COIL POTENTIOMETER 1R6 ADJUSTMENT.

(a) Loosen two setscrews (246) on potentiometer coupler (254). These are the two setscrews nearest to coil stop cam (258). Refer to figure 6-1.

(b) Connect test cable between coupler and coupler control units. Energize antenna coupler and run coil until maximum ribbon is wound onto metallic drum and minimum electrical limit stop operates. (Note direction of rotation of coil stop cam (258).)

(c) With coil in minimum stop position, gently rotate coil potentiometer 1R6 by turning coupler (254) in same direction that coil stop cam was rotating prior to engaging coil limit stop. Continue rotating coil potentiometer in this direction until its stop is reached. DO NOT FORCE POTENTIOMETER BEYOND ITS STOP!

(d) Now set coil dial on coupler control to 70 and back-rotate potentiometer 1R6 until coupler control coil meter reads 0. Lock setscrews (246).

(6) TAP POTENTIOMETER 1R7 ADJUSTMENT.

(a) Rotate coil until approximately 10 turns of ribbon are on the ceramic drum.

(b) Loosen the two setscrews (84) in coupler (85) on tap potentiometer shaft (90). Refer to figure 6-1. These are the two setscrews nearest the primary gear plate.

(c) Connect test cable between coupler and coupler control units. Energize coupler and run tap until minimum electrical limit stop operates (tap closest to point where ribbon leaves ceramic drum). Observe direction of rotation of gear (360) which is the tap potentiometer driven gear.

(d) With fingers, gently turn coupler in same direction that gear (360) was turning before minimum tap stop was reached. Continue rotating tap potentiometer in this direction until its stop is reached. DO NOT FORCE POTENTIOMETER BEYOND ITS STOP!

(e) Now set tap dial on coupler control to 70 and back-rotate potentiometer 1R7 until coupler control tap meter reads 0. Lock setscrews (84).

(7) VARIABLE CAPACITOR 1C7 ALIGNMENT.

(a) Operate variable vacuum capacitor 1C7 by rotating fiber gear (348) until plates are far apart (bellows compressed) as needed to disengage sector gear (381) from gear train.

(b) At this point, check setting of switch 1S10 as follows (see figure 5-2).

1. Rotate sector gear (381) until leading edge of sector aligns with outer edge of gear (383).

2. Verify that rotating contact of switch 1S10 is in alignment with contact 11, as shown in figure 5-2.

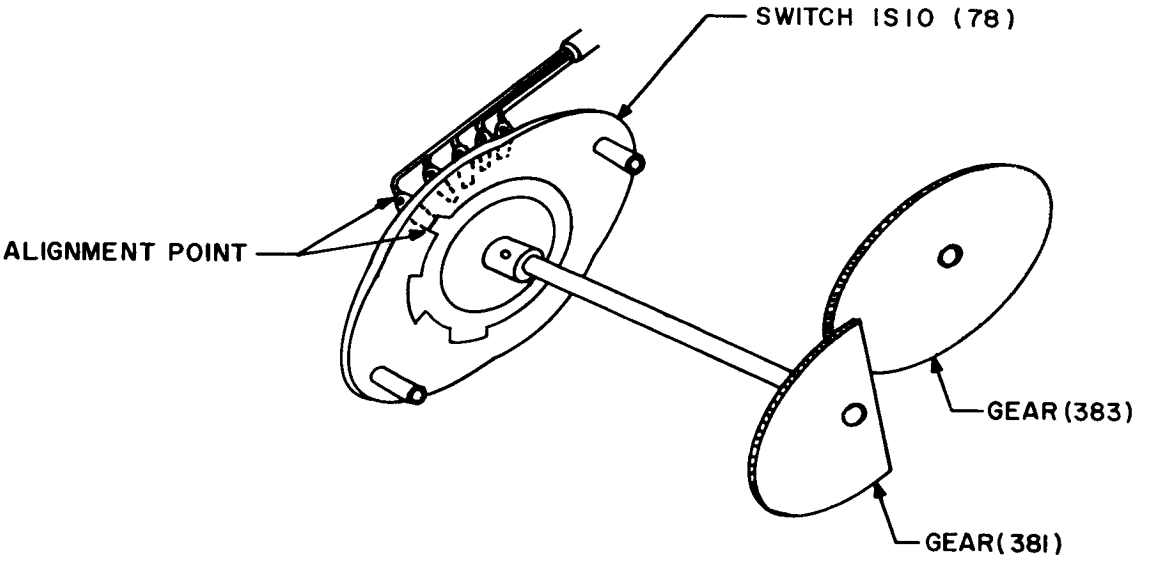


Figure 5-2. Capacitor Drive Switch 1S10 Alignment

(c) With sector gear (381) disengaged, turn fiber gear (348) to run capacitor toward maximum until plates are just beginning to engage. Mark the lead screw gear (179) with a non-conducting pencil to indicate its position.

(d) Now run capacitor gear train by hand toward minimum capacity (bellows compressed) exactly seven turns.

(e) Engage sector gear and run capacitor by hand toward maximum capacity (bellows expanded) until lead screw has completed three revolutions. This completes capacitor alignment.

c. FINAL CHECK.

(1) With test cable made up using plugs furnished with Field Change 5, connect Antenna Coupler CU-714/SRA-22 to Coupler Control C-2698/SRA-22.

(2) Energize the equipment and check all controls, electrical limit stops, and transmitting potentiometers for proper operation.

(3) De-energize the equipment and check that all setscrews and securing screws are properly tightened. A drop of varnish (glyptol) ion screws not provided with lockwashers is useful in preventing loosening of screws with vibration.

(4) EXERCISE EXTREME CARE THAT CABLE TO BLOWER UNIT IS ROUTED WELL CLEAR OF R-F ASSEMBLY. Replace black fiberglass shrouds and return unit to its case.

5-6. REMOVAL, ADJUSTMENT, REPAIR, AND REASSEMBLY OF PARTS AND SUBASSEMBLIES.

This section contains essential instructions for removal and disassembly of Coupler Control C-2698/SRA-22 and removal and replacement of tap assembly and coil assembly of Antenna Coupler CU-714/SRA-22. For complete overhaul and disassembly procedures, refer to Chapter 7.

a. REMOVAL AND DISASSEMBLY OF COUPLER CONTROL C-2698/SRA-22.

(1) Radio Set AN/XXX or associated transmitter should be de-energized and tagged.

(2) Release two fasteners on dust cover of coupler control and remove dust cover.

(3) Remove two screws that mount right side of coupler control to rack. This will allow unit to swing out.

(4) Remove coaxial connectors 2P1, 2P2, 2P3, and 2P4, and plugs 2P5 and 2P6 from connectors on rear panel of unit.

(5) Remove two screws that mount hinge to rack, holding unit to keep weight off hinge. Carefully lay unit on a bench.

(6) Remove coaxial plug 2P12 from directional coupler and plug 2P11 from relay 2K3.

(7) With a suitable wrench, remove nut and lockwasher from connector 2J1.

(8) Remove the 14 screws and lockwashers holding rear panel to chassis. This will allow the rear panel to swing down. Care should be taken not to damage the cable.

(9) Viewing coupler control from front, remove nine screws that mount front panel to chassis. This will allow front panel to swing down. Care should be taken not to damage cables.

(10) With front and rear panels removed, the disassembly or removal of components is obvious. Refer to figures 5-3, 5-4, 5-5, and 5-6 for location of components. The only adjustment necessary in this unit is that of potentiometers 2R1 and 2R2. Refer to paragraph 5-5b of this section for complete alignment.

(11) Perform the steps of paragraph 5-6a in reverse order for reassembly of front and rear panels.

b. REMOVAL AND REPLACEMENT OF ANTENNA COUPLER CU-714/SRA-22 COMPONENTS. - These procedures are presented in the order for complete disassembly of Antenna Coupler CU-714/SRA-22. However, for the removal procedures for any one component, refer to the applicable section of the procedure.

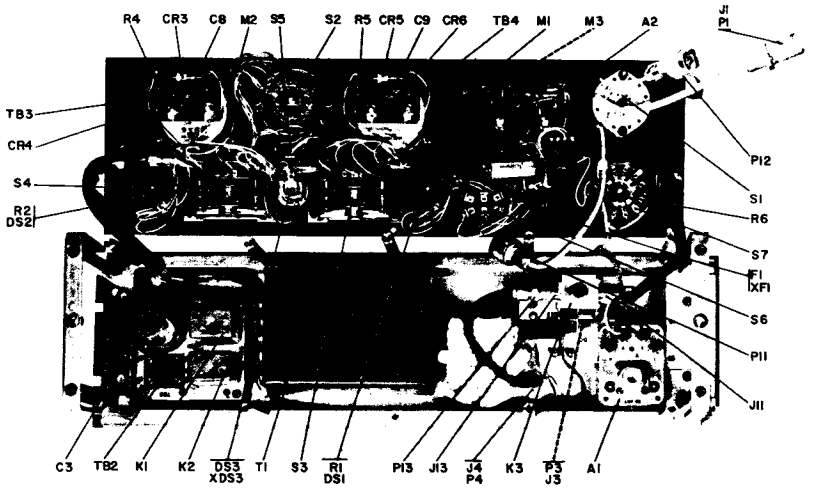


Figure 5-3. Coupler Control C-2698/SRA-22, Front Panel Removed

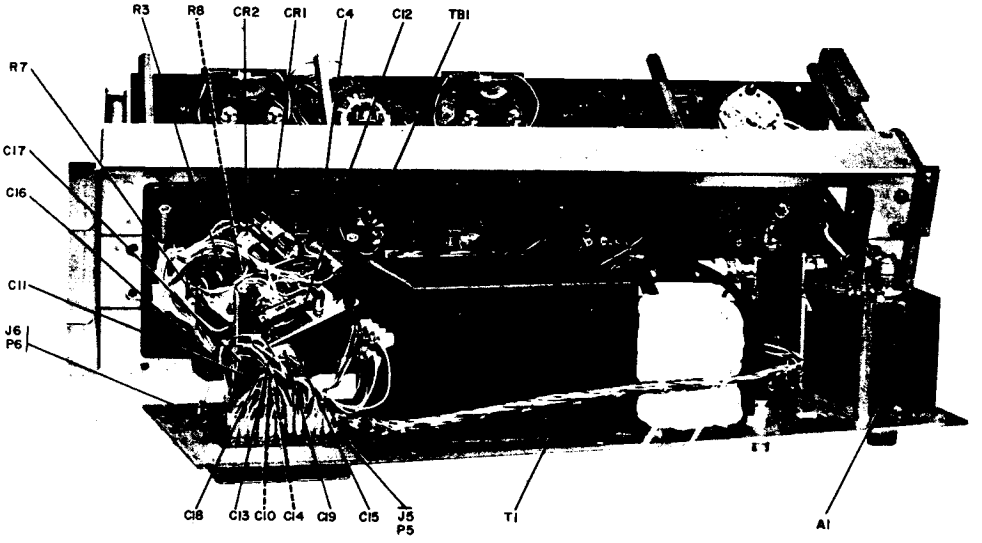


Figure 5-4. Coupler Control C-2698/SRA-22, Rear Panel Removed

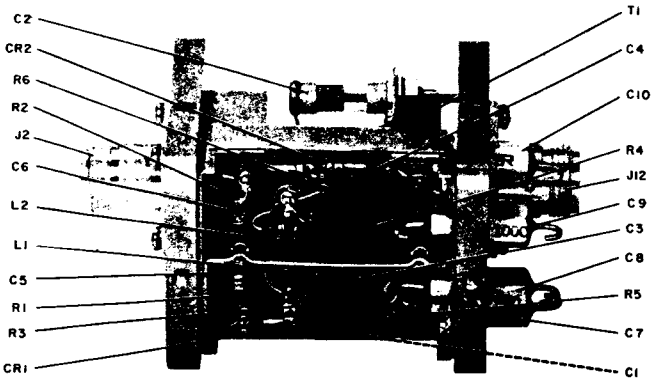


Figure 5-5. Coupler Control C-2698/SRA-22, Directional Coupler

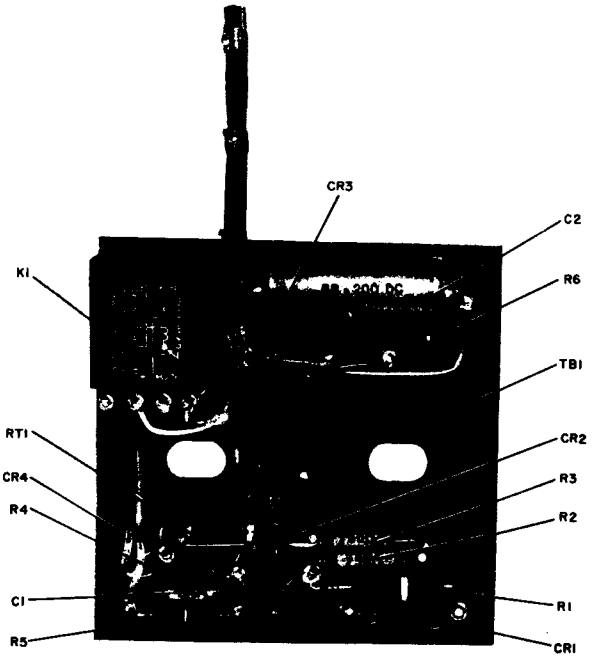


Figure 5-6. Coupler Control C-2698/SRA-22, VSWR Protector

(1) REMOVAL OF ANTENNA COUPLER UNIT FROM CASE. - Refer to figure 6-1 and proceed as follows.

(a) Remove plug 1P7 and coaxial connector 1P8 from connectors 1J7 and 1J8 (41 and 45) on antenna coupler unit.

(b) Disengage 12 captive screws (1) holding antenna coupler unit in its case.

(c) Pull unit out slowly from case, and disconnect jack 1J9 (460) from plug 1P9 (269). Remove gasket (2) and 28 screws (3, 6, 8, 11, and 14) holding shrouds (5, 10, 13, and 15) over coil drum assembly. Washers (7) and nuts (9 and 12) will also be removed by this procedure.

(2) TAP ASSEMBLY AND COIL ASSEMBLY REMOVAL AND REPLACEMENT. - Refer to figure 6-1 and proceed as follows.

(a) Remove antenna coupler unit from its case as outlined in paragraph 5-6b(1).

(b) Manually run coil and tap to maximum (all of coil ribbon wound on ceramic drum and tap assembly run toward capacitor end of drum). Secure ribbon to ceramic drum with tape. Holding drums securely, disengage ribbon from metallic drum by removing screw (105) and release tension carefully. Tape free end of ribbon to ceramic drum to prevent ribbon damage.

(c) Unsolder bus wire on connector 1J8 (45). Remove screws (19) (1 panhead and 5 flathead) from front plate. Pull plate straight forward until coil slug (28) clears ceramic drum, then allow front casting (49) to swing down. Care should be taken not to damage ceramic coil form or wires.

(d) Check core slug (28) for heat damage. Replace if necessary by removing nylon bolt (25) and core slug (28).

(e) Remove five screws (70) and three screws (70A) holding front plate (71). Swing front plate (71) to one side.

(f) Loosen three setscrews (73) to free collar (74) and gently remove ceramic coil assembly by sliding shaft out of collar (74).

(g) If ceramic drum is to be replaced, remove screw (145) from center of drum. Remove the drive assembly by removing six screws (157) along with washers (155 and 156) and nuts (154).

Note

When replacing drum drive assembly, make sure that assembly end-stop block is positioned in such a manner that tap contacts stop within 1/2 inch from hole where ribbon enters ceramic drum.

(h) To replace ribbon (144), solder new ribbon end to stud in ceramic drum hole and run ribbon onto drum in grooves provided. Tape loose end of ribbon to ceramic drum to prevent uncoiling.

(j) To remove aluminum drum (107), remove roll pin (75) and slide drum off shaft (103).

(k) Perform coil stop adjustments in paragraph 5-5b(2) and tap stop adjustments in paragraph 5-5b(3).

(m) Replace front plate (71) and front casting (49).

CAUTION

Be sure that grounding spring (36) of aluminum shorting drum is properly seated and making good mechanical contact.

(3) REMOVAL AND REPLACEMENT OF MOTORS AND GEARS. - Refer to figure 6-1 and proceed as follows.

(a) Remove coil and tap assemblies as outlined in paragraph 5-6b(2) (a through j).

(b) Remove switch 1S10 (78) from shaft of sector gear (381) by removing screws (76) and spacers (79).

(c) Remove gear (102) by removing roll pin (100).

(d) Using a spring hook, remove spring (303) from switch drive arm (304).

(e) Loosen two setscrews (260) in coil actuator stop (261).

Note

When separating primary and secondary gear plates, be careful that actuator stop (261) remains connected to spring (259) and is not lost.

(f) Disengage the capacitor lead screw (180) by rotating gear (277) clockwise or toward maximum capacitance.

(g) Unsolder h-v lead (181) from solder lug (228).

(h) Separate primary gear plate (419) from secondary gear plate (346) by removing screws (298), (310), (297), (492), and (305A) and carefully pulling the gear plates apart, keeping as many of the gears in place as possible.

Note

For easier separation of the gear plates, it has been found to be convenient to notch the primary gear plate at the hole where the cable from potentiometer 1R7 passes through the primary gear plate. This enables the cable to be freed from the gear plate without unsoldering each lead, and allows more freedom between the gear plates.

(j) With the secondary gear plate separated from the primary gear plate, any gear, motor, or other damaged part in the gear train can be replaced.

(k) To reassemble the gear plates, position the antenna coupler so that the secondary gear plate can be guided straight down on top of the primary gear plate. Line up the gear plates, placing coil actuator stop (261) in position on stop assembly shaft (282). Using a spring hook, position the gear shafts into their respective sleeves, making sure that all gears are free and that each section works freely.

(m) Replace all hardware and mount components that have been removed.

(n) Reconnect spring (303) on switch drive arm (304).

(p) Perform the replacement adjustments outlined in paragraph 5-6b(2) (k and m).

(4) REPLACEMENT OF ITEMS NOT REQUIRING THE SEPARATION OF GEAR PLATES. - Various items mounted on the primary and secondary gear plates can be replaced without the necessity of separating or unfastening the gear plates. Refer to figure 6-1 and proceed as follows.

(a) REPLACEMENT OF COIL INDICATOR POTENTIOMETER 1R6 AND COIL LIMIT SWITCH 1S12. - Remove coil indicator potentiometer 1R6 (255) by loosening setscrews (246) and removing four screws (252) that secure clamps (253). Unsolder the green-white-blue wire from potentiometer W (wiper) terminal, the two orange-white-brown wires from the CCW (counterclockwise) terminal, and the white-black-orange-red wire from the CW (clockwise) terminal.

Remove coil limit switch 1S12 (506) by loosening setscrews (246) and removing bracket (256), screws (247) and (248), and sliding switch 1S12 (506) off switch drive shaft (258). Unsolder white-red-orange wire from switch 1S12B terminal 10, white-brown-green wire from switch 1S12A terminal 3, red wire from switch 1S12B terminal 12, and orange wire from switch 1S12A terminal 8. Next, remove screws (499) to free switch wafer from bracket.

Replacement of coil indicator potentiometer 1R6 (255) and coil limit switch 1S12 (506) is the reverse of removal. However, when replacing switch 1S12 wafer, make sure that the red dot at terminal 1 of the wafer faces potentiometer 1R6.

CAUTION

Do not tighten setscrews (246) on coupler (254) until the potentiometer adjustment outlined in paragraph 5-5b(5) is performed.

(b) REPLACEMENT OF TAP INDICATOR POTENTIOMETER 1R7 AND TAP LIMIT SWITCHES 1S13 AND 1S14. - Remove tap indicator potentiometer 1R7 (90) by loosening setscrews (84) and removing four screws (88) that secure clamps (89). Unsolder red-white-green wire from the potentiometer W (wiper) terminal, orange-white-brown wire from the CCW (counterclockwise) terminal, and black wire from the CW (clockwise) terminal.

Remove tap limit switches 1S13 (495) and 1S14 (496) by loosening setscrews (84) on coupler (85) and removing four screws (492 and 83) that mount potentiometer bracket (498) and tap limit switch bracket (490) to primary gear plate (419). Switch 1S13 (495) may be replaced by unsoldering brown wire from terminal 10 (wiper arm) and orange-white-blue wire from terminal 12. Remove switch 1S13 wafer (495) from tap limit switch bracket (490) by removing screws (491). Switch 1S14 (496) may be replaced by unsoldering white-green-orange wire from terminal NC-2 and red-white-blue wire from terminal NC-1. Remove switch 1S14 (496) by grinding or drilling out two rivets holding switch to arm actuator bracket. When replacing switch 1S14 (496), use two Phillips panhead 2-56 NC-2A, 1/2-inch length machine screws (Collins part no. 343-0128-00), lockwashers (Collins part no. 310-6320-00), and hexagon nuts (Collins part no. 313-0037-00) in place of the rivets removed.

Replacement of tap indicator potentiometer 1R7 (90) and tap limit switches 1S13 (495) and 1S14 (496) is the reverse of removal.

CAUTION

Do not tighten setscrews (84) on coupler (85) until potentiometer adjustment outlined in 5-5b(6) is performed.

(c) REPLACEMENT OF VACUUM VARIABLE CAPACITOR 1C7. - To remove vacuum variable capacitor 1C7 (171), first run the capacitor by turning gear (348) until plates are as far apart (bellows compressed) as needed to disengage sector gear (381) from gear train. With sector gear (381) disengaged, run capacitor to maximum (plates meshed, bellows extended) until lead screw assembly (180) disengages. Remove bus wire connection screw (161) from top of capacitor (171) and three screws (164) from mounting flange. Lift capacitor 1C7 (171) up off lead screw (180) and corona shield (176).

Note

If ceramic standoffs (319) are to be replaced, follow procedure for replacing vacuum variable capacitor 1C7, except that four screws (172) holding corona shield are removed instead of three capacitor mounting flange screws (164). Standoff (319) may now be removed by unscrewing them from studs (318) and replaced.

Replace capacitor 1C7 (171) by placing it on corona shield (176) and rotating gear (348) until lead screw (180) engages into capacitor. Replace three screws (164), making sure that spark gap contact (166) and terminal lug (167) are in their proper place. Connect top terminal lug (163) to top of capacitor with screw (161). Perform adjustments outlined in paragraph 5-5b(7).

(d) REPLACEMENT OF CAPACITOR LIMIT SWITCH 1S11. - To remove capacitor limit switch 1S11 wafer (192), unsolder the leads listed in table 5-3.

TABLE 5-3. CAPACITOR LIMIT SWITCH 1S11 WIRE CONNECTIONS

CONTACT NO.	WIRE COLOR	NUMBER OF WIRES
1	White	2
2	Brown-white	2
3	Black-white	2
4	Not used	0
5	White-red-brown	1
6	White-blue-black	1
7	White	1

Remove self-locking nuts (190) and slide switch 1S11 wafer (192) off switch shaft (304). Replacement of the capacitor limit switch 1S11 wafer (192) is the reverse of removal.

(e) REPLACEMENT OF CAPACITOR SERIES-SHUNT SWITCH 1S9 AND CAPACITOR DRIVE SWITCH 1S10. - To remove capacitor series-shunt switch 1S9, remove three round nuts (196) from fiber standoff studs (236). Remove screw (200) from ground return standoff (233). Remove round nut (225) securing high voltage output lug (215) and screw (224) securing high voltage capacitor output lug (220). Exercise care not to damage round nuts (225) since they function as corona balls. Remove retainer ring (205) and slide switch plate (231) off switch shaft (304). Remove switch contact plate (245) from coupler (240) by removing screws (239). All switch contacts are now accessible and can be replaced by removing their respective retaining screws.

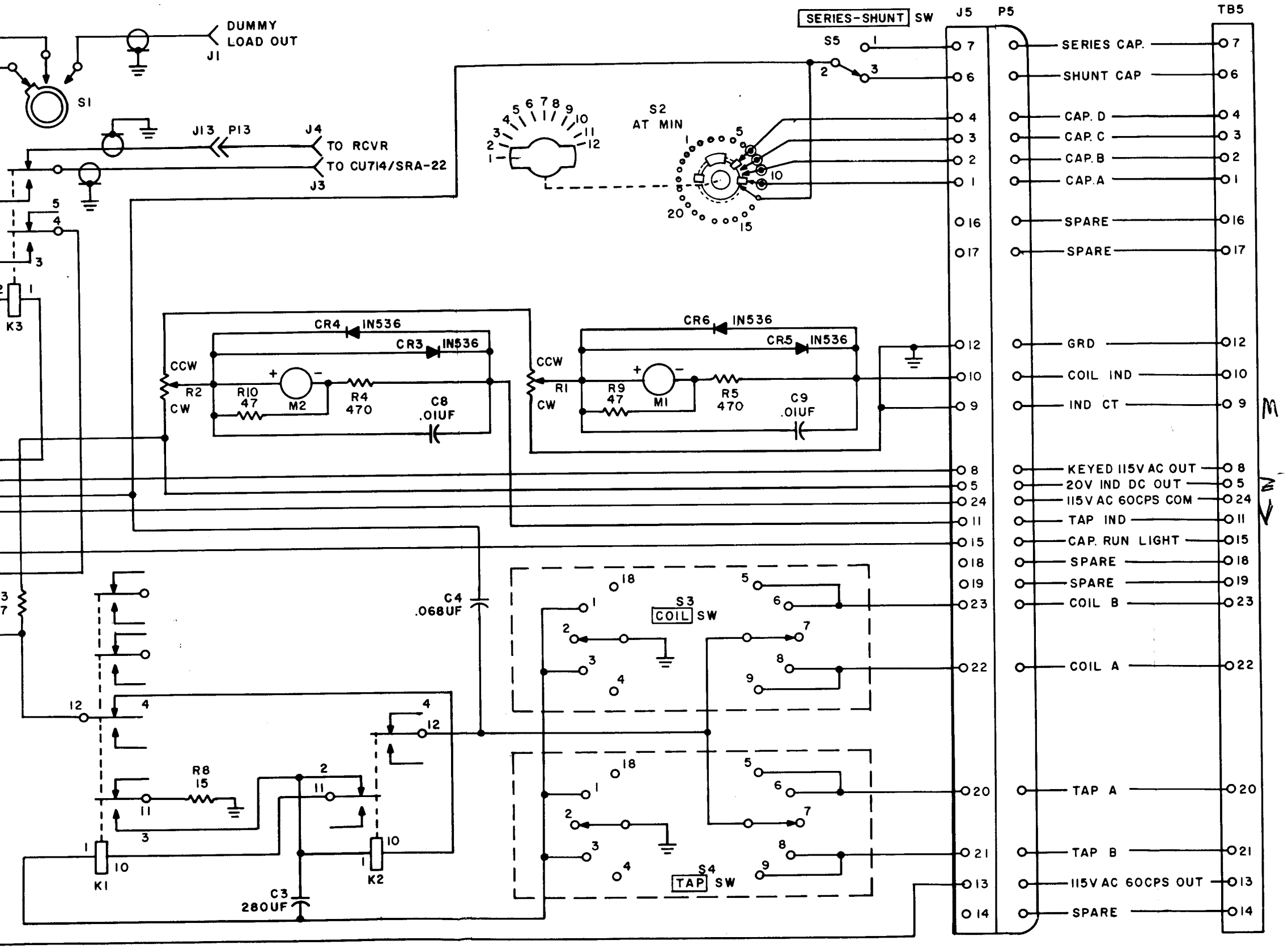
Replacement of capacitor series-shunt switch 1S9 is the reverse of removal.

To remove capacitor drive switch 1S10 (78) from shaft of sector gear (381), remove screws (76) and spacers (79). Unsolder the leads from the 1S10 switch contacts shown in table 5-4.

TABLE 5-4. CAPACITOR DRIVE SWITCH 1S10 WIRE CONNECTIONS

CONTACT NO.	WIRE COLOR	NUMBER OF WIRES
7	Blue-white	1
8	Black-red-white	1
9	Black-orange-white	1
10	Black-green-white and gray jumper to contacts 18 and 19	2
11	Red-orange-white-brown and white	2

Replacement of capacitor drive switch 1S10 is the reverse of removal.



NOTES:

1. AIR1 AND AIR2 SELECTED TO MATCH WITHIN 1%.
2. AIR3, AIR4, AIR5 AND AIR6 SELECTED VALUES ±1% AIR3-AIR4 SELECTED FROM RANGE BETWEEN 4750-6980 OHMS. AIR5-AIR6 SELECTED FROM RANGE BETWEEN 51.1 AND 1000 OHMS.
3. R9 AND R10 USED WITH MARION NULL INDICATOR METER ONLY.
4. MARION NULL INDICATOR METER IS NOT USED ON EQUIPMENT FROM SERIAL NUMBER 97 UP, EXCEPT FOR SERIAL NUMBERS 98,99,104 AND 108.
5. COMPONENTS R7 AND C12 ADDED SERIAL NUMBER 125 UP.
6. TRANSFORMER PRIMARY WIRED FOR 115V OPERATION. SEE BELOW FOR 230V OPERATION.
   a. REMOVE BUS JUMPERS FROM TRANSFORMER TERMINALS (1,3 AND 2,4).
   b. REMOVE THE TAPS WIRE (WHITE-GREEN TRACER) THAT GOES FROM T1-2 TO C4-1 (ON THE TERMINAL BOARD TB1) FROM T1-1 AND PLACE IT ON T1-3.
   c. JUMPER TERMINALS T1-2 AND T1-3 TOGETHER WITH BUS WIRE.
   d. CHANGE F1 TO 3/4 AMP.
7. R8 CHANGED TO 15 OHMS AND PLACED FROM K1 PIN 11 TO GROUND EFFECTIVE SERIAL NUMBER 217 AND UP.
8. S6 AND PA INTERLOCK NO.1 AND PA INTERLOCK NO.2 ADDED SERIAL NUMBER 336 AND UP.
9. TERMINAL BOARD TB5, CABLE AND PLUG P5 ASSEMBLY ADDED SERIAL NUMBER 336 AND UP.
10. C18 AND C19 ADDED SERIAL NUMBER 336 AND UP.
11. F1 CHANGED TO 1.5 AMP FAST-BLO SERIAL NUMBER 336 AND UP.
12. BUSHIPS HAS AUTHORIZED AN EIB FIELD CHANGE FOR EARLIER SERIAL NUMBER EQUIPMENT.
13. A2R2 AND A2R3 SELECTED FROM RANGE BETWEEN 215-825 OHMS.
14. ADD UNIT DESIGNATION "2" TO COMPONENT DESIGNATION FOR COMPLETE REFERENCE DESIGNATION. EXAMPLE: 2A2CR1

Figure 5-7. Coupler Control C-2698/SRA-22, Schematic Diagram

SEE NOTE 6

230V AC

AC COMMON

T1

F1 3/4 AMP

J6

115V AC TO UNIT

RF IN J2

DIRECTIONAL COUPLER (SUBASSEMBLY A1)

C1 .5-3Pf

CR1 IN82A

C3 500Pf

L1 220

C5 43Pf

T1

R1 10

R2 10

C6 43Pf

CR2 IN82A

C2 .5-3Pf

J12

P12

C4 500Pf

L2 220

R3 NOTE 2

R4 NOTE 2

C7 1000Pf

C8 1000Pf

R5 NOTE 2

R6 NOTE 2

C9 1000Pf

C10 1000Pf

NOTE 1

NOTE 1

WHITE (FWD 1000 WATT)

BLACK (FWD 100 WATT)

RED (REF 1000 WATT)

GREEN (REF 100 WATT)

REFLECTED 1000

FORWARD 1000

100

100

S7 (REAR VIEW)

M3 UA 2-200

R6 1K

P11 J11

S1

DUMMY LOAD OUT J1

J13 P13

J4 TO RCVR

J3 TO CU714/SRA-22

ANTENNA TRANSFER RELAY

K3

J6

XMIT INTLK NO. 1 — 14 — C14 .01UF

28V DC IN — 11 — C16 .01UF

KEY LINE — 12 — C17 .01UF

KEYED 115V AC IN — 13 — C13 .01UF

PA INTLK NO. 2 — 9 — C18 .01UF

PA INTLK NO. 1 — 8 — C19 .01UF

115V AC — 2

115V AC OUT — 10 — C10 .01UF

XMIT INTLK NO. 2 — 15 — C15 .01UF

INTLK NO. 3 — 7

GROUND — 16

115V AC COMMON — 1 — C11 .01UF

S6 TUNE ↔ OPERATE

F1 1.5 AMP

CAP RUN LIGHT DS3

T1

CR2 IN82

R7 20

C12 20UF

CR1 IN82

R6 270K

C2 .68UF

CR3 IN647

CR1 IN456

K1

VSWR PROTECTOR (SUBASSEMBLY A2)

R5 12K

C1 2.2UF

R4 75

RT1 100

R3 NOTE 13

R2 NOTE 13

R1 1000

CR4 2N 886

CR2 IN963B

CR4 IN536

CR3

CCW

R2

CW

R10 47

M2

R4 470

C8 .01U

R3 47

C .068U

R8 15

K1

K2

C3 280UF

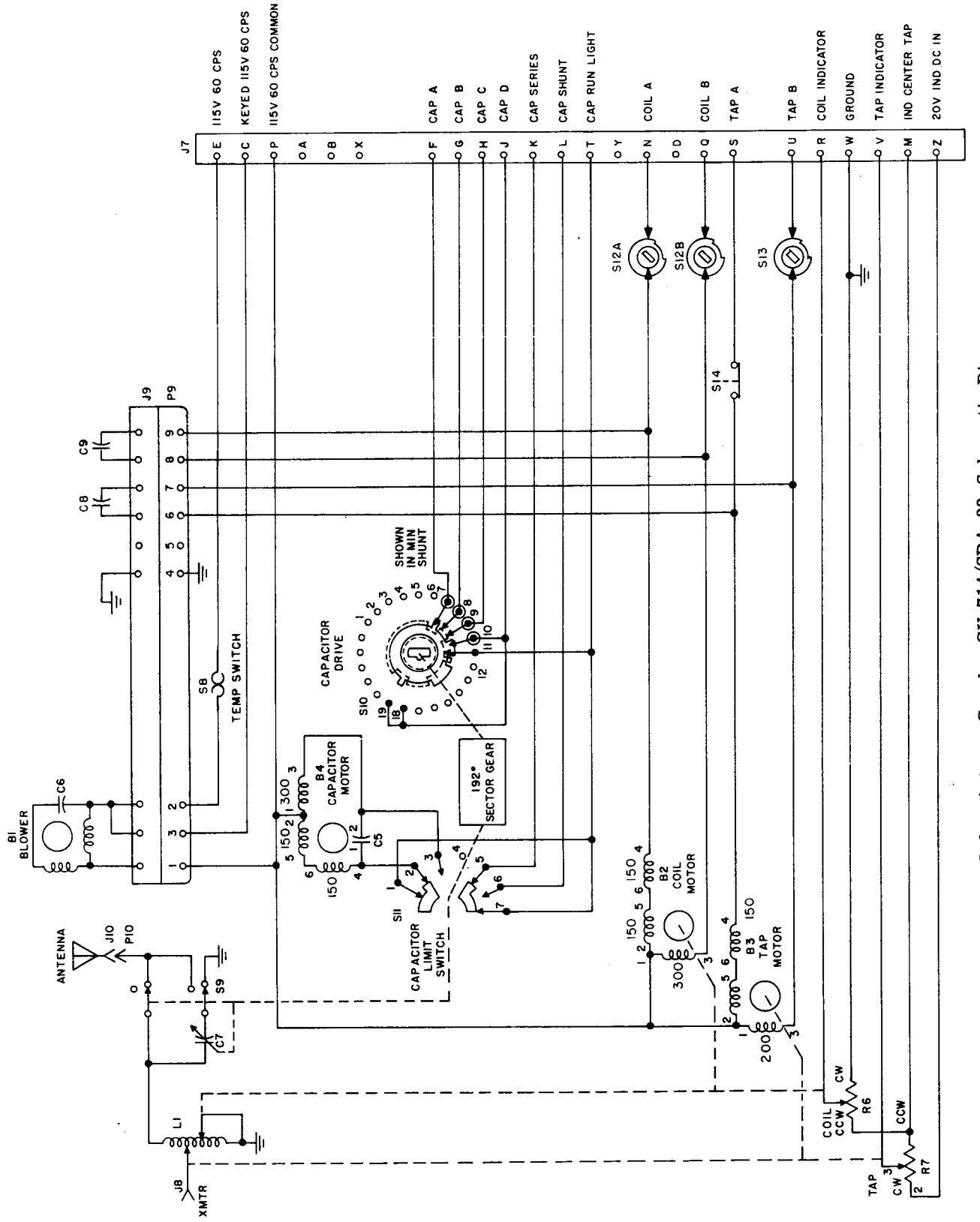


Figure 5-8. Antenna Coupler CU-714/SRA-22, Schematic Diagram