control and protection circuits are traced first. Thereafter, the circuits are traced in the sequence used to discuss their general theory. Simplified schematic diagrams are provided and referenced throughout the following paragraphs. In addition, reference should be made to the main schematics in section VII and to the definitions and relay and switch function tables in paragraph 4.3.1.

4.4.1 MOTOR CONTROL CIRCUITS.

The motor control circuits cause motors B401 and B501 to operate in one of two directions, driving variable inductor L401 and variable capacitor C501 toward either maximum or minimum, depending upon the positions of control circuit relays. Steps a through e outline the sequence of operation of motors B401 and B501 and the control circuit relays involved. Refer to figure 4-16 throughout the following discussion.

NOTE

The discussion in steps a through d assumes that terminal 2 and 9 of relays K705 and K706 are grounded directly. Actually, these terminals are grounded through contacts of limit switches S401A, S501, and S502.

a. Assume a capacitive error is seen by the phasing discriminator. Relay K703 is energized through contacts of switch S601, and relays K701, K704, K705, and K706 are de-energized. The black B401 lead is connected to 27.5 volts d-c through J401-4, P401-4, K703-13, K703-8, K706-14, and K706-10. The red B401 lead is connected to ground through J401-11, P401-11, K701-14, K701-10, K704-13, K704-7, K706-11, and K706-2. When connected in this manner, motor B401 drives variable inductor L401 toward maximum.

b. Assume an inductive error is seen by the phasing discriminator. Relay K704 is energized through contacts of switch S601, and relays K701, K703, K705, and K706 are de-energized. The red B401 lead is connected to 27.5 volts d-c through J401-11, P401-11, K701-14, K701-10, K704-13, K704-8, K705-14, and K705-10. The black B401 lead is connected to ground through J401-4, P401-4, K703-13, K703-7, K705-11, and K705-2. When connected in this manner, motor B401 drives variable inductor L401 toward minimum.

c. Assume the series tuning elements reach minimum. Relay K705 is energized and relays K701, K703, K704, and K706 are de-energized. The black B401 lead is connected to 27.5 volts d-c through J401-4, P401-4, K703-13, K703-7, K705-11, and K705-1. The red B401 lead is connected to ground through J401-11, P401-11, K701-14, K701-10,

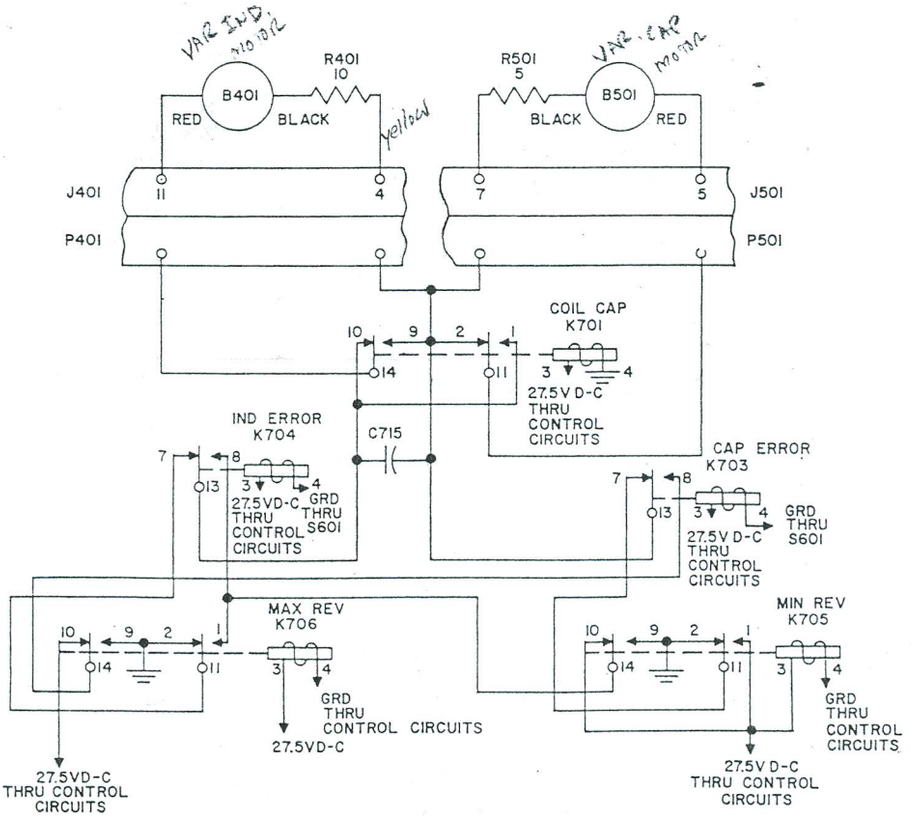


Figure 4-16. Motor Control Circuits, Simplified Schematic Diagram

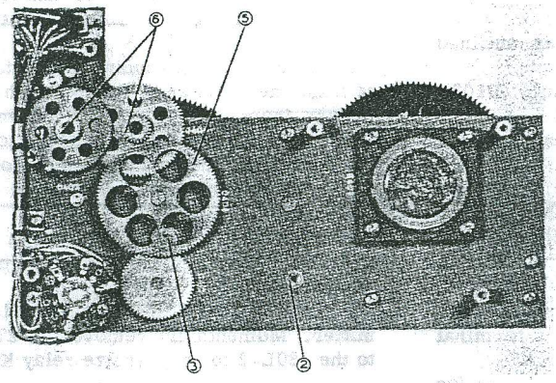


Figure 5-2. Variable Inductor Subassembly, Bottom View, Lubrication Points

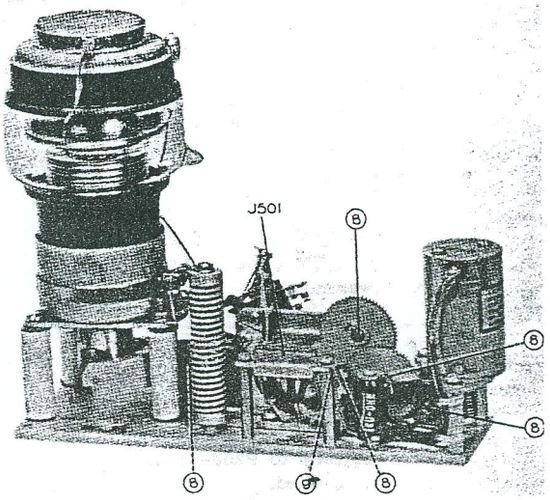


Figure 5-4. Variable Capacitor Subassembly, Rear View, Lubrication Points

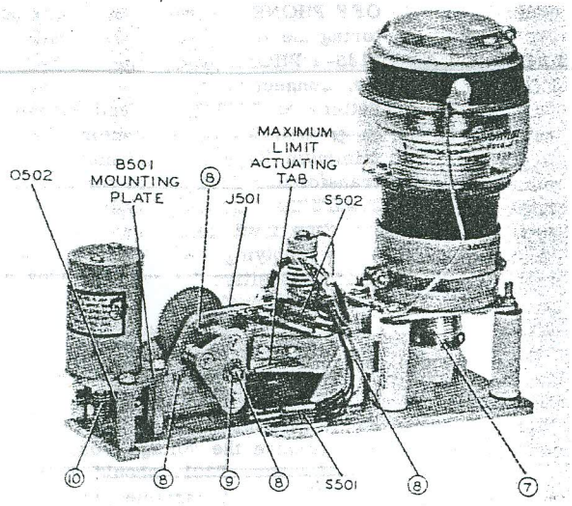


Figure 5-3. Variable Capacitor Subassembly, Front View, Lubrication Points

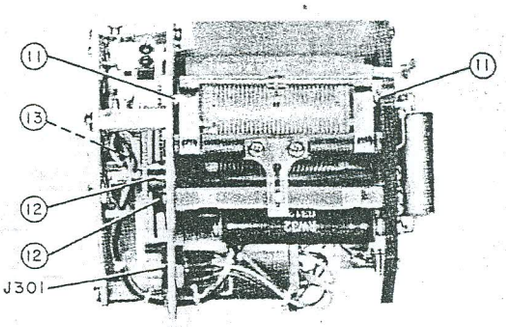


Figure 5-5. R-F Autotransformer Subassembly, Side View, Lubrication Points

TABLE 5-6. VARIABLE INDUCTOR SUBASSEMBLY, TROUBLE ISOLATION (Cont)

SYMPTOM	PROBABLE CAUSE	REMEDY
4. 180L-2 circuits do not function correctly as determined by mechanical cycle tests, paragraph 5.2.2.1.	1. Connector P401/J401 defective.	Replace or repair as necessary.
	2. Switch S401A, S401B, S402A, or S402B defective.	Replace or adjust defective switch.
	3. Mechanical linkage between B401 and switches defective.	Repair as necessary.
	4. Motor B401 defective.	Replace B401.

TABLE 5-7. VARIABLE CAPACITOR SUBASSEMBLY, TROUBLE ISOLATION

SYMPTOM	PROBABLE CAUSE	REMEDY
1. 180L-2 tunes continuously until relay K711 opens.	1. Variable capacitor C501 defective.	Replace C501.
	2. R-f line within variable capacitor subassembly open.	Repair as necessary.
2. Motor B501 fails to run.	1. Connector P501/J501 defective.	Replace or repair as necessary.
	2. Resistor R501 defective.	Replace R501.
	3. Motor B501 defective.	Replace B501.
	4. Switch S501 or S502 defective.	Replace or adjust defective switch.
3. 180L-2 circuits do not function correctly as determined by mechanical cycle tests, paragraph 5.2.2.1.	1. Connector P501/J501 defective.	Replace or repair as necessary.
	2. Resistor R501 defective.	Replace R501.
	3. Motor B501 defective.	Replace B501.
	4. Switch S501 or S502 defective.	Replace or adjust defective switch.
	5. Internal wiring of variable capacitor subassembly defective.	Repair as necessary.

5.3.3.2 RESISTANCE MEASUREMENTS. Table 5-8 lists typical resistance measurements for tubes V601, V602, and V603 and chopper G601. These resistance values are intended for trouble-shooting procedures and are not intended to be absolutely correct in measurement. Variations from the given values may occur with the equipment still in good operating condition. When making the resistance measurements, the equipment should be disconnected, and the main chassis dust cover and servo-amplifier cover removed. The

Care should be exercised during the disassembly and reassembly procedures to avoid loss of small parts, washers, and gears. In addition, a wiring diagram should be drawn before removal of any part requiring unsoldering of several wires. The diagram should show any color coding or markings of the wires and the terminals to which they are connected.

NOTE

Considerable time should be spent in trouble-shooting and adjustment procedures before attempting to disassemble the 180L-2 sub-assemblies. If, however, trouble is known to exist in a detailed part or group of detailed parts which is not readily accessible, applicable portions of disassembly procedures in paragraphs 5.3.4.1 through 5.3.4.3 should be followed. These procedures are not intended to infer that a unit should be disassembled regularly since this disturbs factory adjustments.

5.3.4.1 DISASSEMBLY, VARIABLE INDUCTOR SUBASSEMBLY. Perform the following operations when it is desired to disassemble the variable inductor subassembly for maintenance procedures. Refer to figure 5-20.

a. Remove the variable inductor subassembly as outlined in paragraph 5.3.2.1.
b. Manually rotate variable inductor L401 to the maximum position. Rotate until the mechanical stop functions and the tape is on the ceramic drum (1).
c. Remove the retaining ring from gear O428 (2).
d. Hold gear O432 (3) in place and remove gear O428 (2). Carefully release the tension on gear O432 (3).
e. Remove the Phillips-head screw securing the tape terminal lug (4) to the metal drum (5).
f. Wind end of tape on ceramic drum (1), and secure with cellulose or electrical tape.
g. Remove the retaining ring from gear O402 (6), and remove gear O402.
h. Remove one Phillips-head screw and washer securing resistor R401 (7).
i. Remove two Phillips-head screws securing motor B401 (8). Remove the lacing from the B401 leads, and unsolder the leads from jack J401 (9). Unsolder the B401 lead shield.
j. Loosen the setscrew of gear O406 (10), and drive out the groove pin (item 11). Remove gear O406.
k. Remove the retaining ring from gear O404 (12), and remove gear O404.
l. Remove one Phillips-head screw securing the cable clamp (13), and remove the cable clamp.
m. Remove two Phillips-head screws securing switch S402 (14) and switch S401 (15). If the switch wafers are being replaced, unsolder the leads, and identify in some manner for later replacement.
n. Remove four Phillips-head screws securing the ceramic drum core (16), and remove the ceramic drum core.
o. Remove eight Phillips-head screws securing to plate A402 (17) to the two end plates (18 and 19), th middle plate (20), and the rear plate (21). Remov top plate A402 (17) and the ceramic and metal drums
p. Remove six Phillips-head screws securing r-terminals E408 and E406 (22), r-f contact arms E40 and E405 (23), and plates (24).
q. Remove seven Phillips-head screws securing th two end plates (18 and 19), the middle plate (20), an the rear plate (21) to bottom plate A401 (25). Remov the end plates, middle plate, and rear plate.
r. Remove retaining ring from gear O417 (26), an remove gear O417 and stop lever arm O419 (27
s. Remove retaining rings from gears O413 (28 O410 (29), and O408 (30), and remove gears O41 O410, and O408 from bottom plate A401 (25).
t. Remove springs O424 and O425 (31) from post and remove springs O424 and O425.
u. Remove retaining rings securing cam stop O42 (32) to bottom plate A401, and remove cam stop O42
v. Unsolder the tape from the ceramic drum (1), an secure to the ceramic drum with cellulose or electri cal tape.
w. Remove two screws and washers securing th contact (33) to the ceramic drum (1), and remove th terminal strip.
x. Remove four Phillips-head screws securing gea O442 (34) to the ceramic drum (1), and remove gea O442.
y. Remove seven Phillip-head screws securing th metal drum end plates (35), and remove metal drum end plates.
z. Detach springs (36), and remove retaining rings from the two pins (37). Remove gear O432 (3)

5.3.4.2 DISASSEMBLY, VARIABLE CAPACITOR SUBASSEMBLY. Perform the following operations when it is desired to disassemble the variable capacitor subassembly for maintenance procedures. Refer to figure 5-21.

a. Remove the variable capacitor subassembly as outlined in paragraph 5.3.2.2.
b. Connect the 27.5-volt d-c power source between J501-7 and J501-15 (positive 27.5 volts d-c to J501-7 and negative 27.5 volts d-c to J501-15). A Cannon type DA-15S connector may be used to complete the test connections. Leave the power switch off until completion of step c.
c. Jumper terminals 5 and 10 of J501.

CAUTION

No mechanical stops are included with the variable capacitor subassembly. If switch S501 is defective, damage may result to the variable capacitor subassembly, if run beyond the electrical stop position. To avoid this possibility, the movement of C501 should be observed carefully, and the power removed if C501 attempts to run beyond the maximum limit.

Note: to drive capacitor to "minimum" put +27 VDC on Term 5, with a jumper between 2 & 7, neg 27 vd on 15.

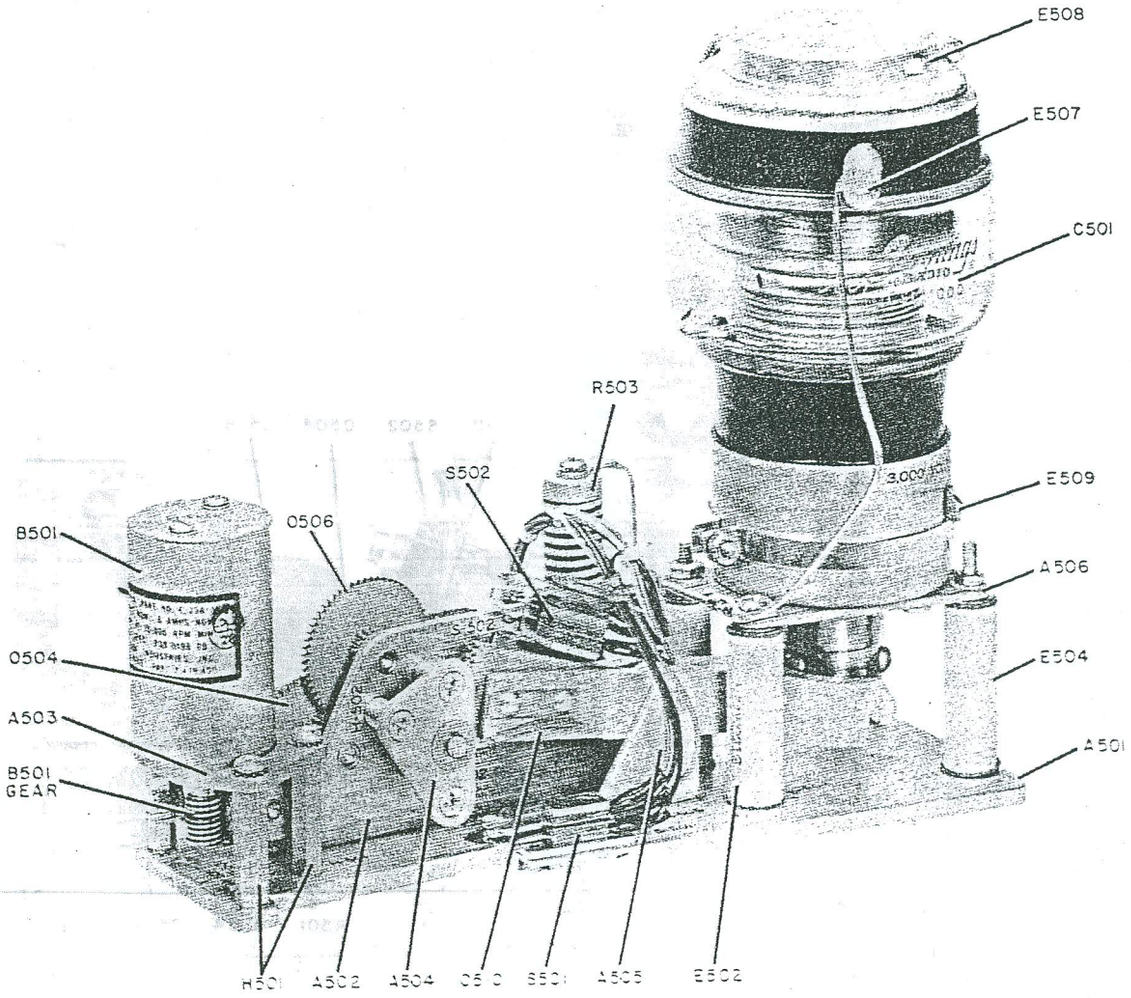


Figure 6-7. Variable Capacitor Subassembly, Front View

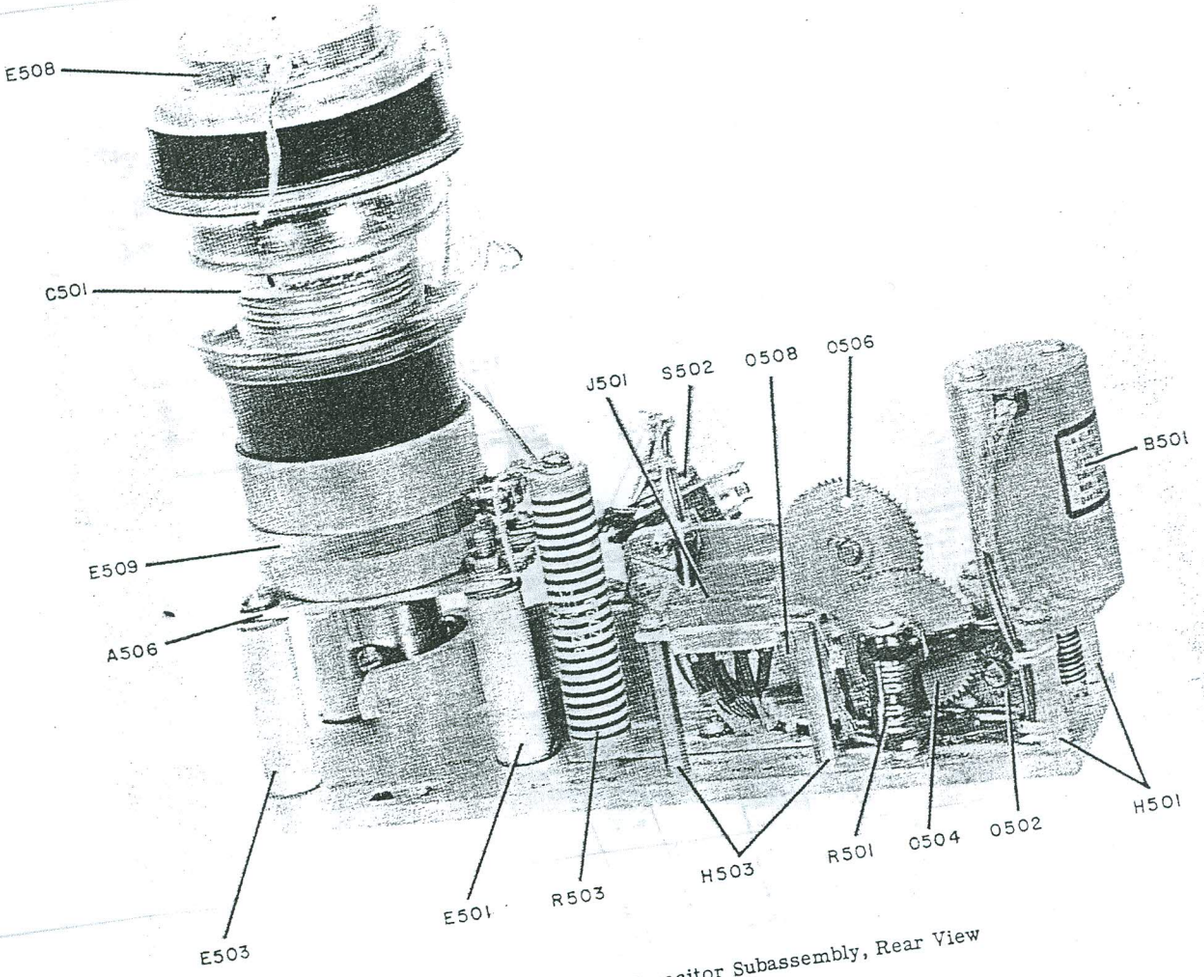


Figure 6-8. Variable Capacitor Subassembly, Rear View

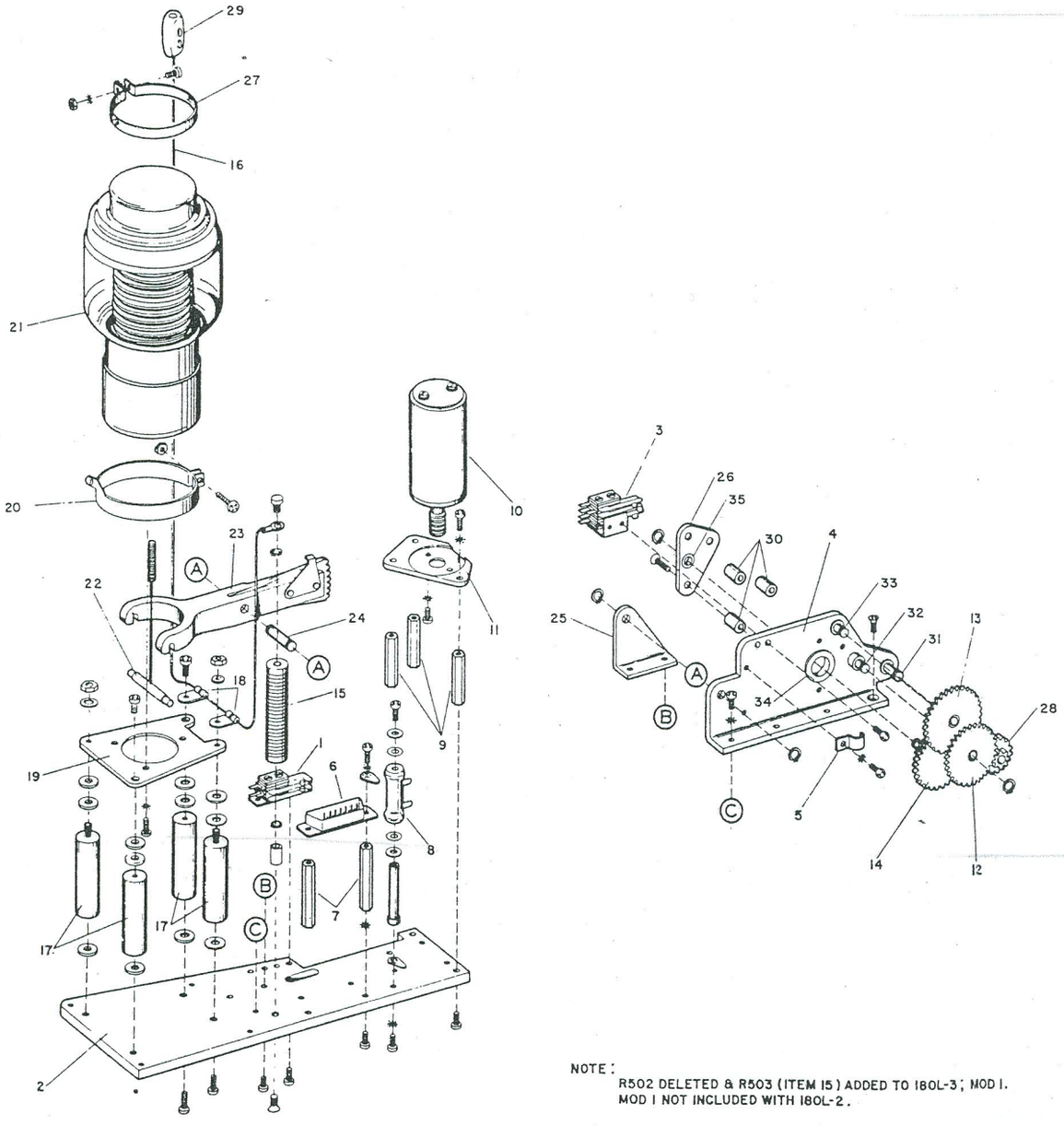
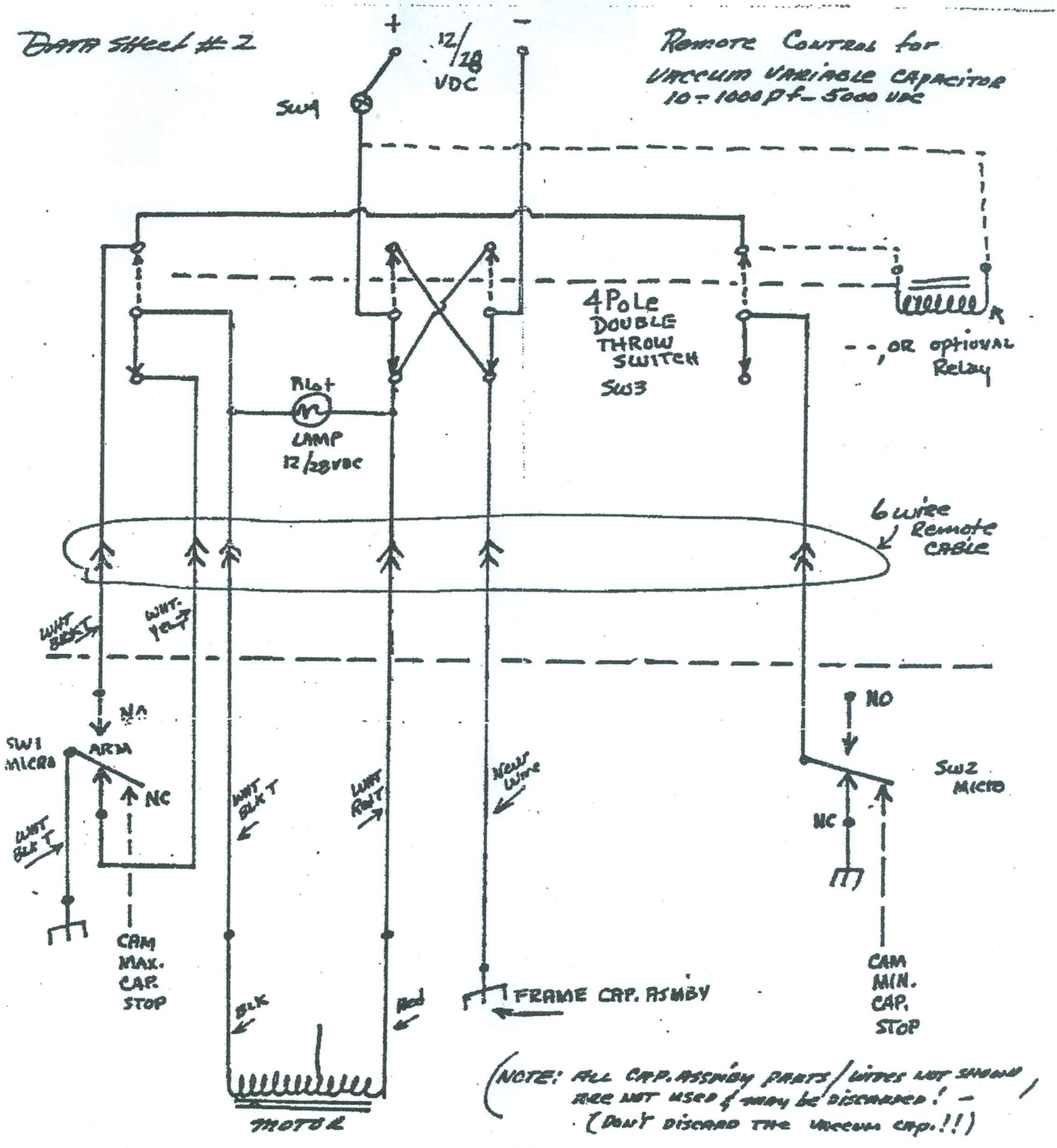


Figure 5-21. Variable Capacitor Subassembly, Exploded View

ITEM NO.	SYMBOL NO.	DESCRIPTION
1	S501	Switch
2	A501	Base plate
3	S502	Switch
4	A502	Gear plate
5		Cable clamp
6	J501	Jack
7	H503	Spacing posts
8	R501	Resistor
9	H501	Spacing posts
10	B501	Motor
11	A503	Motor mounting plate
12	O504	Gear assembly
13	O503	Gear assembly
14	O508	Gear assembly
15	R503	Resistor
16		R-f lead
17	E501, 2, 3, 4	Spacer insulators
18		R-f terminals
19	A506	C501 mounting plate
20	E509	Contact
21	C501	Variable capacitor
22	O514	Yoke bar
23	O510	Yoke
24	O513	Yoke shaft
25	A505	Yoke support plate
26	A504	Bearing plate
27	E508	Terminal clamp
28	O502	Gear assembly
29	E507	Connector
30	H502	Spacers
31	O503	Gear post
32	O505	Gear post
33	O507	Gear post
34	O511	Bearing
35	O512	Bearing

Data Sheet #2

Remote Control for
Vaccum Variable Capacitor
10 - 1000 pf - 5000 VDC



(NOTE: ALL CAP. ASSMBY PARTS / WIRES NOT SHOWN ARE NOT USED & MAY BE DISCARDED! — (DON'T DISCARD THE VACCUM CAP.!!)

AS SHOWN - SW4 IS ON - MOTOR IS MOVING TOWARD MAX. CAP. Pilot Lamp ON. AT MAX CAP - CAM SW1 PRESSES ARM from NC to NO STOPING MOTOR. Pilot Lamp is OFF. (RLY (IF USED) IS CONNECTED TO END THRU SW1 NO & SW3 IS AUTO CHANGED.) OTHERWISE SW3 MAY BE MANUALLY SWITCHED to START MOTOR TOWARD MIN. CAP - THEN SW1 ARM returns TO NC (normally closed) but END CONNECTION THRU SW2 CONTINUES MOTOR TOWARD min Cap until MIN. CAP. CAM SWITCHES SW2 TO NO (normally open).