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ALLIANCE
TENNA-ROTOR[®]
Service Manual

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THE **ALLIANCE** MANUFACTURING CO., INC. ALLIANCE, OHIO 44601
A NORTH AMERICAN PHILIPS COMPANY

Alliance

TENNA-ROTOR

SERVICE MANUAL

Models: T-10, U-83, K-22, K-22A, T-12, U-98, T-20, U-100, T-45,
C-225, C-225A

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TENNA-ROTORS® IN GENERAL

The Alliance Tenna-Rotor® consists of two units: the rotor unit, which mounts on the mast below the antenna, and the control box, which is placed on or about the TV receiver. These are interconnected by a four- or five-conductor cable.

The theory of operation concerns two separate circuits. The first is the power circuit, which in all Tenna-Rotors® transmits the power that actuates the motor and rotates the antenna. The second is the indicator or signal circuit, which reports the rotor's progress back to the control box. In the K-22, the signal circuit turns on the panel light when the rotor reaches the stop or end of rotation. In the T-10, T-12, T-20, and T-45, the signal circuit registers the antenna direction on the control box indicator. The signal circuit in the U-83, U-98, and U-100 actuates the escapement assemblies, causing the rotor to turn to the desired position automatically.

The Model C-225 is an automatic, transistorized unit using a unique patented Phase-sensing unit. The use of this bridge circuit results in extreme accuracy, quiet operation of control, and constant synchronization.

Rotation is attained from a reversible, capacitor-type 24 volt, AC motor and is limited by mechanical stops within the rotor housing. The U-83, U-98, and U-100 controls are protected by a thermostat within the rotor or control assembly.

The Alliance Tenna-Rotor® Models K-22, T-12, and U-98 produced after June 1, 1958, have been changed from a speed of 2 RPM to a speed of 1 RPM.

This change makes possible better orientation for "color" and "black and white" television reception, improves torque, braking, and general overall performance.

Kits are available to convert the T-10, U-83, K-22, T-12, and U-98 rotors manufactured before June 1, 1958, to 1 RPM.

INSTALLATION AND SERVICE HINTS . . .

1. Make sure all terminal connections are properly made and all leads tinned and securely attached. Make sure no loose strands of wire are shorting between terminals or between terminals and case of the rotor or control.

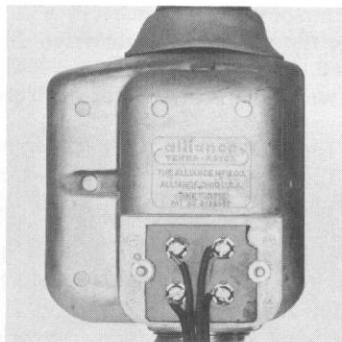


Fig. 1. Rotor Unit for Models T-10, U-83, K-22, K-22A, T-12, U-98, T-20, and U-100 Showing Terminal Connections.

2. For antenna installations in windy areas, and for installations consisting of more than two bays, it is advisable to use the Alliance Thrust Bracket (Fig. 3).

3. On Models U-83, K-22, U-98, U-100, and C-225, pointing the rear of the antenna toward the area containing the most stations will give minimum movement of the antenna to reach stations.

4. On Models T-10, T-12, T-20, and T-45, the antenna must point north when rotor is in its complete clockwise or counter-clockwise stop position. Rotors are shipped with

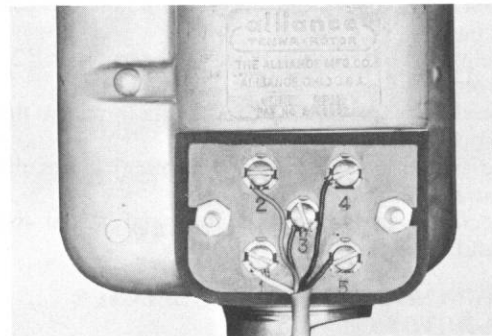


Fig. 2. Rotator Unit for Models T-45, C-225, and C-225A Showing Terminal Connections.

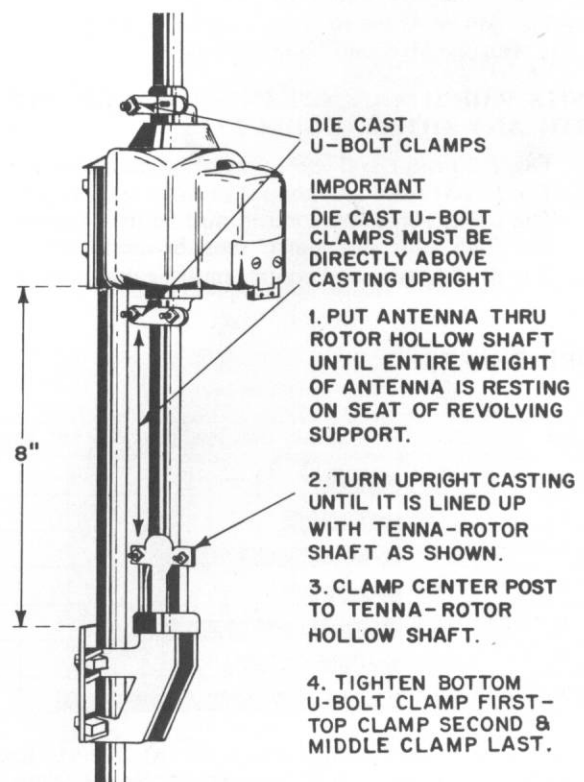


Fig. 3. Proper Installation Using Thrust Bracket.

General Information • Alliance Tenna-Rotor®

the shaft turned to the stop position. If unit is bench checked or moved from one location to another, be sure to turn rotor to the stop position before installing, with antenna oriented NORTH.

5. A section of wooden dowel inserted in the antenna masts where clamping brackets attach will make a much sturdier installation.

6. In the event that guying is necessary, guying holes are provided in all models.

CONNECTION OF CABLE ON 4 WIRE MODELS:

The silver wire connects to terminal #3 at the rotor and control.

The wire next to it connects to terminal #1 at rotor and control.

Third wire connects to terminal #2 at the rotor and control.

Fourth wire connects to terminal #4 at the rotor and control.

CONNECTION OF CABLE ON 5 WIRE MODELS:

Silver wire connects to terminal #1 at the rotor and control.

The wire next to it connects to terminal #2 at the rotor and control.

The third wire connects to terminal #3 at the rotor and control.

The fourth wire connects to terminal #4 at the rotor and control.

The fifth wire connects to terminal #5 at the rotor and control.

INTERCHANGEABILITY OF ALLIANCE TENNA-ROTORS®:

Model K-22 rotor or control is interchangeable with the ATR and F-4 models.

The Model T-12 rotor or control is interchangeable with the DIR and T-10 models.

The Model U-98 rotor or control is interchangeable with the HIR and U-83 models.

UNITS WHICH ARE NOT INTERCHANGEABLE WITH ANY OTHER MODELS:

The T-20 rotor and control must be used together.

The U-100 rotor and control must be used together.

The C-225 rotor and control must be used together.

The T-45 rotor and control must be used together.

The K-22A rotor and control must be used together.

WIRE CHARTS

AWG	STRANDING	50ft.	100ft.	150ft.	200ft.	250ft.	300ft.	350ft.	400ft.
22	7 x 30	█							
20	7 x 28	█	█						
20	DOUBLED 7 x 28	█	█	█					
20	10 x 30	█	█	█	█				
20	DOUBLED 10 x 30	█	█	█	█	█			
18	16 x 30	█	█	█	█	█	█		
18	DOUBLED 16 x 30	█	█	█	█	█	█	█	

Fig. 4A. Rotor Lead Length Chart for All Models Except Model T-20. Maximum Resistance Allowable, 1.2 Ohms per Lead.

IMPORTANT FOR PROPER PERFORMANCE DO NOT EXCEED THE MAXIMUM LENGTHS PER WIRE SIZE (AWG) ON CHART

AWG	STRANDING	50ft.	100ft.	150ft.	200ft.	250ft.	300ft.	350ft.	400ft.
22	7 x 30	█							
20	7 x 28	█	█						
20	DOUBLED 7 x 28	█	█	█					
20	10 x 30	█	█	█	█				
20	DOUBLED 10 x 30	█	█	█	█	█			
18	16 x 30	█	█	█	█	█	█		
18	DOUBLED 16 x 30	█	█	█	█	█	█	█	

Note: Use cable with copper wire conductors only. DO NOT USE COPPER CLAD STEEL.

Fig. 4B. Rotor Lead Length Chart for Model T-20. Maximum Resistance Allowable, 1 Ohm Per Lead.

IMPORTANT USE A GOOD GRADE OF COPPER ONLY. DO NOT USE COPPER CLAD STEEL WIRE. DO NOT EXCEED MAXIMUM LENGTHS PER CHART.

AWG	Ft/Ohm	All Rotors Except T-20 Maximum Length (Ft)	T-20 Maximum Length (Ft)
18	156.5	190	156
*18 doubled	313	380	313
16	249	275	225
14	396	435	350
12	629.6	700	565
10	1001	1100	900
9	1262	1390	1135
8	1592	1750	1430

* Two Lengths of 4 or 5 Conductor Cable in Parallel. The Larger Gage Wire; i. e., 16 Gage or Larger Can Be Connected to Short Runs of #20 Gage Cable for Connection to Rotor and Control. Maximum Lengths Given Above Allows for 10' of #20 for All Gages #16 or Larger.

Fig. 5. Wire Chart for Extra Long Runs of Cable for All Models. For Proper Performance, the Allowable Total Resistance Per Load on All Models, Except the T-20 is 1.2 Ohms. On T-20 Units, the Resistance is 1.0 Ohm.

USE OF TWO (2) OR MORE ALLIANCE TENNA-ROTOR CONTROLS WITH ONE (1) ROTOR

Two or more controls can be used with one rotor on Models K-22, K-22A, T-10, T-12, T-20, and T-45.

Procedure

1. Connect one control to rotor per instructions received with the Alliance Tenna-Rotor, using No. 20 cable or larger. Check chart on instruction sheet for runs of more than 125 ft. Do not exceed total length for size required.

The K-22, K-22A, T-10, T-12, and T-20 Alliance Tenna-Rotors use four-conductor cable. The T-45 Tenna-Rotor uses five-conductor cable.

2. Remove the motor capacitor from all additional controls to be used.

The K-22 and T-10 Tenna-Rotor controls have a 4098-A capacitor.

The T-12 Tenna-Rotor control has a 4098-B capacitor.

The T-20 Tenna-Rotor control has an 8588-B capacitor.

The T-45 and K-22A Tenna-Rotor controls have a 18061-A capacitor.

3. Connect all controls in Parallel to the first control; that is, connect terminal 1 of first control to terminal 1 of additional control or controls. Connect terminal 2 of first control to terminal 2 of additional control or controls, etc.

Two controls CAN NOT be used with the Alliance Tenna-Rotors U-83, U-98, U-100, C-225, or C-225A.

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model T-10 is actuated by depressing the right or left end of the bar switch located on top of the control box. Depressing the right end rotates the antenna clockwise and depressing the left end rotates the antenna counterclockwise. The antenna direction is registered on a direction indicator, located on the front of the control case. The direction indicator is actually a voltmeter which measures the voltage across a potentiometer mounted in the rotator unit. Rotating the antenna varies the voltage across the potentiometer causing the meter to register. The unit can be identified by the red neoprene weather shield and the new style rotator housing (Figure 1). This unit operates at a speed of two RPM and a motor brake has been included to prevent drifting and windmilling.

The T-10 rotor may be converted to a speed of one RPM by use of our RCR Kit B.

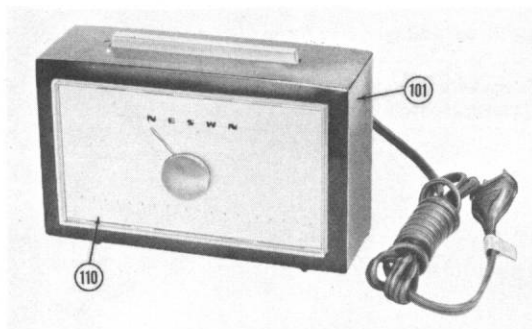


Fig. 6 Control Box—Model T-10.

SERVICING PROCEDURE

Power-off Checks

1. Be sure that four-conductor cable is connected to proper terminals. Terminal No. 1 in the rotator should be connected to terminal No. 1 on the control box, and so on with No.'s 2, 3, and 4.

2. Hollow shaft (Item #4) must have "play."

3. Primary input contacts (Item #109) within the control box should make solid contact for left and right positions, and should have approximately $\frac{1}{16}$ inch clearance in open position.

Power-on Checks

1. Line voltage should be approximately 115 volts.

2. Run unit to counterclockwise stop by depressing left end of control bar (Item #107). Indicator pointer should decrease steadily, stopping at the left side of the dial when the rotator reaches the counterclockwise stop.

3. Run unit to clockwise stop by depressing end of control bar. Indicator pointer should increase steadily, stopping at the extreme right end of the dial when the rotator reaches the clockwise stop.

4. Adjust calibrating rheostat (Item #108) for full-scale north reading, when unit is at full clockwise stop.

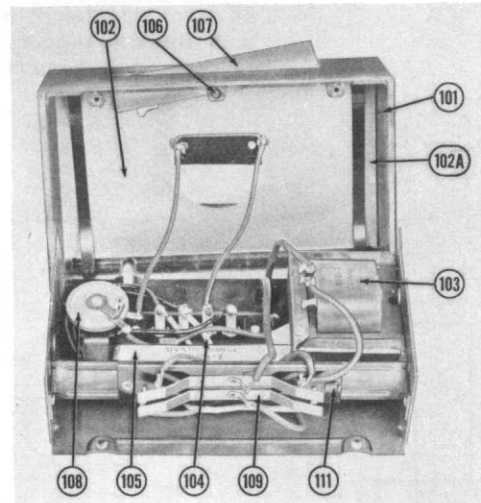


Fig. 7. Internal Components—Model T-10 Control Box.

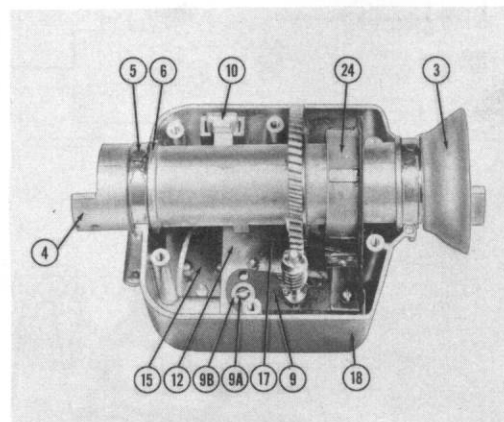


Fig. 8. Internal Components—Model T-10 Rotator Unit.

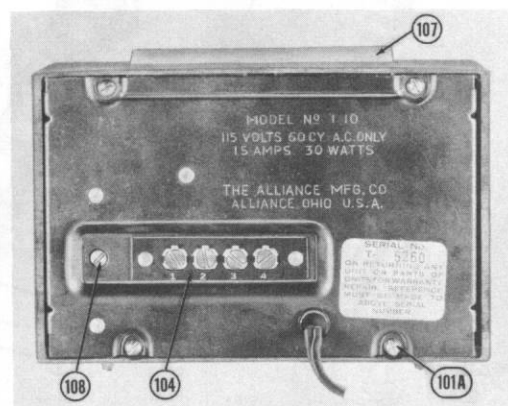


Fig. 9 Rear View of Model T-10 Control Box Showing Terminal Strip.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotator unit fails to operate when control lever is moved for left or right operation.	<p><i>If motor is inoperative:</i> Check primary input contacts. Directional switching contacts. Internal connections to motor. Capacitor and Motor.</p> <p><i>If motor is operating:</i> Check gear system to be sure all gears are properly meshing and are not slipping where there are staked assemblies.</p>

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
Indicator fails to register direction of rotation.	<p>Check meter to determine if it is faulty. Check potentiometer for broken connections or open windings. Check contact spring for proper contact with potentiometer.</p>
Rotor operates slowly or sluggishly.	<p>Check hook up of four conductor cable. Check size and length of four conductor cable. (See figure 4) Change capacitor.</p>

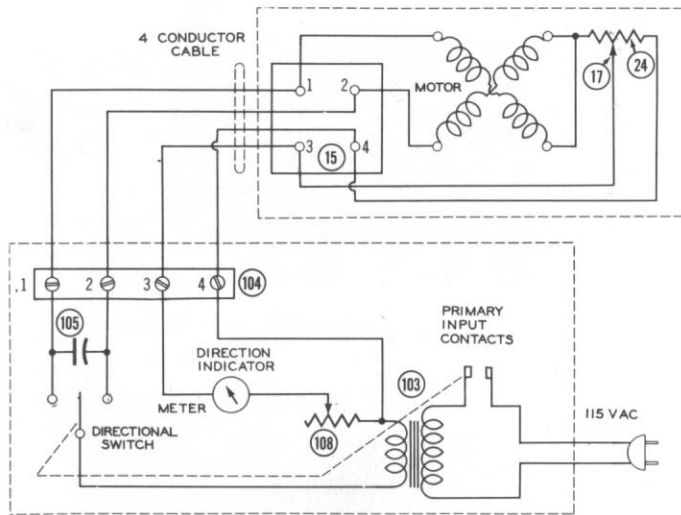


Fig. 10. Schematic Wiring Diagram—Model T-10.

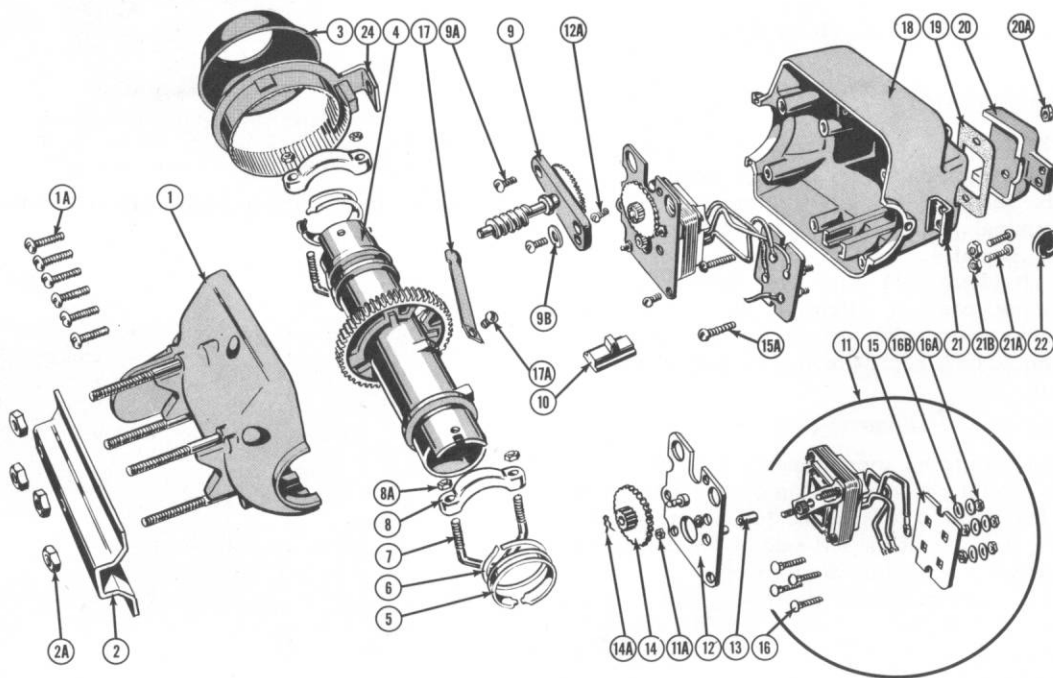


Fig. 11. Exploded View of Model T-10 Rotator Unit.

T-10 PARTS LIST

ITEM	NAME	PART NO.
	Rotator Assembly	5460-R
1	Housing Assembly, RH	5454-R
1A	Housing Screws, 10-32 x 3/4	3429-N
2	Clamping Plate	5456-A
2A	Nuts, Hex, 1/4 x 20	8100-E
3	Weather Shield	3375-B
**4	Shaft Assembly	
5	Bearing Collar	3987-A
6	Thrust Washer	3376-A
***7	U-Bolt	18291-A
***8	Mast Clamp	18292-R
***8A	Nut, Hex, 1/4 x 20	8100-E
9	Worm Assembly	5462-R
9A	Screw, RHM, 8-32 x 3/8	3429-Q
9B	Washer, #8	2715-H
10	Stop Slide	3320-A
11	Motor and Term Assembly	5726-R
11A	Nut, Hex, 6-32	601-P
12	Mounting Plate Assembly	4263-R
12A	Screw, RHM, 8-32 x 3/8	3429-Q
13	Spacers	4141-A
14	Gear and Pinion Assembly	3373-R
14A	Hairpin Cotter	4243-H
15	Terminal Plate Assembly (old terminal plate)	5700-R 4253-A
15A	Screw, RHM, 8-32 x 1	8013-A
16	Bolt, Carriage, 8-32 x 5/8	3359-G
16A	Nut, Hex, 8-32	3426-A

** No longer available as individual part—replace by ordering RCR Kit B—2 to 1 RPM Conversion

*** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

T-10 PARTS LIST Continued

ITEM	NAME	PART NO.
16B	Washer, #8	2715-H
17	Contact Spring	8539-A
17A	Screw, H. H. self-tap—W-6-32 x 1/4	8622-A
18	Housing Assembly, LH	5326-B
19	Gasket	5449-A
20	Terminal Cover	5327-A
20A	Nut, 8-32	3426-A
21	Strain Relief Clamp	3380-A
21A	Screw, RHM, 6-32 x 1/2	3031-M
21B	Nut, Hex, 6-32	601-P
22	Grommet	3387-B
24	Potentiometer	5725-R
	Control Box Complete	5491-R
101	Case	5481-A
101A	Screw, RHM, 6-32 x 1/4	1369-L
102	Meter Assembly	5352-R
102A	Retainer	5495-A
103	Transformer	5357-R
104	Terminal Strip Assembly	3803-S
105	Capacitor	4098-A
106	Pivot Pin	5355-A
107	Control Bar	5484-A
108	Calibrating Resistor	4094-B
109	Switch Assembly	5346-R
110	Window	18164-R
111	Insulating Strip	5351-A
	Foot Pads	5756-A

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model U-83 is a fully automatic unit. The control knob is turned to the desired direction and the rotator automatically rotates the antenna to that position and stops. The dial lights up when the direction is selected and turns off when the antenna reaches that position. This unit operates at a speed of two RPM, with a motor brake to prevent drifting and windmilling. Model U-83 can be identified by the grey neoprene weather shield and the new style rotator housing (Figure 1).

The U-83 rotor may be converted to a speed of one RPM by use of our RCR Kit A.

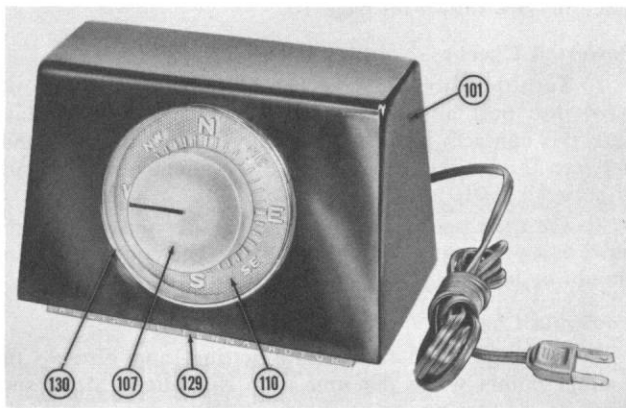


Fig. 12 Control Box—Model U-83.

SERVICING PROCEDURE

Power-off Checks

1. Viewing from front, left pawl (Item #118) should clear slotted escapement disc by .020 inch with electromagnet in energized position. Adjust by bending electromagnet armature tip (Item #117). (See Figure 17.)

2. Right pawl (Item #118) should clear slotted escapement disc by .020 inch with electro-magnet in de-energized position. Adjust by bending tab on electromagnet assembly. (This tab also holds down the armature.) (See Figure 17.)

3. Left pawl must come to rest in any given stop position. After stop position is reached, depress armature against electromagnet by hand to make sure pawl drops freely into slot. Adjustment is made by moving indent spring assembly (Item #126).

4. Contact switch (Item #17) in the rotator unit must make contact only when cam lobe (Item #24) comes in contact with the switch. If shaft assembly (Item #4) is removed from rotator unit, cam lobes must be 1/2 turn away from contact points in end-stop position on both directions. (See Figure 14.)

5. Be sure that four-conductor cable is connected to proper terminals. Terminal No. 1 in the rotator connects to No. 1 on the control box, and so on with No's. 2, 3, and 4.

6. Primary input contacts should be .020 inch apart. Adjustment can be made at factory only.

7. Red pointer on dial face should point to the direction which corresponds with the antenna at the stop position. This adjustment is made by removing the knob and inserting a narrow tool through the elongated radial slot to the gripping holes in the pointer, and turning the pointer to the correct position.

Power-on Checks

1. Line voltage should be approximately 115 volts.
2. Turn knob (Item #107) to extreme counterclockwise stop. Electromagnet must not buzz and mechanism must move correctly, no sticking or slipping. Rotator must turn to extreme counterclockwise stop and light must turn off when rotator reaches the stop.
3. Turn knob (Item #107) to extreme clockwise stop. Rotator must return to extreme clockwise position and the light must go off when the rotator reaches the stop.

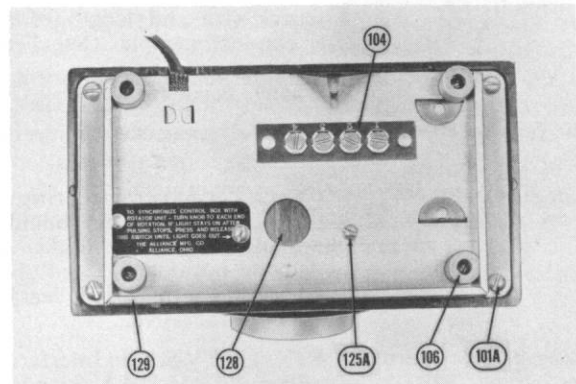


Fig. 13. Bottom View of Model U-83 Control Box Showing Terminal Strip.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotator fails to operate when knob is turned to desired direction.	<i>If motor is operating:</i> Check gear train for improper meshing or slippage.
	<i>If motor is inoperative:</i> Press tuning spring—if control box mechanism operates properly, the trouble is NOT in the solenoid, transformer, or the mechanical parts of the escapement assembly.
	Check input contacts to be sure they are closed.
	Check terminals 1-3 or 2-3, depending upon the desired direction of rotation for approximately 24 volts.
	Check contact springs on the frame assembly for proper contact with rings.

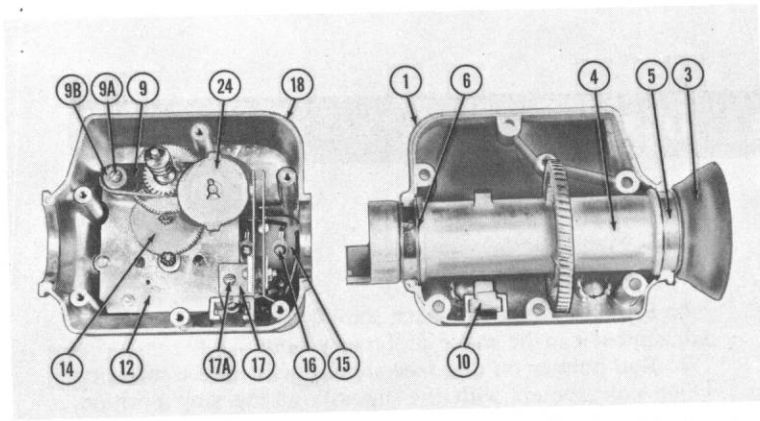


Fig. 14. Internal Components—Model U-83 Rotator Unit.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
	Check capacitor for short. Check contact switch in rotator unit for proper operation. Switch should close when cam lobe hits switch blade. Check motor for shorts or breaks.
Light fails to go off at stop position.	Out of sync, check sync, data on bottom of control box. Input contacts improperly adjusted.
Rotor operates slowly or sluggishly.	Check hook up for four conductor cable. Check size and length of four conductor cable. (See Figure 4.) Change capacitor.
Light fails to come on.	Bulb bad or socket connections loose.
Solenoid buzzes.	Check armature seating on bracket. Armature should be replaced with side marked "X" in up position. Check to see that pawl clearance is not excessive.
Excessive TV interference.	Refer to "TV Screen Interference from the Model U-83 control case."
Control skips or sticks.	Refer to "Adjustments to eliminate skipping and sticking in the Model U-83 control case."

ADJUSTMENT INSTRUCTIONS

TV SCREEN INTERFERENCE FROM THE MODEL U-83 CONTROL CASE

TV screen interference from the control case is caused by insufficient tension on the main contacts in the detent body assembly. (This is Code No. 124 on the Model U-83 Exploded View Parts List.) Detailed drawings of the assembly are shown on page 10.

Power-off Checks

1. Turn the knob until the breaker pin is away from the pawl disc post and the contact points are closed. Make sure the contacts are closing securely, and the clearance between the breaker pin head and the contact switch blade is between 0.010 and 0.030.
2. Turn the knob back until the breaker pin reaches the pawl disc post and opens the contacts. The contact opening should be between 0.015 and 0.030.

Power-on Checks

1. Turn the knob to the dial setting, and observe the contact points while the unit is in operation. Make sure there is no arcing or flashing at the points while the control is turning.
2. Turn the TV set on, to determine whether the flash occurs each time the control pulses or clicks, or only when the unit is turned on and off. If the flashing occurs each time the control clicks, use the following procedures to correct the trouble.

Procedures

1. If the contact is flashing, increase the tension at A. Do this by inserting a screwdriver through the side of the frame assembly, directly over the transformer, and prying at A to bring the contacts together. (Be careful! Too much tension can cause slow or sticky operation of the control.)

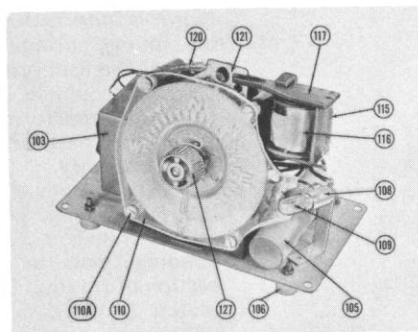


Fig. 15. Internal Components—Model U-83 Control Box.

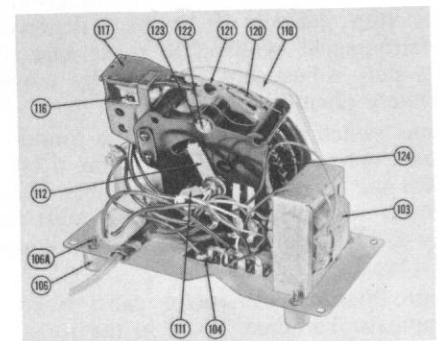


Fig. 16. Internal Components—Model U-83 Control Box.

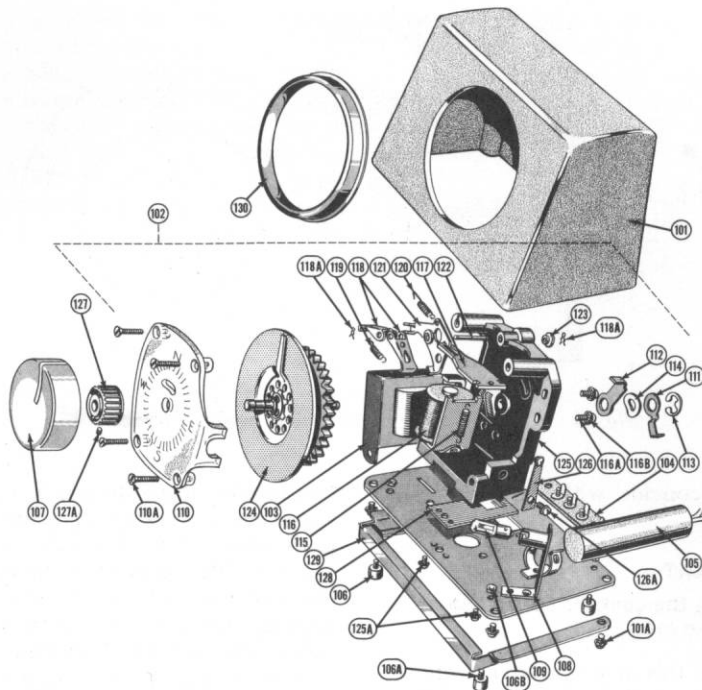


Fig. 17. Exploded View of Model U-83 Control Box.

2. If the contact points do not open far enough, turn the knob until the screw on B is visible through the small round hole in the rear of the frame assembly. Turn this screw clockwise to increase the contact opening. Do not move the screw more than 1/4 turn in either direction. After this screw is set, it should be held in place with radio service cement. Plastic cement can also be used.

3. The breaker pin should be replaced if it shows any deformity around the head. (Breaker pins were formerly made of polystyrene and nylon. They are now made of machined Bakelite.) The latter pins will be sent, upon request, to any service technician wishing to replace the old ones.

ADJUSTMENTS TO ELIMINATE SKIPPING AND STICKING IN THE MODEL U-83 CONTROL CASE

The Model U-83 Tenna-Rotor® is an automatic rotor. Therefore, it may get out of synchronization between the control box and the rotator. Incorrect operation by the owner can produce this defect. It can be corrected by using the realignment switch on the bottom plate of the control. Incorrect setting of the electromagnet assembly will cause incorrect clearance between the pawl and the pawl wheel. This will result in slipping or skipping when the unit is in operation. If either condition exists, the control will lose or gain degrees each time it is operated. In addi-

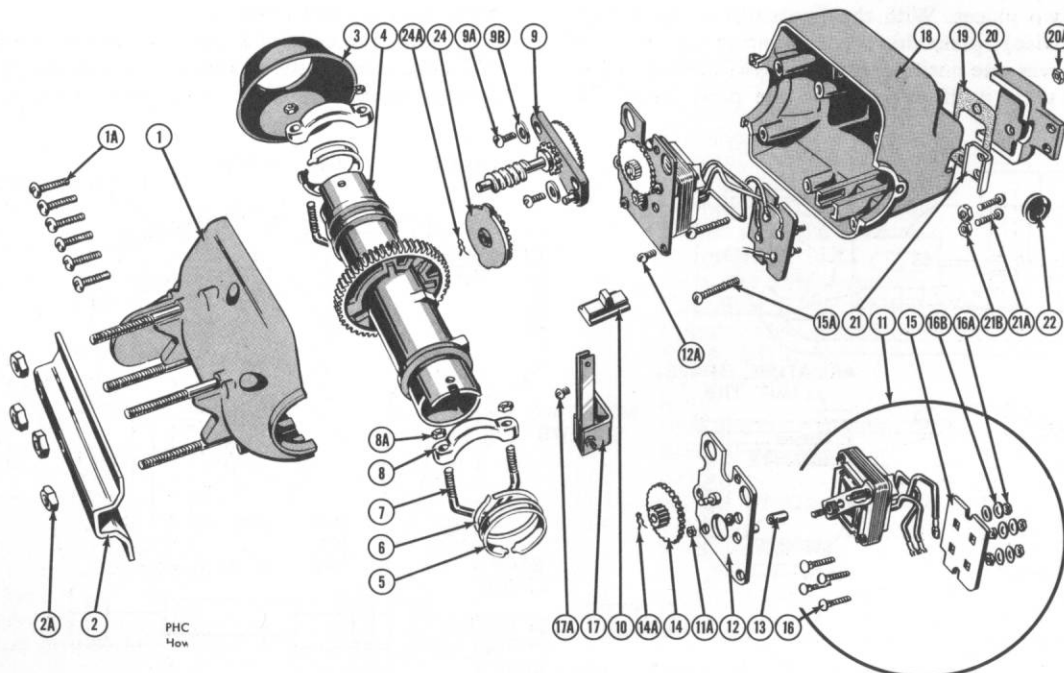


Fig. 18. Exploded View of Model U-83 Rotator Unit.

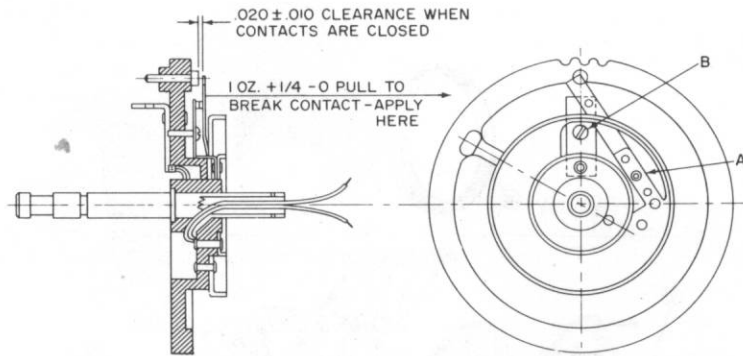


Fig. 19. Detailed Drawing of Detent Body Assembly.

tion, the dial setting will not coincide with the direction the antenna is pointing.

IMPORTANT:

This trouble is entirely within the control. The rotor need not be removed from the mast.

There are two places where this misadjustment might occur. The first is in the tension spring that controls the operation of the pawl lifter arm. If the unit is sticking, check the pawl operation by shortening this spring approximately one coil. The second place is in the proper positioning of the electromagnet assembly. On the first Model U-83's, the electromagnet was mounted in slotted holes in the frame assembly. These holes were slotted so that the magnet could be moved up or down for the proper adjustment. If the screws holding this unit in place became loosened, the complete electromagnet assembly could drop. As a result, the control would be out of adjustment. (The frame assembly has been revised, and slotted holes have been replaced with holes just large enough to accommodate the mounting screws. The armature is bent on the assembly line in order to provide the proper pawl clearance. Once this setting has been made, it should not change.)

To make the proper pawl adjustment, you must gauge the clearance at two places. With the knob turned to the left (counterclockwise), press down on the armature until the red pointer moves one position, and the pawl directly below the armature seats itself in a slot in the pawl wheel. By

holding the armature down, you will have a clearance between the pawl, directly below the tension spring, and the pawl wheel. The clearance at this point should be from $\frac{1}{64}$ to $\frac{1}{32}$ inch. Since you cannot gain access directly under the armature, you must check the clearance on this side beneath the armature travel limit tab. Press the armature down until the pawl beneath it contacts the pawl wheel without moving the red pointer. With the pawl touching the pawl wheel, the clearance between the armature and the travel limit tab should be 0.015, or $\frac{1}{64}$ inch between the armature and the lowest touching point of the tab.

Three other checks should be made, as follows:

1. Check the top surface of the iron core in the electromagnet assembly to make sure there are no burrs that may contact the armature when it is down. This will cause a loud buzz in the control. It may also lock the armature in the down position. When the armature is down, it should touch the front half of the iron core, and should clear the back half by approximately 0.010 inch.
2. Turn the control knob completely around in either direction. Then, by pressing the armature, operate the control manually one complete turn. Check the pawl wheel to make sure there are no burrs or high spots in the slot or on the outside diameter of this wheel. Remove any burrs with a small point file.
3. Turn the control knob to its end of rotation in either the clockwise or the counterclockwise position. Then, by depressing the armature, bring the red pointer around to

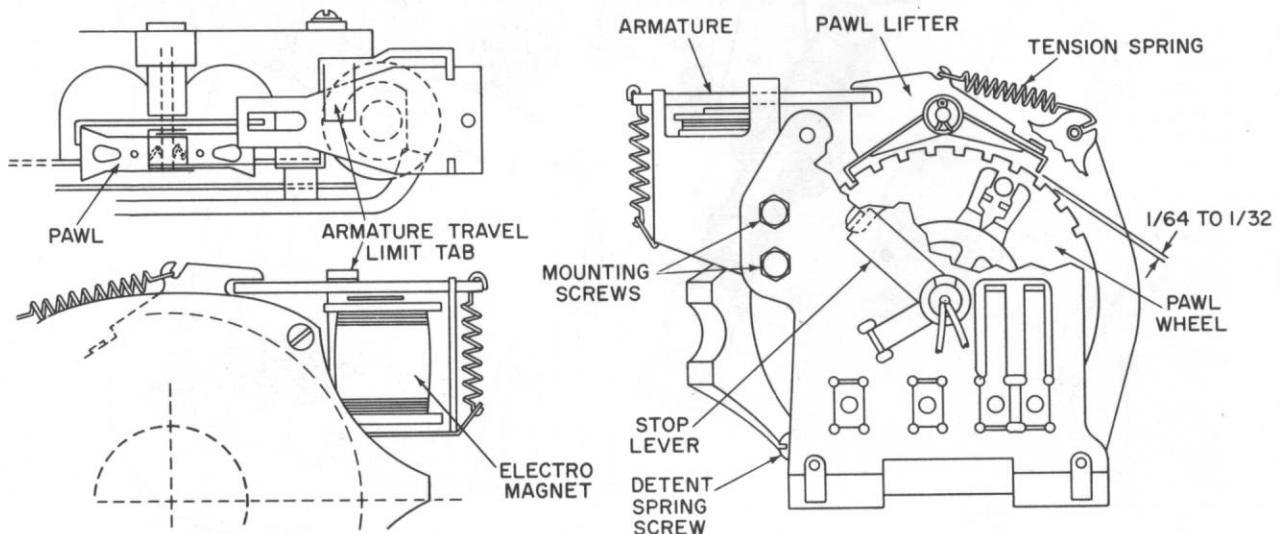


Fig. 20. Detailed Drawing of U-83 Control Case.

coincide with the knob setting. Make sure the control is at its end of rotation before checking the following. (The end of rotation can be determined by the position of the stop lever at the back of the frame assembly.) If the knob has been turned clockwise, the stop lever should be at the extreme left of the slotted hole, as shown in the drawing on page 000. The stop lever will be in the opposite position if the knob is turned counterclockwise. After the end of rotation has been reached, pressing and releasing the armature should move the pawl, directly below the tension

spring, freely in and out of the slot on the pawl wheel. If the pawl does not meet and seat freely in this slot, loosen the screw holding the detent spring, and move the spring up or down until it does. Then tighten the detent screw into place, and recheck the pawl to see that it is seating freely.

CAUTION:

Whenever you are operating the control manually by depressing the armature, make sure to press down directly above the iron core center.

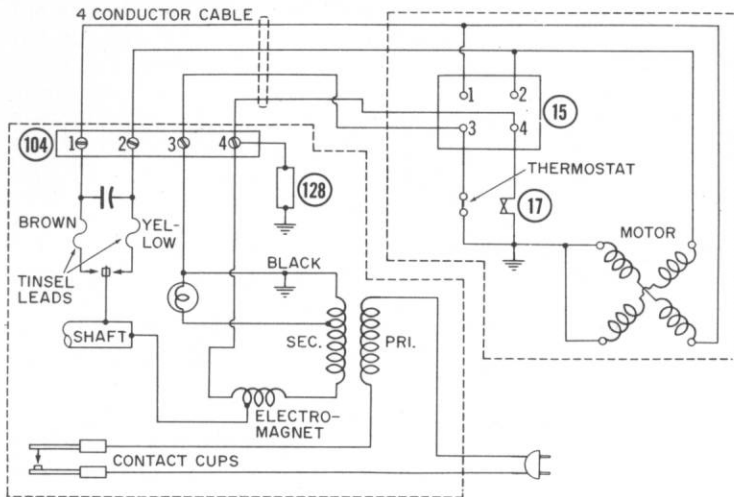


Fig. 21. Schematic Wiring Diagram—
Model U-83.

U-83 PARTS LIST

ITEM	NAME	PART NO.
	Rotator Assembly	5471-R
1	Housing Assembly, RH	5454-R
1A	Housing Screws, 10-32 x 3/4	3429-N
2	Clamping Plate	5456-A
2A	Nuts, Hex, 1/4-20	8100-E
3	Weather Shield	3375-C
**4	Shaft Assembly	
5	Bearing Collar	3987-A
6	Thrust Washer	3376-A
***7	U-Bolt	18291-A
***8	Mast Clamp	18292-R
***8A	Nut, Hex, 1/4 x 20	8100-E
9	Worm Assembly	5474-R
9A	Screw, RHM, 8-32 x 3/8	3429-Q
9B	Washer, #8	2715-H
10	Stop Slide	3320-A
11	Motor and Term Assembly	5714-S
11A	Nut, Hex, 6-32	601-P
12	Mouting Plate Assembly	4263-R
12A	Screw, RHM, 8-32 x 3/8	3429-Q
13	Spacers	4141-A
14	Gear and Pinion Assembly	3373-R
14A	Hairpin Cotter	4243-H
15	Terminal Plate Assembly (Later Version)	5700-R
	Terminal Plate Assembly (Early Version)	4253-A
15A	Screw, RHM, 8-32 x 1	8013-A
16	Bolt, Carriage, 8-32 x 5/8	3359-G
16A	Nut, Hex, 8-32	3426-A
16B	Washer, #8	2715-H
17	Contact Switch Assembly	5908-R

U-83 PARTS LIST Continued

ITEM	NAME	PART NO.
17A	Screw, RHM, 6-32 x 3/16	1369-L
18	Housing Assembly, LH	5326-B
19	Gasket	5449-A
20	Terminal Cover	5327-A
20A	Nut, 8-32	3426-A
21	Strain Relief Clamp	3380-A
21A	Screw, RHM, 6-32 x 1/2	3031-M
21B	Nut, Hex, 6-32	601-P
22	Grommet	3387-B
24	Cam and Gear	5584-B
24A	Hairpin Cotter	604-C
	Control Box Complete	5500-R
101	Case	5559-A
101A	Screw, RHM, 8-32 x 3/8	1369-L
102	Frame and Dial Assembly	5539-S
103	Transformer	5512-A
104	Terminal Strip Assembly	3803-S
105	Capacitor	4098-A
106	Bumper (feet)	5628-A
106A	Screw, RHM, 6-32 x 1/2	3031-M
106B	Nut, Hex, 6-32	601-P
107	Knob	5556-R
108	Bulb Socket Assembly	5558-R
109	Bulb (Type 47)	4274-A
110	Dial	8519-A
110A	Screw, Self-tapping, 6-20	603-K
111	Terminal	5540-A
112	Stop Lever	5537-A
113	Retaining Ring	4243-B
114	Spring Washer	5568-A
115	Spring	5595-A

** No longer available as individual part—replace by ordering RCR Kit A — 2 to 1 RPM Conversion

*** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

U-83 PARTS LIST Continued

ITEM	NAME	PART NO.
*116	Electro-magnet Assembly	5541-R
116A	Screw, RHM, 6-32 x 1/2	3031-M
116B	Lockwasher, #6	2128-A
117	Armature	5547-A
118	Pawl	5523-A
118A	Hairpin Cotter	604-A
119	Pawl Spring	5667-A
120	Tension Spring	5569-A
121	Pawl Lifter Assembly	5521-R
122	Pawl Shaft	5552-A
123	Bushing	5520-A

U-83 PARTS LIST Continued

ITEM	NAME	PART NO.
124	Detent Body Assembly	5524-R
125	Frame Assembly	5515-R
125A	Screw, RHM, 6-32 x 3/8	3429-P
126	Indent Spring Assembly	5518-R
126A	Screw, RHM, 6-32 x 3/8	3429-P
127	Knob Hub	5555-A
127A	Set Screw	S-614-N
128	Tuning Spring	5563-A
129	Emblem Strip	5557-C
130	Bezel	5560-A

*No longer available. Part No. 8511-R solenoid can be used to replace the No. 5541-R Electromagnet by replacing No. 5515-R Frame assembly with the No. 5515-S Frame assembly and replacing No. 5521-R Panel Lifter assembly with No. 8515-A Panel Lifter assembly. Connect leads per the U-98 schematic wiring diagram, Fig. 40.

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model K-22 is actuated by depressing the right or left end of the bar switch located on top of the control box. Depressing the right end rotates the antenna clockwise and depressing the left end rotates the antenna counterclockwise. An indicator light comes on at the control box when the rotator reaches its full clockwise or counterclockwise limits. The unit operates at a speed of two RPM giving the operator an approximate direction indication, i.e., 15 seconds equals 180 degrees of rotation. The K-22 is identified by the black neoprene weathershield and is interchangeable with the ATR and F-4 Tenna-Rotor®.

K-22 Tenna-Rotors® manufactured after June 1, 1958, operate at a speed of one RPM. These can be identified by the date stamp on the rotor and by serial number on the control box. Serial number K54001 and over are one RPM. Earlier Model K-22 rotors may be converted to one RPM by use of our RCR Kit B.

SERVICE PROCEDURE

Power-off Checks

1. Be sure that four conductor cable is connected to the proper terminals. Terminal No. 1 in the rotor should be connected to terminal No. 1 on the control box and so on with Nos. 2, 3, and 4.
2. Hollow shaft (Item No. 6) must have "play."
3. Primary input contacts (Item No. 111) within the control box should make solid contact when lever is depressed at either end. There should be at least $\frac{1}{16}$ inch clearance in open position.

Power-on Checks

1. Line voltage should be approximately 115 volts.
2. Run unit counterclockwise by depressing left end of control bar (Item No. 103). Light should come on when unit reaches stop.
3. Run unit clockwise by depressing right end of control bar (Item No. 103). Light should come on when unit reaches stop.

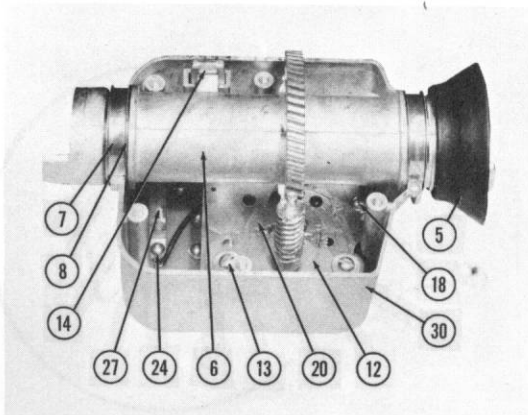


Fig. 24. Internal Components—Model K-22 Rotator Unit.

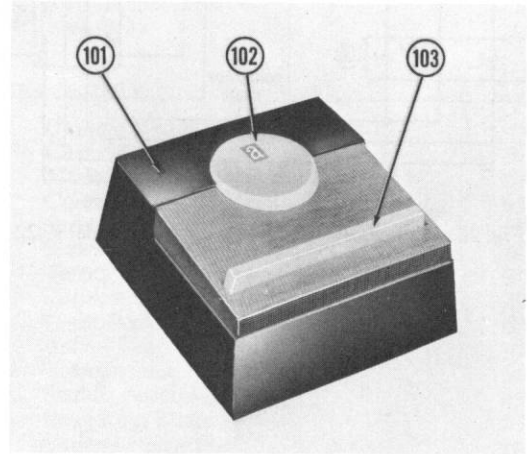


Fig. 22. Control Box—Model K-22.

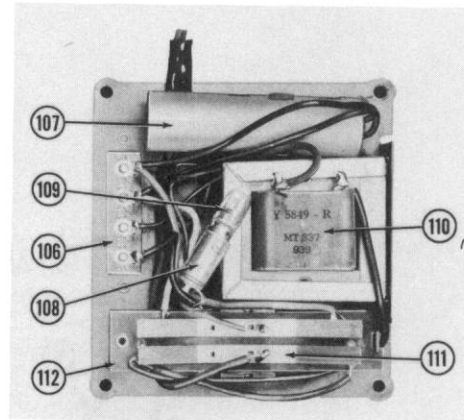


Fig. 23. Internal Components—Model K-22 Control Box.

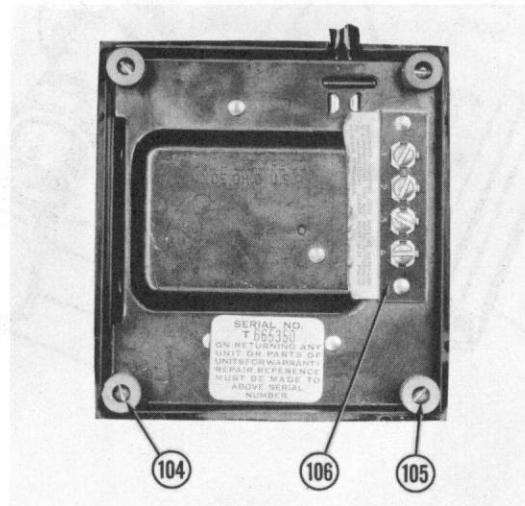


Fig. 25. Bottom View of Model K-22 Control Box Showing Terminal Strip.

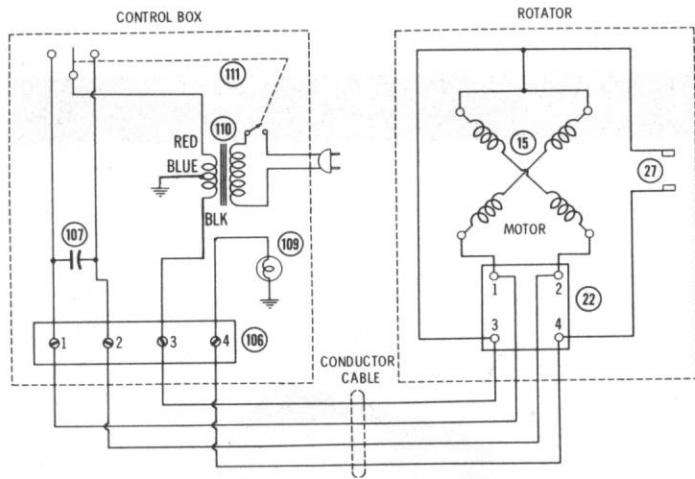


Fig. 26. Schematic Wiring Diagram—Model K-22.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
<p>Rotor unit fails to operate when control lever is moved for right or left operation.</p>	<p><i>If motor is inoperative:</i> Check primary input contacts. Check directional switching contacts. Check internal connections in control box. Check capacitor. Check motor. Check four conductor cable for size and length. (See Figure 4.)</p> <p><i>If motor is operating:</i> Check gear system to be sure gears are meshing properly and are not slipping where there are staked assemblies.</p>
<p>Rotator operates slowly or sluggishly.</p>	<p>Check hook-up of four conductor cable. Check size and length of four conductor cable. (See Figure 4.) Check capacitor.</p>
<p>Indicator light fails to come on at stop position.</p>	<p>Check bulb. Check contact spring in rotor.</p>

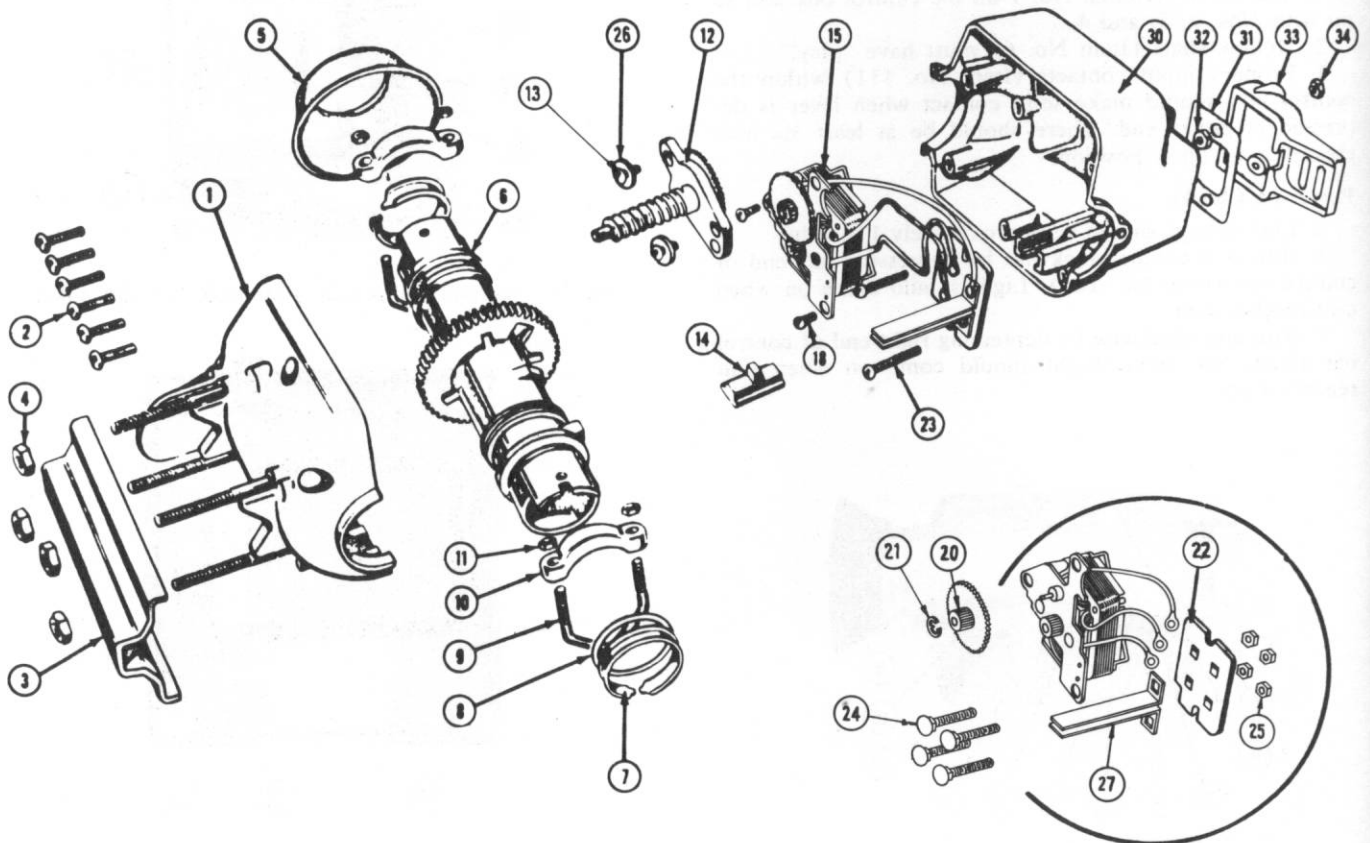


Fig. 27. Exploded View of Model K-22 Rotator Unit.

K-22 PARTS LIST

ITEM	NAME	PART NO
	Rotator Assembly	5450-R
1	Housing Assembly, RH	5454-R
2	Housing Screws, 10-32 x 3/4	3429-N
3	Clamping Plate	5456-A
4	Nut, Hex, 1/4 x 20	8100-E
5	Weather Shield	3375-A
**6	Shaft Assembly (2 RPM)	
6A	Shaft Assembly (1 RPM)*	9373-R
7	Bearing Collar	3987-A
8	Thrust Washer	3376-A
***9	U-Bolt	18291-A
***10	Mast Clamp	18292-R
***11	Nut, Hex, 1/4 x 20	8100-E
12A	Worm Assembly (1 RPM)*	18073-R
13	Screw, RH Washer, 8-32 x 3/8	3429-Q
14	Stop Slide	3320-A
15	Motor & Gear Assembly	18511-R
18	Screw, RHM, 8-32 x 3/8	3429-Q
20	Gear & Pinion Assembly	3373-R
21	Retaining Ring	4243-H
22	Terminal Plate	4253-A
23	Screw, RHM, 8-32 x 1	8013-A

* Used on one RPM Rotors manufacturing after June 1, 1958. Serial numbers K54001 and over.

** No longer available as individual part—replace by ordering RCR Kit B—2 to 1 RPM Conversion

*** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

K-22 PARTS LIST Continued

ITEM	NAME	PART NO.
24	Bolt, Carriage, 8-32 x 5/8	3359-G
25	Nut, Hex, 8-32	3426-A
26	Washer, #8	2715-H
27	Contact Spring	3358-A
30	Housing Assembly, LH	5326-B
31	Gasket	5449-A
32	Nut, Hex, 8-32	3426-A
33	Terminal Cover	9319-A
34	Nut, 8-32	3426-A

CONTROL BOX

	Control Box Complete	5859-R
101	Case	5836-A
102	Medallion	5858-A
103	Control Bar	9180-A
104	Screw, Self Tapping, 6-20 x 1/2	603-N
105	Screw, Self Tapping, 6-20 x 1/2	603-N
106	Term. Strip Assembly	3803-S
107	Capacitor	4098-A
108	Light Socket Assembly	5558-R
109	Bulb (Type 47)	4274-A
110	Transformer	5849-R
111	Switch Assembly	5864-R
112	Insulating Strip	5351-A
	†Control Pivot Pin	1091-M

†Not illustrated—part of Control Box, NOT part of rotator.

MODEL K-22A TENNA-ROTOR

The Alliance Tenna-Rotor® Model K-22A is functionally identical to the K-22 Tenna-Rotor. The difference is in the output operating voltage. The K-22A Rotor is identified by the tan weathershield on the rotor. The K-22A control has the Model number stamped on the base.

NOTE:

The K-22A Rotor and the K-22A control are not interchangeable with any other model.

The K-22A Rotor (tan weathershield) must be used with the K-22A control only.

Service information and parts are the same as the K-22 except for the following parts changes:

- Rotor Assembly—Part No. 5460-T
- Item 5, Weathershield—Part No. 3375-D
- Item 15, Motor and Gear Assy.—Part No. 18511-T
- Control Assembly—Part No. 5859-S
- Item 107, Capacitor—Part No. 18061-A
- Item 110, Transformer—Part No. 18469-R

When ordering parts, be sure to check identification on the rotor and control and order by correct part number. Parts listed above are NOT interchangeable with those used in the K-22 Tenna-Rotors.

GENERAL INFORMATION

The Alliance Tenna-Rotor®, Model T-12, is actuated by depressing the right or left end of the bar switch located on top of the control box. Depressing the right end rotates the antenna clockwise. The antenna direction is registered on a direction indicator, located on the front of the control case. The Model T-12 differs from the Model T-10 in that the indicator of the T-12 indicates direction of the antenna at all times and the Model T-10 indicates direction only when control bar is depressed. The Model T-12 control case can be used with the T-10 rotors manufactured after January, 1954. To use the T-12 control with a DIR or T-10 manufactured before January, 1954, it is necessary to change the potentiometer and contact spring in the rotor with new parts. The new potentiometer needed is part No. 5725-R. The new contact spring needed is part No. 8539-A.

The T-12 rotor can be identified by the red weather-shield.

The T-12 Tenna-Rotors® manufactured after June 1, 1958, operate at a speed of one RPM. These may be identified by the date stamp on the rotor and by serial number on the control box. Serial number T1122001 and over are one RPM. Earlier Model T-12 rotors may be converted to one RPM by use of our RCR Kit B.

SERVICE PROCEDURE

Power-off Checks

1. Be sure that four conductor cable is connected to proper terminals. Terminal No. 1 in the rotor should be connected to Terminal No. 1 on the control box and so on with Nos. 2, 3, and 4.

2. Be sure strands of four conductor cable wire are not shorting between terminals; between terminal and rotor casing or between terminal and control box chassis. Such shorts will cause meter and/or side or front potentiometer and/or calibrating resistor to burn up.

3. Hollow shaft (Item No. 6) must have "play."

4. Primary input contacts (Item No. 111) within the control box should make solid contact for left or right

positions and should have approximately $\frac{1}{16}$ inch clearance in open position.

Power-on Checks

1. Line voltage should be approximately 115 volts.
2. Run unit to counterclockwise stop by depressing left end of the control bar (Item No. 103). Indicator

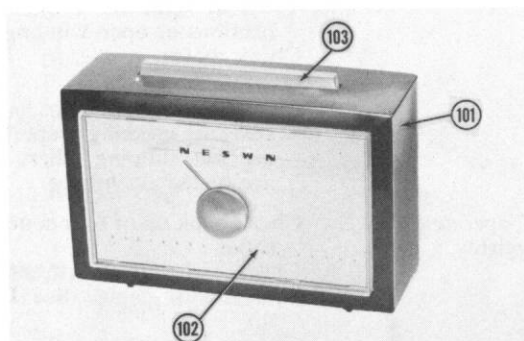


Fig. 28. Control Box—Model T-12.

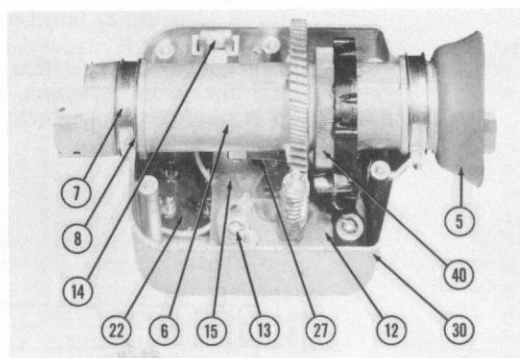


Fig. 29. Internal Components—Model T-12 Rotator Unit.

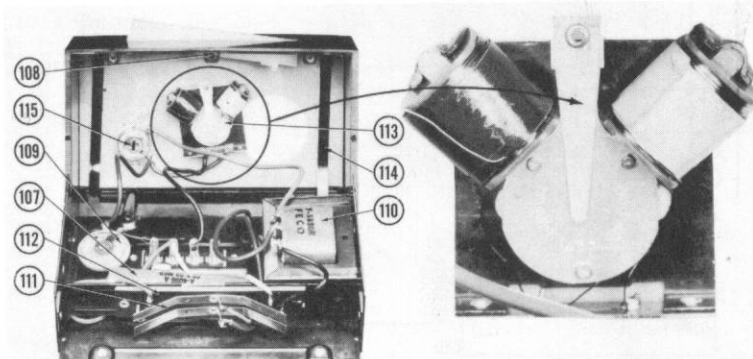


Fig. 30. Internal Components—Model T-12 Control Box.

pointer should decrease steadily, stopping at left side of the dial when rotor reaches the counter-clockwise stop.

3. Adjust calibrating resistor (Item No. 109) for full scale north reading when unit is at full counterclockwise stop.

4. Run unit to clockwise stop by depressing right end of control bar. Indicator should increase steadily stopping at the extreme right end of dial when rotator reaches the clockwise stop.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotor unit fails to operate when control lever is moved for left or right position.	<i>If motor is inoperative:</i> Check control switch contacts. Check internal connections in control box. Check capacitor. Check potentiometer (Item No. 40) in rotor for broken connections or open winding. Check motor.
	<i>If motor is operating:</i> Check gear system to be sure gears are meshing properly and are not slipping where there are staked assemblies.
Rotor operates slowly or sluggishly.	Check hook up of four conductor cable. Check size and length of four conductor cable. (See Figure 4.) *Change capacitor.
Meter fails to indicate properly.	Check Meter. Check side or front potentiometer (Item No. 115) and calibrating resistor (Item No. 109) for dirty, open, or burnt windings.* Check contact spring (Item No. 27) for proper contact with potentiometer in rotator.

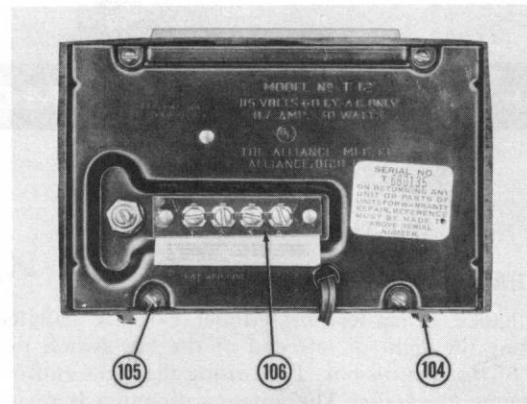


Fig. 31. Rear View of Model T-12 Control Box Showing Terminal Strip.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
	Check spring tension on rear of meter and adjust per instructions page 19. Adjust side or front potentiometer and calibrating resistor per instructions.
	* On some units, the potentiometer (Item No. 115) will be mounted on the side of metal chassis.

ADJUSTMENT INSTRUCTIONS

The T-12 Tenna-Rotor® is shipped from the factory with the side or front potentiometer adjusted and the only adjustment which should be necessary on a new unit is on the calibrating resistor which is located on the back of the control box. However, if it is impossible to get full scale north reading when the unit is at full clockwise stop or when parts have been replaced in the control box, adjust control box in the following manner:

- Run rotator to full clockwise stop.
- Turn calibrating resistor to clockwise stop.

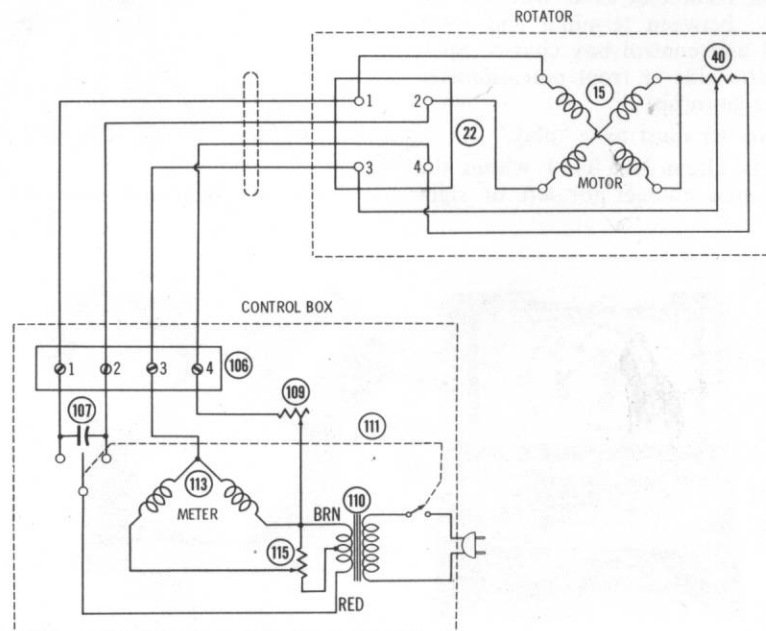


Fig. 32. Schematic Wiring Diagram—Model T-12.

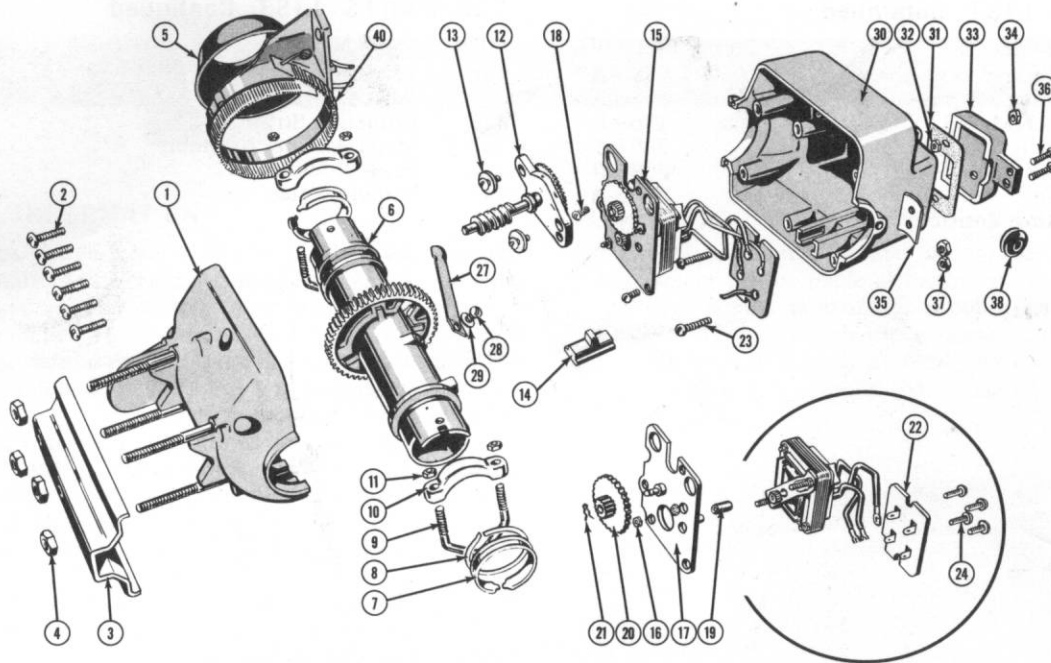


Fig. 33. Exploded View of Model T-12 Rotator Unit.

Remove chassis from case.

Adjust side or front potentiometer so pointer indicates N on right side of scale. DO NOT GO PAST N.

Contacts must be held closed on right side with some nonmetallic object while this adjustment is made.

Replace chassis in case.

Run rotator to full counterclockwise stop and adjust calibrating resistor for N indication on left side of dial.

If preceding adjustments are made on service bench, use 125 feet of No. 20 four conductor cable between the rotator and control case.

NOTE:

If full range cannot be obtained with the above adjustments, check four conductor cable for recommended length and size per Figure 4.

ADJUSTMENT OF SPRING TENSION ON REAR OF METER

If pointer sticks, bend banjo slightly to relieve tension on spring until pointer moves smoothly.

With control box in normal position, tilt 90 degrees clockwise and 90 degrees counterclockwise from normal resting position. If pointer moves, adjust spring tension by bending banjo slightly until no movement is noted when control box is tilted. Bend only the metal section to which bronze spring is attached. Do not bend bronze spring. Use extreme care.

T-12 PARTS LIST

ITEM	NAME	PART NO.
	Rotator Assembly	5460-R
1	Housing Assembly, RH	5454-R
2	Housing Screws, 10-32 x 3/4	3429-N
3	Clamping Plate	5456-A
4	Nut, Hex, 1/4-20	8100-E
5	Weather Shield	3375-B
**6	Shaft Assembly (2 RPM)	

** No longer available as individual part—replace by ordering RCR Kit B — 2 to 1 RPM Conversion

T-12 PARTS LIST Continued

ITEM	NAME	PART NO.
6A	Shaft Assembly (1 RPM)*	9373-R
7	Bearing Collar	3987-A
8	Thrust Washer	3376-A
***9	U-Bolt	18291-A
***10	Mast Clamp	18292-R
***11	Nut, Hex, 1/4 x 20	8100-E
12	Worm Assembly	5462-R
12A	Worm Assembly (1 RPM)*	18073-R
13	Screw, RH Washer, 8-32 x 3/8	3429-Q
14	Stop Slide	3320-A
15	Motor & Term. Assembly	5726-R
16	Nut, Hex, 6-32	601-P
17	Mounting Plate Assembly	4263-R
18	Screw, RHM, 8-32 x 3/8	3429-Q
19	Spacers	4141-A
20	Gear & Pinion Assembly	3373-R
21	Hairpin Cotter	4243-H
22	Terminal Plate Assembly	5700-R
23	Screw, RHM, 8-32 x 1	8013-A
24	Screw, Binding Head, 6-32 x 5/16	608-H
27	Contact Spring	8539-A
28	Screw, Self Tapping, H.H.-W. 6-20 x 1/4	8622-A
29	Lock Washer	2128-A
30	Housing Assembly LH	5326-B
31	Gasket	5449-A
32	Nut, Hex, 8-32	3426-A
33	Terminal Cover	5327-A
34	Nut, Hex, 8-32	3426-A
35	Strain Relief Clamp	3380-A
36	Screw, RHM, 6-32 x 1/2	3031-M
37	Nut, Hex, 6-32	601-P
38	Grommet	3387-B
40	Potentiometer	5725-R

* Used on one RPM Rotors manufactured after June 1, 1958. Serial number T1122001 and over.

*** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

	Control Box Complete	5877-R
101	Case	5481-A
102	Window	18164-R

T-12 PARTS LIST Continued

ITEM	NAME	PART NO.
103	Control Bar	9180-A
104	Foot Pads	5756-A
105	Screw, RHM, 6-32 x 1/4	1369-L
106	Term. Strip Assembly	3803-S
107	Capacitor	4098-B
108	Pivot Pin	5355-A
109	Calibrating Resistor	4094-C

T-12 PARTS LIST Continued

ITEM	NAME	PART NO.
110	Transformer	5880-R
111	Switch Assembly	5864-S
112	Insulating Strip	5351-A
113	Meter & Panel Assembly	5765-R
114	Panel Retainer	5495-A
115	Potentiometer	8532-B

GENERAL INFORMATION

The Alliance Tenna-Rotor®, Model U-98, is an improved fully automatic unit. The control of this unit is actuated by a solenoid instead of the electro-magnet used in the U-83 Automatic Tenna-Rotor®. The control knob is turned to the desired direction and the rotator automatically rotates the antenna to that position and stops. The dial lights up when the direction is selected and turns off when the antenna reaches that position. The unit operates at a speed of two RPM, with a motor brake to prevent drifting and windmilling. The U-98 is directly interchangeable with the Model U-83.

The U-98 rotor can be identified by the grey weather-shield.

The U-98 rotors manufactured after June 1, 1958, operate at a speed of one RPM. These can be identified by the date stamp on the rotor and by the serial number on the control box. Serial number U840501 and over are one RPM. Earlier Model U-98 rotors may be converted to one RPM by use of our RCR Kit A.

SERVICE PROCEDURE

Power-off Checks

1. Viewing from front, left pawl (Item No. 121) should clear slotted escapement disc by .010 inch to .035 inch with solenoid in energized position.

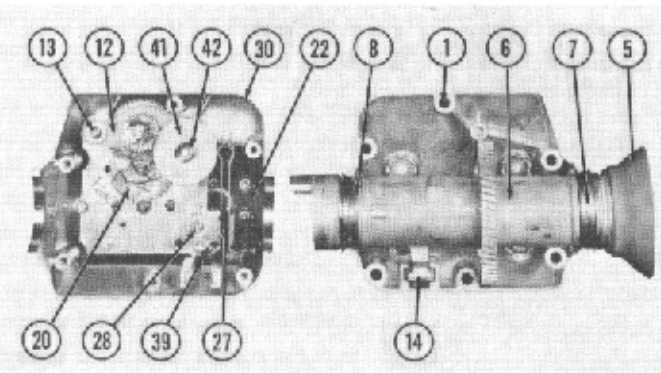
2. Right pawl (Item No. 121) should clear slotted escapement disc by .010 inch to .035 inch with solenoid in de-energized position.

3. Left pawl must come to rest in any given stop position. After stop position is reached, depress plunger in solenoid by hand to make sure pawl drops freely into slot. Adjustment is made by moving indent spring assembly (Item No. 133).

4. Contact spring (Item No. 27) in the rotor unit must make contact only when cam lobe (Item No. 41) comes in contact with the switch. If shaft assembly (Item 6 or 6A) is removed from the rotor unit, cam lobes must be 1/2 turn away from contact points in end-stop position in both directions. See Fig. 36.

5. Be sure that four conductor cable is connected to proper terminals. Terminal No. 1 in the rotor connects to No. 1 on the control case and so on with Nos. 2, 3, and 4.

6. Check length and size of four conductor cable. (See Figure 4.)



7. Primary input contacts should be .020 inch apart. Adjustment can be made at factory only.

8. Red pointer on dial face should point to the direction which corresponds with the antenna at the stop position. This adjustment is made by removing the knob and inserting a narrow tool through the elongated radial slot to the

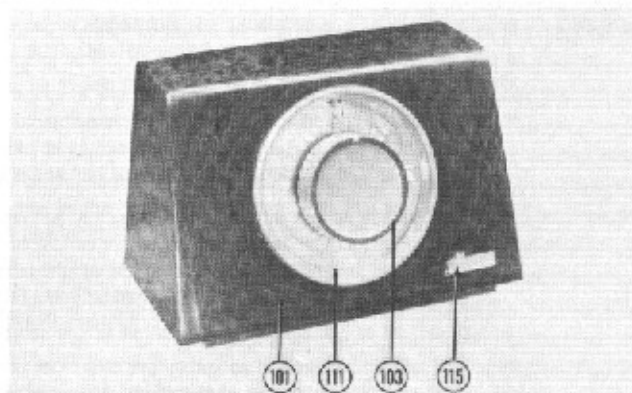


Fig. 34. Control Box—Model U-98.

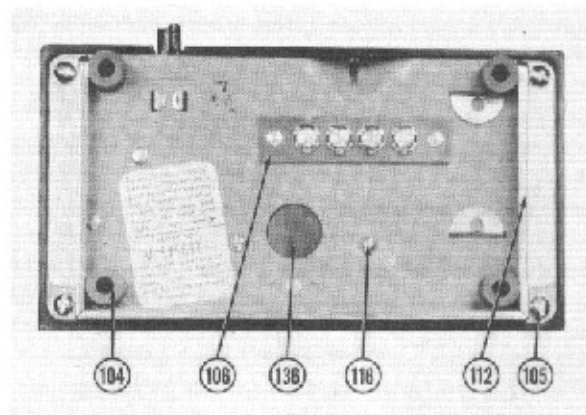


Fig. 35. Bottom View of Model U-98 Control Box Showing Terminal Strip.

Fig. 36. Internal Components—Model U-98 Rotator Unit.

gripping holes in the pointer and turning the pointer to the correct position.

Power-on Checks

1. Line voltage should be approximately 115 volts.
2. Turn knob (Item No. 103) to extreme counterclockwise stop. Solenoid must not buzz and mechanism must move correctly, no sticking or slipping. Rotator must turn to extreme counterclockwise stop and light must turn off when rotator reaches the stop. If the light does not turn off, synchronize unit per instructions on bottom of control case.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotator fails to operate when knob is turned to desired direction.	<p><i>If motor is operating:</i> Check gear train for improper meshing or slippage.</p> <p><i>If motor is inoperative:</i> Press tuning spring—if box mechanism operates properly, the trouble is not in the solenoid, transformer, or the mechanical parts of the escapement assembly. Check input contacts to be sure they are closed. Check terminals 1-3, or 2-3, depending upon desired direction of rotation for approximately 24 volts. Check contact springs on the frame assembly for proper contact with rings. Check capacitor in control. Check contact switch in rotor for proper operation. Switch should close when cam lobe hits switch blade. Check motor for shorts or open connections.</p>

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
Rotor operates slowly or sluggishly.	<p>Check hook up for four conductor cable. Check size and length of four conductor cable. (See Figure 4.) Change capacitor.</p>

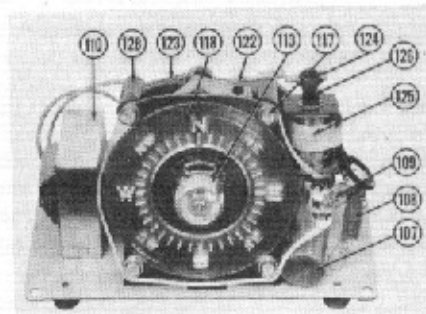


Fig. 37. Internal Components—Model U-98 Control Box.

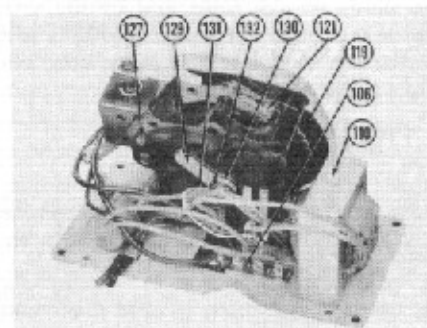


Fig. 38. Internal Components—Model U-98 Control Box.

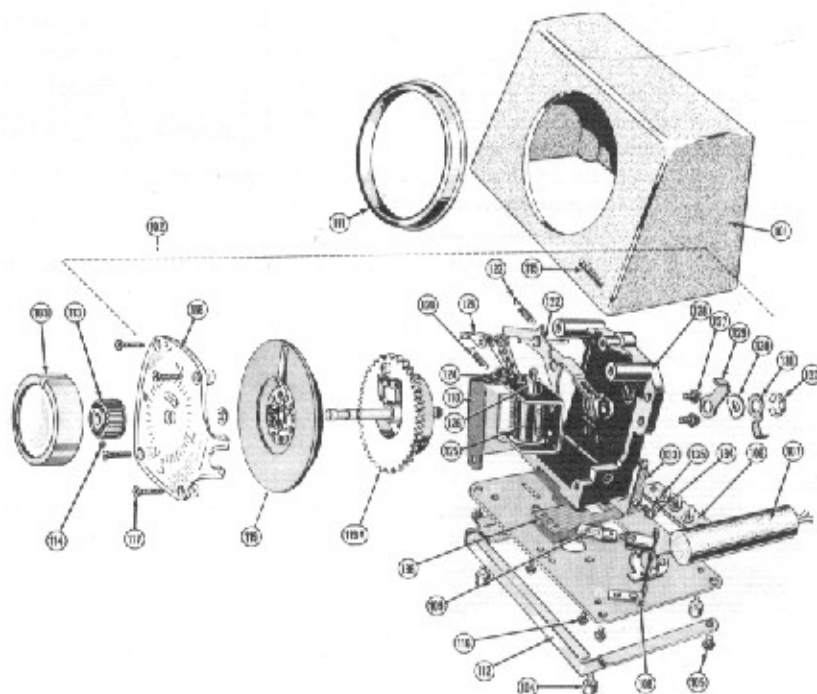


Fig. 39. Exploded View of Model U-98 Control Box.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
Light fails to go off at stop position.	Check synchronization per instructions on bottom of control case. Input contacts improperly adjusted.
Light fails to come on.	Bulb bad or socket connections loose.
Rotor operates—light on, but control fails to operate.	Check for short between terminals 3 and 4 or short from terminal No. 4 to casting of rotor or chassis of control. Check capacitor (Item No. 39) across contact switch (Item No. 27) for short.

(Note: In some cases rotor may not operate with these symptoms because the voltage drops approximately 5 volts at the control box.)

U-98 PARTS LIST

ITEM	NAME	PART NO.
1	Rotator Assembly	5471-R
2	Housing Assembly RH	5454-R
3	Housing Screws, 10-32 x 3/4	3429-N
4	Clamping Plate	5456-A
5	Nut, Hex, 1/4 x 20	8100-E
6	Weather Shield	3375-C
**6	Shaft Assembly (2 RPM)	
6A	Shaft Assembly (1 RPM)*	9373-R
7	Bearing Collar	3987-A
8	Thrust Washer	3376-A
**9	U-Bolt	18291-A
**10	Mast Clamp	18292-R
**11	Nut, Hex, 1/4 x 20	8100-E
12	Worm Assembly	5474-R
12A	Worm Assembly (1 RPM)*	18074-R
13	Screw, RH Washer, 8-32 x 3/8	3429-Q

** No longer available as individual part—replace by ordering RCR Kit A—2 to 1 RPM Conversion

*** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

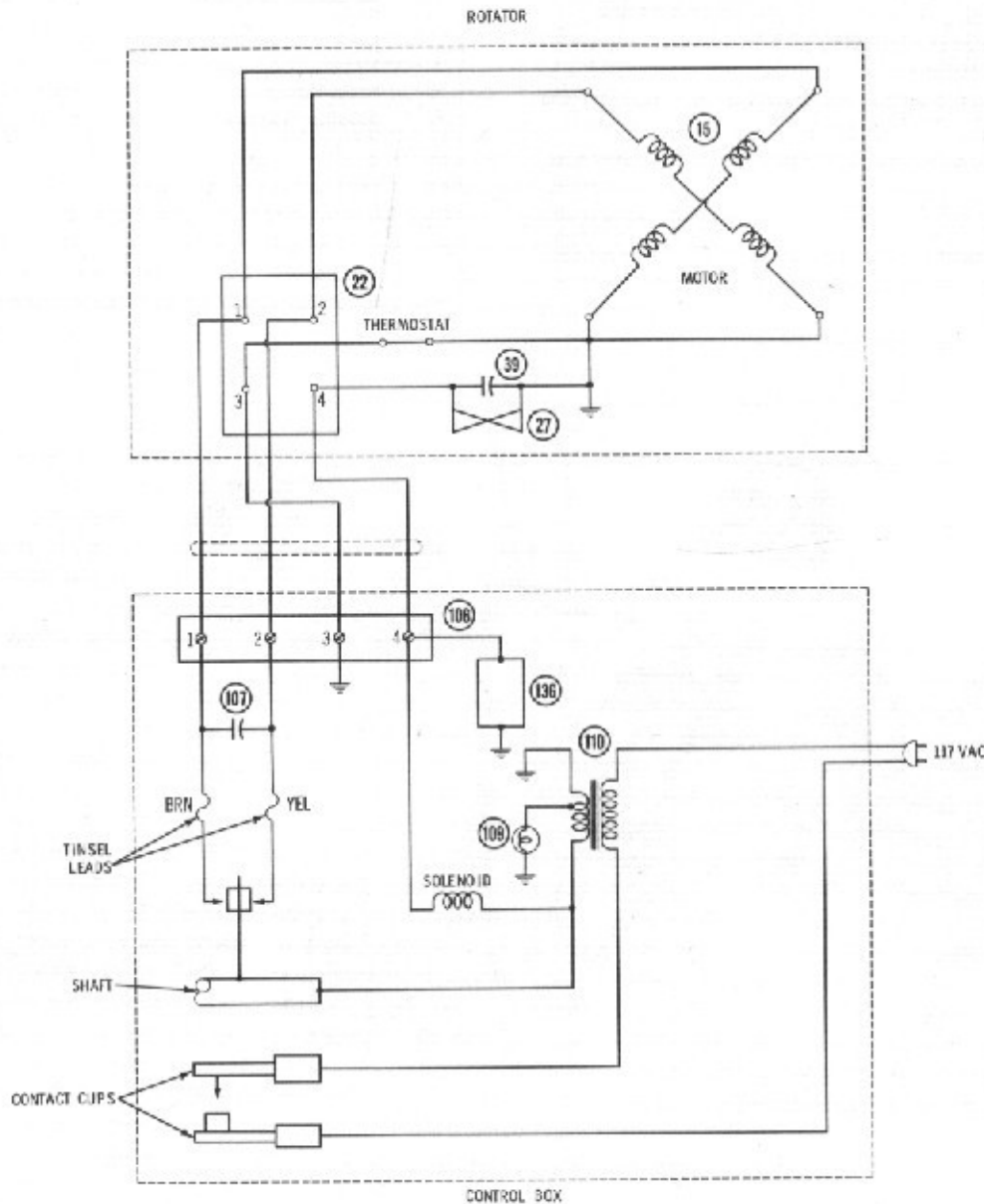


Fig. 40. Schematic Wiring Diagram—Model U-98.

U-98 PARTS LIST Continued

ITEM	NAME	PART NO.
14	Stop Slide	3320-A
15	Motor & Term. Assembly	5714-S
16	Nut, Hex, 6-32	601-P
17	Mounting Plate Assembly	4263-R
18	Screw, RHM, 8-32 x 3/8	3429-Q
19	Spacers	4141-A
20	Gear & Pinion Assembly	3373-R
21	Hairpin Cotter	4243-H
22	Terminal Plate Assembly	5700-R
23	Screw, RHM, 8-32 x 1	8013-A
24	Screw, Binding Head, 6-32 x 3/16	608-H
27	Contact Switch Assembly	5908-R
28	Screw, RHM, 6-32 x 3/16	1369-L
30	Housing Assembly	5326-B
31	Gasket	5449-A
32	Nut, Hex, 8-32	3426-A
33	Terminal Cover	5327-A
34	Nut, 8-32	3426-A
35	Strain Relief Clamp	3380-A
36	Screw, RHM, 6-32 x 1/2	3031-M
37	Nut, Hex, 6-32	601-P
38	Grommet	3387-B
39	Capacitor .01 ceramic	8533-B
41	Cam and Gear	5584-B
41A	Cam and Gear (1 RPM)*	4292-B
42	Retaining Ring	2825-A

* Used on one RPM Rotors manufactured after June 1, 1958. Serial number U840501 and over.

	Control Box Complete	8515-R
101	Case	5559-A
102	Frame & Dial Assembly	8516-R
103	Knob—brown	8529-R
	Knob—ivory	5556-R

U-98 PARTS LIST Continued

ITEM	NAME	PART NO.
104	Bumper	5628-A
105	Screw, RH Washer, 8-32 x 3/8	2396-E
106	Term. Strip Assembly	3803-S
107	Capacitor	4098-A
108	Light Socket Assembly	5558-R
109	Bulb (Type 47)	4274-A
110	Transformer	5512-A
111	Bezel	8525-B
112	Trim Strip	8528-A
113	Knob Hub	5555-A
114	Set Screw	614-N
115	Emblem	8530-A
116	Screw, Self Tapping, 6-20 x 1/2	603-N
117	Screw, Self Tapping, 6-20 x 5/8	603-K
118	Dial	8519-A
**119	Spring Motor & Hub Assembly	8534-R
**119A	Detent Body Assembly	5524
120	Pawl Spring	5667-A
121	Pawl	8518-A
122	Pawl Lifter Assembly	8512-A
123	Spring Tension	8520-A
124	Grommet	8509-A
125	Solenoid Assembly	8511-R
126	Plunger	8504-A
127	Screw, Hex H. Washer, 6-32 x 1/2	5676-A
128	Frame Assembly	5515-S
129	Stop Lever	5537-A
130	Spring Washer	5568-A
131	Terminal	5540-A
132	Retaining Ring	4243-B
133	Indent Spring Assembly	5518-R
134	Screw, RHM, 6-32 x 3/8	3429-P
135	Washer, 5-16	2715-A
136	Tuning Spring	5563-A

** Complete Detent and Spring Motor assembly consists of Items 119 and 119A, Part No. 5524 R.

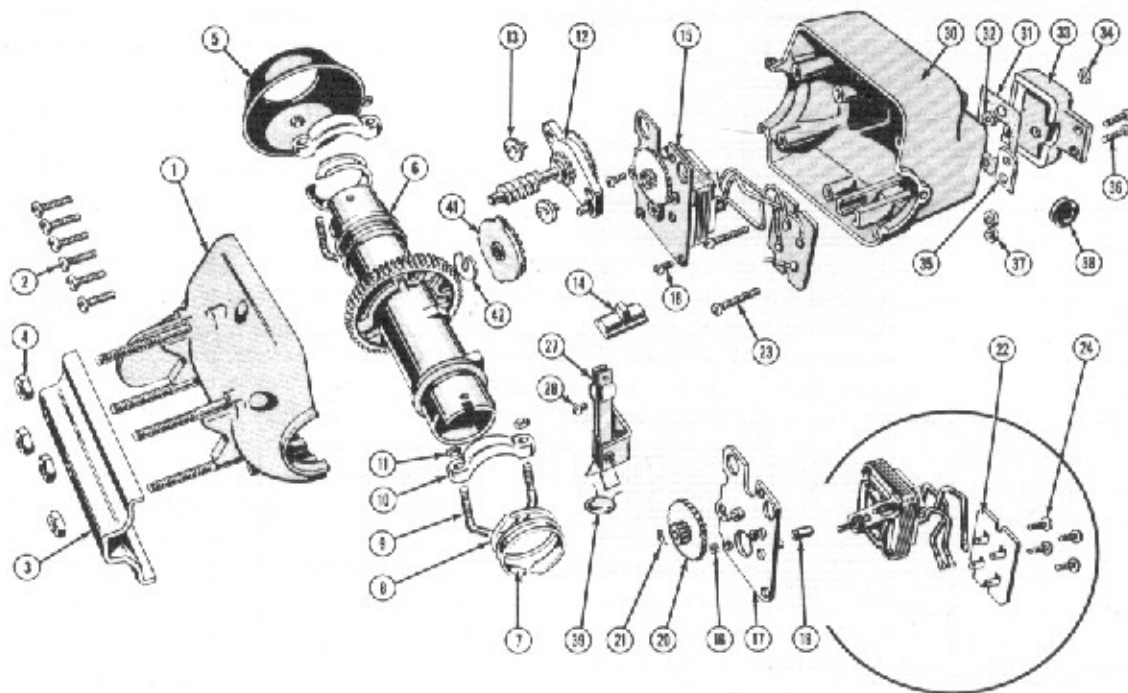


Fig. 41. Exploded View of Model U-98 Rotator Unit.

GENERAL INFORMATION

The Alliance Tenna-Rotor®, Model T-20, is actuated by depressing the right or left end of the control bar (Item No. 103) located on top of the control box. Depressing the right end rotates the antenna clockwise. The antenna direction is registered on a direction indicator, located on the front of the control. The rotor operates at a speed of 1 RPM and is equipped with a motor brake to prevent drifting.

The T-20 rotor can be identified by the brown weather-shield and the model number T-20 stamped into the metal housing.

The control can be identified by the model number T-20 stamped on the bottom of the control and by the square medallion on the dial window instead of the round medallion used on the T-12.

THE T-20 ROTOR AND CONTROL ARE NOT INTERCHANGEABLE WITH ANY OF THE FORMER ALLIANCE MODELS. THE T-20 ROTOR CAN BE USED ONLY WITH THE T-20 CONTROL AND VICE VERSA.

NOTE:

Although some T-20 parts are interchangeable with the parts used on the T-12, many of the important or critical parts are not. Check the T-20 parts list before replacing any parts. For example: the meter, transformer, capacitor, motor, all potentiometers, etc., are different and cannot be interchanged with parts used on any other model. The outward appearance of the T-20 is identical to the T-10 and T-12, so be sure to check model number on bottom of control and model number stamped in rotor housing when ordering replacement units or parts.

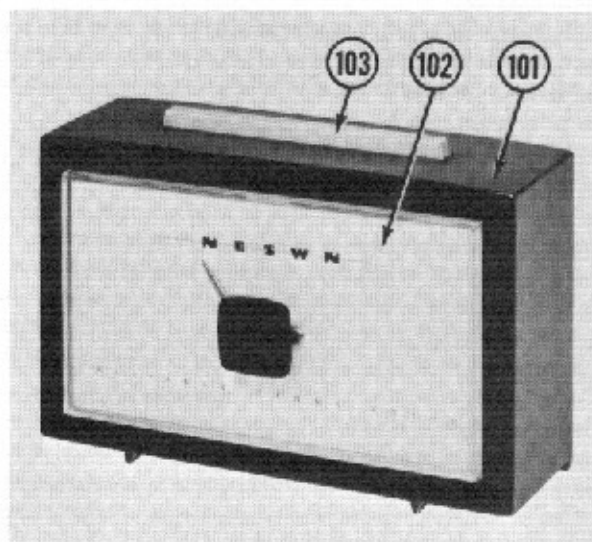


Fig. 42 Control Box—Model T-20.

CHANGE NOTICE:

On units built after January 28, 1963, with serial number 1546812 and over, the meter assembly has been changed.

Item #116

Resistor 10 ohm ½ Watt Part No. 6550-A changed to

Item #116

Resistor 4.7 ohm 1 Watt Part No. 6779-E

Item #117

Resistor 27 ohm 1 Watt Part No. 6779-D changed to

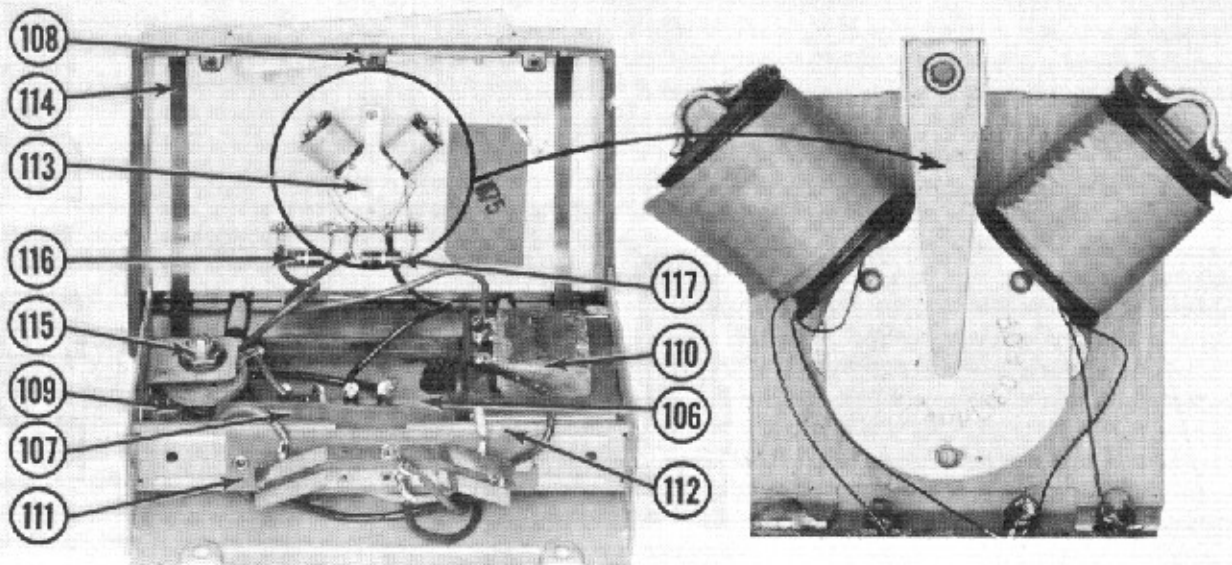


Fig. 43. Internal Components—Model T-20 Control Box.

Item #117

Resistor 18 ohm 1 Watt Part No. 6779-F

If it becomes necessary to replace a resistor, use the same value as used originally in the unit.

SERVICING PROCEDURE

Power-off Checks

1. Be sure that four conductor cable is connected to proper terminals. Terminal No. 1 in the rotor should be connected to Terminal No. 1 on the control box and so on with Nos. 2, 3, and 4.

2. Be sure strands of four conductor cable wire are not shorting between terminals; between terminal and rotor casting or between terminal and control box chassis. Such shorts will cause meter and/or front potentiometer and/or calibrating resistor to "burn up."

3. Hollow shaft (Item No. 6) must have "play."

4. Primary input contacts (Item No. 111) within the control box should make solid contact for left or right positions and should have approximately 1/16 inch clearance in open position.

Power-on Checks

1. Line voltage should be approximately 115 volts.

2. Run unit to counterclockwise stop by depressing left end of the control bar (Item No. 103). Indicator pointer should decrease steadily, stopping at left side of the dial when rotor reaches the counterclockwise stop.

3. Adjust calibrating resistor (Item No. 109) for full scale north reading when unit is at full counterclockwise stop.

4. Run unit to clockwise stop by depressing right end of control bar. Indicator should increase steadily stopping at the extreme right end of dial when rotator reaches the clockwise stop.

VOLTAGE CHART

Conditions of measurement:

Line Voltage.....117 VAC

Tolerance± 10%

Measured values at control box terminals

1. Control Only—4 Conductor Cable disconnected—Left end of bar depressed.

Terminal #1—#2.....	0 V.
Terminal #1—#3.....	22.5 VAC
Terminal #1—#4.....	28.5 VAC
Terminal #2—#3.....	22.5 VAC
Terminal #2—#4.....	28.5 VAC
Terminal #3—#4.....	6.0 VAC

2. Locked Rotor—100' of #20 A.W.G. 4 Conductor Cable connected to control and rotor. Rotor turned to counter-clockwise stop. Indicator on left "N" position.

Terminal #1—#2.....	18 VAC
Terminal #1—#3.....	14 VAC
Terminal #1—#4.....	15 VAC
Terminal #2—#3.....	17 VAC
Terminal #2—#4.....	20 VAC
Terminal #3—#4.....	2.5 VAC

3. Locked Rotor—100' of #20 A.W.G. 4 Conductor Cable connected to control and rotor. Rotor turned to clockwise stop. Indicator on right "N" position.

Terminal #1—#2.....	18 VAC
Terminal #1—#3.....	14 VAC
Terminal #1—#4.....	20 VAC
Terminal #2—#3.....	13 VAC
Terminal #2—#4.....	15 VAC
Terminal #3—#4.....	5.5 VAC

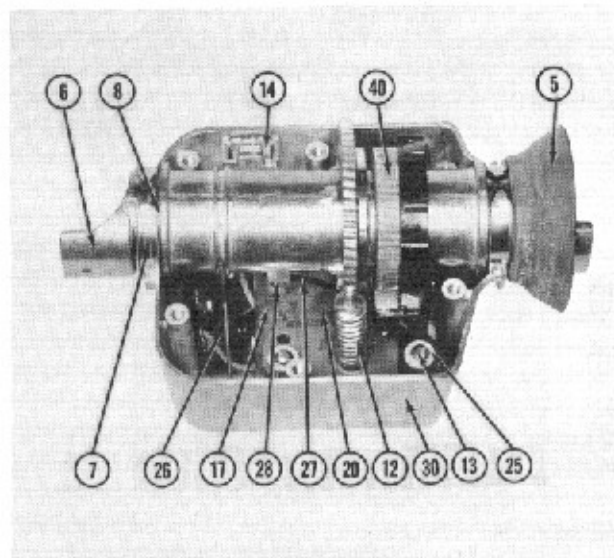


Fig. 44. Internal Components—Model T-20 Rotator Unit.

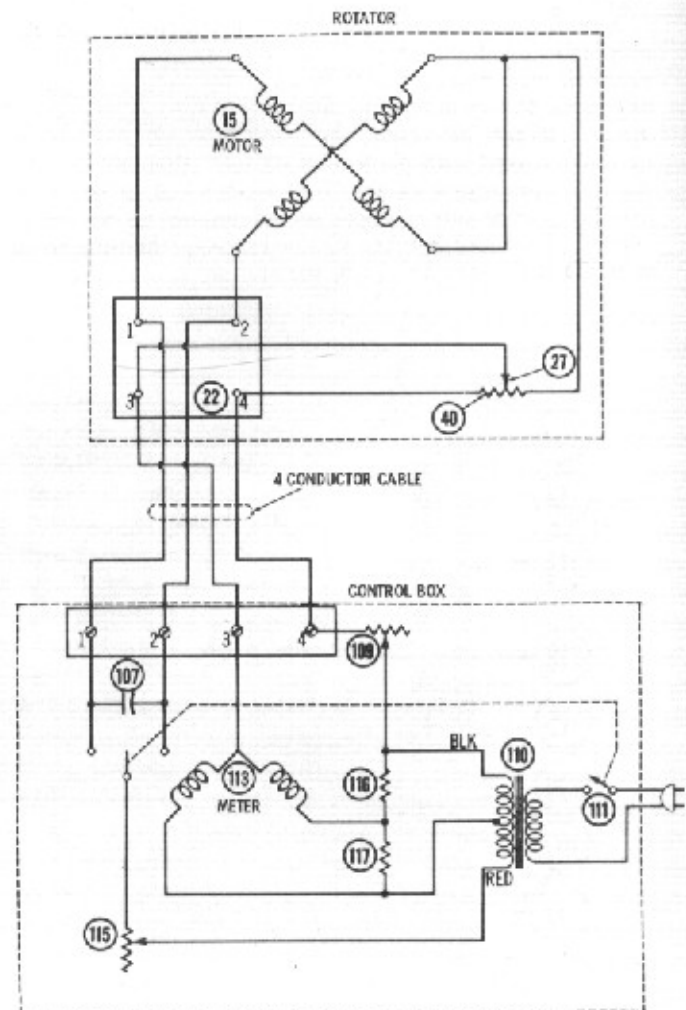


Fig. 45. Schematic Wiring Diagram—Model T-20.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotor unit fails to operate when control lever is moved for left or right position.	<p><i>If motor is inoperative:</i></p> <p>Check control switch contacts. Check internal connections in control box. Check capacitor. Check potentiometer (Item No. 40) in rotor for broken connections or open winding. Check motor.</p> <p><i>If motor is operating:</i></p> <p>Check gear system to be sure gears are meshing properly and are not slipping where there are staked assemblies.</p>
Rotor operates slowly or sluggishly.	<p>Check hook up of four conductor cable. Check size and length of four conductor cable. (See Figure 5.) Change capacitor.</p>
Meter fails to indicate properly.	<p>Check meter. Check front potentiometer (Item No. 115) and calibrating resistor (Item No. 109) for dirty, open, or burnt windings. Check contact spring (Item No. 27) for proper contact with potentiometer in rotator. Check spring tension on rear of meter and adjust per instructions on this page. Adjust front potentiometer and calibrating resistor per instructions.</p>

ADJUSTMENT INSTRUCTIONS

The T-20 Tenna-Rotor® is shipped from the factory with the front potentiometer adjusted and the only adjustment which should be necessary on a new unit is on the calibrating resistor which is located on the back of the control box. However, if it is impossible to get full scale north reading when the unit is at full clockwise stop or when parts have been replaced in the control box, adjust control box in the following manner:

Run rotator to full clockwise stop.

Turn calibrating resistor to clockwise stop.

Remove chassis from case.

Adjust front potentiometer so pointer indicates N on right side of scale. **DO NOT GO PAST N.** Contacts must be held closed on right side with some non-metallic object while this adjustment is made.

Replace chassis in case.

Run rotator to full counterclockwise stop and adjust calibrating resistor for N indication on left side of dial.

If preceding adjustments are made on service bench, use 100 feet of #20 copper four conductor cable between the rotator and control case.

NOTE:

If full range cannot be obtained with the above adjustments, check four conductor cable for recommended length and size per Figure 5.

ADJUSTMENT OF SPRING TENSION ON REAR OF METER

If pointer sticks, bend banjo slightly to relieve tension on spring until pointer moves smoothly.

With control box in normal position, tilt 90 degrees clockwise and 90 degrees counterclockwise from normal resting position. If pointer moves, adjust spring tension by bending banjo slightly until no movement is noted when control box is tilted.

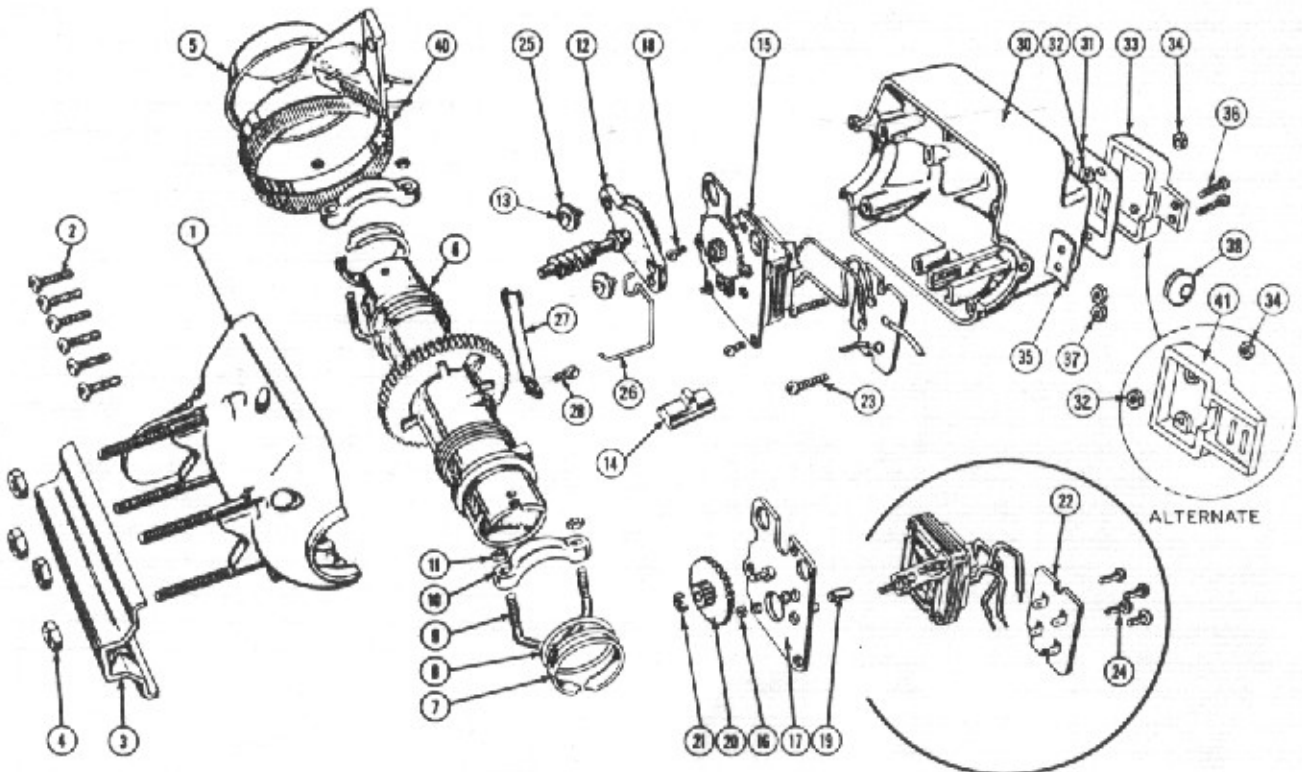


Fig. 46. Exploded View of Model T-20 Rotator Unit.

T-20 PARTS LIST

ITEM	NAME	PART NO.
1	Rotator Assembly Complete	8591-R
1	Housing Assembly RH	5454-R
2	Housing Screws, 10-32 x 3/4	3429-N
3	Clamping Plate	5456-A
4	Nut, Hcx, 1/4 x 20	8100-E
5	Weathershield	3375-E
6	Shaft Assembly	9373-R
7	Bearing Collar	3987-B
8	Thrust Washer	3376-B
*9	U-Bolt	18291-A
*10	Mast Clamp	18292-R
*11	Nut, Hex, 1/4 x 20	8100-E
12	Worm Assembly	5462-S
13	Screw, RHM, 8-32 x 1/2	2298-A
14	Stop Slide	3320-A
15	Motor & Gear Assy.	8593-R
16	Nut, Hex	601-P
17	Mounting Plate Assy.	4263-R
18	Screw, RHM, 8-32 x 3/8	3429-Q
19	Spacers	4141-A
20	Gear & Pinion Assy.	3373-R
21	Retaining Ring	4243-H
22	Terminal Plate Assy.	8919-R
23	Screw, RHM, 8-32 x 1	8013-A
24	Screw, Binding Hd., 6-32 x 3/16	608-H
25	Washer, Metal	2715-H
26	Spring, Ground	9130-A
27	Contact Spring	8539-A
28	Screw, Self Tapping, 6-32 x 1/4	8622-A
30	Housing LH	14246-A
31	Gasket	5449-A
32	Nut, Hex, 8-32	3426-A
33	Terminal Cover	5327-A
34	Nut, 8-32	3426-A
35	Strain Relief Clamp	3380-A
36	Screw, RHM, 6-32 x 1/2	3031-M
37	Nut, Hcx, 6-32	601-P
38	Grommer	3387-B
40	Potentiometer Assy.	5725-S
41	Terminal Cover (Alternate for item 33)	9319-A

* New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

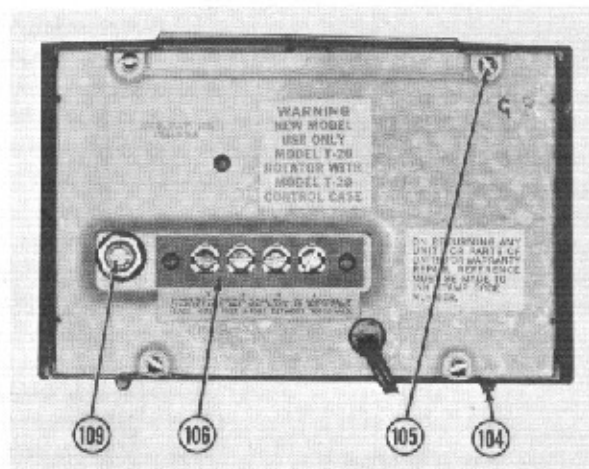


Fig. 47. Rear View of Model T-20 Control Box Showing Terminal Strip.

T-20 PARTS LIST Continued

ITEM	NAME	PART NO.
	Control Complete	8599-R
101	Case	5481-A
102	Window	18164-R
103	Control Bar	9180-A
104	Foot Pads	5756-A
105	Screw, RHM, 6-32 x 1/4	1369-L
106	Terminal Strip Assy.	3803-S
107	Capacitor	8588-B
108	Pivot Pin	5355-A
109	Calibrating Resis. (rear)	4094-D
110	Transformer Assy.	8589-R
111	Switch Assy.	5864-S
112	Insulating Strip	5351-A
113	Meter & Panel Assy.	8908-R
114	Panel Retainer	5495-A
115	Front Calib. Resistor	4094-D
116	Resistor 4.7 ohm 1W	6779-E
117	Resistor 18 ohm 1W	6779-F

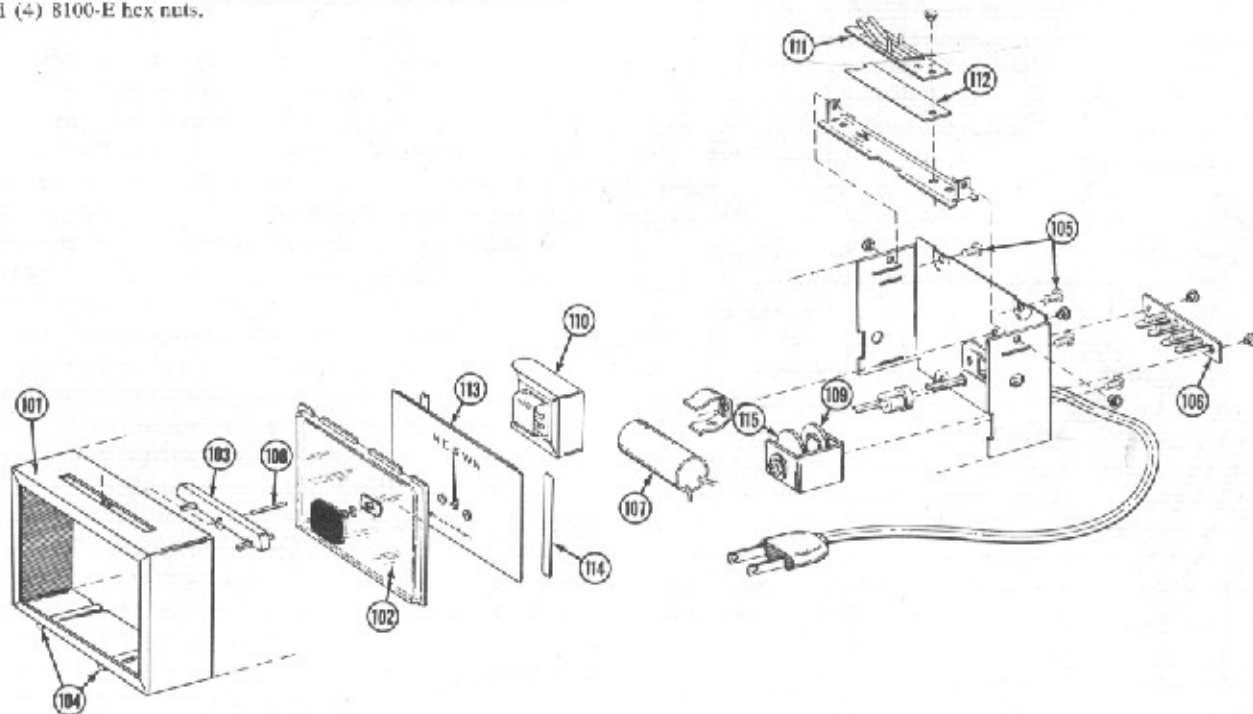


Fig. 48. Exploded View of Model T-20 Control Box.

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model U-100 is a fully automatic unit. The control knob is turned to the desired direction and the rotor automatically rotates the antenna to that position and stops. The dial lights up when the direction is selected and turns off when the antenna reaches that position. The unit operates at a speed of 1 RPM and is equipped with a motor brake to prevent drifting or windmilling. The U-100 rotor can be identified by the blue weathershield and the model U-100 stamped into the metal housing. The U-100 control can be identified by the Model number U-100 stamped on the bottom of the control. **The U-100 Rotor and Control are not interchangeable with any of the former Alliance Models.**

PLEASE NOTE:

Although some U-100 parts are interchangeable with the parts used on the U-98, many of the important or critical parts are not. Check the U-100 parts list before replacing any parts. For example—the transformer, solenoid, capacitor, frame and dial assembly, and the motor are different and cannot be interchanged with parts used on any of our other models.

The outward appearance of the U-100 is identical with the U-98 so be sure to check model number on bottom of the control and model number stamped in rotor housing when ordering replacement units or parts. Note: **The U-100 Rotor can be used only with the U-100 control and Vice Versa.**

SERVICING PROCEDURE

Power-off Checks

1. Viewing from front, left pawl (Item No. 121) should clear slotted escapement disc by .010 inch to .035 inch with solenoid in energized position.

2. Right pawl (Item No. 121) should clear slotted escapement disc by .010 inch to .035 inch with solenoid in de-energized position.

3. Left pawl must come to rest in any given stop position. After stop position is reached, depress plunger in solenoid by hand to make sure pawl drops freely into slot. Adjustment is made by moving indent spring assembly (Item No. 133).

4. Contact spring (Item No. 27) in the rotor unit must make contact only when cam lobe (Item No. 41) comes in contact with the switch. If shaft assembly (Item 6) is removed from the rotor unit, cam lobes must be $\frac{1}{2}$ turn away from contact points in end-stop position in both directions. See Fig. 53.

5. Be sure that four-conductor cable is connected to proper terminals. Terminal No. 1 in the rotor connects to No. 1 on the control case and so on with Nos. 2, 3, and 4.

6. Check length and size of four conductor cable. See Figure 4.

7. Primary input contacts should be .020 inch apart. Adjustment can be made at factory only.

8. Red pointer on dial face should point to the direction which corresponds with the antenna at the stop position. This adjustment is made by removing the knob and inserting a narrow tool through the elongated radial slot to the gripping holes in the pointer and turning the pointer to the correct position.

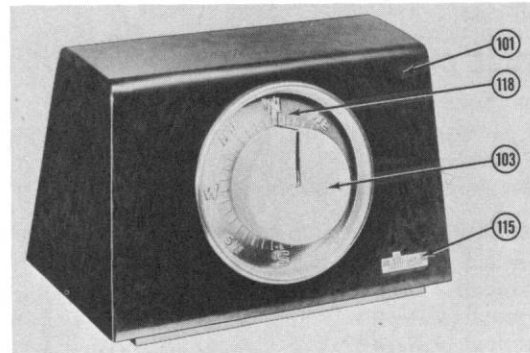


Fig. 49. Control Box—Model U-100.

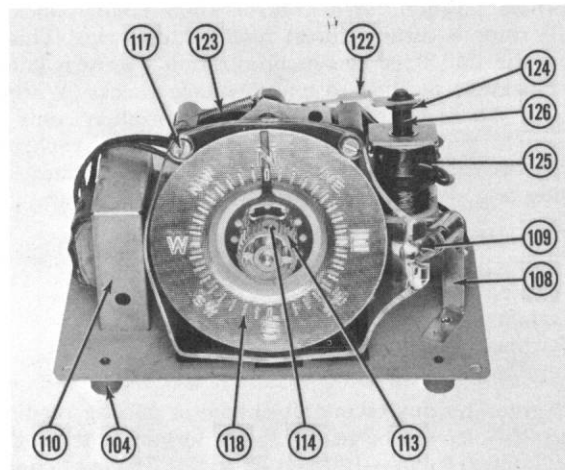


Fig. 50. Internal Components—Model U-100 Control Box.

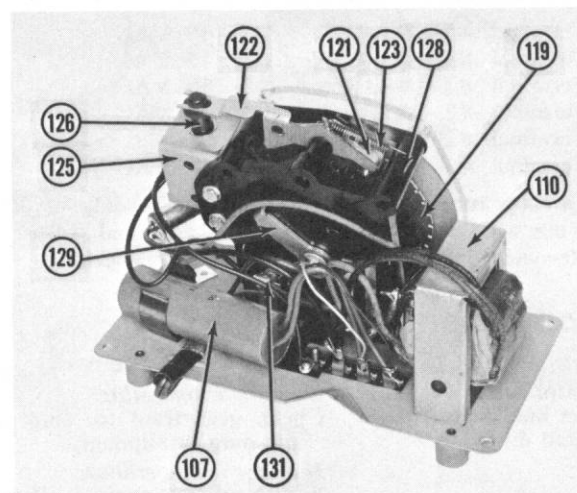


Fig. 51. Internal Components—Model U-100 Control Box.

Power-on Checks

1. Line voltage should be approximately 115 volts.
2. Turn knob (Item No. 103) to extreme counterclockwise stop. Solenoid must not buzz and mechanism must move correctly, no sticking or slipping. Rotator must turn to extreme counterclockwise stop and light must turn off when rotator reaches the top. If the light does not turn off, synchronize unit per instructions on bottom of control case.

VOLTAGE CHART

Conditions of measurement:

- Line Voltage..... 117 VAC
- Tolerance..... ± 10%
- Measured values at control box terminals

1. Control Only—4 Conductor Cable disconnected

- Terminal #1—#2..... 0 V
- Terminal #1—#3..... 29 VAC
- Terminal #1—#4..... 0 V
- Terminal #2—#3..... 29 VAC
- Terminal #2—#4..... 0 V
- Terminal #3—#4..... 29 VAC

2. Locked Rotor—100 feet of #20 A.W.G. 4 conductor cable connected to control and rotor. With rotor at full **clockwise** position, turn control knob counterclockwise. While rotor is turning, press reset button twice. This will throw the unit “out of synchronization.” Return knob to full clockwise position to make voltage checks. Warning: Control should be left “out of synchronization” only long enough to make the voltage checks, then re-synchronize. If left unsynchronized for a long period of time, overheating and damage to the transformer will result.

- Terminal #1—#2..... 20 VAC
- Terminal #1—#3..... 18 VAC
- Terminal #1—#4..... 0 V
- Terminal #2—#3..... 15 VAC
- Terminal #2—#4..... 20 VAC
- Terminal #3—#4..... 17 VAC

With rotor turning **counterclockwise**, a pulsing reading of 20 to 25 volts will be read between terminals #1 and #4.

3. Locked Rotor—100 feet of #20 A.W.G. 4 conductor cable connected to control and rotor. With rotor at extreme **counterclockwise** position, turn control knob clockwise. While rotor is turning, press reset button twice. This will throw the unit “out of synchronization.” Return knob to extreme counterclockwise position to make voltage checks.

- Terminal #1—#2..... 19 VAC
- Terminal #1—#3..... 15 VAC
- Terminal #1—#4..... 19 VAC
- Terminal #2—#3..... 17 VAC
- Terminal #2—#4..... 0 V
- Terminal #3—#4..... 16 VAC

With rotor turning **clockwise**, a pulsing reading of 20 to 25 volts will be read between terminals #2 and #4.

Re-synchronize unit immediately after checking.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotator fails to operate when knob is turned to desired direction.	<i>If motor is operating:</i> Check gear train for improper meshing or slippage. <i>If motor is inoperative:</i> Press tuning spring—if box mechanism operates properly, the trouble is not in the sole-

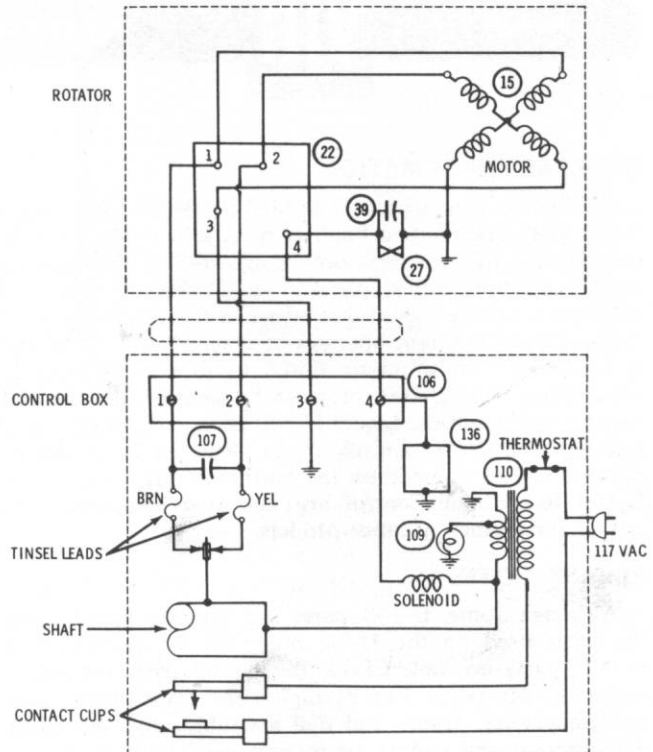


Fig. 52. Schematic Wiring Diagram—Model U-100.

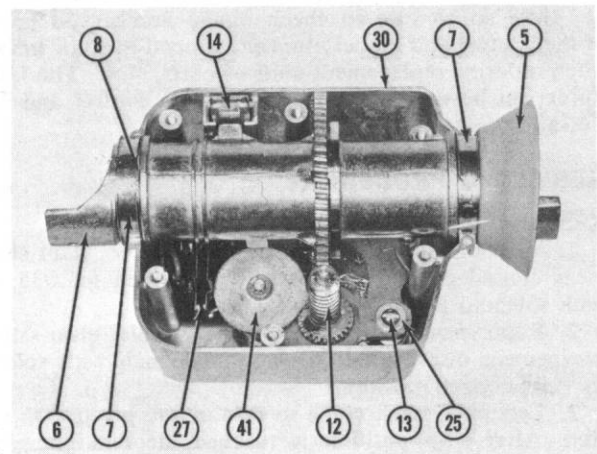


Fig. 53. Internal Components—Model U-100 Rotator Unit.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
	noid, transformer, or the mechanical parts of the escapement assembly.
	Check input contacts to be sure they are closed.
	Check terminals 1-3, or 2-3, depending upon desired direction of rotation for approximately 18 to 20 volts.
	Check contact springs on the frame assembly for proper contact with rings.
	Check capacitor in control.
	Check contact switch in rotor for proper operation. Switch should close when cam lobe hits switch blade.
	Check motor for shorts or open connections.

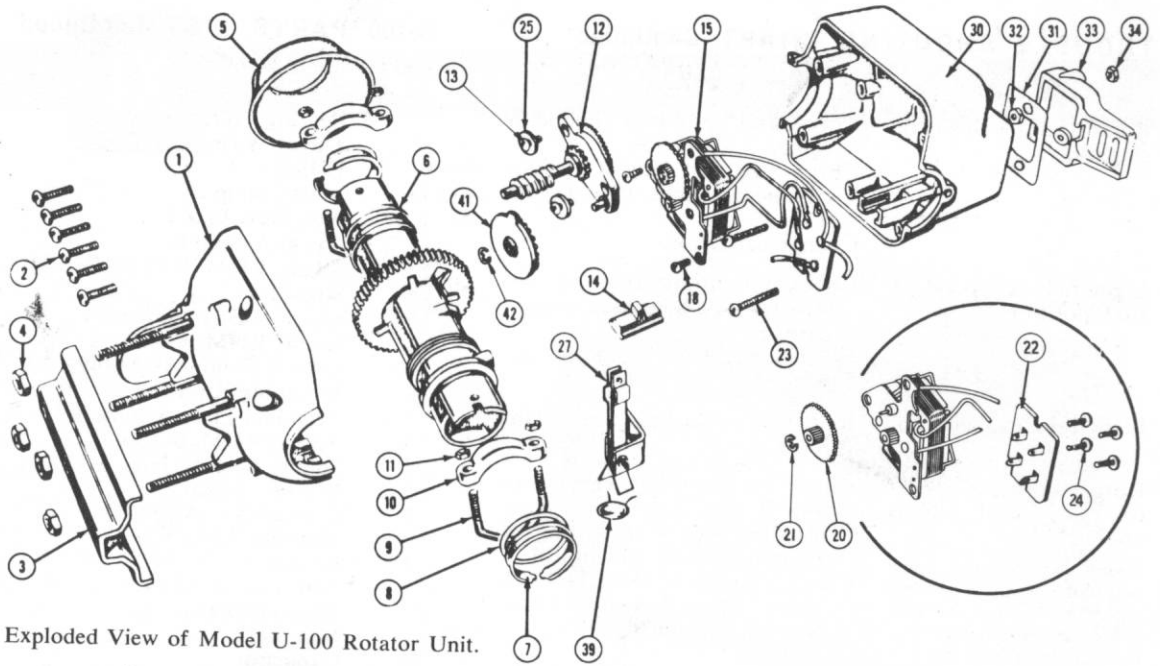


Fig. 55. Exploded View of Model U-100 Rotator Unit.

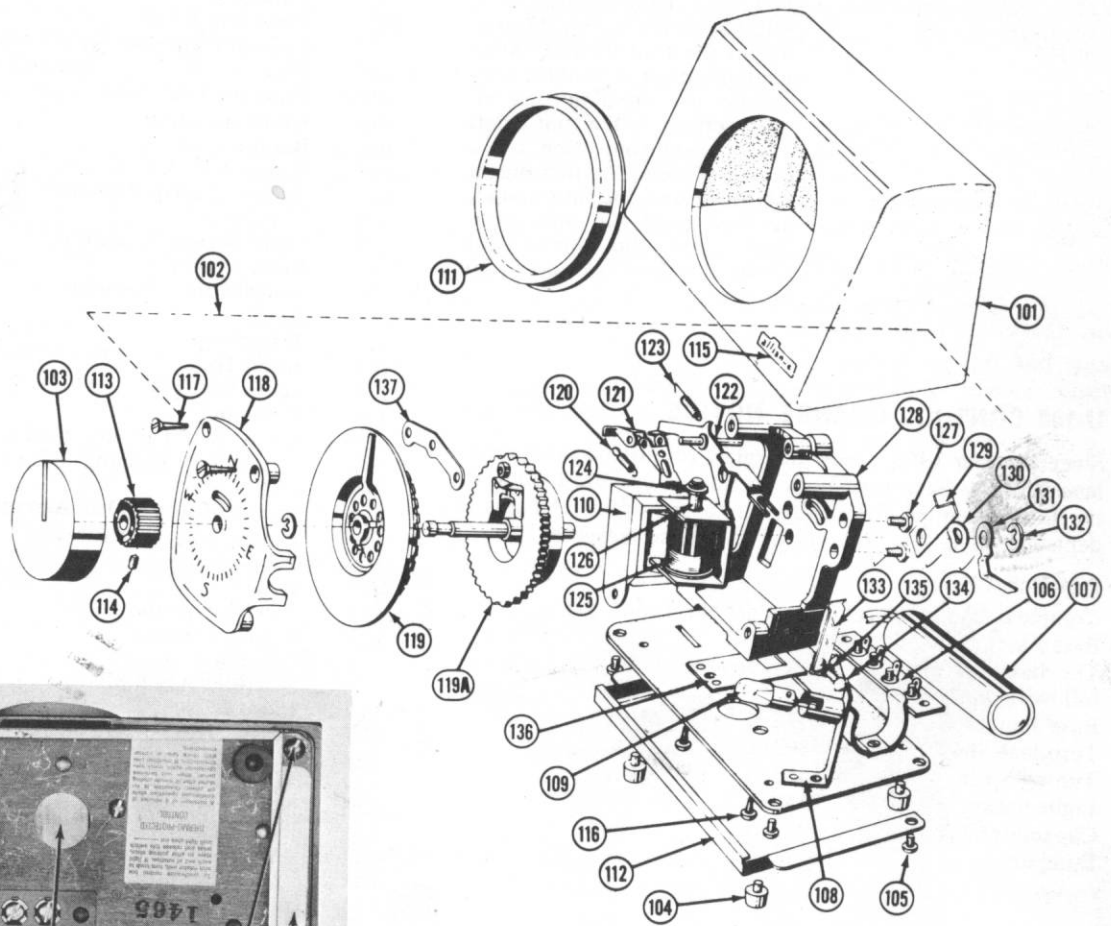


Fig. 56. Exploded View of Model U-100 Control Box.

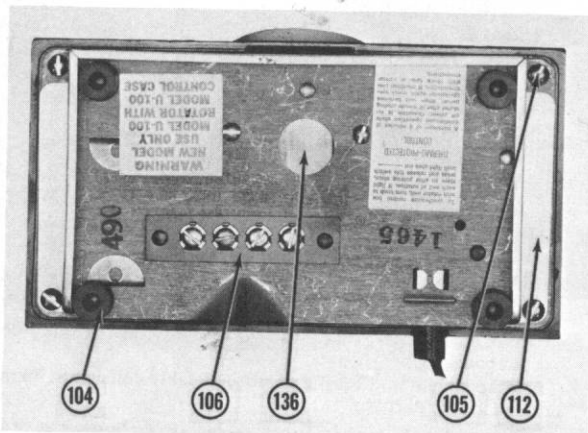


Fig. 54. Bottom View of Model U-100 Control Box Showing Terminal Strip.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
Rotor operates slowly or sluggishly.	Check hook up of four conductor cable.
	Check size and length of four conductor cable. (See Figure 4.)
	Change capacitor.
Light fails to go off at stop position.	Check synchronization per instructions on bottom of control case.
	Input contacts improperly adjusted.
Light fails to come on.	Bulb bad or socket connections loose.
Rotor operates—light on, but control fails to operate.	Check for short between terminals 3 and 4 or short from terminal No. 4 to casting of rotor or chassis of control.
	Check capacitor (Item No. 39) across contact switch (Item No. 27) for short.
Rotor and Control inoperative—Light "OFF."	U-100 units manufactured after July 10, 1963, have a thermostat in the transformer. After a minimum of 4 minutes continuous use on a normal installation, or, if the unit is left out of synchronization for a period of time, the thermostat will open and the unit cannot be used until the unit cools "off" and the thermostat closes. This can take up to 30 minutes.

U-100 CONTROL CHANGE NOTICE

Since October 1969, a new fiberglass reinforced polypropylene base has been used on a portion of our production of the U-100 control. When present supply of metal bases is depleted, all U-100 controls will have the new base.

Parts List Changes

Complete Control Assembly—Part No. 18649-R
 Base Assembly—Part No. 18647-R
 The base assembly 18647-R consists of and replaces the following parts:

Base Plate	8914-R
Terminal Strip	3803-S
Tuning Spring	5563-A
Light Socket	5558-A
Capacitor Clip	8903-A
Bumpers	18174-A

U-100 PARTS LIST

ITEM	NAME	PART NO.
	Rotor Complete	8910-R
1	Housing Assembly RH	5454-R
2	Housing Screws, 10-32 x 3/4	3429-N
3	Clamping Plate	5456-A
4	Nut, Hex, 1/4 x 20	8100-E
5	Weathershield	3375-F
6	Shaft Assembly	9373-R

U-100 PARTS LIST Continued

ITEM	NAME	PART NO.
7	Bearing Collar	3987-B
8	Thrust Washer	3376-B
***9	U-Bolt	18291-A
***10	Mast Clamp	18292-R
***11	Nut, Hex, 1/4 x 20	8100-E
12	Worm Assembly	18074-R
13	Screw, RHM, 8-32 x 3/8	3429-Q
14	Stop Slide	3320-A
15	Motor & Gear Assembly	18508-R
18	Screw, RHM, 8-32 x 3/8	3429-Q
20	Gear & Pinion Assembly	3373-R
21	Retaining Ring	4243-H
22	Terminal Plate Assembly	8919-R
23	Screw, RHM, 8-32 x 1	8013-A
24	Screw, Binding Hd., 6-32 x 5/16	608-H
25	Washer, Metal	2715-H
27	Contact Sw. Assembly	5908-R
30	Housing, LH	14246-A
31	Gasket	5449-A
32	Nut, Hex, 8-32	3426-A
33	Terminal Cover	9319-A
34	Nut, 8-32	3426-A
39	Capacitor	8533-B
41	Cam & Gear	4292-B
42	Retaining Ring	4243-K
	Control Complete	8913-R
* 101	Case	5559-A
102	Frame & Dial Assy.	8516-S
103	Knob Assembly	5556-R
104	Bumper	5628-A
105	Screw, RHM, 8-32 x 3/8	3429-Q
106	Terminal Strip Assembly	3803-S
107	Capacitor	18061-A
108	Light Socket Assembly	5558-R
109	Bulb (type 47)	4274-A
110	Transformer Assembly	9100-R
111	Bezel	8525-B
112	Trim Strip	8528-A
113	Knob Hub	5555-A
114	Set Screw	8066-A
115	Emblem	8530-A
116	Screw, Self Tapping, 6-20 x 1/2	603-N
117	Screw, Self Tapping, 6-20 x 3/8	603-K
118	Dial	8519-A
** 119	Spring Motor & Disc Assembly	18504-R
** 119A	Detent Body Assembly	18505
120	Pawl Spring	5667-A
121	Pawl	8518-A
122	Pawl Lifter Assembly	8512-R
123	Spring Tension	8520-A
124	Grommet	8509-A
125	Solenoid Assembly	8511-S
126	Plunger	8504-A
127	Screw, Hex, 6-32 x 1/2	8027-D
128	Frame Assembly	5515-S
129	Stop Lever	18042-A
130	Spring Washer	5568-A
131	Terminal	5540-A
132	Retaining Ring	4243-B
133	Indent Spring	18093-A
134	Screw, RHM, 6-32 x 3/8	3429-P
135	Washer, 5/16	2715-P
136	Tuning Spring	5563-A
137	Tie Plate	8502-A

* Late models use case, Part No. 18147-A. Interchangeable with early models.
 ** Complete Detent and Spring Motor assembly consists of Items 119 and 119A, Part No. 18505-R.
 *** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model T-45 is an improved version of the T-20 indicator type. Five conductor cable is used to connect the control box to the rotator. Three wires are used for the motor circuit. Two wires are used for the potentiometer which is part of the meter circuit. The extra conductor makes it possible for the meter potentiometer to be operated on a separate circuit. By this mode of operation, the motor circuit and the meter circuit are independent of each other, resulting in much smoother meter operation, greatly improved accuracy, and elimination of inaccuracies due to temperature changes in the control box, and variations of the capacitor and line voltage. Model T-45 has an improved control bar which remains level and is much easier to operate (See Fig. 62).

Two T-45 controls can be used with one rotor where desired by removing the capacitor (Item #108) from one unit and connecting the controls in parallel. Both meters on the T-45 will track and show the antenna direction at all times.

The T-45 rotor uses the same type housing, hollow shaft mast support, worm gears, etc., as the T-20 rotor. The potentiometer is different. The T-45 rotor can be identified by the yellow weathershield and T-45 stamped in the casting. The rotor speed is 1 RPM.

NOTE:

The T-45 control must be used with the T-45 rotor. The rotor and control cannot be interchanged in any way with any other unit.

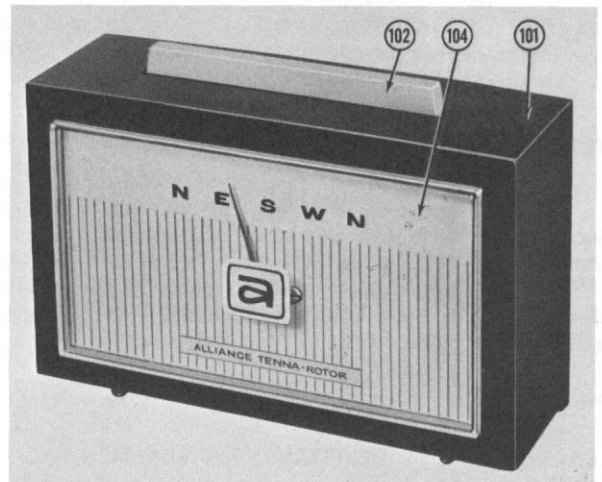


Fig. 57. Control Box—Model T-45.

SERVICING PROCEDURE**Power-off Checks**

1. Be sure five conductor cable is connected to proper terminals. Terminal No. 1 in the rotator should be connected to terminal No. 1 on the control box, and so on with Nos. 2, 3, 4, and 5.
2. Hollow shaft assembly (Item #25) must have "play."
3. Primary input contacts (Item #111) within the control box should make solid contact for left and right positions, and should have approximately $\frac{1}{16}$ inch clearance in open position.

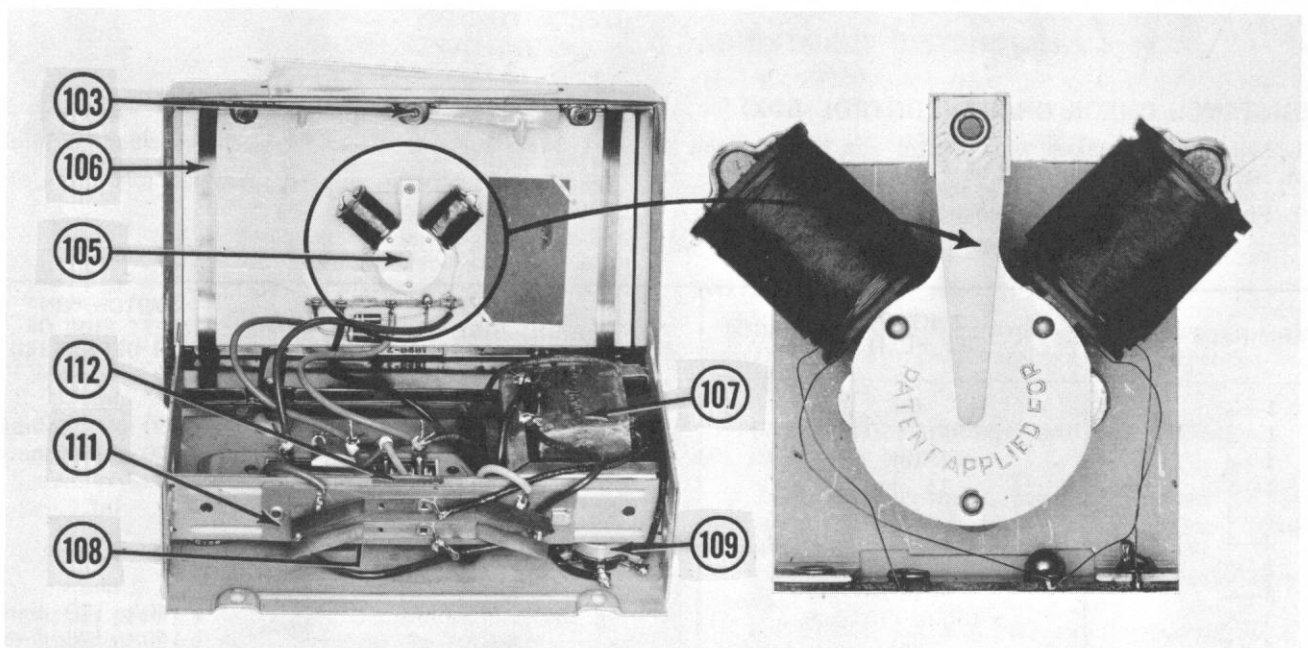


Fig. 58. Internal Components—Model T-45 Control Box.

Power-on Checks

1. Line voltage should be approximately 117 volts.
2. Run unit to clockwise stop by depressing right end of control bar (Item #102). Indicator pointer should increase steadily, stopping at right side of the dial when rotor reaches the clockwise stop.
3. Adjust calibrating resistor (Item #109) for full scale north reading when unit is at full clockwise stop.
4. Run unit to counterclockwise stop by depressing left end of control bar. Indicator pointer should decrease steadily stopping at the extreme left end of dial when rotator reaches the counterclockwise stop.

RESISTANCE CHECK CHART (ROTOR)

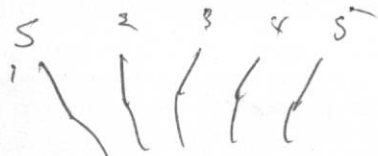
1. Measurements taken with a V.T.V.M.
2. Measurements taken at control box end of five conductor cable with five conductor cable disconnected at control box.
3. Measurements will vary due to lead length, accuracy of meter used, etc.; however, readings obtained should indicate if the difficulty is in the rotor or cable.
4. Maximum lead resistance allowable is 1.2 ohms per lead.

LEAD NOS.

RESISTANCE MEASUREMENTS

- | | |
|-----|---|
| 1—2 | *4 ohms to 157 ohms plus lead resistance. |
| 1—3 | *1.5 ohms to 154 ohms plus lead resistance. |
| 1—4 | *4 ohms to 157 ohms plus lead resistance. |
| 1—5 | 153 ohms plus lead resistance. |
| 2—3 | 2.5 ohms plus lead resistance. |
| 2—4 | 5 ohms plus lead resistance. |
| 2—5 | *4 ohms to 157 ohms plus lead resistance. |
| 3—4 | 2.5 ohms plus lead resistance. |
| 3—5 | *1.5 ohms to 154 ohms plus lead resistance. |
| 4—5 | 153 ohms plus lead resistance. |

* Readings will vary from low reading to high reading depending upon the position of the antenna which varies the position of the contact on the potentiometer.



RESISTANCE CHECK CHART (CONTROL BOX)

1. Measurements taken with control box disconnected from AC outlet.
2. Five conductor cable disconnected at control box.
3. Measurements taken between specified terminals. Readings will vary due to component part tolerances, ohm-meter accuracy, etc.

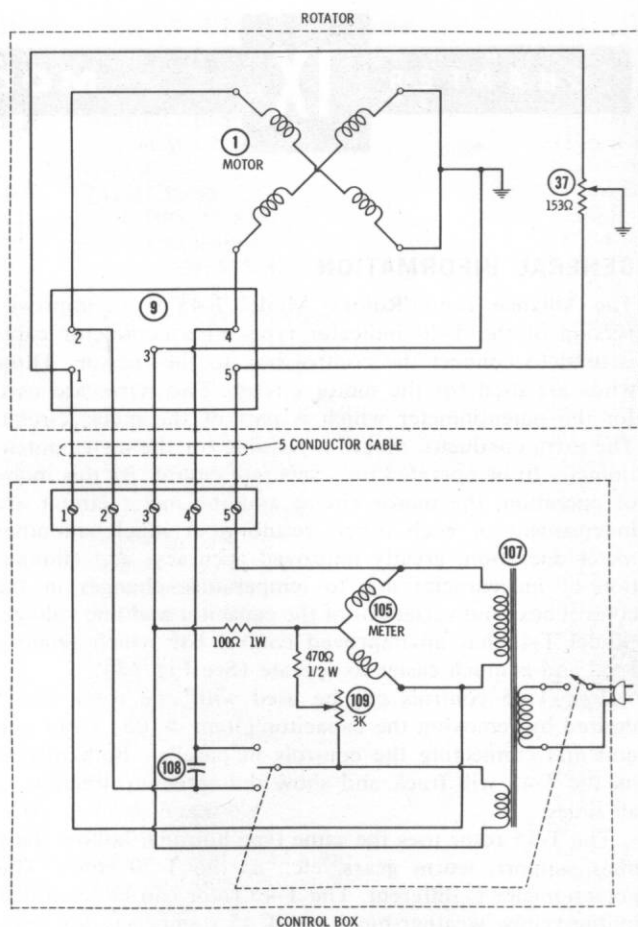


Fig. 59. Schematic Wiring Diagram—Model T-45.

TERMINALS	SWITCH IN OFF POSITION	SWITCH "ON" RIGHT SIDE OF BAR DEPRESSED	SWITCH "ON" LEFT SIDE OF BAR DEPRESSED
1—2	Inf.	† 150 to 170 ohms	Inf.
1—3	† 150 to 170 ohms	† 150 to 170 ohms	† 150 to 170 ohms
1—4	Inf.	Inf.	† 150 to 170 ohms
1—5	13 ohms	13 ohms	13 ohms
2—3	Inf.	2 ohms	Inf.
2—4	Inf.	Inf.	Inf.
2—5	Inf.	† 150 to 170 ohms	Inf.
3—4	Inf.	Inf.	2 ohms
3—5	† 150 to 170 ohms	† 150 to 170 ohms	† 150 to 170 ohms
4—5	Inf.	Inf.	† 150 to 170 ohms

† Readings will vary from 150 to 170 ohms depending upon setting of calibrating resistor.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotor unit fails to operate when control bar is depressed.	<i>If motor is inoperative:</i>
	Check 117VAC source.
	Check control switch contacts.
	Improperly installed control bar (See Figure 62.)
	Check internal connections in control box.
	Check for strands of wire shorting at terminals of both rotor and control (See "Resistance Chart").
	Check transformer (Item #107).
	Check potentiometer (Item #37) in rotor for broken connections or open winding.
	Check motor.
	<i>If motor is operating:</i>
Rotor operates slowly or sluggishly.	Check gear system to be sure gears are meshing properly and are not slipping where there are staked assemblies.
	Check hookup of five conductor cable.
	Check size and length of five conductor cable. (See Figure 4.)
Rotor operates but does not make complete 360° rotation.	Replace capacitor. (NOTE: Replace with capacitor part No. 18061-A. DO NOT SUBSTITUTE CAPACITORS.)
	Check installation.
	Check to be sure antenna lead has sufficient slack.
Meter fails to indicate correctly.	Check thrust bearing bracket whenever used. Mast must be perfectly aligned to prevent binding. (See Figure 3.)
	Replace capacitor. (NOTE: Replace with capacitor part No. 18061-A. DO NOT SUBSTITUTE CAPACITORS.)
	Check gears in rotor for damage.
	Check hookup per instructions enclosed with unit.
	Check lead wire length and size (See Figure 4.)
	Check for strands of wire shorted between terminals or between terminals and case of either rotor and control. (Shorted wires may damage the potentiometer in the rotor.)
	Check for pinched leads at stand-offs (causing open #1 or #5 leads).
	Check meter.
	Adjust calibrating resistor (Item #109) per instructions packaged with unit.
	Check potentiometer (Item #37) in rotor.
Meter does not hold or show proper direction after control bar is released.	Check banjo tension spring adjustment (See "Adjustment Instructions").

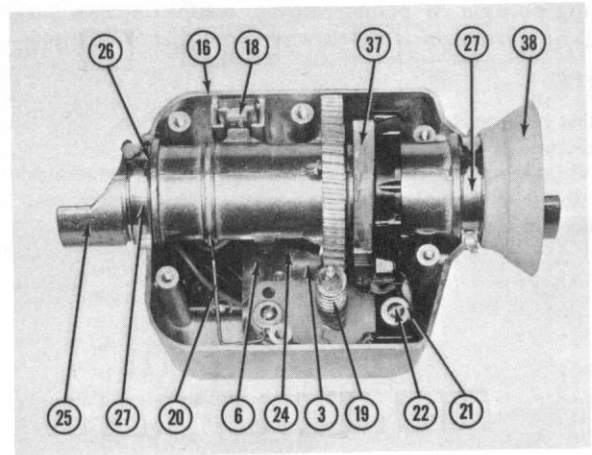


Fig. 60. Internal Components—Model T-45 Rotator Unit.

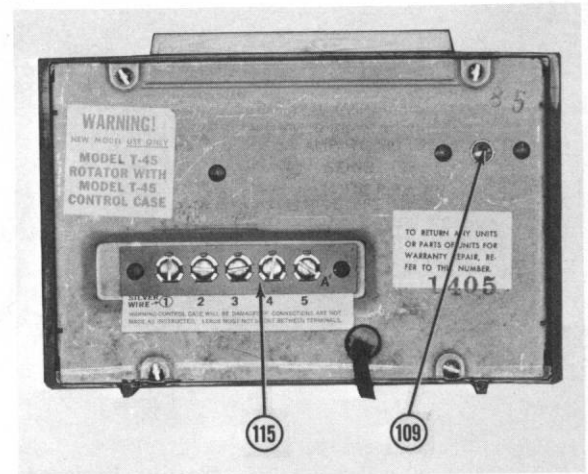


Fig. 61. Rear View of Model T-45 Control Box Showing Terminal Strip.

ADJUSTMENT INSTRUCTIONS

The T-45 is shipped from the factory so that the only adjustment necessary is on the calibrating resistor which is located on the back of the control box.

Run rotator to full clockwise stop and adjust calibrating resistor (Item #109) for N indication on right side of dial.

If above adjustment is made on service bench, use 100 feet of No. 20 copper five conductor cable.

NOTE:

If full range cannot be obtained with the above adjustment, check five conductor cable for recommended length and size per Fig. 4.

ADJUSTMENT OF BANJO SPRING TENSION ON REAR OF METER

In following adjustment, extreme care must be taken. Bend only the metal section to which bronze spring is attached. Do not bend bronze portion.

If indicator pointer sticks, carefully bend banjo assembly to release pressure.

If pointer does not hold position after control bar is released, bend banjo spring assembly to increase tension.

With control box in normal position, tilt 90 degrees clockwise, then 90 degrees counterclockwise from normal

Model T-45 • Alliance Tenna-Rotor®

resting position. If pointer moves, readjust spring tension until no movement is noted when control box is tilted.

NOTE:

The new control bar can be used in Models T-10, T-12, K-22, and T-20 Control Boxes.

When installing the new control bar in the above models, be sure high portion of step section is toward rear of control case.

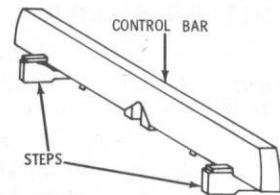


Fig. 62. Control Bar—Model T-45.

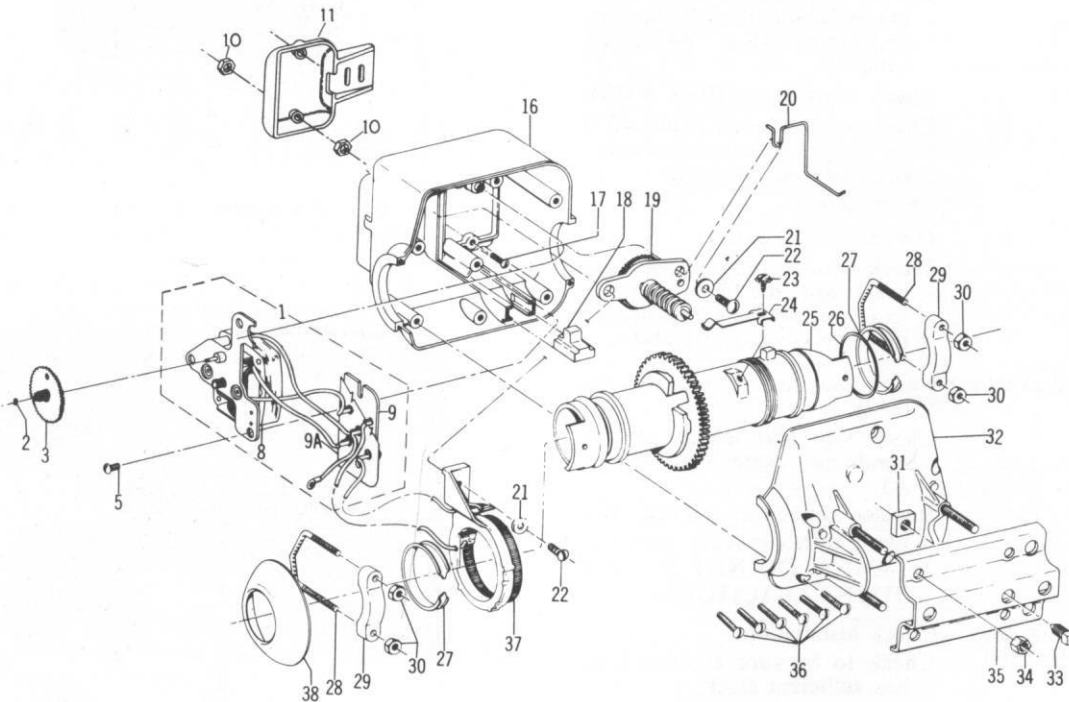


Fig. 63. Exploded View of Model T-45 Rotator Unit.

NOTE: All T-45 units built after August 1, 1967 will use Control Case 18145-A instead of 5481-A, and a new chassis which may be used in older Control cases by trimming off tabs on bottom of chassis as shown in Detail "A". Item #103, pivot pin 5355-A is not used with new Control Cases.

Two (2) screws #6-32 x 1/4", Part No. 1369-L are required to secure control case to chassis. Four (4) screws can be used on chassis with 4 holes.

The new 18145-A case can be used with the old chassis by securing case to chassis through two bottom holes using two (2) self-tapping screws, Part No. 8027-A and two flat washers Part No. 2715-A.

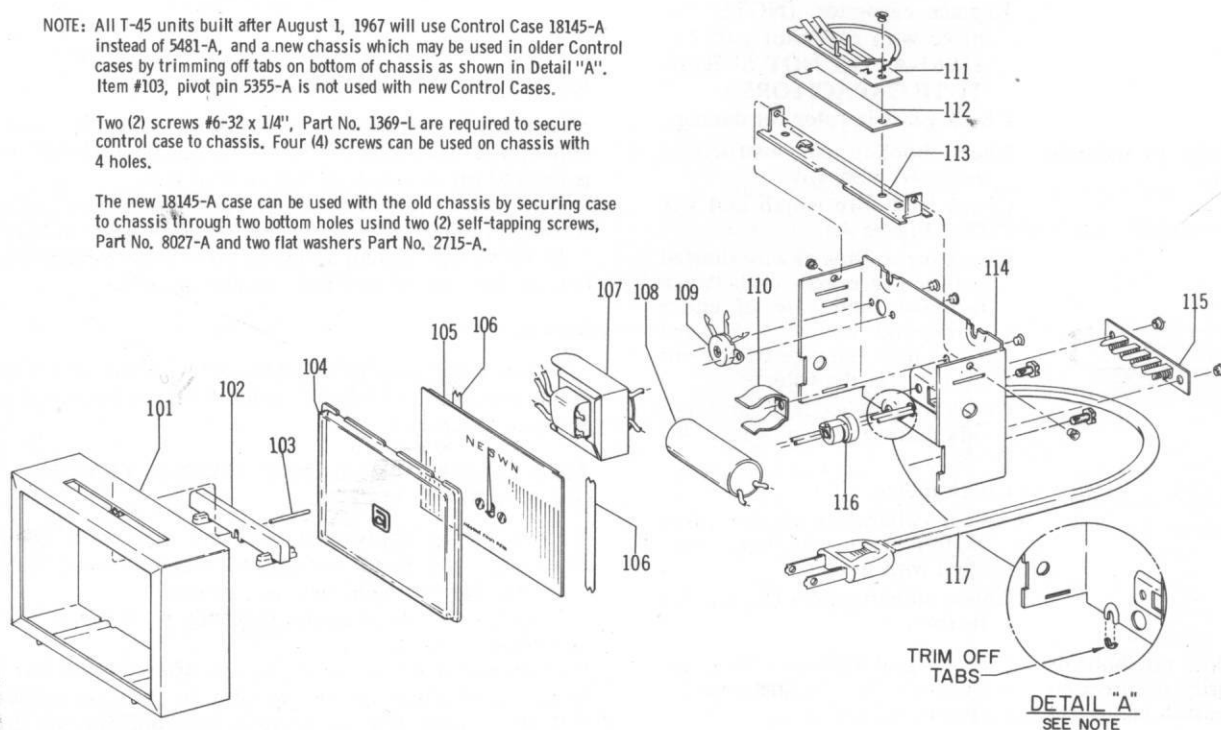


Fig. 64. Exploded View of Model T-45 Control Box.

T-45 PARTS LIST

ITEM	NAME	PART NO.
	Rotor, Complete	9186-R
1	Motor & Gear Assembly	18509-R
2	Retaining Ring	4243-H
3	Gear & Pinion	3373-R
5	Screw, RHM—8-32 x 3/8	3429-Q
8	Part of Item 1	—
9	Terminal Plate Assembly	9132-R
9A	Gasket	9157-A
10	Nut, Hex—8-32	3426-A
11	Terminal Cover	9319-A
16	Housing L.H.	14246-A
17	Screw, RHM—8-32 x 1	8013-A
18	Stop Slide	3320-A
19	Worm Assembly	18073-R
20	Spring (Ground)	9130-A
21	Washer, Metal	2715-H
22	Screw, RHM—8-32 x 1/2	2298-A
23	Screw, Self Tap. Wash—6-32 x 1/4	8622-A
24	Contact Spring	9315-A
25	Shaft Assembly	9373-R
26	Thrust Washer	3376-B
27	Bearing Collar	3987-B
**28	U-Bolt	18291-A
**29	Mast Clamp	18292-R
**30	Nut, Hex, 1/4 x 20	8100-E

** New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

T-45 PARTS LIST Continued

ITEM	NAME	PART NO.
31	Nut (Square)	3783-A
32	Housing RH Clamp	5454-R
33	Set Screw, Sq. Hd.	3770-A
34	Nut, Hex—1/4 x 20	8100-E
35	Clamp Plate	5456-A
36	Screw, RHM—10-32 x 3/4	3429-N
37	Potentiometer Assembly	9188-R
38	Weathershield (yellow)	3375-H
	Control, Complete	9175-R
*101	Case	5481-A
102	Control Bar	9180-A
103	Pivot Pin	5355-A
104	Window	9346-B
105	Meter and Panel Assembly	9182-R
106	Panel Retainer	5495-A
107	Transformer Assembly	9160-R
108	Capacitor	18061-A
109	Calibrating Resistor	6579-A
110	Capacitor Clip	8903-A
111	Switch Assembly	5864-S
112	Insulating Strip	5351-A
113	Switch Bracket—Part of Chassis Assembly	
114	Chassis Assembly—Not sold separately	
115	Terminal Strip	9086-R
116	Strain Relief	5494-A
117	Cord & Plug Assembly	5493-S

* Note—5481A case should be used on Model T-10, T-12, T-20 and early T-45 controls. 18145A case should be used on late model T-45 controls.

BLANK

GENERAL INFORMATION

Alliance Tenna-Rotor® Model C-225 employs a completely redesigned control case which features exact positioning control. The C-225 control box combines the following three control principles which are novel to the rotator field:

1. An electric bridge circuit for direction selection.
2. Selective load circuit for transistor operation of more than one control relay.
3. Sequential selection of the on-off circuit and of the direction operation circuit.

The control of this unit is operated by turning the knob to the desired direction. The rotation then automatically rotates the antenna to that position. A small red light in the lower left-hand corner indicates the antenna is moving. The red light goes "out" when the antenna reaches the pre-selected position.

The rotator unit uses the same type housings, feed through mast, same worm driven gears, etc., used in previous Alliance models. Model C-225 rotator can be identified by the green weather shield and the Model No. C-225 stamped into the metal housing.

NOTE:

Effective on production after October 1, 1964 the gear on the #9373R shaft assembly was changed to steel for added strength.

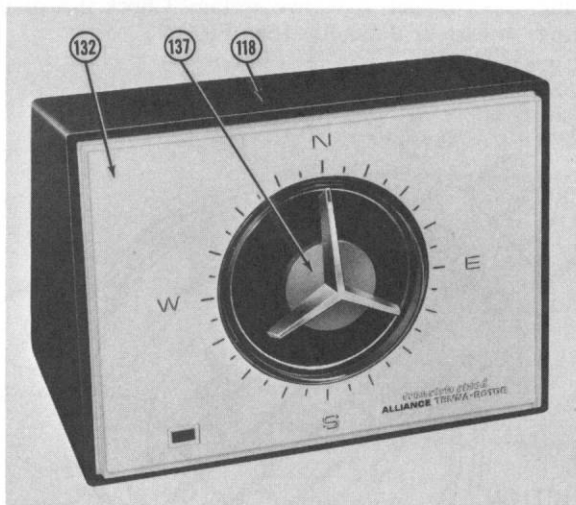


Fig. 65. Control Box—Model C-225.

CIRCUIT DESCRIPTION

The operation of the C-225 Tenna-Rotor® can be more readily understood by referring to Fig. 66 which is a partial schematic showing the four legs of the bridge circuit employed in the schematic diagram shown in Fig. 68.

The circuit of Fig. 68 may be operated by grasping the control box knob (Item #137) and moving it to a new selected position for the antenna. Assume that the antenna

is oriented to the east and the control knob is rotated clockwise to the south direction. This movement of the knob actuates open switch assembly contacts S1-2 and S1-3 by means of the lost motion of the switch operator (Item #113) before the control box potentiometer (Item #107) is moved. This lost motion is approximately one degree, just sufficient to actuate the switch assembly contacts. The closing of the switch assembly contacts S1-2 and S1-3 energize the transformer primary and the 20 VCT secondary winding. The opening of switch assembly contacts S1-1 and S1-4 prevents energization of the motor (Item #1) at this time. The energization of the 20V secondary energizes both the bridge circuit and the amplifier circuit. The clockwise movement of the control knob increases the resistance of the control potentiometer (Item #107) and hence, increases the impedance in this leg of the bridge which includes the control box potentiometer and the rotator potentiometer (Item #107 and #40). Accordingly, the alternating current bridge will have an output voltage at terminals 6 and 4. This output voltage will be in phase with the voltage from mid tap terminal 6 to terminal 5 or from mid tap terminal 6 to terminal 7. In this case, with the increasing resistance of the control potentiometer, the potential of the bridge output voltage (from terminal 4 to terminal 6) is in phase with the voltage from terminal 5 to terminal 6. As the potential at terminal 5 swings positive, the potential at terminal 4 also swings positive and this tends to decrease the conduction through transistor 101-2. This decreasing current through transistor 101-2 decreases the current through load resistor 101-14, and hence, the potential at the collector of transistor 101-2 is less positive or more negative. This more negative swinging voltage is applied through coupling

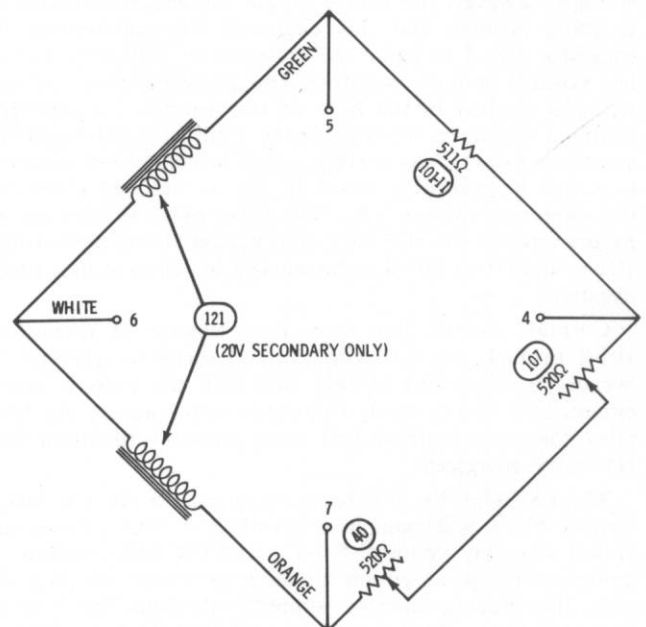


Fig. 66. Bridge Circuit Used in Model C-225.

capacitor 101-15 to the base of transistor 101-4. This is a pulse of current which occurs during the first half cycle of the reference voltage. The pulse of current passes through transistor 101-4 through the two relay coils in series and through diode 101-1 to terminal 7 which is negative in the first half cycle. Capacitors 101-3 and 101-7 smooth this half cycle pulse causing continuous energization of the two relays.

The energization of the HV relay closes its contacts 8 and 9 keeping the entire circuit energized. The energization of the LV relay moves the contact blade to energize contact 3 which establishes a motor energization circuit directly to motor winding B with the leading current supplied through the motor shunt capacitor (Item #131) to the motor winding A. Accordingly the motor will run in a clockwise direction to rotate the antenna to the pre-selected south position. Also, the rotator potentiometer (Item #40) is rotated counterclockwise to decrease the resistance thereof and upon rebalance of the bridge circuit, the output falls to a null and the HV relay will become de-energized opening the HV relay contacts 8 and 9, and de-energizing the complete circuit.

Assume that the antenna is oriented to the south and it is desired to point the antenna to the east position. The control knob must now be rotated counterclockwise. This counterclockwise movement decreases the resistance of the control potentiometer (Item #107). The potential of the bridge output voltage from terminals 4 to 6 will now be in phase with the source voltage from mid tap terminal 6 to terminal 7. Thus, when terminal 5 goes positive, the output at terminal 4 will go negative with respect to terminal 6. This applies a negative bias to the base of transistor 101-2 causing this transistor to increase conduction through the load resistor 101-14. The collector of transistor 101-2 thus becomes increasingly positive on this half cycle resulting in transistor 101-4 being biased into complete non-conduction.

Bias resistor 101-12 provides a small leakage current so that transistor 101-2 is biased into a partially conducting region. Transistor 101-4 is normally biased by resistor 101-5 as a self bias resistor, and, hence, the normal condition of transistor 101-4 is substantially a non-conducting condition. During the next half cycle of the reference voltage, however, the bridge output voltage at terminal 4 is going positive and this decreases the conduction of transistor 101-2 to make the collector of transistor 101-2 less positive or more negative. This more negative voltage swing is applied to the base of transistor 101-4 through coupling capacitor 101-15, biasing transistor 101-4 into a conducting state. Accordingly, a half wave pulse of current is passed by transistor 101-4 in the second half cycle of the reference voltage. This half wave pulse of current is passed through the HV relay coil, voltage dropping resistor 101-6, and diode 101-8 to terminal 5 which is at that time negative.

Currents cannot flow from the collector of transistor 101-4 through the two relay coils in series to terminal 7 because it is positive at that time and the path is open circuited by diode 101-1. Capacitor 101-3 across the HV relay coil smooths these half wave pulses to maintain the HV relay energized.

The LV relay has not been energized, so the LV relay contact blade will remain at terminal 2. The closing of switch assembly contacts S-1-1 and S1-4 will establish a motor energization circuit directly to motor winding A with the leading current supplied through the motor capacitor (Item #131) to motor winding B. Accordingly, the motor will run in a counterclockwise direction to

rotate the antenna to the desired east position. Also, the rotator potentiometer is rotated clockwise to increase the resistance thereof and upon rebalance of the bridge circuit, the bridge output voltage falls to a null and the HV relay will become de-energized to open its contacts 8 and 9 and de-energized the complete circuit.

SERVICING PROCEDURE

Power-Off Checks (With line cord disconnected from AC source)

1. Be sure five conductor cable is connected to the proper terminals. Terminal No. 1 of the rotator should be connected to terminal No. 1 of the control box, and so on with Nos. 2, 3, 4, and 5.

2. Hollow shaft assembly (Item #27) must have "play."

3. Viewing from the rear, switch contacts S1-1 and S1-4 of the switch assembly (Item #116) should be closed. Primary input contacts S1-2 and S1-3 of the switch assembly should be "open" and have approximately $\frac{1}{16}$ inch clearance.

Power-on Checks

1. Line voltage should be approximately 117 volts.

2. Turn knob (Item #137) to extreme clockwise stop. Rotator must turn to extreme clockwise stop and light must turn out when rotator reaches the stop.

3. Turn knob to extreme counterclockwise stop. Rotator must turn to extreme counterclockwise stop and light must go out when rotator reaches the stop.

4. Switch assembly contacts S1-2 and S1-3 should make solid contact and S1-1 and S1-4 should be open while knob is being turned.

NOTE:

If light comes on bright, but rotator does not turn when knob is released, or if unit operates intermittently, check friction spring. Tighten one notch. Early models had one spring. Later models have two springs. Check this or these springs in case of difficulty. (See Fig. 67).

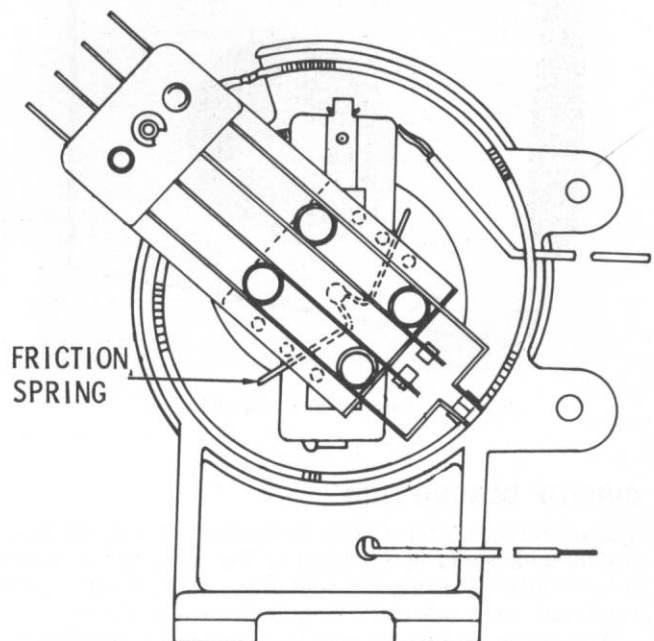


Fig. 67. Friction Spring Adjustment—Model C-225.

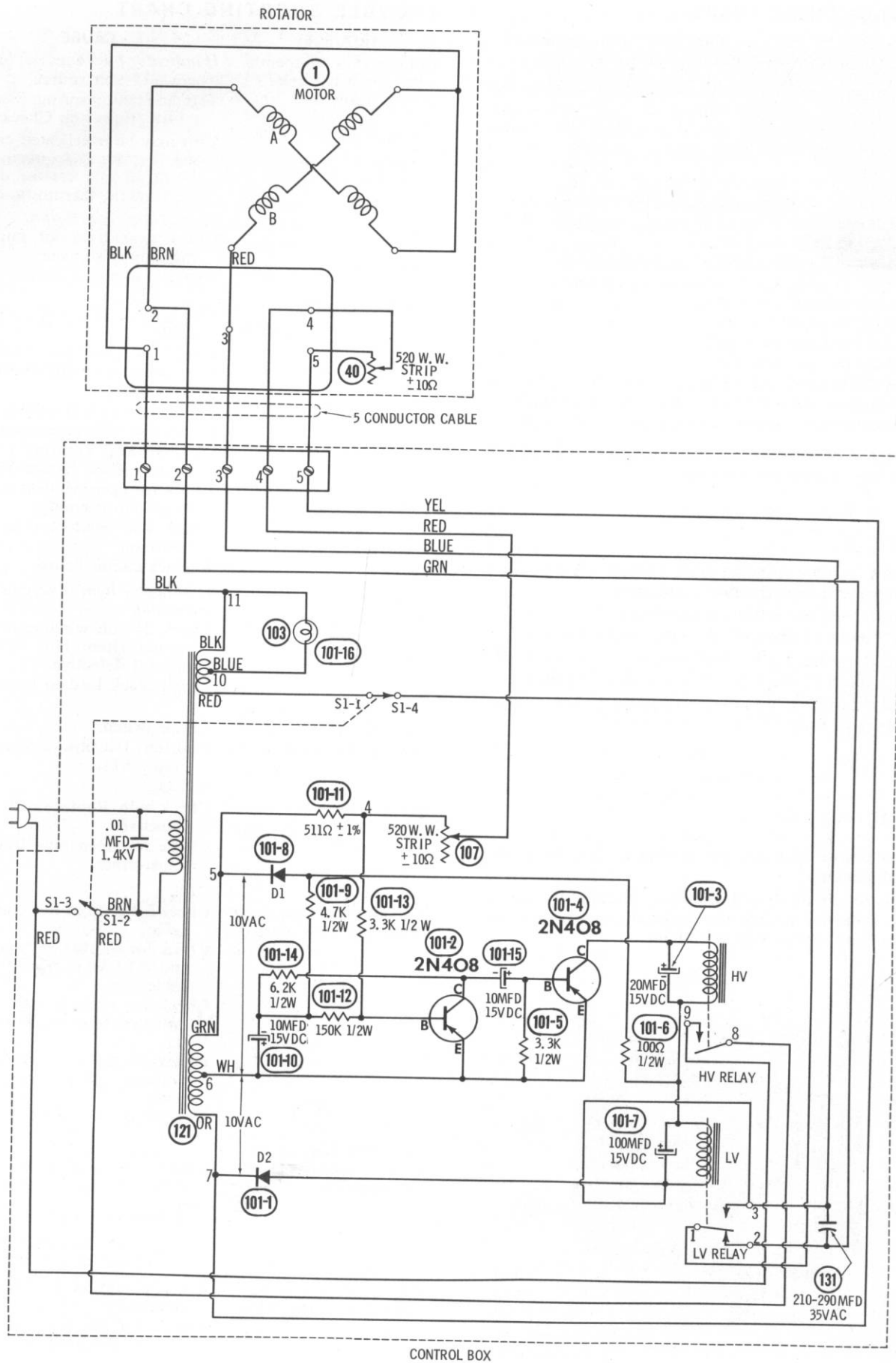


Fig. 68. Typical Wiring Diagram—Model C-225.

RESISTANCE CHECK CHART

Ohmmeter used to check installed rotor from ground.

1. Five-conductor cable disconnected at control box.
2. Measurements taken with a V.T.V.M. Readings will vary due to lead length, accuracy of meter used, etc. However, readings obtained should indicate if the trouble is in the rotor or cable even though readings are not 100% accurate.

- Lead #1 to Lead #2—2.5 ohms plus lead resistance.
- Lead #1 to Lead #3—2.5 ohms plus lead resistance.
- Lead #1 to Lead #4—Inf.
- Lead #1 to Lead #5—Inf.
- Lead #2 to Lead #3—5 ohms plus lead resistance.
- Lead #2 to Lead #4—Inf.
- Lead #2 to Lead #5—Inf.
- Lead #3 to Lead #4—Inf.
- Lead #3 to Lead #5—Inf.
- Lead #4 to Lead #5—2 ohms to 511 ohms plus lead resistance depending on position of contact on potentiometer, meter accuracy, and lead length.

The resistance of each lead of #20 five conductor cable is approximately 1 ohm per 100 feet.

Example:

Checking a rotor installed with 75 feet of #20 wire, the following readings should be obtained:

- Lead #1 to Lead #2—Approximately 2.5 ohms plus 1.5 ohms (2 leads @ .75 ohms each) 4 ohms
- Lead #1 to Lead #3—Approximately 2.5 ohms plus 1.5 ohms (2 leads @ .75 ohms each) 4 ohms
- Lead #2 to Lead #3—Approximately 5 ohms plus 1.5 ohms (2 leads @ .75 ohms each) 6.5 ohms

CONTROL

Check continuity of leads, potentiometer, line cord, etc., with an ohmmeter.

Service to circuit board assembly should not be attempted. Defective boards should be disconnected at pin connectors and replaced as assemblies.

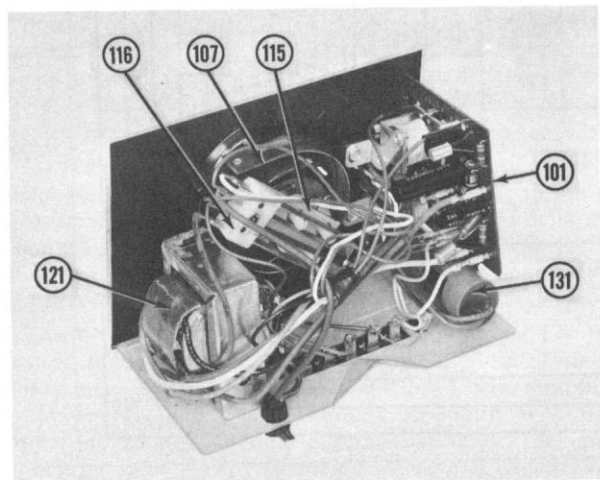


Fig. 69. Internal Components—Model C-225 Control Box.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotator fails to operate when knob is turned to desired direction.	<p><i>If indicator bulb does not light:</i> Check 117 volt source. Tighten friction spring. (See note under "Power-on Checks").</p> <p>Unit may be overheated causing the thermostat to open. Wait 10 to 15 minutes for unit to cool and the thermostat closes.</p> <p><i>If indicator light is dim:</i> Check gear train for improper meshing or slippage. Replace motor capacitor (Item No. 131). Check hook up of five conductor cable. Check five conductor cable with an ohmmeter for shorted or open leads.</p> <p><i>If indicator light is bright:</i> Check low voltage contacts. (Adjust and tighten friction spring—(See Figure 67). Check for open white or red lead to switch assembly. Check five conductor lead and hook up. Replace circuit board.</p> <p><i>If indicator light is very bright or burns out.</i> Check 24 volt winding of transformer (Item No. 121). Replace if defective. Check black lead to board.</p>
Rotator turns before control knob is released.	Check switch. Tighten friction spring (See Figure 67).
Rotator turns but indicator light does not come "on."	Check bulb. Replace with #47 if defective. Check for open blue lead from transformer.
Rotator turns to one position and stays there.	Check hook up of five conductor cable. Check for shorted or "open" #4 and #5 lead in five conductor cable. Check for open or dirty potentiometer (Item No. 40) in rotor. Check for open or dirty potentiometer (Item No. 107) in control. Replace circuit board.
Rotator operates slowly or sluggishly.	Check size and length of five conductor cable. (See Figure 4). Change capacitor (Item No. 131).
Rotator oscillates back and forth. Light blinks.	Clean potentiometer. Replace if necessary. Check for shorted contacts on switch assembly (Item No. 116). Replace circuit board.

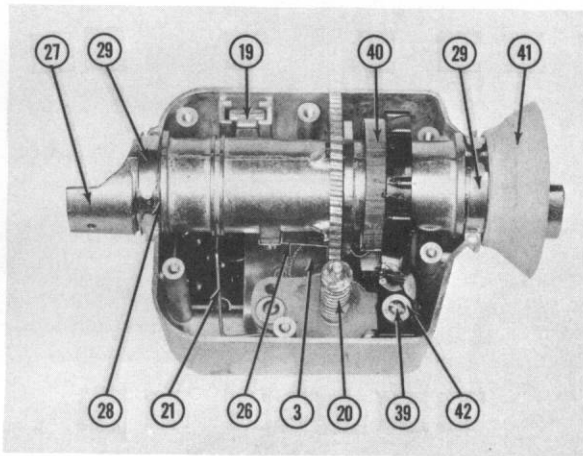


Fig. 70. Internal Components—Model C-225 Rotator Unit.

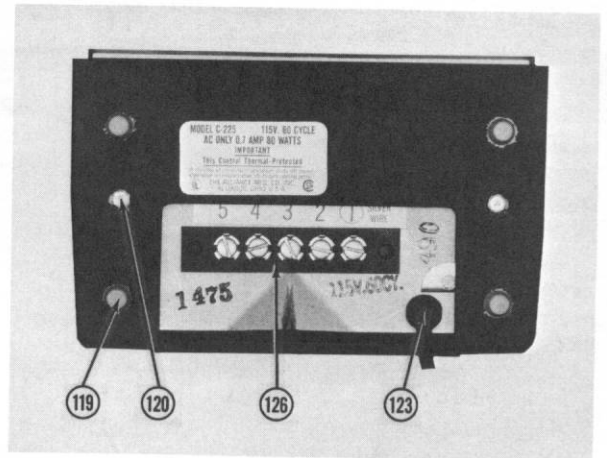


Fig. 71. Bottom View of Model C-225 Control Box Showing Terminal Strip.

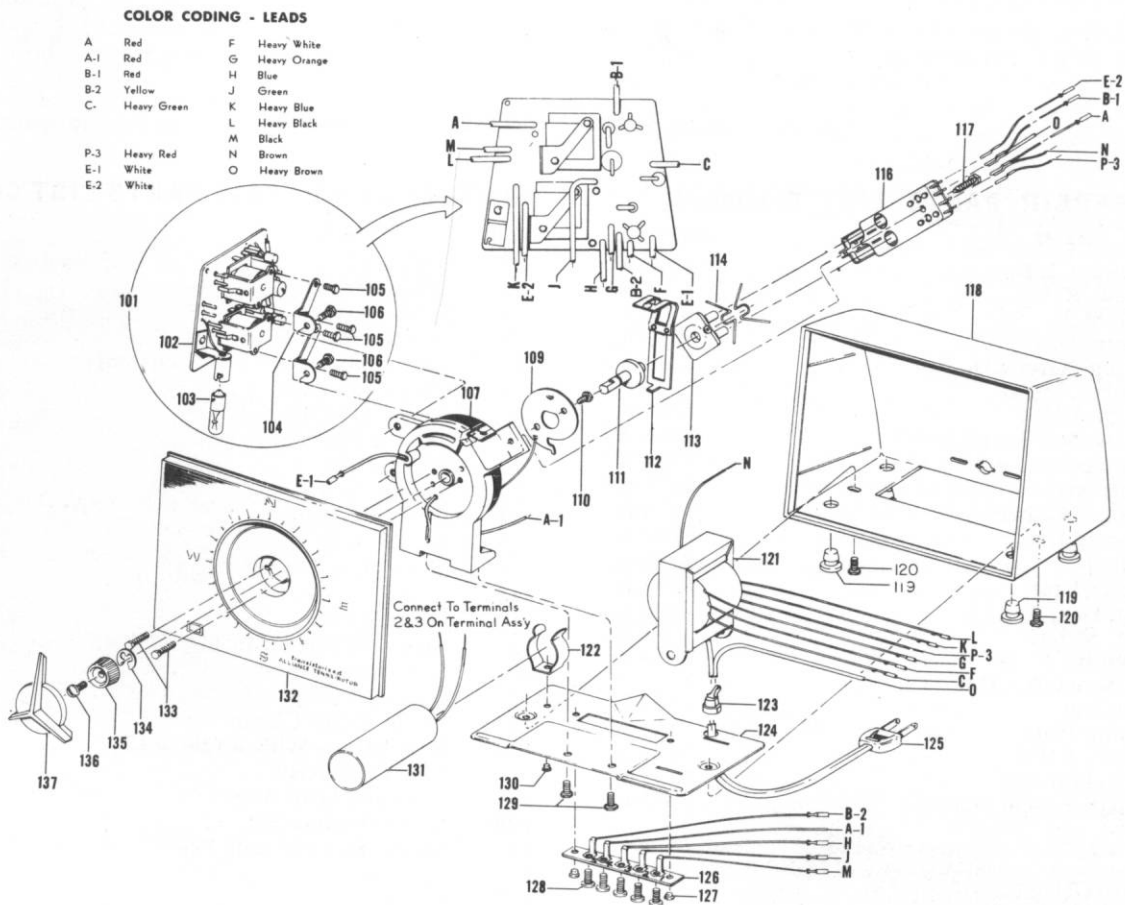


Fig. 72. Exploded View of Model C-225 Control Box.

ROTOR REPAIR PARTS LIST

ITEM	NAME	PART NO.
1	Rotor Complete	9129-R
2	Motor & Gear Assy.	18513-R
3	Retaining Ring	4243-H
4	Gear & Pinion	3373-R
5	Screw, RHM	3429-Q

ROTOR REPAIR PARTS LIST Continued

ITEM	NAME	PART NO.
8	Part of Item 1—Motor & Terminal Assy.	
9	Terminal Plate Assy.	9132-R
9A	Gasket	9157-A
10	Screw, Binding Hd.	608-H
11	Nut, Hex	3426-A
12	Terminal Cover	9319-A

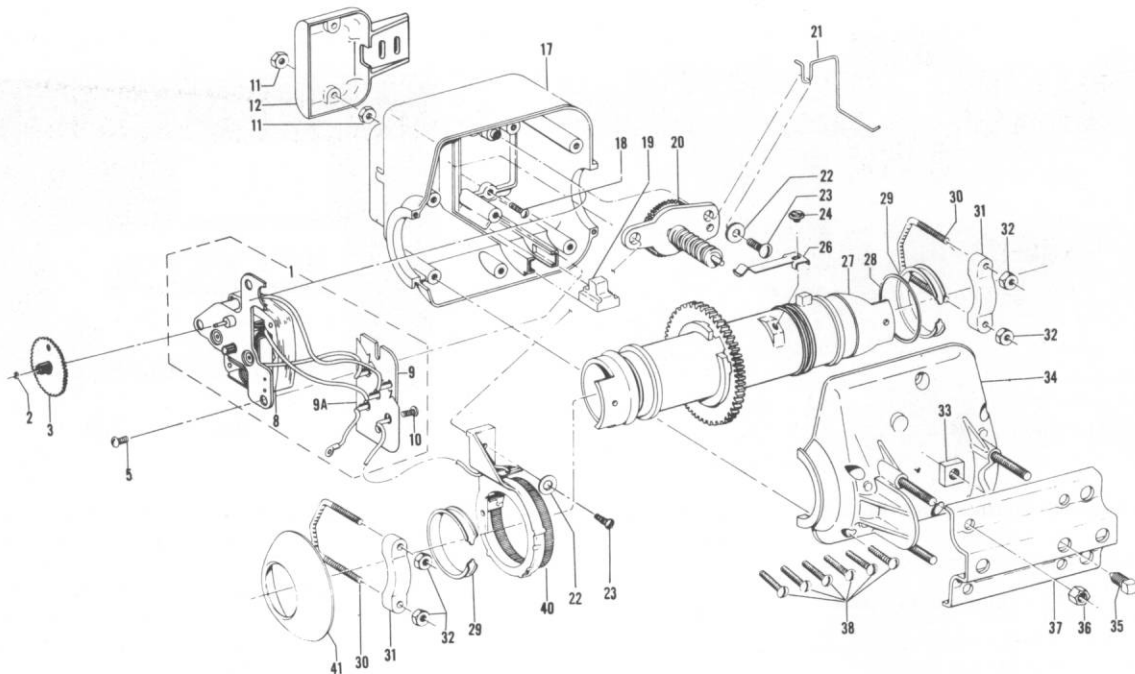


Fig. 73. Exploded View of Model C-225 Rotator Unit.

ROTOR REPAIR PARTS LIST Continued

ITEM	NAME	PART NO.
17	Housing, L.H.	14246-A
18	Screw, RHM	8013-A
19	Stop Slide	9082-A
20	Worm Assy.	18073-R
21	Spring (Ground)	9130-A
22	Washer, Metal	2715-H
23	Screw, RHM.	2298-A
24	Screw, Self Tapping	8622-A
26	Contact Spring	9315-A
27	Shaft Assy.	9373-R
28	Thrust Washer	3376-B
29	Bearing Collar	3987-B
*30	U-Bolt	18291-A
*31	Mast Clamp	18292-R
*32	Nut, Hex, 1/4 x 20	8100-E
33	Nut, Square	3783-A
34	Housing, R. H.	5454-R
35	Set Screw, Sq. Hd.	3770-A
36	Hex Nut	8100-E
37	Clamp Plate	5456-A
38	Screw, RHM	3429-N
40	Potentiometer	9137-R
41	Weathershield (Green)	3375-G

* New heavy-duty hardware. When replacing old hardware, order complete set; i.e., (2) 18291-A U-bolts, (2) 18292-R mast clamps, and (4) 8100-E hex nuts.

CONTROL BOX REPAIR PARTS LIST

ITEM	NAME	PART NO.
101	Control Box Complete	9112-R
	Circuit Board & Component Assy.	9148-R

CONTROL BOX REPAIR PARTS LIST Continued

ITEM	NAME	PART NO.
103	Bulb #47	4274-B
104	Angle Bracket	9142-A
105	Screw, RHM	8026-C
106	Screw, Hex Hd. Self Tap	8027-A
107	Potentiometer, BKT & Cam Assy.	9123-R
109	Cam Plate Assy.	9135-R
110	Screw, Hex Hd. Self Tap	8027-B
111	Shaft & Hub Assy.	9115-R
112	Slider Plate	9150-R
113	Switch Operator	9097-A
114	Friction Spring	9111-A
116	Switch Assy.	18144-R
117	Screw, Hex Hd., Self Tap	8027-E
118	Case	9088-B
119	Foot, Rubber	9121-A
120	Screw, Hex Hd. Mach.	8026-B
121	Transformer Assy.	9143-R
122	Capacitor Clip	8903-A
123	Strain Relief Clamp	9125-A
124	Base Plate—With #128, #126	9124-R
125	Line Cord Assy.	9133-R
126	Terminal Strip Assy.	9086-R
128	Screw-Binding Hd.	608-H
129	Screw, Hex Hd. Self Tap	8027-A
131	Capacitor	18061-A
132	Dial Face	9089-A
133	Screw, Hex Hd. Self Tap	8027-C
134	Retaining Ring	4243-B
135	Hub, Knob	9094-A
136	Screw, Binding Hd.	608-H
137	Control Knob	9090-A

GENERAL INFORMATION

The Alliance Tenna-Rotor® Model C-225A is an improved exact-positioning control. The C-225A employs an integrated-circuit control circuit combined with a completely resistive electric bridge circuit for direction selection. A direct-current bridge circuit increases the immunity of the unit to stray from magnetic fields.

The control of this unit is operated by turning the control knob to the desired direction. The rotor then automatically rotates the antenna to that position. A small red light in the lower left-hand corner indicates the antenna is moving. The red light goes "out" when the antenna reaches the pre-selected position.

The Model C-225A uses the same rotor as the C-225 and can be identified by the green weathershield.

NOTE:

For location of parts in the control, see Figs. 74, 75, and 76.

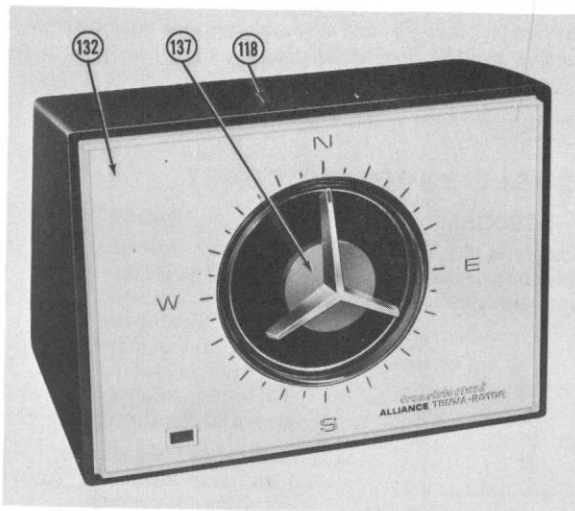


Fig. 74. Control Box—Model C-225A.

CIRCUIT DESCRIPTION

The operation of the C-225A Tenna-Rotor can be readily understood by referring to Fig. 77. This partial schematic shows the four legs of the bridge circuit along with the integrated circuit (Item #101-8) and relays. The schematic shows pin 5, non-inverting input of the IC, tied to a mid-reference point of the power supply which is established by the two 12.1K ohm resistors (Item #101-4 and #101-5). The inverting input, pin 4 of the IC, is tied to the junction of the 511 ohm resistor (Item #101-3) and the control potentiometer (Item #107). If the control potentiometer is rotated clockwise, its resistance is increased and pin 4 of the IC becomes positive with respect to pin 5. If the control potentiometer is rotated counterclockwise, its resistance decreases and pin 4 becomes negative with respect to pin 5. When pin 4 becomes positive, the output of the IC (pin 10)

which is normally at the mid-point of the power supply, moves toward B- and current flows through the LV relay coil and at the same time through the HV relay coil and the 470 ohm resistor (Item #101-6) to B+ and both relays become energized. When pin 4 of the IC becomes negative, the output of the IC moves toward B+ and current flows from B- through the 470 ohm resistor (Item #101-7) and HV relay coil to B+. The LV relay coil is by-passed in this manner; therefore, only the HV relay is energized.

Assume that the antenna is oriented to the east and the control knob (Item #137) is rotated clockwise to the south direction. This movement of the knob closes the normally open switch assembly contacts SI-1 and SI-4 by means of the lost motion of the switch operator (Item #113, Fig. 78). This lost motion is approximately one degree which is just sufficient to actuate the switch assembly contacts before the control box potentiometer is moved.

The closing of the switch assembly contacts SI-2 and SI-3 energizes the transformer primary and applies power to the circuit. The opening of switch assembly contacts SI-1 and SI-4 prevents the motor from running. The clockwise rotation of the control potentiometer increases its resistance, pin 4 of the IC moves positive, and both the HV and the LV relays are energized. When the HV relay energizes, its contacts 8 and 9 close across switch assembly contacts SI-2 and SI-3. When the control knob is released after the desired direction is reached, contacts 8 and 9 will keep the primary circuit energized. When the LV relay energizes, LV relay contacts 1 and 2 close and switch assembly contacts SI-1 and SI-4 will also close, establishing a circuit directly to motor winding A with leading current supplied through the motor shunt capacitor (Item #131) to motor winding B. The motor will run in a clockwise direction to rotate the antenna to the pre-selected south position. As the rotor moves, the resistance of the rotor potentiometer (Item #40) is decreased. Rebalance of the bridge occurs when the total resistance of both potentiometers equal the 511 ohm resistor (Item

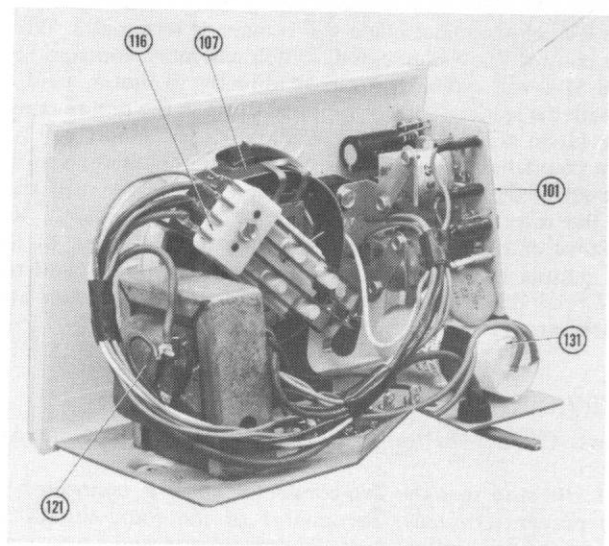


Fig. 75. Internal Components—Model C-225A Control Box.

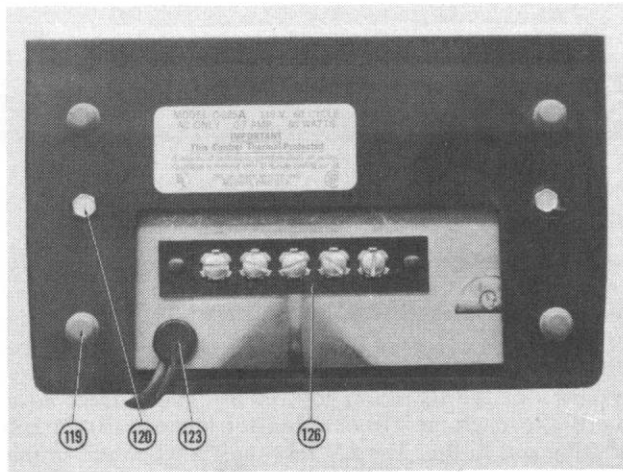


Fig. 76. Bottom View of Model C-225A Control Box.

#102-3). At this point, pin 4 of the IC is at the same potential as pin 5; the output of the IC returns to the mid-point of the power supply and the HV relay de-energizes opening the HV relay contacts 8 and 9 which removes power from the circuit.

Now assume that the antenna is oriented to the south and the control knob is returned to the east position. The counterclockwise rotation of the knob decreases the resistance of the control potentiometer and pin 4 of the IC becomes negative with respect to pin 5. The output of the IC swings positive energizing the HV relay.

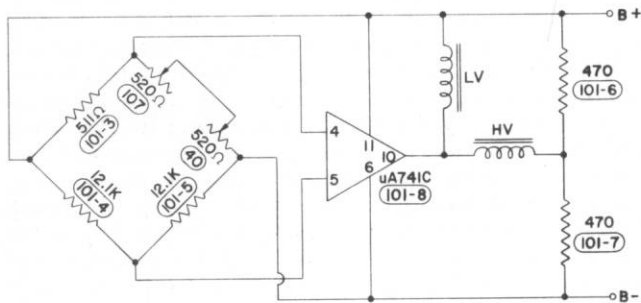


Fig. 77. Bridge Circuit Used in Model C-225A.

The LV relay has not been energized in this manner, so the LV relay contact blade will remain at terminal 3. When the control knob is released, switch assembly contacts SI-1 and SI-4 will establish a circuit directly to motor winding B with the leading current supplied through the motor capacitor (Item #131) to motor winding A. The motor will run in a counterclockwise direction to rotate the antenna to the pre-selected east position. As the rotor moves, the resistance of the rotor potentiometer (Item #40) is increased. Re-balance of the bridge circuit is reached; the output of the IC returns to the mid-point of the power supply, and the HV relay de-energizes opening the HV relay contacts 8 and 9 and removes power from the circuit.

SERVICING PROCEDURE

Power-Off Checks (with line cord disconnected from AC Source)

1. Be sure that the five-conductor cable is connected to the proper terminals. Terminal 1 of the rotor should be connected to terminal 1 of the control box and so on with numbers 2, 3, 4 and 5.

2. Hollow shaft assembly (Item #27, Fig. 73, Chapter X) must have "play."
3. Viewing the switch assembly (Item 116, Fig. 75) from the rear, switch contacts SI-1 and SI-4 should be closed and primary input contacts SI-2 and SI-3 should be open and have approximately 1/16 inch clearance.

Power-On Checks

1. Line voltage should be approximately 117 VAC.
2. Turn the control knob (Item #137, Fig. 74) to the extreme clockwise stop. The rotor must turn to the extreme clockwise stop and the light must turn off when the rotor reaches the stop.
3. Turn the control knob to the extreme counterclockwise stop. The rotor must turn to the extreme counterclockwise stop and the light must go out.
4. Switch assembly contacts SI-2 and SI-3 should make solid contact and SI-1 and SI-4 should be open while the knob is being turned.

NOTE:

If the light comes on bright, but the rotor does not turn when the knob is released, or, if the unit operates intermittently, tighten the friction spring one notch (see Fig. 67, Chapter X).

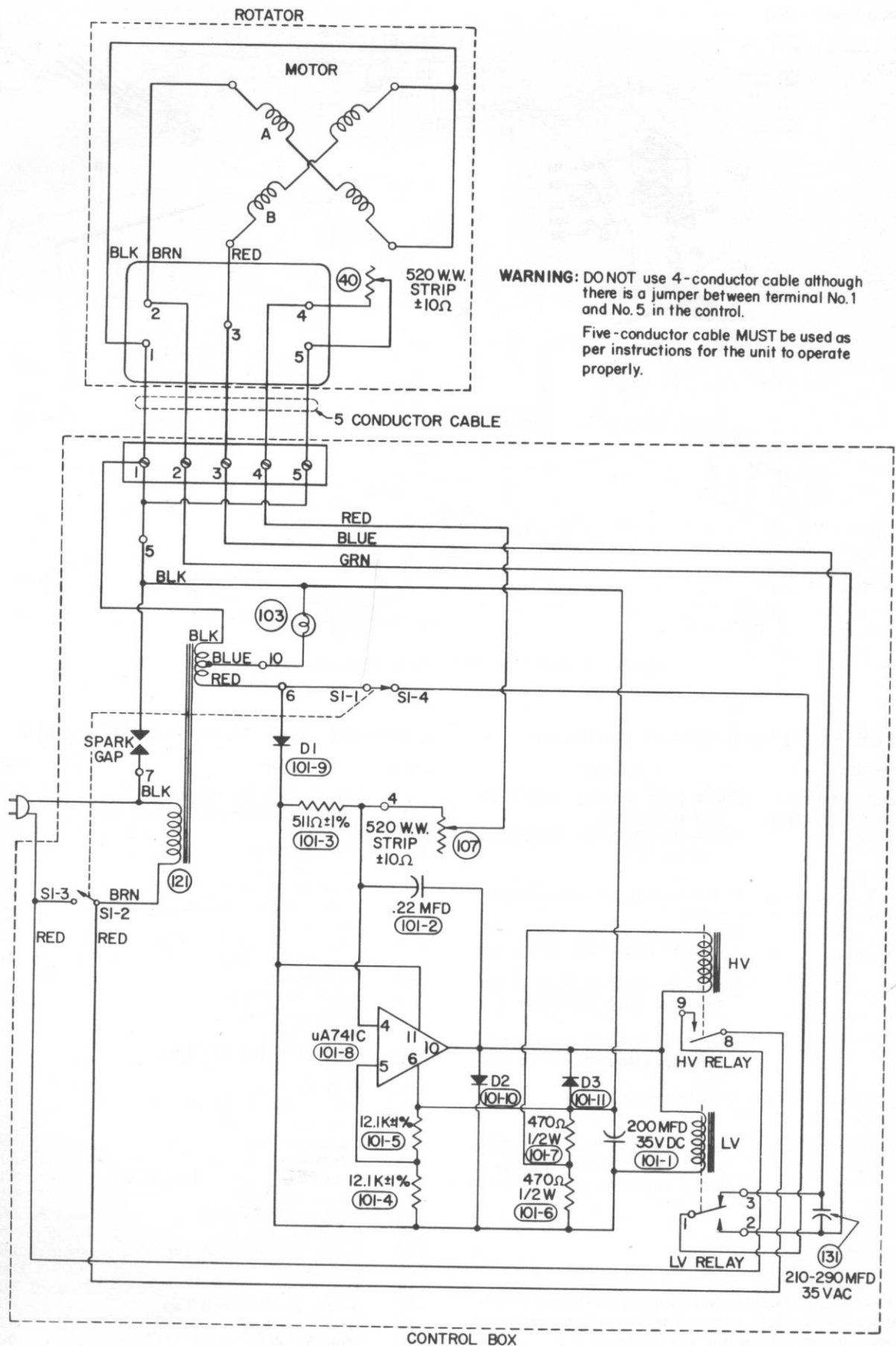
CONTROL

Check continuity of leads, potentiometer, line cord, etc., with an ohmmeter.

Service to circuit board assembly should not be attempted. Defective boards should be disconnected at pin connectors and replaced as assemblies.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE
Rotor fails to operate when knob is turned to desired direction.	<i>If indicator bulb does not light:</i> Check 117 volt source. Tighten friction spring. (See note under "Power-on Checks.") Unit may be overheated causing the thermostat to open. Wait 10 to 15 minutes for unit to cool and the thermostat closed.
	<i>If indicator light is dim:</i> Check gear train for improper meshing or slippage. Replace motor capacitor (Item #131). Check hook-up of five-conductor cable. Check five-conductor cable with an ohmmeter for shorted or open leads.
	<i>If indicator light is bright:</i> Check low voltage contacts. (Adjust and tighten friction spring—see Fig. 67, Chapter X.) Check for open white or red lead to switch assembly. Check five conductor lead and hook-up Replace circuit board.
Rotor turns before control knob is released.	Check switch (see Service Procedure). Tighten friction spring (see Fig. 67, Chapter X).



WARNING: DO NOT use 4-conductor cable although there is a jumper between terminal No.1 and No.5 in the control.

Five-conductor cable **MUST** be used as per instructions for the unit to operate properly.

Fig. 78. Typical Wiring Diagram—Model C-225A.

COLOR CODING - LEADS

A	Red	F	Yellow
A-1	Red	G	Black
B-1	Red	H	Blue
B-2	Black	J	Green
		K	Heavy Blue
		L	Heavy Black
		M	Black
P-3	Heavy Red	N	Heavy Brown
E-1	White	O	Heavy Brown
E-2	White		

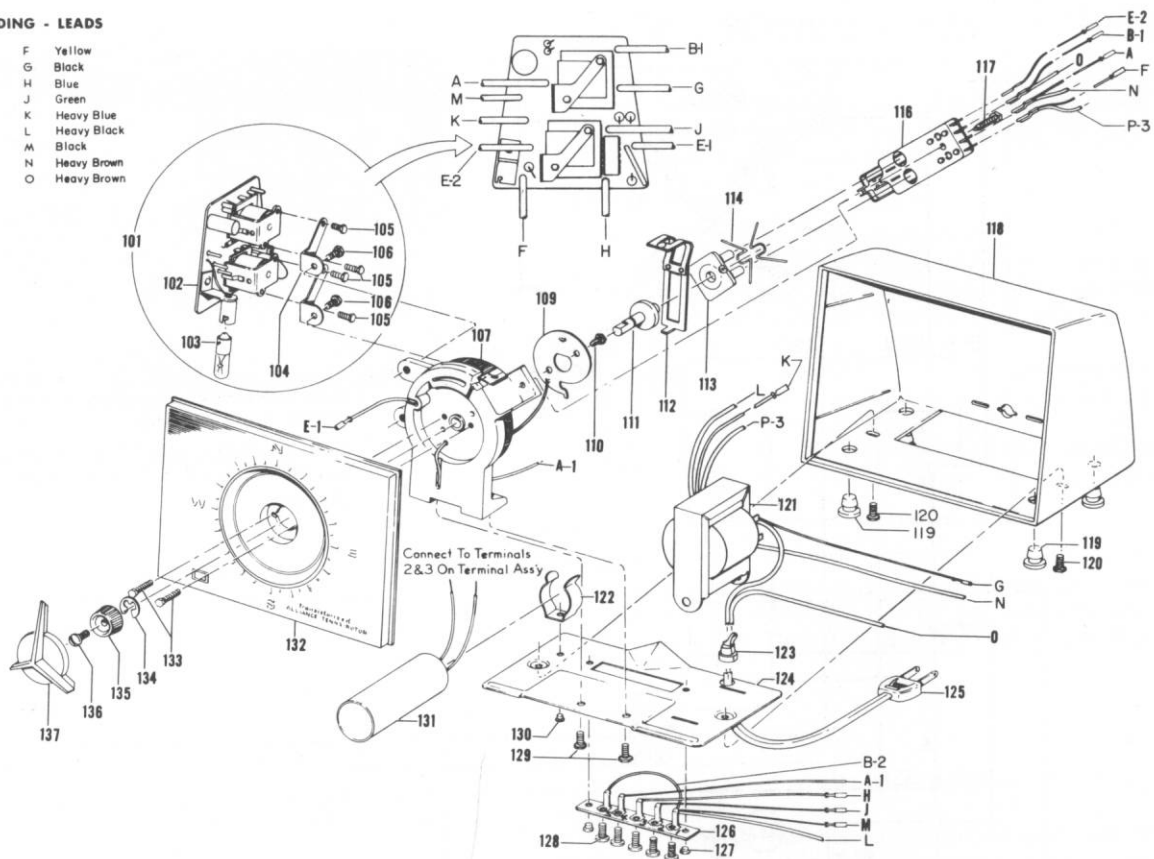


Fig. 79. Exploded View of Model C-225A Control Box.

TROUBLE SHOOTING CHART Continued

TROUBLE	CAUSE
Rotor turns but indicator light does not come "on."	Check bulb. Replace with #47 bulb if defective. Check for open blue lead from transformer.
Rotor will not make a full rotation.	Check hook-up of five-conductor cable. Check for shorted or "open" #4 and #5 lead in five-conductor cable. Check for open or dirty potentiometer (Item #40) in rotor. Check for open or dirty potentiometer (Item #107) in control. Replace circuit boards.
Rotor operates slowly or sluggishly.	Check size and length of five-conductor cable (see Fig. 4). Change capacitor (Item #131, Fig. 75).

ROTOR

The Model C-225A uses the same rotor as the Model C-225. A resistance check chart, rotor parts list, and an exploded view of the rotor may be found in Chapter X.

For location of components of C-225A control, see Fig. 74, 75 and 76.

CONTROL BOX REPAIR PARTS LIST

ITEM	NAME	PART NO.
	Control Box Complete	18771-R
101	Circuit Board & Component Assy.	18776-R
103	Bulb #47	4274-B
104	Angle Bracket	9142-A
105	Screw, RHM	8026-C
106	Screw, Hex Hd. Self Tap	8027-A
107	Potentiometer, BKT & Cam Assy.	9123-R
109	Cam Plate Assy.	9135-R
110	Screw, Hex Hd. Self Tap	8027-B
111	Shaft & Hub Assy.	9115-R
112	Slider Plate	9150-R
113	Switch Operator	9097-A
114	Friction Spring	9111-A
116	Switch Assy.	18144-R
117	Screw, Hex Hd. Self Tap	8027-E
118	Case	9088-B
119	Foot, Rubber	9121-A
120	Screw, Hex Hd. Mach.	8026-B
121	Transformer Assy.	18764-R
122	Capacitor Clip	8903-A
123	Strain Relief Clamp	9125-A
124	Base Plate—with #128, #126	9124-R
125	Line Cord Assy.	9133-R
126	Terminal Strip Assy.	9086-R
128	Screw-Binding Hd.	608-H
129	Screw, Hex Hd. Self Tap	8027-A
131	Capacitor	18061-A
132	Dial Face	9089-A
133	Screw, Hex Hd. Self Tap	8027-C
134	Retaining Ring	4243-B
135	Hub, Knob	9094-A
136	Screw, Binding Hd.	608-H
137	Control Knob	9090-A