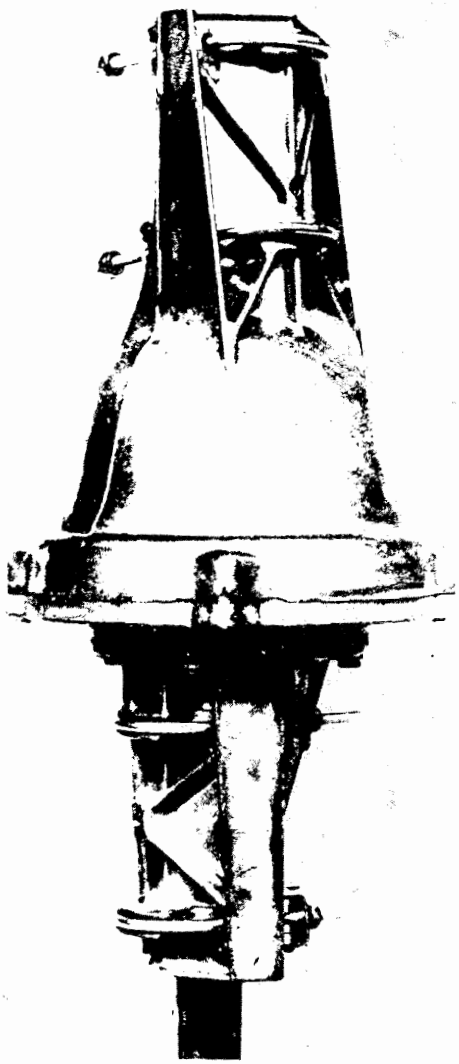
CD-45-II
ROTOR SYSTEM

ORDER NO. 302 — 120 VAC
302-2 — 220 VAC

OWNER'S MANUAL



E CD-45-II IS RECOMMENDED FOR MEDIUM SIZE
MMUNICATIONS ANTENNAS.

R LARGER ANTENNAS, THE HAM IV OR T²X
AVY-DUTY ROTORS ARE RECOMMENDED.

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.
9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.

CHAPTER 1

INSTALLATION AND OPERATION

Section I. Cautions

Cautions

A. Install *properly and safely.*

B. Towers, often the highest *metal* parts in the vicinity, *require extreme caution* during erection and placement. *Extreme care* must be taken during erection so that *metal towers and beams do not contact power lines* even if the beams slip or rotate, towers fall or fracture, or metal wires blow in the wind, etc.

C. Metal towers or other position mechanisms *must be placed so that if they fracture or blow over* in high winds, *they cannot contact power lines*, be a hazard to individuals, or endanger property.

D. When not mounted within a tower with a thrust bearing as shown in Figure 1, the rotator must be *derated.*

E. Metal towers must be *grounded properly* at the *tower location before the tower is erected.* This is to minimize electrical hazard and the possibility of lightning damage. Do not bury bare aluminum wires or stakes in the ground. Use copper ground stakes. The service entrance ground should be checked. The household convenience outlet should be the 3-prong type (grounded back to the service entrance).

F. The *control box* is not weatherproof and must be located in the house, ham shack or other *protected location.*

G. Read this manual fully *before proceeding.*

The CD-45-II rotor has been carefully designed and manufactured to give many years of trouble-free service when carefully and professionally installed. It consists of the strongest and best commercially available components.

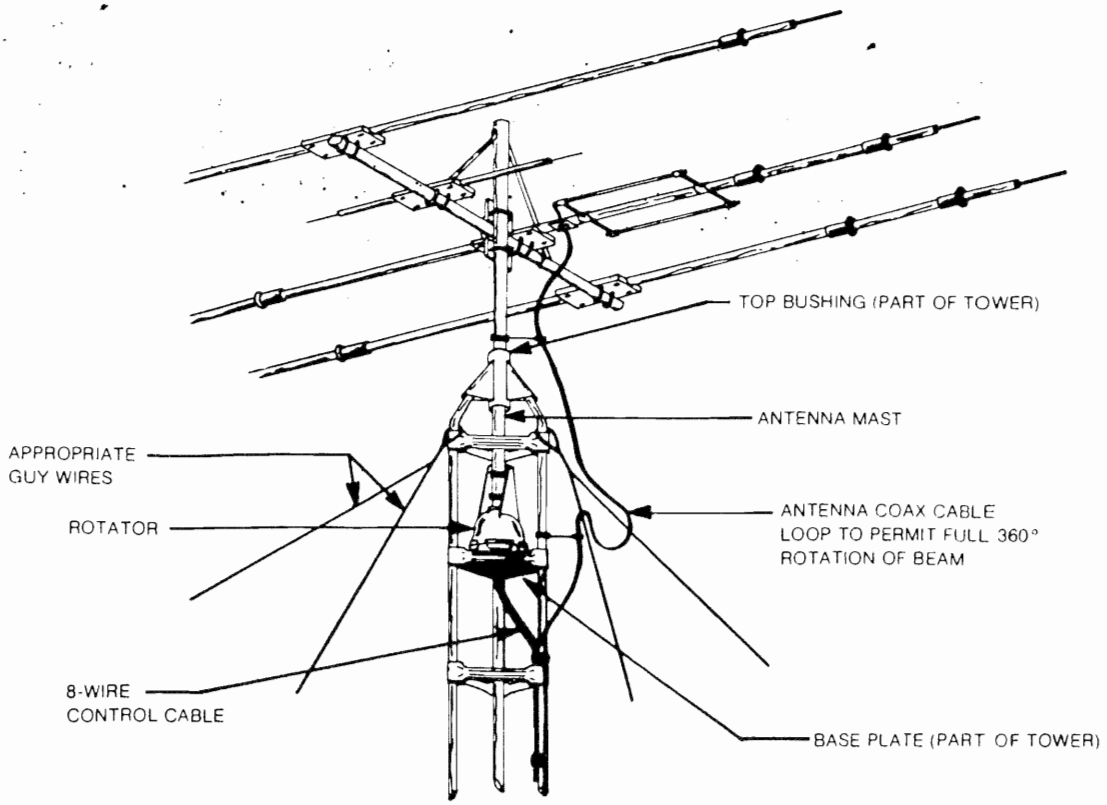


Figure 1. Inside Tower Mounting

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Section II. Components of the CD-45-II

eral

The CD-45-II rotor consists of a bell type rotator, a metered control unit and the necessary mounting hardware. The rotator is designed to mount on a plate inside a tower or on a mast. The rotator unit must be wired to the control unit with an 8-wire cable. The control unit must be placed inside the house or another protected location. Included in the rotor are:

A. Owner's Manual

B. Rotator (Includes Lower Mast Support)

C. Mounting Hardware Kit

D. Control Unit

Due to the wide variety of towers available, each installation will have different requirements. The gauge of the 8-wire cable to connect the control unit to the rotator *depends upon the distance between the rotator and control.* The longer the distance the larger the diameter of the wire required. Various antennas or beams require different installation methods. For this reason, the owner must procure the remainder of the components after checking their compatibility. In general, these will be:

A. The beam or antenna desired and a suitable antenna mast.

B. A tower or other mechanism to position the rotator and beam for safe and effective rotation (see **CAUTIONS**).

C. 8-wire cable to connect the control to the rotator. (See **SPECIFICATIONS**.)

D. Coaxial cable to connect the beam to the communications equipment.

E. Appropriate guy wires as required.

F. Grounding hardware.

Section III. Installation Information

ypes of stallation

There are three general types of installations. See Figures 1, 2 and 3.

1. The recommended installation is an "inside" tower mount, as per Figure 1, with a top bushing or bearing to provide lateral support and resist high wind loads. The wind loading during storms, the rotational inertia of the antenna and unbalanced weight are more important than the dead weight of the antenna. It is important to minimize the height of the antenna above the rotator to decrease the overturning force induced in a high wind (see "Unbalanced Weight" and "Wind Pressure").
2. An "Outside" tower mount, as per Figure 2, is the best type of installation when not using an inside tower mount. The rotator is not as well protected but the installation is simpler. The lower mast support, which is included with the rotator, is required.
3. A telescoping or other type mast, as shown in Figure 3, can also be used. The lower mast support is also required for this installation.

There are variations of the above falling generally into one of the illustrated categories. The size of the antenna, type of mounting, peak wind velocities, etc., are interrelated and the components must be matched carefully.

1. ***Unbalanced Weight:*** Weight should be as closely balanced as possible. Unbalanced weight creates a bending moment of force which is concentrated on the mast at the point where it is clamped to the top of the rotor.

   This moment tends to strain the mast of that point and also to bind the ball bearings by creating excessive downward pressure on one side and upward pressure on the other. Such unbalance places additional stresses on the motor and gear train. Unbalanced weight becomes critical as the distance from the antenna boom to the clamping point at the rotor is increased.

2. ***Wind Pressure*** against the boom and elements produces a bending force on the mast which can cause the same stresses as unbalanced weight. To strengthen the installation to withstand unbalanced weight and wind pressure, the top mast should be as short and as strong as possible. In multiple arrays the heaviest sections should be closest to the rotator.

   After procuring the type of tower or other positioning mechanism of the owner's choice, the next step is to wire the rotator to the control box and check out its operation prior to installation.

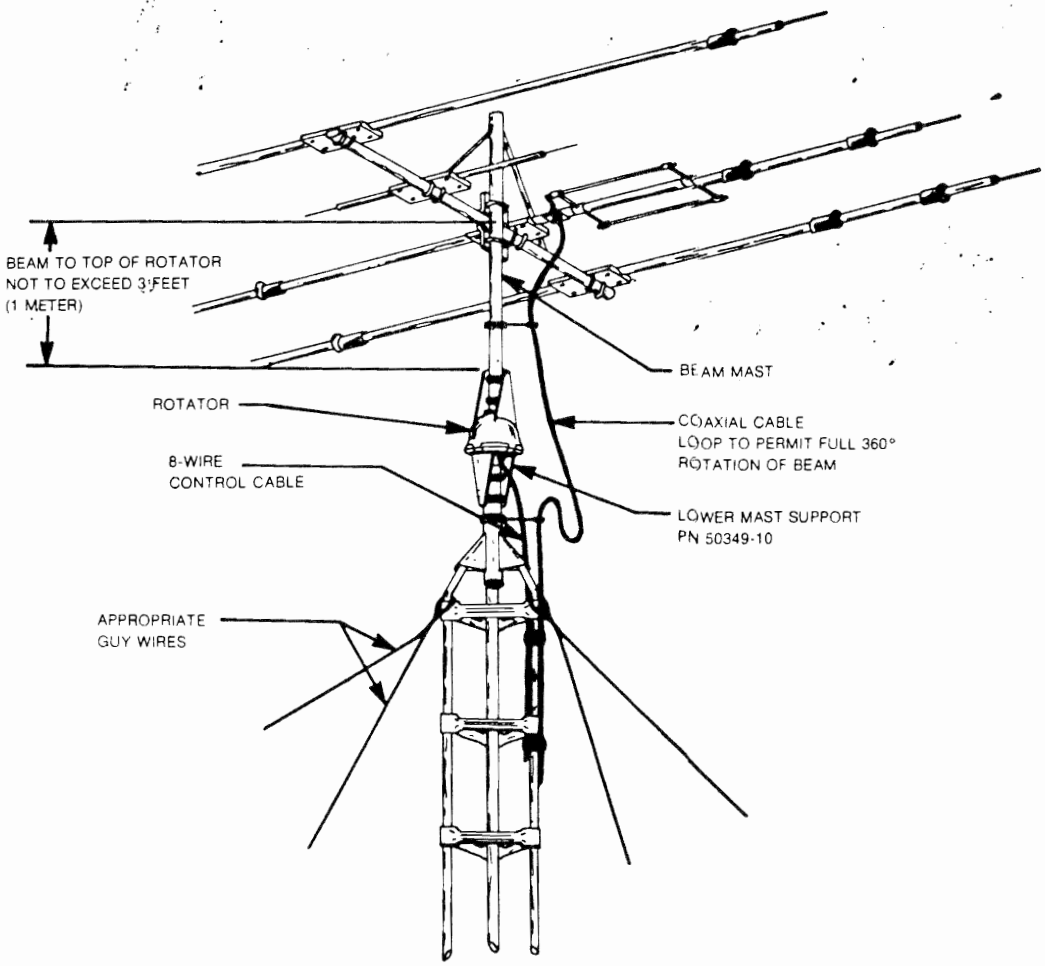

Figure 2
Top of Tower Mounting

Section IV. Wiring and Check-Out

A preliminary operation check should be made prior to actual installation. We recommend the following procedure:

A. Decide the length of the 8-wire cable required and procure the proper amount and gauge size required. See cable Specifications, page 18.

B. Strip and tin 3/8" on both ends (16 wires) after removing about four inches of the jacket. Tinning can be accomplished, after twisting the strands together, with an ordinary soldering iron and radio solder being careful not to melt the insulation.

C. With the control unit and the rotator on the work table, connect the 8-wire cable between the two units using the full length of cable that will be used in the installation.

It is important that terminal #1 on the rotator is connected to the #1 terminal on the control unit and so on. NOTE: The specifications call for heavier gauge wire in two locations, Terminals #1 and #2.

If the Hy-Gain HAM IV is required at a later date, due to a larger antenna or a beam being required, it will only be necessary to purchase the HAM IV rotator, Part Number 51569-10. The control units and cable requirements are identical, therefore, only the installation of the heavier duty rotator will be necessary.

CAUTION

Shorts between the terminals or grounded leads may damage the rotor.

Wire the rotator and the control unit as shown in Figures 4 and 5.

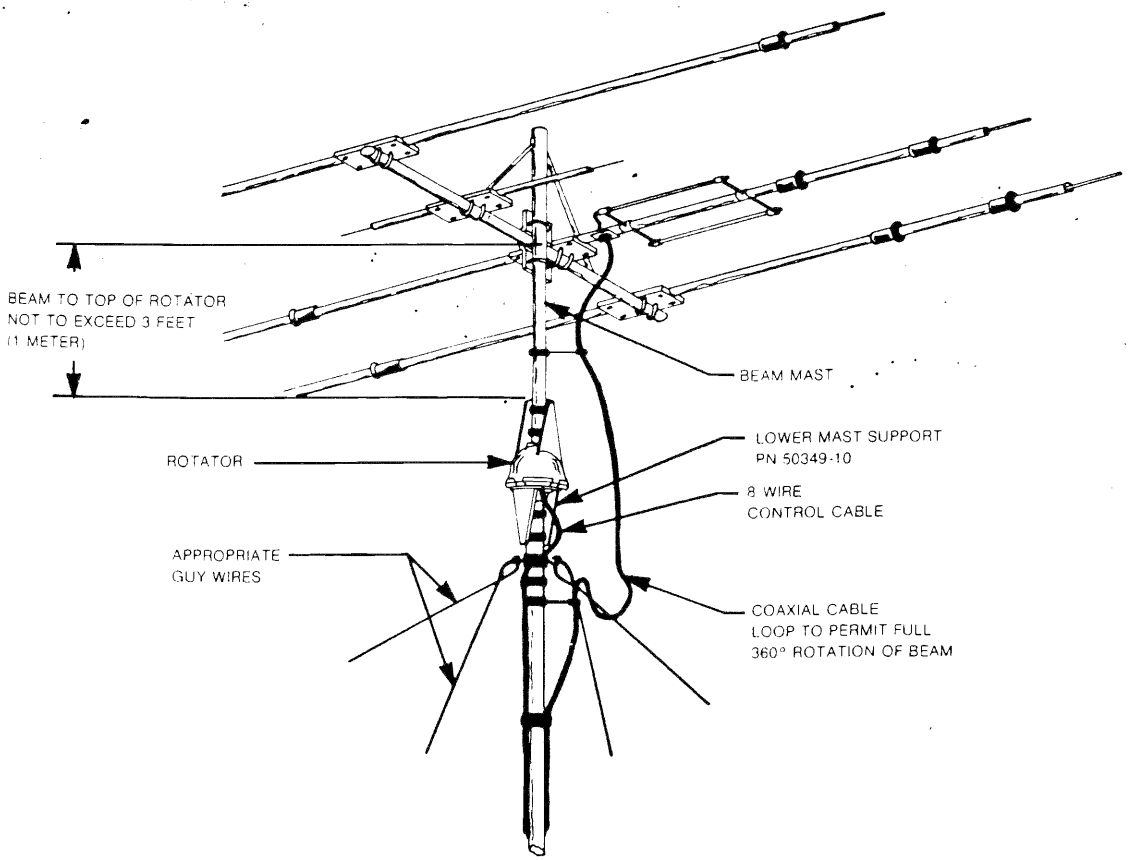

Figure 3. Pole Mounting

D. Install four (4) ¼"-20 x 1¼" bolts in the four mounting holes in the bottom of the bell housing. Run them in about ½" and leave them as close to equal length as possible.

E. With the rotator sitting in the upright position, resting on the four (4) ¼"-20 x 1¼" bolt heads, and connected to the control unit by the 8-wire cable, plug the power cord into a 120 VAC 50/60 Hz or 220 VAC 50/60 Hz wall socket, depending on which unit you have.

F. Turn the power switch on. The meter should be illuminated.

G. Depress the "Brake Release" (Center) lever, hold it, and simultaneously depress the CCW direction switch (Left). The rotator should turn CCW (looking from the top). This is S - E - N - W - S. Release the CCW direction switch; the rotator will coast down and stop. Now release the brake switch. The rotator is now locked into position.

H. Repeat the above for CW direction by depressing the brake switch first, then the CW direction switch (Right).

CAUTION

It is best to release the direction switch just prior to the end of rotation (extreme CW or CCW position) in order not to cause undue stress on the stop arm and/or the gears.

I. Return the rotator to full CW position.

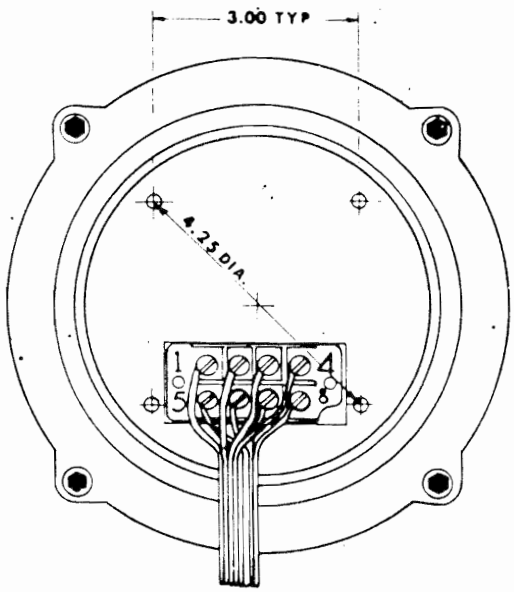

Figure 4. Rotator Wiring

Section V. Mounting the Rotator

Tower

The rotator is mounted inside a tower (see Figure 1) to the flat tower plate by means of four bolts furnished in the hardware kit. Use the following procedure:

1. Locate the rotator in the tower directly under the bushing. Note that the tower plate must be cut out to allow the connecting 8-wire cable to pass through the plate.
2. Reattach the wires to the rotator in ***exactly*** the same manner as used in the trial assembly and secure the wires to the tower in such a manner that the wires will not be strained.
3. The rotator is attached to the tower plate by means of four (4) bolts and lockwashers (see Figure 6). The flat tower plate must be drilled in four places unless the tower plate is already properly drilled.
4. Tighten the four (4) bolts but not to final tightness. Observe how the rotator turns. It must rotate in such a manner as to turn the mast concentrically to the top [illegible]shing.
5. [illegible]semble the mast to the top of the rotator using the U-bolts, nuts and lockw[illegible]s through the rotator a[illegible]lamp plate as shown in Figure 6. The maximu[illegible] diam[illegible] that ma[illegible]ed is 2 1/16" O.D.. We recommend 1½" nominal st[illegible]ss of .145". For stacked arrays or ver[illegible]avy-duty wall thickness. .200". Both stee[illegible]sed [illegible] speci[illegible]cation ASTM-120.
6. If the rotator, top bushing and mast are properly aligned, there should be unrestricted rotation through a full 360°. If not, the rotator may have to be moved slightly on the plate and/or the mast may have to be shimmed using shims between the mast and the V-shaped bell rotator casting. If a high quality bearing is used in the top of the tower (*Recommended*) the shimming procedure must be done more carefully as closer tolerances are required. ***It is important that the rotator not try to turn the mast eccentrically with the top bushing or bearing.*** The geometry is such that a mast of 2.062 inches (52 mm) will be exactly centered. For each .0625 inch (1.6 mm) less mast diameter used, .031 inches (.8 mm) of shim must be wrapped around the mast at the clamping points.
7. Tighten the four (4) bolts carefully - to approximately 100 inch-pounds of torque.
8. R[illegible]n. Mount the beam pointing South. The [illegible]ure 1 in such a manner that it will not [illegible]round in a circle to the full 360°" counterclockwise position.

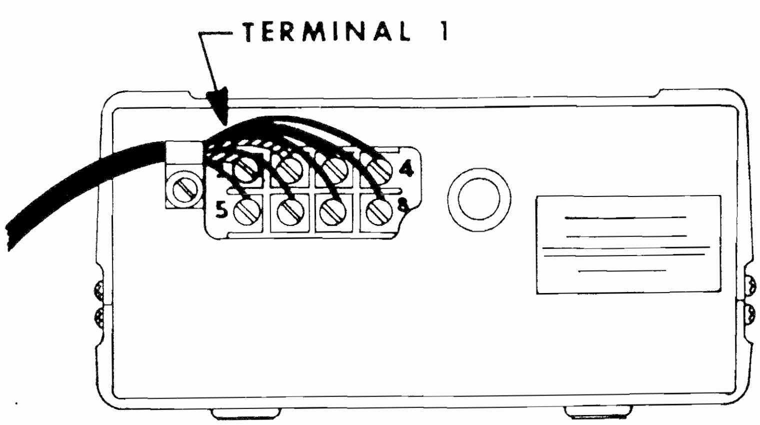

Figure 5. Control Unit Wiring

de Tower

Referring to Figures 2, 3 and 7, an outside tower or pole mount is made in the same manner except that the rotator is fastened by four (4) bolts to the lower mast support, Part Number 50349-10. Since the eccentricity of the rotator turning in reference to the tower is no longer important, the shimming procedure is not necessary. The four (4) screws must be torqued to the same specification, and the 8-wire cable securely fastened.

CAUTION

The rotator is designed for vertical operation with the bell shaped housing in the up position. Water and other contamination will get into the motor unit if it is mounted horizontally or upside down.

Section VI. Operation

liminary Check Calibration

1. Turn the control box "on" with the upper right "on-off" switch. The meter should be lighted and the needle should be to the right.
2. Depress the brake lever (Center) and hold. Depress the CCW lever (Left) and operate the rotator to its full CCW position. If the meter does not move from the right to the left hand position, press and release the "calibrate" switch.
3. With the rotator in its full CCW position, if the meter is not at its full left position, carefully adjust the zero (CCW South) position with the screw directly under the meter to exactly South.
4. Meter calibration of the extreme full scale (right hand or clockwise South) can be accomplished at any time without disturbing the rotator using the following procedure:
   a. With the control unit "on", push in and release the "calibrate" knob.
   b. The meter should now indicate full scale to the right. If it does not, turn the calibrate knob until it does.

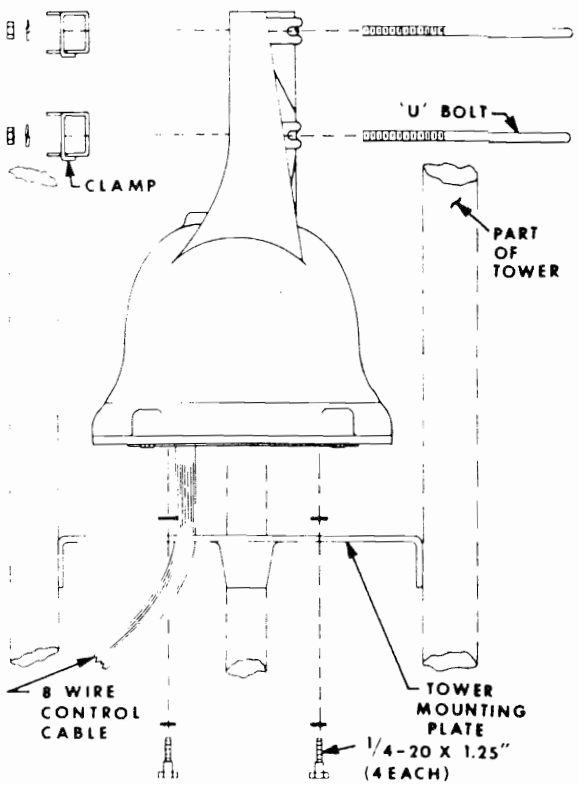

Figure 6. Rotator Mounting in a Tower

c. Without turning the knob, push it in and release it. The right scale is now fully calibrated to adjust for minor variations in component values. Do not, then, turn the knob, even in the "push-off" position because to do so will require that it again be recalibrated.

5. Return rotator to its full CW end of rotation. When the control unit is turned "off", the meter needle will fall to the left "S" position and return to indicate the rotor position as soon as the control unit is turned "on" again. It will not damage the unit to leave it turned "on" for extended periods.

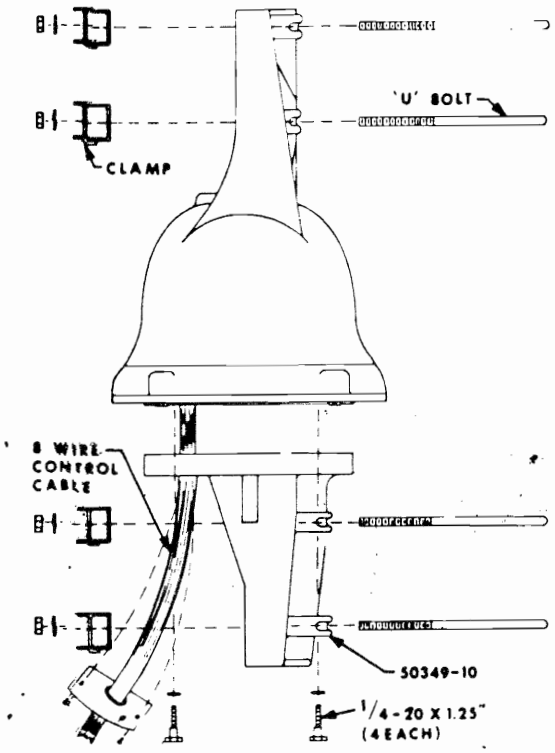

Figure 7
Rotator Mounting with Lower Mast Support

Section VII. Grounding

neral

The tower, or other metal support device must be grounded to earth ground *at location*. Use heavy copper cable looped so that if the tower comes down for any reason there will be adequate slack to prevent the ground wire from breaking. Use one or more 18" copper jacked steel stakes driven into the moist earth and fasten the wire securely at the stake and at the tower.

As mentioned in the "Cautions" portion, the steel chassis of the control box should be either grounded to a cold water pipe in the house or back to the electrical service entrance box where the power comes into the house. This normally is accomplished with the third wire of the 3-prong plug which then depends on the wall outlet being adequately grounded back to the service entrance as well as to the utility ground. If there is any doubt, have this checked by a licensed electrician.

Section VIII. South Centered Meter Scale Conversion

General

The stock CD-45-II unit is shipped with the meter scale installed for North center operation, ends of rotation at the South position. Since some geographic locations and/or popular working areas may favor having the Meter South Center, ends of rotation at the North position, we have provided the CD-45-II with a reversible meter scale.

We recommend the following procedure:

1. Disconnect the power cord.
2. Remove the 8-wire control cable, carefully labeling each wire with its corresponding terminal number. This operation may be omitted if the control box can be worked on easily without removing the leads.
3. Remove the top and bottom covers.
4. Slip the lamp and holder off the lamp holder bracket. Loosen the hex nut on the transformer that is holding the lamp holder bracket and swing the bracket clear of the wires leading to the printed circuit board.
5. Carefully remove the hex nuts on the meter studs to free the printed circuit board. Slip the P.C. board off the studs and pull it down under the chassis.

   CAUTION

   It is good practice to use a short test lead or jumper wire to short the meter movement when it is not in the circuit.
6. Loosen the meter retaining clips and remove the meter from the chassis.
7. Insert a small pen knife between the clear meter cover and black housing at either corner of the edge and gently pry the cover loose from that corner. Repeat for the other corner Meter cover should pop off.
8. Carefully slip a pen knife under each corner of the lower edge of the white meter scale and twist slightly until the scale clears the two small indexing pins. Remove the scale, turn it over, and re-install it. Make sure the scale fits over the indexing pins and that it is flush and tight against the black housing. This will assure free movement of the indicator needle.
9. Re-install the meter (remove the temporary jumper), the P.C. board, and lamp hardware. Check for pinched, shorted and/or overstressed wires.
10. Re-install the top and bottom covers.
11. Reconnect the 8-wire control cable in the exact sequences as they were removed.

If your beam was installed originally using the CD-45-II with a North Center Scale, the antenna mast must be loosened and repositioned. In order for the meter to indicate properly, the front of your beam must point North when the rotator is at the ends of rotation.

Recalibrate the meter.

50559-10 Tower Mounting/ Spacing Kit

The tower mounting/spacing kit is a flat plate equipped with four (4) 0.5 inch standard bushings drilled to match the hold-down screw holes in the bottom of a Hy-Gain bell type rotator. The plate is designed to allow enough clearance under the bottom of the rotator to clear the control cable without drilling a hole in the tower mounting plate.

On any inside tower installation care must be exercised to get the top mast shimmed to the exact rotational center of the rotator upper mast support. The geometry is such that a mast of 2.062 inches (52 mm) will be exactly centered. For each .0625 inch (1.6 mm) less mast diameter used, .031 inch (.8 mm) of shim must be wrapped around the mast at the clamping points.

CHAPTER 2

CONSTRUCTION AND SERVICING

Section I. Control Unit

General Description
(See Pages 16 & 17)

1. ***Power:*** The on/off switch is a turn-to-operate type. The unit is protected by a 3 amp line fuse which is located in a fuse holder on the back panel. The power transformer supplies power for the rotator motor. The transformer is protected by a thermal cut-out switch located in the primary. If the cut-out switch opens, turn the unit off and wait 10-15 minutes before resuming operation.
2. ***Meter Circuit:*** The position indicator meter and its circuity is powered by the meter transformer. When the power switch is "on" the meter is illuminated and continually indicates rotator position. Stability is assured by the 13 volt zener regulated power supply.
3. ***Calibration:*** The calibration switch is a push-on/push-off, turn to adjust type. It calibrates the right hand position (full scale) of the meter.
4. ***Rotator Control:*** CCW rotation is controlled by the left hand lever and CW rotation by the right hand lever. The center lever is the brake release.

Section II. Rotator

General Description
(See Pages 17 & 18)

1. ***Outer Housing:*** The upper mast support (Bell) and the lower support are cast aluminum. The upper mast support is secured to the base casting by four 12-24 x ¾" taptite hex head screws.
2. ***Position Sensor:*** The position sensing potentiometer is located in the top of the bell casting.
3. ***Drive:*** A low voltage AC motor and its associated gears drive the output ring gear at about 1 RPM. The ring gear in turn is mechanically interlocked to the upper mast support (Bell).
4. ***Brake:*** The brake is a disc type which is an integral part of the motor armature. When power is applied to the motor, the armature lifts pulling the two disc pads apart which allows the gear train to operate freely. With no power applied, the weight of motor armature forces the two brake pads together which in turn brakes the rotator.
5. ***Rotation Limits:*** Two electrical end of rotation switches, activated by the stop arm, disconnect the motor power just before the rotating bell housing reaches its full CCW (0°) or CW (360°) positions.
6. ***Bearings:*** Two rows of ball bearings are provided. Lubricate sparingly with factory approved special low temperature grease (PN 51497-10).

Section III. Troubleshooting

General

Most operational difficulties with rotors are traceable to broken, shorted or grounded wires usually at the terminal strips. Time spent in cutting the leads to exact lengths, tinning, forming, and wrapping around terminals, cutting insulation to exact length, and clamping to prevent strain on any single wire, will pay dividends.

Mechanical Play

Frequently the slight motion of the antenna array in gusts of wind is due more to the natural flexing of the elements and mast than it is due to actual play in the rotator mechanism. A slight amount of "play" is built into the rotator to avoid binding due to environmental changes.

Antenna Rotates In Heavy Wind

This is usually a matter of the mast slipping in the support. If "slipping" or "turning" is suspected, return the rotator to the end of rotation and visually check to be sure that the antenna is in the original stop location as installed. Check the nuts on the U-bolts to insure that they are tight.

Lack of Power

If the antenna rotation is slow or sluggish or hard to start, check for proper voltages. If the voltages are correct, the 140 MFD motor start capacitor could be at fault. It is recommended that a new capacitor be tried before action is taken.

If the electrical circuit is okay, then check for mechanical binding. Pay particular attention to bearings and alignment of the shaft on an inside tower mount. On any inside tower installation, care must be exercised to get the top mast shimmed to the exact rotation center of the rotator upper mast support.

Improper Meter Indication

The brake and motor operate independently of the indicating system. If the pilot light burns at proper brilliancy, the instrument transformer is OK and the output is not shorted. Check the ⅛ AMP meter circuit fuse with an ohmmeter. Check for about 13 VDC across terminals #3 and #7 with the switch operated. If the proper voltage is not obtained, check the individual components in the meter circuit. If the 13 VDC is present, check for 500 ohms across rotor leads #3 and #7. If 500 ohms is present from #3 and #7, see if the readings from #3 to ground and #7 to ground total 500 ohms.

NOTE: If the needle remains in the right hand "S" position, check to be sure the calibration switch is not in the "calibrate" position.

An intermittent condition in any component in the rectifier or meter circuits within the control box, as well as in the cable or potentiometer circuit in the rotator itself can cause meter fluctuation or error. Possible cause of such trouble may be localized by placing a test DC meter across terminals #1 and #3 or #1 and #7 comparing the action of the test meter with the panel meter.

No Rotation — Indication OK

Either the thermal cutout in the power transformer has opened or there is actually trouble motor circuit. After allowing time for the thermal cutout to restore service, proceed to "Checking Rotator from Ground" and "Checking Control Unit".

Ground Wires

Grounds on cable leads can burn out either the line fuse or the small fuse in the meter circuit. For full explanations, refer to the Schematic. If lead #3 or lead #7 is grounded, it shorts out part of the potentiometer so that as rotation progresses to the other end, the full DC voltage is applied across a decreasing portion until current becomes so high that the potentiometer burns out. Note also that any grounds may put an overload on the power transformer which could cause the line fuse to blow, or overload the rectifier circuit so that the ⅛ amp fuse blows.

Checking the Control Unit

1. **Voltages with unit plugged in.**

   To check the control unit, plug the line cord into AC power. With no connections to the terminals tun the on-off switch to the "on" position, the meter light will illuminate. The meter needle will remain on the left hand "S". Terminals 1 and 2 should show 30 volts AC (approximately) when the brake lever is depressed.

   Terminals 1 and 5 should show 30 volts AC with brake release lever depressed and CW lever depressed.

   Terminals 1 and 6 should show 30 volts AC with brake release lever depressed and CCW lever depressed.

   Terminals 3 thru 7 should show approximately 13 VDC.

2. **Resistances with unit not plugged in.**

   Disconnect the AC power source and remove the 8-wire control cable. Be sure to tag each wire with the corresponding terminal number.

   The control box can be checked without removing the cover by using a volt-ohmmeter to check values across terminals. Resistance across terminals #1 and #2 should read .4 Ohms. Read same value across terminals #1 thru #5 with clockwise switch lever (right hand) depressed and across terminals #1 thru #6 with counterclockwise switch lever (left hand) depressed. Resistance across input line cord with on-off switch in the "on" position and the brake lever depressed should read 3.8 Ohms.

Checking the Rotator From the Ground

You may possibly avoid bringing the rotator down by making electrical checks from the control box position. This is done by disconnecting the eight (8) wires from the screw terminals and tagging them carefully #1 through #8 to correspond with the terminal numbers from which they were removed. From the schematic diagram it is apparent that the resistance of the lead wires will be added to the resistance of the motor windings and potentiometer strip in making the resistance checks as shown in Table 1.

To Check	Read Resistance	Between Terminals
½ Motor Winding	1.5 ohms *	1-8
½ Motor Winding	1.5 ohms *	1-4
½ Motor + Switch	1.5 ohms *	1-5
½ Motor + Switch	1.5 ohms *	1-6
Entire Motor	3.0 ohms *	4-8
Right Limit Switch	0 ohms + leads	8-5
Left Limit Switch	0 ohms + leads	4-6
Entire Pot Strip	500 ohms	3-7
Pot Arm to + End	0 to 500 ohms	1-3
Pot Arm to — End	0 to 500 ohms	1-7
	*plus leads	

Table 1

Section IV. Disassembly of the Rotator

(Applies only to out of Warranty units)

assembly

In order to service the rotator, the unit must be disassembled. We recommend the following procedure:

1. Remove the bottom mast support to permit the rotator to be set on a flat surface.
2. Remove four (4) screws and carefully raise top casting to expose potentiometer and drive mechanism.
3. Carefully remove upper ball retaining ring. Keep it circular, and lay it on clean paper.
4. Inspect inside of top housing for small scratches or burned spots on the ribs. These are an indication that a switch blade or connection is rubbing during rotation. See that the pot strip is clean and not burned at either end. See that pot body is secure and that pot arm is clean at the point of contact. Use only fine rouge cloth to polish contact arm. Check limit switch to see if wires are secure and insulation is undamaged. Contacts should be clean.. Check for 1/32" clearance between switch blades and motor — particularly alongside of lockwasher under motor fastening. Greater clearance gets switch too close to top bell housing ribs.
5. If the drive ring happens to be near end of rotation, operate the top spur gear to rotate the mechanical stop on the drive ring away from the area of the limit switch. See that the mechanical stop lever (which is positioned between the two limit switches) will open each electrical contact before it hits the corresponding mechanical stop. Also see that the stop lever has not been deformed and that the electrical contacts are clean and uncorroded.
6. rotate the top spur gear several revolutions to determine that the motor and its bearings are operating freely. Look for broken teeth in any of the gears.
7. Remove the drive ring gear from the base housing. This is accomplished by first pulling up on the side opposite the gear train. Then raise the entire ring slightly upward with the side away from the gear train higher so that it will slide out from under the gears. Examine closely for evidence of broken or worn teeth.
8. Examine the inside of the screw terminal strip to see that there is proper clearance between the solder lugs and frame and that there are no faults in the insulation. Pay particular attention to the insulation at the point where the wires are held in metal clips.
9. To remove potentiometer, remove hex nuts. Unsolder leads. Mounting studs are are staked to the motor frame. Be sure that the potentiometer strip is clean and that the potentiometer arm is not corroded. Use only fine rouge cloth as an abrasive. In replacing the potentiometer be sure the connections are on the side which overhangs the motor.
10. To replace the motor, first remove the potentiometer per Step 9, then unsolder black motor lead if not done in Step 9, the red lead from the inside left limit switch lug, and the blue lead from inside the right limit switch lug. Fastenings holding motor on studs may then be removed and the motor pulled up and out. In replacing a motor, be sure to see that the round hole in the motor is next to the limit switch. Use special internal-external lockwasher over the stud that works in the slotted hole in the motor. Be sure that the pinion is snug against the spur gear before tightening this fastening over the slot.

11. When it is necessary to closely inspect or replace gears, it is possible to remove motor, limit switch, potentiometer, and terminal strip without unsoldering. Remove motor fastening from the mounting studs. Work motor up and out, exercising care in pulling leads and terminal strip through the window in the gear housing. Remove plate to expose gears. Carefully note position for proper replacement.

Section V. Re-Assembly of the Rotator

Re-Assembly

It is assumed in the following instructions that the motor and gear train along with the potentiometer and the limit switches are likewise assembled, wired and operative.

1. See that a small amount of low temperature, high quality, light weight grease is conservatively distributed around the ball bearings, ring gear and spur gears. Only an even film of grease is desirable (approximately one thimbleful of grease should be used to lubricate a completely dry rotator). Excessive grease will only run out at high temperatures or cause power loss at low temperatures.
2. Rotate the upper spur gear until the inwardly protruding mechanical stop on the ring gear touches the channel shaped stop lever and pushes it far enough to the left to just open the left hand limit switch contact (it is assumed that the rotator is viewed from the side of the limit switch). This situation represents the extreme clockwise end of rotation. The potentiometer arm must then be rotated to its extreme clockwise position against the top stop.
3. Secure the upper bell housing upside down by the mast support in a vise with the open end of the "V" toward the bench. The boss that drives the potentiometer arm, which is located in the bottom part of the housing, will then be to the left of center.
4. Clean the inner portion of the housing and apply a small amount of grease to the ball race. Then carefully insert one ball bearing assembly with the flanged rim up and against the outer edge of the casting.
5. Grasp the operating mechanism by the flat base, steady the ring gear, invert the mechanism and lower it into the housing. In doing this, note that the serrated portion of the potentiometer arm must engage the driving boss in the housing and that the three driving bosses on the ring gear must engage into the mating recesses in the top housing. This situation will result automatically if the previous instructions have been followed.
6. Clean the exposed bearing race and apply a film of grease. Then apply the top bearing assembly to the race with the rim downward.
7. Clean the retaining ring and apply a light film of grease to the ball race only. Lower the retaining ring into place so that the assembly holes will approximately line up with the threaded holes in the upper housing. Insert the four (4) assembly screws and use a heavy screwdriver to completely tighten the four (4) assembly screws. Torque to 85 inch-pounds.
8. It is suggested that all eight wires be connected from the control box while the rotor is still on the bench and that its complete operation be checked.

Section VI. How to Get Factory Service

If service is required, the unit must be packed securely and sent prepaid to:

TELEX WARRANTY SERVICE CENTER, DEPT. 623
TELEX COMMUNICATIONS, INC./HY-GAIN DIVISION
8601 N.E. Highway 6
P.O. Box 5579
Lincoln, NE 68505 U.S.A./Phone: (402) 467-5321

For units that are in warranty, no charge will be made for any repair work required. Include a copy of your sales receipt. For out-of-warranty units, call the Warranty Service Department for prices.

The price includes rebuilding the unit, replacing all defective and/or worn parts, and return freight charges. Hy-

The price includes rebuilding the unit, replacing all defective and/or worn parts, and return freight charges. Hy-Gain reserves the right to change prices at its option. When returning items for repair, a check or money order for the repair charges must be included. Be sure to include your name, address, zip code, and telephone number. Also, give a brief description of the problem.

IF YOUR UNIT IS DAMAGED, CONTACT YOUR DEALER OR THE SHIPPER. IF ANY OF THE ITEMS ARE MISSING, RETURN THE COMPLETE UNIT TO YOUR DEALER OR WRITE THE FACTORY FOR ASSISTANCE. A COPY OF YOUR SALES RECEIPT MUST ACCOMPANY ANY RETURN.

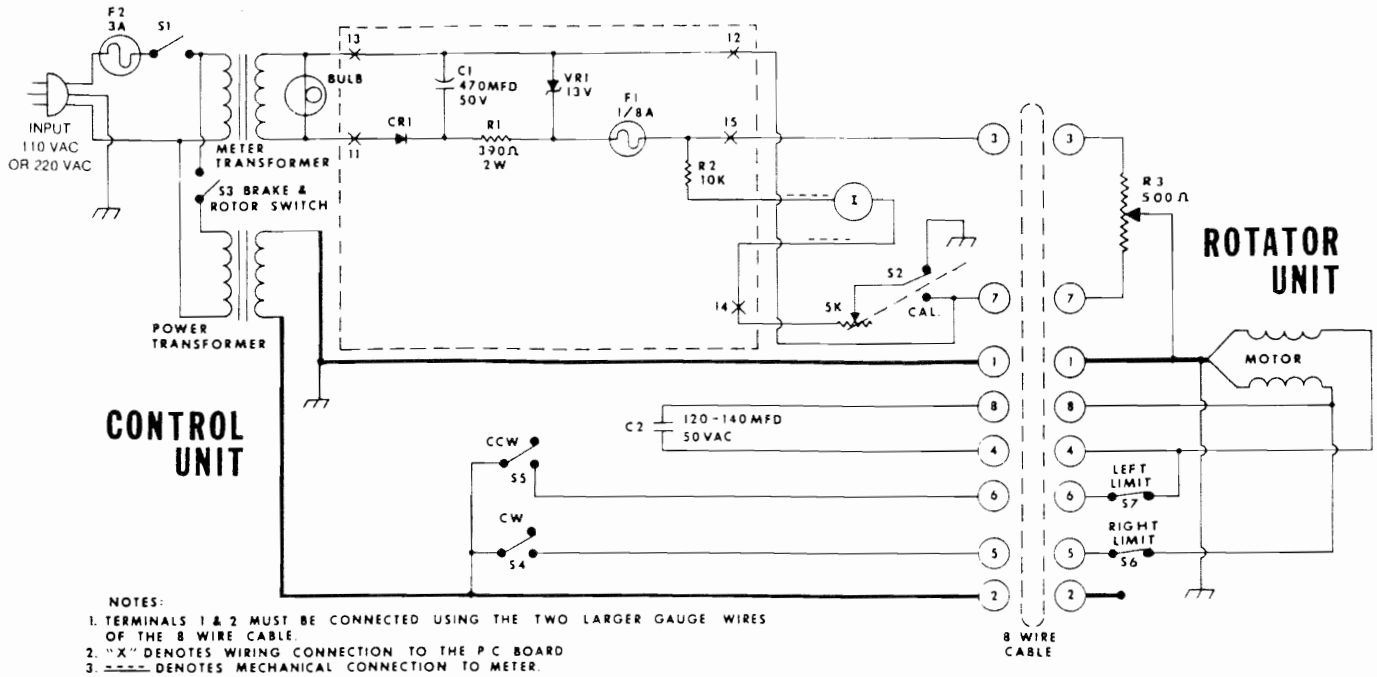

Figure 8. Schematic

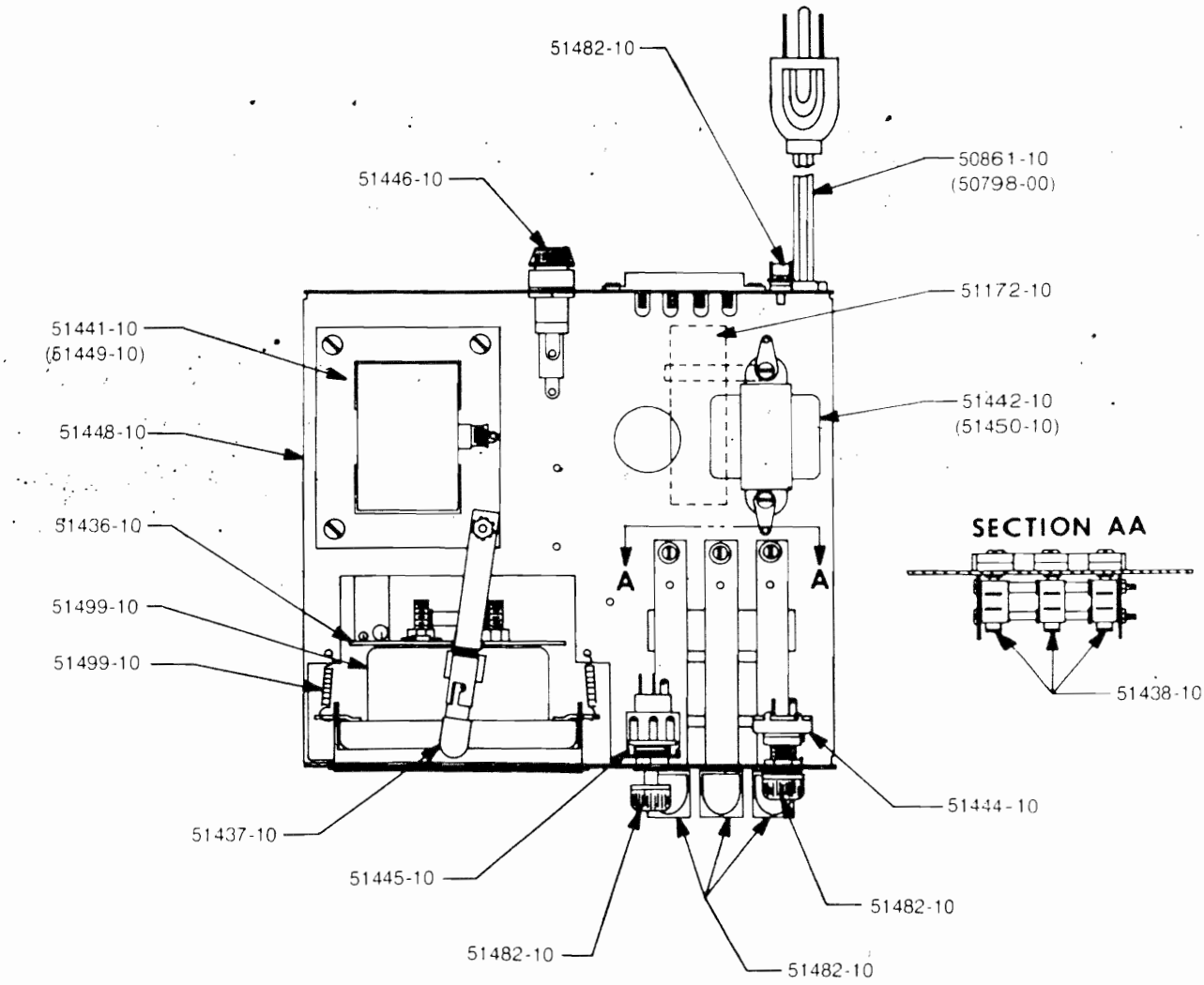

Figure 9. Control Unit - Top View

CHAPTER 3

REPLACEMENT PARTS KITS

CONTROL UNIT HAM IV/CD-45-II

Part Number	Description
	Control Unit, Complete, 220 VAC
51568-10	Control Unit, Complete, 120 VAC
51436-10	Printed Circuit Board Kit
	Capacitor, 470 MFD (1) C-1
	Resistor, 390 Ohm 2W (1), R-1
	Diode, Zener (1) D-1
	Diode, (1) D-2
	Resistor, 10K Ohm 1/4W (1) R-2
	Fuse 1/8 Amp (1) F-1
51437-10	Expendable Parts Kit
	Fuse, 3 Amp (2) F-2
	Fuse, 1/8 Amp (2) F-1
	Bulb, Meter (2)
51438-10	Switch Kit, Brake/Direction
	Switch (3) S-3, S-4 & S-5
51481-10	Cover Kit
	Cover, Top
	Cover, Bottom
	Skid Pads (4)
	Screws (8)
51482-10	Miscellaneous Hardware Kit
	Knob On/Off (1)
	Knob Calibration (1)
	Terminal Board (8 terminals) and Screws (2)
	Lever, Switch (3) (For S-3, S-4 & S-5)
	8-Wire Cable Strain Relief & Screw
51449-10	Transformer Kit, Power 220 VAC
51441-10	Transformer Kit, Power 120 VAC
51450-10	Transformer Kit, Meter 220 VAC
51442-10	Transformer Kit, Meter 120 VAC
51172-10	Capacitor, Motor Start Kit
50861-10	Line Cord Kit, 3-Wire, 110 VAC
50798-00	Line Cord Kit, 3-Wire, 220 VAC (European plug)
51499-10	Meter Kit
	Meter (1)
	Bezel (1)
	Mounting Hardware
51444-10	Switch Kit, On/Off (S-1)
51445-10	Switch Kit, Calibration (S-2)
51446-10	Fuse Holder Kit (for F-2)
51570-10	Face Plate Kit
51448-10	Chassis Kit

CD-45-II ROTATOR

Part Number	Description
51744-10	Rotator, Complete E/W Hardware
50304-10	Upper Mast Support Kit
51310-10	Ball Bearing Kit (2 required)
	Ball Bearings (25)
	Bearing Retainer (1)
50422-10	Spur Gear Kit
	3 Assembled Gears (short pinion) Upper 3
	1 Assembled Gear (large pinnion) Upper Left
	3 Stacked Spur Gears (Lower Right)
	5 Spacers & Washers
50370-10	Base Casting and Gear Shaft Assembly Kit
51459-10	Motor Mounting Plate Assembly Kit
51471-10	Motor and Pinnion Kit
51460-10	Potentiometer Kit, Sensor
51461-10	End of Rotation Switch Assembly Kit
50349-10	Lower Mast Support Kit
51465-10	Terminal Board Kit (8 terminals)
	Terminal Board (1)
	Screws (2)
51466-10	Hex Head Screw Kit
	Screw, (4) Hex Head 12-24 x ¾ (Taptite)
50424-10	Bearing Race Kit
50313-10	Ring Gear Kit
50423-10	Stop Arm Kit
50425-10	Mounting Hardware Kit
51497-10	Grease Kit

Hy-Gain reserves the right to change prices at its option. Current prices may be obtained by calling or writing the factory. Please send self addressed stamped envelope.

ROTATOR UNIT
CD-45-II

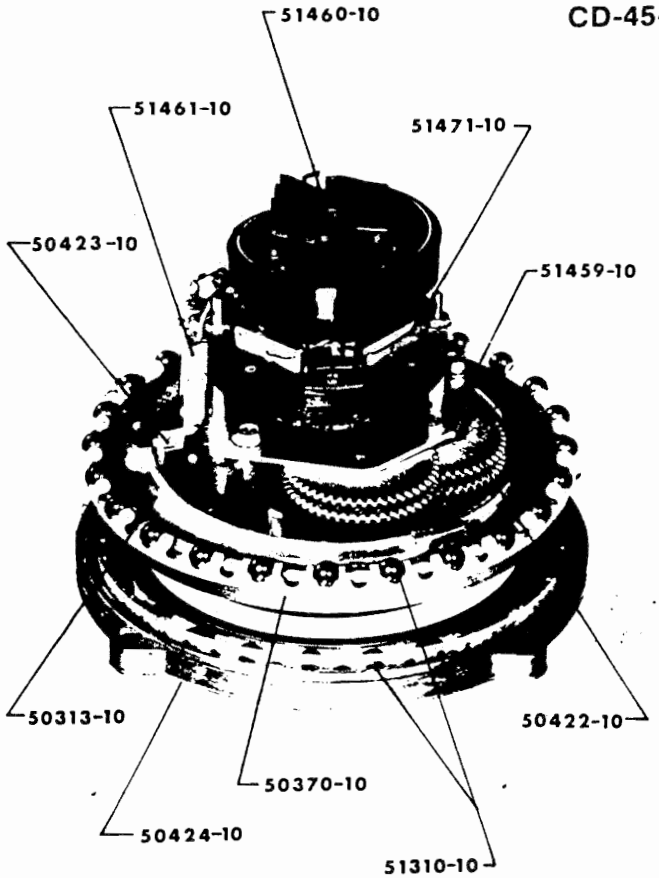

Figure 10

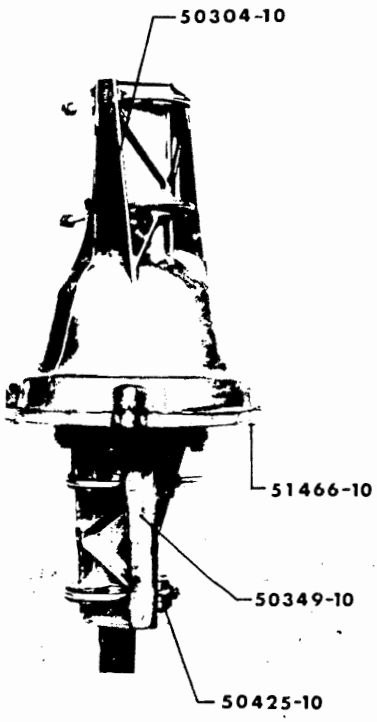

Figure 11

CHAPTER 4
CD-45-II SPECIFICATIONS

Specifications

Input voltage	120 VAC 50-60 Hz
Optional	220 VAC 50-60 Hz
Motor	24 VAC, 2.25 Amp, split phase
Power transformer	120/26 VAC 10% duty, thermal protected
Optional	220/26 VAC 50-60 Hz
Meter transformer	120/13 VAC continuous duty
Optional	220/13 VAC
Meter	D.C. voltmeter 1000 ohms/volt
Meter scale	direct reading, North centered, 5° increments
Optional	South centered
Recommended cable	Belden 8448 or equivalent for up to 150 feet (45 m). Use #18 wires for terminals 1 and 2.
Maximum cable resistance	1.0 ohm per terminal for 1 and 2 2.5 ohms per terminal for 3 thru 8.
Rotation time	45-60 seconds with 60 Hz input
Brake	disc type, intergral part of the motor armature
Rotator size	8" (20 cm) maximum diameter by 17⅜" (44 cm) high with lower mast support. Without lower mast support, 10⅞" (28 cm)
Permissable mast size	form 1.37" (35 mm) to 2.062" (52 mm)
Control unit size	8.5 inches (21.6 cm) wide x 9.0 inches (22.8 cm) deep x 4.3 inches (11.0 cm) high
Mounting hardware	clamps and ¼" U-bolts
Shipping volume	2280 cu. in. (37.350 cu. cm)
Shipping weight	24 pounds (10.88 kg)