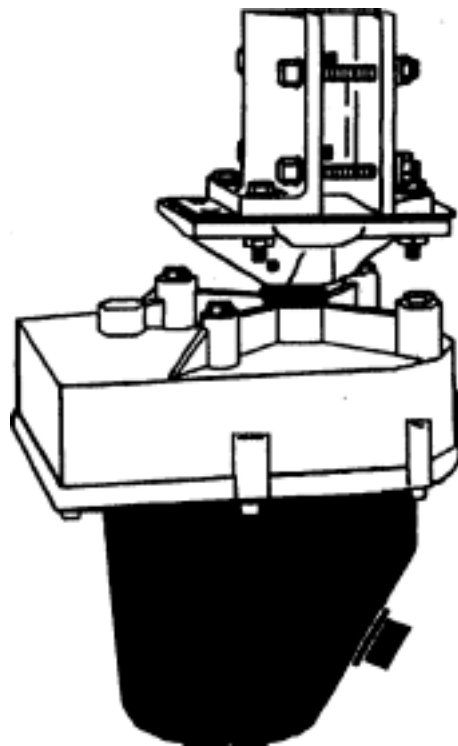
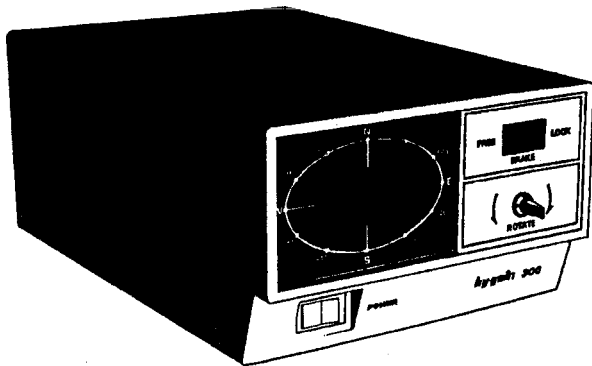


HDR-300A

Heavy Duty Rotator System

Instruction Manual



hy-gain®

TABLE OF CONTENTS

Page	
	CHAPTER 1 - INSTALLATION AND OPERATION 1-1
	Section I. Components of the HDR-300/A Rotator System 1-1
	Gear Motor Assembly..... 1-1
	Control Console..... 1-1
	Tower Compatibility 1-2
	Antenna Compatibility..... 1-2
	Section II. Specifications 1-3
	Section III. Pre-Installation Instructions..... 1-4
	Pre-Installation Check..... 1-4
	Section IV Voltage Conversion..... 1-9
	Section V Calibration and Installation Procedures..... 1-12
	Calibration..... 1-12
	Installation..... 1-12
	Section VI. Operations and Maintenance..... 1-15
	Operations 1-15
	Use the Digital Readout System..... 1-16
	Maintenance 1-16
	CHAPTER 2 - TROUBLESHOOTING AND SERVICE INFORMATION..... 2-1
	Section 1. Troubleshooting 2-1
	Section II. Voltage and Resistance Measurements..... 2-5
	Voltage and Resistance Charts..... 2-5
	Section III. How to Get Factory Service..... 2-6
	Service Information 2-6
	CHAPTER 3 - HDR-300/A PARTS LIST AND SCHEMATICS..... 3-1

LIST OF ILLUSTRATIONS

Figure		Page
1	Control Console Rear Panel	1-4
2	Socket Contact Application	1-5
3	Control Cable Connector Attachments.....	1-7
4	Control Cable - Rotator Wiring Guide.....	1-8
	Detail A-Actuator Shown in the "000" Position	1-8
5	Solenoid and Potentiometer Wiring Guide.....	1-9
6	Wiring for 115 VAC	1-10
7	Wiring for 230 VAC	1-11
8	HDR-300/A Rotator Mounting Hardware.....	1-13
9	Top View of HDR-300/A and Tower Mounting Plate for Hy-Gain Crank-Up Towers HG-54HD and HG-70HD.....	1-14
10	Typical Installation of Rotator Mounted Below Plate	1-14
11	Gear Motor Assembly with Cover	3-4
12	Output Gear and Shaft Assembly.....	3-4
13	Gear Motor Assembly - Side View	3-5
14	Gear Motor Assembly - Top View	3-5
15	Gear Motor Schematic.....	3-6
16	Steel and Fiber Gears.....	3-6
17	Exterior View - Control Console.....	3-7
18	Interior View of Control Console.....	3-7
19	Schematic Main P.C. Board	3-8
20	Main P .C. Board.....	3-8
21	Components and Wiring of Main PC. Board	3-9
22	Schematic of Display PC. Board	3-10
23	Display P.C. Board	3-10
24	Components of Display PC. Board - PN 871166-1	3-11
25	Rear Mounted Components - Front Panel of Control Console	3-11

PLEASE RECORD THE FOLLOWING INFORMATION FOR YOUR RECORDS:

Date of Purchase: _____

Purchased From: _____

Price Paid: _____

Serial Number (on Gear Motor): _____

CHAPTER 1

INSTALLATION AND OPERATION

Section I. Components of the HDR-300/A Rotator System

General Description

Gear Motor Assembly

The HDR 300/A Rotator is a compact, high torque antenna rotator that can be used for positioning large antenna systems. The gear train is constructed of heavy steel-spur gears for maximum strength and reliability. To provide for quiet, vibration free operation, a fiber drive gear from the motor is used. An aluminum housing reduces weight and helps prevent corrosion. The gears are lubricated with a low temperature grease that is stable from -60°F to 280°F. The HDR-300/A also features a new 17-4 PH stainless steel heat-treated output shaft for increased corrosion resistance and increased wear resistance.

The gear train is driven by a 1/10 HP permanent magnet split capacitor motor. The motor is supplied with 24 VAC, 50/60 Hz, single phase power through one of two limit switches. Gear motor stall torque at 70°F typically exceeds 5000 inch/pounds. Full load torque exceeds 2300 inch/pounds. The motor contains a thermal overload circuit breaker which will not allow the motor to operate if it is too hot. The breaker will automatically reset after the motor cools down. This usually takes 5 to 15 minutes depending upon ambient temperature. The gear motor will operate reliably from -30°F to +120°F.

The HDR-300/A Rotator has a low voltage solenoid brake/clutch assembly. This assembly is installed on the motor shaft and prevents gear damage by slipping when the braking torque or brake-holding torque exceeds 7500 inch/pounds. This value may drop if the clutch is allowed to slip several times. The braking torque and brake-holding torque will always be greater than 5000 inch/pounds unless the rotator system is subjected to misuse, neglect or incorrect wiring.

Azimuth indication is provided by a 3-turn, 1000 ohm wire wound potentiometer that is geared to the rotator output shaft. An analog output is obtained by a varying DC voltage as the rotator is turned. Because a 3-turn potentiometer is used, the amount of over-travel can be as great as 180° without damage to the potentiometer. However, the over-travel is limited to approximately 20° by the limit switches. This gives a maximum travel of 400°. Ferrite beads have been added to the wires on the potentiometer to reduce susceptibility to high-power RF.

General Description

Control Console

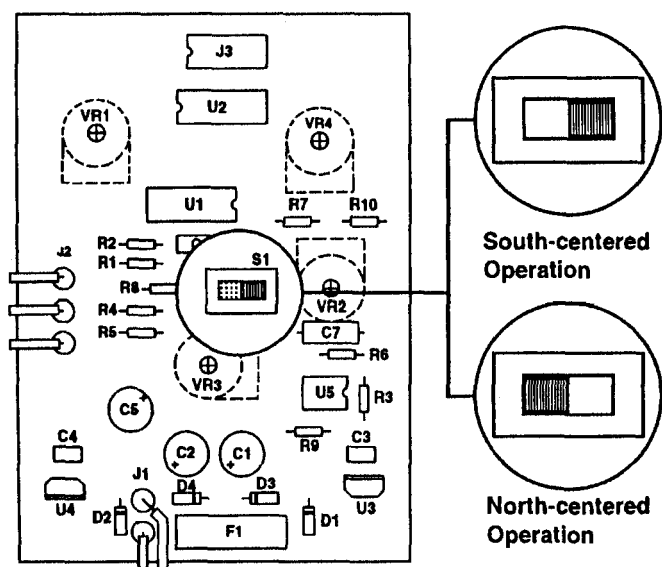
The Control Console actually consists of two separate systems. The first system supplies 24 VAC to the motor. The second system supplies 5 VDC to the azimuth potentiometer and receives the analog signal from the potentiometer which is converted into seven segment LED's digital form and displayed on the front panel.

The 24 VAC transformer comes wired for 115 VAC, although it can be easily rewired for 230 VAC operation. Power is supplied to the rotation control switch through the brake control switch. Before the antenna can be turned the brake must be in the "FREE" position. This also permits the operator to allow the antenna to coast to a stop before locking the brake. This will prevent the brake/clutch assembly from slipping under high torque conditions. The brake switch has a reminder light to tell you that the antenna is free to rotate.

When the power switch is turned on, 5 VDC is supplied to the potentiometer in the rotator. As the rotator is turned from 0° to 360°, output voltage from the potentiometer is varied from .833 to 2.500 VDC. This analog voltage is compared to a reference voltage and finally converted into a digital format for display purposes. The display system is capable of displaying -99° to +999°, although the limit switches on the rotator limit the rotation from -20° to +380°. Potentiometers are available through the back plate for zero and gain calibration.

A new main PC Board, P/N 871165-2, and a small adjustment to the position of the 3-turn potentiometer allows the HDR-300/A to operate as a North-centered or South-centered antenna rotator.

This new main PC Board has (4) four trim pots and one 2 position slide switch. The two new trim pots affect how the rotator switches from 359 degrees to 000 degrees while in the Northcentered mode of operation. The slide switch selects either North-center or the original South-center operation. Choose whether you wish to use the rotator in North or South-centered operation. If you want South-centered operation, place the switch in the right (open) position. If you want North-centered operation, place the switch in the left (closed) position.



Tower Compatibility

The HDR-300/A is a large, heavy-duty antenna rotator; therefore it is meant to be installed in towers capable of withstanding near the maximum wind loading capacity of this rotator, which is 25 square feet (2.3 sq. meters). The HDR300/A may be installed in smaller and medium-duty tower structures, but the installation will be more difficult and in some cases will degrade the operation of some features of the tower.

We recommend that you install this rotator in a tower that is rated for at least 15 square feet of wind area. For towers with wind loading capacities of less than 15 square feet, either the T²X "Tailtwister" or Ham IV may be installed easily and operated safely.

Antenna Compatibility

As stated earlier, the HDR-300/A is a large, heavy-duty antenna rotator, and as such, should be used primarily in systems that require this capacity. For antenna systems that exhibit less than 15 square feet of wind area, the HDR-300/A is NOT required. The Ham IV may be used to turn wind areas up to 15 square feet and the T²X "Tailtwister" may be used to turn wind areas up to 20 square feet.

Alternatively, do not exceed the maximum wind area capacity of this rotator (25 square feet). Also, the wind area ratings of antennas with boom lengths longer than 30 feet are not valid to use when selecting a rotator. Long-boom yagi or logperiodic antennas require more braking and turning torque than shorter antennas with the same wind area.

NOTE: The maximum antenna area of 25 square feet is only valid if no antenna boom is more than 30 feet long and all elements are less than 50 feet long.

Section II. Specifications

Specifications

Mechanical

Full Load Torque.....	2,300 in.-lbs. (2656 kg-cm)
Stall Torque.....	5,000 in.-lbs. (5774 kg-cm)
Braking Torque (minimum).....	5,000 in.-lbs. (5774 kg-cm)
Coasting Torque.....	600 in.-lbs. (693 kg-cm)
Maximum Vertical Load.....	500 lbs. (226.8 kg)
Maximum Antenna Area (when mounted inside tower).....	25 sq. ft. (2.325 sq. m)
*Maximum Effective Moment.....	5000 ft.-lbs. (691 kg-m)
Maximum Travel.....	400°
Rotation Time.....	approx. 60 seconds for 360°
Mast Size.....	1 1/4" to 3" O.D. (3.2 to 7.6 cm)
Temperature Range.....	-30° to +120°F (-35°C to 49°C)
Weight:	
Rotator.....	27 lbs. (12.2kg)
Control Console.....	21 lbs. (9.52 kg)
Recommended Inside Tower Width.....	9.5" (24.1 cm) minimum

Electrical

Power Requirement.....	108-130 VAC 50/60 cycle 2.5A or 215-245 VAC 50/60 cycle 1.5A
Motor.....	24 VAC, 6A maximum, 1/10 HP, PSC, single phase
Solenoid.....	24 VAC, 0.5A maximum
Digital Readout Accuracy.....	± 1°

*Effective Moment is defined as the product of the antenna weight and the turning radius. The Effective Moments of stacked antennas may be added together.

Control Cable	Requirements:	
Length of Run	Minimum	Recommended for Maximum Torque
0-100 Feet:	two #18 and six #22 AWG Bertek 6308-18 or Belden 8448	two #16 and six #18 AWG Belden 9405
100-200 Feet:	two #16 and six #18 Belden 9405	seven #14 Belden 8628
200-300 Feet:	seven #14 Belden 8628	twelve #14 Belden 8629

CAUTION:

Before purchase of the control cable is made, consideration should be taken to the wire size and O.D. of the cable in comparison to the connectors being used.

Belden 9495 (3-#14 AWG) and Belden 8489 (4-#18 AWG) can be used in place of Belden 8628. Also, Belden 8620 (4-#16 AWG) and 3-#12 hook-up wire can be used in place of Belden 8629.

The three large wires are used on pins 1, 2, and 3. The four smaller wires are used on pins 4, 8, 9, and 10. The maximum resistance in the three large wires should not exceed 0.5 ohms each.

Use the Effective Moment rating of the antennas to determine compatibility.

Section III. Pre-Installation Instructions

Pre-Installation Check

It is required that a preliminary operational check be made on the rotator system prior to actual installation. First, check each item against the Parts List. If any of these items are missing or damaged, follow the instructions on our warranty label.

Next, set up the control unit and the rotator assembly for an operational check using the following procedure:

STEP 1: Determine if you wish to operate this unit on 115 VAC or 230 VAC. The HDR-300/A comes prewired for 115 VAC, but can be easily modified for 230 VAC operation. If 230 VAC operation is desired, go to Section IV before returning to Step 2.

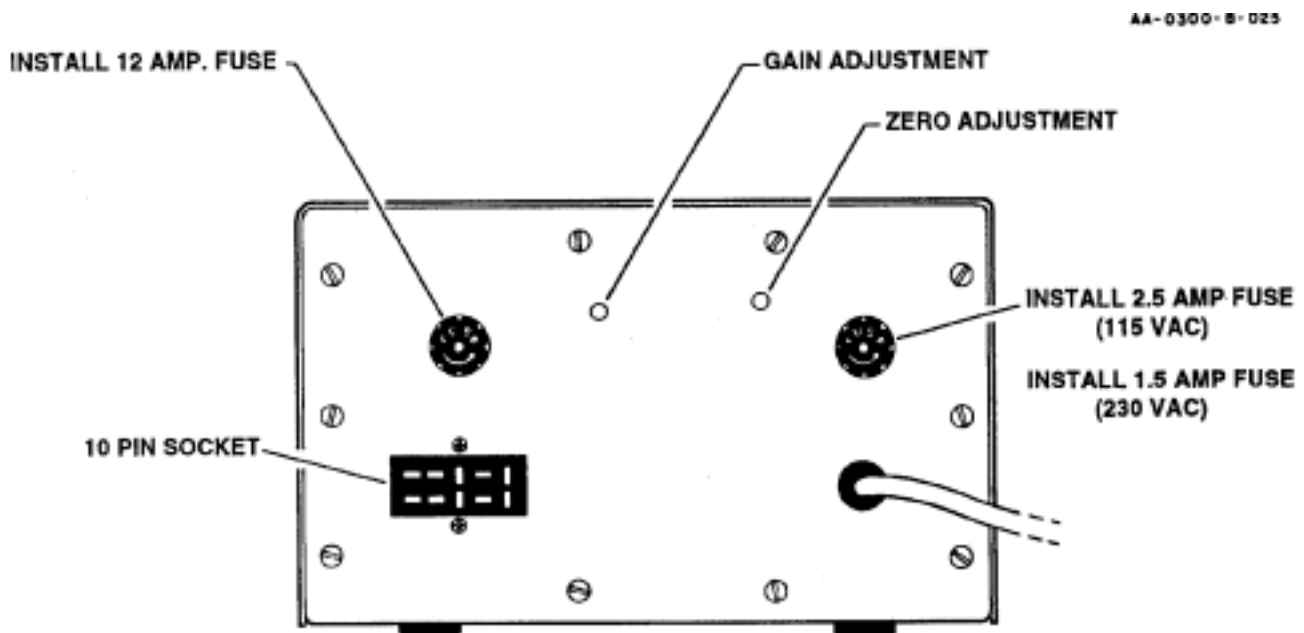


Figure 1
Control Console Rear Panel

STEP 2: Referring to Figure 1, Control Console Rear Panel, install a 2.5A fuse (1.5A for 230 VAC) and a 12A fuse in the appropriate fuse holders.

STEP 3: With the Control Console setting on a suitable workbench, plug the power cord into the appropriate wall socket.

STEP 4: Turn the power switch on. The switch light should come on and stay lit until turned off. The LED digital readout should also come on. You will notice that the digits will change for a second or two until the system has stabilized. Once stabilized, the display should read between "-85" and "-99" or "---". All of these are under-range indicators showing that the control cable has not been plugged in. The over-range indicator is "EEE". This will occasionally appear during stabilization, but should not stay on unless there is a wiring mistake. Turn the power switch off.

STEP 5: Measure out the control cable required for your installation. (See Specifications.) Stretch the cable out to its full length when testing. Strip the wires on both ends as shown in Figure 2. Attach one end to the 10 pin connector and the other end to the 8

Attach the other wire ends to the AMP socket contacts, Figure 2. The maximum wire size that should be used with these is 14 AWG, with a maximum insulation diameter of 0.135 inch. Crimp and solder these socket contacts securely to each wire.

Before inserting a socket contact into the receptacle, install the AMP seal protector (sheath) (PN 650294) in the socket portion of the contact as shown in Figure 2.

Moisten the sheath with isopropyl alcohol. Align the contact with the back of the cavity and insert it straight into the appropriate cavity until bottomed. Remove the sheath from the front of the receptacle and use on the other contacts.

Repeat for each contact. pull back lightly on each conductor to be sure each contact is locked in each cavity. Once locked in place, the contacts may only be safely removed with an extraction tool. This tool consists of a tube with an OD of 0.129 and an ID of 0.115. When inserted over the contact from the front side, this tool compresses the locking tabs, permitting easy removal.

STEP 6: Plug the 8 pin connector into the rotator receptacle.

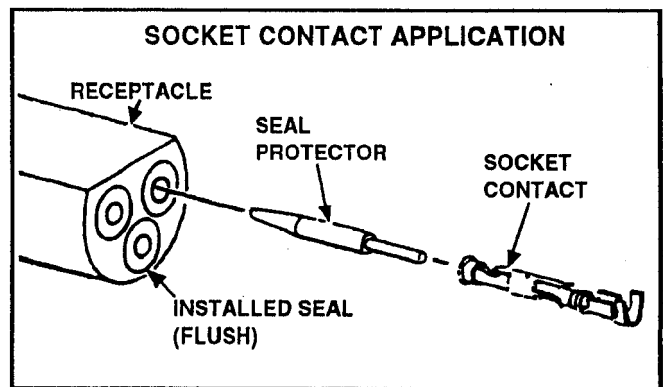


Figure 2
Socket Contact Application

STEP 7: Plug the 10 pin connector into the control console. Turn on the control console power switch. The digital readout should show a heading between -10 and 010 degrees. If it doesn't, refer to Chapter 2, Section I, Troubleshooting guide. Final calibration will take place in Section V

STEP 8: Set the rotator so that the cover is facing you. Move the brake switch on the control console to the "FREE" position. The switch should light up, indicating that the antenna is free to turn. You should also hear the solenoid release the brake and the solenoid will make a humming noise which is normal.

STEP 9: Set the rotator so that the output shaft is facing you. Move the rotate switch on the control console to the right.

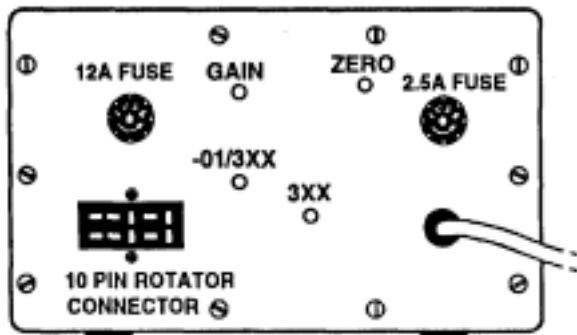
NOTE: The brake must be in the "FREE" position before the rotate switch will operate.

The output shaft should rotate clockwise. If not, refer to Chapter 2, Troubleshooting. Move the rotate switch back to the center position. The output shaft should coast to a stop.

Move the rotate switch to the left. The output shaft should rotate counterclockwise.

North-Center Calibration:

Place the gearmotor assembly (P/N 871159) on your bench, and attach your control cable to both the control unit and the gearmotor unit. Turn on the control unit and rotate the gearmotor fully CCW. If South-centered, the display should read approx. -15 degrees.



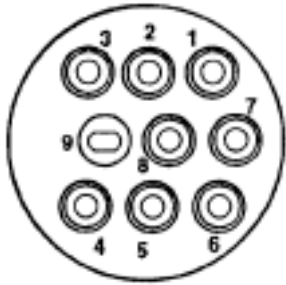
If North-centered, the display should read approx. 165 degrees. If not, adjust the ZERO pot for this value. Once you have the correct display, rotate the gearmotor fully CW. If South-centered, the display should read approx. 375 degrees. If North-centered, the display should read approx. 195 degrees. If not, adjust the GAIN pot for this value. If you are using South-centered operation, this completes the adjustments on the bench.

If you are using North-centered operation, rotate CCW until you reach a display of `000'. As you rotate further CCW the display should change to `359', `358', etc. You can expect some ambiguity near the switchover from `359' to `000'. Try rotating both directions near this point, and watch the display. If there is a large jump (e.g. from `355' to `002') or an overlap (e.g. from `359' to `-007'), you will need to adjust the two lower pots marked "-01/3XX" and "3XX". Rotate to where "-01" is displayed. If "-01" can not be obtained, rotate to the closest positive heading (e.g. "00" or "01"). This may require quick reflexes on the brake switch. Adjust the new pot marked "-01/3XX" until "-01" is replaced by "3XX", where "X" may be any digit. Adjust the new pot marked "3XX", so that "359" is displayed.

You may now rotate plus and minus a few degrees to check the operation of the 359/000 switchover. You may notice that the operation is slightly different between CW and CCW (hysteresis). Occasionally you will see either "360" or "-01". This is normal! This completes the bench adjustments for North-centered operation.

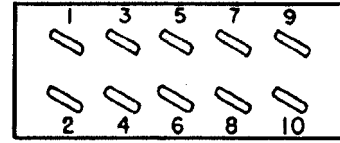
Leave your gearmotor at the center of rotation, and install it within your tower.

**8 PIN CONNECTOR
FOR ROTATOR END
OF CONTROL CABLE**



(WIRE SIDE VIEW)

**10 PIN CONNECTOR
FOR CONTROL CONSOLE
END OF CONTROL CABLE**



(SOLDER SIDE VIEW)

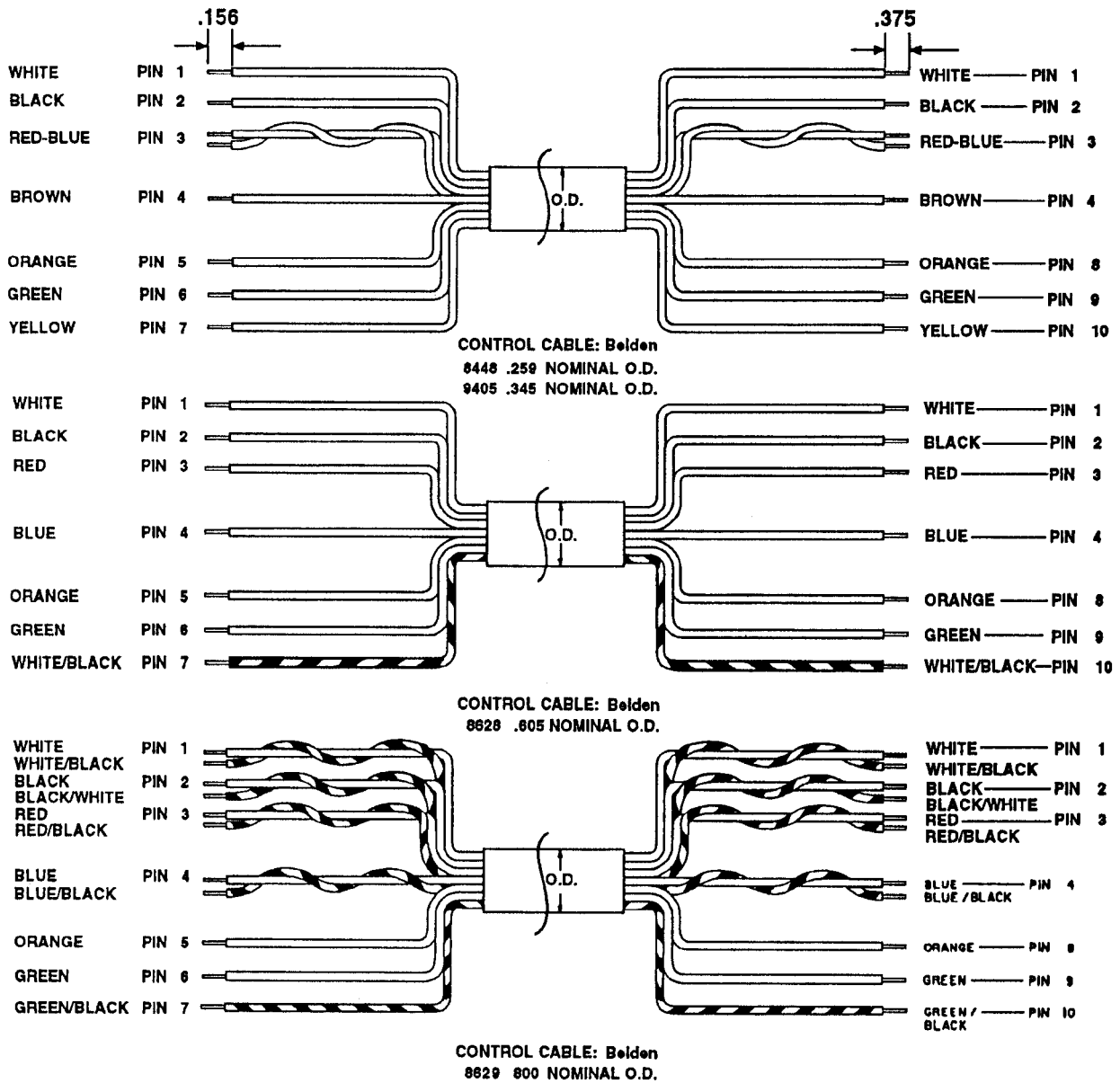
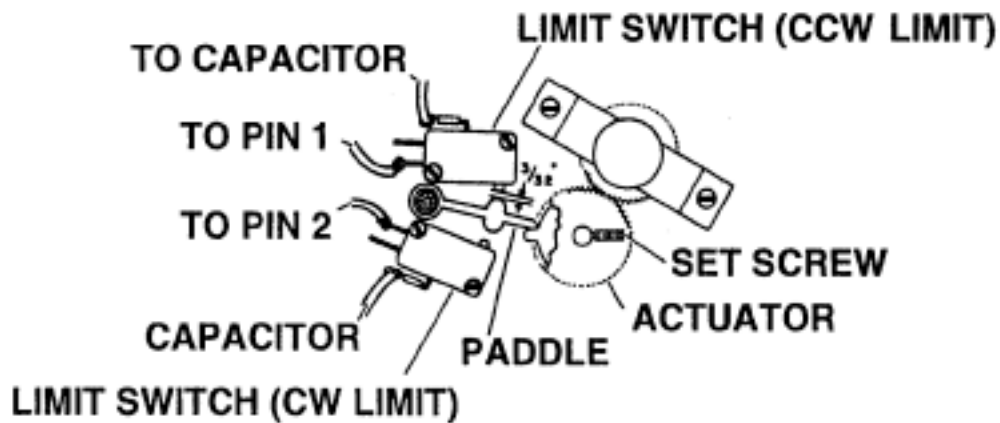
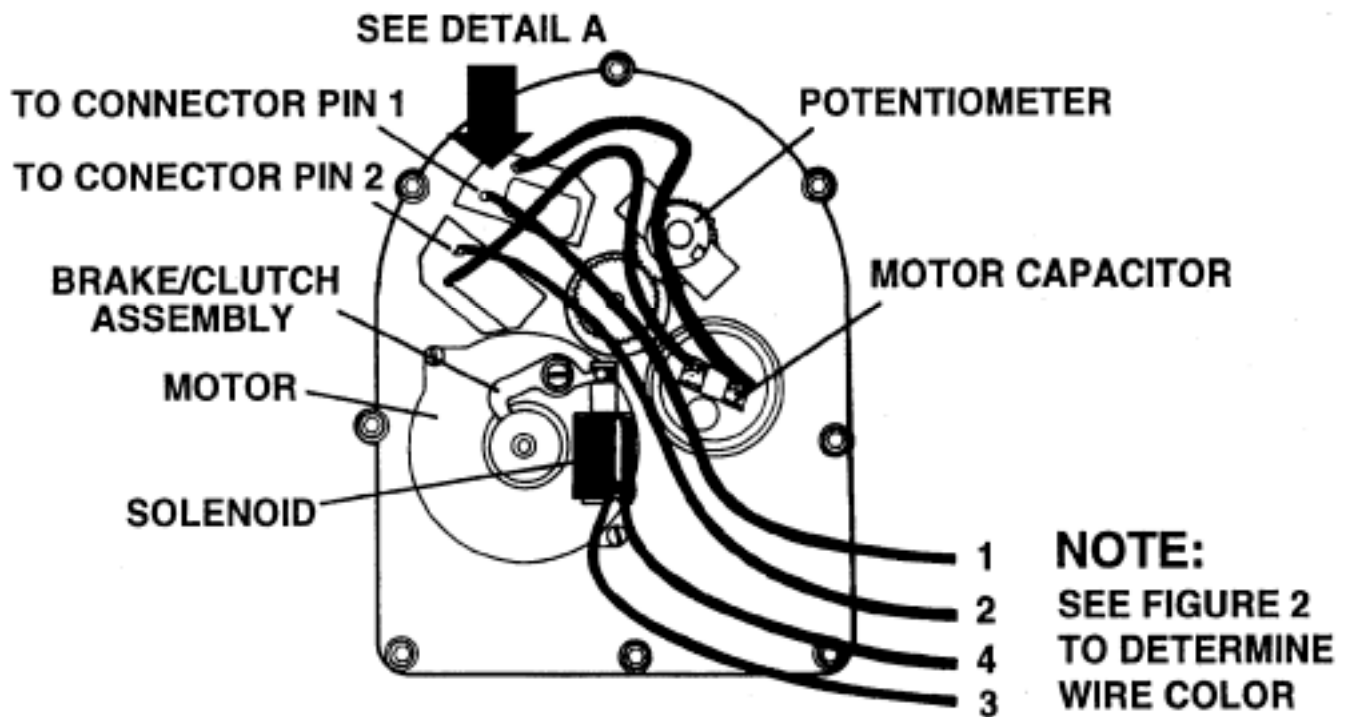


Figure 3
Control Cable Connector Attachments



DETAIL A
Actuator Shown in the "000" position.

Figure 4
Control Cable-Rotator Wiring Guide

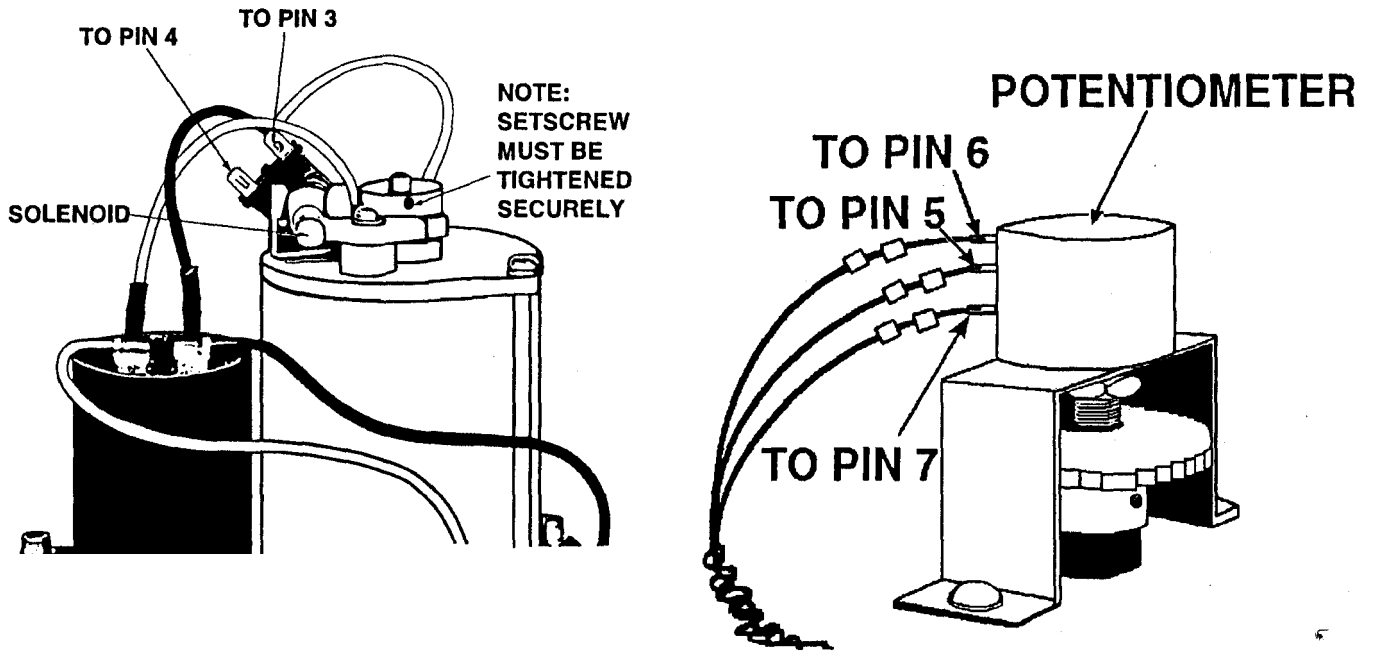


Figure 5
Solenoid and Potentiometer Wiring Guide

Section IV Voltage Conversion

CAUTION:

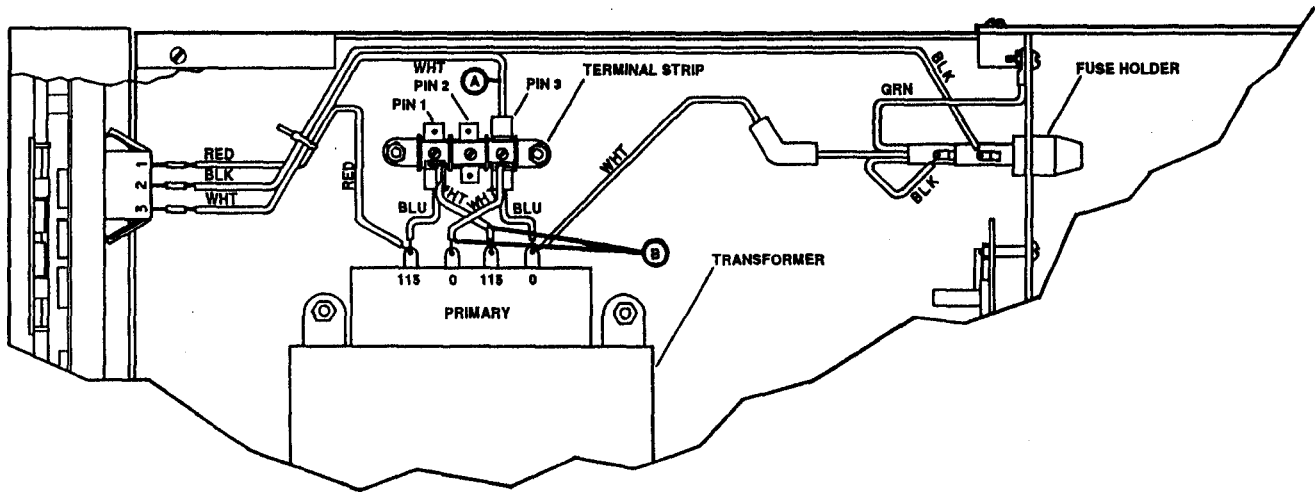
Dangerous and lethal voltage exist inside this unit. Remove the power cord from the socket before servicing this unit.

To convert the voltage of this unit, follow the procedure below and Figure 5 for 115 VAC, or Figure 6 for 230 VAC.

Arrange the three white wires indicated with A and B to the configuration shown for the desired voltage.

Refer to Figure 1 and install the fuse indicated for the voltage that will be used.

Replace the power cord's plug with the appropriate one for the power system requirements in your area.



115

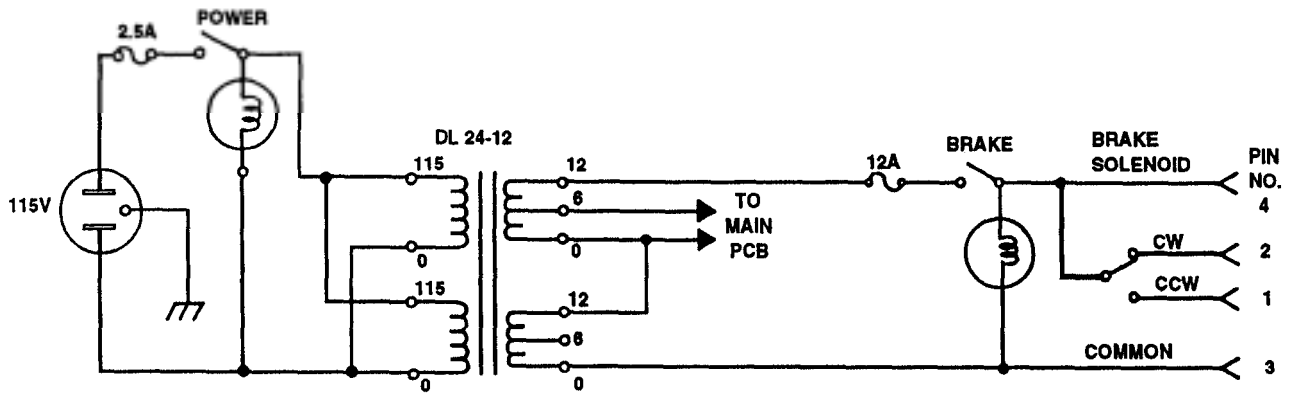
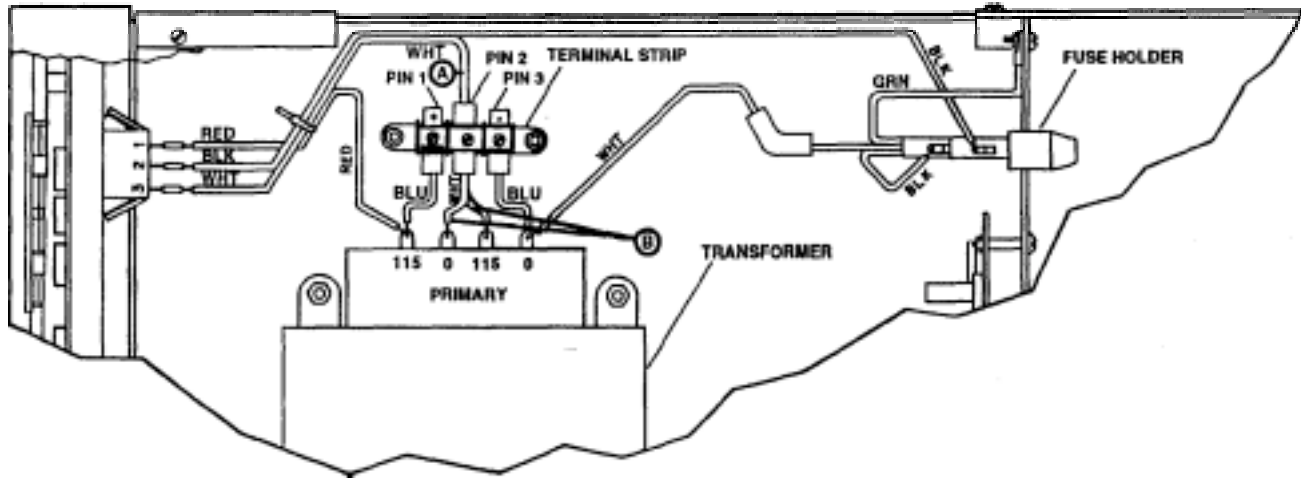


Figure 6 Wiring for
115 VAC



230

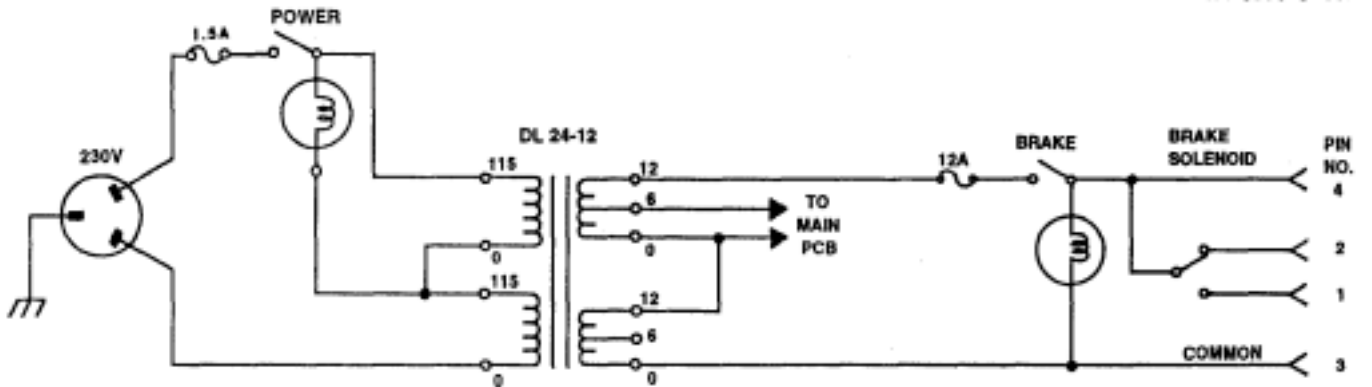


Figure 7 Wiring for
230 VAC

Section V Calibration and Installation Procedures

Calibration

The HDR-300/A is shipped from the factory with two calibration steps completed. The 3-turn potentiometer is matched to the rotator assembly and the digital display is calibrated to zero.

If these items are replaced or become uncalibrated, refer to Chapter 2, Section III for calibration procedures.

Only one calibration step should normally have to be performed. This is a gain adjustment to the digital voltmeter incorporated into the display circuitry. This adjustment can be made either with the rotator installed or on the bench. The best method is to adjust it on the bench first, then check it again on the tower!

Set the rotator on the bench with the output shaft parallel to the bench top. Assemble the mast clamps and platform as shown in Figure 7. Insert the key into the keyway in the platform, and slide the mast clamp assembly onto the output shaft. This may unbalance the rotator, so you may wish to tip it back on the plastic housing. Turn on the control console and turn the rotator so the display reads "00". Line up the mast clamp assembly on a distant object, so that after turning the rotator through 360°, the mast clamp assembly is again lined up on the same object. Turn the rotator clockwise until this alignment is obtained. Using a small screwdriver, adjust the gain potentiometer so that the display reads "360", See Figure 1.

Turn the rotator back to "000" to check the alignment again. If "360" cannot be obtained by adjusting the gain potentiometer, refer to Chapter 2, Troubleshooting. Turn the rotator both counterclockwise and clockwise until each limit switch is found. The counterclockwise limit switch should be between -10 and -25 degrees. The clockwise limit switch should be between 370 and 385 degrees. Return the rotator to "000".

If everything checks out, the HDR-300/A is now ready for installation.

Installation

Remove the mast clamp assembly from the output shaft. At this time, coat the platform hole with heavy grease to prevent corrosion. If your rotator mounting plate is not permanently attached to the tower, it should be removed at this time. Assemble the rotator to the rotator mounting plate. (For Hy-Gain towers see Figures 7 and 8.) The rotator requires four (4) mounting holes, each 3/8 inch in diameter, four (4) inches apart on a 5.656 inch (5 21/32") diameter circle. Refer to the template for mounting hole locations on the mounting plate which is furnished in this manual. For small towers, the mounting holes must be arranged on the mounting plate so that the output shaft is centered within the tower and that the gear housing doesn't interfere with a tower leg or bracing.

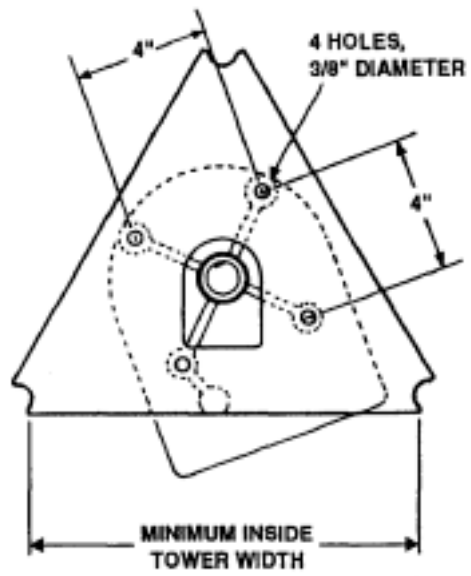


Figure 9
 Top View of HDR-300/A and Tower Mounting Plate for
 Hy-Gain Crank-Up Towers HG-54HD and HG-70HD

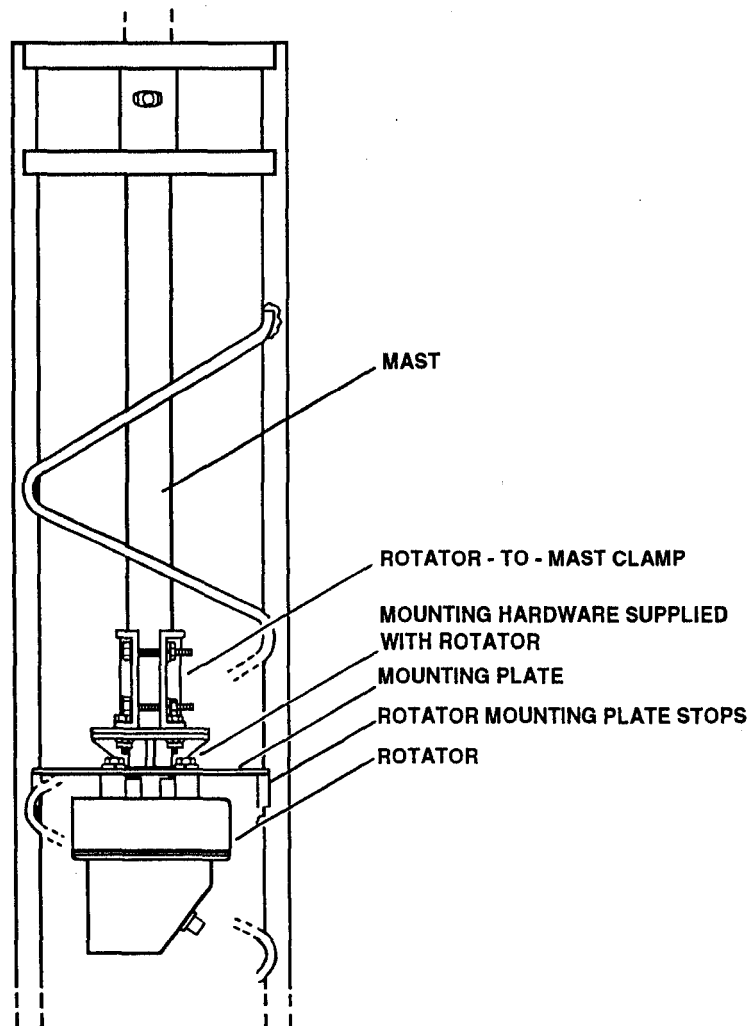


Figure 10
 Typical Installation of Rotator Mounted Below Plate

For towers that must be climbed for installation, follow these instructions:

Make sure that the rotator will match the holes in your mounting plate per previous information. Under NO circumstances should the rotator be lifted by the mast clamp assembly. The rotator may be pulled up the tower by first attaching the mounting plate to the rotator. The rope can be attached to mounting plate. Another method is to secure a 5/16"-18 eyebolt into one of the mounting holes and attach the rope to it for lifting. A rope cradle may also be used. Once the rotator is mounted securely within the tower, the mast clamp assembly can be installed and the control cable taped to the tower.

Tighten the setscrew into the platform. Lower the mast into the mast clamp. Tighten the four (4) 3/8 inch bolts so that the mast is held securely. Center the mast above the output shaft and tighten the four (4) 5/16 inch bolts on the platform. The antenna should be oriented so that it is pointing north when the readout shows "000".

Route the control cable down the tower using appropriate strain relief. Route the control cable to the control console and plug it in. Using the same calibration steps as before, line the antenna up with a distant object. Rotate the antenna until the antenna is again lined up with the same object. Check the digital readout and adjust if necessary.

CAUTION:

If using a crank-up tower, do not completely nest the tower with the HDR-300/A installed. Because of the shape of the gear box, a portion of the rotator extends out of the tower.

Section VI. Operations and Maintenance

Operations

The HDR-300/A brake release feature is designed to decrease the effects of torsional forces caused by rapid deceleration and instant stopping of large antennas and beams. By releasing the rotate switch slightly before the point of intended antenna position, letting the unit coast to a full stop, then locking the brake, the torque on both the tower and rotator is held to a minimum. This will prolong the life of your rotator system and will maintain the maximum

NOTE: When the rotator is not in use, the brake switch should be set in the "lock" position. The brake switch incorporates a light to remind you that the antenna is free to turn.

The brake switch must be in the "FREE" position before the rotator will turn.

CAUTION:

Although operation of the HDR-300/A at its rated capacity of 25 square feet in strong winds (50 mph plus) is not recommended, it is possible as long as certain precautions are taken.

Always allow the antenna to coast to a stop before locking the brake.

- 2 Always keep the brake locked when the rotator is not being turned.
- 3 Avoid rotating near the ends of rotation. Do not depend on the limit switches to stop rotation of a large antenna in strong winds.

These precautions should also be followed when rotating medium size antenna (7 to 15 square feet) in light winds. When followed, the life of the rotator system will be prolonged.

Use the Digital Readout System

The HDR-300/A incorporates a very accurate digital display of azimuth bearing information. This display will always indicate the exact direction of the antenna once calibrated. A readout of "000" degrees indicates that the antenna is pointing due North. A readout of "090" indicates East, "180" indicates South, "270" indicates West, and "360" indicates North again.

Because of the type of digital readout system used, overtravel in the clockwise direction is indicated by 360 to 385 which would correspond the 000 to 025 degrees. Overtravel in the counterclockwise direction is indicated by negative numbers such as -01 to 125 degrees.

During normal rotation, the display will increment in steps of approximately 4 degrees. This is because the rotation is faster than the display system. Once the rotator is allowed to coast, the increments will be in steps of 1 degree. The conversion rate of the digital display system is 4 Hz. This prevents a rapid flickering of the display during rotation.

The digital display system also incorporates two filters that eliminate both 50/60 Hz and RF modulation of the display.

Maintenance

Rotator Assembly: The gears are lubricated with a special low temperature grease that is stable from -60°F to +280°R After three to five years of service, the gears should be checked to insure adequate lubricant. This grease can be obtained through Hy-Gains's Customer Service Department for a nominal charge.

The output shaft of the rotator is stainless steel to prevent corrosion; however, after many years of service, some rusting may occur in the platform hole. You should coat this hole with grease before installation to prevent corrosion.

The HDR-300/A has numerous features to prevent water entry. The output shaft uses a special V-shaped O-ring to prevent water entry at this point. The mast clamp assembly uses an aluminum plate to keep the platform from damaging the O-ring and to prevent water from running through the mast clamp assembly.

Also, a new plastic housing is provided to keep the motor, capacitor, limit switches, and potentiometer dry. A drain hole is provided to eliminate condensation water. Periodically check the O-ring and the plastic housing to insure moisture resistance.

CHAPTER 2

TROUBLESHOOTING AND SERVICE

Section L Troubleshooting

Troubleshooting

Symptom	Possible Causes
Power Switch has no effect	Fuse not installed. Fuse Blown.
Power Switch lights but LED's do not light.	14 wire jumper cable disconnected. Digital readout not zeroed.
Digital display still reads "-85" and "-99" or "----" (Step 7, Chapter 1, Section III).	Control cable not plugged in. Potentiometer wired incorrectly. 10 pin connector wired incorrectly. 8 pin connector wired incorrectly. Potentiometer not installed correctly.
Digital display reads between "-99" and "-10" (Step 7, Chapter 1, Section III).	Potentiometer not installed correctly. Digital readout not zeroed. Potentiometer wired incorrectly. 10 pin connector wired incorrectly. 8 pin connector wired incorrectly

Troubleshooting Continued

Symptom	Possible Causes
Digital display reads greater than "10" (Step 7, Chapter 1, Section III).	<p>Potentiometer not installed correctly.</p> <p>Digital readout not zeroed.</p> <p>Potentiometer wired incorrectly.</p> <p>10 pin connector wired incorrectly.</p> <p>8 pin connector wired incorrectly.</p>
Brake switch has no effect when switched to "FREE" position.	<p>Solenoid wired incorrectly.</p> <p>10 pin connector wired incorrectly.</p> <p>8 pin connector wired incorrectly.</p> <p>Control cable not plugged in.</p> <p>12 Amp fuse not installed.</p>
Brake solenoid buzzes but doesn't release brake.	<p>Too much voltage drop in control cable.</p> <p>Use a heavier cable.</p>
Rotate switch has no effect.	<p>Brake still in lock position.</p> <p>Control cable not plugged in.</p> <p>10 pin connector wired incorrectly.</p> <p>8 pin connector wired incorrectly.</p> <p>Limit switch stuck.</p> <p>End of rotation - Switch direction.</p>

Troubleshooting Continued

Symptom	Possible Causes
Rotate Switch has no effect. (cont.)	Limit switch wired incorrectly.
	Not pushing hard enough on rotate switch.
	12 Amp fuse not installed or blown out
	Motor is too hot - wait 10 minutes.
Motor hums when rotate switch is pressed but motor won't turn.	Motor output shaft is binding within the motor.
	Loosen the two long screws holding the motor housing and recenter it.
Rotator able to go less than -50 or greater than 450 degrees.	Rotator has coasted past one of the limit switches.
Output shaft runs opposite the direction in- dicated by the rotate switch.	Limit switches wired incorrectly.
	10 pin connector wired incorrectly.
	8 pin connector wired incorrectly.
Digital display runs opposite the direction in- dicated by the output shaft.	Potentiometer wired incorrectly.
	10 pin connector wired incorrectly.
	8 pin connector wired incorrectly
"360" can not be obtained by adjusting the gain potentiometer (Chapter 1, Section V).	Potentiometer not installed correctly
	Digital readout not zeroed.

Troubleshooting Continued

Symptom	Possible Causes
Digital readout is changing more than 1 degree with brake switch locked.	<p>High winds causing antenna to rock.</p> <p>High RF field near control cable.</p> <p>Brake system failed.</p> <p>250 μF capacitor not working.</p>
Digital readout is changing more than 5 degrees with brake switch locked.	<p>Extremely high winds causing antenna to rock.</p> <p>Brake system failed.</p> <p>Very high RF field near control cable.</p> <p>250 μF capacitor not working.</p>
Rotator able to go less than -25 degrees and/or greater than 385 degrees.	<p>Limit switches) broken.</p> <p>Limit switch actuator loose or misadjusted.</p> <p>Gain control not calibrated.</p> <p>Digital readout not zeroed.</p>
Rotator will turn with no load but will not turn a large antenna.	<p>Mast is binding in tower.</p> <p>Control cable is too small.</p> <p>Winds are too strong.</p> <p>Antenna is too large.</p> <p>Thrust bearing is not used.</p>

Section II. Voltage and Resistance Measurements

Voltage and Resistance Charts

Control Unit, 10 pin socket:		
Between Pin Numbers	Voltage or Resistance	Tolerance
1-3 (with rotate switch to the right)	24 VAC	± 10%
2-3 (with rotate switch to the left)	24 VAC	± 10%
4-3 (with brake "Free")	24 VAC	± 10%
8-10	+5 VDC	± 5%
9-10	180KL2	± 20%
10-chassis	zero ohms	

Rotator Unit, 8 Pin Socket:	
Between Pins Resistance	
<u>Excluding</u> Control Cable	
1-3	1.0 ohm
2-3	1.0 ohm
1-2	2.0 ohms
3-4	32 ohms
5-7	1000 ohms
6-7	150-550 ohms
5-6	450-850 ohms

Section III. How to Get Factory Service/Calibration

Service Information

Do not ship equipment to the manufacturer without prior authorization. We prefer to send special shipping labels which will avoid the delay of an unexpected shipment.

If time is extremely important, wire or call for approval and we will rush labels to you. When a shipment is expected, even the time of sending the labels is less than that lost when an unexpected shipment is received.

It is very important that the shipment be well packed and fully insured. Damage claims must be settled between you and the carrier and will greatly delay any returns. Proper packing normally avoids this trouble.

ALL SHIPMENTS MUST BE SENT TO US PREPAID. We do not accept collect shipments. All returns should be made in our standard cartons only - so save our carton when unpacking the unit. When a shipment is returned, it will be handled in one of three ways:

1. Where all service is in warranty, the shipment will be returned prepaid by a carrier of our choice. Warranty claims must be accompanied by a copy of the bill-of-sale.
2. If there are any charges not covered by warranty, we will hold the shipment and advise you of costs, which you can then send.
3. Or, upon your written authorization, we will ship C.O.D. for any charges not covered by warranty, then the carrier will collect these charges and the transportation costs on arrival. Unclaimed or refused C.O.D. shipments will not be reshipped until payment of service and transportation charges is received. Shipment will then be made collect for reshipment transportation charges.

NOTE: we will not ship by means of a carrier that will not fully insure the shipment. Some carriers have a \$200.00 limit. The exception to this is when there is no other means (APO-FPO-etc.) of shipment than parcel post, then we will ship by this means with your written agreement that you assume any loss over that which the carrier will [insure. C.O.D. shipments](#) cannot be made to APO-FPO addresses.

All replacement parts orders must be prepaid or [C.O.D. only. Replacement](#) part price quotes will be furnished on request for those who desire prepaid shipment or cannot accept C.O.D. shipments.

Calibration

Most replacement parts do not need adjustment or calibration. The two exceptions are the 3-turn potentiometer and the main P .C. board.

To Recalibrate The Pot Within The Gearmotor Assembly:

Place the gearmotor assembly (P/N 871159) on your bench, and remove the black plastic cover. Attach your control cable to both the control unit and the gearmotor unit. Place a voltmeter across pins 9 and 10 (A digital VOM is best to use). Turn on the control unit and rotate the gearmotor to it's center of rotation. (Watch the plastic limit switch actuator while turning the rotator) With the gearmotor at the mechanical center of rotation, loosen the screws which hold the pot assembly to the gearmotor. It is easier to remove one screw, then pivot this assembly so that the plastic gears unmesh. When loose enough so that the pot's plastic gear turns freely, adjust the position of this gear until the voltmeter reads 3.07 volts. Carefully re-mesh the plastic gears and tighten the two screws. The voltmeter should read within the range of 3.05 to 3.10. If not, repeat this adjustment.

Rotate the gearmotor CCW until the limit-switch actuator is approximately 1/8" from the limit-switch arm, and has not opened the circuit. The actuator should "point" to the pivot-post of the limit switch arm. (The voltage should read approx. 2.25 volts) Adjust the "Zero" potentiometer so that the digital display reads "000". Mark this position with a pen or pencil on the gearmotor. Rotate the gearmotor a full revolution CW until your mark is reached again. (The voltage should read approx. 3.89 volts) Adjust the "Gain" pot until "360" is shown on the digital display. The rotator is now calibrated for South-centered operation.

To calibrate for North-centered operation, adjust the slide switch to the left (closed) position. Rotate CCW to where "-O1" is displayed. If "-O1" can not be obtained, rotate to the closest positive heading (e.g. "00" or "01"). This may require quick reflexes on the brake switch. Adjust the new pot directly under the "Gain" pot until "-O1" is replaced by "3XX", where "X" may be any digit. Adjust the new pot centered between the "Zero" and "Gain" pots and two inches lower, so that "359" is displayed. You may now rotate plus and minus a few degrees to check the operation of the 359/000 switchover. You may notice that the operation is slightly different between CW and CCW (hysteresis). Occasionally you will see either "360" or "-O1". This is normal!

New PCB 871165-2		
Switch	South-Center <u>right (open)</u>	North-Center left closed
<u>Voltage at Center of Rotation</u>	3.07	3.07
<u>Voltage at full CCW</u>	2.25	2.25
<u>Voltage at full CW</u>	<u>3.89</u>	<u>3.89</u>

Service Information

If you are encounter technical problems and need assistance, you should contact Hy-Gain Customer Service Department.

All requests, inquires, warranty claims, or for ordering replacement parts, contact:

Hy-Gain

308 Industrial Park Road Starkville,
Mississippi 39759 USA Phone: 662-
323-9538

CHAPTER 3

HDR-300/A PARTS LIST AND SCHEMATICS

PARTS

NOTE: Item numbers may not necessarily be in numerical order.

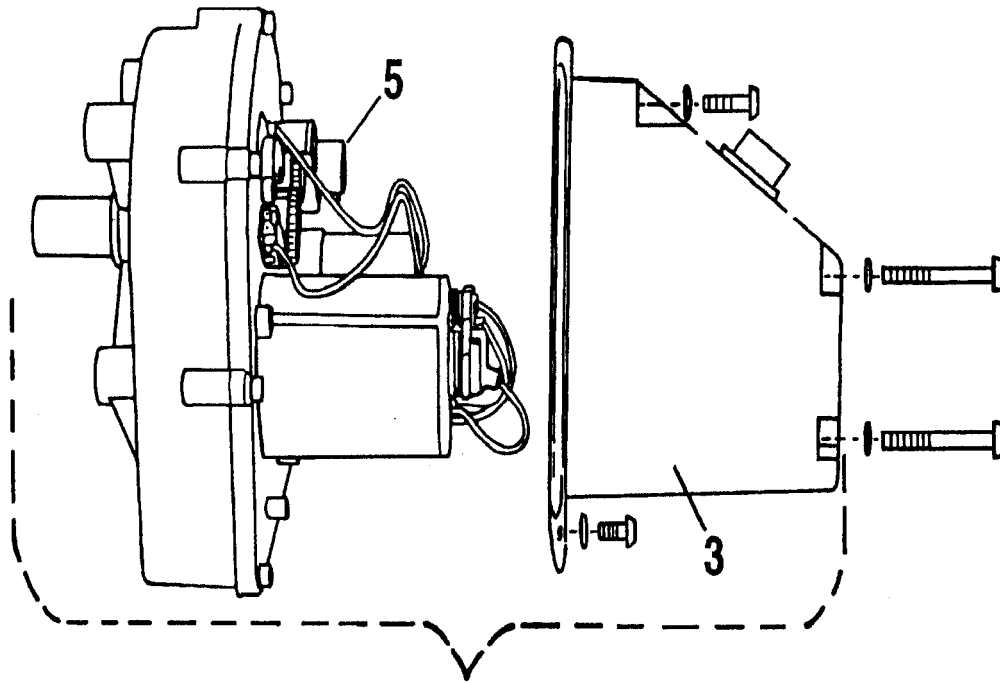
Item No.	Part No.	Description	Qty
1	870511	Gear Motor Assembly.....	1
2	250117	Gear, 1T2-32038.....	1
3	470643	Cover, black plastic.....	1
4		(Not Used)	
5	722958	Potentiometer, 3-turn (1 K ohm)	1
6	*740200-2	Gear Motor, VW47.....	1
64	500350	Screw, panhead, #4-40 x 5/8".....	4
65	559612	Nut, hex, #4-40.....	4
66	561166	Flatwasher, #6.....	4
67	569613	Lockwasher, internal, #4.....	4
68	500346	Screw, pan head, #10-24 x 6".....	2
69	500347	Screw, pan head, #10-24 x 13/4 ".....	2
70	500348	Screw, pan head, #10-24 x 3/8"	7
71	561165	Flatwasher, #10.....	11
72	650290	Connector, AMP 208677-1.....	1
	650291	Contact, AMP 66602-1.....	7
	450581	Wire seal for yin contact, AMP 207565-2.....	1
	871161	Parts Pack, Fuses	1
7	710043	Fuse, 1.5A/3AG slo-blow.....	2
8	710044	Fuse, 2.5A/3AG slo-blow.....	2
9	710045	Fuse, 12A/3AG slo-blow.....	2
	871532	Parts Pack Box, HDR-300.....	1
10	170429	Platform Plate	1
11	375917	Platform.....	1
12	375918	Clamp, mast	2
	870512	Parts Pack, AMP Plug.....	1
	652292	AMP plug, 208678-1.....	1
	650293	AMP socket, 66601-1.....	8
	650294	AMP sheath, 208338-1.....	3
	871533	Parts Pack, Hardware.....	1
13	385928	Key, plated, 1/4" sq. x 15/8 ".....	1
14	500155	Bolt, hex head, 3/8"-16 x 3 1/2", stainless steel	4
15		(Not Used)	
16	505842	Bolt, hex head, 5/16"-18 x 1", stainless steel	4
17	509712	Bolt, hex head, 5/16"-18 x 1 1/2", stainless steel	4
18	536395	Setscrew, Allen, 1/4"-20 x 3/8" ss, with nyloc patch	2
19	555694	Nut, hex, 3/8"-16 stainless steel	4
20	555747	Nut, hex, 5/16"-18 stainless steel	4
21	560024	Flatwasher, medium, 5/16", stainless steel	4
22	561016	Lockwasher, split, 3/8", stainless steel	4

HDR-300/A PARTS LIST (cont.)

Item No.	Part No.	Description Qty
23	564792	Lockwasher, split, 5/16", stainless steel 8
24	567180	Flatwasher, 3/8", stainless steel.....4
25	640024	Plug, 10 pin.....1
26		(Not Used)
27	871869	Control Console Assembly1
28	51845039	Screw, Philips, #4-40 x 3/8"..... 2
29	250105	Spacer, hex head, #8-32 x 3/8"4
30	179808	Cover, console.....1
31	451623	Strain Relief 1
32	460293	Front Panel.....1
33	350834-1	Back Plate1
34	450375	Front Panel Label.....1
35	506460	Screw, Round head, #10-24 x 3/4"4
36	506650	Screw, round head, #6-32 x 1/2.....4
37	506665	Screw, round head, #6-32 x 1/4"2
38	506800	Screw, round head, #8-32 x 3/4"6
39	509234	Screw, round head, #8-32 x 1/2"6
40	511577	Screw, Type A, pan head, #6 x 5/16"4
41	556970	Nut, hex, #10-24.....4
42	556990	Nut, hex,#8-3212
43	557000	Nut, hex, #6-32.....2
44	557010	Nut, hex, #4-40.....2
45	567125	Lockwasher, internal, #10..... 4
46	567135	Lockwasher, internal,#8.....8
47	600221	Power Cord1
48	640026	10 Pin Receptacle1
49	660020	Terminal Strip1
50	700088	Power Switch1
51	700092	Brake Switch.....1
52	700089	Rotate Switch.....1
53	710044	Fuse, 2.5A/3AG slo-blow.....1
54	710045	Fuse, 12A/3AG slo-blow.....1
55	718105	Fuse holder, 3AG.....2
56	52158025	Capacitor, disc, ceramic, .1pf.....2
57	730063	Transformer, 24 VAC.....1
58	870994	Jumper Cable Assembly1
59	871165-2	Main PC. Board Assembly (Refer to Figures 18, 19, & 20).....1
60	871166-1	Display PC. Board Assembly (Refer to Figures 21, 22, and 23)1
61	871275	Bezel and Lens Assembly.....1
62	871870	Main Chassis w/feet.....1
63	04890	Cable Tie 4"6
64	59000111	Screw, M4-.7 x 10, pan head, Philips4
65	51845039	Screw, #4-40 x 3/8" pan head..... 2

GEAR MOTOR PARTS

Item No.	Part No.	Description Qty
6	740200-2	Gear Motor, VW47.....1
6A	740200-A	Gear Housing, aluminum casting (upper)1
6B	-B	Gear Housing aluminum casting (lower)1
6C	-C	Solid Output- Gear Shaft Output Assembly (358810).....1
6D	-D	Machined Steel Gear #21
6E	-E	Machined Steel Gear #31
6F	-F	Steel and Fiber Combo Gear #4.....1
6G	-G	Motor Assembly, 24 VAC, including end plate and mounting hardware1
6H	-H	Solenoid, 24 VAC, and mounting bracket and screws 1
6I	-I	Solenoid Plunger.....1
6J	-J	Brake Locking Arm, Spring, Mounting Screws, and Washers1
6K	-K	Clutch/Brake Assembly 2/Allen setscrew1
6L	-L	Motor Capacitor.....1
6M	-M	Limit Switch and Insulator and hardware2
6N	-N	Jumper Wire.....1
6O	-O	Jumper Wire.....1
6P	-P	Plastic Paddle Arm and Push-Out1
6Q	-Q	Plastic Limit Switch Actuator w/Allen setscrew..... 1
6R	-R	Plastic Gear (knurled shaft)1
6S	-S	(Not Used)
6T	-T	Potentiometer Mounting Bracket and mounting hardware1
6U	-U	Output Shaft Bearing and Washers 1
6V	-VG	Ear Housing Hardware1
6W	-W	Low Temperature Grease.....1
6X	-X	V-Ring Seal.....1



COMPLETE ASSEMBLY

Figure 11

Gear Motor Assembly with Cover

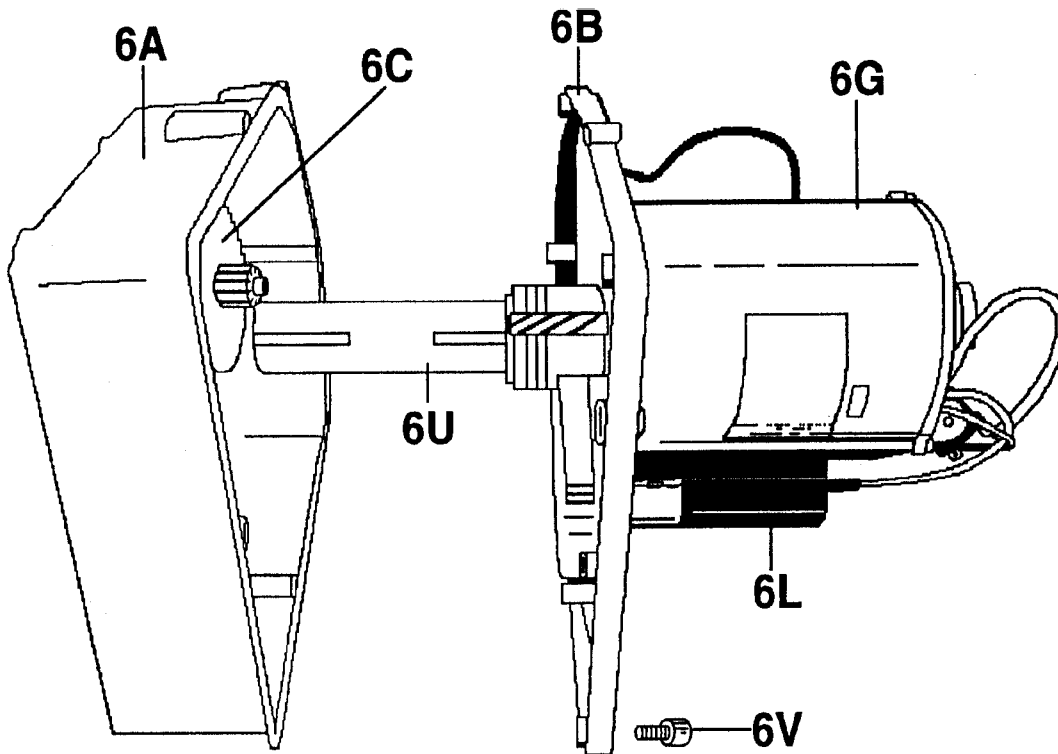


Figure 12

Output Gear and Shaft Assembly

Item No.	Description	Item No.	Description
3	Cover, black plastic	6C	Solid Output Gear and Shaft Assembly #1
5	Potentiometer, 3-turn	6G	Motor Assembly, 24 VAC, including end plate mounting hardware
6	Gear Motor	6L	Motor Capacitor
6A	Gear housing, aluminum casting (upper)	6U	Output Shaft (PN 358810)
613	Gear Housing, aluminum casting (lower)	6V	Gear Housing Hardware

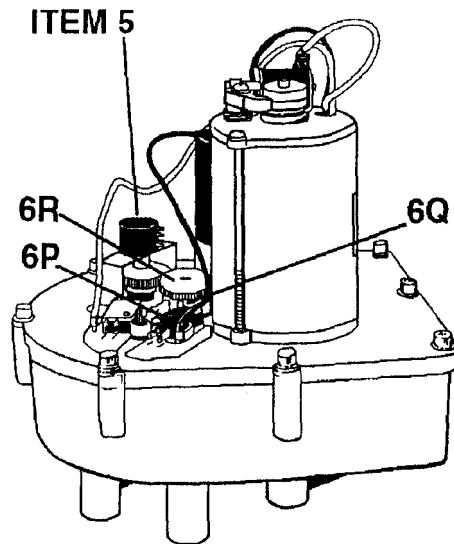


Figure 13
Gear Motor Assembly-Side

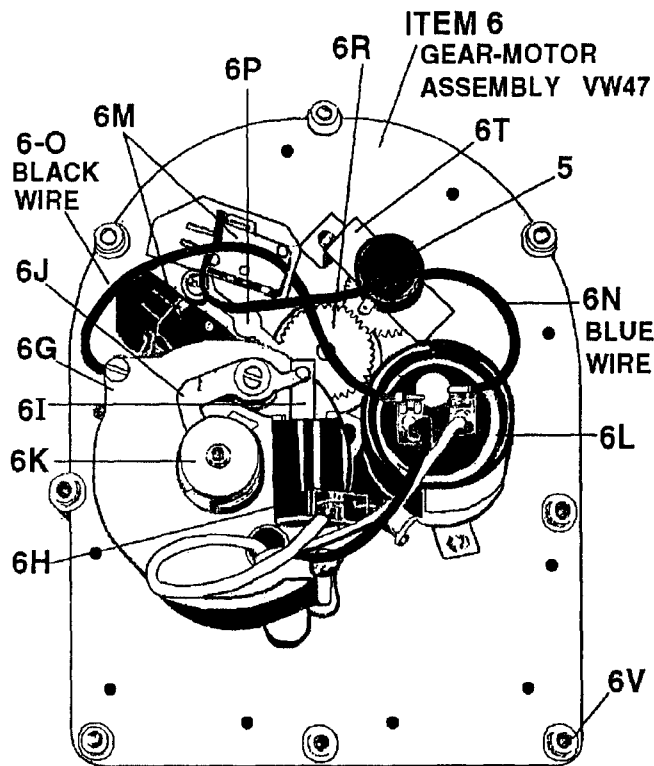


Figure 14
Gear Motor Assembly-Top View

Item No.	Description	Item No.	Description
5	Potentiometer, 3-turn (1K ohm)	6L	Motor Capacitor
6	Gear Motor	6M	Limit Switch and Insulator and Hardware
6G	Motor Assembly, 24 VAC, including end plate and mounting hardware	6N	Jumper Wire
6H	Solenoid, 24 VAC, and mounting bracket and screws	6O	Jumper W iere
6I	Solenoid Plunger	6P	Plastic Paddle Arm and Push-Out
6J	Brake Locking Ann, Spring, Mounting Screws and Washers	6Q	Plastic Limit Switch Actuator w/Allen setscrew
6K	Clutch/Brake Assembly w/Allen setscrew	6R	Plastic Gear (knurled shaft)
		6T	Potentiometer Mounting Bracket and mounting hardware
		6V	Gear Housng Hardware

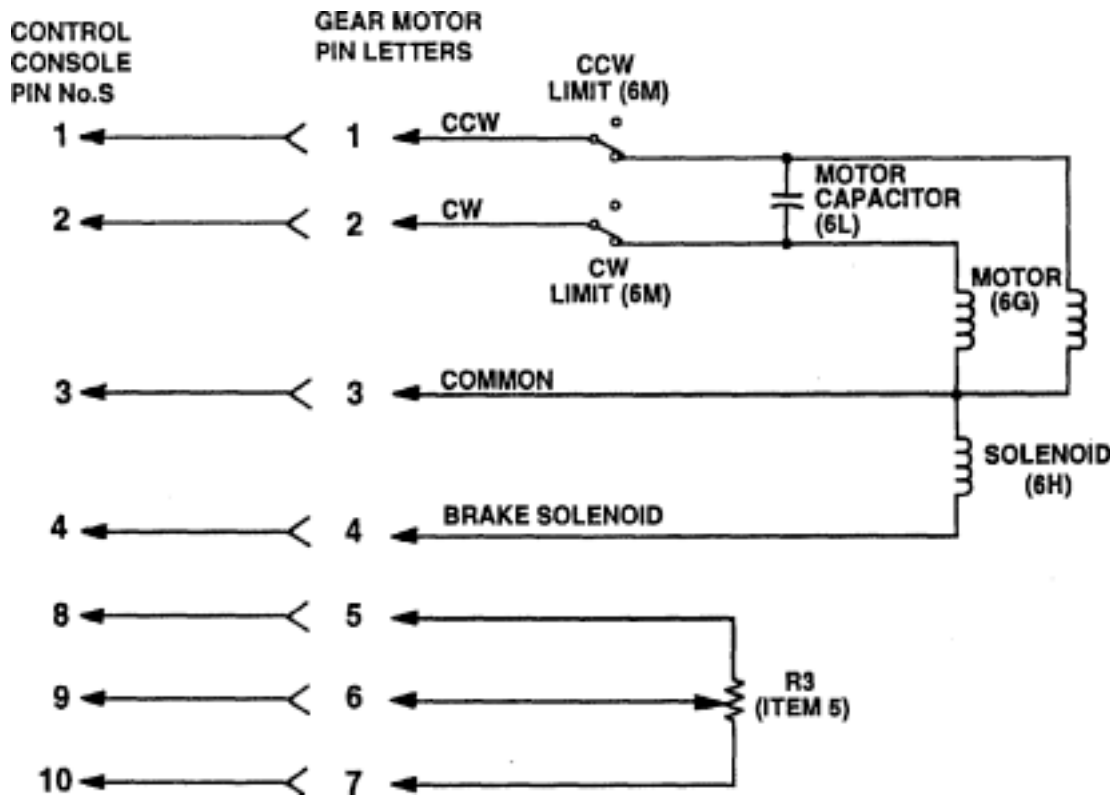
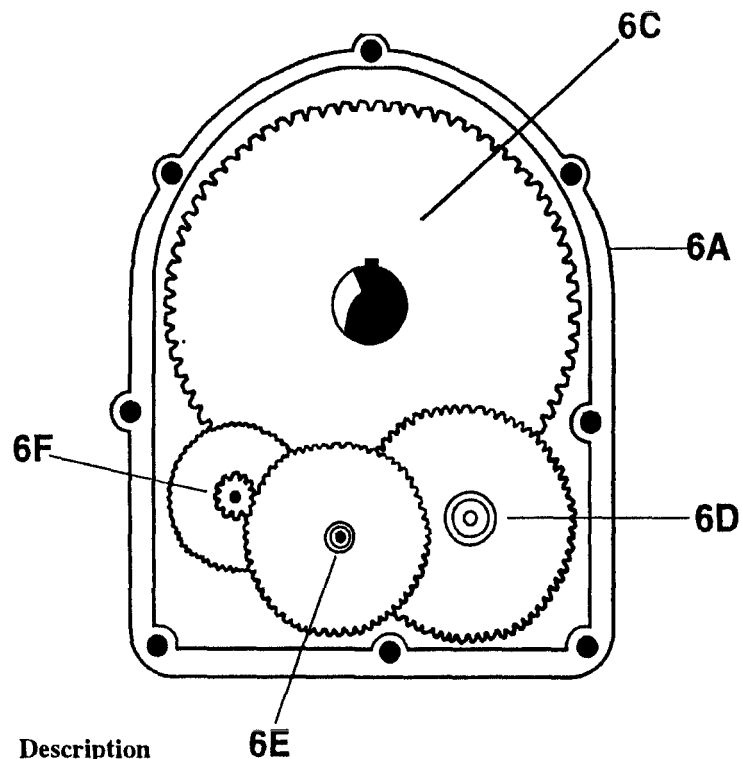
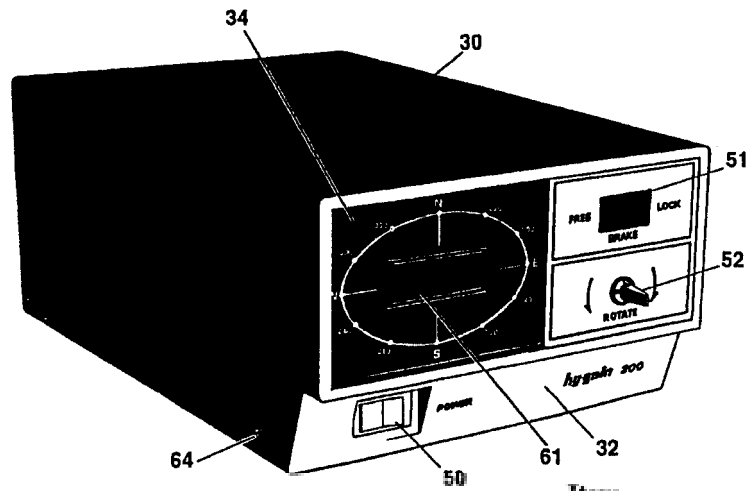


Figure 15
Gear Motor Schematic



No.	Description
6A	Gear Housing, Aluminum Casting (Upper)
6C	Solid Output Gear
6D	Machined Steel Gear #2
6E	Machined Steel Gear #3
6F	Steel and Fiber Combo Gear #4

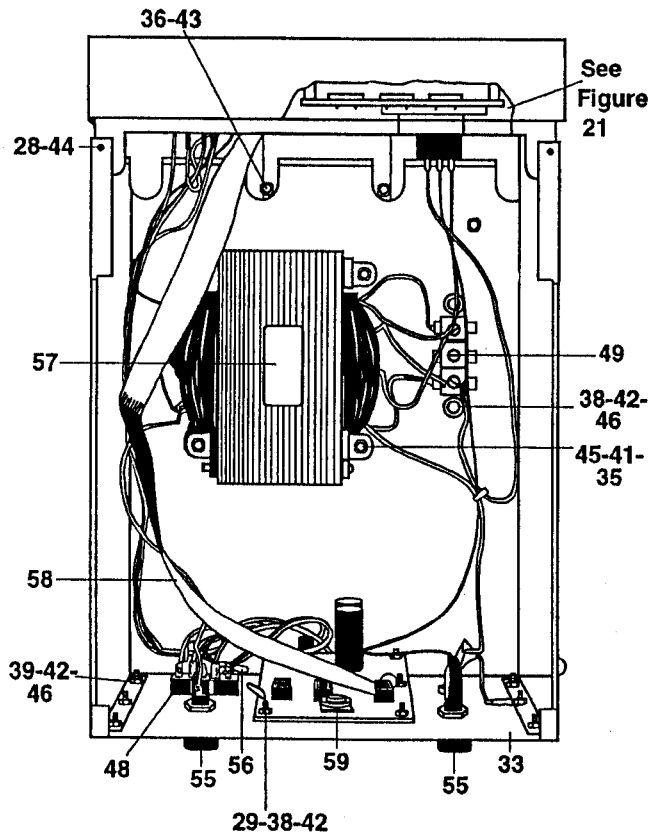
Figure 16
Steel and Fiber Gears



Item No.	Description
30	Cover, Console
32	Front Panel
34	Front Panel Label
50	Power Switch

Item No.	Description
51	Brake Switch
52	Rotate Switch
61	Bezel and Lens Assembly
64	Screw, M4-.7 x 10 Pan head

Figure 17
Exterior View-Control Console



Item No.	Description
28	Screw, Phillips, #4-40 x 3/8"
29	Spacer, hex head, #8-32 x 3/8"
33	Back Plate
35	Screw, round head, #10-24 x 3/4"
36	Screw, round head, #6-32 x 1/8"
38	Screw, round head, #8-32 x 3/4"
39	Screw, round head, #8-32 x 1/2"

Item No.	Description
41	Nut, hex, #10-24
42	Nut, hex, #8-32
43	Nut, hex, #6-32
44	Nut, hex, #4-40
45	Lockwasher, internal, #10
46	Lockwasher, internal, #8
48	10 Pin Receptacle

Item No.	Description
49	Terminal Strip
55	Fuseholder, 3AG
56	Capacitor, disc, ceramic 1μF
57	Transformer, 24 VAC
58	Jumper Cable Assembly
59	Main P.C. Board Assembly

Figure 18
Interior View of Control Console

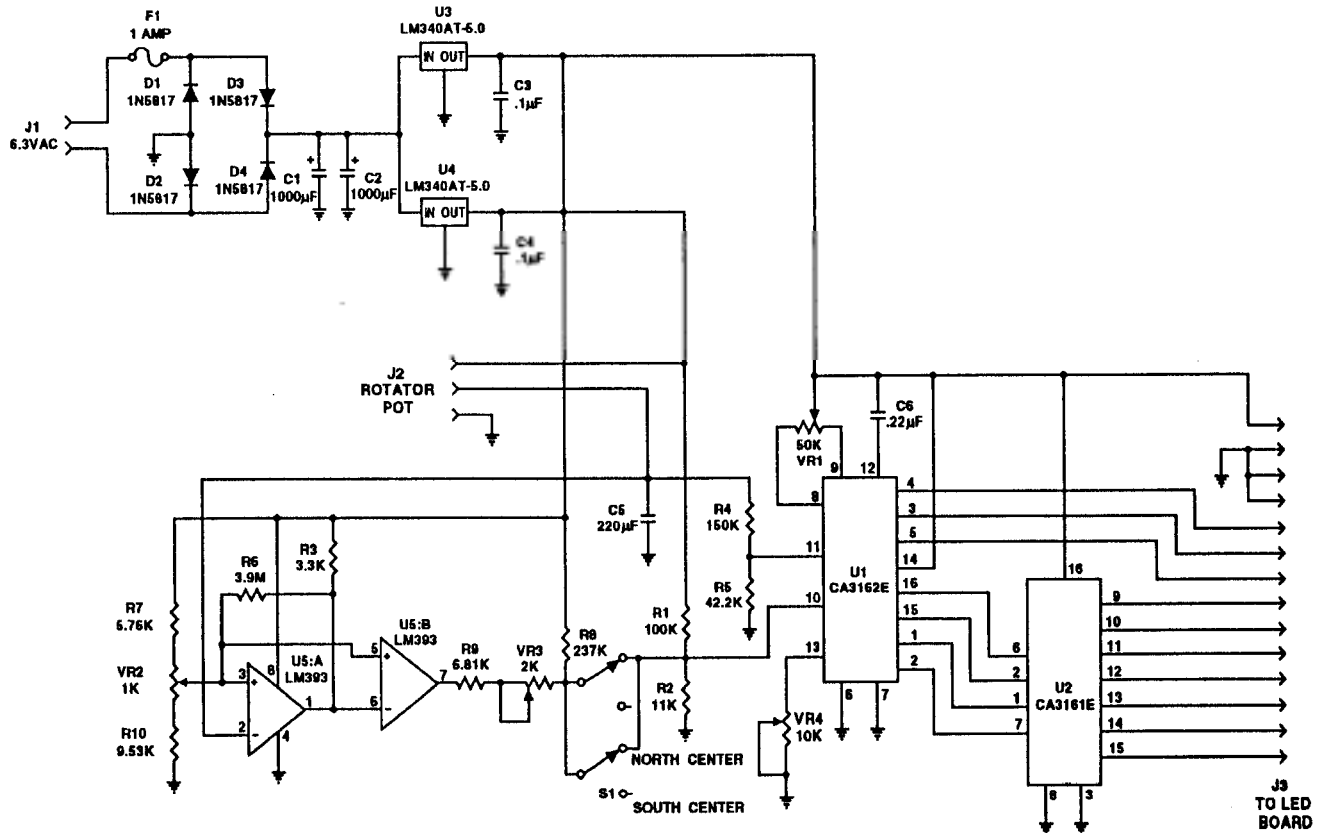


Figure 19
Schematic Main P.C. Board

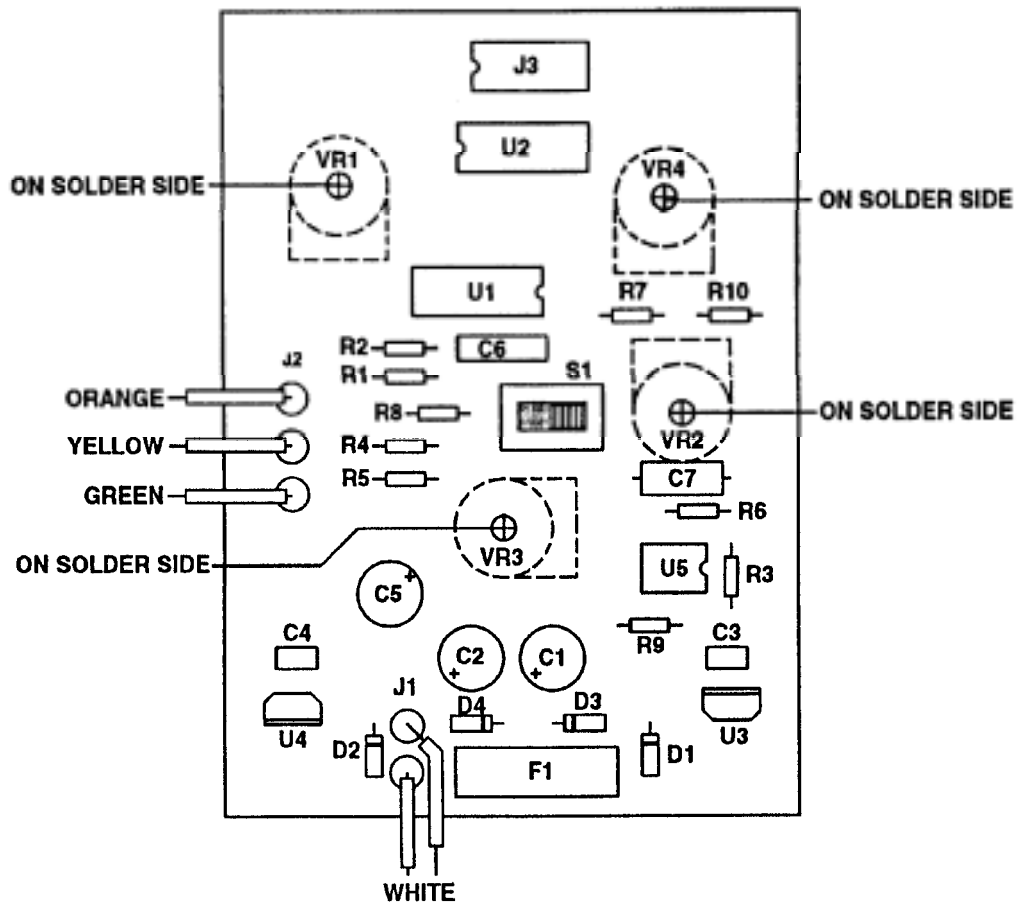
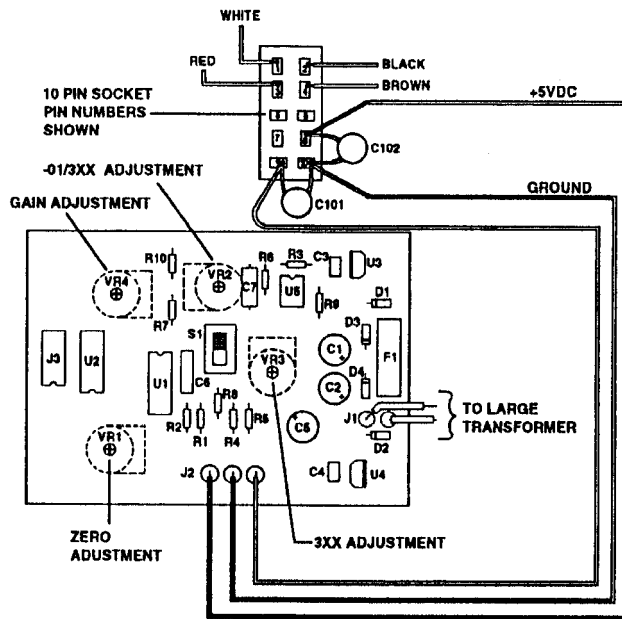


Figure 20
Main PC. Board



Main P.C. Board - PN 871165-2

Parts List for Main P.C. Board (871165-2)

Part Designator	Part Number	Description
C101 and C102	52158025	Capacitor, disc, ceramic, .1 pF, 25V
C1 and C2	722463	Capacitor, electrolytic, 1000pF, 16VDC
C3 and C4	52158025	Capacitor, disc, ceramic, .1pF, 25V
C5	51821016	Capacitor, electrolytic, 220pF
C6	722465	Capacitor, .22 pF 12VDC, disc,
R1	54046100	Resistor, 100K, 1/4W 1%
R2	54045110	Resistor, 11 K, 1/4W 1 %
R3	52154269	Resistor, 3.3K, 1/4W 1%
R4	722469	Resistor, 150K, 1/4W 1 %
R5	722975	Resistor, 42.2K, 1/4W 1 %
R6	52154195	Resistor, 3.9M, 1/4W, 1%
R7	54044576	Resistor, 5.76K, 1/4W 1 %
R8	54046237	Resistor, 237K, 1/4W, 1 %
R9	54044681	Resistor, 6.81K, 1/4W 1%
R10	54044953	Resistor, 9.53K, 1/4W 1%
VR1	722467	Variable Resistor, 50K
VR2	723441	Variable Resistor, 1 K
VR3	723421	Variable Resistor, 2.5K
VR4	722468	Variable Resistor, 10K
D1-D4	58678000	Diode, IN5817, low voltage turn on
U1	760098	A/D IC CA3161E
U2	760099	Driver IC, CA 3161E
U3 and U4	760097	LM348AT 5.0
U5	53284000	LM393
S1	70000	Switch, 2-position
F1	710076	Fuse, 1 amp, 3AG, Fast acting

NOTE: All designators correspond with Figures

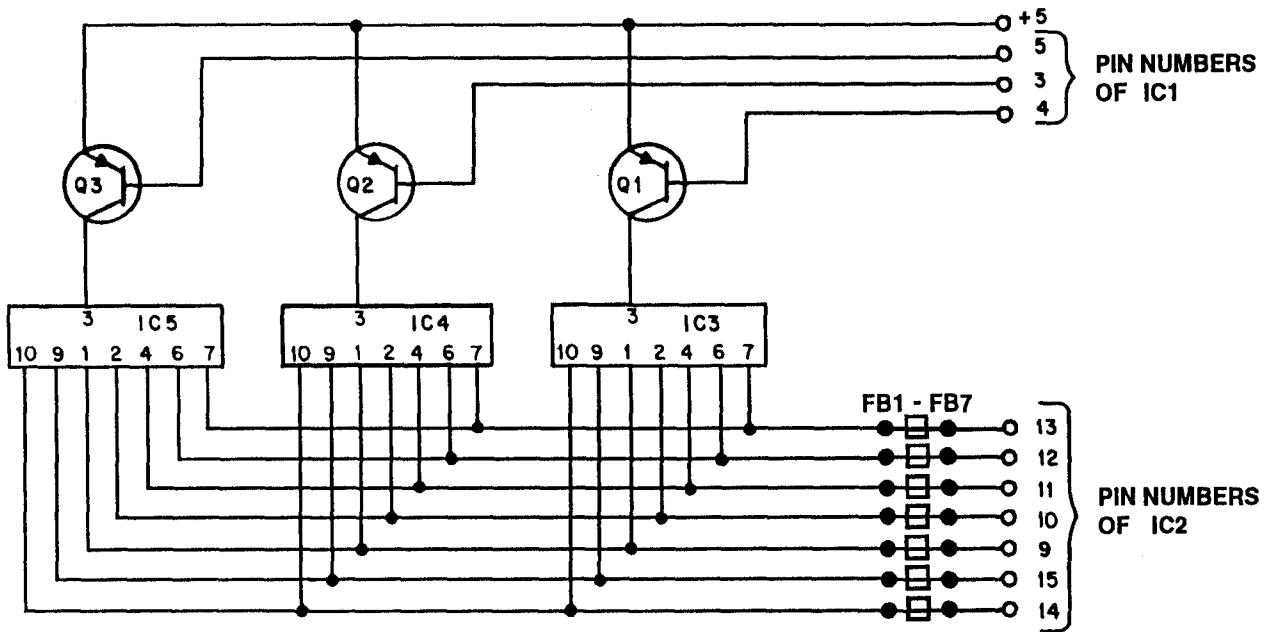


Figure 22
Schematic of Display P.C. Board

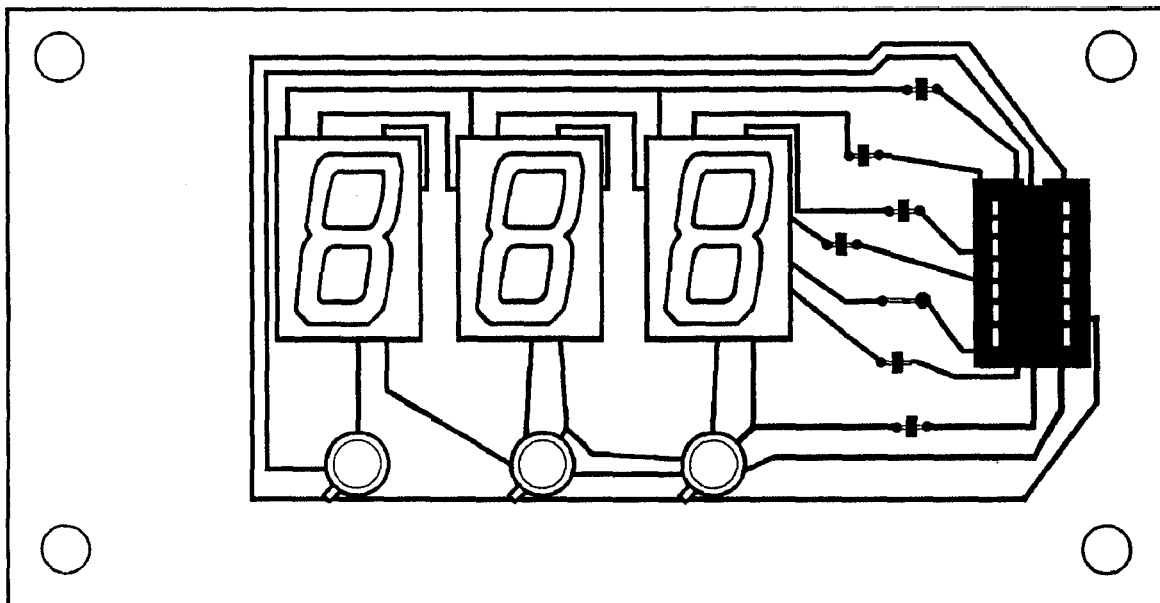
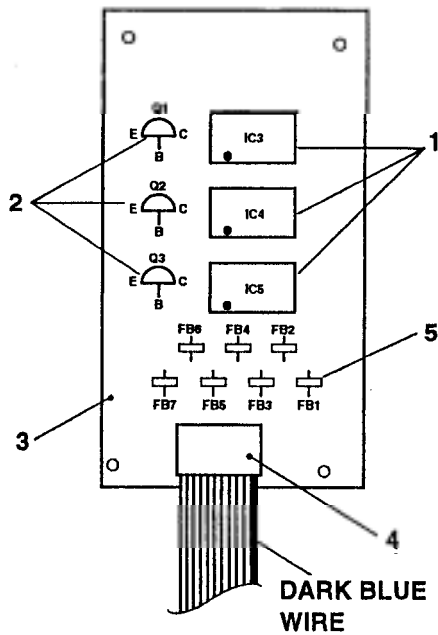


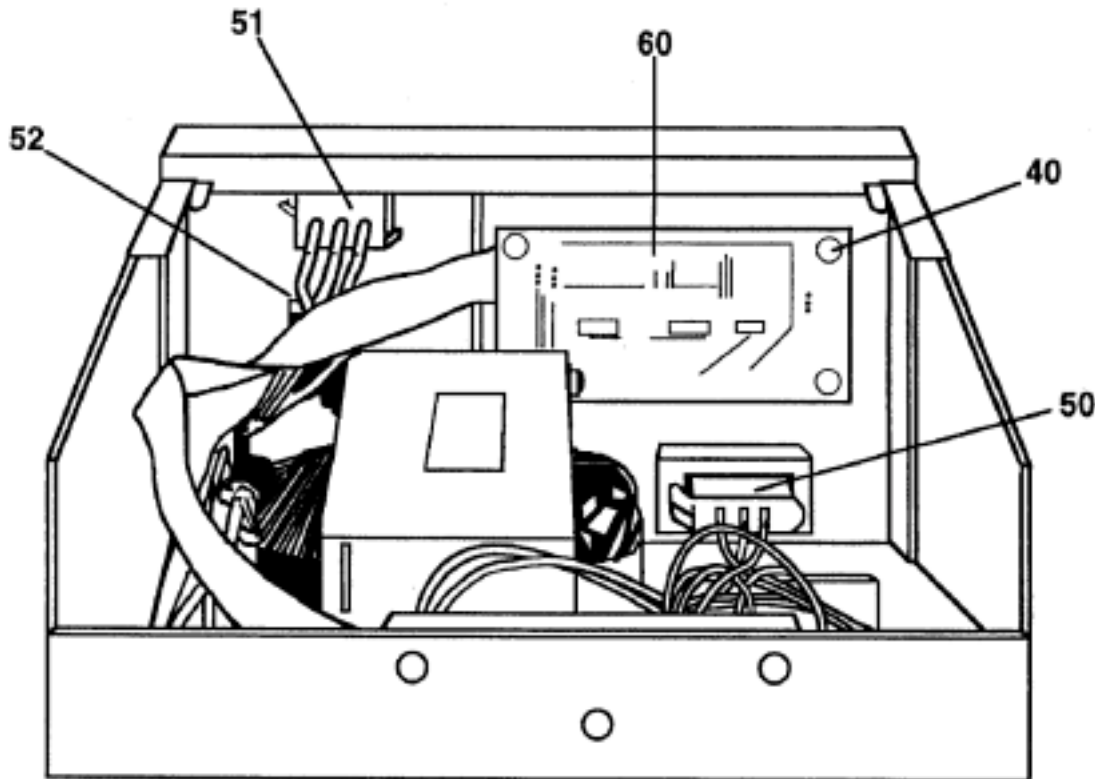
Figure 23
Display PC. Board



Item No.	Part No.	Component	Description
1	760100	IC3, IC4, IC5	IC, Display, FND 507
2	760101	Q1, Q2, Q3	Transistor
3	750166-1	PCB	Display Board
4	650028	Dip Socket	14 Pin
5	56632007	FB1, FB2, FB3, FB4, FB5, FB6, FB7	Bead Ferrite

NOTE: All references to Item Numbers correspond to this drawing only. They do not correspond to the Item Numbers in the Parts List.

Figure 24



Item No.	Description
40	Screw, Type A, pan head, #6 x 5/16"
50	Power Switch
51	Brake Switch
52	Rotate switch
60	Display PC. Board Assembly

Figure 25

Rear Mounted Components-Front Panel of Control Console