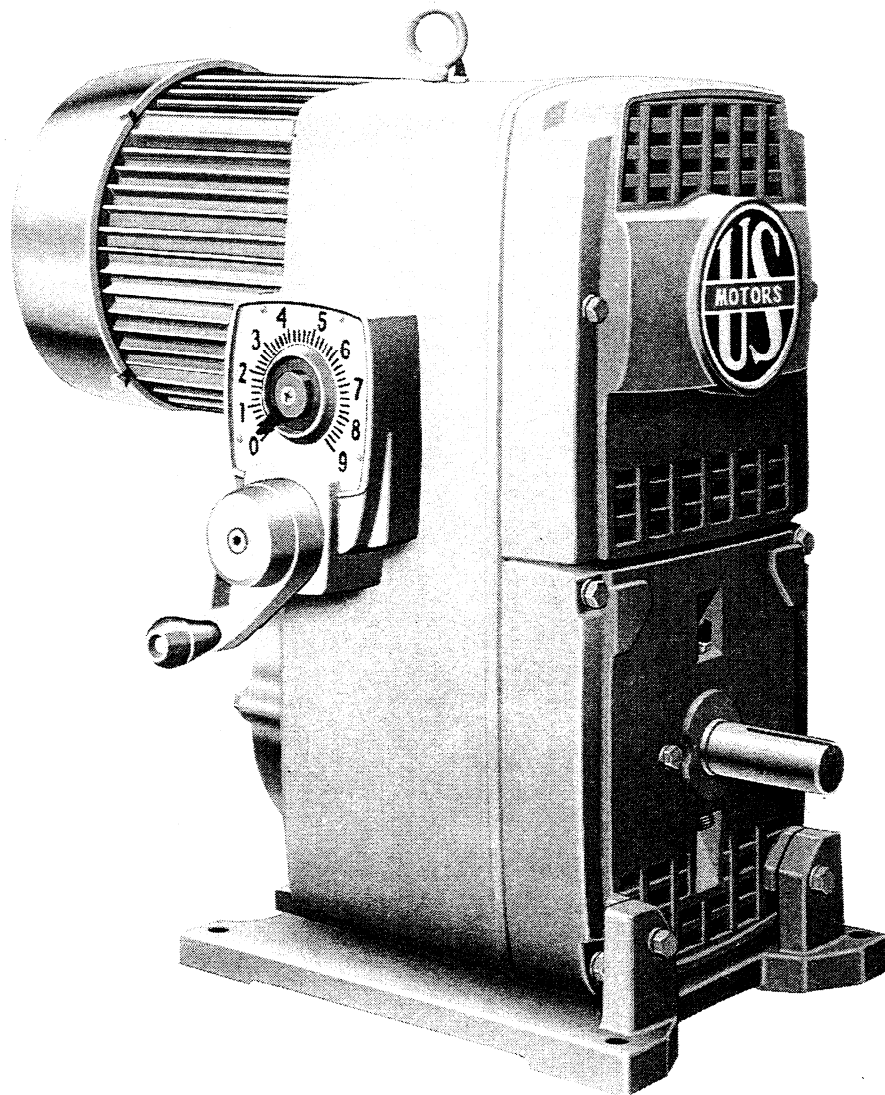


# **VARIDRIVE<sup>®</sup>**



## **INSTALLATION AND MAINTENANCE MANUAL**

P/N 343756

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**USMOTORS**  
DRIVEN BY YOUR SUCCESS



TABLE OF CONTENTS

| <u>SECTION</u>                            | <u>PAGE</u> |
|---|-------------|
| SAFETY.....                               | 2 – 3       |
| GENERAL INFORMATION.....                  | 4           |
| FRAME AND TYPE INFORMATION .....          | 5           |
| BELT CHANGING INSTRUCTIONS .....          | 6 – 14      |
| Frame 1.....                              | 7           |
| Frames 6,10,15 & 25.....                  | 6 – 9       |
| Frames 23,44 & 55 .....                   | 10          |
| Frame 65.....                             | 11          |
| Frame 70.....                             | 12 – 13     |
| Frame 84.....                             | 14 – 15     |
| ELECTRIC REMOTE SPEED INDICATOR.....      | 16 – 17     |
| Installation Instructions .....           | 16          |
| Mounting Dimensions .....                 | 17          |
| ELECTRIC REMOTE CONTROL INSTRUCTIONS..... | 18 – 19     |
| Type ERR & ERRL .....                     | 18          |
| Type ERM .....                            | 19          |
| PNEUMATIC VARITROL INSTRUCTIONS .....     | 20 – 25     |
| Installation .....                        | 20          |
| Operation & Troubleshooting .....         | 21 – 24     |
| Air Pressure Settings .....               | 25          |
| Using Time Delay Control.....             | 25          |
| MECHANICAL REMOTE CONTROLS .....          | 26 – 43     |
| LUBRICATION INSTRUCTIONS .....            | 44          |
| OIL CAPACITY – VARIDRIVE SYNCROGEAR ..... | 45          |
| ENDOLUBE REPLACEMENT .....                | 46 – 48     |
| PARTS ORDERING INFORMATION .....          | 49          |
| INSTALLATION RECORD .....                 | 50          |

**SAFETY FIRST**

High voltage and rotating parts can cause serious or fatal injury. Safe installation, operation and maintenance must be performed by qualified personnel. Familiarization with and adherence to NEMA MG2, the National Electrical Code, and local codes is recommended. It is important to observe safety precautions to protect personnel from possible injury. Personnel should be instructed to:

1. Avoid contact with energized circuits or rotating parts.
2. ALWAYS DISCONNECT ELECTRICAL POWER AT THE MOTOR STARTER, FUSE BOX, OR CIRCUIT BREAKER BEFORE HANDLING ELECTRICAL CONNECTIONS. DOUBLE CHECK TO BE SURE POWER IS OFF, AND THAT IT CAN NOT BE TURNED ON WHILE YOU ARE WORKING ON THE EQUIPMENT.
3. Act with care in accordance with prescribed procedures in handling and lifting this equipment.
4. Be sure unit is electrically grounded and proper electrical installation wiring and controls are used consistent with local and national electrical codes. Refer to "NATIONAL ELECTRICAL CODE HANDBOOK" – NFPA NO. 70. Employ qualified electricians.
5. Be sure equipment is properly enclosed to prevent access by children or other unauthorized personnel in order to prevent possible accidents.
6. Be sure shaft key is fully captive before unit is energized.
7. Avoid contact with capacitors until safe discharge procedures have been completed.
8. All units are shipped without oil. Always be sure oil lubricated units are filled with correct oil to proper level before operating.
9. Provide proper safeguards for personnel against rotating parts and applications involving high inertia loads which can cause overspeed.
10. Avoid extended exposure to equipment with high noise levels.
11. Be familiar with the equipment and read all instructions thoroughly before installing or working on equipment.

Cont'd



**CAUTION** – Please observe the following items:

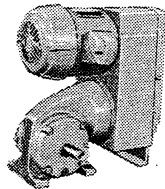
12. The VARIDRIVE handwheel should never be turned at any time other than while the drive is operating. Turning the handwheel while the drive is not operating can result in a damaged VARIBELT, or damaged control linkage.
13. Never try to force the handwheel beyond the speeds shown on the nameplate.
14. The numerals on the handwheel indicator are reference indication only of an approximate point in the speed range of the drive. The handwheel indicator is not intended to be used to indicate actual speed output. Electric tachometers are available at nominal cost for accurate speed indication and should be used where knowledge of operating speed is necessary to the proper or safe function of your driven machine.
15. Should you remove the spring from the driven variable shaft use caution. The spring is under compression. The force exerted by the spring on larger frame sizes can approach several hundred pounds. "Captive Spring" designs, which prevent accidental release of the spring are incorporated in recent production frame sizes 15 (5 HP), 23, 25, 44, 55, 65, 70 and some 84 frames.
16. VARIDRIVES are packaged for shipment with the assumption that if placed in storage, it will be in a clean, dry inside area. If other storage conditions prevail, special packaging should be specified on the order.
17. Use safety glasses to protect your eyes, especially if cover plates are removed to inspect equipment while it is running or while a mallet or hammer is used.

Your U.S. VARIDRIVE has been accurately adjusted and tested before shipment. No adjustments are normally necessary if the drive is operated under normal conditions.

See the Table of Contents and the following pages in this manual for more specific information.

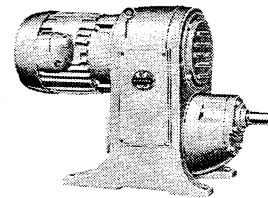


The U.S. VARIDRIVE is a constant torque, variable speed, belt drive transmission, normally furnished complete with an electric motor. Low and intermediate speeds employ a geared output using either right angle worm gears (Figure 1) or helical steel parallel gears (Figures 2 & 3).



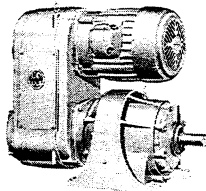
**TYPE VAV-JF-GW  
SINGLE REDUCTION**

**FIGURE 1**



**TYPE VEU-TF-GH  
SINGLE REDUCTION**

**FIGURE 2**



**TYPE VEV-TF-GD  
DOUBLE REDUCTION**

**FIGURE 3**

Units, furnished with gears require oil lubrication. The bearings located within the gear housing are lubricated by the oil when the proper oil and oil level is maintained. Other bearings, located in the motor and the VARIDRIVE belt transmission are grease lubricated and many require periodic relubrication for longest life and good maintenance practice.

Other mechanical parts such as chain, cams, etc. may be lubricated with grease or oil now and then to avoid corrosion and undue wear. These parts are normally common to the handwheel control and handwheel control mechanism.

Drives which incorporate U.S. ENDOLUBE construction (Frame sizes 1, 6, 10, 15, 23, 25, 44 and 55), do not require relubrication of the transmission shafts. Frames 65, 70 and 84 do not use ENDOLUBE, therefore, these larger drives do require periodic lubrication of the drive shafts.

When your drive includes a geared take-off, the gear case must be filled with the proper oil to correct oil level before placing the unit into operation. A nameplate or decal may be found on the gear case which specified the proper oil. Periodic oil changes are recommended; initially oil should be drained and replaced after the first 100 hours of operation. Oil should be changed at least once or twice each year thereafter, or more often depending on operating conditions.



VARIDRIVES are typically described by frame and type in basic symbol groups, from which the VARIDRIVE components can be determined according to the following tables.

### VARIDRIVE FRAME

| 6                                       | 145                                      | 5                                  |
|---|--|------------------------------------|
| ↓                                       | ↓  | ↓                                  |
| VARIDRIVE BELT CASE SIZE DESIGNATIONS   | MOTOR FRAME SIZE DESIGNATIONS            | GEAR REDUCER SIZE DESIGNATIONS     |
| 6, 10, 15, 23, 25<br>44, 55, 65, 70, 84 | STANDARD NEMA FRAMES<br>SIZES: 56 TO 445 | PARALLEL SHAFT<br>RIGHT ANGLE      |
|   |  | USEM SIZES<br>5 to 70<br>6, 11, 20 |

### VARIDRIVE TYPE

| VAV   | TF  | GR   |
|---|---|--|
| ↓   | ↓   | ↓  |
| VARIDRIVE BELT CASE TYPE DESIGNATIONS   | MOTOR TYPE DESIGNATIONS                     | GEAR REDUCER TYPE DESIGNATIONS   |
| VA<br>BASE MOUNTED<br>6, 10, 15 Case  | AF, RF<br>OPEN DRIPPROOF                    | SINGLE REDUCTION   |
| VAV<br>FOOTLESS FRAME<br>(6, 10, 15 Case)   | TF, JF<br>TOTALLY ENCLOSED<br>FAN COOLED    | GR<br>FOOTED PARALLEL<br>GB<br>HELICAL GEARS   |
| VE<br>HORIZONTAL FOOTED<br>(23, 25, 44, 55, 65, 70 Case)  | TFN, JFN<br>TOTALLY ENCLOSED<br>NON VENTED  | GH<br>FOOTLESS PARALLEL<br>GS<br>HELICAL GEARS   |
| VEU<br>UPRIGHT FOOTED<br>(23, 25, 44, 55, 65, 70, 84 Case)  | EF, LF<br>EXPLOSIONPROOF<br>FAN COOLED      | DOUBLE REDUCTION<br>GD<br>FOOTED PARALLEL<br>GL<br>HELICAL GEARS   |
| VEV<br>FOOTLESS FRAME<br>(23 Case)  | EFN, LFN<br>EXPLOSIONPROOF<br>NON VENTED    | TRIPLE REDUCTION<br>GM<br>FOOTED PARALLEL<br>HELICAL GEARS   |
| VEV-1<br>FOOTLESS FRAME<br>Suffix "1" is used to indicate the longer frame center distance sometimes required for motor and take off shaft on same side.<br>(25, 44, 55 Case) | TFC<br>ALLGUARD                             | RIGHT ANGLE WORMS  |
|   | JFC<br>PROCESS DUTY<br>FOOD & BEVERAGE DUTY | GW<br>FOOTED SINGLE REDUCTION<br>GWB<br>FOOTED DOUBLE REDUCTION<br>WORM AND HELICAL GEARS<br>GWV<br>FLANGED OUTPUT |

NOTE: Only two frame and two type designations (VARIDRIVE and motor) will appear on nameplate on gearless VARIDRIVES.

EXAMPLE: Model number 8126 (Section 301, page 4)

1 HP, 1900-190 RPM, frame 6-145T-5, type VAV-TF-GR

Frame (6-145T-5): 6 case VARIDRIVE with 145T frame motor and size 5 gear reducer

Type (VAV-TF-GR): Footless frame with TEFC motor and single reduction, footed, parallel helical gear reducer.



The U.S. VARIBELT is designed expressly for your particular U.S. VARIDRIVE. It has been chosen to match the capacity and operating conditions of the drive. Use of any belt other than a U.S. VARIBELT voids the Warranty and can seriously affect the performance, capacity and life of your U.S. VARIDRIVE.

The following instructions are general. Your drive has an instruction plate located on the VARIDRIVE frame case which specifically covers both lubrication and belt changing. Refer to it for more specific information.

It is always to your advantage to replace the VARIBELT before complete failure. Rumbling or excessive vibration may indicate that the belt is approaching failure and should have prompt inspection. Remove the side cover on the drive to inspect the belt — if it is frayed on the edges, or if cracks in the cog roots have progressed through the side wall, the belt should be replaced.

**NOTE:** Whenever working on the drive it is good safety practice to remove the fuses from the fuse clips in the electrical supply either at the motor starter or main to prevent accidental starting.

### 1 FRAME

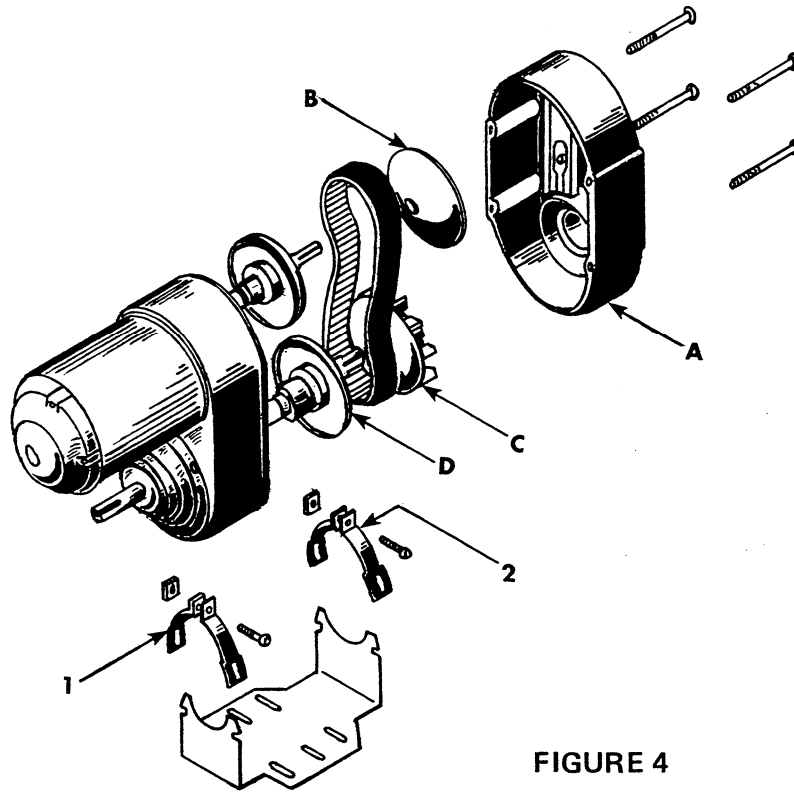


FIGURE 4

### 1 FRAME — REFER TO FIGURE 4

1. Open power supply disconnect and lock open.
2. Remove entire VARIDRIVE Unit from mounting base (gearless drive only) by disassembling base clamps at locations (1) and (2).
3. Turn control to low speed.
4. Remove four cover screws and remove cover (A).
5. Slide VARIDISC (B) free from motor shaft and remove VARIBELT.
6. Install new VARIBELT between VARIDISCS (C) and (D).
7. Replace VARIBELT over motor shaft and reassemble VARIDISC (B) against belt.
8. Replace cover (A) and tighten four screws.
9. Remount VARIDRIVE Unit in base and tighten base clamps (1) and (2).





6, 10, 15, and 25 FRAME

"C" ASSEMBLY

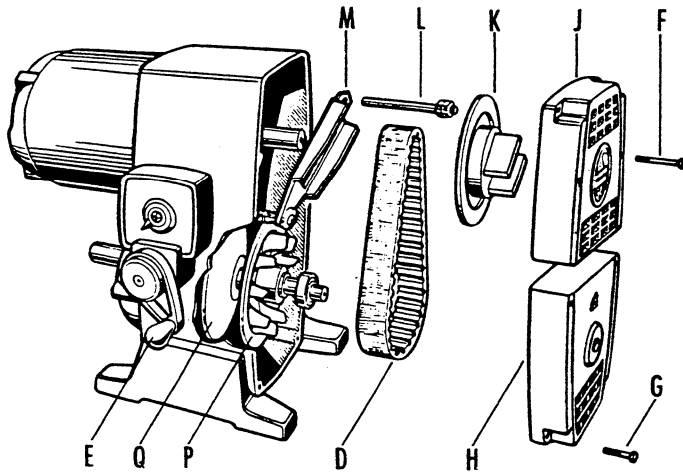


FIGURE 4

"Z" ASSEMBLY

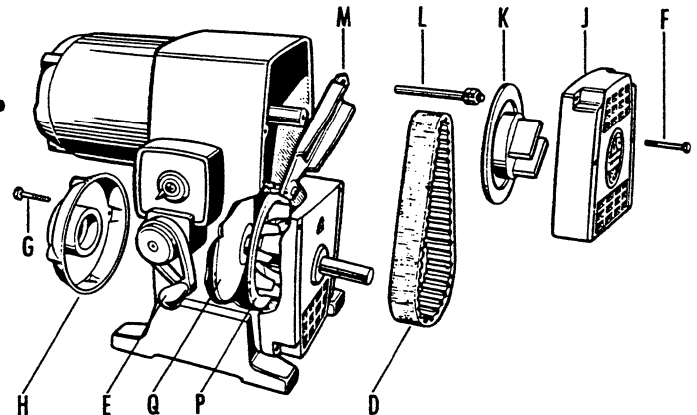


FIGURE 5

6, 10, 15 and 25 FRAMES – REFER TO FIGURES 4 and 5

1. If possible run the drive to high speed by turning the handwheel so that the indicator is at maximum speed setting.
2. Open power supply disconnect and lock open.
3. Remove the front cover (J).
4. Remove the support bracket (H).
5. Use a piece of wood or other non-metallic material as a wedge and place it between the discs ( P & Q ) on the variable speed end to block them in the open position. Use care not to nick or damage disc surfaces.
6. Remove the stud (L) holding the formed steel shifting lever (M). Note the position of the two locknuts on stud (L) for reassembly in same position.
7. Move shifting lever (M) to free VARIDISC (K) without removing chain from shifting lever (M).
8. Remove VARIDISC (K) then withdraw belt (D) through bracket (H) opening in variable end.
9. Replace belt and reassemble by reversing above steps 1 through 7.

Cont'd

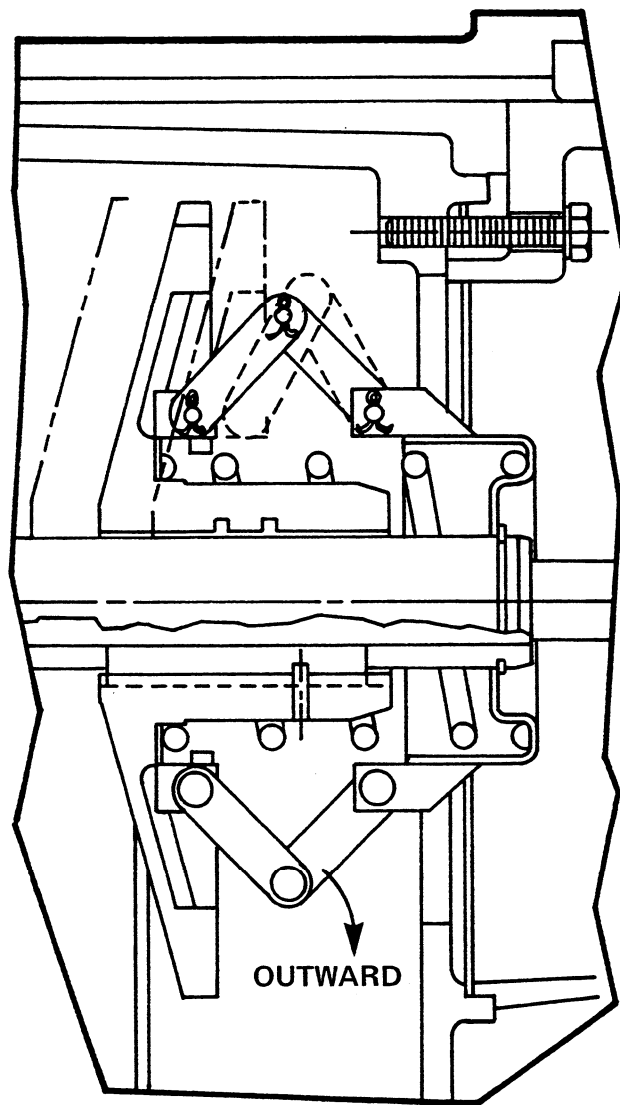


FIGURE 6

10. On units supplied with a spring compensator (Refer to fig. 6). Make sure compensator arms are open outward when discs are assembled to shaft.
11. Rotate unit by hand and turn control wheel (DO NOT FORCE HANDWHEEL) until belt slack is taken up.



23, 44 and 55 FRAME

"C" ASSEMBLY

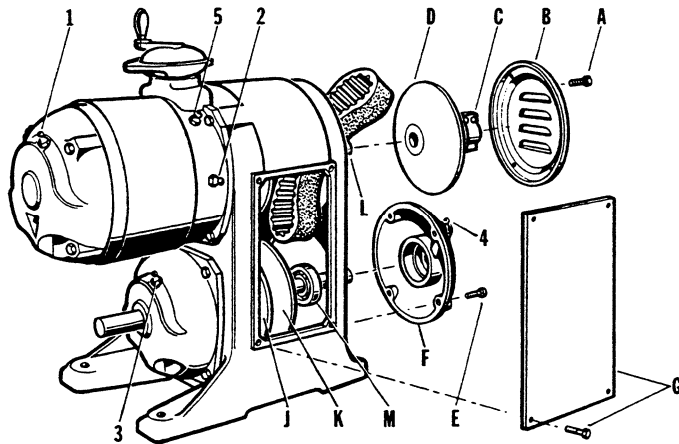


FIGURE 7

"Z" ASSEMBLY

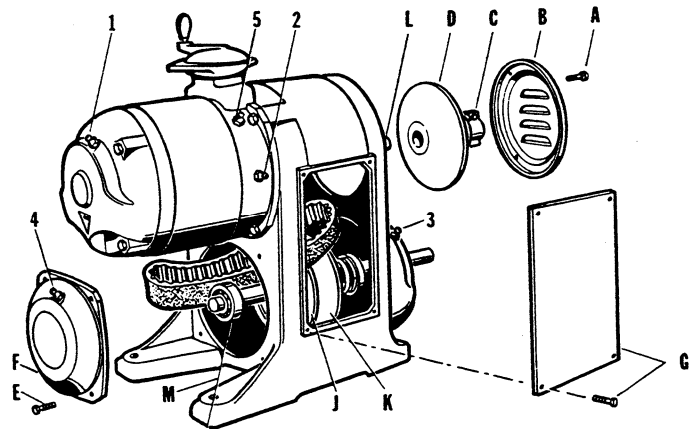


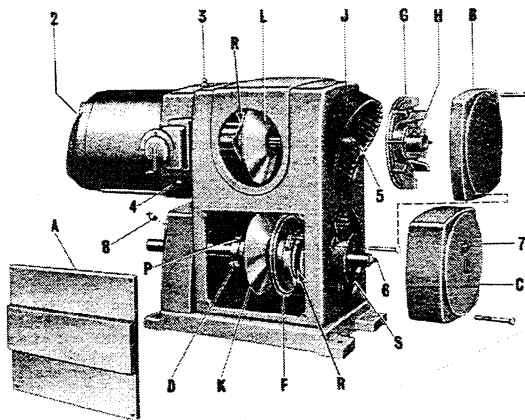
FIGURE 8

23, 44 and 55 FRAMES — REFER TO FIGURES 7 and 8

1. With VARIDRIVE running, adjust control wheel to high speed-position.
2. Open power supply disconnect and lock out.
3. Remove front cover (B), support bracket (F) and side covers (G).
4. Use a piece of wood or other non-metallic material as a wedge and place it between the discs (J & K) on the variable speed end to block them in the open position. Use care not to nick or damage disc faces.
5. Carefully mark the axial and radial position of stationary VARIDISC (D) in relation to shaft **BEFORE** removal.
6. Loosen clamping bolts (C) and slide VARIDISC (D) off shaft. Wedge open the split hub if VARIDISC is tight on shaft.
7. Withdraw VARIBELT, over motor shaft and remove through bracket opening at disc (D) for "C" flow and opening at bracket (F) for "Z" flow.
8. Install new VARIBELT.
9. Install VARIDISC (D) to its original premarked position and tighten clamping bolts.
10. Rotate unit by hand and turn control wheel (DO NOT FORCE HANDWHEEL) until belt slack is taken up.
11. Replace brackets and covers.

### 65 FRAME

#### "C" ASSEMBLY



E 9

#### "Z" ASSEMBLY

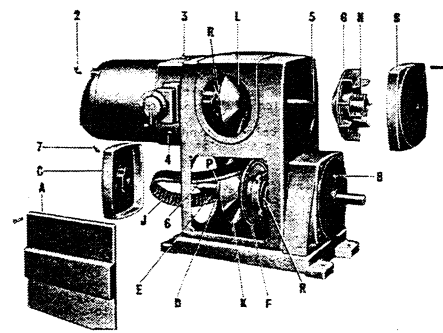


FIGURE 10

65 FRAME – REFER TO FIGURES 9 and 10

1. With VARIDRIVE running, adjust control wheel to high speed position.
2. Open power supply disconnect and lock open.
3. Remove covers (A & B) and lubrication pipe extension.
4. If your unit is "C" assembly refer to Figure 9 and assemble three of the hex head cap screws which were removed from cover (B) into spring assembly (S) and compress spring about 1/8 inch.
- 4A. If your unit is "Z" assembly refer to Figure 10 and remove locknuts (D) from studs (E) and advance studs until the spring loaded VARIDISC (F) is moved about 1/8 inch.
5. Remove bracket (C).
6. Carefully mark the axial and radial position of stationary VARIDISC (G) in relation to shaft **BEFORE** removal.
7. Loosen clamping bolts (H) and slide VARIDISC (G) off shaft. Wedge open the split hub if VARIDISC is tight on shaft.
8. Withdraw VARIBELT over motor shaft and remove through bracket (C) opening.
9. Install new VARIBELT.
10. Install VARIDISC (G) to its original premarked position.
11. Secure bolts (H) and re-attach lubrication pipe extension.
12. Replace bracket (C).
13. If your unit is "C" assembly remove the three hex head cap screws which were used to compress the spring.
- 13A. If your unit is "Z" assembly, back off studs (E) until VARIDISC (F) is in original position. Studs (E) must not contact VARIDISC (F). Replace locknuts (D).
14. Replace covers (A & B).



70 FRAME

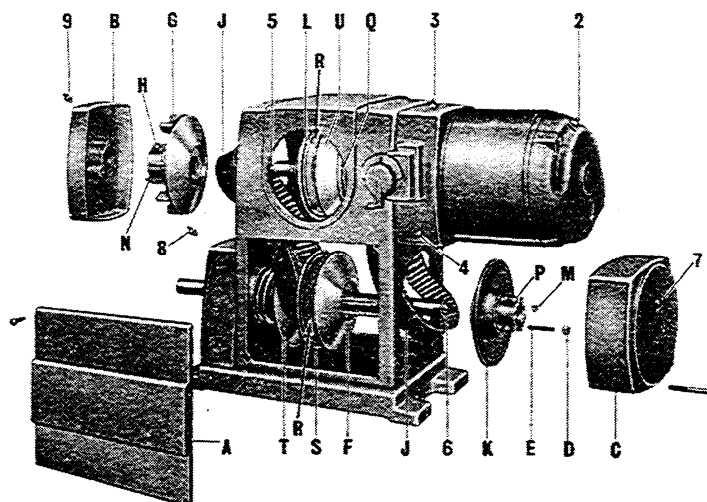


FIGURE 11

70 FRAME – REFER TO FIGURE 11

1. With VARIDRIVE running, adjust control wheel to "Low Speed" position.
  2. Open power supply disconnect and lock open.
  3. Remove plate covers (A) and support brackets (B & C).
  4. Remove locknuts (D) from studs (E) and advance studs until spring loaded VARIDISC (F) is moved about 1/8 inch.
  5. Mark the axial and radial positions of stationary VARIDISCS (G & K) in relation to shaft **BEFORE** removal.
  6. Remove hex nuts (M & N) from VARIDISCS (G & K).
  7. Loosen clamping bolts (H & P) and slide VARIDISCS (G & K) off shafts. Wedge open the split hubs if VARIDISCS are tight on shaft.
- CAUTION:** Keep shims and shim plate with VARIDISCS to avoid misplacement or damage.



8. Pass upper loops of VARIBELTS (J) over end of motor shaft and lower loops under end of variable shaft. The VARIBELTS can now be withdrawn through the support bracket openings.
9. Having removed support brackets (B & C) and VARIDISCS (G & K) as described above, insert new VARIBELTS (J) through openings in frame case; position lower loop of one belt between VARIDISCS (S & T) and upper loop of other belt between VARIDISCS (U & Q) and position against VARIDISCS (F & L).
10. Install VARIDISCS (G & K) to their original premarked positions. Secure clamping bolts (H & P).  
**CAUTION:** Be sure all shims are replaced with VARIDISCS.
11. Install hex nuts (M & N) on spacer studs which protrude through VARIDISCS (G & K).
12. Back off studs (E) until VARIDISC (F) is in original position. Studs (E) must not be in contact with VARIDISC (F). Replace locknuts (D).
13. Replace support brackets (B & C) and plate covers (A).

83 & 84 FRAME

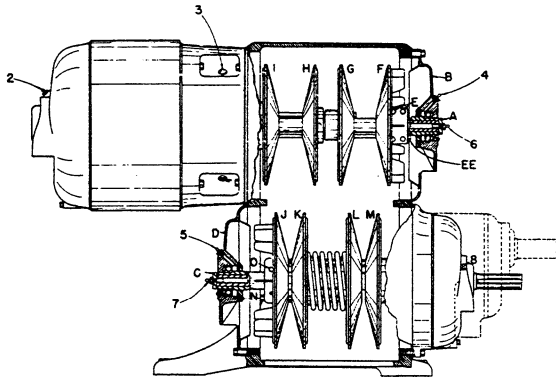


FIGURE 12

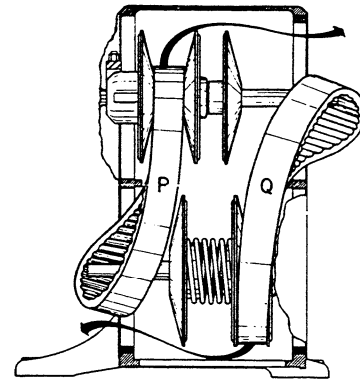


FIGURE 13

83 & 84 FRAME – REFER TO FIGURE 12 and 13

1. With VARIDRIVE running, adjust control wheel to high speed position. Stop VARIDRIVE. Open power supply disconnect and lock open. Turn control wheel to low speed position thus loosening belts.
2. Remove louvered plate cover from side of VARIDRIVE.
3. Remove support brackets (B & D) from case. Bearings in support brackets remain sealed.
4. Remove tie bolts (EE) and VARIDISC (F).
5. Loosen clamping bolts (E) on VARIDISC (F) and remove from shaft. The split hub may be wedged apart if VARIDISC is tight on shaft.  
**CAUTION:** Keep shims and shim plate with VARIDISC to avoid misplacement or damage.
6. Remove tie bolts (N) from VARIDISC (J) and loosen clamp bolts (O). Remove VARIDISC (J) together with shims, shim plate and spacer tubes.
7. Draw loop of VARIBELT (P) over end of variable shaft and VARIBELT (Q) over end of motor shaft. Refer to Figure 13.
8. Replacement of belts will be facilitated by wedging VARIDISCS (L & M) apart with a block of wood or other non-metallic material before removing VARIBELT (Q).

Cont'd



9. VARIBELTS may be withdrawn from case through openings for support bracket.
  10. With support brackets (B & D) and VARIDISCS (F & J) removed as described above, insert VARIBELT (P) through opening in case and place between VARIDISCS (H & I) only.
  11. Likewise insert VARIBELT (Q) through opening in case and place between VARIDISCS (L & M). If these VARIDISCS are not blocked apart it will be necessary either to pry them apart until belt can be inserted or to screw tie bolts (N) into tapped holes in VARIDISC (L) to force VARIDISCS (L & M) apart. These bolts must be removed after VARIBELT is in place to permit replacing VARIDISC (J).
  12. Loop VARIBELT (P) over end of variable shaft and VARIBELT (Q) over end of motor shaft. See Figure 13.
  13. Replace VARIDISC (J) using tie bolts (N) to bring VARIDISC against spacers. Tighten clamp bolts (O).
  14. Replace VARIDISC (F) bringing into contact with spacer rod. Tighten clamping clamp bolts (E) securely.
- CAUTION:** Be sure all shims are replaced with VARIDISCS.





INSTALLATION INSTRUCTIONS  
Type ERSI Frames 6-84

1. Assemble adapter plug (A) and gear (B) to VARIDRIVE shaft, using screw (C) & washer (D)
2. Attach housing (E) to support bracket with (2) screws (F).
3. Thread speed pick-up (G) into housing (E) and adjust so that end of pick-up is within .010" minimum to .040" maximum of O.D. of gear teeth during complete revolution and then tighten palnut (H)
4. Attach cover (I) with (2) screws (J).
5. Remove Tachometer from Tachometer case, remove jumper clip from circuit board mounting studs, connect magnetic pulser speed pick-up leads and 115 volt A.C. power supply per connection diagram.
6. Adjust zero speed if necessary on tachometer on front of tachometer indicator.
7. With VARIDRIVE running at maximum speed adjust "full scale adjustment screw" on back of Tachometer so that meter reads 100%. A reading of 100% may be obtained for speed between 1750 and 4500 RPM via the adjustment screw.
8. Replace Tachometer in Tachometer case.
9. If pick-up cable other than cable supplied by USEM is used, cable other than shielded is not recommended.

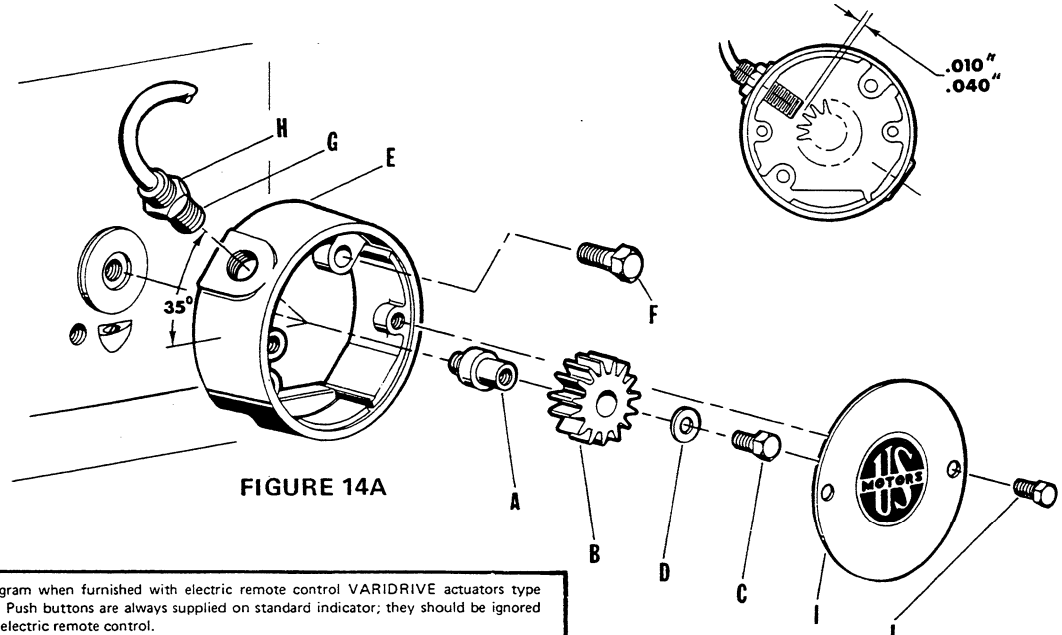
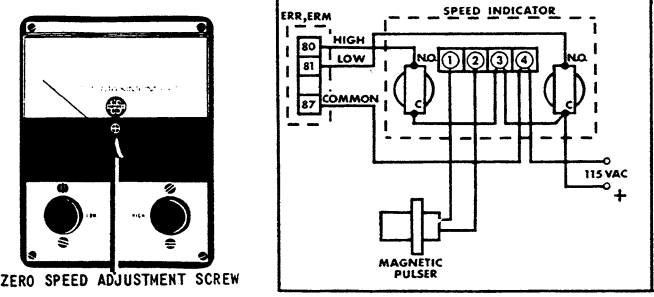


FIGURE 14A

Connection Diagram when furnished with electric remote control VARIDRIVE actuators type ERR and ERM. Push buttons are always supplied on standard indicator; they should be ignored if not used with electric remote control.



Connection diagram for type ERSI Spd. Indicator only.

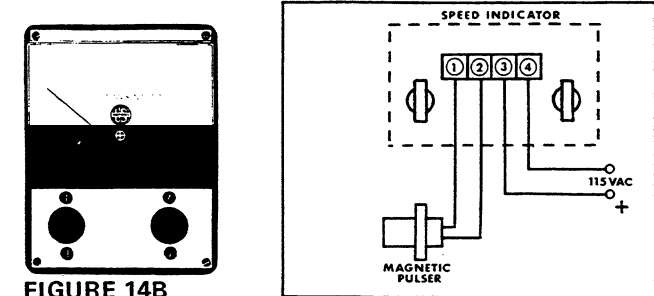
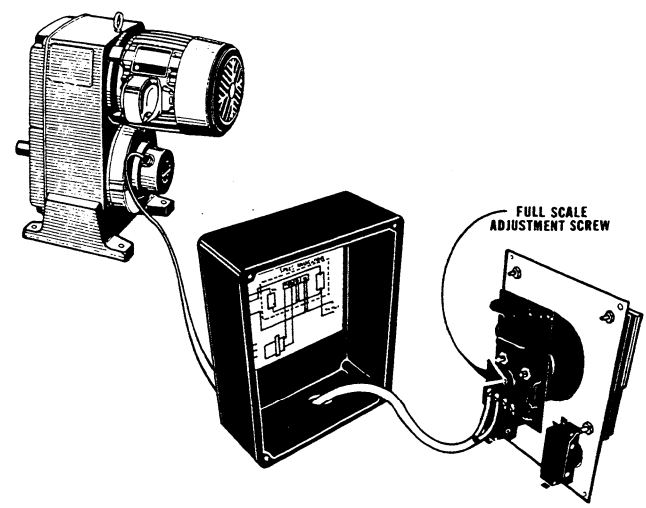
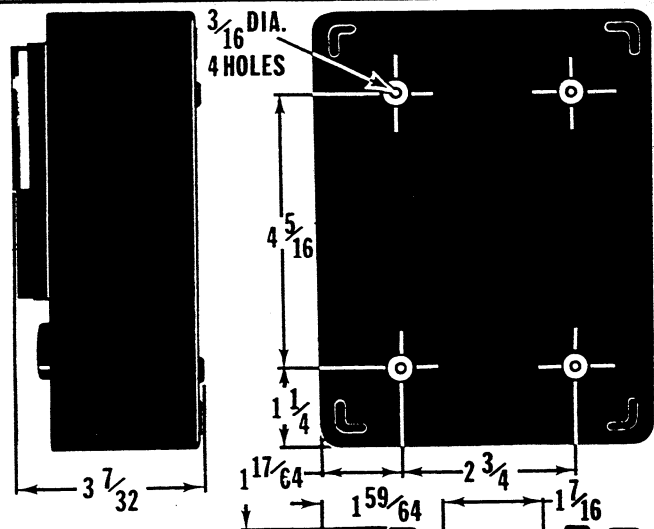
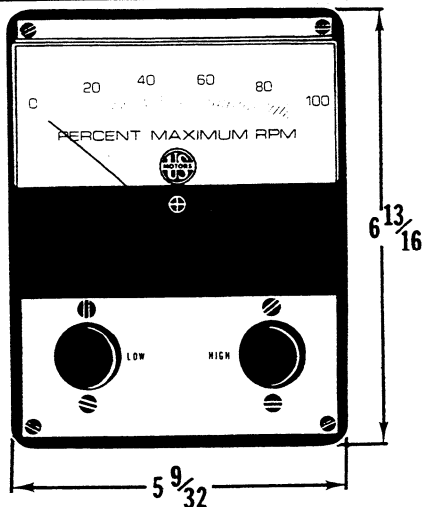


FIGURE 14B





### MOUNTING DIMENSIONS



MOUNTING DIMENSIONS SPEED INDICATOR WITHOUT ENCLOSURE (FOR PANEL MOUNTING)

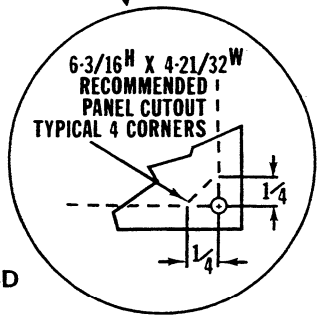
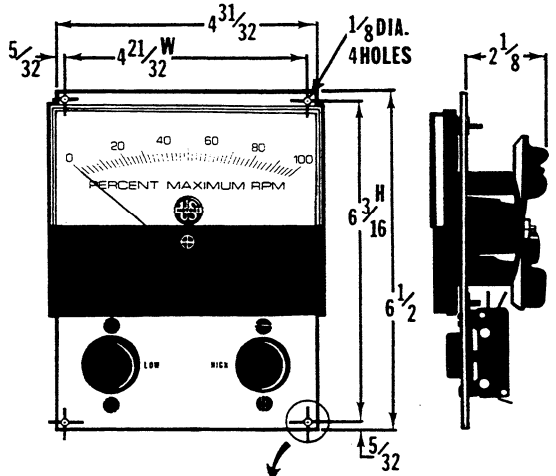
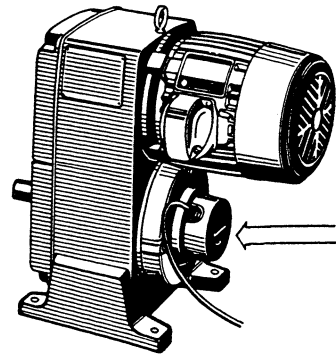


FIGURE 14D

FIGURE 14C

$\frac{7}{8}$  DIA. 2 HOLES (SNAP BUTTON PLUG)

In some cases the Tachometer Generator cannot be mounted with the motor conduit box in a position adjacent to the generator assembly. Refer to Company for accurate information regarding interference in this mounting position.



Ten feet of two conductor cable is included with speed pickup. Speed Pickup housing mounted on VARIDRIVE extends approximately  $1 \frac{5}{8}$ " from face of VARIDRIVE support bracket and is approximately  $3 \frac{3}{4}$ " in diameter. Refer to Company for dimensions not shown above.



INSTALLATION AND WIRING

SEPARATE SINGLE PHASE POWER SUPPLY FOR TYPE ERR & ERRL USED ON FRAMES 6, 10, 15 and 25 VARIDRIVES

1. For units requiring operation from separate power supply, connect one line (white) of 115 VAC supply to terminal 87 as shown in Figure 15.
2. Connect line 2 (black) through relay to common side of high and low push button as shown in Fig. 15, and connect N.O. side of push buttons to terminals 80 and 81.

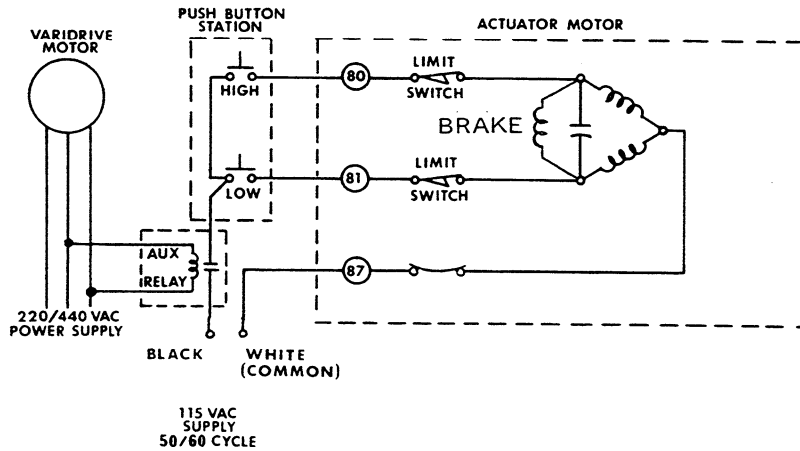


FIGURE 15

FOR POWER SUPPLY FROM VARIDRIVE MOTOR FOR TYPE ERR & ERRL USED ON FRAME SIZES 6, 10, 15 and 25

1. Three phase (230/460 VAC, 190/380 VAC) 50/60 cycle connect L<sub>1</sub> to motor lead terminal #1 and L<sub>2</sub> to motor lead terminal #4 as shown in Figure 16.
2. Single phase (115/230 VAC) 50/60 cycle connect L<sub>1</sub> to blue motor lead and L<sub>2</sub> to white motor lead as shown in Figure 16.

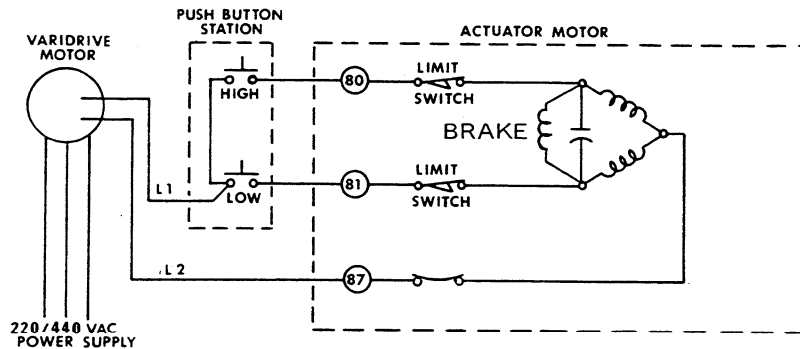
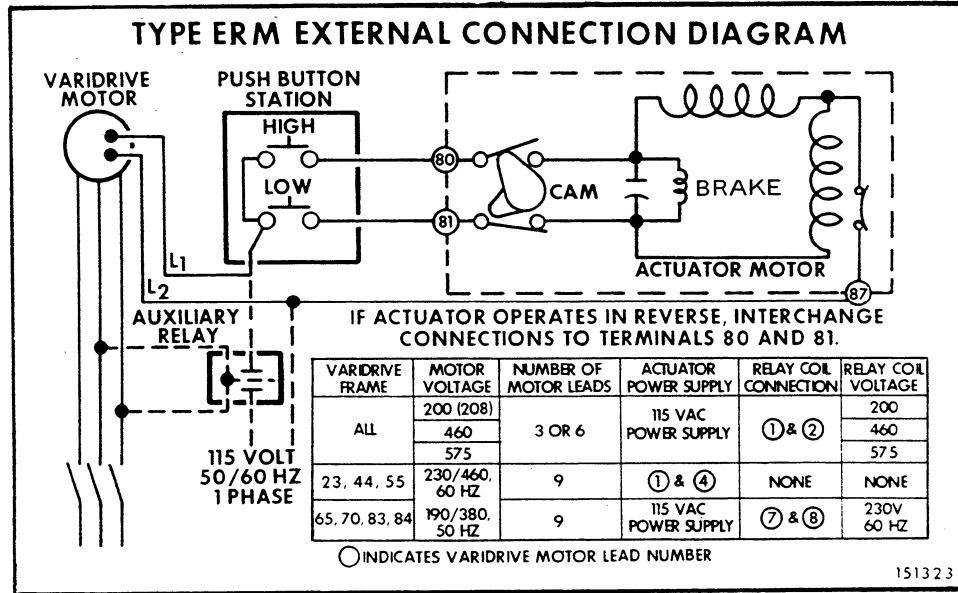


FIGURE 16



**POWER SUPPLY FOR TYPE ERM USED ON FRAMES 23, 44 & LARGER**



**FIGURE 17**



If your drive is equipped with U.S. PNEUMATIC VARITROL refer to Figure 19 or 20. The VARITROL has been preset at the factory, however, minor adjustments may be required.

All fittings are normally 1/4" NPT, and piping used should be 1/4" I.D. **EXCEPT** for piping between the supply air filter and the cushion air pressure regulator. This should be 3/8" tubing. Copper tubing is recommended for both the signal air input and supply air inputs to the actuator.

Supply air must be furnished and maintained within 60 to 150 PSI. Always be sure that the air supply is clean.

### INSTALLATION

1. The supply air filter regulator and gauge must be installed by the customer.
2. After piping and tubing is installed check system for any air leakage. All joints must be tight.
3. The solenoid valve is normally supplied with a 230 VAC (also good for 220V) coil and should be connected to motor leads #7 and #8, so that its operation is sequenced from the VARIDRIVE motor. The solenoid must energize or de-energize at the same time as power to the VARIDRIVE motor is turned on or off.
4. If the load on the VARIDRIVE would cause it to stop in less than 5 seconds install a time delay relay per Figure 21. This will let the drive continue to run until it has returned to low speed. The time delay will then shut the drive off.  
**CAUTION:** The drive must be allowed to return to low speed before it comes to a stop whenever a PNEUMATIC VARITROL is used. If emergency stopping is required, the drive must be jogged before starting until all slack in the VARIBELT is taken up.
5. Supply air should be set according to Figure 22. The gauge is on the supply air filter regulator. The adjustment is on the top of the supply air filter regulator.
6. Cushion air should be set according to Figure 22. The gauge is on the bottom of the actuator. The adjustment is on the cushion air regulator.
7. Signal air should normally be 3 to 15 PSI to control the speed of the drive over its entire range. Speed increases with signal increase.
8. See Figure 18 for trouble shooting guide.



OPERATION OF THE PNEUMATIC ACTUATOR ASSEMBLY

The following description is only to inform the reader of operating principles of the PNEUMATIC ACTUATOR ASSEMBLY. Should service or disassembly of the ACTUATOR become necessary consult your local U.S. ELECTRICAL MOTORS representative or distributor.

The PNEUMATIC ACTUATOR ASSEMBLY functions as follows:

The power air, which does the work, enters the piston chamber at the port marked (A). The signal air, which controls the power air, enters the diaphragm chamber at the port marked (B). As the signal air pressure increases, it causes the valve (C) to rise; this causes more power air to enter the top of the piston chamber, forcing the piston down. As the signal air decreases, the valve (C) closes and the port (D) opens, allowing the air in the top of the piston chamber to be exhausted through the ports (E). This allows the piston to rise, due to the cushion air pressure in chamber (F). The range spring (G) provides the counter balancing force necessary to cause the piston to assume a position proportional to the signal air pressure and is independent of the force required to hold this position.

The compensating spring (H) adjusts the relationship between signal pressure and VARIDRIVE speed, i.e.; piston position. This spring can be adjusted by means of the zero adjusting screw (J). Turning this screw in (clockwise), reduces the speed. Turning it out (counter-clockwise), raises the speed.

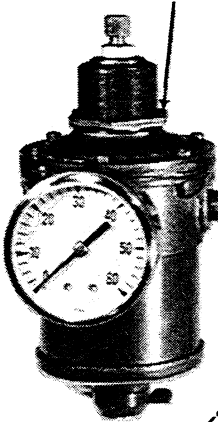
TROUBLE SHOOTING

FIGURE 18

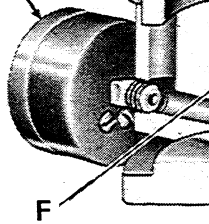
| TROUBLE                                     | CAUSE                                    | REMEDY   |
|---|--|--|
| SPEED WILL NOT CHANGE OR CHANGES TOO SLOWLY | Clogged Air system                       | a. Check for proper value of supply and cushion air.<br>b. Clean valve orifice by removing valve under protective cap on PNEUMATIC ACTUATOR with air pressure off, and blowing out orifice by turning air on.            |
|   | Solenoid Valve inoperative               | a. Check for voltage at coil.<br>b. Check electrical connection.<br>c. Remove valve from line to check operation of system.  |
|   | Leak in air system                       | a. Check all air connections and tighten as necessary.<br>b. Make sure all screws on the PNEUMATIC ACTUATOR ASSEMBLY except the zeroing screw under the protective cap are tight.  |
|   | Excessive friction in mechanical linkage | a. Check VARIDRIVE for bound or sticking varidisks.<br>b. Check and lubricate internal speed changing linkage.   |
| HUNTING (SPEED OSCILLATION)                 | Instrument Signal                        | Experience has shown that in cases where hunting is experienced, the causes generally are in the instruments rather than the PNEUMATIC ACTUATOR. Refer to the INSTRUMENT INSTRUCTION BOOKS for adjustment or correction. |

PNEUMATIC ACTUATOR WITH CUSHION AIR REGULATOR  
15 thru 55 CASE

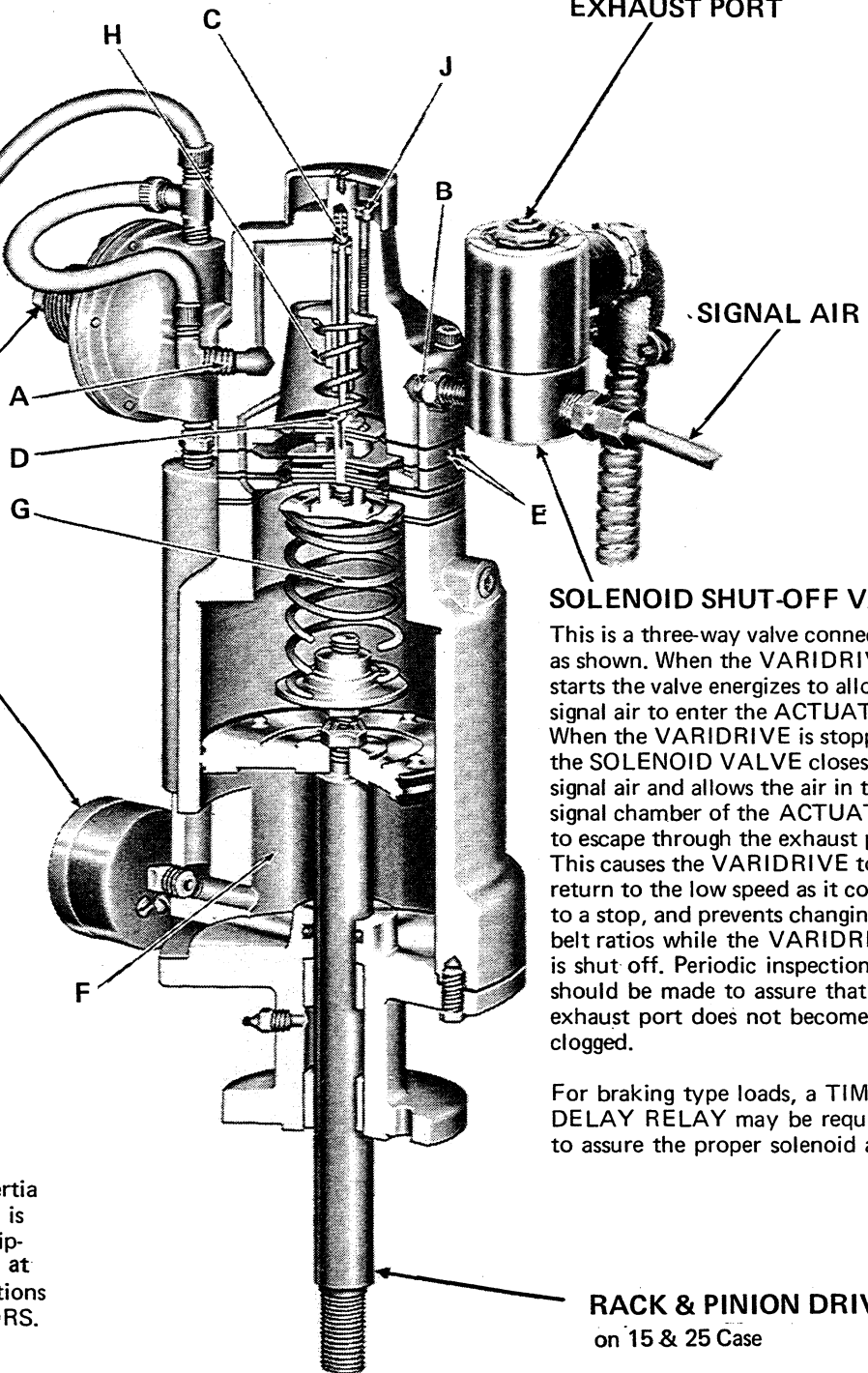
**SUPPLY AIR FILTER  
REGULATOR and GAUGE**  
Used to assure the PNEUMATIC  
ACTUATOR a source of clean air  
regulated to the proper pressure.



**CUSHION AIR PRESSURE  
REGULATOR and GAUGE**  
Supplies air pressure to the bottom  
of the PNEUMATIC ACTUATOR  
piston to provide positive reverse  
thrust of the ACTUATOR.



**CAUTION:**  
If application involves high inertia  
loads such as a flywheel, there is  
a possibility of damage to equip-  
ment due to motor over-speed at  
shut-down. Refer such applications  
to U. S. ELECTRICAL MOTORS.



**SOLENOID SHUT-OFF VALVE**  
This is a three-way valve connected  
as shown. When the VARIDRIVE  
starts the valve energizes to allow  
signal air to enter the ACTUATOR.  
When the VARIDRIVE is stopped,  
the SOLENOID VALVE closes to  
signal air and allows the air in the  
signal chamber of the ACTUATOR  
to escape through the exhaust port.  
This causes the VARIDRIVE to  
return to the low speed as it coasts  
to a stop, and prevents changing  
belt ratios while the VARIDRIVE  
is shut off. Periodic inspection  
should be made to assure that the  
exhaust port does not become  
clogged.

For braking type loads, a TIME  
DELAY RELAY may be required  
to assure the proper solenoid action.

**RACK & PINION DRIVE**  
on 15 & 25 Case

FIGURE 19



## **PNEUMATIC ACTUATOR**

### **REVERSING RELAY OPERATION**

The reversing relay is used in place of the usual cushion air pressure regulator. This relay is used to provide faster action and stabilized positioning on the larger sized actuators.

The relay requires three connections as follows:

1. A 60 PSI input supply.
2. A 3-15 PSI signal air connection.
3. An output connection to the cushion air port of the pneumatic actuator.

The reversing relay has a loading pressure adjustment located at the top of the unit. This adjustment is used to control the speed at which the actuator will change the speed of the VARIDRIVE.



65, 70, 84 CASE VARIDRIVE  
PNEUMATIC ACTUATOR WITH REVERSING RELAY CONNECTIONS

**SUPPLY AIR FILTER  
REGULATOR & GAUGE**

USED TO ASSURE THE PNEUMATIC  
ACTUATOR OF A SOURCE OF CLEAN  
AIR REGULATED TO THE PROPER  
PRESSURE.

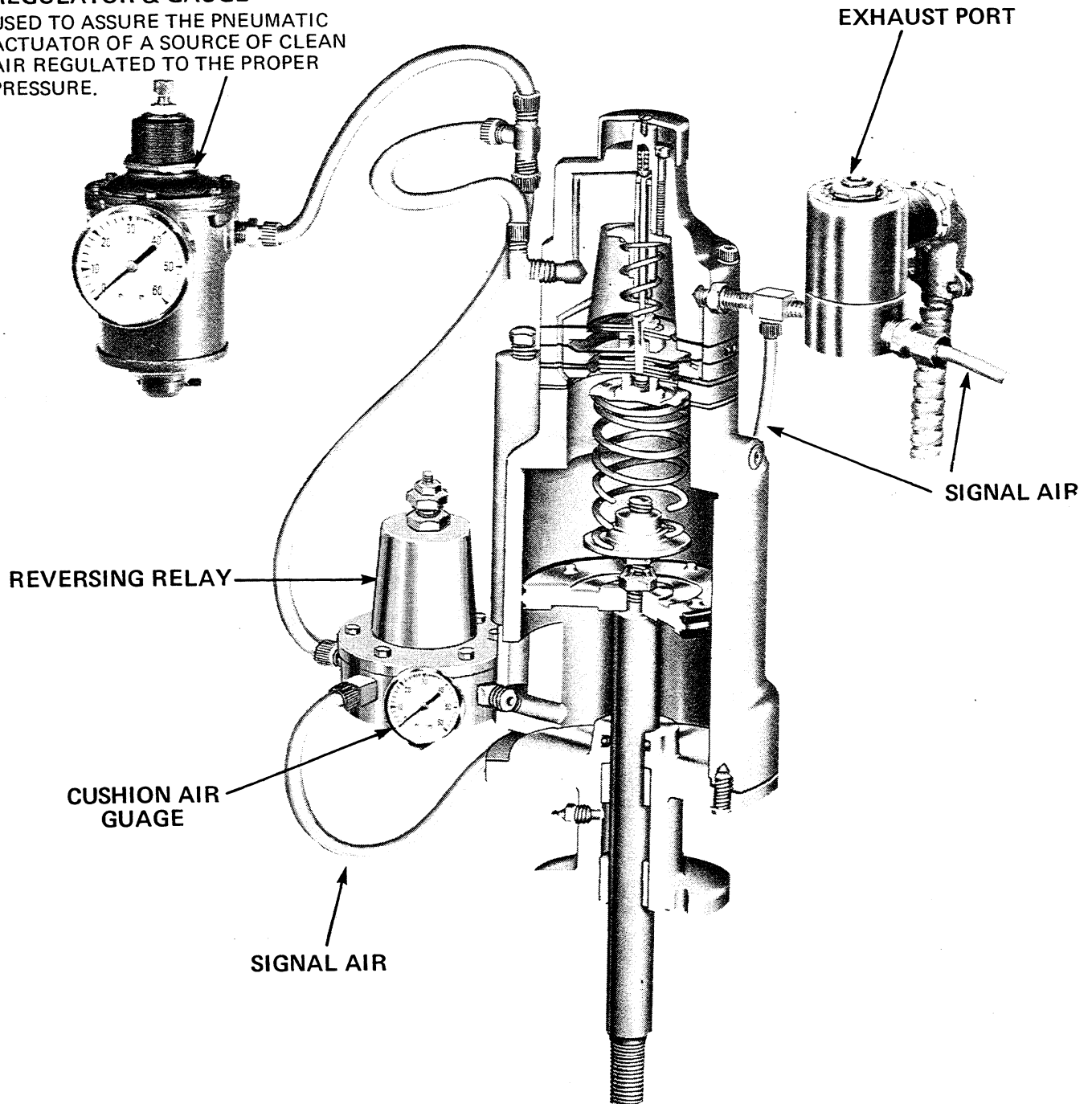


FIGURE 20

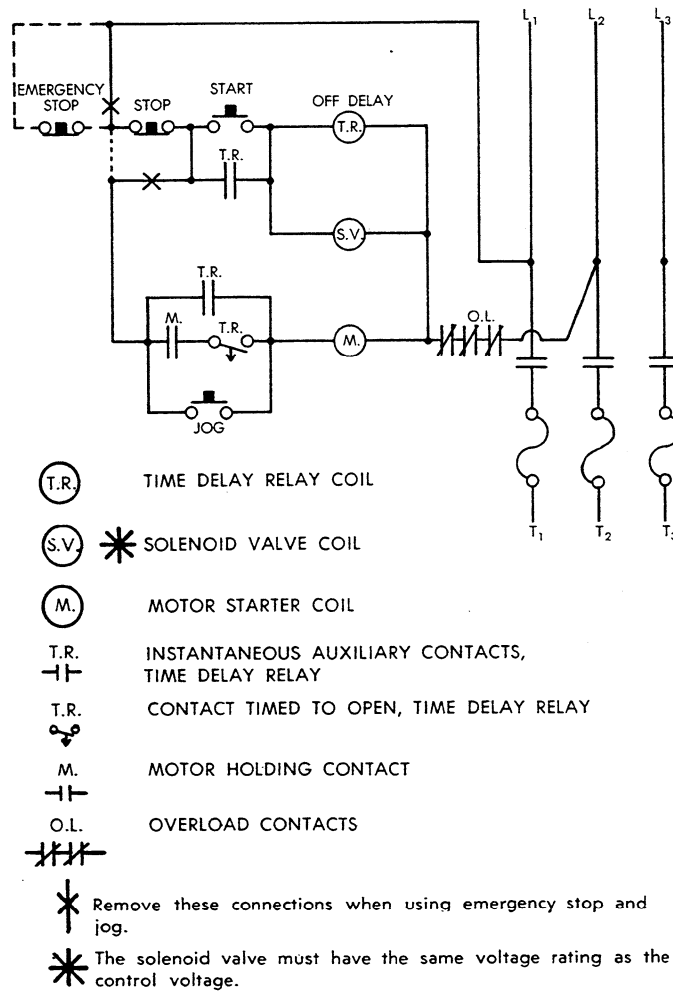


FIGURE 21

### AIR PRESSURE SETTINGS

| VARIDRIVE FRAME | CUSHION PRESSURE APPROXIMATE SETTINGS | SUPPLY PRESSURE APPROXIMATE SETTINGS |
|-----------------|---------------------------------------|--------------------------------------|
| 15              | 6-12 PSI                              | 40 PSI                               |
| 23              | 6-12 PSI                              | 40 PSI                               |
| 25              | 6-12 PSI                              | 40 PSI                               |
| 44              | 12-20 PSI                             | 60 PSI                               |
| 55              | 16-20 PSI                             | 60 PSI                               |
| 65              | 30 PSI                                | 60 PSI                               |
| 70              | 30 PSI                                | 60 PSI                               |
| 84              | 30 PSI                                | 60 PSI                               |

FIGURE 22

## 6, 10 CASE VARIDRIVE— SLEEVE COUPLING REMOTE CONTROL .

## Installation Instructions

When remote controls are furnished with the VARIDRIVE, the adaptor bracket is mounted on the VARIDRIVE frame at the factory. Customer mounts only the control knob assembly on his support and connects the control rod using the procedure below.

When remote controls are furnished separately, the customer must mount the adaptor bracket on the VARIDRIVE frame, using the procedure below:

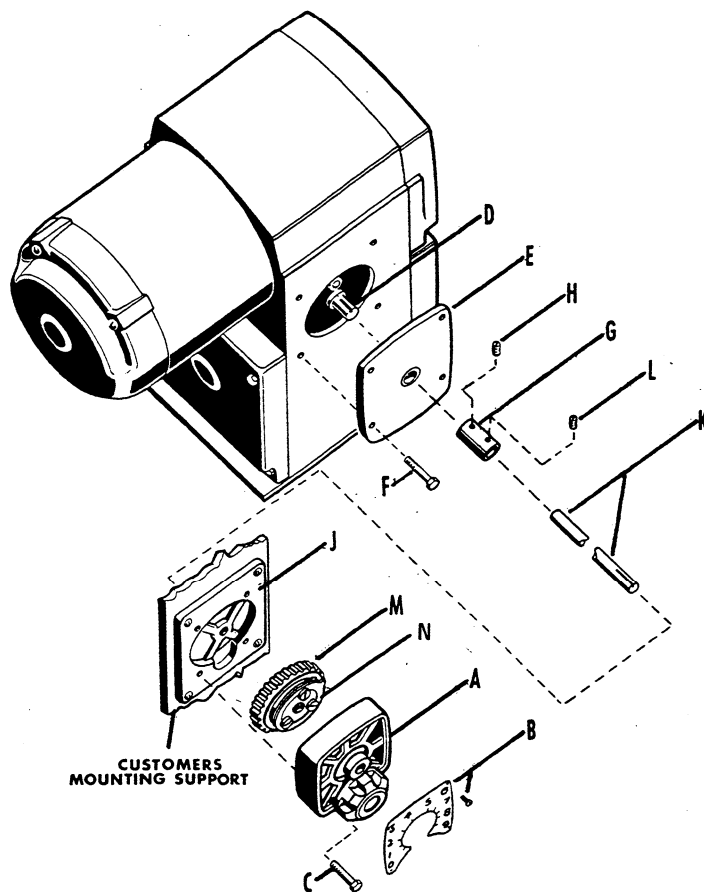


FIGURE 24

1. Remove the control knob assembly from the VARIDRIVE as follows:  
Remove dial plate covering screws which secure the control knob assembly to the VARIDRIVE. Remove all control knob parts except cam shaft "D" and adaptor plate assembly (10 case only, not shown). Note position of speed stop ring "N" in relation to cam shaft. It must be assembled to control rod "K" in the same position.
2. Install adaptor bracket "E" on VARIDRIVE using (4) screws "F". (thru adaptor plate assembly on 10 case).
3. Install sleeve coupling "G" on cam shaft "D" and tighten set screw "H".
4. Using control knob adaptor "J" as a template, drill a 9/16" hole for control rod "K" and (4) mounting holes into the mounting support. Attach control knob adaptor "J" to the mounting support.

5. Pass control rod "K" thru the adaptor and mounting support and into the sleeve coupling. Tighten set screw "L".
6. Place gear "M" on control rod "K" observing original position of speed stop ring "N".
7. Assemble control knob assembly "A" to adapter using (4) screws "C". Replace dial plate "B".



### 6, 10 CASE VARIDRIVE – FLEXIBLE SHAFT REMOTE CONTROL

#### Installation Instructions

When remote control is furnished with the VARIDRIVE, the gear box is mounted on the VARIDRIVE at the factory. Customer mounts only the control hand wheel on his support and connects flexible shaft by setting pointer to zero and inserting the driven end of the flexible shaft "K" into gear box "C" and tightening coupling. **CAUTION:** The speeds of this unit have been calibrated for this control.

When remote control is furnished separately from VARIDRIVE, the customer mounts the gear box on the VARIDRIVE frame, using procedure below:

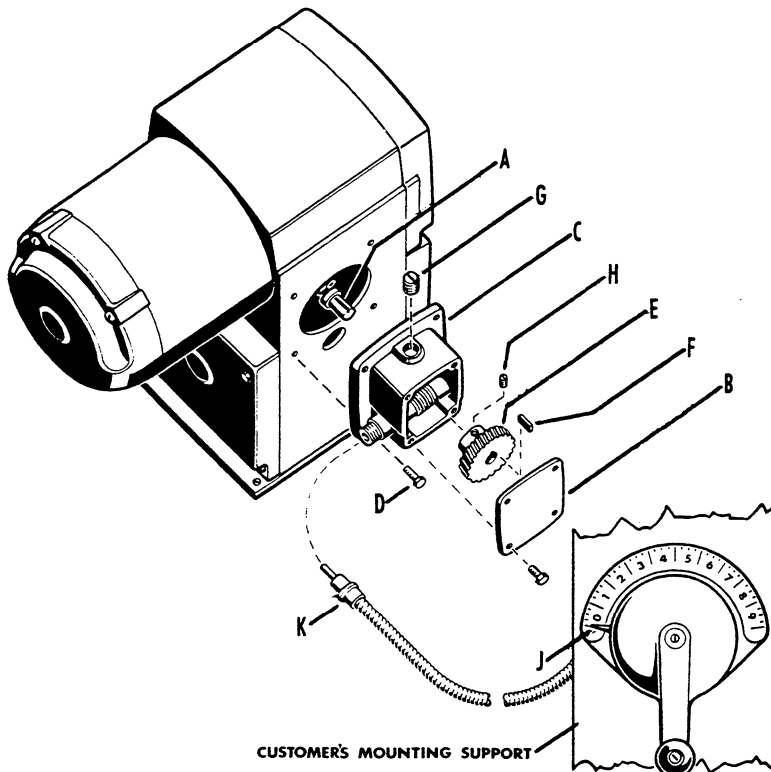


FIGURE 23

1. Start the VARIDRIVE and run to low speed using standard control knob. Stop the VARIDRIVE.
2. Remove control knob assembly from the VARIDRIVE as follows:  
Remove dial plate covering the screws which secure the control knob assembly to the VARIDRIVE; remove all control knob parts except cam shaft "A" and adaptor plate assembly (10 case only – not shown).
3. Remove cover "B" from gear box "C".
4. Mount gear box "C" to VARIDRIVE (thru adaptor plate assembly on 10 case). Before tightening the four (4) screws "D", insure there is no binding of cam shaft against gear box.

5. Install gear "E" on the cam shaft, using square key "F".
6. Remove plug "G" from gear box and tighten set screw "H" through plug hole. Replace plug.
7. Coat gears and partially fill housing with a good grade bearing grease.
8. Replace cover "B".
9. Set pointer "J" on new control at zero and insert driven end of flexible shaft "K" into gear box "C" and tighten coupling.

**Caution:** The flexible shaft should not be bent in a radius of less than 5 inches or beyond 180 degrees and should be secured in at least two places to prevent twisting.

## 6, 10 CASE VARIDRIVE – RIGHT ANGLE REMOTE CONTROL

## Installation Instructions

When right angle remote control is furnished with the VARIDRIVE, the gear box is mounted on the VARIDRIVE frame at the factory. The customer mounts only the control knob assembly and connects the control rod using the procedure below, omitting Step 1 through 4.

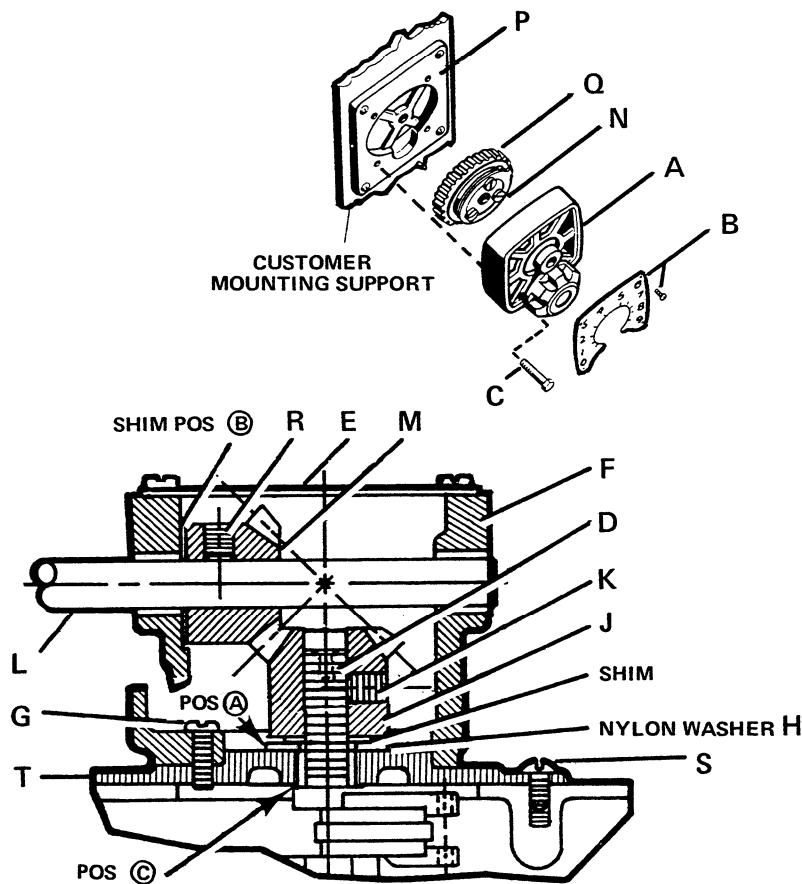


FIGURE 25

When remote controls are furnished separately, the customer must mount the gear box on the VARIDRIVE frame, using the procedure below:

- Remove the control knob assembly from the VARIDRIVE as follows:  
Remove dial plate covering screws which secure the control knob assembly to the VARIDRIVE. Remove all control knob parts except cam shaft "D" and adaptor plate assembly (10 case only – not shown). Note position of speed stop ring "N" in relation to cam shaft. It must be assembled to control rod "L" in the same position.
- Mount adaptor bracket assembly "T" to VARIDRIVE (thru adaptor plate assembly on 10 case). Before tightening the (4) screws "S", insure there is no binding of cam shaft against gear box.
- Remove cover "E" from gear box "F" and mount gear box to adaptor bracket with screws "G".
- Install nylon washer "H" and gear "J" on control shaft. Do not tighten set screw "K".
- Pass control rod "L" into gear box, through gear "M" and into bearing on opposite side of box.
- Adjust driven gear "J" to obtain proper mesh and tighten set screw "K". Shims may be used at position (A).
- Shim at position (B) to limit control rod end play from .002 to .005. Secure gear "M" to control rod by tightening set screw "R".



**6, 10 CASE VARIDRIVE – RIGHT ANGLE REMOTE CONTROL (Cont'd)**

8. Coat gears and partially fill housing with a good grade bearing grease.
9. Using knob control adaptor "P" as a template, drill a 9/16" hole for control rod "L" and (4) mounting holes into the mounting support. Attach control knob adaptor "P" to the mounting support.
10. Pass control rod "L" thru the adaptor "P" and mounting support.
11. Place gear "Q" on control rod "L" observing original position of speed stop ring "N".
12. Assemble control knob assembly "A" to adaptor (P) using (4) screws "C". Replace dial plate "B".

**15 & 25 CASE VARIDRIVE  
UNIVERSAL JOINT, SLEEVE COUPLING AND CHAIN & SPROCKET REMOTE CONTROL****Installation Instructions**

When remote control is furnished separately, it should be assembled per the instructions below. When finished with the VARIDRIVE, omit Steps 1 through 3. See figure 26 and 27.

1. Remove screw "A" and handwheel "B" from VARIDRIVE handwheel assembly.
2. Remove (2) pins "C", (2) springs "D", locking cam "E" and square key "F".
3. Attach dust cover "G" to control housing using (2) pan head screws.
4. Place square key in keyway of control shaft "H" and slide either sleeve coupling, universal joint or sprocket onto control shaft. Tighten set screw.

**Universal Joint and Sleeve Coupling Only –**

5. Insert control rod "J" into open end of Universal joint or sleeve coupling and tighten set screw.

**Chain and Sprocket Only –**

6. Mount pillow block "K" within two inches of chain centerline after determining correct center distance.
7. Pass control rod through pillow block, "K" slide sprocket "L" onto control rod "J" and tighten set screw.
8. Install chain using connecting link provided. Use care not to overtension chain.

**All remote Controls –**

9. Using the remote control housing assembly "M" as a template, drill a 9/16" clearance hole for the control rod and (4) mounting screw holes in the mounting support.
10. Slide sleeve coupling "N" onto control rod "J" and tighten set screw.



**15 & 25 CASE VARIDRIVE**

**UNIVERSAL JOINT, SLEEVE COUPLING AND CHAIN & SPROCKET REMOTE CONTROL (Cont'd)**

11. Place key "F" in keyway of input shaft of remote control housing assembly.
12. Place two springs "D" into holes in locking cam "E". Force pins "C" against springs and slide locking cam onto input shaft.
13. Assemble handwheel "B" to input shaft and secure with screw "A".
14. Turn handwheel to obtain same pointer indication on remote dial as is on VARIDRIVE mounted dial.
15. Insert square key in shaft "P" and pass shaft through hole in mounting support and into sleeve coupling "N".
16. Attach control housing assembly "M" to mounting support with four screws.
17. Tighten set screw in sleeve coupling "N".
18. Start VARIDRIVE and run to minimum speed. Pointer on remote dial should be at zero. If not, stop VARIDRIVE, loosen set screw in sleeve coupling "N" and turn handwheel until pointer indicates zero. Retighten coupling set screw.
19. Start VARIDRIVE and shift to maximum speed. Remove plug in side of control housing "M" and screw in speed stop screw until it bottoms. If maximum speed cannot be obtained, back speed stop screw out and advance handwheel until maximum speed is obtained.





UNIVERSAL JOINT & SLEEVE COUPLING  
REMOTE CONTROL

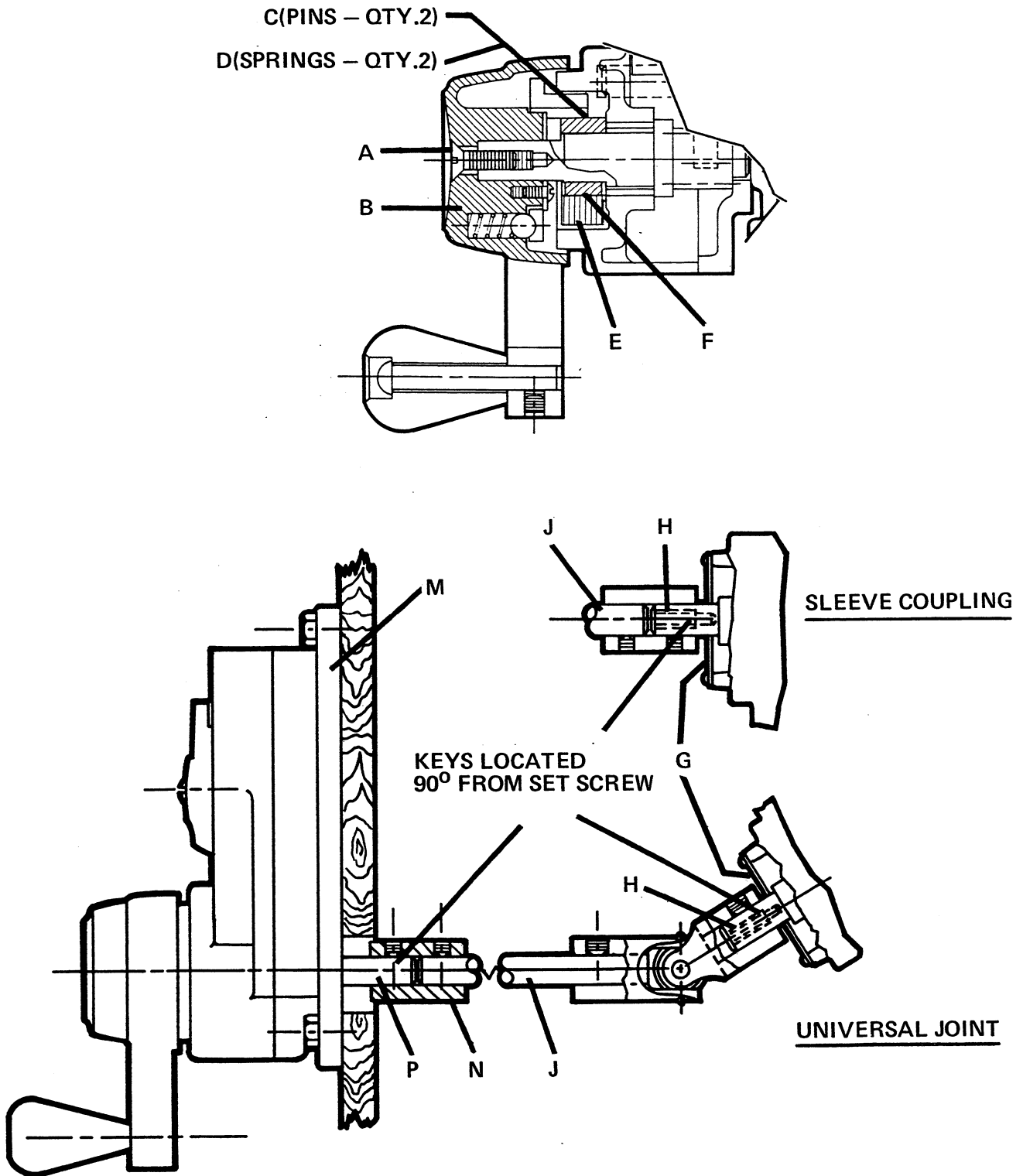


FIGURE 26

CHAIN & SPROCKET REMOTE CONTROL

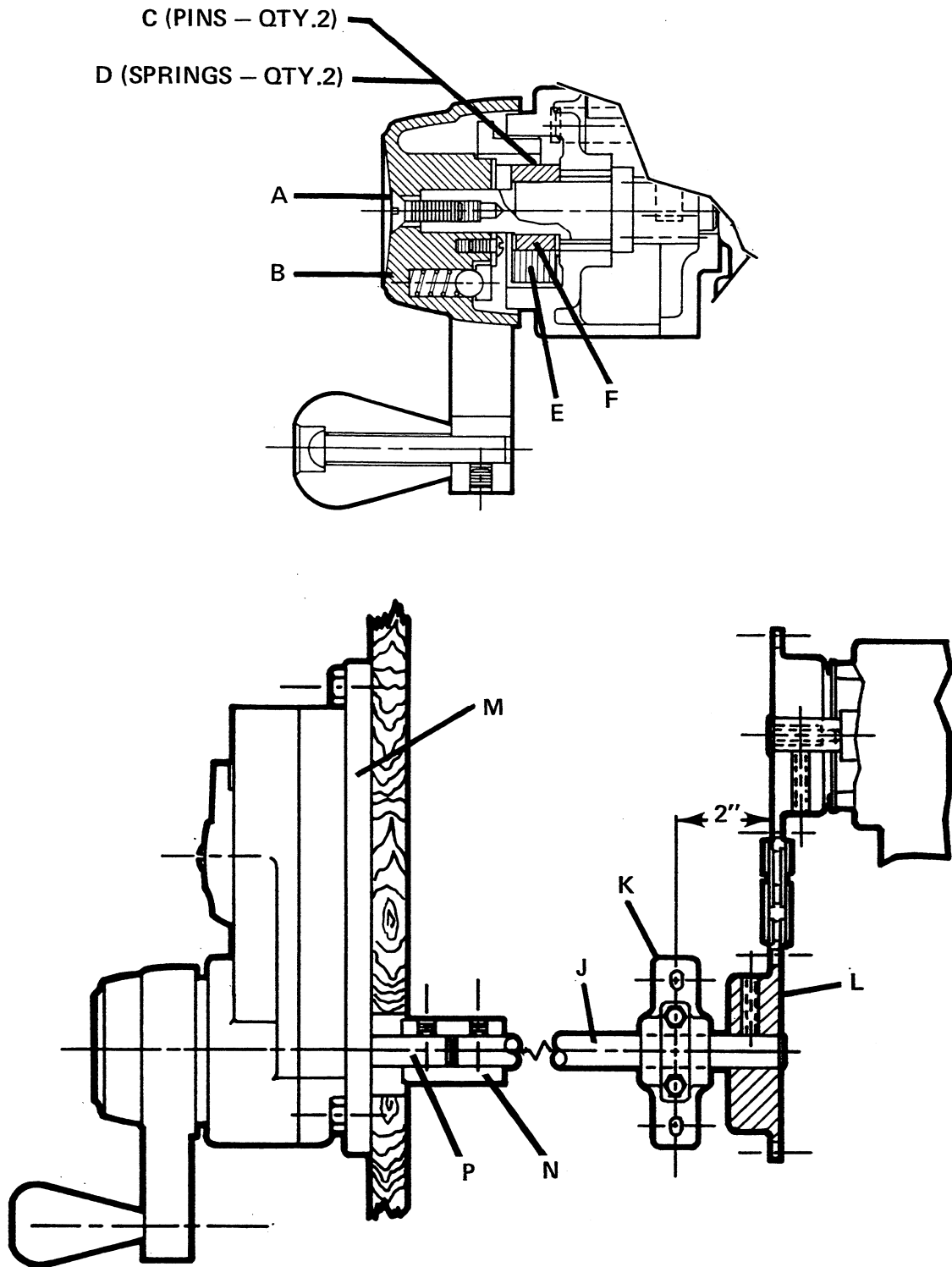


FIGURE 27



## 15 &amp; 25 CASE VARIDRIVE – RIGHT ANGLE REMOTE CONTROL

**Installation Instructions**

When right angle remote control is furnished with the VARIDRIVE, the gear box is mounted on the VARIDRIVE frame at the factory. The customer mounts only the handwheel assembly and connects the control rod using the procedure below, omitting Steps 1 through 4. See figure 28.

When remote control is furnished separately, the customer must mount the gear box on the VARIDRIVE frame using the procedure below:

1. Remove screw "A" and handwheel "B" from VARIDRIVE handwheel assembly.
2. Remove (2) pins "C", (2) springs "D", locking cam "E" and square key "F".
3. Assemble gear housing "G" to control housing.
4. Place square key in shaft "H" and slide gear "R" onto shaft. Do not tighten set screw.
5. Pass control rod "J" into gear box, through gear "S" and into bearing on opposite side of box.
6. Adjust driven gear "R" to obtain proper mesh and tighten set screw. Shims may be used at position (A).
7. Shim at position (B) to limit control rod end play from .002 to .005. Secure gear "S" to control rod by tightening set screw.
8. Coat gears and partially fill housing with a good grade bearing grease.
9. Attach cover "T" to gear housing.
10. Using the remote control housing assembly "M" as a template, drill a 9/16" clearance hole for the control rod and (4) mounting screw holes in the mounting support.
11. Slide sleeve coupling "N" onto control rod "J" and tighten set screw.



### 15 & 25 CASE VARIDRIVE – RIGHT ANGLE REMOTE CONTROL (Cont'd)

12. Place key "F" in keyway of input shaft of remote control housing assembly.
13. Place two springs "D" into holes in locking cam "E". Force pins "C" against springs and slide locking cam onto input shaft.
14. Assemble handwheel "B" to input shaft and secure with screw "A".
15. Turn handwheel to obtain same pointer indication on remote dial as is on VARIDRIVE mounted dial.
16. Insert square key in shaft "P" and pass shaft through hole in mounting support and into sleeve coupling "N".
17. Attach control housing assembly "M" to mounting support with four screws.
18. Tighten set screw in sleeve coupling "N".
19. Start VARIDRIVE and run to minimum speed. Pointer on remote dial should be at zero. If not, stop VARIDRIVE, loosen set screw in sleeve coupling "N" and turn handwheel until pointer indicates zero. Retighten coupling set screw.
20. Start VARIDRIVE and shift to maximum speed. Remove plug in side of control housing "M" and screw in speed stop screw until it bottoms. If maximum speed cannot be obtained, back speed stop screw out and advance handwheel until maximum speed is obtained.



15 & 25 CASE – RIGHT ANGLE REMOTE CONTROL

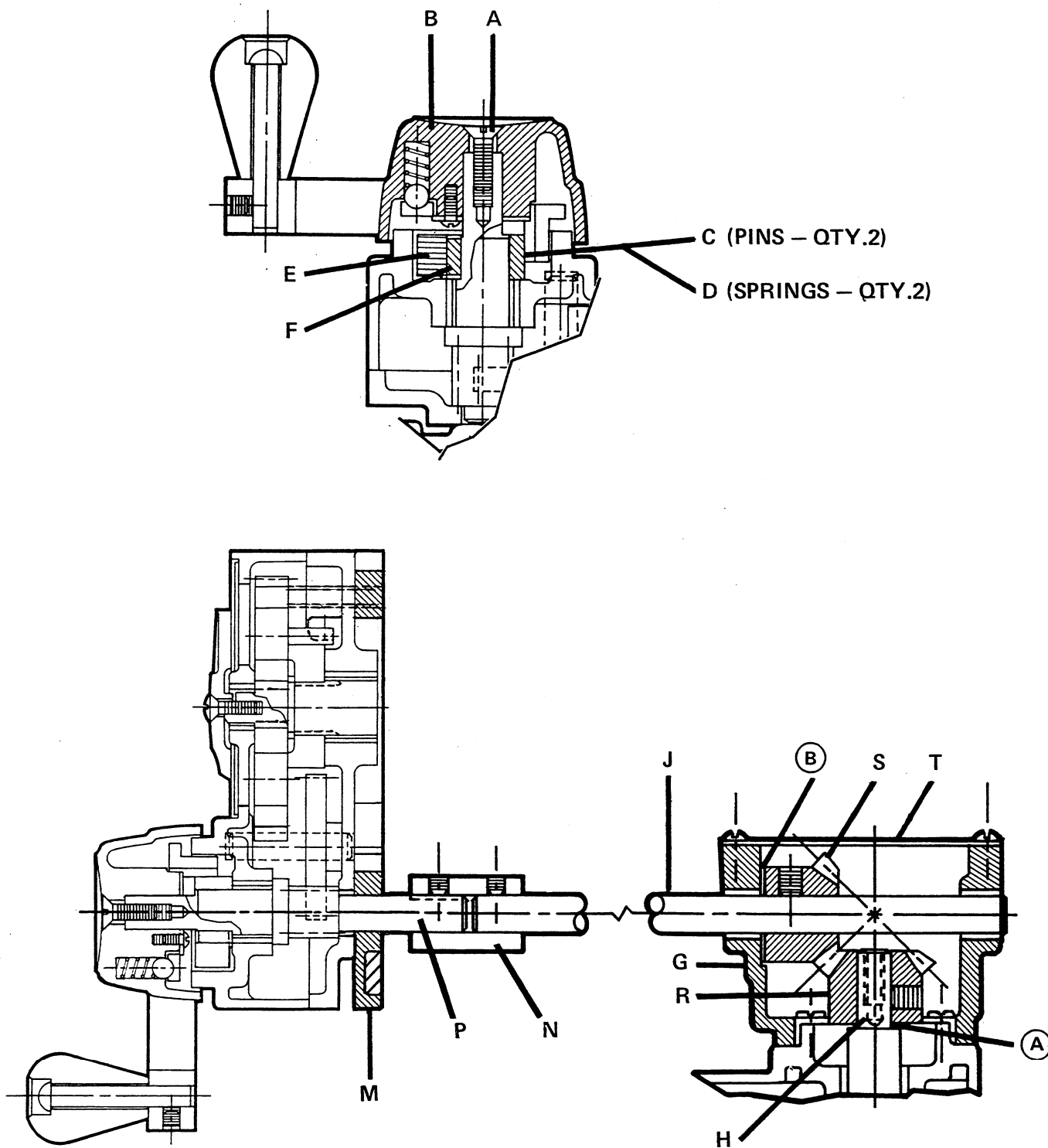


FIGURE 28



**23, 44, 55, 65, 70, 84 CASE VARIDRIVES  
UNIVERSAL JOINT, SLEEVE COUPLING AND CHAIN & SPROCKET REMOTE CONTROL**

**Installation Instructions**

When remote control is furnished separately, it should be assembled per the instructions below. When furnished with the VARIDRIVE, omit Steps 1 through 5. See Figures 29 and 30.

1. Remove screw "A", handwheel "B", felt washer "C" and pointer ring gear "D".
2. Remove (4) screws "E", dial plate "F", cam housing "G", locking pins "H" and springs "J".
3. Remove lockring "K", locking cam "L" and square key "M";
4. Use lockring "K" to secure bearing "N".
5. Attach clamping plate "P" to VARIDRIVE with (4) screws.
6. Place Universal joint, sleeve coupling or sprocket on VARIDRIVE control shaft and tighten set screw.

**Chain and Sprocket Remote Control Only —**

7. Mount pillow block "S" within two inches of chain centerline after determining correct center distance.

**All Remote Controls —**

8. Using handwheel adaptor "Q" as a template, drill 7/8" clearance hole for control rod "R" and (4) holes for mounting screws. Mount the handwheel adaptor to the mounting support.
9. Install snap ring "T" and bearing "U" on control rod "R".



**23, 44, 55, 65, 70, 84 CASE VARIDRIVES**

**UNIVERSAL JOINT, SLEEVE COUPLING AND CHAIN & SPROCKET REMOTE CONTROL (Cont'd)**

Universal Joint or Sleeve Coupling Only –

10. Pass control rod "R" through handwheel adaptor and mounting support and into universal joint or sleeve coupling. Make sure bearing "U" is seated against shoulder of adaptor and tighten set screw.

Chain and Sprocket Only –

11. Pass control rod "R" through handwheel adaptor, mounting support and pillow block. Install sprocket "V" on control rod and tighten set screw.
12. Install chain using connecting link provided to join ends. Use care not to overtension chain.

All Remote Controls –

13. Place square key "M" in control rod keyway.
14. Insert locking cam "L" into cam housing "W". (NOTE: This is not same cam housing removed earlier).
15. Insert (2) springs "J" into holes in locking cam.
16. Depress springs and slide locking pins "H" into cam housing in front of springs.
17. Slide the locking cam sub-assembly onto the control rod so the square key "M" engages the locking cam keyway. Place lock ring "X" in the control rod groove in front of the locking cam.
18. Rotate the cam housing to line up the mounting holes. Place dial plate "F" over the cam housing and secure with (4) screws.
19. Temporarily slide handwheel "B" onto the control rod. Start the VARIDRIVE and run to minimum speed. Stop the VARIDRIVE and remove handwheel.
20. Install pointer ring gear "D" with pointer at zero.
21. Lubricate all gear teeth and partially fill housing with a good grade bearing grease.
22. Fit felt washer "C" into groove in handwheel, slide handwheel onto control rod and secure with screw "A".



23, 44, 55, 65, 70 CASE VARIDRIVES  
UNIVERSAL JOINT, SLEEVE COUPLING and CHAIN & SPROCKET REMOTE CONTROLS

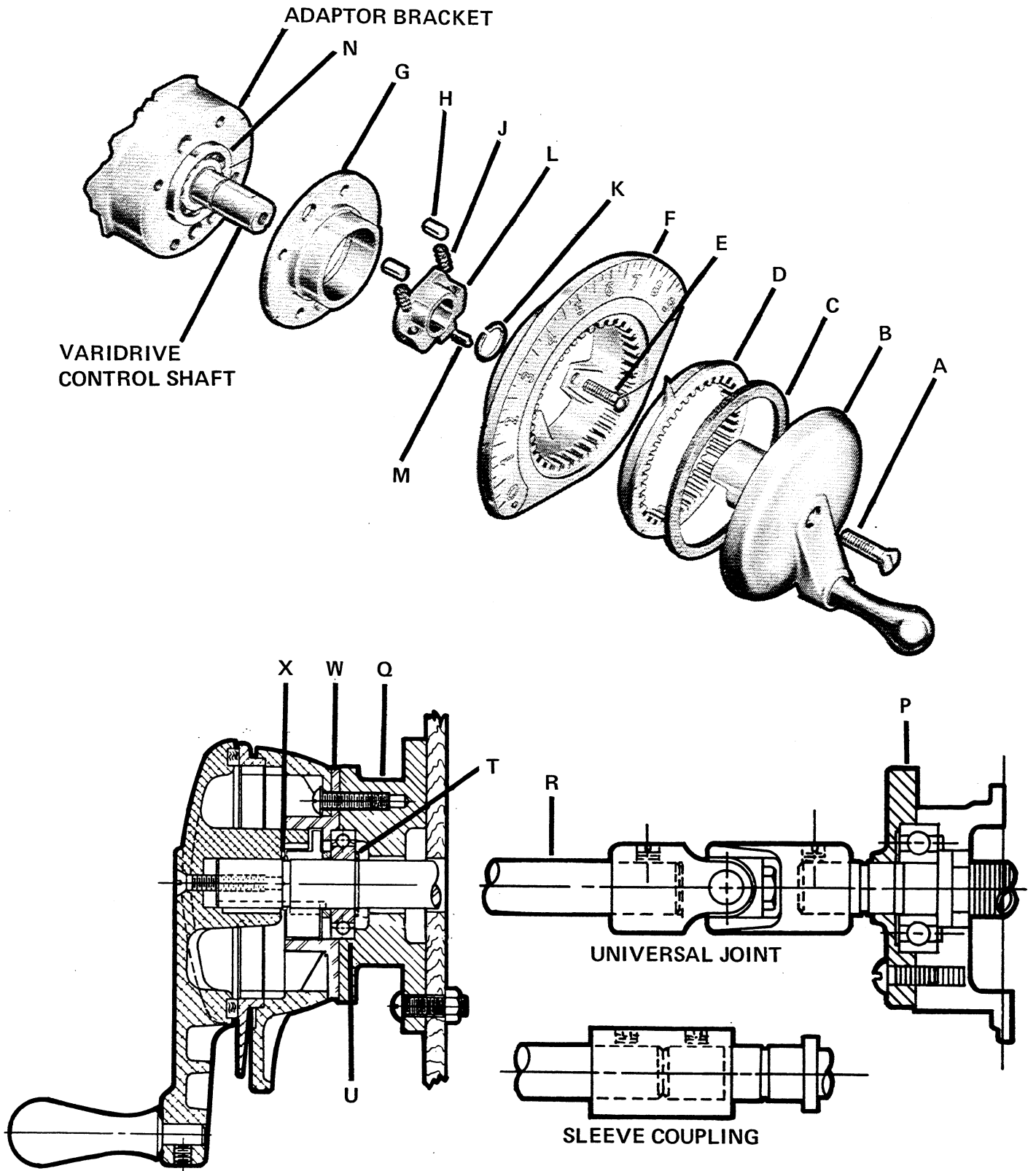
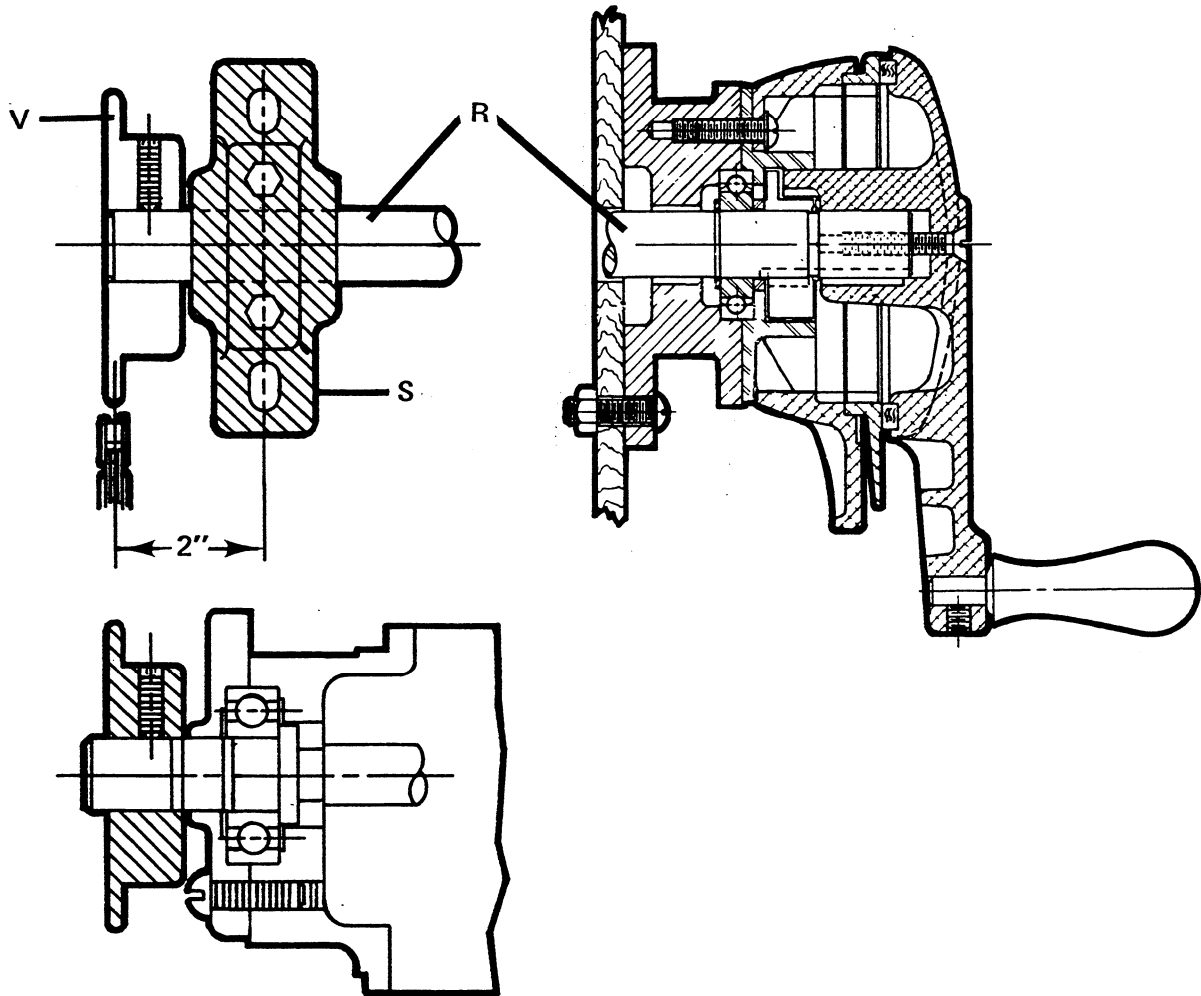


FIGURE 29





CHAIN & SPROCKET REMOTE CONTROL

FIGURE 30



### 23, 44, 55, 65, 70, 84 CASE VARIDRIVES – RIGHT ANGLE REMOTE CONTROL

#### Installation Instructions

When right angle remote control is furnished with the VARIDRIVE, the gear box is mounted on the VARIDRIVE frame at the factory. The customer mounts only the handwheel assembly and connects the control rod using the procedure below, omitting Steps 1 through 7. See Figure 31.

When remote control is furnished separately, the customer must mount the gear box on the VARIDRIVE frame, using the procedure below:

1. Remove screw "A", handwheel "B", felt washer "C" and pointer ring gear "D".
2. Remove (4) screws "E", dial plate "F", cam housing "G", locking pins "H" and springs "J",
3. Remove lockring "K" locking cam "L" and square key "M".
4. Using lockring "K" to secure bearing "N".
5. Assemble gear housing "P" to frame case using (4) screws.
6. Slide spacing collar "Q" onto control shaft "R".
7. Slide gear "S" onto control shaft. Do not tighten set screw.
8. Using handwheel adaptor "Z" as a template, drill 7/8" clearance hole for control rod "U" and (4) holes for mounting screws. Mount the handwheel adaptor to the mounting support.
9. Pre-lubricate bearings "T" using a recommended bearing grease.
10. Install snap ring "AA" and bearing "BB" on control rod "U".



## 23, 44, 55, 65, 70, 84 VARIDRIVES – RIGHT ANGLE REMOTE CONTROL (Cont'd)

11. Pass end of control rod "U" thru handwheel adaptor "Z", mounting support, clamping plate "V", first bearing "T", spacer "DD" and second bearing "T".
12. Insert control rod and bearings into gear housing and slide gear "X" onto control rod. Secure clamping plate "V" to gear housing with (4) screws. Press gear "X" against bearing and tighten set screw. Bearing "BB" must be seated in handwheel adaptor.
13. Adjust gear "S" to obtain proper gear mesh and tighten set screw. Shims may be used between gear "S" and spacing collar "Q".
14. Coat gears and partially fill housing with a good grade bearing grease.
15. Attach cover "Y" to gear housing.
16. Place square key "M" in control shaft keyway.
17. Insert locking cam "L" into cam housing "W". (NOTE: This is not same cam housing removed earlier.)
18. Insert (2) springs "J" into holes in locking cam.
19. Depress springs and slide locking pins "H" into cam housing in front of springs.
20. Slide the locking cam sub-assembly onto the control shaft so the square key "M" engages the locking cam keyway. Place lock ring "CC" in the control shaft groove in front of the locking cam.
21. Rotate the cam housing to line up the mounting holes. Place dial plate "F" over the cam housing and secure with (4) screws.
22. Temporarily slide handwheel "B" onto the control shaft. Start the VARIDRIVE and run to minimum speed. Stop the VARIDRIVE and remove handwheel.
23. Install pointer ring gear "D" with pointer at zero.
24. Lubricate all gear teeth and partially fill housing with a good grade bearing grease.
25. Fit felt washer "C" into groove in handwheel, slide handwheel onto control shaft and secure with screw "A".

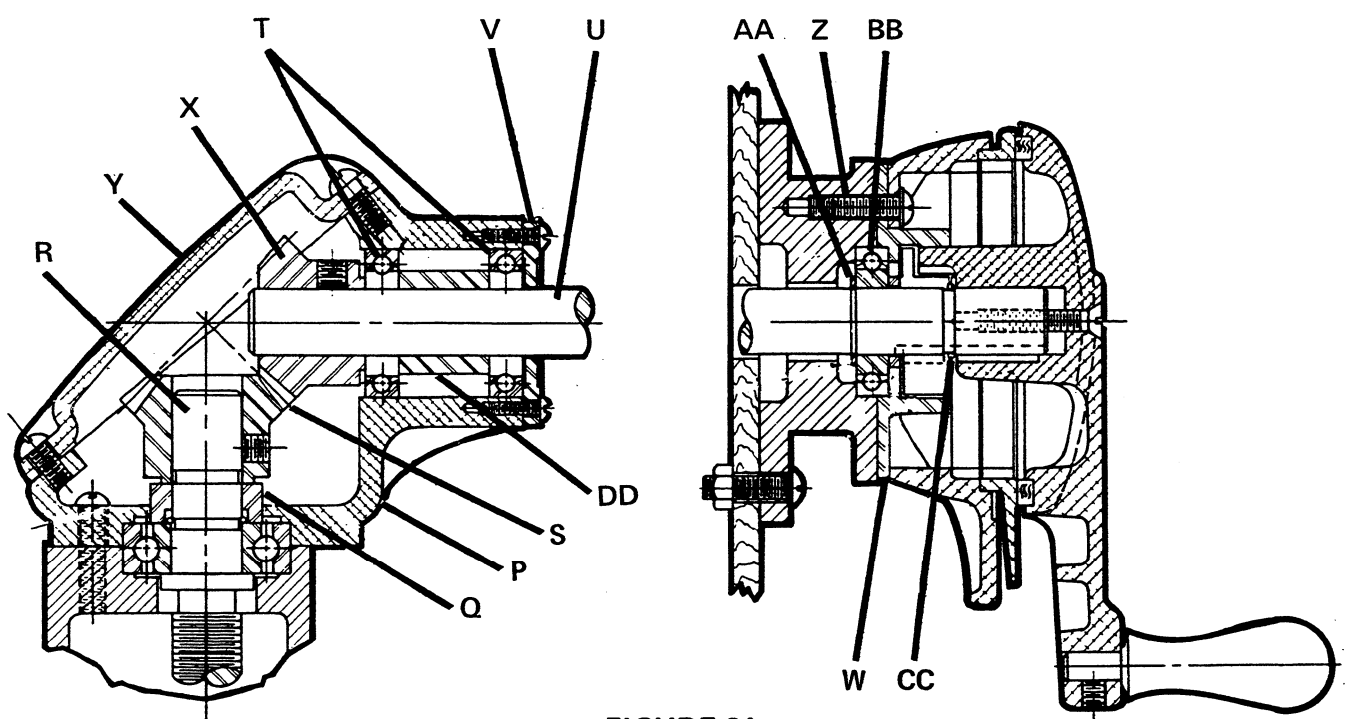
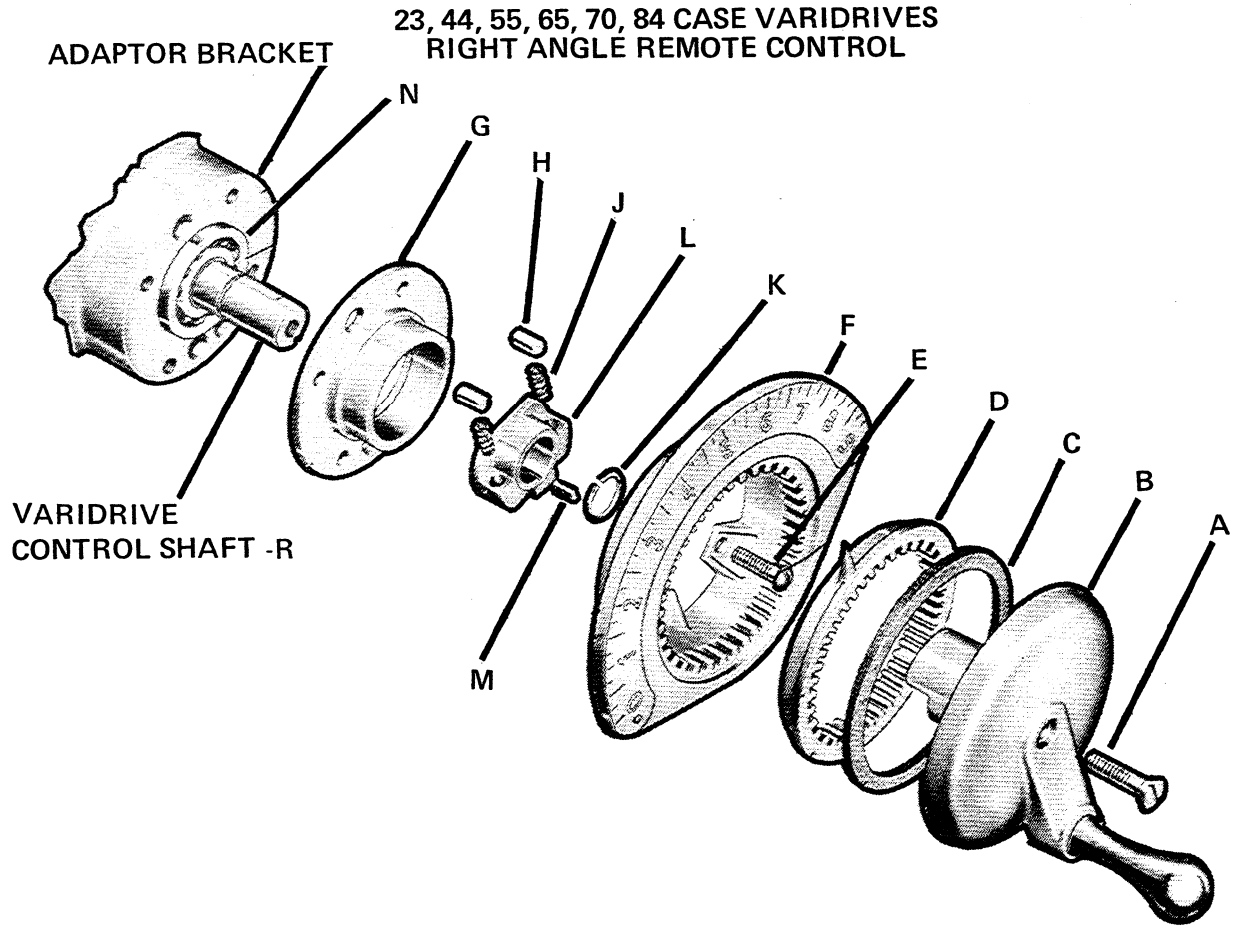


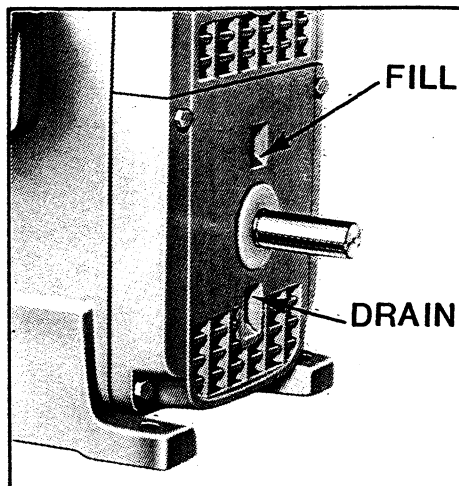
FIGURE 31



Refer to the Lubrication Instruction Plates located on the VARIDRIVE transmission and on the gear head when a geared take-off shaft is supplied.

1. Grease all points indicated periodically as recommended. Follow instructions given on the instruction plate on the VARIDRIVE frame.
2. Use the proper type and weight of oil as indicated on the plate on the gear frame case.
  - A. Fill gear unit with oil before operating.
  - B. Fill to proper oil level. An oil level plate may be found at one of the pipe plug locations on the gear frame. If no plate is evident follow instruction sheet or tag furnished with drive.
  - C. Change oil twice a year or every 2500 hours, whichever occurs first.
3. Generally, unless otherwise indicated on the instruction plates;
  - A. Regrease bearings at least once each year, more often if the application is damp, or dusty. (Sealed bearings are lubricated for life and require no further greasing — the instruction tag will show you bearing locations requiring periodic regreasing.)
  - B. If unit is used more than 8 hours per day regrease bearings at least twice yearly.
  - C. Grease VARIDRIVE shafts (frames 65, 70 and 84) monthly (bi-weekly if operated more than 8 hours per day). Use care to avoid overgreasing, since excess grease will throw out onto the belt and disc faces.
  - D. Run the drive over its entire speed range AT LEAST ONCE EACH WEEK to maintain lubrication of the shafts.
  - E. Lubricate handwheel linkage at least twice each year for minimum wear and continued smooth operation.

Careful maintenance and lubrication will keep your drive in best condition and give you optimum life along with reduced repairs and repair expense.



| SUGGESTED REGREASING INTERVALS |   |         |        |
|--------------------------------|---|---------|--------|
| SERVICE                        | MOTOR HORSEPOWER  |         |        |
|                                | 15-50   | 60-100  | 100 Up |
| A                              | 1-2 Yrs   | 1-2 Yrs | 1 Yr   |
| B                              | 1 Yr  | 1 Yr    | 6 Mos  |
| C                              | 1 Yr  | 6 Mos   | 3 Mos  |
| D                              | 4 Mos   | 3 Mos   | 3 Mos  |
| SERVICE SYMBOL                 | TYPES OF SERVICE  |         |        |
| A                              | Infrequent operation or light duty in clean atmosphere                                    |         |        |
| B                              | 8-16 Hrs/Day in clean, relatively dry atmosphere  |         |        |
| C                              | 12-24 Hrs/Day, heavy duty, or if moisture is present                                      |         |        |
| D                              | Heavy duty in dirty, dusty locations; high ambients; moisture laden atmosphere; vibration |         |        |



**OIL CAPACITY and TYPES OF GEARING  
FOR U.S. SYNCROGEARS & U.S. VARIDRIVE-SYNCROGEARS**

**RIGHT ANGLE WORM SYNCROGEAR UNITS**

| FRAME SIZE | TYPES        | REDUCTION | APPROXIMATE OIL QUANTITY<br>IN U.S. QUARTS |
|------------|--------------|-----------|--|
| 1          | GW, GWO, GWV | 1         | 3/4  |
| 6          | GW, GWO, GWV | 1         | 1  |
| 6          | GWB          | 2         | 1-1/4                                      |
| 10         | GWB          | 2         | 2  |
| 11         | GW, GWV      | 1         | 2  |
| 20         | GW, GWV      | 1         | 3-1/2                                      |
| 11         | GWB          | 2         | 2  |
| 20         | GWB          | 2         | 4  |

**PARALLEL SHAFT HELICAL GEAR SYNCROGEAR UNITS**

| FRAME SIZE | TYPES        | REDUCTION | APPROXIMATE OIL CAPACITY<br>IN U.S. QUARTS |
|------------|--------------|-----------|--|
| 5          | GR           | 1         | 1/8  |
| 5          | GD, GDO, GDF | 2         | 1  |
| 10         | GH, GS       | 1         | 1/8  |
| 11         | GH           | 1         | 1/8  |
| 21         | GD, GDO, GDF | 2         | 4  |
| 21         | GH           | 1         | 1/4  |
| 22         | GH           | 1         | 1/4  |
| 30         | GD, GDO, GDF | 2         | 4-1/2                                      |
| 30         | GDV          | 2         | 7  |
| 31         | GS           | 1         | 1/4  |
| 40         | GD, GDO, GDF | 2         | 12   |
| 40         | GDV          | 2         | 14   |
| 41         | GH           | 1         | 3/8  |
| 41         | GL, GLO, GLF | 2         | 12   |
| 41         | GS           | 1         | 1-1/4                                      |
| 41         | GM, GMO, GMF | 3         | 16   |
| 42         | GH           | 1         | 3/8  |
| 50         | GH           | 1         | 1  |
| 50         | GD, GDO, GDF | 2         | 18   |
| 50         | GL, GLO, GLF | 2         | 18   |
| 50         | GM, GMO, GMF | 3         | 24   |
| 50         | GR, GS       | 1         | 2  |
| 51         | GDV, GLV     | 2         | 19   |
| 60         | GB           | 1         | 16   |
| 60         | GR           | 1         | 6-1/2                                      |
| 61         | GD, GDO, GDF | 2         | 24   |
| 61         | GL, GLO, GLF | 2         | 24   |
| 61         | GLV          | 2         | 44   |
| 61         | GM, GMO, GMF | 3         | 36   |
| 61         | GMV          | 3         | 44   |
| 70         | GD, GDO, GDF | 2         | 56   |
| 70         | GM, GMO, GMF | 3         | 48   |
| 70         | GMV          | 3         | 44   |



MANY COMPANIES HAVE SCHEDULED MAINTENANCE PROGRAMS IN WHICH EQUIPMENT IS PERIODICALLY CHECKED. THE PROGRAMS EXTEND EQUIPMENT LIFE AND KEEP THE COST OF REPAIRS AT A MINIMUM.

USERS RECOGNIZE THAT ENDOLUBE® RELIEVES THEM OF THE EXPENSE OF DAY-TO-DAY LUBRICATION MAINTENANCE. THEY ALSO RECOGNIZE THAT MECHANICAL PARTS WEAR, AND THAT THEY MUST BE REPLACED AT SOME POINT IN TIME. THE ATTACHED CHARTS GIVE THE POINTS AT WHICH VARIDRIVE® MAINTENANCE SHOULD BE SCHEDULED.

THE TABLE ON PAGE 47 SHOWS WEAR DIMENSIONS FOR ROTATIONAL AND RADIAL LOOSENESS. FIGURE 48 OUTLINES INSTRUCTIONS ON HOW TO MEASURE ROTATIONAL LOOSENESS AND THEREBY DETERMINE THE AMOUNT OF KEY WEAR. FIGURE 2 ON PAGE 48 OUTLINES INSTRUCTIONS ON HOW TO MEASURE RADIAL LOOSENESS AND DETERMINE THE AMOUNT OF BUSHING WEAR.

WHEN THE ENDOLUBE KEYS AND BUSHINGS HAVE REACHED THE OPTIMUM REPAIR POINT, PARTS SHOULD BE ORDERED AND "DOWN" TIME SCHEDULED FOR REPAIR. WHEN THE KEYS AND BUSHINGS PASS THE MAXIMUM SAFE WEAR POINT, OTHER PARTS MAY REQUIRE REPLACEMENT.



**ENDOLUBE WEAR INSPECTION DIMENSIONS**

| VARIDRIVE<br>FRAME | VARIDISC® | KEY<br>DESIGN | ROTATIONAL LOOSENESS<br>(SEE FIGURE 1) |                      | RADIAL LOOSENESS<br>(SEE FIGURE 2) |                      |
|--------------------|-----------|---------------|--|----------------------|------------------------------------|----------------------|
|                    |           |               | OPTIMUM<br>REPAIR<br>POINT             | MAXIMUM<br>SAFE WEAR | OPTIMUM<br>REPAIR<br>POINT         | MAXIMUM<br>SAFE WEAR |
| 1                  | Driver    | Square        | 5/32                                   | 1/4                  | .044                               | .088                 |
|                    | Driven    | Square        | 5/32                                   | 1/4                  | .044                               | .088                 |
| 6                  | Driver    | Square        | 7/32                                   | 11/32                | .046                               | .088                 |
|                    |           | "V"           | 11/32                                  | 17/32                | .045                               | .084                 |
|                    | Driven    | Square        | 3/16                                   | 5/16                 | .048                               | .088                 |
|                    |           | "V"           | 3/8                                    | 9/16                 | .046                               | .086                 |
| 10                 | Driver    | "V"           | 13/32                                  | 19/32                | .050                               | .093                 |
|                    | Driven    | "V"           | *7/16                                  | *5/8                 | *.055                              | *.102                |
| 14                 | Driver    | Square        | 7/32                                   | 11/32                | .034                               | .066                 |
|                    | Driven    | Square        | 3/16                                   | 5/16                 | .040                               | .072                 |
| 15                 | Driver    | Square        | 7/32                                   | 11/32                | .042                               | .080                 |
|                    |           | "V"           | 11/32                                  | 17/32                | .032                               | .062                 |
|                    | Driven    | Square        | 7/32                                   | 11/32                | .046                               | .084                 |
|                    |           | "V"           | 5/16                                   | 1/2                  | .046                               | .084                 |
| 23                 | Driver    | Square        | 7/32                                   | 11/32                | .038                               | .072                 |
|                    |           | "V"           | 5/16                                   | 1/2                  | .038                               | .072                 |
|                    | Driven    | Square        | 7/32                                   | 11/32                | .044                               | .084                 |
|                    |           | "V"           | 3/8                                    | 9/16                 | .042                               | .078                 |
| 25                 | Driver    | "V"           | 11/32                                  | 17/32                | .035                               | .066                 |
|                    | Driven    | "V"           | *11/32                                 | *17/32               | *.040                              | *.075                |
| 44                 | Driver    | Square        | 5/16                                   | 1/2                  | .048                               | .088                 |
|                    |           | "V"           | 3/8                                    | 9/16                 | .048                               | .088                 |
|                    | Driven    | Square        | 9/32                                   | 15/32                | .054                               | .098                 |
|                    |           | "V"           | 11/32                                  | 17/32                | .051                               | .096                 |
| 54                 | Driver    | Square        | 5/16                                   | 17/32                | .048                               | .088                 |
|                    | Driven    | Square        | 9/32                                   | 15/32                | .054                               | .098                 |
| 55                 | Driver    | "V"           | 5/16                                   | 1/2                  | .048                               | .088                 |
|                    | Driven    | "V"           | 11/32                                  | 17/32                | .051                               | .096                 |

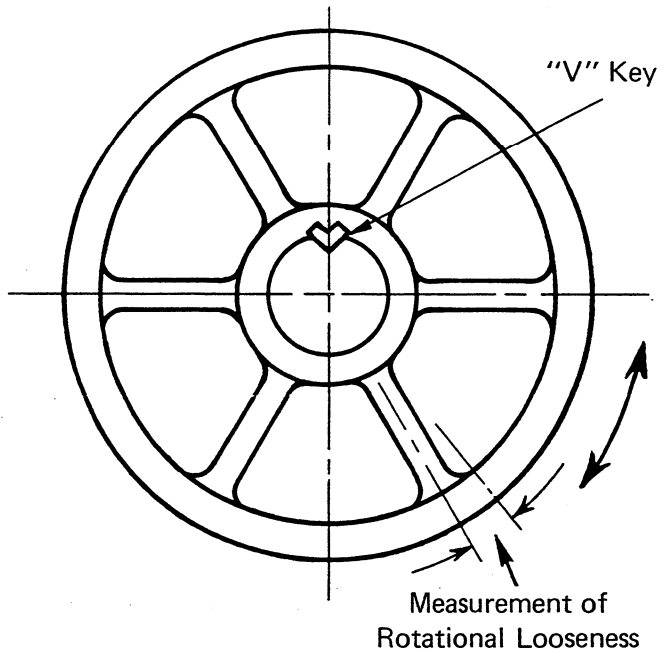
\*Measurement at maximum VARIDISC radius, not at flats.

NOTE: Dimensions shown are as measured at VARIDISC O.D. as shown in Figures 1 and 2.

Optimum shaft replacement point = .002 wear per inch of shaft diameter.



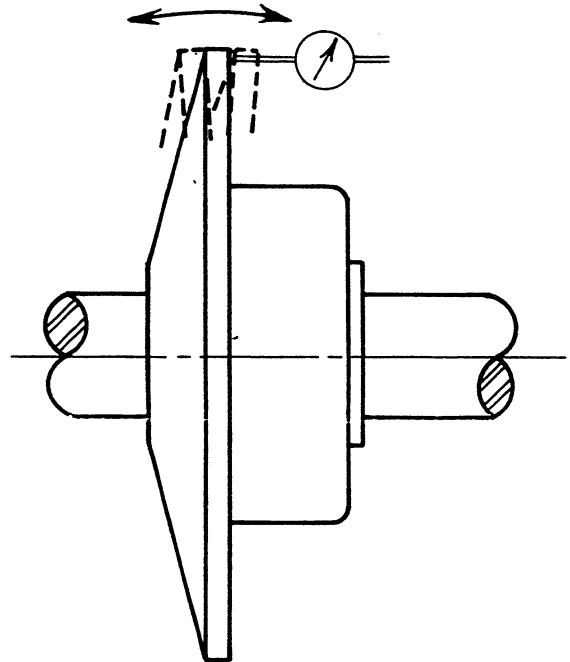
**FIGURE 1**  
**ROTATIONAL LOOSENESS**



**INSTRUCTIONS:**

1. Inscribe reference mark on VARIDISC outside diameter.
2. Hold shaft stationary.
3. Rotate VARIDISC counter-clockwise as far as possible.
4. Rotate VARIDISC clockwise as far as possible and measure distance the reference mark moves.
5. Compare distance with dimensions given on data sheet.
6. Replace parts if recommended limits are exceeded.

**FIGURE 2**  
**RADIAL LOOSENESS**



**INSTRUCTIONS:**

1. Cock the VARIDISC on shaft as shown in diagram, first in one direction and then in the opposite direction.
2. Measure total distance the VARIDISC rim moves. Measure as close to outside diameter as possible.
3. Compare distance with dimensions given on data sheet.
4. Replace parts if recommended limits are exceeded.



**PARTS ORDERING INSTRUCTIONS**

YOUR DRIVE HAS A NAMEPLATE MOUNTED ON THE MOTOR FRAME WHICH GIVES COMPLETE INFORMATION FOR THE DRIVE. WHENEVER PARTS ARE ORDERED THE FOLLOWING INFORMATION IS REQUIRED.

|                    |   |
|--------------------|---|
| HP                 | MOTOR RPM   |
| FRAME SIZE         | OUTPUT RPM, MAX.  |
| TYPE               | OUTPUT RPM MIN.   |
| PHASE              | GEAR RATIO (IF UNIT IS FURNISHED<br>WITH A GEARED OUTPUT) |
| FREQUENCY          | SERIAL NO.  |
| VOLTAGE            | AND/OR MODEL NO. OR I.D. NO.                              |
| NEMA DESIGN LETTER |   |

A REPAIR PARTS LIST MAY BE OBTAINED SHOWING THE PARTS BREAKDOWN FOR YOUR DRIVE. IN ORDERING PARTS FURNISH COMPLETE DRIVE INFORMATION AND FROM THE REPAIR PARTS LIST GIVE THE FOLLOWING FOR QUICK, ACCURATE PART IDENTIFICATION AND REPLACEMENT.

ITEM NUMBER  
DESCRIPTION OF PART  
PAGE AND SECTION NO. OF  
THE PARTS LIST  
DATE OF PARTS LIST

THE U.S. VARIBELT IS DESIGNED EXPRESSLY FOR YOUR PARTICULAR U.S. VARIDRIVE. USE OF ANY BELT OTHER THAN A U.S. VARIBELT CAN SERIOUSLY AFFECT THE PERFORMANCE, CAPACITY AND LIFE OF YOUR U.S. VARIDRIVE.

REPLACEMENT VARIBELTS OR PARTS CAN BE ORDERED THROUGH LOCAL DISTRIBUTORS, LOCAL U.S. SALES OFFICES OR THROUGH OUR MAIN PARTS DISTRIBUTION CENTER LOCATED AT:

U.S. ELECTRICAL MOTORS  
3363 MIAC COVE  
MEMPHIS, TN 38118  
PHONE (901)367-5918  
FAX (901)366-4225

# INSTALLATION RECORD

## NAMEPLATE & INSTALLATION INFORMATION

SERIAL NUMBER ..... \_\_\_\_\_  
HP ..... \_\_\_\_\_  
MOTOR R.P.M. .... \_\_\_\_\_  
PHASE ..... \_\_\_\_\_  
FREQUENCY ..... \_\_\_\_\_  
AMPS ..... \_\_\_\_\_ AT ..... VOLTS  
DESIGN ..... \_\_\_\_\_  
GEAR RATIO ..... \_\_\_\_\_  
OUTPUT R.P.M. .... \_\_\_\_\_ MAX.  
  \_\_\_\_\_ MIN.  
FRAME ..... \_\_\_\_\_  
TYPE ..... \_\_\_\_\_  
U.S. VARIBELT NO. .... \_\_\_\_\_  
DATE PURCHASED ..... P.O. NUMBER .....  
DATE INSTALLED ..... \_\_\_\_\_  
LOCATION OR JOB SITE ..... \_\_\_\_\_  
MACHINE OR INSTALLATION NUMBER ..... \_\_\_\_\_  
PURCHASED FROM ..... \_\_\_\_\_

## RECORD OF MAINTENANCE

GRADE & TYPE OF OIL USED .....

| DATE OF LAST OIL CHANGE |  | DATE LAST REGREASED |  | DATE OF LAST OVERHAUL OR REPAIR |  |
|-------------------------|--|---------------------|--|---------------------------------|--|
|                         |  |                     |  |                                 |  |
|                         |  |                     |  |                                 |  |
|                         |  |                     |  |                                 |  |
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