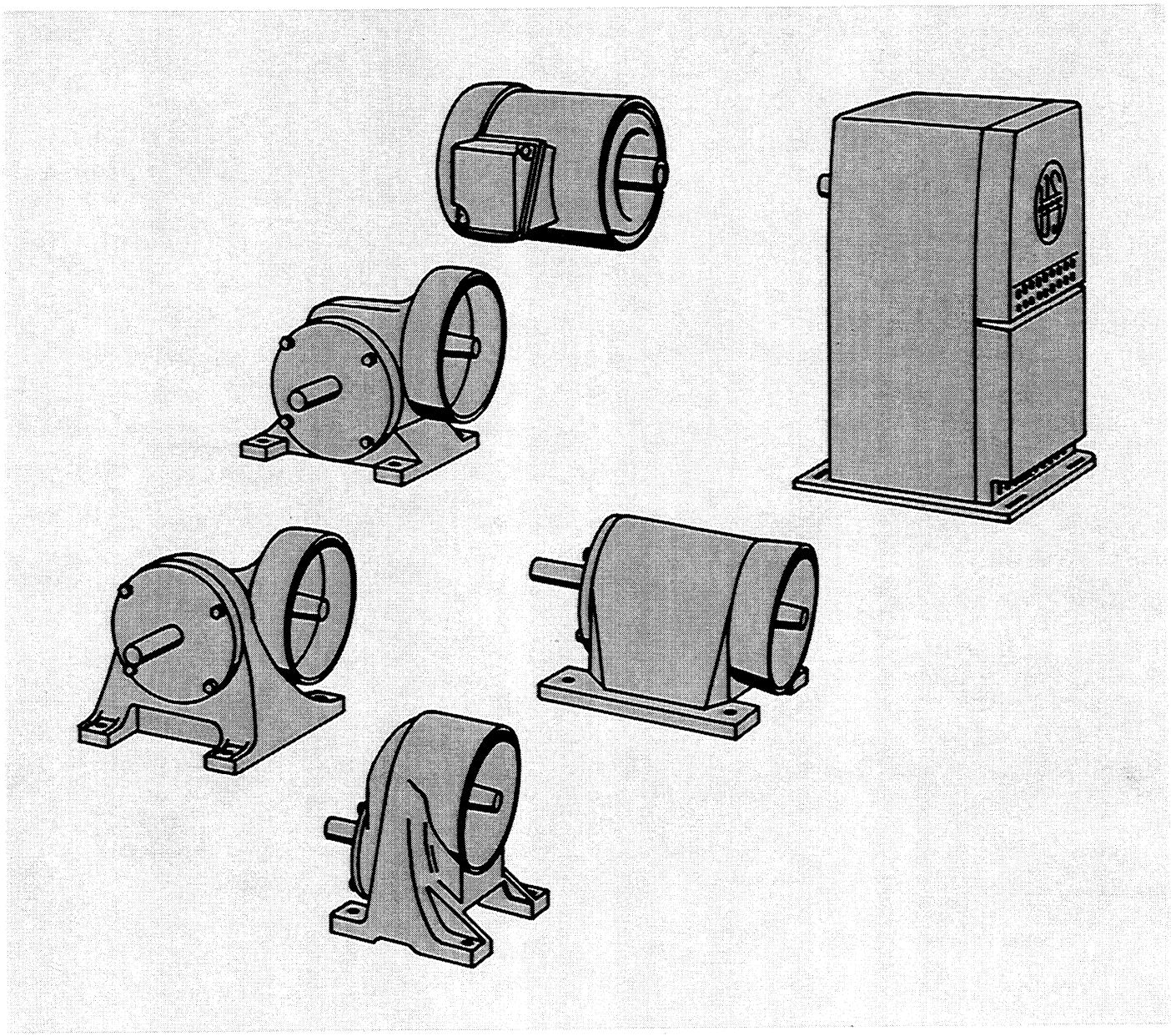
MODULAR PRODUCTS



MODULAR PRODUCTS
ASSEMBLY INSTRUCTIONS

USMOTORS
DRIVEN BY YOUR SUCCESS

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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. DISCONNECT ALL POWER TO MOTOR PRIOR TO INITIATING ANY MAINTENANCE OR REPAIRS.
2. AVOID CONTACT WITH ROTATING PARTS.
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 ELECTRICTIANS.
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. ALWAYS BE SURE OIL LUBRICATED UNITS ARE FILLED WITH CORRECT OIL TO PROPER LEVEL BEFORE OPERATING.
8. PROVIDE PROPER SAFEGUARDS FOR PERSONNEL AGAINST ROTATING PARTS AND APPLICATIONS INVOLVING HIGH INERTIA LOADS WHICH CAN CAUSE OVERSPEED.
9. AVOID EXTENDED EXPOSURE TO EQUIPMENT WITH HIGH NOISE LEVELS.
10. OBSERVE GOOD SAFETY HABITS AT ALL TIMES AND USE CARE TO AVOID INJURY TO YOURSELF OR DAMAGE TO YOUR EQUIPMENT.
11. BE FAMILIAR WITH THE EQUIPMENT AND READ ALL INSTRUCTIONS THOROUGHLY BEFORE INSTALLING OR WORKING ON EQUIPMENT.

GENERAL:

1. Thoroughly clean tapered bores, tapered shafts and all registers of rust preventative and/or oil and grease using a petroleum solvent. (Stoddard solvent, mineral sprits, kerosene, naphtha etc.)

2. Prior to assembling motor module rotate input shaft of gear or drive module by hand. Listen and feel for any unusual noise or mechanical interference.

ASSEMBLY OF MOTOR MODULE TO GEAR OR DRIVE MODULE

1. Mount motor rotor to gear or drive tapered shaft and insert rotor stud into shaft. HAND tighten rotor stud. (Note: Be sure nut is on shortest thread end of the rotor stud).

2. Mount frame assembly to drive register, install motor short end bracket and fully tighten motor bolts to drive.
   Note: For ease of assembly of frame 48, 56 and 140 with thru-frame mounting bolts.

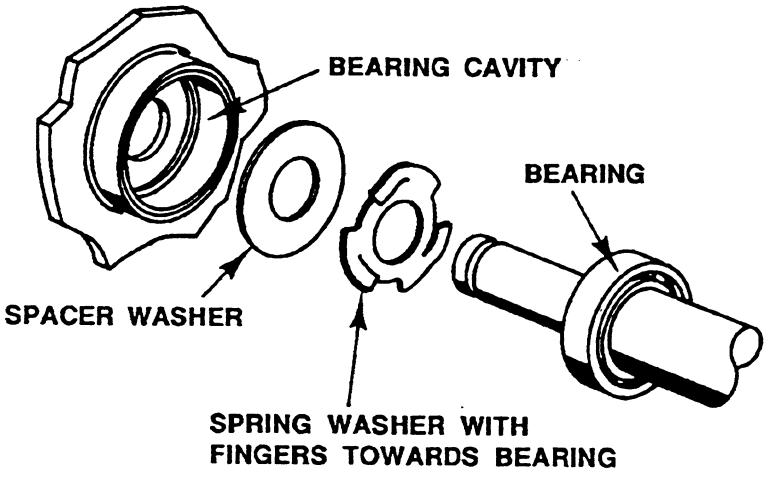
   A. Insert two (2) studs, two to three inches longer than frame and short end bracket, into drive 180° from each other.

   B. Slide frame and short end bracket over studs and insert and tighten two (2) thru bolts.

   C. Remove studs.

   D. Insert and tighten remaining two (2) thru bolts.

3. 48, 56 and 140T frame motors have spring washers and may have shims behind the short end bearing. If removed they should be replaced in position as shown below.



4. Rotor stud can now be fully tightened by holding exposed motor shaft with a spanner wrench. Tighten rotor stud to specified torque.

Motor Frame	Stud Size	Tightening Torque
48	1/4-20	7 to 8 lb-ft
56-140	1/4-20	10 to 12 lb-ft
180-210	3/8-16	37 to 40 lb-ft
250-280	1/2-13	95 to 100 lb-ft
320-400	5/8-11	190 to 200 lb-ft
440	3/4-10	315 to 325 lb-ft

CAUTION: Do not over - tighten rotor studs.

5. Mount fan on shaft and install snap ring or tighten bolt. Install fan cover guard.

ASSEMBLY OF VARIDRIVE MODULE TO GEAR MODULE

1. Remove bracket plug (6 & 10 frame) or protective cover from Varidrive and remove stud from shaft.
2. Mount Varidrive to gear drive, engaging tapered shafts and insert stud into shaft (be sure nut is on shortest thread end of stud) hand tighten stud.
3. Insert mounting screws through adaptor holes into tapped holes in gear case and tighten.
4. Remove support bracket from Varidrive. Stud can now be fully tightened by holding exposed shaft with a spanner wrench (do not hold gear box output shaft) tighten to specified torque.
5. Reassembly support bracket and bracket plug or protective cover.
6. If necessary to change speed range or handwheel position, refer to pages 10 and 11.

ASSEMBLY OF MODULAR OUTPUT GEAR MODULE TO GEAR MODULE

NOTE: Modular output module must be assembled to gear module prior to installing the motor module.

1. Insert through shaft stud into final gear module shaft and hand tighten.
2. Mount gear module on final gear module engaging taper shafts.
3. Insert mounting screws through holes in flange into gear case tapped holes and tighten.
4. Tighten nut on through shaft stud to specified torque.

MODULAR ASSEMBLY TEST INSTRUCTIONS

GENERAL:

1. Visually check unit against face of order for correct frame, type, horsepower, speed and assembly position.

2. Place unit on a resilient pad or mount to test fixture or base.

3. Prior to applying power, ground test motor windings per following instruction.

4. Megger test for modular assemblies.

   A. Purpose to determine if during assembly the insulation to ground has been damaged.

      1. Set Megger voltage to 500 VDC if the high voltage rating of the test motor is under 400 volts. Set Megger voltage to 1000 VDC if high voltage rating is greater or equal to 400 volts.

      2. Record resistance reading.

      3. Multiply the reading by the factor associated with the ambient temperature listed in table below.

TEMP F	FACTOR	TEMP F	FACTOR
50	.12	85	.50
55	.17	90	.60
60	.19	95	.70
65	.23	100	.80
70	.29	105	1.00
75	.33	110	1.20
80	.40	115	1.75

      4. The insulation to ground is good if the resistance reading times the temperature factor is greater than the value listed below.

RATED VOLTAGE	TEST VOLTAGE	MIN. RESISTANCE IN MEG OHMS
115	500	1.115 M OHMS
230	500	1.230 M OHMS
460	1000	1.460 M OHMS
575	1000	1.575 M OHMS

5. SYNCROGEAR

   A. Connect A.C. power to motor and energize.

   B. Listen for abnormal gear or bearing noise and look for evidence of oil leakage. Note: Worm gear modules are shipped without oil. Do not run in excess of 30 seconds without adding oil.

   C. Turn off power to motor and disconnect leads. Replace outlet box cover.

6. VARITRAC

   A. Rotate output shaft by hand, listen and feel for any unusual noise or mechanical interference. Do this at various positions of the handwheel speed setting.

   B. Rotate handwheel thru entire range of travel and feel for unusual tighness or looseness in this movement; adjust accordingly by tightening or loosening screw in center of handwheel.

   C. Connect A.C. power to motor and energize motor.

   D. Listen for bearing or mechanical noise while operating unit thru the entire speed range, including start-up and coast-down.

   E. Turn off all power to A.C. motor and disconnect leads. Replace conduit box cover.

7. VARIDRIVE

   A. Connect A.C. power to motor and energize motor

   B. Run unit thru full speed range, checking for bearing or mechanical noise and for excessive vibration. Do not run unit over 30 seconds without oil in the gear box. Note: Helical gear modules are supplied with oil. Worm gear modules are supplied without oil.

   C. Speed stops of Varidrive Modules are approximate and require final settings. Using a tachometer, refer to pages 9 thru 11 for setting high and low speed steps.

   D. Turn off power to motor and disconnect leads. Replace outlet box cover.

8. VARIMAG

   A. Connect A.C. power to motor. Connect D.C. power from clutch control to clutch and/ or brake coils.

   B. Connect tachometer leads to voltmeter.

   C. Energize A.C. motor

   D. Energize clutch coil and adjust for 100% rated currect per nameplate.

   E. Check A.C. Tachometer output voltage (45 $^{+20\%}_{-10\%}$ volts/1000 RPM).

   Acceptable tach voltage range are:
   4 pole speed - 72 VAC to 97 VAC
   6 pole speed - 48 VAC to 65 VAC
   8 pole speed - 36 VAC to 49 VAC
   10 pole speed - 29 VAC to 39 VAC

   Note: Values are for 60 hertz operation - for 50 hertz values multiply given voltages by .833)

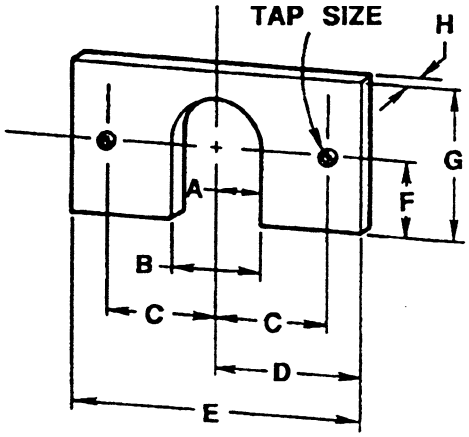
   F. Listen for bearing noise or deflection during complete duration of tests, including coast - down.

   G. Units with Eddy Current Brake (Type EDC) should be checked at this point. De-energize clutch coil completely and energize brake coil to 100% rated current per nameplate. Check for output shaft stopping, unit must come to an immedate stop.

   H. De-energize clutch and/or brake coil. Turn off all power to A.C. motor and disconnect leads. Mount outlet box covers.

DISASSEMBLY OF MODULAR PRODUCTS - BREAKING TAPERED FITS

1. Frames 48 thru A280



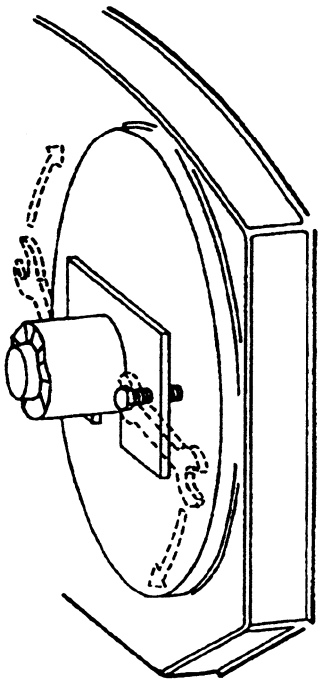


FIGURE 1

FRAME	A	B	C	D	E	F	G	H	TAP SIZE
48	13/32	13/16	1-5/16	1-13/16	3-3/8	1	2	1/4	1/4-20 UNC
56-180T	17/32	1-1/16	2-1/8	2-5/8	5-1/4	1	2	1/4-3/8	3/8-16 UNC
210T-A280T	13/16	1-5/8	2-1/2	3	6	1-1/4	2-1/2	3/8-1/2	3/8-16 UNC

A. Remove all modular unit parts execpt the tapered assembly from the drive unit. Remove the nut and drawbolt from the tapered shaft connection.

B. Fabricate a tool per the diagram and table of dimensions given above.

C. Place the tool slot over the male taper such that when two bolts are threaded into the tool and tightened, force will be applied to the tappered shaft, tending to separate the taper. After the separating force is applied, a mild tap with a mallet on the O.D. of the female shaft will break the fit.

2. Frames 280 thru 440

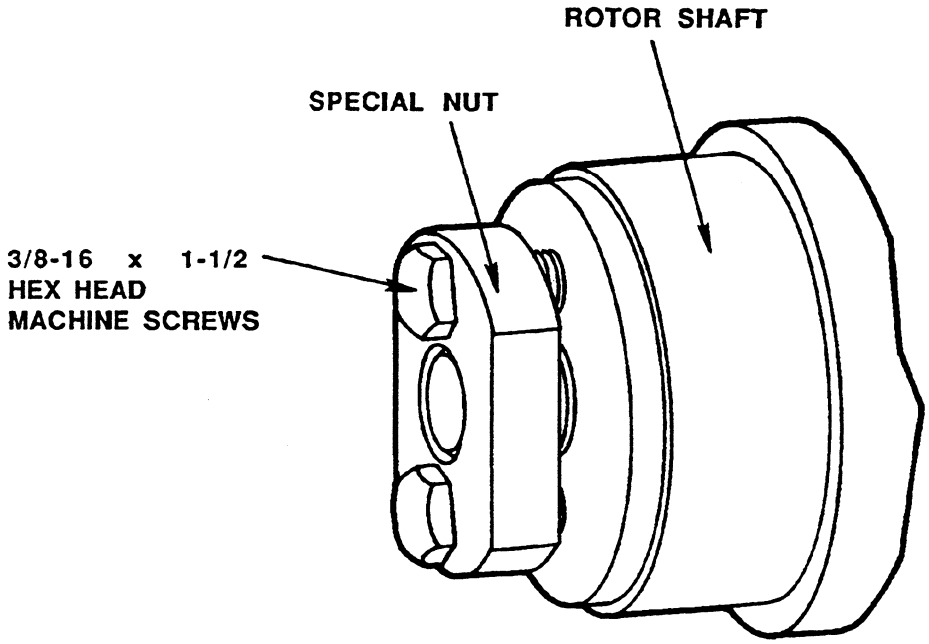


FIGURE 2

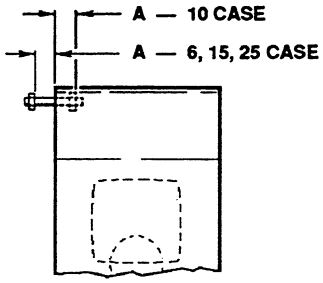
A. Remove all motor parts except the rotor assembly from the drive unit. Back off the special nut at the end of the rotor shaft as illustrated in Figure 2.

B. Line up the two clearance holes in the nut with the threaded holes in the shaft.

C. Insert and tighten two bolts (size per figure 2). This will pull the rotor shaft towards the nut, thereby applying a separating force to the tapered connection. A mild tap with a mallet on the O.D. of the female shaft will break the fit.

SPECIAL INSTRUCTIONS FOR SETTING SPEED STOPS

Speed stops are initially set at plant of manufacture as shown below:

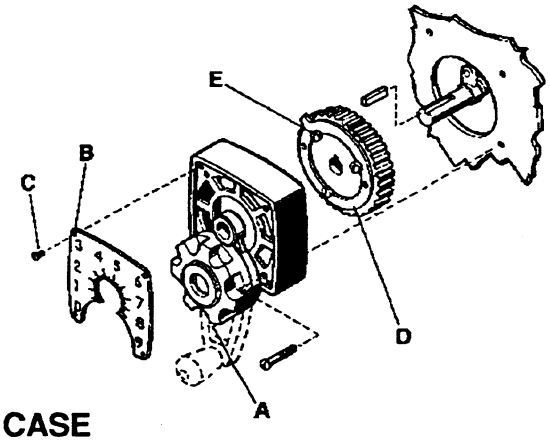


SIZE	LOW SPEED DIMENSION A	HIGH SPEED DIAL READING
6	0"	6.1
10	1/4"	7
15	1/2"	4.4
25	3/32	6

Speed stops must be reset per following instructions after motor & gear modules are assembled to varidrive module.

LOW SPEED 6, 10, 15, & 25 CASE

1. Remove front cover from VARIDRIVE®
2. Before starting VARIDRIVE. Make sure belt is not in contact with motor shaft. CAUTION: Keep hands and tools clear of rotating components.
3. With speed indicator at 0 adjust nuts on shift lever stud until take off speed is 1 to 3% below minimum required full load speed.
4. 6 case requires a stud support to be assembled between the two nuts. Line up hole in support with hole in frame case.
5. Make sure the two adjusting nuts are locked together. Use grade A loctite or equivalent.
6. Replace front cover.
7. CAUTION:
   Do not run unit slower than approximately 10% of minimum nor more than 10% faster than maximum nameplate speed as belt damage could otherwise result.



HIGH SPEED 6 & 10 CASE

1. Disassemble dial plate "B" from unit by removing (4) screws "C".
2. Speed stop "D" will now be exposed. Loosen (3) screws "E".
3. With VARIDRIVE running, adjust handwheel "A" until take-off speed is approximately 3 to 5% above maximum required full load speed.

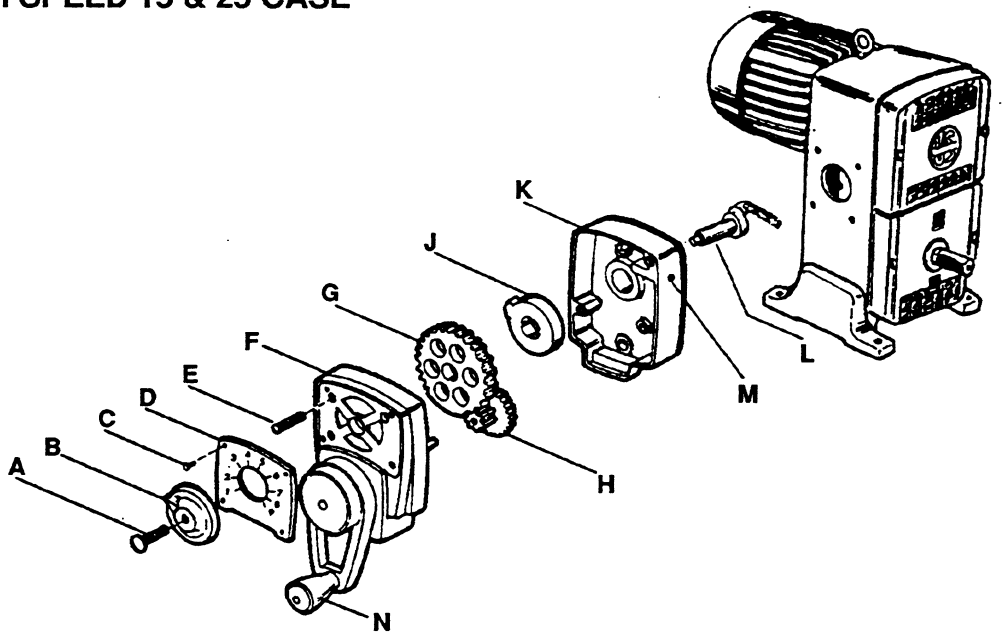
HIGH SPEED 6 & 10 CASE CON'T

4. Stop VARIDRIVE and without changing position of the handwheel, rotate speed stop "D" in a clockwise direction until it hits the handwheel shaft.

5. Tighten screws "E".

6. Replace dial plate.

HIGH SPEED 15 & 25 CASE



1. Partially back out set screw "M".

2. With VARIDRIVE running, adjust handwheel "N" until take off speed is approximately 3 to 5% above maximum required full load speed.

3. Stop VARIDRIVE and without moving the handwheel, tighten set screw "M" until it hits protrusion on speed stop collar "J". Secure set screw with grade A loctite or equivalent.

4. If maximum speed is such that set screw "M" does not contact speed stop collar "J", the collar must be relocated by the following procedure:

   A. Remove screw "A" and disassemble pointer "B".

   B. Remove (4) screws "C" and dial plate "D".

   C. Remove (3) screws "E" and disassemble outer part of control housing assembly "F" and gears "G" and "H". Note position of gear "G" on cam shaft "L".

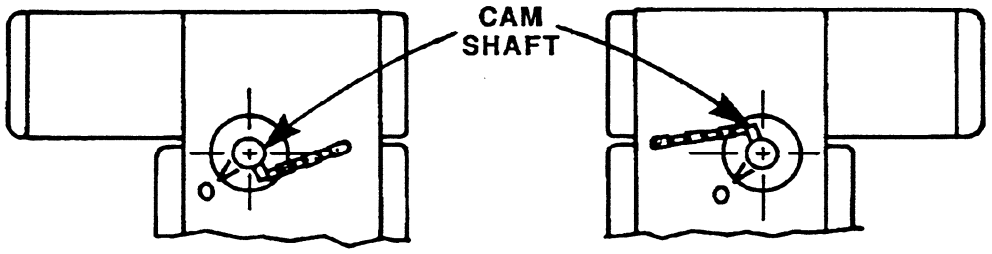
   D. Remove speed stop collar "J" and rotate it in a clockwise direction until protrusion on collar is in position to engage set screw "M" and reassemble it on cam shaft "L".

   E. Reassemble control mechanism, making sure gear "G" is installed in its proper position.

   F. Adjust speed per above instructions.

INSTRUCTIONS FOR RELOCATING SHIFT CONTROL

1. Turn handwheel to low speed position (dial indicator at 0).
2. Disassemble front cover from VARIDRIVE and remove shift lever stud.
3. Remove dial plate and screws that attach control mechanism to VARIDRIVE.
4. Pull control mechanism away from VARIDRIVE and remove chain from camshaft (6 case) or cam from camshaft (10, 15 & 25 case).
5. Without changing position of handwheel, gear or speed stop, cam shaft must be disassembled, rotated 180° and reassembled. See sketch for proper cam shaft location.
6. Reassemble chain or cam to cam shaft and mount control mechanism to VARIDRIVE.
7. Reassemble stud on side of VARIDRIVE frame case opposite the shift control mechanism, tightening stud unitl threads bottom out.
8. Install shift lever on stud and set speed stops per preceding instructions.



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