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Dynamic®

DRIVE SOURCE INTERNATIONAL, INC.

Fractional HP Ajusto-Spede® Drives
.25 through 1.5 HP

INSTRUCTION MANUAL

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DANGER HIGH VOLTAGE

Motor control equipment and electronic controllers are connected to hazardous line voltage. When servicing drives and electronic controllers, there may be exposed components with their cases and protrusions at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power whenever possible to check controllers or to perform maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on an electronic controller or electrical rotating equipment.

CAUTION

Rotating shafts and above ground electrical potentials can be hazardous. Therefore, it is strongly recommended that all electrical work conform to National Electrical Codes and local regulations. Installation, alignment and maintenance should be performed only by qualified personnel.

Factory recommended test procedures, included in the instruction manual, should be followed. Always disconnect electrical power before working on the unit.

REFER TO OSHA RULES AND REGULATIONS, PARAGRAPH 1910.219 FOR GUARDS ON MECHANICAL POWER TRANSMISSION APPARATUS.

Note – Since improvements are continually being made to available equipment, the enclosed data is subject to change without notice. Any drawings are for reference only, unless certified.

IMPORTANT NOTICE

The printed contents in this manual are to be used for reference only. Due to periodic engineering design changes and the addition of modifications, this material is provided as a guide only. Please refer to the drawings for your specific unit. For additional information regarding contents of this manual, please contact:

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This notice is provided to clarify the intent of the instruction book contents and to inform our customers how to obtain appropriate technical assistance from the proper source.

SECTION 1

GENERAL INFORMATION

This service instruction manual relates to the line of Dynamatic® Fractional Horsepower Ajusto-Spede® Drives with standard modifications. Observe all procedures for installation, maintenance and operation. Our equipment is designed for industrial use. You may depend on many years of service, if the equipment receives adequate maintenance and is operated properly within its designed scope. Personnel working on or with this equipment must be well qualified and under proper supervision. Refer any questions to the Factory in Sturtevant, Wisconsin 800-548-2169.

Safety

Printed circuit board No. 15-46-17 replaces printed circuit board No. 15-46-13. This new board incorporates an "Unattended Start" feature. This controller safety circuit prevents automatic restarting of drive output shaft after power outage. If line power to the drive is interrupted, the Run/Stop switch on the operator station must be reset before the drive will restart. If the unattended start feature is not required due to a similar customer furnished circuit, the unattended start feature can be bypassed by cutting jumper wire W3 on the new printed circuit board. NOTE - Any drive sold previously with a 15-46-13 board that requires replacement will be replaced with the new board. Therefore, if your board is replaced, be aware that the unattended start feature will be incorporated in your drive.

Electrical rotating equipment and associated controllers can be dangerous. Therefore, it is essential that only skilled or trained personnel be allowed to work with this equipment under competent supervision.

The Instruction manual should be made available to all maintenance and operating personnel. It is extremely important to become familiar with all safety requirements. DSI/Dynamatic® makes use of various types of labels to alert personnel to existing hazards and to warn of potential hazards. Heed these labels and instruct others in their meaning and importance. Labels are as follows:

DANGER: is used to call attention to an immediate hazard where failure to follow instructions could be fatal. Danger labels are illustrated with the standard OSHA red, white and black danger symbol. The label has a white background with black letters.

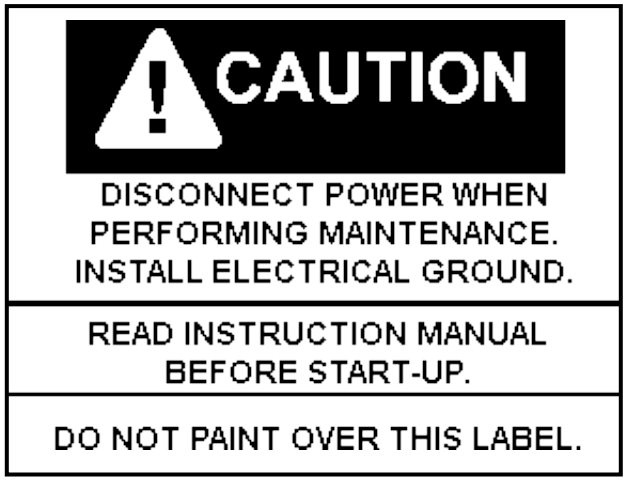
WARNING: identifies hazards having possibilities for injury to personnel. Warning labels also have the standard OSHA danger symbol but are illustrated in black and orange.

42-225-1 FOR FUSE REPLACEMENT USE

	TYPE	RATED VOLTS	RATED AMPS
FU			
FU			
FU			
FU			
FU			

INSTRUCTION or ***NOTE***: is used where there is a need for special instructions relating to safety, proper operation or maintenance.

The green ground label is used to identify the stud provided inside the cabinet to which the customer's ground is to be connected.



CAUTION: is used to warn of potential hazards and unsafe practices. Caution labels are illustrated with black lettering on a yellow background, sometimes denoting the standard OSHA symbol for electrical shock.

Note - The only exception to our label specification is when the size of the label prohibits the use of OSHA symbols. Example - labels used on the printed circuit boards.

Training
Training programs are recognized as an essential part of safety for both operating and maintenance personnel. In addition, training provides the know-how required to get the best performance out of the equipment and to keep it operating with minimum down time. You can arrange one of our training sessions by contacting us in Sturtevant, Wisconsin. A nominal fee is charged for this service.

Warranty
The Company's Standard Terms and Conditions of Sale include a statement of the warranty policy covering this equipment. Basically, the Company warrants that the equipment will be free of any defects in material or workmanship. Therefore, it is essential that you inspect the equipment carefully upon receipt to make sure that no hidden damage is found and that proper procedures are followed to ensure that the equipment remains in good condition.

Shipping
The equipment is assembled and tested prior to shipment to ensure that it functions properly. It is then inspected carefully and packed by approved methods. The carrier assumes the responsibility of the equipment reaching its destination in good condition.

Receiving
Upon receipt of shipment, each carton should be inspected immediately for damage and content. Compare all items received with your packing slip. Check carefully for signs of rough handling that may be an indication of hidden damage. In the event of damage, file a claim with the carrier promptly. If you require assistance in settling your claim, notify Customer Service at the factory. When communicating with Customer Service, refer to your purchase order number and complete model number as shown on the nameplate of unit involved. See Section 7. Describe as completely as possible the problem encountered.

Inspection
Carefully examine housing, C-Face, conduit box, lead wires and terminals. Check and tighten all exterior screws and nuts.

Hand rotate the shaft to determine that it rotates freely and that no binding exists.

Handling
The Fractional Horsepower Ajusto-Spede unit weighs approximately 50 lbs. Transport by means of hand or forklift truck, provided the unit is properly supported. **Do not** jar, pound on, or lift unit by its shaft.

Storage (Short and Long Term)
When the unit is not put to immediate use, it may be necessary to place it in storage. The storage area must be clean, dry and protected from sudden changes in temperature, humidity, shocks and vibration. Maintain temperature between 0º and 40ºC. (32º and 104ºF.). Do not allow the temperature to drop below the dew point. Humidity is not to exceed 60%.

1. Open airtight coverings to permit circulation.

2. Lift the brushes off slip rings to avoid corrosion.

3. Rotate shaft at least once a month to redistribute bearing lubricant and to prevent brinelling of the bearings.

If unit is placed in storage for over a two-year period, change the bearings before returning it to service.

SECTION 2

EQUIPMENT DESCRIPTION

The standard fractional horsepower Ajusto-Spede® drive has three basic components: a) mechanical unit consisting of an AC motor and eddy-current clutch, b) a controller (either side mounted to the mechanical unit or remotely mounted) and c) an operator's station.

The Fractional HP Ajusto-Spede drive can be used to accurately control speed or torque, depending on the type of controller used. The set speed can be easily adjusted between minimum and maximum speeds stamped on the nameplate. A torque control option is available when tension control is desired.

Basic Drive Description

The mechanical unit consists of an AC induction motor and eddy-current clutch self-contained in a common housing. Power for the clutch is supplied by an electronic controller mounted in a junction box on the mechanical unit. A separate operator's station is provided for ON/OFF switching and control of output shaft speed. The basic assembly can be modified with a gear reducer, one of three different types of brakes and options to the controller, which can be installed at the factory or in the field. Several factory-only modifications are also available. Special instructions are provided when necessary.

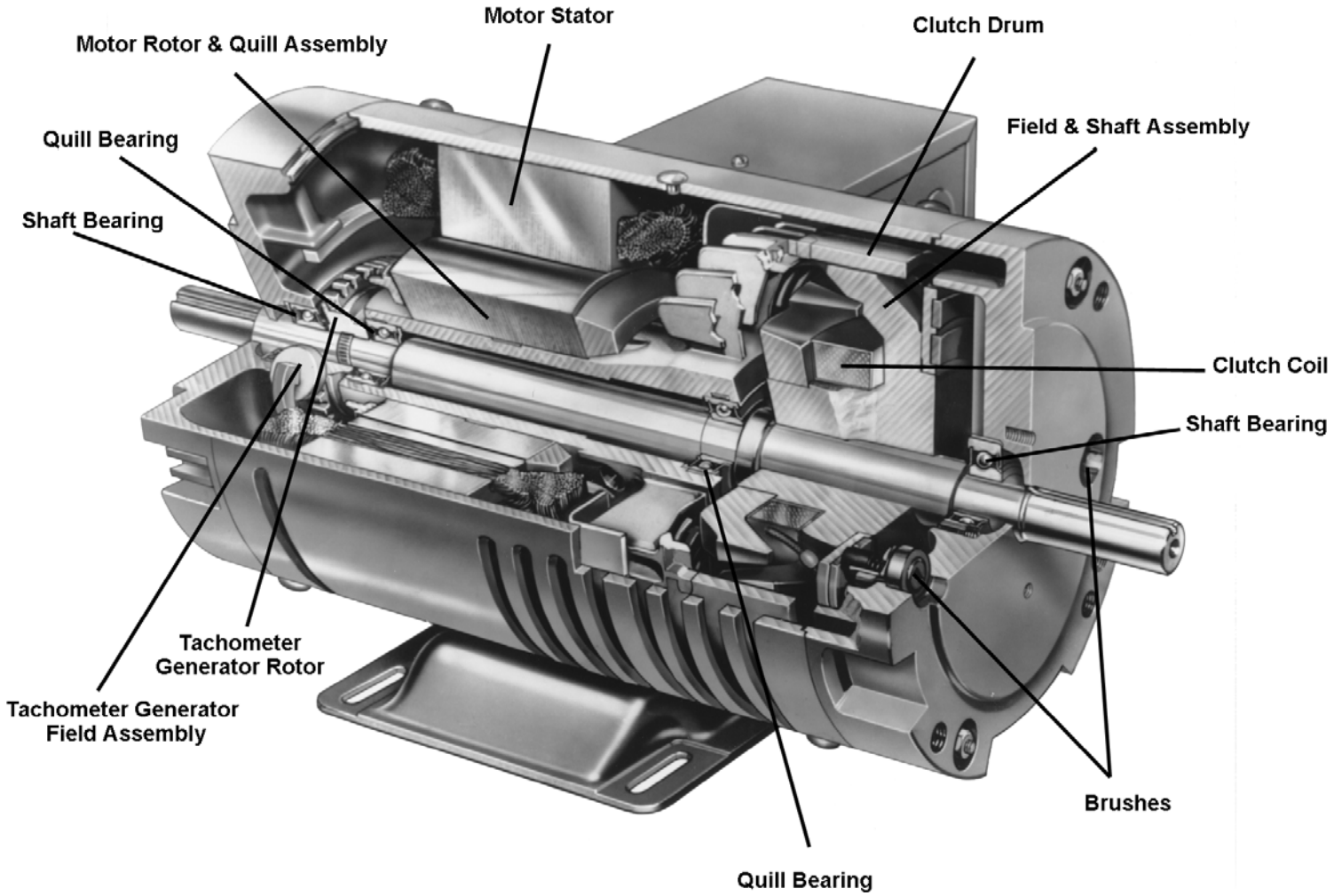


Figure 2-1: Basic Unit, Cutaway View

Standard fractional HP Ajusto-Spede® drives are available in sizes from 1/4 through 1-1/2 HP, single or three phase, for all standard and special voltage or frequency combinations. The regulated speed range, shown on the nameplate, is usually from 50 to 1600 RPM or 65 to 3300 RPM, depending on motor speed.

AC Motor

The AC motor is a conventional squirrel cage two- or four-pole motor, supplying a constant input speed. The motor must be provided with an approved motor controller and overload protection. The motor controller must be purchased separately. The motor stator is wound for either single or three- phase operation. Single phase Type "C" units are capacitor start and capacitor run; the capacitor is mounted on top of the drive housing. Single-phase type "K" units are capacitor start only and are generally used in reversing type applications. A transformer winding, wound in the motor stator, provides the controller with an 80 VAC power supply. The hollow motor rotor is pressed over the quill to become an integral part of the fan and eddy- current drum assembly.

Eddy-Current Clutch

The input member (motor rotor and quill assembly) is the constant speed member and is bearing mounted on the shaft. The quill bearings are the inner bearings shown in Figure 2-1. The output member (field and shaft assembly) is supported by bearings in each end bracket; these are the outer bearings shown in Figure 2-1. This assembly is free to rotate independently of the motor rotor and quill assembly. The field assembly is pressed on and welded to the shaft. Excitation to the field coil is transmitted through two slip rings attached to the assembly, with brushes and holders located in the adjacent end bracket. The brushes are located 180º apart on the horizontal centerline. The unit has a double shaft extension, on either one or both ends, with NEMA 56C-Faces, to drive a variety of loads.

A tachometer generator located in the motor end of the unit provides an AC voltage proportional to shaft RPM. The tachometer generator field assembly, consisting of laminated poles and windings, is mounted in the end bracket. A permanent magnet tachometer generator rotor is pressed on the shaft adjacent to the field assembly. See Figure 2-1.

The voltage generated by the standard "W2" tachometer generator is intended for velocity feedback to the electronic controller only. If Increased capacity is required, an optional "G2" type generator is available. This generator can be ordered separately and installed by re-replacing the end bracket with the generator field in it.

Figure 2-2: Controller View

Electronic Controller

The electronic controller is a small, transistorized, plug-in printed circuit board located in the drive's junction box, which also contains the terminal board for the interconnecting wiring to the control station and the ac motor. See Figure 2-2.

Figure 2-3: Operator's Station

Operator's Station

The standard operator's station consists of a Speed potentiometer and a Run/Stop rocker switch mounted in a general-purpose enclosure. When special control functions are required, a different control station with the necessary hardware is supplied. An exception is the torque control, which requires a special printed circuit board in the mechanical unit.

The Speed potentiometer is adjusted by a knob marked in increments of 0 through 10 in reference to the output speed. See Figure 2-3.

Principle of Operation

When the motor is started, the field and shaft assembly remains stationary until voltage is applied to the clutch coil. Energizing the clutch coil produces magnet c flux. This flux crosses the air gap from the field assembly poles to the drum assembly, passes along the clutch drum axially and returns across the air gap back to the field assembly poles. This magnetic flux path is disrupted when the drum is rotating relative to the field assembly. As a result, eddy-currents are generated in the inner surface of the drum. These eddy-currents produce a series of magnetic poles on the drum surface that interact with the electromagnetic poles of the field assembly to produce torque. It is this torque that causes the field and shaft assembly to follow clutch drum rotation.

To generate eddy-currents and produce torque, there must be a relative speed difference between the clutch drum and field assembly. This speed difference is called "slip." With zero slip, there are no eddy-currents generated and no torque produced. As slip increases, torque increases. Similarly, torque is increased by increasing field coil current. This torque versus slip is shown in Figures 2-5 through 2-9. Because no torque is produced at zero slip, some slip must occur to produce the required torque. For this reason, maximum output speed is always less than motor speed.

Contact by the two carbon brushes against the copper slip ring assembly permits the clutch coil to be energized continuously.

Heat generated in the clutch drum is relative to the torque and amount of slip. This heat is dissipated from the drum surface. The fan blades on the drum, which run continuously at full speed, provide cooling air for the clutch and motor, enabling the drive to transmit full torque at low output speeds.

The brushes and bearings are the only wearing parts in the unit.

To maintain constant speed, the torque must be modulated to meet the demand of the load; too little torque increases the speed and too much torque decreases it. Modulation is automatically controlled by a solid-state speed controller. The controller feedback path is a closed loop. See Figure 2-4.

The operator's station delivers a command signal from the Speed potentiometer to the drive, indicating operating speed. The internal tachometer generator supplies a velocity feedback voltage to the controller representing the actual speed of the drive's output shaft. Modulation takes place continuously during operation. The feedback system can operate satisfactorily even when the drive system requirements are changing.

When the drive is started the operator sets the Speed potentiometer which applies a command signal to the controller. Since feedback is not present, due to the output shaft being stationary, the command signal turns the amplifier on full and maximum excitation is applied to the clutch coil.

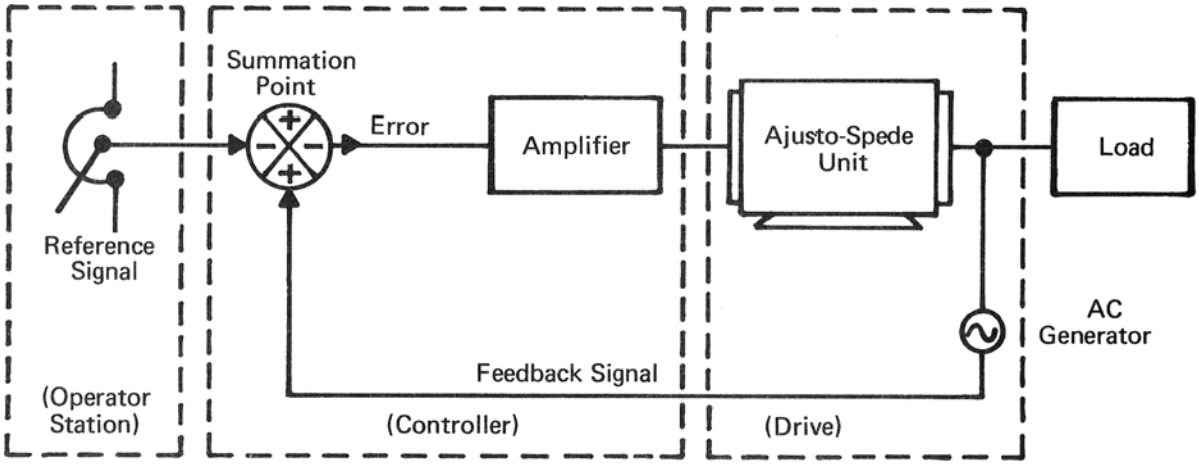


Figure 2-4: Example of Simple Closed Loop Speed Control

The magnetic field generated produces a high output torque at the drive's shaft and accelerates the shaft speed. As shaft speed increases, the tachometer signal also increases, and it is fed back and compared with the operators signal. The controller then begins reducing excitation to the clutch coil. This signal is compared to the set reference signal and clutch excitation is adjusted accordingly. Automatic adjustment is therefore continuous during operation.

When full speed is achieved the controller maintains excitation at a level required to maintain the set speed. As the load changes, excitation is adjusted accordingly to maintain the set speed.

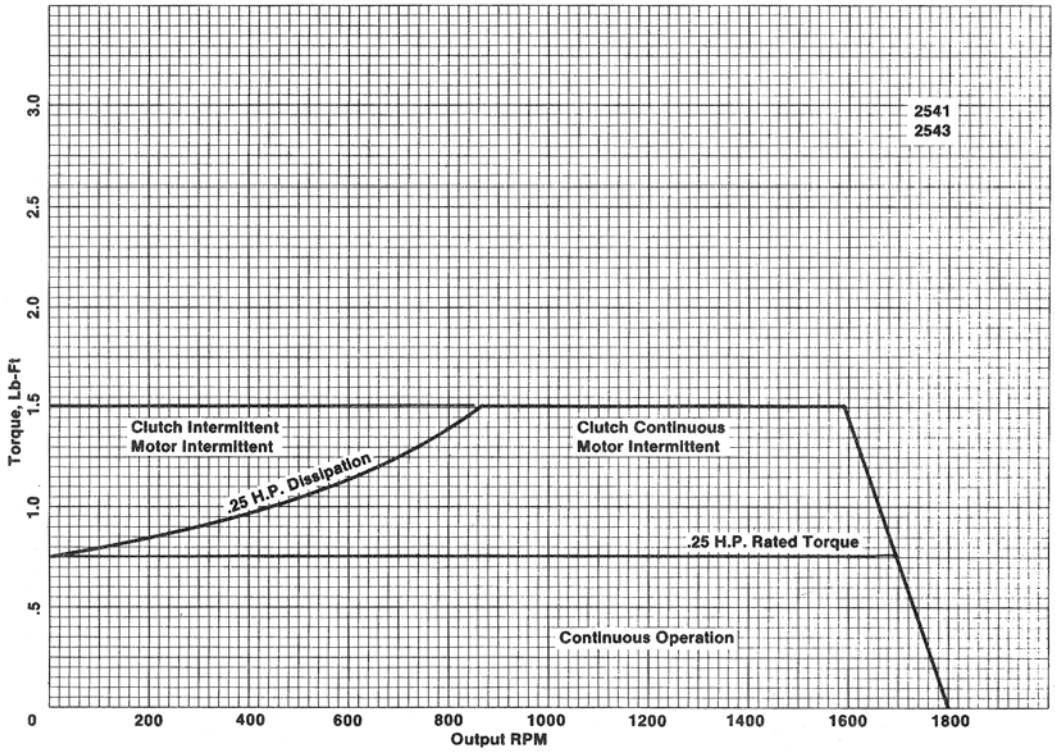


Figure 2-5: Torque Vs. Output Speed for Fractional Drive ¼ HP

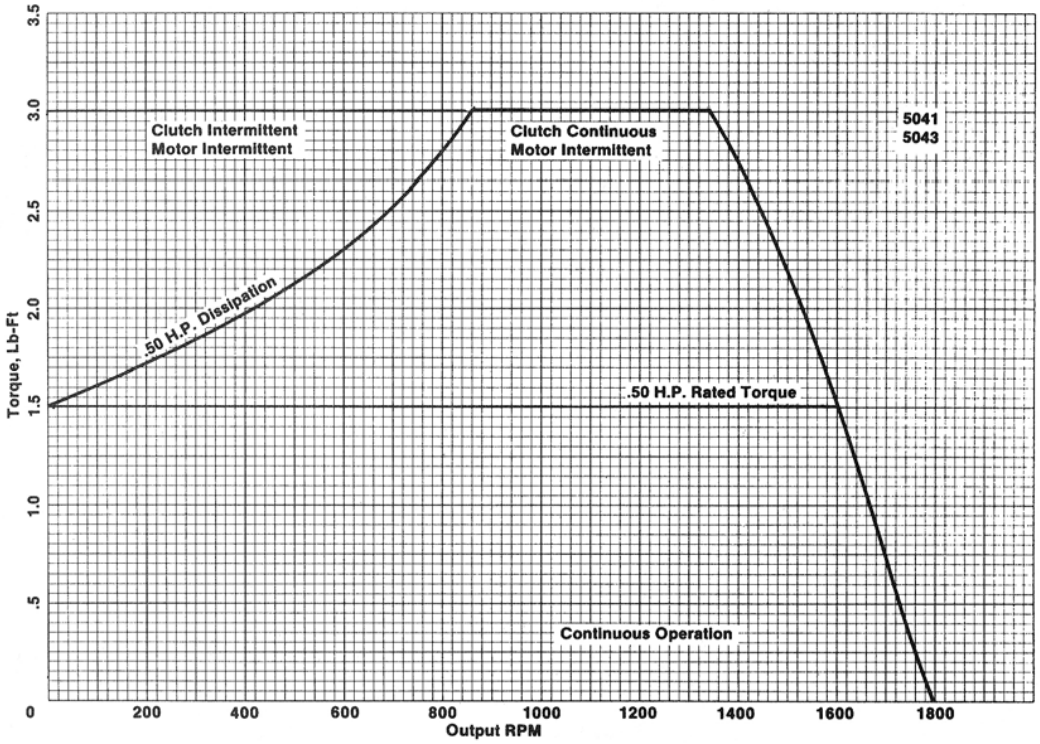


Figure 2-6: Torque Vs. Output Speed for Fractional Drive ½ HP

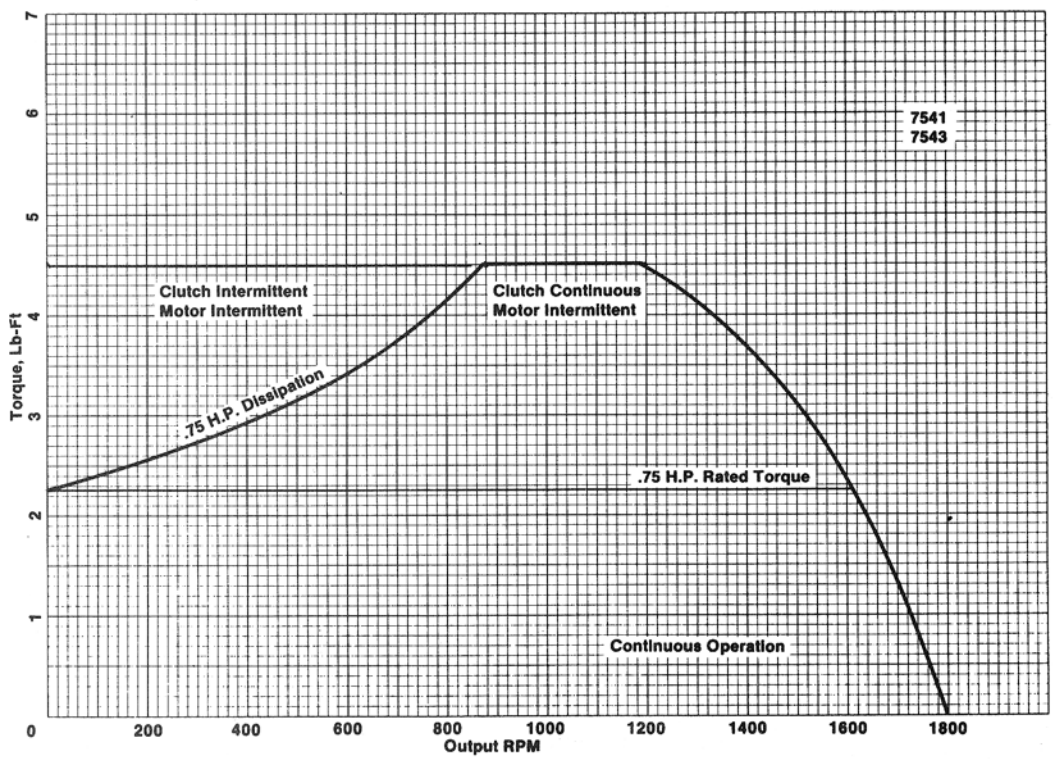


Figure 2-7: Torque Vs. Output Speed for Fractional Drive ¾ HP

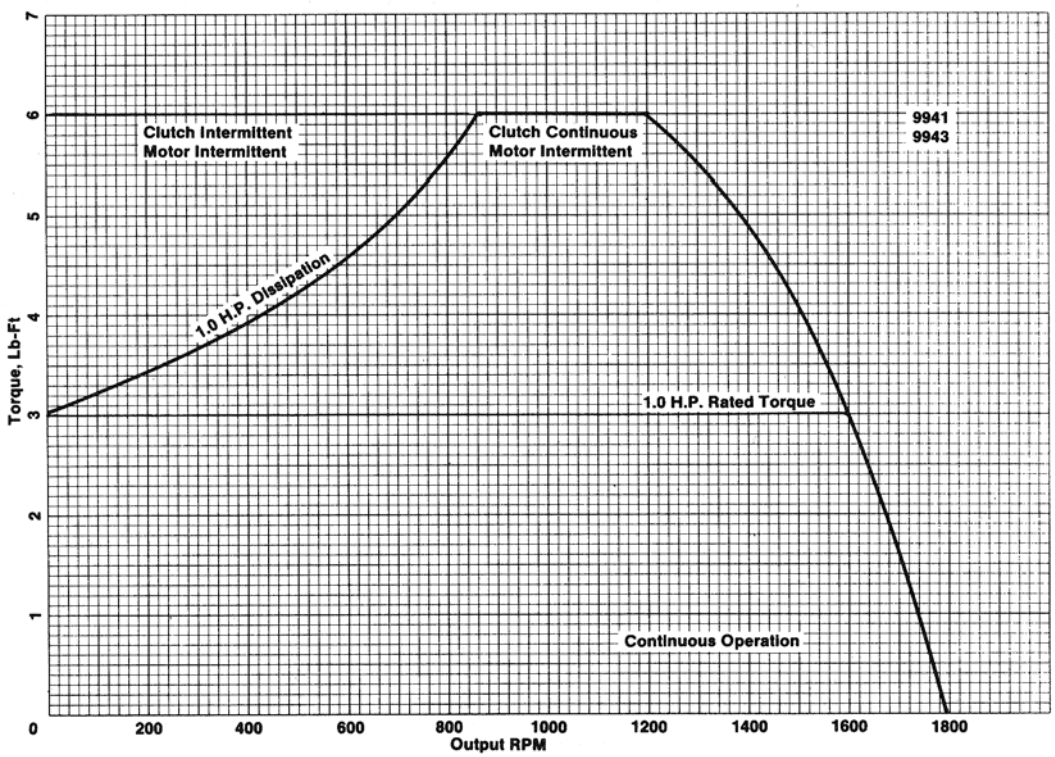


Figure 2-8: Torque Vs. Output Speed for Fractional Drive 1 HP

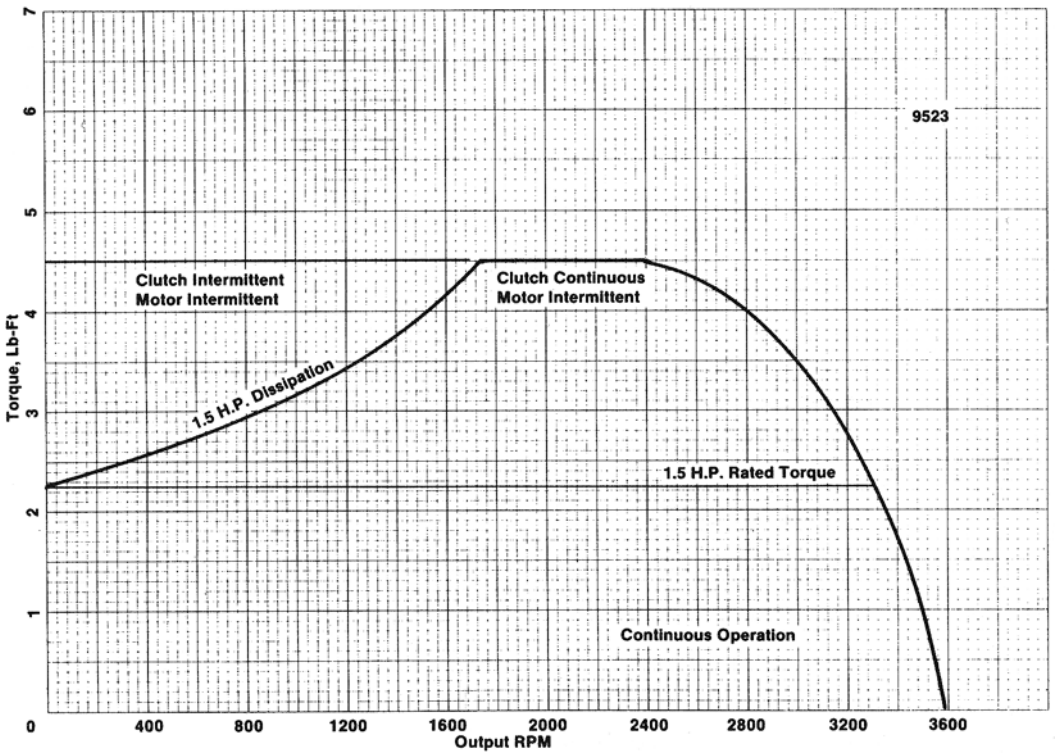


Figure 2-9: Torque Vs. Output Speed for Fractional Drive 1-½ HP

SECTION 3

INSTALLATION

Proper operation and long life of the eddy-current unit depend on its installation, location and environment. These instructions are intended as a guide for the safe and proper installation, but do not cover all possible situations that may arise. Refer any questions to the factory or one of its sales offices.

Location and Environment
The clutch is an open, drip-proof, self-ventilated unit that should be installed in an area suitable to its design. An adequate supply of clean, dry cooling air is required. Locate the unit away from any obstruction, usually at least twelve inches from a wall, to permit free air movement and accessibility for routine maintenance and inspection. Do not obstruct ventilating openings or mount the unit within the base of a machine without making provision for adequate inlet and outlet of cooling air.

CAUTION: Beware of re-circulation of cooling air. Hot air discharge must not be allowed to re-enter the unit or any adjacent air-cooled unit.

These units are designed to operate under standard service conditions unless purchased for certain specific environmental conditions. Standard service conditions are listed in Table 3-1. If purchased for special environmental conditions, consult the contract papers for the unit.

Operation in ambient above 40ºC (104ºF) requires the HP dissipation to be de-rated 10% for each 5.5ºC (10ºF) interval to a maximum ambient of 65ºC (148ºF). For operation above 1000 meters (3300 feet), it is necessary to de-rate the HP dissipation 5% for each 330-meter (1100 foot) interval to an altitude of 3000 meters (10,000 feet).

The unit should never be placed in any hazardous location restricted by the National Electrical Code, Article 500, unless it is specifically designed for a specific hazardous service and it is approved for such service conditions by the local code inspection and enforcement agencies.

Site Preparation
Before installation, make sure the jobsite is free of debris and all heavy construction, especially overhead. Provide protection for all personnel and equipment in the area, as required by the conditions. Clean up construction dust, dirt and scrap material so it is not pulled into the unit by cooling fan suction.

CAUTION: Electric welding equipment must be solidly earth grounded. Do not use clutch or motor as a current path. Serious bearing and insulation damage may result.

When planning the installation, be sure to include access for maintenance, the correct size, number and location of conduits, and adequate electrical service for the equipment. Remember, the location should provide adequate space for the removal of the unit or a component of it.

Mounting surfaces must be machined flat and level to support all feet evenly and be rigid enough to prevent flexing or resonance. As a rule, the base plate should be at least as thick as the mounting feet or flange. Do not set the unit directly on a wood or concrete floor. Consult the factory for weight and center of gravity data.

Unit Preparation
Move the unit to the jobsite using proper handling procedures. Refer to Section 1, "Handling", for more information. If the unit has been stored in a cool location, allow it to reach room temperature before removing packing material. Then remove all temporary screens, cover plates, tie-down bolts and banding. Before proceeding, review the application requirements and check the unit nameplate to be sure the correct unit is being installed and electrical service is correct.

Table 3-1: Standard Service Conditions

Altitude	Not exceeding 1000 meters (3300 ft.)
Ambient Temperature	-10º to 40ºC (14º to 104ºF)
Coil Voltage	Not exceeding 10% over nameplate rating
Environment	Clear of dust, dirt, moisture and vapors

Examine the unit for damage or lost accessories. The following check should be made before installation.

1. Turn shaft by hand and observe any binding, rubbing or noise that may indicate damage to bearings or other components.

2. Use a light to check inside openings for foreign material.

3. Open junction box cover and check continuity and leakage to ground.

4. If unit has been stored outdoors and especially in humid climates, check for condensation and water damage to insulation and bearings.

5. Make sure accessory equipment is complete and undamaged. Movable devices should be operated to determine if they function freely and correctly.

Correct any deficiency and remove dirt, rust and protective coatings. Use a safe solvent to clean shaft, flange face and mounting feet. Remove burrs with a fine file or scraper. Do not use emery cloth, sandpaper or any other abrasive.

Sizing Sheaves and Sprockets (Overhung Load)
Before a sheave or sprocket is installed on the shaft, make sure it does not exceed the minimum diameter limitation. This is a limitation established by the overhung load capacity of the unit. Too small a sheave may result in early bearing failure or a broken shaft. Calculate the minimum sheave diameter using the following formula.

$$PD\ min. = \frac{126{,}000 \times HP \times Lf \times Tf}{OHL \times RPM}$$

Where: PD min. = Minimum pitch diameter, in inches.
HP = Rated horsepower of clutch from clutch nameplate.
Lf = Load factor of clutch is a ratio of maximum expected load to rated load, usually at least a factor of 1.5. See Table 3-2.
Tf = Tension factor for type of belt drive used. See Table 3-3.
OHL = Overhung load capacity of shaft of a standard unit is 55 lbs. If the shaft has a gear reducer, refer to Table 5-2 in Section 5; otherwise, consult the factory.

The pitch diameter of the sheave or sprocket must be equal to or larger than the minimum calculated. When a smaller diameter must be used, mount the pulley on a separate jackshaft, supported by separate bearings. Align the jackshaft to the unit's shaft as described for directly connected shafts. Note that OHL is in pounds force at the center of the shaft keyway.

Table 3-2: Load Factors

Type of Load	Lf
Load never exceeds full load	1.0
Load sometimes equals 125% of full load	1.25
Normal loads	1.5
Occasional loads equal to 200% of full load	2.0

Table 3-3: Tension Factors

Type of Drive	Tf
Chain and sprocket	1.0
Pinion or gear	1.25
V-belt and sheave	1.50
Flat belt and pulley	2.50

Installing Sheaves, Sprocket or Couplings
Coupling halves, sheaves, sprockets or gears should be installed on the shaft before mounting the unit. Before installing these hubs on the shaft, inspect the shaft and its key. Remove any burrs using a fine file. Do not use emery cloth or other abrasives. Also, be sure the key fits snugly to the sides of the keyways on both the shaft and device hubs. Some clearance between the top of the key and the hub keyway is acceptable and will make installation easier.

Generally, the device should be installed on the shafts by following the device manufacturer's instructions. Devices with split hubs or light interference fits that use set screws should not present any problems. Devices with hubs that rely on heavy interference fits, however, must be installed with care. Do not pound such hubs in place. Instead, heat the hub in an oil bath or oven to 135ºC (275ºF) to expand the bore. Then, after coating the shaft with a light film of oil, slip the hub on the shaft. Be very careful to stop the hub at the correct position on the shaft, as it will quickly shrink once the heat is transferred to the shaft.

Reactive Force
"P" in Figure 3-1 represents the pull produced in a chain or belt and is a direct function of the torque of the driving sprocket or sheave. "R" represents the

normal reactive force imposed on the shaft and is equal to "P" plus the tension required to prevent the belts from slipping.

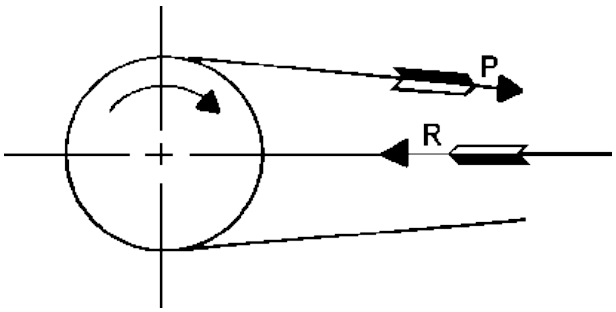


Figure 3-1: Reactive Force

When chain and sprocket drives are used, the reactive force "R" will be approximately equal to "P", additional tension is not required in a chain for effective transmission of power. When V-belts are used, the reactive force "R" will be approximately 1.5 times the value of "P" because of the added tension required to keep belts and sheaves from slipping. When flat belts and sheaves are used, "R" will be 2.5 to 3 times "P", depending on sheave size. Belting strains imposed on the unit's shaft should not be greater than the amount required to prevent sheaves from slipping and should never exceed the overhung load value.

Mounting

After preparing the site and unit, place the unit on a metal mounting base or plate. Then proceed as follows:

1. One or more mounting feet on the unit may not contact their mounting pads. With a feeler gauge, find and measure gap between each foot and its pad.

2. Place slotted shim, equal in thickness to measured gap, under each high mounting foot.

3. Install mounting bolts or nuts finger tight.

4. Proceed with alignment as described below under "Alignment".

Any burrs or other irregularities that would prevent proper seating must be removed. Once base is determined to be level, set unit in place. Any high spots on the base should be scraped or filed.

Alignment

Proper alignment of this unit is a condition of its warranty. Misalignment between directly connected shafts will cause increased bearing loads and vibration, even when a flexible shaft coupling is used. After alignment, other factors can cause the alignment to change. For this reason, the original alignment should be as accurate as possible.

Direct Coupled Shafts -

All couplings, even flexible couplings, are designed to permit only a limited amount of misalignment. Generally, the coupling manufacturer specifies limits for both angular and offset misalignment. When using such limits in place of the values specified in this alignment procedure, remember that the limits are maximums and they cannot be used at the same time. If, as an example, angular misalignment is at its limit, then offset misalignment must be zero. Always use a dial indicator to check alignment.

Note: Dial indicators used for alignment must be non-magnetic due to possible magnetism of the unit's shaft. If possible, rotate both shafts when required in procedure. If one shaft cannot be turned, alignment can still be checked by rotating the other shaft with indicator attached to it.

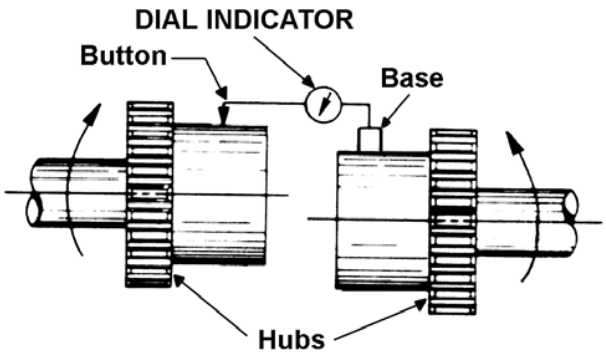


Figure 3-2: Offset Alignment Check

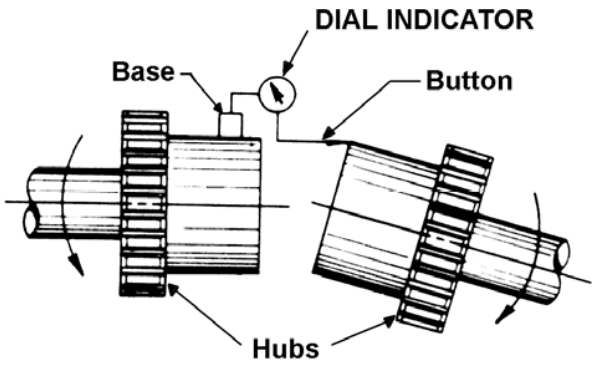


Figure 3-3: Angular Alignment Check

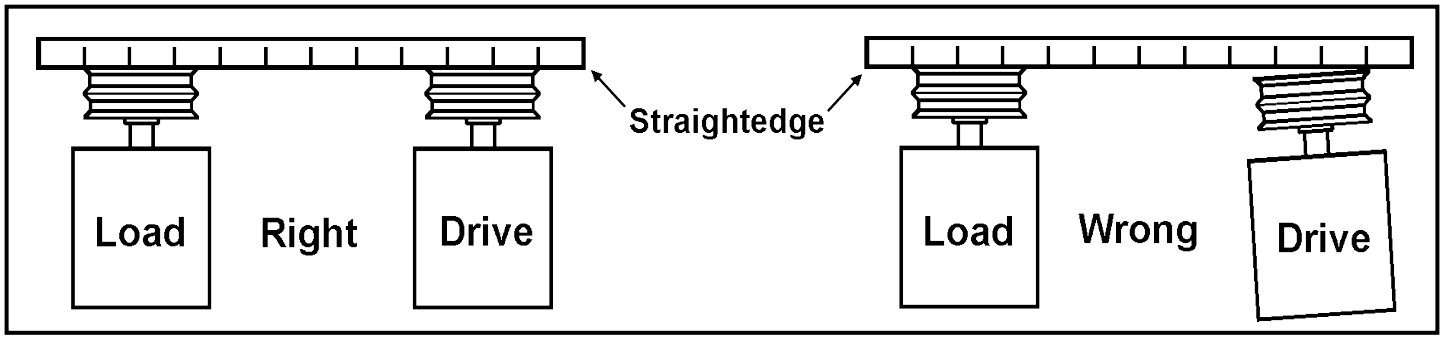


Figure 3-4: Parallel Shaft Alignment

1. Clamp base of indicator to hub of unit's shaft and position its indicator button on machined outer diameter of other hub, as shown in Figure 3-2.
2. Scribe a mark to indicate position of button.
3. Read indicator dial. Zero if convenient. Then rotate both shafts equally**,** keeping button on scribe mark and noting dial readings. Locate position of maximum reading and record it. Then rotate shafts and take readings at each one-quarter revolution. The maximum difference or run-out between any two readings should not exceed 0.001 inch. If it does, realign the units and repeat.
4. Once run-out is acceptable, reposition indicator button on machined face of driven shaft hub as shown in Figure 3-3.
5. Scribe a mark to indicate position of button.
6. Read indicator dial. Zero if convenient. Then rotate both shafts equally, keeping button on scribe mark and noting dial readings. Locate position of maximum reading and record it. Then rotate shafts and take readings at each one-quarter revolution. Compare four readings and calculate maximum difference between any two readings. Divide resulting value by twice the distance from shaft centerline to button position. The result, angular misalignment, should not exceed 0.001 inch per inch. If it does, realign units and repeat.

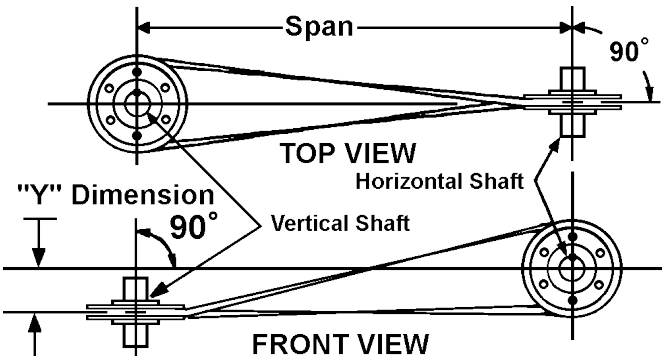
For horizontal or foot mounted machines, the shims are placed under the feet. The shims should be the same size as the mounting foot and slotted to permit inserting without removing the bolt. Try to obtain shims of the thickness required or use as few thick shims as possible. Do not use many thin shims stacked to make up the thickness required. De-burr shim edges.

Parallel Connected Shafts -
Parallel shafts must be aligned to prevent excessive thrust loads on the unit's shaft and to minimize belt or chain wear. To check parallel shaft alignment, simply place a straightedge across the faces of the two sheaves or sprockets as shown in Figure 3-4. When properly aligned, the straightedge should contact the faces of both devices squarely. The object is to have the belt leave or enter the groove without rubbing or thrusting against the side of the groove.

Quarter-twist belts are often used to transmit power between a horizontal and vertical shaft. These shafts must be perpendicular and aligned as shown in Figure 3-5 to minimize belt wear and bearing loads. When looking down, as shown in the top view, a line perpendicular to the horizontal sheave at the center of its sheave must pass through the center of the vertical shaft. When looking at the end of the horizontal shaft, as shown in the front view, a line perpendicular to the vertical shaft at the center of its sheave must pass a distance "Y" below the center of the horizontal shaft.

Belt Tension
Belt and chain drives are tensioned by sliding the unit sideways after loosening the hold down bolts. It is very important to establish the proper tension, which is one just above the point of slippage. Belts that are too loose will slip, preventing proper acceleration or full output speed while creating belt overheating and pulley groove wear. On the other hand, tightening the belt or chain more than is necessary increases wear of the belt, bearings and shaft.

When available, follow the belt manufacturer's instructions for optimum tensioning. When such instructions are not available and the belt and sheave are not sized marginally, a simple check may be made to determine belt tension. To per- form this check, place thumb on belt at a point midway between the two sheaves and press



SPAN		"Y" DIMENSION	
Inches	mm	Inches	mm
60	1525	2.50	63
80	2030	2.75	70
100	2540	3.00	76
120	3050	4.00	101
140	3560	5.25	133

SPAN		"Y" DIMENSION	
Inches	mm	Inches	mm
160	4060	6.50	165
180	4570	7.75	200
200	5080	9.00	230
220	5590	10.50	270
240	6100	12.00	305

Figure 3-5: Perpendicular Shaft Alignment

downward. The belt should deflect a distance equal to one half of its thickness for each 24 inches of distance between the sheaves.

Because the simple check described above is not very precise, it is not recommended when the sheave is at or near the minimum size permitted by the unit's overhung load capacity. In such cases, even slight over-tightening of the belts can cause serious damage. To avoid these problems, check tension of marginally sized belts or sheaves as follows:

1. Obtain overhung load capacity of unit from page 3-2, Table 5-2 or the factory, and multiply by 0.03125.

2. Divide result of step 1 by the number of belts being used.

3. From result of step 2, add one of the following belt modulus factors, according to the belt type being used:

Belt Type	Modulus Factor	Belt Type	Modulus Factor
A	0.500	E	5.938
B	0.813	3V	0.375
C	2.500	5V	0.750
D	5.000	8V	1.563

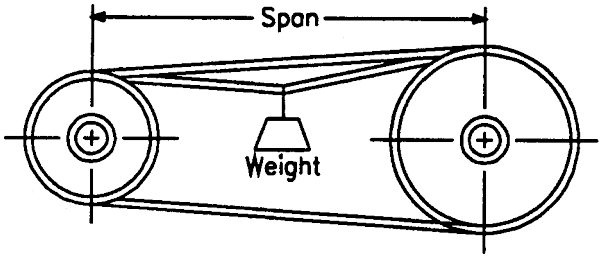
4. Hang weight on one belt at midpoint of belt span, as shown in Figure 3-6. Weight should be equal in pounds to value obtained in step 3. Belt should deflect 1/64" for each inch of span length. Adjust tension to obtain this result. Check other belts and adjust tension for average.

5. When belt slips after being tensioned, as described above, sheave or belts are improperly sized.

6. With new belts, tension should be checked and corrected after each 24 hours of operation until belts are broken in.

Final Mounting

After completing the initial mounting procedures and necessary alignment, secure the unit as follows:



$$\text{Weight} = \frac{\text{OHL} \times 0.03125}{\text{No. belts used}} + \text{Mf}$$

OHL = Overhung Load Capacity from page 3-2 or Table 5-2
Mf = Belt Modulus Factor

Figure 3-6: Precise Belt Tension Check

1. Make sure unit is level and its feet are still in contact with the mounting pads. If several thin shims were installed during alignment, consider replacing them with thicker shims. A few thick shims are preferred to large number of thin ones.

2. Tighten mounting bolts or nuts to secure unit to base. Recheck alignment and, if necessary,

correct it. Tightening bolts may pull unit down, especially when many shims are used.

3. For directly coupled units, dowel al interconnected units to base to ensure that shaft alignment will be maintained. For belt coupled units recheck belt tension and correct it if necessary. Tightening bolts or nuts may have moved unit, causing over-tensioning, even though tension was proper before bolts were tightened.

Shaft and Belt Guards

Before applying power and starting the unit, install guards over all rotating shafts, couplings, belts and chain devices. Refer to OSHA rules and regulation, paragraph 1910.219 for requirements covering guards on mechanical power transmission apparatus. Be sure machine is safe to operate and all safety devices have been installed, checked out and made operable.

Electrical Connections

Lead designations on wires are placed approximately 6 inches from exposed end and are firmly attached in a legible position.

Controller and motor connections are provided in Table 3-4. See Figure 3-7 to select motor lead connections conforming to available line voltage. The motor is either dual voltage or single voltage, three phase or single phase. Single-phase motors will have capacitor start; three phase motors will not.

All wiring to unit, including any accessories, must conform to the National Electrical Code and all other applicable state and local codes. Consult the nameplate for specifications covering the ac motor. Leads for the clutch are terminated in a junction box mounted on the housing. Accessories may also be wired to the same junction box or may be terminated in another junction box attached to the accessory. Connections from the junction boxes to the controller are made by connecting each lead or terminal to corresponding leads or terminals in the controller. Because interlocks are essential to safe operation, pay special attention to wiring these devices.

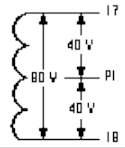
Unit Designation	Lead Designation	Lead Color
Alnico Generator Brake Coil Clutch Coil	G1 & G2 B1 & B2 C1 & C2	Grey Orange White
Motors with Integral Single Phase Transformer Windings		Purple Red with White Tracer Purple
Motor	T1,T2,T3 T4,T5,T6 T7,T8,T9	Black

Table 3-4: Lead Designation and Color

Unattended Start Feature

The new printed circuit board, No. 15-46-17, incorporates an "Unattended Start" feature. If line power to the drive is interrupted, the Run/Stop switch on the operator station must be reset before the drive will restart. If the unattended start feature is not required due to a similar customer furnished circuit, the unattended start feature can be bypassed by cutting jumper wire W3 on the new printed circuit board. Any previous printed circuit board, 15-46-13, that requires repair or replacement will be replaced with this new board and will incorporate the unattended start feature.

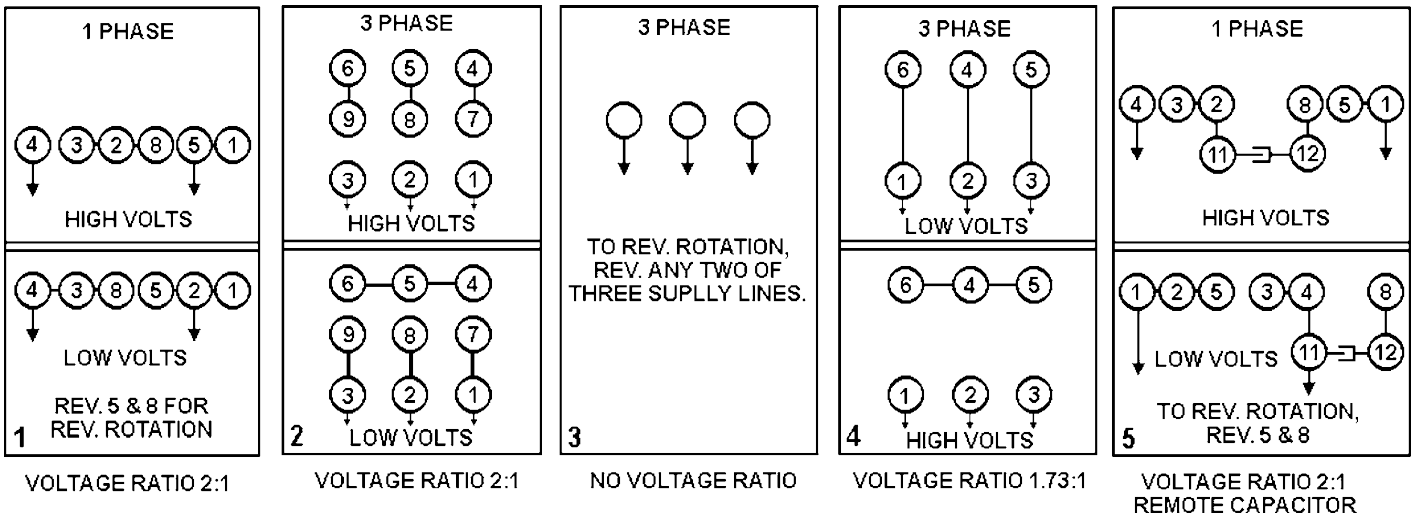


Figure 3-7: Motor Connections

Motor Reversing

3 phase - Standard 3 phase units can be reversed by interchanging any two supply leads. This is normally accomplished by the customer's reversing starter.

No other modification is necessary.

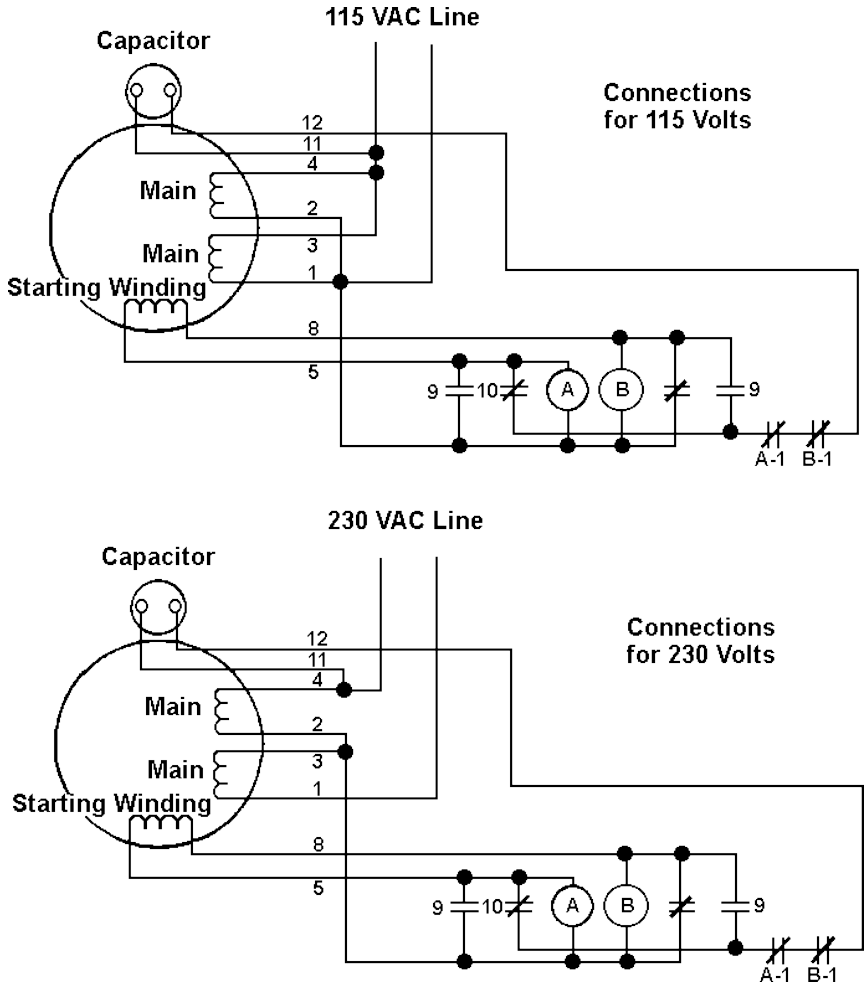
1 phase - Standard 1 phase units are reversed by interchanging motor leads 5 and 8.

When fast reversing of single-phase drives is necessary, a Type K motor winding is required. This is a factory option. Two un-mounted AC relays A & B will be supplied with this modification to provide high starting torque for rapids reversing (4 per minute under no load). See Figure 3-8

Pick-up voltage is 130-140 VAC. Dropout voltage is 45 VAC maximum. Relays A-1 & B-1 represent normally closed contacts.

Relays 9 & 10 represent the open and closed contacts of a double-pole, double-throw switch used for reversing. The switch contacts must not overlap.

Alternate opening and closing of the contacts on the dpdt switch effect positive reversal of the motor.



EB-11333/C

Figure 3-8: Schematic Diagrams of Motor Power Connections

SECTION 4

MAINTENANCE

CAUTION: Remove power from drive before performing maintenance procedures.

Cleaning
The Ajusto-Spede® drive should be kept clean. Remove all external dust and grease with an approved cleaning solution, such as Chloroethene. Use 25 psi of compressed air to remove dust from the interior surfaces. Repaint nicks and scratches to prevent rusting. If the drive is disassembled, clean all parts before reassembling them. Periodically remove the junction box cover and clean interior parts and surfaces. Be sure to keep the Speed control potentiometer clean.

Lubrication and Bearing Replacement
This Ajusto-Spede® drive contains four pre-lubricated bearings packed with an enough recommended grease and sealed on both sides. If the bearings become damaged, worn out or are removed during disassembly, replace them with new bearings during re-assembly. Bearing removal is covered in the disassembly procedure that follows.

If the drive remains idle for two or more years, the bearing grease will become oxidized; replace the bearings before renewing operation. Obtain replacement bearings from the Renewal Parts Department at DSI/Dynamatic®.

Inspection of Slip Rings and Brushes
The slip ring assembly is an integral part of the field and shaft assembly, consisting of two metal rings molded into an arc-resistant fiberglass material, connected by wire leads to the clutch coil. Two brush holders are positioned in the C-Face end bracket to hold the brushes against the slip rings. Inspect brushes periodically and replace them if worn.

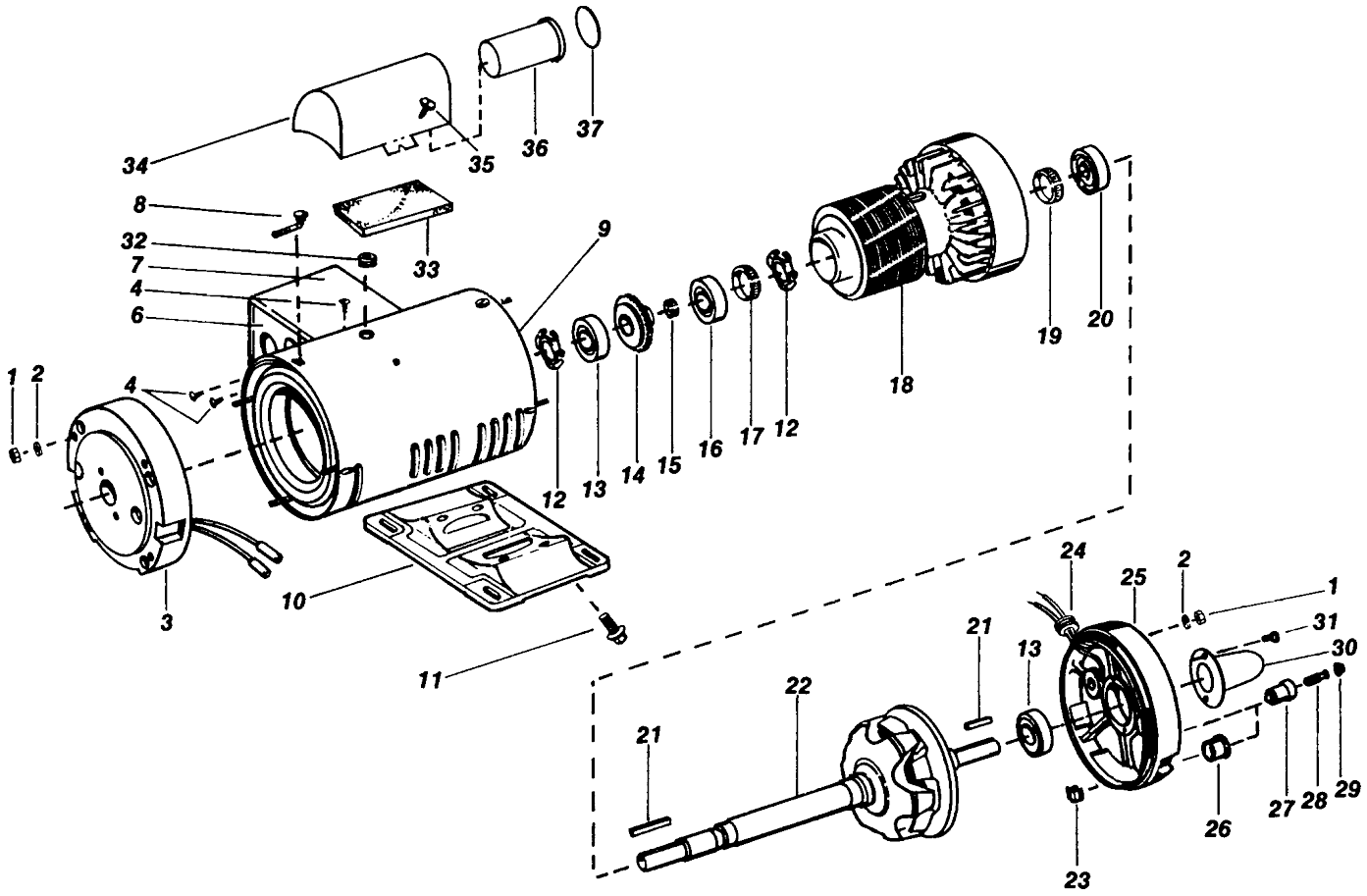
Disassembly Procedure
Disconnect the FAS drive and move it to a suitable work area where it can be disassembled without interference, danger of losing parts or having parts damaged. The area should be reasonably clean to keep dirt and chips from getting into components, electrical windings, bearings and the unit itself during re-assembly.

CAUTION: Do not attempt to disassemble the drive with the electrical power connected. Make sure the AC power is switched OFF and locked out. All wires coming to the unit should be identified, disconnected and the ends taped.

Proceed with the disassembly as outlined in the following steps (see Figure 4-1 and Table 4-1):

1. Remove two brush holder caps (29) and brushes (28) from end bracket (25).
2. Remove two pan head screws (31) and shaft protector (30), if installed.
3. Remove a key (21) from each end of the shaft, if still installed.
4. Remove four hex nuts (1) and lock washers (2) from end bracket (25).
5. Being careful of wire leads, remove end bracket (25). Remove wire leads from brush holder assembly, if necessary. See Figure 4- 6.
6. Carefully slide motor rotor and quill assembly (18), which includes field and shaft assembly (22), out of motor and shell assembly (9).
7. Remove four hex nuts (1) and lock washers (2) from end bracket (3).
8. Being careful of generator leads, remove C-Face end bracket and generator assembly (3) from motor shell assembly (9). Disconnect the plastic connector. Remove loading spring (12).
9. With a suitable puller, remove a bearing (13) from each end of shaft. See Figures 4-5 through 4-8.
10. Remove generator rotor (14) from shaft. See Figure 4-7.
11. Remove motor rotor and quill assembly (18) from field and shaft assembly (22) toward the motor end, using a suitable puller.

    NOTE: bearing (16) and loading spring (12) will be removed along with the motor rotor and quill assembly.



D-160600

Figure 4-1: Exploded View of Standard FAS

12. Remove tolerance ring (17).

13. Remove bearing (20) with a puller (see Figure 4-8) and remove bearing tolerance ring (19).

14. Generator stator is pressed into C-Face end bracket and generator assembly (3) and peened in four places. Do not remove generator.

CAUTION: Bearings that have been removed should be replaced with new bearings. Balls and races may be brinelled during disassembly.

Re-assembly Procedure
Reassemble the drive in the reverse order of disassembly. Use new bearings.

NOTE - Prongs of both items (12) should be toward bearings (13) and (16).

ADDENDUM – rev. 8/21/03

Table 4-1: Parts List (FAS) Ref Figure 4-1

Item Number	No. Req'd.	Description	Part Number
1	8	Hex nut	DY-10403
2	8	Lockwasher	DY-9995
3†	1	C-Face end bracket & generator assembly (1800 rpm or 3600 rpm)	C-160608-††
4	5	Self-tapping screw	DY-11636
6	1	Junction box	D-160592-0100
7	1	Junction box cover	C-160606-0100
8	8	End bracket bolt	A-160609-0100
9	1	Motor and shell assembly	D-160591-††
10	1	Base - Specify one of the following:	
		Standard shown (also shown Figure 4-4)	B-152667-0100
		Optional (shown in Figure 4-2)	C-160142-0100
		Optional (shown in Figure 4-3)	C-160143-0100
11	4	Thread forming screw	DY-16345
12	2	Loading spring	DY-9103
13†	2	Bearing, size 203	DY-10187
14†	1	Generator rotor	A-151627-0200
15	1	Tolerance ring	DY-16343
16†	1	Bearing, size 203	DY-13441
17	1	Bearing tolerance ring	DY-16346
18	1	Motor rotor and quill assembly	C-160629-††
19	1	Bearing tolerance ring	DY-16326
20†	1	Bearing, size 204	DY-13440
21	2	Key	DY-670
22	1	Field and shaft assembly	C-160624-††
23	2	Tinnerman speed clip	DY-12575
24	1	Rubber grommet	DY-10644
25	1	C-Face end bracket & brush holders	C-160607-0100
26	2	Tinnerman speed clip	DY-12569
27†§	**2**	**Brush holder body**	**A-150170-0003 (-0002)**
28†§	**2**	**Brush, carbon**	**A-150171-0200 (-0100)**
29†§	**2**	**Brush holder cap**	**A-150170-0010 (-0001)**
30	1	Shaft protector	A-152655-0100
31	2	Pan head sems screw	DY-11980
32*	1	Rubber grommet	DY-10644
33*	1	Sponge for capacitor	A-152658-0100
34*	1	Case for capacitor	B-160675-0100
35*	2	Thread forming screw	DY-16344
36*	1	Capacitor	23-278-††
37*	11	Insulation disc	A-152659-0100

† Recommended Spare Parts. †† Specify M-4 number; see master bill.

§ New design – please provide serial number before ordering; old design part number in parentheses.

* Included on single phase drives only.

Bases

4 slots are parallel to centerline of Ajusto-Spede ® frame.

4 slots are perpendicular to centerline of Ajusto-Spede® frame.

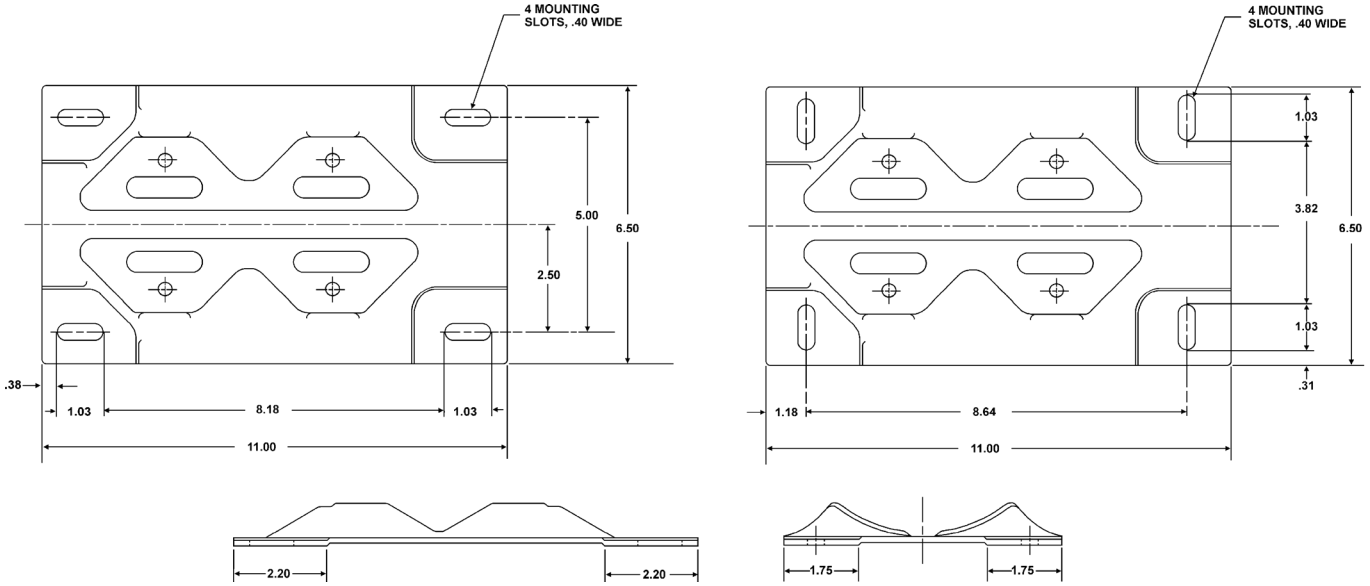


Figure 4-3: Optional Base No. 160142-0100

Optional Base No. 160143-0100

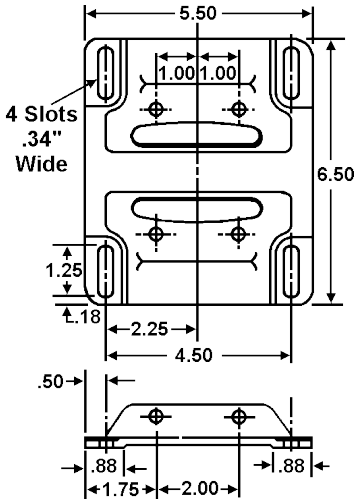


Figure 4-4: Standard Base No. 152667

Table 4-2 Which Base to use when one is specified

Ajusto-Spede® Drive Configuration	Bases Used
Standard Unit	152667
Unit with Friction Brake	152667
Unit with Spring Set Brake	152667
Unit with Eddy Current Brake	160142 or 160143
Unit with Flange Mounted Gear Reducer	160142 or 160143
Unit with Flange Mounted Gear Reducer and Friction Brake	160142 or 160143
Unit with Flange Mounted Gear Reducer and Spring Set Brake	160142 or 160143
Unit with Flange Mounted Gear Reducer and Eddy-Current Brake	160142 or 160143

Bearing Puller Order Part Number DY-12677

The puller is a special tool development of DSI/Dynamatic®. It is intended to be used in conjunction with disassembly instructions for a standard fractional HP Drive contained in this instruction manual. For price and delivery contact the factory at 262-554-7977, or toll free at 1-800-548-2169

Figure 4-5

Figure 4-6

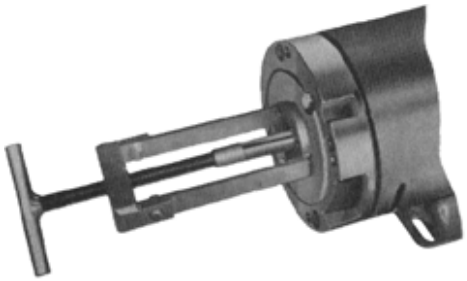
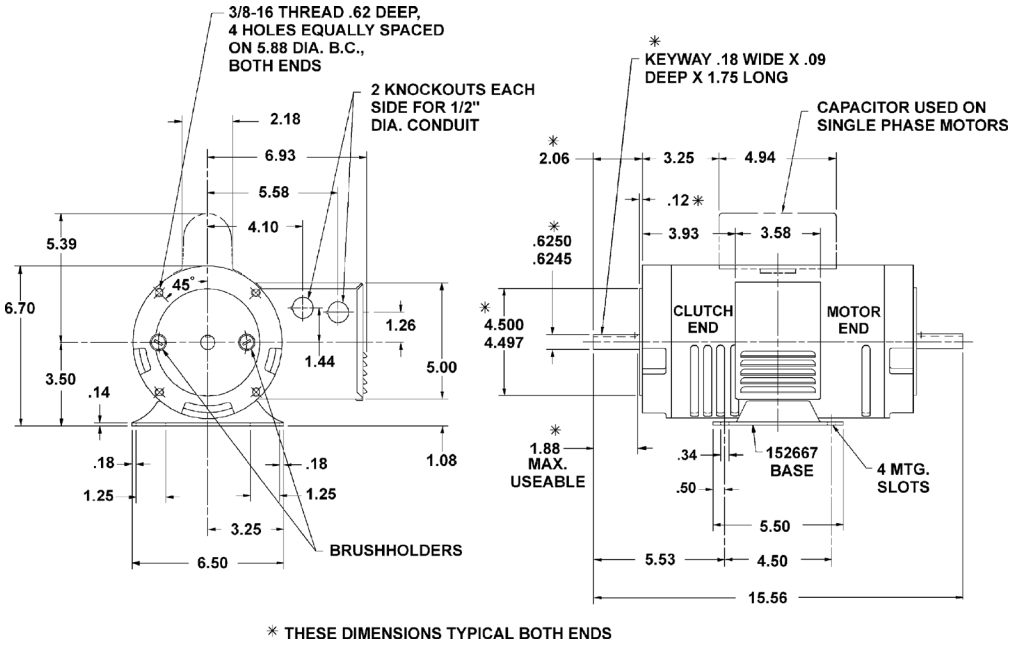


Figure 4-7

Figure 4-8



C-160182 *Figure 4-9: Outline Drawing – Standard C-Face Drive with Base*

SECTION 5

MECHANICAL MODIFICATIONS

Modular Eddy-Current Brake

The modular eddy-current brakes come pre-assembled from the factory.

The eddy-current brake unit consists of a field permanently attached to the adapter flange with a drum mounted on the shaft. The brake unit is mounted on a standard C-Face. The brake works on the principle of eddy-currents. When voltage is applied to the coil, eddy-currents are generated in the drum, which in turn produce the braking torque. The brake will provide controlled deceleration only but will not provide a holding function. If the brake is not initially mounted at the factory, it will have to be installed when received. When ordering the brake, specify which side to mount the conduit box on. Assembly procedure follows.

Assembling the Brake

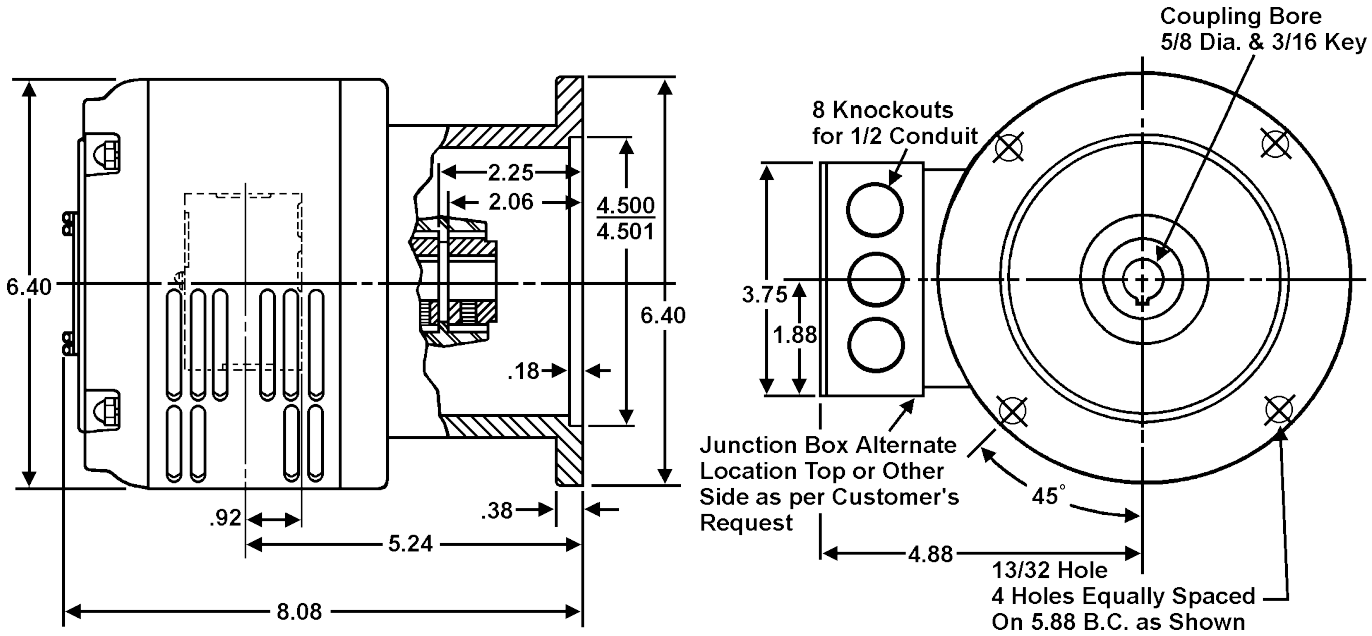
Assembly procedure of eddy-current brake to the standard FAS unit, is as follows (see Figure 5-8):

1. Place the hub portion of coupling (20) on the Ajusto-Spede shaft flush with the end of the shaft and secure it with the hub set screw.

   Make sure the brake coupling hub is flush with the end of the brake shaft. Both hubs are then in the proper position on the shafts. Mount the coupling sleeve on the brake (or Ajusto-Spede® hub).

2. Mount the brake assembly onto the unit and attach it by inserting and tightening four cap screws (27). The brake is in the proper position if the nameplate is up and it is on the same side as the junction box on the Ajusto-Spede. Mount on C-Face end bracket and generator assembly (3) (see Figure 4-1), if possible, to avoid having to remove this brake to check or replace brushes from end bracket (25) (see Figure 4-1).

3. The use of flexible conduit is recommended to connect wires between the brake and Ajusto-Spede junction boxes. Follow the electrical prints for connecting the lead wires from the brake to the controller and operator's station.



C-160466

Figure 5-7: Modular Eddy Current Brake

Table 5-7: Parts List

Item No.	No. Req'd.	Description	Part Number
1	1	Spring	DY-9103
2	1	Shaft	160464-0100
3†	2	Bearing	DY-10187
4	1	Shaft cover	150937-0100
5	1	Washer	DY-16474
6	6	Pan head sems	DY-11980
7	1	End Bracket	150897-0100
8	1	Drum & fan assy.	††
10	4	Lockwasher	DY-15
11	4	Locking stud	150936-0100
12	1	Shell	150784-0200
13	1	Grommet	DY-7321
14	4	Clip	36-42-3
15	1	Machine screw	DY-67
16	1	Adapter flange	160454-0100

Item No.	No. Req'd.	Description	Part Number
18	1	Retaining ring	DY-15107
19	1	Key	DY-11209
20	1	Coupling	DY-15109
21	4	Lockwasher	DY-10213
22	2	Machine screw	DY-3202
23	1	Junction box	DY-193
24	3	Socket hd screw	DY-9077
25	3	Lockwasher	DY-4497
26	1	Field assembly	160478-††
27	4	Hex hd Screw	DY-7594
28	1	Protective Plug	DY-11450
29	1	Conduit Assembly	160459-0300
30	4	Lockwasher	DY-4771
31	2	Flatwasher	DY-16620
32	1	Gasket	B-86223-0100

† Recommended spare parts
†† Specify M-4 number; see master bill

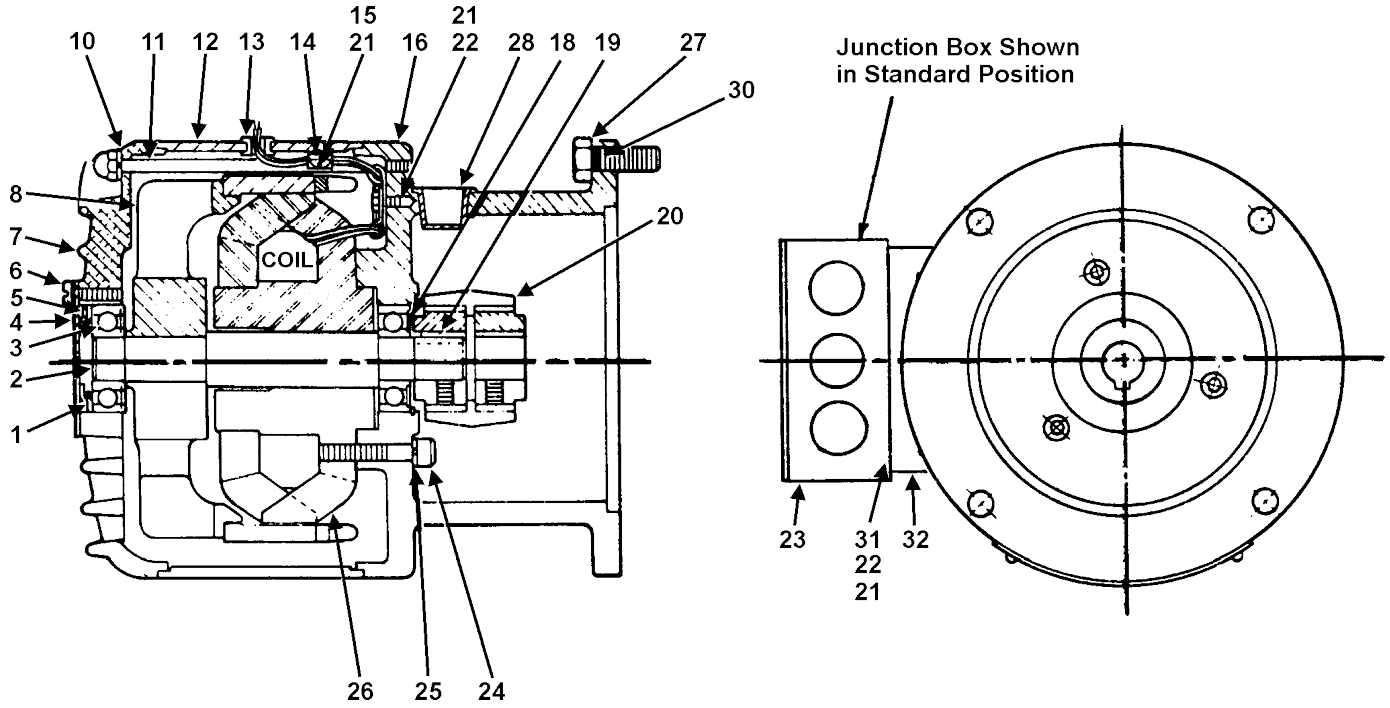


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Figure 5-8: Cutaway View of Modular Eddy Current Brake

SECTION 6

ELECTRICAL CONTROLLER WITH MODIFICATIONS

Type 15-47 Electronic Controller (80 Volt Input)

Location and Installation

The standard Type 15-47 controller, as shown in Figure 6-1, is an integral part of the mechanical drive. It is mounted in an enclosure on the side of the drive. When mounting the mechanical unit, avoid mounting it with the controller enclosure positioned in a way that allows foreign matter to enter the louvered cover. The controller should not be operated in ambient temperature above 40ºC. (104ºF.)

Avoid operating the drive for long periods of time without the louvered cover in its proper position.

The controller printed circuit board, No. 15-46-17, replaces obsolete board No. 15-46-13. This new board incorporates an “unattended start" feature.

If line power to the drive is interrupted, the Run/Stop switch on the operator station must be reset before the drive will restart.

If the unattended start feature is not required due to a similar customer furnished circuit, the unattended start feature can be bypassed by cutting jumper wire ""W3" on the printed circuit board.

The controller is designed to operate satisfactorily at a minimum of 50 rpm on 1600 rpm models and at a minimum of 65 rpm on 3300 rpm models. Continued operation below the prescribed speeds will result in unstable performance.

Wiring

The controller enclosure has knockouts located on both sides for 1/2-inch conduit. Remove the L-shaped enclosure cover to facilitate connecting all leads.

The controller contains easily accessible terminals. When interconnecting the system's

control elements follow the connection diagram in Figure 6-1.

Since these wires carry low current, the minimum sizes (not smaller than No. 22 AWG) permitted by local codes may be used. Use shielded wire or separate conduit on all governor generator and Speed potentiometer connections. Ground shield at one end only.

The motor leads should be run in a separate conduit. Failure to do this may result in erratic operation due to pickup of stray voltages.

The motor is single or dual voltage, single or three phase. If the drive is single phase, with a capacitor supplied, refer to the label in the cover of the conduit box for proper motor connection.

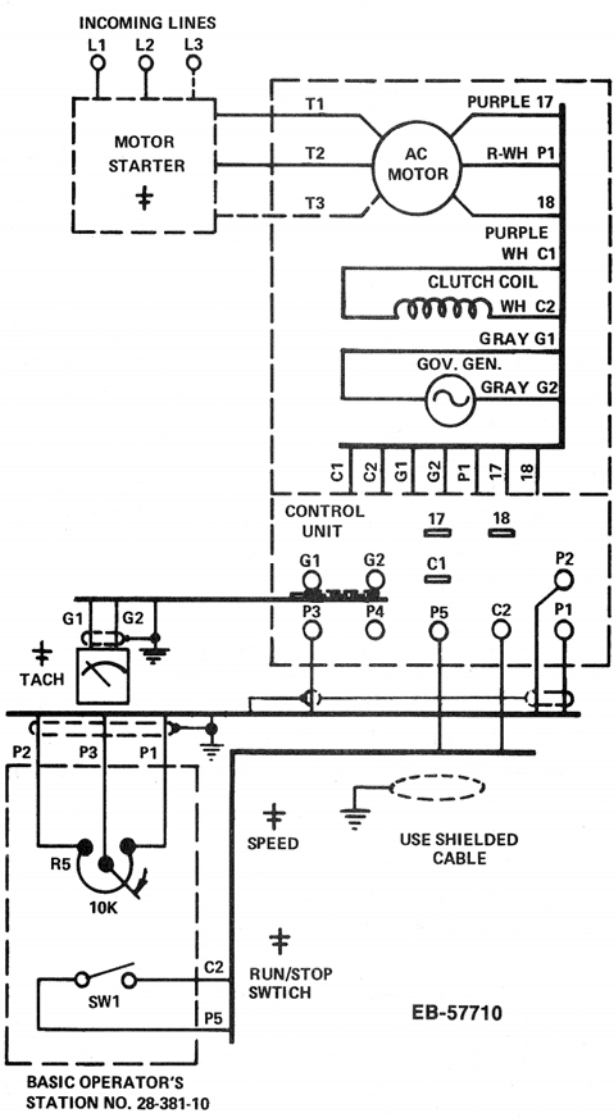


Figure 6-1: Controller Connection Diagram

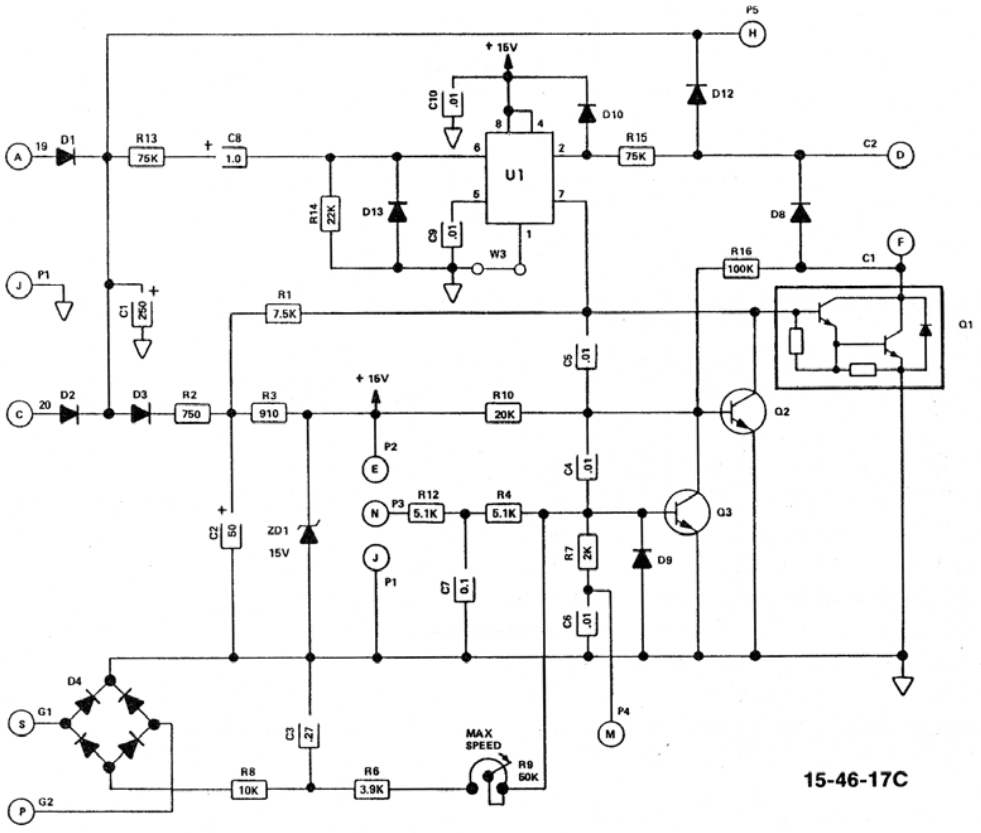


Figure 6-2: Type 15-47 Controller Schematic Diagram - 80 Volt Input

Start-Up Procedure

Start the AC motor. Set the Stop/Run switch in the Run position.

Turn the Speed potentiometer R5 to the maximum position (10 on Dial) to accelerate the drive to full speed. Adjust the Maximum Speed pot (located on the plug-in printed circuit board) until maximum rated output speed (shown on the nameplate) is obtained. Determine the output speed by use of a tachometer or stroboscope.

Adjust the Speed potentiometer R5 to the desired setting. Subsequent change in operating speed can be made by adjusting the Speed potentiometer.

If the unit will not run--Check:

1. Fuses on PCB.
2. Incoming line voltage to motor.
3. Voltage across outside terminals of Speed potentiometer R5; it should read approximately 15 VDC.
4. For an open clutch field coil (C1 & C2). Disconnect C1 lead from terminal board and check coil resistance (between C1 & C2 clutch leads); it should be approximately 30 ohms for a 40 VDC clutch coil.
5. A loss of line voltage for more than a one second duration will cause the drive to shut down. With the unattended start feature to restart the drive, it is necessary to first place the Stop/Run switch in the Stop position and then return it to the Run position.

If unit runs at top speed only--Check:

1. Voltage of G1 & G2 - should be approximately 45 VAC at full speed.
2. Return operator's Speed potentiometer R5 slowly to zero. If the drive suddenly stops, check for an open circuit in Speed potentiometer R5.
3. G1 or G2 governor generator for open leads.

If unit hunts or runs erratically--Check:

1. For dirt on operating surfaces of Speed control potentiometer.

2. That mechanical unit is electrically grounded.

3. For brushes not seated properly or contaminated slip rings.

If unit drifts in speed--Check:

1. Loading on the drive that may be excessive, particularly at low speeds, so drive overheats and will not pull the load.

2. For wide variation in line voltage.

3. If problem persists; replace PCB.

Spring Set Brake

It is necessary to connect two brake leads, L1 and L2A, to the controller. L2A is connected from the brake to the switch in the operator's station. The second lead, L1, is connected directly to the incoming line. See Figure 6-3.

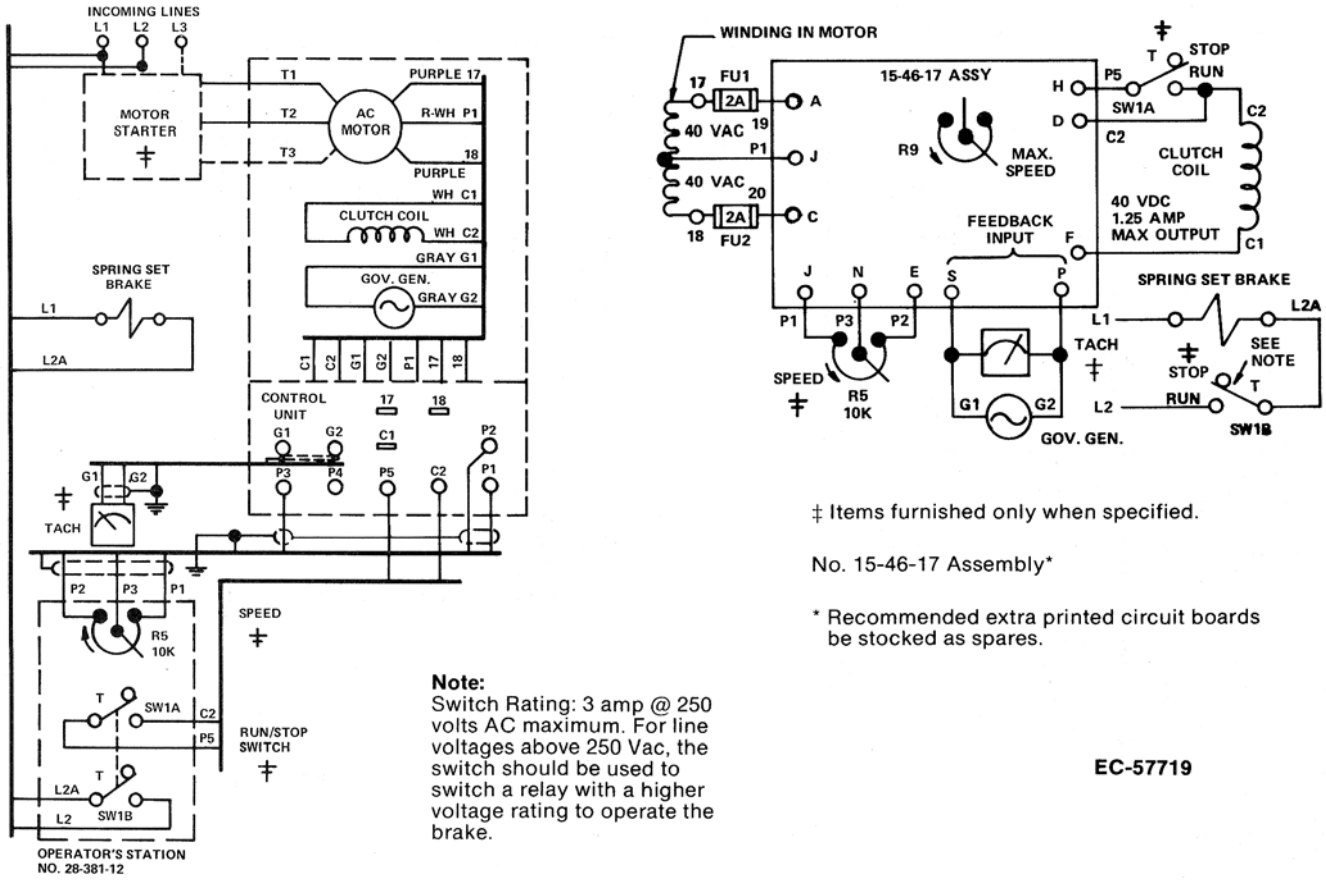


Figure 6-3: Spring Set Brake Connection Diagram

Non-Adjustable Braking

Non-adjustable braking gives a fixed, full voltage output to the brake coil, either friction brake or eddy-current brake, when the Run/Stop switch is set in the Stop position. A back-diode rectifier is mounted in the 28-381-13 operator's station to prevent any voltage surge back to the 15-47 controller when the brake is de-energized. See Figure 6-4.

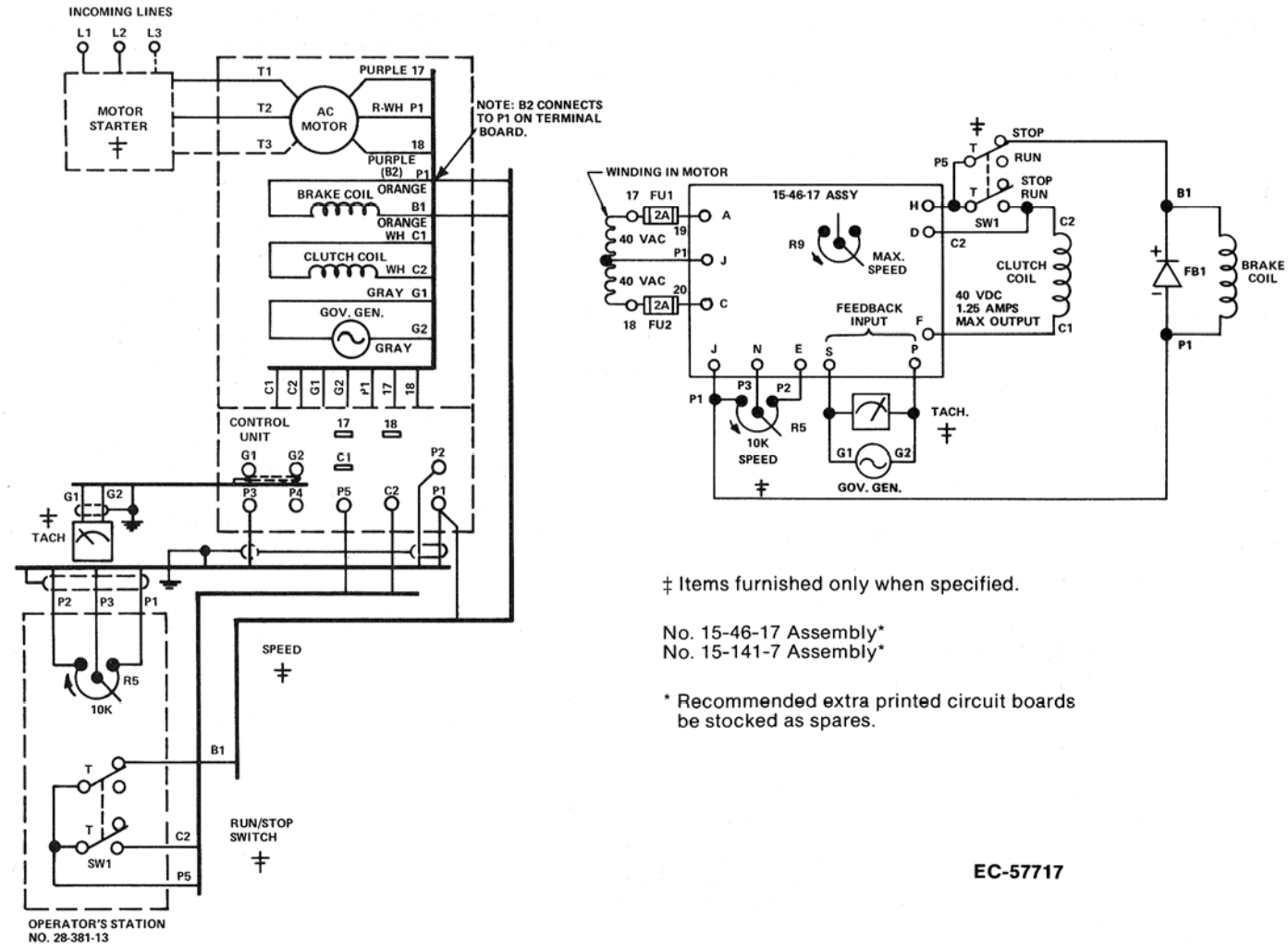


Figure 6-4: Non-Adjustable Braking Connection Diagram

Mutuatrol®
Set-Up Procedure

A Mutuatrol type controller allows the clutch and brake to be mutually regulated. The primary purpose is accurate speed control using driving or braking torque as required when overhauling loads exist. It consists of a transistorized amplifier operating an eddy-current clutch and eddy-current brake mounted on the same drive. It provides for proportional braking when the drive is stopped or overhauled.

The Maximum Speed pot R9 is a single turn, thumb-operated potentiometer. Overlap Adjust pot R7 and Brake Bias pot R8 are trimmer screw type adjusting potentiometers. From maximum position to zero position are approximately 15 to 20 turns in the CCW direction. (See Figures 6-5 and 6-6.)

The procedure for setting the Potentiometers follows:

1. Set the Run/Stop switch to the Stop position. Start the ac motor. Allow approximately 2 to 3 minutes for the zener diode to stabilize.
2. Set the Run Speed potentiometer to maximum speed position (10 on dial). Turn the Maximum Speed pot R9 full CW and Overlap Adjust trimmer pot R7 full CCW. These settings are at the zero end or minimum position.
3. Start the drive and apply full load if possible. Adjust the Maximum Speed potentiometer R9 so that the drive just reaches its full rated speed with full load applied. If it is impractical to apply full load, adjust the Maximum Speed potentiometer R9 so that the drive runs at 3% above full rated speed. To determine accurate output speed, use a tachometer or stroboscope. Decreasing the Speed potentiometer R5 setting will decrease the output speed. Stop the drive.
4. Set the Speed potentiometer R5 to mid-range (50% on dial). Turn the Overlap Adjust pot R7 and Brake Bias pot R8 trimmer screws full CCW (this is at the zero end). Using a voltmeter, 0-50 VDC range, connect the meter leads to brake terminals B1 and P5. Start the drive and turn the Overlap Adjust pot trimmer screw CW until an approximately 3 VDC reading is obtained on the meter. Set the Run/Stop switch to the Stop position. Turn the Brake Bias trimmer pot screw CW until an approximately 10 VDC reading is obtained on the meter. Disconnect the voltmeter.
5. The purpose of the Overlap Adjust potentiometer is to provide control over clutch/brake "overlap".
6. If faster braking is desired, increase the Brake Bias potentiometer setting.

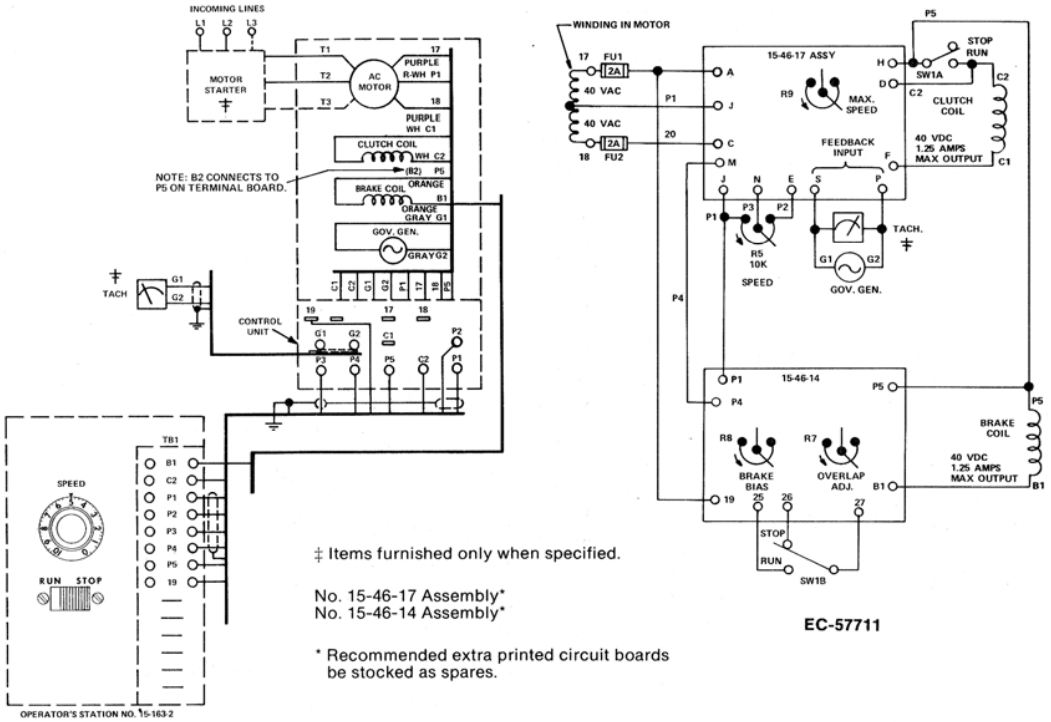


Figure 6-5: Mutuatrol Clutch & Brake Control Connection Diagram

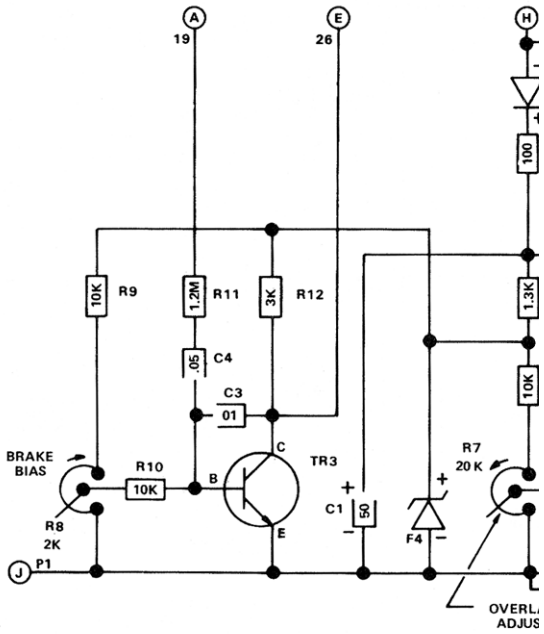


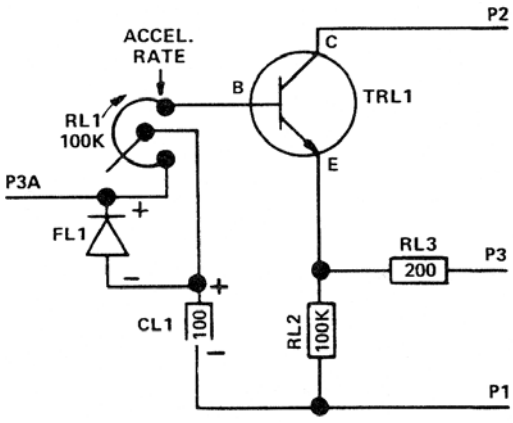
Figure 6-6: Mutuatrol Clutch and Brake Control Schematic

Logarithmic Acceleration

This module is a small printed circuit board mounted in the control station, it provides a means of controlling the rate of rise of the reference voltage, thus controlling the rate of acceleration of the output speed. The acceleration rate potentiometer can be varied from 2 to 40 seconds for full output speed. See Figure 6-7.

Set the acceleration rate potentiometer RL1 to the desired rate of speed. When the drive is energized, the speed will increase logarithmically to the preset speed. See Figure 6-8.

Figure 6-7: Logarithimic Acceleration Schematic



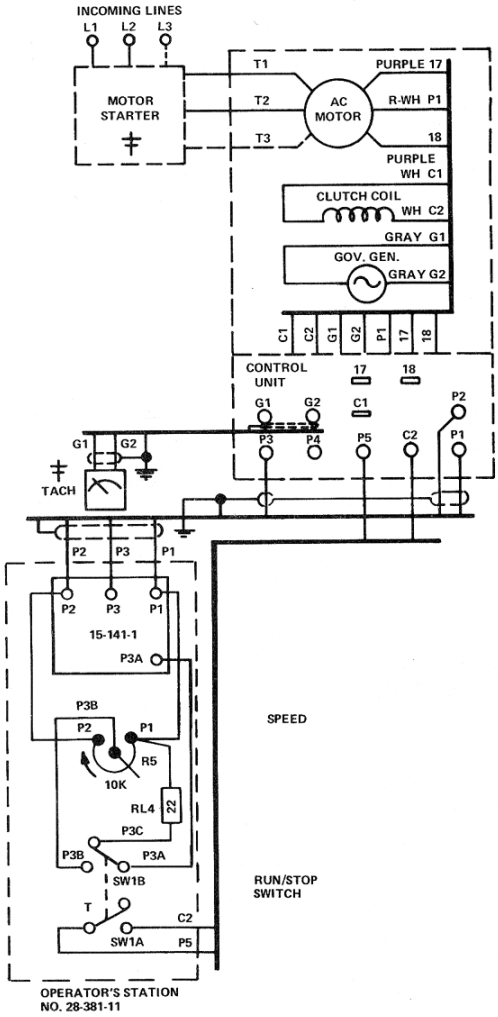


Figure 6-8: Logarithimic Acceleration Connection Diagram

Linear Acceleration

Acceleration is controlled at a constant rate. At any rate setting, 50% of speed is obtained in half the set time, 25% of speed in one fourth the set time, etc. The time to reach maximum speed is adjustable from 7 to 70 seconds. See Figures 6-9 and 6-10.

To set Bias potentiometer R8 with full load applied, set the Speed potentiometer R5 at zero. Turn the Bias potentiometer R8 CCW. When the output shaft begins to rotate, back off the control just enough to stop rotation.

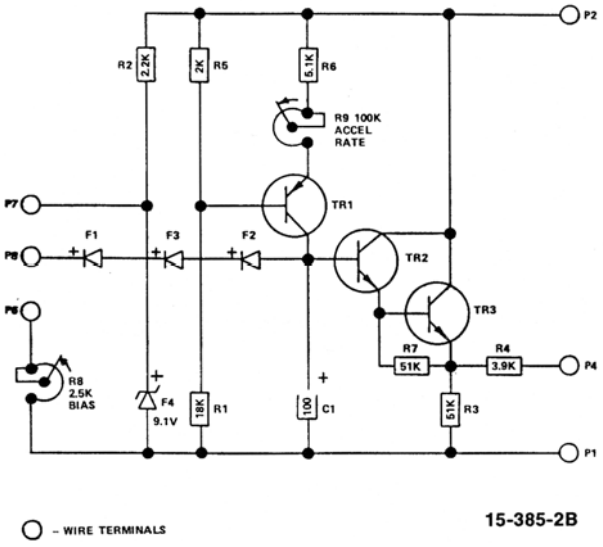


Figure 6-9: Linear Acceleration Schematic

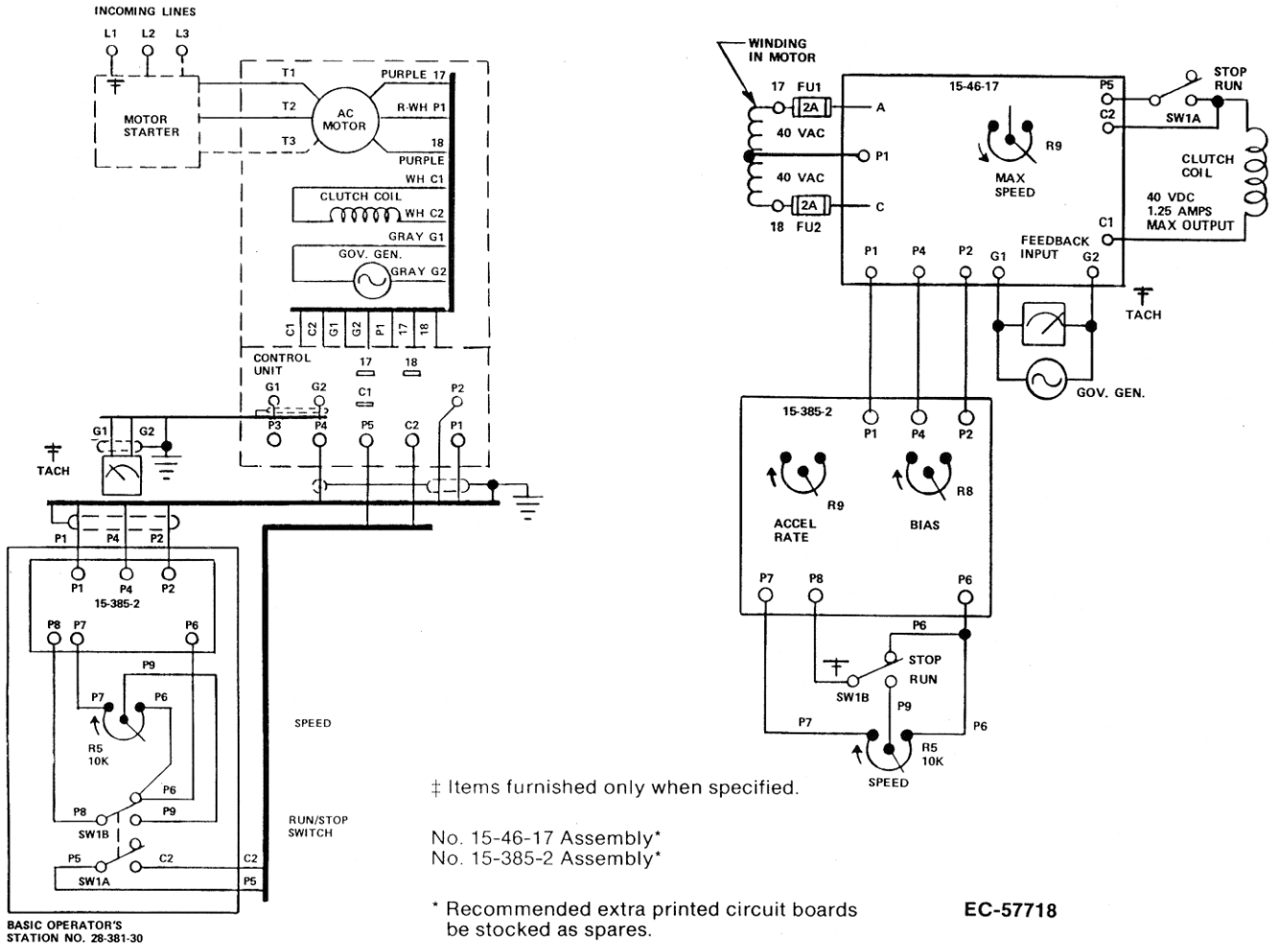


Table 6-10: Linear Acceleration Connection Diagram

Tachometer Follower Set-Up Procedure

The Tachometer Follower allows the drive to "follow" a remote tachometer generator on some other drive. The operator can switch to Manual Speed control independently of the remote mode when desired. With the Ratio and Bias potentiometers set properly, the speed match between two fractional hp drives can be obtained within ±2%. This matching accuracy specification is valid only if the potentiometers shown in Figures 6-14 and 6-15 are set up properly.

The procedure for setting the potentiometers follows:

1. Set the Manual/Automatic switch SW2 to its Manual position.
2. Start the drive.
3. Adjust the Maximum Speed potentiometer R9 for maximum rated speed (full CCW position).
4. Set the Manual/Automatic switch SW2 to its Automatic position.
5. Set the Ratio and Bias potentiometers at 50%.
6. Set the Run/Stop selector switch SW1 to its Run position. Run the master drive at 100 rpm. Adjust the Bias potentiometer RF6 until a follower RPM of 200 under light load is obtained.
7. Run the master drive at 1500 rpm. Adjust the Ratio potentiometer until a follower rpm of 1500 (-5, +0 RPM) is obtained.
8. Run the master drive at 100 rpm. Adjust the Bias potentiometer RF6 until a follower rpm of 90 (+0, -5 rpm) under light load is obtained.
9. Run the master drive at 1500 rpm. Readjust the Ratio potentiometer R55 until a follower rpm of 1500 (+0, -5 rpm) is obtained.
10. Steps 8 and 9 may have to be repeated to obtain maximum follower linearity.

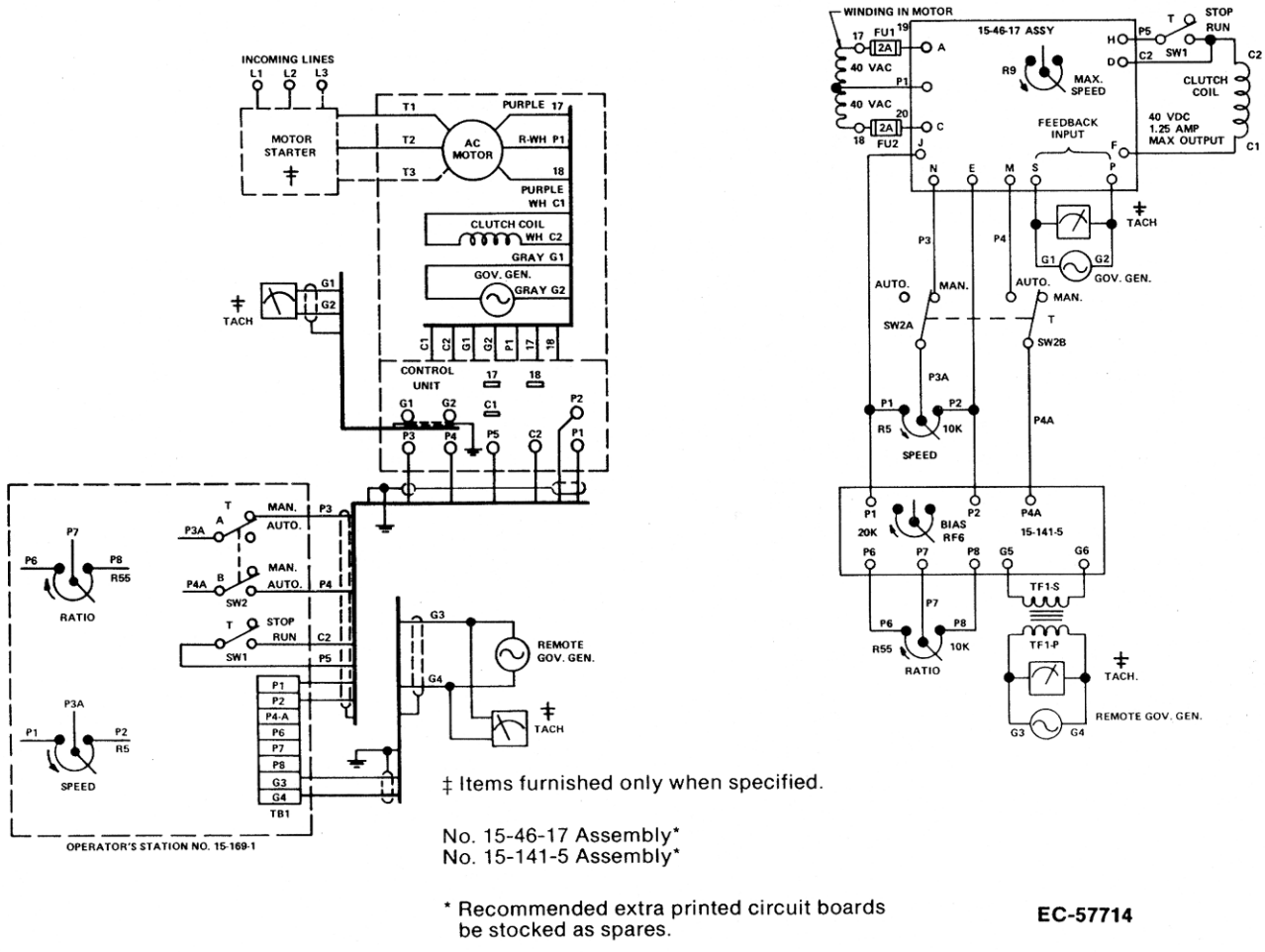
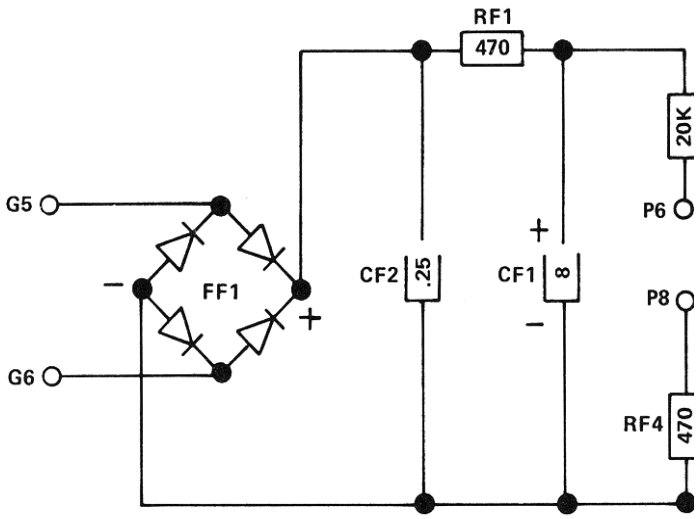


Figure 6-11: Tachometer Follower Connection Diagram

Figure 6-12: Tachometer Follower Schematic



Threading

This modification allows the customer to select a second adjustable speed by use of a selector switch. Operator's station includes Run, Speed

and Thread potentiometers, Run-Thread selector switch and clutch Run/Stop switch. See Figure 6- 13.

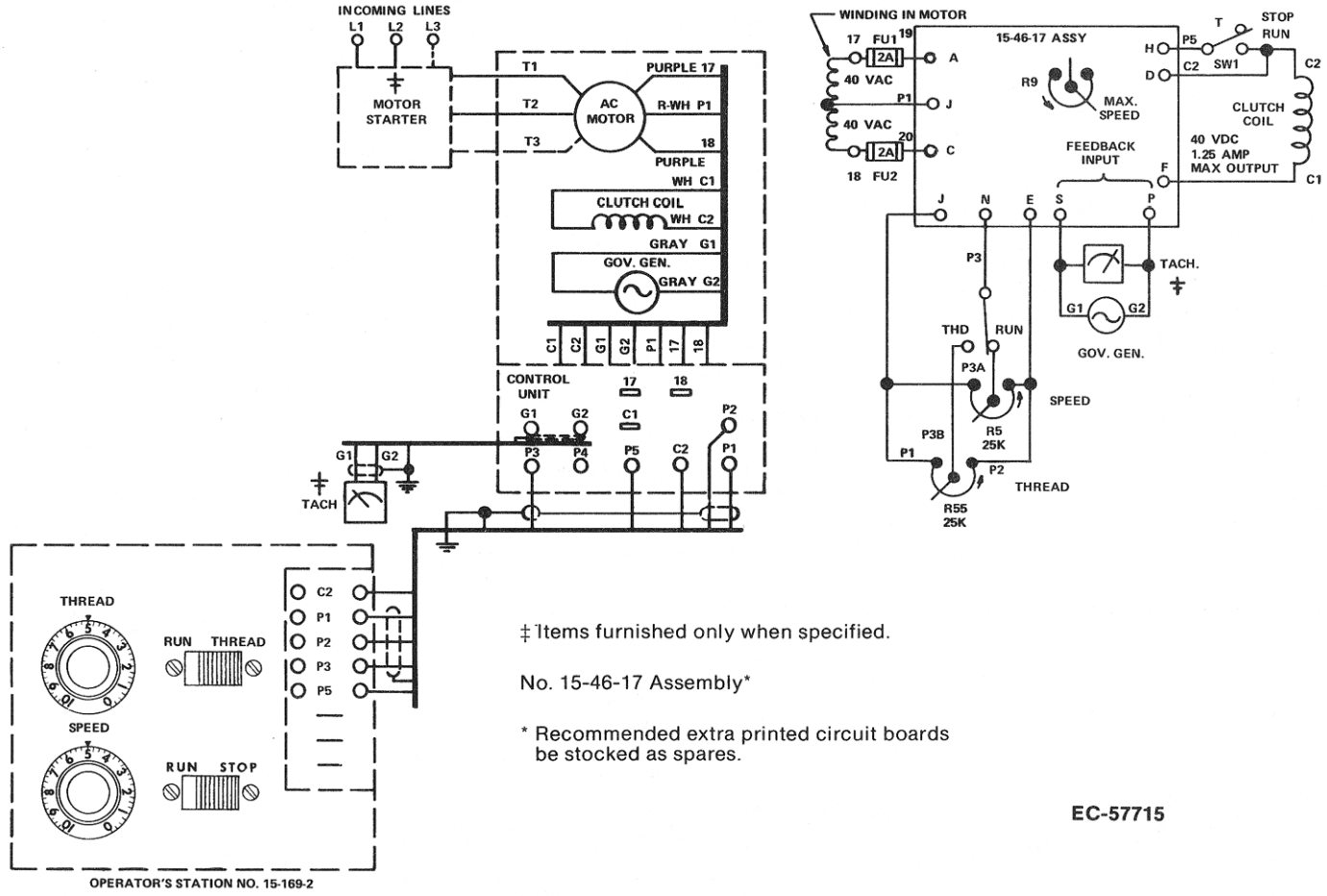


Figure 6-13: Threading Connection Diagram

Adjustable Torque

This modification provides constant voltage to the clutch coil. Since clutch torque is a function of this voltage, the magnitude of clutch torque is then dependent upon the operator's potentiometer setting which adjusts the voltage and torque/slip characteristics of the particular drive. See Figure 6-

14 for connections. Selection of low or high range, as shown in Figure 6-18, can be made with switch SW1 located on the main PCB. The low range covers approximately 0-90%, while the high range covers 70% or more of rated motor torque, permitting fine adjustments.

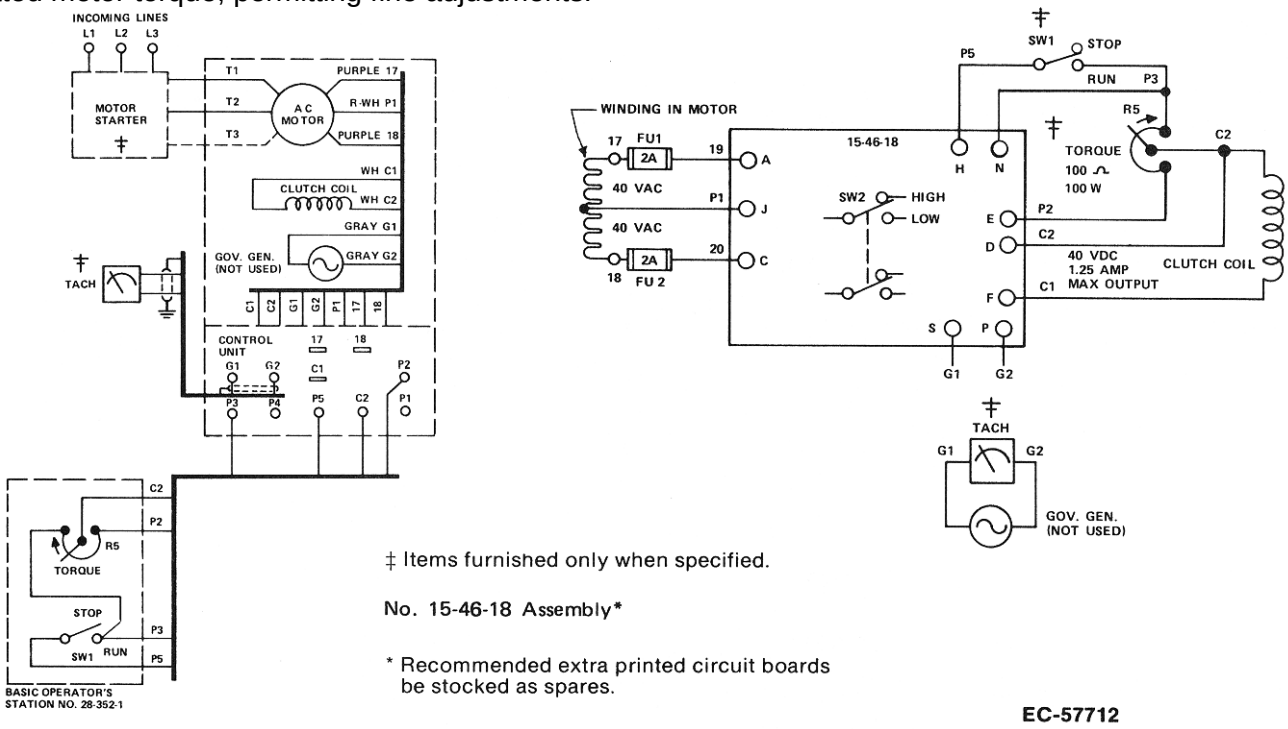


Figure 6-14: Adjustable Torque Connection Diagram

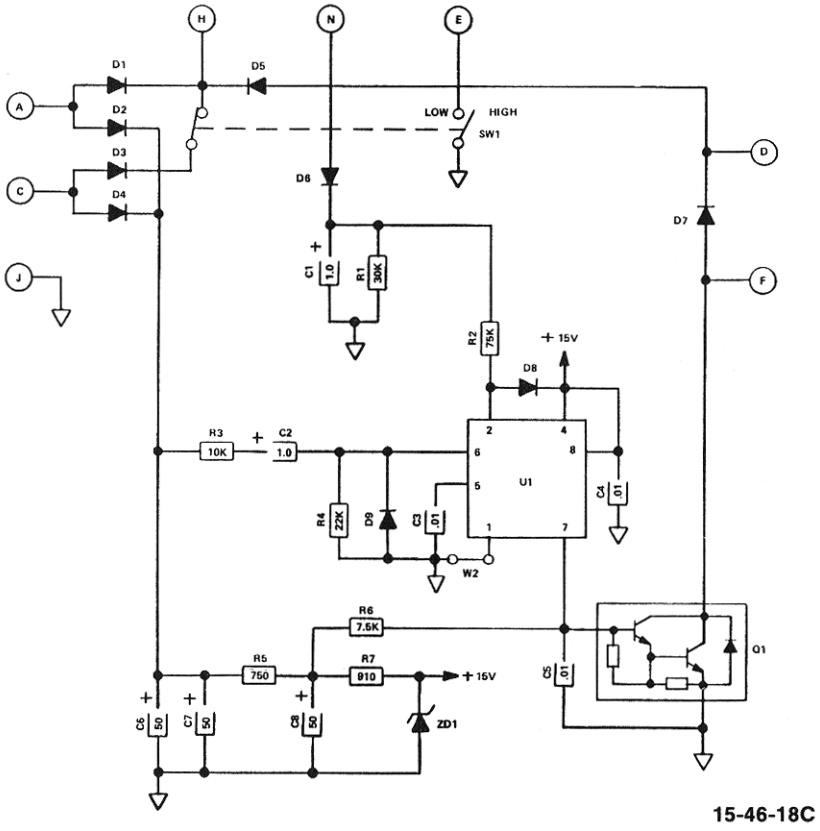


Figure 6-15: Adjustable Torque Schematic

Control Station Dimensions

Table 6-1: Available Control Stations

Control	Description
28-381-10	Basic Control Station
28-381-11	Log Acceleration
28-381-12	Spring Set Brake
28-381-13	Non-Adjustable Brake
38-381-30	Linear Acceleration
28-352-1	Adjustable Torque Option
15-163-1	Low Signal Follower
15-163-2	Mutuatrol®
15-169-1	Tachometer Follower
15-169-2	Threading

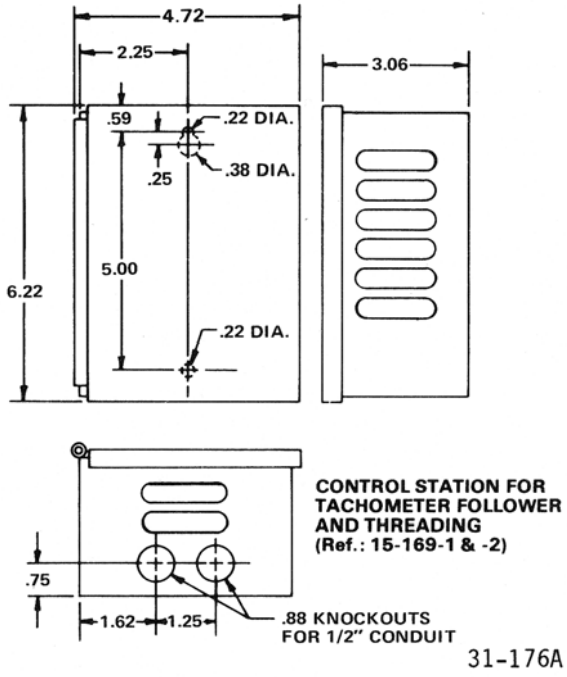


Figure 6-16: No. 15-169- Control Stations*

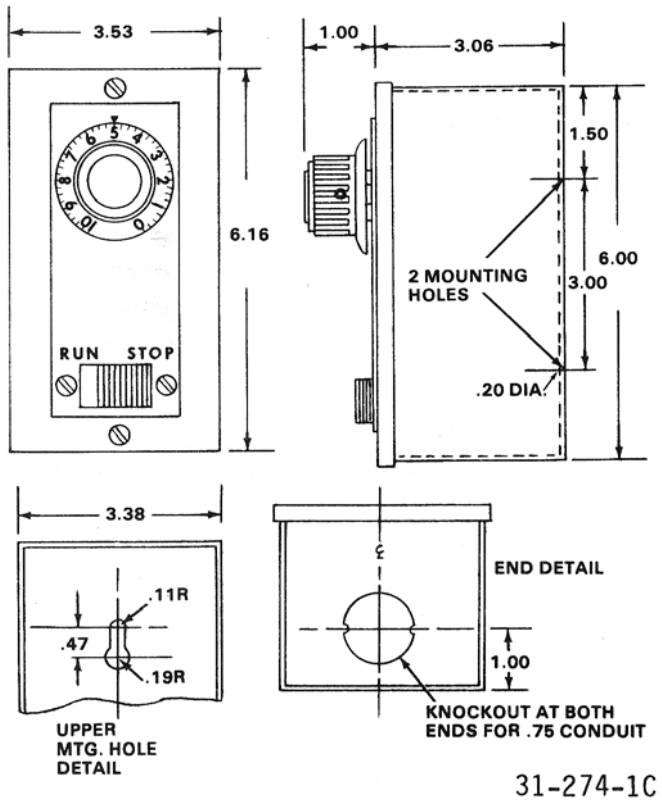


Figure 6-17: No. 28-381- Control Stations*

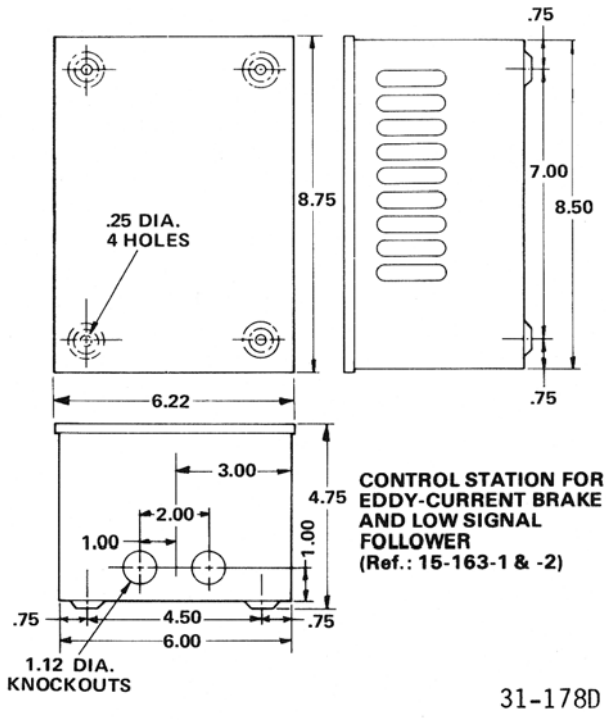


Figure 6-18: No. 15-163- Control Stations*

SECTION 7

SERVICE & RENEWAL PARTS

DSI/Dynamatic® provides a total service program to ensure your satisfaction with its products. DSI/Dynamatic® maintains an Aftermarket Sales & Service Department which offers the following services to you: Training, factory repair service and renewal parts. The company also maintains a nation-wide network of distributors and authorized service centers. Please contact the factory for the location nearest you.

Renewal Parts and Recommended Spares
Seriously consider the value of stocking recommended spare parts. The lost profits due to downtime vs. the cost of spare parts on hand, you alone can evaluate. Each installation is different and depends on the output volume and loading of the machine. The list of recommended spare parts included in this manual is based on average conditions and service life history. Prices change periodically due to the economy as do production quantities available; therefore, prices are not included. Prices can be obtained through the Major Parts Distributors or the Customer Service Department at Sturtevant, Wisconsin. Complete parts lists and other renewal parts information are available on request.

DSI/Dynamatic® maintains a stock of replacement parts, which is dedicated exclusively for maintenance, spare parts, emergency breakdown and other aftermarket requirements at its Sturtevant, Wisconsin location.

Non-standard parts, low usage and obsolete items are not included in the parts inventory.

Ordering Instructions
Please contact the factory to purchase direct, or to locate an authorized distributor in your area.

To ensure that correct parts are furnished, include complete nameplate data from your specific unit, a purchase order number, description of the part and the quantity required. The nameplate lists the Model number, Pro number and Serial number. These numbers are necessary to identify the unit and parts required.

Renewal parts will be shipped from the factory, distributor's stock or will be manufactured on receipt of order, depending on part usage. The standard renewal parts warranty, as published in the Company Terms and Condition of Sale for Renewal Parts will apply.

Repair Service
DSI/Dynamatic® will repair your drive to like new condition. Please contact Customer Service at the Sturtevant, Wisconsin location for repair information.

Any item returned will be repaired on a time and material basis if deemed repairable unless a quotation is requested before authorizing the repair. Printed circuit boards and control assemblies will be replaced. All replacement boards and assemblies carry a new factory warranty.

Do not return any item to the factory without a Return Authorization Form; comply with the "Return Instructions" that follow.

Return Instructions
Items being returned for repair, including warranty repairs, require a Return Authorization Form. Contact our Customer Service Department for the form and return authorization. Provide all the information requested on the form and return it with the equipment and your purchase order.

Those items not manufactured by DSI/Dynamatic®, such as instruments, meters and digital counters, are repaired by the vendor. Returning them to the factory will only delay the repair. Contact the Repair Service Department at the factory for shipping instructions.

Any return for reasons other than repair requires a Return Authorization (RA) form from the Product Manager at the factory.

M-4 Standard Ajusto-Spede Nameplate
When ordering replacement parts refer to the Model Number given on M-4 nameplate. See Figure 7-1 below.

Figure 7-1: M-4 Nameplate

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7900 Durand Avenue, Bldg 3
Sturtevant, WI USA 53177
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Phone: (262) 554-7977 - Fax: (262) 554- 7041
Email: sales@dynamatic.com
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