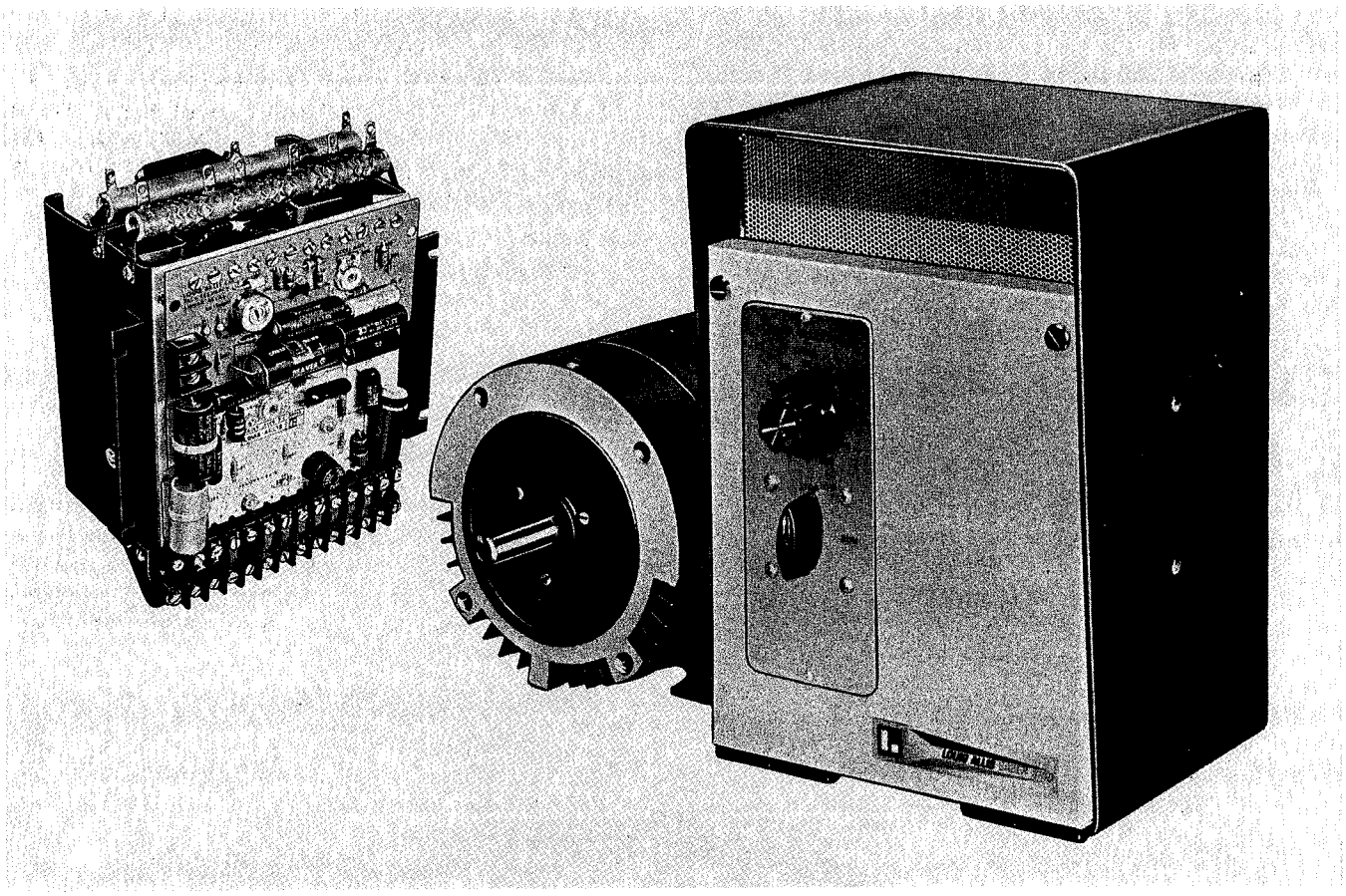
3F-100000
EFF. 10/83

SABER™ 3100

FRACTIONAL DC STATIC DRIVE



INSTRUCTIONS AND WIRING DIAGRAMS

MagneTek Drives & Systems

This instruction manual covers installation, operation, adjustments and maintenance of the equipment, but does not provide for every possible circumstance that may occur, nor does it define all modifications, variations or details of the equipment. Should further information be desired or should particular problems develop which are not covered sufficiently herein, please contact your nearest Louis Allis representative.

WARRANTY

Standard products manufactured by the Company are warranted to be free from defects in workmanship and material for a period of one year from the date of shipment, and any products which are defective in workmanship or material will be repaired or replaced, at the option of the Company, at no charge to the Buyer. Final determination as to whether a product is actually defective rests with the Company. The obligation of the Company hereunder shall be limited solely to repair and replacement of products that fall within the foregoing limitations, and shall be conditioned upon receipt by the Company of written notice of any alleged defects or deficiency promptly after discovery within the warranty period, and in the case of components or units purchased by the Company, the obligation of the Company shall not exceed the settlement that the Company is able to obtain from the supplier thereof. No products shall be returned to the Company without its prior consent. Products which the Company consents to have returned shall be shipped f.o.b. the Company's factory. The Company cannot assume responsibility or accept invoices for unauthorized repairs to its components, even though defective. The life of the products of the Company depends, to a large extent, upon type of usage thereof, and THE COMPANY MAKES NO WARRANTY AS TO FITNESS OF ITS PRODUCTS FOR SPECIFIC APPLICATIONS BY THE BUYER NOR AS TO PERIOD OF SERVICE UNLESS THE COMPANY SPECIFICALLY AGREES OTHERWISE IN WRITING AFTER THE PROPOSED USAGE HAS BEEN MADE KNOWN TO IT.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

This warranty does not apply to experimental or developmental products.

RECEIPT OF SHIPMENT

All equipment is tested against defect at Louis Allis and is shipped in good condition. Any damages or shortages evident when equipment is received must be reported immediately to the commercial carrier who transported the equipment. Assistance is available from the nearest Louis Allis district office, if required. Always refer to Louis Allis order number, equipment description and serial number when contacting Louis Allis.

EQUIPMENT STORAGE

For long periods of storage, equipment should be covered to prevent corrosion. Equipment should be stored in a clean, dry location. After storage, insure that equipment is dry and no condensation has accumulated before applying power. All rotating equipment stored longer than three months requires regreasing.

SAFETY FIRST

This equipment has been designed to provide maximum safety for operating personnel. However, hazardous voltages exist within the confines of the enclosure. Installation and servicing should therefore be accomplished by qualified personnel only and in accordance with OSHA regulations.

1. DESCRIPTION

Louis Allis Saber™3100 drives are standard purpose adjustable speed, fractional horsepower, static dc drives. Each Saber 3100 drive consists of a solid state power unit, fractional horsepower dc drive motor and operators controls.

1.1 DRIVE MOTOR

Saber 3100 dc motors are built according to NEMA standards for general applications and are designed for compatible operation with single phase, full wave rectifier power supplies (figure 1).

1.1.1 Identification - Reference motor part/serial number stamped on the nameplate in any correspondence with Louis Allis . All other information on the nameplate should also be referenced.

1.1.2 Specifications - Motor specifications are contained in table 1.

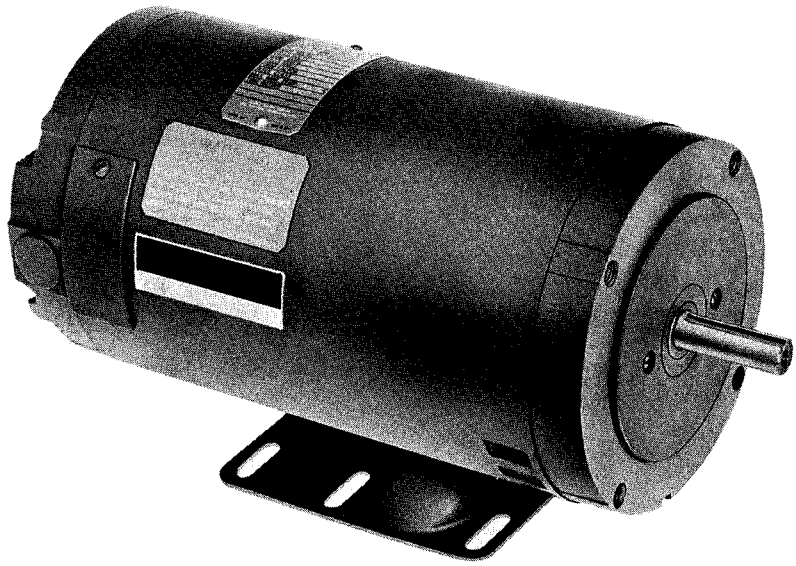


FIGURE 1 DRIVE MOTOR

1.2 OPERATORS CONTROLS

Controls required for operation of the drive may be provided on a remote station or in the enclosure cover. Manual (switch) operated drives are provided with operators controls mounted on the enclosure door. Contactor operated drives are provided with remote operators control stations as standard. Standard operators control stations are shown in Figure 2.

FIGURE 2 STANDARD OPERATORS CONTROL STATIONS

SPECIFICATIONS
TABLE I

DRIVE

INPUT POWER ..... 230/115 vac -5% + 10% single phase 50/60 ± 2 Hz.
INPUT CURRENT ..... See Table II
MAXIMUM ALTITUDE ..... 3300 feet above sea level
AMBIENT TEMPERATURE ..... 10° to 40° C
CONTROLLED SPEED RANGE ..... Up to 30:1 at 100% rated torque
SPEED CONTROL ACCURACY ..... ± 5% regulation due to load changes
DRIVE EFFICIENCY .....75% for 1/4 horsepower rating improving to 85% for 1 horsepower drives
DISPLACEMENT POWER FACTOR ..... 70% - 80% (at maximum speed and rated torque)
DRIVE SERVICE FACTOR 1.0

MOTOR

MOTOR HORSEPOWER AVAILABLE ..... 1/4, 1/3, 1/2, 3/4, and 1 horsepower
BASE SPEEDS AVAILABLE ..... 1725 rpm
FIELD VOLTAGE ..... 100 vdc
ARMATURE VOLTAGE ..... 90 vdc
AMBIENT TEMPERATURE ..... 10° minimum to 40° C maximum
MAXIMUM ALTITUDE ..... 3300 feet above sea level
SERVICE FACTOR 1.0

POWER UNIT

INPUT VOLTAGE ..... 230/115 vac -5% + 10% single phase 50/60 ± 2 Hz.
OUTPUT VOLTAGE .....100 vdc (to motor field) 90 vdc (to motor armature)
INPUT-OUTPUT CURRENT ..... Current ratings at 100% load for each horsepower are listed in Table II.
OVERLOAD CAPACITY ..... 150% for 60 seconds
AMBIENT TEMPERATURE ..... 10° minimum to 40° C maximum (power unit with enclosure)
10° minimum to 55° C maximum (power unit without enclosure)

SIZE

STANDARD ENCLOSURE ..... 12" high 8¼" wide 8" deep
POWER UNIT (WITHOUT ENCLOSURE) ..... 9¾" high 6¼" wide 5½" deep

WEIGHT*

STANDARD ENCLOSURE ..... 9.5 lbs.
POWER UNIT (WITHOUT ENCLOSURE) ..... 3.4 lbs.

WEIGHT APPLIES TO BASIC UNIT WITH DOOR MOUNTED OPERATOR'S CONTROLS
FOR STANDARD CONTACTOR OPERATED DRIVES, ADD 2 LBS.
FOR STANDARD CONTACTOR OPERATED DRIVES WITH REVERSING, ADD 2.3 LBS.

1.3 POWER UNIT

Saber 3100 drive power units are solid state, adjustable voltage power supplies. Single phase ac input power is converted through solid state components to controlled dc power for motor speed control. "State of the Art" circuitry and packaging techniques are combined with modular construction to provide a compact, attractive unit, easy to operate and maintain (figure 3).

1.3.1 Specifications - Power unit specifications are listed in table 1.

1.3.2 Drive Identification - All correspondence with the Louis Allis Company should reference power unit serial number, and identification number stamped on the unit nameplate. This identification number contains all required drive information. The first six digits are the basic power unit model number. The last six digits or "backfield" number describes modifications to the basic model.

The complete number appears as – 73103L – 00 00 00
(A) (B) (C)

Two basic models are available in the Saber 3100 line of drives:

Model 73103L ..... 1/4 and 1/3 horsepower
Model 73104J ..... 1/2 through 1 horsepower

(A) The first two digits in the backfield number designate basic module addition and describes drive type.
- 10 - Armature Feedback, Standard Control
- 11 - Armature Feedback, with Acceleration Control
- 12 - Armature Feedback, with Follower Control

(B) The second group of digits represent type of switching logic employed in the drive.
- 00 - Manual (switch) operation, non-reversing without dynamic braking or reversing with dynamic braking.
- 01 - Manual (switch) operation non-reversing with dynamic braking
- 10 - Contactor operation, non-reversing (without dynamic braking)
- 11 - Contactor operation, non-reversing with dynamic braking
- 21 - Contactor operation, reversing with dynamic braking

(C) Third suffix digits represent enclosures, switching, and Operators Controls.
- 00 - Power unit only without enclosure
- 10 - Standard enclosure, remote OCS, used with contactor operated drives
- 21 - OCS in enclosure door for non-reversing manual (switch) operated drives
- 22 - OCS in enclosure door for reversing manual (switch) operated drives
- 25 - OCS in enclosure door for non-reversing manual (switch) operated follower drives
- 26 - OCS in enclosure door for reversing manual (switch) operated follower drives

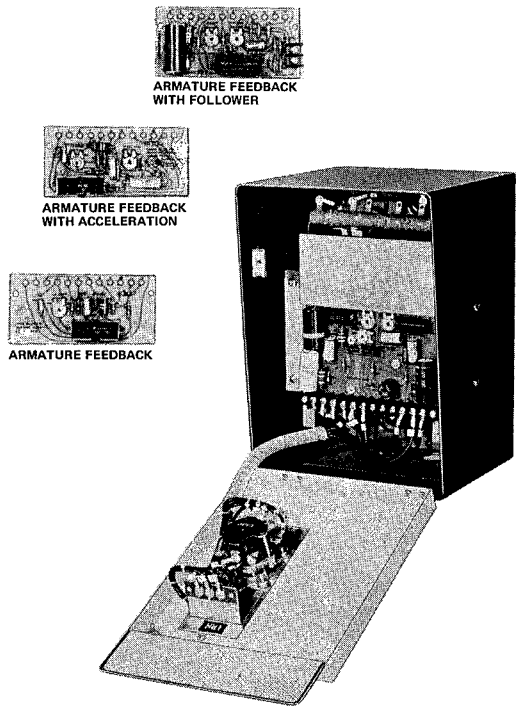


FIGURE 3 POWER UNIT

2. INSTALLATION

2.1 MOTOR MOUNTING

The Saber 3100 drive motor must be mounted rigid enough to prevent transfer of external vibration to the motor. Mount motor using shims as required under mounting feet. Use of shims insures against stress of the motor housing when tightening mounting bolts. Motors with "C" face are bolted to a support or directly to the driven unit.

2.1.1 Motor to Load Connection - Saber 3100 drive motors may be connected to the driven machine by belting, direct coupling or by gearing. Correct alignment is essential for long, low maintenance motor life.

1. BELTED CONNECTION - Motor and load sheaves must be in line. Belt tension should be sufficient for no-slip operation. Excessive tightness will cause unnecessary strain on motor bearings.
2. DIRECT COUPLING - Flexible couplings are recommended for direct connection of motor to load. Alignment is critical for extended motor bearing life and must be checked with a dial indicator.
3. GEARING - When drive motor is coupled to driven machine through gears, insure that flanges are properly mated and motor connection to gear unit is proper. Connect gear unit to load according to manufacturers instructions.

2.1.2 MOTOR ALIGNMENT - Align motor using shims under mounting feet or mounting surface. Alignment should be checked with a dial indicator. Indications of misalignment are:

Excessive Vibration
Chatter
Overheating of bearings

2.2 POWER UNIT MOUNTING

The power unit is designed for wall mounting. Remove power unit from enclosure (4 screws) and use enclosure as a template for marking mounting hole location (3 holes). Mount enclosure using standard hardware and replace power unit (Figures 4, 5 and 6). When power unit is supplied without enclosure, mount power unit with standard hardware through the insulating standoffs on the heat sink bracket.

2.2.1 CONDUIT ENTRY - Two holes are provided for 3/4" conduit in the bottom of the power Unit enclosure.

2.3 ELECTRICAL INTERCONNECTIONS

Saber 3100 drives are available for either manual (switch) operation or for contactor operation. Contactor operated drives have two terminal strips on the power module. Manual (switch) operated drives have a single terminal strip.

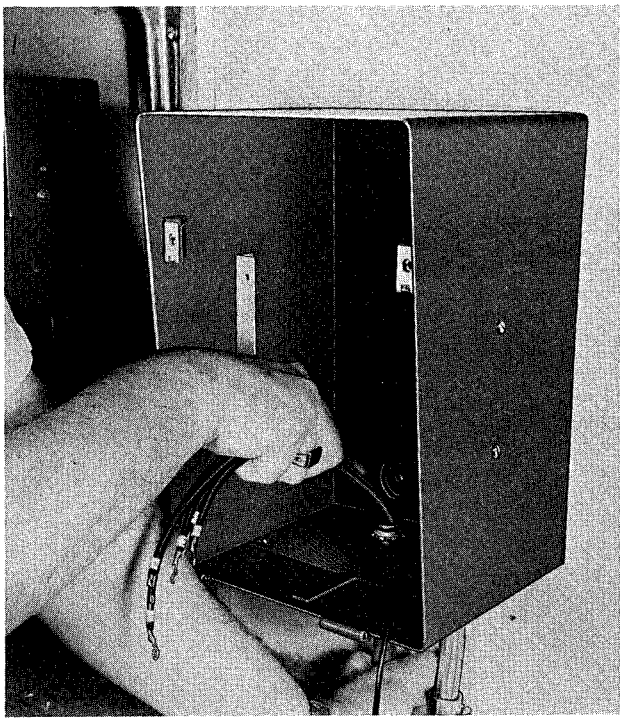


FIGURE 4 ENCLOSURE MOUNTING

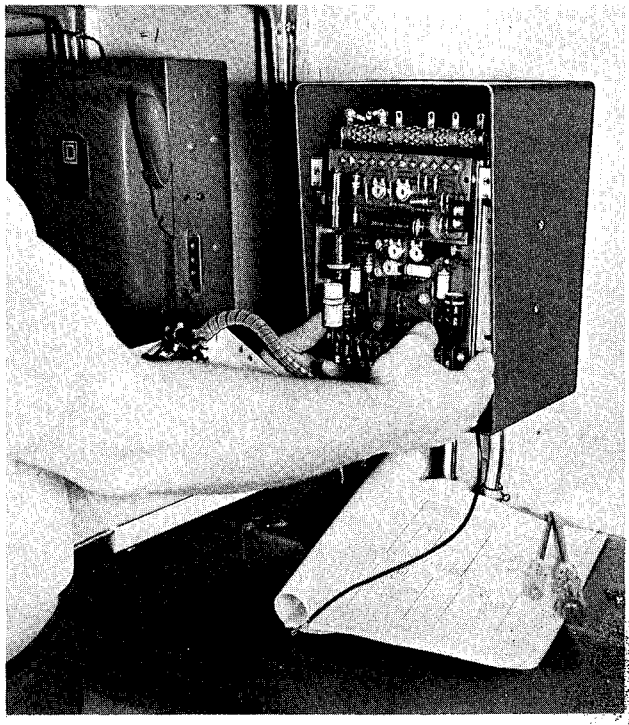


FIGURE 5 MAIN ASSEMBLY MOUNTING

2.3.1 Manual (switch) Operated Drives - Connect this type drive as shown in figure 7 interconnection diagram.

2.3.2 Contactor Operated Drives - Connect this type drive as shown in figure 8 interconnection diagram.

2.3.3 Armature Resistor Connections - Saber 3100 Drive Power units are provided in two horsepower ranges: 1/4 through 1/3 hp, and 1/2 through 1 hp. When shipped, armature resistors are connected for highest horsepower in the range. Reconnect armature resistor as shown in figures 9 and 10 for horsepower of drive motor supplied.

CAUTION

ALWAYS CHECK DRIVE MOTOR HORSEPOWER AND ARMATURE RESISTOR CONNECTIONS WHEN INSTALLING SABER 3100 DRIVES.

2.3.4 Dynamic Braking Resistor Connections - Dynamic braking resistor (when supplied) is mounted behind the armature resistor in the drive Power Unit (see figure 11). This resistor is connected for either 1/3 horsepower or 1 horsepower depending on Power Unit supplied with the drive. Reconnect dynamic braking resistor as shown in figure 11 for horsepower of drive motor supplied.

CAUTION

ALWAYS CHECK DRIVE MOTOR HORSEPOWER AND DYNAMIC BRAKING RESISTOR CONNECTIONS WHEN INSTALLING SABER 3100 DRIVES.

2.3.5 Wire Size - Consult current rating table (Table II) to select power (AC input and motor armature) wire size conforming to local codes. All other wiring should be sized for 1 amp (RMS).

TABLE II
FULL LOAD CURRENT RATINGS (AMPERES)

HORSE POWER	INPUT AC (RMS)	ARMATURE DC (AVG)	ARMATURE DC (RMS)
1/4	5.2	3.1	4.4
1/3	6.0	3.7	5.2
1/2	7.8	5.4	7.3
3/4	11.5	7.7	10.8
1	15.2	10.5	14.5

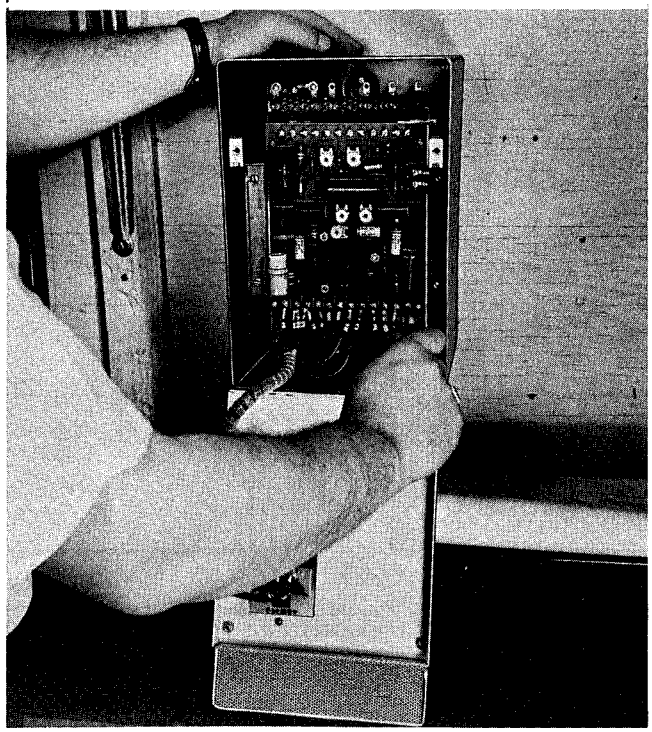
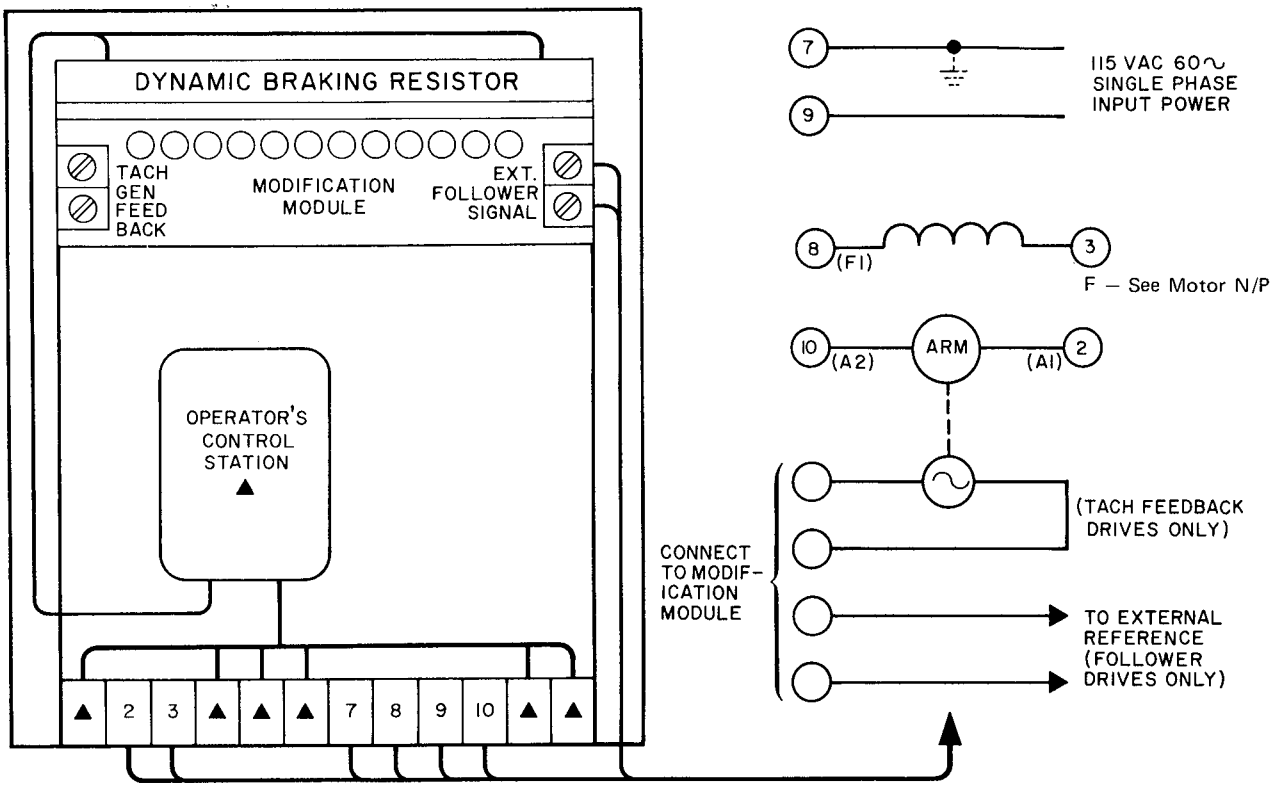
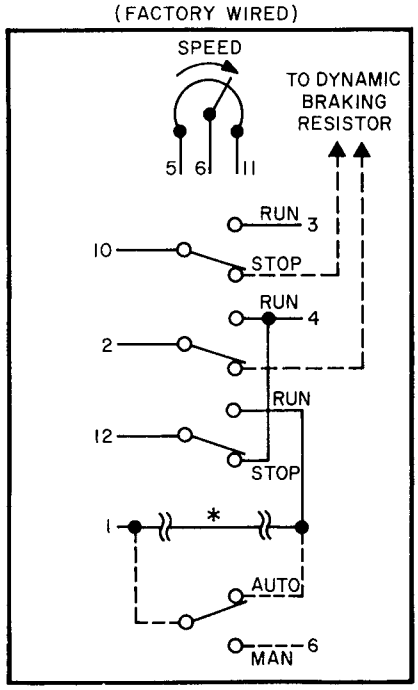
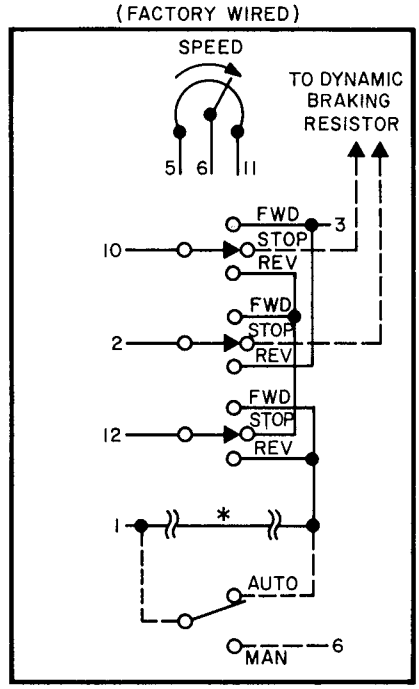


FIGURE 6 WIRING







NOTES:

▲ FACTORY WIRED – NO CONNECTIONS REQUIRED DURING INSTALLATION.

* JUMPER REMOVED WHEN FOLLOWER IS SUPPLIED.

FIGURE 7 INTERCONNECTION DIAGRAM MANUAL (SWITCH) OPERATED

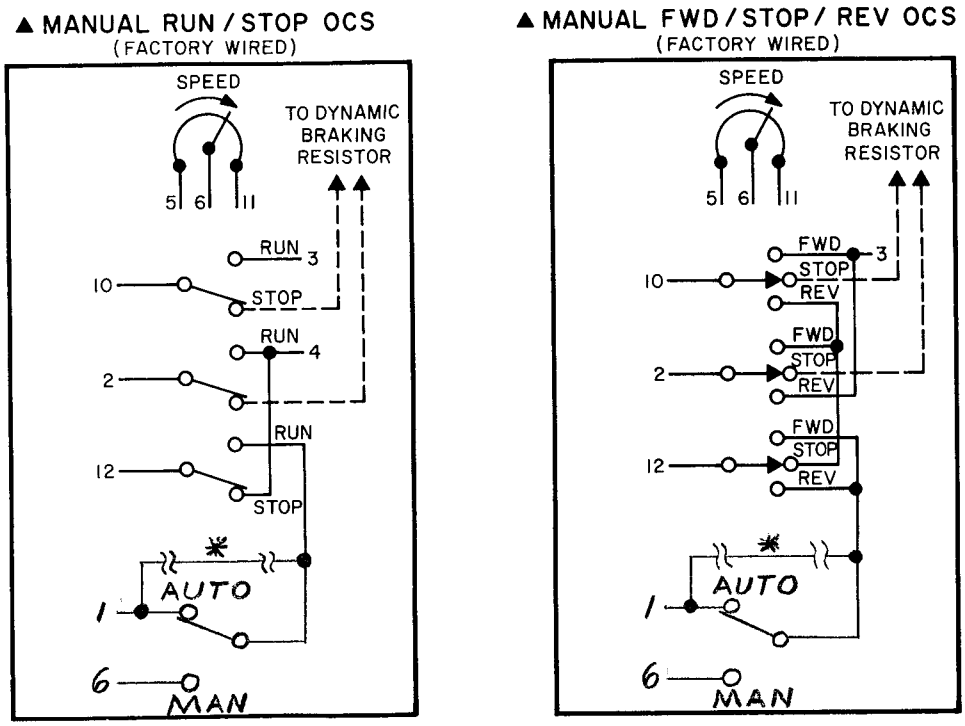
INSERT (BETWEEN PP 6 and 7)

FOR

SABER 3100 (3F-100000)

IMPORTANT

The OCS diagrams (Figure 7 on page 6) are incorrect. DO NOT USE. Correct OCS diagrams are shown below. Connect OCS for a Manual (switch) Operated Drive as shown below.

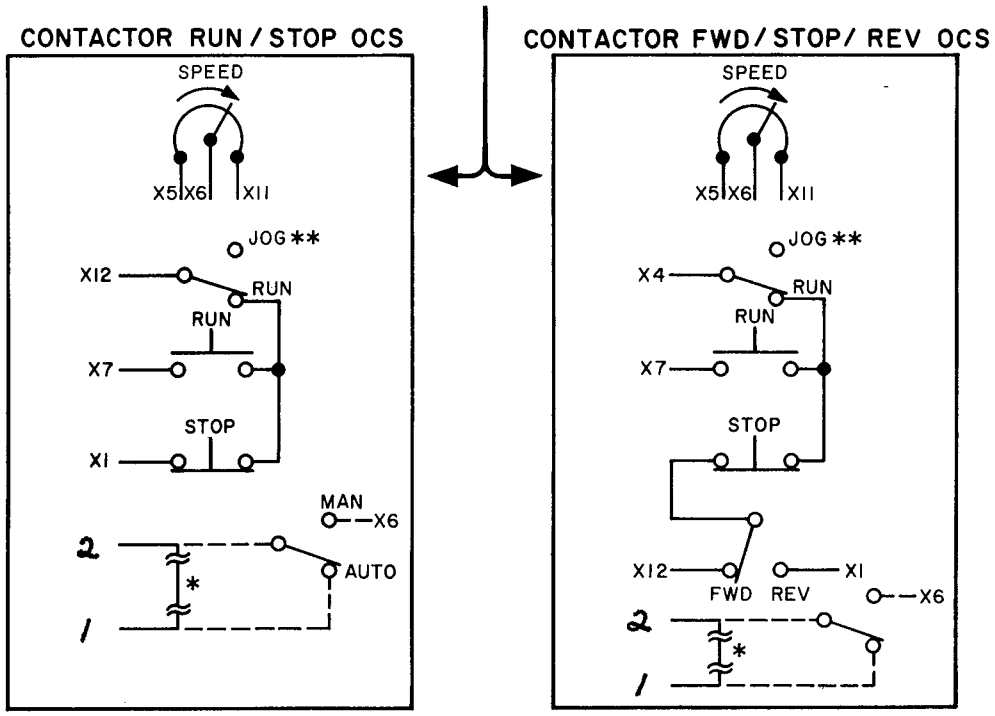


NOTES:
▲ FACTORY WIRED - NO CONNECTIONS REQUIRED DURING INSTALLATION.
* JUMPER REMOVED WHEN FOLLOWER IS SUPPLIED.

FIGURE 7 INTERCONNECTION DIAGRAM MANUAL (SWITCH) OPERATED

IMPORTANT

The OCS diagrams (Figure 8 on page 7) are incorrect. DO NOT USE. Correct OCS diagrams are shown below. Connect OCS for a Contactor Operated Drive as shown below.

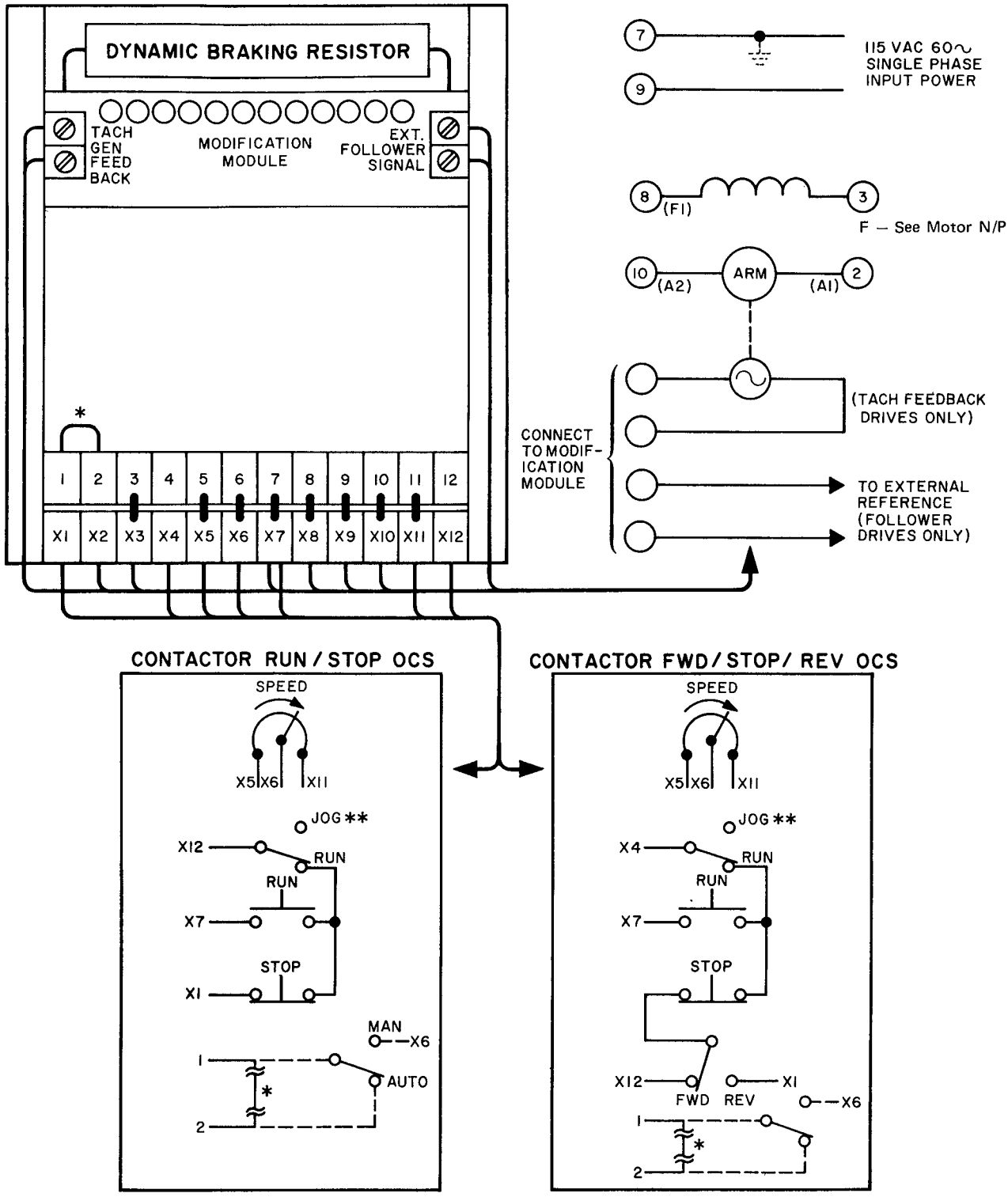


NOTES:

* JUMPER REMOVED WHEN FOLLOWER SUPPLIED. JUMPER IS LOCATED ON POWER MODULE TERMINAL STRIP.

** JOG SUPPLIED AS MODIFICATION TO BASE UNIT.

FIGURE 8 INTERCONNECTION DIAGRAM CONTACTOR OPERATED



NOTES:

* JUMPER REMOVED WHEN FOLLOWER SUPPLIED. JUMPER IS LOCATED ON POWER MODULE TERMINAL STRIP.

** JOG SUPPLIED AS MODIFICATION TO BASE UNIT.

FIGURE 8 INTERCONNECTION DIAGRAM CONTACTOR OPERATED

2.4 INSTALLATION CHECK LIST

Perform the following checks for proper installation prior to application of power.

2.4.1 Check to insure all wiring and connections are correct and conform to figure 7 or 8 depending on type drive provided.

2.4.2 Check motor for proper alignment and secure mounting.

2.4.3 Check dynamic braking resistor (if supplied) and armature resistor for proper mounting (figure 9A).

2.4.4 Check armature resistor connection for proper horsepower (figures 9 and 10).

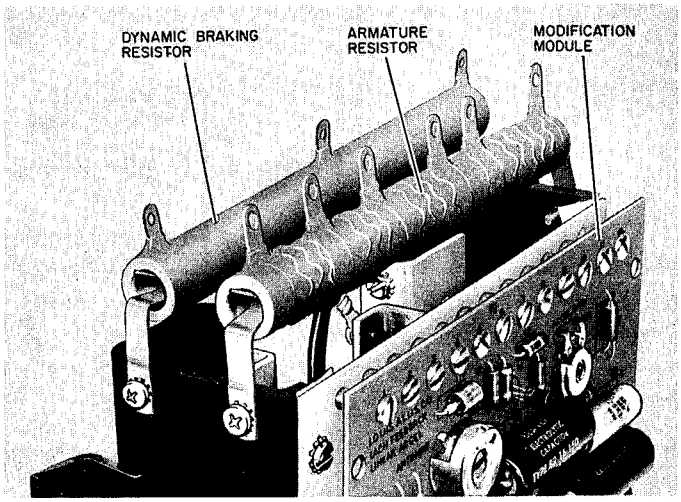
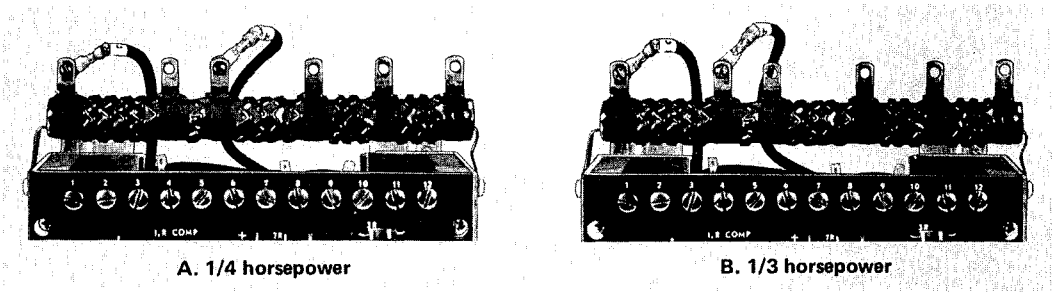
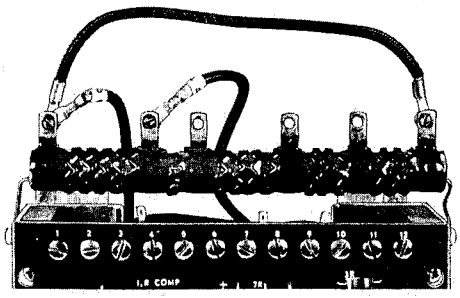


FIGURE 9A DYNAMIC BRAKING AND ARMATURE RESISTORS

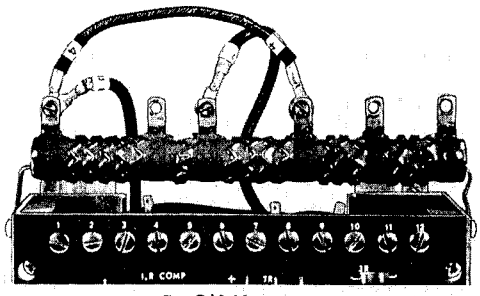


A. 1/4 horsepower **B. 1/3 horsepower**

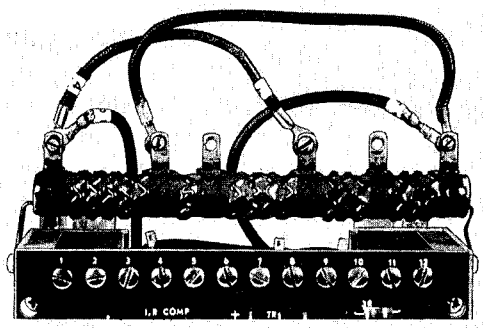
FIGURE 9 ARMATURE RESISTOR CONNECTIONS 1/4 AND 1/3 HORSEPOWER (MODEL 73103L)



A. 1/2 Horsepower



B. 3/4 Horsepower



C. 1 Horsepower

FIGURE 10 ARMATURE RESISTOR CONNECTIONS 1/2 THROUGH 1 HORSEPOWER (MODEL 73104J)

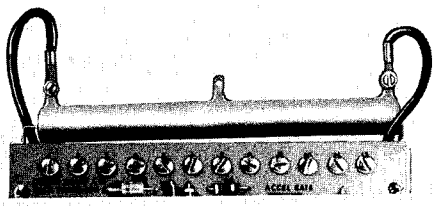
2.4.5 Check connection of dynamic braking resistor, if supplied (figure 11).

2.4.6 Tighten all terminal strip screws to insure good connections.

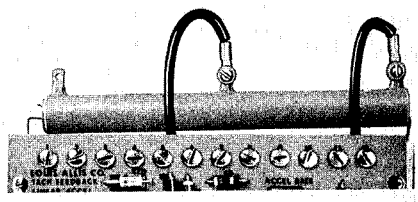
2.4.7 Measure resistance from all motor terminals to ground. Resistance should be greater than 2 megohms (use 20,000 ohms/volt multimeter. Do not use meggar or similar device when motor is connected to electronic equipment).

2.4.8 Check power unit fuse. (Model 73103L - 8 amp; model 73104J - 15 amp).

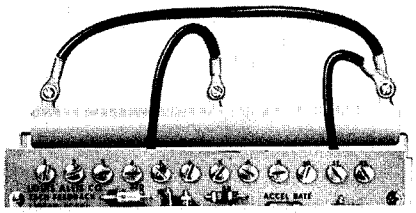
2.4.9 Perform setup and adjustment procedure.



A. 1/4 Horsepower



B. 1/3 through 1/2 Horsepower



C. 3/4 through 1 Horsepower

FIGURE 11 DYNAMIC BRAKING RESISTOR CONNECTIONS 1/8 THROUGH 1 HORSEPOWER

3. DRIVE OPERATION

The Saber 3100 drive is a speed regulated fractional horsepower static dc drive. Speed of a shunt wound dc motor, decreases slightly as load is applied and tends to increase when load is removed. Amount of motor speed change between no load and full load condition is termed regulation. To improve motor regulation characteristics, power input to the motor must vary as load is increased and decreased. This is achieved by continually comparing actual drive speed to desired speed. Desired speed is preset by a reference current signal in the power unit, while a feedback current signal represents actual drive speed. Comparison of these two current signals is used to control drive motor speed.

The power unit converts ac input power to controlled dc output power. The closed loop regulator portion of the power unit continuously compares reference and feedback signals and varies output power accordingly to provide accurate speed regulation.

Figure 12 is a basic block diagram of the standard Saber 3100 drive with armature voltage feedback and load (IR) compensation. Armature voltage is used as an approximate measurement of speed. Speed is not directly monitored. Since speed of a dc shunt motor decreases slightly when load is applied, and increases when load is removed, a load (IR) compensation circuit is included to compensate for load induced speed changes. A compensated reference circuit is used to adjust power amplifier output to compensate for line voltage variations.

Current limit protection circuit is included on all Saber 3100 drives to protect drive components from overload damage. Control signals from this circuit keeps power unit output within preset safe limits by continually monitoring armature voltage and current.

3.1 DRIVE MOTOR

The drive motor used is a conventional shunt wound dc motor. Speed control is achieved by holding shunt field voltage constant and varying armature voltage. Both voltages are supplied from the power unit. Motor speed is variable from base speed to effectively zero, however, the motor should not be run continuously at full torque below specified minimum speed. Minimum allowable speed at full torque is equal to base speed divided by 30.

3.2 POWER UNIT

The main power unit function is to supply controlled dc motor armature voltage. Controlled armature voltage is variable from 0 - 90 vdc. Instantaneous value of voltage depends on SPEED control setting and motor load. The

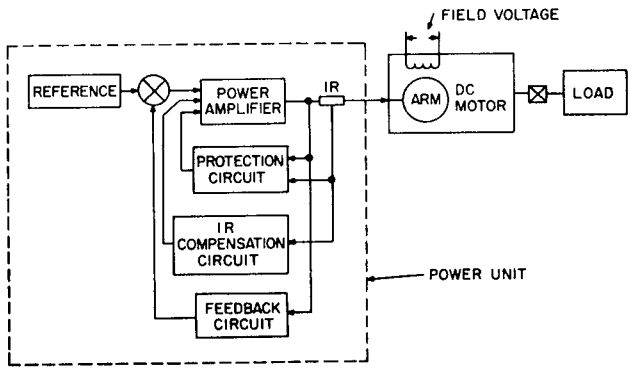


FIGURE 12 BLOCK DIAGRAM OF DRIVE WITH ARMATURE FEEDBACK

power unit also supplies dc voltage (100 vdc) to the motor shunt field.

The regulator portion of the power unit maintains drive speed constant with a feedback signal approximately equal to the reference signal. The basic regulator consists of power circuit, firing circuit, reference source and feedback circuit. Power circuit and firing circuit make up the regulator power amplifier.

Reference source and feedback circuit are located on the modification board.

All modification modules perform the same basic function. Signals representing desired speed and actual speed are compared. An error signal is provided to the power amplifier representing the difference between these two signals.

3.2.1 Power Amplifier - The power unit power amplifier consists of a firing circuit and power circuit. Power output from the power amplifier is controlled by an error current signal from the node of the regulator (located on the modification board). The error current is the result of comparison between desired drive speed and actual drive speed.

The amplified error signal controls firing angle of the firing circuit. The firing circuit developes a pulse at a position on the ac waveform determined by the value of the error current input. The greater the level of error current the more advanced the firing angle. If motor load causes armature current to exceed the level set by the current limit adjustment, the current limit current overrides the error current input and reduces the firing angle. Power amplifier output is maintained at a safe level by action of the current limit circuit.

The power circuit is a full wave bridge rectifier consisting of two diodes and two silicon controlled rectifiers (SCR's). Voltage is not applied to the motor armature until the SCR's are turned on at the firing angle. The SCR bridge rectifies ac supply voltage and supplies pulsating dc voltage to the motor armature. The amount of dc output voltage depends on when, in the ac waveform, the SCR's in the bridge conduct. If the SCR's are turned on late in the ac half cycle, average dc output voltage will be low. If the SCR's are turned on early in the ac half cycle, average dc output voltage will be high (figure 13).

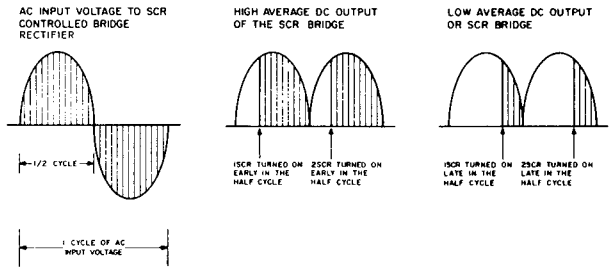


FIGURE 13 VOLTAGE WAVESHAPES

3.2.2 Current Limit Circuit - Current limit circuit has no effect on drive operation until armature current exceeds a preset value determined by CURRENT LIMIT adjustment setting. When this preset value is reached, current output from this circuit will override error current and cause the power amplifier output to remain at a safe level. This action protects the motor and power amplifier from overload damage.

3.3 MODIFICATION MODULES

The basic armature and tachometer generator modules are available in three configurations. The basic module, whether armature or tachometer feedback, functions in a similar manner for all three types. Refer to table III for a summary of modification modules available.

TABLE III
MODIFICATION MODULE SUMMARY

TYPE OF MODULE	NUMBER	DESCRIPTION OF OPERATION
ARMATURE FEEDBACK	46S01252-0030/-0040	Paragraph 3.3.1
ARMATURE FEEDBACK with ACCELERATION	46S01253-0020	Paragraph 3.3.1 and 3.3.3
ARMATURE FEEDBACK with FOLLOWER	46S01251-0020	Paragraph 3.3.1 and 3.3.4

3.3.1 Armature Feedback Module - This module is used for 2% regulation of drive speed. Feedback current is proportional to armature voltage and is fed to the module from the motor armature circuit. The module consists of three circuits: reference, feedback and IR compensation circuits. Error current results from a comparison of three currents in the error sensing node: (1) reference current determined by SPEED and MIN SPEED control settings, (2) feedback current proportional to armature voltage, (3) IR compensation current proportional to motor losses (figure 14).

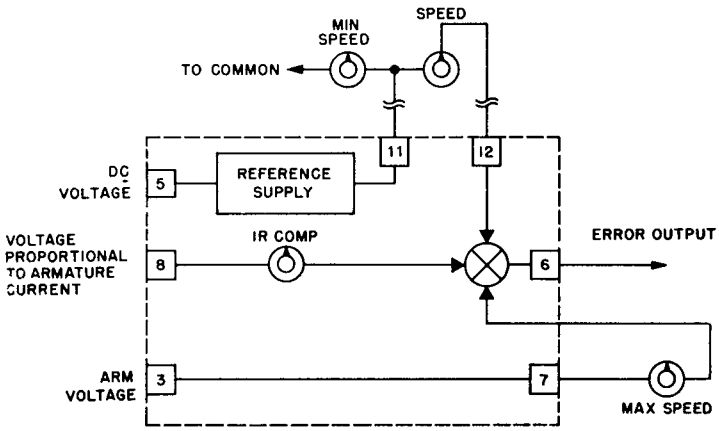


FIGURE 14 ARMATURE FEEDBACK MODULE

The module is supplied with dc voltage from the power unit power supply and is filtered for use as a reference supply. Reference supply is semi-regulated because shunt field current of the motor varies with line voltage and causes motor speed to vary. Use of the semi-regulated reference minimizes effect of line voltage variation on motor speed by varying armature voltage. The desired reference current input is supplied to the module from the SPEED control and MIN SPEED adjustment. A feedback current signal proportional to armature voltage is compared to the reference current at the regulator node. Error current from this comparison is provided to the power amplifier to control power amplifier output.

The IR compensation circuit monitors armature current and supplies a current signal to the error node. This signal modifies power amplifier output to correct for load induced speed changes. IR COMP adjustment setting determines amount of IR compensation current signal and is adjusted for minimum speed change due to normal load changes.

MIN SPEED adjustment (located on power module) sets minimum level of reference current from the module supply, and sets the low limit for the SPEED control. MAX SPEED adjustment (located on power module) limits feedback signal to the error node. This adjustment is used to limit maximum speed of the drive at 100% setting of the SPEED control.

3.3.2 Acceleration Circuit - The power unit may be modified by substitution of an Armature Feedback with Acceleration module. This module contains a circuit providing controlled acceleration of the drive. (figure 15).

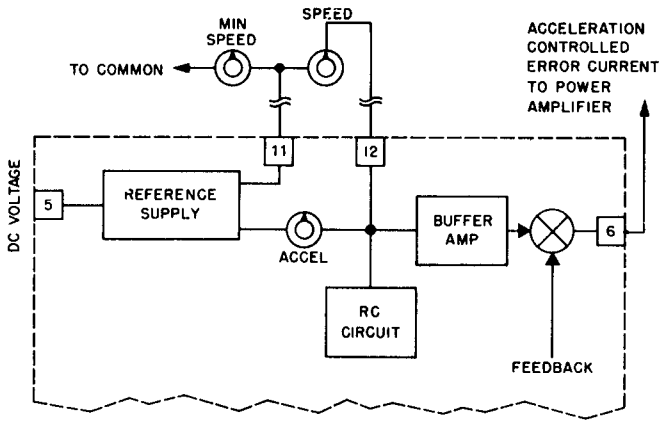


FIGURE 15 ACCELERATION CIRCUIT

The reference input to the error node is modified by the acceleration circuit consisting of an RC time delay network and a buffer amplifier. The RC time delay network is connected across the reference supply. When the drive is started, preset reference from the SPEED control is supplied to the acceleration circuit. The capacitor in the RC network charges to the reference voltage selected by the setting of the SPEED control and MIN SPEED adjustment. The time required for the capacitor to charge is adjusted by changing ACCEL RATE adjustment setting. Increasing the ACCEL RATE adjustment (clockwise rotation) decreases time required for the drive motor to reach desired speed. This increases acceleration rate. Acceleration time is adjustable from 2 to 15 seconds. The buffer amplifier decreases RC time delay network loading and improves linearity of the drive acceleration rate. The circuit is reset each time RUN/STOP switching circuits are operated.

3.3.3 Follower Circuit - The power unit may be modified by substitution of an Armature Feedback with Follower module. This module contains a circuit which allows use of an external reference.

With this type of module, two modes of operation are provided. Manual mode of operation is the same as for the basic module. In the automatic follower mode (AUTO), drive speed will follow an external signal source at a ratio determined by setting of the TRACKING adjustment. The external signal source mav be either a tachometer generator or a variable dc supply (figure 16).

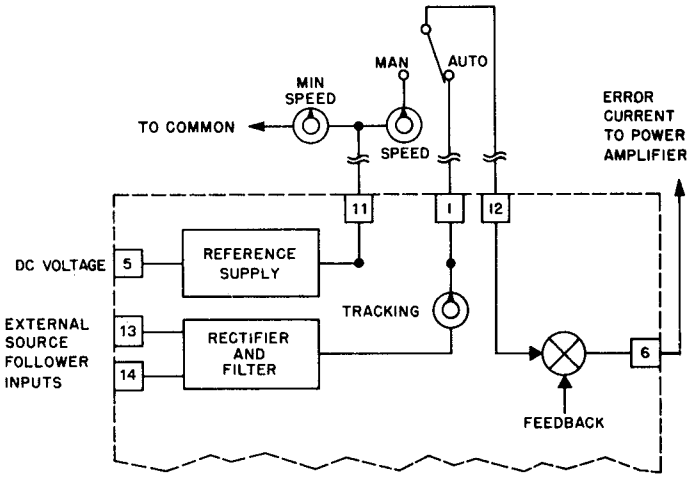


FIGURE 16 FOLLOWER CIRCUIT

In the AUTO mode of operation, reference function is switched from the manual reference supply to the follower circuit. Value of external reference voltage and the TRACKING adjustment setting determine drive speed.

The MIN SPEED adjustment setting determines minimum reference signal supplied to the power amplifier module with no external reference applied. This feature can be used as a low speed tracking adjustment.

TRACKING adjustment setting provides a means for adjusting drive operation at high speeds. Proper adjustment of TRACKING and MIN SPEED adjustments sets tracking of the external source over the speed range of the drive. TRACKING and MIN SPEED adjustments interact with each other.

The drive will follow either an ac or a dc tachometer-generator providing the tachometer-generator output is within specified limits.

- 1 AC tachometer-generator - Output must be between 12 and 60 volts rms, at 4 milliamps loading, for drive to run at base speed. Output frequency at lowest operating speed must be more than 30 Hz.

- 2 DC tachometer-generator or external dc voltage. Source output must be zero for zero drive speed. Maximum output can be from 15 to 85 vdc for base speed operation of the motor at 4 milliamp loading.

TABLE IV
CONTROLS AND ADJUSTMENTS

1 - MAX SPEED

Adjustment setting determines maximum drive speed when SPEED control is at 100% setting. Counter-clockwise rotation decreases drive top speed. MAX SPEED is normally adjusted for rated motor speed when SPEED control is at 100% setting.

2 - MIN SPEED

Adjustment setting determines minimum drive speed when SPEED control is at 0% setting. Clockwise rotation increases drive minimum speed. MIN SPEED adjustment is also used to set low speed tracking. Adjustment range - 0 to 25% rated speed.

3 - CURRENT LIMIT

Factory adjustment set for 150% of rated motor armature current. CURRENT LIMIT adjustment setting determines allowable level of current in the drive motor armature and limits output of power unit if preset level is exceeded. Adjustment range - 75% to 150% rated motor armature current.

4 - IR COMPENSATION

Adjustment provided on armature feedback drives to compensate for motor losses. Clockwise rotation increases amount of compensating signal to the regulator error node. Adjustment range - up to 20 volts dc or 22% of rated armature voltage.

5 - ACCEL

Adjustment setting determines rate of drive acceleration. Clockwise adjustment decreases acceleration time increasing rate of acceleration. Adjustment range from 2 to 15 seconds.

6 - TRACKING

Adjustment setting provides high speed tracking for follower drives. Clockwise rotation increases speed with given input from the external source.

7 - SPEED

Control is located on the operators control panel and sets drive speed from zero to 100% of rated speed.

8 - RUN/STOP

Switch for energizing drive. Reference figure 2 for all standard operator control panels available with Saber 3100 drives.

9 - DAMPING

Switch compensates for inertia load conditions. IN position compensates for light inertia loads which cause drive speed oscillation or hunting. OUT position used for medium to high inertia loads in which drive speed oscillation or hunting is not a problem.

4. ADJUSTMENTS, OPERATION, AND SCHEMATICS

Physical location of controls, adjustments, and switches are shown in figure 17. A description of control, adjustment and switch functions is given in table IV.

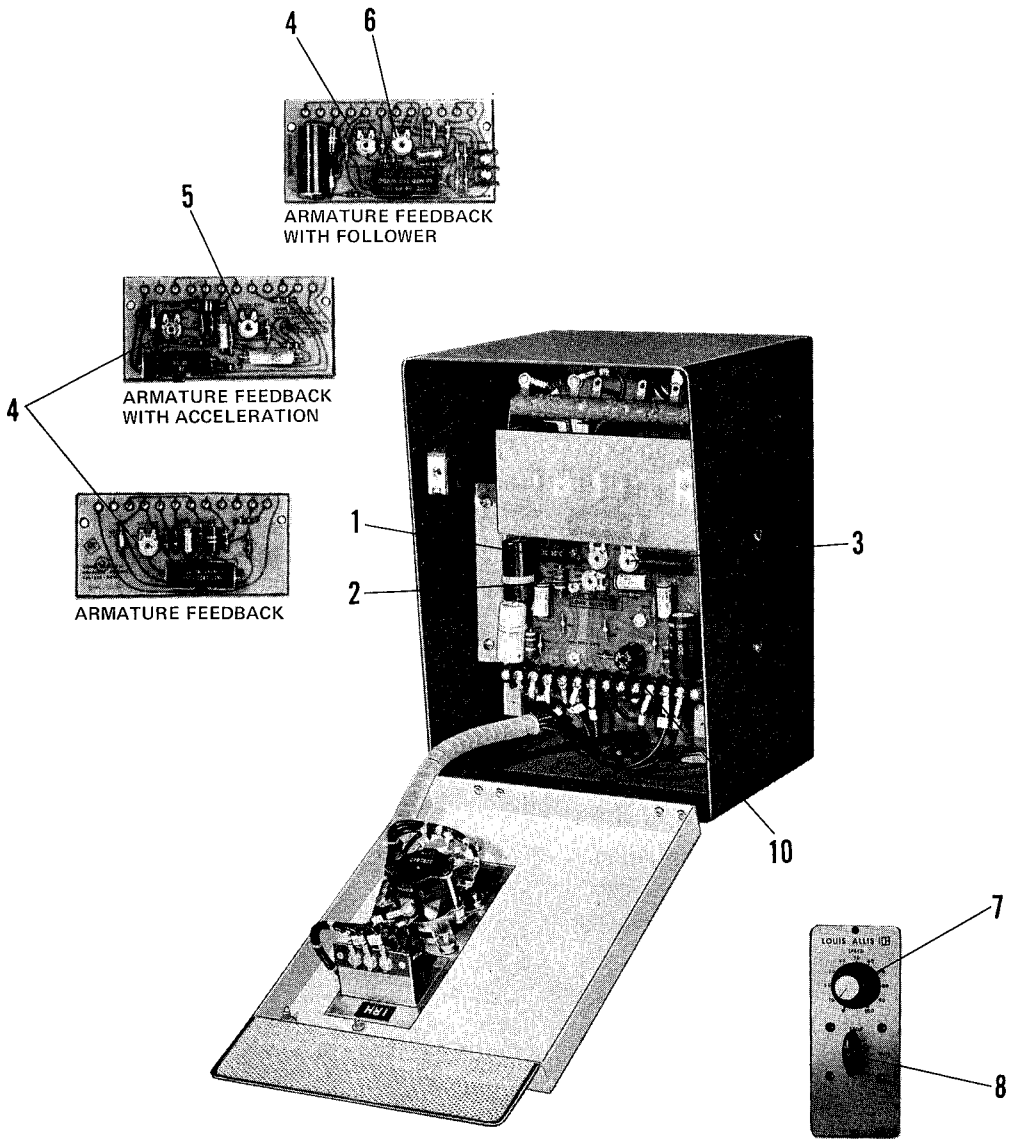


FIGURE 17 - CONTROLS AND ADJUSTMENTS

ARMATURE FEEDBACK MODULE

SETUP AND ADJUSTMENT PROCEDURE

1) Set controls, adjustments, and switches to the following initial settings:

   SPEED – Zero setting.
   FWD/REV switch (furnished on contactor operated reversing drives - Set for desired direction of rotation.
   MIN SPEED – Zero setting.
   MAX SPEED – 25% setting.
   CURRENT LIMIT – This adjustment is factory set and does not require field adjustment.
   DAMPING – OUT position.
   IR COMP – 50% setting.

2) Start drive and rotate SPEED control to 100% setting.

3) Adjust MAX SPEED for rated speed of the motor (approximately 90 Volts dc at test point 5 with normal loading).

4) Rotate SPEED control to zero.

5) Adjust MIN SPEED adjustment clockwise until drive begins to rotate, then decrease setting until drive stops. (If drive rotation at some minimum speed is required with SPEED control set at zero, increase setting of MIN SPEED adjustment for drive rotation at desired speed).

6) Increase SPEED control setting for normal drive run speed.

7) Adjust IR COMP adjustment for desired drive regulation and stability. Increase setting to improve drive regulation. If drive instability or hunting occurs, reduce setting of IR COMP adjustment.

8) If drive speed oscillates or hunts due to light inertia load, place DAMPING switch to IN position.

9) Stop drive. Setup is completed.

MANUAL (SWITCH) OPERATED DRIVES

SEQUENCE OF OPERATION

MAIN POWER ENERGIZED

Power Supply provides voltage to reference supply in module. Motor field supply is energized.

SET AUTO/MAN SWITCH (if supplied) TO MAN POSITION AND SET RUN/STOP SWITCH TO RUN POSITION

Reference voltage from SPEED control is applied to module, error current is applied to Power Amplifier. Armature is connected to power amplifier and drive motor accelerates to speed determined by SPEED Control setting.

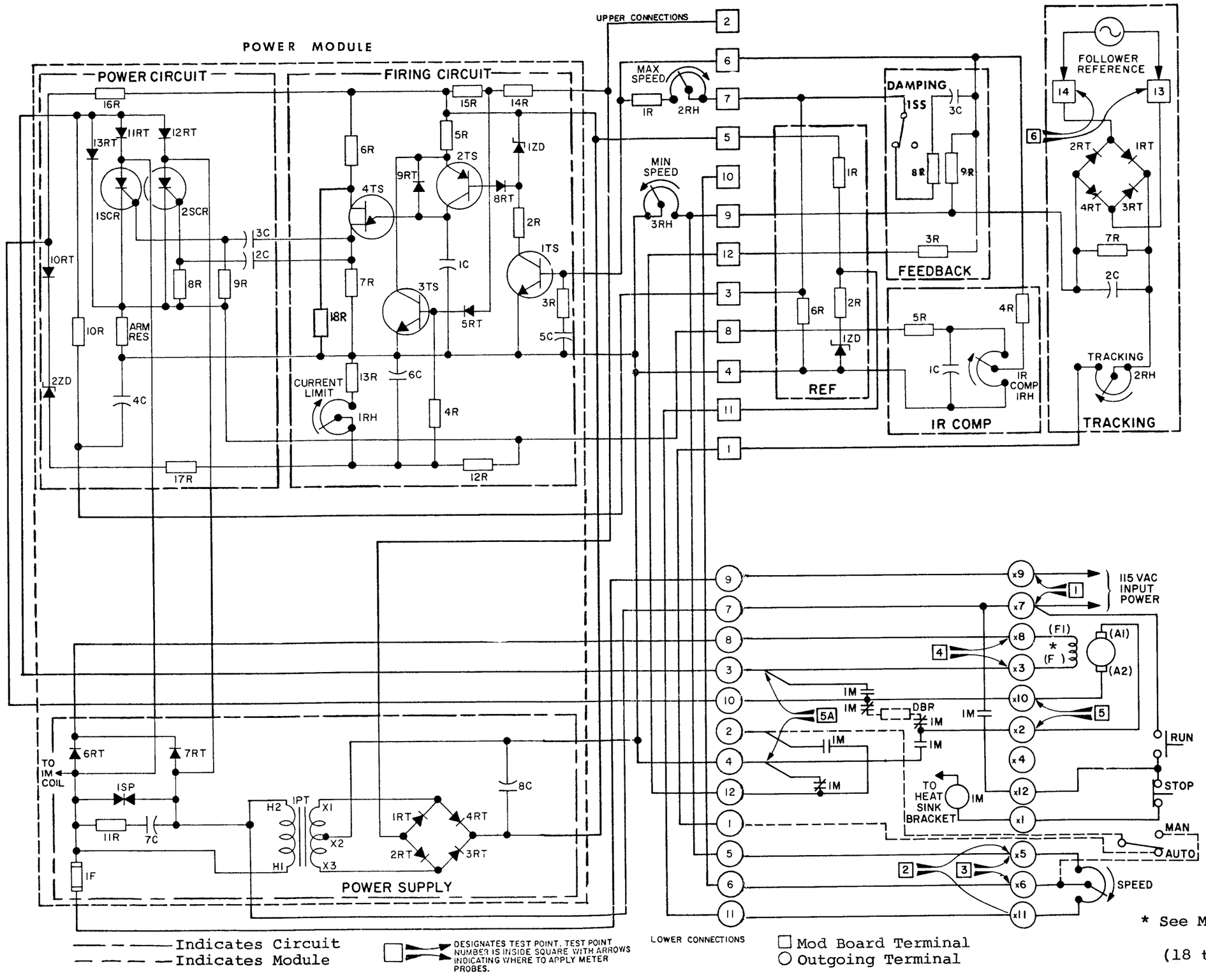
SET RUN/STOP SWITCH TO STOP POSITION

Armature Loop is opened and dynamic braking resistor (if supplied) is connected to armature. Reference input from SPEED control is removed from module and drive motor stops.

SET AUTO/MAN SWITCH TO AUTO POSITION
(Follower Drives Only)

Reference from external source is connected to module. Armature is connected to power amplifier when RUN/STOP switch is placed in RUN position. Drive motor speed follows reference from external source.

ARMATURE FEEDBACK WITH FOLLOWER MODULE



CONTACTOR OPERATED DRIVES

——— Indicates Circuit
— — — Indicates Module

DESIGNATES TEST POINT. TEST POINT NUMBER IS INSIDE SQUARE WITH ARROWS INDICATING WHERE TO APPLY METER PROBES.

□ Mod Board Terminal
○ Outgoing Terminal

* See Motor N/P

5. MAINTENANCE

5.1 MOTOR MAINTENANCE

Refer to separate dc motor instruction manual for maintenance instructions.

5.2 POWER UNIT MAINTENANCE

WARNING

DISCONNECT INPUT POWER BEFORE ATTEMPTING TO PERFORM MAINTENANCE PROCEDURES ON THE POWER UNIT. PERSONNEL WILL BE EXPOSED TO DANGEROUS ELECTRICAL CIRCUITRY WHEN THE SUB-PANEL DOOR IS OPENED.

The power unit should be periodically cleaned and visually inspected for signs of damage. Set up a regular cleaning schedule based on the atmospheric conditions at the installation. Visually inspect components for signs of damage, excessive heating, etc. Replacement of such components during an inspection may prevent a component failure during a production run.

5.2.1 Component Location - Location of all major components is shown in figure 18.

5.2.2 Module Repair - Module repair requires special techniques. Unless plant maintenance personnel are familiar with recommended procedures for printed circuit repair, contact the nearest Louis Allis District Office for assistance. Defective modules may be sent to Louis Allis, Drives & Systems Apparatus Return Department, 16555 W. Ryerson Road, New Berlin, Wisconsin 53151, for repair.

NOTE

Your warranty may be voided if module repair is unauthorized.

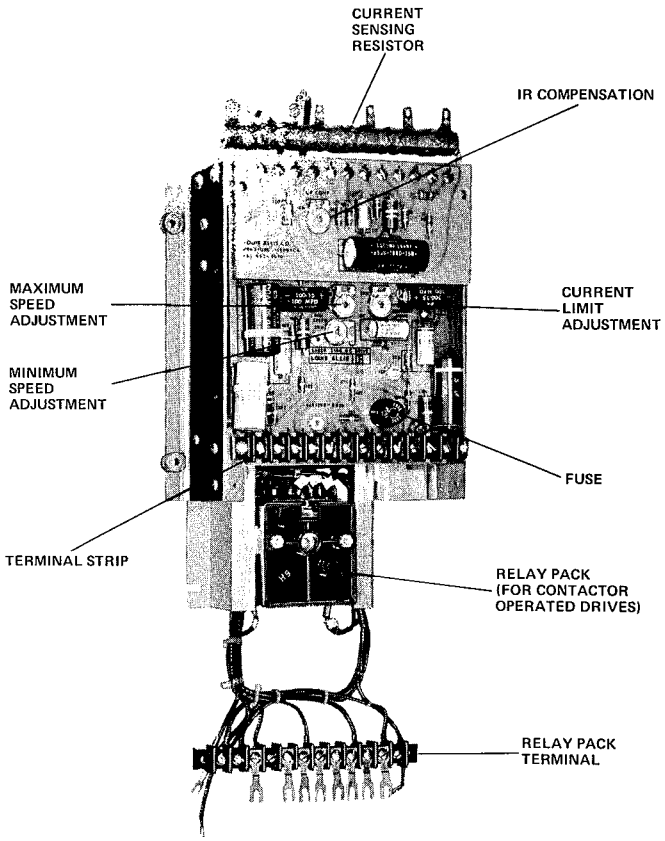


FIGURE 18 COMPONENT LOCATION

6. TROUBLESHOOTING

In order to effectively troubleshoot a piece of equipment, a basic understanding of the equipment operation is essential. The information contained in this manual is intended to provide this basic understanding of equipment operation.

Logical troubleshooting is accomplished by separating properly operating sections from those not operating properly. When the malfunctioning section is located, the problem unit within the section must be isolated, and finally, the malfunctioning component part repaired or replaced. By following a systematic approach and utilizing the troubleshooting aids included in this manual, it should be possible for maintenance personnel to isolate any trouble to the major component of the drive.

6.1 VOLTAGE CHECK POINTS

Voltage check points are indicated by numbered squares and arrows on the schematic diagrams. These checks will be made in the normal trouble-shooting procedure for a particular problem outlined in the troubleshooting aid.

All voltage checks should be made on power unit terminal strips using a Simpson Model 260 multimeter, or equivalent.

6.2 TROUBLESHOOTING TABLE

This table (table V) contains information for solving most Saber 3100 drive problems. First locate the applicable problem in the table and determine the type of drive. Perform the actions indicated. Probable solution is shown in the lower half of the table.

WARNING

TROUBLESHOOTING OF THIS DRIVE SHOULD BE PERFORMED ONLY BY PERSONNEL THOROUGHLY FAMILIAR WITH ELECTRICAL SAFETY PRECAUTIONS AND WITH USE OF TEST EQUIPMENT. PERSONNEL WILL BE EXPOSED TO DANGEROUS ELECTRICAL VOLTAGES WHEN THE POWER UNIT DOOR IS OPENED.

WARNING

IF AN OSCILLOSCOPE IS USED, MAINTENANCE PERSONNEL SHOULD NOT STAND ON GROUNDED SURFACES OR CONTACT GROUND POTENTIAL WHEN TOUCHING THE OSCILLOSCOPE. THE OSCILLOSCOPE CHASSIS SHOULD NOT BE GROUNDED THROUGH A GROUNDING PLUG OR BY CONTACT WITH A GROUND SURFACE.

TABLE V
TROUBLESHOOTING TABLE

	PROBLEM: DRIVE DOES NOT RUN	PROBLEM: DRIVE RUNS AT HIGH SPEED ONLY
TYPE OF DRIVE	SOLUTION	SOLUTION
ARMATURE FEEDBACK MANUAL SWITCH OPERATION	Turn speed control to 50% setting and perform actions 1, 2, 3, 5, & 8	Turn speed control to 50% setting and perform actions 1, 3, 5, & 8
ARMATURE FEEDBACK CONTACTOR OPERATION	Turn speed control to 50% setting and perform actions 1, 2, 3, 5, 6, & 7	Turn speed control to 50% setting and perform actions 1, 3, 5, 6, & 7
FOLLOWER DRIVES MANUAL SWITCH OPERATION	Turn speed control to 50% setting and perform actions 1, 4, 5, & 8	Turn speed control to 50% setting and perform actions 1, 4, 5, & 8
FOLLOWER DRIVES CONTACTOR OPERATION	Turn speed control to 50% setting and perform actions 1, 4, 5, 6, & 7	Turn speed control to 50% setting and perform actions 1, 4, 5, 6, & 7

		PROBABLE CAUSE	
ACTION	NORMAL CONDITION	NORMAL CONDITION	ABNORMAL CONDITION
1 CHECK SOURCE POWER TEST POINT 1	115 VAC	Not Yet Known Proceed To Next Action	Line Power To Unit
2 CHECK REFERENCE VOLTAGE TEST POINT 2	15 VDC	Not Yet Known Proceed To Next Action	Check Fuse 1F
3 CHECK REFERENCE INPUT TEST POINT 3	7.5 VDC	Not Yet Known Proceed To Next Action	Replace Speed Control
4. CHECK EXTERNAL REFERENCE TEST POINT 6	DC-Source*- AC-Tach*-	Not Yet Known Proceed To Next Action	External Follower Source Problem
5 CHECK MOTOR FIELD VOLTAGE TEST POINT 4	100 VDC	Not Yet Known Proceed To Next Action	Replace Power Module
6 CHECK MOTOR ARMATURE VOLTAGE TEST POINT 5	45 VDC	Not Yet Known Proceed To Next Action	Replace Power Unit
7 CHECK MOTOR ARMATURE VOLTAGE TEST POINT 5A	45 VDC	Open Armature Replace Motor	Replace Relay Pack
8. CHECK MOTOR ARMATURE VOLTAGE TEST POINT 5	45 VDC	Open Armature Replace Motor	Replace Power Unit

* Depends on source used, check voltage of source

7. SPARE PARTS LISTS

All service and replacement parts for the Saber 3100 power unit and operator's control stations are available from The Louis Allis Company, Drives & Systems Division, Parts Department. Table VI lists Saber 3100 power unit replacement parts. Due to the modularized construction of the Saber 3100 power unit, parts replacement is limited to module replacement only: e.g., "mod board", power module, contactor module, or OCS.

TABLE VI
RECOMMENDED SPARE PARTS FOR POWER UNIT
(Models 73103L and 73104J)

PART DESCRIPTION		LOUIS ALLIS PART NO.
1/4 – 1/3 HP Power module		46S1304-0030
1/2 – 1 HP Power module		46S1304-0040
Armature feedback "mod board"	115VAC	46S1252-0030
	230VAC	46S1252-0040
Armature feedback W/accel "mod board"		46S1253-0010
Armature feedback W/follower "mod board"		46S1251-0010
Tachometer Feedback "mod board"		46S1303-0010
Tachometer Feedback W/Accel "mod board"		46S1254-0010
Tachometer Feedback W/Follower "mod board"		46S1300-0010
Contactor module, non-rev		46S1336-0001
Contactor module, rev W/dynamic braking		46S1319-0001
Contactor		5P32-0017
Dynamic braking assembly		46S1342-0000
Potentiometer Ass'y, 1K ohm		44S184-0544
1/4 - 1/3 HP Power Unit Fuse		Type ABC - 8 Amp 5P17-0135
1/2 - 1 HP Power Unit Fuse		Type ABC - 15 Amp 5P17-0119