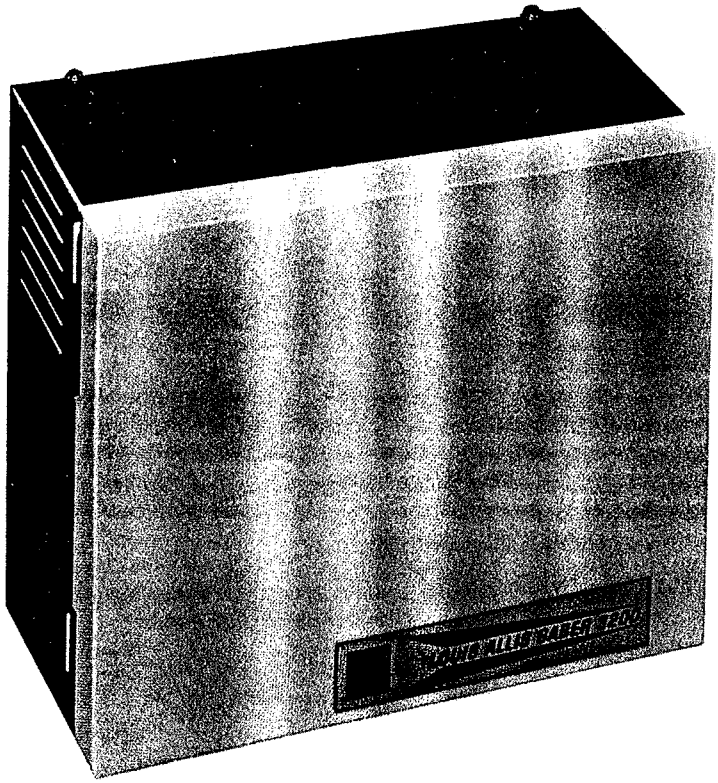
3G-100000
EFFECTIVE 12/85
Supersedes 5/84

# LOUIS ALLIS SABER™ 3200

## DC STATIC DRIVE INSTRUCTIONS



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.

# WARNING

THE ABOVE-GROUND ELECTRICAL POTENTIALS OF LOUIS ALLIS EQUIPMENT CAN BE HAZARDOUS. THEREFORE, **IT IS STRONGLY RECOMMENDED THAT ALL ELECTRICAL WORK CONFORMS TO NATIONAL ELECTRICAL CODES AND LOCAL REGULATIONS.** INSTALLATION, ALIGNMENT AND MAINTENANCE SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL . . . PREFERABLY FACTORY TRAINED.

ONLY FACTORY RECOMMENDED TEST PROCEDURES INCLUDED IN THIS INSTRUCTION MANUAL SHOULD BE FOLLOWED. ELECTRICAL POWER SHOULD ALWAYS BE DISCONNECTED BEFORE WORKING ON THE CONTROLLER. **WHEN TESTING OR TROUBLESHOOTING USE ONLY GROUNDED CHASSIS, FLOATING COMMON TYPE TEST EQUIPMENT.**

RECOMMENDED TEST EQUIPMENT:

A. Battery Operated VOM

B. Digital Multimeter

C. Oscilloscope With Differential Type Pre-Amp (To Allow Grounding Per National Electrical And Local Codes)

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# SECTION I
# DESCRIPTION

## 1.1 GENERAL

Saber 3200 drives are 1-5 horsepower standard purpose, static adjustable speed dc drives manufactured by Louis Allis. The drive consists of a solid state power unit, a dc motor, and an operator's control station.

## 1.2 DC MOTOR

Louis Allis Flexitorq dc motors are built in accordance with NEMA standards and are designed specifically for use with single-phase, full wave rectified power supplies.

For other dc motor information, refer to the dc motor instruction manual.

## 1.3 OPERATOR'S CONTROL STATION

Controls necessary for the remote operation of the drive are located on the operator's control station (OCS). This is a small general purpose enclosure designed for industrial applications.

## 1.4 POWER UNIT

The power unit converts single-phase ac input power to controlled dc power for dc motor speed control. It features "state of the art" circuitry and attractive design.

**1.4.1 Specifications** – Power unit specifications are given in table 1-2.

**1.4.2 Identification** – Reference power unit serial number and identification number stamped on the power unit nameplate, in any correspondence with The Louis Allis Company. The identification number contains all pertinent drive information. The first six digits are the power unit model number. This number describes horsepower, type of feedback, and whether the drive is non-reversing or reversing. A complete list of model numbers is given in table 1-3.

The last six digits describe modifications to the basic model.

73201L – 00 00 00
(A) (B) (C)

(A) The digits appearing here designate circuit modifications.

00 – basic model with no modifications
01 – acceleration modification
02 – jog modification
03 – acceleration/jog modification
04 – thread modification
05 – acceleration/thread modification
06 – follower modification
07 – transducer follower modification

(B) The digits appearing here designate whether test meter and/or dynamic braking are supplied.

00 – neither one supplied
01 – dynamic braking supplied
10 – standard test meter supplied
11 – standard test meter and dynamic braking supplied
20 – follower test meter supplied
21 – follower test meter and dynamic braking supplied

(C) The digits appearing here designate modifications to the power unit enclosure.

00 – no enclosure supplied
10 – standard enclosure supplied
21 through 24 – enclosure with deep door supplied – operator's controls mounted on door

When an identification number is not used, a serial number will be stamped on the nameplate and should be used in any correspondence with the Company.

## TABLE 1-1
## MOTOR SPECIFICATIONS

| | |
|---|---|
| Horsepower Range Available | 1, 1.5, 2, 3 and 5 horsepower |
| Base Speeds (standard motors) | 1750 and 2500 RPM |
| Controllable Speed Range: | |
| Drip-Proof (DPG) | 2:1 for 100% torque, 30.1 for 60% torque |
| Totally Enclosed Non-Ventilated (TENV) | 30:1 for 100% torque |
| Shunt Field Voltage | 200 vdc |
| Armature Voltage | 180 vdc |
| Ambient Temperature | 40°C maximum |
| Operating Altitude | 3300 feet above sea level maximum |
| Service Factor | 1.00 |

## TABLE 1-2
## POWER UNIT SPECIFICATIONS

| | |
|---|---|
| Input Voltage | 230 vac –5%, +10%, 1 phase, 50/60 hz |
| Output Voltage | 200 vdc field voltage, 180 vdc armature voltage |
| Overload Capacity | 150% for 1 minute, 200% for 5 seconds |
| Speed Control Accuracy: | |
| With Armature Feedback | ±2% due to load changes, ±15% due to other variables |
| With Tachometer-Generator | ±1% due to load changes, ±3% due to other variables |
| Controllable Speed Range | 30:1 by armature control |
| Operating Temperature Range | +10°C to +40°C |
| Size | refer to outline drawing |
| Weight | refer to outline drawing |

## TABLE 1-3
## SABER 3200 POWER UNIT MODEL NUMBERS

| 2% SPEED CONTROL ACCURACY | | | |
|---|---|---|---|
| NON-REVERSING | | REVERSING | |
| POWER UNIT MODEL NO. | HORSEPOWER | POWER UNIT MODEL NO. | HORSEPOWER |
| 73201L | 1 | 73231M | 1 |
| 73202J | 1-1/2 | 73232K | 1-1/2 |
| 73203R | 2 | 73233S | 2 |
| 73204P | 3 | 73234Q | 3 |
| 73205N | 5 | 73235F | 5 |
| 1% SPEED CONTROL ACCURACY | | | |
| NON-REVERSING | | REVERSING | |
| POWER UNIT MODEL NO. | HORSEPOWER | POWER UNIT MODEL NO. | HORSEPOWER |
| 73206L | 1 | 73236M | 1 |
| 73207J | 1-1/2 | 73237K | 1-1/2 |
| 73208R | 2 | 73238S | 2 |
| 73209P | 3 | 73239Q | 3 |
| 73210K | 5 | 73240L | 5 |

# SECTION 2
# INSTALLATION

## 2.1 GENERAL

Installation and interconnection wiring must be done in conformance with the National Electrical Code, regulations of the Occupational Safety and Health Administration, and/or other national, regional, or industry codes and standards.

## 2.2 MOUNTING

**2.2.1 Power Unit** – The power unit is designed for wall mounting. Fasten sub-panel to the wall mounting rack using standard hardware. Slide enclosure over sub-panel with the four screws supplied (see controller outline drawing).

**2.2.2 DC Motor** – Refer to dc motor instruction manual.

## 2.3 ELECTRICAL INTERCONNECTIONS

**2.3.1 General** – See paragraph 2.3.2 to determine the correct diagram for interconnecting all standard model controllers and associated drive equipment. Only the schematic diagram applicable for the order is included at the rear of this instruction manual, or located behind the "Drawings" tab of a systems oriented instruction manual.

For standard model controllers, the interconnection diagram is located on the backside of the schematic diagram.

It is recommended that all notes on these diagrams (schematic and interconnection) be read and understood before wiring.

**2.3.2 Interconnection Diagrams** – To locate the correct interconnection and OCS information for standard model drives, follow these steps:

1) Obtain identification number from power unit nameplate.

   This number is composed of the model number (first six digits) plus a six digit backfield number which designates modifications to the basic model.

   73201L-001010
   model no. backfield no.

2) Located model number in table 2-1. Opposite the model number is the number of the interconnection diagram which applies to the drive.

3) After the correct interconnection diagram has been determined, circle one of the OCS types on that diagram which matches the OCS supplied with the drive (if supplied by Louis Allis). The first two backfield numbers describe the modification to the basic model which determines the type of OCS used with the drive.

   First two digits of backfield number and OCS type:

   00-OCS type 1
   01-OCS type 1
   02-OCS type 2
   03-OCS type 2
   04-OCS type 3
   05-OCS type 3
   06-OCS type 4
   07-OCS type 4

## TABLE 2-1
## INTERCONNECTION DIAGRAMS

| MODEL NO. | INTERCONNECTION DIAGRAM NO. | MODEL NO. | INTERCONNECTION DIAGRAM NO. |
|---|---|---|---|
| 73201L | 1 | 73231M | 2 |
| 73202J | 1 | 73232K | 2 |
| 73203R | 1 | 73233S | 2 |
| 73204P | 1 | 73234Q | 2 |
| 73205N | 1 | 73235F | 2 |
| 73206L | 1 | 73236M | 2 |
| 73207J | 1 | 73237K | 2 |
| 73208R | 1 | 73238S | 2 |
| 73209P | 1 | 73239Q | 2 |
| 73210K | 1 | 73240L | 2 |

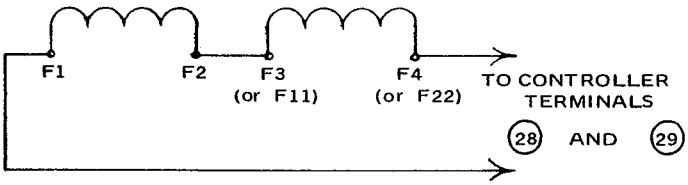
**2.3.3 Motor Field Connections** – Refer to the following instructions before installing motor.

The dc motor may be furnished with either a single (200 volt) or a dual (100/200 volt) voltage shunt field winding. Refer to motor nameplate or other instructions to determine shunt field connections of motor furnished.

When motor is furnished with dual (100/200 volt) shunt field windings:

1) Connect shunt field for 200 volt field supply as shown below, then

2) Wire F1 and F4 (or F1 and F22) to terminals (28) and (29) of the controller.




When motor is furnished with a single (200 volt) shunt field winding, it is necessary to connect only the motor shunt field (normally tagged either F1 and F2 or F1 and F4) to terminals (28) and (29) of the controller.

Motor may be furnished with or without a series field (leads tagged S1 and S2). When series field is provided, connect as shown in this manual. When motor is furnished without a series field, connect armature leads A1 and A2 direct to controller terminals (35) and (36).

For future reference, make notation of the applicable motor field connections on the interconnection and schematic diagrams in this manual.

The motor may be provided with control leads (C1 and C2) to commutating field. These leads are not used with this drive and should be taped.

**2.3.4 Tach Information** – Refer to the following instructions before installing tachometer:

AC tachometers may be of the dual-voltage type. Lead tagging for 45 VAC/1000 RPM connections is T1–T2. Tagging for 90 VAC/1000 RPM connections is T1–T3.

This equipment required use of the 45 VAC/1000 RPM connections, T1–T2.

If tachometer similar to G.E. AN102 is used, refer to Note 2 of Figure 3.6 before proceeding.

# SECTION 3
# DRIVE OPERATION

## 3.1 DESCRIPTION OF OPERATION

The Saber 3200 drive is a speed regulated dc drive. The speed of a shunt wound dc motor will drop slightly when load is applied. The amount of motor speed change between no load and full load, is called regulation. To improve on the motor regulation characteristics, power input to the motor must vary with load. This is achieved by continually monitoring drive speed and comparing it to desired speed. Desired speed is set by the reference signal while the feedback signal represents actual drive speed.

The power unit converts ac input power to controlled dc output power. The regulator portion of the power unit continuously compares reference and feedback signals and varies output power accordingly to provide accurate speed regulation. This type of system is commonly referred to as a closed loop system.

Two types of feedback are offered on the Saber 3200 drive. The standard drive utilizes armature voltage feedback with load (IR) compensation. The standard drive with 1% speed control accuracy utilizes tachometer-generator feedback.

Figure 3-1 shows the basic block diagram of the standard drive using armature voltage feedback with load (IR) compensation. This method of speed control does not monitor speed directly. Armature voltage is measured as an approximate measurement of speed. Since the speed of a dc shunt motor will decrease slightly when load is applied, a load (IR) compensation circuit is included to compensate for load speed change.

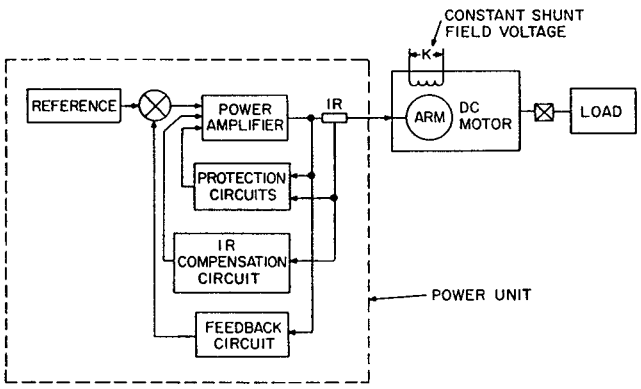



Figure 3-1. Block Diagram of 2% Speed Control Drive

Figure 3-2 shows the basic block diagram of the standard drive with 1% speed control accuracy (tachometer-generator feedback). With this type of speed control, load compensation is not required since speed is monitored directly by the tachometer-generator. Speed change due to load change is therefore limited only by the accuracy of the power unit and tachometer-generator. Speed control accuracy is improved with this type of feedback because speed is measured directly.

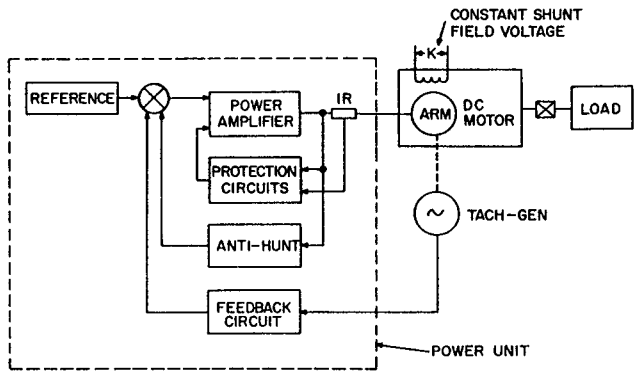



Figure 3-2. Block Diagram of 1% Speed Control Drive

Protection circuits are included in all Saber 3200 drives to protect the drive components from overload damage. Control signals from these circuits keep power unit output within preset safe limits by continually monitoring armature voltage and current.

An engineered Saber 3200 drive may have additional circuitry or reference and feedback circuits other than those mentioned in this section. Additional or other modifying circuits function so as to add to or replace the normal reference and feedback signal(s). The primary controlling factor still remains a reference and feedback comparison. Refer to individual module descriptions, printed circuit board schematics, or other descriptive material included with this instruction manual, for the operation of these circuits.

## 3.2 POWER UNIT

The main function of the power unit is supplying controlled dc motor armature voltage. Controlled armature voltage is variable from 0-180 vdc. The instantaneous value of voltage depends on SPEED control setting and motor load. The power unit also supplies a constant dc voltage (200 vdc) to the motor shunt field.

The regulator portion of the power unit maintains the drive speed constant with feedback signal approximately equal to reference signal. The basic regulator consists of a power amplifier module and a reference and feedback module.

The reference and feedback module used depends on the type of feedback. Standard Saber 3200 drives with armature feedback use reference and feedback module 46S01314–0010. Standard Saber 3200 drives with 1% speed control accuracy (tachometer-generator feedback) use reference and feedback module 46S01314–0020. Both modules perform the same function. supplying an error current to the power amplifier module which is the difference between desired and actual drive speed.

**3.2.1 Reference and Feedback Module** – 46S01314–0010 (Supplied on Saber 3200 drives with armature feedback) – This module supplies three control currents to the power amplifier module: error, IR compensation, and current limit. All of these currents affect the output of the power amplifier. The error current results from a comparison of reference current and feedback current. Amount of reference current is determined by the settings of SPEED and MIN SPEED controls. Feedback current is proportional to armature voltage and IR compensation and current limit currents are proportional to armature current.

This module contains four circuits: reference, feedback, IR compensation, and current limit. Block diagram of the module is shown in figure 3-3 typical schematic diagram is shown in figure 3-4.

The reference circuit is supplied with pulsating dc voltage from power amplifier module. This pulsating dc voltage is filtered and used as the reference supply. SPEED and MIN SPEED control settings determine how much of the available reference voltage is used. The resulting reference current is supplied to the error sensing node. The reference

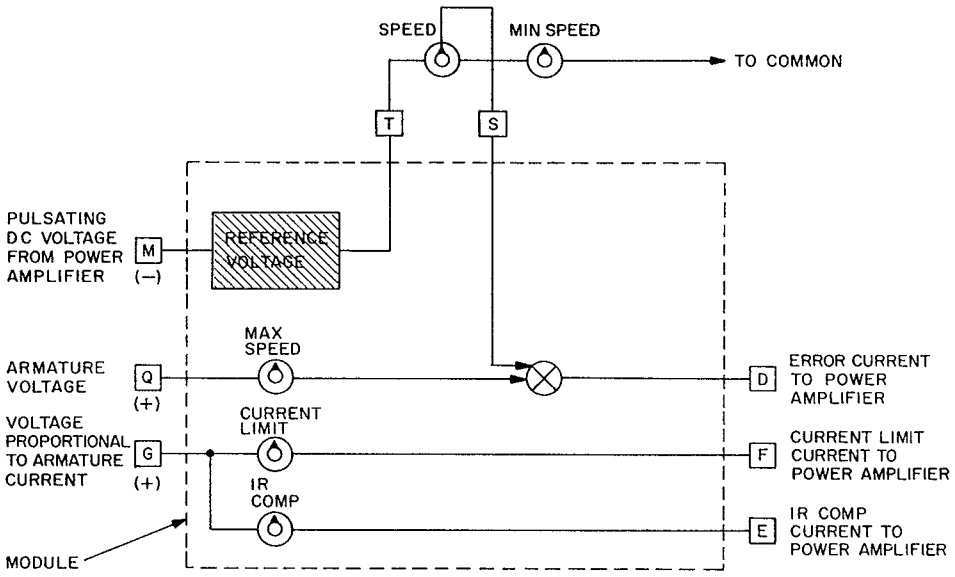



Figure 3-3. Functional Block Diagram of Reference and Feedback Module 46S01314–0010

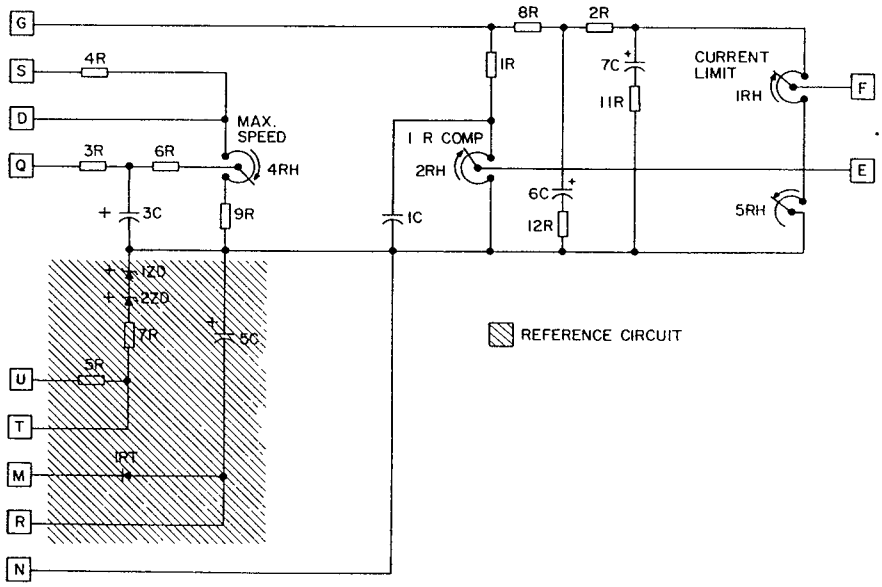



Figure 3-4. Typical Schematic of Reference and Feedback Module 46S01314–0010

supply is semi-regulated, which is desirable because the motor is operated with fixed shunt field voltage. Shunt field voltage will vary with line voltage and if armature voltage is not varied to compensate for these changes in field voltage, motor speed will vary. The use of a semi-regulated reference minimizes the effect of line voltage variations on motor speed.

The feedback circuit monitors armature voltage. MAX SPEED adjustment setting determines the amount of available feedback voltage that will be used. Current resulting from this adjustment setting is fed to the error sensing node where it is compared to reference current. The difference in these two signals (error signal) controls the power amplifier output under constant load conditions.

The IR compensation circuit samples armature current and supplies a current signal to the power amplifier. This signal modifies power amplifier output to correct for changes in motor load. IR COMP adjustment setting determines amount of IR compensation current signal.

Current limit circuit also monitors armature current. This 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 drop back to a lower level. This action protects the motor and power amplifier from overload damage.

**3.2.2 Reference and Feedback Module** – 46S01314–0020 (Supplied on Saber 3200 drives with 1% speed control accuracy) – This module supplies two control currents to the power amplifier module. These currents are error and current limit.

Error current results from a comparison of three currents in the error sensing node. The three currents are: (1) Reference current determined by SPEED and MIN SPEED control settings; (2) Feedback current proportional to motor speed, (3) Anti-hunt current proportional to changes in armature voltage.

Current limit current is determined by CURRENT LIMIT adjustment setting and amount of armature current.

This module contains four circuits. reference, feedback, anti-hunt, and current limit. Block diagram of the module is shown in figure 3-5. Typical schematic diagram is shown in figure 3-6.

The reference circuit is supplied with pulsating dc voltage from the power amplifier module. This pulsating dc voltage is filtered and zener-diode regulated in the reference circuit. Resulting regulated dc voltage is used as the reference voltage and the SPEED and MIN SPEED control settings determine how much of the available reference voltage is used. Resulting reference current is supplied to the error sensing node.

The feedback circuit is supplied with either ac or dc voltage depending on type of tachometer-generator used. Tachometer-generator voltage varies directly with load speed. If an ac tachometer-generator is used, ac voltage is rectified and filtered in the feedback circuit. The resulting dc voltage is supplied to the MAX SPEED adjustment where the amount of feedback is controlled. Current resulting from MAX SPEED adjustment setting is supplied to the error sensing node where it is compared to reference current.

The anti-hunt circuit responds only to changes in drive operation. The current signal output of this circuit has a dampening effect on drive response during periods of change. This circuit keeps the drive from reacting to minor variations which could cause erratic operation.

The anti-hunt circuit samples changes in armature voltage. ANTI-HUNT adjustment setting determines amount of current fed to the error sensing circuit during changes in armature voltage. The current adds to the feedback current from the MAX SPEED adjustment.

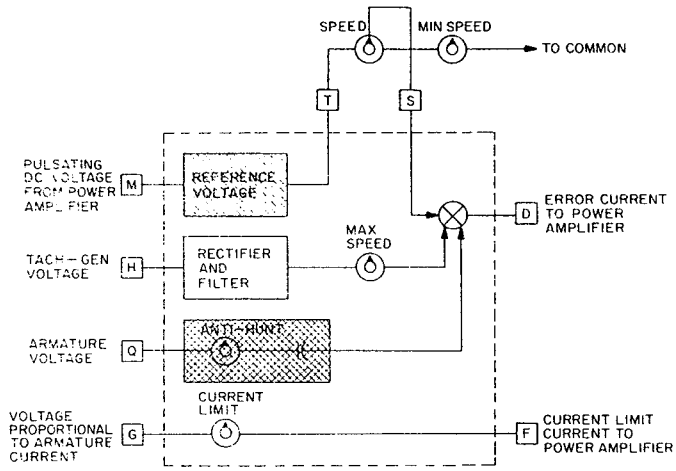



Figure 3-5. Functional Block Diagram of Reference and Feedback Module 46S01314–0020

Current limit circuit also monitors armature current. This 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 out of this circuit will override error current and cause the power amplifier output to drop back to a lower level This action protects the motor and power unit from overload damage.

**3.2.3 Power Amplifier Module** – Output of the power amplifier module is controlled by input current signals from the reference and feedback module. On Saber 3200 drives with armature feedback these currents are. error, IR comp, and current limit. On Saber 3200 drives with 1% speed control accuracy (tachometer-generator feedback) these currents are error and current limit. With either type of feedback, the control current input to the amplifier represents the difference between desired and actual drive speed. This control current signal controls armature voltage. Block diagram of module is shown in figure 3-7, typical schematic diagrams are shown in figures 3-8 and 3-9.

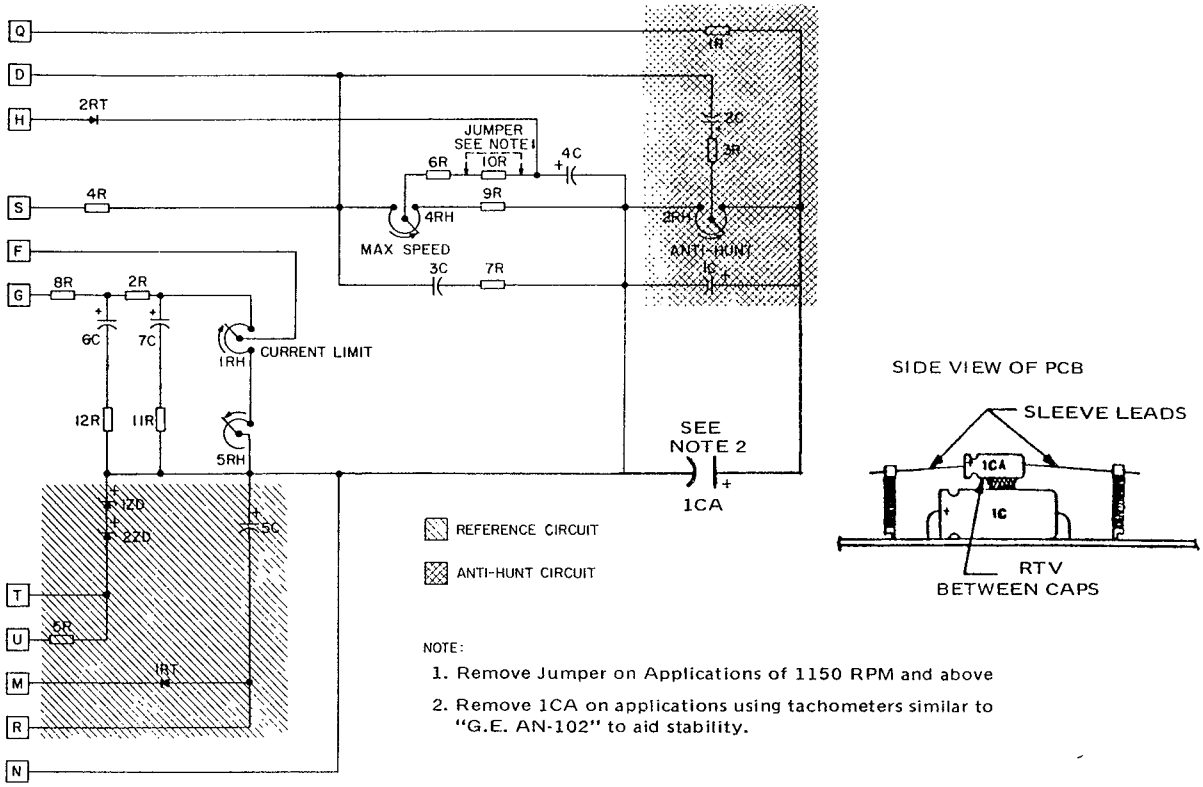



Figure 3-6. Typical Schematic of Reference and Feedback Module 46S01314–0020

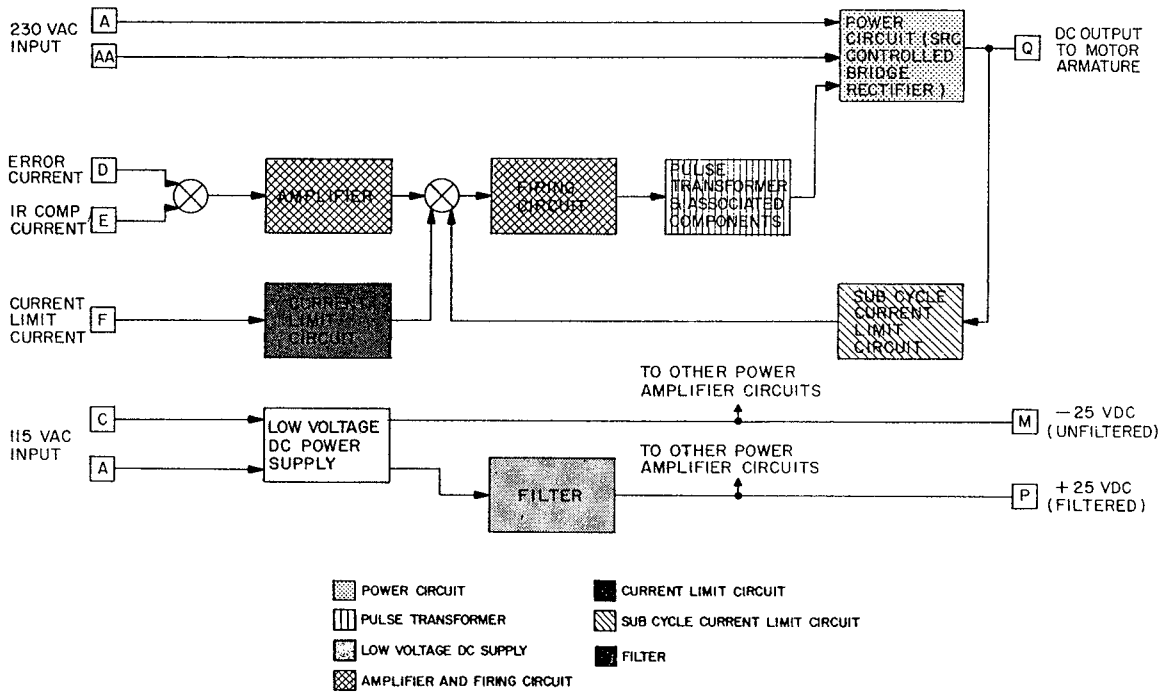



Figure 3-7 Functional Block Diagram of Power Amplifier Module 46S01315–0010/0020

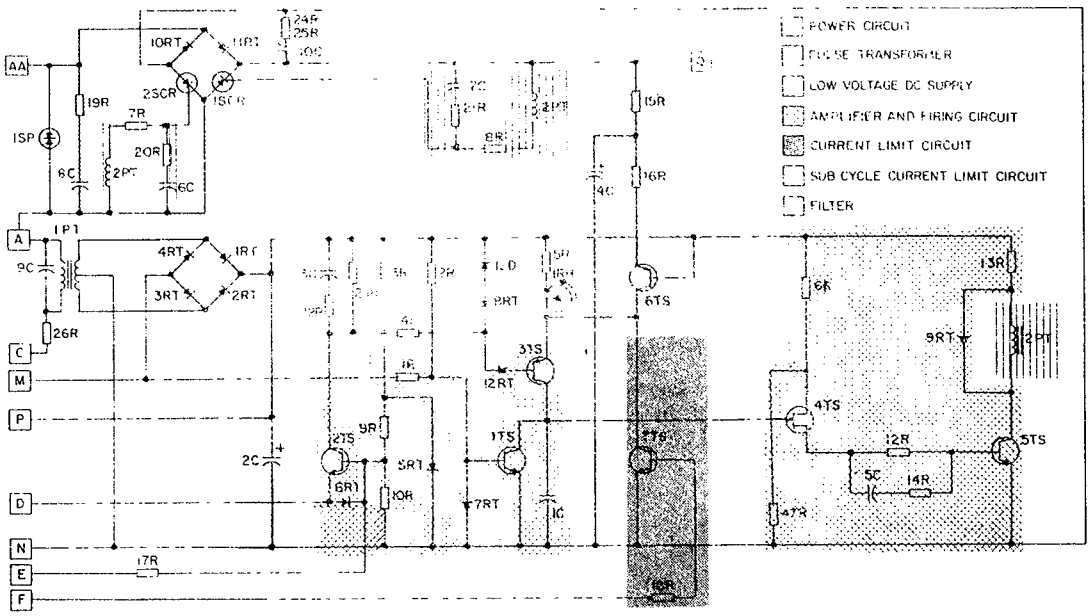



Figure 3-8 Typical Schematic of Power Amplifier Module 46S01315-0010

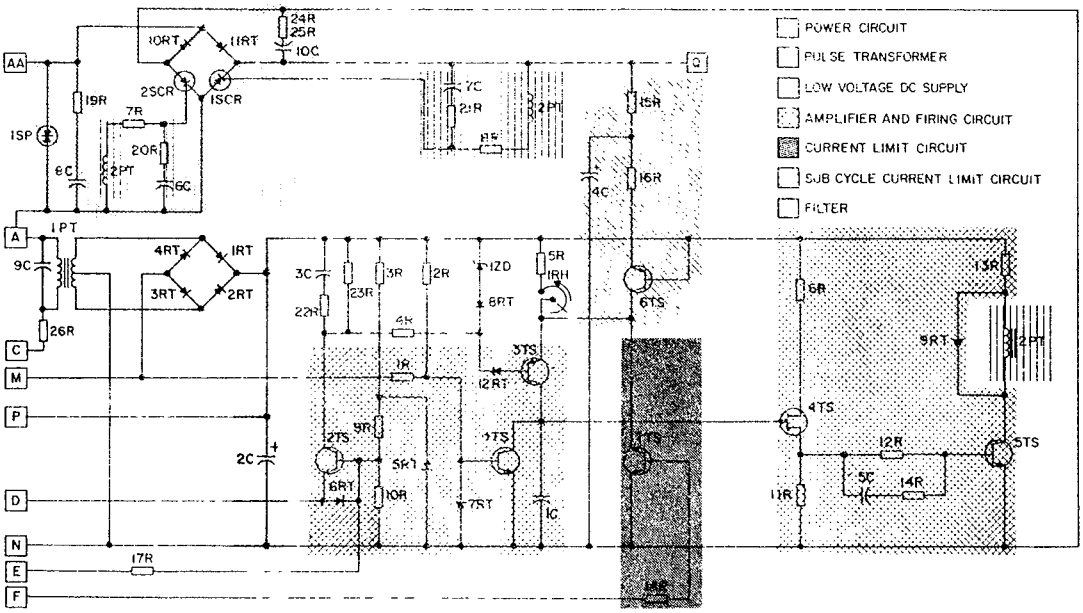



Figure 3-9 Typical Schematic of Power Amplifier Module 46S01315-0020

The amplified signal controls firing rate of the firing circuit. The firing circuit develops pulses at a rate determined by the input signal. These pulses are transformer coupled to the SCR's in the power circuit and determine where in the ac waveform the SCR's conduct.

When motor load exceeds CURRENT LIMIT adjustment setting, the current limit signal overrides the input signal. This prevents output from exceeding safe limits.

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. The SCR bridge rectifies ac supply voltage and supplies pulsating dc voltage to the motor armature. The amount of dc output voltage depends on where 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 3-10).

3.2.4 Reversing Drives -- The direction of rotation of a dc shunt motor can be changed by reversing the direction of current flow through either the armature or shunt field. The Saber 3200 drive is reversed by changing the direction of current flow through the armature. This modification

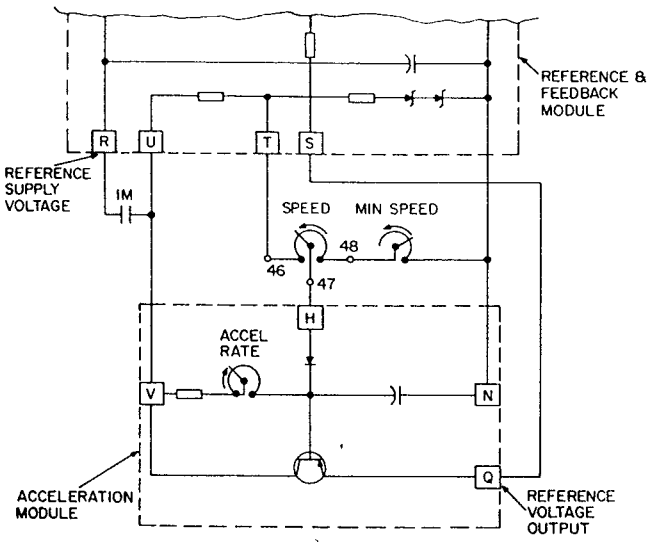



Figure 4-2. Typical Schematic of Acceleration Module

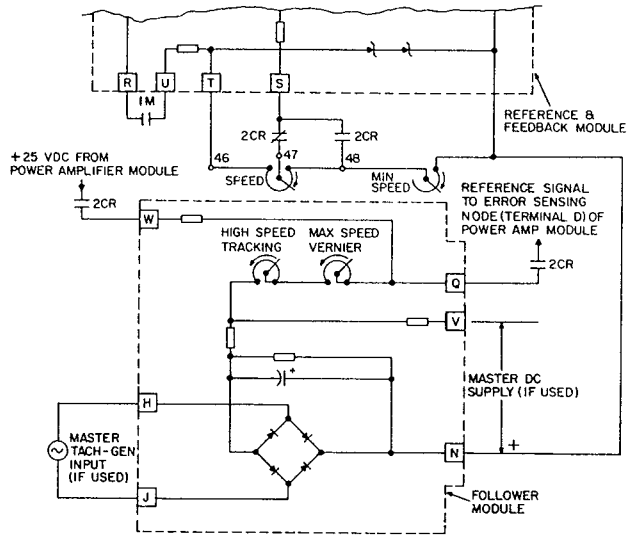



Figure 4-3. Typical Schematic of Follower Module

## 4.5 FOLLOWER MODIFICATION

The follower modification allows drive speed to follow an external source at an adjustable ratio. When placed in the auto mode of operation, drive speed will follow the external source at a ratio determined by the HIGH SPEED TRACKING and SPEED VERNIER adjustments. The external source may be either a tachometer-generator or a variable dc supply (see figure 4-3).

The drive will follow either an ac or dc tachometer-generator (connected to power unit terminals 56 and 57) provided the outputs are within specified limits.

**AC Tachometer-Generator** – Output must be between 25 and 70 volts rms at 5 milliamps loading, for drive to run at base speed. Output frequency at lowest operating speed must be more than 30 hz.

**DC Tachometer-Generator** – Output must be between 25 and 80 vdc at 5 milliamps loading, for drive to run at base speed.

The drive will also follow a variable dc supply (connected to power unit terminals 58 and 66) provided its output is within specified limits.

**DC Supply** – Output must be between 10 and 20 vdc at 5 milliamps loading, for drive to run at base speed.

In the auto mode of operation, the reference function is switched from the reference and feedback module to the follower module. The value of external reference voltage and the HIGH SPEED TRACKING adjustment setting determine drive speed rather than the setting of the SPEED control.

The MIN SPEED adjustment serves a different function in this mode of operation. Its setting determines whether a turn-on or turn-off signal is supplied to the power amplifier module with no external reference applied. This feature allows drives with different loads to be started simultaneously by a common reference.

## 4.6 TRANSDUCER FOLLOWER MODIFICATION

The transducer follower modification (figure 4-4) allows drive speed to follow a current signal from a transducer through a process instrument. This follower circuit was specifically designed to work in conjunction with transducer amplifiers which provide signal outputs at zero transducer signal inputs; i.e., 4-20ma, 10-50ma.

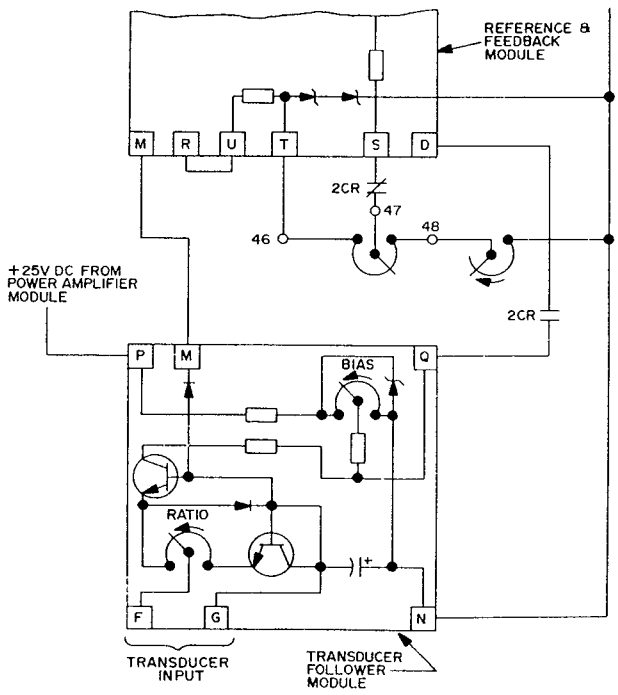



Figure 4-4. Typical Schematic of Transducer Follower Module

The drive will follow a signal from the process instrument transducer amplifier (connected to terminals (+)56 and (–)57 provided outputs of the process instrument are:

1. Capable of working properly into 10 to 100 ohms impedance, and

2. have an output current in the range of 5 to 20ma at drive top speed.

In the auto mode of operation, the reference function is switched from the reference and feedback module to the transducer follower module. The effect of the inherent current signal of the amplifier is compensated for by adjusting the BIAS so that the signal to the module truly represents an output signal of the transducer. Drive speed will follow the current signal at a ratio as determined by the setting of the RATIO adjustment. Drive speed, therefore, will be determined by the value of the external reference current and the RATIO adjustment setting rather than the setting of the SPEED control.

NOTE -

System stability is not guaranteed when the external source and drive are parts of a closed loop system.

**CAUTION**

CARE SHOULD BE TAKEN TO AVOID A GROUND LOOP BETWEEN THE SABER 3200 CONTROLLER AND THE PROCESS INSTRUMENT TRANSDUCER AMPLIFIER, BECAUSE CONDITIONS COULD ARISE FOR A POTENTIAL TO EXIST BETWEEN THE UNITS. EITHER THE PROCESS INSTRUMENT, OR THE SABER 3200, OR BOTH, SHOULD BE ISOLATED FROM THE LINE THROUGH THE USE OF AN ISOLATION TRANSFORMER.

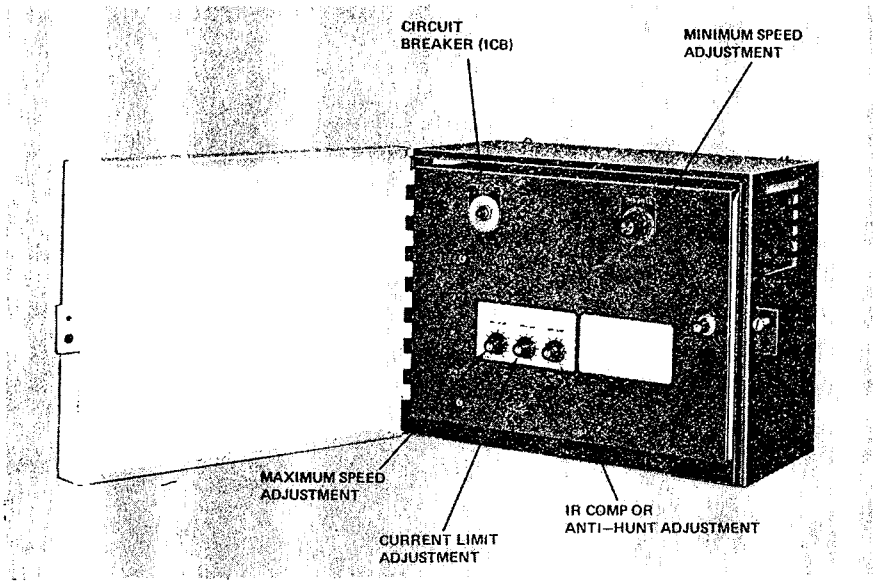
# SECTION 5
# CONTROLS, ADJUSTMENTS, AND SWITCHES

## 5.1 LOCATION

The physical location of each control adjustment, and switch for standard model controllers is shown in figure 5-1.

## 5.2 DESCRIPTION

A functional description of each control, adjustment, and switch is given in table 5-1.



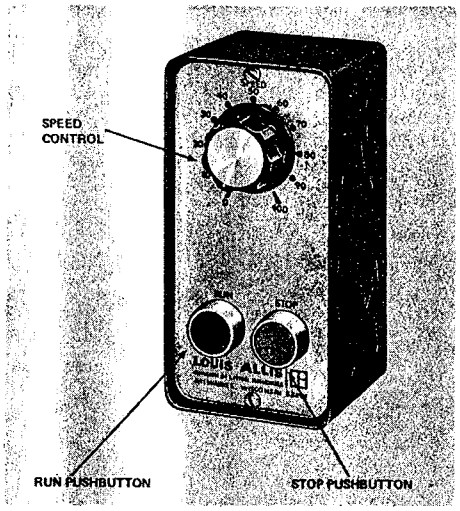




Figure 5-1. Physical Location of Controls, Adjustments, and Switches

## TABLE 5-1
## FUNCTION OF CONTROLS, ADJUSTMENTS, AND SWITCHES

### COMMON TO ALL STANDARD MODEL SABER 3200 DRIVES

MIN SPEED ADJUSTMENT – Determines drive speed with SPEED control set at zero. Minimum speed is adjustable from zero to 10% of base speed.

MAX SPEED ADJUSTMENT – Determines drive speed with SPEED control at 100% setting.

SPEED CONTROL – Allows operator to determine running speed of the drive. Drive speed is adjustable from the low limit (set by MIN SPEED adjustment) to the high limit (set by MAX SPEED adjustment).

CURRENT LIMIT ADJUSTMENT – Limits maximum amount of armature current that can flow. Adjustment is factory set to limit maximum armature current to 150% of rated current. Range of adjustment is from 70% to 150% of rated current. Also see "Setup and Adjustment Procedure" located on reverse side of standard model controller (basic unit or with modification) schematic diagram.

# SECTION 6
# MAINTENANCE AND TROUBLESHOOTING

## 6.1 POWER UNIT MAINTENANCE

**WARNING**

ALWAYS REMOVE AC INPUT POWER BEFORE PERFORMING ANY MAINTENANCE FUNCTIONS ON THE CONTROLLER. ELECTRICAL SHOCK CAN CAUSE SERIOUS OR FATAL INJURY.

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 site. 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.

**6.1.1 Component Location** – Location of all major components is shown in figure 6-1.

**6.1.2 Module Removal** – Most power unit components are mounted on printed circuit boards. To remove these modules, loosen all terminal strip screws, knobs, and relieve holding clips. Remove module gently to avoid possible damage to mounted components. Insert replacement module in terminal strip, affix holding clips, replace knobs, and tighten all connections.

**6.1.3 Module Repair** – Module repair requires special techniques. Do not attempt module repair before contacting Louis Allis.

Defective or suspected faulty modules may be sent to Louis Allis, Drives & Systems Division, 16555 W. Ryerson Road, New Berlin, Wisconsin 53151, c/o Apparatus Return Department for test or repair. Prior to returning parts, however, contact your nearest Louis Allis District Office for apparatus return and shipping instructions.

NOTE

Your warranty may be voided if module repair is unauthorized.

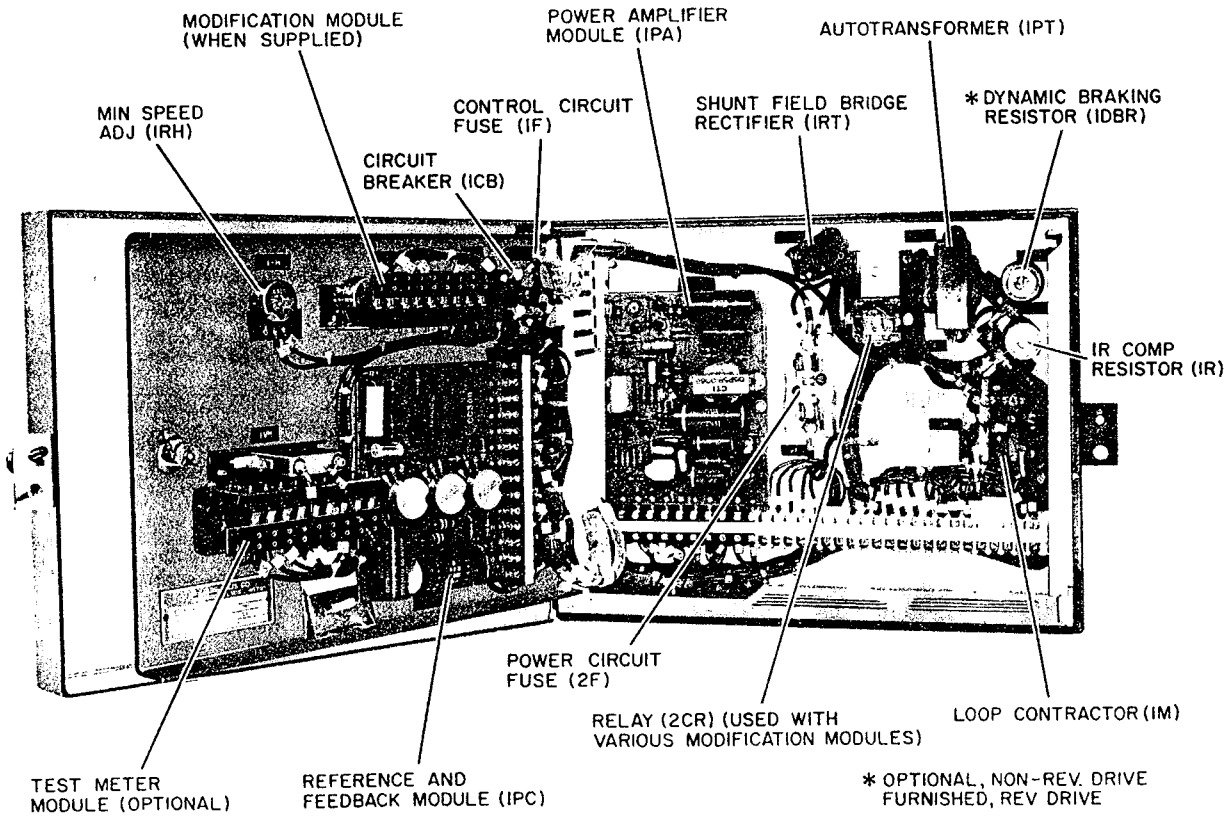



Figure 6-1. Location of Power Unit Components

## 6.2 TROUBLESHOOTING

> **WARNING**
>
> ALWAYS OBSERVE ELECTRICAL SAFETY PRECAUTIONS WHEN AC INPUT POWER IS APPLIED TO THE DRIVE. ELECTRICAL SHOCK CAN CAUSE SERIOUS OR FATAL INJURY.
>
> ALWAYS REMOVE AC INPUT POWER WHEN REPLACING FUSES, TRANSFORMERS, WIRING, AND CONTROLLED COMPONENTS.

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

By following a systematic approach and utilizing the troubleshooting aids, tables 6-1 and 6-2, it is possible for maintenance personnel to isolate any trouble to the major component or module level.

**6.2.1 Voltage Check Points** – Voltage check points are shown on the standard model schematic diagrams. Some of these checks will be made in the normal troubleshooting procedure for a particular problem outlined in table 6-1.

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

**6.2.2 Troubleshooting Table** – Table 6-1 contains information which will be helpful in solving most Saber 3200 drive problems.

**6.2.3 Abbreviated Troubleshooting Table** – Table 6-2 is designed to be used for drives equipped with the test meter modification. Most problems can be isolated without the use of additional test equipment.

### TABLE 6-1
### TROUBLESHOOTING TABLE

**Problem:** Drive does not start when RUN pushbutton is pressed

| TYPE OF DRIVE | SOLUTION |
|---|---|
| All models with no modifications<br>All models with either jog or thread modification | Turn SPEED control to 50% setting and perform actions 1 thru 7 |
| All models with accel modification | Turn SPEED control to 50% setting and perform actions 1, 2, 3, 4, 5, 9, 6 & 7 |
| All models with accel/jog modification | Turn SPEED control to 50% setting and perform actions 1, 2, 3, 4, 5, 10, 6 & 7 |
| All models with accel/thread modification | Turn SPEED control to 50% setting and perform actions 1, 2, 3, 4, 5, 11, 6 & 7 |
| All models with follower modification | If drive doesn't run in MAN mode, perform actions 1 thru 7 with SPEED control set at 50%<br>Drive runs in MAN mode but not in AUTO mode. If using master d.c. reference, perform action 12. If using master tach-gen reference, perform action 13. If using transducer reference, perform action 16. |

**Problem:** Drive runs at high speed only

| TYPE OF DRIVE | SOLUTION |
|---|---|
| Models with armature voltage feedback and any modification | Turn SPEED control to 50% setting and perform actions 4, 5, 6 & 7 |
| Models with tach-gen feedback and any modification | Turn SPEED control to 50% setting and perform actions 4, 5, 6, 8 & 7 |

**Problem:** Drive runs at low speed only

| TYPE OF DRIVE | SOLUTION |
|---|---|
| All models with any modification | Turn SPEED control to 100% setting and perform action 17 |

**Problem:** Drive operation is unstable

| TYPE OF DRIVE | SOLUTION |
|---|---|
| Models with armature voltage feedback and any modification | Perform action 14 |
| Models with tach-gen feedback and any modification | Perform actions 15 & 18 |

## TABLE 6-1 (Continued)
## TROUBLESHOOTING TABLE

| ACTION | NORMAL CONDITION | PROBABLE CAUSE | |
|---|---|---|---|
| | | NORMAL CONDITION | ABNORMAL CONDITION |
| 1. Check voltage input to power unit – test point 1 | 230 VAC ±10% | Not yet known. Proceed to next action. | Main circuit breaker (2CB) open or ac line problem. |
| 2. Check power amplifier input voltage – test point 2 | 115 VAC | Not yet known. Proceed to next action. | Circuit breaker (1CB) open or fuse (1F) blown. |
| 3. Check power amplifier input voltage – test point 3 | 230 VAC | Not yet known. Proceed to next action. | Fuse (2F) blown. |
| 4. Check reference supply voltage – test point 4 | Approx (-) 15 VDC | Not yet known. Proceed to next action. | Ref & feedback module faulty or contactor (1M) contacts not completing ref. circuit. |
| 5. Check reference voltage input – test point 5 | Approx (-) 7.5 VDC | Not yet known. Proceed to next action. | Speed or min speed controls faulty. |
| 6. Check motor shunt field voltage – test point 6 | 200 VDC | Not yet known. Proceed to next action. | Bridge rectifier (1RT) faulty. |
| 7. Check power amplifier output voltage – test point 7 | Approx. 90 VDC | Open armature circuit. | Power amp. module or ref. & feedback module faulty. |
| 8. Check tach-gen output voltage – test point 8 | Voltage output should represent drive speed. See tach-gen name-plate | Not yet known. Proceed to next action. | Tach-gen faulty. |
| 9. Check reference voltage output of accel module – test point 9 | Approx (-) 7.5 VDC | Not yet known. Proceed to next action. | Accel module faulty. |
| 10. Check reference voltage output of accel/jog module – test point 10. | Approx (-) 7.5 VDC | Not yet known. Proceed to next action. | Accel/jog module faulty. |
| 11. Check reference voltage output of accel/thread module – test point 11. | Approx (-) 7.5 VDC | Not yet known. Proceed to next action. | Accel/thread module faulty. |
| 12. Check master dc reference voltage input to follower module – test point 12. | Greater than zero, less than (-) 20 VDC | Follower module faulty. | Master dc reference supply faulty. |
| 13. Check master tach-gen input to follower module – test point 13. | Greater than zero, less than 70 VAC for ac tach-gen or 80 VDC for dc tach-gen. | Follower module faulty. | Master tach-gen faulty. |
| 14. Reduce setting of IR COMP adjustment. | Drive stability should be improved. | IR COMP adjustment not properly set. | Pulsating load. |
| 15. Increase setting of ANTI-HUNT adjustment. | Drive stability should be improved. | ANTI-HUNT adjustment not properly set. | Pulsating load. |
| 16. Check transducer current input to follower module – test point 15. | Greater than zero, less than 50 ma. | Follower module faulty. | Transducer or transducer amplifier faulty. |
| 17. Check drive speed. | Drive speed should be at rated nameplate rpm. | SUB-CYCLE CURRENT LIMIT (1 RH) adjustment not properly set. See "Set Up and Adjustment Procedures." | Problem in the power, ref & feedback, and/or speed control circuitry. Turn SPEED control to 50% setting and refer to actions 4, 5, & 7. |
| 18. Note if tachometer used with system is similar to "G.E. AN102". | Drive stability should be improved. | "1CA" was not removed on 46S01314-0020 Ref. & Feedback PCB. | Pulsating Load |

## TABLE 6-2
## ABBREVIATED TROUBLESHOOTING TABLE
### (For use on drives equipped with the test meter modification)

| PROBLEM | SOLUTION |
|---|---|
| Drive does not start when RUN pushbutton is pressed. | Turn SPEED control to approx. 50% setting and perform actions 1 thru 4. |
| Drive runs at high speed only. | (Drives with armature feedback) Turn SPEED control to approx. 50% setting and perform actions 1, 2 & 3.<br>(Drives with tach-gen feedback) Turn SPEED control to approx. 50% setting and perform actions 1, 2, 5 & 6. |
| Drive runs at low speed only. | Turn SPEED control to 100% setting and perform action 4. |
| Drive operation is unstable. | (Drives with armature feedback) Reduce setting of IR COMP adjustment.<br>(Drives with tach-gen feedback) Increase setting of ANTI-HUNT adjustment. (See Note Below) |

| ACTION | NORMAL CONDITION | PROBABLE CAUSE | |
|---|---|---|---|
| | | NORMAL CONDITION | ABNORMAL CONDITION |
| 1. Check reference supply voltage (REF position) | Approx. 15 VDC | Not yet known. Proceed to next action. | Several possible causes. Follow instructions given in table 6-1 to isolate problem. |
| 2. Check reference voltage input (REF POT position) | Approx. 7.5 VDC | Not yet known. Proceed to next action. | SPEED or MIN SPEED controls faulty. |
| 3. Check power amplifier output voltage (ARM VOLTS position) | Approx. 90 VDC | Not yet known. Proceed to next action. | Power amp. module or ref. & feedback module faulty. |
| 4. Check armature current (ARM CUR position) | 2 VDC = full load current. Must be some reading. | Mechanical lockup in machine. | Open armature circuit. |
| 5. Check tach-gen output voltage (TACH VOLT position) | Voltage output should represent speed. See tach-gen nameplate. | Not yet known. Proceed to next action | Tach-gen faulty. |
| 6. Check power amplifier output voltage (ARM VOLTS position) | Approx. 90 VDC | Bridge rectifier (1RT) faulty. | Power amp. module or ref. & feedback module faulty. |
| 7. Check drive speed. | Should be at rated nameplate speed. | SUB-CYCLE CURRENT LIMIT (1 RH) adjustment not properly set. See "Set Up and Adjustment Procedure." | Power, ref & feedback, and/or speed control circuitry faulty. Turn SPEED control to 50% setting and perform actions 1, 2, & 3. |

NOTE: Drive instability may result if "1CA" is not disconnected on the Ref. & Feedback PCB (46S01314-0020), when drive is connected to a tachometer similar to "G.E. AN102".

# SECTION 7
# PARTS LIST

## TABLE 7-1
### POWER UNIT PARTS USAGE KEY

| Power Unit Model No. | Reference & Armature Feedback Module Part No. 46S1314–0010 1PC | Reference & Tach Feedback Module Part No. 46S1314–0020 1PC | Power Amplifier 15 Amp. Part No. 46S1315–0010 1PA | Power Amplifier 25 Amp. Part No. 46S1315–0020 1PA | Fuse .5 Amp., 250V Part No. 5P17–0137 1F | Fuse 15 Amp., 250V Part No. 5P17–0103 2F | Fuse 20 Amp., 250V Part No. 5P17–0134 2F | Fuse 25 Amp., 250V Part No. 5P17–0116 2F | Fuse 30 Amp., 250V Part No. 5P17–0107 2F | Fuse 50 Amp., 600V Part No. 5P17–0115 2F | Loop Contactor Part No. 5P32–0017 1M | Anti-Plugging Relay Part No. 5P48–0066 1AP | AC Relay Part No. 5P36-0287 1MFCR 1MRCR | Loop Contactor Part No. 5P32-0017 1MF 1MR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73201L | 1 | | 1 | | 1 | 1 | | | | | 1 | | | |
| 73202J | 1 | | 1 | | 1 | | 1 | | | | 1 | | | |
| 73203R | 1 | | 1 | | 1 | | | 1 | | | 1 | | | |
| 73204P | 1 | | 1 | | 1 | | | | 1 | | 1 | | | |
| 73205N | 1 | | | 1 | 1 | | | | | 1 | 1 | | | |
| 73206L | | 1 | 1 | | 1 | 1 | | | | | 1 | | | |
| 73207J | | 1 | 1 | | 1 | | 1 | | | | 1 | | | |
| 73208R | | 1 | 1 | | 1 | | | 1 | | | 1 | | | |
| 73209P | | 1 | 1 | | 1 | | | | 1 | | 1 | | | |
| 73210K | | 1 | | 1 | 1 | | | | | 1 | 1 | | | |
| 73231M | 1 | | 1 | | 1 | 1 | | | | | | 1 | 2 | 2 |
| 73232K | 1 | | 1 | | 1 | | 1 | | | | | 1 | 2 | 2 |
| 73233S | 1 | | 1 | | 1 | | | 1 | | | | 1 | 2 | 2 |
| 73234Q | 1 | | 1 | | 1 | | | | 1 | | | 1 | 2 | 2 |
| 73235F | 1 | | | 1 | 1 | | | | | 1 | | 1 | 2 | 2 |
| 73236M | | 1 | 1 | | 1 | 1 | | | | | | 1 | 2 | 2 |
| 73237K | | 1 | 1 | | 1 | | 1 | | | | | 1 | 2 | 2 |
| 73238S | | 1 | 1 | | 1 | | | 1 | | | | 1 | 2 | 2 |
| 73239Q | | 1 | 1 | | 1 | | | | 1 | | | 1 | 2 | 2 |
| 73240L | | 1 | | 1 | 1 | | | | | 1 | | 1 | 2 | 2 |

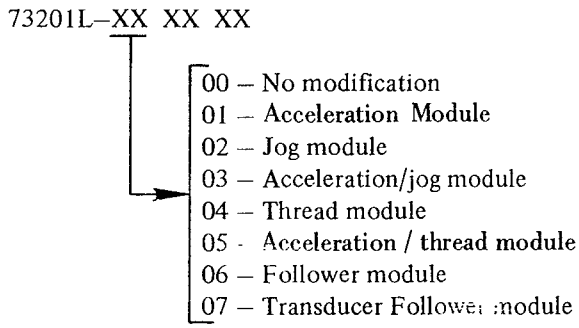
## TABLE 7-2

### RECOMMENDED SPARE PARTS FOR POWER UNIT

| PART DESCRIPTION | SYMBOL | LOUIS ALLIS PART NO. | RECOMMENDED STOCKED QUANTITY BASED ON THE NUMBER OF IDENTICAL POWER UNITS | | | |
|---|---|---|---|---|---|---|
| | | | 1–4 | 5–9 | 10–25 | 26 & UP |
| Printed Circuit Modules: | | | | | | |
| Reference and Armature Feedback | 1PC | 46S1314–0010 | 1 | 1 | 2 | 3 |
| Reference and Tach Feedback | 1PC | 46S1314–0020 | 1 | 1 | 2 | 3 |
| Power Amplifier – 15 Amp. | 1PA | 46S1315–0010 | 1 | 1 | 2 | 3 |
| Power Amplifier – 25 Amp. | 1PA | 46S1315–0020 | 1 | 1 | 2 | 3 |
| *Acceleration/Jog | | 46S1293–0010 | 1 | 1 | 2 | 3 |
| *Acceleration | | 46S1293–0020 | 1 | 1 | 2 | 3 |
| *Jog | | 46S1293–0030 | 1 | 1 | 2 | 3 |
| *Thread | | 46S1293–0050 | 1 | 1 | 2 | 3 |
| *Acceleration/Thread | | 46S1293–0060 | 1 | 1 | 2 | 3 |
| *Follower | | 46S1294–0010 | 1 | 1 | 2 | 3 |
| *Transducer Follower | | 46S1410–0010 | 1 | 1 | 2 | 3 |
| AC Relay | 2 CR | 5P36-0262 | 1 | 1 | 2 | 3 |
| Loop Contactor | 1M or 1MF, 1MR | 5P32–0017 | 0 | 1 | 2 | 2 |
| Anti Plug Relay | | 5P48–0066 | 0 | 1 | 2 | 2 |
| Fuse 0.5 Amp, 250 V | 1F | 5P17–0137 | 10 | 15 | 20 | 20 |
| Fuse 15 Amp, 250 V | 2F | 5P17–0103 | 10 | 15 | 20 | 20 |
| Fuse 20 Amp, 250 V | 2F | 5P17–0134 | 10 | 15 | 20 | 20 |
| Fuse 25 Amp, 250 V | 2F | 5P17–0116 | 10 | 15 | 20 | 20 |
| Fuse 30 Amp, 250 V | 2F | 5P17–0107 | 10 | 15 | 20 | 20 |
| Fuse 50 Amp, 600V | 2F | 5P17–0115 | 10 | 15 | 20 | 20 |
| Full Wave Rectifier (Field Supply) | 1RT | 5P50–0058 | 1 | 2 | 3 | 4 |
| Potentiometer, 100 ohm, 2W Min. Speed | 1RH | 5P40–0145 | 1 | 2 | 3 | 4 |
| AC Relay | 1MFCR, 1MRCR | 5P36-0287 | 1 | 1 | 2 | 3 |

### *MODIFICATION MODULE KEY

The power unit identification number consists of 12 digits. The first six comprise the model number. The last six digits describe modifications to the basic model. The 7th and 8th digits indicate whether one of the modification modules listed above is supplied.



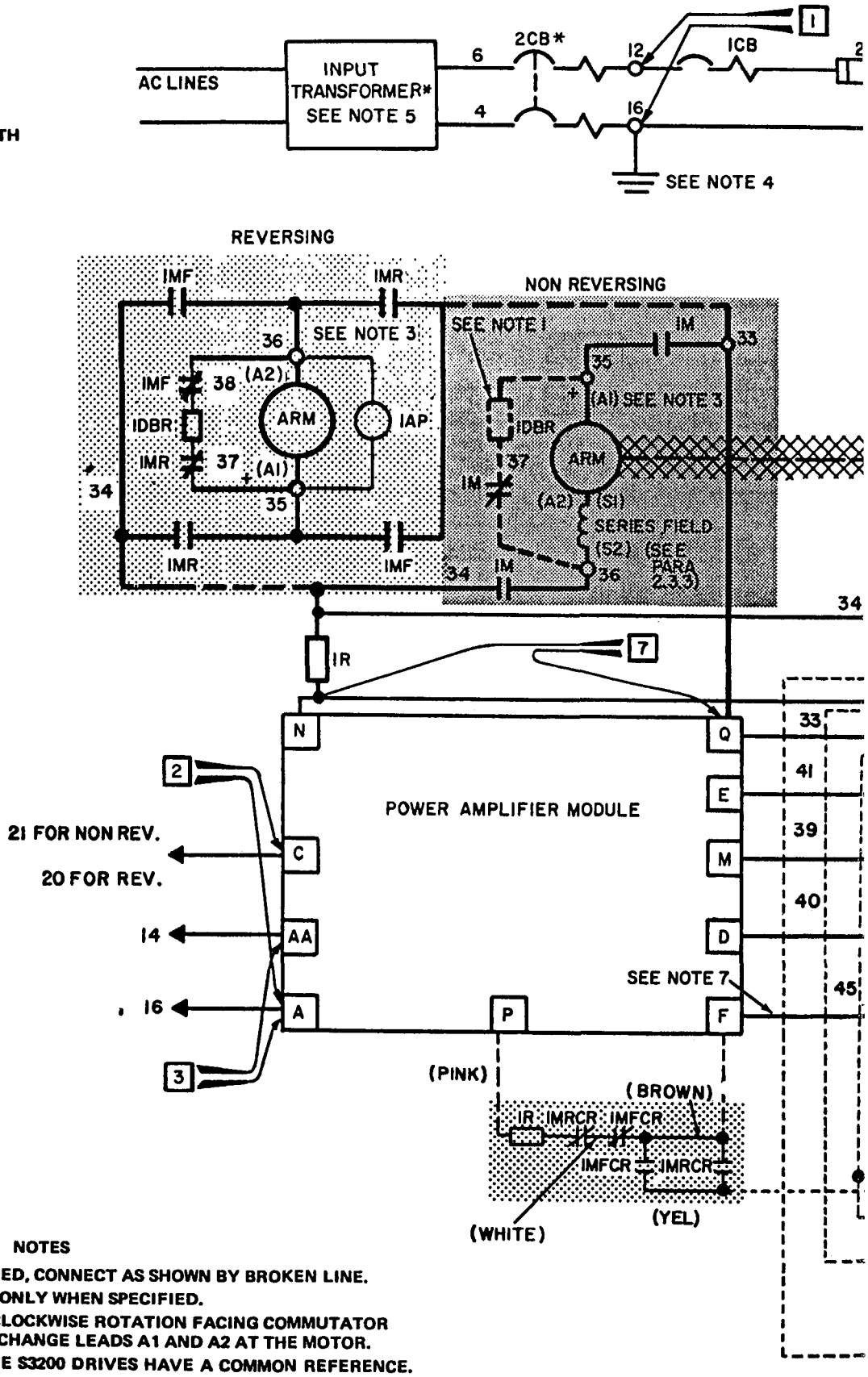

**When ordering replacement part, give part name, part symbol, and serial number of controller being serviced.

NOTE

ALL REVERSING DRIVES ARE SUPPLIED WITH DYNAMIC BRAKING. SEE SHADED KEY.

| MODEL NO. | SHADING KEY (ONLY AREAS INDICATED APPLY TO YOUR DRIVE) |
|---|---|
| 73201L | |
| 73202J | |
| 73203R | |
| 73204P | |
| 73205N | |
| 73206L | + |
| 73207J | + |
| 73208R | + |
| 73209P | + |
| 73210K | + |
| 73231M | |
| 73232K | |
| 73233S | |
| 73234Q | |
| 73235F | |
| 73236M | + |
| 73237K | + |
| 73238S | + |
| 73239Q | + |
| 73240L | + |

SHADING KEY




NOTES

1. WHEN DYNAMIC BRAKING IS SPECIFIED, CONNECT AS SHOWN BY BROKEN LINE.
2. * INDICATES COMPONENT SUPPLIED ONLY WHEN SPECIFIED.
3. D.C. MOTOR SHOWN FOR COUNTER-CLOCKWISE ROTATION FACING COMMUTATOR END. TO REVERSE ROTATION INTERCHANGE LEADS A1 AND A2 AT THE MOTOR.
4. TO BE GROUNDED UNLESS MULTIPLE S3200 DRIVES HAVE A COMMON REFERENCE.
5. FOR OPERATION ON AC LINE VOLTAGE OTHER THAN 230 VAC, AN INPUT TRANSFORMER IS REQUIRED.
6. IR COMP ADJUSTMENT SUPPLIED ON DRIVES USING ARMATURE FEEDBACK. ANTI-HUNT ADJUSTMENT SUPPLIED ON DRIVES USING TACH-GEN FEEDBACK.
7. REMOVE JUMPER FROM TERMINAL F OF POWER AMPLIFIER TO TERMINAL F OF REFERENCE AND FEEDBACK PCB FOR REVERSING APPLICATIONS.

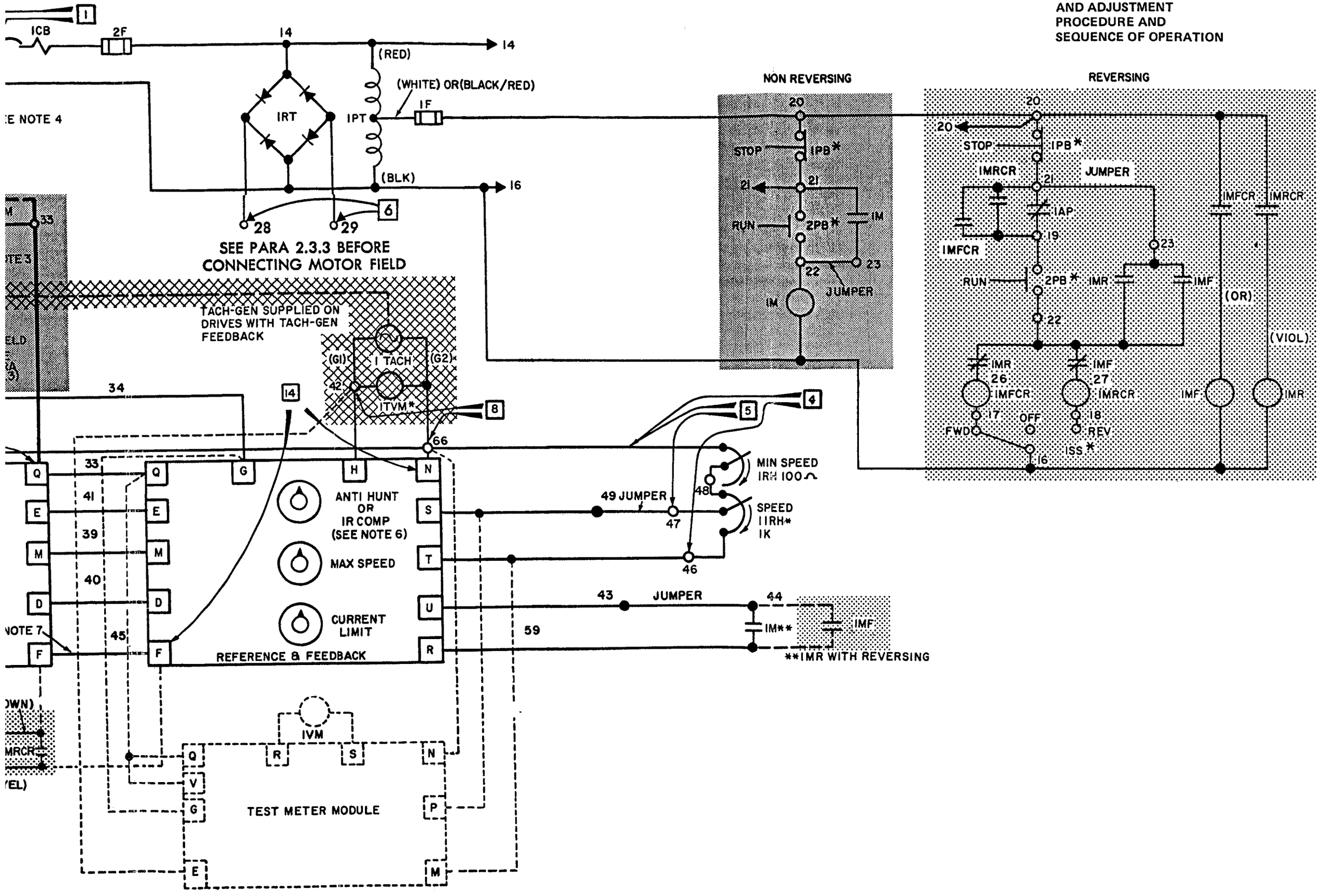
DESIGNATES TEST

TEST POINT NUMBE
INDICATING WHERE

# BASIC SABER 3200 DRIVE

## NON REVERSING DRIVES – MODELS 73201L THROUGH 73210K
## REVERSING DRIVES – MODELS 73231M THROUGH 73240L

SEE REVERSE SIDE FOR INTERCONNECT DIAGRAM AND SET-UP AND ADJUSTMENT PROCEDURE AND SEQUENCE OF OPERATION




DESIGNATES TEST POINT.

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

## SET UP AND ADJUSTMENT

1) Set controls, adjustments, and switches to initial positions.
MIN SPEED – Zero setting.
SPEED – Zero setting.
MAX SPEED – 25% setting.
CURRENT LIMIT – Factory set and does not normally need to be adjusted. Factory set to limit maximum armature current to 150% of rated current. With drive in operation, check current limit output (Test Point 14) at 100% full load amps to 150% full load amps - approx. 0.6 - 0.9 vdc.
SUB-CYCLE CURRENT LIMIT (1RH) - Located on power amplifier module. This adjustment is factory checked for proper operation, however, it MUST be checked and possibly reset at time of drive startup.
Customer load conditions and dc motor characteristics, and/or replacement of the power amplifier module may require that 1RH be adjusted at time of drive startup. If 1RH is set too low, the drive will rotate slowly or be at a stand-still, and will not accelerate to max speed when SPEED control is turned to 100% setting. Setting 1RH too high will result in excessive armature current. The following steps describe the correct adjustment of 1RH, SUB-CYCLE CURRENT LIMIT potentiometer.

   a) Connect dc voltmeter to measure armature voltage at terminals 35 (+) and 36 (–).

   b) Adjust MAX SPEED, MIN SPEED, and CURRENT LIMIT as discussed herein.

   c) Turn SUB CYCLE CURRENT LIMIT potentiometer 1RH fully counterclockwise.

   d) Energize drive and press the RUN pushbutton.

   e) Turn SPEED control to 100% setting. The motor will rotate slowly, or be at a stand-still. The dc voltmeter will indicate less than 50 vdc.

   f) Slowly rotate SUB CYCLE CURRENT LIMIT potentiometer 1RH clockwise. The armature voltage and motor speed will increase slowly, and then very rapidly.

   g) To check adjustment under load, load motor to normal load that is not greater than 100% at slowest possible speed. Rotate SPEED control to 100% setting. If drive accelerates smoothly to max speed, no further adjustment is needed on 1RH. If drive does not accelerate, but keeps rotating, slowly turn 1RH clockwise until drive begins to accelerate to max speed.

IR COMP – 50% setting (furnished on drives using armature voltage feedback).
ANTI-HUNT – 100% setting (furnished on drives using tachometer-generator feedback).
FWD–OFF–REV SWITCH – Set for desired direction of rotation (furnished on reversible drives).

2) Close main circuit breaker.
3) Press RUN pushbutton.
4) Rotate SPEED control to 100% setting.
5) Adjust MAX SPEED adjustment setting until armature voltage (test point 7) is 180 vdc. With this set up maximum speed equals base speed.
6) Rotate SPEED control to zero.
7) Increase MIN SPEED adjustment setting until drive begins to rotate and then decrease setting until drive stops. If it is desirable to have the drive rotate at some minimum speed with the SPEED control set at zero, then increase setting of MIN SPEED adjustment until drive is rotating at desired speed.
8) Increase SPEED control setting until drive is rotating at desired run speed.
9a) Set IR COMP adjustment (furnished on drives using armature feedback) for desired drive regulation and stability. Increase setting to improve drive regulation. If drive instability or hunting occurs, reduce setting of this adjustment.
9b) Decrease ANTI–HUNT adjustment (furnished on drives using tachometer-generator feedback) setting until drive instability or hunting occurs; then increase adjustment setting until hunting stops.
10) Press STOP pushbutton. Set up is completed.

---

**WHEN A REPLACEMENT REFERENCE AND FEEDBACK PCB IS INSTALLED, THE FOLLOWING PROCEDURE MUST BE FOLLOWED TO PROPERLY SET CURRENT LIMIT:**

1) Remove ac input power from Saber 3200 controller.
2) Turn SPEED control to zero.
3) Turn MIN SPEED adjustment to zero; adjustment is located on subpanel door.
4) Turn CURRENT LIMIT adjustment to zero; adjustment is located on subpanel door.
5) Turn potentiometer 5RH on reference and feedback board PCB fully clockwise.
6) Disconnect one motor field lead.
7) Connect a voltmeter (0-10V) between terminals G and N on the reference and feedback PCB, or if controller is equipped with testmeter option, turn selector knob to the armature current position and proceed to step 8.
8) Apply power to the controller and press RUN pushbutton.

**CAUTION**
**PROCEED CAREFULLY**

**The following two adjustments must be made with extreme caution to prevent damage to the controller and motor armature.**

a) Slowly turn MIN SPEED adjustment fully clockwise while watching voltmeter. Voltage should not exceed 5 volts. If it does, reference and feedback PCB is not operating correctly.

b) While watching voltmeter, slowly turn 5RH on the reference and feedback PCB until approximately 3 volts is read on the voltmeter or testmeter. The control is now set for 150% current limit.

**CAUTION**

**Do not allow 150% overcurrent to flow longer than 30 seconds. If more time is required, allow five to ten minutes for the motor to cool, and repeat step 8.**

9) Remove ac input power from the controller and reconnect motor field lead.

## SEQUENCE OF OPERATION

### MAIN CIRCUIT BREAKER CLOSED

230 volts ac is applied to autotransformer (1PT), bridge rectifier (1RT), and power amplifier module. 115 volt ac output of autotransformer (1PT) is applied to relay circuitry and power amplifier module.

### RUN PUSHBUTTON PRESSED

Run relay (1M) (relay 1MF CR or 1MF CR for reversing drives) energizes: armature loop circuit is completed; reference circuit is completed by closing relay contacts between terminals U and R on reference and feedback module. Reference voltage is applied to SPEED control.

Reference current resulting from SPEED control setting turns on power amplifier module. The dc voltage output of the power amplifier module is applied to motor armature. Motor accelerates to run speed.

### SPEED CONTROL SETTING CHANGED

Amount of reference current changes and drive speed changes accordingly.

### STOP PUSHBUTTON PRESSED

Run relay (1M) (relay 1MF CR or 1MR CR for reversing drives) de-energizes: armature loop circuit is opened; reference circuit is opened.

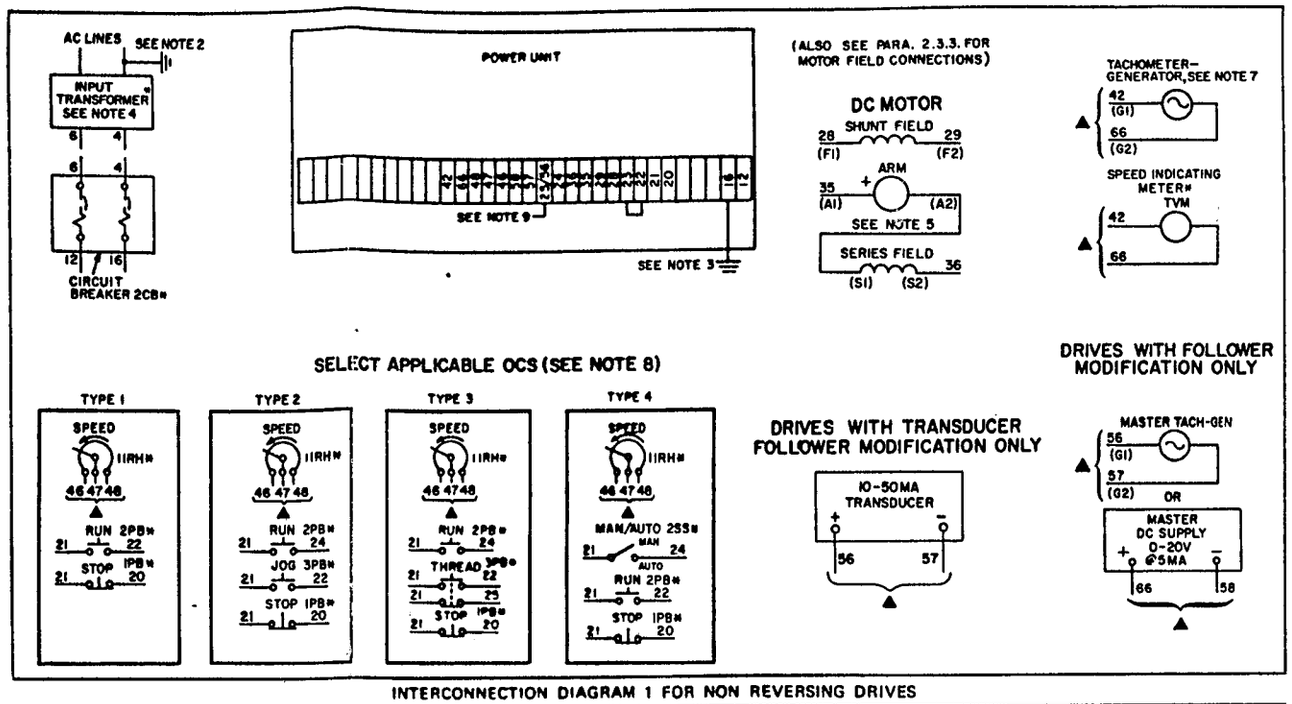
Motor coasts to a stop. (If dynamic braking is included the drive will be brought to a stop quickly.)

### MAIN CIRCUIT BREAKER OPENED

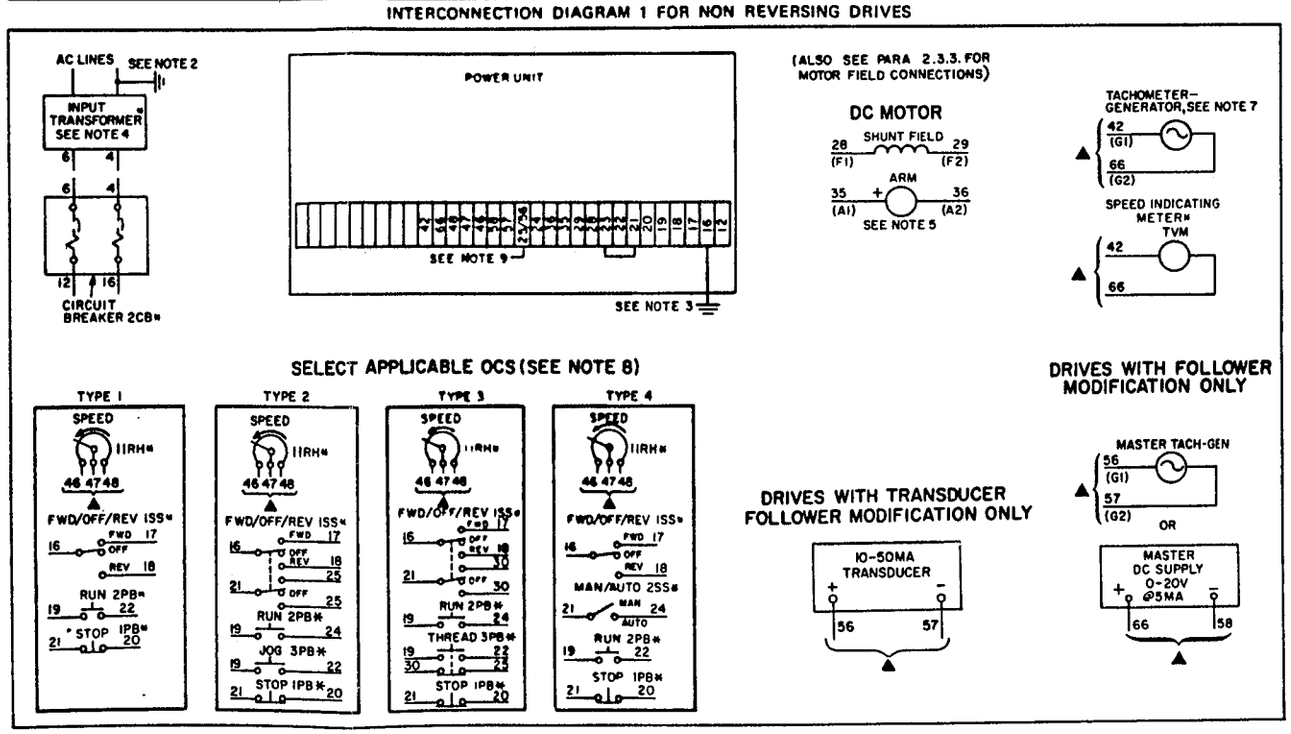
All power removed from the drive.



## INTERCONNECTION DIAGRAM




INTERCONNECTION DIAGRAM 1 FOR NON REVERSING DRIVES




INTERCONNECTION DIAGRAM 2 FOR REVERSING DRIVES

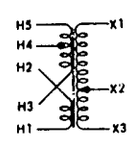
### NOTES
APPLICABLE TO BOTH FIGURES

1. *INDICATES COMPONENT SUPPLIED ONLY WHEN SPECIFIED.
2. IF CUSTOMER SYSTEM IS GROUNDED IT MUST BE AT THIS POINT.
3. CAN BE GROUNDED ONLY IF CUSTOMER SYSTEM IS NOT.
4. TRANSFORMER FURNISHED FOR 208V, 460V AND 575V APPLICATIONS WHEN SPECIFIED. SEE CONNECTION DIAGRAMS AT RIGHT.
5. DC MOTOR SHOWN CONNECTED FOR COUNTERCLOCKWISE ROTATION FACING COMMUTATOR END. TO REVERSE ROTATION INTERCHANGE LEADS A1 AND A2 AT THE MOTOR.
6. A WIRES INTERCONNECTING THESE TERMINALS MAY BE RUN IN A COMMON CONDUIT. THIS CONDUIT MUST NOT CONTAIN POWER, AC CONTROL OR FIELD CONDUCTORS.
7. TACHOMETER-GENERATOR FURNISHED ON DRIVE MODELS WITH 1% SPEED CONTROL ACCURACY AND ON DRIVE MODELS WITH 2% SPEED CONTROL ACCURACY WITH SPEED INDICATION.
8. OCS TYPE DETERMINED BY DRIVE MODIFICATION (REFER TO PARAGRAPH 2.3.3). CONNECTIONS DIAGRAMS APPLY ONLY TO OCS'S SUPPLIED BY THE LOUIS ALLIS COMPANY.
9. THIS TERMINAL IS NUMBERED 56 ON DRIVES WITH FOLLOWER MODIFICATION.

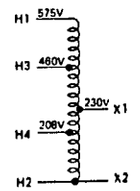
### INPUT TRANSFORMER CONNECTIONS

ISOLATION TYPE

| INPUT VOLTS | CONN. TOGETHER | CONN. LINE TO | 230V OUTPUT |
|---|---|---|---|
| 208 | H1-H3 H2-H4 | H1-H4 | X1 X3 |
| 230 | H1-H3 H2-H4 | H1-H4 | X1 X2 |
| 460 | H2 H3 | H1-H4 | X1 X2 |
| 575 | H2 H3 | H1 H5 | X1 X2 |




AUTOTRANSFORMER TYPE



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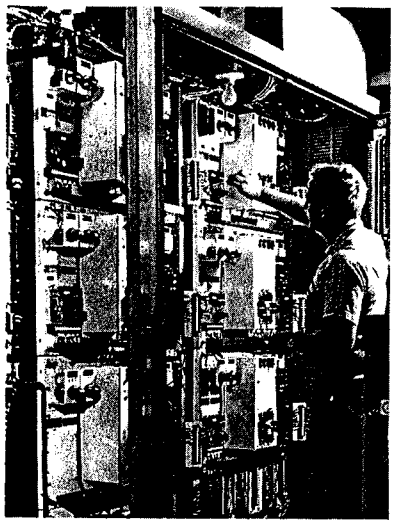
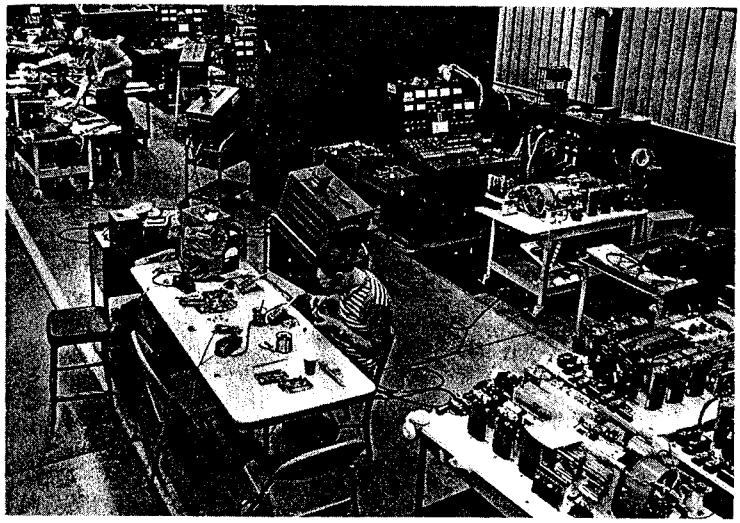
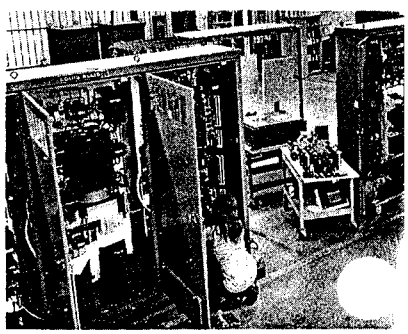
TESTING



ASSEMBLY



COMPONENTS



DESIGN ENGINEERING

MANUFACTURING

MagneTek Drives & Systems