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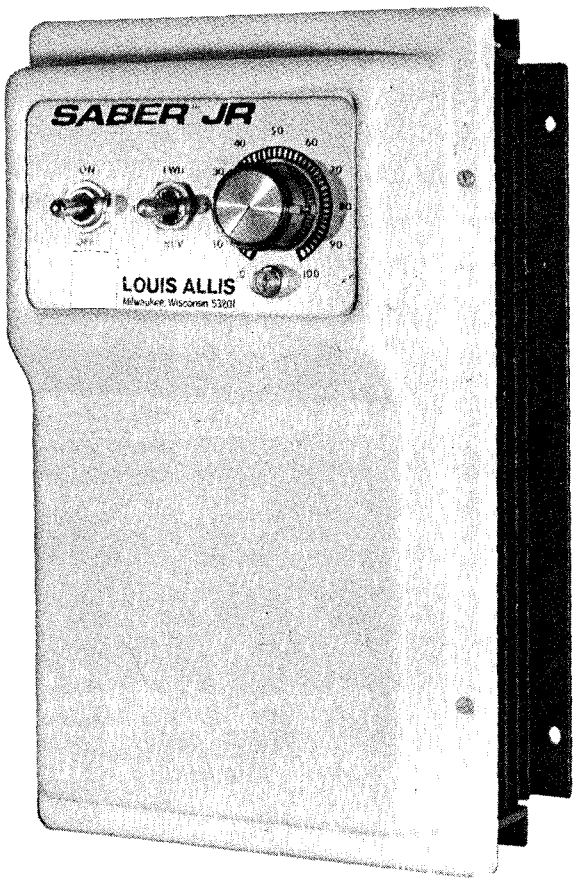
INSTRUCTION MANUAL

Louis Allis

SABER™ JR

NON-REVERSING MODEL



REVERSING MODEL

DC Adjustable Speed SCR Control

LouisAllis®
A Division of MagneTek, Inc

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 distributor.

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 your Louis Allis distributor If it is necessary to contact your nearest Louis Allis District Office always refer to your 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

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

CAUTION

NEVER CONNECT CAPACITORS ACROSS THE INVERTER OUTPUT AND MOTOR. UPON APPLICATION OF POWER, THE INVERTER INITIALLY SEES THE CAPACITORS AS A SHORT CIRCUIT, HIGH CURRENTS RESULT AND EQUIPMENT WILL BE DAMAGED.

IF REQUIRED, POWER FACTOR CORRECTION CAPACITOR NETWORKS MAY BE CONNECTED ACROSS THE INPUT POWER SOURCE ONLY AFTER CONSULTING LOUIS ALLIS.

IMPROPER USE OF POWER FACTOR CORRECTION CAPACITOR NETWORKS WILL DAMAGE EQUIPMENT.

NOTICE

This equipment is exempted from FCC regulations.

See 47CFR15.801.

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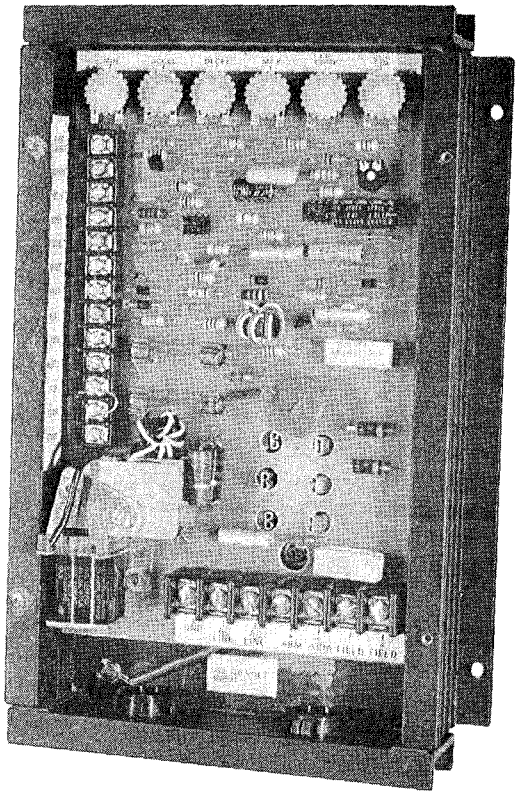


Figure 1.1. SABER™ JR Non-Reversing Model

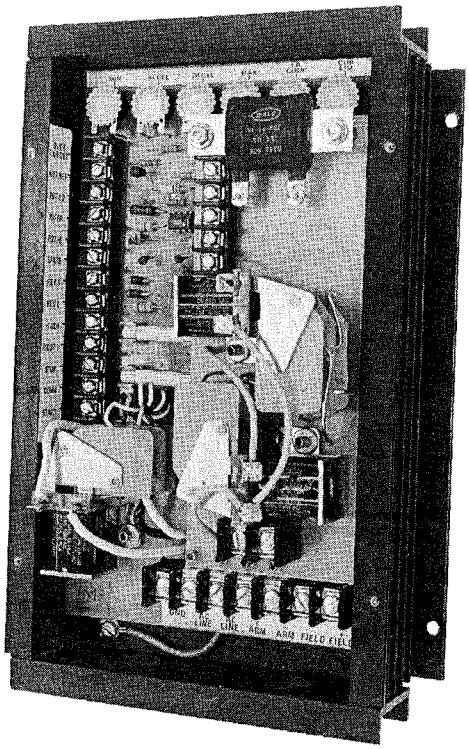


Figure 1.2. SABER™ JR Reversing Model

SECTION 1
INTRODUCTION

1.1 GENERAL INFORMATION

The SABER™ JR drive is available in the 1/4 through 2 horsepower ratings operating on single phase AC power. Incoming AC power is converted to adjustable DC power by solid state components and supplied to the DC motor for controlling the operating speed over a wide range Complete control of the desired drive motor operation is placed in the hands of the machine operator

THE SABER™ JR DRIVE IS COMPOSED OF TWO UNITS:

1 CONTROLLER

The controller is the heart of the SABER™ JR drive This power conversion unit, by use of solid state circuitry, converts AC input power to controlled DC power. All control circuits are contained in a totally enclosed non-ventilated, convection cooled wall-mounted enclosure The operator's controls are built into the controller cover

2. MOTOR

DC motors are permanent magnet types, built in accordance with NEMA standards and are available in totally enclosed non-ventilated or fan cooled enclosures Motors used with the SABER™ JR drive have been designed specifically for use with single phase, full wave rectified, power supplies

1.2 STANDARD DRIVE FEATURES

The following features are included in all SABER™ JR drives:

OPERATION – from 115 volt or 230 volt +10% -5% AC, single phase 50/60 Hz, ± 2 Hz power supply depending on model

SPEED RANGE – infinitely adjustable over a 20:1 speed range

POWER UNIT OVERLOAD CAPACITY – rated 200% load for 60 seconds.

LINE VOLTAGE COMPENSATION – maintains speed within ±2% or less of base speed with +10% -5% AC line voltage variations

FULL WAVE RECTIFICATION – for higher efficiencies, smoother operation and smaller motor frame size

TRANSIENT VOLTAGE PROTECTION – provided by surge protection network.

ADJUSTABLE CURRENT LIMIT – prevents damage to the power unit and the driven machine due to excessive overload conditions

OVERLOAD PROTECTION – provided by adjustable current limit.

SHORT CIRCUIT PROTECTION – standard type AC line fuses disconnects unit from the power line in the event of power unit or motor failure

STANDARD ADJUSTMENTS

Minimum Speed – adjustable from 0 to 40% rated speed

Maximum Speed – adjustable to allow pre-setting of maximum motor speed

Current Limit – adjustable from 75 to 200% of rated motor current

IR (Load) Compensation – adjustable to enable the motor to maintain base speed within ±2% regardless of load changes

Linear Accel/Decel – adjustable from 0 to 10 seconds (no load)

MODULAR CONSTRUCTION – All solid state circuitry mounted on printed circuit assemblies for ease of modification and servicing

PRINTED CIRCUIT BOARDS WITH COLOR CODED LABELS – for ease of identification and replacement

1 3 PERFORMANCE DATA

1 SERVICE CONDITIONS

The SABER™ JR drive is designed to operate under the following conditions

ALTITUDE – Up to 3300 feet above sea level

AMBIENT TEMPERATURE – From 10° to 40°C

LINE VOLTAGE – Either 115 or 230 volts +10% -5%

LINE FREQUENCY – 50/60 Hz, ± 2 Hz

2 SPEED RANGE

Continuous operation at rated torque throughout the controlled speed range of 20:1

3 DISPLACEMENT POWER FACTOR

(At maximum speed and rated load) 70-80%

4. DRIVE SERVICE FACTOR . 1 0

5. CONTROLLER OVERLOAD CAPACITY

200% full load current for 60 seconds

6. SPEED REGULATION

Standard drive with 100% load change . . . ±2% of motor base speed

All other variables – voltage, frequency, temperature and drift . . 15% of motor base speed

7 EFFICIENCY

The conversion efficiency of the SABER™ JR Power unit is approximately 97% at rated load and speed Overall drive efficiency can be estimated by multiplying the conversion efficiency by the motor efficiency. The drive efficiency is approximately 75% for the 1/4 horsepower rating and improves as the horsepower increases to 85% for the 2 horsepower rating.

1.4 AVAILABLE MODELS

CONTROL

HP	BASE SPEED	AC INPUT (VOLTS)	ARMATURE DC OUTPUT (VOLTS)	NON-REVERSING ①	REVERSING w/DB ②
				MODEL NO.	MODEL NO
1/4	1750	115	90	99211K	99212S
1/3	1750	115	90	99213Q	99214F
1/2	1750	115	90	99215M	99216K
3/4	1750	115	90	99217S	99218Q
1	1750	230	180	99219F	99220J
1.5	1750	230	180	99221R	99222P
2	1750	230	180	99223N	99224L

① Non-Reversing Drive Contactor Operated with OCS in Controller Cover
② Reversing Drive with Dynamic Braking Contactor Operated with OCS in Controller Cover

SECTION 2
INSTALLATION AND STARTUP

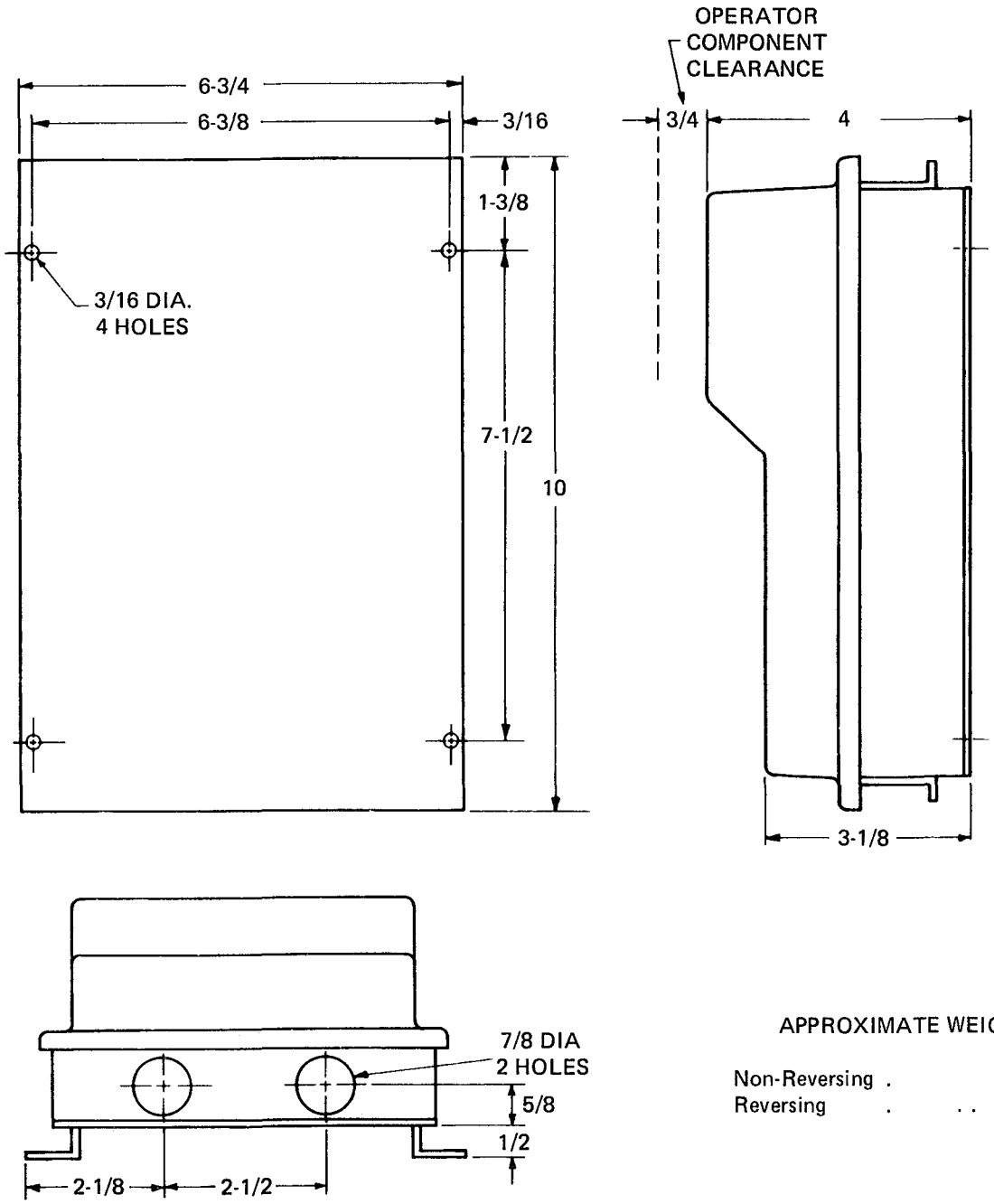
2.1 PHYSICAL INSTALLATION

Mounting dimensions recommended for installation are provided in Figure 2 1.

The SABER™ JR is designed for wall mounting Use the Controller chassis as a template for marking the four mounting hole locations, and mount with standard hardware.

CAUTION

Never mount Controller where the ambient temperature exceeds 45°C



APPROXIMATE WEIGHT

Non-Reversing .	3 0 Lbs.
Reversing . .	3.8 Lbs

Figure 2.1. General Dimensions for SABER™ JR

2 2 CONDUIT ENTRY

Two capped holes are provided for 1/2 inch conduit in the bottom end plate A top end plate without holes is also provided Both end plates are interchangeable, thereby providing option for either top or bottom conduit entry

2.3 ELECTRICAL CONNECTIONS

Two terminal blocks are provided TB1 for control and TB2 is for power external connection An interconnection diagram is provided on the inside of the cover for the controller and also illustrated in this manual, Figure 2 2 for reversing models and Figure 2 3 for non-reversing models

If installation of a remote operators station is desired see Schematic Diagram. Anti-plugging is provided in the form of a three position pause hesitation switch (2SS) and a similar component must be used.

Note

Connections to field power supply terminals F+ and F- are required when using wound field motors, if using a permanent magnet motor, these connections are not required

2.4 ELECTRICAL DATA

THE SABER™ JR Controller is designed for use with standard Louis Allis FLEXITORQ® permanent magnet DC motors, as well as wound field DC motors

Table 2 1 is a voltage breakdown of the 1/4 through 2 horsepower Controllers

2.5 IDENTIFICATION OF EQUIPMENT

A nameplate is provided with each Controller Embossed on each nameplate is the following information:

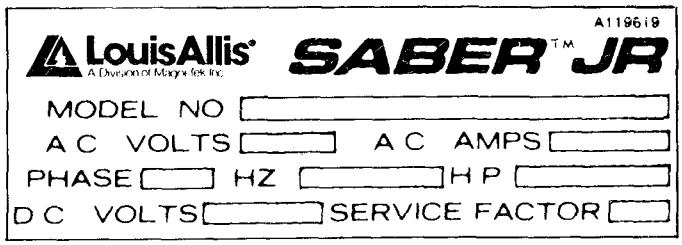


Figure 2.4. Nameplate

All correspondence with Louis Allis should reference the above data

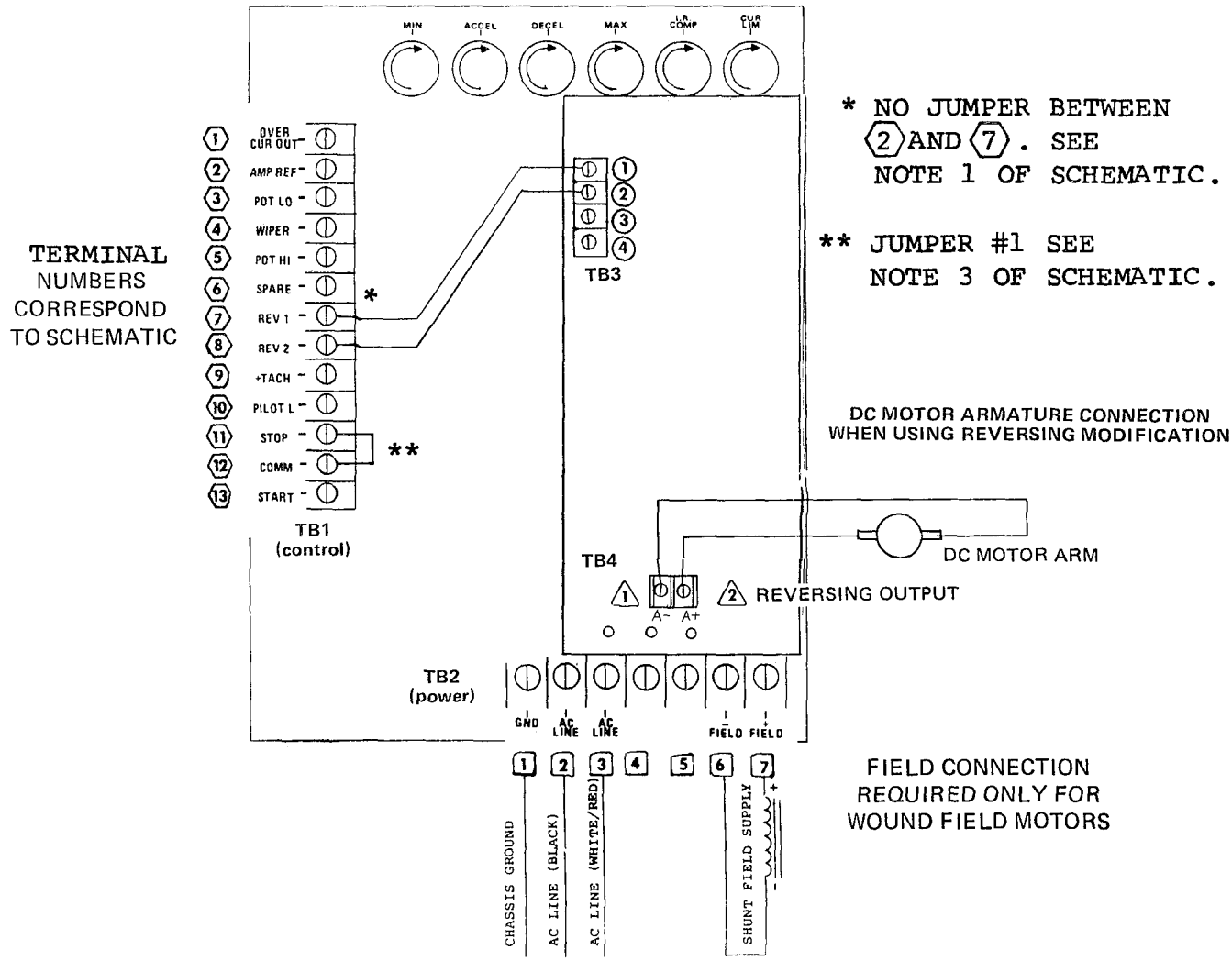


Figure 2.2. Interconnection - Reversing Model

TABLE 2 1
ELECTRICAL DATA OF 1/4 THROUGH 2 HP CONTROLLERS

Drive HP	AC Input, 50/60 Hz			DC Armature		DC Field*	
	Volts (+10% -5%)	Amps at Full Load (RMS)	Phase	Volts	Amps at Full Load	Volts	Amps
1/4	115	3 5	1	90	2.5	100	1
1/3	115	4 4	1	90	3.2	100	1
1/2	115	6 5	1	90	4.7	100	1
3/4	115	9 3	1	90	7.1	100	1
1	230	6.5	1	180	4 7	200	1
1.5	230	9 7	1	180	7.0	200	1
2	230	12 9	1	180	9.2	200	1

* Motor Field Voltage (Required only when wound field DC motor is used)

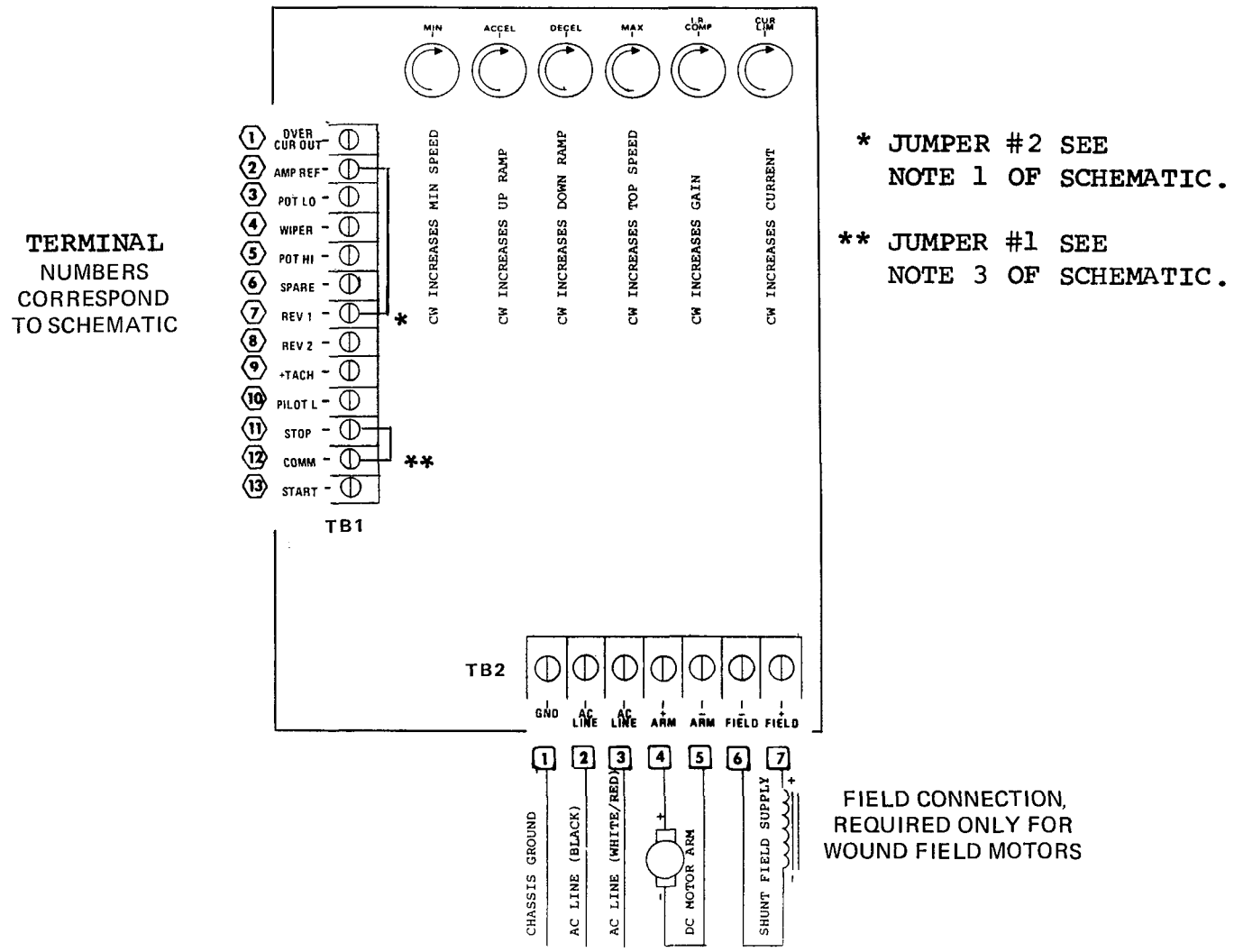


Figure 2.3. Interconnection - Non-Reversing Model

⬡ TERMINALS ON TB1

□ TERMINALS ON TB2

○ TERMINALS ON TB3

△ TERMINALS ON TB4

– – – – APPLIES ONLY TO REVERSING MODEL

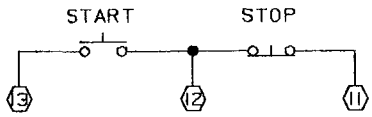
———— APPLIES ONLY TO NON-REVERSING MODEL

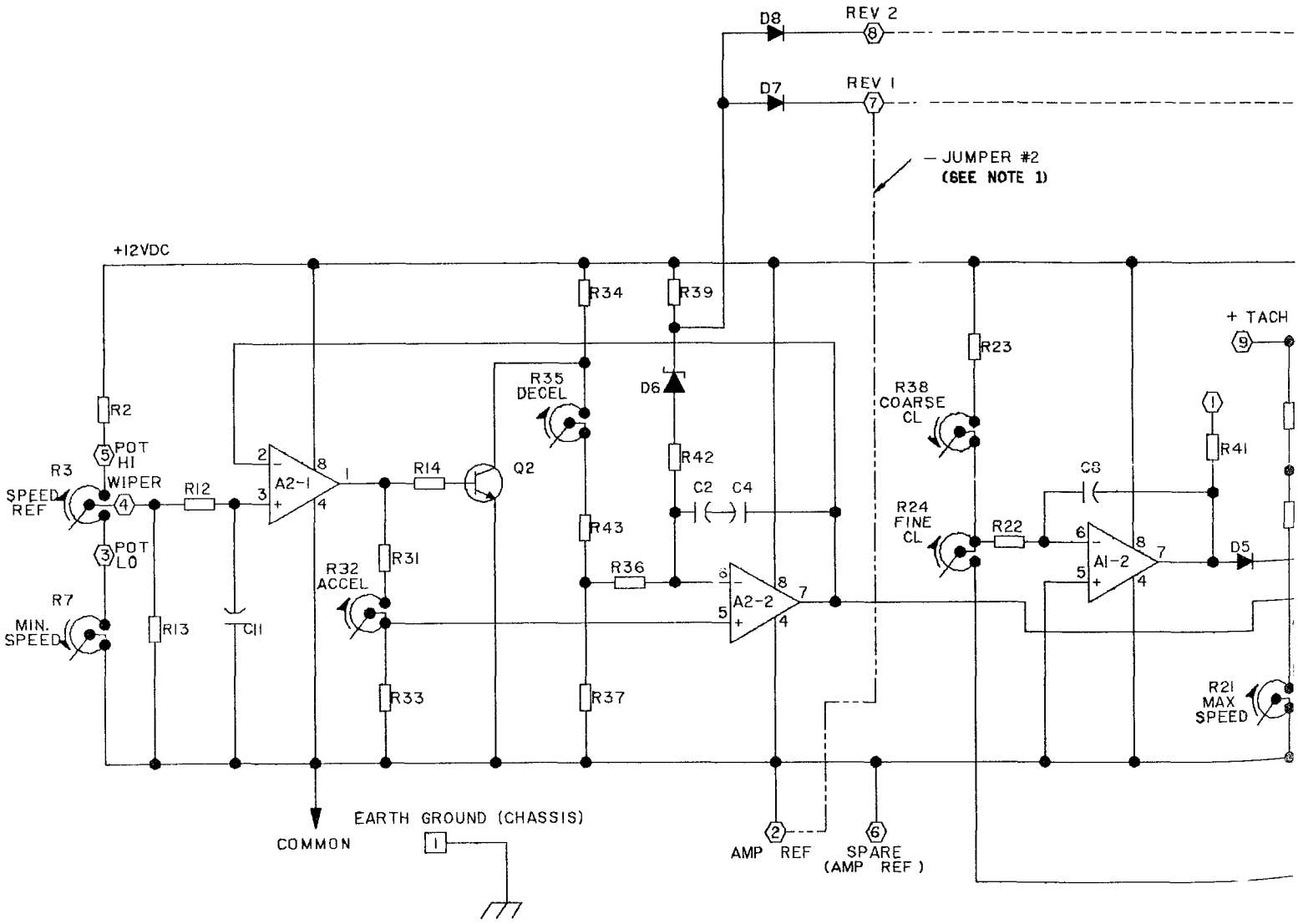
NOTES:

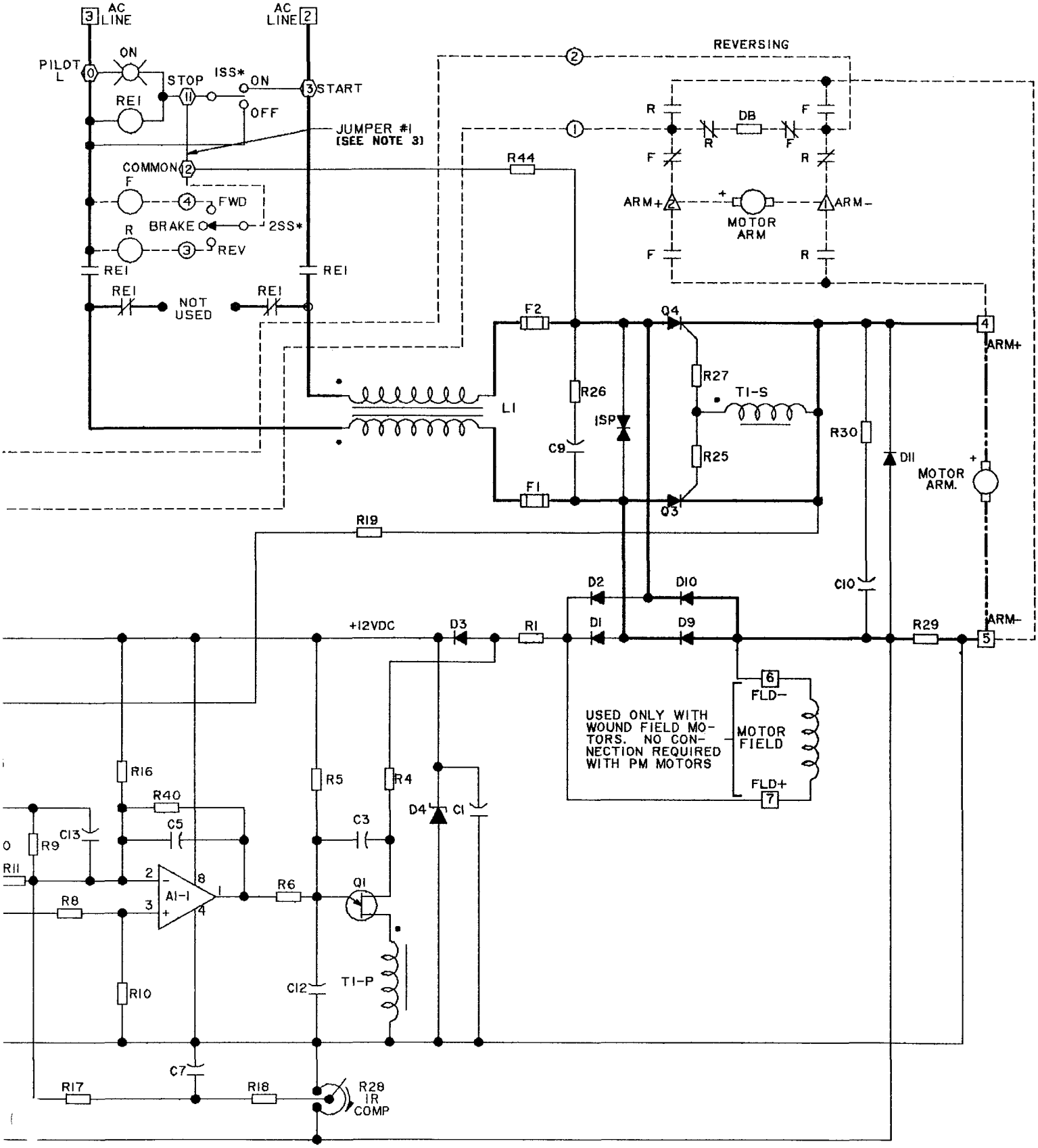
1. JUMPER #2 [BETWEEN ⑵ AND ⑺] IS REQUIRED ONLY ON THE NON-REVERSING MODEL.
   DO NOT ADD JUMPER #2 ON REVERSING MODEL!

2. ISS [MOMENTARY TOGGLE SWITCH RETURNS TO CENTER]
   2SS 3 POSTION TOGGLE SWITCH

3. JUMPER #1[BETWEEN ⑾ AND ⑵] MUST BE REMOVED IF USING REMOTE PUSHBUTTON OPERATOR'S CONTROL STATION SEE BELOW:







Schematic Diagram
SABER™ JR

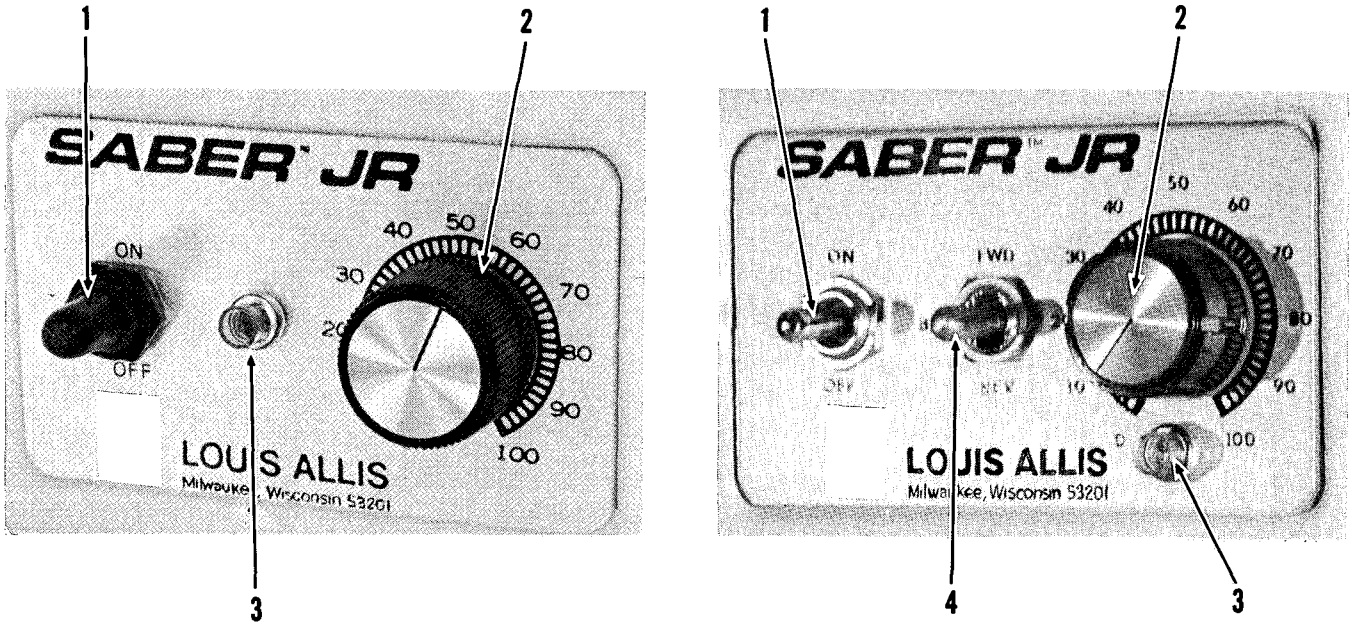
SECTION 3
OPERATOR CONTROLS

3.1 OPERATOR CONTROLS AND INDICATORS

Controls required for operation of the SABER™ JR Controller are provided on the enclosure cover. These controls are illustrated in Figure 3.1 and their function defined in Table 3.1. Note that reference numbers in Figure 3.1 correspond to numbers in Table 3.1.

TABLE 3.1
FUNCTION OF CONTROLS

Ref. No.	Control Name	Function
1	ON/OFF switch	Momentary Switch; Turns Controller ON or OFF.
2	SPEED pot	Controls speed of motor
3	INDICATOR lamp	Lights when Controller is ON
4	FWD-BRK-REV	(Only on reversing models) Controls direction of motor rotation. Will not allow instantaneous reversal of motor rotation.



NON-REVERSING MODEL

REVERSING MODEL

Figure 3.1. Operator Controls

SECTION 4
START/STOP PROCEDURES

4.1 INSPECTION AFTER INSTALLATION

After installation and BEFORE energizing Controller, perform the following checks:

1. Inspect all wiring for accidental grounds, pinched or loose wiring and other defects.

2. Insure that input power supply voltage, frequency, and phase are correct as identified on Controller nameplate and caution labels provided with unit.

3. VERIFY that both the controller and motor nameplate HP ratings ARE THE SAME. If different, controller fuses F1 and F2 will require replacement. Select fuse rating according to the AC FUSE TABLE on page 12. Motor HP rating CANNOT EXCEED rating of controller.

If HP ratings were different, the IR COMP and CURRENT LIMIT (COARSE) adjustments will require readjusting. Preset both adjustments according to Table 4.1.

4.2 INITIAL START-UP

Both the external branch disconnect and Controller ON/OFF switch are to be in OFF position before proceeding.

1. Turn Controller SPEED pot to zero (0) setting.

2. Insure Controller ON/OFF switch is in OFF position.

3. Turn on input power at external branch disconnect.

4. Momentarily set Controller ON/OFF switch to ON position.

5. Slowly turn Controller SPEED pot clockwise while observing motor rotation. If motor rotation is

TABLE 4.1

CURRENT LIMIT COARSE ADJUSTMENT PRESETS

115 VAC MODEL			
MOTOR HP	IR COMP (R28)	CURRENT LIMIT (COARSE)* (R38)	APPROX. FLA.
1/4			2.5
1/3			3,2
1/2			4.7
3/4			7.1
230 VAC MODEL			
MOTOR HP	IR COMP (R28)	CURRENT LIMIT (COARSE)* (R38)	APPROX. FLA.
1			4.7
1-1/2			7.0
2			9.2

* In a reversing controller, the Reversing PCB must be temporarily removed to access R38 (See Figure 6.1).

incorrect, turn off power at external disconnect, momentarily set controller ON/OFF switch to OFF and ONLY THEN reverse motor armature connections at Controller terminals A+ and A-. Repeat steps 1 thru 5.

6. Check for satisfactory operation throughout speed range. If satisfactory, no further adjustments are required. Otherwise, refer to ADJUSTMENTS SECTION, paragraph 5.1 and proceed as instructed.

4.3 START/STOP PROCEDURES

To start:

1. Momentarily set Controller ON/OFF switch to ON.

NOTE

The Controller may be started with the SPEED pot set at any position.

2. Adjust SPEED pot to desired motor speed.

To stop:

1. Momentarily set Controller ON/OFF switch to OFF.

SECTION 5
ADJUSTMENTS

5.1 GENERAL

This section describes the six potentiometer adjustments associated with the Controller Printed Circuit Board (PCB). These pots are located at the top of the PCB and are labeled:

1. MIN (minimum speed)
2. ACCEL (acceleration)
3. DECEL (deceleration)
4. MAX (maximum speed)
5. I.R. COMP (load compensation)
6. CUR LIM (current limit)

All adjustments are preset at the factory. A "typical" test motor is utilized. The MAX and CUR LIM adjustments do not depend on individual motor characteristics and therefore should be correct as received. The IR COMP and MIN adjustments, however, are somewhat dependent on the characteristics of the particular motor used and should therefore be readjusted by the user when the drive is installed. Job-site adjustment of IR COMP is necessary to achieve specified regulation. The adjustments are permanent; periodic readjustment is normally not required.

WARNING

1. When power is on, circuit board and components are "HOT" with respect to Controller enclosure. Even when Controller ON/OFF switch is set to OFF, voltage may still be present at one side of ON/OFF switch.

2. When making adjustments, ALWAYS use screwdriver with insulated shaft to avoid short circuiting of board components.

3. Whenever Controller COVER is removed, it MUST be supported to avoid contact between Controller chassis and terminals of operator controls.

A. Momentarily set Controller ON/OFF switch to OFF.

B. Turn SPEED pot to zero setting.

C. Remove four screws that fasten cover, then fold cover away from chassis to expose the adjustable pots located at top portion of control.

D. Momentarily set Controller ON/OFF switch to ON and proceed with adjustments as described in Table 5.1.

TABLE 5.1
ADJUSTMENT PROCEDURES

DESIGNATOR	FUNCTION	ADJUSTMENT
MIN*	Calibrates minimum Motor Speed (in low speed range) when SPEED pot is at zero setting. Clockwise rotation of MIN pot increases minimum motor speed	a) Set SPEED control pot to zero. b) Slowly rotate MIN pot clockwise until motor starts to rotate c) Slowly rotate MIN pot counterclockwise until motor stops Note: If a minimum motor speed greater than zero is desired, rotate MIN pot clockwise until desired minimum motor speed is obtained.
I R COMP*	Calibrates speed regulation (% speed change from no load to full load at rated base speed)	a) Set SPEED control pot at 20% speed b) Rotate I R COMP pot clockwise until motor begins to hunt c) Rotate I R COMP pot counterclockwise until motor hunting stops d) Rotate I R COMP pot 1/3 of the span between setting at which point motor hunting stopped and the fully counterclockwise position
MAX	Calibrates maximum motor speed (in high speed range) when SPEED pot set at 100%. Clockwise rotation of MAX pot increases maximum motor speed	a) Turn drive power off. b) Connect DC voltmeter across armature leads A1 and A2 at the motor. c) Set meter scale for correct motor armature voltage rating (90VDC or 180VDC) d) Turn power on. Set SPEED control pot at 100% (fully clockwise) e) Adjust MAX pot to rated motor armature voltage indicated by DC voltmeter Note: A tachometer or strobe light may be used in lieu of DC voltmeter. Proceed as described above except adjust MAX pot to rated motor base speed indicated by tachometer or strobe light
CUR LIM	Limits DC motor armature current to prevent damage to the motor or control. Current limit is preset at the factory for 150 to 200% of rated motor current Clockwise rotation of the CUR LIM pot increases motor armature current (or torque that motor will deliver).	a) Turn power off b) Connect a DC ammeter (in series) in the motor armature circuit, between motor terminal A1 and the control c) Turn power on. d) Set SPEED control pot at 10% position. e) Apply friction braking to the motor shaft until motor stalls (zero RPM) f) While motor is stalled, set stall current at 150% of rated motor armature nameplate current, by adjusting the CUR LIM pot accordingly.
ACCEL	Calibrates time required to accelerate to set speed.	a) Adjust ACCEL pot for desired acceleration time. Clockwise rotation increases, and counterclockwise rotation decreases acceleration time.
DECEL	Calibrates time required to decelerate from set speed.	a) Adjust DECEL pot for desired deceleration time. Clockwise rotation increases, and counterclockwise rotation decreases deceleration time.

* Dependent on individual motor characteristics

SECTION 6
BILL OF MATERIALS

Capacitors

C1	47MF/16V
C2	2 2MF/50V
C3	.01MF/100V
C4	2 2MF/50V
C5	2MF/50V
C7	330MF/16V
C8	22MF/250V
C9	01MF/1000V
C10	1MF/20V (068MF/400V)
C11	01MF/100V
C12	1MF/200V
C13	.1MF/200V

Diodes

D1	S3A4
D2	S3A4
D3	SI1872
D4	IN941A/12V
D5	SI1872
D6	IN963B/6V
D7	SI1872
D8	SI1872

Resistors

R1	7.5K/5W (15K/7W)
R2	1 5K/1/2W
R3	5K Speed Pot
R4	4 7K/1/2W
R5	39K/1/2W
R6	27K/1/2W
R7	5K/PT15YD
R8	470K/1/2W
R9	22K/1/2W
R10	10K/1/2W
R11	2 2K/1/2W
R12	47K/1/2W
R13	1 2M/1/2W
R14	10K/1/2W
R15	1K/1/2W
R16	220K/1/2W
R17	470/1/2W
R18	470/1/2W
R19	47K/1/2W (91K/2W)
R20	470/1/2W
R21	5K/PT15YD
R22	100K/1/2W
R23	47K/1/2W
R24	1K/PT15YD
R25	10/1/2W
R26	150/1/2W
R27	10/1/2W
R28	100/PT15YD
R29	015/5W
R30	150/1/2W
R31	4 7K/1/2W
R32	250K/PT15YD
R33	1K/1/2W
R34	4 7K/1/2W
R35	250K/PT15YD
R36	180K/1/2W
R37	1K/1/2W
R38	250K/PT10V
R39	4 7K/1/2W
R40	100K/1/2W
R41	4 7K/1/2W
R42	4 7K/1/2W
R43	27K/1/2W
R44	560/2W

NOTE: Parts within parenthesis are used for 230V applications, all others are used for both 115V and 230V applications

Other Components

A1	LM358P IC
A2	LM358P IC
L1	Noise Suppressor
T1	Pulse Transformer
Q1	2N4871 UJT
Q2	2N4124 Transistor
RE1	S87R11A2B1D1 120V/230V Coil Relay

1	7-Position Terminal Strip (TB2)
1	13-Position Terminal Strip (TB1)
1	Main PC Board
1	Extrusion
1	Sponge Lid Gasket
1	Solid End Plate
1	End Plate W/2 Holes
12	#5 Self-Threading Screws
1	Gentron Bridge (1SP, D9, D10, D11, Q3, Q4)
4	919 Terminal Pins
4	Fuse Clips
2	Fuses* - Littel fuse, Bussman or equivalent

*AC FUSE TABLE

HP	115VAC 50/60Hz	230VAC 50/60Hz
1/4	4A	
1/3	5A	
1/2	7A	
3/4	10A	
1		7A
1-1/2		10A
2		15A

1	White Plastic Housing
1	Speed Pot Knob
1	Speed Pot O-Ring, Nut, & Lock Washer
1	125V Pilot Light (250V)
2	End Plate Gasket

(COMPONENTS USED ON REVERSING MODEL ONLY)

Resistors

DB, 5 Ohm, 30 Volts

F	S87R11A2B1D1 120V/230V Coil Relay
R	S87R11A2B1D1 120V/230V Coil Relay
1	4-Position Terminal Strip (TB-3)
1	2-Position Terminal Strip (TB-4)

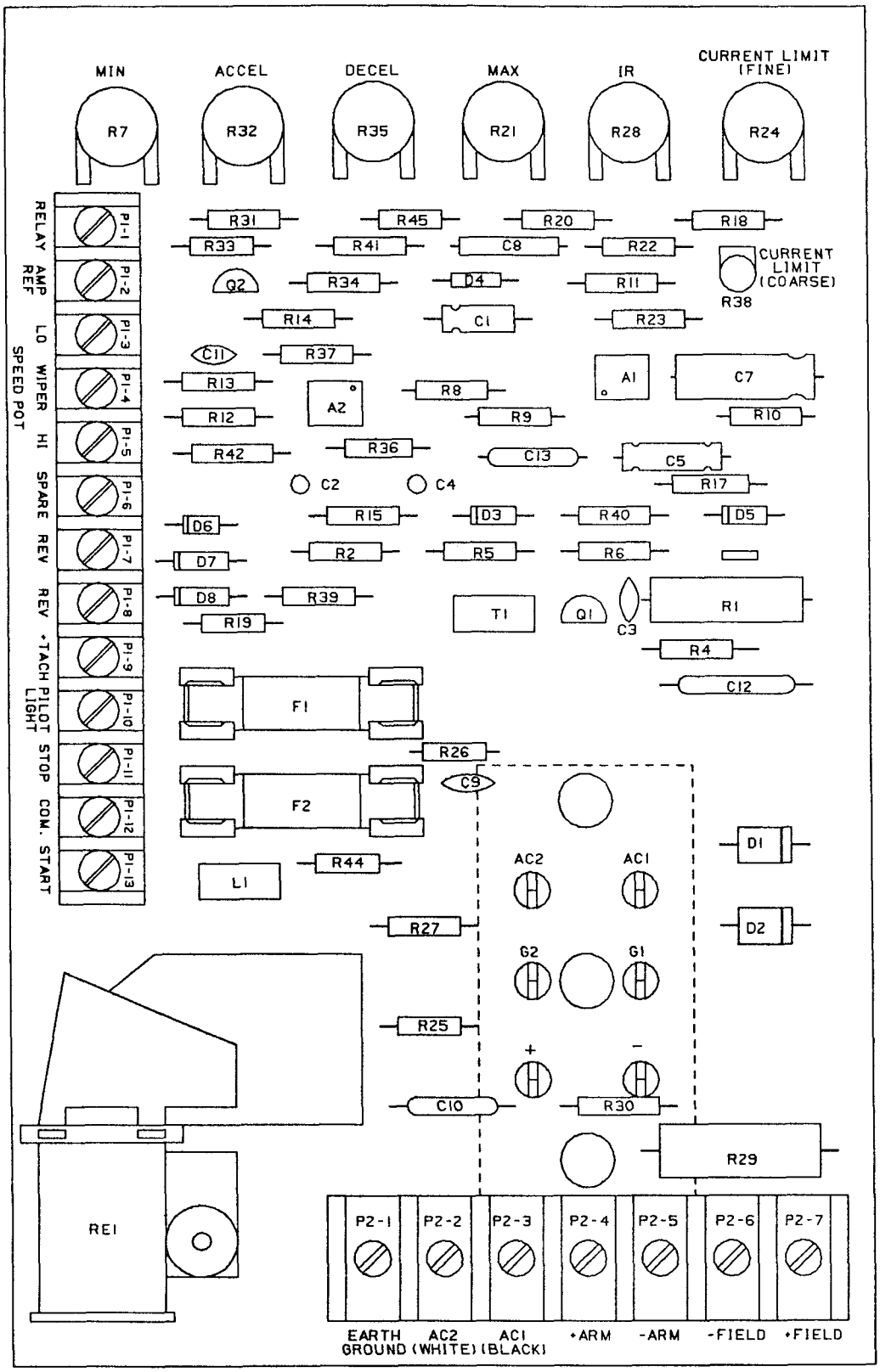


Figure 6.1. Control PCB