owners guide

24 Volt LVC (Low Voltage Control) MAGNETIC MOTOR CONTROL SYSTEMS

INTRODUCTION

The single and three phase Rockwell definite purpose Low Voltage Control (LVC) motor starters have been designed exclusively for use on the Rockwell stationary power tools.

The basic function of a Rockwell definite purpose starter is to provide ON-OFF motor control. In addition to providing ON-OFF control, every Rockwell motor starter offers the following features:

Motor Overload Protection - All starters are supplied with thermal overload relays which protect the power tool motor from burnouts due to excessive heat resulting from a sustained motor overload, extended motor cycling, or stalled rotor.

No Voltage or Low Voltage Protection (LVP) - No voltage or low voltage protection prevents the dangerous restarting of a power tool following a temporary power failure. Upon a loss of voltage or a reduction of voltage, the magnetic contactor in the starter will open. When power is restored, the motor will not automatically restart, but must be manually restarted by pushing the start button of the ON-OFF switch.

Low Voltage Control (LVC) - The Rockwell definite purpose motor starters provide low voltage control as a unique safety feature. The pushbutton ON-OFF switch operates at a 24 volt level, not at line voltage. The 24 volt low voltage control eliminates the possibility of electrical shock to the operator.

This manual includes a description of the basic LVC motor starters, instructions for wiring the starters to the power source, and instructions for changing the voltage of an LVC motor starter.

Rockwell

438-01-655-5021 DATED 3-10-77

TABLE OF CONTENTS

SAFETY RULES

1. Installing and servicing should always be accomplished by qualified electrical personnel.

2. Read the instruction manual before wiring and operating this motor starter. Failure to follow instructions can cause injury.

3. Always disconnect the electrical power before removing the cover of the starter.

4. Operate the motor starter only with the cover of the starter in place.

5. Do not operate the machine unless the motor starter is properly grounded as specified in the instructions.

6. Follow national and local electrical codes when wiring the motor starter.

7. Always use proper heater coils as specified in the heater coil chart located on the inside of the starter cover.

8. Make sure the motor starter is disconnected from the electrical power source before the primary connections of the control transformer are changed.

9. The LVC Motor Starter has been designed and engineered for use only on Rockwell Stationary Power Tools.

10. Occasionally inspect the starter to ensure that it is securely mounted, clean and dry.

INDEX FOR WIRING AND SCHEMATIC DIAGRAMS

SINGLE PHASE LVC MAGNETIC MOTOR STARTER

Fig. 1, illustrates the standard single phase LVC magnetic motor starter, Rockwell Part No. 438-01-316-0072.

The starter is made up of four basic components: 1) overload block, 2) magnetic contactor, 3) transformer, and 4) start/stop station. The start/stop station is not shown in Fig. 1. Neither are the input connections from the start/stop station, input connections for single phase electrical power, or the leads from the power tool motor.

A wiring diagram and schematic diagram of the single phase LVC magnetic motor starter is shown in Fig. 2.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic diagram does not show the physical relationship of the components. The schematic diagram does show in a straight line form the circuit functions of the various components.

The single phase starter is comprised of a power circuit and a control circuit.

The power circuit carries the motor load current and is shown with heavy lines in the wiring and schematic diagrams to represent heavy gage wire sized for the motor current. In the motor starter, the power circuit is wired with black wires.

The main function of the control circuit is to start and stop the electric motor by means of the start/stop pushbuttons. The diagrams in Fig. 2 illustrates the control circuit with light lines to represent light gage wire sized for control current. The control circuit consists of the control transformer with fuse, start/stop push buttons, start button interlock contact, magnetic contactor coil, and overload switch. The control circuit is wired with red wires in the motor starter.

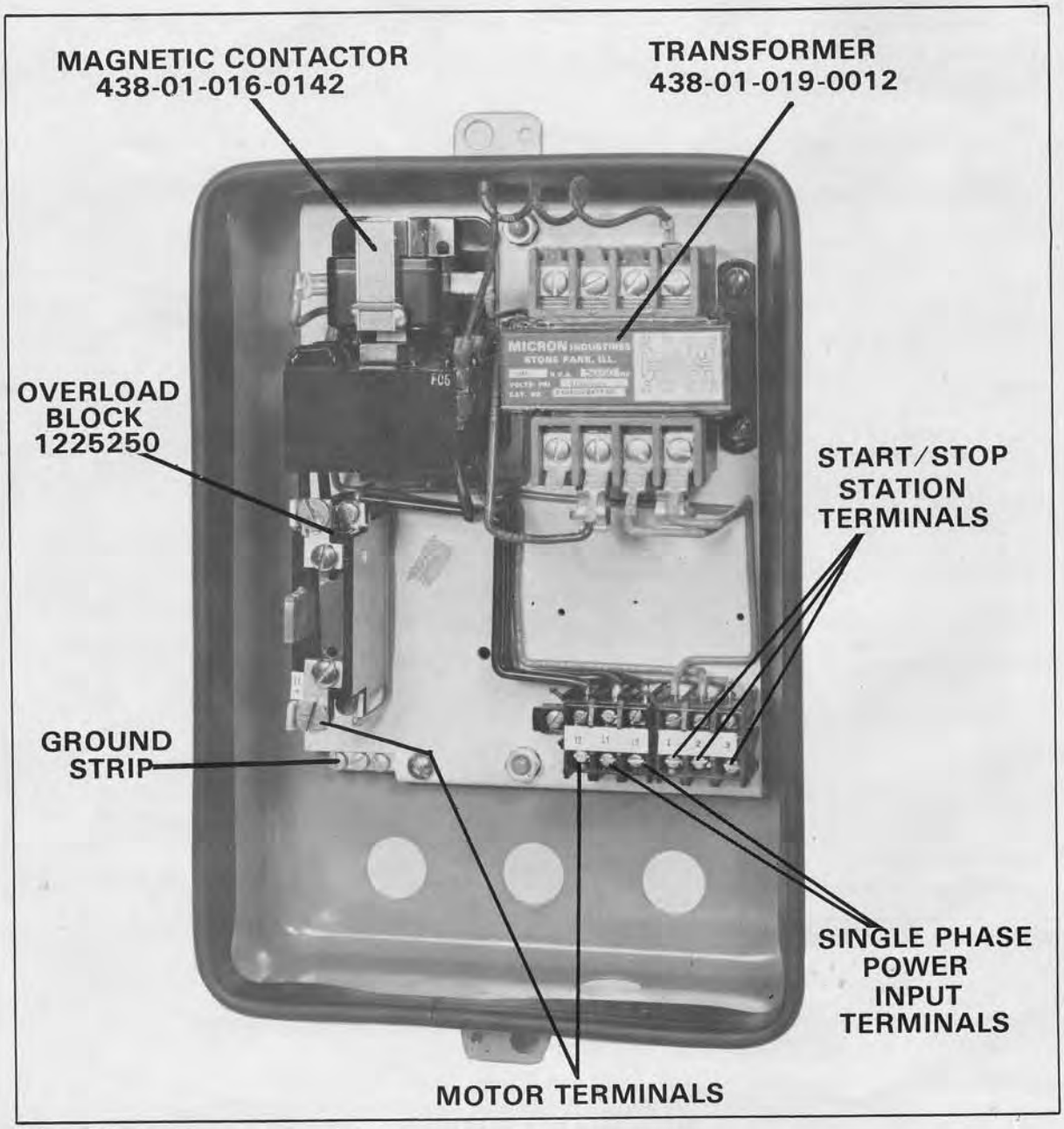


FIG. I – STANDARD SINGLE PHASE MOTOR STARTER
ROCKWELL NO. 52-540

INSTRUCTIONS FOR CONNECTING THE SINGLE PHASE MOTOR STARTER TO THE POWER SUPPLY

In general, stationary tools ordered with a single phase motor 1-1/2 horsepower or less are shipped from the factory with a cord set and plug. No field wiring is necessary.

Stationary tools ordered with a single phase motor greater than 1-1/2 horsepower must be wired in the field. The single phase LVC motor starter should be wired as follows:

Refer to Fig. 3 and remove and discard the plastic plug covering the entrance hole in the bottom of the starter enclosure. Bring the input power cord through the entrance hole. Connect the black power lead to terminal L1, the white power lead to terminal L2, and the green ground lead to the ground strip in the lower left hand corner of the starter.

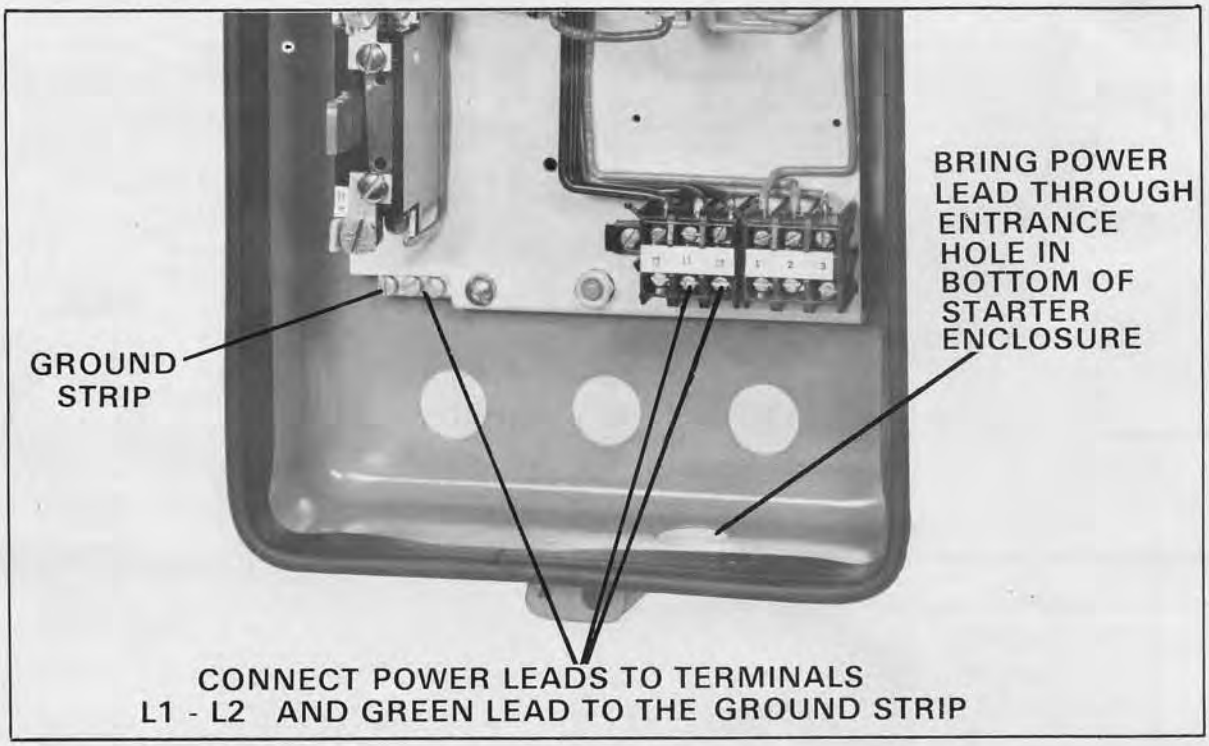


Fig. 3

Several points must be stressed and closely followed when connecting the input power to the motor starter.

1. To preserve the dust-tight integrity of the motor starter, an oil-tight box connector should be used for fastening the input cable to the starter enclosure at the entrance hole.

2. If copper stranded wires are used for the input leads, the wires must be soldered dipped or tinned before they are connected to terminals L1 and L2 and the ground strip.

3. The wires must be connected to terminals L1 and L2 through the front face of the terminal block as shown in Fig. 4. The screws on the top of the terminal block are used for clamping the wires in the terminal block.

4. The ground strip has provisions for three ground leads. The input power, start/stop station, and motor must be grounded via the ground strip. Two ground wires must never be inserted in the ground strip under one screw.

5. If metal conduit is used in place of cable, the green ground wire from the single phase input power system is omitted.

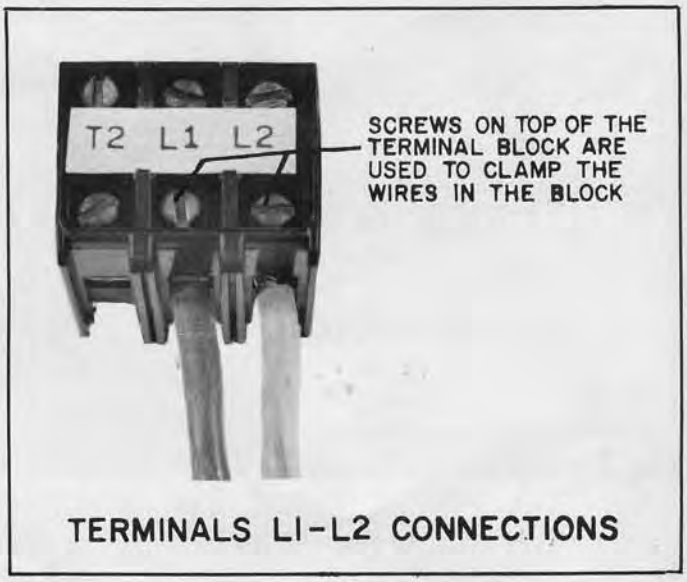


Fig. 4

THREE PHASE LVC MAGNETIC MOTOR STARTER

Fig. 5 illustrates the standard three phase LVC motor starter, Rockwell Part No. 438-01-316-0073.

The three phase starter consists of four basic components: (1) overload block with heaters, (2) magnetic contactor, (3) transformer, (4) start/stop station. The start/stop station is not shown in Fig. 5. Neither are the input connections from the start/stop station and the input connections from the three phase motor or power supply.

A wiring diagram and schematic diagram of the three phase LVC magnetic motor starter is shown in Fig. 6.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic diagram does not show the physical relationship of the components. The schematic diagram does show in straight line form the circuit functions of the various components.

The three phase LVC motor starter is comprised of a power circuit and a control circuit. The diagrams in Fig. 6 illustrates the power circuit with heavy lines to represent heavy gage wire sized for the motor current; whereas, the control circuit is shown with light lines in the diagrams to represent light gage wire sized for control current. In the motor starter, the power circuit is wired with black wires and the control circuit is wired with red wires.

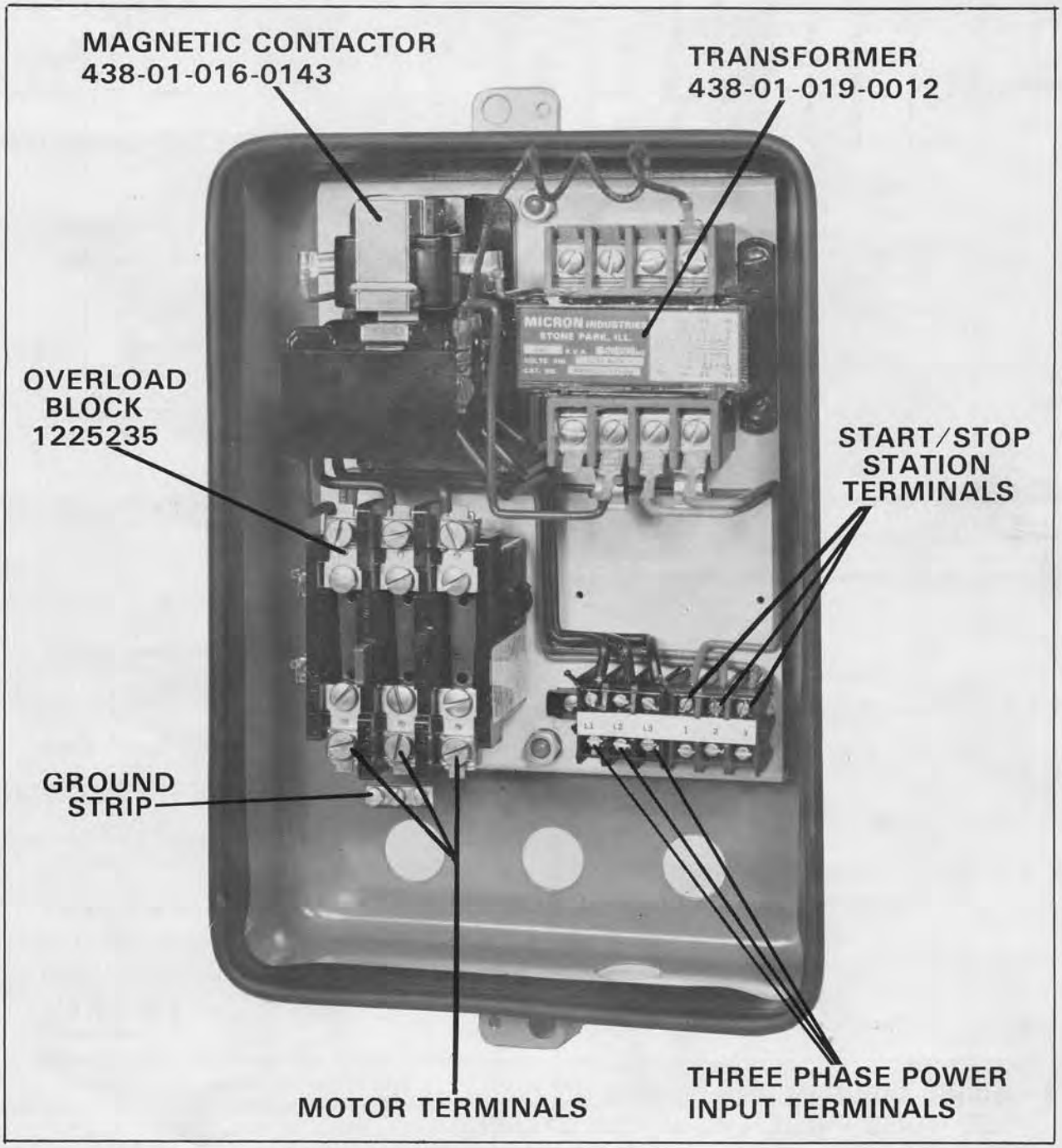


FIG. 5 – STANDARD THREE PHASE MOTOR STARTER
ROCKWELL NO. 52-541

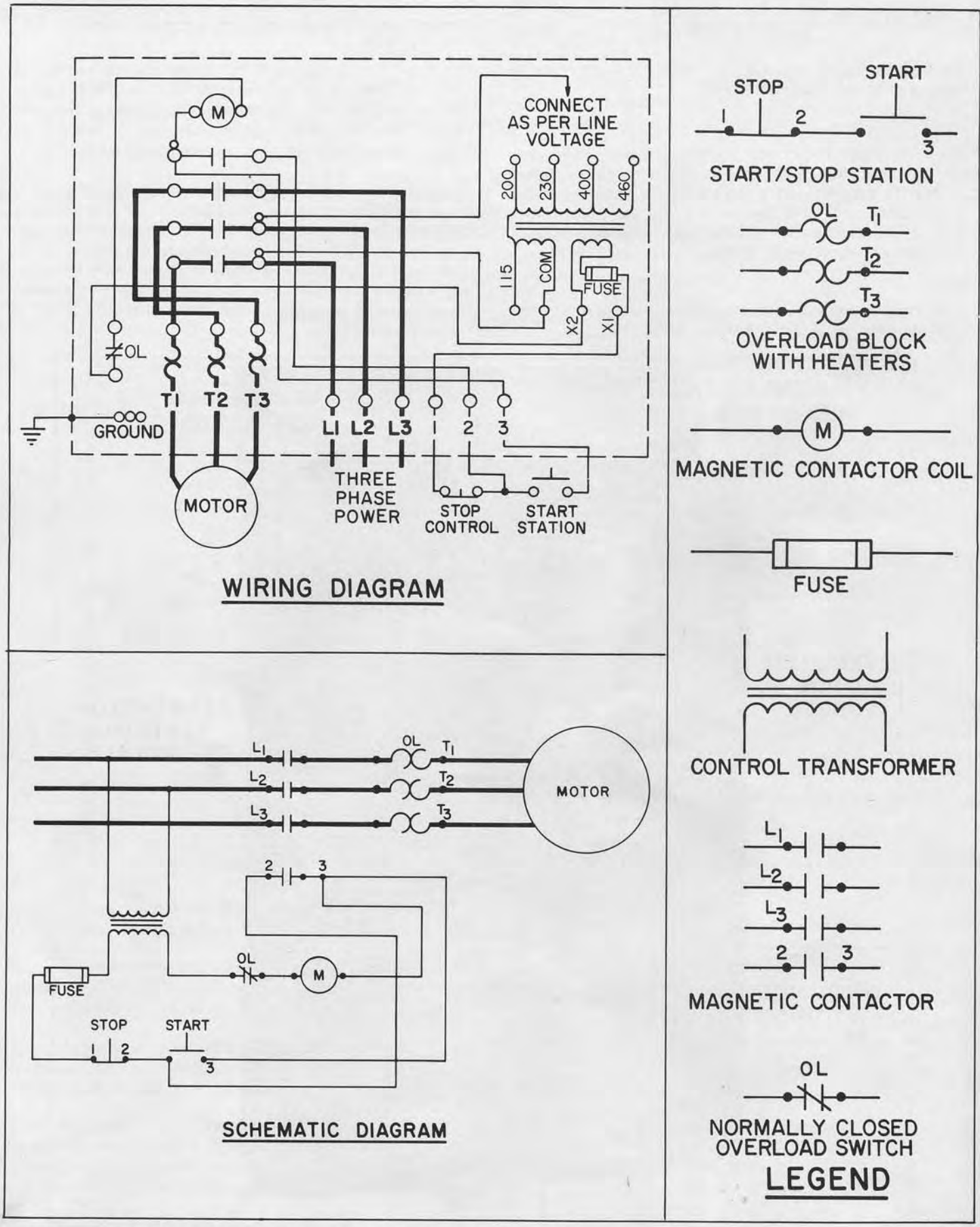


FIG. 6 – WIRING DIAGRAM AND SCHEMATIC DIAGRAM OF THE THREE PHASE LVC MOTOR STARTER ROCKWELL NO. 52-541

INSTRUCTIONS FOR CONNECTING THE THREE PHASE MOTOR STARTER TO THE POWER SUPPLY

All three phase motor starters must be wired in the field as follows: Refer to Fig. 7 and remove and discard the plastic plug covering the entrance hole in the bottom of the starter enclosure. Bring the three phase power lead through the entrance hole. Connect the red, white, and black power leads to terminals L1-L2-L3 and the green ground lead to the ground strip in the lower left-hand corner of the starter enclosure.

NOTE: If the machine runs backwards once the motor is turned on, simply interchange any two of the three input power leads in terminals L1-L2–L3.

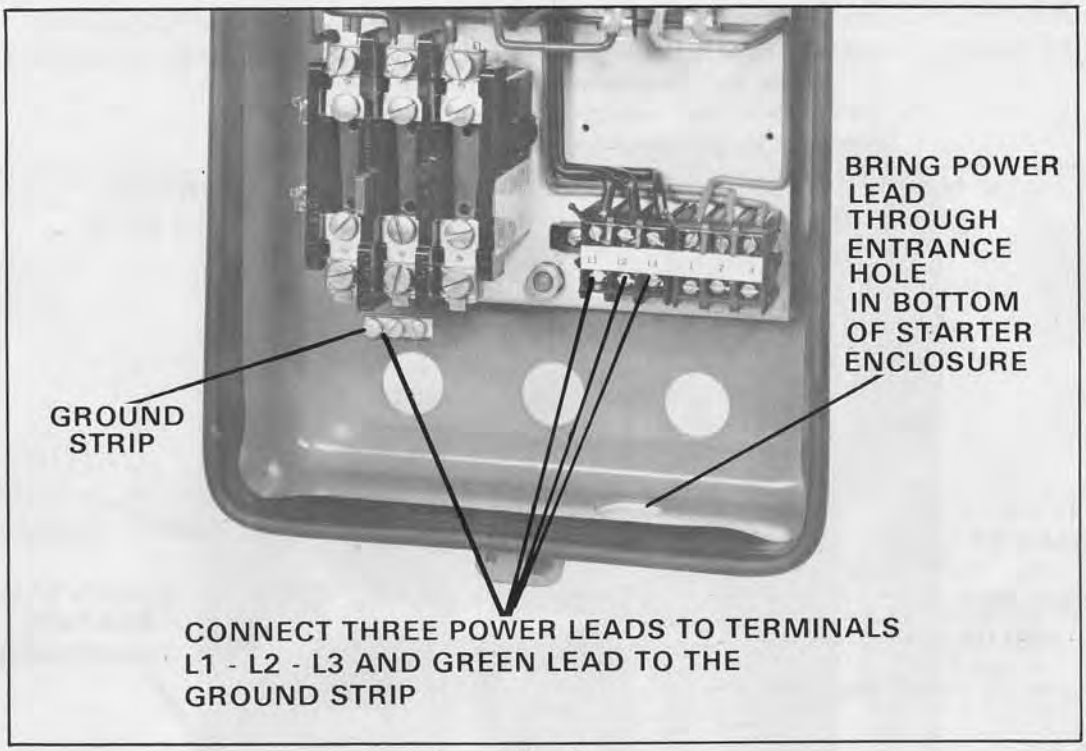


Fig. 7

Several points must be stressed and closely followed when connecting the input power to the motor starter.

1. To preserve the dust-tight integrity of the motor starter, an oil-tight box connector should be used for fastening the input cable to the starter enclosure at the entrance hole.

2. If copper stranded wires are used for the input leads, the wires must be soldered dipped or tinned before they are connected to terminals L1-L2-L3 and the ground strip.

3. The wires must be connected to terminals L1-L2-L3 through the front face of the terminal block as shown in Fig. 8. The screws on the top of the terminal block are used for clamping the wires in the terminal block.

4. The ground strip has provisions for three ground leads. The input power, start/stop station, and motor must be grounded via the ground strip. Two ground wires must never be inserted in the ground strip under one screw.

5. If metal conduit is used in place of cable, the green ground wire from the three phase input power system is omitted.

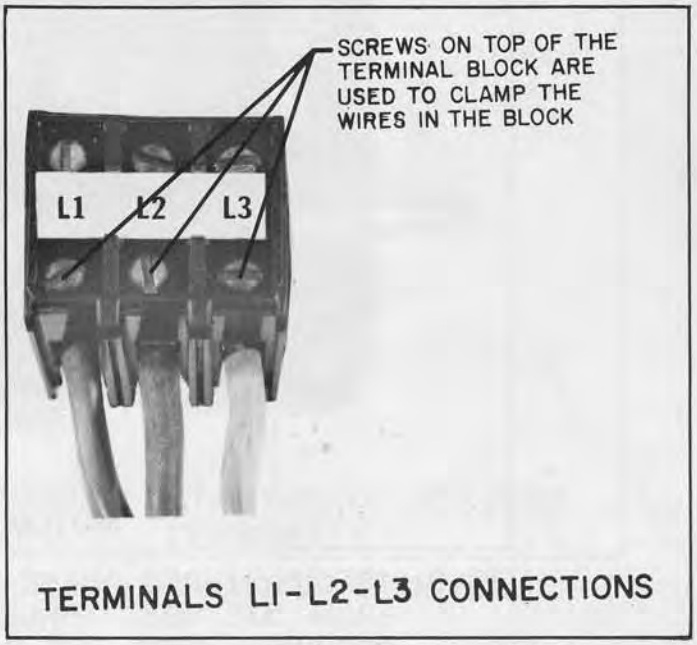


Fig. 8

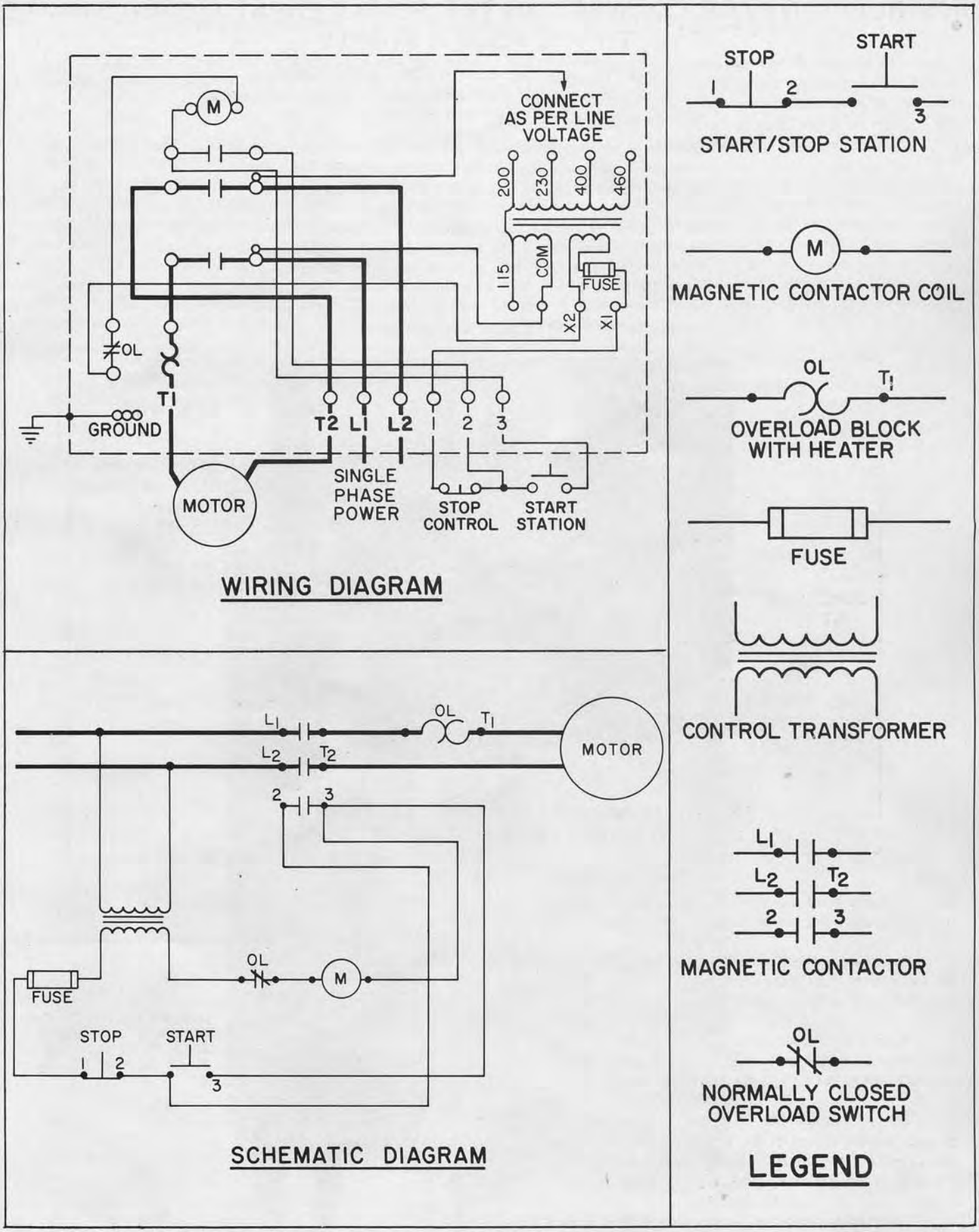


FIG. 2 – WIRING DIAGRAM AND SCHEMATIC DIAGRAM OF THE SINGLE PHASE LVC MOTOR STARTER ROCKWELL NO. 52-540

SPECIAL THREE PHASE MAGNETIC MOTOR STARTER FOR OPERATION FROM 575 VOLT THREE PHASE POWER SYSTEMS

Fig. 9, illustrates the special LVC starter which has been designed for use exclusively on 575 volt, three phase power systems.

The only difference between the 575 volt three phase LVC starter and the standard three phase starter, shown in Fig. 5, is the control transformer.

The control transformer in the standard three phase starter, shown in Fig. 5, has a multi-tapped primary which enables the starter to be used from either a 115, 200, 230, 400 or 460 volt three phase power system. In the special 575 volt three phase starter, the control transformer has a 575 volt primary so that the starter will only function from a 575 volt three phase power system.

The instructions for connecting the power supply to the special 575 volt starter are identical to the instructions for connecting the power supply to the standard three phase motor starter. See instructions for connecting the power supply to the three phase motor starter on page 9.

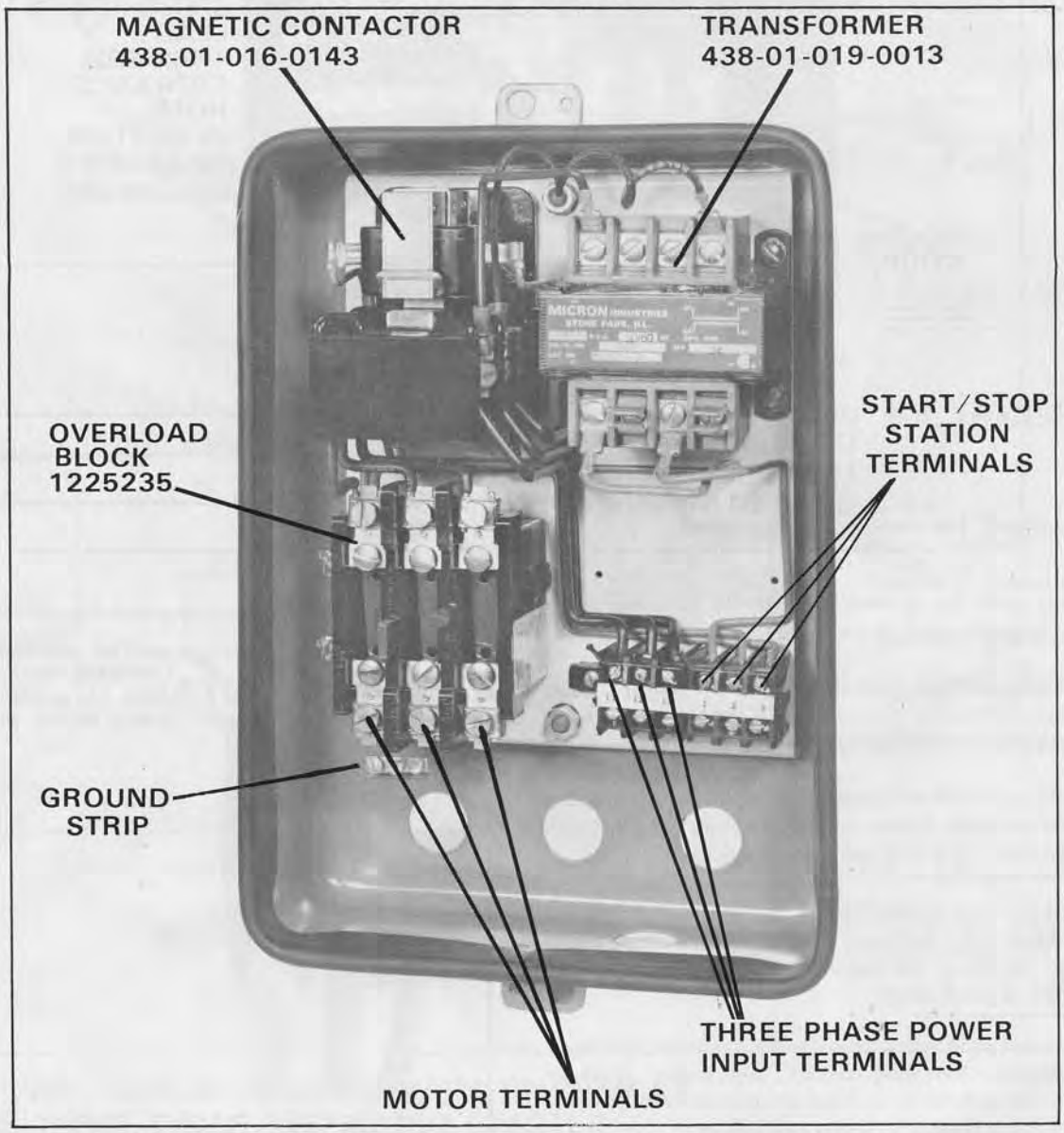


FIG. 9– SPECIAL THREE PHASE MOTOR STARTER FOR OPERATION FROM 575 VOLT THREE PHASE POWER SYSTEMS ROCKWELL PART 438-01-316-0076

SPECIAL SINGLE PHASE LVC REGENERATION MOTOR STARTER

The special single phase LVC regeneration motor starter has been designed for use primarily on the radial arm saws supplied with a single phase motor.

The starter is a special unit in that three motor leads are connected to the starter so that the starter will open and close the motor start winding through one of the poles of the magnetic contactor.

Fig. 10, illustrates the special single phase LVC regeneration motor starter, Rockwell Part No. 438-01-316-0077.

A wiring diagram and schematic diagram of the special single phase LVC regeneration motor starter is shown in Fig. 11.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic does not show the physical relationship of the components. The Schematic diagram does show in straight line form the circuit functions of the various components.

The single phase LVC regeneration motor starter is comprised of a power circuit and a control circuit. The diagrams in Fig. 11, illustrates the power circuit with heavy lines to represent heavy wire gage sized for the motor current; whereas, the control circuit is shown with light lines in the diagrams to represent light wire gage sized for control current. In the starter, the power circuit is wired with black wires and the control circuit is wired with red wires.

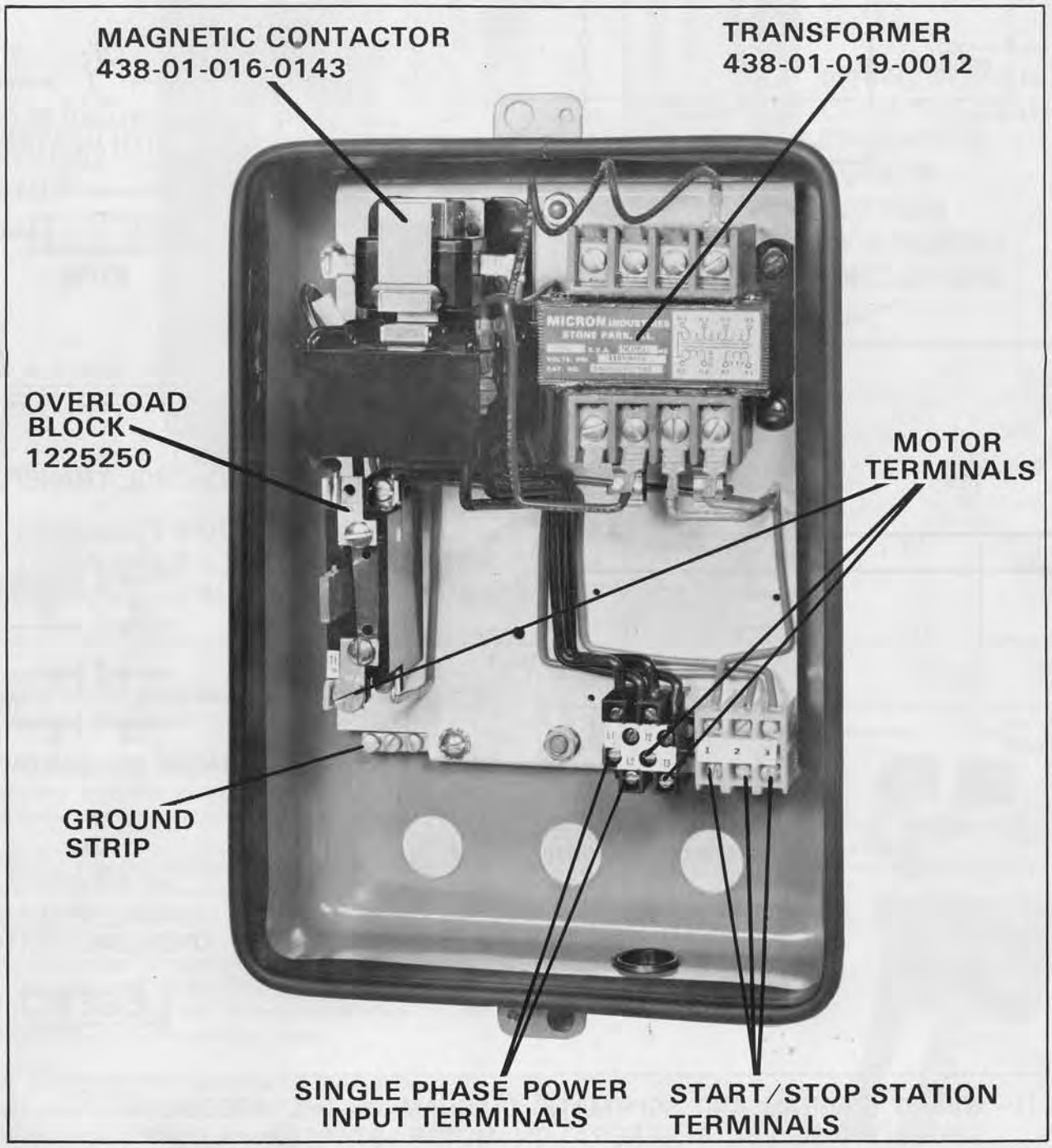


FIG. 10 - SPECIAL SINGLE PHASE LVC REGENERATION MOTOR STARTER
ROCKWELL PART 438-01-316-0077

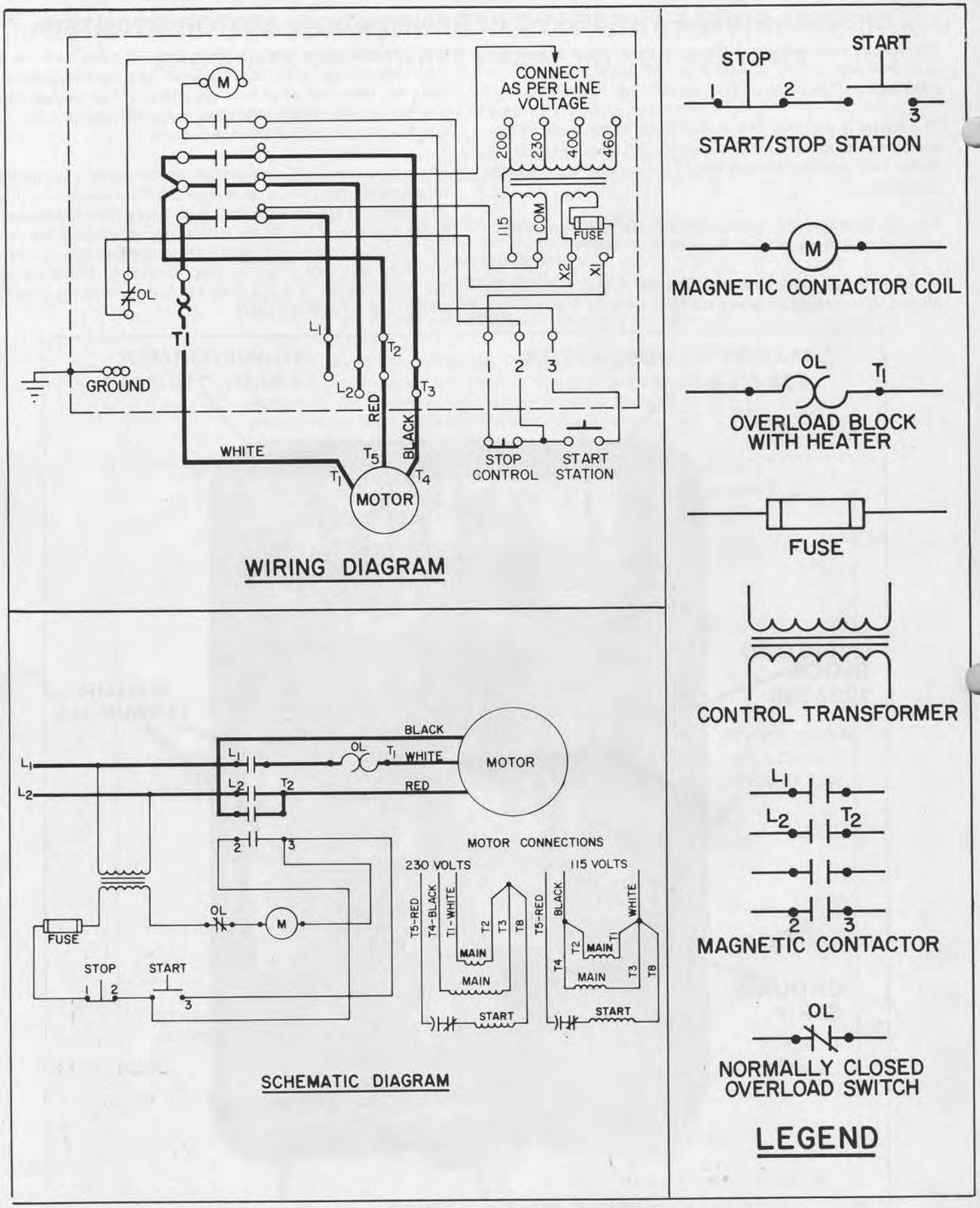
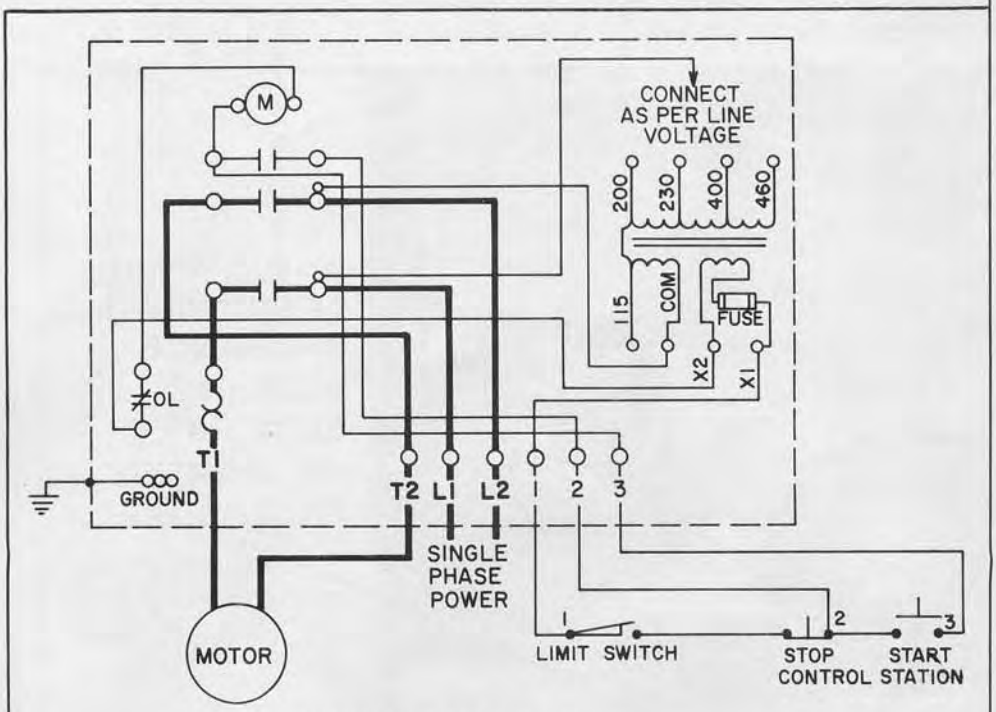


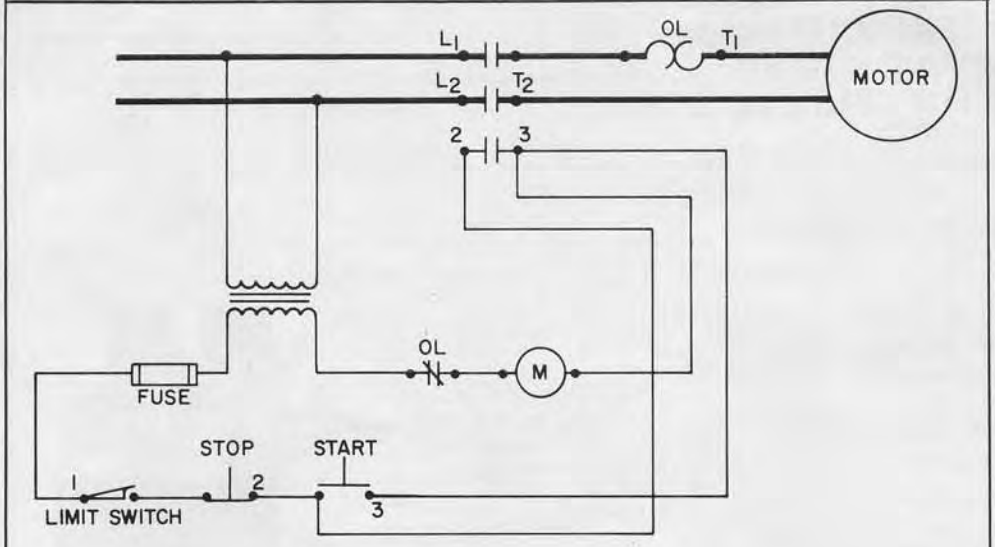
FIG. 11 – WIRING DIAGRAM AND SCHEMATIC DIAGRAM OF THE SPECIAL SINGLE PHASE LVC REGENERATION MOTOR STARTER ROCKWELL PART 438-01-316-0077

LVC MAGNETIC MOTOR STARTERS FOR 9" x 16" BANDSAWS

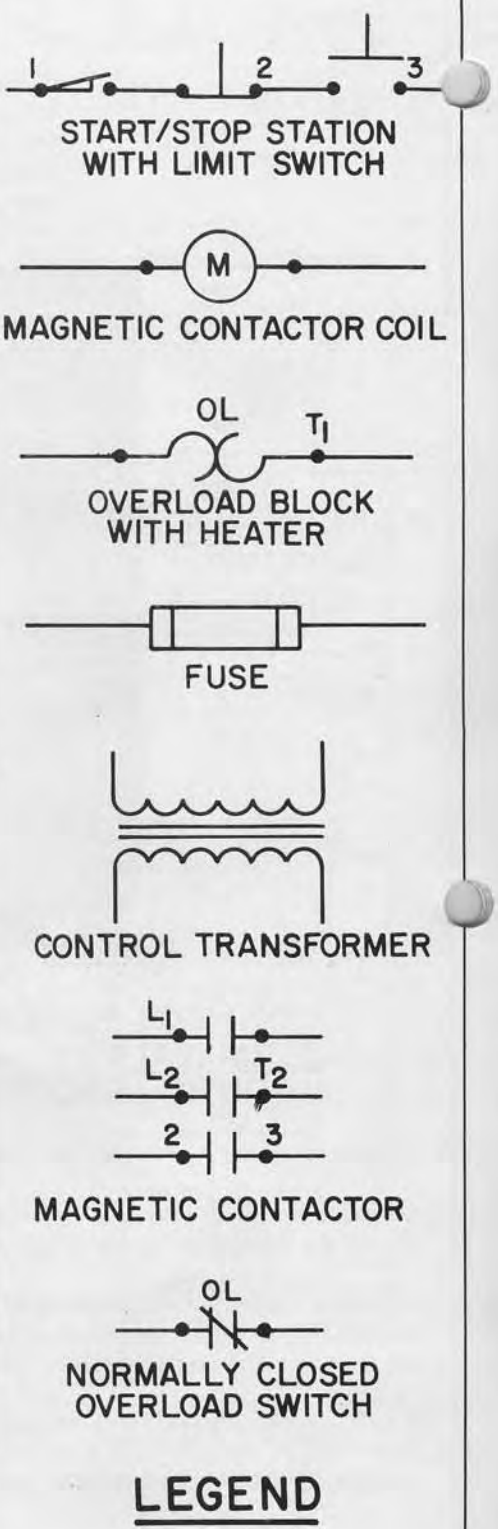
The LVC control system for the 9" x 16" Bandsaw is identical to the standard LVC Magnetic Motor Starters shown on page 4 for Single Phase and page 7 for Three Phase, with the exception of a limit switch in the control circuit. Fig. 14 illustrates the wiring and schematic diagram for the single phase 9" x 16" Band Saw and Fig. 15 illustrates the wiring and schematic diagrams for the three phase 9" x 16" Band Saw.



WIRING DIAGRAM

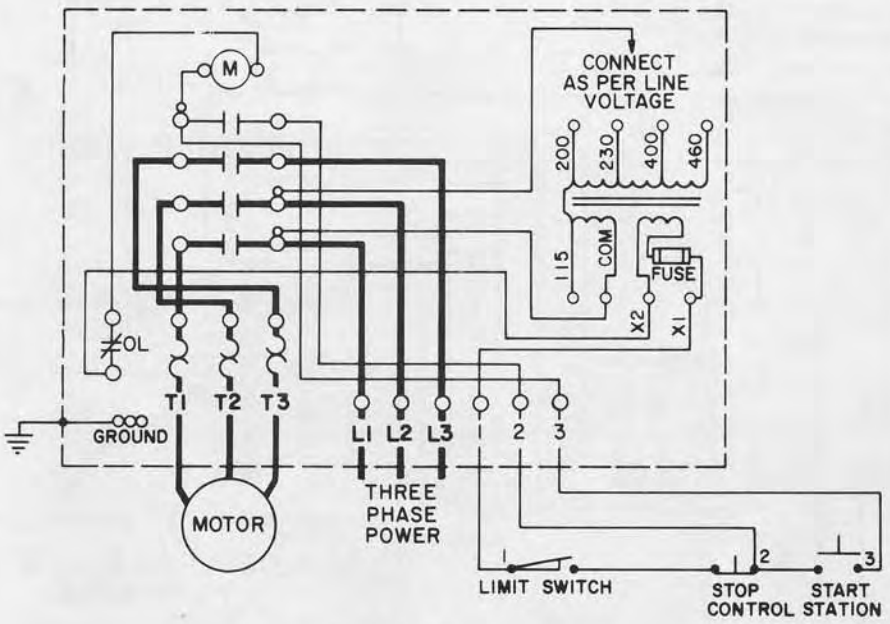


SCHEMATIC DIAGRAM

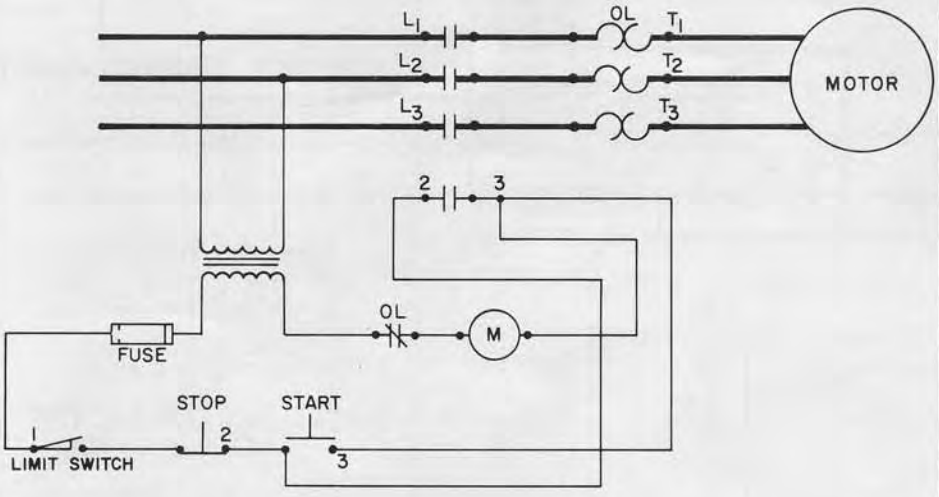


LEGEND

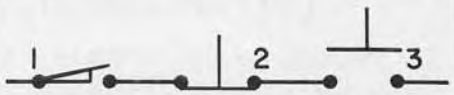
FIG. 14 – SINGLE PHASE



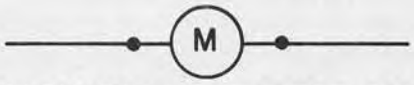
WIRING DIAGRAM



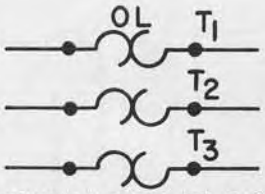
SCHEMATIC DIAGRAM



START/STOP STATION WITH LIMIT SWITCH

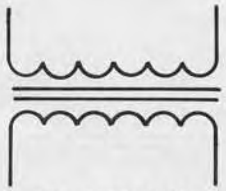


MAGNETIC CONTACTOR COIL

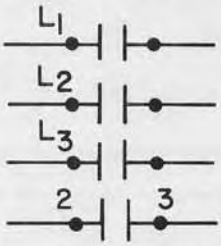


OVERLOAD BLOCK WITH HEATERS

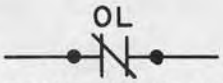
FUSE



CONTROL TRANSFORMER



MAGNETIC CONTACTOR



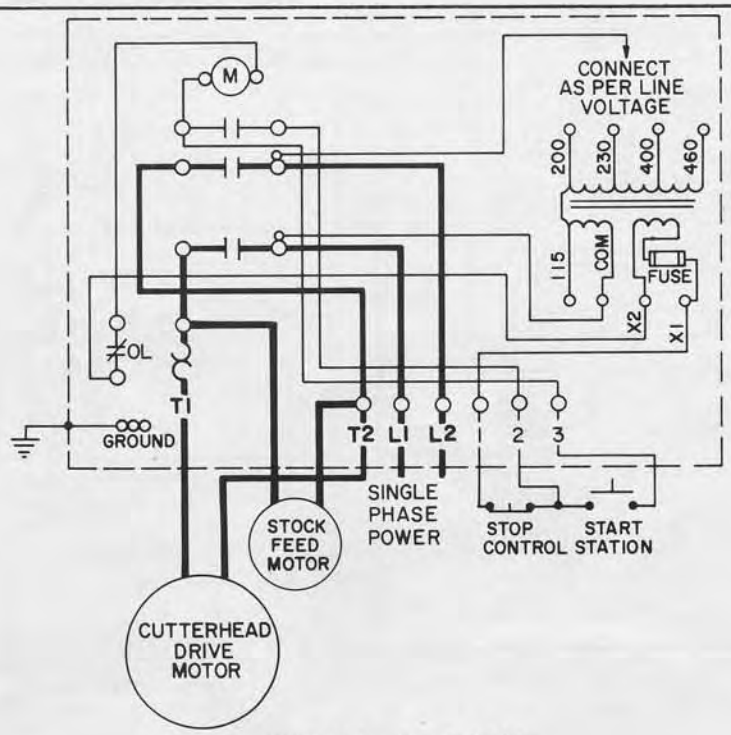
NORMALLY CLOSED OVERLOAD SWITCH

LEGEND

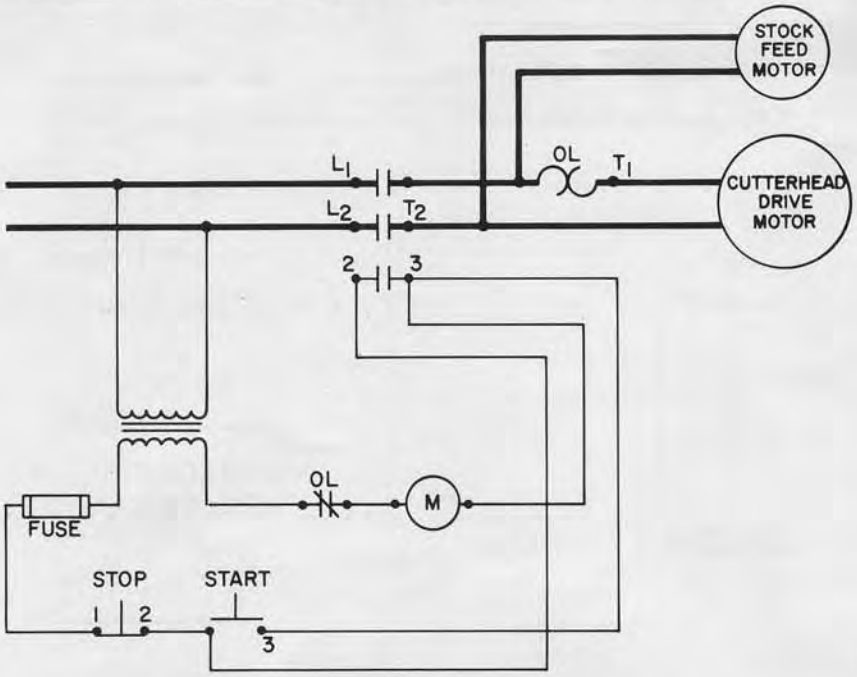
FIG. 15 – THREE PHASE

LVC MAGNETIC MOTOR STARTERS FOR 18" x 6" PLANERS

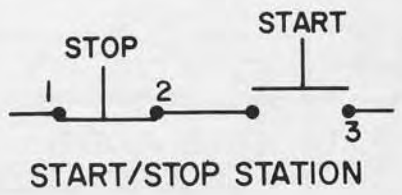
The LVC control system for the 18" x 6" Planer is identical to the standard LVC Magnetic Motor Starter shown on page 4 for Single Phase and page 7 for Three Phase, with the exception that two motors are controlled from the motor starter. Fig. 16 illustrates the wiring and schematic diagrams for the single phase 18" x 6" Planer and Fig. 17 illustrates the wiring and schematic diagrams for the three phase 18" x 6" Planer.



WIRING DIAGRAM



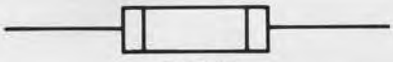
SCHEMATIC DIAGRAM



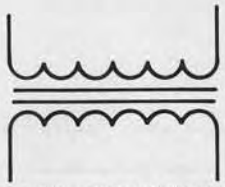
START/STOP STATION

MAGNETIC CONTACTOR COIL

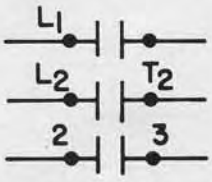
OVERLOAD BLOCK WITH HEATER



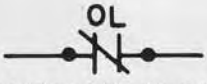
FUSE



CONTROL TRANSFORMER



MAGNETIC CONTACTOR



NORMALLY CLOSED OVERLOAD SWITCH

LEGEND

FIG. 16 – SINGLE PHASE

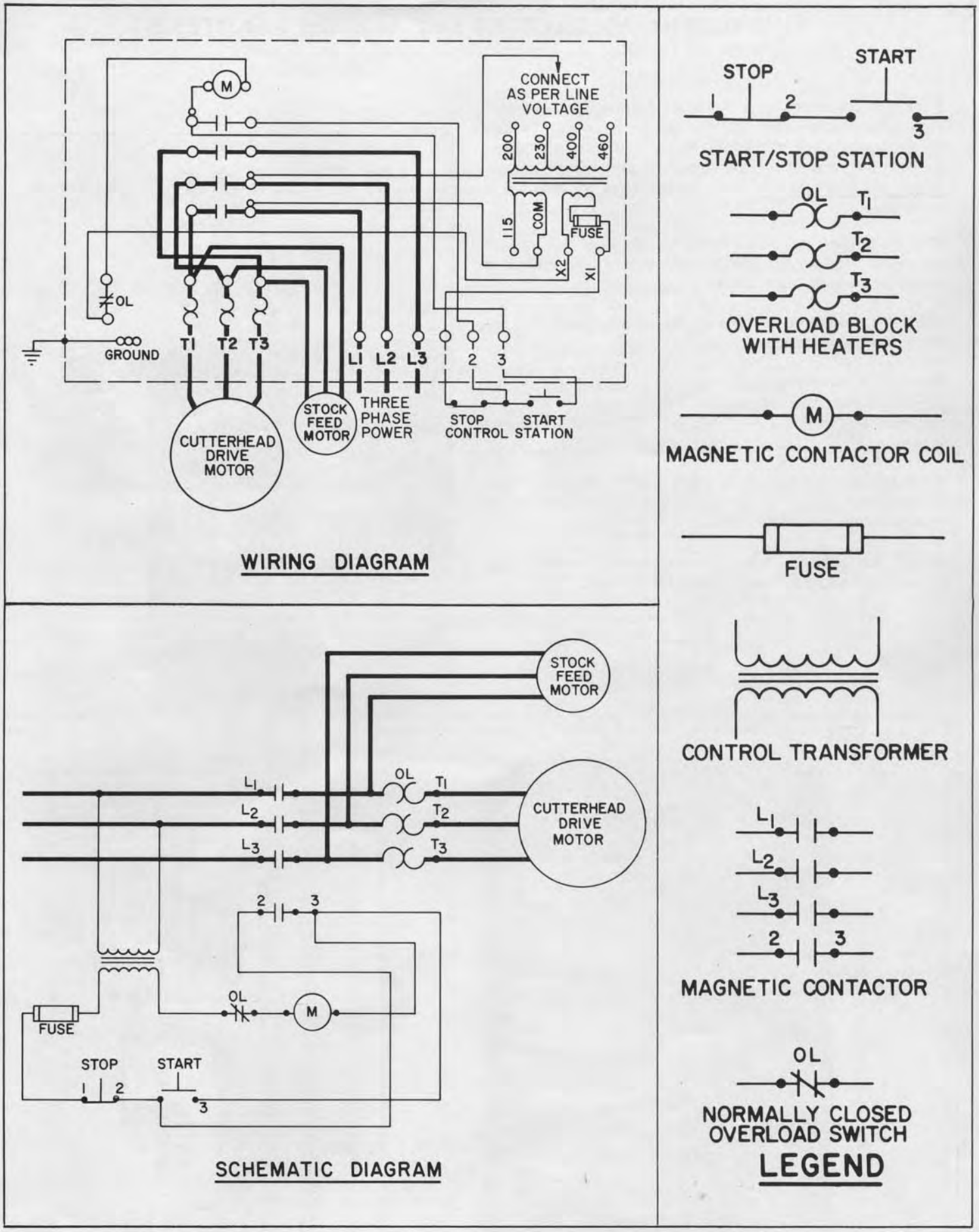


FIG. 17 — THREE PHASE

CHANGING VOLTAGE OF LVC MOTOR STARTERS

If it ever becomes necessary to operate a stationary power tool from a line voltage other than the voltage for which the tool was originally wired, three steps must be followed to modify the electrical package for operation from the new line voltage. Disconnect Motor Starter from power source and proceed as follows:

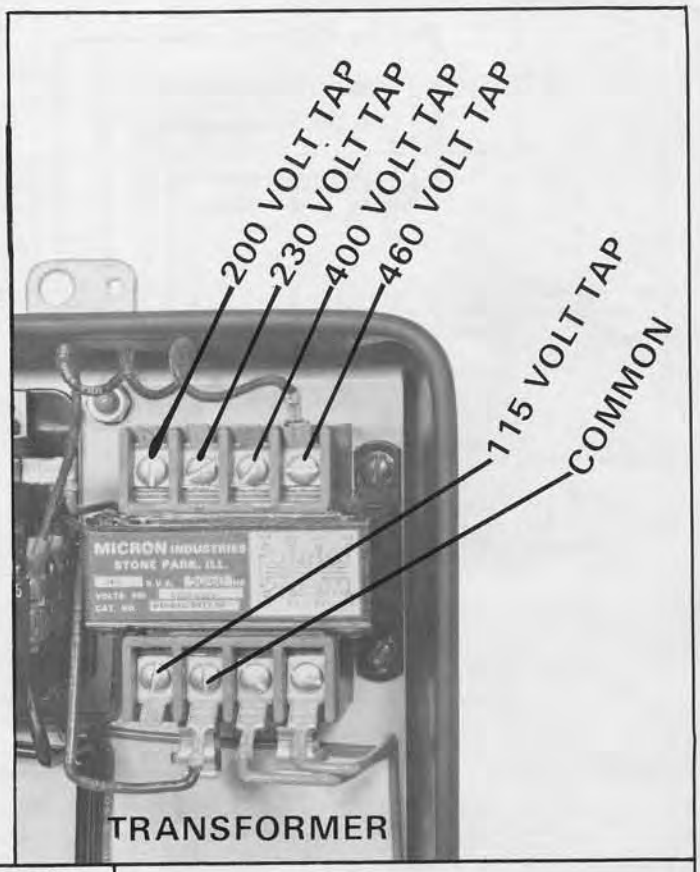
STEP 1—Remove the motor junction box cover and change the motor lead connections for the proper line voltage as shown on the motor nameplate.

STEP 2 – Change the primary of the control transformer for the proper line voltage, as follows:

The control transformer supplied with all starters, except the 575 volt three phase starter, has a multi-tapped primary for operation from either a 115, 200, 230, 400 or 460 volt power system.

When changing voltage of an LVC motor starter, the transformer primary pigtail must be changed corresponding to the new input voltage. See Fig. 18.

NOTE: For 208 volt power systems, connect the transformer primary to the 200 volt tap, not the 230 volt tap.



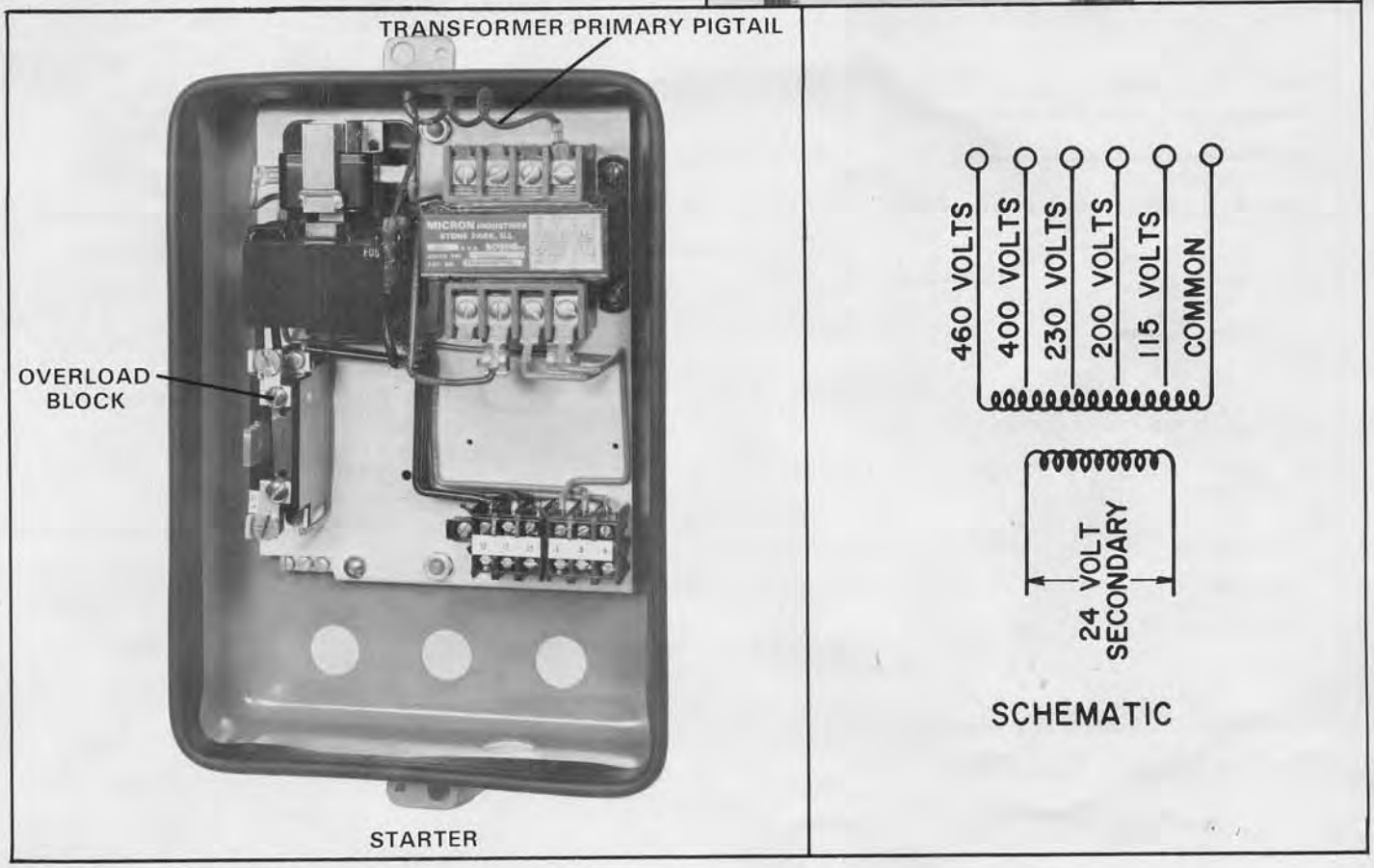


FIG. 18 – CHANGING VOLTAGE

STEP 3 – Change the heater elements in the overload block, Fig. 18, for the proper voltage/ampere rating shown on the motor nameplate.

For every LVC motor starter, a heater coil chart is located on the inside cover of the motor starter enclosure. See Fig. 19.

Note from the motor nameplate, the full load current for the new line voltage. Select the heater or heaters one code number lower than specified in the table of the heater coil chart which will give a maximum trip rating of approximately 115% of the motor nameplate current.

For example on three phase starters, assume it is necessary to pick a heater for a motor with a nameplate rating of 10.6 amperes. Reference to the heater coal chart in Fig. 19, shows that a 10.6 full load motor ampere rating corresponds to a heater code number, E-56. Thus, heater number, E-55, should be specified which will give a maxmimum trip rating of approximately 1.15 x 10.6 = 12.2 amperes.

FURNAS ELECTRIC COMPANY, BATAVIA, ILLINOIS

CATALOG NUMBER

MAGNET COIL RATING

VOLTS HERTZ INSPECTED

E "Standard Trip" HEATER ELEMENTS FOR NON-COMPENSATED RELAYS

Heaters shown in the table provide a maximum trip rating of 125% of the motor nameplate amperes, which is suitable for 40° C motors. For all other motors select heaters one code number lower than specified in the table, which give a maximum trip rating of approximately 115%.

The tripping current of any heater in a 40° C ambient is 25% greater than the lower value of motor amperes shown in the table.

Starters do not provide protection from short circuits. A protective device should be provided in accordance with the N.E.C. (C.E.C. in Canada) and not exceed the values shown in the table if shown.

Full Load Mo. Amps. Min.	Max.	Heater Code No.	Max. Rat. of Prot. Device Fu.	Bkr.
.41	.43	E5	2	2
.44	.47	E6	2	2
.48	.51	E7	2	2
.52	.56	E8	2	2
.57	.61	E9	2	2
.62	.67	E11	2	2
.68	.73	E12	3	3
.74	.77	E13	3	3
.78	.84	E14	3	3
.85	.93	E16	3	3
.94	1.00	E17	4	4
1.01	1.08	E18	4	4
1.09	1.15	E19	4	4
1.16	1.27	E23	4	4
1.28	1.45	E24	5	5
1.46	1.61	E26	5	5
1.62	1.81	E27	6	6
1.82	2.00	E28	6	6
2.01	2.12	E29	8	8
2.13	2.29	E31	8	8
2.30	2.43	E32	8	8
2.44	2.66	E33	8	8
2.67	2.98	E34	10	10
2.99	3.16	E36	10	10
3.17	3.39	E37	12	12
3.40	3.69	E38	12	12
3.70	4.00	E39	12	12
4.01	4.48	E41	15	15
4.49	5.00	E42	15	15
5.01	5.44	E44	20	20
5.45	5.99	E46	20	20
6.00	6.60	E47	20	20
6.61	6.96	E48	25	25
6.97	7.26	E49	25	25
7.27	7.99	E50	25	25
8.00	8.89	E51	30	30
8.90	9.74	E52	30	30
9.75	10.5	E53	35	35
10.6	11.5	E54	35	35
11.6	12.3	E55	35	35
12.4	13.4	E56	40	40
13.5	15.2	E57	50	50
15.3	17.2	E60	60	60
17.3	18.9	E61	60	60
19.0	20.6	E62	70	70
20.7	22.0	E65	80	80
22.1	23.4	E66	80	80
23.5	25.5	E67	90	90
25.6	28.3	E69	100	100

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SINGLE PHASE

FURNAS ELECTRIC COMPANY, BATAVIA, ILLINOIS

E "Standard Trip" HEATER ELEMENTS FOR NON-COMPENSATED RELAYS

Heaters shown in the table provide a maximum trip rating of 125% of the motor nameplate amperes, which is suitable for 40° C motors. For all other motors select heaters one code number lower than specified in the table, which give a maximum trip rating of approximately 115%.

The tripping current of any heater in a 40° C ambient is 25% greater than the lower value of motor amperes shown in the table.

Starters do not provide protection from short circuits. A protective device should be provided in accordance with the N.E.C. (C.E.C. in Canada) and not exceed the values shown in the table if shown.

Full Load Mo. Amps. Min.	Max.	Heater Code No.	Max. Rat. of Prot. Device Fu.	Bkr.
.27	.29	E3	2	2
.30	.32	E4	2	2
.33	.35	E5	2	2
.36	.37	E6	2	2
.38	.40	E7	2	2
.41	.45	E8	2	2
.46	.49	E9	2	2
.50	.53	E11	2	2
.54	.57	E12	3	3
.58	.62	E13	3	3
.63	.67	E14	3	3
.68	.75	E16	3	3
.76	.79	E17	4	4
.80	.86	E18	4	4
.87	.92	E19	4	4
.93	1.01	E23	4	4
1.02	1.15	E24	5	5
1.16	1.29	E26	5	5
1.30	1.43	E27	6	6
1.44	1.57	E28	6	6
1.58	1.68	E29	8	8
1.69	1.81	E31	8	8
1.82	1.93	E32	8	8
1.94	2.11	E33	8	8
2.12	2.37	E34	10	10
2.38	2.50	E36	10	10
2.51	2.69	E37	12	12
2.70	2.93	E38	12	12
2.94	3.18	E39	12	12
3.19	3.56	E41	15	15
3.57	3.96	E42	15	15
3.97	4.31	E44	20	20
4.32	4.84	E46	20	20
4.85	5.25	E47	20	20
5.26	5.52	E48	25	25
5.53	5.74	E49	25	25
5.75	6.25	E50	25	25
6.26	7.03	E51	30	30
7.04	7.74	E52	30	30
7.75	8.30	E53	35	35
8.31	9.01	E54	35	35
9.02	9.64	E55	40	40
9.65	11.1	E56	50	50
11.2	12.6	E57	50	50
12.7	14.4	E60	60	60
14.5	15.4	E61	60	60
15.5	17.0	E62	70	70
17.1	18.2	E65	80	80
18.3	20.0	E66	80	80
20.1	21.9	E67	80	80
22.0	23.7	E69	90	90
23.8	24.9	E70	100	100
25.0	26.7	E72	100	100
26.8	27.0	E73	125	125

1EP177 D26640

THREE PHASE

Fig. 19