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This manual may not be complete in all aspects of product maintenance and repair. **All products should be used only by qualified and properly trained personnel, following proper safety procedures.** All products should be regularly inspected and maintained, and their condition, application and use should be periodically evaluated by qualified personnel. Only qualified and properly trained technicians should perform maintenance, repair and replacement procedures. Attempting these procedures without proper training may cause machine damage or operator injury!

Products may be unsupported by The Challenge Machinery Company due to age or the unavailability of parts from their original manufacturer. No parts or product support will be available to repair or maintain unsupported products. Older products may not be UL listed (if the product does not have a UL label it is not a listed product), and may not comply with applicable installation or other regulations or requirements if relocated to a new facility. Many municipalities require a product to be UL listed before an electrician will connect power to them. Often the cost of updating an older product to comply with current safety regulations is greater than the value of the product.



**The Challenge Machinery Company**  
6125 Norton Center Drive  
Norton Shores, MI 49441-6081 USA

ChallengeMachinery.com

## ***MODEL MS-5***

### ***Technical Service and Parts Manual***

**Serial Numbers:**  
965600 through 159999,  
MS5-A-150000 and up

*Sold and Serviced by*

**F.300-BT**  
August 2015

# 1.0 Introduction

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THIS MANUAL is designed to help you get the most from your Challenge equipment. Keep this manual in a safe, convenient place for quick reference by operators and service personnel.



## CAUTION

**SAFETY ALERT!** This symbol means **CAUTION: Personal safety instructions!** Pay special attention to the instructions in bold type. Personal injury may result if the precautions are not read and followed.

**READ THIS MANUAL BEFORE OPERATING!** Follow precautions and instructions given and you should have years of trouble-free operation. If after reading the manual questions still remain, contact your Authorized Challenge Dealer.

**FOR PARTS AND SERVICE,** contact the Authorized Challenge Dealer from whom you purchased your machine. Use the illustrations and parts lists at the back of this manual to identify the correct parts needed. Always give the **SERIAL NUMBER** and **MODEL** of your machine to insure the correct parts are sent as soon as possible.

Take a few minutes right now to **RECORD YOUR MACHINE SERIAL NUMBER** in the space provided below. Also be sure to fill out the warranty card accompanying your machine and return it **DIRECTLY TO CHALLENGE.**

If you bought a used machine, it is important to have the following information on record at Challenge. Copy this page, fill in the information and send it care of The Challenge Service Department, 6125 Norton Center Drive • Norton Shores • MI 49441-6081.

|                    |                |     |
|--------------------|----------------|-----|
| CHALLENGE MODEL    | SERIAL NUMBER  |     |
| ATTN               | COMPANY        |     |
| ADDRESS            |                |     |
| CITY               | STATE/PROVINCE | ZIP |
| PHONE              | DATE INSTALLED |     |
| DEALER NAME & CITY |                |     |

### \* WARRANTY INFORMATION \*

It is very important that you read and understand the conditions outlined in the *Warranty Information Sheet* attached to the outside of the shipping container of your machine.

The *Warranty Information Sheet* must be filled out completely and returned to THE CHALLENGE MACHINERY COMPANY in order for the warranty to be issued for this machine.

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# 2.0 Safety

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## 2.1 Precautions

- This machine is designed for one-person operation. Never operate the machine with more than one person.
- Safe use of this machine is the responsibility of the operator. Use good judgment and common sense when working with and around this machine.
- Read and understand all instructions thoroughly before using the machine. If questions remain, contact the dealer from which you purchased this machine. Failure to understand the operating instructions may result in personal injury.
- Only trained and authorized people should operate this machine.
- Do not alter safety guards or devices. They are for your protection. Severe personal injury may result.
- Disconnect power before cleaning or performing maintenance. See Section 2.2 Power Lockout Procedure.
- Observe all caution labels on this machine.
- High Speed Drill - Keep rags, loose clothing and long hair away from rotating drill. Personal injury could result from items being caught on drill.
- Keep foreign objects off table and away from drill.
- Be extremely careful when handling and changing the drills. Severe lacerations or dismemberment could result from careless handling procedure.
- Keep the floor around the machine free of trim, debris, oil and grease.
- If the machine sounds or operates abnormally, turn it off and consult the Trouble Shooting section of this manual. If the problem cannot be corrected, have it checked by a qualified service person or your Authorized Challenge Dealer.
- CRUSH HAZARD, keep feet off the pedal when handling paper under the pressure feet. DO NOT REST FOOT ON PEDAL at any time!
- DO NOT REACH UNDER THE DRILL AREA!
- DO NOT OPERATE WITH ANY GUARDS REMOVED! Replace all guards after adjusting, lubricating or servicing the machine.
- Severe Lacerations - Contact with high-speed drill could cause severe injury. Always turn machine off and wait for drill to stop before removing drill bits. Keep hands away from drill(s) when operating.

## 2.2 Power Lockout Procedure

For maximum safety when making adjustments or repairs to your machine, be sure to lock out the main power control switch to which the machine is connected. The switch should be moved to the OFF position and a padlock placed in the loop. The person servicing the machine should hold the key.

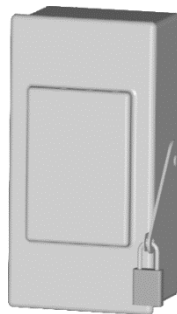


Figure 1

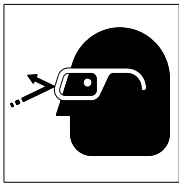
## 2.3 Warning Label Definitions

The following warning labels are found at various locations on your machine. Read and understand the meaning of each symbol. If a label is lost from the machine, it should be replaced. The item number and location of each label can be found in Section 5.0, Main Assemblies.



**HAZARDOUS AREA**

Disconnect power before cleaning, servicing, or making adjustments not requiring power. Do not alter safety guards or devices; they are for your protection. Replace all guards. Do not operate with any guards removed.



**EYE WEAR**

Always wear eye protection when operating this machine.



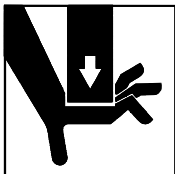
**SHOCK HAZARD**

Disconnect power before removing cover. Replace cover before operation.



**SINGLE OPERATOR**

Do not operate with more than one person.



**CUT/CRUSH HAZARD**

Keep hands from under drills.

## 3.0 Maintenance Guide

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# ⚠ NOTICE ⚠

**The instructions on the following pages are for the use of trained service personnel only!**

**Attempting to perform repair and replacement procedures without proper training may cause machine damage or operator injury!**


**PARTS CUSTOMERS:** The Challenge Machinery Company provides parts with the express understanding that they are to replace parts found missing or no longer serviceable on equipment designed and/or manufactured by Challenge. The Challenge Machinery Company assumes no liability for any modification or alteration to any Challenge products, and any such modification or alteration to any Challenge product is not authorized by The Challenge Machinery Company. Any modification or alteration of any Challenge product will void any remaining warranty.

## 3.1 Routine Maintenance

### General

Production losses can be reduced if good maintenance practices are followed. The following suggestions may be helpful:

1. Recognize the fact that the user of hydraulic equipment has more control over maintenance than the manufacturer.
2. Technicians should be familiar with use, care, and limitations of the equipment. Technicians and/or maintenance personnel **SHOULD READ THIS MANUAL COMPLETELY**.
3. Use properly trained maintenance personnel.
4. Establish a program of systematic preventative care for your equipment or put this machine on an existing preventative maintenance program.
5. Analyze and isolate trouble before having any part of the equipment dismantled.
6. Be aware of how your machine should sound and perform. If the machine is not operating properly or if it doesn't "sound right", stop running your job immediately and try to identify the problem.
7. Call the dealer for any problems that cannot be handled by your own personnel.

 **CAUTION** Always handle drills with care to avoid severe lacerations, even dull drills are sharp enough to cause lacerations.

### Daily

1. **Keep drills sharp!** Sharpen drills often and reset the drill depth if needed.
2. Lubricate the hollow drills frequently with the Drill-Ease provided.
3. For better hollow drill life, remove the drills when not in use and soak in light oil. Wipe off excess oil before drilling.
4. Wipe off excess grease from the drill heads and idlers.

### Weekly (or every 40 hours of operations)

1. Spray the chip chute with silicone spray to prevent the drill chips from sticking and piling up.

### Monthly

1. Oil the table height adjusting knob shaft with a light machine oil. Wipe off excess oil.
2. Check the hydraulic oil supply for the proper level. This check is made by removing the rear panel and visually checking the hydraulic oil level in relation to the oil fill line located on the hydraulic tank (fig. 2 page 8). The oil level should be no higher than the oil fill line to allow room for expansion of

the oil when running. Use only a recommended premium grade anti-wear hydraulic oil series ISO VG 100. Oils other than the recommended type will cause seals, cups and 'o'-rings to deteriorate.



Fig. 2

### Yearly

1. Check all adjustments
2. Tighten all screws
3. Change the hydraulic oil in the reservoir. Oil may have to be changed more often if contamination of any kind gets in the oil.

### Vertical Table Guide

**▲▲ CAUTION** PINCH POINT: This adjustment requires a guard to be removed for adjustment and testing purposes only. Be very careful while adjusting. Replace all guards before operating. DO NOT operate machine with any guards removed.

The vertical guide block is located on the right side of the machine beneath the table and may need periodic adjustments to keep the table steady, yet allow it and stock to fall away from the drills as rapidly as possible. The table down stroke is controlled by the weight of the table (gravity) and return springs.

Remove the guide block cover guard. Tighten the two guide block lock nuts (fig. 3) and power the table up by pressing the foot pedal. Gradually back the lock nuts off evenly until the table releases freely. Retest the upstroke and table return, and check the table for side play. Replace guard.



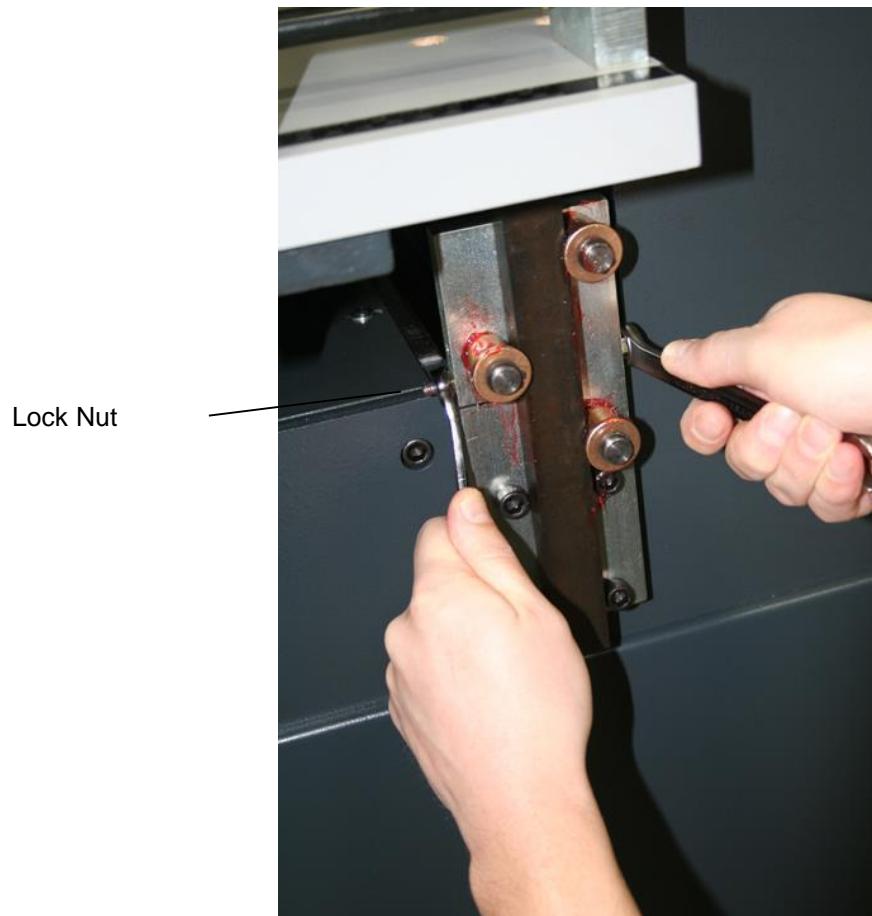


Fig. 3

**▲▲ CAUTION** PINCH POINT: Replace guard after adjusting

### Hydraulic

Through normal use, hydraulic systems gum up and seals wear. Signs of wear are hydraulic leaks and erratic operations of the vertical speed. Check with your Authorized Dealer for a current repair and/or replacement policy.

**▲▲ CAUTION** NEVER USE Automatic Transmission oil or brake fluid as a substitute! Oils other than the recommended type (premium grade anti-wear hydraulic oil ISO series VG 100) will cause seals, cups and O-rings to deteriorate. Unsafe operating conditions will result.

### Drill Heads

Through normal use, bearings will wear and need replacement. Signs of wear are excessive noise, heat or loose spindles.

# 4.0 Troubleshooting

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## **▲▲ CAUTION**

Never work on this machine with the power on unless the instructions say the machine power must be on. Lock the power off at the wall disconnect switch. See 2.2 Power Lockout Procedure page, 4.

## **▲▲ CAUTION**

Whenever repairing hydraulic components, loosen connections slowly to bleed off any trapped pressure.

Problem;

### **WON'T START -**

1. Blown fuse.
2. Main Power Switch in off position
3. Defective start button.
4. Safety shield or drill head cover interlock switches not contacted or defective.
5. Defective starter.
6. Overload tripped
7. Loose wire.

### **LACK OF POWER -**

1. Low voltage.
2. Hydraulic fluid low.
3. Relief valve in pump stuck open.
4. Check speed control valve.
5. Hydraulic cylinder needs to be replaced.

### **SPINDLE MOTOR STALLS -**

1. Low voltage.
2. Drive belt is loose.
3. Drill bits are dull.
4. Drill bits are plugged.
5. Drill heads need to be repaired.

### **TABLE STROKE WON'T ADJUST -**

1. Stroke adjustment chain off sprockets.
2. Broken chain.

### **TABLE WON'T RETURN AUTOMATICALLY -**

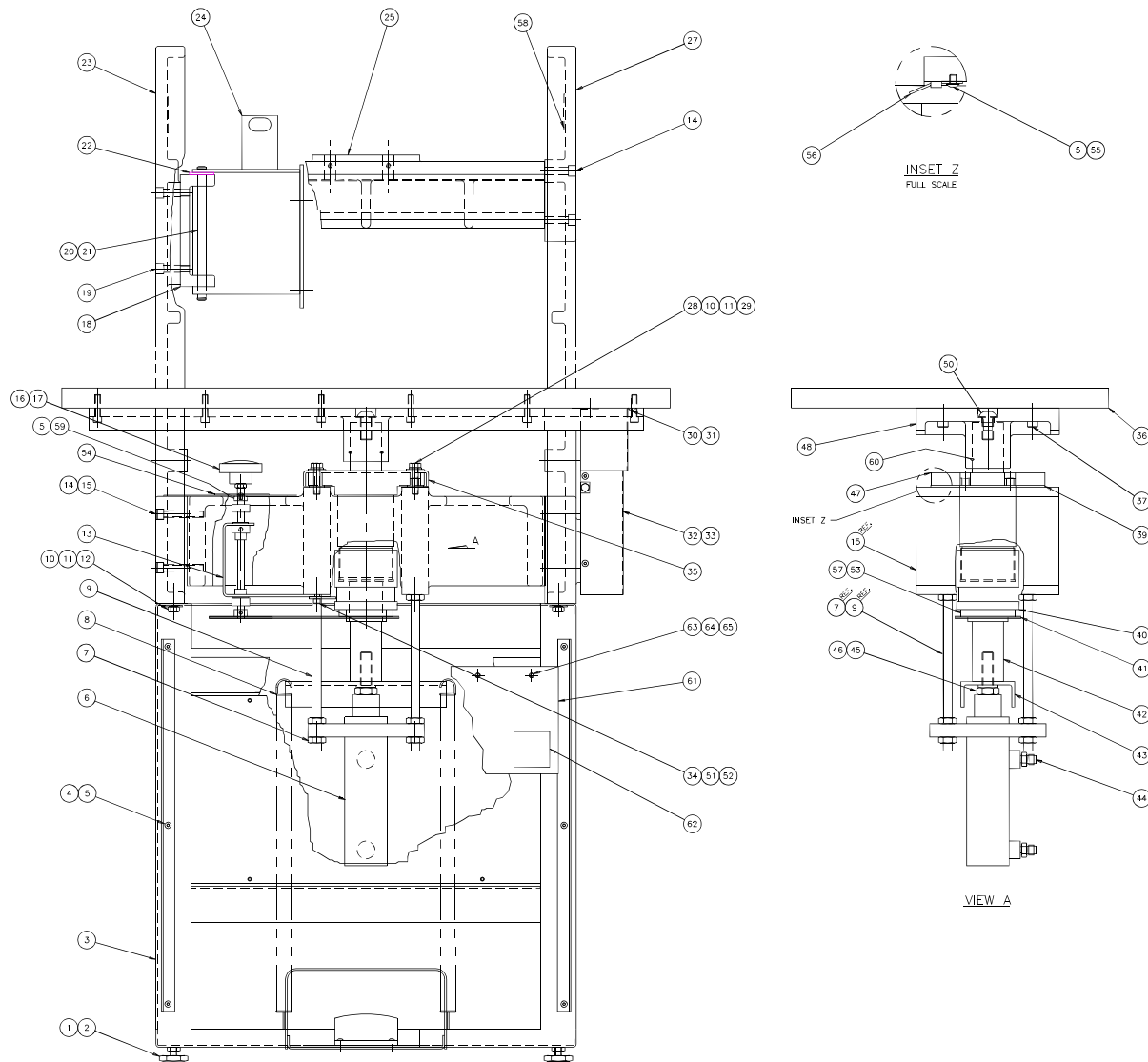
1. Check continuity between the isolated block and ground.

**NOTES**

# 5.0 Main Assemblies

## 5.1 Main Assembly – Front View

45000 Sheet 1 Rev. N



## Main Assembly – Front View – Parts List

45000 Sheet 1 Rev. N

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES                | QTY |
|-----|---------------|---|-----|
| 1   | 16543         | LEVELER                                   | 4   |
| 2   | H-6424-6      | 3/8-16 HEX JAM NUT                        | 4   |
| 3   | 45051         | BASE ASSEMBLY                             | 1   |
| 4   | 45049         | BRACKET - LOWER BASE COVER                | 2   |
| 5   | H-6910-102404 | #10-24 X 1/2 BUTTON HD SOC. CAP SCREW     | 9   |
| 6   | H-377         | HYDRAULIC CYLINDER                        | 1   |
| 7   | H-6424-8      | 1/2-13 HEX JAM NUT                        | 12  |
| 8   | 8843-1        | SPRING - TABLE RETURN                     | 2   |
| 9   | 45007         | ROD - CYLINDER MOUNTING                   | 4   |
| 10  | H-7327-12     | 3/8 MEDIUM LOCKWASHER                     | 8   |
| 11  | H-7321-6      | 3/8 FLAT WASHER                           | 8   |
| 12  | H-6913-608    | 3/8-16 X 1 HEX HD CAP SCREW               | 4   |
| 13  | 45136-1       | TABLE ADJUSTMENT ASSEMBLY                 | 1   |
| 14  | H-6918-616    | 3/8-16 X 2" SOC. HD. CAP SCREW            | 14  |
| 15  | 45073         | BRACE - CROSS                             | 1   |
| 16  | S-1753-2      | KNOB - TABLE ADJUSTMENT                   | 1   |
| 17  | H-6424-6      | 3/6-16 HEX JAM NUT                        | 1   |
| 18  | 45070         | BRACKET - MOTOR                           | 1   |
| 19  | H-6918-612    | 3/8-16 X 1-1/2 SOC HD CAP SCREW           | 2   |
| 20  | 45001         | PIN - MOTOR                               | 1   |
| 21  | S-1193-50     | 1/2 'E' RING                              | 2   |
| 22  | 11288         | WASHER - NYLON                            | 1   |
| 23  | 45077         | SIDE FRAME - L.H.                         | 1   |
| 24  | 45002         | BRACKET ASSEMBLY - MOTOR                  | 1   |
| 25  | 45079-1       | DOVETAIL                                  | 1   |
| 26  |               |   |     |
| 27  | 45075         | SIDE FRAME - R.H.                         | 1   |
| 28  | H-6913-612    | 3/8-16 X 1-1/2 HEX HD CAP SCREW           | 4   |
| 29  | 11288-1       | WASHER - NYLON                            | 4   |
| 30  | 45117         | COVER - TABLE GUIDE - TOP                 | 1   |
| 31  | S-1088-5      | #10 X 5/8 TYPE AB SCREW                   | 2   |
| 32  | 45017         | COVER - VERTICAL TABLE GUIDE              | 1   |
| 33  | H-6910-102402 | #10-24 X 1/4 BUTTON HD SOC. CAP SCREW     | 4   |
| 34  | H-7321-4      | 1/4 FLAT WASHER                           | 2   |
| 35  | 45092         | COVER - TABLE ROD GUIDE                   | 1   |
| 36  | 45011-2       | TABLE                                     | 1   |
| 37  | H-6918-510    | 5/16-18 X 1-1/4 SOC HD CAP SCREW          | 11  |
| 38  |               |   |     |
| 39  | 45084         | ISOLATOR                                  | 2   |
| 40  | 45131         | NUT - ADJUSTING                           | 1   |
| 41  | 45135-1       | CHAIN                                     | 1   |
| 42  | 45115-1       | ROD - TABLE                               | 1   |
| 43  | 45037         | BRACKET - RETURN SPRING                   | 1   |
| 44  | H-236-3       | ADAPTER - 9/16-18 S.A.E. 'O' RING TO TUBE | 2   |

## Main Assembly – Front View – Parts List (cont)

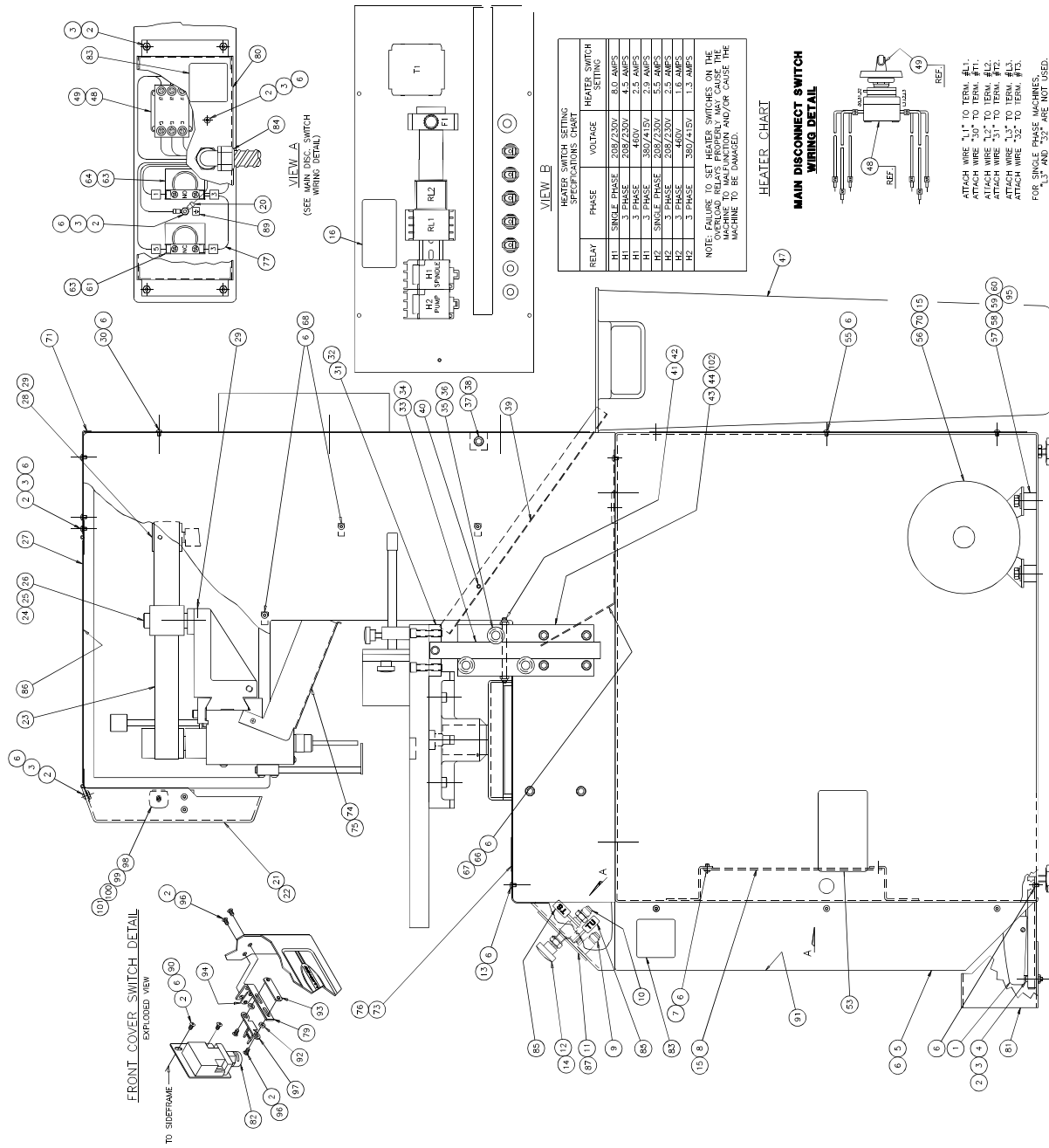
45000 Sheet 1 Rev. N

| NO. | PART NO.     | DESCRIPTION OF ACCESSORIES          | QTY |
|-----|--------------|-------------------------------------|-----|
| 45  | H-6913-1012  | 5/8-11 X 1-1/2 HEX HD. CAP SCREW    | 1   |
| 46  | H-7327-20    | 5/8 MEDIUM LOCKWASHER               | 1   |
| 47  | 45137        | GUIDE ASSEMBLY - TABLE ROD          | 1   |
| 48  | 45116-2      | BRACKET - TABLE MOUNTING            | 1   |
| 49  |              |                                     |     |
| 50  | H-6910-1010  | 5/8-11 X 1-1/4 BUTTON HD. CAP SCREW | 1   |
| 51  | 45118        | STOP - TABLE TRAVEL                 | 1   |
| 52  | H-6918-405   | 1/4-20 X 5/8 SOC. HD CAP SCREW      | 2   |
| 53  | 45138        | SPROCKET - TABLE ADJ.               | 1   |
| 54  | 45142        | DECAL - TABLE ADJ.                  | 1   |
| 55  | H-7330-#10   | #10 EXT. TOOTH LOCKWASHER           | 1   |
| 56  | EE-2425      | WIRE ASSEMBLY - AUTO TRIP           | REF |
| 57  | H-6910-83208 | SCREW - #8-32 X 1" BUT HD CAP       | 2   |
| 58  | S-1781-16    | LABEL - CAUTION                     | 2   |
| 59  | 45165        | BLOCK - TABLE ADJ. ROD              | 1   |
| 60  | H-6938-406   | SCREW, 1/4-20 X 3/8 SOC SET SCR     | 2   |
| 61  | 47157-5      | SHIELD - PLEXIGLASS                 | 1   |
| 62  | S-1781-35    | LABEL - SHOCK HAZARD                | 1   |
| 63  | E-1152-36    | SPACER - 1/4-20 X 2"                | 2   |
| 64  | H-6910-403   | SCREW - 1/4-20 X 3/8 BUT HD. CAP    | 2   |
| 65  | H-7324-8     | WASHER - 1/4-20 INT. TOOTH          | 2   |

**Notes:**

# 5.2 Main Assembly – Side Elevation

45000 Sheet 2 Rev. X





## Main Assembly – Side Elevation – Parts List

45000 Rev. X

| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES            | QTY  |
|-----|----------------|---------------------------------------|------|
| 1   | E-875-4        | FOOTSWITCH (REPAIRS ONLY)             | REF. |
| 2   | H-7324-#10     | #10 INT. TOOTH LOCKWASHER             | 23   |
| 3   | H-6423-#10     | #10-24 HEX NUT                        | 16   |
| 4   | H-6918-102406  | #10-24 X 3/4 SOC. HD CAP SCREW        | 2    |
| 5   | 45048          | COVER - LOWER BASE                    | 1    |
| 6   | H-6910-102404  | #10-24 X 1/2 BUTTON HC SOC. CAP SCREW | 50   |
| 7   | H-7330-#10     | #10 EXT. TOOTH LOCKWASHER             | 4    |
| 8   | EE-2369-3      | POWER PNL ASSY.-380/415V (3 PHASE)    | 1    |
| 8   | EE-2385-3      | POWER PNL ASSY.-(SINGLE PHASE)        | 1    |
| 8   | EE-2386-3      | POWER PNL ASSY.-208-230/460V (3 PH)   | 1    |
| 9   | H-237-5        | ELBOW 90%%D - 1/8 NPT X 9/16-18 TUBE  | 1    |
| 10  | H-241-5        | ADAPTER - 1/8 NPT X 9/16-18 TUBE      | 1    |
| 11  | 45110          | PANEL - CONSOLE                       | 1    |
| 12  | 4771-1         | VALVE                                 | 1    |
| 13  | 45081          | COVER                                 | 1    |
| 14  | H-7322-8       | 1/2 POLISHED WASHER                   | 1    |
| 15  | S-1694         | TYRAP                                 | 2    |
| 16  | S-1781-11      | CAUTION LABEL - SHOCK                 | 1    |
| 17  |                |                                       |      |
| 18  |                |                                       |      |
| 19  |                |                                       |      |
| 20  | EE-2753        | WIRE ASSEMBLY - GROUND                | 1    |
| 21  | 45047-1        | COVER - FRONT                         | 1    |
| 22  | 45109          | LABEL                                 | 1    |
| 23  | 45160          | DRIVE BELT                            | 1    |
| 24  | 45129          | PULLEY ASSEMBLY (UNCROWNED)           | 2    |
| 25  | 20075-7        | SHIM                                  | 2    |
| 26  | 45040-1        | PIN - IDLER PULLEY                    | 2    |
| 27  | 45043          | COVER ASSEMBLY - TOP                  | 1    |
| 28  | 45103-2        | DRIVE PULLEY - 2.1" DIA.              | 1    |
| 29  | H-6938-404     | 1/4-20 X 1/4 CUP PT. SOC. SET SCREW   | 3    |
| 30  | 45145-1        | COVER ASSEMBLY - REAR                 | 1    |
| 31  | 45015          | BLOCK - GUIDE                         | 1    |
| 32  | H-6918-612     | 3/8-16 X 1-1/2 SOC. HD CAP SCREW      | 2    |
| 33  | 45016          | GUIDE - VERTICAL                      | 1    |
| 34  | H-21S-500-1750 | 1/2 X 1-3/4 ROLL PIN                  | 1    |
| 35  | S-1073-50      | 1/2" RETAINING RING                   | 3    |
| 36  | A-10257-8      | BEARING - FLANGED (BRONZE)            | 3    |
| 37  | H-6918-616     | 3/8-16 X 2" SOC. HD CAP SCREW         | 2    |
| 38  | 45107          | TIEBAR                                | 1    |
| 39  | 45032          | CHIP CHUTE - LOWER                    | 1    |
| 40  | H-5254-406     | 1/4-20 X 3/4 SOC. SHOULDER SCREW      | 2    |
| 41  | 45080-1        | STUD - TABLE GUIDE                    | 1    |

## Main Assembly – Side Elevation – Parts List (cont)

45000 Rev. X

| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES          | QTY |
|-----|----------------|-------------------------------------|-----|
| 42  | H-5248-4       | 1/4-28 FLEX LOCK NUT                | 2   |
| 43  | 45012          | VERTICAL TABLE GUIDE ASSEMBLY       | 1   |
| 44  | H-6918-612     | 3/8-16 X 1-1/2 SOC. HD CAP SCREW    | 4   |
| 45  |                |                                     |     |
| 46  |                |                                     |     |
| 47  | 56143          | WASTE BIN                           | 1   |
| 48  | E-3082         | SWITCH - MAIN DISCONNECT            | 1   |
| 49  | E-3083         | SWITCH FACE - MAIN DISCONNECT       | 1   |
| 50  |                |                                     |     |
| 51  |                |                                     |     |
| 52  |                |                                     |     |
| 53  | 41130          | PLATE - SERIAL NUMBER               | 1   |
| 54  |                |                                     |     |
| 55  | 45056          | COVER - REAR                        | 1   |
| 56  | H-407-2        | HYD POWER UNIT ASM. (50/60 C. 3 PH) | 1   |
| 56  | H-378-2        | HYD. POWER UNIT ASM. (50/60C 1 PH.) | 1   |
| 57  | 40016-2        | VIBRATION MOUNT                     | 4   |
| 58  | H-7321-5       | 5/16 FLAT WASHER                    | 4   |
| 59  | H-7327-10      | 5/16 MED LOCKWASHER                 | 4   |
| 60  | H-6423-5       | 5/16-18 HEX HUT                     | 4   |
| 61  | E-3073-5       | PUSHBUTTON - OFF (RED)              | 1   |
| 62  |                |                                     |     |
| 63  | 16520          | RING - ANTI ROTATION                | 2   |
| 64  | E-3073         | PUSHBUTTON - ON (GREEN)             | 1   |
| 65  |                |                                     |     |
| 66  | 45147          | COVER - LOWER BASE TOP              | 1   |
| 67  | 8254-2         | GROMMET                             | 1   |
| 68  | S-1694-2       | CABLE TIE                           | 3   |
| 69  |                |                                     |     |
| 70  | E-1237-2       | WIRE NUT (3 PHASE MACHINES ONLY)    | 3   |
| 71  | 45150          | COVER - CORNER                      | 1   |
| 72  |                |                                     |     |
| 73  | S-1781-16      | CAUTION LABEL                       | 1   |
| 74  | H-21S-250-1250 | 1/4 X 1-1/4 ROLL PIN                | 2   |
| 75  | 45159          | CHIP CHUTE                          | 1   |
| 76  | S-1781-31      | LABEL - SINGLE OPERATOR             | 1   |
| 77  | E-709-R        | WIRE, #18 GA. RED MTW 6" LONG       | 1   |
| 78  |                |                                     |     |
| 79  | 45173          | BRACKET - DOOR INTERLOCK KEY        | 1   |
| 80  | 45176          | COVER - DISCONNECT SWITCH           | 1   |
| 81  | 45168          | GUARD - FOOTSWITCH                  | 1   |
| 82  | EE-2749-1      | SWITCH ASM - BELT GUARD             | REF |
| 83  | S-1781-35      | LABEL - CAUTION                     | 3   |

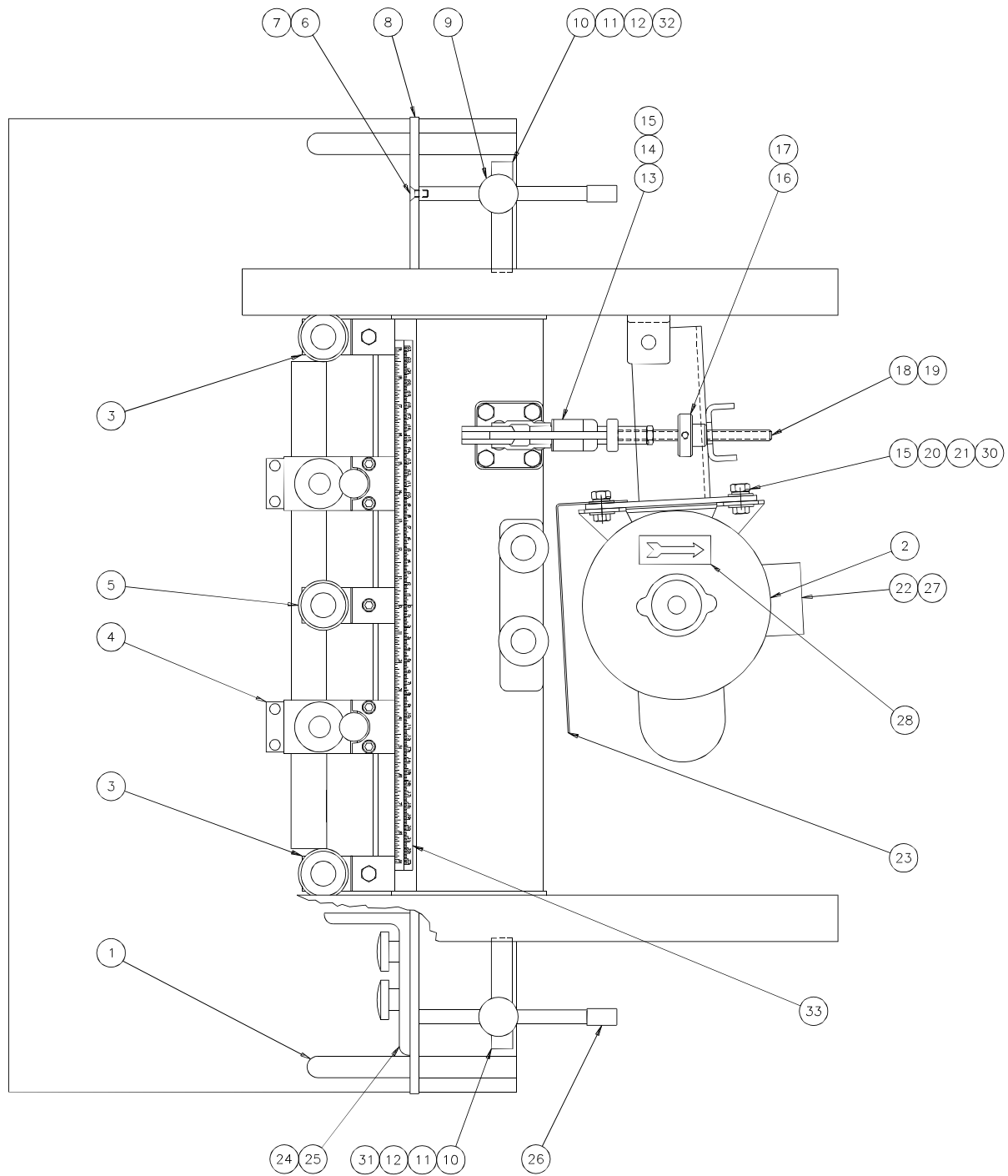
## Main Assembly – Side Elevation – Parts List (cont)

45000 Rev. X

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES               | QTY |
|-----|---------------|--|-----|
| 84  | EE-2751-1     | CONDUIT ASM - CONTROL CONSOLE - 3PH      | REF |
| 84  | EE-2751       | CONDUIT ASM - CONTROL CONSOLE - 1PH      | REF |
| 85  | S-1694-5      | TYRAP - IDENTIFICATION                   | 2   |
| 86  | S-1781-46     | LABEL - BELT INSTALLATION                | 1   |
| 87  | H-6910-102406 | SCREW - #10-24 X 3/4 BUT HD SOC          | 6   |
| 88  |               |  |     |
| 89  | S-1781-42     | LABEL - GROUND                           | 1   |
| 90  | H-7321-#10    | WASHER - #10 PLAIN                       | 2   |
| 91  | S-1781-47     | LABEL - FUSE REPLACEMENT                 | 1   |
| 92  | E-1152-62     | SPACER                                   | 2   |
| 93  | H-6416-102412 | WELDNUT                                  | 1   |
| 94  | H-6416-102406 | WELDNUT                                  | 1   |
| 95  | H-7321-5      | 5/16 FLAT WASHER (3 PH MACHINES ONLY)    | 6   |
| 96  | H-6888-102404 | SCREW - #10-24 X 1/2 BUT HD, TAMP. PROOF | 4   |
| 97  | 45180         | ACTUATOR - INTERLOCK SWITCH              | 1   |
| 98  | 45179         | MAGNETIC CATCH                           | 2   |
| 99  | H-6923-44012  | SCREW - #4-40 X 3/4 ROUND HD. MACH       | 2   |
| 100 | H-7324-#4     | WASHER - #4 INT. TOOTH                   | 2   |
| 101 | H-6423-#4     | NUT - #4-40 HEX                          | 2   |
| 102 | A-10644-1     | COLLAR                                   | 4   |

### 5.3 Main Assembly – Top View

45000 Sheet 3 Rev. G



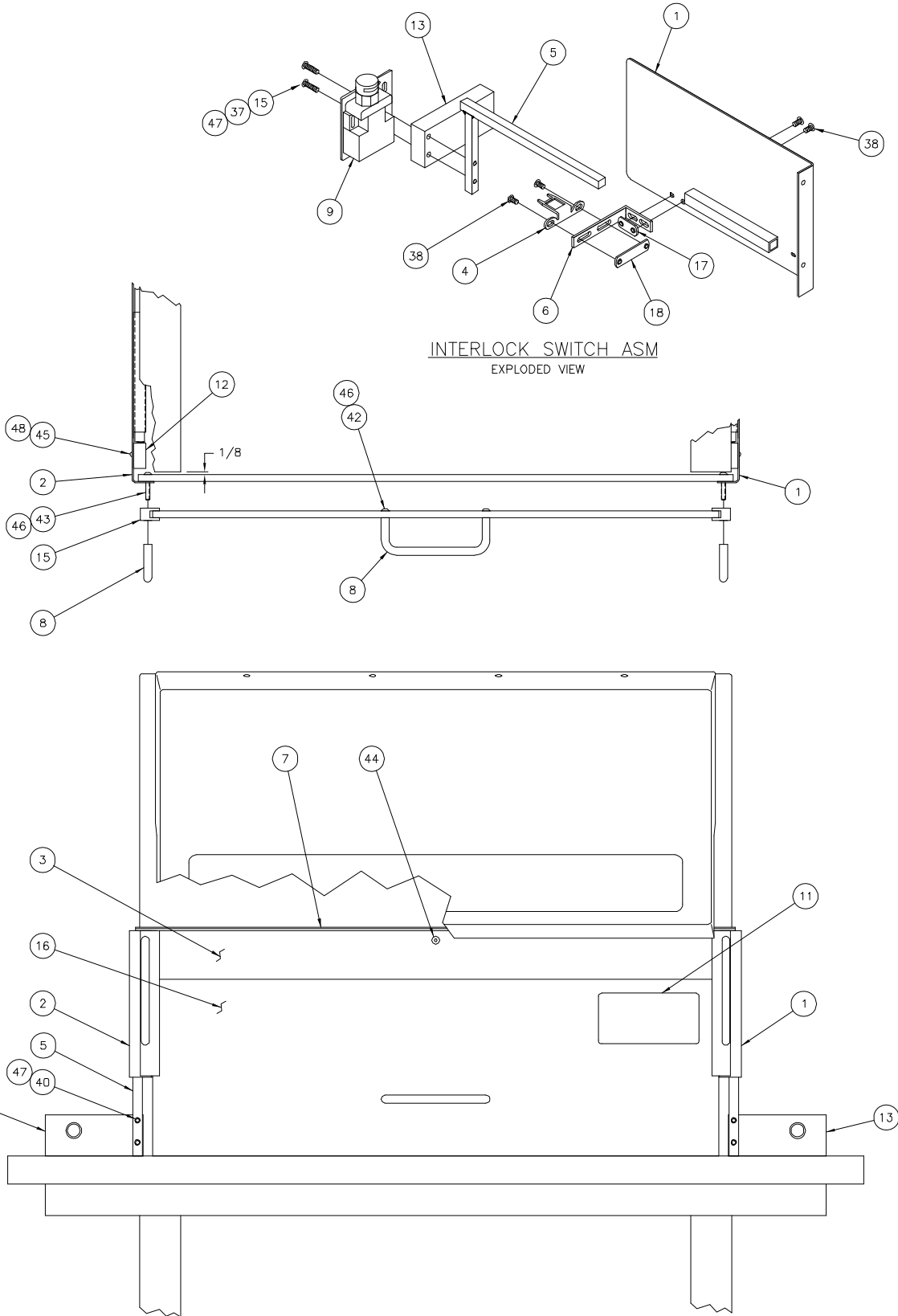
## Main Assembly – Top View – Parts List

45000 Rev. G

| NO. | PART NO.   | DESCRIPTION OF ACCESSORIES             | QTY                |
|-----|------------|--|--------------------|
| 1   | 4636-3     | SCALE - B/G POSITION                   | 2                  |
| 2   | S-1781-12  | CAUTION LABEL                          | 1                  |
| 3   | 45035      | IDLER ASSEMBLY - STATIONARY            | 2                  |
| 4   | 45152      | DRILL HEAD ASSEMBLY                    | AS REQ'D           |
| 5   | 45161      | IDLER ASSEMBLY - MOVEABLE              | 1 FOR STD HEADS    |
|     |            |  | 2 FOR NARROW HEADS |
| 6   | H-6909-405 | 1/4-20 X 5/8 FLAT HD SOC CAP SCREW     | 2                  |
| 7   | 45018      | ROD - B/G GUIDE                        | 2                  |
| 8   | 45020      | BACKGAUGE                              | 1                  |
| 9   | 8278-3     | KNOB                                   | 2                  |
| 10  | 45019      | BLOCK - BACKGAGE GUIDE (60 Hz.)        | 2                  |
| 11  | H-6913-614 | 3/8-16 X 1-3/4 HEX HD CAP SCREW        | 4                  |
| 12  | H-7321-6   | 3/8 FLAT WASHER                        | 4                  |
| 13  | 45006      | CLAMP                                  | 1                  |
| 14  | H-6913-506 | 5/16-18 X 3/4 HEX HD CAP SCREW         | 4                  |
| 15  | H-7327-10  | 5/16 MED. LOCKWASHER                   | 8                  |
| 16  | 45060      | KNOB - BELT TENSIONER                  | 1                  |
| 17  | H-6964-404 | 1/4-20 X 1/4 SOC SET SCREW (BRASS TIP) | 1                  |
| 18  | 45059      | STUD - BELT TENSIONER                  | 1                  |
| 19  | H-6423-6   | 3/8-16 HEX NUT                         | 1                  |
| 20  | H-7321-5   | 5/16 FLAT WASHER                       | 4                  |
| 21  | H-6423-5   | 5/16-18 HEX NUT                        | 4                  |
| 22  | E-1600-191 | MOTOR (208-230/460 V. 3 PH. 60 C.)     | 1                  |
| 22  | E-1600-192 | MOTOR (208-230 V. 1 PH. 60 C.)         | 1                  |
| 22  | E-1600-189 | MOTOR (200-230/380-415 V. 3 PH. 50 C.) | 1                  |
| 22  | E-1600-190 | MOTOR (208-230 V. 1 PH. 50 C.)         | 1                  |
| 23  | 45146      | BRACKET - CHIP DEFLECTOR               | 1                  |
| 24  | 45066      | SIDEGUIDE                              | 2                  |
| 25  | 8278-4     | KNOB                                   | 4                  |
| 26  | 45143      | VINYL CAP                              | 2                  |
| 27  | E-1237-1   | WIRE NUT (YELLOW)                      | 3                  |
| 28  | S-1106     | ARROW DECAL                            | 1                  |
| 29  | 45106-1    | TOOL KIT (NOT SHOWN)                   | 1                  |
| 30  | H-6913-508 | 5/16-18 X 1" HEX HD CAP SCREW          | 4                  |
| 31  | 45019-1    | BLOCK - BACKGAGE GUIDE, R.H. (50 Hz.)  | 1                  |
| 32  | 45019-2    | BLOCK - BACKGAGE GUIDE, L.H. (50 Hz.)  | 1                  |
| 33  | 45065-1    | SCALE                                  | 1                  |

# 5.4 Main Assembly – Spindle Guard (S/N's 135928 and up)

45000 Sheet 4 Rev. G



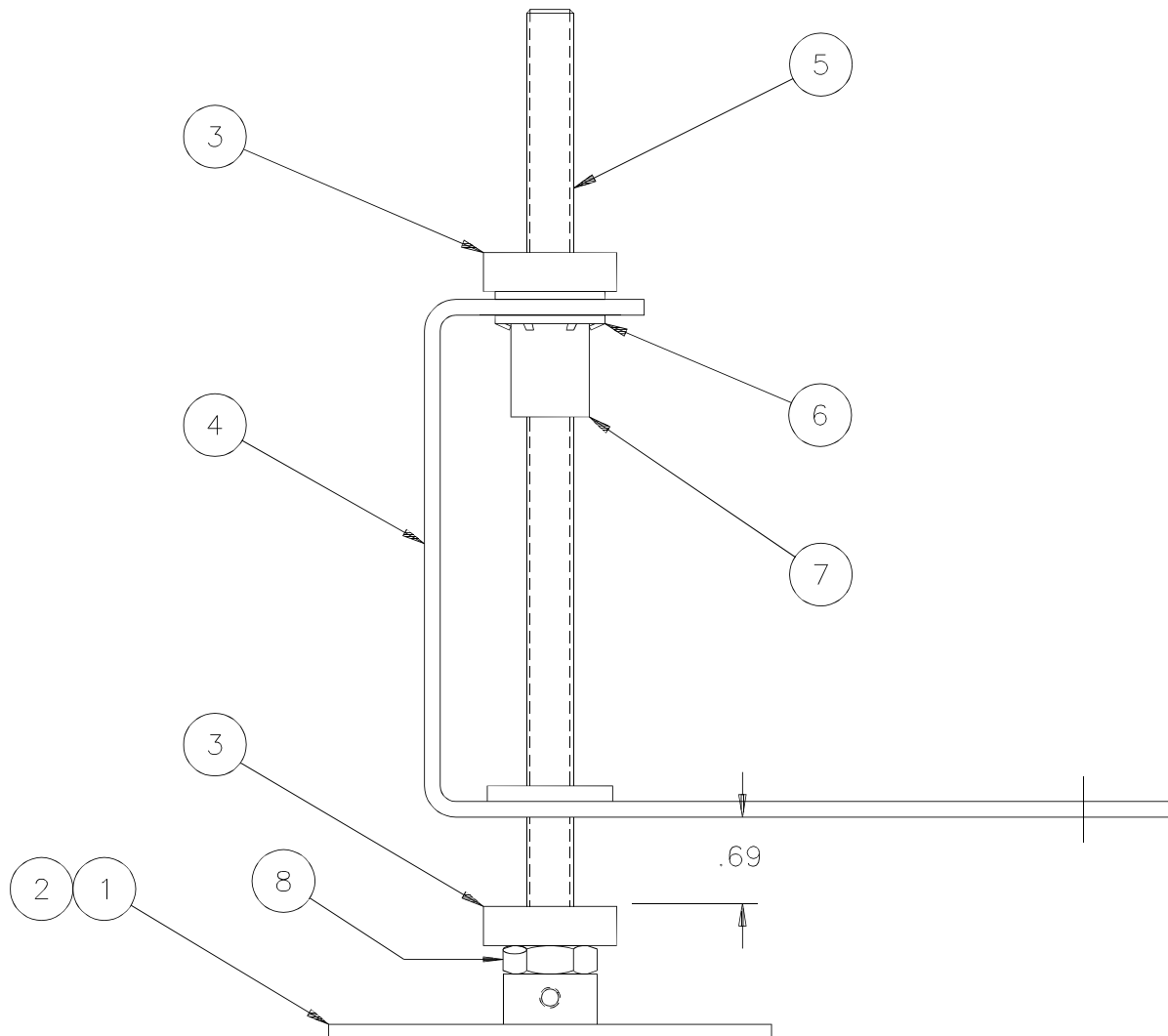
## Main Assembly – Spindle Guard – Parts List

45000 Rev. G

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES               | QTY |
|-----|---------------|--|-----|
| 1   | 45169-1       | GUARD - R.H. SIDE                        | 1   |
| 2   | 45170         | GUARD - L.H. SIDE                        | 1   |
| 3   | 45171         | GUARD - CENTER                           | 1   |
| 4   | 45180         | ACTUATOR - INTERLOCK SWITCH              | 1   |
| 5   | 45174         | SUPPORT - SPINDLE GUARD                  | 2   |
| 6   | 45175-1       | BRACKET - GUARD INTERLOCK KEY            | 1   |
| 7   | 45177         | SUPPORT - SHIELD                         | 1   |
| 8   | 13940         | HANDLE                                   | 3   |
| 9   | EE-2750-1     | SWITCH ASM - TABLE                       | REF |
| 10  |               |  |     |
| 11  | S-1781-16     | WARNING LABEL                            | 1   |
| 12  | 45179         | CATCH - MAGNETIC                         | 2   |
| 13  | 45019-1       | BLOCK - BACKGAGE GUIDE, R.H.             | 1   |
| 14  | 45019-2       | BLOCK - BACKGAGE GUIDE, L.H.             | 1   |
| 15  | 45186         | GUARD MOUNT                              | 2   |
| 16  | 45185         | GUARD - LOWER                            | 1   |
| 17  | H-6416-102406 | WELDNUT                                  | 1   |
| 18  | H-6416-102412 | WELDNUT                                  | 1   |
|     |               |  |     |
| 37  | H-6910-102410 | SCREW - #10-24 X 1-1/4 BUT HD CAP        | 2   |
| 38  | H-6888-102404 | SCREW - #10-24 X 1/2 BUT HD, TAMP. PROOF | 4   |
| 39  | H-6918-102408 | SCREW - #10-24 X 1" SOC HD CAP           | 2   |
| 40  | H-6918-102410 | SCREW - #10-24 X 1-1/4 SOC HD CAP        | 2   |
| 41  | H-6910-102404 | SCREW - #10-24 X 1/2 BUT. HD             | 2   |
| 42  | H-6910-83204  | SCREW - #8-32 X 1/2" BUT HD CAP          | 2   |
| 43  | H-6910-83210  | SCREW - #8-32 X 1-1/4" BUT HD CAP        | 4   |
| 44  | H-6910-83203  | SCREW - #8-32 X 3/8 BUT HD SOC           | 1   |
| 45  | H-6923-44012  | SCREW - #4-40 X 3/4 ROUND HD. MACH.      | 2   |
| 46  | H-7324-#8     | WASHER - #8 INT. TOOTH                   | 6   |
| 47  | H-7324-#10    | WASHER - #10 INT. TOOTH                  | 4   |
| 48  | H-6423-#4     | NUT - #4-40 HEX                          | 2   |

## 5.5 Table Adjustment Assembly

45136-1 Rev. C



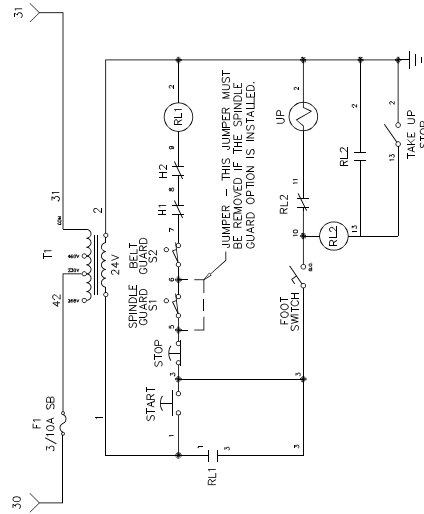
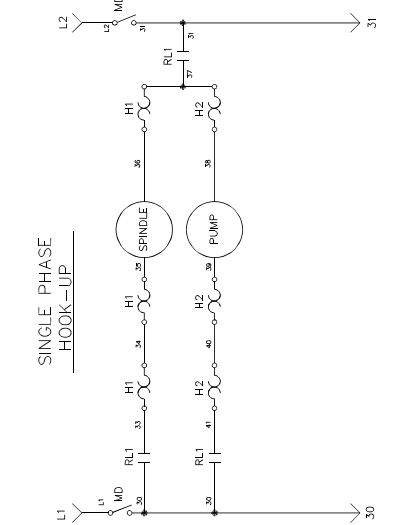
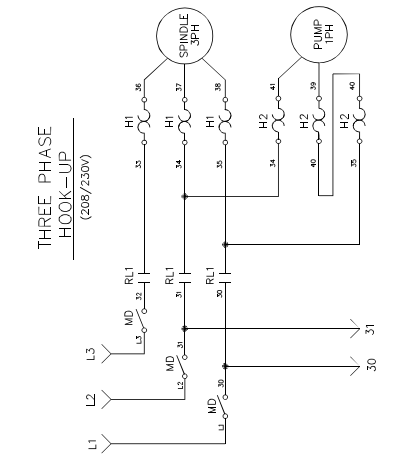
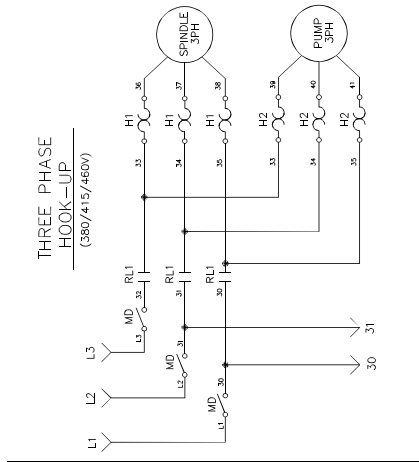
| NO. | PART NO.     | DESCRIPTION OF ACCESSORIES        | QTY |
|-----|--------------|-----------------------------------|-----|
| 1   | 45139-1      | SPROCKET                          | 1   |
| 2   | H-6938-83204 | #8-32 X 1/4 CUP PT. SOC SET SCREW | 2   |
| 3   | S-1818-4     | COLLAR - THREADED                 | 2   |
| 4   | 45122-1      | BRACKET                           | 1   |
| 5   | 45008-1      | ROD                               | 1   |
| 6   | H-6450-62    | PUSH ON RETAINING RING            | 1   |
| 7   | A-10257-10   | BEARING - FLANGED                 | 1   |
| 8   | H-6424-6     | NUT - 3/8-16 HEX JAM              | 1   |



**NOTES**

# 5.6 Basic Machine Schematic

E-2384-1 Rev. B



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## Electrical Sequence of Operation

NOTE: Please see section on Hydraulic Sequence of Operation for more details

### Electrical Sequence of Operation

A. Close the main disconnect switch (MD).

B. Press the ON button (START)

C. Press the footswitch (FOOTSWITCH).

### Electrical Schematic References

(Drawing E-2384-1)

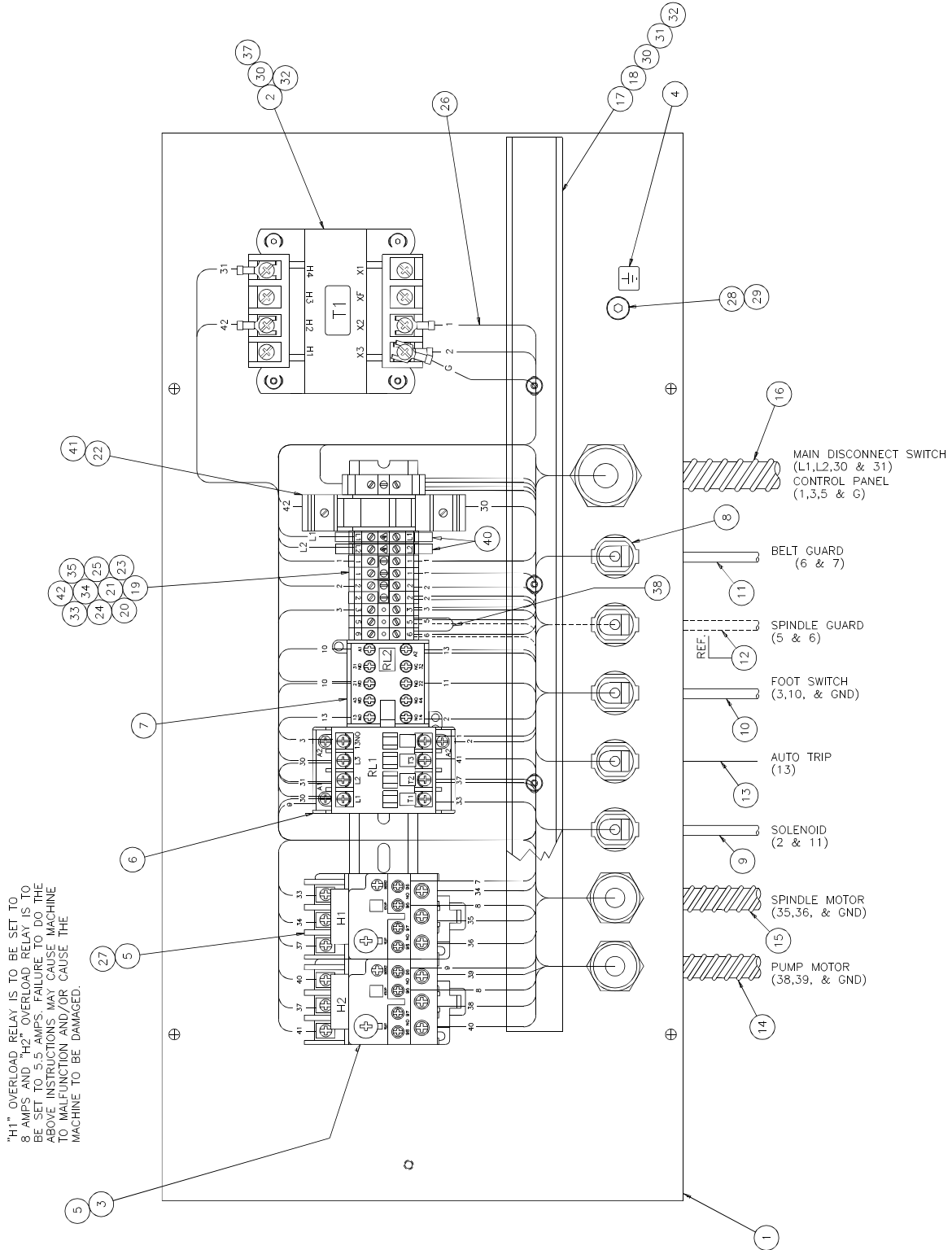
While the main disconnect switch "MD" is closed. Power is brought to the transformer "T1", provided the fuse "F1" is conductive. Transformer "T1" provides power to the hydraulic motor and spindle motor contactors "RL1. Until power is applied thru the transformer "T1" the contactors are open and therefore the motors will not run. Opening the main disconnect switch "MD" at any time cuts power to the transformer "T1".

When the Start switch is closed, the hydraulic motor and spindle motor relay coil "RL1" will energize, provided the interlock switches "S1" and "S2" are closed. Power is then supplied to the hydraulic and spindle motors. "RL1" remains energized until the STOP switch or any interlock switch is opened.

While the FOOTSWITCH switch is closed, power is brought to the UP solenoid, which raises the table. When the table reaches the top, the TAKE UP STOP switch closes, causing the relay coil of "RL2" to energize. While "RL2" is energized, The UP solenoid becomes de-energized, which lowers the table. Opening the FOOTSWITCH switch de-energizes "RL2" and the UP solenoid.

# 5.7 Power Panel Assembly – 208/230V (1ph)

EE-2385-3 Rev. E



Power Panel Assembly – 208/230V (1ph) Parts List  
EE-2385-3 Rev. E

| NO. | PART NO.  | DESCRIPTION OF ACCESSORIES              | QTY |
|-----|-----------|---|-----|
| 1   | 45119-1   | PANEL - ELECTRICAL                      | 1   |
| 2   | E-1089-40 | TRANSFORMER - 208/230/460 75VA          | 1   |
| 3   | E-2441-14 | RELAY - OVERLOAD, 4.5A to 6.5A (H2)     | 1   |
| 4   | S-1781-42 | LABEL - MAIN GROUND                     | 1   |
| 5   | E-2445-1  | BRACKET - OVERLOAD RELAY                | 2   |
| 6   | E-2805    | STARTER - 24V COIL (A16-30-10-16) (RL1) | 1   |
| 7   | E-2403-8  | RELAY - RL2                             | 1   |
| 8   | S-1350-16 | STRAIN RELIEF                           | 5   |
| 9   | EE-2396-1 | CABLE ASSEMBLY - SOLENOID               | 1   |
| 10  | E-875-4   | FOOTSWITCH - SINGLE SWITCH              | 1   |
| 11  | EE-2749-1 | CABLE ASSEMBLY - SWITCH, BELT GUARD     | 1   |
| 12  | EE-2750-1 | CABLE ASm. - SWITCH, SPINDLE GUARD      | REF |
| 13  | EE-2425   | WIRE ASSEMBLY - AUTO TRIP               | 1   |
| 14  | EE-2392   | CONDUIT ASSEMBLY - PUMP MOTOR           | 1   |
| 15  | EE-2393   | CONDUIT ASSEMBLY - SPINDLE MOTOR        | 1   |
| 16  | EE-2751   | CONDUIT ASSEMBLY - CONT. PNL. & MD SW   | 1   |
| 17  | E-1429-13 | WIRING DUCT ( 18" LONG)                 | 1   |
| 18  | E-2719-10 | WIRING DUCT COVER ( 16-1/4" LONG)       | 1   |
| 19  | E-1977-17 | RAIL - MOUNTING (12-1/2" LONG)          | 1   |
| 20  | E-2068-3  | TERMINAL BLOCK - GROUND                 | 1   |
| 21  | E-2068-8  | TERMINAL BLOCK - FEED THROUGH           | 9   |
| 22  | E-1974-10 | TERMINAL BLOCK - MIDGET FUSE HOLDER     | 1   |
| 23  | E-2507-2  | FIXED BRIDGE - 2 POLE                   | 2   |

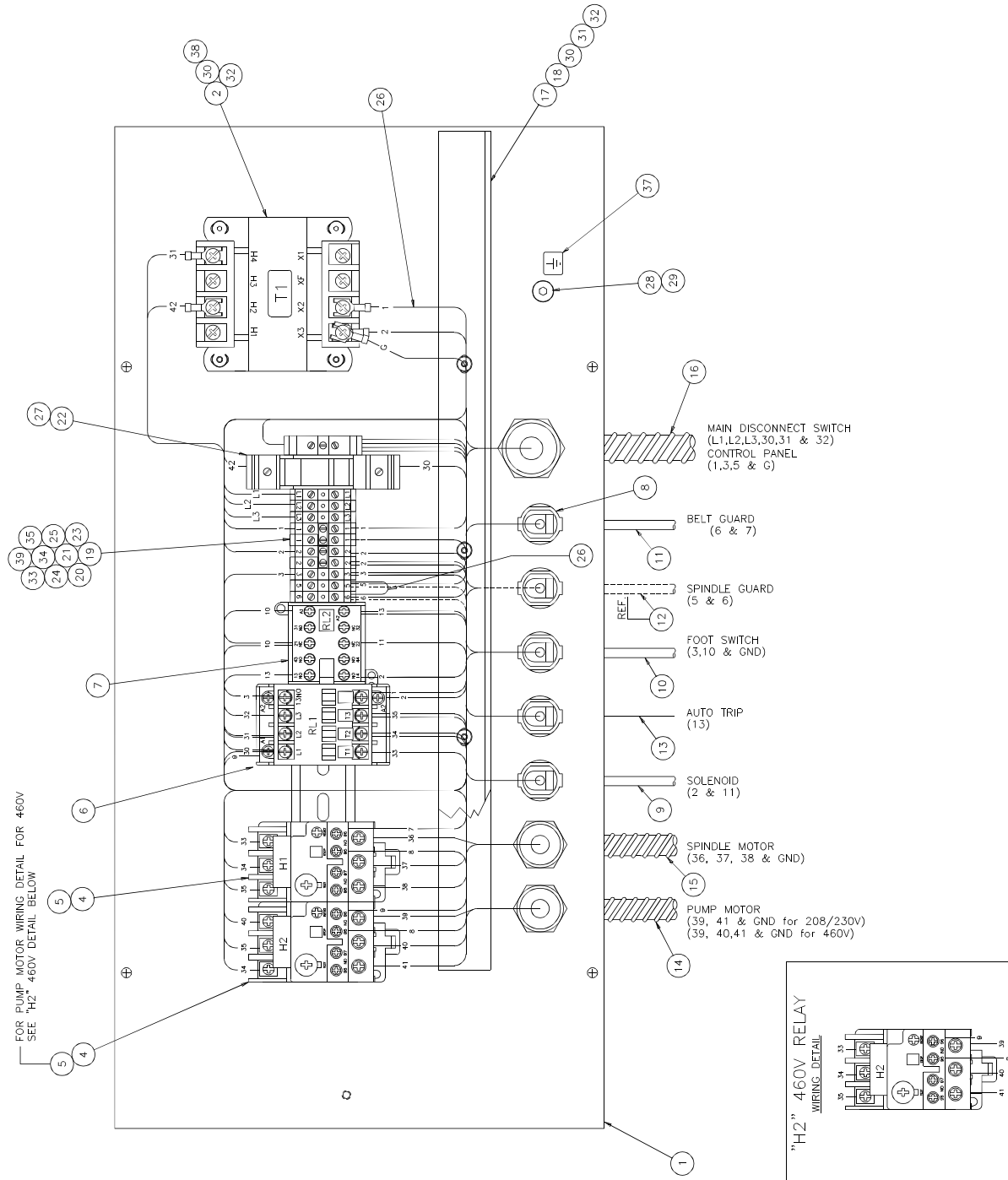
Power Panel Assembly – 208/230V (1ph) Parts List (cont.)  
 EE-2385-3 Rev. E

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES           | QTY |
|-----|---------------|--------------------------------------|-----|
| 24  | E-1356-107    | LABEL - TERMINAL BLOCK               | 1   |
| 25  | E-1356-108    | LABEL - TERMINAL BLOCK               | 1   |
| 26  | EE-3122       | WIRES - CUT LIST (208/230V 1PH)      | 1   |
| 27  | E-2441-15     | RELAY - OVERLOAD, 6.0A to 8.5A (H1)  | 1   |
| 28  | H-6910-403    | SCREW - 1/4-20 x 3/8 BUT HD SOC CAP  | 1   |
| 29  | H-7324-8      | WASHER - 1/4" INT. TOOTHLOCK         | 1   |
| 30  | H-6910-83204  | SCREW - #8-32 X 1/2" BUT HD SOC CAP  | 8   |
| 31  | H-7321-#8     | WASHER - #8 USS FLAT                 | 4   |
| 32  | H-7330-#8     | LOCKWASHER - #8 SHAKEPROOF           | 8   |
| 33  | H-6910-102403 | SCREW - #10-24 X 3/8" BUT HD SOC CAP | 4   |
| 34  | H-7330-#10    | LOCKWASHER - #10                     | 4   |
| 35  | H-7321-#10    | WASHER - #10 USS FLAT                | 4   |
| 36  | S-1694        | TYRAP ( NOT SHOWN )                  | 2   |
| 37  | E-1584-51     | LABEL - TRANSFORMER "T1"             | 1   |
| 38  | E-709-R       | WIRE - #18 GA. RED MTW 4" LONG       | 1   |
| 39  |               |                                      |     |
| 40  | E-2752        | COVER - TERMINAL BLOCK, YELLOW       | 2   |
| 41  | E-2308-9      | FUSE - MIDGET, 3/10A SLO-BLO         | 1   |
| 42  | E-2864        | SEPERATOR PLATE - TERMINAL BLOCK     | 1   |

**NOTES**

# 5.8 Power Panel Assembly – 208/230/460V (3ph)

EE-2386-3 Rev. F





Power Panel Assembly – 208/230/460V (3ph) Parts List  
 EE-2386-3 Rev. F

| NO. | PART NO.   | DESCRIPTION OF ACCESSORIES               | QTY |
|-----|------------|--|-----|
| 1   | 45119-1    | PANEL - ELECTRICAL                       | 1   |
| 2   | E-1089-40  | TRANSFORMER - 208/230/460 75VA           | 1   |
| 3   |            |  |     |
| 4   | E-2441-14  | RELAY - OVERLOAD (H1 & H2), 4.5A to 6.5A | 2   |
| 5   | E-2445-1   | BRACKET - OVERLOAD RELAY                 | 2   |
| 6   | E-2805     | STARTER - 24V COIL (A16-30-10-81) (RL1)  | 1   |
| 7   | E-2403-8   | RELAY - RL2                              | 1   |
| 8   | S-1350-16  | STRAIN RELIEF                            | 5   |
| 9   | EE-2396-1  | CABLE ASSEMBLY - SOLENOID                | 1   |
| 10  | E-875-4    | FOOTSWITCH - SINGLE SWITCH               | 1   |
| 11  | EE-2749-1  | CABLE ASSEMBLY - SWITCH, BELT GUARD      | 1   |
| 12  | EE-2750-1  | CABLE ASSEMBLY - SWITCH, SPINDLE GUARD   | REF |
| 13  | EE-2425    | WIRE ASSEMBLY - AUTO TRIP                | 1   |
|     | EE-2392-2  | CONDUIT ASSEMBLY - PUMP MOTOR (230V 1PH) |     |
| 14  | EE-2392-1  | CONDUIT ASSEMBLY - PUMP MOTOR (460V 3PH) | 1   |
| 15  | EE-2393-1  | CONDUIT ASSEMBLY - SPINDLE MOTOR         | 1   |
| 16  | EE-2751-1  | CONDUIT ASSEMBLY - CONT. PNL. & MD SW    | 1   |
| 17  | E-1429-13  | WIRING DUCT ( 18" LONG)                  | 1   |
| 18  | E-2719-10  | WIRING DUCT COVER ( 16-1/4" LONG)        | 1   |
| 19  | E-1977-17  | RAIL - MOUNTING (12-1/2" LONG)           | 1   |
| 20  | E-2068-3   | TERMINAL BLOCK - GROUND                  | 1   |
| 21  | E-2068-8   | TERMINAL BLOCK - FEED THROUGH            | 10  |
| 22  | E-1974-10  | TERMINAL BLOCK - MIDGET FUSE HOLDER      | 1   |
| 23  | E-2507-2   | FIXED BRIDGE - 2 POLE                    | 2   |
| 24  | E-1356-105 | LABEL - TERMINAL BLOCK                   | 1   |
| 25  | E-1356-106 | LABEL - TERMINAL BLOCK                   | 1   |
| 26  | EE-3121    | WIRES - CUT LIST (208/230V 3PH)          | 1   |
| 27  | E-2308-9   | FUSE - MIDGET, 3/10A SLO-BLO             | 1   |
| 28  | H-6910-403 | SCREW - 1/4-20 x 3/8 BUT HD SOC CAP      | 1   |

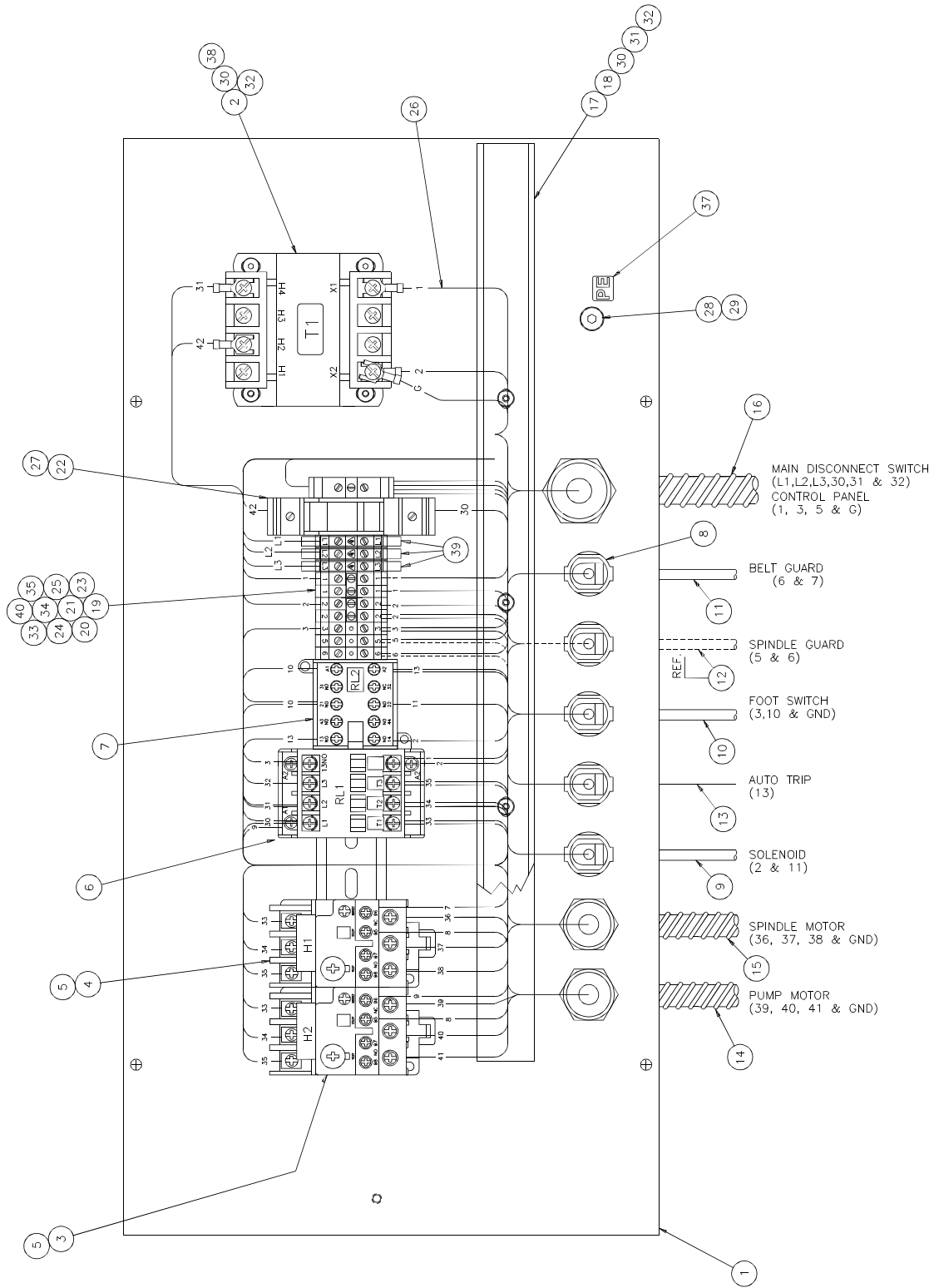
Power Panel Assembly – 208/230/460V (3ph) Parts List (cont)  
 EE-2386-3 Rev. F

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES           | QTY |
|-----|---------------|--------------------------------------|-----|
| 29  | H-7324-8      | WASHER - 1/4" INT. TOOTHLOCK         | 1   |
| 30  | H-6910-83204  | SCREW - #8-32 X 1/2" BUT HD SOC CAP  | 8   |
| 31  | H-7321-#8     | WASHER - #8 USS FLAT                 | 4   |
| 32  | H-7330-#8     | LOCKWASHER - #8 SHAKEPROOF           | 8   |
| 33  | H-6910-102403 | SCREW - #10-24 X 3/8" BUT HD SOC CAP | 4   |
| 34  | H-7330-#10    | LOCKWASHER - #10                     | 4   |
| 35  | H-7321-#10    | WASHER - #10 USS FLAT                | 4   |
| 36  | S-1694        | TYRAP ( NOT SHOWN )                  | 2   |
| 37  | S-1781-42     | LABEL - MAIN GROUND                  | 1   |
| 38  | E-1584-51     | LABEL - TRANSFORMER "T1"             | 1   |
| 39  | E-2864        | SEPERATOR PLATE - TERMINAL BLOCK     | 1   |

**NOTES**

# 5.9 Power Panel Assembly – 380/415V (3ph)

EE-2369-3 REV. "D"



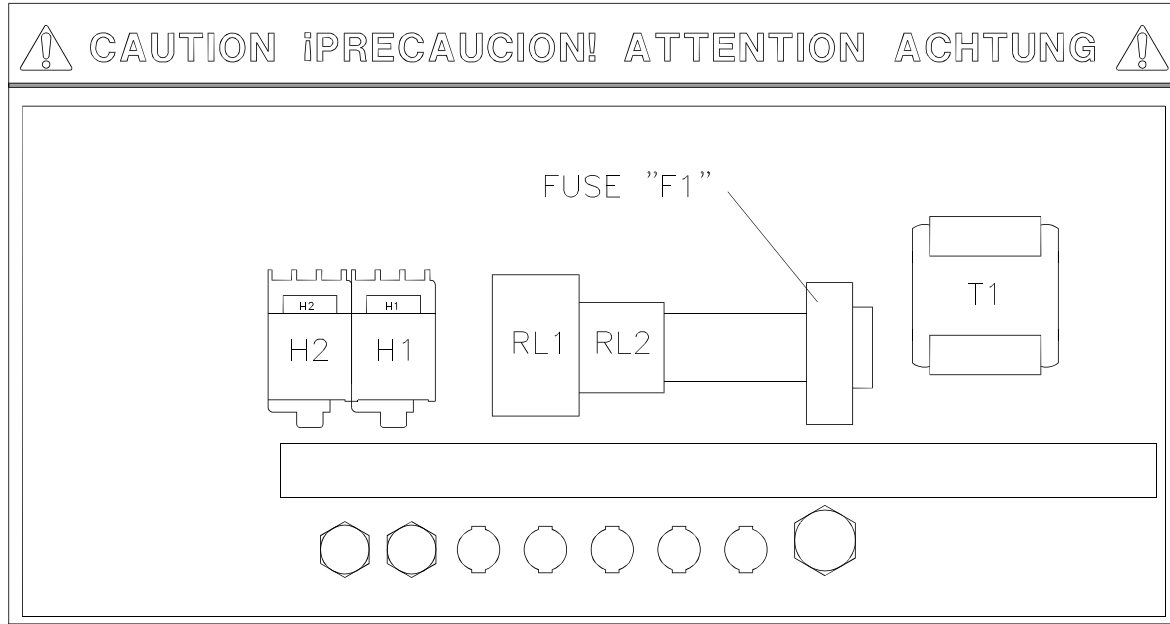
### Power Panel I Assembly – 380/415V (3ph) Parts List

EE-2369-3 REV. "D"

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES                    | QTY |
|-----|---------------|---|-----|
| 1   | 45119-1       | PANEL - ELECTRICAL                            | 1   |
| 2   | E-1089-39     | TRANSFORMER - 230/380/415 50VA                | 1   |
| 3   | E-2441-17     | RELAY - OVERLOAD (PUMP), 1.3A to 1.8A (H2)    | 1   |
| 4   | E-2441-16     | RELAY - OVERLOAD (SPINDLE), 2.2A to 3.1A (H1) | 1   |
| 5   | E-2445-1      | BRACKET - OVERLOAD RELAY                      | 2   |
| 6   | E-2805        | STARTER - 24V COIL (A16-30-10-81) (RL1)       | 1   |
| 7   | E-2403-8      | RELAY - RL2                                   | 1   |
| 8   | S-1350-16     | STRAIN RELIEF                                 | 5   |
| 9   | EE-2396-1     | CABLE ASSEMBLY - SOLENOID                     | 1   |
| 10  | E-875-4       | FOOTSWITCH - SINGLE SWITCH                    | 1   |
| 11  | EE-2749-1     | CABLE ASSEMBLY - SWITCH, BELT GUARD           | 1   |
| 12  | EE-2750-1     | CABLE ASSEMBLY - SWITCH, SPINDLE GUARD        | REF |
| 13  | EE-2425       | WIRE ASSEMBLY - AUTO TRIP                     | 1   |
| 14  | EE-2392-1     | CONDUIT ASSEMBLY - PUMP MOTOR                 | 1   |
| 15  | EE-2393-1     | CONDUIT ASSEMBLY - SPINDLE MOTOR              | 1   |
| 16  | EE-2751-1     | CONDUIT ASSEMBLY - CONT. PNL. & MD SW         | 1   |
| 17  | E-1429-13     | WIRING DUCT ( 18" LONG)                       | 1   |
| 18  | E-2719-10     | WIRING DUCT COVER ( 16-1/4" LONG)             | 1   |
| 19  | E-1977-17     | RAIL - MOUNTING (12-1/2" LONG)                | 1   |
| 20  | E-2068-3      | TERMINAL BLOCK - GROUND                       | 1   |
| 21  | E-2068-8      | TERMINAL BLOCK - FEED THROUGH                 | 10  |
| 22  | E-1974-10     | TERMINAL BLOCK - MIDGET FUSE HOLDER           | 1   |
| 23  | E-2507-2      | FIXED BRIDGE - 2 POLE                         | 2   |
| 24  | E-1356-105    | LABEL - TERMINAL BLOCK                        | 1   |
| 25  | E-1356-106    | LABEL - TERMINAL BLOCK                        | 1   |
| 26  | EE-3121       | WIRES - CUT LIST                              | 1   |
| 27  | E-2308-9      | FUSE - MIDGET, 3/10A SLO-BLO                  | 1   |
| 28  | H-6910-403    | SCREW - 1/4-20 x 3/8 BUT HD SOC CAP           | 1   |
| 29  | H-7324-8      | WASHER - 1/4" INT. TOOTHLOCK                  | 1   |
| 30  | H-6910-83204  | SCREW - #8-32 X 1/2" BUT HD SOC CAP           | 8   |
| 31  | H-7321-#8     | WASHER - #8 USS FLAT                          | 4   |
| 32  | H-7330-#8     | LOCKWASHER - #8 SHAKEPROOF                    | 8   |
| 33  | H-6910-102403 | SCREW - #10-24 X 3/8" BUT HD SOC CAP          | 4   |
| 34  | H-7330-#10    | LOCKWASHER - #10                              | 4   |
| 35  | H-7321-#10    | WASHER - #10 USS FLAT                         | 4   |
| 36  | S-1694        | TYRAP ( NOT SHOWN )                           | 2   |
| 37  | S-1781-45     | LABEL - "PE" PROTECTED EARTH                  | 1   |
| 38  | E-1584-51     | LABEL - TRANSFORMER "T1"                      | 1   |
| 39  | E-2752        | COVER - TERMINAL BLOCK, YELLOW                | 3   |
| 40  | E-2864        | SEPERATOR PLATE - TERMINAL BLOCK              | 1   |

### 5.10 Label – Component Placement/Heater settings

S-1781-47 Rev. B



**CAUTION:** FIRE HAZARD, REPLACE ONLY WITH SAME TYPE AND RATING FUSE.



|    | VALUE<br>CLASSEMENT<br>CLASIFICACIÓN<br>WERT | DIMENSION<br>(INCHES) | PART NUMBER<br>ARTICLE NUMBRE<br>ARTÍCULO NÚMERO<br>TEIL ZAHL |
|----|--|-----------------------|---|
| F1 | .3AMP T                                      | 13/32x1-1/2           | E-2308-9  |

| HEATER SWITCH SETTING SPECIFICATIONS CHART |              |          |                       |
|--|--------------|----------|-----------------------|
| RELAY                                      | PHASE        | VOLTAGE  | HEATER SWITCH SETTING |
| H1   | SINGLE PHASE | 208/230V | 8 AMPS                |
| H1   | 3 PHASE      | 208/230V | 4 AMPS                |
| H1   | 3 PHASE      | 460V     | 2.5 AMPS              |
| H1   | 3 PHASE      | 380/415V | 2.88 AMPS             |
| H2   | SINGLE PHASE | 208/230V | 5.5 AMPS              |
| H2   | 3 PHASE      | 208/230V | 2.5 AMPS              |
| H2   | 3 PHASE      | 460V     | 1.6 AMP               |
| H2   | 3 PHASE      | 380/415V | 1.3 AMPS              |

MS5 DRILL

S-1781-47

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## Hydraulic Sequence of Operation

NOTE: Please see section on Electrical Sequence of Operation for more details

### Hydraulic Sequence of Operation

A. Pump relay is energized providing power to the hydraulic motor.

B. Energize the UP solenoid (the table is sent up).

C. De-energize the UP solenoid (the table is sent down).

### Hydraulic Schematic References

(drawings H-378-2 and H-407-2)

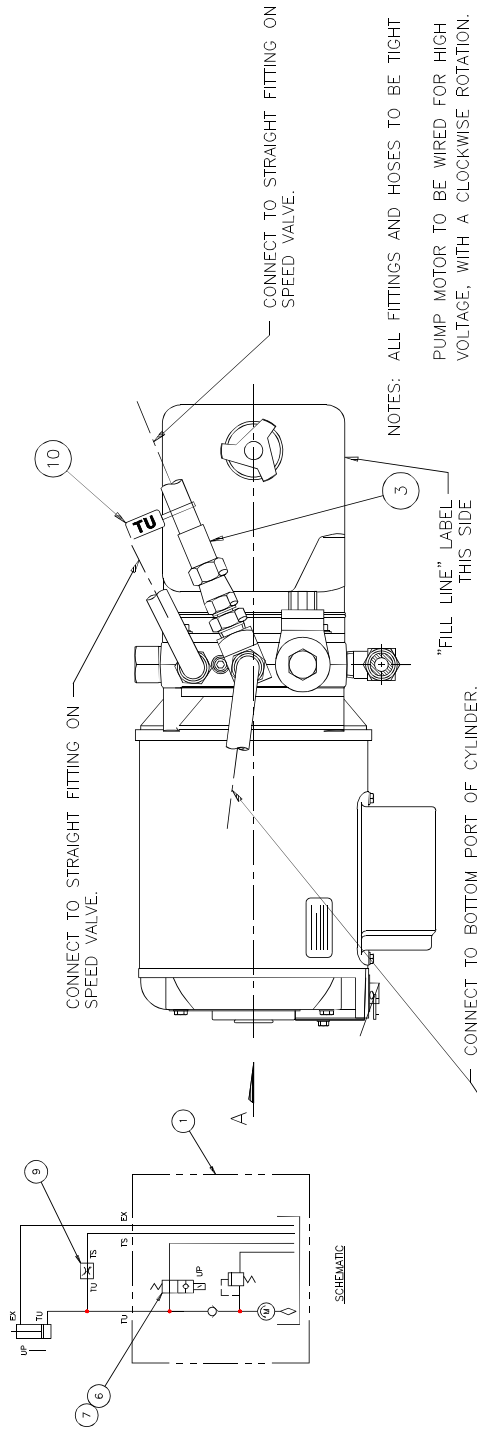
Once the pump relay “RL1” is energized, the hydraulic motor runs with the UP solenoid de-energized. This allows oil to flow through the UP solenoid valve (item #6) and back to tank. The table remains in the down position.

When the UP solenoid is energized, oil stops flowing through the UP solenoid valve (item #6) and flows to the table up (TU) port of the table speed adjustment valve (item #9) and to the table up (TU) port of the cylinder. Oil exits the table speed adjustment valve (item #9) through the table speed (TS) port and then returns to tank. The amount of oil that flows through the valve affects how much oil flows to the cylinder piston. As the piston moves up, excess oil in the cylinder is forced out the excess (EX) cylinder port and back to tank.

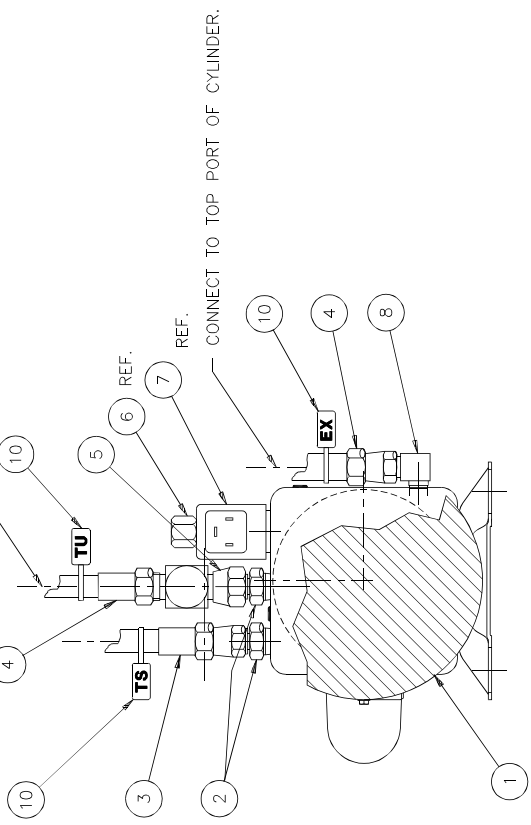
When the UP solenoid is de-energized, oil from the pump flows freely through the UP solenoid valve (item #6) and back to the tank. This allows oil to flow out of the cylinder through the table up (TU) cylinder port, through the UP solenoid valve (item #6) and back to the tank. Two springs force the piston down. The pump relay “RL1” remains energized.

# 5.11 Hydraulic Power Unit – Single and Three Phase

H-378-2 Rev. A (50/60Hz 1ph)  
H-407-2 Rev. A (50/60Hz 3ph)



| NO. | PART NO.  | DESCRIPTION OF ACCESSORIES              | QTY |
|-----|-----------|---|-----|
| 1   | H-372-2   | HYD. POWER UNIT – 208/230V 50/60C 1PH   | 1   |
| 2   | H-405-2   | HYD. POWER UNIT – 230/460V 60C 3PH      | 2   |
| 3   | H-241-6   | ADAPTER – 3/8 NPT TO 9/16 TUBE          | 2   |
| 4   | H-242-10  | HYDRAULIC HOSE ASSEMBLY 39" LONG        | 2   |
| 5   | H-242-41  | HYDRAULIC HOSE ASSEMBLY 25" LONG        | 2   |
| 6   | H-553     | TEE – SWIVEL RUN – TUBE (1PH UNIT ONLY) | 1   |
| 7   | H-263-2   | TEE (3PH UNIT ONLY)                     | REF |
| 8   | H-200-5   | SOLENOID CARTRIDGE                      | REF |
| 9   | E-1069-17 | COIL                                    | REF |
| 10  | H-237-4   | ELBOW – 1/4 NPT TO 9/16 TUBE            | 1   |
| 11  | H-4771-1  | TABLE SPEED ADJUSTMENT VALVE            | REF |
| 12  | S-1694-5  | TYRAP – IDENTIFICATION                  | 4   |

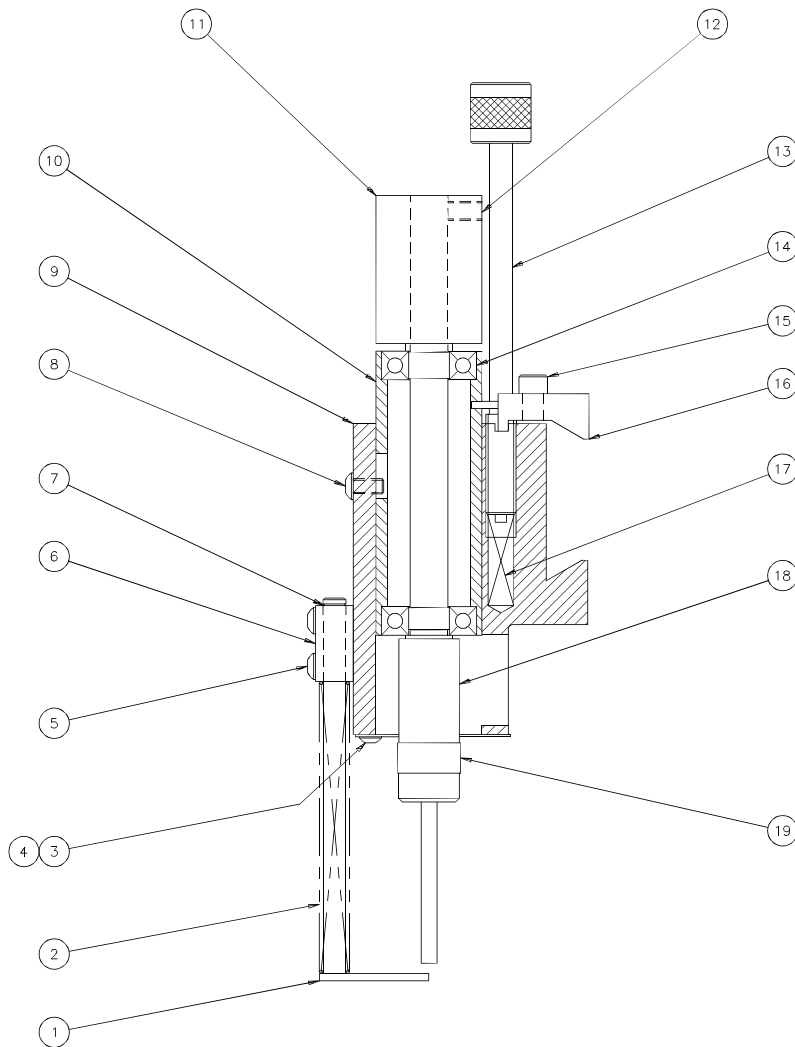


VIEW B  
FITTINGS ROTATED FOR CLARITY



## 5.12 Drill Head Assembly

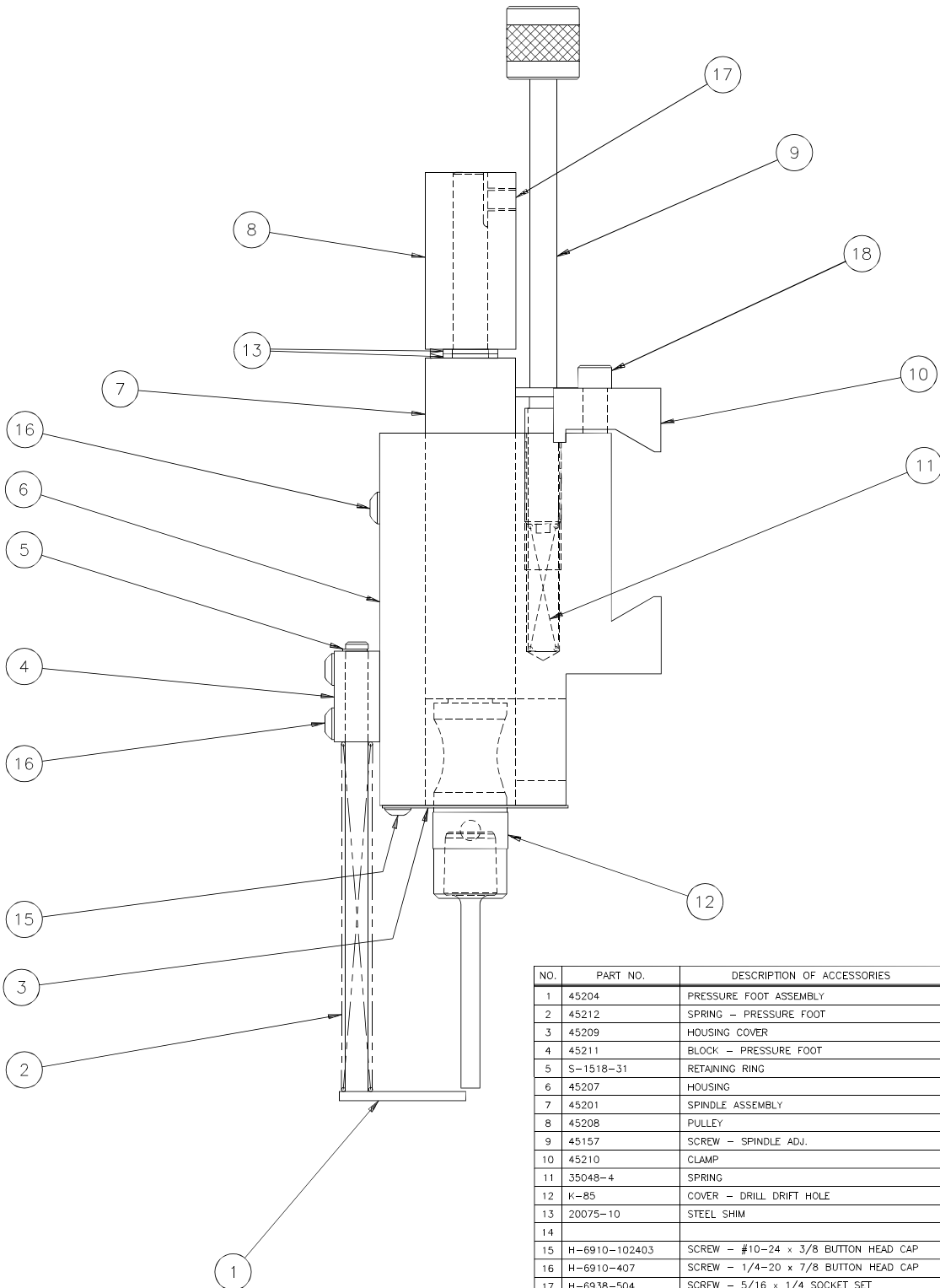
45152-1 Rev. A



| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES            | QTY |
|-----|---------------|---------------------------------------|-----|
| 1   | 45126         | PRESSURE FOOT ASSEMBLY                | 1   |
| 2   | 4629-1        | SPRING - PRESSURE FOOT                | 2   |
| 3   | 45158         | COVER - HOUSING                       | 1   |
| 4   | H-6910-102403 | #10-24 X 3/8 BUTTON HEAD CAP SCREW    | 2   |
| 5   | H-6910-407    | 1/4-20 X 7/8 BUTTON HEAD CAP SCREW    | 2   |
| 6   | 45125         | BLOCK PRESSURE FOOT                   | 1   |
| 7   | S-1518-37     | RETAINING RING                        | 2   |
| 8   | H-6910-404    | 1/4-20 X 1/2 BUTTON HEAD CAP SCREW    | 1   |
| 9   | 45153         | HOUSING                               | 1   |
| 10  | 45156         | SLEEVE                                | 1   |
| 11  | 45154         | PULLEY                                | 1   |
| 12  | H-6938-506    | 5/16-18 X 3/8 SOCKET SET SCREW        | 1   |
| 13  | 45157         | SCREW - SPINDLE ADJUSTING             | 1   |
| 14  | S-706         | BEARING                               | 2   |
| 15  | H-6918-510    | 5/16-18 X 1-1/4 SOCKET HEAD CAP SCREW | 2   |
| 16  | 45090         | CLAMP - HOUSING                       | 1   |
| 17  | 35048-4       | SPRING                                | 1   |
| 18  | 45155         | SPINDLE                               | 1   |
| 19  | K-85          | COVER - DRILL DRIFT HOLE              | 1   |

# 5.13 Narrow Drill Head Assembly

45200 Rev. A.

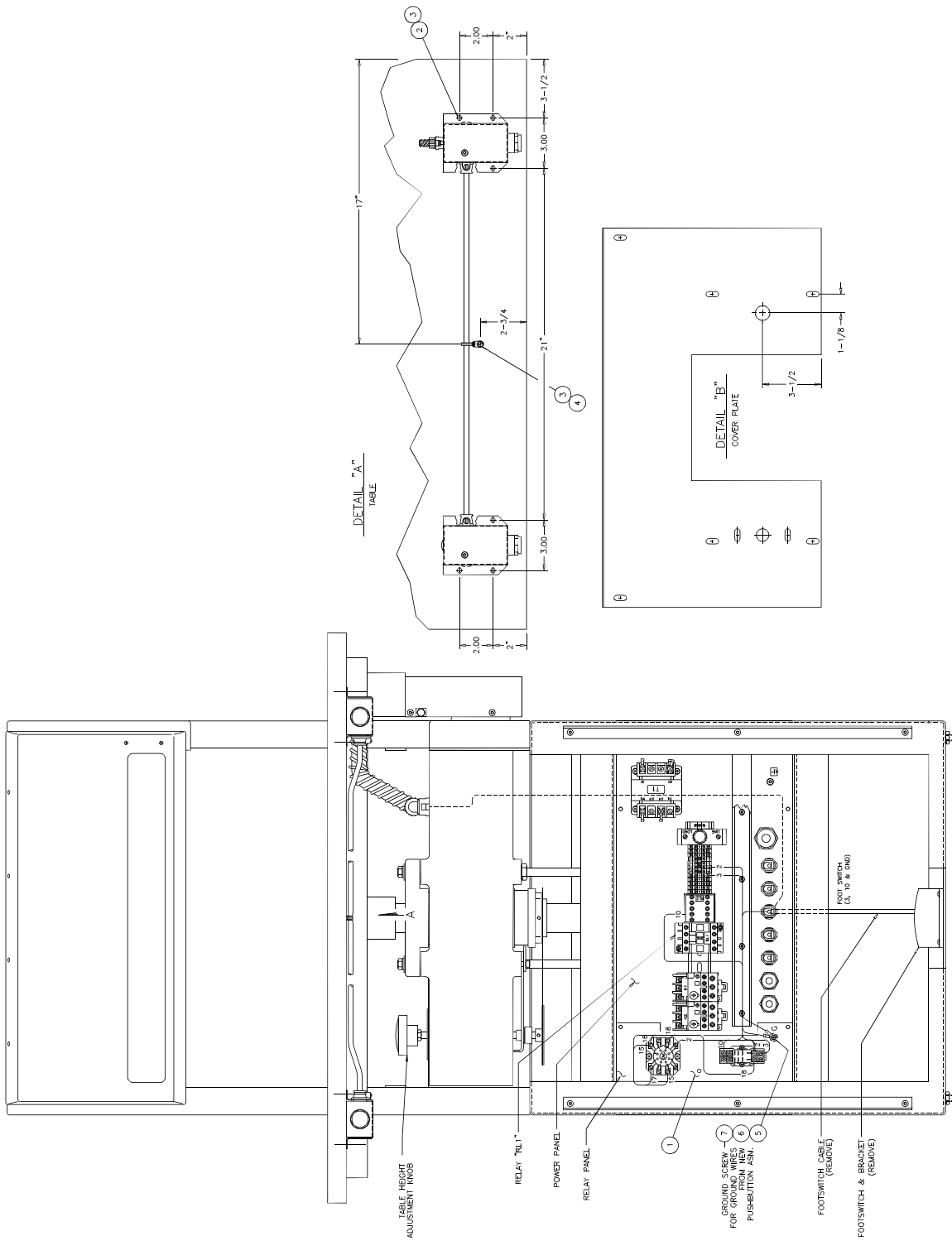


| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES           | QTY |
|-----|---------------|--------------------------------------|-----|
| 1   | 45204         | PRESSURE FOOT ASSEMBLY               | 1   |
| 2   | 45212         | SPRING - PRESSURE FOOT               | 2   |
| 3   | 45209         | HOUSING COVER                        | 1   |
| 4   | 45211         | BLOCK - PRESSURE FOOT                | 1   |
| 5   | S-1518-31     | RETAINING RING                       | 2   |
| 6   | 45207         | HOUSING                              | 1   |
| 7   | 45201         | SPINDLE ASSEMBLY                     | 1   |
| 8   | 45208         | PULLEY                               | 1   |
| 9   | 45157         | SCREW - SPINDLE ADJ.                 | 1   |
| 10  | 45210         | CLAMP                                | 1   |
| 11  | 35048-4       | SPRING                               | 1   |
| 12  | K-85          | COVER - DRILL DRIFT HOLE             | 1   |
| 13  | 20075-10      | STEEL SHIM                           | 2   |
| 14  |               |                                      |     |
| 15  | H-6910-102403 | SCREW - #10-24 x 3/8 BUTTON HEAD CAP | 2   |
| 16  | H-6910-407    | SCREW - 1/4-20 x 7/8 BUTTON HEAD CAP | 3   |
| 17  | H-6938-504    | SCREW - 5/16 x 1/4 SOCKET SET        | 1   |
| 18  | H-6918-510    | SCREW - 5/16-18 x 1-1/4 SOCKET HEAD  | 2   |

**Notes**

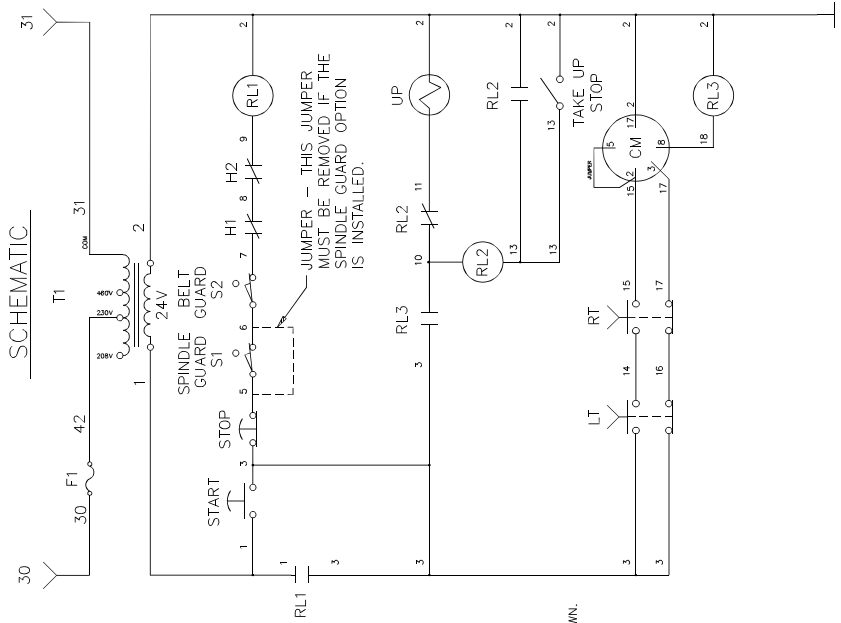
# 5.14 Two Hand Control Option

A-4851-48 Rev. A



## Two Hand Control Option – Parts list

A-4851-48 Rev. A



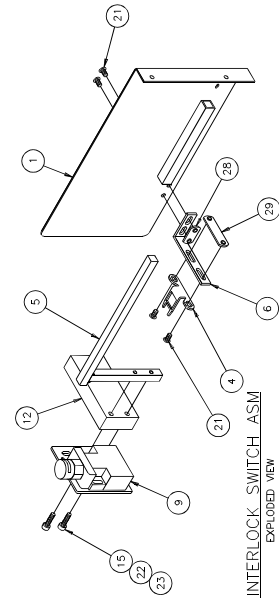
### INSTALLATION INSTRUCTIONS: REMOVE POWER FROM THE MACHINE.

- 1) REMOVE THE FRONT OUTSIDE COVER TO THE MACHINE. ( MACHINE IS SHOWN WITH COVERS REMOVED ).
- 2) REMOVE THE TWO SCREWS FROM THE LEFT HAND SIDE OF THE POWER PANEL.  
INSTALL THE (2) STAND-OFFS (ITEM #9).
- 3) INSTALL THE RELAY PANEL ASSEMBLY (ITEM #1) AS SHOWN AND SECURE WITH THE SCREWS AND WASHERS REMOVED IN STEP #2.
- 4) REMOVE THE FOOT SWITCH, FOOT SWITCH BRACKET AND DISCONNECT THE FOOT SWITCH CABLE FROM THE POWER PANEL (DO NOT REMOVE THE STRAIN RELIEF FROM THE PANEL)
- 5) DISPOSE OF THE FOOT SWITCH, FOOT SWITCH CABLE, FOOT SWITCH BRACKET AND MOUNTING HARDWARE.
- 6) REMOVE THE COVER TO THE WIRE DUCT AND ROUTE THE WIRES FROM THE RELAY BOARD (ITEM #1) TO THE POWER PANEL AS SHOWN.
- 7) ON THE UNDER SIDE OF THE TABLE LOCATE, MARK AND DRILL (9) .161 DIA. HOLES 1/2" DEEP USING THE GIVEN DIMENSIONS.
- 8) USING THE SUPPLIED #10 X 5/8 SCREWS (ITEM #3) INSTALL THE PUSH BUTTON BOX ASSEMBLY - AS SHOWN.
- 9) INSTALL THE TY-RAP USING THE LAST #10 X 5/8 WOOD SCREW AND SECURE THE CABLE TO THE BOTTOM OF THE TABLE.  
LOOSEN THE SET SCREW ON THE TABLE HEIGHT ADJUSTMENT KNOB AND SET THE KNOB ASIDE. REMOVE THE PLATE ON THE SWAPT AND SET ASIDE. REMOVE THE (6) BUTTON HEAD SCREWS AND SET THEM ASIDE. CAREFULLY REMOVE THE COVER PLATE.
- 11) ON THE COVER PLATE, LOCATE AND DRILL (1) 7/8 DIA. HOLE AS SHOWN IN DETAIL "B"
- 12) REINSTALL THE COVER PLATE AND TABLE HEIGHT ADJUSTMENT KNOB USING THE HARDWARE SET ASIDE IN STEP #10.
- 20) INSTALL THE LOOSE END OF THE CONDUIT FROM THE PUSH BUTTONS INTO THE HOLE IN THE TOP OF THE COVER PLATE.
- 13) BRING THE WIRES FROM THE CONDUIT DOWN TO THE STRAIN RELIEF WHERE THE FOOTSWITCH CABLE WAS REMOVED IN STEP #4. ROUTE THE WIRES THROUGH THE STRAIN RELIEF AND TIGHTEN THE SCREW ON THE BACKSIDE.
- 14) ATTACH THE WIRES FROM THE CONDUIT TO THE LOCATIONS WHERE THE FOOTSWITCH WIRES WERE REMOVED. ATTACH THE GROUND WIRE FROM THE NEW PUSHBUTTON SWITCH ASSEMBLY TO THE GROUND SCREW ON THE RELAY PANEL - AS SHOWN.
- 15) DOUBLE CHECK ALL WIRING AND REINSTALL THE WIRE DUCT COVER.
- 16) REINSTALL ALL COVERS!
- 17) APPLY POWER TO THE MACHINE.

| NO. | PART NO.     | DESCRIPTION OF ACCESSORIES              | QTY |
|-----|--------------|---|-----|
| 1   | EE-2646-1    | PANEL ASSEMBLY - RELAY, 2 HAND CONTROL  | 1   |
| 2   | EE-2647-1    | BUTTON ASSEMBLY - DRILL, 2 HAND CONTROL | 1   |
| 3   | H-6962-1005  | SCREWS - #10 X 5/8" WOOD                | 9   |
| 4   | S-1694-2     | TY-RAP - #10 MOUNT                      | 1   |
| 5   | E-1214-57    | CONNECTOR, #6 INS. LOCKING FORK         | 1   |
| 6   | H-6910-63204 | SCREW, #6-32 X 1/2" BUT HD              | 1   |
| 7   |              |   |     |
| 8   |              |   |     |
| 9   | E-1152-61    | STAND-OFF - 3/4" LONG                   | 2   |

# 5.15 Drill Guard Kit

K-45180 Rev B (S/N's: 965600 to 135927)

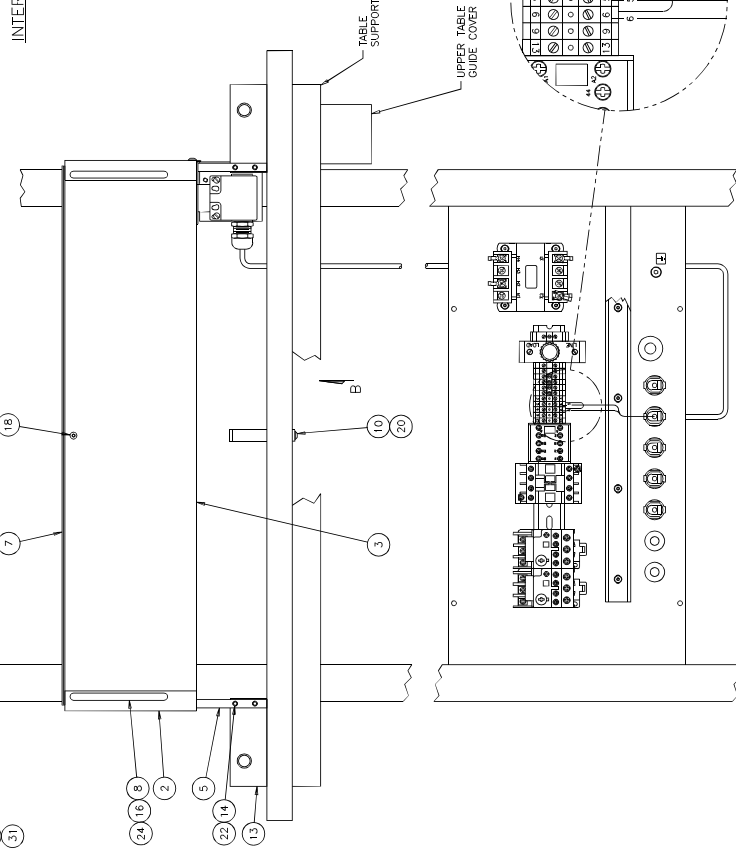
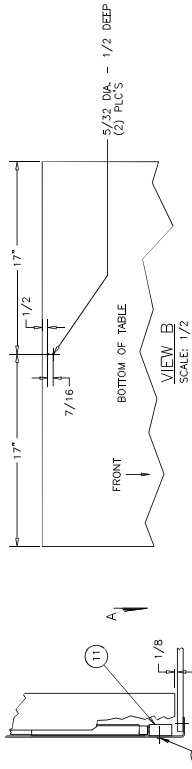


INTERLOCK SWITCH ASM  
EXPLODED VIEW

**INSTALLATION INSTRUCTIONS**

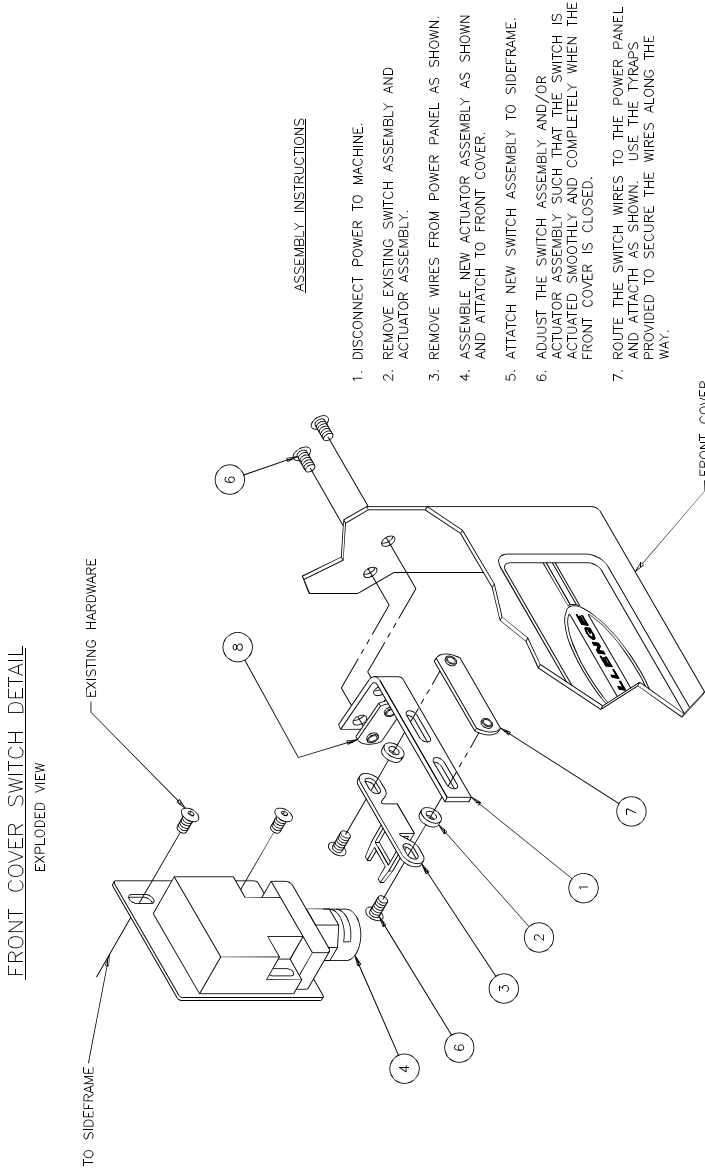
1. DISCONNECT POWER TO MACHINE.
2. REMOVE LOWER FRONT COVER.
3. REMOVE JUMPER AND CONNECT INTERLOCK SWITCH WIRES TO TERMINAL AS SHOWN.
4. REPLACE FRONT COVER.
5. REMOVE THE TABLE BY REMOVING THE (11) SCREWS THAT ATTACH TABLE TO THE TABLE SUPPORT AND THE (2) SCREWS THAT MOUNT THE TABLE GUIDE TO THE TABLE (NEAR THE RIGHT REAR OF THE TABLE).
6. DRILL (2) HOLES IN BOTTOM OF TABLE AS SHOWN. DO NOT DRILL THROUGH TABLE TOP.
7. ATTACH CHIP CHUTE LIFTER (ITEM #10).
8. REMOVE BACKGAGE GUIDE BLOCKS AND REPLACE WITH NEW BLOCKS (ITEMS #12 & #13) AS SHOWN.
9. REATTACH TABLE.
10. ASSEMBLE SPINDLE GUARD AND ATTACH ALL PARTS TO MACHINE AS SHOWN. IT MAY BE NECESSARY TO LEAVE SOME SCREWS FINGER TIGHT UNTIL ALL PARTS ARE IN PLACE. MAKE SURE THE INTERLOCK SWITCH ARE ALIGNED WITH THE FRONT OF THE SWITCH. TIGHTEN ALL SCREWS AND NUTS.
11. ADJUST THE POSITION OF THE MAGNETIC CATCHES (ITEM #11) AS SHOWN.

| ITEM | QTY | DESCRIPTION OF ACCESSORIES |
|------|-----|----------------------------|
| 1    | 1   | DRUM - 1/2" DIA.           |
| 2    | 1   | DRUM - 1/2" DIA.           |
| 3    | 1   | DRUM - 1/2" DIA.           |
| 4    | 1   | DRUM - 1/2" DIA.           |
| 5    | 1   | DRUM - 1/2" DIA.           |
| 6    | 1   | DRUM - 1/2" DIA.           |
| 7    | 1   | DRUM - 1/2" DIA.           |
| 8    | 1   | DRUM - 1/2" DIA.           |
| 9    | 1   | DRUM - 1/2" DIA.           |
| 10   | 1   | DRUM - 1/2" DIA.           |
| 11   | 1   | DRUM - 1/2" DIA.           |
| 12   | 1   | DRUM - 1/2" DIA.           |
| 13   | 1   | DRUM - 1/2" DIA.           |
| 14   | 1   | DRUM - 1/2" DIA.           |
| 15   | 1   | DRUM - 1/2" DIA.           |
| 16   | 1   | DRUM - 1/2" DIA.           |
| 17   | 1   | DRUM - 1/2" DIA.           |
| 18   | 1   | DRUM - 1/2" DIA.           |
| 19   | 1   | DRUM - 1/2" DIA.           |
| 20   | 1   | DRUM - 1/2" DIA.           |
| 21   | 1   | DRUM - 1/2" DIA.           |
| 22   | 1   | DRUM - 1/2" DIA.           |
| 23   | 1   | DRUM - 1/2" DIA.           |
| 24   | 1   | DRUM - 1/2" DIA.           |
| 25   | 1   | DRUM - 1/2" DIA.           |
| 26   | 1   | DRUM - 1/2" DIA.           |
| 27   | 1   | DRUM - 1/2" DIA.           |
| 28   | 1   | DRUM - 1/2" DIA.           |
| 29   | 1   | DRUM - 1/2" DIA.           |
| 30   | 1   | DRUM - 1/2" DIA.           |
| 31   | 1   | DRUM - 1/2" DIA.           |



# 5.16 Belt Guard Switch Replacement Kit

K-45181 Rev. A (For S/N's: 965600 to 975272 Only)



**ASSEMBLY INSTRUCTIONS**

1. DISCONNECT POWER TO MACHINE.
2. REMOVE EXISTING SWITCH ASSEMBLY AND ACTUATOR ASSEMBLY.
3. REMOVE WIRES FROM POWER PANEL AS SHOWN.
4. ASSEMBLE NEW ACTUATOR ASSEMBLY AS SHOWN AND ATTACH TO FRONT COVER.
5. ATTACH NEW SWITCH ASSEMBLY TO SIDEFRAME.
6. ADJUST THE SWITCH ASSEMBLY AND/OR ACTUATOR ASSEMBLY SUCH THAT THE SWITCH IS ACTUATED SMOOTHLY AND COMPLETELY WHEN THE FRONT COVER IS CLOSED.
7. ROUTE THE SWITCH WIRES TO THE POWER PANEL AND ATTACH AS SHOWN. USE THE TIRGAPS PROVIDED TO SECURE THE WIRES ALONG THE WAY.

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES      | QTY |
|-----|---------------|---------------------------------|-----|
| 9   | S-1694        | TIRGAP (NOT SHOWN)              | 2   |
| 8   | H-6416-102406 | WELDNUT                         | 1   |
| 7   | H-6416-102412 | WELDNUT                         | 1   |
| 6   | H-6810-102404 | SCREW - #10-24 x 1/2 BUT HD CAP | 4   |
| 5   |               |                                 |     |
| 4   | EE-2749-1     | SWITCH ASSEMBLY                 | 1   |
| 3   | 45180         | ACTUATOR                        | 1   |
| 2   | E-1152-62     | SPACER                          | 2   |
| 1   | 45173         | BRACKET                         | 1   |

