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Norton Shores, MI 49441-6081 USA

ChallengeMachinery.com

## ***MODEL EH-3D***

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

**Serial Numbers:**  
**085279 through 159999,**  
**EH3-D-150000 and up**

*Sold and Serviced by*

**F.352-LT**  
January 2024

# 1.0 Introduction

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.



**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 on the front cover of this manual. 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 Dr. • 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.
- 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.
- ALWAYS WEAR SAFETY GLASSES when operating the drill machine.
- 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.
- Have your electrician make sure the machine is properly grounded and that there is sufficient power to operate the machine properly.
- CRUSH HAZARD, keep feet off the pedal when handling paper under the clamp. DO NOT REST FOOT ON PEDAL at any time!
- DO NOT REACH UNDER THE DRILL AND CLAMP 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.
- When replacing hydraulic parts, loosen the connections slowly to release pressure. Never loosen connections with the machine running.

### 2.2 Power Lockout Procedure

For maximum safety when making adjustments or repairs to your machine, be sure to UN-PLUG the power cord from the wall socket. For added safety – coil the cord up so that the plug is in view at all times by the person servicing the machine.

## 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



### 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.



### SHOCK HAZARD

Disconnect power before removing cover. Replace cover before operation.



### SHOCK HAZARD

Disconnect power before removing cover. Replace cover before operation.



### SINGLE OPERATOR

Do not operate with more than one person.

## 3.0 Specifications

| Description  | Inch Units                 | Metric Units |
|--|----------------------------|--------------|
| Number of Drill Heads  | 3                          |              |
| Drill Diameters  | 13 sizes from 1/8" to 1/2" | 3-13mm       |
| Range between Drills   | 2-3/4" to 4-1/2"           | 7cm to 11cm  |
| Range between Outside Drills   | 5-1/2" to 9"               | 14cm to 23cm |
| Maximum Drilling Capacity  | 2-1/2"                     | 63mm         |
| Backgauge Adjustment Range   | 0 to 5"                    | 0 to 13cm    |
| Auto Trip Backgauge (optional)   | 0 to 4-1/2"                | 0 to 11cm    |
| Vertical Adjustment of Ind. Heads  | 1/4"                       | 6mm          |
| Adjustable Range (to side guide)   | 0 to 14"                   | 0 to 37cm    |
| <b>Dimensions</b>  |                            |              |
| Table Size   | 19-1/2" x 31-1/2"          | 50cm x 80cm  |
| Table Height   | 37"                        | 94cm         |
| Overall Height   | 59-1/4"                    | 151cm        |
| Floor Space Required   | 36" x 41-1/2"              | 91cm x 105cm |
| Net Weight (@)   | 525lbs                     | 236kg        |
| Shipping Weight (@)  | 570lbs                     | 257kg        |
| <b>Electrical</b>  |                            |              |
| 208/230 Volts (+/-10%)/18Amps, 1 phase, 50/60Hz, AC. Service size: 30Amps. |                            |              |

Challenge reserves the right to make changes to any product or specification without notice and without incurring responsibility to existing units.

# 4.0 Installation Guide

Refer to Figure 1 on this page as well as the parts lists and drawings in the back of this manual for part identification and orientation, if necessary.

All guards and instruction plates are installed for your safety and information and must remain on the machine as shipped from the factory.

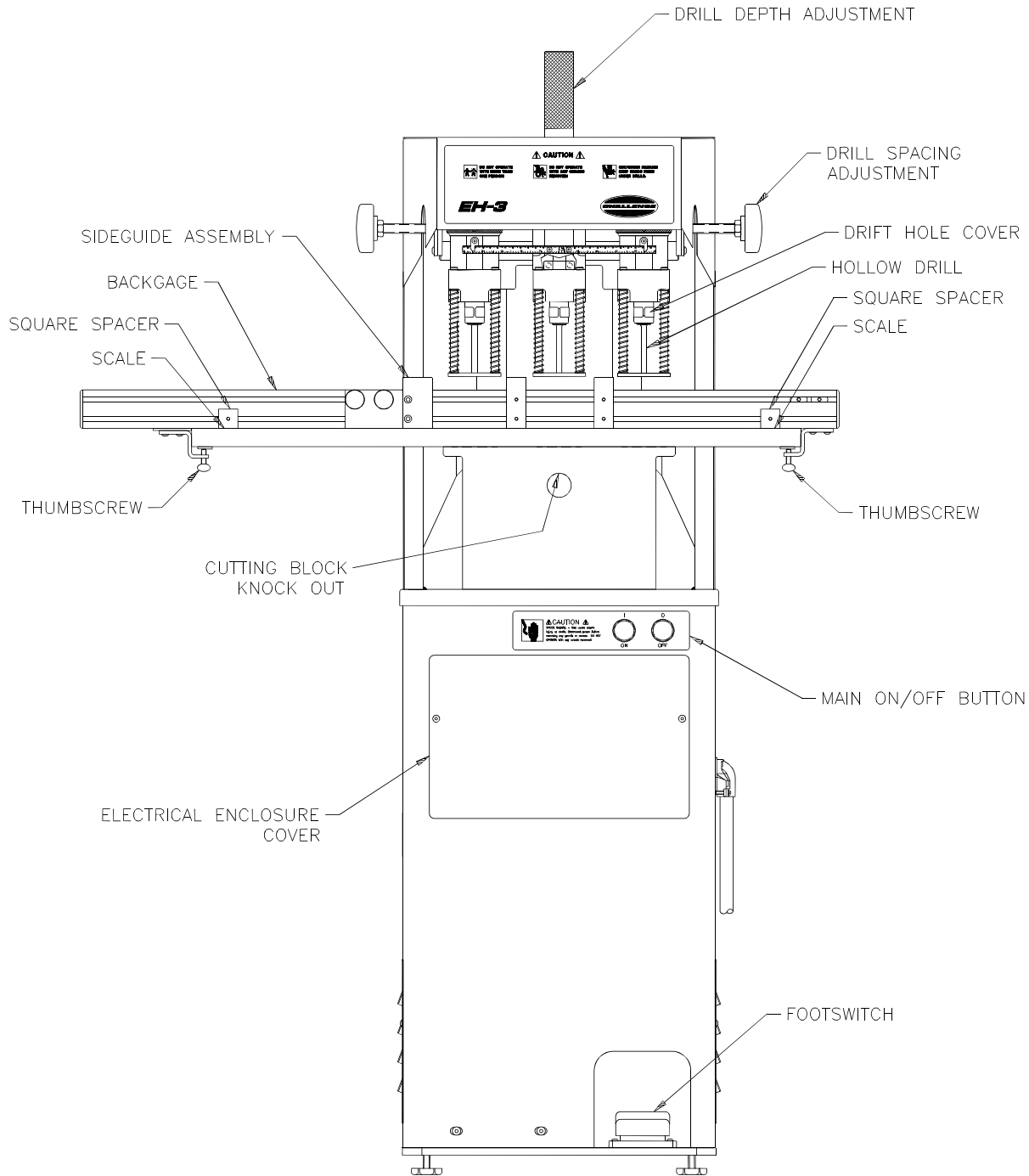


Figure 1



## 4.1 Uncrating the Paper Drill

This machine is shipped on a wooden skid and is enclosed with a protective corrugated cover. It is held onto the skid with plastic straps. Remove the straps and carefully cut the corrugated cover down the side and unwrap it from around the machine. The table, backgauge, and other accessories are packed in separate boxes and are secured to the machine. Remove these and carefully position the machine on the floor. Immediately after uncrating, check off parts received against the packing list. Also, examine for any physical signs of damage incurred during shipping. The machine is inspected before and after it is crated at our plant. The responsibility for filing a claim against the carrier for damages incurred during shipment rests with the receiver of goods (FOB our factory).

Clean all parts with a commercial cleaning solvent before installing or using the machine.

## 4.2 Installing the Table and Backgauge

Locate the four (4) table mounting bolts, washers, & nuts shipped in the backgauge box. Set the table assembly in place and attach using the hardware as shown in Figure 2, but leave the hardware loose.

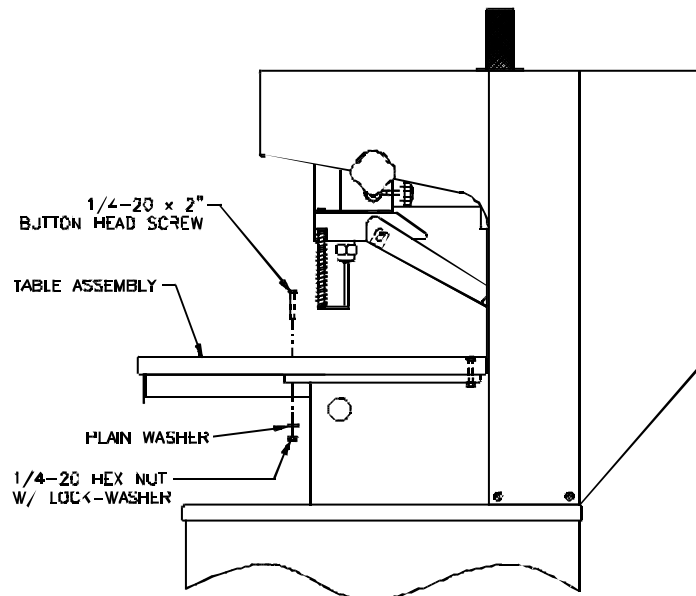


Figure 2

### 4.2.1 Using Standard Backgauge:

Attach the backgauge assembly to the table and set both sides to the 6-5/8" position (as shown in Figure 3 on page 10). Next, position the table so that the back surface of the backgauge comes in contact with the front of each pull down shaft (Figure 4 on page 10). Now tighten the front two table-mounting screws. Then move the backgauge forward and tighten the rear two screws.

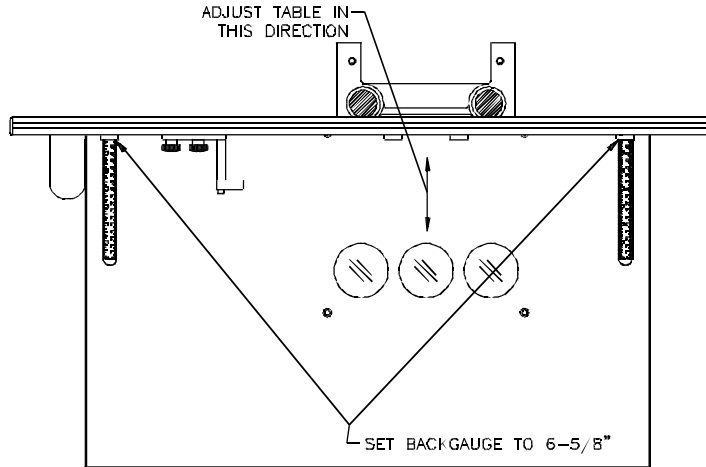


Figure 3

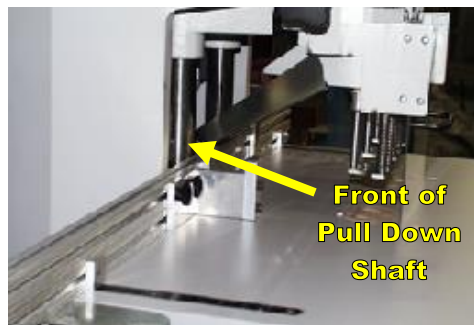


Figure 4

#### 4.2.2 Using Auto-Trip Backgauge:

Attach the backgauge assembly to the table and set both sides to the 4-1/2" position (as shown in Figure 5). Next, position the table so that the front surface of the backgauge is 3-3/8" from the front of each pull down shaft (see Figure 5). Now tighten the front two table-mounting screws. Then move the backgauge forward and tighten the rear two screws.

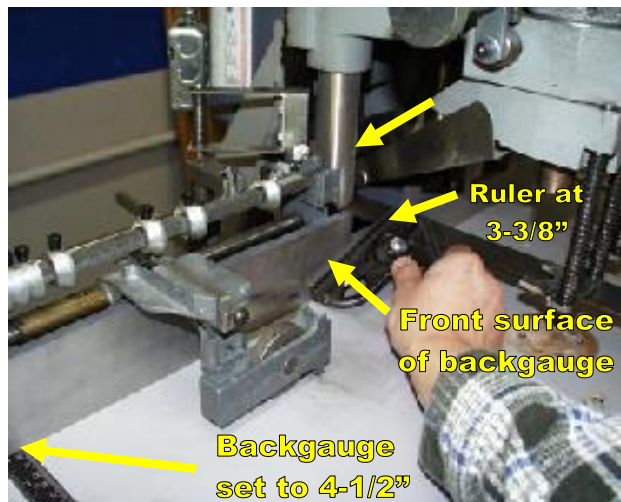


Figure 5

Note: Further adjustments may be necessary once the machine is ready to drill. See Table Position Adjustment (See section 8.3.1 on page 26).

### 4.3 Installing the Drill Blocks and Drills

#### **CAUTION**

Always handle drills with care to avoid severe lacerations. Even dull drills are sharp enough to cause lacerations.

Place the drill block knock-outs in position (refer to Figure 1 if necessary). Now set the three drill blocks place. Check to see if the blocks are flush with the table. Place shims under the blocks if necessary.

Insert the tapered head of the hollow drills into the spindles. Be sure that the drift hole covers are in place before operating the machine (Figure 1). The drift hole covers prevent paper chips from flying out while drilling.

### 4.4 Hydraulic Level Check

Check the level of the oil in the hydraulic reservoir. This check is made by first removing the louvered panel at the left side of the stand (two screws hold it in place) and locating the breather cap on the top of the reservoir. The breather cap has a dip stick attached for checking the oil. When screwed in (and then removed to check) there should be approximately an 1/8" (3 mm) of oil on the stick. Some machines are equipped with a clear reservoir in which case the oil level can be checked by visually inspecting the oil level. There is a full level line marked on the reservoir. Recommended oils are found in the maintenance section of this manual (page 23).

### 4.5 Hooking up the Power Line

#### **CAUTION**

Always disconnect the power when cleaning, servicing, or lubricating your drill, see Lock Out Procedures, page 5.

This EH-3D is factory wired for 230 Volts, single phase, 50/60Hz and is supplied with a power cord with a NEMA 'L6-30P' plug. It is the customer's responsibility to have a NEMA 'L6-30R' receptacle wired by a licensed electrician to a 30 Amp circuit (minimum). If your location requires this machine to run on 208 Volts, a qualified technician should open the power panel cover and move the jumper that is located in the terminal block from 11 and 11A to 11 and 11B. Replace the power panel cover before plugging the machine into the wall socket.

**IMPORTANT: Select the proper voltage link to match the voltage supplied to the machine (Figure 6).**

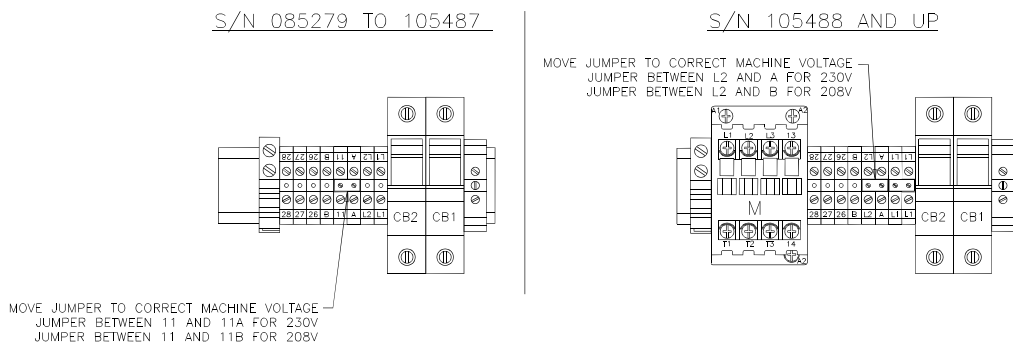
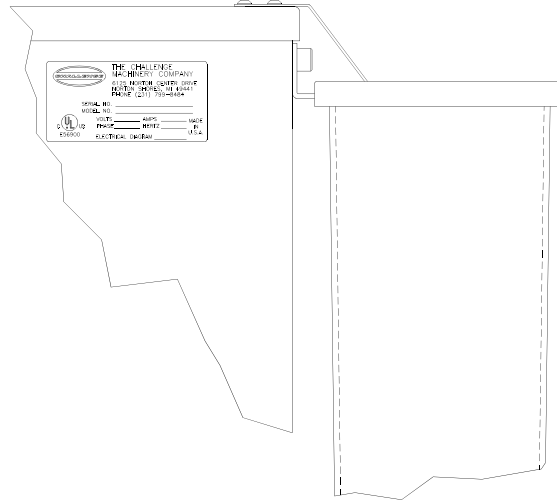


Figure 6

## 4.6 Installing the Chip Container

The chip container is installed by slipping it over the two hooks provided on the rear of the machine.



## 5.0 Operation

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### 5.1 Starting the Machine

The power for this machine is supplied by two motors; one is for the hydraulic power pack, the other is for the spindle. They are both started and stopped simultaneously by a single set of start-stop buttons located on the stand under the table (Figure 1 on page 8). Be sure both motors are operating before trying to drill paper.

### 5.2 Operating the Drill



Always wear safety glasses when operating this machine.

Pressing down on the foot switch activates the hydraulic unit, which brings the drill heads (and drills) down to the table. When the drills reach the bottom of their stroke, they will automatically return the “up” position. (Note: The vertical stroke of the drills must be set before drilling to provide the proper drill depth. See section 5.3 on page 13 for adjustment procedures). The pedal must be released and depressed again before drilling the next set of holes, assuring full control and allowing no repeat stroke. By releasing the pedal, the operator can stop the drills in their downward stroke at any time allowing them to return to their normal position, thus preventing costly errors. **NEVER REST YOUR FOOT ON THE PEDAL WITHOUT INTENDING TO BRING DOWN THE DRILLS!**

### 5.3 Adjusting the Vertical Stroke

The vertical stroke of the machine determines the exact depth the drills will reach at the bottom of their stroke. Whenever installing a new set of drills, the vertical stroke must be adjusted before drilling.

The two outside heads are provided with independent height adjustment while the center head works from the center overall adjusting screw. This is necessary because of the variance in length of the drills. Start by adjusting the center head to its highest point. This is accomplished by turning the drill depth adjustment screw (Figure 1 on page 8) counterclockwise until it stops turning. Then adjust the side heads all the way up by turning the knurled ring on the heads clockwise (use the provided drill drift in the holes if necessary). Now, with the new drills in the place, put two or three sheets of paper under the heads. The center spindle should then be adjusted so that the center drill just cuts through the paper. Too deep will cause a ragged hole in the bottom sheets as well as a shorter drill life from drilling into the cutting block. After the center drill is adjusted, each outside spindle can be adjusted. Turn counterclockwise to lower and clockwise to raise. No locking is necessary. Once all three drills are set, drill through a full lift of paper. A final adjustment of the drill depth adjusting screw may be necessary to obtain the best results.

### 5.4 Setting the Distance between Drill Heads

This machine incorporates three drilling heads operating on three belt-driven spindles. The center head is stationary while the two outside heads have a lateral adjustment of 1-3/4” each.

This provides an adjustment range of 2-3/4” to 4-1/2” (7 cm to 11 cm) between the center drill and either of the outside drills, or a range of 5-1/2” to 9” (14 cm to 23 cm) between the two outside drills.

The lateral adjustment is accomplished by loosening the clamp knob (a black, plastic hand knob) located at the rear of each outside head, and then turning the 4-lobed, black knob located at the

## 5.0 Operation

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outside of each head. This moves the heads along a shaft. A scale and pointer located at the front of the heads gives a reading in inches and millimeters of the center-line relationship to the center head. When a setting is made, make certain that the clamp knob is tightened again.

Any combination of three heads can be used, that is one, two, or three holes may be drilled if desired. It is recommended, however that no more than two half inch hollow drills be used at the same time.

### 5.5 Setting the Backgauge Position

The backgauge position is adjusted by first loosening the two thumb screws under the table. This will allow the backgauge to move freely. Then use the two scales on the top of the table to set the backgauge to the desired position. The scales read in inches and millimeters and will give the distance from the edge of the sheet to the center of the holes. Be sure the 1" (2.5 cm) square pieces mounted to the backgauge are aligned on top of the scales to provide the proper reading (Figure 1 on page 8). Tighten the thumbscrews when finished.

### 5.6 Using the Side Guide

To adjust the position of the side guide, loosen the two black knobs until the side guide is free to slide sideways. Slide the side guide to the desired position and then tighten the two knobs. For certain hole positions, it may be necessary to remove the rectangular spacer from the side guide assembly (Figure 7).

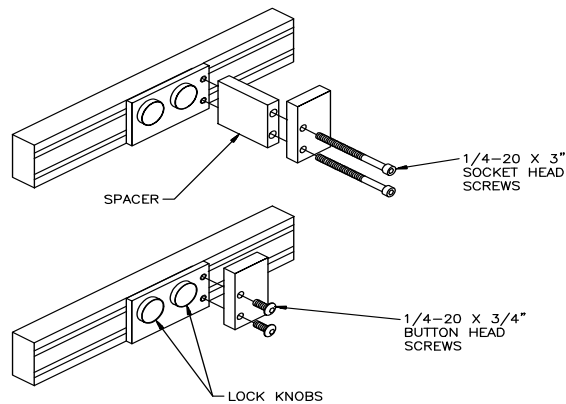


Figure 7

### 5.7 Adjusting the Stroke Speed

The hydraulic unit is equipped with an adjustable valve for regulating the speed on the drill stroke (up and down travel). Soft stocks such as mimeographs, etc., are apt to wrinkle at high speeds, and the speed should be set to a point where the best results are obtained.

This adjustment is made by turning the adjustable valve (located on the right side of the drilling machine stand) counterclockwise to reduce speed and clockwise to increase speed (Figure 8 on page 15).

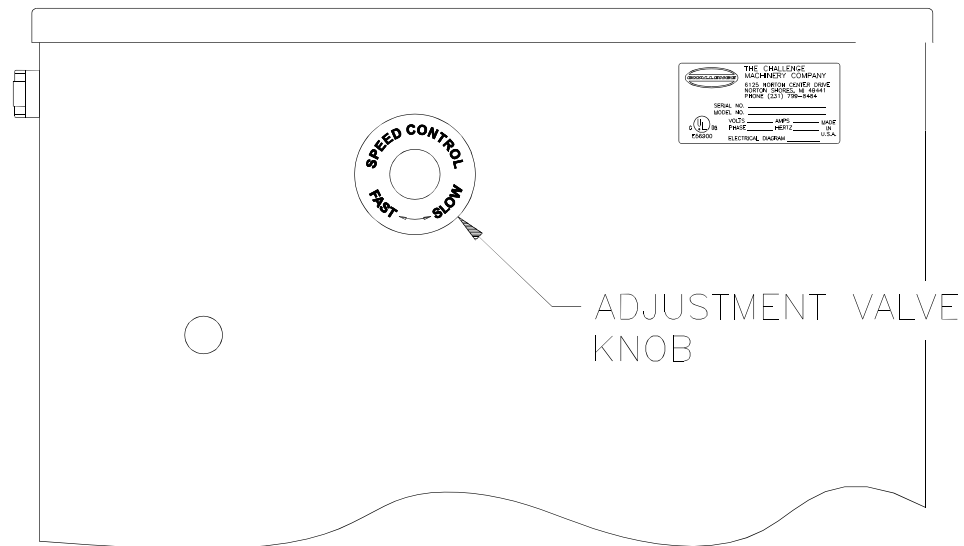


Figure 8

## 5.8 Removing the Cutting Blocks

Each cutting block is removed by inserting your fingers in the hole provided in the frame (under the table) and pushing up on the cutting stick knock out. There are three holes: one on each side of the frame and one in the front.

## 5.9 Removing the Drills from the Spindle

Remove the drift hole cover from the spindle to expose the drift hole. Then, with the flat side down, insert the drill drift into the hole and lift upward. The upward movement forces the drill down and releases it from the spindle.

## 6.0 Drilling Tips

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**Important!** To prevent the drill from overheating, always avoid drilling too slowly. The drill stroke speed should be set at the fastest speed possible that still allows the drills to cut easily through the paper.

**Slotted Holes** - Instead of punching slotted holes for five and seven hole universal binding work, save time and cost by drilling a 1/2" (1.3 cm) diameter hole in place of the slot. The slot is only intended to allow the post or ring to be used in either location, and the large hole permits this.

**Plastic Bindings** - Drilling holes for plastic bindings, instead of punching them, is practical and saves a great deal of time, particularly on long run jobs.

**Keep Drills Sharp** - A dull drill is the major cause of drill breakage and production tie-ups. Usually after three hours of drilling, depending on the type of paper being processed, the drill should be sharpened. A dull drill results in poor quality work.

**Keep Drills Clean** - A dirty and rusty drill will not permit the free upward passage of the drill chips. Pressure built up by a clogged drill will split or break the drill. To keep it free from dirt or rust, clean the drill of all chips after each use and apply a light oil to the inside and outside. Drills should be cleaned out immediately after each use. This is particularly true if a coated or varnished stock has been drilled. On these jobs the coating on the chips frequently fuse the chips into one solid mass when the drill cools, causing breakage the next time the drill is used.

**Lubricate Drills** - Lubrication assists in the passage of the chips and helps avoid overheating of the drills. Use readily available stick lubricants for this purpose. Hold the end of the stick against the side of the rotating drill. Be sure to touch the cutting edge with the lubricant also. Wipe off excess oil before drilling. **CARE MUST ALWAYS BE TAKEN WHEN HANDLING DRILLS.**

**Keep Spindle Clean** - Clean out the drill spindle frequently. This will prevent any buildup in the spindle of the drill.

**Set the Drills Correctly** - Do not cut too deeply into the cutting block. The drill should just touch the block and cleanly cut through the bottom sheet. During drilling, do not set the drill deeper into the block but change the position of the block frequently. Drilling deeper into the block dulls the drills quickly. Use a piece of chipboard underneath your stock. This will make handling the stock easier and will ensure that the last sheet is cut cleanly through.

**Check for Drill Wobble** - If spindles are badly worn or bent through mis-adjustment, have them replaced immediately. A wobbly or loosely held drill can break.

**Check Your Drill Sharpener** - The cutting edge of the sharpening bit should be inspected frequently to make certain that it is sharp and free of nicks. Never let a drill drop onto the sharpening bit. It will chip the sharpening edge. Use gentle pressure when sharpening - let the sharpening bit do the work. Carefully check the sharpness of the drill after sharpening. The cutting edge should be razor sharp.

**Check Belt on the Drilling Machine** - The belt should be kept tight to assure proper speed of the drill. When the drill slows down, it acts more like a punch, which results in poor quality work and drill breakage.

Just a little time and effort taken with each use of your paper drilling machine should result in trouble free operation over many years.



# 7.0 Accessories for Challenge Paper Drilling Machine

## 7.1 Genuine Challenge Hollow Drills

### *In 13 Standard Sizes For Every Drilling Need*

All drills carried in stock by local Challenge dealers (**17/32"** & **9/16"** available by special order).  
**Hollow Drills**

| <b>Diameter x Drill Capacity</b> | <b>Cat. No.</b> |
|----------------------------------|-----------------|
| 1/8" x 5/8" (3.2 x 16mm)         | CD-2-3          |
| 5/32" x 11/8" (4 x 29mm)         | CD-52           |
| 3/16" x 15/8" (4.8 x 41mm)       | CD-3            |
| 7/32" x 2" (5.6 x 51mm)          | CD-72           |
| 1/4" x 2" (6.3 x 51mm)           | CD-4            |
| 17/64" x 2" (6.7 x 51mm)         | CD-174          |
| 9/32" x 2" (7.1 x 51mm)          | CD-92           |
| 5/16" x 2" (7.9 x 51mm)          | CD-5            |
| 11/32" x 2" (8.7 x 51mm)         | CD-112          |
| 3/8" x 2" (9.5 x 51mm)           | CD-6            |
| 13/32" x 2" (10.3 x 51mm)        | CD-132          |
| 7/16" x 2" (11.1 x 51mm)         | CD-7            |
| 1/2" x 2" (12.7 x 51mm)          | CD-8            |
| <i>Special order drills:</i>     |                 |
| 17/32" x 2" (13.5 x 51mm)        | CD-172          |
| 9/16" x 2" (14.3 x 51mm)         | CD-9            |

### **Teflon Coated Hollow Drill Bits**

| <b>Diameter x Drill Capacity</b> | <b>Cat. No.</b> |
|----------------------------------|-----------------|
| 1/8" x 5/8" (3.2 x 16mm)         | TCD-2-3         |
| 5/32" x 11/8" (4 x 29mm)         | TCD-52          |
| 3/16" x 15/8" (4.8 x 41mm)       | TCD-3           |
| 7/32" x 2" (5.6 x 51mm)          | TCD-72          |
| 1/4" x 2" (6.3 x 51mm)           | TCD-4           |
| 17/64" x 2" (6.7 x 51mm)         | TCD-174         |
| 9/32" x 2" (7.1 x 51mm)          | TCD-92          |
| 5/16" x 2" (7.9 x 51mm)          | TCD-5           |
| 11/32" x 2" (8.7 x 51mm)         | TCD-112         |
| 3/8" x 2" (9.5 x 51mm)           | TCD-6           |
| 13/32" x 2" (10.3 x 51mm)        | TCD-132         |
| 7/16" x 2" (11.1 x 51mm)         | TCD-7           |
| 1/2" x 2" (12.7 x 51mm)          | TCD-8           |

## 7.2 Challenge Drill-Ease Lubricant Stick

Cat. No. 4688

This lubricating stick provides a dry stainless lubricant which has many uses throughout the printing plant. It is specially recommended for use on hollow drills for easier drilling, particularly when drilling clay-coated stock. It eliminates binding and excessive heating of the drill. Will not discolor the stock.

CARE MUST ALWAYS BE TAKEN WHEN USING STICK AND HANDLING DRILLS.

## 7.3 Challenge Drilling Blocks

Cat. No. KK-473-3

These Challenge 3" End-Wood Drilling Blocks are for round hole drilling operations. Sold in packages of 12.



## 7.4 Handi-Sharp Drill Sharpener

Cat. No. 57100

Replacement Cutting Bit  
Adapter for other style drill bits

Part No. 6469  
Part No. 57114

## 7.5 Hollow Drill Sharpener

*For fast, easy drill sharpening*

**⚠ CAUTION** Drills are sharp even after use. Be careful to keep edge away from your body. To prevent personal injury and/or damage to the drill, ALWAYS keep drills in protected area.

### 7.5.1 Using the Chip Remover

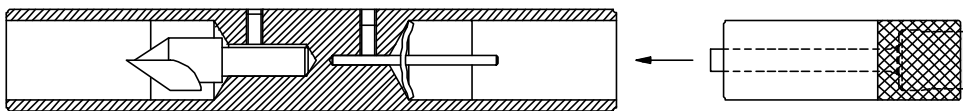


Figure 9 – cut-away view

1. CAREFULLY place a hollow drill in the holder section as shown, and insert the holder (with drill) into the chip remover end as shown.
2. Firmly tap the entire assembly on a solid surface to remove the chips from the hollow drill.

### 7.5.2 Using the Drill Sharpener

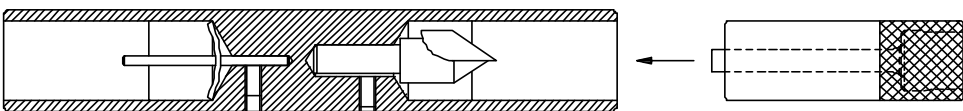


Figure 10 – cut-away view Figure 11

Figure 12

1. CAREFULLY place a hollow drill in the holder section as shown, and insert the holder (with drill) into the sharpener end as shown. Be very careful to bring the drill and cutting tool together with out bumping. **The cutting tool is made of GLASS HARD material and may be chipped.**
2. USE CLOCKWISE ROTATION while maintaining an even pressure, until the hollow drill is sharpened (usually two or three turns). The cutting tool seldom requires replacing, but when it does become necessary, the bit can be ordered through your Challenge Dealer (**Cat. No. 4952**).

**Challenge Hollow Drill Sharpener  
Extra Cutting Bit**

**Part No. A-4950  
Part No. 4952**

## 7.6 Right Side Guide Kit

Cat. No. K-5731

This kit includes all of the parts and hardware necessary to add a right-hand sideguide to your existing backgauge. When used in conjunction with the left-hand sideguide, multiple hole patterns can be drilled by shifting the stock from one sideguide to the other between drilling cycles. (See Figure 13 on page 19.)

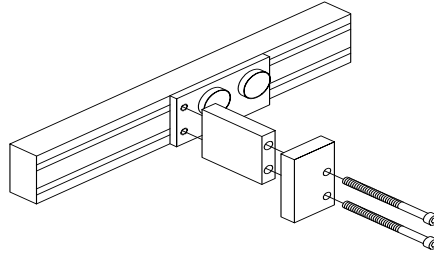


Figure 13

## 7.7 Auto-Trip Backgauge

Cat. No. A-4615-9

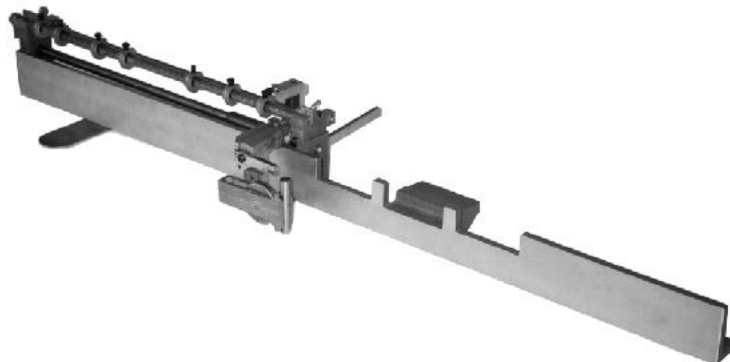


Figure 14

## 7.0 Accessories for Challenge Paper Drilling Machine

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This optional backgauge assembly provides additional versatility to the EH-3D. The automatic trip on the side guide permits step and repeat type of operation with a minimum distance between holes of 3/8" (9.5 mm) with the standard stops or 1/4" (6.3 mm) minimum by the use of a fixed gage, available as optional equipment.

As each set of holes is drilled, the side guide is automatically tripped, and as soon as the drills clear the stock on their up stroke, the guide is free to move to its next stop. This is accomplished by pushing the stock to the left and moving the guide at the same time. When drilling one, two or three holes only, that fall within the 9" (23 cm) limitations of the machine, the automatic trip bracket (located at the left of the machine) can be turned so that it does not engage the trip lever.

### 7.7.1 Setting the side guide stops

First set the rear gage to the desired back margin. Be sure both sides are set to the same dimension and tighten the two thumbscrews. Next, remove the guide shaft and set the guide stops to the desired distance between holes (a scale in the guide shaft is provided for this purpose). The guide shaft is then replaced in the rear gage and final adjusting or centering of holes is accomplished with the knurled screw at the extreme left end of the guide shaft.

The automatic trip gage comes equipped with seven stops. Additional stops can be purchased at a very nominal price. Challenge fixed index gages are recommended where the same job is to be handled over and over again. They are easily and quickly attached and removed. NOTE: When drilling narrow strips, the side guide roller assembly should be mounted on the inside of the side guide assembly.

## 7.8 Fixed Gages

*For Fast, Accurate Hole Spacing*  
(For use with optional auto-trip backgauge only)

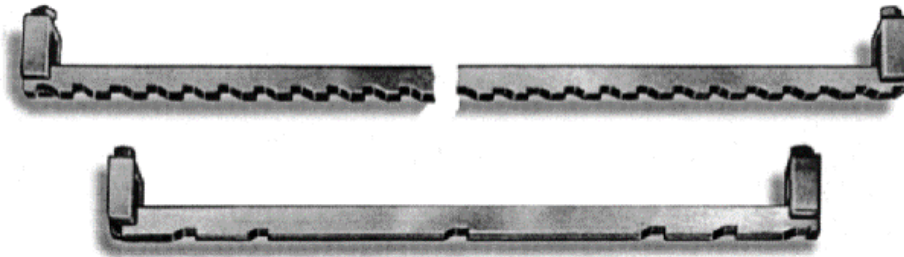


Figure 15

These fixed gages with pre-cut hole spacings fit on the side guide in place of the moveable stops. To use, position the gage so that the right end lines up with the dimension on the scale for the centerline of the first hole to be drilled. Use of the stops on fixed gages is the same as using the adjustable stops.

In addition to 2-5 hole patterns, fixed gages are available from stock in the following standard types:

- 22-stop gage, 1/2" centers for multi-ring binders
- 25-stop gage, 3/8" centers
- 25-stop gage, 1/4" centers
- 34-stop gage, 1/2" centers
- 46-stop gage, 3/8" centers

50-stop gage, 1/4" centers

Custom patterns can also be supplied, call for details.

### 7.9 Two-Hand Control Kit

Cat. No. A-4851-52

This 2-hand control safety kit can be installed on the EH-3D in place of the standard foot pedal control. All of the necessary hardware and instructions are included in the kit. The 2-hand control offers anti-tie-down and anti-repeat features, which means both buttons must be released between each cycle, and both buttons must be pressed within .5 seconds of each other. (See Figure 16)

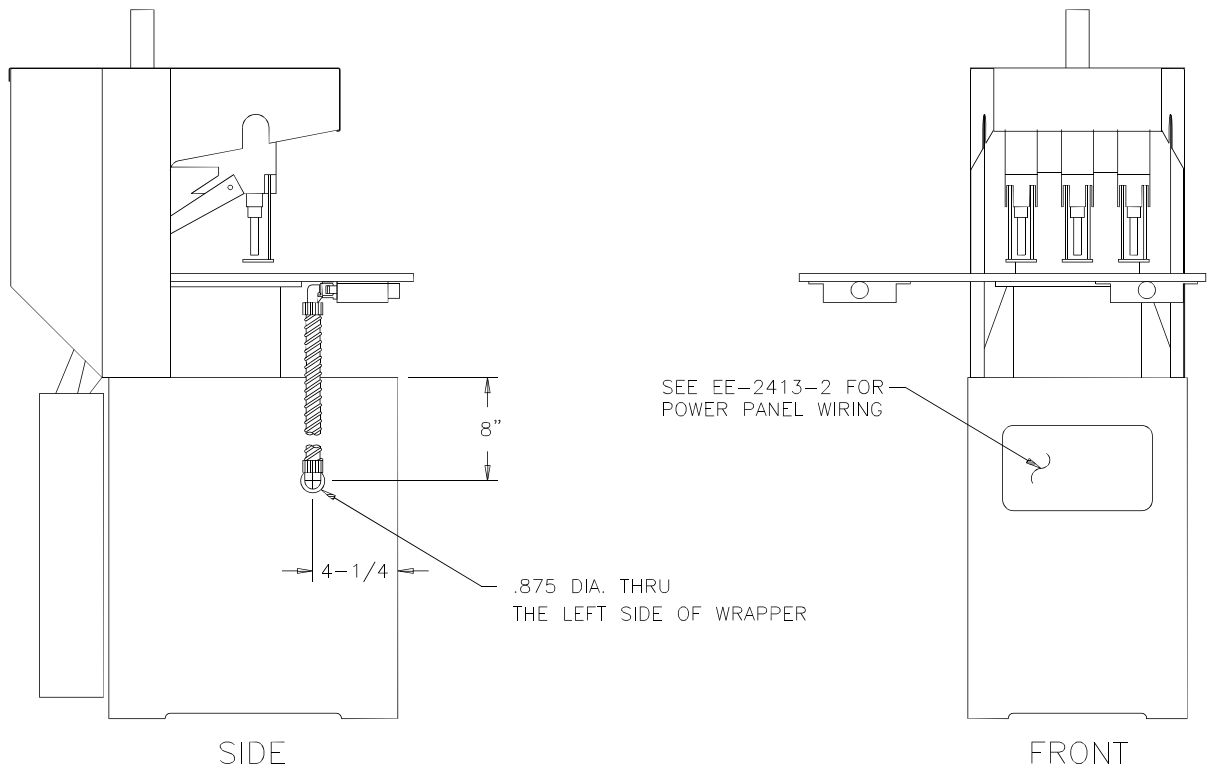
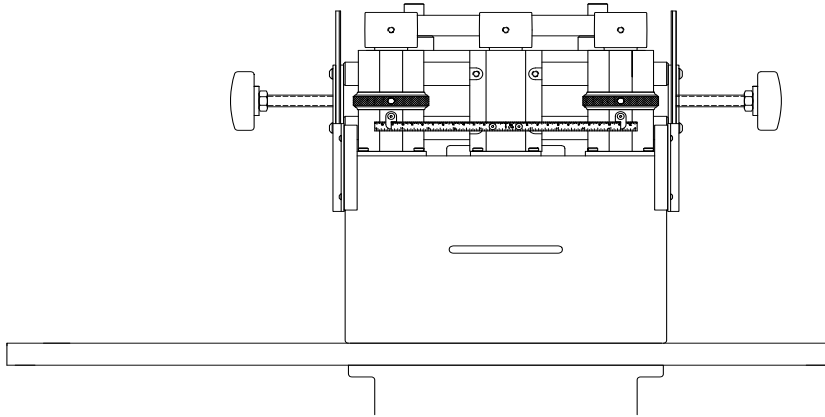


Figure 16

## 7.10 Drill Shield Kit

Cat. No. 48004



**Figure 17**

This drill shield safety kit includes a clear Lexan shield that protects the operator from contacting the spinning drills. The kit can be installed on all EH-3A, EH-3B, EH-3C and EH-3D machines. All of the necessary hardware and instructions are included in the kit.

## 8.0 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:** Parts with the express understanding that they are to replace parts found missing or no longer serviceable on equipment designed and/or manufactured at 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.

## 8.1 Troubleshooting

### CAUTION

DISCONNECT THE POWER AND LOCK IT OUT whenever working on the machine unless the instructions specifically require the machine to be powered (see Power Lockout Procedure, page 5). Some of the following tests may require the machine to be operational for checking and adjusting. Be very careful that tools and other people are clear of moving parts, and that the drill is not accidentally operated while adjustments are being made.

### CAUTION

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

| <b>Problem</b>                | <b>Area to Check</b>  | <b>Solution</b>   |
|-------------------------------|---|---|
| 1. No power                   | Power to machine  | Connect power   |
|                               | Tripped Circuit Breaker   | Reset Circuit Breaker   |
| 2. Lack of power              | Relief valve in pump may be bad or have dirt in it                  | Clean or replace relief valve or pump   |
|                               | Check oil level – may be low  | Add oil   |
|                               | Check voltage at machine – may be low                               | Remove other machinery on line or provide a dedicated line                          |
| 3. Drill head won't return    | Check lift springs – may be broken or stuck (replace if necessary). | Pry up head, clean & oil shafts   |
|                               | Pull down shafts froze in frame.                                    | Pry up head, clean & oil shafts   |
| 4. Drill head won't come down | Check for broken lift spring – may be jammed                        | Replace spring  |
|                               | Speed control valve out of adjustment or defective                  | Try to readjust, may have to replace  |
| 5. Spindle motor stalls       | Dull drills   | Sharpen drills  |
|                               | Check for low voltage   | (See above)   |
|                               | Drive belt may be loose   | Adjust belt tension (See Adjustment section of this manual)                         |
|                               | Check for paper plugging drills                                     | Clean out hollow drills – We recommend cleaning and soaking drills in oil overnight |



## 8.2 Routine Maintenance



Always disconnect the power when cleaning, servicing, or lubricating your drill, see Lock Out Procedures, page 5.

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. Operators should be familiar with use, care, and limitations of the equipment. **ALL OPERATORS 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.

### 8.2.1 Daily

1. Sharpen the hollow drills often and reset the spindle adjusting knobs if needed.
2. Lubricate the hollow drill frequently with the lubricating stick provided.
3. For better hollow drill life, remove the drills when not in use, clean out, and soak in light oil. Wipe off excess oil before drilling.

### 8.2.2 Weekly (or every 40 hours of operation)

1. Check the drive belt tightness and wear. The drive belt must be kept tight or it will stall the motor and plug or break the drills. See [Section 4.3.2](#) for instructions on how to tighten the belt.
2. Clean and oil the guide bar shafts around frame.
3. Clean and oil the rear support brackets.

### 8.2.3 Monthly

1. Check the hydraulic oil supply for the proper level. This check is made by removing the rear panel and visually inspecting the level of the oil in the clear reservoir. The oil should be filled to the fill line on the tank. If your machine is equipped with a dip stick on the breather cap, remove the cap and check the dip stick. There should be approximately 1/8" (3 mm) of oil on the stick.

2. Use only one of the recommended oils or an ISO VG 100 Hydraulic Fluid equivalent. Oils other than the recommended type will cause seals, cups and O-rings to deteriorate. See Section 8.5.1 on page 28.

### 8.2.4 Yearly

1. Check all adjustments.
2. Tighten all screws.
3. Change hydraulic oil in reservoir. Oil may have to be changed more often if contamination of any kind gets in the oil. (Capacity: 1-1/2 Quarts/1.4 liters)
4. Grease lift springs.

## 8.3 Adjustments

### 8.3.1 Table Position Adjustment

Set the backgauge to the 1" position. Drill a few sheets of paper and measure the distance between the center of each hole to the edge of the paper. If it is not 1" (2.5 cm), loosen the (4) screws that mount the table to the base and carefully move the table to compensate for the error. Tighten the screws and drill some more paper. Repeat this procedure until the holes measure 1" (2.5 cm).

### 8.3.2 Belt Tightness Adjustment

Loosen the two set screws (Figure 18). Turn the Adjustment Screw (Figure 18) to move the motor in and out as needed. The belt must be tight enough that it does not slip. Tighten both set screws when finished.

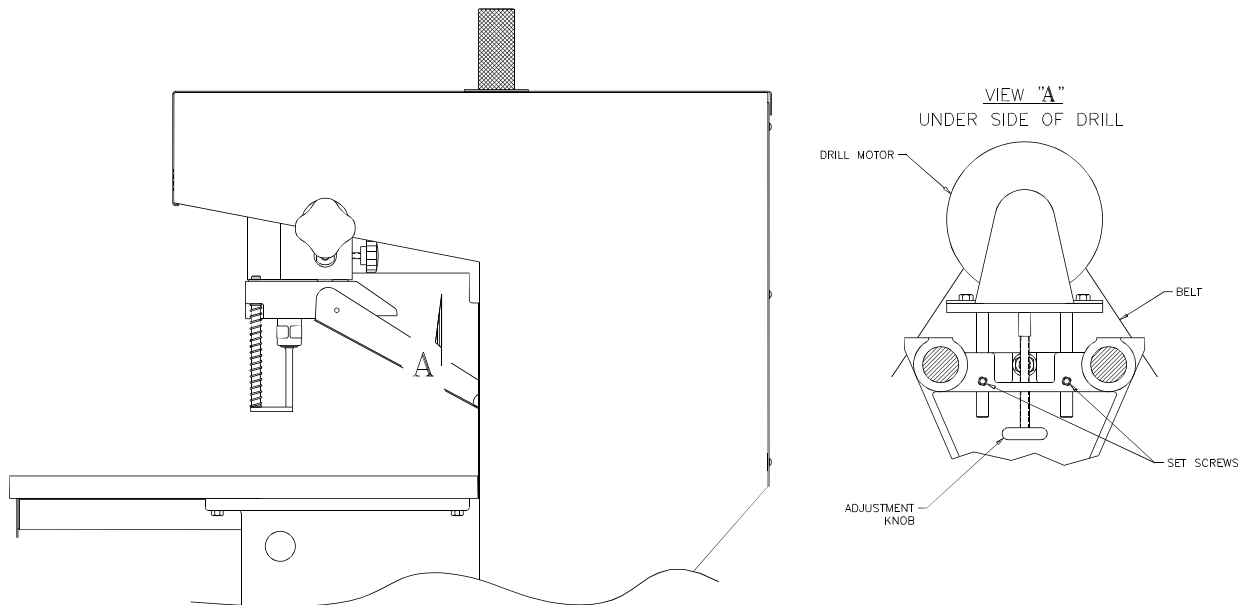


Figure 18

## 8.4 Drill Head Replacement

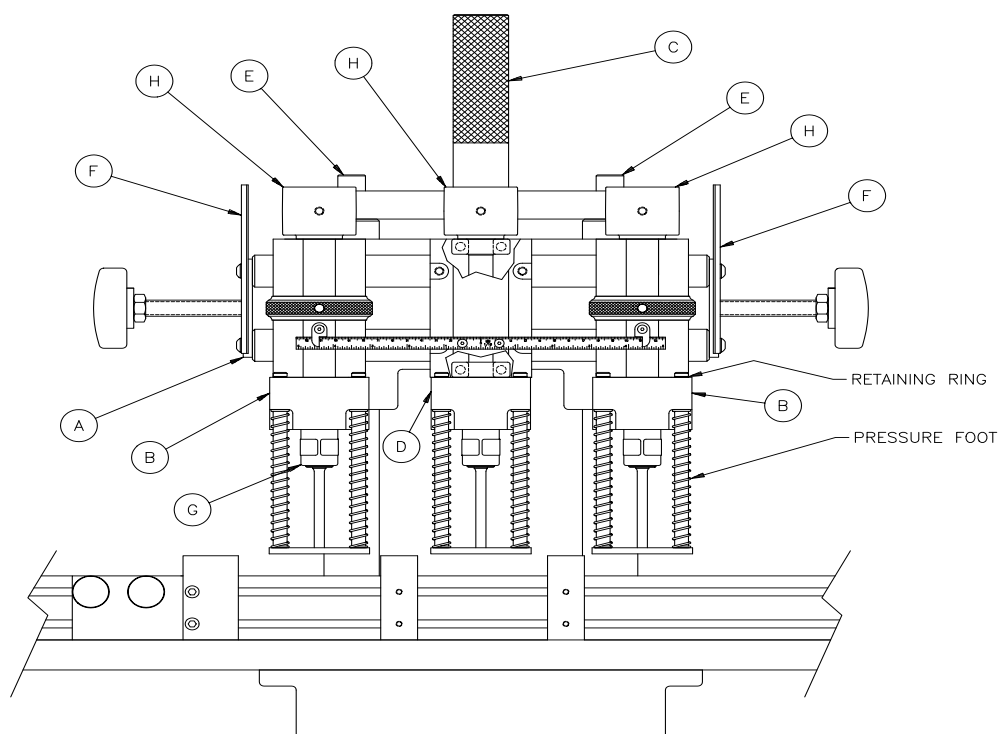


Figure 19

### **CAUTION**

Always disconnect the power when cleaning, servicing, or lubricating your drill, see Lock Out Procedures, page 5.

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

Replacement Procedure:

1. Remove cover.
2. Remove belt.
3. Remove chip pan assembly.

### 8.4.1 Side Head Bearing Replacement

1. Remove end plate "A" and shield "F" from shaft.
2. Slide head off shafts.
3. Remove chip chute "B" from head.
4. Remove pulley "H" from spindle.
5. Tap spindle "G" out from head.
6. Tap out bearings (must use rod from opposite end of each bearing).
7. Tap the upper bearing (S-706) in place using a piece of wood between the hammer and the bearing (an old drill block works fine).

- Place the lower bearing (S-706) on the spindle and tap in the spindle and bearing simultaneously. Use the wood block from the previous step to protect the spindle.
- Replace the chip chute and pulley.

### 8.4.2 Center Head Bearing Replacement

- Raise head as far as possible by turning knob "C".
- Remove pulley "H".
- Remove chip chute "D".
- Remove cutting block from table.
- Back off bolts "E" approximately 1/2" and slide head up on rods so there is enough clearance between table and bottom of head to allow spindle to be removed (place block between table and head to hold in up position).
- Tap out spindle (down).
- Tap out bearings (must use rod from opposite end of each bearing).
- Tap the upper bearing (S-706) in place using a piece of wood between the hammer and the bearing (an old drill block works fine).
- Place the lower bearing (S-706) on the spindle and tap in the spindle and bearing simultaneously. Use the wood block from the previous step to protect the spindle.
- Replace the chip chute and pulley.
- Adjust head for drill depth.

## 8.5 Hydraulic

Through normal use, hydraulic systems gum up and seals wear. Signs of wear are hydraulic leaks and erratic operation of the vertical speed. Check with your Authorized Challenge Dealer for a current repair and/or replacement policy. Replace oil yearly. (Capacity: 1-1/2 Quarts/1.4 liters)

**⚠ CAUTION** NEVER USE Automatic Transmission oil or brake fluid as a substitute! Oils other than the recommended type will cause seals, cups and O-rings to deteriorate. Unsafe operating conditions will result.

### 8.5.1 Recommended Oils

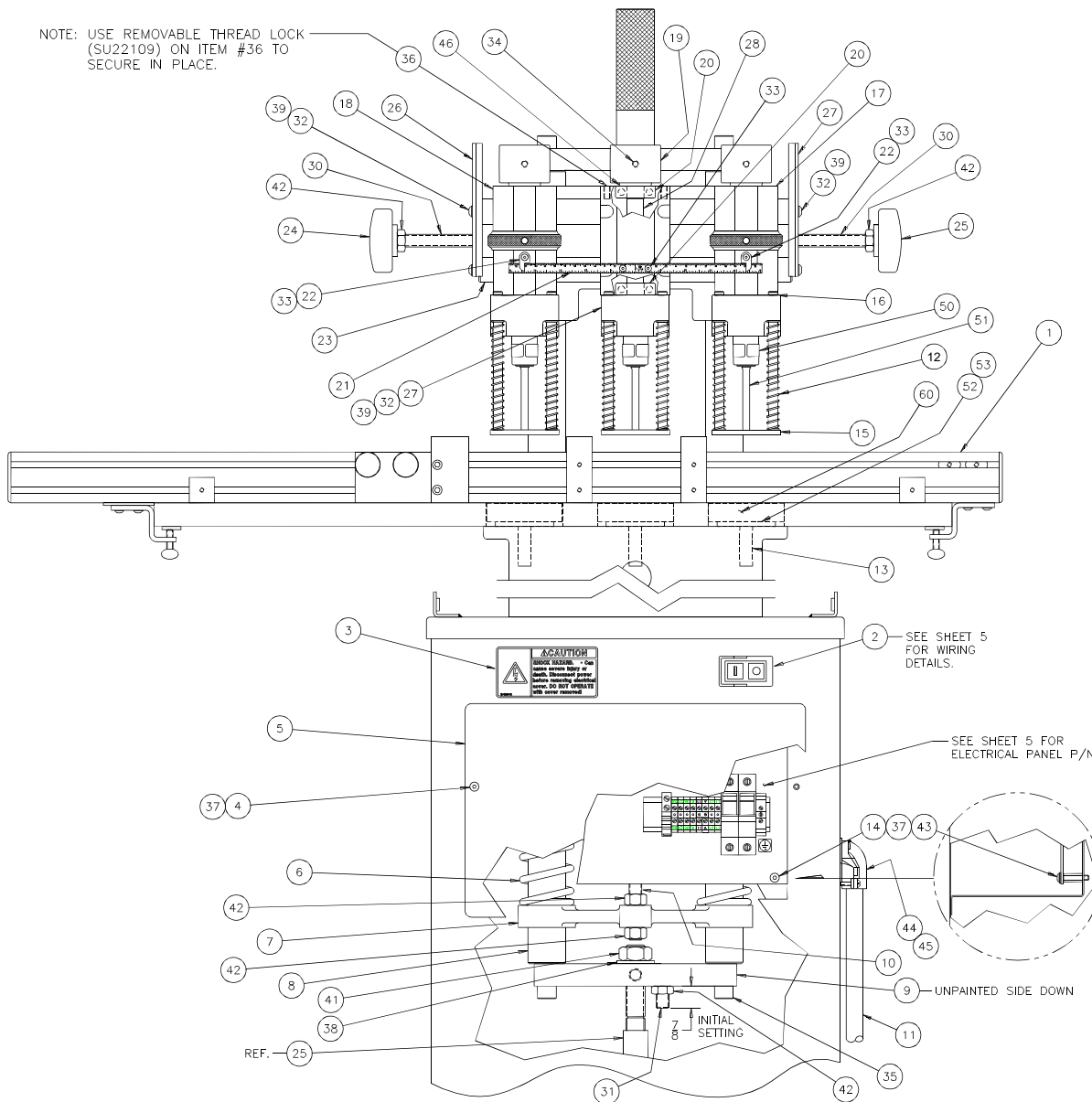
| Oil Name               | Distributor   |
|------------------------|---------------|
| Rykon No. 100          | AMOCO         |
| Duro AW Oil 465        | Arco          |
| AW Machine Oil 100     | Chevron       |
| Pacemaker XD No. 100   | Citgo         |
| Super Hydraulic 100    | Conoco        |
| Nuto H-100             | Exxon         |
| Harmony 100 AW         | Gulf          |
| HO 2A Hydraulic Oil    | Lubriplate    |
| DTE No. 18             | Mobil         |
| Pennzoil AW 100        | Pennzoil      |
| Magnus A Oil 215       | Phillips      |
| Tellus 100             | Shell         |
| Energol HLP 100        | Sohio         |
| Industron 100 Std. Oil | Indiana/Boron |
| Sunvis 851 WR          | Sunoco        |
| Rando HD 100           | Texaco        |
| Unax AW 100            | Union Oil Co. |

## NOTES

# 9.0 Parts Lists & Schematics

## 9.1 Main Assembly – Front View – A-5846-10 Sh't. 1 of 5 Rev. A

S/N 085279 to 105487

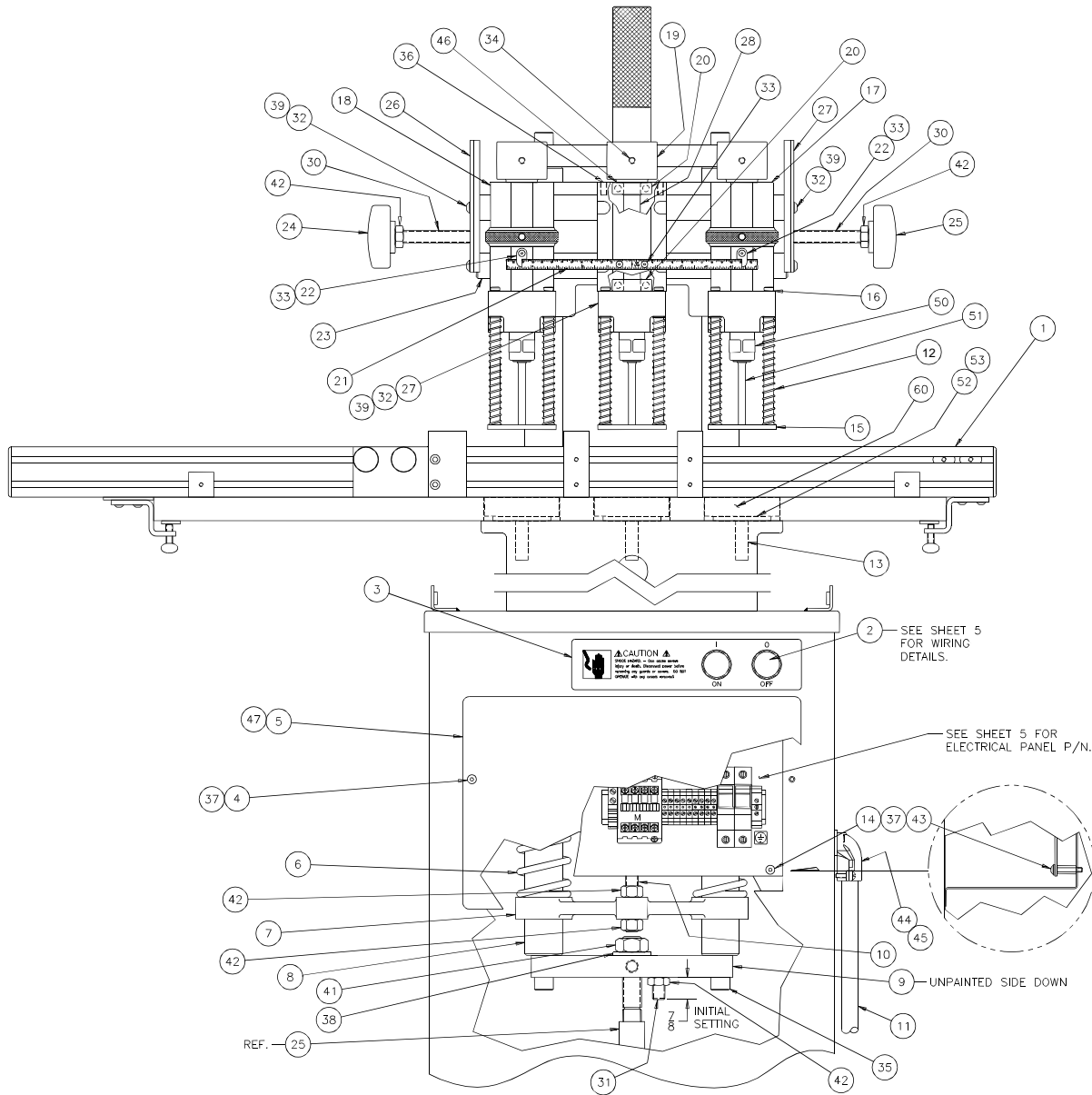


## Main Assembly – Front View, Parts list

| NO. | PART NO.           | DESCRIPTION OF ACCESSORIES              | QTY  |
|-----|--------------------|---|------|
| 1   | 5700               | BACKGAUGE ASM.                          | 1    |
| 2   | E-3255             | SWITCH – ELECTROMAGNETIC ON/OFF         | 1    |
| 3   | S-1781-11          | LABEL – SHOCK HAZARD, COVER REMOVAL     | 1    |
| 4   | S-1864-2           | CAPTIVE RETAINING DEVICE                | 2    |
| 5   | K-480-3            | FRONT GRILL                             | 1    |
| 6   | K-250-8            | SPRING                                  | 2    |
| 7   | K-249              | LIFT SPRING BRACKET                     | 1    |
| 8   | KK-440-16          | GUIDE BAR ASM                           | 2    |
| 9   | K-836-4            | GUIDE ROD BRACKET                       | 1    |
| 10  | K-251-3            | ROD – LIFT SPRING                       | 1    |
| 11  | EE-2889            | CABLE ASSEMBLY – POWER                  | 1    |
| 12  | 4629-1             | SPRING – PRESSURE FOOT                  | 6    |
| 13  | KK-281-2           | CUT STICK KNOCK OUT                     | 3    |
| 14  | E-1152-61          | STANDOFF – 3/4"                         | 4    |
| 15  | A-4626-7           | PRESSURE FOOT ASM.                      | 3    |
| 16  | S-1518-37          | RETAINING RING                          | 6    |
| 17  | <b>A-5847-1-6R</b> | SPINDLE BLOCK ASM. – R.H.               | 1    |
| 18  | <b>A-5862-1-6R</b> | SPINDLE BLOCK ASM. – L.H.               | 1    |
| 19  | 4693-1             | PULLEY                                  | 1    |
| 20  | S-706              | BEARING                                 | 2    |
| 21  | 5859               | SCALE – SPINDLE LOCATION                | 1    |
| 22  | 5858               | INDICATOR                               | 2    |
| 23  | 5856               | SHAFT – SPINDLE BLOCK GUIDE             | 2    |
| 24  | 5710               | ADJ. SCREW KNOB                         | 2    |
| 25  | 16541-2            | HYDRAULIC POWER UNIT ASM.               | REF. |
| 26  | 5716-2             | GUARD – L.H.                            | 1    |
| 27  | 5717-2             | GUARD – R.H.                            | 1    |
| 28  | K-16-4             | SPINDLE                                 | 1    |
| 29  | K-57-19            | CHIP CHUTE – CENTER                     | 1    |
| 30  | 5711               | ADJ. SCREW                              | 2    |
| 31  | H-6953-828         | SCREW – 1/2-13 X 1-3/4 OVAL PT. SOC SET | 1    |
| 32  | H-6910-406         | SCREW – 1/4-20 X 3/4 BUT. HD. CAP       | 6    |
| 33  | H-6910-63203       | SCREW – #6-32 X 3/8 BUT. HD. CAP        | 4    |
| 34  | H-6938-408         | SCREW – 1/4-20 X 3/8 SET                | 1    |
| 35  | H-6918-814         | SCREW – 1/2-13 X 1-3/4 SOC. CAP         | 2    |
| 36  | H-6938-404         | SCREW – 1/4-20 X 1/4 SOC. SET           | 4    |
| 37  | H-6910-102403      | SCREW – #10-24 X 3/8 BUT. HD. CAP       | 6    |
| 38  | H-7321-12          | WASHER – 3/4 USS FLAT                   | 1    |
| 39  | H-7327-8           | WASHER – 1/4 MEDIUM LOCK                | 4    |
| 40  | H-7327-16          | WASHER – 1/2 MEDIUM LOCK                | 4    |
| 41  | H-5239-12          | NUT – 3/4 LIGHT FLEX LOCK               | 1    |
| 42  | H-6424-8           | NUT – 1/2 HEX JAM                       | 5    |
| 43  | H-7324-#10         | WASHER – #10 INT. TOOTH                 | 4    |
| 44  | E-519              | NUT – 1/2 CONDUIT LOCK                  | 1    |
| 45  | S-887              | CONNECTOR – CABLE STRAIN RELIEF         | 1    |
| 46  | H-7321-10          | WASHER – 5/8 FLAT                       | 1    |

# 9.2 Main Assembly – Front View – A-5846-10 Sh't. 1 of 5 Rev. D

S/N 105488 and Up



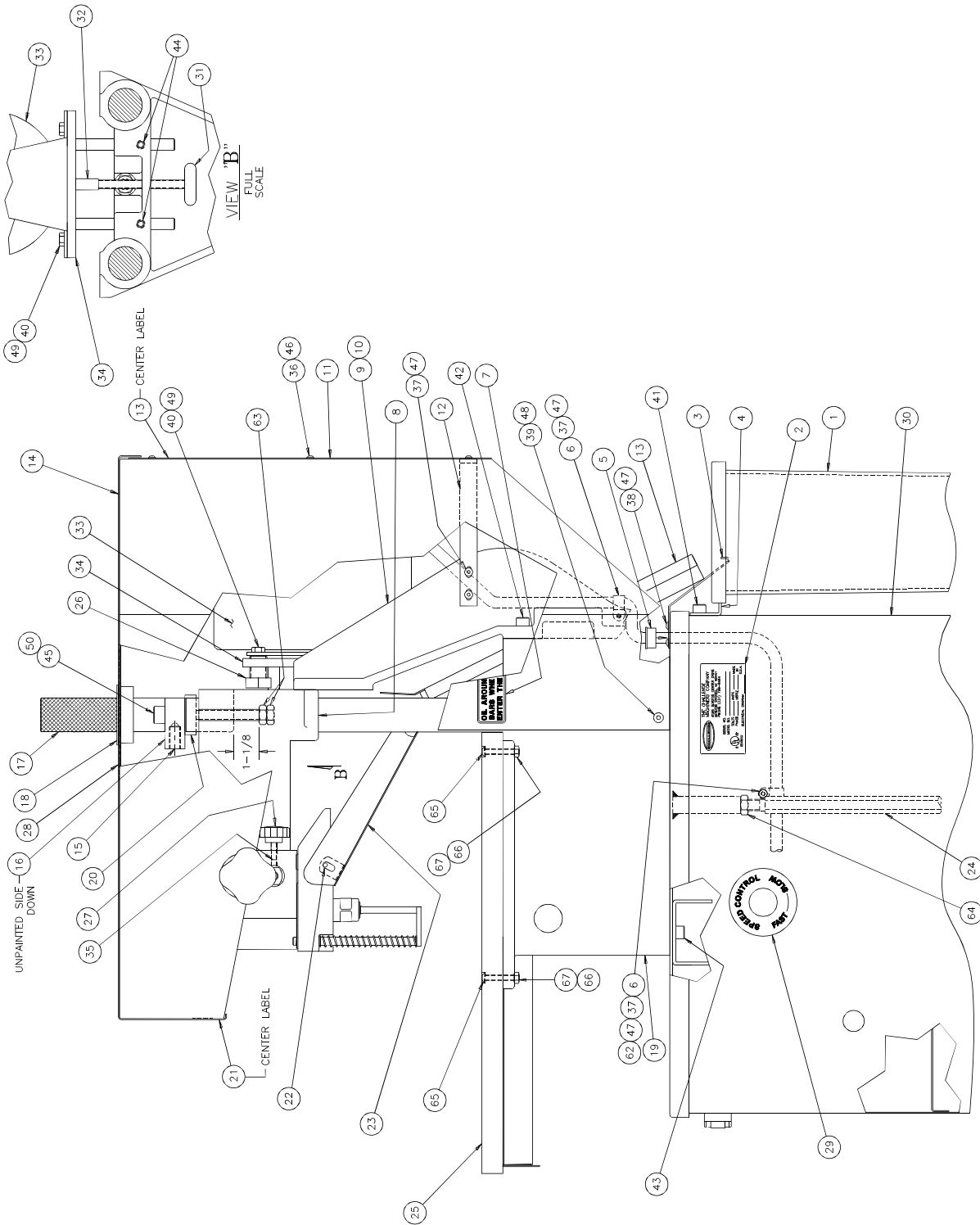


## Main Assembly – Front View, Parts list rev. “D”

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES                | QTY  |
|-----|---------------|---|------|
| 1   | 5700          | BACKGAUGE ASM.                            | 1    |
| 2   | E-3073-( )    | SWITCH - START AND STOP                   | REF. |
| 3   | 5712          | LABEL - SHOCK HAZARD, COVER REM., ON/OFF  | 1    |
| 4   | S-1864-2      | CAPTIVE RETAINING DEVICE                  | 2    |
| 5   | K-480-3       | FRONT GRILL                               | 1    |
| 6   | K-250-8       | SPRING                                    | 2    |
| 7   | K-249         | LIFT SPRING BRACKET                       | 1    |
| 8   | KK-440-16     | GUIDE BAR ASM                             | 2    |
| 9   | K-836-4       | GUIDE ROD BRACKET                         | 1    |
| 10  | K-251-3       | ROD - LIFT SPRING                         | 1    |
| 11  | EE-2889       | CABLE ASSEMBLY - POWER                    | 1    |
| 12  | 4629-1        | SPRING - PRESSURE FOOT                    | 6    |
| 13  | KK-281-2      | CUT STICK KNOCK OUT (S/N: 125781 & UP)    | 3    |
|     | KK-281-5      | CUT STICK KNOCK OUT (S/N: 125780 & BELOW) |      |
| 14  | E-1152-61     | STANDOFF - 3/4"                           | 4    |
| 15  | A-4626-7      | PRESSURE FOOT ASM.                        | 3    |
| 16  | S-1518-37     | RETAINING RING                            | 6    |
| 17  | A-5847-1-6R   | SPINDLE BLOCK ASM. - R.H.                 | 1    |
| 18  | A-5862-1-6R   | SPINDLE BLOCK ASM. - L.H.                 | 1    |
| 19  | 4693-1        | PULLEY                                    | 1    |
| 20  | S-706         | BEARING                                   | 2    |
| 21  | 5859          | SCALE - SPINDLE LOCATION                  | 1    |
| 22  | 5858          | INDICATOR                                 | 2    |
| 23  | 5856          | SHAFT - SPINDLE BLOCK GUIDE               | 2    |
| 24  | 5710          | ADJ. SCREW KNOB                           | 2    |
| 25  | 16541-2       | HYDRAULIC POWER UNIT ASM.                 | REF. |
| 26  | 5716-2        | GUARD - L.H.                              | 1    |
| 27  | 5717-2        | GUARD - R.H.                              | 1    |
| 28  | K-16-4        | SPINDLE                                   | 1    |
| 29  | K-57-19       | CHIP CHUTE - CENTER                       | 1    |
| 30  | 5711          | ADJ. SCREW                                | 2    |
| 31  | H-6953-828    | SCREW - 1/2-13 X 1-3/4 OVAL PT. SOC SET   | 1    |
| 32  | H-6910-406    | SCREW - 1/4-20 X 3/4 BUT. HD. CAP         | 6    |
| 33  | H-6910-63203  | SCREW - #6-32 X 3/8 BUT. HD. CAP          | 4    |
| 34  | H-6938-408    | SCREW - 1/4-20 X 3/8 SET                  | 1    |
| 35  | H-6918-814    | SCREW - 1/2-13 X 1-3/4 SOC. CAP           | 2    |
| 36  | H-6938-404    | SCREW - 1/4-20 X 1/4 SOC. SET             | 4    |
| 37  | H-6910-102403 | SCREW - #10-24 X 3/8 BUT. HD. CAP         | 6    |
| 38  | H-7321-12     | WASHER - 3/4 USS FLAT                     | 1    |
| 39  | H-7327-8      | WASHER - 1/4 MEDIUM LOCK                  | 4    |
| 40  | H-7327-16     | WASHER - 1/2 MEDIUM LOCK                  | 4    |
| 41  | H-5239-12     | NUT - 3/4 LIGHT FLEX LOCK                 | 1    |
| 42  | H-6424-8      | NUT - 1/2 HEX JAM                         | 5    |
| 43  | H-7324-#10    | WASHER - #10 INT. TOOTH                   | 4    |
| 44  | E-519         | NUT - 1/2 CONDUIT LOCK                    | 1    |
| 45  | S-887         | CONNECTOR - CABLE STRAIN RELIEF           | 1    |
| 46  | H-7321-10     | WASHER - 5/8 FLAT                         | 1    |
| 47  | S-1781-188    | LABEL - POWER CONNECTION PROCEDURE        | 1    |
| 50  | K-85          | COVER - DRIFT HOLE                        | 3    |
| 51  | CD-4-2-1/2    | DRILL - 1/4" X 2-1/2                      | 3    |
|     | CD-5-2-1/2    | DRILL - 5/16" X 2-1/2                     | 3    |
| 52  | 5841          | SHIM - 26 GAGE                            | 3    |
| 53  | 5841-1        | SHIM - 20 GAGE                            | 3    |
| 54  | 4687          | DRILL DRIFT (NOT SHOWN)                   | 1    |
| 55  | 4688          | DRILL EASE STICK (NOT SHOWN)              | 1    |
| 56  | S-1615        | CORK - FOR DRILL CLEANER (NOT SHOWN)      | 1    |
| 57  | W-130         | 3/16" HEX ALLEN WRENCH (NOT SHOWN)        | 1    |
| 58  | W-137         | 5/32" HEX ALLEN WRENCH (NOT SHOWN)        | 1    |
| 59  | W-141         | 1/8" HEX ALLEN WRENCH (NOT SHOWN)         | 1    |
| 60  | KK-473-3      | 1 DOZEN WOOD DRILL BLOCKS                 | 1    |
| 61  | A-4950-2      | DRILL SHARPENER/CHIP REMOVER (NOT SHOWN)  | 1    |

### 9.3 Main Assembly – Upper Right View – A-5846-10 Sh't. 2 of 5 Rev. A

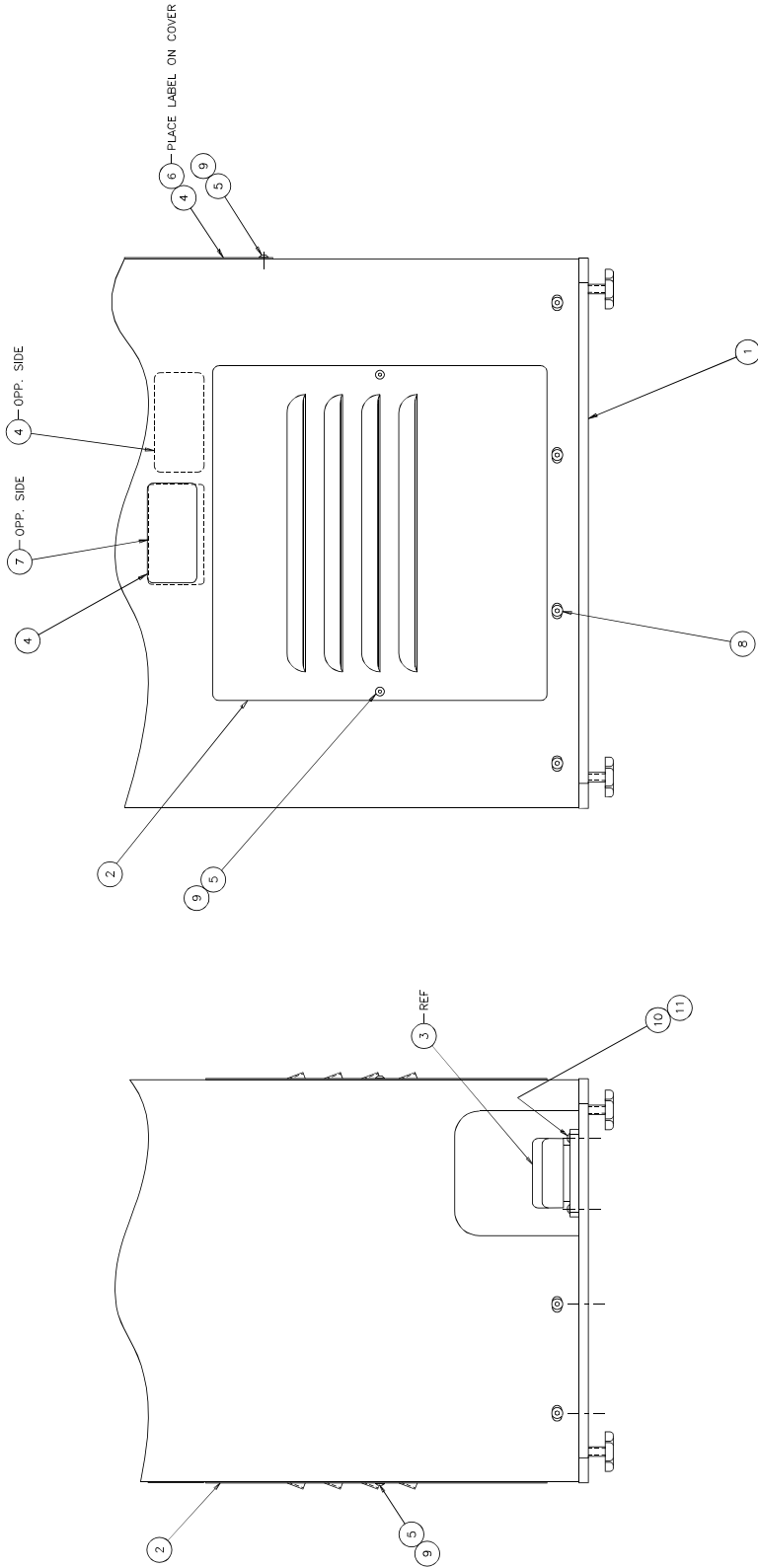
REV "C"



**Main Assembly – Upper Right View, Parts List REV. "C"**

| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES          | QTY |
|-----|----------------|-------------------------------------|-----|
| 1   | 5739           | WASTE BIN                           | 1   |
| 2   | 41130          | SERIAL PLATE                        | 1   |
| 3   | 5886           | HINGE                               | 1   |
| 4   | 5870           | HOOK - CHIP BAG                     | 2   |
| 5   | E-1172-4       | SNAP IN BUSHING                     | 1   |
| 6   | E-968-4        | CLAMP - 3/8" CABLE                  | 3   |
| 7   | S-1880         | LABEL - OIL                         | 2   |
| 8   | K-2-24         | SPINDLE BRACKET                     | 1   |
| 9   | K-478-3        | BRACE - R.H. GUIDE                  | 1   |
| 10  | K-479-4        | BRACE - L.H. GUIDE                  | 1   |
| 11  | 5725           | BACK COVER                          | 1   |
| 12  | 5733           | HOOD SUPPORT                        | 1   |
| 13  | S-1781-16      | LABLE - CAUTION                     | 2   |
| 14  | 5720-3         | HOOD ASM.                           | 1   |
| 15  | S-2021         | SPRING PLUNGER                      | 1   |
| 16  | K-836-4        | GUIDE ROD BRACKET                   | 1   |
| 17  | K-780-2        | SPINDLE ADJ. ROD                    | 1   |
| 18  | E-1172-11      | SNAP IN BUSHING                     | 1   |
| 19  | K-1-33         | FRAME                               | 1   |
| 20  | S-1818-2       | THREADED COLLAR                     | 1   |
| 21  | 5729-1         | LABEL - FRONT PANEL                 | 1   |
| 22  | H-21S-187-0500 | PIN - 3/16 X 1/2 ROLL               | 2   |
| 23  | A-5878-1       | CHIP CHUTE SWING ASM.               | 1   |
| 24  | 5715           | JACK SCREW                          | 1   |
| 25  | 5734           | TABLE ASM.                          | 1   |
| 26  | 5738           | ADJUSTING SCREW                     | 2   |
| 27  | S-1602         | KNOB - SPINDLE LOCK                 | 2   |
| 28  | S-1781-86      | LABEL - DRILL DEPTH ADJ.            | 1   |
| 29  | S-1684         | LABEL - SPEED CONTROL               | 1   |
| 30  | KK-289-34      | STAND ASM.                          | 1   |
| 31  | AA-6098        | BELT ADJ. ASM.                      | 1   |
| 32  | 16075          | SPACER - MOTOR BELT ADJ.            | 1   |
| 33  | E-1600-69      | MOTOR - SPINDLE, 60 HZ              | 1   |
|     | E-1600-70      | MOTOR - SPINDLE, 50 HZ              |     |
| 34  | KK-265-4       | MOTOR BRACKET ASM.                  | 1   |
| 35  | 5857           | PLUG                                | 2   |
| 36  | H-6910-83204   | SCREW - #8-32 X 1/2 BUT. HD. CAP    | 8   |
| 37  | H-6910-102404  | SCREW - #10-24 X 1/2 BUT. HD. CAP   | 6   |
| 38  | H-6910-102403  | SCREW - #10-24 X 3/8 BUT. HD. CAP   | 1   |
| 39  | H-6910-404     | SCREW - 1/4-20 X 1/2 BUT. HD. CAP   | 4   |
| 40  | H-6913-504     | SCREW - 5/16-18 X 1/2 HEX HD. CAP   | 4   |
| 41  | H-6918-606     | SCREW - 3/8-16 X 3/4 SOC. HD. CAP   | 2   |
| 42  | H-6918-610     | SCREW - 3/8-16 X 1-1/4 SOC. HD. CAP | 4   |
| 43  | H-6918-608     | SCREW - 3/8-16 X 1" SOC. HD. CAP    | 4   |
| 44  | H-6951-612     | SCREW - 3/8-16 X 3/4 NYLOC SOC. SET | 2   |
| 45  | H-6918-814     | SCREW - 1/2-13 X 1-3/4 SOC. HD. CAP | 2   |
| 46  | H-7324-#8      | WASHER - #8 INT. TOOTH              | 8   |
| 47  | H-7324-#10     | WASHER - #10 INT. TOOTH             | 6   |
| 48  | H-7324-8       | WASHER - 1/4 INT. TOOTH             | 4   |
| 49  | H-7322-5       | WASHER - 5/16" PLAIN                | 4   |
| 50  | H-7327-16      | WASHER - 1/2 MED. LOCK              | 2   |
| 52  | H-6423-#10     | NUT - #10-24 HEX                    | 1   |
| 53  | H-6433-8       | NUT - 1/2-13 HEX JAM, L.H. THREAD   | 2   |
| 54  | H-6424-8       | NUT - 1/2-13 HEX JAM                | 1   |
| 55  | H-6910-416     | SCREW - 1/4-20 X 2" BUTTON HD.      | REF |
| 56  | H-7324-8       | WASHER - 1/4 INT. TOOTH             | REF |
| 57  | H-6423-4       | NUT - 1/4-20 HEX                    | REF |

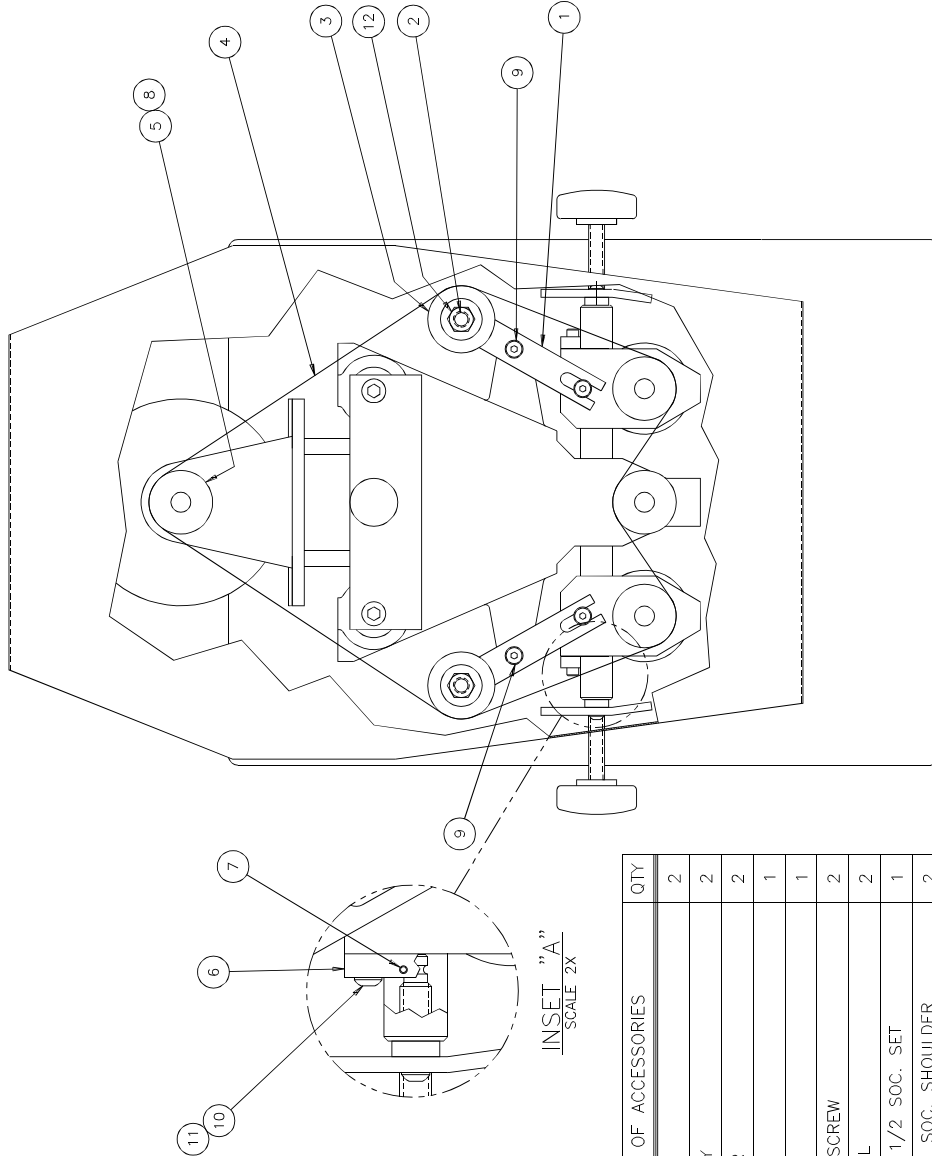
9.4 Main Assembly – Lower Right View – A-5846-10 Sh't. 3 of 5 Rev. A



| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES             | QTY |
|-----|---------------|--|-----|
| 1   | 16541-3       | HYD. POWER UNIT ASM.                   | 1   |
| 2   | K-480-2       | COVER - SIDES                          | 2   |
| 3   | EE-3259       | FOOTSWITCH ASSEMBLY - FROM POWER PANEL | REF |
| 4   | S-1781-16     | LABEL - CAUTION                        | 3   |
| 5   | S-1864-2      | CAPTIVE RETAINING DEVICE               | 6   |
| 6   | K-480-3       | COVER                                  | 1   |
| 7   | S-1842        | LABEL - HYD. FLUID                     | 1   |
| 8   | H-6894-405    | SCREW - 1/4-20 X 5/8 WHIZ LOCK         | 14  |
| 9   | H-6910-102403 | SCREW - #10-24 X 3/8 BUT. HD. SOC.     | 6   |
| 10  | H-6910-102406 | SCREW - #10-24 X 3/4 BUT. HD. SOC.     | 2   |
| 11  | H-7324-#10    | WASHER - #10 INT. TOOTHLOCK            | 2   |
| 12  |               |  |     |

### 9.5 Main Assembly – Top View – A-5846-10 Sh't. 4 of 5 Rev. A

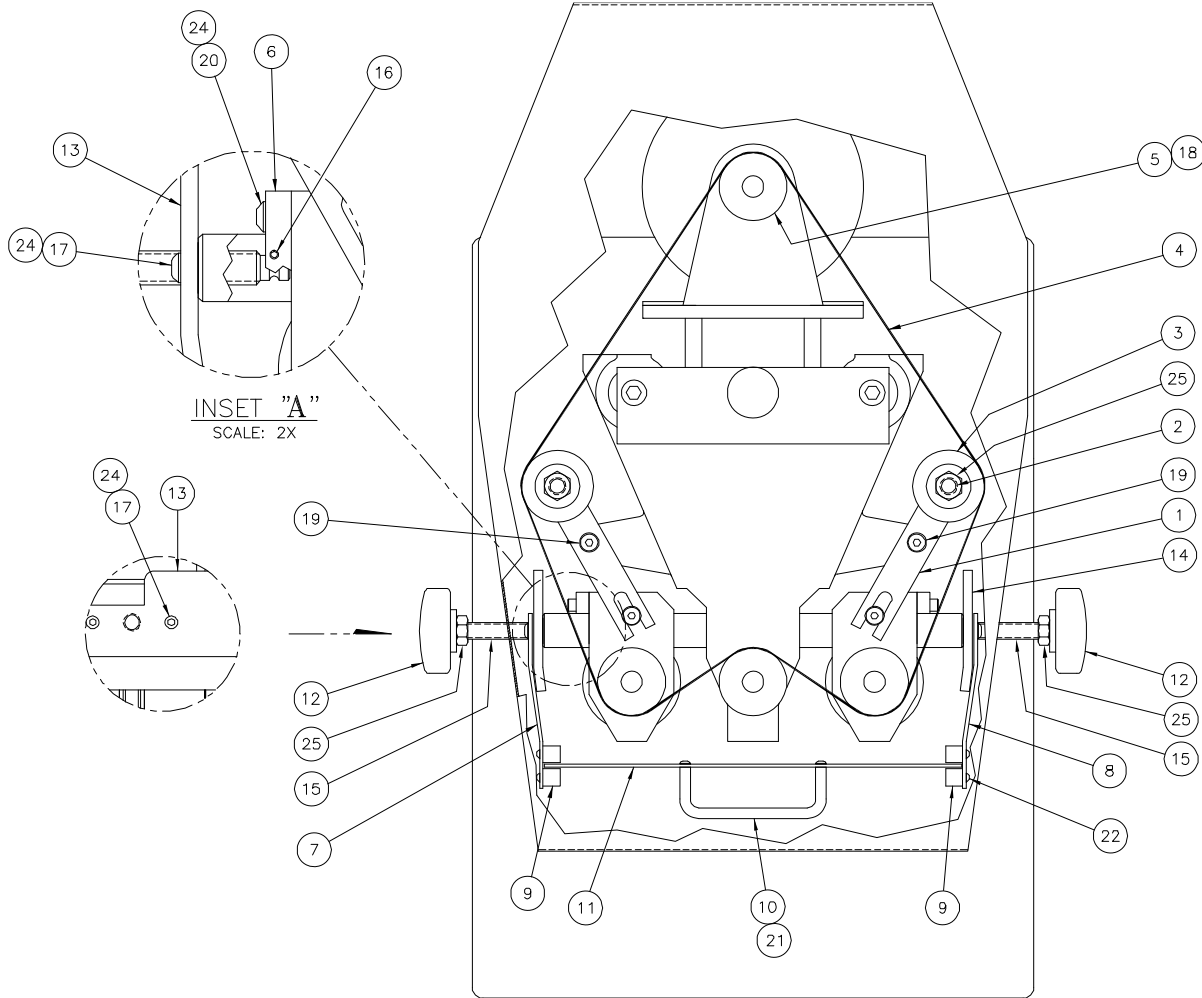
S/N's 085279 to 135900



| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES      | QTY |
|-----|----------------|---------------------------------|-----|
| 1   | 5861-1         | ARM - IDLER PULLEY              | 2   |
| 2   | 5889           | STUD - IDLER PULLEY             | 2   |
| 3   | A-5887-1       | PULLEY ASM. - IDLER             | 2   |
| 4   | S-1661-1       | BELT - FLAT                     | 1   |
| 5   | S-694-4        | PULLEY - MOTOR                  | 1   |
| 6   | 5852           | BLOCK - ADJUSTING SCREW         | 2   |
| 7   | H-21S-125-1000 | PIN - 1/8 X 1" ROLL             | 2   |
| 8   | H-6938-408     | SCREW - 1/4-20 X 1/2 SOC. SET   | 1   |
| 9   | H-5254-604     | SCREW - 3/8 X 1/2 SOC. SHOULDER | 2   |
| 10  | H-6910-406     | SCREW - 1/4-20 X 3/4 BUT. HD.   | 4   |
| 11  | H-7327-8       | WASHER - 1/4 MEDIUM LOCK        | 4   |
| 12  | H-6424-8       | NUT - 1/2-13 HEX JAM            | 2   |

### 9.6 Main Assembly – Top View – A-5846-10 Sh't. 4 of 5 Rev. B

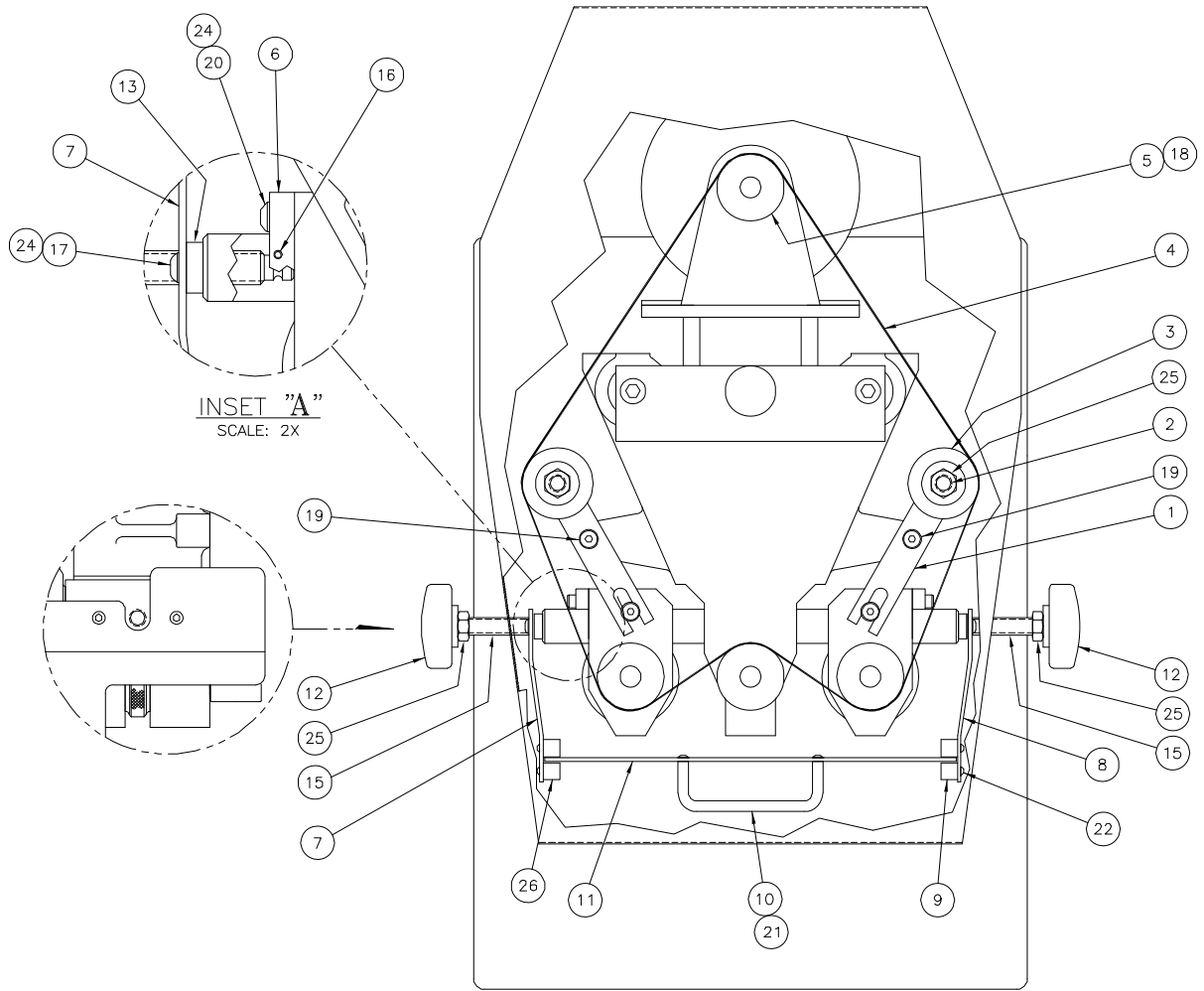
S/N's 135901 to 14xxxx



| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES        | QTY |
|-----|----------------|-----------------------------------|-----|
| 1   | 5861-1         | ARM - IDLER PULLEY                | 2   |
| 2   | 5889           | STUD - IDLER PULLEY               | 2   |
| 3   | A-5887-1       | PULLEY ASM. - IDLER               | 2   |
| 4   | S-1661-1       | BELT - FLAT                       | 1   |
| 5   | S-694-4        | PULLEY - MOTOR                    | 1   |
| 6   | 5852           | BLOCK - ADJUSTING SCREW           | 2   |
| 7   | 48001-1        | BRACKET - SHIELD, L.H.            | 1   |
| 8   | 48001-2        | BRACKET - SHIELD, R.H.            | 1   |
| 9   | 48002-1        | GUIDE - SHIELD                    | 4   |
| 10  | 13940          | HANDLE                            | 1   |
| 11  | 48003-1        | SHIELD                            | 1   |
| 12  | 5710           | ADJ. SCREW KNOB                   | 2   |
| 13  | 5716-2         | GUARD - LH                        | 1   |
| 14  | 5717-2         | GUARD - RH                        | 1   |
| 15  | 5711           | ADJ. SCREW                        | 2   |
| 16  | H-21S-125-1000 | PIN - 1/8 X 1" ROLL               | 2   |
| 17  | H-6910-406     | SCREW - 1/4-20 X 3/4 BUT. HD. CAP | 6   |
| 18  | H-6938-408     | SCREW - 1/4-20 X 1/2 SOC. SET     | 1   |
| 19  | H-5254-604     | SCREW - 3/8 X 1/2 SOC. SHOULDER   | 2   |
| 20  | H-6910-406     | SCREW - 1/4-20 X 3/4 BUT. HD.     | 4   |
| 21  | H-6910-83202   | #8-32 X 1/4 BUTTON HD CAP SCREW   | 2   |
| 22  | S-1088-3       | #6 X 3/8 PN HD S.M. SCREW         | 8   |
| 23  |                |                                   |     |
| 24  | H-7327-8       | WASHER - 1/4 MEDIUM LOCK          | 8   |
| 25  | H-6424-8       | NUT - 1/2-13 HEX JAM              | 4   |

### 9.7 Main Assembly – Top View – A-5846-10 Sh't. 4 of 5 Rev. C

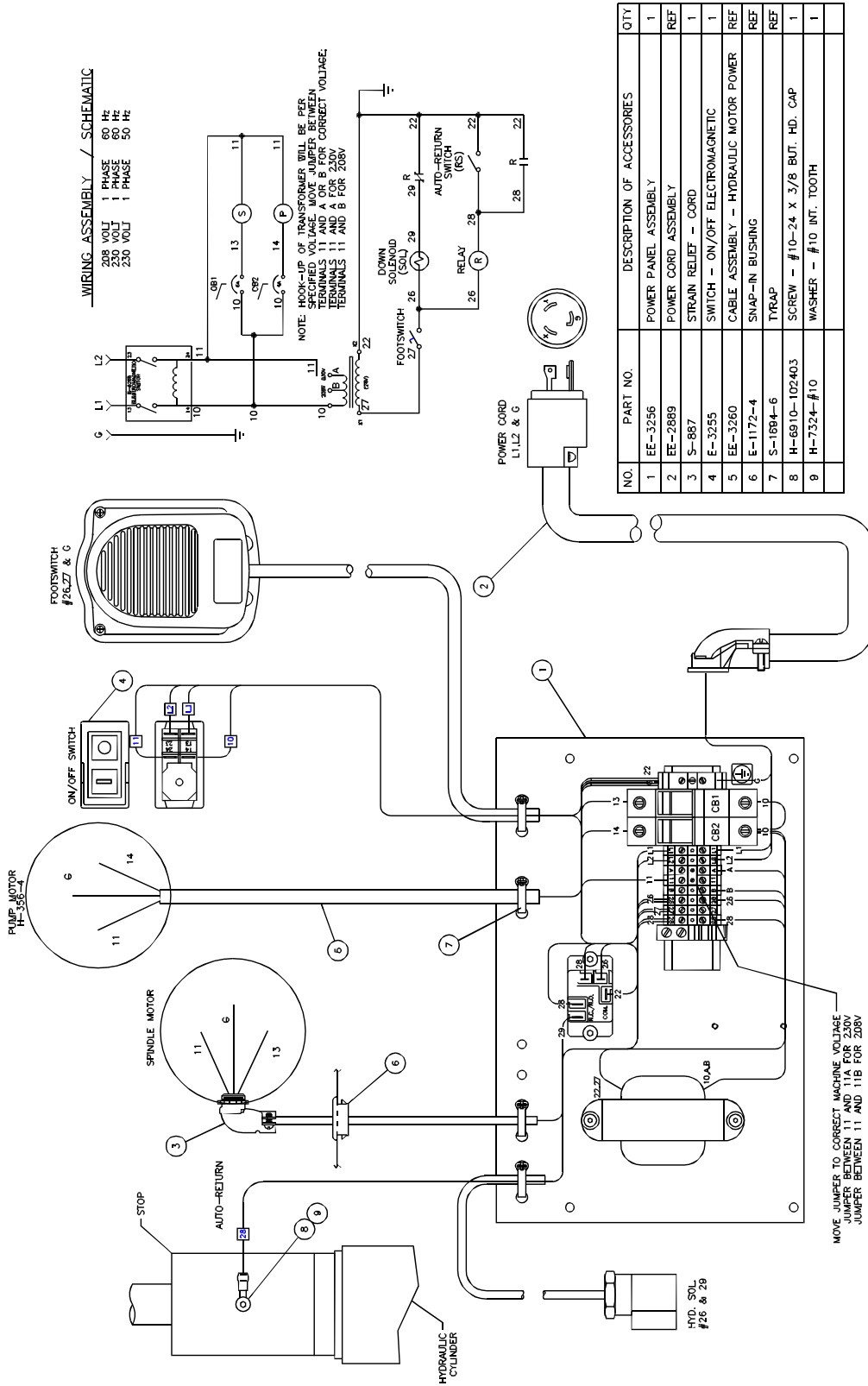
S/N's 14xxxx and Up (ECN 13N070)



| NO. | PART NO.       | DESCRIPTION OF ACCESSORIES        | QTY |
|-----|----------------|-----------------------------------|-----|
| 1   | 5861-1         | ARM - IDLER PULLEY                | 2   |
| 2   | 5889           | STUD - IDLER PULLEY               | 2   |
| 3   | A-5887-1       | PULLEY ASM. - IDLER               | 2   |
| 4   | S-1661-1       | BELT - FLAT                       | 1   |
| 5   | S-694-4        | PULLEY - MOTOR                    | 1   |
| 6   | 5852           | BLOCK - ADJUSTING SCREW           | 2   |
| 7   | 48001-3        | BRACKET - SHIELD, L.H.            | 1   |
| 8   | 48001-2        | BRACKET - SHIELD, R.H.            | 1   |
| 9   | 48002-1        | GUIDE - SHIELD                    | 2   |
| 10  | 13940          | HANDLE                            | 1   |
| 11  | 48003-1        | SHIELD                            | 1   |
| 12  | 5710           | ADJ. SCREW KNOB                   | 2   |
| 13  | 5851           | ADJ. SCREW PLATE                  | 2   |
| 15  | 5711           | ADJ. SCREW                        | 2   |
| 16  | H-21S-125-1000 | PIN - 1/8 X 1" ROLL               | 2   |
| 17  | H-6910-406     | SCREW - 1/4-20 X 3/4 BUT. HD. CAP | 6   |
| 18  | H-6938-408     | SCREW - 1/4-20 X 1/2 SOC. SET     | 1   |
| 19  | H-5254-604     | SCREW - 3/8 X 1/2 SOC. SHOULDER   | 2   |
| 20  | H-6910-406     | SCREW - 1/4-20 X 3/4 BUT. HD.     | 4   |
| 21  | H-6910-83202   | #8-32 X 1/4 BUTTON HD CAP SCREW   | 2   |
| 22  | S-1088-3       | #6 X 3/8 PN HD S.M. SCREW         | 8   |
| 24  | H-7327-8       | WASHER - 1/4 MEDIUM LOCK          | 8   |
| 25  | H-6424-8       | NUT - 1/2-13 HEX JAM              | 4   |
| 26  | 48002-2        | LEFT GUIDE - SHIELD               | 2   |

# 9.8 Main Assembly – Wiring Detail – A-5846-10 Sh't. 5 of 5 Rev. A

S/N 085279 to 105487

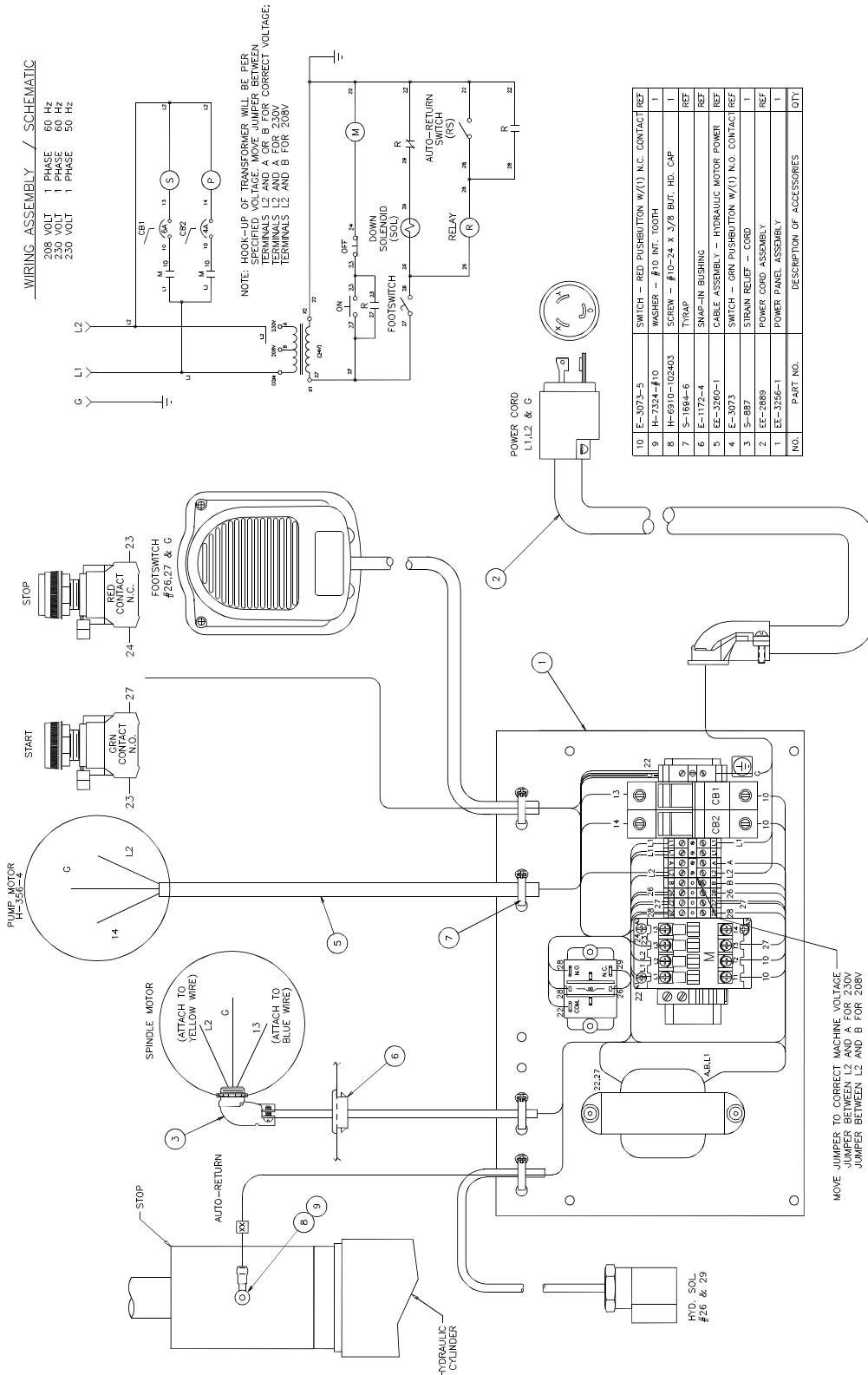


| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES             | QTY. |
|-----|---------------|--|------|
| 1   | EE-3256       | POWER PANEL ASSEMBLY                   | 1    |
| 2   | EE-2889       | POWER CORD ASSEMBLY                    | REF  |
| 3   | S-887         | STRAIN RELIEF - CORD                   | 1    |
| 4   | E-3255        | SWITCH - ON/OFF ELECTROMAGNETIC        | 1    |
| 5   | EE-3260       | CABLE ASSEMBLY - HYDRAULIC MOTOR POWER | REF  |
| 6   | E-1172-4      | SNAP-IN BUSHING                        | REF  |
| 7   | S-1684-6      | TYRAP                                  | REF  |
| 8   | H-6910-102403 | SCREW - #10-24 X 3/8 BUT. HD. CAP      | 1    |
| 9   | H-7324-#10    | WASHER - #10 INT. TOOTH                | 1    |



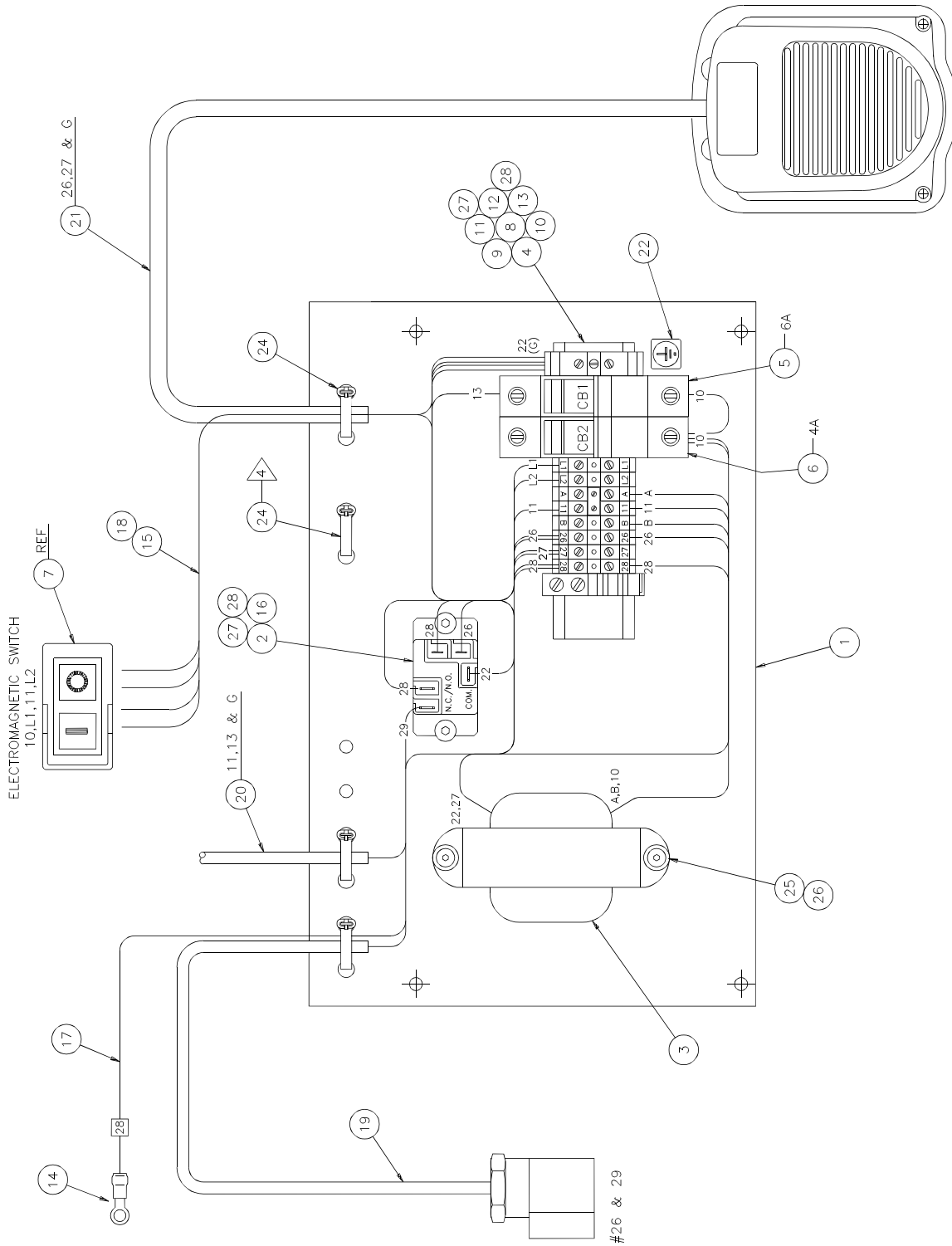
# 9.9 Main Assembly – Wiring Detail – A-5846-10 Sh't. 5 of 5 Rev. B

S/N 105488 and Up



# 9.10 Power Panel Assembly – Wiring Detail – EE-3256 Rev. C

S/N 105487 and Below

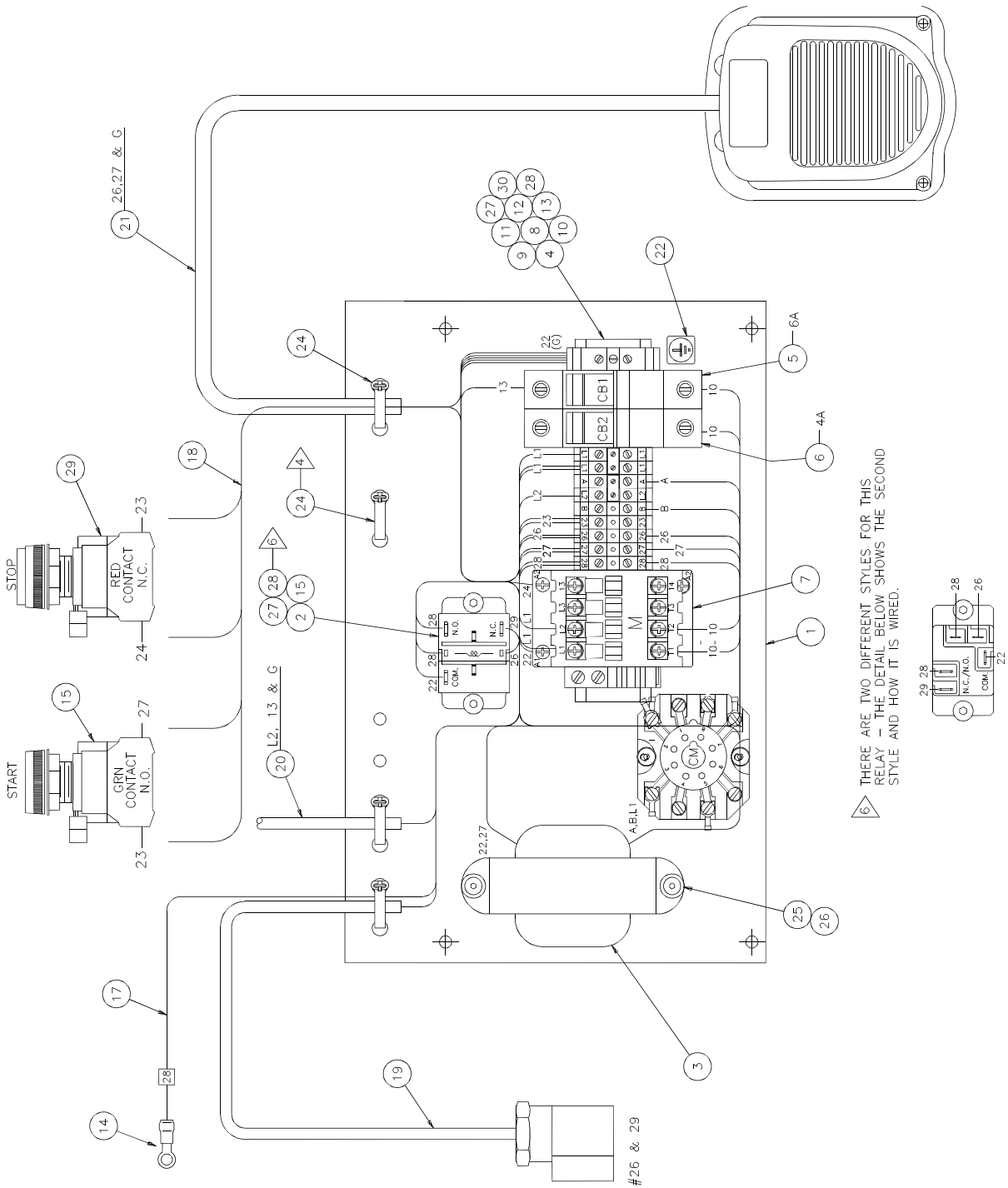


## Power Panel Assembly – Parts List – EE-3256 Rev. C

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES                 | QTY |
|-----|---------------|--|-----|
| 1   | E-3257        | PANEL - ELECTRICAL                         | 1   |
| 2   | E-2232-1      | RELAY                                      | 1   |
| 3   | E-2742-13     | TRANSFORMER, 50VA - 230V PRIM./24V SEC.    | 1   |
| 4   | E-1977-23     | MOUNTING RAIL - TERMINAL BLOCK 5" LONG     | 1   |
| 5   | E-3264-7      | CIRCUIT BREAKER - TRIP 6A (CB1)            | 1   |
| 6   | E-3264-5      | CIRCUIT BREAKER - TRIP 4A (CB2)            | 1   |
| 7   | E-3255        | SWITCH - ON/OFF ELECTROMAGNETIC            | REF |
| 8   | E-2068-8      | TERMINAL BLOCK - 10GA FEED THRU            | 8   |
| 9   | E-2068-3      | TERMINAL BLOCK - GROUNDING                 | 1   |
| 10  | E-2070-1      | END BLOCK - TERMINAL BLOCK                 | 1   |
| 11  | E-2507-2      | FIXED BRIDGE - 2 POLE                      | 1   |
| 12  | E-1356-()     | MARKING STRIP - TERMINAL BLOCK             | 2   |
| 13  | E-1214-51     | CONNECTOR - 3/16 FULLY INS. Q.D.           | 2   |
| 14  | E-1214-8      | CONNECTOR - #10 INS. RING (16-22GA)        | 1   |
| 15  | E-1214-49     | CONNECTOR - 1/4" FULLY INS. Q.D. (16-14GA) | 4   |
| 16  | E-1214-65     | CONNECTOR - 1/4" FULLY INS. Q.D. (18-22GA) | 2   |
| 17  | E-709-R       | WIRE, #18 GA. RED MTW 82" TOTAL            | 1   |
| 18  | E-849-R       | WIRE, #16 GA. RED MTW 68" TOTAL            | 1   |
| 19  | EE-2354-1     | CABLE ASSEMBLY - SOLENOID                  | 1   |
| 20  | EE-3258       | CABLE ASSEMBLY - SPINDLE MOTOR POWER       | 1   |
| 21  | EE-3259       | CABLE ASSEMBLY - FOOTSWITCH                | 1   |
| 22  | S-1781-197    | LABEL - GROUND SYMBOL, PRIMARY             | 1   |
| 23  | S-1694        | TYRAP (NOT SHOWN)                          | 5   |
| 24  | S-1694-6      | TYRAP                                      | 4   |
| 25  | H-6910-83203  | SCREW, #8-32NC X 3/8" BUT HD CAP           | 2   |
| 26  | H-7324-#8     | WASHER, #8 INT. TOOTH                      | 2   |
| 27  | H-6910-102403 | SCREW, #10-24NC X 3/8" BUT HD CAP          | 4   |
| 28  | H-7324-#10    | WASHER, #10 INT. TOOTH                     | 4   |

# 9.11 Power Panel Assembly – Wiring Detail – EE-3256-1 Rev. B

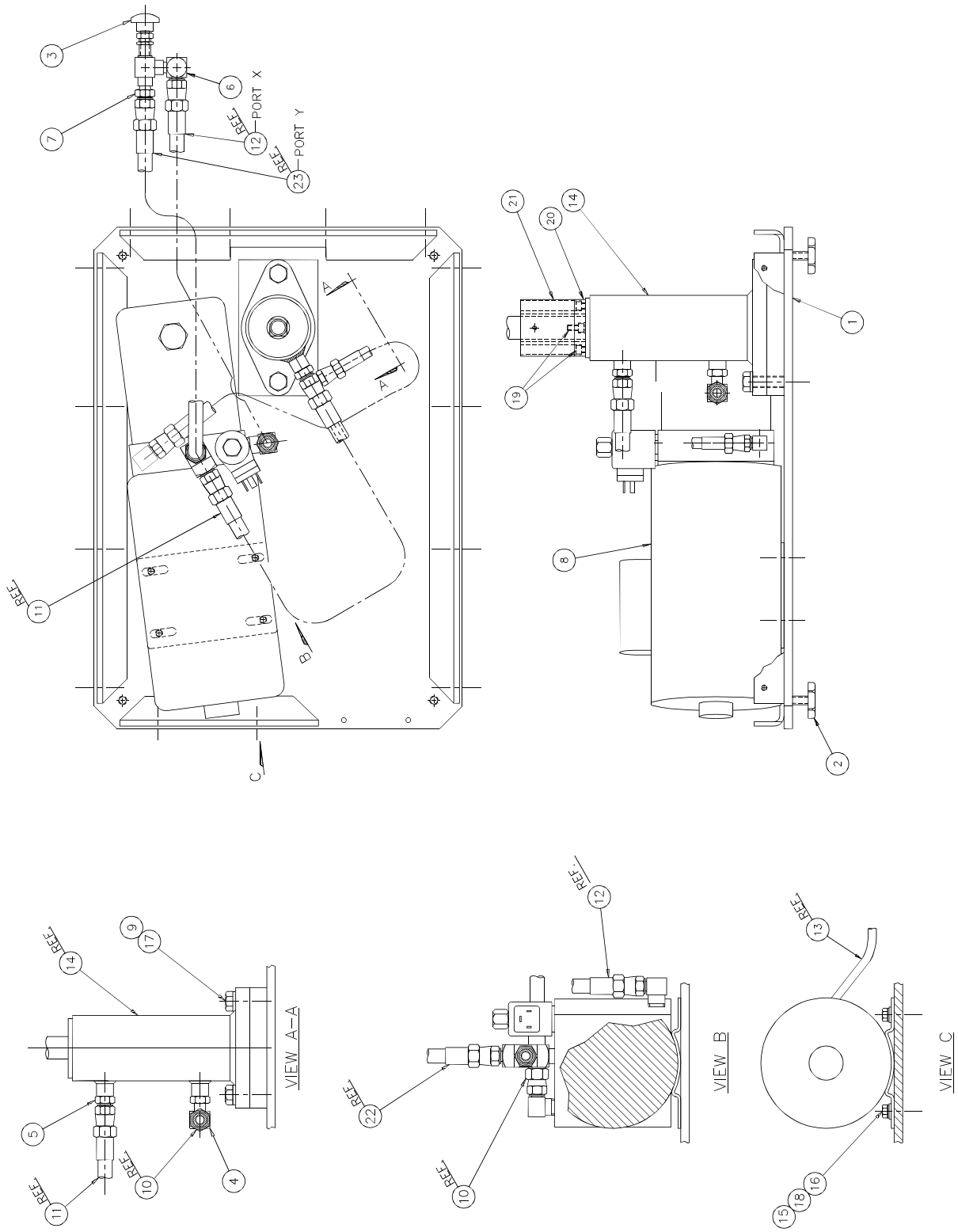
S/N 105488 and Up



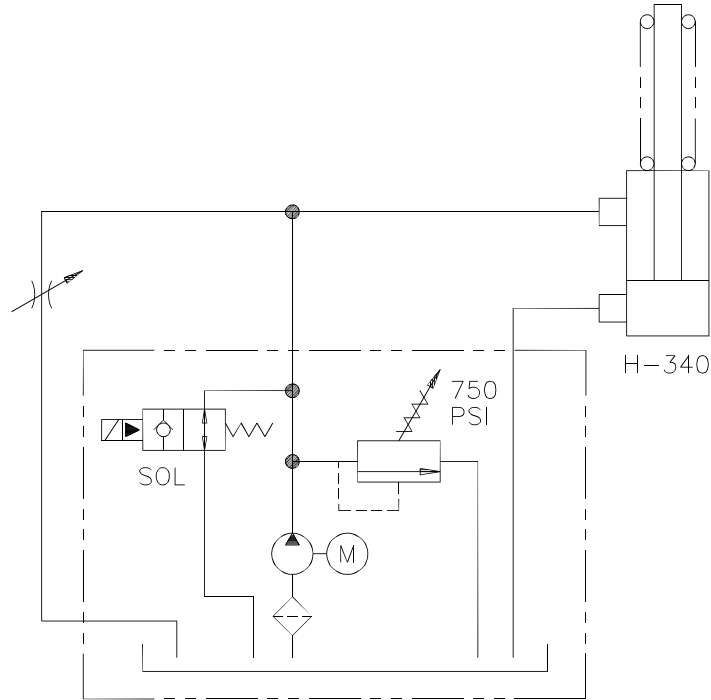
## Power Panel Assembly – Parts List – EE-3256-1 Rev. B

| NO. | PART NO.      | DESCRIPTION OF ACCESSORIES                 | QTY |
|-----|---------------|--|-----|
| 1   | E-3257        | PANEL - ELECTRICAL                         | 1   |
| 2   | E-2232-1      | RELAY                                      | 1   |
| 3   | E-2742-13     | TRANSFORMER, 50VA - 230V PRIM./24V SEC.    | 1   |
| 4   | E-1977-18     | MOUNTING RAIL - TERMINAL BLOCK 6-1/2" LONG | 1   |
| 5   | E-3264-7      | CIRCUIT BREAKER - TRIP 6A (CB1)            | 1   |
| 6   | E-3264-5      | CIRCUIT BREAKER - TRIP 4A (CB2)            | 1   |
| 7   | E-2805        | STARTER - CONTACTOR                        | 1   |
| 8   | E-2068-8      | TERMINAL BLOCK - 10GA FEED THRU            | 9   |
| 9   | E-2068-3      | TERMINAL BLOCK - GROUNDING                 | 1   |
| 10  | E-2070-1      | END BLOCK - TERMINAL BLOCK                 | 1   |
| 11  | E-2507-2      | FIXED BRIDGE - 2 POLE                      | 2   |
| 12  | E-1356-( )    | MARKING STRIP - TERMINAL BLOCK             | 2   |
| 13  | E-1214-51     | CONNECTOR - 3/16 FULLY INS. Q.D.           | 2   |
| 14  | E-1214-8      | CONNECTOR - #10 INS. RING (16-22GA)        | 1   |
| 15  | E-1214-65     | CONNECTOR - 1/4" FULLY INS. Q.D. (18-22GA) | 2   |
| 16  | E-3073        | SWITCH - GRN PUSHBUTTON W/(1) N.O. CONTACT | 1   |
| 17  | E-709-R       | WIRE, #18 GA. RED MTW 148" TOTAL           | 1   |
| 18  | E-1213-B      | WIRE, #10 GA. BLACK MTW 32" TOTAL          | 1   |
| 19  | EE-2354-1     | CABLE ASSEMBLY - SOLENOID                  | 1   |
| 20  | EE-3258-1     | CABLE ASSEMBLY - SPINDLE MOTOR POWER       | 1   |
| 21  | EE-3259       | CABLE ASSEMBLY - FOOTSWITCH                | 1   |
| 22  | S-1781-197    | LABEL - GROUND SYMBOL, PRIMARY             | 1   |
| 23  | S-1694        | TYRAP (NOT SHOWN)                          | 5   |
| 24  | S-1694-6      | TYRAP                                      | 4   |
| 25  | H-6910-83203  | SCREW, #8-32NC X 3/8" BUT HD CAP           | 2   |
| 26  | H-7324-#8     | WASHER, #8 INT. TOOTH                      | 2   |
| 27  | H-6910-102403 | SCREW, #10-24NC X 3/8" BUT HD CAP          | 4   |
| 28  | H-7324-#10    | WASHER, #10 INT. TOOTH                     | 4   |
| 29  | E-3073-5      | SWITCH - RED PUSHBUTTON W/(1) N.C. CONTACT | 1   |
| 30  | E-2864-1      | SEPERATOR PLATE - TERMINAL BLOCK           | 1   |

9.12 Main Assembly – Hydraulic Power Unit – 16541-3 Rev. A



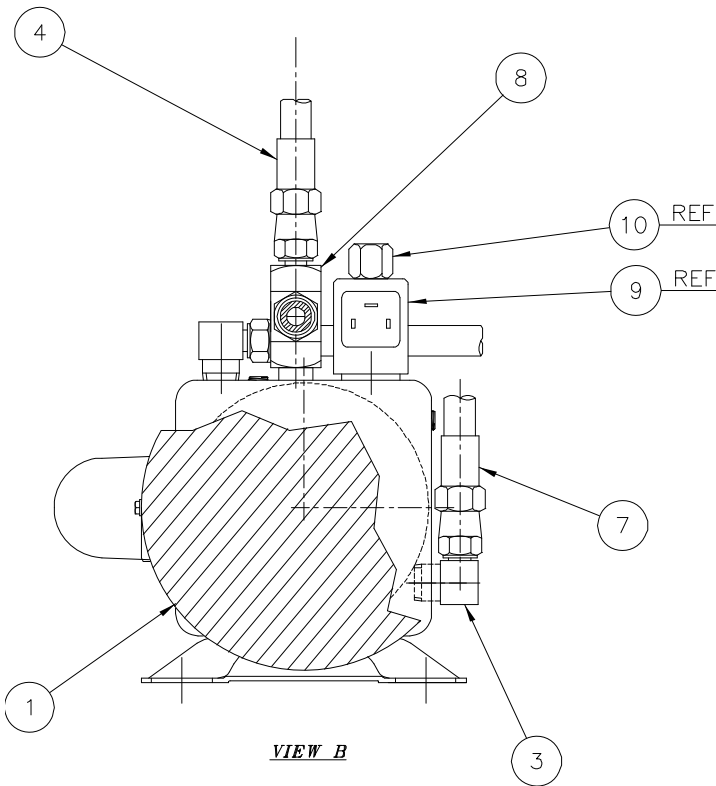
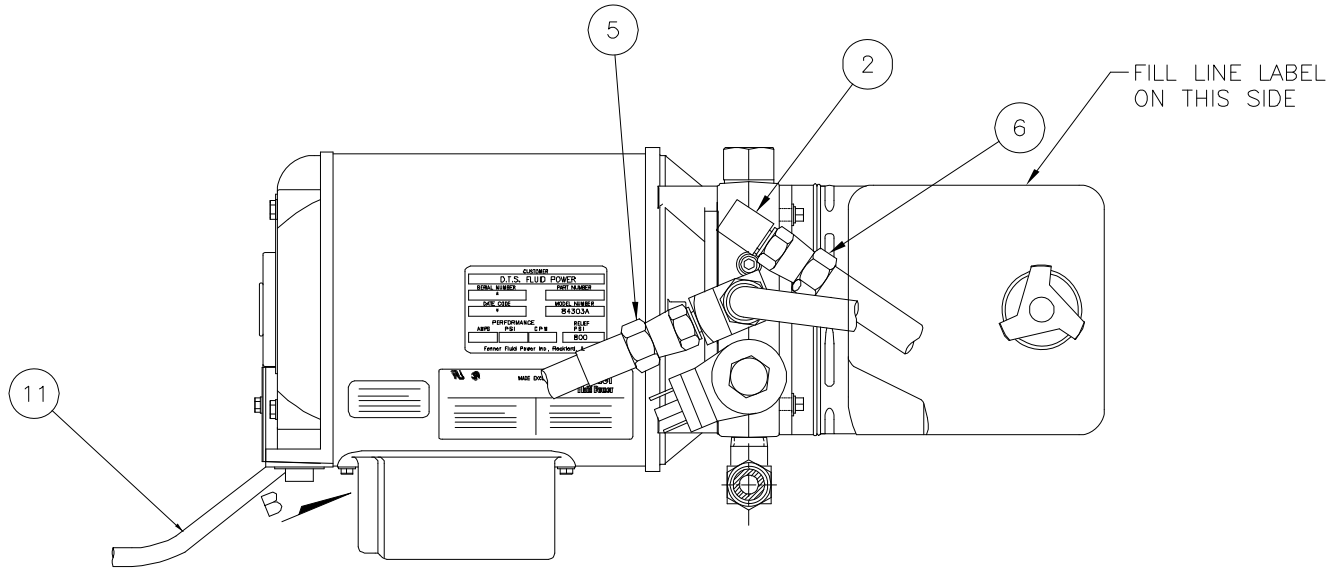
## Hydraulic Power Unit Assembly – Parts List/Hydraulic Schematic



HYDRAULIC SCHEMATIC

| NO. | PART NO.   | DESCRIPTION OF ACCESSORIES                | QTY  |
|-----|------------|---|------|
| 1   | 16540-1    | WELDMENT – POWER PACK BASE                | 1    |
| 2   | 16543      | FOOT – BASE                               | 4    |
| 3   | 4771-1     | VALVE – NEEDLE                            | 1    |
| 4   | H-230-5    | ELBOW – 7/16 O-RING TO 7/16 TUBE          | 1    |
| 5   | H-236-5    | ADAPTER – 7/16 O-RING TO 9/16 TUBE        | 1    |
| 6   | H-237-5    | ELBOW – 1/8 NPT TO 9/16 TUBE              | 1    |
| 7   | H-241-5    | ADAPTER – 1/8 NPT TO 9/16 TUBE            | 1    |
| 8   | H-356-4    | HYD. POWER UNIT – 115/208/230V 50/60C 1PH | 1    |
| 9   | H-7327-16  | LOCKWASHER – 1/2 MEDIUM                   | 2    |
| 10  | H-242-32   | HOSE ASSEMBLY – 18" LONG                  | REF. |
| 11  | H-242-2    | HOSE ASSEMBLY – 15" LONG                  | REF. |
| 12  | H-242-42   | HOSE ASSEMBLY – 30" LONG                  | REF. |
| 13  | EE-3260    | CABLE ASSEMBLY – HYD. MOTOR               | REF. |
| 14  | H-340      | CYLINDER – HYDRAULIC                      | 1    |
| 15  | H-7327-10  | LOCKWASHER – 5/16 MEDIUM                  | 4    |
| 16  | H-6913-505 | SCREW – 5/16-18 X 5/8 HEX                 | 4    |
| 17  | H-6913-812 | SCREW – 1/2-13 X 1-1/2 HEX                | 2    |
| 18  | H-7321-5   | WASHER – 5/16 PLAIN                       | 4    |
| 19  | H-6918-405 | SCREW – 1/4-20 X 5/8 SOC. HD. CAP         | 4    |
| 20  | 5719       | ISOLATOR                                  | 1    |
| 21  | 5718-1     | STOP                                      | 1    |
| 22  | H-242-41   | HOSE ASSEMBLY – 25" LONG                  | REF. |
| 23  |            |   |      |
|     |            |   |      |

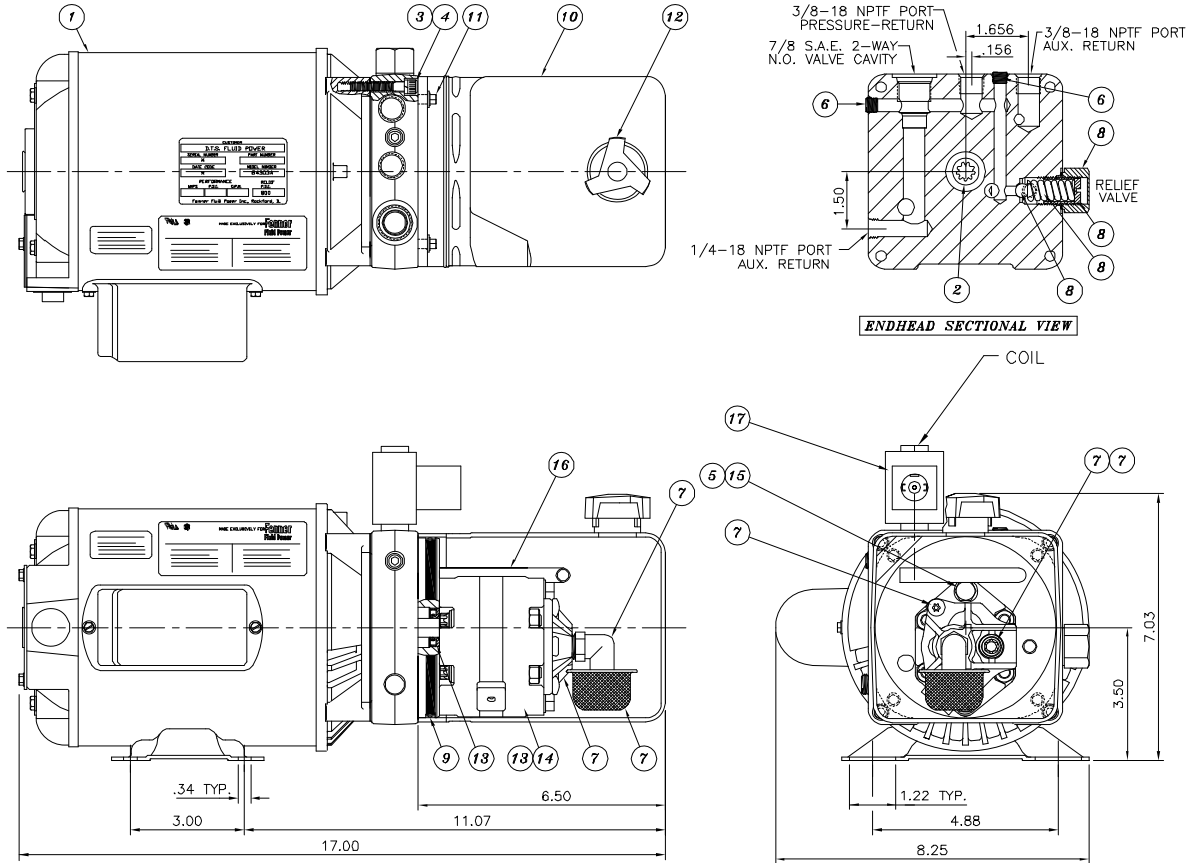
9.13 Hydraulic Power Unit Assembly – H-356-4 Rev. B



| NO. | PART NO.  | DESCRIPTION OF ACCESSORIES                | QTY  |
|-----|-----------|---|------|
| 1   | H-372-5   | HYD. POWER UNIT – 115/208/230V 50/60C 1PH | 1    |
| 2   | H-237-3   | ELBOW – 3/8-18 NPT X 7/16-20 TUBE         | 1    |
| 3   | H-237-4   | ELBOW – 1/4 NPT X 9/16-18 TUBE            | 1    |
| 4   | H-242-41  | HOSE ASSEMBLY – 25" LONG                  | 1    |
| 5   | H-242-2   | HOSE ASSEMBLY – 15" LONG                  | 1    |
| 6   | H-242-32  | HOSE ASSEMBLY – 18" LONG                  | 1    |
| 7   | H-242-42  | HOSE ASSEMBLY – 30" LONG                  | 1    |
| 8   | H-263-2   | TEE – 3/8-18 NPT X 9/16-18 TUBE           | 1    |
| 9   | E-1069-17 | 24 V. COIL                                | REF. |
| 10  | H-200-5   | CARTRIDGE SOLENOID                        | REF. |
| 11  | EE-3260-1 | CABLE ASM. – HYD. MOTOR POWER             | 1    |

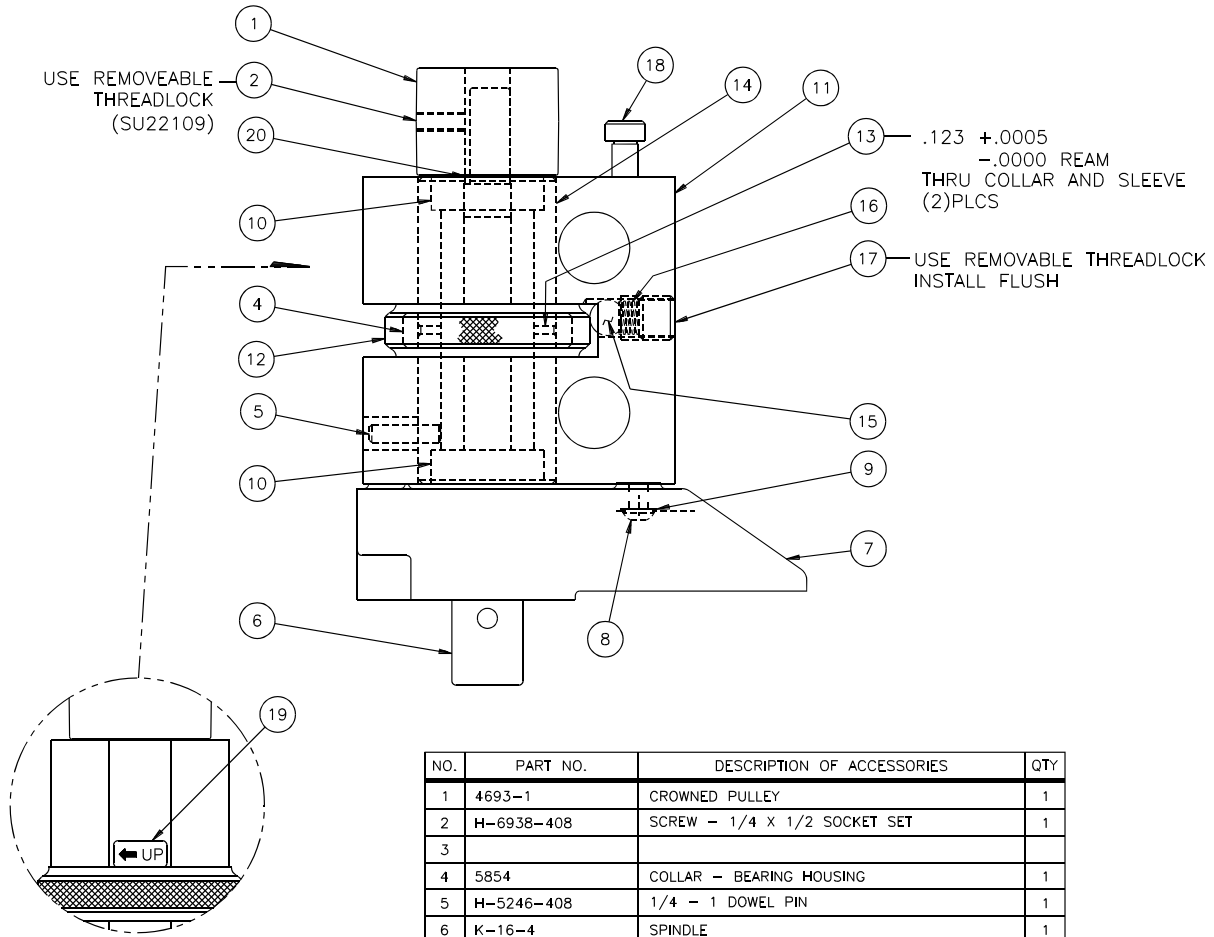


### 9.14 Hydraulic Power Unit – H-372-5



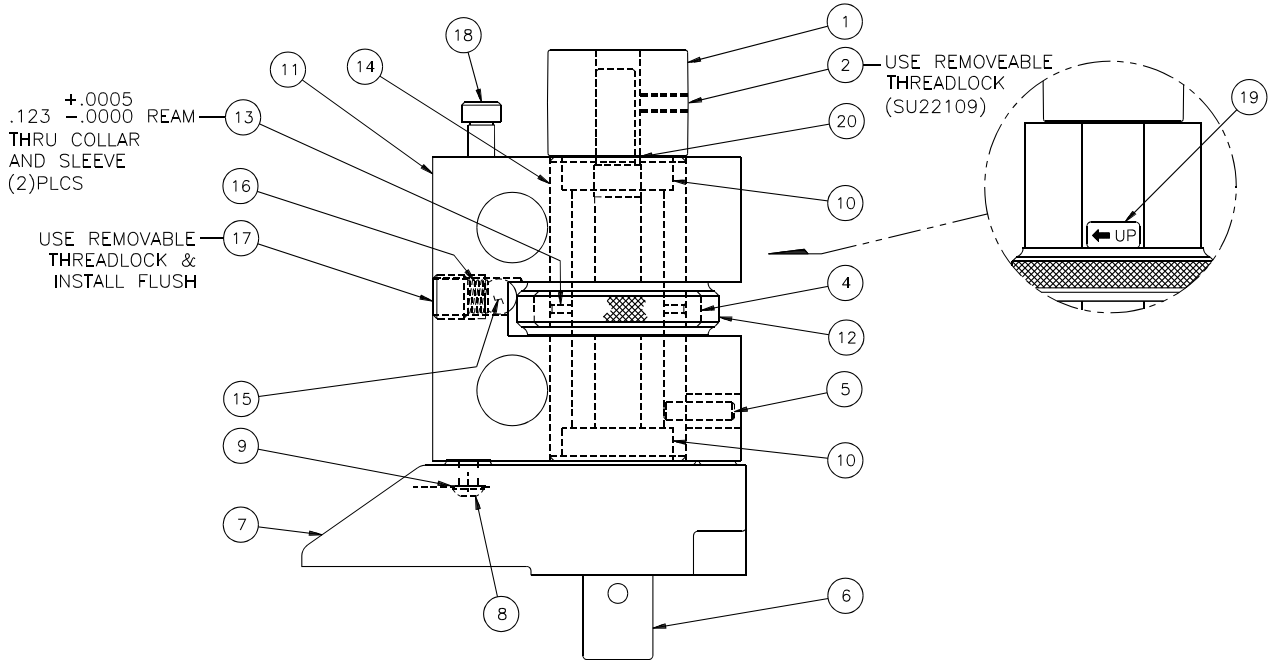
| NO. | CMC P/N   | DESCRIPTION OF ACCESSORIES  | QTY |
|-----|-----------|-----------------------------|-----|
| 1   | H-531     | MOTOR AC 115/208-230        | 1   |
| 2   | H-532     | COUPLING                    | 1   |
| 3   | N/A       | 1/4 LOCKWASHER              | 4   |
| 4   | N/A       | M6x1.0 35MM SHCS            | 4   |
| 5   | H-533     | WASHER                      | 2   |
| 6   | H-534     | PLUG 1/8 N.P.T.             | 2   |
| 7   | H-535     | INLET PLUMBING KIT          | 1   |
| 8   | H-536     | ADJ. RELIEF VALVE ASM.      | 1   |
| 9   | H-537     | RESERVOIR O-RING            | 1   |
| 10  | H-538     | RESERVOIR                   | 1   |
| 11  | H-539     | RESERVOIR SCREW             | 4   |
| 12  | H-540     | BREATHER                    | 1   |
| 13  | H-541     | PUMP O-RING KIT             | 1   |
| 14  | H-542     | PUMP ASSEMBLY               | 1   |
| 15  | H-543     | PUMP MOUNTING BOLT          | 2   |
| 16  | H-544     | 3/8 RETURN TUBE             | 1   |
| 17  | E-1069-17 | 24 V. COIL                  | 1   |
| 18  | H-200-5   | CARTRIDGE-SOLENOID (N/S)    | 1   |
| 19  | H-545     | ADAPTER - DAYCO (NOT SHOWN) | 1   |
| 20  | H-546     | TEE - DAYCO (NOT SHOWN)     | 1   |

9.15 R.H. Spindle Block Assembly A-5847-1-6R Rev. B



| NO. | PART NO.    | DESCRIPTION OF ACCESSORIES   | QTY |
|-----|-------------|------------------------------|-----|
| 1   | 4693-1      | CROWNED PULLEY               | 1   |
| 2   | H-6938-408  | SCREW - 1/4 X 1/2 SOCKET SET | 1   |
| 3   |             |                              |     |
| 4   | 5854        | COLLAR - BEARING HOUSING     | 1   |
| 5   | H-5246-408  | 1/4 - 1 DOWEL PIN            | 1   |
| 6   | K-16-4      | SPINDLE                      | 1   |
| 7   | 5872-2      | CHIP CHUTE RH                | 1   |
| 8   | H-6910-406  | 1/4 X 3/4 BUT HD CAP SCREW   | 2   |
| 9   | H-7327-8    | 1/4 MED LOCK WASHER          | 2   |
| 10  | S-706       | 6693 BALL BEARING            | 2   |
| 11  | 5848-1-6    | SPINDLE BLOCK RH             | 1   |
| 12  | 5855-1      | ADJUSTMENT NUT               | 1   |
| 13  | H-5246-204  | 1/8 X 1/2 DOWEL PIN          | 2   |
| 14  | 5853        | SLEEVE - BEARING HOUSING     | 1   |
| 15  | 5737        | 1/2" DIA. STEEL BALL         | 1   |
| 16  | 35048-2     | SPRING                       | 1   |
| 17  | H-6938-1004 | SCREW - 5/8-11 X 1/2 SOC SET | 1   |
| 18  | H-5254-604  | SCREW - 3/8 X 1/2 SHOULDER   | 1   |
| 19  | S-1781-87   | LABEL - DRILL DEPTH ADJ.     | 1   |
| 20  | H-7321-10   | WASHER - 5/8 FLAT            | 1   |

9.16 L.H. Spindle Block Assembly A-5862-1-6R Rev. B



| NO. | PART NO.    | DESCRIPTION OF ACCESSORIES   | QTY |
|-----|-------------|------------------------------|-----|
| 1   | 4693-1      | CROWNED PULLEY               | 1   |
| 2   | H-6938-408  | SCREW - 1/4 X 1/2 SOCKET SET | 1   |
| 3   |             |                              |     |
| 4   | 5854        | COLLAR - BEARING HOUSING     | 1   |
| 5   | H-5246-408  | 1/4 - 1 DOWEL PIN            | 1   |
| 6   | K-16-4      | SPINDLE                      | 1   |
| 7   | 5873-2      | CHIP CHUTE LH                | 1   |
| 8   | H-6910-406  | 1/4 X 3/4 BUT HD CAP SCREW   | 2   |
| 9   | H-7327-8    | 1/4 MED LOCK WASHER          | 2   |
| 10  | S-706       | 6693 BALL BEARING            | 2   |
| 11  | 5863-1-6    | SPINDLE BLOCK LH             | 1   |
| 12  | 5855-1      | ADJUSTMENT NUT               | 1   |
| 13  | H-5246-204  | 1/8 X 1/2 DOWEL PIN          | 2   |
| 14  | 5853        | SLEEVE - BEARING HOUSING     | 1   |
| 15  | 5737        | 1/2" DIA. STEEL BALL         | 1   |
| 16  | 35048-2     | SPRING                       | 1   |
| 17  | H-6938-1004 | SCREW - 5/8-11 X 1/2 SOC SET | 1   |
| 18  | H-5254-604  | SCREW - 3/8 X 1/2 SHOULDER   | 1   |
| 19  | S-1781-87   | LABEL - DRILL DEPTH ADJ.     | 1   |
| 20  | H-7321-10   | WASHER - 5/8 FLAT            | 1   |

