You have downloaded a manual for our

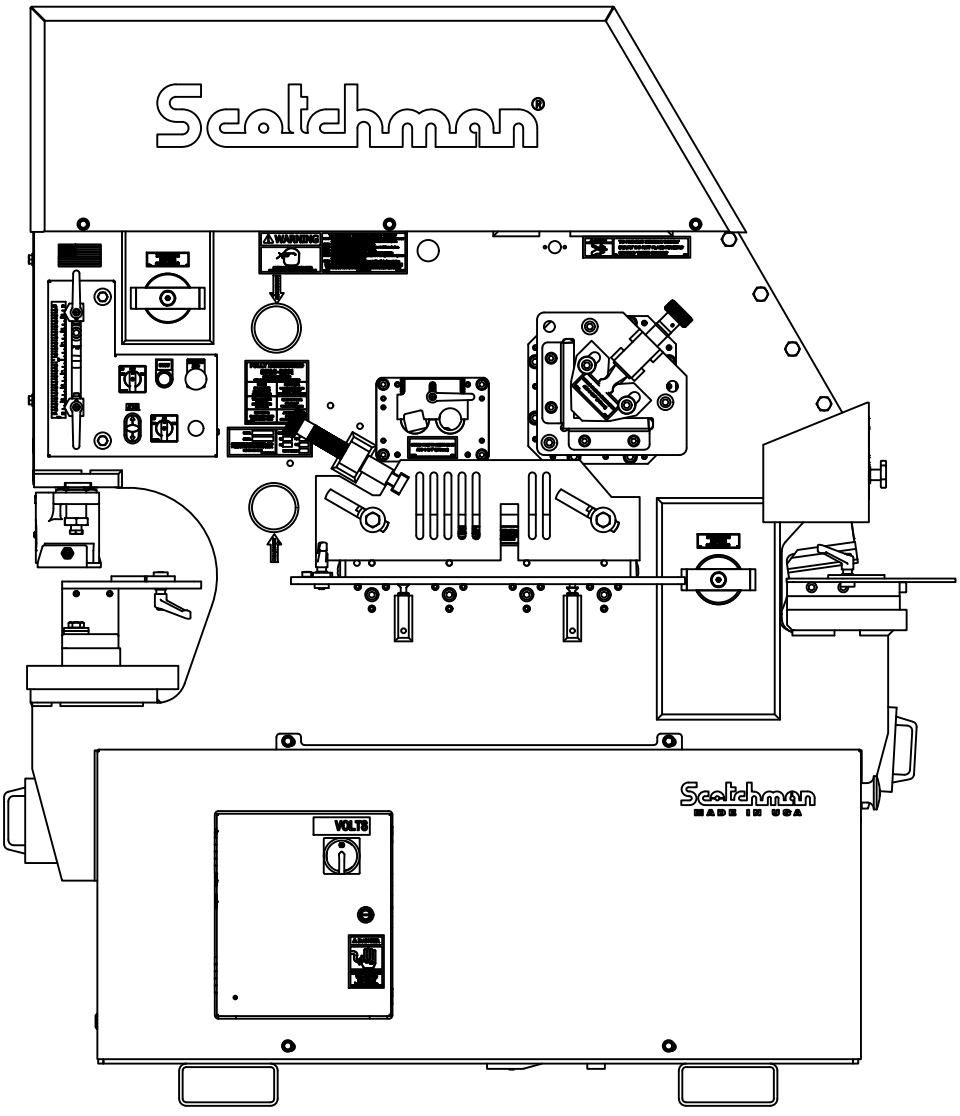
Model FI-8510-20M Ironworker.

This manual does not include all of the

optional tooling for this machine.

If you would like a tooling manual,

please download our #40 Tooling Manual.



Scotchman®

Metal Fabricating Solutions

www.scotchman.com

MODEL

FI-8510-20M

IRONWORKER

SERIAL # 1405M1221 & UP

JANUARY 2025

SCOTCHMAN INDS. - 180 E US HWY 14 - PO BOX 850 - PHILIP, SD 57567 Call: 1-605-859-2542

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1.0 INTRODUCTION

The Scotchman FI-8510-20M is a versatile, multi-purpose, shearing, punching and forming machine engineered for trouble free operation.

The design of the machine combines simplicity of operation with smooth, full stroke control.

The ability of the operator to control the machines direction of movement at any point in the stroke, (stop, jog or reverse), gives the Scotchman Ironworker a tremendous advantage over mechanical ironworkers.

There is no chance of the Scotchman being "accidentally tripped".

The Hydraulic system operates at a maximum pressure of 2,700 PSI (185 BAR) and is protected from overload by a relief valve.

The Scotchman FI-8510-20M is designed as a fully-integrated, tooled Ironworker.

On this model, the tools are an integral part of the machine and are designed for the user that wants the advantage of five separate working stations without the necessity of tooling changes.

While this is a fully-integrated machine, Scotchman still offers many optional tools that are adaptable to this model.

Some of the optional tools available are: a channel shear, pipe notcher and brake attachment, as well as a variety of special tools.

If you have a special application, please contact your dealer or the factory.

FI85 SAFETY Video

Scan with Camera on Phone

2.0 SAFETY PRECAUTIONS

1. **The operators of this machine must be qualified and well trained in the operation of the machine. The operators must be aware of the capacities of the machine and the proper use of the hold down devices, strippers and guards provided with the machine.**
2. **All of the guards, adjustable restricters and awareness barriers must be installed on the machine and kept in good working order. Promptly replace worn or damaged parts with authorized parts.**
3. **Never place any part of your body into or under any of the machines moving parts, strippers or hold devices.**
4. **Wear the appropriate personal protective equipment. Safety glasses are required at all times, whether operating, setting up or observing this machine in operation. Since heavy pieces of metal with sharp edges can be processed on this machine, the operator should also wear steel-toed shoes and tight fitting leather gloves.**
5. **Strictly comply with all warning labels and decals on the machine. Never remove any of the labels. Replace worn or damaged labels promptly.**
6. **Always disconnect and lock out the power when performing maintenance work or setting up any tooling on the machine. Follow the procedures outlined in the operators manual for setting up, changing or aligning any tooling on this machine.**
7. **Never operate this machine with dull or damaged tooling. Replace worn punches, dies and blades promptly.**
8. **Practice good housekeeping. Keep the area around the machine clear and well lit. Do not obstruct the operators position by placing anything around the machine that would impede the operators access to the machine.**
9. **Never modify this machine in any way without the written permission of the manufacturer.**
10. **Never leave this machine running unattended.**
11. **Always operate the punch station facing the station, standing. Never operate any of the work stations from a sitting or kneeling position.**
12. **Set up a program of routine inspections and maintenance for this machine. Make all repairs and adjustments in accordance with the manufacturers instructions.**
13. **A safety video for this machine is available online at Scotchman.com. Scotchmans YouTube channel also has this video, and many other helpful & informative videos related to this machine.**

IT IS HIGHLY RECOMMENDED THAT ANYONE WHO OPERATES THIS MACHINE SHOULD VIEW AND UNDERSTAND THE SAFETY VIDEO

If this machine was purchased used, watch the safety video - Its free and can be viewed online and at any time.

2.1 WARRANTY

Scotchman Industries, Inc. will, within three (3) years of the date of purchase, replace F.O.B. the factory or refund the purchase price for any goods which are defective in materials or workmanship, provided the buyer returns the warranty registration card within thirty (30) days of the purchase date and, at the sellers option, returns the defective goods freight and delivery prepaid to the seller, which shall be the buyers sole and exclusive remedy for defective goods.

Hydraulic and electric components are subject to their respective manufacturers warranties.

This warranty does not apply to machines and/or components which have been altered, changed or modified in any way or subjected to abuse and abnormal use, inadequate maintenance and lubrication or subjected to use beyond the sellers recommended capacities and specifications.

In no event shall the seller be liable for labor cost expended on such goods or consequential damages.

The seller shall not be liable to the purchaser or any other person for loss or damage directly or indirectly arising from the use of the goods or from any other cause.

No officer, employee or agent of the seller is authorized to make any oral representations or warranty of fitness or to waive any of the foregoing terms of sale and none shall be binding on the seller.

Any electrical changes made to the standard machine due to local electrical code variation must be paid by purchaser.

As we constantly strive to improve our products, we reserve the right to make changes without notification.

3.0 WARNING LABELS

ITEM	PART #	DESCRIPTION
1	003100	Safety Glasses Label
*2	003101	Sabre Blade Decal
3	003105	Fingers Beyond Bar Guard
4	003110	Punch And Die Warning
5	003140	Finger Beyond Tool Shear
6	003170	1/2" Max Notcher Cap/Sticker
7	003175	Caution Contamination (not shown)
8	003200	Jog Decal
9	004349	Notice Notcher Sticker
10	010117	27" Scotchman Decal
11	014325	Warning High Press Hose
12	015420	5-5/8" Cutting Edge
13	015425	4-1/4" Cutting Edge
14	019102	Decal "Reservoir Capacity" (not shown)
15	019103	Decal "LUBRICATE"
16	019105	DECAL "GREASE POINT"
17	019127	US Flag Decal
18	003122	Danger Voltage Sticker
19	003535	FI85 Decal Package

***NOT SHOWN - Located On Shear Arm**

BACKSIDE OF MACHINE

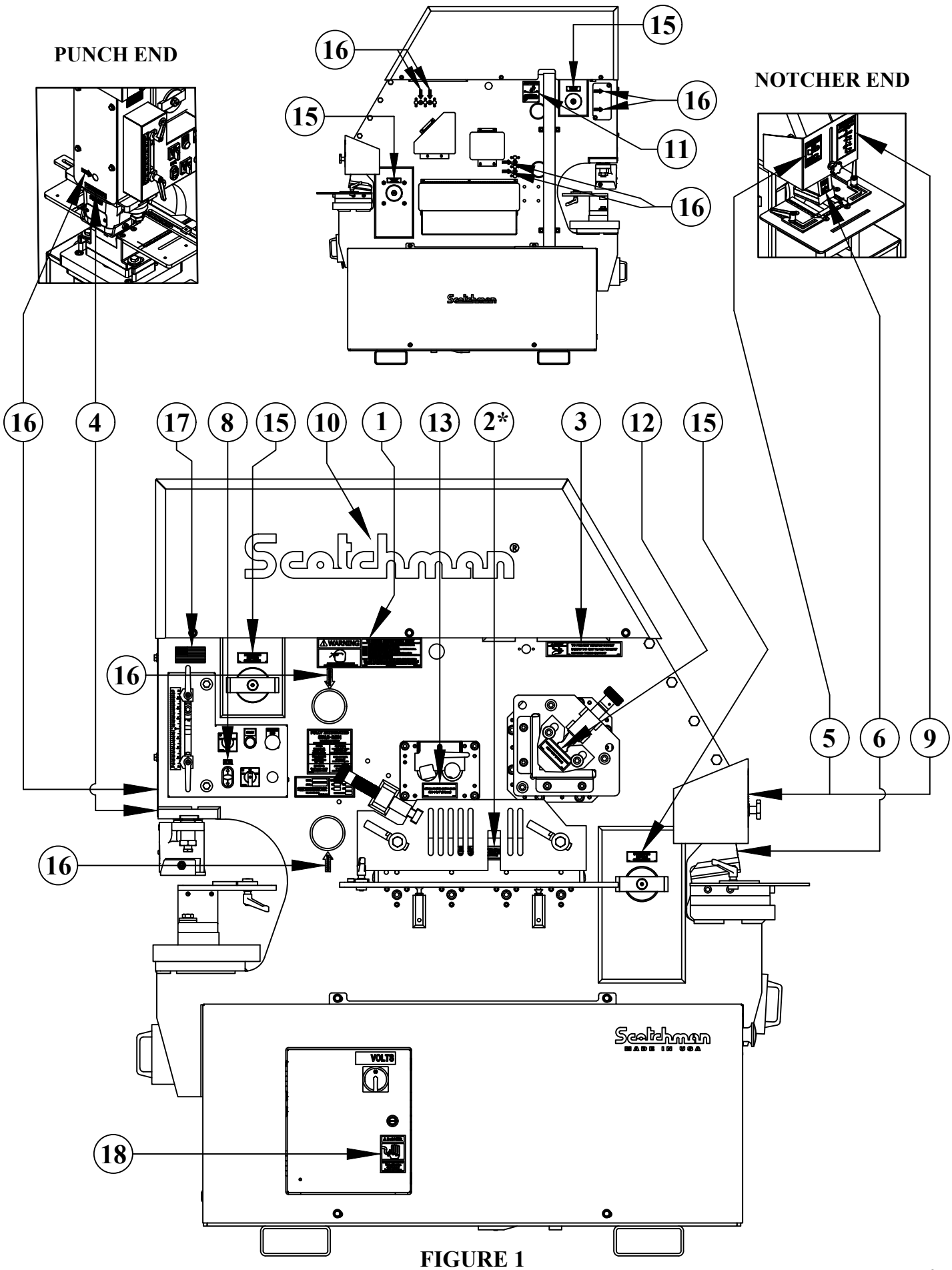


FIGURE 1

4.0 INSTALLATION AND SET-UP

⌦ **CAUTION: THIS SECTION DISCUSSES INSTALLATION AND SET-UP PROCEDURES. PLEASE READ THOROUGHLY BEFORE OPERATING THIS MACHINE.**

4.1 PHYSICAL DIMENSIONS

ITEM	DESCRIPTION	INCHES	CM
A	Floor to Punch Ram	43	109.2
B	Floor to Top of Die	37-1/4	94.6
C	Floor to Top of Bolster	31-1/4	79.4
D	Floor to Bottom of Bolster	29-5/8	75.2
E	Throat Depth	10	25.4
F	Floor to Bottom Of Base	3	7.6
G	Floor to Bar Shear	37-7/16	95.1
H	Floor to Notcher	37-3/8	94.9
I	Floor to Rod Shear	47-11/16	121.1
J	Floor to Angle Shear	48-5/16	122.7
K	Height	78	198.1
L	Width	28-1/2	72.4
M	Floor to Top Of Shroud	25-1/2	64.8
N	Length	66-1/4	168.3
O	Punch Stroke	3.65	9.3
P	Weight	4,550 LBS.	2,064 KG.

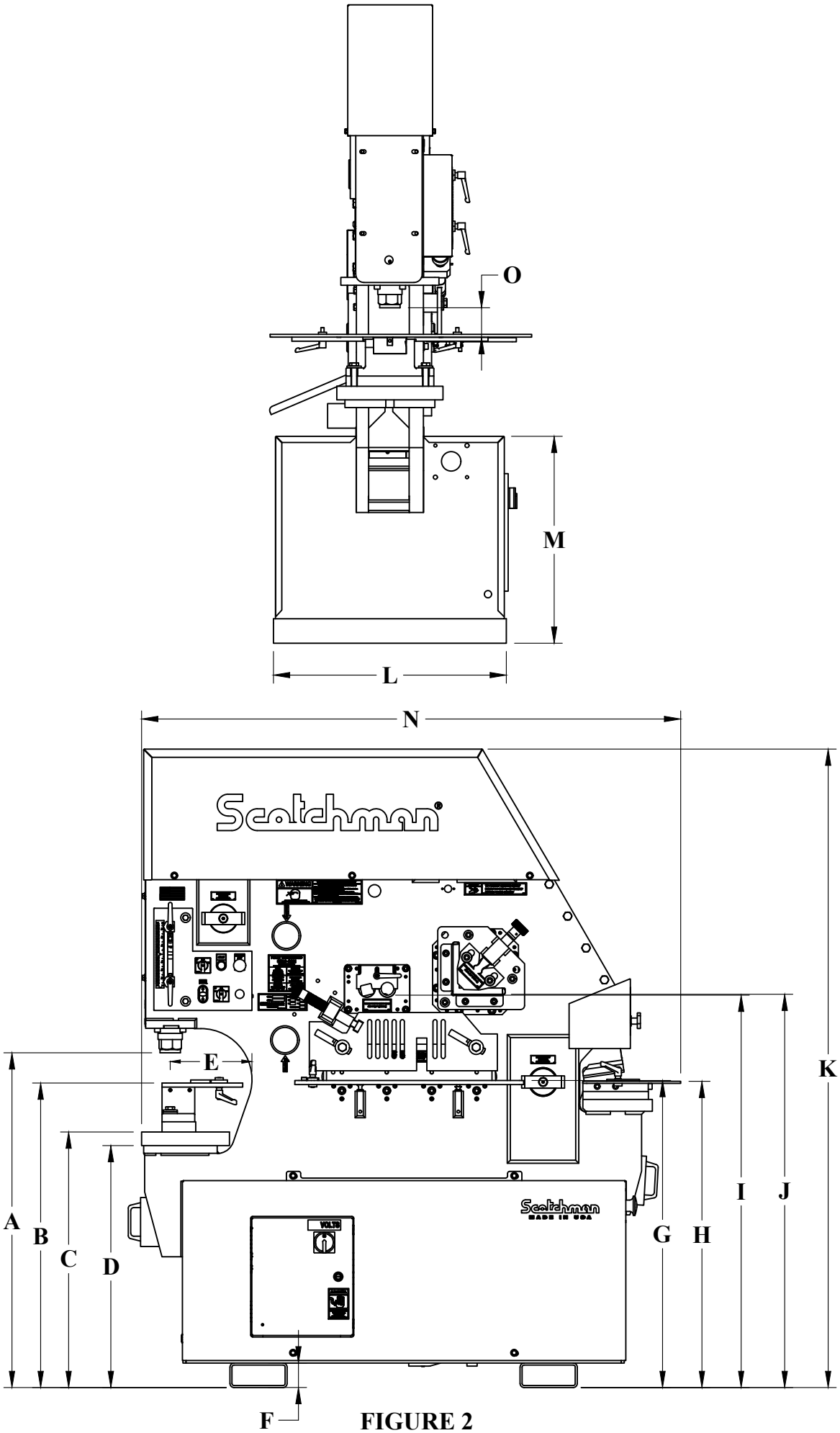


FIGURE 2

4.2 MACHINE MOVING PROCEDURES

⌦ **CAUTION: BE SURE THAT ANY LIFTING DEVICE HAS ADEQUATE CAPACITY BEFORE ATTEMPTING TO MOVE THIS MACHINE. THIS MODEL WEIGHS 4,550 LB. (2064 KG). IT IS DESIGNED TO BE MOVED BY A FORKLIFT ONLY. THERE ARE FORKLIFT SLOTS DESIGNED INTO THE BASE OF THE MACHINE FOR THIS PURPOSE.**

SEE FIGURE 3 BELOW:

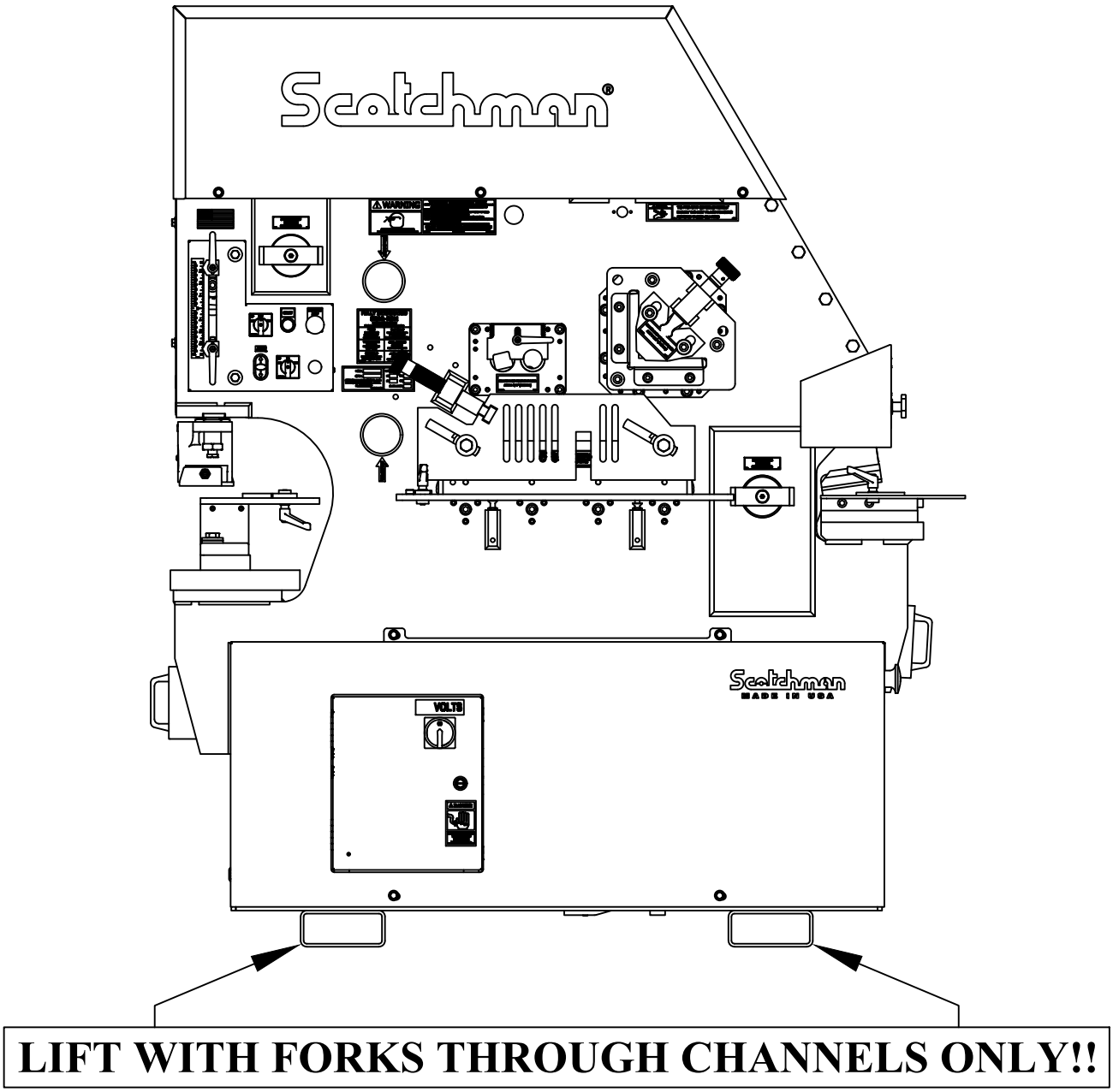


FIGURE 3

4.3 PHYSICAL INSPECTION

Any damage to the machine during shipment should be reported to the delivery carrier immediately. A damage report must be made so that a claim can be placed. The carrier is responsible for shipping damage, but it is the customer's responsibility to immediately report damages, external or internal. After the machine has been located, remove the side shrouds and inspect the interior of the machine for possible shipping damages.

CHECK SPECIFICALLY THE FOLLOWING ITEMS:

A. Stroke control handles and limit switches.

B. Pump and motor assembly.

C. Hydraulic hoses and fittings.

D. Starter box and control box.

E. Electrical connections.

F. Control valve.

G. A general inspection of machine shrouds, guards and awareness barriers.

H. Check the re-pack box for all accessory items ordered with the machine.

The reservoir is full of oil. The recommended oil is a lightweight, non-foaming, anti-wear, hydraulic oil such as Mobil DTE-25, with a minimum ISO cleanliness code of 20/18/15, or equivalent.

The reservoir holds 13.5 U.S. gallons (51 liters).

CAUTION: DO NOT OVER FILL!

4.4 ELECTRICAL REQUIREMENTS

PN 011898 RATING TABLE					
LINE VOLTAGE (3PH)	208	230	380	460	575
MAX. HP	5	5	5	5	5
MOTOR FLA	14	12.6	7.7	6.3	5.1
OVERLOAD	ZB32-24	ZB32-24	ZB32-10	ZB32-10	ZB32-10

3-PHASE POWER

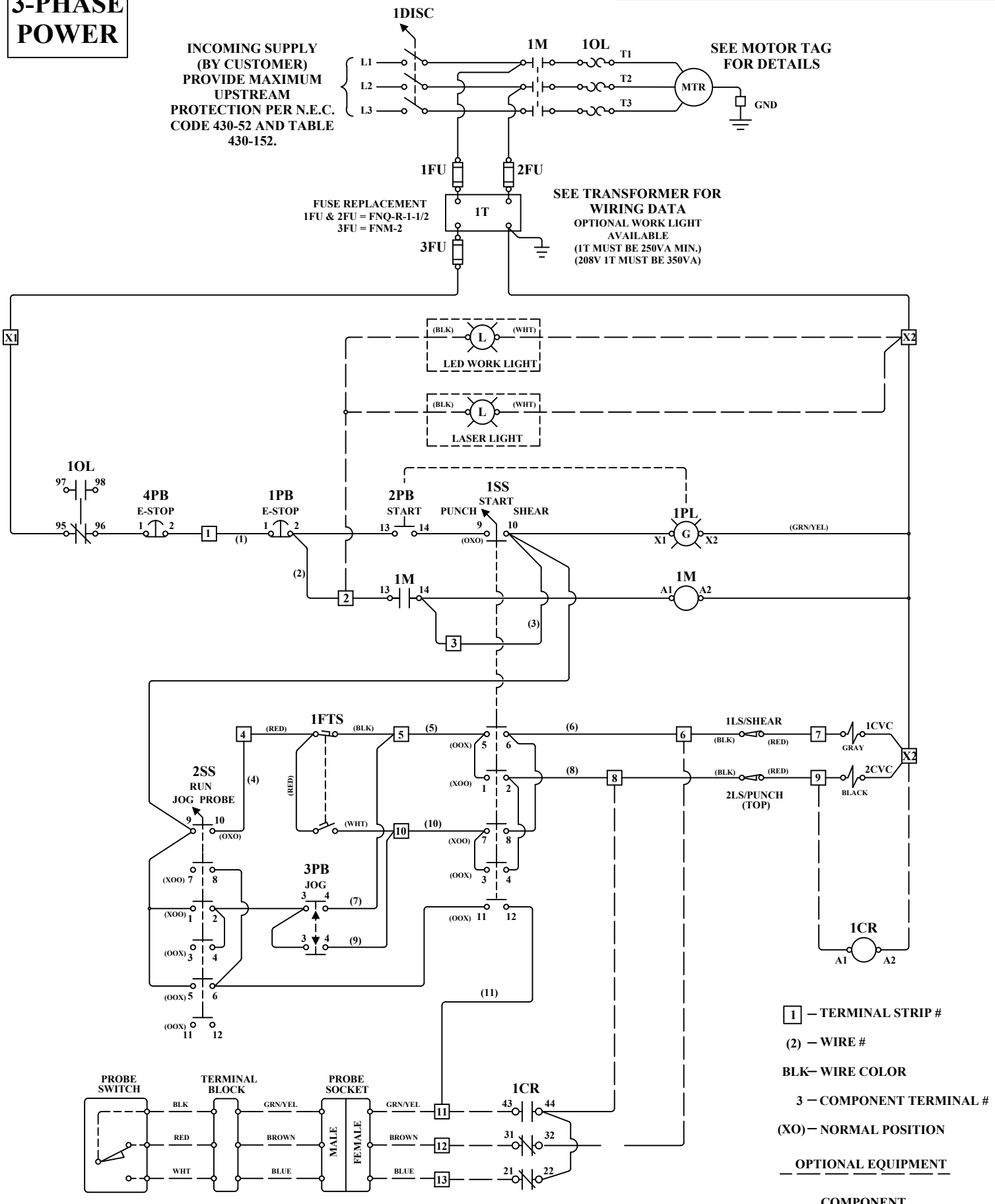


FIGURE 4

SINGLE PHASE POWER

PN 011898 RATING TABLE	
LINE VOLTAGE (1PH)	230
MAX. HP	5
MOTOR FLA	24.5
OVERLOAD	ZB32-24

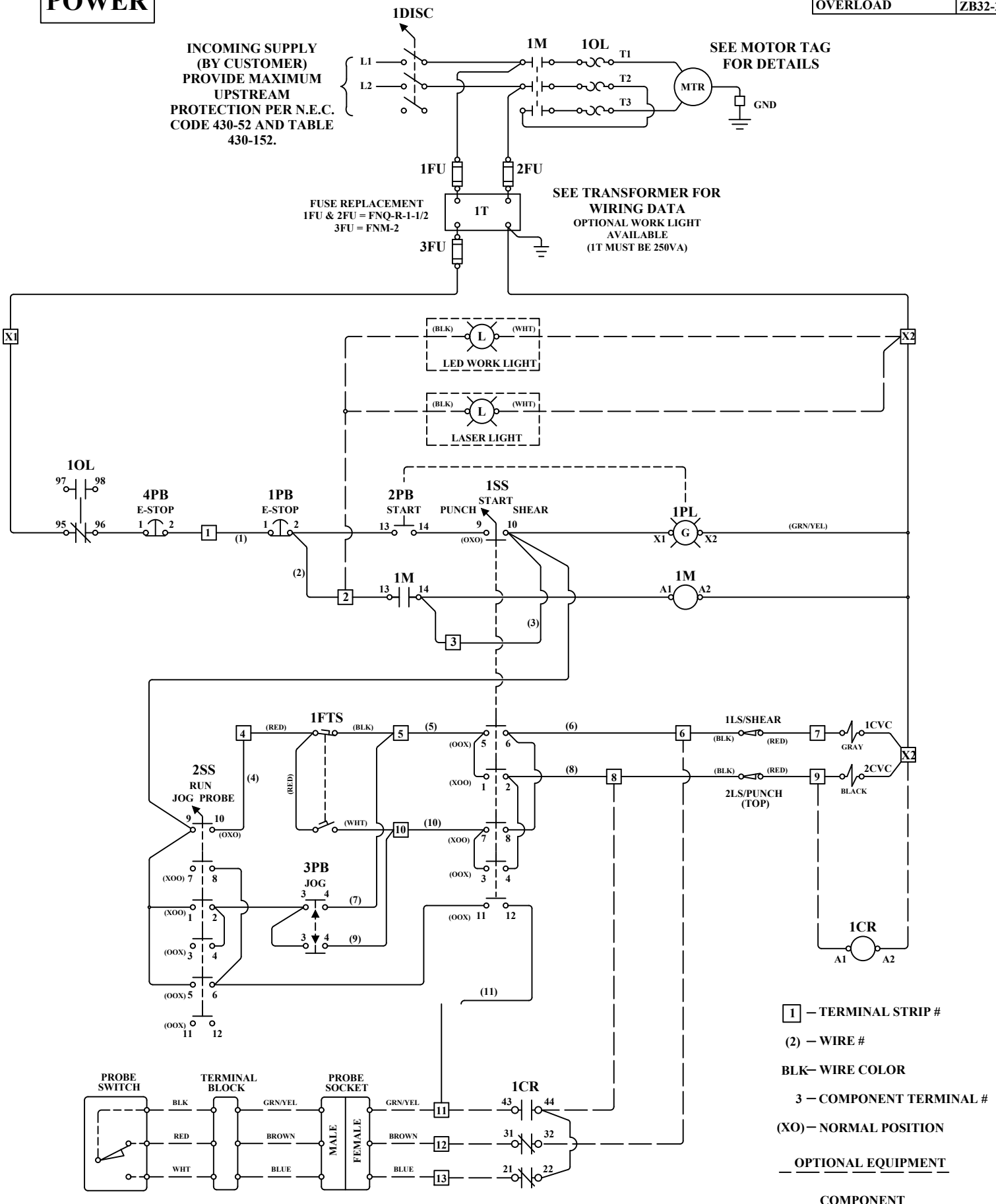


FIGURE 4A

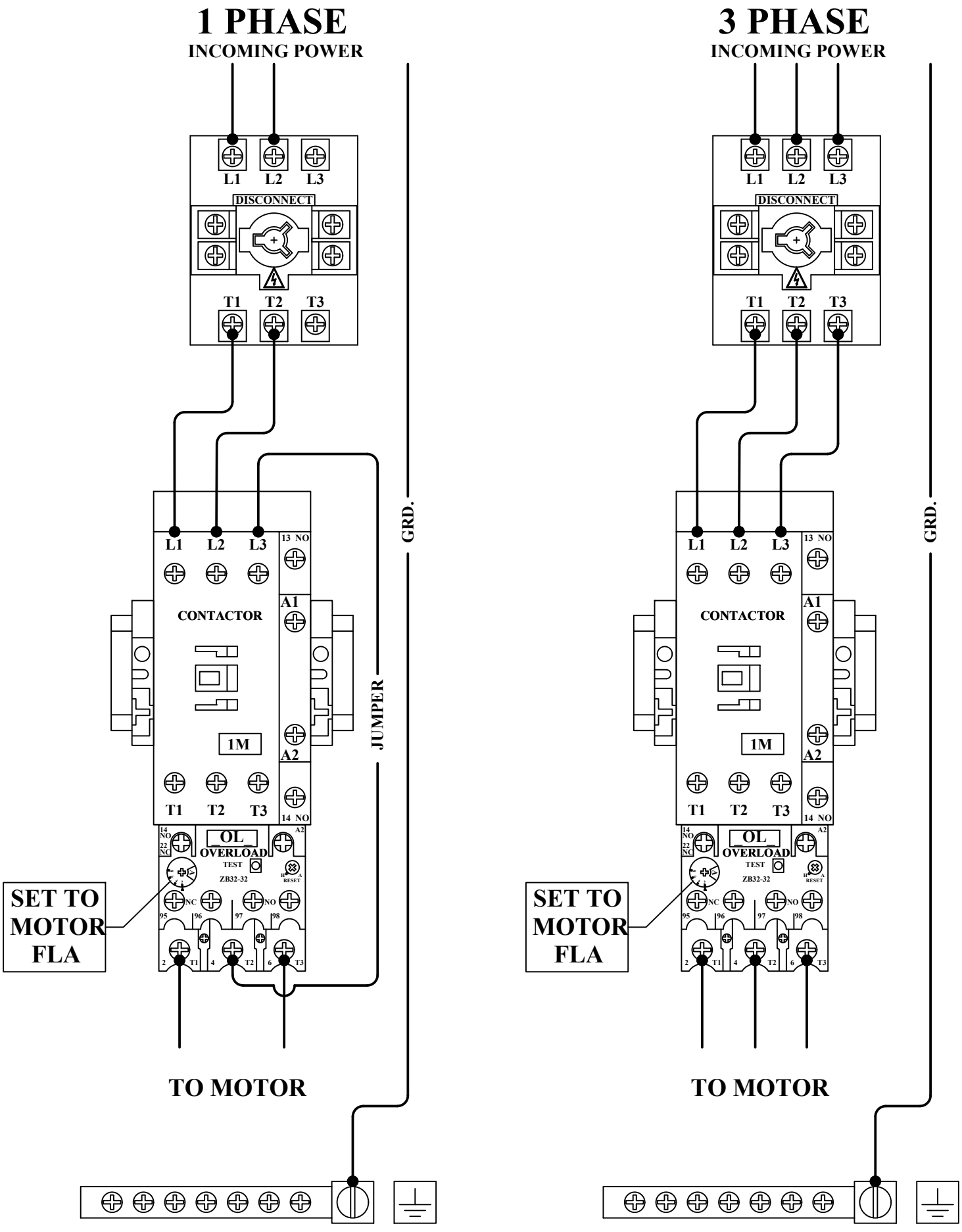

1 PHASE
INCOMING POWER
L1
L2
L3
DISCONNECT
T1
T2
T3
GRD.
JUMPER
CONTACTOR
13 NO
A1
A2
14 NO
1M
OL
OVERLOAD
TEST
ZB32-32
SET TO MOTOR FLA
TO MOTOR
3 PHASE
INCOMING POWER
L1
L2
L3
DISCONNECT
T1
T2
T3
GRD.
CONTACTOR
13 NO
A1
A2
14 NO
1M
OL
OVERLOAD
TEST
ZB32-32
SET TO MOTOR FLA
TO MOTOR

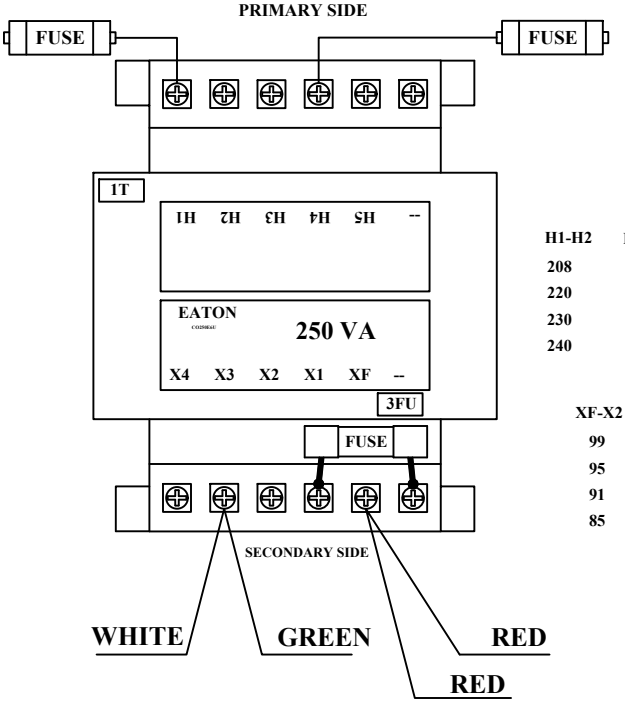
FIGURE 4B

Newer machines (Serial #1210M and up) have the 250 KVA Transformer as standard equipment. Previously, 150 KVA was standard. The 150KVA Transformer is compatible with the LED Light Package.

230v/460v TRANSFORMER

250VA

PRIMARY SIDE



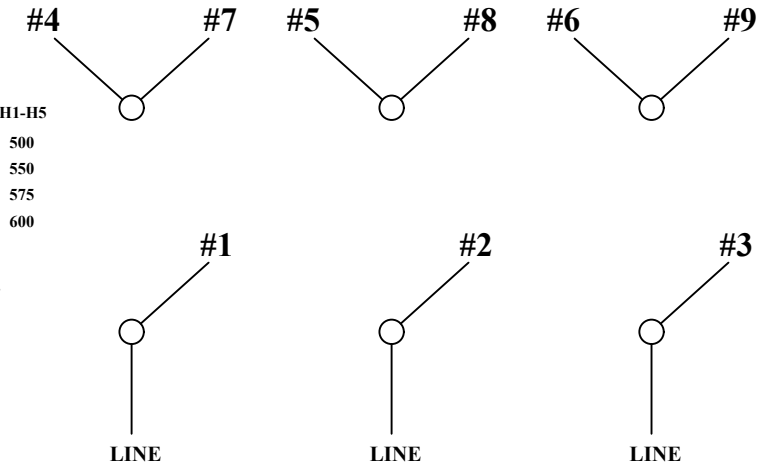
H1-H2	H1-H3	H1-H4	H1-H5
208	380	440	500
220	400	460	550
230	415	480	575
240			600

XF-X2	XF-X3	XF-X4
99	120	130
95	115	125
91	110	120
85	100	110

MOTOR WIRING BELOW

HIGH VOLTAGE C0NNECTION

(460 VOLT 3PH)

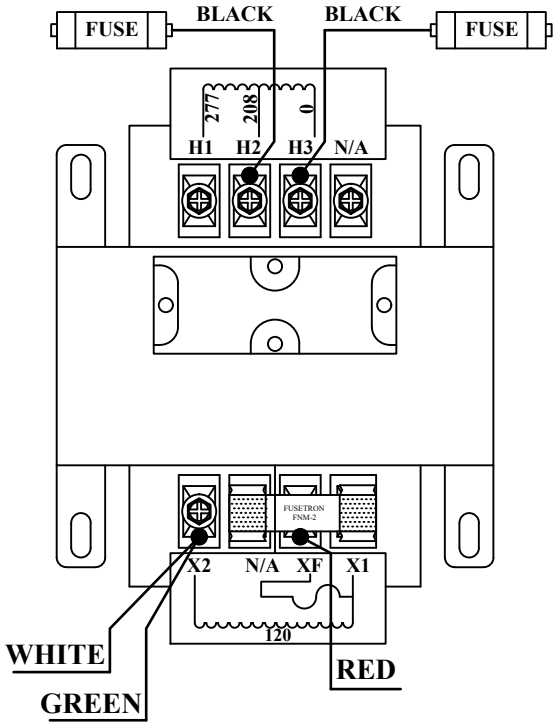


#1 - #9 are Wires From the Motor

208v/277v TRANSFORMER

350VA

PRIMARY SIDE



LOW VOLTAGE C0NNECTION

(230 VOLT 3PH)

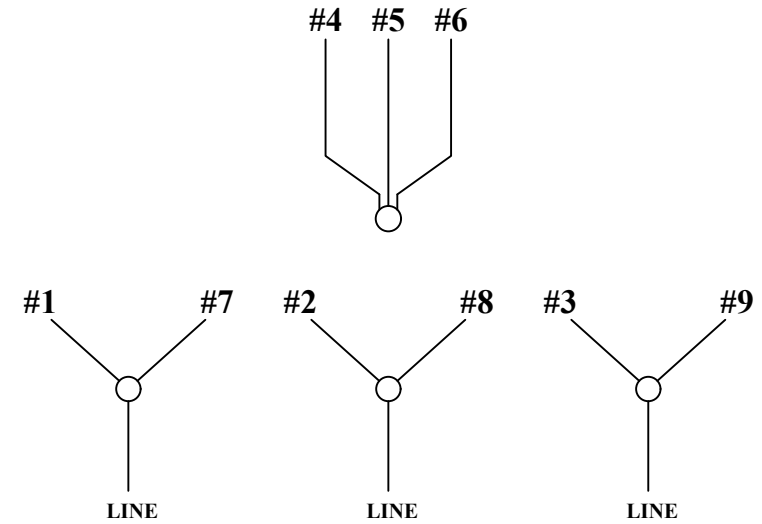


FIGURE 4C

CAUTION: TO PREVENT DAMAGE TO THE MOTOR AND DANGER TO THE OPERATOR, ALL ELECTRICAL CONNECTIONS SHOULD BE MADE BY A LICENSED ELECTRICIAN.

All machines are wired for three phase electrical power unless otherwise specified by customer. The supply voltage should be (+ or -) 10% of the motor voltage rating, to insure satisfactory machine performance. Check the motor data tag for full load current requirements.

The electrical diagram for the machine is inside the cover of the control box.
SEE DIAGRAMS IN FIGURES 4A THRU 4D
For electrical supply lines ten feet (3 m) or shorter, we recommend at least 12 and preferably 10, gauge wire. For longer supply lines, use at least 10 gauge and preferably, 8 gauge. We do not recommend supply lines longer than twenty five feet (7.5 m).

POWER REQUIREMENTS

Motor frame	3PH=182T 1PH=184T
MOTOR VOLTAGE (VAC)	FULL LOAD CURRENT (AMPS)
208	14
230	12.6
380	7.7
460	6.3
575	5.1
230 (single phase)	24.5
Motor power rating:	5hp Speed 1,725 RPM
KVA power rating:	5.6 KVA Frequency 60 HZ
Starting Current:	210% Full Load

Scotchman

MADE IN USA

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4.5 MACHINE START-UP

BEFORE STARTING THIS MACHINE, TAKE TIME TO THOROUGHLY REVIEW THE ONLINE SAFETY VIDEO (AT SCOTCHMAN.COM OR ON SCOTCHMANS YOUTUBE CHANNEL) AND THE OPERATOR'S MANUAL.

This machine is equipped with a lock-out, disconnect switch as standard equipment. We strongly urge you to follow the OSHA directive CFR-1910.147 (effective 09-01-90) regarding lock-out, tag-out procedures.

BEFORE POWERING THE MACHINE be sure that all packing materials and tools have been removed from the machine and that all work stations are clear.

TO POWER THE MACHINE:

1. **Place the disconnect switch (1) in the ON position and the selector switch (2) in the START position. Make sure the Emergency Stop button (3) is pulled out.**
2. **Power the machine by pushing the green START button (4). Once the machine has been powered, it will not move until the selector switch (2) has been placed in either the PUNCH or the SHEAR position. Placing the switch in the PUNCH position will cause the shear to close and the punch to retract. Placing the switch in the SHEAR position will cause the shear to open and the punch to close. If the machine does not move when the selector switch is moved, the motor rotation is not correct. The electrician will have to switch two of the line wires to change the direction of rotation. Any time that the power to the machine has been turned off, the selector switch (2) must be placed in the START position to restart the machine.**

4.6 MACHINE STROKE INSPECTION & ADJUSTMENT

The stroke setting is important for the proper operation of the machine. If this setting has changed, the machine may over-travel and cause the cylinder to "bottom out". This continued condition will eventually cause the starter overload to open. It can also cause the hydraulic oil to overheat and damage hydraulic system components. A slight change in the stroke setting can result in inadequate stroke to operate the tooling. A check of the machine's stroke setting is made at the punch end of the machine.

SEE FIGURE 5 ON THE FOLLOWING PAGE

1. **Set the stroke control handles (5) out to their farthest position.**
2. **Place the disconnect switch (1) in the ON position and the selector switch (2) in the START position. Make sure the Emergency Stop button (3) is pulled out.**
3. **Turn the run-jog switch (6) to the JOG position.**
4. **The die holder must be removed and the stripper swung back, out of the way.**
5. **Power the machine by pushing the green START button (4). Jog the ram down until it measures 8-1/16 inches (205 mm) from the bolster to the bottom of the ram.**
6. **Turn the machine's power off.**
7. **Check to see if the metering boss has contacted the lower limit switch. If it has not, loosen the two mounting plate screws (7) and move the mounting plate (8) up until contact is made.**
9. **Tighten the screws and re-check the dimensions. Repeat, if needed.**

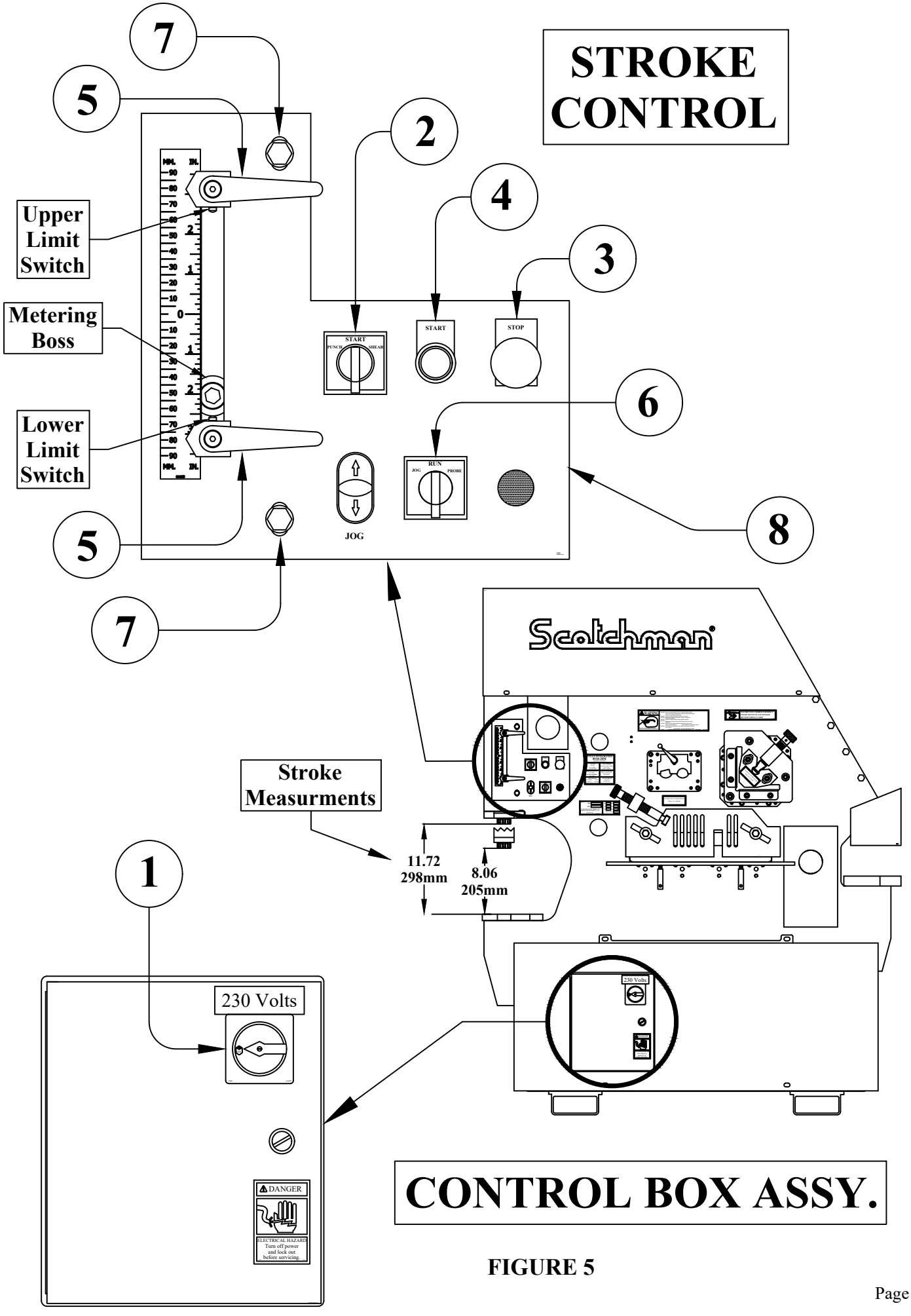

STROKE CONTROL
7
5
2
4
3
Upper Limit Switch
Metering Boss
Lower Limit Switch
START
PUNCH
SHEAR
START
STOP
6
RUN
JOG
PROBE
JOG
5
8
7
Scotchman
Stroke Measurments
11.72
298mm
8.06
205mm
1
230 Volts
230 Volts
DANGER
ELECTRICAL HAZARD
Turn off power and lock out before servicing.
CONTROL BOX ASSY.

FIGURE 5

5.0 MAINTENANCE

The Scotchman Ironworker is an exceptionally rugged machine designed for long life with a minimum amount of maintenance. A regular program of servicing will extend the life of the machine and prevent costly down time.

5.1 LUBRICATION

IMPORTANT: Before operating the FI-8510-20M, apply oil to the angle shear blades, bar shear blades and the punch and die. Re-oil punches and dies every 5 to 10 holes and blades every 10 to 15 cuts. The oil will allow the machine to shear, punch and strip more easily and increase tool life considerably. (We recommend cutting oil or motor oil swabbed on with a brush or applied with a squirt can or a spray applicator.)

Grease the main pins (D & K) and the punch ram bushing (L) daily.

(SEE FIGURE 6 ON THE FOLLOWING PAGE.)

Grease all other fittings twice per week.

Mobil Grease XHP 222 Special is recommended.

Once a month, check the oil level in the reservoir. It should be approximately 2 inches (50mm) below the top of the reservoir.

The recommended hydraulic oil is a lightweight, non-foaming, hydraulic oil such as Mobil DTE-25, with a minimum ISO cleanliness code of 20/18/15, or equivalent.

The reservoir capacity is 13.5 U.S. gallons (51 liters)

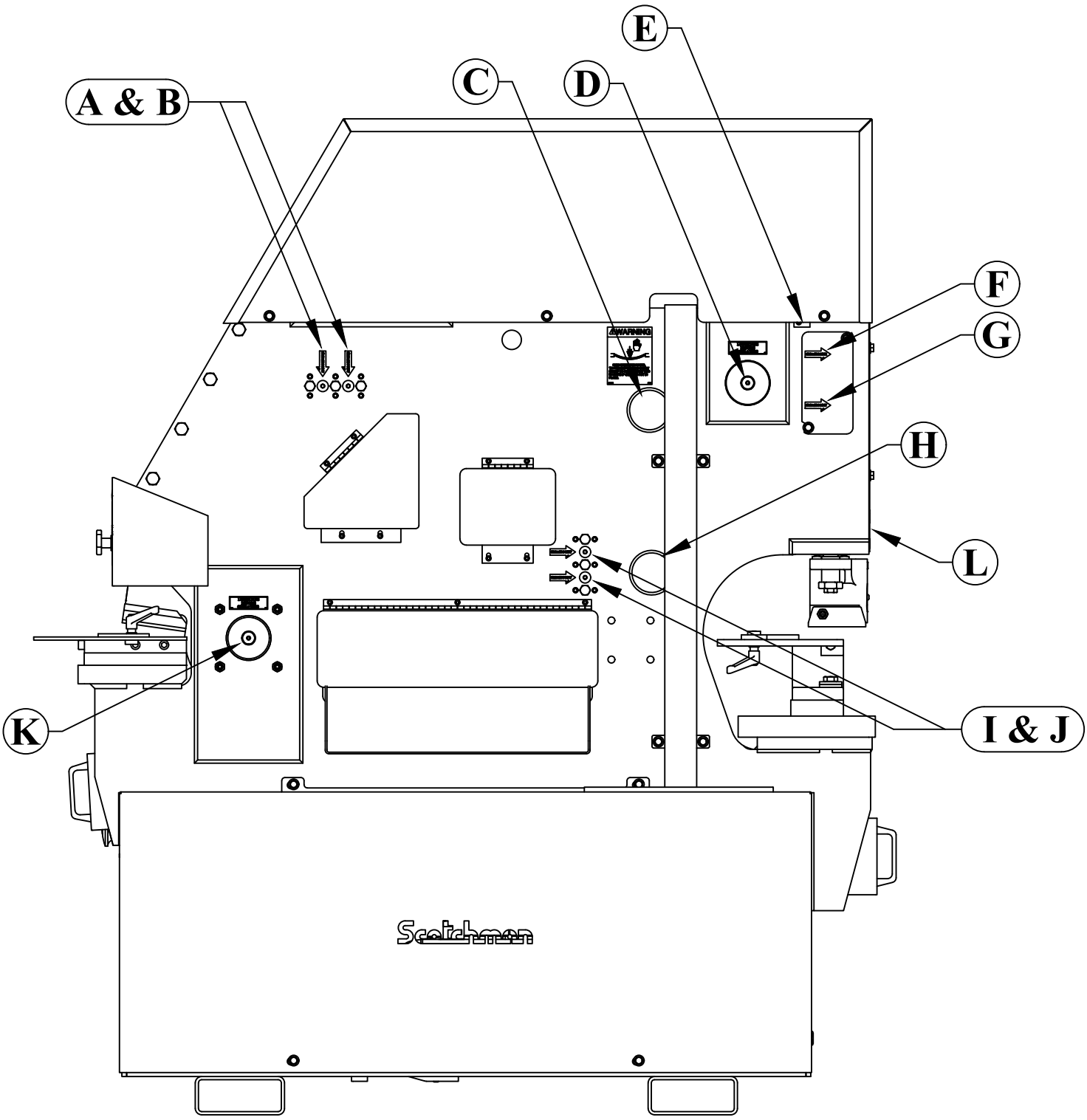


FIGURE 6

5.2 SCHEDULED MAINTENANCE

A program of scheduled maintenance should be set up and documented according to your application and the frequency you use this machine. The following is a list of some important items that should be included in a scheduled maintenance program.
Since the FI-8510-20M can be used for a wide variety of applications with many optional tools, every user must design and implement a scheduled maintenance program that fits their needs.

1. EVERY 500 HOURS OR SIX MONTHS:

A. Check the tolerance between the punch ram and the punch ram bushing. For parts identification, SEE FIGURE 7 ON THE FOLLOWING PAGE.

TO CHECK THE CLEARANCE BETWEEN THE RAM AND THE BUSHING:

1. **Install a punch and die following the method outlined in SECTION 6.1.**
2. **Place the run/jog switch in the JOG position. With the punch in the die, jog the machine up and down several times, watching for any lateral movement of the punch in the die.**
3. **If any movement is noted, check the mounting bolts (O) in the punch ram bushing. Make sure that they are tight. Also, check the bolt (N) through the punch ram straps to make sure that its not so tight that the straps are binding on the arm or the punch ram.**
4. **If there is still lateral movement of the punch in the die, remove the punch ram and the bushing and check the clearance between the two parts.**
5. **If the clearance between the two parts is more than five thousandths (.005) of an inch (.12mm), replace both parts.**

B. Check the condition of all cutting blades on the machine and any optional tools.

C. Check the condition of the bushings in the drive beam and the upper beam. This can be done visually by watching the beams for vertical movement while the machine is in operation. The cylinder shroud on the top of the machine must be removed to view the drive beam. If vertical movement is noted, block or support the beam with a lifting device and remove the main pin and check the clearance. If the clearance exceeds twelve thousandths (.012) of an inch (.3mm), replace the bushing.

2. EVERY 1,500 HOURS OR 1 YEAR:

A. Change the hydraulic fluid in the reservoir and replace the filter. For recommended fluids, SEE SECTION 5.1.

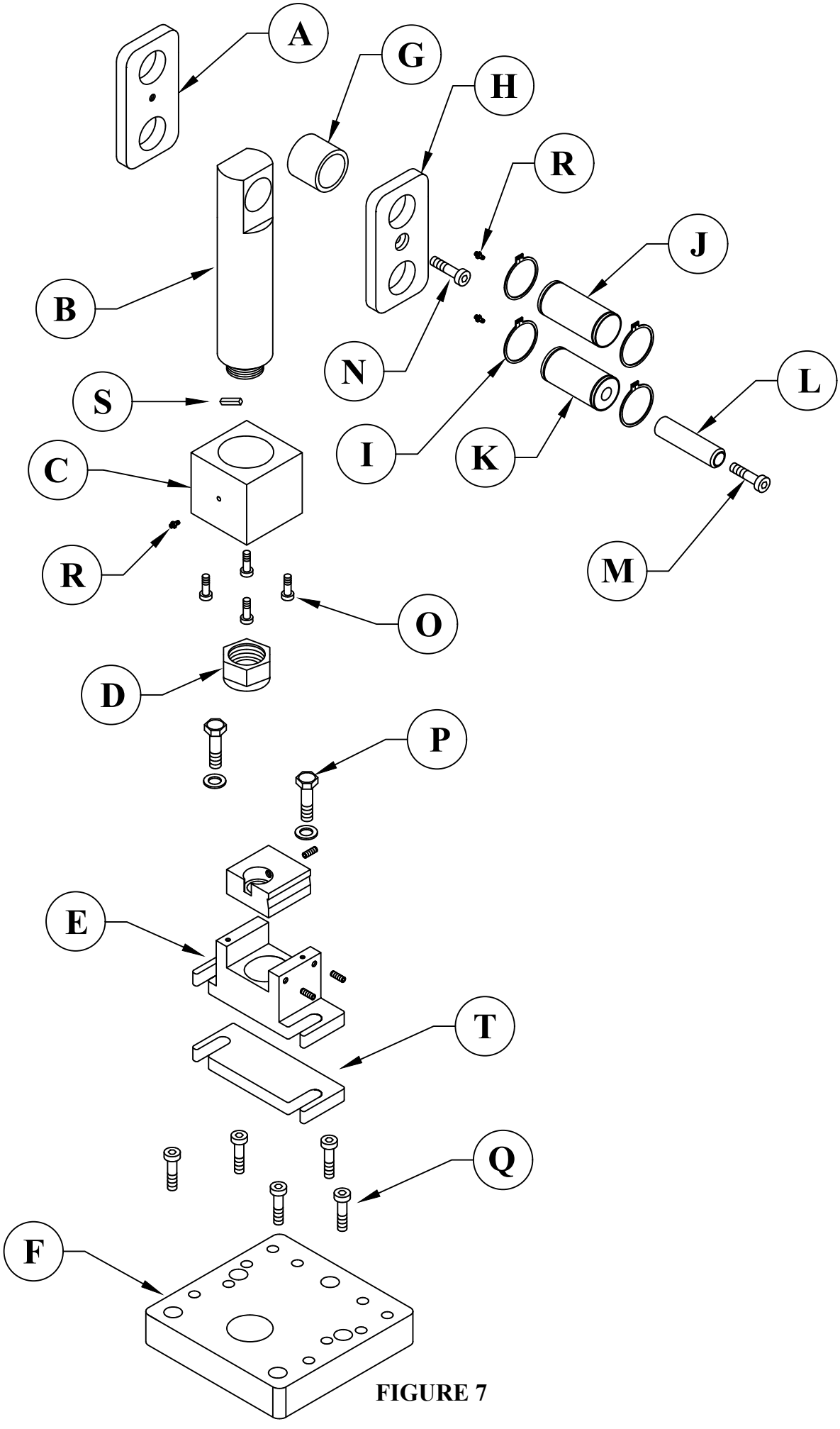
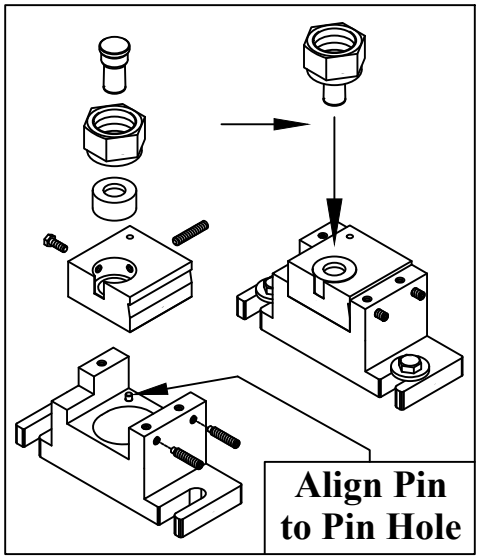
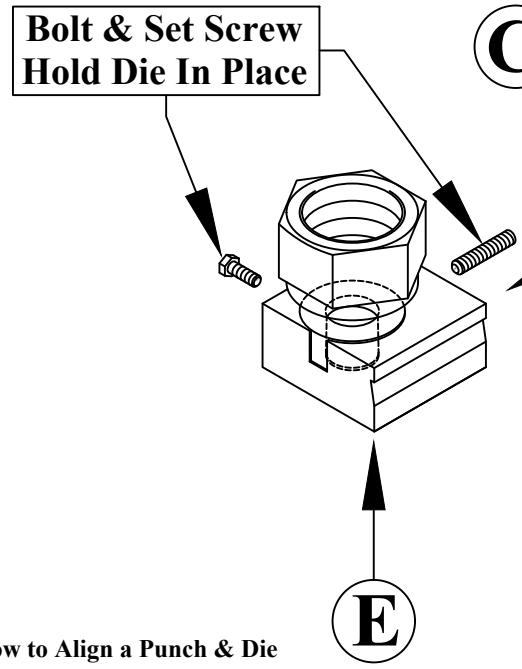


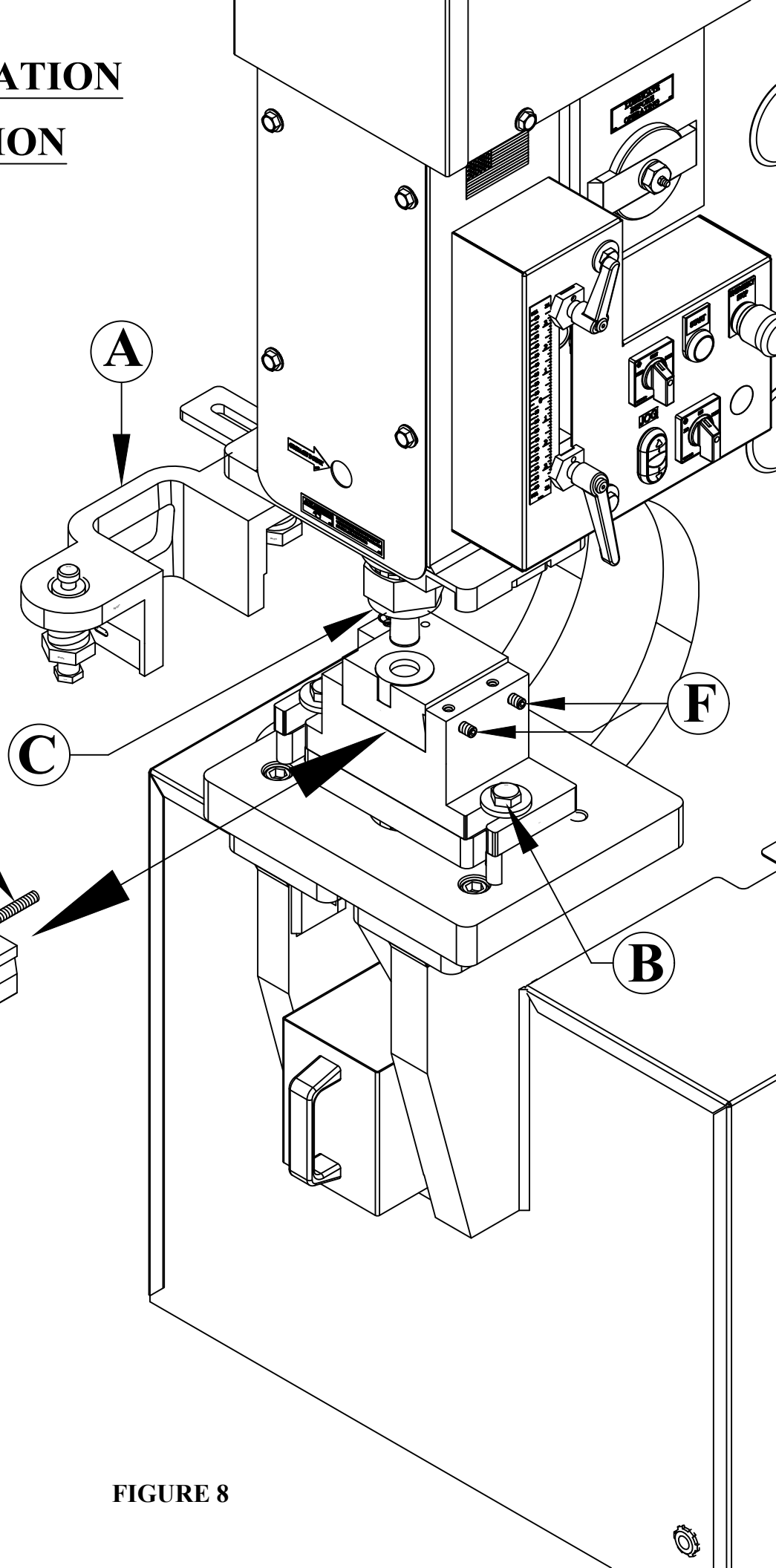
FIGURE 7

6.0 MACHINE OPERATION

6.1 PUNCH OPERATION







How to Align a Punch & Die

Scan with Camera on Phone

FIGURE 8

SEE FIGURE 8 ON THE PREVIOUS PAGE

A. ALIGNMENT AND REMOVAL OF PUNCHES AND DIES:

➲ **WARNING: Failure to properly align punches and dies can cause serious bodily injury to personnel and/or damage to equipment. Please read carefully and understand the following method. It would also be helpful to refer to the safety video on scotchman.com for a visual reference. Also, our YouTube Channel has the safety video as well as many other helpful and informative videos related to this machine.**

► **PLEASE NOTE: THERE IS AN EMERGENCY STOP PALM BUTTON ON BOTH ENDS OF THIS MACHINE.**

1. **With the machine in the PUNCH position and the ram retracted, turn the machines electrical power off at the disconnect switch.**
2. **Release the stripper (A) by pushing up on the right hand bolt, swinging it out of the way of the punch ram and retaining nut.**
3. **Loosen the die holder bolts (B).**
4. **Remove the punch retaining nut (C) and set the punch retaining nut and punch aside.**
5. **Loosen the two set screws (F) holding the die insert in the die holder. Remove the die insert and loosen the bolt holding the die and remove the die.**

► **NOTE: The die insert has an alignment pin in it and it must be lifted up to remove it.**

6. **Place the disconnect in the ON position and the selector switch in the START position. Power the machine by pressing the green START button.**

⌦ **CAUTION: IF YOU ARE USING THE OFFSET DIE HOLDER FOR FLANGED PUNCHING, PLEASE SEE SPECIAL INSTRUCTIONS IN SECTION 7.8A BEFORE CONTINUING.**

7. **Check to make sure that there are no objects (such as tools) under or on any of the moving parts.**
8. **Place the selector switch in the SHEAR position and allow the ram to fully extend.**
9. **Turn the machine's power OFF.**
10. **Clean the die insert cavity of any foreign material.**
11. **Select the proper punch and die. Make sure that there is proper clearance between the punch and die. For recommended clearances, SEE PARAGRAPH I ON PAGE 28.**
12. **Clean both the punch and the die of any foreign material.**
13. **Insert the proper die in the die insert (E). (If the die has a flat spot in it, align this with the bolt in the die insert.) Tighten the bolt firmly with a wrench.**
14. **Insert the punch into the punch retaining nut (C). Make sure that it seats properly. Place the punch retaining nut assembly on the die insert, with the punch inserted in the die. Place the insert back in the die holder and tighten the two set screws (F). Make sure that the alignment pin in the insert seats in the hole in the die holder.**

15. **Raise the punch retaining nut (C) and turn it on to the punch ram. (The die holder may have to be moved slightly to align the punch retaining nut to the punch ram.)**
16. **If you are using a keyed punch, manually rotate the punch until the key seats in the ram, before tightening the punch retaining nut.**
17. **Use a wrench to tighten the punch retaining nut (C). Make sure that there is equal clearance on all sides of the punch in the die.**
18. **Re-tighten the bolts (B) in the die holder.**
19. **Check to be sure of proper alignment. Realign, if necessary.**
20. **Return the stripper to the FORWARD position. (For stripper adjustment procedures, SEE FIGURE 9 ON PAGE 27.)**
21. **Place the disconnect switch in the ON position and the selector switch in the START position. Power the machine by pressing the green START button.**
22. **Place the selector switch in the SHEAR position. Jog the machine several times with the foot switch, without letting the punch come out of the die, to be sure that the alignment is correct.**
23. **Place the selector switch in the PUNCH position.**
24. **Oil the punch and die every five to ten holes.**

B. KEYED PUNCHES:

This machine is equipped with a 1/4 inch (6.3mm) keyed punch ram. When punching holes other than rounds, we recommend using keyed punches. All Scotchman shaped punches are supplied with the keyway as standard equipment.

► **NOTE: If you do not use keyed punches, it may be helpful to hold the body of the punch with a wrench while tightening the punch retaining nut. This will help to keep the punch from rotating with the nut as it is being tightened.**

C. CHECK ALL PUNCHING TOOLS FOR TIGHTNESS.

The punch and die alignment should be checked intermittently during punching operations. To do this, bring the punch down so that it enters the die. Turn the machine off. Check and tighten the punch retaining nut, the set screws holding the die and die insert and the bolts holding the die and the die holder. Check for equal clearance between the punch and die. Place the selector switch in the START position and the run/jog switch in the JOG position and power the machine. Place the selector switch in the SHEAR position and jog the machine several times, to be sure of proper alignment. Place the selector switch in the PUNCH position and the run/jog switch in the RUN position.

D. PROPER ADJUSTMENT OF THE STRIPPER. (SEE FIGURE 9 BELOW.)

1. **The height of the stripper is adjusted using the adjustment bolts (A & B).**
2. **The stripper is opened by pushing up on item (C) and swinging it out toward the front of the machine.**
3. **If you are punching light material or pieces too small to contact both sides of the stripper, install the plate (D) on the bottom of the stripper.**
4. **For maximum visibility and safety, always adjust the stripper down as close to the material as possible.**
5. **If the stripper is not adjusted down or the down stroke of the machine is not adjusted, the punch retaining nut will contact the stripper, causing damage to the stripper.**
6. **The down stroke of the machine should be adjusted so that there is a maximum penetration of the punch into the die of 1/8 of an inch (3mm).**

⌦ **<u>CAUTION</u>: TO PREVENT PUNCH BREAKAGE ON THE RETURN STROKE, THE STRIPPER MUST BE ADJUSTED SO THAT THE BOTTOM OF THE STRIPPER IS PARALLEL WITH THE MATERIAL BEING PUNCHED.**

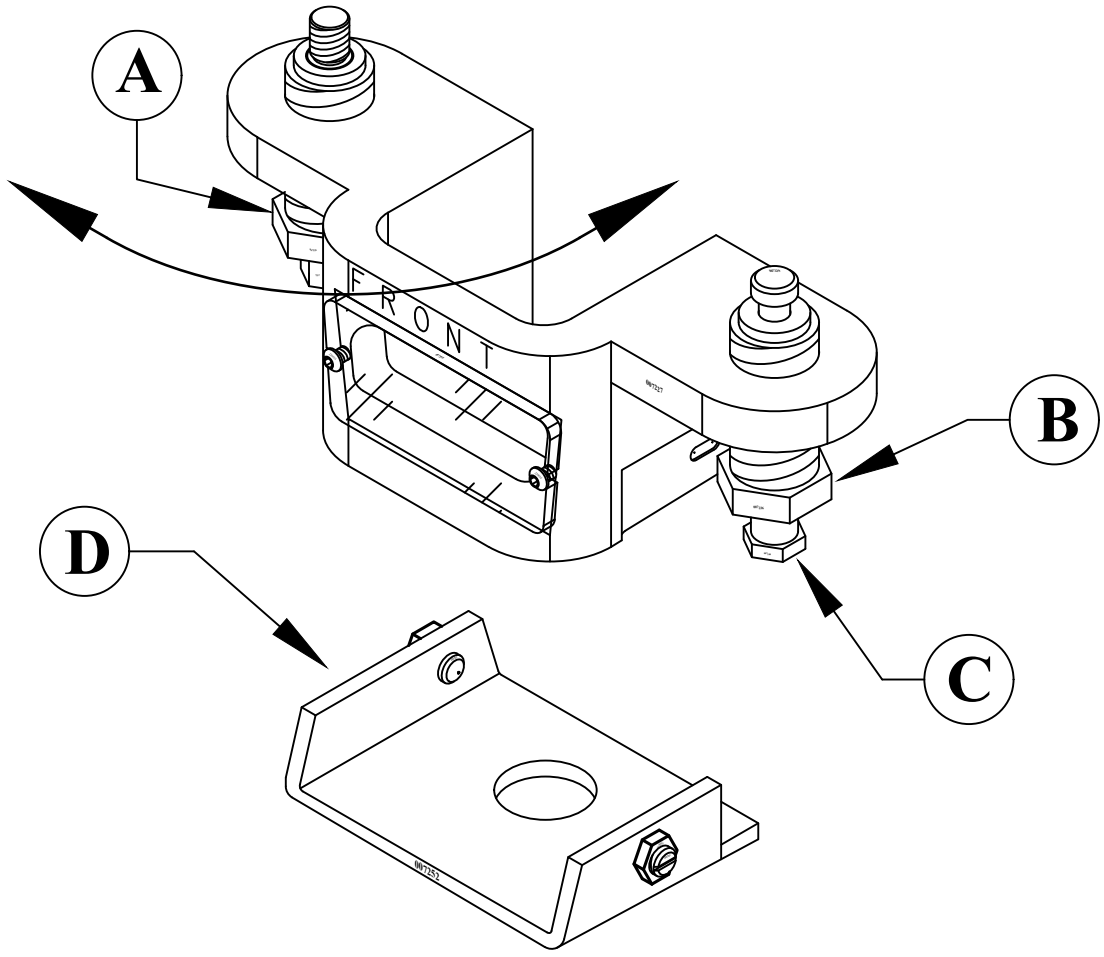


FIGURE 9

E. DO NOT PUNCH ANYTHING THICKER THAN THE PUNCH DIAMETER.

This "rule of thumb" can be extended, but the punch supplier or Scotchman should be consulted first, i.e. (Do not punch plate thicker than 1/2 inch with a 1/2 inch diameter punch.)
This rule of thumb applies to mild steel only and must be reduced when punching alloy steels.
Contact the factory or your local dealer before attempting to punch any type of alloy steel.

F. LUBRICATE THE PUNCH AND DIE.

This will hold stripping forces to a minimum and greatly extend punch life.
Lubrication must be applied after every 5 to 10 holes.

G. PUNCH FULL AND COMPLETE HOLES. DO NOT PUNCH PARTIAL HOLES.

The side thrust encountered in punching a partial hole can force the punch over against the die and result in punch or die breakage and possible injury to the operator.

H. MAINTAIN SUFFICIENT MATERIAL BETWEEN THE PUNCHED HOLE AND THE EDGE OF THE WORKPIECE.

The edge of the punch should clear the edge of the workpiece by a distance equal to the thickness of the material being punched. Any edge distance of less than this amount will result in a deformed workpiece.

I. STAY WITHIN RATED PUNCHING CAPACITIES.

The FI-8510-20M Ironworker is designed to operate in mild steel.
Within conservative limits, it can also operate in medium carbon annealed steel and some forms of abrasion resistant steels.

Conditions of high shock can be encountered when punching alloyed steels. The machine rating must be reduced accordingly. Punch to die clearance depends on the material thickness.

In mild steels, material thicknesses of 1/4 through 5/8 inch (6 to 16mm) should have a total punch to die clearance of 1/32 inch. (Punch diameter + 1/32" = Die diameter.) 3/4 through 1 inch (19 thru 25mm) mild steel should have a minimum of 1/16 inch clearance. (Punch diameter + 1/16" = Die diameter.)

In thin materials, the recommended punch to die clearance is 1/10 of the material thickness.
We do not recommend less than 1/64 of an inch (.4mm) total clearance due to working clearances necessary in the punch ram and punch bushing.

The maximum material thickness this machine is designed to punch is 1 inch (25mm) mild steel. For capacities, SEE THE PUNCH TONNAGE CHART IN FIGURE 10 ON THE FOLLOWING PAGE.

► **NOTE: When punching larger diameter holes or alloy steels, set the down stroke of the machine so that the punch stops just above the plane of the die, approximately fifteen thousandths of an inch (.3mm). This will reduce the punching shock encountered in these applications.**

MAXIMUM MATERIAL THICKNESS IS 1 INCH (25MM).

Rated on mild steel having 65,000 psi tensile.

TONS REQUIRED PER HOLE TO PUNCH MILD STEEL HAVING 65,000 PSI TENSILE STRENGTH															
HOLE DIAMETER		1/8 .125	3/16 .1875	1/4 .250	5/16 .3125	3/8 .375	7/16 .4375	1/2 .500	9/16 .5625	5/8 .625	11/16 .6875	3/4 .750	13/16 .8125	7/8 .875	15/16 .9375	1 1.00
METAL GAUGE	THICKNESS INCHES	PRESSURE IN TONS														
28	.015	.2	.2	.3	.4	.4	.5	.6	.7	.7	.8	.9	1.0	1.1	1.2	1.3
26	.018	.2	.3	.4	.4	.5	.6	.7	.8	.9	1.0	1.1	1.1	1.2	1.3	1.4
24	.024	.2	.4	.5	.6	.7	.8	.9	1.1	1.2	1.3	1.4	1.5	1.6	1.8	1.9
22	.030	.3	.4	.6	.7	.9	1.0	1.2	1.3	1.5	1.6	1.8	1.9	2.1	2.2	2.4
20	.036	.4	.5	.7	.9	1.1	1.2	1.4	1.6	1.8	1.9	2.1	2.3	2.5	2.6	2.8
18	.048	.5	.7	.9	1.2	1.4	1.6	1.9	2.1	2.4	2.6	2.8	3.1	3.3	3.5	3.8
16	.060	.6	.9	1.2	1.5	1.8	2.1	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7
14	.075	.7	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.8	5.1	5.5	5.9
12	.105	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.1	5.7	6.2	6.7	7.2	7.7	8.2
10	.135	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6	7.3	7.9	8.6	9.2	9.9	10.6
5/32	.157	–	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	8.4	9.2	10.0	10.7	11.5	12.3
3/16	.188	–	2.8	3.7	4.6	5.5	6.4	7.4	8.3	9.2	10.1	11.0	12.0	12.9	13.8	14.8
1/4	.250	–	–	4.9	6.1	7.4	8.6	9.8	11.1	12.3	13.5	14.7	16.0	17.2	18.4	19.7
3/8	.375	–	–	–	–	11.1	12.8	14.8	16.5	18.5	20.2	22.1	23.8	25.8	27.5	29.5
1/2	.500	–	–	–	–	–	–	19.7	22.0	24.6	26.9	29.5	31.8	34.4	36.8	39.4
5/8	.625	–	–	–	–	–	–	–	–	30.8	33.7	36.9	39.9	43.0	46.0	49.2
3/4	.750	–	–	–	–	–	–	–	–	–	–	44.3	47.7	51.7	55.2	59.0
1	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	80.0

FIGURE 10

6.2 BAR SHEAR OPERATION

⌦ **CAUTION: WHEN THE BAR SHEAR STATION IS NOT IN USE, ALWAYS CRANK THE HOLD-DOWN DEVICE TO ITS DOWN POSITION.**

When using the bar shear on your Scotchman Ironworker, always use the hold-down device. Never put any part of your body between the hold-down and the material to be sheared. A maximum clearance of 1/8" (3mm) between the hold-down and the material to be sheared is acceptable.

The maximum tonnage available on the bar shear is to the right, or closest to the pivot point. For applications that do not require the maximum tonnage, move the material to the left, for minimal distortion of the drop off piece. Do not attempt to shear pieces that are too short for the hold-down to grip as this will cause the material to "kick-up" and probably result in damage to the machine.

It is also important that the hold-down is correctly adjusted to avoid possible damage to the machine and injury to the operator. The hold-down is adjustable to cover all thicknesses of material within the rated capacity of the machine. A shear support table with adjustable guide is fitted to allow the accurate feeding of material at any angle. By feeding angle iron through the angle slot, it is possible to miter the leg of angle, having already cut the angle to the desired length in the angle shear. The maximum material that can be sheared is 1 x 12 inch (25 x 305mm), 3/4 x 20" (19 x 505mm) mild steel.

The standard shear blades fitted to the machine comprise of an upper shaped moving blade and a bottom rectangular fixed blade. The combination of these two blades offers absolute minimum distortion through all thicknesses of material within the rated capacity of the machine. After a period of time and subsequent dulling of the blades, the blades can be removed and turned. The lower fixed blade can be turned offering four cutting edges and the upper moving blade can be turned offering two cutting edges. Alternatively, the machine can have a pair of 'rectangular blades' fitted, which offers multi-edged economy shearing with only a small margin of distortion on wide bars.

After turning or grinding worn blades, they must be refitted and adjusted to clearances listed in this section. The upper 'moving blade' is not adjustable and the 'fixed blade' must be adjusted to suit. The 'fixed blade' securing and adjusting screws are more accessible when the shear table and the hold-down have been removed. An even clearance between the 'moving' and 'fixed blade' along their entire length is important and attention should be given to ensuring that the 'fixed blade' is in a vertical plane.

REFER TO SECTION 6.2B.

THE BASIC METHOD OF OPERATING THE BAR SHEAR CONSISTS OF FIVE STEPS:

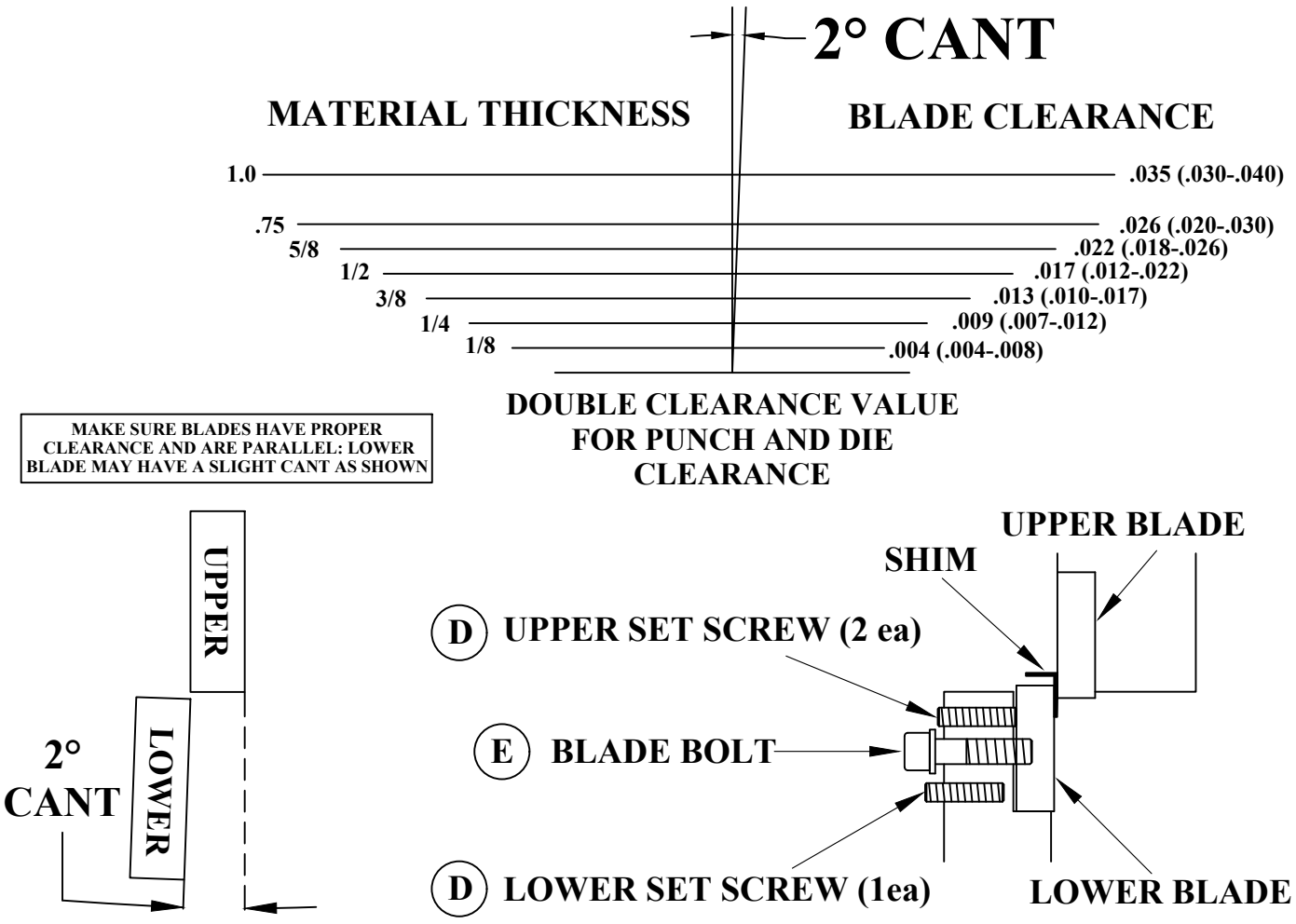
1. **Place the selector switch in the ON position and both selector switches in the START position and power the machine.**

2. **Place the selector switch in the SHEAR position.**
3. **Place the material to be sheared between the shear blades.**
4. **Adjust the hold-down device down until it contacts the material to be sheared and tighten both hold-down bolts. REFER TO SECTION 6.2A. This prevents "kick-up" of the workpiece and possible damage to the machine.**
5. **DEPRESS THE FOOT PEDAL.**
   Lubricating oil should be applied to the blades every 10 to 15 cuts.

IN ADDITION TO THE FIVE BASIC STEPS OF OPERATION, THE OPERATOR SHOULD ALSO BE FAMILIAR WITH THE FOLLOWING:

MAINTAIN PROPER BLADE CLEARANCE.

The quality of the cut is an immediate indication of the condition of the shear blades or the amount of clearance between the blades. For adjustment procedures, REFER TO SECTIONS 6.2B.



Based on mild steel of 65,000 tensile strength.

REFER TO SECTION 6.2B, FOR SHEAR BLADE ADJUSTMENT.

FIGURE 11

6.2A HOLD-DOWN ADJUSTMENT

- **Ensure that the hold-down is correctly adjusted for the relevant material.**

➲ **NEVER allow the ends of the material to pass beyond the hold-down when shearing. This may cause serious damage to the machine. Always feed material from the hold-down side.**

- **Keep the blade area clean. Do not allow buildup of mill-scale.**
- **Stay within the rated capacity of the machine.**
- **The quality of the cut is usually an indication of the condition of the blades or their setting.**

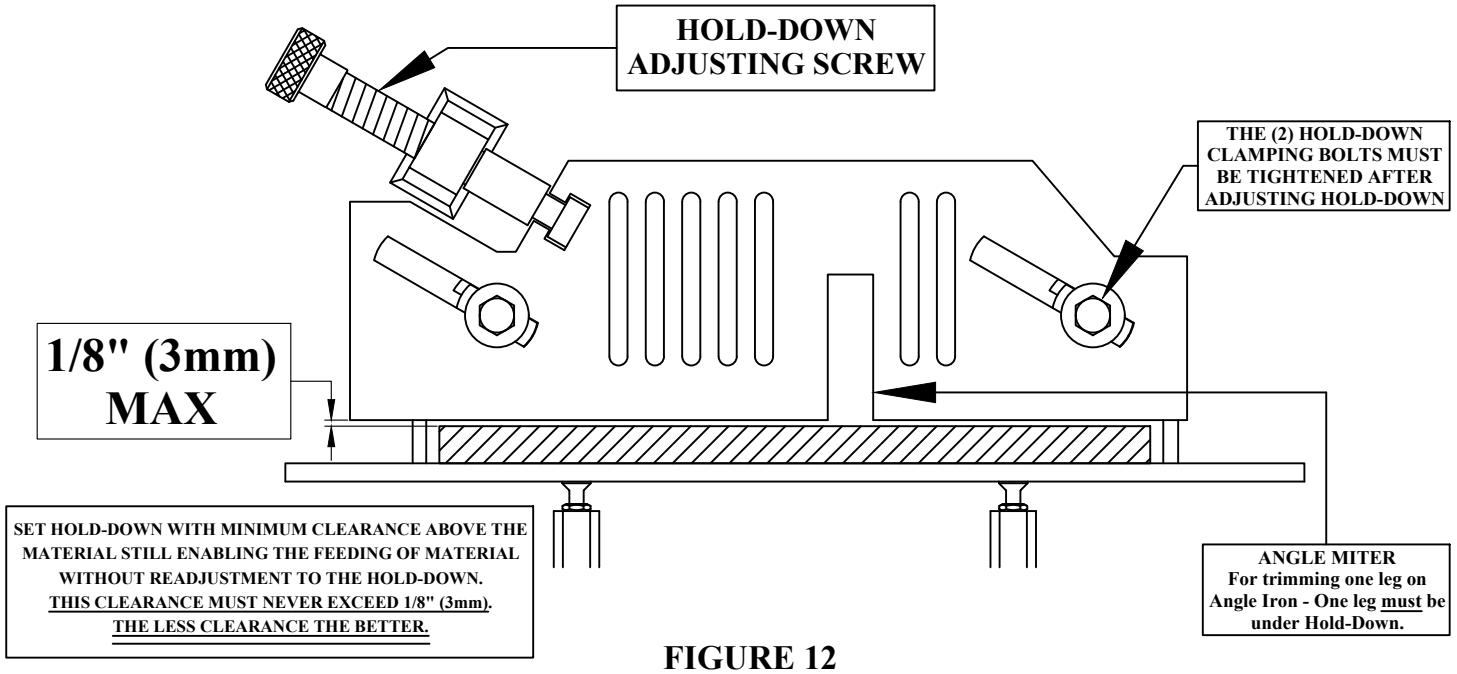
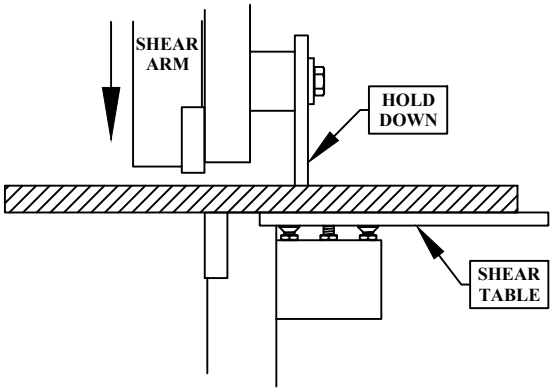


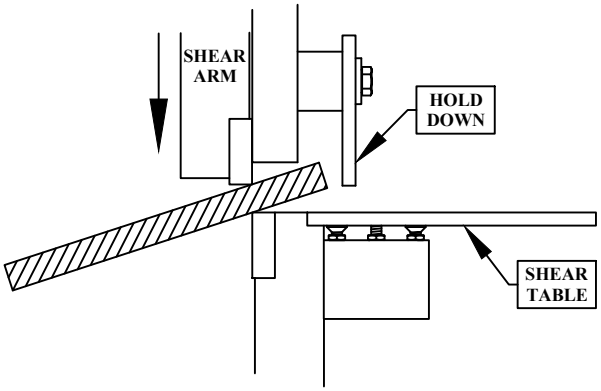
FIGURE 12

CORRECT USE OF HOLD-DOWN



CORRECTLY SET HOLD-DOWN

NOT CORRECT!!



NEVER FEED THE MATERIAL BEYOND THE HOLD-DOWN AND OPERATE THE MACHINE. THIS MAY CAUSE INJURY TO THE OPERATOR AND SERIOUS MACHINE DAMAGE.

FIGURE 13

6.2B SHEAR BLADE ADJUSTMENT

- **To set the blades, lower the arm so that the upper blade crosses the lower blade. (If fitting new or re-ground blades, ensure that the lower blade is fully adjusted away from the upper blade before lowering the arm.)**
- **Switch off the machine.**
- **Remove the shear hold-down and the shear support table.**
- **Adjust the lower blade to the upper blade to achieve desired clearance. See Figure 14 below. Ensure that the lower blade is adjusted with a slight cant, or tilt of a few thousandths of an inch, so that the cutting edge of the blade is closer to the top blade.**
- **Lock the upper blade in position by tightening the upper blade securing screws.**
- **Check and readjust the blade setting, if necessary.**
- **Re-fit the hold-down and the shear support table to the machine.**
- **The upper blade has two cutting edges, whereby the lower blade has four. It is possible to replace the shaped upper blade with a rectangular lower blade, therefore offering multi-edged economy shearing with only a very small amount of distortion on wide bars.**

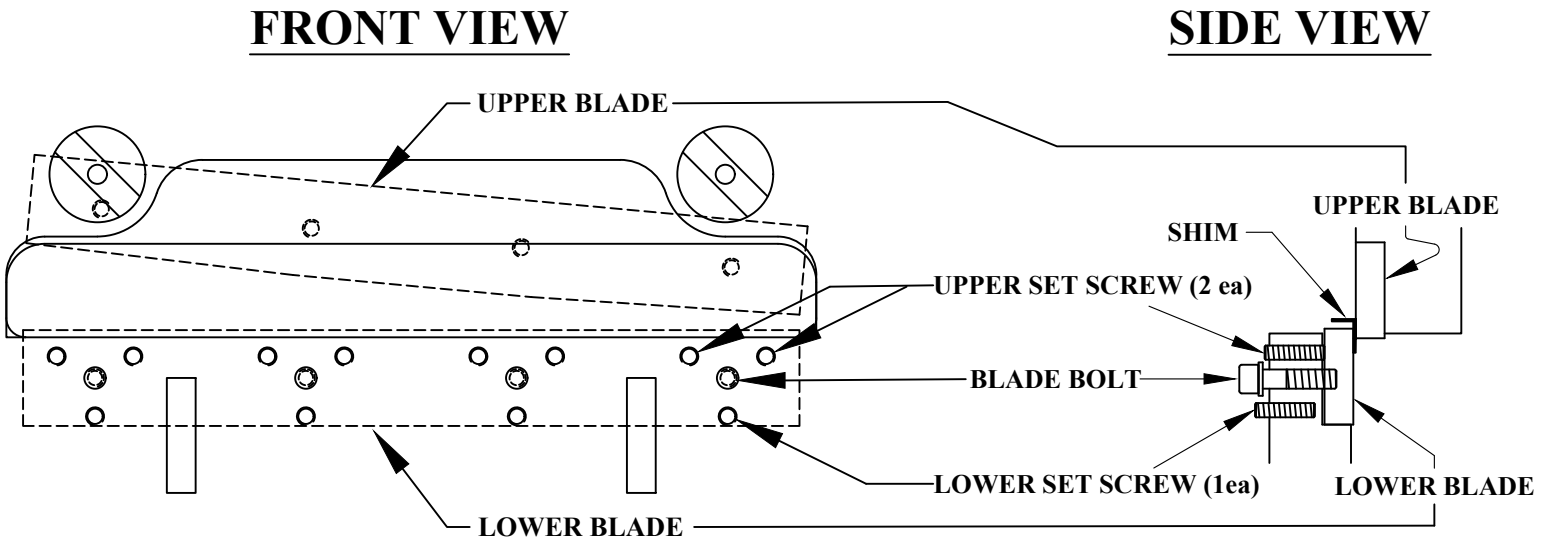


FIGURE 14

6.3 TOOLING ARM ADJUSTMENT

For parts identification, SEE FIGURE 15 ON THE FOLLOWING PAGE.

Adjustment of the tooling arm is maintained by a pressure plate at the pivot point, two rub plates backing up the arm and the two rub plates at the notcher station.

⌦ **CAUTION: BEFORE MAKING ANY ADJUSTMENTS ON THE TOOLING ARM, THE BAR SHEAR BLADES, ANGLE SHEAR BLADES AND ROD SHEAR BLADES MUST BE BACKED OFF TO PREVENT DAMAGE TO THE BLADES. THE LOWER NOTCHER BLADES MUST BE REMOVED TO PREVENT POSSIBLE INJURY TO THE OPERATOR AND DAMAGE TO THE BLADES. AFTER THE TOOLING ARM HAS BEEN ADJUSTED, THE BLADES FOR EACH TOOL SHOULD BE READJUSTED FOLLOWING THE INSTRUCTIONS FOR EACH RESPECTIVE TOOL.**

1. **After backing off or removing all of the tooling blades, the tooling arm back-up rub plates (H) and the notcher rub plates (P) should be backed off and checked for wear. If the rub plates are worn, they should be rotated or replaced. DO NOT adjust the rub plates back up to the arm yet.**
2. **First, adjust the pressure plate (I) at the pivot point. This is adjusted by loosening the locking nuts (S) on the adjustment screws (R). Tighten the screws in a diagonal order. Adjust the screws up snug. Tighten the adjusting screws to 30 ft-lbs (41 Nm).**
   Excessive tightening of these screws will only increase wear .
3. **Adjust the rub plates (P) on the notcher, adjusting one side up until the rub plates make contact. Then, adjust the other side up the same way. Tighten the locking bolts (O).**
4. **Adjust the two tooling arm rub plates (H).**

✉ **NOTE: TO GAIN VISUAL ACCESS, IT MAY BE NECESSARY TO REMOVE THE CYLINDER SHROUD AND THE DROP-OFF COVER ON THE BAR SHEAR.**

5. **Place the selector switch in the START position and the run/jog switch in the JOG position. Power the machine. Place the selector switch in the SHEAR position. Jog the tooling arm to a point where the rub plates will meet in the center position. Adjust the center adjustment screws (N) in until the rub plates contact each other. Then, adjust the rest of the adjustment screws until they contact the rub plate.**
6. **Tighten the mounting bolts (O) in the rub plates (H).**
7. **The tooling arm is now adjusted and the blades on each respective tool can be readjusted following the instructions in their respective sections.**

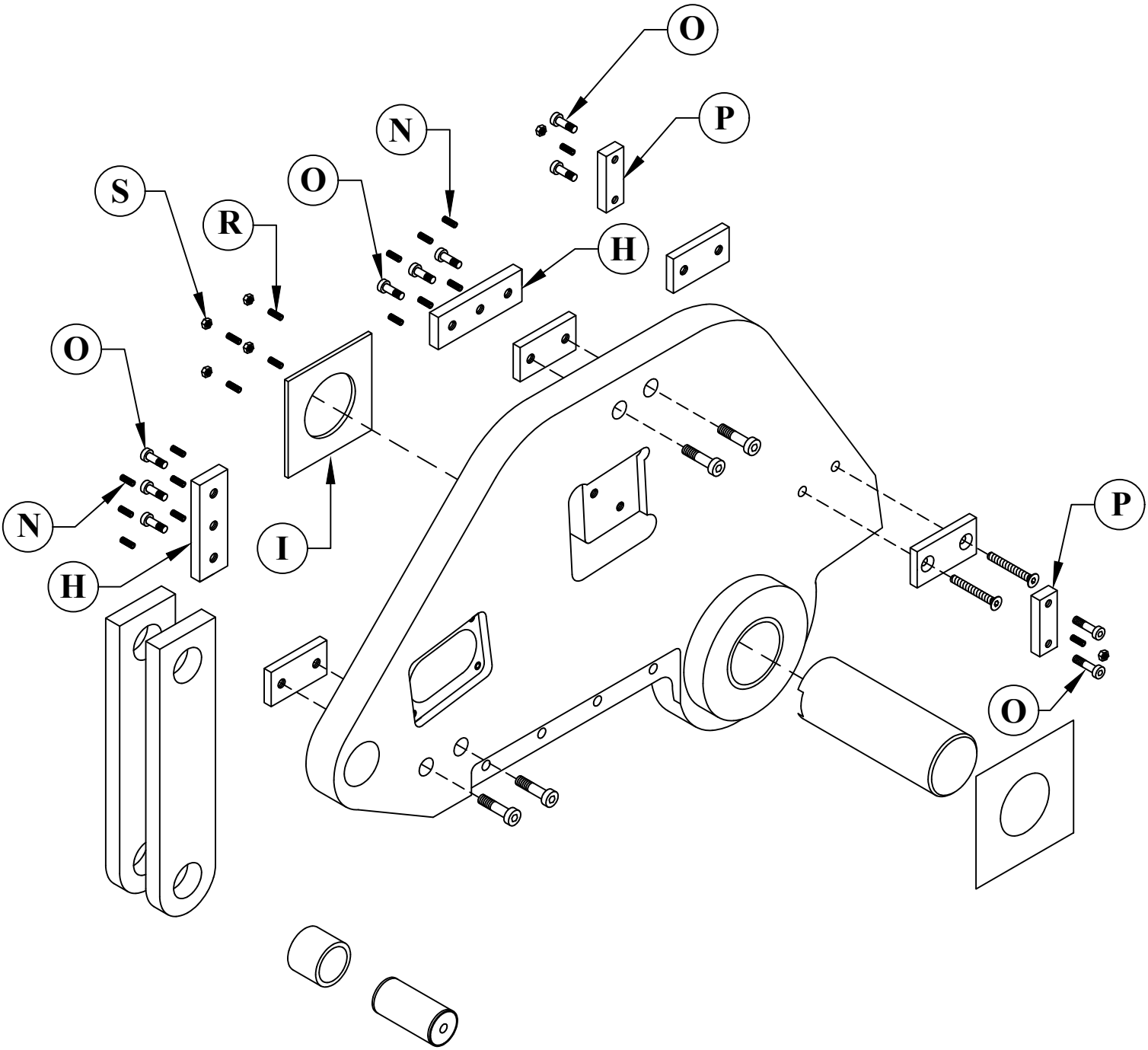


FIGURE 15

6.4 ANGLE SHEAR OPERATION

The angle shear on this model is a crop-off design that parts the material without a slug.
The maximum capacity of the angle shear is 6 x 6 x 1/2 inch (157 x 157 x 12mm) mild steel.
To prevent kick-up of the material, adjust the hold-down device to within 1/16 of an inch (1.5mm) of the material.

➲ **NEVER allow any portion of your body to extend beyond any of the guards or hold-down devices on this ironworker.**

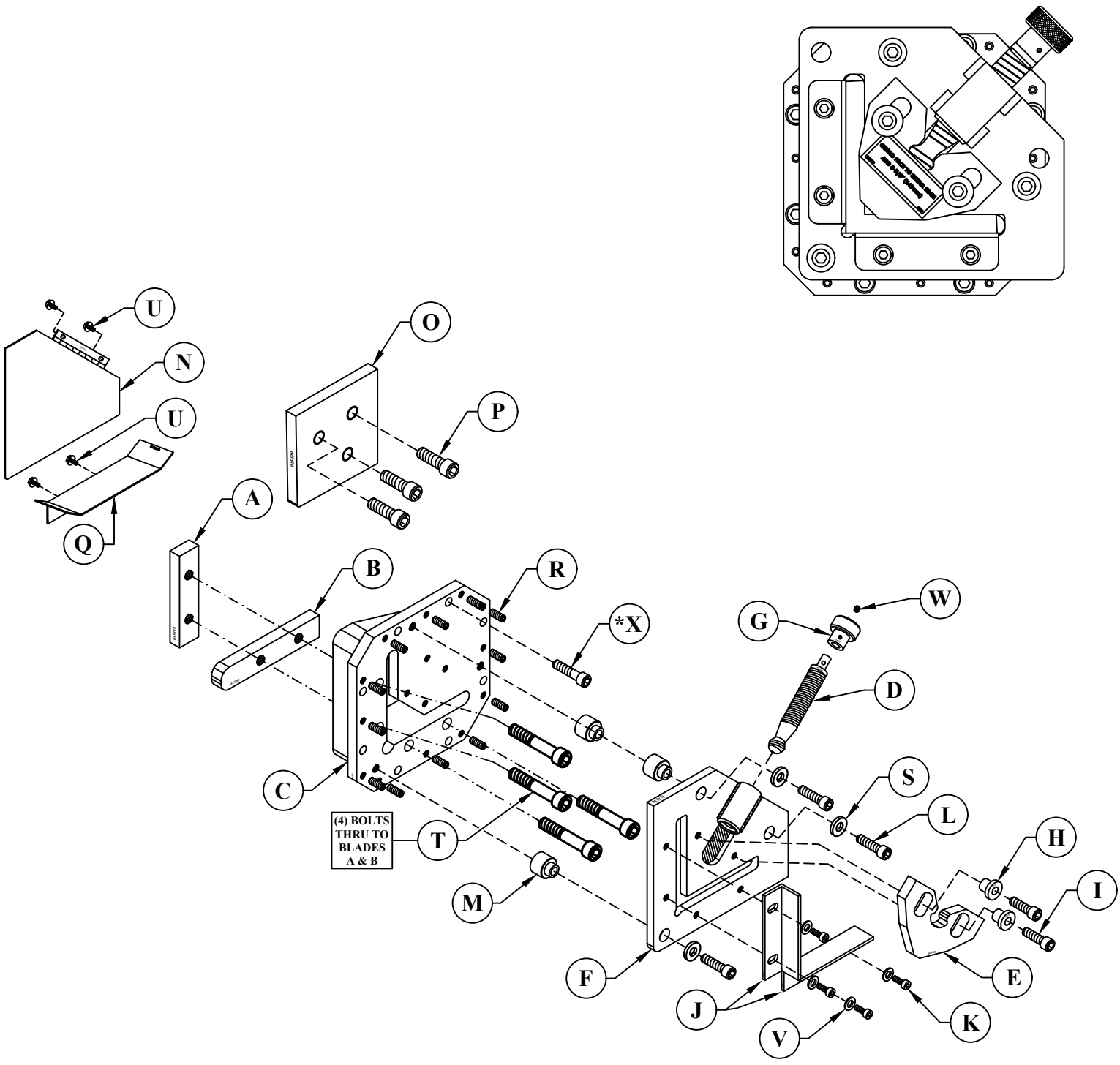
For best results, always feed the material at a true horizontal plane to the shear.
The angle shear is operated with the selector switch in the SHEAR position.
Lubricate the blades every 10 to 15 cuts.

6.4A ANGLE SHEAR BLADE ADJ. OR REPLACEMENT

For parts identification, SEE FIGURE 16 ON THE FOLLOWING PAGE.

1. **With the machine in the SHEAR position, TURN THE POWER OFF.**
2. **Remove the hold-down assembly via three bolts (L) and washers (S).**
3. **The angle shear blade block (C) is bolted to the frame with eight bolts (*X) - two on each side & two top and bottom. Remove them and carefully remove angle shear block - It is heavy!!**
4. **Back the adjusting screws (R) out until they retract into the back of the holder.**
5. **Remove the four bolts (T) from the lower blades and remove the lower blades (A & B).**
6. **After the lower blades (A & B) are removed, place the selector switch in the START position and the run/jog switch in the JOG position.**
7. **Power the machine and place the selector switch in the SHEAR position.**
8. **Jog the tooling arm down to a point where the upper blade (O) can be removed.**
9. **Turn the machine's power off and remove the upper blade (O) via three bolts (P).**
10. **Reverse the process to install new blades. The angle shear blades can be sharpened. If the lower blades have been sharpened, they may have to be shimmed. A clearance of .015 to .020 thousandths of an inch (.4 to .5mm) between the upper and lower blades is recommended.**

► **NOTE: Blade (A) has four cutting edges and can be flipped or rotated. Blade (B) has two cutting edges and can be rotated. Blade (O) has just one cutting edge and must be sharpened or replaced. ALWAYS CHECK CLEARANCE when blades are changed.**



***X - Only one of the (8) bolts is shown for clarity**

FIGURE 16

6.5 ROD SHEAR OPERATION

The rod shear cavity is designed to shear up to 1-1/2 inch (38mm) round and 1-1/4 inch (31mm) square rods. To prevent kick-up of the material, adjust the hold-down device to within 1/16 inch (1.5mm) of the material. For best results, always feed the material at a true horizontal plane to the blades.

➲ **NEVER allow any portion of your body to extend beyond any of the guards or hold-down devices on this ironworker.**

The rod shear is operated with the selector switch in the SHEAR position. Lubricate the blades every 10 to 15 cuts. Special blades are available. For prices, contact your local dealer or the factory.

6.5A ROD SHEAR BLADE ADJUSTMENT OR REPLACEMENT

For parts identification, SEE FIGURE 17 ON THE FOLLOWING PAGE.

1. **Remove the handle (J) holding the guard hold-down device (D) to the machine.**
2. **Remove the bolts (H) holding the stationary blade holder (C) and the blade.**
3. **After removing the holder, back the set screw adjustment bolts (G) off until they retract into the holder.**
4. **It may be necessary to power the machine and jog the tooling beam to a position where the moving blade (A) can be removed.**
5. **After jogging the machine, turn the power off and remove the moving blade.**
6. **At this point, the blade may be sharpened or new blades installed.**

► **NOTE: The blades are designed to fit only one way and can not be reversed.**

7. **Install the moving blade (A) on the tooling arm.**
8. **Place the stationary blade (B) and holder (C) on the machine and start the mounting bolts. DO NOT TIGHTEN.**
9. **With steady hand pressure, hold the stationary blade against the moving blade and adjust the adjustment screws (G) in until they contact the frame of the machine. Turn the adjustment screws in 1/4 of a turn more after they contact the frame. A clearance of ten thousandths (.010) of an inch (.25mm) is recommended.**
10. **Tighten the mounting bolts (H) and mount the guard hold-down device (D).**

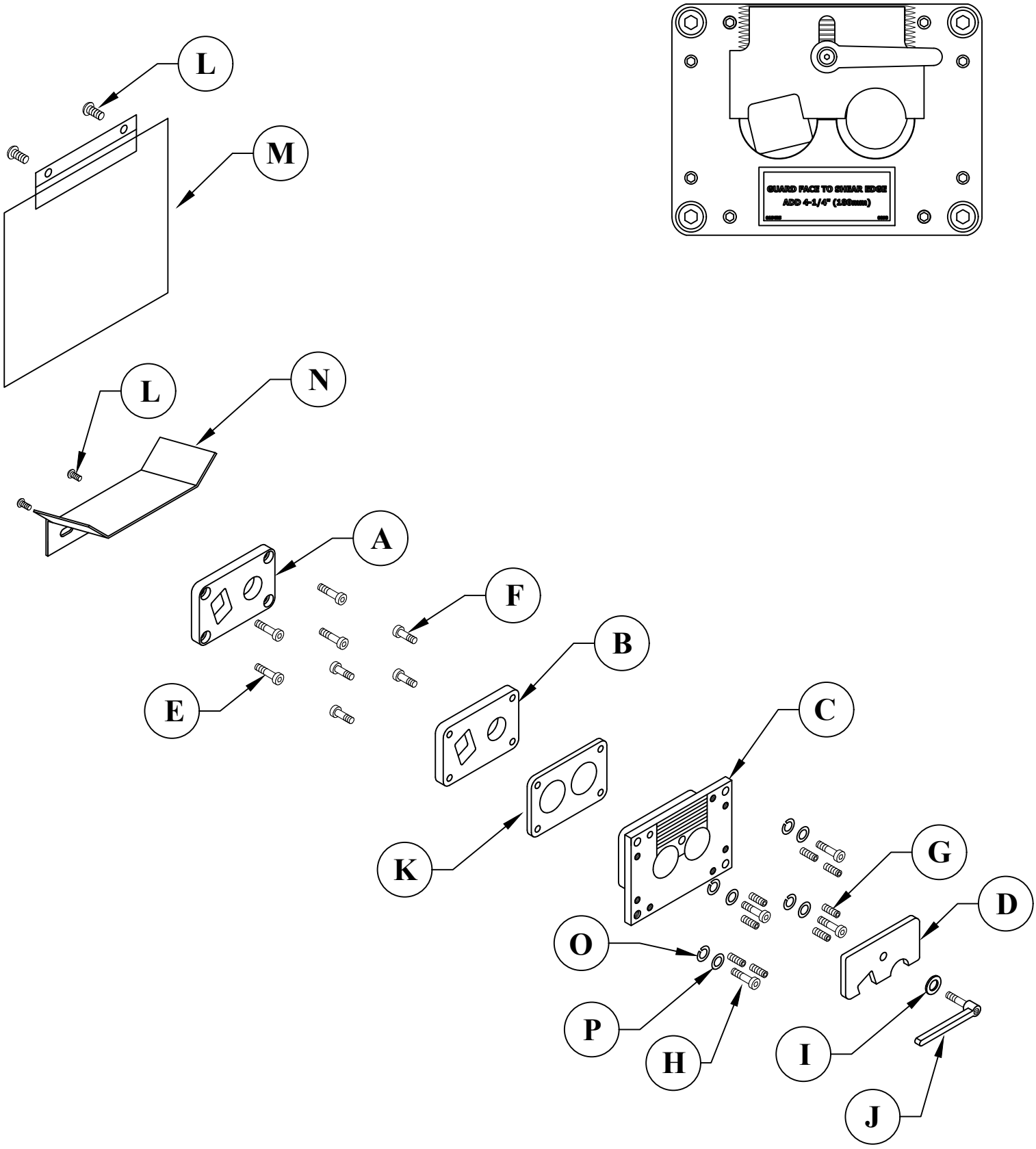


FIGURE 17

6.6 RECTANGLE NOTCHER OPERATION

This tool is operated with the selector switch in the PUNCH position.

⌦ **CAUTION: WHEN THE NOTCHER STATION IS NOT IN USE, BE SURE THAT THE GUARD IS IN THE FULL DOWN POSITION, TO PREVENT ANYONE FROM STORING TOOLS OR MATERIAL ON THE TABLE OR IN THE BLADE CAVITY.**

Notching applications up to 3 x 5 inch (76 x 127mm) rectangular and 3 x 3 inch (76 x 76mm) 90 degree vee notch in 1/2 inch (12mm) material is the maximum capacity of this section of the machine.

TO OPERATE THE NOTCHER, USE THE FOLLOWING STEPS:

1. **Always maintain 1/4 of an inch (6.3mm) clearance between the material and the guard.**
2. **Place the workpiece between the blades. Cycle the machine until the blades have sheared through the material. Continue to hold your foot on the pedal while you remove the material toward you on a horizontal plane.**
3. **Once the material is away from the blades, remove your foot from the pedal. The machine will return to a neutral position, ready for the next cut.**
4. **DO NOT USE THE SAFETY GUARD AS A STRIPPER!**
   The safety guard will not support the load. Lubricate the blades every 10 to 15 cuts.

6.6A RECT. NOTCHER BLADE ADJ. OR REPLACEMENT

For parts identification, SEE FIGURE 18 ON THE FOLLOWING PAGE.

1. **Place the machine in the PUNCH position and allow the machine to retract to the end of the stroke. TURN THE POWER TO THE MACHINE OFF!**
2. **Raise the notcher guard (1) to its highest position.**
3. **Remove the notcher table (8).**
4. **Remove the bolts (14) holding the lower blade holder (17) and remove it.**
5. **The lower blades (12 & 13) can now be replaced or rotated, to expose a new cutting edge.**
6. **Remove the top blade (10). The top blade cannot be rotated and must be replaced, if damaged. Before installing a new top blade, check the arm for possible wear. If there is no wear, install the new blade on the arm.**
7. **Place the selector switch in the START position and the run/jog switch in the JOG position. Power the machine.**
8. **Place the selector switch in the PUNCH position. Jog the arm down to a point where the top blade is parallel with the bolster. TURN THE POWER OFF.**
9. **Replace lower blade holder (17) with the blades (12 & 13) installed. Start the mounting bolts (14). DO NOT TIGHTEN.**
10. **Manually align the lower blades to the upper blades with equal clearance all the way around. A clearance of twenty five thousandths (.025) of an inch (.6mm) is recommended. The lower blades may require shimming to achieve the proper clearance. Tighten the blade holder bolts to approximately 85 foot pounds of torque. Recheck the alignment.**

NOTCHER ASSEMBLY

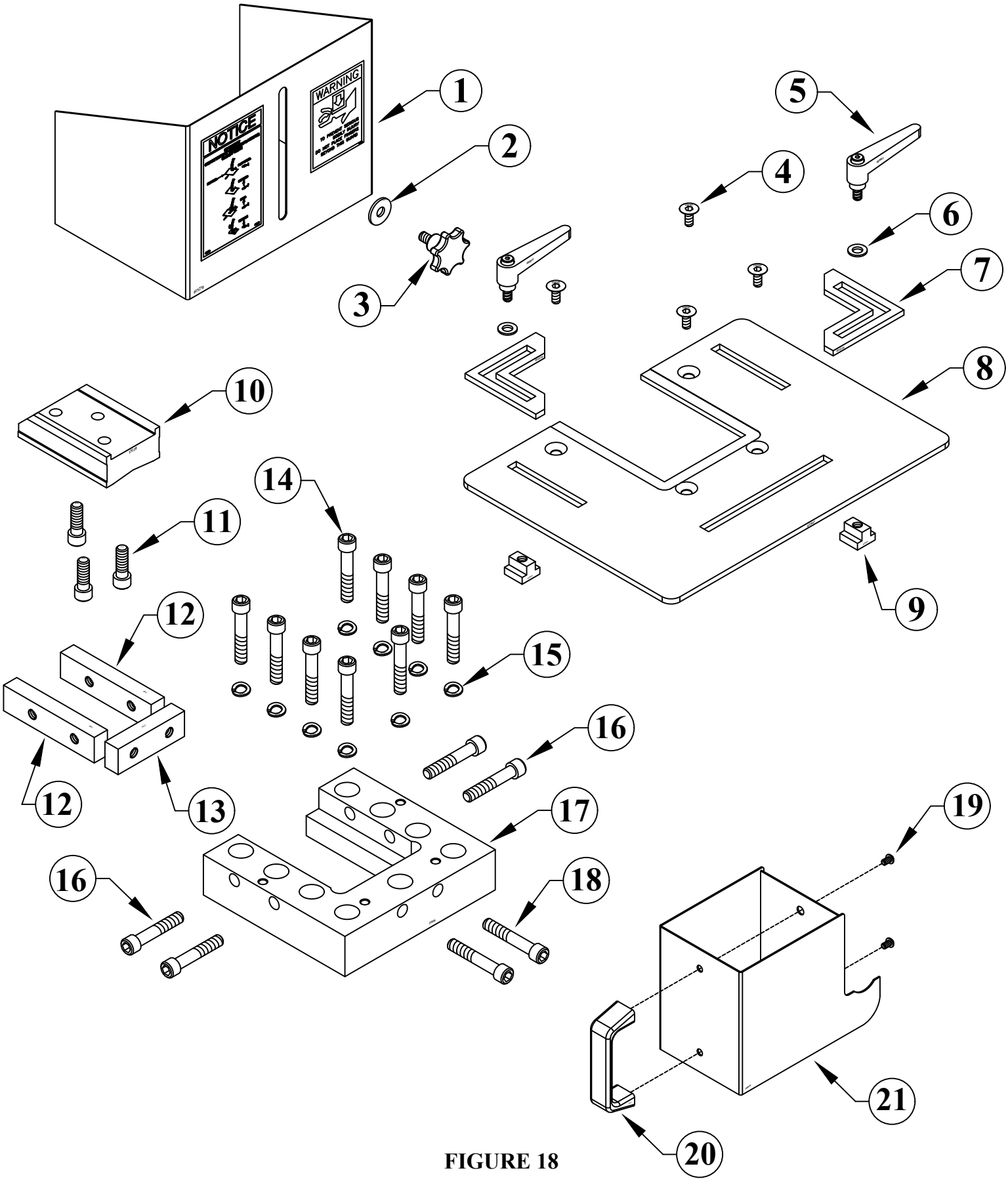


FIGURE 18

6.7 JOG CONTROL

On the FI-8510-20M Ironworker, a jog control is standard equipment. To utilize this feature, place the run/jog switch in the JOG position. When the switch is in the JOG position, the foot pedal is inoperable. When the switch is in the RUN position, the jog control is inoperable. This feature is very helpful for setting the stroke controls precisely, to eliminate excessive travel to the workpiece and setting up the optional tooling that is available for the punch station. The jog control is also used for many of the maintenance and repair functions discussed in this manual.

⌦ **CAUTION: WHEN THE JOG FEATURE IS USED, THE MACHINE WILL REMAIN AT WHATEVER POINT THE JOG CONTROL IS RELEASED. WHEN THE RUN/JOG SWITCH IS CHANGED TO THE "RUN" POSITION, THE MACHINE WILL MOVE TO WHATEVER POSITION THE SELECTOR SWITCH IS SET IN.**

7.0 OPTIONAL TOOLS

This segment will cover the optional tools that can be purchased for the FI-8510-20M, along with the proper and safe methods to install and operate them. As with all functions of this machine, safety glasses are required when using any of these tools.

7.1 PIPE NOTCHER

The pipe notcher is a component tool designed to saddle cut pipe and tubing for applications such as railings. There are notchers available to notch angles in pipe and tubing, also. For prices and availability, contact your local dealer or the factory. Two inch (2") schedule 80 is the maximum thickness of pipe that can be cut. Lighter weight tubing may be cut, but will require different dies for best cutting results. Separate dies are required for each size pipe being notched.

7.1A PIPE NOTCHER INSTALLATION

SEE FIGURE 19 ON THE FOLLOWING PAGE.
The pipe notcher installs in the punch station on this model. To install the pipe notcher, remove the punch stripper and die holder.

1. **Before installing the pipe notcher, place the selector switch in the PUNCH position and allow the ram to retract fully. Turn off the power to the machine.**
2. **Install the punch pusher (B) and the #45 punch retaining nut (A) on the punch ram.**
3. **Install the upper and lower dies and the return springs in the notcher.**
4. **Bolt the riser (C) to the top notcher die.**
5. **Place the notcher on the bolster (E) and line the riser (C) up to the punch pusher (B).**
6. **Anchor the notcher to the bolster with the finger clamps (D) provided with the tool.**

⌦ **CAUTION: WITH THE PIPE NOTCHER MOUNTED IN THE MACHINE, THE DOWN STROKE OF THE MACHINE MUST BE ADJUSTED TO PREVENT DAMAGE TO THE TOOL AND POSSIBLE INJURY TO THE OPERATOR. THE UPPER DIE SHOULD NOT PASS THE LOWER DIE BY MORE THAN 1/32 OF AN INCH (.8MM).**

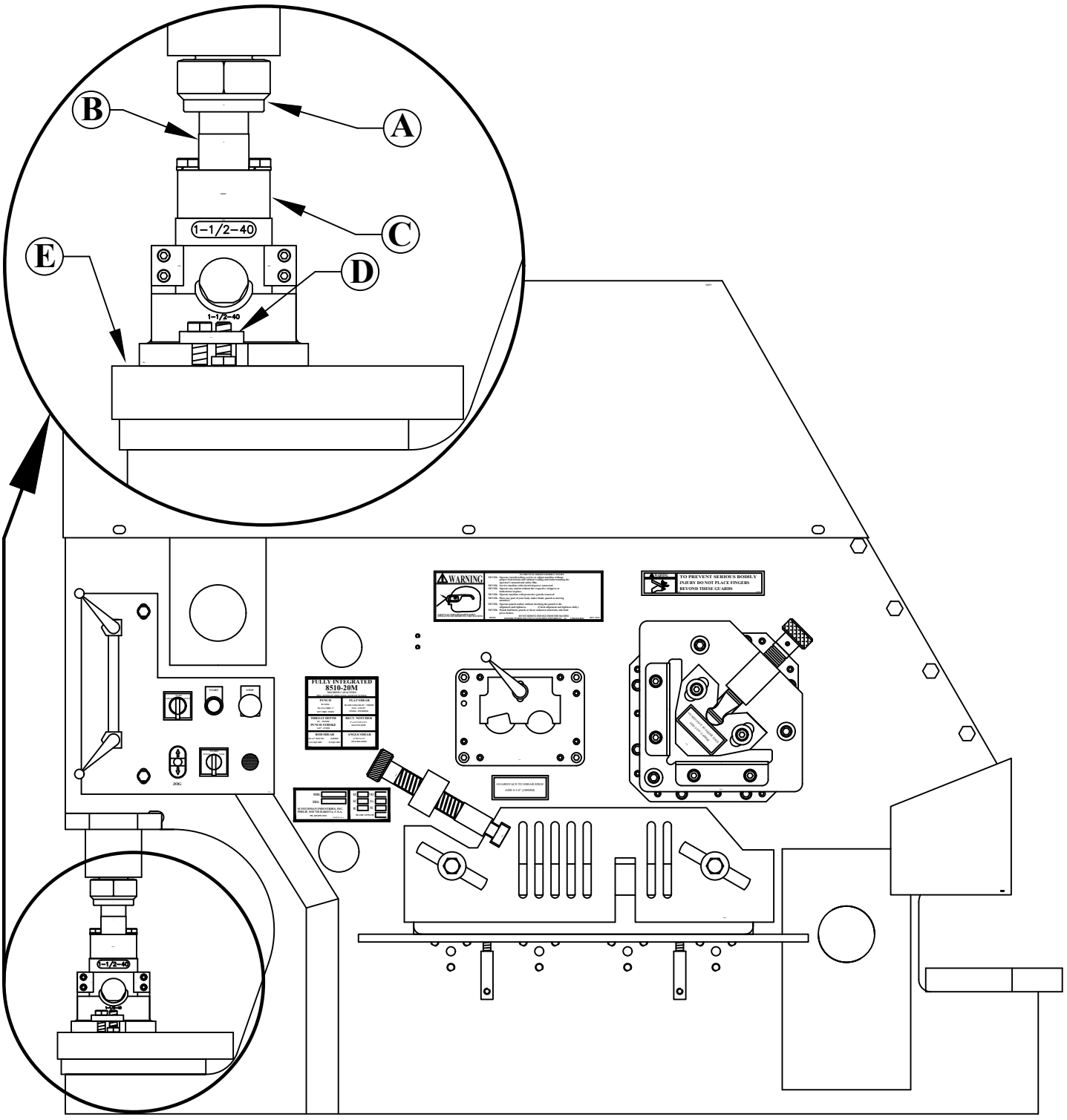


FIGURE 19

7.1B PIPE NOTCHER OPERATION

The following is Scotchman Industries. recommendation for maintenance and alignment of this tool.

➲ **PLEASE READ CAREFULLY BEFORE USE.**

TO ACHIEVE THE BEST RESULTS FROM YOUR UNIT,
PLEASE OBSERVE THESE SIMPLE RULES:

1. **Keep the unit clean. Whenever dirt or metal chips accumulate, remove the 8mm limit screw located in the center, at the rear of the punch. Lift out the punch holder and the two springs (1/2 x 3 inch). Clean the unit with solvent.**
2. **CAUTION: Do not remove the M-10 dowel pin from the upper punch.**
3. **Check the alignment of the unit. After cleaning the unit, always check the alignment of the punch And die section. To check the alignment, insert the punch and holder, without the springs, into the housing and check the gap. SEE FIGURE 20 ON THE FOLLOWING PAGE.**
4. **If proven correct, tighten the two 10mm socket head cap screws holding the die section in place. Apply some high pressure lube all around the inside of the housing. Then, reassemble the unit, reversing the above procedures.**

⌦ **CAUTION: ALWAYS WEAR SAFETY GLASSES WHEN USING THIS TOOL.**

5. **With the tool properly located and secured, place the selector switch in the START position and the run/jog switch in the JOG position.**
6. **Power the machine and place the selector switch in the PUNCH position.**
7. **Jog the ram down to 1/8 of an inch (3mm) above the riser on the tool and set the upper stroke control. Jog the machine on down until the upper die just passes the lower die (DO NOT EXCEED 1/32 of an inch (0.8mm) and set the lower stroke control.**
8. **Place the run/jog switch in the RUN position.**
9. **Before operating, lubricate the sides and back of the upper die with way oil. Repeat this lubrication daily. Cutting blades should be lubricated with a cutting oil or motor oil before making the first cut and after every 10 to 15 cuts.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

⌦ **CAUTION: TO PREVENT POSSIBLE INJURY TO PERSONNEL AND DAMAGE TO THE TOOL, THIS TOOL MUST BE REMOVED WHEN IT IS NOT IN USE.**

PIPE NOTCHER DIE ALIGNMENT

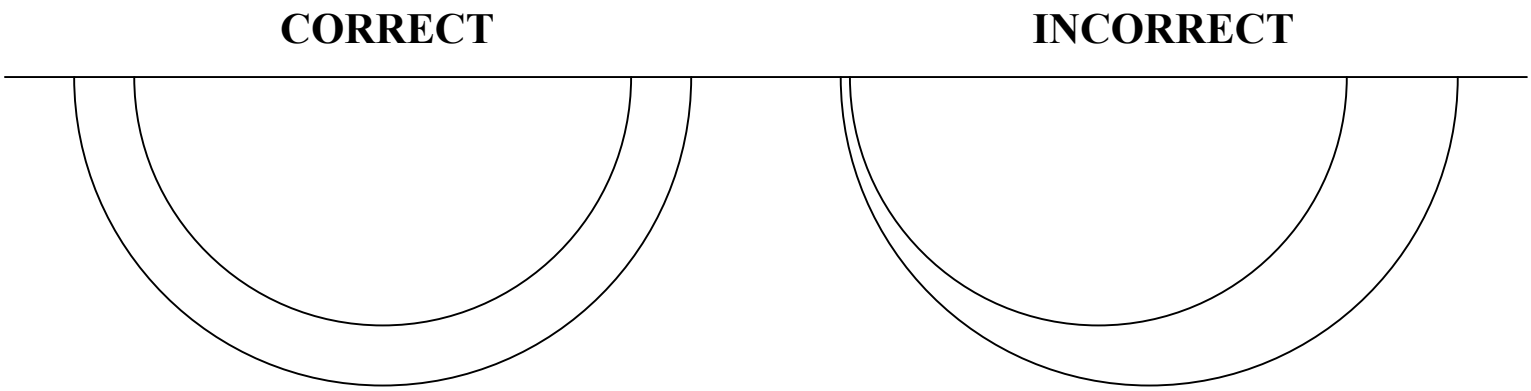


FIGURE 20

7.2 6 X 6 NINETY DEGREE NOTCHER

The 6 x 6 ninety degree notcher is a component tool designed to cut 90 degree Vee notches in angle and flat stock. It has a maximum capacity of 5/16 inch (8mm) thick mild steel.

7.2A 6 X 6 NINETY DEGREE NOTCHER INSTALLATION

SEE FIGURE 21 ON THE FOLLOWING PAGE.
The 6 x 6 ninety degree notcher mounts in the punch station. When the notcher is in the punch station, the selector switch must be in the PUNCH position.

⌦ **CAUTION: CARE MUST BE TAKEN TO SET THE UPPER AND LOWER STROKE CONTROLS ON THE MACHINE. FAILURE TO DO SO WILL RESULT IN DAMAGE TO THE TOOL AND POSSIBLE INJURY TO THE OPERATOR.**

The upper stroke should be set so that the pusher assembly is held in place by the spring tension of the tool. the lower stroke must be set so that the upper blade just passes the lower blades at the point of the vee by no more than 1/16 of an inch (1.5mm). To mount the notcher in the punch station, remove the die holder and stripper. Mount the notcher to the bolster (A), using the two bolts (B). Install the pressure block (D) and the punch pusher (E) and the retaining nut (F). After the notcher is mounted, install the neoprene slug pad.

7.2B 6 X 6 NINETY DEGREE NOTCHER OPERATION

- **Lubricate the blades before starting and every 10 to 15 cuts, thereafter.**
- **The slug must be removed with a magnetic probe or tongs after every cut.**
- **DO NOT attempt to shear material thicker than 5/16 of an inch (8mm).**
- **NEVER side-load the notcher.**

➲ **DO NOT REMOVE THE SLUGS BY HAND.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

➲ **ALWAYS REMOVE THE NOTCHER WHEN IT IS NOT IN USE.**

6 X 6 NINETY DEGREE NOTCHER

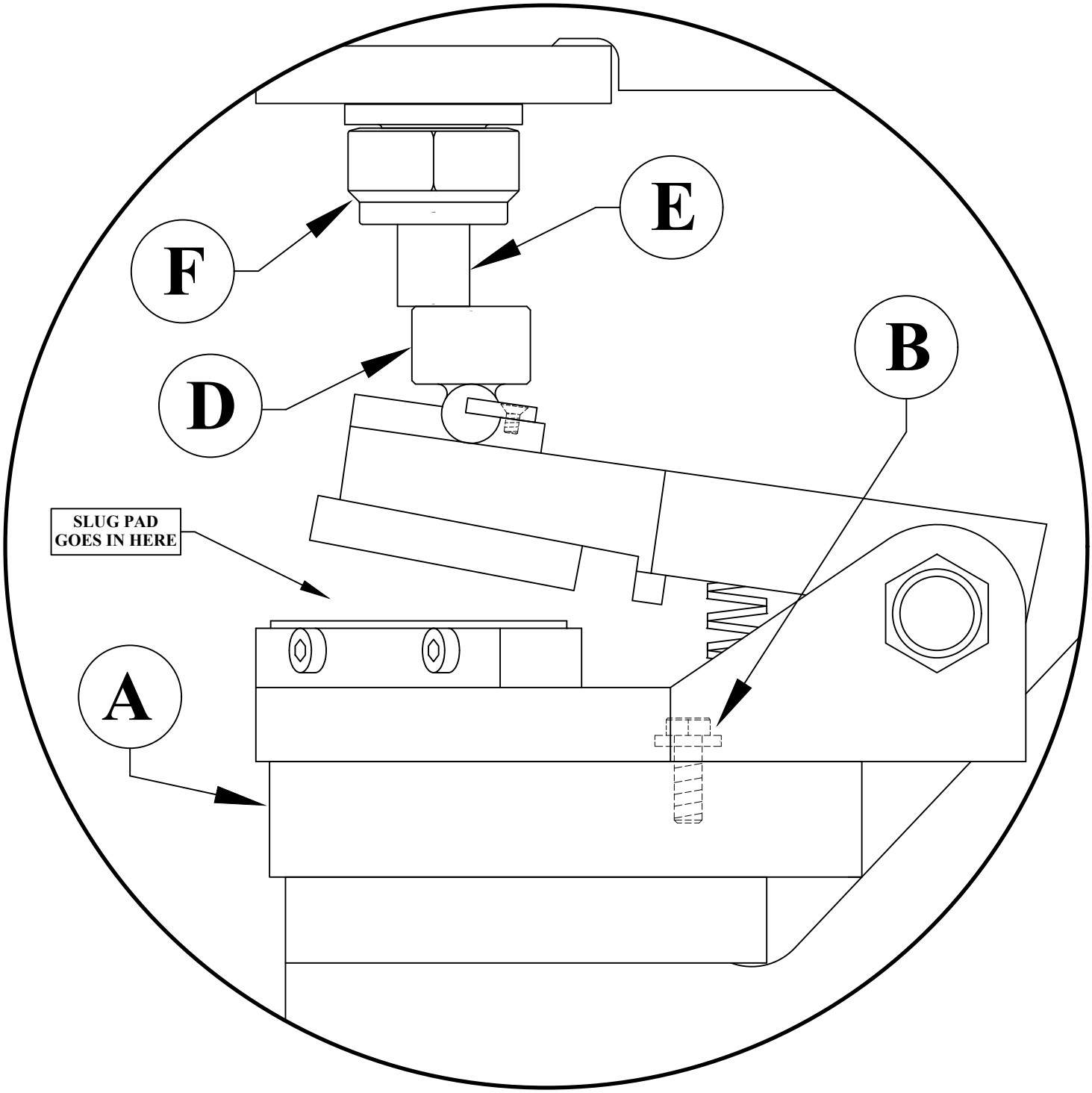


FIGURE 21

7.3 12 & 24 INCH BRAKES

Brakes are component tools designed to bend and form mild steel. They are shipped standard with dies to accommodate material up to 1/4 of an inch (6.3mm) thickness.

7.3A 12 & 24 INCH BRAKE INSTALLATION

SEE FIGURE 22 ON THE FOLLOWING PAGE.

➲ **PRIOR TO INSTALLING A BRAKE ON THIS MACHINE, THE SELECTOR SWITCH MUST BE IN THE "PUNCH" POSITION TO OPERATE THIS TOOL.**

The brake is installed in the punch station and secured to the punch bed (A) with finger clamps (B).

1. **Place the selector switch in the PUNCH position and allow the ram to retract. Turn the power to the machine off.**
2. **Install the brake on the punch bed (A), using the finger clamps (B) provided.**

► **NOTE: THE 12 INCH BRAKE AND 24 INCH BRAKE ARE MOUNTED IN THE PUNCH STATION ON THE FI-85. THE 24 INCH BRAKE NEEDS TO BE MOUNTED AS SHOWN IN FIGURE 22 ON THE FOLLOWING PAGE. THE 12 INCH BRAKE CAN BE MOUNTED IN EITHER CONFIGURATION.**

3. **After the tool is secured to the machine, make sure that the punch ram is aligned directly over the center of the brake (C).**
4. **Place the selector switch in the START position and the run/jog switch in the JOG position.**
5. **Power the machine and place the selector switch in the PUNCH position.**
6. **Jog the ram down to the brake, allowing 1/8 of an inch (3mm) between the ram and the tool. Set the upper stroke control.**
7. **Place the run/jog switch in the RUN position.**

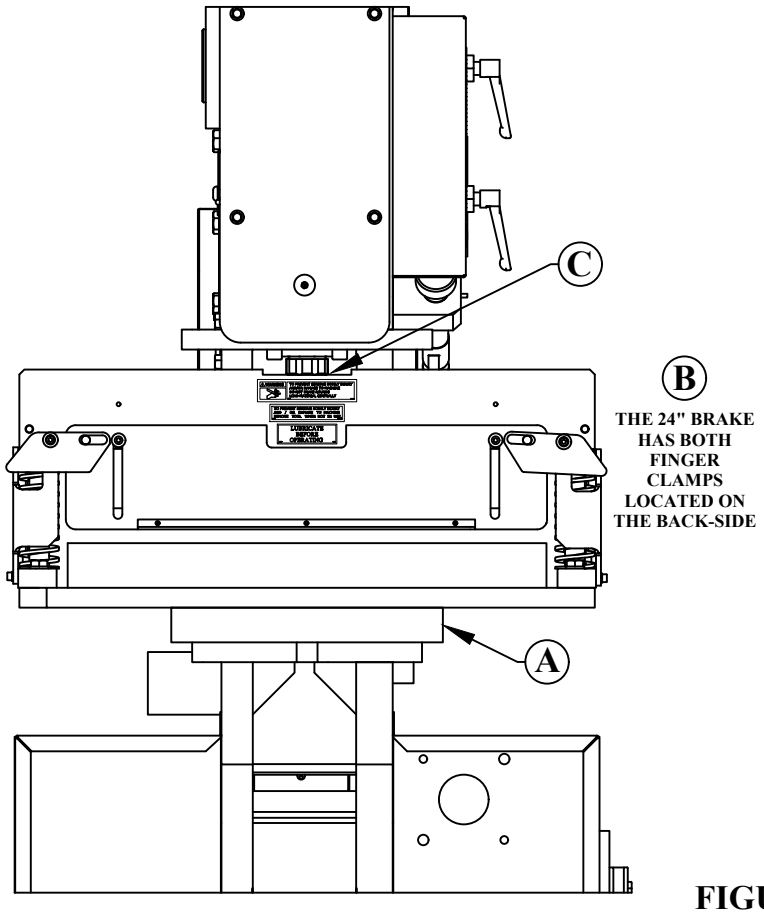
THREE VERY IMPORTANT POINTS TO REMEMBER:

1. **Never allow any part of your body to get between the upper and lower dies of a brake.**
2. **Brakes must be center loaded. NEVER side load a brake; it will put undue pressure on the guide parts, causing damage to the tool and an unsatisfactory bend.**
3. **Never hold the workpiece while performing a bending operation.**

12" & 24" BRAKE MOUNTING

An FI-8510 machine is shown below with a 12" brake (left) and a 24" brake (right) mounted in the punch station. The 24" brake can only be mounted as shown (facing the end of machine) as there is not enough throat depth to mount it the other way. This does limit how far the material can extend out from the back side of the brake.

FI-8510 WITH 24" BRAKE SHOWN BELOW



FI-8510 WITH 12" BRAKE SHOWN BELOW

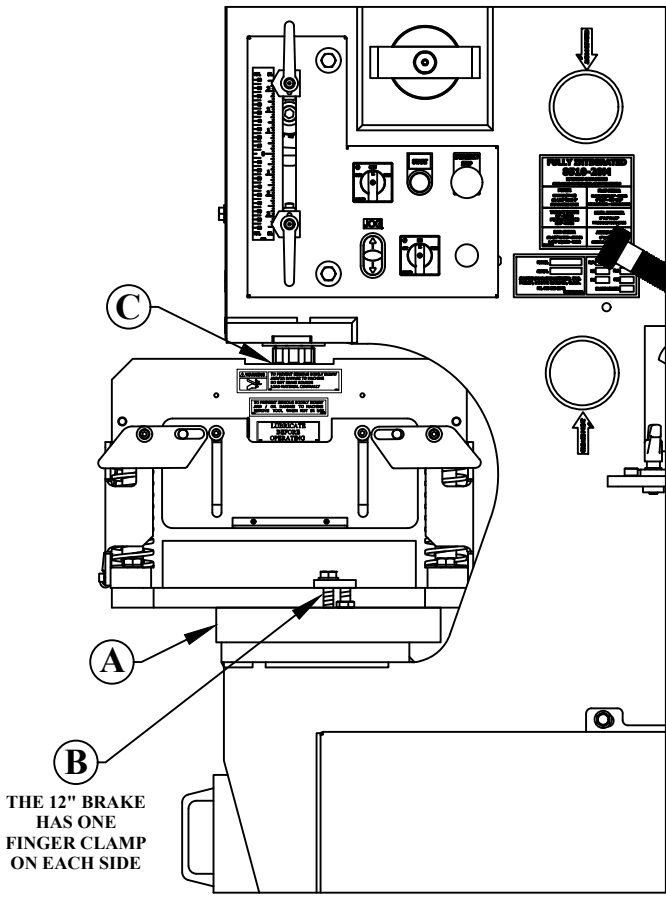


FIGURE 22

7.3B 12 & 24 INCH BRAKE OPERATION

➲ **NEVER PUT YOUR HANDS INTO OR AROUND A BRAKE WHILE IT IS IN OPERATION.**

Hold short pieces with tongs or a similar device.

In using the brake, it is necessary to load the brake centrally. (Visual centering is sufficient.)

If the work is performed off-center, the guide pins could be damaged.

The brake lift is provided by the springs.

If sticking occurs at the bottom of the stroke and the upper die does not return, usually a slight tap on the upper die is sufficient to free the guides.

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

➲ **DO NOT ATTEMPT TO FREE THE BRAKE BY HAND.**

Sticking can be caused by lack of lubrication, complexity of the part being bent or bent guide pins.

Keep the guides well lubricated and replace them if they are damaged.

It is common practice to have the bottom die opening 8 times the thickness of the material being bent.

For tonnage requirements, SEE FIGURE 23 ON THE FOLLOWING PAGE.

If parts require bends of less than 90 degrees, adjust the stroke until the desired bend is obtained.

A great variety of standard brake dies can be used with this unit.

Dies are available from Scotchman Industries or your local dealer.

All brakes are shipped with 2 inch (50mm) vee opening dies, unless otherwise specified.

The brakes on this machine have 85 tons of force available.

⌦ **CAUTION: TO PREVENT POSSIBLE INJURY TO PERSONNEL AND DAMAGE TO THE TOOL, THIS TOOL MUST BE REMOVED WHEN IT IS NOT IN USE.**

B R A K E T O N N A G E C H A R T

PRESSURE IN TONS PER LINEAR FOOT REQUIRED TO MAKE 90 DEGREE AIR BEND IN MILD STEEL

THICKNESS OF METAL		WIDTH OF V-DIE OPENING																				
GAUGE	INCHES	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5	6	7	8	10	12
20	.036	2.9	**2.2**	1.7	1.2	1.0																	
18	.048		4.0	**2.9**	1.6	1.3																	
16	.060			5.6	**3.6**	2.7	2.2	1.7															
14	.075				6.0	**4.5**	3.4	3.0	2.5	2.1													
13	.090					6.8	**5.4**	4.3	3.7	3.3	2.9												
12	.105					10.1	7.4	**6.3**	5.4	4.4	4.0	3.2											
11	.120						10.5	8.8	**7.2**	6.2	5.4	4.3	3.2										
10	.135							11.3	9.6	**8.4**	5.6	4.1											
9	.150								13.1	11.9	**9.0**	6.7	5.2	3.5									
7	.188									16.4	14.0	**11.2**	7.6	5.8	4.5								
1/4	.250										28.8	22.0	**15.3**	11.5	9.1	7.5	6.2						
5/16	.313											38.0	26.0	**19.2**	16.0	12.5	10.6	7.6					
3/8	.375												41.0	29.9	**24.0**	19.4	16.0	12.3	9.3				
7/16	.438													45.2	35.0	**28.0**	24.0	17.0	14.6	11.1			
1/2	.500														47.9	39.0	**33.1**	24.0	19.0	15.6	12.7		
5/8	.625															69.5	58.0	**42.2**	32.4	26.0	23.0	16.5	
3/4	.750																92.0	69.0	**52.2**	42.2	36.0	27.0	21.0
7/8	.875																	104	80.0	**63.0**	52.5	39.4	31.2
1.0	1.00																		112	90.0	**76.0**	56.2	44.0

PRESSURES HIGHLIGHTED IN **BOLD** ARE FOR DIES WITH FEMALE DIE OPENINGS APPROX. 8 TIMES METAL THICKNESS, WITH RADIUS ON MALE DIE EQUAL TO METAL THICKNESS, AND ARE CONSIDERED IDEAL FOR RIGHT ANGLE BENDING.

BENDING PRESSURES REQUIRED FOR OTHER METALS AS COMPARED TO 65,000 P.S.I. TENSILE MILD STEEL ON CHART:

SOFT BRASS - - - - - - - - - - - - 50% OF PRESSURE LISTED
SOFT ALUMINUM - - - - - - - - - 50% OF PRESSURE LISTED
ALUMINUM ALLOYS (HEAT TREATED) - SAME AS STEEL
STAINLESS STEEL - - - - - - - - - 50% MORE THAN STEEL
CHROME MOLYBDENUM - - - - 100% MORE THAN STEEL

FIGURE 23

7.4 ANGLE IRON BRAKE

This brake is designed to form box frames out of angle iron. It has a maximum capacity of 1/4" (6mm).

7.4A ANGLE IRON BRAKE INSTALLATION

SEE FIGURE 24 ON THE FOLLOWING PAGE.

This brake mounts in the punch station and the selector switch must be in the PUNCH position to operate this tool. The die holder, punch retaining nut and the stripper must be removed to install this tool. Mount the tool so that it lines up directly under the punch ram (A) and anchor it to the punch bed with the clamp (B) provided.

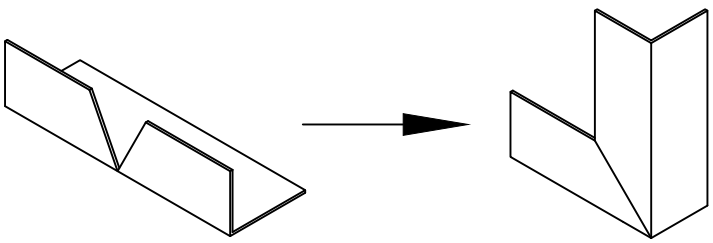
7.4B ANGLE IRON BRAKE OPERATION

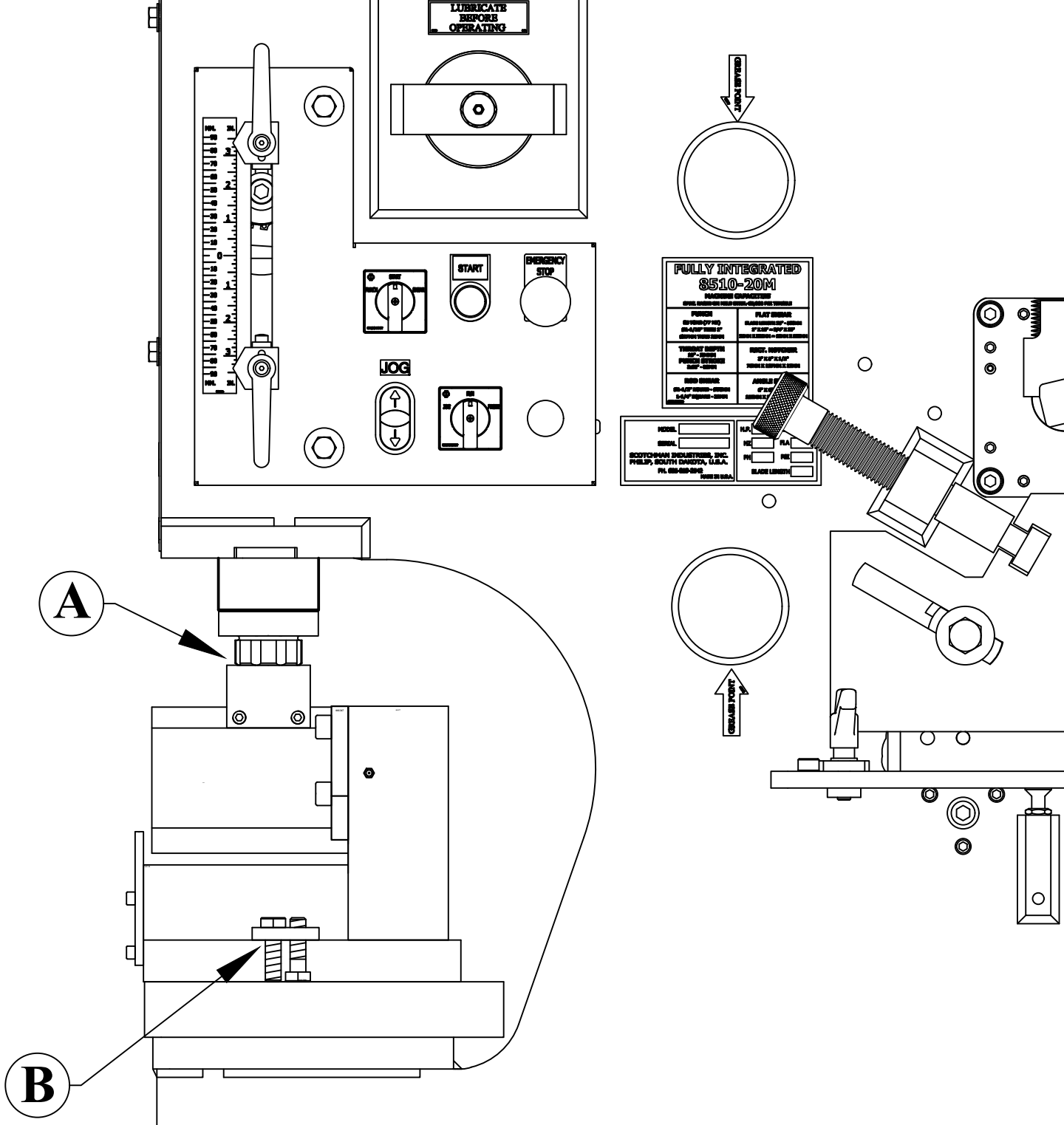
The down-stroke of the machine must be set, to prevent damage to the tool. Grease the brake guides every two hours of operation.

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

➲ **ALWAYS REMOVE THIS TOOL WHEN IT IS NOT IN USE.**

Tool is designed to bend notched angle iron to a 90° angle as shown below.




LUBRICATE BEFORE OPERATING
START
EMERGENCY STOP
JOG
FULLY INTEGRATED
S510-20M
GREASE POINT
A
B

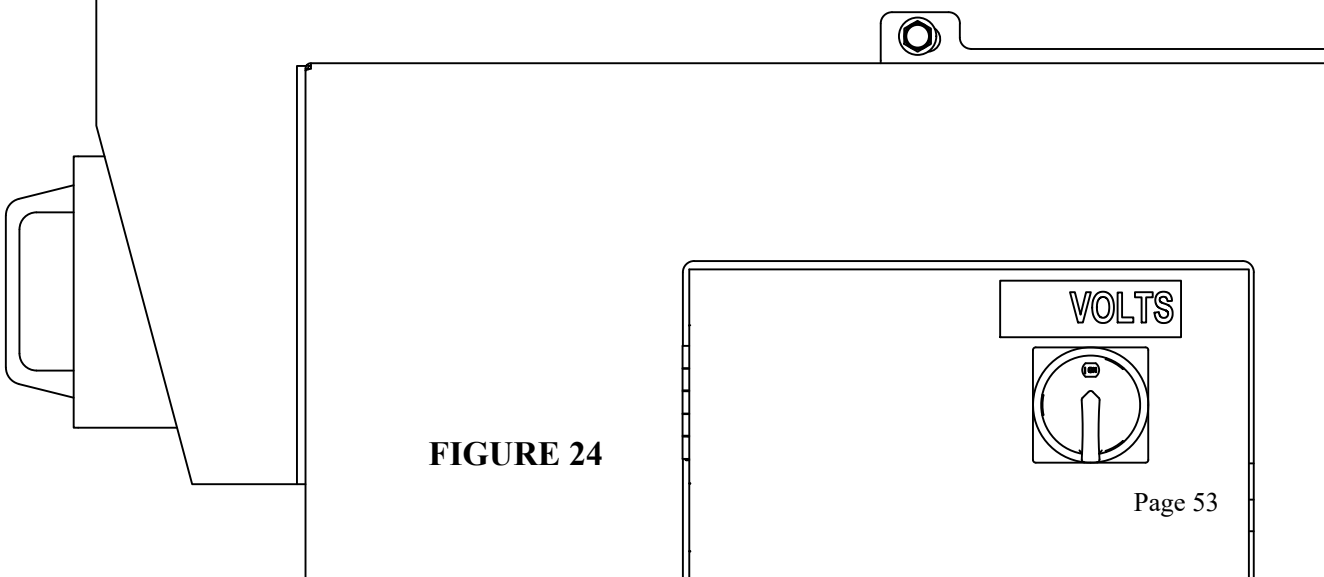

VOLTS

FIGURE 24

7.5 CHANNEL SHEAR

The channel shear is a component tool designed to shear 2 to 6 inch (51 to 152mm) standard channel. It is mounted in the punch station and is operated with the selector switch in the PUNCH position.

7.5A CHANNEL SHEAR INSTALLATION

For clarity, the tool is shown with the guard removed. DO NOT operate the tool with the guard removed.

► **NOTE: THE BOLSTER MUST BE REMOVED FIRST, TO ALLOW ROOM FOR THIS TOOL.**

1. **Place the selector switch in the PUNCH position and allow the ram to retract. Turn the power to the machine off.**
2. **Before installing the tool on the machine, remove the top blade (A) and install the spring guide rods (B) and springs. (REFER TO THE INSERT IN FIGURE 25.) Install the spring guide rods with the head down in the tool's side plate. Then, install the springs on the rods.**
3. **Replace the top blade (A).**
4. **There is an extra set of backup set screws for the stationary vertical blades. These longer screws must be used when shearing smaller channel.**
5. **Because of clearances, it is necessary to mount the finger clamps (C) to the punch bed and start the bolts before installing the tool.**
6. **After the finger clamps are in place, slide the tool onto the punch bed under the finger clamps.**
7. **Align the tool so that the punch ram will come down directly over, and be evenly distributed on, the pressure block of the tool. If the ram pressure is not evenly distributed on the pressure block, the side load may cause damage to the tool.**
8. **After a visual inspection has been made on the lineup, tighten the finger clamp bolts.**
9. **Place the selector switch in the START position and the run/jog switch in the JOG position. Power the machine and place the selector switch in the PUNCH position.**
10. **Jog the punch ram down to within 1/8 of an inch (3mm) of the pressure block on the tool and set the upper stroke control. Set the lower stroke control as low as possible, without bottoming out the ram on any part of the tool.**
11. **Place the run/jog switch in the RUN position.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

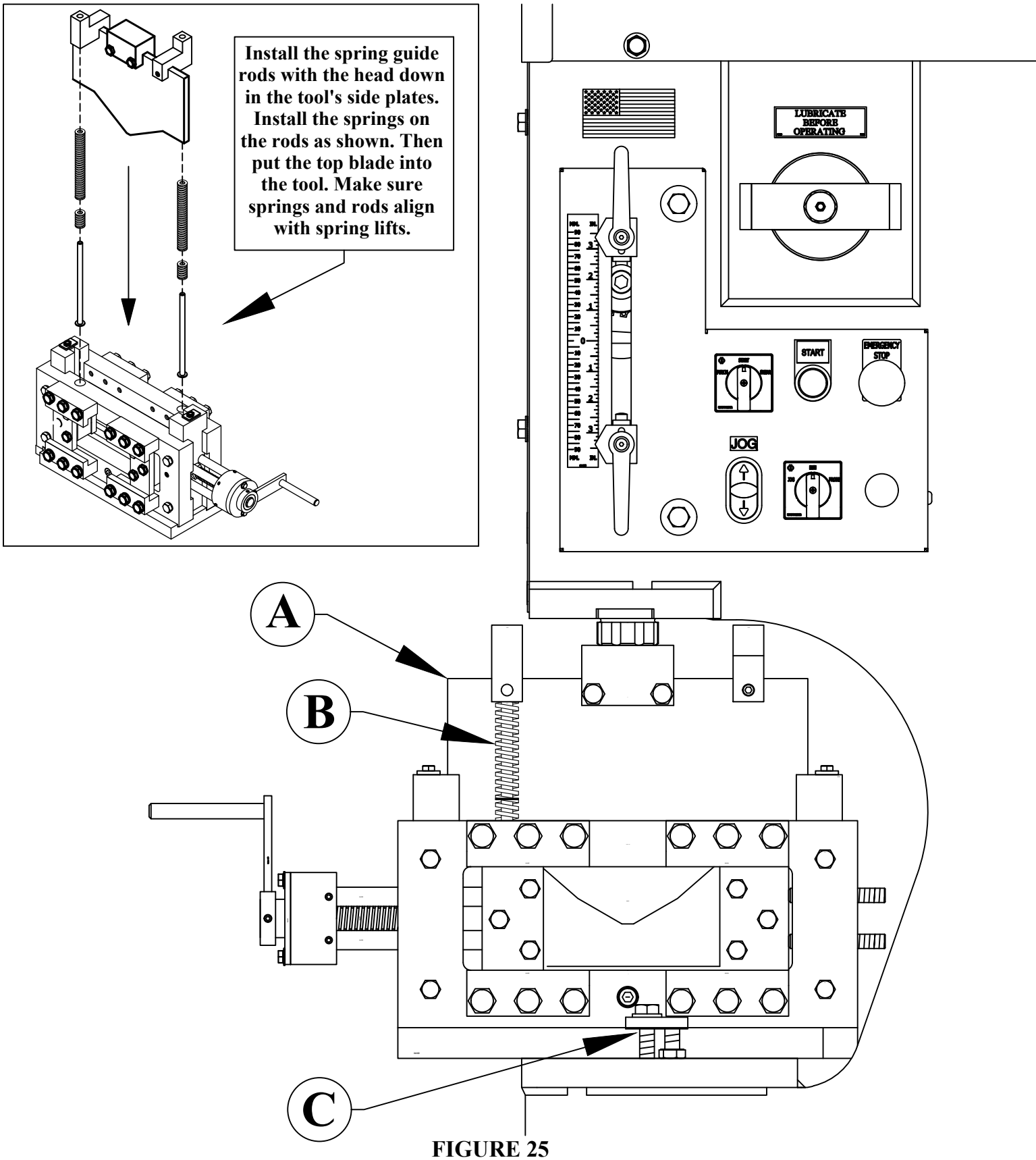


FIGURE 25

7.5B CHANNEL SHEAR OPERATION

The following are basic steps in shearing with the Channel Shear.

A. ADJUST BOTH MOVING AND STATIONARY SIDE BLADES TO THE SIZE OF CHANNEL BEING SHEARED.

Improper adjustment of the vertical blades will result in damage to the Channel Shear. To keep the channel centered in the unit, it is necessary to reset the stationary side blades for each size of channel.

ONE METHOD OF ACCOMPLISHING THIS ADJUSTMENT IS AS FOLLOWS:

1. **Place a piece of channel, the size to be sheared, in the tool.**
2. **Place the selector switch in the START position and the run/jog switch in the JOG position. Power the machine and place the selector switch in the PUNCH position.**
3. **Jog the upper blade down to a point just above the channel and turn the power to the machine off. Locate the channel so that the upper blade contacts both legs, which will center it in the tool.**
4. **Adjust the movable vertical blades up to the flange of the channel. Loosen the fixed vertical blade clamps (four places) and slide the fixed blades up to the channel flange.**
5. **Tighten the blade clamps and adjust the back-up socket set screws up against the fixed vertical blades.**
6. **Check to see that the blades have good alignment, front and back, and have maintained their perpendicular position to the lower blades.**

B. POSITION THE ADJUSTING HANDLE.

The adjusting handle can be relocated to permit easy opening and closing of the movable vertical blades. (Approximately 1/2 turn will lock and unlock the workpiece.)

C. SET THE BOTTOM OF THE STROKE AS LOW AS POSSIBLE.

The bottom of the stroke should be set as low as possible, without bottoming any part of the upper blade, blade holder or pressure block.

D. PROCEDURE FOR SHEARING:

Lubricate the blades with oil before making the first cut and every 10 to 15 cuts, thereafter.
This lubrication is critical on the channel shear.

Position the workpiece.

"Snug" the movable blades up to the channels flange and make the shear stroke.

Before releasing the foot pedal, back the movable blades off by 1/2 turn of the crank.

Make sure that the slug drops from the chute after each stroke.

All of the bottom and vertical blades are symmetrical and can be turned to present four (4) cutting edges.

Clearance between the upper and lower blades is changed by the addition or removal of shims.

The recommended blade clearance is twenty thousandths (.020) (.5mm).

For efficient shearing, blades must be kept sharp.

E. A FEW SPECIAL PRECAUTIONS:

1. **The stationary blade adjustment on the tool must be made so that the point of the upper blade makes contact with the channel directly in the center of the web.**

2. **The crank adjustment must be used to clamp up the material prior to the cut and loosened after the cut.**

3. **Any systems used to feed the material must hold the material at a true horizontal plane.**

4. **Do not place any part of your body in or near the blade and return spring area.**

5. **Lubricate the blades every 10 to 15 cuts, for maximum blade life.**

⌦ **<u>CAUTION</u>: TO PREVENT POSSIBLE INJURY TO PERSONNEL AND DAMAGE TO THE TOOL, THIS TOOL MUST BE REMOVED WHEN IT IS NOT IN USE.**

7.6 PICKET FENCE TOOL

The picket fence tool is designed to put picket fence points on square tubing from 1/2 to 1 inch (12 to 25 mm). This tool is mounted in the punch station and operated with the selector switch in the PUNCH position.

7.6A PICKET FENCE TOOL INSTALLATION

SEE FIGURE 26 ON THE FOLLOWING PAGE.

1. **Remove the die holder, stripper and the punch retaining nut.**
2. **Install the punch pusher (E) with the #45 punch retaining nut (D).**
3. **Install the tool on the bolster so that the punch pusher aligns with the ram on the tool.**
4. **Anchor the tool to the punch bed with the finger clamps (C) provided.**

7.6B PICKET FENCE TOOL OPERATION

CAUTION: THE DOWNSTROKE OF THE MACHINE MUST BE SET BEFORE OPERATING THIS TOOL. FAILURE TO SET THE DOWNSTROKE OF THE MACHINE WILL RESULT IN DAMAGE TO THE TOOL AND POSSIBLE INJURY TO PERSONNEL.

1. **Set the down stroke of the machine so that the upper die clears the lower die by twice the wall thickness of the tube, plus 1/32 of an inch (.8mm).**
2. **Rotate the tube guide on the front of the tool to the proper size. If you are cutting 1 inch tube, remove the tube guide.**
3. **Adjust the tube stop (A) just low enough to contact the upper edge of the tube.**
4. **Adjust the rest stop (B) so that it is approximately half of the tube size below the lower die.**
5. **Feed the tube into the tool until it contacts the stop (A). Depress the foot pedal.**
6. **Make sure that the slugs eject from the tool as the next piece is fed into the tool.**
7. **Lubricate the dies every 10 to 15 cuts and grease the ram daily.**

⌦ **CAUTION: TO PREVENT POSSIBLE INJURY TO PERSONNEL AND DAMAGE TO THE TOOL, THIS TOOL MUST BE REMOVED WHEN IT IS NOT IN USE.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

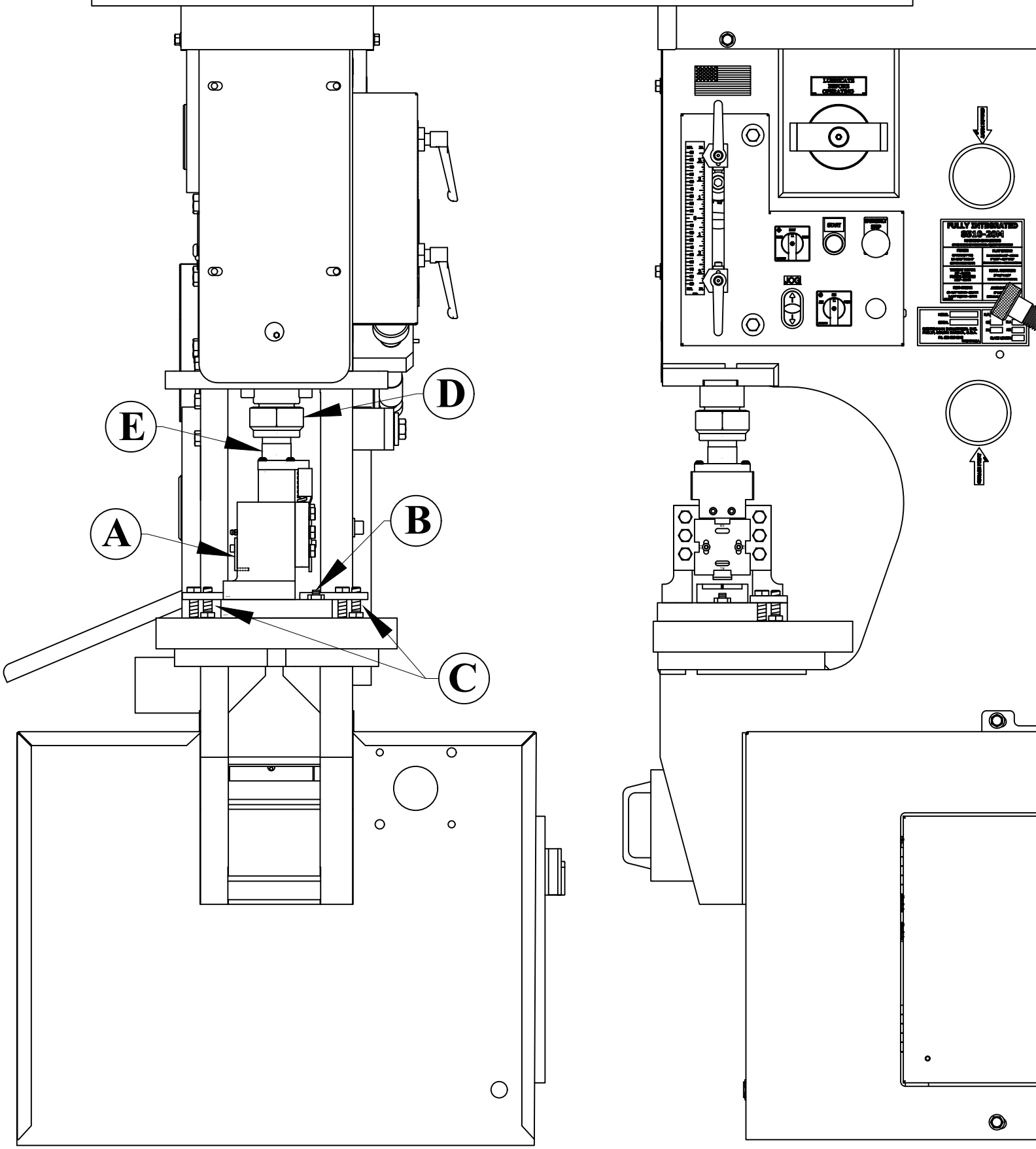


FIGURE 26

7.7 SQUARE TUBE SHEAR

The square tube shear is designed to shear square tubing from 1/4" to 2" (6mm to 51mm).
16 gauge (.060 or 1.5mm) is the maximum material thickness.

7.7A SQUARE TUBE SHEAR INSTALLATION

SEE FIGURE 27 ON THE FOLLOWING PAGE.

Make sure blade cap is bolted to upper blade and springs installed as shown in upper left of Figure 27.

Tool mounts in the punch station. The punch bolster must be removed as tool mounts on punch bed (A).

Place machine in PUNCH mode and adjust the stroke so the punch ram goes to its highest position.

1. **Mount the tool over the slug release slot in the punch bed (A) and squarely under punch ram (C).**
2. **Anchor the tool with the finger clamps (B) provided - One finger clamp on each side.**

7.7B SQUARE TUBE SHEAR OPERATION

1. **The selector switch must be in the PUNCH position to operate this tool.**
2. **Set the up-stroke of the machine so that the size of tube you want to shear will feed through the tool. Make sure that the up-stroke is set so that there is spring tension on the pressure block at all times.**
3. **Set the down stroke of the machine so that the upper blade passes the lower blade by approximately 1/8 of an inch (3mm).**

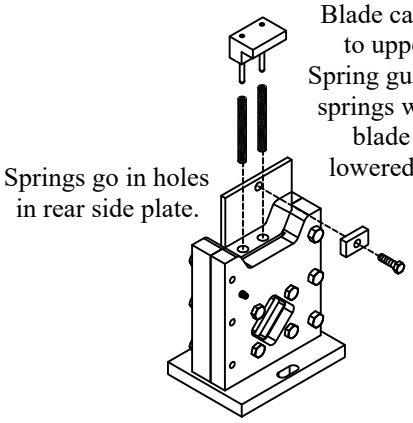
⌦ **CAUTION: DO NOT OVER STROKE OR "BOTTOM OUT' SQUARE TUBE SHEAR AS IT COULD CAUSE DAMAGE TO THE TOOL.**

4. **Feed the tubing through the shear to the desired length and depress the foot pedal.**
5. **Lubricate the blades every ten to fifteen cuts as this will increase blade life.**

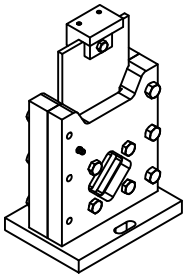
NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

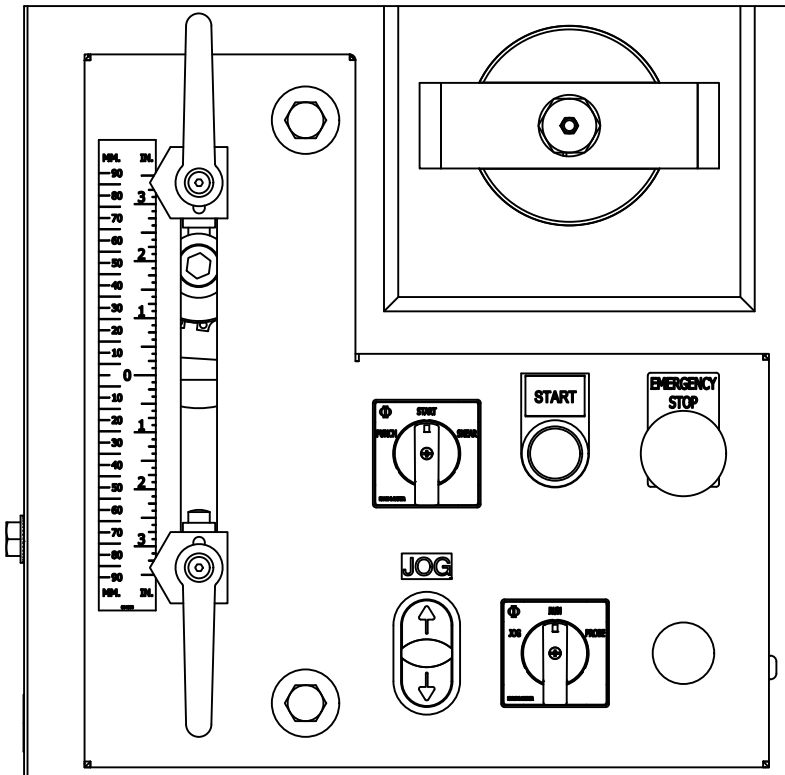
⌦ **CAUTION: ALWAYS REMOVE THIS TOOL WHEN IT IS NOT IN USE.**

TUBE SHEAR



ASSEMBLED VIEW





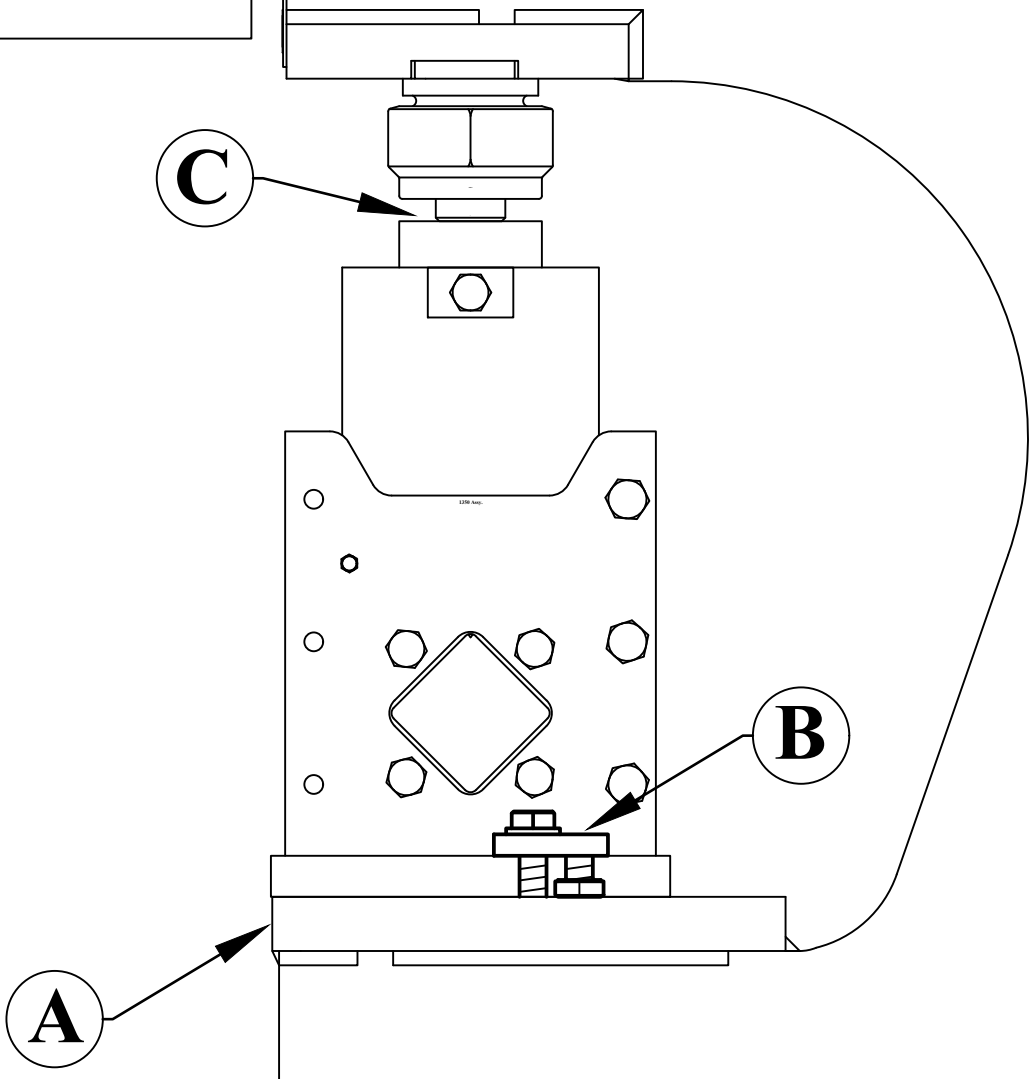


FIGURE 27

7.8 OPTIONAL DIE HOLDERS AND PUNCH RETAINING NUTS

SEE FIGURE 28 ON THE FOLLOWING PAGE FOR 7.8A thru 7.8E

7.8A OFFSET DIE HOLDER OR FLANGE PUNCHING

The offset die holder is used for punching holes in the flange of structural shapes such as channel, I-beam and H-beam. The offset die holder is installed in place of the standard die holder. The offset die holder requires four bolts to anchor it to the bolster. Use the two bolts provided with the die holder. Use the same method of installing and aligning punches and dies as outlined in SECTION 6.1, with a few exceptions. The down stroke of the machine must be set. Use the instruction sheet that came with the die holder.

CAUTION: FAILURE TO SET THE STROKE WILL ALLOW THE PUNCH RETAINING NUT TO STRIKE THE DIE HOLDER, CAUSING DAMAGE TO THE MACHINE AND POSSIBLE INJURY TO THE OPERATOR. BECAUSE OF ITS DESIGN, THE OFFSET DIE HOLDER HAS A MAXIMUM CAPACITY OF 40 TONS. EXCEEDING 40 TONS WILL DAMAGE THE TOOL AND MAY CAUSE INJURY TO THE OPERATOR. FOR PUNCH TONNAGE REQUIREMENTS, REFER TO FIGURE 10 ON PAGE 29.

➲ **CAUTION: THE OFFSET DIE HOLDER MUST BE REMOVED WHEN IT IS NOT IN USE.**

7.8B 2-1/2 INCH AND 3 INCH DIE INSERTS

Always follow the preferred method of aligning punches and dies. SEE SECTION 6.1.

The 2-1/2 inch and 3 inch die inserts are used in place of the standard die inserts.

These die inserts are for oversized punching.

For sizes and applications, see the Punches & Dies Section of the #40 TOOLING PARTS MANUAL.

7.8C 6 X 6 DIE HOLDER

Always follow the preferred method of aligning punches and dies. SEE SECTION 6.1.

The 6 x 6 die holder is used in place of the standard die holder.

This 6 x 6 die holder is provided with a riser plate that must be used with this model and mounted with the bolts provided. Capacities for oversize punching with this tool go up to 4 inches (100mm).

For sizes and application, see the Punches & Dies Section of the #40 TOOLING PARTS MANUAL.

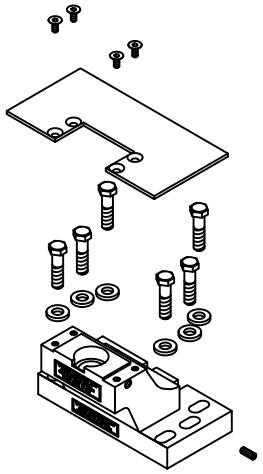
7.8D #45 PUNCH RETAINING NUT

The #45 punch retaining nut is of the same design as the #40 and is used in oversize punching applications. FOR REQUIREMENTS, see the Punches & Dies Section of the #40 TOOLING PARTS MANUAL.

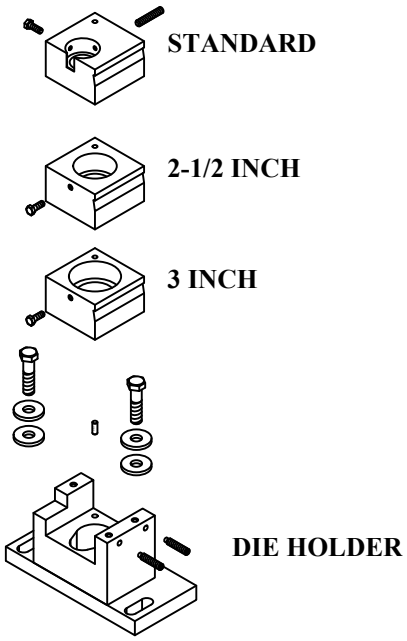
7.8E HEAVY DUTY SPLIT-RING RETAINING NUT

The heavy duty split-ring retaining nut is used in oversize punching applications that require a punch with a 2 inch (50mm) shank diameter (E). Follow the instructions in SECTION 6.1 for proper punch and die alignment. This retaining nut requires the heavy duty nut wrench (F) which should be ordered when ordering the nut. To use the heavy duty split-ring retaining nut, remove the six socket head cap screws (D). Slide the retaining ring (C) over the punch shank. Place the split-rings (B) into the groove in the punch. Place the ring nut (A) on the punch and replace the six socket head cap screws (D).

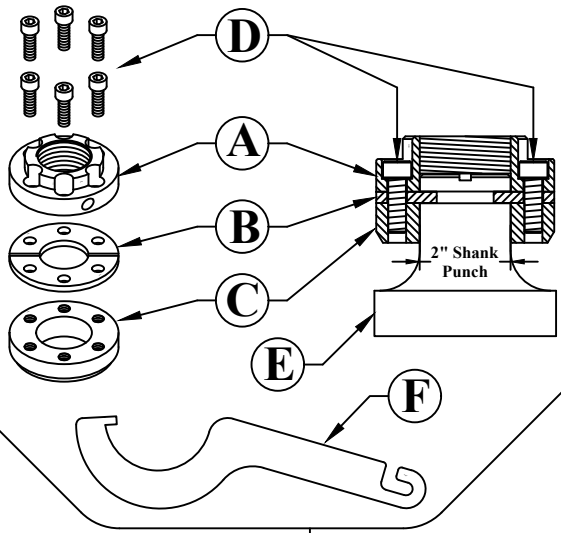
7.8A OFFSET DIE HOLDER OR FLANGE PUNCHING



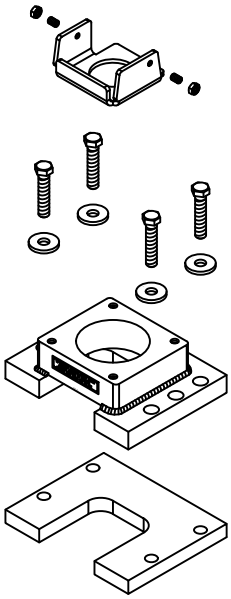
7.8B 2-1/2 AND 3 INCH (63 AND 76 MM) DIE INSERTS



7.8E HEAVY DUTY SPLIT-RING RETAINING NUT



7.8C 6 X 6 DIE HOLDER



7.8D #45 PUNCH RETAINING NUT

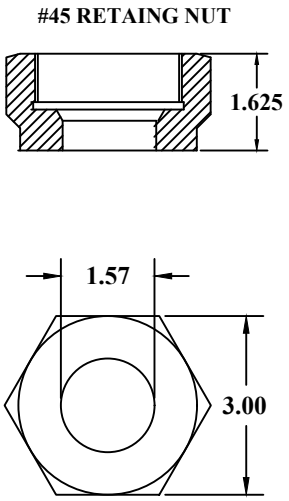


FIGURE 28

7.9 48 INCH BACK GAUGE

The Back Gauge is an option that mounts to the drop-off (back) side of the machine.

You can make consistent & repeatable cuts using our Back Gauge tool and save time doing so as well.

It is available in either a manual version (P/N 025603) or an electric version (P/N 026615).

The Back Gauge is adjustable so it can be used with the various stations on the machine.

It is also adjustable for length. A ruler is affixed to help adjust the length quickly and accurately.

The machine comes from the factory with (4) drilled and tapped holes for mounting the Back Gauge.

7.9A MANUAL BACK GAUGE P/N 025603

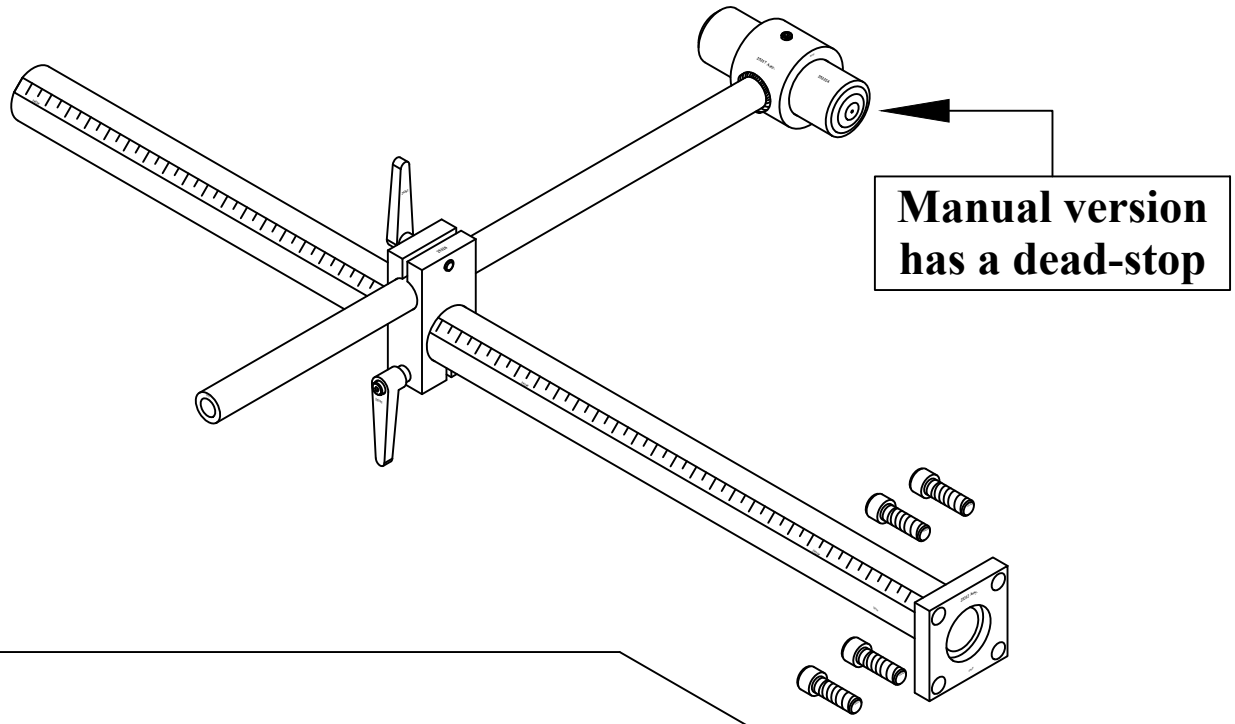
Once the manual Back Gauge is mounted to the machine and adjusted correctly, the operator moves the material thru the machine until in contacts the stop on the Back Gauge. Then the foot pedal is used to activate the machine.

7.9B ELECTRIC BACK GAUGE P/N 026615

The FI-85 is pre-wired from the factory to accept the electric version of the Back Gauge.
Once mounted to the machine and adjusted correctly, the operator moves the material thru the machine and when it contacts the switch in the Electric Back Gauge, the machine will activate and cut the material.
If you already have an FI-85, the machines serial number is needed to make sure you get the correct Electric Back Gauge. Machines built before 1/12/22 use P/N 026600. Call the factory for assistance.

We also have a conveyor available (P/N 026997) for this machine to help increase production.
Please call the factory for more information at 1-800-843-8844 or go to www.scotchman.com.

025603 - Deluxe Back Gauge 48"



026615 - 48" XL/FI85 Electric Back Gauge

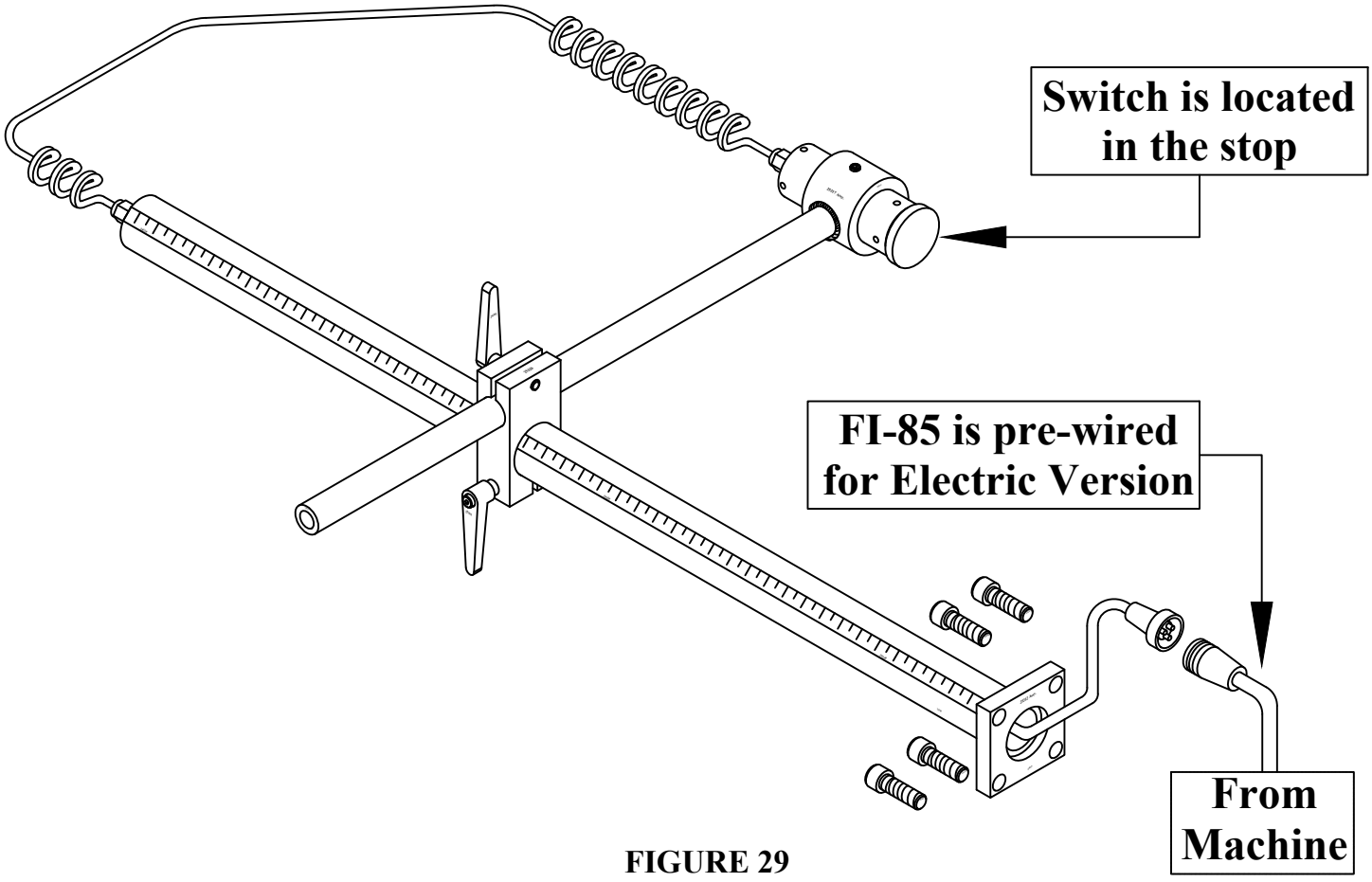


FIGURE 29

7.10 MULTI-SHEAR TOOL

The Multi-Shear tool is designed to shear standard Unistrut profiles, as well as many other specialty profiles.

7.10A MULTI-SHEAR TOOL INSTALLATION

SEE FIGURE 30 ON THE FOLLOWING PAGE.

1. **Remove the punch, die, and die holder and install the short pusher as shown in upper left.**
2. **Turn the machine on and put it in the PUNCH position. Run the punch ram up to its highest setting.**
3. **Place the tool in the punch station under the punch ram as shown in Fig. 30.**
4. **Use two bolts and thick washers (A & B) to mount the tool to the punch bolster. The base has a two mounting holes: (A) has a slot in the base of the tool and (B) is a centered mounting hole on the other end of the base. For clarity, the base is shown with the mounting locations left-center Fig. 30.**
5. **Make sure the pusher is aligned with the pusher riser top of the moving blade and not contacting the pusher riser bolts before tightening mounting bolts. The pusher may me slightly off to one side or the other - This is fine.**
6. **The strut guide (C) may be like the one shown, or it may be adjustable. It depends on what the profile being sheared is like.**

► **NOTE: A TECHNICAL DRAWING OR SAMPLES OF THE SHAPE YOU WANT TO SHEAR IS REQUIRED TO PURCHASE THIS TOOL.**

7. **Make sure that the upstroke is set so that there is spring tension on the pressure block at all times.**
8. **Set the down stroke of the machine so that the moving blade travels only far enough to shear the material and no further.**

7.10B MULTI-SHEAR TOOL OPERATION

1. **The selector switch must be in the PUNCH position to operate this tool.**
2. **Set the down stroke of the machine so that the moving blade travels only far enough to shear the material and no further. "Bottoming out" this tool may ruin it!!**
3. **Feed the material through the shear to the desired length and depress the foot pedal. The Material Length Stop (D) screws into the back of the tool, if needed.**
4. **The tool has two (2) grease zerks; one on each side. Grease before using and every two hours after.**
5. **Lubricate the blades every ten to fifteen cuts.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

⌦ **CAUTION: ALWAYS REMOVE THIS TOOL WHEN IT IS NOT IN USE.**

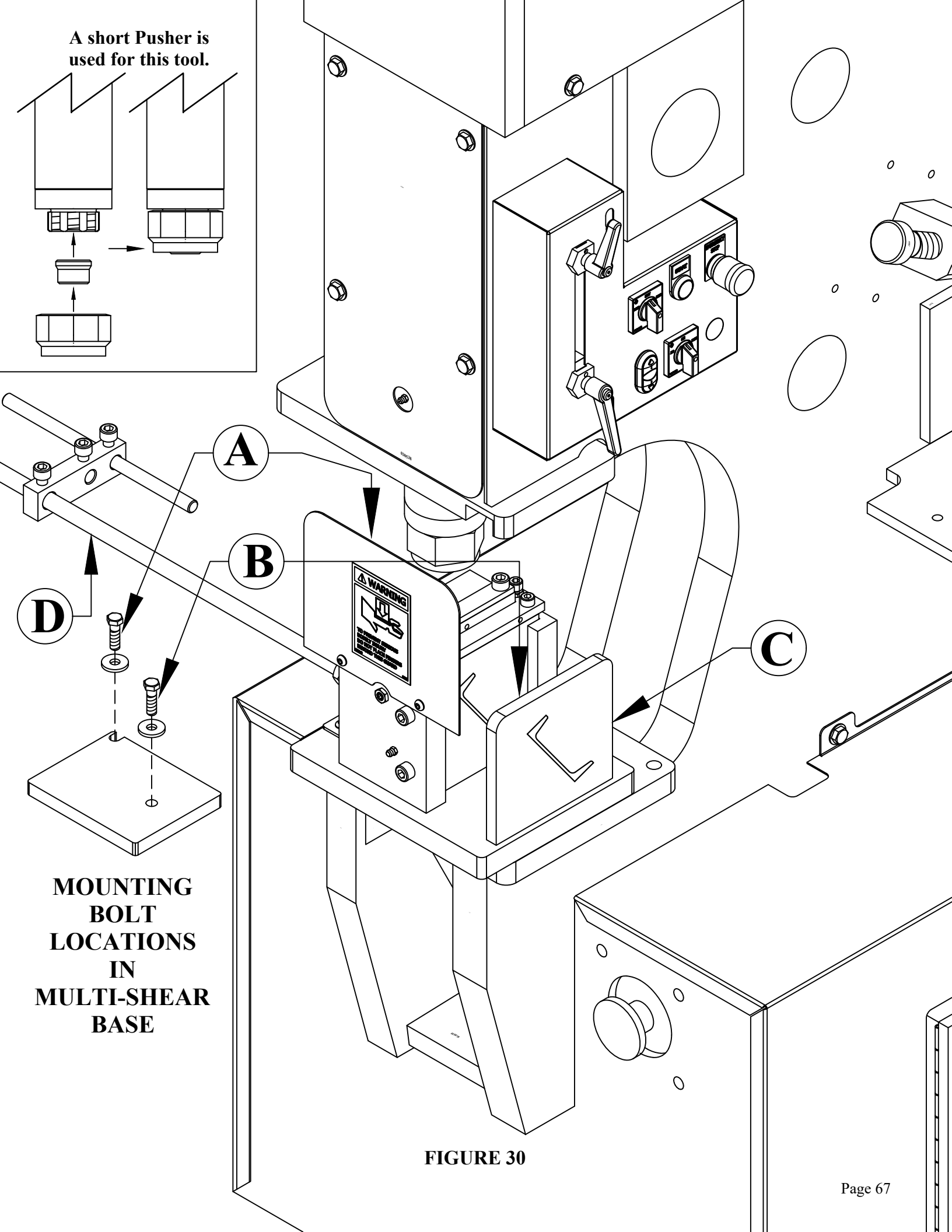

A short Pusher is used for this tool.
A
B
C
D
WARNING
MOUNTING BOLT LOCATIONS IN MULTI-SHEAR BASE

FIGURE 30

7.11 WELD COUPON BENDER TOOL

The Weld Coupon Bender Tool is designed to bend welded test coupons into "U" and "V" shapes for the purpose of testing soundness and ductility of welds. The maximum size of a test clip is 7" long x 2" wide x 3/8" (178 x 51 x 10mm) thick. Rollers are 4" apart (102mm).

7.11A WELD COUPON BENDER TOOL INSTALLATION

SEE FIGURE 31 ON THE FOLLOWING PAGE.

The Weld Coupon Bender Tool mounts in the punch station and is held in place with a finger clamp (A) as shown.

1. **Remove the jam nut, punch, die, and die holder. Turn the machine on and put the switch in the PUNCH position and run the punch ram up to its highest setting. Turn off machine.**
2. **Set tool on punch bolster and make sure that the rocker cap (B) is squarely under the punch ram and that the stationary back of the coupon bender will clear the punch ram as it moves down.**
3. **On the left side of the tool, under the roller, there are two lines machined in the tools back support. The upper line is for when the "V" die (C) is used and the lower line is for when the "U" die (in tool) is used. Stroke is to be set by aligning the bottom of the ram with the appropriate line machined in the back support. Please see the the lower part of FIGURE 31 under "Setting the Stroke".**

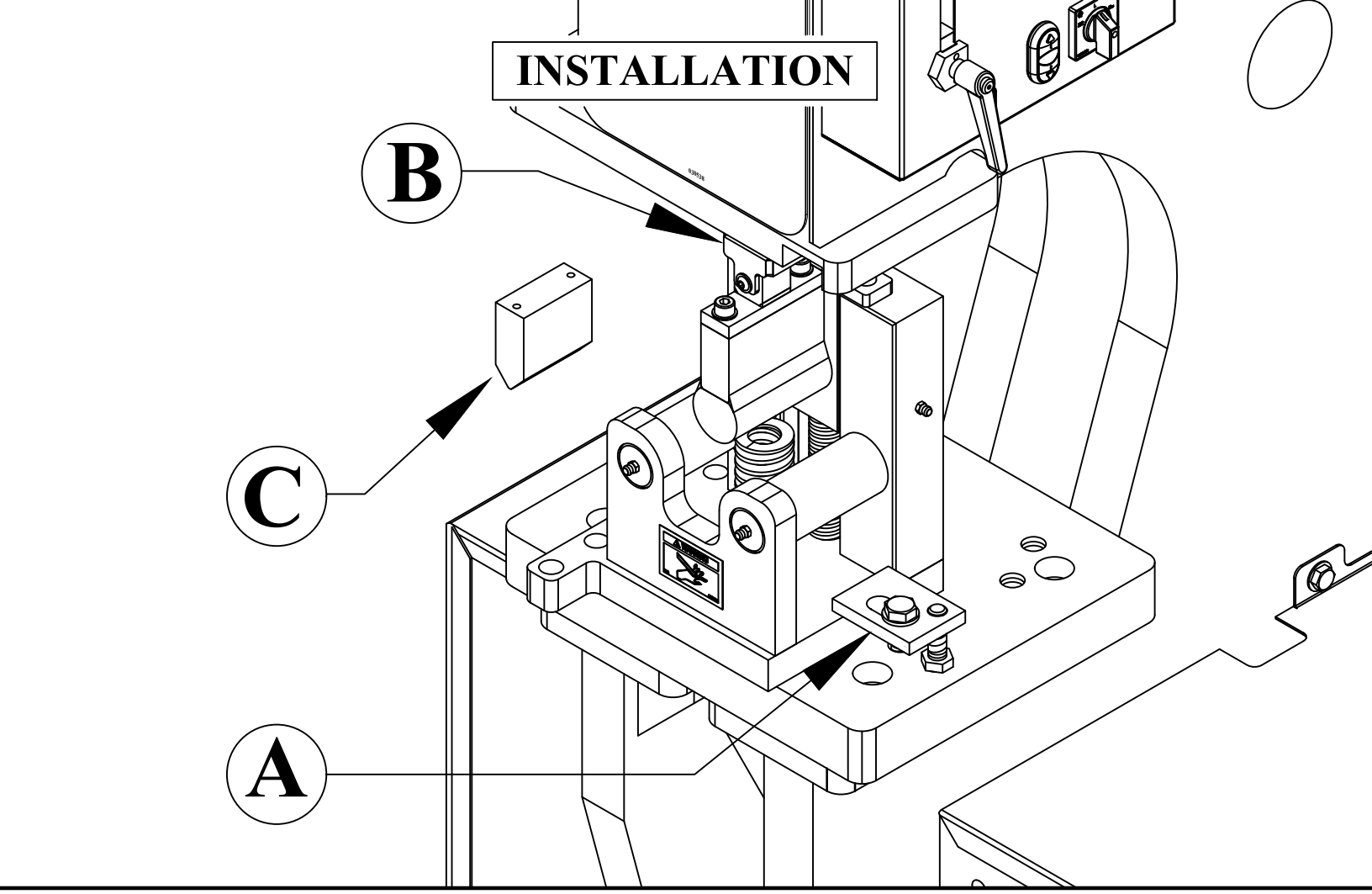
► **NOTE: THE DOWN STROKE MUST BE SET PROPERLY WITH THIS TOOL.**

7.11B WELD COUPON BENDER TOOL OPERATION

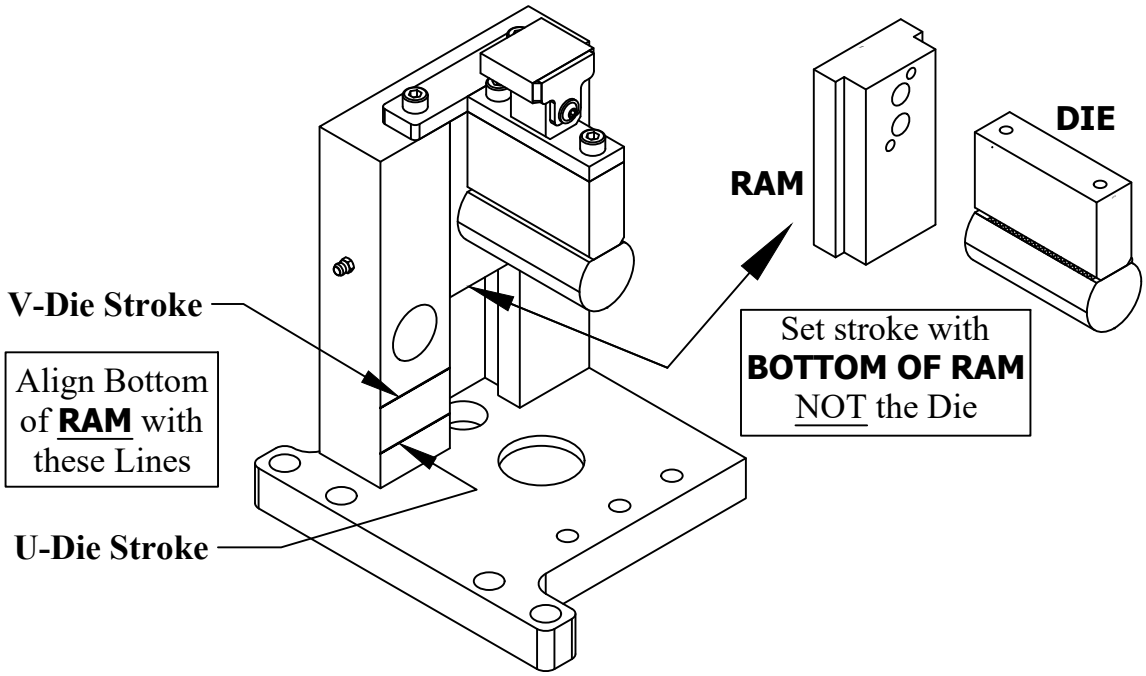
1. **Grease the rocker cap (B) between the upper arm and the tool and again after every two hours of use. Grease the ram, using the two grease zerks on the side.**
2. **Lightly grease the rollers, using the two grease zerks on the front of the weld tester. Make sure that the rollers still turn easily; too much grease can cause the tool to not work properly.**
3. **Lightly lubricate the underside of the die and the outside of the two rollers with a spray lube such as WD-40 and again, every 10-15 bends, thereafter.**
4. **Insert the weld test coupon by sliding it on to the rollers. Using the back of the weld tester, square up the test piece and then, move it forward enough to center it under the die. Make sure that the weld test coupon is square and centered under the die.**
5. **Make sure that the down stroke of the tool is set so that the bottom of the ram - NOT the die - is aligned with the correct scribe line.**
6. **After bending the weld test coupon, let the tool return to the resting position. Remove the test coupon and inspect the weld. The tool can be seen in use at www.scotchman.com.**

NOTE: If tool ever jams or gets stuck - REMOVE THE TOOL FROM THE MACHINE BEFORE ATTEMPTING TO FREE IT.

⌦ **CAUTION: ALWAYS REMOVE THIS TOOL WHEN IT IS NOT IN USE.**



SETTING THE STROKE



CAUTION: DO NOT STROKE TOOL PAST THE U-DIE STROKE LINE

FIGURE 31

7.12 URETHANE STRIPPER

Scotchman does not recommend this unit for all general punching applications. However, using this specially designed "Non Deform" stripper unit does offer a significant advantage over a standard stripper arrangement in reducing distortion when punching a confined patter or series of holes in flat bars or plates.

► **NOTE: THIS STRIPPER ONLY WORKS WITH #40 TOOLING. THE MAXIMUM HOLE SIZE THAT CAN BE PUNCHED ARE 1-1/4 (31mm) ROUND AND OVAL AND 3/4 (19mm) SQUARE.**

The action of this unit will minimize distortion in the work piece and in many cases eliminate costly correction and straightening processes. Of course, there is a limit to how much material can be removed in a confined area without causing some deformation. Contact your local Scotchman dealer for advice. Combining this unit with a linear feed repetitive stop system for punching a series of holes in flat bar will significantly increase productivity. Because of the action of this type of unit, particular attention must be paid when setting the stroke length. The stripper unit moves in conjunction with the punch and extra care must be taken by the operator. (Refer to the setting and operating instructions in this section.)
The maximum thickness which can be punched using this unit is 3/4" (19mm) in steel with a rated tensile strength of 65,000 psi.

7.12A INSTALLING THE URATHANE STRIPPER, PUNCH & DIE

1. **Raise the top limit switch to its highest position. Power the machine and let the punch ram retract to its full UP position.**
2. **Open the standard stripper and remove it from the machine by removing the left hand mounting bolt.**
3. **If there is a punch and die installed in the machine, remove them. Remove table from die holder (1).**
4. **Loosen the two bolts (2) holding the die holder and replace the die holder.**
5. **Remove the punch ram adapter (3) from the end of the punch ram.**
6. **Disassemble the urethane stripper by removing the two M12 bolts (4) and large washers (5).**
7. **Install the stripper mounting plate (6) and the punch ram adapter to the punch ram with the bolts provided.**

8. **Select the proper punch and die. Make sure that there is proper clearance between the punch and die. <u>For recommended clearances:</u>**
   GO TO SECT. 6.1 "PUNCH OPERATION" - Letter "I"
9. **Clean both the punch and die of any foreign material.**
10. **Insert the proper die in the die insert (7). If the die has a flat spot in it, and the flat spot needs to be on the side instead of the back; remove the die insert by loosening the two set screws (8) from the side of the die holder, and insert the die by aligning the flat spot with the side set screw (9). Then tighten the set screw firmly with a wrench and re-install the die insert. Mount table on the die holder.**
11. **Insert the punch into the punch retaining nut. Make sure that it seats properly. Place the punch retaining nut assembly on the die insert, with the punch inserted in the die.**

► **<u>NOTE</u>: IF YOU ARE USING PUNCHES THAT REQUIRE A KEY, INSERT THE KEY IN THE PUNCH AT THIS POINT.**

12. **Place the selector switch in the ON position and the selector in the start position. Power the machine by pressing the green START button.**
13. **Check to make sure that there are no objects (such as tools) under or on any of the moving parts.**
14. **Place the selector switch in the jog position and carefully inch the punch ram to its set DOWN position.**
15. **Turn machine's power OFF.**
16. **Lift the punch retaining nut and start threading it onto the punch ram adapter.**
17. **Use a wrench to tighten the punch retaining nut. Make sure that there is equal clearance on all sides of the punch in the die.**
18. **Re-tighten the bolts in the die holder.**
19. **Check to be sure of proper alignment. Realign, if necessary.**
20. **Power the machine on and place the selector switch in the JOG position. Carefully inch the punch ram down until there is just enough space to slide the lower assembly (10) underneath the stripper mounting plate and power off the machine.**
    (See "Gap" IN FIGURE 31).

► **<u>NOTE</u>: LINE UP THE POSTS (11) OF THE LOWER ASSEMBLY WITH THE BUSHING HOLES IN THE STRIPER MOUNTING PLATE.**
<u>FAILURE TO DO THIS MAY RESULT IN DAMAGE TO THE BUSHINGS!</u>

21. Using the M12 hex bolts and large washers, insert the bolts through the large bushing holes of the of the stripper mounting plate, and thread the bolts into the posts. Tighten the bolts all the way, making sure the posts are guided into the bushings correctly. The bolts should be tightened until they bottom out on the top of the posts.

7.12B CHANGING THE URETHANE SPRINGS

SEE FIGURE 31A

If the unit is constantly over stroked or over a period of time, it may be necessary to renew the urethane springs. REFER TO FIGURE 31A. The springs should be checked periodically. (A sure sign of over stroking is cracking or splitting of the springs.)

1. **Remove both M12 hex bolts (4) and large washers (5) from the stripper assembly.**
2. **Remove the lower assembly (10) of the stripper by lifting the stripper mounting plate (6) with equal force on each end (to avoid binding).**

► **NOTE: IF THE STRIPPER IS ATTACHED TO THE MACHINE, RAISE THE PUNCH RAM SO THAT THE LOWER ASSEMBLY OF THE STRIPPER CAN BE REMOVED.**

3. **If the posts gets stuck in the bushings (12) of the stripper mounting plate, it may be necessary to remove the set screws (13) so the stripper plate (14) will be able to be removed.**

► **CAUTION: KEEP HANDS CLEAR: WHEN THE SET SCREWS ARE REMOVED, THE STRIPPER PLATE WILL LIKELY FALL DOWN TO THE TABLE & INJURE ANY BODY PARTS THAT ARE UNDERNEATH IT.**

4. **If the posts have become loose in the stripper plate, remove the appropriate set screws, (or if the set screws have already been removed), apply a thread locking solution such as Blue Loctite® and reinsert the set screws, making sure they are inserted into the dimples on the bottom of the posts (SEE "DIMPLE TOWARDS FRONT" IN FIGURE 31).**
5. **While the lower assembly is removed it is recommended to check the conditions of the bushings in the stripper mounting plate for excessive wear, if they need to be replaced, the stripper mounting plate must be removed from the punch ram, then the bushings can be removed using a hammer and a large diameter punch. Use a rubber mallet or a block of wood when installing new bushings so no damage is caused to the bushings.**

6. Using the M12 hex bolts and large washers, insert the bolts through the large bushing holes of the stripper mounting plate, and thread the bolts into the posts. Tighten the bolts all the way, making sure the posts are guided into the bushings correctly. The bolts should be tightened until they bottom out on the top of the posts.

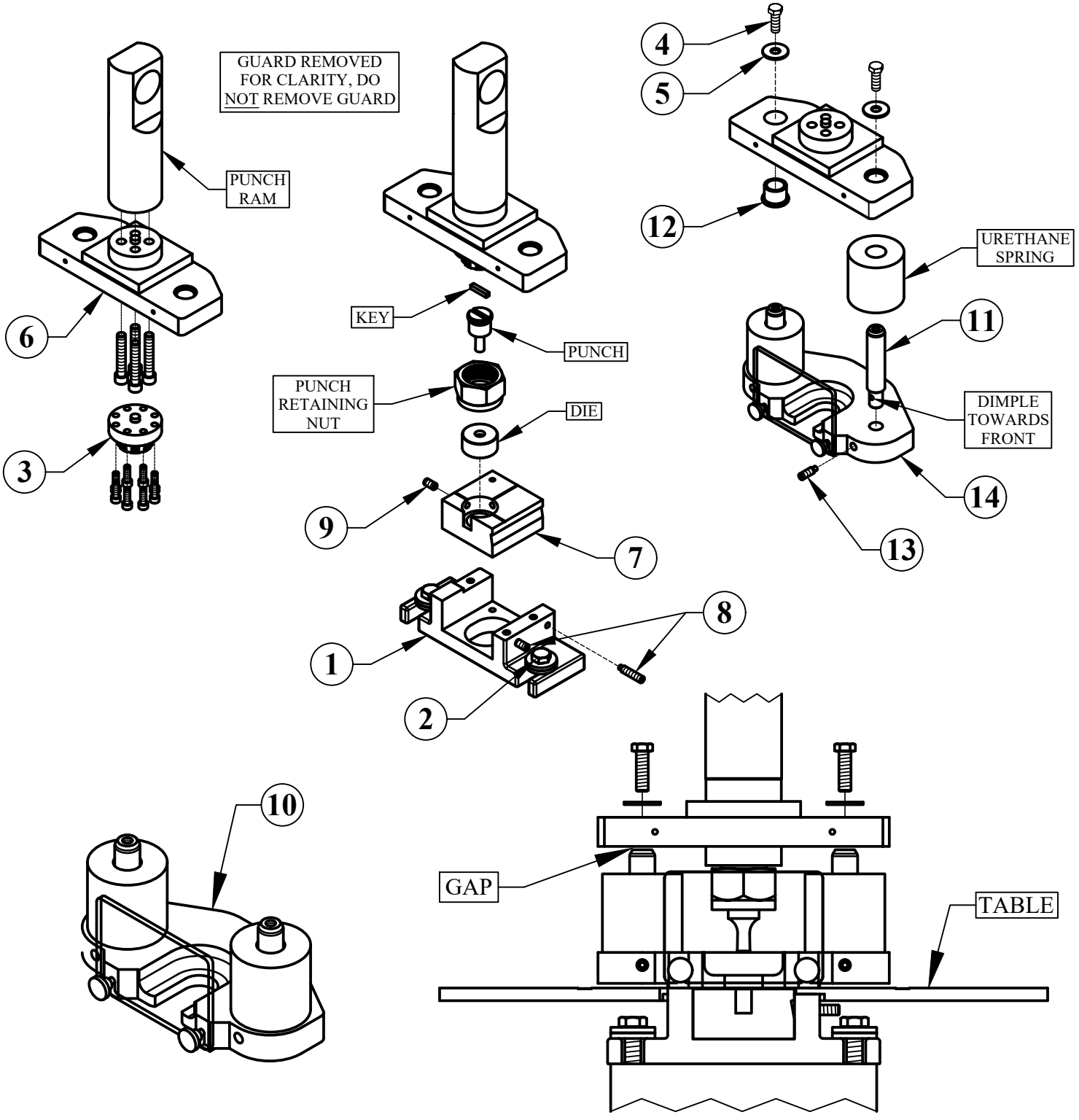


FIGURE 31A

8.0 TROUBLE SHOOTING GUIDE

8.1 ELECTRICAL TROUBLE SHOOTING - MOTOR

⌦ **CAUTION: ALL ELECTRICAL WORK PERFORMED ON THE FI-8510-20M IRONWORKER SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN.**

A. MOTOR WILL NOT RUN:

1. **Check the selector switch. The machine will not start unless the selector switch is in the START position.**
2. **Check the disconnect switch. Make sure that it is in the ON position.**
3. **Check the emergency stop buttons. A defective or stuck emergency stop button will not allow the machine to be powered. To check the emergency stop buttons, place a jumper wire between terminals x1 and 1. Turn the machine on. If the machine runs, turn the power off, remove the jumper and repair or replace the emergency stop buttons.**

   DO NOT OPERATE THIS MACHINE WITH THE EMERGENCY STOP BUTTONS BYPASSED!!

4. **Check to be sure that the plant voltage and phase correspond to the machine voltage and phase.**

5. **Check the line wiring connections at the starter. (For the wiring diagrams, SEE SECTION 4.4 PAGE 14 thru 16.)**
6. **Check the line voltage at the starter. If the correct line voltage is present at the starter, either the starter or the motor is defective. Contact your local dealer or the factory.**

B. THE MOTOR RUNS BUT THE MACHINE WILL NOT CYCLE WHEN DEPRESSING THE FOOT PEDAL:

1. **Check the selector switch. The machine will not move unless the selector switch is in either the PUNCH or the SHEAR position.**
2. **Check the motor rotation. It should be counterclockwise when viewed from the shaft end of the motor.**
3. **Check the stroke control adjustment and make sure that only one limit switch is in contact with the metering boss. If both limit switches are in contact with the metering boss, the machine will not move. Loosen the stroke control handles and move the limit switches. Try the machine again.**
4. **Check the run/jog switch. The foot pedal will not operate the machine when this switch is in the JOG position.**

5. **Check the fuses in the control box. There are two fuses on the primary side and one on the secondary side. Remove the fuses and check them with an Ohm meter.**
6. **Check the limit switches. (For procedures, REFER TO SECTION 8.2 ON THE FOLLOWING PAGE.)**
7. **No power from the transformer: Check the voltage across the transformers secondary terminals. It should read 110 to 120 volts.**
8. **The solenoid on the control valve is not functioning. REFER TO SECTION 8.3.**
9. **The foot pedal switch is not functioning properly. A voltage test may be run on the terminal strip in the control box to determine if the foot switch is working properly.**

WARNING: THERE IS LINE VOLTAGE PRESENT IN THE CONTROL BOX WHEN THE MACHINE IS POWERED. THESE TESTS SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN.

TO TEST THE FOOT SWITCH:

Power the machine and place the selector switch in either the PUNCH or the SHEAR position.
Test the voltage between terminal #s 5, 10 and ground.
With the pedal up, the voltage should read 110 to 120 volts between 5 and ground.
There should be no voltage reading between 10 and ground.
With the pedal depressed, the voltage should read 110 to 120 volts between 10 and ground.
There should be no voltage reading between 5 and ground.

IF THESE READINGS ARE NOT CORRECT, continue on with the following steps.

A. **Turn off the machines power and remove the cover on the foot pedal. Check for loose connections.**

B. **Make sure that the switches are adjusted properly. (You should hear two distinct "clicks" approximately 1/2 inch (12mm) apart when depressing the pedal.) There is a set screw adjustment on the pedal shaft to adjust the switches.**

C. **Check the switches with an Ohm meter.**

10. **Damage to the foot pedal cord: Check the continuity of the wires in the cord with an Ohm meter. Make sure that the power to the machine is off and locked out. The wires must be disconnected from the pedal and the terminal block.**

8.2 LIMIT SWITCH INSPECTION PROCEDURE

To determine if the limit switches are functioning properly, place the run/jog switch in the JOG position and move the limit switches out to their farthest position.

Place the selector switch in the START position and power the machine.

Place the selector switch in the PUNCH position.

While holding the jog control, use a pencil or similar device and depress the limit switch that the metering boss is traveling towards.

If the machine does not stop when the switch is depressed, the limit switch or the control valve is not functioning properly.
If the machine stops when the jog control is released, the problem is in the limit switch.
For instructions if the machine does not stop when the jog control is released, SEE SECTION 8.3.

Check the limit switch plunger to make sure that it is operating freely.
The limit switch can be tested with an Ohm meter.

The limit switch wires must be disconnected from the terminal block.
The switch should read continuity with the plunger out and open with the plunger depressed.

8.3 CONTROL VALVE INSPECTION

THE MACHINE WILL ONLY TRAVEL IN ONE DIRECTION.

THIS COULD BE CAUSED BY:

1. **Contamination in the hydraulic oil which causes the spool to stick in one position: With the machines power off, the spool of the valve can be manually shifted. To shift the spool manually, on each end of the control valve, there is a pin in the center of the knurled nut that holds the coil on. Using a small punch or similar device, push these pins in by hand; first one, then the other. After manually shifting the spool, turn the machine on and try it again. If the machine now operates, the hydraulic oil and filter should be changed.**

2. **A defective coil on the control valve: The coils can be checked using an Ohm meter. The wires to the coils must be disconnected. If the ohm reading shows open, the coil is defective and must be replaced.**

8.4 HYDRAULICS

THE MOST COMMON HYDRAULIC PROBLEMS ARE:

1. **Low level of hydraulic oil in the reservoir: The reservoir holds 13.5 U.S. gallons (51 Liters). The level should be 1" (25mm) below the top of the reservoir.**
2. **Contamination in the hydraulic oil: The oil and the filter should be changed at least once a year and any time there is a possibility that contamination has gained access into the system. Replace hydraulic oil with a lightweight, non-foaming, hydraulic oil such as Mobil DTE-25**
3. **Low pressure caused by worn or damaged parts in the cylinder or pump: There is a pressure port for a pressure gauge provided on all machines. The port will be on the valve manifold or the pressure line between the pump and the valve. A gauge with a minimum capacity of 3,000 PSI (207 BAR) is required.**
4. **In order to check the machines hydraulic pressure, the hydraulic pressure relief valve must be in "bypass mode". This happens when the machine is "stalled out". Below explains how to do this:**

   With the machine's power off, install the pressure gauge. Power the machine and put it in the Shear mode. Place a piece of thick steel in the bar shear toward the punch end of the machine and clamp it down with the hold down device. When attempting to shear the piece, the machine should stall and go into bypass mode. Watch the pressure gauge for a reading. The system pressure of this machine is 2,700 PSI (185 BAR). The pressure can be changed by adjusting the relief valve on the control valve manifold. If the pressure cannot be adjusted to 2,700 PSI, call your local dealer or the factory.

8.5 SEAL REPLACEMENT - CYLINDER

For parts identification, REFER TO FIGURE 32 ON THE FOLLOWING PAGE.

1. **After removing the cylinder from the machine, lay it on its side, with the ports down, and allow the hydraulic fluid to drain.**

2. **After the fluid drains, clamp the cylinder in a vise or similar holding device.**

3. **The cylinder head (A) is threaded into the cylinder tube. There are pin holes (C) in the top of the head for a pin wrench.**

4. **To remove the head, place a pin wrench in the pin holes on the head and rotate the head counterclockwise.**

5. **After the head has been removed, anchor the cylinder to a floor anchor, or something similar, and hook a come-along to the cylinder clevis and pull the shaft (B) and piston (D) out of the tube.**

6. **Remove the locking nut (E) from the cylinder shaft and slide the piston and head off of the shaft and remove all seals.**

7. **Clean all of the parts and inspect the inside of the tube, the piston, the shaft and the inside of the head for scoring or nicks.**

8. **Install the new seals and lubricate them before re-assembling the parts.**

9. **Place the head and piston on the shaft and torque the locking nut on the shaft to 100 foot pounds.**

10. **Stand the cylinder tube upright in a vise and place the shaft assembly on the tube.**

11. **Turn the head back into the tube with the pin wrench.**

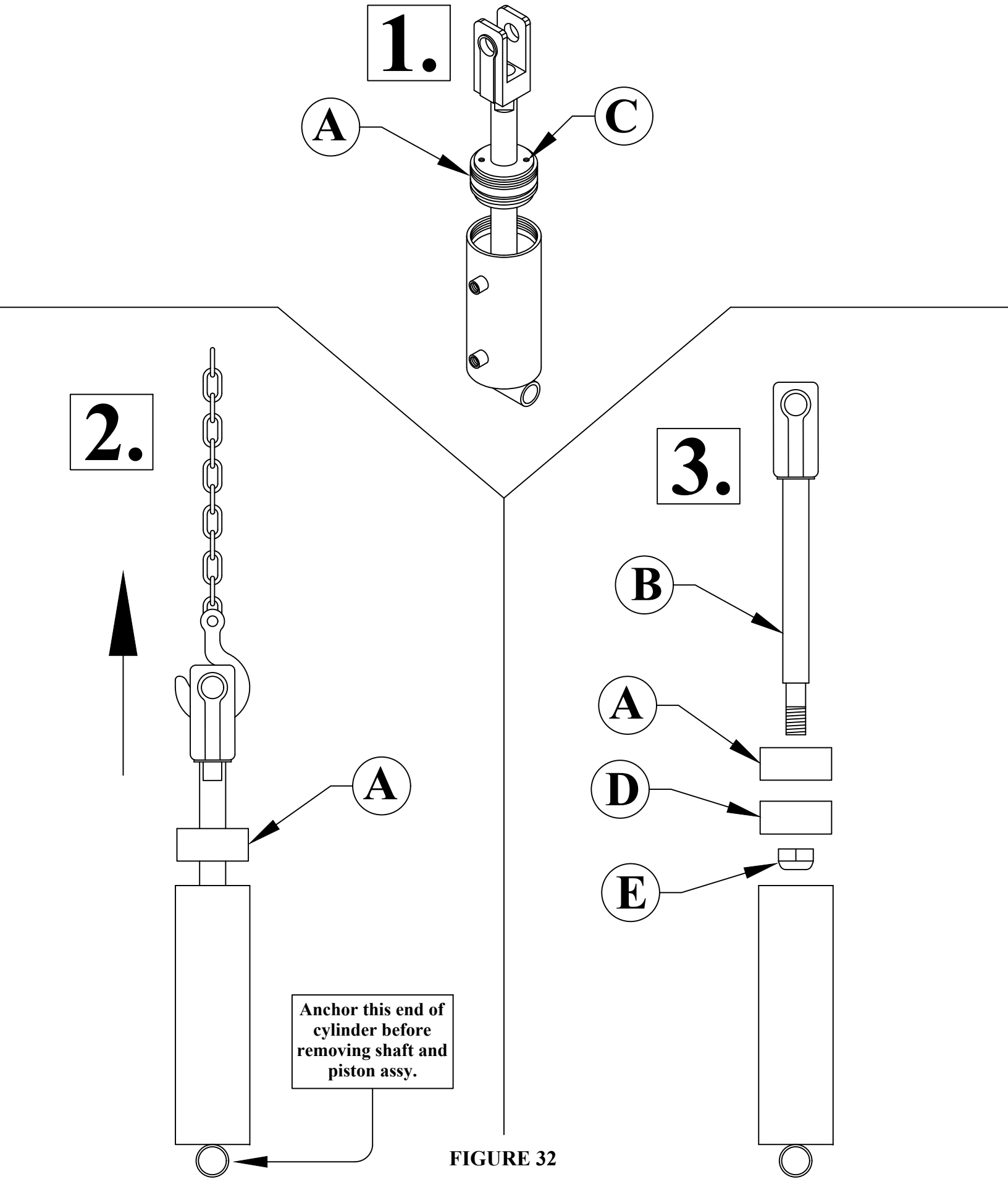

1.
A
C
2.
A
Anchor this end of cylinder before removing shaft and piston assy.
3.
B
A
D
E

FIGURE 32

9.0 PARTS LISTS

The Following Sections Contain Parts Lists And Drawings. For Your Convenience, Always Give Your Complete Serial Number When Ordering Parts.

9.1 TOOLING ARM ASSEMBLY

ITEM	PART #	DESCRIPTION
A	015388	Tooling Beam
B & C	015313	Main Pin & Bushing
D	004232	Brass Wear Plate
E & F	015173	Pin & Bushing
G	015382	Connecting Link Assembly
H	004109	Frame Rub Plate
I	004231	Pressure Plate
J	006015	Tooling Arm Rub Block
K	004015	Rub Plate (Counter)
L	233433	M12 x 85 FSHCS Bolt
M	221325	M12 x 55 SHCS Bolt
N	218112	M12 x 35 Set Screw
O	204222	M10 x 55 SHCS
P	004103	Frame Rub Plate (Notcher)
Q	080174	Grease Bolt
R	218130	M12 x 80 Set Screw
S	210014	M12 Jam Nut
T	218215	M16 x 60 Set Screw
U	210016	M16 Jam Nut
V	204222	M10 x 55 SHCS

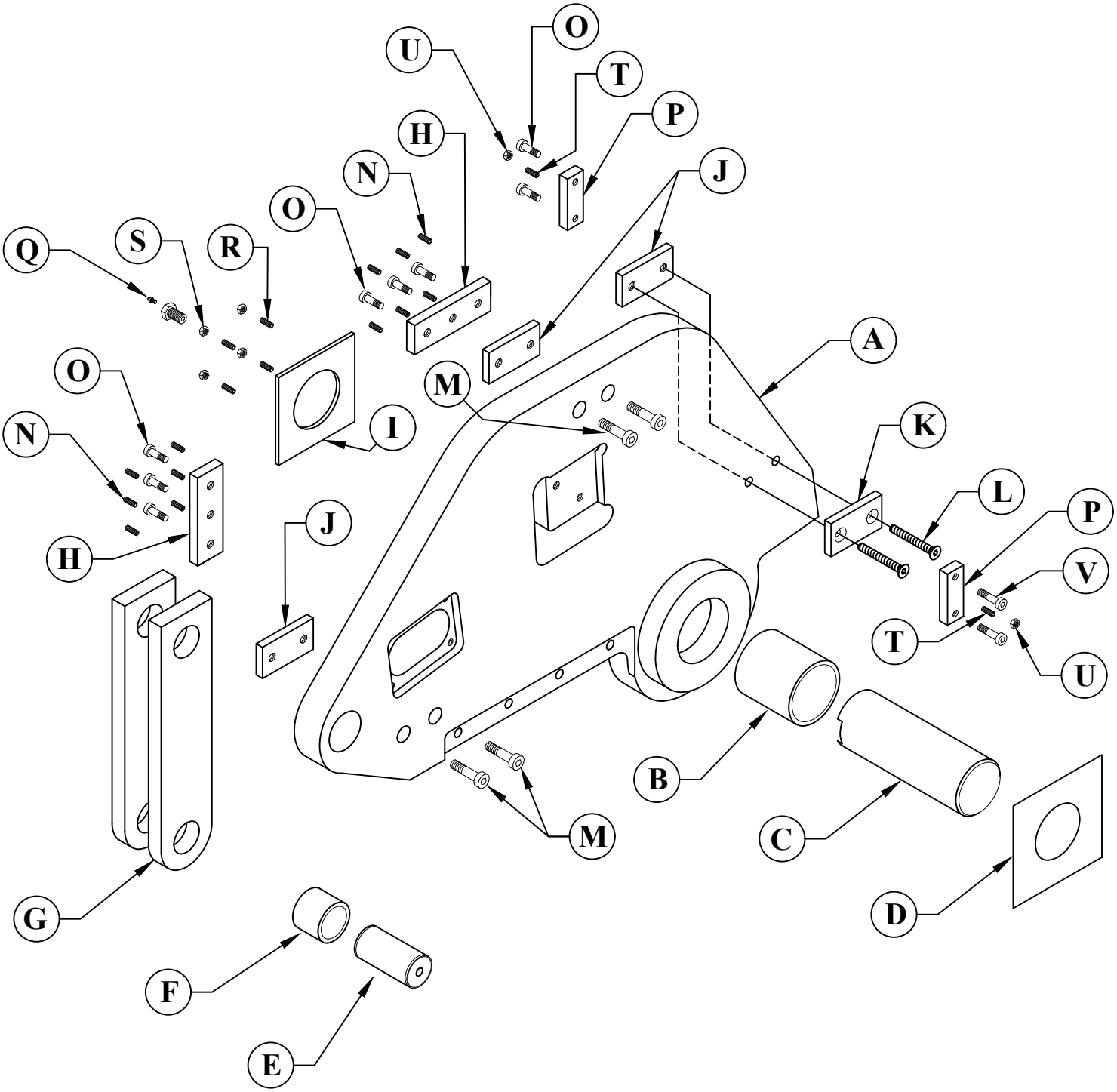


FIGURE 33

9.2 DRIVE ARM ASSEMBLY

ITEM	QTY	PART #	DESCIPTION
A	1	015385	Drive Beam Assy.
B	2	006174	Pin & Bushing Kit (2 ea)
C	4	016620	Snap Ring 2" (4 ea)
D	1	015318	Pin & Bushing Kit
E	2	016625	2-1/2" Snap Ring (2 ea)
F	1	032074	Pin & Bushing Kit
G	1	221328	M12 x 75 SHCS
H	1	080309	Meter Boss 85/120
I	1	036167	Lower Punch Pin 90
J	1	201440	M12 x 100 HHCS
K	1	015132	Punch Link Kit FI85 / DO70
L*	1	010230	Punch Ram and Bushing Kit (I I - PP)
M	1	210014	M12 Jam Nut
N	2	080174	Grease Bolt Main Pin (2 ea)
O	4	221315	M12 x 40 SHCS (4 ea)
P	1	016095	#40 XL Punch Retaining Nut
Q	1	006202	#82 Metric Die Insert
Q1		006252	Insert for 2-1/2" Dies
Q2		006302	Insert for 3" O.D. Dies
R	1	219060	M10 x 50 Set Screw
S	1	077145	M7.5 x 20 Dowel Pin
T	2	201640	M16 x 90 HHCS (2 ea)
U	2	113017	Ried Hardened Washer (2 ea)
V	2	204220	M10 x 30 HHCS (2 ea)
W	1	006013	Die Holder Mertic
X	2	218058	M10 x 45 Set Screw (2 ea)
Y	1	015440	Die Holder Spacer
Z	4	221417	M16 x 45 SHCS (4 ea)
AA	1	025153	Punch Bolster
BB	1	026697	Guide Finished
CC	2	026618	Tee Nut (2 ea)
DD	3	230107	M8 x 16 FSHCS (3 ea)
EE	1	026713	Punch Table with Scale
FF	2	080063	RS/Jig Handle (2 ea)
GG	1	080182	M5 Allen Wrench
HH	2	214012	M10 Regular Washer (2 ea)
I I	1	015250	FI Punch Ram
J J	1	012077	3" Punch Holder
KK	8	221120	M8 x 25 SHCS (8 ea)
LL	2	141010	3/16 x 1/2 Roll Pin (2 ea)
MM	1	015033	Insert - Inc. LL & NN
NN	1	004123	1/4" Key
OO	1	030645	Guide Block
PP	1	243101	Grease Zerk

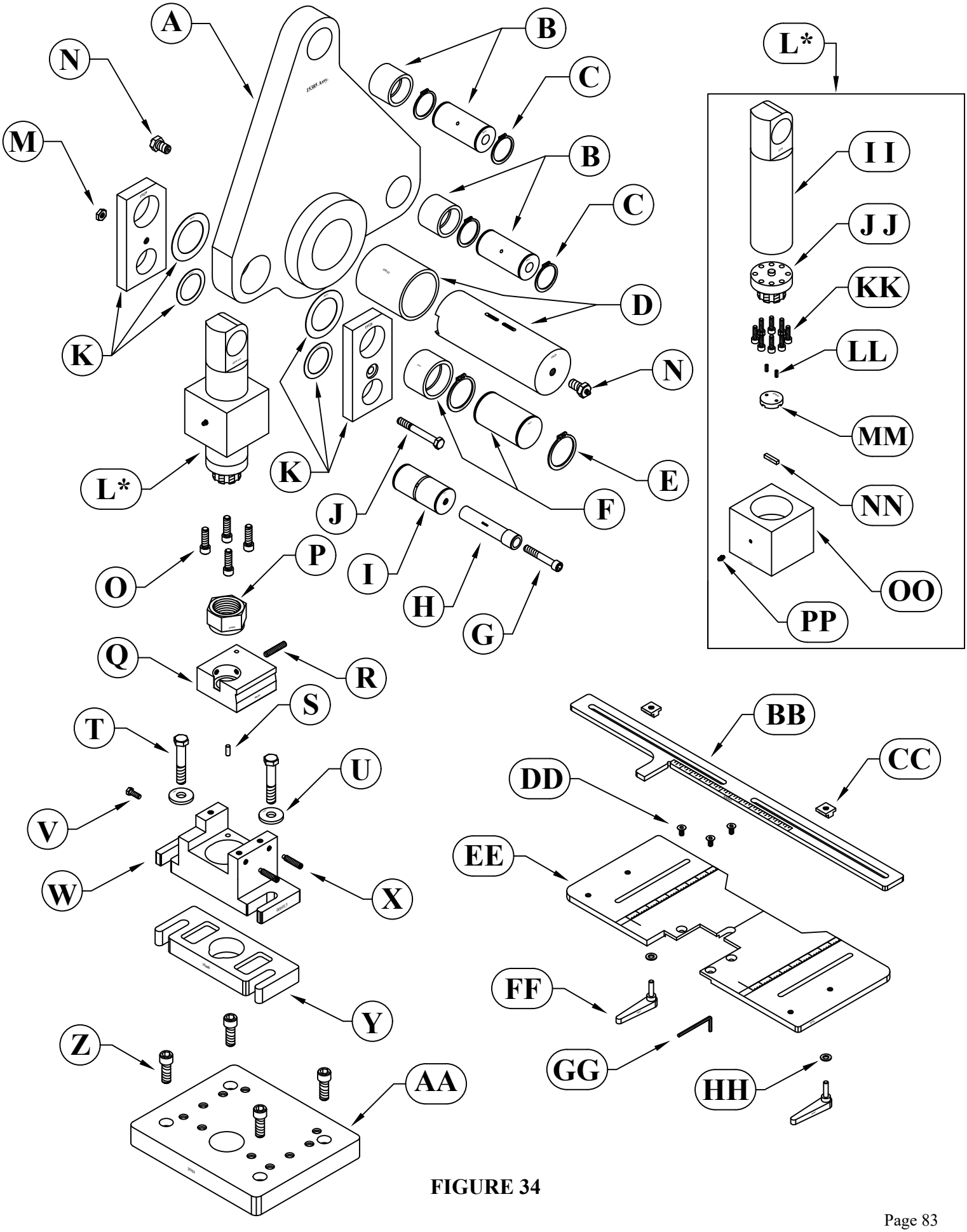

A
B
C
B
C
D
N
E
F
G
H
I
J
K
K
L*
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
AA
BB
CC
DD
EE
FF
GG
HH
L*
I I
J J
KK
LL
MM
NN
OO
PP

FIGURE 34

9.3 FLAT BAR SHEAR ASSEMBLY

ITEM	PART #	DESCRIPTION
1	025078	Shear Holddown Painted
2	201610	M16 X 25MM HHCS
3	113017	1 3/4 OD X 21/32 ID REID Washer
4	214014	M12 Regular Washer
5	218120	M12 X 50MM Set Screw
6	221328	M12 X 75MM SHCS
7	025083	Holddown Knob Bar Shear
8	015381	Shear Adj. Screw
9	218022	M6 X 6MM Set Screw
10	025257	Bar Shear Blade 20"
11	224205	M10 X 16MM WLCS
12	205425	M12 X 65MM HHCS
13	025260	Sabre Blade Bar Shear 20"

ITEM	PART #	DESCRIPTION
14	080063	RS/Jig Handle
15	025705	Guide
16	026698	Rest Button
17	080430	XL Shear Table
18	026618	Tee Nut (M10)
18A	080435	Shear Table Sales (Inc. 14,15,16,17,18)
19	220029	M10 X 35 BHCS
20	230210	M10 X 30 FSHCS
21	210012	M10 Jam Nut
22	015376	Shear Chute
23	025409	Bar Shear Door Painted
24	220014	M6 X 10MM BHCS

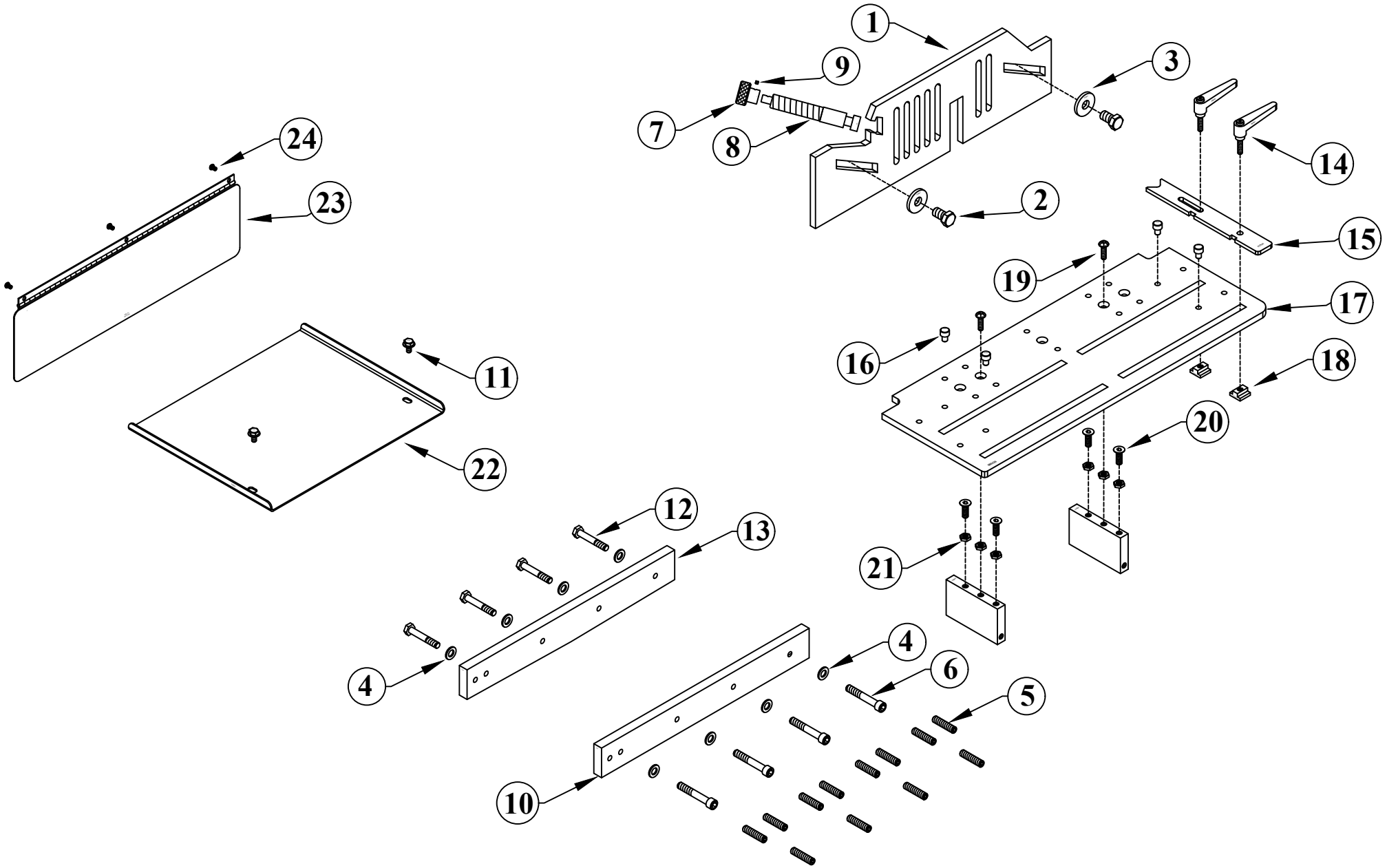
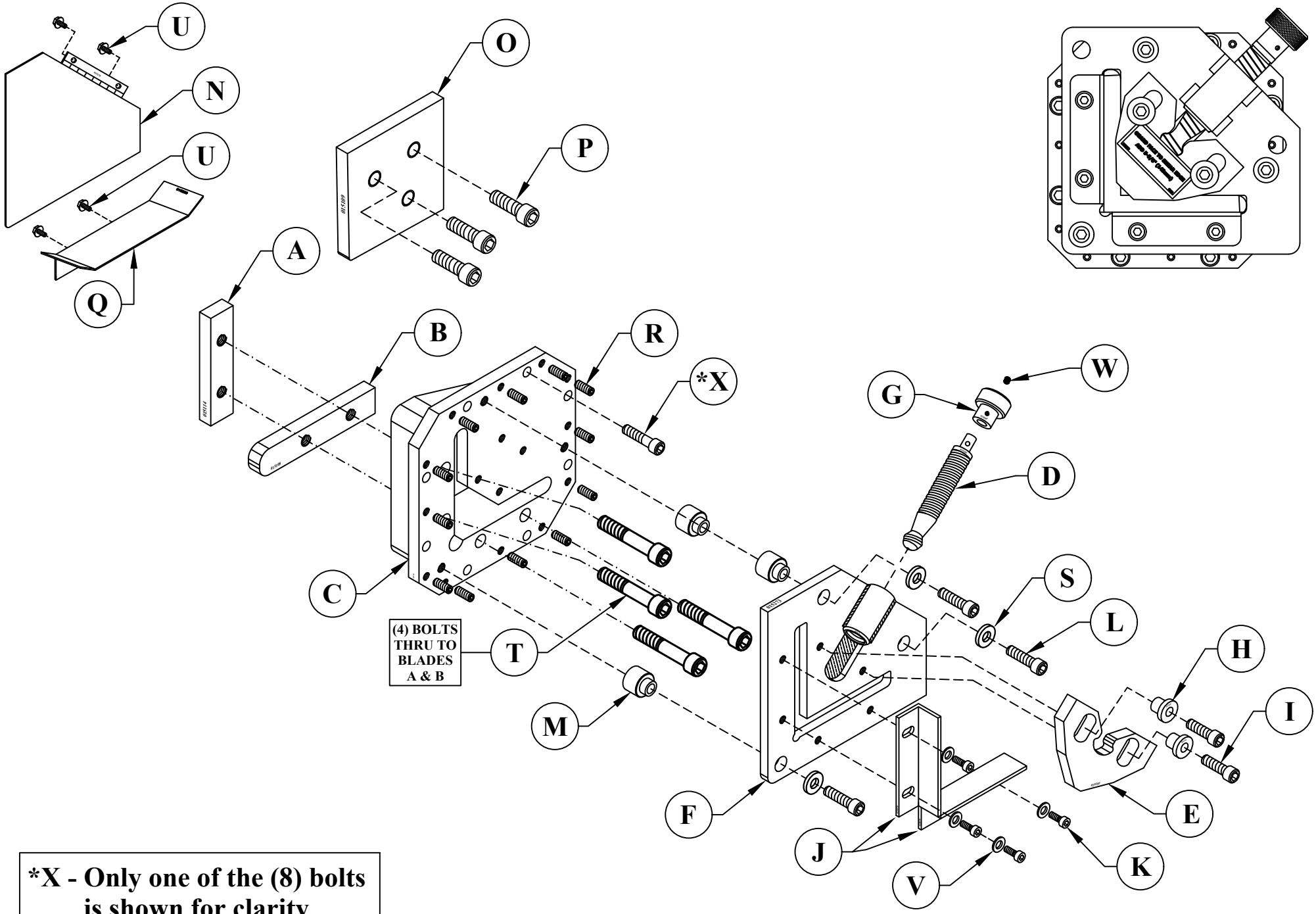


FIGURE 35

9.4 SIX INCH ANGLE SHEAR ASSEMBLY (S/N 1057 & UP)

ITEM	QTY	PART #	DESCRIPTION
A	1	015114	Short Angle Blade
B	1	015108	Lower Angle Blade
C	1	015100	Angle Shear Block
D	1	025180	Hold Down Screw
E	1	025182	Angle Shear Slider
F	1	015273	Hold Down Assembly
G	1	025083	Knob
H	1	025183	Hold Down Standoff
I	2	221315	M12 x 40 SHCS
J	2	025070	Angle Shear Guide Bracket
K	4	060250	M10 x 20 SHCS
L	3	221317	M12 x 45 SHCS
M	3	015274	Pillar
N	1	015171	Angle Shear Door
O	1	015109	Upper Angle Shear Blade
P	3	221420	M16 x 50 SHCS Bolt
Q	1	015269	Angle Shear Slug Chute
R	12	219050	M10 x 25 Set Screw
S	3	162005	Flat Washer
T	4	221435	M16 x 90 SHCS
U	4	224005	M6 x 12 WLCS
V	4	214012	M10 Flat Washer
W	1	218022	M6 x 6 Set Screw
*X	8	221320	M12 X 50MM SHCS



***X - Only one of the (8) bolts is shown for clarity**

FIGURE 36

9.5 ROD SHEAR ASSEMBLY

ITEM	PART#	DESCRIPTION
A	004095	Beam Blade
B	004096	Adjustable Blade
B1	004097	Set of Rod Shear Blades (Inc. A&B)
C	004295	Fixed Blade Holder
D	004758	Hold Down
E	221212	M10 x 30 SHCS Bolt
F	221220	M10 x 40 SHCS Bolt
G	219050	M10 x 25 Set Screw
H	221220	M10 x 40 SHCS Bolt
J	080063	Handle
K	015278	Spacer
L	220030	M6 BHCS
M	015175	Door Assembly
N	015268	Slug Chute
O	214012	M10 Washer
P	212012	M10 Lock Washer

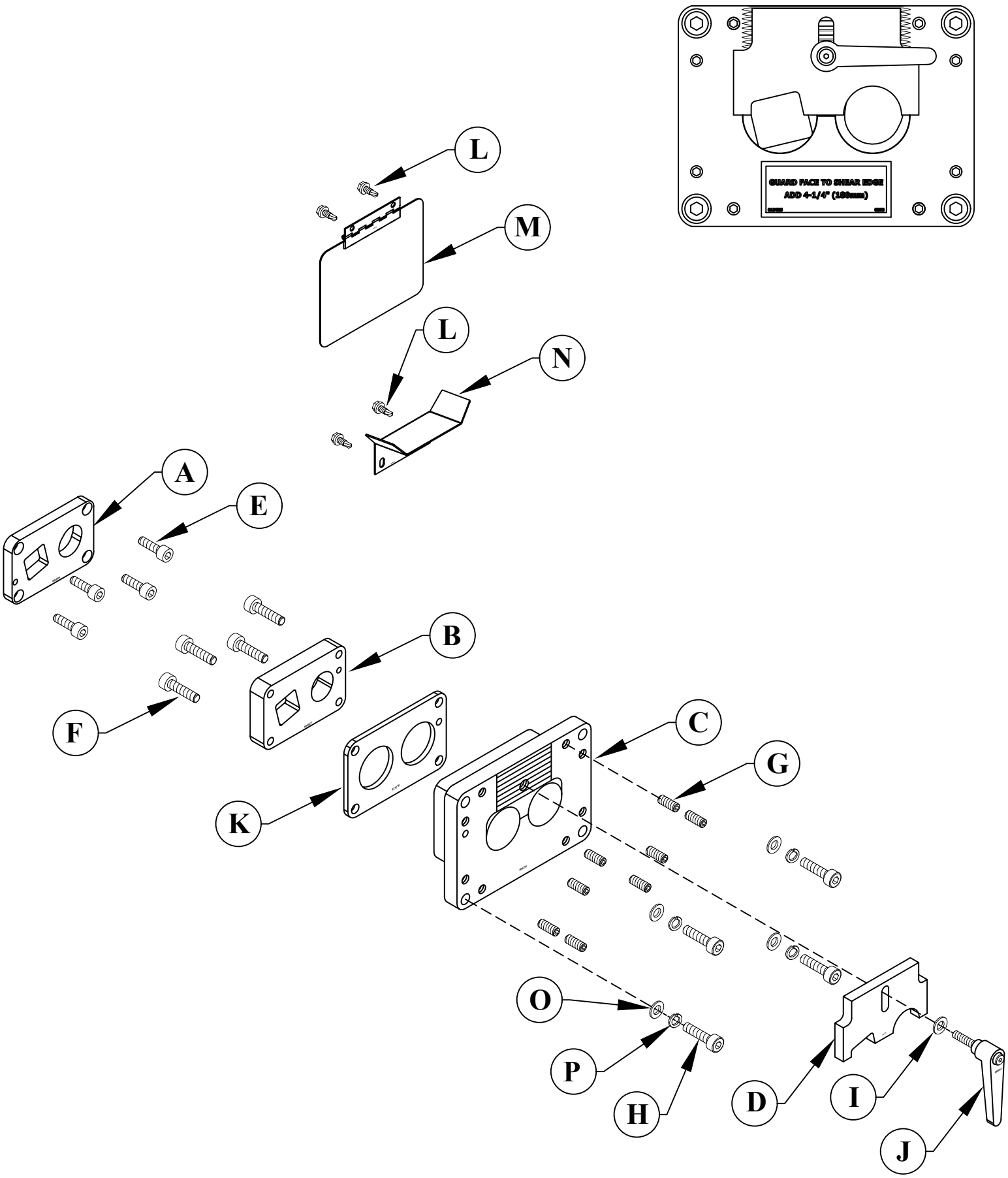


FIGURE 37

9.6 NOTCHER ASSEMBLY

ITEM	QTY.	PART #	DESCRIPTION
1	1	015270	FI85 Notcher Guard
2	1	213012	M10 Black Washer
3	1	090400	M10 X 25MM FK Knob
4	4	230207	M10 X 20 FSHCS
5	2	080061	Stroke Adjustment Handle
6	2	214012	M10 Regular Washer
7	2	014116	L Table Stop
8	1	033047	D.O. Notcher Table S/N: 1294M0216 & UP
8A	1	014119	Table - S/N 1293M0116 & Prior
8B	1	014215	Notcher Table W/Guides S/N 1293M0116 & Prior
9	2	026624	Tee Nut Notch Table
10	1	015110	Top Notcher Blade
11	3	221314	M12 X 35MM SHCS
12	2	004892	A.S. & Notcher Blade
13	1	015111	Front Notcher Blade
14	9	221322	M12 X 60MM SHCS
15	9	212014	M12 Lock Washer
16	4	221326	M12 X 65MM SHCS
17	1	033046	DO70/95 FI85 Blade Holder S/N: 1294M0216 & UP
17A	1	015113	Notcher Blade Holder - Obsolete S/N: 1293M0116 & Prior Replaced with ITEMS 8 & 17
18	2	221327	M12 X 70MM SHCS
19	2	220014	M6 X 10MM BHCS
20	1	046018	Handle MT/105
21	1	300020	Slug Bucket Turret Includes 19 & 20

NOTCHER ASSEMBLY

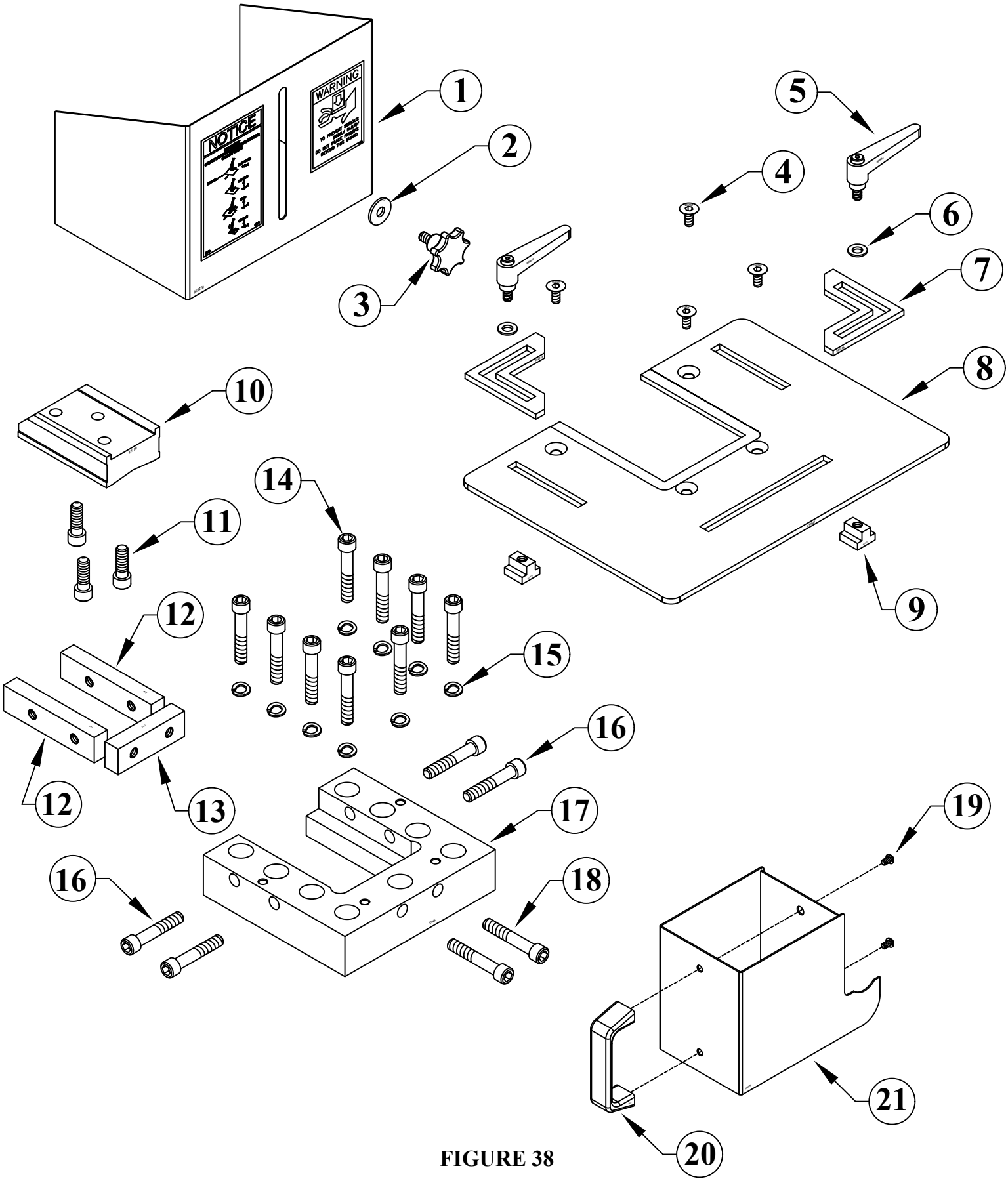


FIGURE 38

9.7 UPPER PANEL

ITEM	QTY	PART #	DESCRIPTION
1	2	004086	Micro Switch Mount
2	2	004087	Pointer Rev. A
3	1	004521	Legend Plate Holder
4	1	011210	Legend Punch/Start/Shear K&N
5	1	011211	Legend Jog/Run/Probe K&N
6	2	011222	Cam Switch XL K&N
7	1	011500	Legend Stop
8	1	011509	Legend Start
9	1	011862	E-Stop Operator Pkgd. W/ 11872
10	1	011867	Contact M22-K01
11	2	011874	Contact Element
12	1	011879	Start Button
13	1	011886	Jog Push Button Pkgd. W/ 11872
14	1	011912	Ground Wire Ass'y
15	1	015602	Stroke Cover Painted
16	1	073206	M6 DIN934 Hex Nut
17	4	073450	M4 X 16MM DIN912 SHCS
18	48	077907	Shroud Edge
19	2	080061	Stroke Adjustment Handle
20	1	158101	7/8 Steel Hole Plug
21	1	220020	M6 X 16MM ISO 7380 BHCS
22	1	562040	Wire Cable Clamp
23	2	562112	Limit Switch
24	85	660457	18/12 Cable (19015) (not shown)
25	32	660470	16GA Black MTW Wire (not shown)
26	4	660505	Black Nylon Cable Tie (not shown)
27	1	004085	Scale Stroke Control
28	2	213012	M10 Black Washer
29	2	201240	M10 X 110MM HHCS

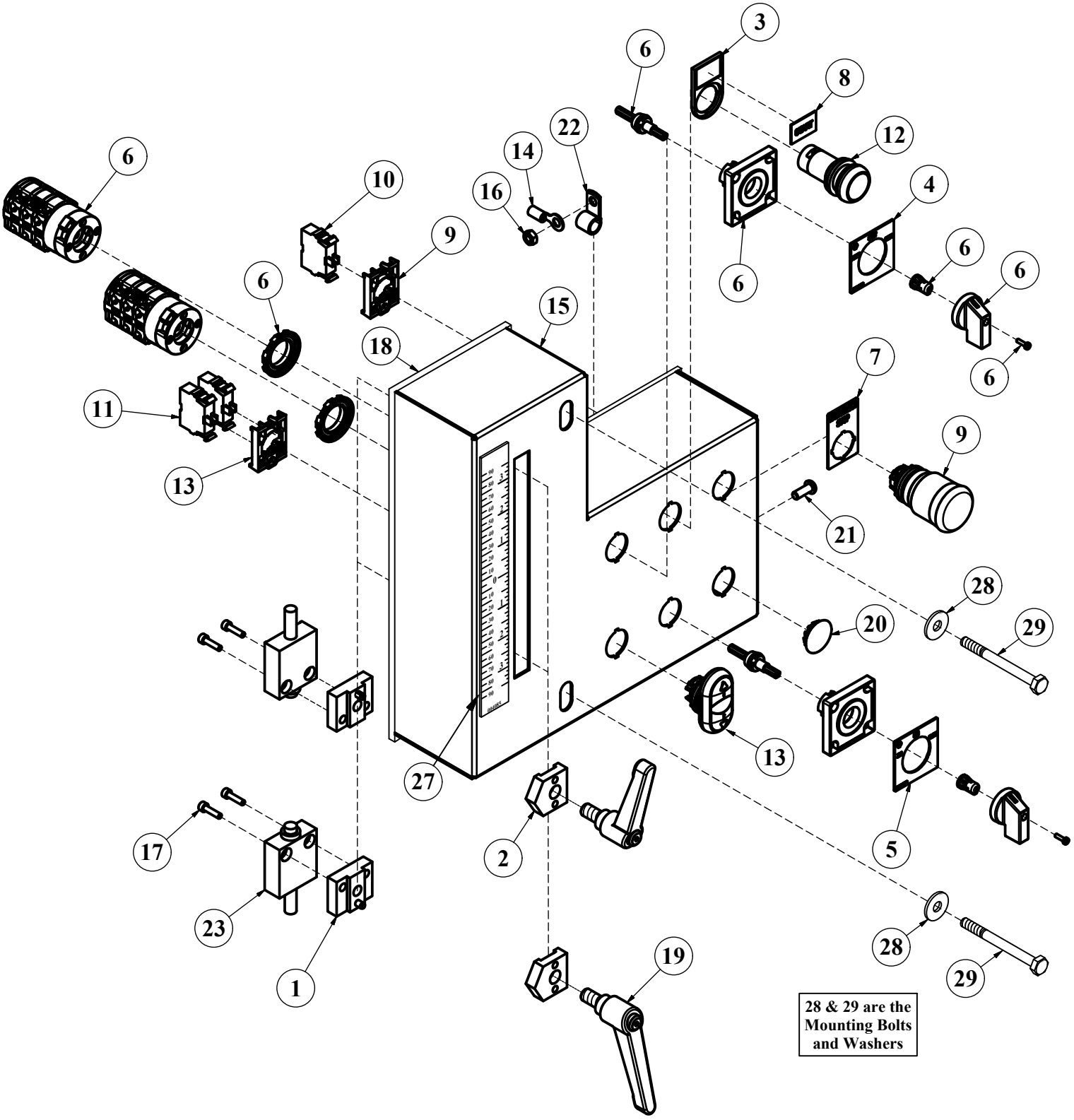


FIGURE 39

9.8 STRIPPER ASSEMBLY

ITEM	PART#	DESCRIPTION
A	015228	Stripper
A1	015229	Stripper Assy (Includes all items on this page.)
B	007229	Adjustment Screw (Left)
C	007237	Stripper Stud (Left)
D	007240	Spring Retainer
E	015247	Spring
F	007236	Adjustment Screw (Right)
G	007239	Spring Rod
H	220014	M-6 x 10 BHCS
I	007248	Sight Glass (3-15/16 x 2-3/16)
	007268	Sight Glass (5 x 2-1/4)
J	007253	Stripper Plate
K	230007	M-6 x 16 FSHCS
L	007244	Stripper Retainer
M	001541	Ball Spring Screw
N	110014	1/2 x 13 Jam Nut

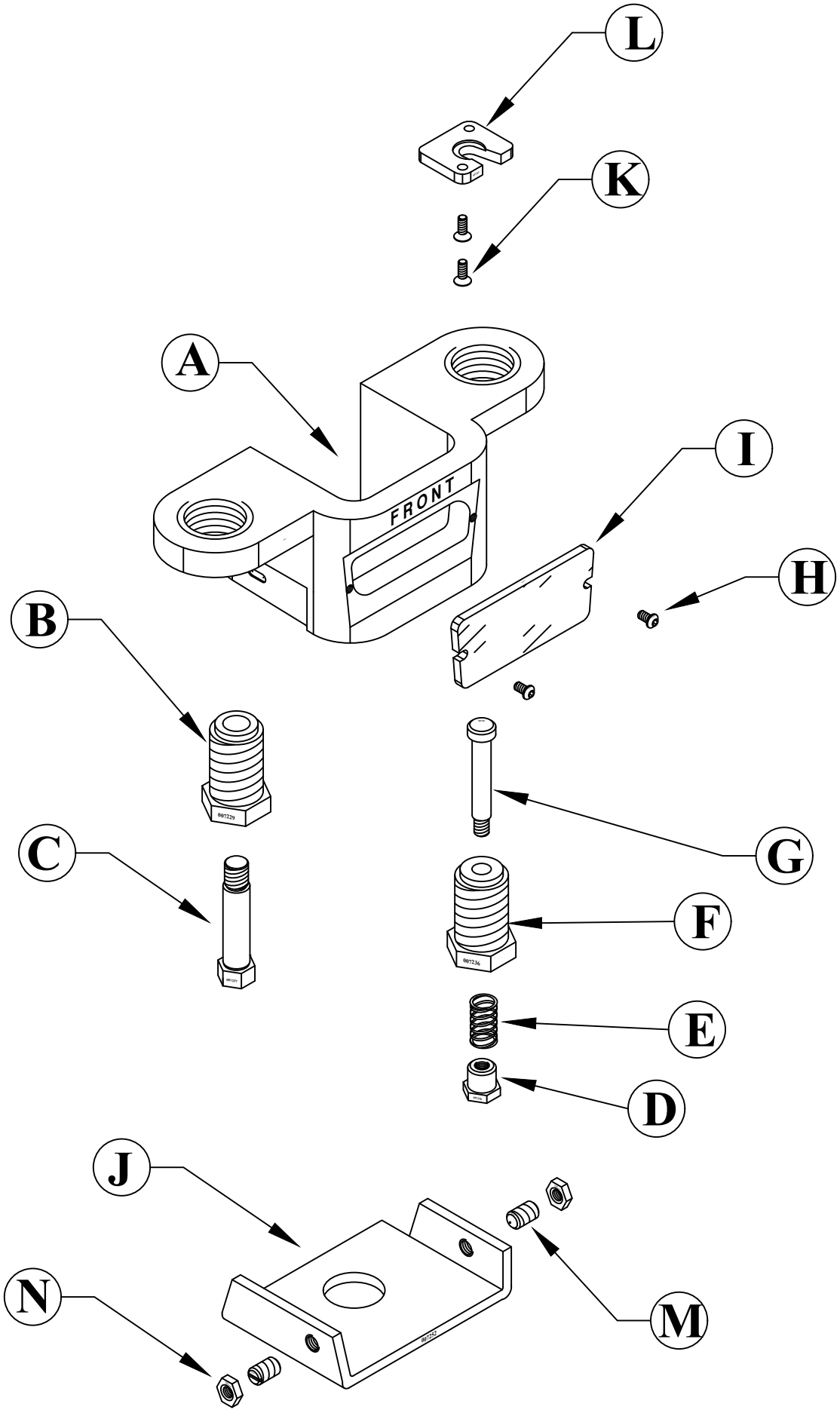


FIGURE 40

9.9 SHEET METAL & CYLINDER

ITEM	PART#	DESCRIPTION
A	015395	Front Shroud
B	004220	Hose Cover
C	224205	M-10 WLCS
D	016620	2" Snap Ring
E	015134	Cylinder Anchor Pin
G	015377	Cylinder Shroud
H	015010	FI-85 Cylinder Assy. (Inc. I)
H1	080375	Cylinder Seal Kit
I	004185	Cylinder Clevis
J	015397	Rear Shroud
K	015098	Punch Cover

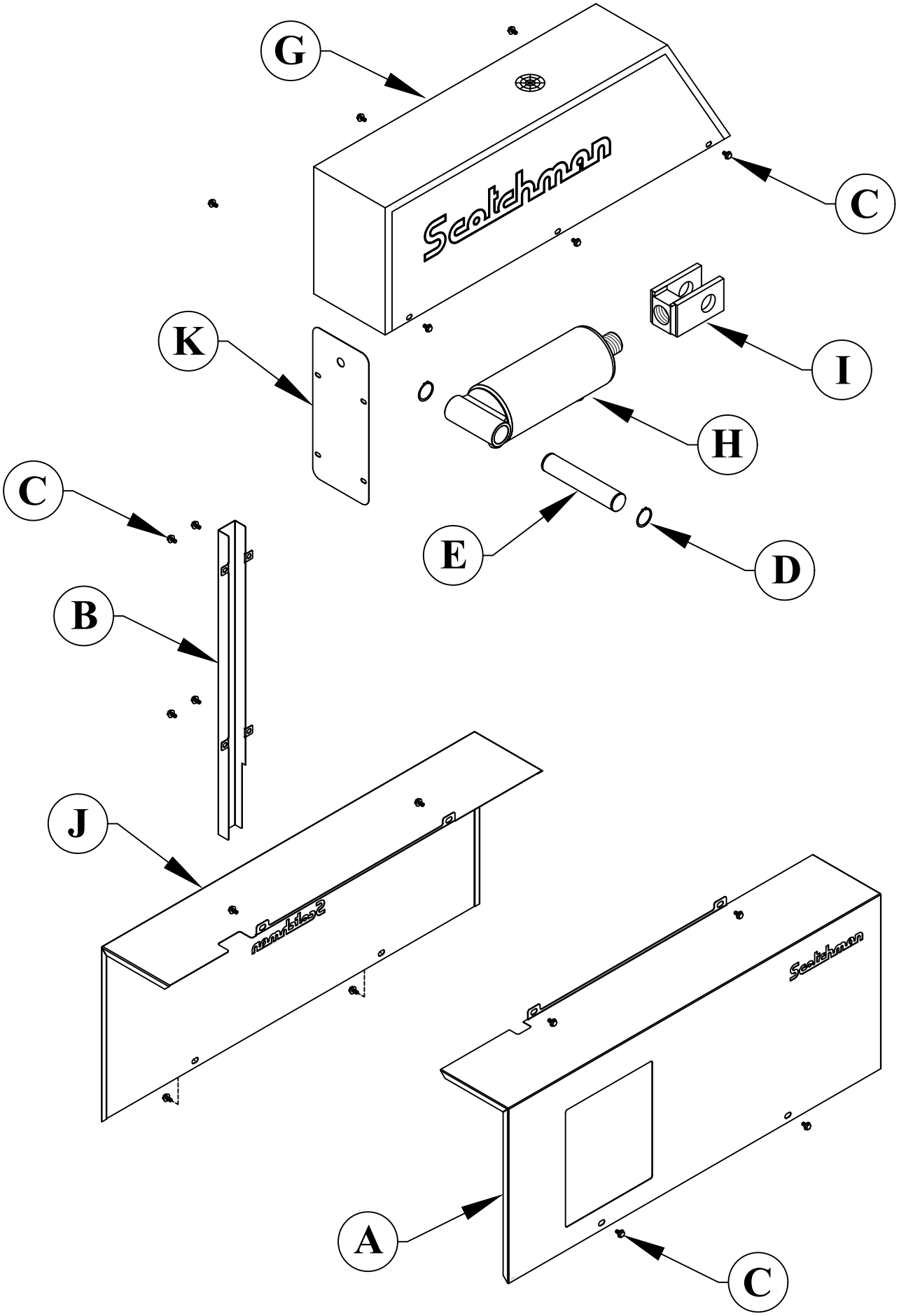


FIGURE 41

9.10 POWER UNIT

ITEM	PART #	DESCRIPTION
A	006860	Filter (Ser.#'s 1225M0613 & Prior)
A1	006863	Filter (Ser.#'s 1226M0613 & Up)
B	N/A	Fitting
C	006840	Return Hose
D	016088	Breather Cap
E	017105	Fitting (Obsolete)
F	003810	Ball Valve
G		Fitting
H	006830	Suction Hose
I		Fitting
J	Per Machine	Shaftless Motor (Must Specify - See Below)
	006915	230V 1PH Motor Assy.
	006905	208/230V 3PH Motor Assy.
	006910	460V 3PH Motor Assy.
K*	007340	Pump
L	006960	Motor Pads
M	003952	Fitting
N	006835	Pressure Hose
O		Fitting
P		Manifold Mounts
Q	006870	Manifold w/Valve
Q1	006872	Manifold
Q2	006865	Relief Cartridge
R	552180	Parker Valve
R1	552181	Parker Coil For 552180
R2	552135	Sales Valve Assembly
S		Fitting
T		Reservoir
U	158050	Magnetic Plug (Obsolete)
V	003768	Cylinder Hose (88")
W	003771	Cylinder Hose (96")
X	006850	Inlet Strainer (Not Pictured)

K* - S/N 4480 and prior: hydraulic pump located inside reservoir
S/N 4481 and after: hydraulic pump mounted outside reservoir.

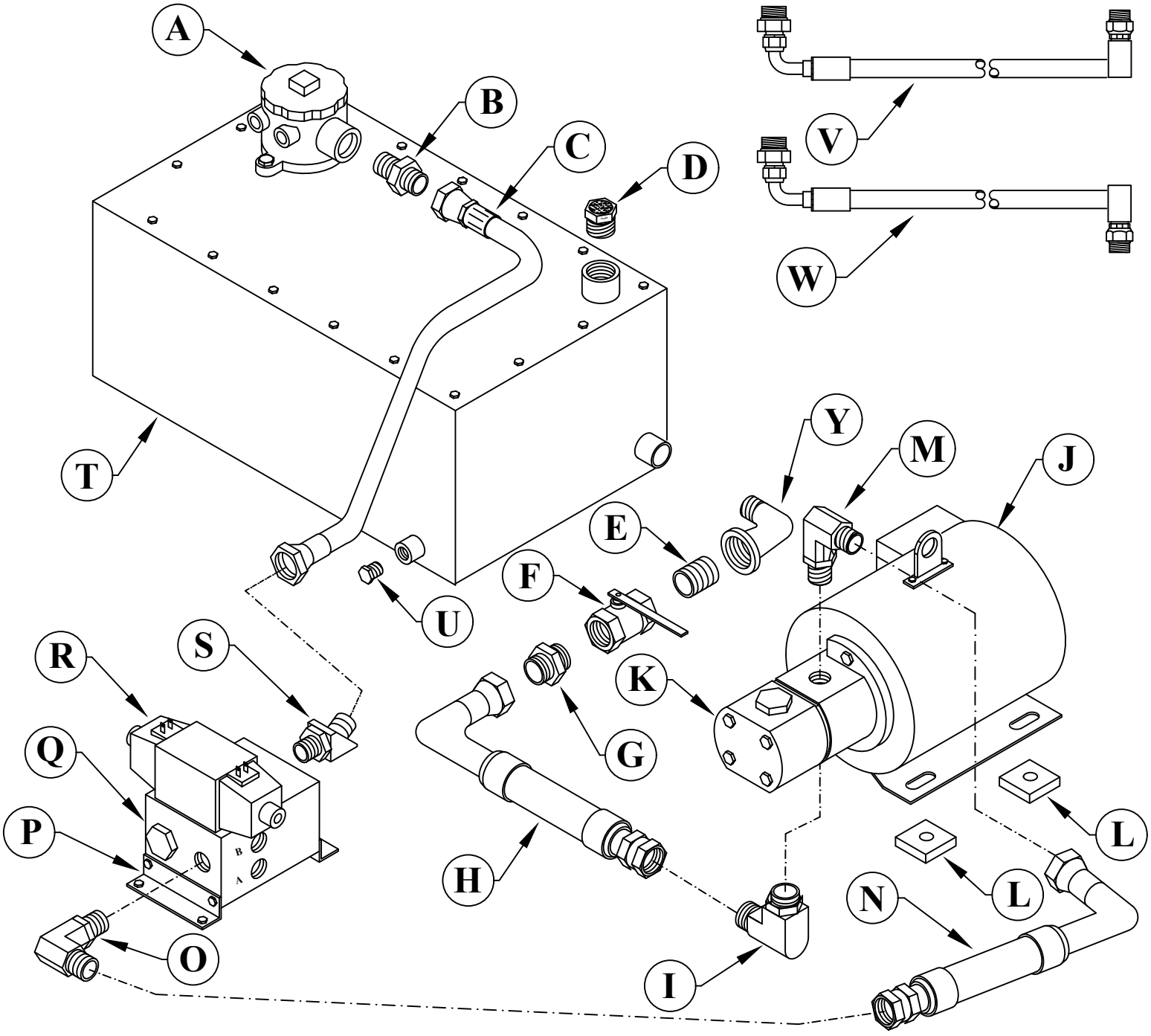
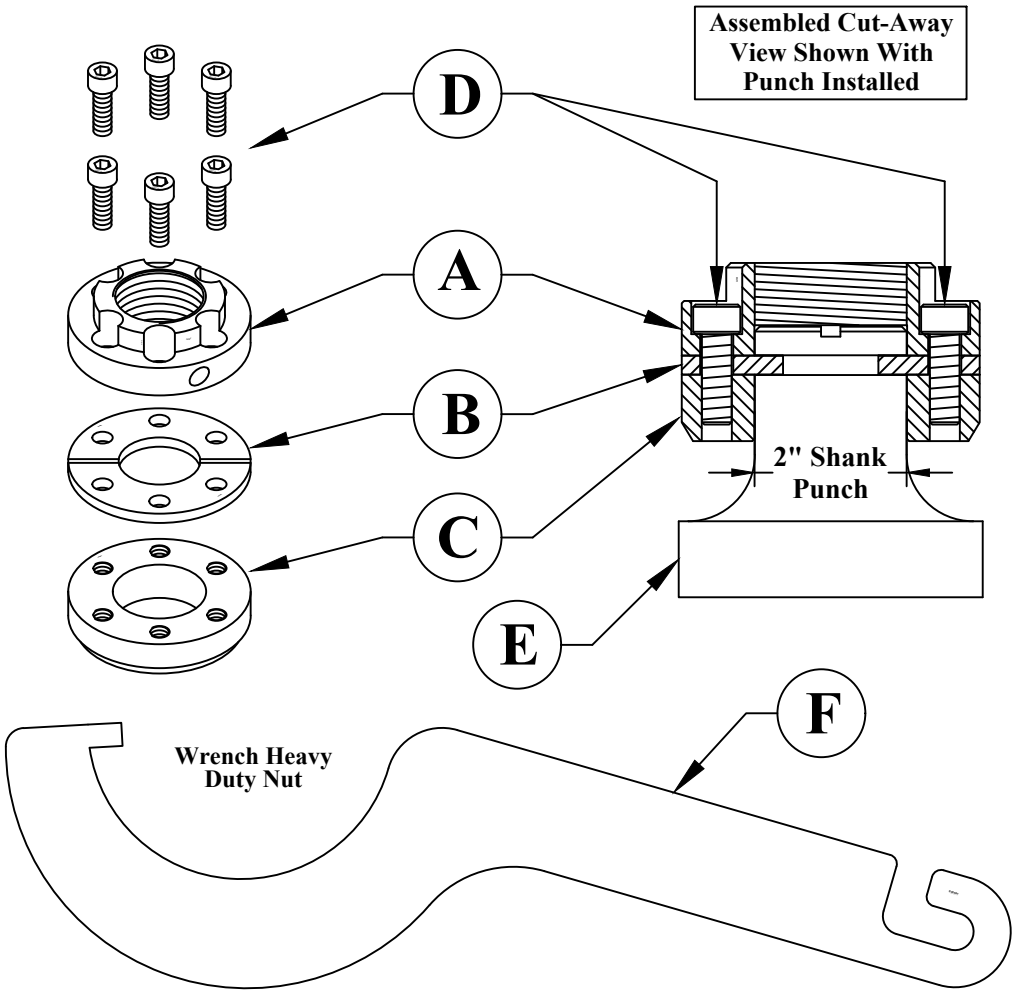


FIGURE 42

9.11 PUNCH RETAINING NUTS

ITEM	PART #	DESCRIPTION
A	026501	Ring Nut
B	026502	Split Ring (2 Required)
C	026503	Retaining Ring
D	221212	M-10 SHCS Bolt
E	N/A	(Example of Split Ring Punch shown)
E1	026500	Complete Heavy Duty Retaining Nut (Includes A, B, C & D)
F	018507	Wrench Heavy Duty
G	016095	#40 Retaining Nut
H	016096	#45 Retaining Nut
I	019098	Wrench For G & H


Assembled Cut-Away
View Shown With
Punch Installed
D
A
B
C
E
2" Shank
Punch
F
Wrench Heavy
Duty Nut

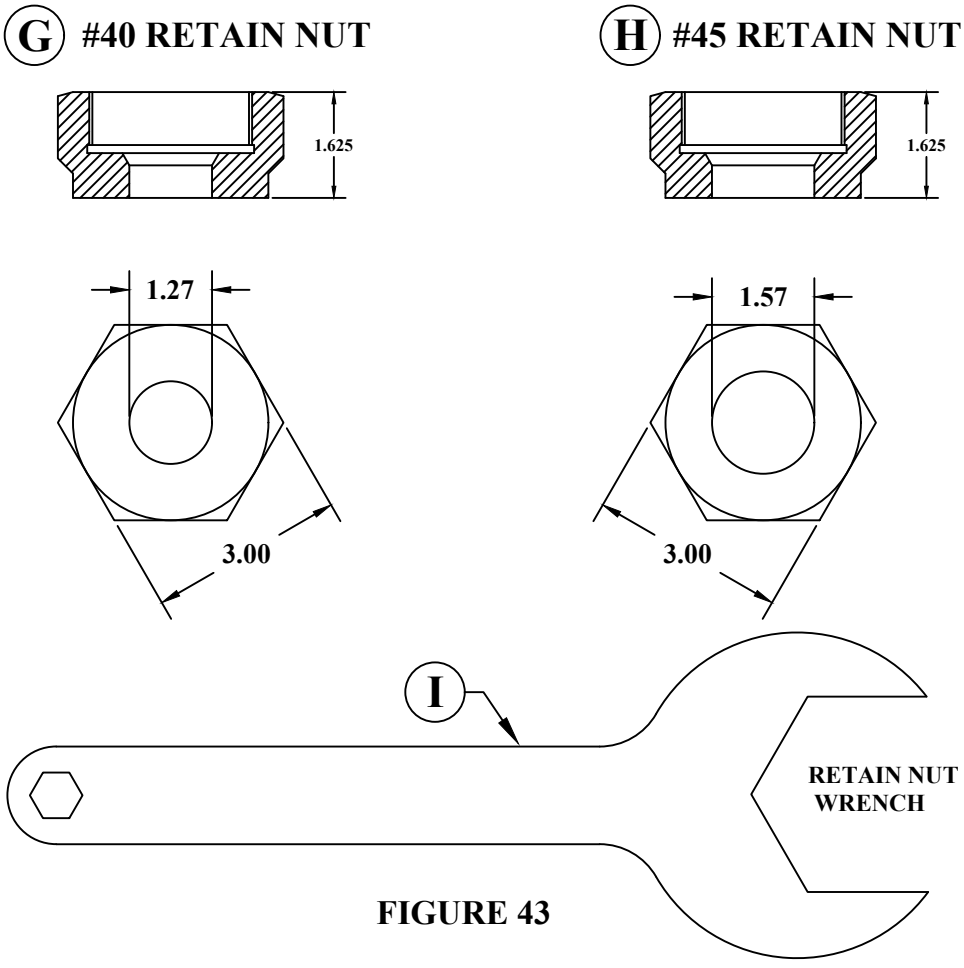

G #40 RETAIN NUT
H #45 RETAIN NUT
1.625
1.625
1.27
1.57
3.00
3.00
I
RETAIN NUT
WRENCH

FIGURE 43

9.12 ELECTRICAL UNIT

ITEM	PART #		DESCRIPTION
	DIL	DILM	
A	011861		Transformer
A1	011932		Transformer (208V - 277V)
B	011933		Primary Fuse
C	011835		Secondary Fuse
D	004211		Emergency Stop Assembly
D1	004218		Emergency Stop Button
D2	004414		Emergency Stop Box
D3	004210		Emergency Stop Switch
E	N/A	011975	Contactor with 120v Coil
G	011846	N/A	Coil (Obsolete)
I	562453		Foot Switch
	011753		Cord (Foot Switch)
	*562451		Microswitch For SSC Foot Pedal (not shown)
	*562452		Microswitch For Linemaster Foot Pedal (not shown)
M	011854		Disconnect Switch
M1	011895		Disconnect Switch Knob
N	011975-011999	011999	Overload (230 Volt 3ph & 1ph)
	011994 (Obsolete)	011998	Overload (460 Volt)
	011994 (Obsolete)	011998	Overload (575 Volt)
O	011873		Start Switch Lamp

*** BEFORE ORDERING A MICROSWITCH: Inspect foot pedal to determine if it's a LINEMASTER or SSC.**

PN 011898 RATING TABLE					
LINE VOLTAGE (3PH)	208	230	380	460	575
MAX. HP	5	5	5	5	5
MOTOR FLA	14	12.6	7.7	6.3	5.1
OVERLOAD	ZB32-24	ZB32-24	ZB32-10	ZB32-10	ZB32-10

3-PHASE POWER

See Pg. 14A for Single Phase

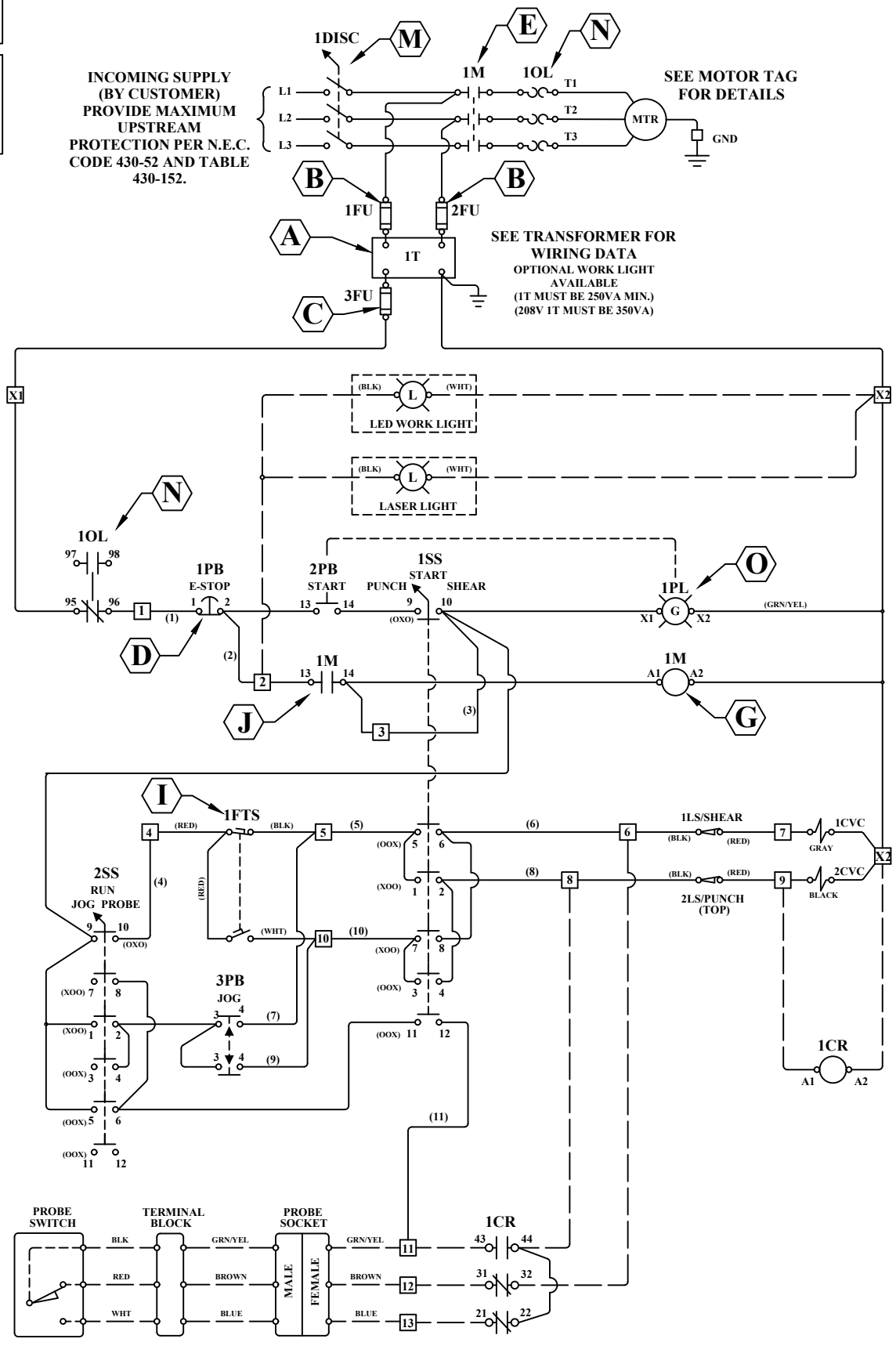


FIGURE 44

10.0 SUPPLEMENT FOR OLDER MODELS

10.1 SIX INCH ANGLE SHEAR ASSEMBLY (Ser. # 1060 & Prior)

ITEM	PART #	DESCRIPTION
A	015114	Short Angle Blade
B	015108	Lower Angle Blade
C	015100	Angle Shear Block
D	015104	Angle Shear Hold Down Rod
E	015105	Angle Shear Hold Down Block
F	221212	M10 x 30 SHCS Bolt
G	015206	Hold Down Guard
H	221435	M16 x 90 SHCS Bolt
I	015107	Rest Angle Shear (Obsolete when stock is gone)
J	221320	M12 x 50 SHCS
K	212014	M12 Lock Washer
L	219050	M10 x 25 Set Screw
M	220026	M8 x 12 BHCS
N	015171	Angle Shear Door FI-85
O	015109	Upper Angle Shear Blade
P	221420	M16 x 50 SHCS

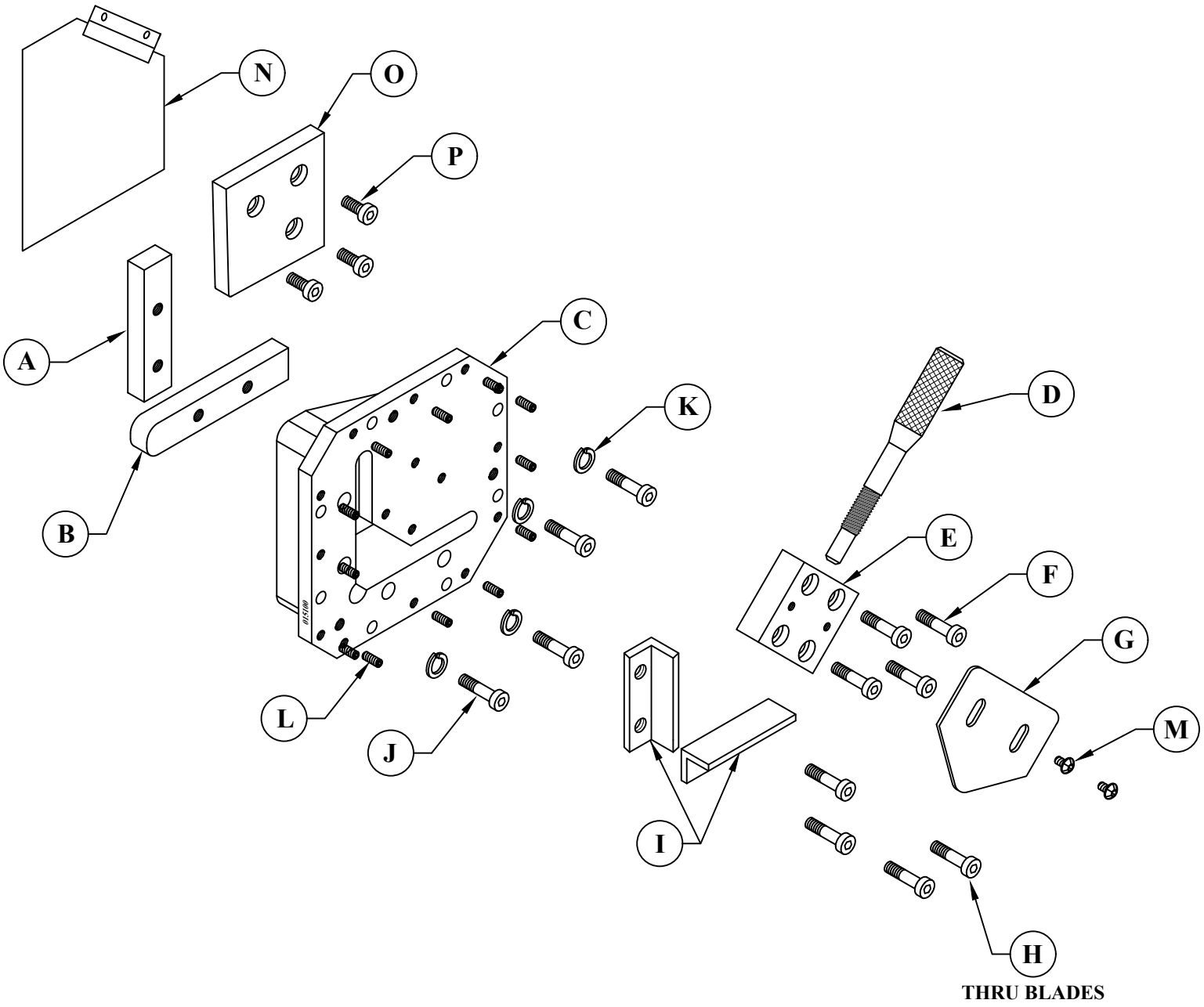


FIGURE 45