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PN: T2613-2  
Programmable CNC/Goto

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## 1. Safety

Safety must be a primary concern. When operating or performing maintenance procedures, follow all standard safety guidelines. Do not wear loose fitting clothing or any articles that may be pulled into any moving parts.

Be sure that when operating the equipment, all safety devices operate properly. Never under any circumstances disable, remove, or alter the original configuration of the safety system.

Should any component of the safety system become inoperable, immediately discontinue operation, and notify a supervisor.

- ! **NEVER** place fingers, hands, or any other body part in or under the blade area or other moving mechanisms.
- ! Proper eye protection must be worn at all times when operating the machine.
- ! Always insure that the machine is turned **OFF** before servicing the machine.

Read and understand this manual prior to operating the machine.

The area around the Piranha 1/4-12 Shear should be well lighted, dry, and free of obstacles.

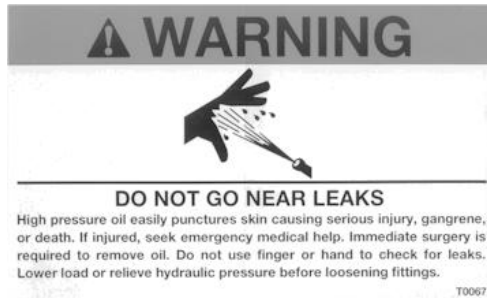
The Piranha 1/4-12 Shear is designed for single person operation only.

When servicing the machine always practice standard lockout/tag-out procedures to avoid personal injury.

Qualified maintenance personnel only should perform service operations on the Piranha 1/4-12 Shear.

### 1.1. Warning Labels

Located around the Piranha 1/4-12 Shear are labels warning the operator of various dangers and precautions to be aware of when operating or servicing the machine.

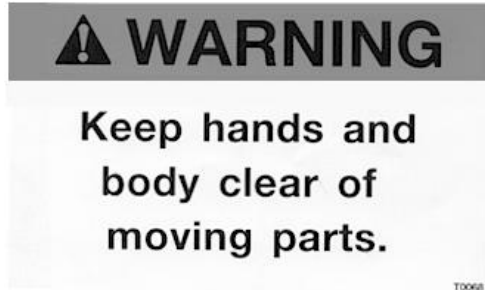


Do not go near leaks

High-pressure oil easily punctures skin causing injury, gangrene and even death. If injured, seek emergency medical help.

Immediate surgery is required to remove oil. Do not use finger or hand to check for leaks. Lower load or relieve pressure before loosening fittings.

Part – T0067

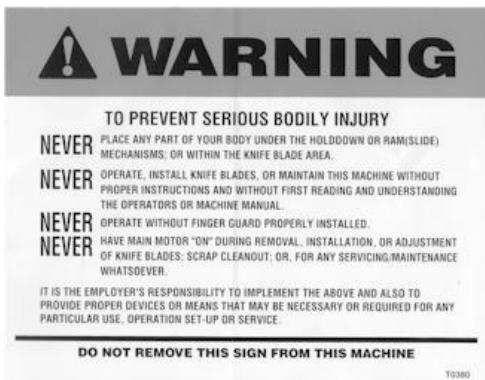


Keep hands clear of moving parts.  
Part – T0068



To prevent serious bodily injury do not remove throat guard except when slitting. Replace for normal operation. It is the employer's responsibility to implement the above and also to provide proper devices or means that may be necessary or required for any particular use, operation set-up or service.

Part – T0379



To prevent serious bodily injury;  
Never place any part of your body under the hold down or ram (slide) mechanisms; or within the knife blade area.

Never operate, install knife blades, or maintain this machine without first reading and understanding the operators or machine manual.

Never operate without the finger guard properly installed.

Never have main motor "on" during removal, installation, or adjustment of knife blades; scrap cleanout; or, for any servicing/maintenance whatsoever.

It is the employer's responsibility to implement the above and also to provide proper devices or means that may be necessary or required for any particular use, operation set-up or service.

Part – T0380



To insure proper operation of shear back gauge;

Never ram material against back gauge.

Never use back gauge drive to move material being cut on table.

Never pass material being cut over or under back gauge.

Always use disappearing feature cutting parts larger than normal back gauge range.

Failure to follow these instructions may result in damage to back gauge. Always refer to operation manual for proper use of machine

Part – T0381



Moving part; do not obstruct.

Part – T0382



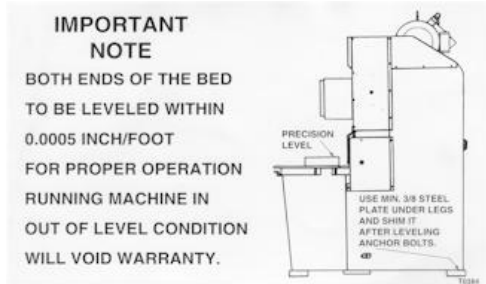
To prevent serious bodily injury;

Do not enter rear area of machine while in operation.

It is the employer's responsibility to implement the above and also to provide proper devices or means that may be necessary or required for any particular use, operation set-up or service.

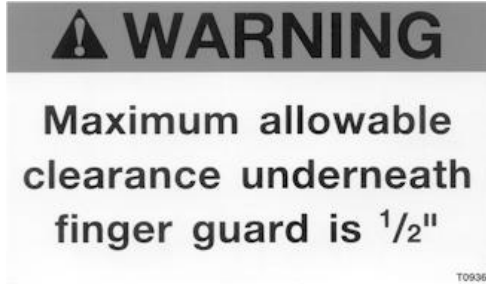
Part – T0383





Both ends of the bed are to be leveled within 0.0005 inch/foot for proper operation. Running the machine out of level will cause damage and void the warranty.

Part – T0384



Maximum allowable clearance under finger guard is 1/2".

Part – T0936

## 1.2. Safety

1. Immediately report any questionable operation, unusual action, unsafe condition or improper maintenance to the proper personnel.
2. When working with other people insure that all persons are clear of the shear prior to machine operation.
3. Insure that the proper safe material handling equipment (tongs, pliers, vacuum lifters or other mechanical devices) available to the shear operator.
4. When changing the settings of shear controls, insure that the controls are properly adjusted and test cycle the machine to verify correct operation.
5. Insure that all devices are in proper working order.
6. Anytime that the machine has been left unattended or inoperative for even a brief time, verify the correct position of all controls and proper shear operation.
7. Develop a sense of safety for yourself and any persons around you as well as your surrounding area.

### **1.3. Safety Standards & Specifications**

#### **Electrical System Design/Manufacture:**

The machines manufactured in Hutchinson, KS, are furnished with electrical/electronic products that are UL (Underwriter's Laboratory) approved. These components have the UL numbers printed or stamped on them and can be easily traced to the point of manufacture.

#### **Hydraulic System Design/Manufacture:**

Hydraulic components used in Piranha machines are approved by NFPA (National Fluid Power Association), and those approval numbers can be traced through the manufacturer's part numbers.

#### **ANSI/OSHA Compliance:**

Mega Manufacturing meets the current ANSI construction standards for manufacturing of ironworkers, press brakes, and shears:

#### **ANSI B11.4—Shears, Construction, Care, and Use**

The ANSI B11 standards were developed to establish levels of responsibility for manufacturing safe products, installation, training, and use of these products. The levels of responsibility are fairly evenly distributed between the manufacturer, the owner/end user of the equipment, and the operator. Specific guarding requirements are in general assigned to the owner/end user of the equipment.

Please understand that this ruling places the primary burden of responsibility for maintenance of guarding on the owner /end user of the equipment. Inherent in this requirement is the responsibility of the owner/end user of the equipment to develop and maintain guarding specific to their application for the equipment. These ANSI safety requirements may be acquired from:

**American National Standard Institute  
254 West 43<sup>rd</sup> Street  
New York, New York 10036  
Telephone (212) 302-1286  
[www.ansi.org](http://www.ansi.org)**

**PO Box 457  
Hutchinson, KS 67504-0457  
Phone: (800) 338-5471  
Fax: (620) 669-8964**

## **2. Introduction**

The Piranha Maxi Shear is a heavy steel constructed, high performance hydraulic powered machine that provides you several important advantages surpassing most other shears in today's market. The Piranha's single hydraulic cylinder and mechanical linkage system provides the following advantages: 1. The upper shear blade moves parallel to the lower blade thus providing maximum blade life, 2. Full length gibbs guide the ram laterally and front-to-back at all times during the shearing process thus increasing rigidity, shearing accuracy, and blade life, 3. The straight-line shearing action improves shearing accuracy in all metal thickness.

The machine arrives fully assembled requiring only hydraulic oil and electrical power to become fully operational. The heavy steel "C" frames, interlocking cross members, ram, and bed provide the rigidity and resistance to deflection that is necessary for accurate performance. State-of-the-art, maintenance-free, aerospace bearings provide high load capacity and low friction in the form of a thin walled sleeve. They are completely non-metallic and require no lubrication.

Other standard features include: Full length hardened slides with non-metallic ways, variable cut length adjustment, hydraulic hold downs with replaceable polyurethane shoes, heavy duty, inch/mm motorized, disappearing back gauge with Go-To features and .100" retract feature on each stroke. A 53" squaring arm with recessed inch/mm scale, four-edge high chrome, high carbon shear blades top and bottom.

Proper understanding and application of the information and procedures given in this manual will aid in establishing a preventative maintenance program and provide assistance for correcting malfunctions that may occur in the machine. The repair parts list provides information for part procurement and assembly breakdowns to aid in disassembly and re-assembly for repair parts installation. Please have machine serial number available when contacting the factory for service or repair parts.

### **Warranty**

Mega Mfg. will replace or repair with like parts, either new or rebuilt, F.O.B. the factory, or refund the purchase price for any parts on ironworkers, pressbrakes, or shears, which are defective in materials and workmanship within (12) months of the date of purchase. Provided the buyer returns the warranty registration within (30 days) of the purchase date, and, at the seller's option, returns the defective materials freight and delivery prepaid to the seller, which shall be the buyer's sole remedy for the defective materials. A 5 year warranty against defects in materials and workmanship applies to major structural components on pressbrakes and shears. Seller shall not be liable to purchaser or any other person for consequential or incidental damages. Hydraulic and electrical components are subject to their respective manufacturer's warranties. This warranty does not apply to machines and/or components which have been altered in any way, or subjected to abusive or abnormal use, inadequate maintenance and lubrication, or to use beyond seller recommended capacities and specifications. Seller shall not be liable under any circumstances for labor costs expended on such goods or consequential damages. Seller shall not be liable to purchaser or any other person for loss or damage directly or indirectly arising from the use of the goods or any other cause. No employee, agent, officer, or seller is authorized to make oral representations or warranty of fitness or to waive any of the foregoing terms of sale and none shall be binding on the seller.

### 3. Installation

**BEFORE INSTALLING THIS SHEAR, READ AND UNDERSTAND THE SHEAR MANUAL WITH PARTICULAR ATTENTION TO “SAFETY TIPS FOR MAINTENANCE PERSONNEL” THE CURRENT ANSI B11.4 STANDARD-“SAFETY REQUIREMENTS FOR THE CONSTRUCTION, CARE AND USE OF SHEARS.” Copies can be ordered from: American National Standards Institute, 1430 Broadway, New York, New York 10018**

#### 3.1. Unpacking

**CAUTION: THE SHEAR IS HEAVY IN FRONT. GUARD AGAINST TIPPING UNTIL ANCHOR BOLTS ARE SECURED.**

This machine was carefully packaged at the factory to avoid damage during shipment, should any damage be noticed, contact the responsible freight company immediately and report the damage. Indicate any damage on the Bill of Lading. All Warranty information included in this packet must be returned to the factory.



**Figure 1: Lifting Lug Location**

The Piranha 1/4-12 Shear must only be lifted using a crane, and the lifting lugs located in front of the hydraulic oil tank on top of the machine. **Do not** lift the machine from the bottom (forklift or jack) as the machine is top and front heavy and can tip resulting in serious bodily harm or death. Lifting the machine from the bottom can also result in machine damage.

**WARNING: CHECK BLADE GAP BEFORE CYCLING MACHINE.**

**FAILURE TO DO SO MAY CAUSE BLADE DAMAGE**

## 3.2. Placement

Piranha recommends that the machine be placed on a reasonably level concrete foundation suitable to support the shear's total weight and in accordance with local building codes. The machine should be placed on a single concrete pad free of cracks and seams. Prior to anchoring or setting, the shear should be leveled and shimmed. Section 3.4 of this manual discusses leveling the machine. Anchoring can be accomplished using suitable masonry anchors. Use the machine as a template for anchoring hole locations. Placement of the machine should allow easy access around the machine for the operator and maintenance personnel. For safe operation placement should allow tooling to be installed onto the bed from the end of the machine.

It is recommended that a minimum four-foot area around the Piranha 1/4-12 Shear be provided.

### 3.2.1. Initial leveling

**CAUTION: THE SHEAR IS HEAVY IN FRONT. GUARD AGAINST TIPPING BEFORE AND DURING LEVELING.**

Level adjusting screws are only provided on the rear feet. The Piranha 1/4-12 Shear must be placed on four steel pads: 2 each 6" x 6" x 3/4" for the front feet and 2 each 6" x 6" x 1/2" for the rear feet. These pads are provided with the shear.

## 3.3. Cleaning

Clean the bed surface, with a mild solvent so as not to damage the paint finish on the machine. The main cylinder rod must also be free of contaminants. Any contaminants left on the cylinder rod may damage the chrome finish and related hydraulic seals. The cylinder rod must be clean and dry. Wipe down the rest of the shear with a mild cleaning solution.

## 3.4. Precision Leveling

The Piranha 1/4-12 Shear must be leveled precisely prior to operation. The following steps represent the typical leveling procedure. These instructions must be followed to avoid damaging the machine.

Using a machinist level, having an accuracy of one-half thousandths of an inch per foot, place the level facing front to back on the left side of the shear squaring arm. Adjust the rear leveling bolt until the bubble on the level is centered. Then, repeat for the right side, placing the level on the outside of the table. It's very important that the sides of the table be parallel to each other with no crosscorner binding of the table. Once the machine is level, place shims having a thickness equal to the gap, between the base plate and the bottom of the shear foot. After your shim stock is in place release the adjusting bolts and recheck the level to ensure that the left and right side of the machine have remained parallel. Tighten the anchoring bolts and recheck the level of the shear. If necessary, re-adjust the shim pack height if the shear has moved during anchoring. Do not cycle machine before it's leveled, or you may damage the shear blades!

### NOTE:

**Re-check machine level after the first 200 hours of operation, and at regular intervals. Consult the Maintenance section for additional information.**

### **3.5. Electrical**

**CAUTION: ELECTRICIANS CHECKING DIRECTION OF ROTATION SHOULD BE CAUTIONED NOT TO OPERATE THE SHEAR UNTIL IT HAS BEEN THOROUGHLY CHECKED, CLEANED, LEVELED AND LUBRICATED. A WIRING DIAGRAM IS FURNISHED IN THIS MANUAL. SHEAR OPERATING MODE SWITCH MUST BE IN THE OFF POSITION WHEN CHECKING MOTOR ROTATION.**

**BEFORE DRILLING ANY HOLES IN THE ELECTRICAL ENCLOSURE, BE SURE THAT THE ELECTRONIC CIRCUIT BOARDS/EQUIPMENT ARE PROTECTED FROM METAL CHIPS CONTACTING THE CIRCUIT BOARD(S). DO NOT USE COMPRESSED AIR TO BLOW METAL DEBRIS FROM THE ENCLOSURE. USE A VACUUM TO REMOVE ANY METAL PARTICLES.**

Voltage requirements may be verified by comparing the fuse part number to the chart located on the inner door panel of the main electrical box. (See Figure 2)

**SHORT CIRCUIT AND OVERLOAD FUSE PROTECTION  
F1-F2-F3**

| 15 HP MOTOR |      |      | 20 HP MOTOR |      |     |
|-------------|------|------|-------------|------|-----|
| VOLTAGE     | TYPE | AMP  | VOLTAGE     | TYPE | AMP |
| 208 VOLT    | J    | 50   | 208 VOLT    | J    | 90  |
| 230 VOLT    | J    | 40   | 230 VOLT    | J    | 80  |
| 460 VOLT    | J    | 20   | 460 VOLT    | J    | 40  |
| 575 VOLT    | J    | 17.5 | 575 VOLT    | J    | 30  |

**Figure 2: Fuse Size Chart**

**3.5.1 Motor Rotation**

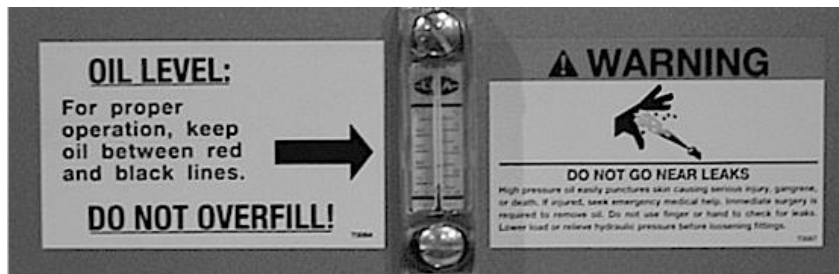
Electrical connection of the 3-phase systems requires proper phasing. When connecting the press to a 3-phase power source, the rotational direction of the pump drive motor must be correct. The rotational direction may be observed by removing the orange cover plate located on the pump/motor adapter. The motor must rotate in the direction of the arrow on the motor. Before operating the machine insure the cover is securely in place.

A licensed electrician should perform all electrical connections.

**!** **Warning** - The control transformer is for machine operation only. Do not use the machine transformer to power any secondary devices.

**3.6. Hydraulic**

Before applying power to the Piranha 1/4-12 Shear, the hydraulic reservoir must be filled with oil. To fill the reservoir, locate and remove the filler/breather cap on top of the reservoir. Fill the reservoir with Mobil DTE-13 or ISO32 equivalent, filtered to an ISO 17/15/13-cleanliness level. The proper oil level is between the red and black lines of the sight gauge found on the rear of the reservoir (See Figure 3). Do not over fill the reservoir. Replace the filler/breather cap.



**Figure 3: Oil Level & Temperature Sight Gauge**

Upon initial start-up of the hydraulic unit visually inspect around the machine for any possible leaks. Do not search for hydraulic oil leaks using exposed flesh; hydraulic pressure can puncture the skin.

### **3.6.1 Rear Safety Guards**

Reposition the yellow machine safety guards, so they protrude past the rear of the side frames. The guards must be positioned to prevent a person from entering the backgauge bar travel area.



## 4. Operator Controls

Operator selectable controls are provided on the Pedestal Control and on the Main Control Panel. Functionality of both stations is described in the following subsections.

### 4.1. Main Control Panel Programmable CNC

The main control panel is located on the left hand side of the Piranha 1/4-12 Shear. The following subsections describe the controls located on this panel.



Figure 4: Main Control Panel-Programmable CNC

#### 4.1.1. Start

Depressing the green Start pushbutton will apply power to the electric motor that drives the Piranha 1/4-12 Shear hydraulic power unit.

#### 4.1.2. Stop

Depressing the stop button will stop the pump motor, but will maintain electrical power to the backgauge control. Re-calibration of the backgauge is not required when the Stop button is depressed.

#### 4.1.3. E-Stop

When you depress the emergency stop, electrical power will be removed from the drive motor and all base machine control circuits, stopping all machine movement. Twist the button clockwise to reset it. The machine cannot start until the E-Stop button has been reset. The backgauge must go through its calibration sequence when the machine is powered up again.

#### **4.1.4. Up Button**

The up button will raise the ram from any position to the full up position

#### **4.1.5. Cut Length Selector Switch**

The cut length selector switch controls the stroke depth of the ram. Shortening the ram stroke permits rapid shearing of shorter material.

#### **4.1.6. Mode Selector Switch**

The run mode selector switch permits three operating modes:

**Single:** The ram will descend when the footswitch is depressed and will pause when the footswitch is released at any point during the down stroke. The shear ram will complete only one cycle in this mode. The footswitch must be reactivated to begin a new shearing cycle.

**Jog:** During a shear cycle, the ram will stop when the footswitch is released.

**Continuous:** The ram will cycle continuously when the footswitch is depressed. Releasing the footswitch during the down stroke will cause the ram to stop, releasing the footswitch during the upstroke will not affect the return stroke of the ram.

#### **4.1.7. Shadow Light Switch**

The shadow light switch will turn on lights that cast a shadow line onto the material being sheared.

## 4.2. Backgauge Control-Programmable CNC

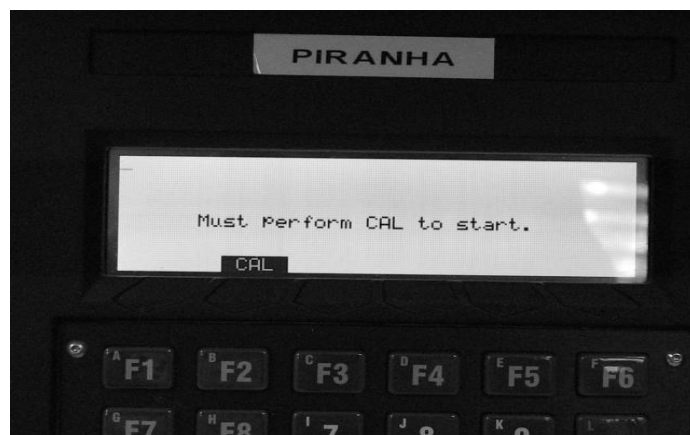
### 4.2.1 Keypad Functions



**MAIN BACKGAUGE CONTROL CONSOLE**

### 4.2.2 Calibration / Re-calibration

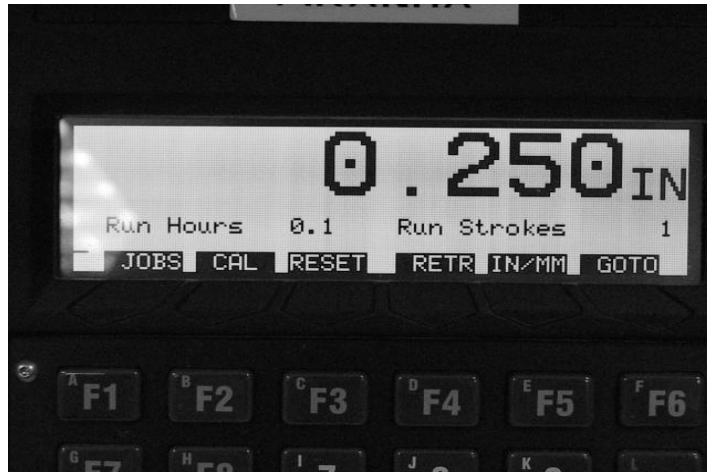
On initial power up or when the E-Stop button has been depressed, the backgauge /controller must be calibrated. The controller will sequence through a start routine and ask for the calibration button to be depressed. Simply depress the "CAL" (F2) button and the backgauge will automatically perform the calibration sequence.



**CALIBRATION SCREEN**

### 4.2.3 Programming A Job

When the calibration sequence has been performed, the controller will display the "MAIN SCREEN". See Figure #3.



### MAIN SCREEN

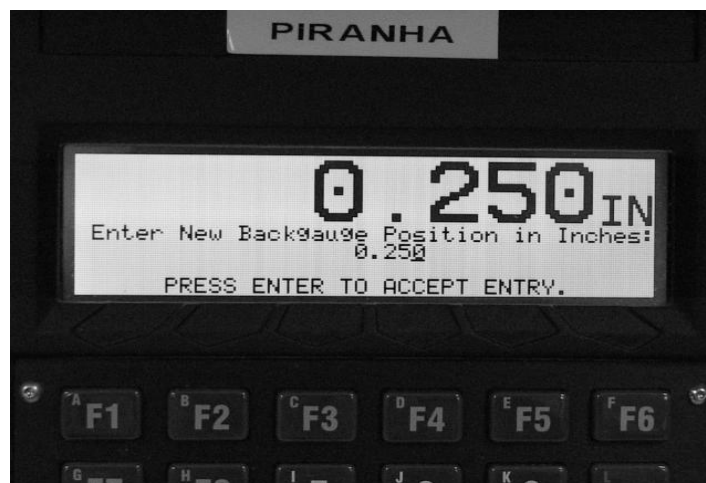
**IN/MM:** Depress the IN/MM button to toggle between Inch and MM modes. Programming may be done in either mode.

**RETR:** Depressing the RETR button will cause the backgauge to position in the fully retracted mode, i.e.: the backstop bar will be positioned at the furthest dimension and parked in the “disappearing position.”

Two options are available for programming a job, a single “Go-To” dimension, or a multi step job.

#### 4.2.3.1 Go-To Function

Depress the “Go-To” button, enter the desired dimension (must be between .250 & 36.00”) and press enter. The control will display an “Entry accepted” message and the backgauge will move to the programmed position. Position the material against the backstop bar, operate the footswitch to initiate the shear cycle.

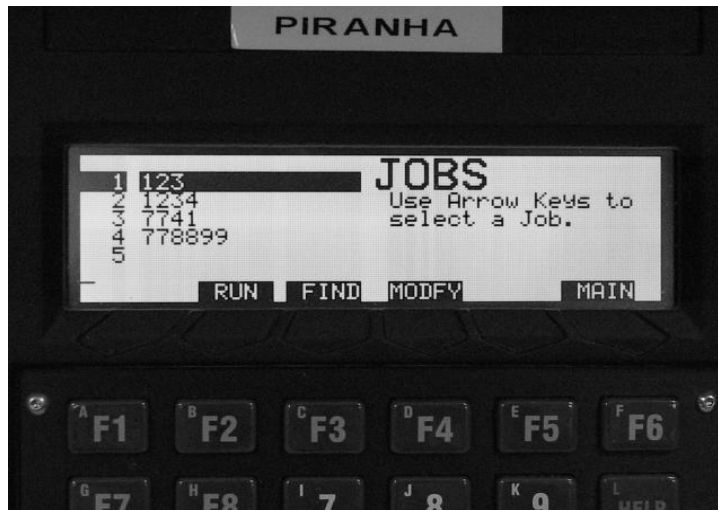


### GO-TO SCREEN

#### 4.2.3.2 Programming Jobs

To program a multi step job, perform the following steps:

1. Depress the "JOBS" button (F1)
2. Use the up or down arrow keys to select a blank job field.
3. Depress the "MODIFY" button.
4. Depress the "NEW" button.
5. Enter a job name. The entry may be all alphas, numeric or alphanumeric. To use the alpha characters, depress the "SHIFT" button which is located on the lower left corner of the keypad.  
**Note:** If you make an error entering the job title, use the left/right arrow button to move the cursor under the incorrect digit, press the "DEL" button, and continue entering the correct information.
6. When the job title is programmed, depress the "ENTER" button.
7. Depress the "EDIT" button
8. Enter the target backgauge dimension and depress the "ENTER" button.
9. Enter the number of cuts (or cycles) in the "Reps" field; depress the "ENTER" button.
10. To enter additional steps or cycles, depress the "ADD" (F1) button and repeat steps 8 & 9.
11. If one of the steps requires the backgauge to retract fully, depress the "RTRCT" button (F5) in the "Length" field.
12. When the job is programmed, depress the: DONE" (F6) button.
13. To run the job, depress the "DONE" button.
14. Depress the "RUN" button.
15. Depress the "ENTER" button, and the backgauge will advance to the position programmed in step 1.
16. When the complete job has been cycled, the screen will display "JOB COMPLETE".
17. Depress the "OK" (F5) button and the screen will revert to the "MAIN SCREEN" display.



**MULTI-STEP JOB SCREEN**

#### 4.2.4 Recalling and Running an Existing Job

1. From the Main screen, depress the "JOBS" button (F1)
2. Using the up/down arrow buttons, maneuver the desired job to the highlighted field and depress "RUN" (F2).
3. Enter the number of cycles required to run this job.
4. The screen will display a confirmation of the job number to run, depress the "ENTER" button to run the job.

#### 4.2.5 Editing a Job

1. From the Main screen, depress the "JOBS" button (F1)
2. Using the up/down arrow buttons, maneuver the job list to the highlighted field and depress "MODIFY" (F4).
3. The "JOB ENTRY" screen will display.
4. Depress the "EDIT" (F3) button.
5. The parameters of each step will display. Using the up/down arrow buttons, move the field to the step to edit and depress the "EDIT" (F2) button.
6. Edit the first field or press the "ENTER" button to advance to the next field to be changed. Make the desired changes and depress the "ENTER" button to accept the changes.
7. Depress the DONE" (F6) button to complete the sequence.
8. Depress the DONE" (F6) button again to enter the "JOBS" screen.

#### 4.2.6 Renaming a Job

1. From the Main screen, depress the "JOBS" (F1) button
2. Using the up/down arrow buttons, maneuver the job list to the highlighted field and depress "MODIFY" (F4).
3. The "JOB ENTRY" screen will display.
4. Depress the "RENAM" (F2) button.
5. Enter the new name for the job,
6. Depress the "ENTER" button to accept the changes.
7. Depress the DONE" (F6) button to complete the sequence.

#### 4.2.7 Copying a Job

1. From the Main screen, depress the "JOBS" (F1) button
2. Using the up/down arrow buttons, maneuver the job list to the highlighted field and depress "MODIFY" (F4).
3. The "JOB ENTRY" screen will display.
4. Depress the "COPY" (F4) button.
5. The COPY screen will display information stating the "copy from XXX and the New Job will be XXX (2)"
6. Depress the "OK" (F2) button.
7. The job will be copied and renamed XXX (2).
8. To rename the job, use the up/down arrow buttons, maneuver the job to the highlighted field.
8. Depress the "RENAM" (F2) button.
9. Enter the new name for the job,
10. Depress the "ENTER" button to accept the changes.
11. Depress the DONE" (F6) button to complete the sequence.

#### 4.2.8 Stroke Counter

1. From the Main screen, depress the “RESET” (F3) button
2. To reset the stroke counter, depress the “STRKS” (F4) button.
3. Depress “DONE” (F6) button.

#### 4.2.9 Hour Meter

1. From the Main screen, depress the “RESET” (F3) button
2. To reset the hour meter, depress the “HOURS” (F2) button.
3. Depress “DONE” (F6) button.

#### 4.2.10 Protected Access Screens

F7, - F9 are dedicated function pushbuttons.

F9 will return an operator to the “MAIN SCREEN”

F7 is a protected access screen for supervisor entry. This screen permits the resetting of service-required messages and other machine tuning functions. A temporary access code (9999) is programmed, permitting initial access to the protected screen. This enables a supervisor to enter preferred access code. The following section describes the functions available in the Supervisor Screen.

**Delay Time:** Permits programming a “global” time delay between shearing cycles in Continuous Mode.

**Zero Offset:** Permits electronic tuning of the backgauge calibration position. This is a “global” adjustment.

##### **Zero Offset Adjustment Procedure:**

1. Press F7 Button
2. Enter password, Factory Default is 9999
3. Press Enter
4. Press Zero Offset button (F2)
5. Enter correction dimension
6. Press Enter
7. Press Done (F6)

**Service Notes:** At predetermined intervals, a \*Srvc. Req'd message will appear in the upper left corner of the display. This function reminds the operator or maintenance department that scheduled preventative maintenance is due. Depressing the “SERVICE NOTES” (F3) pushbutton will display the maintenance requirements for this service cycle. Piranha highly recommends that this schedule is followed. Failure to do so may result in unscheduled maintenance requirements. Follow on-screen instructions to reset the service timer.

**To clear the service reminder,** press F7 and enter the Supervisor password (Factory default password is 9999) and press Enter. Press F3 – Clear – Done.

**Reset:** Supervisor Hours & Supervisor Strokes

**New Password:** Permits supervisor(s) to change password at their discretion.

**F8:** is a Mega protected screen and is only accessible through a password supplied by the factory. This section contains vital machine operational codes and settings and must not be accessed without authorization and supervision from a Piranha service engineer.

### 4.3. Main Control Panel Programmable GOTO

The main control panel is located on the left hand side of the Piranha 1/4-12 Shear. The following subsections describe the controls located on this panel.



Figure 5: Main Control Panel-Programmable GOTO

#### 4.3.1. Start

Depressing the green Start pushbutton will apply power to the electric motor that drives the Piranha 1/4-12 Shear hydraulic power unit.

#### 4.3.2. Stop

Depressing the stop button will stop the pump motor.

#### 4.3.3. Up Button

The up button will raise the ram from any position to the full up position

#### 4.3.4. Mode Selector Switch

The run mode selector switch permits the operator to select between three operating modes:

**Single:** The ram will descend when the footswitch is depressed and will pause when the footswitch is released at any point during the down stroke. The shear ram will complete only one cycle in this mode. The footswitch must be reactivated to begin a new shearing cycle.

**Jog:** During a shear cycle, the ram will stop when the footswitch is released.



**Continuous:** The ram will cycle continuously when the footswitch is depressed. Releasing the footswitch during the down stroke will cause the ram to stop, releasing the footswitch during the upstroke will not affect the return stroke of the ram.

## 4.4. Backgauge Control-Programmable GOTO

### 4.4.1. Programming and Data Entry Keys

**0-9** Use the number keys to input numerical values, or to perform special functions when used in conjunction with the Function (FCN) key.

**IN/MM** Select measurement unit (inch or metric). Depress this key to toggle between the two modes.

**FCN** Function key is used in conjunction with other data entry keys to enable special functions.

**CAL** Used to enable calibrate the backgauge.

**GO** Used to initiate backgauge movement to a programmed position.

**CLR** Clears data entry, zeros display, cancels preset mode.

**Decimal** Used to enter decimal during data entry. Restores display to target after GO has been depressed.

**Decimal Blinking** Target dimension is being displayed, to view actual dimension, momentarily depress CAL button.

**Decimal Solid** Actual position is being displayed, to view target dimension, depress decimal point button.

### 4.4.2. Programming Functions

#### 4.4.2.1. Backgauge Positioning

Enter desired dimension using keypad and depress GO button. Backgauge will position to programmed dimension.

#### 4.4.2.2. Presets

This control will store 9 preset dimensions (1-9).

To **program a preset dimension**, (1) enter the dimension using the keypad, (2) press FCN, the letter "P" will show on the left side of the display.

(3) press and hold the preset number the dimension is to be stored with until the flashing stops. For example, if a dimension of 12.375" is to be stored in preset #7, use the following procedure. On the keypad enter (1) (2) (.) (3) (7) (5) (FCN) Press and hold (7) until the flashing stops. 12.375 has been stored in preset #7.

To **recall a stored preset**, press the FCN key, press the desired stored preset number (1-9), when the GO button is depressed, the backgauge will position to the preset dimension. For example, to recall preset #7 (which has a dimension of 12.375" stored), Press FCN, press #7 (on the keypad), 12.375

will display on the LED readout. Depress the GO button to position the backgauge to 12.375”

**WARNING: DO NOT USE PRESET STATION #0** for programming preset stations. This will cause a BG positioning malfunction which may damage the BG system.

#### **4.4.2.3. Calibration / Re-calibration**

To calibrate the backgauge to an actual position, use the following procedure:

1. Measure the actual distance from the lower blade edge to the backgauge bar. (Example 20 inches) Press (CLR), (2) (0)(.) (0) (0) Press and hold (CAL) until flashing stops. The display will show the calibrated value (20.000”)
2. Enter a short distance, (i.e. 3”), press GO button, backgauge will position to 3”.
3. Shear a piece of metal and measure the sheared part with a caliper. Enter the measured dimension onto the keypad, press and hold CAL until the flashing stops. Verify the accuracy by shearing another part. Repeat step # 3 if minor adjustments are required.

**IMPORTANT:**

**DO NOT DEPRESS THE STOP BUTTON WHEN THE SHEAR BACKGAUGE IS IN MOTION.** This will cause the backgauge to lose calibration and will require recalibration.

**ENSURE SHEAR BLADE/RAM IS AT THE TOP OF STROKE** before turning machine off. Failure to do so will require backgauge recalibration.

**NOTE:** If the backgauge begins “Hunting” for position (continuously goes past the target position), either the drive chain (FIG 25A & B) is too loose or the “Drag Block” (Fig 25C & E) has become loose. To adjust the drag block, loosen the jam nut (FIG 25E) and tighten the adjusting screw clockwise in 1/16 rotations until the “Hunting” stops.

**WARNING:** Over adjusting the tightness on the drag block will cause premature motor failure or electrical over current which will result in a blown fuse.

## 5. Shear Operation

**BEFORE OPERATING THE SHEAR, READ AND UNDERSTAND THE CURRENT ANSI B11.4 STANDARD. CAUTION: READ AND UNDERSTAND THIS ENTIRE MANUAL BEFORE PLACING SHEAR IN OPERATION.**

**WARNING: CHECK BLADE GAP BEFORE CYCLING MACHINE.**

**FAILURE TO DO SO MAY CAUSE BLADE DAMAGE**

- ! Always review the instructions provided in this manual and observe shearing safety rules!
- ! Insure that no tools, bolts or other obstructions are in the knife area prior to operating the shear.
- ! Locate any available safety handling tools required.
- ! Keep the floor and surrounding area clean and free of obstruction, debris and oil.

### **5.1. Setting the Shear Blades / Ram Gib Check And Adjustment Procedure:**

The following procedure for blade adjustment is recommended:

1. Verify that the shear is level.
2. **ALWAYS** check gib clearance before adjusting blade clearance.

#### **Checking gib clearance:**

3. Position the shear ram at the top of stroke so the slides are in full contact with the gibs.
4. Remove Side Cover Guards from gib area.
5. Ensure clearance exists between the Blades to prevent blade clash when the blades cross.
6. When checking slide clearances, it is easiest to perform the checks from the rear of the machine. When checking the bottom gib clearances, the low side (left side) and the high side (right side) should be checked 3" from the bottom of the gib assembly. When checking the clearances at the top of the gibs, the low (left side) should be checked from the top gib assembly. The high side (right side) should be checked from the top gib assembly:
7. With a feeler gauge, check the clearance at the bottom of the slide. The feeler gauge must fit between the bearing material and the front side of the ram slide. Acceptable clearance is .003-.004"
8. Repeat this measuring procedure for the other side of the machine.

#### **Adjusting gib clearance:**

9. To tighten clearances, loosen the 3/8" jam nut located at the bottom of the slide assembly. Using an Allen wrench rotate the setscrew clockwise until correct clearance is achieved. Lock jam nut on setscrew.
10. Repeat this procedure for the other side of the machine if adjustment is required.
11. To check the clearance on the top of the slide, insert a feeler gauge between the bearing surface on the rear side of the ram slide. Acceptable clearance is .003"-.004"
12. To tighten clearances, loosen the 3/8" jam nut located at the top of the slide assembly. Using an Allen wrench rotate the setscrew clockwise until correct clearance is achieved. Lock jam nut on setscrew.

13. Repeat this procedure for the other side of the machine if adjustment is required.
14. Re-adjust the remaining setscrews by tightening the screws with a firm “snug”. Tighten the jam nuts.
15. After all the adjustments have been made, re-check the clearances to ensure that they have not moved during the adjustment process.

**ADJUSTING SIDE THRUST BEARINGS:**

1. To set the clearance, loosen the top and bottom jam nuts. Using an Allen wrench rotate the top setscrew clockwise until the set screws stops firmly. Back off setscrew and re-tighten to a light stop. Lock jam nut on setscrew.
2. Repeat this procedure for the bottom adjusting screw.
3. Re-adjust the remaining setscrews by tightening the screws to a light “snug”. Tighten the jam nuts.
4. Repeat this procedure for the other side of the machine.
5. Grease the gibs after adjustments are complete. Cycle the ram while greasing the gibs.

**CHECKING AND ADJUSTING SHEAR BLADE CLEARANCE:**

Nominal knife clearance is typically .004” at the ends and .002” in the center of the shear. The feeler gauge should have a slight resistance or “drag” as it is slid across the blade intersect point.

1. Jog the ram down until the knives intersect before reaching the first hold down.
2. Check clearance at this point and then jog ram down and check clearance at the center of the machine and then at the far end or (high side) of the machine.
3. To adjust blade gap clearance at each end of the blade, loosen top 4 bed bolts, two on each end of the table, and four table stabilizer bolts. Two bolts are located at the bottom of the vertical table stiffener on the inside of the side frame. The second set of stabilizer bolts are located on the outside bottom middle of the side frame. Adjust table in or out by adjusting the “push/pull” table adjusting bolts located in a machined pocket on the table ends.
4. Be sure that the blade gap in the center of the shear will not interfere when adjusting the end clearance. When correct blade clearance is achieved, re-tighten the four table bolts to 300 ft. lbs. Tighten the stabilizing bolts on the outside of the side frame to 300 ft. lbs.
5. If blade gap adjustment is required for the center of the shear, use the stiffener adjustment bolts located at the rear of the stiffener.
6. To close the gap in the center of the shear, loosen one inside bolt and tighten the outside bolt. When correct blade clearance is achieved, tighten the counter locking bolts securely. Recheck blade gap before cycling the shear.

**NOTE:** When rotating the blades, clean and lightly oil blade and seat before installing blade. Tighten blade bolts firmly. Set clearance adjustment to maximum before overlapping, blades: Follow procedure in section 5.1. When grinding blades, grind top and bottom of blade only. Shim lower blade, flush with bed top surface. Clean and lightly oil blade and seat. Tighten blade bolts firmly; again, set clearance to maximum before adjusting to avoid damage to blades; proceed as directed in section 5.1.

## 6. Maintenance Procedures

### **BEFORE MAINTAINING OR REPAIRING THE SHEAR, READ AND UNDERSTAND THE CURRENT ANSI B11.4 STANDARD.**

This section describes the procedures and requirements for maintaining and repairing the major components of the Piranha 1/4-12 Shear.

#### **6.1. Maintenance Schedule**

This section outlines the suggested points and intervals for regular scheduled maintenance. The hydraulic power unit is very sensitive to dirt and other contaminants, but will provide many years of reliable service with a minimum amount of service. The operating temperature and the cleanliness of the oil directly effect the life of the hydraulic oil. Regular oil and filter changes will keep the system clean and free of sticking and clogged valves. Because hydraulic cylinders are lubricated with every stroke, keeping them clean and free of scratches and dings that may damage the cylinder rod seals is most important.

The Piranha 1/4-12 Shear is shipped with an extra hydraulic oil filter. It is important that after the first forty hours of operation the oil filter be replaced. Upon using the included extra oil filter it is suggested that a replacement filter be ordered for the next scheduled filter change.

See parts list for correct filter part number.

1. After First 40 hours:
  - Change hydraulic filter
  - Check fluid level
  - Check gib clearances
  - Grease ram slides
  - Check fittings, bolts, nuts for tightness
2. Every 40 hours (weekly) thereafter:
  - Grease ram slides.
  - Check fittings, bolts, nuts for tightness
3. Every 3 months:
  - Change hydraulic filter  
*The hydraulic filter element should be changed every 3 months depending on workload and environmental conditions. See repair parts section for re-ordering instructions and part numbers.*
  - Check hydraulic fluid level
  - Check machine level & gib clearances
4. Every Year:
  - Grease electric motor
  - Check machine level
5. Every Two (2) years:
  - Change hydraulic fluid

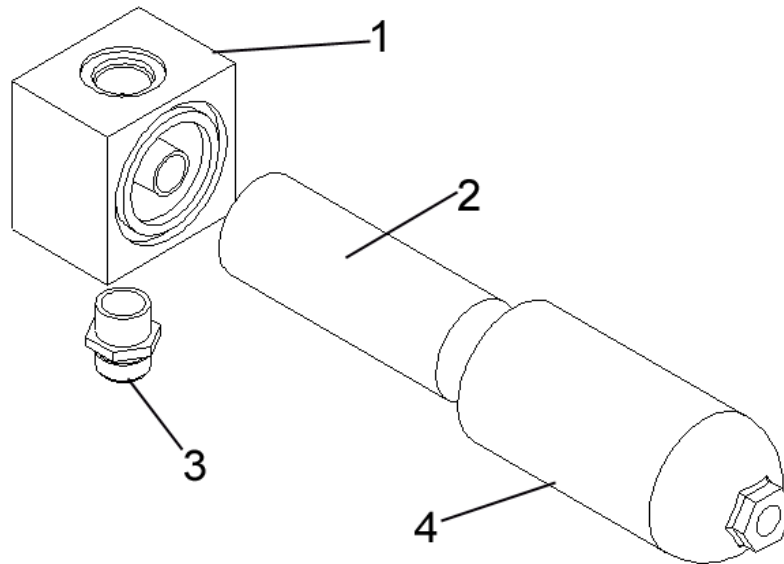
## 6.2. Hydraulic Power Unit

The hydraulic power unit is a sophisticated and complex system. Only trained personnel should attempt to perform adjustment procedures on the unit. The power unit generates very high pressures. **Never check for leaks using hands.**

Before servicing the hydraulic system, block the ram and turn power off.

### 6.2.1. Oil Filter Replacement

Verify the exact element number prior to ordering the replacement element.



**Figure 6: Oil Filter Assembly Exploded View**

| Item | Description     |
|------|-----------------|
| 1    | Filter Body     |
| 2    | Filter Element  |
| 3    | Fitting - inlet |
| 4    | Filter Bowl     |

**Table 1: Oil Filter Assembly Descriptions**

The following steps represent a typical filter element replacement.

1. Insure the main electric power is locked out at the safety disconnect.
2. Place a small container (½-gallon) under the filter bowl.
3. Remove the filter bowl by turning in a counterclockwise direction.
4. Remove the filter element by pulling and turning at the same time.
5. Lubricate the O-ring on the new filter with hydraulic oil and slide into place.
6. Wipe the inside of the filter element bowl and replace.

When changing the hydraulic oil, a new oil filter should also be installed.

## 7. Hydraulic & Electrical Schematics

### 7.1. Electrical Schematic-Programmable CNC

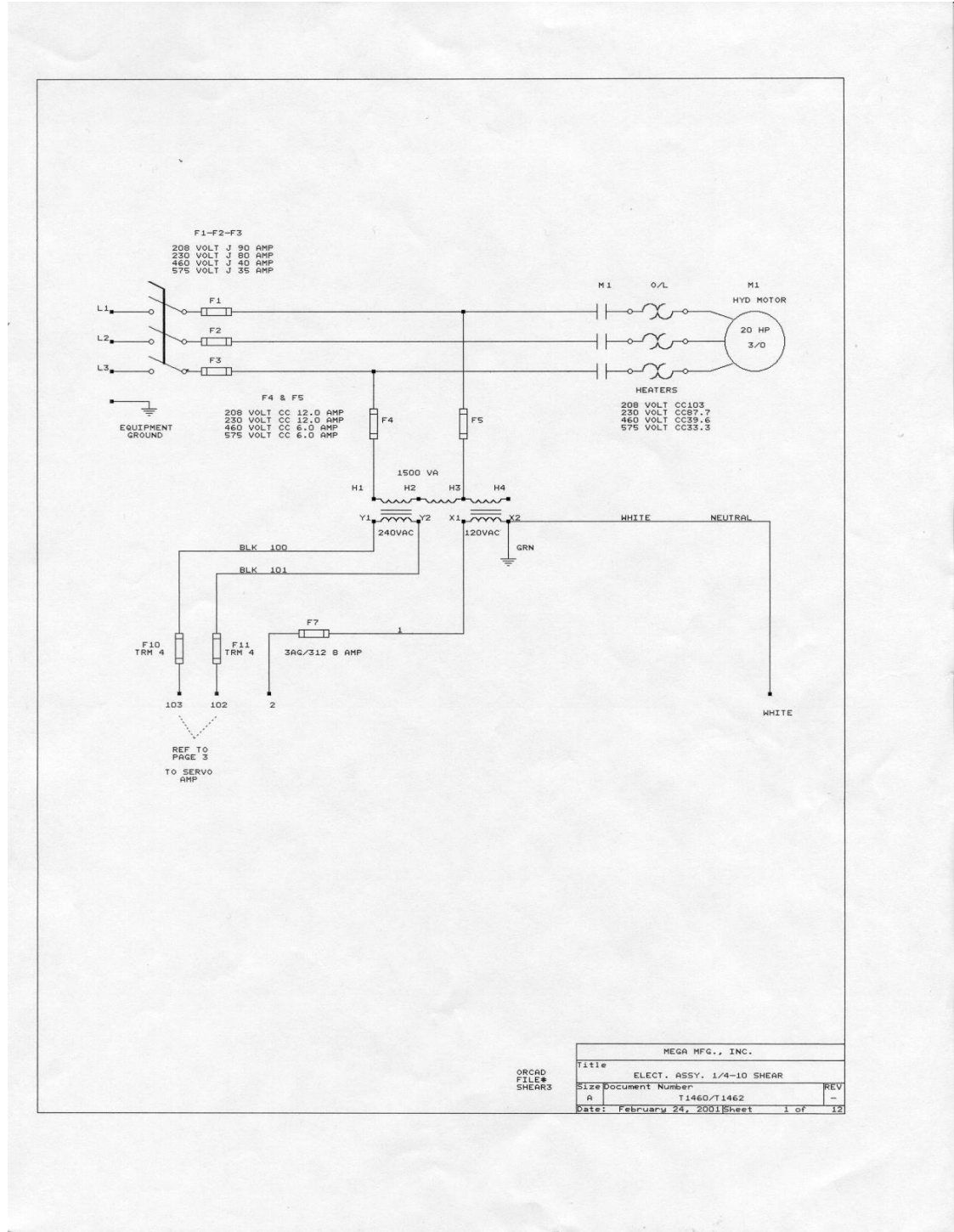


Figure 7: Electrical Diagram 1 of 10

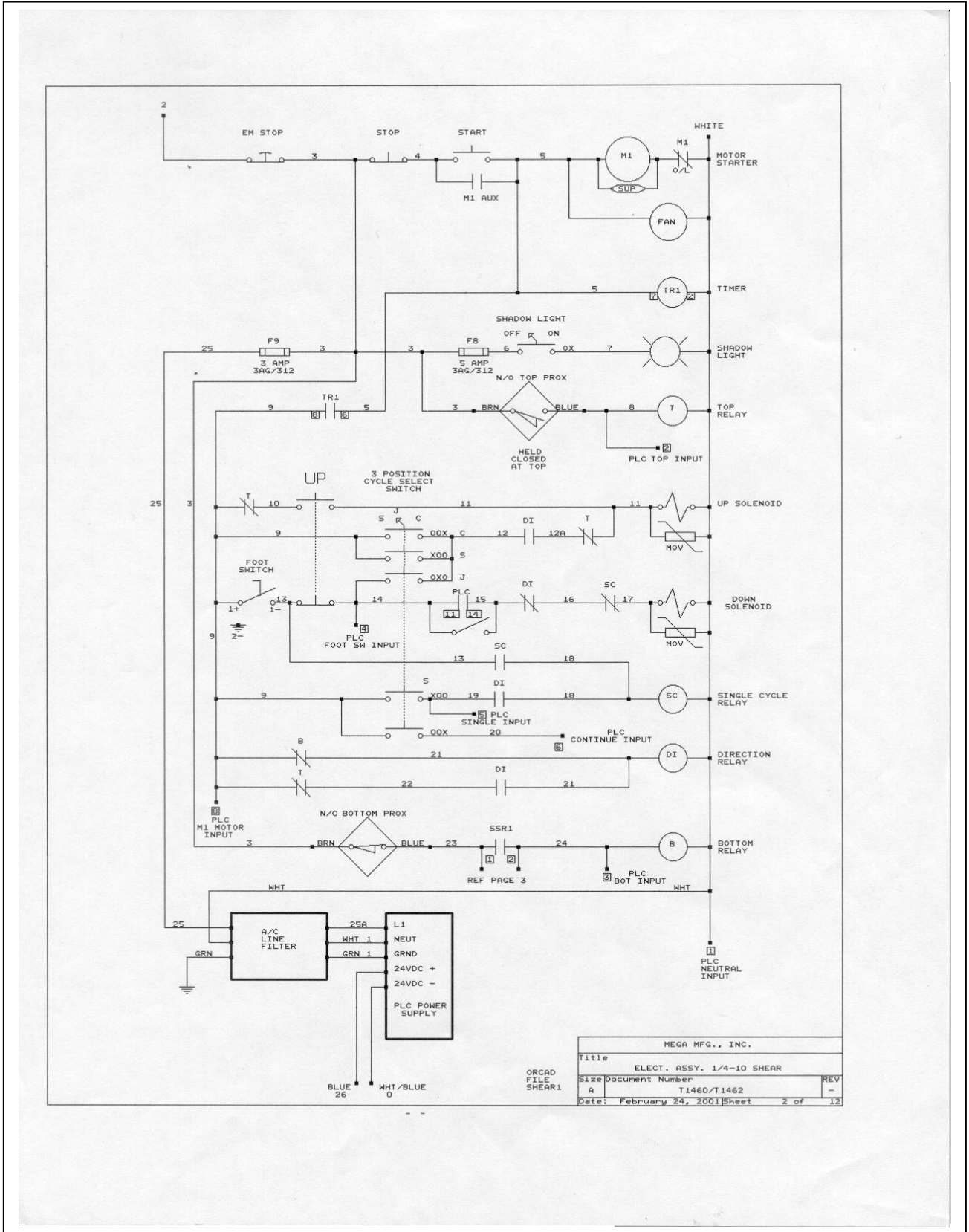
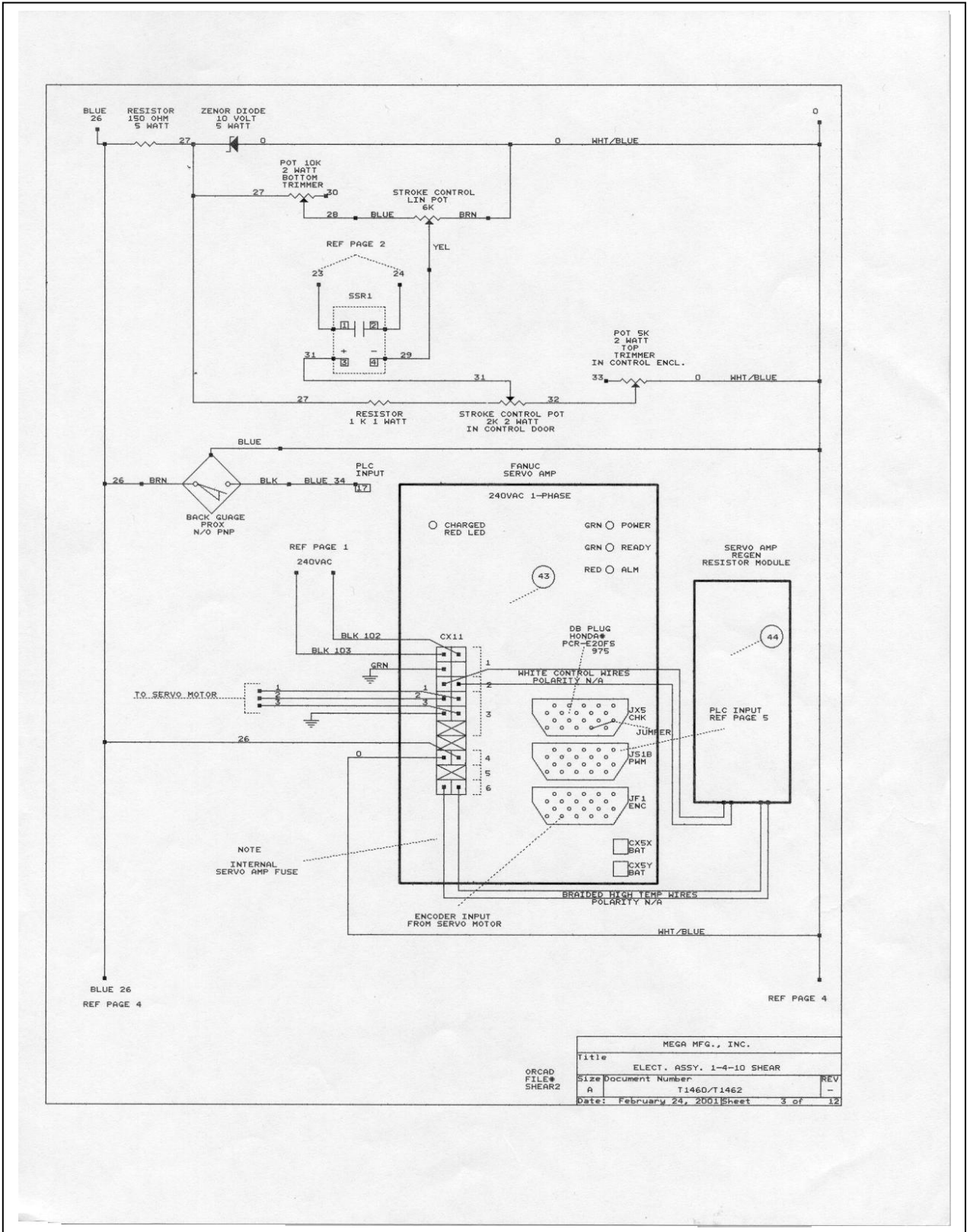


Figure 8: Electrical Diagram 2 of 10





|                         |                           |
|-------------------------|---------------------------|
| MEGA MFG., INC.         |                           |
| Title                   | ELECT. ASSY. 1-4-10 SHEAR |
| Size                    | Document Number           |
| A                       | T1460/T1462               |
| Date: February 24, 2001 | Sheet 3 of 12             |

Figure 9 Electrical Diagram 3 of 10



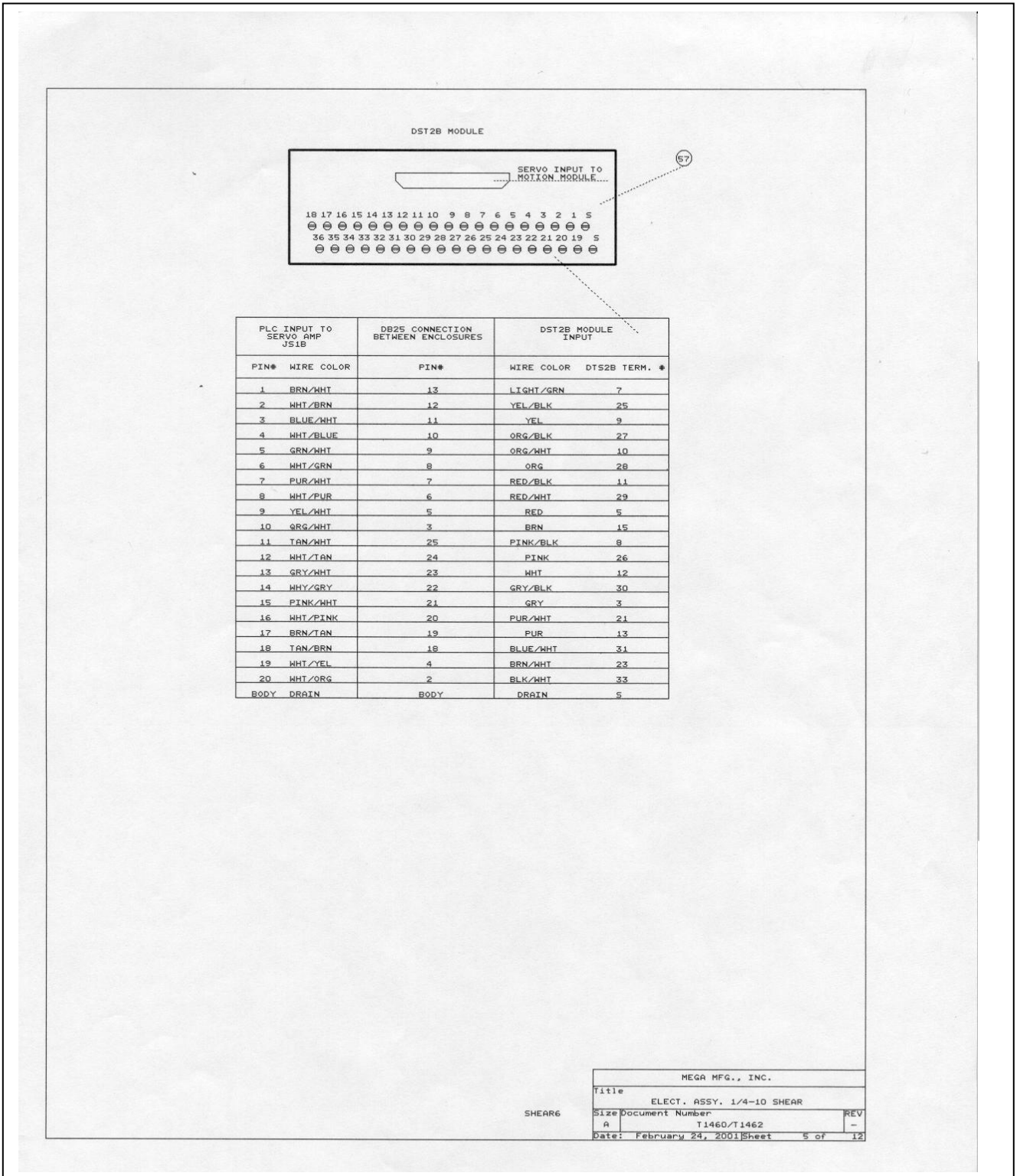


Figure 11 Electrical Diagram 5 of 10

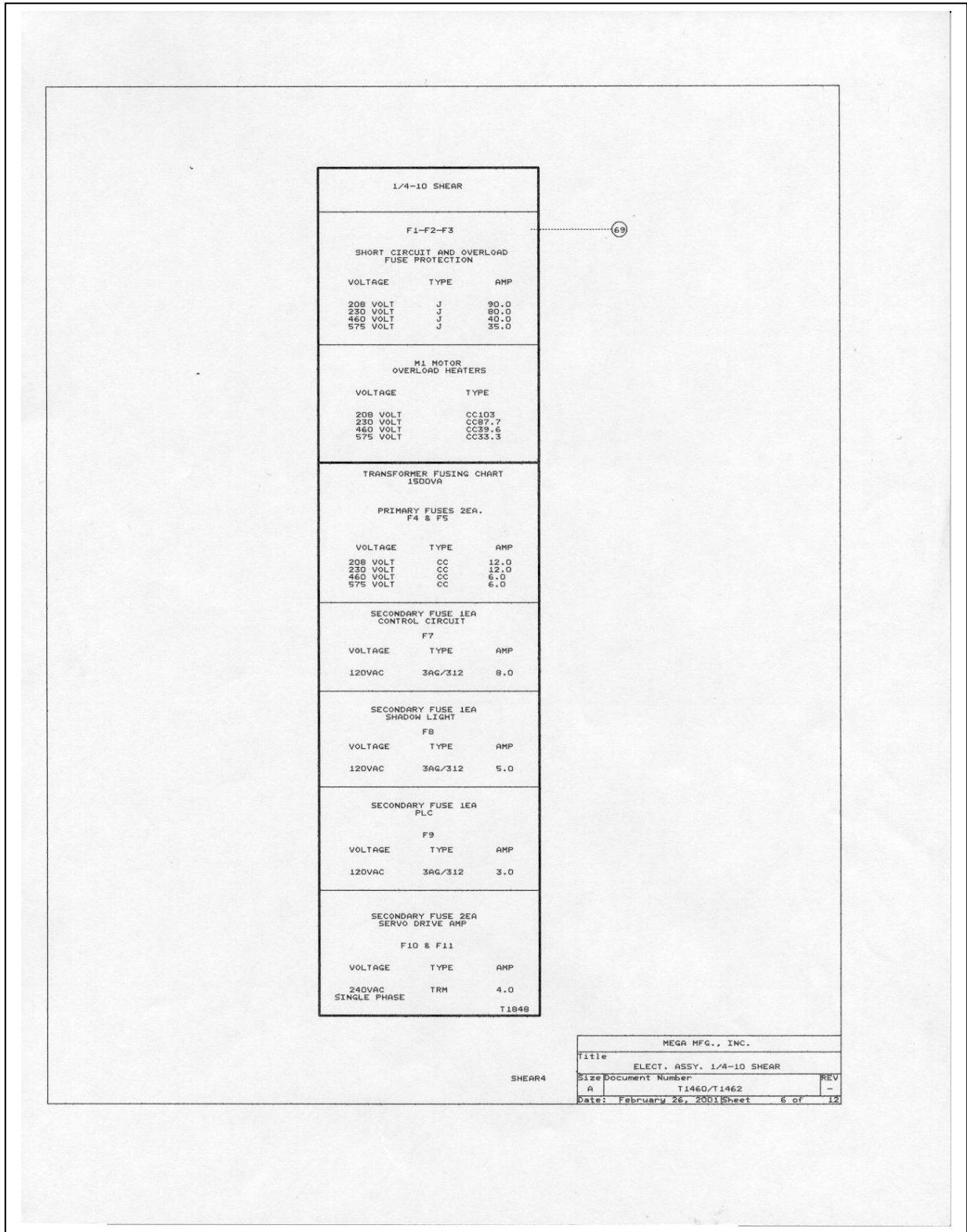


Figure 12: Electrical Diagram 6 of 10

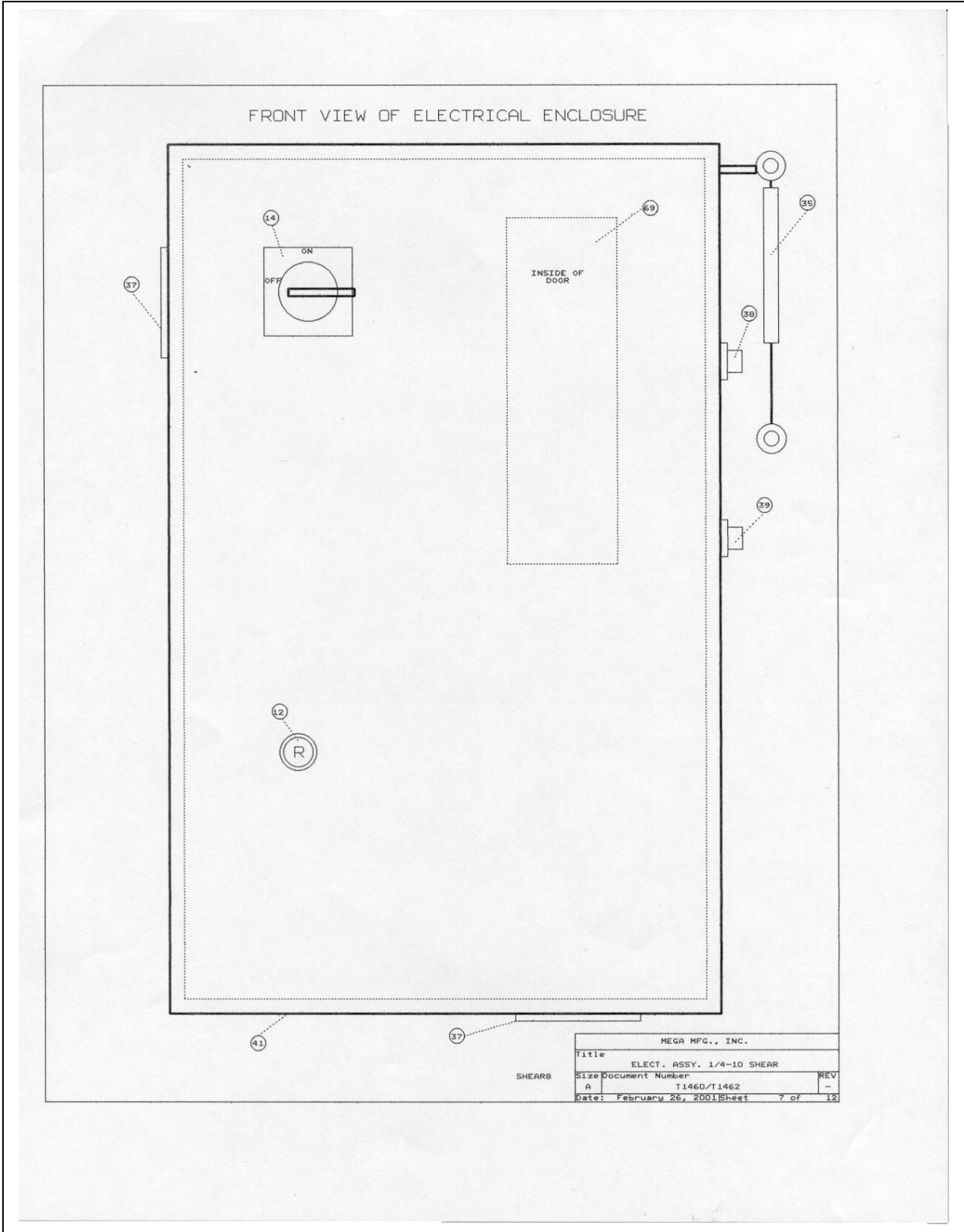


Figure 13: Electrical Diagram 7 of 10

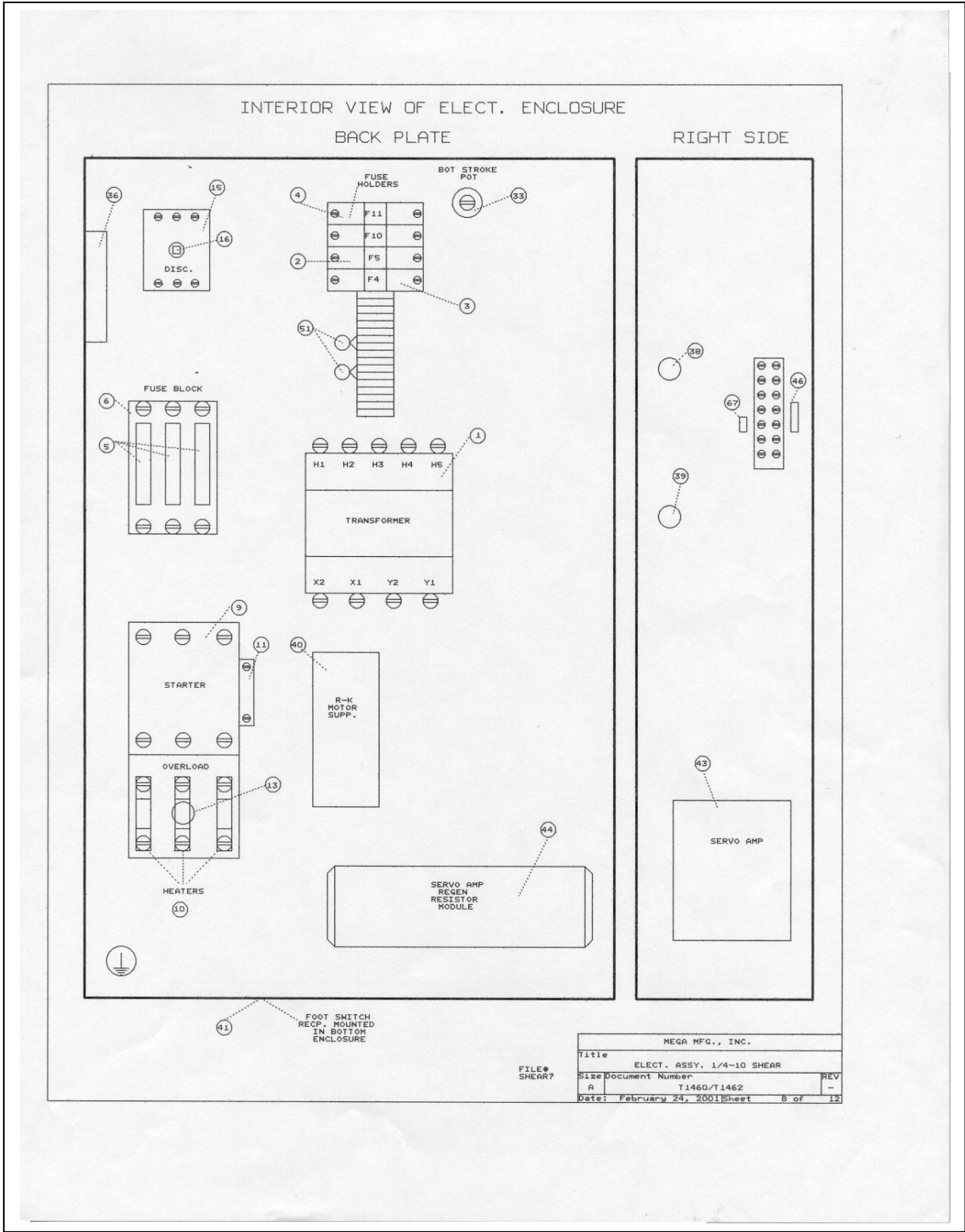


Figure 14: Electrical Diagram 8 of 10

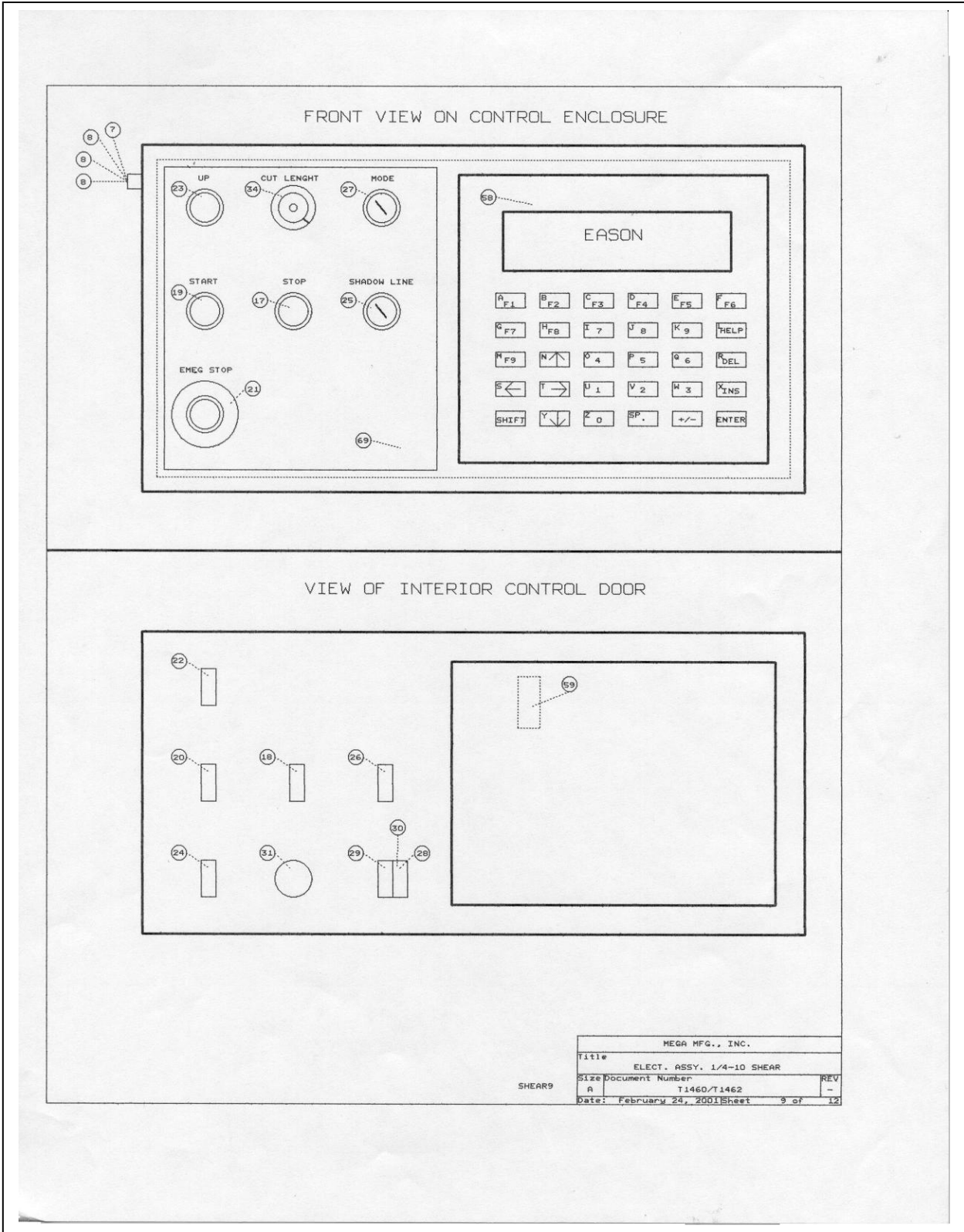


Figure: 15: Electrical Diagram 9 of 10

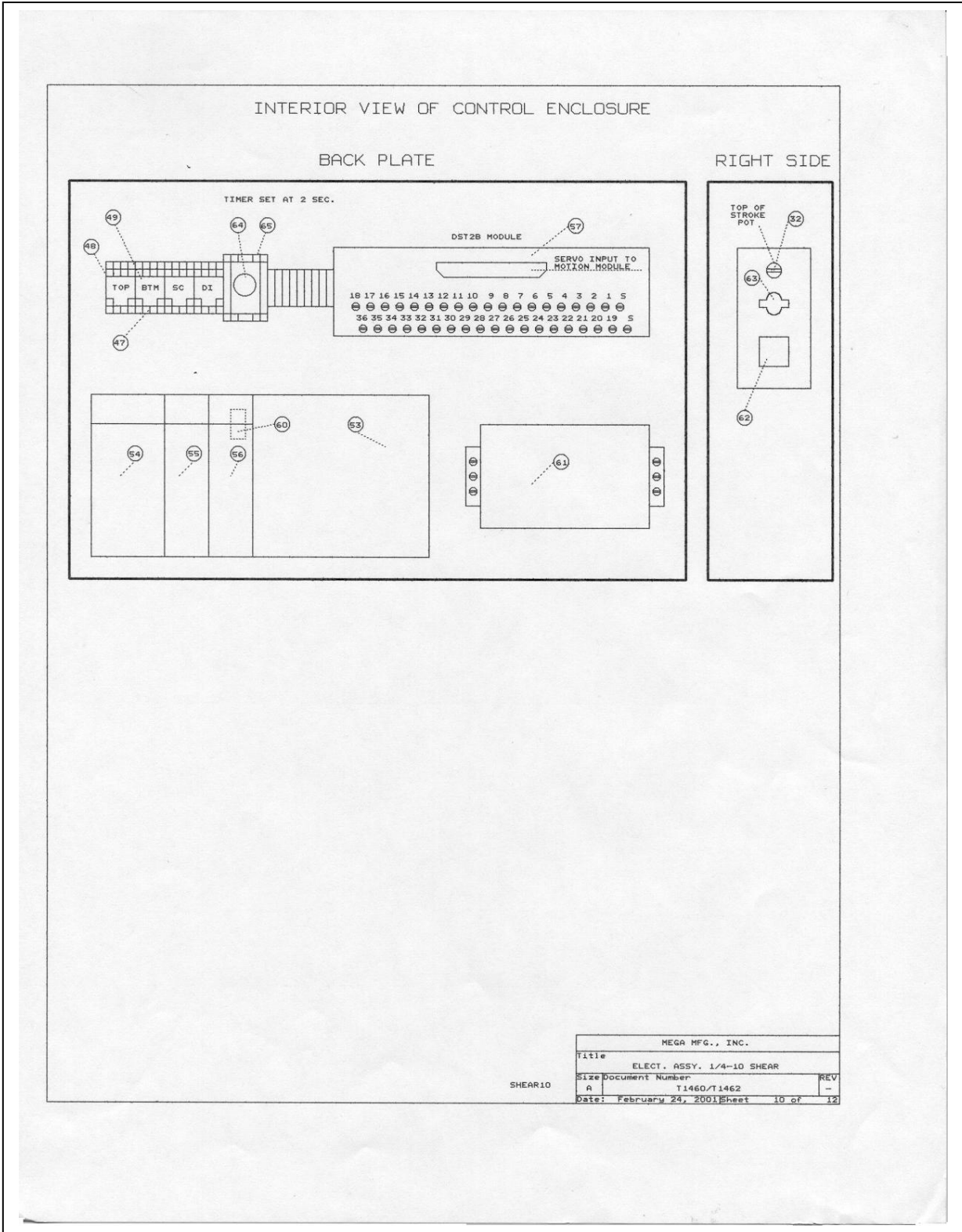


Figure: 16: Electrical Diagram 10 of 10



### Electrical Component List - Programmable CNC

| FIG | DESCRIPTION                                   | QTY | VOLTAGE        | PART #  |
|-----|---|-----|----------------|---------|
| 1   | Transformer 208/230/460/575 Volt              | 1   | 208 - 575 Volt | T1868   |
| 2   | Transformer Primary Fuse F4-F5                | 2   | 208 Volt       | T0770   |
| 2   | Transformer Primary Fuse F4-F5                | 2   | 230 Volt       | T0770   |
| 2   | Transformer Primary Fuse F4-F5                | 2   | 460 Volt       | T1138   |
| 2   | Transformer Primary Fuse F4-F5                | 2   | 575 Volt       | T1138   |
| 3   | Transformer Primary/Secondary Fuse Holder     | 2   |                | T1866   |
| 4   | Transformer Secondary Fuse F10-F11 Servo      | 2   |                | T1867   |
| 5   | Fuse, Motor Short Circuit Protection AJT-90   | 3   | 208 Volt       | T0781   |
| 5   | Fuse, Motor Short Circuit Protection AJT-80   | 3   | 230 Volt       | T0780   |
| 5   | Fuse, Motor Short Circuit Protection AJT-40   | 3   | 460 Volt       | T0777   |
| 5   | Fuse, Motor Short Circuit Protection AJT-30   | 3   | 575 Volt       | T1869   |
| 6   | Fuse Holder, " " " 208 Volt                   | 1   | 208 Volt       | T0784   |
| 6   | Fuse Holder, " " " 230 Volt                   | 1   | 230 Volt       | T0784   |
| 6   | Fuse Holder, " " " 460 Volt                   | 1   | 460 Volt       | T0784   |
| 6   | Fuse Holder, " " " 575 Volt                   | 1   | 575 Volt       | T0784   |
| 7   | Fuse Holder, Control Circuits                 | 3   |                | T0733   |
| 8   | Fuse, Control Circuits F7                     | 1   | 8 Amp          | T0734   |
| 8   | Fuse, Control Circuits F8                     | 1   | 5 Amp          | T0736   |
| 8   | Fuse, Control Circuits F9                     | 1   | 3 Amp          | T1870   |
| 9   | Starter, Motor                                | 1   |                | T0729   |
| 10  | Starter Overload Heaters CC-103               | 3   | 208 Volt       | T0786   |
| 10  | Starter Overload Heaters CC-87.7              | 3   | 230 Volt       | T0788   |
| 10  | Starter Overload Heaters CC-39.6              | 3   | 460 Volt       | T0785   |
| 10  | Starter Overload Heaters CC-33.0              | 3   | 575 Volt       | T0787   |
| 11  | Starter Aux Contact                           | 1   |                | T1303   |
| 12  | Starter Overload Reset Button                 | 1   |                | 531686  |
| 13  | Starter Overload Reset Button Shaft           | 1   |                | 5316861 |
| 14. | Disconnect Operator                           | 1   |                | 531604  |
| 15. | Disconnect                                    | 1   |                | 531602  |
| 16. | Disconnect Shaft                              | 1   |                | T0727   |
| 17. | Stop Button, Red Extd.                        | 1   |                | 5316111 |
| 18. | Stop Button, Contact Block W/Base, NC         | 1   |                | 5316121 |
| 19. | Start Button, Green Flush                     | 1   |                | 5316101 |
| 20. | Start Button Contact Block W/Base, NO         | 1   |                | 531696  |
| 21. | E Stop Button                                 | 1   |                | T0737   |
| 22. | E Stop Button Contact Block W/Base N/C        | 1   |                | 5316121 |
| 23. | Up Button - Yellow                            | 1   |                | T1668   |
| 24. | Up Button Contact Block W/Base, NO            | 1   |                | 531696  |
| 25. | Shadow Light Selecta Switch 2 Pos             | 1   |                | 531695  |
| 26. | Shadow Light Selecta Contact Block W/Base, NO | 1   |                | 531696  |
| 27. | Mode Selecta Switch 3 Pos                     | 1   |                | 5316451 |
| 28. | Mode Selecta, Contact Block W/Base NO         | 1   |                | 531696  |
| 29. | Mode Selecta, Contact Block N/O               | 3   |                | 5316781 |
| FIG | DESCRIPTION                                   | QTY | VOLTAGE        | PART #  |

|     |   |   |                |            |
|-----|---|---|----------------|------------|
|     |   |   |                |            |
| 30. | Mode Selecta, Contact Block N/C               | 2 |                | 591596     |
| 31. | Potentiometer, Stroke Control, 2 K 2 Watt     | 1 |                | T1871      |
| 32. | Potentiometer, Top Stroke Trimmer 5K          | 1 |                | T1414      |
| 33. | Potentiometer, Bottom Stroke Trimmer 10K      | 1 |                | T1678      |
| 34. | Potentiometer, Knob                           | 1 |                | T0762      |
| 35. | Potentiometer, Linear Stroke Control          | 1 |                | T1252      |
| 36. | Fan   | 1 |                | T0726      |
| 37. | Fan Grills, Filter                            | 2 |                | T0725      |
| 38. | Prox, Top - N/O                               | 1 |                | T1674      |
| 39. | Prox, Bottom - N/C                            | 1 |                | T1675      |
| 40. | Suppressor, Motor                             | 1 |                | 591604     |
| 41. | Foot Switch Recp                              | 1 |                | 531618     |
| 42. | Foot Switch                                   | 1 |                | T0748      |
| 43. | Servo Amp                                     | 1 |                | T0927      |
| 44. | Servo Amp Regen Module                        | 1 |                | T0927      |
| 45. | Servo Amp Motor                               | 1 |                | T0926      |
| 46. | Resistor 150 OHM 5 Watt                       | 1 |                | 591629     |
| 47. | Relay Socket                                  | 4 |                | T1306      |
| 48. | Relay Socket Clips                            | 8 |                | T1304      |
| 49. | Relay, 120Vac 4 Pole, Silver Flashed          | 4 |                | T0739      |
| 50. | Hyd. Valve Din Cables A/C                     | 2 |                | 591531     |
| 51. | Suppressor, Mov                               | 2 |                | 591619     |
| 52. | Shadow Lamps                                  | 8 |                | T0467-1    |
| 53. | PLC, CPU Base                                 | 1 |                | 5916073    |
| 54. | PLC, Power Supply                             | 1 |                | 5916072    |
| 55. | PLC,Relay Module                              | 1 |                | T0924      |
| 56. | PLC,Motion Module                             | 1 |                | T0925      |
| 57. | PLC,Aux.Term,Block                            | 1 |                | T0930      |
| 58. | Eason   | 1 |                | T0933      |
| 59. | Eason, E-Prom -Programmed                     | 1 |                | T1775 Rev# |
| 60. | PLC, EE Prom                                  | 1 |                | T1774 Rev# |
| 61. | Suppressor, A/C Line Filter                   | 1 |                | T1861      |
| 62. | Relay - Solid State                           | 1 |                | T1862      |
| 63. | Toggle Switch                                 | 1 |                | 531619     |
| 64. | Timer - 5 Sec.                                | 1 |                | T1863      |
| 65. | Timer Socket - 8 Pin Octal                    | 1 |                | T1864      |
| 66. | Shadow Light Sockets - Double Contact         | 8 |                | T0466      |
| 67. | Diode, Zener - 10 Volt 5 Watt                 | 1 | 10 Volt 5 Watt | T1865      |
| 68. | Decal, Control Legend                         | 1 |                | T1251      |
| 69. | Decal, Elect. Enclosure                       | 1 |                | T1848      |
|     | Servo Motor Harness                           |   |                | T1465      |
|     | AC Harness (parts within the harness include) |   |                | T1464      |
|     | Backgauge Harness Assembly, PLC               |   |                | T1459      |
|     | Linear Pot Harness                            |   |                | T1463      |
|     | Prox Switch Assembly                          |   |                | T1667      |

7.1.1. Electrical Schematic – Programmable GOTO

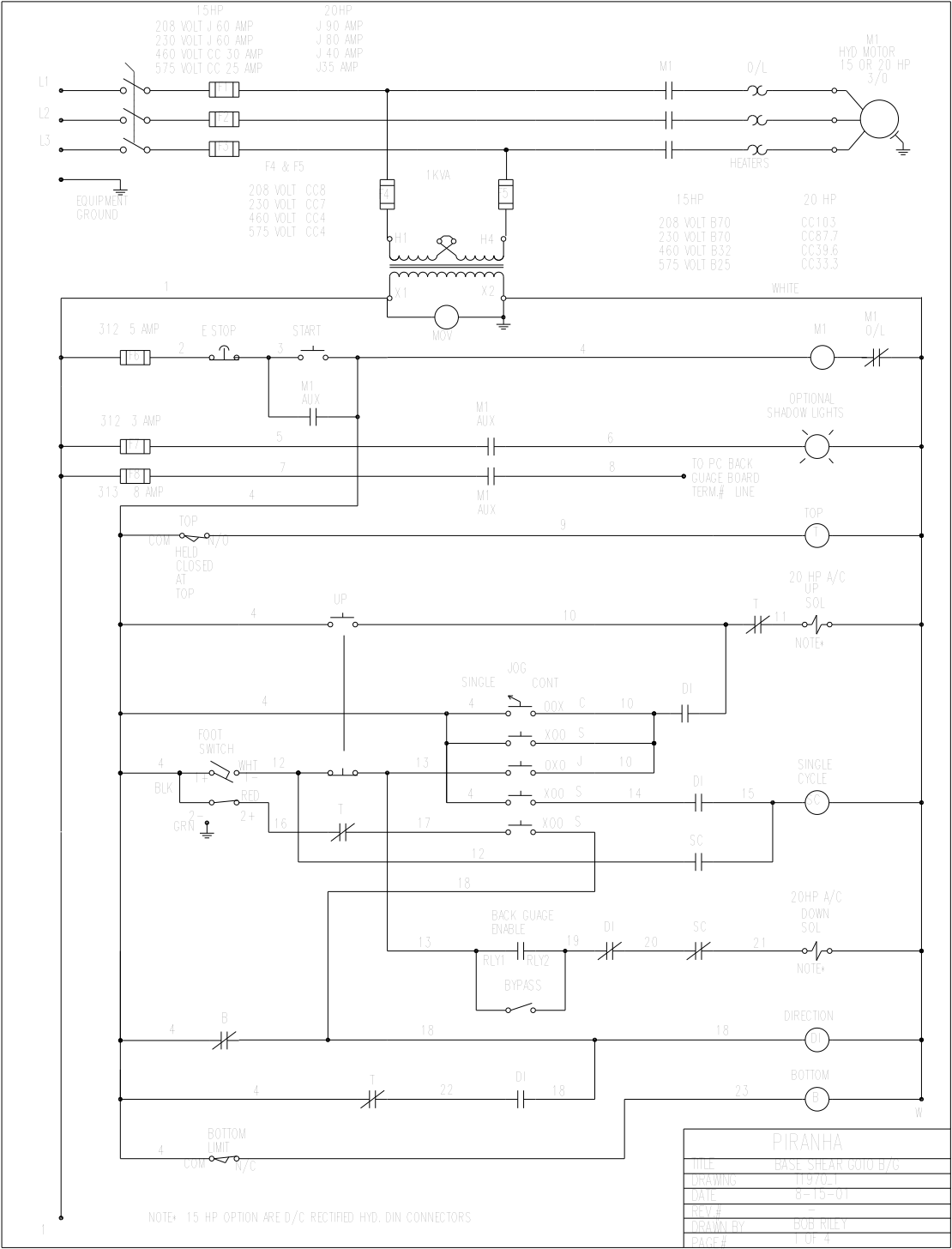


Figure: 17: Electrical Diagram 1 of 4

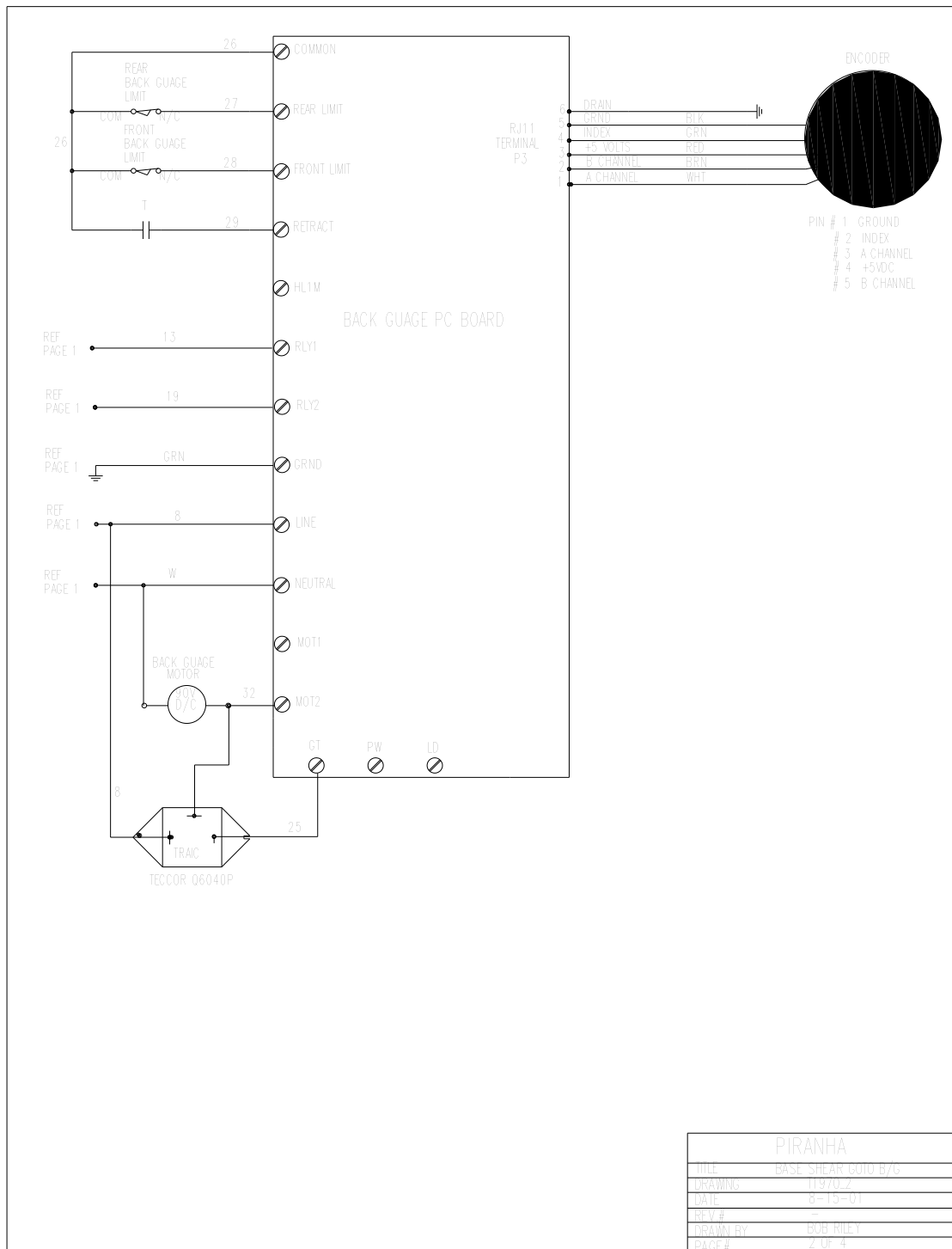


Figure: 18: Electrical Diagram 2 of 4

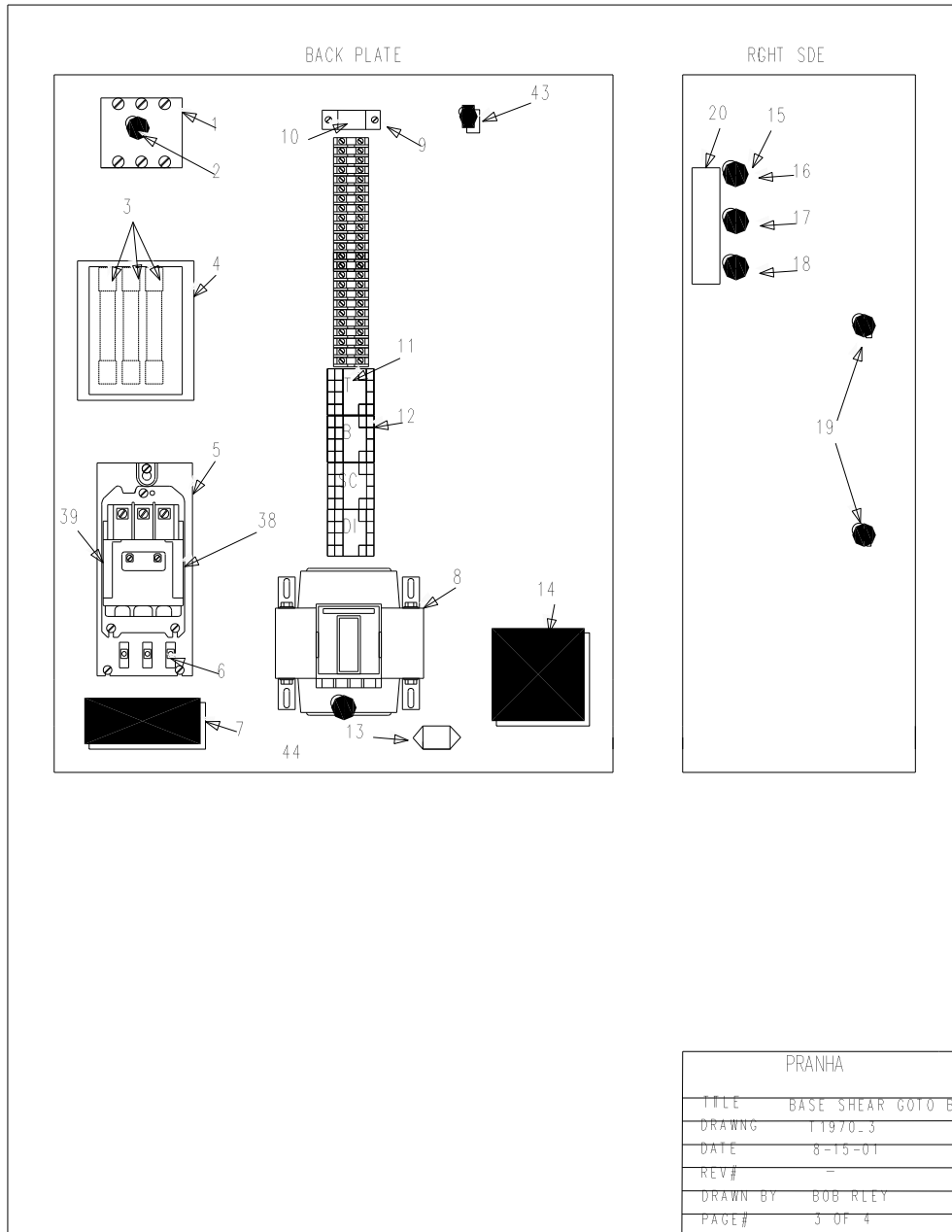


Figure: 19: Electrical Diagram 3 of 4

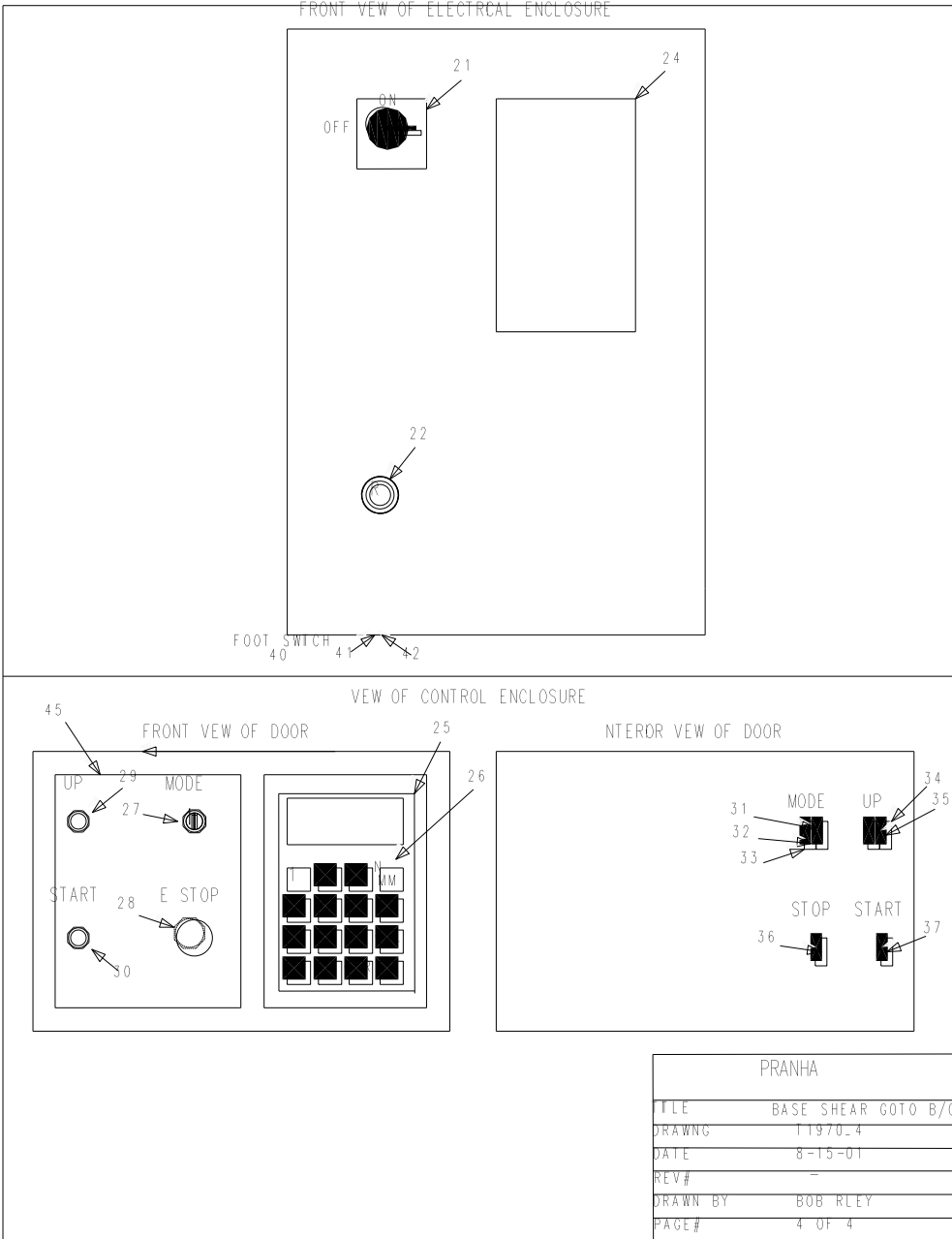


Figure: 20: Electrical Diagram 4 of 4

**Electrical Component List – Programmable GOTO**

| <b>FIG</b> | <b>DESCRIPTION</b>                | <b>QTY</b> | <b>VOLTAGE</b> | <b>PART #</b> |
|------------|-----------------------------------|------------|----------------|---------------|
| 1          | DISCONNECT 20HP                   | 1          | 208/230        | 0591602       |
| 1          | DISCONNECT 15HP                   | 1          | 480/575        | 0531605       |
| 2          | DISCONNECT SHAFT                  | 1          | ALL            | T0727         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 15HP   | 3          | 208            | T0779         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 15HP   | 3          | 230            | T0779         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 15HP   | 3          | 460            | T0775         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 15HP   | 3          | 575            | T0774         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 20HP   | 3          | 208            | T0781         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 20HP   | 3          | 230            | T0780         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 20HP   | 3          | 460            | T0777         |
| 3          | FUSES, MOTOR SHORT CIRCUIT 20HP   | 3          | 575            | T2256         |
| 4          | FUSE BLOCK, SHORT CIRCUIT 15HP    | 1          | 208/230        | T0782         |
| 4          | FUSE BLOCK, SHORT CIRCUIT 15HP    | 1          | 460/575        | T0783         |
| 4          | FUSE BLOCK, SHORT CIRCUIT 15HP    | 1          | 208/230        | T0784         |
| 4          | FUSE BLOCK, SHORT CIRCUIT 20HP    | 1          | 460/575        | T0782         |
| 5          | STARTER, M1 20HP                  | 1          | 208/230        | 0541641       |
| 5          | STARTER, M1 15HP                  | 1          | 460/575        | 0531641       |
| 5          | STARTER, M1 20HP                  | 1          | 208/230        | T0729         |
| 5          | STARTER, M1 20HP                  | 1          | 460/575        | T2257         |
| 6          | HEATERS, M1 OVERLOAD 15HP B70     | 3          | 208            | 0541642       |
| 6          | HEATERS, M1 OVERLOAD 15HP B70     | 3          | 230            | 0541642       |
| 6          | HEATERS, M1 OVERLOAD 15HP B32     | 3          | 460            | 0541643       |
| 6          | HEATERS, M1 OVERLOAD 15HP B25     | 3          | 575            | 0521616       |
| 6          | HEATERS, M1 OVERLOAD 20HP CC103   | 3          | 208            | T0786         |
| 6          | HEATERS, M1 OVERLOAD 20HP CC87.7  | 3          | 230            | T0788         |
| 6          | HEATERS, M1 OVERLOAD 20HP CC39.6  | 3          | 460            | 0531638       |
| 6          | HEATERS, M1 OVERLOAD 20HP CC33.0  | 3          | 575            | T2258         |
| 7          | SUPPRESSOR, MOTOR M1              | 1          | ALL            | 0501604       |
| 8          | TRANSFORMER                       | 1          | 208            | T2244         |
| 8          | TRANSFORMER                       | 1          | 230/460        | T2245         |
| 8          | TRANSFORMER                       | 1          | 575            | T2246         |
| 9          | FUSE HOLDER, TRANSFORMER PRIMARY  | 1          | ALL            | T1302         |
| 10         | FUSE, TRANSFORMER PRIMARY         | 3          | 208            | T2247         |
| 10         | FUSE, TRANSFORMER PRIMARY         | 3          | 230            | T2248         |
| 10         | FUSE, TRANSFORMER PRIMARY         | 3          | 460/575        | T2249         |
| 11         | RELAY, 4 POLE 120V A/C            | 4          | ALL            | T0739         |
| 12         | RELAY SOCKETS                     | 4          | ALL            | T1306         |
| 13         | TRIAC, D/C BACK GAUGE MOTOR       | 1          | ALL            | T2250         |
| 14         | PRINTED CIRCUIT BOARD, BACK GAUGE | 1          | ALL            | T2114         |
| 15         | FUSE HOLDER, PANEL MOUNT          | 3          | ALL            | T0733         |
| 16         | FUSE, CONTROL CIRCUIT             | 1          | ALL            | T0736         |
| 17         | FUSE, SHADOW LIGHT                | 1          | ALL            | T2251         |
| <b>FIG</b> | <b>DESCRIPTION</b>                | <b>QTY</b> | <b>VOLTAGE</b> | <b>PART #</b> |
| 19         | FUSE, BACK GAUGE CIRCUIT          | 1          | ALL            | T2252         |

|    |  |   |     |            |
|----|--|---|-----|------------|
| 20 | DECAL, CONTROL FUSES                   | 1 | ALL | T2200      |
| 21 | DISCONNECT OPERATOR                    | 1 | ALL | 0531604    |
| 22 | RESET BUTTON W/ SHAFT                  | 1 | ALL | 0531686-1  |
| 24 | DECAL, MOTOR SHORT CIRCUIT/TRANSFORMER | 1 | ALL | T2201      |
| 25 | BACK GAUGE DISPLAY MODULE              | 1 | ALL | T2113      |
| 26 | KEYPAD, BACKGAUGE                      | 1 | ALL | T2018      |
| 27 | SELECTA SWITCH, 3 POS,MODE             | 1 | ALL | T1670-1    |
| 28 | EMEG. STOP OPERATOR, RED MUSHROOM      | 1 | ALL | T0737-1    |
| 29 | PUSH BUTTON OPERATOR, YELLOW EXTED.    | 1 | ALL | T1668-1    |
| 30 | PUSH BUTTON OPERATOR, GREEN FLUSH      | 1 | ALL | 05316101-1 |
| 31 | CONTACT BLOCK W/ BASE 1N/O             | 1 | ALL | 0531696-1  |
| 32 | CONTACT BLOCK 1 N/O                    | 1 | ALL | 05316781-1 |
| 33 | CONTACT BLOCK 1 N/C                    | 2 | ALL | 0591596-1  |
| 34 | CONTACT BLOCK W/ BASE 1N/O             | 1 | ALL | 0531696-1  |
| 35 | CONTACT BLOCK 1 N/C                    | 1 | ALL | 0591596-1  |
| 36 | CONTACT BLOCK W/ BASE 1 N/C            | 1 | ALL | 05316121-1 |
| 37 | CONTACT BLOCK W/BASE 1 N/O             | 1 | ALL | 0531696-1  |
| 38 | STARTER AUX. CONTACT, 1 N/O            | 1 | ALL | T01303     |
| 39 | STARTER AUX. CONTACT, 2 N/O            | 1 | ALL | T2253      |
| 40 | FOOT SWITCH                            | 1 | ALL | T0748      |
| 41 | FOOT SWITCH PLUG                       | 1 | ALL | 0531617    |
| 42 | FOOT SWITCH RECP.                      | 1 | ALL | 0531618    |
|    | SHADOW LIGHT LAMPS                     | 8 | ALL | T0467-1    |
|    | SHADOW LIGHT LAMP SOCKETS              | 8 | ALL | T0466      |
| 43 | TOGGLE SWITCH                          | 1 | ALL | 0531619    |
| 44 | SUPPRESSOR, MOV                        | 2 | ALL | 0591619    |
| 45 | DECAL, CONTROL PANEL                   | 1 | ALL | T1964      |
|    | RECTIFIED HYD. PLUGS                   | 2 | ALL | 0531529    |
|    | ENCODER                                | 1 | ALL | T2159      |



7.2. Hydraulic Schematic- 20 HP Motor

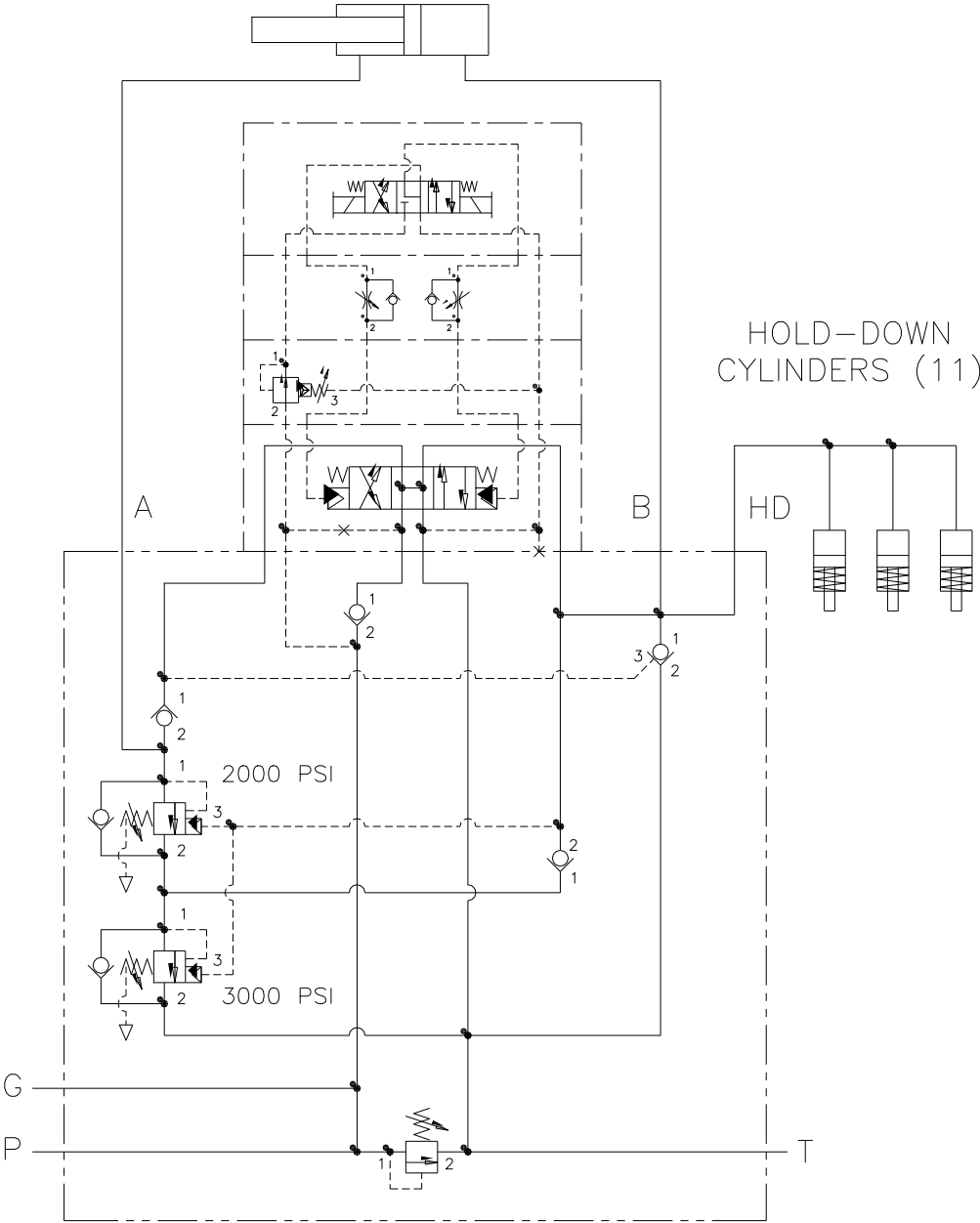


Figure 21: Hydraulic Diagram 1 of 1



## 8. Parts

Diagrams are provided for the major assemblies of the shear. The accompanying parts lists provide item references and descriptions. Part numbers and quantities are provided only where applicable.

Repair parts are available for the Piranha 1/4-10 Shear from the manufacturer. Always provide the model and complete serial number of the press brake along with the part number description and quantity of the desired parts.

### 8.1. Finger Guard & Hold downs



**Figure 23: Finger Guard**

| Item | Description                 | Part # | Qty. |
|------|-----------------------------|--------|------|
| 1    | Finger Guard Mounting Bolts |        |      |
| 2    | Hold Down Mounting Bolts    |        | 26   |
| *3   | Hold Down Cylinder          | T2606  | 11   |
| *3   | Hold Down Cylinder-LHS      | T2607  | 1    |
| *3   | Hold Down Cylinder-RHS      | T2608  | 1    |
| 3    | Hold Down Cylinder (STD)    | T0425  | 13   |
| 4    | Finger Guard                | T3344  | 1    |

\* Supplied with "Enhancement Package"

## 8.2. Ram & Linkage

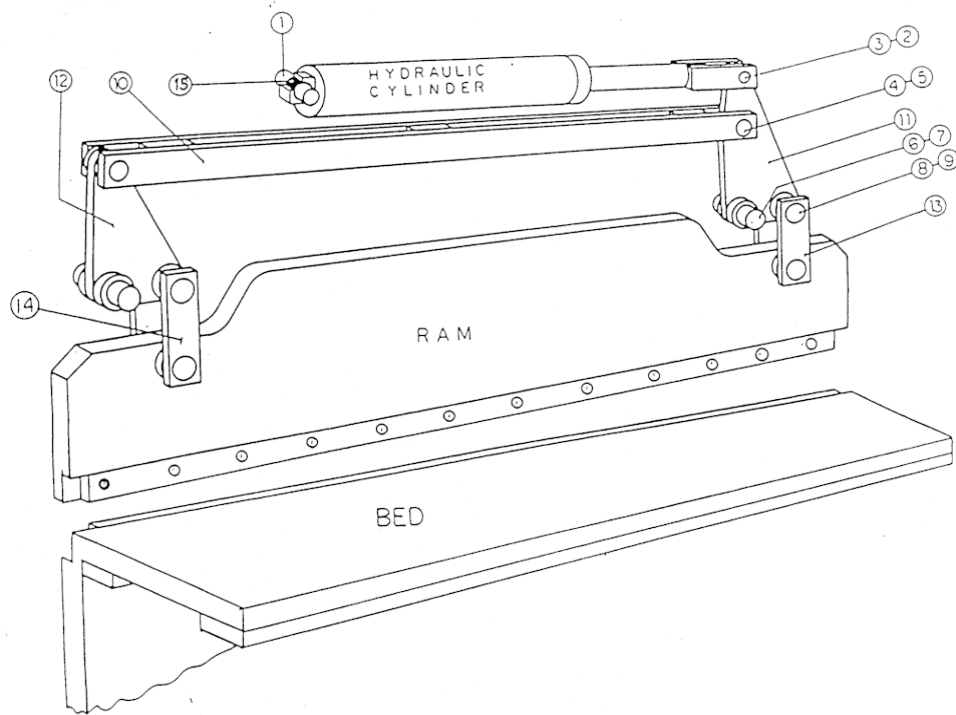
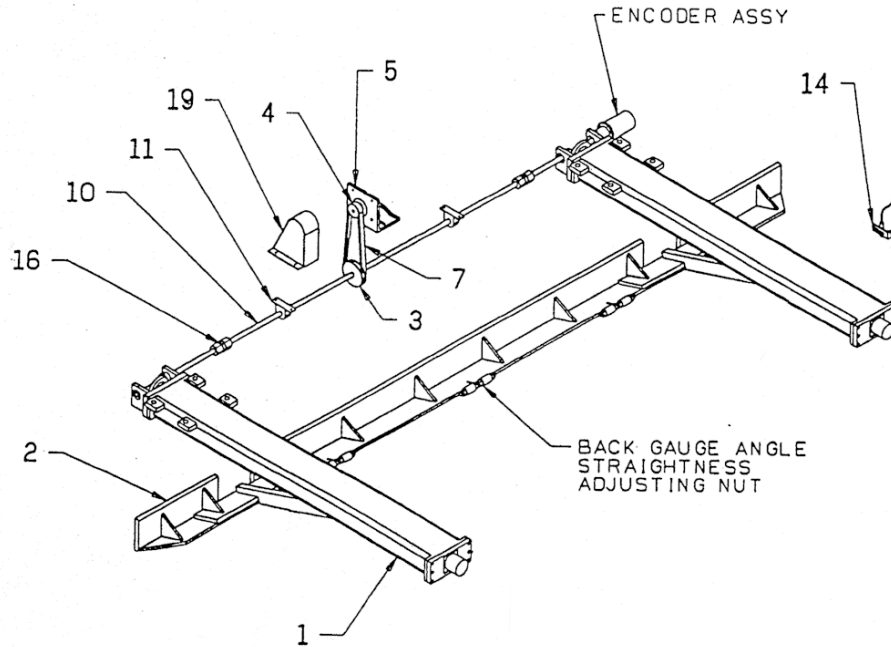


Figure 24: Ram & Linkage

| Item | Qty. | Description                | Part #                    |
|------|------|----------------------------|---------------------------|
| 1    | 1    | Cylinder Pin               | T2460-1                   |
| 2    | 1    | Cylinder Lever Pin         | T2456                     |
| 3    | 2    | Fiberglide Liner 1.5 x 2.5 | T270                      |
| 4    | 2    | C-Rod Pin                  | T2457                     |
| 5    | 2    | Fiberglide Liner 1.75 x 2  | T271                      |
| 6    | 1    | Main Hinge Pin             | T2458                     |
| 7    | 2    | Fiberglide Liner 3 x 2.5   | T273                      |
| 8    | 4    | Link Pin                   | T8212                     |
| 9    | 4    | Fiberglide Liner           | T272                      |
| 10   | 1    | C-Rod                      | T3276-1                   |
| 11   | 1    | Lever, Long                | T2652                     |
| 12   | 1    | Lever, Short               | T2648                     |
| 13   | 2    | Link                       | T8214                     |
| 14   | 2    | Link                       | T8214                     |
| 15   | 2    | Fiberglide Liner 1.5 x 2.5 | T270                      |
| 16   | 1    | Hydraulic Cylinder         | T0603-1                   |
| 17   | 1    | Ram                        | T32821-1                  |
| 18   | 1    | Bed                        | T3360(Base)<br>T3281(EHP) |

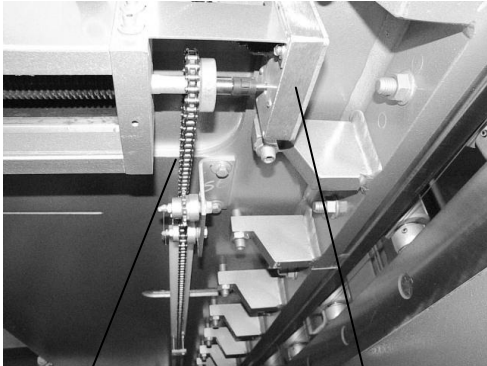
### 8.3. Back Gauge Assembly-Programmable CNC



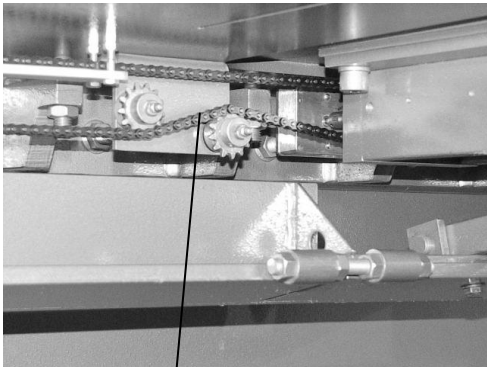
**Figure 25: Back Gauge Assembly**

| Item | Description                              | Part #  | Qty. |
|------|--|---------|------|
| 1    | Back Gauge Track                         |         | 2    |
| 2    | Back Stop-Machined                       | T33551  | 1    |
| 3    | Timing Belt Sprocket                     | T457-10 | 1    |
| 4    | Bushing, 5/8" Bore                       | T469    | 1    |
| 5    | Motor Mount Bracket                      | T0625   | 1    |
| 6    | Motor / Encoder Assembly                 |         |      |
| 7    | Timing Belt                              | T468    | 1    |
| 8    |  |         |      |
| 9    |  |         |      |
| 10   | Transmission Shaft                       | T2172   | 1    |
| 11   | Bearing, Pillow Block, 5/8" Cast Housing | T0698   | 2    |
| 12   |  |         |      |
| 13   |  |         |      |
| 14   | Sensor Bracket Assembly                  | T14-925 | 1    |
| 15   | Prox Switch                              | T04085  | 1    |
| 16   | 5/8" Taper Nut Assembly                  | T1242   | 1    |
| 17   |  |         |      |
| 18   | Traveling Arm                            | T0592   | 1    |
| 19   | Servo Motor Guard                        | T22204  | 1    |

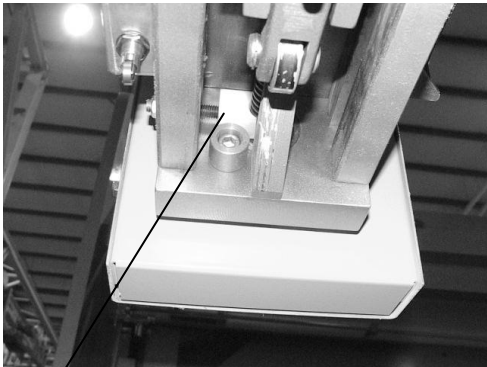
8.3.1. Back Gauge Assembly Programmable GOTO



Chain Drive Encoder Assy

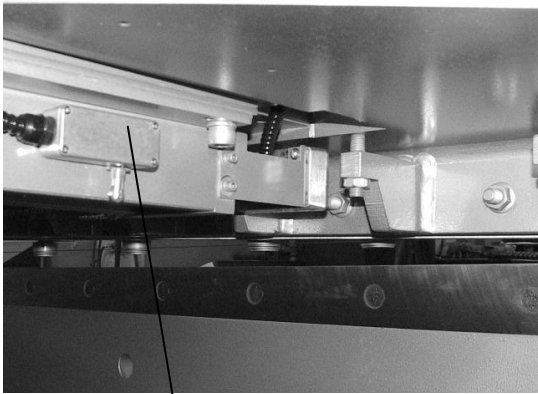


Chain Tension Idler Assy



Back Gauge Drag Block

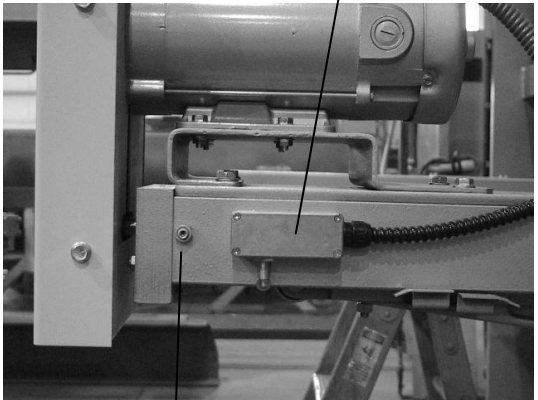
FIG #  
25A 25D



Front Power Cut Off Back Gauge Limit Switch

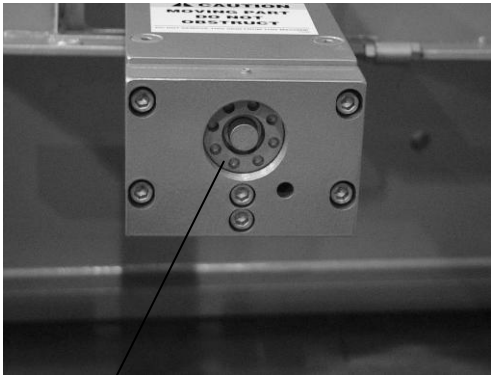
Rear Power Cut Off Back Gauge Limit Switch

25B 25E



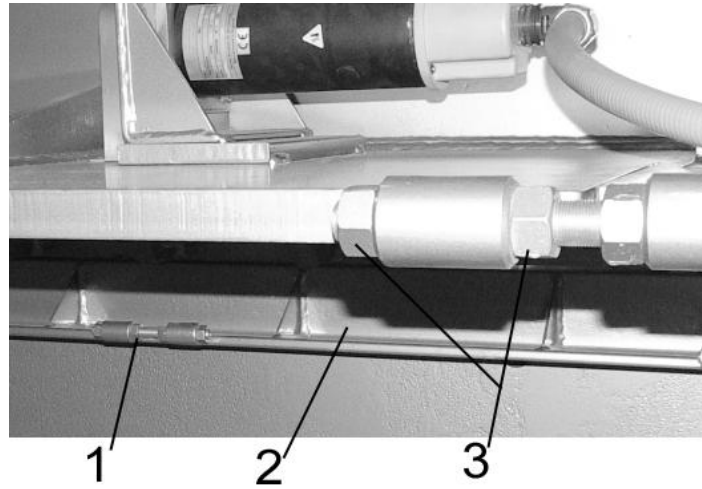
Back Gauge Drag Block Adjustment Nut

25C 25F



Back Gauge Lead Screw Spanner Nut

### 8.4. Back Gauge & Bar Adjustment

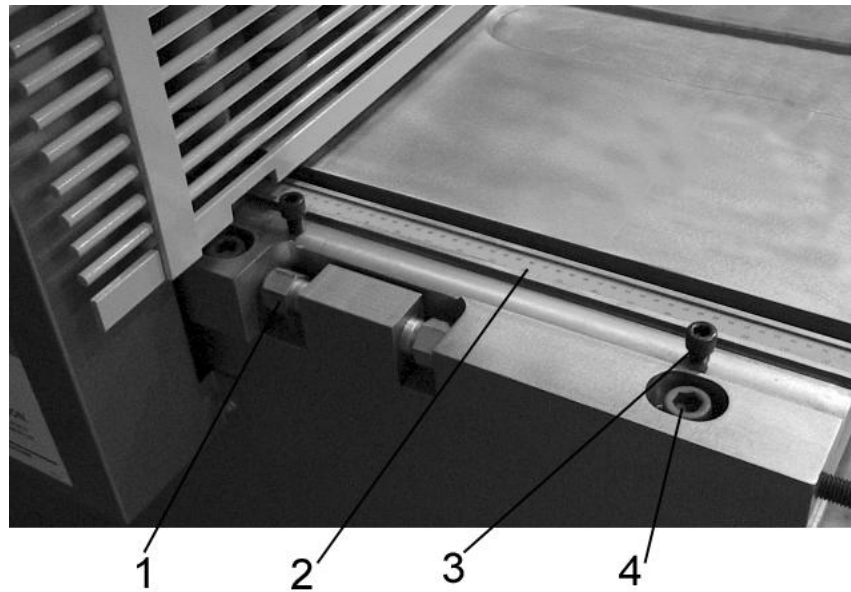


**Figure 26: Back Gauge & Bar Adjustment**

| Item | Qty. | Description                 | Part #  |
|------|------|-----------------------------|---------|
| 1    | 3    | Back Stop Straightener Assy |         |
| 2    | 2    | Back Stop Machined ¼-12     | T33551  |
| 3    | 8    | 1" -14 NF ND Hex Nut GR8    | 0531260 |

### 8.5.

## 8.6. Bed Components



**Figure 27: Bed Components**

| Item | Qty. | Description                  | Part #  |
|------|------|------------------------------|---------|
| 1    | 4    | Bed Adjustment Bolts         | T0469   |
| 2    | 4    | ¾" x 2 SHCS                  | 0591601 |
| 2    | 4    | ¾" Lock Washer               | 0531314 |
| 3    | 6    | ½" x 1-1/4" SHCS             | 0531081 |
| 4    | 1    | Control End Scale 72 (2-Pcs) | T0504   |
| 5    | 1    | Far End Scale 24"            | T1196   |



8.7. Hydraulic Assemblies-20 HP Motor

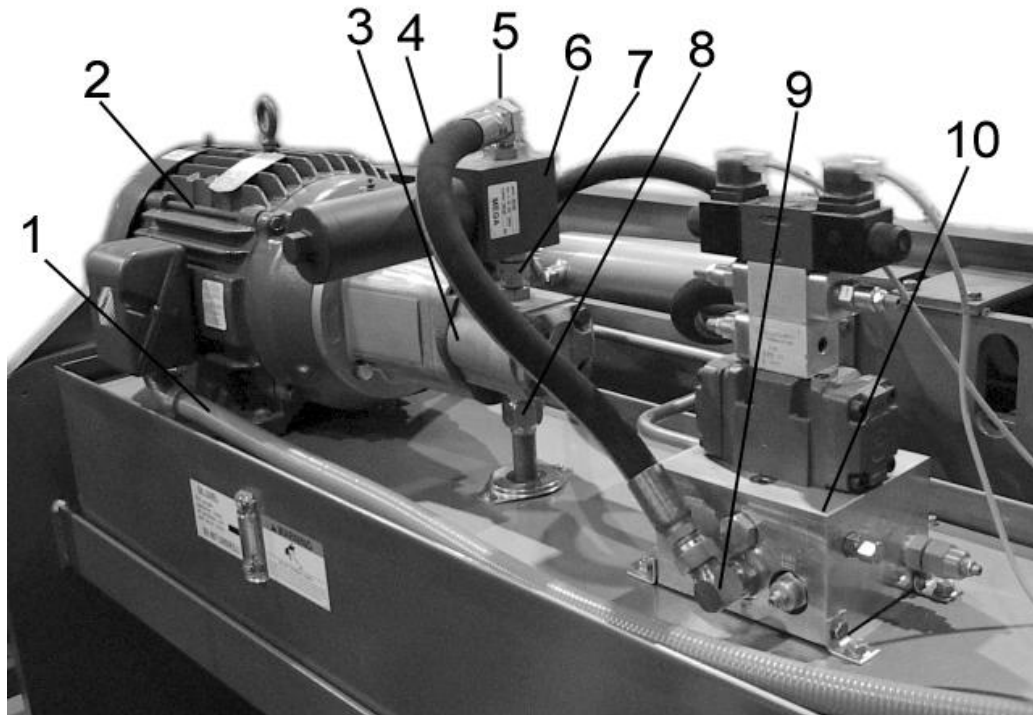
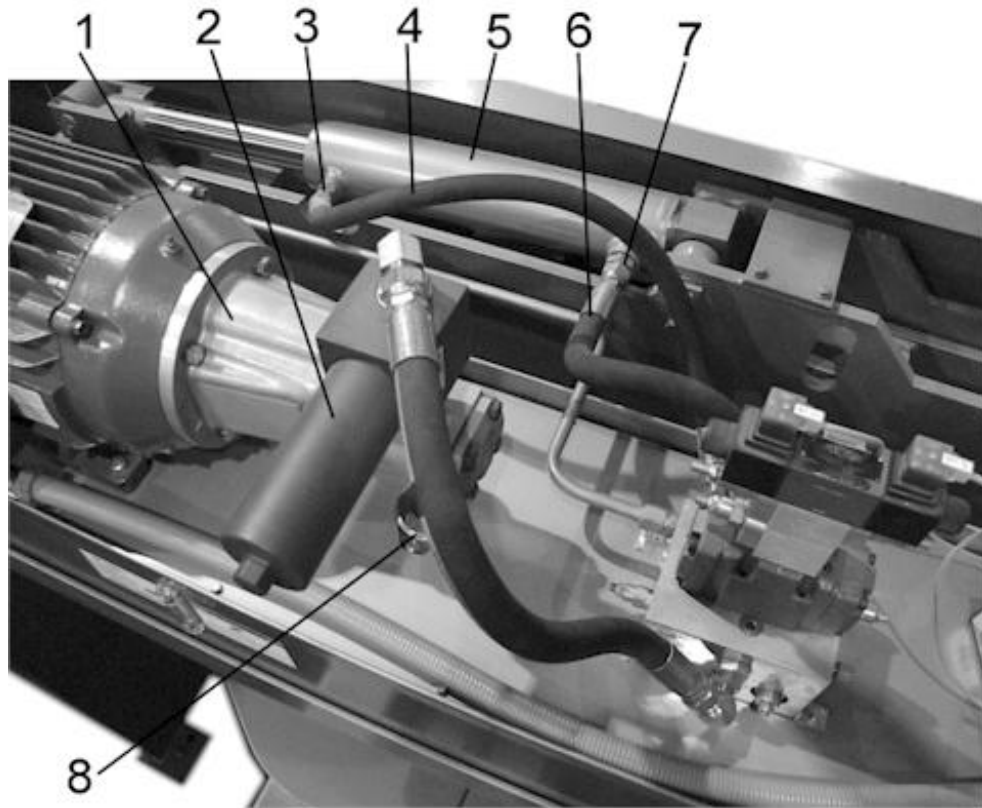


Figure 28: Hydraulic Power Unit

| Item | Description                      | Part #   | Qty. |
|------|----------------------------------|----------|------|
| 1    | Motor Power Harness              | T04088   | 1    |
| 2    | Motor                            |          |      |
|      | 20 HP - 220/440 Volt             | 0571660  | 1    |
|      | 20 HP – 440 Volt                 | 0571662  | 1    |
|      | 20 HP – 575 Volt                 | 0571665  | 1    |
| 3    | Pump                             | 05915701 | 1    |
| 4    | Hose, Filter Valve Pack P        | T1065    | 1    |
| 5    | Fitting, Filter Outlet           | 0531538  | 1    |
| 6    | Filter Assembly                  | 0591550  | 1    |
| 7    | Fitting, Inlet Filter 6400-12-12 | 0551211  | 1    |
| 7    | Fitting, Outlet /Pump 6400-12-16 | 0591506  | 1    |
| 8    | Fitting, Inlet Pump 6400-16      | R539504  | 1    |
| 8    | Suction Tube                     | T0434    | 1    |
| 9    | Fitting, P Port 6801-12          | 0531531  | 1    |
| 10   | Valvepack                        | T0271-1  | 1    |

Table 2: Hydraulic Power Unit Descriptions

**8.7.1. Hydraulic Assemblies-15 HP Motor**



**Figure 29: Hydraulic Fittings**

| Figure-Item | Description                      | Part #  |
|-------------|----------------------------------|---------|
| 1           | Pump Adapter                     | 0551571 |
| 2           | Filter Assembly                  | 0591550 |
| 3           | Fitting A-Port 6802-10           | 0531509 |
| 4           | Hose A-Port to Cylinder 34" #10  | T0433   |
| 5           | Cylinder                         | T0603-1 |
| 6           | Hose, B-Port to Cylinder 19" #12 | T0029   |
| 7           | Fitting, Cylinder B-Port 6400-12 | R639576 |
| 8           | 2-Bolt Flange                    | T0029   |

8.7.2. Valve Body Assembly 20 HP

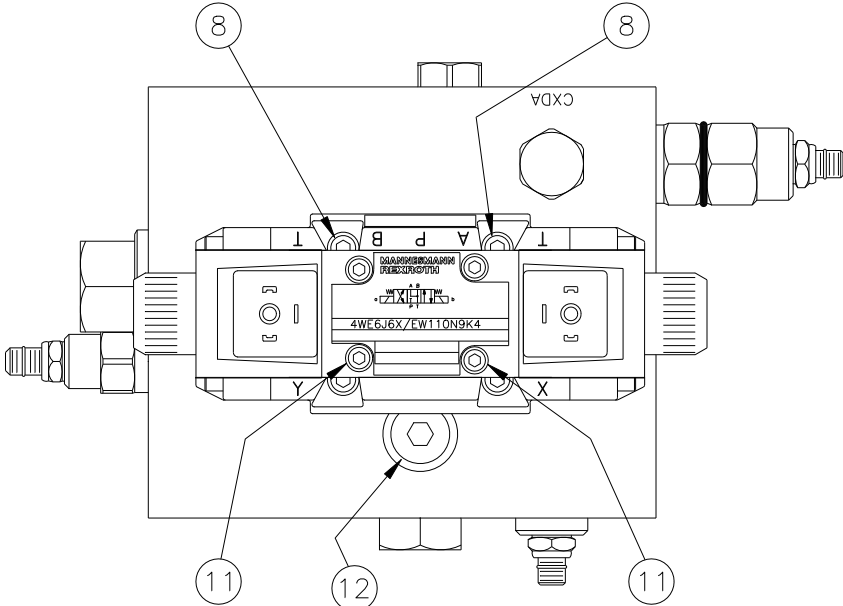


Figure 30: Valve Body Assembly Top View

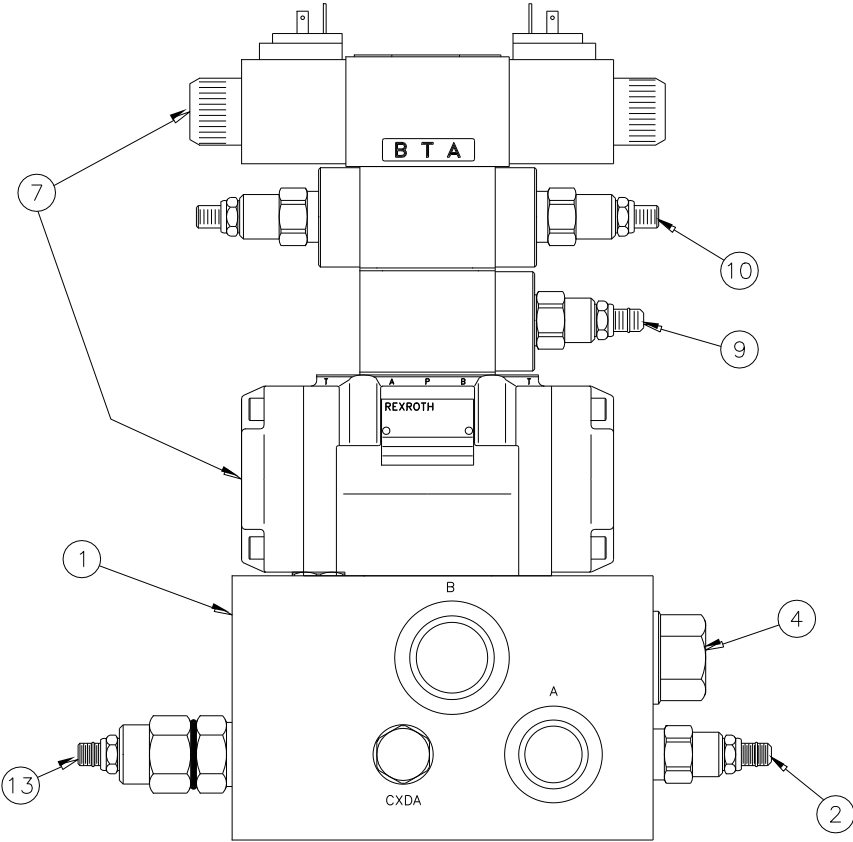


Figure 31: Valve Body Assembly Front View

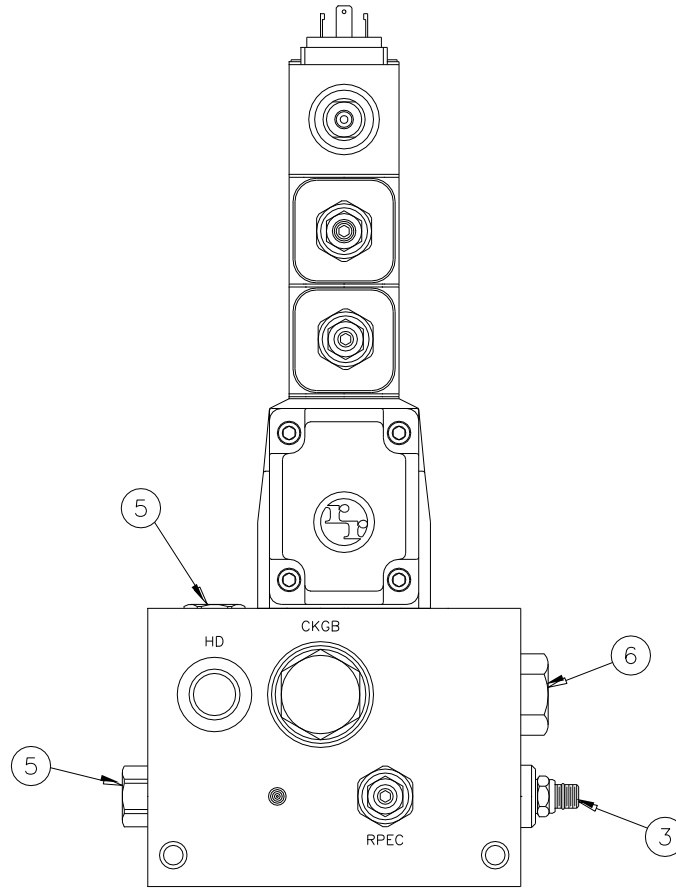


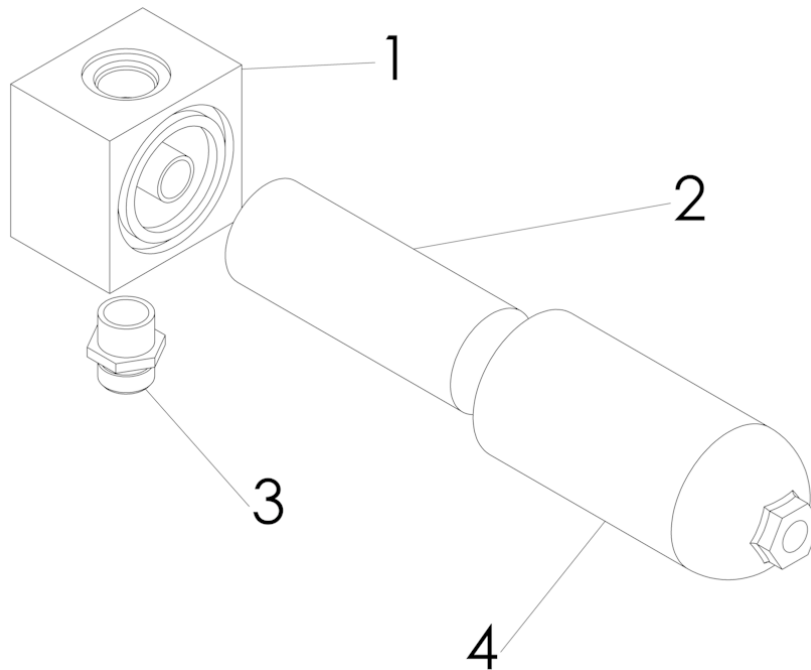
Figure 32: Valve Body Assembly Left Side View

| Item | Qty.       | Description                     | Cartridge | Coil    | Seal Kit |
|------|------------|---------------------------------|-----------|---------|----------|
| 1    | 1          | Valve Pack Body                 | T1016     | n/a     | n/a      |
| 2    | 1          | PO Relief Valve RPEC-LAN        | T1067     | n/a     | T1079    |
| 3    | 1          | Vented CB Valve CAE-LHN         | T1069     | n/a     | T0866    |
| 4    | 1          | Check Valve PTO CKGB-XCN        | T0232     | n/a     | T0869    |
| 5    | 2          | Check Valve CXDA-XAN            | T1070     | n/a     | T1079    |
| 6    | 1          | Check Valve CXED-XCN            | T1071     | n/a     | T0867    |
| 7    | 1          | Directional Control Valve       | T1072     | n/a     | T1081    |
|      | 2          | Directional Control Valve Coils | n/a       | 0571586 | n/a      |
| 8    | 4          | ¼"-20 x 1-3/4" SHCS             | 0581145   | n/a     | n/a      |
| *9   | 1          | Reducing Valve PBDB-LAN-EBP     | T1273     | n/a     | T0870    |
| *10  | 1          | Valve, Flow D03 Sandwich        | n/a       | n/a     | T1079    |
| 11   | 1 set of 4 | M5 x 140 SHCS                   | T1076     | n/a     | n/a      |
| 13   | 1          | CB Valve CAEA-LHN               | T0231     | n/a     | T0866    |

\* Optional

| Item | Qty.       | Description                     | Cartridge | Coil    | Seal Kit |
|------|------------|---------------------------------|-----------|---------|----------|
| 1    | 1          | Valve Pack Body                 |           | n/a     | n/a      |
| 2    | 1          | PO Relief Valve RPEC-LAN        | T1067     | n/a     | T1079    |
| 3    | 1          | Vented CB Valve CAE-LHN         | T1069     | n/a     | T0866    |
| 4    | 1          | Check Valve PTO CKGB-XCN        | T0232     | n/a     | T0869    |
| 5    | 2          | Check Valve CXDA-XAN            | T1070     | n/a     | T1079    |
| 6    | 1          | Check Valve CXED-XCN            |           | n/a     |          |
| 7    | 1          | Directional Control Valve       | 0531574   | n/a     | T0873    |
|      | 2          | Directional Control Valve Coils |           | 0531583 | n/a      |
| 8    | 4          | ¼"-20 x 1-3/4" SHCS             | 0581145   | n/a     | n/a      |
| 9    |            |                                 |           | n/a     |          |
| 10   |            |                                 | n/a       | n/a     |          |
| 11   | 1 set of 4 | M5 x 140 SHCS                   |           | n/a     | n/a      |
| 13   | 1          | CB Valve CAEA-LHN               | T0231     | n/a     | T0866    |

### 8.8. Oil Filter Assembly



**Figure 33: Oil Filter Assembly (PN-0591550) Exploded View**

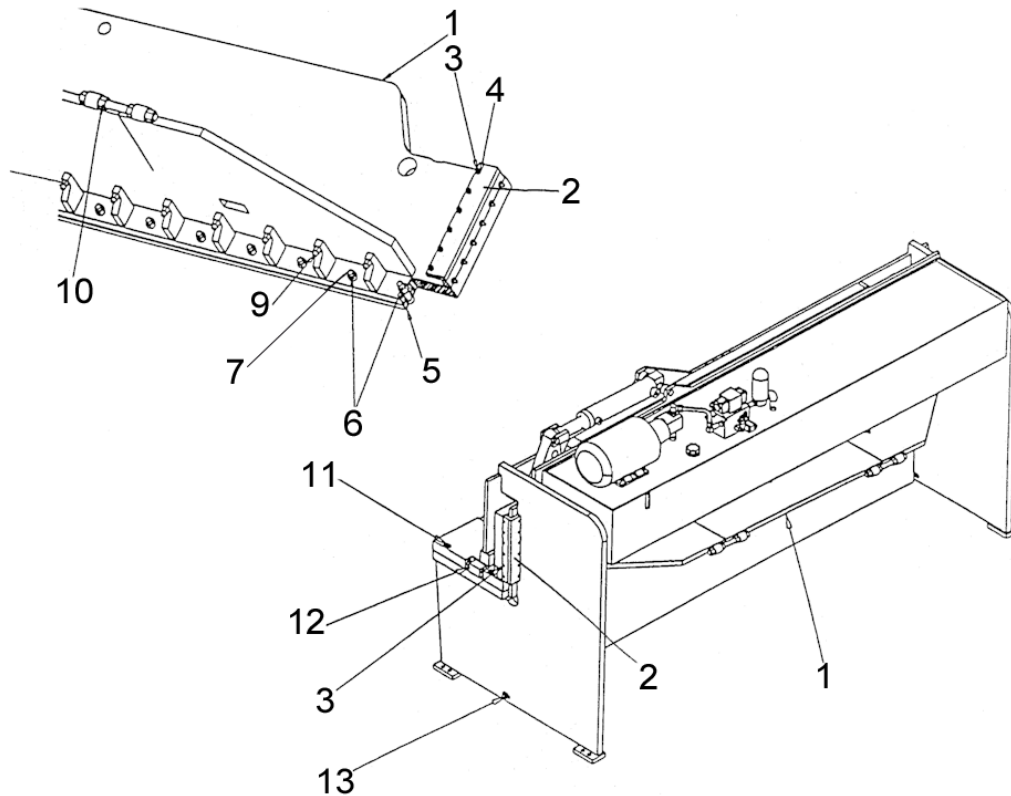
| Figure-Item | Description     | Part #  |
|-------------|-----------------|---------|
| 1           | Filter Element  | 0591551 |
| 2           | Fitting – inlet | T0913   |
|             |                 |         |

## **8.9. Main Operator Control Panel-Programmable CNC**

*Refer to Section 7 for detailed electrical component list*



### 8.10. Blade Adjust Components



**Figure 34: Blade Adjust Components**

| Item | Description                       | Qty | Part Number |
|------|-----------------------------------|-----|-------------|
| 1    | ¼-12 Ram                          | 1   | T32821-1    |
| 2    | Gib Supports                      | 2   | T9850       |
| 3    | 3/8"-16 SSS 2-1/4" Flat Point     |     | T0078       |
| 4    | 3/8"-16 FIN Hex Nut Plain         |     | 0531210     |
| 5    | ¼-12 Knife 12' Shear              | 2   | T3283       |
| 6    | ¼-12 Shear Knife Bolt (Ram)       | 16  | T0456       |
| 7    | ¼-12 Shear Knife Nut              | 32  | T055        |
| 6    | ¼-12 Shear Knife Bolt (Table)     | 16  | T1405       |
| 9    | Blade Straightness Adjustment Nut |     |             |
| 10   | Ram Tension Nut                   |     |             |
| 11   | Bed Locking Bolts                 |     |             |
| 12   | Blade Clearance Adjustment Bolts  |     |             |
| 13   | Bed Locking Bolts                 |     |             |

8.11. Ram Slides

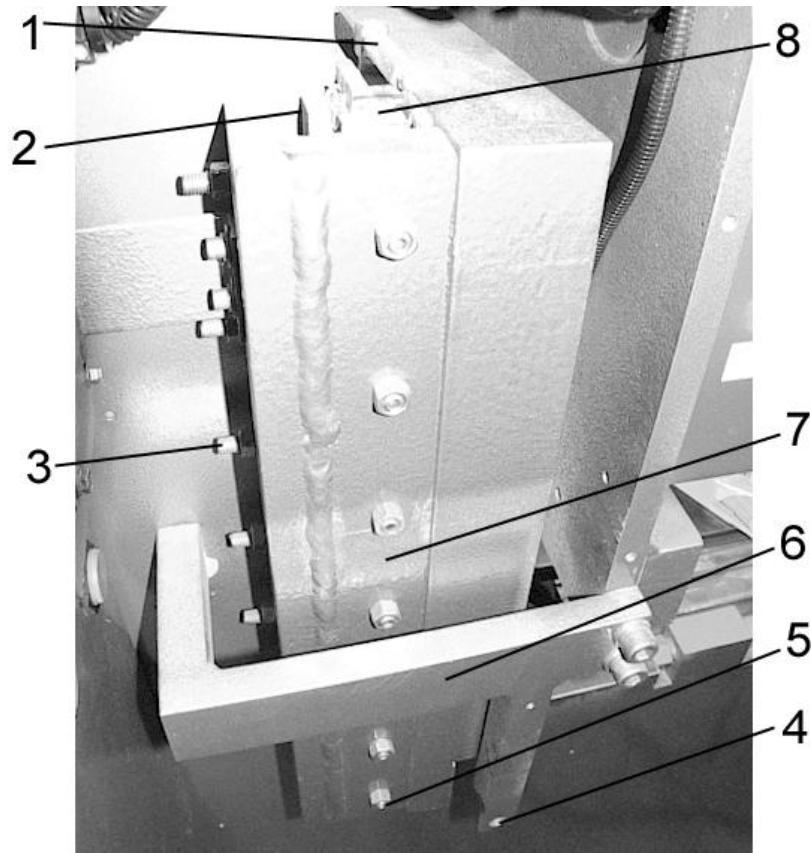
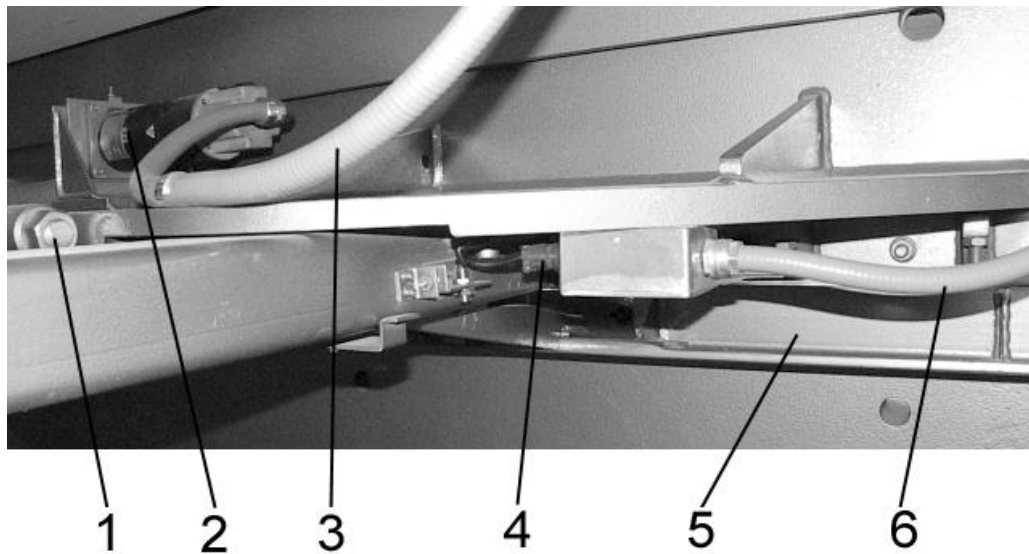


Figure 35: Gib Parts

| Item | Description                  | Part #  | Qty |
|------|------------------------------|---------|-----|
| 1    | Elbow                        | T0445   | 2   |
| 1    | Lubrication Fitting          | T0446   | 2   |
| 2    | Slide Bearing Phenolic       | T0398   | 4   |
| 2    | Slide Bearing                | T0397   | 4   |
| 3    | 3/8" x 2-1/4" SSS Flat Point | T0078   | 14  |
| 4    | Shadow Line Adjustment Screw | T0319   | 1   |
| 4    | Shadow Line Adjustment Nut   | 0581198 | 1   |
| 5    | 3/8" Hex Nut                 | 0531210 | 28  |
| 5    | 3/8" x 1-3/4" SSS Flat Point | 0581121 | 14  |
| 6    | Tie Bar Left                 | T03171  | 1   |
| 6    | Tie Bar Right                | T03161  | 1   |
| 7    | Gibs                         | T9850   | 1   |
| 8    | Slide Left                   | T5828   | 1   |
| 8    | Slide Right                  | T5637   | 1   |

**8.12. Back Gauge Motor Assembly**



**Figure 36: Back Gauge Motor Assembly**

| Item | Description        | Part # | Qty |
|------|--------------------|--------|-----|
| 1    | Servo Motor        | T0567  | 1   |
| 2    | Servomotor Harness | T04087 | 1   |
|      |                    |        |     |
|      |                    |        |     |

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## 9. Glossary

|                                    |   |
|------------------------------------|---|
| <b>AC Motor</b>                    | <i>An electric motor designed to operate using AC power.</i>  |
| <b>Accuracy</b>                    | <i>The deviation of a value from its theoretical value after the device has been correctly calibrated.</i>  |
| <b>Ambient Condition</b>           | <i>The surrounding atmosphere and environment.</i>  |
| <b>ANSI</b>                        | <i>American National Standards Institute. A national, nonprofit organization. Its principle function is to establish industry-wide standards that are put in place through a process of consensus among qualified participants.</i> |
| <b>Backlash</b>                    | <i>Mechanical clearances that exists or may develop through wear between a driven component and a drive source.</i>   |
| <b>Ball Bushing/Linear Bearing</b> | <i>A tubular shaped ball bearing assembly designed for linear movement on a shaft.</i>  |
| <b>Bed</b>                         |   |
| <b>Circuit Breaker</b>             | <i>A device used with electrical equipment to provide overload protection.</i>  |
| <b>Coupling (Shaft)</b>            | <i>A mechanical device used to join a motor output shaft to a machine part, typically a roller.</i>   |
| <b>Cycle</b>                       | <i>A series of events or operations that recur regularly and usually lead back to the start.</i>  |
| <b>Cylinder</b>                    | <i>A piston-type actuator.</i>  |
| <b>DC Power Supply</b>             | <i>An electrical device used to convert incoming AC power to regulated DC power.</i>  |
| <b>Electrical Spike</b>            | <i>An unpredictable and infrequent momentary high electrical voltage which can harm electrical/electronic devices.</i>  |
| <b>Encoder</b>                     | <i>A device typically electromechanical, that translates motion into electrical pulses. See also Resolver, Tachometer, or Transducer.</i>   |

|                               |  |
|-------------------------------|--|
| <b>Feedback</b>               | <i>The return to an input of a part of the output of a machine or control system, or process.</i>  |
| <b>Fuse</b>                   | <i>Electrical overload protection device.</i>  |
| <b>Fuse Block</b>             | <i>A holder for a fuse or fuses including wire termination.</i>  |
| <b>Gauge</b>                  | <i>A stop against which the material or workpiece is placed to locate it within the point of operation.</i>                                |
| <b>Gibs</b>                   | <i>The machine members used for guiding the ram.</i>   |
| <b>Grease zerk</b>            | <i>Fitting designed to accept grease for lubricating components.</i>   |
| <b>Hydraulics</b>             | <i>The branch of mechanics, which uses controlled hydraulic oil flow, and pressure to provide force to an actuator.</i>                    |
| <b>Inertia</b>                | <i>A property of matter by which it stays at rest or in uniform motion in the same straight line unless acted on by an external force.</i> |
| <b>Lifting lugs</b>           | <i>Steel plates with large holes that are attached to the press brake to assist in lifting the machine.</i>                                |
| <b>Limit Switch</b>           | <i>Typically, an electrical device that provides position information to a control system.</i>   |
| <b>Low Voltage</b>            | <i>A voltage reading that is lower than the required or expected voltage.</i>  |
| <b>Machinist Square Level</b> | <i>Machinists level having four sides. Permits' measuring vertical surfaces as well as horizontal surfaces.</i>                            |
| <b>Motor Starter</b>          | <i>A relay capable of withstanding inductive load generated when starting an electric motor (AC or DC).</i>                                |
| <b>Open Loop</b>              | <i>A control concept in which feedback is not used to modify the characteristics of the output.</i>  |
| <b>Operator Interface</b>     | <i>Typically, a control or control panel provided for an operator to modify or monitor system variables.</i>                               |

|                           |  |
|---------------------------|--|
| <b>Photo Sensor</b>       | <i>An electronic sensor that uses light wavelengths to detect the position or presence of an object.</i>   |
| <b>Point of Operation</b> | <i>The location in the shear where the material or a workpiece is positioned and work is performed.</i>  |
| <b>Pressure Reducer</b>   | <i>Typically, a hydraulic component that senses secondary pressure to maintain that output pressure regardless of the incoming pressure.</i>   |
| <b>Pressure Relief</b>    | <i>Typically, a hydraulic component that uses a spring to hold an orifice closed until system pressure overcomes the spring and allows flow to the reservoir.</i>  |
| <b>Proximity Sensor</b>   | <i>An electrical device capable of detecting the presence of an object.</i>  |
| <b>PSI</b>                | <i>Acronym. Available Force expressed in Pounds per Square Inch</i>  |
| <b>Pushbutton</b>         | <i>A small button or knob actuated by pushing, provided for operator control, electrical, pneumatic, or mechanical.</i>  |
| <b>Relay</b>              | <i>An electromechanical device for remote or automatic control that is actuated in variation of conditions of an electrical circuit and that operates other devices in an electrical circuit.</i>                        |
| <b>Repeatability</b>      | <i>The closeness of agreement among multiple measurements of an output, for the same value of the measured signal under the same operating conditions, approaching from the same direction for full range traverses.</i> |
| <b>Reset</b>              | <i>To restart or arm a control or safety system.</i>   |
| <b>RPM</b>                | <i>Acronym. Rotational speed expressed as Revolutions per Minute.</i>  |
| <b>Safeguarding</b>       | <i>A method for protection of personnel from hazards using guards, safety devices, or safe work procedures.</i>  |
| <b>Selector Switch</b>    | <i>A small button or knob actuated by turning, provided for operator control, electrical, pneumatic, or mechanical.</i>  |

|                                    |  |
|------------------------------------|--|
| <b>Service (Safety) Disconnect</b> | <i>Typically, a large mechanical switch that is provided to completely remove incoming power for the purpose of storage or service of a machine.</i>   |
| <b>Setup</b>                       | <i>The process of adjusting the press brake and the installation and adjustment of work holding devices or tooling and appropriate safeguarding to ensure proper and safe operation of the press brake.</i>                                |
| <b>Shield (foil or braided)</b>    | <i>Typically, a metallic encasement surrounding wiring or components to avoid interference from RF signals.</i>  |
| <b>Solenoid Valve</b>              | <i>Typically, a pneumatic or hydraulic valve actuated by an electromagnetic coil.</i>  |
| <b>Throat</b>                      | <i>An opening or recess in the ram (housing) to permit the positioning of material or workpieces.</i>  |
| <b>Transducer</b>                  | <i>A device typically electromechanical, that translates motion into electrical pulses.</i>  |
| <b>Transformer</b>                 | <i>An electrical device that employs the principle of mutual induction to convert variations of current in a primary circuit into variations of voltage and current in a secondary circuit.</i>  |
| <b>Valve</b>                       | <i>Any of numerous mechanical devices by which the flow of liquid, gas, or loose material in bulk may be started, stopped, or regulated by a moveable part that opens, shuts, or partially obstructs one or more ports or passageways.</i> |



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## **11. Addendums**