MODEL 460
AUTOMATIC
ROTARY BLADE GRINDER

PATENT NO. 7,329,172

ASSEMBLY
AND
SERVICE
MANUAL

WARNING

You must thoroughly read and understand this manual before assembling or maintaining the equipment, paying particular attention to the Warning & Safety instructions.

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SAFETY INSTRUCTIONS

Safety Awareness Symbols are inserted into this manual to alert you to possible ***Safety Hazards***. Whenever you see these symbols, follow their instructions.

The ***Warning Symbol*** identifies special instructions or procedures which, if not strictly observed, **could result in personal injury.**

The ***Caution Symbol*** identifies special instructions or procedures which, if not correctly followed, **could result in damage to or destruction of equipment.**

1. **KEEP GUARDS IN PLACE** and in working order.
2. **REMOVE WRENCHES AND OTHER TOOLS.**
3. **KEEP WORK AREA CLEAN.**
4. **DON'T USE IN DANGEROUS ENVIRONMENT.** Don't use Grinder in damp or wet locations. Machine is for indoor use only. Keep work area well lit.
5. **KEEP ALL VISITORS AWAY.** All visitors should be kept a safe distance from work area.
6. **MAKE WORK AREA CHILD-PROOF** with padlocks or master switches.
7. **DON'T FORCE THE GRINDER.** It will do the job better and safer if used as specified in this manual.
8. **USE THE RIGHT TOOL.** Don't force the Grinder or an attachment to do a job for which it was not designed.
9. **WEAR PROPER APPAREL.** Wear no loose clothing, gloves, neckties, or jewelry which may get caught in moving parts. Nonslip footwear is recommended. Wear protective hair covering to contain long hair.
10. **ALWAYS USE SAFETY GLASSES.**
11. **SECURE YOUR WORK.** Make certain that the rotary blade is securely fastened with the components provided before operating.
12. **DON'T OVERREACH.** Keep proper footing and balance at all times.
13. **MAINTAIN GRINDER WITH CARE.** Follow instructions in the Assembly and Service Manual for lubrication and preventive maintenance.
14. **DISCONNECT POWER BEFORE SERVICING.**
15. **REDUCE THE RISK OF UNINTENTIONAL STARTING.** Make sure all switches are OFF before plugging in the Grinder.
16. **USE RECOMMENDED ACCESSORIES.** Consult the manual for recommended accessories. Using improper accessories may cause risk of personal injury.
17. **CHECK DAMAGED PARTS.** A guard or other part that is damaged or will not perform its intended function should be properly repaired or replaced.
18. **KNOW YOUR EQUIPMENT.** Read this manual carefully. Learn its application and limitations as well as specific potential hazards.
19. **KEEP ALL SAFETY DECALS CLEAN AND LEGIBLE.** If safety decals become damaged or illegible for any reason, replace immediately. Refer to replacement parts illustrations in Service Manual for the proper location and part numbers of safety decals.
20. **DO NOT OPERATE THE GRINDER WHEN UNDER THE INFLUENCE OF DRUGS, ALCOHOL, OR MEDICATION.**

SAFETY INSTRUCTIONS

IMPROPER USE OF GRINDING WHEEL MAY CAUSE BREAKAGE AND SERIOUS INJURY.

Grinding is a safe operation if the few basic rules listed below are followed. These rules are based on material contained in the ANSI B7.1 Safety Code for "Use, Care and Protection of Abrasive Wheels". For your safety, we suggest you benefit from the experience of others and carefully follow these rules.

DO

1. **DO** always **HANDLE AND STORE** wheels in a **CAREFUL** manner.
2. **DO VISUALLY INSPECT** all wheels before mounting for possible damage.
3. **DO CHECK MACHINE SPEED** against the established maximum safe operating speed marked on wheel.
4. **DO CHECK MOUNTING FLANGES** for equal and correct diameter.
5. **DO USE MOUNTING BLOTTERS** when supplied with wheels.
6. **DO** be sure **WORK REST** is properly adjusted.
7. **DO** always **USE A SAFETY GUARD COVERING** at least one-half of the grinding wheel.
8. **DO** allow **NEWLY MOUNTED WHEELS** to run at operating speed, with guard in place, for at least one minute before grinding.
9. **DO** always **WEAR SAFETY GLASSES** or some type of eye protection when grinding.
10. **DO TURN OFF COOLANT** before stopping to avoid creating an out-of-balance condition.

DON'T

1. **DON'T** use a cracked wheel or one that **HAS BEEN DROPPED** or has become damaged.
2. **DON'T FORCE** a wheel onto the machine **OR ALTER** the size of the mounting hole. If wheel won't fit the machine, get one that will.
3. **DON'T** ever **EXCEED MAXIMUM OPERATING SPEED** established for the wheel.
4. **DON'T** use mounting flanges on which the bearing surfaces **ARE NOT CLEAN, FLAT AND FREE OF BURRS.**
5. **DON'T TIGHTEN** the mounting nut **EXCESSIVELY.**
6. **DON'T** grind on the **SIDE OF THE WHEEL** (see Safety Code B7.2 for exception).
7. **DON'T** start the machine until the **WHEEL GUARD IS IN PLACE.**
8. **DON'T JAM** work into the wheel.
9. **DON'T STAND DIRECTLY IN FRONT** of a grinding wheel whenever a grinder is started.
10. **DON'T FORCE GRINDING** so that motor slows noticeably or work gets hot.

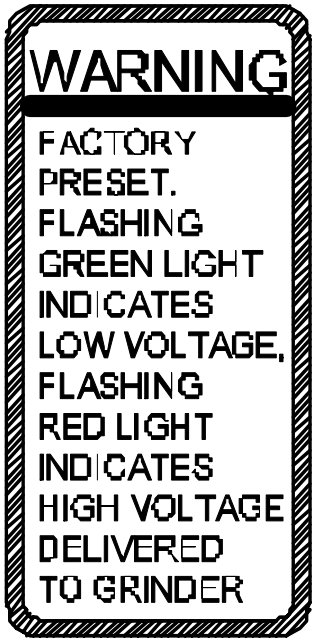
AVOID INHALATION OF DUST generated by grinding and cutting operations. Exposure to dust may cause respiratory ailments. Use approved NIOSH or MSHA respirators, safety glasses or face shields, and protective clothing. Provide adequate ventilation to eliminate dust, or to maintain dust level below the Threshold Limit Value for nuisance dust as classified by OSHA.

This machine is intended for grinding the rotary blades from a rotary type mowing unit <u>ONLY.</u> Any use other than this may cause personal injury and void the warranty.

To assure the quality and safety of your machine and to maintain the warranty, you MUST use original equipment manufactures replacement parts and have any repair work done by a qualified professional.

ALL operators of this equipment must be thoroughly trained BEFORE operating the equipment.

Do not use compressed air to clean grinding dust from the machine. This dust can cause personal injury as well as damage to the grinder. Machine is for indoor use only. Do <u>not</u> powerwash machine.



The grinder is equipped with a high/low voltage relay (LVR) which is factory preset at 100 VAC low voltage trip and 140 VAC high voltage trip. If the power supply line does not deliver a minimum of100 VAC and a maximum of 140 VAC power under load, the relay will open and trip out the starter. If this occurs, your power supply line is incorrect and must be correct before proceeding further with the grinder.

A steady green light indicates - Power Up/ Fault cleared.
A steady red light indicates - Relay energized
A flashing red light indicates - Overvoltage trip
A flashing green light indicates - Undervoltage trip

CONTENTS

SPECIFICATIONS

Electrical Requirements ..... 115V 50/60 Hz, 15-amp circuit
Net Weight ..... 890 lbs [404 kg]
Shipping Weight ..... 1080 lbs [490 kg]
Maximum Grinding Length ..... 34 in. [86 cm]
Sound Level ....Less than 75 Dba

SKILL AND TRAINING REQUIRED FOR SERVICING

This Service Manual is designed for technicians who have the necessary mechanical and electrical knowledge and skills to reliably test and repair the 460 Rotary Blade Grinder. For those without that background, service can be arranged through a local distributor.

This Manual presumes that you are already familiar with the normal operation of the Grinder. If not, you should read the Operators Manual, or do the servicing in conjunction with someone who is familiar with its operation.

PERSONS WITHOUT THE NECESSARY KNOWLEDGE AND SKILLS SHOULD NOT REMOVE THE CONTROL BOX COVER OR ATTEMPT ANY INTERNAL TROUBLESHOOTING, ADJUSTMENTS, OR PARTS REPLACEMENT!

If you have questions not answered in this manual, please call your distributor. They will contact the manufacturer if necessary.

TORQUE REQUIREMENTS

Throughout this manual we refer to torque requirements as "firmly tighten" or the like. For more specific torque values, refer to the information below.

Bolts Going into a Nut, or Into a Thread Hole in Steel.
Refer to table at the right.

Bolts Going into a Thread Hole in Aluminum.
Use the Grade 2 values in the table at the right.

Socket-Head Screws
Use the Grade 8 values in the table at the right.

Machine Screw

No. 6 Screws:	11in.-lbs [0.125 kg-m]
No. 8 Screws:	20 in.-lbs [0.23 kg-m]
No. 10 Screws:	32 in.-lbs [0.37kg-m]

	GRADE 2	GRADE 5	GRADE 8
			
	SMOOTH HEAD	3 MARKS on HEAD	6 MARKS on HEAD
1/4 In. thread	6 ft-lbs (0.8 kg-m)	9 ft-lbs (1.25 kg-m)	13 ft-lbs (1.8 kg-m)
5/16 In. thread	11 ft-lbs (1.5 kg-m)	18 ft-lbs (2.5 kg-m)	28 ft-lbs (3.9 kg-m)
3/8 In. thread	19 ft-lbs (2.6 kg-m)	31 ft-lbs (4.3 kg-m)	46 ft-lbs (6.4 kg-m)
7/16 In. thread	30 ft-lbs (4.1 kg-m)	50 ft-lbs (6.9 kg-m)	75 ft-lbs (10.4 kg-m)
1/2 In. thread	45 ft-lbs (6.2 kg-m)	75 ft-lbs (10.4 kg-m)	115 ft-lbs (15.9 kg-m)

ASSEMBLY INSTRUCTIONS

UNPACK THE CARTONS

NOTE: Before you install the machine, read the following assembly procedure completely. Then study "Getting to Know Your Bedknife Grinder" in the Operators Manual.

Use care when unpacking. Double-check the packing cartons for any miscellaneous items before discarding.

Inspect all items for shipping damage as they are removed from the shipping containers. If you find any damage, notify the carrier's claims agent and do not proceed further until the damage has been inspected by the agent. Refer also to the "Shipping and Receiving Instructions" packed with the unit.

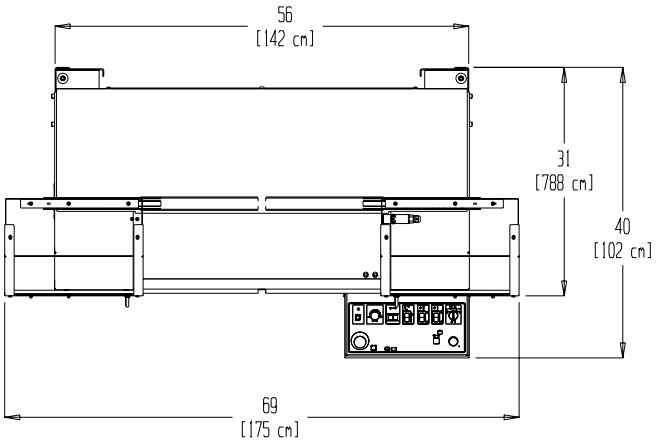


FIG. 1

Remove the Grinder from the Pallet

To remove the Grinder from the wood pallet, unbolt the four brackets that hold each end of the Grinder legs to the bottom of the pallet.

THE GRINDER WEIGHS 920 LBS [417 KG]. TO LIFT, USE POWER EQUIPMENT

The machine has adjustable feet that are located in holes in the wood pallet. Lift machine up straight to clear the pallet and then move machine to final position on floor.

Remove any additional shipping straps, and window protective sheets after positioning unit on the floor.

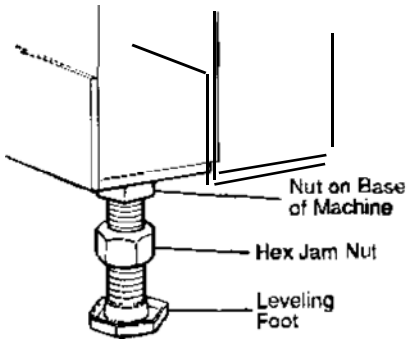


FIG. 2

LOCATE AND LEVEL THE GRINDER

Set the Grinder on a level concrete floor, on a single uncracked slab of concrete

The 460 Rotary Blade Grinder will require an operating area of about 75" W x 75" D x 75" H (190 x 190 x 190 cm). The machine operator will operate the unit from the front of the machine. Position the base to allow sufficient operating room in front of the machine. See FIG. 1.

Place level on the top of the Traverse Base. Adjust the leveling feet as necessary to bring to level. See FIG. 2.

Place a level across the Traverse Base from front to rear. Adjust the leveling feet on the end of the machine as necessary to level.

When both front to back and side to side leveling procedures have been completed, thread the hex jam nuts up against the nut that is welded to the bottom until they lock into place. Be careful not to move the leveling feet during this process. See FIG. 2. Make certain that all four leveling feet are firmly contacting the floor.

Recheck with level after locking nuts are firmly tightened.

ASSEMBLY INSTRUCTIONS (Continued)

APPLY POWER

BEFORE YOU APPLY POWER TO THE GRINDER, REFER TO THE "IMPORTANT GROUNDING INSTRUCTIONS" ON PAGE 9.

FIG. 4

115 Volt Model Only. Plug the control box power cord into a standard 115V AC 15-amp grounded receptacle. See FIG. 4.

220 Volt Model Only. For 220 Volt Applications order Part No. 4600951, which includes a 230 to 115 Volt Step Down Transformer. See Details on page 8.

IT IS RECOMMENDED THAT THIS 460 ROTARY BLADE GRINDER HAS ITS OWN PERMANENT POWER CONNECTION FROM THE POWER DISTRIBUTION PANEL, WITH NO OTHER MAJOR POWER DRAW EQUIPMENT ON THE SAME LINE.

IT IS REQUIRED THAT THE POWER DELIVERED TO THIS GRINDER IS 115 VAC - 15 AMPS. THE TOLERANCE ON THIS POWER REQUIREMENT IS +/- 5%. THEREFORE THE MINIMUM VOLTAGE REQUIREMENT IS 109VAC WITH 15 AMPS. VOLTAGE MUST BE CHECKED WITH ALL EQUIPMENT UNDER LOAD (OPERATING) ON THE CIRCUIT.

DO NOT OPERATE THIS GRINDER WITH AN EXTENSION CORD.

DO NOT OPERATE THIS GRINDER ON A GROUND FAULT INTERUPTER (GFI) CIRCUIT. THE (GFI) WILL TRIP CONSTANTLY.

PROPER GROUNDING OF THE RECEPTACLE GROUND IN YOUR BUILDING MUST BE VERIFIED. IMPROPER GROUNDING IN YOUR BUILDING MAY CAUSE THE GRINDER TO MALFUNCTION.

The grinder is equipped with a high/low voltage relay (LVR) which is factory preset at 100 VAC low voltage trip and 140 VAC high voltage trip. If the power supply line does not deliver a minimum of 100 VAC and a maximum of 140 VAC power under load, the relay will open and trip out the starter. If this occurs, your power supply line is incorrect and must be correct before proceeding further with the grinder.

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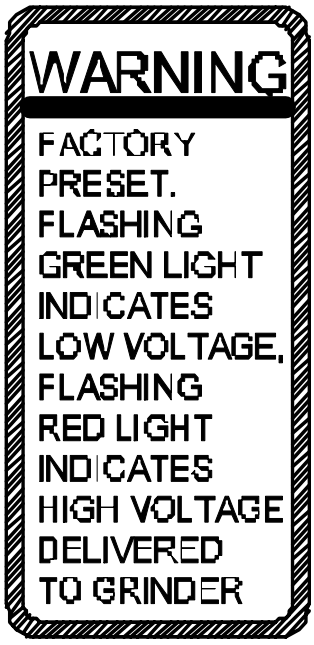


When installing the grinder, the following guidelines should be used to establish the wire size between the power panel in your building and the grinder receptacle. Note that the wiring in your building must be per code between main power panels and sub panels.

FOR 15 AMP RATED LARGE MACHINES

For 0 to 30 Feet from panel to receptacle = Use 14 Ga. Wire.
For 30 to 50 Feet from panel to receptacle = Use 12 Ga. Wire.
For 50 to 80 Feet from panel to receptacle = Use 10 Ga. Wire.
For 80 to 140 Feet from panel to receptacle = Use 8 Ga. Wire.

For 0 to 15 Meters from panel to receptacle = Use 2.5mm Wire.
For 15 to 42 Meters from panel to receptacle = Use 4.0mm Wire.

ASSEMBLY INSTRUCTIONS (Continued)

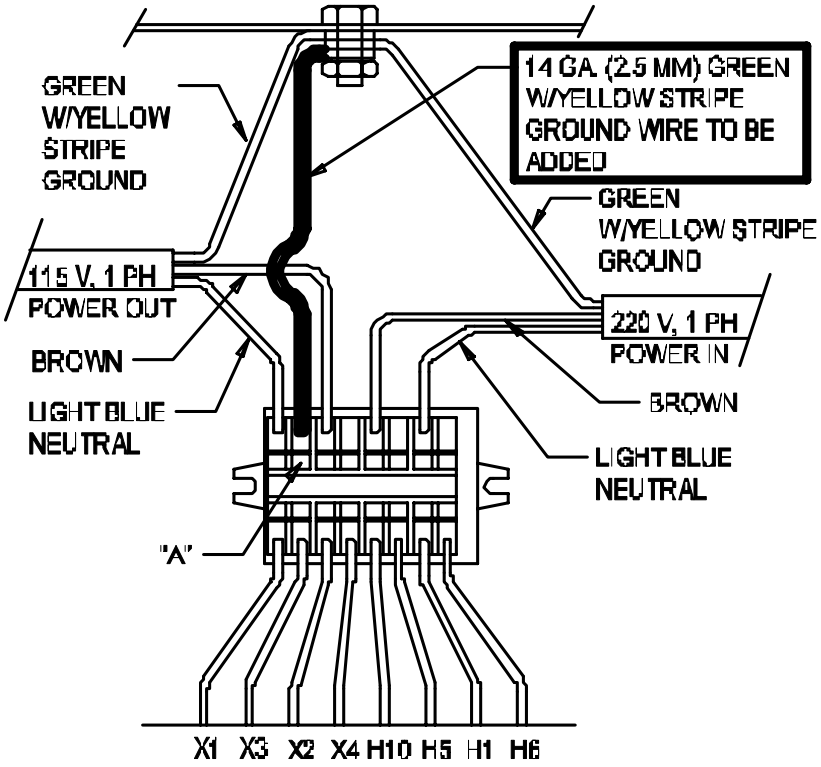
FOR 220-240 V 50 or 60Hz applications Product No. 4600951 should be ordered.

4600951 includes a 2 KVA 220-240 Volt Step Down to 110-120 Volt 50/60 Hz transformer which is prewired.

The wiring diagram is shown in FIG. 5.

The power cord has no connector. A connector which is appropriate for your locality and 220 volt, 8 amp application should be installed.

USE ONLY A QUALIFIED ELECTRICIAN TO COMPLETE THE INSTALLATION.



INDIVIDUALLY WIRE NUT TRANSFORMER LEADS H2, H3, H4, H7, H8 AND H9

FIG. 5

INSTALL THE GREEN W/YELLOW STRIPE WIRE SUPPLIED INTO THE TERMINAL BLOCK IN THE HOLE OPPOSITE WIRE X3 AS SHOWN. TO INSTALL THE WIRE INSERT A SMALL SCREWDRIVER INTO THE CAVITY MARKED "A" TO OPEN THE WIRE HOLE.

ATTACH THE OTHER END OF THE GREEN W/YELLOW STRIPE WIRE SUPPLIED TO THE GROUND STUD ON THE TRANSFORMER.

IMPORTANT GROUNDING INSTRUCTIONS

In case of a malfunction of breakdown, grounding reduces the risk of electrical shock by providing a path of least resistance for electrical current.

This Grinder has an electrical cord with an equipment grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded according to all local or other appropriate electrical codes and ordinances.

Before plugging in the Grinder, make sure it will be connected to a supply circuit protected by a properly-sized circuit breaker or fuse. SEE SERIAL NUMBER PLATE FOR FULL LOAD AMP RATING OF YOUR MACHINE.

Never modify the plug provided with the machine--if it won't fit the outlet, have a proper outlet and circuit installed by a qualified electrician.

ALWAYS PROVIDE A PROPER ELECTRICAL GROUND FOR YOUR MACHINE. AN IMPROPER CONNECTION CAN CAUSE A DANGEROUS ELECTRICAL SHOCK. IF YOU ARE UNSURE OF THE PROPER ELECTRICAL GROUNDING PROCEDURE, CONTACT A QUALIFIED ELECTRICIAN.

MAINTENANCE & LUBRICATION

DAILY MAINTENANCE IS SPECIFIED ON PAGE 6 OF THE OPERATOR'S MANUAL, AND IS TO BE PERFORMED BY THE OPERATOR. LISTED BELOW ARE PERIODIC MAINTENANCE ITEMS TO BE PERFORMED BY YOUR COMPANY'S MAINTENANCE DEPARTMENT:

1. Monthly check fan air filter located on the left side panel, inside the grinding enclosure. Replace if necessary.

2. Monthly check movement of the blade clamping blocks. Remove and clean any parts that are sticking or binding. Reassemble taking care to line up all balancing marks. Check balance.

3. Check Traverse bearings at least every month. Lubricate per proceedure on next page. Replace when there is excess movement of grinding heads due to bearing wear.

4. Every two months check the movement of the grinding heads in the veritical directions. Remove shoulder bolts, springs, and ratchet handles, clean all surfaces and re-assemble.

5. Every Six months check traverse belt tension. Adjust tension per procedure in adjustments section of this manual.

6. Every six months to a year check infeed screws on the top and bottom grinding heads. Remove bellows and clean and grease if needed. Make any needed adjustments to the locknut, coupling, or stepper motor locations (See adjustments section for details.)

7. Every six months check brass backlash nut and rubber bellows on the infeed shaft. Replace if worn. (See adjustments section for details.)

8. Check the brushes on the auto traverse drive motor once every two years. Replace as necessary. See Troubleshooting Section.

MAINTENANCE & LUBRICATION (Continued)

LUBRICATION OF LINEAR BEARINGS

STEP 1--Thoroughly clean the shafts.

STEP 2--Flood spray the four shafts with a spray lubricant **(Do not use teflon based lubricant)** until the lubricant is dripping off the shafts. See FIG. 6 Then run the carriage back and forth through its full range of travel. This will carry the lubricant into the bearings.

STEP 3--With a clean rag, wipe off the excess amount of lubricant from the shafts. Run the carriage back and forth through its full range of travel and wipe the shafts after each traverse. Repeat until the shafts are dry to the feel. This completes the lubrication process.

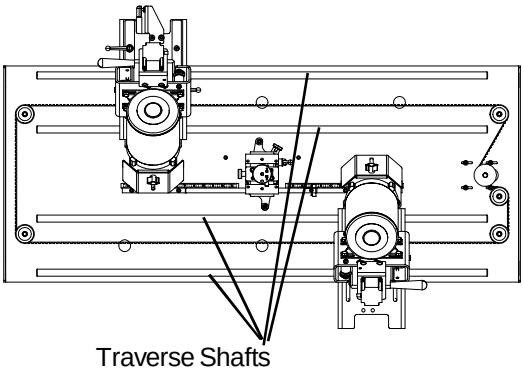


FIG. 6

If the unit will be shut down for an extended period of time, more than two weeks see Lubrication Frequency below.

Recommended lubricant is CRC 3-36.

LUBRICATION FREQUENCY

The lubrication frequency is to check the shaft monthly during grinder operation.

If the unit will be shut down for an extended period of time, more than two weeks, then the shafts and other appropriate parts of the unit should be flooded with lubricant and that lubricant left in place until the unit is brought back into service. When the unit is brought back into service the full lubrication procedure as stated above should be repeated.

CLEANING AND MAINTENANCE GUIDELINES FOR POLYCARBONATE WINDOWS

Cleaning Instructions

DO NOT USE GASOLINE
Adherence to regular and proper cleaning procedures is recommended to preserve appearance and performance.

Washing to Minimize Scratching

Wash polycarbonate windows with a mild dish washing liquid detergent and lukewarm water, using a clean soft sponge or a soft cloth. Rinse well with clean water. Dry thoroughly with a moist cellulose sponge to prevent water spots. Do not scrub or use brushes on these windows. Also, do not use butyl cellosolve in direct sunlight.

Fresh paint splashes and grease can be removed easily before drying by rubbing lightly with a good grade of VM&P naphtha or isopropyl alcohol. Afterward, a warm final wash should be made, using a mild dish washing liquid detergent solution and ending with a thorough rinsing with clean water.

Minimizing Hairline Scratches

Scratches and minor abrasions can be minimized by using a mild automobile polish. Three such products that tend to polish and fill scratches are Johnson paste Wax, Novus Plastic Polish #1 and #2, and Mirror Glaze plastic polish (M.G. M10). It is suggested that a test be made on a corner of the polycarbonate window with the product selected following the polish manufacturer's instructions.

Some Important "DON'TS"

- **DO NOT** use abrasive or highly alkaline cleaners on the polycarbonate windows.
- **NEVER** scrape polycarbonate windows with squeegees, razor blades or other sharp instruments.
- Benzene, gasoline, acetone or carbon tetrachloride should **NEVER** be used on polycarbonate windows.
- **DO NOT** clean polycarbonate windows in hot sun or at elevated temperatures.

Graffiti Removal

- Butyl cellosolve, (for removal of paints, marking pen inks, lipstick, etc.)
- The use of masking tape, adhesive tape or lint removal tools works well for lifting off old weathered paints.
- To remove labels, stickers, etc., the use of kerosene, VM&P naphtha or petroleum spirits is generally effective. When the solvent will not penetrate sticker material, apply heat (hair dryer) to soften the adhesive and promote removal.

GASOLINE SHOULD NOT BE USED!

ADJUSTMENTS

TO REPLACE THE CARRIAGE LINEAR BEARINGS

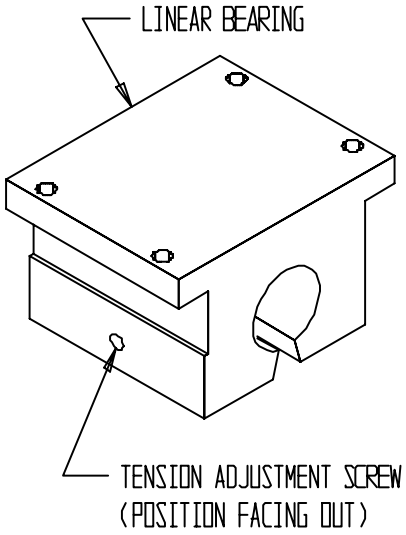


FIG. 6A

Outer Rail Bearings:

1. To replace the bearing on the top rail or bottom rail See Fig 7, first remove the grinding head. The Grinding head is secured to the Carriage base with 2 shoulder bolts and 2 adjustable handles. Then remove the screws for the bearing. Slide the bearing off the end of the shafts.
2. Clean the shaft. (Use CRC 3-36 lubrication that is specified on page 10 of this manual.)
3. Slide the new bearing on the shaft with the tension adjustment screw pointing outward. See FIG. 6A. Adjust the tension screw of the linear bearing so when you radially rotate the bearing around the shaft there should be no free play between bearing and shaft.
   NOTE: Tension is to tight if you feel a cogging action when you rotate the linear bearing around the shaft. This cogging is from skidding the bearing balls on the shaft and indicats the tension screw is to tight. Finally, slide the bearing back and forth on the shaft. It should have a smooth uniform motion.

SETTING THE BEARING TENSION CORRECTLY IS CRITICAL TO PROPER GRINDING. BEARINGS THAT ARE TO TIGHT OR TO LOOSE WILL CAUSE POOR GRINDING QUALITY. ALSO, BEARINGS THAT ARE TO TIGHT WILL HAVE SUBSTANTIALLY SHORTER LIVE AND MAY DAMAGE THE SHAFT.

4. Install the bearing with the screws and nuts. Move the proximity switches so that the grinding head can travel through its full range of motion. Move the head back and forth through this range of motion several times. Reinstall Grinding heads.

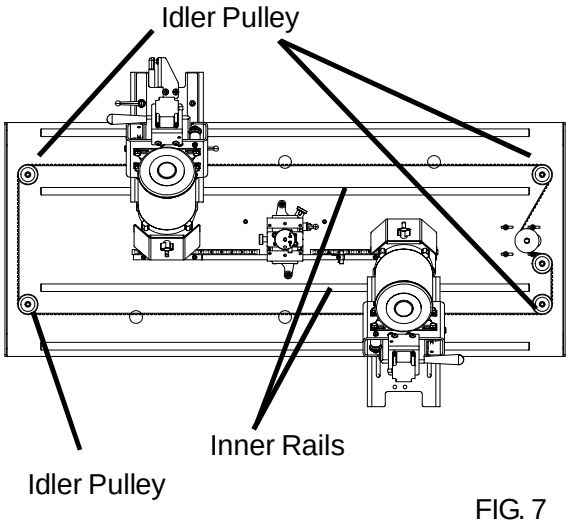


FIG. 7

Inner Rail Bearings:

1. To replace a bearing on either of the two inner most rails See Fig 7., first remove the idler pulley that is at the end of the shaft where the bearing will be removed.
2. Remove the grinding head. The Grinding head is secured to the Carriage base with 2 shoulder bolts and 2 adjustable handles. Removed the screws for the bearing. Slide the bearing off the end of the shafts (Where pulley was removed).
3. Clean the shaft. (Use CRC 3-36 lubrication that is specified on page 10 of this manual.)
4. Slide the new bearing on the shaft with the tension adjustment screw pointing to outward. Adjust the bearing as detailed above. Install the bearing with screws and nuts.
5. Reinstall the Idler pulley removed in step 1. Check the belt tension and make adjustment if needed. (see Traverse Belt Tension in Adjustments section.)
6. Move the proximity switches so that the grinding head can travel through its full range of motion. Move the head back and forth through this range of motion several times.
   Reinstall the Grinding Heads.

SPRING PLUNGER (ANGLE POSITION)

Adjust the position of the spring plunger for a positive detent at each position, but still easily moveable. See FIG 8.

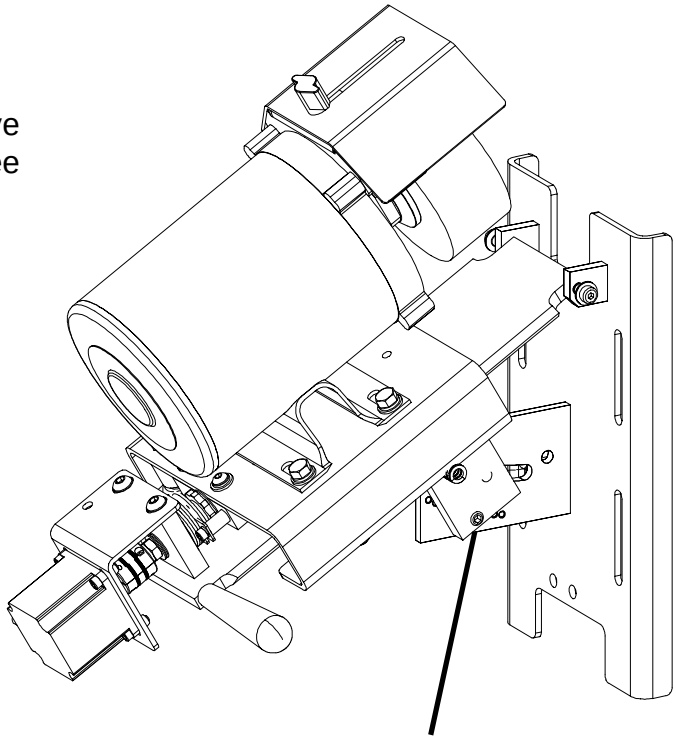


FIG. 8

PIVOT SHAFT CLAMP BLOCK ADJUSTMENT

To adjust the return position of the center support assembly, loosen the clamp shaft nut. See FIG. 10 Disengage the relief release system from bar by rotating it. This will allow the center support assembly to rotate. The springs located on the back of the traverse base return the assembly to the position so that the relief release system engages the bar located on the traverse base. With the clamp Shaft nut loose the assembly should rotate on the pivot shaft. (Note you may need to tap the end of the Clamp shaft with a rubber hammer if it appears to be bound up.) Adjust so the Relief Release bar is over the Anti- rotate bar on the frame. Tighten the Clamp Shaft nut and test to make sure the system works with both left and right sided blades.

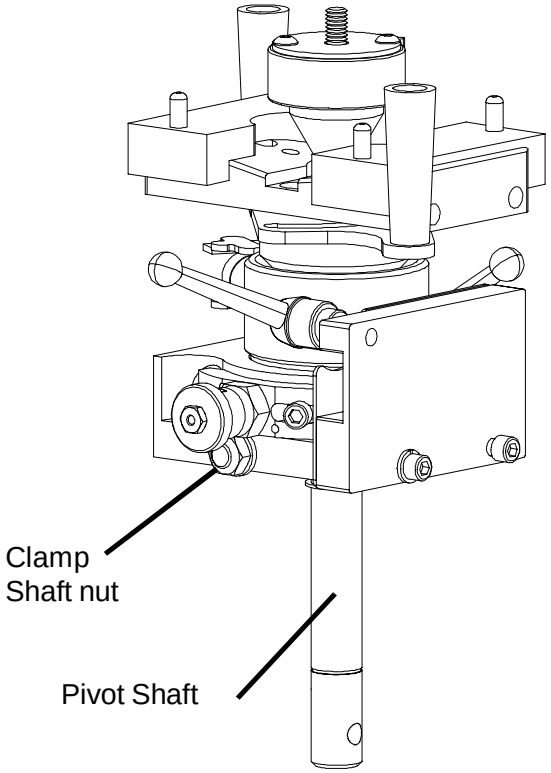


FIG. 10

BALANCER ASSEMBLY

If it becomes necessary to disassemble the Center Support Assembly, mark all parts in relation to each other before disassembly. The Assembly is balanced at the factory. To maintain this balance it must be assembled with the parts in there appropriate places. If the balance is not correct after assembly it may be necessary to balance by using set screws in the balance holes located on the clamp base assembly. (Note these are sealed with silocon to keep debis from affecting the balance.)

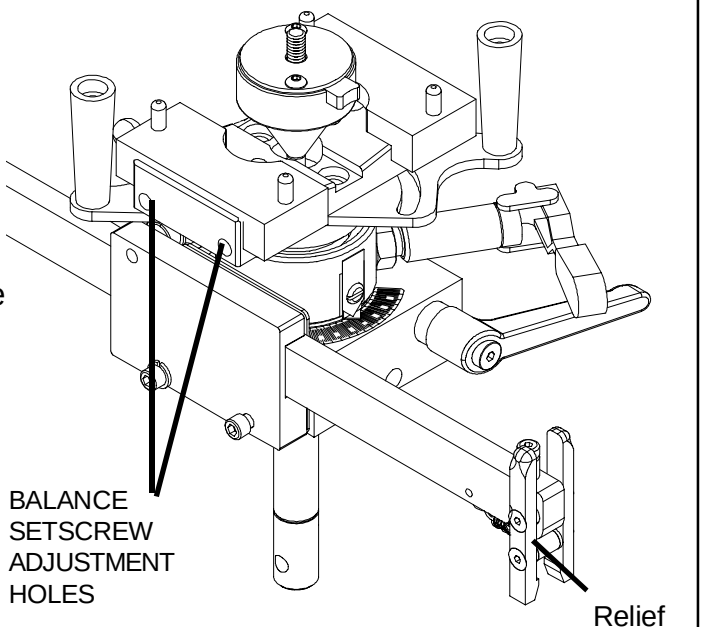


FIG. 11

ADJUSTMENTS (Continued)

CAM PLATE ALIGNMENT SETSCREW

To make adjustments to the cam plate start position loosen the nut located on the position setscrew and adjust the setscrew so that the relief slide bar pin engages the cam plate smoothly. See FIG 12 After this is adjusted lock the setscrew in place by tightening the nut on the setscrew.

The stop position for when the bottom head is moved to the left side of the grinder is done with the other setscrew. Make the adjustments as stated above and lock this in place.

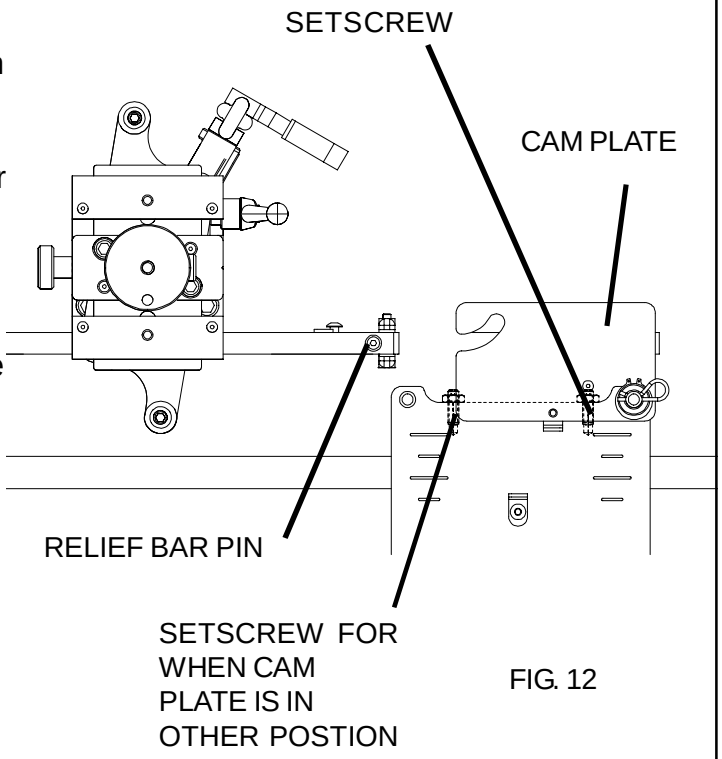


FIG. 12

TRAVERSE BELT TENSION

To adjust the belt tension, loosen the screws that hold the traverse motor to the traverse base. See FIG 13. Apply pressure (approximately 100 lbs) to the motor toward the center of the machine. While applying pressure tighten the bolts that hold the motor in place. Check the tension on the belt.

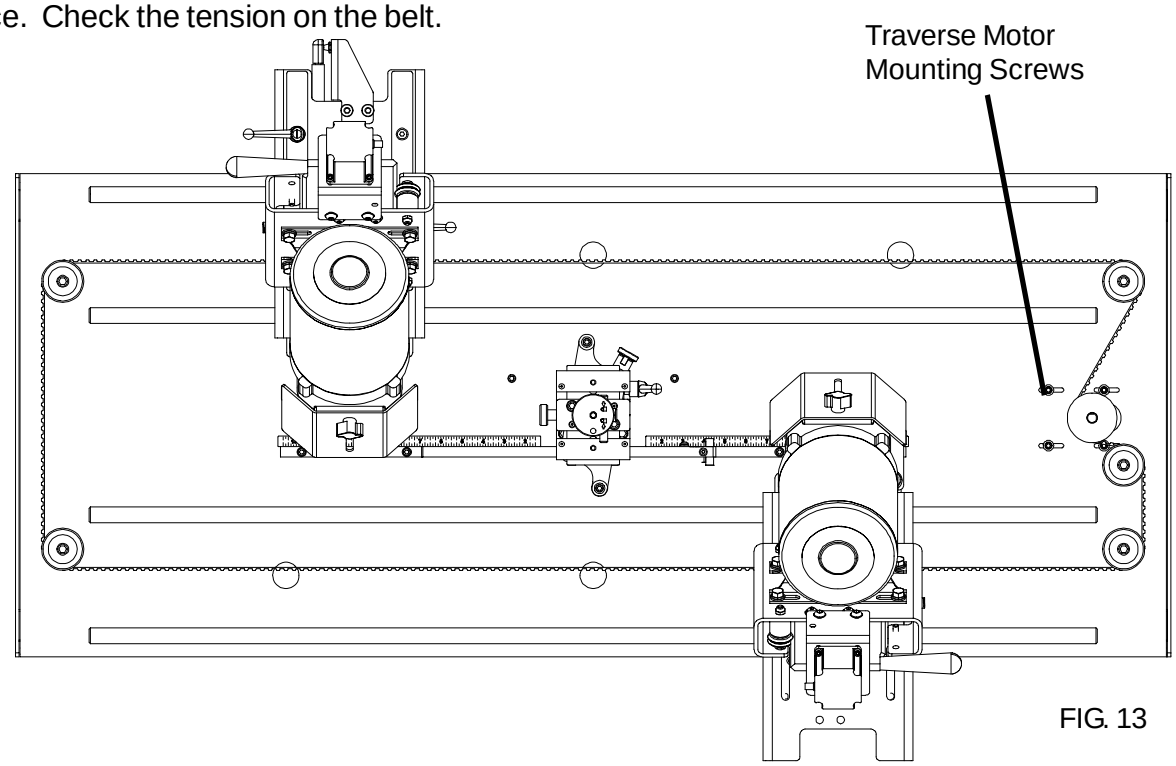


FIG. 13

TO ADJUST THE PROXIMITY SWITCHES

For the proximity switches to work properly and reverse the direction of the carriage at each end of a traverse, a distance of 3/16 in. +/- 1/32 [4.75 mm +/- 0.75] must be maintained between the top of the switch and the actuator bracket on the bottom of the carriage. See FIG. 14.

To adjust the clearance, loosen one of the switch mounting nuts while tightening the other.

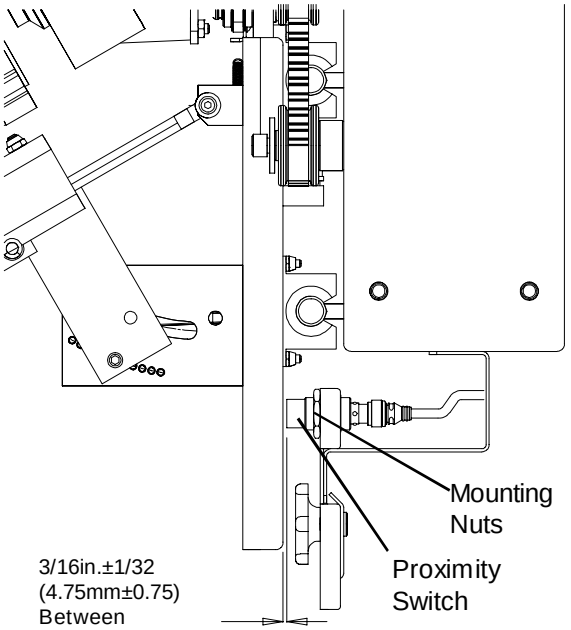


FIG. 14

ADJUSTING THE PRELOAD TENSION ON THE SMALL GRINDING HEAD SLIDE VEE ROLLERS

The small grinding head slide vee rollers are positioned two fixed and one adjustable on the side. To set the correct preload on the right side adjuster, tighten the setscrew in FIG. 15 until the spring is fully compressed solid, then back off 1/2 turn.

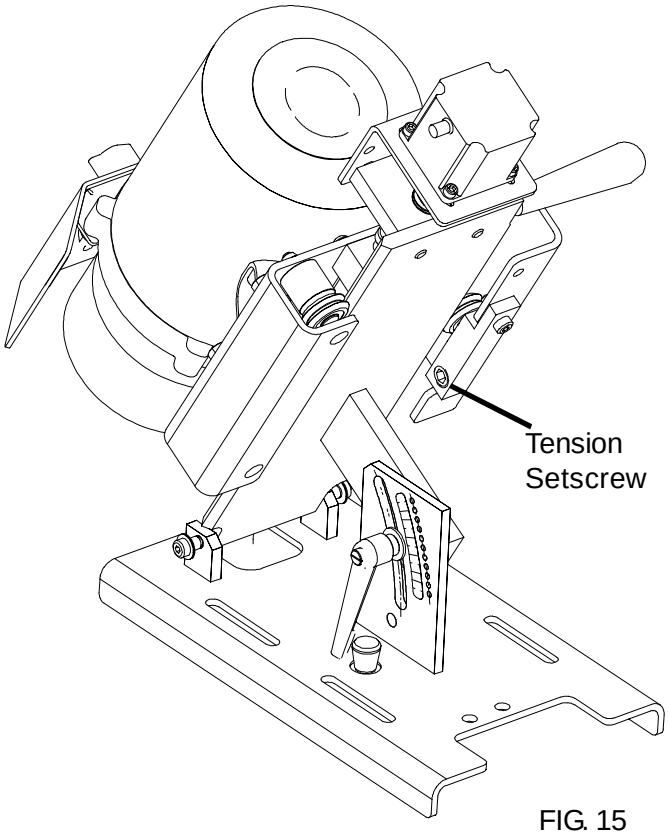


FIG. 15

ADJUSTMENTS (Continued)

TO ELIMINATE CARRIAGE INFEED BACKLASH

If there is backlash in the carriage infeed system, there are two adjusting points to check:

1.Conical washer and Shaft Backlash nut:

A. Remove rubber bellows retainer and pull back bellows to get access to the Backlash Nut.
B. Unscrew the shoulder bolt.
C. Turn the backlash nut counterclockwise until the conical washers are touching each other, finger tight. Continue turning the backlash nut counterclockwise two notches and any additional amount until the notch is centered over the shoulder-bolt hole.
D. Reinstall the shoulder bolt to lock the nut in position.
E. Reinstall the rubber bellows.

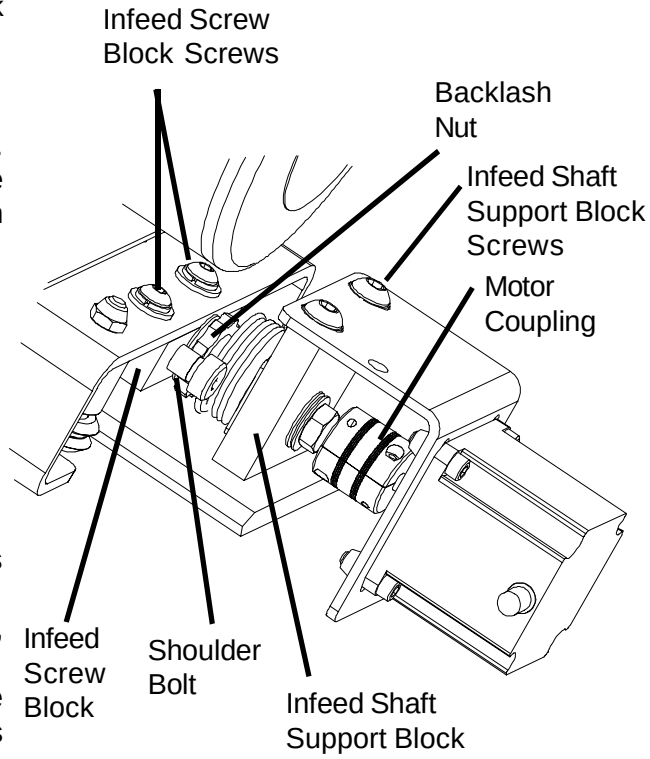


FIG. 16

2. Infeed bearing block adjustment:

A. Loosen the infeed shaft support block screws.
B. Let the infeed shaft support block find its neutral position and snug the screws.
C. Run the infeed system thru its full range. If it moves freely thru the full range, tighten the screws and recheck free movement thru the full range. If good, you are done. If still binding see step D.
D. If it does not move freely thru the full range, move the grinding head to the binding location and repeat steps A, B and C. Repeat this process until it moves freely thru its full range.

If repeated adjustments does not allow free travel thru the full range, it may be necessary to loosen the infeed screw block screws letting the infeed screw block find neutral and go thru the proceedure of floating both the infeed screw block and the Infeed shaft support block until you find the combination that allows free movement thru the full range when all screws are tight.

It rarely is involved, but it may be necessary to loosen the four mounting screws that hold the stepper motor and allow it to float into alignment with the infeed shaft and retighten to achieve a smooth infeed.

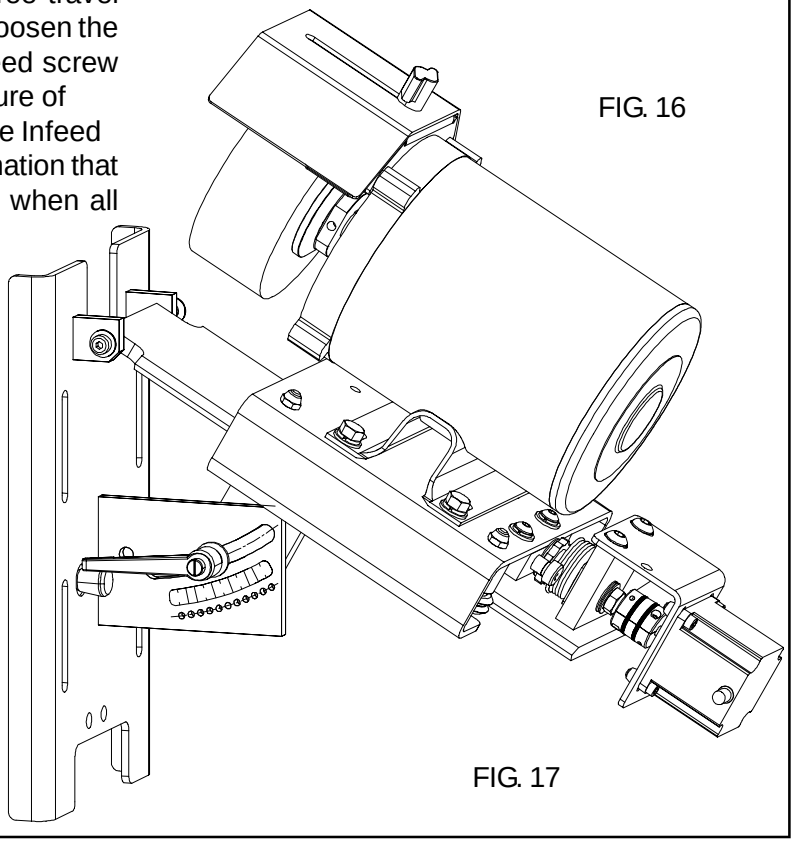


FIG. 17

ADJUSTMENTS (Continued)

POTENTIOMETER ADJUSTMENTS TRAVERSE DRIVE CONTROL (TDC)

(Right Traverse) Forward Acceleration--Factory set at full (CCW) 8:30. Do not change this setting.
(Left Traverse) Reverse Acceleration--Factory set at full (CCW) 8:30. Do not change this setting.

Max. Speed--Set at 2:30 for maximum voltage of 90 Volts DC to the traverse motor. When voltage is above 90 volts DC, the traverse motor will start to pulsate and not run smoothly.

IR COMP--Factory set to 9:00. IR COMP is current (I) resistance (R) compensation (COMP).
IR COMP adjusts the output voltage of the drive which balances load to motor RPM. Regulation of a traverse motor may be improved by slight adjustment of the IR COMP trim pot clockwise from its factory-set position. Overcompensation causes the motor to oscillate or to increase speed when fully loaded. If you reach such a point, turn the IR COMP trim pot counterclockwise until the symptoms disappear.

(Right Traverse) Forward Torque--Factory set at full (CW) 11:00. Do not change this setting.
(Left Traverse) Reverse Torque--Factory set at full (CW) 11:00. Do not change this setting.

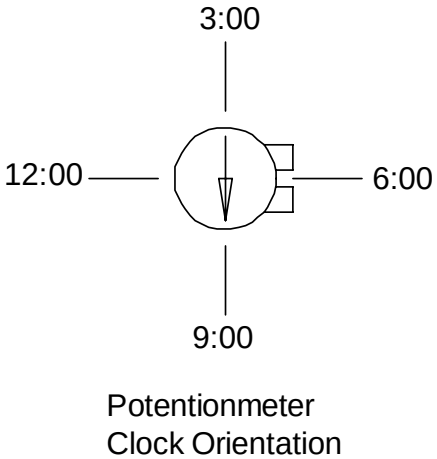
(DB) Dead Band is the potentiometer setting for the 50 or 60 Hz cycle control. Factory set to 3:00 for 60 Hz operation. Recalibrate to the 9:00 position for 50 Hz power.

Min. Speed--Factory set at full (CCW) 8:30. Do not change this setting.

Armature Voltage Selector switch (SW504) is on the top board and set to 90VDC. Do not change this setting.

Diagnostic LED's indicate the function that is currently being performed:

- **POWER indicates that ac power is being applied to the control.**
- **Limit FWD and REV are not used and should not light up.**



Potentionmeter
Clock Orientation

FWD ACC - 8:30
REV ACC - 8:30
MAX SPD - 2:30
IR COMP - 9:00
REV TQ - 11:00
FWD TQ - 11:00
DB - 3:00 60Hz/
9:00 50Hz
MIN SPD - 8:30
TACH - NA

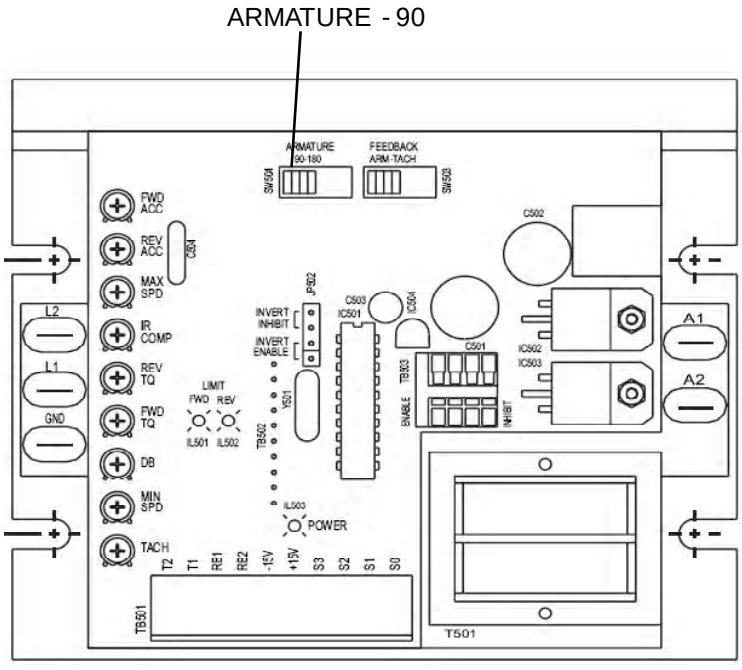


FIG. 18

ELECTRICAL TROUBLESHOOTING

SKILL AND TRAINING REQUIRED FOR ELECTRICAL SERVICING

This Electrical Troubleshooting section is designed for technicians who have the necessary electrical knowledge and skills to reliably test and repair the 460 Rotary Blade Grinder electrical system. For those without that background, service can be arranged through your local distributor.

This manual presumes that you are already familiar with the normal operation of the Grinder. If not, you should read the Operators Manual, or do the servicing in conjunction with someone who is familiar with its operation.

Persons without the necessary knowledge and skills should not remove the control box cover or attempt any internal troubleshooting, adjustments, or parts replacement.

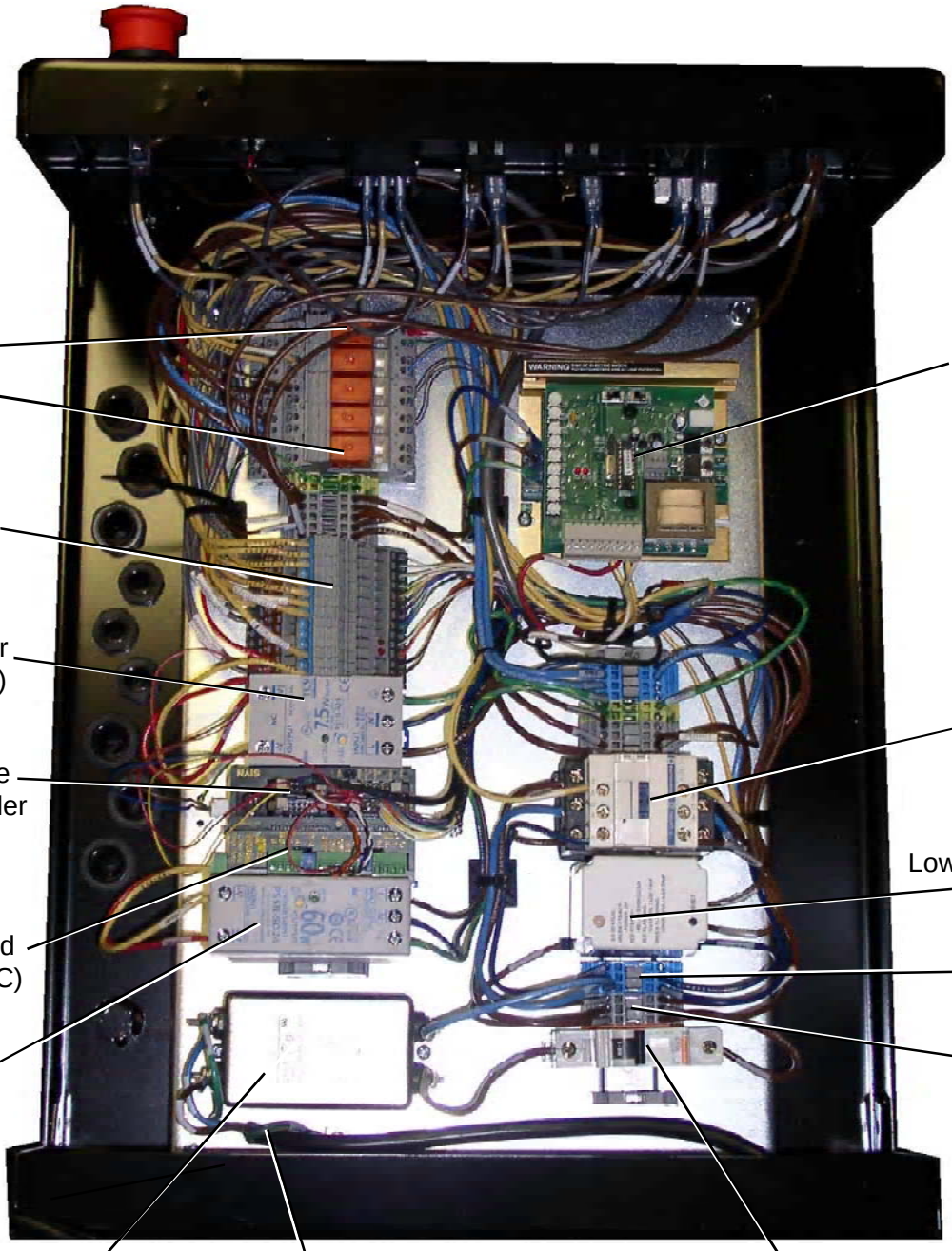
If you have any question not answered in this manual, please call your distributor. They will contact the manufacturer if necessary.

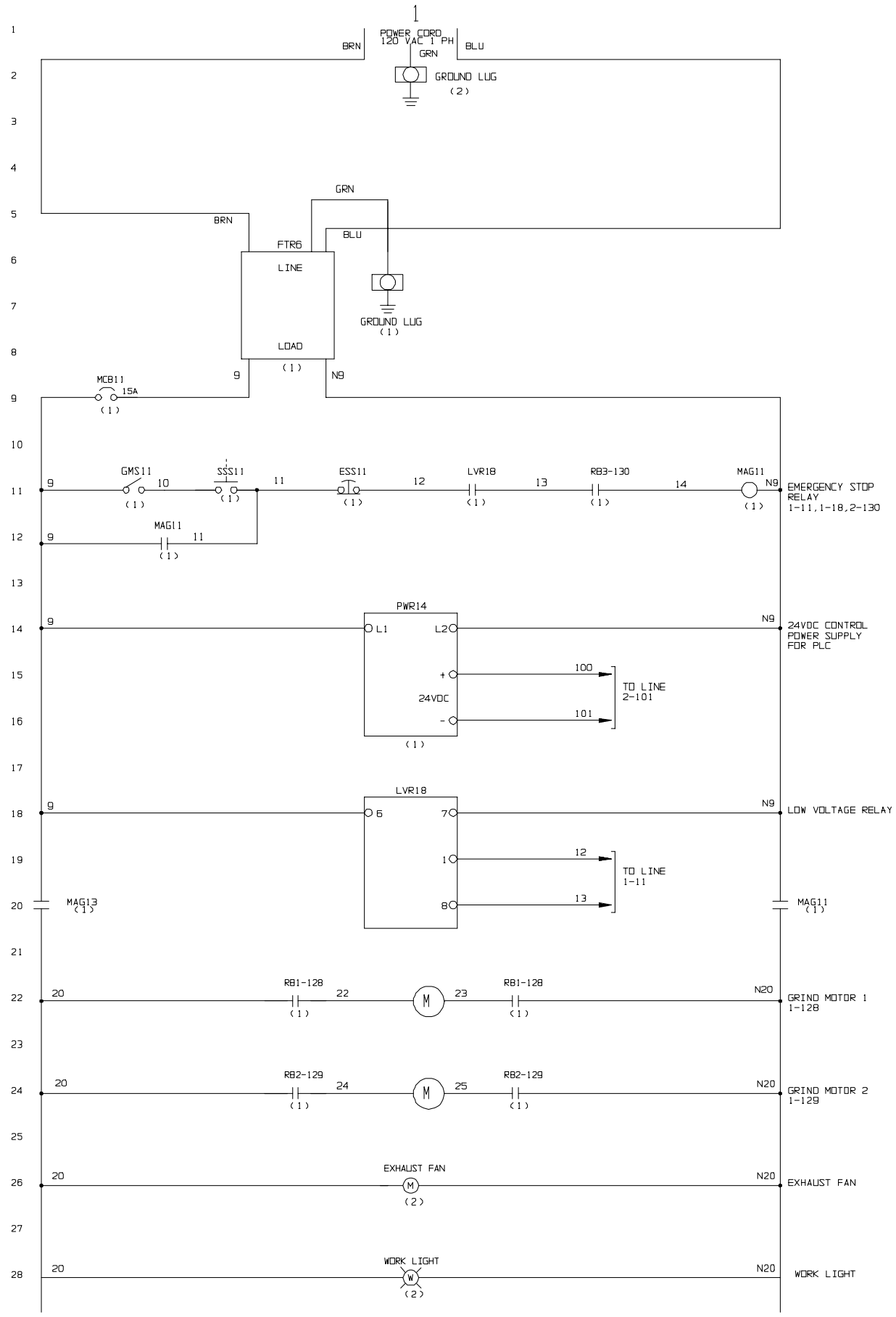
WIRE LABELS

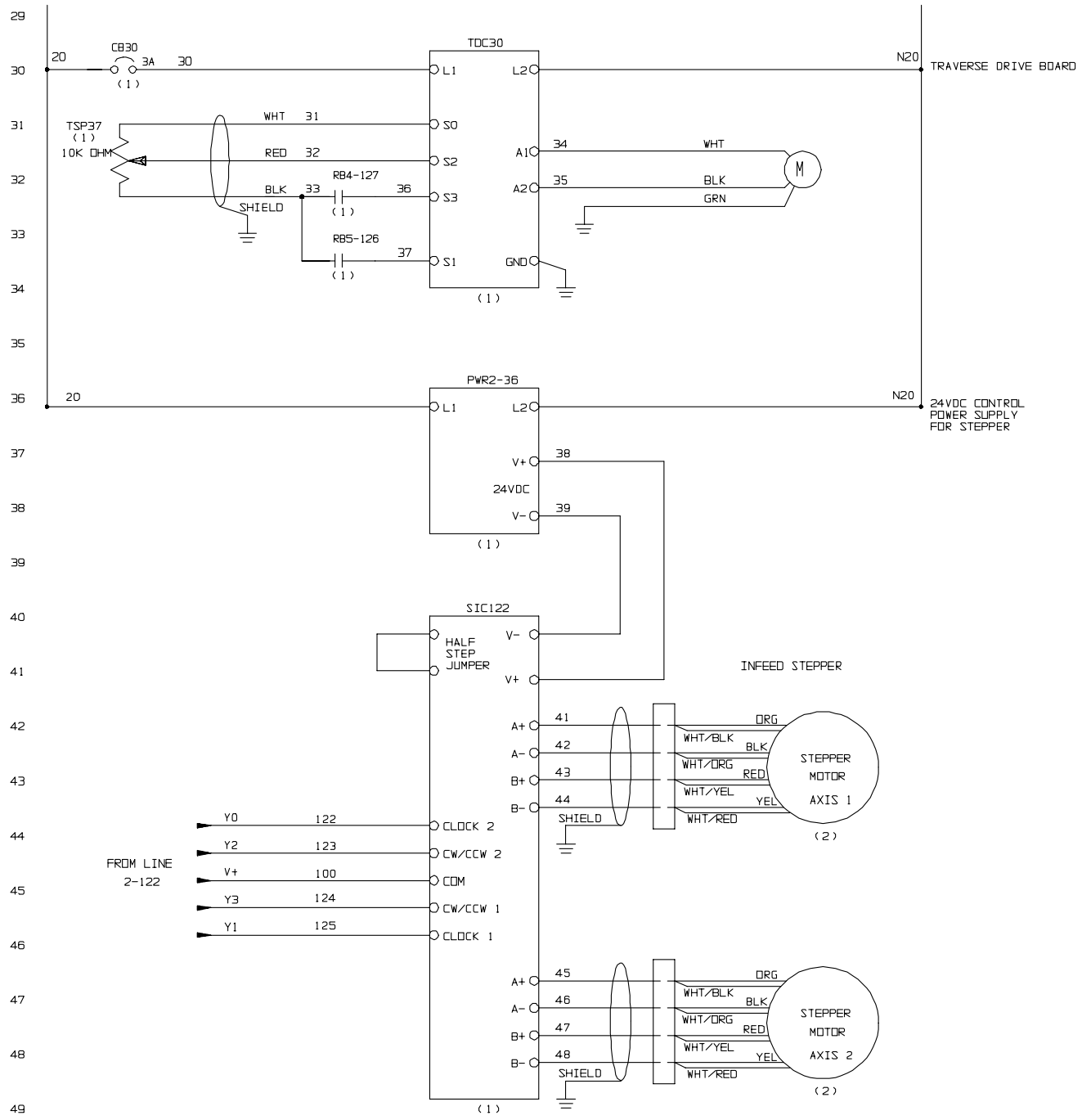
All wires on the 460 Rotary Blade Grindier have a wire label at each end for troubleshooting. The wire label has a code which tells you wiring information. The wire label has a seven position code. The first two or three digits are the wire number: 01-118. The next three numbers or letters are the code for the component to which the wire attaches. Example: LVR for Low Voltage Relay. The last two numbers or letters are the number of the terminal on the component to which the wire attaches.

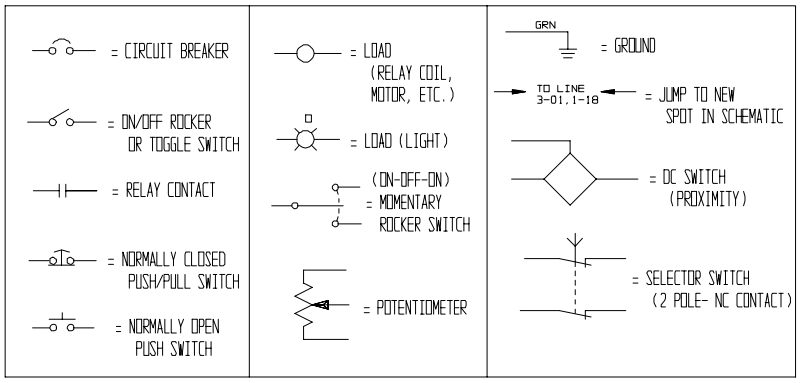
ELECTRICAL TROUBLESHOOTING INDEX

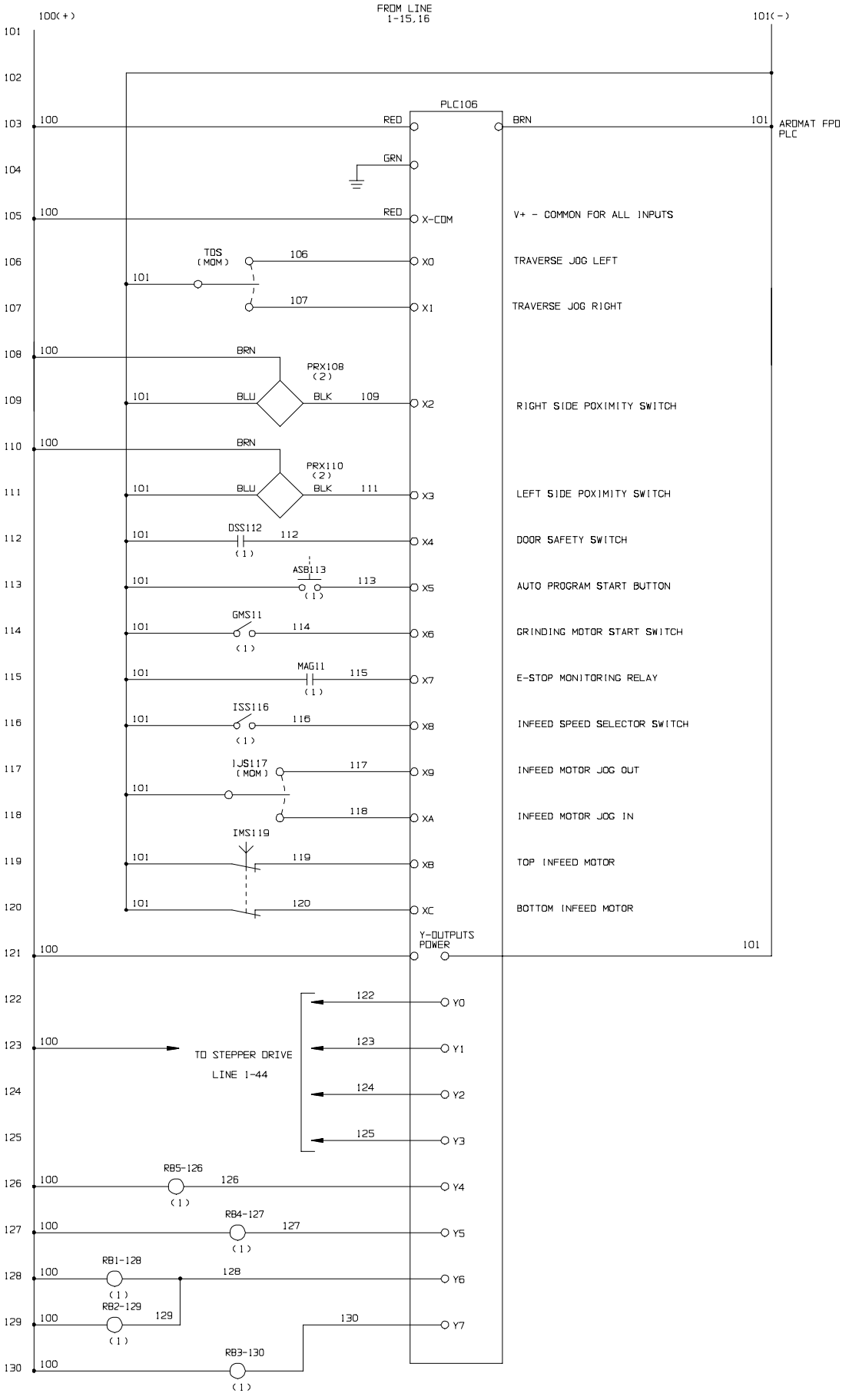
460 MANUAL CONTROL PANEL IDENTIFICATION




POWER CORD
120 VAC 1 PH
BRN
GRN
BLU
GROUND LUG
(2)
FTR6
LINE
LOAD
(1)
GROUND LUG
(1)
MCB11
15A
(1)
GMS11
SSS11
ESS11
LVR18
RB3-130
MAG11
EMERGENCY STOP
RELAY
1-11,1-18,2-130
PWR14
L1
L2
24VDC
+
-
24VDC CONTROL
POWER SUPPLY
FOR PLC
TO LINE
2-101
LVR18
LOW VOLTAGE RELAY
TO LINE
1-11
MAG13
MAG11
RB1-128
GRIND MOTOR 1
1-128
RB2-129
GRIND MOTOR 2
1-129
EXHAUST FAN
WORK LIGHT

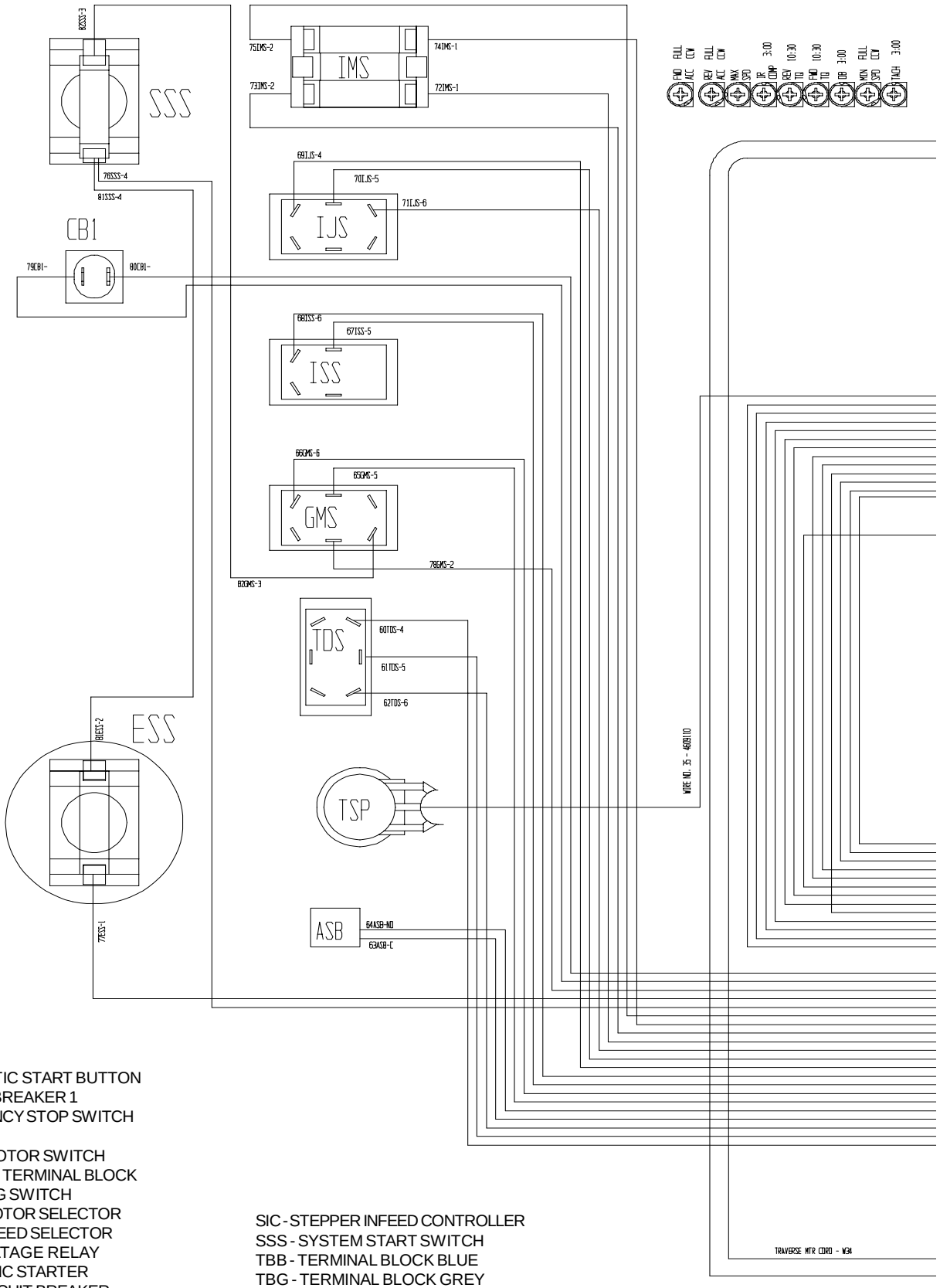

TDC30
CB30
3A
20
30
(1)
L1
L2
N20
TRAVERSE DRIVE BOARD
TSP37
(1)
10K OHM
WHT 31
RED 32
BLK 33
SHIELD
S0
S2
S3
S1
RB4-127
RB5-126
36
37
A1
A2
GND
34
35
WHT
BLK
GRN
M
PWR2-36
24VDC
V+
V-
38
39
SIC122
HALF STEP JUMPER
INFEED STEPPER
41
42
43
44
A+
A-
B+
B-
ORG
WHT/BLK
BLK
WHT/ORG
RED
WHT/YEL
YEL
WHT/RED
STEPPER MOTOR AXIS 1
STEPPER MOTOR AXIS 2
(2)
FROM LINE 2-122
Y0 122
Y2 123
V+ 100
Y3 124
Y1 125
CLOCK 2
CW/CCW 2
COM
CW/CCW 1
CLOCK 1
45
46
47
48
24VDC CONTROL POWER SUPPLY FOR STEPPER


= CIRCUIT BREAKER
= ON/OFF ROCKER OR TOGGLE SWITCH
= RELAY CONTACT
= NORMALLY CLOSED PUSH/PULL SWITCH
= NORMALLY OPEN PUSH SWITCH
= LOAD (RELAY COIL, MOTOR, ETC.)
= LOAD (LIGHT)
(ON-OFF-ON) = MOMENTARY ROCKER SWITCH
= POTENTIOMETER
GRN
= GROUND
TO LINE 3-01,1-18
= JUMP TO NEW SPOT IN SCHEMATIC
= DC SWITCH (PROXIMITY)
= SELECTOR SWITCH (2 POLE- NC CONTACT)


100(+)
FROM LINE 1-15,16
101(-)
PLC106
RED
BRN
GRN
AROMAT FPD PLC
X-COM
V+ - COMMON FOR ALL INPUTS
TDS (MOM)
X0
TRAVERSE JOG LEFT
X1
TRAVERSE JOG RIGHT
PRX108 (2)
BLU
BLK
X2
RIGHT SIDE POXIMITY SWITCH
PRX110 (2)
X3
LEFT SIDE POXIMITY SWITCH
DSS112
X4
DOOR SAFETY SWITCH
ASB113
X5
AUTO PROGRAM START BUTTON
GMS11
X6
GRINDING MOTOR START SWITCH
MAG11
X7
E-STOP MONITORING RELAY
ISS116
X8
INFEED SPEED SELECTOR SWITCH
IJS117 (MOM)
X9
INFEED MOTOR JOG OUT
XA
INFEED MOTOR JOG IN
IMS119
XB
TOP INFEED MOTOR
XC
BOTTOM INFEED MOTOR
Y-OUTPUTS POWER
Y0
Y1
Y2
Y3
TO STEPPER DRIVE LINE 1-44
RB5-126
Y4
RB4-127
Y5
RB1-128
Y6
RB2-129
Y7
RB3-130

ELECTRIC DIAGRAM

4604522

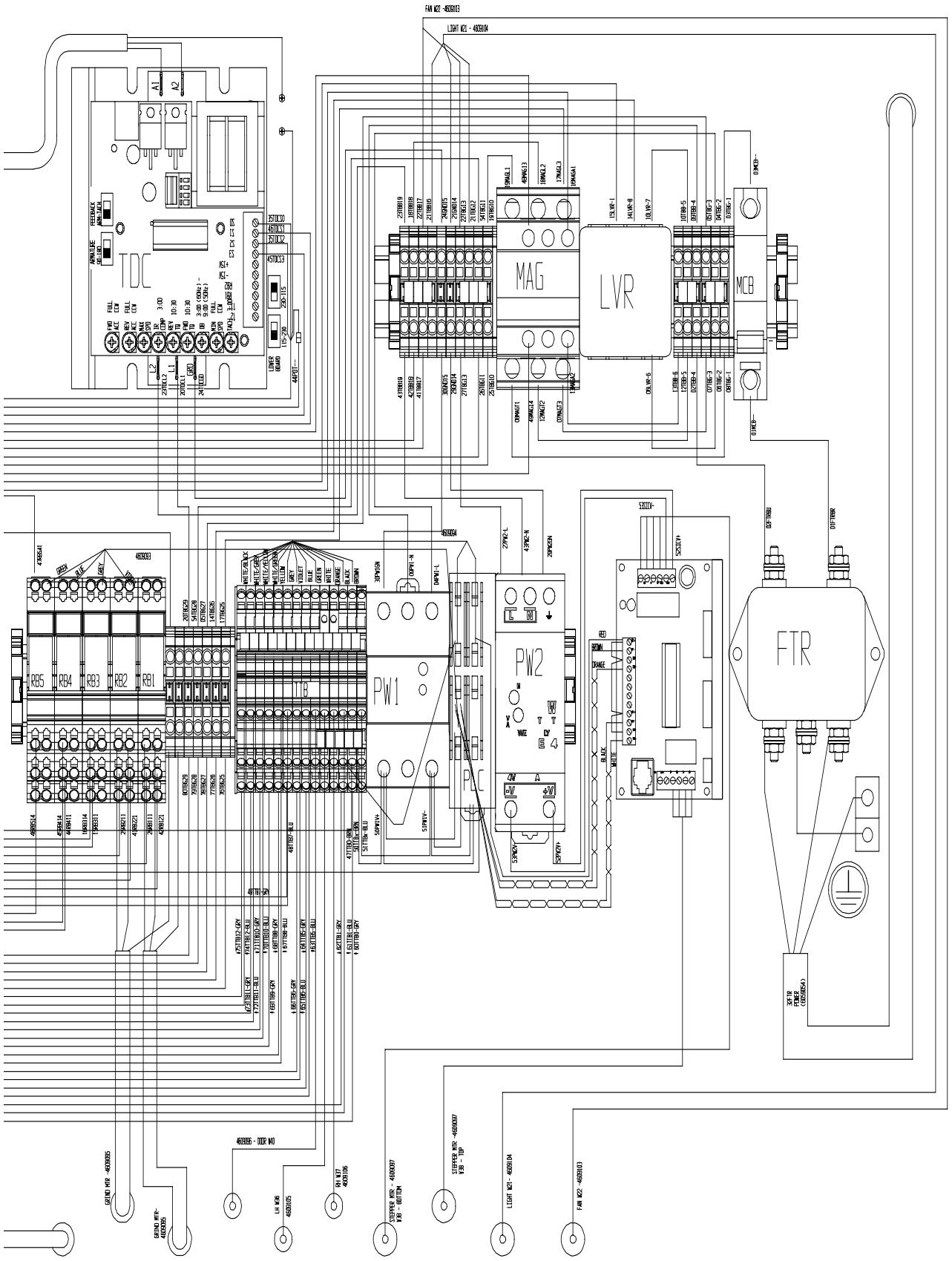


ASB - AUTOMATIC START BUTTON
CB1 - CIRCUIT BREAKER 1
ESS - EMERGENCY STOP SWITCH
FTR - FILTER
GMS - GRIND MOTOR SWITCH
GND - GROUND TERMINAL BLOCK
IJS - INFFED JOG SWITCH
IMS - INFEED MOTOR SELECTOR
ISS - INFEED SPEED SELECTOR
LVR - LOW VOLTAGE RELAY
MAG - MAGNETIC STARTER
MCB - MAIN CIRCUIT BREAKER
PLC - PROGRAMMABLE LOGIC CONTROLLER
PW1 - POWER SUPPLY 1
PW2 - POWER SUPPLY 2
RB1 - RELAY BLOCK 1

SIC - STEPPER INFEED CONTROLLER
SSS - SYSTEM START SWITCH
TBB - TERMINAL BLOCK BLUE
TBG - TERMINAL BLOCK GREY
TDC - TRAVERSE DRIVE CONTROL
TDS - TRAVERSE DRIVE SWITCH
TSP - TRAVERSE SPEED POTENTIOMETER
TTB - TIERED TERMINAL BLOCK

ELECTRIC DIAGRAM

4604522



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ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--AC Main Power Controls: no electrical power to control panel.

Verify all wires shown on the wiring diagram on pages 88 are correct and pull on wire terminals with approximately 3 lbs force to verify there are no loose terminal connections and/or no loose crimps between wire and terminal. If problem persists, test as listed below.

Possible Cause	Checkout Procedure	
Emergency Stop Botton(ESS) is Depressed	**A.** Pull Up on ESS Button	Machine works Yes--end troubleshooting No--go to Step **B.** next
You must push the System Start Switch (SSS) to get power to control Panel	**B.** Listen for the Magnetic Starter (MAG) contacts to pull in with a clunk	Machine works Yes--end troubleshooting No--go to step **C.** next.
Main Power Cord is not plugged in	**C.** Plug in main power cord	Machine works Yes--end troubleshooting No--go to step **D.** next.
Guard doors must be closed and ALL Switches **MUST** be turned **OFF.**	**D.** Close guard doors and turn off all switches.	Machine works Yes--end troubleshooting No--go to step **E.** next.
Relay Block 3 relay is not powered	**E.** Check for Red light on in Relay Block 3 (RB3).	Red light is on Yes--Skip to Step **M.** No-- go to step **F.** next.
No DC Power	**F.** Check for Green light on in DC Power Supply 1 (PW1).	Green light is on Yes--Go to Step **G.** next. No-- Skip to step **H.**
PLC is not functioning	**G.** Check for PLC output light Y7 is on.	Green light on PLC next to Y7 on the PLC is lit. Yes--Replace relay block in RB3 No--Contact factory - PLC problem.
Main 15 amp outlet circuit breaker has tripped	**H.** Check circuit breaker in your building and reset if necessary. (Check wall outlet with a light to make sure it works)	Machine works Yes--end troubleshooting No--light works in outlet--go to Step **I.** No-- light does not work in outlet. You must solve your power delivery problem independent of machine.
No 120 Volts AC power to Filter (FTR)	**I.** Check for 120V at Cord into FTR (Power Cord #32)	FTR "Line" Terminals for 120 Volts AC Yes--Go to Step **J**. next. No--Replace Power Cord
No 120 Volts AC power out of Filter	**J.** Check for 120V out of FTR	FTR "Load" Terminals for 120 Volts AC Yes--Go to Step **K**. next. No--Replace Filter
No 120 Volts AC power to Main Circuit Breaker (MCB)	**K.** Check for 120V to MCB	MCB left terminal (01MCB--) to Neutral (Blue) term on FTR for 120 volts AC Yes--Go to Step **L**. next. No--Check wires (#01), replace if bad

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Causes	***Checkout Procedure***	
No 120 Volts AC power from Main Circuit Breaker (MCB)	**L.** Check for 120V from MCB	MCB right terminal (03MCB--) to Neutral (Blue) Terminal on FTR for 120 Volts AC Yes--Go to Step **M**. next. No--Flip Switch on MCB to "ON" - Machine works-- end trouble shooting Machine does not work-- replace MCB
	M. Check for 120 Volts AC at terminal Block 27.	Measure 120 volts AC fromTerminal Block 27 (05TBG27) to the Neutral (Blue) Terminal on FTR Yes--Go to Step **N**. next. No--Check wire # 05. Verify Jumpers on grey Terminal Blocks 1-3.
Grind Motor Switch not working	**N.** Check for 120 Volts AC at Grind Motor Switch (GMS) Terminals 3	Measure 120 volts AC from GMS Terminal 3 (82GMS-3) to the Neutral (Blue) Terminal on FTR Yes--Go to Step **O**. next. No--Flip Switch and check again- Works--Switch is upside down. Does not work-- Check wiring/Verify continuity of W#78 / Replace Switch if bad
System Start Switch not working	**O.** Hold in green System Start Switch (SSS) and Check voltage out of contact at terminal 4	Measure 120 Volts AC from (SSS) terminal 4 to the Neutral (Blue) Terminal Block 4 (02TBB-4) Yes--Go to Step **P.** next No--Check wire #82 for continuity, then verify contact continuity. Replace bad part.
Emergency Stop Switch not working	**P.** Hold in SSS and Check voltage out of contact at terminal 1 of the red Emergency Stop Switch (ESS) MAKE SURE ESS SWITCH IS PULLED UP!	Measure 120 Volts AC from (ESS) terminal 1 to the Neutral (Blue) Terminal Block 4 (02TBB-4) Yes--Go to Step **Q.** next No--Check wire #81 for continuity, then verify NC contact continuity. Replace bad part.
LVR has detected improper voltage or is not functioning	**Q.** Hold in SSS and Check voltage at Low Voltage Relay (LVR). LVR must be installed in 8-pin socket.	Measure 120 Volts AC from LVR terminal 1 (15LVR-1) to the Neutral (Blue) block 02TBB-4 Yes--Go to Step **R.** next No--Check for 120 Volts AC from LVR terminal 6 to term 7. Yes--Check light on top of LVR: -Light on top should be steady red. Indicates Relay is energized. Replace LVR if there is red light & voltage at Terminal 8 but not at 1. -Flashing Green indicates Undervoltage trip. -Flashing Red indicates Overvoltage trip. (If light is flashing press reset button located on top of LVR. Light should change to green then steady red.) If flashing after reset is pressed then you must solve your power delivery problem independent of machine. No--Verify wires to LVR terminal 6 & 7.
Relay Block 3 relay is not functioning	**R.** Hold in SSS and Check voltage at Relay Block 3 (RB3) terminal14.	Measure 120 Volts AC from RB3 terminal 14 to the Neutral (Blue) Terminal Block 4 (02TBB-4) Yes-- Go to Step **S.** next No--Verify voltage into RB3 terminal 11. Replace relay in RB3 if there is 120 VAC to RB3 terminal 11 but not 14.
Mag Starter is bad	**S.** Hold in SSS and Check voltage at MAG A1 & A2.	Measure 120 Volts AC from MAG Term A1 to Term A2 Yes--MAG Should pull in with clunck, if not replace MAG. No--Verify Continuity of Wires (#13 & 16)

ELECTRICAL TROUBLESHOOTING (Continued)

***PROBLEM*--Machine Shuts off 2 seconds after you turn on Grind Motor Switch.**

Possible Cause	***Checkout Procedure***	
Low Voltage	**A.** Remove electrical box cover and watch LVR light on top of LVR	-Light on top should be steady red. Indicates Relay is energized. If the light turns off then comes back green then red this means the sensor has detected a trip mode and restarted. (It is tripping under load and the unloaded power is not outside the range. This is a power delivery problem independent of machine. Make sure there is no other equipment on the circuit and that the correct size wire was used for the outlet.) -Flashing Green indicates Undervoltage trip. -Flashing Red indicates Overvoltage trip. (If light is flashing press reset button located on top of LVR. Light should change to green then steady red.) If flashing after reset is pressed then you must solve your power delivery problem independent of machine.

***PROBLEM*--(MAG) turns on only with System Start Switch held in.**

Possible Cause	***Checkout Procedure***	
(MAG) holding contact has failed	**A.** Check wiring to MAG holding contact in T3 . Verify the magnetic starter holding contact is recieving power.	Measure 120 Volts AC at MAG term T3 to Neutral (Blue) Terminal on FTR for 120 Volts AC. Yes--Go to Step **B.** next. No-- Check wiring to MAG T3. Replace wire #07 if necessary.
	B. Check continuity of MAG holding contact. **UNPLUG MACHINE**. Remove cover plate on top of MAG. Hold in center of MAG (Blue Area) to manual pull in contact. Check continuity between T3 to L3.	Verify continuity between T3 to L3 Yes-- Check wiiring from MAG L3 to Grey Terminal Block 25 wire #17. Then from TBG 25 to SSS Terminal 4 wire #76. No-- Replace MAG

ELECTRICAL TROUBLESHOOTING (Continued)

***PROBLEM--* Grinding Motors Don't turn on when GMS is switched to On.**

Possible Cause	***Checkout Procedure***	
Guard Doors are Open	**A.** Close the front doors	Machine works Yes--end troubleshooting No--go to Step **B.** next
Door Safety Switches are not working properly	**B.** Check Alignment of Door Safety Switches on doors	Check alignment of door switch. Make adjustments if necessary. Yes--end troubleshooting No--go to Step **C.** next
	C. Check for light on PLC inputs X4	Light next to X4 is on. Yes--Skip to Step **F.** No--go to Step **D.** next
	D. Check for 24VDC at the Door Safety Switch. Open Cover on Switch and check voltage with **doors Open.**	Measure 24VDC from Terminal 13 to 14 on Door safety Switch. Yes--Go to Step **E.** next No--Check connections and verify continuity of wire 40 to TTB4 & PLC cable.
	E. Check for 0 VDC at the Door Safety Switch. Check voltage with **doors Closed.**	Measure 0 VDC from Terminal 13 to 14 on Door safety Switch when doors are closed. Yes-- X4 should light on PLC - verify wiring and contact factory- PLC issue. No--Recheck door switch alignment. Replace Door Safety Switch.
	F. Check for light on PLC inputs X6	Light next to X6 is on. Yes--Skip to Step **I.** No--go to Step **G.** next
Grind Motor Switch (GMS) is not working properly	**G.** Check for 24 VDC into GMS. Remove yellow wire 65 at GMS terminal 5.	Remove wire 65 (65GMS-5) and measure 24 volts DC from wire to the V+ on PW1. Yes--Reinstall wire. Go to Step **H**. next. No--Verify continuity of wires from TTB.
	H. Verify Continuity of GMS with power off.	Turn Power off. Verify continuity between terminals on GMS where wire #65 & wire #66 are plugged into. Continuity: Yes-- verify wire #66 at TTB6 & Cable from TTB to PLC, Light X6 should be lit see Step **F.**, contact factory if not- Issue with PLC No-- replace GMS.
Relay Blocks 1 & 2 are not wroking properly.	**I.** Check for red LED light on RB1 & RB2.	Lights on RB1 & RB2 are on. Yes--Go to Step **J.** next No--Verfy there is 24 volts DC from A1 to A2 on RB1 & RB2. Yes-- Replace removable relay. No-- Check continuity of cable from PLC and wire from TTB, verify jumper on A1/A2 side. If only one light is out, check jumper on RB1 to RB2. Replace removable Relay in one with Light out. (To verify it is the removable relay, switch with another relay)

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Cause	***Checkout Procedure***	
	J. Check voltage into RB1 and RB2	Measure 120 volts AC from RB1 terminal 11 to terminal 21 and RB2 terminals 11 to 21 Yes--Go to Step **K**. next. No--Check wiring/Verify Continuity or wires to RB1 11 & 21 and RB2 11 & 21
	K. Check voltage out of RB1 and RB2	Measure 120 volts AC from RB1 terminal 14 to terminal 24 and RB2 terminals 14 to 24 Yes--Go to Step **K**. next. No-- Replace removable Relay block in RB1 or RB2 or both depending on above voltage check. (To verify it is the removable relay, switch with another relay)
Bad Grinding motor	**K.** Remove electrical access panel on grinding motor and check for voltage at the motor.	Measure 120 volts AC at motor terminals from brown incoming wire to blue incoming wire. Yes--Replace Grinding motor No-- Replace Grinding motor cord

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--Traverse Drive not working in (manual) jog mode
Assuming 115 Volts AC to control panel and all other manual mode functions are working.

Possible Cause	Checkout Procedure	
Traverse Speed Pot (TSP) set to zero	**A.** Set (TSP) to 35 on the control panel	Traverse works Yes--end troubleshooting No--go to step **B.** next
Circuit Breaker 1 (CB1) (3 amp) tripped	**B.** Press in on CB1 to Reset. Too heavy a grind causes grinding head traverse motor to overload and trip the circuit breaker.	Traverse works Yes--end troublshooting No--go to Step **C.** next
Traverse Drive Control (TDC) does not have power	**C.** Check for 120 Volts AC incoming to (TDC).	The Green Power LED on TDC should be lit. Light on--Skip to Step **D.** Light off-- Measure 120 volts AC from wire #20 at L1 to wire #23 at L2 Yes-- Replace TDC No--Check continuity of wire #20 at L1 and #23 at L2 and CB1
Traverse Direction Switch (TDS) not working	**D.** Hold in the Traverse Left Button on the control panel. Check for light on PLC inputs X0. (Right Button turns on X1)	Light next to X0 on PLC is: On-- Skip to Step **G.** Off-- go to Step **E.** next
	E. Check for 24 volts DC into TDS. (Remove yellow wire at TDS terminal 5 and check voltage from wire to power supply)	Measure 24 volts DC from PW1 V+ to wire at TDS terminal 5 (61TDS-5) Yes--go to step **F.** next No-- Check continuity of wire #61
	F. Hold in the Traverse Left Button on the control panel. Check for 24 volts DC Out of TDS. (Terminal 4 is on the right side of the switch. Use Term 6 for Traversing right.)	Measure 24 volts DC from PW1 V+ to TDS terminal 4 (60TDS-4) Yes--Check continuity of wire#60 from TDS to TTB, and PLC input cable. No-- Check continuity of TDS.
Check PLC out signal	**J.** Hold in the Traverse Left Button on the control panel. Check for light on PLC outputs Y4. (If the Right Traverse Button is held, Y5 should be lit.)	Light is: On-- go to step **K.** next Off-- Verify that prox is not on. (Lights X2 & X3 should be off on PLC. If on, go to Proximity Switch troubleshooting section.) If X2 or X3 is not on, Contact Factory -- Issue with PLC
Bad Relay Block Relay	**K.** Verify that Relay Block RB5 light comes on when Traverse Left is pressed, and that RB4 light comes on when Traverse Right is pressed	Lights come: On-- go to step **L.** next Off-- Check for 24 volts DC to A1 to A2 on Relay Block with button held. Yes-- Replace Relay Block No-- Check continuity of wires to A1 (#47) & A2 (PLC Cable)

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Cause	Checkout Procedure	
Bad Relay Block Relay	**L.** Remove wires at RB4 & RB5 and verify continuity from terminal 11 to term 14 when Relay Block light is on.	Continuity when light is on Yes--Reinstall wires, go to step **M.** next No-- Replace removable relay
(TSP) (10K) is bad	**M.** Check (TSP) for 10,000 ohms Remove three wires from (TDC) red from term S2 white from term S0 black from inline connector (Wire 39)	Check for 10,000 ohms red to white wire Full CCW--0 ohms Full CW--10,000 ohms Red to black wire Full CCW--10,000 ohms Full CW--0 ohms Yes--go to Step **N.** next No--replace (TSP)
No DC Voltage from (TDC) Traverse Drive Control	**N.** Check for 90 Volts DC across (TDC) terminals A1 to A2 this voltage drives the DC traverse motor. NOTE: Traverse must be on and have (TSP) turned full CW to maximum voltage of 90 VDC, and Left or Right Direction must be pressed on TDS	Check (TDC) terminals A1 to A2 for 90 Volts DC Yes--go to step **O.** next No--Replace TDC Note:If voltage is less than 90 VDC verify pots on TDC. See page 24
Traverse Motor is bad	**O.** Check traverse motor continuity	Remove wires from terminals A1 & A2 0 ohms across the black and white wires Yes--Replace motor. No--go to Step **N.**
Worn motor brushes	**N.** Inspect Motor Brushes	Remove the brushes one at a time and maintain orientation for reinsertion. See if brush is worn short, 3/8" [10 mm] minimum length. Yes--replace motor brushes No--replace Traverse Drive Motor

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--Traverse Proximity Switches not working in (manual) jog mode
Assuming 115 Volts AC to control panel and all other manual mode functions are working.

Possible Cause	Checkout Procedure	
Gap between flag and prox is incorrect.	**A.** Gap between flag and Prox should be 3/16" to 1/4" [4-6mm]. Prox light does not light when Grinding head is over prox.	If incorrect, adjust per adjustment section of manual. Light on Prox works Yes--Skip to Step **D.** No-- go to step **B.** next
Proximity switch is bad	**B.** Disconnect Prox from cable at Prox head and switch with other Prox on machine.	Place metal object in front of Prox. Light on Prox come on. Yes-- Replace bad Prox Head No-- go to step **C.** next
	C. Measure 24 volts DC to Prox cord at TTB	Measure 24 volts DC from Blue terminal to Brown terminal on TTB 3 Yes-- Replace Prox Cord. No-- Verify Jumpers on TTB
	D. With Prox light on, the correlating LED on the TTB should be on.	LED on TTB is on Yes--Skip to step **F.** No--go to step **E.** next
	E. With Prox light on, Measure from the correlating TTB Grey terminal to the Brown term on TTB3	Measure 24 volts DC from Grey Terminal to Brown Terminal Yes-- Replace TTB No-- Verify Prox head is functioning by switching with other Prox. Replace if bad or replace Prox Cord.
	F. Light on PLC X2 for right side and PLC X3 for left side should come on.	Light on PLC comes on Yes--Contact factory - Issue with PLC No--Verify continuity of cable from TTB to PLC. Replace cable or TTB.

ELECTRICAL TROUBLESHOOTING (Continued)

***PROBLEM*--Machine exhaust fan does not come on. (Machine must be on)**

Possible Cause	***Checkout Procedure***	
Bad Fan cord	**A.** Remove cord at fan. Check voltage across terminals.	Measure 120 volt AC across terminals at cord plug. Yes-- Replace Fan No-- Go to step **B**. next
	B. Disconnect Fan cord from fan power cord (two male to femal terminals about 2 feet down fan cord.) Check voltage from cord that goes back to the electrical box	Measure 120 volt AC across female terminals at end of cord from electrical box. Yes-- Replace Fan cord No-- Replace Fan Power Cord.

***PROBLEM*--Machine Light does not come on. (Machine must be on)**

Possible Cause	***Checkout Procedure***	
Switch on light must be set to on position	**A.** Press switch on light to on.	Light works Yes-- End troubleshooting No-- Go to step **B**. next
	B. Must be plugged into 60 Hz power. (If there is a transformer on this machine it is likely that you are connected to 50 Hz power)	Your machine is connected to 60 Hz power Yes-- Go to step **C**. next No-- Replace light with 120 volt 50 Hz light.
	C. Replace Light Bulb	Light works Yes-- End troubleshooting No-- Go to step **D**. next
	D. Open cover on Light. Check incoming voltage from light power cord.	Measure 120 volt AC across end of light power cord from electrical box. Yes-- Replace light No-- Replace Light Power Cord.

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--Both Stepper Infeed not working in (manual) jog mode.
Assuming 115 Volts AC to control panel and all other manual (jog) mode functions are working.

Possible Cause	Checkout Procedure	
Infeed Jog Switch is not held to on position	**A.** Hold switch on in either direction	Stepper motor works: Yes--end troubleshooting No--go to Step **B.** next
Actuator is at physical limit	**B.** Move stepper in opposite direction	Stepper Motor works: Yes--end troubleshooting No--go to step **C.** next
High Low Switch is not on high speed	**C.** Put switch on high speed (rabbit) for ease of checkout of Stepper Infeed Control (SIC)	High speed works: Yes--end troubleshooting No--go to Step **D.** next
Stepper motor drive coupling is loose	**D.** You can feel stepper pulses on motor when (HLS) is on high or low & (IJS) switch is depressed in either in or out direction. Check for loose coupling. Retighten coupling to drive infeed screw.	Stepper works: Yes--end troubleshooting No--go to Step **E.** next
24 Volt Dc Power Supply for steppers not working (PW2)	**E.** Check for green light on PW2	Green light is on: Yes-- Skip to step **G.** No-- go to step **F.** next
	F. Check for 120 Volts AC into PW2	PW2 terminal L to Terminal N for 120 Volts AC Yes-- go to step **G.** next No-- Check wires #27 & #43
	G. Check for 24 Volts DC into Stepper Infeed Controller (SIC)	Measure 24 Volts DC from V+ to V- into SIC. **NOTE: SIC is power sensitive, Yellow V- wire must be installed in the V- terminal and Red V+ must be in the V+ terminal.** Yes-- go to step **H.** No-- Check wires from pwersupply, Replace PW2 (power supply).
Infeed Jog Switch (IJS) not working	**H.** Press and hold Stepper infeed "In" button. Check for light on PLC next to XA. (X9 is the light indicates "Out" button is pressed.)	Light on PLC is on: Yes-- Skip to step **K.** No-- go to step **I.** next
	I. Check for 24 Volts DC into IJS. Remove yellow wire #70 at IJS and measure to V+ on PW1	Measure 24 volts DC from yellow wire 70IJS-5 to V+ on PW1 Yes-- go to step **J.** next No-- Check continuity of wire #70

Possible Cause	Checkout Procedure	
	J. Remove wire #70 on Terminal 5 and Wire #71 on Terminal 6. Press and hold IJS "In" button and check continuity of Terminal 5 to Term 6.	Continuity from Terminal 5 to Terminal 6: Yes-Reinstall wires. Check continuity of Wire #71, TTB10 and PLC inputs Cable. Contact factory - Issue with PLC. No--Replace IJS
No signal from Infeed Motor Selector Switch	**K.** With Infeed Motor Selector (IMS) set to infeed both motors (center position) Check for PLC lights next to XB (Top) and XC (bottom).	Light XB and XC on: Yes--Contact Factory -- issue with PLC or Stepper Drive (SIC) No-- Check continuity of Wires #72, 73, 74, 75 and of Contacts on IMS.

PROBLEM--Only One Stepper Infeed is working in (manual) jog mode.
Assuming 115 Volts AC to control panel and all other manual (jog) mode functions are working.

Possible Cause	Checkout Procedure	
Infeed Motor Selector Switch (IMS) in wrong position.	**A.** Move IMS to center position.	Both Stepper motors work: Yes--end troubleshooting No--go to Step **B.** next
No signal to PLC	**B.** Check for PLC lights next to XB (Top) and XC (bottom).	Light XB and XC on: Yes--go to Step **C.** next No-- Check continuity of Wires #72, 73, 74, 75 and of Contacts on IMS.
	C. Switch Infeed motor connections to Stepper Infeed Controller (SIC).	Same infeed stepper motor works and other one still does not work: Yes--Bad Stepper motor or Cord. Remove bad stepper motor and verify that it does not work by plugging into the connection at the good stepper motor. If motor works, then replace cord. If motor does not work, replace motor No--Contact Factory, issue with Stepper Infeed Controller or PLC

MECHANICAL PROBLEM -- Excess vibration in grinder.

Possible Cause	Checkout Procedure	
Lower grinding wheel is loading up with grinding dust on the inside in an out of balance position.	Vacuum out the center of the cupped lower grinding head grinding wheel.	Vibrration is gone. Yes--end troubleshooting No--Inspect for loose components or damaged grinding wheel.

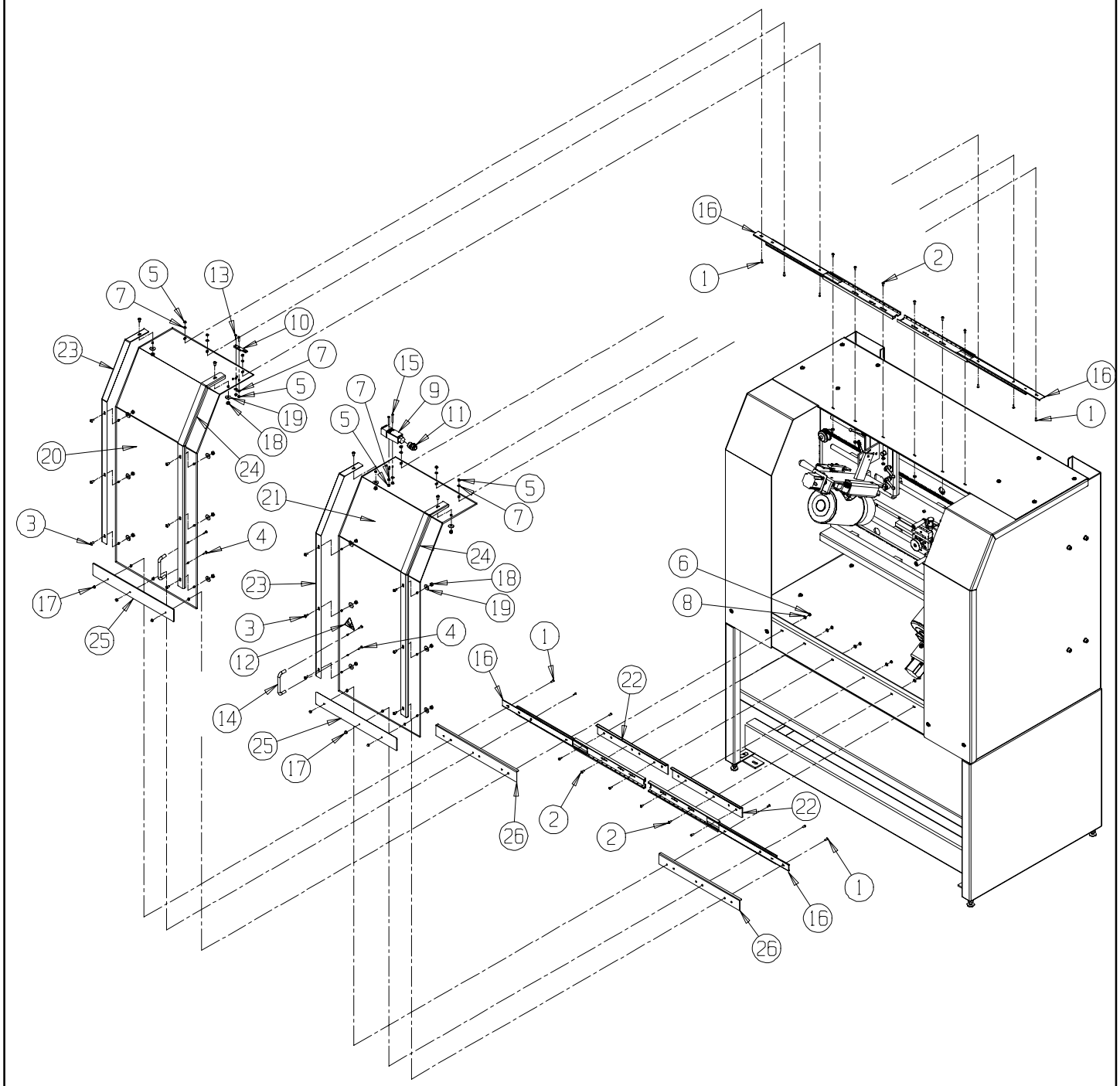
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B160807	8-32 x 1/2" Long Button Head Socket Cap Screw
2	B190813	10-24 x 1/2" Long Button Head Socket Cap Screw
3	B250816	1/4-20 x 1/2" Long Button Head Socket Cap Screw
4	D161266	8 x 3/4" Long Pan Head Machine Screw
5	J167000	8-32 Locknut Jam with Nylon Insert
6	J197000	10-24 Locknut Jam with Nylon Insert
7	K160001	#8 Flat Washer SAE
8	K190001	#10 Flat Washer SAE
9	3707728	Safety Interlock Switch
10	3707372	Safety Interlock Switch Key
11	3707563	Liquid Tight Strain Relief (for Wire Dia .27-.46)
12	3708458	Sharp Warning Decal
13	3708819	8-32 x 3/4" Long Button Head Safety Screw *
14	3708857	Black Pull Handle
15	3708865	8-32 x 1 1/2" Long Button Head Safety Screw *
16	3708918	Door Track Slide (2 Pack)
17	3708925	8-32 Acorn Nut - Self Locking
18	3708926	1/4-20 Hex Nut - Center locking
19	3708927	Flat Washer - .5 OD x .27 ID x .032 Thick
20	4609064	Left Side Guard Door
21	4609065	Right Side Guard Door
22	4609075	Door Side Spacer Plate
23	4609076	Left Side Window Brace
24	4609077	Right Side Window Brace
25	4609078	Door Slide Cover Plate
26	4609109	Door Track Shield

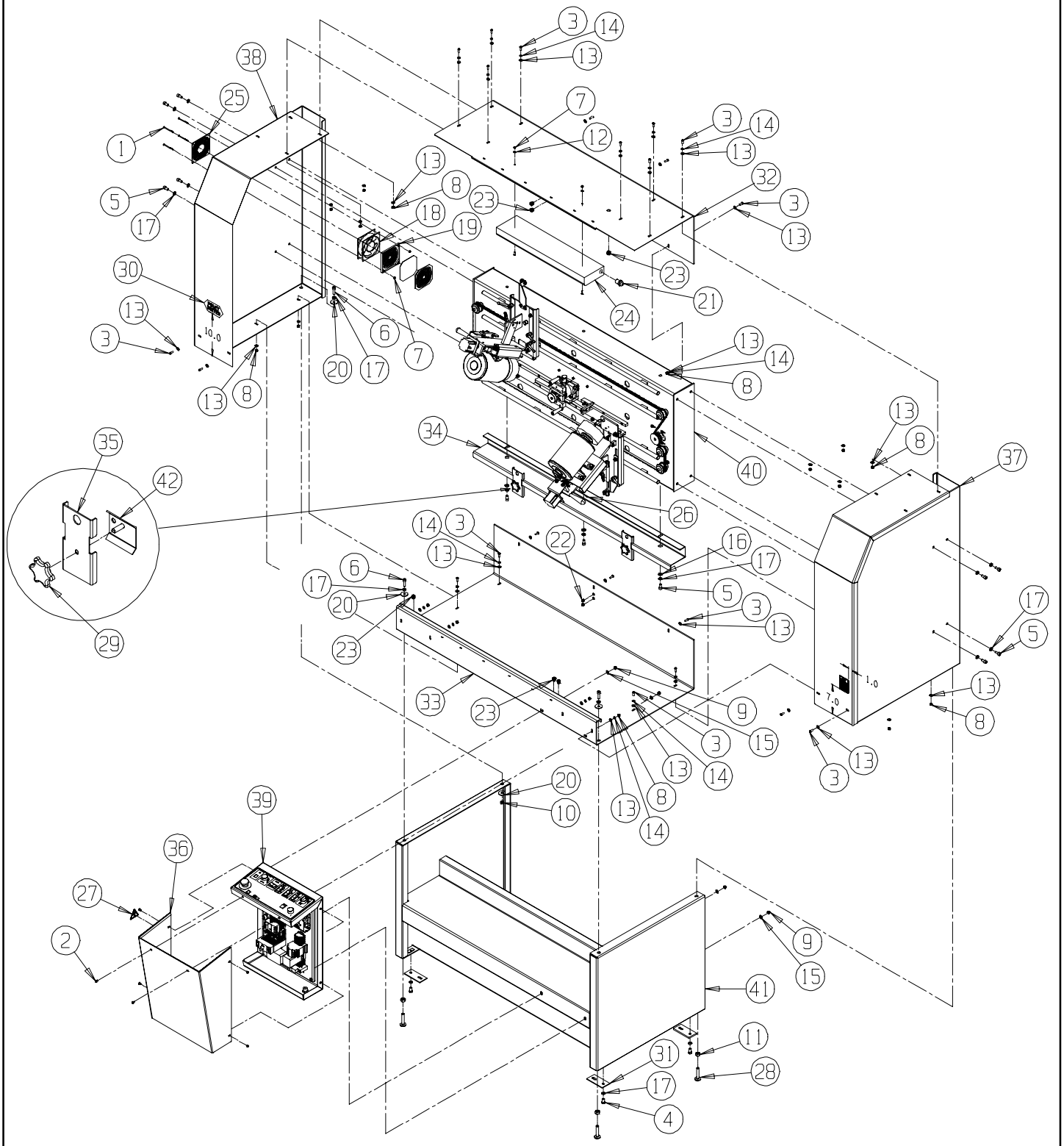
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B164005	8-32 x 2 1/2" Long Flat Head Socket Cap Screw
2	B250816	1/4-20 x 1/2" Long Button Head Socket Cap Screw
3	B251216	1/4-20 x 3/4" Long Button Head Socket Cap Screw
4	B371201	3/8-16 x 3/4" Long Hex Head Screw
5	B371211	3/8-16 x 3/4" Long Socket Head Cap Screw
6	B372011	3/8-16 x 1 1/4" Long Socket Head Cap Screw
7	J167000	8-32 Locknut Jam with Nylon Insert
8	J251000	1/4-20 Hex Nut
9	J317000	5/16-18 Locknut Jam with Nylon Insert
10	J371000	3/8-16 Hex Nut
11	J501000	1/2-13 Hex Nut
12	K160001	#8 Flat Washer SAE
13	K250001	1/4 Flat Washer SAE
14	K251501	1/4 Split Lockwasher
15	K310001	5/16 Flat Washer SAE
16	K370001	3/8 Flat Washer SAE
17	K371501	3/8 Split Lockwasher
18	3707689	Square Axial Fan
19	09902	Filter Guard Assembly for Fan
19a	3707714	Filter (5 pack)
20	3589106	Flat Washer - 1.4 OD x .4 ID x .13 Thick
21	3707049	Liquid Tight Strain Relief (for Wire Dia .23-.39)
22	3707066	Strain Relief - Push in (for Wire Dia .22-.25)
23	3707273	Strain Relief - Push in (for Wire Dia .33-.36)
24	3707836	24" Fluorescent Light (60Hz 120VAC - only)
24a	3707837	Flourescent Bulb (T8)
25	3707696	Fan Guard
26	3708046	Rubber Gromet
27	3708448	Electrical Warning Decal
28	3709563	Adjustable Leveling Bolt
29	3709613	Star Knob 5/16-18 Female Threaded
30	3709926	Foley United Decal
31	3889068	Anchor Strap
32	4609056	Frame Top Panel
33	4609057	Frame Bottom Panel
34	4609066	Proximity Bracket Mounting Panel
35	4609067	Proximity Bracket
36	4609081	Control Panel Cover
37	4609502	Frame Side Weldment - Right
38	4609503	Frame Side Weldment - Left
39	4609511	Control Panel Assembly (see page 46)
40	4609514	Traverse Assembly (see page 40)
41	4609560	Frame Base Let Weldment
42	6009572	Proximity Rail Clamp Weldment
	4609097	Stepper motor Cord (Not Shown)
	4609107	Proximity Sensor Cord -Left (Not Shown)
	4609108	Proximity Sensor Cord -Right (Not Shown)
	3707601	Proximity Sensor (Not Shown)
	B161014	8-32 x 5/8 Phil Pan Hd Mach Screw (Not Shown)
	J257000	1/4-20 Locknut Jam Nylon (Not Shown)
	3708121	Double Cord Clamp (Not Shown)

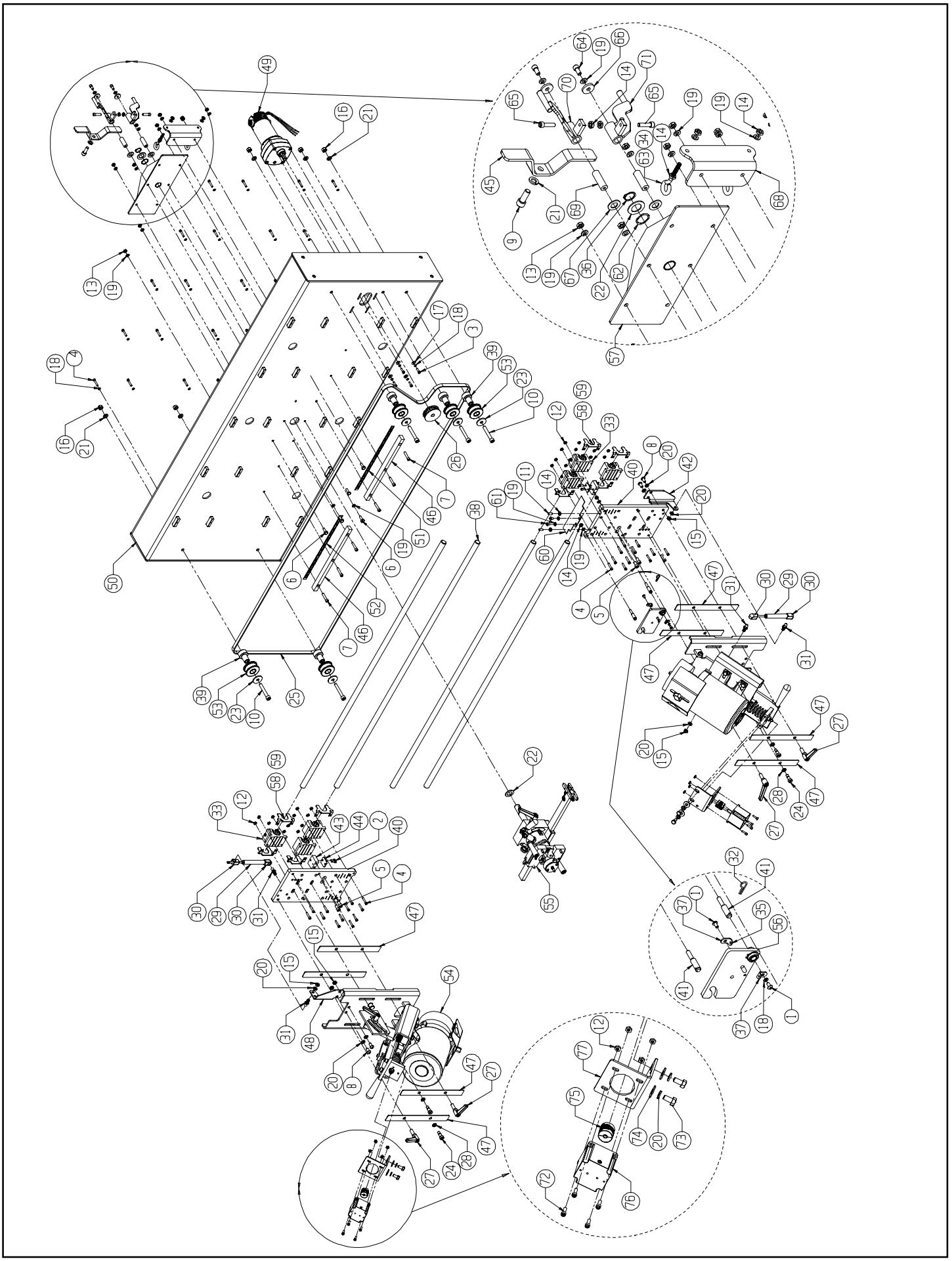

DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B190613	10-24 x 3/8" Long Button Head Socket Cap Screw
2	B190811	10-24 x 1/2" Long Socket Head Cap Screw
3	B191031	10-32 x 5/8" Long Socket Head Cap Screw
4	B191611	10-24 x 1" Long Socket Head Cap Screw
5	B311011	5/16-18 x 5/8" Long Socket Head Cap Screw
6	B251201	1/4-20 x 3/4" Hex Head Cap Screw
7	B252011	1/4-20 x 1 1/4" Long Socket Head Cap Screw
8	B311013	5/16-18 x 5/8 Long Button Head Socket Cap Screw
9	B371611	3/8-16 x 1" Long Socket Head Cap Screw
10	B374011	3/8-16 x 2 1/2" Long Socket Head Cap Screw
11	C251020	1/4-20 x 5/8" Long Cup Point Socket Head Set Screw
12	J197000	10-24 Locknut Jam with Nylon Insert
13	J251000	1/4-20 Hex Nut
14	J252000	1/4-20 Jam Hex Nut
15	J312000	5/16-18 Jam Hex Nut
16	J371000	3/8-16 Hex Nut
17	K190001	#10 Flat Washer SAE
18	K191501	#10 Split Lockwasher
19	K251501	1/4 Split Lockwasher
20	K311501	5/16 Split Lockwasher
21	K371501	3/8 Split Lockwasher
22	80355	Thrust Washer 1.25 OD x .75 ID
23	3589106	Flat Washer - 1.38 OD x .39 ID x .13 Thick
24	3708158	3/8 x 1/2"Long Shoulder Bolt
25	3708896	Cog Belt
26	3708898	Cog Drive Pulley
27	3708908	3/8-16 x 7/8" Long Adjustable Handle
28	3708913	Wave Spring .56 OD
29	3708915	Gas Spring
30	3708916	10mm Ball Socket
31	3708917	10mm ball stud w/ 5/16-18 x .55 long thread
32	3708931	Hairpin
33	3708944	Linear Bearing 3/4" Shaft
34	3708933	Extension Spring .84OD x 6" Long
35	3708935	Extension Spring .44OD x 1.5" Long
36	3709331	External Retaining Ring for 3/4" Shaft
37	3929040	Spring Clip
38	4609005	Traverse Shaft
39	4609007	Pulley Shaft
40	4609009	Carriage Base Plate
41	4609020	Pivot Shaft
42	4609149	Bottom Gas Spring Bracket
43	4609024	Belt Clamp Block
44	4609025	Belt Clamp Plate
45	4659214	Spring Bar
46	4609054	Anti-rotate Bar
47	4609071	Vertical Slide/Cover Plate
48	4609087	Top Gas Spring Bracket
49	4609100	Traverse Motor Assembly
50	4609101	Main Base Machined
51	4609111	Scale Decal - Right Side
52	4609112	Scale Decal - Left Side
53	4609508	Idler Pulley Assembly
54	4609510	Grinding Head Assembly (see page 42)
55	4609550	Center Support Assembly (see page 44)
56	4609532	Cam Plate Assembly
57	4609541	Base Support Assembly
58	4609117	Rail Wiper Bracket - 3/4"
59	3969064	Foam Wiper

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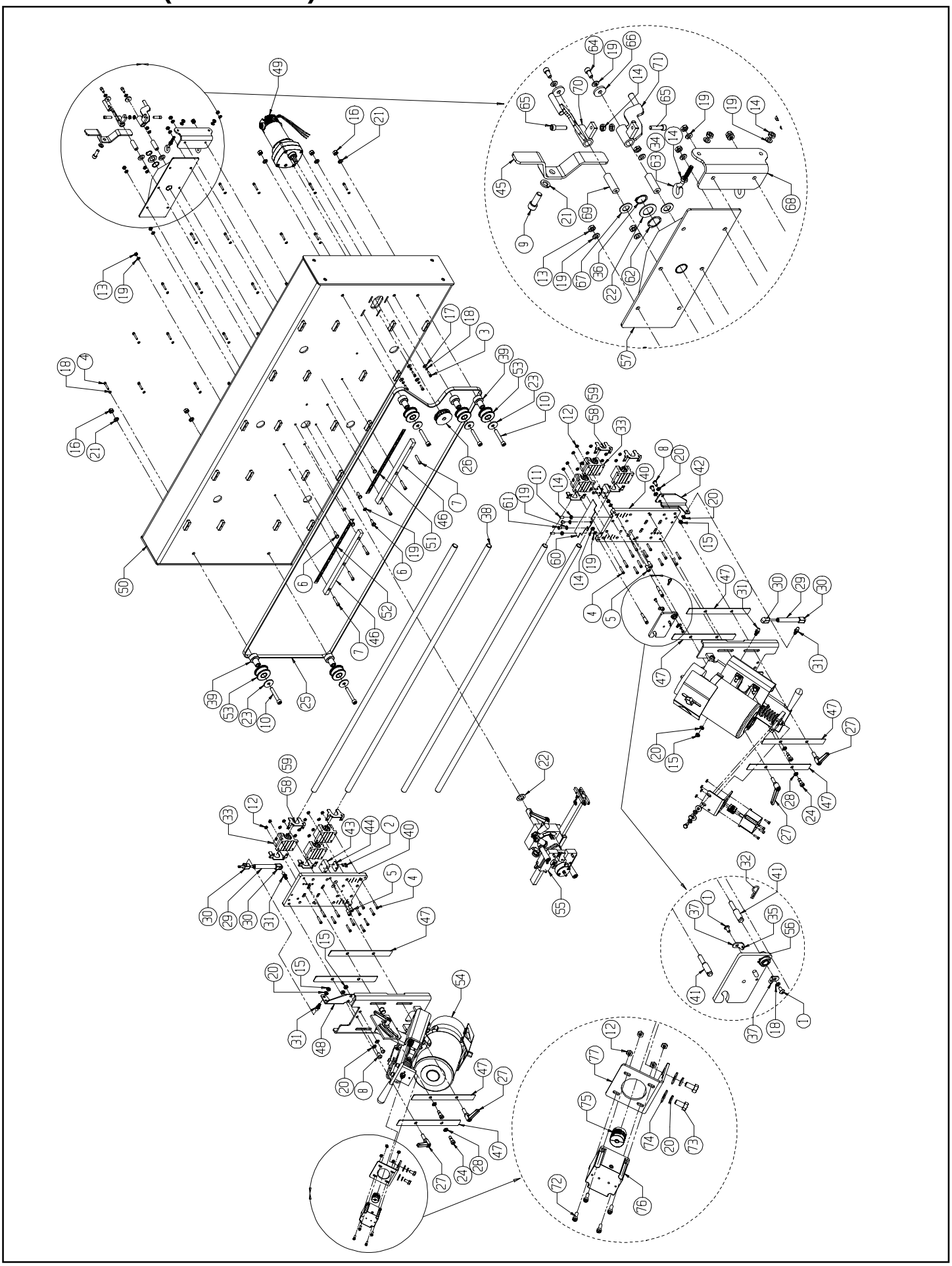

DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
60	4609118	Dust Shield
61	B250616	1/4-20 x 3/8 Button Head Socket Cap Screw
62	3708419	Wave Spring
63	3706025	Eyebolt
64	B250811	1/4-20 x 1/2" Long Socket Head Cap Screw
65	B251611	1/4-20 x 1" Long Socket Head Cap Screw
66	3589089	Flat Washer .88 OD x .27 ID
67	3709027	Thrust Washer .92 OD x .51 ID
68	4659213	Spring Tensioner Bracket
69	4659218	Return Pivot Shaft
70	4659517	Upper Spring Return Weldment
71	4659518	Lower Spring Return Weldment
72	B191011	10-24 x 5/8" Long Socket Head Cap Screw
73	B311001	5/16-18 x 5/8" Long Socket Head Cap Screw
74	K310001	5/16 Flat Washer
75	3708629	Flex Coupling
76	4609014	Stepper Motor Assy
77	4609019	motor mount bracket

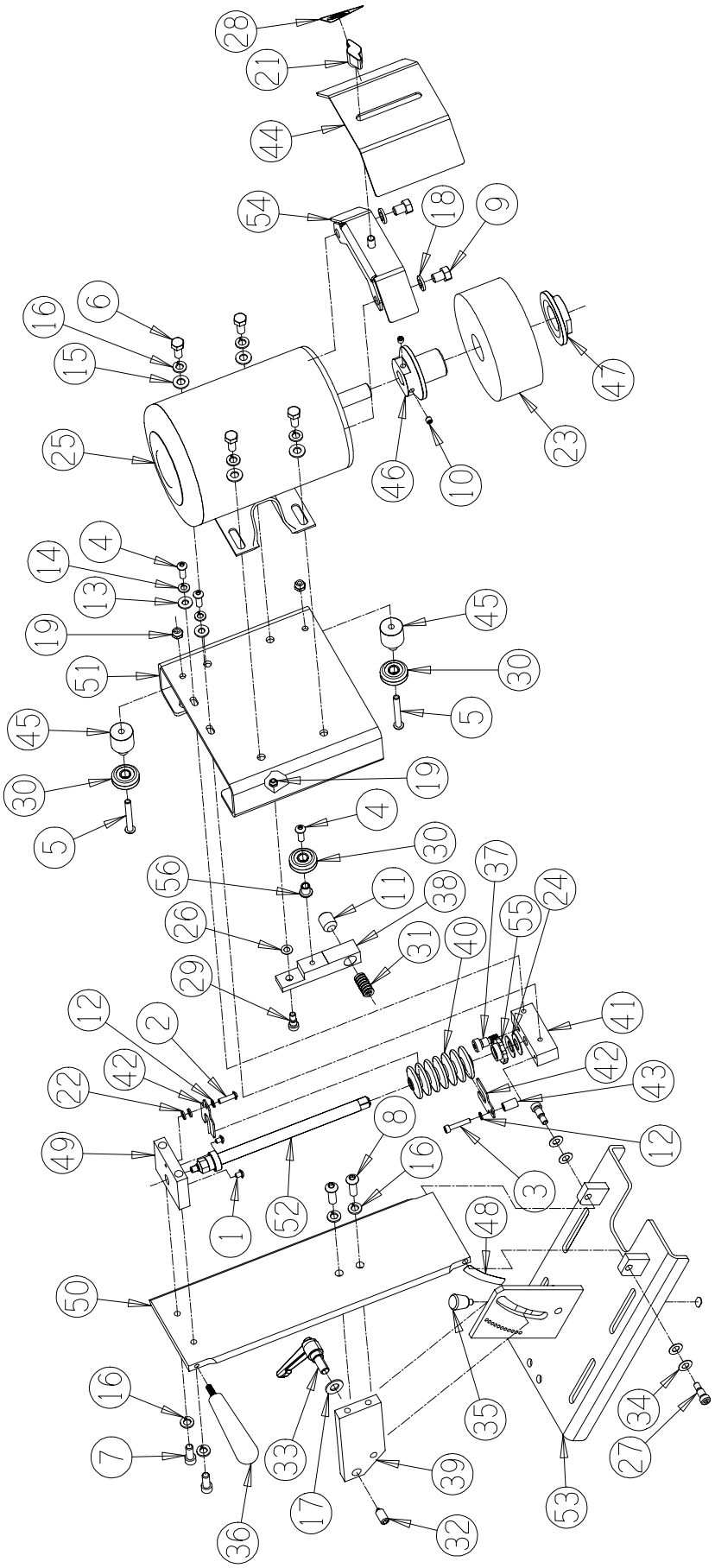
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B190402	10-24 x 1/4" Long Round Head Machine Screw
2	B191213	10-24 x 3/4"Long Button Head Socket Cap Screw
3	B191611	10-24 x 1" Long Socket Head Cap Screw
4	B251216	1/4-20 x 3/4" Long Button Head Socket Cap Screw
5	B253216	1/4-20 x 2" Long Button Head Socket Cap Screw
6	B311201	5/16-18 x 3/4" Long Hex Head Cap Screw
7	B311611	5/16-18 x 1" Long Socket Head Cap Screw
8	B311613	5/16-18 x 1"Long Button Head Socket Cap Screw
9	B371201	3/8-16 x 3/4" Long Hex Head Cap Screw
10	C250460	1/4-28 X 1/4" Long Socket Set Screw
11	C621060	5/8-18 x 5/8" Long Socket Head Set Screw
12	K191501	#10 1/4 Split Lockwasher
13	K250001	1/4 Flat Washer SAE
14	K251501	1/4 Split Lockwasher
15	K310001	5/16 Flat Washer SAE
16	K311501	5/16 Split Lockwasher
17	K370101	3/8 Heavy Flat Washer
18	K371501	3/8 Split Lockwasher
19	J257000	1/4-20 Locknut Jam with Nylon Insert
21	80169	2-Prong Knob - 5/16-18 Female
22	3589127	Spacer Washer .37 OD x .19 ID x .06 Thick
23	3700046	Straight Cup Grinding Wheel - 5 x 2 x 1.25 Bore
24	3706021	Conical Washer
25	3707960	1/2 HP Motor
26	3708103	Conical Washer .50 OD x .26 ID x .02 Thick
27	3708425	Shoulder Bolt 5/16 Dia. x 3/8 Long
28	3708461	3600 RPM Warning Decal
29	3708543	Shoulder Bolt .5/16 Dia. x 5/16 Long
30	3708657	Dual Vee Roller
31	3708658	Compression Spring
32	3708907	1/2-13 Ball Nose Srping Plunger
33	3708908	3/8-16 x .78" Long Adjustable Handle
34	3708912	Conical Washer .63 OD x .23 ID x .02 Thick
35	3708914	Spring loaded Plunger
36	3709384	1/4-20 x 3/4" Long Knob
37	3709809	Shoulder Bolt 3/8 Dia. x 3/8 Long
38	4609011	Roller Pivot Arm
39	4609013	Angle Clamp Plate
40	4609015	460 Boot
41	4609016	Infeed Screw Block
42	4609033	Boot Retainer
43	4609043	Spacer - .20 x .375 x .62 Long
44	4609048	Spact Guard Cover
45	4609069	V Roller Bushing - 1.46 Long
46	4609084	Grinding Wheel Adapter
47	4609085	Grinding Wheel Flange
48	4609086	Grind Angle Decal
49	4609147	Infeed Shaft Support Block
50	4609148	V-Roller Plate
51	4609504	Motor/Bearing Plate Weldment
52	4609519	Infeed Left Hand ACME Shaft Assembly
53	4609527	Adjustable Base Plate
54	4609570	Spark Guard Bracket Weldment
55	6009024	1/2-10 ACME Backlash Nut
56	6609028	V Roller Short Bushing

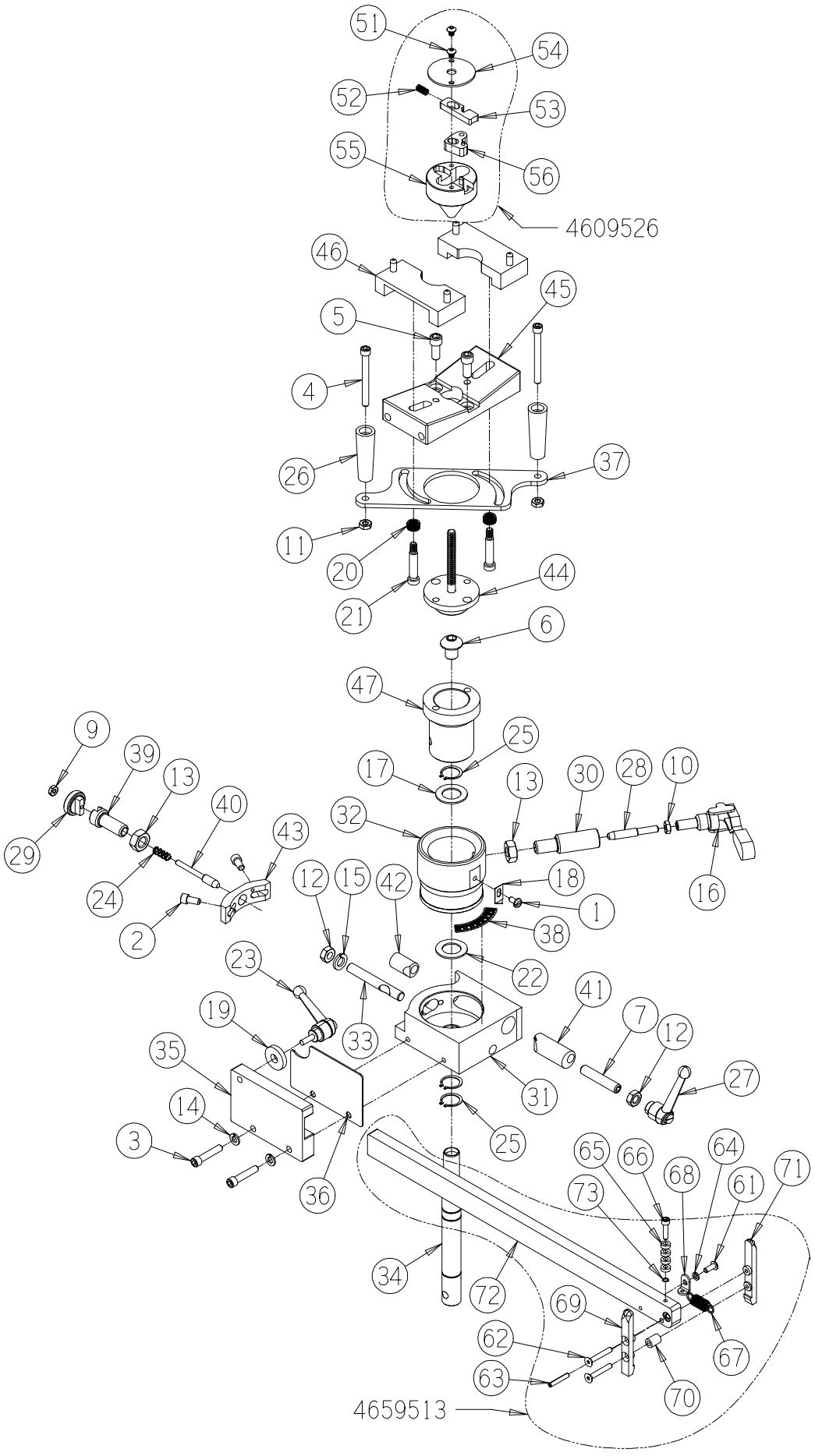
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B190602	10-24 x 3/8" Round Head Machine Screw
2	B251011	1/4-20 x 5/8" Long Socket Head Cap Screw
3	B252011	1/4-20 x 1 1/4" Long Socket Head Cap Screw
4	B254011	1/4-20 x 2 1/2" Long Socket Head Cap Screw
5	B311211	5/16-18 x 3/4" Long Socket Head Cap Screw
6	B501216	1/2-13 x 3/4" Long Button Head Cap Screw
7	C376420	3/8-16 x 4" Long Socket Head Set Screw
8	H120802	1/8" Diameter x 1/2" Long Roll Pin
9	J191100	10-32 Hex Nut
10	J252000	1/4-20 Hex Jam Nut
11	J257000	1/4-20 Locknut Jam with Nylon Insert
12	J372000	3/8-16 Hex Jam Nut
13	J502100	1/2-20 Hex Jam Nut
14	K251501	1/4 Split Lockwasher
15	K371501	3/8 Split Lockwasher
16	80335	Clamp - Destaco
17	80355	Thrust Washer 3/4 ID x 1 1/4 OD
18	3559024	Pointer
19	3599028	Spacer 3/8 x 1 x .188 Thick
20	3706031	Wave Spring
21	3708125	Shoulder Bolt 5/16 Diameter x 1 1/4" Long
22	3708193	Conical Washer .88 ID x 1.36 OD x .02 Thick
23	3708786	Adjustable Handle 5/16-18 x 5/8" Long
24	3708949	Compression Spring
25	3709331	Retaining Ring
26	3709370	Handle
27	3709437	Adjustable Handle 3/8-16 Female
28	4609091	Balance Lock Pin
29	4609092	Balancer Lock Knob
30	4609116	Alignment Pin Body
31	4609125	Angle Lock Block
32	4609126	Angle Position Ring
33	4609127	Shaft Locking Stud
34	4609130	Center Pivot Shaft
35	4609131	Rotate Bar Clamp Block
36	4609132	Clamp Block Plate
37	4609135	Cam Plate
38	4609139	Blade Angle Decal
39	4609141	Zero Pin Housing
40	4609142	Zero Position Pin
41	4609143	Rotate Lock Bar
42	4609144	Threaded Lock Bar
43	4609145	Zero Pin Bracket
44	4609534	Center Shaft Block Assembly
45	4609538	Clamp Base Plate Assembly
46	4609539	Blade Clamp Block Assembly
47	4609551	Bearing Housing Assembly
51	B190613	10-24 x 3/8" Long Button Head Cap Screw
52	3706030	Compression Spring
53	4609122	Cone Release Slide Plate
54	4609123	Cone Cover Plate
55	4609524	Center Cone Sub Assembly
56	4609537	Cone Cam Assembly
61	B190813	10-24 x 1/2" Long Button Head Cap Screw
62	B192005	10-24 x 1 1/4 " Long Flat Head Cap Screw
63	H191602	3/16 Diameter x 1" Long Roll Pin
64	K191501	#10 Split Lockwasher
65	3706051	Ball Bearing .38 OD
66	B191231	10-32 x 3/4" Long Socket Head Cap Screw
67	3706048	Extension Spring
68	3929040	Spring Clip
69	4609051	Release Bar
70	4609052	Spacer
71	4609072	Release Bar Threaded
72	4609518	Rotate Bar Assembly
73	3706050	Shim Washer .25 OD

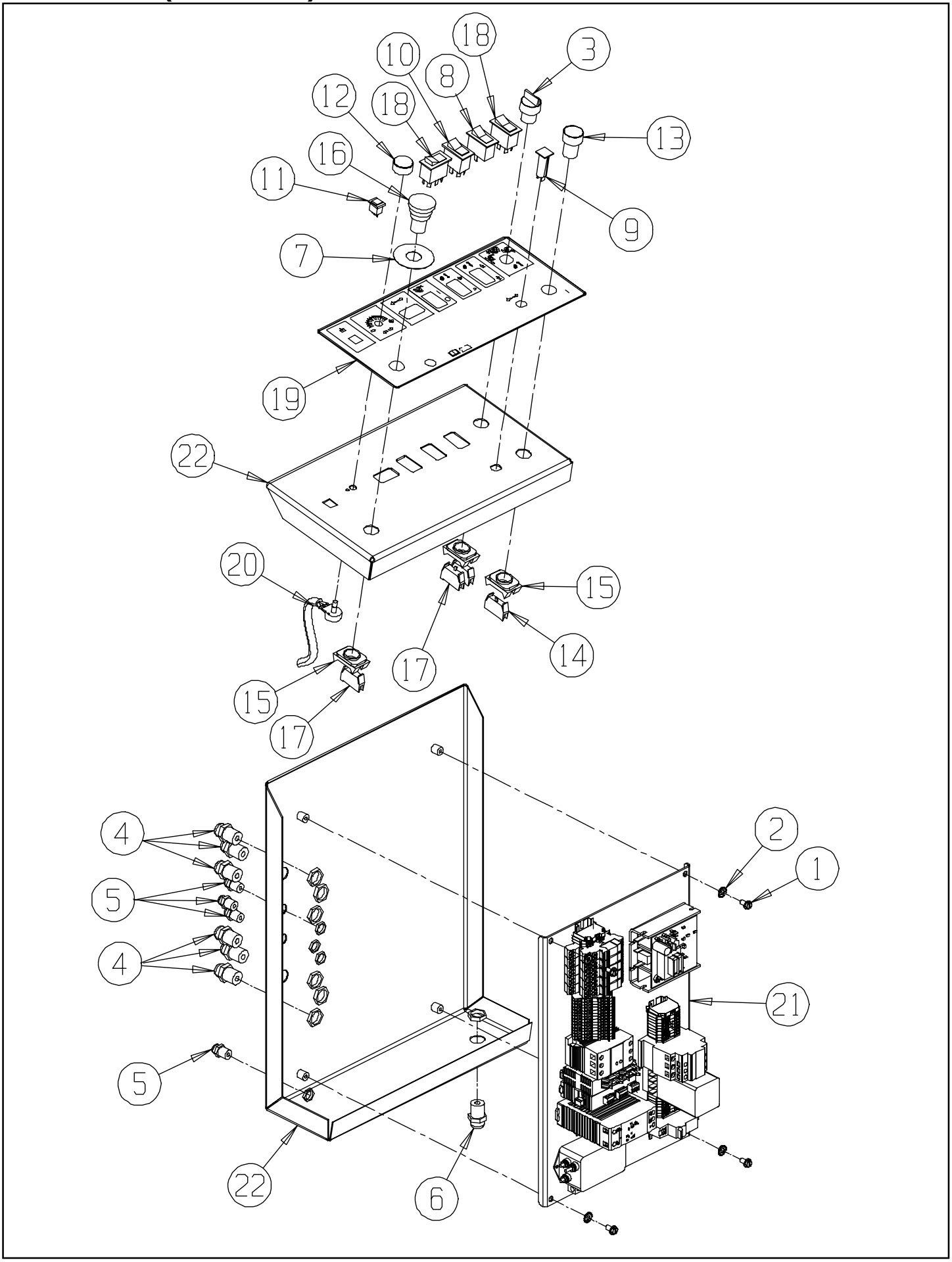
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B250800	1/4-20 x 1/2" Long Thread Cutting Screw
2	R000536	1/4 Lock Washer
3	80367	3 Position Selector Switch
4	3707009	Liquid Tight Strain Relief (for Wire Dia. .27 - .47)
5	3707029	Liquid Tight Strain Relief (for Wire Dia. .19 - .30)
6	3707093	Liquid Tight Strain Relief (for Wire Dia. .43 - .55)
7	3707342	Yellow Emergency Stop Ring
8	3707367	ON/OFF Rocker Switch (DPST)
9	3707399	3 Amp Circuit Breaker
10	3707429	ON/OFF Rocker Switch (DPDT)
11	3707434	Square Unlight Push Button
12	3707446	Potentiometer Knob with Pointer
13	3707564	Green Start Push Button
14	3707565	Normaly Open (NO) Contact Block
15	3707566	Switch Mounting Latch
16	3707567	Push/Pull Red Emergency Stop Button
17	3707568	Normaly Closed (NC) Contact Block
18	3707713	ON/OFF/ON Momentary Rocker Switch
19	4609082	Control Panel Decal
20	4609110	Traverse Potentiometer Assembly
21	4609522	Electrical Panel Sub-Assembly (see page 48)
22	4609568	Control Panel Weldment
	D160666	8 X 3/8 Self Tap Phil. Pan Hd (Ground - Not Shown)
	4609092	Wire Harness - Control Panel (Not Shown)
	4609095	Grinding Motor Cord (Not Shown)
	4609096	Door Safety Switch Cord (Not Shown)
	4609102	Axial Fan Cord (Not Shown)
	4609103	Fan Power Cord (Not Shown)
	4609104	Light Power Cord (Not Shown)
	6059054	Main Power Cord (Not Shown)

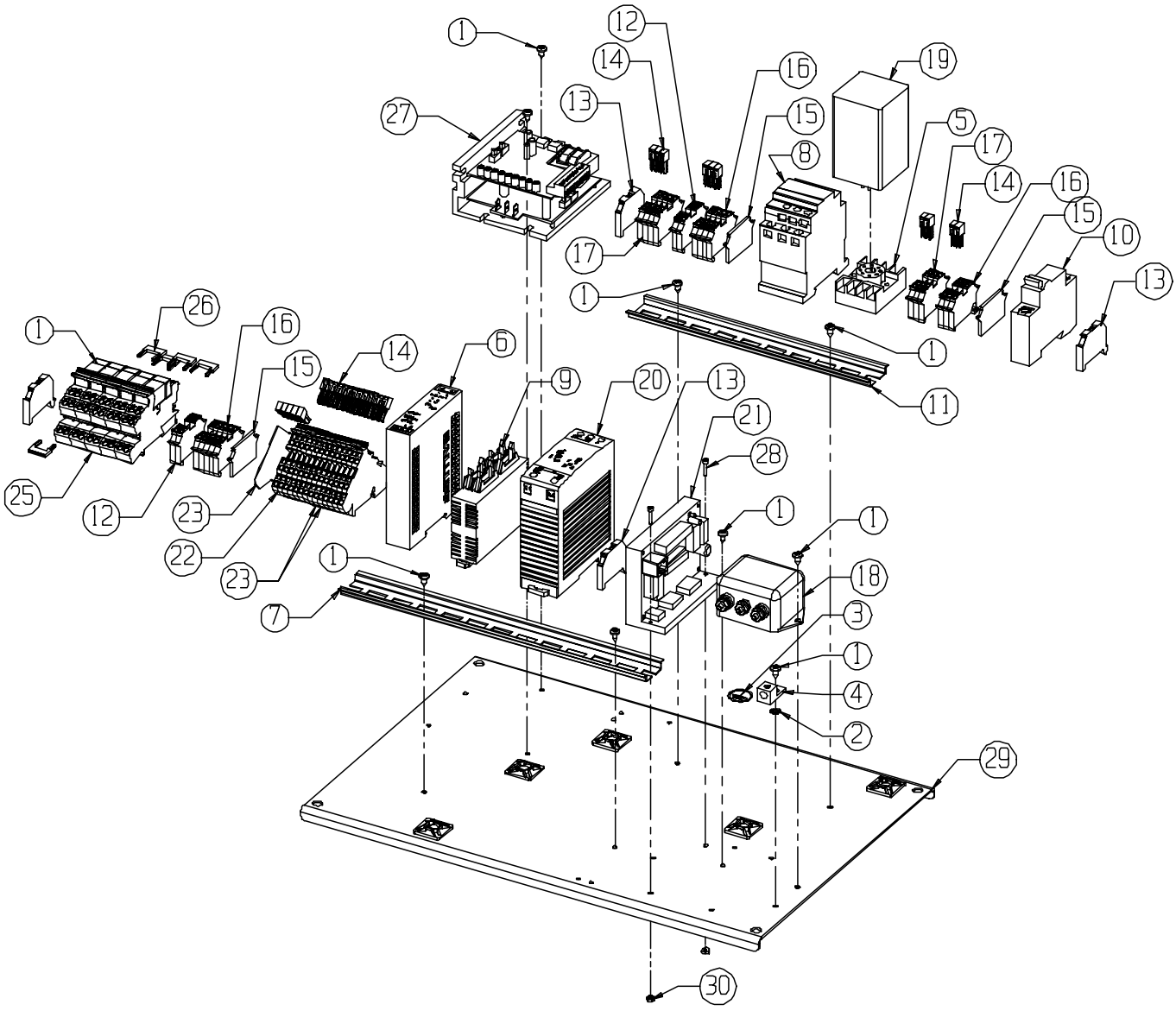
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	D160666	#8 x 3/8" Long Phillips Pan Head Self Tapping Screw
2	R000480	#8 Lock Washer
3	3707163	Primary Ground Decal
4	3707164	Primary Ground Lug
5	3707073	8 Pin Socket
6	3707333	24 VDC .3 Amp Power Supply
7	3707829	12" Long Din Rail
8	3707556	1 HP Magnetic Starter
9	3707569	Aromat PLC
10	370589	15 Amp Circuit Breaker
11	3707606	9" Long Din Rail
12	3707624	Ground Terminal Block
13	3707625	Screwless Terminal Block End Stops
14	3707626	Adjacent Terminal Block Jumper
15	3707627	Terminal Block End Plate
16	3707628	Grey 2-Conductor Terminal Block
17	3707629	Blue 2-Conductor Terminal Block
18	3707654	20 Amp Line Filter
19	3707688	Low Voltage Relay (Low/High)
20	3707682	24 VDC 60 Watt Power Supply
21	4609154	2 Axis Stepper Drive
22	3707684	3 Tier Terminal Block
23	3707685	3 Tier Terminal Block w/LED
24	3707686	3 Tier Terminal Block End Plate
25	3707694	Relay Terminal Block (8A - 24VDC)
26	3707695	2 Pole Jumper - Wide
27	3707697	Traverse Drive
28	B110811	#4-40 Socket Head Cap Screw x 1/2 Long
29	4609079	Electrical Sub Panel
30	J117000	#4-40 Locknut with Nylon Insert
	4609097	Stepper motor Cord
	4609107	Proximity Sensor Cord -Left
	4609108	Proximity Sensor Cord -Right
	3707601	Proximity Sensor