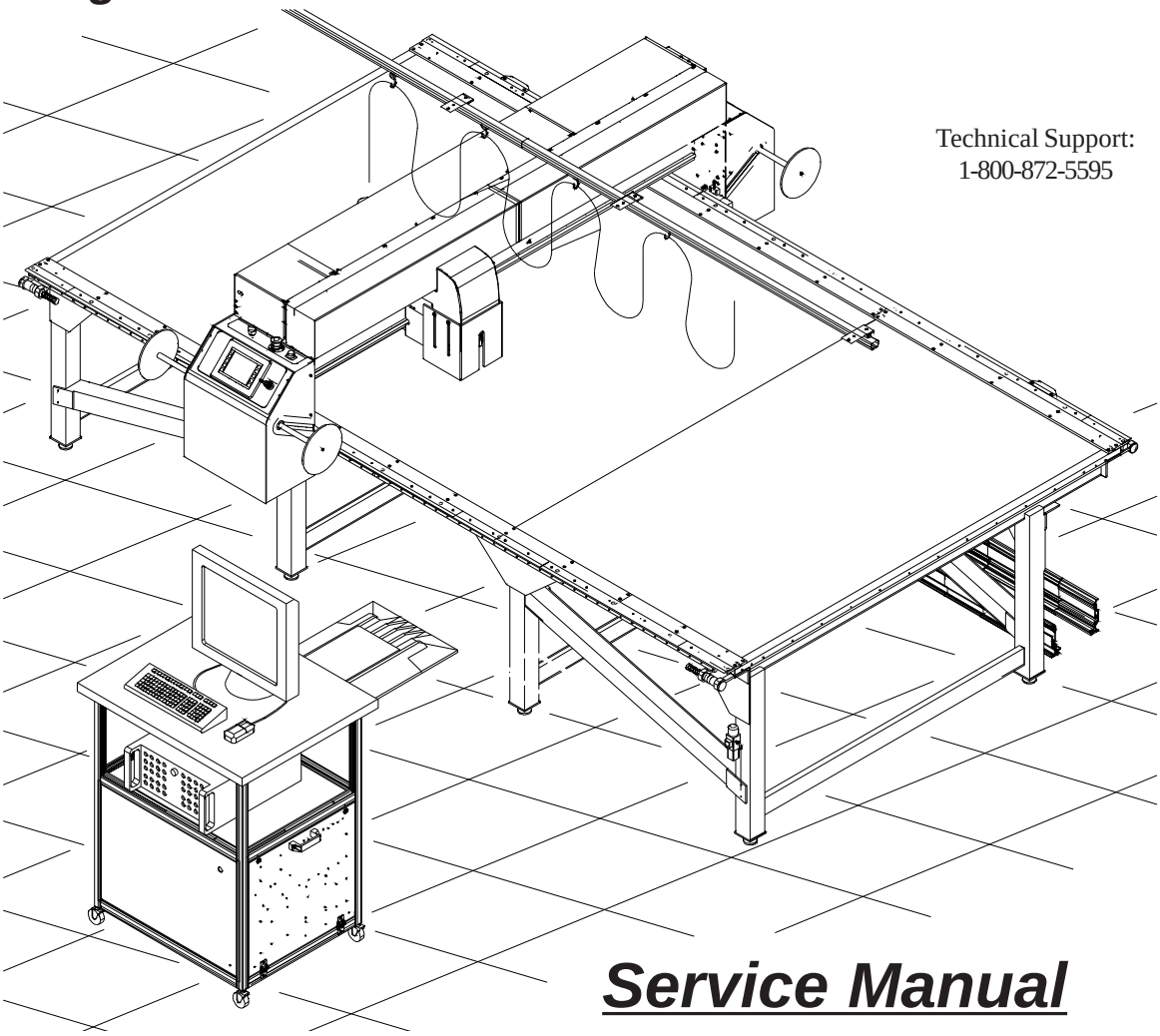
Eastman®

THE EASTMAN ®
Eagle
Automatic Laser Cutting System

Model: Eagle S3L



Technical Support:
1-800-872-5595

Service Manual

⚠ DANGER

This machine is equipped with a class IV laser product. Avoid eye or skin exposure to direct or scattered radiation at all times. Approved laser protective eyewear required.

Misuse of this machine or failure to follow all safety instructions on this machine and in the instruction manual may result in death or serious personal injury to the user.

⚠ WARNING

This machine is equipped with a very sharp knife. Keep hands, arms, and hair away from the knife area at all times.

Misuse of this machine or failure to follow all safety instructions on this machine and in the instruction manual may result in serious personal injuries.

Eastman®
Over a Century of Cutting Expertise

779 Washington St., Buffalo, N.Y. 14203-1396 U.S.A. • (716)856-2200 • Fax (716)856-1140 or (716)856-2068
Manufacturers of Eastman Cloth Cutting and Cloth Spreading Machines
Website: www.EastmanCuts.com

Form E-554

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IMPORTANT

The purchaser must instruct all operators on the proper use of this equipment. All standard industrial safety measures and equipment should be provided to protect the operator. Operators must be cautioned that improper or careless use of this equipment may cause personal injury. If you do not have qualified operators to instruct new persons, contact your EASTMAN sales representative or EASTMAN factory direct.

Electrical connections and servicing to this equipment should be made by a qualified electrician who is familiar with applicable codes and regulations. Disconnect this equipment from electrical power source before proceeding with any disassembly for adjustment or repair.

Safety Information

Throughout this manual, safety information is presented by the use of the terms DANGER, WARNING, CAUTION, ELECTRICAL HAZARD, and NOTE. These terms have the following meanings:

Danger

A danger contains instructions for the use or maintenance of the machine. Failure to follow these procedures may result in death or serious personal injury to the user.

WARNING

A warning contains critical information regarding potential safety hazards that can occur during proper use or misuse of the machine. Failure to follow these procedures may result in serious personal injury to the user.

CAUTION

A caution contains instructions for the use or maintenance of the machine. Failure to follow these procedures may result in damage to the machine.

ELECTRICAL HAZARD

An electrical hazard calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond an Electrical Hazard.

Supplementary information may be given in a Note.

Safety and Indemnification

During the life of the machine, the purchaser agrees to provide to all machine users (including its own employees and independent contractors) all relevant safety information, including warning labels and instruction manuals. The purchaser also agrees to maintain the safety features and working condition of the machine, and to adequately train all users in the safe use and maintenance of the machine. The purchaser agrees to defend, protect, indemnify, and hold Eastman Machine Company and its subsidiaries harmless from and against all claims, losses, expenses, damages, and liabilities to the extent that they have been caused by the purchaser's failure to comply with the terms and instructions of this manual.

General Safety Precautions

WARNING

- This machine is equipped with very sharp and dangerous tools. Keep hands, arms, and hair away from the cutting area and drive system at all times. Safety gloves, glasses, and appropriate clothing may prevent serious personal injuries.

- Disconnect the power supply to the machine when it is not in use or during routine maintenance, including cleaning and lubrication.

- The purchaser must instruct all operators in the proper use of the machine according to the instructions in this manual. This training must include instruction on the potential safety hazards arising from the use or misuse of the machine. In addition to such training, the purchaser should provide written work instructions as necessary to ensure correct use of the machine for specific cutting and spreading applications.

- Do not modify this machine or disable safety features. Unauthorized modification may result in serious personal injuries to the user. Electrical connections to this machine must be made by a qualified electrician familiar with applicable codes and regulations.

- Safety labels must be kept clean and legible at all times. Call the Eastman Machine factory to order replacement labels.

CAUTION

- This equipment is not designed for use in conditions of extreme temperature or humidity. Operating this equipment in an environment outside the specified ranges may result in damage and will void the warranty.

Acceptable temperature range:
10ºC to 35ºC (50ºF to 95ºF).
Acceptable operating humidity range:
20% to 80% (non-condensing).

- Altitude: We anticipate that the system will operate within all specifications at an altitude up to 1000m above mean sea level.

- Transportation:During transportation and storage, the system is capable of withstanding ranges from -25ºC to 55ºC and for periods not exceeding 24 hrs. at up to +70ºC.

- Lifting/Moving:The lifting or moving of this system must be in accordance with the installation requirements. Failure to adhere to these installation requirements may cause injury to persons or hinderance or the machine performance.

- This system operates at 96dba under full load. Hearing protection devices must be used during prolonged exposure to the noise.

Laser Safety Precautions

DANGER: serious personal injury

- This Class IV laser product emits ***invisible*** infrared laser radiation in the 10.6 ìm CO_2 wavelength band.

  Do not allow laser radiation to enter the eye by viewing direct or reflected laser energy. CO_2 laser radiation can be reflected from metallic objects even though the surface is darkened. Direct or diffuse laser radiation can inflict severe corneal injuries leading to permanent eye damage or blindness. All personnel must wear eye protection suitable for 10.6 ìm CO_2 radiation when in the same area as an exposed laser beam. Eyewear protects against scattered energy but is not intended to protect against direct viewing of the beam—never look directly into the laser output aperture or view scattered laser reflections from metallic surfaces.

  Enclose the beam path whenever possible. Exposure to direct or diffuse CO_2 laser radiation can seriously burn human or animal tissue, which may cause permanent damage.

DANGER: serious personal injury

- This product is not intended for use in explosive, or potentially explosive, atmospheres.

WARNING: serious personal injury

- U.S. Customers should refer to and follow the laser safety precautions described in the American National Standards Institute (ANSI) Z136.1-2000 document, *Safe Use of Lasers*. Procedures listed in this Standard include the appointment of a Laser Safety Officer (LSO), operation of the product in an area of limited access by trained personnel, servicing of equipment only by trained and authorized personnel, and posting of signs warning of the potential hazards.

  European customers should appoint a Laser Safety Officer (LSO) who should refer to and follow the laser safety precautions described in EN 60825-1, 2007—*Safety of Laser Products*.

WARNING: serious personal injury

- Materials processing with a laser can generate air contaminants such as vapors, fumes, and/or particles that may be noxious, toxic, or even fatal. Material Safety Data Sheets (MSDS) for materials being processed should be thoroughly evaluated and the adequacy of provisions for fume extraction, filtering, and venting should be carefully considered. Review the following references for further information on exposure criteria:

  ANSI Z136.1-2000, *Safe Use of Lasers*, section 7.3.

  U.S. Government's *Code of Federal Regulations*: 29 CFR 1910, Subpart Z.

  Threshold Limit Values (TLV's) published by the American Conference of Governmental Industrial Hygienists (ACGIH). It may be necessary to consult with local governmental agencies regarding restrictions on the venting of processing vapors.

WARNING: serious personal injury

- The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser Safety Hazard Information

Eastman lasers should be installed and operated in manufacturing or laboratory facilities by trained personnel only. Due to the considerable risks and hazards associated with the installation and operational use of any equipment incorporating a laser, the operator must follow product warning labels and instructions to the user regarding laser safety.

To prevent exposure to direct or scattered laser radiation, follow all safety precautions specified throughout this manual and exercise safe operating practices per ANSI Z136.1-2000 at all times when actively lasing.

Always wear safety glasses or protective goggles with side shields to reduce the risk of damage to the eyes when operating the laser.

The CO2 laser is an intense heat source and will ignite most materials under the proper conditions. Never operate the laser in the presence of flammable or explosive materials, gases, liquids, or vapors.

The use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous ***invisible*** laser radiation, damage to, or malfunction of the laser. Severe burns will result from exposure to the laser beam.

Safe operation of the laser requires the use of an external beam block to safely block the beam from traveling beyond the desired work area. Do not place your body or any combustible object in the path of the laser beam. Use a water-cooled beam dump or power meter, or similar non-scattering, noncombustible material as the beam block. Never use organic material or metals as the beam blocker; organic materials, in general, are apt to combust or melt and metals act as specular reflectors which may create a serious hazard outside the immediate work area.

Other hazards

The following hazards are typical for this product family when incorporated for intended use: (A) risk of injury when lifting or moving the unit; (B) risk of exposure to hazardous laser energy through unauthorized removal of access panels, doors, or protective barriers; (C) risk of exposure to hazardous laser energy and injury due to failure of personnel to use proper eye protection and/or failure to adhere to applicable laser safety procedures; (D) risk of exposure to hazardous or lethal voltages through unauthorized removal of covers, doors, or access panels; (E) generation of hazardous air contaminants that may be noxious, toxic, or even fatal.

Disposal

This product contains components that are considered hazardous industrial waste. If a situation occurs where the laser is rendered nonfunctional and cannot be repaired, it may be returned to Eastman who, for a fee, will ensure adequate disassembly, recycling and/or disposal of the product.

Additional laser safety information

The SYNRAD web site (http://www.synrad.com/LaserFacts/lasersafety.html) contains an on-line laser safety handbook that provides information on (1) Laser Safety Standards for OEM's/System Integrators, (2) Laser Safety Standards for End Users, (3) References and Sources, and (4) Assistance with Requirements.

In addition, the Occupational Safety and Health Administration (OSHA) provides an on-line Technical Manual (located at http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_6.html). Section III, Chapter 6 and Appendix III are good resources for laser safety information.

Another excellent laser safety resource is the Laser Institute of America (LIA). Their comprehensive web site is located at http://www.laserinstitute.org.

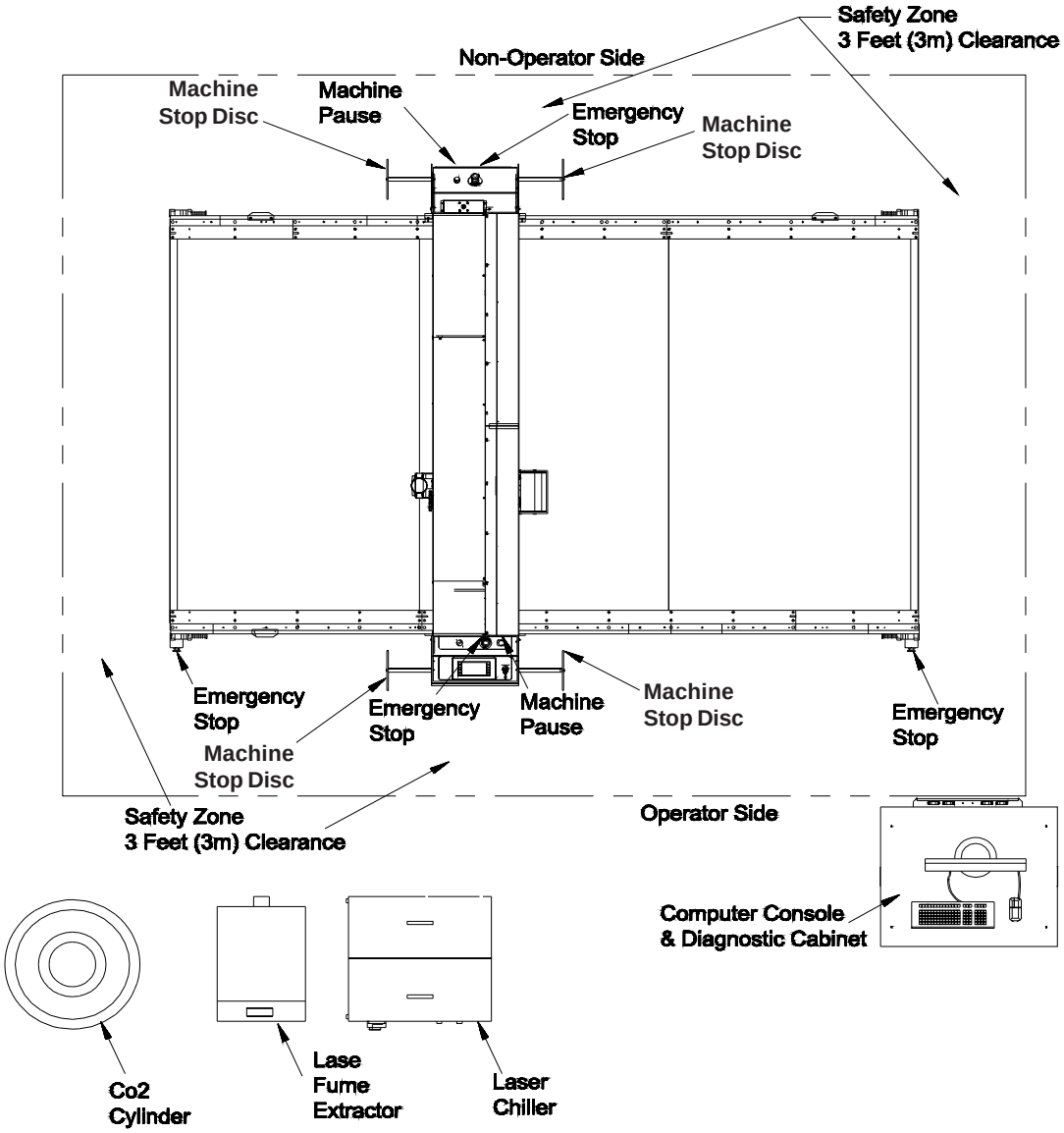
Safety Zone and Stop Devices

Pause Buttons/Stop Discs

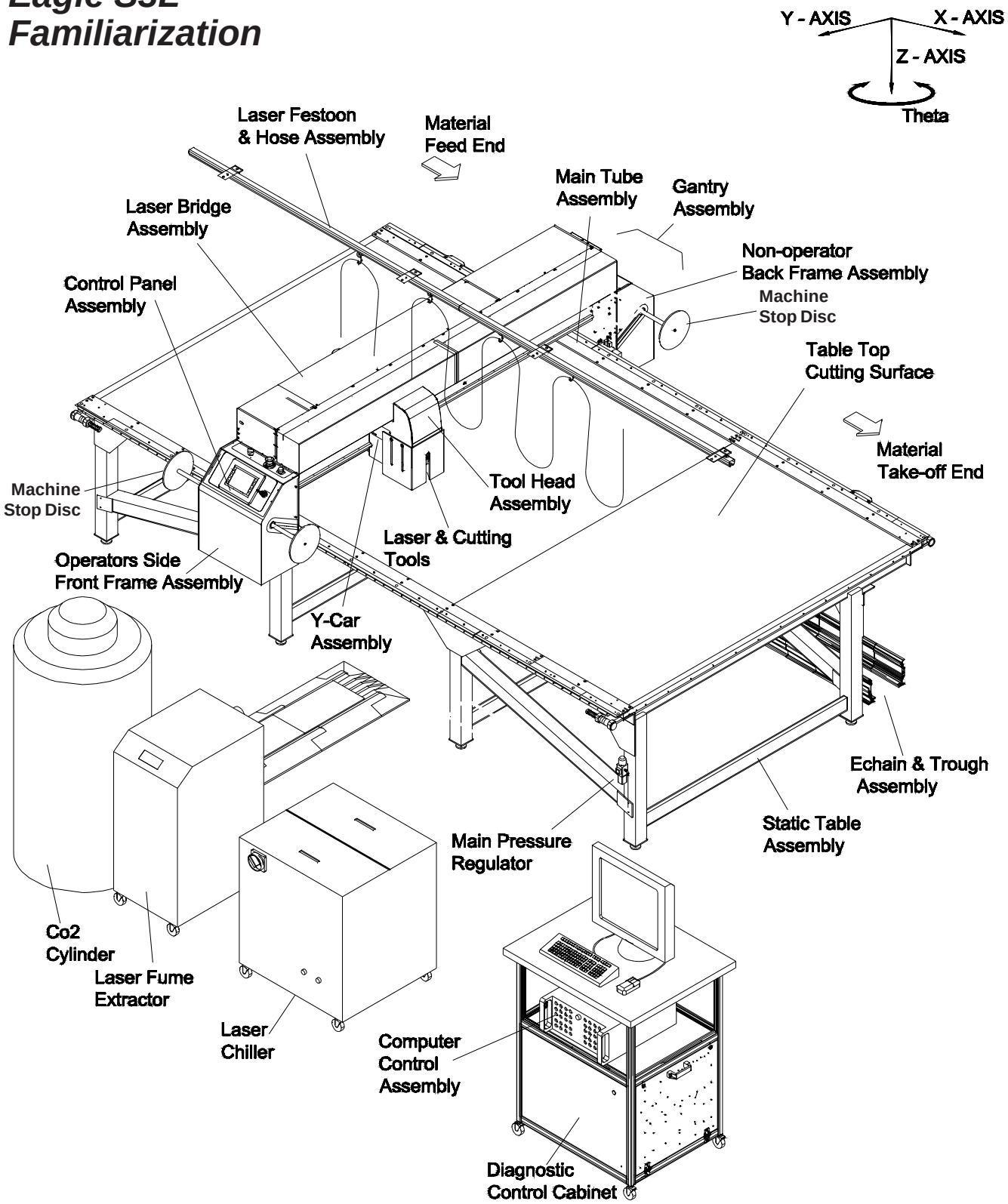
The yellow buttons above the control panel and on the non-operator side of the gantry as well as the stop discs on each side of the gantry will pause the machine. Activating either the button or the stop discs will execute a controlled stop of the plotter, with the machine remaining fully powered. After releasing the pause button or resetting the stop discs and pressing NEXT on the Touch Screen UIT, the cutter will resume cutting the work in progress. Pressing ABORT will cancel the job.

Emergency Stop Buttons

There are red Emergency Stop buttons located on each side of the gantry as well as on the operator side right and left ends of the table. Pressing any of the Emergency Stop buttons will execute a controlled stop of the gantry before cutting all power to the motors and e-box. To release an Emergency Stop condition, pull out the Stop button hit the ABORT key on the Touch Screen UIT. The table must be re-homed by pressing the ZERO TABLE button before restarting the cutter. Emergency stop mats are also available as an option.



Eagle S3L
Familiarization



The Eastman ***Eagle S3L*** Automated Laser Cutting machine has been inspected and tested at the factory prior to shipment. The Eagle S3L machine is shipped partially disassembled and requires some assembly and setup before operation can take place. To get the best performance, familiarize yourself and all operators with all functions and adjustments of this equipment. Before any operation takes place it is important to carefully read and follow the instructions in these reference manuals.

Reference Manuals

E-553 ..... Eagle S3L Illustrated Parts List
E-554 ..... Eagle S3L Service Manual
E-555 ..... Eagle S3L Operation Manual
E-515 ..... Cutting Tools Illustrated Parts Manual
E-519 ..... Cutting Surface Selection Chart
E-522 ..... Air Brush Marking System Manual

INSTALLATION

Site Preparation

Loading Dock
In most cases the machine will be transported by a common carrier freight truck. The freight truck will require a loading dock to remove the shipping crates. If a loading dock is not available, contact Eastman to make special shipping arrangements. Before moving the shipping crates, verify the path to the installation area is clear and equipment is available to move the shipping crates. The freight door opening must be a minimum of 96 inches (2438 mm) wide.

Floor Space
The floor space required will very and depend on the machine size purchased. The approximate area required for a standard machine is 3 feet wider than the machine cutting width and 3 feet longer than the table length. The Computer, Laser Chiller and Fume Extractor will be located out side this safety zone. It is important to have this space available as parts/components of the machine travel at high speed. Additional space maybe required for optional accessories like an A-frame, carousel, etc..

Ventilation
It is recommended that the machine be installed in a clean and dry environment. This will extend it's useful life. Damage to the machine may occur if the surrounding environment is not clean. The room should be adequately ventilated to provide clean cool air.

Compressed Air Supply
The machine requires clean and dry compressed air for operation. The air supply must be 75-90 psi dry filtered air at a minimum of 15 CFM. The filter must remove 95-98% of all particles 40 microns or larger. All air lines must be in place at time of installation.

Floor Support
The floor must be able to suspend loads greater than machine weight and additional working loads. Please consult factory for the approximate weight of your machine.

Floor Leveling
It is important that the machine be installed on a level and stable floor. No deviation more than 1" from horizontal, (+/-½") over the entire length is acceptable during installation. The machine is equipped with leveling feet which can handle irregular surfaces up to 1" per 16 foot grade.

Utilities (power outlets)
It is the responsibility of the customer to provide electrical power and compressed air requirements to the machine. An Internet connection is not required but is recommended. For your specific machine requirements refer your install guide provided by Eastman.

Note: Electrical connections to this equipment should be made by a qualified electrician who is familiar with applicable codes and regulations

Preparation before Unpacking
Before unpacking, the following items should be reviewed:

- It is the customers responsibility to provide a qualified electrician to provide power to the system. Connections will include power to the VFD or starter units, vacuum blowers, diagnostic control cabinet, laser chiller and fume extractor.

Note: Each blower will require a separate VFD or Starter.

- Co2 tank and regulator.
- Compressed air requirements.
- Static table placement and orientation.

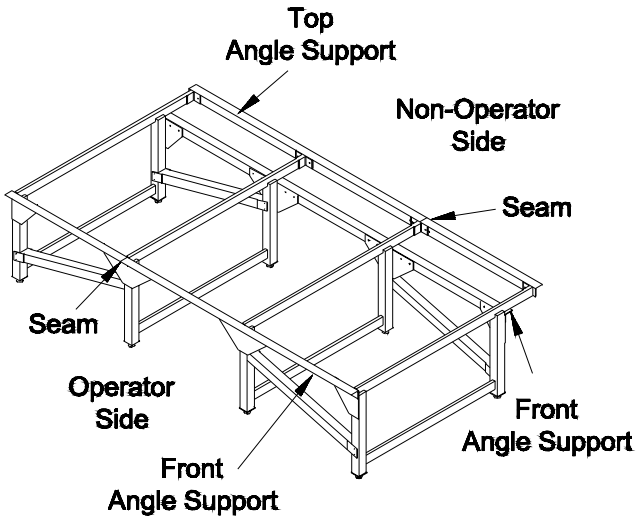
Unpacking Instructions

- Identify the contents of each crate and position them in the approximate final location. The safety zone illustration can be used as a guide.
- Inspect the items in the boxes and verify that all components, hardware and accessories are included and undamaged.
- Leave the gantry on the wooden pallet and place the store in a safe and convenient place.
- Remove the table structure and hardware from the crate and use the following steps to install.

Table Assembly

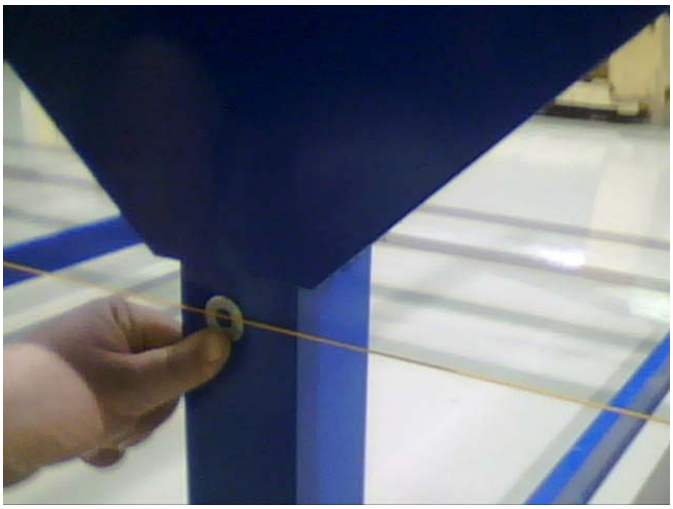
Place frames upside down on floor. Install ½" nut onto leveling pad and install leveling pad halfway into threaded holes. Place the table end frames at the ends as they are not the same as the middle frames.

Stand up table frames in proper orientation. Place the front angle supports on both sides and top angle supports on overhang side. Stagger the angle support seams on both sides of the table. Attach angle supports flush at joints and to frame gusset using 3/8" allen head bolt, two flat washers, a lock washer and nut. Hand tighten until frame is straight, level and square.

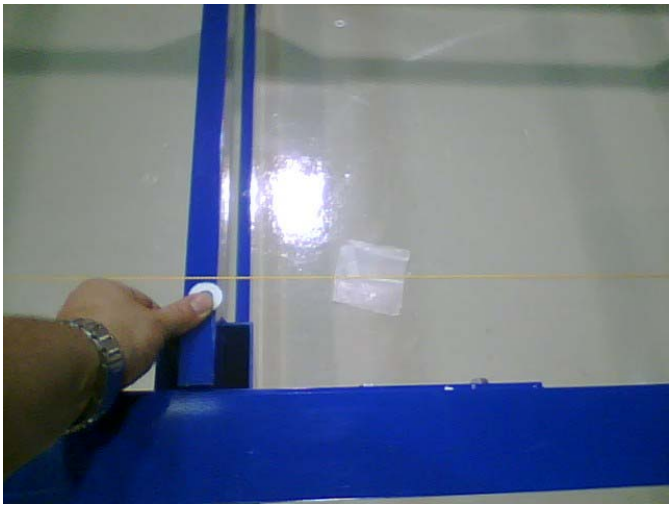


Measure diagonally across frame to opposite inside corners, adjust frame until dimensions are equal.

Secure a string line to the end table frame legs. Locate string 1" below gusset. Straighten frame by moving frame sections in or out until table is straight along its entire length.



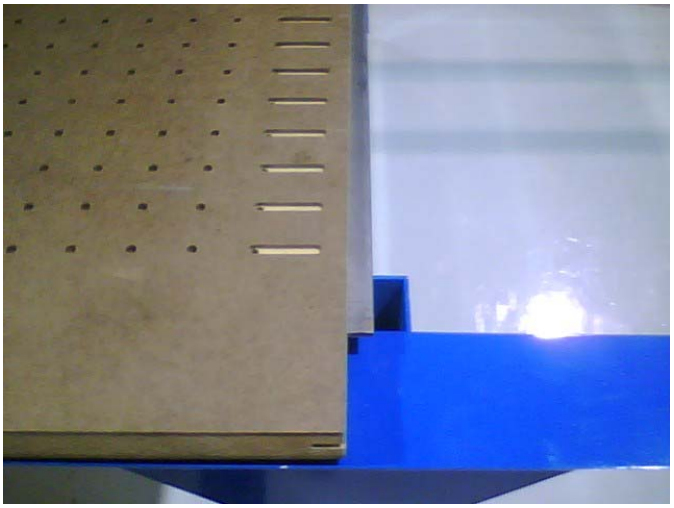
Vertically level frame legs. Place spacer blocks under ends of string line and line level at center.



Adjust end feet to level string, then intermediate feet . Adjust feet on opposite side to level across end supports, attach string to opposite side and repeat leveling method.

Tighten feet lock nuts and frame bolts securely. Recheck to ensure that frame is square, straight and level. Readjust as needed.

Table Top & Top Hat Installation
Starting with left table top (18" blank edge) or right table top (8" blank edge). Apply silicone bead around hole in plenum bottom and install vacuum top hat using (6) small TEK screws. Place table top on appropriate end of table frame (blank edge at end). Position the table top flush with front angle support edge and halfway onto cross support. Clamp onto frame end at corners. Insert table spline into table top slot. Prepare and install remaining tabletops. Use mallet and wood block to secure into place. Keep edges aligned flush along operator side and joints tight.

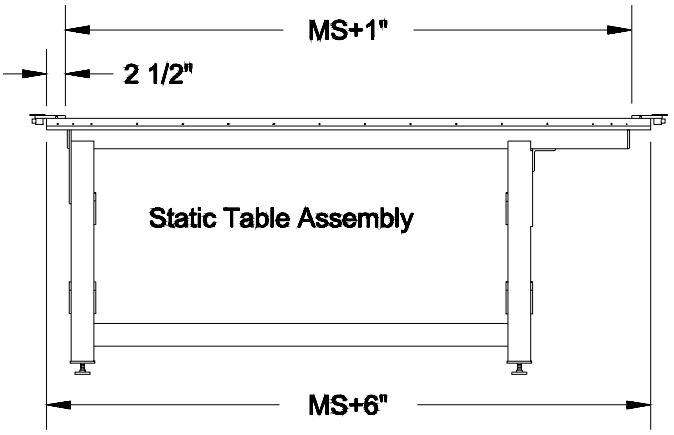


Rack & Rail installation
Layout racks and rails on appropriate side of table: R = operator side, L = non-operator side. Each Piece is marked for proper mating of parts. Layout rack plates on table to correspond to rack hole patterns.

Mark a line on the operators side table top 2 ½" from the tabletop edge. Attach a tight string line from end to end 1/16" to inside of mark. Place rack plate sections 1/16" from string line (2 ½" from edge). Centered on table from end to end. Place ¼" x ¼" key in keyways for each section. Clamp first rack plate section to table top at each end and center.

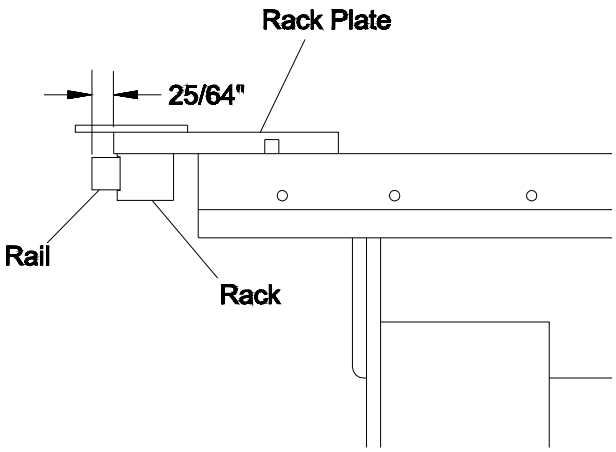
Drill ¼" clearance holes through existing rack plate, table top and angle. Secure using ¼" flat head screw, flat washer, lock washer and nut. Do not over tighten. Repeat for remaining sections on operator side.

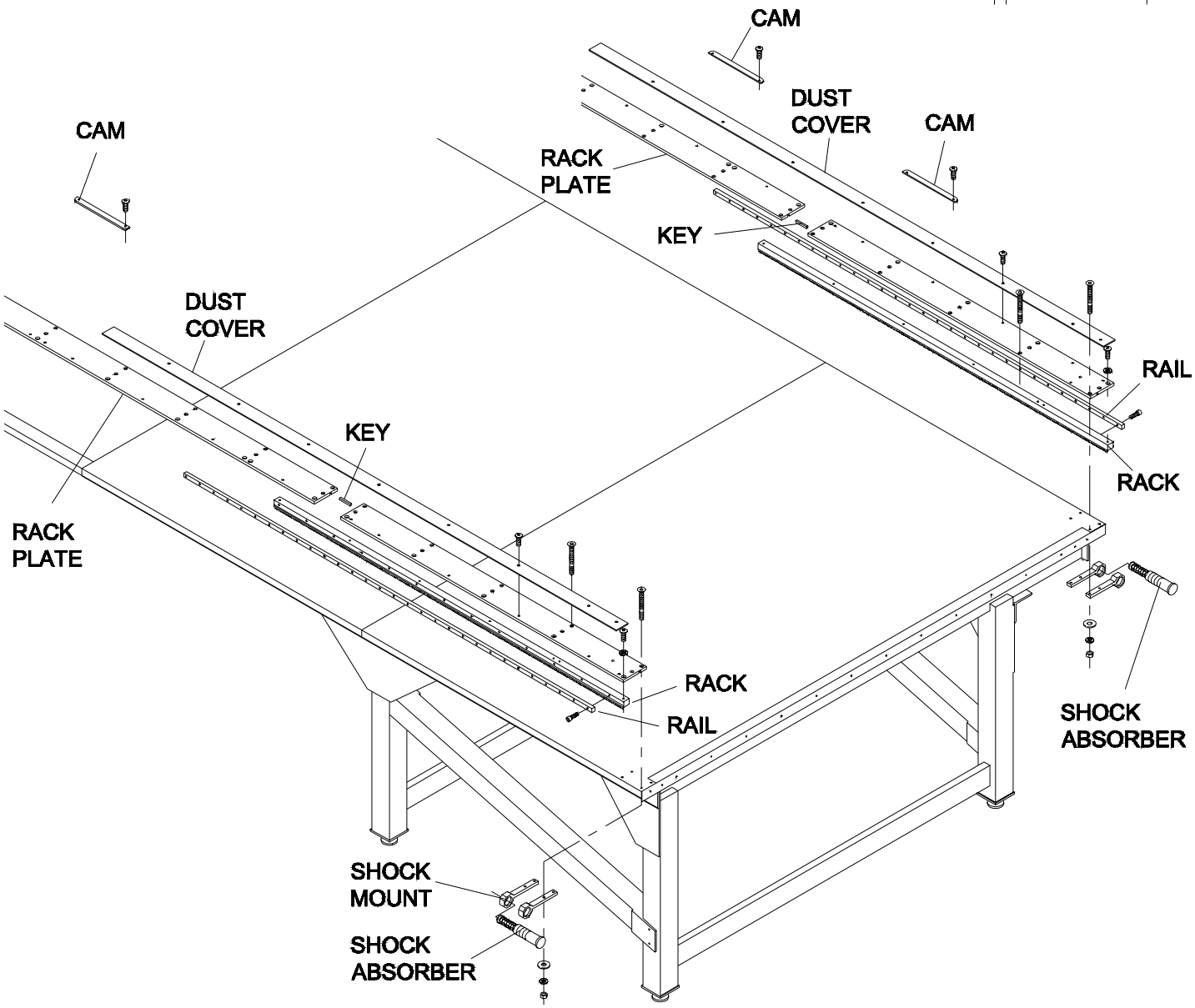
Install rack plates on non-operator side in same manner. Verify the distance between operator and non-operator side rack plates are machine size + 1" from inside to inside.



Attach rail to rack using M3 x 16 socket head screws. Do not secure at this time. Clamp rack and rail assembly in position as shown. Attach rack to the rack plate using #10 button head screws and washers. Do not secure at this time.

Set rack/rail position using the 25/64" rail-to-rack plate gauge. Tighten end rack screw. Clamp rack spacer tool at first joint. Use gauge to set rack/rail position with rack faces flush. Secure one rack screw on each side of gear joint. Tighten all rack screws on first section only. Repeat procedure for all sections. After assembly is complete on both sides of the table, tighten all screws. Ensuring that joints are aligned precisely.





Vacuum Assembly Installation
Review Vacuum Assembly drawing and determine blower and piping layout. Remove rubber seals from fittings. Place large tee on blower intake and reducers on each end and secure using large TEK screws. Position blower under table in proper location with motor towards operator side. Assemble remaining vacuum piping using (4) small TEK screws and silicone sealant at each joint, with blast gates at proper angle towards operator side.

If Equipped, attach blast gate brackets and handles to front angle support with small TEK screws. Ensure clearance between gantry plate and blast gate handles when blast gates are fully open.

Position silencers and secure using two rubber sleeve and small pipe. Place silencer board in position. The blowers are ready for power hookup. Verify correct motor rotation and vacuum.

Note: Power connections to each blower should be made by a qualified electrician and is the customers responsibility.

Install (4) angle braces on frame end sections using (2) large TEK screws on each angle brace end. Clamp table end covers into place. Drill 1/8" pilot holes and attach using #8 x 2" deck screws.

Gantry Installation
Remove gantry side covers & (4) rail car assemblies. Place one inner assembly on each rail. Set two 4" x 4" blocks on table top to support the gantry. Carefully guide spur gear under rack and set gantry onto 4" x 4" blocks. Slide outer rail car onto each rail. Secure the rail cars to each side of gantry. Adjust backlash on each side of gantry ensuring gantry side plates are level. Assemble stop discs. Reinstall operator side cover onto gantry.

Assemble shock absorbers to mounts, place shock mounts under front angle supports, flush to ends. Drill ¼" holes through angle, table top and rack plate. Install using ¼" button head screws, flat washers, lock washers and nuts. Install dust covers to rack plate using ¼" button head screws.

Install (2) home cam ramps on dust cover starting 15-3/4" from left table end. Drill, tap and install using # 8-32 x 3/8" screws. Install (1) right limit cam on dust cover starting 8 ½" from right table end, non-operator side in same manner. Check roller limit switches (3) for proper cam contact. The switch rollers must depress approximately 1/16". Adjust limit switches as required.

E-chain & E-stop Installation
Install E-stop boxes and mounting plates to operator side angle supports.

Assemble the e-chain trough and position assembly under the table overhang. Place the e-chain in the trough. Secure the e-chain assembly to the gantry. Square the trough to the table structure along its entire length. The cables leaving the e-chain will exit the bottom of trough immediately. Connect e-chain cables, air line, Co2 line, and water lines to gantry. Replace gantry covers and at this time.

Route cables, air line, Co2 line, and water lines under the table, through cable protector floor mat and to the final destination.

Place diagnostic control cabinet, fume extractor, chiller and Co2 tank in working location. Run the cables thru the bulk head connectors and connect inside the diagnostic cabinet as required. Notify the electrician to begin making the final electrical connections to the diagnostic cabinet, chiller and fume extractor. Test voltage and ground plug before making any connections. Turn on main power switch, and test for proper voltage at computer outlets. Setup computer, keyboard and monitor. Install air regulator at customer specified location and set to 90 PSI.

Fume extractor hose and Festoon installation
Install the festoon assembly 68" above the table surface and centered (approx. 102" from the floor). Place the trollies in the track and space the trollies evenly in the track along its entire length. Secure the fume hose to the gantry y-car. Hook the hose to the trollies using the web loops and zip ties. Check for proper operation. Connect the hose to the fume extractor.

Chiller Installation
Connect the two chiller lines the inlet and outlet fittings on chiller unit. Fill the chiller with clean distilled water. Refer to the chiller manual for filling instructions.

Co2 Tank Installation
Co2 tank installation is the customers responsibility. All applicable codes and regulations should be followed for a safe work environment. Connect Co2 Line the regulator. Set the regulator to 20 psi operating pressure.

Signage and safety glasses
There are (4) four warning signs supplied with you laser cutter. The signs should be displayed in a manner all operators and spectators can view before entering you machine area. All operators and spectators must where laser approved safety glasses when the laser is operating.

Environmental Conditions

Condition	Normal Operating Condition	If Outside the Normal Condition
Temperature	55-100 degrees Fahrenheit	Cutter may not operate correctly
Humidity	20% and 80% relative humidity (Non-Condensing)	Cutter may not operate correctly
High Altitude	Sea Level to 1000 Feet above Sea Level	Blower Pressure will be lower (less material hold down
Radio Frequency* interference (RFI) (i.e...RF Welding Equipment)	No Interference Mnimum Recommendation 75 feet away	Cutter may not operate correctly
Electrical Power Disturbance	No Disturbances	Cutter may not operate correctly
General Shop Cleanliness	Clean Environment	Cutter may not operate correctly
Clean/Filtered Shop Air	Clean Air	Cylinders and Valves may not operate

* RF Interference:

For customers using RF welders or other equipment that emits RF, Eastman Machine Company recommends that this equipment be kept at least 70 feet away from the Eastman cutting system. High levels of RF emissions may cause the electronic controls in the system to malfunction. Please note that interference and damage, caused by RF emissions from equipment that is not stationed at least 70 feet away, may not be covered under the warranty of your Eastman cutting system.

Customer is responsible for installing and using earth grounds to protect machine from RF.

SERVICE and MAINTENANCE

Warning: Always disconnect power source (lockout/tagout) to machine before proceeding with any maintenance, adjustments or repair. Failure to disconnect power may cause serious personal injury and/or damage to machine.

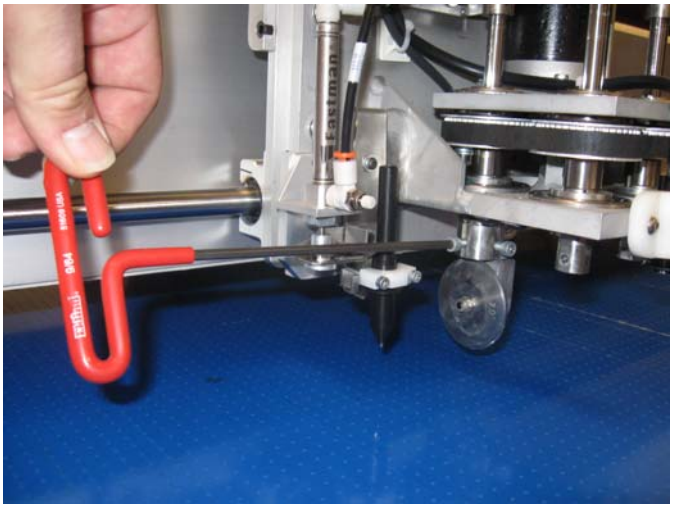
Warning: This machine is equipped with a very sharp knife and powerful laser. Use caution when working on this machine. Failure to keep hands, arms, and loose objects away from knife area may cause serious personal injury.

Service and maintenance to this machine should be performed by qualified personnel. If you do not have qualified personnel, contact your Eastman Sales Representative or Eastman Factory direct.

Aligning, Cleaning and Replacing Consumables

Tool Holder removal

Warning: Always handle blades with care. Safely dispose of use blades.



To remove the tool holder assembly, turn the power off to the gantry (use lock out / tag out if required). Loosen the two allen head screws on the tool holder. Carefully slide tool holder off the tool spindle.

To install tool holder assembly, slide the holder on the spindle ensuring that the alignment tang is engaged on the spindle. Tighten the two allen head screws.

Note: If the tool type is different from the one removed, it is important to re-map and change the tool type represented in the software to match the one installed.

Note: Tools do not need to be re-calibrated unless cut accuracy is critical to 0.010" or less. If calibration is needed refer to operator's manual.

Caution: Failing to re-map a tool after changing tool types can result in damage to the table cutting surface, tool and or tool spindle. (Example: changing a punch to a drag knife).

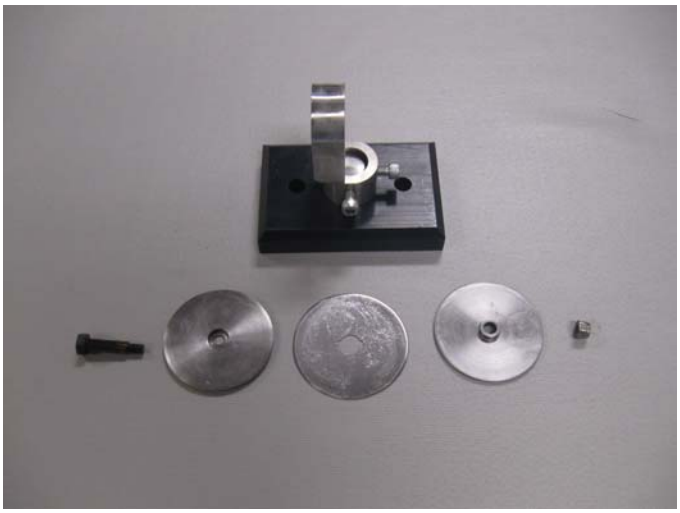
Round Knife Replacement

⚠ Warning: Always handle blades with care. Safely dispose of use blades.

Place the tool holder assembly on the tool changing station (Eastman #68-26141) as shown. Engage alignment tang in tool changing station and secure both holder screws to prevent movement.

Using nut drivers (Eastman #67-26450 & 67-26451), Remove the blade retaining nut.

⚠ Caution: Improper depth limits may cause damage to cutting surface.



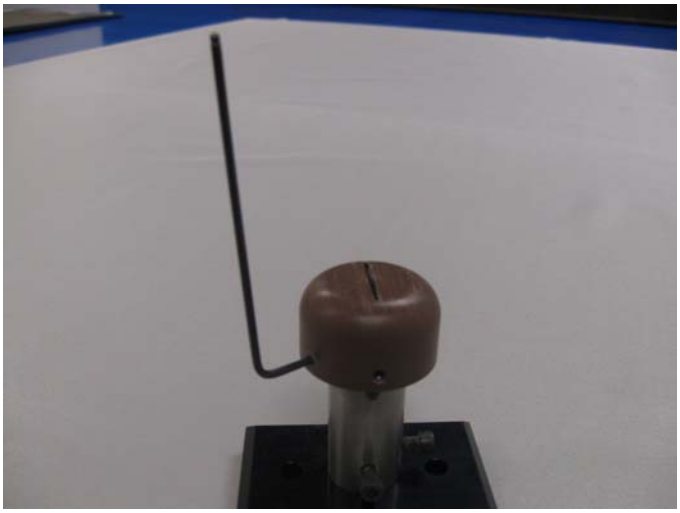
Carefully remove the worn knife. Replace with a new Genuine Eastman knife. Failure to use genuine Eastman knives may void your warrantee. Ensure that the depth limiters and new knife are installed in the same sequence as removed.

⚠ Warning: Always handle blades with care. Safely dispose of use blades.

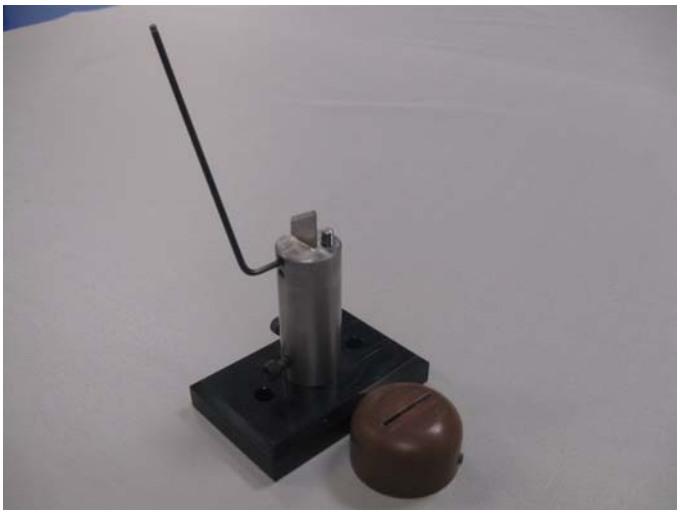
Drag Knife Replacement

⚠ Warning: Always handle blades with care. Safely dispose of use blades.

Place the tool holder assembly on the tool changing station (Eastman #68-26141) as shown. Engage alignment tang in tool changing station and secure both holder screws to prevent movement.



Using allen wrench, loosen the two setscrews on the depth limiting foot. Remove the depth limiting foot from the tool holder assembly.



Loosen the setscrew that retains the knife in the holder.

Carefully remove the worn knife and replace with a new drag knife. Ensure that the knife is replaced with the sharp edge pointing to alignment tang.

If a change in depth of penetration is required for the knife, remove the assembly from the tool changing station. Adjust the blade depth by turning the internal setscrew found inside the tool holder.

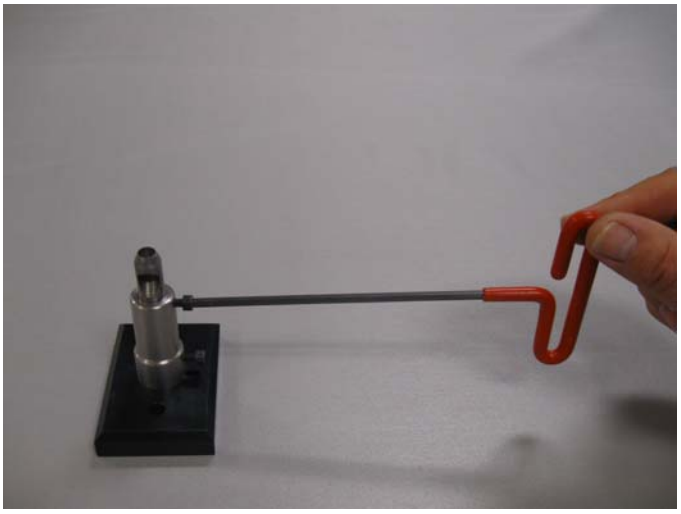
Turning the setscrew clockwise will result in less blade exposure. Turning the setscrew counterclockwise will results in more blade exposure. It is advised the blade be exposed only enough to cut the material as required. Return the depth limiting foot back on to the tool holder assembly and tighten both screws.

To measure blade exposure, use Tool Depth Scale (Eastman #68-26142) as shown in the automated cutting tools manual.

⚠ Caution: Improper depth limits may cause damage to cutting surface.

Punch Replacement

⚠ Warning: Always handle punches blades with care. Safely dispose of use punch blades.

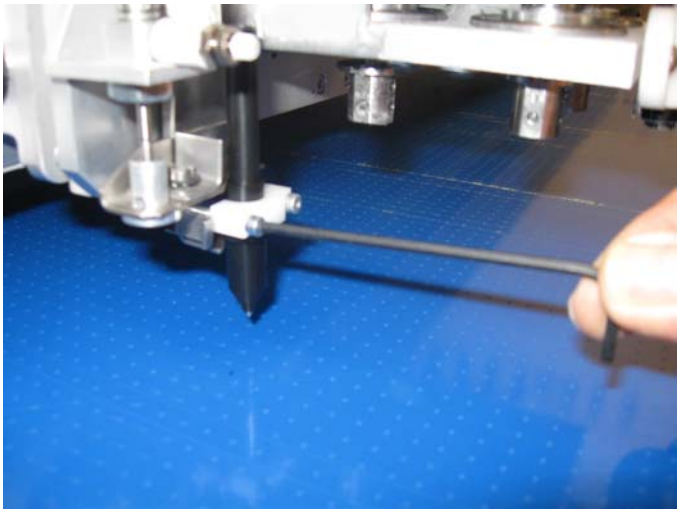


Place the tool holder assembly on the tool changing station (Eastman #68-26141) as shown. Engage alignment tang in tool changing station and secure both holder screws to prevent movement.

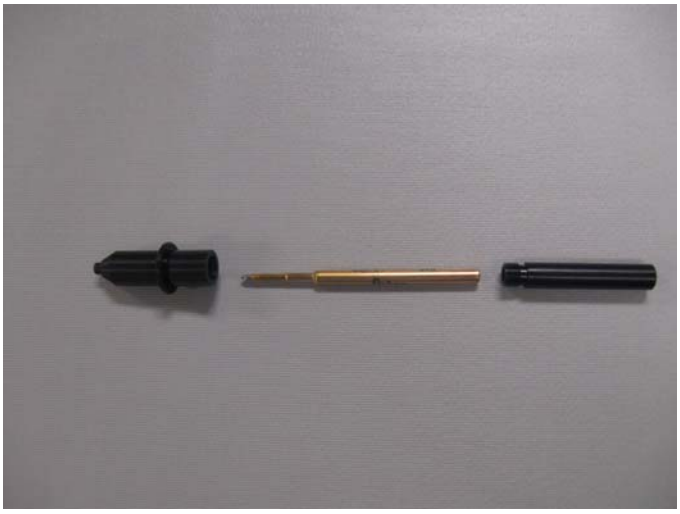
Using an allen wrench, loosen the locking screw as shown. Remove worn punch blade from holder and replace with new punch blade. Secure locking screw.

Pen Replacement

Using an allen wrench remove the screws holding the white plastic pen saddle.

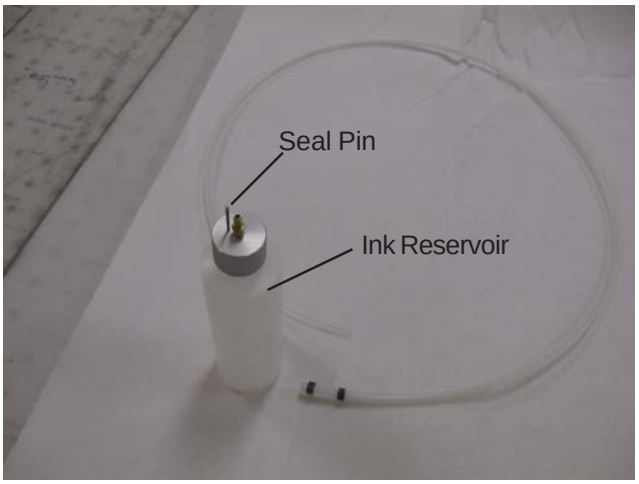


Remove the marking pen.



Disassemble the pen exposing the pen ink refill. Replace with new refill. Reassemble the marking pen. Secure pen and white plastic saddle by mounting and tightening the screws with the allen wrench.

Airbrush Ink Refill
When the ink supply runs low, replace the 1/2 pint ink reservoir with a fresh container of ink. This will eliminate impurities clogging the air brush.



If refilling the 1/2 pint ink reservoir from gallon containers, the ink reservoir should be drained and cleaned. This will help avoid thick sediment from forming at the bottom of the ink reservoir.

Note: Ink should always be shaken before refilling or installing a new ink reservoir.

Note: Always seal the bottle top vent hole with the sealing pin when not in use. If the vent hole is not sealed, the ink will thicken and may cause airbrush clogging.

It is recommended to activate the airbrush at the beginning and end of each shift. Eastman ink is considered a self cleaning ink and will clean the air brush as it is activated.

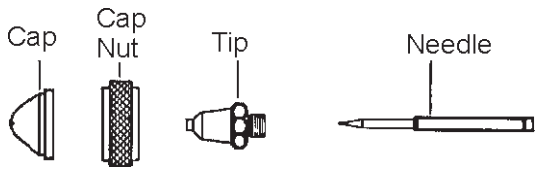
If using a washable ink, check expiration date. Washable ink has a 6 month expiration date. After expiration date the ink can potentially damage the air brush and should not be used.

Cleaning of Airbrush
The air brush stylus has been designed for minimum maintenance. The leather packing washers should be lubricated once a month with light oil. Old packing washers cause leakage of air or fluid. Flush clean solvent through the fluid passage of the stylus and wipe off the outside with clean solvent. Never leave the entire stylus immersed in solvent. Dirty spray caps and tips should be cleaned by soaking in solvent and blow clean with air.

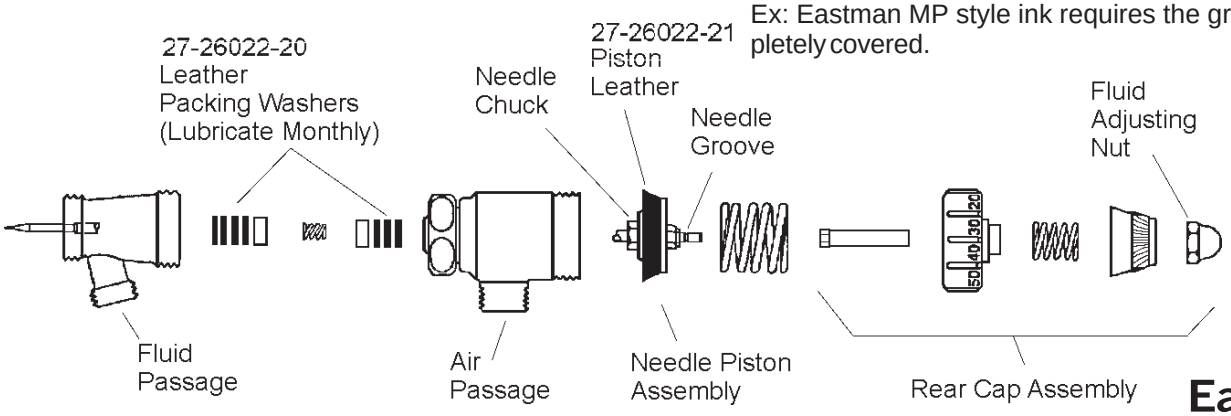
Note: Never use wire or sharp instruments to clean ports as permanent damage may occur.

Spray Tip and Cap Replacement
Remove the Airbrush stylus from tool head. Release needle pressure from the seat of tip, by backing off the fluid adjusting nut. Loosen spray cap nut and remove spray cap and spray tip. Leave needle in place. Check cap and tip size. Install new cap and tip. Note: use only matching size cap and tip. Secure spray cap nut.

Needle Removal
Remove the Airbrush stylus from tool head. Release needle pressure from the seat of tip, by backing off the fluid adjusting nut.Remove the rear cap assembly. Using a pair of pliers, grip the needle piston assembly nut and pull the assembly out.Loosen the needle chuck and slide needle out. Replace needle to desired position and secure needle chuck. Reassemble in reverse order.



Needle Setting
Ink should be mixed thoroughly and always strained through a lint free cloth or fine mesh filter (Eastman# 67-26588) before using. The needle-piston assembly has a needle chuck which locks the needle in position. The single groove on the shank of the needle indicates location at which to lock the piston. Lock piston slightly below mark for use with very heavy fluids and slightly above mark (nearer blunt end) for light fluids.
Ex: Eastman MP style ink requires the groove to be completely covered.



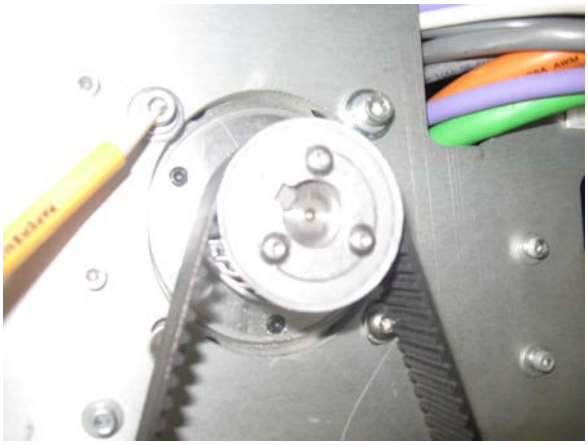
Eastman®
Over a Century of Cutting Expertise

X-Motor Belt Replacement
X-Motor belts are located under the gantry and covers.

1. Power down the machine using proper shut down/lock out procedures.

2. Remove the gantry end cover.

3. Loosen the (4) motor screws to remove belt tension.



4. Remove the (6) shaft support plate screws and rotate plate down out of way.

5. If equipped, loosen belt guides.

6. Remove old worn belt and replace with new belt.

7. Hold the belt on the large pulley and roll the belt onto the motor pulley until the belt seats itself into the pulley teeth.

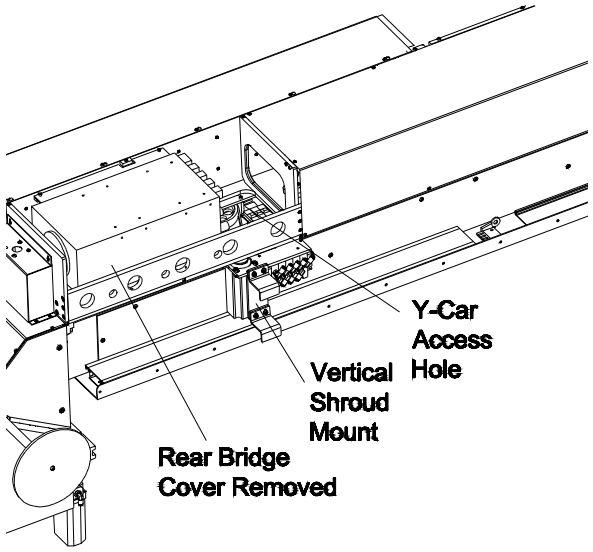
8. Rotate the Support plate into position and secure (6) screws.

9. Tension the belt by applying up pressure to motor as shown. Secure motor screws. Secure the belt tensioner if equipped.

10. Reinstall gantry cover.

Y-Motor Belt Replacement
Y-Motor belt is located on the y-car under the laser bridge.

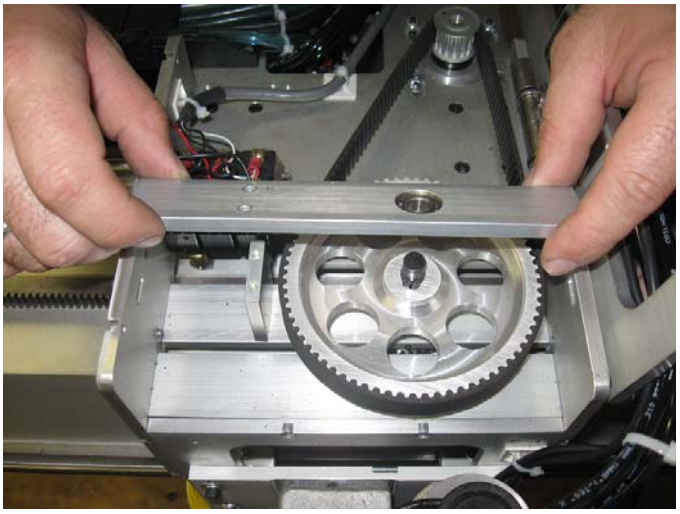
1. Power down the machine using proper shut down/lock out procedures.



2. Remove the tool head cover and the non-operator side rear bridge cover. Remove the fume extractor shroud.

3. Remove the vertical shroud mount by removing (2) screws.

4. Loosen the (4) y-motor mounting screws to release belt tension.



5. Remove (6) screws holding the upper pulley plate & bearing. Lift the upper pulley plate & bearing evenly to remove. A prybar or screwdriver may be required.

6. Remove old belt and replace with new.

7. Install upper pulley plate & bearing. Secure all (6) screws. Check backlash and adjust if required.

8. Set belt tension and secure motor.

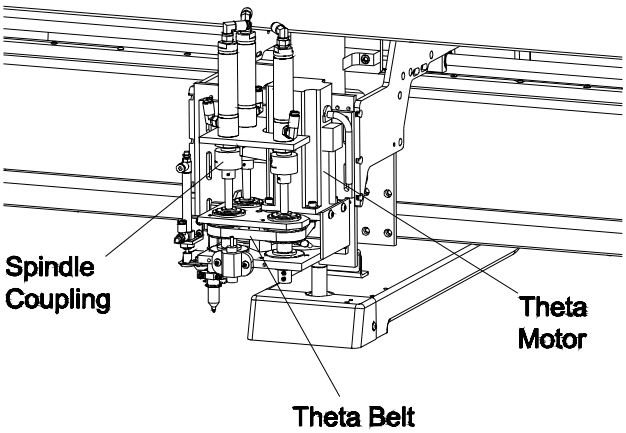
9. Reassemble the remaining components.

Theta-Motor Belt Replacement

The Theta-Motor Belt in located on the tool head. There are a variety of tool heads available for your system and the process may vary slightly.

1. Power down the machine using proper shut down/lock out procedures.

2. Remover the tool head cover.



3. Loosen the (4) theta motor mounting screws to release belt tension.

4. Label each brass spindle coupling with corresponding spindle number. This will ensure the coupling is reassembled on the same spindle. Remove coupling.

5. Some models may require the removal of the home sensor and/or belt tensioner. If required, remove them now.

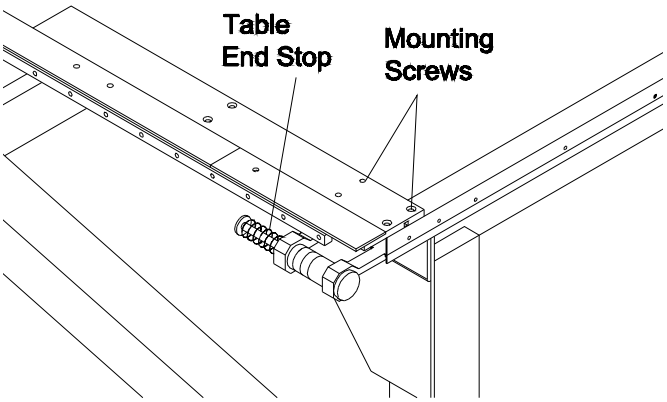
6. Remove the old belt and replace with new. It is not recommended to cut the old belt off.

7. Reassemble in reverse order. Check belt tension and adjust as required.

X-Axis Linear Bearing Replacement

It is important to regularly inspect and replace the linear bearings on the Eastman cutting system. Properly maintaining your linear bearings with grease and regular replacement will prevent damage to the linear rails, increase life of spur gears, increase cutting performance and accuracy.

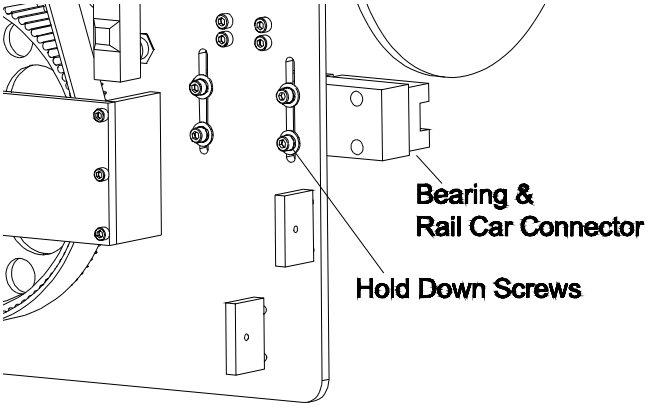
1. Power down the machine using proper shut down/lock out procedures.



2. Remove table end stop and (4) screws..

3. Remove the gantry end cover.

4. Place wood block under gantry for support.



5. Remove the (4) hold down screws. Place a small mark on the top of the rail car (this will be used later for installation). Slide the bearing & rail car off the end of the table.

Note: Damaged or worn bearings will release small balls when removed from rail.

6. Remove the linear bearings from the rail car.

7. Slide the new linear bearings on the rail. The bearing grease fittings should be facing out for easy access.

8. Mount the rail car onto the bearings. The small mark should be used now to show the top of the car.

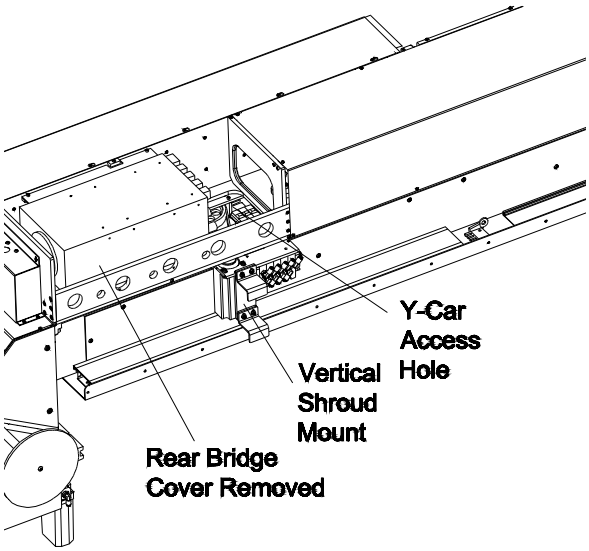
9. Install the bearing & rail car onto the gantry side frame. Remove the wood block and adjust backlash if required.

10. Reinstall remaining components.

Y-Axis Top Linear Bearing Replacement

Y-Axis Linear Bearings are located on the y-car assembly.

1. Power down the machine using proper shut down/lock out procedures.



2. Remove the tool head cover and the non-operator side rear bridge cover. Remove the fume extractor shroud.

3. Remove the non-operator side gantry cover and the upper bearing access cover.

4. Remove the linear bearing screws (4) and slide the bearing thru the access opening as shown.

5. Remove new bearings from package and press the Zerk grease fitting provided into the bearings. Using a grease gun and the grease gun adapter provided with machine, fill the bearings with white or clear lithium grease.

6. Slide the new bearings onto the linear rail and ensure that bearing adjustment screws are accessible from the back of gantry. Be careful not to damage the bearing seals while mounting on the linear rail.

7. Adjust the bearing preload by turning the setscrew

clockwise (as shown) to increase bearing preload. To test for preload simply rotate the bearing. Preload is set when a slight drag is felt.

8. Slide the bearings under the Y-car and secure.

9. After the replacement of new bearings check for the Y car backlash and adjust as required.

10. Please note, bearing replacement may effect Y-car cutting calibration.

11. Reassemble the remaining components.

Y-Axis Front Linear Bearing Replacement
Y-Axis Linear Bearings are located on the y-car assembly.

1. Power down the machine using proper shut down/lock out procedures.

2. Remove the tool head cover.

3. Remove the non-operator side gantry cover and the upper bearing access cover.

4. Identify all air lines and label them for spindle location and function if not already marked.

5. Disconnect all air lines by depressing the red color buttons and slightly pulling on the air lines.

6. Disconnect the theta motor cable and theta motor feedback cable.

7. Disconnect the laser pointer cable and position sensor.

8. Remove the (6) screws and remove the tool head.

9. Remove the (4) screws which secure the linear bearing to the tool head interface plate and slide the bearing thru the access opening as shown.

10. Remove new bearings from package and press the Zerk grease fitting provided into the bearings. Using a grease gun and the grease gun adapter provided with machine, fill the bearings with white or clear lithium grease.

11. Slide the new bearings onto the linear rail and ensure that bearing adjustment screws are accessible from the back of gantry. Be careful not to damage the bearing seals while mounting on the linear rail.

12. Adjust the bearing preload by turning the setscrew clockwise (as shown) to increase bearing preload. To test for preload simply rotate the bearing. Preload is set when a slight drag is felt.

13. Slide the bearings in position and secure.

14. After the replacement of new bearings check for the Y car backlash and adjust as required.

10. Please note, bearing replacement may effect Y-car cutting calibration.

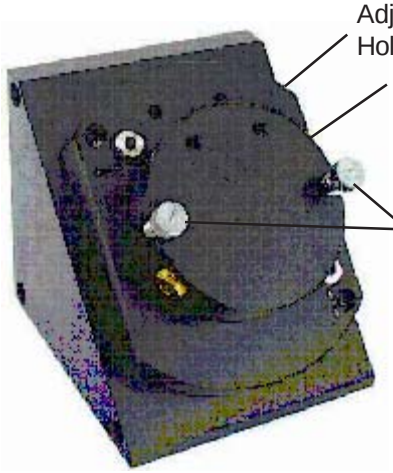
16. Reassemble the remaining components.

Laser Mirror Replacement

Note: Damage to optics may result from improper cleaning or handling. Read the instructions completely before starting.

1. Power down the machine using proper shut down/lock out procedures.

2. Remove the laser bridge covers.



3. Remove the mirror cap by turning the (2) thumb screws and pulling straight out of the adjustable mirror holder.

4. The mirror is held on the mirror cap with thermal compound. To remove the mirror, carefully rotate and lift the mirror and shim off the mirror cap.

⚠ CAUTION: Handle shim with care. It is very thin and can be easily damaged.

5. Apply a thin, even coating of Eastman Thermal Compound (81-26011) to the inner surface of the mirror cap.

6. Carefully slip the shim on to the mirror cap.

⚠ CAUTION: It is extremely important in the steps that follow you do not touch the reflective surface of the mirror and protect the mirror from being scratched or contaminated with debris. Always wear powder free gloves or finger cots when handling any optics.

7. Carefully unpack the mirror being careful not to touch the reflective surface (Lens cleaning tissue #81-26009).

8. Apply a thin, even coating of Eastman Thermal Compound (81-26011) to the back (non-reflective) surface of the mirror.

9. Hold the mirror cap with one hand and grip the mirror by its edges with the other hand (do not touch the reflective surface). Place the back surface of the mirror into the shim and onto the inner surface of the mirror cap. While applying pressure to the mirror, rotate the mirror against the mirror cap to secure the mirror to the mirror cap with the thermal compound.

10. Wipe any excess thermal compound from the edges of the mirror and mirror cap. Be careful not to get thermal compound on the reflective surface of the mirror.

11. Line up the mounting holes in the mirror cap with the tapped holes in the adjustable mirror holder.

12. Press the mirror cap into the adjustable mirror holder.

13. Make sure the springs are on the mirror cap thumb screws, then install the two thumb screws with the springs through the mirror cap and into the adjustable mirror holder .

14. Tighten the two thumb screws until they bottom against the adjustable mirror holder compressing the springs.

15. Replace the laser bridge covers.

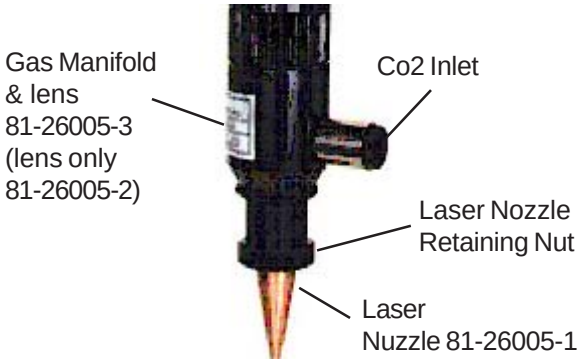
16. Check beam focus and adjust as required.

Laser Focus Lens Replacement

Note: Damage to optics may result from improper cleaning or handling. Read the instructions completely before starting. Always use Lens cleaning tissue #81-26009.

1. Power down the machine using proper shut down/lock out procedures.

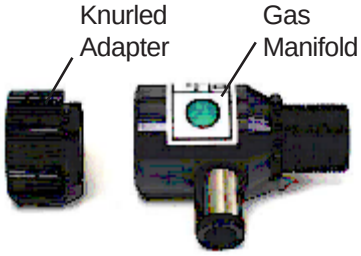
2. Remover the tool head cover.



3. Remove the Co2 Inlet tube and laser nozzle by turning the laser nozzle retaining nut clockwise as viewed from the top.

4. Turn the gas manifold clockwise as viewed from the top. Place the assembly on a clean dry surface.

5. Remove the knurled adapter from the gas manifold by turn the manifold clockwise as viewed from the top.



⚠ CAUTION: When handling any optics use powder free latex gloves or finger cots. Always use Lens cleaning tissue #81-26009.

6. With the large end of the gas manifold up insert the prongs of the Lens Removal Tool into the notches of the lens retainer nut. Hold the gas manifold and turn the tool counterclockwise until the lens retainer nut is removed.

⚠ CAUTION: To prevent the lens from falling out do not turn the gas manifold over until instructed to do so.

7. With the large end of the gas manifold still up place a piece of lens tissue over the large end of the gas manifold. While holding the lens tissue (81-26009) in place turn the gas manifold over so the lens will drop out onto the lens tissue.

8. Remove the O-Ring that the Lens was sitting on in the gas manifold and inspect it. Replace if necessary

9. Clean and Inspect the Lens. Replace if necessary.

10. Inspect the cleaned or new lens to make sure there is no contamination on either surface. Insert the lens into the gas manifold so the flat surface will rest on the O-Ring.

NOTE: To determine the curved surface of the lens look thru the lens. The curved surface will be the surface showing the smaller image. The flat surface will be the surface showing the larger image.

11. Using the Lens Removal Tool (81-26010) install the lens retaining nut into the gas manifold over the lens. Just barely tighten it.

12. Replace the knurled adapter on gas manifold by holding the gas manifold and turn the knurled adapter clockwise

13. Replace the gas manifold, laser nozzle, Co2 inlet tube and tool head cover.

Laser Optics Cleaning

Note: Damage to optics may result from improper cleaning or handling. Read the instructions completely before starting. Always use Lens cleaning tissue #81-26009.

If possible optics should be cleaned in a dust free air-conditioned room. Always wear powder free gloves, finger cots or lens cleaning tissue (81-26009) when handling any optics.

Always handle optics by their edges, never touch the optical surfaces.

1. Wash hands with soap to remove all oils, then put on powder free gloves or finger cots.

2. Hold the optic by its edges and blow any dust off with low-pressure dry nitrogen (2 to 5 PSI) or air from a blow bulb.

⚠ CAUTION: Do not use air from a shop air compressor.

3. Soak a clean lens tissue or absorbent cotton ball with acetone or reagent grade isopropyl alcohol.

4. With the soaked lens tissue (81-26009) or cotton ball wipe the optic in one direction.

5. Repeat steps 3 and 4 three times using a clean lens tissue or cotton ball.

6. Inspect the optic. If there is any dust on it or it appears cloudy repeat steps 2 through 5. If it is clean, proceed to step 7.

7. While holding the optic by its edges place a clean piece of lens tissue over the optic, then apply a few drops of Tech Spec lens cleaner or reagent grade isopropyl alcohol to the lens tissue.

8. Drag the lens tissue off the surface of the optic in one direction.

9. Repeat step 8 three times.

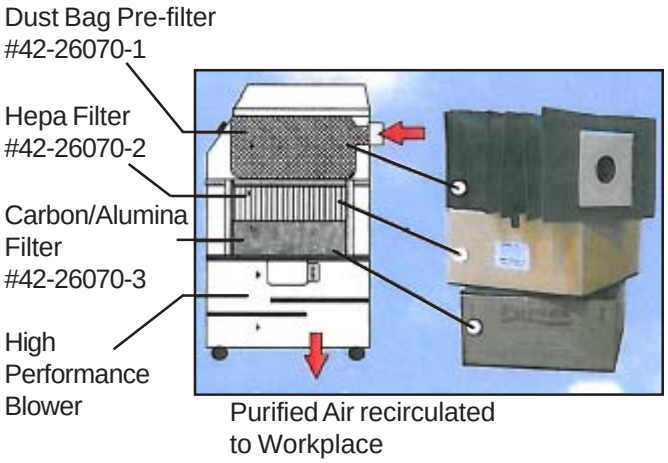
10. Rotate the optic 90° and repeat steps 8 three times.

11. Inspect the optic to make sure that it is clean.

12. Turn the optic over and repeat steps 2 through 11 to clean the other side.

Fume Extractor Filter Replacement

The fume extractor system monitors each filter for purity. The control panel will show the percentage of life used and will display a red light when a given filter is to be replaced. The filter life will vary on material cut and duty cycle. Testing will yield the filter life.



1. Press the Off button on the fume extractor control panel to power down the fume extractor.

2. Unlatch the lid and open the fume extractor.

3. Remove the old filters. Dispose of filter without disturbing the filter debris.

4. Install new filters in order as shown. Note airflow arrow on each filter.

5. Firmly insert dust bag over inlet pipe.

6. Close and latch lid. Press power ON and check display. The red filter replacement lights should be off and the system ready for use.

Chiller Coolant Level

The coolant required for the chiller/laser combination is clean distilled water and a corrosion inhibitor/algaecide such as Optishield® Plus or equivalent (10:1 ratio water/algaecide).

⚠ Caution: Do Not use antifreeze or glycol based liquid in you chiller as it may damage the laser unit.

The chiller coolant level can be monitored thru the clear coolant level tube located on the front of the chiller. If the coolant level falls below the minimum line add coolant as required.

1. Power down the chiller and disconnect power using proper shut down/lock out procedures.

2. Remove the chiller side panel.

3. Remove the filler cap and add coolant as required.

4. Replace filler cap and side panel.

CALIBRATION & ADJUSTMENTS

Warning
Always disconnect power source (lockout/tagout) to machine before proceeding with any maintenance, adjustments or repair. Failure to disconnect power may cause serious personal injury and/or damage to machine.

Warning
This machine is equipped with a very sharp knife and powerful laser. Use caution when working on this machine. Failure to keep hands, arms, and loose objects away from knife area may cause serious personal injury.

Service and maintenance to this machine should be performed by qualified personnel. If you do not have qualified personnel, contact your Eastman Sales Representative or Eastman Factory direct.

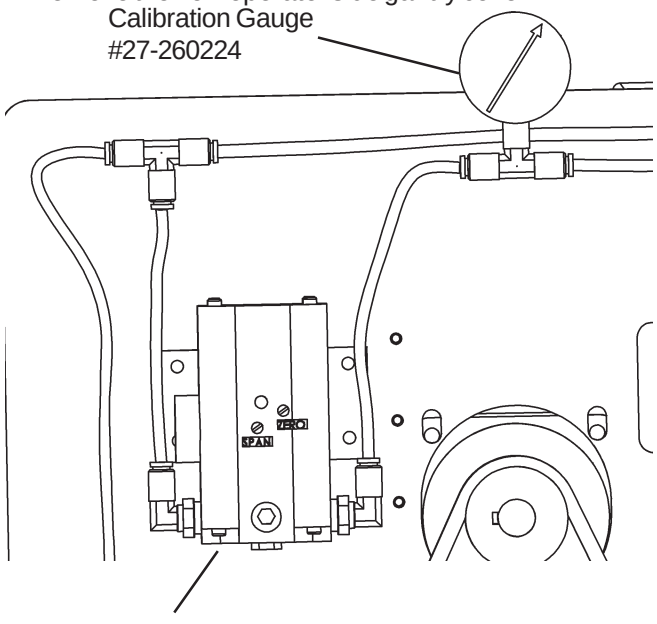
Pressure Transducer Calibration

Note: The Pressure Transducer is calibrated at the factory and may be adjusted by the Eastman Service Technician during machine installation. Calibration should only be performed if prior settings are found to be undesirable.

The pressure transducer is located under the non-operator side gantry cover.

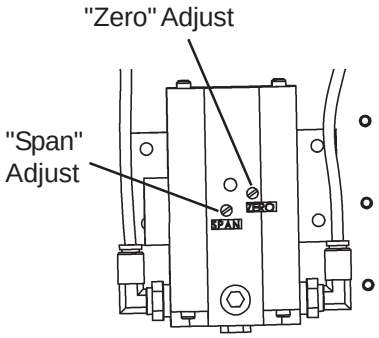
1. Adjust the main incoming regulator pressure to 90psi by turning the regulator knob.

2. Remove the non-operator side gantry cover.



3. Remove the tool head air tube from transducer output port. Install calibration gauge (27-26024) at transducer output as shown.

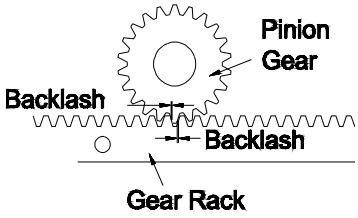
4. Set software tool pressure at 10psi. (CutPro, Machine Settings, ToolBox). Send cut file to gantry. Push "Up" and Down" on the touch screen panel to activate new cylinder pressure. Turn "Zero" adjust screw until calibration gauge reads 10psi.



5. Set software tool pressure at 90psi (CutPro, Machine Settings, ToolBox). Send cut file to gantry. Push "Up" and Down" on the touch screen panel. Check main pressure regulator to ensure 90psi is supplied to your machine. Turn "Span" adjust screw until calibration gauge reads 90psi.

Repeat steps 4 and 5 at least three times verifying gauge reading are accurate. Be sure to push "Up" and Down" on the touch screen panel each time to activate new cylinder pressure.

Gantry Backlash Adjustment
This procedure ensures that the gantry drive gears are properly engaged to the gear racks and the cut pieces are accurately processed on the automated cutting machine. Performing this procedure also help minimize wear, repair, and replacement of gantry drive components. Any excessive backlash will result in accuracy issues observed in the cut piece.

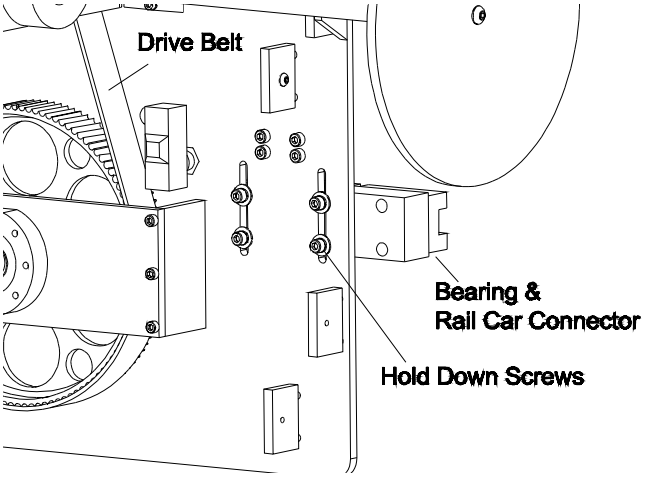


Power-up the system, Zero table, and move gantry to center of table. Stand in front of the gantry and push side to side on the gantry side cover. If there is any free side to side movement then backlash exists. Follow the same procedure to check backlash on the non-operator side of the gantry. If backlash exists, perform the following steps.

1. Power down the machine using proper shut down/lock out procedures.

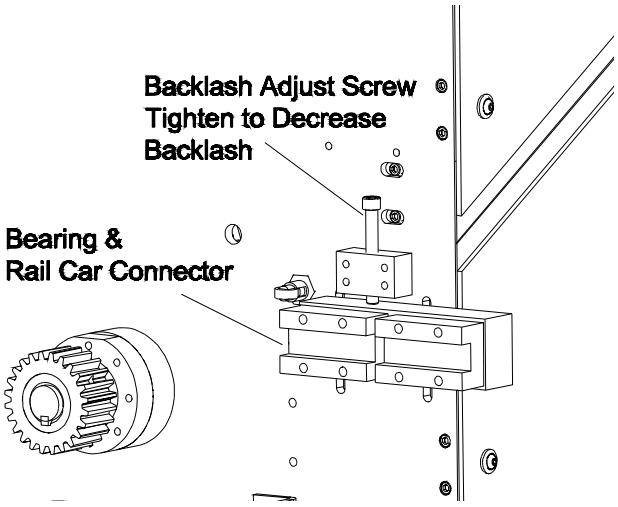
2. Remove gantry side cover.

3. Check drive belt for deflection. If required, tighten belt or belt tensioners at this time.



4. Loosen (8) screws holding the two rail cars to the gantry side plate.

5. Using an allen wrench, turn the backlash adjusting screws 1/4-turn clockwise to reduce backlash. Adjust screws so the gantry remains level with table and backlash is removed. DO NOT overtighten screws. This may cause restricted gantry movement, Amp Faults & excessive drive component wear.



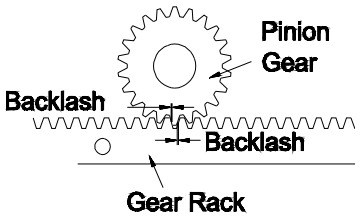
6. Secure (8) screws holding the two rail cars to the gantry side plate.

7. Recheck backlash and adjust if required.

8. Replace gantry cover.

Y-Car Backlash Adjustment

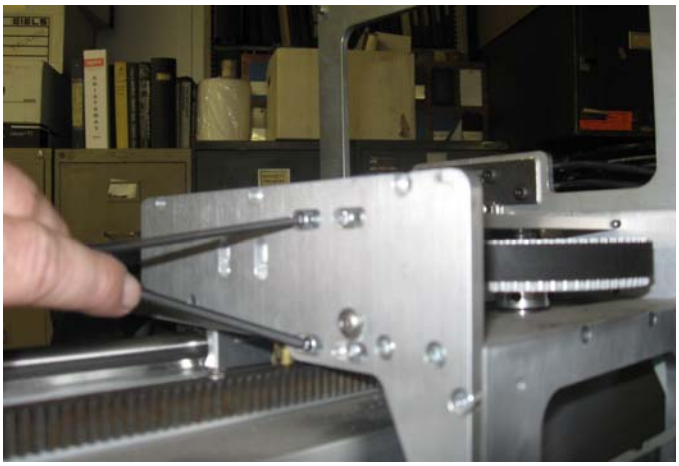
Power down the machine using proper shut down/lock out procedures. Hold Y-car and rotate large gear belt pulley and observe any movement or a clicking noise. If there is any free movement or a clicking noise then backlash exists.



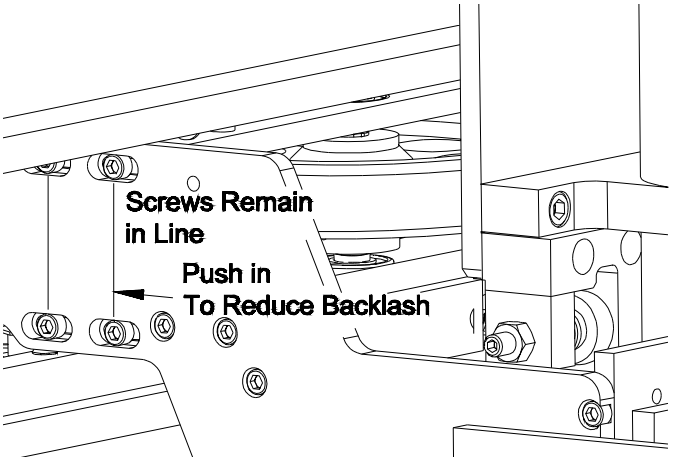
1. Remove the laser vacuum shroud and tool head cover.

2. Loosen the (4) y-car motor mounting screws.

3. Loosen the (4) pulley plate screws on each side of the y-car.



4. Push the lower screws in to reduce backlash. Note: The upper and lower screws must be in line to ensure correct mating of gear and rack.



5. Secure screws and check backlash. Readjust if required.

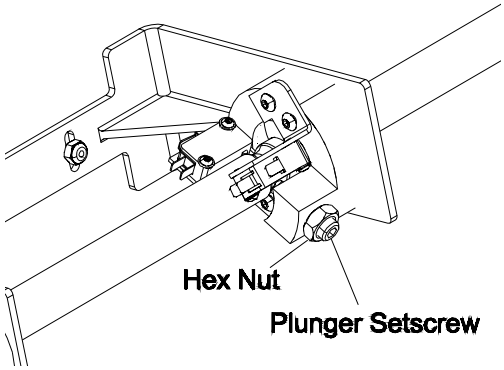
6. Using a screw driver or small prybar apply a small amount of pressure to the y-motor. Check belt tension for belt deflection and secure (4) motor screws. Do not over tighten the belt.

7. Replace the laser vacuum shroud and tool head cover.

Stop Disc Adjustment

Power up the machine. Move the stop discs and check activation pressure. The stop discs should only activate when disks are pressed in with minimum pressure. Adjust as required.

1. Remove the gantry side cover to expose the stop disc assembly.



2. Adjust plunger depth. Loosen the plunger nut while holding setscrew with allen key. Tighten the setscrew to increase stop disc resistance and loosen setscrew to decrease stop disc resistance.

3. Replaced gantry cover.

Laser Focus Lens Adjustment

The Eastman Laser system is design with one focusing lens located above the laser nozzle. The lens is focused at the factory and should not be adjusted. If adjustment is required, only qualified personnel with proper laser training should perform the adjustments.

WARNING: Make sure everyone in the area has Co2 laser safety glasses on before continuing.

1. Set the output power of the laser at 20% power and 20ms time.

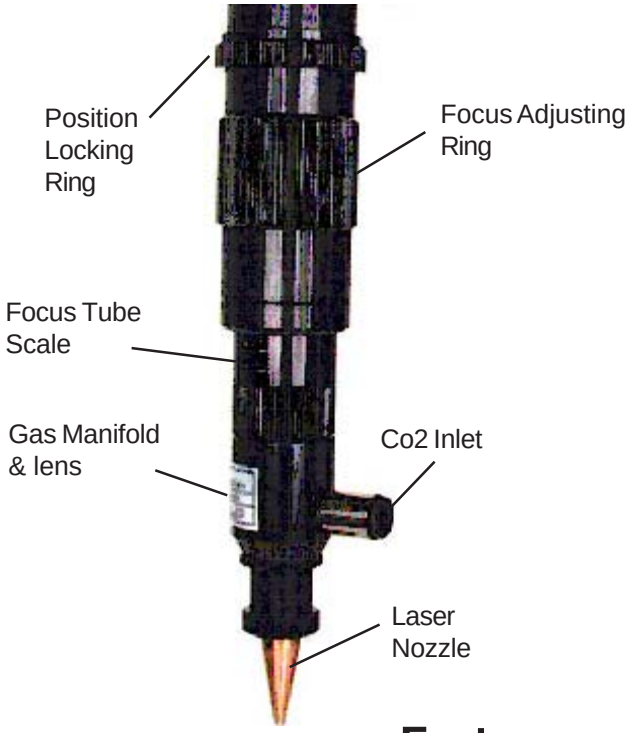
2. Place a business card or similar card stock on the work surface, under the laser nozzle.

3. Enable the laser and perform a test pulse.

4. Loosen the Position Locking Nut by turning it clockwise as viewed from the top.

5. Adjust the Focus Adjusting Ring all the way in by turning clockwise as viewed from the top until it stops.

6. Test Pulse the laser, and then observe the hole in the card.



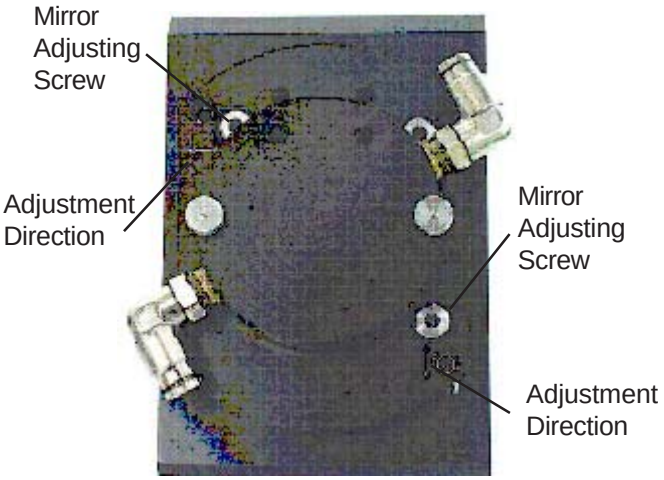
7. Turn the Focus Adjusting Ring counterclockwise two turns as viewed from the top. Test Pulse the laser, and observe the hole in the card. Repeat making a series of holes in the card. As you do this you will see the holes getting smaller then they will get larger.

8. When the holes start getting larger stop.

9. Turn the Focus Adjusting Ring clockwise one turn at a time, test pulse the laser and observe each hole in the card. Repeat this process until you get the smallest hole. If you go too far and the holes start getting larger turn the Focus Adjusting Ring counterclockwise and test pulse the laser until you get back to the smallest hole.

10. Lock the Position Locking Nut by turning counterclockwise as viewed from the top.

Laser Mirror Alignment/Adjustment
The Eastman Laser system is design with three (3) beam deflecting mirrors. The mirrors are aligned at the factory and should not be adjusted. If adjustment is required, only qualified personnel with proper laser training should perform the adjustments.



1. The two 1/4 - 80 recessed mirror adjusting screws are used to adjust laser beam. Arrows located near the adjusting screws indicate the direction of the adjustment. The mirror can be tilted ±1°. Adjust as required.

⚠ CAUTION: Do not adjust the three spring-loaded mounting screws.

Gantry Calibration Procedure
The EastmanPro software is designed with easy to follow step by step calibration instructions. To begin, press the calibration button on the touch screen. Select the Calibration procedure required. Follow the specific calibration instructions displayed on your computer. New machine calibration begin with Size calibration, followed by Holder calibration and then Cutting Tools calibration.

SCHEDULES MAINTENANCE PROCEDURES

⚠ Warning
Always disconnect power source (lockout/tagout) to machine before proceeding with any maintenance, adjustments or repair. Failure to disconnect power may cause serious personal injury and/or damage to machine.

⚠ Warning
This machine is equipped with a very sharp knife and powerful laser. Use caution when working on this machine. Failure to keep hands, arms, and loose objects away from knife area may cause serious personal injury.

Service and maintenance to this machine should be performed by qualified personnel. If you do not have qualified personnel, contact your Eastman Sales Representative or Eastman Factory direct.

⚠ Caution
It is important to perform regular maintenance on the equipment. A daily, weekly and monthly schedule should be maintained. Failure to do so can result in frequent break down damage to equipment and/or injury.

Proper maintenance will help to ensure the reliable operation of your cutting system. You should allow 5 to 10 minutes for daily inspections, 30 minutes for weekly inspections and one hour for monthly inspections. Time invested on these tasks will minimize downtime. Eastman Machine Company is not liable for damage as a result of poor maintenance and any resulting damage would be repaired at user's expense. The following is the recommended maintenance schedule:

Daily Maintenance (Start of each shift)

1. Carefully inspect the machine and cutting surface. Look for any debris, loose cables or any other obstruction that may interfere with machine movement or cutting. Vacuum cutting belt as required to remove dust and dirt which may clog the vacuum.

1. Check the pen lift assembly. Make sure pen moves smoothly up and down. Ensure pen is seated properly in mount and that the pen holder is tight.

3. After the system is powered up, check both the X and Y axes for backlash. If the backlash is excessive on either axis, adjust as required.

4. Check tools to verify that they are securely fastened to tool shaft. Check round knife blades to make sure they rotate freely. Check blade edges for nicks and replace as required. Check limiting disks relative to material thickness and requirements. Check the set screws in drag knife foot and tighten if necessary.

5. Check chiller coolant level. Fill if required.

6. Check Fume extractor filter status. Replace if required.

7. Check Co2 pressure.

8. At the end of each work session make sure both the computer and plotter carriage are off. Cleanup scraps from table and remove any CD or Disks from the disk drives.

Weekly or every 40 hours


Caution

Before performing the weekly tasks make sure the cutting system and computer are turned off at the electrical disconnect and locked out.

1. Lubricate table rail linear bearings with Eastman lubricant 67-26325 (Mobil: SEA 10 Non-detergent Vactra No. 1) See Lubrication Chart.

2) Using a clean dry rag to wipe clean the table linear rails. Lubricate with Eastman lubricant 67-26324, see lubrication chart.

3. Lubricate table linear bearings with Eastman Lubricant 67-26324 (Mobil: NLG1 Grade 2 Moblith AW-2), see Lubrication Chart.

4. Lubricate tool head cylinder couplings with Eastman Lubricant 67-26009 (Loctite: Krytox PFPE Lubricant Mfg. # 29711), see Lubrication Chart.

5. Lubricate tool head bearing shafts with Eastman Lubricant 67-26009 (Loctite: Krytox PFPE Lubricant Mfg. # 29711), see Lubrication Chart.

6. Using compressed air, clean dust and debris from inside of carriage.

7. Use clean dry rag to wipe down Y-axis rails and lubricate.

8. Check for loose fasteners on the Y-car. Tighten as required.

9. Remove the tool head cover. Inspect the cutting head assembly. Look for any wires or air hoses rubbing or wearing.

10. Rotate the tool holders by hand. They should rotate freely without any play relative to each holder and the drive motor. If they don't rotate freely examine the bearings for wear, examine shafts for damage and or bent condition and check belt for wear and proper tension.

First Working Day of Month


Caution

Before performing the weekly tasks make sure the cutting system and computer are turned off at the electrical disconnect and locked out.

1. Remove tool head cover and inspect electrical connections to make sure they are tight.

2. Inspect connectors for any discoloration or signs of heating.

3. Check Drive belts for signs of wear such as cuts, frays or missing teeth. Replace if required.

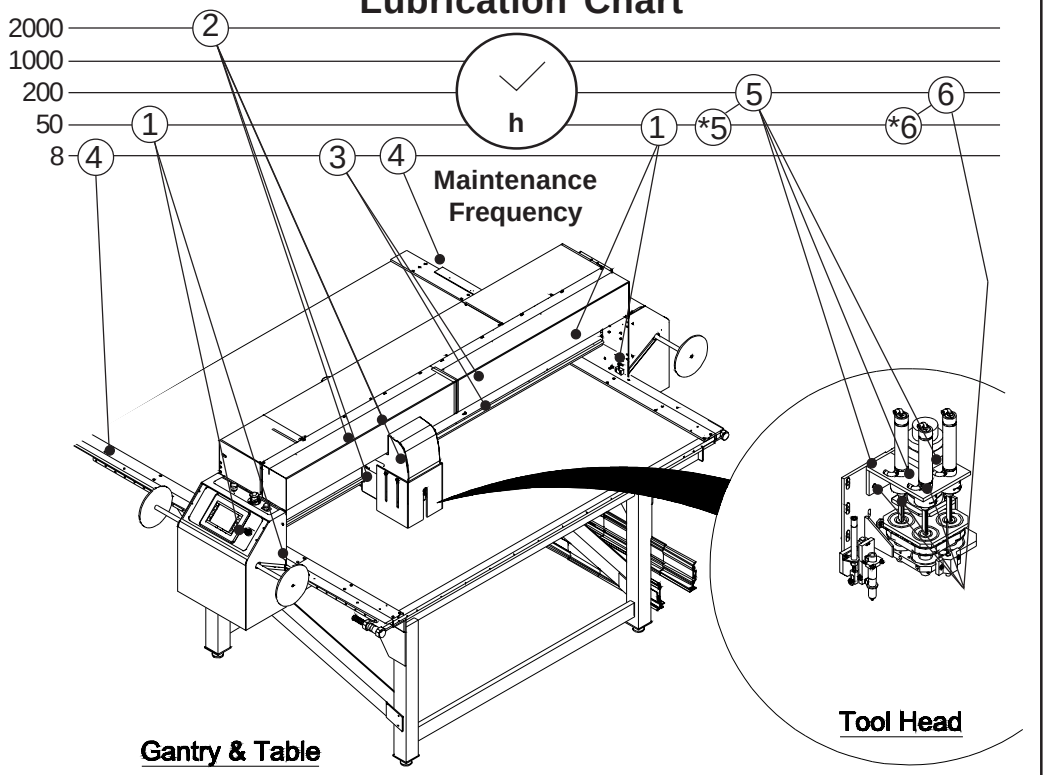
4. Check belt tension. Belt should be tight enough to prevent backlash between drive pulley and driven pulley.

5. Check all shafts and pulleys. Pulleys need to be seated tightly on the shaft.

6. Check all electrical plugs and connector to ensure they are securely fastened.

Lubrication Chart

Below are the recommended lubrication points for your system.



Machine Component	Gantry	Y-Car	Gantry	Table Rail	Standard Tool Head		Recipricating Tool Head	
Nature of Action / Action Point	1	2	3	4	5	6	*5	*6
Clean & Lube			8	8	200	200	*50	*50
Replenish	50	2000						
Libricant Designation	Mobil: NLG1 Grade 2 Moblith AW-2		Mobil: SAE 10 Non-detergent Vactra No. 1		Loctite: Krytox PFPE Lubricant mfg# 29711			
Eastman No.	67-26324		67-26325		67-26009			

* Recipricating tool head option only.

Yearly Maintenance Checklist
Below is the recommended maintenance checklist for you system. It provides a good guideline for yearly maintenance and can be copied for you maintenance records.

Operators Side Gantry	Comments	Signoff
Verify Stop Discs are operational.		
Check emergency stop switch, wiring & light bulb.		
Check pause switch, wiring & light Bulb.		
Check touch screen (UIT) control assembly and cables.		
Check to joystick for proper operation.		
Check tools on/off switch wiring & light bulb.		
Check safety labels. Replace if damaged.		
Inspect drive belt (cracks & thread separation).		
Check large pulley bearings.		
Check X1 home switch & wiring.		
Check X-neg limit switch & wiring.		
Check & secure large pulley screws.		
Check & secure X1 motor drive pulley screws.		
Check & secure spur gear screws.		
Remove and inspect X-axis Linear bearings.		
Check all wiring and cables for any wear, cracks or loose connections.		
Check & adjust backlash for X1 motor assembly.		
Check & secure all screws.		

Non-Operators Side Gantry	Comments	Signoff
Verify Stop Discs are operational.		
Check emergency stop and pause switch, wiring & light bulb.		
Check touch screen (UIT) control assembly and cables.		
Check to joystick for proper operation.		
Check tools on/off switch wiring & light bulb.		
Check safety labels. Replace if damaged		
Inspect drive belt (cracks & thread separation).		
Check large pulley bearings.		
Check X2 home switch & wiring.		
Check X-pos limit switch & wiring.		
Check & secure large pulley screws.		
Check & secure X2 motor drive pulley screws.		
Check & secure spur gear screws.		
Remove and inspect X-axis Linear bearings.		
Check all wiring and cables for any wear, cracks or loose connections.		
Check air hose, Co2 hose and coolant lines for wear or leaks.		
Check E-chain mount and strain relief.		
Check laser enable light & wiring.		
Check & adjust backlash for X2 motor assembly.		
Check purge filter and regulator. Replace filter if required.		
Check & secure all screws.		

E-chain Assembly	Comments	Signoff
Check X-axis E-chain assembly (Loose connections or wear in chain).		
Check all E-chain cables for wear or damage.		
Check cable strain relief's and tighten as required.		
Check air hose for damage or leaks.		
Check Co2 hose for damage or leaks.		
Check coolant hoses for damage or leaks.		

Gantry Main Tube Assembly	Comments	Signoff
Check Y-home switch and cam for proper operation.		
Check Y-pos & Y-neg switches and cams for proper operation.		
Check Y-echain and Strain Relief's and tighten as required.		
Check Y-echain cables for any wear, cracks or loose connections.		
Check Air hose for wear or leaks.		
Check & secure linear rails, oils rails and grease bearings.		
Check and secure gear rack.		
Check & secure all screws.		

Y-Carriage Assembly	Comments	Signoff
Inspect Y-motor drive belt (cracks & thread separation).		
Adjust y-car drive belt backlash.		
Examine air solenoid block. Use manual trigger button to fire each solenoid.		
Check all airlines for leaks.		
Check Y-car cables for any wear, cracks or loose connections.		
Check & secure large pulley screws.		
Check & secure Y motor drive pulley screws.		
Check & secure spur gear.		
Inspect Linear bearings & grease .		
Check limit switches for damage.		
Check & secure all screws.		

Tool Head Assembly	Comments	Signoff
Inspect theta motor drive belt (cracks & thread separation).		
Adjust belt backlash.		
Check safety labels. Replace if damaged.		
Check cylinder coupling for excessive wear. Apply grease.		
Check Cylinder linear rails for wear or damage. Apply grease		
Test theta home prox sensor		
Check theta drive pulley for wear. Secure setscrews		
Examine air cylinder for leaks or binding motion.		
Check & secure all screws.		

Laser Bridge Assembly	Comments	Signoff
Inspect all covers for proper fit.		
Check safety labels. Replace if damaged.		
Inspect all safety limit switches for proper operation.		
Remove fume extractor funnel. Clean and inspect for damage.		
Check Coolant, Co2 and air Purge lines for leaks		
Check laser enable light for proper operation.		
Check all cables for any wear, cracks or loose connections.		
Inspect and clean laser beam mirrors (3).		
Inspect and clean laser beam focusing lens (3).		
Check brass laser beam nozzle for damage.		
Check laser beam for proper alignment and focus.		
Check & secure all screws.		

Diagnostic Cabinet	Comments	Signoff
Inspect all internal components for discoloration and ensure screw terminals and wiring connectors are tight and secure		
Clean inside using dry compressed air.		
Clean and inspect fans for proper operation.		

Rack & Rail Assembly	Comments	Signoff
Clean and oil linear rails.		
Check rack and rail gap(s).		
Check rack and rail for wear.		
Check shocks for proper operation.		
Tighten all Linear rail screws (M3).		
Tighten rack screws (#10-32 x 1/2).		
Check & secure all screws.		

Table Vacuum Assembly	Comments	Signoff
Inspect blower motors for excessive noise. Clean as required.		
Inspect blower power cables for cracks or wear.		
Check vacuum piping for leaks and loose hardware.		

Variable Frequency Drives (VFD)	Comments	Signoff
Check cables for cracks and wear.		
Inspect and clean VFD cooling fan and filter.		

Computer Assembly	Comments	Signoff
Check all cable connections. Secure as required.		
Inspect and clean computer fan and filter.		

TROUBLE SHOOTING GUIDE

Warning

Always disconnect power source (lockout/tagout) to machine before proceeding with any maintenance, adjustments or repair. Failure to disconnect power may cause serious personal injury and/or damage to machine.

Warning

This machine is equipped with a very sharp knife and powerful laser. Use caution when working on this machine. Failure to keep hands, arms, and loose objects away from knife area may cause serious personal injury.

Service and maintenance to this machine should be performed by qualified personnel. If you do not have qualified personnel, contact your Eastman Sales Representative or Eastman Factory direct.

Problem: UIT Does Not Power Up

Description of Problem:
The UIT does not power. Screen is blank and not lit up.

Troubleshooting:

1. Touch the screen to see if it turns on. If the machine sits idle for a long period of time the touch screen goes into a sleep mode to protect the screen.

2. Make sure your cutting software is open on the cutting system computer.

4. Find the black ethernet power supply (PoE) located next to the computer. Verify the green LED is illuminated.

5. If there is no green LED lit, check the AC outlets located on the back of the diagnostic cabinet. If there is no AC power, check the AC power cord and fuses F3 and F4 in the diagnostic cabinet.

Problem: Machine Stop during Cut Due to Unintentional pause

Description of Problem:
The machine stops in middle of cut and displays message “Machine Paused, Press Zero, Next or Abort” on Touch Screen. When pressing NEXT on the keypad, the machine will continue to cut where it left off. This is typically caused by an intermittent pause circuit, usually in thestop discs.

Troubleshooting:

1. Check stop disc activation. The stop discs should <u>not</u> activate by a slight touch or vibration. They should activate only when moved by minimum pressure. Remove gantry side cover. Check the pause plunger. Tighten the plunger to increase activation pressure and loosen to decrease activation pressure.

Problem: The buttons on the Touch Screen are out of alignment

Description of Problem:
The touch screen buttons do not match where the screen needs to be touched to activate the command. Operator needs to push above, below, right or left of the button for the command to take effect.

Troubleshooting:
Touch screen calibration in required. Proceed as follows.

1) Power down the cutting system.

2) Place finger on the upper left corner of the touch screen as Shown. While holding finger on the screen, turn ON the main power switch located on the back of the diagnostic control cabinet.

3) Remove finger after the "Power On Setup" screen appears.

4) Using the left and right arrows to navigate, go to the Calibration Screen (screen page 2). Press Touch screen to begin calibrating.

5) Using a paper clip or fine tip object, press the center of the cross as shown. The cross will reappear in the lower right corner. Press the center of the cross.

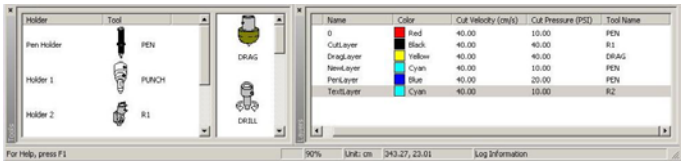
6) Navigate to screen page 3. Select save and exit to complete calibration.

The touch screen will restart in normal mode. Check for proper screen operation and begin your normal start-up procedure.

Problem: The Cutting Tool or Pen does not move down
Description of Problem:
The tool or Pen does not move down when cutting a file or they are delayed coming down at the beginning of a cut. This can be caused by an electrical short, tool mapping in software or a problem with the power supply.

Troubleshooting:
1.Make sure the gantry Tools ON switch is turned on. This can be verified by making sure the laser pointer is on.

2.Verify the mapping of your tools and layers are mapped properly under each tool.



a)Look at the tool bar at the bottom of the Cut window to quickly verify tool and layer mapping. If there is no Tool Bar as shown, then click on “View” then click on “Layers” and “Tools” in the main E-Suite menu.

b)If the layer is not mapped to a tool or the tool is not on the tool holder then just click and drag the tool to the spindle or the layer to the tool before sending the file to the cutter.

3.With E-Suite closed, check tool holder to see if it moves freely and is not damaged or bent.

4.Make sure you have pressure at the tools. Try pulling tool the holder down by hand to see if it has pressure.

5.Check tool connections.

a) Hit the Cut Down button on the UIT to verify the corresponding green LED light is on. Located on the slice output cards (non-operator gantry side plate).

b) Try firing the tool manually by pressing red button under solenoid block. Each solenoid can be manually fired by pressing the individual button.

c) Check cable connection at air manifold for proper connection.

6.The Pen or Tool delays coming down and misses the beginning of marker or cut.

a) Check the 24 VDC power supply located in the diagnostic cabinet. Make sure the green led is on.

b) Check the 24 VDC power supply fuse.

c) Check flow control valves on the pen air cylinder.

Problem: Laser Fume Extractor has reduced vacuum or no vacuum.
Description of Problem:
An odor is present when cutting with the laser tool or Laser cutting path is wider than normal

Troubleshooting:
1. Check the laser fume extractor for power and is turned ON.

2. Increase vacuum pressure using the fume extractor control panel.

3) Replace vacuum filters.

4) Clean vacuum hose and funnel.

Problem: Laser cutting path is too wide
Description of Problem:
The laser cutting path increases to an undesirable width.

Troubleshooting:
1. Check for damage to brass laser nozzle. Replace nozzle if any damage is present.

2. Check for brass laser nozzle alignment. If the tube or nozzle is bent, the laser beam will reflect off the inside wall of the nozzle causing a wide path. To verify, perform a test pulse on a piece of card board. If the dot has a ring or partial ring around it, the nuzzle is bent or the mirrors may need to be adjusted.

3. Check laser power and cutting speed. Settings may vary when changing materials. Testing will yield best results.

RF/EMI Interference
Some factory environments may have equipment that generates Radio Frequency (RF) or Electro-Magnetic Interference (EMI). These signals in close proximity to the Eastman cutting system can generate electrical noise and cause problems for the machine and computer (Eastman does offer a shielded mouse). It is recommended that any RF Welders or other equipment generating RF or EMI noise be a minimum of 75 feet (23 meter) from the Eastman cutting system.

Problems of this nature are typically difficult to resolve and must be approached in a systematic manner. To reduce the effects of electrical noise generated by RF, Eastman Machine Company has the following recommendations:

Step 1) Install an earth ground as close as possible to the transformer feeding AC power to the cutting system.

Step 2) Enclose all AC power cables in rigid conduit and secure to the earth ground. Route the four power cables for the computer controls around the end of the conveyor instead of under the unit.

Step 3) Ground conduits to the table frames.

Step 4) Implementation of the foregoing should reduce the level of interference to a workable level. In the event that RF is still determined an issue, installation of RF filters and/or power line filters may be required.

Problem: Loss of laser cutting power
Description of Problem:
The laser cutting power decreases causing non-cut edges.

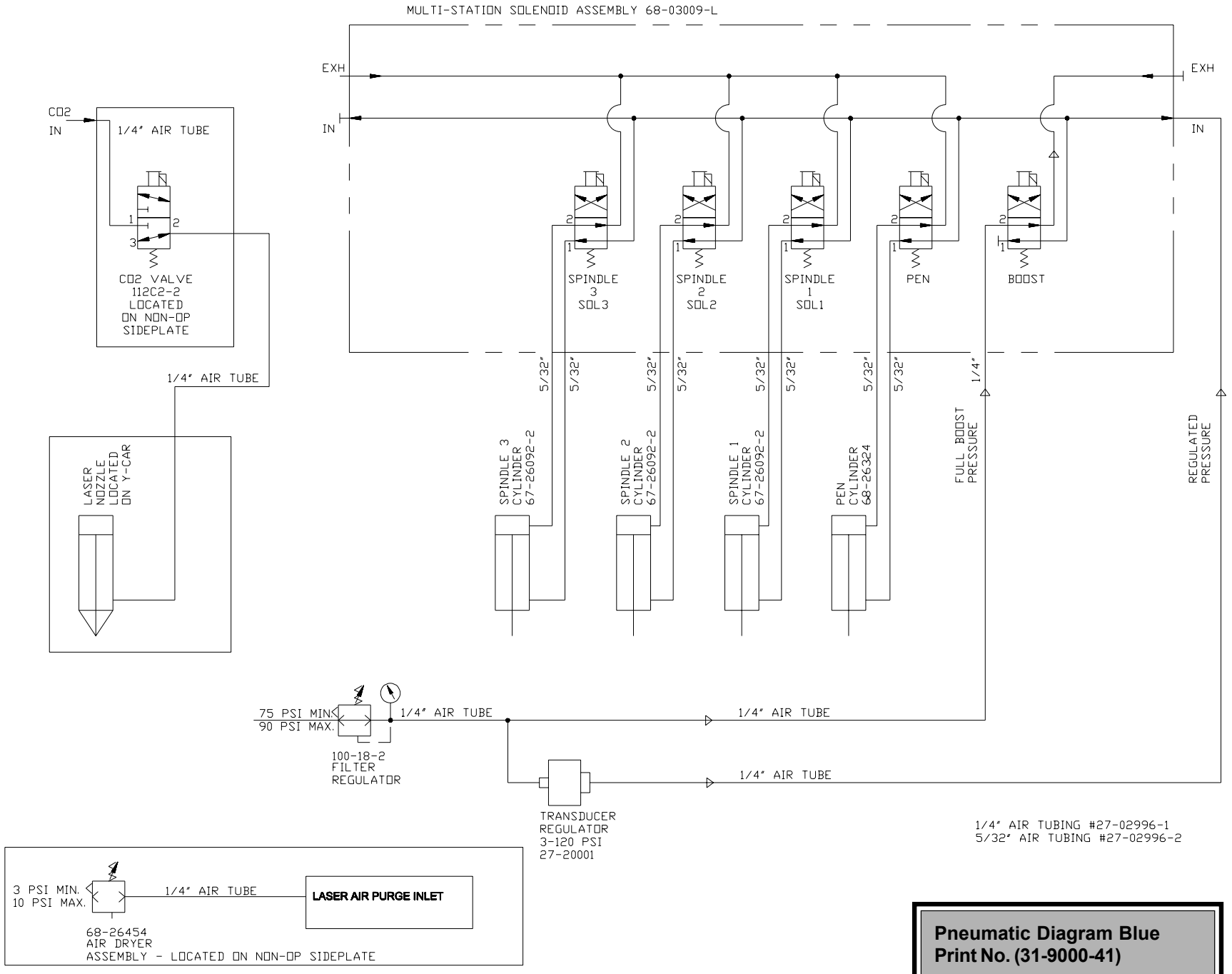
Troubleshooting:
1. Damaged or dirty lens. Check for damage or dirt on the focusing lens. Clean or replace lens as required.

2. Damaged or dirty Mirror. Check for damage, burn mark or dirt on the beam deflecting mirrors. Clean or replace mirrors as required.

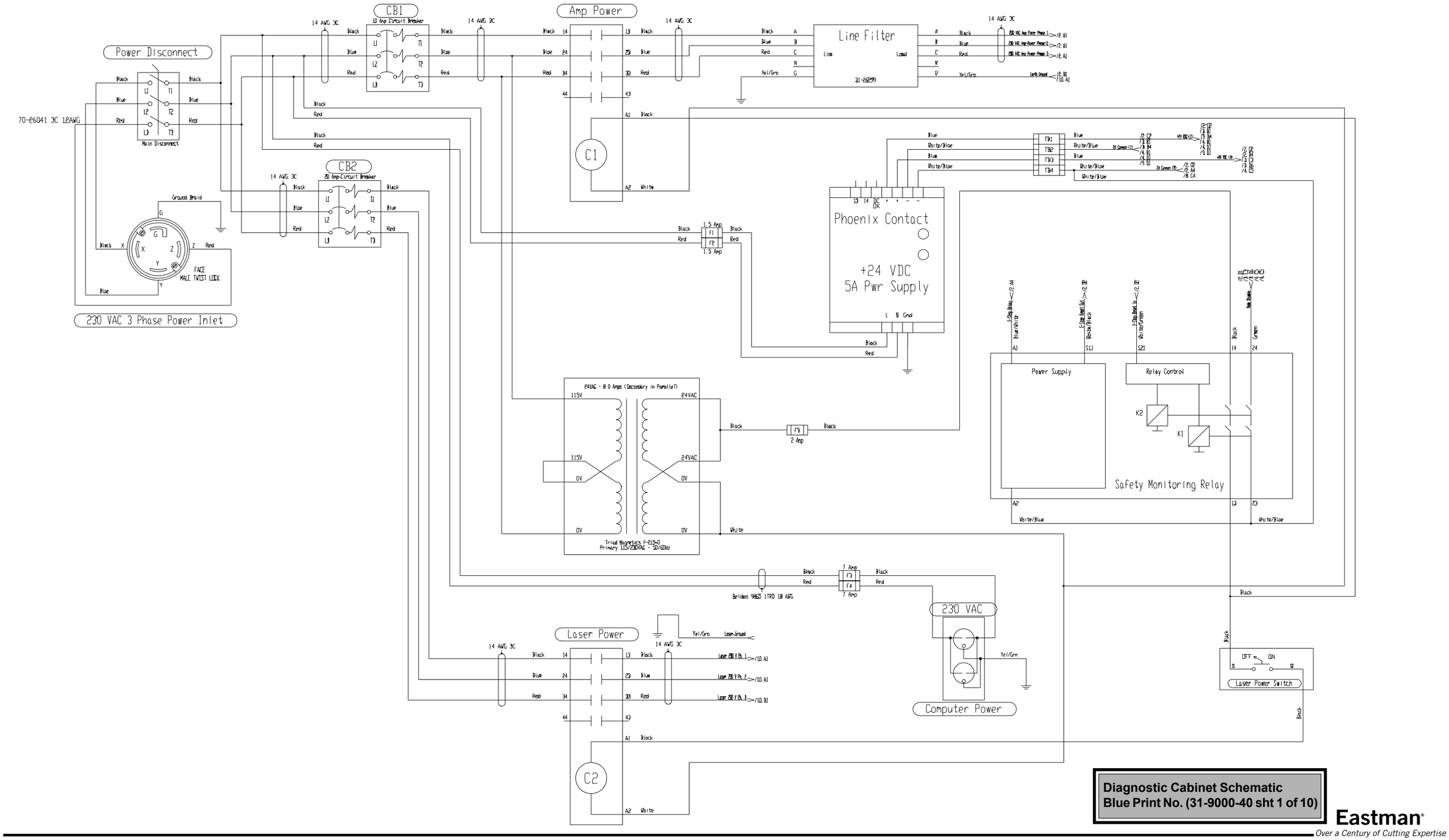
3. Damage or debris in laser nozzle. Check for damage or debris in laser nozzle. Clean or replace laser nozzle as required.

ELECTRICAL & PNEUMATIC DIAGRAMS

The following electrical and pneumatic drawings are for reference only. Eastman maintains the right to change electrical and pneumatic specifications without notice. Any modifications to machine wiring without written permission from Eastman Machine Company shall void all warranties.

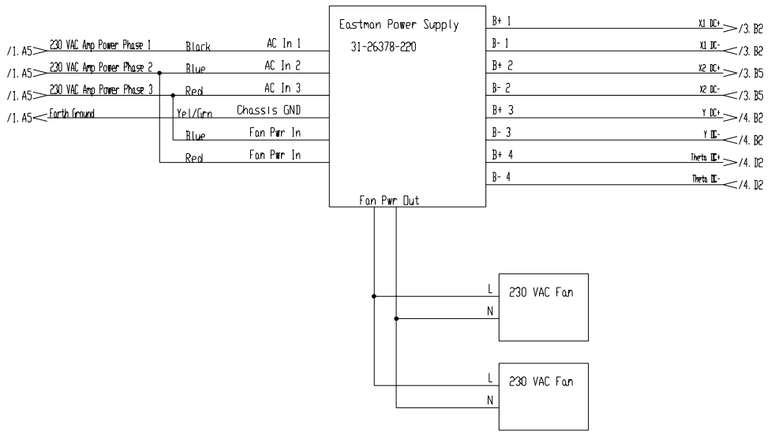


Pneumatic Diagram Blue
Print No. (31-9000-41)

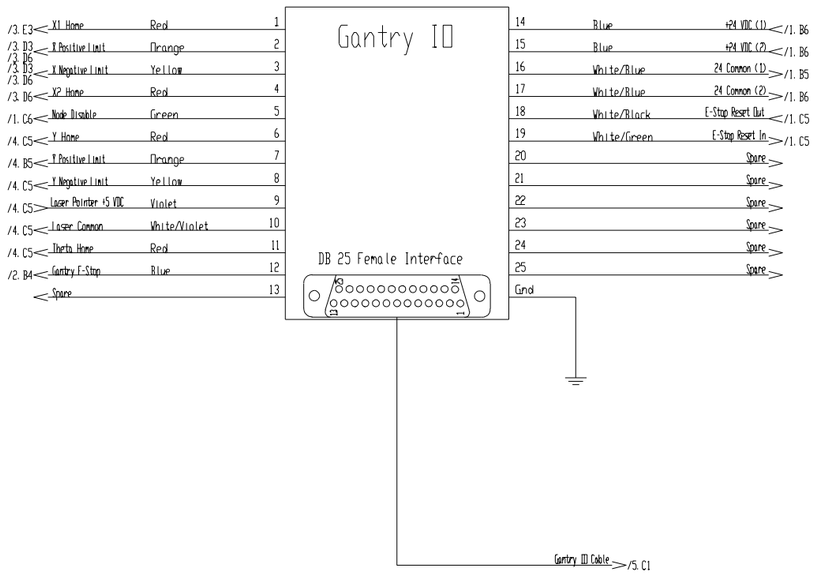


Diagnostic Cabinet Schematic
Blue Print No. (31-9000-40 sht 1 of 10)

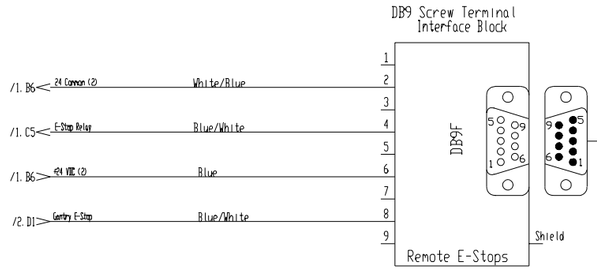
DC Power To Amps



Fans are located on Amplifier Chassis



To Gantry Thru X E-Chain



DB9 Cable Out Bulkhead To E-Stop Boxes

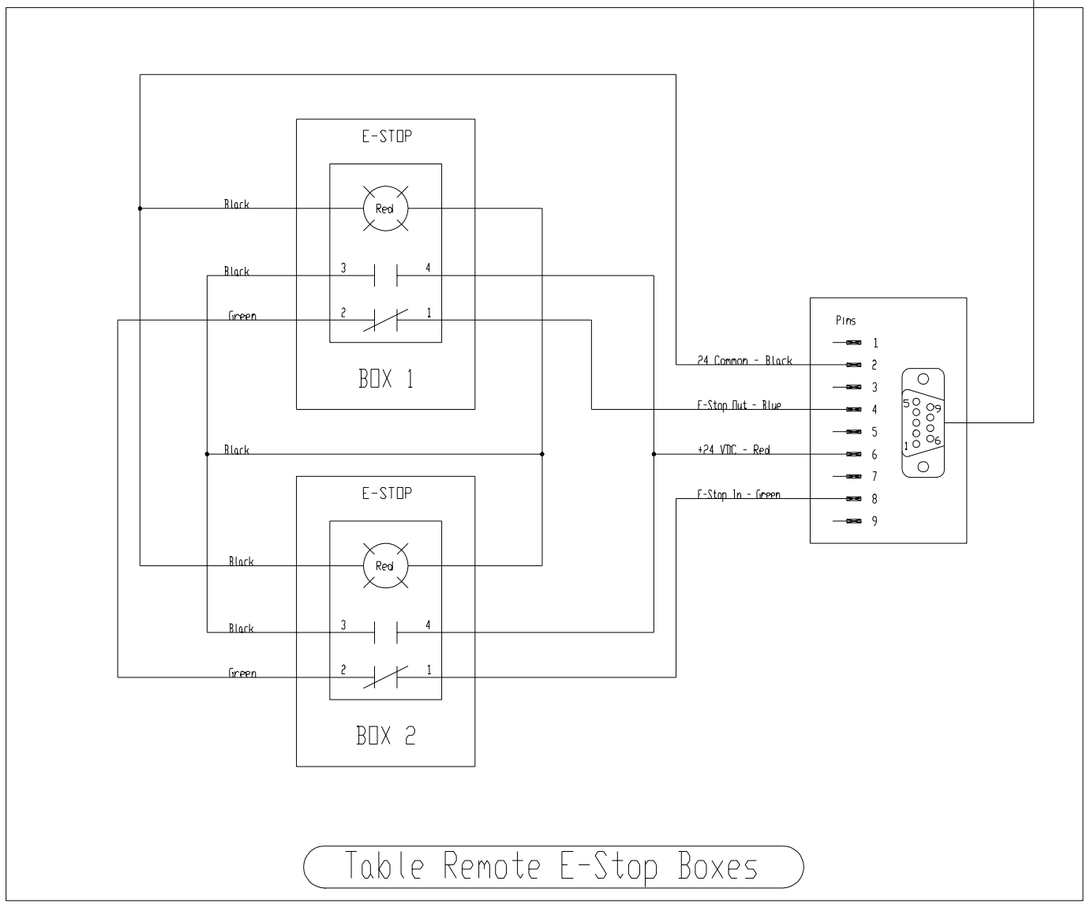
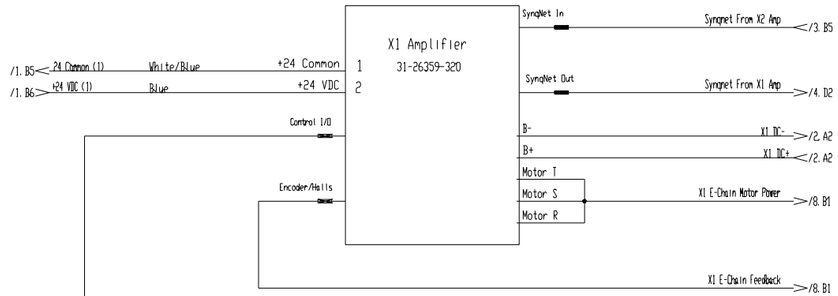
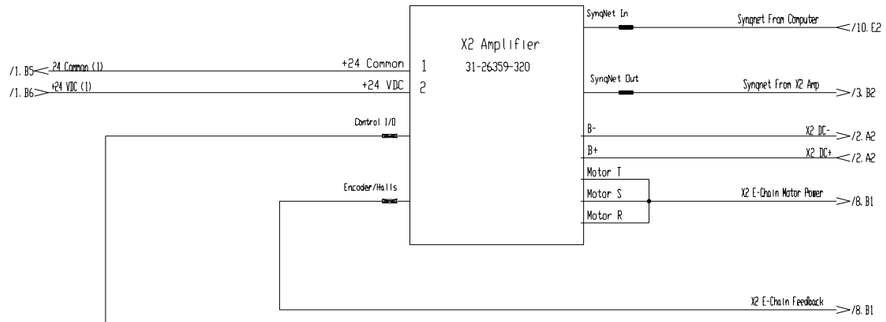


Table Remote E-Stop Boxes

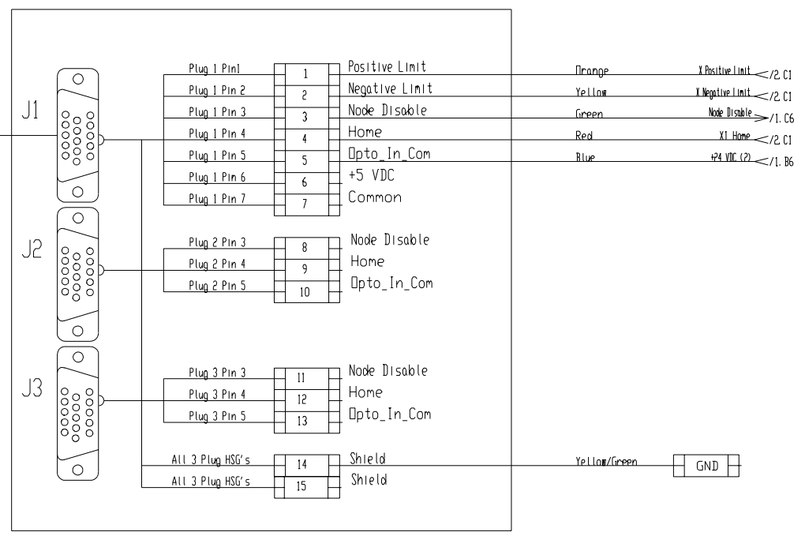
Diagnostic Cabinet Schematic
Blue Print No. (31-9000-40 sht 2 of 10)

Eastman®
Over a Century of Cutting Expertise

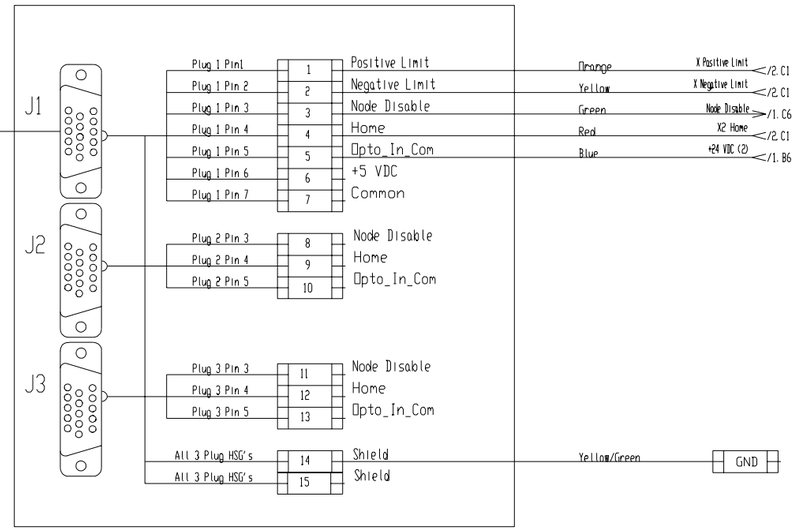




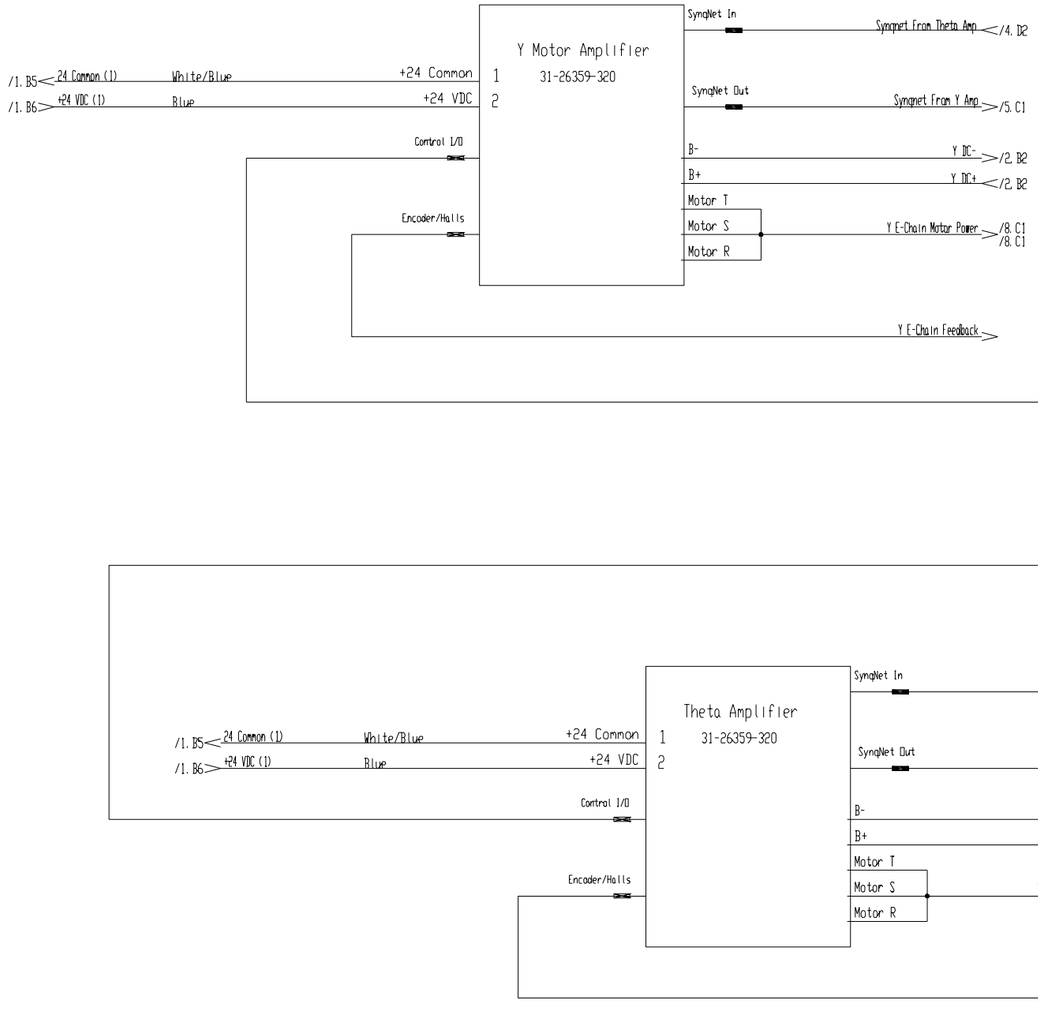
X1 Amplifier
Custom I/O Block



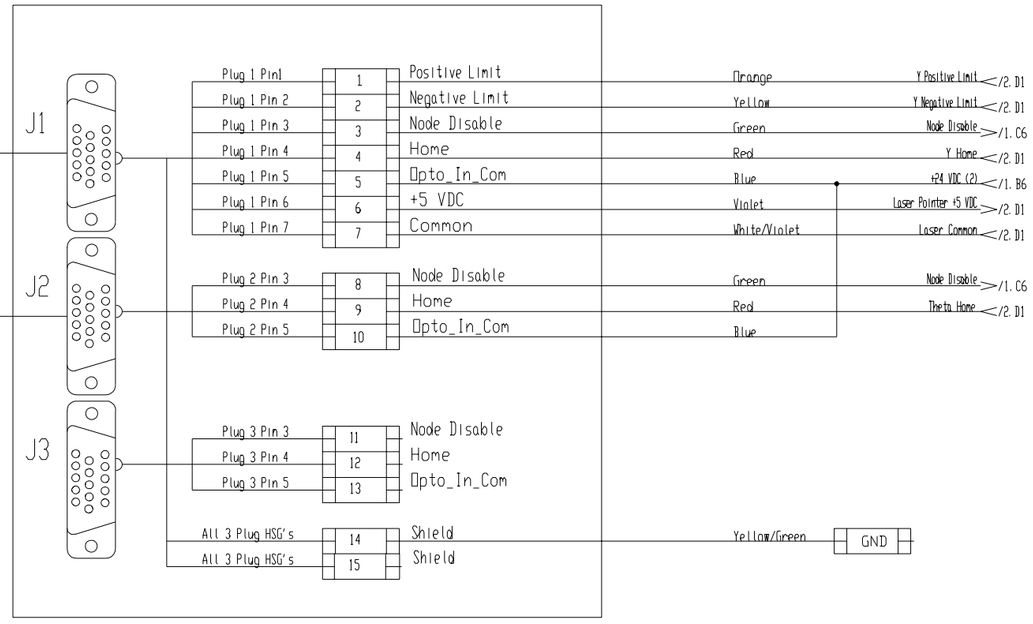
X2 Amplifier
Custom I/O Block



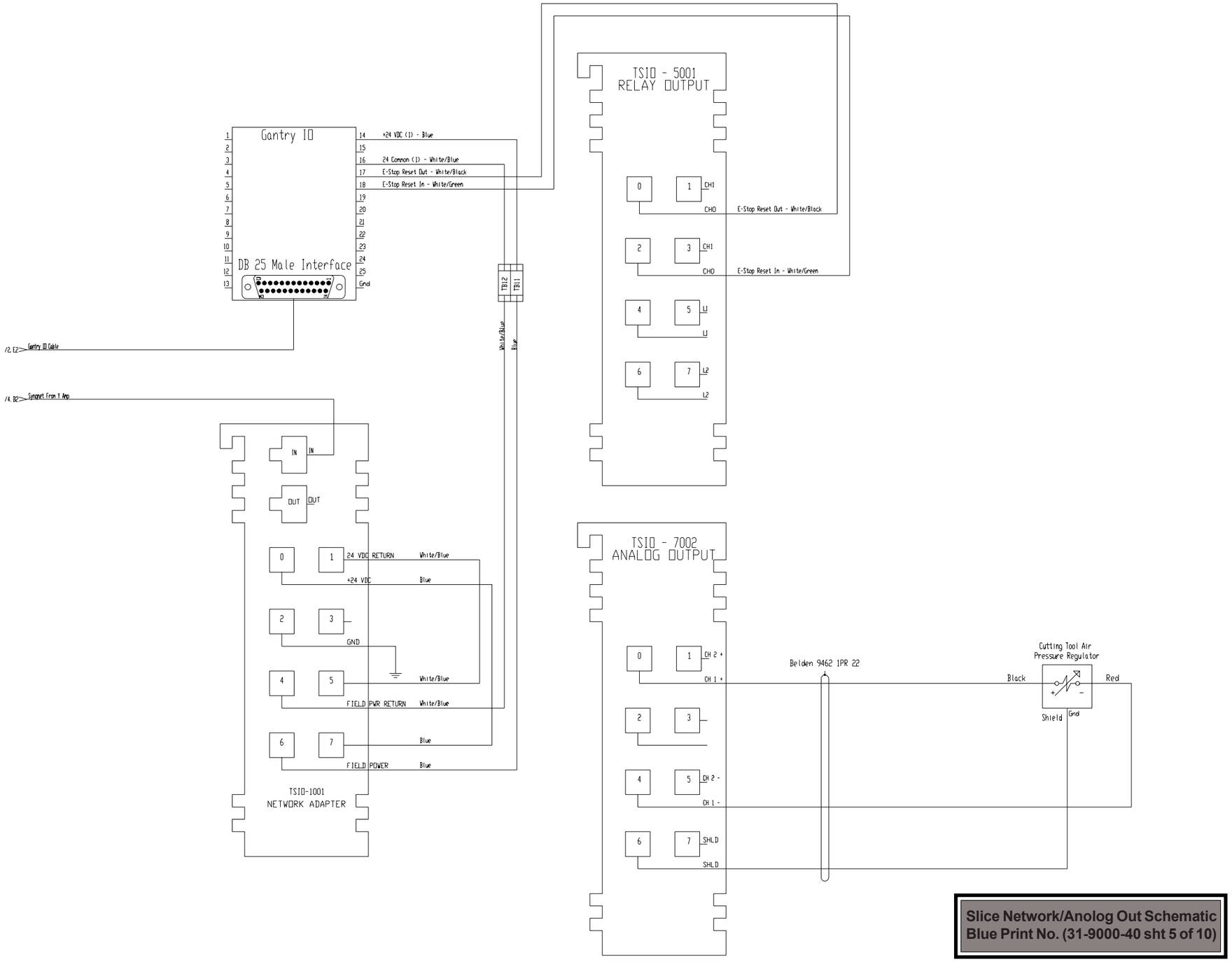
Diagnostic Cabinet Schematic
Blue Print No. (31-9000-40 sht 3 of 10)



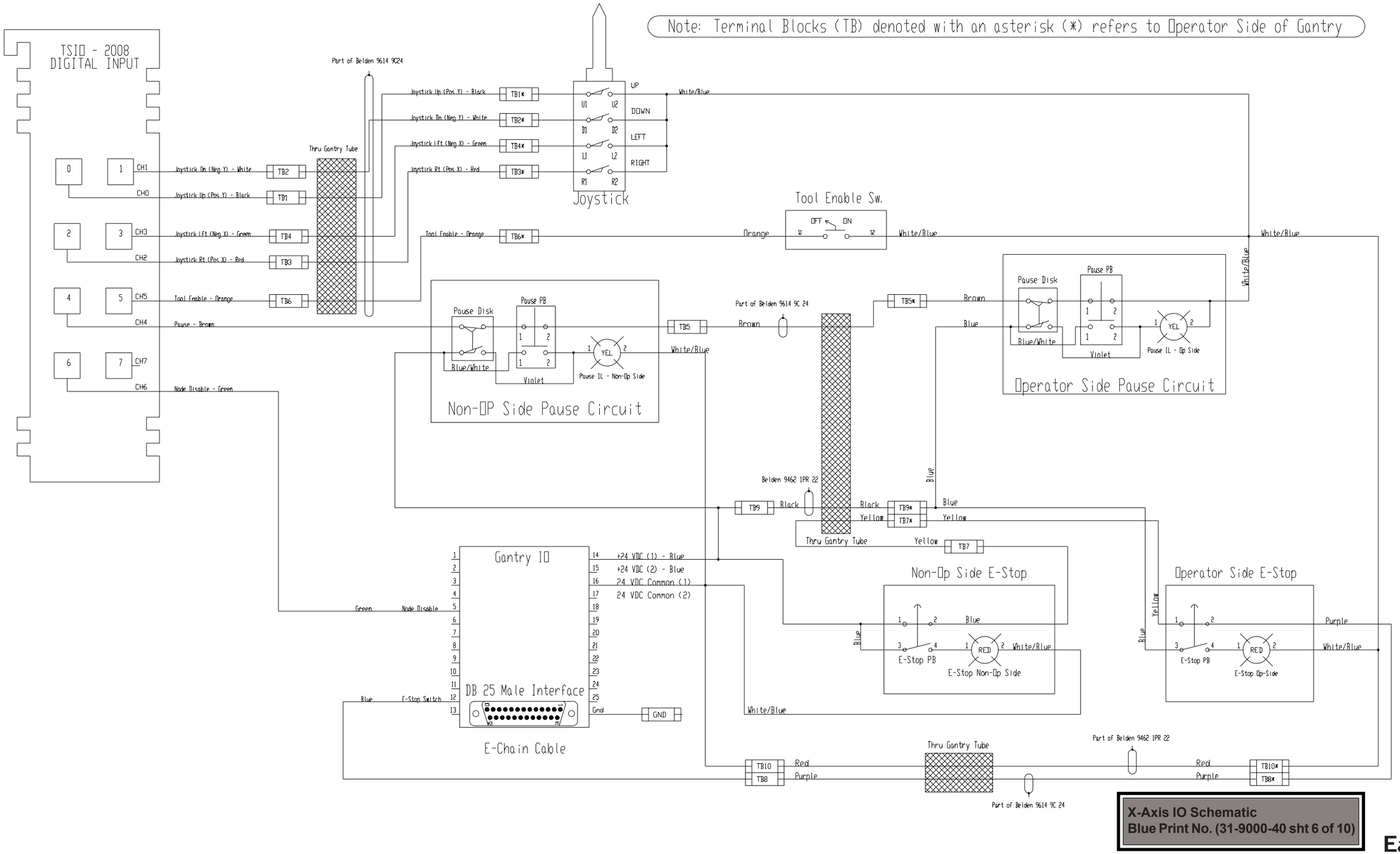
Custom I/O Block



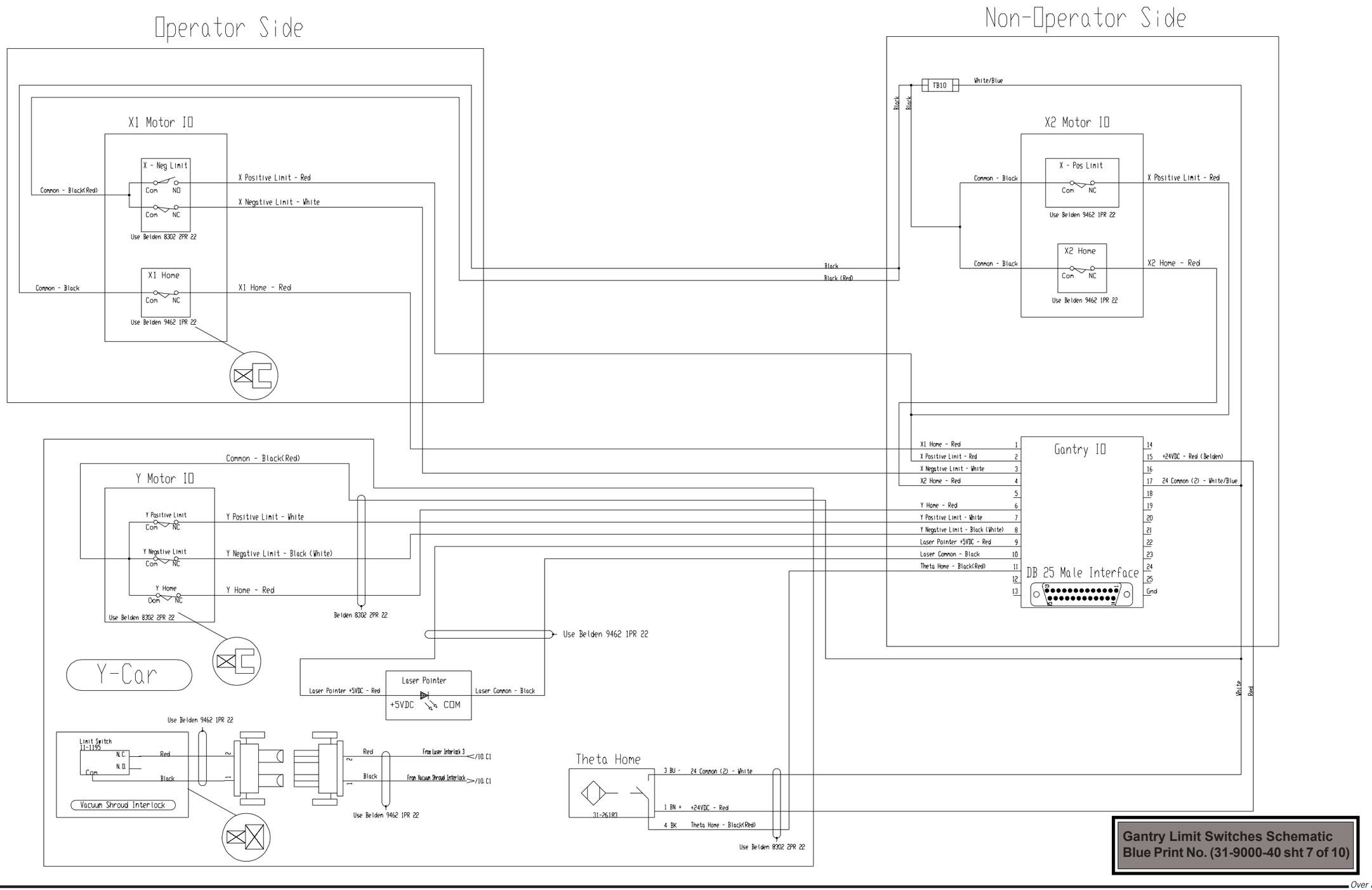
Diagnostic Cabinet Schematic
Blue Print No. (31-9000-40 sht 4 of 10)



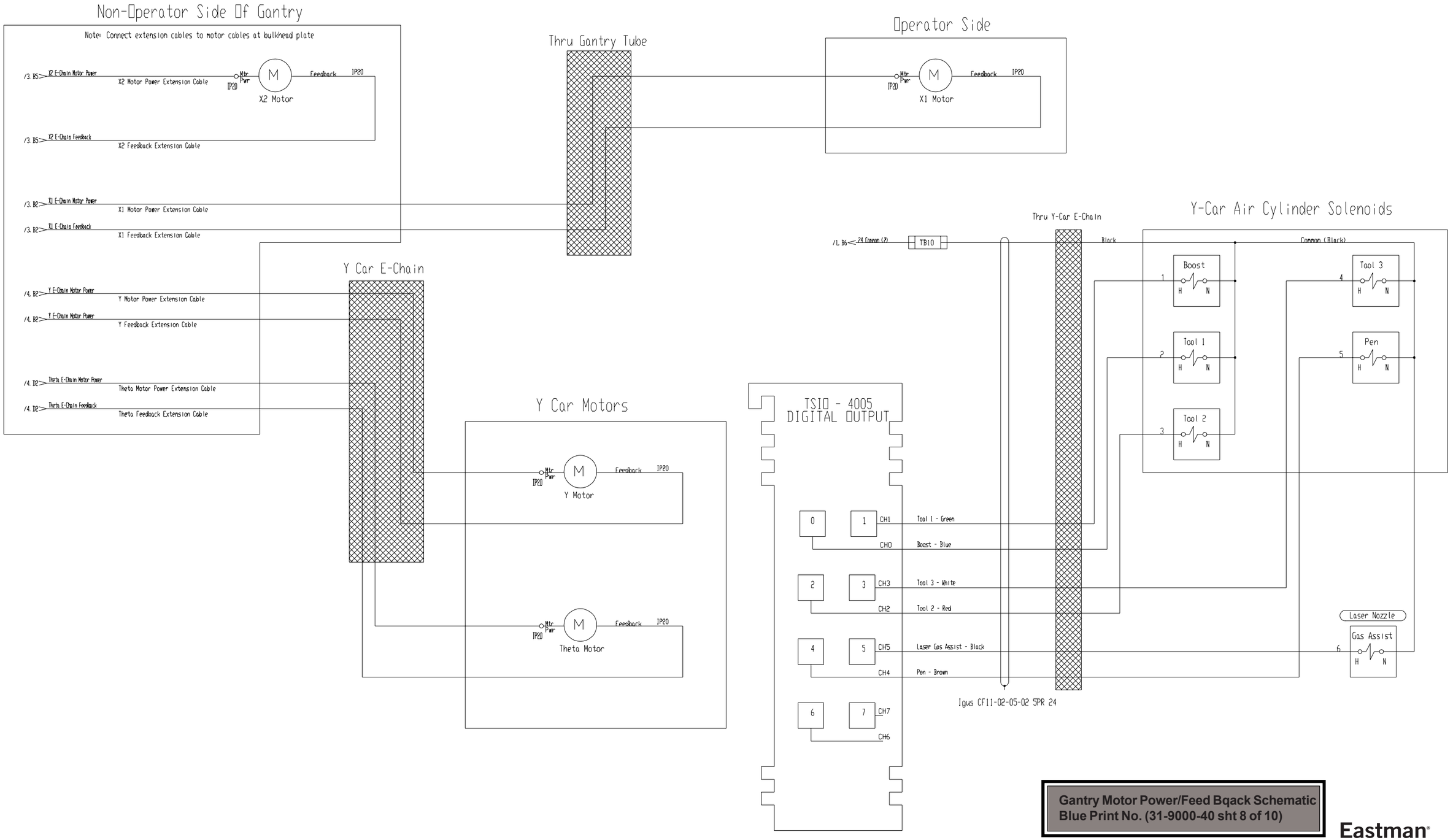
Slice Network/Anolog Out Schematic
Blue Print No. (31-9000-40 sht 5 of 10)



X-Axis IO Schematic
Blue Print No. (31-9000-40 sht 6 of 10)

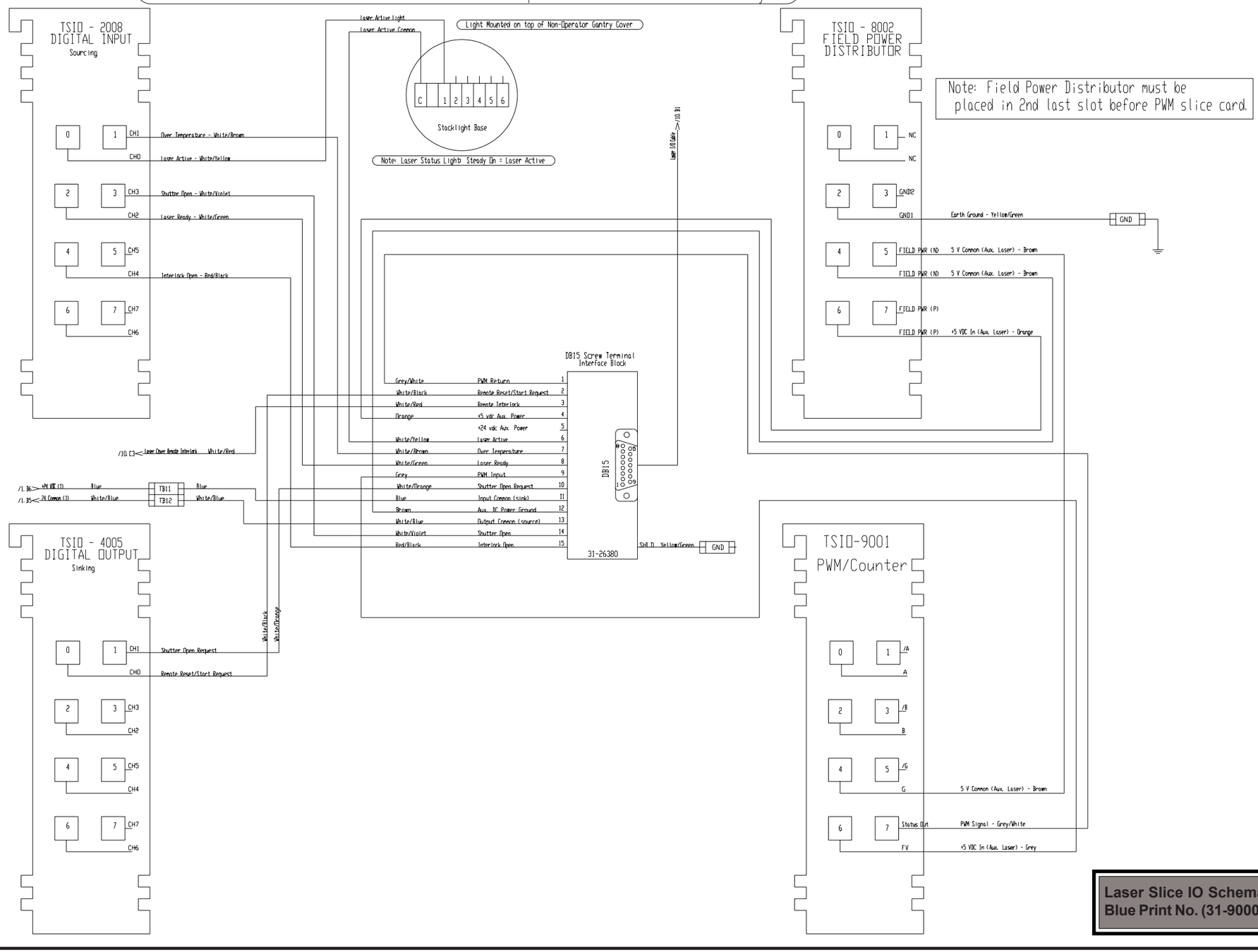


Gantry Limit Switches Schematic
Blue Print No. (31-9000-40 sht 7 of 10)

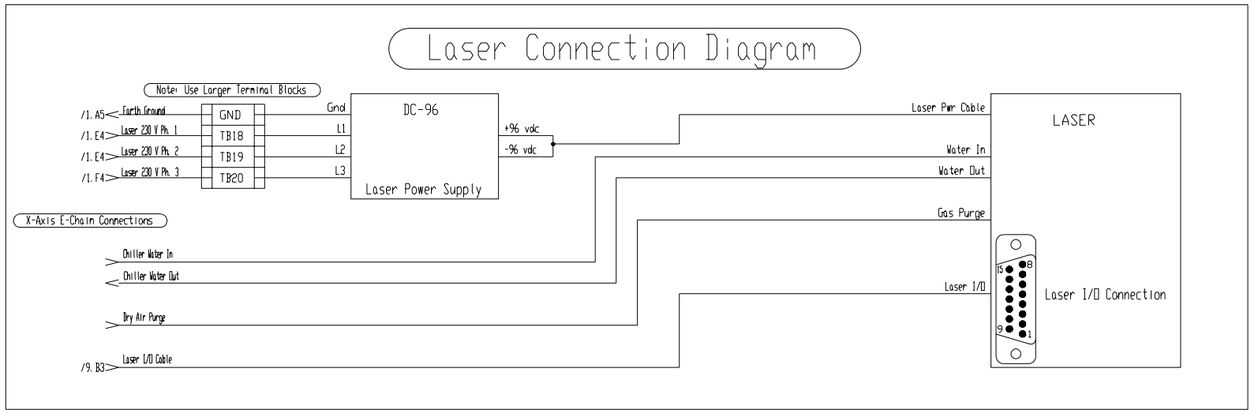


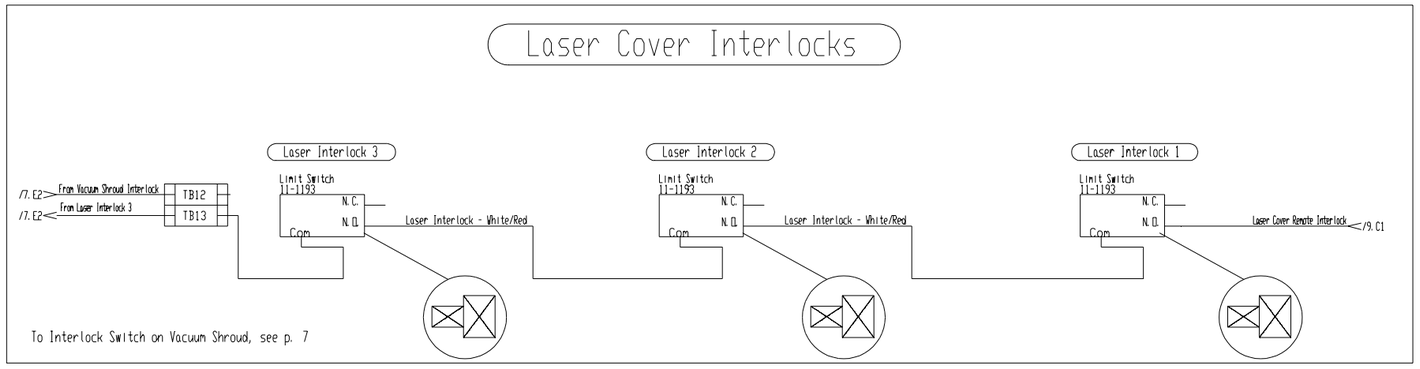
Gantry Motor Power/Feed Bqack Schematic
Blue Print No. (31-9000-40 sht 8 of 10)

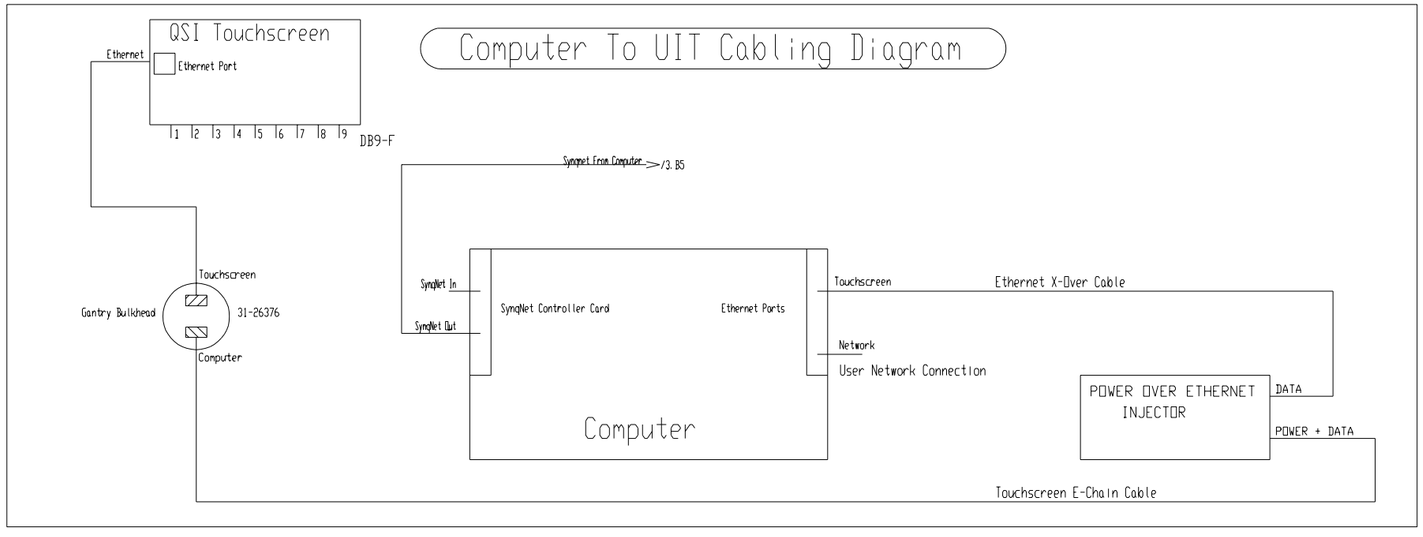
Laser Slice I/O Interface - Non-Operator Side of Gantry



Laser Slice IO Schematic
Blue Print No. (31-9000-40 sht 9 of 10)



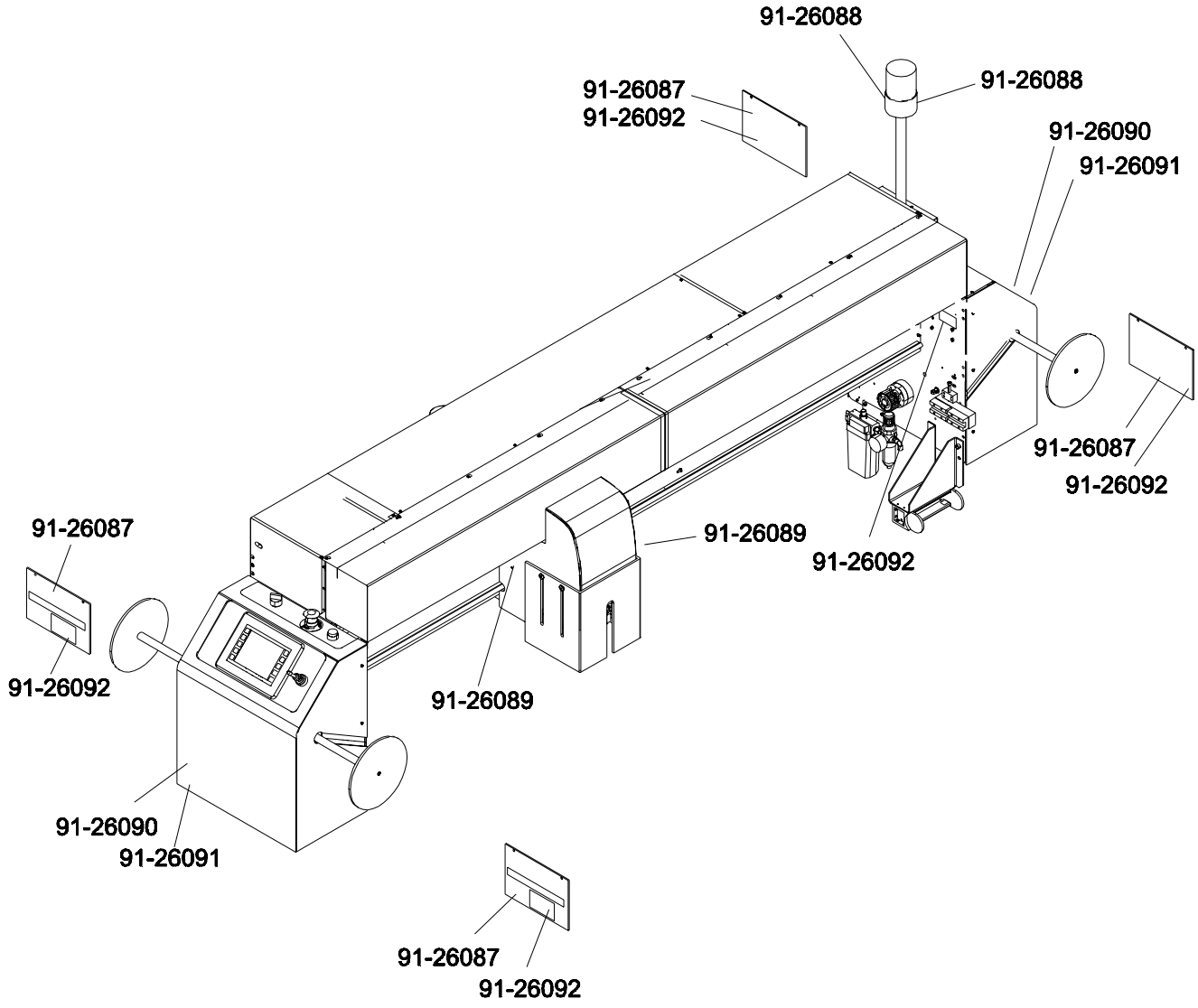




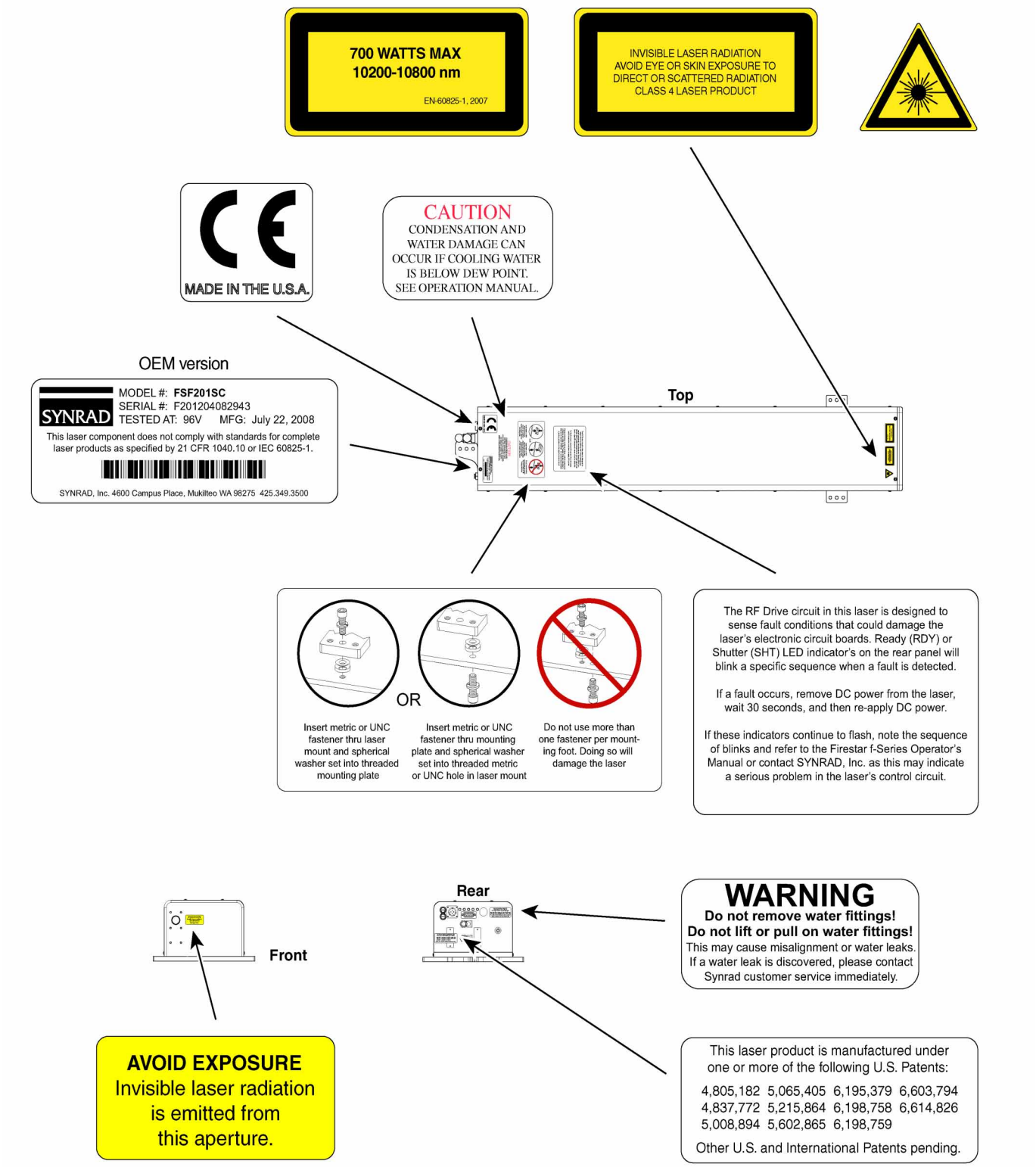
Laser Slice IO Schematic
Blue Print No. (31-9000-40 sht 10 of 10)

Label Locations
Gantry Assembly

Label Part Number and Description Chart.	
91-26087	Sign, Laser Danger
91-26088	Decal, Laser Operating
91-26089	Decal, Laser Danger
91-26090	Decal, Laser Eye Protection
91-26091	Decal. Class IV Laser
91-260 92	Decal, 200 Watt Laser Spec



Label Locations
Laser Module



Agency Compliance

-Center for Devices and Radiological Health (CDRH) requirements
-Federal Communications Commission (FCC) requirements
-European Union (EU) requirements

SYNRAD lasers are designed, tested, and certified to comply with certain United States (U.S.) and European Union (EU) regulations. These regulations impose product performance requirements related to electromagnetic compatibility (EMC) and product safety characteristics for industrial, scientific, and medical (ISM) equipment.

In the U.S., laser safety requirements are governed by the Center for Devices and Radiological Health (CDRH) under the auspices of the U.S. Food and Drug Administration (FDA) while radiated emission standards fall under the jurisdiction of the U.S. Federal Communications Commission (FCC). Outside the U.S., laser safety and emissions are governed by European Union (EU) Directives and Standards.

Center for Devices and Radiological Health (CDRH) requirements

Eastman lasers comply with requirements for Class IV laser products imposed by the Radiation Control for Health and Safety Act of 1968. Under this Act, the U.S. Food and Drug Administration (FDA) issued a performance standard in the *Code of Federal Regulations* (CFR) for laser products. This performance standard, (21 CFR, Subchapter J, Part 1040.10) was developed to protect public health and safety by imposing requirements upon manufacturers of laser products to provide an indication of the presence of laser radiation, to provide the user with certain means to control radiation, and to assure that all personnel are adequately warned of potential hazards through the use of product labels and instructions.

Product features incorporated into the design to comply with CDRH requirements are integrated as panel controls or indicators, internal circuit elements, or input/output signal interfaces. Specifically, these features include a *Keyswitch*, lase and laser ready indicators, remote interlock for power on/off, a laser aperture shutter switch, and a five-second delay between power on and lasing.

Federal Communications Commission (FCC) requirements

The United States Communication Act of 1934 vested the Federal Communications Commission (FCC) with the authority to regulate equipment that emits electromagnetic radiation in the radio frequency spectrum. The purpose of the Communication Act is to prevent harmful electromagnetic interference (EMI) from affecting authorized radio communication services. The FCC regulations that govern industrial, scientific, and medical (ISM) equipment are fully described in 47 CFR, Part 18, Subpart C. SYNRAD's Firestar f201 lasers have been tested and found to comply by demonstrating performance characteristics that have met or exceeded the requirements of 47 CFR, Part 18, Radiated and Conducted Emissions.

FCC information to the user

NOTE: The following FCC information to the user is provided to comply with the requirements of 47 CFR, Part 18, Section 213.

Interference Potential

In testing, SYNRAD, Inc. has not discovered any significant electrical interference traceable to Firestar f-Series lasers.

System Maintenance

Ensure that all exterior covers are properly fastened in position.

Measures to Correct Interference

If you suspect that your Firestar laser interferes with other equipment, take the following steps to minimize this interference:

1) Use shielded cables to and from the equipment that is experiencing interference problems.

2) Ensure that the Firestar laser is properly grounded to the same electrical potential as the equipment or system it is connected to.

FCC caution to the user

The Federal Communications Commission warns the user that changes or modifications of the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

European Union (EU) requirements

Laser safety standards

Under the Low Voltage Directive, 2006/95/EC, the European Norm (EN) document EN 60825-1 was developed to protect persons from laser radiation by imposing requirements upon manufacturers of laser products to provide an indication of laser radiation; to classify laser products according to the degree of hazard; to require both user and manufacturer to establish procedures so that proper precautions are adopted; to ensure adequate warning of the hazards associated with accessible radiation through signs, labels, and instructions; to improve control of laser radiation through protective features; and to provide safe usage of laser products by specifying user control measures.

Eastman®

Technical Data
EASTMAN® Eagle S3L

Eagle S3L

Maximum Machine Speed*	60 in/sec. (150 cm/sec.)
Maximum Table Length	None
Cut Accuracy*	+/- .015" (+/- .4 mm)
Gantry Weight	Approx. 200 lbs. (145 kg)
Eagle S3L Operating Voltage	110v; 60hz
Blower Operating Voltage	220v; 60hz
Power Requirement (Eagle S3l)	110V/20A
(Blowers)	220V/25A
Minimum Operating Pressure	75 PSI
Volume of Air Service	5 SCFM
Minimum Temperature	55° non-condensing

Laser Specifications

Laser Class:	IV
Model	Synrad Firestar f201 sealed CO2
Output Power	200W
Beam Diameter	3.5mm
Cooling	Water
Input voltage/current	96 VDC/36A
Heat Load (max)	4000W
Wavelength	10.2-10.7 um

Information based on a standard 72" Maximum cutting capacity machine.

* Relative to the type and quality of fabric, Cutting speed, Pulling mode, Operational Settings etc.

Machine Size	Working Width	Table Width (Including Rack & Rail)	Overall Machine Width
60" (1530 mm)	58.6" (1488 mm)	72" (1830 mm)	91" (2310 mm)
66" (1680 mm)	64.6" (1641 mm)	78" (1980 mm)	97" (2464 mm)
72" (1830 mm)	70.6" (1793 mm)	84" (2130 mm)	103" (2616 mm)
78" (1980 mm)	76.6" (1946 mm)	90" (2290 mm)	109" (2770 mm)

Please allow 3 ft working clearance on all sides.

* For all other sizes consult factory.

Limited Warranty. Eastman warrants to the buyer that the equipment shall be free from defects in materials or workmanship for a period of 180 days commencing on the date of invoice. Any goods or parts claimed by the buyer to be defective must be returned to Eastman, freight charges prepaid, within the 180-day warranty period. If Eastman determines that the goods or parts are defective in materials or workmanship, Eastman's sole obligation under this warranty shall be, at Eastman's sole option, to repair or replace the defective goods or parts or to provide the buyer a credit equal to the portion of the purchase price allocable to the defective goods or parts. This warranty shall not apply if defects are caused by product misuse or neglect, if the machine has been altered or modified by the buyer, or if other than genuine Eastman belts, emery wheels, knives or parts are used in the machine. THIS WARRANTY IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Limitation of Liability. Eastman's liability to the buyer, and the buyer's remedies from Eastman, whether in contract, negligence, tort, under any warranty or otherwise, shall be limited to the remedies provided in the foregoing Limited Warranty. In no event shall Eastman have any responsibility or liability to the buyer for (a) any special, indirect, incidental, or consequential damages, including, but not limited to, loss of use, revenue, or profit, even if Eastman has been advised of the possibility of such damages, or (b) any claim against the buyer by any third party. The price stated for the product sold is a consideration for limiting Eastman's liability.

Eastman®
Over a Century of Cutting Expertise

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Manufacturers of Eastman Cloth Cutting and Cloth Spreading Machines
Website: www.EastmanCuts.com

Form E-554