# Vulcan
CUTTING SYSTEMS

# OPERATION MANUAL

## MODEL 1000 B




LOCKFORMER

711 OGDEN AVE. LISLE IL. 60535-1399 PHONE 630-964-8000 FAX 630-964-5685

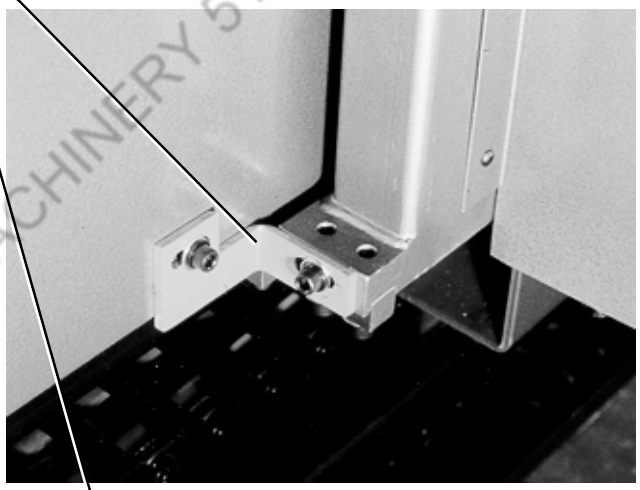
6/2004

# SHIPPING BRACKET REMOVAL

## IMPORTANT!

**REMOVE YELLOW STEEL ANGLE BRACKETS SHOWN IN THE PHOTOS BEFORE ATTEMPTING TO OPERATE YOUR VULCAN MACHINE. THESE BRACKETS WERE USED TO SECURE THE MACHINE DURING SHIPPING.**

REMOVE THESE BRACKETS



DO NOT ANCHOR THE TABLE TO THE FLOOR. A Lockformer installation technician will level the equipment and secure it to the floor.

# SAFETY INFORMATION

**YOU ARE NOT READY TO OPERATE THIS EQUIPMENT UNTIL YOU HAVE READ AND UNDERSTOOD THE SAFETY INFORMATION IN THIS MANUAL.**

**SAFETY FIRST! All Personnel working with or near the Vulcan must read this section!**

In addition to the following guidelines, refer to Sections 1, 2, and 3 of this manual for additional safety information.

The Vulcan Plasma Arc Cutting System can be used with complete safety by it's operator and any persons in the immediate area, but personnel must take precautions against light, heat, radiation, fumes, and noise produced while performing plasma cutting operations. By paying close attention to the following guidelines the Vulcan will provide cost efficient service with minimal risk to personnel. Everyone who works with or near this machine must familiarize themselves with it's possible hazards and how to avoid them by following the simple, effective means explained below.

**TERM DESCRIPTION**

**CAUTION:** Hazards or unsafe practices which could result in minor personal injury, and product or property damage.

**WARNING:** Hazards or unsafe practices which could result in severe personal injury or death.

**DANGER:** Immediate hazards which will result in severe personal injury or death.

**The words "should" and "must" as used in this manual shall have the following meaning; the use of should means we strongly suggest that the instruction be followed. The use of must means that the instruction is mandatory for the safety of equipment and personnel.**

**INSTANT-ON TORCHES** - The torch installed on this machine is an instant-on torch. It will fire (produce a plasma arc) immediately after the torch switch closure or remote switch closure for a machine torch. Always stand away from the torch as a precaution against accidental torch firing. Be aware of this potential hazard. Failure to heed this warning can result in serious bodily injury.

**EMERGENCY STOP-** This switch shuts off power to all parts of the machine except the plasma unit. The torch will stop cutting, but its power will still be active, so throw the main DISCONNECT switch to cut all power!

**CARRIAGE MOVEMENT** - The carriage upon which the plasma cutting torch is mounted moves with firm, steady force and can injure anyone in its path. It can travel the entire length of the table (Y axis). The torch unit also travels across the carriage when cutting (X axis). Keep these paths clear. Always remain away from the moveable parts of the machine when it is in operation, or is about to be started. NOTE: When used in this manual, the term "machine" will refer to the carriage only. Other sections of the Vulcan will be described by their specific name and listed separately.

**BURN SAFETY** - Intense ultraviolet light, sparks, and hot metal produced by plasma arc cutting will harm exposed skin and eyes. Operators and bystanders must wear protective clothing and equipment to avoid hazards.

**EYE SAFETY** - Wear appropriate tinted safety goggles with side shields, or a welding helmet to protect eyes. Refer to the chart for recommended lens or shield shade;

| Arc Current | Lens/Shield Shade |
|---|---|
| Up to 100 Amps | Shade No. 8 |
| 100-200 Amps | Shade No. 10 |
| 200-300 Amps | Shade No. 12 |
| Over 400 Amps | Shade No. 14 |

Do not use eyewear with broken or pitted lenses or covers. Replace them at once.

Post warnings and inform people in the area not to look directly at the arc unless appropriate glasses, goggles, or a welding helmet is worn.

The Vulcan Operating Area should be adapted to reduce the reflection and transmission of ultraviolet light. Install protective screens or curtains to reduce ultraviolet transmissions. Paint walls and other surfaces with dark colors to reduce reflection.

**SKIN SAFETY** - Always wear protective clothing including, but not exclusive to, gauntlet gloves, safety shoes, and head covering.

Flame retardant clothing with cuffless trousers to shield body from sparks and slag is strongly suggested.

After cutting, the sheet edges and the cutting table are dangerously sharp and hot. To avoid cuts and burns, use heavy gloves to handle pieces during removal.

Never touch the front of the torch when starting it. After cutting has been completed, allow adequate time for the front of the torch to cool.

Qualified first-aid personnel and facilities should be available at or near any Vulcan site to treat accidental eye and skin burns at once.

**FUME HAZARDS AND PRECAUTIONS** - Plasma Arc Cutting vaporizes metals into toxic gases, so constant ventilation and precautions regarding exposure to the operator or any persons near the Vulcan are absolutely necessary! An appropriate ventilation system, designed to safely withdraw toxic fumes from the area, must be installed and used whenever the Vulcan is operated. Do not use the Vulcan in a confined space unless a safe ventilation system and an operator's fresh air supply is present and working properly! Refer to Section 1, Preliminary Installation for details regarding the necessary initial ventilation setups.

Be sure to activate the ventilation system before starting the torch. Check periodically to confirm that the vent system continues to remove air efficiently! To ensure that it pulls with its greatest force during cutting, always cover the table top(s) completely, so that air can only flow through a small area forcing gases into the 12" vent hole. If sheets smaller than 5 x 10' are used, cover excess space on table top(s) with scrap metal.

Do not cut containers with toxic materials inside or containers that have held toxic materials. Clean such containers thoroughly before cutting.

Stock containing or coated with significant percentages of beryllium, cadmium, lead, mercury, or zinc can all give off poisonous fumes when burned by plasma arc cutting. Do not cut this stock unless the operator, or anyone else subjected to the fumes, wears appropriate respiratory equipment, an air supplied helmet, or that the table ventilation system is working efficiently.

ALways wear a proper breathing mask and use proper ventilation when cutting galvanized metal.

**EXTREME CAUTION!** Various chlorinated solvents decompose and can turn to lethal phosgene gas when exposed to ultraviolet radiation caused by plasma cutting. Do not use such solvents on stock to be cut by the Vulcan. Ask your vendor about suspect solvent formulas. Do not keep these or any degreasing agents near the plasma arc cutting system.

**FIRE HAZARDS AND PRECAUTIONS** - Heat, sparks and slag produced by plasma cutting of metal can cause explosions or fire. Keep fire extinguishers within the immediate Vulcan area. Do not leave any combustible matter within 35 ft. (10 meters) of the Vulcan site!

It is strongly recommended that containers used for poisonous or explosive substances never be plasma cut.

Be sure that the Vulcan area ventilation system works properly. Never start the Vulcan as long as air around it is laden with flammable/explosive agents such as dust, gasoline or other flammable gas, or combustible liquid vapors. Let the vent system remove such substances first!

Quench freshly cut metal in water or allow metal to cool after cutting before handling it, or allowing it to contact combustible substances nearby that might be ignited by its heat.

**ELECTRICAL HAZARDS AND PRECAUTIONS**

**Primary Safety Directive -** To perform maintenance or work with the machine's electrical components, always disconnect the main switch to disable power entirely from all parts of the Vulcan, to avoid the dangers of electrocution.

Because plasma cutting requires greater (open circuit) voltage than ordinary welding, up to 300 VDC, extreme protection precautions against electrocution must be used while cutting.

Input Connections (Refer also to Section 1, Preliminary Machine Installation)

Install a wall-mounted line disconnect switch as close to the plasma unit power supply as possible and fuse it according to local electrical codes. This switch allows the operator to turn the power supply off quickly in an emergency situation.

Conform to all national, state, and local electrical codes for primary wiring sizes and types.

Be sure that input conductors are of proper size to carry Plasma Unit's rated current.

Primary power cable must have a minimum 600 v. rating.

Do not use the system with a damaged power cord. Inspect the primary power cord frequently for damage or cracking of the cover. **EXPOSED WIRING CAN KILL!!** If a power cord is damaged, replace it immediately.

Inspect the torch leads. Replace if frayed or damaged.

Never operate the plasma system unless the power supply unit covers are in place. Exposed power supply connections present a severe electrical hazard.

Do not touch the workpiece, including the waste cutoff, while cutting. Leave the workpiece in place until after all cutting is complete.

Before changing the torch parts, disconnect the main power or unplug the power supply. After changing the torch parts and returning the retaining cap to its operating position, plug the power supply in again.

Never bypass or shortcut the safety interlocks.

Before removing a power supply cover for maintenance, disconnect the main power at the wall disconnect switch or unplug the power supply. To avoid exposure to severe electrical hazards, wait five minutes after disconnecting the main power to allow capacitors to discharge.

Wear insulated gloves and boots to maintain proper insulation against electrical shock. If you must work in or near a damp area, use extreme caution.

Check cable often for any cracking or peeling of covers and replace defective wiring IMMEDIATELY!

NOTE! To avoid a tripping hazard, it is suggested that bright Safety Tape be put around the ground rod and any cable that must lay in a space where people walk.

NOTE! Personal Protection - Keep your body and clothing dry. Do not operate the Vulcan in a wet or damp environment without proper insulation against ELECTROCUTION! Do not stand, sit, or otherwise be in any contact with water while operating machine or ELECTROCUTION may result!

Do not operate the Vulcan if any of its electrical cables, torch leads, or the torch itself is damaged. Do not attempt any maintenance to the Vulcan, including service to torch, plasma unit, or power supply, without first disconnecting power from machine entirely by shutting off the main disconnect!

**EXPLOSION PREVENTION** - WARNING: The plasma system uses compressed gas. Observe proper precautions when handling and using compressed gas equipment and cylinders. Refer to the Publication Index at the rear of this section.

When cutting with the plasma system, do not cut in atmospheres containing explosive dust or vapors. Do not cut pressurized cylinders or any closed container.

**Compressed Gas Cylinders** - Be certain to take correct precautions when handling and operating compressed gas equipment and cylinders.

Handle and use compressed gas cylinders in strict accordance with safety standards such as published by the Compressed Gas Association in Arlington, VA. (CGA), American Welding Society in Miami, Fla. (AWS), and the Canadian Standards Association in Ontario, Canada (CSA).

Do not move a cylinder unless its protective valve cover is in place. Do not use a cylinder unless it is secured in place, upright.

Do not use a cylinder that leaks or is otherwise physically damaged. Do not use hammers or any other implement to force a stuck valve open. Return cylinders with any such defects to supplier.

Never lubricate cylinder valve(s) with oil or grease.

Never move or transport a cylinder without it's protective valve cover in place.

Do not use a cylinder or its contents for any other purpose than that for which it was designed.

Do not place a cylinder near electrical hazards such as welding arcs, or expose it to an open flame or excessive heat, sparks, or slag of any kind, which can cause it to rupture or explode.

**Hose** - Label and color-code all gas hoses in order to clearly identify the type of gas present in each hose. Consult applicable national, state, or local codes for detailed information.

Never use an oxygen hose for any gas other than oxygen.

Use the shortest possible lengths of hose to avoid damage, reduce pressure drop, and prevent possible volume flow restriction. Let the hose lie as straight as possible to prevent kinks when interconnecting system components. Coil excess hose and place it out of the way to prevent damage and reduce tripping danger.

Check hose regularly for wear, leaks, loose connections, or damage from heat, flames or sparks. Immediately replace damaged or unreliable hose!

**Pressure Regulators** - Maintain all pressure regulators used on the Plasma Unit of the Vulcan in proper working order to avoid failure and danger to operating personnel. Do not use any regulator that leaks, creeps excessively, or is otherwise damaged. It is strongly recommended that any malfunctioning equipment be serviced only by trained technicians, at it's manufacturer's designated facility.

NEVER lubricate regulator(s) with oil or grease and do not use a regulator for any gas other than that for which it was designed.

**NOISE PREVENTION** - The plasma cutting process can generate high levels of noise. Depending upon the arc current, material being cut, acoustics, and size of the cutting room, distance from the torch, and other factors, acceptable noise levels as defined by national, state, or local codes may be exceeded by your plasma system.

**GROUNDING** - Before operating the plasma system:
Input Power - Be sure the power cord is plugged into a properly grounded outlet or that the power cord ground wire is properly connected to the ground in the disconnect box. If installation of the plasma system involves connecting a power cord to the power supply, ensure that the power cord ground wire is properly connected. Conform to national, state, and local standard when fastening the power ground wire to the power supply chassis. CSA standards recommends placing the power cord ground wire on the stud first; then place the other wires on top of the power cord ground. Fasten the retaining nut tightly.

Make sure that all electrical connections are tight to avoid excessive heating.

**Input Power** - Connect ground lead of power input cable to both electrical system ground in disconnect box, and to ground stud in Plasma Unit power supply. Be certain all ground lugs are large enough to carry rated current load and make all connections tight to prevent resistance heating.

**Output Power** - Connect all positive output ground leads to cutting table Star Ground (referred to, and illustrated in Section 1). Connect Star Ground to reliable Earth Ground. Refer to National Electrical Code, Grounding Electrode System or other appropriate source for suitable Ground specifications.

Work Table - Clamp the work cable with good metal-to-metal contact to the workpiece (not the drop off portion) or to the work table itself.

Connect the work table to a good earth ground. Consult the U.S. National Electrical Code, Article 250, Section H *Grounding Electrode System*, or other appropriate national, state, or local codes.

For additional information, refer to the index at the rear of this section.

**ELECTRIC AND MAGNETIC FIELDS (EMF)**
Plasma arc cutting systems create electric and magnetic fields that may interfere with the correct operation of electronic health support equipment, such as pacemakers or hearing aids. Anyone who wears a pacemaker or hearing aid should consult a doctor before operating or being near any plasma system when it is in use. To minimize exposure to EMF: (1) Keep both the work cable and the torch lead on one side of your body. Keep your body from coming in between the torch lead and the work cable. (2) Keep the distance of work cable to the table as short as possible to eliminate loop areas. (3) Route torch leads as close as possible to work cable. (4) Do not wrap the torch lead or work cable around your body. (5) Stay as far away from power source as possible.

**SAFETY DEVICES** - The plasma unit used on the Vulcan have safety interlocks to prevent danger to personnel and damage to machine. Never attempt to short out or override these interlocks! Check the interlocks and all safety related parts of the plasma unit frequently and replace them IMMEDIATELY if they are not working!

The interlocks disconnect the power supply when the retaining cap is loosened.

Never bypass or shortcut the safety interlocks on any of the plasma system units.

Do not use the plasma unit unless all of its power supply covers are in place; failure to do so will ENDANGER the operator and bystanders near the machine and will interfere with the cooling of the vital parts of unit, which may be damaged as a result.

Be certain that all electrical connections are covered with appropriate insulation material. Cracked insulation must be replaced!

Each plasma unit is designed to be used only with specific Vulcan torches. Do not substitute other torches which may overheat and present a potentially dangerous situation to the operator and any personnel in the area.

## PUBLICATION INDEX

The Publication Index contains a list of publications dealing with plasma arc cutting equipment safety practices.

**1. American National Standards Institute, 1430 Broadway, New York, NY 10018 (212) 354-3300.**

ANSI Standard Z41.1, *Standard for Men's Safety-Toe Footwear*
ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*
ANSI Standard Z88.2, *Practices for Respiratory Protections*
ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection*

**2. American Welding Society, 550 LeJeune Road, P.O. Box 351020, Miami, FL 33135 (305) 443-9353.**

ANSI Standard Z49.1, *Safety in Welding and Cutting*
AWS Standard A6.0, *Welding and Cutting Containers Which Have Held Combustibles*
AWS Standard F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping that Have Held Hazardous Substances*

**3. National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210 (617) 770-3000.**

NFPA Standard 51, *Oxygen - Fuel Gas Systems for Welding and Cutting*
NFPA Standard 70-1978, *National Electrical Code*
NFPA Standard 51B, *Cutting and Welding Processes*

**4. Superintendent of Documents, U.S. Government Printing Office, North Capitol Street, Washington, D.C. 20402 (202) 783-3238.**

NIOSH, *Safety and Health in Arc Welding and Gas Welding and Cutting*
OSHA, *Safety and Health Standards*, 29FR 1910

**5. Canadian Standards Association Standard Sales, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada (416) 747-4000.**

CSA Standard W117.2, *Code for Safety in Welding and Cutting*
Canadian Electrical Code Part 1, *Safety Standards for Electrical Installations*

**6. Compressed Gas Association, 1235 Jefferson Highway, Arlington, VA 22202 (703) 979-0900.**

CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders*

**7. National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103 (215) 564-3484.**

NWSA booklet, *Welding Safety Bibliography*

**THIS SAFETY ALERT SYMBOL INDICATED IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY OR DEATH.**

# WARNING

BEFORE ANY MACHINE IS USED BY AN EMPLOYEE OR IS LOANED OR RENTED, MAKE ABSOLUTELY CERTAIN THAT THE OPERATOR(S) PRIOR TO OPERATING:

1. IS INSTRUCTED IN SAFE AND PROPER USE.
2. REVIEWS AND UNDERSTANDS THE MANUAL(S) PERTAINING TO THE MACHINE.

IT IS THE USER'S RESPONSIBILITY TO UNDERSTAND AND FOLLOW THE MANUFACTURER'S INSTRUCTIONS ON MACHINE OPERATION AND MAINTENANCE, AND TO OBSERVE ALL PERTINENT LAWS AND REGULATIONS.

**YOU ARE NOT READY TO OPERATE THIS EQUIPMENT UNTIL YOU HAVE READ AND UNDERSTOOD THE SAFETY INFORMATION IN THIS MANUAL.**

**REMEMBER, A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT. GIVE COMPLETE AND UNDIVIDED ATTENTION TO THE JOB AT HAND.**

**WARNING, DO NOT WEAR LOOSE CLOTHING, JEWELRY, OR UNRESTRAINED HAIR OR BEARD STYLES WHICH MAY CATCH IN MOVING PARTS.**

**WARNING, THE OPERATOR MUST HAVE AUXILIARY OPERATING PERSONNEL CLEARLY WITHIN HIS FIELD OF VISION AT ALL TIMES!**

**WARNING,** DO NOT HANDLE MATERIAL (COIL, SHEET OR BLANK) WITHOUT WEARING PROTECTIVE GLOVES.

**WARNING,** NARROW OR UNSTABLE COILS MUST NOT BE TRANSPORTED WITHOUT THE AID OF BLOCKING AND/OR SIDE SUPPORTS

**DANGER,** COILS MUST NEVER BE CARRIED OVER THE HEADS OF OTHER EMPLOYEES.

**WARNING,** KEEP LIQUIDS (SOLVENTS, LUBRICANTS, ETC.) AWAY FROM ELECTRICAL EQUIPMENT.

**WARNING,** YOU MUST NEVER DISCONNECT OR REMOVE ANY SAFETY DEVICE OR OPERATE ANY MACHINE WHO'S SAFETY DEVICES HAVE BEEN DISCONNECTED OR REMOVED.

**DANGER,** DISCONNECT AND LOCK OUT ALL POWER SOURCES BEFORE INITIATING ANY REPAIRS.

**WARNING,** IMPROPER OPERATION OF THIS MACHINE MAY CAUSE DAMAGE TO THE MACHINE AND/OR PERSONAL INJURY TO THE OPERATOR AND NEARBY PERSONNEL.

**WARNING,** HYDRAULIC SYSTEMS ARE HIGHLY PRESSURIZED. ESCAPING HYDRAULIC OIL, EVEN AN INVISIBLE PINHOLE LEAK, CAN PENETRATE BODY TISSUES CAUSING SERIOUS INJURY. WHEN LOOKING FOR LEAKS, USE A PIECE OF WOOD OR CARDBOARD. (NEVER USE THE HANDS OR ANY OTHER PART OF THE BODY)

**WARNING,** IF ANY PART OF THIS MACHINE SHOULD BECOME OVER LUBRICATED AND LUBRICANT SPILLS OVER OR BUILDS UP, IT SHOULD BE CLEANED UP IMMEDIATELY, SO AS NOT TO HINDER THE PROPER OPERATION OF THE MACHINE OR ENDANGER OTHER PERSONNEL.

**WARNING,** DO NOT OPERATE ANY EQUIPMENT WITHOUT GUARDS AND COVERS INSTALLED IN PLACE.

**WARNING,** KEEP THE WORK AREA CLEAR OF OBSTRUCTIONS AND THE FLOOR CLEAN AND DRY.

**WARNING,** NEVER USE STOOLS, BOXES, CRATES OR SIMILAR ITEMS AS SUBSTITUTES FOR WORK PLATFORMS, SCAFFOLDING OR LADDERS.

**WARNING,** DO NOT OPERATE ANY EQUIPMENT WHICH HAS LOOSE, WORN, OR BROKEN PARTS.

**WARNING,** BEFORE PERFORMING ANY MAINTENANCE ON THIS MACHINE, BE SURE THAT THE MAIN DISCONNECT SWITCH IS SHUT OFF AND LOCKED IN PLACE.

**WARNING,** DO NOT OVERLOAD EQUIPMENT BEYOND IT'S STATED OR IMPLIED CAPACITIES.

**DANGER,** YOU MUST NEVER CHECK DIMENSIONS OF WORKPIECE WHILE EQUIPMENT IS OPERATING.

**The Lockformer Company**
**711 Ogden Ave., Lisle, IL. 60532 (630) 964-8000**

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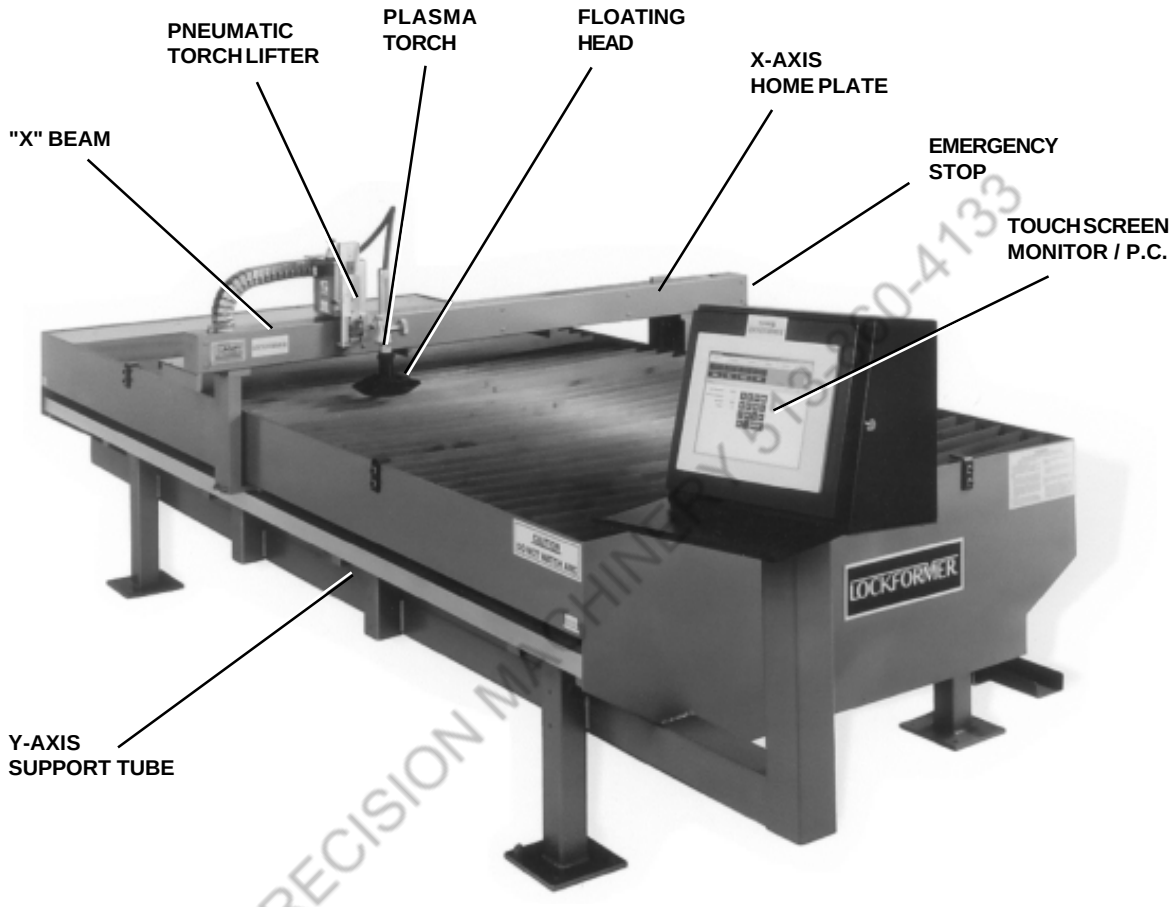
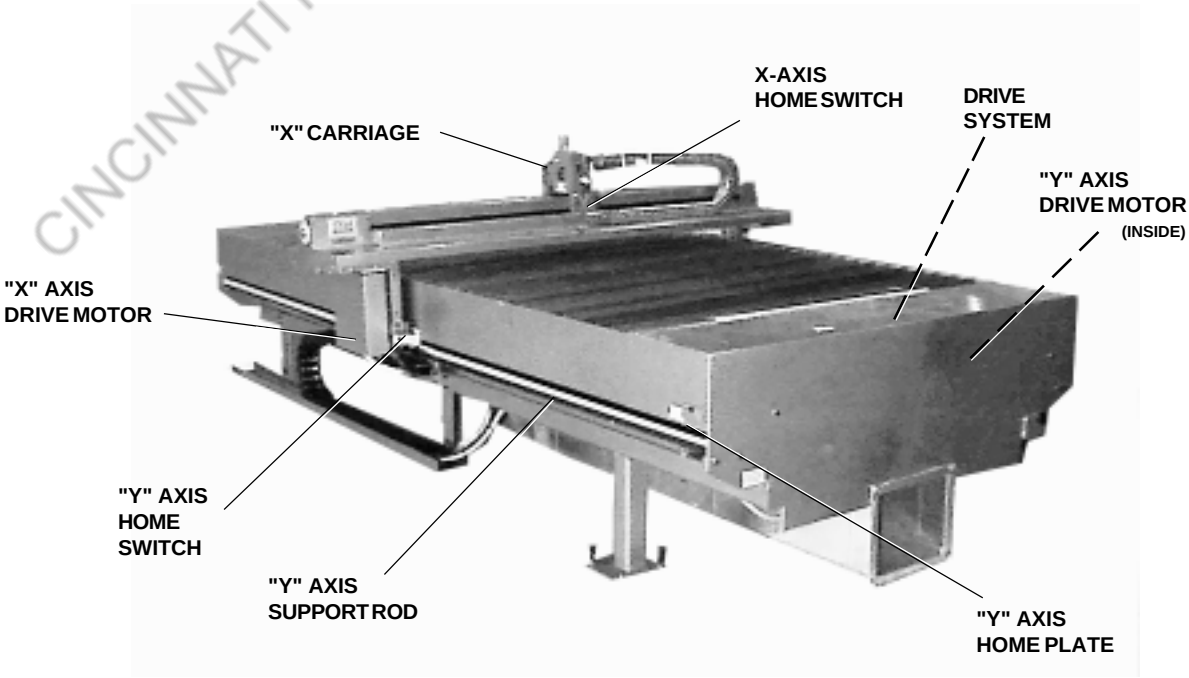
# *Vulcan* 1000B

## REFERENCE PHOTOS



# SECTION 1

## PRELIMINARY MACHINE INSTALLATION

1. Safety
2. Uncrating
3. Location of Machine
4. Incoming Power Supply for Plasma Unit
5. Grounding Procedure / Power Supply
6. Ventilation
7. 200 Foot Cable Category 5E Cable Set Up Procedure
8. 5.7 / 5.8 Touch Screen Networking Procedures (3) Pages
9. Optional Control Positions Drawing Number AA55773

The following information outlines the factory procedures for preliminary installation of the Lockformer Vulcan Cutting Machine. Appropriate Lockformer reference and assembly drawings accompany this manual. See section 4.

## 1. SAFETY

Voltages used on this machine are potentially hazardous. Therefore, all equipment must be installed and maintained in accordance with local requirements and National Electrical Codes. Also see the SAFETY FIRST section of this manual.

## 2. UNCRATING

The machine's crating should ensure that all components arrive in good order, but as the assemblies are uncrated, check all contents with the packing list for possible damage from shipping. If anything shows up missing, or damaged, notify the carrier in writing at once. It is the responsibility of the receiver to file any claims for damage against the carrier. As each assembly or detail is unpacked, it should be placed in a suitable dry area and have its preservative removed by use of a nontoxic fluid. Avoid the use of trichlorethylene or perchloroethylene, and ensure that the cleaning area is well ventilated.

## 3. LOCATION OF MACHINE

The Vulcan needs a floor space where vibration is at an absolute minimum. Precision operation is necessary for accurate cutting, thus avoid areas where the transmission of any heavy vibration, (from trucks, factory equipment, etc.) may occur nearby.

Choose a site for the Vulcan near gas and electrical outlets, and if possible, near any related production lines, for manufacturing efficiency. Material handling is also important, so be sure to provide space for stockpiling material and moving it by hoist, truck, or other means. Adequate lighting and ventilation must be available for safety reasons, as noted in the safety material.

DO NOT ANCHOR THE TABLE TO THE FLOOR. A Lockformer installation technician will level the equipment and secure it to the floor.

## 4. INCOMING POWER SUPPLY FOR PLASMA UNIT

The proper cable setup procedures are as follows:

1. Locate the Plasma Unit (consult Lockformer Service Department).

2. Use as short a power cord as is practical to connect the machine to its power supply. Do not use a cable that is too short - use one that leaves some slack so it cannot stretch or break during use. Do not coil the cables. Follow all applicable local, state, and national codes.

3. Route AC power wires to keep them away from any auxiliary power; this includes solenoids, control boxes, etc.

4. Connect the Vulcan to an AC power source for its use exclusively. Do not operate any other machinery from the same power line as the Vulcan!

## 5. GROUNDING PROCEDURE / POWER SUPPLY

A Vulcan and its peripheral equipment must be properly grounded for safe, efficient operation of this system, which requires careful routing and connection of ground wires. Star Ground is the term used here to describe the method of focusing all of the system's ground wires by directing them all to same central tie point to an earth ground. Refer to accompanying Lockformer assembly drawings to assist in the correct arrangement of electrical connections for grounding. Figure # 1, which appears at the end of this section, is a Star Ground assembly drawing, showing suggested positioning for grounding wires.

Set up the grounding as follows:

a. Use the system's work table as the Star Ground tie point. Position the Star Ground lug as shown in figure # 1, near plasma supply and in close proximity to location of ground rod. NOTE! This ground rod must be installed according to the National Electrical Code Standards. See the Safety First section.

b. Install a copper ground rod into the floor (at least 8 ft. long and 1/2" in diameter) in close proximity to the STAR Ground, directly beneath it if possible. See figure 1 for recommended location options.

NOTE! To avoid tripping on cable, it is suggested that bright safety tape be put around ground rod and any cable that must be the space where people walk.

c. Connect the star ground to the ground rod with a stranded wire (minimum 2 AWG) This wire cannot be more than 4 feet long. Be sure each end of the wire is tightly secured to ground and rod, respectively.


PHOTO 1

d. Connect the green wire secured to machine gusset, to the Star Ground lug.

e. Clean any surfaces, to which either end of a ground wire will be connected, of any rust or grease, to ensure that all ground connections make the necessary contact with the component; then connect all grounding wires, making sure all connections are tight. Use wire (minimum of 8 AWG) for grounding straps.

**CAUTION**

**Do not ground to electrical conduit or pipes carrying gases or flammable liquids.**
**Use only recommended sizes of electrical cable.**

NOTE: Supply power to machine through a shielded main power line. Do not use any type of extension cord.

The Vulcan Plasma Unit has been prewired for voltage ordered.

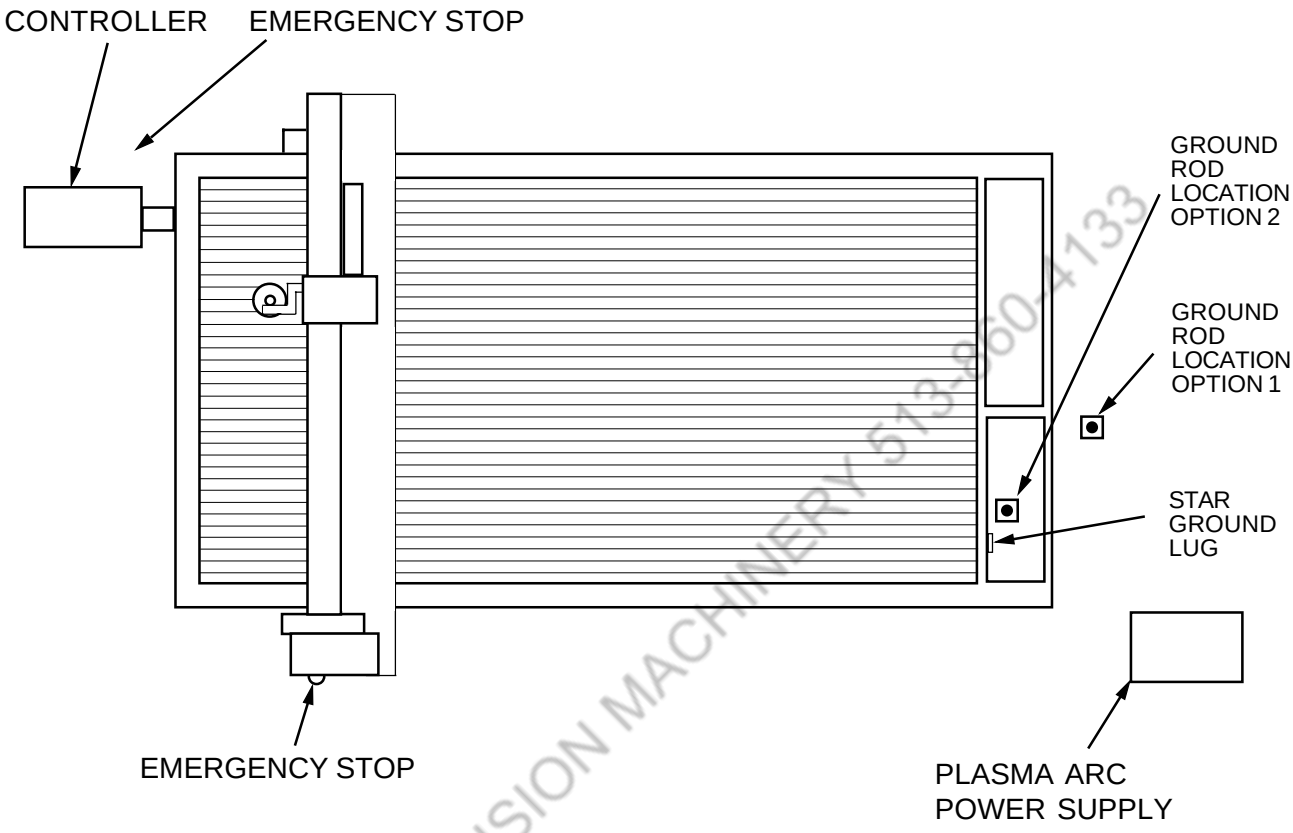



Figure 1

## 6. VENTILATION (see SAFETY, FIRST foreword for additional information!)

To remove the toxic gases that are generated when metal is vaporized, a suction system with minimum. 3000-3500 cfm. exhaust draw must be installed on the cutting table through the opening provided at the bottom on the end of table.

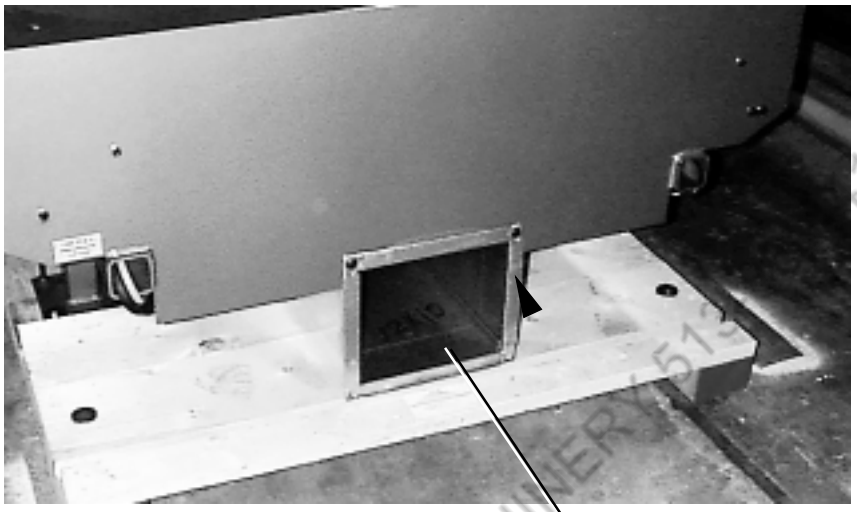


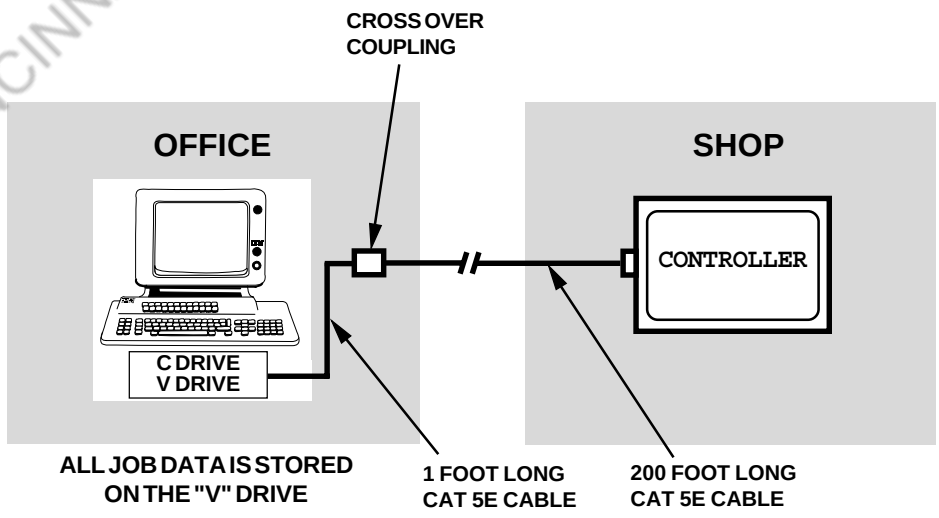
PHOTO 2

EXHAUST OPENING

## 7. CAT 5E CABLE SET UP PROCEDURE

Run a Category 5 Cable enclosed in 1" diameter conduit to the rear of the control console.

**WARNING** Do not pull on the cable ends. The cable ends are not covered under the warranty, If broken during installation.



# 8. 5.7/5.8 TOUCH SCREEN NETWORKING PROCEDURES

### Vulcan 5.7/5.8 TouchScreen Networking Procedures

Note: These configurations assume that the Vulcan Shop Computer and the Vulcan TouchScreen Computer are not being networked to a company-wide network. **The company's networking personnel must configure any networking to a company-wide network.**

These configurations assume that the Vulcan Shop Computer serves as the Vulcan data repository.

These procedures apply to Windows version **XP Professional or XP Home Edition** operating systems.

> **Before beginning verify the following:**

1. The NICs (network interface cards) are installed and the crossover cable connected between the Vulcan Shop Computer and the Vulcan TouchScreen Computer.
2. A keyboard and a mouse is connected to the TouchScreen using the splitter cable is contained in the LCD Monitor box.
3. The black protection block is connected to printer port 1.
4. The following software has been installed on the **TouchScreen** computer.
   A. Vulcan Software
   B. VS Control Program
   C. .NET Framework
5. The Vulcan Shop Computer is powered on and the Vulcan software has been loaded.

## From the Vulcan TouchScreen Computer

**To Set Computer Name and Workgroup Name**

1. Select Start and highlight **MY COMPUTER** from the selection pop-up window. Right click the mouse on **MY COMPUTER** and choose show on the desktop. This will place an icon for **MY COMPUTER** on your desktop.
2. Right click on the **MY COMPUTER** icon located on the desktop and choose properties. The System properties window will now appear.
3. Choose the Computer Name tab.
4. Click the Change button next to "rename this computer" or "join a domain." The Computer Name changes Window now appears.
5. In the computer name box, type **Vulcan-ts1.**
6. In the workgroup name box, type **VULCAN**.
7. Choose OK from the Welcome to the Vulcan workgroup window and OK from the prompt to restart computer window.
8. Restart your computer by selecting Start, Shutdown, and Restart.

## To Set IP Address and Subnet

1. Select Start and Control Panel from the pop-up menu.
2. Choose Network Connections.
3. Right click on Local Area Connection and choose properties. The Local Area Connection Properties window now appears.
4. From the Local Area Connection Properties window, highlight Internet Protocol and choose Properties.
5. Choose Use the following IP address.
6. Enter **192.168.0.2** for the IP address.
7. Enter **255.255.255.0** for the subnet mask.
8. Choose OK.
9. Close the Local Area connections window.
10. Close My Computer window.

## To Map Shared C Drive

1. Double click on **MY COMPUTER.**
2. From the **MY COMPUTER** window, choose **Tools** and **Map Network Drive**. The map network drive window now appears.
3. From the Drive list, use the drop down menu and choose **V**:
4. From the folder list, choose **\\Vulcan1\Vulcan1C**. If this choice is not available in the list, type **\\Vulcan\Vulcan1C**. \\Vulcan 1 represents the name of the computer serving as the Vulcan data repository. Vulcan1C represents the Share Name of the C Drive on the computer that is serving as the Vulcan data repository. If the computer name is not Vulcan 1 or the share name of the C drive is not Vulcan 1C, adjust what you type accordingly.
5. Choose Reconnect at Logon.
6. Choose Finish.
7. Close the **MY COMPUTER** Window.

***Note: In VSControl, the default for Vulcan data path is V: \ Engvul and the path for Vulcan Parts is V:\VulParts.***

## To Change Screen Resolution and Display Effects

1. Right mouse click anywhere on the desktop and choose Properties. The display properties window appears.
2. Choose the Settings tab.
3. Slide the Screen Resolution bar to 1024 X 768 pixels.
4. Choose OK.
5. Choose the Appearance tab.
6. Choose the Effects button.
7. **Deselect** Use the following method to smooth edges of screen fonts.
8. Choose Ok.
9. Choose Ok to close the Display Properties window.

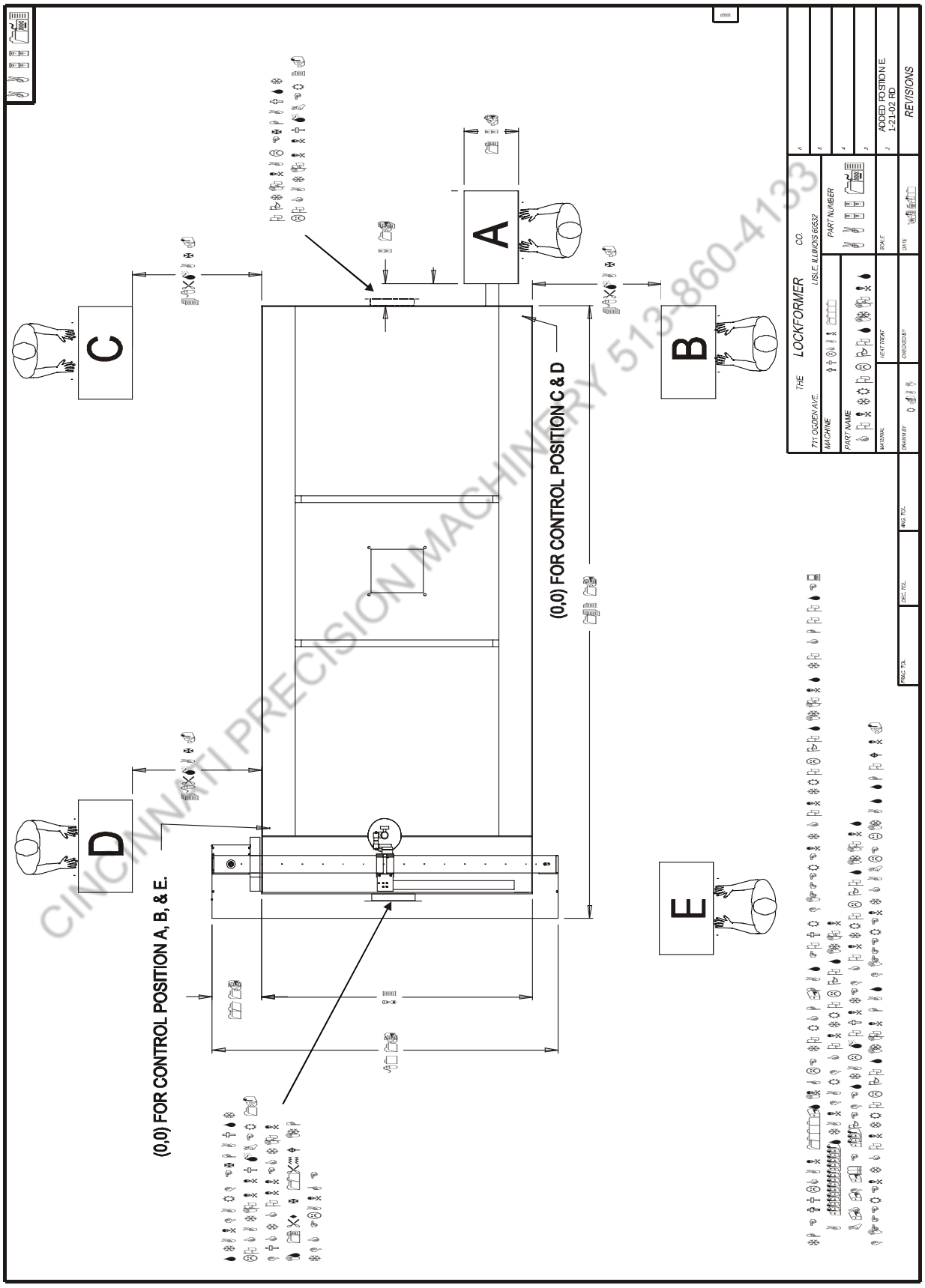
## To Change Vulcan User Number and Data Drive

Before proceeding, verify the Vulcan Software has been loaded onto the TouchScreen computer.

1. Double click on the Vulcan Icon. The VSII main program window appears.
2. Choose Program.
3. Choose Options,
4. Change the **Data** drive to **V**.
5. Change the **User** to **2**.
6. **Exit** the Vulcan program to save the changes.

# 9. OPTIONAL CONTROL POSITIONS

Option furnished is as specified on the original purchase agreement.



# SECTION 2

## OPERATION AND PROCEDURES

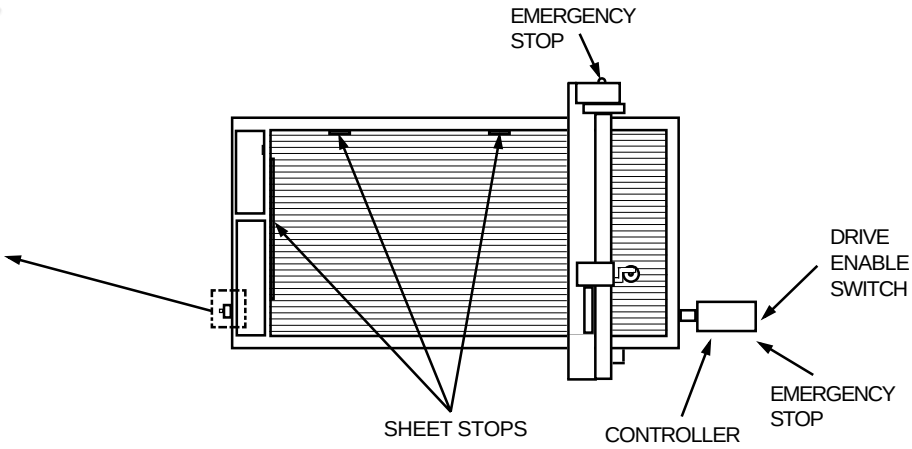
1. Quick Start Operational Procedure
2. Operation Details
3. Initial Torch/Head Set-Up Procedure
4. Emergency Stop
5. Plasma Unit Set-Up
6. Exhaust Activation

   Illustration 1 Top View
7. How to Operate a Vulcan Without a Touch Screen

# 1. QUICK START OPERATIONAL PROCEDURE

1. Start up the office computer.
2. Turn the power switch located on the rear of the V1000B to the ON position.
3. Start the exhaust system.
4. Make sure that the air compressor is on and that all valves are open.
5. Start up the plasma unit.
6. The VS controller touch screen should appear automatically. If it does not, double click on the VS control icon.
7. Touch the INITIALIZE prompt.
8. Be sure that both Emergency Stop switches are in the OFF (released) position.
9. Press the green DRIVE ENABLE button on the right side of the control enclosure.
10. Touch the DRIVE ON prompt.
11. Touch the HOME 0,0 prompt.
12. Select JOB prompt.
13. Type in the JOB NUMBER and press ENTER.
14. Type in the starting sheet number and press ENTER.
15. Change speed if necessary and press ENTER.
16. When the job number, sheet number, and speed are displayed correctly, press OK.
    NOTE: The computer screen will display the current sheet to be cut.
17. Place a sheet of metal onto the table against the sheet stops.
18. Touch the START CUT prompt.
19. The torch will now lower, cut all parts listed on the sheet, then move to the park location.
20. After the sheet has been completed the computer will automatically access the next sheet to be cut. Repeat the steps 17 through 20.

POWER SWITCH




**CAUTION** **ALL PERSONNEL MUST STAND CLEAR OF THE PATH OF THE CUTTING TORCH WHICH CAN TRAVERSE THE ENTIRE LENGTH OF THE TABLE(S).**

# 2. OPERATING PROCEDURE

Detailed screen by screen operating instructions are contained on the following pages:

## Auto Cut Tab

**Options available when the AUTO CUT TAB, is selected.**

In this window:

Auto Cut Buttons:

Initialize

Initialize Button **Loads a file, which tells the program what type of cutting table is present. It also initializes the control box (checks to see if it's on, etc.) located in the middle compartment at the auto home end of the table. The controller will disengage the servos if they were previously on. The head may be physically hand-positioned at any location desired.**

Drives On

Drives On Button **Initializes the servos. This feature checks if power is present to the servos, then engages them. (At this point the head CAN NOT be moved manually because the servos are engaged). Note: The E-Stops must be disengaged and the drive enable button pressed.**

Home 0,0

Home 0,0 Button **Moves the head to a table 0,0 point using two proximity switches. It then positions itself slightly off of the proximity switches to a point over the corner of the metal. The red crosshair cursor on the display indicates the position of the torch head.**

Auto Cut / Download Buttons:

**After the torch has gone to the Home position (0,0) you may download one of the following:**

Liner

Liner Button **Touch to download a LINER job. This will display an input keypad. Enter the number of the LINER to be cut.**

Part

Part Button **Touch to download a specific PART. This will display an input keypad. Enter the number of the PART to be cut.**

Blank

Blank Button **Touch to download a specific BLANK. This will display an input keypad. Enter the number of the BLANK to be cut.**

To download a BLANK, A Job must first be downloaded.

Job

Job Button Touch to download a specific JOB. This will display an input keypad. Enter the number of the JOB to be cut.

# Downloading A Liner Job

**How to enter and download a LINER JOB.**

Entering a Liner Job Number:

1. **Press the Liner Button. This will display the LINER NUMBER PAD.**
2. **Enter the number of the Liner Job you want to be cut and touch enter.**
3. **Enter the sheet number that you wish to start from and touch enter. The system will default to sheet number 1. For example you can restart a JOB at any sheet number by simply selecting that sheet number.**
4. **The Cut Speed information may be entered or it may be set in the Shop Setup /Insulation/ Thickness Tab. If entered in shop setup this number will be downloaded for you. You may always change the cut speed that is currently downloaded.**
5. **After the cut speed is set, touch the OK button to enter.**

*Liner Job Input Number Pad:*

# Downloading A Part

**How to enter and download a PART.**

Entering a Part Number:

1. **Touch the PART BUTTON. This will display the PART INPUT NUMBER PAD.**
2. **Enter the Part Number you wish to cut and press enter. This will display the default Cut Speed.**
3. **Enter the CUT SPEED information for the part. The CUT SPEED is NOT downloaded when Cutting Vulcan Parts.**
4. **After you set the cut speed touch the OK button to enter.**

*Part Input Number Pad:*

# Downloading A Blank

**How to enter and download a BLANK.**

Entering a Blank Number:

To download a BLANK, A Job must first be downloaded.

1. **Touch the BLANK BUTTON. This will display the BLANK INPUT NUMBER PAD.**
2. **Enter the number of the Blank you wish to cut and touch enter.**
3. **The Cut Speed information may be entered or it may be set in the Shop Setup /Metal/ Gauge Tab. If entered in the shop setup this number will be downloaded for you. You may always change the cut speed that is downloaded.**
4. **After the cut speed is set touch enter.**
5. **Touch OK to continue.**

*Blank Input Number Pad:*

# Downloading A Job

**How to enter and download a JOB.**

Entering a Job Number:

1. **Press the Job Button. This will display the JOB NUMBER PAD.**
2. **Enter the Job Number you wish to cut and touch enter.**
3. **Enter the sheet number that you want to start from and touch enter. The system will default to sheet number 1. For example you can restart a JOB at any sheet number by simply selecting that sheet number.**
4. **The Cut Speed information may be entered or it may be set in the Shop Setup /Metal/ Gauge Tab. If entered in the shop setup this number will be downloaded for you. You may always change the cut speed that is downloaded.**
5. **After you set the cut speed press the OK button to enter.**

*Job Input Number Pad:*

# After A Job Has Been Downloaded

**Available options after the Job is downloaded.**

In this window:

Auto Cut Buttons:

| | |
|---|---|
| Exit | Exit Button **exits and discards the Job data that has been downloaded.** |
| Torch | Torch Down Button **moves the torch head down or up.** Torch |
| Start Cut | Start Cut Button **starts the cut process. The torch is on and ignited.** |
| Sheet | Sheet Up Button **shows the next sheet in the job.** |
| Sheet | Sheet Down Button **shows the previous sheet in the job.** |
| Dry Run | Dry Run Button **shows the cut path. The torch is moving but it is** NOT **ignited.** |
| Speed | Speed Button **allows the speed to be changed at any time.** |

# After Start Cut Has been Pressed

**Options available after downloading a JOB and touching the START CUT button.**

In this window:

Auto Cut Buttons:


Pause Button **pauses the cut.**

***While the torch is cutting you may change the speed up or down on the fly by using these two buttons.***


Speed Up Button **increases your cut speed by 3% each time it is touched.**

If you wish to change the percentage to increase your speed, please call customer service @ 1-800-441-2840


Speed Down Button **decreases your cut speed by 3% each time it is touched.**

If you wish to change the percentage to decrease your speed, please call customer service @ 1-800-441-2840

Auto Cut Buttons After You Pause:

**After a job has been started, then paused, the next two buttons will be displayed.**


Forward Path Button **moves forward in the cut path.**


Rewind Path Button **reverses in the cut path.**

# Manual Tab

**Options available when the MANUAL MODE, is selected.**

In this window:

Manual Cut Buttons:

Torch Down Button **moves the torch head up or down.** Torch

Go-To Button **Relative mode will ask for X and Y. The numbers entered for the new point, will be added or subtracted from the current position. For example: if the location now is X=10 and Y=10 and a move of X=2 and Y=4, is entered the new location will be X=12, Y=14.**

**Absolute mode will ask for X and Y. The numbers entered will make the new point, the absolute X and Y value of the drawing, no matter where the torch is currently positioned. For example: if the location now is X=10 and Y=10 and a move of X=2 and Y=4 is entered, the new location will be X=2, Y=4.**

Rip Cut Button **Relative mode will ask for X and Y. The numbers entered for the new point, will be added or subtracted from the current position. For example: if the location now is X=10 and Y=10 and a move of X=2 and Y=4 is entered, the new location will be X=12, Y=14.**

**Absolute mode will ask for X and Y. The numbers entered will make the new point the absolute X and Y value of the drawing, no matter where the torch is currently positioned. For example: if the location now is X=10 and Y=10 and a move of X=2 and Y=4, is entered, the new location will be X=2 , Y=4.**

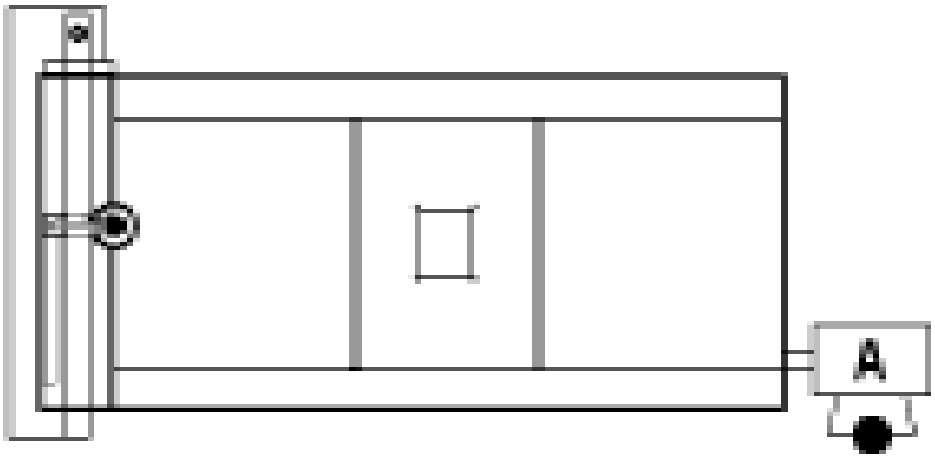
After entering a Go-To or a Rip Cut you must touch the Start button to begin the move or touch Exit.

*Manual Move Buttons:*

**Touch a move button to start, touch again to stop or touch pause.**

**The illustration shows is how the move buttons are orientated to the controller in the** A **position at the right end of the table.**

*Top View of Table:*



# Display Tab

**Options available when the DISPLAY TAB, is selected.**

In this window:

Display Buttons:

Sheet ↑ Sheet Up Button **Shows the next sheet in the job.**

Sheet ↓ Sheet Down Button **Shows the previous sheet in the job.**

Search Search Button **Lets you to find a specific Blank or Piece.**

Blank # Blank # Button **Shows the Blank number of the blanks on the sheet being viewed.**

**The controller saves the last way the blanks were viewed.**

Piece # Piece # Button **Shows the Piece number of the blanks on the sheet being viewed.**

**The controller saves the last way the blanks were viewed.**

Cut # Cut # Button **Shows the Cut number of the blanks on the sheet being viewed.**

**The controller saves the last way the blanks were viewed.**

Label **Label Button** This feature is not currently available

# Options Tab

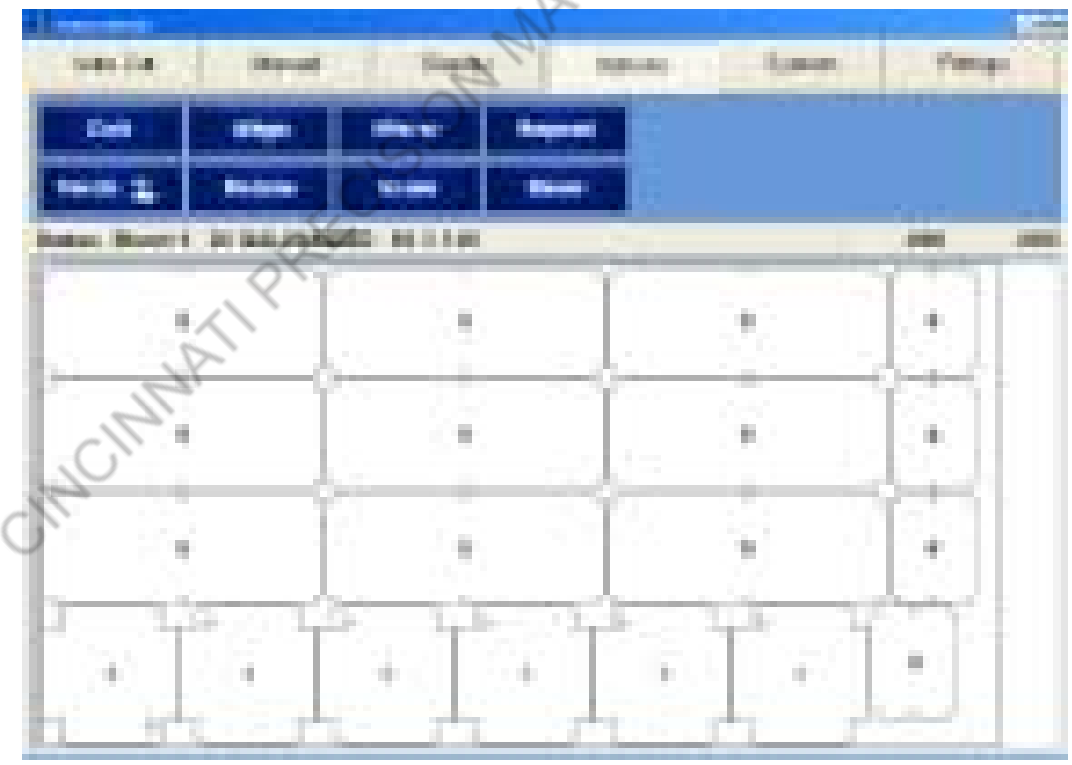
**These features are not currently available.**

In this window:

Options Buttons:

| | |
|---|---|
| Exit | Exit Button **exits and discards the Job data that has been downloaded.** |
| Torch | Torch Down Button **moves the torch head up or down.** Torch |
| Align | Align Button **is not currently available.** |
| Rotate | Rotate Button **is not currently available.** |
| Mirror | Mirror Button **is not currently available.** |
| Scale | Scale Button **is not currently available.** |
| Repeat | Repeat Button **is not currently available.** |
| Skew | Skew Button **is not currently available.** |

Options Screen:



## Fittings Tab

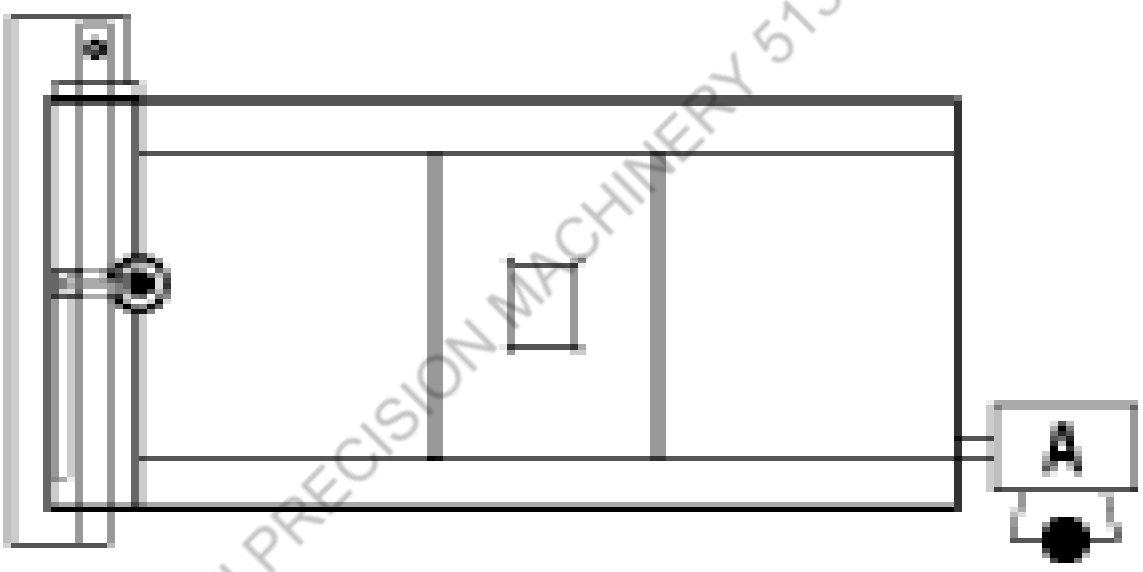
**When pressed the controller program will minimize to the tool bar. This allows access to the desktop. From the desktop the Vulcan program can be accessed by clicking on the icon. At this point you may enter a fitting or make changes to a job or part.**

## Table View

**This page displays the MANUAL MOVE BUTTONS and their orientation to the table.**

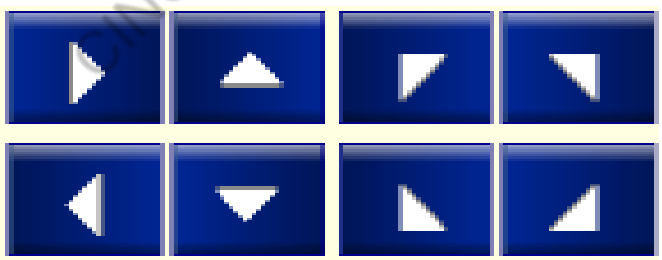
In this window:

***Top View of Table:***




This orientation is shown with the controller in the **A** position at the right end of the table.

*Manual Move Buttons:*



## 3. INITIAL TORCH/HEAD SETUP PROCEDURE

The distance of the torch to the material is critical and must be checked prior to cutting the job and adjusted if necessary. The exact distance may vary according to material type and thickness. The Hypertherm operations manual provides the correct setting.

a. Jog the torch head to the setup location. SEE ILLUSTRATION #1. (At the rear of this section)

b. Lower the torch using the HEAD UP/DOWN key.

c. Loosen the two set screws located on the shield collar.

d. Loosen the two screws located on the Height Adjustment Knob assembly. The shield will now set flat on the work piece.

e. To lower or raise the torch in relation to the material, turn the height adjustment knob until the correct height is achieved, then tighten the two set screws.



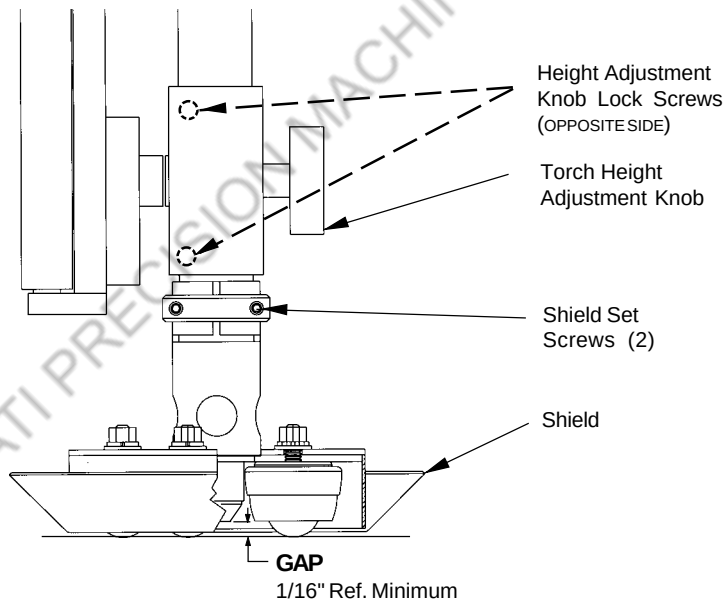



ILLUSTRATION 2

*NOTE: Torch to work distance should never be less than 1/16"*
*Torch body should be square and plumb to workpiece.*

After the torch height setup is complete, raise the torch by pressing HEAD UP/DOWN key. To relocate at (0,0) press the GO HOME key.

## 4. EMERGENCY STOP

Press an Emergency Stop push button if any problems or irregularities occur. These buttons (one located on the side of the controller, and one located on the far side of the bridge) will disable all operations of the Vulcan Cutting Machine.

Pressing the Emergency Stop push buttons will cause the following:


all power to be removed from the drives immediately
all outputs to be disabled (plasma torch will be turned off)

To restart the machine after an Emergency Stop shutdown:

release the Emergency Stop push button
press the DRIVES ON key
press the AUTO ZERO key to home the machine to (0,0)



## 5. PLASMA UNIT SETUP

**NOTE: The gas (air) supply should be clean, dry, and free of oil to ensure maximum consumable life.**

A three stage filter assembly is recommended to filter the gas (air). CONTACT LOCKFORMER SERVICE DEPARTMENT FOR DETAILS.

Before applying power to the Plasma unit, verify that the input gas (air) pressure is set according to the figure as shown in the Hypertherm operations manual.

After connecting power to the unit, set the main switch to the ON position.

Set switch on plasma unit to TEST to allow gas to flow through the torch.

Adjust the gas pressure regulator on the Hypertherm unit for the setting specified in the Hypertherm manual.

**NOTE**: For systems using 50 ft. long lead sets add 5 psi to the figure specified in the manual.

Adjust the amperage knob on the plasma unit to the setting specified in the Hypertherm manual.

## 6. EXHAUST ACTIVATION

**Do not run the Vulcan Plasma Cutter without the appropriate ventilation system turned on.**

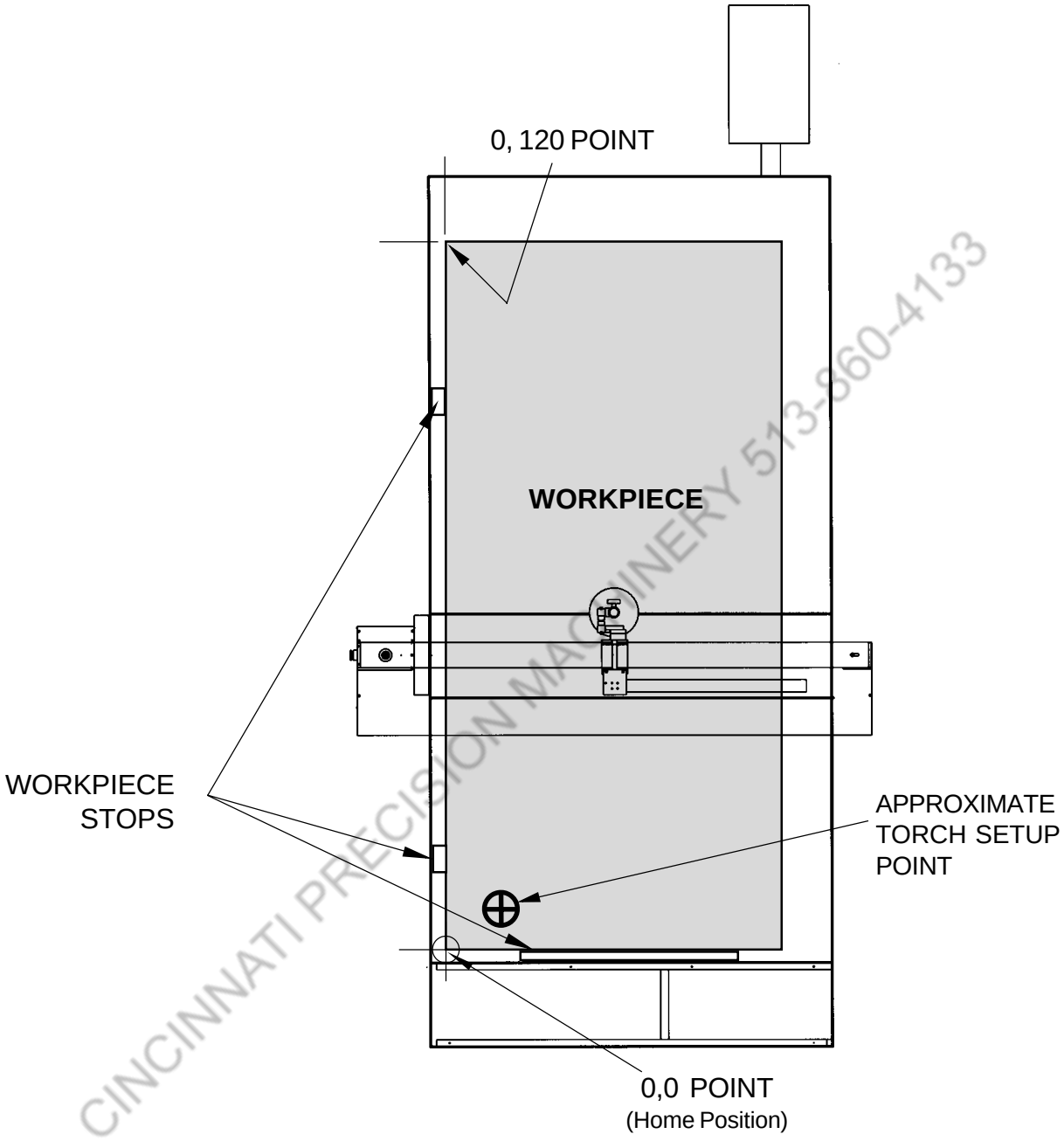





ILLUSTRATION 1

# 7. HOW TO OPERATE A VULCAN WITHOUT A TOUCH SCREEN

**3 Items Needed**

**Computer:** The best computer to use is your office computer, but any computer will work as long as it has Windows XP and Vulcan and shop data loaded.

**Vulcan CD:** The CD is needed to load the VSControl and .Net Framework.

**9 Pin Serial Cable (6 - 10'):** This cable will be used to connect the temporary computer to the Vulcan cutting table.

## Instructions

1. Move computer to within 6 feet of control box.
2. Connect the 9 pin cable between the serial port -1 on the back of the computer to the 9 pin female connector inside the Vulcan control box.
3. Turn the computer on.
4. Load VSControl.
   a. Place the Vulcan CD in the CD Drive. The Vulcan install menu will pop-up automatically.
   b. Click on ***VSControl Program*** - select ***Next*** from the welcome screen- select ***Full Install*** and ***Next*** - select ***Table Model*** - select ***Next*** to start installation - select ***Finish*** to complete the installation.
5. Load .Net Framework. After loading VSControl, the computer will return automatically to the Vulcan main screen. Click on ***Install .Net Frame work.***
   a. Select ***Yes*** to install. Net Framework.
   b. After loading is complete, click on ***Exit*** and remove CD from drive.
6. Reboot computer.
7. The VSControl should appear automatically. If it doesn't, just double click on the VSControl icon.
   a. Click on ***Initialize.***
   b. Press the green enable button.
   c. Click ***Drives on.***
   d. Click ***Home 0, 0***

## 7. HOW TO OPERATE A VULCAN WITHOUT A TOUCH SCREEN (CONT.)

8. Click on ***System*** from the VSControl.
    a. Change ***Job Data Path*** to **c:\ENGVUL**
    b. Change ***Parts Data Path*** to **c:\VULPARTS**
9. Click on ***Auto Cut.***
10. You are now ready to download a job and cut.

# SECTION 3

## MAINTENANCE

1. Safety
2. Inspection and Upkeep
3. Lubrication
4. Reinstallation and Assembly of the Vulcan Torch Head
5. Torch Height Adjustment
6. Torch Lifter Adjustment

**1. SAFETY** - Shut Off main power disconnect to cut off power from Vulcan (including Plasma Unit) before attempting to work on electrical circuits or performing any cleaning of machine that involves reaching in between parts that can move!

Do not touch electrically hot parts! Keep cables dry, free of oil and grease, and protected at all times from damage by hot metal and sparks. Do not use cable with worn or damaged insulation; repair or replace it immediately. Keep equipment clean, in good condition, and free of oil, grease and other combustibles.

DO NOT use equipment which is not functioning properly. Perform all required repairs and test the machine to ensure that it is in proper operating condition before resuming production.

**2. INSPECTION AND UPKEEP** - Proper lubrication (see Table below), along with a clean machine and work area are the 2 most important factors for trouble-free operation. Remove any accumulation of debris before the start of an 8 hour workday. Inspect and maintain the Vulcan as often as required. Past experience has shown these to be the best guidelines to follow:

a) Clean accumulated dirt from all areas.

b) Tighten loose hardware, including all gas and electrical connections; loose power connections can overheat during use of machine.

c) Replace any power cables and connectors that get worn or damaged at once! Check for frayed, cracked insulation, particularly in areas where conductors enter equipment.

d) Clean all components, particularly electrical parts where metallic particles can cause short circuits; blow out Torch Ball casters as explained later.

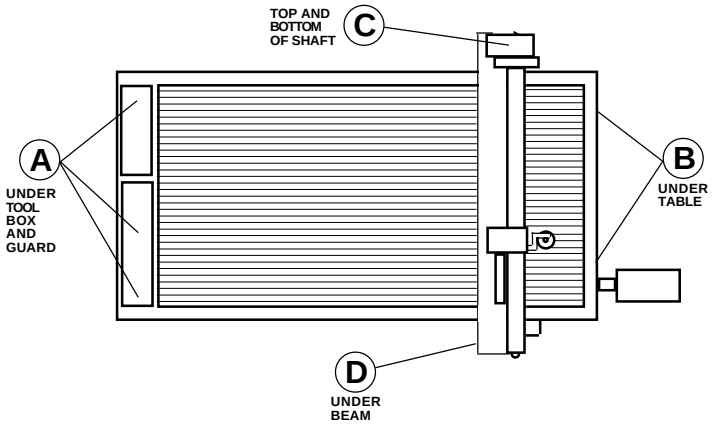
Keep rollers, and rail support rod clean to allow smooth motion of moving parts, WHICH IS ESSENTIAL FOR THIS MACHINE! Use a wire brush to remove dirt and debris from such areas.

**3. LUBRICATION** - Lubrication and the time periods when required are presented in the Lubrication Table below. Where TRIBOL 878 is designated as a lubricant, use only a thin film, then let it dry to prevent dust pickup.

| Item: | Time Interval: | Operation: | Lubricant: |
|---|---|---|---|
| Rail and Support Rod | Every 8 Hours | Clean with Galv-Off | TRIBOL 878 |
| Carriage Wheels | Every 8 Hours | Clean with Galv-Off | TRIBOL 878 |
| Grease Fittings | Every 6 Months | Apply Grease | TRIBOL 777-1 |

**GREASE FITTING LOCATIONS**

| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| A | 3 | "Y" AXIS DRIVE SHAFT PILLOW BLOCKS |
| B | 2 | "Y" AXIS IDLER PULLEYS |
| C | 2 | "X" AXIS DRIVE SHAFT |
| D | 1 | "X" AXIS IDLER PULLEY |




The next subsection explains complete resetting of torch head if it has been disturbed or installation of new head if ever needed. This procedure is not routine maintenance.

## 4. REINSTALLATION AND ASSEMBLY OF THE VULCAN TORCH HEAD

Regular maintenance of the torch head includes resetting the torch height for the stock being cut, and cleaning; as described at the end of this section.

If a torch head is ever to be removed and a new one installed, or if a torch head has to be reset, use the following procedure:

1. Disconnect primary power leads and gas tanks before beginning actual removal of torch head from main machine.

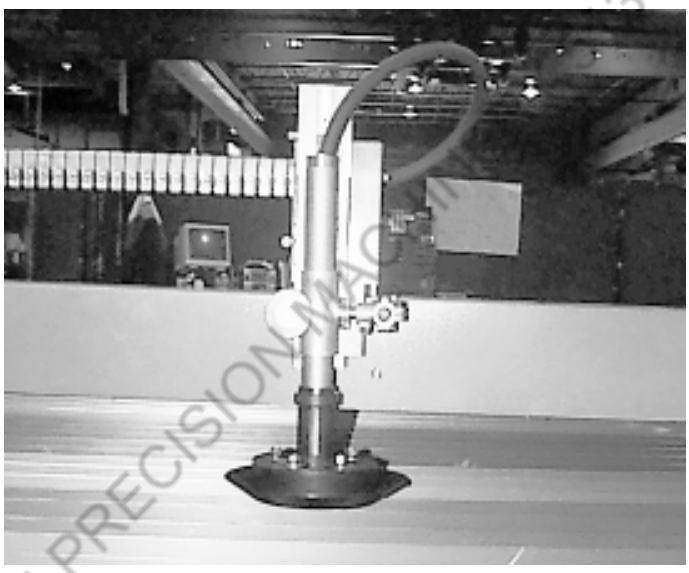


PHOTO 1

Complete head assembly in place on bracket.

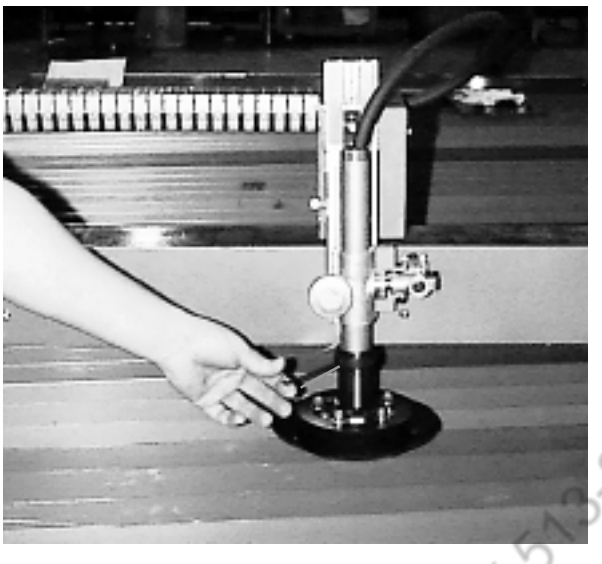


PHOTO 2

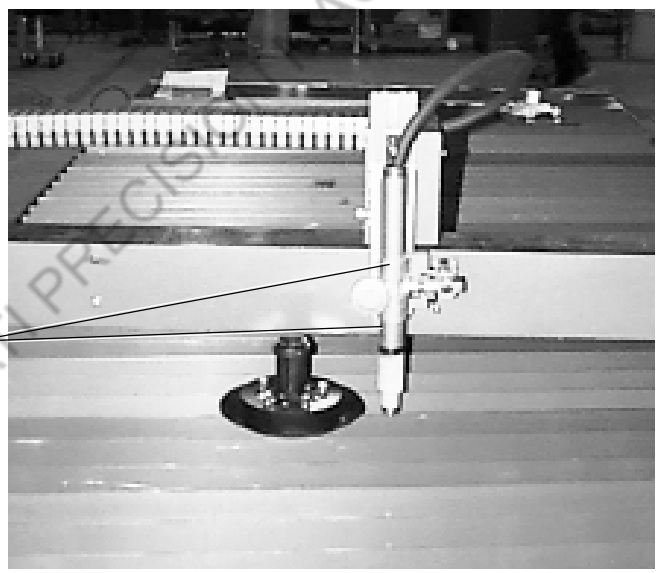



PHOTO 3



2. Loosen the floating head's fastening screws as shown in photo 2, then remove the lower assembly from the torch head as shown in Photo 3.

3. Carefully remove the torch by removing the mounting screws located on the side of the torch assembly as shown in photo 3.

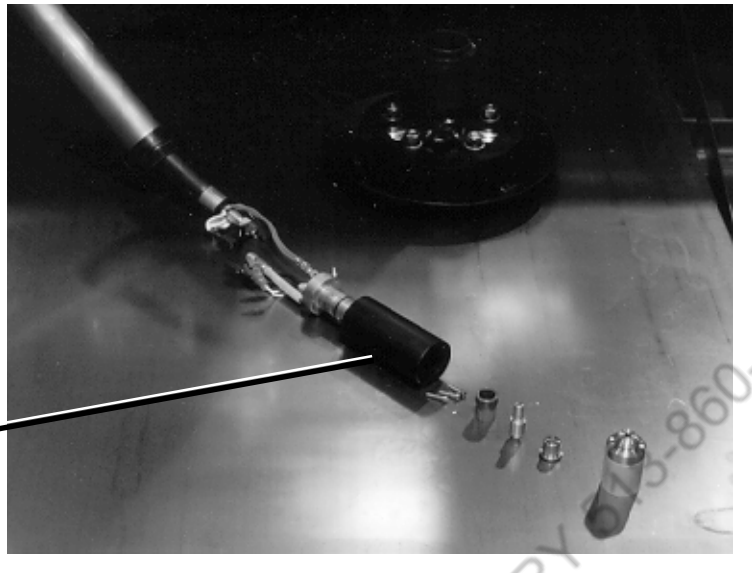



PHOTO 4

4. Remove the torch assembly from the holder casting. Now remove the torch body by loosening the threaded collar. Unscrew housing to expose wires. ( See photo 4)



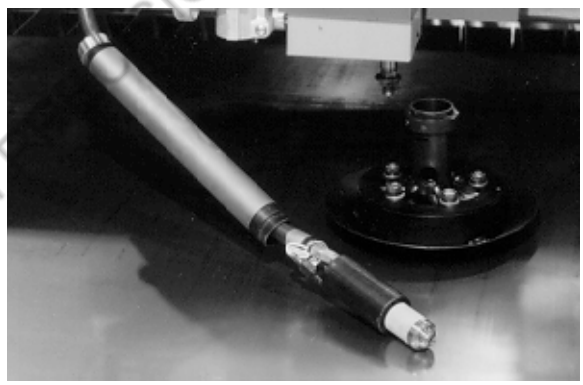


PHOTO 5

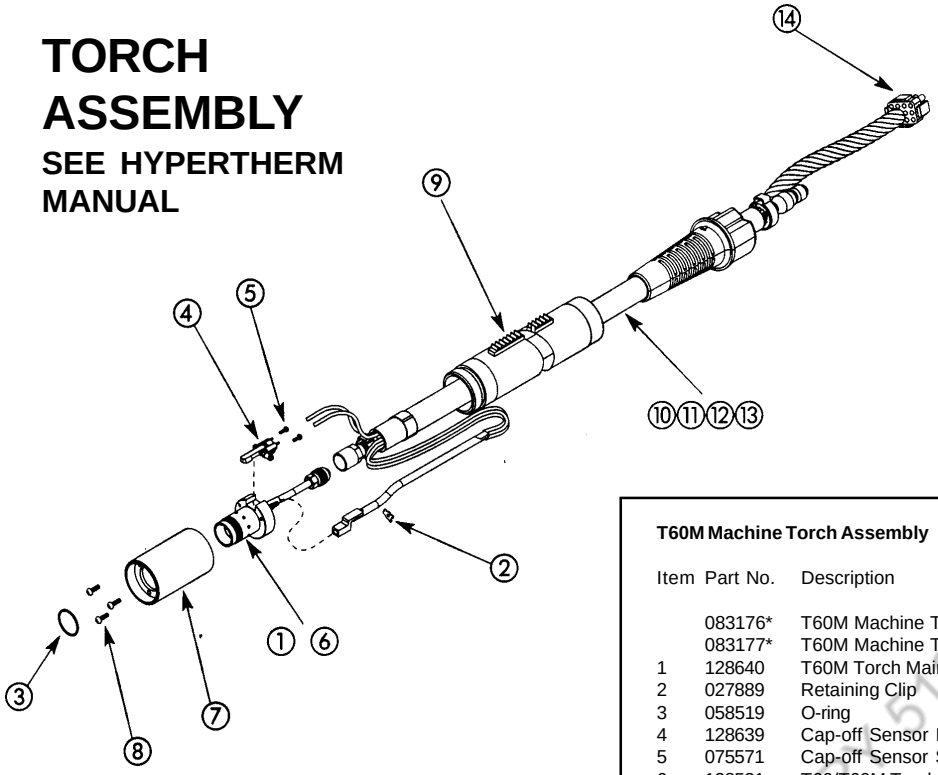
5. Use a 3/32" hex key to remove 3 socket head screws and carefully disconnect the two fittings (See photo 5) as follows:

a. Remove black shrink wrap tubing.
b. Remove screw (phillips head) holding terminal.
c. Using two line wrenches (5/16" and 7/16") disconnect the tubing fittings.

6. Perform the steps above in reverse to install a new Torch head.

# TORCH ASSEMBLY

**SEE HYPERTHERM MANUAL**




**T60M Machine Torch Assembly**

| Item | Part No. | Description |
|---|---|---|
| | 083176* | T60M Machine Torch Assembly with 35 ft (10.7 m) Lead |
| | 083177* | T60M Machine Torch Assembly with 50 ft (1 5.2 m) Lead |
| 1 | 128640 | T60M Torch Main Body Replacement Kit |
| 2 | 027889 | Retaining Clip |
| 3 | 058519 | O-ring |
| 4 | 128639 | Cap-off Sensor Replacement Kit |
| 5 | 075571 | Cap-off Sensor Screws |
| 6 | 128521 | T60/T60M Torch Head Repair Kit |
| 7 | 128643 | Torch Mounting Sleeve Replacement Kit |
| 8 | 075004 | Torch Mounting Screws |
| 9 | 128710 | Torch Positioning Sleeve |
| 10 | 128634 | 15 ft (4.6 m) Torch Lead Replacement Kit |
| 11 | 128633 | 25 ft (7.6 m) Torch Lead Replacement Kit |
| 1 2 | 128635 | 35 ft (10.7 m) Torch Lead Replacement Kit |
| 1 3 | 128641 | 50 ft (15.2 m) Torch Lead Replacement Kit |
| 1 4 | 128638 | ETR Repair Kit (Regional Repair Centers only) |
| | 128645 | Torch Mounting Kit (for reassembly after installation) |



**5. Torch Height Adjustment** - In case a Torch Assembly's setting is ever disturbed and needs resetting, or if a new Torch Head must be installed, The Torch Head's ball casters and Torch Nozzle must be set correctly in relation to each other and to the sheets the Torch will cut.

To adjust the Torch to the correct settings, place a test sheet on the table beneath the Torch Head, loosen the two brass Torch Holder Screws (at right of Torch), loosen the two set screws (near bottom of Torch Assembly, just above the top of the black Head Shield) and let the Head Assembly slip down all the way, so it rests on the sheet (Photo 6).

Looking under the Torch, use the torch height adjustment knob to set the bottom of the Torch Nozzle to 1/16" minimum above the sheet, and retighten the set screws. The Ball Casters and Torch Nozzle are now in correct relation to each other, approximately 1/16" apart.

To set the entire Torch Assembly at the correct height, use the Knob to raise the Assembly up so all 5 ball casters just barely touch the sheet (previously they had rested all the way down). Now, retighten the brass Torch Holder Screws. NOTE: The head must be square and perpendicular to panel, with all 5 casters touching it after resetting. If it is not square, reset the Torch by using the vertical pivoting adjusting screws behind it.

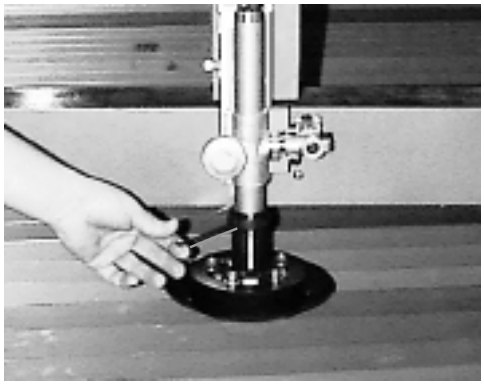


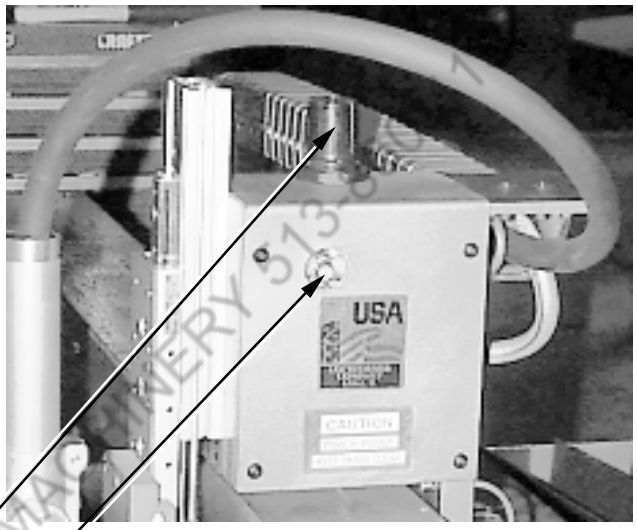
PHOTO 6

Torch height setting of casters resting on sheet is only a starting setting; see Section 2 for more information on setting torch properly for different thicknesses of stock.

Whenever drastically changing thickness of stock to be cut (by 1/8" or more), the height setting of the bottom of the torch must be reset. Raise the torch assembly, if necessary to allow for thicker stock. It is unnecessary to change the torch height for thinner stock; then slide a test sheet of the new thickness under torch. Use knob to raise or lower torch as needed, so ball casters barely rest on new sheet, as explained above; then retighten its fastening screws.

## 6. Torch Lifter Adjustment

The torch lifter has two adjustments which are located on the lifter assembly cover as shown on the accompanying photo. The counterbalance knob on top controls the amount of weight that the torch imparts upon the workpiece. Greater force is used when cutting thin materials that have a tendency to be uneven. The speed adjustment located on the side regulates the speed which the torch travels. This adjustment should be set so that no shock occurs at the end of the torch's travel. Remember to lock these adjustments after settings are made.




TORCH LIFTER ADJUSTMENTS



## IMPORTANT!

Beside the normal service required for the plasma cutting torch in its Instructions, the ball casters of the torch head must be cleaned after every three or four panels, to prevent dust buildup and resultant clogging.

To clean the ball casters, raise the torch to its maximum height and shut off machine power supply. Then manually push each ball up into its caster housing, at the same time blowing the dust out with compressed air. Check for cleanliness by spinning each ball. If it does not spin freely, repeat the above operation until it does. Be certain to reset torch to its proper height.

## CAUTION

Use safety glasses and a #M# 08500 nontoxic particle mask or its equivalent when blowing the dust out of the ball caster.

# SECTION 4

## ASSEMBLY DRAWINGS AND PARTS LISTS

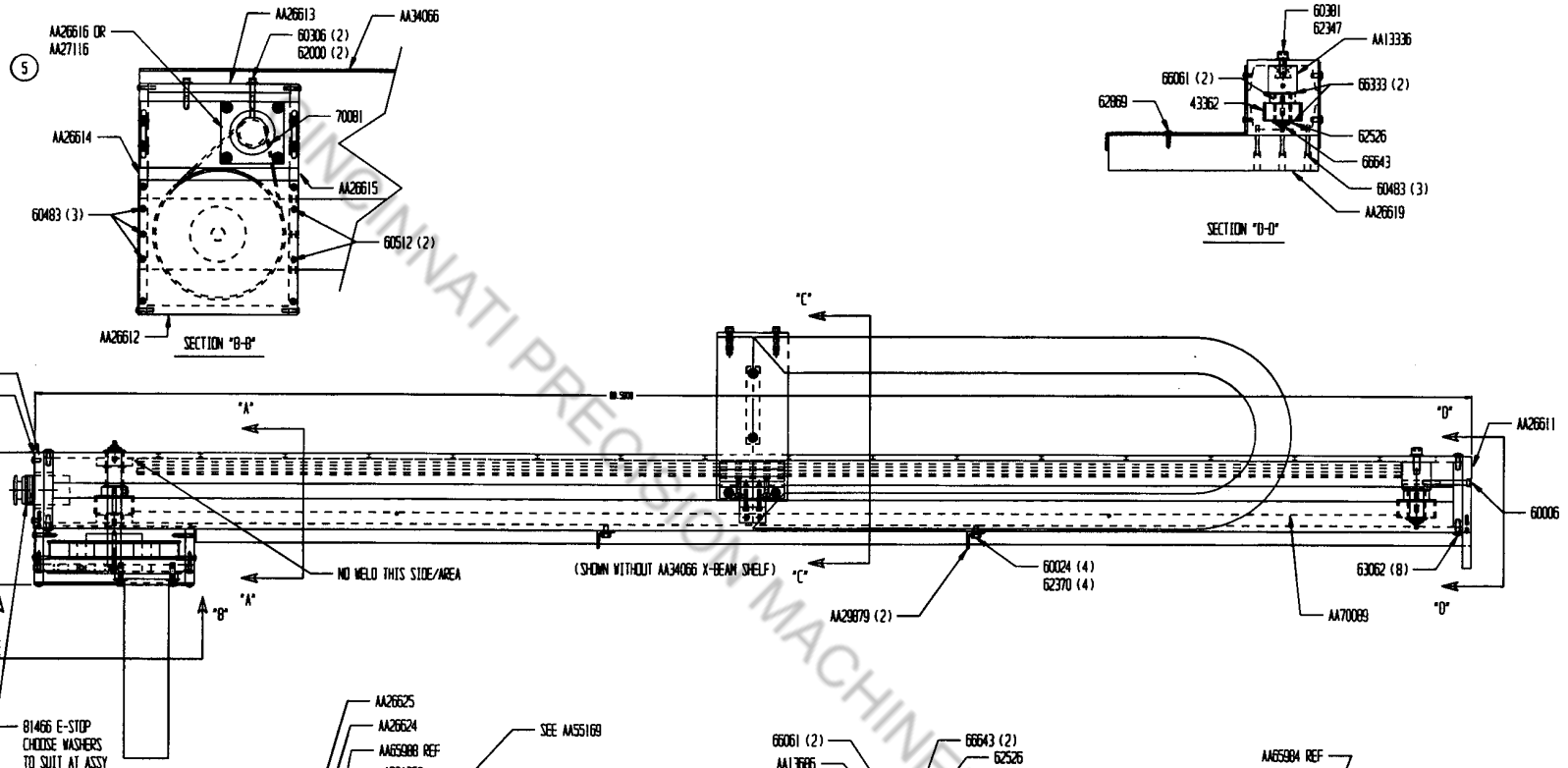
Assembly Drawings:

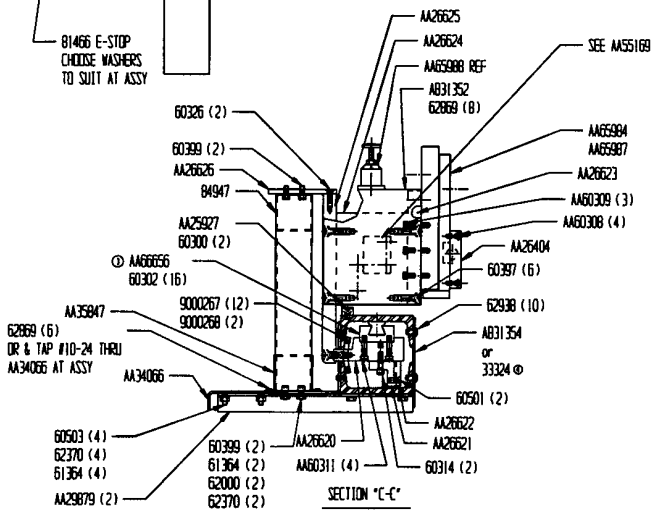
| | |
|---|---|
| Sub Assembly X Beam | AA55143 |
| General Assembly | AA55144 |
| Pneumatic Connections | AA55169 |
| Sub Assembly Y Axis | AA55335 |
| X and Y Prox. Cables | AA80504 / AA80505 |
| Power In Cable | AA85482 |
| Univ. Power Out Cable | AA85483 |
| Cable X Axis | AA85484 |
| Cable Y Axis | AA85485 |
| Plasma Cable | AA85486 |
| Torch Lifter Cable | AA85487 |
| E-Stop, X-Beam Cable | AA85489 |
| E- Stop / Drive Enable Cable | AA85490 |
| Control and Drive System Electricals A, B, and C | |

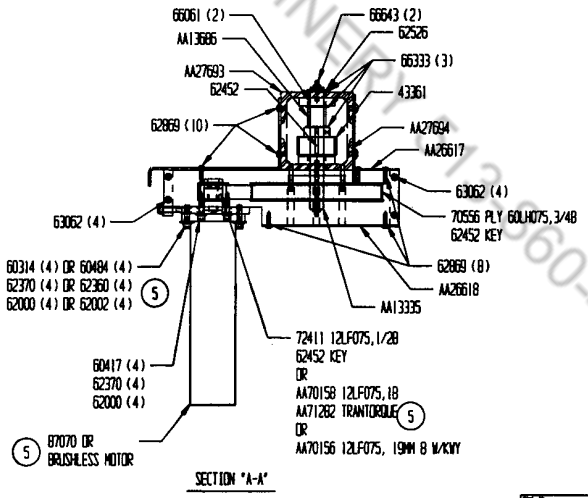
Parts Lists (Bills of Material)

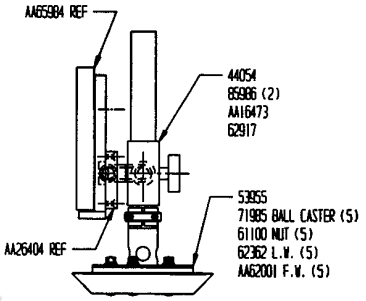
648508.....Y Axis
648608.....X Beam
649107.....Electricals

AA55143

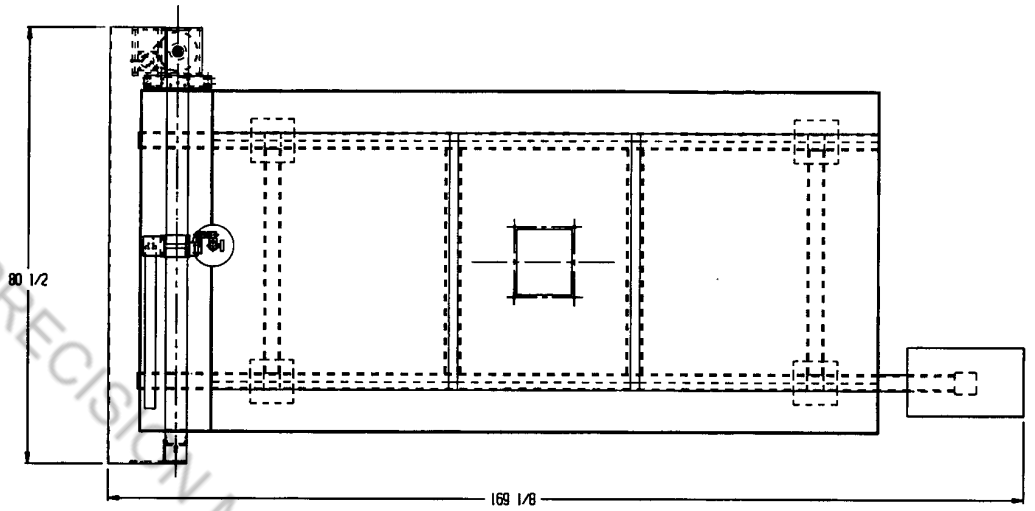


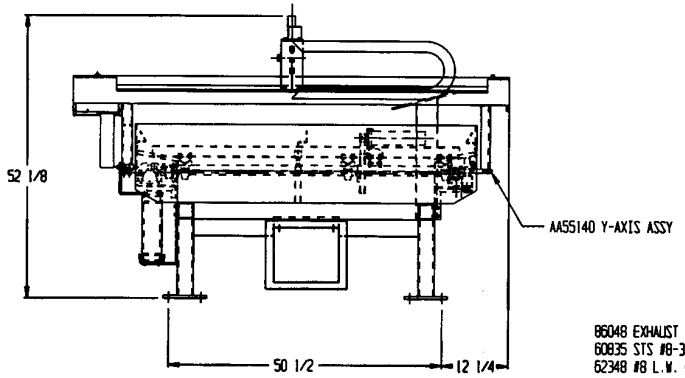



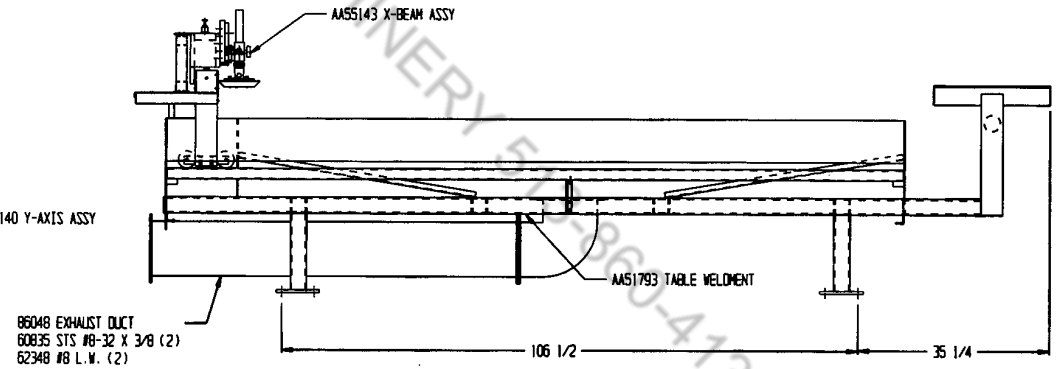




| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 GOODEN AVE. LISLE, ILLINOIS 60532 | | | |
| MACHINE V1000, V10008 | PART NUMBER | | |
| PART NAME SUB-ASSY "X" BEAM | | AA55143 | |
| MATERIAL | DRAWN BY R.DAI | DATE 2-11-00 | REVISIONS |



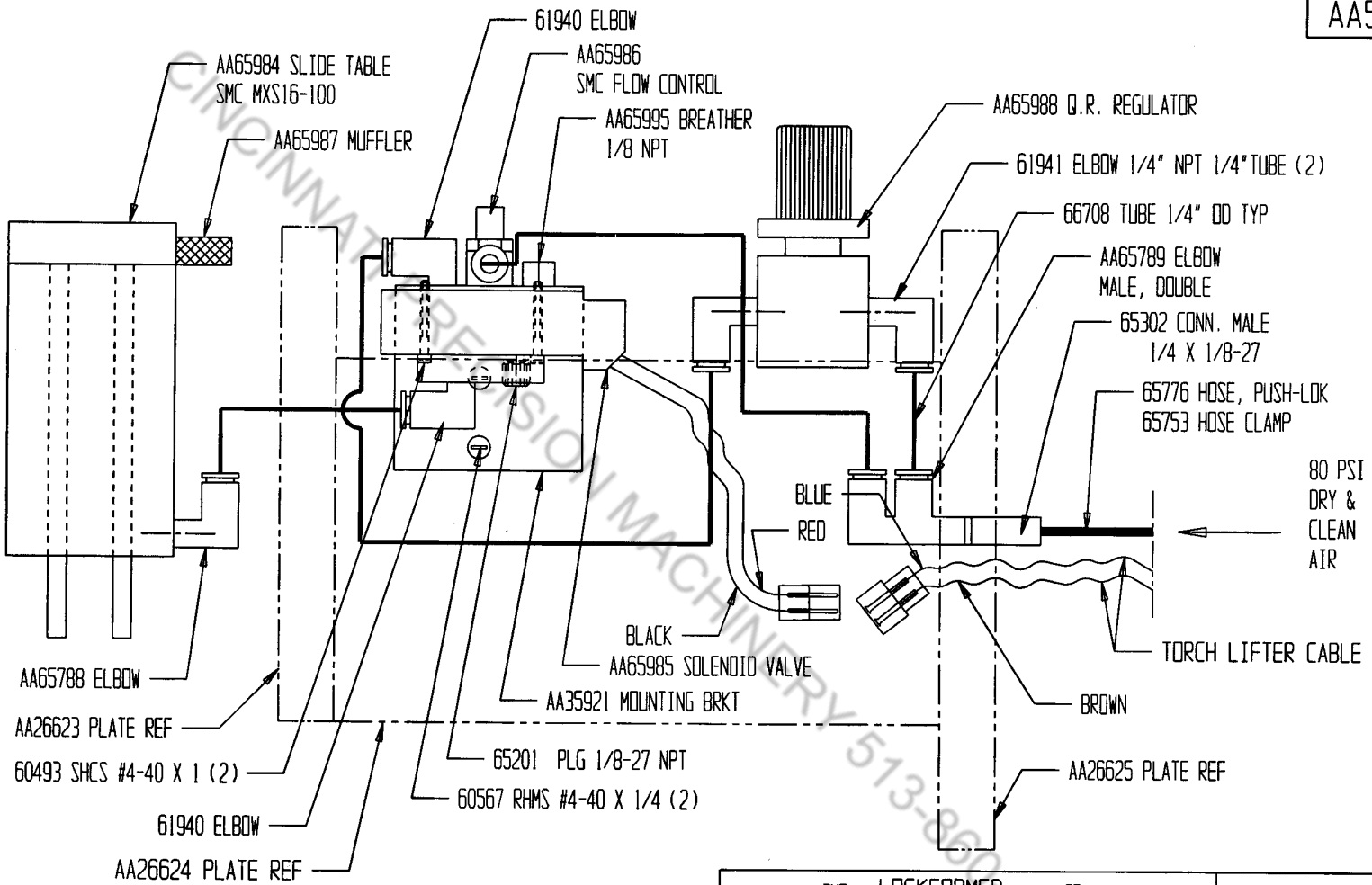




| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | |
| MACHINE VULCAN 1000 | | PART NUMBER AA55144 | |
| PART NAME GENERAL ASSEMBLY | | | |
| DRAWN R.DAL | DESIGNED | DATE 2-11-00 | REVISIONS |

FRAC. DEC. ±1/16 ±.002/-.000 ANG.

AA55169





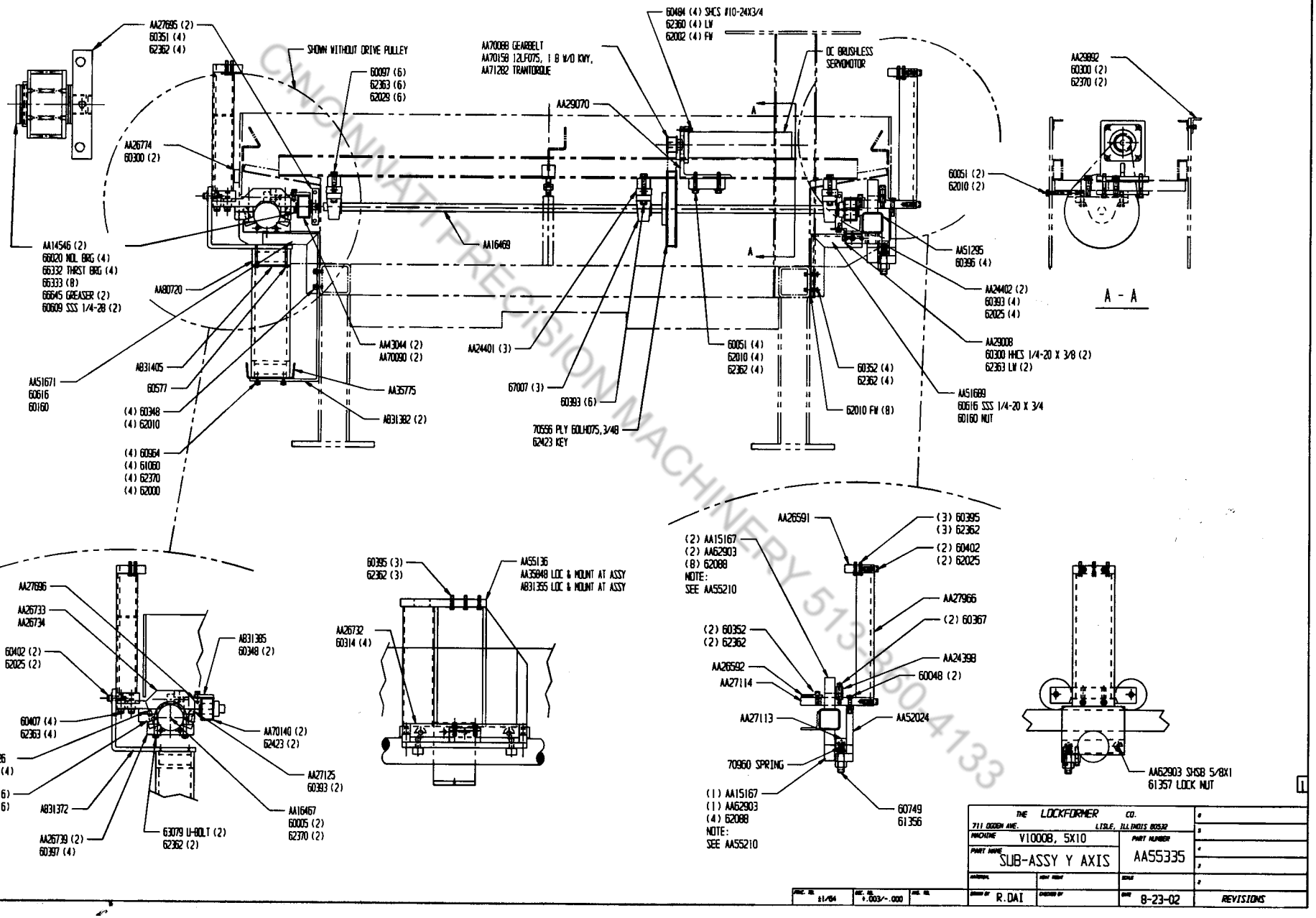

1

NOTE:
1. CONNECT RED WIRE TO BLUE WIRE, AND BLACK WIRE TO BROWN WIRE.
2. USE REGULATOR TO ADJUST TORCH'S DOWNWARD SPEED. USE FLOW CONTROL TO ADJUST TORCH'S UPWARD SPEED.
3. MOUNT BRACKET TO AA26624 PLATE FIRST BEFORE MOUNTING THE SOLENOID VALVE TO THE BRACKET.

| | | |
|---|---|---|
| THE LOCKFORMER CO. | | 6 |
| 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | 5 |
| MACHINE V1000 | PART NUMBER AA55169 | 4 |
| PART NAME PNEUMATIC CONNECTIONS | | 3 |
| MATL / HEAT TREAT / SCALE | | 2 |
| DRAWN BY R.DAI / CHECKED BY / DATE 9-20-00 | | REVISIONS |

FRAC. TOL ±1/64 | DEC. TOL +.003/-.000 | ANG. TOL

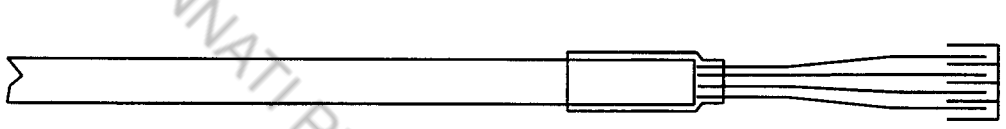
AA55335





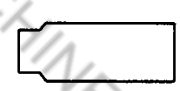

| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | |
| MACHINE V1000B, 5X10 | | PART NUMBER AA55335 | |
| PART NAME SUB-ASSY Y AXIS | | | |
| MATERIAL | HEAT TREAT | SCALE | |
| DRAWN BY R.DAI | CHECKED BY | DATE 8-23-02 | REVISIONS |
| DEC. ±1/64 | DEC. ±.003/-.000 | ANG. | |

AA80504
AA80505




TURK RK4T-10/S618 - X-AXIS AA80504
TURK RK4T-6/S618 - Y-AXIS AA80505

640440-4 AMP/TYCO CONN RECEPT 4POS 22AWG MTA100



THIS SHAPE REPRESENTS
THERMOSHRINK TUBING

1

LOGOSOL PART # 131320055 , 131320056



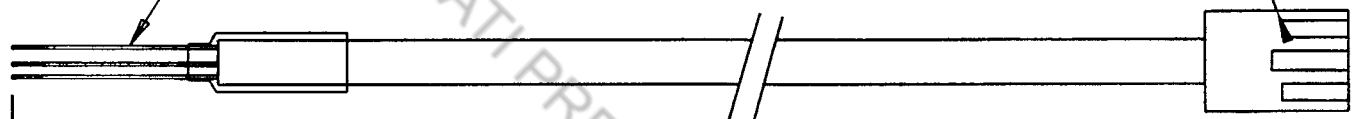
THE LOCKFORMER CO.
711 OGDEN AVE. LISLE, ILLINOIS 60532

| | | | |
|---|---|---|---|
| MACHINE: VULCAN 1000B | | PART NUMBER: AA80504 AA80505 | 6 |
| PART NAME: X and Y - PROX CABLE | | | 5 |
| MATERIAL: | HEAT TREAT: NONE | SCALE: FULL | 4 |
| FRAC. TOL: ±1/64 | DEC. TOL: ±.005 | ANG. TOL: ±1° | 3 |
| DRAWN BY: MK | CHECKED BY: | DATE: 3/31/03 | 2 |
| | | | REVISIONS |

AA85482

704-00/00 Qualtek CONN AC PLUG STRIGHT FEMALE SCREWTRM, MAX-10A, 250V

4" INSULATION REMOVED, CUTOFF THE SHIELD WIRE



BROWN
BLUE
GRN/YEL

GND

N L

18 AWG SHIELDED THREE CONDUCTOR POWER CORD SJT TYPE - ALPHA 1941/3F*

106"

BROWN - L
BLUE - N
GRN/YEL - GND
SHIELD - GND

THIS SHAPE REPRESENTS THERMOSHRINK TUBING

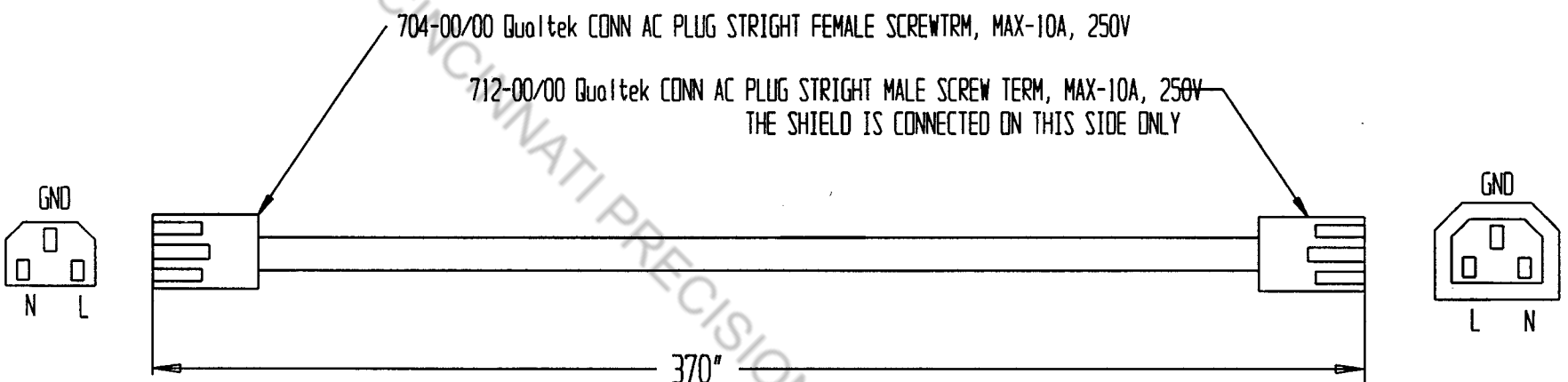
1

LOGOSOL # 131320052



| | | | | |
|---|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | | 6 |
| MACHINE VULCAN 1000B | | | PART NUMBER AA85482 | 5 |
| PART NAME POWER IN CABLE | | | | 4 |
| MATERIAL | HEAT TREAT NONE | | SCALE FULL | 3 |
| FRAC. TOL ±1/64 | DEC. TOL ±.005 | ANG. TOL ±1° | DRAWN BY MK | CHECKED BY | DATE 3/31/03 | 2 |
| | | | | | | REVISIONS |

AA85483




BROWN - L
BLUE - N
GRN/YEL - GND

18 AWG SHIELDED THREE CONDUCTOR POWER CORD SJT TYPE - ALPHA 1941/3F*

BROWN - L
BLUE - N
GRN/YEL - GND
SHIELD - GND

1

LOGOSOL PART # 131320053



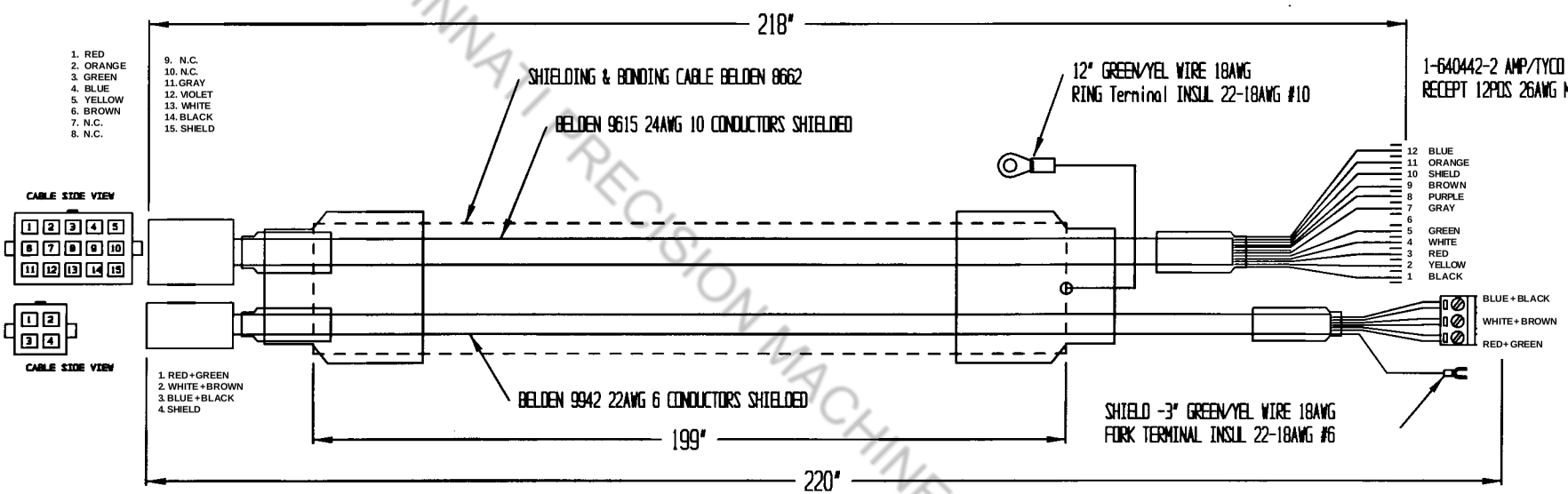
THE LOCKFORMER CO.
711 OGDEN AVE. LISLE, ILLINOIS 60532

| | | | |
|---|---|---|---|
| MACHINE: VULCAN 1000B | | PART NUMBER: AA85483 | 6 |
| PART NAME: UNIV POWER OUT CABLE | | | 5 |
| | | | 4 |
| MATERIAL: | HEAT TREAT: NONE | SCALE: FULL | 3 |
| | | | 2 |
| FRAC. TOL: ±1/64 / DEC. TOL: ±.005 / ANG. TOL: ±1° | DRAWN BY: MK / CHECKED BY: | DATE: 3/31/03 | REVISIONS |

AA85484

172163-1 AMP/TYCO 15 CIR UNIV MATE-N-LOK CONNECTOR

170365-1 AMP/TYCO MINI UNIVERSAL MATE-N-LOK
SOCKET LP,AWG 26~22, Insulation 1.2~1.75mm

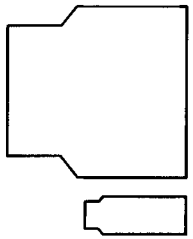



172159-1 AMP/TYCO 4 CIR UNIV MATE-N-LOK CONNECTOR

170366-1 AMP/TYCO MINI UNIVERSAL MATE-N-LOK
SOCKET LP,AWG 22~18, Insulation 1.5~2.2mm

PX-2ESDV-03 or EM2565-03-H
PINREX/Magnum Terminal Block3Poles 5.08

1



THOSE SHAPES REPRESENT
THERMOSHRINK TUBING

LOGOSOL PART # 131320049

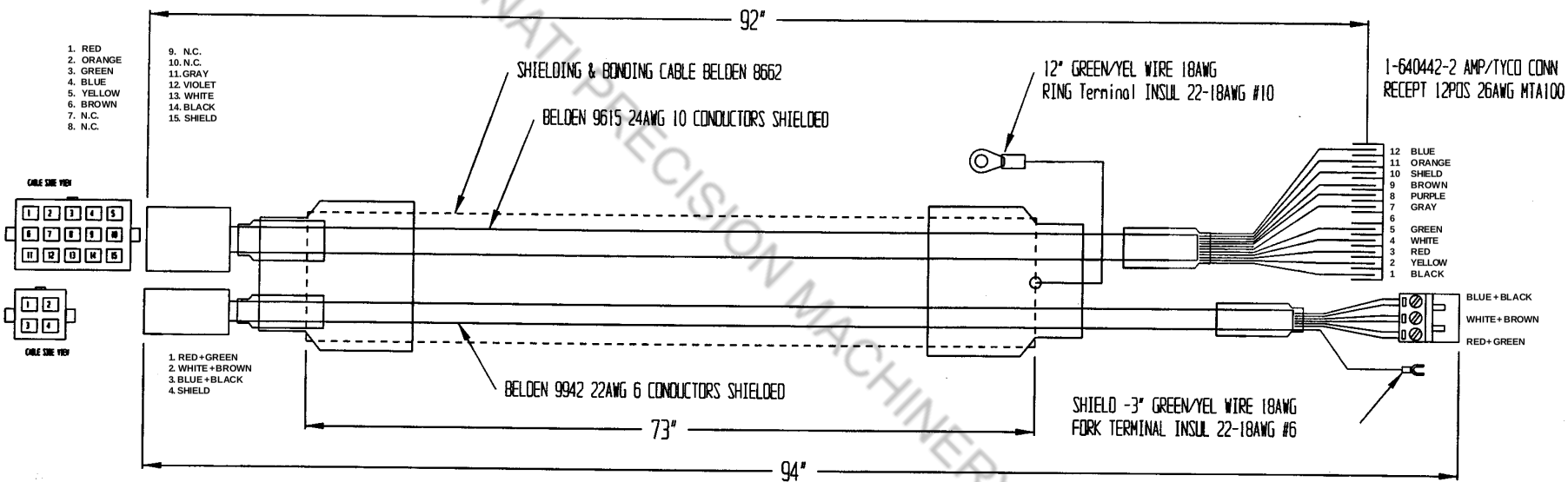


| | | | | | |
|---|---|---|---|---|---|
| THE LOCKFORMER CO. | | | | | 6 |
| 711 OGDEN AVE. | | | LISLE, ILLINOIS 60532 | | 5 |
| MACHINE VULCAN 1000B | | | | PART NUMBER | 4 |
| PART NAME CABLE X- AXIS | | | | AA85484 | 3 |
| MATERIAL | | HEAT TREAT NONE | | SCALE FULL | 2 |
| FRAC. TOL ±1/64 | DEC. TOL ±.010 | ANG. TOL ±1° | DRAWN BY MK | CHECKED BY | DATE 3/31/03 | REVISIONS |

AA85485

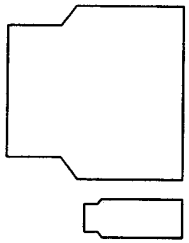
172163-1 AMP/TYCO 15 CIR UNIV MATE-N-LOK CONNECTOR

170365-1 AMP/TYCO MINI UNIVERSAL MATE-N-LOK
SOCKET LP,AWG 26~22, Insulation 1.2~1.75mm




172159-1 AMP/TYCO 4 CIR UNIV MATE-N-LOK CONNECTOR

170366-1 AMP/TYCO MINI UNIVERSAL MATE-N-LOK
SOCKET LP,AWG 22~18, Insulation 1.5~2.2mm



THOSE SHAPES REPRESENT
THERMOSHRINK TUBING

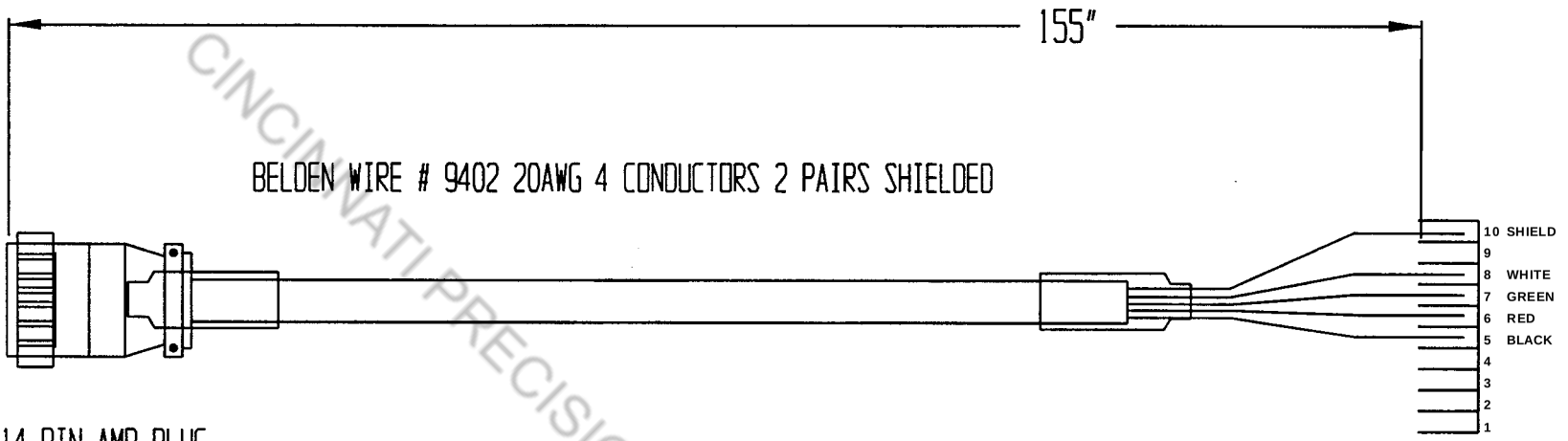
PX-2ESDV-03 or EM2565-03-H
PINREX/Magnum Terminal Block3Poles 5.08

LOGOSOL PART # 131320049

1

| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | 6 |
| MACHINE VULCAN 1000B | | PART NUMBER AA85485 | 5 |
| PART NAME CABLE Y- AXIS | | | 4 |
| | | | 3 |
| MATERIAL | HEAT TREAT NONE | SCALE FULL | 2 |
| FRAC. TOL ±1/64 / DEC. TOL ±.010 / ANG. TOL ±1° | DRAWN BY MK / CHECKED BY | DATE 3/31/03 | REVISIONS |

AA85486

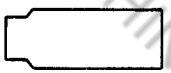



14 PIN AMP PLUG
AMP PART# 206044-1

AMP CRIMPING PIN 24-20 GA
AMP PART# 66400-4

AMP HOOD AND CLAMP
AMP PART# 206070-1

1-640428-0 AMP/TYCO CONN RECEPT 10POS 22AWG MTA156



THIS SHAPE REPRESENTS
THERMOSHRINK TUBING

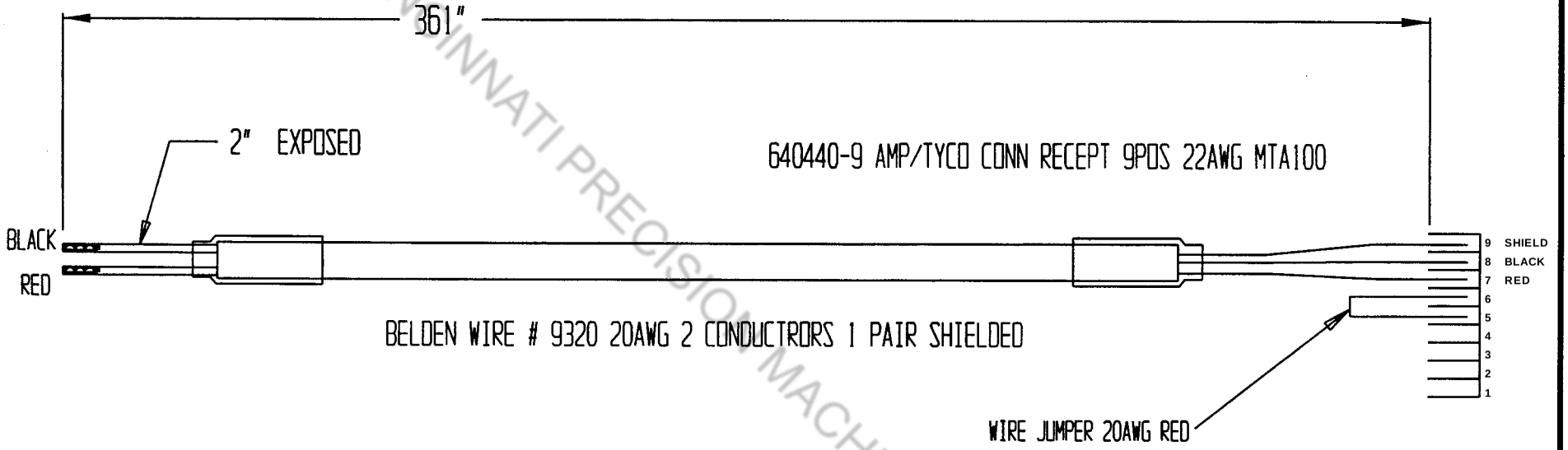
1

LOGOSOL PART# 131320054



| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | 6 |
| MACHINE VULCAN 1000B | | PART NUMBER AA85486 | 5 |
| PART NAME PLASMA CABLE | | | 4 |
| MATERIAL | HEAT TREAT NONE | SCALE FULL | 3 |
| | | | 2 |
| FRAC. TOL ±1/64 / DEC. TOL ±.005 / ANG. TOL ±1° | DRAWN BY MK / CHECKED BY | DATE 3/31/03 | REVISIONS |

AA85487




THIS SHAPE REPRESENTS
THERMOSHRINK TUBING

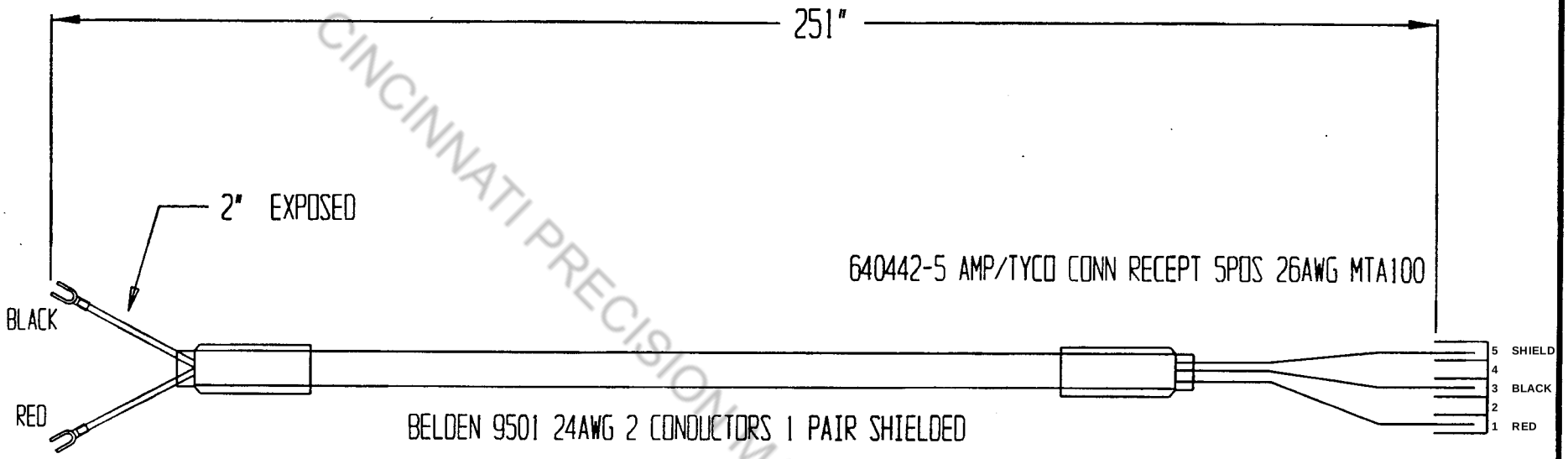
1

LOGOSOL PART # 131320057



| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. | | | 6 |
| 711 OGDEN AVE. | | LISLE, ILLINOIS 60532 | 5 |
| MACHINE: VULCAN 1000B | | PART NUMBER: AA85487 | 4 |
| PART NAME: TORCH LIFTER CABLE | | | 3 |
| MATERIAL: | HEAT TREAT: NONE | SCALE: FULL | 2 |
| FRAC. TOL: ±1/64 / DEC. TOL: ±.005 / ANG. TOL: ±1° | DRAWN BY: MK / CHECKED BY: | DATE: 3/31/03 | REVISIONS |

AA85489




321035 AMP/TYCO SPADE 22-26 AWG #4 YEL PIDG (Fork terminal)

THIS SHAPE REPRESENTS THERMOSHRINK TUBING

1

LOGOSOL PART # 131320059

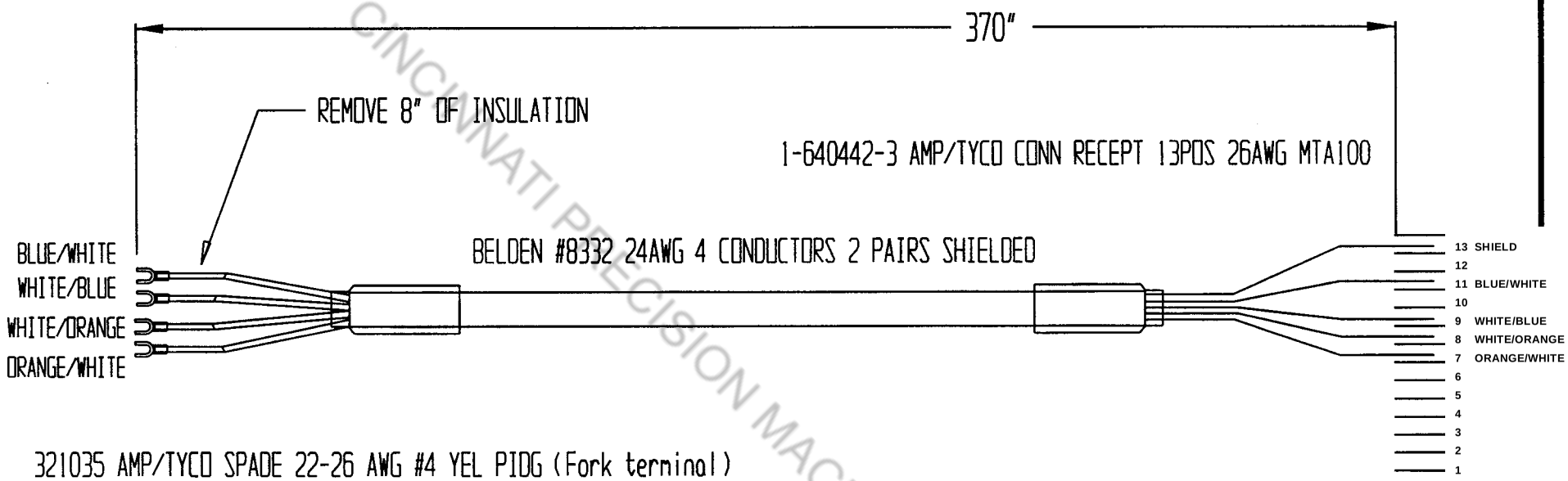


THE LOCKFORMER CO.
711 OGDEN AVE. LISLE, ILLINOIS 60532

| | | | |
|---|---|---|---|
| MACHINE: VULCAN 1000B | | PART NUMBER: AA85489 | |
| PART NAME: E-STOP , X-BEAM CABLE | | | |
| MATERIAL: | HEAT TREAT: NONE | SCALE: FULL | |
| FRAC. TOL: ±1/64 | DEC. TOL: ±.005 | ANG. TOL: ±1° | DRAWN BY: MK |
| CHECKED BY: | DATE: 3/31/03 | | |

6
5
4
3
2
REVISIONS

AA85490




321035 AMP/TYCO SPADE 22-26 AWG #4 YEL PIDG (Fork terminal)

THIS SHAPE REPRESENTS THERMOSHRINK TUBBING

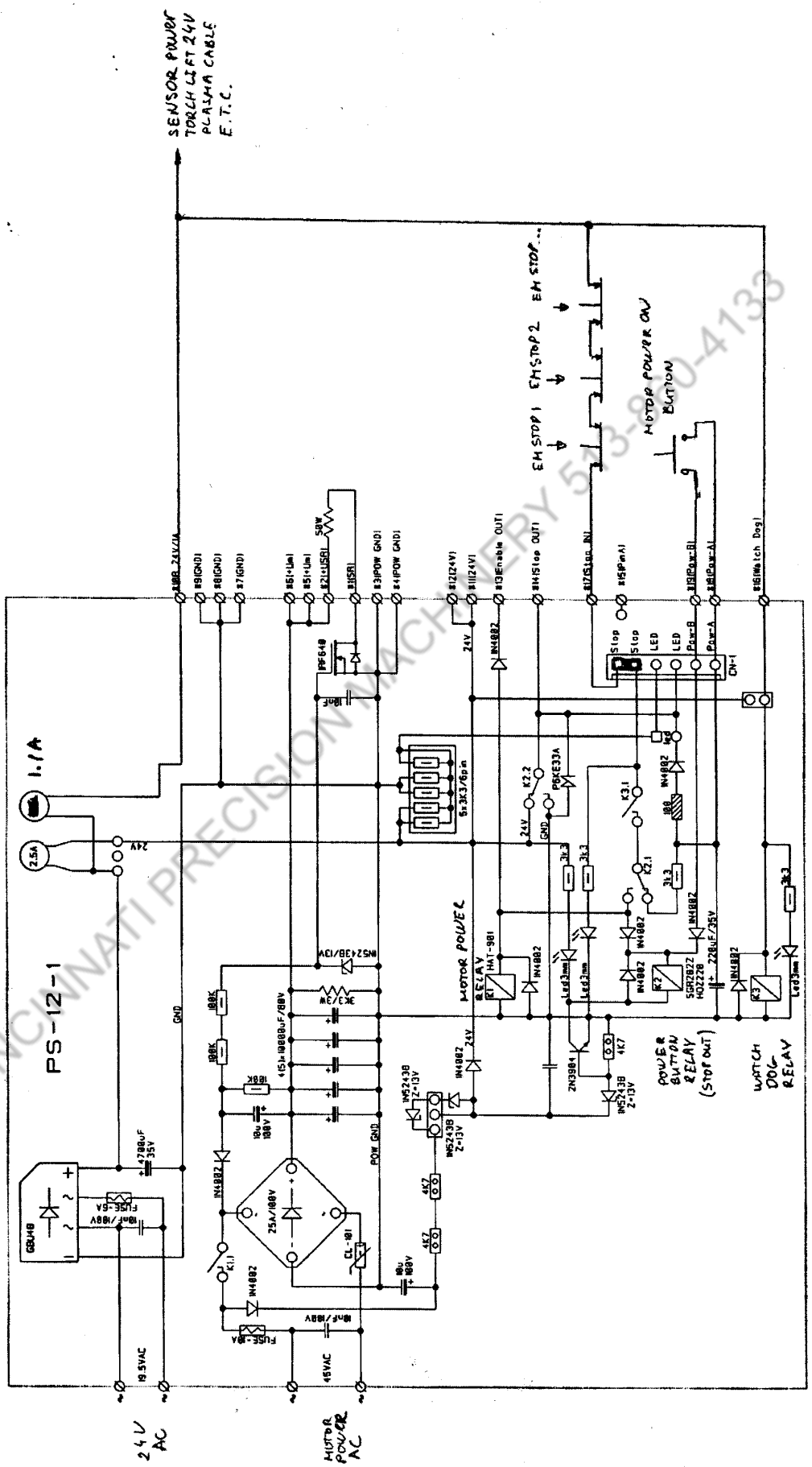
1

LOGOSOL PART # 131320060

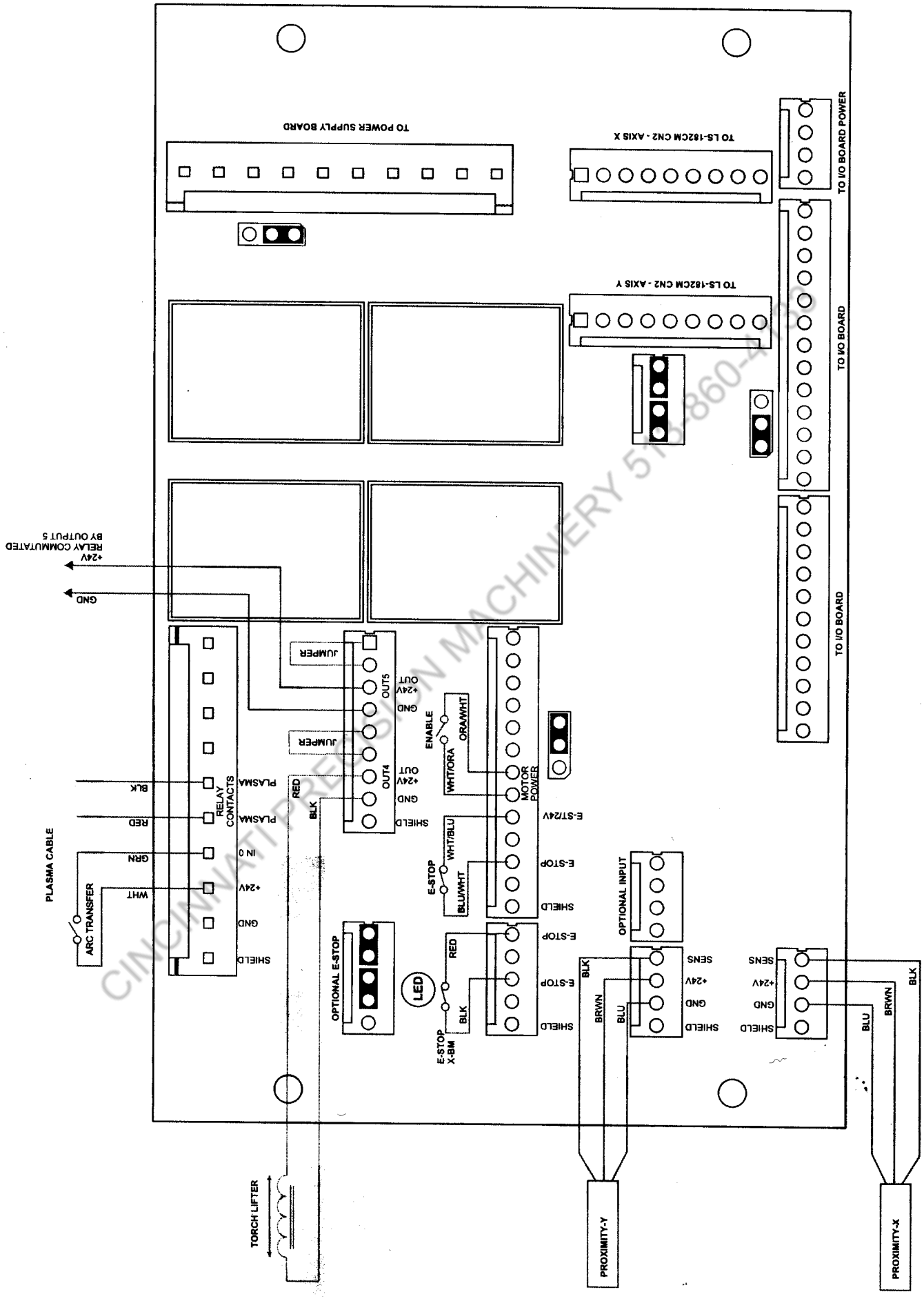


| | | | |
|---|---|---|---|
| THE LOCKFORMER CO. 711 OGDEN AVE. LISLE, ILLINOIS 60532 | | | 6 |
| MACHINE VULCAN 1000B | | PART NUMBER AA85490 | 5 |
| PART NAME E-STOP / DRIVE ENABLE CABLE | | | 4 |
| | | | 3 |
| MATERIAL | HEAT TREAT NONE | SCALE FULL | 2 |
| FRAC. TOL ±1/64 / DEC. TOL ±.005 / ANG. TOL ±1° | DRAWN BY MK / CHECKED BY | DATE 3/31/03 | REVISIONS |

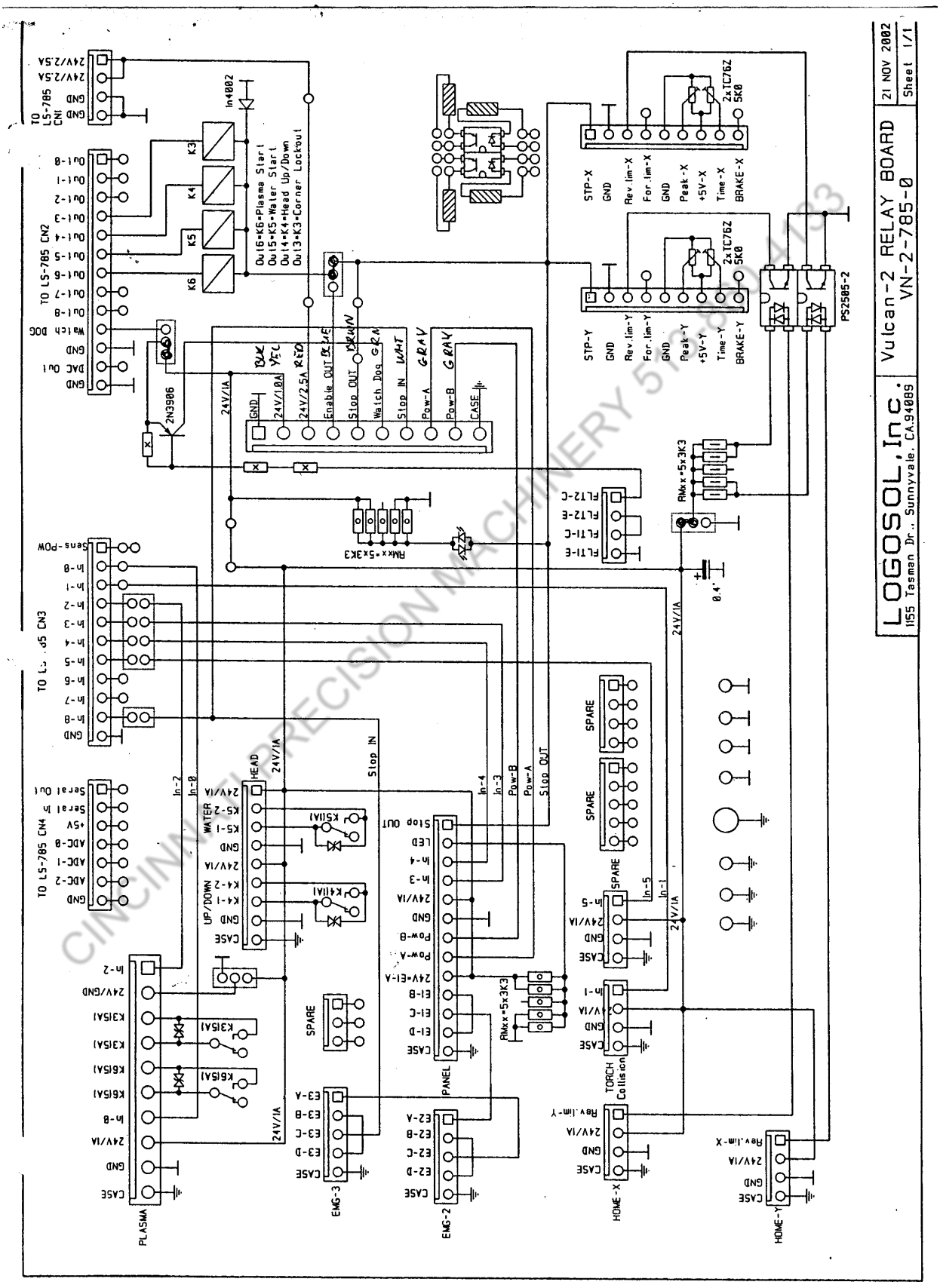
# CONTROL AND DRIVE SYSTEM ELECTRICALS A



# CONTROL AND DRIVE ELECTRICALS B



# CONTROL AND DRIVE ELECTRICALS C



(rblum) 03/28/2003 BOM OR WHERE USED FOR 648508
UM: EA I/T: O DESCRIPTION: Y AXIS V10008 5X10 SUP.ROD,

| STOCK NUMBER | I/T | UM | COMPONENT DESCRIPTION | | QTY US |
|---|---|---|---|---|---|
| 60005 | 4 | EA | HHCS,1/4-20,3/4 | | 2. |
| 60020 | 4 | EA | HHCS,5/16-18,1-3/4 | | 6. |
| 60048 | 4 | EA | HHCS,5/16-18X1-1/4 | | 2. |
| 60097 | 4 | EA | HHCS,3/8-16,1-3/4 | | 6. |
| 60160 | 4 | EA | HHCS,1/2-13,2-3/4 | | 2. |
| 60300 | 4 | EA | SHCS,1/4-20X3/8 | | 6. |
| 60314 | 4 | EA | SHCS,1/4-20X1,NYLOCK | | 4. |
| 60351 | 4 | EA | SHCS,5/16-18X7/8 | | 4. |
| 60352 | 4 | EA | SHCS,5/16-18 X 1 | | 6. |
| 60367 | 4 | EA | SHCS,5/16-18X1-3/4,NYLOCK | | 2. |
| 60393 | 4 | EA | SHCS,3/8-16X1,NYLOCK | | 12. |
| 60395 | 4 | EA | SHCS,5/16-18X1-1/4,NYLOCK | | 6. |
| 60396 | 4 | EA | SHCS,1/4-20X1-1/4,NYLOCK | | 4. |
| 60397 | 4 | EA | SHCS,5/16-18X1,NYLOCK | | 8. |
| 60402 | 4 | EA | SHCS,3/8-16 X 1 | | 6. |
| 60407 | 4 | EA | SHCS,3/8-16X1-1/2 | | 4. |
| 60608 | 4 | EA | SSS,1/4-28X5/16 | | 2. |
| 60616 | 4 | EA | SSS,1/4-20X3/4 | | 2. |
| 60749 | 4 | EA | SSS,5/8-11 X 2 | | 1. |
| 60964 | 4 | EA | FHSCHS,1/4-20X3/4 | | 4. |
| 61060 | 4 | EA | NUT,1/4-20,FINISHED | | 4. |
| 61349 | 4 | EA | NUT,STOP,7/16-20,#29 NTE-070 | (MORE) | 6. |
| 61356 | 4 | EA | NUT,HEX,JAM,5/8-11 | | 1. |
| 61357 | 4 | EA | NUT,1/2-13,GRIPCO LOCKNUT | | 1. |
| 62000 | 4 | EA | WSHR,FLAT.281 ID X .625 OD X | (MORE) | 4. |
| 62010 | 4 | EA | WHSR,FLAT,5/16,1,1/16 | | 18. |
| 62025 | 4 | EA | WSHR,FLAT,3/8,5/8,.031 | | 10. |
| 62029 | 4 | EA | WSHR,FLAT,3/8,7/8,1/16 | | 6. |
| 62362 | 4 | EA | WSHR,LOCK,5/16,MED | | 26. |
| 62363 | 4 | EA | WSHR,LOCK,3/8,MED | | 12. |
| 62370 | 4 | EA | WSHR,LOCK,1/4,MED | | 8. |
| 62423 | 4 | EA | KEY,STRT,3/16,3/16,1-1/2 | | 4. |
| 63079 | 4 | EA | BOLT,U,MC MASTER #3043T32 | | 2. |
| 65313 | 4 | EA | NPL,1/4"NPT,FEM, | (MORE) | 1. |
| 66020 | 4 | EA | BRG,NDL,B-128,3/4X1X1/2 | | 4. |
| 66332 | 4 | EA | BRG,NTA-1220,.750X1.250X.078 | | 4. |
| 66333 | 4 | EA | BRG,TRB-1220,.750X1.250X.060 | | 8. |
| 66645 | 4 | EA | CONN,GREASER,1/4-28,90DEG | (MORE) | 2. |
| 66823 | 4 | EA | BRG,CAMROLL,CF-1-B MC GILL | | 6. |
| 67007 | 4 | EA | BRG.,PILLOW BLOCK, 3/4" BORE | | 3. |
| 70556 | 4 | EA | GEARBELT PULLEY, 60LH075,3/4 | (MORE) | 1. |
| 70960 | 4 | EA | SPRG,06M10,5/8 OD,1 | | 1. |
| 80968 | 4 | EA | PLT,MTG,TYRAP,TC-5342-A | | 2. |
| 80987 | 4 | EA | CLAMP,JIFFY,3/8 | | 4. |
| 84884 | 4 | EA | TERMINAL,STA-KON RING,#E6-14, | (MORE) | 3. |
| AA14546 | 2 | EA | PIN,IDLER,3/4"DIA,1.660 LG | | 2. |
| AA16467P | 4 | EA | BEARING ROD,1045,2.5 DIA.X136 | (MORE) | 1. |
| AA16469 | 2 | EA | Y-AXIS DRIV SHAFT | | 1. |
| AA24398 | 2 | EA | Y AXIS WHEEL MOUNT OPER SIDE | (MORE) | 1. |
| AA24401 | 2 | EA | PILLOW BLOCK MOUNT | | 3. |
| AA24402 | 2 | EA | RAIL SUPPORT BAR | | 2. |
| AA26591 | 2 | EA | X BEAM CONNECTION BAR OPER | (MORE) | 1. |
| AA26592 | 2 | EA | BELT CLAMP OPER SIDE | | 1. |
| AA26593 | 2 | EA | WHEEL/BELT CLAMP BAR OPER SIDE | | 1. |
| AA26732 | 2 | EA | TOP SPACER BAR | | 1. |
| AA26733 | 2 | EA | MOUNTING BRACKET,LEFT CAM FOLL | (MORE) | 1. |
| AA26734 | 2 | EA | MOUNTING BRACKET,RIGHT CAM FOL | (MORE) | 1. |
| AA26739 | 2 | EA | BEARING ROD MOUNTING BRACKET | | 2. |
| AA26774 | 2 | EA | Y-AXIS TARGET BLOCK | | 1. |

(rblum) 03/28/2003 BOM OR WHERE USED FOR 648508
UM: EA I/T: 0 DESCRIPTION: Y AXIS V10008 5X10 SUP.ROD,

| STOCK NUMBER | I/T | UM | COMPONENT DESCRIPTION | | QTY | U |
|---|---|---|---|---|---|---|
| AA27113 | 2 | EA | PIVOT PLATE | | 1 | |
| AA27125 | 2 | EA | INSIDE CAMROL BAR | | 1 | |
| AA27126 | 2 | EA | OUTSIDE CAMROL BAR | | 1 | |
| AA27695 | 2 | EA | IDLER MOUNTING PLATE | | 2 | |
| AA27696 | 2 | EA | BELT CLAMP CAM FOLLOWER SIDE | | 1 | |
| AA27941 | 2 | EA | Y TO X SUPPORT OPER SIDE | | 1 | |
| AA29008 | 2 | EA | ANGLE CONNECTING 1-1/2X1-1/2X | (MORE) | 1 | |
| AA29070 | 2 | EA | ANGLE MOTOR MTG. | | 1 | |
| AA35775 | 2 | EA | WIRE TROUGH | | 1 | |
| AA35848 | 2 | EA | GANTRY MOTOR COVER | | 1 | |
| AA43044 | 2 | EA | PULLEY,IDLER TIMING | | 2 | |
| AA51295 | 2 | EA | Y-AXIS SUPPORT ANGLE WELDMENT | (MORE) | 1 | |
| AA51671 | 2 | EA | SUPPORT WLDT ROD | | 1 | |
| AA51689 | 2 | EA | SUPPORT WLDT, TUBE | | 1 | |
| AA52024 | 2 | EA | HOLD DOWN WHEEL BRKT. | | 1 | |
| AA55136 | 2 | EA | SUPPORT LEG-MACHINED | | 1 | |
| AA55210 | 2 | EA | WHEEL ASSY(REPLACES55469 & ITS | (MORE) | 3 | |
| AA55335 | 2 | EA | Y AXIS V10008 | | 0 | |
| AA62903 | 4 | EA | BOLT,SHOULDER,5/8 X 1"LG. | | 1 | |
| AA70088 | 4 | EA | 285L075, GEAR BELT 3/4" WIDE | (MORE) | 1 | |
| AA70090 | 4 | EA | GEARBELT,1"WIDE,709 TEETH,"L" | (MORE) | 2 | |
| AA70140 | 4 | EA | PULLEY,16LF100,3/4 BORE,WITH | (MORE) | 2 | |
| AA70158 | 4 | EA | PLY,12LF075 1.000+/-.0015 BORE | (MORE) | 1 | |
| AA71282 | 4 | EA | TRANTORQUE 5/8 ID,1 OD,FENNER | (MORE) | 1 | |
| AA80720 | 4 | EA | CABLE CARRIER,0450.61,53 LINKS | | 1 | |
| AB31355 | 2 | EA | TRAVEL SENSOR BRACKET | | 1 | |
| AB31372 | 2 | EA | CABLE CARRIER BRACKET | | 1 | |
| AB31382 | 2 | EA | CABLE TROUGH BRACKET, CENTER | | 2 | |
| AB31385 | 2 | EA | BELT CLAMP PLATE | | 1 | |
| AB31405 | 2 | EA | CLAMP PLATE | | 1 | |

(Pblum) 03/28/2003 BOM OR WHERE USED FOR 648608
UM: EA I/T: O DESCRIPTION: "X" BEAM,V1000B

| STOCK NUMBER | I/T | UM | COMPONENT DESCRIPTION | | QTY US |
|---|---|---|---|---|---|
| AA26404 | 2 | EA | TORCH HOLDER | | 1. |
| AA26610 | 2 | EA | X BEAM END PLATE MOTOR SIDE | | 1. |
| AA26611 | 2 | EA | X BEAM END PLATE OPER SIDE | | 1. |
| AA26612 | 2 | EA | MOTOR HOUSING FRONT PLATE | | 1. |
| AA26613 | 2 | EA | MOTOR HOUSING BACK PLATE | | 1. |
| AA26614 | 2 | EA | MOTOR HOUSING SIDE PLATE OUTER | | 1. |
| AA26615 | 2 | EA | MOTOR HOUSING SIDE PLATE INNER | | 1. |
| AA26617 | 2 | EA | MOTOR HOUSING FRONT TOP COVER | | 1. |
| AA26618 | 2 | EA | MOTOR HOUSING PULLEY COVER | | 1. |
| AA26619 | 2 | EA | SHELF SUPPORT OPER SIDE | | 1. |
| AA26620 | 2 | EA | TORCH ASSY,BELT IDLING BLOCK | | 1. |
| AA26621 | 2 | EA | TORCH ASSY BELT CLAMP 1 | | 1. |
| AA26622 | 2 | EA | TORCH ASSY BELT CLAMP 2 | | 1. |
| AA26623 | 2 | EA | TORCH HOLDING PLATE | | 1. |
| AA26624 | 2 | EA | TORCH HOR. TRANSITION PLATE | | 1. |
| AA26625 | 2 | EA | TORCH VERT TRANSITION PLATE | | 1. |
| AA26626 | 2 | EA | TORCH CABLE BRACKET | | 1. |
| AA27116 | 2 | EA | X MOTOR MOUNT PLATE | | 1. |
| AA27146 | 2 | EA | SHIPPING BRKT. | | 1. |
| AA27147 | 2 | EA | SHIPPING BRKT. | | 1. |
| AA27148 | 2 | EA | SHIPPING BRKT. | | 1. |
| AA27693 | 2 | EA | X BEAM TOP CHANNEL | | 1. |
| AA27694 | 2 | EA | X-BEAM BOTTOM CHANNEL | | 1. |
| AA29879 | 2 | EA | SHELF SUPPORT ANGLE | | 2. |
| AA32072 | 2 | EA | SHIPPING BRACKET,X-AXIS | | 1. |
| AA34066 | 2 | EA | X BEAM SHELF | | 1. |
| AA35847 | 2 | EA | "X" BEAM WIRE COVER | | 1. |
| AA35867 | 2 | EA | E-STOP MOUNT | | 1. |
| AA35921 | 2 | EA | BRACKET SOLENOID VALVE MTG. | | 1. |
| AA55143 | O | EA | SUB-ASSY X-BEAM | | O. |
| AA55144 | O | EA | GENERAL ASSY VULCAN 1000 | | O. |
| AA55169 | O | EA | PNEUMATIC CONNECTION,LIFTER | | O. |
| AA60308 | 4 | EA | SHCS M5X14MM LG | | 4. |
| AA60309 | 4 | EA | S.H.C.S.,M6X 1MM X 30MM LG. | | 3. |
| AA60311 | 4 | EA | M6X1MMX25MM LG. SHCS (METRIC) | | 4. |
| AA62001 | 4 | EA | WSHR,FLAT,5/16,3/4,1/16,PLATED | | 5. |
| AA62903 | 4 | EA | BOLT,SHOULDER,5/8 X 1"LG. | | 2. |
| AA65788 | 4 | EA | ELBOW,MALE,1/4 TUBE #10-32 UNF | (MORE) | 1. |
| AA65789 | 4 | EA | ELBOW,MALE,DOUBLE,1/4,1/8NPT, | (MORE) | 1. |
| AA65984 | 4 | EA | SLIDE TABLE | | 1. |
| AA65985 | 4 | EA | VALVE/SMC SY5120-5MZ-01T PILOT | (MORE) | 1. |
| AA65986 | 4 | EA | FLOW CONTRL SMC NAS2211F-N01- | (MORE) | 1. |
| AA65987 | 4 | EA | 1/8 MUFFLER | | 1. |
| AA65988 | 4 | EA | QUICK RELIEVING REGULATOR | | 1. |
| AA65995 | 4 | EA | BREATHER,CATCHING VFP-18V-B | (MORE) | 1. |
| AA66656 | 4 | EA | BRG.,LINEAR HIWIN AGH25-CA-1- | (MORE) | 1. |
| AA70089 | 4 | EA | ELO75.1530 GEAR BELT,3/4"WIDE | (MORE) | 1. |
| AA70158 | 4 | EA | PLY,12LF075 1.000+/-.0015 BORE | (MORE) | 1. |
| AA71282 | 4 | EA | TRANTORQUE 5/8 ID,1 OD,FENNER | (MORE) | 1. |
| AA80750 | 4 | EA | AMP PLUG #770069-1 ALLIED | | 1. |
| AA80751 | 4 | EA | AMP RECEPTACLE #770065-1 | (MORE) | 1. |
| AA80752 | 4 | EA | AMP PIN #770147-1 ALLIED | (MORE) | 2. |
| AA80753 | 4 | EA | AMP SOCKET #770146-1 ALLIED | | 2. |
| AB31352 | 2 | EA | "X" CARRIAGE COVER | | 1. |
| AB31354 | 2 | EA | X BEAM DUST COVER | | 1. |
| MM60361 | 4 | EA | M6X1.0X20LG SHCS | | 4. |

(rblum) 03/28/2003 BOM OR WHERE USED FOR 648608

UM: EA I/T: 0 DESCRIPTION: "X" BEAM,V10008

| STOCK NUMBER | I/T | UM | COMPONENT DESCRIPTION | | QTY US |
|---|---|---|---|---|---|
| 43361 | 2 | EA | PULLEY,GRBELT DR/IDLR,16LF075 | | 1. |
| 43362 | 2 | EA | PULLEY,GRBELT DR/IDLER,16LF075 | | 1. |
| 44054 | 2 | EA | TORCH HOLDER ASSY,REAMED,AIRCO | | 1. |
| 53955 | 2 | EA | FLOATING HD WLDMT | | 1. |
| 60000 | 4 | EA | HHCS,1/4-20,1/2 | | 4. |
| 60006 | 4 | EA | HHCS,1/4-20,2-1/4 | | 1. |
| 60300 | 4 | EA | SHCS,1/4-20X3/8 | | 2. |
| 60302 | 4 | EA | SHCS,1/4-20X5/8 | | 16. |
| 60306 | 4 | EA | SHCS,1/4-20X1-1/2 | | 2. |
| 60314 | 4 | EA | SHCS,1/4-20X1,NYLOCK | | 4. |
| 60326 | 4 | EA | FHSHCS,1/4-20X3/4,NYLOCK | | 2. |
| 60381 | 4 | EA | SHCS,3/8-16X7/8 | | 1. |
| 60397 | 4 | EA | SHCS,5/16-18X1,NYLOCK | | 6. |
| 60399 | 4 | EA | SHCS,1/4-20X1/2,NYLOCK | | 4. |
| 60483 | 4 | EA | SHCS,10-24X1-1/4 | | 3. |
| 60493 | 4 | EA | SHCS,4-40X1 | | 2. |
| 60501 | 4 | EA | FHSMS,1/4-20X1/2,SLOTTED | | 2. |
| 60503 | 4 | EA | FHSHCS,1/4-20X3/4 | | 4. |
| 60512 | 4 | EA | SHCS, 10-24X1-3/4,3/4LG. SHANK | | 5. |
| 60567 | 4 | EA | RHMS,4-40X1/4" | | 2. |
| 61100 | 4 | EA | NUT,HEX,5/16-18 FINISHED | | 5. |
| 61364 | 4 | EA | NUT,HEX,JAM,1/4-20 | | 6. |
| 61940 | 4 | EA | ELBOW,1/8NPT,1/4T,31095611 | | 2. |
| 61941 | 4 | EA | ELBOW,1/4NPT,1/4T,31095614 | | 2. |
| 62000 | 4 | EA | WSHR,FLAT.281 ID X .625 OD X | (MORE) | 8. |
| 62348 | 4 | EA | WSHR,LOCK,#8 (SAME AS 62002) | | 2. |
| 62362 | 4 | EA | WSHR,LOCK,5/16,MED | | 5. |
| 62370 | 4 | EA | WSHR,LOCK,1/4,MED | | 14. |
| 62452 | 2 | EA | KEY,STRT,3/16,3/16,1-1/4 | | 3. |
| 62526 | 4 | EA | RETAINING RING,5160-75 | | 2. |
| 62773 | 4 | EA | BHSCS1/4-20 X 3/8, | | 8. |
| 62869 | 4 | EA | BHSCS,10-24 X 3/8 | | 48. |
| 62917 | 4 | EA | PIN,DOWEL, 5/8 X 2 | | 1. |
| 62938 | 4 | EA | BHSCS1/4-20 X 1/2, | | 10. |
| 63062 | 4 | EA | BHSCS1/4-20X3/4 NYLOCK | | 16. |
| 65201 | 4 | EA | PLG,PIPE,1/8-27X1/4,SKT HD | | 1. |
| 65301 | 4 | EA | CONN,MALE,30182-4-4B,1/4X1/4 | (MORE) | 1. |
| 65302 | 4 | EA | CONN,MALE,30182-2-4B,1/4X1/8 | (MORE) | 1. |
| 65753 | 4 | EA | CLAMP,HOSE,MINI,1/4"TO 5/8 | | 1. |
| 65776 | 4 | FT | HOSE,PUSH-LOK,801-4,1/4",500' | (MORE) | 45. |
| 66061 | 4 | EA | BRG,NDL,B-1212-OH,3/4X1X3/4 | (MORE) | 4. |
| 66333 | 4 | EA | BRG,TRB-1220,.750X1.250X.060 | | 5. |
| 66643 | 4 | EA | CONN,GREASER,#205010,1/4-28 | (MORE) | 3. |
| 66708 | 4 | IN | TUBE,1/4,NYLON,.035WA,NN-4-035 | (MORE) | 30. |
| 70081 | 4 | EA | BELT,TIMING,270L075 | (MORE) | 1. |
| 70556 | 4 | EA | GEARBELT PULLEY, 60LH075,3/4 | (MORE) | 1. |
| 71985 | 4 | EA | CAST,BALL,TYPE SBT-1 | | 5. |
| 80987 | 4 | EA | CLAMP,JIFFY,3/8 | | 4. |
| 81466 | 4 | EA | SWITCH,EMERGENCY,OIL TIGHT | (MORE) | 2. |
| 82108 | 4 | IN | WIRE,10 GA,STRND,G/Y | (MORE) | 240. |
| 84947 | 4 | EA | FLEXIBLE CONDUIT,#060RICO | (MORE) | 1. |
| 85986 | 4 | EA | TORCH HOLDER,SWIVEL | | 2. |
| 9000267 | 4 | FT | 3M #4932(3/8X36)#DOUBLE BACK | (MORE) | 12. |
| 9000268 | 4 | EA | #200.063 6FT. LENGTH(FLEX= | (MORE) | 2. |
| AA13335 | 2 | EA | X AXIS DRIVE SHAFT | | 1. |
| AA13336 | 2 | EA | X AXIS IDLER SHAFT | | 1. |
| AA13686 | 2 | EA | SPACER ROUND | | 1. |
| AA16473 | 2 | EA | PIN | | 1. |
| AA25927 | 2 | EA | Y-AXIS TARGET BLOCK | | 1. |

(rblum) 03/28/2003 BOM OR WHERE USED FOR 649107
UM: EA I/T: 0 DESCRIPTION: ELECTRICS,VULCAN 10008

| STOCK NUMBER | I/T | UM | COMPONENT DESCRIPTION | | QTY | US |
|---|---|---|---|---|---|---|
| 80201 | 4 | EA | SWITCH,600 TAXS | | 1. | |
| 80384 | 4 | EA | HTR,P39 | (MORE) | 1. | |
| 80525 | 4 | EA | CORD,SJO,14-3,10'L,STRIP 4-1 | | 1. | |
| 80968 | 4 | EA | PLT,MTG,TYRAP,TC-5342-A | | 35. | |
| 81816 | 4 | IN | SPRIAL WRAP | | 12. | |
| 82124 | 4 | EA | CONNECTOR,0.125"-0.375"DIA., | (MORE) | 1. | |
| 82143 | 4 | EA | LOCKNUT,REVERE PART NO:BL50, | (MORE) | 1. | |
| 82315 | 4 | IN | TUBE,SHRINK,1" ID | | 12. | |
| 84364 | 4 | IN | SHRINK TUBE, 3/4"-3/8",BLK FIT | (MORE) | 12. | |
| 85345 | 4 | EA | NAMEPLT,EMERGENCY STOP DECAL | (MORE) | 2. | |
| AA42542 | 4 | EA | LEGEND PLATE DRIVE ENABLE | | 1. | |
| AA80011 | 4 | EA | ENCLOSURE,COMPUTER MONITOR | | 1. | |
| AA80503 | 4 | EA | SWITCH,PROXIMITY,TURCK P/N | (MORE) | 2. | |
| AA80506 | 4 | EA | MOTOR,SERVO,PANASONIC,750 WATT | | 2. | |
| AA80864 | 4 | EA | OUTLET HAND BOX MORGAN | (MORE) | 1. | |
| AA80866 | 4 | EA | DUPLEX RECEPTACLE MORGAN | (MORE) | 1. | |
| AA80867 | 4 | EA | DUPLEX COVER (HENDYBOX) | (MORE) | 1. | |
| AA85480 | 4 | EA | DRIVE BOX,SERVO,#910182008 | | 1. | |
| AA85481 | 4 | EA | CABLE SYSTEM V10008 | | 1. | |
| AA85491 | 4 | EA | CABLE,CAT 5E SHIELDED 200 FT. | | 1. | |
| AA85492 | 4 | EA | COUPLING,CAT 5E CROSSOVER | | 1. | |
| AA85493 | 4 | EA | SWITCH,PUSH,MOMENTARY N/O | (MORE) | 1. | |
| AA85494 | 4 | EA | FAN COOLING 115 VOLTS V10008 | | 1. | |
| AA85495 | 4 | EA | POWER CORD 115 VOLT AC | | 1. | |
| AA85496 | 4 | EA | KEYBOARD,BLACK V10008,PART # | (MORE) | 1. | |
| AA85825 | 4 | EA | PANEL PC,15"MONITOR,TOUCH SCRN | | 1. | |
| AB35074 | 2 | EA | BRACKET,COOLING FAN | | 1. | |
| AB85009 | 4 | EA | CABLE,CAT 5E ONE FOOT | | 1. | |

# SECTION 5

## TROUBLESHOOTING

**SECTION 6**

**TROUBLESHOOTING GUIDE**:

Most minor difficulties that users have with the Vulcan have very simple explanations and solutions. This Section was prepared to make it easier for operating personnel to solve such problems quickly, so it is not necessary to consult Lockformer in many cases.

**Caution Shut Off All Incoming Power To Check Any Electrical Components Before Servicing!**

# 1. X and Y Axis Movement

| PROBLEM | SOLUTION |
|---|---|
| Drives will not power-up. Display says: "Press Drives On" | 1. Check the two Emergency-Stop switches. The one on the controller and the other at the end of the bridge.<br>2. Check Safety Control Cable from E-stop to Controller.<br>3. Controller |
| Controller displays "Axis Following Error" after pressing AUTO ZERO | 1. Motor - Switch X and Y motor. If problem goes to other drive motor, then bad motor.<br>2. Cable - Make sure cables are connected.<br>3. Controller |
| Machine will not stop when Auto Zeroing in X or Y axis. | 1. Inspect Home Switch for visible damage. (X-Home is at the end of the bridge, Y-Home is on the Y-1 rail)<br>2. Check the gap between Home Switch and the Homing Plate for both the X and Y Home. Give an allowance of 0.018". (Use a feeler gauge or piece of 26 ga. metal)<br>3. Wave a Quarter over the Home Switch while the machine is moving. If it stops, adjust the Homing Plate. If not, replace the switch.<br>4. Bad input/output cable on the controller. |
| Following error for X or Y axis | 1. Check bearings.<br>2. Bad motor (switch motor to check). |

# 2. Cutting Errors

| | |
|---|---|
| Torch cutting off the sheet | 1. Check the sheet size.<br>2. Check for correct placement. Sheet must be against the stops.<br>3. Check and adjust the Zero Home plates. |
| Parts are being cut 1/8 to 1/4" too large, or the machine overshoots | 1. Loose or worn pinion gears.<br>2. Loose belt.<br>3. Check encoder. To check, zero the machine. Use the MDI to move the machine to (0,120), then physically measure the distance to see if it moved 120 inches.<br>4. Switch motors. |

# 3. Torch Movement

| | |
|---|---|
| Machine moves rapidly when Auto Zeroing X-axis, followed by screen message:<br>Axes: X<br>Following Error Exceeded | Check encoder cable. |
| Torch will not raise or lower | 1. Check for any binding at torch lifter with power off.<br>2. Check air pressure. Minimum air pressure must be 40 psi.<br>3. Check for 24 VDC at lifter assembly. If "yes", replace the 4-way valve. If "no", check cable and fuses on back of controller.<br>4. Check torch counterbalance pressure and torch up-speed controls on the torch lifter assembly cover. If either control is fully closed, no travel will occur. |
| Torch head goes up and down too fast or too slow. | Adjust the screw on the two brass muffler on the four-way valve. NOTE: The top screw is for moving up, and the bottom screw is for moving down. |



# 4. Computer Block

| | |
|---|---|
| Block Not Found on computer | Protection Block must be plugged in properly. |

# 5. Error Codes

| | | |
|---|---|---|
| No Startup File | Initialization | Startup.txt file not found |
| Could not open scanner port | Initialization | Could not open the scanner port specified in startup.txt |
| Cannont Initialize Controller | Initialization | Could not initialize LogoSol controller - No power, cable disconnected, ?? |
| No Setups file found | Drives On | SetupsVP.txt file not found |
| Error reading Setups file. Line # | Drives On | Line # is invalid in the SetupsVP.txt file |
| No Master Setups file | Drives On | SetupsVP.txt file could not be found in the Master subdirectory |
| No Params file found | Drives On | Params.VP.txt file not found |
| Error reading Params file. Line # | Drives On | Line # is invalid in the ParamsVP.txt file |
| No Master Params file | Drives On | ParamsVP.txt file could not be found in the Master subdirectory |
| No Events file found | Drives On | Events.VP.txt file not found |
| Error reading Events file. Line # | Drives On | Line # is invalid in the EventsVP.txt file |
| No Master Events file | Drives On | ParamsVP.txt file could not be found in the Master subdirectory |
| No power to servos | Drives On | No electrical power found to servos |
| Could not initialize servos | Drives On | Failure to initialize the servos. ?? |
| Could not initialize path | Drives On | Failure to initialize the path routines in the dll. ?? |
| Could not initialize IO card | Drives On | Failure to initialize the IO card in the controller ?? |
| Cut path goes off table | Start Cut/Dry Run | The path goes off the table at some point |
| | Manual Goto | |
| Speed exceeds maximum limit | Manual Goto | The entered speed exceeds the maximum machine speed |
| Invalid Password | Control Setups | Invalid password (15732) entered when trying to access control setups screen |
| Servo fault | In Motion | Servo reported a fault. Excessive speed, general failure, jamming |
| General fault | In Motion | Error reported by Dll with unknown reason. Not sure if we would ever get this. |
| Skipped segment | In Motion | Not used |
| Bad Segment | In Motion | Invalid line or arc segment sent to dll. ?? |
| Machine power has been lost | In Motion | Power has been lost to the servos |
| Lost arc feedback | In Motion | Arc feedback has been lost after cutting has started |
| No arc feedback | Torch On | Arc feedback was not detected after gas has been turned on |
| Scanner timeout | Scanning | Optimization of insulation did not complete |
| Cannot mix different materials | Scanning Insulation | Cannot mix linear with different materail types on same sheet |
| Cannot mix different thicknesses | Scanning Insulation | Cannot mix linear with different thicknesses on same sheet |
| Try smaller blank | Scanning Insulation | Sheet full, try smaller blank or cut sheet |
| Invalid Job | Scanning Insulation | Scanned label is not from same job at the one selected |