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RIMROCK

SERVO DRIVE RECIPROCATOR WITH TRIANGLE CONTROLS

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I/O RACK RIBBON CABLE 306B11083-04
1-AXIS SERVO CARD CABLE TO IC PCB 411C16814-01
MICROPROCESSOR CARD DRAWINGS:
CPU BOARD 140B11440-05(SHT 1-2)
SERVO BOARD 140B11442-11
DIGITAL I/O BOARD, NOT USED ON ALL 140B11441-01
DIGITAL INTERFACE BOARD 140B11440-11
43,47, 60, 66, 72" MODULE SCHEMATIC AND ASSEMBLY 411D11450-17(SHT 1-3)
HD60, HD80" MODULE SCHEMATIC AND ASSEMBLY 411D11450-24(SHT 1-3)
HD80" W/SLIDE BASE MODULE SCHEMATIC AND ASSEMBLY 411D11850-07(SHT 1-4)
WIRING LAYOUT CONTROL CABLE IN BOX 411C11450-29
HEAT SINK ASSEMBLY FOR HD60 AND HD80" CONTROLS 411D11429-19
CONTROL BOX AND MAIN PANEL SCHEMATIC AND ASSEMBLY 140D11850-01(SHT 1-3)
TRIANGLE INTERCONNECTIONS MEGA TABLE 140D11850-100(SHT 1-2)
RECIPROCATOR MAIN CONTROL CABLE 411D11302-500
REMOTE KEYPAD BOX SINGLE AND DUAL ASSEMBLIES 140D11850-50(SHT 1-2)
REMOTE VIDEO KEYPAD BOX 140D11850-65
KEYPAD CONTROL CABLE 140C16801-133
VIDEO CONTROL CABLE 140C16803-01
REMOTE KEYPAD AND VIDEO MOUNT ASSEMBLY 140D11450-101
REMOTE PUSH BUTTON ENABLE KIT SCHEMATIC AND ASSEMBLY 140D16809-100(SHT 1)
REMOTE CONTROL BOX ASSEMBLY 306D11367

7. MECHANICAL DRAWINGS

MOUNTING LAYOUT 410-60"	SDRD47LAYOUT
MOUNTING LAYOUT 410-47"	SDRD60LAYOUT
MOUNTING LAYOUT 410-72"	SDRD72LAYOUT
43, 47,60, 66, 72" MAIN BODY ASSEMBLY AND WIRING	410D11600-01(SHT 1-4)
ARM ASSEMBLY, 60, 66, 72"	410D11600-22
ARM ASSEMBLY, 43, 47"	410D11600-23
HOSE ASSEMBLY, 2 LUBE	410D11600-63
HOSE ASSEMBLY, 3 LUBE	410D11600-65
POWER BASE ASSEMBLY 10.5" TRAVEL	410D11600-41
MANUAL BASE ASSEMBLY 10.5" TRAVEL	410D11600-42
SHOCK MOUNT SUB-BASE ASSEMBLY	410D11600-91
SPRAY ARM ASSEMBLY, 1 LUBE	410D11600-81
SPRAY ARM ASSEMBLY, 2 LUBE	410D11600-84
HD60 AND HD80" MAIN BODY ASSEMBLY AND WIRING	410D11602-01(SHT 1-4)
HD 80" ARM ASSEMBLY	410D11602-21
HD 60" ARM ASSEMBLY	410D11602-22
HD 80" HOSE ASSEMBLY	410D11602-63
POWER BASE ASSEMBLY 14.5" TRAVEL	410D11600-44
POWER BASE ASSEMBLY 18.5" TRAVEL	410D11600-45
HD SLIDE BASE ASSEMBLY 45" TRAVEL 2 LUBES	410D11579-2
HD SLIDE BASE ASSEMBLY 45" TRAVEL 3 LUBES	410D11579-3
SPRAY ARM ASSEMBLY 2 LUBES	410D11602-80
18" Q.R. EXTRUSION MANIFOLD 1 LUBE 025 NOZZLE	110D15911-125
18" Q.R. EXTRUSION MANIFOLD 2 LUBE 025 NOZZLE	110D15912-125
24" Q.R. EXTRUSION MANIFOLD 1 LUBE 025 NOZZLE	110D15921-125
24" Q.R. EXTRUSION MANIFOLD 2 LUBE 025 NOZZLE	110D15922-125
PNEUMATIC ASSEMBLY (1 LUBE)	163D09381-33
PNEUMATIC ASSEMBLY (2 LUBE)	163D09382-31
PNEUMATIC ASSEMBLY (3 LUBE)	163D09382-33
RIMROCK SPRAY CATALOG	FRONT COVER
DIE CAST MACHINE SAFETY (NADCA #E-908)	LAST SECTION

MANUAL REVISION HISTORY

MANUAL VERSION NUMBER	SOFTWARE VERSION NUMBER	COMMENTS	DATE	BY
3.14	3.14	PRELIMINARY RELEASE, FIRST FOR TRIANGLE	9/22/94	RJM
3.15	3.15	UPDATED KEYPAD DESCRIPTION AREA	10/13/94	RJM
3.16	3.19	ADDED DOCUMENTATION FOR 80" MACHINE	08/01/95	RJM
3.19	3.19	REVISE AND UPDATE	5/10/96	MDJ
3.20	3.20	REVISE AND UPDATE TO SOFTWARE	07/06/98	JMH
3.21	3.21	REVISE AND UPDATE TO SOFTWARE	07/06/98	ACY
3.21	3.21	ADDED MECHANICAL SPARE PARTS LIST	08/06/98	ACY

1
Introduction

WARNING

Please read entire manual before attempting any installation or set up of this machine. Failure to do so may result in personal injury or machine damage.

The door interlock switch located inside the control panel does not remove power from the entire control panel. This switch only disables I/O control power, therefore use extreme caution when door is open.

410 SERVO DRIVE RECIPROCATOR

WARRANTY

For a period of six (6) months from the date of shipment or prior to the first 250,000 cycles, RIMROCK Corporation will repair or replace, at it's option, any part of the system that is found to be defective in workmanship or material. Determination of our obligation under this warranty will be made by RIMROCK after examination of alleged defective materials are returned to us transportation prepaid.

The foregoing warranty is exclusive, and in lieu of all other warranties, whether written, oral, or implied, including the warranty of merchantability and the warranty of fitness for a particular purpose.

Any alteration, modification or repair to any circuit board contained in the system will **VOID** all warranties. All electronic repairs **MUST** be handled through RIMROCK Corporation.

1. INTRODUCTION

1.1 GENERAL EQUIPMENT SAFETY

The invention of automatic equipment used on die casting machines greatly enhanced the production and efficiency of making quality castings. Like any other machinery, if not used safely it can pose a hazard to personnel as well as damage to the equipment.

Safety of operation begins with training personnel in the safe operation and maintenance of this equipment. Operator and maintenance people must understand how the equipment works in order to operate it safely. The owner/end user of this equipment is responsible for the training to safely operate and maintain this equipment. RIMROCK will provide equipment training when requested.

Machine owners, operators, maintenance and service personnel must be aware of the fact that every day common safety practices are vital part of their job and must be compiled with constantly. Use of personnel protective equipment and keeping the work area clean and free of potential hazards will enhance any safety program. In addition, all warning labels, signs and guards must always be replaced if they are removed for any reason. Safety violations should always be reported to the proper personnel.

Always remember automatic equipment starts by a signal and gives you no warning. Always be aware of this and make sure the equipment is shut off and all power sources locked out before you work on or around the equipment.

In addition to the safety precautions in the manual, all the latest OSHA Instructions, Local, Federal and National Safety Codes and Safety Rules must be understood and followed to operate equipment safely. For additions safety information on die casting, refer to NADCA's Die Casting Safety Manual E-908.

1.2 INSTALLATION SAFETY

Study the equipment's manual before attempting to install this machine. The installation must be made with only qualified personnel capable of positioning, anchoring, making power connections and interlocking this equipment with other equipment. Failure to use qualified personnel could result in personnel injury as well as damage to your equipment. The electrical connections must be made by a qualified electrician who must be able to read and understand electrical schematics in order to assure a safe hook-up. Correct grounding of interlock connections are explained and illustrated in your manual. In addition, a safety barrier must be installed to prevent personnel from entering the path of moving equipment while it is operating. It should also be noted that proper clearance must be allowed for all movements of your equipment. By following these recommended steps your equipment should operate safely and correctly.

1.3 SET-UP AND OPERATION SAFETY

Operator and maintenance personnel must read the equipment manual and be trained in the proper operation of this equipment in order to set-up ant operate it safely. Always make sure all control panel switches are "off" when power is first applied. Never make any adjustments to the equipment while it is operating. Remember, the machine has the ability to strike you, pinch or grab loose clothing which may result in injury to you. In order to stay out of its path, you must always know in which direction the machine is going to move next. It should never be necessary to make adjustments to this equipment with the power "ON". If you find it necessary to make an adjustment or for troubleshooting with the power "ON", a second qualified person should be at the operator panel operating the equipment in "MANUAL" mode. The second person should always have sight of the person working on the equipment. Under NO circumstances would any adjustments be made while the equipment is moving. Never operate the equipment before making sure the area is clear and all safety guards and devices are in place. Only authorized personnel should modify the programming of this equipment and it can never be operated without the

recommended interlocks. Any unsafe conditions of equipment operation should be reported to the proper personnel immediately.

1.4 MAINTENANCE SAFETY

Do not attempt to perform any maintenance on this equipment until you read and understand all the safety instructions and all the power sources are locked out according to OSHA's Lock Out Procedures. Be sure the electrical power in the interlock system is "OFF" when the machines power is disconnected. these are usually yellow wires and can supply power from another source when the main disconnect is off. Always turn power "OFF" before removing the circuit boards to prevent damage to the boards and also "Electrical Shock" to yourself. Keeping your equipment clean and the area in which it is located clean is a vital part of your safety program. Developing a set periodic maintenance program of your own, plus following recommended maintenance in this manual will extend your equipment's life and make it safer to operate. Do not attempt to alter, bypass or short circuit any safety device or systems on this equipment. All guards, shields, barriers or covers must be put back after any maintenance is performed or repairs are completed before the equipment is returned to service. The end user of this equipment is responsible for the safe operation of the equipment and for the safety of their plant operations and maintenance personnel.

1.5 MACHINE DESCRIPTION

The RIMROCK Model 410 Reciprocator is a fully programmable die spray system, using one motor for the power source. This motor drives a face mounted gear reducer that is directly coupled to the main drive shaft. The main drive shaft is attached to the Multi- Link arm which holds the spray manifold.

The motor is controlled with a newly developed computer control system. This computer system allows complete control of the reciprocator. Each movement of the machine has a wide range of programmable positions, dwell times and spray functions. All positions are programmed from the control panel allowing for easy and fast adjustments.

The control system is mounted in one control cabinet. The system consists of: keypad, cards, card cage, motor controller, input/output rack, power supply, message center and relays.

THE COMPUTER SYSTEM CONSISTS OF THE FOLLOWING:

Keypad - Mounted on the front of the operators panel, it is used to program the system and show digital readouts of all programmable functions of the unit. It communicates to the CPU card via a serial communication network. This allows the Keypad to be located away from the main control box.

Video Keypad - As an option this machine is available with a Video Touch Screen Operator Interface, for use as a Keypad. This Video Interface utilizes a Capacitive Touch Screen on front of a Color LCD Flat Panel Display. All RIMROCK Machines in a cell can be controlled by this one interface. All functions are similar to utilizing a Standard Keypad. The only exceptions are in the teach area, where this device makes programming easier.

Card Cage - Uses a STD bus system for communication between the various cards.

Servo Card - This card reads the output of the encoder mounted on the motor, and feeds the speed signals to the servo drive. The encoder allows constant tracking of the machine's movement.

Central Processing Unit (CPU) - The CPU Card is the brain of the entire system. It handles all information to and from the other cards. This card also contains plug in chips (FLASH EPROM), which contains the system software, (Software is a computer program that tells the system how to work). The software has been electronically written into the EPROM. The information written to the EPROM is retained whether power is applied or not. It does not require battery back up to retain it's program. The CPU card houses a set of self contained

battery backed RAM chips that are the storage chips for the operating parameters (the settings that the customer programs in for his operation). It has serial communications that allow it to communicate to the Keypad and the Message center. It also has Digital I/O that connects the computer to the I/O rack. Which sends and receives signals from the input/output modules mounted on the I/O rack.

Input / Output Rack - This card-like rack contains modules that connect the computer to the outside world. All signals to and from the die cast machine and reciprocator are connected to plug in modules which interface computer signals to the die cast machine and the reciprocator.

Power Supply - The supply is the 5-24-12 VDC regulated supply for the computer and for the key pad. The 24 volt DC supply feeds the reciprocator limit switches and interlock circuits.

Message Center - The 410 features a microprocessor based message center that communicates with the system CPU via a serial link. This message center is designed to make the users job easier and faster which increases productivity. Diagnostics, cycle and programming messages result in decreased set-up time, faster troubleshooting and even simpler programming. In the event of a fault, the fault number, as well as, an explanation message is displayed by the message center.

Multiple Lube Option - The 410 Reciprocator is available with multiple lube capability. The one lube is standard and multiple lubes is a customer option. When the system is used with multiple LUBES the other lubes are called LUBE B, & LUBE C. If the second lube is used, the spray program will use LUBE B DWELL-SET TIME and LUBE B SWEEP-SET TIME for it's spray functions. If a third lube is used, the spray program will use the auxiliary keys to program it's spray functions. The outputs for the spray functions are described in the SPRAY FUNCTION section of this manual.

Horizontal Drive - The reciprocator has a horizontal drive assembly, either powered or manual. This drive will move the reciprocator parallel to the center line of the die cast machine. The manual unit uses a adapter tool that mounts on the horizontal drive screw at the rear of the unit. A ¾" wrench should be used to turn the tool which will move the machine. If the powered drive (a customer option) is selected, a motor that drives the drive screw is mounted on the rear of the reciprocator. It is controlled by a three position selector switch which is mounted in the main control panel.

1.6 UNPACKING INSTRUCTIONS

After removing top and sides of shipping crate, remove the spray package and control panel. Note the interconnecting cable is permanently attached to the reciprocator and should not be removed. Care must be taken when handling the reciprocator and cable assembly. Remove the mounting bolts that secure the reciprocator during shipping. Remove the covers to expose the lifting lugs. Using a crane of the appropriate size, the machine weighs approximately 500 pounds (700 pounds for 80" version), place the hook in the lifting lugs on top of the reciprocator and lift it out of the crate.

1.7 MODES OF OPERATION

There are two modes of operation available on the Servo Drive Reciprocator. The Reciprocator can only be in one mode of operation at a time. These two modes are:

MANUAL with MANUAL TEACH

AUTOMATIC with AUTO TEACH

The mode of operation is selected by pressing either MANUAL or AUTO keys located on the keypad (SEE KEYPAD DRAWING IN SECTION 3).

MANUAL MODE:

This mode of operation allows the operator to run the Reciprocator in a jog mode to determine the correct position settings for AUTO CYCLE with the die cast machine. In this mode of operation the Die Cast Machine Clear interlock must be present to extend the arm forward and into the die. Manual teach is also available in this mode.

AUTOMATIC MODE:

After the correct settings are found and input from the MANUAL mode, the Reciprocator is now ready to operate with the die cast machine in full AUTO CYCLE. Auto teach is available in this mode.

1.8 KEYPAD SECTIONS

PANEL DISPLAY:

The graphic display on the KEYPAD shows the position and status of the Reciprocator in all modes and all settings at all times. This graphic display give the operator a convenient means of checking the status of the Reciprocator, even if the Reciprocator is not currently visible. This display contains the following readouts:

DISPLAY SECTIONS:

Each section contains a LED numeric display, a set key and a LED indicator. Each LED will light up when the Reciprocator is in that particular function and the LED numeric display will show the current setting of that function.

PLEASE REFER TO SECTION 3 FOR PROGRAMMING INSTRUCTIONS

1.9 SEQUENCE OF OPERATION

The Reciprocator begins and ends each cycle at the REST position. Unless the short cycle option is activated the rest position is with the spray arm completely retracted. Upon receiving a RECIPROCATOR APPROACH signal from the Die Cast Machine, the Reciprocator will move to the Approach position. It will remain there until it receives the RECIPROCATOR START interlock form the Die Cast Machine. At this time it will cycle through the program steps that are programmed into the current memory area. Upon completion of the programmed cycle the Reciprocator will return to the Rest position and give the CYCLE COMPLETE interlock output.

1.10 MACHINE POSITIONS

The following positions, shown on the keypad Machine Status area, are the positions of the Reciprocator. The LED's on this diagram shows the current position of the Reciprocator.

REST:

This position is the point where the Spray Arm is at its fully retracted position. At this point the Rest Position Proximity Switch is actuated. This point is used as the zero point for the encoder. The REST LED will stay on as long as the arm is in this position. If Short Cycle is selected the Rest Position is still with the arm fully retracted.

APPROACH POSITION:

This is a programmable position that the arm will move to when the Reciprocator Approach interlock is received. It is also the position that the Spray Arm will stop at in cycle when the Short Cycle option is activated.

IN DIE:

This led is activated any time the Reciprocator is extended past the Approach Position, and indicates the Spray Arm is in the die area.

2
Installation

2. INSTALLATION

2.1 MOUNTING THE RECIPROCATOR

Mount the reciprocator on top of the stationary platen of the die cast machine on a flat surface. Side to side location can be found by centering the reciprocator spray manifold on the center line of the die cast machine. Proper end to end positioning of the reciprocator will place the arm so it is centered in the die spray area. The mounting blocks should be positioned in the center of their adjustment on the side plate. This will allow the reciprocator to be adjusted 5 ¼ inches each direction. At this time you can use the crane to set the reciprocator on top of the machine, positioning it as explained above.

Once the reciprocator is positioned correctly, mark the mounting bolt holes. Now remove the reciprocator from the platen and drill the proper size holes for the mounting hardware (the holes in the mount plate have clearance for ½" bolts). The last step is to re-position the reciprocator on the platen and bolt it down.

NOTE: A spacer might be required under the reciprocator if the spray nozzle assembly is to clear the top of the platen on the die cast machine.This will depend on the manifold configuration and how you mount the Reciprocator to the Die Cast Machine.

2.2 PROXIMITY SWITCH ADJUSTMENTS

Proximity switches are used on the Reciprocator to indicate physical positions of the arm. These Proximity switches are mounted inside the body of the Reciprocator, refer to mechanical assembly drawings for location of proximity switches.

2.2.1 REST POSITION PROXIMITY SWITCH:

(701-PS)

When this proximity switch is tripped the REST POSITION LED on the control panel lights and the Input #12 is activated. In this position the arm is fully retracted and the REST POSITION proximity switch (701-PS) will be tripped. This is the only position of the arm that will allow the Auto Mode to be entered. This proximity switch is not adjustable.

It is also used to signal the servo drive card that the arm has reached the full retracted position (fully CCW motor rotation). If this switch is tripped at an in-appropriate time a Following Error will be generated.

To access this proximity switch, remove the side cover's on the machine. There are four proximity switches located under the cover's in the same area. The rest position proximity switch is the bottom one. The rest position proximity switch is factory set and can not be adjustment in the field. This proximity switch is used to home the machine after power is applied to the control panel (see Homing Procedure).

2.2.2 CHECK POSITION:

(702-PS)

This position is used by the computer to check the arm position during an Auto cycle. It uses a factory set proximity switch (702-PS) that activates Input #13. The function of the Check Position is to insure the spray manifold is repeating the same spray positions from cycle to cycle.

If it is necessary to reset this position (and not the proximity switch) see AUX 3 key explanation in this manual.

Aux. 3 Section 3 Page 4

To access this proximity switch, remove the cover's from the machine. There are four proximity switches located under the cover's in the same area. The check position proximity is in the second one up from the bottom. This switch is factory set and is not adjustable in the field.

2.2.3 RECIPROCATOR CLEAR:

(703-PS)

This proximity switch is used to signal the Die Cast Machine that the Reciprocator is clear of the die area and any core pull cylinders. It is set

by the customer to actuate at the appropriate position. Care must be taken not to set it so that the die could hit the spray arm as it closes. If Short Cycle is activated (see section 3) this proximity switch must be set to allow it to trip when the arm stops at the Approach Position.

To access this proximity switch, remove the side cover's on the machine. There are four proximity switches located between the side plates in the same area. The reciprocator clear proximity switch is the closest to the top of this cluster of switches. This switch is adjustable and must be set by the customer.

There are three sets of contacts that trip at the same time to be used at the customer's convenience. This proximity switch should be adjusted so it trips when the reciprocator is clear of the dies and core pull cylinders so the dies will close without interfering with the reciprocator.

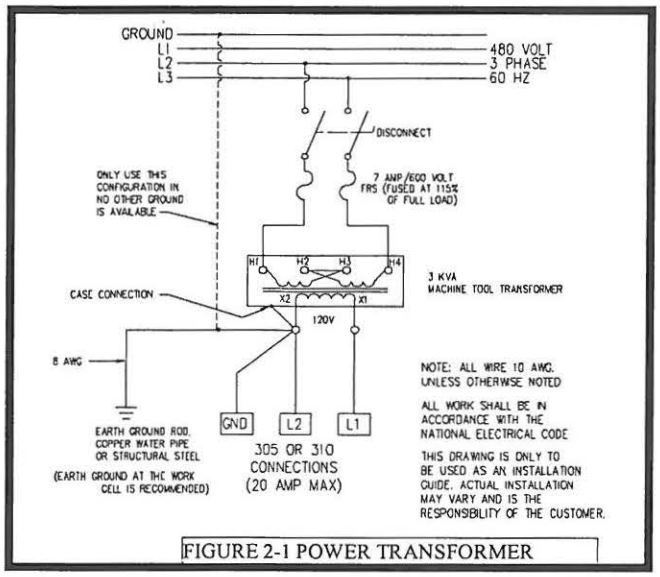


FIGURE 2-1 POWER TRANSFORMER

2.2.4 CLOCK WISE PROXIMITY SWITCH

(706-PS)

This proximity switch is used by the servo control system , and alerts the computer system when ever it is tripped. It is factory set at the extreme end of the forward travel of the 410 SDR.

If this switch is tripped at an in-appropriate time a Following Error will be generated

2.3 ELECTRICAL

Requirements 47, 60, 72": 120 VAC, 15 amp, 1 phase with ground; conduit with interlock wires and 3 power wires. Refer to electrical drawings for a guide to the electrical installation.

Requirements 80": 120 VAC, 5 amp, 1 phase with ground, 220 VAC, 15 amp, 1 phase with ground; conduit with interlock wires and power wires. Refer to electrical drawings for a guide to the electrical installation.

All interconnections are made on the connector supplied at the bottom of the control cabinet or on panel mounted terminals in the control cabinet. This machine may come equipped with quick disconnects on the right hand side of the control box. The second connection position from the top is where the machine wiring connections are made and consist of the motor, encoder wires and limit switch wires. The other end of this conduit is connected to Reciprocator .

The lower connector is used for interlocking connections. Power connections are connected inside the control box on a terminal strip.

Connect the power as follows:

120 VAC to 7L1 (Circuit Breaker)

Neutral to 7L2

Ground to GND

As with all computers, a proper ground connection is required. To check the power, read the voltage between 7L1 and 7L2, the voltage should be 120 VAC. The voltage between 7L2 and GND should not exceed 1.0 VAC at any time during the cycle. Refer to Figures 2-1 and 2-2 for a power connection guideline.

We strongly suggest using a dedicated 3.0 KVA machine tool transformer as a power source for the Reciprocator. Do not use a general purpose transformer because it will not regulate the current, causing the voltage to vary when the transformer is near its saturation point. See Figure 2-1 for 410-47, 60, 72 inch transformer connection recommendations, and electrical box

assembly drawings for transformer connection for the 410-80 inch. A non-dedicated transformer may cause noise and/or spikes on the Reciprocator power line which will cause various computer related problems while cycling.

Note to PLC user:

All the interlocks required are dry contacts, since a dry contact draws very little current, triac type outputs may not shut off. This is due to the nature of a triac, which requires a minimum of current draw to shut off completely.

To prevent this type of problem it is suggested that either a load resistor be tied across the output or an interface relay be driven by the PLC output. Some PLC manufacturers have already taken care of this problem by including an isolated interface for each I/O contact within the PLC - be aware of which type you have.

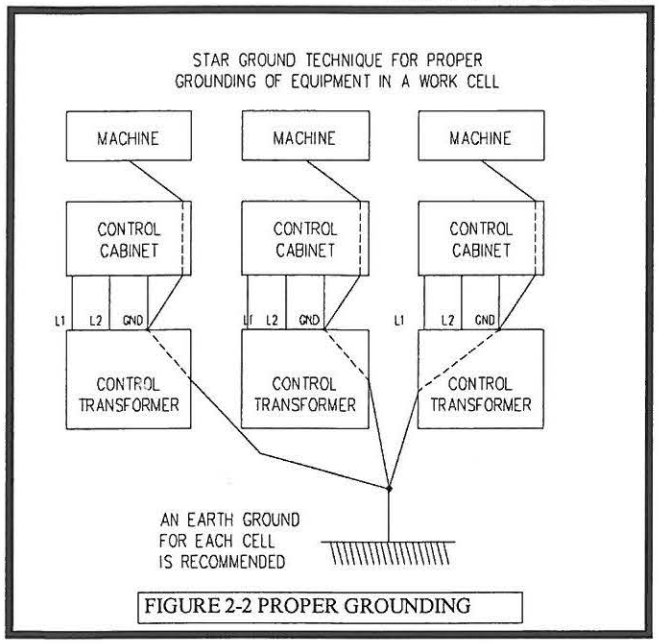


FIGURE 2-2 PROPER GROUNDING

2.4 INTERLOCKING *

Referencing Electrical drawings.

The following input interlocks are designed for the safe operation of the Reciprocator and should be used in all cases, not defeated or jumped out.

All connections for interlocks are located on the right hand side of the control box in the lower quick disconnect fitting or on panel mounted terminals in the control cabinet. All contacts must be 120 VAC dry contacts, meaning that there will be no electrical link between the D.C.M. and the reciprocator (isolated with relays). The interlock LED's on the keypad show whether or not the interlocks are present.

2.4.1 INPUTS*

RECIPROCATOR START: (SLOT # 10)

Wire #'s 703 & 707 N/O contacts are activated (closed) when the reciprocator is to start its cycle. Run this from the PART SENSED signal if an extractor is used, from an operator push button or from a door switch.

DIE START OPEN: (SLOT #9)

Wire #'s 703 & 708 N/O contacts are activated (closed) on die start open, deactivated (opened) on die full open. This contact signals the reciprocator to move to the Approach Position. (Recip. Approach)

DIES FULL OPEN: (SLOT #8)

Wire #'s 703 & 709 N/O contacts are activated (closed) when dies are full open. (O.K. to Extend)

DIE LOCKED: (SLOT #11)

Wire #'s 703 & 710 N/O contacts are activated (closed) when dies are locked up, deactivated (opened) on die unlock. (Recip. Reset)

EXTERNAL SAFETY:

Can be used with contacts from safety gates, mats, beams, etc. and connected across wires 701 and 702. If this connection is not closed (I.E. safety violated) there will be no power to the Interlocks and motor controls, but there will

be 120 VAC Present at the 24 and 5 volt power supplies. To restore power the safety must be made and the manual on key must be pressed. This interlock is used to provide a method of stopping the movement of the Reciprocator by turning off the Servo motor controller.

Note: This interlock has the same effect as opening the control box door and can also be used as a remote shutdown.

CONTINUE FROM WAIT #1: (SLOT #15)

Wire No. 703 and 749 N/O contacts are activated (closed) when the reciprocator is to continue from the programmed wait #1 function. See Section 3 for programming of the wait #1 function. This wait function is typically used for the movement of hydraulic die core slides during an automatic spray cycle.

CONTINUE FROM WAIT #2: (SLOT #22)

Wire No. 703 and 750 N/O contacts are activated (closed) when the reciprocator is to continue from the programmed wait #2 function. See Section 3 for programming of the wait #2 function. This wait function is typically used for the movement of hydraulic die core slides during an automatic spray cycle.

DCM IN AUTO: (SLOT #23)

* This is only a recommendation and is in no way the only way to interface a Reciprocator with a die cast machine. RIMROCK accepts no liability for actual interlocking of our equipment with the die cast machine. Wire No. 703 and 762 N/O contacts are activated (closed) when the DCM is in AUTO mode. If properly programmed, absence of this signal will prevent the reciprocator from going to AUTO mode. The loss of this signal while the reciprocator is in AUTO will result in a 9.03 fault. See Section 3 for programming of check DCM in AUTO (Aux 4.7).

2.4.2 OUTPUTS*

CYCLE COMPLETE: (SLOT #1)

Wire #'s 714 & 715 N/O contacts are closed when spray cycle is complete. This contact is a momentary contact, released when the reciprocator receives the reset interlock (die locked).

RECIPROCATOR CLEAR:

Wire #'s 736 & 737 and 738 & 739 and 741 & 742 are N/O contacts that close when the reciprocator is clear of any interference with the die cast machine. These contacts are for machine interlocking. These contacts are directly controlled by PS-703. (See Section 2 & 3 - Arm Positions for more information.)

RECIPROCATOR IN AUTO: (SLOT #16)

Wire No. 743 and 744 are N/O contacts that close when the reciprocator is in AUTO mode.Wiring can be done by customers to their specifications. This output can signal the die cast machine or turn on a light, etc.

RECIPROCATOR WAIT #1: (SLOT #7)

Wire No. 747 and 748 are N/O contacts that close when the reciprocator is programmed into a wait state. The contact is maintained closed until the Continue from Wait #1 Input is activated. See Section 3 for programming of the Wait #1 function. This wait function is typically used for the movement of hydraulic die core slides during an automatic spray cycle.

RECIPROCATOR WAIT #2: (SLOT #21)

Wire No. 759 and 760 are N/O contacts that close when the reciprocator is programmed into a wait state. The contact is maintained closed until the Continue from Wait #2 Input is activated. See Section 3 for programming of the Wait #2 function. This wait function is typically used for the movement of hydraulic die core slides during an automatic spray cycle.

RECIPROCATOR FAULTED: (SLOT 17)

Wire No. 745 and 746 are N/O contacts that close if the reciprocator has a fault condition occur. Wiring can be done by customers to their specifications. This output can signal the die cast machine or turn on a light, etc.

* This is only a recommendation and is in no way the only way to interface a Reciprocator with a die cast machine. RIMROCK accepts no liability for actual interlocking of our equipment with the die cast machine.

2.5 PLUMBING CONNECTIONS:

SPRAY BLOW: Spray on a one lube unit has (4) hoses:

1. Pilot Air ------
2. Spray Air ---------->For lube (lube A) spray

3. Lube ----------

4. Blow ----------> For blow air

A two lube system will have (3) additional hoses:

1. Pilot Air -------

2. Spray Air ----------> For lube (lube B) spray

3. Lube ----------

A three lube system will have (3) additional hoses:

1. Pilot Air -------

2. Spray Air ----------> For lube (lube C) spray

3. Lube ----------

2.6 DRY CYCLING:

This machine may be dry cycled by insuring that the Die Cast Machine clear input is active and giving a cycle start input.

2.7 HOMING SEQUENCE:

With the machine in the manual mode, up to two LED's could be flashing, depending on where the machine was positioned when the machine was turned off. The MANUAL LED will be flashing and possibly the AUX 5 LED. If both are flashing, home the machine by pressing the AUX 5 key. If the AUX 5 LED is not flashing, the arm must be retracted to the Rest Position (using the retract key). The AUX 5 LED should now be flashing. If so pressing the AUX 5 key will automatically home the machine. When the machine homes it is finding the "0" position for the arm. Pressing the manual key during homing will stop the homing process.

2.8 MACHINE SIZE SETUP

The machine is shipped with the default settings as explained in Section 3 of this manual. You will have to program settings that will work for your application. Remember to select the correct machine size before starting programming.

3
Programming

3. Lube ----------

4. Blow ----------> For blow air

A two lube system will have (3) additional hoses:

1. Pilot Air -------

2. Spray Air ----------> For lube (lube B) spray

3. Lube ----------

A three lube system will have (3) additional hoses:

1. Pilot Air -------

2. Spray Air ----------> For lube (lube C) spray

3. Lube ----------

2.6 DRY CYCLING:

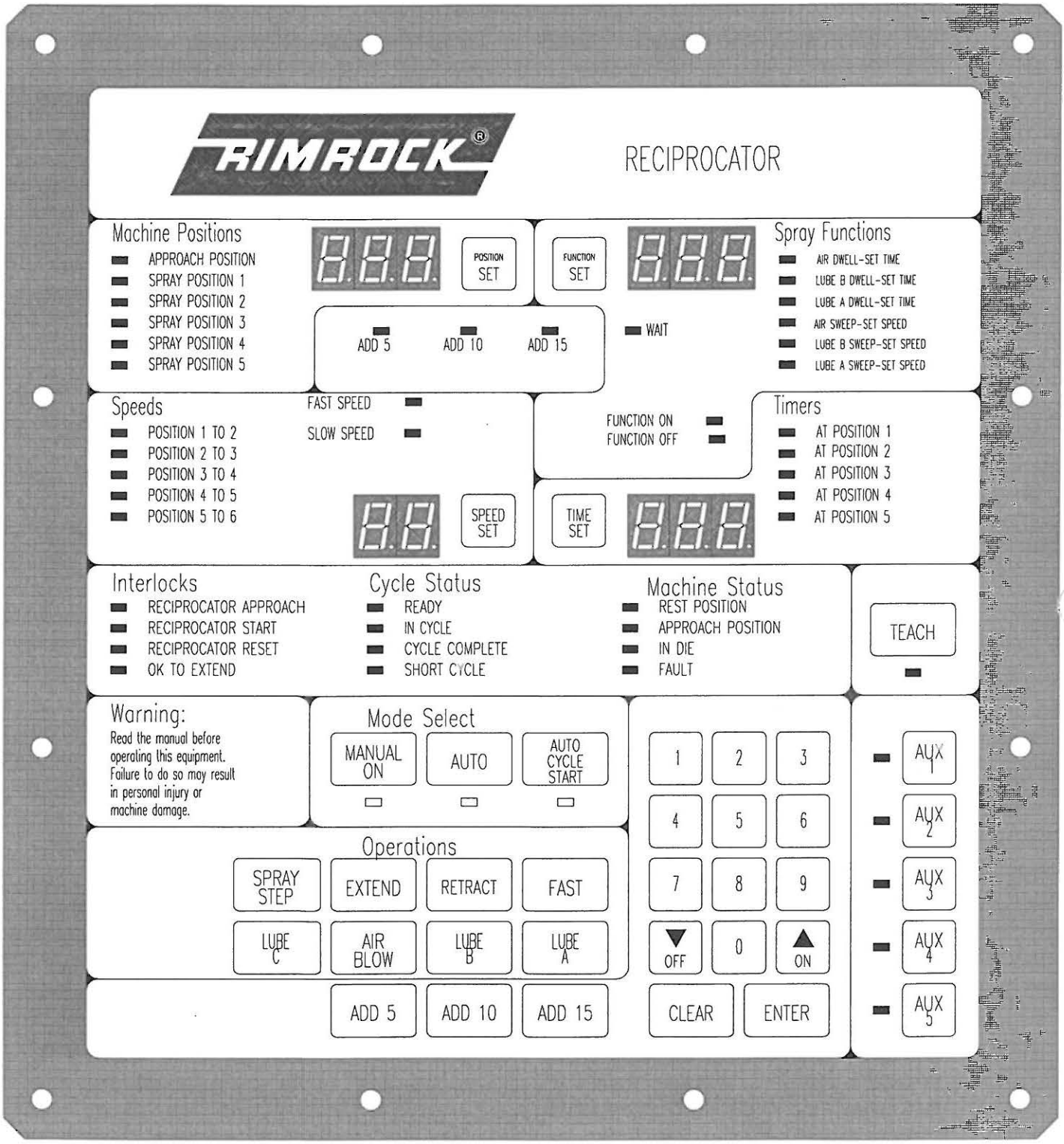
This machine may be dry cycled by insuring that the Die Cast Machine clear input is active and giving a cycle start input.

2.7 HOMING SEQUENCE:

With the machine in the manual mode, up to two LED's could be flashing, depending on where the machine was positioned when the machine was turned off. The MANUAL LED will be flashing and possibly the AUX 5 LED. If both are flashing, home the machine by pressing the AUX 5 key. If the AUX 5 LED is not flashing, the arm must be retracted to the Rest Position (using the retract key). The AUX 5 LED should now be flashing. If so pressing the AUX 5 key will automatically home the machine. When the machine homes it is finding the "0" position for the arm. Pressing the manual key during homing will stop the homing process.

2.8 MACHINE SIZE SETUP

The machine is shipped with the default settings as explained in Section 3 of this manual. You will have to program settings that will work for your application. Remember to select the correct machine size before starting programming.


RIMROCK®
RECIPROCATOR
Machine Positions
APPROACH POSITION
SPRAY POSITION 1
SPRAY POSITION 2
SPRAY POSITION 3
SPRAY POSITION 4
SPRAY POSITION 5
POSITION SET
FUNCTION SET
ADD 5
ADD 10
ADD 15
WAIT
Spray Functions
AIR DWELL-SET TIME
LUBE B DWELL-SET TIME
LUBE A DWELL-SET TIME
AIR SWEEP-SET SPEED
LUBE B SWEEP-SET SPEED
LUBE A SWEEP-SET SPEED
Speeds
POSITION 1 TO 2
POSITION 2 TO 3
POSITION 3 TO 4
POSITION 4 TO 5
POSITION 5 TO 6
FAST SPEED
SLOW SPEED
SPEED SET
FUNCTION ON
FUNCTION OFF
TIME SET
Timers
AT POSITION 1
AT POSITION 2
AT POSITION 3
AT POSITION 4
AT POSITION 5
Interlocks
RECIPROCATOR APPROACH
RECIPROCATOR START
RECIPROCATOR RESET
OK TO EXTEND
Cycle Status
READY
IN CYCLE
CYCLE COMPLETE
SHORT CYCLE
Machine Status
REST POSITION
APPROACH POSITION
IN DIE
FAULT
TEACH
Warning:
Read the manual before operating this equipment. Failure to do so may result in personal injury or machine damage.
Mode Select
MANUAL ON
AUTO
AUTO CYCLE START
Operations
SPRAY STEP
EXTEND
RETRACT
FAST
LUBE C
AIR BLOW
LUBE B
LUBE A
ADD 5
ADD 10
ADD 15
1
2
3
4
5
6
7
8
9
OFF
0
ON
CLEAR
ENTER
AUX 1
AUX 2
AUX 3
AUX 4
AUX 5

3. PROGRAMMING

All initial programming must be done in the manual mode. Programming in auto mode is used for fine tuning and will be discussed in the next section.

3.1 GENERAL ALGORITHM

In general, any time a parameter needs to be changed, the sequence of keystrokes is:

1. While in manual mode, press the TEACH key, causing the teach LED to flash.

2. Enter into any of the five sections containing the parameter that needs to be changed by pressing one of the four SET keys or AUX keys.

3. Press the same SET key, or AUX key until the LED next to the parameter to be changed lights up. The present values in memory appear in the window as the parameters are scrolled through.

4. If in the timers or speeds section, enter in the new value with the numeric portion of the keypad. If in the arm position or dipper position section, jog the arm or dipper to the desired position or enter it numerically.

5. Finally, to enter the value into memory, press the ENTER key. When the new value is accepted the TEACH LED will once again start flashing.

Note: If a number punched in with the numerical portion of the keypad is incorrect, it may be cleared from the display with the CLEAR key. This is only effective if the ENTER key has not yet been pressed. Also, if a value is out of the acceptable range for the parameter, the displayed value will flash until the clear key is pressed.

If further parameters need to be changed, follow steps 2) through 5) again.

To exit the teach mode press the TEACH key again. The TEACH LED must be flashing in order to exit teach mode. If the LED is not flashing then the ENTER or CLEAR key must be pressed first to get the TEACH LED back to its flashing condition. Also, the teach mode will be exited if no key is pressed for 60 seconds; this is the "hands-off" feature of the Reciprocator. If in AUTO TEACH the manual key can be used to terminate teach and auto mode.

3.2 TYPICAL RECIPROCATOR CYCLE:

In a typical 410 cycle the reciprocator will be waiting at the Rest Position as the die cast machine dwells. As soon as the dies start to open (Reciprocator Approach Interlock) the arm will move to the Approach Position. When the dies are full open (O.K. to Extend) and the part is clear of the dies (Reciprocator Start), either manually or by an extractor, the 410 will start its spray cycle. The 410 Reciprocator can spray many different combinations of spray cycles. Below is a standard Sweep & Spray, Stop & Spray cycle. This is the same cycle used as an example in the Programming Section.

1. Move to a position above the parting line.
2. Move down to position 1, turn on the Lube and Dwell for 1.0 sec. (Stop and Spray)
3. Sweep down to position 2 at 35% full speed with Lube on. (Sweep & Spray)
4. Dwell at position 2 for 1.0 sec. with Lube on. (Stop & Spray)
5. Sweep down to position 3 at 15% full speed with Lube on. (Sweep & Spray)
6. Dwell at position 3 for 1.0 sec. with Lube on. (Stop & Spray)
7. Sweep down to position 4 at 45% with Lube on. (Sweep & Spray)
8. Dwell at position 4 for 1.0 sec. with Lube on. (Stop & Spray)
9. Sweep up to position 5 at 45% full speed with Air and Lube on. (Sweep & Spray)

10. Sweep up to position 6 at 45% full speed with Lube on. (Sweep & Spray)

11. Sweep up to position 7 at 25% full speed with Air on, turn off air at position 7 and continue out of die space. (Sweep & Blow)

After the 410 reaches position 7 it will stop all air blow (after Dwell if used) and move out of the die at the Fast Speed until it reaches its deceleration position. At this time it will give the Cycle Complete signal and continue to move to the Rest Position. When the Rest Position is reached the Reciprocator Fully Retracted proximity switch is made, allowing the dies to close.

One variation of this would be to have the Short Cycle ON. If this is the case then the arm will move from Position 7 at the Fast Speed until it reaches the Approach Position. Then the Cycle Complete signal will be given and the Reciprocator Clear proximity switch will be made, allowing the dies to close. However, the 410 will stay at this position until the next cycle is started.

3.3 KEYPAD DESCRIPTION

Note: Machines that utilize video operator stations do not have LED's as listed below.

RECIP STOP PUSH BUTTON (MAINTAINED):

A maintained red mushroom head push button is located on the operators panel. De-pressing this push button puts the reciprocator in a standby mode. It does this by interrupting power to the main control relay. This removes all power from the motor control circuit. However it does not remove power from all components in the control box. Provisions have been made for daisy chaining more maintained stop push buttons in series with this switch. This can be done per your requirements.

MANUAL/ON Key With LED:

When the MANUAL/ON key is pressed, the machine enters a jog type mode. The LED stays on (steady) until the AUTO or RECIP STOP key is pressed. If the machine needs to be homed, the manual LED will flash until the unit is homed. Homing the machine is done when the rest position proximity switch is activated and when AUX 5 key is pressed. For a complete description of the homing sequence, see Homing Sequence Section 2. Interlock LED's, and Machine Status LED's are active. All machine interlocks are considered when manually moving machine (i.e.: OK to Extend must be present for the arm to enter the die area). This key activates the control system (turn it on).

NOTE: The yellow push button on the right hand side of the keypad labeled ON duplicates this key.

AUTO Key With LED:

When the AUTO key is pressed the machine enters a fully automatic mode. The LED stays on (steady) until MANUAL is pressed. To enter the Auto mode the reciprocator arm must be at the rest position.

NOTE: The green push button on the right hand side of the keypad labeled AUTO duplicates this key.

AUTO CYCLE START Key With LED:

When in AUTO mode pressing this key starts a fully automatic cycle. The LED stays on (steady) until this cycle is completed or MANUAL is pressed. If a cycle start signal is present from the die cast machine or the system is in Auto Teach this key will not start a cycle.

NOTE: The green push button on the right hand side of the keypad labeled AUTO CYCLE START duplicates this key.

TEACH Key With LED:

When the teach key is pressed, the machine enters a set-up mode. The LED flashes until a set key is pressed, the teach key is pressed again or 10 seconds elapses. If in Manual cycle, Teach mode terminates when the TEACH key is pressed while the teach LED is flashing or after the 10 second "HANDS OFF" feature times out, the flashing of the TEACH LED indicates a section set key can now be pressed to change or review the values in that section. When the TEACH LED is on steady, this indicates a set function has been entered and is waiting for a new value to be entered, or is ready to review an

old value. This key will be used to set-up, change, or review the machine parameters. The changing of parameters through this key will be permitted during Manual Mode (manual teach) using the operation keys or the numeric key pad and during the Auto Mode (auto teach) using the arrow keys.

POSITION SET Key:

When in the teach mode, pressing the position set key enables the spray positions to be reviewed. With further pressing of the position set key, each position will be sequenced through and its value displayed. Any position may be changed by using the numeric key pad, or, if in Manual Teach, moving the machine by using the operation key to the position desired and pressing the ENTER key. When an operation key is pressed and released, the display will show the position of the arm.

ENTER Key:

This key is used to enter a new parameter into memory. The current value displayed will be entered replacing the old value. If the value is invalid for that parameter the display will flash until the CLEAR key is pressed or 10 seconds elapses.

CLEAR Key:

This key is used to clear an entry before the enter key is pressed, or to exit a section if no values have been changed, without leaving the Teach Mode. This key will never destroy original data. Pressing this key before a parameter has been modified will start the teach LED flashing, allowing you to exit the Teach Mode.

AUXILIARY Keys (keypad version):

When the AUXILIARY key is pressed (AUX 1, AUX 2, AUX 3, AUX 4, OR AUX 5) the number of the parameter to be changed will be shown in the numeric display next to the SPEED SET key and the associated parameter data will be shown in the numeric display next to the TIMER SET key. Each time the AUXILIARY key is pressed the next parameter will be displayed.

AUX 1: The 410 Reciprocator does not use the AUX 1 parameters.

AUX 2: This auxiliary key has 3 parameters and is used to set all auxiliary times. The AUX 2 Parameters are:

1. Lube Purge A timer. After the spray cycle is complete the purge timer is activated, this cleans the spray nozzles of excess lube. The purge function leaves the spray air "A" solenoids activated for the purge time. The spray air solenoid is output number 6 and uses wire numbers 718 & 7L2. The range is 0 to 99.9.

2. Lube Purge B timer. After the spray cycle is complete the purge timer is activated, this cleans the spray nozzles of excess lube. The purge function leaves the spray air "B" solenoids activated for the purge time. The spray air solenoid is output number 5 and uses wire numbers 719 & 7L2. The range is 0 to 99.9.

3. Lube Purge C timer. After the spray cycle is complete the purge timer is activated, this cleans the spray nozzles of excess lube. The purge function leaves the spray air "C" solenoids activated for the purge time. The spray air solenoid is output number 19 and uses wire numbers 722 & 7L2. The range is 0 to 99.9.

AUX 3: This auxiliary key has 5 parameters and is use to set all auxiliary positions. The AUX 3 Parameters are:

1. Check Position. This key is used to set the check position. While in the MANUAL TEACH mode and with the arm fully retracted the AUX 3 key may be pressed. At this time the AUX 3 LED will be on. Press the ARM EXTEND key, at this time the arm will begin to extend until it reaches the CHECK POSITION proximity switch. When the arm reaches the CHECK POSITION proximity switch release the ARM EXTEND key and at this time the arm will perform a short homing sequence. The speed of the arm during homing is a set value and cannot be changed. The value is entered by the CPU and is the encoder counts from rest (proximity switch) to check (proximity switch) position.

2. NOT USED

3. NOT USED

4. Lube "C" Dwell Position Set. During an Auto Cycle this function will turn on the lube output

These LED's will give a visual indication that an interlock is present. These indicators are:

RECIPROCATOR APPROACH

RECIPROCATOR START

RECIPROCATOR RESET

O.K. TO EXTEND

CYCLE STATUS Indicators:

These LED's will show the condition of the machine while in the auto mode. These indicators are:

READY

IN CYCLE

CYCLE COMPLETE

SHORT CYCLE

MACHINE STATUS Indicators:

These LEDS will show the condition of machine devices. This will assist in troubleshooting if there is a fault condition or devices need checked. These indicators are:

REST POSITION

APPROACH POSITION

IN DIE

FAULT

MACHINE POSITIONS

APPROACH POSITION:

This is a position above the top of the dies that the reciprocator can move to as the dies are opening and the part is being removed. Care must be taken in setting this position so as not to move the arm into any core pull cylinders on the top of the dies. **Note:** The O.K. TO EXTEND interlock is not needed to move to this position, unless the safe extend option is active (see explanation of AUX 4-4).

SPRAY POSITION 1 through 20:

These positions are the places at which the reciprocator can do one or all of the following functions:

1. Stop and spray. (Dwell times)
2. Change spray functions:
    a. Change the lube it is spraying.
    b. Turn another lube on.
    c. Turn a lube off.
    d. Turn on the blow air.
3. Change the speed at which the arm is moving.
4. Change the direction of travel.
5. Activate a wait function

The changes listed above can be done before the stop (if dwell time is used), or after the stop (as it begins to move again).

SPEEDS

POSITION 1 TO 2 through 19 TO 20:

This is the speed the arm will travel during an Auto cycle from one SPRAY POSITION to another. Range = 01% to 99%.

FAST SPEED:

The speed the arm will travel during an Auto cycle from the APPROACH POSITION to SPRAY POSITION 1 and from the last programmed spray position to REST. This speed is also used for the Manual cycle when the FAST key is pressed with another arm operation key. Range = SLOW SPEED to 99%.

SLOW SPEED:

The speed the arm will travel during an Auto Cycle from the REST POSITION to the APPROACH POSITION. This speed is also used for the Manual Cycle when the EXTEND or RETRACT key is pressed.

Range = 01% to 25% but must be less than FAST SPEED.

DWELL TIMES

AT POSITION 1 to 20:

This time is the time the arm will stop at a certain SPRAY POSITION. (Stop and Spray) Range = 0.0 to 99 seconds.

SPRAY FUNCTIONS

AIR DWELL-SET TIME:

During an Auto Cycle this function will turn on the air output solenoid during a DWELL TIME at a given SPRAY POSITION. The air solenoid output is output #2 and uses wire numbers 704 & L2.

LUBE B DWELL-SET TIME (Two Lube only):

During an Auto Cycle this function will turn on the LUBE B output solenoid during a DWELL TIME at a given SPRAY POSITION. The LUBE B solenoid output is output #3 and uses wire numbers 706 & L2.

After the dwell timer times out the purge timer is activated, this cleans the spray nozzles of excess lube (see AUX 2 parameters). The purge function leaves the spray air "B" solenoids activated for the purge time. The spray air "B" solenoid is output number 5 and uses wire numbers 719 & L2.

LUBE DWELL-SET TIME (lube A):

During an Auto Cycle this function will turn on the lube output solenoid during a DWELL TIME at a given SPRAY POSITION. The lube solenoid output is output #4 and uses wire numbers 705 & L2.

After the dwell timer times out the purge timer is activated, this cleans the spray nozzles of excess lube (see AUX 2 parameters). The purge function leaves the spray air "A" solenoids activated for the purge time. The spray air "A" solenoid is output number 6 and uses wire numbers 718 & L2.

AIR SWEEP-SET SPEED:

During an Auto Cycle this function will turn on the air output solenoid during a SWEEP from one SPRAY POSITION to the next. The air solenoid output is output #2 and uses wire numbers 704 & L2.

LUBE B SWEEP-SET SPEED (Two Lube only):

During an Auto Cycle this function will turn on the LUBE B output solenoid during a SWEEP from one SPRAY POSITION to the next. The LUBE B solenoid output is output #3 and uses wire numbers 706 & L2.

After the sweep is completed, the purge timer is activated, this cleans the spray nozzles of excess lube (see AUX 2 parameters). The purge function leaves the spray air "B" solenoid activated for the purge time. The spray air "B" solenoid is output #5 and uses wire numbers 719 & L2.

LUBE SWEEP-SPEED SET (lube A):

During an Auto Cycle this function will turn on the lube output solenoid during a SWEEP from one SPRAY POSITION to the next. The lube solenoid output is output #4 and uses wire numbers 705 & L2.

After the sweep is completed, the purge timer is activated, this cleans the spray nozzles of excess lube (see AUX 2 parameters). The purge function leaves the spray air "A" solenoid activated for the purge time. The spray air "A" solenoid is output #6 and uses wire numbers 718 & L2.

WAIT 1 FUNCTION (OPTIONAL):

During an auto cycle this function will turn on the wait 1 output #7 at a given spray position. This function, if programmed, will become active after a dwell and before a sweep. The reciprocator will wait at the spray position until it receives an CONTINUE FROM WAIT 1 (input # 15) from the DCM. A wait can be programmed at all 20 positions

WAIT 2 - 4 FUNCTIONS (OPTIONAL):

The reciprocator can have up to 3 additional (for a total of 4) programmable wait outputs and inputs. These are functionally identical to the original wait function except the teaching of these functions must be enabled. See AUX 4.4, Set Cycle Options, for enabling instructions. If two or more waits are programmed for a spray position, then all associated continue from wait inputs must be on for the reciprocator to continue the cycle.

WAIT WITH SPRAY FUNCTION:

The reciprocator wait functions usually wait after spraying at a dwell position. This option allows the reciprocator to spray while waiting. If set, the wait outputs will come on at the start of a spray dwell. The dwell time programmed will be counted down and when it reaches zero the programmed continue from wait input(s) will be checked. If the input(s) are not on, then spraying will continue until they do come on. Once the wait inputs do come on after the dwell time expires, the reciprocator will continue the cycle. The ability to teach this parameter must be enabled on key pad systems. See AUX 4.4, Set Cycle Options, for Enabling Instructions.

ARM POSITIONS

APPROACH POSITION:

This is a position above the top of the dies that the reciprocator can move to as the dies are opening and the part is being removed. Care must be taken in setting this position so as not to move the arm into any core pull cylinders or other obstructions on the top of the dies. **Note:** The O.K. TO EXTEND interlock is not needed to move to this position, unless the safe extend option is active (see explanation of AUX 4-4).

REST POSITION:

In this position the arm is fully retracted and the REST POSITION limit switch (701-PS) will be tripped. When this limit switch is tripped the REST POSITION LED on the control panel lights and the Input #12 is on. This is the only position of the arm that will allow the Auto Mode to be entered.

IN DIE:

When the arm is advanced past the APPROACH POSITION the IN DIE LED on the control panel lights indicating the arm is in the die.

CHECK POSITION:

This position is used by the computer to check the arm position during an Auto cycle. It uses a factory set proximity switch (702-PS) that activates Input #13. If it is necessary to reset this position see AUX 3 key explanation in this manual. Because the CHECK POSITION is checked on each cycle it must be adjusted so it is tripped on each cycle.

The function of the Check Position is to insure the spray manifold is repeating the same spray positions from cycle to cycle.

3.4 TEST PROGRAM (ONE LUBE):

NOTE: This test is for keypad versions, the video version is similar. The program below will allow the 410 Reciprocator to spray the following sequence:

1. Move to a position above the parting line.
2. Move down to position 1, turn on the Lube and Dwell there for 1.0 sec. (Stop and Spray)
3. Sweep down to position 2 at 35% full speed with Lube on. (Sweep & Spray)
4. Dwell at position 2 for 1.0 sec. with Lube on. (Stop & Spray)
5. Sweep down to position 3 at 15% full speed with Lube on. (Sweep & Spray)
6. Dwell at position 3 for 1.0 sec. with Lube on. (Stop & Spray)
7. Sweep down to position 4 at 45% with Lube on. (Sweep & Spray)
8. Dwell at position 4 for 1.0 sec. with Lube on. (Stop & Spray)
9. Sweep up to position 5 at 45% full speed with Lube and Air on. (Sweep & Spray)
10. Sweep up to position 6 at 45% full speed with Lube on. (Sweep & Spray)
11. Dwell at position 6 for 1.0 sec. with Lube on. (Stop & Spray)
12. Wait at position 6 until input from DCM is turned on.
13. Sweep up to position 7 at 25% full speed with Air on, turn off air at position 7 and continue out of die space. (Sweep & Blow)

POSITION SET SECTION:

1. Activate the machine by pressing the MANUAL key.

2. At this point if the MANUAL/ON LED is flashing the machine will have to be homed. If this is the case, see Homing Sequence in Section 2, if not continue on with #3.

The machine is now ready to program

NOTE: Homing the machine must be executed each time power is applied to the control panel. If power has not been removed it is not necessary to home the machine before programming or changing any values.

3. Press TEACH key.
4. Press POSITION SET key, the APPROACH POSITION LED will light.
5. Move the arm using the EXTEND key to the desired position for the approach position. This position should move the arm to a position just above the top surface of the dies.

NOTE: On dies having core pull cylinders on the top of the dies, care must be taken not to move into them or other obstructions.

6. Press ENTER key. This enters this position into the memory.
7. Press the POSITION SET key until the SPRAY POSITION 1 LED lights and 01 appears in the function numeric display.
8. Using the EXTEND key, move the arm until it reaches the approximate first spray position desired.
9. Press ENTER key, This enters SPRAY POSITION 1.
10. Press the POSITION SET key until the SPRAY POSITION 2 LED lights and 02 appears in the function numeric display.
11. Using the EXTEND key, move the arm until it reaches the approximate second spray position desired.
12. Press ENTER key. This enters SPRAY POSITION 2.
13. Press the POSITION SET key until the SPRAY POSITION 3 LED is lights and 03 appears in the function numeric display.
14. Using the EXTEND key, move the arm until it reaches the approximate third spray position desired.
15. Press the ENTER key. This enters SPRAY POSITION 3.
16. Press the POSITION SET key until the SPRAY POSITION 4 LED lights and 04 appears in the function numeric display.
17. Using the EXTEND key, move the arm until it reaches the approximate fourth spray position desired.
18. Press the ENTER key. This enters SPRAY POSITION 4.
19. Press the POSITION SET key until the SPRAY POSITION 5 LED lights and 05 appears in the function numeric display.
20. Using the RETRACT key, move the arm until it reaches the approximate fifth spray position desired.
21. Press the ENTER key. This enters SPRAY POSITION 5.
22. Press the ADD 5 key. This enables you to access positions 6 through 10.
23. Press the POSITION SET key until the SPRAY POSITION 1 LED lights and 06 appears in the function numeric display.
24. Using the retract key, move the arm until it reaches the approximate sixth spray position.
25. Press the ENTER key. This enters SPRAY POSITION 6
26. Press the POSITION SET key until the SPRAY POSITION 2 LED lights and 07 appears in the function numeric display.
27. Using the retract key, move the arm until it reaches the top of the die cavity. This will allow you to use the Air Sweep "Air Blow Off" on the way out of the die.
28. Press the ENTER key. This enters SPRAY POSITION 7.

THIS COMPLETES THE POSITION SETTING PORTION OF PROGRAMMING THE 410 RECIPROCATOR.

SPEED SET SECTION: (Sweep Speeds)

1. Press SPEED SET key until the LED beside POSITION 1 TO 2 lights.
2. Enter 35 (using keypad), 35 should now be displayed in the digital display to the left of the speed set key. The value of 35 tells the machine to run at 35% of full speed.
3. Press ENTER key, the sweep speed for POSITION 1 TO 2 has now been set.
4. Press SPEED SET key so the LED beside POSITION 2 TO 3 lights.
5. Enter 15 (using keypad).
6. Press ENTER key, the sweep speed for POSITION 2 TO 3 has now been set at 15%.
7. Press SPEED SET key so the LED beside POSITION 3 TO 4 lights.
8. Enter 45 (using keypad).
9. Press ENTER key, the sweep speed for POSITION 3 TO 4 has now been set at 45%.
10. Press SPEED SET key so the LED beside POSITION 4 TO 5 lights.
11. Enter 45 (using keypad).
12. Press ENTER key, the sweep speed for POSITION 4 TO 5 has now been set at 45%.
13. Press SPEED SET key so the LED beside POSITION 5 TO 6 lights.
14. Enter 45 (using keypad).
15. Press ENTER key, the sweep speed for POSITION 5 TO 6 has now been set at 45%.
16. Press SPEED SET key so the LED beside FAST SPEED lights.
17. Enter 45 (using keypad).
18. Press ENTER key, the FAST SPEED has now been set at 45%.
19. Press SPEED SET key so the LED beside SLOW SPEED lights.
20. Enter 10 (using keypad).
21. Press ENTER key, the SLOW SPEED has now been set at 10%.
22. Press ADD 5 key. This gives you access to speeds up to position 11.
23. Press SPEED SET key so the LED beside POSITION 1 TO 2 lights and the positions 06, 07 are displayed in the top two numeric displays.
24. Enter 25 (using keypad).
25. Press ENTER key, the sweep speed for POSITION 6 TO 7 has now been set at 25%. This is the blow off speed.

THIS COMPLETES THE SPEED SET SECTION OF PROGRAMMING THE 410 RECIPROCATOR.

TIME SET SECTION: (Dwell Times)

1. Press TIME SET key until the LED beside AT POSITION 1 lights.
2. Enter 1.0 (using keypad).
3. Press ENTER key, this will enter a 1.0 sec the dwell time AT POSITION 1.
4. Press TIME SET key until the LED beside AT POSITION 2 lights.
5. Enter 1.0 (using keypad).
6. Press ENTER key, this will set the dwell time AT POSITION 2 to 1.0 sec.
7. Press TIME SET key until the LED beside AT POSITION 3 lights.
8. Enter 1.0 (using keypad).
9. Press ENTER key, this will set the dwell time AT POSITION 3 to 1.0 sec.
10. Press TIME SET key until the LED beside AT POSITION 4 lights.
11. Enter 1.0 (using keypad).
12. Press ENTER key, this will set the dwell time AT POSITION 4 to 1.0 sec.
13. Press TIME SET key until the LED beside AT POSITION 5 lights.
14. Enter 1.0 (using keypad).

15. Press ENTER key, this will set the dwell time AT POSITION 5 to 1.0 sec.

16. Press ADD 5 key. This gives you access to timers from positions 6 through 10.

17. Press TIME SET key until the LED beside AT POSITION 1 lights.

18. Enter 1.0 (using keypad).

19. Press ENTER key, this will set the dwell time AT POSITION 6 to 1.0 sec.

THIS COMPLETES THE TIME SET SECTION OF PROGRAMMING THE 410 RECIPROCATOR

SPRAY SET SECTION: (Spray Functions)

1. Press SPRAY SET key until the LED beside the LUBE DWELL- SET TIME lights.
2. Enter 1 (using keypad) for SPRAY POSITION 1. The absolute position number (1 through 20) will be displayed in the Spray Functions digital display. The LED FUNCTION ON or FUNCTION OFF will be lit to indicate status of spray function at a given position. Entering a 2 from the keypad will display the status (on or off) of the function at position 2. If the function selected is a DWELL, the AT POSITION 2 LED will blink. If a SWEEP is the selected function, the SPEED POSITION 2 TO 3 LED will blink and likewise for a wait function the POSITION 2 LED will blink.
3. Press ON (using keypad). Notice FUNCTION ON LED is lit.
4. Press ENTER key, this will turn on LUBE DWELL AT POSITION 1.
5. Enter 2 (using keypad).
6. Press ON (using keypad). Notice FUNCTION ON LED is lit.
7. Press ENTER key, this will turn on LUBE DWELL AT POSITION 2.
8. Enter 3 (using keypad).
9. Press ON (using keypad). Notice FUNCTION ON LED is lit.
10. Press ENTER key, this will turn on LUBE DWELL AT POSITION 3.
11. Enter 4 (using keypad).
12. Press ON (using keypad). Notice FUNCTION ON LED is lit.
13. Press ENTER key, this will turn on LUBE DWELL AT POSITION 4.
14. Enter 5 (using keypad).
15. Press ON (using keypad). Notice FUNCTION ON LED is lit.
16. Press ENTER key, this will turn on LUBE DWELL AT POSITION 5.
17. Press ADD 5 key. This gives you access to spray functions for positions 6 through 10.
18. Press SPRAY SET key until the LED beside the LUBE DWELL-SET TIME lights.
19. Enter 1 (using keypad).
20. Press ON (using keypad). Notice FUNCTION ON LED is lit.
21. Press ENTER key, this will turn on LUBE DWELL AT POSITION 6
22. Press SPRAY SET key until LED beside AIR SWEEP-SPEED SET lights.
23. Enter 1 (using keypad).
24. Press ON (using keypad). Notice FUNCTION ON LED is lit.
25. Press ENTER key, this will turn on the AIR SWEEP from Position 6 to 7. This will give air blow off on the way out of the die.
26. Press SPRAY SET key until LED beside WAIT lights.
27. Enter 1 (using keypad).
28. Press ON (using keypad). Notice FUNCTION ON LED is lit.

THIS COMPLETES THE SPRAY FUNCTION SECTION OF PROGRAMMING THE 410 RECIPROCATOR

NOTE: While in teach, there is a "HANDS OFF" feature that will return the system to the

MANUAL or AUTO mode if there has not been any key strokes for 60 seconds.

3.5 AUTO TEACH:

AUTO TEACH function will also change the program. Enter AUTO TEACH while in Auto mode, by pressing the TEACH key. The Teach LED will flash. If no key is pressed for 60 seconds the system will return to the Auto mode. Pressing the manual key will also terminate teach and auto mode.

The use of the AUTO TEACH function will not interrupt the cycle of the machine. While in teach, the auto cycle messages will be overridden by the teach messages. Once you drop out of teach the auto cycle messages will return.

After pressing the teach key, any set key can be used to enter any area. If no values have been changed within 60 seconds the system will return to the Auto mode, retaining all present values.

Once a value has been selected it can be changed by using the up arrow or down arrow keys. Pressing the up arrow key will increase the value by 1 digit. If the up arrow key is pressed and held it will continue to increase the value at the rate of 1 digit every 1/10 second. The same holds true for the down arrow except it decreases the value. Spray Functions may also be changed by using the same arrow keys up arrow for "on" and down arrow for "off". If a wrong key is pressed you may clear the display by pressing the clear key. This will return the display to the original value.

After the desired value is changed, press the ENTER key. The display will blank for 1/2 second then return, indicating the new value has been entered.

The changed values will be stored and executed on the next cycle. You may exit the AUTO TEACH mode by pressing the TEACH key again or by not pressing any key for 60 seconds.

If the manual key is pressed, then both teach and auto mode will be terminated.

3.6 AUXILIARY KEY DEFAULTS

When the 410 reciprocator is shipped from the factory it has zero's in all of its parameters. This means that before the reciprocator can be used in an Auto cycle it must be programmed for the die in the machine (see programming section).

The following is a list of AUX key default values set at RIMROCK. These values are used for testing and will not work in a normal die cast program.

KEY NO.	DESCRIPTION	DEFAULT
AUX 1	1 MINIMUM SPEED (310 ONLY)	15
	2 CUSHION SPEED (310 ONLY)	15
AUX 2	1 LUBE A PURGE TIME	0.0
	2 LUBE B PURGE TIME	0.0
	3 LUBE C PURGE TIME	0.0
	4 LUBE D PURGE TIME	0.0
AUX 3	1 CHECK POSITION	NOT SET
	2 DECEL POSITION (310 ONLY)	0
	3 CUSHION DECEL ADJUSTMENT(310 ONLY)	400
	4 LUBE C DWELL POSITIONS SET	0
	5 LUBE C SWEEP POSITIONS SET	0
	6 LUBE D DWELL POSITIONS SET	0
	7 LUBE D SWEEP POSITIONS SET	0
AUX 4	1 STROKE LENGTH	0.0

	2 SHORT CYCLE ON/OFF	0(OFF)
	3 ACTIVE MEMORY AREA	1
	4 SET CYCLE OPTIONS	0(OFF)
	5 9.01 FAULT SENSITIVITY	2.0
	6 MESSAGE CENTER PRIORITY	0(NONE)
	7 CHECK DCM IN AUTO	0(OFF)
	8 REST CUSHION ON/OFF	0(OFF)
AUX 5	CYCLE STATISTICS (HOME KEY)	

SERVO DRIVE RECIPROCATOR WITH TRIANGLE CONTROLS

410 SDR SET UP SHEET

MACHINE # _____ DIE # _____

JOB NAME - # _____

SHOT POSITION _____ MEMORY AREA _____

CONTROL PANEL SETTINGS

MACHINE POSITIONS

APPROACH POS ____ POSITION 1 _____ POSITION 2 _____

POSITION 3 ____ POSITION 4 _____ POSITION 5 _____

POSITION 6 ____ POSITION 7 _____ POSITION 8 _____

POSITION 9 ____ POSITION 10 _____ POSITION 11 _____

POSITION 12 ____ POSITION 13 _____ POSITION 14 _____

POSITION 15 ____ POSITION 16 _____ POSITION 17 _____

POSITION 18 ____ POSITION 19 _____ POSITION 20 _____

SPRAY FUNCTIONS Position #s Function Turned On

AIR DWELL-SET TIME _____

*LUBE B DWELL-SET TIME _____

LUBE A DWELL-SET TIME _____

AIR SWEEP-SET SPEED _____
*LUBE B SWEEP-SET SPEED _____
LUBE A SWEEP-SET SPEED _____

* Two Lube ONLY

SPEEDS

POSITION 1 TO 2 _____ POSITION 2 TO 3 _____

POSITION 3 TO 4 _____ POSITION 4 TO 5 _____

POSITION 5 TO 6 _____ POSITION 6 TO 7 _____

POSITION 7 TO 8 _____ POSITION 8 TO 9 _____

POSITION 9 TO 10 _____ POSITION 10 TO 11 _____

POSITION 11 TO 12 _____ POSITION 12 TO 13 _____

POSITION 13 TO 14 _____ POSITION 14 TO 15 _____

POSITION 15 TO 16 _____ POSITION 16 TO 17 _____

POSITION 17 TO 18 _____ POSITION 18 TO 19 _____

POSITION 19 TO 20 _____

FAST SPEED _____

SLOW SPEED _____

DWELL TIMES

AT 1 _____ AT 2 _____ AT 3 _____

AT 4 _____ AT 5 _____ AT 6 _____

AT 7 _____ AT 8 _____ AT 9 _____

AT 10 _____ AT 11 _____ AT 12 _____

AT 13 _____ AT 14 _____ AT 15 _____

AT 16 _____ AT 17 _____ AT 18 _____

AT 19 _____ AT 20 _____

NOTE: PRESSURES: LUBE _____ PSI

SPRAY AIR _____ PSI

PILOT AIR _____ PSI

AUX 1 Settings are not used on 410.

AUX 2

(Lube Purge A) _____

(Lube Purge B) _____

(Lube Purge C) _____

AUX 3 410 does not use the decel position or cushion decel adjustment parameters.

(Check Position) _____

NOT USED_____

NOT USED_____

410 SDR SET UP SHEET PAGE 3

(Lube C Dwell Position Set) _____
Position #s Function Turned On

(Lube C Sweep Position Set) _____
Position #s Function Turned On

AUX 4

(Stroke length) _____

(Short Cycle) _____

(Active Memory Area) _____

(Set Cycle Options) _____

(9.01 Fault Sensitivity) _____

(Message Center Priority) _____

(Check DCM in AUTO) _____

4. COMPONENTS

4.1 ELECTRICAL - GENERAL

The reciprocator electrical system components each run off one of the power sources available in the control cabinet.

Referring to the schematic, the primary power source is the 120 VAC power supplied by the customer. This powers the interlocks, the cycle complete relay (702 CR) and feeds the transformers primary side.

The 120 VAC supply also powers the power supply. The power supply is a 5, 12 and 24 VDC regulated supply. The 5 volt and 12 volt supply power the card cage and keypad. The 24V supply powers the proximity switches.

The I/O rack, located on the top of the control module, is the means by which the various components (operating at one of the voltage levels) are interconnected. The modules on the I/O rack are the basis of the inter-connections. For instance, when an interlock is made it will send its 120V signal to its corresponding yellow module and light up the LED next to it to show the signal was received. The circuit boards in the card cage, specifically the Digital I/O, receive a low voltage DC signal from the I/O rack telling it the module is "on". The same is true of the limit switches which turn on their corresponding white modules. The CPU can, in turn, send signals back by turning on various black and red modules. The function of each module is shown on the schematic.

4.2 ELECTRICAL - SPECIFIC

****

Whenever a board is removed from or inserted into the card cage, the power must be off. Failure to do this may damage the boards.

****

CENTRAL PROCESSING UNIT (CPU BOARD):

The CPU is the brain of the reciprocator, it contains the software and interfaces the other boards. The software is contained on the FLASH EPROM chip and the current values of the programmable parameters are held on the battery backed ram chip. Refer to the CPU drawing for the detail of this board. This board connects to the keypad and message center from its front edge.

The digital I/O can be part of the CPU or separate and is responsible for receiving the input signals from and sending the output signals to the I/O rack. This board has a ribbon cable running between it and the I/O rack.

P/N: see detail assembly drawings for part number.

SERVO BOARD:

The Servo board powers and receives feedback from the encoder, controls the signals that drive the arm, thus keeping track of and controlling the arm's position. It is connected to the computer, to the servo drive and to the encoder.

P/N: see detail assembly drawings for part number.

I/O RACK:

The I/O rack interfaces the various input and output signals between the card cage, the reciprocator and the D.C.M. Each module on the I/O rack has a fuse and LED that correspond with it. A fuse is located to the bottom right of each module and the LED is directly to the left of the module.

The LED's indicate when the module is "on". It is possible for the LED to be on if the fuse is blown, so if a function corresponding to a certain module is not working but the LED lights, check the fuse. P/N: 7622-201

I/O MODULE P/N:

120 VAC INPUT: 7622-402 (yellow)

120 VAC OUTPUT: 7622-403 (black)

24 VDC INPUT: 7622-404 (white)

24 VDC OUTPUT: 7622-405 (red)

CARD CAGE:

4
Components

410 SDR SET UP SHEET PAGE 3

(Lube C Dwell Position Set) _____
Position #s Function Turned On

(Lube C Sweep Position Set) _____
Position #s Function Turned On

AUX 4

(Stroke length) _____

(Short Cycle) _____

(Active Memory Area) _____

(Set Cycle Options) _____

(9.01 Fault Sensitivity) _____

(Message Center Priority) _____

(Check DCM in AUTO) _____

4. COMPONENTS

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The reciprocator electrical system components each run off one of the power sources available in the control cabinet.

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The digital I/O can be part of the CPU or separate and is responsible for receiving the input signals from and sending the output signals to the I/O rack. This board has a ribbon cable running between it and the I/O rack.

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I/O MODULE P/N:

120 VAC INPUT: 7622-402 (yellow)

120 VAC OUTPUT: 7622-403 (black)

24 VDC INPUT: 7622-404 (white)

24 VDC OUTPUT: 7622-405 (red)

CARD CAGE:

The card cage houses the boards referred to above. The boards may be placed in any of the slots in the cage and in any order (RIMROCK has spelled out positions on drawings for convenience only). The card cage, and thus the boards, receive their power from the connector on the bottom of the cage. These boards are very voltage sensitive so the voltage going into the card cage must be held at 5.20 to 5.25 VDC. Refer to the 5V power supply section for adjusting this voltage. Be sure the power is off when inserting or removing the boards from the card cage.

DOOR SWITCH:

The door switch is in series with the control power. The reciprocator will not go into MANUAL or AUTO mode until the door switch is either pressed in by the cabinet door or pulled out when the door is open. Its intermediate position is open.

CONTROL POWER RELAY (701 CR):

This relay is the control power relay and is activated by the output module in slot 0 on the I/O rack. It goes closed when the MANUAL/ON key is pressed.

SERVO MOTOR CONTROLLER:

The motor controller takes the analog signals from the servo board in the card cage (through wires 45 & 46) and converts it into the appropriate speeds and motor directions. The motor controller table on the schematic shows the wiring of the servo drive and the motor controller. The control box wiring diagram, shows the motor controller pots and dip switch settings. The settings for these pots are also shown on this drawing and are shown at their correct positions.

The servo motor controller used in the RIMROCK 410 Servo Drive Reciprocator is an Advanced Motion Controls B25A-AC, (B25A40 for 80") series Pulse Wave Modulated servo amplifier. It has a red/green LED on the top, when the LED is red the drive is powered, but not enabled. When the LED is green the drive is powered and enabled. Enabled indicates that the motor can move if given a command. This controller has four user potentiometers which are described below.

****

WARNING: Hazardous voltages are exposed during the set up and operation of the motor control unit. **Exercise extreme caution-ONLY** qualified personnel should perform adjustments to the motor control unit.

****

Potentiometer 1 - Loop Gain

This control sets the voltage to current scaling factor. Turning it clock-wise increases the loop gain. ***The unit is shipped with Potentiometer 1 in the full CCW position and it is recommended that it not be changed.***

Potentiometer 2 - Current Limit

This control limits the motor's top end torque (current). It adjusts both continuous and peak current limit maintaining selected ratio. Turning it clock-wise increases the current limit. ***The unit is shipped with Potentiometer 2 in the full CW position and it is recommended that it not be changed.***

Potentiometer 3 - Reference Gain

This control adjusts the ratio between the input signal and the output variables (voltage, current, velocity). Turning it clock-wise increases the reference gain. ***The unit is shipped with Potentiometer 3 in the full CW position and it is recommended that it not be changed.***

Potentiometer 4 - Offset / Test

This control adjusts the imbalance in the input signal or in the amplifier (servo motor controller). ***The unit is shipped with Potentiometer 4 in the middle of its adjustment and it is recommended that it not be changed.***

Wires 703 and L2 feed in the power to the servo motor controller.

P/N: 06664-51

ENCODER:

The encoder is an optical device which tracks the arm. It works by shining a light through a disk which rotates with the arm. The disk has fine etches in it around its circumference where the light shines through. These etches in turn cause a series of pulses in the light as it shines through. The encoder then sends these pulses back to the servo card where they are counted, thus keeping track of the arm. The encoder is powered by and directly connected to the servo board in the card cage. Some models of encoders are susceptible to damage due to improper wiring so care must be taken when working with them. The encoder on the 410 SDR is part of the motor that drives the arm, and cannot be disassembled.

INTERCONNECT PCB:

The interconnect PCB (Rimrock Corporation P/N 140C11450-253) provides connectivity between the Servo Controller card,the servomotor encoder, the servomotor brake, and the servo amplifier. The servomotor encoder inputs plus over travel proximity switches (full extend and rest switches) are routed to the servo controller. The servo amplifier analog inputs and servo amplifier enable signals are routed from the servo controller. The failsafe brake signal from the servo controller is used to operate the solid state output module, which, in turn, operates the arm brake.

POWER SUPPLY:

This power supply feeds both the card cage and the keypad. The card cage requires a steady voltage input, so the power supply is regulated. The pot. which regulates it is located in the top of the supply and should be set for an output of 5.20 TO 5.25 VDC across wires 15 and 16.

KEYPAD:

The keypad is a combination of the keyboard and a circuit board mounted behind it. The keypad is hooked up directly to the CPU via a serial communications network in the card cage. A 13- pin connector is also located on the back of the keypad which is used to connect any remote switches. This connector may also be used to troubleshoot for any bad keys on the keypad (see the Troubleshooting section).

P/N: 11120-102 (Keypad)

P/N: 11120-109 (Back Display Board)

VIDEO KEYPAD:

As an option this machine is available with a Video Touch Screen Operator Interface, for use as a Keypad. This Video Interface utilizes a Capacitive Touch Screen on front of a Color LCD Flat Panel Display. All RIMROCK Machine in a cell can be controlled by this one interface. All functions are similar to utilizing a Standard Keypad. The only exceptions are in the teach area, where this device makes programming easier. This system is a combination of a Single Board Computer, LCD Color Flat Panel Display, Capacitive Touch Screen and Power Supply, all in one control box.

P/N: 11850-65 (Assembly)

PROXIMITY SWITCHES:

The reciprocator uses four proximity switches:

(1) Full Retract (rest position 701PS)

(2) Check Position PS (702PS)

(3) Reciprocator Clear PS (703PS)

(4) Reciprocator CW PS (706PS)

These are all normally open switches.

P/N:02863-20

5
Maintenance/ Troubleshooting

5. MAINTENANCE & TROUBLESHOOTING

5.1 MAINTENANCE

BEARING LUBRICATION:

The 410 Servo Drive Reciprocator is equipped bearings that are lubricated at assembly. This means there are grease fittings but no periodic lubrication is required.

GEAR BOX MAINTENANCE:

The gearbox used by the 410 reciprocator is a precision speed reducer. It is filled with grease by the manufacturer of the reducer. A grease change should be done every 10,000 hours or every 2 years. **2.5oz.** of new grease **(Shell Darina XL EP 2)** should be re-packed after removing the old grease and cleaning the internal parts. Before replacing the gearbox input half, the pilot counter-bore in the side plate should be cleaned making sure any gasket or foreign material is removed. The counter-bore should have silicon gasket material applied (Loctite Ultra Copper). Be careful that NO excess silicon goes into the gear box area as this will damage the reducer. Over greasing will also cause damage to the reducer.

5.2 TROUBLESHOOTING

The procedures in this section are intended as a reference for the experienced technician. It is strongly recommended that a digital multi-meter be used for all tests. Any meter used should have an input impedance of 20 megohms or higher.

Here is a list of the trouble codes which will appear in the upper right-hand LED window above the fault number display.

TROUBLE CODE	MEANING
0	NOT USED
1	ENCODER NOT COUNTING UP(310 ONLY)
2	ENCODER NOT COUNTING DOWN(310 ONLY)
3	NOT USED
4	NOT USED
5	NOT USED
6	NOT USED
7	701-CR SHORTED OR JUMPED OUT
8	NOT USED
9	NOT USED
10	NOT USED
11	FULL RETRACT SWITCH ON EARLY(410 ONLY)
12	FULL EXTEND SWITCH CAME ON(410 ONLY)
13	SERVO SYSTEM FAULTED(410 ONLY)

5.2.1 RECIPROCATOR FAULT LIST

In most cases faults can be cleared by pressing the Clear key. The explanation of faults below will indicate the reason for the fault, and in many cases give the correction for the fault.

COMMUNICATION FAULTS
8.91 FAULT- NOT USED
8.92 FAULT- TOO MANY BAD CHECKSUMS (COM1)
8.93 FAULT- TOO MANY CONSECUTIVE RETRIES (COM1)
8.94 FAULT- UNRECOGNIZED COMMAND FROM KEYPAD (COM1)
8.95 FAULT- KEYPAD NOT RESPONDING (COM1 or COM2)
8.96 FAULT- NOT USED
8.97 FAULT- TOO MANY BAD CHECKSUMS (COM2)
8.98 FAULT- TOO MANY CONSECUTIVE RETRIES (COM2)
8.99 FAULT- UNRECOGNIZED COMMAND FROM KEYPAD (COM2)

OPERATIONAL FAULTS
9.00 FAULT- CHECK CONTROL POWER SENSE INPUT
9.01 FAULT- CHECK POSITION ERROR ARM IS OUT OF POSITION
9.02 FAULT- CHECK POSITION NOT SET CORRECTLY
9.03 FAULT- LOST DCM IN AUTO SIGNAL
9.04 FAULT- PROGRAM ERROR
9.05 FAULT- O.K. TO EXTEND LOST (DCM CLEAR SIGNAL)
9.06 FAULT- DIE LOCKED RECEIVED BEFORE CYCLE COMPLETE
9.07 FAULT- ENCODER TRACKING FAULT
9.08 FAULT- NOT USED
9.09 FAULT- NOT USED
9.10 FAULT- NOT USED
9.11 FAULT- NOT USED

- Pull E-Stop Button Out!

5.2.2 COMM. FAULT CORRECTION

8.92 TOO MANY BAD CHECKSUMS - Check for loose connections on (COM1) serial cable or possible R.F. interference

8.93 TOO MANY CONSECUTIVE RETRIES Check for loose connections on (COM1) serial cable or possible R. F. interference.

8.94 UNRECOGNIZED COMMAND FROM KEYPAD Check for loose connections on (COM1) serial cable or possible R. F. interference.

8.95 KEYPAD NOT RESPONDING - Check serial cables and their connections (COM1 or COM2).

8.97 TOO MANY BAD CHECKSUMS - Check for loose connections on (COM2) serial cable or possible R.F. interference.

8.98 TOO MANY CONSECUTIVE RETRIES Check for loose connections on (COM2) serial cable or possible R. F. interference.

8.99 UNRECOGNIZED COMMAND FROM KEYPAD Check for loose connections on (COM2) serial cable or possible R. F. interference.

5.2.3 OPR. FAULT CORRECTION

9.00 CONTROL POWER – Power to the power sense circuit has been lost or is stuck on. If a trouble code of 7 is given then 701-CR is shorted or jumped out. If no trouble code then check the external safeties, door switch, and E-STOP buttons. If those are ok, reapply power by going to manual mode. If trouble code is 7 then circuit breaker 901-CB must be cycled before going to manual mode.

9.01 CHECK POSITION ERROR - Press Clear key, and check Encoder connections, re-teach the Check Position, and check 9.01 fault sensitivity setting. Also check the check position proximity switch for proper operation.

9.02 CHECK POSITION OUT OF RANGE- Press Clear key and reset Check position. It is not set correctly. See Check Position setting under AUX 3 in section 3.

9.03 Lost DCM in auto-press clear key and check status of Input 23.

9.04 PROGRAM Error-Check position proximity switch not activated during auto cycle or Spray Position, less than Approach Position. Modify program to trip check position proximity switch or reposition check position proximity switch. Modify Spray Position or Approach Position.

9.05 NOT O.K. TO EXTEND LOST Lost O.K. to Extend trying to Extend in Auto or Manual. If in Auto-Manually Retract arm out of die. If in Manual-release Extend key or activate O.K. to Extend interlock.

9.06 RESET BEFORE CYCLE COMPLETE- The reset interlock (die locked) is received before the arm reaches the Approach Position. Press the Clear key and check die cast machine cycle.

9.07 ENCODER TRACKING FAULT - Computer has lost track of arm during movement. This fault can also be generated by a proximity Switch that is activated out of sequence. Check the trouble code in the upper right display for additional information. Press the Clear key and check Encoder connections and Servo Motor Controller.

5.2.4 I/O DESCRIPTION

The simplest way to check a module is to switch it with one you know is good. If this corrects the problem replace the module.

Output functions I/O rack 1:

0 Turns on the control power (701-CR) provided the control box door is closed when the manual key is pressed.

1 Turns on cycle complete relay (702-CR) at the end of the Auto cycle. This will stay on until the reset signal is received from the die cast machine or power is removed from the box.

2 Output for Blow valve.

3 Output for Lube "B" pilot solenoid.

4 Output for Lube "A" pilot solenoid.

5 Output for Spray Air "B" solenoid.

6 Output for Spray Air "A" solenoid.

7 Turns on wait 1 relay (708-CR) when it is programmed in an auto spray cycle.

16 Turns on Reciprocator in Auto relay (706-CR) whenever the reciprocator is placed in auto mode.

17 Turns on Reciprocator Faulted relay (707-CR) when a fault occurs on the reciprocator. This will stay energized until the fault condition is cleared.

18 Output for Lube "C" pilot solenoid.

19 Output for Spray Air "C" solenoid.

21 Turns on Wait 2 relay (709-CR) when it is programmed in an auto spray cycle.

Input functions rack I/O 1:

8 Die cast machine interlock (Dies Full Open).

9 Die cast machine interlock (Die Start Open).

10 Die cast machine interlock (Reciprocator Start).

11 Die cast machine interlock (Die Locked).

12 Activated by proximity switch # 701-PS (Rest Position) when reciprocator is fully retracted.

13 Check position, activated by PS-702.

14 Control power sense.

15 Die cast machine interlock (Continue from Wait 1).

22 Die cast machine interlock (DCM in Auto).

23 Die cast machine interlock (Continue from Wait 2).

Output functions Interconnection PCB:

J4 (1,2) Module S1 Output for servomotor brake.

J1 (1,2) Servo controller analog output to servo amplifier.

J1 (3,4) Servo controller enable output to servo amplifier.

Input functions Interconnect PCB:

J4 (4,6) Servomotor (arm) full extend proximity switch.

J4 (5,6) Servomotor (arm) full retract (rest) proximity switch.

J4 (10,11) Servomotor encoder phase A differential inputs.

J4 (8,9) Servomotor encoder phase B differential inputs.

5.2.5 POWER SUPPLY:

As mentioned in the components section this power supply should have a reading of 5.20 to 5.25 VDC across wires 15 and 16. This is the voltage that gets fed into the card cage and keypad. This power supply also has a +/- 12 VDC and a 24 VDC output. The +/- 12 VDC is used for communications and the 24 VDC supply is used for limit switches. The incoming voltage to the power supply should be 120 VAC.

Voltage checking on power supply:

5 volt supply

Using a digital multi meter on 5 volts DC scale measure the voltage on wires # 15 & 16. This should read 5.20 to 5.25 VDC. If the voltage is low, disconnect the power connectors to the card cage and the keypad. Measure the voltage again, if the voltage is normal there is a short somewhere in the wiring, card cage or keypad. Use the elimination method to locate the problem.

12 volt supply

Using a digital multi meter on 20 volts DC scale measure the voltage on wires # 80, 81 & 82. The voltage between 80 and 81 should read 12.0 to 12.1 volts. The voltage between 80 and 82 should read -12.0 to -12.1 volts. If the voltage is low, disconnect the power connectors to the card cage and the keypad. Measure the voltage again, if the voltage is normal there is a short some where in the wiring, card cage or keypad. Use the elimination method to locate the problem.

24 volt supply

Set the DMM to 24 volt scale and measure the voltage across wires # 1 & 11, which should read 24 - 28 volts. If this voltage is low use the elimination method to locate the problem.

To check the isolation between the DC and AC portions of the supply, take readings from 15 to 9L1 and 9L2: the readings should be approximately 0-0.5 VDC. The same is true of wire 16 to 9L1, 9L2 and GND.

To check the DC ripple take readings from 15 and 16: the value should be less than 0.3 VAC.

****

WARNING: Hazardous voltages are exposed during the set up and operation of the motor control unit. **Exercise extreme caution-ONLY** qualified personnel should perform adjustments to the motor control unit.

****

5.2.6 ENCODERS:

One method of checking an encoder is to switch it with an encoder on another machine to see if the problem follows the encoder (remember the encoder on this machine is part

of the motor, so the motor will have to be changed).

Another check that may be made is to jog the arm while in teach mode with an appropriate parameter being displayed (i.e. the APPROACH POSITION parameter while jogging the arm forward). While jogging the arm periodically release the jog key and note the value displayed in the window each time. The value should increase/decrease in an expected manner. Most likely if this is not the case the machine will be experiencing 9.07 (following fault) faults.

5.2.7 CIRCUIT BOARDS:

The only method available for checking a circuit board is to replace it with one that is known to be good.

********** NOTICE **********
When it is necessary to remove a circuit board from the card cage, it is imperative that all power be removed from the control panel. This is also true when installing a circuit board in the card cage. Failure to due so will cause permanent damage to the circuit board.
****

5.2.8 KEYPAD:

If a key on the keypad does not respond, the problem may be that the key has worn out. The method for checking the keys is to first locate the 13-pin connector on the lower right hand portion of the PC board mounted to the back of the keypad. Next, remove this connector and refer to the chart below to find out which two pins correspond to the key in question: the pins are numbered from top to bottom. Next, take a voltmeter set to read ohms or continuity and put the leads on the pins and push the key; continuity should be made.

If the key being tested is the MANUAL/ON key, make sure that the door switch is not the cause of the problem. If the switch is in its center, or open position the reciprocator will not go into MANUAL mode.

Testing Keypad switches:

Using a digital Multi-meter on low ohms scale, the key pad can be checked using the following pin out chart. The pins referred to are located in the lower right hand corner next to the blue ribbon connector on the rear of the display circuit board. They are numbered from the top down . Using a low ohms scale with the leads on the desired pins, depressing the key you wish to test, you should see a "0" reading. This action tells you the key is functioning.

KEY	PIN #'s
manual / on	3,5
auto	2,5
auto cycle start	5,10
position set	3,4
spray set	2,4
speed set	4,10
timer set	4,11
teach	4,12
AUX 1	1,5
AUX 2	1,6
AUX 3	1,7
AUX 4	1,8
AUX 5	1,9
extend	3,7
retract	2,7
fast	7,10
air blow	3,8
lube "B"	2,8
lube "A"	8,10
spray step	2,6
lube "C"	3,6
up arrow/on	8,13
down arrow	8,11
clear	9,12
enter	9,13
add 5	2,9
add 10	10,9
add 15	11,9
1	5,11
2	5,12
3	5,13

4	6,11
5	6,12
6	6,13
7	7,11
8	7,12
9	7,13
0	8,12

When making these tests, use test leads that have a sharp point. Taking care not to short any of these pins, as test results could be wrong.

5.2.9 ELECTRICAL SPARE PART LIST

Mini I/O Rack	07622-401
Mini I/O Module 120 VAC Input	07622-402
Mini I/O Module 120 VAC Output	07622-403
Mini I/O Module 24 VDC Input	07622-404
Mini I/O Module 24 VDC Output	07622-405
Triangle Card Cage	11444-01
Triangle CPU Board (small memory)	11440-05
Triangle CPU Board (large memory)	11440-06
Triangle CPU Breakout I/O Board	11440-11
Triangle Digital I/O Board	11441-01 *
Triangle Servo Board	11442-11
Triangle Message Center	11450-156
Triangle Power Supply	11450-70
Keypad Display Board	11120-109
Keypad Power Supply Board	11450-126
IC PCB Board	11450-253
Electric Brake (not for HD's)	11465-01
Electric Brake (for HD's only)	11465-03

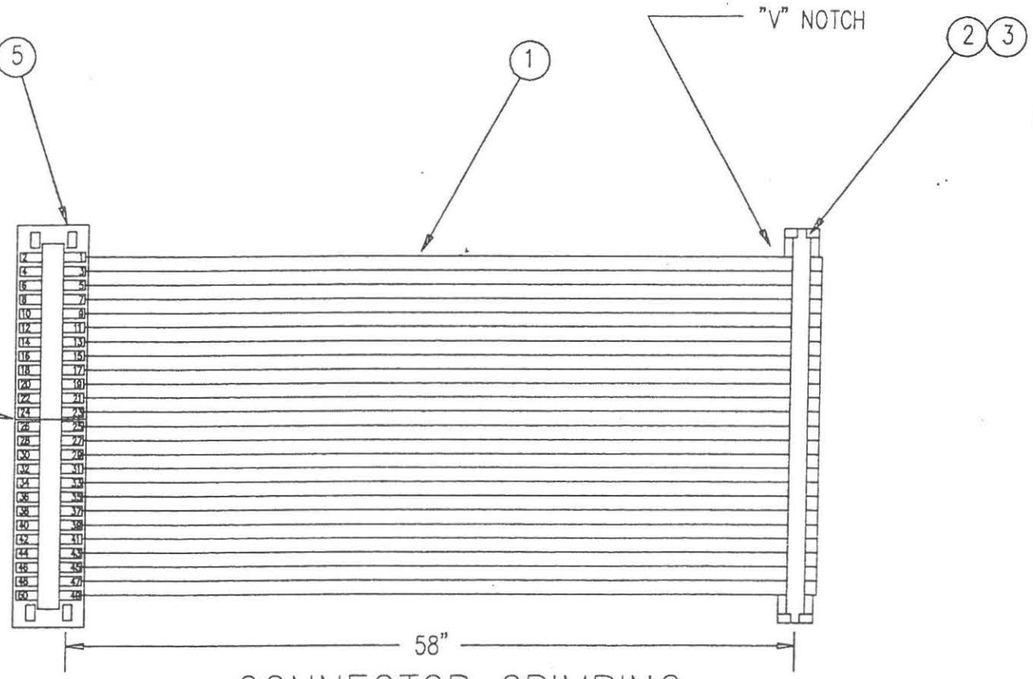
* This part is used with a combination control box only (example 305 & 410 together).

5.2.10 MECHANICAL SPARE PART LIST

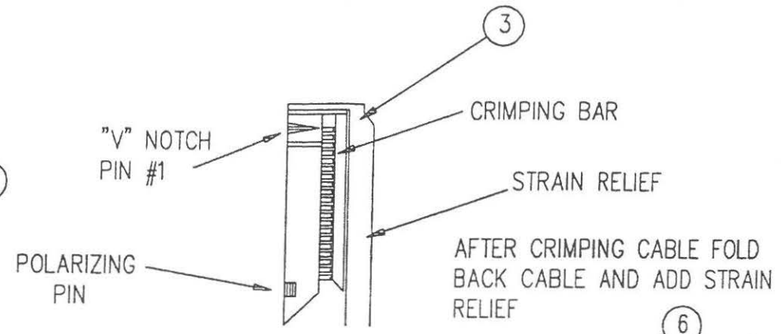
Complete Bearing Replacement Kit	11600-29
Body Bearing Replacement Kit	11600-30
Arm Bearing Replacement Kit	11600-31
Timing Belt (not for 80HD)	11426-03
Timing Belt (for 80HD only)	11426-04

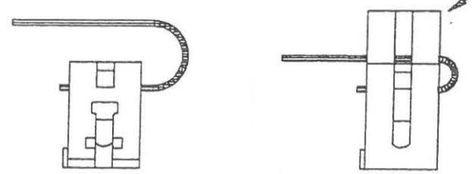
6
Electrical

NOTE:
INSERT POLARIZING KEY (ITEM #4) INTO CONNECTOR (ITEM #5) BETWEEN SLOTS 23/24 AND 25/26 AS SHOWN.



CONNECTOR CRIMPING





STEP 1:
FOLD RIBBON CABLE OVER TOP OF CONNECTOR

STEP 2:
PLACE STRAIN RELIEF (ITEM #6) DOWN OVER CABLE UNTIL IT "SNAPS"

STRAIN RELIEF ASSEMBLY

ITEM	DESCRIPTION	QTY	PART NUMBER
6	STRAIN RELIEF FOR ITEM 5	1	10935-001
5	EDGE CONNECTOR ANSLEY 609-5051M	1	10935-010
4	POLARIZING KEY ANSLEY 609-0005	1	10935-013
3	STRAIN RELIEF ANSLEY 609-5031	1	11042-250
2	HEADER CONNECT. ANSLEY 609-5030	1	11042-350
1	RIBBON CABLE ANSLEY 171-50	58"	11041-50

PART NO. 11083-04

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
195	11/11	REMOVE -05 & -06 - NOT NEEDED,	A	RJM	

REVISIONS

MAT'L: SEE ABOVE

TOLERANCES UNLESS OTHERWISE SPECIFIED
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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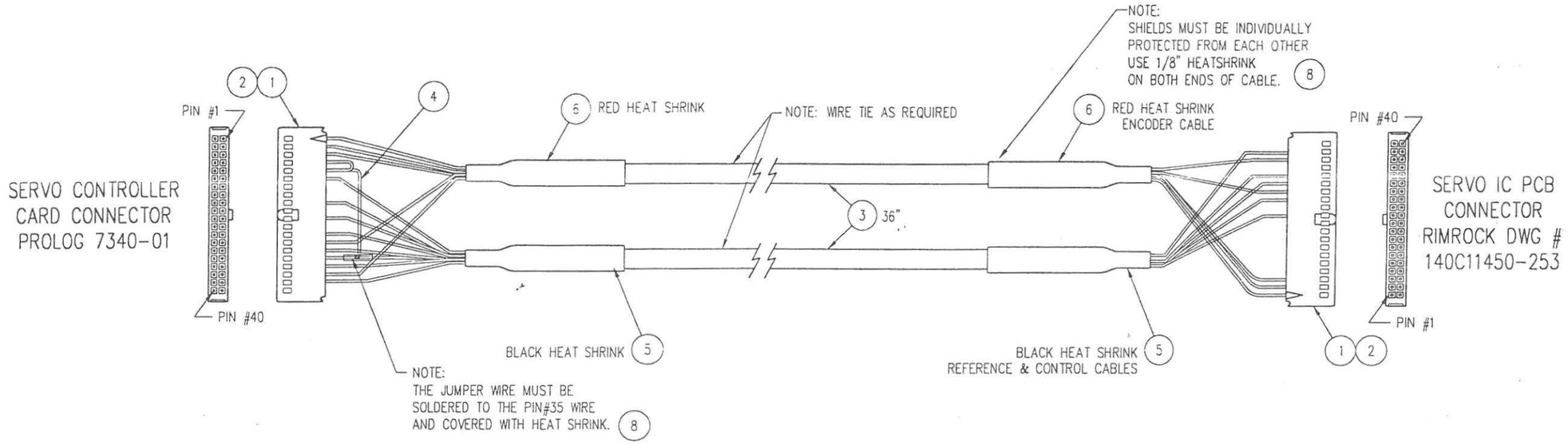
DR CKG	DATE 04.28.94	SCALE FULL	PIC		
CK	DATE	ER 106	SHEET	OF	

DRAWING NO. 306B11083-04 REV A

DRAWING NAME I/O RACK RIBBON CABLE

FOR TRIANGLE CONTROL SYSTEM

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		SERVO CARD TO IC PCB CONNECTOR CABLE			
		SERVO CARD CONN. PIN #	COLOR	FUNCTION	SERVO IC PCB CONN. PIN #
RED HEAT SHRINK	ENCODER CABLE	1	GREEN	A+	1
		2	BLACK	A−	2
		N/C	SHIELD	SHIELD/GREEN	3 Ⓐ
		4	RED	B+	4
		5	BLACK	B−	5
		N/C	SHIELD	SHIELD/RED	6 Ⓐ
		35	WHITE	+5VDC	35
		27	BLACK	5VDC COMM	27
		N/C	SHIELD	SHIELD/WHITE	18 Ⓐ
BLACK HEAT SHRINK	REFERENCE CABLE	38	RED	REF +	38
		37	BLACK	REF −	37
		34	SHIELD	SHIELD/RED	N/C
	CONTROL CABLE	21	WHITE	ENABLE	21
		25	BLACK	BRAKE	25
		18	SHIELD	SHIELD/WHITE	N/C
		30	BLACK	CCW LIMIT	30
		32	GREEN	CW LIMIT	32
		12	SHIELD	SHIELD/GREEN	N/C
	JUMPERS	8-9	BLUE	Z- TO GND	N/C
		7-35	BLUE	Z+ TO +5VDC	N/C

ITEM	DESCRIPTION	QTY.	PART NUMBER
9			
8	HEATSHRINK 1/8" BLACK	30"	09810-4
7	WIRE TIE - SMALL	REF	03010
6	1/4" HEAT SHRINK TUBING, RED	6"	09810-8
5	1/4" HEAT SHRINK TUBING, BLACK	6"	09810-12
4	WIRE 20AWG BLUE	6"	02898-49
3	CABLE, 3-TWISTED PAIR-SHIELDED	72"	02915-15
2	RECEPTACLE PIN	30	11042-103
1	40-PIN CONNECTOR HOUSING	2	11042-40

NOTE : FOR PROLOG 7340-01 ONLY

P/N 16814-01

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
349	10.16.96	UPDATED TO AS BUILT.	A	AR	

REVISIONS

MAT'L: SEE ABOVE

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2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR AOR	DATE 9/10/96	SCALE NTS	PIC
CK	DATE	ER 306	SHEET OF

DRAWING NO. 411 C16814-01 REV A

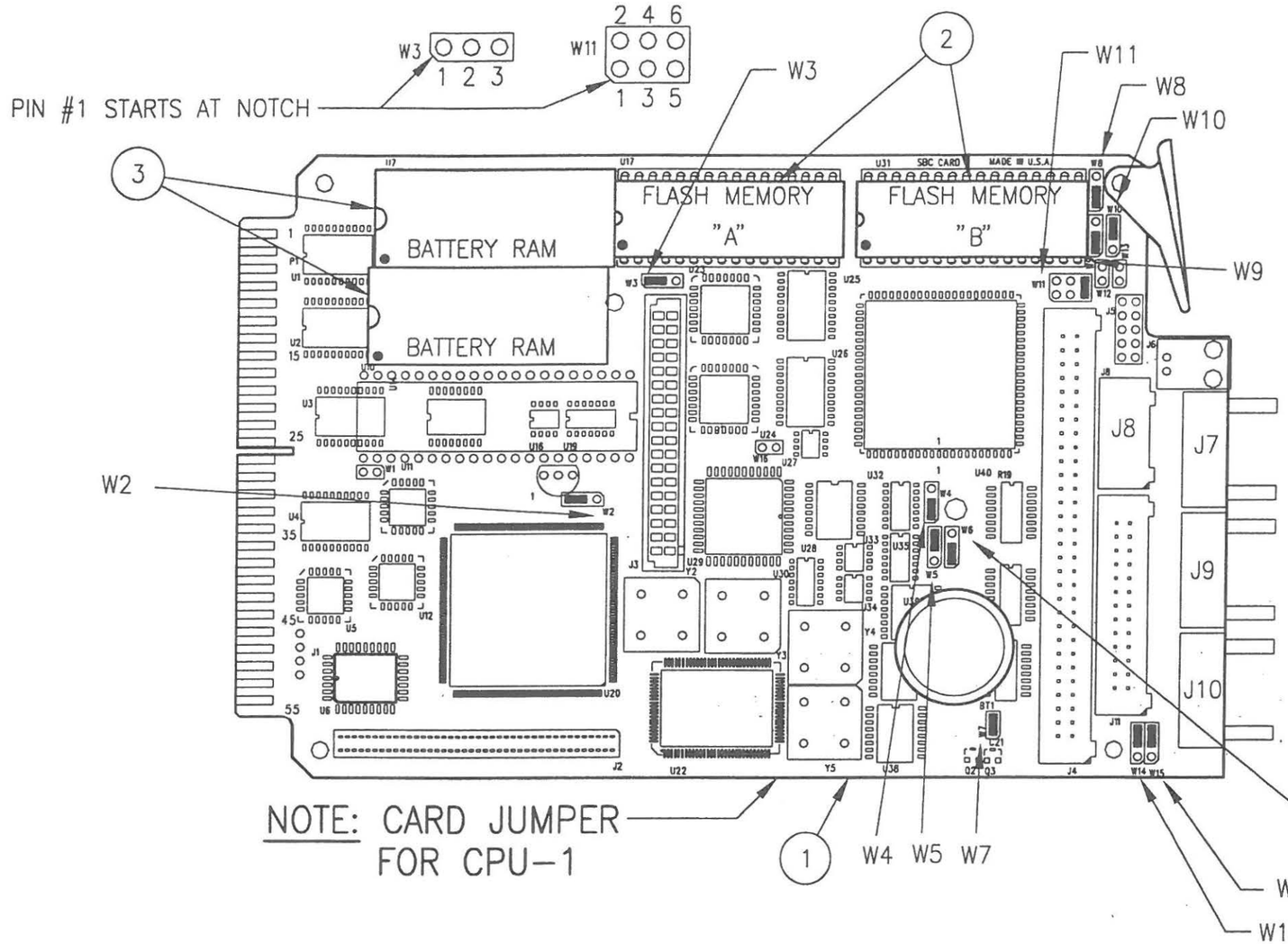
DRAWING NAME CABLE, 1-AXIS SERVO CARD TO 410 IC PCB

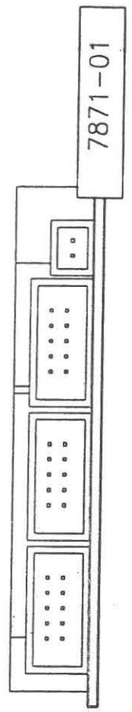
FOR TRIANGLE

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REC 6

NOTE: JUMPER PIN NUMBERING SYSTEM





JUMPER CONFIGURATIONS

CPU-1	
W2	2-3
W3	1-2
W4	1-2
W5	2-3
W7	1-2
W8	1-2
W9	1-2
W10	2-3
W11	5-6
W14	2-3
W15	2-3

CPU-2	
W2	2-3
W3	2-3
W4	1-2
W5	2-3
W7	1-2
W8	1-2
W9	1-2
W10	2-3
W11	3-4
W14	2-3
W15	2-3

JUMPER CONFIGURATION FOR RS-232 COMMUNICATIONS

CPU-1 & CPU-2	
W6	1-2

JUMPER CONFIGURATION FOR RS-485 COMMUNICATIONS

CPU-1 & CPU-2	
W6	2-3

P/N 11440-05 256K RAM (CPU-1)
11440-06 512K RAM (CPU-2)

NOTE: BATTERY RAM - USED TO STORE CUSTOMER PROGRAM PARAMETERS AND SYSTEM MEMORY.
FLASH MEMORY - RIMROCK AND SYSTEM PROGRAMS.

NOTES (UNLESS OTHERWISE SPECIFIED)
4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

ER	DATE	REMARKS	LET	DR	CK
200	07.28.97	ADDED JUMPER TO CPU-2	F	SMB	

REVISIONS

MAT'L: SEE B.O.M.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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DR CKG	DATE 4.13.94	SCALE FULL	PIC
CK	DATE	ER 106	SHEET 1 OF 2

DRAWING NO. 140B11440-05 REV F

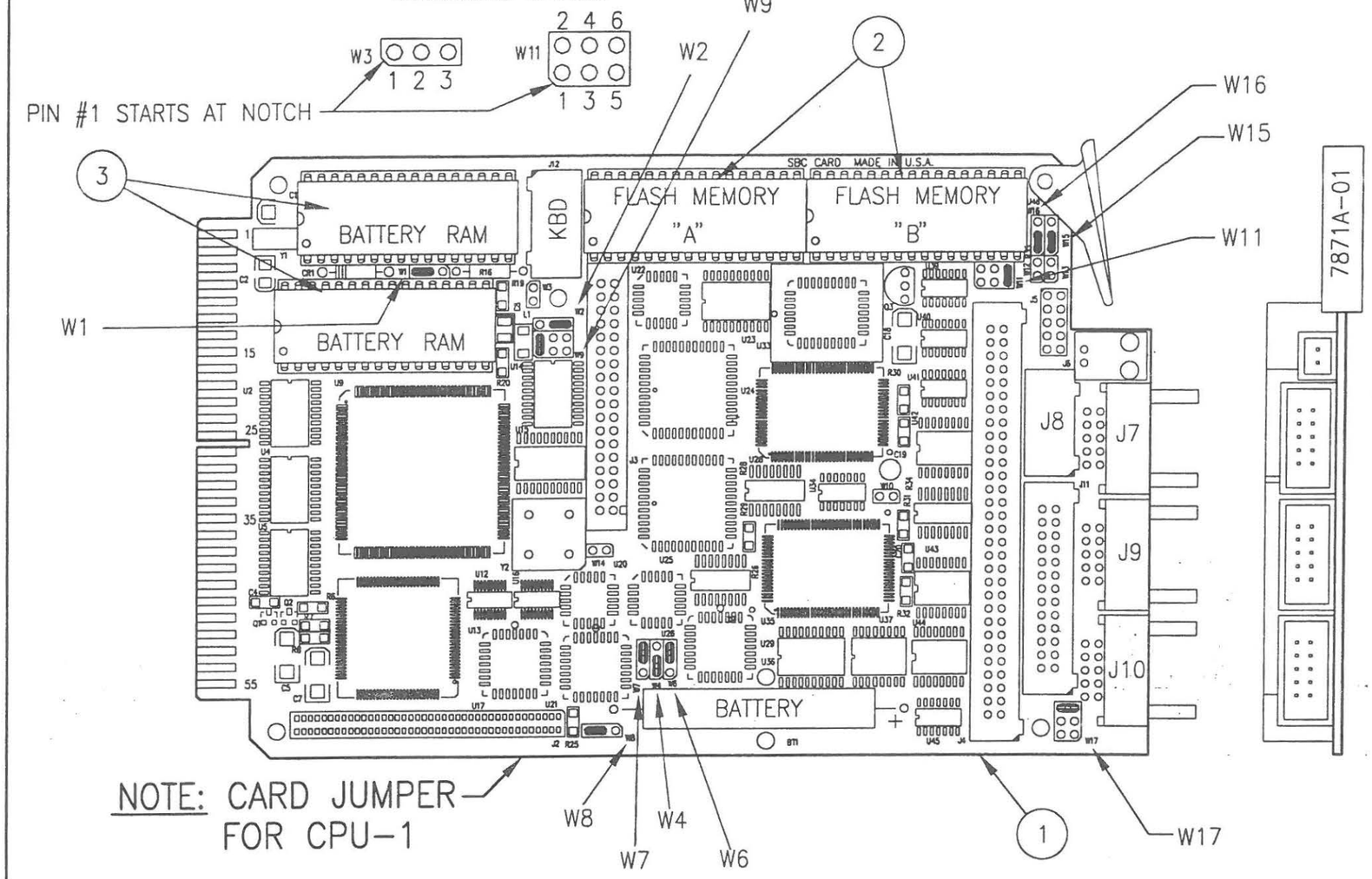
DRAWING NAME SINGLE BOARD SYSTEM

FOR TRIANGLE SYSTEM

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REC6 3

NOTE: JUMPER PIN NUMBERING SYSTEM



JUMPER CONFIGURATIONS

CPU-1	
W1	2-3
W2	2-3
W3	NONE
W4	1-2
W6	2-3
W7	2-3
W8	2-3
W9	1-2
W10	NONE
W11	5-6
W12	NONE
W13	NONE
W14	NONE
W15	1-2
W16	1-2
W17	5-6

CPU-2	
W1	2-3
W2	2-3
W3	NONE
W4	1-2
W6	2-3
W7	2-3
W8	2-3
W9	5-6
W10	NONE
W11	3-4
W12	NONE
W13	NONE
W14	NONE
W15	1-2
W16	1-2
W17	5-6

CPU-3	
W1	2-3
W2	2-3
W3	1-2
W4	1-2
W6	2-3
W7	2-3
W8	2-3
W9	3-4
W10	NONE
W11	3-4 / 5-6
W12	NONE
W13	NONE
W14	NONE
W15	1-2
W16	1-2
W17	5-6

W5 IS NOT PRESENT ON THIS BOARD

P/N 11440-05 256K RAM (CPU-1)
11440-06 512K RAM (CPU-2)
11440-08 1024K RAM (CPU-3)

NOTE: BATTERY RAM - USED TO STORE CUSTOMER PROGRAM PARAMETERS AND SYSTEM MEMORY.
FLASH MEMORY - RIMROCK AND SYSTEM PROGRAMS.

NOTES (UNLESS OTHERWISE SPECIFIED)
4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

ER	DATE	REMARKS	LET	DR	CK
269	07.28.97	ADDED JUMPER TO CPU-3	F	SMB	

REVISIONS

MAT'L: SEE BOM

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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR CKG	DATE 4.13.94	SCALE FULL	PIC
CK	DATE	ER 106	SHEET 2 OF 2

DRAWING NO. 140B11440-05 REV F

DRAWING NAME SINGLE BOARD SYSTEM

FOR TRIANGLE SYSTEM

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RECS 4

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11440-05 - CPU#1 ASSY^ W/RAM & FLASH CHIPS

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11440-02	TRIANGLE 386 CPU BOARD	1.000	EA	CM	P	OR
2	11440-21	FLASH EPROM 256k X 8	2.000	EA	CM	P	OR
3	11440-25	128K X 8 LOW POWER RAM	2.000	EA	CM	P	OR

REC6

4A

07:41:07 02 DEC 1996 Acct ACY Port 26

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11440-06 - CPU#2 ASSY^ W/RAM & FLASH CHIPS

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11440-02	TRIANGLE 386 CPU BOARD	1.000	EA	CM	P	OR
2	11440-21	FLASH EPROM 256k X 8	2.000	EA	CM	P	OR
3	11440-27	256K X 8 LP STATIC RAM	2.000	EA	CM	P	OR

REC6

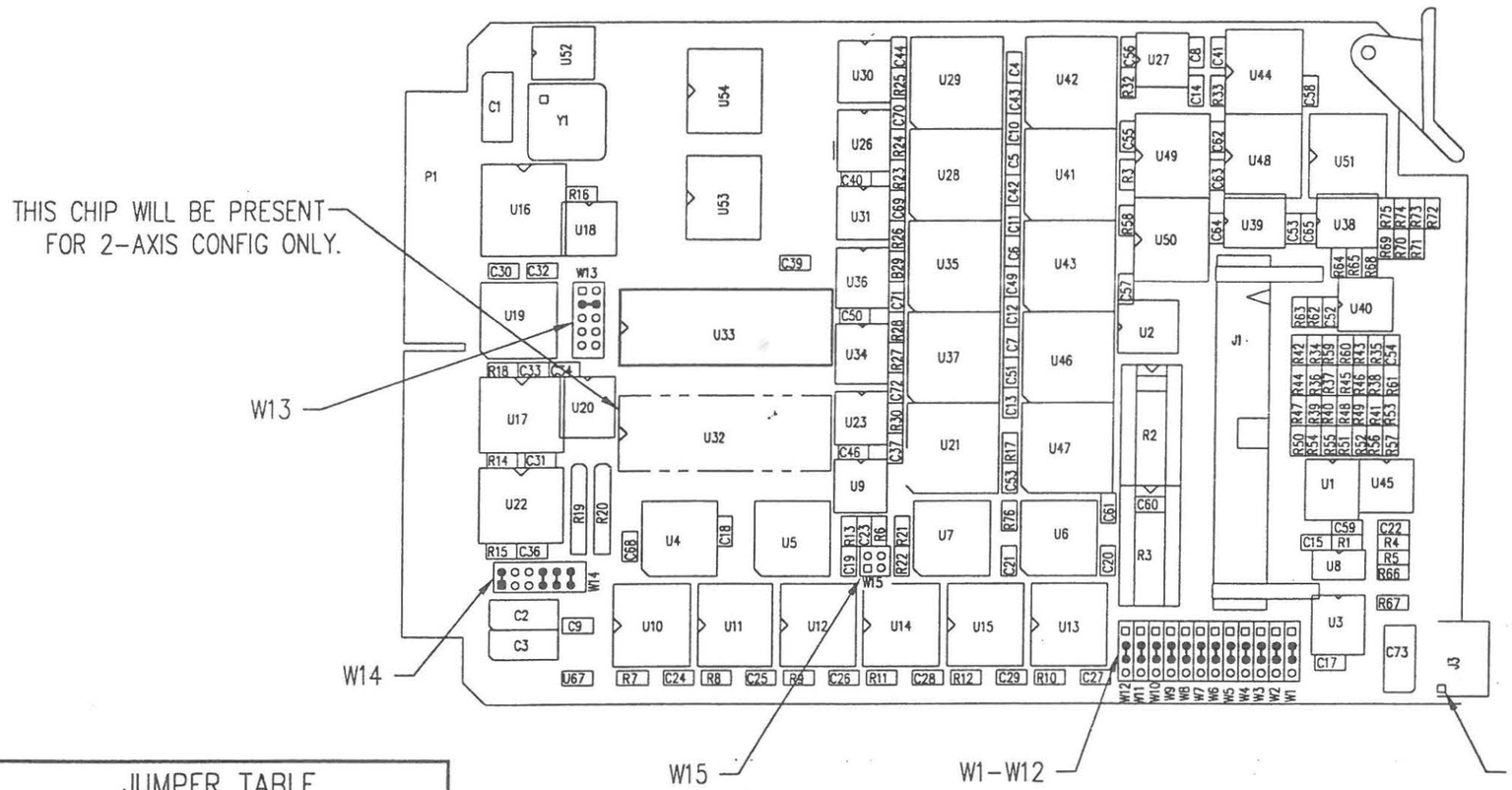
07:42:04 02 DEC 1996 Acct ACY Port 26

Bill of Materials Sorted by Balloon Number by Part Number

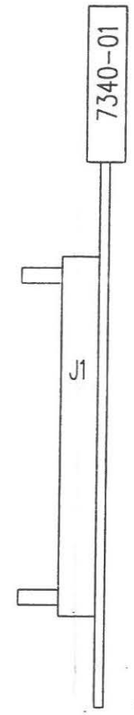
Part Number 11440-08 - CPU#3 ASSY^ W/RAM & FLASH CHIPS

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11440-02	TRIANGLE 386 CPU BOARD	1.000	EA	CM	P	OR
2	11440-21	FLASH EPROM 256k X 8	2.000	EA	CM	P	OR
3	11440-26	512K X 8 LP RAM MODULE	2.000	EA	CM	P	OR

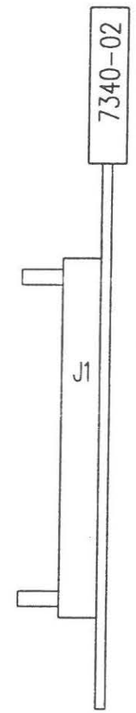
REC'G 5A



END VIEW OF P/N 11442-11
1-AXIS SERVO CARD



END VIEW OF P/N 11442-12
2-AXIS SERVO CARD



JUMPER TABLE		
REF DES	PIN NUMBER	
W1-W12	2-3	Ⓐ
W13	3-4	Ⓐ Ⓑ
W14	1-2, 7-8, 9-10, 11-12	
W15	ALL OPEN	

P/N 11442-11 (SRV-1) 1-AXIS
P/N 11442-12 (SRV-2) 2-AXIS

NOTES: UNLESS OTHERWISE SPECIFIED

1. IDENTIFY WITH PRO-LOG PART NUMBER AND MODEL NUMBER AS APPLICABLE.
2. SEE JUMPER TABLE FOR JUMPER CONFIGURATIONS.
4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
164	10.15 96	ADDED P/N 11442-12 FOR 2-AXIS SERVO CARD, AND CHANGED JUMPER ON W13.	B	AR	
	95	PIN NUMBERING	A	DW	

REVISIONS

MAT'L:

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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR AR	DATE 6.6.95	SCALE FULL	PIC		
CK	DATE	ER 180	SHEET	OF	

DRAWING NO. 140B11442-11 REV B

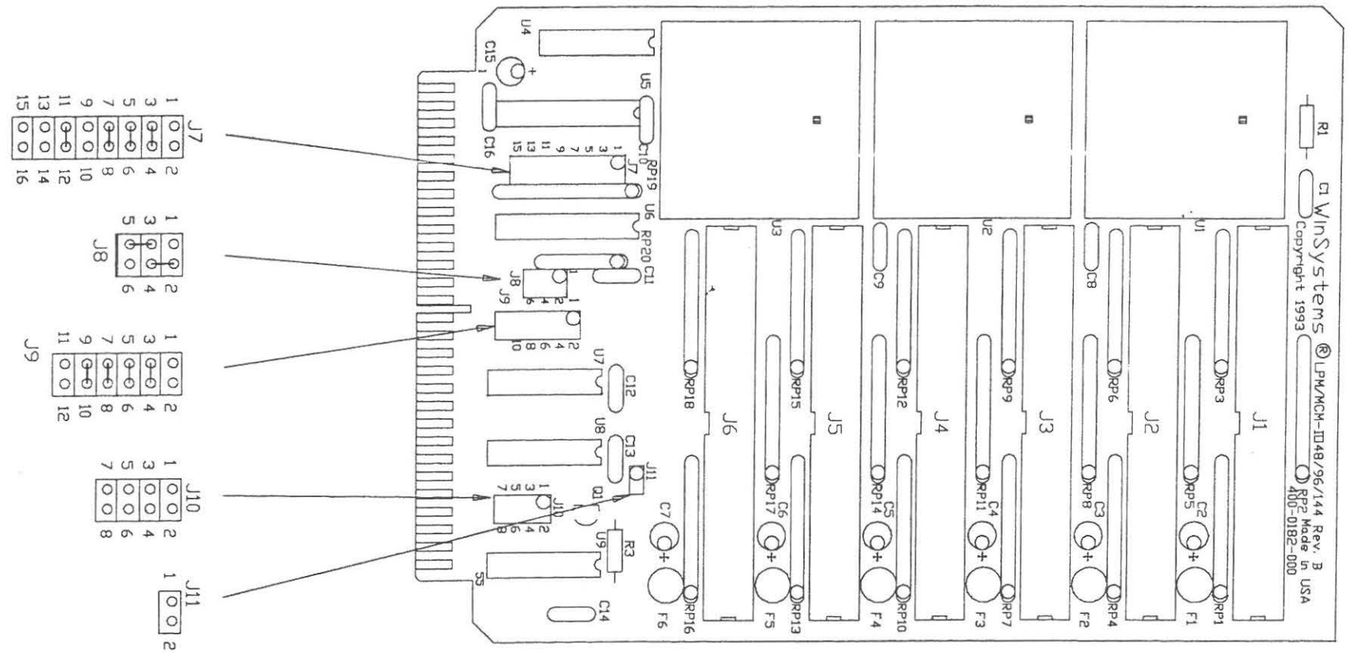
DRAWING NAME SERVO CARD - PROLOG

FOR TRIANGLE CONTROLS

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

REC6 6

NOTE: JUMPER PIN NUMBERING SYSTEM
JUMPERS SHOWN FOR V3.19 AND
ABOVE SYSTEMS



JUMPER
CONFIGURATIONS

DIG-4	
J-7	3-4,5-6,7-8,11-12
J-8	2-4,3-5
J-9	3-4,5-6,7-8,9-10
J-10	NONE
J-11	NONE

JUMPER
CONFIGURATIONS

DIG-4	PREVIOUS TO V 3.19
J-7	3-4,7-8,9-10,11-12
J-8	2-4,3-5
J-9	3-4,5-6,7-8,9-10
J-10	NONE
J-11	NONE

P/N 11441-02

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK

REVISIONS

MAT'L: SEE B.O.M

RIMROCK®*
RIMROCK CORPORATION
1700 RIMROCK ROAD
P.O. BOX 19867
COLUMBUS, OHIO 43219
PHONE: 614-471-5926 TELEX: 245-401 FAX: 614-471-0063

*A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR MDJ	DATE 4-4-96	SCALE FULL	PIC
CK	DATE	ER 092	SHEET OF

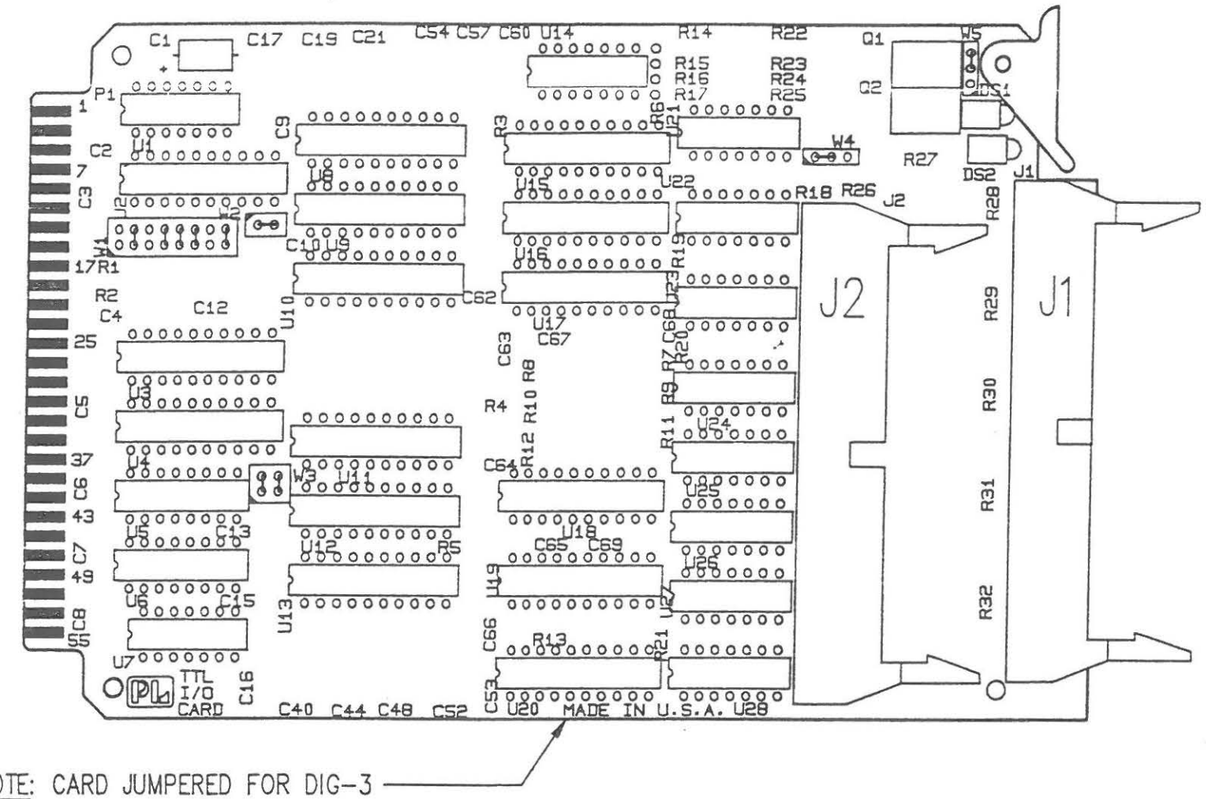
DRAWING NO. 140B11440-25 REV

DRAWING NAME 144 I/O CARD

FOR

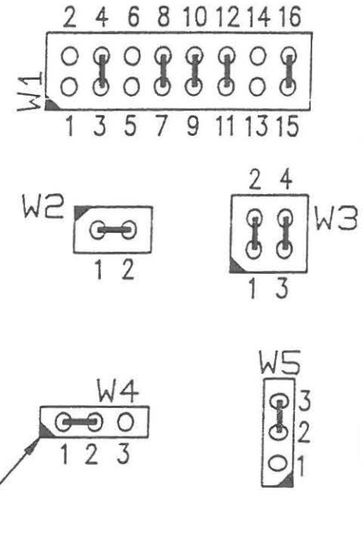
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RECG 6A



NOTE: CARD JUMPERED FOR DIG-3

NOTE: JUMPER PIN NUMBERING SYSTEM



PIN #1 STARTS AT SHADED CORNER

JUMPER CONFIGURATIONS

DIG-1	
W1	3-4,7-8, 9-10,11-12, 13-14,15-16
W2	1-2
W3	1-2,3-4
W4	1-2
W5	2-3

DIG-2	
W1	3-4,7-8, 9-10,11-12, 13-14
W2	1-2
W3	1-2,3-4
W4	1-2
W5	2-3

DIG-3	
W1	3-4,7-8, 9-10,11-12, 15-16
W2	1-2
W3	1-2,3-4
W4	1-2
W5	2-3

P/N-11441-01

NOTES (UNLESS OTHERWISE SPECIFIED)

1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
216	12-2-94	ADD DETAIL TO DRAWING	A	JBA	

REVISIONS

MAT'L: SEE B.O.M.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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DR CKG	DATE 04.26.94	SCALE FULL	PIC
CK	DATE	ER 106	SHEET OF

DRAWING NO. 140B11441-01 REV A

DRAWING NAME DIGITAL I/O CARD

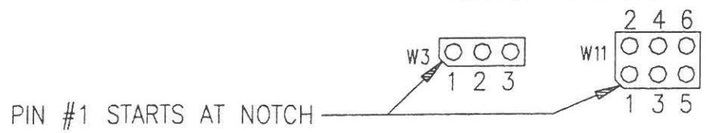
FOR TRIANGLE SYSTEM

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ATLAS BLUEPRINT 556472

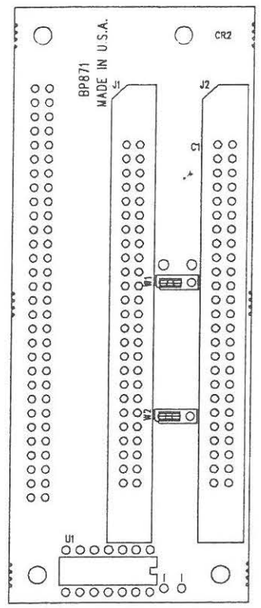
REC6 7

NOTE: JUMPER PIN NUMBERING SYSTEM

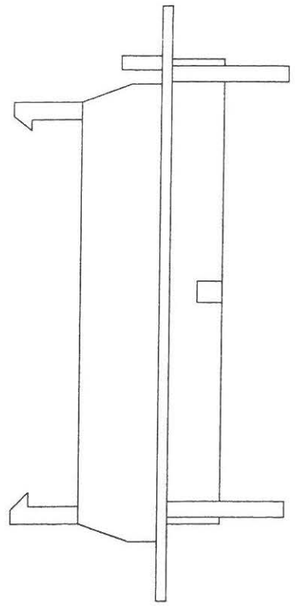


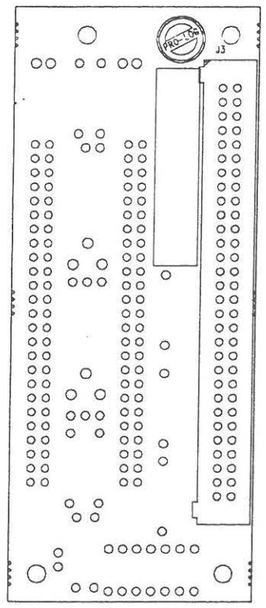
JUMPER CONFIGURATIONS

DBO-1	
W1	1-2
W2	1-2



FRONT VIEW





REAR VIEW

P/N-11440-11

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK

REVISIONS

MAT'L:

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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR CKG	DATE 04.13.94	SCALE FULL	PIC
CK	DATE	ER 106	SHEET OF

DRAWING NO. 140B11440-11 REV

DRAWING NAME I/O BREAK OUT CARD

FOR TRIANGLE SYSTEM

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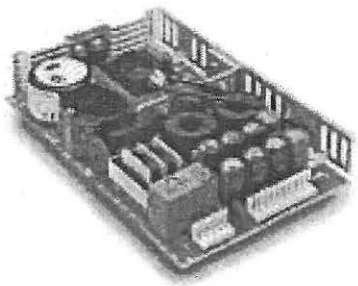
REC6

115 Watts

SRW-115 SERIES

Features

- Universal 85-264 VAC Input
- Compact 4.25" X 7" X 1.25" Size
- Class B Emissions Per EN 55022
- Over 150,000 Hours MTBF
- Open Frame or Optional Chassis and Cover
- 2 Year Warranty
- EN 60950 ITE Certification



All specifications are maximum at 25°C unless otherwise stated and are subject to change without notice.

OUTPUT SPECIFICATIONS

Total Output Power	115W	
Output Voltage Centering	Output 1: ±1% Output 2: ±5% Output 3: ±5% Output 4: ±5%	(All outputs at 50% rated load)
Source Regulation	Outputs 1-4: 0.5%	
Load Regulation	Output 1: 1% (10-100% Load Change) Output 2: 5% (10-100% Load Change) Output 3: 5% (10-100% Load Change) Output 4: 5% (10-100% Load Change)	
Cross Regulation	Output 2: 5.0% Output 3: 5.0% Output 4: 5.0%	(Output 1 Load Varied 50-100%)
Output Voltage Adjust Span Resolution	 Output 1: 95% To 105% 1%	
Output Noise Source Freq. Switching Freq. Total (20MHz)	 Outputs 1-4: 0.5% Outputs 1-4: 1% Outputs 1-4: 1%	(Output under test at 100% rated load)
Hold Up Time	16mS Min, 115W Output 120V Input	
Start Up Time	1 Second	

INPUT SPECIFICATIONS

Source Voltage	85 - 264 Volts Continuous
Frequency Range	47-63 Hz
Source Current True RMS Peak Inrush	 3.5A at 85V Input 40A
Efficiency	.72-.80 (Varies by model)
Turn On Overshoot	None
Transient Response Voltage Deviation Recovery Time Load Change	Outputs 1-4 5% 2mS 50% To 100%
Output Overvoltage Protection (Optional)	Output 1: 110-150%
Output Overpower Protection	110% min., outputs 1-4, Outputs cycle on/off, auto recovery

ENVIRONMENTAL SPECIFICATIONS

Ambient Operating Temperature Range	0° C to +50° C
Storage Temperature Range	-40° C To +85° C
Temperature Coefficient	Outputs 1-4: 0.02%/°C
Shock	Transit drop per MIL-STD-810E Method 516.4 Procedure IV
Vibration	MIL-STD-810E, Method 514.4 Category 1
Conducted Emissions	EN 55022 Class B

GENERAL SPECIFICATIONS

Dielectric Strength	4242 VDC, Primary to Secondary, 1 Sec. 2121 VDC, Primary to Ground, 1 Sec. 500 VDC, Secondary to Ground, 1 Sec.
Power Fail Signal (Optional)	Logic low with input power failure, 2 mS minimum prior to output 1 dropping 1%
Mean-Time Between Failures	150,000 Hours min., MIL-HDBK-217F, 25° C, GB
Weight	2.25 Lbs. Chassis and cover 1.30 Lbs. Open frame

SAFETY SPECIFICATIONS

General		Protection Class: I Overvoltage Category: II Pollution Degree: 2
c UL us	Underwriters Laboratories File E137708	UL 1950 Third Edition
c UL us	UL Recognition Mark For Canada File E137708	CAN/CSA-C22.2 No. 950-M95
TUV	TUV	EN 60950/A11:1997
CE		Low Voltage Directive
		CB Report per IEC 950 (1991) Second Edition, A1, A2, and all national deviations

MODEL LISTING

MODEL	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4
SRW-115-4001	+5V/12A	-5V/4A	+12V/4A	-12V/2A
SRW-115-4002	+5V/12A	+24V/1A	+12V/4A	-12V/2A
SRW-115-4003	+5V/12A	-5V/4A	+15V/3A	-15V/2A
SRW-115-4004	+5V/12A	+24V/1A	+15V/3A	-15V/2A
SRW-115-4005	+5V/12A	+12V/1A	+24V/3A	-12V/1A
SRW-115-4006	+5V/12A	+12V/3A	+15V/2A	-15V/2A
SRW-115-4007 (4)	+5V/12A	+12V/2.5A	+24V/2A	-5V/1A
SRW-115-4008 (4)	+24V/2A	+5V/3A	+5V/2A	-24V/2A
SRW-115-4011	+5V/5A	+15V/1A	+24V/5A	-15V/1A
SRW-115-4013	+5V/13A	+5V/5A	+12V/3A	-5V/3A
SRW-115-4012 (4)	+5V/5A	+12V/1A	+24V/3A	-12V/1A
SRW-115-4014	+3.3V/12A	+5V/4A	+15V/3A	-15V/2A
SRW-115-4015	+3.3V/12A	+5V/4A	+12V/4A	-12V/2A
SRW-115-4016 (5)	+5.2V/12A	+12V/4A	-12V/2A	-2V/9A
SRW-115-4017	5V/8A	19V/1A	19V/2A	54.5V/.5A
SRW-115-3001	+5V/12A		+12V/4A	-12V/2A
SRW-115-3002	+5V/12A		+15V/4A	-15V/2A
SRW-115-3003	+5V/12A		+24V/3A	-12V/1A
SRW-115-3004 (5)	+5V/12A	+24V/1A	+12V/6A	
SRW-115-3005 (5)	+15V/3A	+15V/2A	+24V/2A	
SRW-115-2001	+5V/12A		+24V/3A	
SRW-115-2002	+12V/5A			-12V/5A
SRW-115-2003	+15V/5A			-15V/5A
SRW-115-2004	+24V/2.5A			-24V/2.5A
SRW-115-2005	+5V/12A		+15V/5A	
SRW-115-2006	+5V/12A		+12V/5A	
SRW-115-2007	+17V/3.4A			-17V/3.4A
SRW-115-2008	+9.25V/6A			-9.25V/6A
SRW-115-2010	+7.5V/10A			-7.5V/6A
SRW-115-2011 (4)	+28V/2A			-28V/2A
SRW-115-2012	+12V/8A			12V/2A

NOTES:

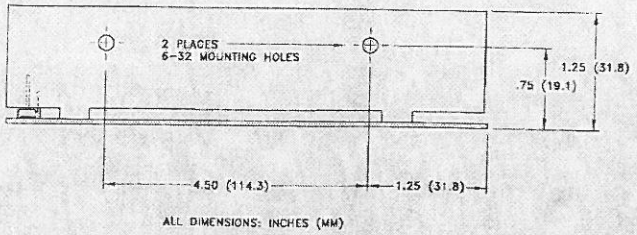
1. Consult factory for alternate output configurations.
2. Consult factory for positive, negative, or floating outputs.
3. Specify optional overvoltage protection, power fail signal, chassis or cover when ordering.
4. UL, CUL, only.
5. TUV only.

INTEGRATED POWER DESIGNS Ph: 570-824-4666 Fx: 570-824-4843

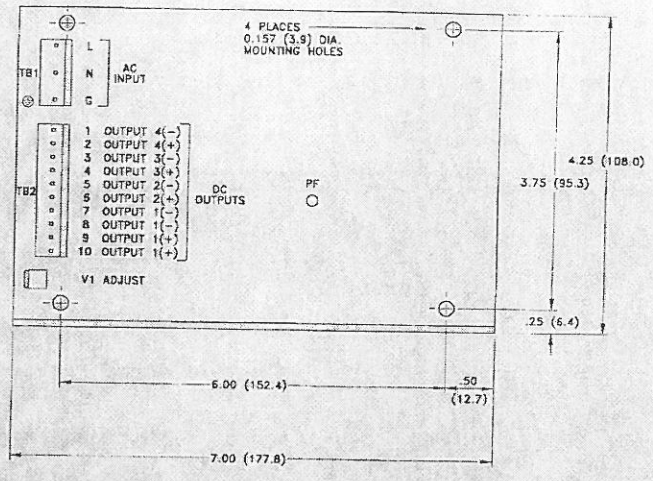
8A

SRW 115 SERIES MECHANICAL INFORMATION

Open Frame



ALL DIMENSIONS: INCHES (MM)



AC Input and Ground Connector TB1:

- .156 inch friction lock header mates with Molex 09-50-3051 or equivalent crimp terminal housing with Molex 08-50-0189 or equivalent crimp terminal.

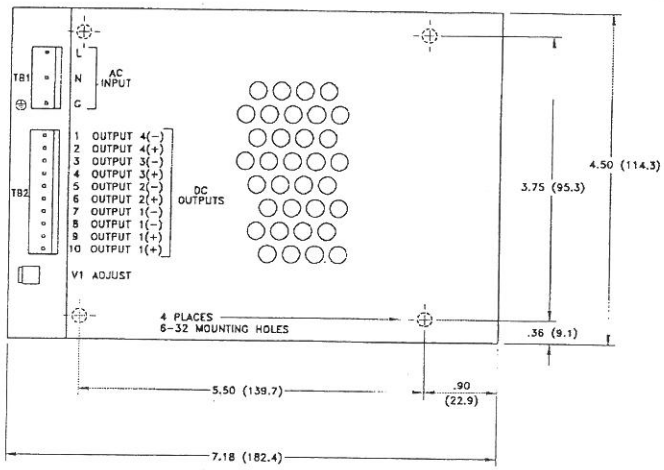
DC Output Connector TB2:

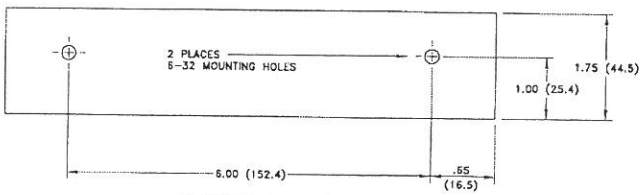
- .156 inch friction lock header mates with Molex 09-50-3101 or equivalent crimp terminal housing with Molex 08-50-0189 or equivalent crimp terminal.

Power Fail Connectors:

- PF: Power fail signal
- TB2-7,8: Power fail signal return

Optional Chassis & Cover

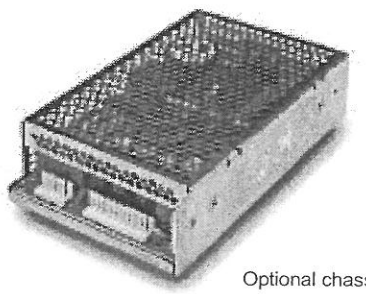




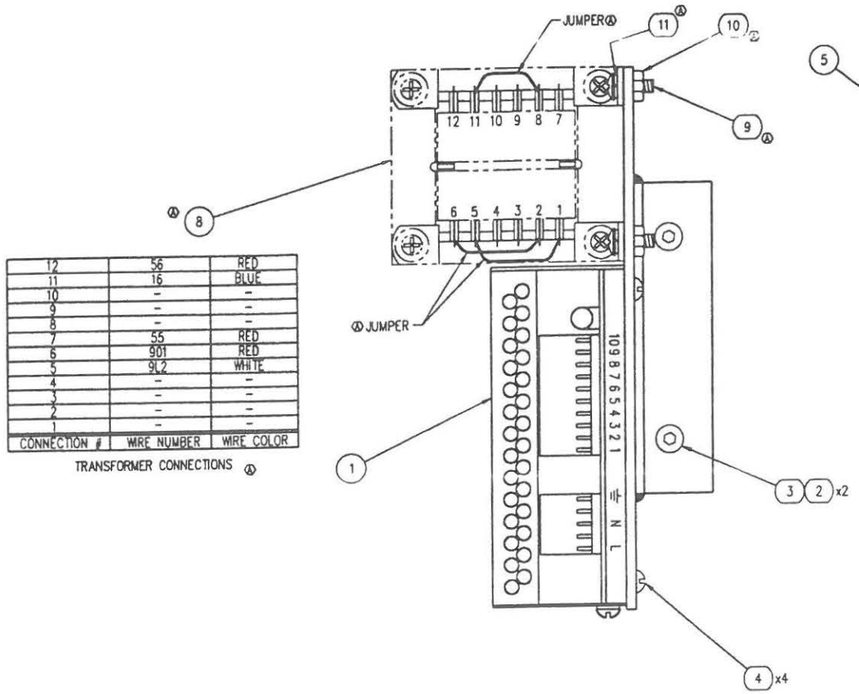
ALL DIMENSIONS: INCHES (MM)

APPLICATIONS INFORMATION

1. Maximum screw penetration into mounting holes is .25 inch.
2. Each output can deliver its rated load but total output power must not exceed 115 watts.
3. A minimum load of 20% is required on output one to insure proper regulation of remaining outputs.
4. Peak to peak output ripple and noise is measured directly at the output terminals of the power supply, without the use of the probe ground lead or retractable tip, 20 MHz bandwidth.
5. This power supply has been safety approved and final tested using a DC dielectric strength test. Please consult factory before performing an AC dielectric strength test.
6. This product is intended for use as a professionally installed component within information technology equipment.

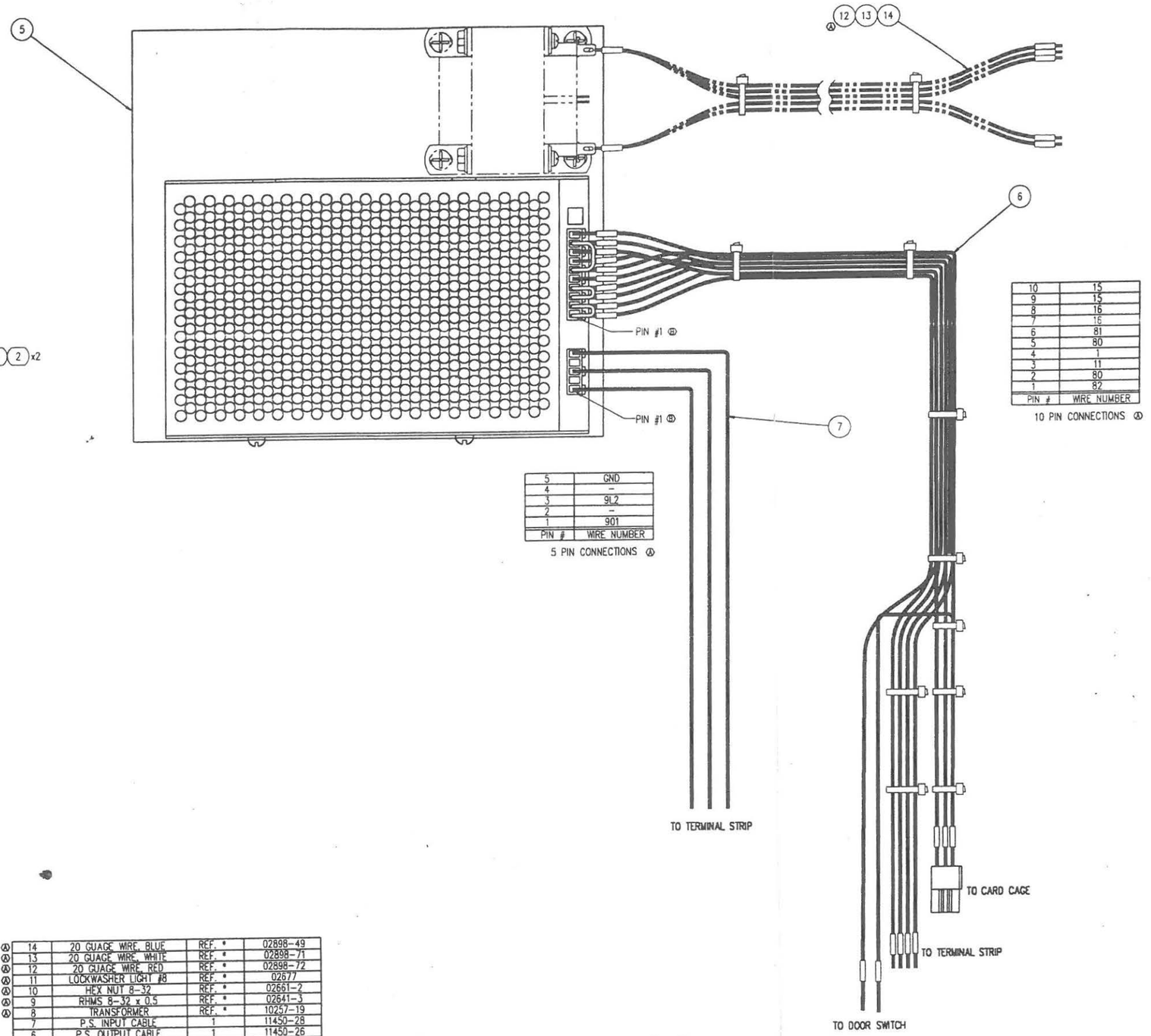


Optional chassis/cover shown



CONNECTION #	WIRE NUMBER	WIRE COLOR
12	56	RED
11	16	BLUE
10	–	–
9	–	–
8	–	–
7	55	RED
6	901	RED
5	9L2	WHITE
4	–	–
3	–	–
2	–	–
1	–	–

TRANSFORMER CONNECTIONS Ⓐ



PIN #	WIRE NUMBER
10	15
9	15
8	16
7	16
6	81
5	80
4	1
3	11
2	80
1	82

10 PIN CONNECTIONS Ⓐ

PIN #	WIRE NUMBER
5	GND
4	–
3	9L2
2	–
1	901

5 PIN CONNECTIONS Ⓐ

BAL.#	DESCRIPTION	QTY.	PART NUMBER
Ⓐ 14	20 GUAGE WIRE, BLUE	REF. *	02898-49
Ⓐ 13	20 GUAGE WIRE, WHITE	REF. *	02898-71
Ⓐ 12	20 GUAGE WIRE, RED	REF. *	02898-72
Ⓐ 11	LOCKWASHER LIGHT #8	REF. *	02677
Ⓐ 10	HEX NUT 8-32	REF. *	02661-2
Ⓐ 9	RHMS 8-32 x 0.5	REF. *	02641-3
Ⓐ 8	TRANSFORMER	REF. *	10237-19
7	P.S. INPUT CABLE	1	11450-28
6	P.S. OUTPUT CABLE	1	11450-26
5	POWER SUPPLY MOUNT	1	11429-08
4	BHCS 6-32 X 3/8	4	08058-6
3	LOCK WASHER, LIGHT #10	2	02678
2	RHMS 10-32 X 1/2	2	02627
1	POWER SUPPLY	1	02275-400

* FOR QUANTITIES, REF. DWG # 140D11850-50

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
776	9.23 98	MIRRORED PIN 1 POSITIONS	B	SMB	
727	9.14 98	ADDED TRANSFORMER, ALONG WITH WIRING AND FASTENERS FOR IT, ADDED CHARTS	A	SMB	

REVISIONS

MATL: SEE B.O.M.

TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
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DR SMB DATE 3.4.98 SCALE FULL PIC
CK DATE DR 134 SHEET OF

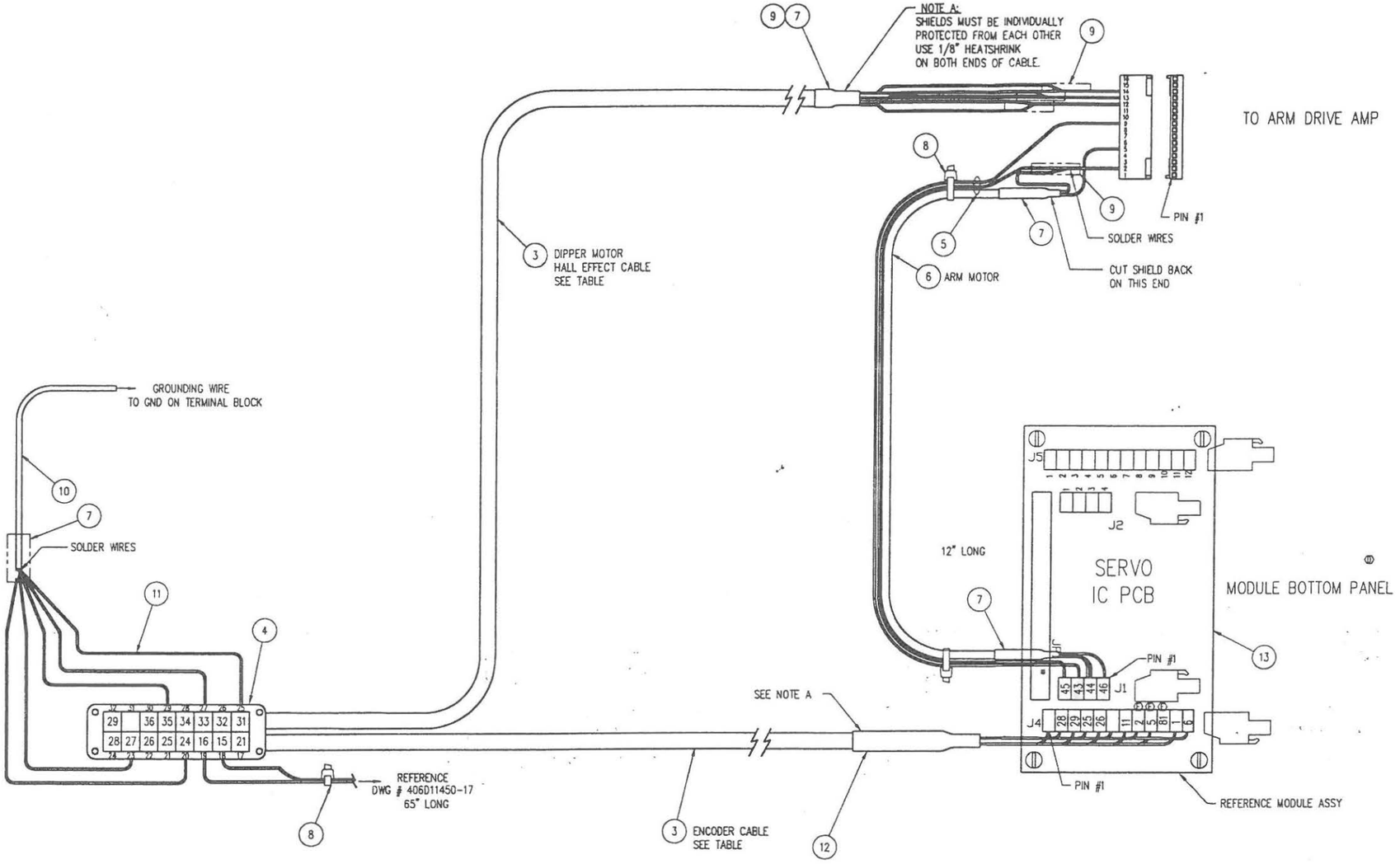
DRAWING NO. 140D11450-70 B

DRAWING NAME TRIANGLE POWER SUPPLY ASSY.

FOR TRIANGLE CONTROLS

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8A



	DRIVE AMP CONNECTIONS CABLE					
	EPIC PIN#	WIRE #	DRIVE AMP PIN#	COLOR	FUNCTION	SERVO IC PCB
HALL EFFECT CABLE	30	36	12	GREEN	HALL 1	–
	30	36	12	BLACK	HALL 1	–
	29	35	N/C	DRAIN	SHEILD/GREEN	–
	26	32	13	WHITE	HALL 2	–
	26	32	13	BLACK	HALL 2	–
	25	31	N/C	DRAIN	SHEILD/WHITE	–
	28	34	14	RED	HALL 3	–
	28	34	14	BLACK	HALL 3	–
	27	33	N/C	DRAIN	SHEILD/RED	–
REFERENCE CABLE	–	46	5	RED	REF +	J1-1
	–	44	2	BLACK	REF –	J1-2
ENABLE CABLE	–	43	9	BLUE	ENABLE	J1-3
	–	45	2	BLUE	ENABLE RETURN	J1-4

	ARM SERVO IC PCB CONNECTIONS CABLE				
	EPIC PIN#	WIRE #	SERVO IC PCB	COLOR	FUNCTION
ENCODER CABLE	17	21	N/C	DRAIN	SHIELD/WHITE
	18	15	N/C	BLUE	+5VDC
	19	16	N/C	BLUE	5VDC COMM
	20	24	N/C	DRAIN	SHIELD/RED
	21	25	J4-4	RED	B+
	22	26	J4-5	BLACK	B–
	23	27	N/C	DRAIN	SHIELD/GREEN
	24	28	J4-2	GREEN	A+
	32	29	J4-3	BLACK	A–
REFERENCE CABLE	–	46	J1-1	RED	REF +
	–	44	J1-2	BLACK	REF –
	–	–	J1-2	DRAIN	DRAIN
CONTROL CABLE	–	43	J1-3	BLUE	ENABLE
	–	45	J1-4	BLUE	ENABLE RETURN
	–	ⓓ5	J4-9	BLUE	CCW LIMIT
	–	ⓓ2	J4-8	BLUE	CW LIMIT
	–	1	J4-11	BLUE	24 VDC
	–	11	J4-7	BLUE	24V COMMON
	–	6	J4-12	BLUE	BRAKE
	–	ⓓ81	J4-10	BLUE	+12 VDC

ITEM	DESCRIPTION	QTY.	PART NUMBER	
12	1/4" HEAT SHRINK TUBING, RED	10"	09810-8	
11	WIRE 20AWG GREEN	3'	02898-74	⑮
10	WIRE 16AWG GREEN	4'	02898-66	⑫
9	HEATSHRINK 1/8" CLEAR	3"	09810-5	
8	WIRE TIE – SMALL	12	03010	
7	1/4" HEAT SHRINK TUBING, BLACK	10"	09810-12	
6	2 CONDUCTOR SHIELDED	TAB	02915-22	
5	WIRE 20AWG BLUE	220"	02898-49	
4	QUICK DISCONNECT RECEPT. 17-32	1	11360-54	
3	CABLE, 3-TWISTED PAIR-SHEILDED	TAB	02915-15	⑮

PART NUMBER	ITEM #3	ITEM #6	HALL EFFECT CABLE	ENCODER CABLE	REFERENCE CABLE
11450-29	124"	66"	60"	64"	66"
11450-129	136"	72"	66"	70"	72"

P/N 11450-29 & -129

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
385	11.6 97	ADDED RED & BLACK SHRINK TUBE, DELETED BLUE SHRINK TUBE	F	SMB	
		REVISIONS			

ER	DATE	REMARKS	LET	DR	CK
428	11.26 96	CORRECTED WIRE NUMBERS	E	AR	
	96	IC PCB.			
072	7.17 95	ADDED P/N 11450-129 CABLE FOR 410-80	C	AR	
041	10.26 94	ADDED GRD FOR DRAINS & CHANGED TO 3-PAIR TWISTED CABLE & MISC.	B	CKC	
041	10.13 94	CORRECT DRIVE CARD TABLE, REMOVE WIRE #31 & #30	A	CKC	
		REVISIONS			

MAT'L:

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

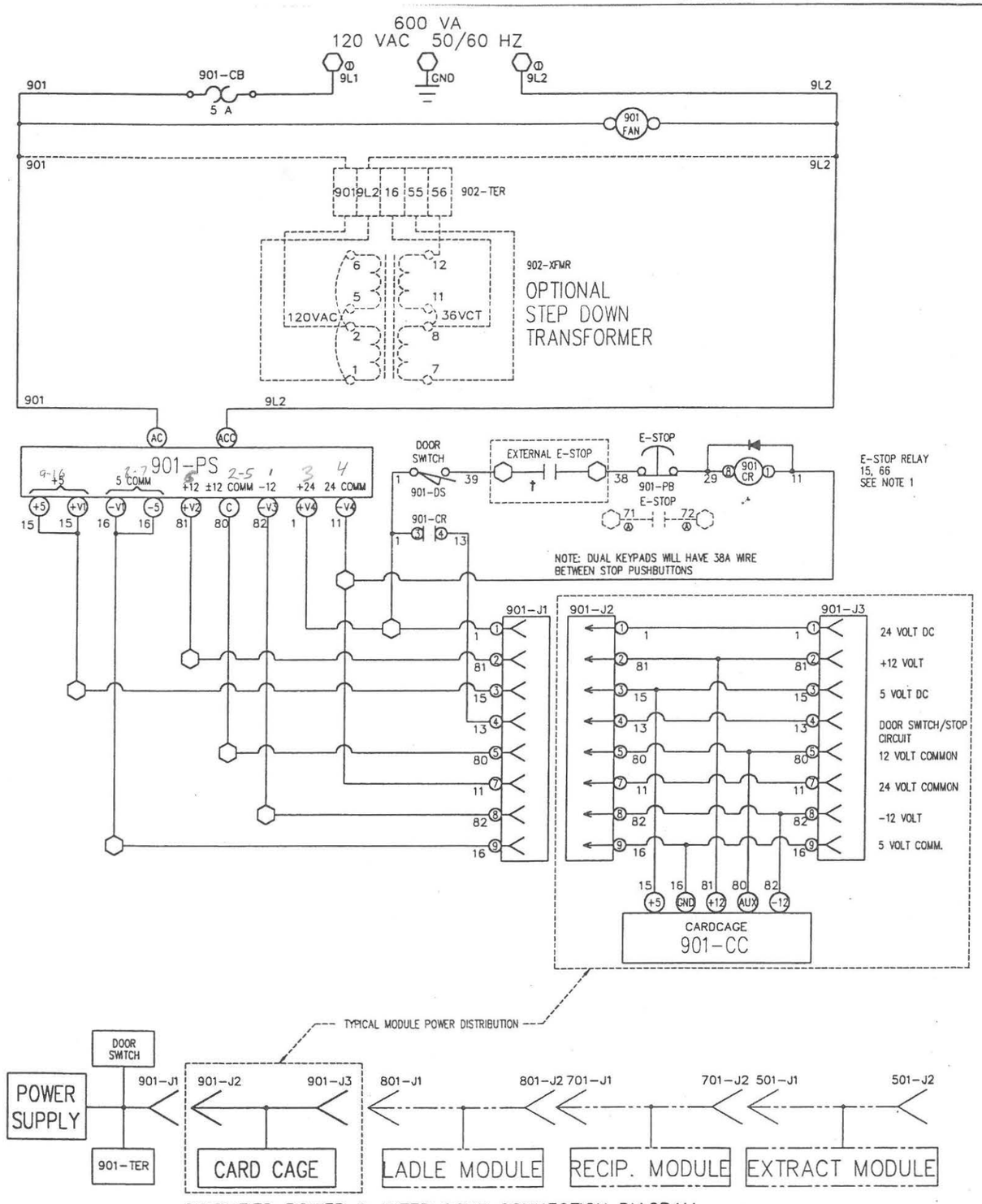
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AMERICAN CONVEYOR
1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE: 614-471-5826 FAX: 614-471-1073
®A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

DR CKC DATE 3.22.94 SCALE NONE PIC
CH DATE ER 041 SHEET OF

DRAWING NO. 411 D11450-29 REV F
DRAWING NAME WIRING LAYOUT FOR SDR
CONTROL CABLE
FOR TRIANGLE SYSTEMS

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LFCG 25

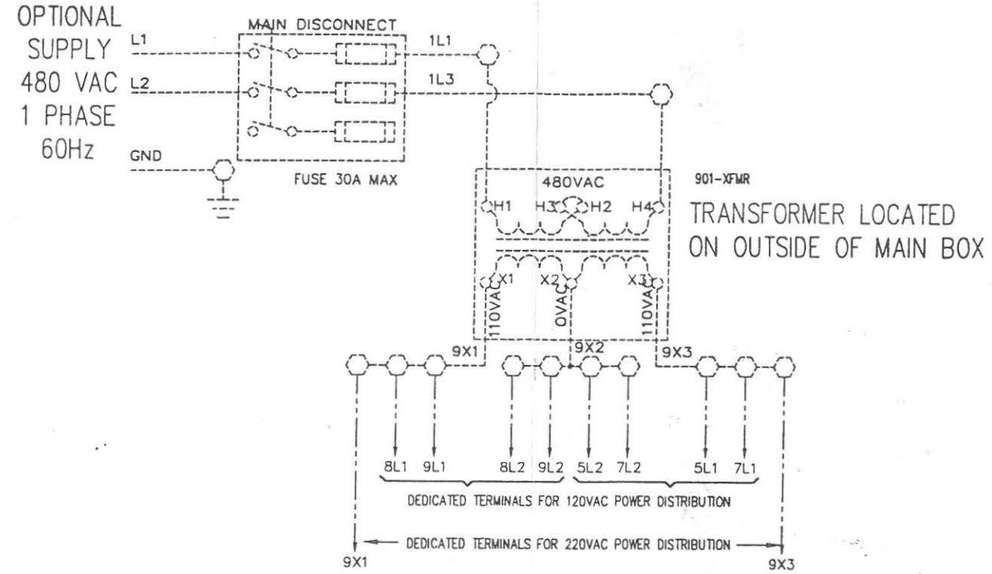


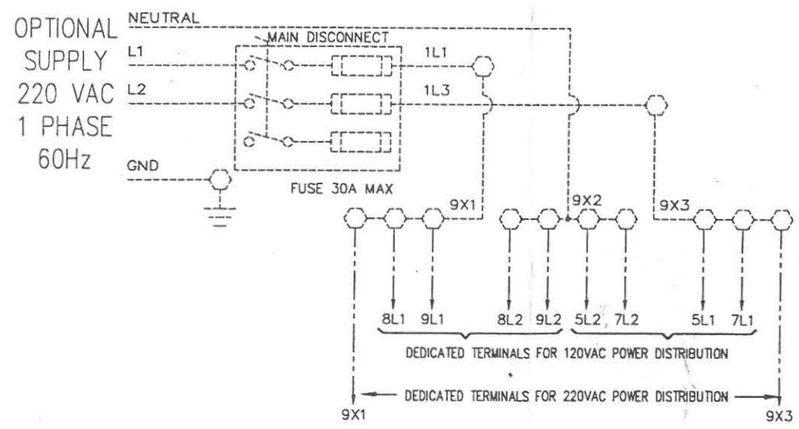
SIMPLIFIED POWER & INTERLOCKS CONNECTION DIAGRAM

POWER TO THE OPTIONAL CONTROL MODULES FLOWS IN SERIES FROM 901-J3.

NOTE: SOME PANELS WILL HAVE FEWER MODULES THAN SHOWN.
CONSULT MODULE MANUAL FOR COMPLETE MODULE SCHEMATICS.

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR





901-CR
5 6 CELL E-STOP CHAIN IF USED

NOTE 1
FIELD UPDATE UNITS WILL HAVE MORE CONNECTORS THAN SHOWN.

† CUSTOMER TO JUMPER IF NOT USING EXTERNAL E-STOP PUSH BUTTON.

28

REVISIONS										
					96					
					672	9-8 98	CORRECTED BALLOON NUMBERS ON SHEET 2 AND 3	D	MP	
					815	8.24 98	SEE PAGE 3 FOR CHANGES	C	MK	
					513	6-20 98	CHANGED TERMINAL STRIP ON SHEET 2 AND 3	B	SME	
DR	DATE	REMARKS	LET	DR	CK	DR	DATE	REMARKS	A	MK

MATL: SEE B.O.M.

DR SME DATE 4.6.98 SCALE NONE PIC
CK DATE ER ECO

RIMROCK

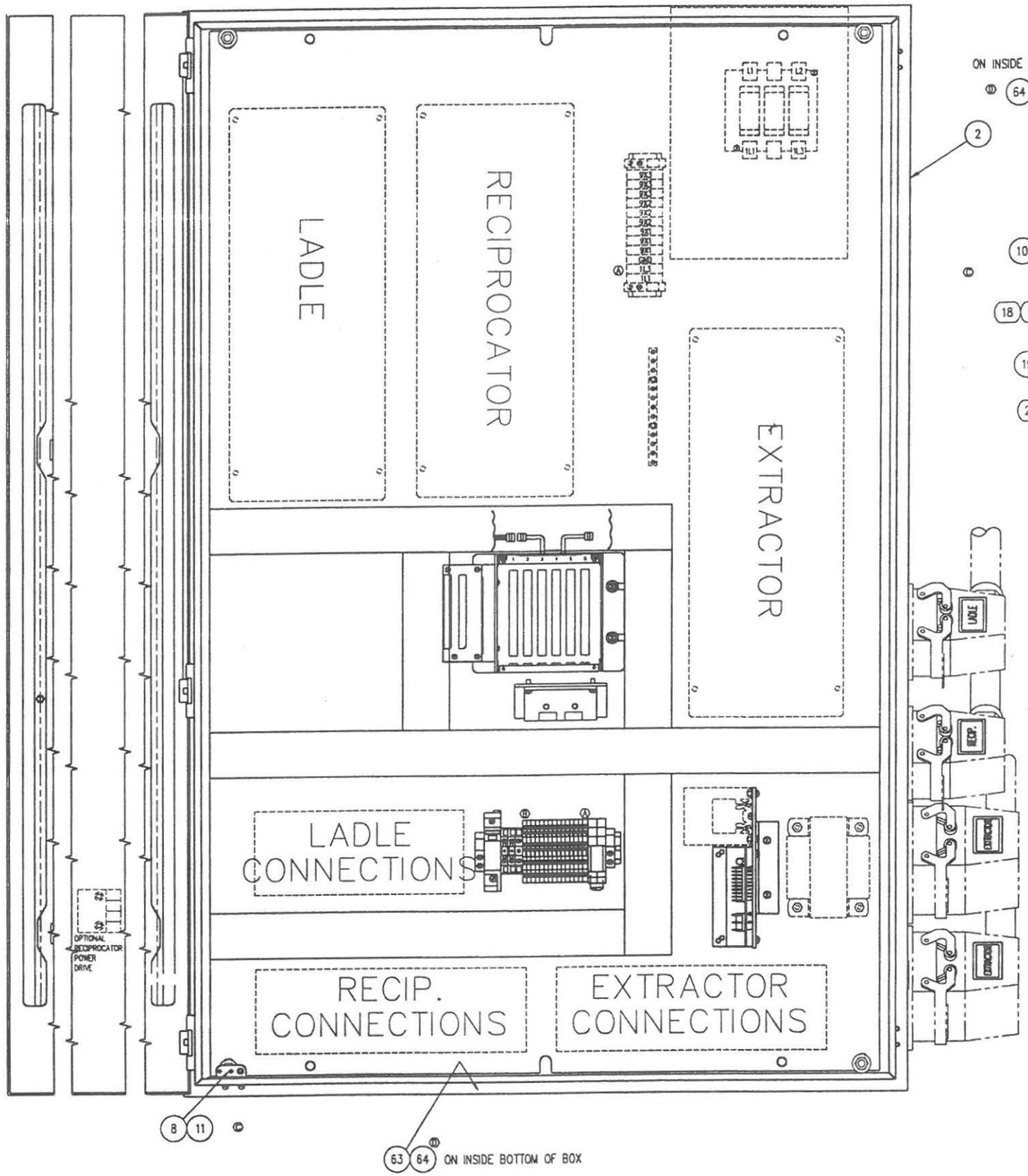
RIMROCK CORPORATION
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COLUMBUS, OHIO 43219
PHONE: 614-471-3926 FAX: 614-471-1073
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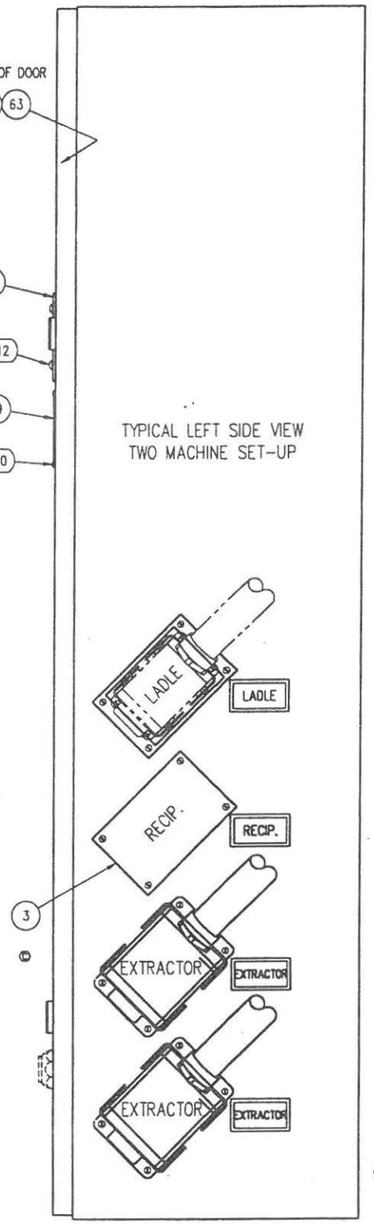
DRAWING NO. 140D11850-01 REV D
DRAWING NAME MAIN PANEL - SCHEMATIC
FOR TRIANGLE SYSTEM

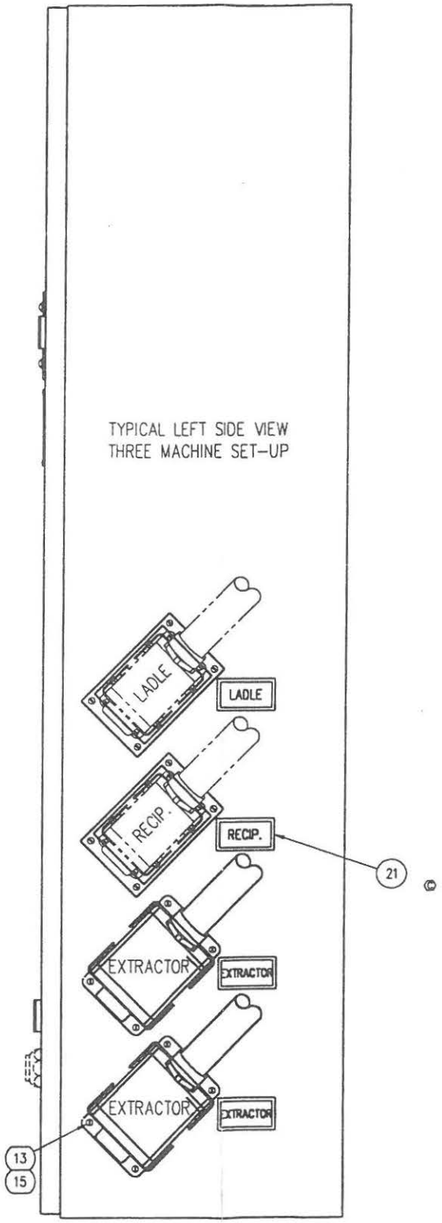
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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DECG







P/N 11850-01

29

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
	98				
672	9-8 98	CORRECTED BALLOON NUMBERS	C	MK	
615	8.24 98	ADDED A TERMINAL TO STRIP	B	SMB	
513	6-19 98	CHANGED TERMINAL STRIP AND ADDED TERMINALS TO POWER STRIP	A	MK	

REVISIONS

MATL: SEE B.O.M.

DR SMB DATE 4.6.98 SCALE 1/3 PIC
CK DATE FOR 5.26

RIMROCK

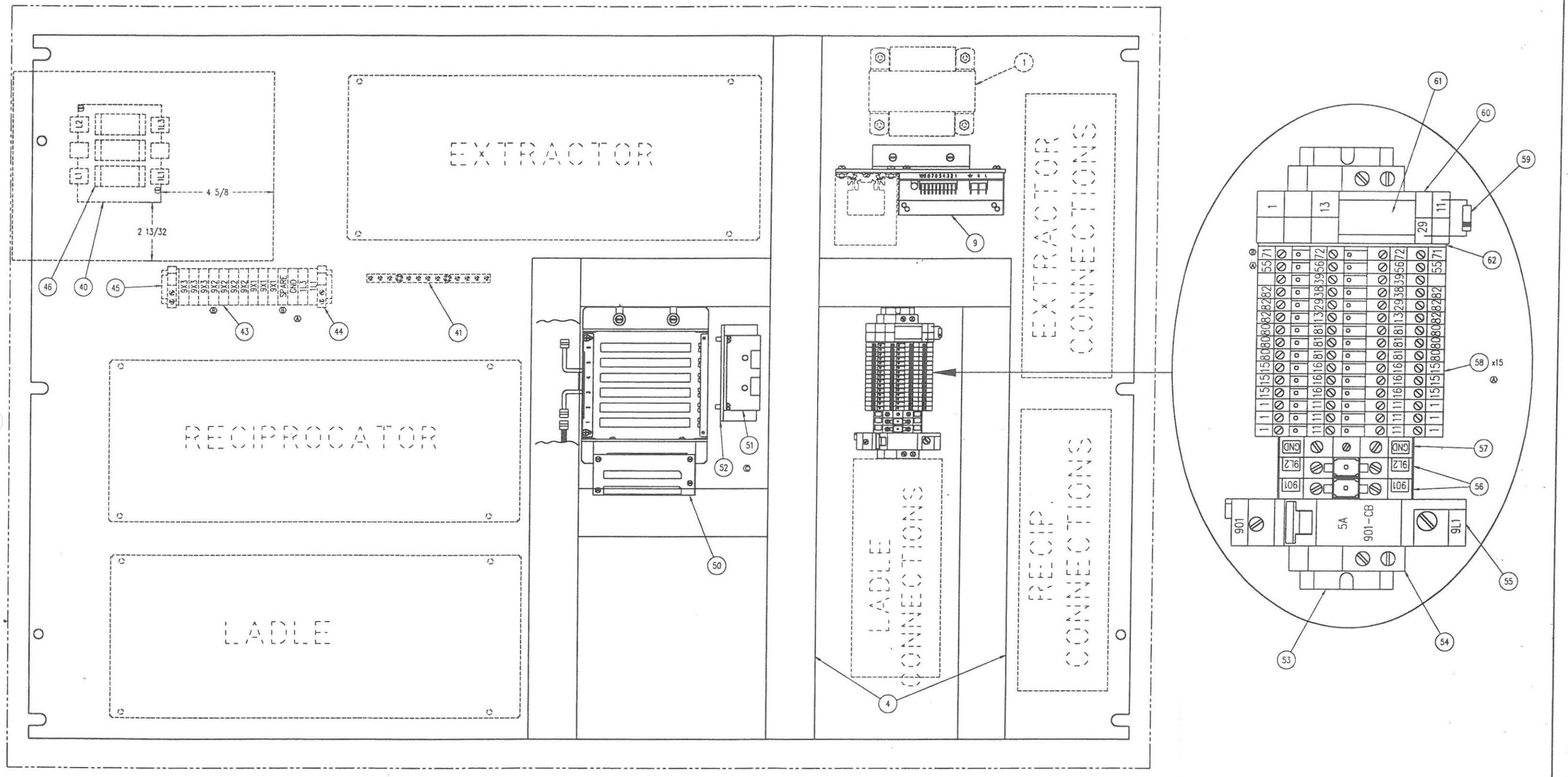
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DRAWING NO. 140D11850-01 REV D
DRAWING NAME MAIN BOX ASSEMBLY

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

FOR TRIANGLE SYSTEM

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT



*NOTE: 40 SERIES BALLOON NUMBERS REPRESENT HIGH VOLTAGE OPTION

30

EN	DATE	REMARKS	LET	DR	CK
			858	10.31	ADDED NEW PARTS ON P02
			672	9-8 98	CORRECTED BALLOON NUMBERS
			615	8.24 98	ADDED TERMINALS 71 AND 72, ADDED FOURTH '9X2' TERM. TO MATCH SCHEMATIC
			513	6-20 98	CHANGED TERMINAL STRIP AND ADDED TERMINALS TO POWER STRIP

REVISIONS

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

MAT'L:

DR SMB DATE 4.6.98 SCALE 1/2 PIC

CK DATE ER 578 SHEET 3 OF 3

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TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DRAWING NUMBER 140D11850-01 D

DRAWING NAME PANEL LAYOUT

FOR TRIANGLE SYSTEM

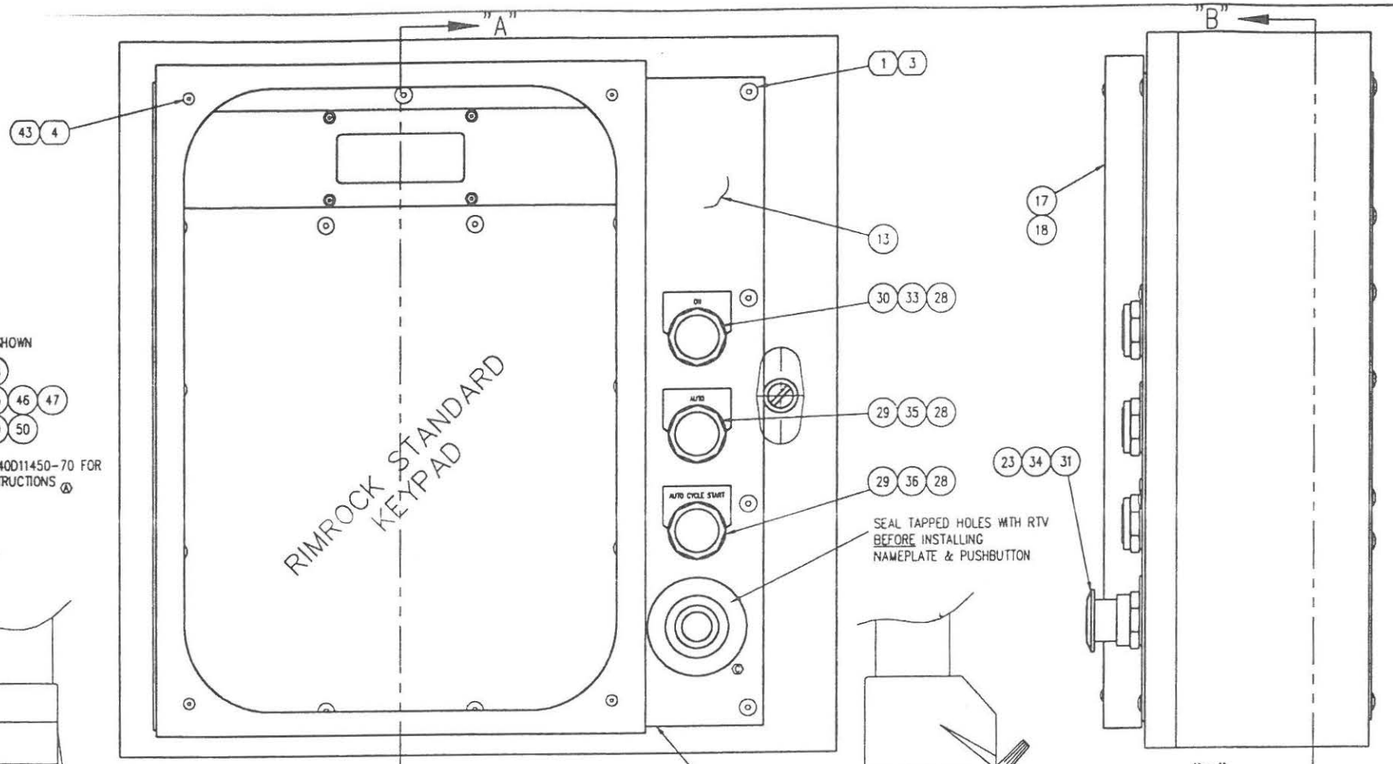
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15:55:42 15 JUL 1998 Acct HDA Port 28

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11850-01 - STD TRIANGLE ENCLOSURE

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP
2	11450-106	ENCLOSURE PUNCHED	1.000	EA	FM	MP
4	05489-8	WIRE DUCT 1.5 X 3" W/COVER	9.000	FT	CM	P
4	11429-20	COVER PLATE EPIC 48 PIN	3.000	EA	FM	P
9	02833-1	SWITCH	1.000	EA	CM	P
9	11450-70	POWER SUPPLY ASSY ^	1.000	EA	SA	MP
10	09520-04	LOGO RIMROCK LG DIE CAST	1.000	EA	CM	P
11	11049	DOOR SWITCH MOUNT	1.000	EA	FM	P
12	02702-8	BHCS 10-32 X 1/2	2.000	EA	HW	P B
13	02894	FLATWASHER #10	10.000	EA	HW	P B
14	02627	RHMS 10-32 X 1/2	10.000	EA	HW	P B
15	02678	LOCKWASHER LIGHT #10	10.000	EA	HW	P B
16	02641-3	RHMS 8-32 X 1/2	4.000	EA	HW	P B
17	02677	LOCKWASHER LIGHT #8	4.000	EA	HW	P B
17	11450-102	LABLE FOR MACHINE PLUGS	1.000	EA	CM	P
18	04373	NUT ELASTIC STOP 10-32	26.000	EA	HW	P B
19	09920-16	NAMEPLATE MADE IN THE USA	1.000	EA	FM	P
20	02809-2	POP RIVET 1/8 X 1/4	4.000	EA	HW	P B
22	08058-6	BHCS 6-32 x 3/8	4.000	EA	HW	P B
23	02554	SHCS 10-32 X 1	12.000	EA	HW	P B
50	11450-154	CARD CAGE TRI ASSY	1.000	EA	SA	MP
51	07620-101	FAN	1.000	EA	CM	P
52	08969	MOUNT FAN	1.000	EA	FM	P
53	02951-6	DIN MOUNT RAIL	9.000	IN	CM	P
54	02364-40	END ANCHOR 55A DIN	2.000	EA	CM	P
55	03017-11	CIRCUIT BREAKER AB 5A DIN	1.000	EA	CM	P
56	08729-105	DIN RAIL MOUNTED TERMINAL	2.000	EA	CM	P
57	08729-106	DIN RAIL MOUNTED GROUND TERMINAL	1.000	EA	CM	P
58	08729-104	DOUBLE STACKED DIN RAIL TERMINALS	14.000	EA	CM	P
59	09759-107	DIODE 1N4001G	1.000	EA	CM	P
60	10894-20	RELAY BASE AB DPDT DIN	1.000	EA	CM	P
61	09979-30	RELAY AB DPDT 24VDC COIL	1.000	EA	CM	P
62	08729-107	DOUBLE STACKED DIN RAIL TERM END PLATE	1.000	EA	CM	P



PARTS NOT SHOWN

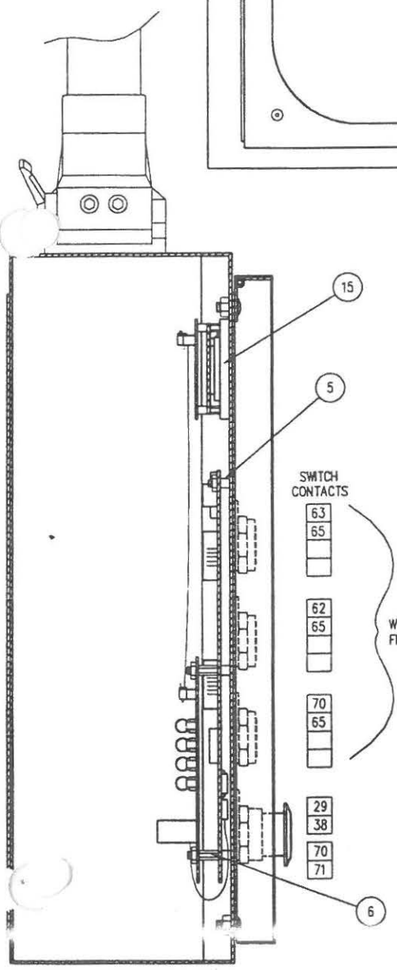
37 38

* 44 45 46 47

Ⓐ

* 48 49 50

*REF. DWG. # 140D11450-70 FOR ASSEMBLY INSTRUCTIONS Ⓐ

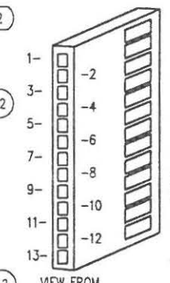


SECTION VIEW A-A

SECTION VIEW B-B

CAUTION: TO INSURE PROPER FUNCTION, PIN #1 ON CONNECTOR MUST ALIGN WITH PIN #1 ON THE HEADER.

CONNECTOR HOUSING PIN-OUT



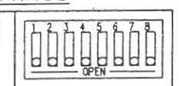
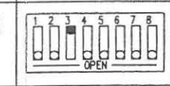
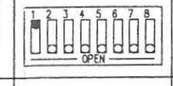
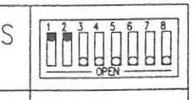
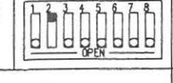
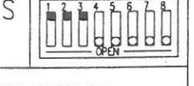
PIN #	WIRE #
2	62
3	63
5	65
10	70

HOUSING P/N 11042-013
PINS (GOLD) P/N 11042-103

25 32 26

INSTALL ON ITEM 32 AND INSERT INTO ITEM 25 PINS 2,3,5,& 10.

KEYPAD DIP SWITCH SETTINGS

300 SERIES LADLE			
400 SERIES LADLE			
300 SERIES 400 SERIES RECIP.		195 SERIES EXT.	
300 SERIES EXT.		400 SERIES EXT.	

NOTE : THESE ARE THE ONLY POSSIBLE SETTINGS FOR THE KEYPAD. ANY OTHER SETTING WILL RESULT IN AN ERROR CONDITION.

NOTE : THESE ARE THE ONLY POSSIBLE SETTINGS FOR THE KEYPAD. ANY OTHER SETTING WILL RESULT IN AN ERROR CONDITION.

PUSH BUTTON WIRE ROUTING

WIRE #	FROM	TERM P/N	TO	TERM P/N
62	PIN 2	11042-103	AUTO P.B.	11215-03
63	PIN 3	11042-103	MANUAL P.B.	11215-03
65	PIN 5	11042-103	MANUAL P.B.	11215-03
70	PIN 10	11042-103	CYCLE START	11215-03
65	MANUAL P.B.	11215-03	AUTO P.B.	11215-03
65	AUTO P.B.	11215-03	CYCLE START P.B	11215-03

ALL WIRES TO BE BLUE #20 AWG. (P/N 02898-49)

KEYPAD ASSEMBLIES

	195 SERIES	LADLES	RECIP'S	300 SERIES	400 SERIES
	11450-63	11450-60	11450-61	11450-62	11450-170
KEYPAD FRONT	11120-104	11120-100	11120-102	11120-105	11120-10
KEYPAD BACK PLANE	11120-109	11120-109	11120-109	11120-109	11120-109
SPACER	07621-111	07621-111	07621-111	07621-111	07621-111

43

P/N- 11850-50 (LADLES)
11850-53 (RECIPROCATORS)
11850-55 (300 SERIES) EXT.
11850-56 (195 SERIES)
11850-59 (400 SERIES) EXT.

NOTES (UNLESS OTHERWISE SPECIFIED)
4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

DR	DATE	REMARKS	LET	DR	CK
844	11.09 98	REPLACED E-STOP PLATE WITH E-STOP LEGEND PLATE.	C	KRS	
802	10.06 98	MOVED PUSH BUTTON LOCATION TO REFLECT CHANGE IN MOUNT PANEL	B	KRS	
727	9.15 98	ADDED "REF. DWG" NOTE	A	SMB	

REVISIONS

MATL: SEE B.O.M.

DR SMB DATE 4.20.98 SCALE 1/2 WT
CK DATE DR 028 SHEET 1 OF 2

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DRAWING NO. 140D11850-50 REV C
DRAWING NAME KEYPAD ASSEMBLY
FOR TRIANGLE SYSTEMS

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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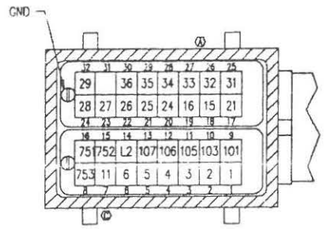
POWER DRIVE CONNECTIONS		
EPIC PIN#	COLOR	WIRE#
9	RED	101
10	BLACK	103
11	ORANGE	105
12	BROWN	106
13	YELLOW	107
14	BLUE	L2

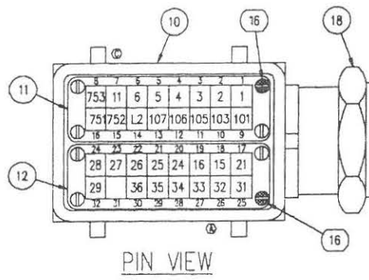
MOTOR CABLE CONNECTIONS				
EPIC PIN#	CANNON PIN#	COLOR	WIRE#	FUNCTION
B	B	ORANGE	753	MOTOR C(3)
15	C	BLACK	752	MOTOR B(2)
16	A	RED	751	MOTOR A(1)
CASE	D	BLUE	GND	GROUND

PROX SWITCH CABLE				
EPIC PIN#	COLOR	WIRE#	FUNCTION	PROX WIRE COLOR
1	RED	1	+24VDC	BROWN (+ ALL)
7	BLACK	11	24VDC COMM	BLUE (- ALL)
2	ORANGE	2	REST L.S.	BLACK
3	BROWN	3	CHECK L.S.	BLACK
4	YELLOW	4	CUSTOMER L.S.	BLACK
5	GREEN	5	CW L.S.	BLACK

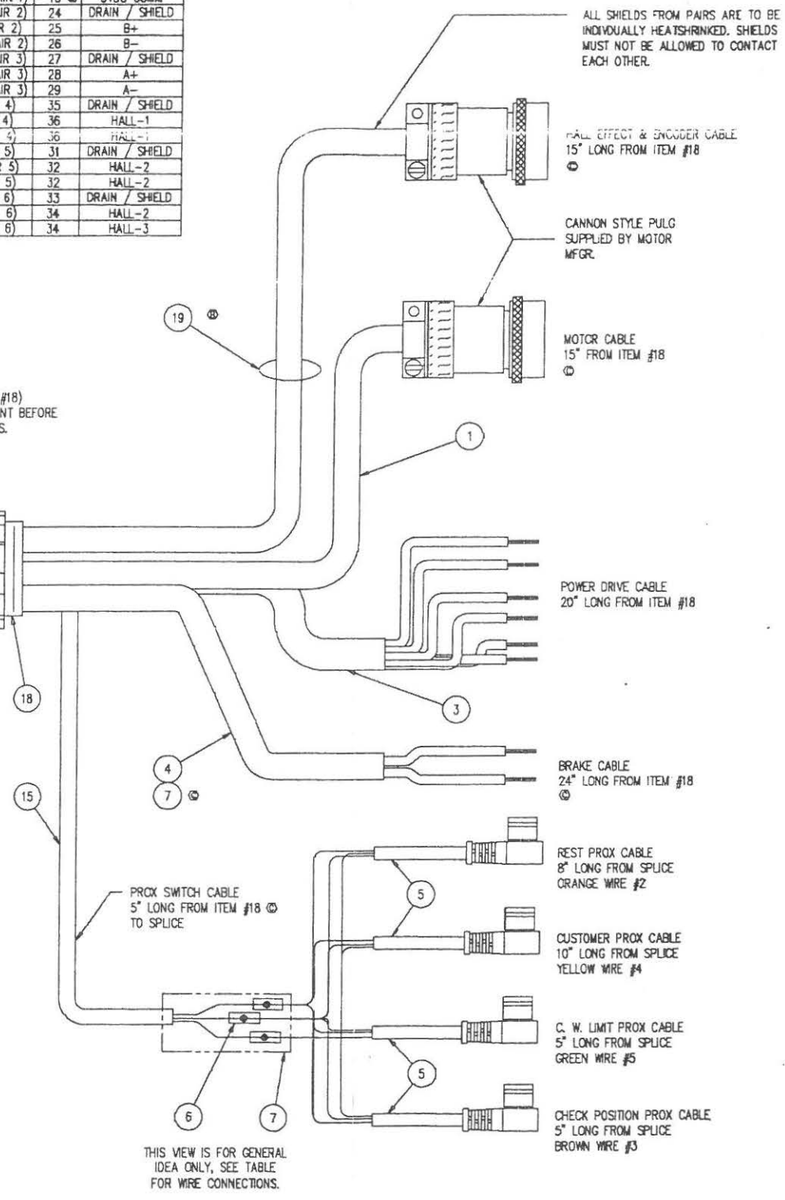
HALL EFFECT / ENCODER CABLE CONNECTIONS				
EPIC PIN#	CANNON PIN#	WIRE & COLOR	WIRE#	FUNCTION
17	HEAT SHRINK	ENCODER / DRAIN (PAIR 1)	21	DRAIN / SHIELD
18	K	ENCODER / WHITE (PAIR 1)	15 ⓓ	+5VDC
19	T	ENCODER / BLACK (PAIR 1)	16 ⓓ	5VDC COMM
20	HEAT SHRINK	ENCODER / DRAIN (PAIR 2)	24	DRAIN / SHIELD
21	N	ENCODER / RED (PAIR 2)	25	B+
22	P	ENCODER / BLACK (PAIR 2)	26	B–
23	HEAT SHRINK	ENCODER / DRAIN (PAIR 3)	27	DRAIN / SHIELD
24	B	ENCODER / GREEN (PAIR 3)	28	A+
32	C	ENCODER / BLACK (PAIR 3)	29	A–
29	HEAT SHRINK	HALL / DRAIN (PAIR 4)	35	DRAIN / SHIELD
30	E	HALL / BLUE (PAIR 4)	36	HALL-1
33	E	HALL / BLACK (PAIR 4)	36	HALL-1
25	HEAT SHRINK	HALL / DRAIN (PAIR 5)	31	DRAIN / SHIELD
26	F	HALL / YELLOW (PAIR 5)	32	HALL-2
26	F	HALL / BLACK (PAIR 5)	32	HALL-2
27	HEAT SHRINK	HALL / DRAIN (PAIR 6)	33	DRAIN / SHIELD
28	G	HALL / BROWN (PAIR 6)	34	HALL-2
28	G	HALL / BLACK (PAIR 6)	34	HALL-3

BRAKE CABLE CONNECTIONS			
EPIC PIN#	COLOR	WIRE#	FUNCTION
6	WHITE	6	BRAKE OFF
7	BLACK	11	24VDC COMM





NOTE:
PLACE CONNECTOR (ITEM #18)
THRU HOSE/CONDUIT MOUNT BEFORE
ATTACHING CANNON PLUGS.



DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.	
-550 50 FT	1	CABLE 14-4 PVC	53'	02829-1	
	1	WIRE 16-2 AWG	53'	02898-65	ⓒ
	1	CABLE 14-6 PVC	53'	02829-2	
	1	SHIELDED CABLE	53'	02915-17	
	1	6-PAIR TWISTED	53'	02915-23	
	1	CONDUIT - 1"	50'	02083-3	
-545 45 FT	1	CABLE 14-4 PVC	48'	02829-1	
	1	WIRE 16-2 AWG	48'	02898-65	ⓒ
	1	CABLE 14-6 PVC	48'	02829-2	
	1	SHIELDED CABLE	48'	02915-17	
	1	6-PAIR TWISTED	48'	02915-23	
	1	CONDUIT - 1"	45'	02083-3	
-540 40 FT	1	CABLE 14-4 PVC	43'	02829-1	
	1	WIRE 16-2 AWG	43'	02898-65	ⓒ
	1	CABLE 14-6 PVC	43'	02829-2	
	1	SHIELDED CABLE	43'	02915-17	
	1	6-PAIR TWISTED	43'	02915-23	
	1	CONDUIT - 1"	40'	02083-3	
-535 35 FT	1	CABLE 14-4 PVC	38'	02829-1	
	1	WIRE 16-2 AWG	38'	02898-65	ⓒ
	1	CABLE 14-6 PVC	38'	02829-2	
	1	6-PAIR TWISTED	38'	02915-23	
	1	SHIELDED CABLE	38'	02915-17	
	1	CONDUIT - 1"	35'	02083-3	
-533 33 FT	1	CABLE 14-4 PVC	36'	02829-1	
	1	WIRE 16-2 AWG	36'	02898-65	ⓒ
	1	CABLE 14-6 PVC	36'	02829-2	
	1	SHIELDED CABLE	36'	02915-17	
	1	6-PAIR TWISTED	36'	02915-23	
	1	CONDUIT - 1"	33'	02083-3	

DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.	
-530 30 FT	1	CABLE 14-4 PVC	33'	02829-1	
	1	WIRE 16-2 AWG	33'	02898-65	ⓒ
	1	CABLE 14-6 PVC	33'	02829-2	
	1	SHIELDED CABLE	33'	02915-17	
	1	6-PAIR TWISTED	33'	02915-23	
	1	CONDUIT - 1"	30'	02083-3	
-525 25 FT	1	CABLE 14-4 PVC	28'	02829-1	
	1	WIRE 16-2 AWG	28'	02898-65	ⓒ
	1	CABLE 14-6 PVC	28'	02829-2	
	1	SHIELDED CABLE	84'	02915-17	
	1	6-PAIR TWISTED	33'	02915-23	
	1	CONDUIT - 1"	25'	02083-3	
-520 20 FT	1	CABLE 14-4 PVC	23'	02829-1	
	1	WIRE 16-2 AWG	23'	02898-65	ⓒ
	1	CABLE 14-6 PVC	23'	02829-2	
	1	SHIELDED CABLE	23'	02915-17	
	1	6-PAIR TWISTED	23'	02915-23	
	1	CONDUIT - 1"	20'	02083-3	
-515 15 FT	1	CABLE 14-4 PVC	18'	02829-1	
	1	WIRE 16-2 AWG	18'	02898-65	ⓒ
	1	CABLE 14-6 PVC	18'	02829-2	
	1	6-PAIR TWISTED	18'	02915-23	
	1	SHIELDED CABLE	18'	02915-17	
	1	CONDUIT - 1"	15'	02083-3	
-510 10 FT	1	CABLE 14-4 PVC	13'	02829-1	
	1	WIRE 16-2 AWG	13'	02898-65	ⓒ
	1	CABLE 14-6 PVC	13'	02829-2	
	1	SHIELDED CABLE	13'	02915-17	
	1	6-PAIR TWISTED	13'	02915-23	
	1	CONDUIT - 1"	10'	02083-3	

50" = 11302-550
45" = 11302-545
40" = 11302-540
35" = 11302-535
33" = 11302-533
30" = 11302-530
25" = 11302-525
20" = 11302-520
15" = 11302-515
Ⓐ 10" = 11302-510
RIMROCK PART NUMBERS

ITEM	DESCRIPTION	QTY	PART NUMBER	
19	CABLE, 6 TWISTED PAIR-SHIELDED	TAB	02915-23	ⓓ
18	CONNECTOR 1" STRAIGHT	2	02103-4	
17	CABLE GRIP	1	02082-4	
16	CODING PIN	2	11360-16	
15	CABLE, SHIELDED 6 CONDUCTOR	TAB	02915-17	
12	QUICK DISCONNECT PLUG #17-#32	1	11360-51	
11	QUICK DISCONNECT PLUG #1-#16	1	11360-50	
10	QUICK DISCONNECT HOOD	1	11360-58	
7	3/8 HEATSHRINK BLACK	30"	09810-2	ⓒ
6	1/8" HEAT SHRINK BLACK	8"	09810-4	
5	PROX CONNECTOR/CABLE	4	02865-21	
4	WIRE, 16 AWG, BLUE	TAB	02898-65	ⓒ
3	CABLE 14-6 PVC	TAB	02829-2	
2	CONDUIT - 1" SEALTIGHT	TAB	02083-3	
1	CABLE 14-4 PVC	TAB	02829-1	

3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS										
ER	DATE	REMARKS	LET	DR	CK	ER	DATE	REMARKS	LET	DR	CK
						178	6.6 96	CHANGED WIRE NUMBER 22 TO 15, AND 23 TO 16.	D	AR	
						022	1.26 95	CHANGED WIRE LENGTHS AND SPECIFICATIONS	C	RR	
						041	10.25 94	ADDED ITEM #18 & CHANGED HALL EFFECT & ENCODER CABLES & TABLES	B	CKC	
						041	10.12 94	ADDED P/N-11302-510 TO DRAWING & CORRECTED ENCODER TABLE	A	CKC	

MATL: SEE ABOVE

RIMROCK CORPORATION
1780 RIMROCK ROAD
P.O. BOX 18867
CINCINNATI, OHIO 45218
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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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DR CKD DATE 09.12.94 SCALE NONE PIC
QC DATE ER 041 SHEET OF
DRAWING NO. 411 D11302-500 REV D
DRAWING NAME: WIRING LAYOUT FOR SDR MAIN
CONTROL CABLE W/ POWER DRIVE
JOB: TRIANGLE CONTROLS

34-42C

CARD CAGE CABLE CONNECTIONS

	RIMROCK MACHINE CONFIGURATIONS			CARD SETS PART NUMBERS	195 SERIES EXTRACTOR: DIGITAL I/O RACK #1 RIBBON CABLE #1 11083-06	195 SERIES EXTRACTOR: DIGITAL I/O RACK #2 RIBBON CABLE #2 11083-06	195 SERIES EXTRACTOR: DIGITAL I/O RACK #3 (OPT. SYS II) RIBBON CABLE #3 11083-06	195 SERIES EXTRACTOR: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	300 SERIES LADLE: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-03	300 SERIES LADLE: ARM ENCODER CABLE 11450-20	300 SERIES LADLE: DIPPER ENCODER CABLE 11450-20	300 SERIES LADLE: DIGITAL I/O RACK #1 RIBBON CABLE 11083-04	300 SERIES RECIP.: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-04	300 SERIES RECIP.: ARM ENCODER CABLE 11450-21	300 SERIES RECIP.: DIGITAL I/O RACK #1 RIBBON CABLE 11082-05	300 SERIES EXT.: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-05	300 SERIES EXT.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-06	300 SERIES EXT.: DIGITAL I/O RACK #2 RIBBON CABLE 11083-06	400 SERIES RECIP.: SERVO IC PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES RECIP.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES RECIP.: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	400 SERIES EXT.: SERVO IC PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES EXT.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES EXT.: DIGITAL I/O RACK #2 RIBBON CABLE 11083-05	400 SERIES EXT.: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	400 SERIES LADLE: SERVO IC PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES LADLE: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES LADLE: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	MODULE POWER CONNECTIONS
COMBINATIONS WITH 400 SERIES EXTRACTOR	400 SERIES EXTRACTOR 300 SERIES LADLE	BOARD CONNECTOR	CPU-2	11450-319					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2											SRV-2 J1	DIG-1 J1	DIG-1 J2	DIG-2 J1					901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 501-J1
	400 SERIES EXTRACTOR 300 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-320									DBO-1 J1	ENC J4	DBO-1 J2								SRV-2 J1	DIG-1 J1	DIG-1 J2	DIG-2 J1					901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
	400 SERIES EXTRACTOR 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-321															SRV-3 J1	DBO-1 J2	DBO-1 J1		SRV-3 J2	DIG-1 J1	DIG-1 J2	DIG-2 J1					901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
	400 SERIES EXTRACTOR 300 SERIES LADLE 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-322					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2							SRV-3 J1	DIG-4 J1	DIG-4 J2		SRV-3 J2	DIG-4 J3	DIG-4 J4	DIG-4 J5					901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1 701-J2 TO 501-J1
	300 SERIES LADLE 300 SERIES RECIP. 400 SERIES EXTRACTOR	BOARD CONNECTOR	CPU-2	11450-323					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2	DIG-4 J2	ENC J4	DIG-4 J1								SRV-2 J1	DIG-4 J3	DIG-4 J4	DIG-4 J5					901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 501-J1 701-J2 TO 501-J1

CARD	CARD DESCRIPTION	PART NUMBER
CPU-1	CENTRAL PROCSSOR UNIT	11440-05
CPU-2	CENTRAL PROCSSOR UNIT	11440-06
CPU-3	CENTRAL PROCSSOR UNIT	11440-08
DBO-1	DIGITAL BREAKOUT I/O	11440-11
DIG-1	DIGITAL I/O	11441-01
DIG-2	DIGITAL I/O	11441-01
DIG-3	DIGITAL I/O	11441-01
DIG-4	DIGITAL I/O 144	11441-02
ENC	ENCODER	11442-03
SRV-1	SERVO CARD 7340-01	11442-11
SRV-2	SERVO CARD 7340-02	11442-12
SRV-3	SERVO CARD 7340-03	11442-13

SERIES	MACHINE TYPE
300 SERIES LADLES	305,305H,352,358
300 SERIES RECIP.S	310,310H
300 SERIES EXTRACTORS	320,322,324,340,344
400 SERIES LADLES	405,454,456,458
400 SERIES RECIP.S	410,410H
400 SERIES EXTRACTORS	495

OPERATOR INTERFACE CABLE CONNECTIONS	
KEYPAD / VIDEO	CPU-X J8
MESSAGE CENTER	CPU-X J10

*NOTE: DIGITAL BREAKOUT I/O BOARD CONNECTS TO CPU-X WITH 60 PIN RIBBON CABLE FROM (DBO-1 J3) TO (CPU-X J4)

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

DR	DATE	REMARKS	LET	DR	CK
		REVISIONS			

DR	DATE	REMARKS	LET	DR	CK
		REVISIONS			

MAT'L:

DR SMB DATE 4.7.98 SCALE NTS PIC

CK DATE DR 578 SHEET 2 OF 2

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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ± 1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ± 1/2
4-DIGIT DECIMALS= ±.0005

140D11850-100 1

DRAWING NAME TRIANGLE INTERCONNECTIONS TABLE

FOR TRIANGLE SYSTEM

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

CARD CAGE CABLE CONNECTIONS

	RIMROCK MACHINE CONFIGURATIONS			CARD SETS PART NUMBERS	195 SERIES EXTRACTOR: DIGITAL I/O RACK #1 RIBBON CABLE #1 11083-06	195 SERIES EXTRACTOR: DIGITAL I/O RACK #2 RIBBON CABLE #2 11083-06	195 SERIES EXTRACTOR: DIGITAL I/O RACK #3 (OPT. SYS III) RIBBON CABLE #3 11083-06	195 SERIES EXTRACTOR: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	300 SERIES LADLE: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-03	300 SERIES LADLE: ARM ENCODER CABLE 11450-20	300 SERIES LADLE: DIPPER ENCODER CABLE 11450-20	300 SERIES LADLE: DIGITAL I/O RACK #1 RIBBON CABLE 11083-04	300 SERIES RECIP.: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-04	300 SERIES RECIP.: ARM ENCODER CABLE 11450-21	300 SERIES RECIP.: DIGITAL I/O RACK #1 RIBBON CABLE 11082-05	300 SERIES EXT.: MOTOR CONTROLLER/REM. PB RIBBON CABLE 11084-05	300 SERIES EXT.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-06	300 SERIES EXT.: DIGITAL I/O RACK #2 RIBBON CABLE 11083-06	400 SERIES RECIP.: SERVO I/C PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES RECIP.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES RECIP.: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	400 SERIES EXT.: SERVO I/C PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES EXT.: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES EXT.: DIGITAL I/O RACK #2 RIBBON CABLE 11083-05	400 SERIES EXT.: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	400 SERIES LADLE: SERVO I/C PCB BOARD #P1 CABLE ASSY. 16814-02	400 SERIES LADLE: DIGITAL I/O RACK #1 RIBBON CABLE 11083-05	400 SERIES LADLE: REMOTE PUSH BUTTON RIBBON CABLE 11084-06	MODULE POWER CONNECTIONS
SINGLE MACHINES	195 SERIES EXTRACTOR	BOARD CONNECTOR	CPU-1	11450-300	DBO-1 J2	DBO-1 J1	DIG-1 J2	DIG-1 J1																				901-J1 TO 901-J2 901-J3 TO 501-J1
	300 SERIES LADLE	BOARD CONNECTOR	CPU-1	11450-301					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2																901-J1 TO 901-J2 901-J3 TO 801-J1
	300 SERIES RECIP.	BOARD CONNECTOR	CPU-1	11450-302									DBO-1 J1	ENC J4	DBO-1 J2													901-J1 TO 901-J2 901-J3 TO 701-J1
	300 SERIES EXTRACTOR	BOARD CONNECTOR	CPU-1	11450-303												DIG-1 J1	DBO-1 J2	DBO-1 J1										901-J1 TO 901-J2 901-J3 TO 501-J1
	400 SERIES LADLE	BOARD CONNECTOR	CPU-2	11450-304																					SRV-2 J1	DBO-1 J2	DBO-1 J1	901-J1 TO 901-J2 901-J3 TO 801-J1
	400 SERIES RECIP.	BOARD CONNECTOR	CPU-1	11450-305															SRV-1 J1	DBO-1 J2	DBO-1 J1							901-J1 TO 901-J2 901-J3 TO 701-J1
	400 SERIES EXTRACTOR	BOARD CONNECTOR	CPU-1	11450-306																		SRV-2 J1	DBO-1 J2	DBO-1 J1	DIG-1 J1			901-J1 TO 901-J2 901-J3 TO 501-J1
COMBINATIONS WITH NO EXTRACTOR	300 SERIES LADLE 300 SERIES RECIP.	BOARD CONNECTOR	CPU-1	11450-307					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2	DIG-1 J2	ENC J4	DIG-1 J1													901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1
	300 SERIES LADLE 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-308					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2							SRV-1 J1	DIG-1 J1	DIG-1 J2							901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1
	195 SERIES EXTRACTOR 300 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-309	DIG-1 J1	DIG-1 J2	DIG-2 J2	DIG-2 J1					DBO-1 J1	ENC J4	DBO-1 J2													901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
COMBINATIONS WITH 195 SERIES EXTRACTOR	195 SERIES EXTRACTOR 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-310	DIG-1 J1	DIG-1 J2	DIG-2 J2	DIG-2 J1											SRV-1 J1	DBO-1 J2	DBO-1 J1							901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
	195 SERIES EXTRACTOR 300 SERIES LADLE	BOARD CONNECTOR	CPU-2	11450-311	DIG-1 J1	DIG-1 J2	DIG-2 J2	DIG-2 J1	DBO-1 J1	ENC J2	ENC J3	DBO-1 J2															901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 501-J1
	195 SERIES EXTRACTOR 300 SERIES LADLE 300 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-312	DIG-4 J3	DIG-4 J4	DIG-4 J6	DIG-4 J5	DBO-1 J1	ENC J2	ENC J3	DBO-1 J2	DIG-4 J2	ENC J4	DIG-4 J1												901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1 701-J2 TO 501-J1
	195 SERIES EXTRACTOR 300 SERIES LADLE 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-313	DIG-4 J3	DIG-4 J4	DIG-4 J6	DIG-4 J5	DBO-1 J1	ENC J2	ENC J3	DBO-1 J2							SRV-1 J1	DIG-4 J1	DIG-4 J2							901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1 701-J2 TO 501-J1
COMBINATIONS WITH 300 SERIES EXTRACTOR	300 SERIES EXTRACTOR 300 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-314									DBO-1 J1	ENC J4	DBO-1 J2	DIG-2 J1	DIG-1 J1	DIG-1 J2									901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
	300 SERIES EXTRACTOR 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-315												DIG-2 J1	DIG-1 J1	DIG-1 J2	SRV-1 J1	DBO-1 J2	DBO-1 J1							901-J1 TO 901-J2 901-J3 TO 701-J1 701-J2 TO 501-J1
	300 SERIES EXTRACTOR 300 SERIES LADLE	BOARD CONNECTOR	CPU-2	11450-316					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2				DIG-2 J1	DIG-1 J1	DIG-1 J2									901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 501-J1
	300 SERIES EXTRACTOR 300 SERIES LADLE 300 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-317					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2	DIG-4 J2	ENC J4	DIG-4 J1	DIG-4 J5	DIG-4 J3	DIG-4 J4									901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1 701-J2 TO 501-J1
	300 SERIES EXTRACTOR 300 SERIES LADLE 400 SERIES RECIP.	BOARD CONNECTOR	CPU-2	11450-318					DBO-1 J1	ENC J2	ENC J3	DBO-1 J2				DIG-4 J5	DIG-4 J3	DIG-4 J4	SRV-1 J1	DIG-4 J1	DIG-4 J2							901-J1 TO 901-J2 901-J3 TO 801-J1 801-J2 TO 701-J1 701-J2 TO 501-J1

NOTE: COMBINATIONS WITH 400 SERIES EXTRACTOR ON SHEET 6 OF 6

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

MAT'L:	DR SMB	DATE 4.6.98	SCALE NONE	PIC	
	CK	DATE	ID 578	SHEET 1 OF 2	

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140D11850-100

DRAWING NAME: TRIANGLE INTERCONNECTIONS TABLE

FOR TRIANGLE CONTROLS

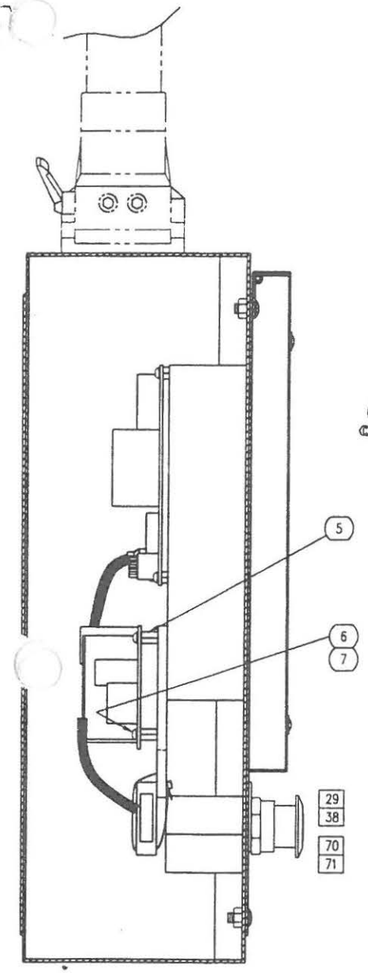
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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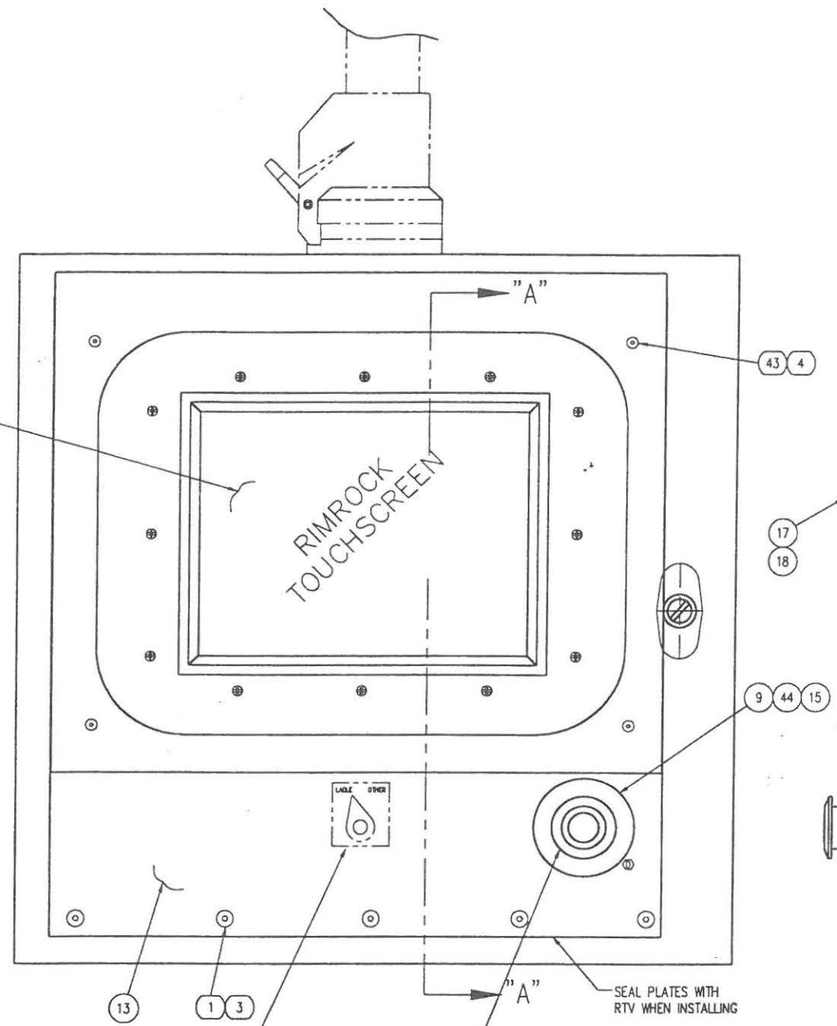
DR	DATE	REMARKS	LET	DR	DATE	REMARKS	LET
		REVISIONS				REVISIONS	

Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11850-58 - KEYPAD ASSY. RECIP & 195

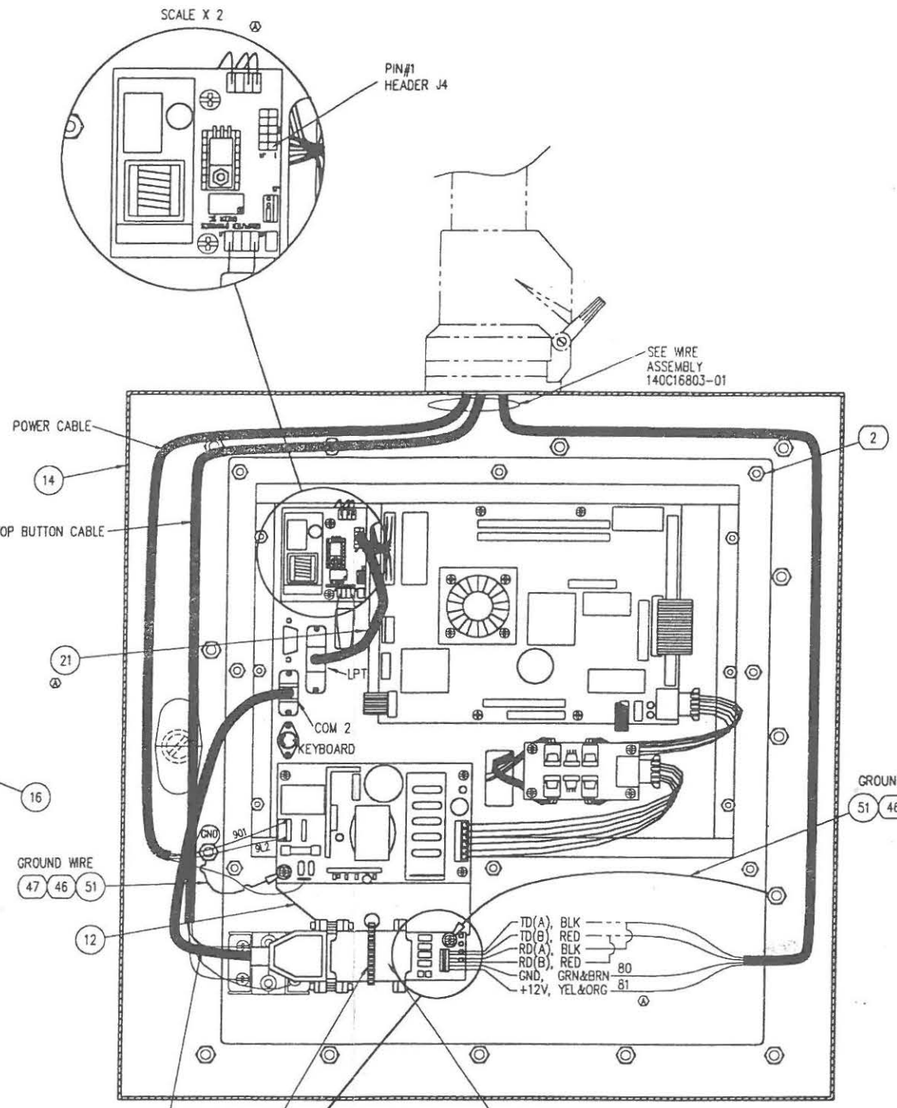
Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	02661-211	KEPS NUT 1/4-20	38.000	EA	CM	P	
2	02661-9	NUT, HEX, KEPS, 6-32 THD	10.000	EA	CM	P	OR
3	02663-12	BHCS 1/4-20 X 3/4	38.000	EA	HW	P B	
4	02702-8	BHCS 10-32 X 1/2	8.000	EA	HW	P B	
5	07621-113	SPACER, NYLON, #6 CLR, 1/4 X 0.312LG	10.000	EA	CM	P	OR
6	07624-136	SPACER	6.000	EA	CM	P	
7	09128-20	BHCS M3 -.5 X 20MM LG	8.000	EA	CM	P	OR
10	11450-126	S.D.B POWER SUPPLY ASSY	2.000	EA	SA	M	E
11	11450-61	KEYPAD ASSY 410 ^ SERIAL	1.000	EA	SA	MP	A
12	11450-156	LCD PCB ASSEMBLY	2.000	EA	CM	P	D
13	11451-04	PANEL MOUNT KEYPAD	2.000	EA	FM	P	B
14	11451-15	ENCLOSURE OPERATOR INTERFACE	1.000	EA	FM	P	B
15	11451-16	SHIELD MESSAGE CENTER	2.000	EA	FM	M	OR
17	11451-22	COVER KEYPAD	2.000	EA	FM	P	A
18	11451-24	SHIELD PLEXIGLAS KEYPAD COVER	2.000	EA	FM	M	OR
19	11083-09	SDB RIBBON CABLE	2.000	EA	SA	M	OR
20	11083-10	MESSAGE CENTER CABLE	2.000	EA	SA	M	OR
22	16803-02	POWER CABLE TRI MESS. CEN.	2.000	EA	SA	MP	OR
23	11215-06	CONTACT BLOCK N.O.	2.000	EA	CM	P	OR
25	11042-013	13-PIN CONNECTOR	2.000	EA	CM	P	
26	11042-103	H.P. RECEPTACLE CONTACT	8.000	EA	CM	P	
28	11215-03	LOGIC REED CONTACT N.O.	6.000	EA	CM	P	A
29	01293-10	PUSHBUTTON GREEN 800T A1	4.000	EA	CM	P	
30	01293-18	PUSHBUTTON YELLOW	2.000	EA	CM	P	
31	01726-16	SWITCH RED MUSH MAINTAIN	2.000	EA	CM	P	OR
32	02898-49	WIRE 20AWG BLUE	26.000	FT	CM	P	
33	05835-64	NAMEPLATE ON	2.000	EA	FM	P	C
34	05835-63	NAMEPLATE STOP	2.000	EA	FM	P	C
35	05490-15	NAMEPLATE AUTO	2.000	EA	FM	P	C
36	05490-6	NAMEPLATE AUTO CYCLE STAR	2.000	EA	FM	P	D
37	08837	WIRE TIE MOUNT - LARGE	4.000	EA	HW	P	
38	03010	WIRE TIE - SMALL	14.000	EA	HW	P	
42	16813-01	KEYPAD DIP SWITCH LABEL	2.000	EA	CM	P B	A
43	04373	NUT ELASTIC STOP 10-32	8.000	EA	HW	P B	
44	11450-63	KEYPAD ASSY 195 ^ SERIAL	1.000	EA	SA	PP	I



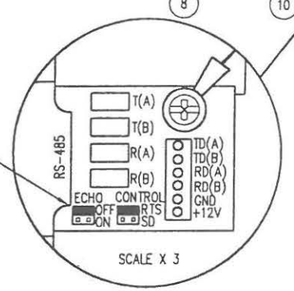
SECTION VIEW A-A







SECTION VIEW B-B



NOTE: RS-485 TO RS-232 CONVERTER
Ⓐ JUMPER CONFIGURATION
ECHO - OFF
CONTROL - RTS

P/N - 11850-65 (STANDARD ASSEMBLY)
11850-66 (405 COMBINATION ASSEMBLY) Ⓐ

46

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
		REVISIONS			
		BILL OF MATL. & ELECTRO PLATE			
711	9.11 98	UPDATED B.O.M., & ADDED BALLOON #52	C	SMB	
505	06.19 98	ADDED 485 TO 232 CONVERTER JUMPER CONFIG. NOTE	B	DLC	
505	06.10 98	ADDED BAL# 19, 20 & 21, ADDED ASSY 11850-66, CORRECTED SIG. WIRE	A	DLC	
ER	DATE	REMARKS	LET	DR	CK
		REVISIONS			

MATL: SEE B.O.M.

DR SMB DATE 4.20.98 SCALE 1/2 WT
CK DATE ER 028 SHEET OF

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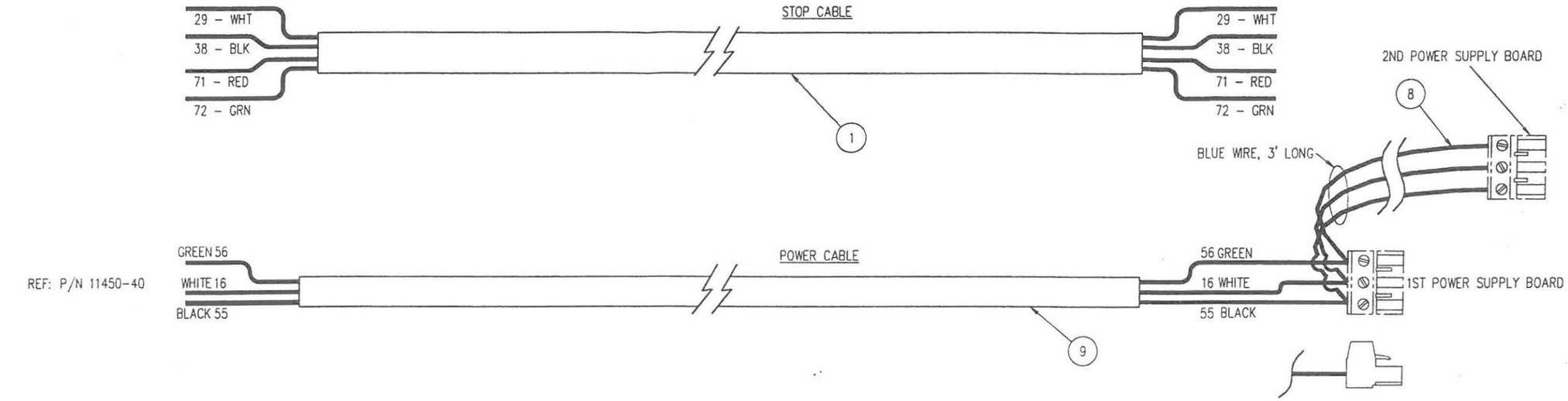
DRAWING NO. 140D11850-65 REV. D
DRAWING NAME TOUCH SCREEN ASSEMBLY
FOR TRIANGLE SYSTEMS

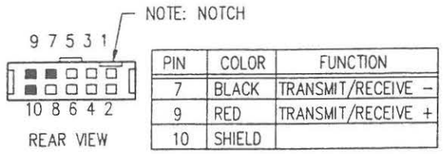
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11850-65 - TOUCH SCREEN ASSY. (COMPUTER DYNAMICS)

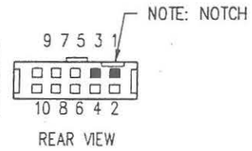
Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	02661-211	KEPS NUT 1/4-20	28.000	EA	CM	P	
2	04373-01	NUT ELASTIC STOP 10-24	8.000	EA	HW	P	OR
3	02663-12	BHCS 1/4-20 X 3/4	28.000	EA	HW	P B	
4	02702-8	BHCS 10-32 X 1/2	4.000	EA	HW	P B	
5	07624-136	SPACER	4.000	EA	CM	P	
6	01052-D	RHMS 6-32 X 3/8	6.000	EA	HW	P B	
7	02676	LOCKWASHER LIGHT #6	6.000	EA	HW	P B	
8	11486-06	DB-9F TO DB-25M CABLE CONVERTER	1.000	EA	CM	P	OR
9	01726-17	OPERATOR RED MUSH MAINT.	1.000	EA	CM	P	OR
10	03011	WIRE TIE - MEDIUM	1.000	EA	HW	P	
11	11486-07	RS232 TO RS485 CONVERTER	1.000	EA	CM	P	OR
12	11451-26	PWR SUPPLY MOUNT,VTS	1.000	EA	FM	M	OR
13	11451-14	PANEL MOUNT TOUCHSCREEN	1.000	EA	FM	P	B
14	11451-15	ENCLOSURE OPERATOR INTERFACE	1.000	EA	FM	P	B
15	05835-63	NAMEPLATE STOP	1.000	EA	FM	P	C
16	11451-21	PANEL BLANK	1.000	EA	CM	P	OR
17	11451-23	COVER TOUCHSCREEN	1.000	EA	FM	P	OR
18	11451-25	SHIELD PLEXIGLAS TOUCHSCREEN COVER	1.000	EA	FM	M	OR
19	11437-02	FLAT PANEL DISP W/TOUCH SCREEN & 486 CPU	1.000	EA	CM	P	OR
21	11448-14	VIDEO IO BACKLIGHT CONTROL	1.000	EA	SA	MP	OR
43	04373	NUT ELASTIC STOP 10-32	4.000	EA	HW	P B	
44	11215-06	CONTACT BLOCK N.O.	2.000	EA	CM	P	OR
46	04727-6	RING TERMINAL 14-16GA #6	2.000	EA	CM	P	
47	04727	WIRE RING LUG #16-14, 1/4	2.000	EA	CM	P	B
51	02898-5	WIRE 14AWG GREEN	2.000	FT	CM	P	

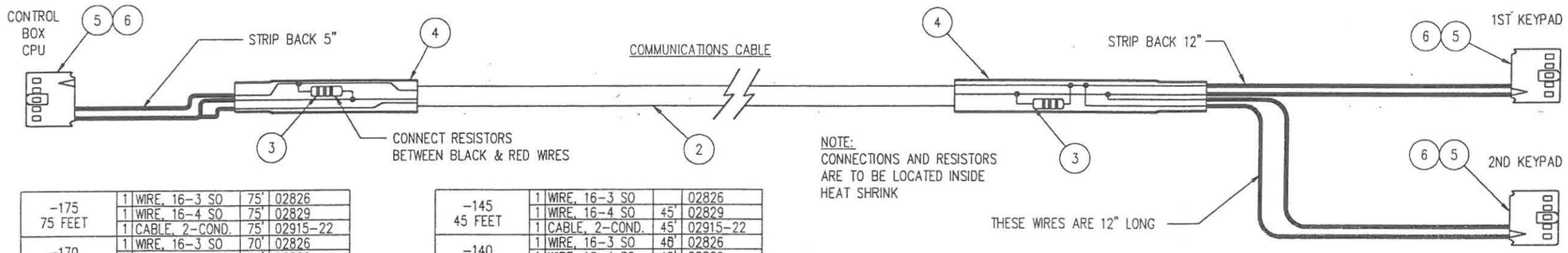




PIN	COLOR	FUNCTION
7	BLACK	TRANSMIT/RECEIVE –
9	RED	TRANSMIT/RECEIVE +
10	SHIELD	

FUNCTION	COLOR	PIN
TRANSMIT / RECEIVE –	BLACK	1
TRANSMIT / RECEIVE +	RED	3



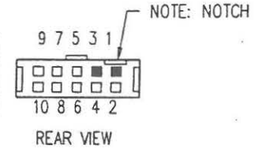


DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.
-175 75 FEET	1	WIRE, 16-3 SO	75'	02826
	1	WIRE, 16-4 SO	75'	02829
	1	CABLE, 2-COND.	75'	02915-22
-170 70 FEET	1	WIRE, 16-3 SO	70'	02826
	1	WIRE, 16-4 SO	70'	02829
	1	CABLE, 2-COND.	70'	02915-22
-165 65 FEET	1	WIRE, 16-3 SO	65'	02826
	1	WIRE, 16-4 SO	65'	02829
	1	CABLE, 2-COND.	65'	02915-22
-160 60 FEET	1	WIRE, 16-3 SO	60'	02826
	1	WIRE, 16-4 SO	60'	02829
	1	CABLE, 2-COND.	60'	02915-22
-155 55 FEET	1	WIRE, 16-3 SO	55'	02826
	1	WIRE, 16-4 SO	55'	02829
	1	CABLE, 2-COND.	55'	02915-22
-150 50 FEET	1	WIRE, 16-3 SO	50'	02826
	1	WIRE, 16-4 SO	50'	02829
	1	CABLE, 2-COND.	50'	02915-22

DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.
-145 45 FEET	1	WIRE, 16-3 SO		02826
	1	WIRE, 16-4 SO	45'	02829
	1	CABLE, 2-COND.	45'	02915-22
-140 40 FEET	1	WIRE, 16-3 SO	46'	02826
	1	WIRE, 16-4 SO	40'	02829
	1	CABLE, 2-COND.	40'	02915-22
-135 35 FEET	1	WIRE, 16-3 SO	35'	02826
	1	WIRE, 16-4 SO	35'	02829
	1	CABLE, 2-COND.	35'	02915-22
-133 33 FEET	1	WIRE, 16-3 SO	33'	02826
	1	WIRE, 16-4 SO	33'	02829
	1	CABLE, 2-COND.	33'	02915-22
-105 05 FEET	1	WIRE, 16-3 SO	07'	02826
	1	WIRE, 16-4 SO	07'	02829
	1	CABLE, 2-COND.	07'	02915-22

Ⓐ

FUNCTION	COLOR	PIN
TRANSMIT / RECEIVE –	BLACK	1
TRANSMIT / RECEIVE +	RED	3



NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125

ER	DATE	REMARKS	LET	DR	CK
REVISIONS					
550	6-25 98	ADDED 5 FOOT CABLE LENGTH	A	MK	
REVISIONS					

MAT'L: SEE B.O.M.

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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR SMB	DATE 4.27.98	SCALE FULL	PIC	
CK	DATE	ER 028	SHEET	OF

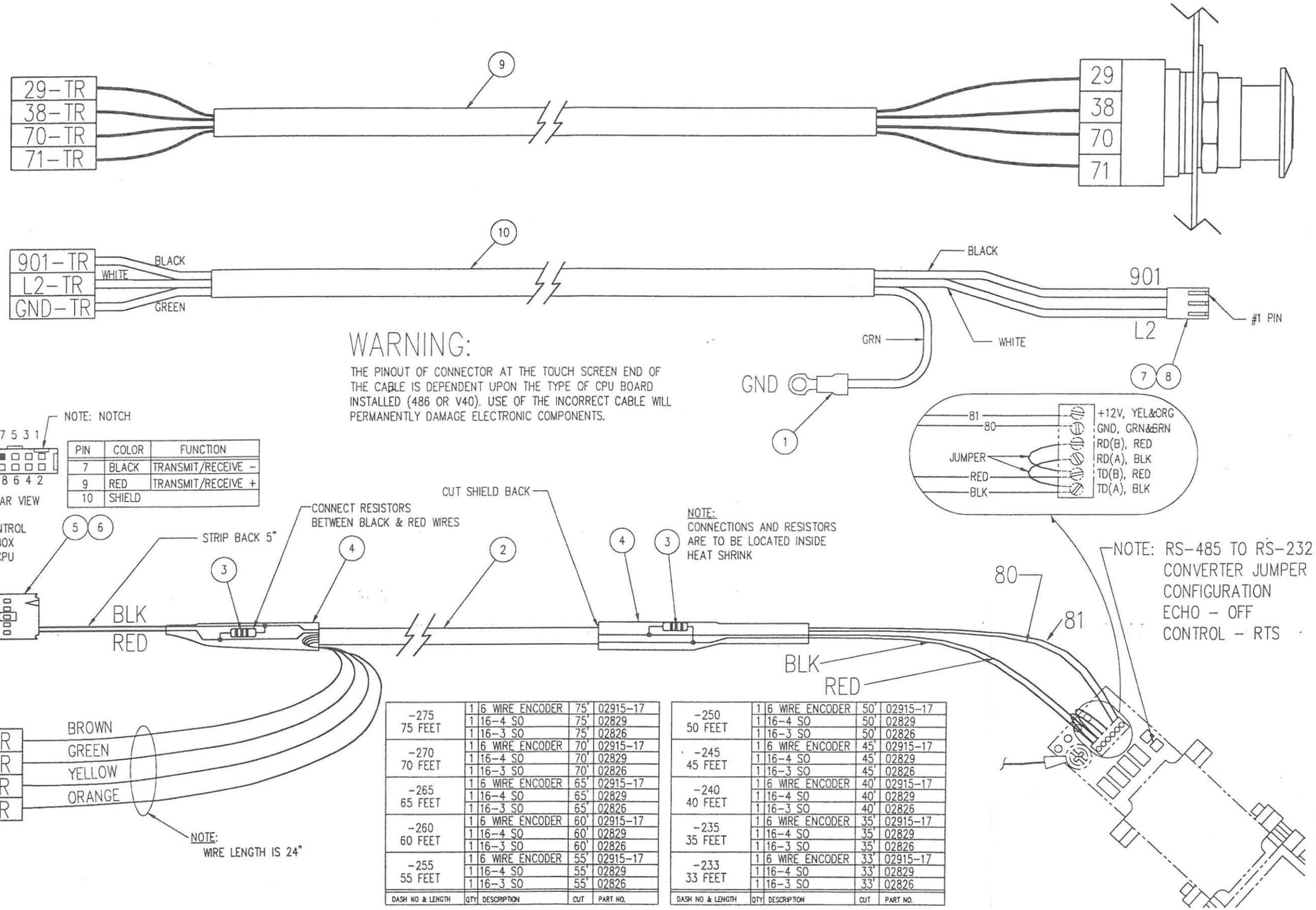
DRAWING NO. 140016801-133 REV A

DRAWING NAME: REMOTE KEYPAD CABLE
ASSEMBLY FOR RS-485
FOR TRIANGLE SYSTEM (NEW ENCLOSURE)

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Bill of Materials Sorted by Balloon Number by Part Number
Part Number 16801-133 - REMOTE KEYPAD ASSY. RS485

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv	
1	02829	WIRE 16-4 SO	33.000	FT	CM	P		
2	02915-22	20-2 SHIELDED CABLE	33.000	FT	CM	P		
3	08295-52	RESISTOR 100 OHM .25W	2.000	EA	CM	P		OR
4	09810-2	HEAT SHRINK 3/8 BLK	0.125	IN	HW	P	B	
5	11042-10	10-PIN CONNECTOR	3.000	EA	CM	P		
6	11042-103	H.P. RECEPTACLE CONTACT	7.000	EA	CM	P		
8	02898-65	WIRE 16AWG BLUE	9.000	FT	CM	P		
9	02826	WIRE 16-3 SO	33.000	FT	CM	P		



PIN	COLOR	FUNCTION
7	BLACK	TRANSMIT/RECEIVE -
9	RED	TRANSMIT/RECEIVE +
10	SHIELD	

DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.
-275 75 FEET	1	6 WIRE ENCODER	75'	02915-17
	1	16-4 SO	75'	02829
	1	16-3 SO	75'	02826
-270 70 FEET	1	6 WIRE ENCODER	70'	02915-17
	1	16-4 SO	70'	02829
	1	16-3 SO	70'	02826
-265 65 FEET	1	6 WIRE ENCODER	65'	02915-17
	1	16-4 SO	65'	02829
	1	16-3 SO	65'	02826
-260 60 FEET	1	6 WIRE ENCODER	60'	02915-17
	1	16-4 SO	60'	02829
	1	16-3 SO	60'	02826
-255 55 FEET	1	6 WIRE ENCODER	55'	02915-17
	1	16-4 SO	55'	02829
	1	16-3 SO	55'	02826

DASH NO & LENGTH	QTY	DESCRIPTION	CUT	PART NO.
-250 50 FEET	1	6 WIRE ENCODER	50'	02915-17
	1	16-4 SO	50'	02829
	1	16-3 SO	50'	02826
-245 45 FEET	1	6 WIRE ENCODER	45'	02915-17
	1	16-4 SO	45'	02829
	1	16-3 SO	45'	02826
-240 40 FEET	1	6 WIRE ENCODER	40'	02915-17
	1	16-4 SO	40'	02829
	1	16-3 SO	40'	02826
-235 35 FEET	1	6 WIRE ENCODER	35'	02915-17
	1	16-4 SO	35'	02829
	1	16-3 SO	35'	02826
-233 33 FEET	1	6 WIRE ENCODER	33'	02915-17
	1	16-4 SO	33'	02829
	1	16-3 SO	33'	02826

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
505	6.22 98	CHANGED TO AS BUILT	A	MK	

REVISIONS

MAT'L: SEE B.O.M.

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2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR	SMB
DATE	5.8.98
SCALE	FULL
PIC	
CK	
DATE	
ER	028
SHEET	OF
DRAWING NO.	140016803-01
REV	A
DRAWING NAME	VIDEO TOUCH SCREEN CABLE ASSEMBLY
FOR	TRIANGLE SYS. TOUCH SCREEN, NEW STYLE

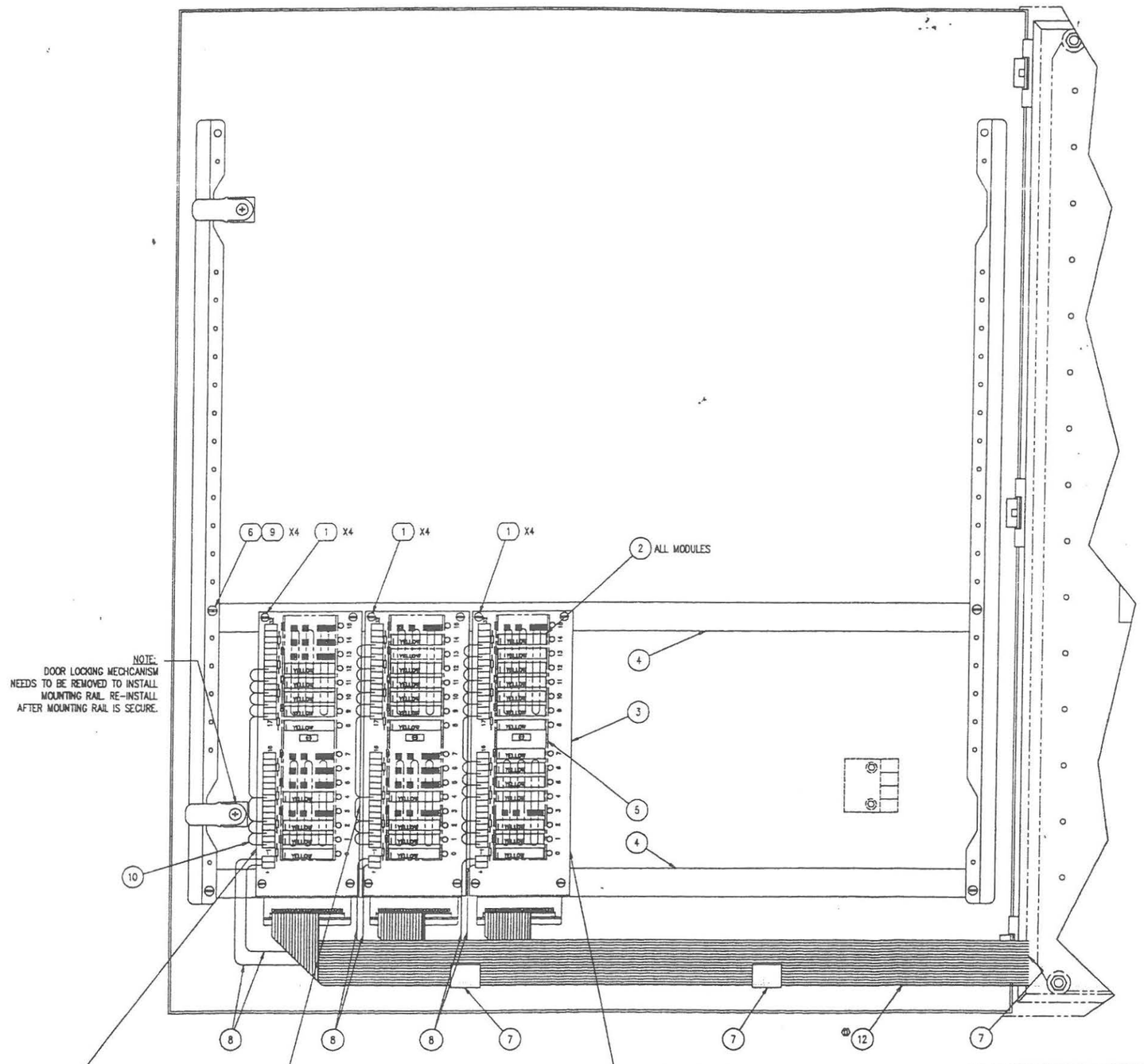
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13:10:21 15 JUN 1998 Acct ACY Port 22

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 16803-233 - VTS CABLE ASSY. 33'

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	04727	WIRE RING LUG #16-14, 1/4	1.000	EA	CM	P	B
2	02915-17	CABLE,SHIELDED 6 COND.	33.000	FT	CM	P	
3	08295-52	RESISTOR 100 OHM .25W	2.000	EA	CM	P	OR
4	09810-2	HEAT SHRINK 3/8 BLK	6.000	IN	HW	P B	
5	11042-10	10-PIN CONNECTOR	1.000	EA	CM	P	
6	11042-103	H.P. RECEPTACLE CONTACT	3.000	EA	CM	P	
7	11042-608	3-PIN RECEPTACLE	1.000	EA	CM	P	
8	11042-607	CRIMP STYLE PIN	2.000	EA	CM	P	OR
9	02829	WIRE 16-4 SO	33.000	FT	CM	P	
10	02826	WIRE 16-3 SO	33.000	FT	CM	P	



4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

	I/O MODULE FUNCTION BY MODEL			
MODULE	305/405	310/410	320	195
MOD 0	MANUAL/ON	MANUAL/ON	MANUAL/ON	MANUAL/ON
MOD 1	AUTO	AUTO	AUTO	AUTO
MOD 2	AUTO CYCLE START	AUTO CYCLE START	AUTO CYCLE START	AUTO CYCLE START
MOD 3	–	–	–	–
MOD 4	AUX 5	AUX 5	AUX 5	AUX 5
MOD 5	–	–	SWING TO DCM	LUBE A
MOD 6	–	–	SWING AWAY	LUBE B
MOD 7	–	–	FAST	AIR BLOW
MOD 8	RETRACT	EXTEND	ARM EXTEND	FORWARD
MOD 9	FORWARD	RETRACT	ARM RETRACT	RETRACT
MOD 10	FAST	FAST	CLAMP EXTEND	CLAMP EXTEND
MOD 11	DIPPER FWD.	LUBE A	CLAMP RETRACT	CLAMP RETURN
MOD 12	DIPPER REV.	LUBE B	ROLL UP	TOGGLE ROLL
MOD 13	DIPPER LEVEL (405) Ⓒ	LUBE C	ROLL DOWN	TOGGLE CLAMP
MOD 14	DIPPER FILL (405) Ⓒ	AIR BLOW	CLAMP	SWING TO DCM
MOD 15	DIPPER POUR (405) Ⓒ	–	UNCLAMP	SWING AWAY

WIRING TABLE FOR REMOTE I/O MODULES

	REMOTE I/O FOR MODEL			
I/O TERMINAL #	305/405	310/410	320	195
F1	8L2	7L2	5L2	5L2
F2	827	727	577	577
F3	8L2	7L2	5L2	5L2
F4	828	728	578	578
F5	8L2	7L2	5L2	5L2
F6	829	729	579	579
F7	–	–	–	–
F8	–	–	–	–
F9	8L2	7L2	5L2	5L2
F10	835	740	575	575
F11	–	–	5L2	5L2
F12	–	–	588	591
F13	–	–	5L2	5L2
F14	–	–	589	592
F15	–	–	5L2	5L2
F16	–	–	591	590
F17	8L2	7L2	5L2	5L2
F18	831	730	580	580
F19	8L2	7L2	5L2	5L2
F20	830	731	581	581
F21	8L2	7L2	5L2	5L2
F22	834	732	582	582
F23	8L2	7L2	5L2	5L2
F24	832	733	583	583
F25	8L2	7L2	5L2	5L2
F26	833	734	584	584
F27	8L2 Ⓒ	7L2	5L2	5L2
F28	882 Ⓓ	726 Ⓒ	585	586
F29	8L2 Ⓒ	7L2	5L2	5L2
F30	881 Ⓒ	735	586	588
F31	8L2 Ⓒ	–	5L2	5L2
F32	880 Ⓒ	–	587	589

Ⓐ

NOTE: STANDARD BOX SHOWN

ER	DATE	REMARKS	LET	DR	CK
205	05.14 97	ADDED 3 PB FOR 405 CORRECT WIRE NUMBER ON 310/410	E	JAS	
190	6.14 96	ADDED NEW P/N'S FOR 410 AND 405	D	ACT	
290	12.11	CHANGED LABLE TO 310 AND FROM 310	C	AR	
223	8.22 95	SEE SHEET 1	B	AR	
091	2.27 95	CHANGED WIRE NUMBER FROM 837 TO 835, ALSO ADDED JUMPERS	A	AR	

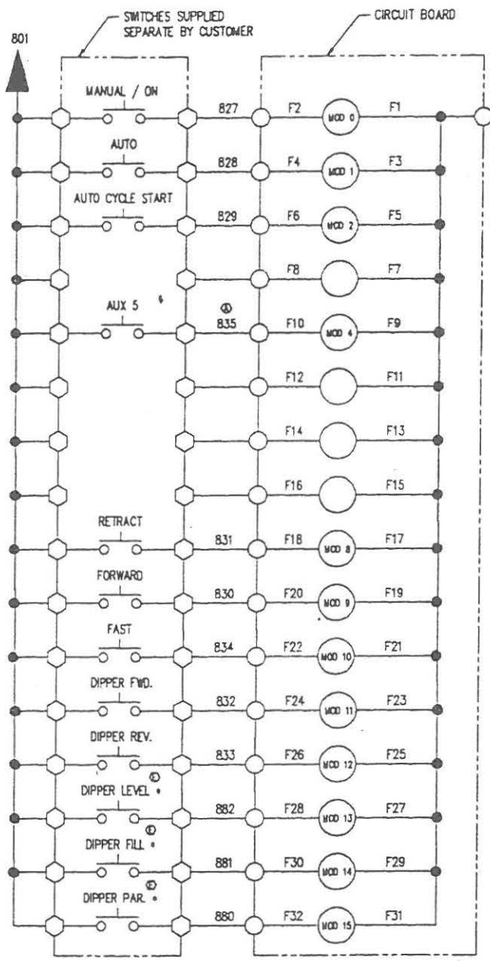
MATL: SEE B.O.M.

TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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7209 RIMROCK ROAD
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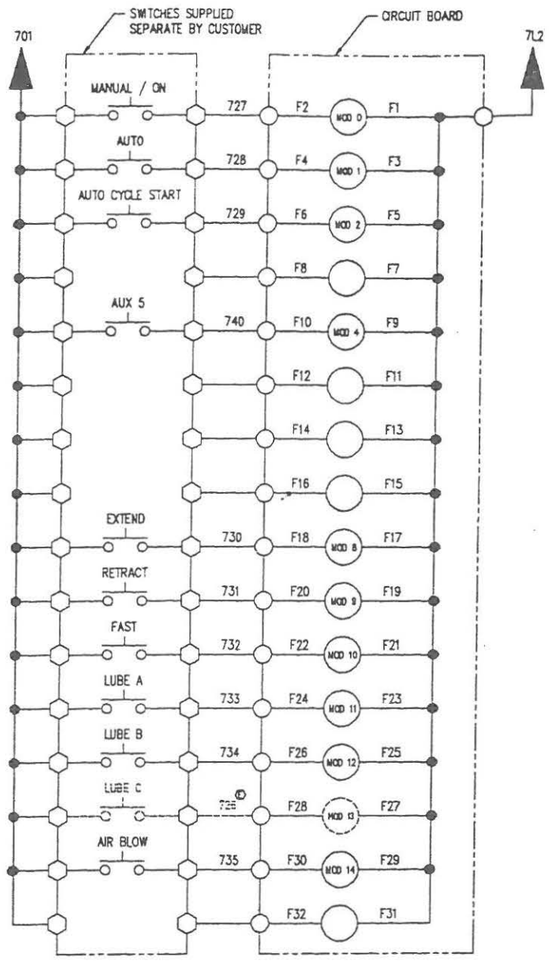
DR CKQ	DATE 11.02.94
CK	DATE
ER 167	SCALE NONE
SHEET 2 OF 2	REV F
DRAWING NO.	140D16809-100
IMAGE	WIRING & PARTS DIAGRAM
FOR	CUSTOMER REMOTE I/O MODULES

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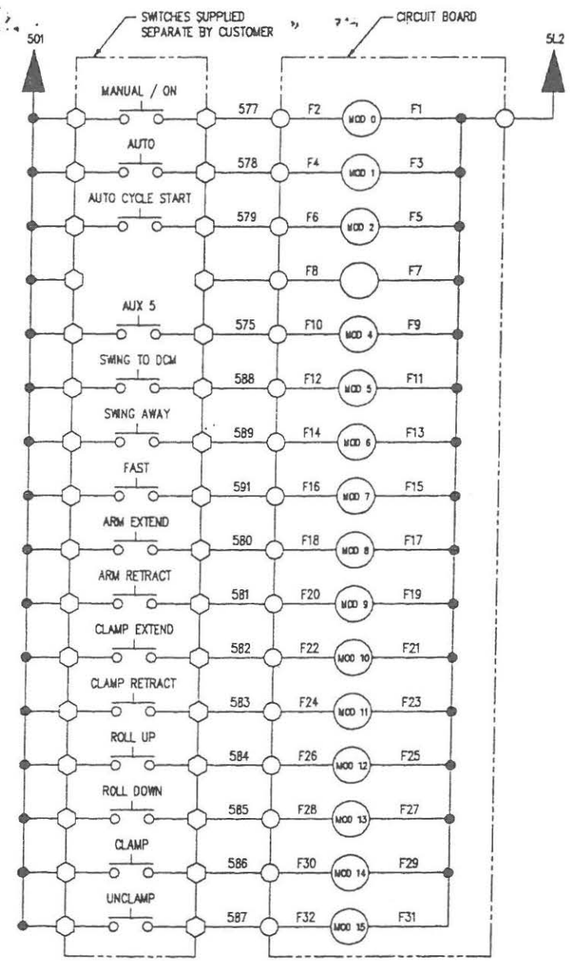


305/405 SCHEMATIC DIAGRAM

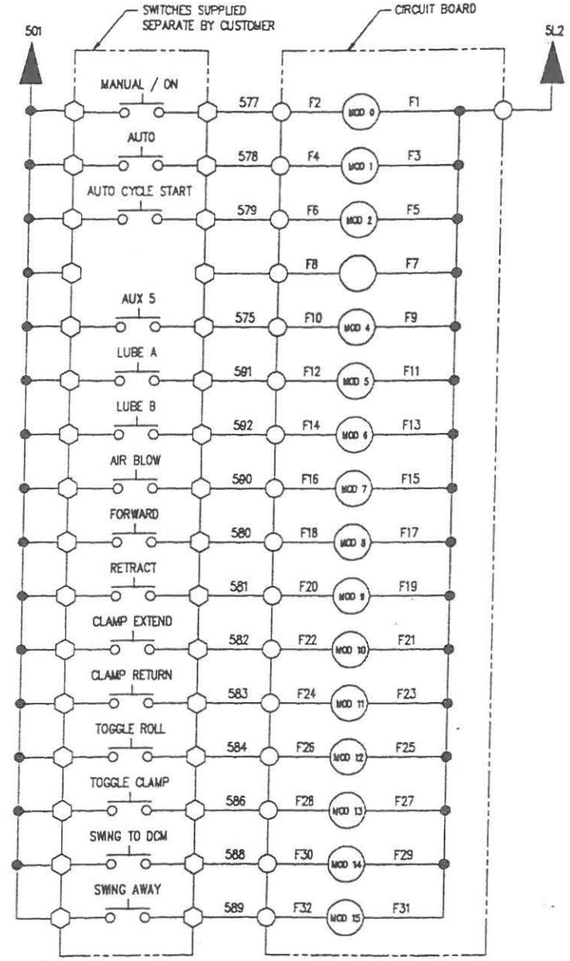
* DENOTES 405 ONLY



310/410 SCHEMATIC DIAGRAM



320 SCHEMATIC DIAGRAM



195 SCHEMATIC DIAGRAM

THESE KITS INCLUDE MOUNTING RAILS ®

305 LADLE KIT P/N-16809-100
310 RECIPROCATOR KIT P/N-16809-101
320 EXTRACTOR KIT P/N-16809-102
195 EXTRACTOR KIT P/N-16809-103
® 410 RECIPROCATOR KIT P/N-16809-104
® 405 LADLE KIT P/N-16809-105

305 LADLE LG. BOX KIT P/N-16809-110
410 RECIPROCATOR LG. BOX KIT P/N-16809-111
320 EXTRACTOR LG. BOX KIT P/N-16809-112
195 EXTRACTOR LG. BOX KIT P/N-16809-113
® 405 LADLE LG. BOX KIT P/N-16809-115

305 LADLE ADD-ON KIT P/N-16809-200
310 RECIPROCATOR ADD-ON KIT P/N-16809-201
320 EXTRACTOR ADD-ON KIT P/N-16809-202
195 EXTRACTOR ADD-ON KIT P/N-16809-203
® 410 RECIPROCATOR ADD-ON KIT P/N-16809-204
® 405 LADLE ADD-ON KIT P/N-16809-205

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
			205	05.14 97	ADD 3 P.B. FOR 405 CORRECT WIRE NUMBER ON 310/410	E	JAS
			190	6.14 96	ADDED P/N'S FOR 410 AND 405	D	ACT
				95		C	AR
			223	8.22 95	ADDED PART NUMBERS FOR "LARGE BOX" INSTALLATIONS	B	AR
			091	2.27 95	CHANGED WIRE NUMBER FROM 837 TO 835	A	AR

REVISIONS

MATL: SEE B.O.M.

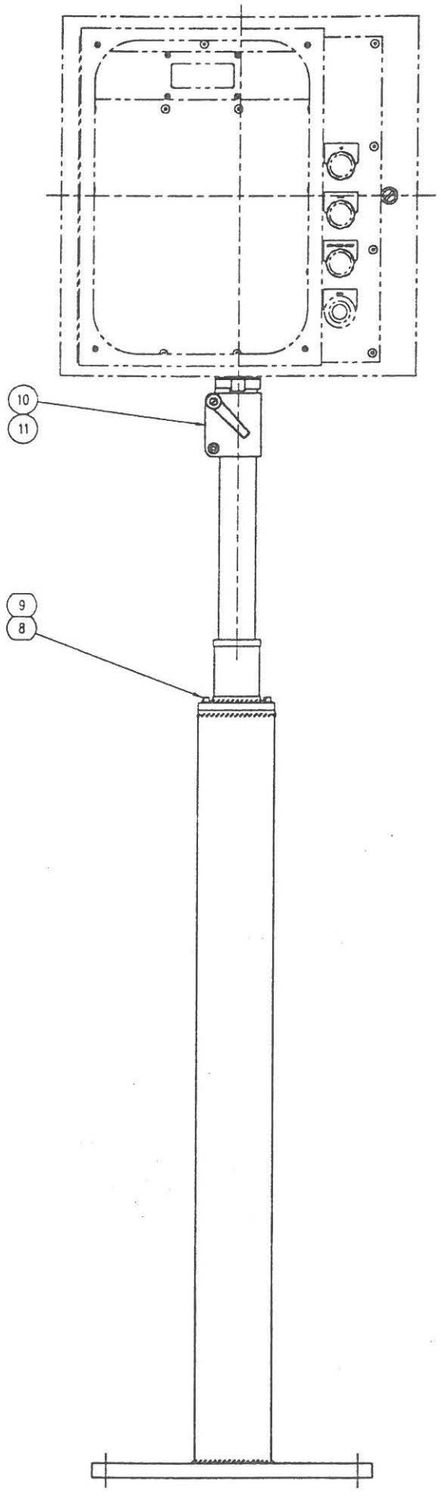
RIMROCK CORPORATION
1709 RIMROCK ROAD
P.O. BOX 68007

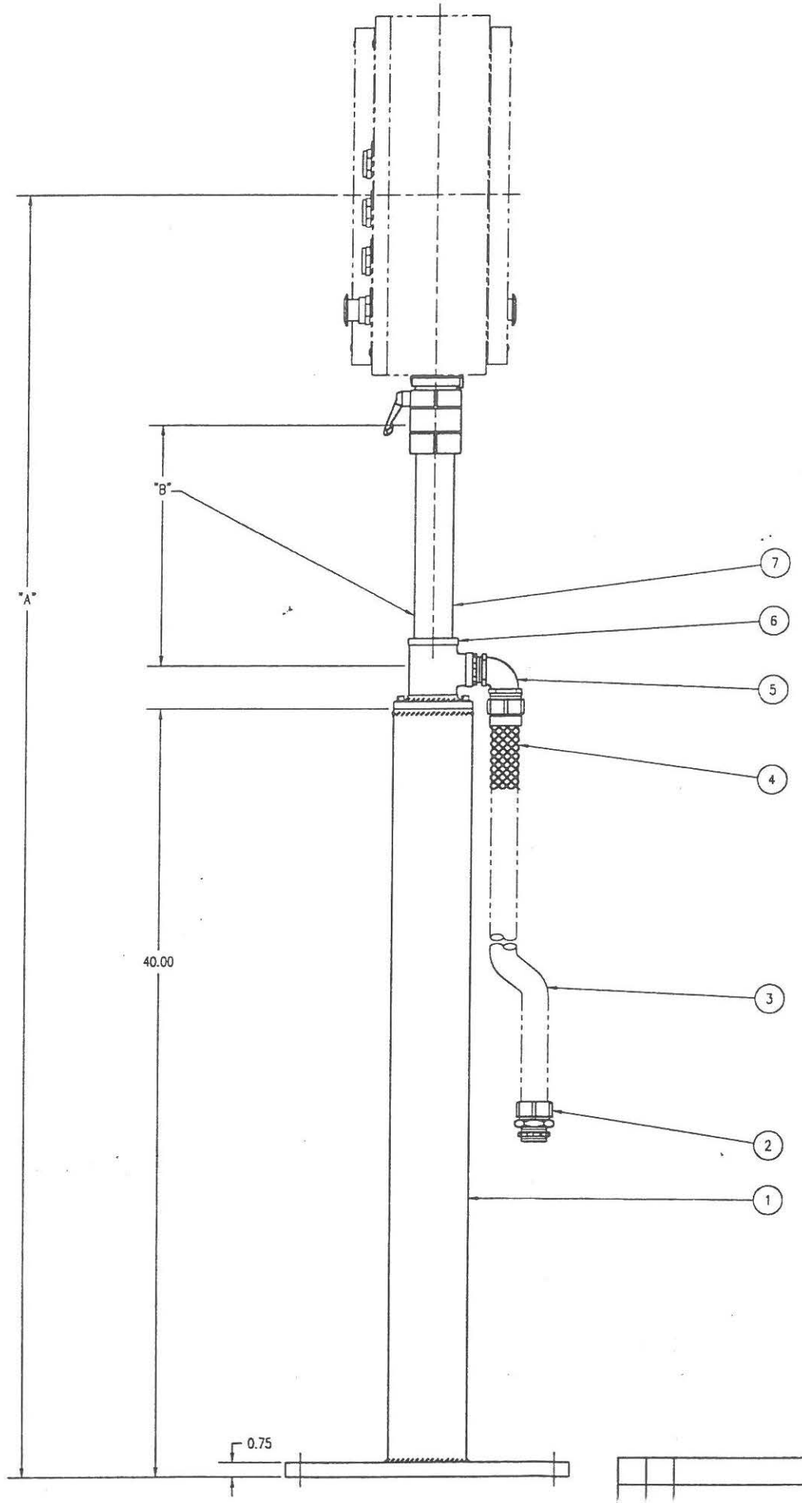
PHONE: 614-471-8239 TELEX: 245-401 FAX: 614-471-0883
® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

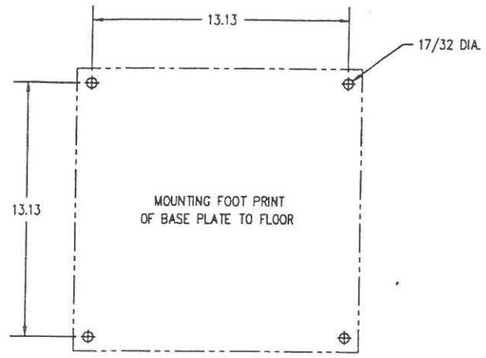
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

ER CKD DATE 11.01.94 SCALE NONE PIC
CK DATE ER 167 SHEET 1 OF 2
DRAWING NO. 140D16809-100 REV E
DRAWING NAME SCHEMATIC, RELAY KIT
FOR CUSTOMER REMOTE I/O MODULES

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT







REFERENCE TABLE			
ASSEMBLY P/N	DIMENSION "A"	DIMENSION "B"	ITEM #7
11850-68	66.5 INCHES	12.5 INCHES	09529-09
11850-69	78.5 INCHES	24.5 INCHES	09529-20

ITEM	DESCRIPTION	QTY	PART NUMBER
11	BOLT- SHCS M6- 1.00 X 12MM	4	09013-12
10	SWIVEL COUPLING 250°	1	16800-02
9	SHCS 1/4-20 X 3/4"	4	02559
8	LOCKWASHER 1/4"	4	02695-4
7	TOP EXTENSION PIPE	1	SEE TABLE
6	TUBE SUPPORT WELDMENT	1	11450-219
5	CONDUIT CONNECTOR 90°	1	02082-4
4	1" CONDUIT KELLEM	1	08395-4
3	CONDUIT 1" EXTRAFLEX	REF.	02083-3
2	CONDUIT CONNECTOR 1" STRAIGHT	1	02103-4
1	BASE SUPPORT WELDMENT	1	11450-218

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

52A

ER	DATE	REMARKS	LET	DR	CK
REVISIONS					

MAT'L: SEE BOM

DR ACY DATE 08.10.98 SCALE 1/4 PIC
CK DATE ER 650 SHEET 1 OF 1

RIMROCK
1921 HAMILTON AVE.
COLUMBUS, OHIO 43219
PHONE: 614-471-5626 FAX: 614-471-1073
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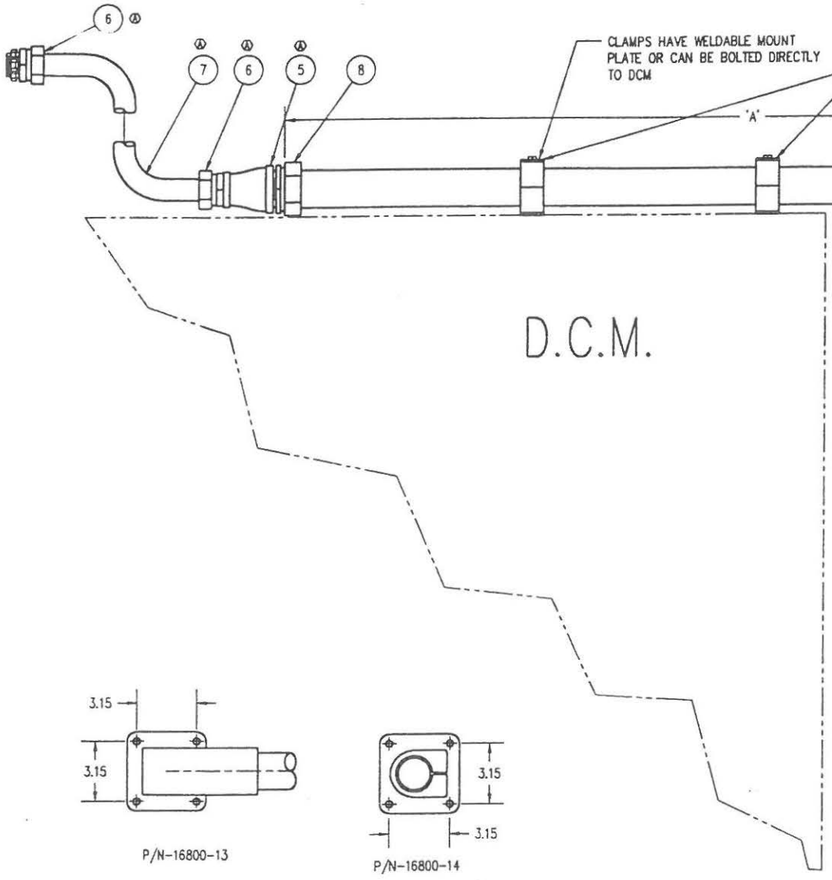
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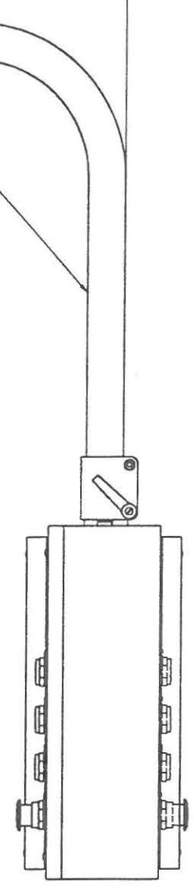
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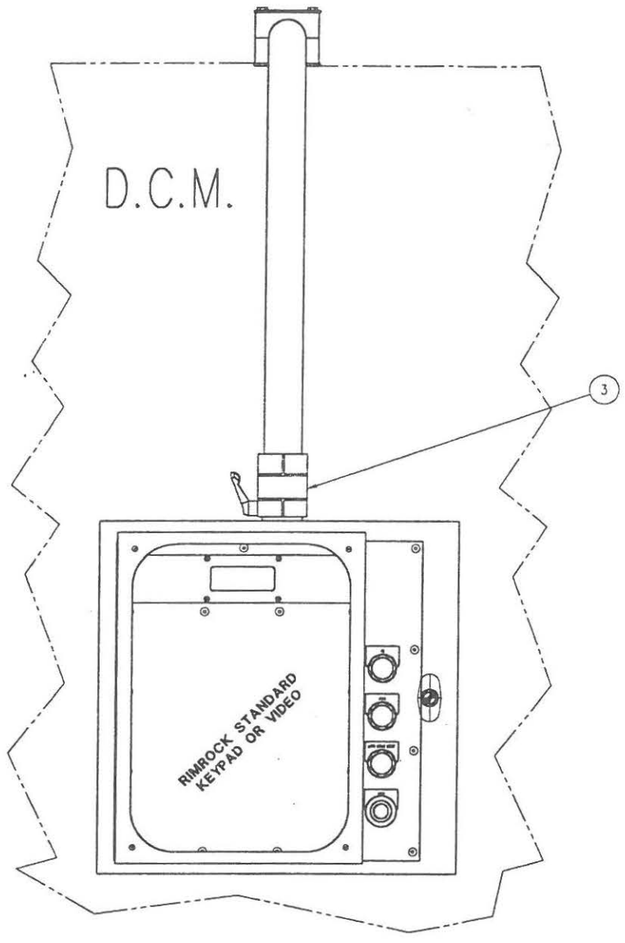
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

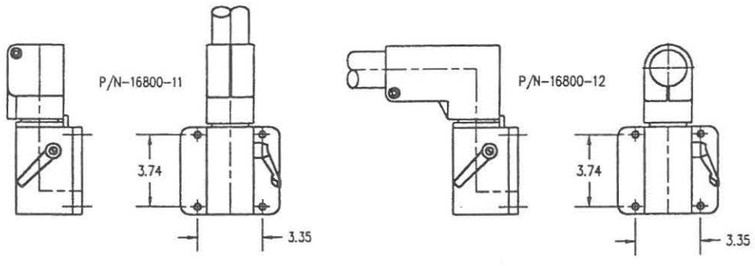
FOR TRIANGLE KEYPAD OR VIDEO ASSEMBLY

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT









OPTIONAL MACHINE MOUNTS
(ORDERED SEPERATELY)

72"	16800-03	11450-104
48"	16800-01	11450-101
'A'	PART NUMBER	ASSY NUMBER

P/N-11450-101

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
505	6-12 98	UPDATED TO NEW OPERATOR ENCLOSURE	B	MAN	
001	1.2 95	UPDATED CONDUIT SIZE TO 1"	A	AR	

REVISIONS

MAT'L: SEE B.O.M.

DR CKD DATE 12.01.94 SCALE 1/4 PIC
CK DATE ER 104 SHEET OF

RIMROCK CORPORATION
1700 RIMROCK ROAD
BILLERICA MASS 01821
COLUMBUS, OHIO 43216
PHONE: 614-471-0838 TELEX: 246-401 FAX: 614-471-0883
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DRAWING NO. 140D11450-101 REV B
DRAWING NAME REMOTE OPERATER MOUNT ASSY
FOR TRIANGLE SYSTEM

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

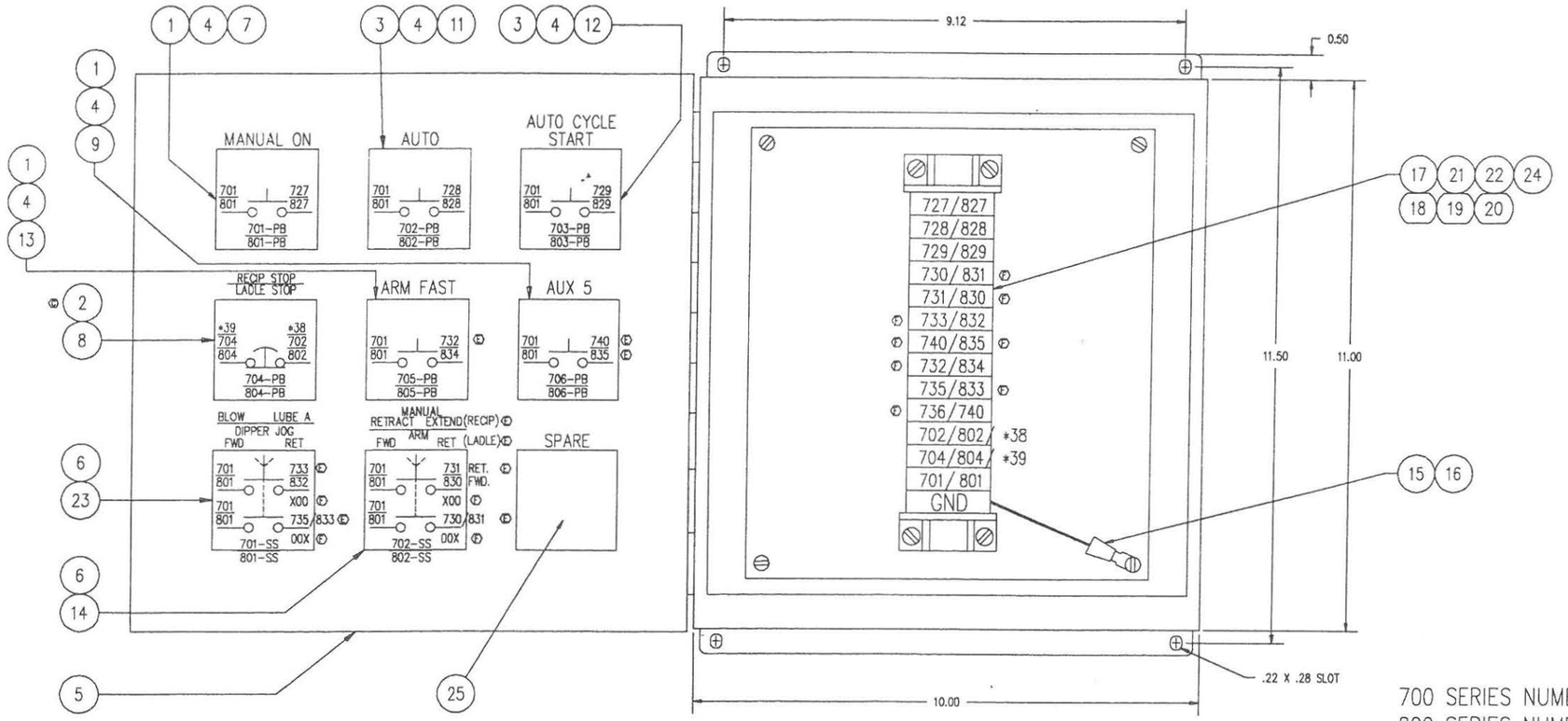
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09:30:49 02 JUL 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 16809-204 - SDR ADD-ON RELAY KIT W/O MOUNTING RAILS

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	16810-16	SBHMS #6-32 x 1.00"	4.000	EA	HW	P B	
2	07622-402	MINI INPUT MODULE 5 VAC	10.000	EA	CM	P	OR
3	07622-210	16-POSITION I/O RACK	1.000	EA	CM	P	OR
5	07622-413	I/O HOLD DOWN 16 POS.	1.000	EA	CM	P	OR
7	08837-05	AD. RIBBON CABLE CLIP	3.000	EA	CM	P	
8	02898-49	WIRE 20AWG BLUE	5.000	FT	CM	P	
10	02898-71	WIRE 20AWG WHITE	6.000	FT	CM	P	
12	11084-06	MOTOR CONT. CABLE W/ I/O	1.000	EA	FM	MP	OR



700 SERIES NUMBER ARE FOR RECIPROCATORS.
800 SERIES NUMBERS ARE FOR LADLES.
NUMBERS MARKED WITH AN * ARE FOR
TRIANGLE CONTROLLED MACHINES.

LADLE PART NUMBER 11367
RECIP PART NUMBER 11367-03

3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
NOTES (UNLESS OTHERWISE SPECIFIED)

REVISIONS										
					182	10.17 94	CORRECTED WIRE NUMBERS AND TAG DESCRIPTIONS	E	DRW
					173	10.11. 94	ADDED RECIP WIRE NUMBERS AND RECIP NAMEPLATES	D	DRW
					167	8.29.	ADDED STOP P.B.		
					059	3.17. 93	ADD PLUG AND RED WIRE CHANGED TAGS	B	DEB
091	2.27 93	CORRECTED WIRE NUMBERS	F	AR	475	01.17 90	CHANGE DRAWING TO REFLECT CORRECT TAGS	A	RM
DR	DATE	REMARKS	LET	DR	CK	DR	DATE	REMARKS	LET	DR CK

MAT'L: SEE B.O.M'S

RIMROCK®
RIMROCK CORPORATION
1700 RIMROCK ROAD
P.O. BOX 19857
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DR WM	DATE 12.14.90	SCALE 3/4	PIC
CK	DATE	EN 454	SHEET OF
DRAWING NO. 306D11367			REV F
DRAWING NAME REMOTE CONTROL BOX ASSEMBLY			
FOR 305/310 REMOTE RELAY KIT			

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

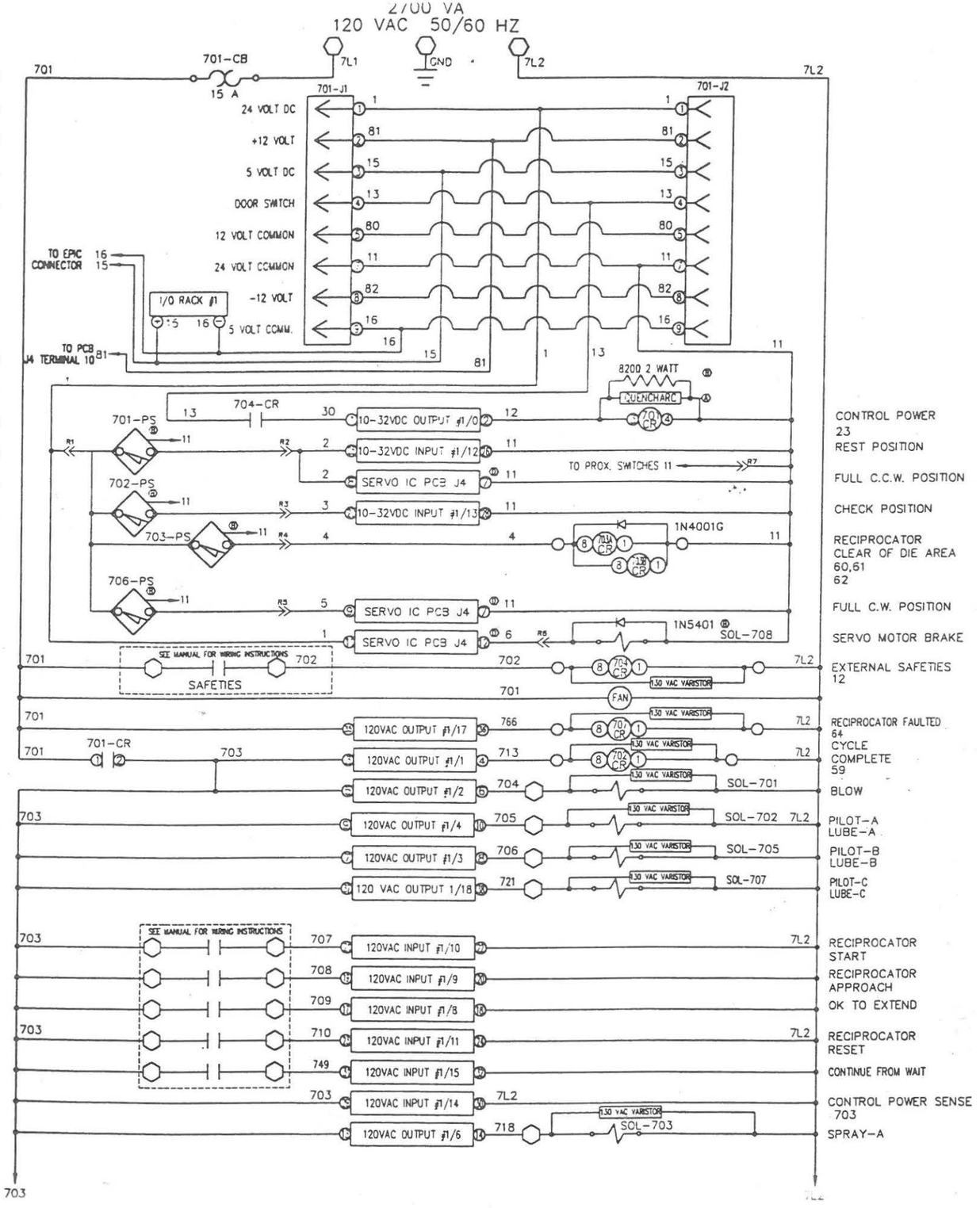
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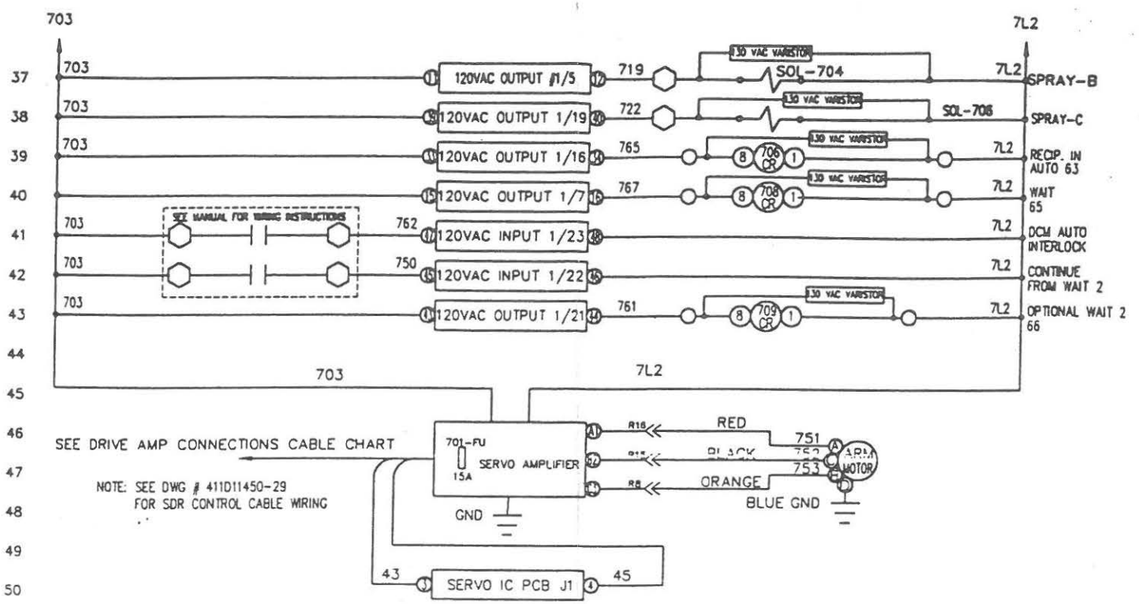
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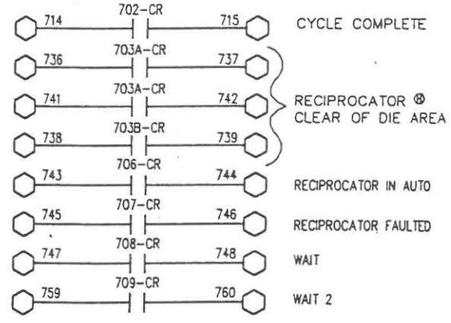
Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11367-03 - REMOTE CONTROL BOX RECIP

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MP	PHNP	BT	Rv Lv
1	01293-18	PUSHBUTTON YELLOW	3.000	EA	CM	P			
2	01726-16	SWITCH RED MUSH MAINTAIN	1.000	EA	CM	P			OR
3	01293-10	PUSHBUTTON GREEN 800T A1	2.000	EA	CM	P			
4	01296	CONTACT BLOCK 800T-XA	5.000	EA	CM	P			
5	11367-01	PANEL AND BOX DRILLING	1.000	EA	FM	M			
6	02413-12	SWITCH SELECTOR 800T-J91A	2.000	EA	CM	P			
7	05835-153	NAMEPLATE MANUAL ON	1.000	EA	CM	P			D
8	05835-159	NAMEPLATE RECIP STOP	1.000	EA	CM	P			D
9	05835-124	NAMEPLATE AUX 5	1.000	EA	FM	P			
11	05490-15	NAMEPLATE AUTO	1.000	EA	FM	P			C
12	05490-6	NAMEPLATE AUTO CYCLE STAR	1.000	EA	FM	P			D
13	05835-137	NAMEPLATE FAST	1.000	EA	FM	P			C
14	05490-28	NAMEPLATE RETRACT MAN EXT	1.000	EA	FM	P			B
15	02898-22	WIRE 12THHN GREEN	0.500	FT	CM	P			
16	01338	WIRE FORK LUG #18-22	1.000	EA	CM	P			
17	02364-2	TERMINAL MOUNTING CHANNEL	8.000	IN	CM	P			
18	02641-3	RHMS 8-32 X 1/2	2.000	EA	HW	P		B	
19	02677	LOCKWASHER LIGHT #8	2.000	EA	HW	P		B	
20	02879-17	FLATWASHER #8	2.000	EA	HW	P		B	
21	02364-10	TERMINAL BLOCK F1 25AMP	14.000	EA	CM	P			
22	02364-36	TERMINAL ANCHOR C,F, & H	2.000	EA	CM	P			
23	05490-32	NAMEPLATE SPRAY BLOW END	1.000	EA	CM	P			
24	02898-1	WIRE 14THHN RED	25.000	FT	CM	P			
25	01981-01	HOLE SEAL	1.000	EA	CM	P			







NOTE: IN SOME CASES IT MIGHT BE NECESSARY TO PLACE A 130 VAC VARISTOR ACROSS THE LOAD BEING ENERGIZED BY 703-CR & 702-CR.

NOTE: 'R' NUMBERS REPRESENT EPIC CONNECTORS ON SIDE OF ENCLOSURE WHERE CABLE IS CONNECTED

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
648	3.11 98	CORRECTED TEXT	I	SMB	
374	5.7 98	CORRECTED TEXT	H	SMB	
385	11.6 97	UPDATED DWG TO CURRENT CONFIGURATION	G	SMB	
257	06.06 97	ADDED LINES: INPUT 41, 42; OUTPUT 43 WAIT 2 LINE 66	F	JAS	
428	11.26	CORRECTED WIRE NUMBERS ON SHEET 3			
178	6.6 96	MOVED SHEET 4 TO DWG # 11600-01 SHEET 4	D	AR	
178	6.6 96	REPLACED I/O RACK #2 WITH THE SERVO IC PCB	D	AR	
013	1.18 96	ADDED LINES 22, 33, 39, & 40 UPDATED TO SCHEMATIC	C	HDM	
212	7.19 95	ADDED DIODE, AND RESISTOR, REMOVED CYCLE COUNTER, CHANGED TO PROX SYMBOL	B	AR	

REVISIONS

DR R.M DATE 9.15.94 SCALE NONE WT
CK DATE LA 041 SHEET 1 OF 3

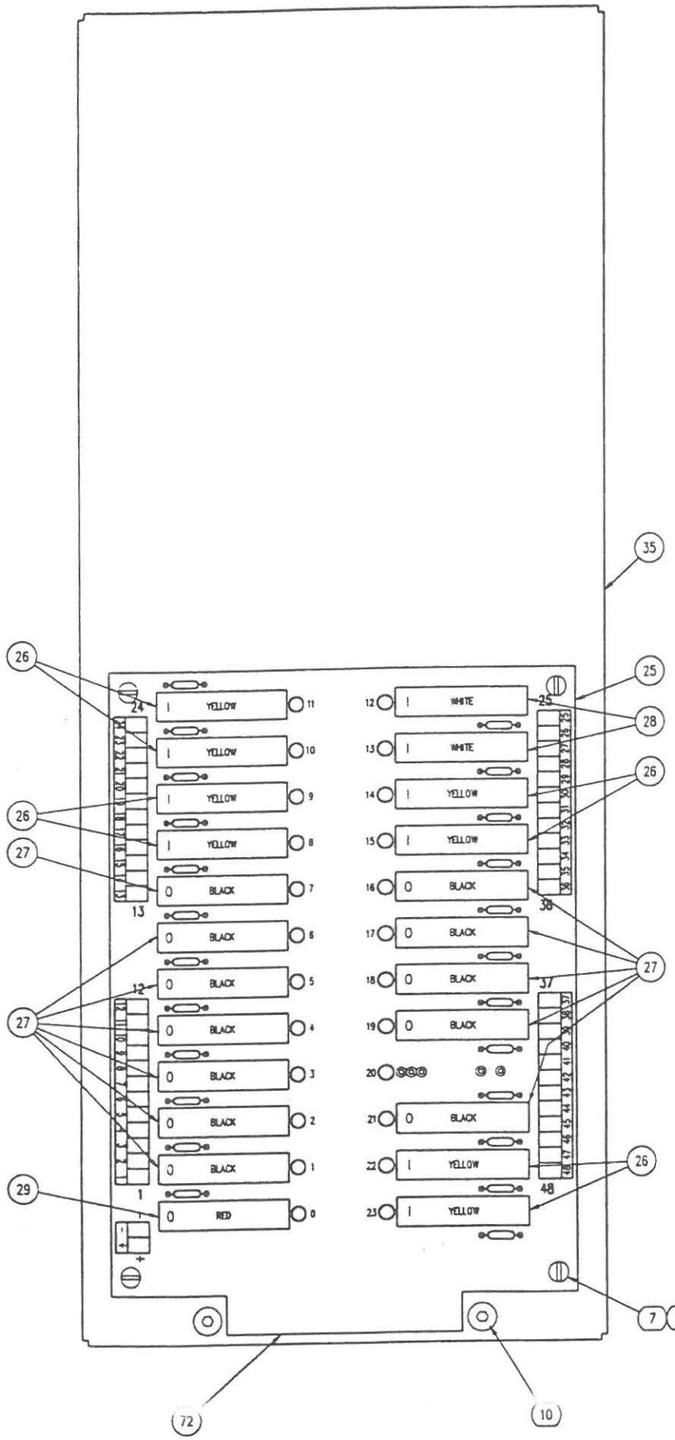
RIMROCK® RIMROCK CORPORATION 1700 RIMROCK ROAD COLUMBUS, OHIO 43229
PHONE: 614-471-5838 FAX: 614-471-1073
®A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

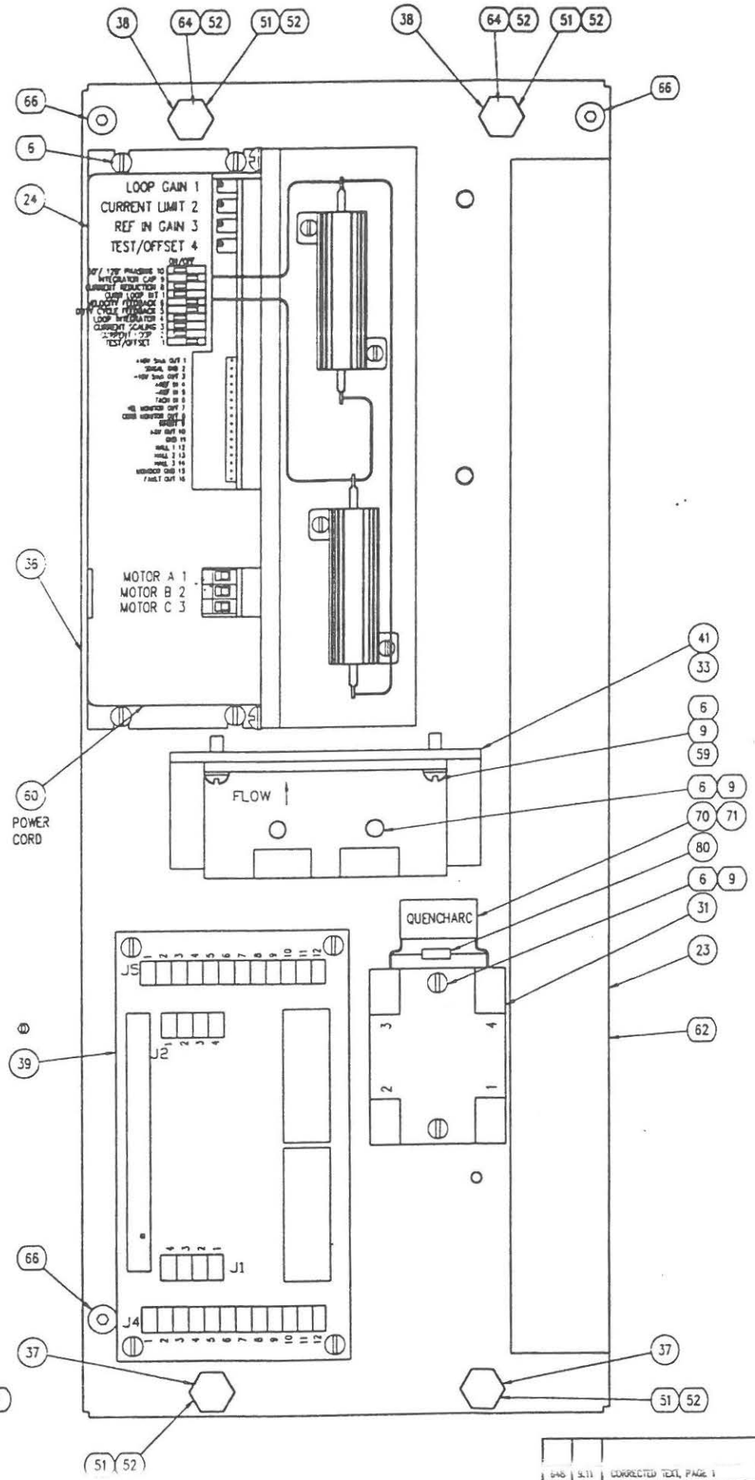
DRAWING NO. 411D11450-17 REV I
DRAWING NAME RECIPROCATOR MODULE - SCHEMATIC
STANDARD 410 SDR
FOR TRIANGLE CONTROLS

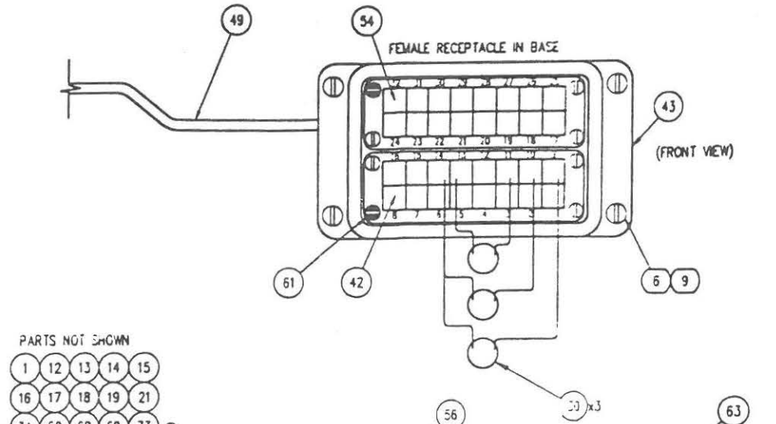
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2

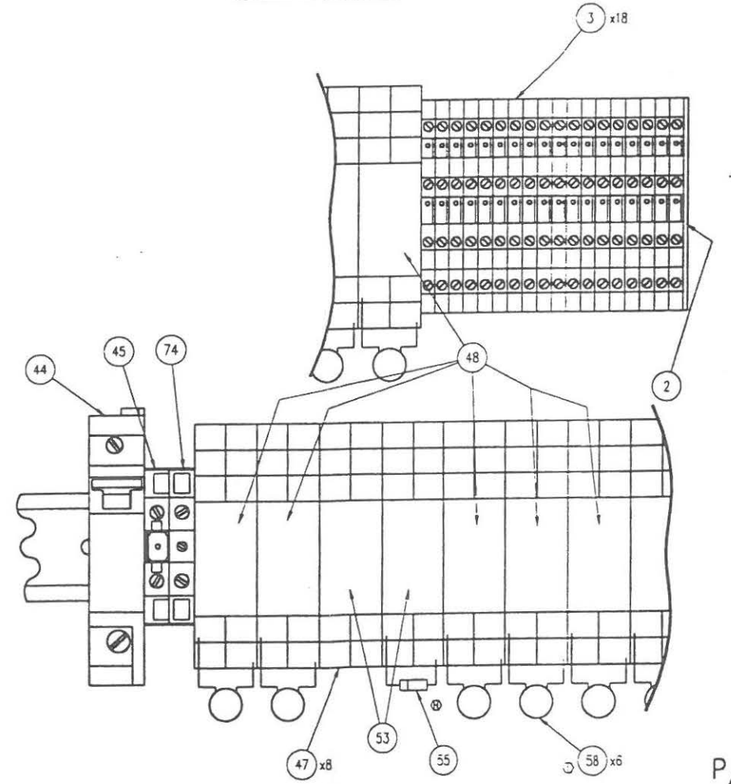
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P/N-11450-17









10

P/N-11450-17

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REVISIONS	LET	DR	CK
348	5.11 98	CORRECTED TEXT, PAGE 1 ADDED BALLOON #5 FOR VARISTORS	I	SMB	
374	5.7 98	CORRECTED TYPOGRAPHICAL ERROR ALTERED DIODE & VARISTOR POSITIONS	H	SMB	
385	11.6 97	UPDATED DWG TO CURRENT CONFIGURATION	G	SMB	
257	06.09 97	ADDED OPTIONAL RELAYS	F	JAS	
428	11.26 96	CORRECTED WIRE NUMBERS ON SHEET 3	E	AR	
178	6.6 96	MOVED SHEET 4 TO DWG # 11600-01 SHEET 4.	D	AR	
178	6.6 96	REPLACED I/O RACK #2 WITH SERVO IC PCB.	D	AR	
013	1.18 96	SEE SHEETS 1 & 3	C	HDA	
212	7.19 95	ADDED RESISTOR, REMOVED CYCLE COUNTER AND ADDED 2 QUENCHARCS.	B	AR	

MATL: SEE B.O.M.

DR R.J.M. DATE 8.18.94 SCALE NONE

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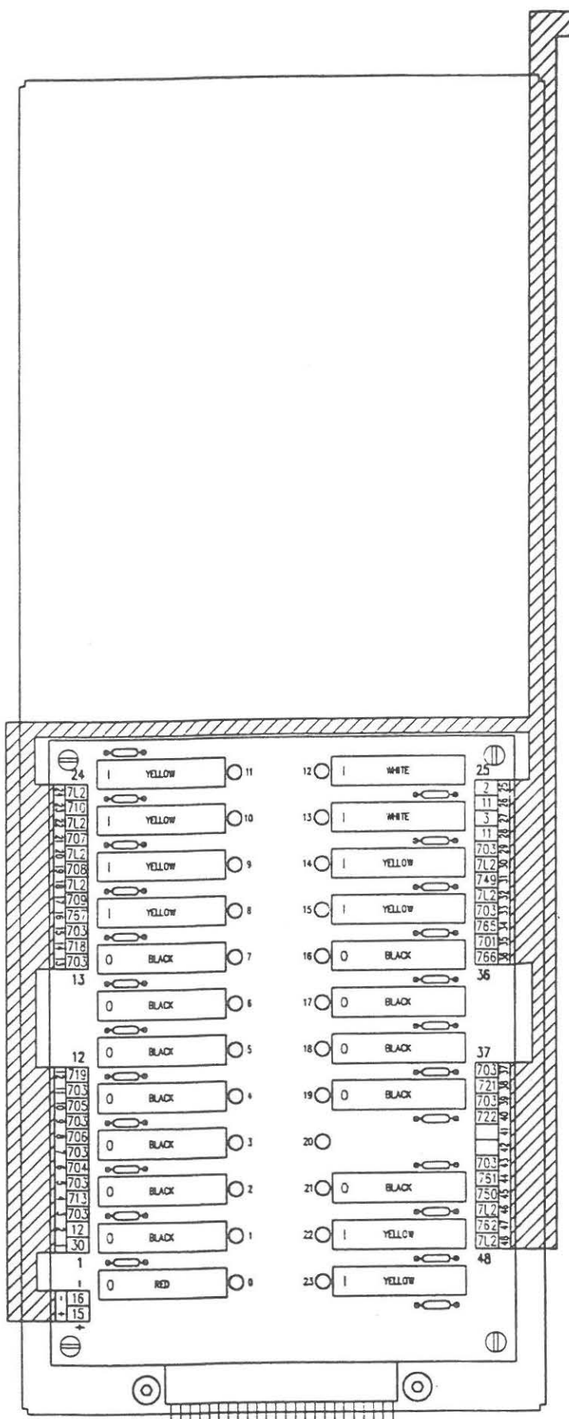
TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
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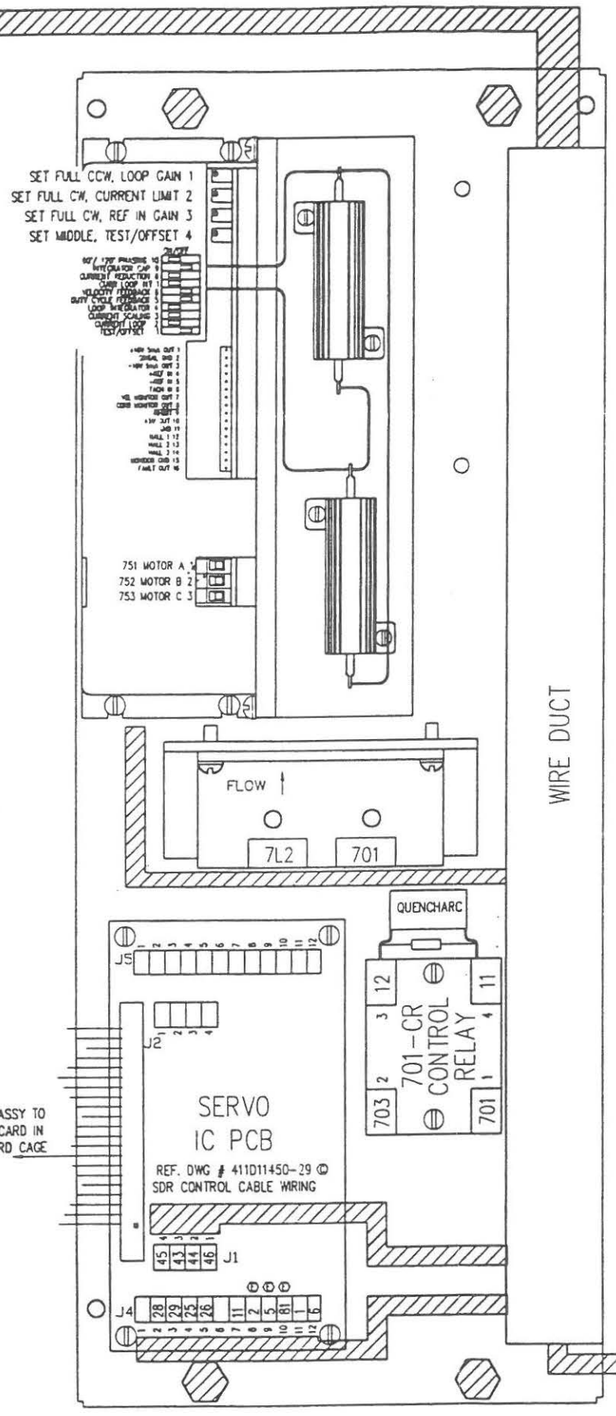
DRAWING NO. 411 D11450-17 REV 1

DRAWING NAME RECIPROCATOR MODULE - B.O.M.
STANDARD 410 SDR

FOR TRIANGLE CONTROLS

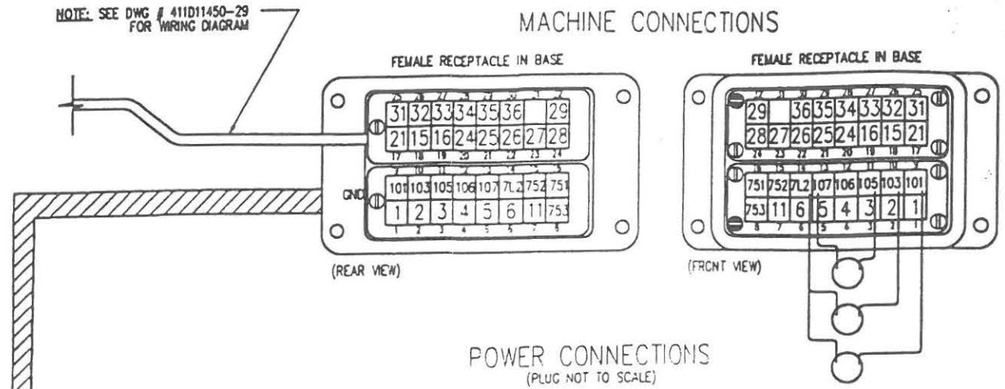
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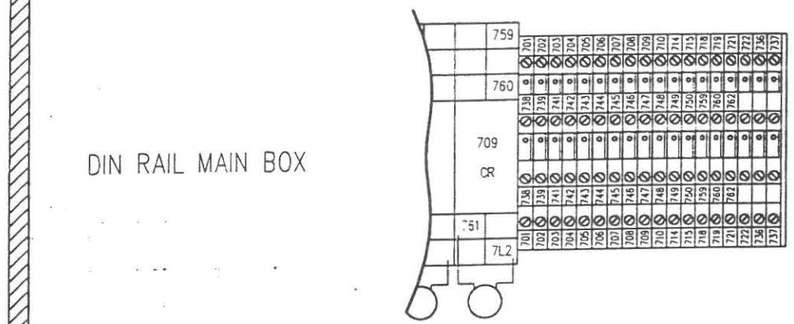


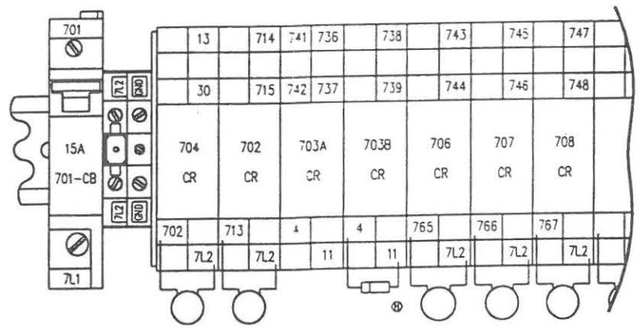


CABLE ASSY TO SERVO CARD IN THE CARD CAGE

SEE TABLE FOR CABLE CONNECTIONS DWG# 140D11450-40, SHEET# 1







P/N-11450-17

TYPICAL WIRE SIZE AND COLOR
12 AWG BLACK 701 ON 701-CB TO 701-CR
14 AWG RED 751, 752, 753 TO SERVO CONNECTOR
14 AWG GREEN GND
20 AWG WHITE 7L2
20 AWG YELLOW: 714,715,736-739,741-748
20 AWG RED ALL REMAINING 120 VOLT AC WIRES
20 AWG BLUE ALL 5-24 VOLTAGE WIRES THAT DO NOT USE CABLES

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

REVISIONS

ER	DATE	REMARKS	LET	DR	CK
	98	SEE PAGE 1 & 2 FOR CHANGES	I	SME	
374	5.7 98	CORRECTED TYPOGRAPHICAL ERROR, ALTERED DIODE & VARISTOR POSITIONS	H	SME	
385	11.6 97	UPDATED DWG TO CURRENT CONFIGURATION	G	SME	
257	06.09 97	ADDED OPTIONAL RELAYS CR 706 – CR 709	F	JAS	
428	11.26 96	CORRECTED WIRE NUMBERS ON THE IC PCB.	E	AR	
178	8.6 96	REVISED SHEET 4 TO DWG # 11600-01 SHEET 4.	D	AR	
178	6.6 96	REPLACED I/O RACK #2 WITH SERVO IC PCB	D	AR	
013	1.18. 96	UPDATED WIRE NUMBERS	C	HDA	
212	7.19 95	ADDED RESISTOR, REMOVED CYCLE COUNTER AND ADDED 2 QUENCHARCS.	B	AR	

REVISIONS

MAT'L: SEE B.O.M.

DR R.M. DATE 8.18.94 SCALE NONE PIC

RIMROCK®

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1700 RIMROCK ROAD
DOLLOUSUS, OHIO 43219
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DRAWING NO. 411 D11450-17 REV I

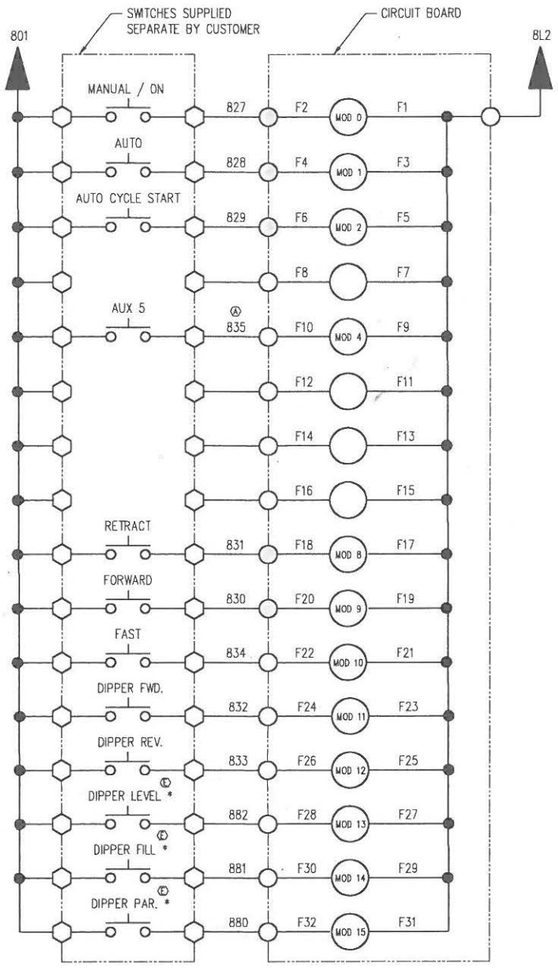
DRAWING NAME RECIPROCATOR MODULE – WIRING

STANDARD 410 SDR

FOR TRIANGLE CONTROLS

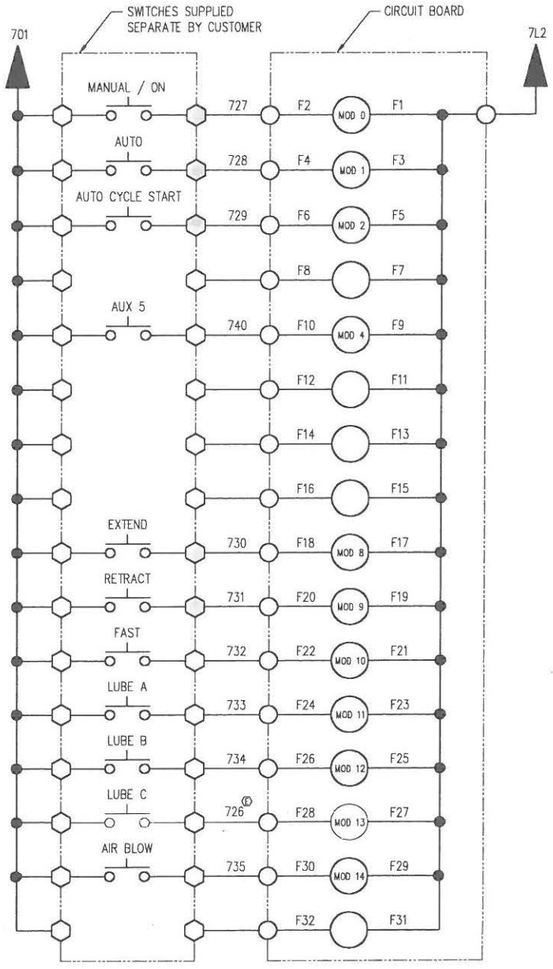
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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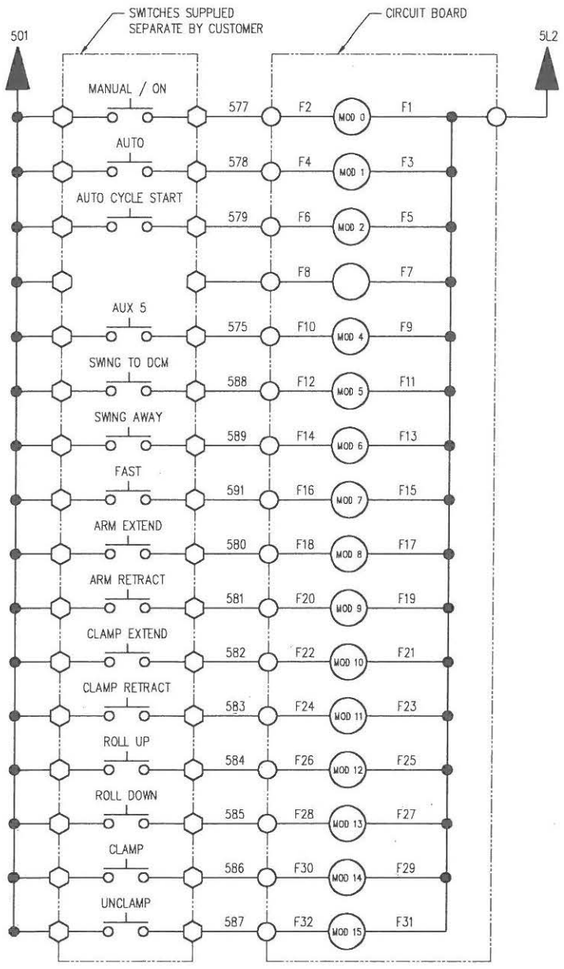


305/405 SCHEMATIC DIAGRAM

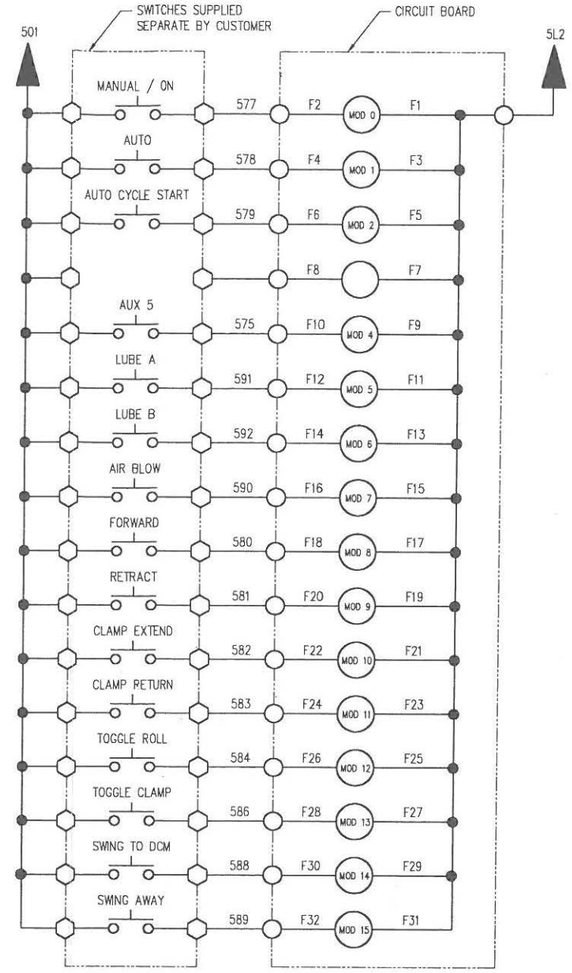
* DENOTES 405 ONLY



310/410 SCHEMATIC DIAGRAM



320 SCHEMATIC DIAGRAM



195 SCHEMATIC DIAGRAM

THESE KITS INCLUDE MOUNTING RAILS ®

305 LADLE KIT P/N-16809-100
310 RECIPROCATOR KIT P/N-16809-101
320 EXTRACTOR KIT P/N-16809-102
195 EXTRACTOR KIT P/N-16809-103
Ⓓ 410 RECIPROCATOR KIT P/N-16809-104
Ⓓ 405 LADLE KIT P/N-16809-105

305 LADLE LG. BOX KIT P/N-16809-110
410 RECIPROCATOR LG. BOX KIT P/N-16809-111
320 EXTRACTOR LG. BOX KIT P/N-16809-112
195 EXTRACTOR LG. BOX KIT P/N-16809-113
Ⓓ 405 LADLE LG. BOX KIT P/N-16809-115

305 LADLE ADD-ON KIT P/N-16809-200
310 RECIPROCATOR ADD-ON KIT P/N-16809-201
320 EXTRACTOR ADD-ON KIT P/N-16809-202
195 EXTRACTOR ADD-ON KIT P/N-16809-203
Ⓓ 410 RECIPROCATOR ADD-ON KIT P/N-16809-204
Ⓓ 405 LADLE ADD-ON KIT P/N-16809-205

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
205	05.14 97	ADD 3 P.B. FOR 405 CORRECT WIRE NUMBER ON 310/410	E	JAS	
190	6.14 96	ADDED P/N'S FOR 410 AND 405	D	ACV	
233	12.11 95	CHANGED LABLE TO 310/410 FROM 310	C	AR	
223	8.22 95	ADDED PART NUMBERS FOR "LARGE BOX" INSTALLATIONS	B	AR	
091	2.27 95	CHANGED WIRE NUMBER FROM 837 TO 835	A	AR	

REVISIONS

MAT'L: SEE B.O.M.

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2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR CKD | DATE 11.01.94 | SCALE NONE | PIC
CK | DATE | ER 167 | SHEET 1 OF 2

DRAWING NO. 140D16809-100 | REV E

DRAWING NAME SCHEMATIC, RELAY KIT

FOR CUSTOMER REMOTE I/O MODULES

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15:53:52 15 JUL 1998 Acct HDA Port 28

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11850-17 - RECIPROCATOR 410 SDR

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP
1	01138-16	WIRE TAB LUG #18-22	5.000	EA	CM	P
2	08729-107	DOUBLE STACKED DIN RAIL TERM END PLATE	1.000	EA	CM	P
3	08729-104	DOUBLE STACKED DIN RAIL TERMINALS	18.000	EA	CM	P
6	02632	RHMS 6-32 X 1/2	15.000	EA	HW	P B
7	02634-1	RHMS 6-32 X 1 1/4	8.000	EA	HW	P B
9	02676	LOCKWASHER LIGHT #6	20.000	EA	HW	P B
10	02702-8	BHCS 10-32 X 1/2	4.000	EA	HW	P B
12	02898-1	WIRE 14AWG RED	40.000	FT	CM	P
13	02898-71	WIRE 20AWG WHITE	30.000	FT	CM	P
14	02898-20	WIRE 12AWG BLACK	6.000	FT	CM	P
15	02898-21	WIRE 12AWG WHITE	6.000	FT	CM	P
16	02898-5	WIRE 14AWG GREEN	10.000	FT	CM	P
17	02898-73	WIRE 20AWG YELLOW	100.000	FT	CM	P
18	02898-49	WIRE 20AWG BLUE	140.000	FT	CM	P
19	03010	WIRE TIE - SMALL	50.000	EA	HW	P
21	04727-2	WIRE LUG RING #16-14, #8	6.000	EA	CM	P
23	05489-29	WIRE DUCT 1" X 3" W/COVER	1.500	FT	CM	P
24	06664-51	SERVO AMP ASSY	1.000	EA	SA	MP
25	07622-401	24 POS. MINI I/O RACK	1.000	EA	CM	P
26	07622-402	MINI INPUT MODULE 5 VAC	8.000	EA	CM	P
27	07622-403	MINI OUTPUT MODULE 5 VAC	7.000	EA	CM	P
28	07622-404	MINI INPUT MODULE 5 VDC	2.000	EA	CM	P
29	07622-405	MINI OUTPUT MODULE 5 VDC	6.000	EA	CM	P
30	08295-34	VARISTOR 390 VOLT	3.000	EA	CM	P
31	07622-30	RELAY SS 25 AMP	1.000	EA	CM	P
33	08969	MOUNT FAN	1.000	EA	FM	P
34	08295-5	VARISTOR 130 VOLT	1.000	EA	CM	P
35	11429-01	SUB PANEL UPPER	1.000	EA	FM	P
36	11429-02	SUB PANEL LOWER	1.000	EA	FM	P
37	11429-07	PANEL STANDOFF LONG	2.000	EA	CM	P
38	11429-06	PANEL STANDOFF SHORT	2.000	EA	CM	P
39	11450-256	PROLOG 1-AXIS SERVO CONT. ASSY	1.000	EA	SA	MP
41	07620-101	FAN	1.000	EA	CM	P
42	11360-53	QUICK DISC RECIP 1-16	1.000	EA	CM	P
43	11360-56	QUICK DISC BASE 32 PIN	1.000	EA	CM	P
44	03017-18	A-B CIRCUIT BREAKER 1492 H150 15AMP 1P	1.000	EA	CM	P
45	08729-105	DIN RAIL MOUNTED TERMINAL	1.000	EA	CM	P
47	10894-20	RELAY BASE AB DPDT DIN	8.000	EA	CM	P
48	09979-30	RELAY AB DPDT 24VDC COIL	7.000	EA	CM	P
49	11450-29	CONTROL CABLE ASSY 410	1.000	EA	SA	MP
50	02898-72	WIRE 20AWG RED	120.000	FT	CM	P
51	02553	SHCS 10-32 X 3/4	4.000	EA	HW	P B
52	02678	LOCKWASHER LIGHT #10	6.000	EA	HW	P B
53	09979-31	RELAY AB DPDT 120VAC COIL	1.000	EA	CM	P
54	11360-54	QUICK DISC RECIP 17-32	1.000	EA	CM	P
56	11042-602	CONNECTOR ENCODER-FEMALE	1.000	EA	CM	P
57	11042-603	TERMINAL ENCODER MALE	8.000	EA	CM	P
59	02651-3	SEA NUT 3-32	1.000	EA	HW	P B
60	16806-01	3-COND. POWER CORD	1.000	EA	CM	P
61	11360-16	DISCONNECT CODING PIN	2.000	EA	CM	P
62	03062-3	SELF TAPPING HH	4.000	EA	HW	P B
63	11042-601	CONNECTOR ENCODER-PLUG	1.000	EA	CM	P

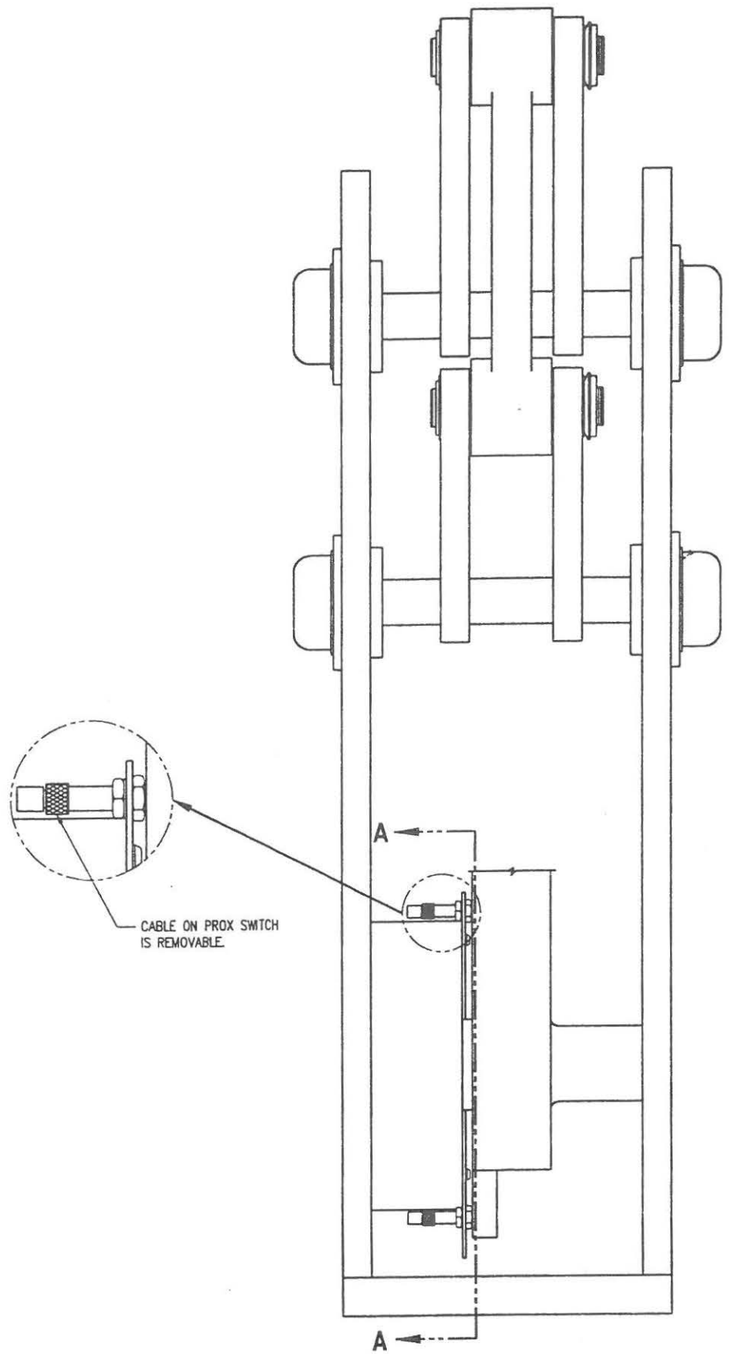
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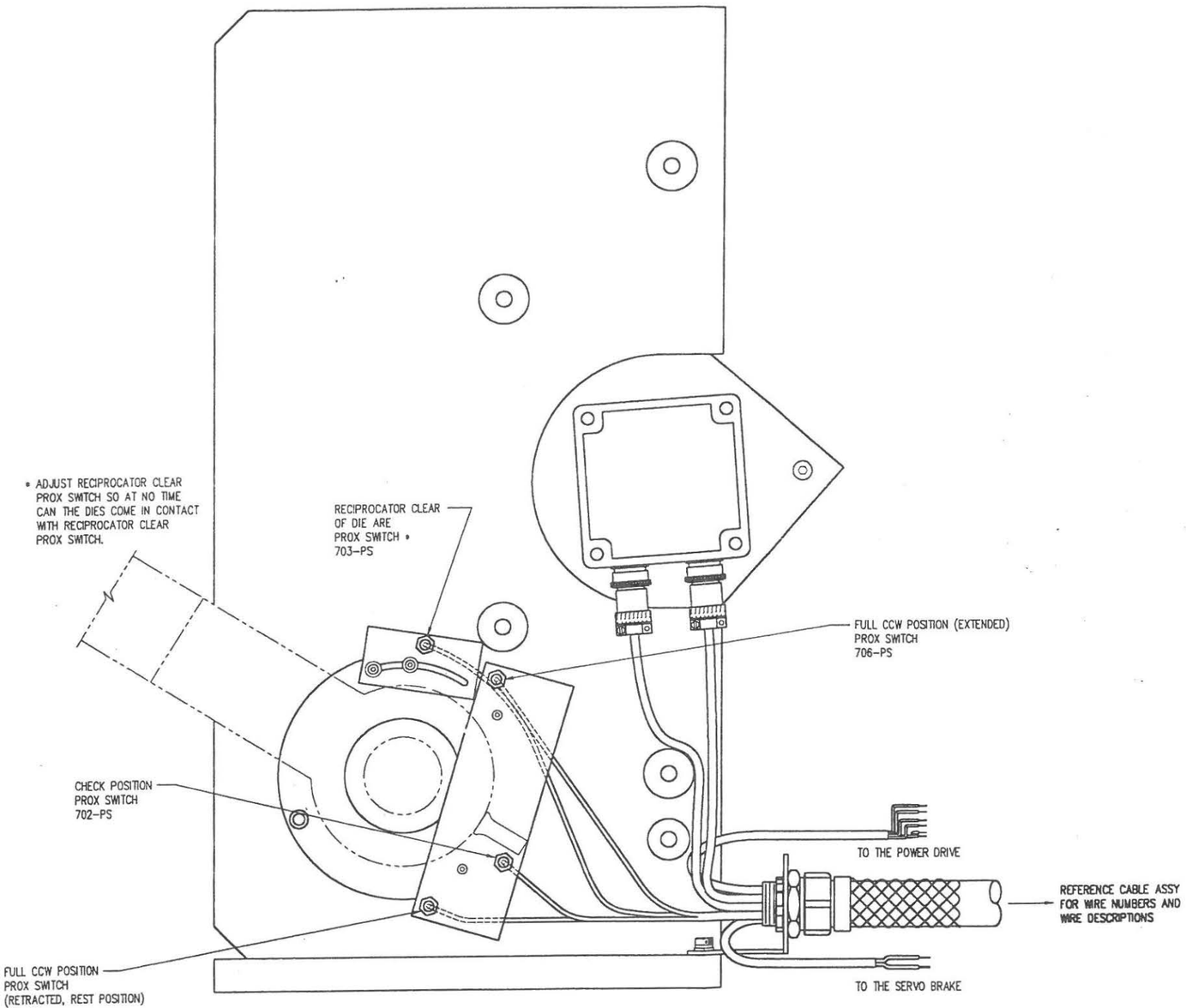
15:53:52 15 JUL 1998 Acct HDA Port 28

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11850-17 - RECIPROCATOR 410 SDR

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP
64	02626	RHMS 10-32 X 3/8	2.000	EA	HW	P B
66	02702-12	BHCS 10-32 X 3/4	4.000	EA	HW	P B
67	11042-604	TERMINAL ENCODER FEMALE	8.000	EA	CM	P
68	04727-6	RING TERMINAL 14-16GA #6	6.000	EA	CM	P
69	04727-7	RING TERMINAL 14-16GA #10	2.000	EA	CM	P
70	08295-40	QUENCHARC	1.000	EA	CM	P
71	01338	WIRE FORK LUG #18-22	2.000	EA	CM	P
72	11083-04	305 I/O RACK RIBBON CABLE	1.000	EA	SA	MP
73	08837-04	TIE ANCHOR MOUNTS	2.000	EA	CM	P
74	08729-106	DIN RAIL MOUNTED GROUND TERMINAL	1.000	EA	CM	P
80	08295-59	RESISTOR 820 OHM 2W	1.000	EA	CM	P
81	09759-109	DIODE 1N5404	1.000	EA	CM	P
85	09759-107	DIODE 1N4001G	6.000	EA	CM	P





SECTION A-A

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
343	8.13 96	SEE PAGE 2 FOR CHANGES	F	SME	
039	1.20 96	SEE PAGE 1 OF 4	E	MJ	
178	6.6 96	WAS DWG # 11450-17 SHEET #4	D	AR	

REVISIONS

MAT'L: SEE B.O.M.

DR JBA DATE 1.13.95 SCALE 1/2 PIC

CK DATE ER DATE

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DRAWING NO. 410D11600-01 REV F

DRAWING NAME MAIN ASSEMBLY 410 - BODY

ELECTRICAL WIRING

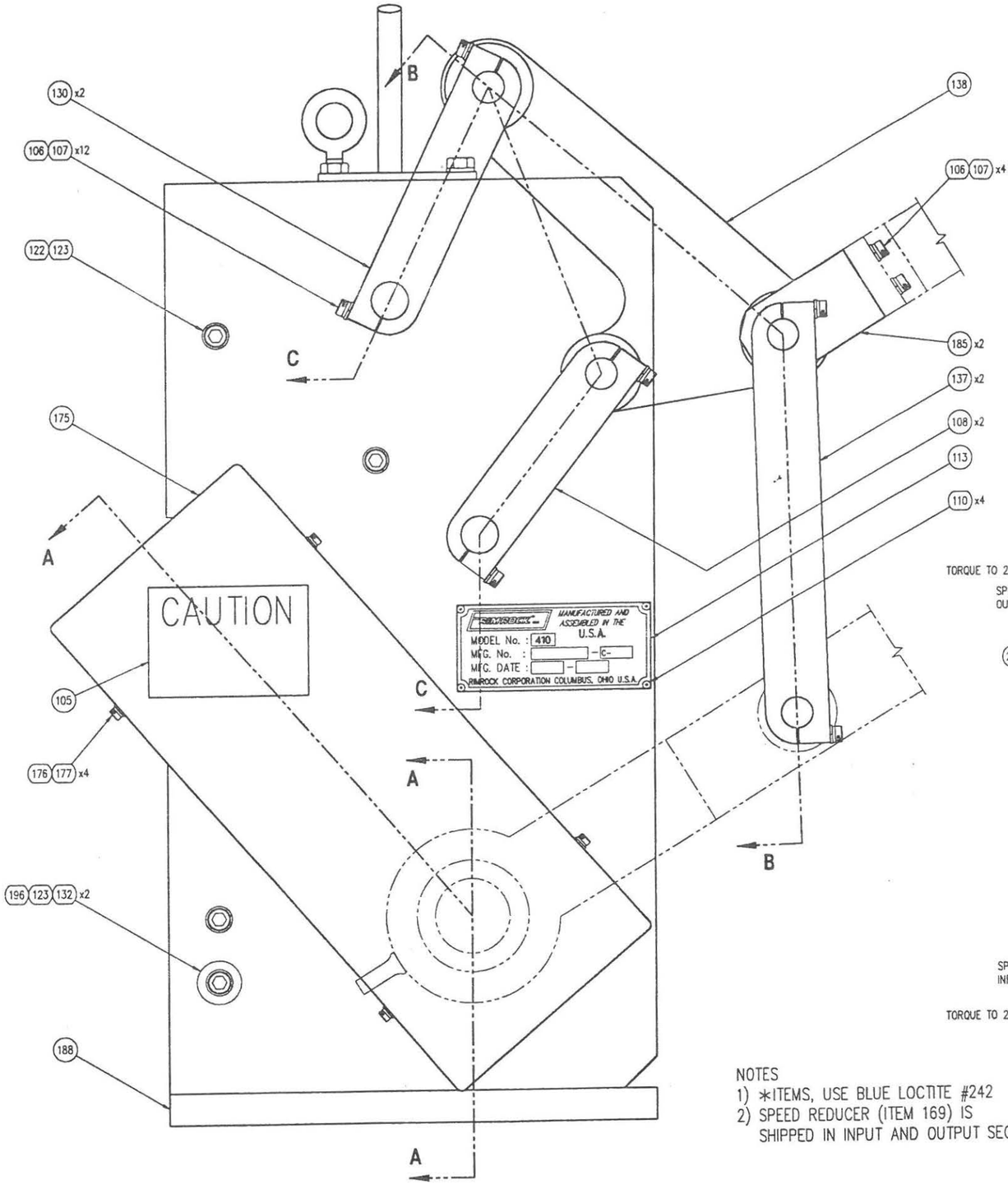
FOR 410 SDR

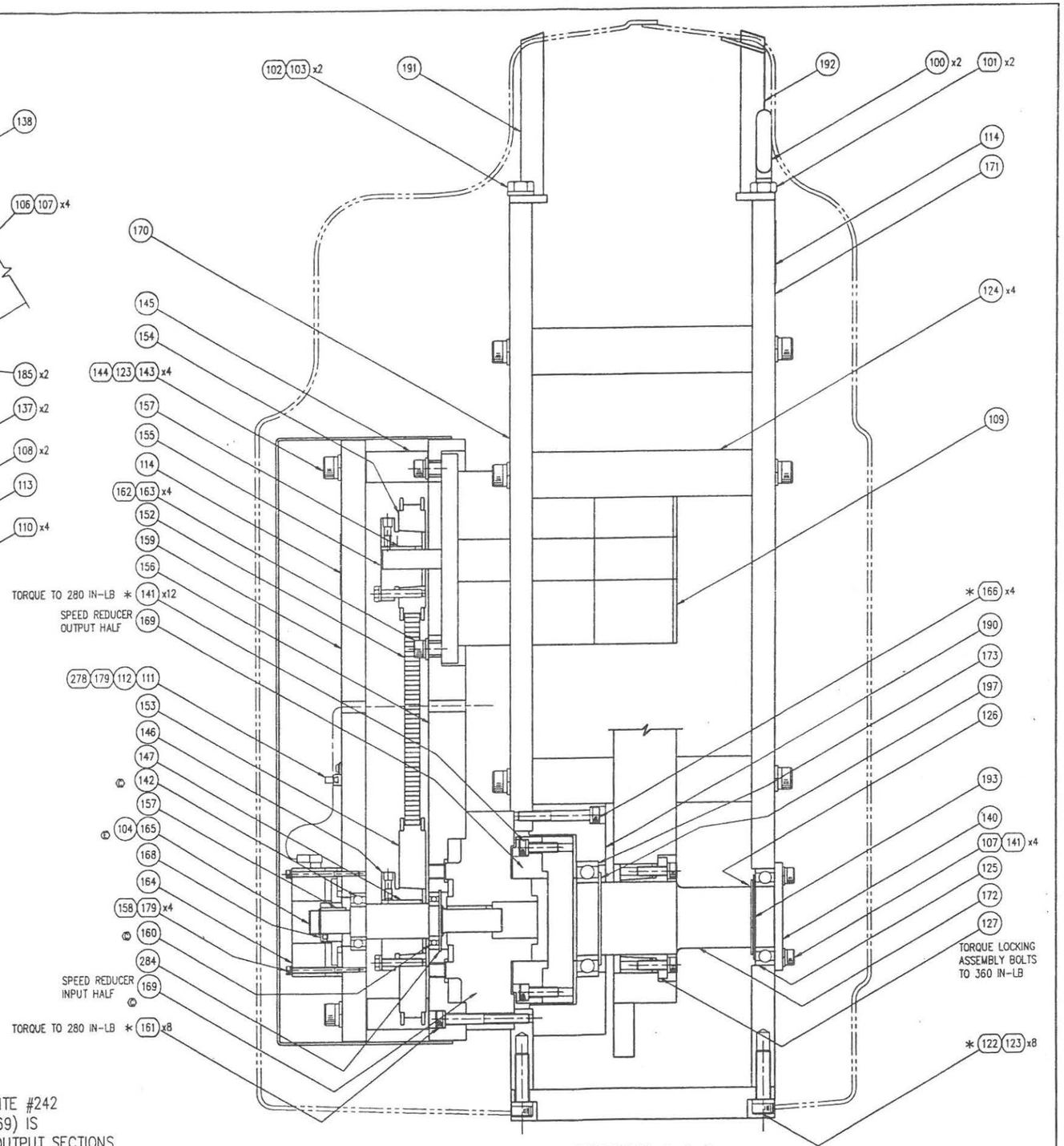
TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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7
Mechanical

SECTION 7





SECTION A-A-A

NOTES
1) *ITEMS, USE BLUE LOCTITE #242
2) SPEED REDUCER (ITEM 169) IS SHIPPED IN INPUT AND OUTPUT SECTIONS

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

REVISIONS										
DR	DATE	REMARKS	LET	DR	CK	DR	DATE	REMARKS	LET	DR	CK
						039	1.20 98	ADDED SNAP RING, BALOON #104	E	MJ	
							98		D	AR	
						001	1.3 96	CHANGE BELT ASSY, BTM PLATE, REMOVE STEEL RING, REPLACE DRIVE SHAFT	C	MDJ	
						133	5.1 95	SEE SHEET 2 OF 3	B	JBA	
343	8.13 98	SEE PAGE 2 FOR CHANGES	F	SMB		080	3.6 95	SEE SHEET 3 FO 3	A	RM	

MATL: SEE B.O.M.

DR MF | DATE 9.09.94 | SCALE 1/2 | PIC

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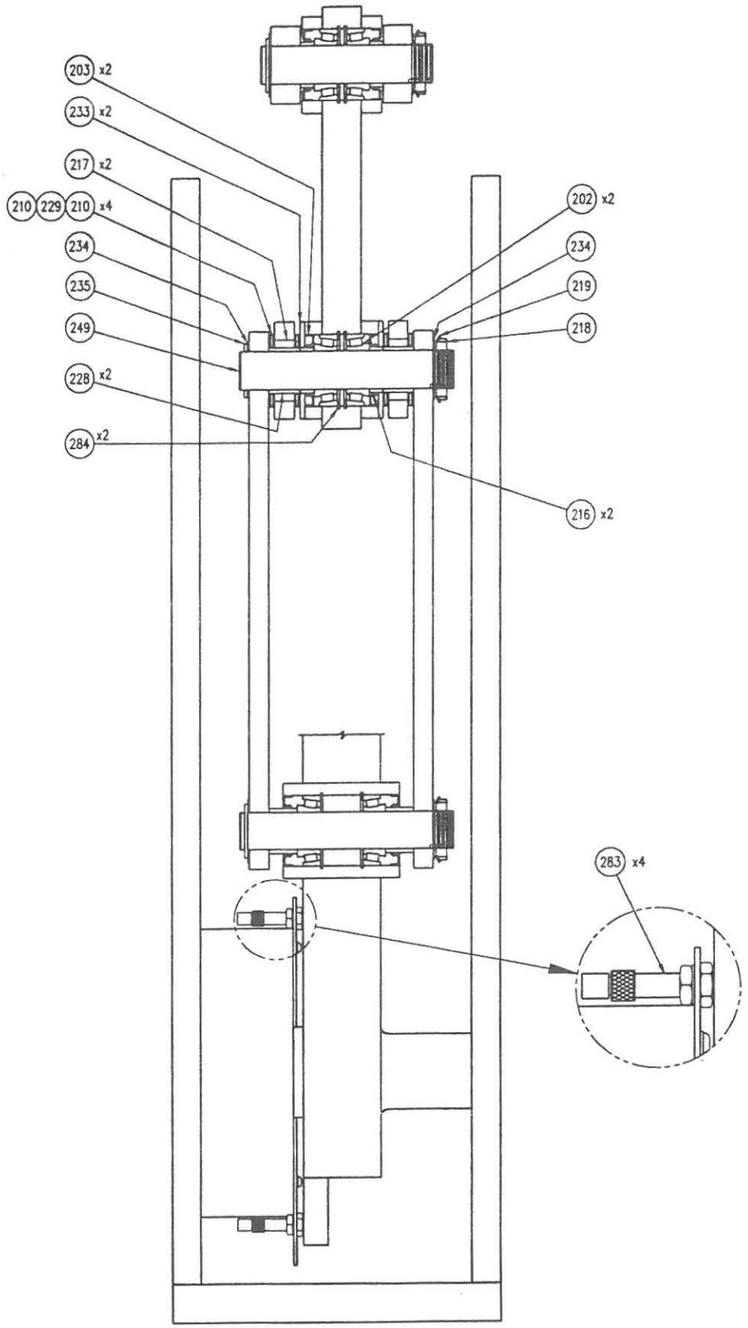
DRAWING NO. 410D11600-01 | REV F

DRAWING NAME MAIN ASSEMBLY 410

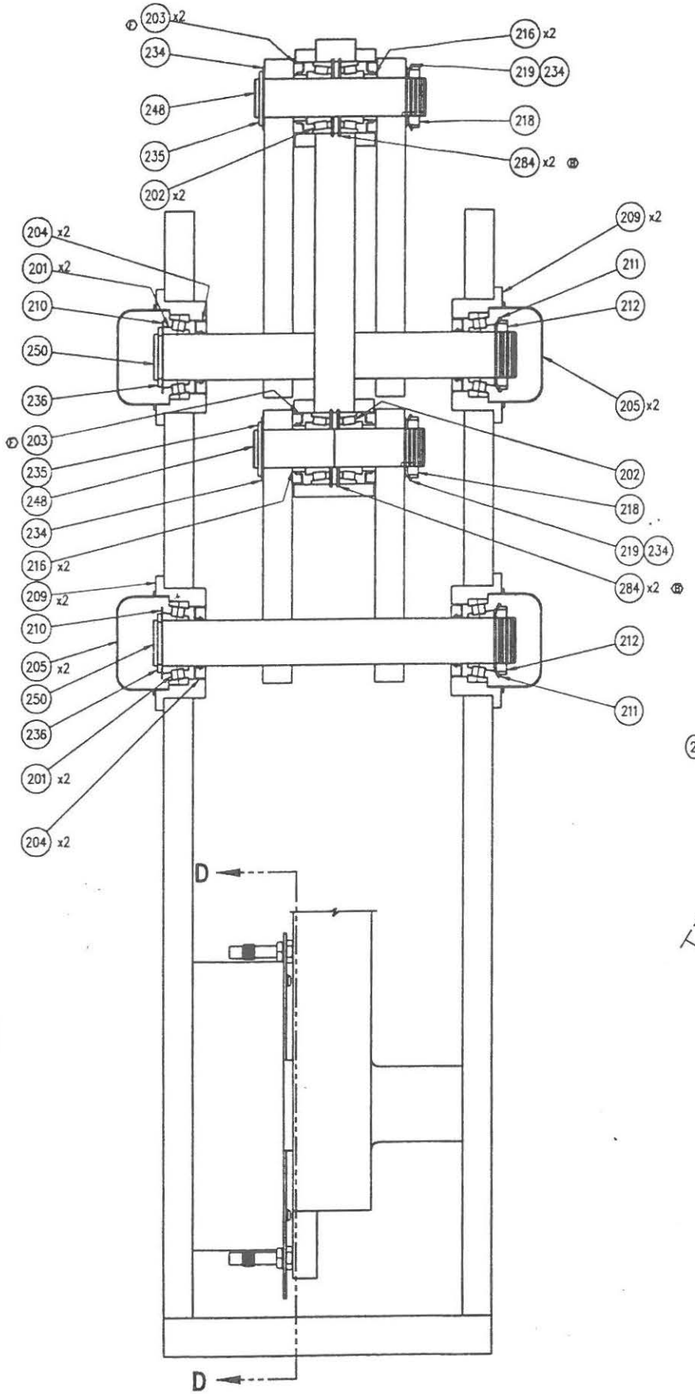
FOR 410 SLR

TOLERANCES UNLESS OTHERWISE SPECIFIED
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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

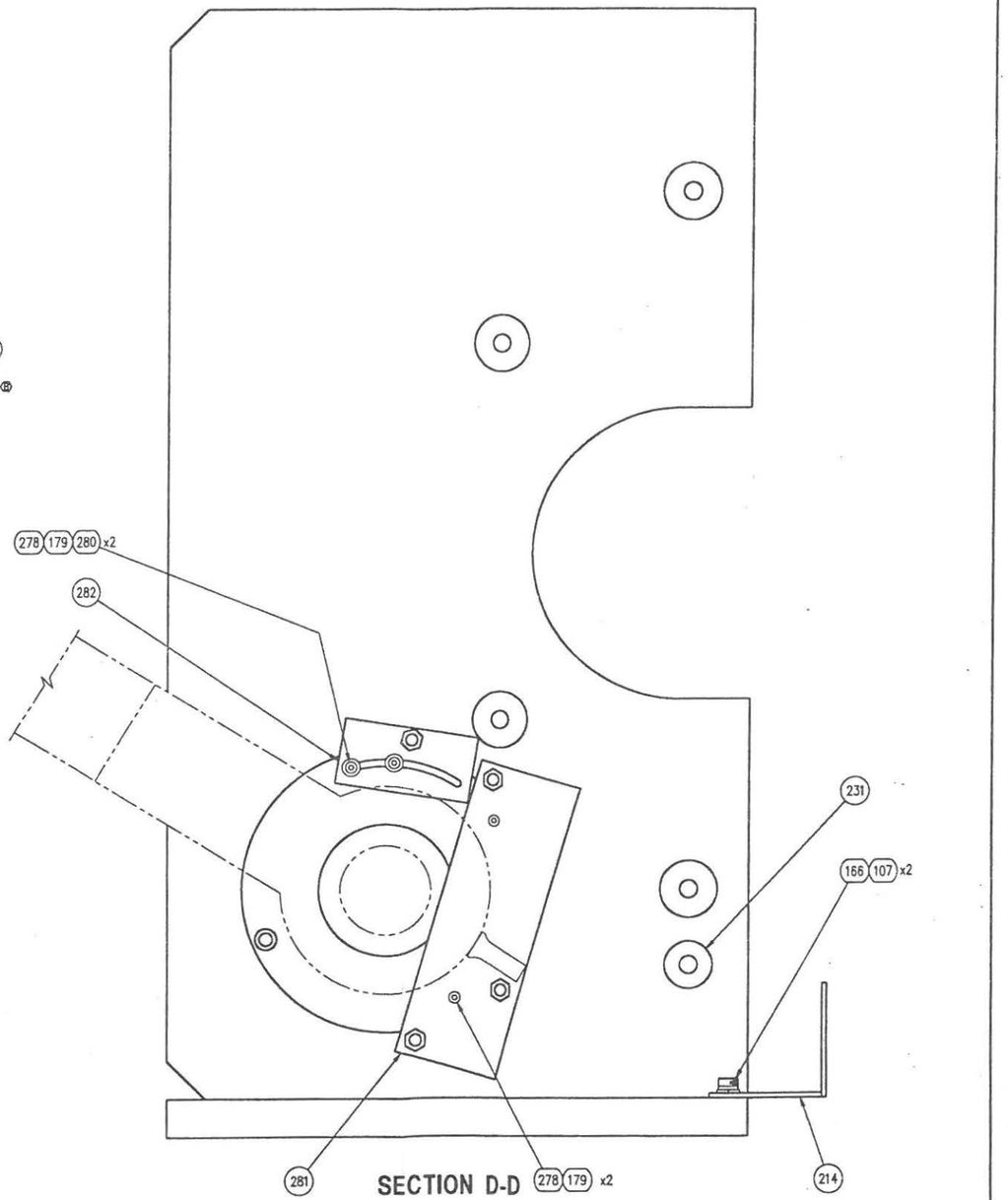
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SECTION B-B



SECTION C-C



SECTION D-D

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
343	8.13 98	CHANGED BALLOON #'S TO MATCH BILL	F	SMB	

REVISIONS

ER	DATE	REMARKS	LET	DR	CK
039	1.20 98	SEE PAGE 1 OF 4	E	MJ	
	96		D	AR	
001	1.3 96	SEE SHEET 1 OF 3	C	MDJ	
133	5.1 95	ADD SNAP RINGS	B	JBA	
080	3.6. 95	SEE SHEET 3 OF 3	A	RM	

REVISIONS

MAT'L: SEE B.O.M.

DR MF | DATE 9.09.94 | SCALE 1/2 | PIC

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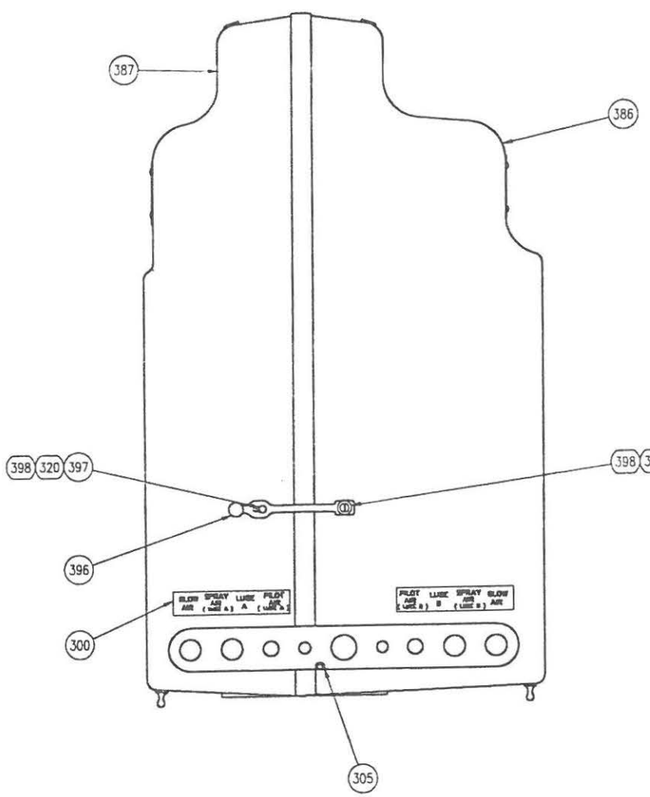
DRAWING NO. 410D11600-01 | REV F

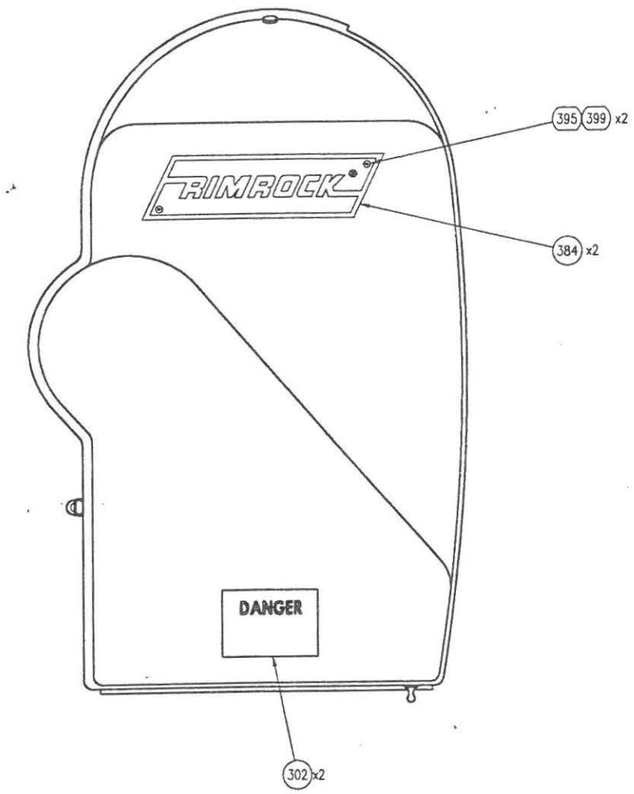
DRAWING NAME MAIN ASSEMBLY 410

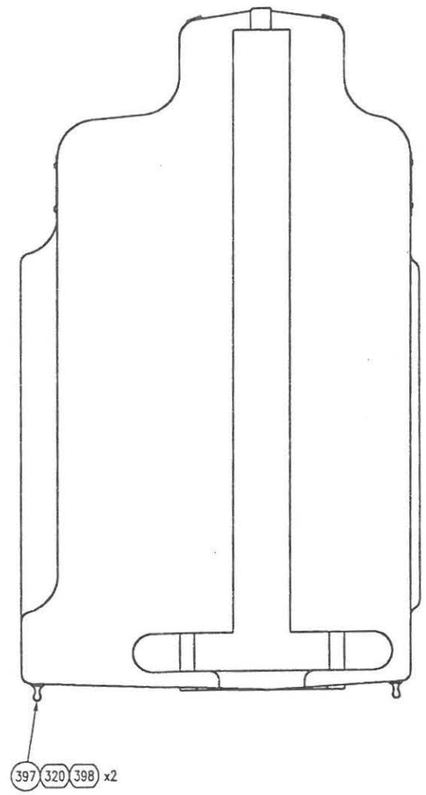
FOR 410 SLR

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	OR	CK
343	8.13 98	SEE PAGE 2 FOR CHANGES	F	SME	
080	3.6. 95	DELETED ITEM 389 & ADDED ITEM 300	A	RM	
039	1.20 98	SEE PAGE 1 OF 4	E	MJ	
		[illegible] 96	D	AR	
001	1.3 96	SEE SHEET 1 OF 3	C	MDL	
133	5.1 95	SEE SHEET 2 OF 3	B	JBA	

REVISIONS

MAT'L: SEE B.O.M.

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3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR	DATE	SCALE	PIC
RM	12.20.94	1/4	

DRAWING NO. 410D11600-01 REV F

DRAWING NAME MAIN ASSEMBLY 410

FOR 410 SLR

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Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11600-01 - 410 STANDARD BODY ASSY

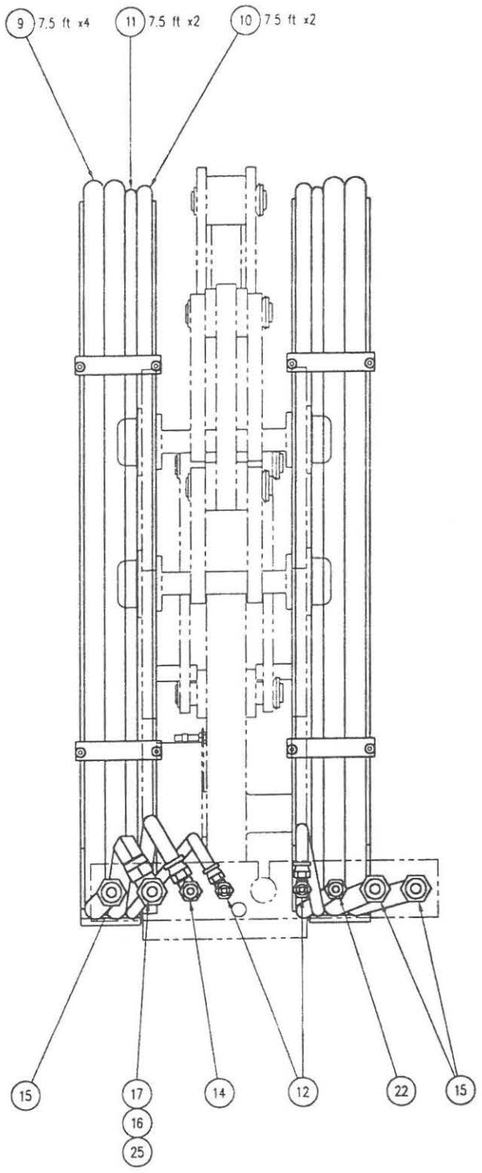
Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
100	03085-01	EYEBOLT	2.000	EA	HW	P	
101	01318	HEX JAM NUT 1/2-13	2.000	EA	HW	P B	
102	08701-19	BOLT HH 1/2-13 X 1 1/2	2.000	EA	HW	P B	
103	02695-8	LOCKWASHER LIGHT 1/2	2.000	EA	HW	P B	
105	09520-22	CAUTION LABEL	1.000	EA	CM	P	
106	09015-40	SHCS M8 -1.25 x 40mm	16.000	EA	HW	P B	OR
107	09001-13	LOCKWASHER M8	20.000	EA	HW	P B	
108	11640-57	SHORT LINK	2.000	EA	FM	M	A
109	06664-48	SERVO MOTOR 54 IN-LB	1.000	EA	CM	P	OR
110	02809-1	POP RIVET 1/8 INCH	12.000	EA	HW	P B	
111	08837-04	TIE ANCHOR MOUNTS	1.000	EA	CM	P	OR
112	03011	WIRE TIE - MEDIUM	1.000	EA	HW	P	
113	09520-17	MACHINE TAG - GENERIC	1.000	EA	CM	P	OR
114	11191-01	LABEL WARRANTY WARNING	2.000	EA	CM	P	
122	09019-40	SHCS M12 -1.75 x 40mm	8.000	EA	HW	P B	OR
123	09001-17	LOCKWASHER M12	14.000	EA	HW	P B	OR
124	11640-30	BODY SPACER	4.000	EA	FM	P	A
125	02150-14	BEARING BALL 50MM 6010-2RS	1.000	EA	CM	P	OR
126	02211-196	SNAP RING 50mm	1.000	EA	CM	P	OR
127	11182-07	RINGFEDER 60mm 7013.1	1.000	EA	CM	P	OR
130	11640-50	CRANK	2.000	EA	FM	M	A
132	09019-25	SHCS M12 -1.75 x 25mm	2.000	EA	HW	P B	OR
137	11640-56	LONG LINK	2.000	EA	FM	M	A
138	11640-58	GUIDE LINK	1.000	EA	FM	P	B
140	11640-19	END CAP	1.000	EA	FM	P	A
141	09015-25	SHCS M8 -1.25 x 25mm	8.000	EA	HW	P B	
142	02150-15	BEARING BALL 25MM 6005-2RS	1.000	EA	CM	P	OR
143	09019-90	SHCS M12 -1.75 x 90mm	4.000	EA	HW	P B	OR
144	09002-17	FLATWASHER M12	4.000	EA	HW	P B	OR
145	11640-03	BELT ASSEMBLY SPACER	4.000	EA	FM	P	A
146	06627-09	QD BUSHING SDS 1 1/8 BORE	1.000	EA	CM	P	OR
147	02672-10	KEY 1/4 SQ. X 1 1/4	1.000	EA	FM	P	
152	11426-03	TIMING BELT 125 TEETH	1.000	EA	CM	P	OR
153	11426-63	63T TIMING BELT SPROCKET	1.000	EA	CM	P	OR
154	11426-36	36T TIMING BELT SPROCKET	1.000	EA	CM	P	OR
155	06627-10	QD BUSHING SH 5/8 BORE	1.000	EA	CM	P	OR
156	11740-02	BELT ASSY BOTTOM PLATE	1.000	EA	FM	M	A
157	02674-4	KEY 3/16 X 1	2.000	EA	FM	P	
158	09010-55	SHCS M4 -0.70 x 55mm	4.000	EA	HW	P B	OR
159	11640-01	TOP PLATE BELT ASSEMBLY	1.000	EA	FM	M	E
160	02150-24	BEARING BALL 25MM 16005-ZZ	1.000	EA	CM	P	O
161	09015-70	SHCS M8 -1.25 X 70mm	8.000	EA	HW	P B	OR
162	02580	SHCS 3/8-16 X 1 1/2	4.000	EA	HW	P B	
163	02695-6	LOCKWASHER LIGHT 3/8	4.000	EA	HW	P B	
164	11465-01	BRAKE 24V SPRING SET	1.000	EA	CM	P	OR
165	11640-09	BELT DRIVE OUTPUT SHAFT	1.000	EA	FM	P	C
166	09015-60	SHCS M8 -1.25 x 60mm	4.000	EA	HW	P B	OR
167	09015-20	SHCS M8 -1.25 x 20mm	8.000	EA	HW	P B	OR
168	11465-02	BRAKE SHAFT ADAPTER 3/4	1.000	EA	CM	P	OR
169	11466-01	SPEED REDUCER 89:1 FA35	1.000	EA	CM	P	OR
170	11640-10	REDUCER SIDE PLATE	1.000	EA	FM	M	L
171	11640-20	SUPPORT SIDE PLATE	1.000	EA	FM	M	H

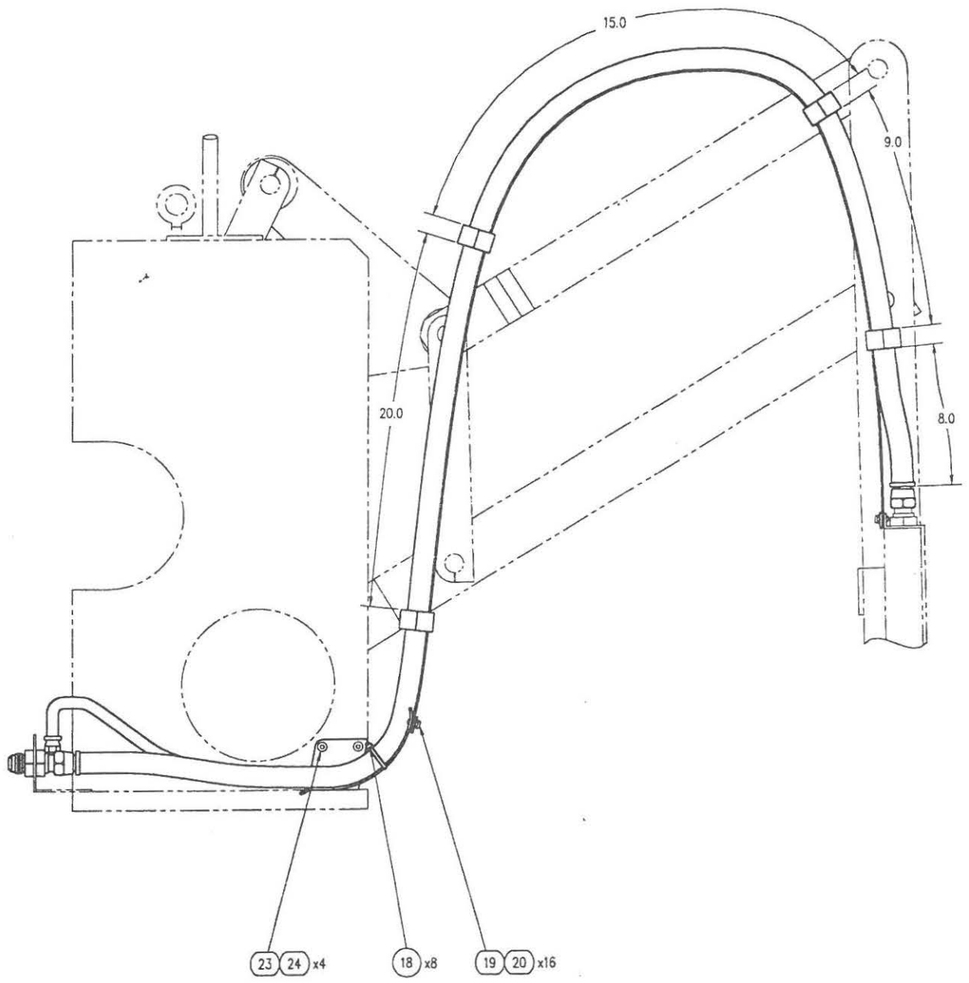
Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11600-01 - 410 STANDARD BODY ASSY

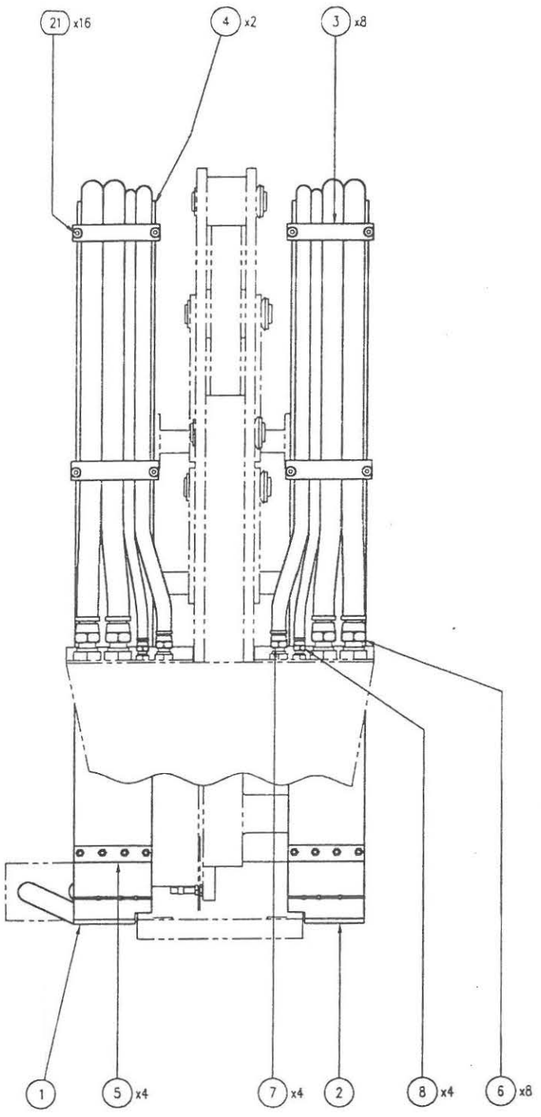
Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
172	11640-40	410 SHOULDER DRIVE SHAFT	1.000	EA	FM	P	F
173	02150-16	BEARING BALL 60MM 6012-2RS	1.000	EA	CM	P	OR
175	11640-04	BELT COVER	1.000	EA	FM	P	C
176	09013-12	SHCS M6 -1.00 x 12mm	4.000	EA	HW	P B	OR
177	09001-11	LOCKWASHER M6	4.000	EA	HW	P B	OR
179	09001-08	LOCKWASHER M4	8.000	EA	HW	P B	OR
185	11630-02	GUIDE ARM SIDEPLATE END	2.000	EA	FM	P	A
188	11640-11	BASE PLATE	1.000	EA	FM	P	D
190	11640-44	BEARING RETAINER	1.000	EA	FM	P	D
191	11640-83	MOTOR COVER SUPPORT	1.000	EA	FM	P	A
192	11640-84	FIXED COVER SUPPORT	1.000	EA	FM	P	A
193	02408-14	THRUST WASHER 50mm ID	3.000	EA	CM	P	OR
196	02878	FLATWASHER 1/2	2.000	EA	HW	P B	
197	02211-237	SNAP RING 60mm	1.000	EA	CM	P	OR
201	11378-14	BEARING 30mm CUP & CONE	4.000	EA	CM	P	OR
202	11378-15	BEARING 25mm CUP & CONE	6.000	EA	CM	P	OR
203	03082-14	SEAL 30mm SHAFT	4.000	EA	CM	P	OR
204	03082-15	SEAL 30mm SHAFT	6.000	EA	CM	P	OR
205	11384	BEARING CAP 7302411	4.000	EA	CM	P	
209	11640-14	BEARING HOUSING	4.000	EA	FM	P	A
210	02408-10	THRUST WASHER 30mm x 1mm	10.000	EA	CM	P	OR
211	03024-35	BEARING LOCKNUT 30MM KMH6	2.000	EA	CM	P	OR
212	03025-35	BEARING LOCKWASHER MBB6	2.000	EA	CM	P	OR
214	11650-90	HOSE BRACKET 410 RECIP	1.000	EA	FM	P	D
216	11640-15	SHAFT SLEEVE	6.000	EA	FM	P	A
217	11640-16	SLEEVE BEARING	2.000	EA	FM	M	OR
218	03024-34	BEARING LOCKNUT 25MM KMH5	3.000	EA	CM	P	OR
219	03025-34	BEARING LOCKWASHER MBB5	3.000	EA	CM	P	OR
228	02406-5	INNER RACE 30mm OD	2.000	EA	CM	P	OR
229	11640-17	MODIFIED THRUST BEARING	4.000	EA	FM	M	OR
231	11640-31	LONG BODY SPACER	1.000	EA	FM	P	B
233	11640-18	SPACER	2.000	EA	FM	P	A
234	02408-11	THRUST WASHER 25mm X 1mm	6.000	EA	CM	P	OR
235	02213-11	SNAP RING 25mm HEAVY DUTY	3.000	EA	CM	P	OR
236	02213-15	SNAP RING 30mm HEAVY DUTY	2.000	EA	CM	P	OR
248	11640-52	LINK PIN	2.000	EA	FM	P	B
249	11640-53	GUIDE PIN	1.000	EA	FM	P	D
250	11640-51	GUIDE SHAFT	2.000	EA	FM	P	D
278	09130-16	BHCS M4 -0.70 x 16mm	5.000	EA	HW	P B	OR
280	09002-08	FLATWASHER M4	2.000	EA	HW	P B	OR
281	11640-90	PROX SWITCH MOUNT	1.000	EA	FM	P	A
282	11640-91	PROX SWITH MOUNT USER	1.000	EA	FM	P	A
283	02863-20	PROX SWITCH 8MM SHORTY	4.000	EA	CM	P	
284	02259-187	SNAP RING 47.6mm INTERNAL	7.000	EA	CM	P	OR
300	09520-21	NAMEPLATE - HOSE CONNECT.	1.000	EA	FM	P	A
302	09520-20	NAMEPLATE-MACHINE START	2.000	EA	CM	P	OR
305	04917	RUBBER GROMMET	1.000	EA	CM	P	
314	02662-2	RHMS 1/4-20 X 1 1/8	5.000	EA	HW	P B	
320	02879-4	FLATWASHER 1/4	4.000	EA	HW	P B	
339	04527	GREASE FITTING	3.000	EA	CM	P	
384	09520-04	LOGO RIMROCK LG DIE CAST	2.000	EA	CM	P	D
386	11640-81	MOTOR SIDE COVER 410	1.000	EA	CM	P	B

Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11600-01 - 410 STANDARD BODY ASSY

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
87	11640-82	FIXED COVER 410	1.000	EA	CM	P	B
395	02702-8	BHCS 10-32 X 1/2	4.000	EA	HW	P B	
396	09973	RUBBER STRAP LATCH	1.000	EA	CM	P	
397	09983	STRAP POST	3.000	EA	FM	M	
398	02914-4	NUT ELASTIC STOP 1/4-20	4.000	EA	HW	P B	
399	04373	NUT ELASTIC STOP 10-32	4.000	EA	HW	P B	







P/N 11600-63

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

DR	DATE	REMARKS	LET	DR	CK

REVISIONS

DR	DATE	REMARKS	LET	DR	CK
442	09.26.97	HOSE ASSEMBLY - STD 2 LUBE	B	JAS	LRK
041	3.10.95	CHANGE ONE 3/8 FITTING FROM A 90 DEG. TO A STRAIGHT FITTING.	A	JBA	

REVISIONS

MAT'L: SEE B.O.M.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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RIMROCK CORPORATION
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COLUMBUS, OHIO 43216
PHONE: 614-471-5826 FAX: 614-471-1073
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DR JBA DATE 1.30.95 SCALE QUARTER
CK DATE DR 041 SHEET OF

DRAWING NO. 410D11600-63 REV B
DRAWING NAME HOSE ASSEMBLY - STD
2 LUBE
FOR 410 RECIP

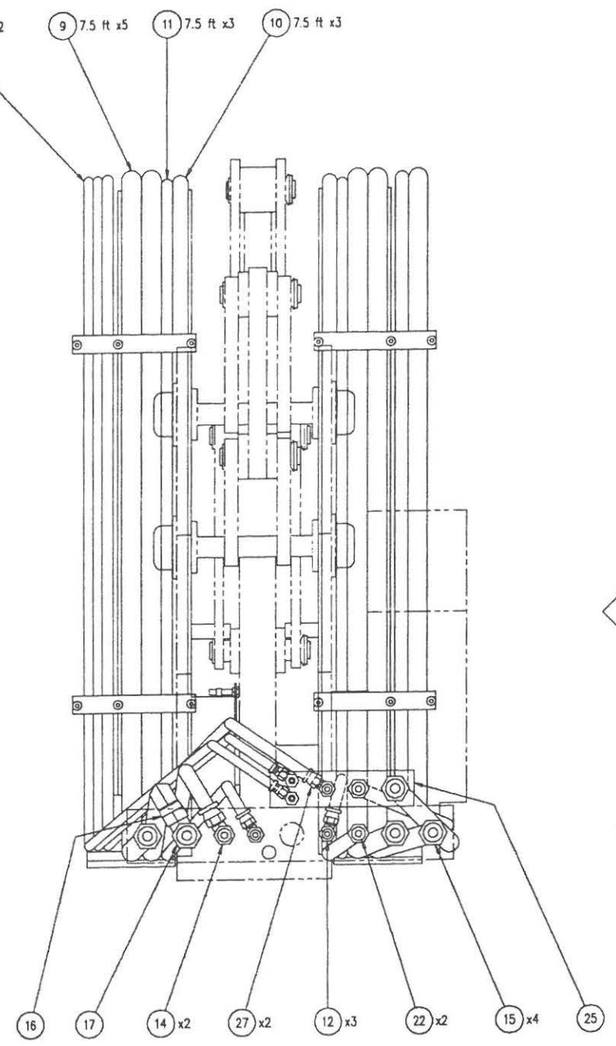
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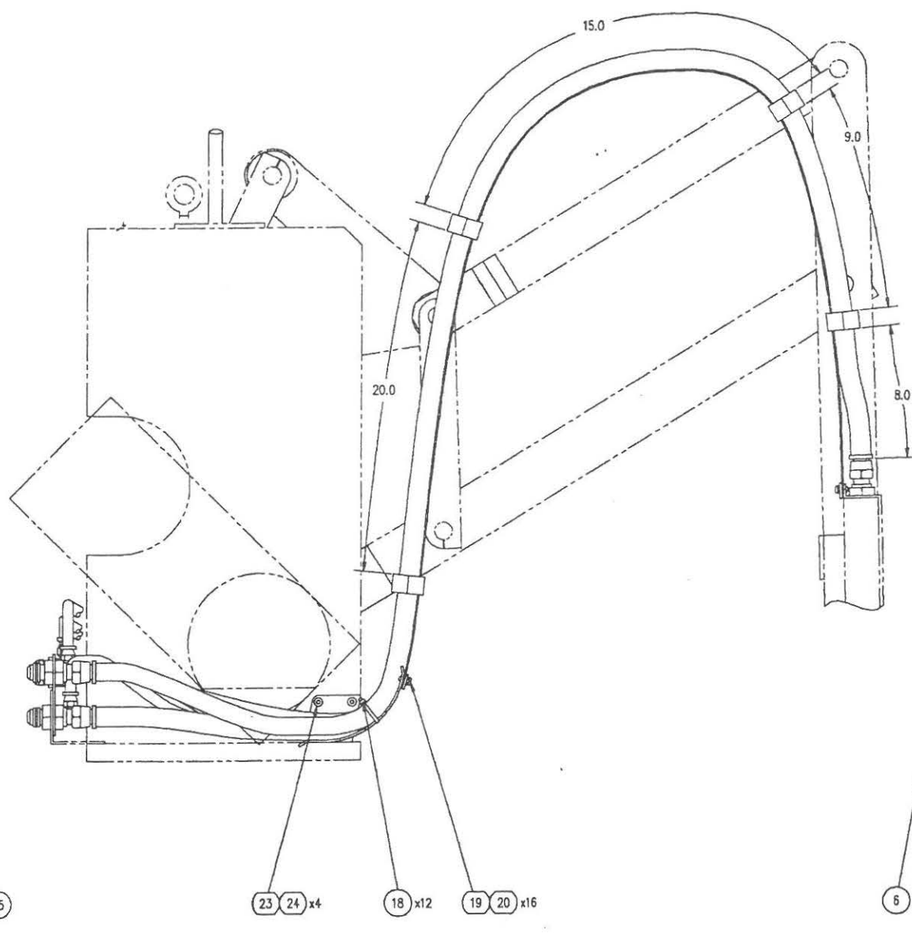
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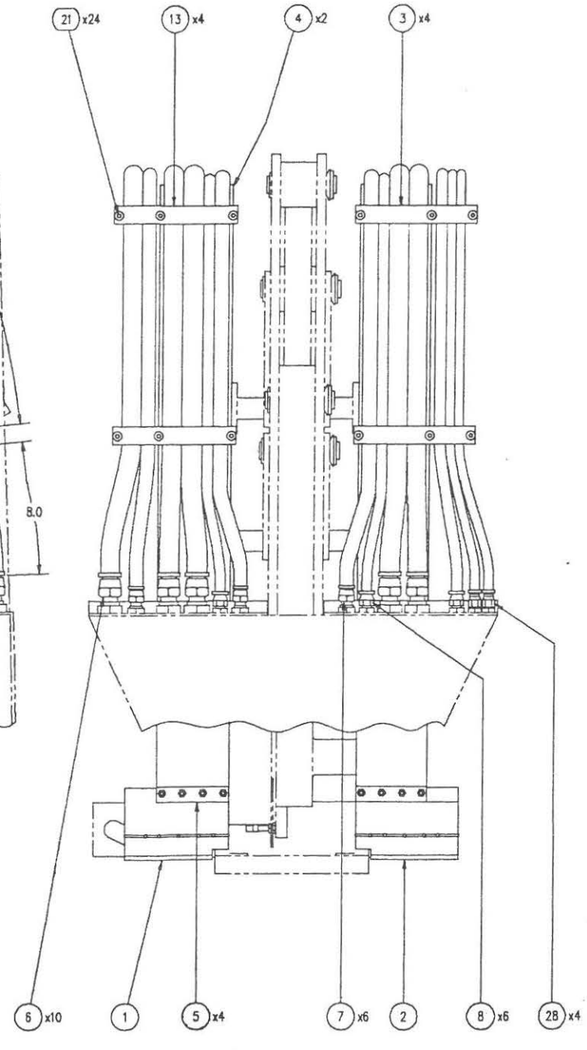
Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-63 - HOSE ASSY 410

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPN	BT	RV Lv
1	11621-07	LOWER HOSE MOUNT-HS	1.000	EA	FM	P		A
2	11621-08	LOWER HOSE MOUNT-OS	1.000	EA	FM	P		A
3	11621-09	HOSE GUIDE-SLIDE	8.000	EA	FM	P		C
4	11621-10	HOSE SHIELD	2.000	EA	FM	P		B
5	11621-06	BAND CLAMP PLATE	4.000	EA	FM	P		A
6	02537-12	FITTING FEMALE HOSE #12	8.000	EA	CM	P		
7	02537-8	FITTING FEMALE HOSE #8	4.000	EA	CM	P		
8	02537-6	FITTING FEMALE HOSE #6	4.000	EA	CM	P		
9	01836	#12 RUBBER HOSE (RAW)	30.000	FT	CM	P		
10	01834	#8 RUBBER HOSE (RAW)	15.000	FT	CM	P		
11	01833	#6 RUBBER HOSE (RAW)	15.000	FT	CM	P		
12	09746-03	BULKHEAD 90^ #6	2.000	EA	CM	P		
14	09746-04	BULKHEAD 90^ #8	1.000	EA	CM	P		
15	08962-12	BULKHEAD UNION #12	3.000	EA	CM	P		
16	09748-07	SWIVEL ELBOW #12	1.000	EA	CM	P		OR
17	09746-12	BULKHEAD 90^ #12	1.000	EA	CM	P		OR
18	03011-1	BLACK WIRE TIE	8.000	EA	CM	P		OR
19	02702-8	BHCS 10-32 X 1/2	16.000	EA	HW	P	B	
20	04373	NUT ELASTIC STOP 10-32	16.000	EA	HW	P	B	
21	09015-25	SHCS M8 -1.25 x 25mm	16.000	EA	HW	P	B	
22	08962-8	BULKHEAD UNION #8	1.000	EA	CM	P		
23	09013-12	SHCS M6 -1.00 x 12mm	4.000	EA	HW	P	B	OR
24	09001-11	LOCKWASHER M6	4.000	EA	HW	P	B	OR







P/N 11600-65

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK

REVISIONS

MATL: SEE B.O.N.

RIMROCK CORPORATION
1700 RIMROCK ROAD
COLUMBUS, OHIO 43228
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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR	JBA	DATE	1.30.95	SCALE	1/4	FIG
CK		DATE		ER	041	SHEET OF

DRAWING NO. 11600-65 REV

DRAWING NAME: HOSE ASSEMBLY - 3 LUBE
OPTIONAL

FOR 410 RECIP.

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

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Bill of Materials Sorted by Balloon Number by Part Number

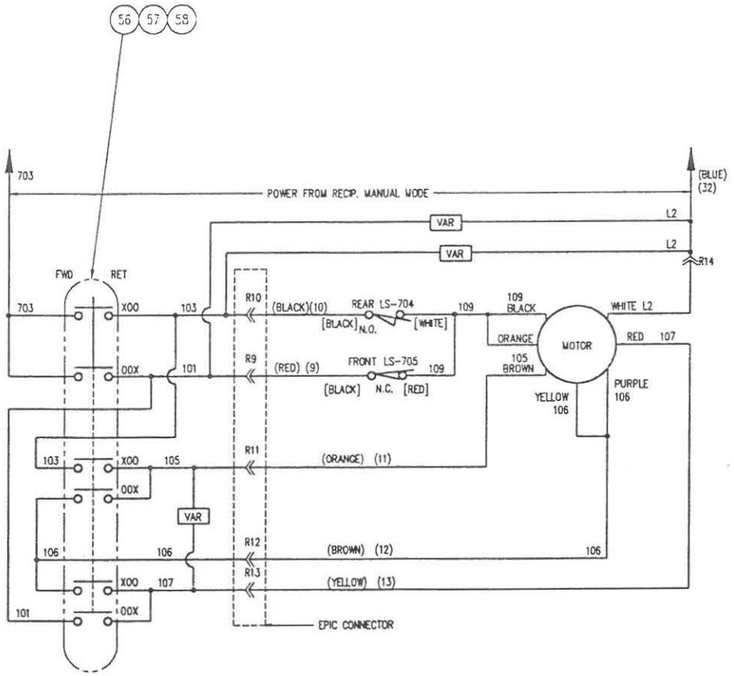
Part Number 11600-65 - HOSE ASSEMBLY 410 3 LUBE

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11621-17	LOWER HOSE MNT HS 3-LUBE	1.000	EA	FM	P	OR
2	11621-08	LOWER HOSE MOUNT-OS	1.000	EA	FM	P	A
3	11621-19	HOSE GUIDE-SLIDE OS 3-LUB	4.000	EA	FM	P	OR
4	11621-10	HOSE SHIELD	2.000	EA	FM	P	B
5	11621-06	BAND CLAMP PLATE	4.000	EA	FM	P	A
6	02537-12	FITTING FEMALE HOSE #12	10.000	EA	CM	P	
7	02537-8	FITTING FEMALE HOSE #8	6.000	EA	CM	P	
8	02537-6	FITTING FEMALE HOSE #6	6.000	EA	CM	P	
9	01836	#12 RUBBER HOSE (RAW)	37.500	FT	CM	P	
10	01834	#8 RUBBER HOSE (RAW)	22.500	FT	CM	P	
11	01833	#6 RUBBER HOSE (RAW)	22.500	FT	CM	P	
12	09746-03	BULKHEAD 90^ #6	3.000	EA	CM	P	
13	11621-20	HOSE GUIDE-SLIDE HS 3-LUB	4.000	EA	FM	P	OR
14	09746-04	BULKHEAD 90^ #8	2.000	EA	CM	P	
15	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
16	09748-07	SWIVEL ELBOW #12	1.000	EA	CM	P	OR
17	09746-12	BULKHEAD 90^ #12	1.000	EA	CM	P	OR
18	03011-1	BLACK WIRE TIE	12.000	EA	CM	P	OR
19	02702-8	BHCS 10-32 X 1/2	16.000	EA	HW	P B	
20	04373	NUT ELASTIC STOP 10-32	16.000	EA	HW	P B	
21	09015-25	SHCS M8 -1.25 x 25mm	16.000	EA	HW	P B	
22	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
23	09013-12	SHCS M6 -1.00 x 12mm	4.000	EA	HW	P B	OR
24	09001-11	LOCKWASHER M6	4.000	EA	HW	P B	OR
25	11650-91	HOSE BRACKET EXTENSION	1.000	EA	FM	P	OR
26	01832	#4 RUBBER HOSE (RAW)	15.000	FT	CM	P	
27	09746-01	BULKHEAD 90^ #4	2.000	EA	CM	P	
28	02537-4	FITTING FEMALE HOSE #4	4.000	EA	CM	P	

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-41 - 410 10.5" POWERED BASE

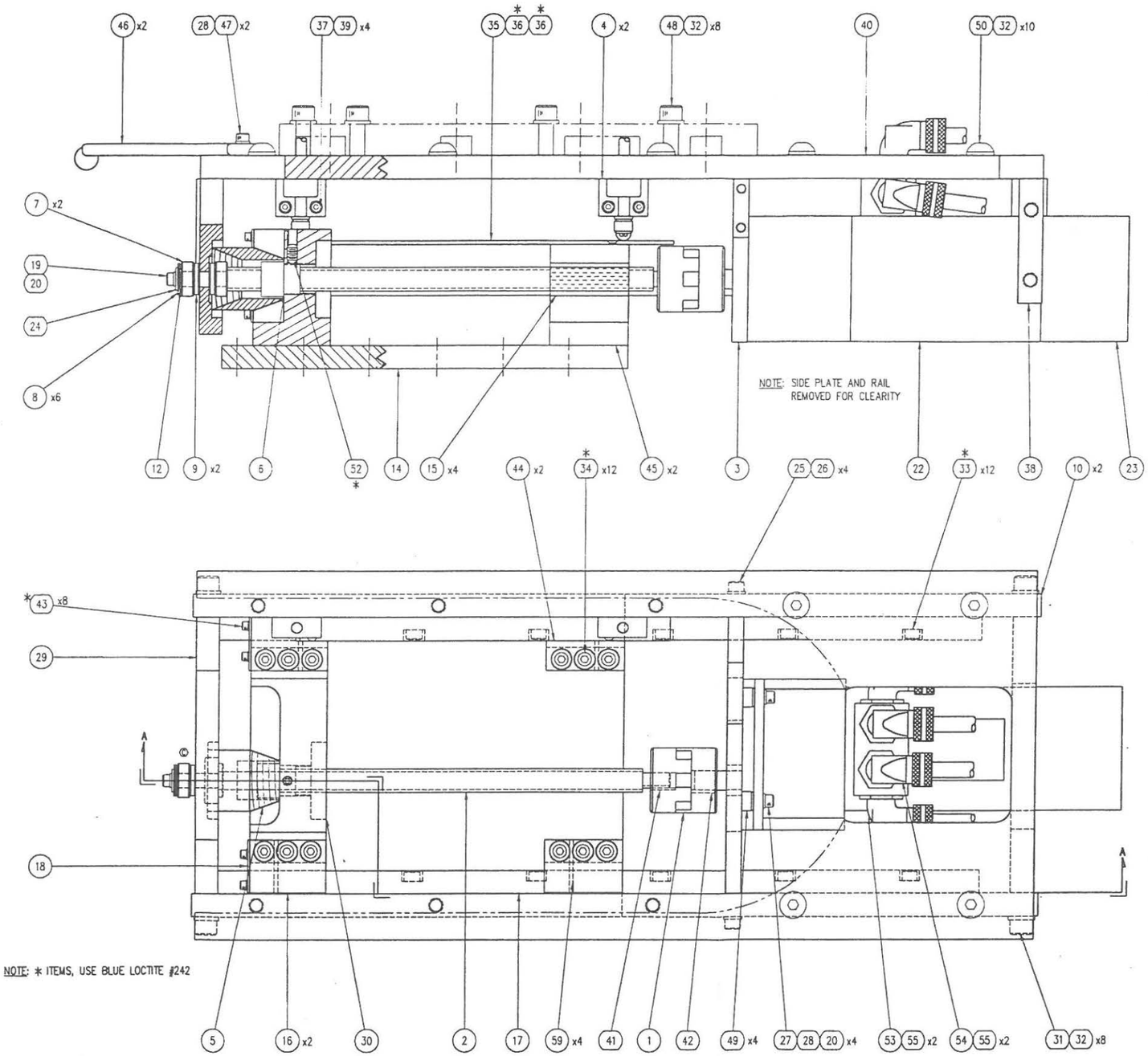
al Sr	al Sbr	Part Number	Description	Qty/ Assy	UM	IT	MP PH	BT NP	Rv Lv
	1	11026-15	SHAFT COUPLING	1.000	EA	CM	P		OR
	2	11650-10	DRIVE SCREW 410	1.000	EA	FM	M		OR
	3	11650-02	GEARMOTOR MOUNT 410	1.000	EA	FM	P		B
	4	03018-12	SWITCH LIMIT	2.000	EA	CM	P		
	5	11469-01	COVER HELICAL WOUND METAL	1.000	EA	CM	P		OR
	6	11292-10	NUT ACME 3/4-2 RH	1.000	EA	CM	P		OR
	7	11468-12	CLAMP COLLAR 1PC 12mm	2.000	EA	CM	P		OR
	8	02408-12	THUST WASHER 12mm ID	6.000	EA	CM	P		OR
	9	02191-3	THRUST WASHER STT1001-1	2.000	EA	CM	P		
	10	11650-04	SIDE PLATE BASE	2.000	EA	FM	P		A
	11	11650-03	COVER RETAINER	1.000	EA	FM	P		B
	12	02213-3	SNAP RING 12mm HEAVY DUTY	1.000	EA	CM	P		OR
	14	11650-05	BASE BOTTOM PLATE	1.000	EA	FM	P		B
	15	11470-01	BEARING 3/4 SQ OPEN	4.000	EA	CM	P		OR
	16	11650-01	BEARING HOLDER LH	2.000	EA	FM	P		C
	17	11650-06	RAIL	2.000	EA	FM	M		A
	18	11650-08	RAIL SCRAPER	2.000	EA	FM	P		A
	19	09013-12	SHCS M6 -1.00 x 12mm	5.000	EA	HW	P	B	OR
	20	09001-11	LOCKWASHER M6	9.000	EA	HW	P	B	OR
	22	06664-50	GEARMOTOR 200 IN LB	1.000	EA	CM	P		OR
	23	06664-25	BRAKE FOR GEARMOTOR	1.000	EA	CM	P		OR
	24	02879-4	FLATWASHER 1/4	1.000	EA	HW	P	B	
	25	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P	B	OR
	26	09001-13	LOCKWASHER M8	4.000	EA	HW	P	B	
	27	09013-35	SHCS M6 -1.00 x 35mm	4.000	EA	HW	P	B	OR
	28	09002-11	FLATWASHER M6	6.000	EA	HW	P	B	OR
	29	11650-09	SCREW ATTACHMENT MOUNT	1.000	EA	FM	P		C
	30	11650-11	ACME NUT MOUNT	1.000	EA	FM	P		C
	31	09019-40	SHCS M12 -1.75 x 40mm	8.000	EA	HW	P	B	OR
	32	09001-17	LOCKWASHER M12	26.000	EA	HW	P	B	OR
	33	09015-25	SHCS M8 -1.25 x 25mm	12.000	EA	HW	P	B	
	34	09017-90	SHCS M10 -1.50 x 90mm	12.000	EA	HW	P	B	OR
	35	11650-12	LIMIT SW STRIKER 410 BASE	1.000	EA	FM	P		OR
	36	09100-10	FHSCS M4 -.70 x 10mm LG	2.000	EA	HW	P	B	OR
	37	09010-25	SHCS M4 -0.70 x 25mm	4.000	EA	HW	P	B	OR
	38	11650-14	BASE TIE	1.000	EA	FM	P		C
	39	09001-08	LOCKWASHER M4	4.000	EA	HW	P	B	OR
	40	11650-15	BASE TOP PLATE	1.000	EA	FM	M		D
	41	02674-5	1/8 SQ KEY X .75" LONG	1.000	EA	FM	P		
	42	02674-4	KEY 3/16	1.000	EA	FM	P		
	43	09010-06	SHCS M4 -0.70 x 6mm	8.000	EA	HW	P	B	OR
	44	11650-16	BEARING HOLDER RH	2.000	EA	FM	P		C
	45	11650-17	SPACER BEARING BLOCK	2.000	EA	FM	P		B
	46	09973	RUBBER STRAP LATCH	2.000	EA	CM	P		
	47	09013-25	SHCS M6 -1.00 x 25mm	2.000	EA	HW	P	B	
	48	09019-55	SHCS M12 -1.75 x 55mm	8.000	EA	HW	P	B	OR
	49	11475-505	SPACER ROUND 5/16 LG	4.000	EA	CM	P		OR
	50	09139-40	BHCS M12 -1.75 x 40mm	10.000	EA	HW	P	B	OR
	52	09043-12	SET SCREW M6 -1.00 X 12mm	1.000	EA	HW	P	B	OR
	53	02481	CONNECTOR CONDUIT 90^	2.000	EA	CM	P		
	54	02484-01	90^ CONDUIT CONNECTOR TOP	2.000	EA	CM	P		OR
	55	02484	CONDUIT LOCKNUT 1/2"	4.000	EA	CM	P		OR



CRITICAL WIRE SIZE
ALL WIRE 14Ga
14Ga RED 101,103,105,106,107
14Ga WHITE 7L2

NOTE: WIRE COLOR IN ( ) IS COLOR OF WIRE IN 14-6 SO CABLE
WIRE NUMBER IN ( ) IS EPIC CONNECTOR PIN NUMBER
WIRE COLOR IN [ ] IS LIMIT SWITCH WIRE COLOR

NOTE: 'R' NUMBERS REPRESENT EPIC CONNECTORS
ON SIDE OF ENCLOSURE WHERE CABLE IS CONNECTED



NOTE: * ITEMS, USE BLUE LOCTITE #242

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
392	5.6 98	UPDATED BOM AND DWG TO REFLECT CHG'S TO THE FRONT PLATE	C	SMB	
385	11.13 97	ADDED "R" NUMBERS TO SCHMATIC	B	SMB	
020	01.16 95	ADDED SPACERS BETWEEN MOTOR AND MOTOR MOUNT	A	KRS	

REVISIONS

MAT'L: SEE B.O.M.

DR JBA DATE 1.12.95 SCALE 1/2 PIC
CK DATE ER DATE

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DRAWING NO. 410D11600-41 REV C
DRAWING NAME 410 10° TRAVEL, BASE, ASSEMBLY
FOR 410 SDR

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ± 1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

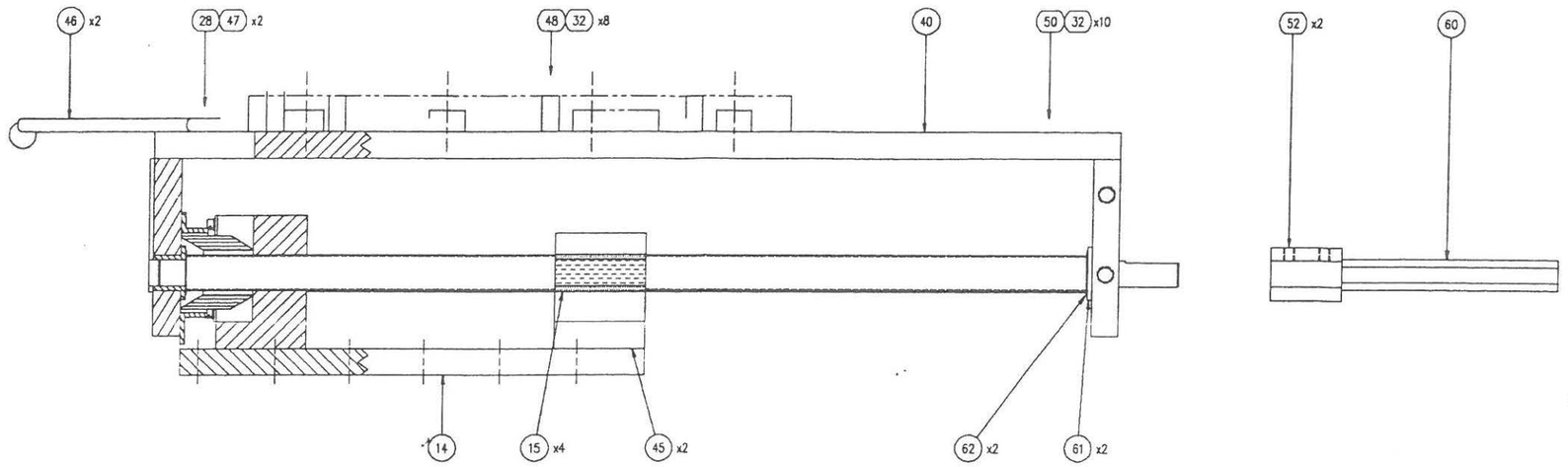
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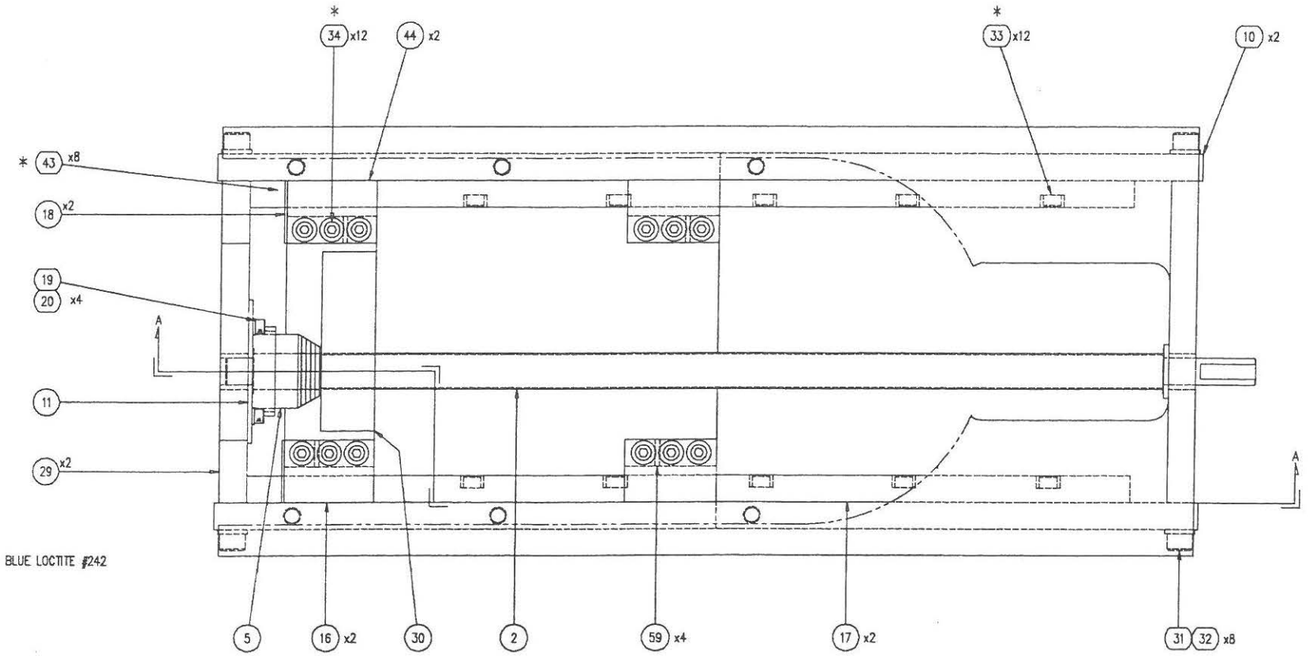
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Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-42 - 410 10.5" MANUAL BASE

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MP PH	BT NP	Rv Lv
2	11650-19	DRIVE SCREW 410 M.B.	1.000	EA	FM	P		OR
5	11469-01	COVER HELICAL WOUND METAL	1.000	EA	CM	P		OR
10	11650-04	SIDE PLATE BASE	2.000	EA	FM	P		A
11	11650-03	COVER RETAINER	1.000	EA	FM	P		B
14	11650-05	BASE BOTTOM PLATE	1.000	EA	FM	P		B
15	11470-01	BEARING 3/4 SQ OPEN	4.000	EA	CM	P		OR
16	11650-01	BEARING HOLDER LH	2.000	EA	FM	P		C
17	11650-06	RAIL	2.000	EA	FM	M		A
18	11650-08	RAIL SCRAPER	2.000	EA	FM	P		A
19	09013-12	SHCS M6 -1.00 x 12mm	4.000	EA	HW	P	B	OR
20	09001-11	LOCKWASHER M6	4.000	EA	HW	P	B	OR
28	09002-11	FLATWASHER M6	2.000	EA	HW	P	B	OR
29	11650-20	SCREW ATTACHMENT MNT M.B.	2.000	EA	FM	M		OR
30	11650-21	SCREW MOUNT FOR 410 M.B.	1.000	EA	FM	P		OR
31	09019-40	SHCS M12 -1.75 x 40mm	8.000	EA	HW	P	B	OR
32	09001-17	LOCKWASHER M12	26.000	EA	HW	P	B	OR
33	09015-25	SHCS M8 -1.25 x 25mm	12.000	EA	HW	P	B	
34	09017-90	SHCS M10 -1.50 x 90mm	12.000	EA	HW	P	B	OR
40	11650-15	BASE TOP PLATE	1.000	EA	FM	M		D
43	09010-06	SHCS M4 -0.70 x 6mm	8.000	EA	HW	P	B	OR
44	11650-16	BEARING HOLDER RH	2.000	EA	FM	P		C
45	11650-17	SPACER BEARING BLOCK	2.000	EA	FM	P		B
46	09973	RUBBER STRAP LATCH	2.000	EA	CM	P		
47	02662-2	RHMS 1/4-20 X 1 1/8	2.000	EA	HW	P	B	
48	09019-55	SHCS M12 -1.75 x 55mm	8.000	EA	HW	P	B	OR
50	09139-40	BHCS M12 -1.75 x 40mm	10.000	EA	HW	P	B	OR
52	02639-8	SET SCREW 1/4-20 X 1/2	2.000	EA	HW	P	B	
59	02729-7	ROLL PIN 1/8 X 7/8	4.000	EA	HW	P	B	
60	11201	TOOL HORIZONAL	1.000	EA	FM	M		
61	02188-12	BEARING SFF 1013-2	2.000	EA	CM	P		
62	02184-1	THRUST WASHER TRA-1220	2.000	EA	CM	P		





NOTE: * ITEMS, USE BLUE LOCTITE #242

4. DELBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

REVISIONS										REVISIONS									
ER	DATE	REMARKS		LET	DR	CK	ER	DATE	REMARKS		LET	DR	CK	ER	DATE	REMARKS		LET	DR	CK

MAT'L: SEE B.O.M.

RIMROCK CORPORATION
1700 RIMROCK ROAD

PHONE: 814-471-0026 TELEX: 245-461 FAX: 814-471-0083
* A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR	JBA	DATE	01.12.95	SCALE	FMLE
CK		DATE		ER	041
DRAWING NO.					
DRAWING NAME	410 10" MANUAL TRAVEL, BASE ASSEMBLY				
FOR	410 SDR				

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

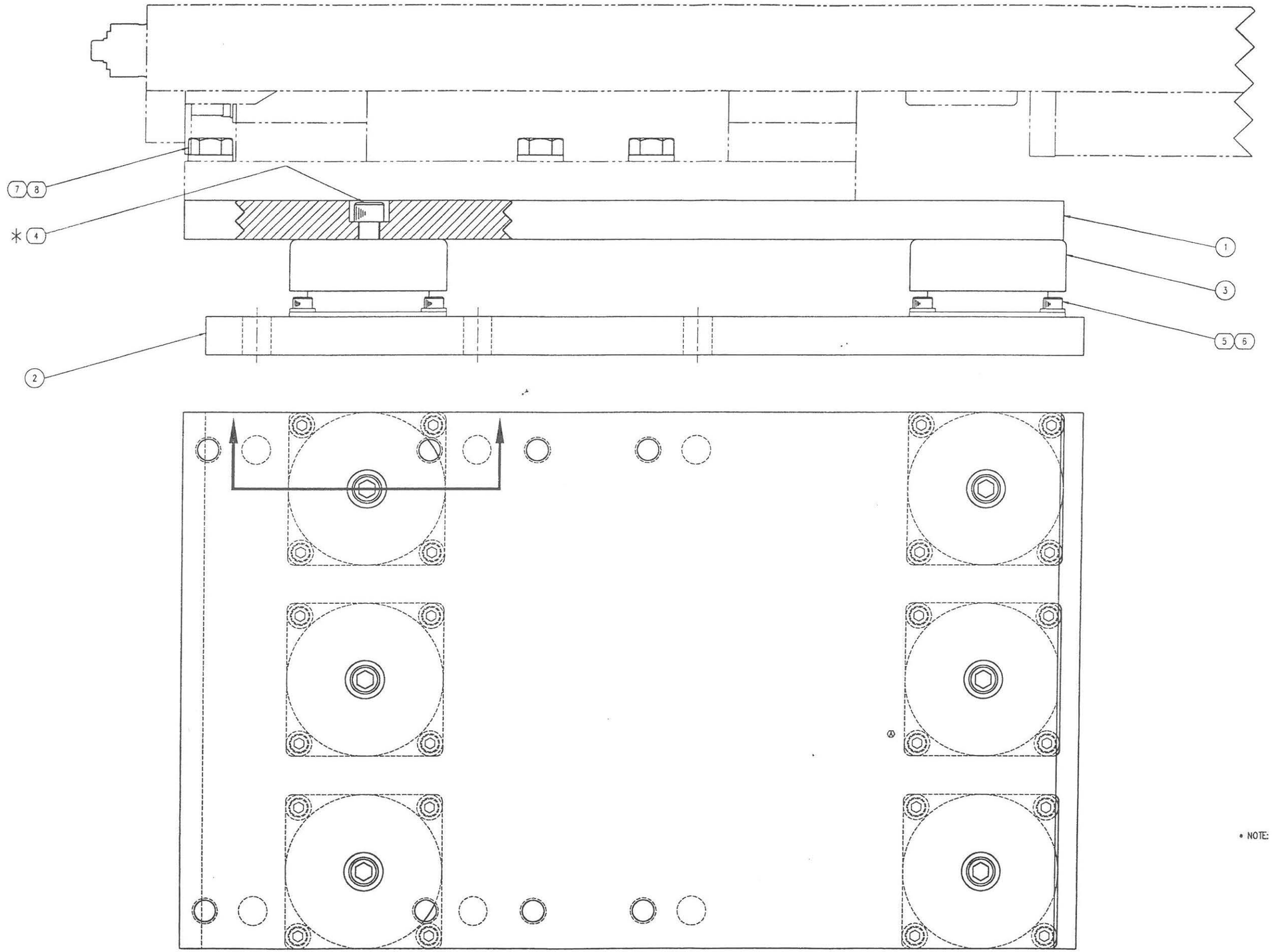
95-98

14:43:56 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-91 - SHOCK BASE ASSY

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11651-10	SHOCK BASE TOP PLATE	1.000	EA	FM	M	OR
2	11651-11	SHOCK BASE BOTTOM PLATE	1.000	EA	FM	P	OR
3	11651-02	SHOCK MOUNT	5.000	EA	CM	P	OR
4	02580	SHCS 3/8-16 X 1 1/2	5.000	EA	HW	P B	
5	02559	SHCS 1/4-20 X 3/4	20.000	EA	HW	P B	
6	02695-4	LOCKWASHER LIGHT 1/4	20.000	EA	HW	P B	
7	08701-19	BOLT HH 1/2-13 X 1 1/2	6.000	EA	HW	P B	
8	02695-8	LOCKWASHER LIGHT 1/2	6.000	EA	HW	P B	



4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
		REVISIONS			
394	5.7 58	ADDED ONE SHOCK TO ASSEMBLY, INCLUDING NECESSARY FASTENERS	A	SME	
ER	DATE	REMARKS	LET	DR	CK
		REVISIONS			

* NOTE: USE BLUE LOCTITE #242

P/N 11600-91

MAT'L: SEE B.O.M.

DR KRS DATE 1.13.95 SCALE FULL PIC
CK DATE ER 010

RIMROCK®
RIMROCK CORPORATION
1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE:614-471-5626 FAX:614-471-1073
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DRAWING NO. 410D11600-91 REV A
DRAWING NAME SHOCK MOUNT SUB-BASE ASSY.
FOR

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

14:47:33 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-81 - 60-2L STD HEAD ASSY 24 LG

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P	OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P	C
4	11621-24	24" ARM-SPRAY HEAD 410	1.000	EA	FM	P	E
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	8.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	4.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	4.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
22	11621-11	HOSE GUARD 24" HS	1.000	EA	FM	P	A
23	11621-12	HOSE GUARD 24" OS	1.000	EA	FM	P	A
24	02102-132	O'RING 2-132	2.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	10.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	10.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

14:45:08 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-82 - 2L HEAD ASSY 11" LG

Bal or	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P	OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P	C
4	11621-25	SPRAY ARM 410 11" LONG	1.000	EA	FM	P	C
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	4.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	2.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	2.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
24	02102-132	O'RING 2-132	2.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

14:45:52 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-87 - 2L HEAD ASSY 18" LG.

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P	OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P	C
4	11621-18	SPRAY ARM HEAD 18"	1.000	EA	FM	P	D
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	6.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	3.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	3.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
22	11621-13	HOSE GUARD 18" HS	1.000	EA	CM	P	C
23	11621-14	HOSE GUARD 18" OS	1.000	EA	CM	P	C
24	02102-132	O'RING 2-132	2.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	6.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	6.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

14:48:06 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-85 - 72-2L STD HEAD ASSY 31 LG

Bal Or	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP		Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M		B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P		OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P		C
4	11621-32	31" ARM-SPRAY HEAD 410	1.000	EA	FM	P		C
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P		
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P		OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P		
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P		
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P		
10	01836	#12 RUBBER HOSE (RAW)	11.000	FT	CM	P		
11	01834	#8 RUBBER HOSE (RAW)	5.500	FT	CM	P		
12	01833	#6 RUBBER HOSE (RAW)	5.500	FT	CM	P		
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P		
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P		
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P		
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P		OR
22	11621-33	HOSE GUARD 31" HS	1.000	EA	FM	P		B
23	11621-34	HOSE GUARD 31" HS	1.000	EA	FM	P		B
24	02102-132	O'RING 2-132	2.000	EA	CM	P		OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P		
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P		
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P	B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P	B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P	B	OR
30	09001-08	LOCKWASHER M4	10.000	EA	HW	P	B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P	B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P	B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P	B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P	B	
35	09130-12	BHCS M4 -0.70 X 12mm	10.000	EA	HW	P	B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P		
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P		
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P		

14:49:00 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-92 - 2L HEAD ASSY 14" LG.

Bal br	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P	OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P	C
4	11621-45	SPRAY ARM HEAD 14"	1.000	EA	FM	P	A
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	6.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	3.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	3.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
24	02102-132	O'RING 2-132	2.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	6.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	6.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

14:49:13 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-95 - 2L HEAD ASSY 28" LONG

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP		Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M		B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P		OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P		C
4	11621-29	SPRAY HEAD 28" LONG	1.000	EA	FM	P		OR
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P		
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P		OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P		
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P		
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P		
10	01836	#12 RUBBER HOSE (RAW)	9.500	FT	CM	P		
11	01834	#8 RUBBER HOSE (RAW)	4.750	FT	CM	P		
12	01833	#6 RUBBER HOSE (RAW)	4.750	FT	CM	P		
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P		
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P		
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P		
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P		OR
22	11621-30	HOSE GUARD FOR 28" ARM	1.000	EA	FM	P		OR
23	11621-31	HOSE GUARD FOR 28" ARM	1.000	EA	FM	P		OR
24	02102-132	O'RING 2-132	2.000	EA	CM	P		OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P		
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P		
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P	B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P	B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P	B	OR
30	09001-08	LOCKWASHER M4	10.000	EA	HW	P	B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P	B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P	B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P	B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P	B	
35	09130-12	BHCS M4 -0.70 X 12mm	10.000	EA	HW	P	B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P		
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P		
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P		

Bill of Materials Sorted by Balloon Number by Part Number
Part Number 11600-97 - 36IN. 2 LUBE SPRAY HEAD ASSY

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	2.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	2.000	EA	FM	P	OR
3	15170-054	MOUNTING CLEAT	2.000	EA	FM	P	C
4	11621-38	36 INCH SPRAY ARM WELDMENT	1.000	EA	FM	P	
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	4.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	2.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	2.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	12.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	6.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	6.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	4.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	2.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	2.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
22	11621-39	HOSE GUARD 36" HS	1.000	EA	FM	P	
23	11621-40	HOSE GUARD 36" OS	1.000	EA	FM	P	
24	02102-132	O'RING 2-132	2.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	2.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	2.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	2.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	2.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	4.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	10.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	10.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

14:49:50 08 MAY 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-86 - 1L HEAD ASSY 11" LG.

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	1.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	1.000	EA	FM	P	OR
3	15170-051	CLEAT	2.000	EA	FM	P	B
4	11621-25	SPRAY ARM 410 11" LONG	1.000	EA	FM	P	C
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	3.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	1.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	1.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	3.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	1.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	1.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	3.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	1.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	1.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
24	02102-132	O'RING 2-132	1.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	1.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	1.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	1.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	1.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	2.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

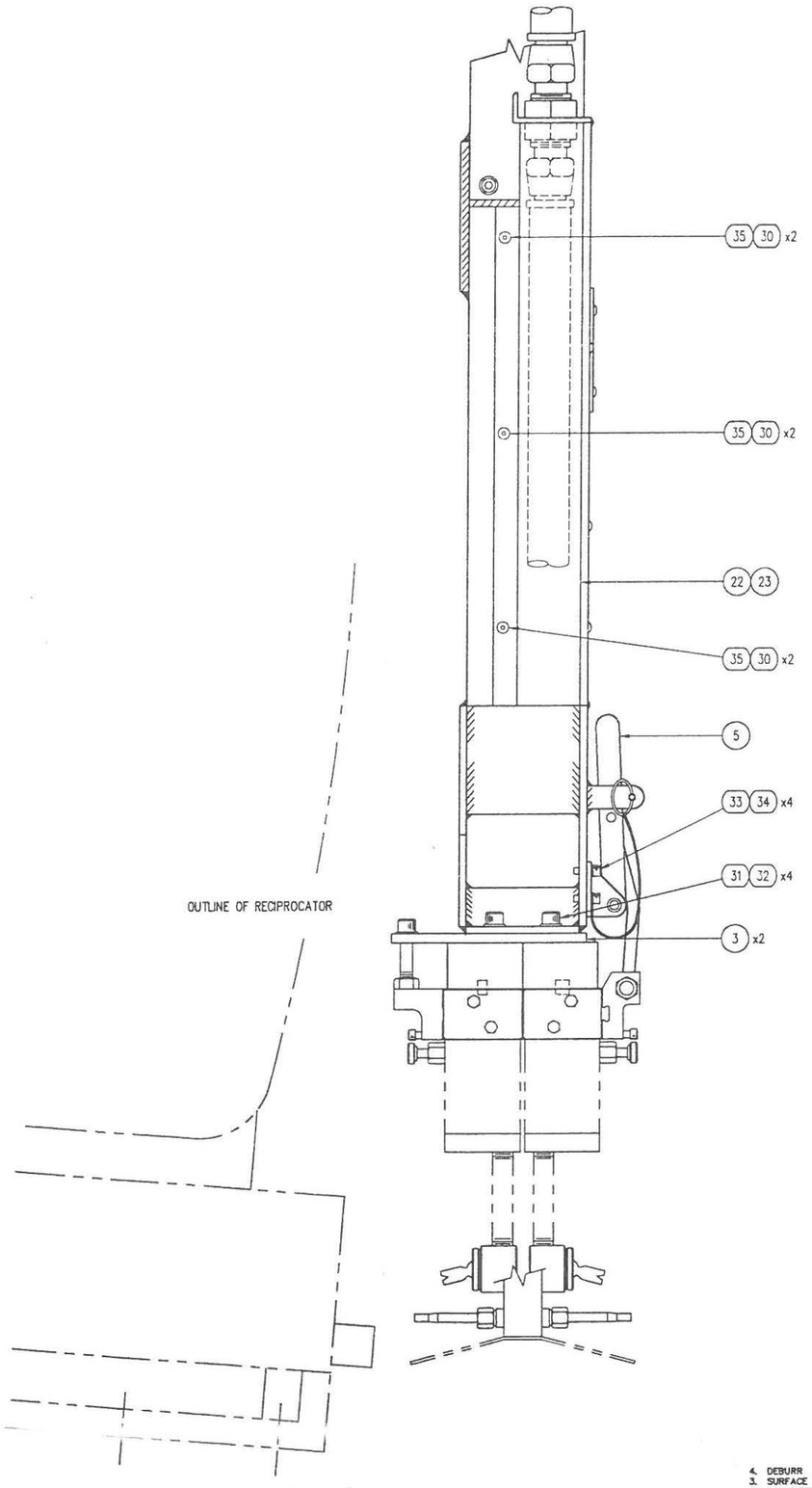
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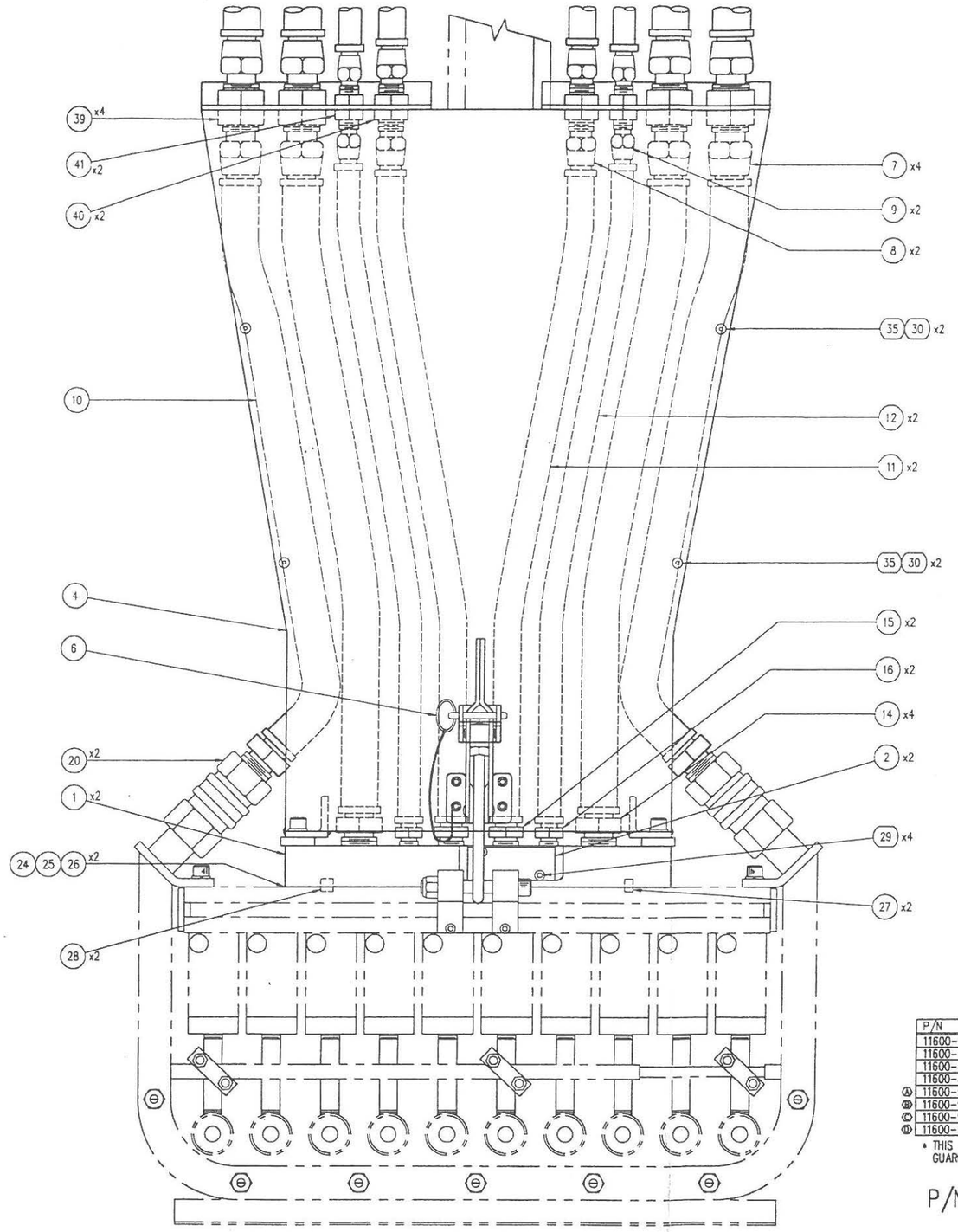
Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-83 - 1L HEAD ASSY 18 LG

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	1.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	1.000	EA	FM	P	OR
3	15170-051	CLEAT	2.000	EA	FM	P	B
4	11621-18	SPRAY ARM HEAD 18"	1.000	EA	FM	P	D
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	3.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	1.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	1.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	4.500	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	1.500	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	1.500	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	3.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	1.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	1.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
22	11621-13	HOSE GUARD 18" HS	1.000	EA	CM	P	C
23	11621-14	HOSE GUARD 18" OS	1.000	EA	CM	P	C
24	02102-132	O'RING 2-132	1.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	1.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	1.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	1.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	1.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	2.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	6.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	6.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	

///





P/N	DESCRIPTION
11600-82*	11 INCH ARM, DOUBLE LUBE
11600-87	18 INCH ARM, DOUBLE LUBE
11600-81	24 INCH ARM, DOUBLE LUBE
11600-85	31 INCH ARM, DOUBLE LUBE
Ⓐ 11600-92*	14 INCH ARM, DOUBLE LUBE
Ⓑ 11600-95	28 INCH ARM, DOUBLE LUBE
Ⓒ 11600-97	36 INCH ARM, DOUBLE LUBE
Ⓓ 11600-100*	16 INCH ARM, DOUBLE LUBE

* THIS ASSEMBLY DOES NOT HAVE HOSE GUARDS (ITEM NO.'S 22 & 23)

P/N 11600-81

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
		REVISIONS			

ER	DATE	REMARKS	LET	DR	CK
	96				
355	10.31 96	ADDED P/N 11600-97	C	MFG	
075	03.18 96	ADDED P/N 11600-95	B	MFG	
	12.11. 95	ADDED P/N 11600-92	A	HDA	
		REVISIONS			

MAT'L: SEE B.O.M. OF PARTICULAR ASSEMBLY

DR JBA | DATE 02.15.95 | SCALE HALF | PIC

CK | DATE | DR DAI | SHEET | OF

RIMROCK CORPORATION
1700 RIMROCK ROAD
P.O. BOX 19867
COLUMBUS, OHIO 43219
PHONE: 614-471-5628 TELEX: 245-401 FAX: 614-471-0063
® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

DRAWING NO. 410D11600-81 | REV D

DRAWING NAME SPRAY ARM ASSEMBLY, 2 LUBE
11, 14, 18, 24, 28, 31 & 36 IN. ARMS

FOR 410 RECIP

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ± 1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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103

INDEPENDENT AIR PILOTED AUTOMATIC SPRAY NOZZLE*

MODEL 026 Series

TYPICAL APPLICATIONS:
Die casting.....Die Release
Forging.....Die Lubrication

SPRAY PATTERNS AVAILABLE:
Flat fan or solid cone.

SPRAY DIRECTION:
Extended figure "8" type spray outlet adjustable thru 360°. No tools required.

LIQUID FLOW:
Independent control of each outlet adjustable by turning dial knobs.

LIQUID SHUTOFF:
Needle type sealing in replaceable Viton seat.

SIZE:
2¾" lg. x 2" high x 2¾" deep.

WEIGHT:
11 oz.

LIQUID INLET:
As supplied in manifold.

SPRAY ATOMIZING AIR INLET:
As supplied in manifold.

PILOT AIR INLET:
As supplied in manifold.

PILOT AIR PRESSURE:
Air-actuated piston shutoff requires 40 PSI minimum pressure controlled by remote 3-way valve.

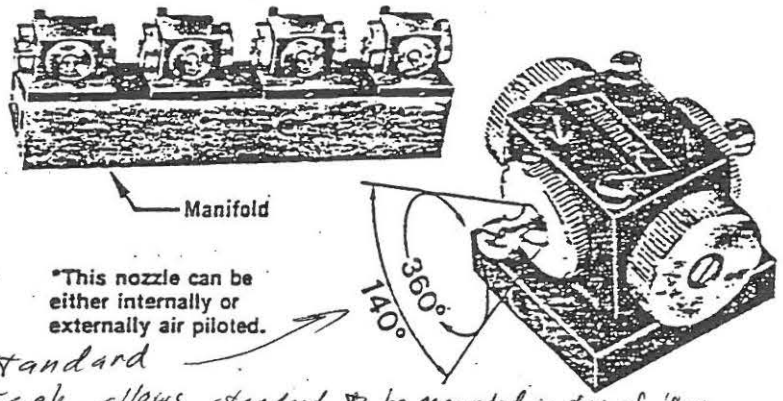
SPRAY ATOMIZING AIR PRESSURE:
Set pressure to achieve degree of atomizing desired, controlled by remote 3-way valve.

LIQUID PRESSURE:
Same as atomizing air pressure

MOUNTING:
Multiple nozzle mounted on manifold. For use on reciprocating type mechanisms for spraying opposing surfaces. Standoff mounting also available.

MATERIAL:
Aluminum, Brass, Polyurethane and Viton Seals.

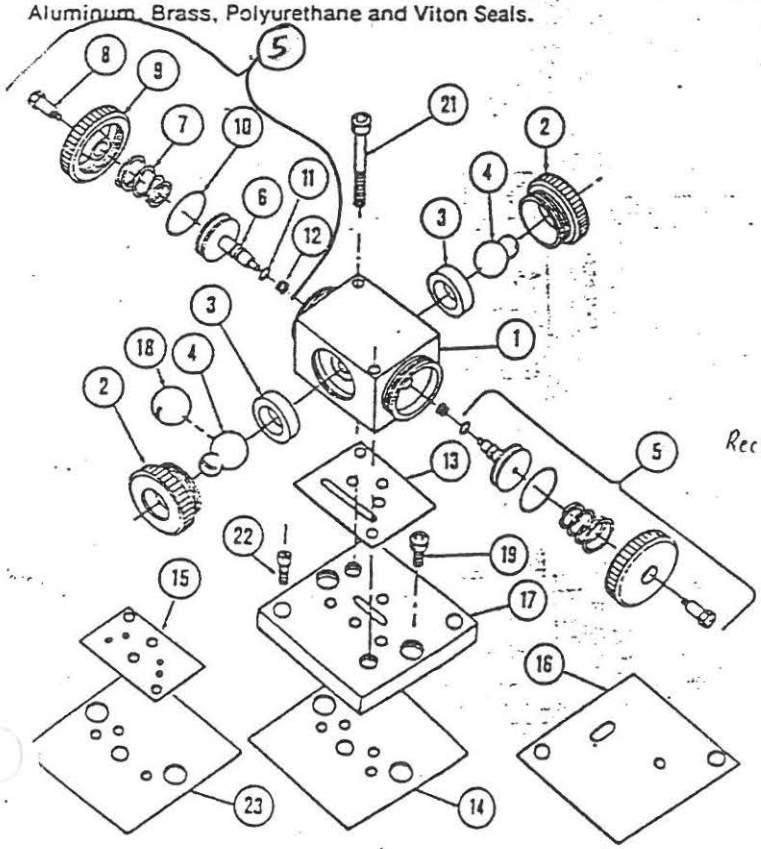
This automatic nozzle is a double-headed improved version of the Model 016 nozzle. It is used for spraying opposing surfaces simultaneously and can be manifold-mounted, ideal for reciprocating mechanisms. It incorporates the unique Figure "8" type spray outlet that is adjustable through a 360° rotation and a 140° arc. This makes it very easy to direct the two sprays other than 180° from each other. Its self-contained, needle-type shutoff and lube metering assembly can be easily removed without tools when cleaning or repairing is required.



*This nozzle can be either internally or externally air piloted.

026 Standard
026 Stack, allows standard to be mounted on top of it

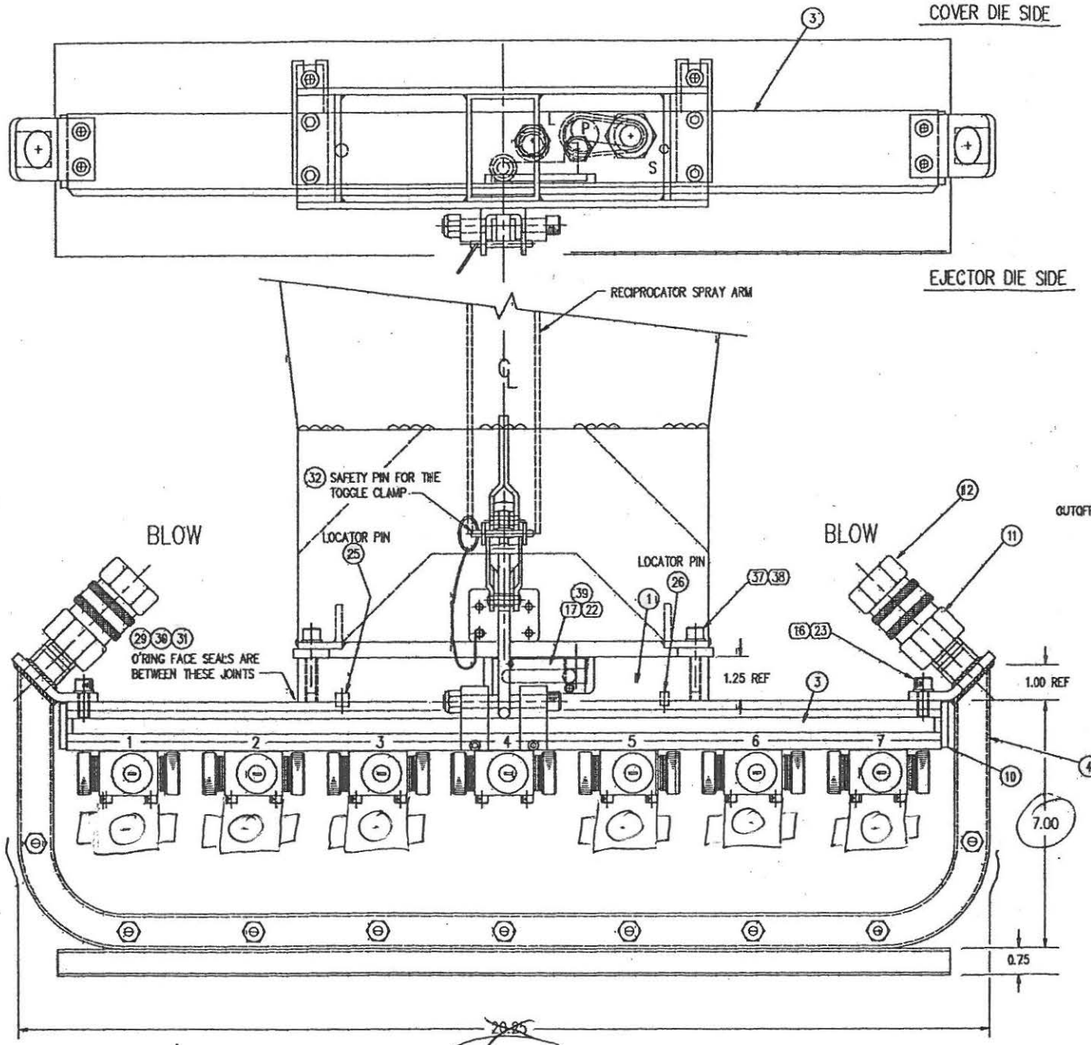
MOUNTING ARRANGEMENT	PART NUMBERS		
	EXTENDED ORIFICE "EIGHT BALL"		Optional Reversible Ball With Wide Conical
	FAN	CONICAL	CONICAL/FAN
Manifold Mounted	026-02100	026-03000	026-01000
Standoff Mounted	026-02110	026-03010	026-01010

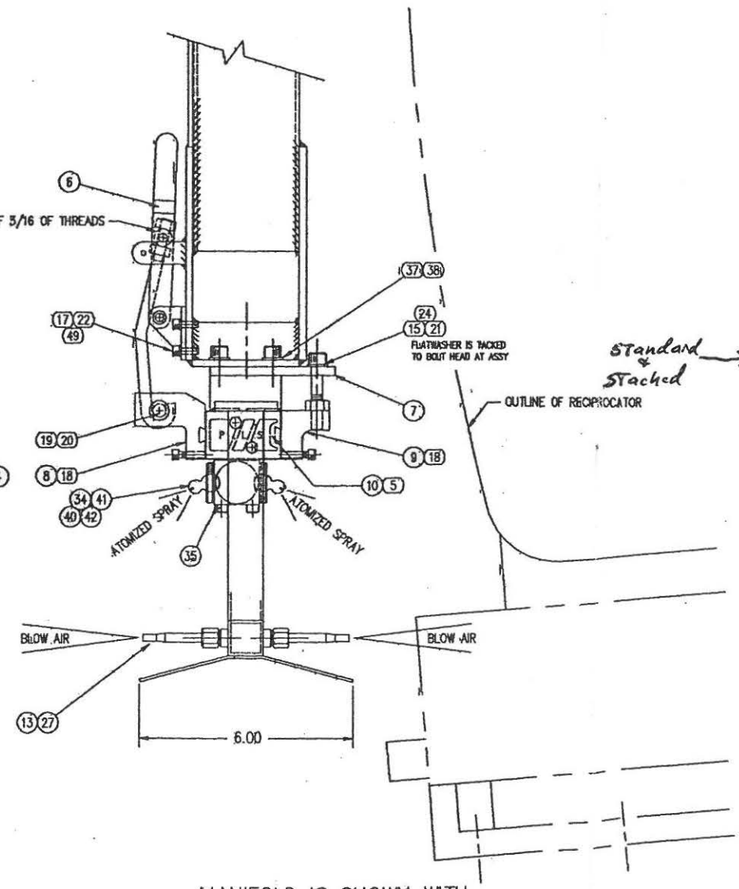


REF. NO.	PART NAME	PART NUMBER	
1	Nozzle Body	09540	
2	Ball Lock Ring	02455	TR
3	Ball Retainer Sleeve	06266K	TR
4	Extended '8' Orifice (Fan)	02456	
	Extended '8' Orifice (Conical)	02465	TR
5	Dial Knob Assembly	06267	TR
6	Piston	06253C	
7	Spring	01271D	
8	Retainer	06254C	
9	Dial Knob	06255C	
10	O-Ring (Air)	01125E	
11	O-Ring (Liquid)	01056E	
12	Orifice Seal (Viton)	01279E	
13	Gasket (Nozzle)	08376F	TR
14	Gasket (Manifold)	09542F	
15	Gasket (Nozzle)	09658F	TR
16	Gasket (006 Recip. Manifold Only)	08381F	
17	Nozzle Bottom Plate	08369	
18	Reversible Ball—Fan and Conical Pattern		
	3/16 Dia. Hole for Wide Conical	02466C	
	3/32 Dial Hole for Narrow Conical	02457C	
19	¼—20 Mach. Screw 2 required	02546	
20	Adapter for Universal Mount Bracket	08377	
21	#10-32 x 1½ Mach. Screw 2 required	02549	
22	#10-32 x 1" Mach. Screw 2 required	02554	
23	Gasket (Manifold External Air Pilot)	09542-1F	
	Repair Kit includes 2 each of Items #3, 10, 11, 12	06265	

Rec1, Rec4
Rec5

REC6





REC5
Note! See Drawing # 110015971 in Front cover of this Book
Item 3 # 15622-071

MANIFOLD IS SHOWN WITH IT'S FULL COMPLIMENT OF 7 NOZZLES

ASSY P/N 15971-105

35a 026-31000 Stackable nozzle body

Standard & Stacked

ITEM	DESCRIPTION	QUAN.	PART N°	
42	SPRAY BALL – CONICAL	REF	02465	
41	SPRAY BALL – FAN	REF	02456	
40	LOCK RING – ALUM	REF	02455	TR
39	SEAL PLATE	REF	08384-22	
38	LOCKWASHER M8	REF	09001-113	
37	SHCS M8 x 40mm	REF	09015-40	
36	GASKET (USE WITH ITEM 35)	REF	09858F	TR
35	MODEL 026 NOZZLE	REF	026-01000	
34	RETAINER SEAL – POLYURETHANE	REF	06266K	TR
33	COVER CAP	REF	09541	
32	SPRING LOADED SAFETY PIN	REF	02862-202	
31	O'RING 2-116 VITON	REF	01340E	
30	O'RING 2-113 VITON	REF	01125E	
29	O'RING 2-132 VITON	REF	02102-132	
28				
27	COMPRESSION FITTING – BRASS	18	01068C	
26	DOWEL PIN 1/4 DIA X 3/8	REF	02749-6	
25	DOWEL PIN 3/8 DIA X 3/8	REF	03063-17	
24	FLATWASHER 5/16	2	02879-5	
23	LOCKWASHER 5/16	2	02695-5	
22	LOCKWASHER M4	REF	09001-08	
21	JAM NUT 5/16-18	2	02653	
20	ELASTIC STOP NUT 3/8-16	1	02386-6	
19	SHCS 3/8-16 X 2 3/4	1	02578-44	
18	SHCS #10-32 X 3/4	4	02353	
17	SHCS M4 x 12mm	REF	09010-12	
16	SHCS 5/16-18 X 3/4	2	02568	
15	SHCS 5/16-18 X 2"	2	02573	
14	JACK CHAIN #14	7"	07547-02	
13	BLOW TUBE ORIFICE 1/4 O.D. X 2" CU	18	01767	
12	DISCONNECT INSERT 3/4 NPT	REF	15624-05	
11	QUICK DISCONNECT 3/8 NPT	2	15624-19	
10	END CAP – ALUM	2	15170-005	
9	BOLT MOUNT – ALUM	2	15170-008	
8	HOOK CLEAT – ALUM	2	15170-027	
7	CLAMP CLEAT – HARDENED STEEL	REF	15170-051	
6	TOGGLE CLAMP	REF	15171-027	
5	HH S TAP SCREW #10-32 X 1/2	4	03062-30	
4	BLOW TUBE WELDMENT	1	15621-508	
3	24" MANIFOLD – ALUM EXTRUSION	1	15622-125	
2				
1	ADAPTER MANIFOLD – ALUM	REF	08384-21	

TR TR TR

Note!

NOTES (UNLESS OTHERWISE SPECIFIED)
1. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
4. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

MATL:

RIMROCK® RIMROCK CORPORATION 17001 RIMROCK ROAD P.O. BOX 15002 COLUMBUS, OHIO 43215 PHONE: 614-471-8926 TELEX: 245-401 FAX: 614-471-0063 ® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

TOLERANCES UNLESS SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DR LRK	DATE 1.27.95	SCALE HALF	FYC
CK	DATE	ER 600	SHEET OF
DRAWING NO.	110 D15971-105		REV
DRAWING NAME	24" Q.R. EXTRUSION MANIFOLD – 1 LUBE W/ 026 NOZZLES		
FOR	410 RECIP		

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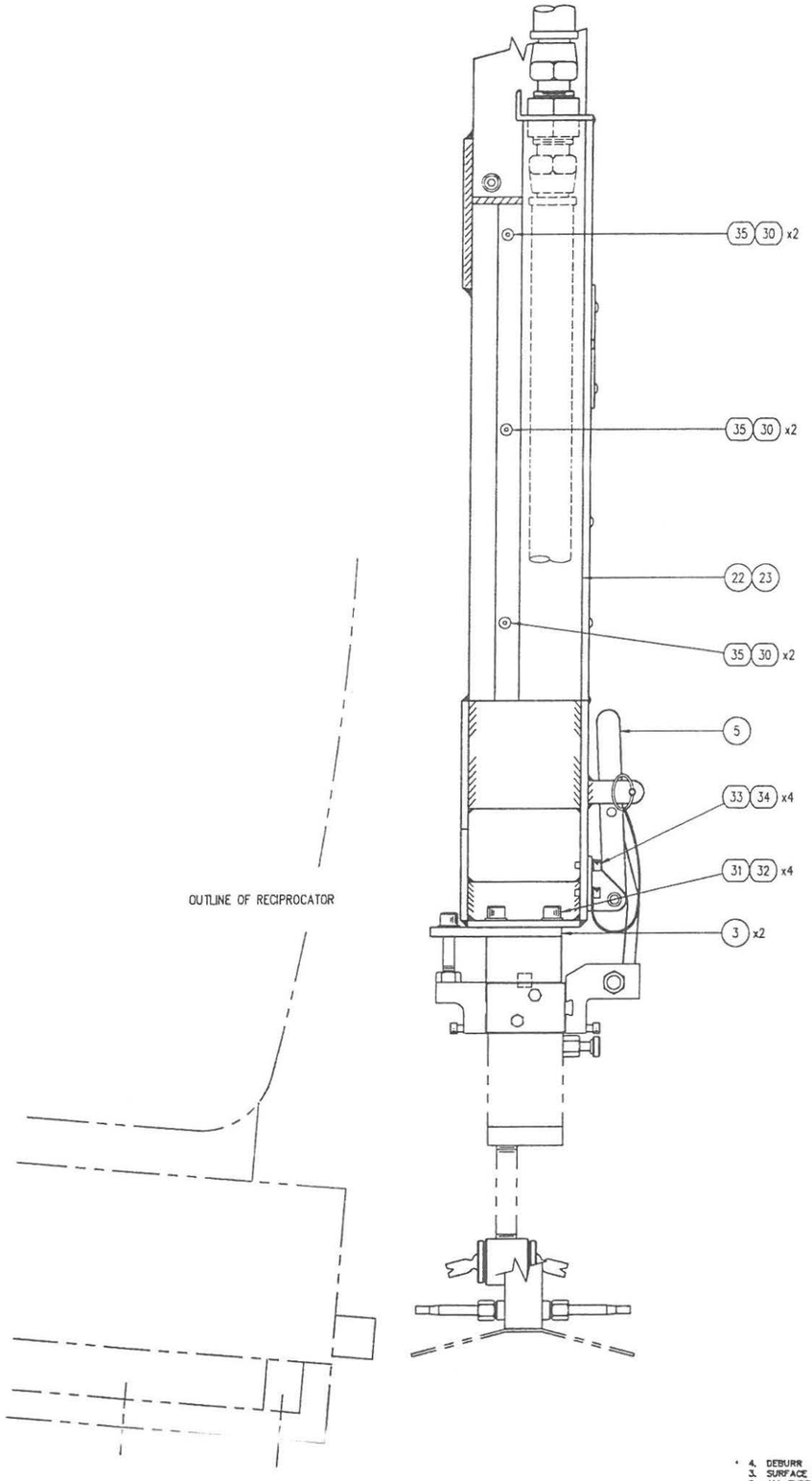
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REVISIONS					

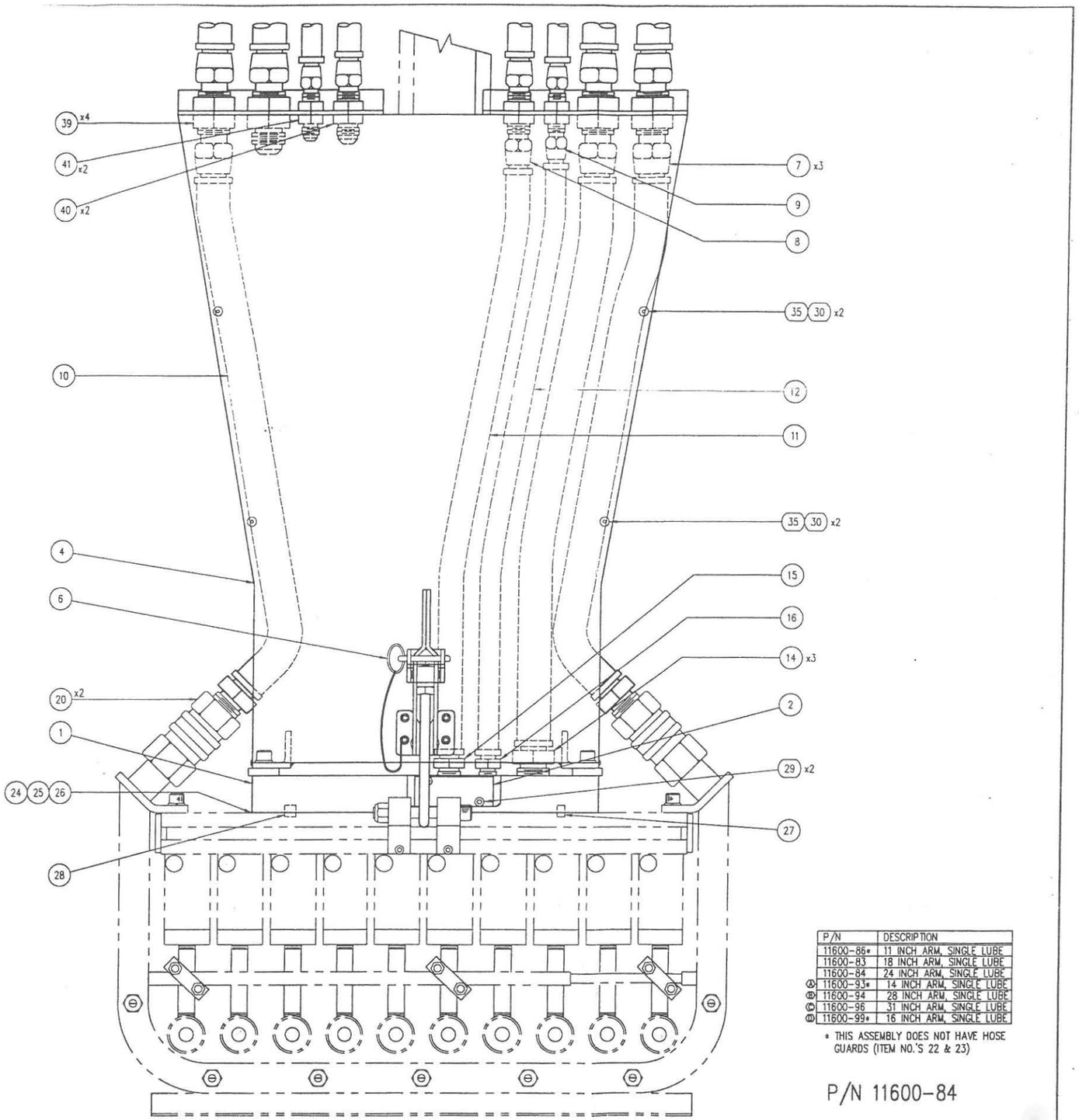
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Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-84 - 1L HEAD ASSY 24" LG

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	08384-21	ADAPTER PLATE	1.000	EA	FM	M	B
2	08384-22	PILOT SEAL PLATE	1.000	EA	FM	P	OR
3	15170-051	CLEAT	2.000	EA	FM	P	B
4	11621-24	24" ARM-SPRAY HEAD 410	1.000	EA	FM	P	E
5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P	
6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P	OR
7	02537-12	FITTING FEMALE HOSE #12	3.000	EA	CM	P	
8	02537-8	FITTING FEMALE HOSE #8	1.000	EA	CM	P	
9	02537-6	FITTING FEMALE HOSE #6	1.000	EA	CM	P	
10	01836	#12 RUBBER HOSE (RAW)	6.000	FT	CM	P	
11	01834	#8 RUBBER HOSE (RAW)	2.000	FT	CM	P	
12	01833	#6 RUBBER HOSE (RAW)	2.000	FT	CM	P	
14	02535	FITTING MALE HOSE 12-12	3.000	EA	CM	P	
15	02532	FITTING MALE HOSE 6-8	1.000	EA	CM	P	
16	02530	FITTING MALE HOSE 4-6	1.000	EA	CM	P	
20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P	OR
22	11621-11	HOSE GUARD 24" HS	1.000	EA	FM	P	A
23	11621-12	HOSE GUARD 24" OS	1.000	EA	FM	P	A
24	02102-132	O'RING 2-132	1.000	EA	CM	P	OR
25	01340-E	O RING VITON 2-116	1.000	EA	CM	P	
26	01125-E	O RING VITON 2-113	1.000	EA	CM	P	
27	02749-6	DOWEL PIN 1/4 X 3/8	1.000	EA	HW	P B	
28	03063-17	DOWEL PIN 3/8 X 1/2	1.000	EA	HW	P B	
29	09100-10	FHSCS M4 -.70 x 10mm LG	2.000	EA	HW	P B	OR
30	09001-08	LOCKWASHER M4	10.000	EA	HW	P B	OR
31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
32	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P B	
34	09001-10	LOCKWASHER M5	4.000	EA	HW	P B	
35	09130-12	BHCS M4 -0.70 X 12mm	10.000	EA	HW	P B	
39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P	
40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P	
41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P	





P/N	DESCRIPTION
11600-86*	11 INCH ARM, SINGLE LUBE
11600-83	18 INCH ARM, SINGLE LUBE
11600-84	24 INCH ARM, SINGLE LUBE
(A) 11600-93*	14 INCH ARM, SINGLE LUBE
(B) 11600-94	28 INCH ARM, SINGLE LUBE
(C) 11600-96	31 INCH ARM, SINGLE LUBE
(D) 11600-99*	16 INCH ARM, SINGLE LUBE

* THIS ASSEMBLY DOES NOT HAVE HOSE GUARDS (ITEM NO.'S 22 & 23)

P/N 11600-84

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
			430	12.12	ADDED P/N 11600-93 TO TABLE
			105	4.11.96	ADDED P/N 11600-96
			075	03.18.96	ADDED P/N 1160094
				12.12.95	ADDED P/N 11600-93

REVISIONS

LET	DR	CK
C	ACY	
B	MQ	
A	HDA	

MATL: SEE B.O.M. OF PARTICULAR ASSEMBLY

DR JBA | DATE 02.15.95 | SCALE HALF | PIC
CK | DATE | ER 041 | SHEET 1 OF 1

RIMROCK®
1700 RIMROCK ROAD
P.O. BOX 18867
COLUMBUS, OHIO 43218
PHONE: 614-471-5828 TELEX: 245-401 FAX: 614-471-0063
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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

410D11600-84 | D

DRAWING NAME: SPRAY ARM ASSEMBLY, SINGLE LUBE
11, 14, 16, 18, 24, 28, & 31 IN. ARM LENGTHS
FOR 410 RECIP

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT

14:50:25 08 MAY 1996 Acct ACY Port 8

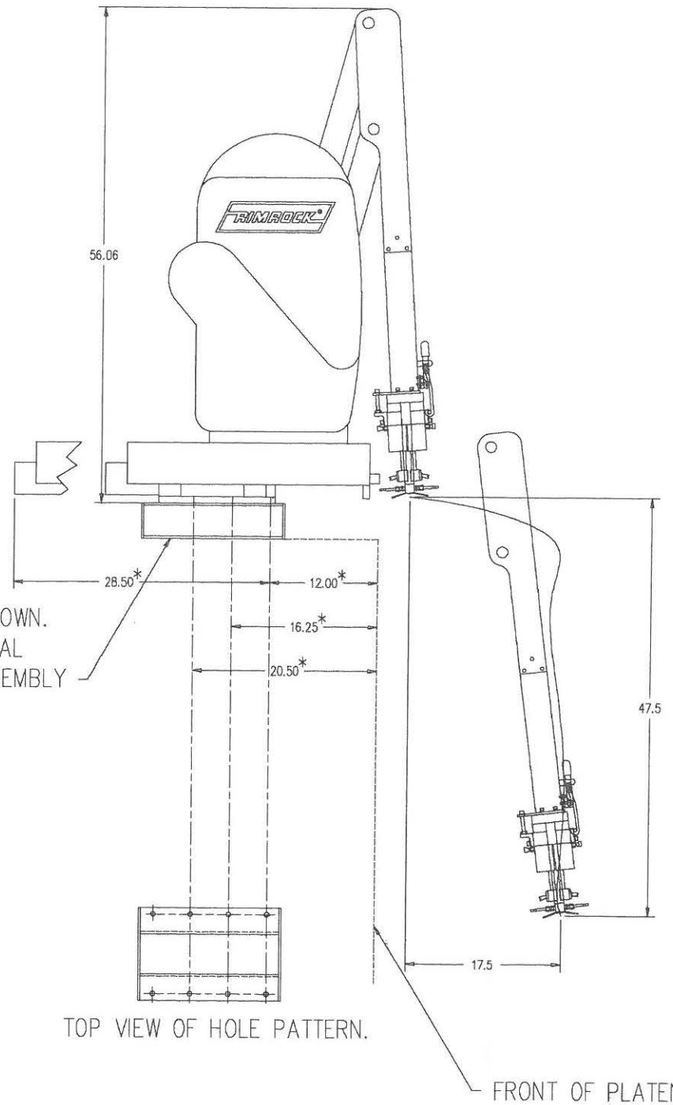
Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-93 - 1L HEAD ASSY 14" LG.

B	Bal Numbr	Part Number	Description	Qty/ Assy	UM	IT	MP PH	BT NP	Rv Lv
	1	08384-21	ADAPTER PLATE	1.000	EA	FM	M		B
	2	08384-22	PILOT SEAL PLATE	1.000	EA	FM	P		OR
	3	15170-051	CLEAT	2.000	EA	FM	P		B
	4	11621-45	SPRAY ARM HEAD 14"	1.000	EA	FM	P		A
	5	15171-02	CLAMP TOGGLE	1.000	EA	CM	P		
	6	02862-202	QUICK RELEASE PIN 3/16IN.	1.000	EA	CM	P		OR
	7	02537-12	FITTING FEMALE HOSE #12	3.000	EA	CM	P		
	8	02537-8	FITTING FEMALE HOSE #8	1.000	EA	CM	P		
	9	02537-6	FITTING FEMALE HOSE #6	1.000	EA	CM	P		
	10	01836	#12 RUBBER HOSE (RAW)	3.000	FT	CM	P		
	11	01834	#8 RUBBER HOSE (RAW)	1.000	FT	CM	P		
	12	01833	#6 RUBBER HOSE (RAW)	1.000	FT	CM	P		
	14	02535	FITTING MALE HOSE 12-12	3.000	EA	CM	P		
	15	02532	FITTING MALE HOSE 6-8	1.000	EA	CM	P		
	16	02530	FITTING MALE HOSE 4-6	1.000	EA	CM	P		
	20	15624-05	QUICK DISCONNECT NIPPLE	2.000	EA	CM	P		OR
	24	02102-132	O'RING 2-132	1.000	EA	CM	P		OR
	25	01340-E	O RING VITON 2-116	1.000	EA	CM	P		
	26	01125-E	O RING VITON 2-113	1.000	EA	CM	P		
	27	02749-6	DOWEL PIN 1/4 X 3/8	1.000	EA	HW	P	B	
	28	03063-17	DOWEL PIN 3/8 X 1/2	1.000	EA	HW	P	B	
	29	09100-10	FHSCS M4 -.70 x 10mm LG	2.000	EA	HW	P	B	OR
	31	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P	B	OR
	09132	09001-13	LOCKWASHER M8	4.000	EA	HW	P	B	
	33	09012-16	SHCS M5 -0.80 x 16mm	4.000	EA	HW	P	B	
	34	09001-10	LOCKWASHER M5	4.000	EA	HW	P	B	
	39	08962-12	BULKHEAD UNION #12	4.000	EA	CM	P		
	40	08962-8	BULKHEAD UNION #8	2.000	EA	CM	P		
	41	08962-6	BULKHEAD UNION #6	2.000	EA	CM	P		

MODEL 410–47 INCH STROKE
RECIPROCATOR.

NOTE: THE DIMENSIONS MARKED WITH AN * ARE ONLY RECOMMENDED VALUES FOR MANIFOLD CLEARANCE TO COVER DIE WHEN THE 410 IS FULLY RETRACTED ON IT'S BASE. THESE VALUES ARE SUBJECT TO CHANGE DEPENDING ON MANIFOLD WIDTH AND/OR SPECIAL BASE APPLICATIONS.



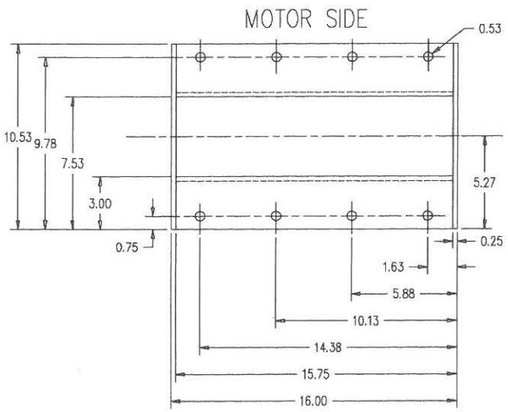
4 INCH OPTIONAL SPACER SHOWN. SPACER HEIGHTS ARE OPTIONAL DEPENDING ON MANIFOLD ASSEMBLY HEIGHT.

TOP VIEW OF HOLE PATTERN.

FRONT OF PLATEN.

TOP VIEW OF MOUNTING FOOT PRINT SHOWN AT TWICE SCALE FOR DIMENSION CLARITY.

WELDMENT AND DRILLING DETAIL



℄ OF RECIP. ARM AND PLATEN

THIS DRAWING IS FOR GENERAL USE ONLY.

4. DEBURR
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
			136	5.3.96	ADDED DIMS AND REMARKS FOR CLARITY	A	ACY

REVISIONS

MAT'L: LAYOUT

DR ACY | DATE 2.20.96 | SCALE 1/8 | PIC
CK | DATE | ER | SHEET 1 OF 1

RIMROCK CORPORATION
1700 RIMROCK ROAD
P.O. BOX 16967
COLUMBUS, OHIO 43216

DRAWING NO. SDRD47LAYOUT | REV B

DRAWING MODEL 410-47 INCH STROKE RECIP.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2–DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3–DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4–DIGIT DECIMALS= ±.0005

MOUNTING LAYOUT.

FOR

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08:28:34 06 AUG 1996 Acct ACY Port 8

Bill of Materials Sorted by Balloon Number by Part Number

Part Number 11600-26 - 410 43" STROKE

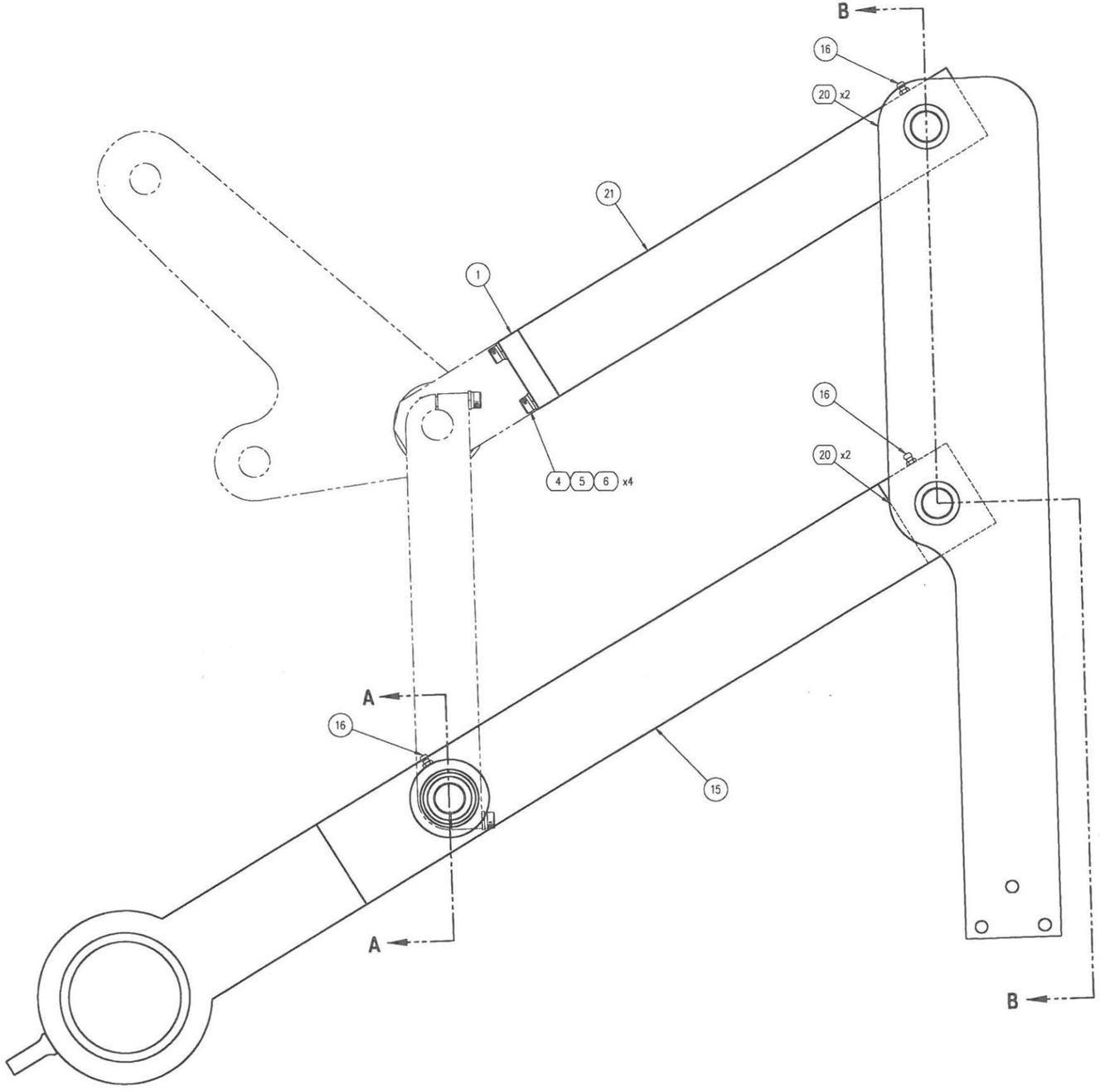
Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11630-03	GUIDE ARM END PLATE	1.000	EA	FM	P	C
2	11378-15	BEARING 25mm CUP & CONE	6.000	EA	CM	P	OR
3	03082-15	SEAL 30mm SHAFT	6.000	EA	CM	P	OR
4	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
5	09002-13	FLATWASHER M8	4.000	EA	HW	P B	OR
6	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
7	02213-11	SNAP RING 25mm HEAVY DUTY	3.000	EA	CM	P	OR
8	02408-11	THRUST WASHER 25mm X 1mm	6.000	EA	CM	P	OR
9	11630-01	ARM SPACER	2.000	EA	FM	P	B
12	11620-30	ARM PIN	2.000	EA	FM	M	B
14	11640-15	SHAFT SLEEVE	4.000	EA	FM	P	A
15	11630-927	DRIVE ARM 27"	1.000	EA	FM	P	OR
16	04527	GREASE FITTING	3.000	EA	CM	P	
17	03024-34	LOCKNUT BEARING 25mm KMH5	3.000	EA	CM	P	OR
18	03025-34	LOCKWASHER BEARING MBB5	3.000	EA	CM	P	OR
19	11620-15	410-43 SPRAY ARM SIDEPLAT	2.000	EA	FM	M	A
20	09043-12	SET SCREW M6 -1.00 X 12mm	4.000	EA	HW	P B	OR
21	11630-17	43 IN GUIDE ARM	1.000	EA	FM	P	OR
22	11640-53	GUIDE PIN	1.000	EA	FM	P	C
23	02259-187	SNAP RING 47.6mm INTERNAL	6.000	EA	CM	P	OR

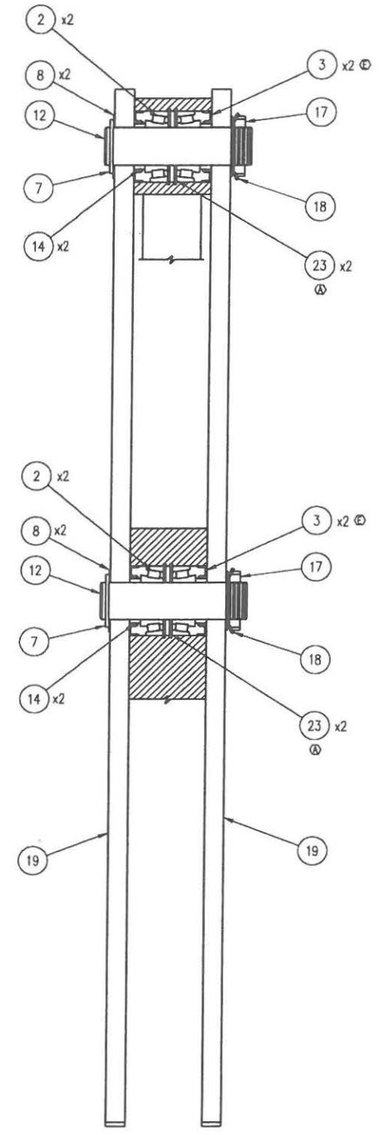
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Bill of Materials Sorted by Balloon Number by Part Number

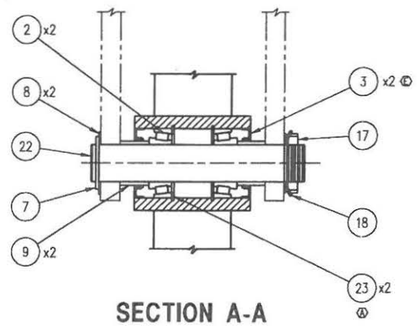
Part Number 11600-23 - 410 47" STROKE

Bal Nbr	Part Number	Description	Qty/ Assy	UM	IT	MPBT PHNP	Rv Lv
1	11630-03	GUIDE ARM END PLATE	1.000	EA	FM	P	C
2	11378-15	BEARING 25mm CUP & CONE	6.000	EA	CM	P	OR
3	03082-15	SEAL 30mm SHAFT	6.000	EA	CM	P	OR
4	09001-13	LOCKWASHER M8	4.000	EA	HW	P B	
5	09002-13	FLATWASHER M8	4.000	EA	HW	P B	OR
6	09015-40	SHCS M8 -1.25 x 40mm	4.000	EA	HW	P B	OR
7	02213-11	SNAP RING 25mm HEAVY DUTY	3.000	EA	CM	P	OR
8	02408-11	THRUST WASHER 25mm X 1mm	6.000	EA	CM	P	OR
9	11630-01	ARM SPACER	2.000	EA	FM	P	B
12	11620-30	ARM PIN	2.000	EA	FM	M	B
14	11640-15	SHAFT SLEEVE	4.000	EA	FM	P	A
15	11630-930	30" DRIVE ARM	1.000	EA	FM	P	A
16	04527	GREASE FITTING	3.000	EA	CM	P	
17	03024-34	LOCKNUT BEARING 25mm KMH5	3.000	EA	CM	P	OR
18	03025-34	LOCKWASHER BEARING MBB5	3.000	EA	CM	P	OR
19	11620-14	410-47 SPRAY ARM PLATE	2.000	EA	FM	M	OR
20	09043-12	SET SCREW M6 -1.00 X 12mm	4.000	EA	HW	P B	OR
21	11630-10	47 IN GUIDE ARM	1.000	EA	FM	P	A
22	11640-53	GUIDE PIN	1.000	EA	FM	P	C
23	02259-187	SNAP RING 47.6mm INTERNAL	6.000	EA	CM	P	OR





SECTION B-B



SECTION A-A

NOTE: P/N 11600-23 SHOWN

Ⓔ 43" ARM ASSY 7" SHRT ARM PLTS	11600-28
Ⓓ 43 INCH ARM ASSEMBLY	11600-26
47 INCH ARM ASSEMBLY	11600-23
DESCRIPTION	PART NUMBER

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
343	8.13 98	CORRECTED BALLOON #'S TO MATCH BILL	E	SMB	
003	01.06 97	ADDED ASSY #11600-28	D	MAS	ACV
225	7.15 96	ADDED 43" ASSY NUMBER	C	AR	
136	5.7 96	ADDED DESCRIPTION AND PART NUMBER	B	ACV	
133	5.1 95	ADD SNAP RINGS	A	JBA	

REVISIONS

MAT'L: SEE B.O.M.

RIMROCK CORPORATION
COLUMBUS, OHIO 43219
PHONE: 614-471-5926 FAX: 614-471-1073
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TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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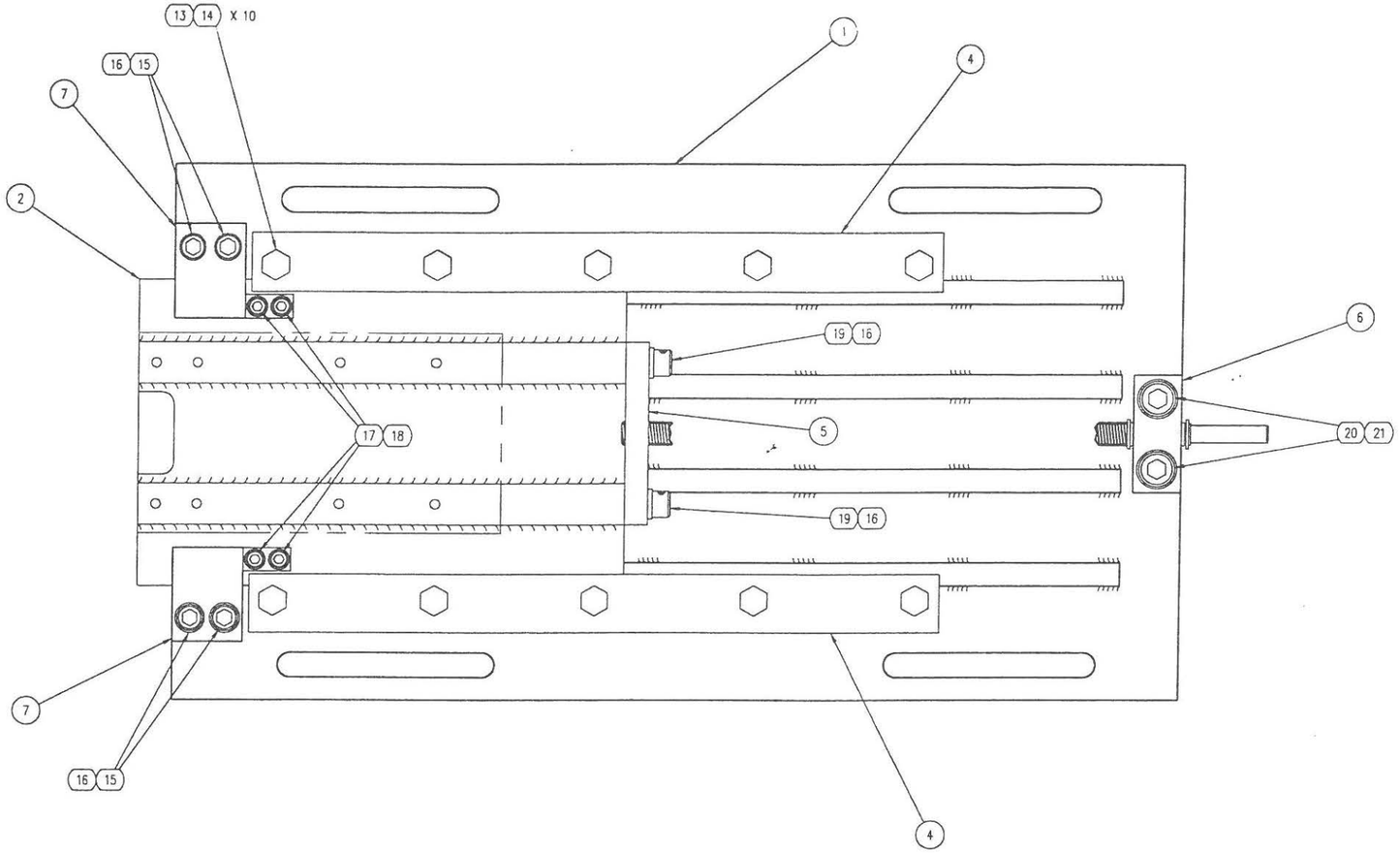
DR RCM DATE 1.3.95 SCALE 1:2 PIC
CK DATE ER 041 SHEET OF

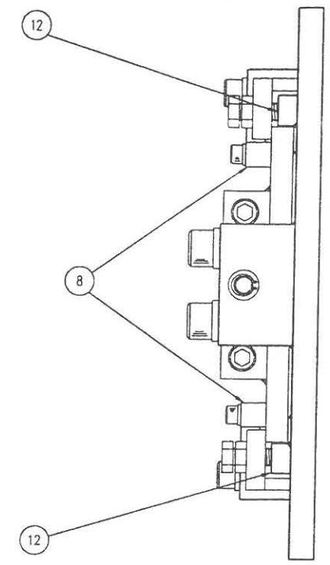
410D11600-23 E

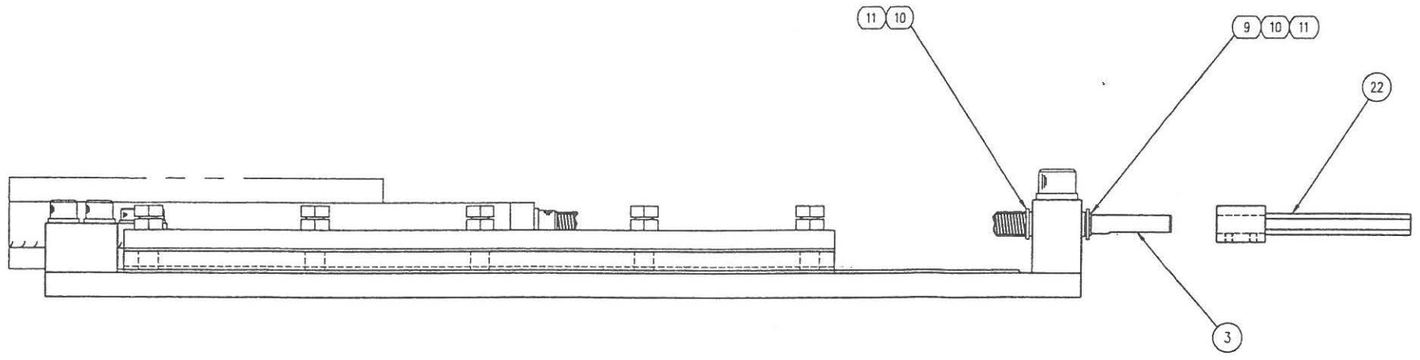
DRAWING NAME ARM ASSEMBLY

FOR 410 ARM

B10







ITEM	DESCRIPTION	QTY	PART NUMBER
22	BASE ADJUSTMENT TOOL	1	11201
21	1" LOCKWASHER	2	02695-16
20	SHCS 1-8 X 4	2	07927-4
19	SHCS 3/4-10 X 2	2	02948
18	1/2 LOCKWASHER	4	02695-8
17	SHCS 1/2-13 X 1.75	4	02589-5
16	3/4 LOCKWASHER	6	02695-12
15	SHCS 3/4-10 X 3	4	02948-2
14	3/4-10 HEX NUT	10	02659
A 13	HHCS 3/4-10 X 3.00	10	08701-35
A 12	GUIDE RAIL	2	11645-09
11	OILITE FLANGE BEARING SFF 1013-2	2	02188-12
10	TORRINGTON TRD1220 THRUST WASHER	2	02180-18
9	WALDES TRUARC SNAP RING #5160-75	1	02213-8
8	STOP BLOCK	2	11645-08
7	STOP BLOCK	2	11645-07
6	PUSH/PULL BLOCK	1	11645-06
5	BASE END CAP	1	11645-05
4	CONTINUOUS TOE CLAMP	2	11645-04
3	BASE ADJUSTMENT SCREW	1	11645-03
2	MOUNT/SLIDE WELDMENT	1	11645-02
1	BASE PLATE	1	11645-01

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK

REVISIONS

ER	DATE	REMARKS	LET	DR	CK
048	3.1.96	SHORTENED LENGTH OF BOLTS, ADDED CONTINUOUS GUIDE RAIL	A	JRC	

REVISIONS

MAT'L: SEE TABLE

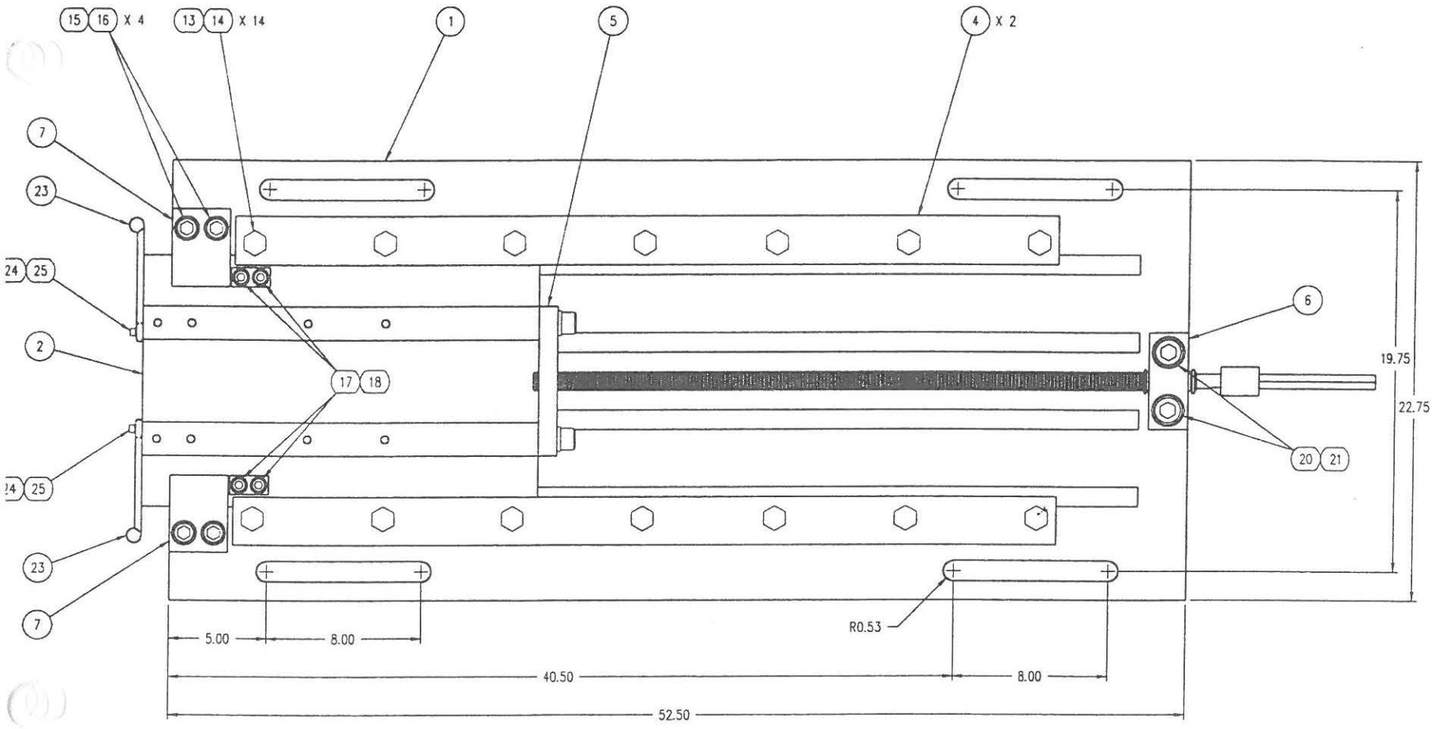
DR JRC DATE 6.03.95 SCALE NTS PIC
CK DATE ER 477

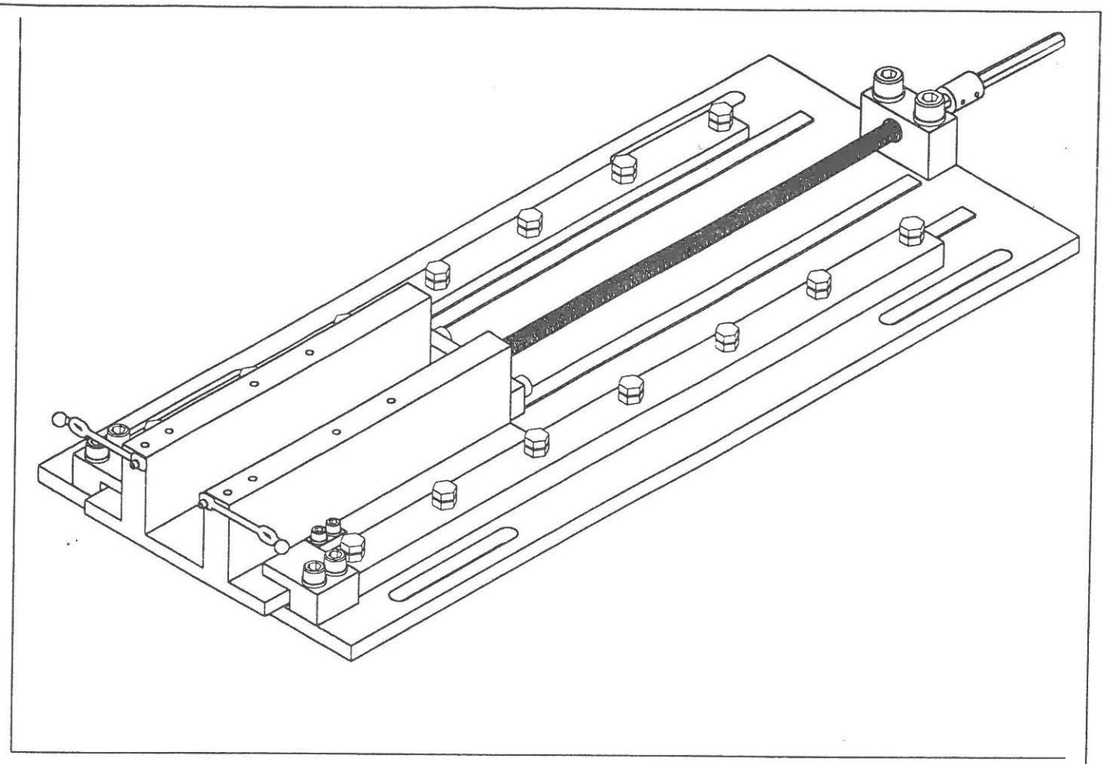
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RIMROCK CORPORATION
1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE: 614-471-5626
FAX: 614-471-1073
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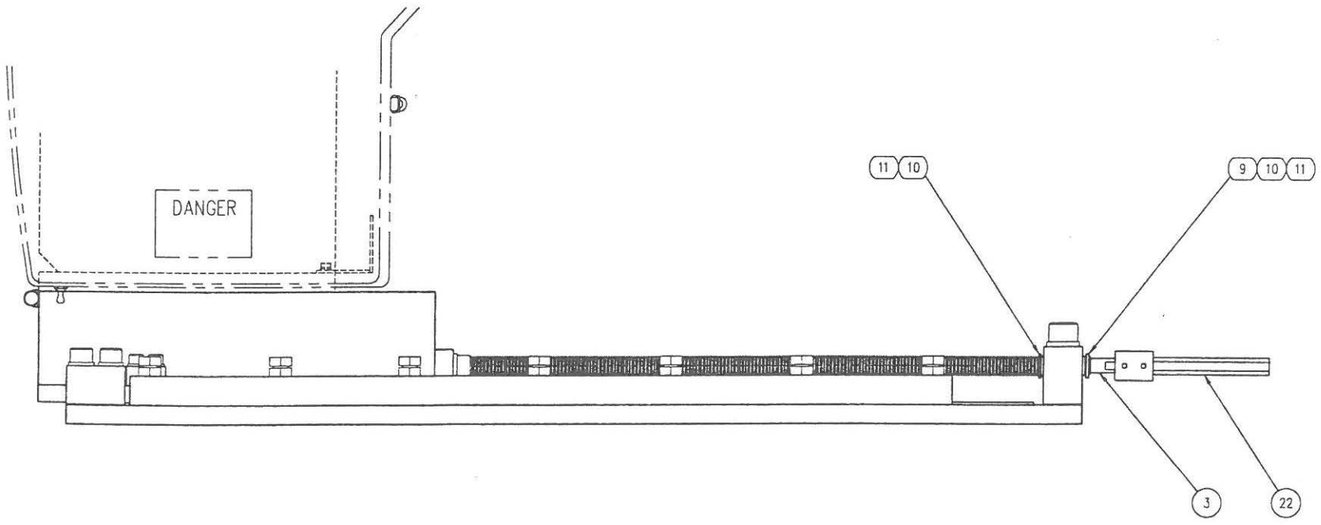
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

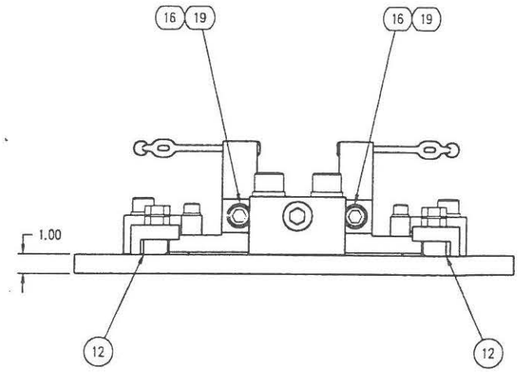
DRAWING NO. 410D11600-43 REV A
DRAWING NAME 20" TRAVEL MANUAL BASE
FOR TECUMSEH

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT.









ITEM	DESCRIPTION	QTY	PART NUMBER
25	SHCS M6 -1.00 X 25mm	2	09013-25
24	FLAT WASHER M6	2	09002-11
23	RUBBER STRAP LATCH	2	09973
22	BASE ADJUSTMENT TOOL	1	11201
21	1" LOCKWASHER	2	02695-16
20	SHCS 1-8 X 4	2	07927-4
19	SHCS 3/4-10 X 2	2	02948
18	1/2 LOCKWASHER	4	02695-8
17	SHCS 1/2-13 X 1.75	4	02589-5
16	3/4 LOCKWASHER	6	02695-12
15	SHCS 3/4-10 X 3	4	02948-2
14	3/4-10 HEX NUT	10	02659
13	HHCS 3/4-10 X 3.00	10	08701-35
12	GUIDE RAIL	2	11645-29
11	OILITE FLANGE BEARING SFF 1013-2	2	02188-12
10	TORRINGTON TRD1220 THRUST WASHER	2	02180-18
9	WALDES TRUARC SNAP RING #5160-75	1	02213-8
8	STOP BLOCK	2	11645-08
7	STOP BLOCK	2	11645-07
6	PUSH/PULL BLOCK	1	11645-06
5	BASE END CAP	1	11645-05
4	CONTINUOUS TOE CLAMP	2	11645-24
3	BASE ADJUSTMENT SCREW	1	11645-23
2	MOUNT/SLIDE WELDMENT	1	11645-22
1	BASE PLATE	1	11645-21

P/N 11600-49

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK

REVISIONS

MAT'L: SEE BILL OF MATERIAL

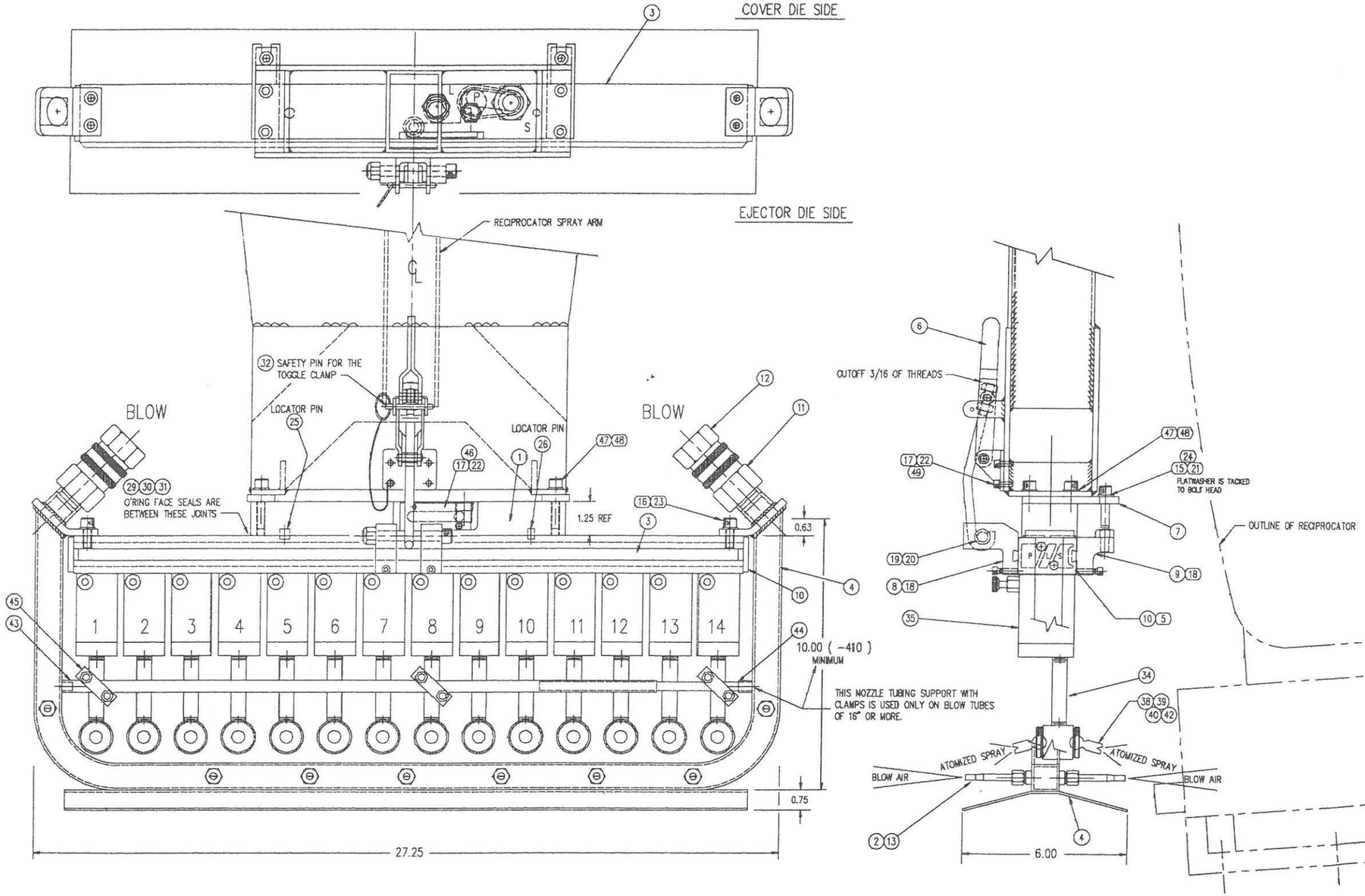
DR ACY | DATE 01.04.99 | SCALE 1/4 | PIC
CK | DATE | ER 10178

RIMROCK CORPORATION
1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE: 614-471-3826 FAX: 614-471-1073
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DRAWING NO. 410D11600-49 | REV
DRAWING NAME 30" MANUAL TRAVEL BASE ASSEMBLY
FOR 410 RECIPROCATOR

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

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MANIFOLD IS SHOWN WITH IT'S FULL COMPLIMENT OF 14 NOZZLES

ASSY P/N 15921-125

ITEM	DESCRIPTION	QUAN.	PART N°
50			
49	HEX NUT M4	REF	09000-08
48	LOCKWASHER M8	REF	09001-13
47	SHCS M8 X 40mm	REF	09015-40
46	SEAL PLATE	REF	08384-22
45	U-BOLT 1/4 DIA X 2" (3)	REF	02730-6
44	SUPPORT TUBE - INNER 8" (1)	REF	15621-021
43	SUPPORT TUBE - OUTER 22" (1)	REF	15621-020
42	SPRAY BALL - CONICAL	REF	15810-05
41	SPRAY BALL - FAN	REF	15810-08
40	LOCK RING - ALUM	REF	02455
39	RETAINER SEAL - POLYURETHANE	REF	06266K
38	SPRAY HEAD - ALUM	REF	11150
37	DOUBLE SPRAY HEAD - ALUM	REF	11151
36	SEAL (SILICONE RUBBER) USE WITH 33	REF	15265-01
35	MODEL 025 NOZZLE	REF	025-00000
34	PIPE NIPPLE ALUM 1/4 NPT X 3"	REF	11346-05
33	BLOCK OFF CAP	REF	08382-08
32	SPRING LOADED SAFETY PIN	REF	02862-202
31	O'RING 2-116 VITON	REF	01340E
30	O'RING 2-113 VITON	REF	01125E
29	O'RING 2-132 VITON	REF	02102-132
28	90° ALUM PIPE ELBOW 1/4 NPT	REF	15606-13
27	45° ALUM PIPE ELBOW 1/4 NPT	REF	15606-14
26	DOWEL PIN 1/4 DIA X 3/8	REF	02749-6
25	DOWEL PIN 3/8 DIA X 3/8	REF	03063-17
24	FLATWASHER 5/16	2	02879-5
23	LOCKWASHER 5/16	2	02695-5
22	LOCKWASHER M4	REF	09001-08
21	JAM NUT 5/16-18	2	02653
20	ELASTIC STOP NUT 3/8-16	1	02386-6
19	SHCS 3/8-16 X 2 3/4	1	02578-44
18	SHCS #10-32 X 3/4	4	02553
17	SHCS M4 X 12mm	REF	09010-12
16	SHCS 5/16-18 X 3/4	2	02568
15	SHCS 5/16-18 X 2"	2	02573
14	JACK CHAIN #4	7"	07547-02
13	BLOW TUBE ORIFICE 1/4 O.D. X 2" CU	18	01767
12	DISCONNECT INSERT 3/4 NPT	REF	15624-05
11	QUICK DISCONNECT 3/4 NPT	2	15624-19
10	END CAP - ALUM	2	15170-005
9	BOLT MOUNT - ALUM	2	15170-008
8	HOOK CLEAT - ALUM	2	15170-027
7	CLAMP CLEAT - HARDENED STEEL	REF	15170-051
6	TOGGLE CLAMP	REF	15171-02
5	HH S TAP SCREW #10-32 X 1/2	4	03062-30
4	BLOW TUBE WELDMENT	1	15621-510
3	24" MANIFOLD - ALUM EXTRUSION	1	15622-025
2	COMPRESSION FITTING - BRASS	18	01068C
1	ADAPTER MANIFOLD - ALUM	REF	08384-21

3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

MATL:

DR LRK DATE 11.26.94 SCALE HALF PIC
CK DATE ER 600 SHEET OF

RIMROCK®
RIMROCK CORPORATION
1700 RIMROCK ROAD
P.O. BOX 19367

DRAWING NO. 110D15921-125 REV

PHONES 614-471-5828 TELEX 245-401 FAX 614-471-0063
® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

DRAWING NAME 24" Q.R. EXTRUSION MANIFOLD-1 LUBE W/ 025 NOZZLES

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

FOR 410 RECIP

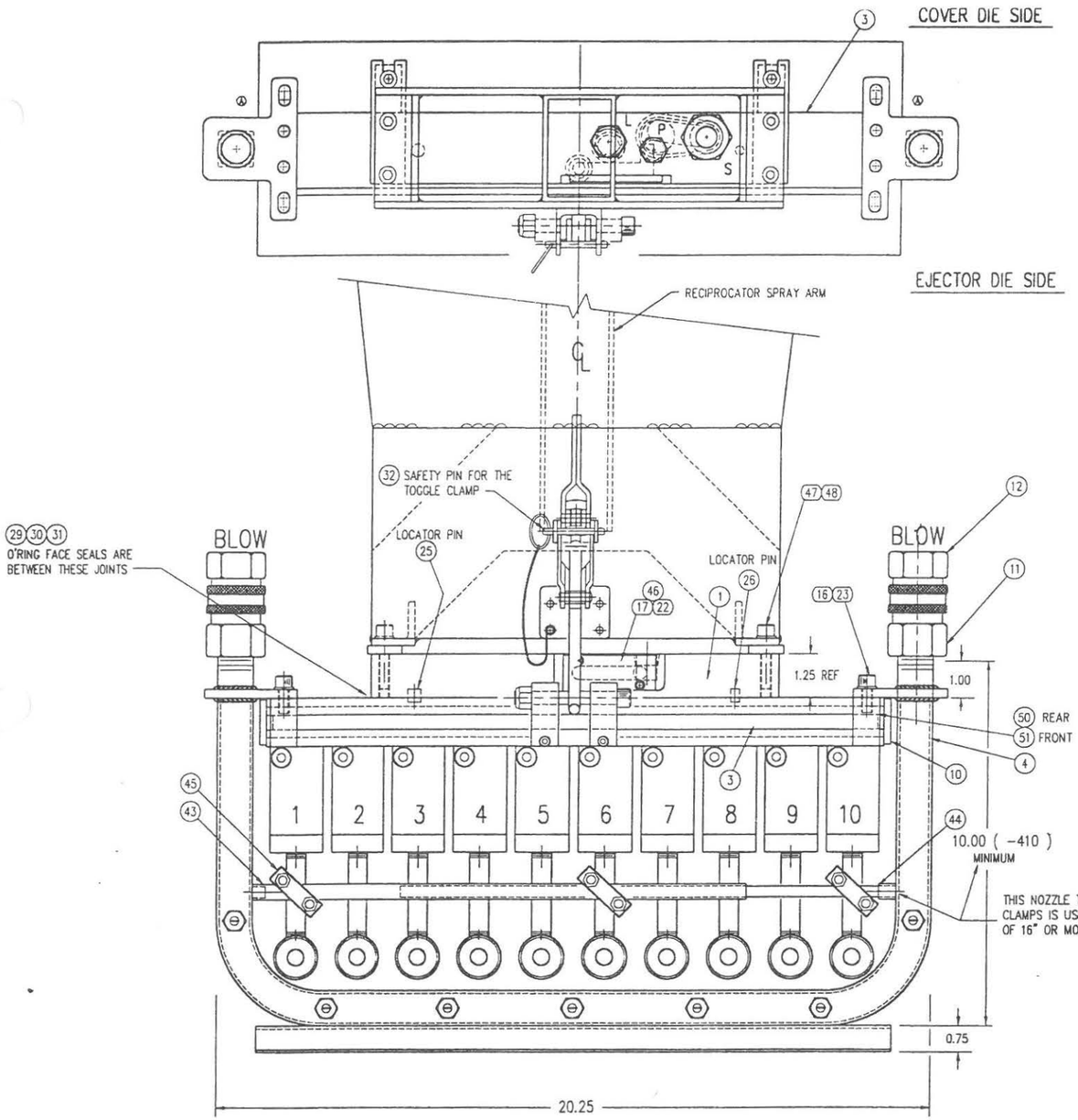
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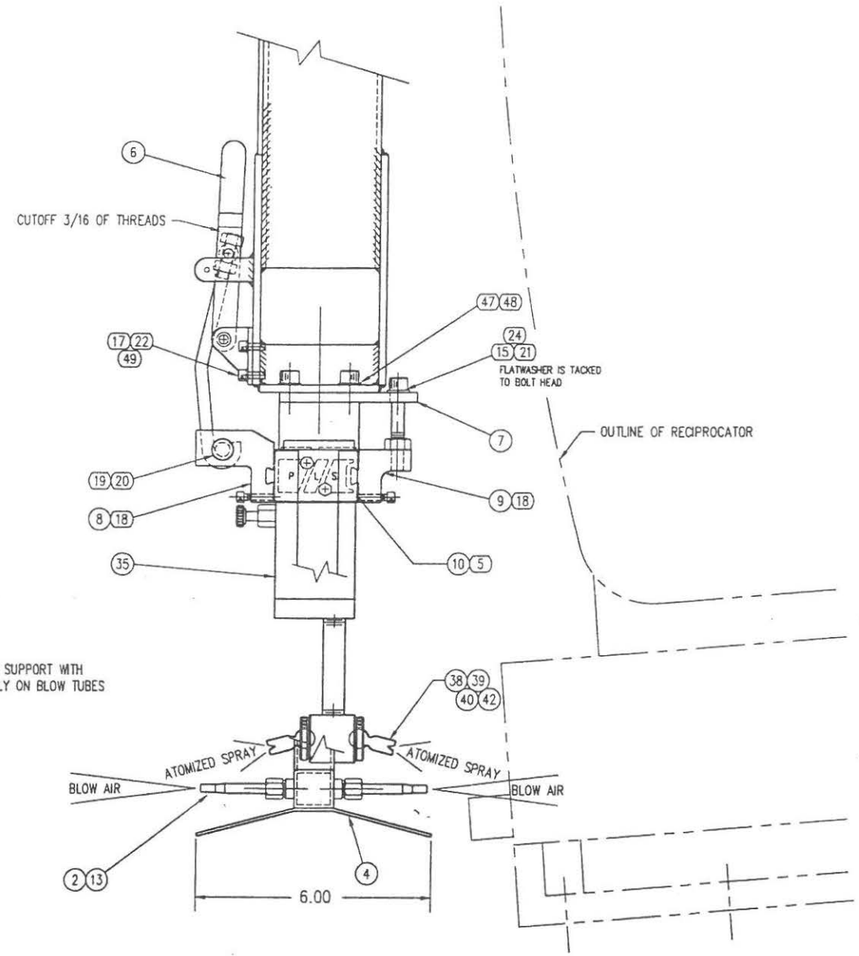
ER	DATE	REMARKS	LET	DR	CK

REVISIONS

ER	DATE	REMARKS	LET	DR	CK

REVISIONS





MANIFOLD IS SHOWN WITH IT'S FULL COMPLIMENT OF 10 NOZZLES

ASSY P/N 15911-125

	ITEM	DESCRIPTION	QUAN.	PART N°
Ⓐ	52	GASKET 1 LUBE	2	15170-240
Ⓐ	51	MOUNT CLEAT - FEMALE	2	15833-15
Ⓐ	50	MOUNT CLEAT - MALE	2	15833-14
	49	HEX NUT M4	REF	09000-08
	48	LOCKWASHER M8	REF	09001-13
	47	SHCS M8 X 40mm	REF	09015-40
	46	SEAL PLATE	REF	08384-22
	45	U-BOLT 1/4 DIA X 2" (3)	REF	02730-6
	44	SUPPORT TUBE - INNER 14" (1)	REF	15621-022
	43	SUPPORT TUBE - OUTER 14" (1)	REF	15621-019
	42	SPRAY BALL - CONICAL	REF	15810-05
	41	SPRAY BALL - FAN	REF	15810-08
	40	LOCK RING - ALUM	REF	02455
	39	RETAINER SEAL - POLYURETHANE	REF	06266K
	38	SPRAY HEAD - ALUM	REF	11150
	37	DOUBLE SPRAY HEAD - ALUM	REF	11151
	36	SEAL (SILICONE RUBBER) USE WITH 33	REF	15265-01
	35	MODEL 025 NOZZLE	REF	025-00000
	34	PIPE NIPPLE ALUM 1/4 NPT X 3"	REF	11346-05
	33	BLOCK OFF CAP	REF	08382-08
	32	SPRING LOADED SAFETY PIN	REF	02862-202
	31	O'RING 2-116 VITON	REF	01340E
	30	O'RING 2-113 VITON	REF	01125E
	29	O'RING 2-132 VITON	REF	02102-132
	28	90° ALUM PIPE ELBOW 1/4 NPT	REF	15606-13
	27	45° ALUM PIPE ELBOW 1/4 NPT	REF	15606-14
	26	DOWEL PIN 1/4 DIA X 3/8	REF	02749-6
	25	DOWEL PIN 3/8 DIA X 3/8	REF	03063-17
	24	FLATWASHER 5/16	2	02879-5
Ⓐ	23	LOCKWASHER 5/16	8	02695-5
	22	LOCKWASHER M4	REF	09001-08
	21	JAM NUT 5/16-18	2	02653
	20	ELASTIC STOP NUT 3/8-16	1	02386-6
	19	SHCS 3/8-16 X 2 3/4	1	02578-44
	18	SHCS #10-32 X 3/4	4	02553
	17	SHCS M4 X 12mm	REF	09010-12
Ⓐ	16	SHCS 5/16-18 X 3/4	8	02568
	15	SHCS 5/16-18 X 2"	2	02573
	14	JACK CHAIN #14	7"	07547-02
	13	BLOW TUBE ORIFICE 1/4 O.D. X 2" CU	14	01767
	12	DISCONNECT INSERT 3/4 NPT	REF	15624-05
	11	QUICK DISCONNECT 3/4 NPT	2	15624-19
	10	END CAP - ALUM	2	15170-005
	9	BOLT MOUNT - ALUM	2	15170-008
	8	HOOK CLEAT - ALUM	2	15170-027
	7	CLAMP CLEAT - HARDENED STEEL	REF	15170-051
	6	TOGGLE CLAMP	REF	15171-02
	5	HH S TAP SCREW #10-32 X 1/2	4	03062-30
	4	BLOW TUBE WELDMENT	1	15621-410
	3	18" MANIFOLD - ALUM EXTRUSION	1	15622-019
	2	COMPRESSION FITTING - BRASS	14	01068C
	1	ADAPTER MANIFOLD - ALUM	REF	08384-21

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125
4. DEBURR

ER	DATE	REMARKS	LET	DR	CK
012	04.21.98	ITM 16 & 23 WAS 2: ADDED ITEM 50/51/52 BLOW TUBE MTG GNG REFLECTED	A	JAS	LRK

REVISIONS

MATL: SEE B.O.M.

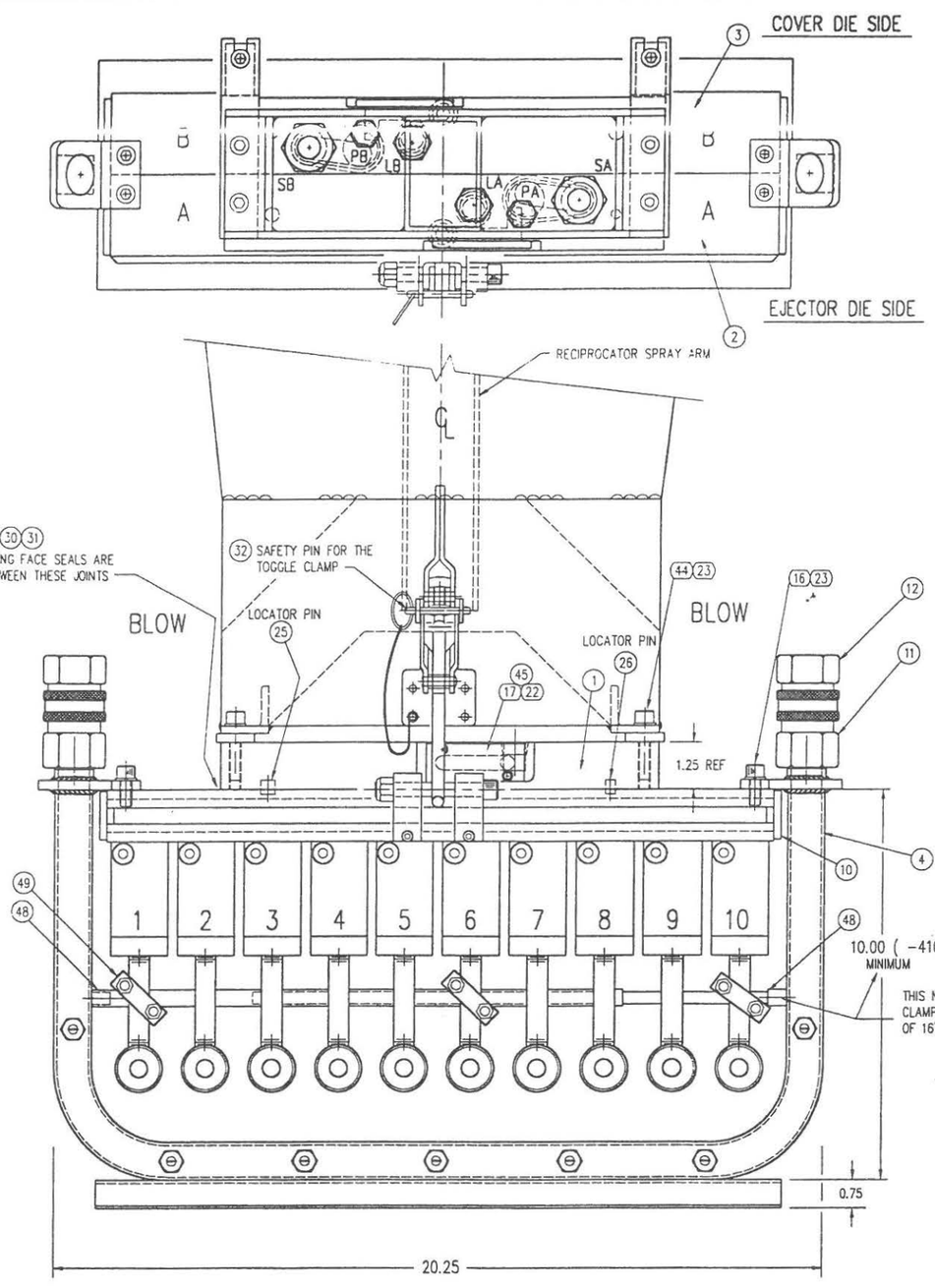
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CK DATE ER 600 SHEET OF

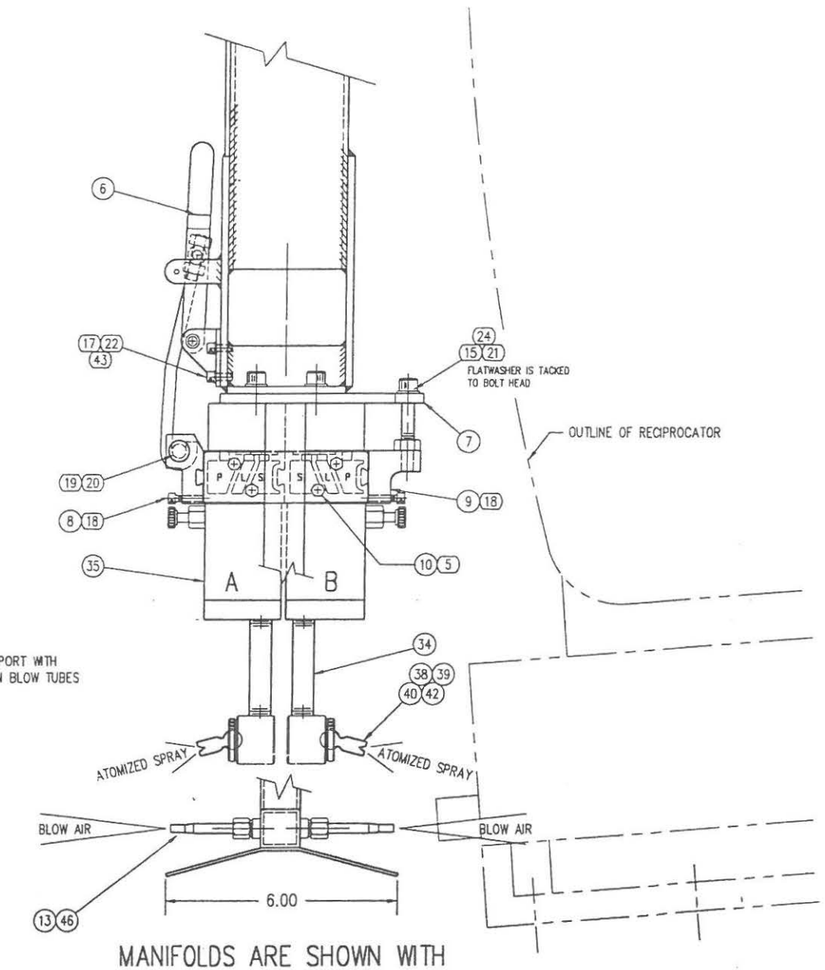
RIMROCK
1700 RIMROCK ROAD COLUMBUS, OHIO 43219
PHONE: 614-471-5626 FAX: 614-471-1073
® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

DRAWING NO. 110 D15911-125 REV. A
DRAWING NAME 18" O.R. EXTRUSION MANIFOLD-
1 LUBE W/025 NOZZLES
FOR 410 RECIP

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT





MANIFOLDS ARE SHOWN WITH THEIR FULL COMPLIMENT OF:
10 NOZZLES PER BAR 'A'
10 NOZZLES PER BAR 'B'

ASSY P/N 15912-125

ITEM	DESCRIPTION	QUAN.	PART N°
50	DUAL DIVERTER SPRAY HEAD - ALUM	REF	11151-08
49	U-BOLT 1/4 DIA X 2" (3)	REF	02730-6
48	SUPPORT TUBE - INNER 14" (1)	REF	15621-022
47	SUPPORT TUBE - OUTER 14" (1)	REF	15621-019
46	COMPRESSION FITTING - BRASS	14	01068-C
45	SEAL PLATE (2)	REF	08384-22
44	SHCS M8 X 40mm	REF	09015-40
43	HEX NUT M4	REF	09000-08
42	SPRAY BALL - CONICAL	REF	15810-05
41	SPRAY BALL - FAN	REF	15810-08
40	LOCK RING - ALUM	REF	02455
39	RETAINER SEAL - POLYURETHANE	REF	06266-K
38	SPRAY HEAD - ALUM	REF	11150
37	DOUBLE SPRAY HEAD - ALUM	REF	11151
36	SEAL (SILICONE RUBBER) USE WITH 33	REF	15265-01
35	MODEL 025 NOZZLE	REF	025-00000
34	PIPE NIPPLE ALUM 1/4 NPT X 3"	REF	11346-05
33	BLOCK OFF CAP	REF	08382-08
32	SPRING LOADED SAFETY PIN	REF	02862-202
31	O'RING 2-116 VITON (2)	REF	01340-E
30	O'RING 2-113 VITON (2)	REF	01125-E
29	O'RING 2-132 VITON (2)	REF	02102-132
28	90° ALUM PIPE ELBOW 1/4 NPT	REF	15606-13
27	45° ALUM PIPE ELBOW 1/4 NPT	REF	15606-14
26	DOWEL PIN 1/4 DIA X 3/8	REF	02749-6
25	DOWEL PIN 3/8 DIA X 3/8	REF	03063-17
24	FLATWASHER 5/16	2	02879-5
23	LOCKWASHER 5/16	4	02695-5
22	LOCKWASHER M4	REF	09001-08
21	JAM NUT 5/16-18	2	02653
20	ELASTIC STOP NUT 3/8-16	1	02386-6
19	SHCS 3/8-16 X 2 3/4	1	02578-44
18	SHCS #10-32 X 3/4	4	02553
17	SHCS M4 X 12mm	REF	09010-12
16	SHCS 5/16-18 X 3/4	4	02568
15	SHCS 5/16-18 X 2"	2	02573
14	JACK CHAIN #14	7"	07547-02
13	BLOW TUBE ORIFICE 1/4 O.D. X 2" CU	14	01767
12	DISCONNECT INSERT 3/4 NPT	REF	15624-05
11	QUICK DISCONNECT 3/4 NPT	2	15624-19
10	END CAP - ALUM	2	15170-006
9	BOLT MOUNT - ALUM	2	15170-008
8	HOOK CLEAT - ALUM	2	15170-007
7	CLAMP CLEAT - HARDENED STEEL	REF	15170-054
6	TOGGLE CLAMP	REF	15171-02
5	HH S TAP SCREW #10-32 X 1/2	8	03062-30
4	BLOW TUBE WELDMENT	1	15621-410
3	18" MANIFOLD - ALUM EXTRUSION	1	15622-018
2	18" MANIFOLD - ALUM EXTRUSION	1	15622-019
1	ADAPTER MANIFOLD - ALUM (2)	REF	08384-21

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

CR	DATE	REMARKS	LET	DR	CK
022	5.1 97	UPDATED WITH NEW BLOW TUBE	B	MD.	
	1.31. 96	UPDATED TO ASSEMBLY	A	HOA	

REVISIONS

MAT'L:

DR LRK DATE 1.12.95 SCALE HALF PIC

RIMROCK

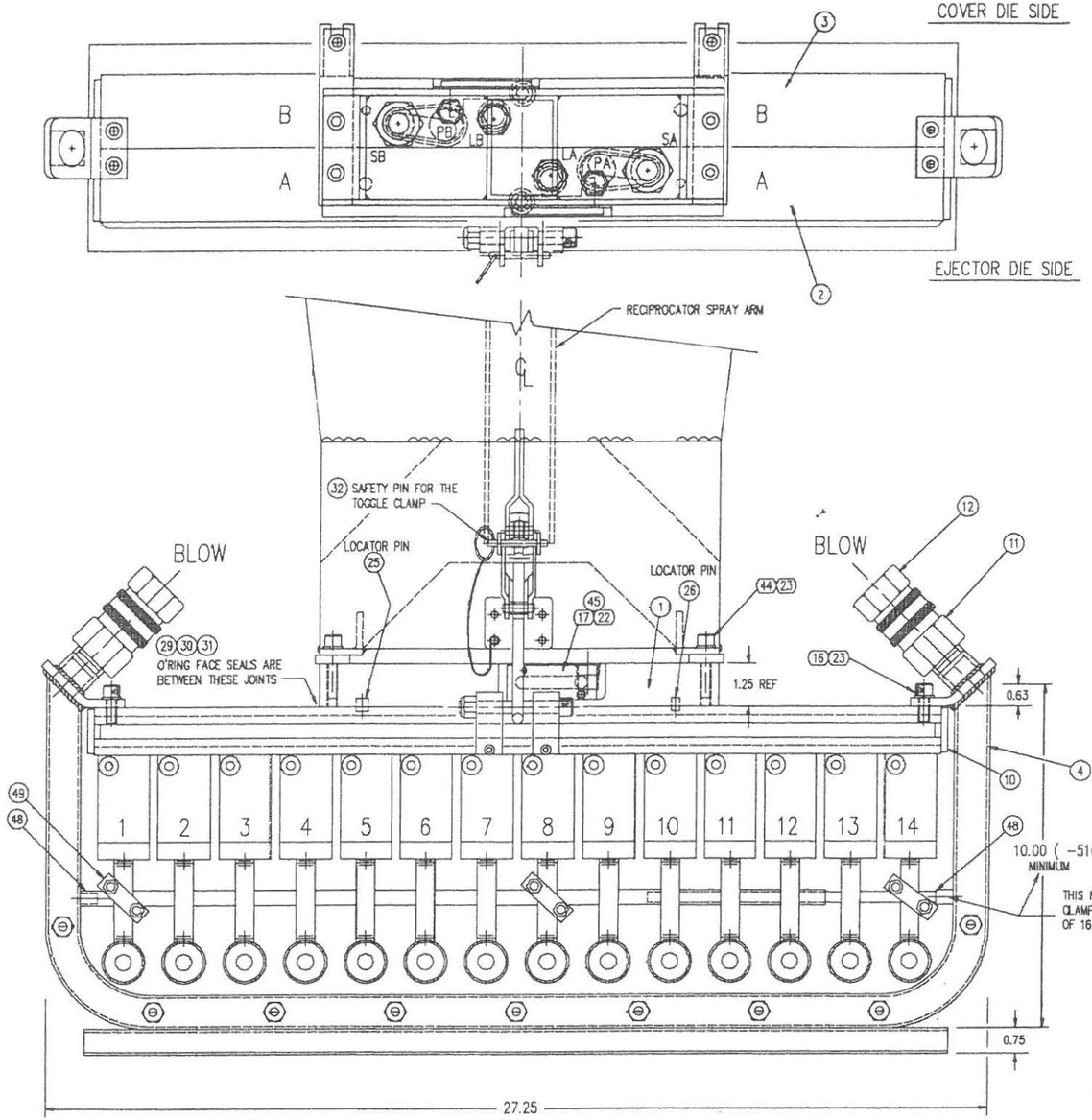
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1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE(614-471-8220 FAX(614-471-1673
® A Registered Trademark of Rimrock Corporation, Columbus, Ohio U.S.A.

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

DRAWING NO. 110 D15912-125 REV B

DRAWING NAME 18" Q.R. EXTRUSION MANIFOLD-
2 LUBE W/ 025 NOZZLES
FOR 410 RECIPROCATORS

THIS DRAWING IS THE PROPERTY OF RIMROCK CORP. AND IS FOR THE CONFIDENTIAL USE OF THE BUYER OR SUPPLIER OF THIS EQUIPMENT



ITEM	DESCRIPTION	QUAN	PART N°
50	DUAL DIVERTER SPRAY HEAD – ALUM	REF	11151-08
49	U-BOLT 1/4 DIA X 2" (3)	REF	02730-6
48	SUPPORT TUBE – INNER 8" (1)	REF	15621-021
47	SUPPORT TUBE – OUTER 22" (1)	REF	15621-020
46	COMPRESSION FITTING – BRASS	18	01068-C
45	SEAL PLATE (2)	REF	08384-22
44	SHCS M8 X 40mm	REF	09015-40
43	HEX NUT M4	REF	09000-08
42	SPRAY BALL – CONICAL	REF	15810-05
41	SPRAY BALL – FAN	REF	15810-08
40	LOCK RING – ALUM	REF	02455
39	RETAINER SEAL – POLYURETHANE	REF	06266-K
38	SPRAY HEAD – ALUM	REF	11150
37	DOUBLE SPRAY HEAD – ALUM	REF	11151
36	SEAL (SILICONE RUBBER) USE WITH 33	REF	15265-01
35	MODEL 025 NOZZLE	REF	025-00000
34	PIPE NIPPLE ALUM 1/4 NPT X 3"	REF	11346-05
33	BLOCK OFF CAP	REF	08382-08
32	SPRING LOADED SAFETY PIN	REF	02862-202
31	O'RING 2-116 VITON (2)	REF	01340-E
30	O'RING 2-113 VITON (2)	REF	01125-E
29	O'RING 2-132 VITON (2)	REF	02102-132
28	90° ALUM PIPE ELBOW 1/4 NPT	REF	15606-13
27	45° ALUM PIPE ELBOW 1/4 NPT	REF	15606-14
26	DOWEL PIN 1/4 DIA X 3/8	REF	02749-6
25	DOWEL PIN 3/8 DIA X 3/8	REF	03063-17
24	FLATWASHER 5/16	2	02879-5
23	LOCKWASHER 5/16	4	02695-5
22	LOCKWASHER M4	REF	09001-08
21	JAM NUT 5/16-18	2	02653
20	ELASTIC STOP NUT 3/8-16	1	02386-6
19	SHCS 3/8-16 X 2 3/4	1	02578-44
18	SHCS #10-32 X 3/4	4	02553
17	SHCS M6 X 12mm	REF	09010-12
16	SHCS 5/16-18 X 3/4	4	02568
15	SHCS 5/16-18 X 2"	2	02573
14	JACK CHAIN #14	7"	07547-02
13	BLOW TUBE ORIFICE 1/4 O.D. X 2" CU	18	01767
12	DISCONNECT INSERT 3/4 NPT	REF	15624-05
11	QUICK DISCONNECT 3/4 NPT	2	15624-19
10	END CAP – ALUM	2	15170-006
9	BOLT MOUNT – ALUM	2	15170-008
8	HOOK CLEAT – ALUM	2	15170-007
7	CLAMP CLEAT – HARDENED STEEL	REF	15170-054
6	TOGGLE CLAMP	REF	15171-02
5	HH S TAP SCREW #10-32 X 1/2	8	03062-30
4	BLOW TUBE WELDMENT	1	15621-510
3	24" MANIFOLD – ALUM EXTRUSION	1	15622-024
2	24" MANIFOLD – ALUM EXTRUSION	1	15622-025
1	ADAPTER MANIFOLD – ALUM (2)	REF	08384-21

MANIFOLDS ARE SHOWN WITH THEIR FULL COMPLIMENT OF:
14 NOZZLES PER BAR 'A'
14 NOZZLES PER BAR 'B'

ASSY P/N 15922-125

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B

REVISIONS

ER	DATE	REMARKS	LET	DR	QK

MATL:

DR LRK DATE 10.12.94 SCALE HALF PIC
QK DATE DR 600 SHEET OF

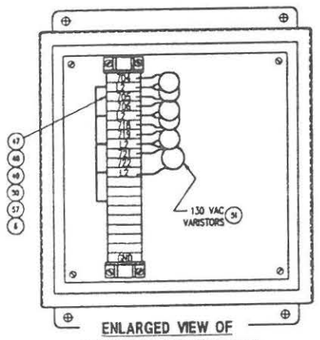
RIMROCK® RIMROCK CORPORATION 1700 RIMROCK ROAD P.O. BOX 19067 PHONE(614)-471-5626 TELEX 240-401 FAX(614)-471-0062
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DRAWING NO. 110D15922-125 REV

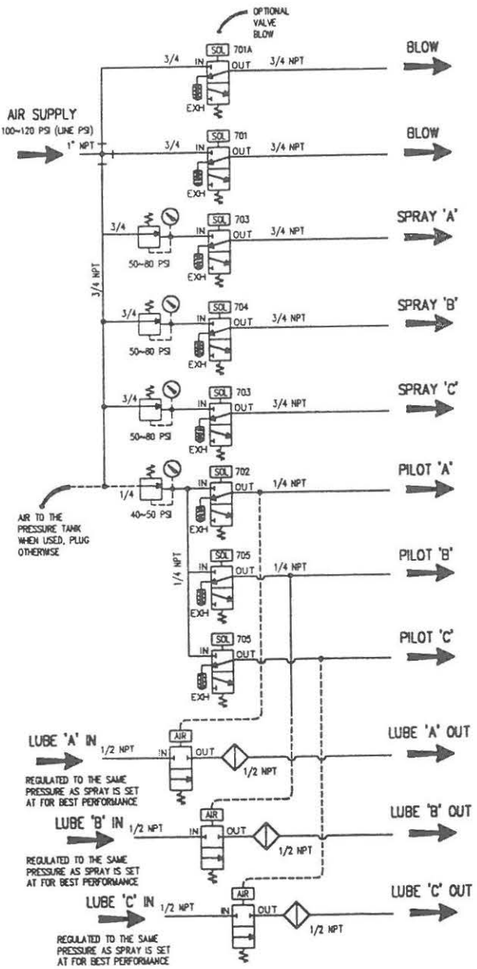
NAME 24" Q.R. EXTRUSION MANIFOLD-
2 LUBE W/ 025 NOZZLES
FOR 410 RECIPROCATORS

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
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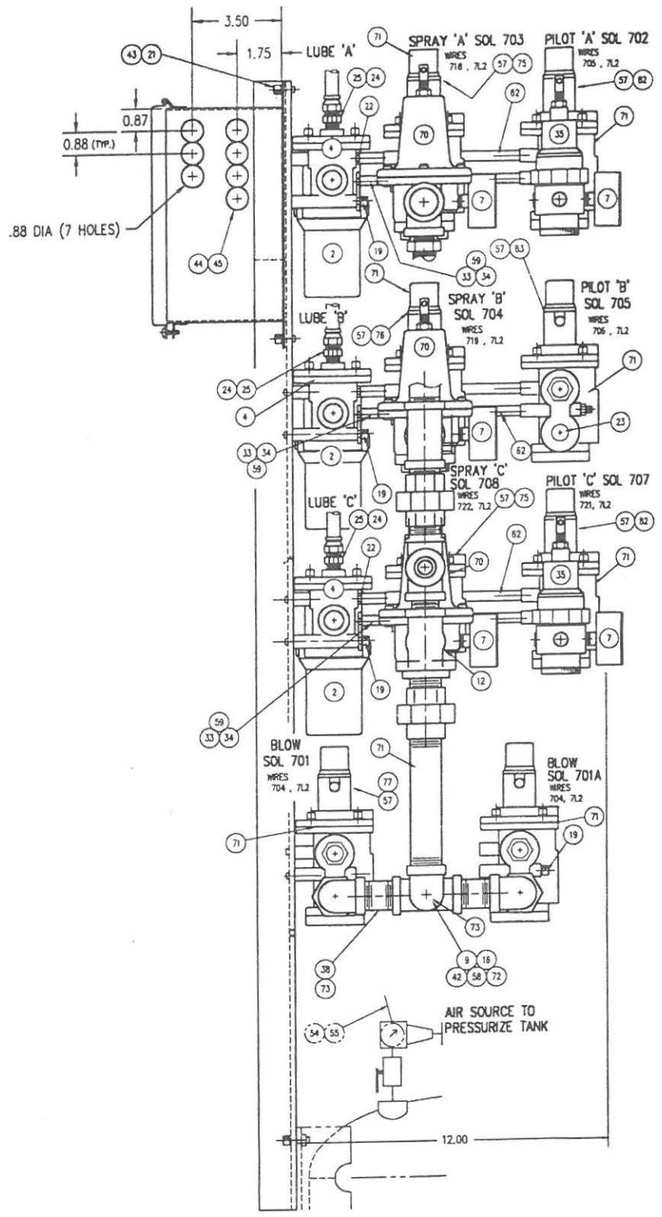
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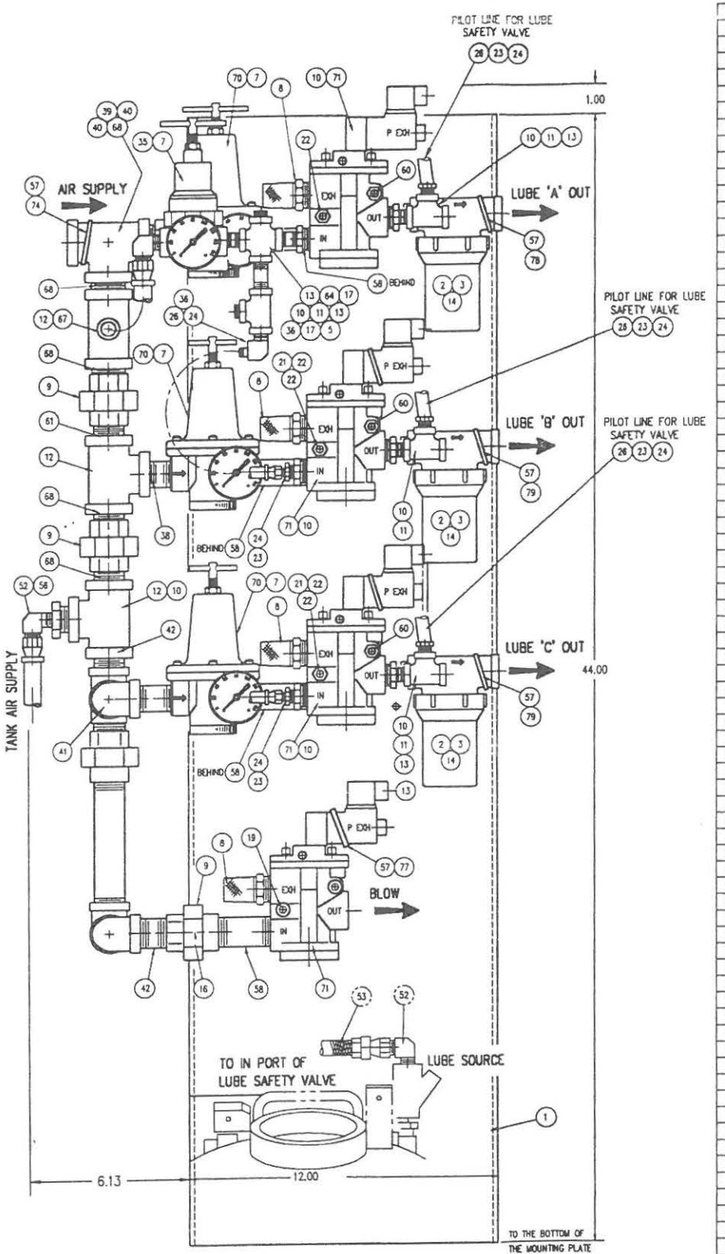


ENLARGED VIEW OF
INSIDE THE JUNCTION BOX



PNEUMATIC SCHEMATIC





ASSY P/N 09382-33

ITEM	DESCRIPTION	QUAN	PART N°
83	NAMEPLATE "PILOT B"	1	15614-14
82	NAMEPLATE "PILOT A"	1	15614-13
81	NAMEPLATE "LUBE B IN"	1	15614-11
80	NAMEPLATE "LUBE A IN"	1	15614-10
79	NAMEPLATE "LUBE B"	1	15614-08
78	NAMEPLATE "LUBE A"	1	15614-07
77	NAMEPLATE "BLOW"	1	15614-05
76	NAMEPLATE "SPRAY B"	1	15614-04
75	NAMEPLATE "SPRAY A"	1	15614-03
74	NAMEPLATE "AIR SUPPLY"	1	15614-01
73	90° PIPE ELBOW 3/4 NPT	1	02204
72	NAMEPLATE "SPRAY C"	1	15614-19
71	VALVE, 3-WAY N.C. SOL OPER 3/4 NPT	9	01284-6
70	AIR PRESSURE REGULATOR 3/4 NPT	3	01421
69	PIPE BUSHING 3/4 NPT - 1/2 NPT	1	02229
68	PIPE NIPPLE 3/4 NPT CLOSE	5	02060
67	NAMEPLATE "PILOT C"	1	15614-20
66	NAMEPLATE "LUBE C"	1	15614-21
65	PIPE NIPPLE 1/2 NPT X 2"	3	02017
64	PIPE CROSS 1/4 NPT	1	02281
63			
62	SPACER 1/4 ID X 2 1/4 LG	4	03016-4
61	PIPE NIPPLE 3/4 NPT X 1 1/2	1	02061
60	ALL THREAD ROD 1/4 X 11 1/2"	2	02359-13
59	FLATWASHER 1/4	4	02879-4
58	PIPE NIPPLE 3/4 NPT X 4"	4	02065
57	WIRE TIE	10	03011
56	HOSE SWIVEL FITTING #6	2	02537-6
55	ST HOSE ADAPTER 1/4 NPT TO #6	1	02533
54	RUBBER HOSE #6	20"	01833
53	BRAIDED SS HOSE ASSY #6 X 15"	REF	02921-2
52	90° ADAPTER FITTING #6 TO 1/4 NPT	2	02519
51	VARISTOR ERZC14DK201	5	08295-5
50	JUMPER	4"	02364-27
49	END ANCHOR	2	02364-36
48	TERMINAL BLOCK	9	02364-10
47	MOUNTING RAIL	5"	02364-2
46	JUNCTION BOX 10X10	1	03087-53
45	LOCKNUT 1/2 NPT	5	02484
44	ST. ELECTRICAL CORD CONNECTOR	5	02475
43	SHCS 1/4-20 X 5/8	4	02546
42	PIPE NIPPLE 3/4 NPT X 2 1/2	1	02063
41	90° PIPE ELBOW 1/2 NPT	1	02203
40	PIPE BUSHING 1" TO 3/4 NPT	2	02232
39	PIPE TEE 1" NPT	1	02134
38	PIPE NIPPLE 3/4 NPT X 2"	3	02062
37			
36	90° ADAPTER FITTING #4 TO 1/4 NPT	1	02517
35	AIR PRESSURE REGULATOR 1/4 NPT	1	01321
34	SPACER 1/4 ID X 1" LG	4	03016-3
33	CLIP, VALVE MOUNTING	2	09671
32			
31	LABEL "RIMROCK LOGO"	1	09520-01
30	NAMEPLATE "LUBE"	1	15614-06
29	NAMEPLATE "LUBE IN"	1	15614-09
28			
27			
26	RUBBER HOSE #4 (2-PC'S)	30"	01832
25	ADAPTER FITTING 1/4NPT - #4	3	02501
24	HOSE SWIVEL FITTING #4	4	02537-4
23			
22	HEX NUT 1/4-20	6	02652
21	LOCKWASHER 1/4	6	02695-4
20	ALLTHREAD ROD 1/4 X 8 1/2"	2	02359-11
19	SHCS 1/4-20 X 3"	4	02564
18			
17	PIPE PLUG 1/4 NPT	3	02351
16			
15		1	02059-6
14	CLOSE NIPPLE 1/2 NPT CLOSE	3	02045
13	PIPE NIPPLE 1/4 NPT CLOSE	3	02015
12	PIPE TEE 3/4 NPT	4	02124
11	PIPE TEE 1/4 NPT	3	02106
10	PIPE BUSHING 3/4 NPT - 1/4 NPT	5	02227
9	PIPE UNION 3/4 NPT	3	02345
8	MUFFLER 3/4 NPT	5	02250-6
7	PRESSURE GAUGE	3	01126
6	PANEL 10 x 10	1	03051-33
5	RHMS #8-32 X 1/2	2	02641-3
4	VALVE, 2-WAY N.C. AIR OPER 1/2 NPT	3	01285-7
3	FILTER ELEMENT 40 MESH SS	REF	16054-06
2	FILTER WITH ELEMENT	3	16054-01
1	MOUNTING PLATE	1	06832-11

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
255	06.03 97	ITEM 27 WAS 02487; 28 WAS 02488 29 WAS 02487-1; 30 WAS 02489	C	JAS	
047	01/30 97	CHANGED MTG PLT	B	JAS	
253	11.22 96	UPDATE TO 1"	A	MFQ	

REVISIONS

MAT'L:

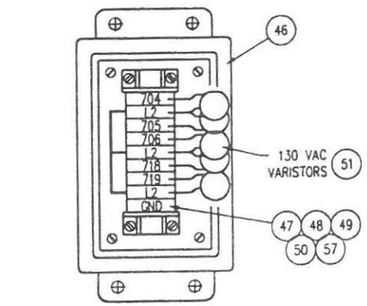
DR HDA DATE 5.7.96 SCALE NTS WT
CK DATE ER 145 SHEET OF

RIMROCK
1700 RIMROCK ROAD
COLUMBUS, OHIO 43219
PHONE: 614-471-5826 FAX: 614-471-1073
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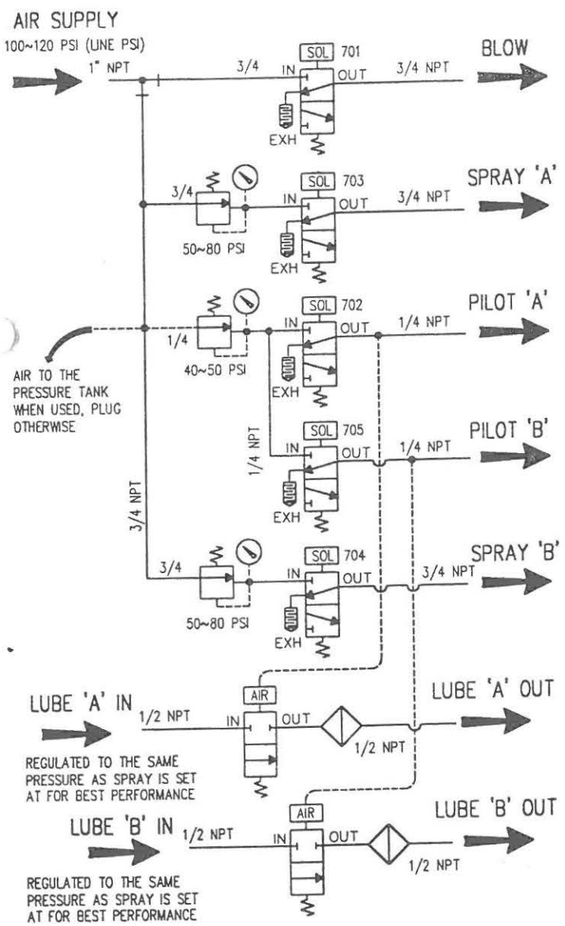
DRAWING NO. 163D09382-33 REV C
DRAWING NAME PNEUMATIC ASSEMBLY, 3-LUBE W/ OPTIONAL BLOW VALVE
FOR 410 SDR RECIP

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ± 1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

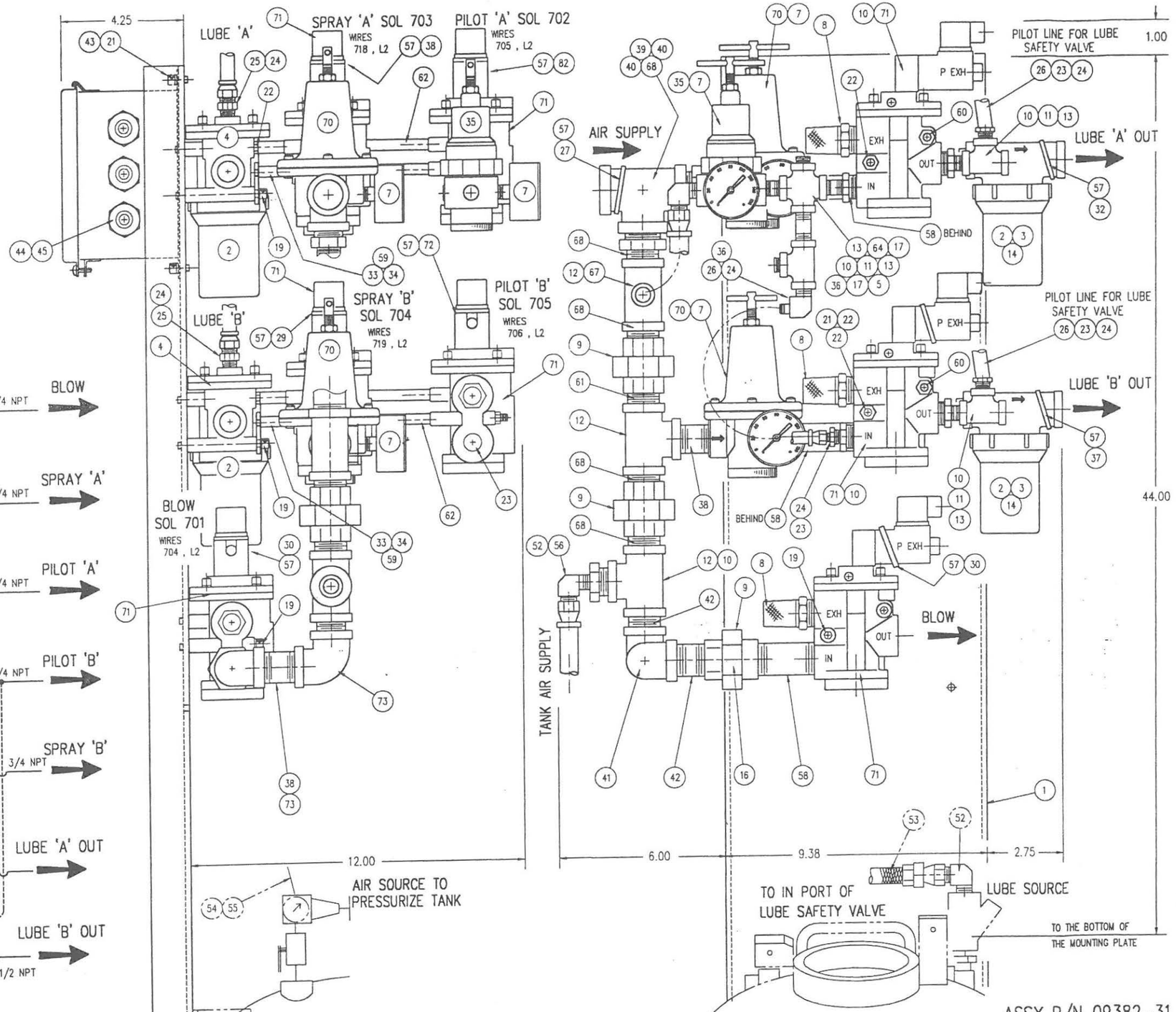
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VIEW OF INSIDE OF JUNCTION BOX



PNEUMATIC SCHEMATIC



ASSY P/N 09382-31

ITEM	DESCRIPTION	QUAN.	PART N°
73	90° PIPE ELBOW 3/4 NPT	2	02204
72	NAMEPLATE "PILOT B"	1	15614-14
71	VALVE, 3-WAY N.C. SOL OPR 3/4 NPT	5	01284-6
70	AIR PRESSURE REGULATOR 3/4 NPT	2	01421
69	PIPE BUSHING 3/4 NPT - 1/2 NPT	1	02229
68	PIPE NIPPLE 3/4 NPT CLOSE	5	02060
67	NAMEPLATE "PILOT A"	1	15614-13
66	NAMEPLATE "LUBE B IN"	1	15614-11
65	PIPE NIPPLE 1/2 NPT X 2"	3	02017
64	PIPE CROSS 1/4 NPT	1	02281
63	NAMEPLATE "LUBE A IN"	1	15614-10
62	SPACER 1/4 ID X 2 1/4 LG	4	03016-4
61	PIPE NIPPLE 3/4 NPT X 1 1/2	1	02061
60	ALL THREAD ROD 1/4 X 11 1/2"	2	02359-13
59	FLATWASHER 1/4	4	02879-4
58	PIPE NIPPLE 3/4 NPT X 4"	4	02065
57	WIRE TIE	10	03011
56	HOSE SWIVEL FITTING #6	2	02537-6
55	ST HOSE ADAPTER 1/4 NPT TO #6	1	02533
54	RUBBER HOSE #6	20"	01833
53	BRAIDED SS HOSE ASSY #6 X 15"	REF	02921-2
52	90° ADAPTER FITTING #6 TO 1/4 NPT	2	02519
51	VARISTOR ERZC14DK201	5	08295-5
50	JUMPER	4"	02364-27
49	END ANCHOR	2	02364-36
48	TERMINAL BLOCK	9	02364-10
47	MOUNTING RAIL	5"	02364-2
46	JUNCTION BOX 6X4X4	1	06679-01
45	LOCKNUT 1/2 NPT	5	02484
44	ST. ELECTRICAL CORD CONNECTOR	5	02475
43	SHCS 1/4-20 X 5/8	4	02546
42	PIPE NIPPLE 3/4 NPT X 2 1/2	1	02063
41	90° PIPE ELBOW 1/2 NPT	1	02203
40	PIPE BUSHING 1" TO 3/4 NPT	2	02232
39	PIPE TEE 1" NPT	1	02134
38	PIPE NIPPLE 3/4 NPT X 2"	3	02062
37	NAMEPLATE "LUBE B"	1	15614-08
36	90° ADAPTER FITTING #4 TO 1/4 NPT	1	02517
35	AIR PRESSURE REGULATOR 1/4 NPT	1	01321
34	SPACER 1/4 ID X 1" LG	4	03016-3
33	CLIP, VALVE MOUNTING	2	09671
32	NAMEPLATE "LUBE A"	1	15614-07
31	LABEL "RIMROCK LOGO"	1	09520-01
30	NAMEPLATE "BLOW"	1	15614-05
29	NAMEPLATE "SPRAY B"	1	15614-04
28	NAMEPLATE "SPRAY A"	1	15614-03
27	NAMEPLATE "AIR SUPPLY"	1	15614-01
26	RUBBER HOSE #4 (2-PC'S)	30"	01832
25	ADAPTER FITTING 1/4NPT - #4	3	02501
24	HOSE SWIVEL FITTING #4	4	02537-4
23			
22	HEX NUT 1/4-20	6	02652
21	LOCKWASHER 1/4	6	02695-4
20	ALLTHREAD ROD 1/4 X 8 1/2"	2	02359-11
19	SHCS 1/4-20 X 3"	4	02564
18			
17	PIPE PLUG 1/4 NPT	3	02351
16			
15		1	02059-6
14	CLOSE NIPPLE 1/2 NPT CLOSE	3	02045
13	PIPE NIPPLE 1/4 NPT CLOSE	3	02015
12	PIPE TEE 3/4 NPT	3	02124
11	PIPE TEE 1/4 NPT	3	02106
10	PIPE BUSHING 3/4 NPT - 1/4 NPT	5	02227
9	PIPE UNION 3/4 NPT	3	02345
8	MUFFLER 3/4 NPT	5	02250-6
7	PRESSURE GAUGE	3	01126
6			
5	RHMS #8-32 X 1/2	2	02641-3
4	VALVE, 2-WAY N.C. AIR OPR 1/2 NPT	2	01285-7
3	FILTER ELEMENT 40 MESH SS	REF	16054-06
2	FILTER WITH ELEMENT	2	16054-01
1	MOUNTING PLATE	1	06832

4. DEBURR
3. SURFACE FINISH 125
2. ALL THREADS CLASS 2A OR 2B
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS

NOTES (UNLESS OTHERWISE SPECIFIED)

ER	DATE	REMARKS	LET	DR	CK
779	10.1.98	UPDATED B.O.M.	B	HDA	
255	06.18.97	ITEM 30 WAS 02489; 29, 02489-1; 28, 02488-27, 02487; ADD BOM ITEMS FROM COL 2-COL 1	A	JAS	

REVISIONS

MAT'L: SEE BILL OF MATERIAL

DR LRK DATE 11.1.94 | SCALE HALF | WT

CK | DATE | ER | APP'D | DATE

RIMROCK

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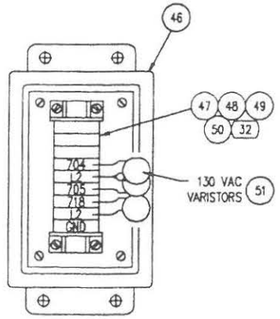
DRAWING NO. 163D09382-31 | REV B

DRAWING NAME PNEUMATIC ASSEMBLY, 2-LUBE

FOR 410 SDR RECIP

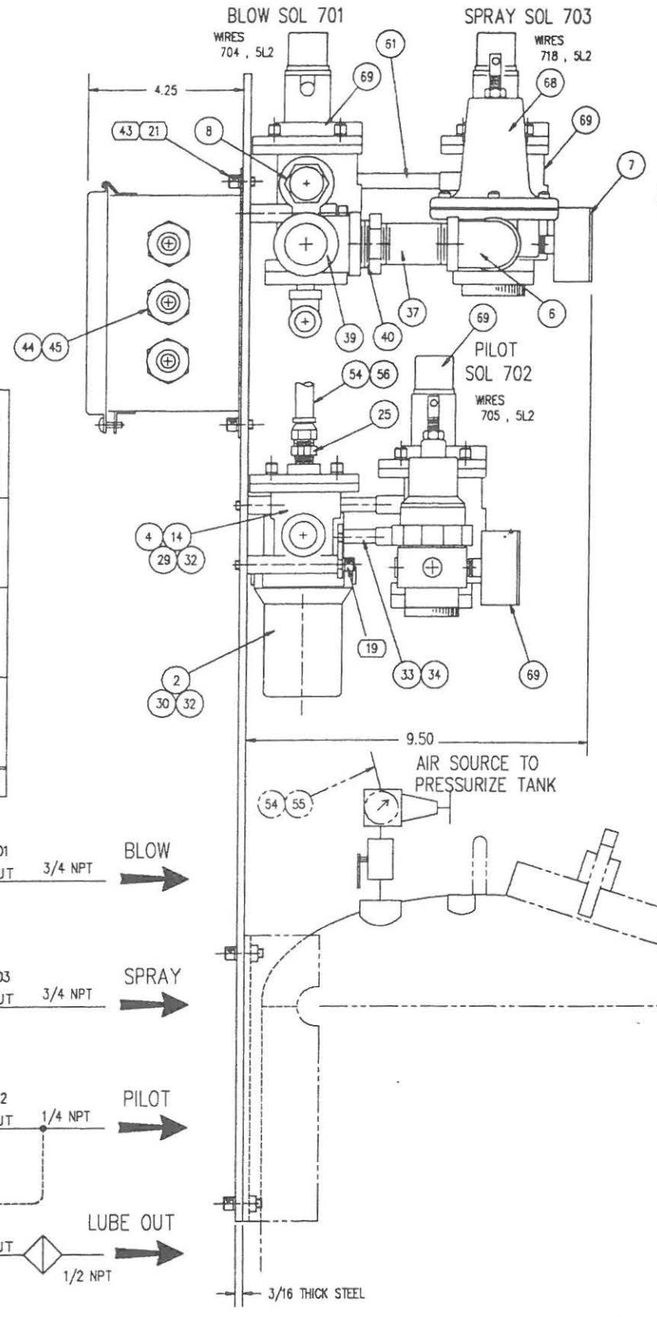
TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010
3-DIGIT DECIMALS= ±.005
4-DIGIT DECIMALS= ±.0005
FRACTIONS= ±1/64
ANGLES= ±1/2

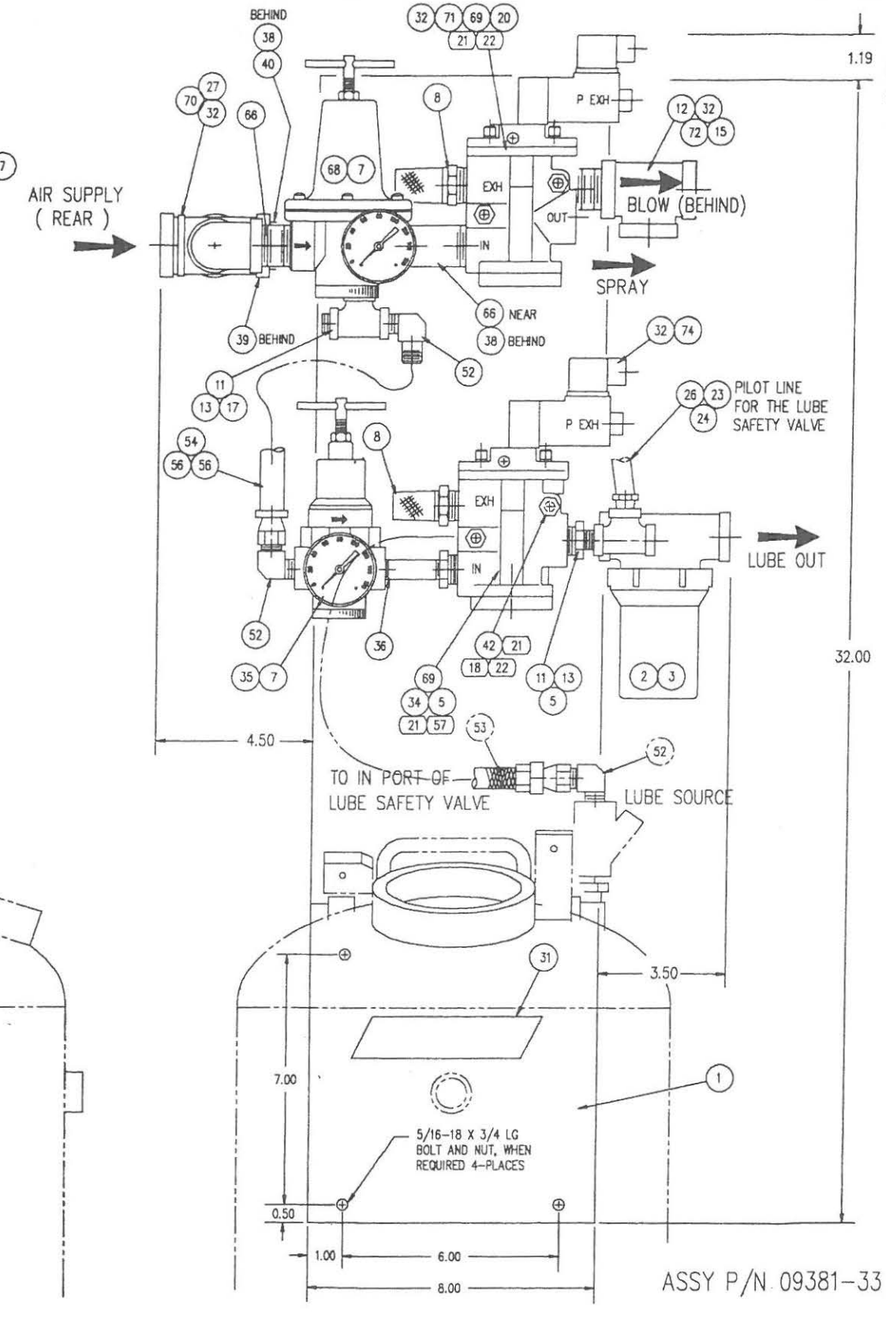
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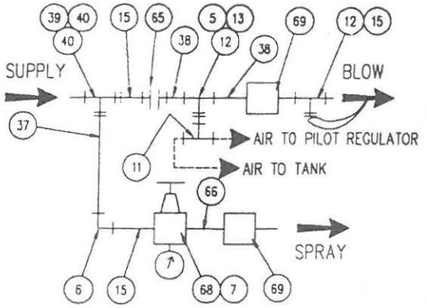
VIEW OF INSIDE OF JUNCTION BOX

75	NAMEPLATE "LUBE"	1	15614-06
74	NAMEPLATE "PILOT"	1	15614-12
73	NAMEPLATE "LUBE IN"	1	15614-09
72	NAMEPLATE "BLOW"	1	15614-05
71	NAMEPLATE "SPRAY"	1	15614-02
70	NAMEPLATE "AIR SUPPLY"	1	15614-01
69	VALVE, 3-WAY N.C. SOL OPER 3/4NPT	3	01284-6
68	AIR PRESSURE REGULATOR 3/4 NPT	1	01421
67			
66	PIPE NIPPLE 3/4 NPT X 3"	2	02064
65	PIPE UNION 3/4 NPT	1	02345
64			
63			
62			
61	SPACER 1/4 ID X 2 1/4" LG	2	03016-4
60			
59			
58			
57	ALL THREAD ROD 1/4 X 4"	2	02359-1
56	HOSE SWIVEL FITTING #6	2	02537-6
ITEM	DESCRIPTION	QUAN.	PART N°



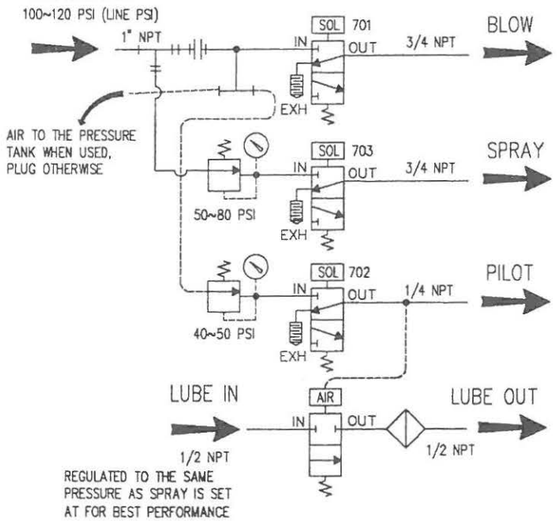


ASSY P/N 09381-33



55			
54	RUBBER HOSE #6	20"	01833
53	BRAIDED SS HOSE ASSY #6 X 15"	REF	02921-2
52	90° ADAPTER FITTING #6 TO 1/4 NPT	2	02519
51	VARISTOR ERZC14DK201	3	08295-5
50	JUMPER	4"	02364-27
49	END ANCHOR	2	02364-36
48	TERMINAL BLOCK	9	02364-10
47	MOUNTING RAIL	5"	02364-2
46	JUNCTION BOX 6X4X4	1	06679-02
45	LOCKNUT 1/2 NPT	3	02484
44	ST. ELECTRICAL CORD CONNECTOR	3	02475
43	SHCS 1/4-20 X 5/8"	3	02546
42	ALL THREAD ROD 1/4 X 7"	1	02359-5
41			
40	PIPE BUSHING 1" TO 3/4 NPT	2	02232
39	PIPE TEE 1" NPT	1	02134
38	PIPE NIPPLE 3/4 NPT X 1 1/2"	3	02061
37	PIPE NIPPLE 3/4 NPT X 2 1/2"	1	02063
36	PIPE NIPPLE 1/4 NPT X 2"	1	02041-3
35	AIR PRESSURE REGULATOR 1/4 NPT	1	01321
34	SPACER 1/4 ID X 1" LG	2	03016-3
33	CLIP, VALVE MOUNTING	1	09671
32	WIRE TIE	8	03011
31	LABEL "RIMROCK LOGO"	1	09520-01
30	LABEL "LUBE OUT"	1	02489
29	LABEL "LUBE IN"	1	02489-1
28	LABEL "AIR OUT"	1	02488
27	LABEL "AIR IN"	1	02487
26	RUBBER HOSE #4 (1-PC)	20"	01832
25	ADAPTER FITTING 1/4 NPT - #4	1	02501
24	HOSE SWIVEL FITTING #4	1	02537-4
23	HOSE ADAPTER #4-1/4 NPT	1	02529
22	HEX NUT 1/4-20	4	02652
21	LOCKWASHER 1/4	7	02695-4
20	ALLTHREAD ROD 1/4 X 8"	2	02359-6
19	SHCS 1/4-20 X 3"	1	02564
18	FLAT WASHER 1/4	2	02879-4
17	PIPE PLUG 1/4 NPT	1	02351
16			
15	PIPE NIPPLE 3/4 NPT CLOSE	1	02060
14			
13	PIPE NIPPLE 1/4 NPT CLOSE	2	02015
12	PIPE TEE 3/4 NPT	1	02124
11	PIPE TEE 1/4 NPT	2	02106
10	RHMS #8-32 X 1/2	2	02641-3
9	PIPE TEE 1/2 X 1/2 X 1/4 NPT	1	02117
8	MUFFLER 3/4 NPT	3	02250-6
7	PRESSURE GAUGE	2	01126
6	PIPE ELBOW 3/4 NPT	1	02204
5	PIPE BUSHING 3/4 TO 1/4 NPT	2	02227
4	VALVE, 2-WAY N.C. AIR OPER 1/2 NPT	1	01285-7
3	FILTER ELEMENT 40 MESH SS	REF	16054-06
2	FILTER WITH ELEMENT	1	16054-01
1	MOUNTING PLATE	1	04359
ITEM	DESCRIPTION	QUAN.	PART N°

AIR SUPPLY
100~120 PSI (LINE PSI)



PNEUMATIC SCHEMATIC

NOTES (UNLESS OTHERWISE SPECIFIED)
1. PARTS TO CONFORM TO RIMROCK CORP. ENGR. & MFG. STANDARDS
2. ALL THREADS CLASS 2A OR 2B
3. SURFACE FINISH 125

REVISIONS							
ER	DATE	REMARKS	LET	DR	CK	ER	DATE	REMARKS	LET	DR	CK

MATL: SEE BILL OF MATERIAL

DR LRK DATE 11.2.94 SCALE HALF PIC
CK DATE ER 041 SHEET OF REV
DRAWING NO. 163D00381-33

RIMROCK CORPORATION 1700 RIMROCK ROAD P.O. BOX 19867 Kalamazoo, MI 49019
PHONE: 616-471-5628 TELEX: 240-401 FAX: 616-471-0083
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DRAWING NAME: PNEUMATIC ASSEMBLY, 1-LUBE

TOLERANCES UNLESS OTHERWISE SPECIFIED
2-DIGIT DECIMALS= ±.010 FRACTIONS= ±1/64
3-DIGIT DECIMALS= ±.005 ANGLES= ±1/2
4-DIGIT DECIMALS= ±.0005

FOR 410 SDR RECIP

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