

**Eagle® 2400 Series**  
**AMSCOMATIC WASHER-STERILIZER**  
 with Printcon™

(9/94)  
 Rev. 4

P-764320-440

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## SUMMARY OF SAFETY PRECAUTIONS

The following is a summary of safety precautions which must be observed when operating or servicing this sterilizer. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to equipment. These precautions are repeated where applicable throughout the manual.

**WARNING:** TO PREVENT POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE RESULTING FROM BURSTING BOTTLES AND HOT FLUID, YOU MUST NOT USE THIS UNIT TO STERILIZE LIQUIDS.

**WARNING:** TO PREVENT POSSIBLE PERSONAL INJURY BEFORE PERFORMING ANY MAINTENANCE OR CLEANING PROCEDURES, ALLOW WASHER/STERILIZER AND LOADING EQUIPMENT TO COOL TO ROOM TEMPERATURE.

**WARNING:** REPAIRS AND ADJUSTMENTS, OTHER THAN THOSE DESCRIBED IN THESE INSTRUCTIONS, SHOULD BE ATTEMPTED ONLY BY EXPERIENCED MECHANICS FULLY ACQUAINTED WITH THIS EQUIPMENT. USE OF INEXPERIENCED, UNQUALIFIED PERSONS TO WORK ON THE EQUIPMENT OR THE INSTALLATION OF UNAUTHORIZED PARTS COULD CAUSE PERSONAL INJURY OR RESULT IN COSTLY DAMAGE.

**WARNING:** WHEN PERFORMING THE REQUIRED QUARTERLY CHECK OF SAFETY VALVES BE CAREFUL OF ESCAPING STEAM. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.

**WARNING:** AVOID PERSONAL INJURY FROM DOOR CLOSING. DO NOT REACH INTO THE STERILIZER UNLESS THE DOOR IS BLOCKED OPEN WITH THE SAFETY BAR ATTACHED BEHIND THE FRONT PANEL. ALSO BE SURE WING PANEL IS IN THE OUT POSITION.

**WARNING:** OPERATE DISCONNECT SWITCH IN SUPPLY LINE TO REMOVE POWER FROM SECONDARY CONTROL PANEL AS IT IS "HOT" EVEN WITH THE POWER SWITCH OFF.

**CAUTION:** Never use a wire brush or steel wool on door and chamber assembly.

**CAUTION:** Before attempting maintenance on thermostatic traps, allow traps to cool to room temperature before removing cover. Since there is nothing to limit expansion, the diaphragm may rupture or fatigue if trap is opened while hot.

**CAUTION:** Do not remove or replace printed circuit cards unless CONTROL switch on secondary panel is positioned at OFF.

**CAUTION:** To prevent jamming and possible damage to spray fittings inside chamber, do not send empty trays or baskets through washer/sterilizer.

**CAUTION:** Take necessary precautions to keep any of the washers or screws from dropping into the control column.

**CAUTION:** The main Printcon PC board contains static-sensitive components. Handle accordingly.

**CAUTION:** If safety valve is found to be defective, do not attempt to repair. Replace it with new valve.

**CAUTION:** Allow thermostatic traps to cool to room temperature before removing cover. Since there is nothing to limit expansion, the diaphragm may rupture or fatigue if trap is opened while hot.

**CAUTION:** Solenoid valves are equipped with a special material which can be attacked by oils and grease. When replacing entire valve, wipe threads clean of cutting oils and use Teflon tape to seal pipe joints.

**CAUTION:** Handle syphon and bellows assembly gently, to avoid damage.

**CAUTION:** Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.



## SECTION 1

## GENERAL INFORMATION

## 1.1 APPLICATION AND DESIGN

The product literature included in this section contains technical data relating to the principle descriptive and identifying characteristics of particulars for this EAGLE washer-sterilizer. The literature is informational rather than instructional. It provides and conveys, textually and illustratively, a general concept of the equipment, its purpose, capabilities, limitations, and technical specifications.



### Eagle® SERIES 2400 AMSCOMATIC WASHER/STERILIZER with Printcon™

TECH  
DATA

Automated Washer/Sterilizer

## DESCRIPTION

Automatic-load and unload, high-volume washer/sterilizer with micro-processor-based Eagle PRINTCON™ digital-printer/controller. Uses steam-heated, water for spray wash and rinses during washing cycle; steam under pressure for sterilizing cycle to automatically process racks of soiled surgical instruments, utensils and glassware.

## Applications

**Wash-sterilize cycle** — for automatically feeding, washing, rinsing, sterilizing and unloading racks or surgical instruments, utensils and glassware. Pre-wash and/or pre-rinse of goods to be processed not required.

**Wash-only cycle** — for thorough high-pressure spray washing of surgical instruments utensils and glassware.

**Sterilize-only cycle** — for rapid steam sterilization of pre-washed surgical instruments, utensils and glassware.

## Chamber Size

Interior dimensions of the chamber are 25 x 18 x 30 inches (635 x 457 x 762 mm).

## Standards

**General.** The pressure vessel complies with applicable requirements of ASME's Boiler and Pressure Vessel Code, Section VIII — Pressure Vessels, Division 1 and is so stamped; ASME Form U-1A is furnished. The chamber (including doors) withstands internal pressure of 50 psig (3.52 kg/cm<sup>2</sup>) and full vacuum.

**Steam, Water and Waste Lines** are seamless, copper tubing (conforming with ASTM Specification B 88) and seamless, red-brass tubing (conforming with ASTM Specification B 135, alloy 1). Fittings are brass.

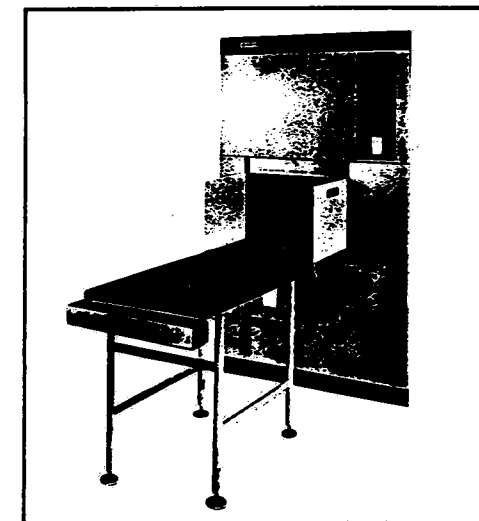
Listed by Underwriters Laboratories Incorporated.

## Optional Air Compressor

**Air Tank** built to ASME National Code and equipped with ASME safety valve.

**Motor** is open drip proof design, NEMA rated for continuous duty and features built-in overload protection.

**Deaerant Dryer** built to ASME National Code.



Typical Only - Some Details May Vary

THE SELECTIONS CHECKED BELOW  
APPLY TO THIS EQUIPMENT

Washer-Sterilizer for use with  
Auto-Load Table; Load Unit  
Capacity

- ☐ Two rack Auto-Load Table  
☐ Three rack Auto-Load Table

Washer-Sterilizer for use with  
conveyor  
☐ Pawl Bar Feed\*  
☐ Horizontal Rack  
Transporter\*

Unloading Unit Capacity  
☐ Two-Rack ☐ Three-Rack

Pump Motor Voltage  
☐ 208 volts ☐ 240 volts  
☐ 480 volts

Materials Processing Accessories  
☐ Loading Racks\*  
☐ Surgical Instrument  
Tray(s)\*

Optional Air Compressor  
☐ Vertical Tank  
☐ Horizontal Tank

\*See separate product  
literature

Item No. \_\_\_\_\_  
Location(s) \_\_\_\_\_

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DESIGN FEATURES  
EAGLE 2400 WITH PRINTCON

Controls are neatly arranged in a readily accessible location at the unloading end of the washer/sterilizer, and include:

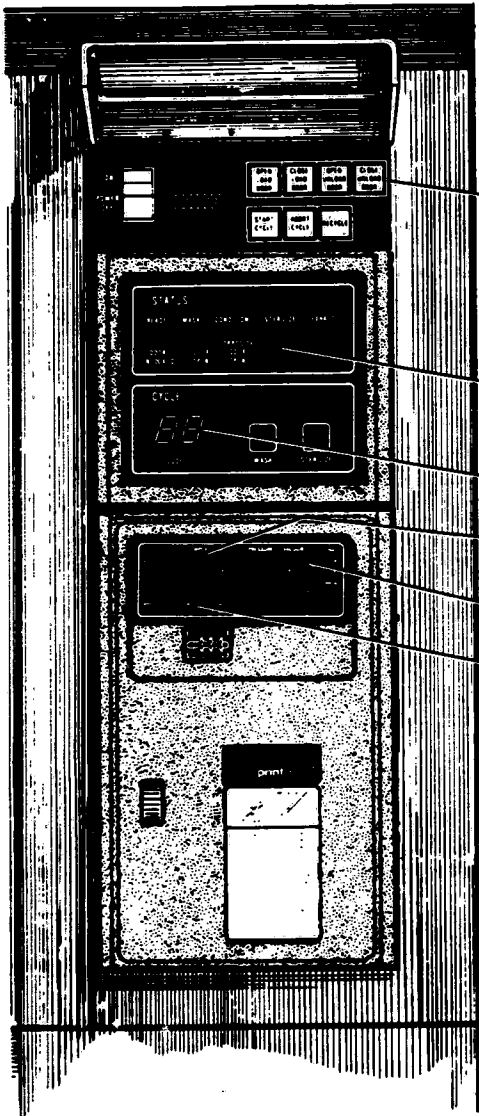


Figure 1. CONTROL PANEL  
(Unloading End.)

1. **Printcon**, digital-printer-controller; controls, monitors, and records daily cycle number, chamber pressure, temperature, date, and time during washing and sterilizing, and provides **continuous LED display** of pressure and temperatures. (When control is turned on, all LEDs on the display board light momentarily for a lamp test.)

**Printcon** provides an easy-to-read **printed record** of all critical cycle data, assuring operator that cycle parameters have been met. The parameters listed above as well as certain operational codes are printed on single ply paper tape by an **alphanumeric printer**. Full roll paper storage is facilitated by a motorized take-up mechanism.

2. **Secondary controls** are located behind the upper control panel. Included is a **power switch**, **cycle counter**, switches to manually open and close doors at both ends of machine, **abort**, **recycle**, and **start cycle** buttons.

3. **Auto-Lume panels** light when power is on. Upper panel gives **cycle door status**; wash/sterilize indicators and message code display, lower panel contains temperature, pressure, time and thumbwheel setting.

- **Status lights** show each phase of washer/sterilizer operation. Light visually alerts operator if door is unlocked. Operator is visually and audibly alerted if temperature set point is not reached or if temperature drops below set point during Sterilize phase.

- **Diagnostic code number** is displayed to indicate specific malfunctions.

- **Temperature** is set on three-digit thumbwheel switch. During cycle, actual temperature is continuously displayed and printed at preprogrammed transition points.

- **Pressure** is continuously displayed and printed at pre-programmed cycle transition points.

- **Time** (in hours and minutes, am/pm) and **Date** (month, day, year) are displayed by touching Time or Date switches.

4. **Non-operating (loading) end instrumentation (below)** includes an autolume panel showing cycle and door status.

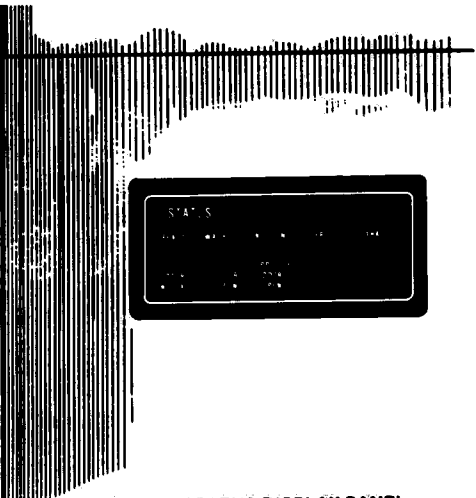


Figure 2. STATUS DISPLAY PANEL  
(Loading End.)

TECHNICAL DATA  
Automatic Control

**Programmed instructions** (cycle and printer) are contained in 8-bit parallel **microcomputers**, each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds ... eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds, operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure.

**Inputs.** Precision temperature settings are made on a **thumbwheel switch**. Timing precision is maintained with the use of quartz crystals. Temperature is sensed by a **resistance thermal detector (RTD)** and pressure by a **strain-gage-type pressure transducer**. These signals are then converted into electrical impulses to provide accurate control inputs and readings during entire cycle.

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed.

**Display panels** include large, easy-to-see **LED digital readouts**, visible legends, and touch-sensitive switches. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

**Alphanumeric Impact Printer** produces characters within a five-by-seven dot matrix. Maximum 20 characters per line are printed on 2-3/8-inch-wide paper tape. Tape exits from an opening flush with the surface of the control panel.

Motorized take-up simplifies tape replacement and provides **automatic full roll tape storage**. Black ink ribbon is contained in a compact, **easy-to-change cartridge**. Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

**Printed Circuit Boards.** Program boards are keyed, plug-in type. Service is accomplished within control panel on side of unit. For diagnostic purposes, light emitting diodes (LEDs) indicate presence of signal to associated valves or other electrically operated devices. All PC boards are **coated** for increased dielectric strength and humidity protection.

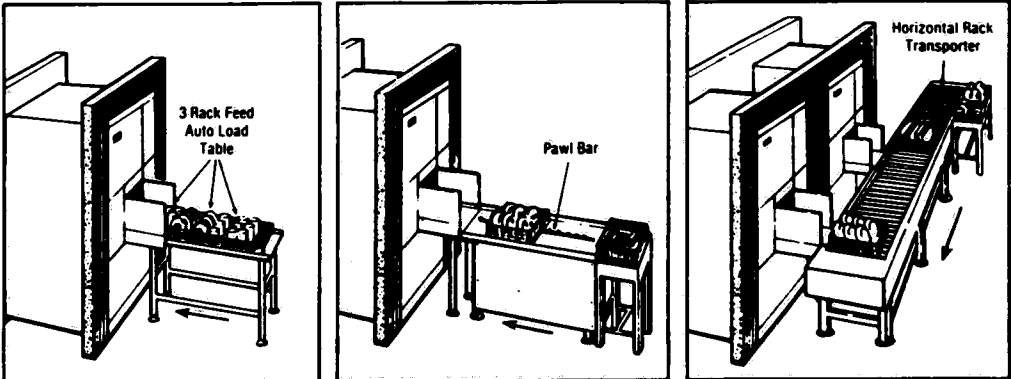


Figure 3. Optional Rack Loading Systems

**Power Supply.** Sterilizer control requires 120 VAC, 50/60 Hz, single-phase (see Engineering Data Chart for pump requirements). Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. The **Printcon** system includes a three-volt **lithium battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

CHAMBER ASSEMBLY

Chamber is **hot-rolled, carbon steel**; the interior is clad with **nickel**. Removable **Monel tracks** (for materials processing rack — see separate product literature) are secured to the chamber walls. The exterior of the chamber is painted and then insulated with a 1-inch (25 mm) thick (nominal) blanket of aluminum-foil-covered glass fiber. The insulation is held by pressure-sensitive tape, aluminum straps and clips.

**Finish.** Uniformity of finish and thickness of nickel cladding on the chamber interior is assured by a fine glass-beading process. The door frames are polished.

**Monel door frames** present a smooth surface for door-gasket contact.

**Doors** are of the same material as the chamber. Bronze (oil-impregnated) bearing eccentrics on the outside of the chamber engage each door and compress a silicone rubber gasket (held by aluminum clamping bars) against the door frame to make the chamber pressure tight. The exterior of each door has a corrosion-inhibiting coating and a painted steel cover.

**Opening, Closing, and Locking Mechanism** operates as follows: Initially, the door at the loading end raises when a rack of goods moves onto the loading unit (described subsequently); the door lowers after the rack has moved into the chamber and then both doors lock automatically. Upon completion of the processing cycle, both doors unlock and the one at the unloading end raises. The rack then discharges onto the unloading unit and the door closes automatically. The cycle can then be repeated; however, the door at the loading end will not open until the door at the unloading end closes.

The opening and closing operation (in conjunction with the processing cycle) is continuous, without operator attention. The doors will not raise while there is pressure or vacuum in the chamber. Either or both doors may be opened or closed independent of the processing cycle by pushing the appropriate buttons, but not while a cycle is in progress or the chamber is pressurized.

## WASHING SYSTEM

**Wash/Rinse Water Spray System** separately emits wash and rinse-water sprays through 12 rotary, brass spray arms. The arms are positioned at the top, sides and bottom of the chamber to ensure complete coverage of the goods being processed. The arms at the side and top of the chamber have multiple nozzles; the bottom-arms have drilled openings. A riser valve is provided in the center of the chamber to mate with the spray manifolds on the Glassware and Bedpan processing racks. A centrifugal pump recirculates the wash and rinse water between the spray arms and a sump. The pump is driven by a 5 hp motor operable on your choice of 208, 240, or 480-volt, 60-Hz, 3-phase electrical service. The welded, stainless steel sump beneath the chamber contains a sparger to steam heat the wash and rinse water.

## COMPONENT OPERATING SYSTEMS

**Vacuum/Exhaust System** has 25 inches (635 mm) Hg capability. It includes a water-powered ejector and air filter. It automatically condenses chamber steam and disposes it to waste.

**Steam and Water Systems.** The Washer/Sterilizer operates on steam from an independent source delivered at 50 to 80 psig (3.52 to 5.62 kg/cm<sup>2</sup>), dynamic and water at 60 to 80 psig (4.22 to 5.62 kg/cm<sup>2</sup>). The steam supply line includes a strainer and automatic pressure regulator; the water line, a strainer and automatic detergent injector.

**Air Supply System.** A filtered air supply of 75-125 psig is required. A pressure regulator is recommended.

**Air Compressor [Optional].** A 1/2 H.P. 20 gallon air compressor supplies air pressure of 85-115 psig for installations which do not have an air pressure source. One compressor can supply sufficient air pressure for operation of up to 5 Washer/Sterilizers. Compressor is furnished with inlet air-filter, pressure gauge, relief valve, manual drain valve, adjustable pressure switch, and desiccant dryer. Air compressor may be remotely located with 1/2" piping recommended between unit and Washer Sterilizer(s).

**Loading\* and Unloading Units.** The loading unit will receive a rack of goods from the rack loading system (ordered separately), actuate the door-opening mechanism, feed the rack into the chamber, actuate the door-closing mechanism, lock both doors, and start the processing cycle... all automatically. Upon completion of the cycle, the door will open and the unloading unit will withdraw the rack from the chamber, and actuate the door-closing mechanism.

All parts of the loading and unloading units are corrosion-resistant and designed to help protect the load against damage and the operator against injury. The loading unit will accept and hold one rack. The unloading unit will accept and hold two or three racks, as specified.

## PERFORMANCE CAPABILITIES

Automatic wash-sterilize cycle is as follows:

- Phase 1 — rack of goods moves into the chamber.
- Phase 2 — a measured amount of detergent and water enters the sump and while the sparger heats the water, it is pumped (circulated) through the spray head nozzles and riser valve to force powerful jets of detergent water into and onto the load.
- Phase 3 — the detergent water is drained.
- Phase 4 — a measured amount of tap water enters the sump and while the sparger heats the water, it is pumped through the spray nozzles into and onto the load. The rinse water is then drained.

\*If ordering new Washer-Sterilizer(s) for use with existing conveyor, check size of existing loading table(s). Loading table furnished with new equipment is 23-1/16" long. Existing system may have longer loading table(s). If required, longer table(s) must be specified and special ordered. State exact size when ordering longer table(s).

• Phase 5 — Phase 4 is repeated to rinse the goods a second time, with either raw tap or Purified (e.g., deionized) Water as determined by the installation.

- Phase 6 — chamber is charged with steam to 285 F (141 C).
- Phase 7 — chamber is evacuated of steam and air then followed by return to atmospheric pressure.
- Phase 8 — rack of goods is discharged from chamber, the door closes.

Intermittent buzzer sounds when unload table is full.

When installed and operated according to instructions furnished, the Washer/Sterilizer will wash and sterilize approximately four loads of goods every hour. Each load may consist of one full basin, bedpan, glassware or tray rack, or one or two (if double-stacked) instrument/hardware loads in general purpose racks.

## OTHER COMPONENTS

**Steam-pressure regulator** operates on supply-line pressure. The regulator is packless, with phosphor-bronze syphon and brass bonnet enclosing a brass stem with Monel disc. The control assembly has a metal cover.

**Thermostatic steam traps** are suitable for an operating pressure of 45 psig (3.16 kg/cm<sup>2</sup>), are compensated for pressure and temperature and have renewable elements and seats.

**Electrical Connections.** External wires are metal-cable enclosed. They terminate in three conduit boxes: one for single-phase service, one for three-phase service, and one with connections for the Washer/Sterilizer interface equipment.

**Sanitary Safeguard.** Equipment and fittings are provided to prevent backflow of pollutants into the water-supply system and the Washer/Sterilizer.

**Coated Panels** are cold-rolled steel. Exposed surfaces have three sprayed-on coatings: surface primer, oven-baked intermediate coating, and textured epoxy.

## INSTALLATION

The Washer/Sterilizer is supported by a painted steel floor stand with height-adjustable, corrosion-resistant flanges. It is arranged for recessing through two walls, each not to exceed 2 inches (51 mm) in thickness. The front and back panels are painted, cold-rolled steel.

## WARRANTY

The American Sterilizer Company warrants that each sterilizer is carefully tested, inspected and leaves the factory in proper working condition, free of visible defects. Standard coverage includes one year on parts (except expendables) and labor. AMSCO representatives can provide full details of the warranty program upon request.

## OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

A coast-to-coast network of skilled and competent specialists can provide periodic PMA inspection and adjustment to assure low-cost peak performance.

CYCLE COMPLETE	
LOAD (00)	
STERILIZER OPERATOR	
WASH 10:02 M:S	
CONDITION 1:40 M:S	
STERILIZE 0:06 M:S	
EXHAUST 1:26 M:S	
TOT. CYCLE 13:16 M:S	
TIME TEMP. PRES.	
°F °C	
CHAMBER TEMP 267.2°F	
SET TEMP 285.0°F	
WASH-START	
CYCLE START 11-06-84	

- to be filled in by operator
- phase time selected
- cycle complete exhaust
- sterilize phase condition phase
- wash phase
- temperature in Fahrenheit pressure in English
- cycle type and temperature selected

POWER ON AT 2-1-82  
9:01A 68.4 0.0P

Power On Message

POWER ON AT 2-1-82  
9:34A 128.5 18.4P

Power Restored  
After Power Failure

ABORT: RESET BUTTON  
• 12:12A 279.4 22.2P

Reset Button Pressed  
During Cycle

11:05A 266.4 25.5P  
ALARM: UNDER TEMP  
11:04A 269.9 27.3P

Temperature Drops  
2 F Below Set Point

DOOR UNLK  
• 9:58A 243.3 12.7P

Door Opened During Cycle

ALARM: TEMP SENSOR  
• 3:45A 386.8 18.8P

Temperature Sensor Failure

ALARM: PRES SENSOR  
• 11:55A 118.0 41.3P

Pressure Sensor Failure

Figure 4. Typical Printout.

Figure 5. Control Monitoring and Communication.

## ENGINEERING DATA

UNIT WEIGHT lbs (kg)		UTILITIES CONSUMPTION												HEAT LOSS BTU/hr. at 70°F (21° C)		SOUND LEVEL (dBA)†††			
		WATER						STEAM***				ELECTRICITY — Amps							
		Cold*		Treated**				AIR†				Pump							
		Peak GPM/hr (kg/hr) Peak gpm (lpm)	Avg. gph (lph)	Avg. g/cycle (l/cycle)	Peak gpm (lpm)	Avg. gph (lph)	Avg. g/cycle (l/cycle)											Peak lbs/min (kg/min)	Avg. lbs/hr (kg/hr)
Ship- ping	Operat- ing															Thru Door (each end)	Between Two Walls		
2575 (1168)	2575 (1168)	40 (151)	300 (1135)	77 (291)	40 (151)	50 (189)	12 (45)	526 (239)	196 (89)	44 (20)	2 (.57)	12.5	16.0	15.0	7.5	2250	3348	75-80	

\*At 60 to 80 psig (4.22 to 5.62 kg/cm<sup>2</sup>), 4 grains per gallon maximum hardness.

\*\*At 20 to 80 psig (1.41 to 5.62 kg/cm<sup>2</sup>)

\*\*\*At 50 to 80 psig (3.42 to 5.62 kg/cm<sup>2</sup>) dynamic; 97% to 100% vapor quality.

†At 75 to 100 psig (5.27 to 7.03 kg/cm<sup>2</sup>), 50-55 F (10-13 C) dew point; filtered.

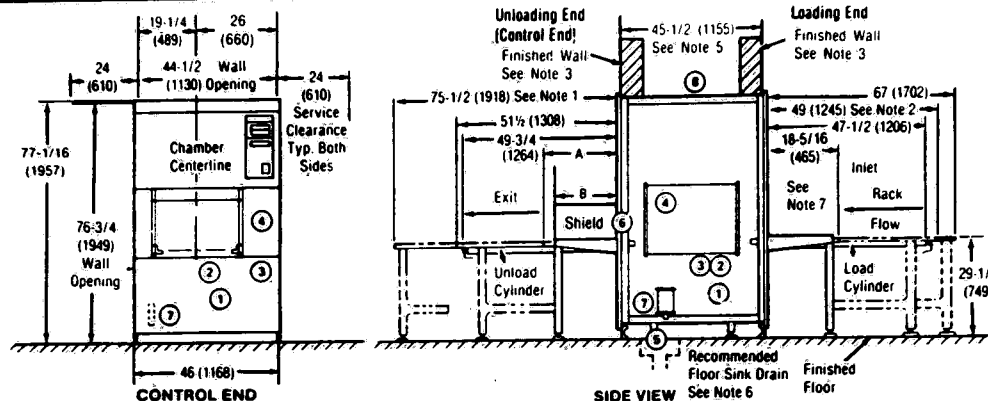
††Includes 1/3 hp motor (not to be connected to 3-phase wash pump).

†††Actual sound levels may vary due to building/room acoustics or the type of walls the unit is recessed through

OPTIONAL AIR COMPRESSOR DATA												
Weight lbs (kg)	Comp. Stages	Operating Speed	Cyl.	Lubricant	TANK			MOTOR		DESICCANT DRYER		
					Size (mm)	Capacity gal (l)	Max. Press. psig (kg/cm <sup>2</sup> )	Electrical	Operating Speed	Max. Press. psig (kg/cm <sup>2</sup> )	Weight lbs (kg)	Air In/Out
122 (56)	1	635	1 (3 cu in)	Splash (356-639)	14x33 (76)	20 (14 l)	200	120/240 V 1 Ph, 60 Hz	1750	200 (14 l)	32 (15)	1/2" 1/2 NPT

## SPECIFICATION WORKSHEET

Item \_\_\_\_\_ Furnish an AMSCO Eagle 2400 AMSCOMATIC washer/sterilizer with Printcon. Construct chamber 25x18x30" (635x457x762 mm) with double doors. Design control with microcomputer to control systems functions; monitor system operations, and visually indicate and print chamber temperature, pressure, time, date and daily cycle number. Arrange washer/sterilizer for recessing through two walls and for operation on steam from an independent source. Furnish auto-load table with ☐ two-rack or ☐ three-rack capacity or furnish ☐ Pawl Bar-feeder or ☐ Horizontal Rack Transporter or furnish unload table of ☐ 2 or ☐ 3 rack capacity. Furnish loading racks ☐ (Specify quantity): ☐ general purpose or ☐ basin or ☐ bedpan or ☐ glassware or ☐ tray or ☐ hold-down screen for GP-rack and ☐ rack dolly. Furnish instrument trays (Specify quantity and length): ☐ 10-1/2" ☐ 20-1/2" ☐ 15" ☐ 9" (x 3" deep). Furnish optional air compressor ☐ horizontal mounted tank ☐ vertical mounted tank.



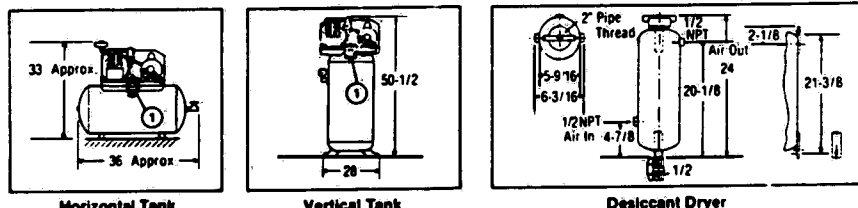
DIMENSIONS ARE INCHES (MILLIMETERS)  
— DRAWING IS NOT TO SCALE —

#### OPERATING REQUIREMENTS

- COLD WATER** — 1 NPT: 60 to 80 psig (4.22 to 5.62 kg/cm<sup>2</sup>); 60 to 80 F (15 to 27 C); 40 gpm (151 lpm) max. flow; water temperature not to exceed 85 F (29 C).
- TREATED WATER** — 1 NPT: 20 to 80 psig (1.41 to 5.62 kg/cm<sup>2</sup>); 40 gpm (151 lpm) max. flow.
- STEAM** — 1 NPT: 50 to 80 psig (3.52 to 5.62 kg/cm<sup>2</sup>), dynamic; condensate free, 97 to 100% saturated vapor, 196 lbs/hr (89 kg/hr).
- AIR** — 1/2 NPT: 75 to 100 psig (5.27 to 7.03 kg/cm<sup>2</sup>), filtered dewpoint 50 to 55 F (10 to 13 C) peak flow 2 scfm.
- DRAIN** — 1-3/8 ODT: 45 gpm (170 lpm). See note 6.
- TERMINAL BOX** — 120-volt, 60 Hz — for controls.
- TERMINAL BOX** — 208, 240 or 480-volt, 60 Hz, 3-phase — for pump motor.
- INTERFACE CONNECTION BOX** — for electrical connection of interface equipment to sterilizer.

... CHECK LOCAL CODES ...

#### OPTIONAL AIR COMPRESSOR



#### OPERATING REQUIREMENTS

- TERMINAL BOX** — 120/240 V, 60 Hz, 1 Phase for compressor motor.

#### NOTES

- Service clearance of 2 feet (610 mm) required around compressor.

This print is for guidance when planning space and utility services. Actual installation prints may be obtained from any AMSCO office representative.

#### NOTES

- The 51-1/2 and 75-1/2 inches (1308 and 1918 mm) dimensions are the overall clearances for two- and three-rack (respectively) unloading units.
- The 49 and 67 inches (1245 and 1702 mm) dimensions are the overall clearances for the two and three-rack (respectively) Auto-Load Table options.
- Finished wall thickness not to exceed 2 inches (51 mm).
- Pipe sizes shown indicate terminal outlets only. Building service lines to and from the equipment should be increased one pipe size to ensure optimum performance.
- Maintain a temperature of 70 to 100 F (21 to 38 C) between the walls.
- Drain requires 3 inch (76 mm) minimum diameter, trapped and approximately 78 sq. inches (503 sq. cm.) x 8 inches (52 mm) deep floor sink drain.
- 18-5/16 is the distance the load and unload table extend respectively with Pawl Bar Feed or Horizontal Rack Transporter on current loading equipment.
- See AMSCO dwgs. 134471-081, 082 and 56399-152 and 153 for equipment and rough in details.

- Inlet air temperature should be less than 80 F. Locate air inlet outside of enclosed service areas. Inlet air pipe size is 3/8". Increase pipe one size diameter for every 10 ft. (3048 mm) inlet filter is placed away from unit.
- Use 1/2" pipe between compressor and Washer/Sterilizer when compressor is remotely located.

## SECTION 2

### OPERATING INSTRUCTIONS

#### 2.1 GENERAL

The following instructions are intended to guide maintenance personnel when: (1) instructing operators in techniques designed to ensure optimum equipment performance; and (2) verifying the validity of operator complaints. See Section 6, **TROUBLE-SHOOTING**, if the sterilizer is not operating properly. Refer to Section 1, **GENERAL INFORMATION**, for capabilities of the equipment. If you are unfamiliar with this equipment, or you wish to review the principles by which the sterilizer operates, you are urged to read Section 3, **PRINCIPLES OF OPERATION**, before beginning actual operation.

Figure 2-1 shows the location of the various controls.

#### 2.2 BEFORE OPERATING THE EQUIPMENT

- Open access door to secondary control panel.

a. Position the **POWER** switch **ON**. Primary control panel lights up and all LEDs on the Printcon display light momentarily for a lamp test to assure the operator that the system is functioning. Chamber doors unlock, unload door opens, and the printer records the time and date that the power is turned **ON**.

**NOTE:** Do not press switches on the loading and unloading units. These switches are designed to be contacted and actuated only by the Amscomatic racks as they sequentially move into and out of the washing chamber.

- Open facility steam, water, and air valves.

2. Check detergent level. Approximately four ounces of detergent are required for each wash cycle. Be sure strainer on end of injector hose is clean.

- Be sure that instructions in paragraph 4.3.1, **Daily Maintenance**, have been carried out.

4. Check for correct time and date by pressing the **TIME** or **DATE** pushbutton. Set time (date) by **simultaneously** pressing **TIME (DATE)** and either **FORWARD** or **REVERSE** buttons. The longer both buttons are simultaneously held, the faster time (date) will change.

- Open Printcon panel and check paper roll. A colored warning stripe will appear on the paper when the roll is near its end. Single ply roll lasts approximately two months. See paragraph 7.13, **Printer Assembly**, if replacement is necessary.

- Check the printout to assure that the inked ribbon cartridge is providing adequate ink. A fresh cartridge should last approximately three to four months. See paragraph 7.13, **Printer Assembly**, if replacement is necessary.

**NOTE:** The visual display and printout of printer can optionally be set to indicate temperature in degrees Fahrenheit or Celsius and pressure can be either in English (PSI gauge and inches Hg vacuum) or metric (Kg/cm<sup>2</sup> gauge and mm Hg vacuum). LEDs on display indicate which units are being displayed. The display of temperature and English pressure can be either single precision (no decimal) or extended precision (one decimal). Metric pressure shows one or two decimal places. Metric vacuum shows no decimal places. See paragraph 7.16, **Main Printcon PC Board**.

- Review paragraph 2.6, **Control Monitoring and Communication Systems**, in order to identify the cause of any abnormal condition during a sterilization cycle.

- Using the thumbwheel switch on the Printcon unit, set the sterilize temperature to 285 F (126 C). This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If a selected temperature is outside the allowable range, 150-295 F (65-132 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

#### 2.3 AUTOMATIC OPERATION: WASH-STERILIZE CYCLE

- Follow instructions in paragraph 2.2, **Before Operating the Equipment**.

- Be sure **POWER** switch is **ON**. Primary control panel and Printcon display should be lit. Washer/Sterilizer is on but not yet ready for cycle (CODE 88). Printer prints **POWER ON** and time. **Note:** During

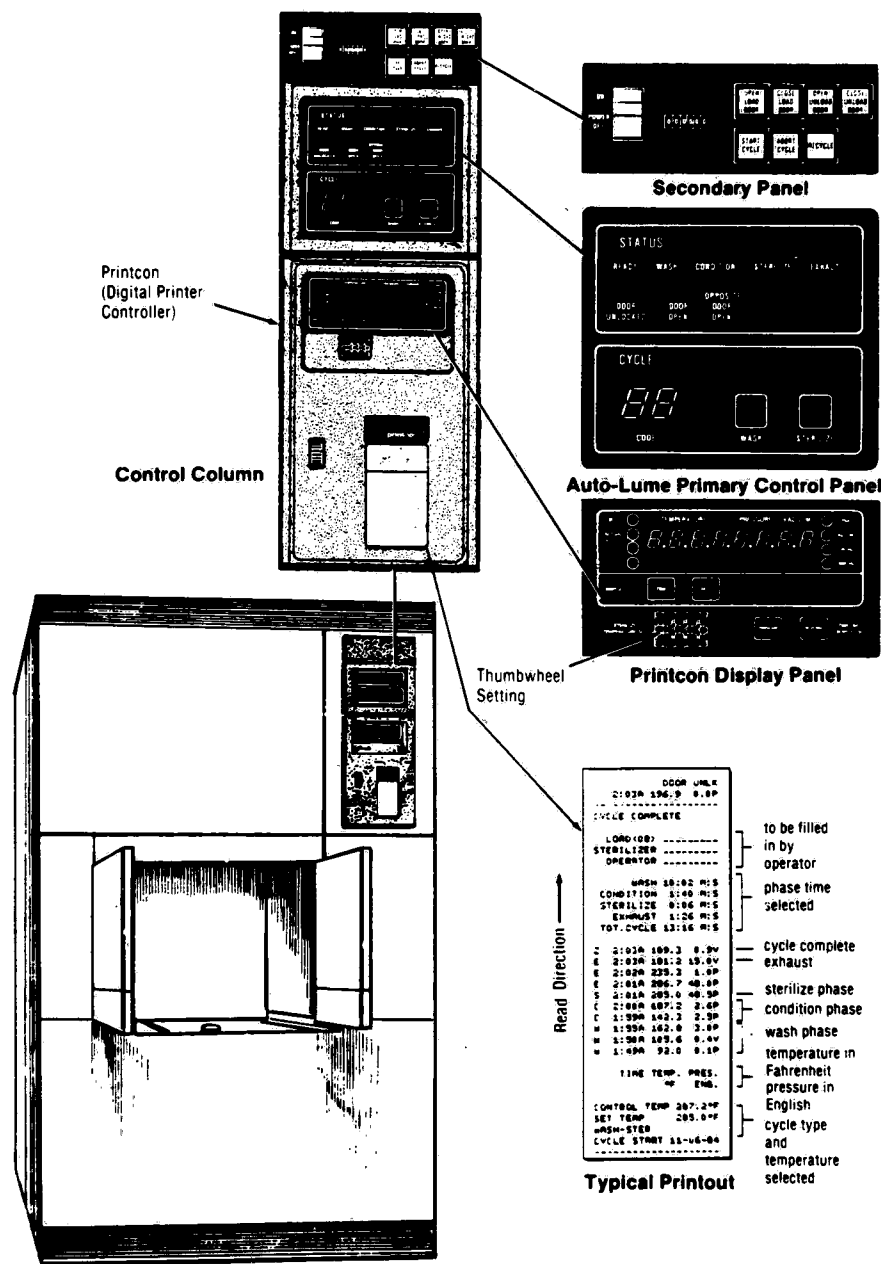


Figure 2-1. CONTROL LOCATIONS: Operating End.

2-2  
764320-440

B- 3

operation of the unit, a 2-digit CODE will be continuously displayed on the primary control panel, showing the status or alarm condition. During an alarm, a buzzer also sounds. For a complete list of codes see Table 2-1.

3. Check that racks are loaded properly.

□ Only racks designed for AMSCOMATIC are used.

**CAUTION: To prevent jamming and possible damage to spray fittings inside chamber, do not process empty racks.**

□ Empty racks, which can jam, are not used.

□ Loaded racks weigh no more than 50 pounds each.

□ Racks with optional support hooks have hooks in closed position.

□ Hinged instruments are in their fully open position in racks.

□ Objects in racks do not protrude up more than 16 inches.

4. Properly position racks on conveyor or rack table (supplied separately) to be received by the rack loading unit.

5. Press CYCLE START button. Rack will move into chamber. Doors will close and lock. WASH light will go on (CODE 01).

**NOTE:** Do not press switches on the loading and unloading units. These switches are designed to be contacted and actuated only by the Amscomatic racks as they sequentially move into and out of the washing chamber.

6. As cycle progresses panel displays codes and Printcon printer prints time, temperature, and pressure at each phase. (See Table 2-1 for explanation of code.) If cycle does not progress as listed in Table 2-1, refer to Section 6, TROUBLESHOOTING.

**WARNING NEVER REACH INTO CHAMBER UNLESS WING PANELS ARE OPEN AND SAFETY BAR IS IN POSITION TO PREVENT HYDRAULIC DOOR FROM SUDDENLY LOWERING AND CAUSING INJURY.**

7. If load does not move into the washer-sterilizer at beginning of cycle, an intermittent buzzer sounds. Check for following:

- Part of load touches top hinged panel (CODE 33)
- Rack jammed on load table (CODE 38)

- Load arm jammed (CODE 32)
- Inlet door open after admitting rack (CODE 24)
- Inlet door not open (CODE 22)

To proceed, remove any obstruction or correct problem and press CYCLE START button.

8. If load does not move out of washer-sterilizer at end of cycle, an intermittent buzzer sounds. Check for following:

- Unload table is full (CODE 54)
- Unload arm not working correctly (CODE 52 or 59)
- Unloading has failed three times (CODE 53)

To proceed, correct problem and press CYCLE START button. Wait for CODE 88 to be displayed.

9. To open doors for access to chamber,

a. Ensure POWER is on, press ABORT CYCLE button.

b. Push DOOR OPEN button.

c. Place wing panels in open position.

d. Block chamber door open with safety bar (Figure 2-2).

e. Turn POWER to OFF.

f. Proceed with maintenance.

10. To turn off machine at end of day

a. Wait until last rack has been discharged and unloading door lowers.

b. Be sure READY light is on.

c. Turn POWER switch to OFF.

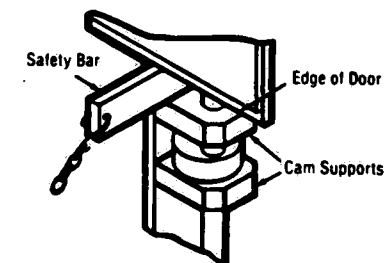


Figure 2-2. INSERTING CHAMBER DOOR SAFETY BAR.

2-3  
764320-440

B- 4

## 2.4 WASH ONLY CYCLE

**NOTE:** Unit requires minor service adjustment to accept cycle. See paragraph 7.18, *Setting WASH or STERILIZE Only Cycle*.

1. Follow instructions in paragraph 2.2, *Before Operating the Equipment*.

2. Be sure POWER switch is ON. Primary control panel and Printcon display should be lit. Washer/Sterilizer is on but not yet ready for cycle (CODE 88). Printer prints POWER ON and time. **Note:** During operation of the unit, a 2-digit CODE will be continuously displayed on the primary control panel, showing the status or alarm condition. During an alarm, a buzzer also sounds. For a complete list of codes see Table 2-1.

3. Check that racks are loaded properly.

☐ Only racks designed for AMSCOMATIC are used.

**CAUTION:** To prevent jamming and possible damage to spray fittings inside chamber, do not process empty racks.

☐ Empty racks, which can jam, are not used.

☐ Loaded racks weigh no more than 50 pounds each.

☐ Racks with optional support hooks have hooks in closed position.

☐ Jointed instruments are in their fully open position in racks.

☐ Objects in racks do not protrude up more than 16 inches.

4. Properly position racks on conveyor or rack table (supplied separately) to be received by the rack loading unit.

5. Press RECYCLE button.

6. Touch STERILIZE button, light will go out. WASH only cycle is now selected.

7. Press CYCLE START button. Rack will move into chamber. Doors will close and lock. WASH light will go on (CODE 01).

**NOTE:** Do not press switches on the loading and unloading units. These switches are designed to be contacted and actuated only by the Amcomatic racks as they sequentially move into and out of the washing chamber.

8. As WASH cycle progresses, primary control panel displays codes and Printcon printer prints time and temperature and pressure. (See Table 2-1 for explanation of code.)

**WARNING: NEVER REACH INTO CHAMBER UNLESS WING PANELS ARE OPEN AND SAFETY BAR IS IN POSITION TO PREVENT HYDRAULIC DOOR FROM SUDDENLY LOWERING AND CAUSING INJURY.**

9. If load does not move into the washer-sterilizer at beginning of cycle, an intermittent buzzer sounds. Check for following:

- Part of load touches top hinged panel (CODE 33)
- Rack jammed on load table (CODE 38)
- Load arm jammed (CODE 32)
- Inlet door open after admitting rack (CODE 24)
- Inlet door not open (CODE 22)

To proceed, remove any obstruction or correct problem and press CYCLE START button.

10. If load does not move out of washer-sterilizer at end of cycle, an intermittent buzzer sounds. Check for following:

- Unload table is full (CODE 54)
- Unload arm not working correctly (CODE 52 or 59)
- Unloading has failed three times (CODE 53)

To proceed, correct problem and press CYCLE START button.

11. To open doors for access to chamber,

- a. Ensure POWER is on, press ABORT CYCLE button. Wait for CODE 88 to be displayed.
- b. Push DOOR OPEN button.
- c. Place wing panels in open position.
- d. Block chamber door open with safety bar (Figure 2-2).
- e. Turn POWER to OFF.
- f. Proceed with maintenance.

12. Turn POWER to ON; unload door will open. Press CLOSE UNLOAD DOOR. Press START CYCLE.

13. To turn off machine at end of day

a. Wait until last rack has been discharged and unloading door lowers.

b. Be sure READY light is on.

c. Turn POWER switch to OFF.

## 2.5 STERILIZE ONLY CYCLE

**NOTE:** Unit requires minor service adjustment to accept cycle. See paragraph 7.18, *Setting WASH or STERILIZE Only Cycle*.

1. Follow instructions in paragraph 2.2, *Before Operating the Equipment*.

2. Be sure POWER switch is ON. Primary control panel and Printcon display should be lit. Washer/Sterilizer is on but not yet ready for cycle (CODE 88). Printer prints POWER ON and time. **Note:** During operation of the unit, a 2-digit CODE will be continuously displayed on the primary control panel, showing the status or alarm condition. During an alarm, a buzzer also sounds. For a complete list of codes see Table 2-1.

3. Check that racks are loaded properly.

☐ Only racks designed for AMSCOMATIC are used.

**CAUTION:** To prevent jamming and possible damage to spray fittings inside chamber, do not process empty racks.

☐ Empty racks, which can jam, are not used.

☐ Loaded racks weigh no more than 50 pounds each.

☐ Racks with optional support hooks have hooks in closed position.

☐ Jointed instruments are in their fully open position in racks.

☐ Objects in racks do not protrude up more than 16 inches.

4. Properly position racks on conveyor or rack table (supplied separately) to be received by the rack loading unit.

5. Press RECYCLE button.

6. Touch WASH button, light will go out. STERILIZE only cycle is now selected.

7. Press CYCLE START button. Rack will move into chamber. Doors will close and lock. CONDITION light will go on (CODE 09 or 10).

**NOTE:** Do not press switches on the loading and unloading units. These switches are designed to be contacted and actuated only by the Amcomatic racks as they sequentially move into and out of the washing chamber.

8. As STERILIZE cycle progresses, primary control panel displays codes and Printcon printer prints time, temperature and pressure. (See Table 2-1 for explanation of codes.)

**WARNING: NEVER REACH INTO CHAMBER UNLESS WING PANELS ARE OPEN AND SAFETY BAR IS IN POSITION TO PREVENT HYDRAULIC DOOR FROM SUDDENLY LOWERING AND CAUSING INJURY.**

9. If load does not move into the washer-sterilizer at beginning of cycle, an intermittent buzzer sounds. Check for following:

- Part of load touches top hinged panel (CODE 33)
- Rack jammed on load table (CODE 38)
- Load arm jammed (CODE 32)
- Inlet door open after admitting rack (CODE 24)
- Inlet door not open (CODE 22)

To proceed, remove any obstruction or correct problem and press CYCLE START button.

10. If load does not move out of washer-sterilizer at end of cycle, an intermittent buzzer sounds. Check for following:

- Unload table is full (CODE 54)
- Unload arm not working correctly (CODE 52 or 59)
- Unloading has failed three times (CODE 53)

To proceed, correct problem and press CYCLE START button.

11. To open doors for access to chamber,

- a. Ensure POWER is on, press ABORT CYCLE button. Wait for CODE 88 to be displayed.
- b. Push DOOR OPEN button.

- c. Place wing panels in open position.
- d. Block chamber door open with safety bar (Figure 2-2).
- e. Turn POWER to OFF.
- f. Proceed with maintenance.

12. Turn POWER to ON; unload door will open. Press CLOSE UNLOAD DOOR. Press START CYCLE.

13. To turn off machine at end of day

- a. Wait until last rack has been discharged and unloading door lowers.
- b. Be sure READY light is on.
- c. Turn POWER switch to OFF.

## 2.6 CONTROL MONITORING AND COMMUNICATION SYSTEMS

A two digit number will appear on primary panel indicating STATUS or ERROR. In the case of error take necessary action or call maintenance. See chart below.

TABLE 2-1. STATUS AND ERROR CODES.

WASH CYCLE	STERILIZE CYCLE	DOORS
01 First Fill	10 Purge	20 Doors Unlocking
02 Wash	11 Steam Charge	21 Doors Locking*
03 First Drain*	12 Sterilize	22 LD DR Opening*
04 Second Fill	13 Exhaust*	23 ULD DR Opening*
05 Rinse	14 Draw Vacuum*	24 LD DR Closing*
06 Second Drain*	15 Air Break*	25 ULD DR Closing*
07 Third (Pure) Fill	16 Complete	
08 Pure Rinse		
09 Third Drain*		
LOAD ARM	UNLOAD ARM	OTHER
30 L.A. Extending	50 U.A. Extending	77 Wing Panel Ajar
31 L.A. Retracting	51 U.A. Retracting	88 NOT READY
32 Timeout Retracting*	52 Timeout Retracting*	89 READY
33 Basket Too High*	53 Failed 3X to ULD*	99 ABORT IN PROCESS
37 Load HBP*	54 ULD Table Full*	
38 Failed to Load BSKT*	59 Timeout Extending*	
39 Timeout Extending		

\*Buzzer sounds

## SECTION 3

### PRINCIPLES OF OPERATION

#### 3.1 GENERAL

The Amscomatic is designed for the high-volume processing of soiled surgical instruments and hospital utensils. A load ram automatically moves loaded racks into the loading end of the chamber, where they are thoroughly washed, rinsed, and steam sterilized. Racks are then ejected from the opposite end of chamber by an unload ram onto a table-like structure. Saturated steam is used as the sterilizing agent.

The Amscomatic is designed to continually load, wash, rinse, sterilize, and unload basket racks automatically without attention. To begin operation each day, it is necessary to turn power ON (a wash/sterilizer cycle is automatically selected), and push the START CYCLE button. After each cycle, when the chamber is unloaded, the control is automatically reset. This will allow each available basket to be loaded into the chamber and processed without operator attention. Also available with minor adjustment is a separate WASH only or separate STERILIZE only cycle. The sterilizer is connected to separate loading and separate unloading systems.

#### 3.2 OPERATOR PANELS

The Operator Panel on the exit (unload) side is the interface between the operator and the sterilizer. The operator panel is composed of status indicators and digital displays, pushbuttons, and power ON/OFF switch.

##### Status Indicators and Digital Displays

The status indicators signal the different states that the sterilizer assumes when power is turned on. The indicators READY, WASH, CONDITION, STERILIZE and EXHAUST indicate the various phases of the cycle. There are also indicators indicating: DOORS UNLOCKED, DOOR OPEN, OPPOSITE DOOR OPEN, WASH cycle, and STERILIZE cycle.

Also, there are other indicators that specify the function of a digital display, for example the AM or PM indicator for the time display, and temperature, pressure and vacuum units as described below.

The PRESSURE/VACUUM display, in conjunction with the indicators, will continuously display the

pressure (PRESSURE indicator on) in PSIG (KG/CM) or vacuum (VACUUM indicator on) in IN HG (MM HG) of the chamber. The display also will continuously monitor chamber TEMPERATURE along with the indicator of the unit of Celsius or Fahrenheit.

##### Message Codes

On the operator panel there is a display for a Message code. These codes are used to warn the operator of a malfunction in the system or to indicate status of WASH or STERILIZE cycle. The various codes are listed and described in the following text.

##### Pushbuttons

The switches on the secondary panel allow the operator to select other states and functions. There are four pushbuttons labeled: OPEN LOAD DOOR, CLOSE LOAD DOOR, OPEN UNLOAD DOOR, and CLOSE UNLOAD DOOR. These allow the operator to manually control the operation of the doors. There are also three more pushbuttons labeled: START CYCLE, ABORT CYCLE, and RECYCLE. The CYCLE START is used by the operator to initiate a cycle. The CYCLE ABORT will abort any phase the control may be in (including the door operations), and return to the NOT READY (see paragraph 3.3) state. If the water is in the chamber when the CYCLE ABORT switch is pushed the control will drain the water first then return to the NOT READY state. The RECYCLE SWITCH is used to clear the chamber and to operate the hydraulic mechanisms. All pushbuttons except CYCLE ABORT are disabled in the READY state and in CYCLE.

The time of day or the date can be displayed upon request by pressing the TIME or DATE pushbutton. Once displayed, it can be changed by pressing the FORWARD or REVERSE pushbutton as long as unit is in the NOT READY state.

##### Set Times

Wash time is set to 305 seconds (rotary dip switch on the Printcon display board set to 61). Sterilize time is set to 5 seconds (rotary dip switch on the Printcon display board set to 01).

The sterilize set temperature will be set to 285 F using the thumbwheel on the Printcon unit. The sterilize control temperature overdrive will be set to 2 F using the overdrive dip switches on the Printcon PC board.

A panel will be used on the inlet (load) side, and will indicate cycle and door status.

3.3 AMSCOMATIC OPERATION

When the ON/OFF switch is set to the ON position with no cycle in progress, the unit is in the NOT READY state (CODE 88). In this state the clock can be set and the doors can be manually operated. The operator must activate the START CYCLE switch to initiate automatic operation.

On power up at the beginning of a day's operation, the unload door will open. This will allow the operator to clean the strainers by opening the wing panels. The doors will be locked open during this procedure.

Pressing the START CYCLE button will automatically close and lock the doors, and set the washer/sterilizer in the READY state (CODE 89). When a rack arrives the load door will open and the rack will be loaded into the chamber. When the loading operation is complete the load door will close. When both doors are closed, they will automatically lock. The READY light will turn off.

With both doors now locked and the rack loaded in the chamber, the cycle will start. The washer will now fill, wash, rinse, and sterilize.

After the cycle is complete both doors will unlock. After the unload door is unlocked and if the unload table is not full, the unload door will open. Once the door is open, the rack will be unloaded. As soon as the basket has unloaded the unload door will close. The READY indicator will turn on. The control is now ready to accept another rack.

If power is turned off with a rack in the chamber, the rack is automatically reprocessed when power is turned back on.

Cycle codes can be continuously displayed, or optionally displayed only in the event of a malfunction.

The cycle abort switch stops automatic operation and puts the unit in the NOT READY state; ABORT IN PROCESS (CODE 99) will light on panel.

3.4 MANUAL DOOR OPERATION

When power is applied to the washer/sterilizer it is normally in the NOT READY state. In the NOT READY state the doors can be operated by activating the desired function on the operator panel. The door operation is based on a hydraulic system which consists of a hydraulic pump, double coil two-position (no center off) solenoid valves and cylinders. The pump is used to generate the pressure required for the operation of the cylinders which raise the doors as well as the operation of the lock and unlock mechanism, and load and unload mechanisms. The valves control the hydraulic flow to the various cylinders as required per function selected. The doors close by gravity after the release pressure (CLOSE DOOR) valve has operated.

There are four pushbuttons to initiate door operations as follows:

- 1. OPEN LOAD DOOR (PB1)
- 2. CLOSE LOAD DOOR (PB2)
- 3. OPEN UNLOAD DOOR (PB4)
- 4. CLOSE UNLOAD DOOR (PB5)

When the door close switch is activated the appropriate door will close. To lock the doors, both doors must be closed and then activate either door close switch and both doors will lock. When the door open switch is activated both doors will unlock and appropriate door will open. Manual door operation is inhibited when the machine is in the READY state or during a cycle. Once in the READY state, activating the ABORT CYCLE switch will set the washer/sterilizer in the NOT READY state.

Activating either wing panel switch inhibits manual door operation and reverses the door closing operation if in process.

**NOTE:** The door raise and lower operations and the lock and unlock operations cannot be stopped part way through because the hydraulic valves controlling these operations are dual action. The operations can only be continued or reversed, or the pump can be stopped. However, if the pump is stopped, action is uncontrolled and unpredictable because of the equalization of pressure between the door, lock, and arm cylinders.

3.5 DOOR VALVES AND LIMIT SWITCHES

Each door has several valves and limit switches associated with its operation. Following is a description of each valve and switch. Each door has one door open limit switch, two door closed limit switches to assure that the door is properly seated before locking, one door unlocking limit switch and two door locked limit switches to assure that the locking cams on both sides of the door have engaged. Also each door has a double coil two-position solenoid valve (no center off) CLOSE DOOR in open position and OPEN DOOR in other position. It is not required to have the hydraulic pump running while closing the doors but the pump must be running to maintain the door open. Every time a door operation is initiated the hydraulic pump will continue to run for one minute to avoid short start/stop cycles which will decrease the life of the pump. The lock/unlock operation is also controlled by a double two-position solenoid valve. Both doors are locked with the lock/unlock doors valve is set to the lock position and both doors are unlocked when the lock/unlock doors valve is set to the unlock position. Doors cannot be locked or unlocked individually.

DOOR COMPONENTS DESCRIPTION

- **Load Door**  
DOOR OPEN LS14  
DOOR UNLOCKED LS12  
DOOR CLOSED LS3  
DOOR LOCKED LS1  
  
OPEN DOOR S6  
CLOSE DOOR S3
- **Unload Door**  
DOOR OPEN LS13  
DOOR UNLOCKED LS7  
DOOR CLOSED LS9  
DOOR LOCKED LS5  
  
OPEN DOOR S2  
CLOSE DOOR S5
- **Common to Both Doors**  
LOCK DOORS S4  
UNLOCK DOORS S1

3.6 DETAILED DOOR OPERATION

It is assumed that the power is ON, the sterilizer is NOT READY (out of cycle) and both load and unload doors are closed and locked. See Door Operation Timing Diagram.

• **Unlocking (CODE 20)**

When an open door switch is activated, PB1 for the load door or PB4 for the unload door, the hydraulic pump (M2) will be energized and the unlock doors (S1) will be pulsed on, setting the lock/unlock valve to unlock. The unlocking mechanism will operate until the door unlocked switches, LS12 for load door and LS7 for the unload door, are activated.

If the above event does not occur within a pre-determined time, an alarm will sound and Message CODE 20 will be displayed on the primary panel indicating door unlocked switch or switches were not activated on time. The control will continue to attempt to unlock the door, this will continue until the ABORT CYCLE button is pushed and the control returns to the NOT READY state.

If the ABORT CYCLE button is activated during unlocking, the unlocking operation will stop and locking will start (see LOCKING).

• **Opening (Load Door CODE 22) (Unload Door CODE 23)**

After a successful door unlocking operation the appropriate door will proceed to open. Following the activation of the door unlocked switches the open door solenoid will be pulsed on, S6 for the load door or S2 for the unload door, and the door will proceed to open until the door open limit switch, LS14 for load door or LS13 for unload door, is activated.

If the above event does not occur within a pre-determined time, an alarm will sound and Message CODE 22/23 will be displayed on the primary panel indicating door open switch was not activated on time. The control will try this operation for one minute, if not successful it will go to the closing procedure.

If the ABORT CYCLE switch is activated during opening, the opening operation will stop and closing will start (see CLOSING).



• **Closing** (Load Door CODE 24) (Unload Door CODE 25)

When a close door switch is activated, PB2 for the load door or PB5 for the unload door, the close door solenoid, S3 for the load door or S5 for the unload door, will be pulsed on. The door will proceed to close until door closed switches, LS3 for the load door and LS9 for the unload door are activated.

If the above event does not occur within a pre-determined time, an alarm will sound and Message CODE 24/25 will be displayed on the primary panel indicating door closed switch was not activated on time. The control will try this operation for one minute, if unsuccessful it will proceed to the opening procedure, then abort.

If the cycle abort switch or wing panel switch is activated during closing, the closing operation will stop and opening will start (see OPENING).

• **Locking** (CODE 21)

Locking operation can be achieved by activating either close door switch. Following the activation of the close door switch the lock doors solenoid (S4) will be pulsed on. The locking mechanism will operate until the door locked limit switches, LS1 for the load door, and LS5 for the unload door are activated. Approximately after one minute the hydraulic pump will stop.

If the above event does not occur within a pre-determined time an alarm will sound and Message CODE 21 will be displayed on the primary panel indicating door locked switch was not activated on time. The control will continue to try to lock for one minute or until the abort button is pushed.

If the cycle abort switch is activated during locking, the locking operation will stop and unlocking will start (see UNLOCKING).

### 3.7 FUNCTIONAL DESCRIPTION OF CYCLE

#### Start Cycle (CODE 89)

- After a rack has been admitted in the chamber and the doors have been closed and locked the sump will fill with water. The control will print the following:

W	10:06A	72.3	0.0P
	Time	Temp	Pres
		°F	Eng
Control Temp		287.0°F	
Set Temp		285.0°F	
Wash-Ster			
Cycle Start	3/29/84		

If the ABORT CYCLE button is pressed any time during the cycle the control will return to the NOT READY state. If water is in the chamber the control will drain the water first. If pressure or vacuum is present, it will be relieved. See Wash/Sterilize Cycle Operation Timing Diagram.

#### First Fill (CODE 01)

- Main water valve (V1) will open and remain open until the end of the cycle. Water fill valve (V2) will open thus allowing water to enter the chamber through an opening located on top of the chamber.

The detergent valve (V4) will also open at this time. When this valve opens, detergent will be drawn from a container through a water ejector in line with the water flowing into the chamber.

Finally, the WASH indicator is turned on. All of the above valves are opened instantaneously such that there is not a noticeable delay between the time it takes to open all valves and the print Message.

The washer/sterilizer will be in the Fill state for 24 seconds (dip switches on control board set to 1100), approximately 12 gallons of water will enter chamber. Then the water fill and the detergent valves will close.

#### Wash (CODE 02)

- The pump water valve (V3) will open and the wash pump (M1) will start. The steam to sump valve (V6) will also open thus heating the water being collected in the sump and recirculated by the pump. In this state the pump will recirculate the water through the spindles and the water will be heated in the sump.

The unit will be in the Wash state for 305 seconds (rotary dip switch on Printcon display board set to 61). Then the steam to sump valve will close. A message will be printed before and after wash as follows:

W	10:12A	120.0	0.0P
W	10:07A	80.0	0.0P

#### First Drain (CODE 03)

- At this time the drain valve (V7) will open and the water will be pumped to the condenser and finally be discharged from the unit. The steam to chamber valve (V8) and water to ejector valve (V9) will open. Draining will continue until the low water sensor (LS23) is activated or a timeout (40+ seconds) occurs in which case an alarm will sound and the Message CODE 03 will be displayed on the primary panel indicating too long in drain.

After the unit is empty, the drain, steam to chamber and water to ejector valves will close.

#### Second Fill (CODE 04)

- Following the drain phase another fill will start. The water fill valve will open.

The unit will be in the Fill state for 24 seconds. See First Fill. Then the water fill valve will close.

#### Rinse (CODE 05)

- The steam to sump valve (V6) will open. The unit will be in the Rinse state for 60 seconds (dip switch on control board set to 1100). Then the steam to sump valve will close.

#### Second Drain (CODE 06)

- At this time the drain valve (V7) will open and the water will be pumped to the condenser and finally be discharged from the unit. The steam to chamber valve (V8) and water to ejector valve (V9) will open. Draining will continue until the low water sensor (LS23) is activated or a timeout (40+ seconds) occurs in which case an alarm will sound and the Message CODE 06 will be displayed on the primary panel indicating too long in drain.

After the unit is empty, the drain, steam to chamber and water to ejector valves will close.

#### Pure Fill (CODE 07)

- Following the drain phase a fill with purified water will start. The pure fill valve (V5) will open. The unit will be in the Pure fill state for 24 seconds. See First Fill. Then the pure fill valve will close.

#### Pure Rinse (CODE 08)

- After the filling has been completed steam to sump valve (V6) will open. The unit will be in the Rinse state for 60 seconds. See Rinse. Then the steam to sump valve will close.

#### Third Drain (CODE 09)

- At this time the drain valve (V7) will open and the water will be pumped to the condenser and finally be discharged from the unit. The steam to chamber valve (V8) and water to ejector valve (V9) will open. Draining will continue until the low water sensor (LS23) is activated or a timeout (40+ seconds) occurs in which case an alarm will sound and the Message CODE 09 will be displayed on the primary panel indicating too long in drain.

After the unit is empty, water to ejector valve will close the wash pump (M1) and pump water (V3) will turn off.

The pure fill, pure rinse, and third drain are included in the cycle via a dip switch on control board.

#### Condition

- Following the drain phase the drain and steam to chamber valves remain open for the purge phase (CODE 10), and the WASH indicator is turned off. The water to condenser valve (V13) opens and the CONDITION indicator will turn on. The following Message will be printed:

C	10:11A	83.1	0.0P
---	--------	------	------

The unit will be in the Purge state for 25 seconds (dip switch on control board set to 0101). Then the drain valve will close.

At the end of the purge another Message will be printed. Then the trap valve (V12) will open and pressure and temperature in the chamber will start building up (CODE 11).

**Sterilize (CODE 12)**

- When the temperature reaches the set point of 285 F (set on the Printcon thumbwheels) the sterilize state is reached, the STERILIZE indicator will turn on, the CONDITION indicator will turn off, and a Message will be printed, as follows:

S 10:14A 285.0 31.4P

If the temperature is not reached within a pre-determined time a timeout occurs in which case an alarm will sound and Message CODE 11 will be displayed on the primary panel indicating that the temperature was not reached. The sterilizer will be in the sterilize state for 5 seconds (rotary dip switch on Printcon display set to 01).

The temperature will be controlled at 287 F (2 F overdrive set on Printcon dip switches). At the end of sterilize the steam to chamber and trap valves will close and the sterilize indicator will turn off.

**Exhaust**

- When the Exhaust state is reached a Message will be printed as follows:

E 10:17A 287.0 29.8P

Also, the EXHAUST indicator will go on. At this time the water to ejector (V9), Drain (V7) and Vacuum (V10) valves will open. In this state pressure will start decreasing rapidly with help from the vacuum being pulled by the ejector through the trap and condenser.

The unit will exhaust (CODE 13) until the pressure/vacuum sensor (PRES#1) reaches 1 psi (PS-2) or a timeout occurs in which case an alarm will sound and Message CODE 13 will be displayed on the primary panel indicating that pressure was not reached.

A vacuum will be pulled (CODE 14) until the pressure/vacuum sensor (PRES#1) reaches 15 in. Hg (VS-1) or a timeout occurs in which case an alarm will sound, and Message CODE 14 will be displayed on the primary panel indicating that vacuum was not reached.

After the unit has reached 15 in. Hg. (VS-1) the vacuum (V10), main water (V1), water to ejector (V9), and water to condenser (V13) valves will close.

The vacuum break valve (V11) will open. In this state vacuum will be released (CODE 15). The unit will vacuum break until the pressure/vacuum sensor (PRES#1) reaches two in. Hg (VS-2) or a timeout occurs, in which case an alarm will sound, and Message CODE 15 will be displayed indicating that atmospheric pressure was not reached.

After the unit has reached two in. Hg (VS-2), the vacuum break valve (V11) valve will close. At this time the counter (CNTR) is incremented. The exhaust indicator will turn off.

**Complete (CODE 16)**

- After having reached the end of the sterilize cycle vacuum level, the Message:

CYCLE COMPLETE  
Load (01) \_\_\_\_\_  
Sterilizer \_\_\_\_\_  
Operator \_\_\_\_\_  
WASH 7 MIN  
STERILIZE 3 MIN  
TOTAL CYCLE 14 MIN

The washer/sterilizer has filled, washed, rinsed, and sterilized the load in the chamber. Now it is ready to unload the basket and load another.

**TABLE 3-1. PROCESS COMPONENT DESCRIPTION.**

MAIN WATER	V1	Main water supply valve to the sterilizer.
WATER FILL	V2	Valve allows water to enter the sump through an opening located on top of the chamber.
PUMP WATER	V3	Valve lets water enter the WATER PUMP (M1) for lubricating and sealing purposes.
DETERGENT	V4	Valve will let detergent be drawn from a container through a water ejector in line with the water flowing into the chamber.
PURE FILL	V5	Valve allows purified water to enter the sump through an opening located on top of the chamber.
STEAM TO SUMP	V6	Valve opens permitting steam to heat the water being collected in the sump and recirculated by the water pump.
DRAIN	V7	Valve will open and the water will be pumped to the condenser and finally be discharged from the unit.
STEAM TO CHAMBER	V8	Valve will let steam into the chamber thus increasing the pressure and temperature required to sterilize the load. It is also used to speed the Draining operation.
WATER TO EJECTOR	V9	Valve opens permitting water to flow through a water ejector thus creating a vacuum.
VACUUM	V10	When this valve opens, it connects the chamber to the suction side of the water ejector.
VACUUM BREAK	V11	Valve will let atmospheric air enter the chamber.
TRAP	V12	When this valve opens, it lets steam condensate and air flow to the steam trap.
WATER TO CONDENSER	V13	Valve lets water flow to the steam condenser and collapses the steam.
WATER PUMP	M1	Pump draws water from the sump and discharges it through the spinners located inside the chamber. The pump is also used for draining.
HYDRAULIC PUMP	M2	Pump is used to generate the pressure required for the operation of the cylinders which raise the doors and operate the lock and unlock mechanism as well as the load and unload mechanisms.
COUNTER	CNTR	Keeps a log of cycles completed.

### 3.8 RECYCLE OPERATION

**NOTE:** The recycle switch (PB6) is active only when the washer/sterilizer is in one of the following three states:

1. LOAD DOOR closed and UNLOAD DOOR open.
2. Both DOORS closed and NOT READY.
3. Both DOORS closed, locked and NOT READY.

Depending on the state of the sterilizer when the recycle switch is activated, the unit will proceed to unlock doors, and then open the unload door, unload the rack, close the unload door, open the load door, load a basket (even if none is present), close the load door, and lock both doors.

After the recycle operation is complete, the unit will remain in the NOT READY state.

### 3.9 FUNCTIONAL DESCRIPTION OF AMSCOMATIC LOADING/UNLOADING SYSTEM

#### Loading

Activation of the START CYCLE switch (PB3) will close the doors and put the washer/sterilizer in the READY state. The READY indicator (RDY) will turn on to acknowledge the start request. When a rack arrives at the washer, its presence is detected by the rack-in-place switch LS11. The load door will now open. When the door has completed the opening operation the extend-load-arm solenoid (S11) will be pulsed on. This will set the Extend/Retract valve to the extend position causing the load arm to fully extend and push the rack into the chamber (CODE 30). When the load HBP (hydraulic back pressure) pressure switch (PS1) is activated, the load retract arm solenoid (S12) will be pulsed on. This will set the Extend/Retract valve to the retract position and the arm will fully retract (CODE 31). If the rack-in-place switch is not actuated and if the load arm retracted (LS6) switch is active the load door will now close and both doors will lock. See Loading Operation Timing Diagram.

If the load pressure HBP is activated and the rack-in-place switch is also active, it may indicate that the rack has jammed. The door will remain open, the alarm will sound and Message CODE 38 will be displayed on the primary panel indicating that the unit is unable to load a rack. The Load Arm will retract and the washer/sterilizer will remain in this state until the START CYCLE switch is activated. When the START CYCLE is activated, the Load Arm will extend again.

If when the rack is being loaded the rack too high switch LS15 is activated the Load Arm will retract. The alarm will sound and Message CODE 33 will be displayed on the primary panel indicating rack too high. The washer/sterilizer will remain in this state until the START CYCLE switch is activated. When the START CYCLE is activated, the Load Arm will extend again.

If after a predetermined time following the extension of the Load Arm, the LOAD HBP is not activated, the Load arm will retract. The alarm will sound and Message CODE 37 will be displayed on the primary panel indicating that the load HBP is not working. The washer/sterilizer will remain in this state until the START CYCLE switch is activated. When the START CYCLE is activated, the Load Arm will extend again.

If after a predetermined time following the retraction of the Load Arm, the load arm retracted switch (LS6) is not activated, the alarm will sound and Message CODE 32 will be displayed on the primary panel indicating that the load arm is not working. Hydraulic pressure will be maintained until the load arm retracted switch is activated.

To clear any of the loading alarms, press the START CYCLE pushbutton.

If on power up, the load arm is not fully retracted, it will be retracted and Message CODE 51 will be displayed.

TABLE 3-2. LOAD COMPONENTS DESCRIPTION

RACK IN PLACE	LS11	Detects presence of rack on the load table.
EXTEND LOAD ARM	S11	When this solenoid is pulsed on, the load extend/retract hydraulic valve is set to the extend position.
RETRACT LOAD ARM	S12	When this solenoid is pulsed on, the load extend/retract hydraulic valve is set to the retract position.
LOAD ARM RETRACTED	LS6	Limit switch to detect that the arm used to load racks into the washer/sterilizer has been fully retracted and will not be in the path of the door when it closes.
START CYCLE	PB3	Switch indicates to the control that the washer/sterilizer is to enter the READY state.
RACK TOO HIGH	LS15	Switch is activated when a rack is too tall to enter the washer/sterilizer.
LOAD HBP	PS1	Pressure switch is used to detect hydraulic back pressure in the system that operates the load and unload cylinders. When zero pressure is detected it means that the load arm has stopped, either normally or abnormally.
WING PANEL SWITCHES	WS1,2	When these switches are activated the control will retract the loading (or unloading) arm and leave the loading (or unloading) door open until the switch is deactivated.

#### Unloading

When the washer/sterilizer has completed processing the load, the doors will unlock. The unload door will open if the unload table full switch (LS4) is not active. If the rack on unload table is active then the unload table is full. The unit will sound an alarm, and Message CODE 51 will be displayed indicating that a rack is on the unload table. The unit will wait in this state until the rack is removed from the unloading table before proceeding with its cycle. See paragraph 3.6 for details of door operation.

Once the unload door is open, the unload extend arm solenoid (S9) will be pulsed on. This will set the Extend/Retract valve to the extend position (CODE 56). When the unload HBP (Hydraulic Back Pressure) pressure switch (PS2) is activated, the retract-unload-arm solenoid (S10) will be pulsed on. This will set the Extend/Retract valve to the retract position and the rack will be unloaded (CODE 57). When the rack-removed- (CODE 58) switch (LS22) is activated, then deactivated, and the unload-arm-retracted (LS20) is also activated the unload door will close. The washer/sterilizer is now ready to accept another rack and the READY indicator will turn on (See Unloading Operation Timing Diagram).

If after a predetermined time following the extension of the Unload Arm, the unload HBP is not activated, the Unload Arm will retract. The alarm will sound and Message CODE 53 will be displayed on the primary panel indicating that the unload HBP is not working. The unit will remain in this state until the START CYCLE switch is activated. When the START CYCLE switch is activated, the Unload Arm will extend again.

If a rack does not come all the way out of the chamber, the rack removed switch will remain active. As soon as the unload arm fully retracts, the arm will again extend and attempt to unload the rack. The operation will be performed three times. After the third unsuccessful attempt to unload the rack, the alarm will sound and the Message CODE 54 will be displayed on the primary panel indicating that the unit was unable to unload a basket. The washer/sterilizer will remain in the retracting state until the START CYCLE switch is activated. When the START CYCLE switch is activated, the Unload Arm will extend again.

**TABLE 3-3. UNLOADING COMPONENTS DESCRIPTION.**

RACK REMOVED	LS22	Limit switch is active when there is a rack being removed from the chamber.
EXTEND UNLOAD ARM	S9	When this solenoid is pulsed, the unload extend/retract hydraulic valve is set to the retract position.
RETRACT UNLOAD ARM	S10	When this solenoid is pulsed, the unload extend/retract hydraulic valve is set to the retract position.
UNLOAD TABLE FULL	LS4	Limit switch indicates that the basket is on the unloading table and that another basket cannot be removed from the washer/sterilizer.
UNLOAD ARM RETRACTED	LS20	Limit switch to detect that the arm used by the unloader to pull racks out of the washer/sterilizer has been fully retracted and will not be in the path of the door when it closes.
UNLOAD HBP	PS2	Pressure switch is used to detect hydraulic back pressure in the system that operates the load and unload cylinders. When zero pressure is detected, it means that the unload arm has stopped either normally or abnormally.

If after a predetermined time following the retraction of the Unload Arm, the unload-arm-retracted switch (LS20) is not activated, the alarm will sound and the Message CODE 52 will be displayed on the primary panel indicating that the unload arm is not working. The Arm will continue to attempt to retract until the unload-arm-retracted switch is activated.

If on power up, the unload arm is not fully retracted, it will be retracted, and Message CODE 50 will be displayed.

#### Conveyor Interface

The WASHER/STERILIZER-IN-ON signal is hard-wired from after the control power switch.

The RACK-ON-EXIT-TABLE signal is on when the EXIT-TABLE-FULL switch LS4 is actuated.

The RACK-ON-INLET-TABLE signal is on when the RACK-IN-PLACE switch LS11 is actuated.

The INLET-DOOR-NOT-OPEN-AND-NO-RACK-ON-LOAD-TABLE signal is on when the DOOR-OPEN switch LS14 is not actuated and the RACK-IN-PLACE switch LS11 is not actuated.

The TREATED-WATER-PUMP signal is on when the PURE-FILL valve V5 is on.

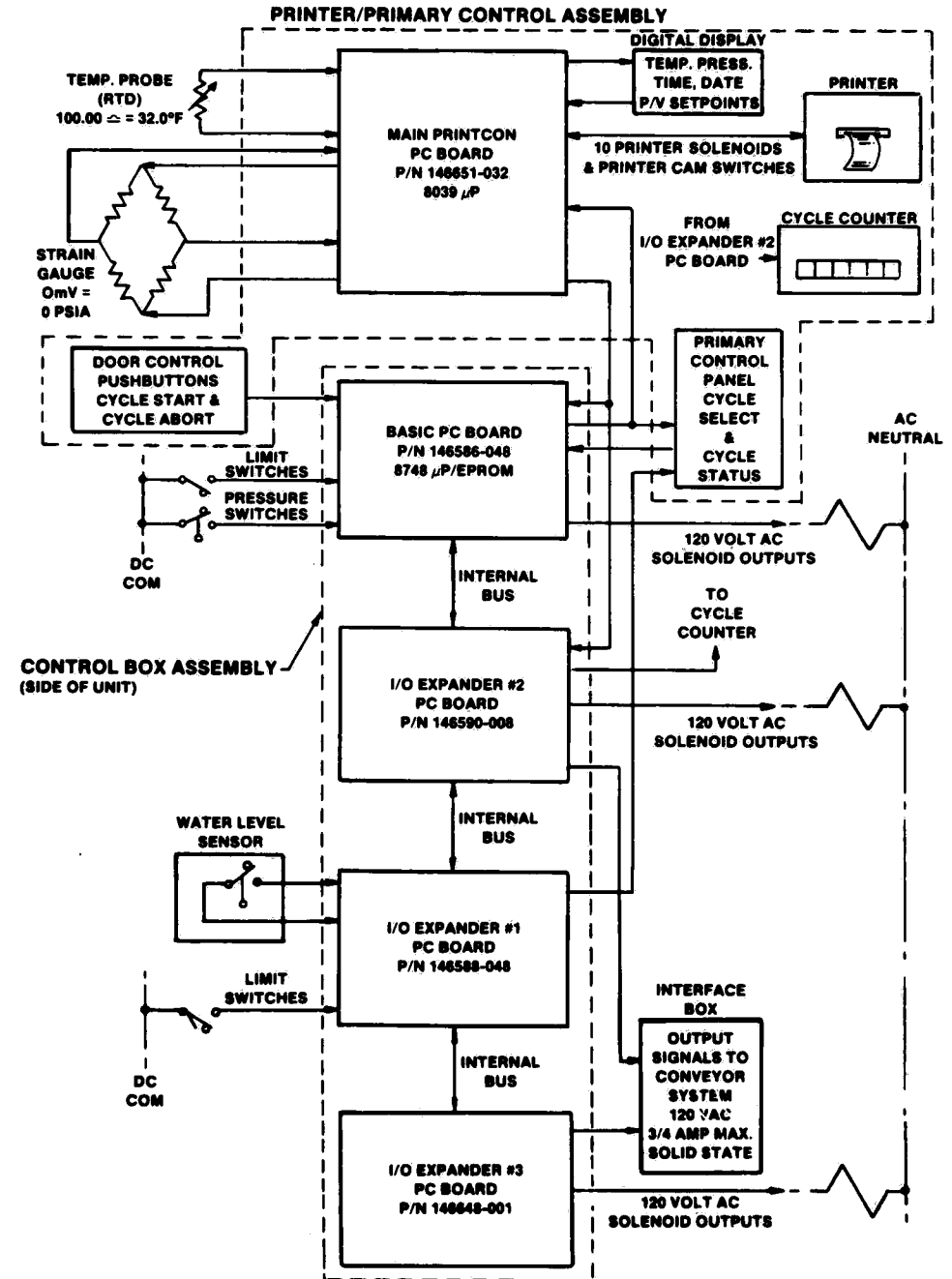
### 3.10 FUNCTIONAL DESCRIPTION OF THE MICROCOMPUTER CONTROL

Refer to the block diagram of Figure 3-1. The control system is made up of two major assemblies: The PRINTER/PRIMARY CONTROL ASSEMBLY mounted on the unloading end of the unit; and the CONTROL BOX ASSEMBLY at the side of the unit.

These two assemblies are interconnected, and each depends on data from the other assembly in order to function: The PRINTER/PRIMARY CONTROL assembly furnishes outputs which toggle on/off when chamber pressure or temperature achieves preset values, or when preset cycle times are completed. The CONTROL BOX ASSEMBLY provides on/off outputs indicating the advance of the cycle to the next phase, and for cycle selection.

The Main Printcon PC Board in the Printer/Primary Control Assembly also accepts the low level analog signals from the temperature probe located in the sump and the pressure sensor (transducer) which measures chamber pressure. It drives the digital displays of pressure and temperature and controls the printer.

The Basic PC Board in the Control Box Assembly controls the other three I/O Expander PC Boards, using their input ports to read inputs such as limit switches; and their output ports to energize solenoid valves and indicator lamps. The I/O Expander PC Boards also contain additional program memory ICs (EPROM) necessary to contain the functions that the washer/sterilizer must perform.



**Figure 3-1. CONTROL BLOCK DIAGRAM.**

Not shown on the block diagram is the power supply located in the Control Box Assembly. This power supply provides the DC voltages for the entire control system.

Following is a functional description of the PC Boards, power supply, temperature probe and pressure sensor.

#### Main Printcon PC Board

The Main Printcon Printed Circuit (PC) Board contains the necessary circuitry to:

1. Translate the pressure transducer and temperature probe signals into digital (binary) values.
2. Monitor the **primary panel** signals to detect selection of a cycle and cycle status indicating alarms and aborts.
3. Control the alphanumeric printer.
4. Send temperature, pressure, time and date data to the Digital Display PC Board.
5. Monitor vacuum, pressure and temperature settings on the Digital Display PC Board.
6. Send the temperature, vacuum, and pressure transition point commands to the Eagle controller.

Figure 3-2 is a block diagram of the Main Printcon PC Board. As on CPU Printed Circuit Board 146586 (see paragraph this section), a **microcomputer IC** is used to control the sequence of operation of this board. It pulls program instructions from IC's A1, A2 and A5. These last IC's also contain input and output lines for control and monitoring of various devices such as the temperature thumbwheels and digital display.

A **Realtime Clock IC** keeps track of the time and date and sends this information to the microcomputer for display or printing. A small on-board lithium battery provides power to the REAL TIME CLOCK IC (only) when power is shut off. The battery is not rechargeable and lasts about one year.

The pressure transducer and the resistive temperature probe provide voltages to this board which vary linearly in response to changes in pressure and temperature respectively. These voltages are fed to a **Multiplexer IC** which is the electronic equivalent of a single-pole rotary switch. The position of this rotary switch is controlled by the microcomputer so that either the pressure voltage or the temperature voltage is applied to the **Instrumentation Amplifier**.

The instrumentation amplifier is a precision IC which boosts the pressure or temperature voltages

to levels convenient for the next IC, the **Analog/Digital (A/D) Converter**. This IC converts the linearly varying pressure and temperature voltages (analog voltages) to a 12-level digital code (12 bit binary) which is proportional to the analog voltage.

This digital code is now in the form required for input to the microcomputer. As an indication of the extreme resolution of the A/D converter, the 12 level code allows  $2^{12}$  or 4,096 distinct output combinations across the analog input range. The pressure transducer measures 0-75 psia, in the Eagle 2400 application.

Once in a digital form, the pressure and temperature data is easily compared by the microcomputer to the **pressure and vacuum set-points and the temperature set on the thumbwheels**.

**Display option** and temperature control switch bank S1 on the Main Printcon PC Board allows selection of Fahrenheit or Celsius temperature display/printing; selection of English (psig and inches Hg) or metric (kg/cm<sup>2</sup> and mm Hg) pressure for display/printing. In addition, an optional decimal point of resolution may be displayed for temperature and pressure (printing is always with extended precision). The next switch gives selection of pressure transducer. This switch should always be in the ON position. **BDC** (binary-coded decimal) **rotary switches S2 and S3** allow setting of the proper year for display and printing. If set to 80, no year will be used. See Section 7 for more information on setting these switches.

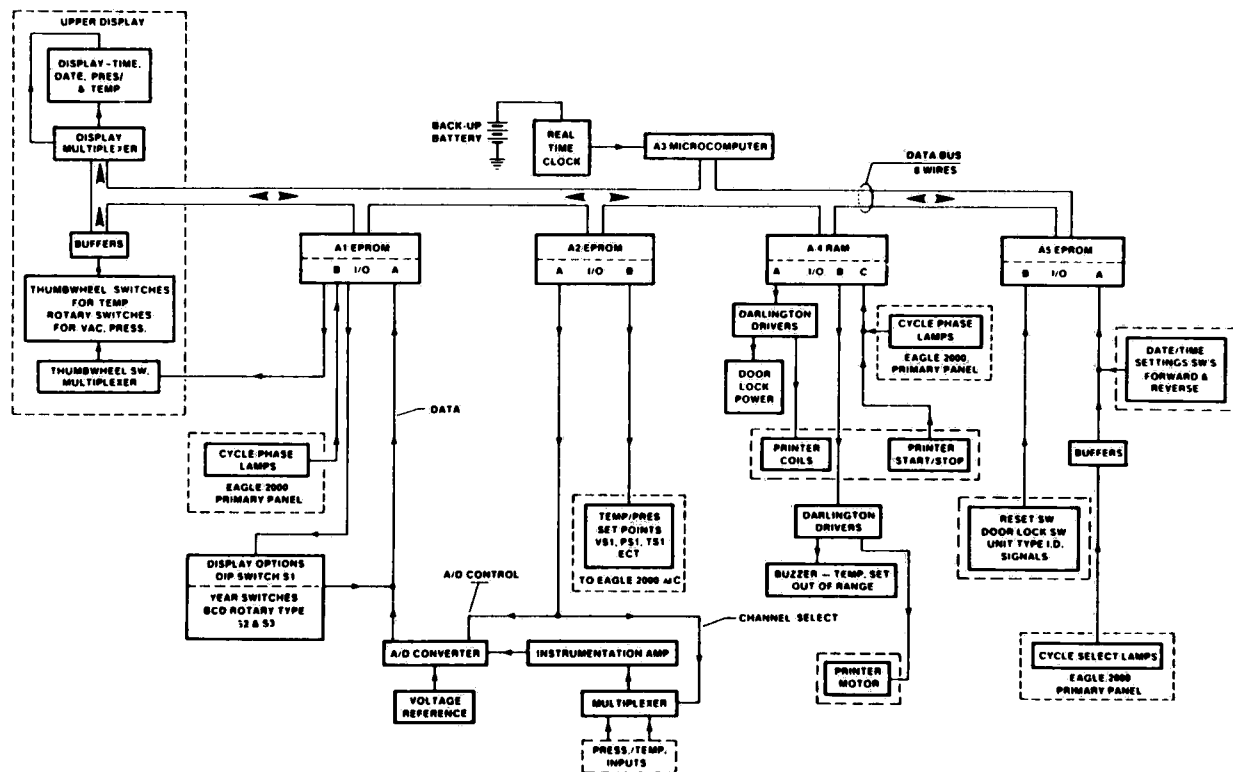
Via the input lines on IC's A1 and A5, this PC board will monitor for a cycle pushbutton (WASH, STERILIZE) to be pressed. This PC board will always provide the vacuum, pressure, and temperature set-point transitions which the card-cage controller needs to continue the cycle. It will monitor the cycle status lamps and print the time, temperature and pressure at each cycle transition. It also prints alarms and aborts if they occur. See Section 2 for a typical cycle printout.

The buzzer depicted on the block diagram will sound if an invalid sterilize temperature is dialed in, and also if an A/D converter or printer failure is detected.

The **Darlington driver IC's** boost up the drive signals generated by the microcomputer to a level sufficient to drive the printer motor and printer coils. The microcomputer, in order to print a message, will turn the printer motor on, wait for status signals from the printer, and selectively activate the printer solenoid coils. Letters and numbers are formed from patterns stored in the program chips.

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Figure 3-2. PRINTCON BLOCK DIAGRAM:  
Main Printcon PC Board.



**Temperature and pressure input circuits:** Temperature is sensed by a **resistive temperature probe**. The probe degree has a resistance of 100 ohms at 0 C, and increases about 0.39 ohms for every degree C that the temperature increases. By connecting the probe as part of a voltage divider circuit, an output voltage exactly related to temperature is obtained (see Figures 3-3 and 3-4).

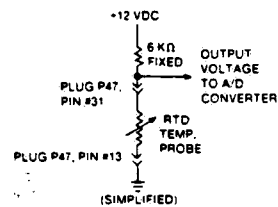


Figure 3-3. TEMPERATURE PROBE SCHEMATIC.

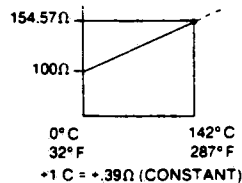


Figure 3-4. TEMPERATURE VS. RESISTANCE CHARACTERISTIC.

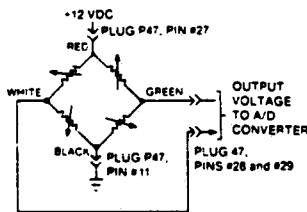


Figure 3-5. PRESSURE TRANSDUCER SCHEMATIC.

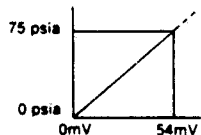


Figure 3-6. PRESSURE VS. TRANSDUCER OUTPUT CHARACTERISTIC.

The pressure transducer also exhibits a resistance change in response to a pressure change, and is termed a **strain gauge** type (see Figures 3-5 and 3-6). Figure 3-5 shows the internal configuration and

output voltage of the pressure transducer, which is also an application of the **Wheatstone Bridge** configuration. The four resistors will vary in resistance in response to a pressure change, and are chosen so that at 0 psia, the output voltage is zero. At 75 psia (full scale) the output voltage is 54 millivolts.

**NOTE:** Printcon is programmed to measure and store the value of the pressure transducer output each time the unload door opens. The control will then use this value for gauge pressure and vacuum measurements in cycle. If power is turned ON with the door(s) closed and locked, the control will assume an ambient pressure of 14.7 psia (29.92 in. Hg; normal sea-level atmospheric pressure). The same applies if RESET is pressed with the door(s) closed and locked.

#### Digital Display PC Board

A block diagram of this PC board is presented in Figure 3-7. The microcomputer presents changeable temperature, pressure, and other information for display to this PC board on the data bus. Note that the data bus is bi-directional, and the microcomputer from time to time will read the data bus for pressure, vacuum and temperature set-points. The control box will activate the decoder/driver, latch, or switch select control IC when fresh data is at hand or needed. J45 connector also interfaces the time, date, forward and reverse touch switches on the display panel overlay.

#### CPU Printed Circuit Board #1 (P-146586; Refer To Figure 3-8)

This PC Board contains the Intel Corporation 8748 single-chip microcomputer and EPROM IC. For maximum accuracy of timing functions, a crystal is used to set the oscillator frequency. The program (sequence of steps to be carried out during sterilizer cycles) is contained, in part, in the 1024 byte EPROM program memory of the 8748. This program is executed by the control and timing circuits of the 8748 microcomputer. While the program is running, the CPU in the microcomputer will make logical decisions based upon the input information that it receives from the data bus, port 1 or port 2.

Actions to be carried out by the unit originate in the microcomputer. These actions or signals are sent to the data bus, port 1 or port 2. Hence, as one can see, information can either enter or leave the ports and data bus under the precision guidance of the control and timing of the microcomputer. The computer also contains a data memory (RAM) capable of storing 64 bytes of information. The RAM is used to store changeable data, i.e., timer inputs.

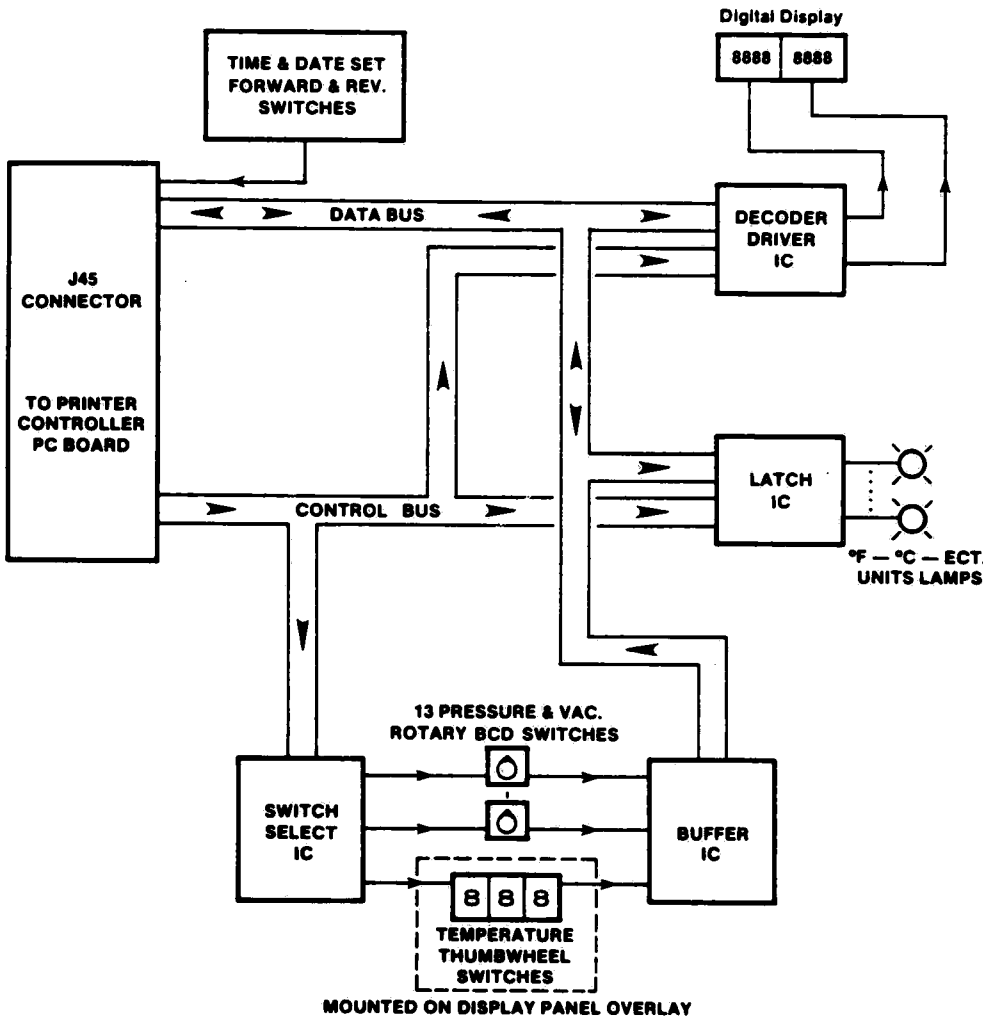


Figure 3-7. DIGITAL DISPLAY BOARD BLOCK DIAGRAM.

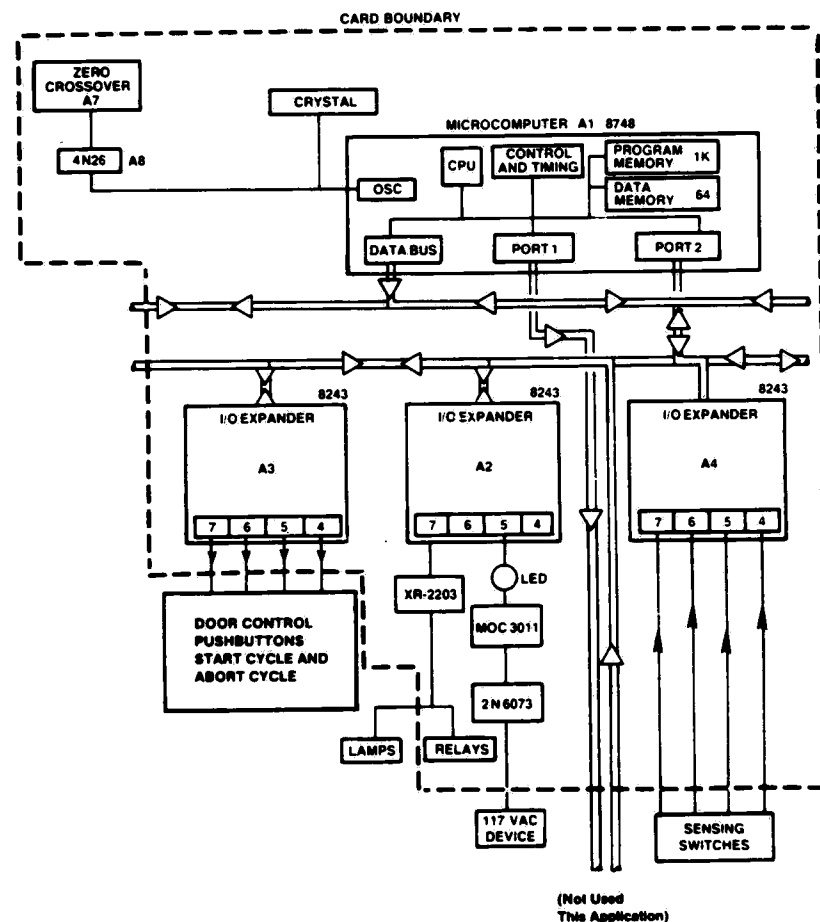


Figure 3-8. CPU PRINTED CIRCUIT BOARD #1.

There are many elements to control and sense in the unit. The number exceeds the capability of the Basic PC Board alone; therefore, additional electronic components must be added to expand the following:

1. Program memory — EPROM.
2. Data memory — RAM.
3. Input/output capacity of the 8748.

The Input/Output (I/O) capacity is expanded by use of an 8243. The I/O expanders pass or accept signals only under the control of the microcomputer. On the Basic PC Board there are three such 8243's: A2, A3 and A4.

A2 operates in a similar fashion as A3. Its output signals drive Darlington pairs capable of passing 600 ma of current which are used to turn on lamps located on the display panel. A2 also drives, via an LED, triac driver ICs. The drivers provide proper signals to turn on triacs which in turn operate AC loads (120 VAC) such as solenoid valves. The optical coupling found in these drivers also serves to isolate the 120 VAC power circuits from the low voltage logic circuits.

The supporting circuits are an external crystal and a zero cross-over network. The crystal, C1 and C2, determines the frequency of the control's operation. This crystal is also the time base for the timers. The zero cross-over network (ZCN) consists of A7, C4, R4, R8, C5, R5, and R6. The ZCN prevents the

computer from actuating a 120 VAC device during peak voltage of the sine wave. THE ZCN monitors the 120 VAC and when the voltage level is at the zero voltage point of the sine wave, it enables the computer output. The ZCN's function is to reduce live transients from being generated which might interfere with the computer operation. These transients might generate false signals should they occur. Another supporting circuit consists of Q9, C13, and R29. This circuit delays the activation of the triac outputs for a few hundred milliseconds until the microcomputer has gained control of the system.

#### I/O Printed Circuit Board #1 (P-146588; Refer To Figure 3-9)

The I/O PC Board is required to control the unit. It contains the A1 support circuits, input buffers and drivers, output buffers and drivers and the data bus required to communicate with the Basic PC Board.

The control system is provided with further expansion capabilities by the addition of this PC Board. This board expands data memory (RAM) by 256 bytes and expands input/output capacity by 22 channels with the addition of an 8155 (A1). The microcomputer can pull from an additional 2,048 program instructions from the 8755 (A2), which increases program capability. The A2 also increases the number of input/output channels by 16.



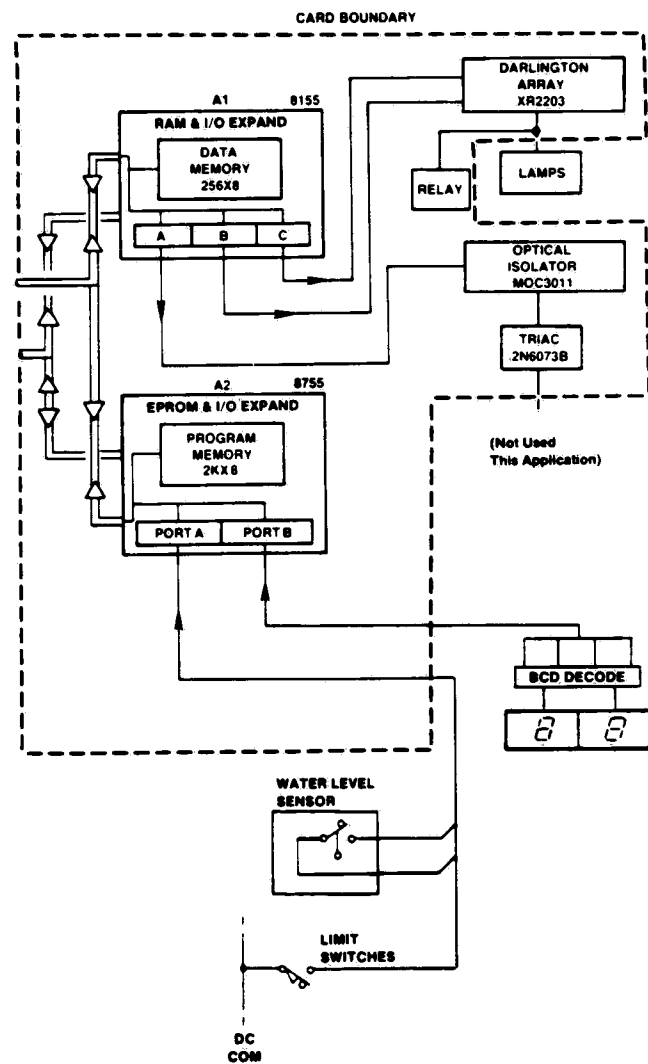


Figure 3-9. I/O #1 PRINTED CIRCUIT BOARD.

**I/O Printed Circuit Board #2 (P-146590; Refer To Figure 3-10)**

This PC Board also increases program capability by an additional 2,048 bytes of program instruction, and increases input/output capacity by adding 15 more output channels and a single 4-20 milliamp proportional control output (not used on this unit). It is basically the same as the 8755 portion of I/O PC Board #1.

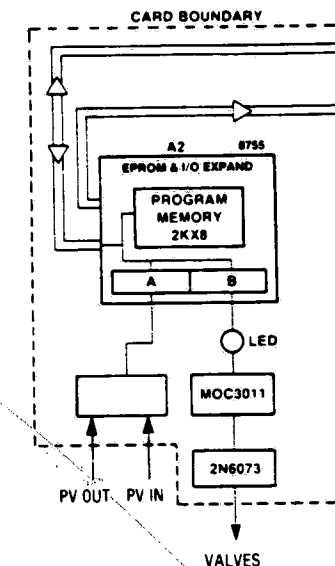


Figure 3-10. I/O #2 PRINTED CIRCUIT BOARD.

**I/O Printed Circuit Board #3 (P-146648; Refer To Figure 3-11)**

This PC Board also increases program capability by an additional 2,048 byte of program instruction, and increases input/output capacity by adding 15 more output channels. It is basically the same as the 8755 portion of I/O PC Board #1.

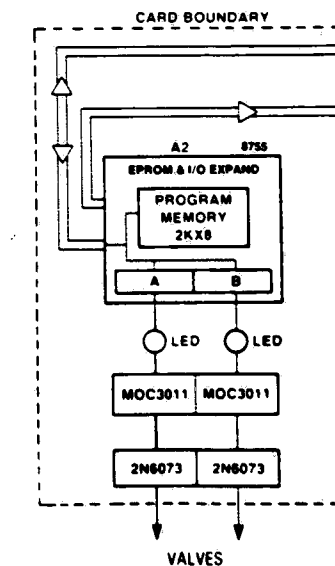


Figure 3-11. I/O #3 PRINTED CIRCUIT BOARD.

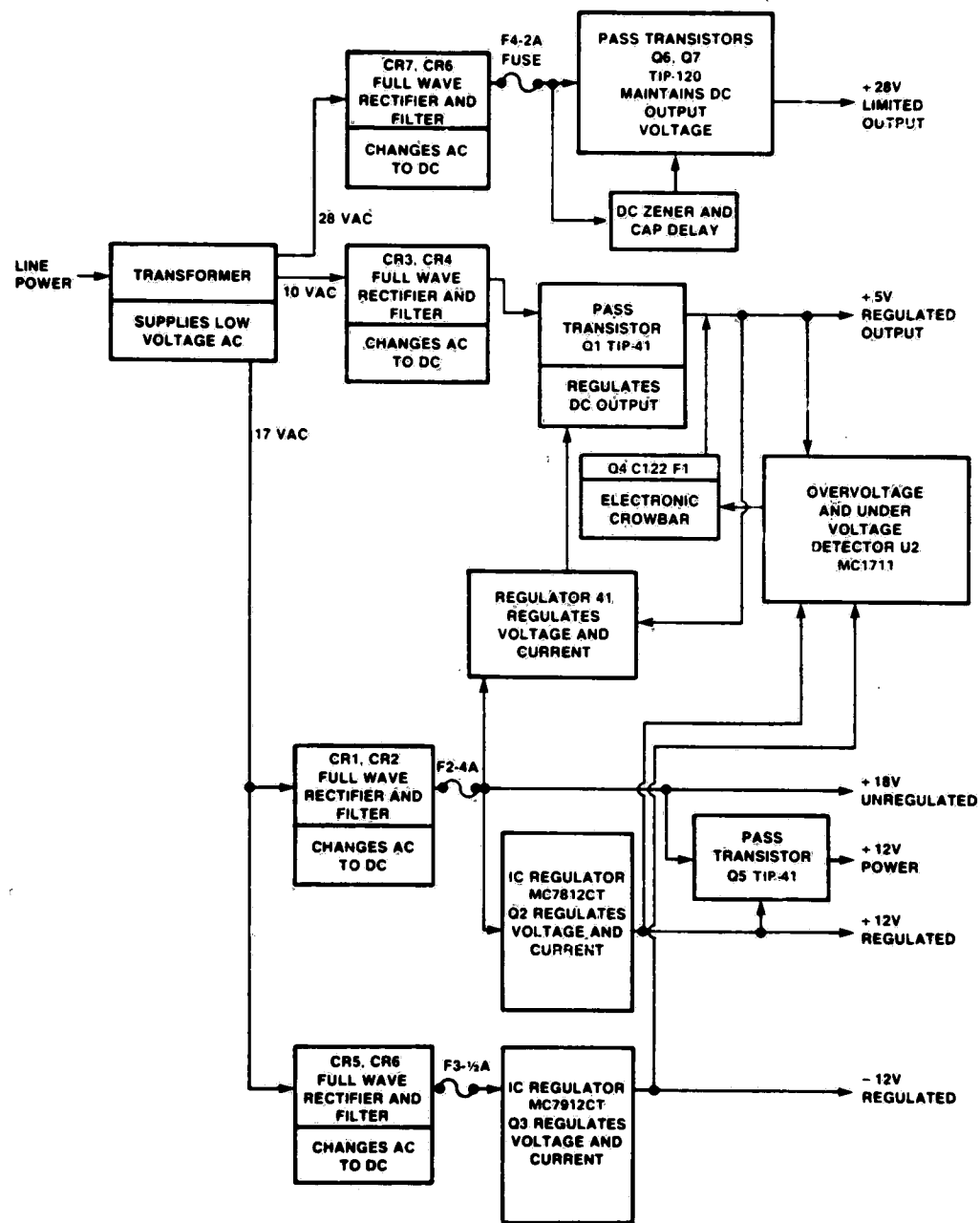


Figure 3-12. PRINTCON REGULATED POWER SUPPLY.

#### Printcon Power Supply (See Figure 3-12)

The power supply for units with Printcon provides the Printcon controller with six separate outputs:

- +5 volts direct current (VDC) at 2.5 amp voltage regulated with current limit and electronic crowbar over- and under-voltage protection (Figure 3-13).
- +12 VDC at 0.1 amp, voltage regulated (Figure 3-14).
- +12 VDC at 1.5 amp, voltage regulated (Figure 3-14).
- 12 VDC at 0.1 amp, voltage regulated (Figure 3-15).
- +18 VDC at 0.5 amp, voltage unregulated.
- +28 VDC at 1.5 amp, zener regulated.

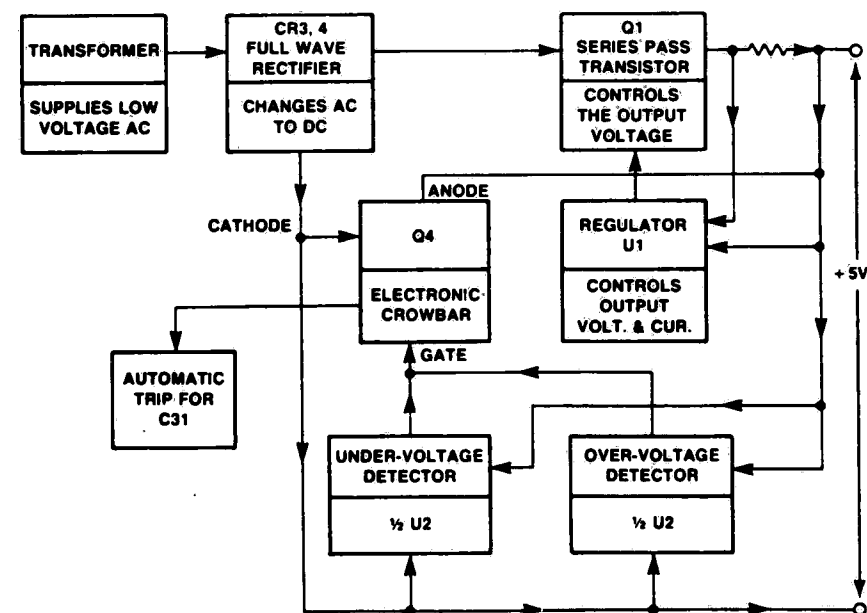


Figure 3-13. PRINTCON 5-VOLT POWER SUPPLY.

These voltage outputs are generated as follows:

1. For the 5 VDC power supply, voltage from the full wave rectifier (CR3 and CR4) is filtered by C2. This filter circuit provides voltage to series pass transistor Q1 which drops the output voltage to 5 volts. Regulating amplifier U1 turns Q1 on and off as it senses voltage fluctuations due to load and line variations. An electronic crowbar (SCR Q4) provides protection from unsafe voltage levels. Dual comparator U2 fires SCR Q4 when the voltage level is greater than 6.5 volts or less than 4.7 volts. When SCR Q4 fires, the 5 VDC output is clamped to approximately 2 VDC by CR10 and Q4. The primary circuit breaker is also tripped by CR9 and Q4.

Potentiometer (pot) R2 permits adjustment of the 5 VDC fold back current limit setpoint. Clockwise rotation of R2 lowers the current limit setpoint. Pot R7 permits adjustment of the 5 VDC output voltage. Clockwise rotation of R7 lowers the output voltage.

2. The +12 VDC regulated output is supplied by the +18 VDC unregulated circuit. The regulated +18 VDC supplies the integrated circuit regulator Q2 which regulates the output voltage (Point B, Figure 3-14).

3. The +12 VDC power output is also supplied by the unregulated +18 VDC power supply. Series pass transistor Q5 uses the +12 VDC regulated supply as a reference to regulate the +12 VDC power output (Point A, Figure 3-14).

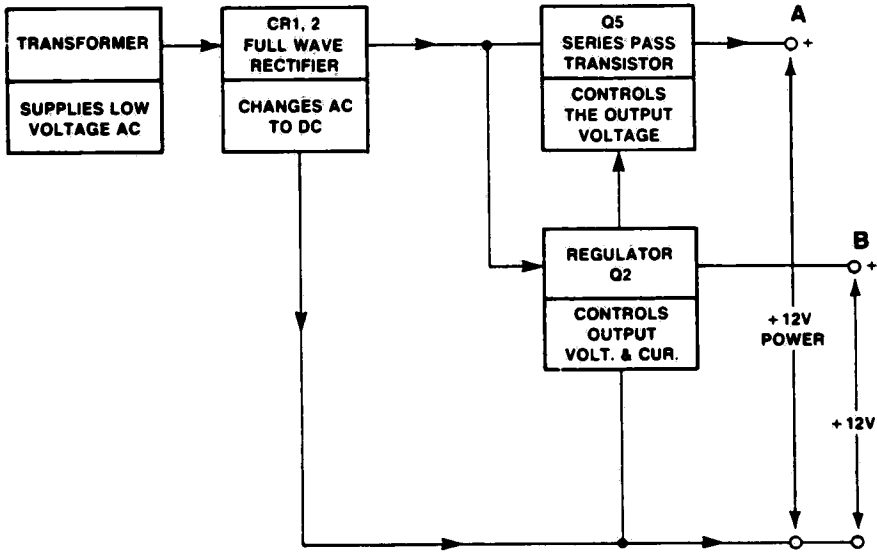


Figure 3-14. PRINTCON 12-VOLT POWER SUPPLY.

4. The -12 VDC power supply operates by using voltage from the full wave rectifier (CR5 and CR6) which is filtered by C4. This filter circuit provides voltage to integrated circuit regulator Q3, through fuse F3, which regulates the output voltage (Figure 3-15).

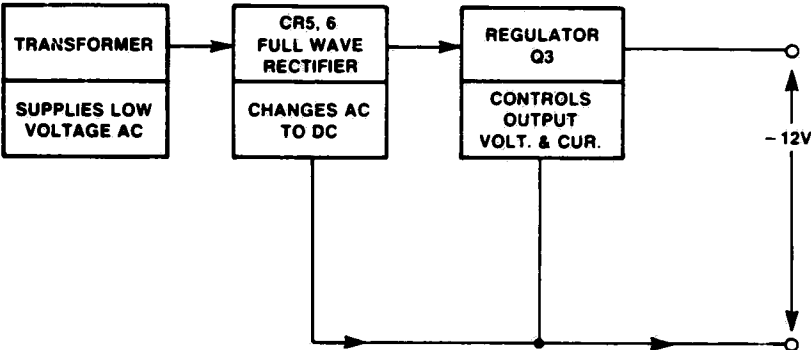


Figure 3-15. PRINTCON -12-VOLT POWER SUPPLY.

5. The +18 VDC unregulated power supply operates as follows: voltage from the full wave rectifier (CR1 and CR2) is filtered by C1. This filter circuit provides unregulated +18 VDC, through fuse F2, and is the supply for the +12 VDC regulated output, the +12 VDC power output, and the +5 VDC regulating amplifier U1 (Figure 3-16).

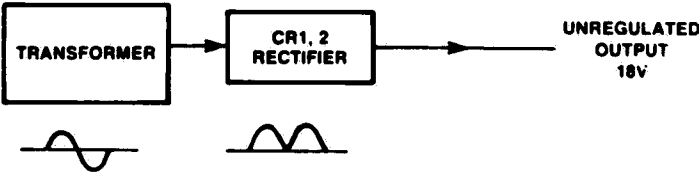


Figure 3-16. PRINTCON 18-VOLT POWER SUPPLY.

6. The +28 VDC power supply operates as follows: Voltage from the full wave rectifier (CR7 and CR8) is filtered by C5. This filtered circuit provides voltage to series pass transistors Q6 and A7 through fuse A4. The series pass transistors operate in parallel and are equalized by R11 and R12. The base reference voltage is provided by R13 and zener Z4, near 28 volts. R13 and C10 provide a slight delay on power turn on (Figure 3-17).

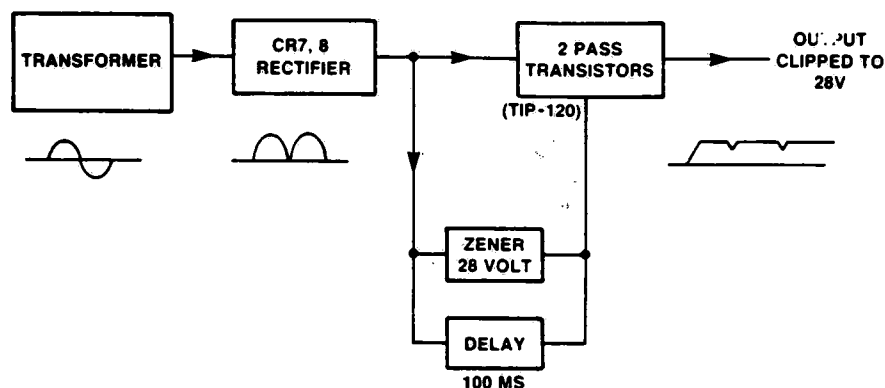


Figure 3-17. PRINTCON 28-VOLT POWER SUPPLY.

## SECTION 4

### INSPECTION AND MAINTENANCE

#### 4.1 GENERAL

Maintenance procedures described should be performed at regular intervals, as indicated. The frequency indicated is the minimum, and should be increased if usage of the unit demands. Should a problem occur, refer to Section 6, TROUBLE-SHOOTING. Paragraph 4.6 is a sample maintenance record which we suggest the Maintenance Department keep. Such a record will prove helpful in assuring regular maintenance.

**WARNING** PRESS THE FACILITY AND CONTROL POWER SWITCHES TO OFF AND WAIT UNTIL CHAMBER COOLS TO ROOM TEMPERATURE BEFORE STARTING ANY MAINTENANCE OPERATIONS.

#### 4.2 ROUTINE INSPECTION

1. Inspect cabinetry for signs of damage or misaligned parts.
2. Check the gauges and printer for cracked or broken glass, or other obvious damage.
3. Open lower access door and check chamber piping for loose fittings or other obvious defects.
4. With facility steam and water valves open, check line and valves for leaks.
5. Clean lint and dirt from control system components.

#### 4.3 PREVENTIVE MAINTENANCE

**WARNING** TO AVOID INJURY FROM DOOR CLOSING, DO NOT REACH INTO THE STERILIZER UNLESS THE DOOR IS BLOCKED OPEN WITH THE SAFETY BAR ATTACHED BEHIND THE FRONT PANEL. ALSO ENSURE WING PANEL IS IN THE OUT POSITION (POWER OFF).

##### Daily

1. Clean out the chamber drain (see Figure 4-1).
  - a. Turn POWER to ON. Door will open.
  - b. Open wing panel and block door open using safety bar. Turn POWER to OFF.

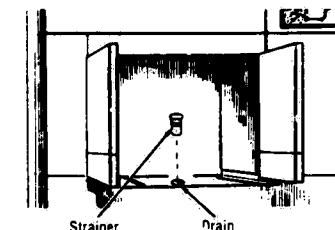


Figure 4-1.

#### LOCATION OF CHAMBER DRAIN STRAINER.

- c. Remove the chamber drain strainer and clean it (see paragraph 4.5).
  - d. Rinse the drain with a hot solution of trisodium phosphate (two tablespoons to one quart of water), or, if trisodium phosphate is objectionable, use a solution of 1/2 cup of AMSCO SONIC DETERGENT and one quart of hot water.
  - e. Wait five minutes.
  - f. Flush the drain with one quart of hot water.
  - g. Replace the chamber drain strainer.
  - h. Inspect the interior of the chamber for any objects which may have fallen out of the racks during previous cycles.
2. Check the control and status signals as follows:
    - a. Watch the unit operate through a complete cycle. Check for burned-out lamps on the primary control and display panels.
    - b. Check the cycle tape for acceptable darkness of print. Make sure that all columns are legible. Swing the printer assembly down and check for an adequate supply of paper remaining.
  3. Check the area around both doors during the STERILIZE phase for steam leaks. Refer to the door adjustment procedures if necessary.
  4. Check the time and date on the control for proper settings.
  5. Check spinner movement using wooden stick. Do not extend hands into chamber beyond chamber drain. If arms do not spin freely, clean or replace (see paragraph 7.7).

### Weekly

1. Door:
  - a. Check drip tray drain. Clean if necessary.
  - b. Lubricate bevel gears. Use *Never Seez*\* high temperature lubricating compound (NBS 16).
  - c. Check all setscrews in gears to ensure tightness.
  - d. Check cams and lubricate on side of eccentric cam at cam and Oilite bushing. Use *Never Seez*\* high temperature Lubricating Compound (NBS 16)
2. Check hydraulic oil reservoir for proper level. Add fluid if needed. Use SAE type "A" transmission fluid.
3. Remove oil from drip pans.

\*Manufactured by *Never-Seez Compound Corporation*.

### Monthly

1. Inspect the doors as follows:
  - a. Inspect both door gaskets. Replace if brittle or cracks are observed.
  - b. Check cables for fraying. Replace if necessary.
  - c. Check the door lift cylinders for leaks. Repair or replace.
2. Check and clean air maze vacuum break filter.
3. Clean riser valve. Replace worn parts.
4. Check detergent injector for proper injection.
5. Check all limit switch actuators for signs of damage.

### Quarterly

1. Open and clean all traps. Replace element or seat if necessary.
2. Clean steam supply strainer.
3. Remove and clean spray arms.
4. Check steam control valve.
5. Clean steam and water supply strainers.
6. Clean filter on air supply if provided.
7. Grease wash pump motor (Dow Corning 44-6400-210).

8. Run a complete cycle using temperature and pressure instrumentation. Check for proper vacuum, pressure and temperature levels.

**WARNING: WHEN PERFORMING THE REQUIRED QUARTERLY CHECK OF SAFETY VALVES BE CAREFUL OF ESCAPING STEAM. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.**

9. Inspect the chamber safety valve as follows:
  - a. Be sure the washer/sterilizer is cool. Remove top panel from loading end of unit.
  - b. Inspect the safety valve for accumulations of rust, scale, or other foreign substances which would prevent the free operation of the valve. The opening of any discharge piping must be clear and free from restrictions.
  - c. Operate try lever (or pull ring) several times. The lever should move freely and return to its closed position after each operation.
  - d. Initiate a cycle and let it proceed to the STERILIZE phase.
  - e. Check safety valve for steam leakage. If valve is leaking, operate the try lever several times to see if the leakage stops. **Avoid letting moisture get under the insulation on chamber as it will cause rusting.**
  - f. If leakage continues, discontinue operation of the washer/sterilizer until a qualified technician replaces the leaky safety valve.

### Yearly

1. Replace the battery on the main Printcon PC Board.
2. Replace the filter cartridge on the hydraulic system.
3. Clean out any dust in the Control Box Assembly on the side of the unit.

### 4.4 PRINTCON MAINTENANCE FREQUENCY CHART

1. Perform the following operations at the intervals specified.
  - a. Change ink cartridge — monthly.
  - b. Check calibration — quarterly.
  - c. Change battery — yearly.
  - d. Set year switches — yearly.

### 4.5 CLEANING

#### Daily

1. Remove chamber drain strainer. Clean out all lint and sediment, then reverse flush strainer under running water.

**CAUTION: Never use wire brush or steel wool on door and chamber assembly.**

2. Wash chamber interior and loading equipment with a mild detergent solution such as Calgonite® (Calgon Corporation).

3. Rinse items with tap water and dry with lint-free cloth. Replace strainer.

#### Monthly

1. Clean gasket sealing surface on chamber door frame(s) with **AMSCO Pry Cream** (included in Door Frame Cleaning Kit, P-753377-091). Wipe off **Pry Cream** with damp cloth.

2. Clean the door gasket(s) with alcohol or mild detergent. Do not clean with carbon tetrachloride, kerosene, gasoline or other hydrocarbons.

3. Spray sealing surface on door frame(s) with **AMSCO Fluorocarbon Spray** (also included in Door

Frame Kit, see above) to prevent gasket(s) from sticking.

4. Open steam and water supply line strainer and clean out sediment.

#### As Necessary

1. Use **AMSCO Stainless Steel Cleaner** on all stainless steel exterior surfaces of both the unit and the loading equipment. Apply the cleaner with a damp cloth or sponge, thoroughly wipe off and then polish with a clean, dry cloth. Use **AMSCO Pry Cleaner** to remove stubborn stains.

**CAUTION: When using AMSCO Stainless Steel Cleaner or AMSCO Pry Cleaner, rub in a back-and-forth motion (in the same direction as the surface grain). Do not rub with a rotary or circular motion. Do not use these cleaners on painted surfaces. Follow directions on containers.**

2. Use a mild detergent such as **AMSCO Sonic Detergent** (P-41591-091) to wash non-stainless steel surfaces. Rinse with tap water, using a sponge or damp cloth. Wipe dry with a lint-free cloth.

#### 4.6 PREVENTIVE MAINTENANCE RECORD

##### EQUIPMENT: AMSCOMATIC WASHER/STERILIZER

This form is utilized for preventive maintenance record only and is not to be used as a guide to perform maintenance.

Department \_\_\_\_\_

(Circle "X" In Column When Inspection Is Performed)

INSPECTION PERFORMED:	1	2	3	4	5	6
1. Discuss equipment operation with department personnel.	X	X	X	X	X	X
2. Inspect recent cycle tapes for signs of trouble.	X	X	X	X	X	X
3. Install test equipment.	X	X	X	X	X	X
4. Inspect loading door switches for proper operation.	X	X	X	X	X	X
5. Inspect unloading door switches for proper operation.	X	X	X	X	X	X
6. Test wash/sterilize cycle.	X	X	X	X	X	X
7. Unloading Door						
A. Inspect door gasket, replace if necessary.	X	X	X	X	X	X
B. Inspect door cables and pulleys.	X	X	X	X	X	X
C. Inspect door lift cylinders.	X	X	X	X	X	X
D. Inspect locking cams.	X	X	X	X	X	X
E. Inspect door locking bevel gears.	X	X	X	X	X	X
F. Inspect guide rollers.	X	X	X	X	X	X
G. Inspect locking cylinders.	X	X	X	X	X	X
H. Adjust clevis.	X	X	X	X	X	X
I. Inspect door adjusting screws.	X	X	X	X	X	X
J. Inspect drain trough.	X	X	X	X	X	X
8. Loading door						
(Repeat steps 7A through 7J)						
9. Clean each input strainer.		X		X		
10. Rebuild steam trap.		X				
11. Inspect each check valve, and rebuild if necessary.					X	X
12. Disassemble vacuum breaker and clean. Rebuild if necessary.		X				
13. Rebuild each solenoid valve.		X				
14. Disassemble the steam control valve, clean, replace worn parts.					X	
15. Flush and reset flow control valve.	X	X	X	X	X	X
16. Inspect air filter. Replace if rusty or clogged.	X	X	X	X	X	X
17. Clean riser valve, replace worn parts.						X

INSPECTION PERFORMED:	1	2	3	4	5	6
18. Remove and clean spray arms.	X	X	X	X	X	X
19. Water pump motor						
A. Inspect coupling.	X	X	X	X	X	X
B. Clean air bleed inlet.	X	X	X	X	X	X
C. Lubricate.		X				
D. Check current.			X			
20. Clean detergent injector.	X	X	X	X	X	X
21. Clean chamber drain strainer.	X	X	X	X	X	X
22. Inspect each diverter valve.	X	X	X	X	X	X
23. Fill oil sump if necessary.	X	X	X	X	X	X
24. Replace oil filter.	X					
25. Hydraulic cylinders						
A. Inspect load/unload cylinders.	X	X	X	X	X	X
B. Inspect locking cylinders.	X	X	X	X	X	X
26. Steam to Chamber ball valve (V8)						
A. Rebuild valve body.			X			X
B. Rebuild pilot air solenoid.			X		X	X
C. Rebuild actuator.					X	
27. All other ball valves						
A. Rebuild valve body.				X		
B. Rebuild pilot air solenoid.				X		
28. Clean tip of water level sensor.					X	
29. Replace all burned-out lamps on primary control panel.	X	X	X	X	X	X
30. Replace inked ribbon cartridge if necessary.	X	X	X	X	X	X
31. Replace Printcon battery.			X			X
32. Run final test cycle. Inspect for proper operation of replacement parts, if applicable.	X	X	X	X	X	X

## SECTION 5

### FIELD TEST PROCEDURE

#### 5.1 GENERAL

The following procedure allows service personnel to determine whether the unit is installed and operating correctly. If the unit will not meet one or more of the standards outlined below, service to the unit is required. See Section 7 for adjustments or repairs and Section 6 for troubleshooting procedures.

Also, every unit must be tested and inspected according to this procedure whenever a part is adjusted, repaired or replaced. Items of non-compliance must be corrected and retested. Keep a record of all readings, measurements, discrepancies, corrections, retests, and reinspections. Each test must meet the standards of material, workmanship, and performance set forth in this procedure.

#### 5.2 TEST EQUIPMENT REQUIRED

**NOTE:** The temperature indicator and pressure gauge used to verify the control accuracy should be calibrated against NBS-traceable devices and their inaccuracies should be known via a calibration report sheet.

1. Digital potentiometer with 1 degree F resolution. Doric model 400A or equal.
2. Compound pressure gauge (30 inches vacuum and 100 PSIG; 1% F.S. accuracy minimum; resolution to 1/2 PSIG).
3. Pressure gauge, 0 - 150 PSIG min. full scale.
4. Pressure gauge, 0 - 100 PSIG min. full scale (main water supply).
5. Graduated flask to 500 ml minimum.
6. 8-inch piece of 2x4.
7. Pressure gauge, 0 - 200 PSIG minimum range (air supply)
8. Stop watch.
9. Spirit level.
10. 6-foot straight edge.
11. Safety bars for doors. These were provided with the unit at shipment.

12. Pressure seal for thermocouple wire. "Conax" style or equal, (P-382782-091).

13. Tee, 1/4 NPT.

14. Nipple, 1/4 x 12 (or longer).

#### 5.3 INSTALL TEST INSTRUMENTS

1. Turn off air, steam, electric and water supply services.
2. Install a pressure gauge (0-200 PSIG) in the air supply line. Install a pressure gauge (0-150 PSIG) in the steam supply line.
3. Install a compound pressure gauge (30 inches Hg — 100 PSIG) to the chamber of the washer/sterilizer, at the tee on the side of the chamber where the pressure transducer mounts. Temporarily disconnect the chamber pressure gauge and use this port. See Figure 5-1.
4. Install the digital thermometer thermocouple wire into the sump and tape the end of the thermocouple wire to the RTD probe. See Figure 5-1.

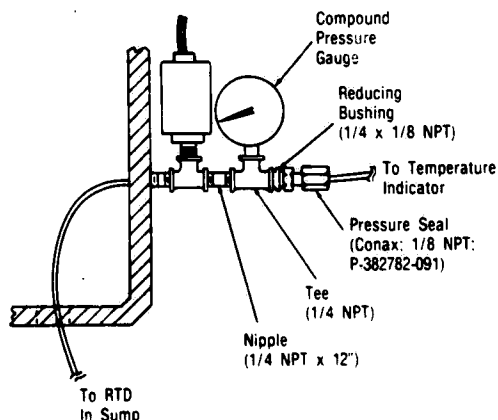


Figure 5-1. INSTALLATION OF TEST EQUIPMENT.

5. If a third positive pressure gauge (0-100 PSIG) is available, connect it to the water service line.

6. Turn the air, steam and water services back on.

7. Check the dip switches on PC Board #2 (second from left) for the following settings: SW1 — #1, #2 OFF and #3, #4 ON. SW2 — #1 OFF, #2 ON, #3 as required and #4 not used. See Section 7 for an explanation of these settings.

8. Check the dip switches on PC Board #3 (third from left) for the following settings: SW1 — #1, #2 OFF and #3, #4 ON. SW2 — #1, #2 OFF and #3, #4 ON. See Section 7 for an explanation of these settings.

9. Tilt the printer assembly forward to expose the 8-pole Service Switch on the Main Printcon PC Board. Set these switches as follows: #1, #2 — OFF; #3, #4 — ON; #5, #6 — OFF; #7, #8 — ON.

10. Open the hinged door covering the digital temperature/pressure display by removing the self-tapping screw from the upper right-hand corner. This will expose a bank of rotary BCD switches. Check for the following settings: PS-1 — not used; PS-2 — 2; PS-3 — not used; PS-5 — not used; VS-1 — 30; VS-2 — 2; VS-4 — 61; VS-5 — 01.

#### 5.4 CHECK FOR PROPER DOOR OPERATION

1. Make sure that no baskets are on the loading and unloading tables or in the chamber.
2. Check the level of oil in the hydraulic sump. If low, add enough oil (transmission fluid type "A") until the level is about 1/2-inch below the return line inlet to the sump.
3. Turn the control POWER switch ON. Observe a 2-3 second Lamp Test of all leads on the temperature/pressure display, changing to actual chamber temperature and pressure. The unload end door must open. CODE 88 must be displayed on the primary control panel. The printer will print POWER ON followed by the date, time, temperature and pressure. When the unload end door unlocks, the message DOOR UNLK will print.
4. Operate, in turn, all four of the door control pushbuttons and check for proper operation of the doors, as follows:
  - Press the CLOSE UNLOAD DOOR button. Only unload end door should close.
  - Again press the CLOSE UNLOAD DOOR button and ensure that both doors lock. The DOORS

UNLOCKED lamp on the primary control panel must go out.

- Press the OPEN UNLOAD DOOR button and ensure that the both doors unlock only, and the DOORS UNLOCKED lamp comes back on. Press this button again. The unload door should open. Press this button a third time. The unload cylinder should operate.
- Repeat the above steps for the LOAD push-buttons.

5. Open the wing panel at either end in turn and ensure that status CODE 77 (wing panel ajar) is displayed in each case.

6. Open the load door with the OPEN LOAD DOOR pushbutton. The door should raise until the lowest edge is at least even with the opening of the end ring. The lift cylinder stop must be adjusted if the height is not obtained. Limit switch LS14 (load door open) must actuate in the door open position.

7. Lower the load door by pushing the CLOSE LOAD DOOR pushbutton. With the load door in the closed (but not locked) position, both limit switches LS3 and LS8 (load door closed) should be actuated. See paragraph 7.2 for adjustment.

8. With the load door closed and unlocked, ensure that limit switch LS12 is actuated. Adjust if necessary.

9. Repeat steps 6, 7 and 8 above for the unload door, making the appropriate adjustments to limit switches LS13 (unload door open), LS2 and LS9 (unload door closed), and LS7 (unload door unlocked).

10. With both doors closed, lock the doors by pressing the CLOSE LOAD DOOR pushbutton. Limit switches LS1, LS5, LS10 and LS21 must be actuated. If not, make the necessary cam adjustments as required, in order that these switches are actuated when the limit-switch-roller operates on the sharp radius of the cams.

11. In this position, check the keyways in the locking gears. They must be parallel to the machine or beyond to be locked. If this is not the case, adjust the locking cylinder device.

12. Check the hydraulic pump pressure during a door operation and, if necessary, adjust the pump relief valve to 260 PSIG  $\pm$  10 PSIG within five minutes of start-up. See Figure 8-37.

## 5.5 INSPECT THE FEEDER UNITS

1. Check that both feeders are level. Adjust the feet on the feeders if required.

2. Align both feeder trays to the rack guides inside the shell, using a long straight edge. Use the slotted holes on the feeder mounting to make adjustments.

3. Check that the distance between the front edge of the feeder plates and the shell end ring is  $3\text{--}3/4 \pm 1/8$  inch.

4. Adjust the leveling feet of the Amscomatic unit so that the chamber floor and rack guides are level and the top surface of the rack guides are at a height of  $29\text{--}1/2$  inches above floor level. Adjust center guide in the chamber to be parallel to the rack guides.

5. Center and adjust the height of the loading and unloading feeder plates so that the entire top surface of the feeder plates is at the same height as the top surface of the rack guides and in the same plane formed by the top surface of the rack guides. Use a 6-foot straight edge for this inspection.

6. Adjust the position of the feeder cylinders so that the center line of the cylinders and the chamber guide are in one straight line. The position of the loading piston head is nominally  $1/2$ -inch behind the front edge of the loading plate, and the unloading piston head is nominally  $1/2$ -inch beyond the front edge of the unloading plate.

7. Turn the control POWER switch ON. The unload end door should open.

8. Press the OPEN LOAD DOOR pushbutton.

a. Use the safety bars supplied with the unit to ensure that the door will not lower due to any component malfunction.

b. The load and unload cylinders will be operated in the following steps. To operate these cylinders, press the appropriate OPEN DOOR button twice.

c. Adjust the guide located under the feeder plates so that when the feeder piston travels into the chamber, the dovetail guides will transfer smoothly onto the chamber guide.

9. Place a rack on the load table and extend the load cylinder into the chamber. When the loading feeder is fully extended into the chamber, check to ensure that the distance between the chamber end-ring (on the loading feeder side) and the back edge

of the Amscomatic rack is  $3 \pm 1/16$  inches. Adjust the position of the cylinder as required to obtain this dimension.

10. When the loading cylinder is fully extended into the chamber, check to ensure that the distance between the riser valve center line and the front or leading edge of the rack is  $12 \pm 1/16$  inches. Adjust the position of the cylinder as required to obtain this dimension.

11. Extend the load arm into the chamber. For proper speed of travel, adjust the needle valve under the feeder tray to indicate  $150 \pm 10$  PSIG pressure while the cylinder is extending. Set PS1 to close above  $50 \pm 10$  PSIG. Pressure switch PS1 opens when the arm is fully extended.

12. Operate the load arm again. When the arm is fully retracted, verify that limit switch LS6 (load arm retracted) is actuated.

13. Extend the unload arm into the chamber. For proper speed of travel, adjust the needle valve under the feeder tray to indicate  $150 \pm 10$  PSIG pressure while the cylinder is extending. Set pressure switch PS2 to close above  $50 \pm 10$  PSIG. Pressure switch PS2 opens when the arm is fully retracted.

14. Operate the unload arm. When the arm is fully retracted, verify that limit switch LS20 is actuated.

15. When both feeders are verified to be working properly, check, using a straight edge, that the riser valve seal is below the basket guide tracks (allow approximately  $1/4$  inch clearance). Adjust as required. If difficulty is encountered, these adjustments can be more easily made after the machine has heated up.

16. Run both feeders manually using a rack loaded to 25-30 lbs to determine that the rack is centered inside the chamber so that the manifold on the rack is directly over the riser valve. Also, verify that the stroke of both cylinders is such that the unload ram will engage the rack where the load ram has positioned it.

## 5.6 CHECK CALIBRATION OF TEMPERATURE AND PRESSURE

1. Turn POWER to OFF. Block unload door closed using the 2x4.

2. With the steam, water and air services on, turn the power on.

3. Note the pressure display after the lamp test is over. It should correspond to the difference between the local uncorrected atmospheric pressure in inches Hg and 29.92 inches Hg. Since this is a coarse reading only due to the autozero feature of the control, make a setting using potentiometer P3 on the Main Printcon PC Board according to the approximation of one inch Hg vacuum displayed for each 1000 feet altitude above sea level. At sea level, set P3 to read 0.0 PSIG.

**NOTE:** The control will wait for one minute for the unload-door-open limit switch LS13 to actuate, before indicating an alarm condition. If the adjustment to P3 has not been made by that time, turn the power off and then on again.

With P3 properly adjusted, turn the POWER OFF, remove 2x4 and turn the POWER back ON.

4. Close the unload door. Press the START CYCLE pushbutton.

5. Start a cycle by pressing down on the limit switch on the load feeder (simulating a rack on the load feeder).

6. During the CONDITION phase, adjust the steam regulator for 45 PSIG. Since the sterilizing temperature is set to 295 degrees, the unit will remain in the CONDITION phase. Wait until the pressure and temperature stabilize at the regulator setting. Verify that the temperature displayed by Printcon is within 1 degree F of the calibrated temperature indicator and that the pressure displayed is within  $1/2$  PSI of the calibrated gauge. If either is not to this specification, a recalibration of the control is indicated. See Section 7 for this procedure.

7. When the accuracy has been checked, abort the cycle with the ABORT CYCLE pushbutton. Reset the sterilize temperature thumbwheels to 285 degrees.

## 5.7 CHECK WASH AND STERILIZE CYCLING OF MACHINE

1. Select a wash/sterilize cycle by turning the power off and then on again.

2. Use a stopwatch to compare the actual cycle times against those listed in Table 5-1. **SUMMARY OF CYCLE.**

a. As the cycle progresses, check the pressure gauges on the water, steam and air lines to ensure that the dynamic pressures are within the requirements specified in the TECH DATA (SD-342) in Section 1 of this manual.

b. During the WASH phase (CODE 02), check the temperature indicated on the Printcon display. It should read between 135-160 F. Adjust the needle valve in the line between STEAM-TO-SUMP valve (V6) and the sump if necessary to obtain this temperature.

c. The water pressure as indicated on the pressure gauge on the manifold piping should read between 20-40 PSI during the WASH (CODE 02) phase. A rapid fluctuation of this reading is normal.

## 5.8 OPERATION TEST — WASH/STERILIZE CYCLE

### 5.8.1 Detergent Injector Valve (V4) Adjustment

1. Proceed through a cycle to the First Fill state (CODE 01).

2. Adjust the detergent injector to consume between 4 and  $4\text{--}1/2$  oz of AMSCO liquid detergent during the First Fill state. This is equivalent to 200 (+25, -0) ml of water. Adjustment of the detergent can be made at IJ-21. The adjustment screw on the knurled handle must be turned clockwise to decrease, or counterclockwise to increase, the amount of detergent used.

3. If detergent is used instead of water for the test, continue through the cycle to rinse the detergent from the chamber.

4. Apply a drop of Loctite 222 on IJ-21 adjustment screw.

### 5.8.2 Machine Cycle

1. With a rack on the load table, press START CYCLE.

2. Ensure proper operation of the sterilizer as follows:

a. Start Cycle

1) Electric, water, and air is supplied to the sterilizer.

2) The ON/OFF power switch is turned ON as well as any remote power switches.



3) The START CYCLE button is pushed. A rack on the load table is loaded into the chamber (see paragraph 5.9. *Operation Test: Automatic Loading and Unloading*) and the following cycle must be verified.

b. First Fill (CODE 01)

1) The Main Water valve (V1) is opened, and remains open until the end of the cycle.

2) The Water Fill valve (V2) is opened, allowing the water to enter the chamber through an opening located on top of the chamber.

3) The Detergent Injector valve (V4) is opened, causing detergent to be drawn from a container through a water ejector in line with the water flowing into the chamber.

4) The Vacuum Break valve (V11) is opened.

5) The WASH indicator light is turned ON.

6) The sterilizer is in the Fill state for 24 seconds (dip switches on the control board set to 1100).

7) At 40-80 PSI water pressure, the chamber will fill with between 9-12 gallons of water.

8) At the end of the First Fill state, the Water Fill valve (V2), the Detergent Injector valve (V4) and the Vacuum Break valve (V11) are closed.

9) CV3 is on until the end of cycle.

c. Wash (CODE 02)

1) The Wash Pump Water valve (V3) is opened and the Wash Pump Motor (M1) starts.

2) The Steam To Sump valve (V6) is opened to heat the water collected in the sump and recirculated by the pump.

3) The sterilizer remains in the Wash state for 305 seconds (rotary dip switch on the Printcon Display Board set to 61).

4) At the end of the Wash phase, the Steam To Sump valve (V6) is closed.

d. First Drain (CODE 03)

1) The Drain valve (V7) is opened and the water is pumped to the condenser and discharged from the sterilizer.

2) The Steam To Chamber valve (V8) is opened.

3) The Water To Ejector valve (V9) is opened.

4) The Wash Pump Water valve (V3) and Wash Pump (M1) is opened and remains open until the Condition phase begins.

5) After 25 seconds draining, draining continues until the LOW WATER sensor (LS23) is activated or a timeout occurs in which case an alarm sounds and the message CODE 03 is displayed on the primary panel indicating too long in drain.

6) At the end of the First Drain phase, valves V7, V8, and V9 are closed.

e. Second Fill (CODE 04)

1) The Water Fill valve (V2) is opened.

2) The Vacuum Break valve (V11) is opened.

3) The sterilizer remains in the Second Fill state for 24 seconds. At the end of the second fill phase, the Water Fill valve (V2) and the Vacuum Break valve are closed.

f. Rinse (CODE 05)

1) The Steam To Sump valve (V6) is opened.

2) The sterilizer remains in the Rinse state for 60 seconds (dip switch on the control board set to 1100).

3) At the end of the rinse phase, the Steam To Sump valve (V6) is closed.

g. Second Drain (CODE 06)

1) The Drain and Exhaust valve (V7) is opened (Water is pumped to the condenser and discharged from the sterilizer).

2) The Steam To Chamber valve (V8) is opened.

3) The Water To Ejector valve (V9) is opened.

4) After 25 seconds draining, the drain continues until the LOW WATER sensor (LS23) is activated or a timeout occurs in which case an alarm sounds and the Message CODE 06 is displayed on the primary panel, indicating too long in drain.

5) At the end of the Second Drain phase, valves V7, V8, and V9 are closed.

h. Pure Fill (CODE 07)

1) The Pure Fill valve (V5) is opened.

2) The sterilizer is in the Pure Fill state for 24 seconds.

3) At the end of the Pure Fill phase, valve V5 is closed.

4) CR2 (treated water) is on during Phase.

i. Pure Rinse (CODE 08)

1) The Steam To Sump valve (V6) is opened.

2) The sterilizer is in the Pure Rinse state for 60 seconds.

3) At the end of the Pure Rinse phase, valve V6 is closed.

j. Third Drain (CODE 09)

1) The Drain and Exhaust valve (V7) is opened.

2) The Steam To Chamber valve (V8) is opened.

3) The Water To Ejector valve (V9) is opened.

4) After 25 seconds draining, draining will continue until the Low Water sensor (LS23) is activated or a timeout occurs in which case an alarm sounds and the Message CODE 09 is displayed on the primary panel, indicating too long in drain.

5) At the end of the Third Drain phase, valve V9 is closed.

k. Condition (CODE 10 - 11)

1) The Drain and Exhaust valve (V7) remains open.

2) The Steam To Chamber valve (V8) remains open.

3) The Water To Condenser valve (V13) is opened and remains open until the beginning of the Exhaust (Vacuum Break) phase (CODE 15).

4) The WASH indicator is turned OFF and the CONDITION indicator is turned ON.

5) The sterilizer remains in the Purge state (CODE 10) for 25 seconds (dip switch on the control board set to 0101).

6) Following Purge, the Drain and Exhaust valve (V7) closes.

7) Another message is printed, after purge.

8) The Trap valve (V12) opens, causing pressure and temperature in the chamber to rise (CODE 11). This represents the Charge state in CONDITION.

l. Sterilize (CODE 12)

1) When the temperature reaches the 285 F set point (set on the Printcon thumbwheel) the sterilize state is reached. At this point, the STERILIZE indicator turns ON and the CONDITION indicator turns OFF.

2) The sterilizer is in the Sterilize state for 5 seconds (rotary dip switch on Printcon set to 01).

3) The temperature is controlled at 287 F (2 F overdrive set on Printcon dip switches).

4) At the end of the Sterilize state the Steam To Chamber valve (V8) and Trap valve (V12) close and the STERILIZE indicator light turns OFF.

m. Exhaust (CODE 13 - 14 - 15)

1) The EXHAUST indicator is turned ON.

2) The Water To Ejector (V9), Drain and Exhaust (V7), and Vacuum (V10) valves are opened.

3) Pressure decreases rapidly.

4) The sterilizer exhausts (CODE 13) until the pressure/vacuum sensor (PRES #1) reaches 1 PSI (CODE 14 (PS-2 set on Printcon) or a timeout occurs).

5) If a timeout occurs, an alarm sounds and Message CODE 13 is displayed on the primary panel indicating vacuum was not reached.

6) After the sterilizer reaches 15 inches Hg, the Vacuum (V10), Main Water (V1), Water To Ejector (V9), and Water To Condenser (V13) valves close. CODE 15 is displayed.

7) The Vacuum Break valve (V11) opens, releasing the vacuum.

8) The sterilizer continues to vacuum break until the pressure/vacuum sensor (PRES #1) reaches 2 inches Hg (VS-2 set on Printcon) or a timeout occurs.

9) If a timeout occurs, an alarm sounds and Message CODE 15 remains displayed on the primary panel, indicating that atmosphere was not reached.

10) After the sterilizer reaches 2 inches Hg, the Vacuum Break valve (V11) closes.

11) The EXHAUST indicator turns OFF.

n. Complete (CODE 16)

1) The cycle is complete and the sterilizer is ready to unload the rack and load another.

2) See paragraph 5.9, *Operation Tests: Automatic Loading and Unloading*.

3. Repeat steps 1 and 2 above two more times to verify repeatability.

4. Retain the printouts as part of the test record.

### 5.9 OPERATION TEST — AUTOMATIC LOADING AND UNLOADING

Start the operational tests for the loading and unloading feeders with the doors open, the main POWER switch OFF, loading/unloading feeder piston heads in the fully retracted position, and no rack in the unit or on the feeders. Verify the following sequence of operations:

#### 5.9.1 Load

1. After the POWER switch is turned to the ON position, the sterilizer proceeds to the NOT READY state and CODE 88 is displayed on the primary panel. If the load arm is not retracted, it is retracted at this time and CODE 32 is displayed. If the unload arm is not retracted, it is retracted at this time and CODE 52 is displayed.

2. Press the START CYCLE pushbutton switch. Activation of the START CYCLE switch (PB3) will close the doors and put the sterilizer in the READY state (CODE 89). The READY indicator will turn ON to acknowledge the start request.

3. When a rack arrives at the unit, its presence is detected by the Basket-On-The-Load-Table switch (LS11). Slide a rack onto the loading feeder plate until the front edge of the rack is approximately 1/4 inch beyond the front edge of the feeder plate. The Basket-In-Place switch (LS11) located near the front edge of the feeder plate will close signaling the load door to open by pulsing the Open Load Door solenoid (S6).

4. The load door attempts to open. CODE 22 is displayed during opening. If the Load-Door-Open switch (LS14) is not closed in one minute, CODE 22 is displayed continuously along with buzzer until door is closed.

5. When the load door is opened, the Load-Door-Open limit switch (LS14) will close. The Extend-Load-Arm solenoid (S11) is pulsed ON to load the rack into the chamber and CODE 30 is displayed.

6. If the Basket-Too-High switch (LS15) is closed while the rack is being loaded, CODE 33 is displayed, an alarm sounds, and the load arm retracts.

7. When the piston rod is completely extended into the chamber, the pressure shown on the gauge should decrease for an instant to below 40 PSI, causing PS1 the HBP (Hydraulic-back-pressure switch) to close, signaling the piston rod to withdraw from the chamber.

8. If after 15 seconds following the extension of the load arm the Load HBP switch (PS1) is not closed, the load arm retracts, and alarm sounds, and CODE 37 is displayed to indicate the Load HBP is not working properly.

9. Also, during loading if the Load-Hydraulic-Back-Pressure switch (PS1) is closed while the Basket-On-The-Load-Table switch (LS11) is closed, the door remains open, an alarm sounds, and CODE 38 is displayed to indicate that a rack is jammed.

10. After the rack is loaded, the Load-Arm-Retract solenoid (S12) is pulsed on, the load arm retracts from the chamber, and CODE 31 is displayed.

11. If after 1 minute following the retraction of the load arm the Load Arm Retracted switch (LS6) is not closed, the alarm sounds and CODE 32 is displayed, indicating that the load arm is not working properly.

12. With the Load-Extend/Retract-Arm in the extreme retract position, the piston head will close the Load-Arm-Retracted limit switch (LS6). This action will initiate the closing of the load door (LS3).

13. The door proceeds to close until the Load-Door-Closed switches (LS3 and LS8) are closed. If these switches are not closed within one minute, an alarm sounds and CODE 24 is displayed, door opens and control returns to CODE 88. Hydraulic pump continues to run.

**NOTE:** Any of the loading alarms are cleared by pressing the START CYCLE pushbutton.

14. Similarly, when the unload door closes, the Unload-Door-Closed switches (LS2 and LS9) are actuated. If these switches are not made within one minute, an alarm sounds and CODE 25 is displayed, door opens and control returns to CODE 88.

15. With both doors closed and a rack loaded, solenoid S4 is pulsed ON (in automatic cycle), operating the locking mechanism until the Doors Locked switches (LS1, LS21, LS5 and LS10) are actuated. If these switches are not actuated within 15 seconds an alarm sounds and CODE 21 is displayed, for 15 seconds. CODE 88 is then displayed.

16. Following the EXHAUST phase, CODE 16 is displayed to indicate the completion of the sterilize cycle.

#### 5.9.2 Unload

1. Upon completion of the processing cycle, the solenoid S1 is pulsed to unlock the doors.

2. After the doors are unlocked the Load-Door-Unlocked switch (LS12) and Unload-Door-Unlocked switch (S7) are closed. If these switches are not closed within 15 seconds, CODE 20 is displayed.

**NOTE:** In an error condition, the control continues to unlock for one minute or until the ABORT button (CODE 99) is pushed, which initiates the locking procedure.

3. After unlocking, the unload door proceeds to open (solenoid S2 pulsed) if the Unload-Table-Full switch (LS4) is not closed. If a rack is on this switch (LS4 close), an alarm sounds and CODE 54 is displayed.

4. If the unload table is not full (LS4 open), the unload door proceeds to open until the Unload-Door-Open limit switch (LS13) is closed. If this switch is not closed within one minute, an alarm sounds and CODE 23 is displayed, door closes and CODE 88 is displayed. Hydraulic pump is turned off after one minute.

5. When the unload door opens, the Extend-Unload-Arm solenoid (S9) is pulsed. This sets the Extend/Retract valve to the extend position. The unload arm extends into the chamber to unload a rack and CODE 50 is displayed.

6. When the piston rod is completely extended into the chamber, the pressure shown on the gauge should decrease for an instant to 40 PSI, causing PS2 (the HBP switch) to close, signaling the piston rod to withdraw from the chamber.

7. If after 1 minute following the extension of the unload arm the Unload HBP PS2 is not closed, the alarm sounds, CODE 59 is displayed, and the arm retracts.

8. If the HBP switch PS2 is closed properly, the Unload-Arm-Retract solenoid (S10) is pulsed ON, the unload arm retracts, and CODE 51 is displayed.

9. As the unload arm retracts, the Basket-Removed switch (LS22) is closed. If after one minute following the retraction of the unload arm the Unload-Arm-Retracted switch (LS20) is not closed, the procedure is repeated 3 times if the arm is not retracted. The alarm sounds and CODE 52 is displayed, indicating the unload arm is not working properly. The sterilizer is now ready to accept another rack and the READY indicator turns ON.

#### 5.9.3 Wing Panels

While the doors are unlocked, when a wing panel switch is closed, the associated arm retracts and door opens. The sterilizer maintains an inactive state with CODE 77 displayed until the wing panel switch is opened. When the wing panel switches are closed, the sterilizer proceeds to the NOT READY state.

TABLE 5-1. SUMMARY OF CYCLE (Part 1 of 2).

CYCLE PHASE	VALVE ACTUATION	CYCLE PHASE INDICATOR LIGHTS	TIME IN POSITION
FIRST FILL	Main Water (V1) Water Fill (V2) Detergent Injector (V4) Vacuum Break (V11)  NOTE: (a) With 40-80 PSI water pressure, the chamber will fill with 9-12 gal. water. (b) Adjust the detergent injector to consume 4 - 4-1/2 oz. of AMSCO liquid detergent during the Fill cycle. This is 200 (+25 -0) ml. of water.	Wash	24 sec. in Fill state (control board dip switches set at 1100)
WASH	Main Water (V1) Wash Pump Water (V3)  NOTE: (a) Adjust the steam to sump flow regulator approx. 2 turns open so that the wash cycle will indicate between 135-160 F on the shell thermometer (large temperature variation is due to seasonal supply water temperature). (b) After the 305 sec. wash, not more than 14 gal. of water should be used. (c) Wash pressure on gauge in washing manifold should pulse 20-40 PSI, if the proper amount of water is in the chamber.	Wash	305 sec. in wash state (rotary dip in PRINTCON display board set to 61)
FIRST DRAIN	Main Water (V1) Wash Pump Water (V3) Drain & Exhaust (V7) Steam to Chamber (V8) Water to Ejector (V9)	Wash	25-35 sec. total drain time.
SECOND FILL	Main Water (V1) Water Fill (V2) Wash Pump Water (V3) Vacuum Break (V11)	Wash	24 sec. in the 2nd Fill state.
RINSE	Main Water (V1) Main Water (V1) Steam to Sump (V6) Wash Pump Water (V3)	Wash	60 sec. in the Rinse state (dip switch on control board set to 1100).
SECOND DRAIN	Main Water (V1) Wash Pump Water (V3) Drain & Exhaust (V7) Steam to Chamber (V8) Water to Ejector (V9)	Wash	25-35 sec. for total drain time.
PURE FILL	Main Water (V1) Wash Pump Water (V3) Pure Water Fill (V5)	Wash	24 sec. in Fill state.

TABLE 5-1. SUMMARY OF CYCLE (Part 2 of 2).

CYCLE PHASE	VALVE ACTUATION	CYCLE PHASE INDICATOR LIGHTS	TIME IN POSITION
PURE RINSE	Main Water (V1) Wash Pump Water (V3) Steam to Sump (V6)	Wash	60 sec. in Pure Rinse state.
THIRD DRAIN	Main Water (V1) Wash Pump Water (V3) Drain & Exhaust (V7) Steam to Chamber (V8) Water to Ejector (V9)	Wash	25-35 sec. total drain time.
CONDITION (During Purge)	Main Water (V1) Drain & Exhaust (V7) Steam to Chamber (V8) Water to Condenser (V13)	Condition	25 sec. in Purge state. (Dip switch on control board set at 0101)
CONDITION (After Purge in the charge state)	Main Water (V1) Steam to Chamber (V8)  NOTE: The pressure and temperature in the chamber will start to rise.	Condition	210 sec.
STERILE	Main Water (V1) Steam to Chamber (V8) Water to Condenser (V13) Trap (V12)  NOTE: (a) The Sterilize state will begin when the chamber temperature reaches set point of 285 F (set on the PRINTCON thumbwheels). (b) During the Sterilize state, the temperature will be controlled at 287 F (2 F overdrive set on PRINTCON dip switches).	Sterilize	5 sec. (rotary dip switch on PRINTCON display set to 01)
EXHAUST	Main Water (V1) Water to Condenser (V13) Water to Ejector (V9) Drain & Exhaust (V7) Vacuum (V10)  NOTE: In the Exhaust state, pressure will start decreasing rapidly.	Exhaust	15 sec.
EXHAUST (Vapor Removal)	Main Water (V1) Water to Condenser (V13) Water to Ejector (V9) Vacuum (V10)  NOTE: The Exhaust (Vapor Removal) state begins when the pressure vacuum sensor reaches 1 PSI.	Exhaust	60 sec.
EXHAUST (Vacuum Break)	Vacuum Break (V11)  NOTE: The Exhaust (Vacuum Break) state begins when the pressure vacuum sensor reaches 15 inches Hg. and ends when the sensor reaches 2 inches Hg. At 2 inches Hg. the vacuum break valve closes. The Exhaust indicator turns OFF completing the cycle.	Exhaust	5-10 sec.

## SECTION 6

### TROUBLESHOOTING

This section contains detailed information for locating and correcting the cause of washer/sterilizer malfunctions.

#### 6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, use the RECYCLE button and operate the unit more than once in case reported problem is being caused by periodic component malfunction.
2. Use the timing diagrams, status codes, valve actuation sequence chart and cycle graph to follow the cycles through the various phases and to check for correct operation of the solenoid valves which control the various phases.
3. Use the operational descriptions (Section 3) and electrical schematics (Section 6) as aids in understanding system operation and how the malfunction of a specific component would affect it.
4. Refer to the following guides for example of what to look for and what to do when troubleshooting.

#### Steam & Water Supplies

- a. Be sure the building-supply valves are fully open.
- b. Be sure the supply pressure is the proper value and that it does not fluctuate. Be sure that gauge readings are accurate.
- c. Be sure the steam supply is of the proper quality and that the steam-supply line is well drained. This will ensure condensate-free steam of between 97 and 100% saturated vapor.
- d. Check all valves and adjust, repair or replace as necessary.
- e. Clean the supply strainers.
- f. Check the drain thermostatic traps; replace the elements if necessary.
- g. Inspect the entire system; correct all leaks.

#### Electronic/Electrical System

a. In general, for any electrical malfunction, first measure or observe the input or output voltage signals as an indicator of the failure. This should isolate the malfunction to:

- Input drives: pressure, temperature, time settings, reset, cycle select.
- Output devices: solenoids, ball valves, relays, panel lamps, etc.
- System logic circuit boards of the controller.

b. In case of malfunctioning AC outputs, check the status of the light emitting diodes (LEDs), on the edge of the printed circuit board. If the LED is on and the associated valve is off, the system logic is correct and the malfunction is in the wiring or output device.

c. If the LED is off, then check the input circuitry, i.e., pressure and limit switches.

d. All voltages are with respect to AC return and all DC voltages are with respect to DC ground.

e. Check circuit breakers first when supply voltage does not appear.

f. Should it become necessary to extract a pin from plugs P16, P23, P25, P40, P42, or P47, proceed as follows:

- On the outside surface of the pin, there is a thin piece of metal sprung outward which locks the pin into the housing. Using a sharp-pointed object such as a pin or needle, push the metal spring inward while gently pulling on the appropriate wire. The pin will slide out of the socket. When installing a new pin, first give the metal spring a slight bend outward to assure its locking capacity.
- Pins in plugs P1, P2, P5, P10, P11, P48, P53, and P54 seldom need replacement. However, if replacement of pins is necessary, a special pin extraction tool (P-764317-221) is required. Order through AMSCO Service Company.

#### Status/Error Codes

The Eagle 2400 Amscomatic control is programmed to display a two digit Status/Error code on the primary control panel if a particular door, feeder, or wash/sterilize operation did not occur in an allotted time.

This feature will rapidly isolate piping component problems to particular components. In general, the appearance of a Status/Error code means a failure in one of the following areas:

- Steam, water or air service is turned off, at a low pressure, or a filter is clogged.

- The sensor — limit switch, temperature probe, pressure transducer, or water level sensor is not working properly.
- The PC Board which accepts a particular sensor input has failed.
- A valve has failed.
- The AC power output from the control to a particular valve has failed.
- Loose or broken wiring.

TABLE 6.1, TROUBLESHOOTING CHART USING STATUS/ERROR CODES is used to look up remedies when a particular Status/Error code is displayed. Codes are listed in numerical order.

TABLE 6-1. TROUBLESHOOTING CHART USING STATUS/ERROR CODES.

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
1. WASH. 1st drain	03	Unit failed to drain in two minutes. 1) Drain ball valve (V7) not working. 2) V7 pilot solenoid not working. 3) No air pressure to pilot solenoid. 4) Chamber drain strainer clogged. 5) Water level sensor not working. 6) No AC signal to V7 pilot valve. (I/O #3 PC Board)
2. WASH. 2nd drain	06	Unit failed to drain in two minutes. 1) (same probable failures as 03 alarm)
3. WASH. 3rd drain	09	Unit failed to drain in two minutes. 1) (same probable failures as 03 alarm)
4. CONDITION	11	Failed to reach exposure temperature within five minutes. 1) Steam To Chamber ball valve (V8) not opening. 2) Steam supply not turned on or at low pressure. 3) V8 pilot solenoid not opening. 4) Steam trap defective. 5) Temperature out of calibration. 6) Chamber Drain ball valve leaking. 7) Vacuum ball valve leaking. 8) No AC signal from PC Board #3 to valve V8.
5. EXHAUST	13	Failed to exhaust down to one PSIG within five minutes. 1) Drain valve (V7) not opening. 2) V7 pilot solenoid not opening. 3) Pressure sensor malfunction. 4) PS2 setpoint not correctly set. 5) No AC signal from PC Board #3 to valve V7.
6. EXHAUST	14	Failed to achieve 15 inches Hg vacuum within five minutes after reaching 1 PSI. 1) Water To Ejector ball valve (V9) not opening. 2) V9 pilot solenoid not opening. 3) Vacuum ball valve (V10) not opening. 4) V10 pilot solenoid not opening. 5) Venturi clogged or nozzle defective. 6) Vac Break ball valve leaking. 7) No AC signal from PC Board #3 to valve V9 or valve V10. 8) Main water valve (V1) not opening.

TABLE 6-1. TROUBLESHOOTING CHART USING STATUS/ERROR CODES (Continued).

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
7. EXHAUST	15	Failed to break vacuum within five minutes. 1) Vac Break ball valve (V11) not opening. 2) V11 pilot solenoid not opening. 3) Air silencer clogged. 4) No AC signal from PC Board #4 to valve V11. 5) Pressure display not ZERO with doors open.
8. Unlocking doors	20	Limit switches LS12 (load) and LS7 (unload) doors unlocked) did not activate in 15 seconds. 1) Low hydraulic oil level. 2) Dual solenoid S1/S4 not working. 3) Limit switch(es) out of adjustment or defective. 4) Defective seal(s) on locking cylinder. 5) No AC signal from Basic PC Board to solenoid S1. 6) Basic PC Board not responding to one or both LS12 or LS7 signals.
9. Locking doors	21	Limit switches LS1 and LS21 (load) or LS5 and LS10 (unload) (doors unlocked) did not activate in 15 seconds. 1) Low hydraulic oil level. 2) Dual solenoid S1/S4 not working. 3) Limit switch(es) out of adjustment or defective (LS1, LS2, LS5 or LS10). 4) Defective seal(s) on locking cylinder. 5) No AC signal to S4 coil from Basic PC Board. 6) Relay CR3 defective. 7) Basic PC Board not responding to CR3 signal.
10. Load door opening	22	Limit switch LS14 (door open) did not activate within one minute. 1) Low hydraulic oil level. 2) Dual solenoid S3/S6 not working. 3) Limit switch (LS14) out of adjustment or defective. 4) Defective seal(s) on lift cylinder. 5) Diverter valve out of adjustment or defective. 6) No AC signal to S3/S6 from Basic PC Board. 7) LS14 input failure on I/O Expander #1 PC Board.

TABLE 6-1. TROUBLESHOOTING CHART USING STATUS/ERROR CODES (Continued).

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
11. Unload door opening	23	Limit switch LS13 (door open) did not activate within one minute. 1) Low hydraulic oil level. 2) Dual solenoid S2/S5 not working. 3) Limit switch out of adjustment or defective. 4) Defective seal(s) on lift cylinder. 5) Diverter valve out of adjustment or bad. 6) No AC signal from Basic PC Board to S2. 7) Filter or strainer on hydraulic system clogged.
12. Load door closing	24	Limit switches LS3 and LS8 (door closed) did not activate within one minute. 1) Dual solenoid S3/S6 not working. 2) No AC signal to S3 from Basic PC Board. 3) Flow control valve closed too far or clogged.
13. Unload door closing	25	Limit switch LS9 and LS2 (door closed) did not activate within one minute. 1) No AC signal from Basic PC Board to solenoid S5. 2) Dual solenoid S2/S5 not working. 3) One or both limit switches out of adjustment or bad. 4) Flow control valve closed too far or clogged. 5) Basic PC Board not responding to limit switch input.
14. Load arm retracting	32	Limit switch LS6 (load arm retracted) did not activate within one minute. 1) No AC signal to solenoid S12 from Basic PC Board. 2) Dual solenoid S11/S12 not working. 3) LS6 out of adjustment or defective. 4) Basic PC Board not responding to LS6 signal. 5) Low hydraulic oil level.
15. Basket is loading	33	Limit switch LS15 (basket too high) is activated. 1) Limit switch LS15 defective. 2) LS15 input failure on I/O Expander #1 PC Board.
16. Basket is loading	38	Pressure switch PS1 and limit switch LS11 are both activated indicating that basket probably jammed. 1) LS11 jammed or defective. 2) PS1 out of adjustment.

TABLE 6-1. TROUBLESHOOTING CHART USING STATUS/ERROR CODES (Continued).

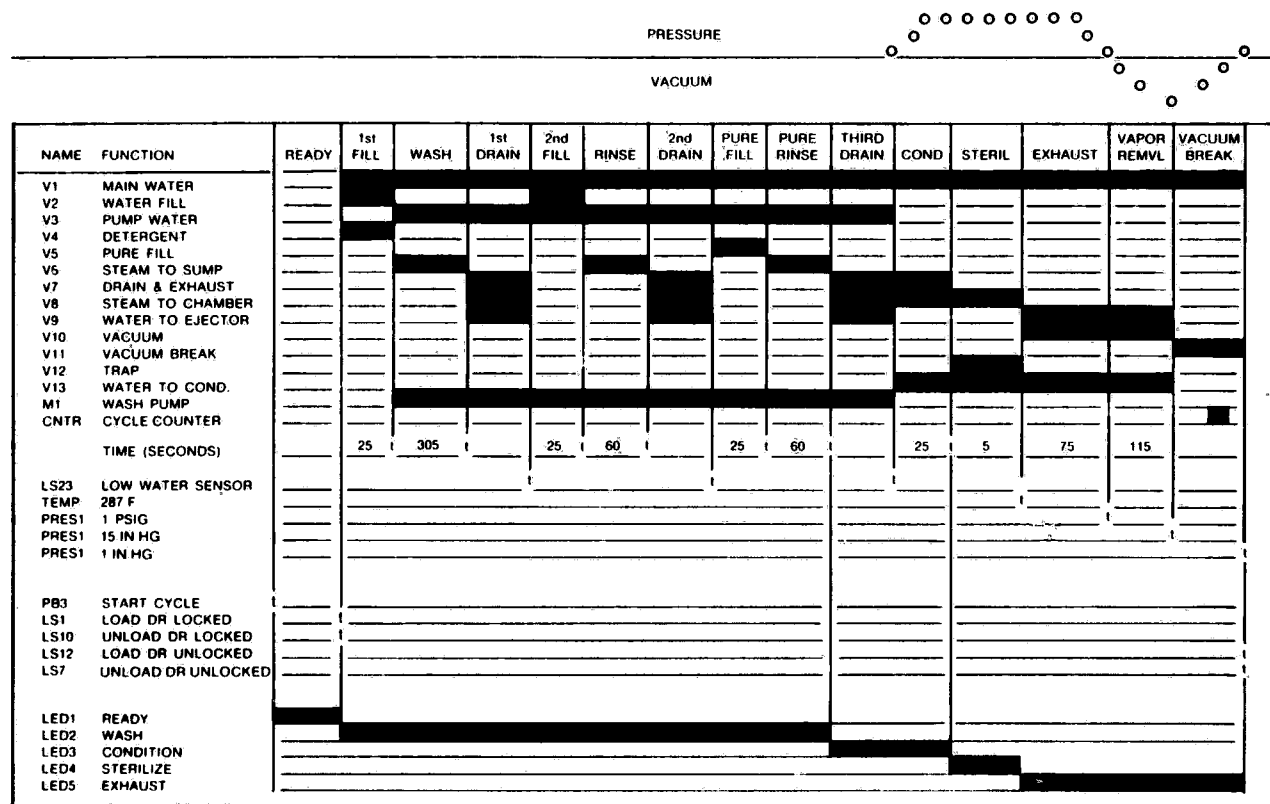
MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
17. Basket is loading	39	Pressure switch PS1 (hydraulic back pressure) did not activate in time. 1) Piston traveling too slow — check needle valve adjustment. 2) PS1 switch out of adjustment. 3) Seals on cylinder leaking. 4) Basic PC Board not responding to PS1 signal. 5) No AC signal from I/O Expander #3 to solenoid S11. 6) Dual solenoid S11/S12 not working. 7) Low hydraulic oil level.
18. Basket is unloading	52	Limit switch LS20 (unload arm retracted) did not activate after arm successfully extended, three attempts were made. 1) LS20 out of adjustment or defective. 2) Dual solenoid S9/S10 not working. 3) No AC signal from I/O Expander #3 to solenoid S9. 4) I/O Expander #1 PC Board not responding to LS20 signal.
19. Basket is unloading	53	Limit switch LS22 (basket removed) did not activate in three tries. 1) LS22 out of adjustment or defective 2) I/O Expander #1 PC Board not responding to LS22 signal.
20. Basket is unloading	54	Limit switch LS4 (basket on unload table) being held activated after three tries to move basket beyond this switch. 1) LS4 jammed or defective. 2) Basic PC Board false response on LS4 input line.
21. Basket is unloading	59	Pressure switch PS2 (hydraulic back pressure) did not activate within one minute. 1) Piston traveling too slow — check needle valve adjustment. 2) PS2 out of adjustment. 3) Leaking seals on cylinder. 4) Basic PC Board not responding to PS2 signal. 5) No AC signal from I/O Expander #3 PC Board to solenoid S9. 6) Dual solenoid S9/S10 not working.

**TABLE 6-1. TROUBLESHOOTING CHART USING STATUS/ERROR CODES (Continued).**

<b>MACHINE OPERATION</b>	<b>ERROR CODE</b>	<b>MEANING AND PROBABLE FAILURES</b>
22. Any phase or idle	77	One or both wing panel limit switches are activated. Not a failure unless both wing panels are actually closed.  1) A wing panel switch is defective. 2) Broken wiring to switch. 3) Basic PC Board defective input line.
23. Out of cycle	88	Machine is in the NOT READY condition. Not a failure as such. Press the START CYCLE button to restart automatic cycling.
24. Any phase	99	An ABORT procedure is in process. Let continue to CODE 88 condition.

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Figure 6-1. CYCLE OPERATION TIMING DIAGRAM.



Note: 1 marks a timeout or a switch transition.



Figure 6-2. LOAD OPERATION TIMING DIAGRAM.

NAME	FUNCTION	LOAD DOOR OPENING	LOADING BASKET	LOAD DOOR CLOSING	LOCKING DOORS	CYCLE STARTS
S6	OPEN LOAD DOOR					
S11	EXTEND LOAD ARM					
S12	RETRACT LOAD ARM					
mv	EXTEND POSITION					
mv	RETRACT POSITION					
S3	CLOSE LOAD DOOR					
S4	LOCK DOORS					
M2	HYDRAULIC PUMP					
CV3	LOAD DR NOT OPEN					
LS11	BASKET IN PLACE					
LS14	LOAD DOOR OPEN					
LS6	LD ARM RETRACTED					
LS8	LOAD DOOR CLOSED					
LS3	LOAD DOOR CLOSED					
LS1	LOAD DOOR LOCKED					
LS21	LOAD DOOR LOCKED					
LS5	ULD DOOR LOCKED					
LS10	ULD DOOR LOCKED					
PS1	LOAD HPB					

**Notes:**

1. **Initial State:** Both doors closed, start switch has been activated. Sterilizer is ready to accept a basket.
2. **t** marks a switch transition.
3. **mv** labels the position of the mechanical valves.

Figure 6-3. UNLOAD OPERATION TIMING DIAGRAM.

NAME	FUNCTION	UNLOAD DR OPENING	UNLOADING BASKET	UNLOAD DR CLOSING	READY STATE
S2	OPEN ULD DOOR				
S9	EXTEND ULD ARM				
S10	RETRACT ULD ARM				
mv	EXTEND POSITION				
mv	RETRACT POSITION				
S5	CLOSE ULD DOOR				
M2	HYDRAULIC PUMP				
LS13	ULD DOOR OPEN				
LS20	ULD ARM RETRACTED				
LS2	ULD DOOR CLOSED				
LS9	ULD DOOR CLOSED				
LS4	UNLOAD TABLE FULL (NOT)				
LS22	BASKET REMOVED				
PS2	UNLOAD HPB				

**Notes:**

1. **Initial State:** Both doors closed, start switch has been activated. Sterilizer is ready to accept a basket.
2. **t** marks a switch transition.
3. **mv** labels the position of the mechanical valves.

Figure 6-4. DOOR OPERATION TIMING DIAGRAM.

NAME	FUNCTION	LOAD DOOR					UNLOAD DOOR				
		UNLOCKING	OPENING		CLOSING		OPENING		CLOSING		LOCKING
S1	UNLOCK DOORS	■					■				
S2	OPEN UNLOAD DOOR				■						
S3	CLOSE UNLOAD DOOR										■
S4	LOCK DOORS								■		
S5	CLOSE UNLOAD DOOR										
S6	OPEN LOAD DOOR		■								
M2	HYDRAULIC PUMP										
mv	LD CLOSE POSITION										
mv	LD OPEN POSITION										
mv	LOCK POSITION										
mv	UNLOCK POSITION										
mv	ULD CLOSE POSITION										
mv	ULD OPEN POSITION										
PB1	OPEN LOAD DOOR										
PB2	CLOSE LOAD DOOR										
PB4	OPEN UNLOAD DOOR										
PB5	CLOSE UNLOAD DOOR										
LS1	LOAD DOOR LOCKED										
LS2	ULD DOOR CLOSED										
LS3	LOAD DOOR CLOSED										
LS5	ULD DOOR LOCKED										
LS7	ULD DOOR UNLOCKED										
LS8	LOAD DOOR CLOSED										
LS9	ULD DOOR CLOSED										
LS10	UNLOAD DOOR LOCKED										
LS12	LOAD DOOR UNLOCKED										
LS13	ULD DOOR OPEN										
LS14	LOAD DOOR OPEN										
LS21	LOAD DOOR LOCKED										

Notes:

1. Initial State: Both doors closed and locked.
2. ■ marks a switch transition.
3. mv labels the position of the mechanical valves.

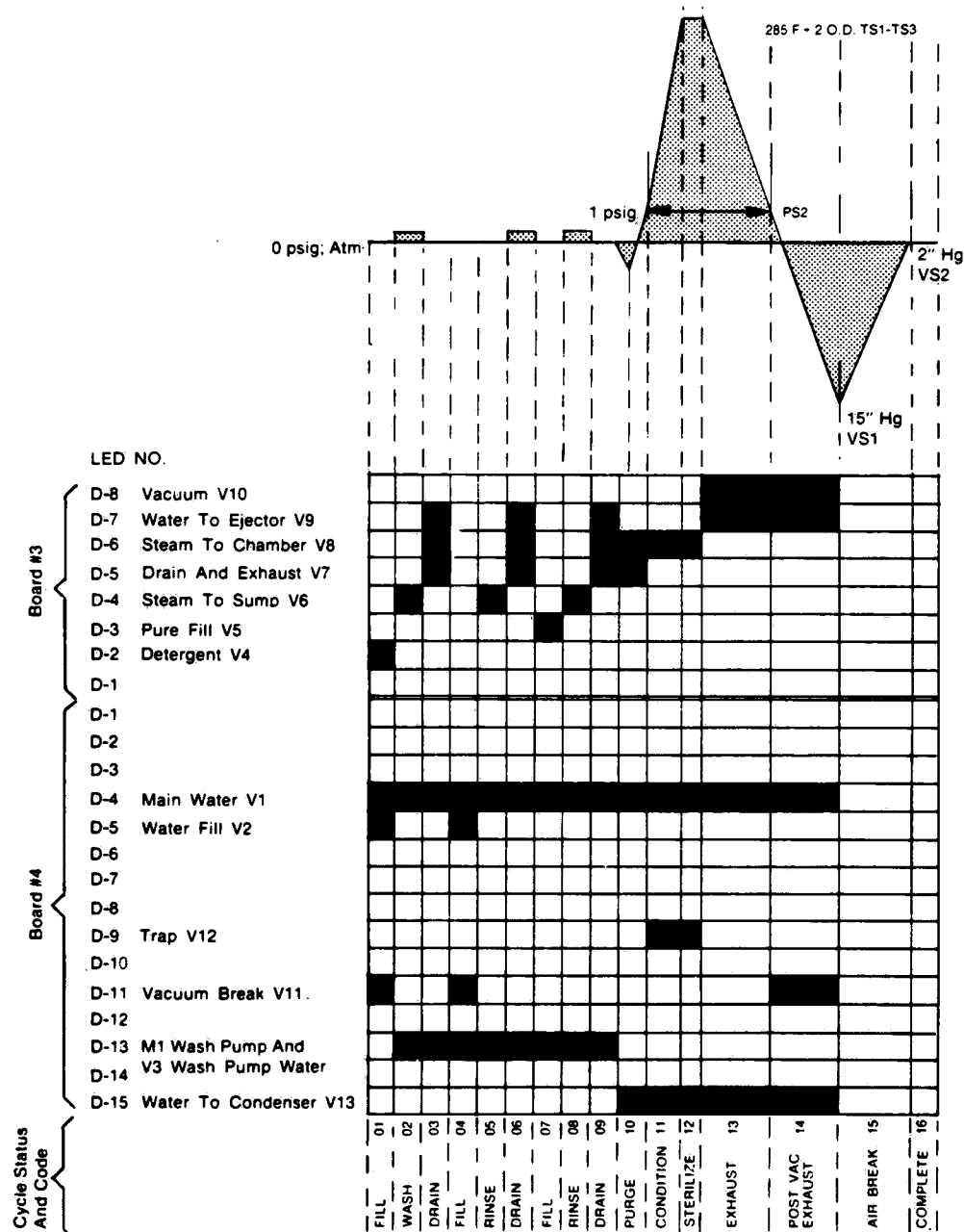


Figure 6-5. CYCLE GRAPH.

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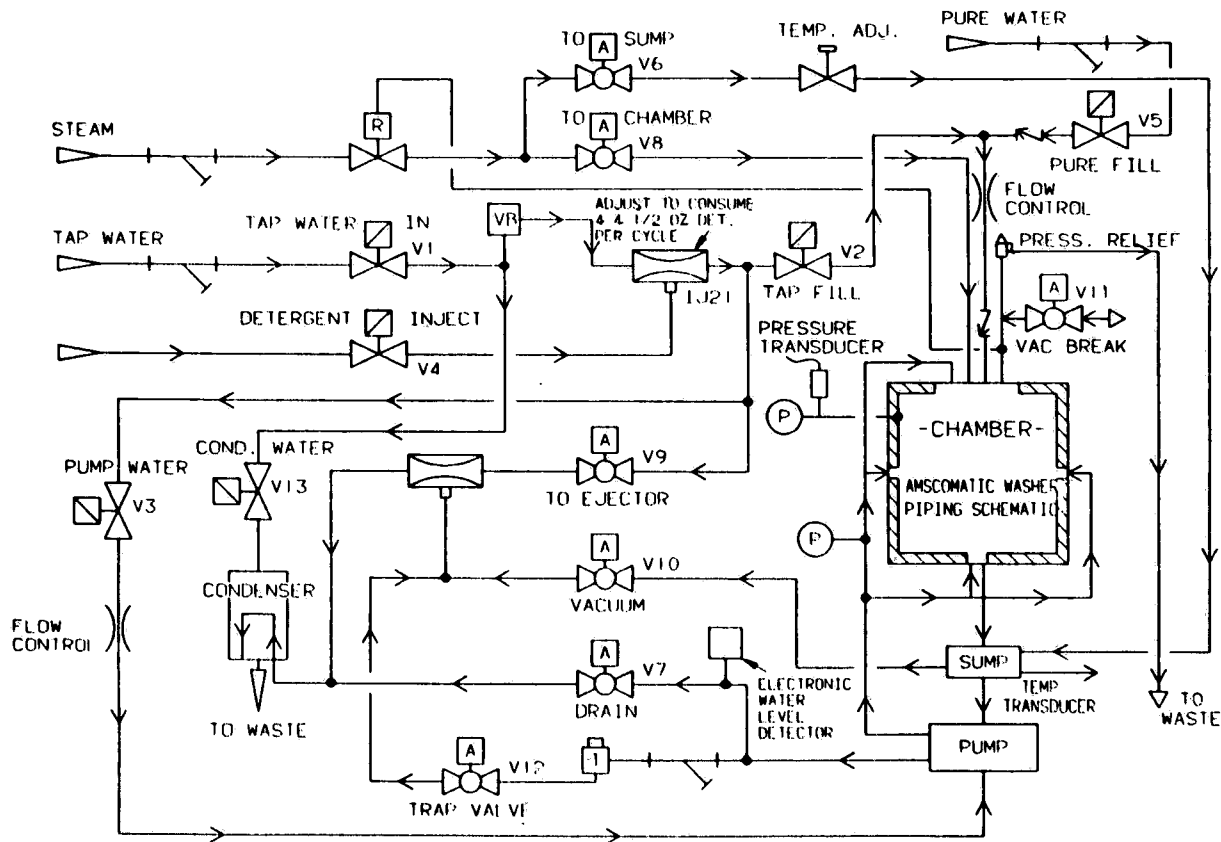
Figure 8-6. VALVE ACTUATION SEQUENCE.

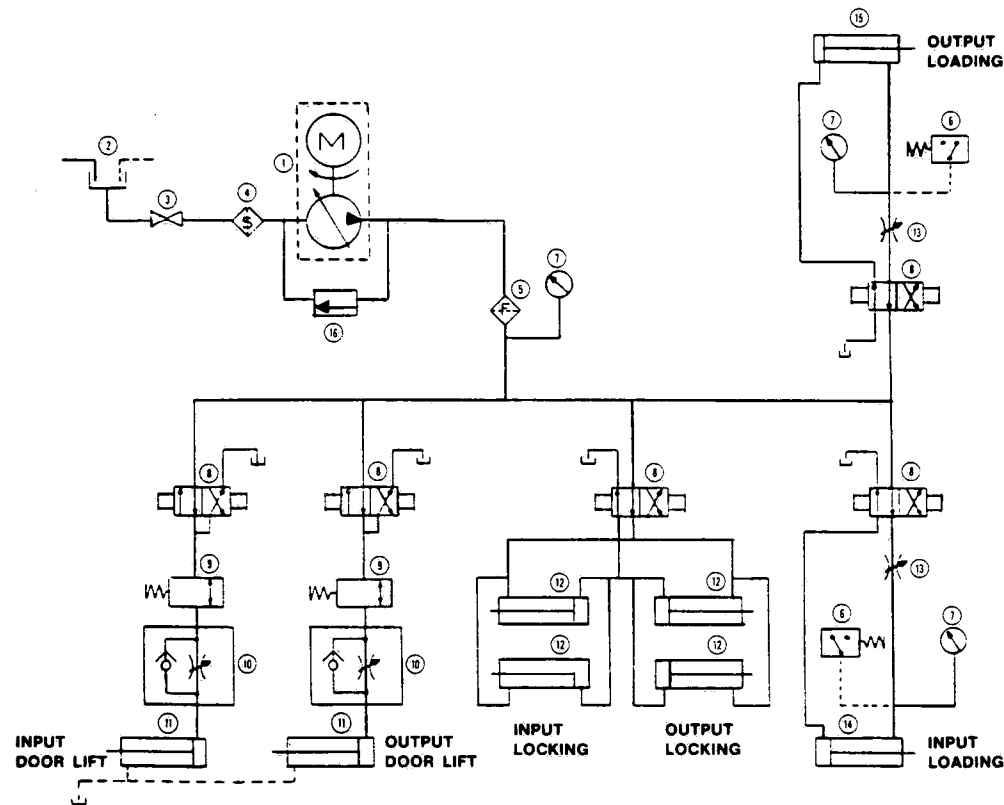
VALVE ACTUATION AND TIMES AT CYCLE SEQUENCE		<div>Main Water (V1) Water Fill (V2) Wash Pump Water (V3) Detergent Injector (V4) Pure Water Fill (V5) Steam to Sump (V6) Drain &amp; Exhaust (V7) Steam to Chamber (V8) Water to Ejector (V9) Vacuum (V10) Vacuum Break (V11) Trap (V12) Water to Condenser (V13) Wash Pump Motor (M1)</div>													
CYCLE SEQUENCE	TIMES (SECONDS)	LED B4 D4	B4 D5	B4 D13	B3 D2	B3 D3	B3 D4	B3 D5	B3 D6	B3 D7	B3 D8	B4 D11	B4 D9	B4 D15	B4 D13
First Fill	24 (±3)	X	X		X							X			
Wash	305 (±10)	X		X			X								X
First Drain	25-35 (±5)	X		X				X	X	X					
Second Fill	24 (±5)	X	X	X								X			
Rinse	60 (±5)	X		X			X								
Second Drain	25-35 (±5)	X		X				X	X	X					
Pure Fill	24 (±5)	X		X		X									
Pure Rinse	60 (±5)	X		X			X								
Third Drain	25-35 (±5)	X		X				X	X	X					
Condition (During Purge)	25 (±5)	X						X	X					X	
Condition (After Purge)	100 (±20)	X							X				X	X	
Sterilize	5 (±1)	X							X				X	X	
Exhaust	15 (±5)	X						X		X	X			X	
Exhaust (Vapor Removal)	60 ( ± 10)	X								X	X			X	
Exhaust (Vacuum Break)	5 (±3)											X			
Off Before Door Unlock															
Total Allowable Time	795 to 1035 (±15)														

F- 11

F- 12

Figure 6-7. PIPING SCHEMATIC.





KEY	QUANTITY	DESCRIPTION
1	1	Motor & Pump Assembly
2	1	Sump Assembly
3	1	Ball Valve
4	1	Strainer
5	1	Filter
6	2	Pressure Switch (PS1: PS2)
7	3	Pressure Gauge
8	5	Control Valve, Dual Coil (S1-S6, S9-S12)
9	2	Diverter Valve
10	2	Flow Control Valve
11	2	Door Lift Cylinder
12	4	Door Lock Cylinder
13	2	Needle Valve
14	1	Loading Cylinder
15	1	Unloading Cylinder
16	1	Pressure Relief Valve

Figure 6-8. HYDRAULIC PIPING SCHEMATIC.

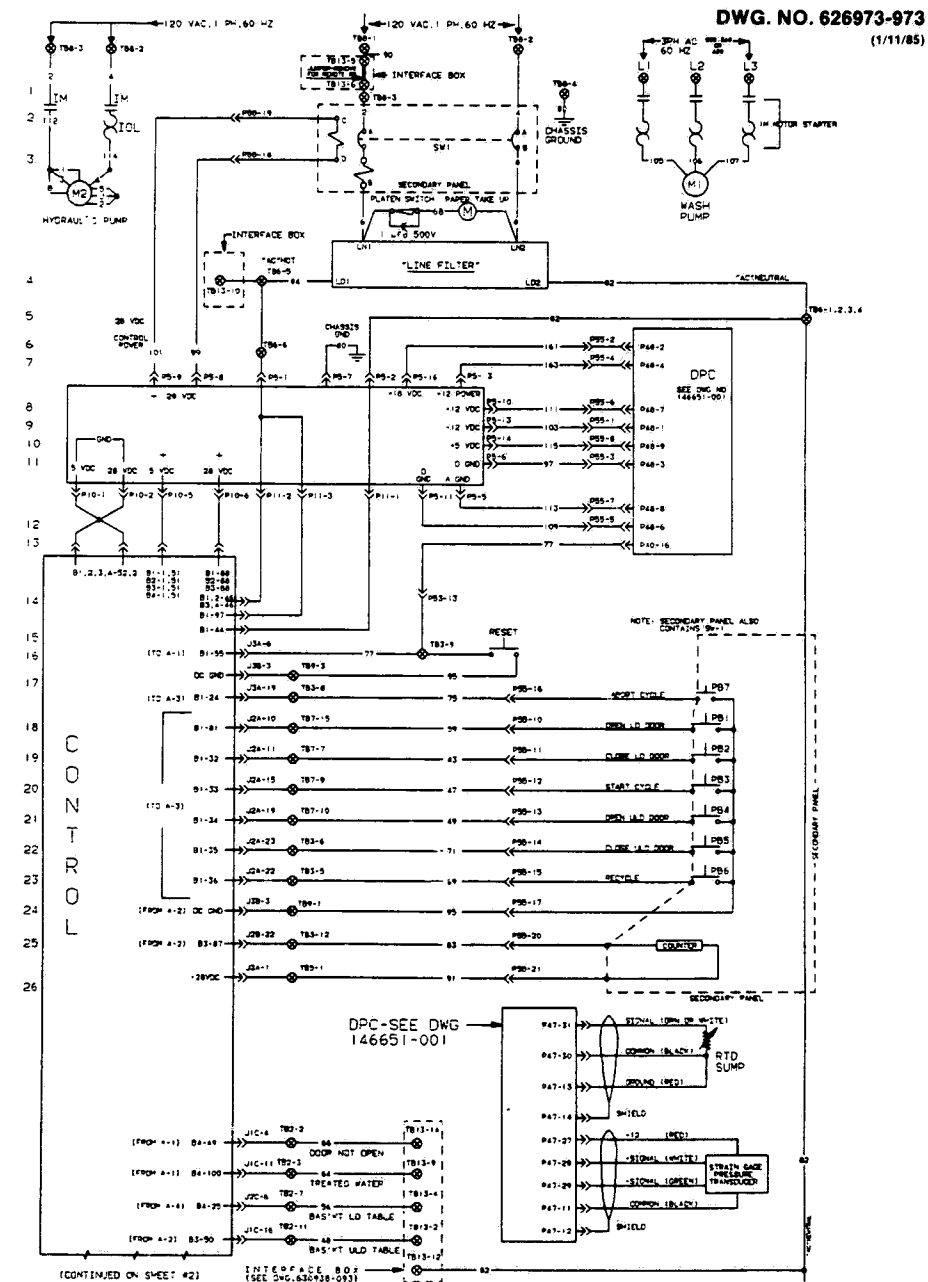


Figure 6-9. ELECTRICAL SCHEMATIC, Unit (Part 1 of 3).

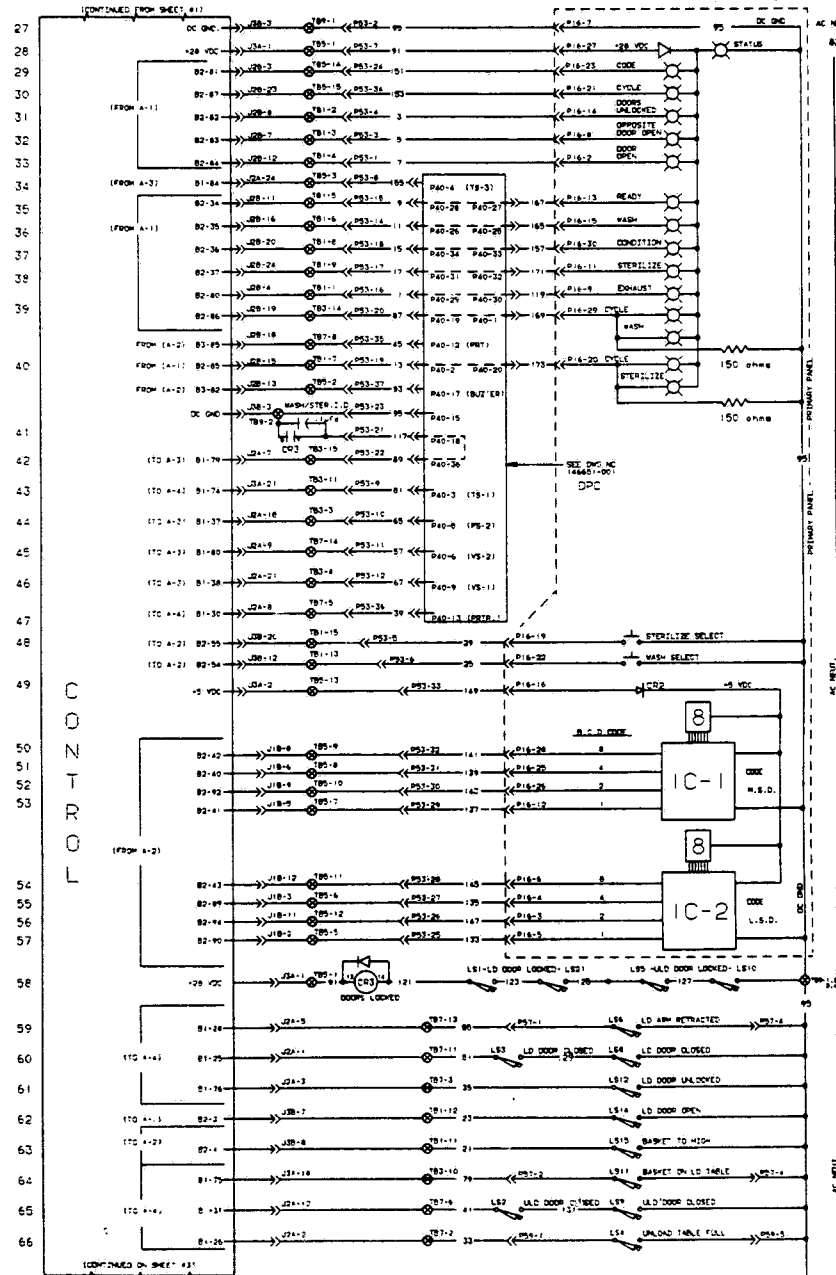


Figure 6-9. ELECTRICAL SCHEMATIC, Unit (Part 2 of 3).

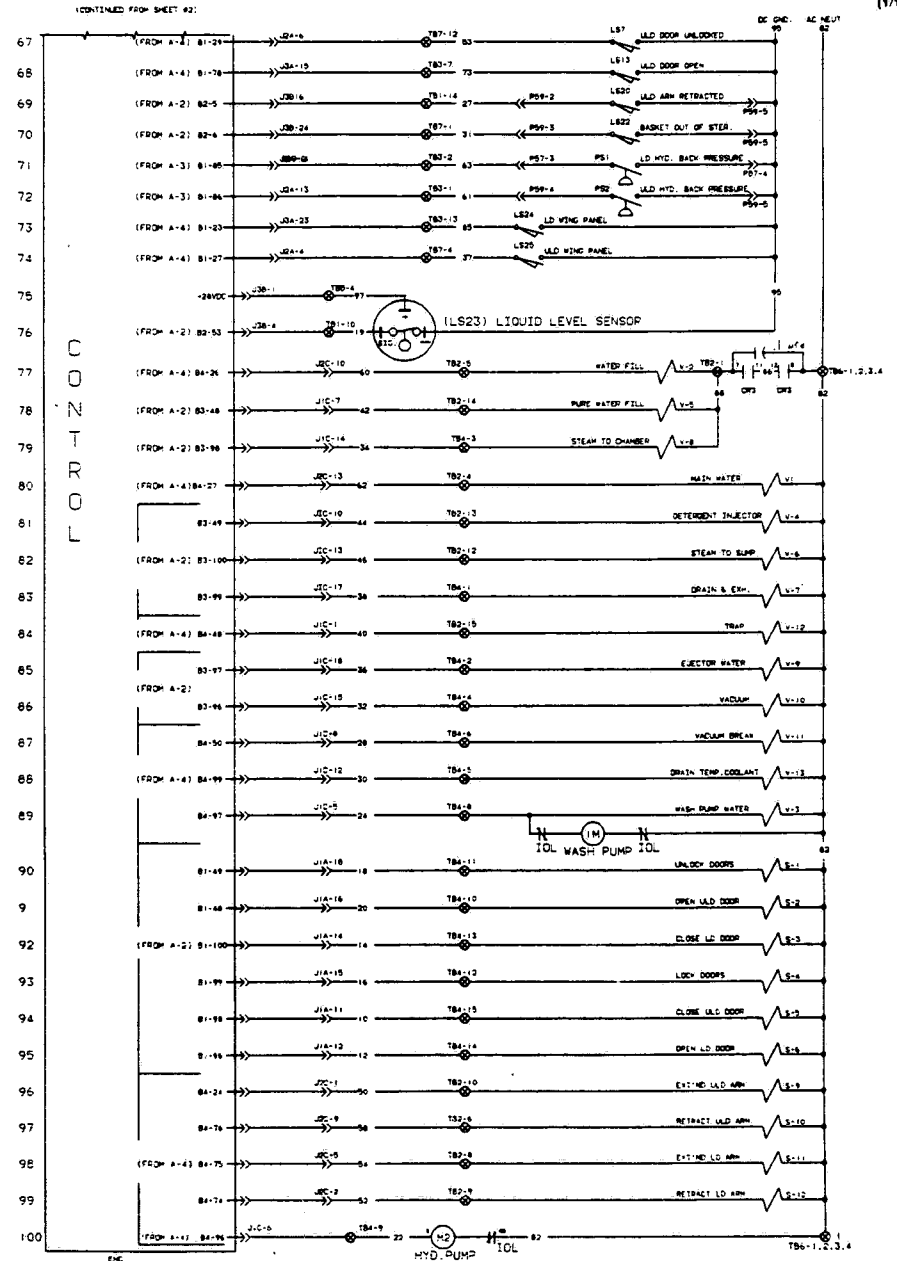
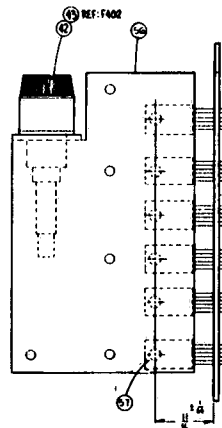
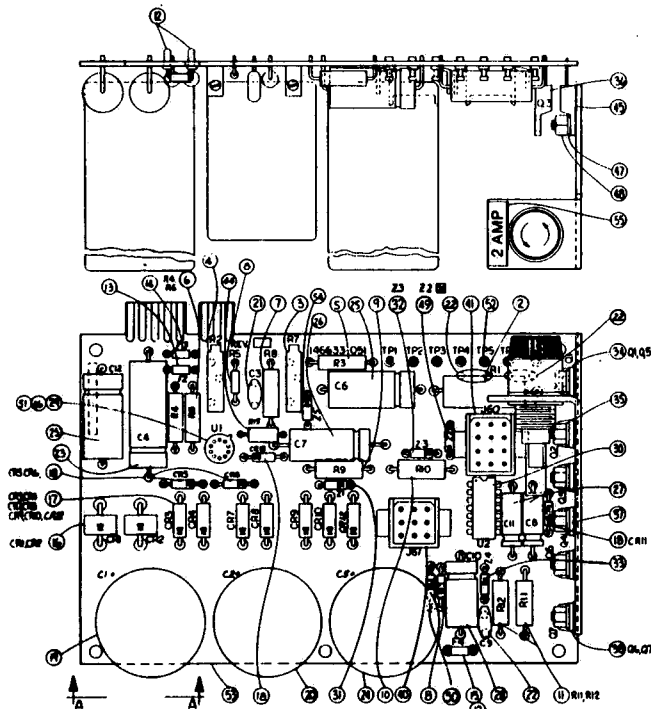


Figure 6-9. ELECTRICAL SCHEMATIC, Unit (Part 3 of 3).



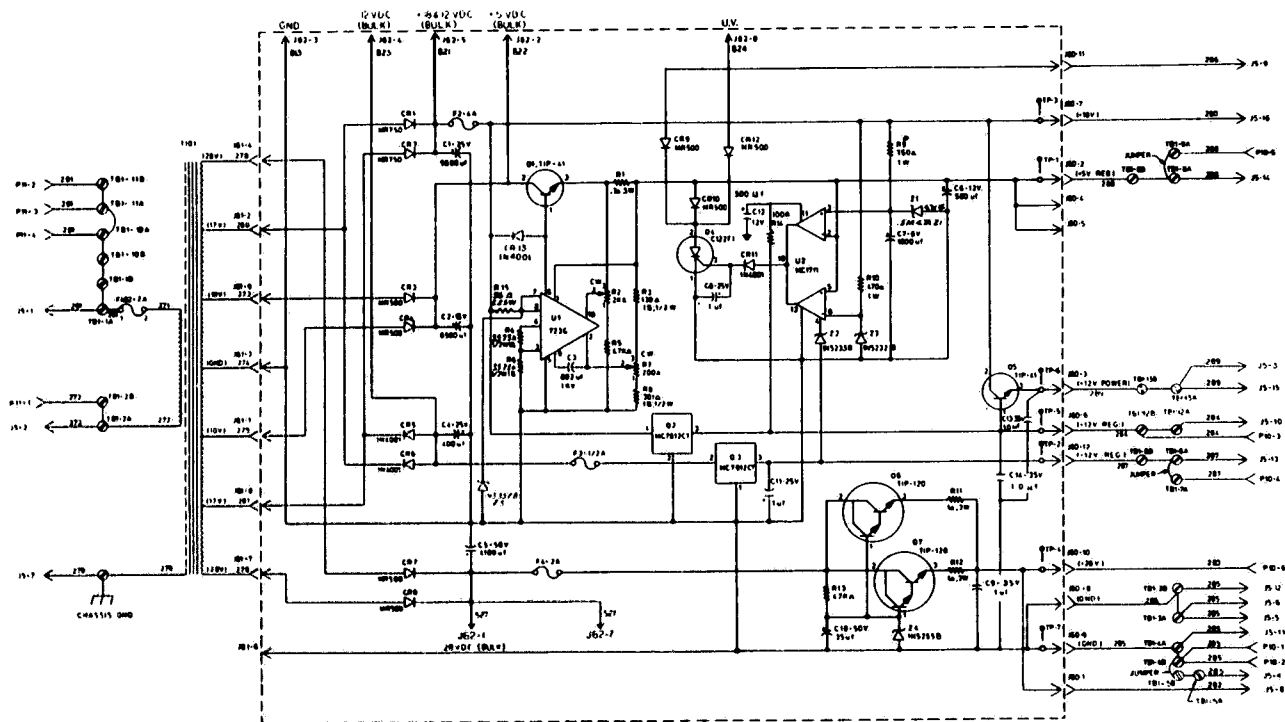
Figure 6-10. PRINTED CIRCUIT BOARD, Power Supply (Part 1 of 2).



QTY.	ITEM NO	DESCRIPTION
X	1	BOARD, POWER SUPPLY P.C. ASSEMBLY
1	2	RESISTOR 5 W.W.W. 311 R1
1	3	POT. 200Ω R7
1	4	POT. 3KΩ R2
1	5	RESISTOR 1/2 W.M.F. 130Ω R3
2	6	RESISTOR 1/2 W.M.F. 3570Ω R4, R6
1	7	RESISTOR 1/2 W.M.F. 301Ω R8
2	8	RESISTOR 1/4 W.C.C. 47KΩ R5, R13
1	9	RESISTOR 1 W.C.C. 470Ω R9
1	10	RESISTOR 1 W.C.C. 470Ω R10
2	11	RESISTOR 3 W.W.W. 1Ω R11, R12
8	12	TERMINAL SPRING SOCKET
1	13	PICOFUSE 4A F2
14	14	PICOFUSE 1/2A F3
1	15	PICOFUSE 2A F4
2	16	RECTIFIER 8A POWER CR1, CR2
7	17	RECTIFIER 3A POWER CR3, CR4, CR7, CR8, CR9, CR10, CR12
4	18	RECTIFIER 1A CR5, CR6, CR11, CR13
1	19	CAPACITOR 3000 μF.D. 25V C1
1	20	CAPACITOR 6500 μF.D. 15V C2
1	21	CAPACITOR 002 μF.D. 1KV C3
3	22	CAPACITOR 1 μF.D. 35 VDC CR, C13, C14
1	23	CAPACITOR 470 μF.D. 25V C4
1	24	CAPACITOR 4100 μF.D. 50V C5
2	25	CAPACITOR 470 μF.D. 16V C8, C12
1	26	CAPACITOR 1000 μF.D. 10V C7
2	27	CAPACITOR 1 μF.D. 50V CR, C11
1	28	CAPACITOR 33 μF.D. 50V C10
1	29	REGULATOR POS. VOLTAGE U1
1	30	COMPARATOR DUAL DIFFER. U2
1	31	DIODE 47V ZENER 1N Z1
1	32	DIODE 58V ZENER 5N Z3
1	33	DIODE 20V ZENER 5N Z4
2	34	TRANSISTOR POWER Q1, Q5
1	35	REGULATOR 12V POSITIVE Q2
1	36	REGULATOR 12V NEGATIVE Q3
1	37	THYRISTOR REV. BLOCK TRIODE Q4
2	38	TRANSISTOR POWER Q6, Q7
1	39	
1	40	HEADER PIN PC MOUNTING J61
1	41	HEADER PIN PC MOUNTING J60
1	42	FUSEHOLDER
1	43	FUSE 2A F402
1	44	RESISTOR 56 Ω 1/4 W. R15
8	45	INSULATOR
1	46	HEATSHIR
8	47	BUSHING NYLON INSULATING
8	48	NUT #4-40 MET
1	49	DIODE 60V ZENER Z2
1	50	RESISTOR 1/4 W.C.C. 100Ω R14
1	51	SOCKET (USED WITH U1 ITEM #29)
2	52	TERMINAL TEST POINT
1	53	BOARD BARE POWER SUPPLY P.C. - DRILL SCHEDULE
1	54	DIODE 15V ZENER 5N Z5
1	55	DECAL - 2 AMP
1	56	HEAT SINK
8	57	SCREW FLAT HD #4-40 X 3/16

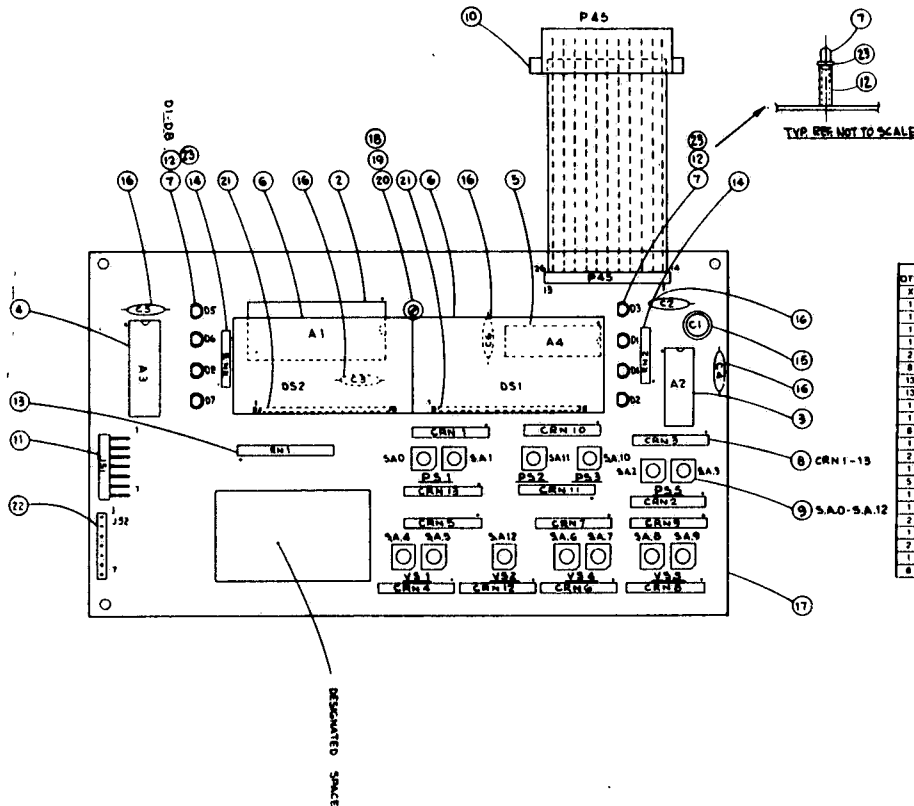
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Figure 6-10. PRINTED CIRCUIT BOARD, Power Supply (Part 2 of 2).



UNLESS OTHERWISE NOTED, ALL RESISTORS ARE 1/4 WATT

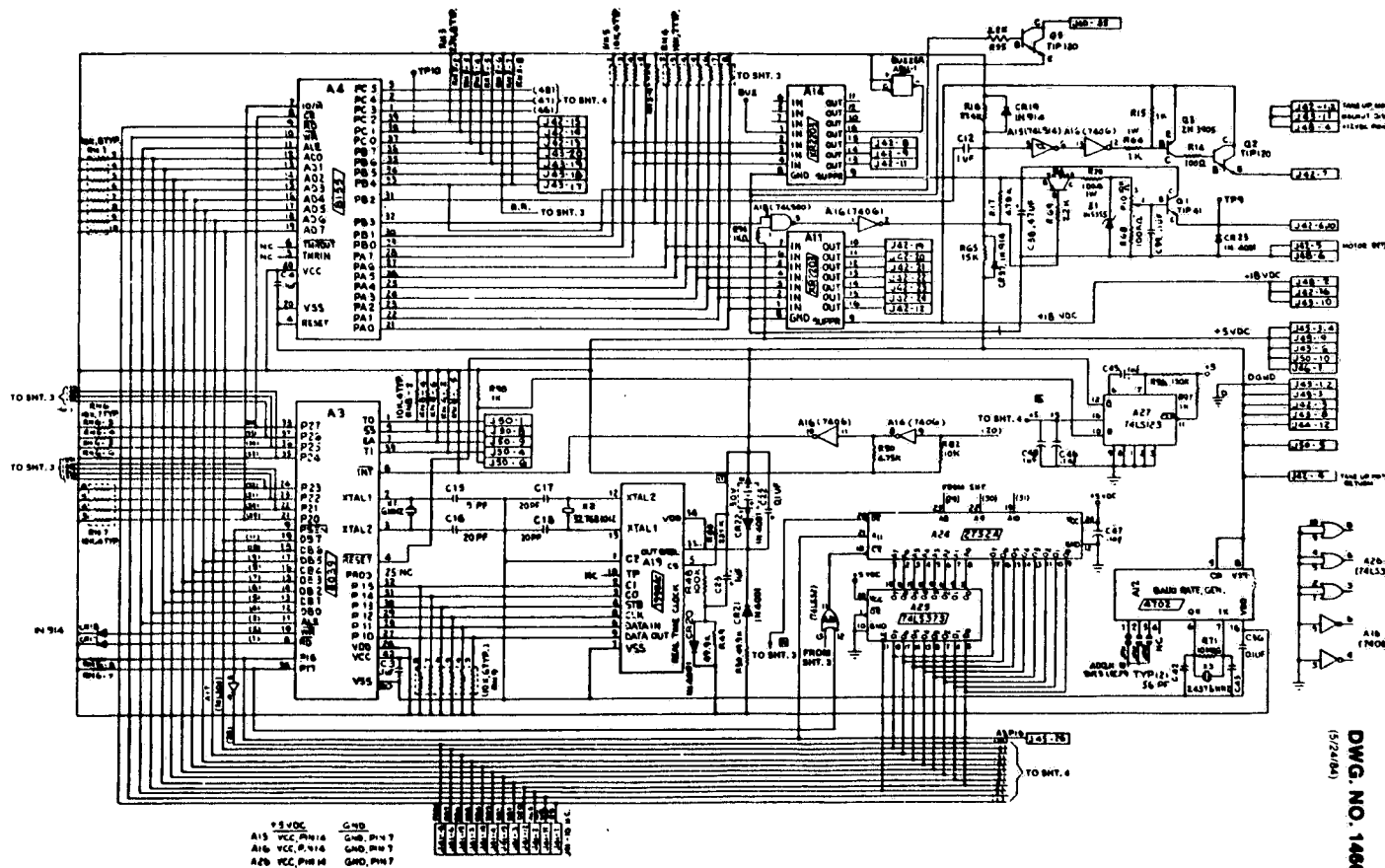
Figure 6-11. PRINTED CIRCUIT BOARD, Digital Display (Part 1 of 2).



QTY.	ITEM NO.	PART NAME	DESCRIPTION MATERIAL
X	1	DIGITAL PRINTER	DISPLAY BOARD
1	2	28 PIN DIP IC	7218A, 8 DIGIT 7 SEG. DISPLAY DRIVER (A1)
1	3	16 PIN DIP IC	74 LS 138 DECODER/MULTIPLEXER (A2)
1	4	20 PIN DIP IC	74LS374 OCTAL D-TYPE LATCH (A3)
1	5	20 PIN DIP IC	WLS 80 TRI-STATE OCTAL BUZZER (A4)
2	6	DISPLAY	QUAD - 7 SEG. DISPLAY (DS1 & DS2)
8	7	LED	SOLID STATE INDICATOR LED, RED (D1-D8)
13	8	DIODE NETWORK	CRN1-13 (SIMILAR TO 1M4150)
13	9	SWITCH	10 POS. ROTARY BCD DIP (S A O - S A 12) EECO 240080
1	10	CABLE ASSEMBLY	9' (J45)
1	11	CONNECTOR	7 POS. S.R. A. HEADER
8	12	LED MOUNT	NYLON, 675 HIGH
1	12	RESISTOR	10K, 9 NETWORK SIP RN1
2	14	RESISTOR	330K, 5 NETWORK SIP RN2,3
1	15	CAPACITOR	220 $\mu$ F, 10V ALUM. C1
3	16	CAPACITOR	1 $\mu$ , 25V CERAMIC C2-C8
1	17	PC BOARD	
1	18	SUPPORT	NYLON
2	19	WASHER	FLAT, NYLON
1	20	SCREW	#6-32 X 3/8 SELF TAPPING
2	21	CONNECTOR	16 POS. S.R. HEADER
1	22	HEADER	7 POS. S.R. HEADER
8	23	BUSHING	INSULATION



Figure 6-12. PRINTED CIRCUIT BOARD, Pritcon (Part 2 of 4).



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# AMSCO

## AMSCOMATIC STERILIZER W/PRINTCON P-764320-441

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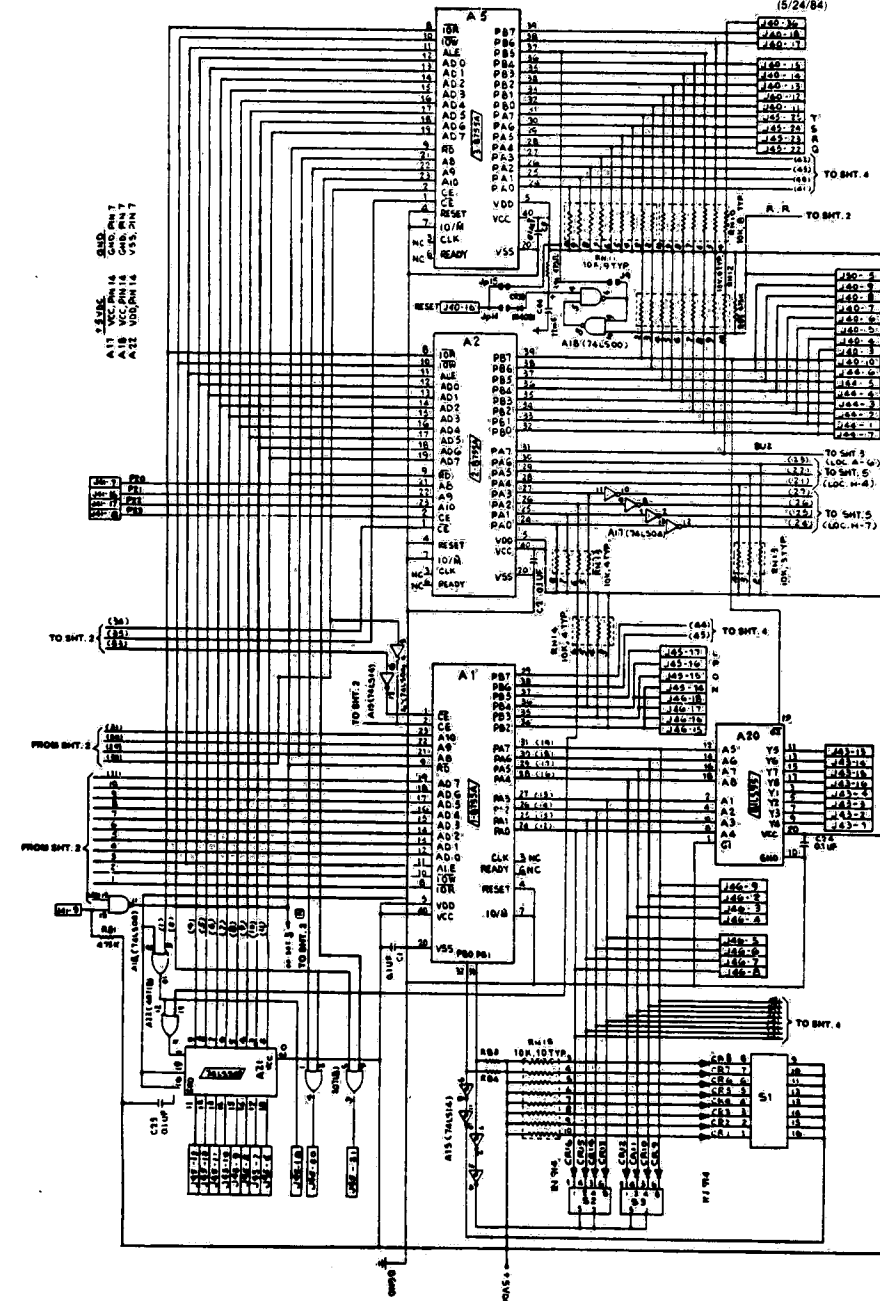
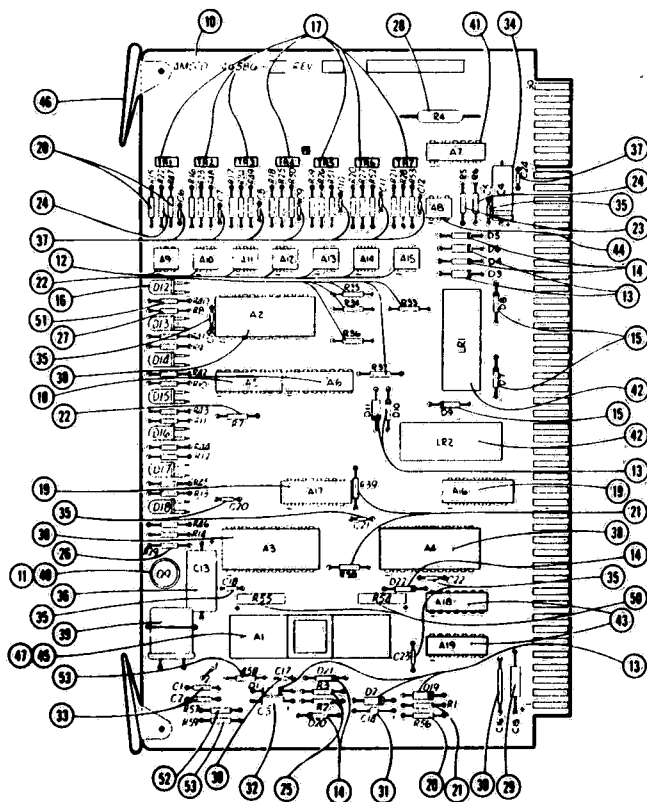


Figure 6-12. PRINTED CIRCUIT BOARD, Printcon (Part 3 of 4).







**Figure 6-13. PRINTED CIRCUIT BOARD, Basic (Part 1 of 2).**

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**TK-1250**

QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
	1	NOT USED	
	2	NOT USED	
	3	NOT USED	
	4	NOT USED	
	5	NOT USED	
	6	NOT USED	
	7	NOT USED	
	8	NOT USED	
1	10	7/8 CARD & DRILL ASSY.	
1	11	PAD, TRANSISTOR	
	12	IC 5058 A	TRIAL DRIVER A9-A15
7	13	RECTIFIER, 1M4001	D1, D2, D3, D4, D10, D11, D19
5	14	DIODE, 1N949	D4, D5, D20-D22
7	15	RECTIFIER, 1M4634	D7, D8, D9
1	16	LAMP, SOLID STATE	HW 5054-2 L.E.D., D12-B1B
	17	TRIAL, 740053	TRC-787
2	18	TRANSISTOR, 2N1203	DARLINGTON - A5, A6
1	19	RESISTOR, NETWORK	616103R2P A16, A17
15	20	RESISTOR	470 OHMS 1/4W 5% CARBON, R15-R21, R47-R53, R56
3	21	RESISTOR	10K 1/4W 5% CARBON, R1, R30, R39
6	22	RESISTOR	1K 1/4W 5% CARBON, R7, R33-R37
3	23	RESISTOR	2.7K 1/4W 5% CARBON, R5
8	24	RESISTOR	100 OHMS 1/4W 5% CARBON, R6, R22-R28
2	25	RESISTOR	510 OHMS 1/4W 5% CARBON, R2, R3
1	26	RESISTOR	330 OHMS 1/4W 5% CARBON, R19
1	27	RESISTOR	580 OHMS 1/4W 5% CARBON, R8-R14
1	28	RESISTOR	18K 1/5W 10%, CARBON, R4
1	29	CAPACITOR	22uF @ 15V TANTALUM-C15
2	30	CAPACITOR	0.1uF @ 12V CERAMIC DISC-C16, C17
1	31	CAPACITOR	0.1uF @ 30V TANTALUM-C18
1	32	CAPACITOR	0.1uF @ 10V TANTALUM-C3
3	33	CAPACITOR	20uF @ 500V CERAMIC DISC-C1, C2
1	34	CAPACITOR	47uF @ 25V TANTALUM, C6
1	35	CAPACITOR	0.01uF @ 25V CERAMIC DISC-C5, C18, C23
1	36	CAPACITOR	0.01uF @ 50V TANTALUM-C13
8	37	CAPACITOR	0.1uF @ 200 VDC CERAMIC DISC-C4-C12, C24
3	38	EXPANDER, I/O	8243 A2, A3, A4
3	39	CRYSTAL, 3MHz	
1	40	TRANSISTOR,	2N3053A Q9
	41	IC 1059	
1	42	RELAY, LATCH	LRI, LR2
2	43	IC-7406	INVERTER HEX BUFFER/DRIVER-AW, A19
	44	IC, 4026	OPTO ISO TRANS., AU
	45	DIP SOCKET	40 PIN AI
	46	REL. CARD	
1	47	HYCROMPUTER	
	48	NOT USED	
	49	NOT USED	
2	50	RESISTOR NETWORK	15K BY 5 R44, R55
1	51	RESISTOR	150 OHMS 1/4W 5% R40-R46
1	52	RESISTOR	5.1K OHMS 1/4W 5% R37
2	53	RESISTOR	1K OHMS 1/4W 5% R34, R35

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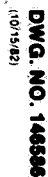
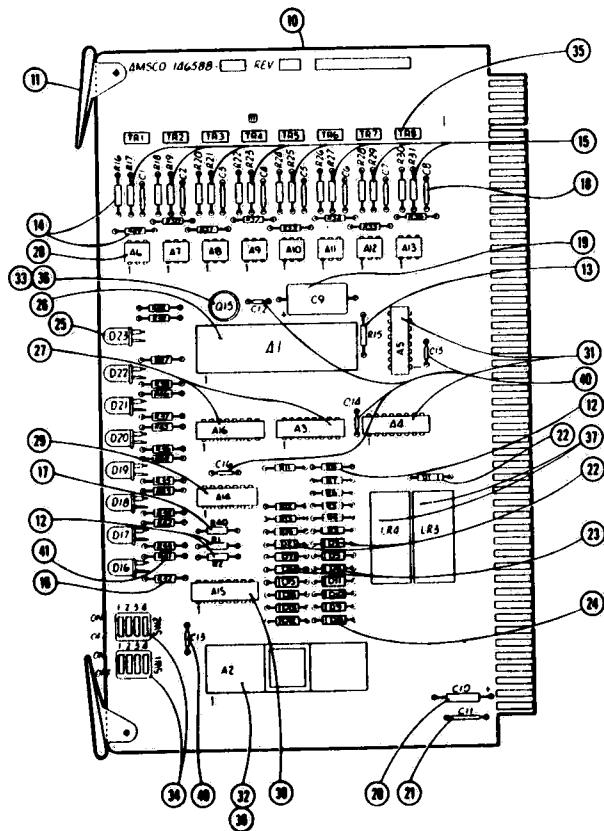


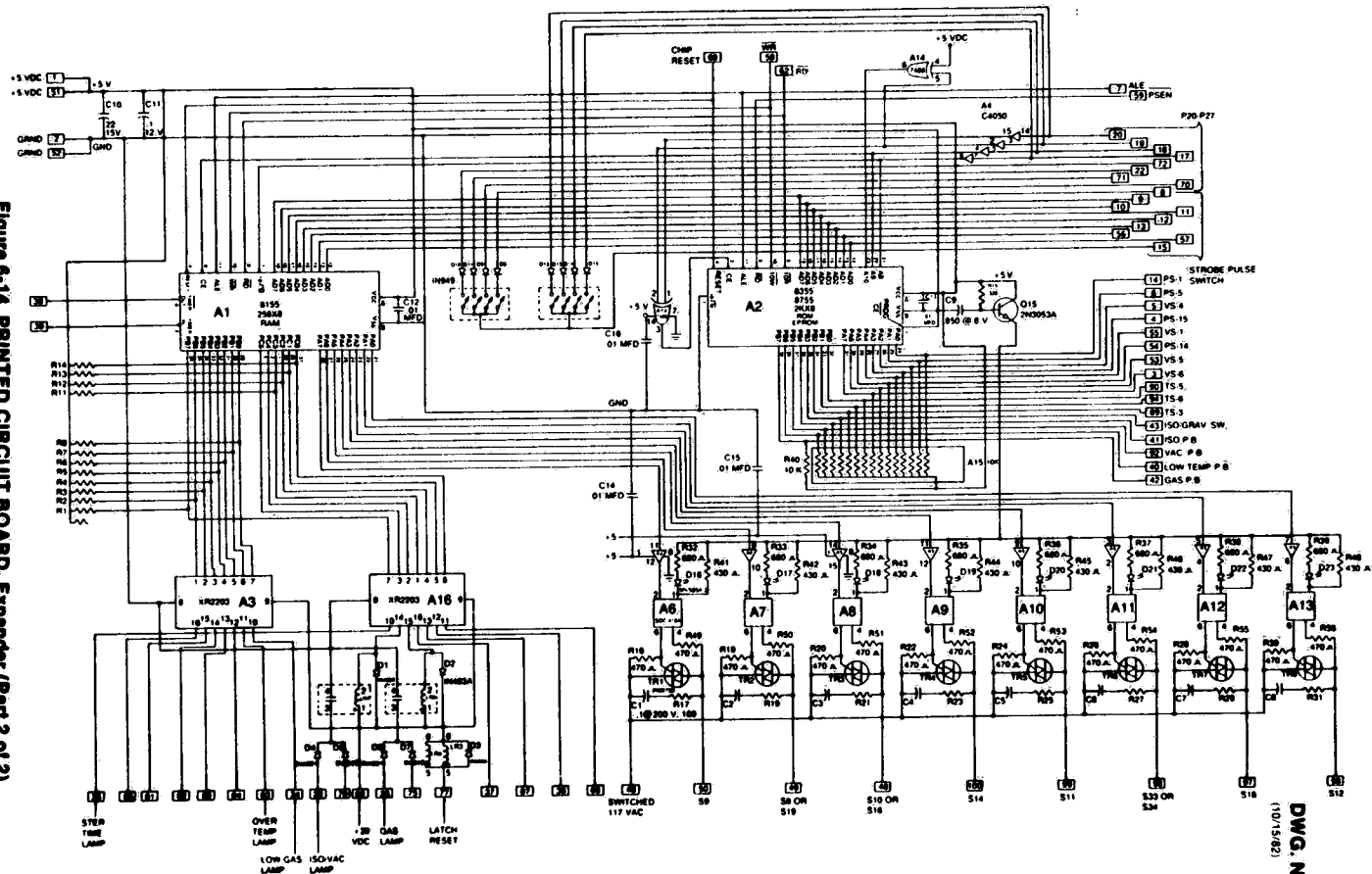
Figure 6-14. PRINTED CIRCUIT BOARD, Expander (Part 1 of 2).



QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
	1	NOT USED	
	2	NOT USED	
	3	NOT USED	
	4	NOT USED	
	5	NOT USED	
	6	NOT USED	
	7	NOT USED	
	8	NOT USED	
1	10	P/C CARD & DRILL SCHD.	
2	11	PULL, CARD	
12	12	RESISTOR, 3K OHMS	1/4W 5%, R1-R6, R11-R14
1	13	RESISTOR, 330 OHMS	1/4W 5%, R15
16	14	RESISTOR, 470 OHMS	1/4W 5%, R16, R18, R20, R22, R24, R26, R28, R30, R49-R56
8	15	RESISTOR, 100 OHMS	1/4W 5%, R17, R19, R21, R23, R25, R27, R29, R31
8	16	RESISTOR, 480 OHMS	1/4W 5%, R32-R39
1	17	RESISTOR, 10K OHMS	1/4W 5%, R40
8	18	CAPACITOR, .1μF, 200V	C1-C8
1	19	CAPACITOR, 850μF, 8V	C9
1	20	CAPACITOR, 22μF, 15V	C10
1	21	CAPACITOR, .1μF, 12V	C11
1	22	DIODE	1N463A, D1, D2, D3
2	23	DIODE	1N4001, D4, D5
10	24	DIODE	1N914, D6, D7, D8-D15
8	25	I.E.D.	HW5054-2 D16-D23
1	26	MOS RAM, 8155	A1
2	27	DARLINGTON, 2N2203	A3, A16
8	28	OPTOISO TRIAC	50K 416A A6-A13
1	29	QUAD ES-OR, 7486	A14
1	30	RESISTOR, NETWORK	VI6C103K2PE A15
2	31	BUFFER, CMOS	CD4050BC A4, A5
1	32	DIP SOCKET, 40 PIN	A2
1	33	TRANSISTOR	2N4053A Q15
2	34	SWITCH, 16 POS HEX	SW1, SW2
8	35	TRIAC, 2M4073B	TR1-TR8
1	36	PAD, TRANSISTOR	Q15
2	37	RELAY, LATCH	LR3, LR4
1	38	BIT ROM	
1	39	NOT USED	
5	40	CAPACITOR	0.01 μF 8 75V C12-C18
8	41	RESISTOR	430 OHMS 1/4W 5% R41-R48

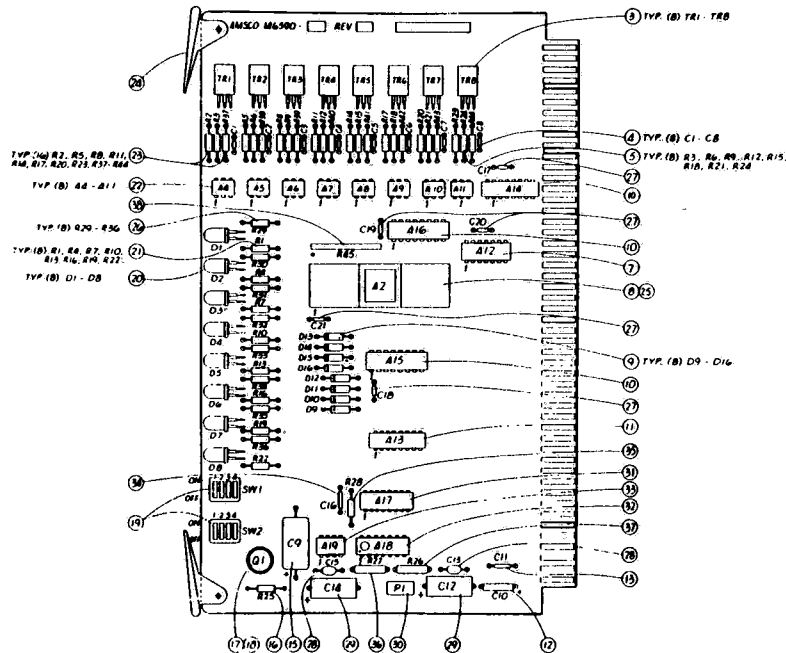
Figure 8-16. PRINTED CIRCUIT BOARD, Expander (Part 2 of 2).

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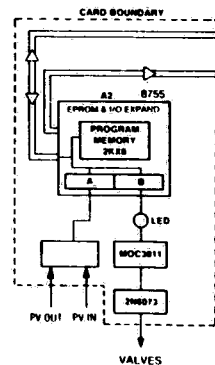


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Figure 6-15. PRINTED CIRCUIT BOARD, #3 (Part 1 of 2).

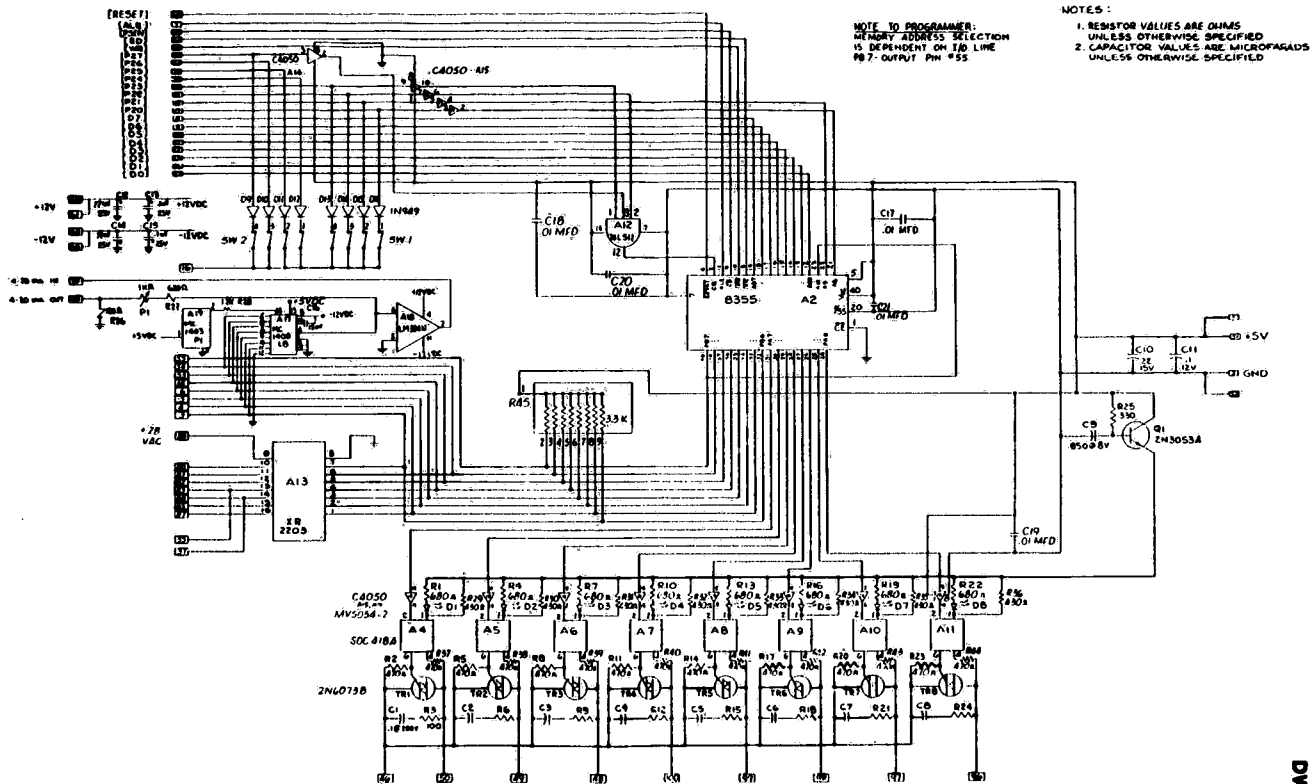


QTY	ITEM NO.	NAME	DESCRIPTION, MATERIAL
1	1	P.C. ASSY	COMBINATION CYAN & GRN
1	2	P.C. CAP & CRILL	SCHEDULE
8	3	16M 200V 50	TR1 - TR8
8	4	CAPACITOR	1uf, 200V, C1 - C8
5	5	RESISTOR, 1/2W	1/2W 5% R3, R6, R9, R12, R15, R16, R21, R24
1	6	IC, TRIPLE	7474, 111, A17
1	7	CAPACITOR, 100M	0.1uF, A2
8	8	DIODE 1N943	DP - D16
3	9	QUAD 14, OR	7405, A15, A16, A18
1	10	DATA INPUT	8253, A19
1	11	CAPACITOR	22uf, 15V, Q10
1	12	COMPARATOR	7474, 12V, C11
1	13	CAPACITOR	0.1uF, EV, A19
1	14	RESISTOR, 3300	1/2W 5% R25
1	15	TRANSISTOR	2N3904, Q1
1	16	PNP, TRANSISTOR	Q1
2	17	SWITCH, 16 POS.	REF SW1, SW2
8	18	LAMP, 100V 0.2	L.E.D. D1 - D16
8	19	RESISTOR, 2200	1/2W 5% R7, R13, R17, R19, R21, R22
8	20	TRIPLE, 0.1uF, 15V	200413M, A1, A11, A18, R18, R22
18	21	RESISTOR, 4700	1/2W 5% R2, R5, R8, R11, R14, R17, R20, R23, R23, R24
1	22	IC, 4002	7474, A17, A20, R23, R23, R24
1	23	SOCKET, LOW PROFILE	40 PIN D, P
8	24	RESISTOR, 4700	1/2W 5% R25, R26
5	25	CAPACITOR	0.1uF 25V C17, C18
2	26	CAPACITOR	0.1uF 100V C19, C20
2	27	CAPACITOR	22uf 15V C12, C14
1	28	IC, 14 PIN	7474, A17
1	29	IC, 14 PIN	7474, A17
1	30	QUAD OP AMP	7474, A17
1	31	REFERENCE, 5V	REF 1403 P1, A19
1	32	CAPACITOR	0.1uF 100V C16
1	33	RESISTOR	1/2W 5% 100K, R27
1	34	RESISTOR	0.1uF 100V C13
1	35	RESISTOR	1/2W 5% 100K, R28
1	36	RESISTOR	1/2W 5% 100K, R29
1	37	RESISTOR	1/2W 5% 100K, R30
1	38	RESISTOR	1/2W 5% 100K, R31
1	39	P.C. ASSY	16M 200V
1	40	EXPANDED, 100V	R25, A2



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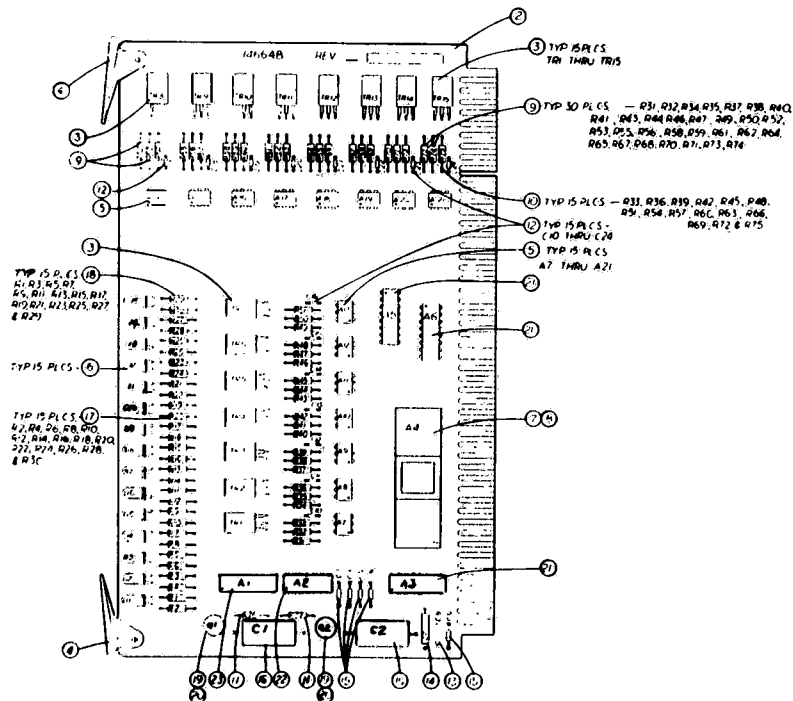
**Figure 6-15. PRINTED CIRCUIT BOARD, #3 (Part 2 of 2).**



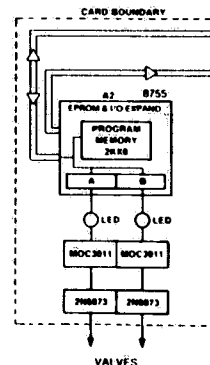
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Figure 6-16. PRINTED CIRCUIT BOARD, #4 (Part 1 of 2).

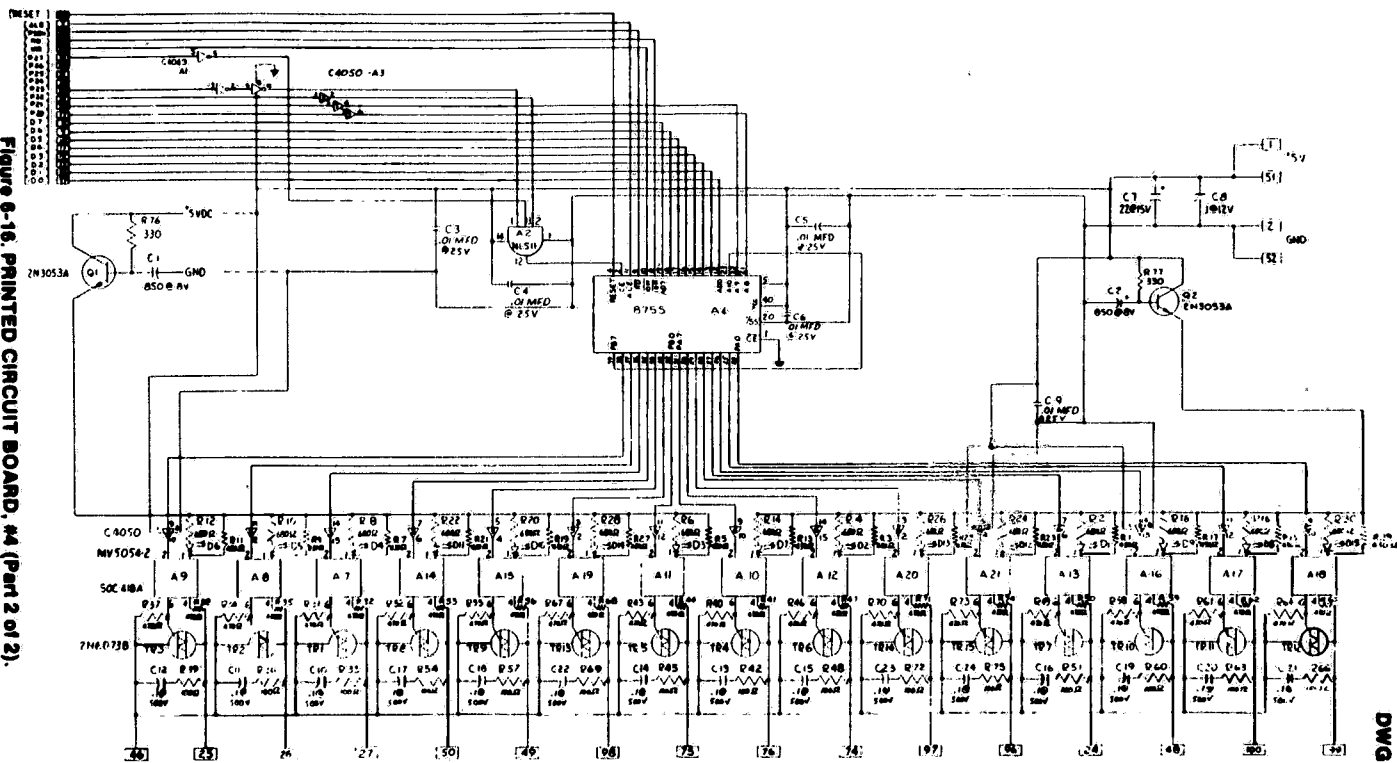


QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
1	1	P.C. BD. ASS'Y	1/03 (BOARD #4)
1	2	P.C. CARD & DRILL SCHEDULE	
15	3	YITALC 2040738	
15	4	TRIM 150	100 410A
15	5	TRIM 150	100 410A
15	6	TRIM 150	100 410A
15	7	TRIM 150	100 410A
15	8	TRIM 150	100 410A
15	9	TRIM 150	100 410A
15	10	TRIM 150	100 410A
15	11	TRIM 150	100 410A
15	12	TRIM 150	100 410A
15	13	TRIM 150	100 410A
15	14	TRIM 150	100 410A
15	15	TRIM 150	100 410A
15	16	TRIM 150	100 410A
15	17	TRIM 150	100 410A
15	18	TRIM 150	100 410A
15	19	TRIM 150	100 410A
15	20	TRIM 150	100 410A
15	21	TRIM 150	100 410A
15	22	TRIM 150	100 410A
15	23	TRIM 150	100 410A
15	24	TRIM 150	100 410A



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Figure 8-16. PRINTED CIRCUIT BOARD, A4 (Part 2 of 2).



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## SECTION 7

### COMPONENT REPAIR, REPLACEMENT AND ADJUSTMENT

#### 7.1 GENERAL

This section includes instructions for disassembly, repair and replacement of selected components. Exploded views and assembly drawings showing the various parts and assemblies referred to are included in *Section 8, ILLUSTRATED PARTS BREAKDOWN*.

**WARNING** AVOID PERSONAL INJURY FROM DOOR CLOSING. DO NOT REACH INTO STERILIZER UNLESS THE DOOR IS BLOCKED OPEN WITH THE SAFETY BAR ATTACHED BEHIND THE FRONT PANEL. ALSO BE SURE WING PANEL IS IN THE OUT POSITION.

#### 7.2 CHAMBER DOOR ASSEMBLY

Normal maintenance of the chamber door and some repairs to the door mechanism can be accomplished without removing the door from the washer/sterilizer. However, the door must be removed to replace the gasket or for major repairs to the locking mechanism.

**NOTE:** To prevent the locking mechanism setscrews from vibrating loose, the following procedure should be used when replacing them or if vibration is a problem.

1. Clean the setscrew with *Locquic Primer (grade-1)* (R-05300-547; manufactured by Loctite Corporation) and wipe dry.
2. Apply a second coat of *Locquic* and allow it to air dry.
3. Apply *Screw Lock* (R-5300-586; manufactured by Loctite Corporation) to the screw and then replace it. *Screw Lock* allows the screw to be adjusted but prevents it from vibrating loose. *Screw lock* can be used wherever this problem occurs.

##### 7.2.1 Door Removal (See Figures 8-19, 8-20 And 8-21)

1. Remove trim panel and door cover (Figure 8-1).
2. Remove cross support (Figure 8-3 or 8-4).
3. Remove upper clamp from cable at door. **Do not** remove the lower clamp at this time.

4. Remove collar from cylinder.

5. Remove actuator from limit switch.

6. Press the OPEN LOAD DOOR or OPEN UNLOAD DOOR button as applicable. Turn the POWER switch OFF when the door is fully open. **Do not** allow cable clamp to become engaged in pulley.

7. Place padding on the loading or unloading unit so that the door may be lowered onto it.

8. Pull out on the bottom of the door so that it clears the gears on the corner of the locking mechanism. Turn the POWER switch ON and press CLOSE LOAD DOOR or CLOSE UNLOAD DOOR as applicable. Guide the door as it lowers until it is resting on the loading or unloading unit. **Note:** To regulate speed at which door lowers, adjust the cylinder flow control valve (see Figure 8-35).

9. Turn POWER switch OFF.

10. Remove remaining clamp from door cable.

11. Place door on padded work bench or table. Clean all parts with solvent and wipe with a clean, lint-free cloth. Replace all damaged or worn gaskets.

12. Reassemble door as follows:

- a. Assemble door and attach to unit in reverse order of removal.
- b. Adjust cable so that it remains snug when door is in down position.
- c. Open door until bottom edge is at least even with top edge of chamber opening. Adjust collar on cylinder rod so that it will rest on cylinder at that point.
- d. Adjust actuator on limit switch so that it is tripped when door is opened (see **step 3**).
- e. Adjust flow control valve as door is lowering so that it will set into place rather than fall rapidly. Secure setscrew.
- f. Refer to paragraph 7.2.3 and shim and align door.

##### 7.2.2 Door Gasket Replacement (See Figure 8-20)

1. Remove door from washer-sterilizer (see paragraph 7.2.1).

2. Remove gasket and gasket bars from door.

**NOTE:** Carefully examine gasket over its entire length for variations in compression. If there are variations in gasket compression around the door, this will mean that it was not properly shimmed. Be sure to correct this condition after replacing the door.

3. Clean door surface, door frame surface and gasket surface with solvent. Make certain that surfaces are free of foreign matter.

4. Run a 1/4-28 tap through the gasket bar holes in door to clean threads.

5. Replace gasket bars. Leave bars loose enough to allow gasket to be inserted.

6. Insert new gasket under gasket bars, tightening gasket bar retaining screws just enough to hold the gasket. **DO NOT** compress the gasket to any great extent in any one area.

7. Tighten gasket bars alternately until almost snug.

8. If gasket appears firmly seated under gasket bars and is flat on the door, snug the gasket bar retaining screws.

9. After gasket has been installed, spray the sealing surfaces (door frame) with AMSCO fluoro-carbon spray to prevent gasket from sticking.

10. Reattach door to the washer/sterilizer and shim door (see paragraph 7.2.3).

##### 7.2.3 Door Shimming Procedure (See Figure 8-20)

1. With no racks in chamber or on tables, turn control power off and then on again. Unload end door automatically opens. Press the CLOSE UNLOAD DOOR pushbutton to close it. Leave the control in the NOT READY (CODE 88 condition).

2. Remove the four door guide rollers and washers from the rear of the door.

3. Remove the shims from the bottom of the door.

4. Loosen the 13 socket head screws at the rear of the door. Using the three special spacers as shim bars, insert part P-92110-001 at the top of the door

and parts P-92110-002 and P-92110-003 at the proper sides. Place all spacers with their widest portion between the gasket bar and end frame. Position the side bars so that the formed portion is at the top of the door just below the roller and over the gasket bar that will hold it in place. Be sure the spacers are in position over their entire length.

5. When all spacers are properly inserted, lock the door by pressing the applicable CLOSE DOOR pushbutton (doors will lock if already closed).

6. Adjust the four socket head screws at the top corners until the spacers are just touching the end frame; then adjust the remaining nine screws until contact also is made at those points (a difference in torque will indicate contact). Recheck all screws before backing out each screw 1/8 to 1/4 turn. Tighten the jam nuts.

7. Using a feeler gauge, measure the distance between the locking cams and the locking surface at the bottom of the door. Add 0.005 inch to this figure for the required shim thickness.

8. Press the applicable OPEN DOOR pushbutton. The door will unlock. Remove the spacers. Allow the door to continue to open far enough to allow installation of the shims then turn POWER to OFF. Close the flow control valve on the side of the lift cylinder to prevent the door from lowering.

9. Attach the required shim thickness at the bottom of the door. Use shims as necessary, placing the thickest shim first.

10. Open the flow control valve. Lower and lock the door (see **step 5**). Adjust the valve as the door is lowering so that it sets into place rather than falls rapidly. Check the locking cams at the bottom of the door to be sure they are tight against the shim (you should not be able to turn the cam with your finger). If necessary, add shims until all cams are tight.

11. Replace the door guide rollers and washers removed in **step 2**.

12. Open the door and with the back rollers tight against the door guides, check the clearance between the door guides and the rollers on the front of the door. If the clearance is not 1/8 inch, add or remove washers between the back rollers and the door as necessary.

**NOTE:** It is important that the clearance given in **step 12** be maintained. If it is not, the door may either bind when going up or catch on the locking cams when coming down.

13. Press START CYCLE pushbutton. Initiate a normal operating cycle by pressing the limit switch on the load table. When the STERILIZE light comes on, observe the door for leaks. If leaking, wait until the cycle is finished and then tighten the adjusting screw approximately 1/4 turn, in the area where the leak occurred. Do not tighten the adjusting screws any more than required to stop the leak. Over-tightening will reduce gasket life.

#### 7.2.4 Door-lifting Cable Replacement (See Figures 8-18 And 8-20)

**WARNING TO PREVENT DOOR LIFT MECHANISM FAILURE, USE ONLY AMSCO APPROVED PARTS WHEN MAKING REPAIRS. THE DOOR LIFT MECHANISM REQUIRES SPECIAL CABLE AND SUPPORTING HARDWARE FOR SAFE OPERATION. WHEN REPLACING DOOR LIFTING CABLE, BE SURE CABLE DOES NOT TWIST, OVERLAP NOR RUB AGAINST ITSELF. A TWIST IN CABLE AT DOOR END CAN RESULT IN CROSSED CABLE AT CYLINDER END.**

1. Raise door.
2. Position safety bar in trough under center of door width.
3. Lower door onto safety bar.
4. Turn off electrical power to unit.
5. Remove and discard door lift and safety cables by loosening or removing saddle clamps and cable clamps.
6. Refer to Figures 7-1 and 7-2 and connect one end of door lifting cable to cleat that is away from you.

**NOTE:** While performing step 7, ensure that cable does not overlap or rub against itself. Also, ensure that cable is not twisted as it is being installed.

7. Route free end of door lifting cable as follows:
  - a. Over front groove of double pulley.
  - b. Through one of the cable clamps removed in step 5, through the lift cylinder clevis, and then through the other cable clamp removed in step 5. Refer to Figure 7-3.
  - c. Cover back groove of double pulley.
  - d. Pull cable taut and attach to saddle clamp on near cleat according to Figure 7-4.

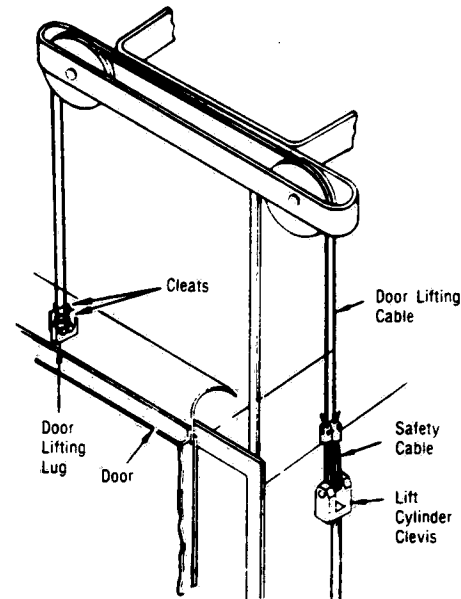


Figure 7-1. ROUTING DOOR LIFTING CABLE.

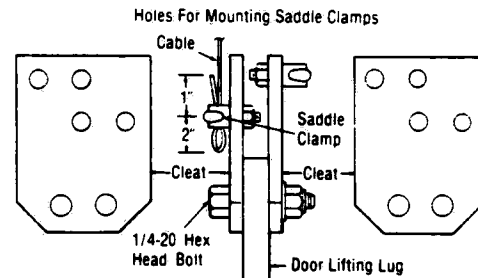


Figure 7-2. ATTACHING DOOR CABLE TO CLEATS.

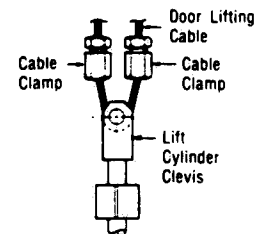


Figure 7-3. CONNECTING DOOR LIFTING CABLE.

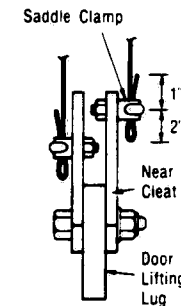


Figure 7-4. MOUNTING SADDLE CLAMPS.

8. Tighten locknuts on saddle clamps.
9. Turn on electrical power to unit.
10. Raise door and remove safety bar.
11. Lower door and again check that door lifting cable is taut.
12. Check that locknuts on saddle clamps are tight.
13. At lift cylinder clevis, add safety cable as shown in Figure 7-5. Ensure that safety cable is not taut.
14. Repeat procedure for door on opposite end of unit.

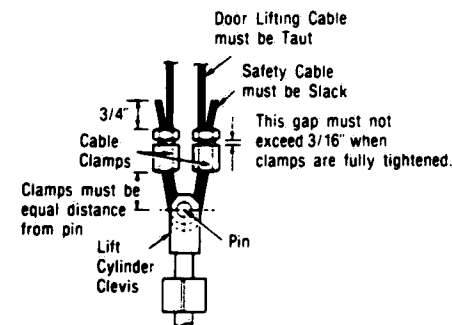


Figure 7-5. ATTACHING SAFETY CABLE.

#### 7.2.5 Limit Switch Actuator Rod Adjustment

1. Make adjustments to the limit switch actuator rods to ensure proper actuation of switches LS2, LS9 (unload) and LS3, LS8 (load) as follows:

- a. Use two gauge blocks, P-83022-001. Place one block on each of the upper door shimming pads, resting on shims. See Figure 7-6.
- b. Lower the door to rest on the block.
- c. Adjust lower switch actuators (with door closed) so that they will touch the area of the door which protrudes beyond the lower shims. Place ends of the actuator approximately 1/4-inch back at the front face of the door.

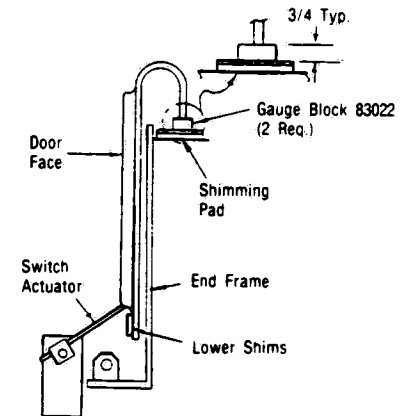


Figure 7-6. ADJUSTMENT OF DOOR LIMIT SWITCHES.

#### 7.3 LOCKING CYLINDERS (See Figures 8-19 And 8-39)

##### 7.3.1 Replacement

1. Close and lock the doors using either CLOSE DOOR pushbutton (twice if a door was open).
2. Turn the control POWER switch OFF.
3. Disconnect the hydraulic lines (be prepared to catch residual oil) and remove the clevis link pin.
4. Remove the cylinder from the mounting pad.
5. Install a new cylinder and then adjust as outlined below.

**NOTE:** Do not replace the link pin or connect the hydraulic lines at this time.

### 7.3.2 Clevis Adjustment

1. Close and lock the doors. Ensure that the locking shaft keys are parallel (or just beyond) to the washer/sterilizer.

2. Loosen the hydraulic lines to relieve pressure (be prepared to catch the residual oil) and remove the clevis link pin.

3. Push in on the locking cylinder rod until it is completely depressed in the cylinder.

4. Ensure that the actuator is keyed in the proper position to the locking shaft and that the pin connecting the actuator and the connection link is in place.

5. Adjust the clevis until the holes are in line with the one in the connection link.

6. Insert the pin through the clevis and the connection link. Install the snap rings.

7. For new cylinder installations, install the drip pan and connect the hydraulic lines in the manner they were removed.

8. Tighten all fittings and then press the applicable OPEN DOOR pushbutton to unlock and open the door. Examine the entire assembly for proper installation.

9. Operate the door several times to ensure no binding and that the connection link does not go beyond clear center when the door is in the unlocked position. If necessary, lock the door and readjust the clevis by turning it clockwise several times.

10. When the door is operating satisfactorily, see that the actuator and locking cylinder are in the same plane and that the roll pin is in the actuator and locking shaft. If necessary, drill through the actuator and shaft and insert the roll.

### 7.3.3 Diverter Valve Adjustment

1. Place the door in the unlocked position. Press the POWER Switch to OFF.

2. Check position of the diverter valve. If not depressed by the actuator, loosen the screws and reposition the valve towards the center of the washer/sterilizer.

**NOTE:** Do not position the valve so as to restrict locking cylinder travel (i.e., the plunger return spring must not be fully compressed).

### 7.4 STEAM TRAP

(See Figures 8-30 And 8-32)

#### Cleaning and Inspection

**WARNING: ALLOW THERMOSTATIC TRAPS TO COOL TO ROOM TEMPERATURE BEFORE REMOVING COVERS. SINCE THERE IS NOTHING TO LIMIT EXPANSION, THE DIAPHRAGM ELEMENT MAY RUPTURE OR FATIGUE IF TRAP IS OPENED WHEN HOT.**

1. Unscrew and remove the cap and element. Use a hex socket wrench to unscrew and remove seat.

2. Wipe the parts clean, taking care to avoid damage to the diaphragm, seat and pointed diaphragm stem. A very fine grade of sandpaper may be used (cautiously) to smooth mating surfaces of the seat and stem.

3. Wipe out the bowl. Do not allow loose material to enter the piping.

4. Test diaphragm for flexibility. Examine soldered joints for cracks or leaks; dip it in boiling water and look for expansion. An element in good condition will be difficult to stretch by hand and will return to original condition quickly when released.

5. Reassemble steam trap in reverse order of disassembly. Install a new element if required. Make certain that all pipe fittings are tight after assembly.

### 7.5 STEAM CONTROL VALVE (See Figure 8-31)

#### Cleaning and Inspection

1. Disconnect pilot line at top of control valve. Remove valve from washer/sterilizer.

2. Turn adjusting screw counterclockwise until all compression is out of spring.

3. Remove the 1/4-20 setscrew opposite the adjusting screw and turn top assembly until lugs on syphon and bonnet assembly line up with notches in bottom plate. Remove top assembly from valve body.

4. Remove the four 1/4-20 screws which secure cover to bottom plate; remove cover. Remove bellows assembly and reinforcement from cover.

**CAUTION:** Handle syphon and bonnet assembly with care at all times to avoid damage.

5. Unscrew and remove syphon and bonnet assembly and valve seat from valve body. Pull stem assembly from syphon and bonnet.

6. Carefully clean all components. Examine the bellows and syphon and bonnet assemblies for cracks. Examine valve seat and valve stem assembly for marred seating surfaces; replace if etched or worn.

7. Reassemble valve in reverse order of disassembly. Make sure valve seat is tight against body shoulder. Adjust bellows assembly so that clearance between valve seat and valve disc on stem is 1/16 inch.

8. Replace control valve on washer/sterilizer and connect pilot line at top of valve.

### 7.6 RISER VALVE (See Figures 8-21 And 8-23)

#### Cleaning and Inspection

1. Unscrew adapter from nipple to remove riser valve from washer/sterilizer chamber. Unscrew valve body from adapter.

2. Remove gasket, snap ring and washer from valve body. Remove guide and spring.

3. Remove screws from ring and seal. Remove stem assembly from valve body.

4. Carefully clean all components and inspect for worn or damaged parts.

5. Reassemble valve in reverse order of disassembly. Use a new gasket and replace any worn or defective parts.

### 7.7 SPRAY ARMS (See Figures 8-21 And 8-22)

1. Unscrew the retaining bearing to remove the spray arm assembly from the washer/sterilizer.

2. Use a round punch to pound out the roll pin. This allows the complete disassembly of the spray arm.

3. Inspect all the parts for wear and replace as required. Clean all parts not replaced.

### 7.8 HYDRAULIC CONTROL VALVE

(See Figures 8-34 And 8-36)

1. With the pump running, check the temperature of the lines to and from the valve. The temperature of the return line should be slightly less than that of the supply line. If not, replace valve.

2. Remove coil and check plunger movement. It should move freely. If it does not, replace valve.

3. If the valve passes the tests in **steps 1 and 2**, replace the coil.

**NOTE:** A possible cause of coil failure is steam leaking from the chamber safety valve thus elevating the coil temperature above its normal operating level. If the safety valve is piped down to the drain (as recommended by UL) this problem will be eliminated.

### 7.9 LOADING OR UNLOADING UNIT CYLINDER TRAVEL (See Figures 8-6 And 8-7)

1. Adjust the position of the feeder cylinders so that the center line of the cylinders and the chamber guide are in one straight line. The position of the loading piston head is nominally 1/2-inch behind the front edge of the loading plate, and the unloading piston head is nominally 1/2-inch beyond the front edge of the unloading plate.

2. Turn the control POWER switch ON. The unload end door should open.

**NOTE:** Use the safety bars supplied with the unit to ensure that the door will not lower due to any component malfunction when working inside chamber.

3. The load and unload cylinders will be operated in the following steps. To operate these cylinders, press the appropriate OPEN DOOR button twice. The appropriate door must be closed each time.

4. Adjust the guide located under the feeder plates so that when the feeder piston travels into the chamber, the dovetail guides will transfer smoothly onto the chamber guide.

5. Place a loaded rack on the load table and extend the load cylinder into the chamber. When the loading feeder is fully extended into the chamber, check to ensure that the distance between the chamber end-ring (on the loading feeder side) and the back edge of the Amscomatic rack is  $3 \pm 1/16$  inches. Adjust the position of the cylinder as required to obtain this dimension.

6. When the loading cylinder is fully extended into the chamber, check to ensure that the distance between the riser valve center line and the front or leading edge of the rack is  $12 \pm 1/16$  inches. Adjust the position of the cylinder as required to obtain this dimension.

7. Extend the load arm into the chamber. For proper speed of travel, adjust the needle valve under the feeder tray to indicate  $150 \pm 10$  PSIG pressure while the cylinder is extending. Set PS1 to close above  $50 \pm 10$  PSIG. Pressure switch PS1 opens when the arm is fully extended.

8. Operate the load arm again. When the arm is fully retracted, verify that limit switch LS6 (load arm retracted) is actuated.

9. Extend the unload arm into the chamber. For proper speed of travel, adjust the needle valve under the feeder tray to indicate  $150 \pm 10$  PSIG pressure while the cylinder is extending. Set pressure switch PS2 to close above  $50 \pm 10$  PSIG. Pressure switch PS2 opens when the arm is fully retracted.

10. Operate the unload arm. When the arm is fully retracted, verify that limit switch LS20 is actuated.

11. When both feeders are verified to be working properly, check, using a straight edge, that the riser valve seal is below the basket guide tracks (allow approximately  $1/4$  inch clearance). Adjust as required. If difficulty is encountered, these adjustments can be more easily made after the machine has heated up.

12. Run both feeders manually using a rack loaded to 25-30 lbs to determine that the rack is centered inside the chamber so that the manifold on the rack is directly over the riser valve. Also, verify that the stroke of both cylinders is such that the unload ram will engage the basket where the load ram has positioned it.

## 7.10 DETERGENT INJECTOR

1. Proceed through a cycle to the First Fill state (CODE 01).

2. Adjust the detergent injector to consume between 4 and 4-1/2 oz of AMSCO liquid detergent during the First Fill state. This is equivalent to 200 (+25, -0) ml of water. Adjustment of the detergent can be made at IJ-21. The adjustment screw on the knurled handle must be turned clockwise to decrease, or counterclockwise to increase, the amount of detergent used.

3. If detergent is used instead of water for the test, continue through the cycle to rinse the detergent from the chamber.

4. Apply a drop of Loctite 222 on IJ-21 adjustment screw.

## 7.11 PNEUMATIC BALL VALVE (See Figure 8-37)

### 7.11.1 General

The Gemini Series 86 and 96 valves are of two-piece body design, which permits disassembly for inspection and repair. Care in cleaning and handling of valve components is particularly important when overhauling ball valves, as a small nick or scratch, caused by mishandling, can be the source of leakage in service.

### 7.11.2 Renewal of Seats and Stem Seal

1. Remove the actuator from the valve by loosening the two hex head capscrews.

2. Remove valve from line.

3. Place valve body in vise with end-plug facing upward. (The use of smooth vise jaws will prevent marring.) Break end-plug loose with wrench; remove end-plug.

4. Remove valve from vise, turn stem to CLOSE position. Remove ball. Remove seat from valve body. Remove stem nut, drive key, Belleville washers, follower and thrustwasher. Remove stem by pushing into valve. Make sure stem seal is removed when stem is withdrawn from body. Remove seat from end-plug. Discard used seats, seal, and thrustwasher.

5. Clean all parts. Inspect area of end-plug and body, which forms metal/metal body seal, for scratches and/or burrs. Lubricate all parts with a lubricant such as Dow-Corning DC-7, giving special attention to the end-plug/body seal area and the end-plug threads.

6. Place new stem seal on stem, position stem in body, place new thrustwasher over stem, install follower (small metal washer) over stem. Position two Belleville washers (cupped) on stem with concave surfaces facing one another. Assemble the drive key, flat side up, and stem nut. To prevent the stem from turning, insert a wood or plastic dowel through the ball port and tighten the nut until the Belleville washers beneath the drive key have just become fully compressed (flattened). Initially, the

nut will spin freely as it is run onto the stem. After the nut contacts the drive key, further tightening will be accompanied by a progressive increase in torque as the Belleville washers become deflected. When the Belleville washers become flattened (are fully deflected), the torque will increase sharply; further tightening should not be attempted as damage to the stem and/or stem seal may result.

7. Check the orientation of the stem nut to the drive key. In order to achieve the desired orientation loosen the nut until the hex/drive key relationship corresponds to either A or B of Figure 7-7. This should not require more than one-twelfth ( $1/12$ ) turn of the nut.

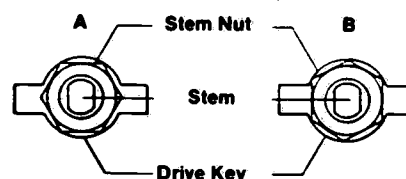


Figure 7-7. HEX/DRIVE KEY RELATIONSHIP.

8. Place new seat in body. Turn stem to CLOSE position, insert ball making sure that lower end of stem engages slot in ball. Turn stem to OPEN position. Place valve body in vise as in step 3. Install new seat in end-plug. Tighten end-plug into body to torque value given in chart of Figure 7-8.

9. Test valve.

### ASSEMBLY TORQUE SPECIFICATIONS (FOOT-LB VALUES FOR INSERTS)

VALVE SIZE	86	96	BRASS
SERIES	SERIES		
$1/4, 3/8, 1/2$	—		40
$3/4$	$1/2$		50
1	$3/4$		60
$1 1/4$	1		100
$1 1/2, 2$	$1 1/2$		180

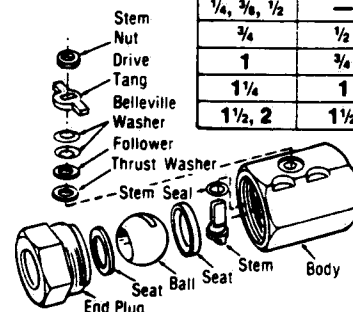


Figure 7-8. PNEUMATIC BALL VALVE.

## 7.11.3 Actuator

1. Remove the actuator from the valve by loosening the two hex head capscrews.

2. Remove fillister head screws, position indicator housing, retaining ring, position indicator, thrustwasher and thrustbearing.

3. Gently push the upper shaft of the pinion assembly until pinion slides out through bottom of actuator.

4. Remove the four socket head capscrews numbered in Figure 7-9 and disconnect spring module from actuator body.

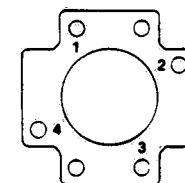


Figure 7-9. VALVE ACTUATOR NAMEPLATE.

5. Gasket — If endcap gasket adheres to actuator body or spring module, carefully remove it so as to avoid damage.

6. Remove pistons from actuator body.

7. Remove O-rings carefully from the pistons and from the upper and lower shaft of the pinion assembly.

### CAUTION: Some solvents may distort O-rings.

8. Clean interior of actuator body, pinion assembly and piston.

9. Grease the pistons, pinion assembly and interior of actuator body liberally. (Make sure the actuator body area, where the pinion assembly is inserted, is also greased.)

**NOTE:** We recommend the use of Houghton Cindol 2321 which is standard in all actuators shipped by the factory. Automotive chassis lube or cup grease is adequate for most applications.

10. Replace O-rings on pistons and pinion assembly.

11. Reinstall the pistons as follows:

a. Position the actuator on a table so the Gemini nameplate is on the left.

b. Orient the first piston so the head goes in first and the tail is on the right.

c. Press the piston into the actuator cavity being careful not to pinch the piston O-ring. Push piston until it contacts the back wall of the actuator.

d. The second piston enters the actuator body cavity tail first with the tail on the left. This piston should be pushed flush with the top of the actuator body cavity.

**NOTE:** It is essential that the pistons be oriented properly for the pinion assembly to be inserted. If piston(s) are misoriented, you can reorient them with your finger through the pinion assembly shaft hole in actuator body.

12. Installation of the pinion assembly — hold the actuator so the Gemini nameplate is to the left. Grasp the pinion assembly by the lower shaft while making sure the short flat on the upper shaft of the pinion assembly faces the nameplate. Insert the pinion assembly through bottom hole of actuator aligning the gears of the pinion assembly with the rack of the pistons in the process.

**NOTE:** Before proceeding, rotate the pinion assembly to ensure that it is properly aligned. The pinion assembly should rotate a full 90° and the short and long flats of the pinion assembly should be oriented as shown in Figure 7-10.

**CAUTION:** Make sure the retaining ring fits into retaining ring groove on pinion assembly. Pressurization of actuator without retaining ring in groove on piston assembly may lead to the ejection of the pinion assembly from actuator body.

13. Replace the thrust bearing, thrust washer, position indicator and retaining ring (flat side up).

14. Replace the position indicator housing; secure with two fillister head screws.

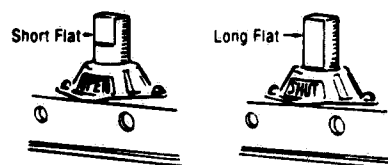


Figure 7-10. PINION ASSEMBLY ORIENTATION.

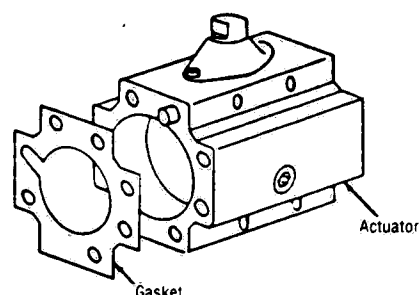


Figure 7-11. GASKET REPLACEMENT.

15. Gasket — Place actuator body so the nameplate is on the left. Replace gasket on the actuator body so the notch in the gasket is at the 10 o'clock position (see Figure 7-11).

16. To disassemble the Spring Module, remove the two remaining socket head capscrews which hold the booster end plate to the booster cylinder.

**NOTE:** The Spring Module is designed so that the spring is preloaded by means of a threaded rod which is secured to the auxiliary piston. The thread lengths are proportioned so that, after the rod is unscrewed from the piston, sufficient thread engagement remains to permit full unloading of the spring.

17. Remove the booster end plate and spring housing from booster cylinder.

**NOTE:** There are two different spring housing designs as shown in Figure 7-12.

18. Booster gasket — If booster gasket adheres to booster end plate, it need not be disturbed; if it adheres to booster cylinder, carefully remove it so as to avoid damage.

19. Grasp spring assembly and remove from booster cylinder.

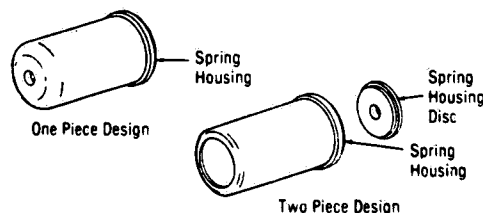


Figure 7-12. SPRING HOUSING DESIGNS.

20. Remove O-ring from booster piston.

21. Loosen assembly bolt in spring cartridge assembly.

**CAUTION:** The plunger O-ring is captured between the piston bearing and booster cylinder and usually need not be removed, however, the use of a solvent to clean this portion of Spring Module may distort the O-ring.

22. Clean assembly bolt, outboard support, spring, booster piston and booster cylinder.

23. Regrease the booster cylinder wall, booster piston, spring, outboard support and assembly bolt liberally.

**NOTE:** We recommend the use of Houghton Cindol 2321 which is standard in all actuators shipped by the factory. Automotive chassis lube or cup grease is adequate for most applications.

24. Reassemble the spring assembly by securing the assembly bolt through the outboard support, spring and booster piston.

25. Grease the booster piston O-ring and reinstall on booster piston.

26. Insert spring assembly into booster cylinder being careful not to pinch the booster piston O-ring.

27. Place booster gasket onto booster cylinder over spring.

28. Place spring housing disc in spring housing if the spring housing is of the two piece design. Place spring housing gasket over spring housing so that it rests on rim at open end of spring housing. Insert spring housing with gasket through booster end plate (see Figure 7-13).

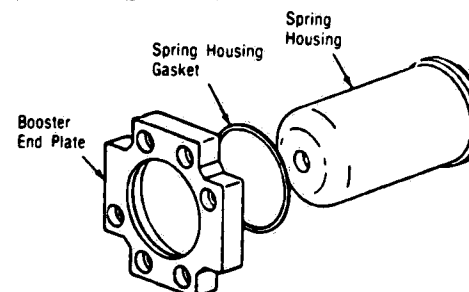


Figure 7-13. SPRING HOUSING/BOOSTER END PLATE ORIENTATION.

**NOTE:** Rim at open end of spring housing fits into groove in booster end plate.

29. Place end plate with spring housing onto spring module assembly.

30. Align booster end plate with holes in booster cylinder and tighten the two short socket head capscrews numbered 1 and 2 in Figure 7-14).

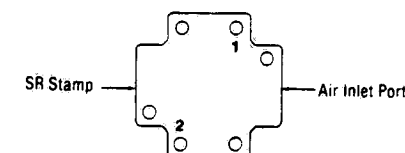


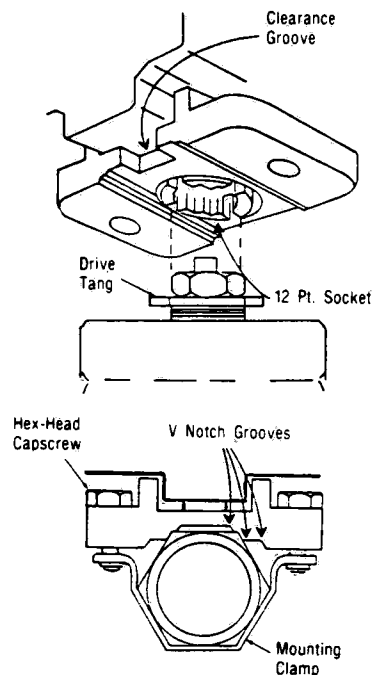
Figure 7-14. SOCKET-HEAD CAPSCREW LOCATIONS.

31. To mount the spring module on actuator body place the spring module assembly in position with the air-inlet on the same side as the plugged mid-section port on the actuator body. The stamped "SR" identification on the far side of the spring module should be on the same side as the actuator nameplate.

#### 7.11.4 Remounting Pneumatic Actuators

1. Turn the valve stem to orient the valve ball to the position desired for spring action, i.e., spring to open or spring to close. Observe the OPEN/SHUT indicator mounted on the actuator shaft to assure it reads the appropriate position for spring action. If not, remove the two screws which hold the OPEN/SHUT indicator cover on the actuator body, rotate the cover 180°, and replace the screws. Recheck the OPEN/SHUT indicator to assure it reads the appropriate position for spring action.

2. Mount the actuator/bracket assembly on the valve so that the 12 point socket engages the stem nut and so the appropriate shaft notch engages the drive key lug. Check the engagement of the valve body in the bracket 'V' notch grooves to ensure that the assembly sits squarely on the valve. When mounting an actuator to a 1/4- or 3/8-inch 86 series valve, position the bracket so the valve end plug is under the clearance groove (see Figure 7-15).



**Figure 7-15. PNEUMATIC ACTUATOR REASSEMBLY.**

3. Place the mounting clamp around the bottom of the valve body and secure the actuator/bracket assembly with the two hex head capscrews provided.

4. Recheck the orientation of the valve ball and actuator OPEN/SHUT indicator to assure that they correspond. If they do not, remount the actuator and check procedure beginning with step 1.

#### 7.12 3-WAY SOLENOID VALVE (AIR) (See Figure 8-17)

##### Valve Disassembly, Repair, And Reassembly

1. Turn the control power off. Turn off the air supply.

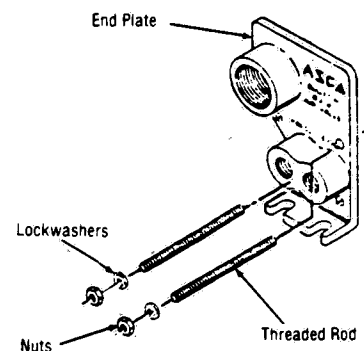
2. Bleed off the air trapped in the pneumatic piping. Disconnect the air tubing from the valve to be worked on.

**CAUTION:** When metal retaining clip disengages, it will spring upward.

3. Remove cover screw, cover, retaining cap or clip and nameplate.

Slip yoke containing coil, sleeves and insulating washers off plugnut/core tube subassembly. Insulating washers are omitted when molded coil is used.

4. Remove the threaded rods which secure the seven solenoid valves together. See Figure 7-16.



**Figure 7-16. DISASSEMBLING 3-WAY SOLENOID VALVES.**

5. Slip out body, body gaskets and gasket retainers.

**IMPORTANT:** Note the position of the notch in the gasket retainer so they may be reassembled in the same manner. The position of the gasket retainer determines the form of flow (normally open or normally closed). Refer to Figure 7-17 for instructions on positioning body gaskets and gasket retainers.

6. Unscrew bonnet with the special wrench adapter provided in the Repair Parts Kit. Remove plugnut/core tube assembly with bonnet gasket attached.

7. Remove body gasket, core assembly and core spring.

8. A 4-40 machine screw (provided in Repair Kit) serves as a self tapping screw to remove insert from body. Thread screw a few turns in one of the holes located in flat surface of insert (either of two holes where disc holder legs are not present may be used).

9. Remove insert by using a pair of pliers on the head of the screw. Remove three gaskets, disc

holder, disc and disc spring. Tag disc spring to ensure proper reassembly. When replacing disc holder in insert, do not use the hole used by the machine screw for insert removal.

10. Reassemble in reverse order of disassembly, paying careful attention to Figure 7-17.

11. Lubricate all gaskets and O-rings with Dow-Corning 111 compound or an equivalent high-grade silicone grease.

12. When replacing insert into body, twist slightly to reduce the possibility of gasket damage.

13. Torque solenoid bonnet to  $90 \pm 10$  inch-pounds.

14. The threaded rods should be tightened evenly to insure proper gasket compression.

#### INSTRUCTIONS FOR POSITIONING BODY GASKET AND GASKET RETAINER

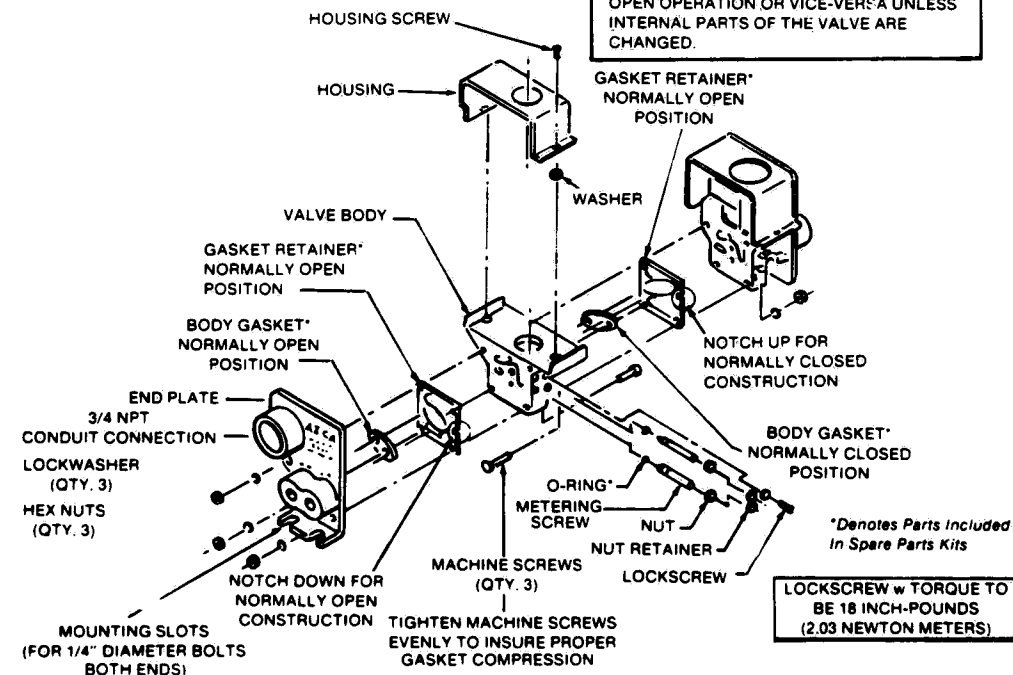
**WHEN FACING CYLINDER CONNECTIONS ON THE VALVE BODY, THE GASKET ON THE LEFT SHOULD BE POSITIONED FOR NORMALLY CLOSED OR NORMALLY OPEN CONSTRUCTION AS DESIRED.**

**NORMALLY CLOSED CONSTRUCTION:** POSITION THE GASKET RETAINER SO THAT NOTCH IS IN THE "UP" POSITION.

**NORMALLY OPEN CONSTRUCTION:** POSITION THE GASKET RETAINER SO THAT NOTCH IS IN THE "DOWN" POSITION.

**UNIVERSAL CONSTRUCTION:** BODY GASKET AND GASKET RETAINER MAY BE POSITIONED FOR EITHER NORMALLY CLOSED OR NORMALLY OPEN OPERATION AS DESIRED.

**IMPORTANT:** ONLY UNIVERSAL CONSTRUCTION VALVES MAY BE USED FOR NORMALLY CLOSED OR NORMALLY OPEN OPERATION. NORMALLY CLOSED VALVES CANNOT BE USED FOR NORMALLY OPEN OPERATION OR VICE-VERSA UNLESS INTERNAL PARTS OF THE VALVE ARE CHANGED.



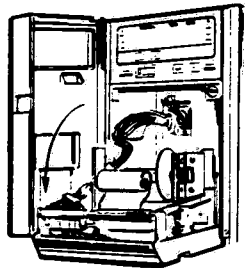
**Figure 7-17. 3-WAY SOLENOID VALVE GASKET RETAINER POSITION.**

## 7.13 PRINTER ASSEMBLY (See Figure 8-12)

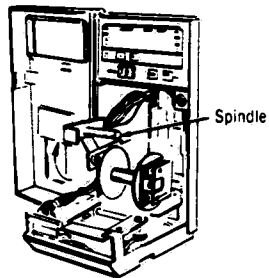
### 7.13.1 Changing Paper (See Figure 7-18)

**NOTE:** Printcon is designed to use 2-3/8 inch wide, one-ply paper tape as supplied by AMSCO. Paper tape supplies must not be stored in areas of high humidity or temperature.

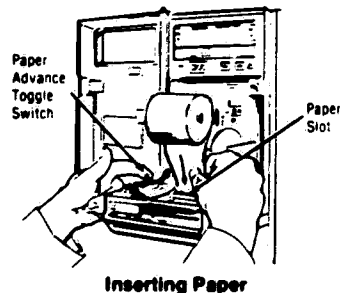
A colored bar will appear on the paper tape indicating that the roll is near the end and should be replaced.



Printer In Lowered Position



Spindle In Raised Position



Inserting Paper

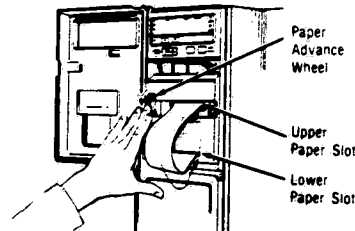
1. Open printer door. Swing printer assembly forward and downward and allow it to rest in service position.

2. If paper has been inserted into the record storage area, it will be necessary to remove the stored record before continuing. Refer to paragraph 7.13.3, *Removing Stored Record*.

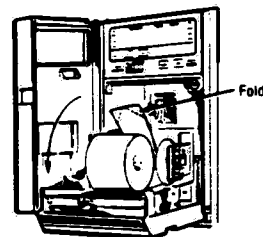
3. Raise front paper spindle.

4. Remove empty paper spool by sliding it to the right.

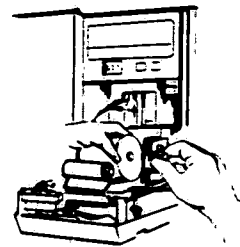
5. Slide fresh paper roll onto spindle with loose end or ends of paper behind the roll going downward.



Inserting Paper Into Automatic Paper Storage Area



Fold Paper Tape



Removing Stored Record

Figure 7-18. CHANGING PAPER.

6. Insert loose end of roll into paper slot. Using index finger of left hand, advance paper by pushing paper advance toggle switch forward. Turn off paper advance. Lower paper spindle. If necessary, operate paper advance again until paper is drawn taut. Turn off paper advance.

7. Swing printer assembly upward and back into operating position.

**NOTE:** Refer to paragraph 7.13.2, *Automatic Paper Storage* if paper storage is desired.

### 7.13.2 Automatic Paper Storage

1. Open door on secondary control panel and position POWER switch to OFF.

2. Using the paper advance thumbwheel on the left side of the upper paper slot, advance paper until it extends 6 to 8 inches below the lower paper slot.

3. Insert the end of the paper tape into the lower paper slot until full 6 to 8 inches is inserted.

4. Swing printer assembly forward and downward and allow it to rest in the service position.

5. Grasp end of the paper tape, fold the two corners to form a V and fully insert the end into the slot of paper take-up spool.

6. Position the POWER switch to ON. Paper take-up spool will take up the paper until taut.

7. Swing printer assembly upward and back into operating position.

### 7.13.3 Removing Stored Record

Printcon is capable of storing an entire roll of paper, however stored record may be removed at any time.

1. Open door on secondary control panel and position the POWER switch to OFF.

2. Open printer door. Using the paper advance thumbwheel on the left side of the upper paper slot, advance paper until it extends 3 to 4 inches below the lower paper slot or until all information on the tape has been advanced.

3. Tear or cut the paper tape.

4. Swing printer assembly forward and downward and allow it to rest in the service position.

5. Position the POWER switch to ON. Paper will advance onto paper take-up spool. Position the power switch to OFF when paper is completely advanced.

6. To remove paper take-up spool, release tension on spring-loaded retaining clip and lift spool from unit.

7. Remove spool end plate and slide paper from spindle.

8. Replace spool end plate and return spool to spring-loaded clip.

9. Refer to paragraph 7.13.2, *Automatic Paper Storage* to reload spool.

### 7.13.4 Changing The Inked Ribbon Cartridge (See Figure 7-19)

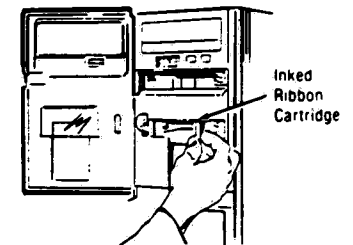


Figure 7-19. REMOVING INKED RIBBON CARTRIDGE.

1. Tear off loose end of paper and open door to the left.

2. Remove old cartridge by placing index finger behind cartridge and pulling upward and forward.

3. Install new cartridge, with ribbon above loose end of paper, by placing it into position and snapping it into place with thumbs of each hand.

4. Close door.

### 7.13.5 Printer Replacement (See Figures 8-15 And 8-16)

1. Open the outer door of the unit.

2. Tilt the printer assembly forward to service position and remove the two #6-32 screws and washers from the back of the printer mounting plate that anchor the silver anodized cover.

3. Remove the cover by disengaging it from the pivot shoulder screws.

4. Pivot the assembly back to the operating position and disconnect J1 and J2 connectors which are plugged into the J20 receptacle mounted on the upper left edge of the printer mounting plate.

5. Printer can now be disassembled by removing the three 1/4-20 hex nuts — two on the right end and one on the left end of the printer. Clip the black wire from the toggle switch off the old printer and solder it to the new printer (wire #11).

6. Upon reassembly, verify that the printer stand-off is 15/16 inch between the printer mount plate and the printer itself. Correct if necessary.

#### 7.13.6 Microswitch Activation Adjustment

1. Lift up the platen and observe the screws which mount the microswitch bracket to the right side plate. Loosen them slightly.

2. Adjust the microswitch position so that the trip point is audible when the platen is parallel to and about 1/16 inch below the ends of the side plate.

3. Tighten the screws securely.

#### 7.14 CYCLE STATUS DISPLAY PANEL

(See Figure 8-12)

1. Remove the metal bracket which covers the primary control panel.

2. Remove the primary control panel by unfastening four hex socket head screws.

3. This allows the primary control panel to be unplugged and removed for lamp replacement.

4. Carefully swing the lug away from the base of the lamp to be changed and remove the lamp (see Figure 7-20).

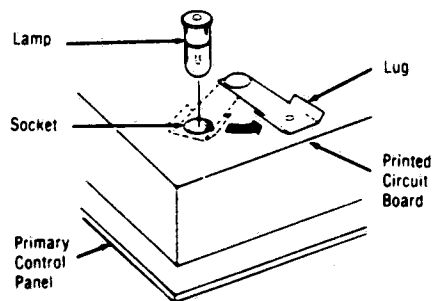


Figure 7-20. LAMP REPLACEMENT.

#### 7.15 DIGITAL DISPLAY (See Figure 8-13)

##### 7.15.1 Display Panel Overlay Replacement

1. Open the outer door of the unit.

2. Remove #6 x 1/4 self tapping screw from top of upper right-hand corner of display panel door. This will allow opening door with left-hand swing.

3. Next, disconnect ribbon cable connections from panel PC Board mounted directly behind panel door — one connector from PC Board and one connector from thumbwheel switch.

4. Remove #4-40 nut from display panel door hinge stud at bottom left corner of display door. Remove hinge stud upward and out. Display panel door may now be removed.

5. Reverse the procedure to install a new Display Panel Overlay.

##### 7.15.2 Temperature Thumbwheel Replacement

1. Follow steps 1 through 3 in the procedure outlined in *Display Panel Overlay Replacement*.

2. Thumbwheel switch is extracted from assembly by removing the #4-40 nuts and washers from the two mounting studs attached to display bracket assembly.

3. Reverse the procedure to install a new thumbwheel switch.

##### 7.15.3 Display PC Board Replacement

**CAUTION:** Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.

**NOTE:** Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation. To avoid damage, the precautions listed below should be taken whenever printed circuit boards are being handled or replaced:

- Always use an ESD safe container when transporting boards from one location to another.

- Do not remove a board from container except at an approved static station or where machine and personnel are properly grounded.

- At the very minimum, use a wrist strap grounded to sterilizer when removing and/or replacing boards.

1. Follow procedure outlined in *Display Panel Overlay Replacement*.

2. The display PC Board is removable by first disconnecting the ribbon cable connector P45 from the main Printcon PC Board.

3. Tilt the printer assembly forward to the service position. This permits access to the opening in the upper rear of Printcon housing where P45 is plugged into the main Printcon PC Board which is mounted on the back side of Printcon housing.

4. Display PC Board can now be removed by disengaging the three circuit board supports.

5. Reverse the procedure to install a new Display PC Board.

##### 7.15.4 Printcon Rotary BCD Switches: Digital Display Board

Rotary switches to control pressure and temperature are located on the Printcon digital display board.

#### 7.16 MAIN PRINTCON PC BOARD

(See Figure 8-12)

##### 7.16.1 Changing The Battery (See Figure 7-21)

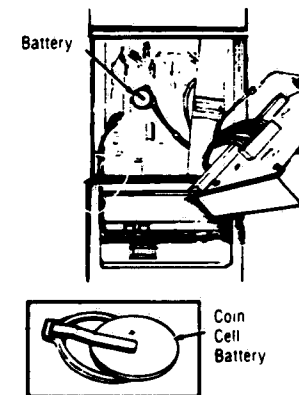


Figure 7-21. CHANGING THE BATTERY.

1. If necessary to replace battery (Lithium coin cell), proceed as follows:

a. Turn POWER switch to OFF.

b. Remove bottom screws on primary panel and lift off catches. (Carefully remove two electrical connections and set panel aside.)

c. Remove battery from holder and install replacement battery.

d. Return printer assembly and closed door.

e. Turn POWER switch ON and reset time and date if necessary.

##### 7.16.2 Changing Units Of Display (Refer to Table 7-1)

TABLE 7-1. PRINTCON SERVICE SWITCH #1 SETTINGS.

Feature	Switch No(s)	Setting
Temperature in FAHRENHEIT	1	OFF
Temperature in CELSIUS	1	ON
Pressure (English) in PSIG; Vacuum in IN HG	2	OFF
Pressure (Metric) in KG/CM <sup>2</sup> ; Vacuum in MM HG	2	ON
Single precision	3	OFF
Extended precision	3	ON
Capacitance Transducer: BESCO 5v = 50 psia	4	OFF
Strain Gauge Transducer: SENSOTEC 36 mv = 50 psia	4	ON
Temperature Overdrive		
TS2 = TS1	5, 6, & 7	5 OFF, 6 OFF, 7 OFF
TS2 = TS1 - 0.5 F	5, 6, & 7	5 ON, 6 OFF, 7 OFF
TS2 = TS1 - 1.1 F	5, 6, & 7	5 OFF, 6 ON, 7 OFF
TS2 = TS1 - 1.6 F	5, 6, & 7	5 ON, 6 ON, 7 OFF
TS2 = TS1 - 2.1 F	5, 6, & 7	5 OFF, 6 OFF, 7 ON
TS2 = TS1 - 2.7 F	5, 6, & 7	5 ON, 6 OFF, 7 ON
TS2 = TS1 - 3.2 F	5, 6, & 7	5 OFF, 6 ON, 7 ON
TS2 = TS1 - 3.8 F	5, 6, & 7	5 ON, 6 ON, 7 ON
Spare Switch	8	Unused



1. The visual display and printing of temperature can be either in degrees Fahrenheit or Celsius. To make this adjustment, locate service switch #1 on the Printcon Control Printed Circuit Board. Using a pencil or pen point, turn the switch to the alternate position. Return printer assembly upward and back to operating position. Close door.

2. The display and printing of pressure can be either in English (PSI gauge and inches Hg vacuum) or metric (kg/cm<sup>2</sup> gauge and millimeters Hg). To make this adjustment follow the procedure in step one and turn service switch #2 to alternate position.

3. The display of temperature and English pressure can be either single precision (no decimal places showing) or extended precision (one decimal place showing). Metric pressure shows one or two decimal places. Metric vacuum always shows no decimal place. To make this adjustment follow the procedure in step one and turn service switch #3 to alternate position.

#### 7.16.3 Adjusting The Temperature Overdrive

For special applications, the temperature overdrive may be adjusted in increments as shown in Table 7-1. For example, if the temperature thumbwheel setpoint is at 270 F (132 C), the actual control temperature can be from 270 F to 273.8 F depending on how service switches, 5, 6 and 7 of switch #1 are set.

#### 7.16.4 Setting The Year Switches

1. The LED year as shown on the Printcon display and printout does not automatically change on December 31st. It must be set annually. To make this adjustment locate rotary switches S2 and S3 on the Printcon Control Printed Circuit Board. Using a small screwdriver, turn the pointer to the desired digits (example: for 1985, set S3 at 8 and S2 at 5).

2. If no year display is needed, the switches may be set as follows: set S3 at 8 and S2 at 0. The month and date will still be displayed, but no year will be shown or printed.

#### 7.16.5 Printcon PC Board Replacement

**CAUTION:** Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.

**NOTE:** Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation. To avoid damage, the precautions listed below should be taken whenever printed circuit boards are being handled or replaced:

- Always use an ESD safe container when transporting boards from one location to another.
- Do not remove a board from container except at an approved static station or where machine and personnel are properly grounded.
- At the very minimum, use a wrist strap grounded to sterilizer when removing and/or replacing boards.

1. Open the outer door of the Printcon unit. The entire unit must be removed from the control column.

2. Remove the front cover panel from the column by taking two cap screws out of the top of the cover and two #10-32 screws out of the bottom.

3. Take off the primary panel by removing four #8-32 mounting screws and washers. It is not necessary to disconnect P16 from the primary panel if care is exercised.

4. Tilt the primary panel forward and reach through the primary panel mounting bracket to disconnect P40 and P48 connections. Disconnect green ground wire #103 from Printer assembly bottom.

**NOTE:** Plug P16 (from primary panel) and plug P40 (from main Printcon PC Board) are identical in construction. Proper identification must be observed at reassembly. Plugs are labeled on the harness and must be installed on the correct PC Board.

5. Remove the four #8-32 Printcon unit mounting screws located two on each side of the unit. Access to the top two screws must be made by opening the display door at the top of the unit. Printer unit must be tilted forward to remove the lower two screws.

6. Printcon unit can now be removed from the column. Main Printcon PC Board is removed from the unit by extracting the eight #6-32 mounting screws and standoffs.

7. Reverse the procedure to install a new main Printcon PC Board.

#### 7.17 CONTROL PANEL AND ASSEMBLY (See Figure 8-12)

##### 7.17.1 Primary Control Panel

1. Disconnect electrical power.
2. Open Printcon display panel.
3. Remove the two screws from bottom of primary panel.
4. Lift off Panel and set aside.
5. Remove the four screws that hold the panel in place.
6. Carefully lift the panel; it contains an integral printed circuit board and interconnecting wires.
7. To replace a lamp, turn the panel over. Rotate the lug (see Figure 7-20) and lift out the bulb. Reverse the procedure and install a new one.
8. To replace the wheel panel, disconnect the wiring. Connect the wiring to the new panel. Use same connector.
9. Reinstall panel and replace the console front panel.

##### Secondary Control Panel

**WARNING** OPERATE DISCONNECT SWITCH IN BUILDING SUPPLY LINE TO REMOVE POWER FROM THIS PANEL AS IT IS "HOT" EVEN WITH THE CONTROL POWER SWITCH OFF.

1. Lift panel door.
2. Lift panel away, being careful of the attached wires.
3. Replace the defective component and reinstall the panel.

**CAUTION:** Do not remove or replace printed circuit cards unless POWER switch on secondary control panel is positioned at OFF.

##### Main Control Assembly (Microcomputer)

**CAUTION:** Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.

**NOTE:** Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation. To avoid damage, the precautions listed below should be taken whenever printed circuit boards are being handled or replaced:

- Always use an ESD safe container when transporting boards from one location to another.
- Do not remove a board from container except at an approved static station or where machine and personnel are properly grounded.
- At the very minimum, use a wrist strap grounded to sterilizer when removing and/or replacing boards.

1. To replace a printed circuit card, simultaneously lift both card pulls to disengage the contacts from the socket.

2. Pull the card straight out. This will prevent damage to the socket and contacts.

3. Install the replacement card; the cards are keyed to prevent improper installation. Ensure pulse switches are properly set if a #2 card.

4. Replace the console front panel.

#### 7.18 SETTING WASH OR STERILIZE ONLY CYCLE

**WARNING** OPERATE DISCONNECT SWITCH IN SUPPLY LINE TO REMOVE POWER FROM THIS PANEL AS IT IS "HOT" EVEN WITH THE POWER SWITCH OFF.

1. To select WASH or STERILIZE only cycle, set ON/OFF switch on board #2 (I/O 1) to OFF. Unit will then accept the selection of WASH for STERILIZE only cycle and do selection of STERILIZE cycle.

## 7.19 PRESSURE TRANSDUCER REPLACEMENT

1. Remove the metal bracket which covers the primary control panel.

2. Remove the primary control panel.

3. This gives access to plug P47 on the upper right section of the main Printcon PC Board. Unplug P47. Identify the cable coming from the pressure transducer (usually red) and then extract all pins of this cable from plug P47.

4. Loosen the cable clamp at the rear of the control box which secures the pressure and temperature probe cables. Cut the tie-wraps inside the control assembly securing the pressure transducer cable. Pull the pressure sensor cable out of the control assembly.

5. Cut the tie-wraps which secure the pressure transducer cable to the frame of the machine.

6. Remove the pressure transducer from the piping. Mount the new transducer. Run the cable into the control assembly through the cable clamp. Install the pins of the cable into plug P47 following the electrical schematic in Section 6. Install new tie-wraps to secure the cable inside the control assembly and along the frame of the machine.

7. Check the pressure calibration as outlined in paragraph 7.22 of this Section.

## 7.20 TEMPERATURE PROBE REPLACEMENT

1. Follow the instructions outlined in the pressure transducer replacement to gain access to plug P47 on the main Printcon PC Board.

2. Free the cable from any supports or ties to the sterilizer. Remove the cable from the control assembly, and remove the probe from the sump.

3. Install a new temperature probe and compression fitting in the sump bushing. Run the cable into the control assembly through the cable clamp at the rear of the assembly. Follow the electrical schematic in Section 6 of this manual to install the new pins into plug P47. Install new tie-wraps in place of ones which were cut.

4. Check the temperature calibration as outlined in paragraph 7.22 of this Section.

## 7.21 REPLACEMENT OF PRINTCON POWER SUPPLY FUSES

If fuse replacement is necessary, refer to Figure 7-22 for locations of these fuses.

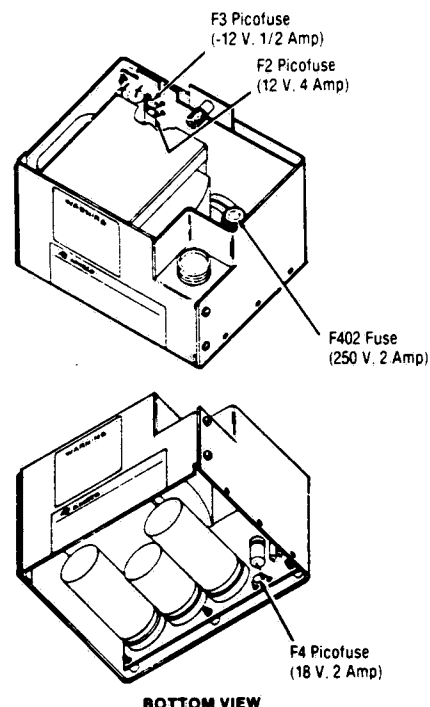


Figure 7-22. POWER SUPPLY FUSE LOCATIONS.

## 7.22 FIELD CALIBRATION OF CONTROL

### 7.22.1 Special tools and equipment required

**NOTE:** The measuring devices should be calibrated against NBS (National Bureau of Standards) traceable equipment and the inaccuracies of the devices should be known via a calibration report sheet.

1. Compound pressure gauge, resolution to 1/2 PSI, 50 PSI full scale minimum.
2. Potentiometer, resolution to 1 degree F, Doric 400A with type T thermocouple wire, or equal.
3. Digital voltmeter or multimeter, resolution to 1 mV DC, B & K model 2800 or equal.

4. Pressure seal for thermocouple wire, "Conax" style or equal, (P-382782-091).

5. Tee, 1/4 NPT.

6. Nipple, 1/4 x 12 (or longer).

7. 8-inch piece of 2 x 4.

**NOTE:** All adjustments in this procedure should be checked whenever the main Printcon PC Board (P-146651-032) is replaced. If the temperature probe is replaced, check the temperature calibration only. If the pressure sensor is replaced, first check the pressure calibration. Then, because the temperature accuracy is affected by pressure adjustments, check the temperature **after** adjusting the pressure.

### 7.22.2 Procedure

1. Install the compound pressure gauge and potentiometer as shown in Figure 5-1 of the Field Test Procedure. Use a piece of autoclaving tape to tape the thermocouple wire to the temperature probe.

2. Check the Service Switch (SW1, 8 pole dual in-line) on the main Printcon PC Board for the following settings:

- #1 — off (Fahrenheit temp)
- #2 — off (English units for pressure/vacuum)
- #3 — on (display tenths on temperature & pressure)
- #4 — on (strain gage input)
- #5 — off
- #6 — on
- #7 — on
- #8 — not used

3. Remove the metal bracket securing the primary control panel to the control assembly. Unfasten the four mounting screws for the primary control panel. Throughout the calibration procedure, leave the primary control panel plugged in. Carefully let the cable support control panel while adjustments are made through panel mounting area.

4. Locate test points TP4, TP5, and TP6 on the main Printcon PC Board (See Figure 7-23).

5. Connect the negative lead of the voltmeter to TP6. Turn the control power on. Measure and make a note of the voltage at TP4. This will be approximately 10 volts DC. Now measure the voltage at TP5 and adjust potentiometer P1 until this voltage is **exactly** 1/2 of the voltage measured at TP4.

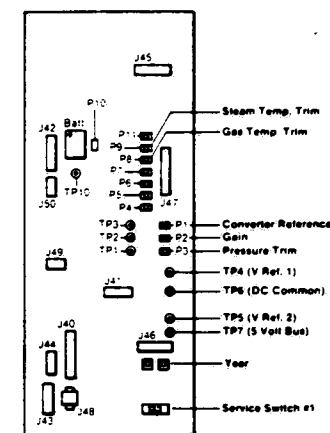


Figure 7-23. PRINTCON PC BOARD TEST POINT AND POTENTIOMETER LOCATIONS.

**NOTE:** This setting was made at the factory and should not require adjustment. However, if adjustment is required, follow the instructions carefully as this setting greatly affects the overall accuracy.

6. Turn power off. Using the 2 x 4, block the unload door closed.

7. Turn the power back on. After the lamp test, observe the pressure display. At sea level, adjust potentiometer P3 to read 0.0 PSIG.

**NOTE:** The control will monitor LS14 (unload door is open) for one minute, waiting for it to activate. At the end of one minute, an alarm will sound. If the adjustment to P3 is not completed by the end of one minute, turn the power off and then on and complete the adjustment.

For altitudes above sea level, adjust P3 according to the approximation of 1-inch Hg vacuum displayed for each 1000 feet altitude. For example, for an elevation of 2700 feet, set P3 to display 2.7 in. Hg vacuum. This is a "coarse" adjustment only because the control will "autozero" the pressure display when the unload door opens (LS14) during the initial "power on" sequence.

8. Remove the 2 x 4.

9. Turn the power off and then on again. The pressure display should "autozero" when the unload

door opens. Set the temperature on the thumb-wheels to 295 degrees F. and press the CYCLE START button. Press on the "basket on load table" limit switch (LS11) to start a cycle.

10. Let the cycle proceed through the WASH phase and then into the CONDITION phase. Wait until the timed purge has completed, and the pressure has risen to the steam regulator setting and stabilized. Adjust potentiometer **P2** until the Printcon pressure display agrees with the compound pressure gauge. Then, adjust potentiometer **P9** until the Printcon temperature display agrees with the temperature readout device. **Always** adjust **P9** after adjusting **P2**.

11. Abort the cycle with the ABORT CYCLE button. Let the pressure exhaust completely from the chamber. Because the adjustments made to **P2** and **P3** interact somewhat, repeat **steps 6-10** until the interaction is eliminated ( $\pm 0.1$  PSIG).

12. Reset the sterilizing temperature to 285 degrees F. Reset the display options on the service switch on the main Printcon PC Board to the desired settings.

7.23 I/O EXPANDER #1 PC BOARD (P-146588-048)

There are two four-pole, dual in-line (DIP) switches on this PC Board labeled SW1 and SW2. SW1 controls the length of the water fill prior to the wash phase. This time is variable from 0 to 30 seconds in 2-second increments by setting the switch as follows:

Fill Time in seconds	#1	#2	#3	#4
0	off	off	off	off
2	on	off	off	off
4	off	on	off	off
6	on	on	off	off
8	off	off	on	off
10	on	off	on	off
12	off	on	on	off
14	on	on	on	off
16	off	off	off	on
18	on	off	off	on
20	off	on	off	on
22	on	on	off	on
24*	off	off	on	on
26	on	off	on	on
28	off	on	on	on
30	on	on	on	on

\*standard setting

The second switch SW2 controls optional features as follows:

- #1 off — Status/Error displayed continuously
- #1 on — Status/Error codes displayed only on error
- #2 off — Allows **WASH only** and **STERILIZE only** cycles to be selected
- #2 on — Allows only the **WASH/STERILIZE cycle** to be selected
- 3# off — Pure rinse is included in wash cycle
- 3# on — Pure rinse is omitted from cycle
- #4 off — (This switch is not used)
- #4 on — (This switch is not used)

7.24 I/O EXPANDER #2 PC BOARD (P-146590-048)

There are two four-pole, dual in-line (DIP) switches on this PC Board labeled SW1 and SW2. SW1 controls the length of the rinse time for all rinses. This time is variable from 0 to 75 seconds in 5-second increments by setting the switch as follows:

Rinse Time in seconds	#1	#2	#3	#4
0	off	off	off	off
5	on	off	off	off
10	off	on	off	off
15	on	on	off	off
20	off	off	on	off
25	on	off	on	off
30	off	on	on	off
35	on	on	on	off
40	off	off	off	on
45	on	off	off	on
50	off	on	off	on
55	on	on	off	on
60*	off	off	on	on
65	on	off	on	on
70	off	on	on	on
75	on	on	on	on

\*standard setting

The second switch, SW2, controls the length of the steam "purge" of the chamber during the CONDITION phase. This time is variable from 0 to 30 seconds in increments of 2-seconds by setting this switch as follows:

Purge Time in seconds	#1	#2	#3	#4
0	off	off	off	off
2	on	off	off	off
4	off	on	off	off
6	on	on	off	off
8	off	off	on	off
10	on	off	on	off
12	off	on	on	off
14	on	on	on	off
16	off	off	off	on
18	on	off	off	on
20	off	on	off	on
22	on	on	off	on
24*	off	off	on	on
26	on	off	on	on
28	off	on	on	on
30	on	on	on	on

\*standard setting

## SECTION 8

### ILLUSTRATED PARTS BREAKDOWN

Eagle 2400 Washer/Sterilizer assemblies and components are illustrated and identified on the following pages. Part number, description and quantity required for each usage is given. Each indentation in the description represents the assembly level. The UNITS PER ASSEMBLY column is specific for the given assembly or subassembly level.

#### HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN

1. Determine the function and application of the part required. See Figure Index below and select the most appropriate title. Note the illustration page number.
2. Turn to the page indicated and locate the desired part on the illustration.
3. From the illustration, obtain the index number assigned to the part desired. Refer to the accompanying description for specific information regarding the part.

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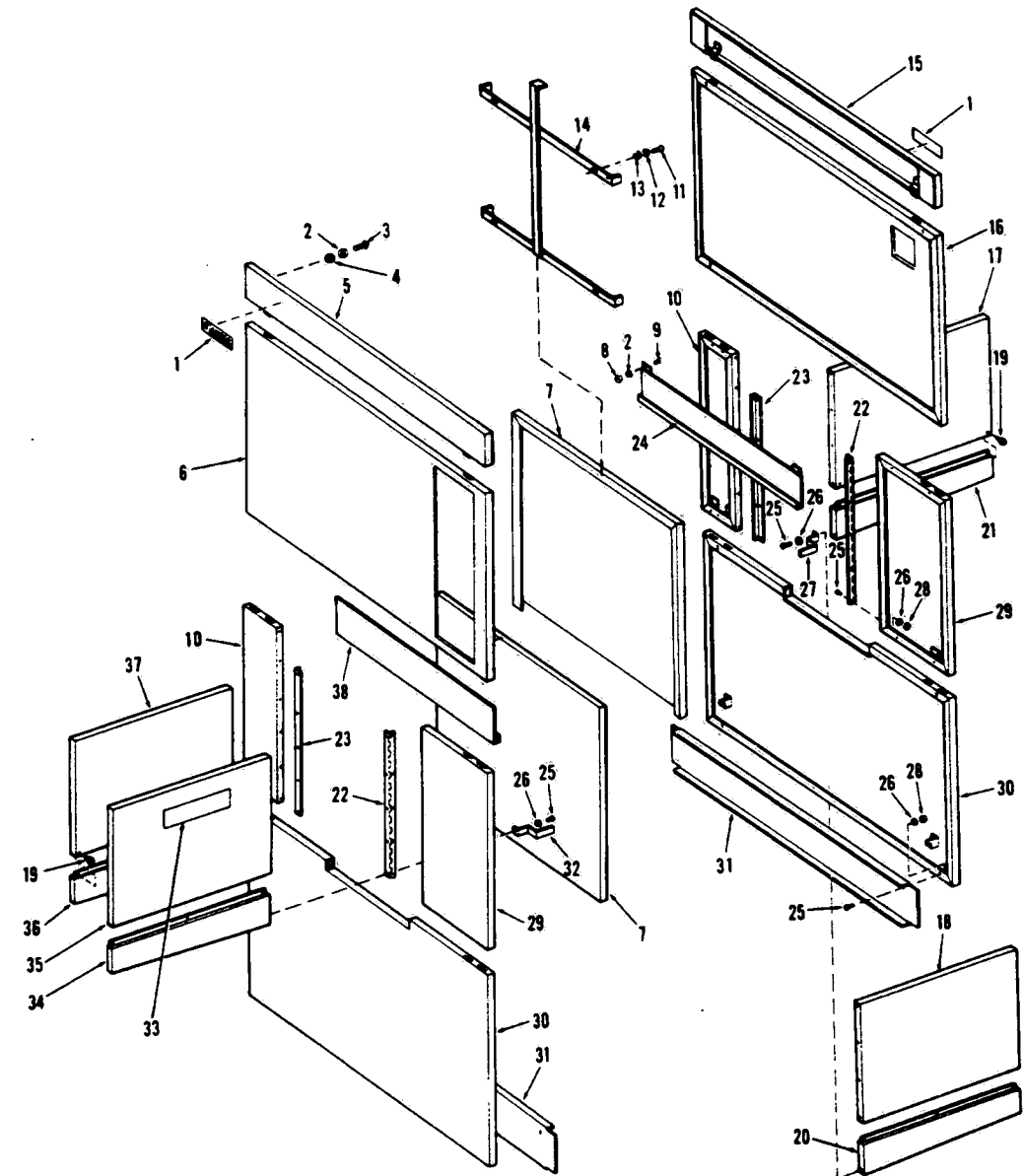


Figure 8-1. EXTERNAL PANELS AND TRIM.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-1-	P 141245	751	EXTERNAL PANELS AND TRIM .....	X
1	P 56399	147	NAMEPLATE .....	2
2	P 19677	041	LOCKWASHER .....	24
3	P 9661	041	SCREW, Round Head, #10-32 x 5/8 .....	20
4	P 5511	041	WASHER, Flat .....	20
5	P 56399	120	PANEL, Top Unload .....	1
6	P 134471	059	PANEL, Upper Unload .....	1
7	P 56399	145	COVER, Door .....	2
8	P 2959	041	NUT, Hex, #10-32 .....	6
9	P 9282	041	SCREW, Flat Head, #10-32 x 3/8 .....	6
10	P 54751	010	PANEL .....	2
11	P 3984	041	SCREW, #6-32 x 3/8 .....	8
12	P 19675	041	LOCKWASHER, #6 .....	16
13	P 5469	041	WASHER, #6 .....	16
14	P 135226	045	SUPPORT .....	2
15	P 56399	119	PANEL, Top Load .....	1
16	P 134471	061	PANEL, Upper Load .....	1
17	P 134468	401	PANEL, Top RH Load .....	1
18	P 134468	402	PANEL, Top LH Load .....	1
19	P 90169	045	SCREW, Self Tap, #10 x 3/8 .....	12
20	P 134468	404	PANEL, Bottom LH Load .....	1
21	P 134468	403	PANEL, Bottom RH Load .....	1
22	P 56396	196	HINGE .....	2
23	P 56396	198	ANGLE .....	2
24	P 51699	010	PANEL, Trim Load .....	1
25	P 4682	041	SCREW, Round Head, #8-32 x 3/8 .....	42
26	P 19676	041	LOCKWASHER, #8 .....	42
27	P 92004	001	ACTUATOR, Load .....	1
28	P 3153	041	NUT, Hex, #8-32 .....	22
29	P 54762	010	PANEL .....	2
30	P 54850	010	PANEL, Bottom .....	2
	P 118081	091	SWITCH, Panel .....	1
31	P 98045	010	PANEL, Kick .....	2
32	P 92003	001	ACTUATOR, Unload .....	1
33	P 150689	001	LABEL, Warning .....	2
34	P 134468	397	PANEL, Bottom RH Unload .....	1
35	P 134468	393	PANEL, Top RH Unload .....	1
36	P 134468	399	PANEL, Bottom LH Unload .....	1
37	P 134468	395	PANEL, Top LH Unload .....	1
38	P 51700	010	PANEL, Trim Unload .....	1

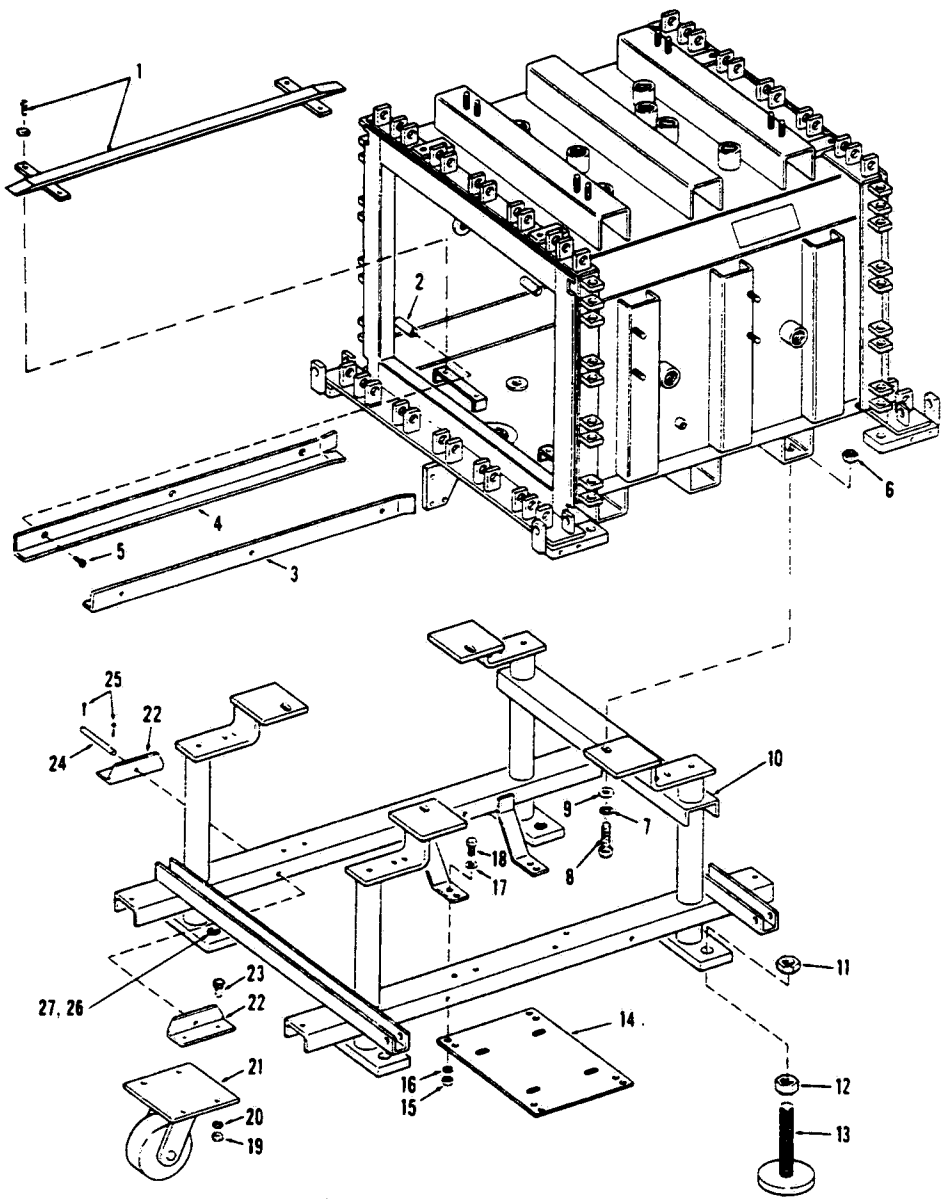


Figure 8-2. SHELL AND STAND ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-2-			SHELL AND STAND ASSEMBLY .....	X
1	P 78349 061		GUIDE PACKAGE, Feeder Unit .....	1
	P 141245 503		SHELL ASSEMBLY .....	1
2	P 150828 431		• SUPPORT, Rail .....	6
3	P 51652 063		• ANGLE, Support, Left Hand .....	1
4	P 51651 063		• ANGLE, Support, Right Hand .....	1
5	P 51580 061		• SCREW, Flat Head, 1/4-20 x 3/8 .....	6
6	P 3099 042		NUT .....	8
7	P 19687 061		LOCKWASHER, 3/8 .....	4
8	P 15339 045		SCREW, 3/8-16 x 1-1/4 .....	4
9	P 5503 045		WASHER .....	4
	P 134471 090		STAND ASSEMBLY .....	1
10	P 134471 091		• FRAME .....	1
11	P 3123 045		• NUT, Hex Jam .....	4
12	P 3107 045		• NUT, Hex .....	4
13	P 91054 045		• FOOT, Leveling .....	4
14	P 51756 010		• PLATE .....	1
15	P 3099 042		• NUT .....	4
16	P 19680 041		• LOCKWASHER .....	8
17	P 90441 045		• WASHER .....	16
18	P 3903 042		• CAPSCREW, Hex Head, 3/8-16 x 1-1/4 .....	8
	P 91057 091		• CASTER ASSEMBLY, Stand .....	4
19	P 3101 091		• • NUT, Hex .....	4
20	P 19681 045		• • LOCKWASHER .....	4
21	P 91058 091		• • CASTER .....	1
22	P 91059 010		• • ANGLE .....	2
23	P 3872 091		• • BOLT, Hex Head .....	4
24	P 91287 045		• ROD, Caster .....	4
25	P 3185 091		• COTTER PIN .....	8
26	P 89239 091		PAD, Jacking Screw .....	4
27	P 89237 045		SCREW, Jacking .....	4

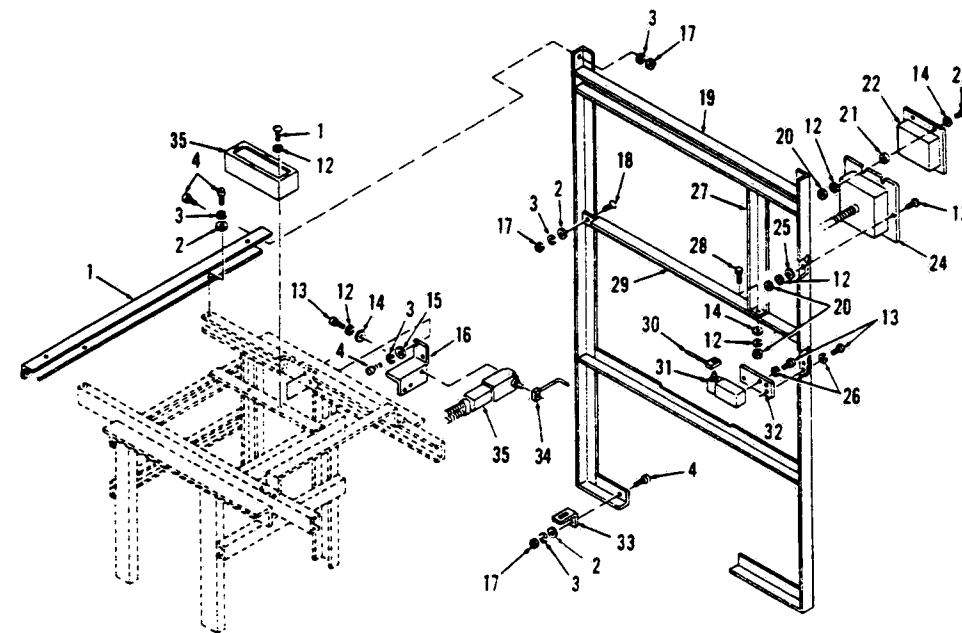


Figure 8-3. FRAME AND CONTROLS: Load End.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-3-			FRAME AND CONTROLS: Load End .....	X
1	P 54796 010		SUPPORT, Frame .....	2
2	P 3515 041		WASHER, 1/4 .....	6
3	P 19678 045		LOCKWASHER, 1/4 .....	14
4	P 13411 091		SCREW, Socket Head, 1/4-20 x 5/8 .....	12
5	P 141212 072		INTERFACE ASSEMBLY .....	1
11	P 9313 041		SCREW, Round Head, #10-32 x 5/16 .....	2
12	P 19677 041		LOCKWASHER, #10 .....	10
13	P 9316 041		SCREW, Round Head, #10-32 x 3/4 .....	8
14	P 17589 045		WASHER .....	6
15	P 31599 041		WASHER .....	2
16	P 97168 010		BRACKET, Switch .....	1
17	P 3040 042		NUT, Hex, 1/4-20 .....	8
18	P 3978 056		SCREW, Flat Head, 1/4-20 x 5/8 .....	2
19	P 163694 001		FRAME ASSEMBLY .....	1
20	P 2960 042		NUT, Hex, #10-32 .....	8
21	P 150825 367		SPACER .....	4
22	P 134471 039		PRIMARY PANEL .....	1
23	P 9315 041		SCREW, Round Head, #10-32 x 1-1/4 .....	4
24	P 134471 063		HARNESS ASSEMBLY .....	1
25	P 24488 091		WASHER .....	2
26	P 18131 091		LOCKWASHER, #10 .....	4
27	P 56399 143		SUPPORT .....	1
28	P 9661 041		SCREW, Round Head, #10-32 x 5/8 .....	2
29	P 55333 010		SUPPORT, Cross .....	1
30	P 80988 091		LEVER, Switch .....	1
31	P 80978 001		SWITCH, Limit .....	1
32	P 150658 001		SUPPORT, Switch .....	1
33	P 81147 001		SUPPORT .....	2
34	P 80984 091		ACTUATOR, Switch .....	1
35	P 134471 050		SWITCH AND WIRING ASSEMBLY .....	1

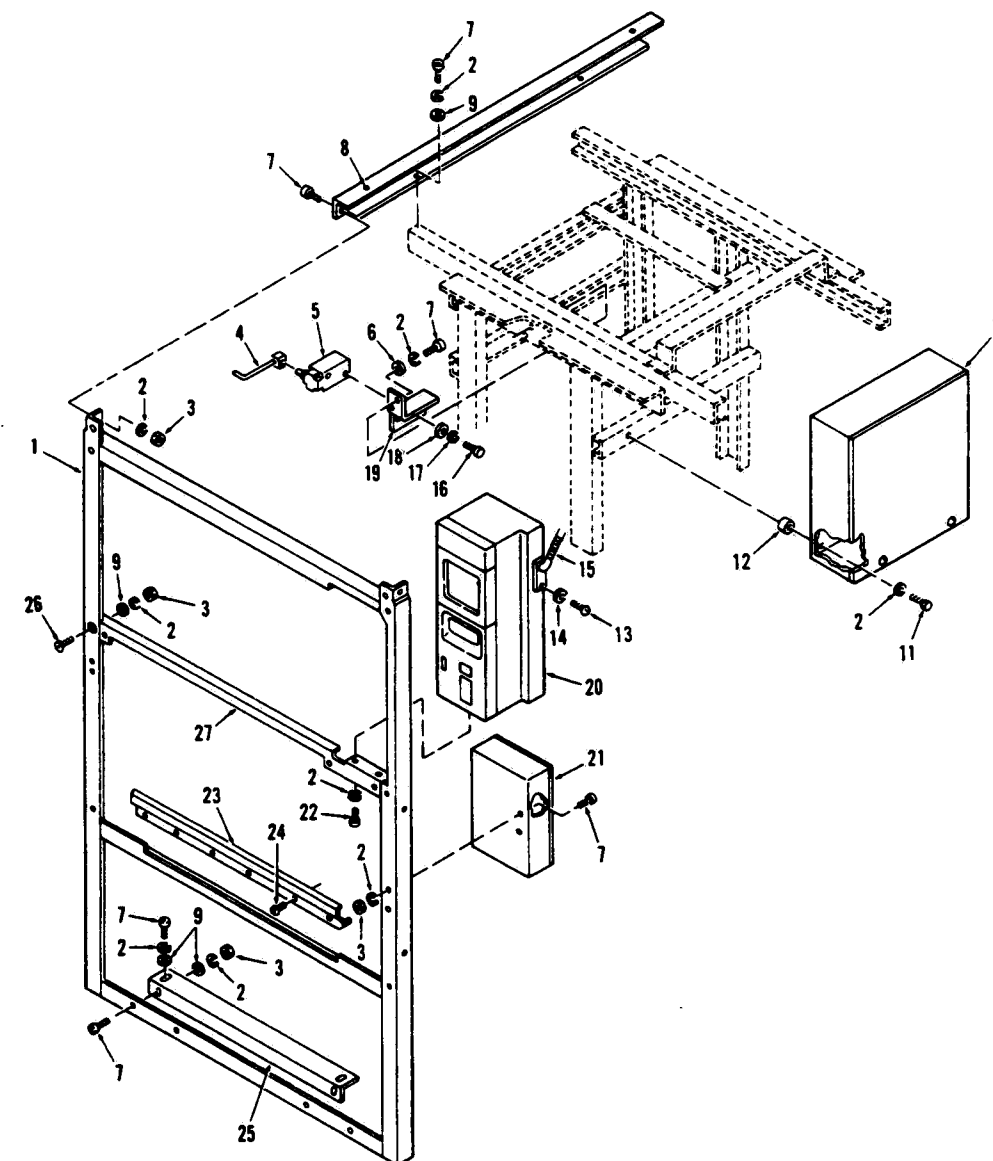


Figure 8-4. FRAME AND CONTROLS: Unload End.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-4-			FRAME AND CONTROLS: Unload End .....	X
1	P 141212 046		FRAME ASSEMBLY .....	1
2	P 19678 045		LOCKWASHER .....	24
3	P 3040 042		NUT, Hex, 1/4-20 .....	10
4	P 80984 091		ACTUATOR, Switch .....	1
5	P 56399 126		SWITCH AND WIRING ASSEMBLY .....	1
6	P 31599 041		WASHER, Flat .....	2
7	P 13411 091		SCREW, Socket Head, 1/4-20 x 5/8 .....	16
8	P 54796 010		SUPPORT FRAME .....	2
9	P 3515 041		WASHER .....	8
10	P 141212 039		PROCESSOR CONTROL ASSEMBLY .....	1
			(See Figure 8-9)	
11	P 45606 091		SCREW, Hex Head, 1/4-20 x 1-3/4 .....	4
12	P 81132 001		SPACER .....	4
13	P 3985 041		SCREW, Round Head, #6-32 x 3/4 .....	2
14	P 84116 002		LOCKWASHER, #6 .....	2
15	P 134471 063		HARNESS ASSEMBLY .....	1
16	P 9316 041		SCREW, Round Head, #10-32 x 3/4 .....	2
17	P 19677 041		LOCKWASHER, #10 .....	2
18	P 17589 045		WASHER .....	2
19	P 97168 010		BRACKET, Switch .....	1
20	P 141212 043		PRIMARY PRINTER CONTROL .....	1
			(See Figure 8-12)	
21	P 134471 033		POWER INPUT BOX, See Figure 8-8 .....	1
22	P 79253 045		SCREW, Hex Head, 1/4-20 x 1/2 .....	4
23	P 54842 061		RETAINER, Water .....	2
24	P 9316 041		SCREW, Round Head, #10-32 x 3/4 .....	6
25	P 54844 010		SUPPORT, Panel .....	1
26	P 3978 056		SCREW, Flat Head, 1/4-20 x 5/8 .....	2
27	P 56399 133		SUPPORT, Cross .....	1

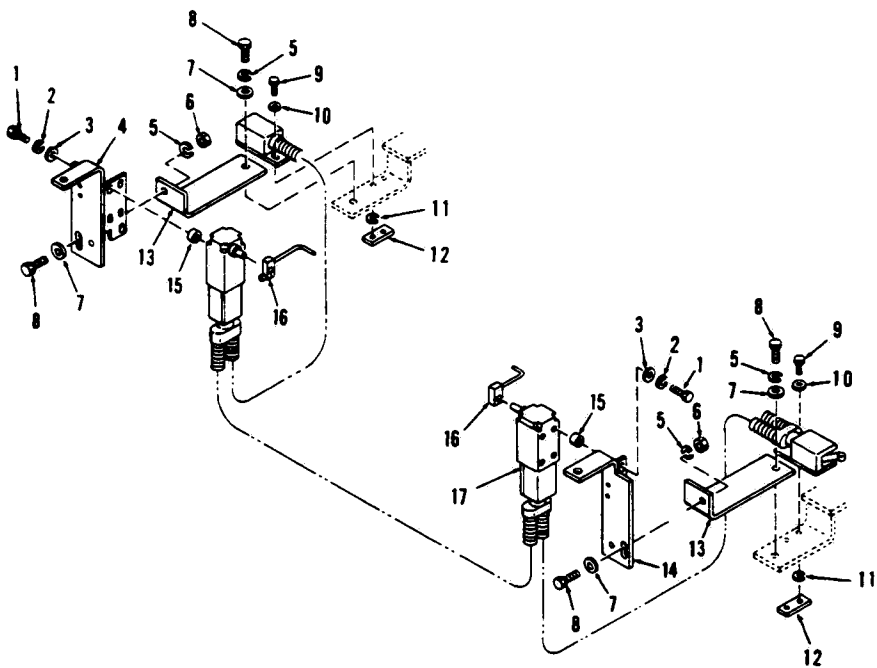


Figure 8-5. LOAD AND UNLOAD SWITCHES.



FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-5-			LOAD SWITCHES.....	X		
			UNLOAD SWITCHES.....		X	
1	P 9316	041	SCREW, Round Head, #10-32 x 3/4 .....	4	4	
2	P 19677	041	LOCKWASHER, #10 .....	4	4	
3	P 17589	045	WASHER .....	4	4	
4	P 56368	001	PLATE, Support RH .....	1	1	
5	P 19680	041	LOCKWASHER, 3/8 .....	4	4	
6	P 3099	042	NUT, Hex, 3/8-16 .....	2	2	
7	P 17263	042	WASHER .....	4	4	
8	P 31838	042	SCREW, Hex Head, 3/8-16 x 1 .....	4	4	
9	P 3987	041	SCREW, #8-32 x 3/4 .....	4	4	
10	P 32403	061	WASHER .....	4	4	
11	P 19676	041	LOCKWASHER, #8 .....	4	4	
12	P 80011	045	TWIN NUT .....	2	2	
13	P 56366	001	SUPPORT .....	2	2	
14	P 56370	001	PLATE, Support LH .....	1	1	
15	P 10453	042	WASHER, Flat .....	4	4	
16	P 80984	091	ACTUATOR, Switch .....	2	2	
17	P 141212	045	SWITCH AND WIRING ASSEMBLY .....	1		
	P 141212	040	SWITCH AND WIRING ASSEMBLY .....		1	
	30745	091	ACTUATOR (Not Shown) .....	3	3	
	56399	118	SWITCH (Not Shown) .....	3	3	

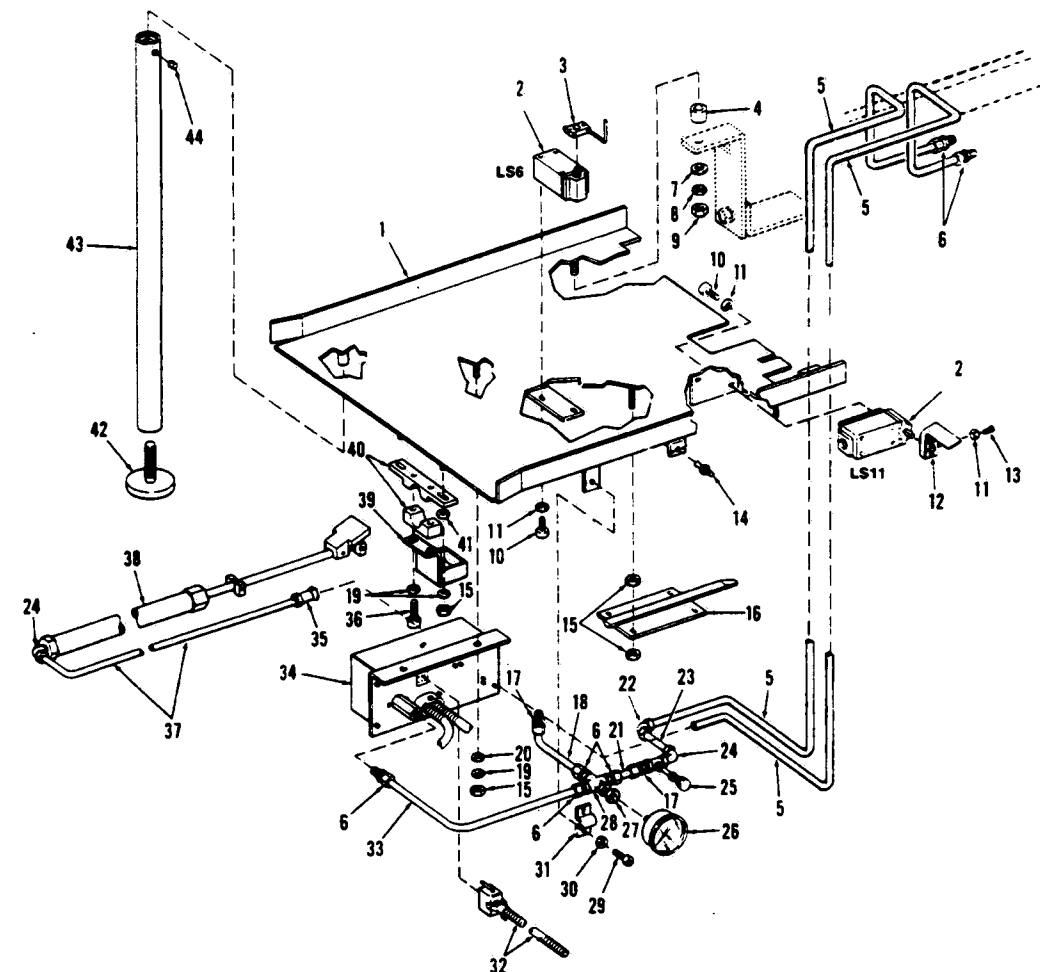


Figure 8-6. LOADING UNIT.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-6-	P 141212	026	LOADING UNIT (1 Basket Exit) .....	X		
	P 141212	027	LOADING UNIT (2 Basket Exit) .....		X	
	P 141212	028	LOADING UNIT (3 Basket Exit) .....			X
			(Incl Unloading Unit. See Figure 8-7)			
1	P 134384	001	PAN, Loading, Long Inlet .....	1	1	1
	P 134385	001	PAN, Loading, Short Inlet .....	1	1	1
2	P 80978	001	SWITCH, Limit .....	2	2	2
3	P 80984	091	ARM, Oper .....	1	1	1
4	P 76446	045	SPACER .....	2	2	2
5	P RM915	103	TUBE, 1/4 x .03 x 108 .....	2	2	2
6	P 45565	091	FITTING, Comp, 1/4 ODT x 1/4 IPS .....	6	6	6
7	P 17263	042	WASHER, Flat .....	2	2	2
8	P 19680	041	LOCKWASHER, 3/8 .....	2	2	2
9	P 3099	042	NUT, Hex, 3/8-16 .....	2	2	2
10	P 15287	041	SCREW, #10-32 x 1/2 .....	4	4	4
11	P 19677	041	LOCKWASHER, #10 .....	6	6	6
12	P 81029	063	ACTUATOR, Limit Switch .....	1	1	1
13	P 16451	042	SCREW, #10-32 x 5/8 .....	2	2	2
14	P 51783	045	STUD .....	2	2	2
	P 51784	045	SPRING .....			
	P 51925	061	RETAINER .....			
15	P 3097	041	NUT, Hex, 1/4-20 .....	14	14	14
16	P 76644	061	GUIDE ASSEMBLY, Loading End .....	1	1	1
17	P 43289	091	FITTING, Comp, 1/4 ODT x 1/8 IPS .....	2	2	2
18	P 76652	091	TUBE, 1/4 OD .....	1	1	1
19	P 19678	045	LOCKWASHER .....	18	18	18
20	P 5503	045	WASHER, Flat .....	2	2	2
21	P 76654	091	TUBE, 1/4 OD .....	1	1	1
22	P 81066	001	ELL, Comp, 1/4 ODT .....	1	1	1
23	P 90340	091	TUBE .....	1	1	1
24	P 42510	091	ELL, Comp, 1/4 ODT x 1/8 IPS .....	2	2	2
25	P 91382	091	VALVE, Needle .....	1	1	1
26	P 54797	091	GAUGE .....	1	1	1
27	P 939	042	BUSHING, Red, 1/4 IPS x 1/8 IPS .....	1	1	1
28	P 45060	091	CROSS, 1/4 IPS .....	1	1	1
29	P 4672	041	SCREW, #6-32 x 5/16 .....	2	2	2
30	P 19675	041	LOCKWASHER, #6 .....	2	2	2
31	P 76655	061	CLAMP, Tube .....	1	1	1
32	P 134471	074	CABLE ASSEMBLY, Loading End .....	1	1	1
33	P 76653	091	TUBE, Press. Switch, 1/4 OD .....	1	1	1
34	P 141212	035	CONTROL ASSY, Load End (See Figure 8-9) .....	1	1	1
35	P 51902	091	COUPLING, Tube To Tube, 1/4 ODT .....	1	1	1
36	P 4003	051	SCREW, 1/4-20 x 1-1/4 .....	4	4	4
37	P RM915	103	TUBE, 1/4 OD x 0.3 x 58 .....	1	1	1
38	P 134468	748	CYLINDER ASSEMBLY (See Figure 8-38) .....	1	1	1
39	P 56396	808	PAN, Oil .....	1	1	1
40	P 56396	809	CLAMP .....	2	2	2
41	P 5474	051	WASHER .....	4	4	4
42	P 56401	055	FOOT ASSEMBLY .....	2	2	2
43	P 56363	001	LEG ASSEMBLY .....	2	1	1
44	P 31276	061	SETSCREW, #10-32 x 1/2 .....	6	6	6

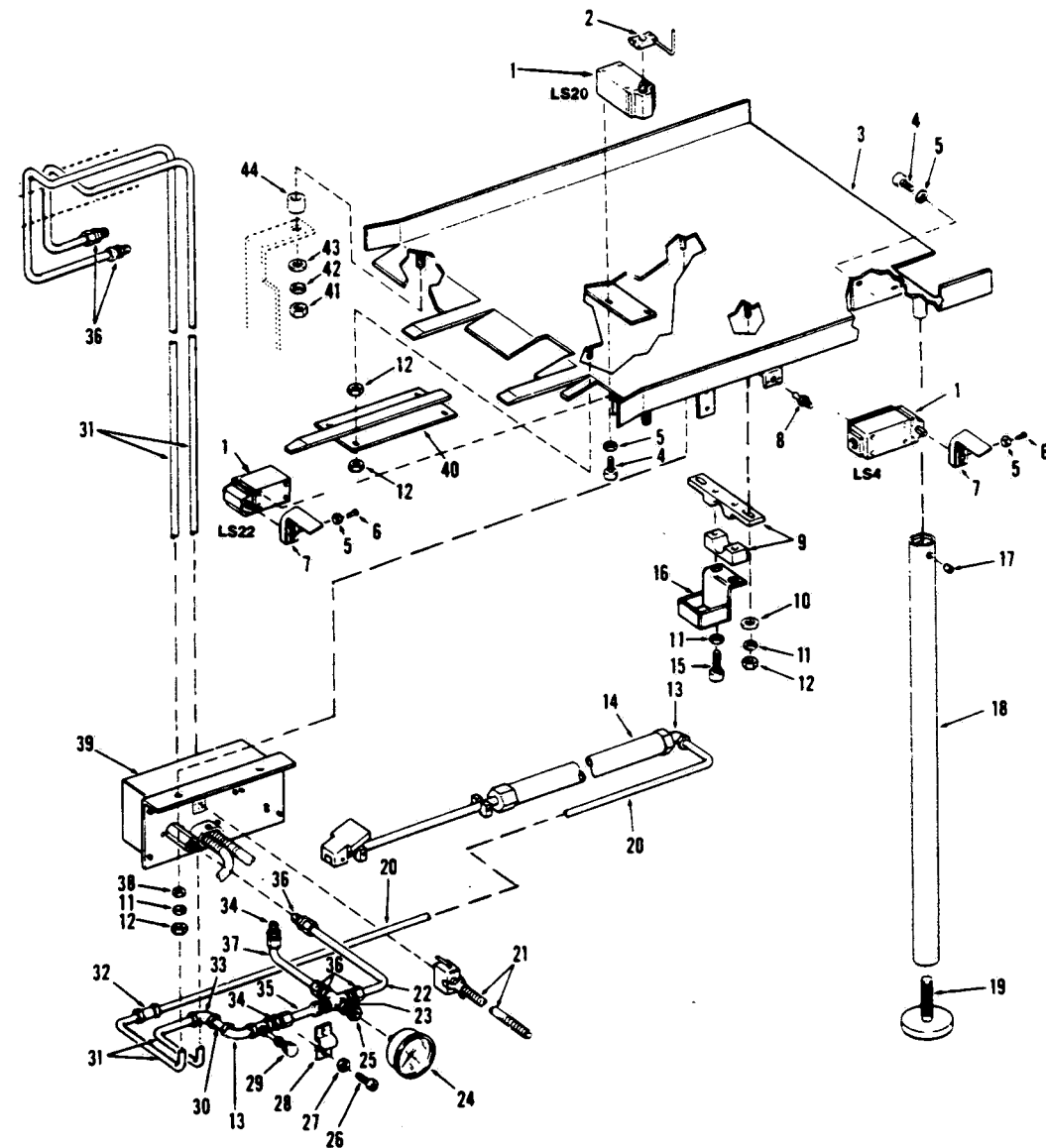


Figure 8-7. UNLOADING UNIT.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-7-			UNLOADING UNIT (1 Basket Exit) .....	X		
			UNLOADING UNIT (2 Basket Exit) .....		X	
			UNLOADING UNIT (3 Basket Exit) .....			X
1	P 80978 001		SWITCH, Limit .....	3	3	3
2	P 80984 091		ARM, Oper .....	1	1	1
3	P 134381 001		PAN, Unloading .....	1	1	1
4	P 134382 001		PAN, Unloading .....		1	
5	P 15287 041		SCREW, #10-32 x 1/2 .....	6	6	6
6	P 19677 041		LOCKWASHER, #10 .....	10	10	10
7	P 16451 042		SCREW, #10-32 x 5/8 .....	4	4	4
8	P 81028 063		ACTUATOR, Limit Switch .....	2	2	2
9	P 51783 045		STUD .....	2	2	2
10	P 51925 061		CLIP .....			
11	P 57784 045		CATCH SPRING .....			
12	P 56396 809		CLAMP .....	2	2	2
13	P 5474 051		WASHER .....	4	4	4
14	P 19678 045		LOCKWASHER, 1/4 .....	18	18	18
15	P 3097 041		NUT, Hex, 1/4-20 .....	14	14	14
16	P 42510 091		ELL, Comp, 1/4 ODT x 1/8 IPS .....	2	2	2
17	P 134468 747		CYLINDER ASSEMBLY (See Figure 8-38) .....	1	1	1
18	P 4003 051		SCREW, 1/4-20 x 1-1/4 .....	4	4	4
19	P 56396 808		PAN, Oil .....	1	1	1
20	P 31276 061		SETSCREW, #10-32 x 1/2 .....	6	6	6
21	P 98092 010		LEG ASSEMBLY .....		1	
22	P 98087 010		LEG ASSEMBLY .....	2	2	2
23	P 56401 055		FOOT ASSEMBLY .....	1	1	1
24	P RM915 103		TUBE, 1/4 OD x .030 x 58 .....	1	1	1
25	P 134471 075		CABLE ASSEMBLY, Rear .....	1	1	1
26	P 76656 091		TUBE, Press. Switch, 1/4 OD .....	1	1	1
27	P 45060 091		CROSS, 1/4 IPS .....	1	1	1
28	P 54797 091		GAUGE .....	1	1	1
29	P 939 042		BUSHING, Red, 1/4 IPS x 1/8 IPS .....	1	1	1
30	P 4672 041		SCREW, #6-32 x 5/16 .....	2	2	2
31	P 19675 041		LOCKWASHER, #6 .....	2	2	2
32	P 76655 061		CLAMP, Tube .....	1	1	1
33	P 91382 091		VALVE, Needle .....	1	1	1
34	P 90340 091		TUBE, 1/4 OD .....	1	1	1
35	P RM915 103		TUBE, 1/4 OD x .030 x 115 .....	2	2	2
36	P 51902 091		COUPLING, Tube To Tube, 1/4 ODT .....	1	1	1
37	P 81066 001		ELL, Comp, 1/4 ODT .....	1	1	1
38	P 43289 091		FITTING, Comp, 1/4 ODT x 1/8 IPS .....	2	2	2
39	P 76702 091		TUBE, 1/4 OD .....	1	1	1
40	P 45565 091		FITTING, Comp, 1/4 ODT x 1/4 IPS .....	6	6	6
41	P 76652 091		TUBE, 1/4 OD .....	1	1	1
42	P 5503 045		WASHER, Flat .....	2	2	2
43	P 141212 036		CONTROL ASSY. (See Figure 8-9) .....	1		
44	P 141212 037		CONTROL ASSY. (See Figure 8-9) .....		1	
	P 76640 061		GUIDE ASSEMBLY, Unloading End .....	1	1	1
	P 3099 042		NUT, Hex, 3/8-16 .....	2	2	2
	P 19680 041		LOCKWASHER, 3/8 .....	2	2	2
	P 17263 042		WASHER, Flat .....	2	2	2
	P 76446 045		SPACER .....	2	2	2

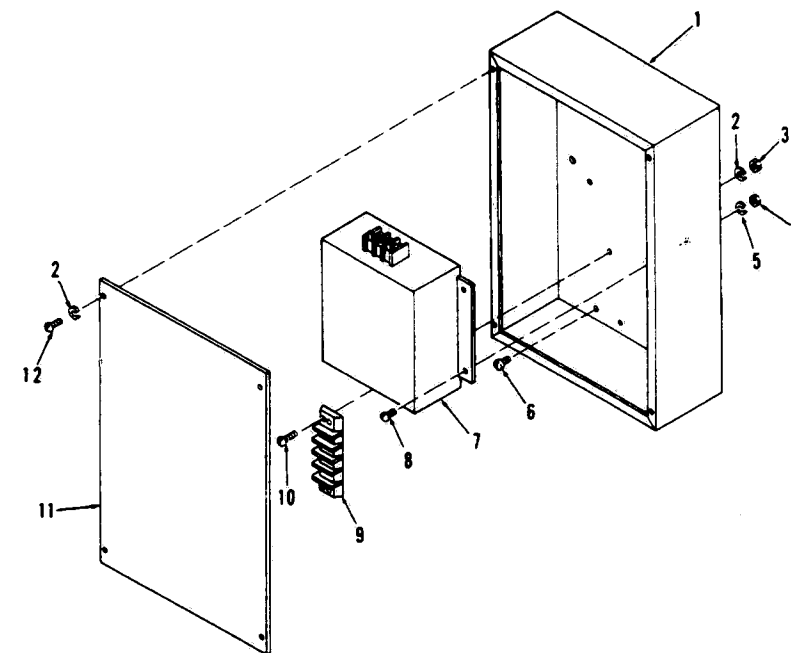


Figure 8-8. POWER INPUT BOX.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-8-	P 134471 033		POWER INPUT BOX .....	X		
1	P 134471 025		BOX, Powerinput .....	1		
2	P 19676 041		LOCKWASHER, #8 .....	6		
3	P 3038 041		NUT, Hex, #8-32 .....	2		
4	P 43287 091		NUT, Hex, #10-24 .....	4		
5	P 81682 006		LOCKWASHER, #10 .....	4		
6	P 82675 001		SCREW, Ground, #10-32 .....	1		
7	P 93821 001		FILTER, 250 VAC-60 Hz-10 Amp .....	1		
8	P 3929 045		SCREW, Round Head, #10-24 x 1/2 .....	4		
9	P 39091 091		STRIP, Terminal .....	1		
10	P 3987 041		SCREW, Round Head, #8-32 x 3/4 .....	2		
11	P 56399 121		COVER .....	1		
12	P 9288 041		SCREW, Round Head, #8-32 x 1/2 .....	4		



FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-10-	P 141212	039	CONTROL BOX ASSEMBLY .....	X
1	P 93838	002	PLUG, P5 .....	1
	P 84352	001	PIN CONTACT .....	A/R
2	P 150825	347	STANDOFF .....	1
3	P 5511	041	WASHER, Flat .....	1
4	P 19685	061	LOCKWASHER, #10 .....	3
5	P 9298	041	SCREW, Round Head, #10-32 x 1/2 .....	3
6	P 134471	041	HARNESS, DC .....	1
7	P 431152	091	CLIP .....	10
8	P 3984	041	SCREW, Round Head, #6-32 x 3/8 .....	4
9	P 134471	038	CONTROL BOX .....	1
10	P 56399	140	CABLE, Interface .....	1
11	P 150783	001	GROMMET, Caterpillar .....	3
12	P 44155	091	GUARD, Button .....	1
13	P 48070	091	SWITCH, Pushbutton .....	1
14	P 150825	366	DECAL, Reset .....	1
15	P 134471	053	CABLE, Feeders .....	1
16	P 80928	091	RELAY .....	1
17	P 84157	001	RECTIFIER, 1.0A-50V .....	1
18	P 150777	001	CAPACITOR, Ceramic Disc .....	2
19	P 78881	045	SCREW, Pan Head, #6-32 x 1/2 .....	18
20	P 150768	001	SOCKET, Relay .....	1
21	P 24840	061	SCREW, Round Head, #10-32 x 1/2 .....	2
22	P 56399	125	COVER, Control Box .....	1
23	P 3960	041	SCREW, Round Head, #6-32 x 1/2 .....	1
24	P 19675	041	LOCKWASHER, #6 .....	21
25	P 3037	041	NUT, Hex, #6-32 .....	5
26	P 451283	091	CLIP, Locking .....	6
27	P 89174	091	BLOCK, Terminal .....	2
28	P 150825	348	SCREEN .....	1
29	P 5469	041	WASHER, Flat .....	4
30	P 617100	399	CABLE, Power Supply-Processor .....	1
31	P 134471	043	CABLE, P53 .....	1
32	P 134471	042	CABLE, P55 .....	1
33	P 134471	040	HARNESS, AC .....	1
34	P 2960	042	NUT, Hex, #10-32 .....	2
35	P 134471	068	MAIN CONTROL ASSEMBLY .....	1
			(See Figure 8-11)	

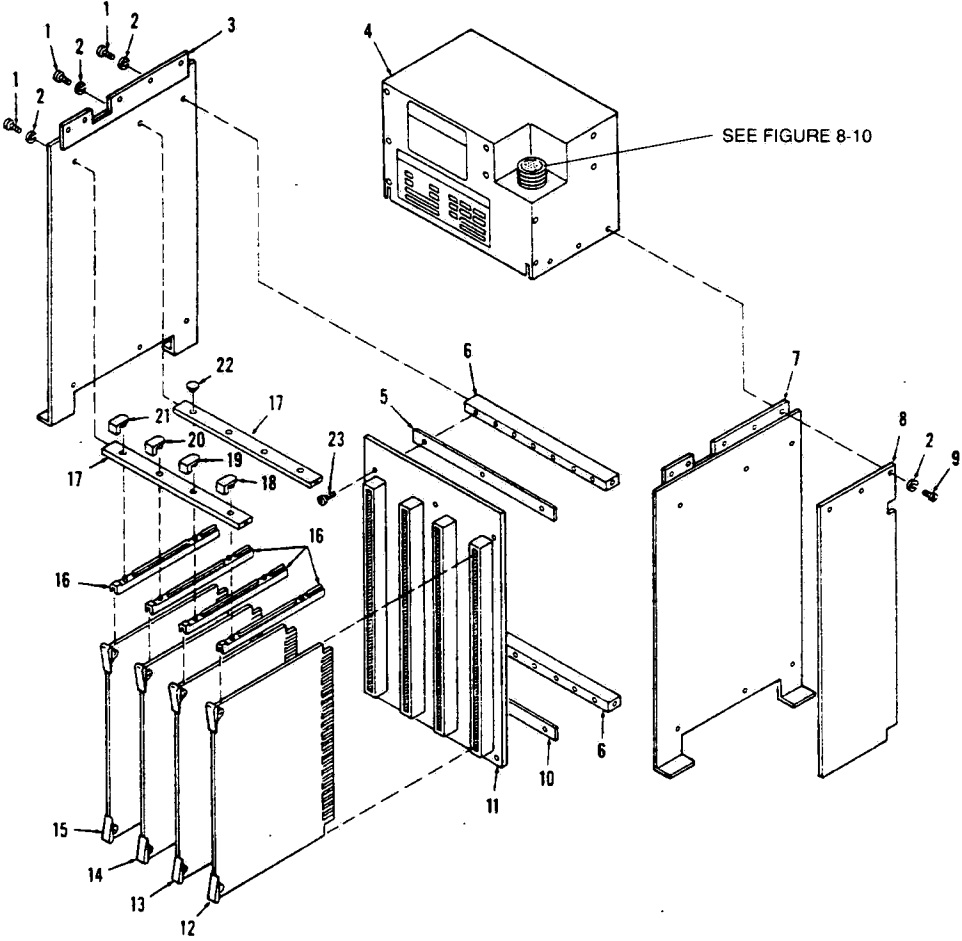


Figure 8-11. MAIN CONTROL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-11-	P 134471	063	MAIN CONTROL ASSEMBLY .....	X
1	P 84117	003	SCREW, Pan Head, #6-32 x 3/8 .....	12
2	P 84116	002	LOCKWASHER, #6 .....	18
3	P 136795	002	SIDE PLATE, LH .....	1
4	P 141198	310	POWER SUPPLY .....	1
	P 146633	051	POWER SUPPLY BOARD .....	
	P 764193	027	• REPAIRED BOARD .....	1
	P 764317	833	• FUSE, 2 Amp. Pico, 125 V (Box of 5) .....	1
	P 764317	834	• FUSE, 4 Amp. Pico, 125 V (Box of 5) .....	1
	P 764317	836	• FUSE, 1/2 Amp Pico, 125 V (Box of 5) .....	1
	P 764317	771	• FUSE, 2 Amp (Box of 5) .....	1
5	P 129138	003	INSULATOR .....	1
6	P 84468	001	RAIL, Mother Board .....	2
7	P 136795	001	SIDE PLATE, RH .....	1
8	P 136800	561	HEAT SINK .....	1
9	P 40357	045	SCREW, Self Tapping, #6 x 1/4 .....	6
10	P 129138	001	INSULATOR .....	1
11	P 146633	031	MOTHER BOARD ASSEMBLY .....	1
12	P 146648	001	#4 PC BOARD, I/O 3 .....	1
13	P 146590	101	#3 PC BOARD, *I/O 2 .....	1
14	P 146590	101	#2 PC BOARD, **I/O 1 .....	1
15	P 146590	101	#1 PC BOARD, Basic CPU .....	1
	P 764193	036	• REPAIRED BOARD .....	1
16	P 84225	001	GUIDE, PC Board .....	8
17	P 129257	001	BAR, Card Guide .....	4
18	P 83528	009	TAB, Locking, I/O 3 .....	1
19	P 83528	008	TAB, Locking, I/O 2 .....	1
20	P 83528	007	TAB, Locking, I/O 1 .....	1
21	P 83528	001	TAB, Locking, CPU .....	1
22	P 84226	001	TAB, Locking .....	12
23	P 84117	001	SCREW, Pan Head, #6-32 x 1/4 .....	6
<p>** All Rev. #2 boards must be changed to new part numbers. New boards are not compatible with older Rev. Boards.</p> <p>* All Rev. #3 boards must be changed to new part numbers. New boards are not compatible with older Rev Boards. HP Grade Kit (2400) 150828-604</p>				

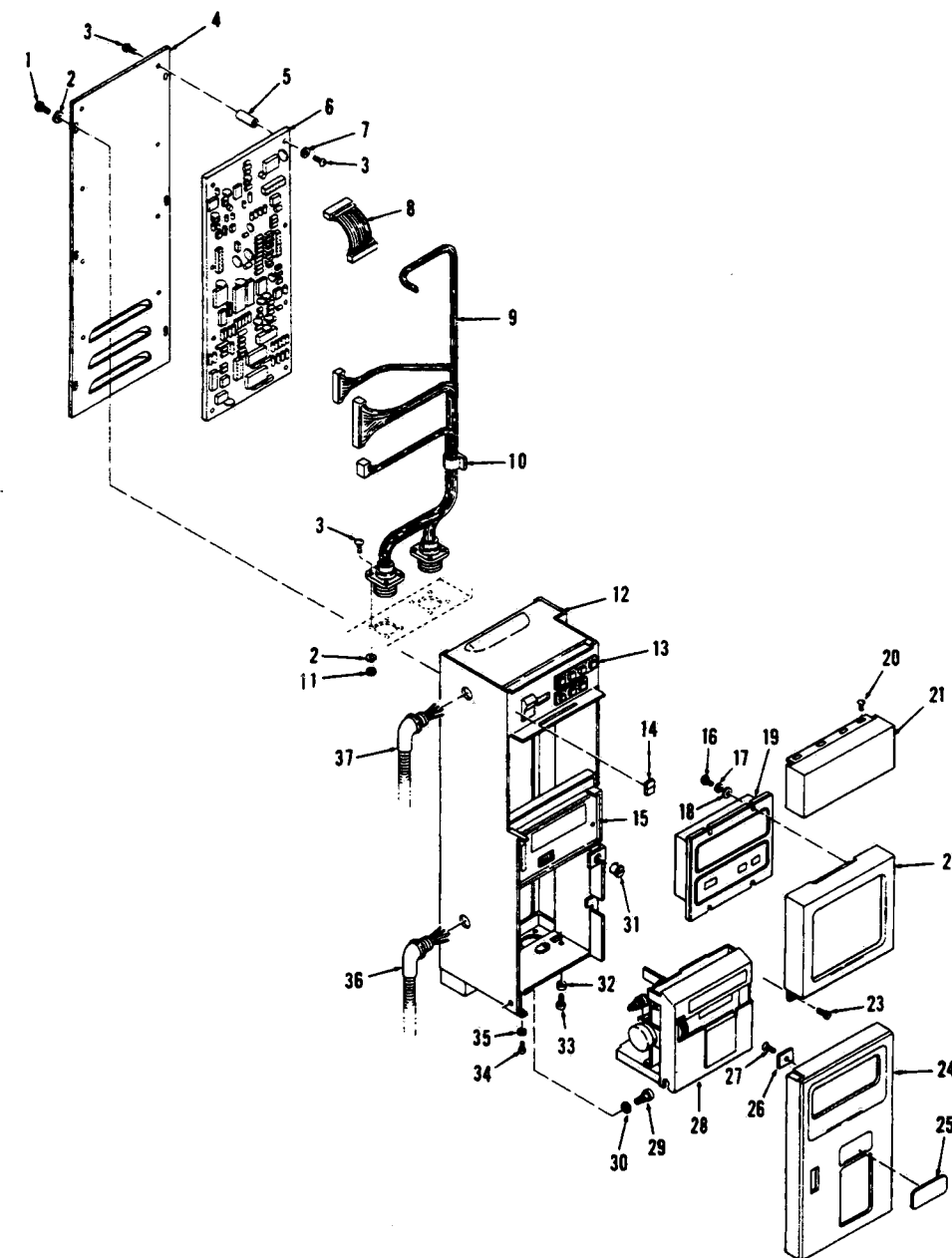


Figure 8-12. CONTROL COLUMN.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-12-	P 141212	043	CONTROL COLUMN.....	X
1	P 12451	041	SCREW, Round Head, #6-32 x 1/4.....	6
2	P 19675	041	LOCKWASHER, #6.....	14
3	P 3984	041	SCREW, Round Head, #6-32 x 3/8.....	24
4	P 134471	057	PLATE, Support.....	1
5	P 129356	033	STANDOFF.....	8
6	P 146654	012	BOARD, PC.....	1
	P 150822	351	• BATTERY, Coin Cell.....	1
	P 764193	045	• REPAIRED BOARD.....	1
7	P 129352	094	WASHER, Flat, #6 (Nylon).....	8
8	P 56399	135	CABLE.....	1
9	P 134471	251	HARNESS, DC.....	1
10	P 150539	001	CLIP, Cable.....	4
11	P 3037	041	NUT, Hex, #6-32.....	8
12	P 141212	053	HOUSING, Control.....	1
13			SECONDARY CONTROL PANEL.....	1
			(See Figure 8-14)	
14	P 150825	365	DECAL, Circuit Breaker.....	1
15			DISPLAY PANEL (See Figure 8-13).....	1
16	P 90623	045	SCREW, Round Head, #8-32 x 5/16.....	4
17	P 19676	041	LOCKWASHER, #8.....	4
18	P 17796	091	WASHER, Flat, #8.....	4
19	P 134471	039	CONTROL, Primary.....	1
	P 764317	536	• LAMP (Box of 10).....	1
20	P 47760	091	SCREW, Hex Socket, #4-40 x 1/4.....	4
21	P 56399	138	COVER, Secondary.....	1
22	P 134471	067	COVER, Primary.....	1
23	P 129356	135	SCREW, Hex Socket, #8-32 x 3/8.....	2
24	P 146649	009	DOOR, Printer Display.....	1
25	P 129356	142	LABEL, Printcon.....	1
26	P 129356	002	STRIKE.....	1
27	P 82340	001	SCREW, Flat Head, #6 x 5/16.....	1
28	P 141198	171	PRINTER, Printcon (See Figure 8-15).....	1
29	P 150822	336	SCREW, Shoulder, #10-32.....	2
30	P 5511	091	WASHER, Flat, #10.....	2
31	P 129356	001	CATCH, Magnetic.....	1
32	P 2959	041	NUT, Hex, #10-32.....	2
33	P 16451	042	SCREW, Hex Socket, #10-32 x 5/8.....	2
34	P 129356	006	SCREW, Shoulder, #4-40 x 1/8.....	2
35	P 5469	041	WASHER, Flat, #6.....	2
36	P 56399	141	CABLE, Printer Take-up.....	1
37	P 56399	127	CABLE, Power Supply.....	1

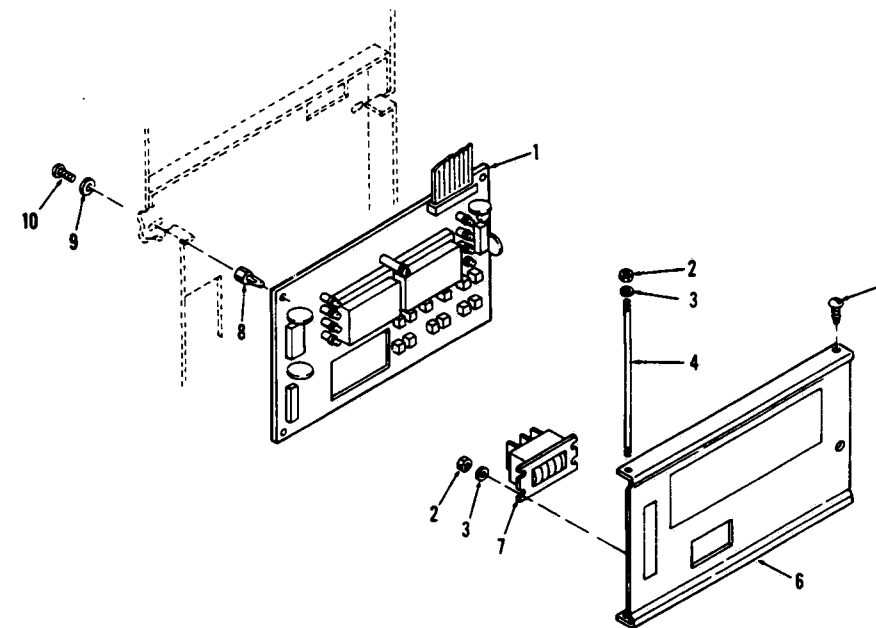


Figure 8-13. DISPLAY PANEL.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-13-			DISPLAY PANEL.....	X
1	P 146633	081	BOARD, PC Digital Display.....	1
	P 764193	029	• REPAIRED BOARD.....	1
2	P 13794	041	NUT, Hex, #4-40.....	4
3	P 84114	001	WASHER, Flat, #4.....	4
4	P 129356	023	STUD.....	1
5	P 40357	045	SCREW, Self Tap, #6 x 1/4.....	1
6	P 93900	001	BRACKET, Display.....	1
7	P 93900	022	SWITCH, Thumbwheel.....	1
8	P 84147	001	SUPPORT.....	3
9	P 5469	041	WASHER, Flat, #6.....	3
10	P 12451	041	SCREW, Round Head, #6-32 x 1/4.....	3

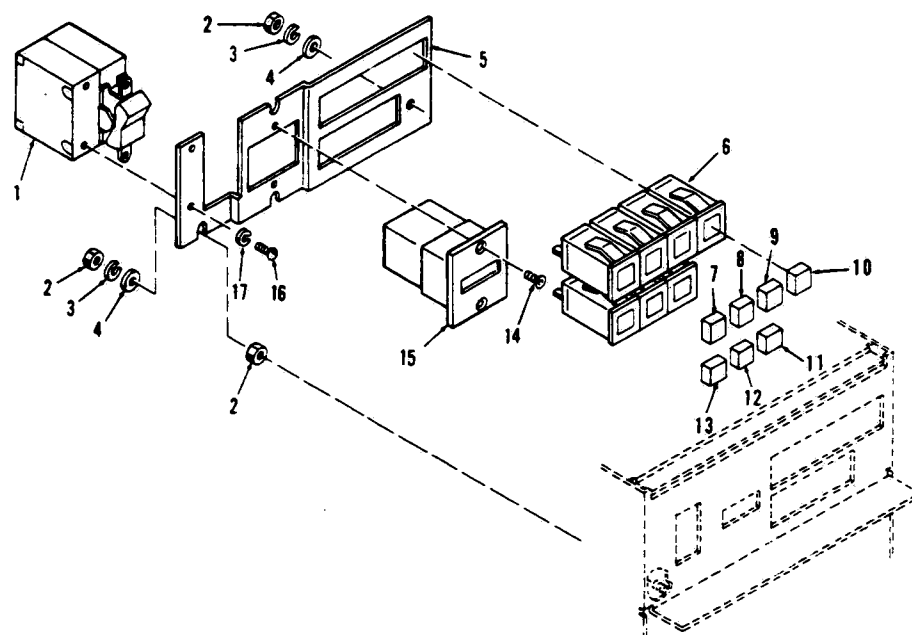


Figure 8-14. SECONDARY CONTROL PANEL.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-14 -			SECONDARY CONTROL PANEL.....	X
1	P 150475 991		CIRCUIT BREAKER .....	1
2	P 3153 041		NUT, Hex, #8-32 .....	7
3	P 19676 041		LOCKWASHER, #8 .....	4
4	P 17796 091		WASHER, Flat, #8 .....	4
5	P 134471 062		PLATE, Mounting .....	1
6	P 129352 168		SWITCH .....	7
7	P 150825 360		LENS, Open Load Door .....	1
8	P 150825 361		LENS, Close Load Door .....	1
9	P 150825 362		LENS, Open Unload Door .....	1
10	P 150825 359		LENS, Close Unload Door .....	1
11	P 150825 356		LENS, Recycle .....	1
12	P 150825 357		LENS, Abort Cycle .....	1
13	P 150825 358		LENS, Start Cycle .....	1
14	P 84119 001		SCREW, Flat Head, #6-32 x 1/4 .....	2
15	P 56399 139		COUNTER, DC .....	1
16	P 12451 041		SCREW, Round Head, #6-32 x 1/4 .....	2
17	P 19675 041		LOCKWASHER, #6 .....	2

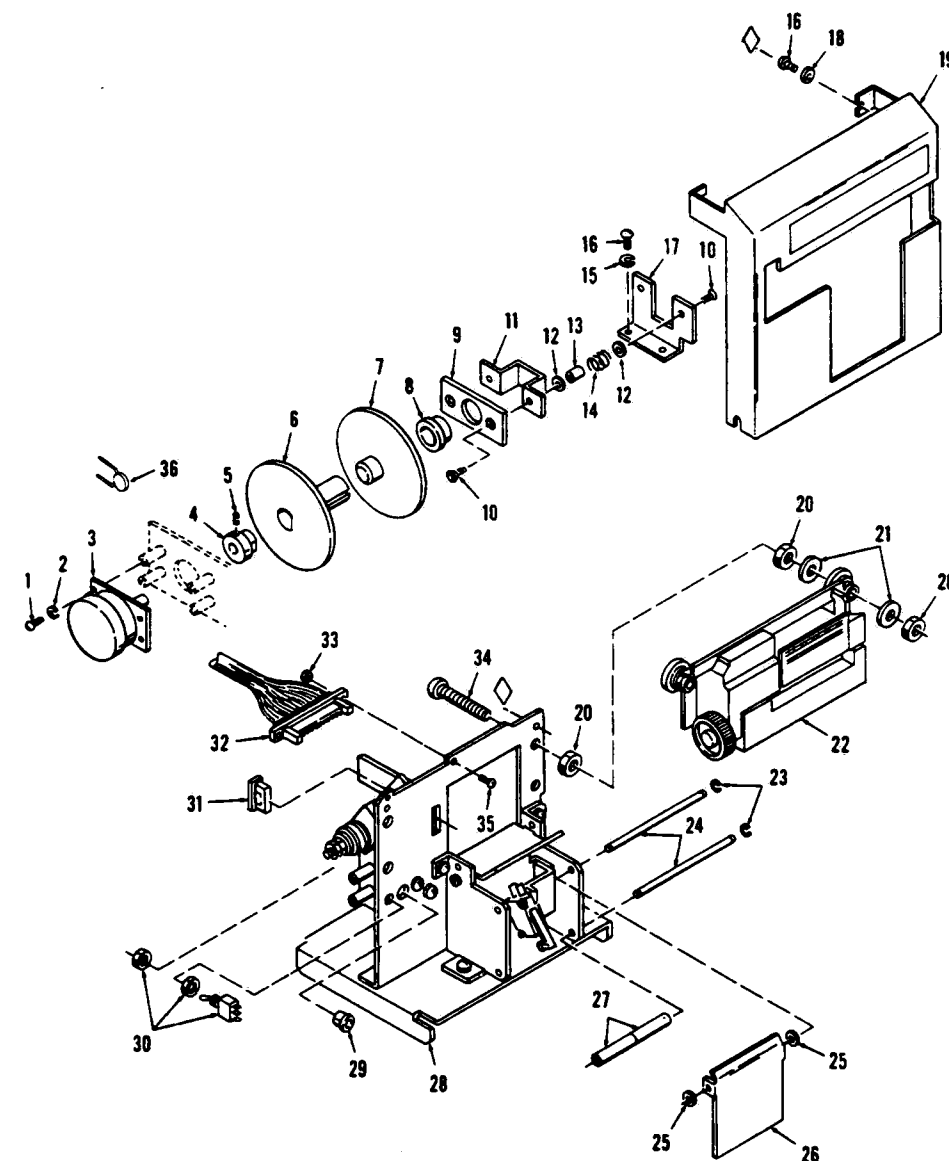


Figure 8-15. PRINTER FRAME ASSEMBLY (Part 1 of 2).



FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-15-	P 141198	571	PRINTER FRAME ASSEMBLY (Part 1 of 2) .....	X
1	P 90993	091	SCREW, Round Head, #4-40 x 3/4 .....	4
2	P 81682	003	LOCKWASHER, #4 .....	4
3	P 41269	091	MOTOR .....	1
4	P 150822	480	STUD, Drive .....	1
5	P 129352	117	SET SCREW, #5-40 .....	1
6	P 93896	077	SPOOL, Drive End .....	1
7	P 56396	300	SPOOL, Idler End .....	1
8	P 129352	662	BEARING, Flange .....	1
9	P 150822	543	RETAINER .....	1
10	P 38698	041	SCREW, Flat Head, #8-32 x 1/4 .....	4
11	P 150822	546	RELEASE, Reel .....	1
12	P 17796	091	WASHER .....	4
13	P 150822	541	SPACER .....	2
14	P 129352	659	SPRING .....	2
15	P 18131	091	LOCKWASHER .....	2
16	P 12451	041	SCREW, Round Head, #6-32 x 1/4 .....	6
17	P 150822	542	SUPPORT .....	1
18	P 5469	041	WASHER, Flat, #6 .....	4
19	P 134468	929	COVER .....	1
20	P 3040	041	NUT, Hex, 1/4-20 .....	9
21	P 31599	041	WASHER, Flat, 1/4 .....	6
22	P 136800	081	PRINTER, Olivette Type .....	1
	P 129356	116	• PAPER, Single Ply (Box of 3 Rolls) .....	1
	P 129356	118	• CARTRIDGE, Inked Ribbon (Box of 2) .....	1
	P 150828	467	PRINTER KIT, EPSON .....	1
	P 134468	927	• PRINTER ONLY .....	1
	P 150828	420	• 2 Ply Paper (3 Rolls) .....	1
	P 129356	117	• 2 Ply Paper (1 Roll) .....	1
23	P 45301	091	E-RING .....	6
24	P 129356	016	SHAFT, Roller .....	3
25	P 129352	094	WASHER, Nylon, #6 .....	2
26	P 129356	020	PLATEN .....	1
27	P 129352	115	TUBE, Roller .....	4
28			FRAME ASSEMBLY, Printer (See Figure 8-16) .....	1
29	P 77797	091	BUSHING, Snap .....	2
30	P 129356	131	SWITCH, Toggle, SPDT .....	1
31	P 150475	014	CATCH, Magnetic .....	1
32	P 134468	530	CABLE ASSEMBLY .....	1
33	P 10370	045	NUT, Hex, #2-56 .....	2
34	P 4004	041	SCREW, Round Head, 1/4-20 x 1-1/2 .....	3
35	P 150824	124	SCREW, Round Head, #2-56 x 3/4 .....	2
36	P 150777	001	CAPACITOR .....	1

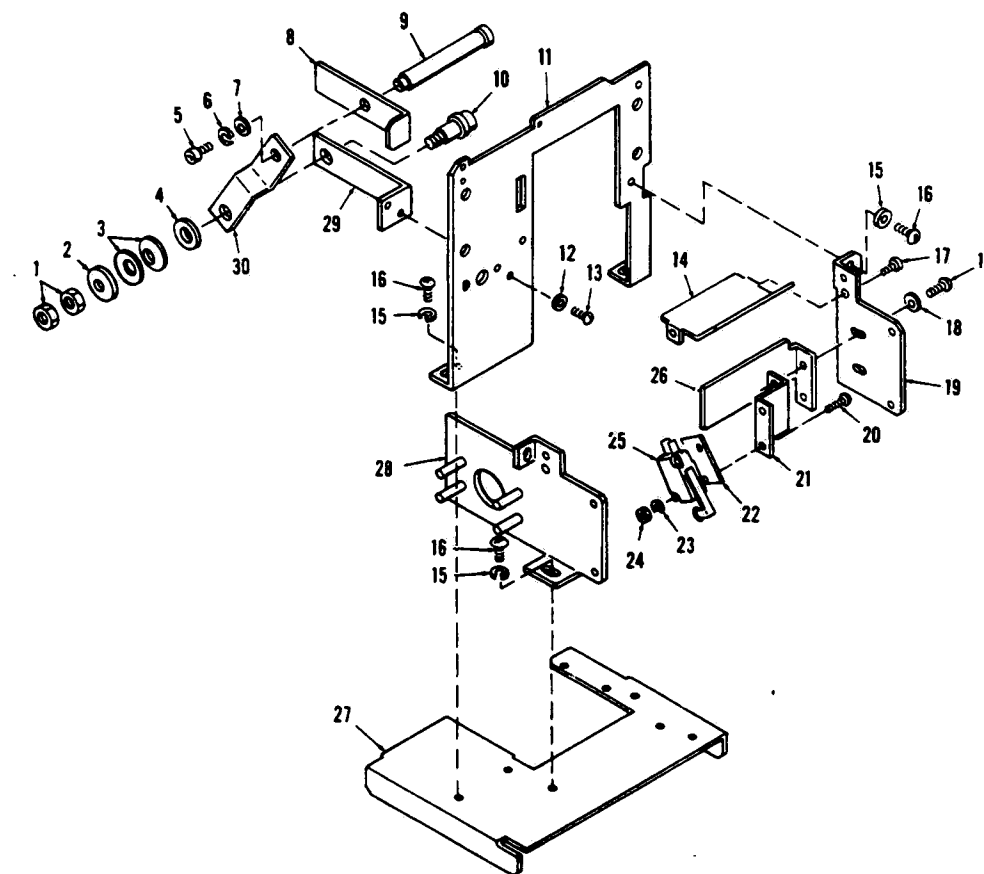


Figure 8-16. PRINTER FRAME ASSEMBLY (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-16-	P 141198	571	PRINTER FRAME ASSEMBLY (Part 2 of 2) .....	X
1	P 19172	061	NUT, Jam, 5/16-18 .....	2
2	P 36690	051	WASHER, Flat .....	1
3	P 129356	132	WASHER, Belleville .....	2
4	P 10412	042	WASHER, Flat .....	1
5	P 33061	061	SCREW, Socket Head, #10-32 x 5/8 .....	1
6	P 19685	061	LOCKWASHER, #10 .....	1
7	P 5511	091	WASHER, Flat, #10 .....	1
8	P 129356	110	STOP .....	1
9	P 150822	540	SPINDLE .....	1
10	P 150044	001	SCREW, Shoulder, 5/16-18 .....	1
11	P 134468	528	PLATE, Mounting .....	1
12	P 5511	091	WASHER, Flat, #10 .....	2
13	P 12539	061	SCREW, Round Head, #10-32 x 3/8 .....	2
14	P 93900	010	PLATE, Paper Feed .....	1
15	P 18131	091	LOCKWASHER, #6 .....	8
16	P 12451	041	SCREW, Round Head, #6-32 x 1/4 .....	7
17	P 77074	045	SCREW, Self-tapping, #8-18 x 3/8 .....	2
18	P 5469	041	WASHER, Flat, #6 .....	2
19	P 56396	298	SIDE, RH .....	1
20	P 90993	091	SCREW, Round Head, #4-40 x 3/4 .....	2
21	P 129356	014	MOUNT, Switch .....	1
22	P 90124	091	INSULATOR .....	1
23	P 81682	003	LOCKWASHER, #4 .....	2
24	P 13794	041	NUT, Hex, #4-40 .....	2
25	P 150822	343	SWITCH, Roller Arm .....	1
26	P 150822	554	SHIELD .....	1
27	P 134468	527	BASE, Printer .....	1
28	P 56396	297	SIDE, LH .....	1
29	P 56396	299	ANGLE, Pivot .....	1
30	P 129356	112	ARM, Pivot .....	1

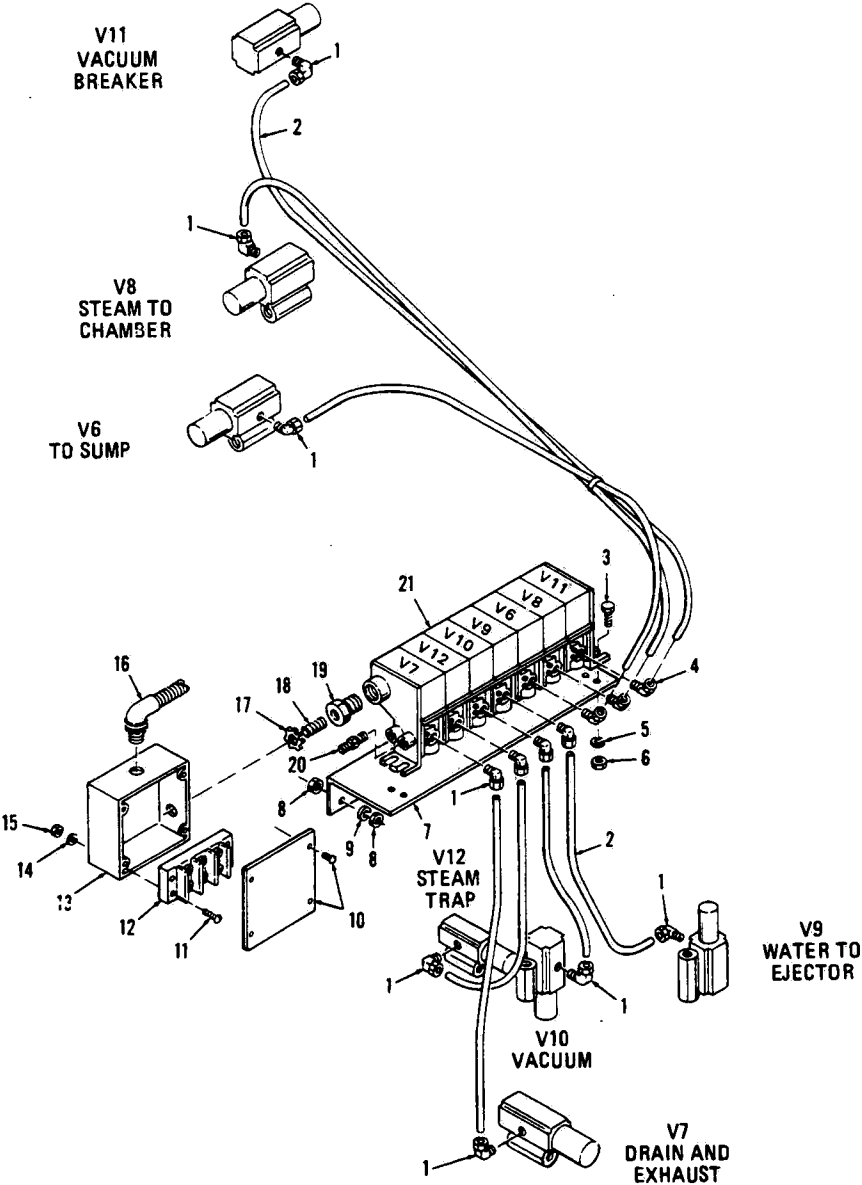


Figure 8-17. MANIFOLD ARRANGEMENT.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-17-	P 141212	042	MANIFOLD ARRANGEMENT .....	X
1	P 21990	091	ELL, Comp, 1/4 ODT x 1/8 NPT .....	11
	P 84371	001	INSERT .....	11
2	R 3500	735	TUBING, Nylon, 1/4 OD .....	A/R
3	P 3848	091	SCREW, Hex Head, 1/4-20 x 3/4 .....	4
4	P 52697	091	ELL, Comp 45°, 1/4 ODT x 1/8 NPT .....	3
	P 84371	001	INSERT .....	3
5	P 19678	045	LOCKWASHER, 1/4 .....	4
6	P 3097	041	NUT, 1/4-20 .....	4
7	P 56399	122	BRACKET, Valve .....	1
8	P 2947	048	NUT, Hex, 5/16-18 .....	4
9	P 81682	008	LOCKWASHER, 5/16 .....	2
10	P 22614	091	COVER .....	1
11	P 3987	041	SCREW, Round Head, #8-32 x 3/4 .....	4
12	P 90746	091	TERMINAL STRIP .....	1
13	P 90754	091	BOX .....	1
14	P 19676	041	LOCKWASHER .....	4
15	P 3038	041	NUT, Hex, #8-32 .....	4
16	P 134471	078	CABLE ASSEMBLY .....	1
17	P 8681	091	LOCK NUT .....	2
18	P 150667	001	NIPPLE, 1/2 NPT x 1-1/4 .....	1
19	P 150476	985	BUSHING, Reducing, 3/4 x 1/2 NPT .....	1
20	P 77774	091	STRAINER, 1/4 NPT .....	1
21	P 56396	819	VALVES, 3-Way, (Gang of 7) .....	1
	P 764317	658	• VALVE, Individual .....	7
	P 764317	593	• KIT, Valve Repair .....	7
	P 764317	594	• COIL .....	7
	P 764321	185	GASKET KIT ACTUATOR, 1/4 Thru 3/4, (Not Shown) .....	
	P 764321	186	GASKET KIT ACTUATOR 1" thru 2", (Not Shown) .....	

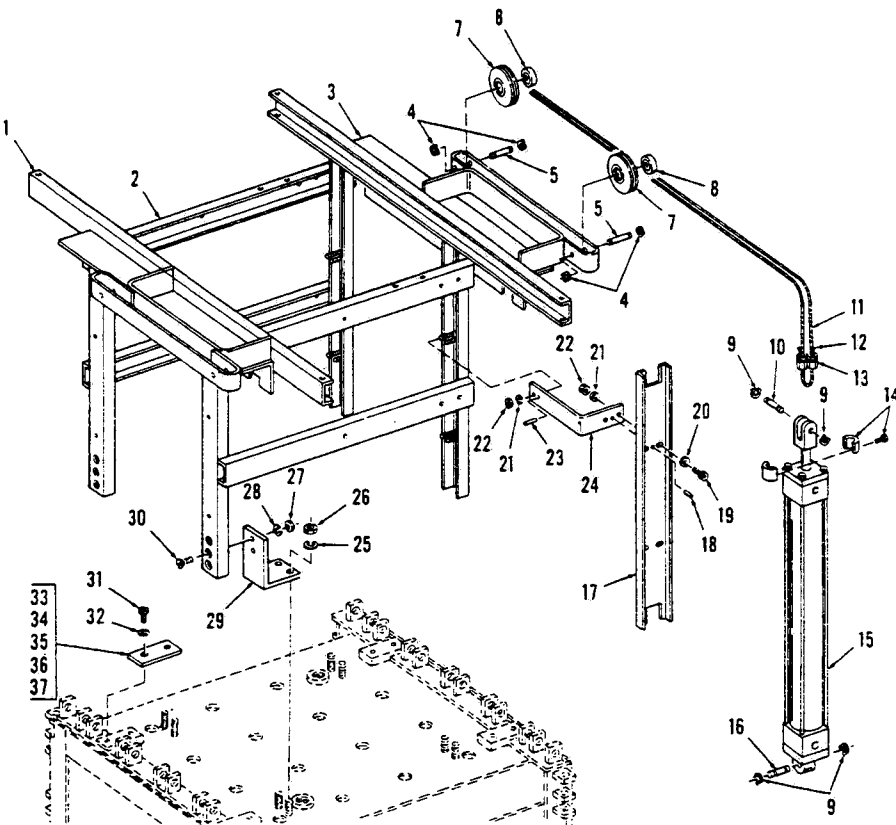


Figure 8-18. DOOR PACKAGE (Part 1 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-18-	P 99096	091	DOOR PACKAGE (Part 1 of 3).....	X
	P 98059	010	SUPERSTRUCTURE DOOR LIFT .....	1
1	P 98060	091	• SUPPORT, Entrance .....	1
2	P 51588	091	• CHANNEL, Horizontal .....	4
3	P 98061	091	• SUPPORT, Exit .....	1
4	P 31952	091	SNAP RING .....	8
5	P 51628	045	SHAFT .....	4
6	P 10456	091	WASHER .....	8
	P 56317	001	PULLEY ASSEMBLY .....	4
7	P 56316	001	• PULLEY .....	4
8	P 150684	001	• BEARING .....	4
9	P 42639	091	RING, Retaining .....	8
10	P 51639	061	PIN .....	4
11	P 150686	001	CABLE, 123" Long .....	2
12	P 150687	001	CABLE, Safety, 9" Long .....	2
13	P 150666	001	CLAMP, Wire .....	4
14	P 81049	091	COLLAR, Split .....	2
15	P 81050	001	CYLINDER LIFT .....	2
	P 754819	091	• KIT, Seal .....	1
16	P 51629	061	SHAFT PIN .....	2
17	P 54768	045	GUIDE, Roller .....	4
18	P 45685	061	ROLLPIN, 3/16 x 1/2 .....	8
19	P 12176	041	SCREW, Socket Head, 1/4-20 x 3/4 .....	16
20	P 49134	061	WASHER, Flat .....	44
21	P 19686	061	LOCKWASHER, 1/4 .....	32
22	P 3097	041	NUT, 1/4-20 .....	32
23	P 47979	061	ROLLPIN, 3/16 x 1-1/4 .....	8
24	P 51595	010	SUPPORT GUIDE .....	8
25	P 19687	061	LOCKWASHER, 3/8 .....	8
26	P 3099	042	NUT, 3/8-16 .....	8
27	P 3098	045	NUT, 5/16-18 .....	8
28	P 19681	045	LOCKWASHER, 5/16 .....	8
29	P 51811	010	SUPPORT .....	4
30	P 38363	052	SCREW, Flat Head, 5/16-18 x 2 .....	8
31	P 23431	041	SCREW, Socket Head, #10-32 x 3/8 .....	8
32	P 46115	091	LOCKWASHER, #10 .....	8
33	P 51753	061	SHIM, 0.093 Thk .....	A/R
34	P 51754	061	SHIM, 0.062 Thk .....	A/R
35	P 51755	061	SHIM, 0.031 Thk .....	A/R
36	P 51872	061	SHIM, 0.010 Thk .....	A/R
37	P 5.871	061	SHIM, 0.015 Thk .....	A/R
	P 764315	830	KIT, Door Safety Bar (Not Shown)	
	P 150691	001	SAFETY BAR (Not Shown)	

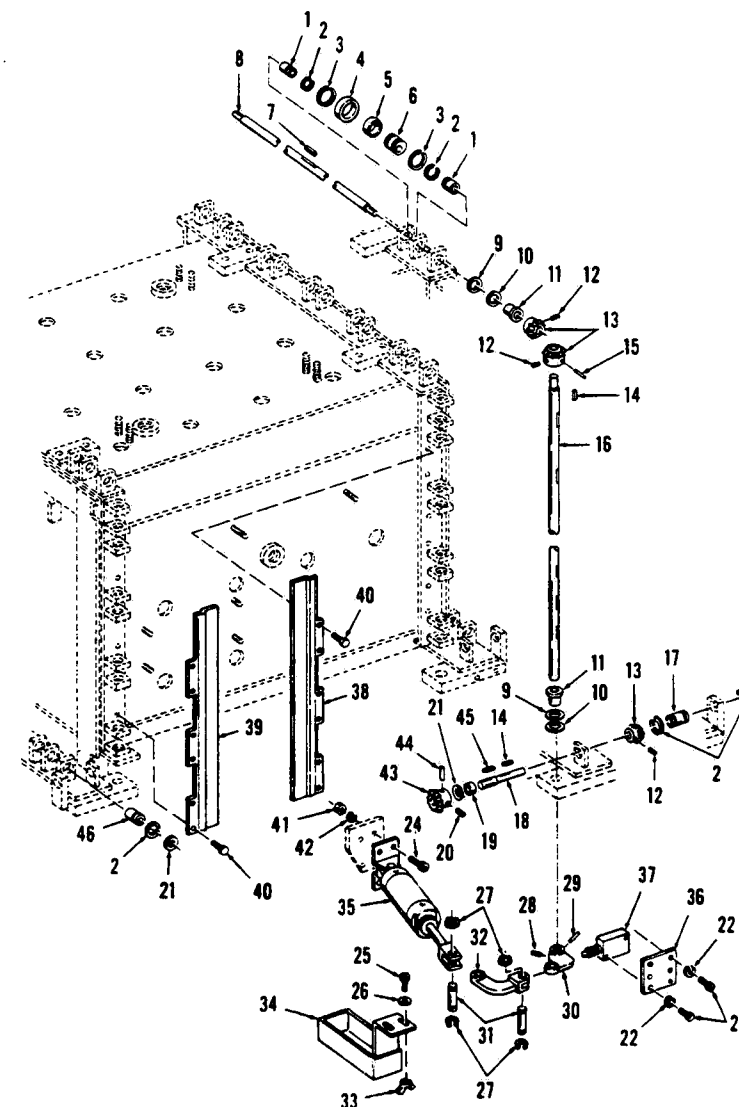


Figure 8-19. DOOR PACKAGE (Part 2 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-19-	P 99096	091	DOOR PACKAGE (Part 2 of 3).....	X
1	P 51673	091	BUSHING, Oilite.....	72
2	P 51680	001	RING, Retaining.....	84
	P 51679	091	CAM ROLLER ASSEMBLY.....	36
3	P 46040	091	• SNAP RING.....	2
4	P 51618	045	• ROLLER, Cam.....	1
5	P 51611	091	• BUSHING, Oilite.....	1
6	P 51592	045	• CAM.....	1
7	P 81078	006	KEY, 1/8 x 5/8.....	36
8	P 54773	045	SHAFT, Top and Bottom.....	4
9	P 81030	061	SHIM, 0.010 Thk.....	A/R
10	P 81031	061	SHIM, 0.015 Thk.....	A/R
	P 150878	390	SHIM, .062 Thk.....	A/R
11	P 51658	091	BUSHING, Flange Oilite.....	12
12	P 4772	045	SETSCREW, 1/4-20 x 1/4.....	16
13	P 51594	045	GEAR.....	16
14	P 17277	091	KEY, 1/8 x 7/8.....	16
15	P 43259	091	SETSCREW, #6-32 x 3/16.....	16
16	P 54772	045	SHAFT, Side.....	4
17	P 51625	091	BUSHING, Oilite.....	4
18	P 51593	045	SHAFT, Short.....	4
19	P 51681	091	BUSHING, Oilite.....	4
20	P 31892	091	SETSCREW, 5/16-18 x 1/4.....	8
21	P 150235	001	SHIM, 0.010 Thk.....	A/R
22	P 19686	061	LOCKWASHER, 1/4.....	8
23	P 12176	041	SCREW, Socket Head, 1/4-20 x 3/4.....	8
24	P 3851	042	SCREW.....	8
25	P 3998	041	SCREW, Round Head, 1/4-20 x 1/2.....	8
26	P 49134	061	WASHER, Flat.....	8
27	P 42639	091	RING, Retaining.....	16
28	P 10583	091	SETSCREW, #10-32 x 3/16.....	4
29	P 43229	061	ROLLPIN.....	4
30	P 51589	043	ACTUATOR.....	4
31	P 51639	061	PIN.....	8
32	P 51635	043	LINK.....	4
33	P 3097	041	NUT, 1/4-20.....	8
34	P 97037	031	PAN, Oil.....	4
35	P 51584	091	CYLINDER LOCK (See Figure 8-39).....	4
36	P 51524	091	SUPPORT, Valve.....	2
37	P 51605	091	VALVE, Diverter.....	2
38	P 54769	045	GUIDE, Roller, Left Hand.....	2
39	P 54770	045	GUIDE, Roller, Right Hand.....	2
40	P 20821	061	SCREW, #10-32 x 3/16.....	24
41	P 3098	045	NUT, 5/16-18.....	8
42	P 19681	045	LOCKWASHER, 5/16.....	8
43	P 51621	045	GEAR.....	8
44	P 33456	061	SETSCREW, #8-32 x 3/16.....	8
45	P 12704	091	KEY, 3/16.....	12
46	P 51624	091	BUSHING.....	4

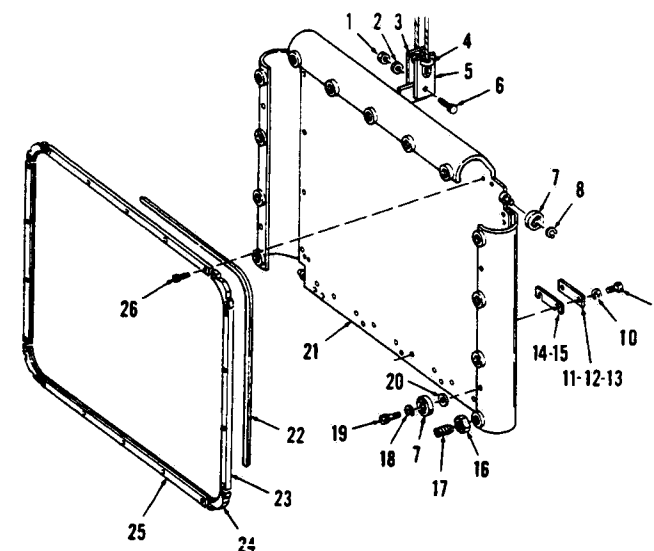


Figure 8-20. DOOR PACKAGE (Part 3 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-20-	P 99096	091	DOOR PACKAGE (Part 3 of 3) .....	X
1	P 118443	045	NUT, Lock, #1/4-20 .....	2
2	P 10445	091	WASHER, Flat, 1/4 .....	2
3	P 118441	045	NUT, Lock, #10-24 .....	8
4	P 18933	091	CABLE CLAMP .....	4
5	P 150685	001	CLEAT, Lifting .....	4
6	P 150773	001	SCREW, Hex, #1/4-20 x 1-1/2 .....	2
7	P 81055	001	ROLLER .....	16
8	P 42641	091	RING, Retaining .....	8
9	P 23431	041	SCREW, Socket Head, #10-32 x 3/8 .....	20
10	P 46115	091	LOCKWASHER, #10 .....	20
11	P 51753	061	SHIM, 0.093 Thk .....	A/R
12	P 51754	061	SHIM, 0.062 Thk .....	A/R
13	P 51755	061	SHIM, 0.031 Thk .....	A/R
14	P 51872	061	SHIM, 0.010 Thk .....	A/R
15	P 51871	061	SHIM, 0.015 Thk .....	A/R
16	P 81173	001	NUT, Hex .....	26
17	P 81208	001	SCREW, Socket Head .....	26
18	P 19687	061	LOCKWASHER, 3/8 .....	8
19	P 16868	041	SCREW, Socket Head, 3/8-16 x 7/8 .....	8
20	P 43754	045	WASHER .....	8
21	P 760265	775	DOOR .....	2
22	P 756124	091	GASKET KIT, Includes Gasket Bar Mounting Screws .....	2
23	P 51586	091	GASKET BAR, Side .....	4
24	P 51512	001	GASKET BAR, Corner .....	8
25	P 51585	091	GASKET BAR, Top and Bottom .....	4
26	P 46705	061	SCREW, Socket Head, 1/4-28 .....	52

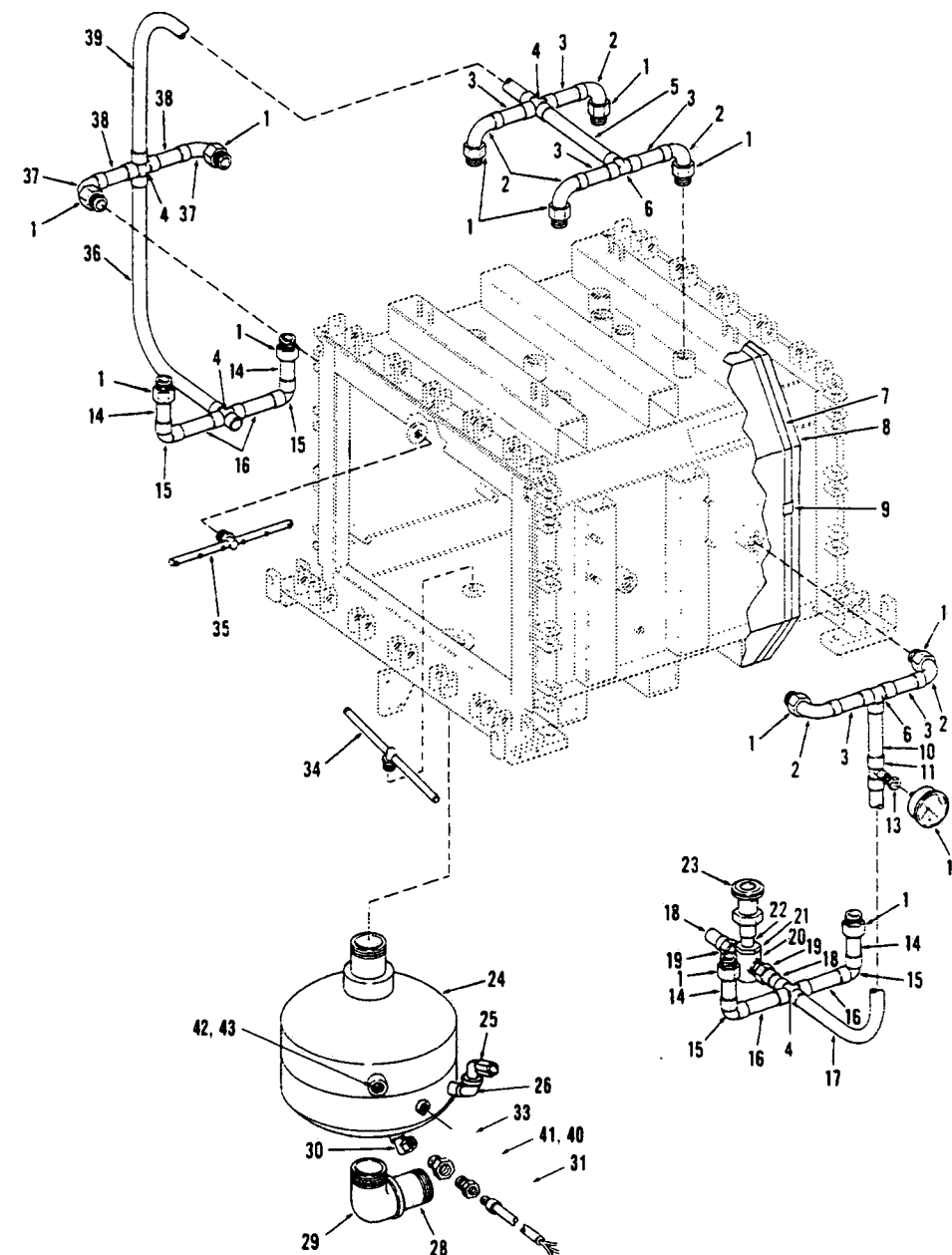


Figure 8-21. SHELL PIPING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-21-				SHELL PIPING ASSEMBLY .....	X		
1	P	51761	091	ADAPTER, 1" NPT .....	12		
2	P	91475	091	ELBOW .....	6		
3	P	79470	091	TUBE, 1/8 .....	6		
4	P	51760	091	CROSS .....	4		
5	P	79471	091	TUBE .....	1		
6	P	89713	091	TEE .....	2		
	P	762193	001	KIT, Insulation .....	1		
7				• INSULATION .....	1		
8				• STRAPPING .....	1		
9				• SEAL .....	1		
				• TAPE .....	1		
10	P	51742	091	TUBE .....	1		
11	P	51772	091	TEE .....	1		
12	P	90525	091	GAUGE .....	1		
13	P	33447	091	REDUCER .....	1		
14	P	51768	091	TUBE .....	4		
15	P	44492	091	ELBOW .....	4		
16	P	51765	091	TUBE .....	4		
17	P	51762	091	TUBE .....	1		
18	P	89961	091	TUBE .....	2		
19	P	51759	091	UNION .....	2		
20	P	51758	091	CROSS .....	1		
21	P	828	091	REDUCER .....	1		
22	P	51743	091	NIPPLE .....	1		
23	P	51795	091	VALVE, Riser (See Figure 8-23) .....	1		
24	P	755715	566	SUMP ASSEMBLY .....	1		
	P	51814	091	• NOZZLE .....	1		
25	P	23972	091	ELBOW, Street .....	1		
26	P	1634	091	ELBOW .....	1		
28	P	51861	091	NIPPLE .....	1		
29	P	51746	091	ELBOW .....	1		
30	P	81062	001	ELBOW, Compression .....	1		
31	P	56396	211	PROBE and Contact .....	1		
33	P	150822	845	BUSHING, RTD Probe .....	1		
34	P	93353	001	ARM, Sprayer (See Figure 8-22) .....	4		
35	P	93354	001	ARM, Sprayer (See Figure 8-22) .....	8		
36	P	51769	091	TUBE .....	1		
37	P	51764	091	ELBOW .....	2		
38	P	51767	091	TUBE .....	2		
39	P	51750	091	TUBE .....	1		
40	P	150822	802	BUSHING, Probe .....	1		
41	P	150822	801	BUSHING, Support .....	1		
42	P	129361	975	BUSHING .....	1		
43	P	93910	880	WATER LEVEL SENSOR .....	1		
	P	93910	879	LIQUID LEVEL DETECTOR ONLY, Flip Top (Not Shown) .....			

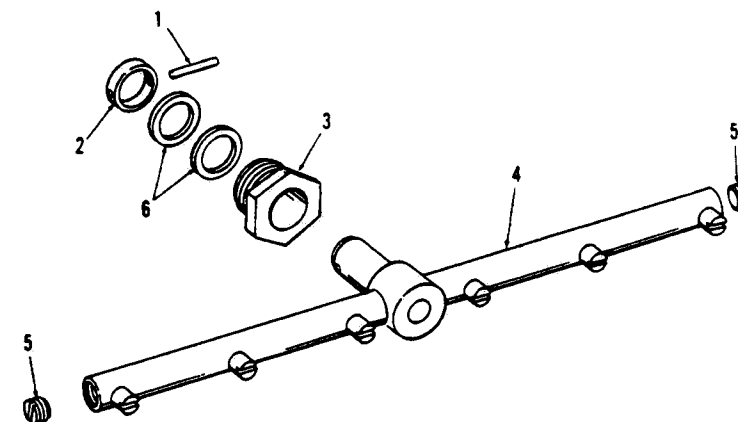


Figure 8-22. ARM AND BEARING.

FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-22-	P	93353	001	ARM AND BEARING, Bottom .....	4		
	P	93354	001	ARM AND BEARING, Top and side .....		8	
1	P	43262	061	PIN, Roll .....	1	1	
2	P	150822	312	RING, Retaining .....	1	1	
3	P	150822	875	BEARING .....	1	1	
4	P	56396	169	ARM ASSEMBLY .....	1		
		56396	170	ARM ASSEMBLY .....		1	
	P	51708	091	• SPRAY NOZZLE .....			
5	P	51874	042	PLUG .....	2	2	
6	P	150822	874	FLANGE BEARING .....	1	1	
	P	764316	204	WRENCH-SOCKET (Not Shown) .....			
	P	764322	082	KIT, Old Style Bearing to New Style .....			

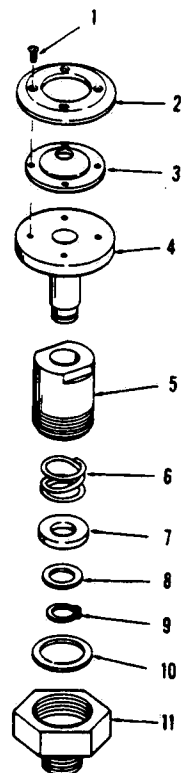


Figure 8-23. RISER VALVE.

FIG. & INDEX NO.	P	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-23-	P	51795	091	RISER VALVE .....	X
1	P	3961	041	SCREW .....	4
2	P	51803	061	RING .....	1
3	P	51789	091	SEAL .....	1
4	P	51800	061	STEM ASSEMBLY .....	1
5	P	51798	043	BODY .....	1
6	P	51807	061	SPRING .....	1
7	P	51808	091	GUIDE .....	1
8	P	51806	061	WASHER .....	1
9	P	42643	091	RING, Retaining .....	1
10	P	150742	001	GASKET .....	1
11	P	51794	043	ADAPTER .....	1

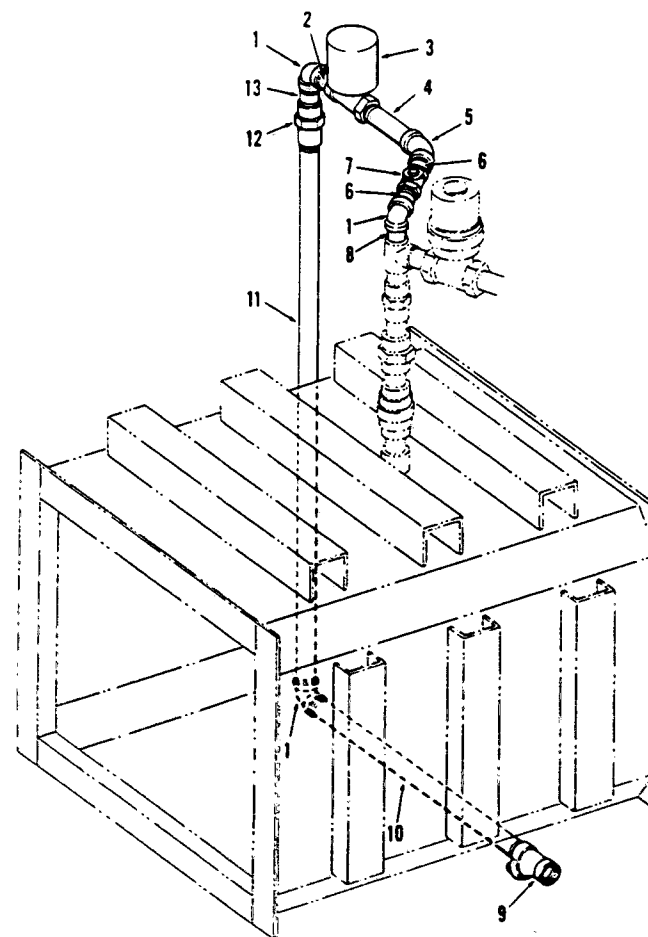


Figure 8-24. DEIONIZED WATER SUPPLY PIPING ASSEMBLY.



FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-24-	P 134471	037	DEIONIZED WATER SUPPLY PIPING ASSEMBLY .....	X
1	P 1637	091	ELBOW, 1 NPT .....	3
2	P 29356	091	NIPPLE, 1 NPT x 2 .....	1
3	P 80028	091	VALVE, Solenoid, 1 .....	1
	P 764319	945	• COIL, RB 41 PB .....	1
	P 764319	946	• KIT, Repair, RB 41 PB .....	1
	P 759494	001	REPAIR KIT, B10P .....	1
	P 764319	955	COIL, B10P .....	1
4	P 29369	091	NIPPLE, 1 NPT x 5-1/4 .....	1
5	P 51852	091	ELBOW, 45°, 1 NPT .....	1
6	P 29354	091	NIPPLE, 1 NPT x 1-1/2 .....	2
7	P 51770	091	VALVE, Check, 1 NPT .....	1
8	P 29362	091	NIPPLE, 1 NPT x 3-1/2 .....	1
9	P 51850	091	STRAINER, 1 NPT .....	1
10	P 44823	091	• NIPPLE, 1 NPT x 25 .....	1
	P 48774	091	ROD, Support (Not Shown) .....	1
	P 39591	010	CLAMP, Pipe (Not Shown) .....	1
11	P 29392	091	NIPPLE, 1 NPT x 42 .....	1
12	P 5283	091	UNION, 1 NPT .....	1
13	P 29364	091	NIPPLE, 1 NPT x 4 .....	1

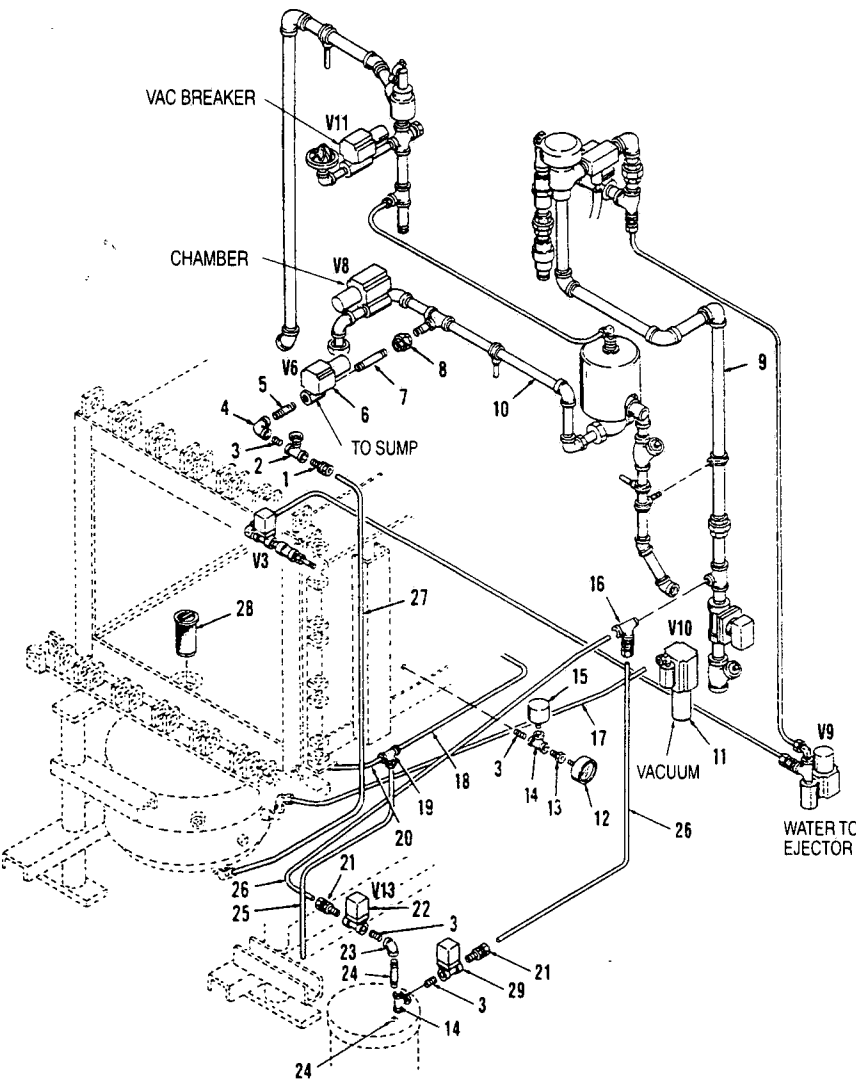


Figure 8-25. PIPING ASSEMBLY (Part 1 of 3).

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-25-	P 630938	060	PIPING ASSEMBLY (Part 1 of 3) .....	X
1	P 90207	091	ADAPTER, 1/2 ODT x 1/4 NPT .....	1
2	P 89076	091	VALVE, Flow Control, 1/4 NPT .....	1
3	P 28916	091	NIPPLE, 1/4 NPT x 7/8 .....	3
4	P 37863	091	ELL. Reducing, 1/4 x 1/2 NPT .....	5
5	P 40614	091	NIPPLE, 1/2 NPT x 1-3/8 .....	1
6	P 150822	928	VALVE, Ball, 1/2 NPT .....	1
	P 764317	587	• KIT, Valve Repair .....	1
	P 764317	578	• KIT, Actuator Repair .....	1
	P 764321	185	GASKET KIT .....	1
7	P 29174	091	NIPPLE, 1/2 NPT x 4 .....	1
8	P 89990	091	UNION, 1/2 NPT .....	1
9			PIPING ASSEMBLY, Part 2 of 3, (See Figure 8-26) .....	1
10			PIPING ASSEMBLY, Part 3 of 3, (See Figure 8-27) .....	1
11			STAND PIPING ASSEMBLY, Part 2 of 2, (See Figure 8-30) .....	1
12	P 90525	091	GAUGE, Pressure .....	1
13	P 939	042	BUSHING, Reducing, 1/4 x 1/8 NPT .....	1
14	P 43649	091	TEE, 1/4 NPT .....	2
15	P 56396	215	TRANSDUCER .....	1
16	P 33405	091	FITTING, Tee Compression, 3/8 ODT x 3/8 NPT (M) x 3/8 ODT .....	1
17	P 915	350	TUBE, 5/8 OD, B75 .....	A/R
18	P 915	315	TUBE, 1/2 OD, B88 .....	A/R
19	P 30981	091	TEE, 1/2 ODT .....	1
20	P 915	315	TUBE, 1/2 OD, B88 .....	A/R
21	P 78292	091	FITTING, Compression, 3/8 ODT x 1/4 IPS .....	2
22	P 41626	091	VALVE, Solenoid, 1/4 NPT .....	1
	P 752018	091	• COIL, J-218 .....	1
	P 758799	091	• KIT, Valve Repair, J-218 .....	1
	P 764319	939	• COIL, GP-218 .....	1
	P 764319	924	KIT REPAIR, GP218 .....	1
23	P 1618	091	ELL, 1/4 NPT .....	1
24	P 28920	091	NIPPLE, 1/4 NPT x 1-3/4 .....	2
25	P 915	315	TUBE, 1/2 OD, B88 .....	A/R
26	P 915	209	TUBE, 3/8 OD, B88 .....	A/R
27	P 915	315	TUBE, 1/2 OD, B88 .....	A/R
28	P 51741	061	STRAINER .....	1
29	P 83523	001	NEEDLE VALVE, 1/4 .....	1

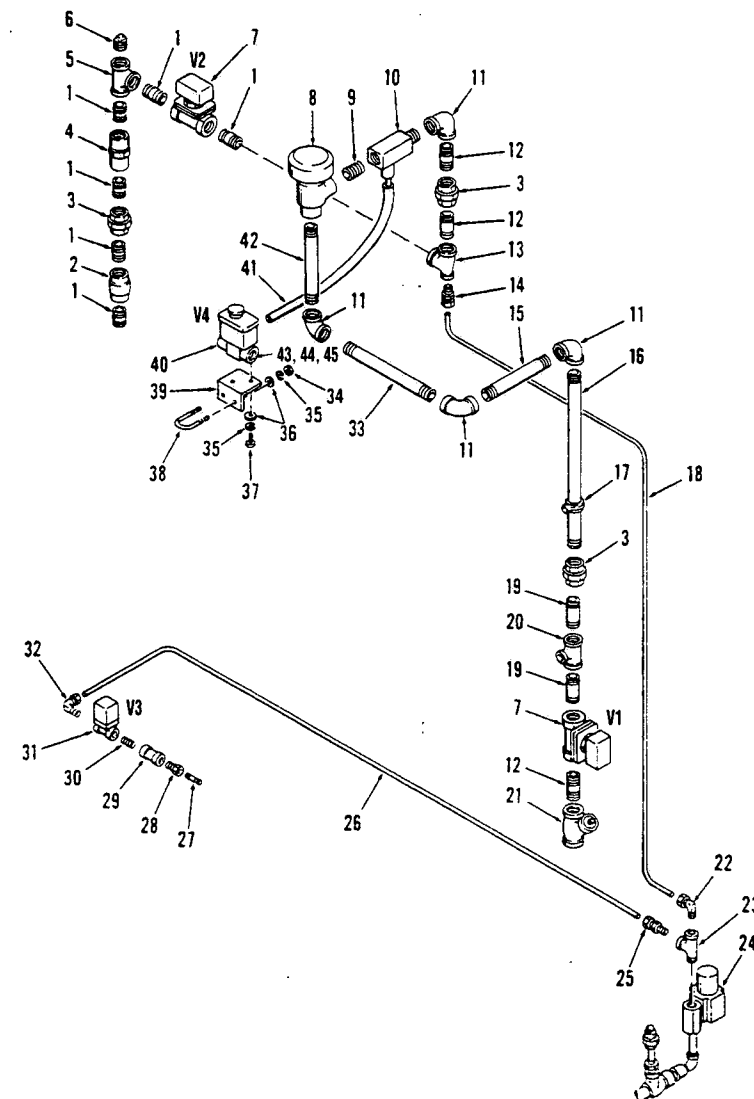
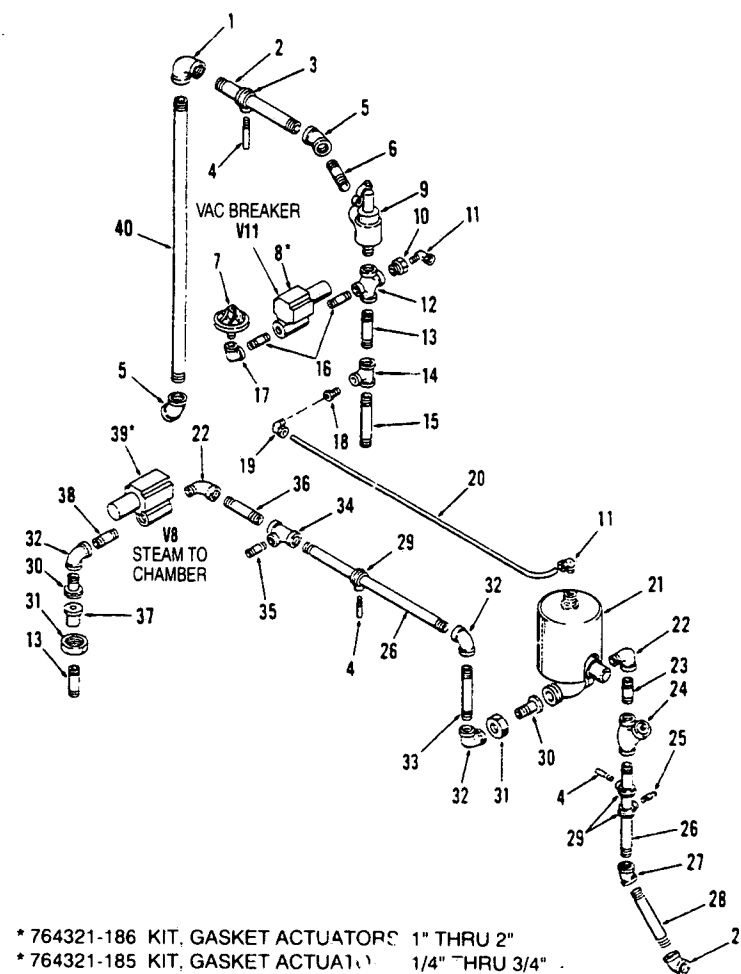


Figure 8-26. PIPING ASSEMBLY (Part 2 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-26-			PIPING ASSEMBLY (Part 2 of 3) .....	X
1	P 29354 091		NIPPLE, 1 NPT x 1-1/2 .....	6
2	P 51770 091		VALVE, Check, 1 NPT .....	1
3	P 5283 091		UNION, 1 NPT .....	3
4	P 51796 044		FLOW CONTROL .....	1
5	P 4942 091		TEE, 1 NPT .....	1
6	P 3444 091		PLUG, Pipe, 1 NPT .....	1
7	P 80028 091		VALVE, Solenoid .....	1
	P 764319 946		• KIT, Valve Repair .....	1
	P 764319 945		• KIT, Coil, 120 V .....	1
8	P 51797 091		VACUUM RELIEF .....	1
	P 757589 091		• KIT, Repair, M2 75BFPRK .....	1
	P 758209 091		• KIT, Repair, M4 74BFPRK .....	1
9	P 29380 091		NIPPLE, 1 NPT x 1-1/4 .....	1
10	P 51903 091		INJECTOR, Model 208 .....	1
	P 758684 091		• 208C, 764321-524 .....	1
11	P 1638 091		ELL, 1 NPT .....	4
12	P 29358 091		NIPPLE, 1 NPT x 2-1/2 .....	3
13	P 4940 091		TEE, Reducing, 1 x 1/2 x 1 NPT .....	1
14	P 81059 001		FITTING, Compression, 1/2 ODT x 1/2 IPS .....	1
15	P 29376 091		NIPPLE, 1 NPT x 7 .....	1
16	P 44819 091		NIPPLE, 1 NPT x 21 .....	1
17	P 39591 010		CLAMP .....	1
18	P 915 315		TUBE, 1/2 OD, B88 .....	A/R
19	P 29360 091		NIPPLE, 1 NPT x 3 .....	2
20	P 4934 091		TEE, Reducing, 1 x 1 x 3/8 NPT .....	1
21	P 51850 091		STRAINER .....	1
			• SCREEN .....	1
22	P 81063 001		ELL, Compression, 1/2 ODT x 1/2 IPS .....	1
23	P 91154 091		TEE, Street, 1/2 NPT .....	1
24			STAND PIPING ASSEMBLY, Part 2 of 2, .....	1
			(See Figure 8-30) .....	
25	P 81057 001		FITTING, Compression, 1/4 ODT x 1/2 IPS .....	1
26	P 915 120		TUBE, 1/4 OD, B280 .....	A/R
27	P 28902 091		NIPPLE, 1/8 NPT x 2-1/2 .....	1
28	P 939 042		BUSHING, Reducing, 1/4 NPT x 1/8 NPT .....	1
29	P 89018 091		REGULATOR .....	1
30	P 28916 091		NIPPLE, 1/4 NPT x 7/8 .....	1
31	P 41626 091		VALVE, Solenoid .....	1
	P 752018 091		• COIL .....	1
	P 758799 091		• KIT, Valve Repair .....	1
32	P 45407 091		ELL, Compression, 1/4 ODT x 1/4 IPS .....	1
33	P 36266 091		NIPPLE, 1 NPT x 10-1/4 .....	1
34			NUT, Hex, #10-24 .....	2
35	P 19685 061		LOCKWASHER, #10 .....	4
36	P 17589 045		WASHER, Flat .....	4
37	P 3929 045		SCREW, Round Head, #10-24 x 112 .....	2
38	P 31370 091		U-BOLT .....	1
39	P 54999 061		BRACKET .....	1
40	P 56396 203		VALVE, Solenoid Insector .....	1
	P 764072 002		• COIL .....	1
	P 764319 127		• KIT, Valve Repair .....	1
41	P 81102 001		TUBE .....	1
42	P 41646 091		1 NIPPLE, 1 NPT x 9 .....	1
43	P 764317 740		TUBING, 10' 1/2 OD x 5/16 ID .....	1
44	P 761696 002		FOOT STRAINER .....	1
45	P 51904 091		INSERT BARB FOR ITEM #40 .....	1



\* 764321-186 KIT, GASKET ACTUATORS 1" THRU 2"  
 \* 764321-185 KIT, GASKET ACTUATORS 1/4" THRU 3/4"

Figure 8-27. PIPING ASSEMBLY (Part 3 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-27-			PIPING ASSEMBLY (Part 3 of 3) .....	X
1	P 1638 091		ELL, 1 NPT .....	1
2	P 150018 001		NIPPLE, 1 NPT x 11 .....	1
3	P 39591 010		CLAMP .....	1
4	P 48774 091		SUPPORT .....	3
5	P 51852 091		ELL, 45°, 1 NPT .....	2
6	P 29356 091		NIPPLE, 1 NPT x 2 .....	1
7	P 37737 091		FILTER .....	1
8	P 150822 928		VALVE, Ball, 1/2 (VII) .....	1
	P 764317 587		• KIT, Valve Repair .....	1
	P 764317 578		• KIT, Actuator Repair .....	1
	P 764321 185		• GASKET KIT .....	1
9	P 51653 091		VALVE, Safety, 3/4 NPT 50 LBS. ....	1
10	P 11506 091		BUSHING, Reducing, 3/4 x 1/8 NPT .....	1
11	P 43289 091		ELL, Comp, 1/4 ODT x 1/8 IPS .....	2
12	P 1336 091		CROSS, 3/4 x 3/4 x 1/2 x 3/4 NPT .....	1
13	P 29302 091		NIPPLE, 3/4 NPT x 4 .....	2
14	P 4924 091		TEE, 3/4 x 3/4 x 3/8 NPT .....	1
15	P 29310 091		NIPPLE, 3/4 NPT x 6 .....	1
16	P 29164 091		NIPPLE, 1/2 NPT x 1-1/2 .....	2
17	P 1633 091		ELL, 1/2 NPT .....	1
18	P 6223 042		BUSHING, Reducer, 3/8 x 1/4 NPT .....	1
19	P 45407 091		ELL, Comp, 1/4 ODT x 1/4 IPS .....	1
20	P 915 120		TUBE, 1/4 OD, TBG .....	A/R
21	P 54780 091		VALVE, Steam, (See Figure 8-31) .....	1
22	P 1636 091		ELL, Street, 3/4 NPT .....	2
23	P 29296 091		NIPPLE, 3/4 NPT x 2-1/2 .....	1
24	P 41389 091		STRAINER .....	1
	P 751552 091		• SCREEN .....	1
	P 3442 091		• PLUG, Pipe .....	1
	P 756207 091		• GASKET .....	1
25	P 28916 091		NIPPLE, 1/4 NPT x 7/8 .....	1
26	P 29333 091		NIPPLE, 3/4 NPT x 11-3/4 .....	2
27	P 1744 091		ELL, 45°, 3/4 NPT .....	2
28	P 29322 091		NIPPLE, 3/4 NPT x 9 .....	1
29	P 39590 010		CLAMP .....	3
30	P 4247 091		SPUD, Male, 3/4 NPT .....	2
31	P 2903 091		NUT, Union, 3/4 NPT .....	2
32	P 1635 091		ELL, 3/4 NPT .....	3
33	P 29307 091		NIPPLE, 3/4 NPT x 5-1/4 .....	1
34	P 4923 091		TEE, 3/4 x 3/4 x 1/2 NPT .....	1
35	P 29167 091		NIPPLE, 1/2 NPT x 2-3/4 .....	1
36	P 29304 091		NIPPLE, 3/4 NPT x 4-1/2 .....	1
37	P 1747 091		END, Threaded .....	1
38	P 150825 346		NIPPLE, 3/4 NPT x 1-7/8 .....	1
39	P 150822 929		VALVE, Ball, 3/4 NPT, V8 .....	1
	P 764317 588		• KIT, Valve Repair .....	1
	P 764317 578		• KIT, Actuator Repair .....	1
	P 764321 181		• KIT, Gasket .....	1
40	P 82314 001		NIPPLE, 1 NPT x 48 .....	1

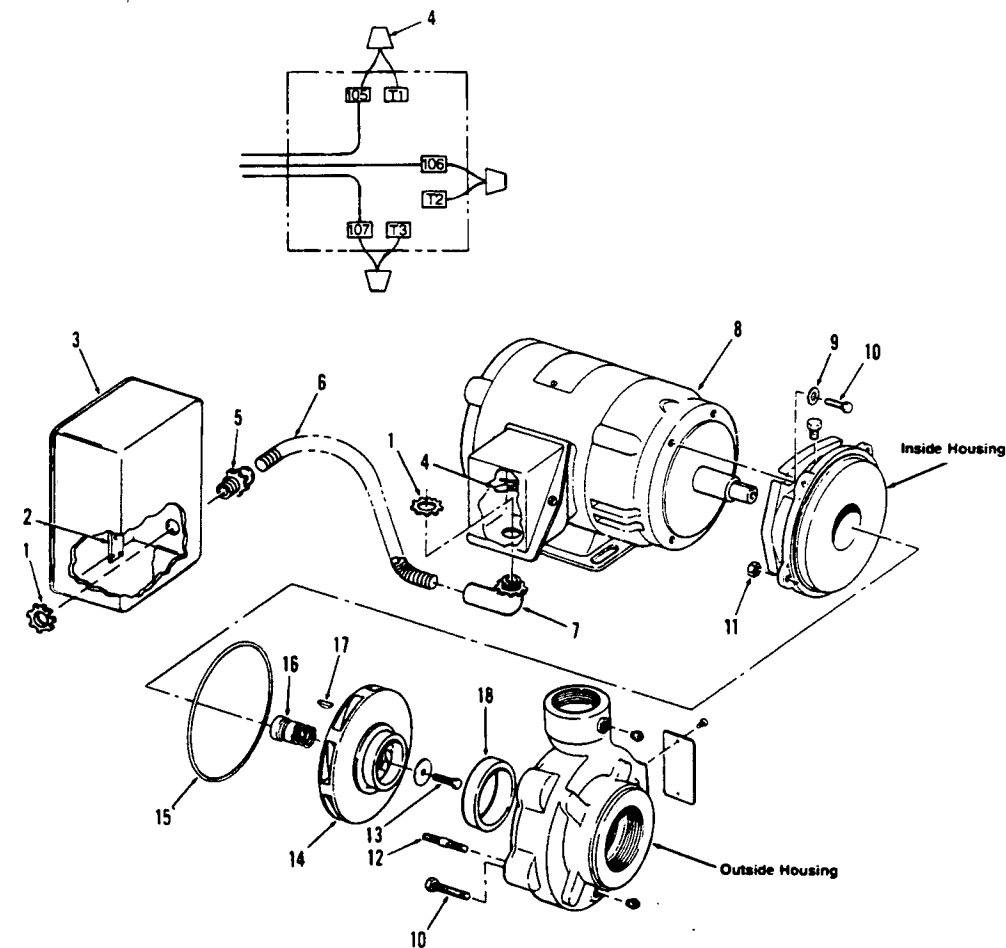


Figure 8-28. MOTOR AND STARTER ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-28-	P 134471	071	MOTOR AND STARTER ASSEMBLY, 208V .....	X		
	P 134471	072	MOTOR AND STARTER ASSEMBLY, 230V, 60Hz .....	X		
	P 134471	073	MOTOR AND STARTER ASSEMBLY, 460V, 60Hz .....		X	
1	P 23358	091	WASHER, Conduit .....	2		
2	P 150063	001	HEATER, 200 Volt .....	3		
	P 150062	001	HEATER, 230 Volt .....		3	
	P 150058	001	HEATER, 460 Volt .....			3
3	P 92677	001	STARTER .....	1		
4	P 17691	091	WIRE NUT .....	3	6	9
5	P 90331	091	CONNECTOR, Straight .....	1		
6	P 89867	091	CONDUIT, Flexible .....	1		
7	P 90625	091	CONNECTOR, 90° .....	1		
8	P 150822	054	MOTOR AND PUMP, 200 Volt .....	1		
	P 150822	055	MOTOR AND PUMP, 230/460 Volt .....	1	1	
	P 758401	091	• PUMP ONLY .....	1		
9	P 5503	045	• • WASHER .....	4		
10	P 3858	041	• • SCREW, Hex Head, 3/8-16 x 7/8 .....	8		
11	P 3042	041	• • NUT, 3/8-16 .....	4		
12	P 17797	091	• • STUD, 3/8-16 x 1-1/2 .....	4		
13	P 9359	061	• • SCREW, Hex Head, 1/4-28 x 5/8 .....	1		
14	P 757066	091	• • IMPELLER .....	1		
	P 764322	920	• • GASKET (BURKS) .....	1		
15	P 752378	091	• • GASKET, Old Style .....	1		
16	P 752377	091	• • SEAL, Old Style, 3/4" .....	1		
	P 764322	012	• • SEAL, New Style, 1-1/4" .....	1		
17	P 16416	091	• • KEY .....	1		
18	P 764316	749	• • RING, Wear .....	1		
	P 93908	931	• • MTG PLATE (Not Shown) .....	1	1	1

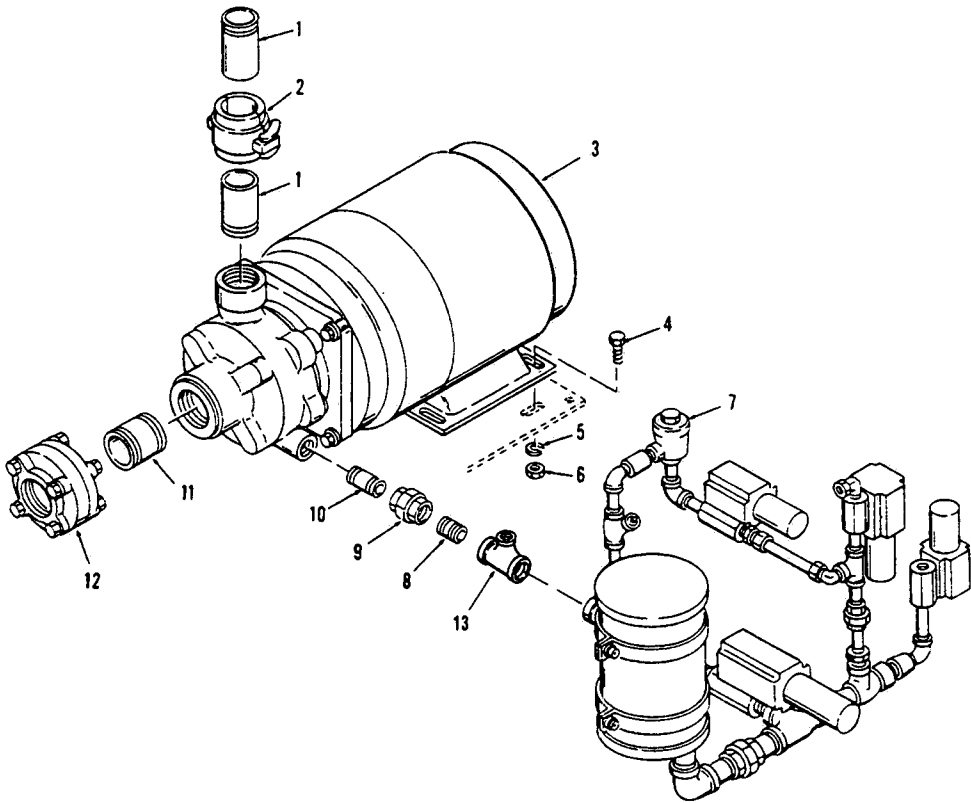
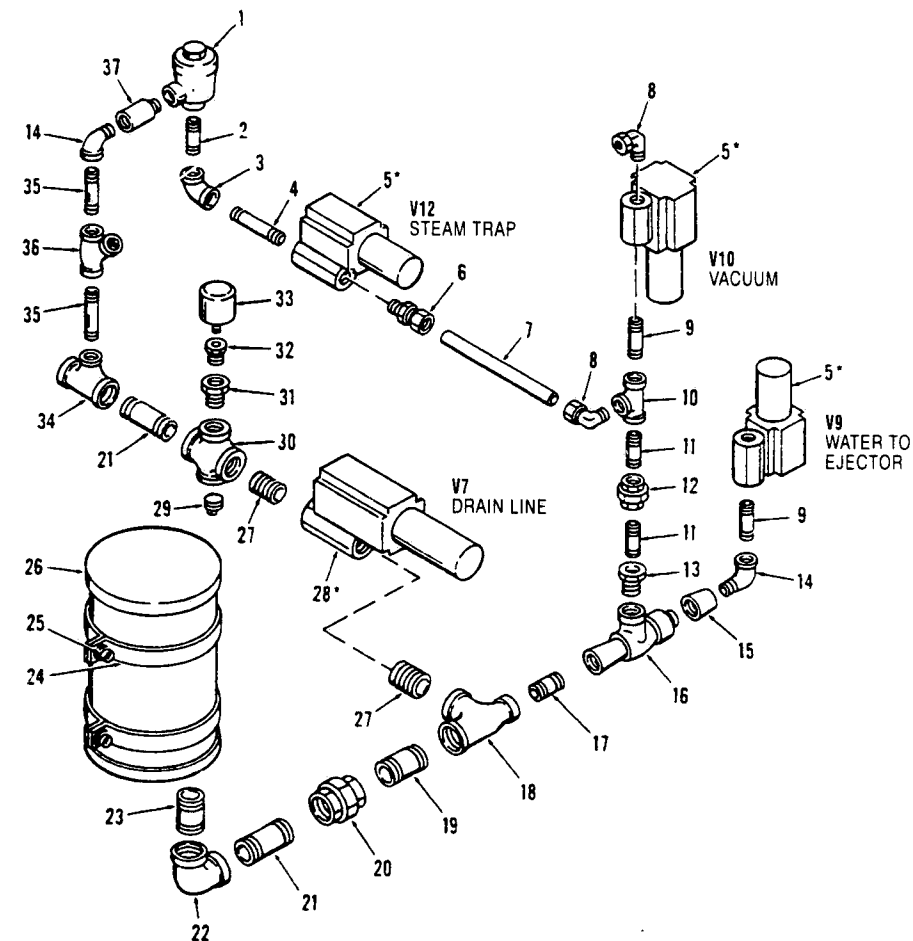


Figure 8-29. STAND PIPING ASSEMBLY (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-29-	P 626973	998	STAND PIPING ASSEMBLY (Part 1 of 2) .....	X
1	P 51749	091	ADAPTER .....	2
2	P 51733	091	COUPLING .....	1
	P 752419	091	• SEAL .....	1
3	P 134471	091	MOTOR AND STARTER ASSEMBLY (See Figure 8-28) .....	1
4	P 31838	042	BOLT, Hex Head, 3/8-16 x 1 .....	4
5	P 19680	041	LOCKWASHER, 3/8 .....	4
6	P 3042	041	NUT, 3/8-16 .....	4
7			STAND PIPING ASSEMBLY, Part 2 of 2 (See Figure 8-30) .....	1
8	P 81109	001	NIPPLE, 1-1/4 NPT x 1-1/2 .....	1
9	P 39596	091	UNION, 1-1/4 NPT .....	1
10	P 79444	091	NIPPLE, 1-1/4 NPT x 2-1/4 .....	1
11	P 51744	091	NIPPLE, 2-1/2 NPT x 4 .....	1
12	P 51745	091	FLANGE, Union, 2-1/2 .....	1
	P 752635	091	• GASKET .....	1
13	P 37301	091	TEE, Reducer, 1-1/4 x 1-1/4 x 1/2 NPT .....	1



\* 764321-186 KIT, GASKET ACTUATORS, 1" THRU 2"  
 \* 764321-185 KIT, GASKET ACTUATORS, 1/4" THRU 3/4"

Figure 8-30. STAND PIPING ASSEMBLY (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-30-			STAND PIPING ASSEMBLY (Part 2 of 2) .....	X
1	P 129222	001	STEAM TRAP, 1/2 NPT (See Figure 8-32) .....	1
2	P 29167	091	NIPPLE, 1/2 NPT x 2-1/4 .....	1
3	P 1633	091	ELBOW, 1/2 NPT .....	1
4	P 29173	091	NIPPLE, 1/2 NPT x 3-3/4 .....	1
5	P 150822	928	VALVE, Ball, 1/2 NPT .....	3
	P 764317	863	VALVE ONLY .....	
	P 764317	587	• KIT, Valve Repair .....	1
	P 764317	578	• KIT, Actuator Repair .....	1
	P 764321	185	GASKET KIT .....	1
6	P 29931	091	CONNECTOR, 5/8 ODT x 1/2 IPS .....	1
7	P 38482	091	TUBE, 5/8 ODT x 8 .....	1
8	P 81064	001	ELL, 5/8 ODT x 1/2 NPT .....	2
9	P 150022	345	NIPPLE, 1/2 NPT x 2-1/16 .....	2
10	P 4931	091	TEE, 1/2 NPT .....	1
11	P 29166	091	NIPPLE, 1/2 NPT x 2 .....	2
12	P 89990	091	UNION, 1/2 NPT .....	1
13	P 836	042	BUSHING, Reducing, 3/4 NPT x 1/2 NPT .....	1
14	P 1634	091	ELL, Street, 1/2 NPT .....	2
15	P 3531	091	COUPLING, Reducing, 3/4 x 1/2 NPT .....	1
16	P 150822	870	EJECTOR .....	1
17	P 29292	091	NIPPLE, 3/4 NPT x 1-1/2 .....	1
18	P 40255	091	TEE, Reducer, 1-1/4 x 3/4 x 1-1/4 NPT .....	1
19	P 150078	001	NIPPLE, 1-1/4 NPT x 2-1/2 .....	1
20	P 39596	091	UNION, 1-1/4 NPT .....	1
21	P 45755	091	NIPPLE, 1-1/4 NPT x 3-1/2, Old Style Units .....	2
22	P 39595	091	ELBOW, 1-1/4 NPT .....	1
23	P 79444	091	NIPPLE, 1-1/4 NPT x 2-1/4 .....	1
24	P 92080	001	BAND ASSEMBLY .....	2
25	P 12453	042	SCREW, Socket Head, 5/16-18 x 1 .....	4
26	P 92078	001	SUMP ASSEMBLY .....	1
27	P 39597	091	NIPPLE, 1-1/4 NPT x 1-3/4 .....	1
28	P 56399	117	VALVE, Ball, 1-1/4 NPT .....	1
	P 764317	590	• KIT, Valve Repair .....	1
	P 764317	579	• KIT, Actuator Repair .....	1
	P 764321	186	• KIT, Gasket .....	1
29	P 3441	091	• PLUG, Pipe, 1 NPT .....	1
30	P 51758	091	CROSS, 1 x 1 x 1-1/4 x 1-1/4 NPT .....	1
31	P 327319	042	BUSHING, Reducing, 1 x 1/4 NPT .....	1
32	P 22472	091	BUSHING, Reducing, 3/4 x 1/4 NPT .....	1
33	P 93896	731	SENSOR, Liquid Level .....	1
34	P 37301	091	TEE, Reducing, 1-1/4 x 1-1/4 x 1/2 NPT .....	1
35	P 29170	091	NIPPLE, 1/2 NPT x 3 .....	2
36	P 47709	091	STRAINER, 1/2 NPT .....	1
	P 750890	091	• SCREEN .....	1
37	P 118372	091	COUPLING, 1/2 NPT .....	1

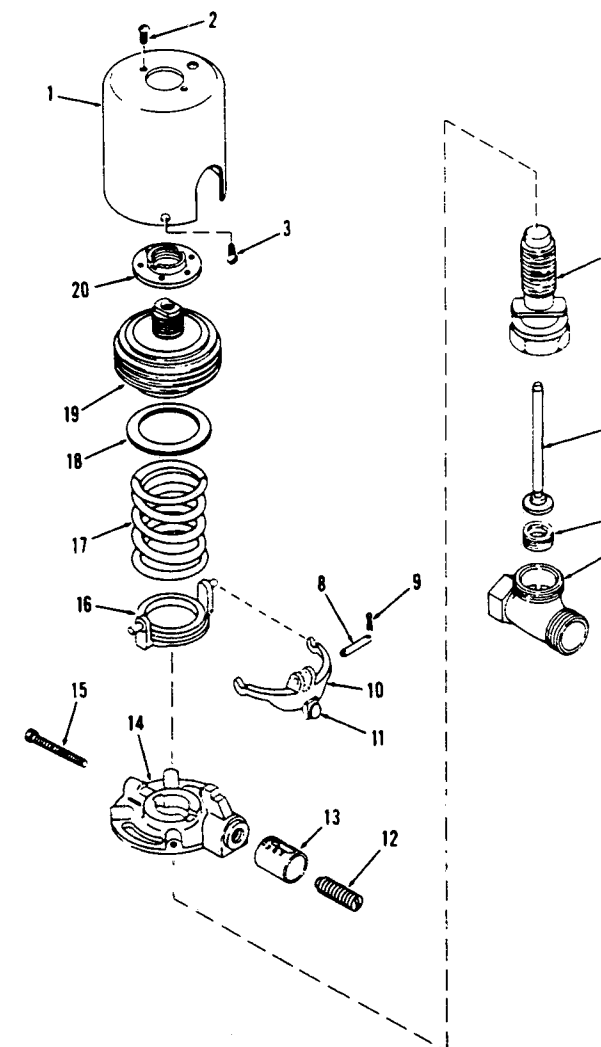


Figure 8-31. STEAM CONTROL VALVE.



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FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-31-	P 54780 091		STEAM CONTROL VALVE, 3/4 NPT .....	X
	P 754359 003		• KIT, Repair	
1	P 22349 045		COVER .....	1
2	P 9276 041		SCREW, 8-32 x 3/16 .....	2
3	P 3969 041		SCREW, 1/4-20 x 1/4 .....	4
4	P 26837 091		SYLPHON AND BONNET ASSEMBLY .....	1
5	P 28267 091		STEM ASSEMBLY .....	1
6	P 22425 061		SEAT, Valve .....	1
7	P 22433 091		BODY, Globe Valve .....	1
8	P 11890 061		PIN, Pivot .....	1
9	P 8897 091		COTTER PIN .....	2
10	P 14976 091		FORK ADJ. ....	1
11	P 2299 045		INSERT .....	1
12	P 11417 045		SCREW, Pressure Adjust .....	1
13	P 31273 044		SLEEVE, Indicator .....	1
14	P 11887 042		PLATE, Bottom .....	1
15	P 12471 041		SCREW, 1/4-20 x 1-1/2 .....	1
16	P 12474 001		SEAT, Lower Spring .....	1
17	P 51657 045		SPRING .....	1
18	P 35911 061		SEAT, Top Spring .....	1
19	P 35880 091		BELLOWS .....	1
20	P 9172 091		REINFORCEMENT .....	1

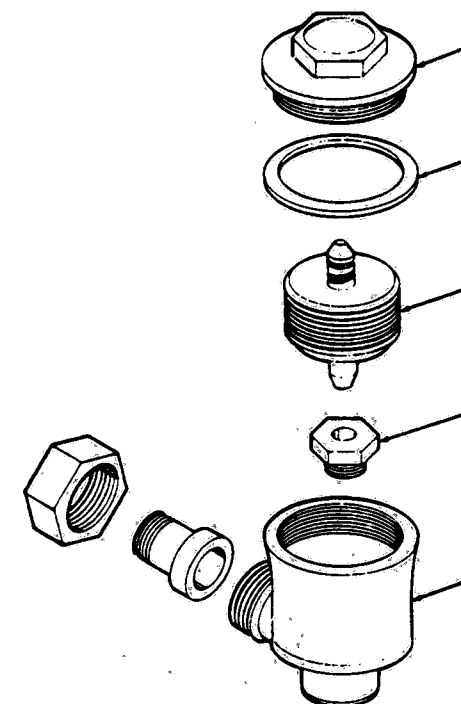


Figure 8-32. STEAM TRAP.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-32-	P 129222 001		STEAM TRAP .....	X
	P 764080 001		KIT, Repair, 1/2 NPT (Include Items 2, 3, 4) .....	1
1	P 764315 209	*	CAP .....	1
2	P 764315 208	*	GASKET .....	1
3	P 764315 207	*	DIAPHRAGM ASSEMBLY .....	1
4	P 764315 206	*	SEAT .....	1
*Not available as separate items. Order Repair Kit P-764080-001 above.				

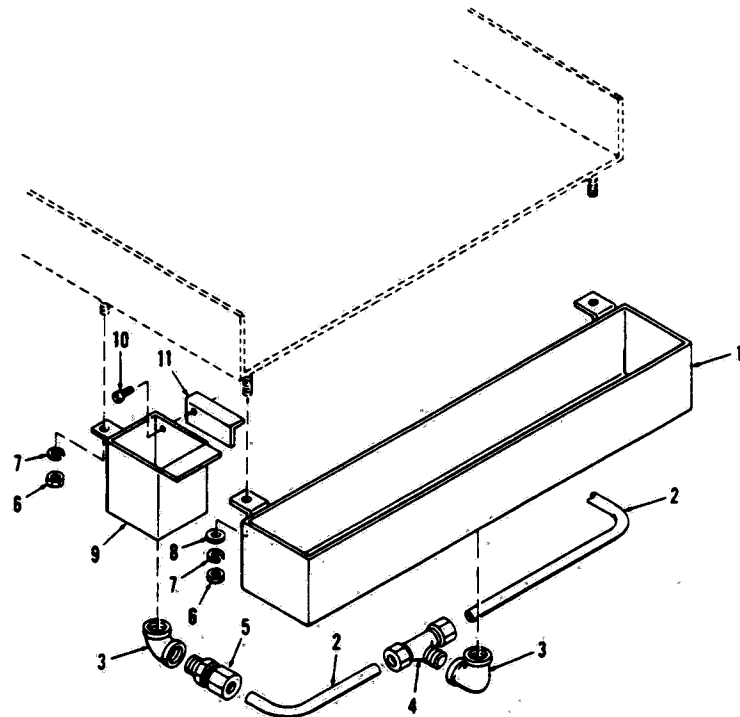


Figure 8-33. EXTERNAL DRAIN.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-33-	P 134301	001	EXTERNAL DRAIN.....	X
1	P 56129	001	EXTENSION.....	1
2	P 915	315	TUBE, 1/2 OD, B88.....	A/R
3	P 7461	091	ELL, 3/4 x 3/8 NPT.....	2
4	P 20610	091	TEE, Comp, 1/2 ODT x 1/2 ODT x 3/8 NPT.....	1
5	P 13658	091	FITTING, Connector, 1/2 ODT x 3/8 NPT.....	1
6	P 3097	041	NUT, 1/4-20.....	5
7	P 19678	045	LOCKWASHER, 1/4.....	5
8	P 10445	091	WASHER, Flat.....	2
9	P 56131	001	PAN.....	1
10	P 90170	045	SCREW, Tapping, #8 x 5/16.....	1
11	P 150177	001	GUARD.....	1

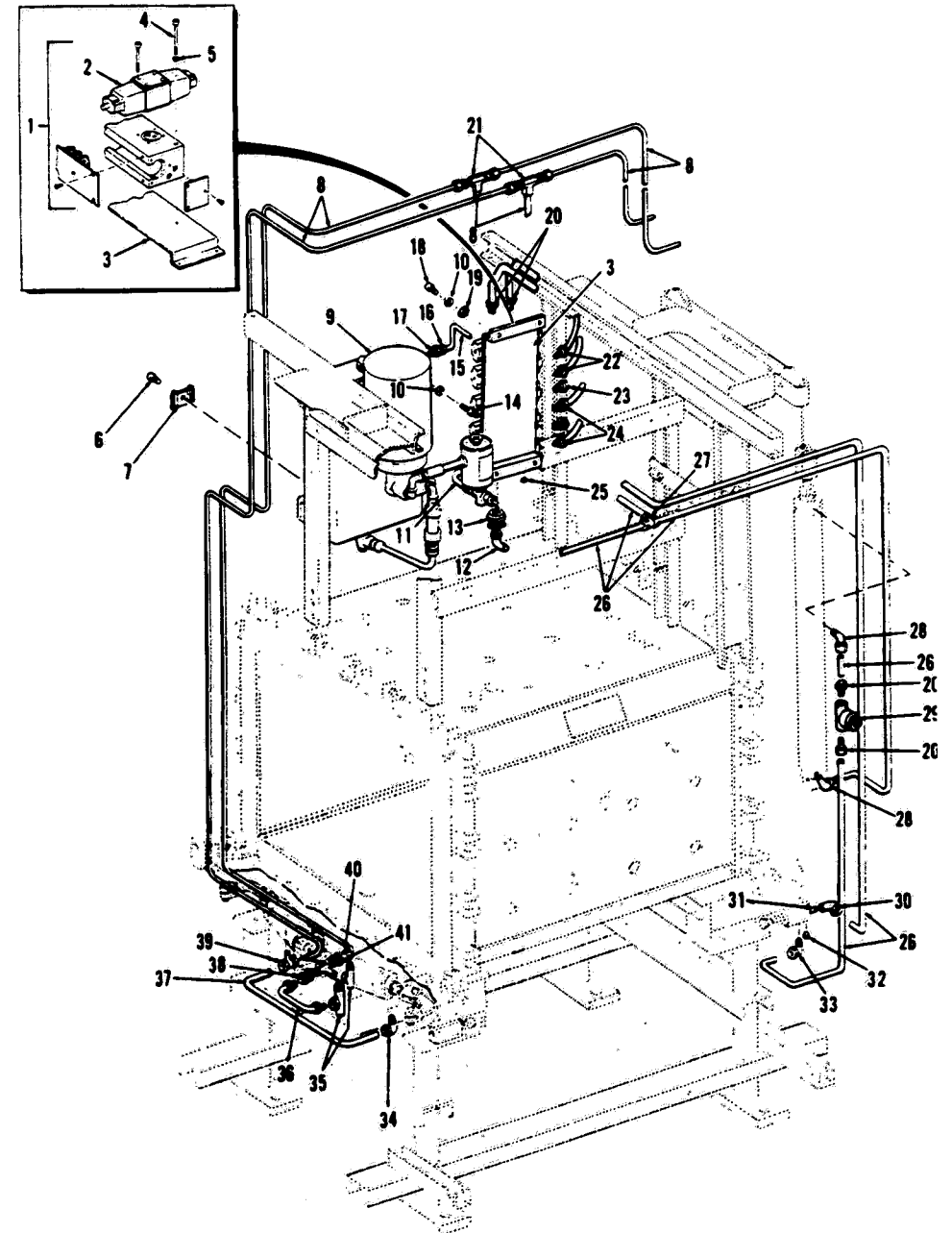


Figure 8-34. HYDRAULIC SYSTEM.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-34-	P 141212	066	HYDRAULIC SYSTEM .....	X
1	P 146655	447	VALVE PACKAGE .....	1
2	P 763890	001	• VALVE ASSEMBLY (See Figure 8-36) .....	5
3	P 93296	001	PLATE, Mounting .....	1
4	P 83779	001	SCREW, Socket Head, 1/4-20 x 3-1/2 .....	2
5	P 10436	041	LOCKWASHER, 1/4 .....	4
6	P 33708	041	SCREW, Flat Head, #10-32 x 5/8 .....	10
7	P 81107	001	CLAMP, Tube .....	11
8			TUBE, 1/4 OD x .030, Wall Copper - ASTM B280 .....	A/R
9	P 141212	067	HYDRAULIC SUPPLY (See Figure 8-37) .....	1
10	P 19686	061	LOCKWASHER .....	10
11	P 136291	001	TUBE, Supply .....	1
12	P 91060	091	CONNECTOR, 1/2 Conduit, 90° .....	1
13	P 37754	091	BUSHING, Reducing, 1-1/4 x 1/2 .....	1
14	P 45613	091	SCREW, Socket Head, 1/4-20 x 1-1/2 .....	4
15	P 93295	001	TUBE, Return .....	1
16	P 45477	091	FITTING, 3/8 ODT x 1/4 IPS .....	1
17	P 849	091	BUSHING, Reducing, 3/8 x 1/4 .....	1
18	P 41992	061	SCREW, Socket Head, 1/4-20 x 5/8 .....	4
19	P 31599	041	WASHER, Flat .....	4
20	P 78293	091	FITTING, Comp. 3/8 ODT x 3/8 IPS .....	6
21	P 46097	091	FITTING, Comp Tee, 1/4 ODT .....	2
22	P 45565	091	FITTING, Comp. 1/4 ODT x 1/4 IPS .....	6
23	P 20580	042	PLUG, Pipe, 1/4 IPS .....	2
24	P 78292	091	FITTING, Comp. 3/8 ODT x 1/4 IPS .....	4
25	P 5896	048	PLUG, Pipe, 3/8 IPS .....	2
26			TUBE, 3/8 OD x .032, Wall Soft Copper - ASTM B88 .....	A/R
27	P 78295	091	FITTING, Compression Tee, 3/8 ODT .....	1
28	P 45530	091	FITTING, Comp Ell, 3/8 ODT x 3/8 IPS .....	4
29	P 81051	001	VALVE, Flow Control .....	2
30	P 81065	001	FITTING, Comp Ell, 3/8 ODT x 1/4 IPS .....	2
31	P 28925	091	NIPPLE, 1/4 x 3 .....	2
32	P 48511	061	PLUG, Pipe, 1/8-27 .....	2
33	P 46055	091	FITTING, Comp Ell, 3/8 ODT x 1/4 IPS .....	2
34	P 42510	091	FITTING, Comp Ell, 1/4 ODT x 1/8 IPS .....	2
35	P 40008	091	ELL, Street, 1/8 IPS .....	4
36	P 81072	001	HOSE ASSEMBLY .....	2
37	P 51665	091	TUBE .....	2
38	P 81071	001	ADAPTER, Straight, 1/8 NPT .....	2
39	P 42581	091	FITTING, Comp Tee, 1/4 ODT x 1/8 IPS .....	2
40	P 81067	001	FITTING, Comp Straight, 1/4 ODT x 1/8 IPS .....	2
41	P 81069	001	TEE, Pipe, 1/8 NPT .....	2
	P 13522	091	TUBE, Oil Funnel .....	1
	P 13523	091	TUBE, Oil Fill .....	1
	P 764316	664	TRANS FLUID DEXTRON II, Gallons .....	5

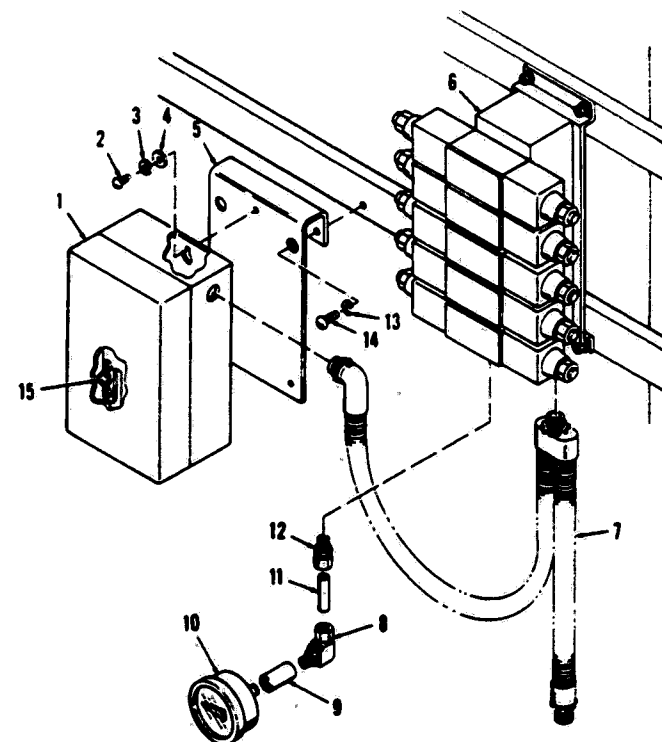


Figure 8-35. HYDRAULIC MOTOR STARTER ARRANGEMENT.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-35-			HYDRAULIC MOTOR STARTER ARRANGEMENT .....	X
1	P 56399	131	STARTER, Motor .....	1
2	P 129062	001	SCREW, Round Head, #10-32 x 3/8 .....	3
3	P 76801	045	LOCKWASHER, #10 .....	3
4	P 20844	061	WASHER, #10 .....	3
5	P 56399	149	BRACKET .....	1
6	P 146194	001	VALVE PACKAGE (See Figure 8-36) .....	1
7	P 134471	049	CABLE ASSEMBLY .....	1
8	P 42510	091	ELL, Comp, 1/4 ODT x 1/8 NPT .....	1
9	P 1306	091	COUPLING, 1/8 NPT .....	1
10	P 54797	091	GAUGE, Pressure .....	1
11	P 80221	091	TUBE, 1/4 x 2 .....	1
12	P 77936	042	FITTING, Comp, 3/8 NPT x 1/4 ODT .....	1
13	P 19678	045	LOCKWASHER, 1/4 .....	2
14	P 3947	041	SCREW, Round Head, 1/4-20 x 1 .....	2
15	P 150825	352	HEATER COIL, 5.6-6.25 AMP .....	1

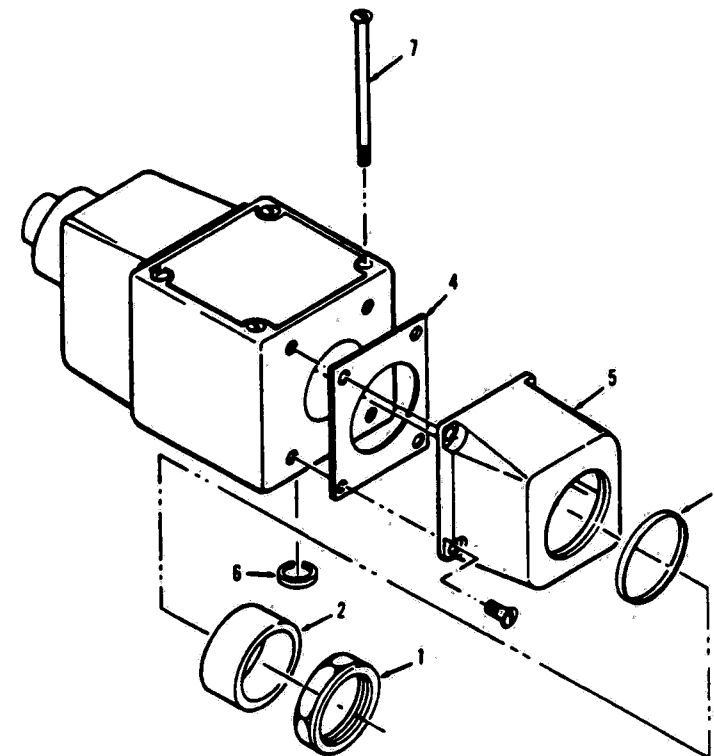


Figure 8-36. VALVE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-36-	P 763890 001		VALVE ASSEMBLY, Before 6-86 .....	X
	P 764321 830		VALVE ASSEMBLY, After 6-86 .....	X
	P 762624 001		KIT, Valve Repair, Includes 1 Thru 7 .....	A/R
	P 764321 831		KIT, Valve Repair .....	A/R
1	P 763875 001		• NUT, Coil Retaining .....	2 2
2	P 763876 001		• COLLAR .....	2 2
3	P 763877 001		• "O" RING, Coil .....	2 2
4	P 763878 001		• GASKET, Coil .....	2 2
5	P 763879 001		• COIL ASSEMBLY .....	2 2
	P 764321 833		• COIL ASSEMBLY .....	2 2
6	P 763880 001		• "O" RING .....	4 4
	P 763889 001		• "O" RING .....	4 4
7	P 763881 001		• KIT, Bolt .....	1 1
	P 764321 832		• KIT, Bolt .....	1 1
	P 764321 831		Repair kit for valve D1VW1DY series valve .....	A/R
	P 764323 926		Repair kit for valve D1VW2ODY series valve .....	A/R
<p>NOTE: Two model valves may be used on the 2400. Check the data plate for the above noted valve numbers prior to ordering spare parts. Disregard any numerals or letters following the "DY" in the data plate number.</p>				

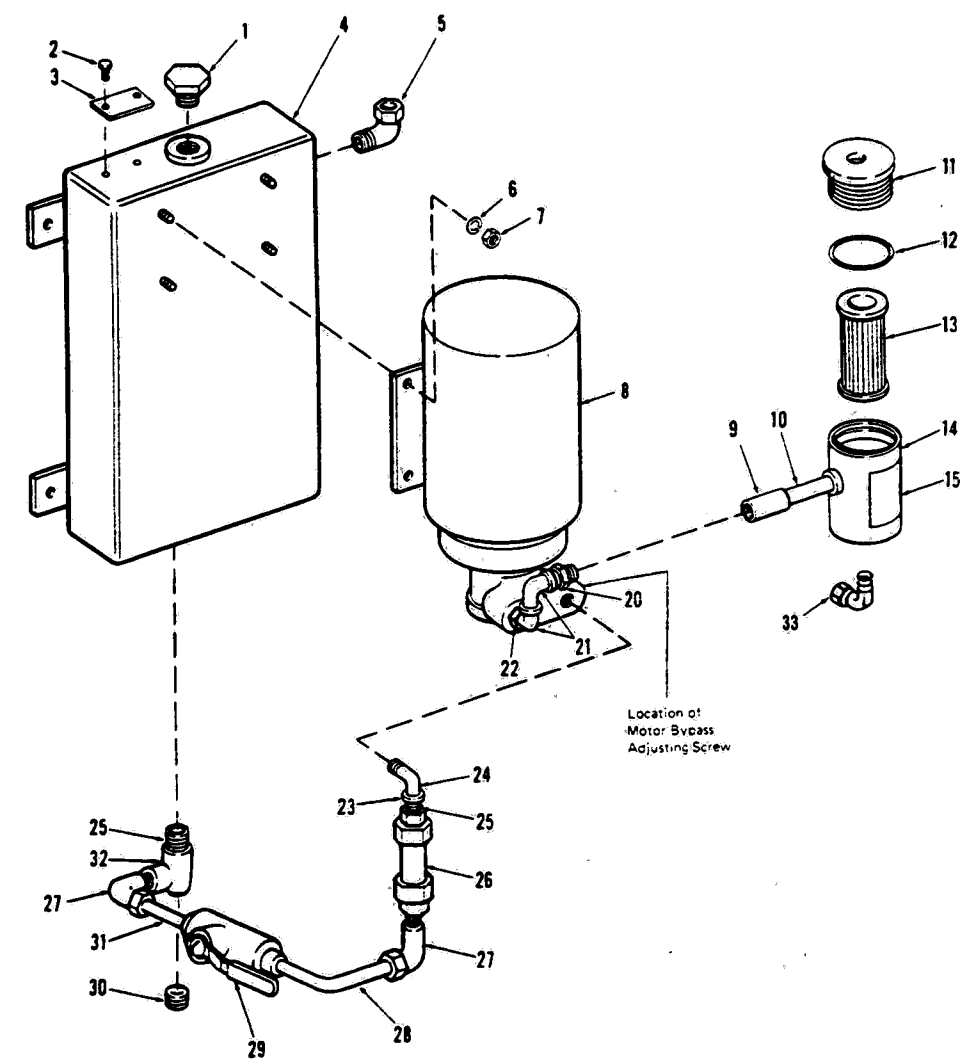


Figure 8-37. HYDRAULIC SUPPLY PACKAGE.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-37-	P 141212	067	HYDRAULIC SUPPLY PKG (With Ball Valve).....	X
1	P 51599	042	CAP, Oil Fill .....	1
2	P 13289	091	SCREW, Drive, #6 x 3/8 .....	2
3	P 81321	091	PLATE, Caution .....	1
4	P 98052	010	SUMP ASSEMBLY .....	1
5	P 45530	091	FITTING, El. ....	1
6	P 19686	061	LOCKWASHER, 1/4 .....	4
7	P 3097	041	NUT, 1/4 .....	4
8	P 51596	091	MOTOR AND PUMP ASSEMBLY .....	1
	P 764321	271	COUPLING, Between Pump and Motor .....	1
	P 752137	091	• MOTOR ONLY .....	1
	P 752136	091	• PUMP ONLY .....	1
	P 764319	998	• SHAFT OIL SEAL .....	1
	P 757067	001	• PUMP GASKET (SHIM), Silver .0005" Thk .....	*
	P 757067	002	• PUMP GASKET (SHIM), Amber .001" Thk .....	*
	P 757067	004	• PUMP GASKET (SHIM), Red .002" Thk .....	*
	P 757067	005	• PUMP GASKET (SHIM), Green .003" Thk .....	*
	P 757067	006	• PUMP GASKET (SHIM), Tan .004" Thk .....	*
	P 757067	007	• PUMP GASKET (SHIM), Blue .005" Thk .....	*
9	P 1310	091	COUPLING .....	1
10	P 28925	091	NIPPLE, 1/4 x 3 .....	1
	P 56276	001	OIL FILTER ASSEMBLY .....	1
11	P 56271	001	CAP, Filter .....	1
12	P 150501	001	O-RING .....	1
13	P 50697	091	FILTER .....	1
14	P 56270	001	CASE, Filter .....	1
15	P 150502	001	LABEL .....	1
20	P 43648	091	VALVE, Check .....	1
21	P 1619	091	ELL, Street, 1/4 .....	2
22	P 76053	091	REDUCER, 1/2 to 1/4 .....	1
23	P 837	091	REDUCER, 1/2 x 3/8 .....	1
24	P 1634	091	ELL, Street, 1/2 .....	1
25	P 29014	091	NIPPLE, 3/8 x 1-1/4 .....	2
26	P 42542	091	STRAINER, 5/8 ODT x 3/8 IPS .....	1
27	P 81165	001	ELBOW, Male .....	2
28	P 81166	001	TUBE, 5/8 ODT .....	1
29	P 81164	001	VALVE, Ball .....	1
30	P 5896	048	PLUG, Pipe, 3/8 .....	1
31	P 91411	091	TUBE, 5/8 ODT .....	1
32	P 4928	042	TEE, 3/8 .....	1
33	P 46055	091	COMP FITTING, El. Male, 1/4 ODT x 1/4 IPS .....	1
	P 764316	664	HYDRAULIC OIL, Trans. Type A, Gallons .....	5
	P 764325	497	OIL BREATHING CAP .....	1
	P 764322	796	KIT, Replacement Motor and Pump .....	1
*As required to maintain end clearance of .001".				

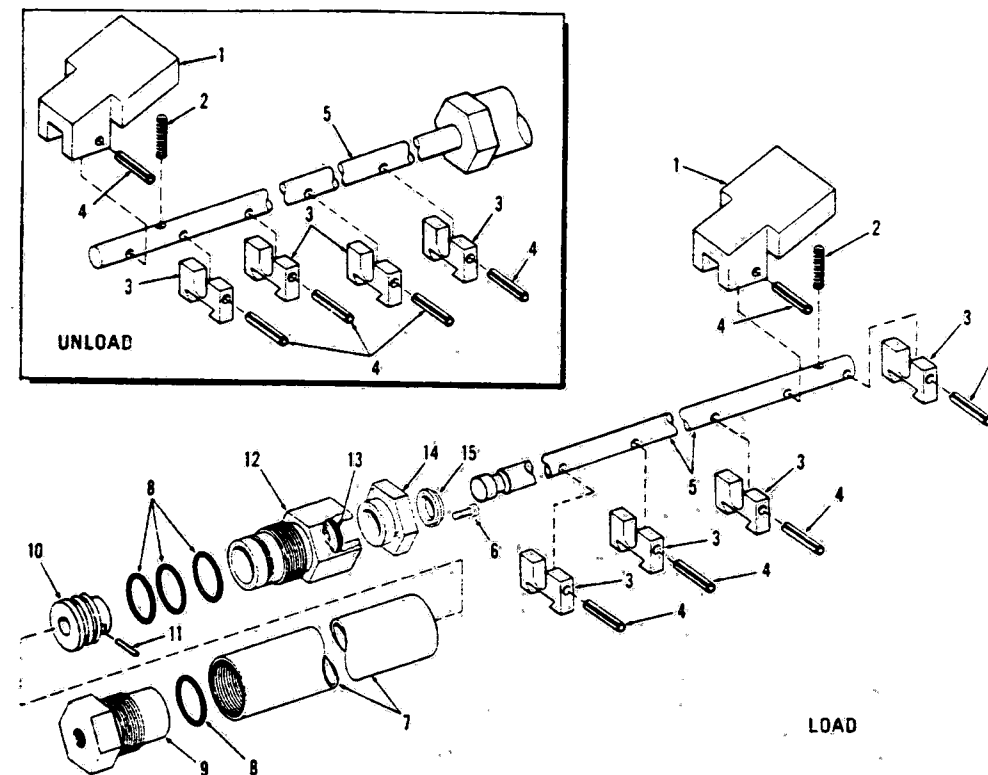


Figure 8-38. CYLINDER ASSEMBLY: Loading And Unloading.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-38-	P 98129 091		CYLINDER, Loading, Before 6-88	X			
	P 98490 091		CYLINDER, Unloading, Before 6-88		X		
	P 134468 748		CYLINDER, Loading, After 6-88			X	
	P 134468 747		CYLINDER, Unloading, After 6-88				X
1	P 51331 034		END, Piston	1	1	1	1
2	P 76465 045		SPRING	1	1	1	1
3	P 76633 061		DOVETAIL	4	4	4	4
4	P 47979 061		PIN, Roll, 3/16 x 1-1/4	5	5	5	5
5	P 55988 001		ROD, Piston Loading	1		1	
	P 55989 001		ROD, Piston Unloading		1		1
6	P 50527 061		SCREW, #8-32 x 1/2	3	3	3	3
7	P 76635 010		BODY, Cylinder	1			
	P 51281 010		BODY, Cylinder		1		
	P 134468 746		CYLINDER			1	
	P 134468 745		CYLINDER				1
8	P 45959 091		"O" RING	4	4	4	4
9	P 51269 091		END, Cylinder Body	1	1	1	1
10	P 79822 001		HEAD, Piston	1	1	1	1
11	P 42617 045		SCREW, Set, #6-32 x 1/4	1	1	1	1
12	P 135759 002		END CYLINDER	1	1	1	1
13	P 82101 001		SEAL	1	1	1	1
14	P 135759 001		CAP, End	1	1	1	1
15	P 82102 001		RING, Wiper	1	1	1	1
16	P 757703 091		SEAL KIT, (Not Shown)	1	1		
	P 764322 475		SEAL KIT, (Not Shown)			1	1
			NOTE: Replacement load and unload cylinders package convert to new cylinders.				
	P 150822 951		LOAD CYLINDER KIT				
	P 150822 952		UNLOAD CYLINDER KIT				

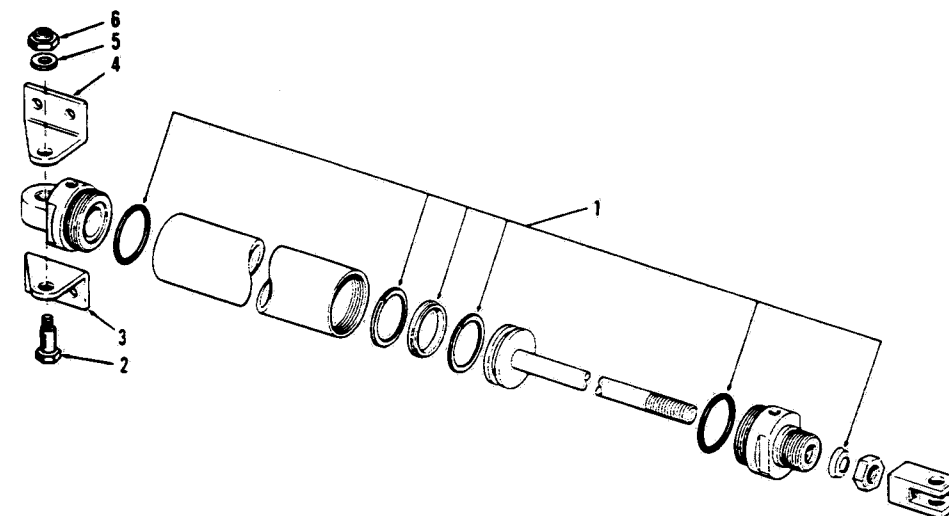


Figure 8-39. LOCKING CYLINDER.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-39-	P 51584 091		LOCKING CYLINDER	X			
1	P 752640 091		SEAL Kit		1		
2	P 150437 001		SCREW, Shoulder		1		
3	P 150435 001		BRACKET, LH		1		
4	P 150436 001		BRACKET, RH		1		
5	P 5503 045		WASHER, Plain		1		
6	P 52151 091		NUT		1		



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