

AMSCO  
Maintenance  
Manual

EAGLE® 3000 SERIES  
Small Sterilizers  
Gravity and Vacumatic

(12/90)

P-764322-693

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## Summary of Safety Precautions

The following are personnel (WARNINGS) and equipment (CAUTIONS) safety precautions to be observed when operating or servicing this unit. This is a listing of all safety precautions appearing in the text. Carefully read them before proceeding to use or service the unit. Observance of these safety precautions will minimize the risk of personal injury or the possible use of improper maintenance methods which may damage the unit or render it unsafe. It is important to understand that these precautions are not exhaustive. AMSCO could not possibly know, evaluate and advise maintenance departments of all conceivable ways in which maintenance might be done or the possible hazardous consequences of each way.

The operation and maintenance procedures recommended by AMSCO are described in this manual. Only these recommended maintenance procedures should be followed.

**WARNING: BURN AND SHOCK HAZARD** - Sterilizer service adjustments should be performed only by qualified service technicians.

**WARNING: SLIPPING HAZARD** - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.

**WARNING: BURN HAZARD** - Sterilizer rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.

**WARNING BURN HAZARD** - When sterilizing liquids, to prevent personal injury or property damage resulting from bursting bottles and hot fluid, you must observe the following procedure:

- Use liquids cycle only. No other cycle is safe for processing liquids.
- Use only vented closures - do not use screw caps or rubber stoppers with crimped seal.
- Use only Type I borosilicate glass bottles - do not use ordinary glass bottles or any container not designed for sterilization.
- Avoid sudden full opening of door at end of cycle. Unlock sterilizer door and open it approximately one inch. Wait at least 10 minutes before unloading sterilizer.
- Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not remove bottles if any boiling or bubbling is present.
- Allow bottles to cool to the touch before attempting to move them from sterilizer cart to the storage area.

**WARNING: BURN HAZARD** - Be sure to position power switch to OFF and wait until chamber cools to room temperature before starting any maintenance procedures.

**WARNING: BURN HAZARD** - Valve(s) is hot and steam will escape from safety valve(s). To prevent burns, wear gloves or use an extension device if it becomes necessary to operate try lever.

**WARNING: SHOCK HAZARD** - Always shut off all electric power to unit at wall disconnect switch before starting steam generator descaling procedure.

**WARNING: BURN HAZARD** - Be careful of steam escaping from valves on sterilizer and steam generator (if applicable). To prevent burns, wear gloves or use an extension device when operating try levers or inspecting for leaks.

**WARNING: BURN HAZARD** - Be careful of steam escaping from around door if lock is not activated. Wear gloves and face protection when testing door with pressure in chamber.

**WARNING: HEALTH HAZARD** - Vapors from solvents can be harmful. Use with adequate ventilation. Follow directions on container.

## Summary of Safety Precautions (continued)

**CAUTION:** Avoid letting moisture get under insulation in chamber or generator (if applicable), as it will cause rusting of the outer jacket.

**CAUTION:** When replacing steam generator sight glass, do not overtorque gland nut or damage to glass will occur.

**CAUTION:** Never use sharp tools to push door gasket into groove.

**CAUTION:** When using AMSCO Stainless Steel Cleaner and Polish 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 direction on containers.

**CAUTION:** Observe the Electrostatic Precautions outlined in Section 7.9. Always wear a grounding wrist strap when removing or replacing PC boards or ICs.

**CAUTION:** The door post is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instruction for removing weld and rewelding.

**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:** Allow thermostatic steam 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:** Handle syphon and bellows assembly gently to avoid damage.



## Section 1 General Information

1

### 1.1 GENERAL

The product literature included in this section contains factual data relating to the principal descriptive and identifying characteristics of particulars for EAGLE sterilizers. 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®3000 Series Small Sterilizers Gravity and Vacumatic

### TECH DATA

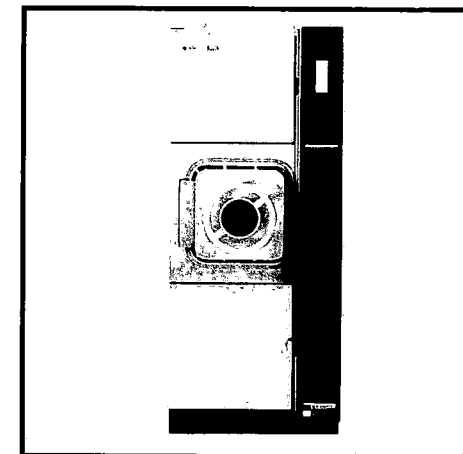
Small Steam Sterilizer

#### DESCRIPTION

Eagle 3000 Series Sterilizers feature an advanced **microcomputer control system**, providing latest standard for cycle setup, selection and monitoring. Once settings are made and cycle started, microcomputers accurately monitor and control system operations. Control column includes an easy-to-read vacuum fluorescent display and an integral thermal printer.

Eagle 3000 Series Sterilizers can be used in a hospital or laboratory and offer a choice of two configurations:

- **Gravity** -- for sterilizing liquids, in flasks with vented closures, at 212° to 254° F (100° to 122° C), and also heat- and moisture-stabile goods at 212° to 280° F (100° to 138° C).
- **Vacumatic** -- for efficient, high-volume processing of heat- and moisture-stabile materials, such as fabrics, wrapped hard goods, glassware or animal bedding at 270° to 280° F (132° to 138° C) through a prevacuum cycle. Vacumatic also provides gravity-type cycles.



Typical only -- some details may vary

#### THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

##### SINGLE DOOR

###### Series

- ☐ 3011: Gravity, 16x16x26"  
☐ 3021: Gravity, 20x20x38"  
☐ 3013: Vacumatic, 16x16x26"  
☐ 3023: Vacumatic, 20x20x38"

###### Door Hinge

- ☐ On Right Side  
☐ On Left Side

###### Mounting

- ☐ For Recessing  
☐ Cabinet Enclosed

##### DOUBLE DOOR

###### Series

- ☐ 3011: Gravity, 16x16x26"  
☐ 3021: Gravity, 20x20x38"  
☐ 3013: Vacumatic, 16x16x26"  
☐ 3023: Vacumatic, 20x20x38"

###### Door Hinge (Operating End First)

- ☐ Right Side/Left Side  
☐ Right Side/Right Side  
☐ Left Side/Right Side  
☐ Left Side/Left Side

###### Mounting

- ☐ For Recessing Through One Wall  
☐ For Recessing Through Two Walls  
 (20x20x38" Sterilizers Only)

##### Power System

- ☐ Steam  
☐ Electric\*\*  
☐ 208 - 240 Volts  
☐ 480 Volts

##### Options

- ☐ Utilities Control Valve Kit

##### Laboratory/Scientific Options

- ☐ Pure Steam Piping (SD-396)  
☐ Pure Steam Piping with stainless-steel electric steam generator  
☐ Door Interlocks (SD-312)  
☐ Door Interlocks w/Cross Contamination Seal (SD-312)  
☐ Chamber Penetration and Accessories (SD-303)

##### Material Handling Accessories\*

- ☐ Rack and Shelves  
☐ Surgical Instrument Trays  
☐ Loading Car and Carriage  
 (20x20x38" Sterilizers Only)

\*See Tech Data Sheet SD-325.

\*\*16x16x26" Double Door sterilizers are not available with electric steam generator.

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

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\*AMSCO -- 1988 - 1990

Gravity units operate by the gravity downward displacement air-removal principle. Vacumatic sterilizers have a mechanical air-evacuation system for high-speed, high-volume sterilization. Both types use steam-under-pressure as the sterilizing agent. Sterilizers are available for connection to building steam supply, or with an integral electric steam generator\*.

\*Except 16x16x26" Double Door Sterilizers.

## Chamber Sizes

Both Gravity and Vacumatic units come in two sizes, with interior dimensions of:

16x16x26 inches (406x406x660 mm) ...or  
20x20x38 inches (508x508x965 mm)

Offering includes choice of single-door (cabinet or recessed) or double-door (recessed one or two" walls) units.

\*20x20x38" sterilizers only.

## Standards

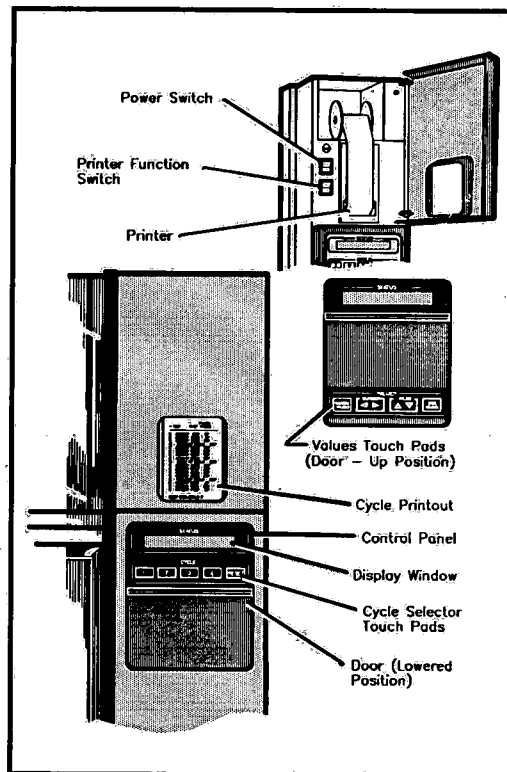
Every sterilizer meets applicable requirements of the following listings and standards, and carries the appropriate symbols:

- **Federal Specification GG-S-1340A** performance requirements for high temperature processing.
- **Seismic Stress Calculations** -- Title 24 (Division T-17 of Part 6) of the California Administrative Code.
- **ETL Testing Laboratories, Inc.** listing and **Canadian Standards Association (CSA)** certification... also includes optional steam generator.
- **ASME Code, Section VIII, Division 1** for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Shell and door are constructed to withstand working pressure of 42 psig (2.95 kg/cm<sup>2</sup>) for 16x16x26-inch sterilizers and 40 psig (2.81 kg/cm<sup>2</sup>) for 20x20x38-inch sterilizers.
- **ASME Code, Section I, Part PMB**, for power boilers. ...if optional steam generator is supplied.
- **ASTM Specification A240** for stainless steel, alloy 304 if welded, alloy 201, 202 or 304 if not welded.
- **ASTM Specification B88** for seamless, copper tubing.
- **ASTM Specification B43 or B135**, alloy 1 for seamless, red brass tubing.

## DESIGN FEATURES

### Stage 2™ Control

Microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or, for liquids, adjustable-slow with accelerator) and drying phases. Control indicates cycle completion visually and also audibly for 90 seconds. At end of cycle, timers reset to the previously selected values, eliminating the need to reset values between repeated cycles. Timers also reset if sterilize temperature drops 2° F (1.1° C) below set point during exposure phase. Control features programmed sterilize-temperature parameters that prevent inadvertent selection of cycles with improper sterilize-temperature settings. If an invalid steril-



Stage 2 Control Column

ize-temperature is selected, cycle cannot be started and a reference message is furnished.

A vertical column, mounted on side opposite door hinge, houses the controls. Side-mounting makes controls easy to access... and it removes them from exposure to the continuous heat, vapor and condensate resulting from the sterilization process. Salient features include:

1. Hinged door at the top of control column which provides access to...
  - **Power Switch** -- controls power to the sterilizer, sterilizer control, and (if equipped) the steam generator.
  - **Printer Function Switch** -- controls two printer functions:
    - » **Duplicate Print** -- pressing top of printer switch generates a complete duplicate printout of either the last completed cycle (when unit is not in cycle), or the current cycle phase and conditions (when unit is in cycle). First line of duplicate printout always indicates DUPLICATE PRINT.
    - » **Print Values** -- pressing bottom of printer switch generates a printout of all currently set cycles and cycle values.

- **Thermal Printer** -- provides an easy-to-read permanent printed record of all pertinent cycle data. The operator can easily verify that the cycle parameters are being met. Computer-generated printouts include date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and any deviations which might jeopardize sterilization process. Printer take-up spool automatically stores an entire roll of paper, providing cycle records which can be saved for future reference.

2. **Control Panel with Display Window** and two rows of Touch Pads. Touch pads are accessed by raising or lowering a sliding door, preventing inadvertent cycle starts or changes.

- **Display Window** features a 2-line x 20-character vacuum fluorescent display. It shows sterilizer status, time (time of day, sterilize time and dry time), temperature, pressure, warnings and instructional messages. Display also indicates any abnormal conditions that may exist either when in the READY mode or when a cycle is in progress. All messages are complete readouts with no codes to be cross-referenced.

- **Values Touch Pads** assign cycles and cycle values to the four Numerical Cycle Selector touch pads. Any combination of available cycles, along with sterilize time and temperature, and dry time values for each cycle, can be programmed. Gravity sterilizers have three types of cycles available... FLASH, GRAVITY and LIQUIDS. Vacumatic units have five types of cycles... FLASH, GRAVITY, LIQUIDS, PREVAC and EXPRESS. Cycles and cycle values are locked in and cannot be changed once cycle is started.

- **Numerical Cycle Selector Touch Pads (1, 2, 3, 4)** start cycles previously assigned by VALUES touch pads. Operator must press pad twice to initiate a cycle, minimizing chances of incorrect cycle selection. Cycle does not start unless chamber door is locked pressure tight. Display shows selected cycle and sterilizer conditions immediately when cycle begins.

- **Reset Touch Pad** resets control in case incorrect cycle is started.

- **Non-Operating End Controls** (for double-door units only) include four Numerical Cycle Selector Touch Pads, by which previously set cycles can be repeated, RESET Touch Pad and a Display Window. Display window is the same as the operating-end display window and concurrently shows the same messages.

- **Vacumatic sterilizer control** provides operator-initiated automatic Vacuum Test and DART® (Bowie-Dick) Test Cycles. Vacuum Test checks the integrity of the piping system. DART (Bowie-Dick) Test assures that cycles meet

air removal requirements for porous load processing. All sterilizers provide a service-technician-initiated Field Self Test mode for expedited troubleshooting in the event of a malfunction.

3. **Service-Selectable Features/Functions** -- Control system allows selection of additional features by modifying dip-switch settings (changes to be performed by a trained service technician).

- **Printer Output and Display Window Information** -- Allows selection of displays and printouts in English, French or Spanish (using standard English characters).

- **Automatic Utilities Control** -- When activated, control system automatically shuts off utilities at set SHUTDOWN time and turns them back on at set RESTART time. Settings are made using VALUES touch pads. If a cycle is in progress when the SHUTDOWN time is reached, utilities will not be shut off until the cycle is complete. (Requires optional Utilities Control Valve Kit.)

- **Access Code for Setting Cycles and Cycle Values** -- Requires entry of a four-digit access code in order to change cycles and cycle values. Pressing the CHANGE VALUE touch pad causes display to request entry of access code. If access code is not properly entered, display advances to first cycle (and related cycle values) not requiring an access code. As few as zero and as many as four cycles may be set for access coding.

- **Automatic Duplicate Print** -- Causes a duplicate printout of cycle data to be furnished automatically at the end of each cycle. This copy may be torn off and placed with sterilizer load. If sterilizer is not set for Automatic Duplicate Print and one is desired, a duplicate printout can be obtained by pressing top of Printer Function Switch.

- **Printout Interval** -- Allows adjustment of cycle-status printout intervals in increments of one-minute (factory setting is every minute for Flash cycles and every five minutes for other cycles).

- **Cycle Complete Intermittent Buzzer** -- Shuts off end-of-cycle reminder if not required. All abnormal-condition warning buzzer signals still function when cycle-complete buzzer is shut off.

- **Temperature Display and Printout Units** -- Allows selection of either Degrees F or Degrees C. Temperature is set and displayed to the nearest degree, however temperature control and printout is to the nearest 0.1 degree.

- **Pressure/Vacuum Display and Printout Units** -- Allows selection of either PSIG/in Hg or Bars (an absolute measurement for scientific use).

CHARGE T = 78.0° F P = 0 PSIG	SLOW EXHAUST T = 184.3° F P = 0 PSIG
STERILIZE 2:43 T = 272.2° F P = 30 PSIG	WARNING T = 118.5° F HOT LIQUIDS P = 0 PSIG
FAST EXHAUST T = 221.3° F P = 1 PSIG	INVALID TIME/TEMP SEE OPERATORS MANUAL

Control Monitoring and Communication

- **Time Display and Printout Units** -- Permits selection of either **Standard AM/PM** or **Military**.
- **Undertemperature Recovery Restart or Resume** -- Allows selection of either restarting or resuming sterilize time in case of an undertemperature condition. **Resume time selection is only for use in a laboratory.**
- **Mode of Operation** -- Permits selection of either **Hospital or Laboratory**. In the laboratory mode, the following values (service-adjustable when in hospital mode) are set by the operator using the Values Touch Pads:
  - » **Sterilize Temperature Overdrive, Overtemperature Point, Undertemperature Point and Chamber Pressure Points.**
  - » **Vacuum Points and Number of Vacuum Pulses** on **Vacumatic sterilizers** only for Prevac and Express cycles.

## TECHNICAL DATA

### Automatic Control

Two 8-bit parallel microcomputers hold programmed instructions with factory-set default values. Control system consists of two connected PC Boards (**Control and Printer**), located in control housing behind control column front panel. Screw mounting and swing-down pivoting of control housing allow for quick installation or removal of PC Boards.

An **internal battery** backs up all **cycle memory** for up to **ten years**. If there is a power failure during a cycle, the Eagle battery back-up system insures that (1) proper cycle completion can still occur, and (2) cycle memory will be retained. When power is lost, the cycle is held in phase until power is restored, thus exceeding the minimum government specification of one minute. Once power returns, the event is recorded on the printout and the cycle resumes or restarts, depending on what phase the cycle was in at the time of power loss.

**Control Board circuits** monitor sterilizer functions and include an A/D converter, a watchdog timer to protect A/C output, and an on-board power supply circuit. Quartz crystals maintain precision timing. A **thermistor** senses temperature and a strain-gauge-type **pressure transducer** senses pressure. These signals, converted into electrical impulses, provide accurate control inputs and readouts throughout the entire cycle. Individual temperature and pressure channel potentiometers for zero and span calibrations are furnished. Temperature-and/or pressure-sensor failure sounds an alarm and message is printed.

**Printer Board** has a 24-column digital alphanumeric printer which produces characters within a five-by-seven dot matrix on 2-1/4" wide, single-ply thermal paper. Printer is controlled by a **dedicated microcomputer**. Print speed is approximately 48 lines per minute. Paper tape exits from an opening flush with the surface of the control panel. Data is automatically printed at the beginning and end of each cycle and at all transition points. Five paper tape rolls are furnished with each unit.

**Power Supply**--Sterilizer operates on 120 VAC, 50/60 Hz, single-phase electrical power service. Internal power supply provides regulated voltage levels for display, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. An additional 208-240 or 480 Volt service is required if unit has an optional steam generator.

EAGLE 3000 VACAMATIC STERILIZER MADE IN U.S.A.			
* POWER UP	3:50:19P		
* READY	3:50:24P		
----- P R E V A C -----			
CYCLE START AT	3:51:52P		
ON	5/03/88		
CYCLE COUNT	03189		
OPERATOR			
STERILIZER			
STER TEMP =	270.0°F		
CONTROL TEMP =	273.0°F		
STER TIME =	4 MIN		
DRY TIME =	5 MIN		

TIME	T.O.F	Psig	V-IN/NG
C 3:51:52P	78.0	0P	
C 3:51:53P	196.4	10P	
C 3:53:43P	167.5	14V	
C 3:54:19P	248.8	26P	
C 3:55:41P	221.8	20V	
G 3:55:52P	252.8	26P	
G 3:57:19P	222.4	21V	
C 3:57:41P	260.8	26P	
C 3:59:17P	219.6	23V	
C 3:59:38P	262.3	26P	
S 3:59:49P	270.1	27P	
S 4:01:49P	273.2	29P	
S 4:03:49P	273.2	29P	
E 4:03:51P	273.3	29P	
E 4:04:41P	210.4	3P	
E 4:09:41P	137.4	28V	
Z 4:11:34P	119.7	0P	
TEMP MAX=274.9°F			
TEMP MIN=270.1°F			
CONDITION = 7:57			
STERILIZE = 4:02			
EXHAUST = 7:43			
TOTAL CYCLE = 19:42			
LOAD 50303			
READY TO UNLOAD			
DOOR OPEN 4:12:07P			

### Typical Printout, Prevacuum Cycle

### Manual Control (Gravity and Liquid Cycles Only)

Sterilizer may be operated manually (without electric power\*) using a single programming wheel. (Automatic control is not functional in this mode.)

\*Except sterilizers equipped with electric steam generator.

### Jacket and Chamber Assembly

**Monel door frames** support and conceal ends of door-holding arms when doors are locked, presenting a smooth surface for door gasket contact.

**Hot-rolled carbon-steel shells**, welded one within the other, form the sterilizer steam jacket. The inside of inner shell is nickel-clad, 0.025-inch (0.63 mm) thick (nominal). A chamber test opening (plugged) is provided.

**Glass-fiber blanket insulation** on outside of chamber assembly is 1 inch (25 mm) thick (nominal), and is double-faced with aluminum foil. It is held in place by pressure-sensitive tape, aluminum straps and clips. Sterilizer jacket is painted prior to being insulated. **Steam-supply opening** inside chamber is shielded by a **baffle**.

### Chamber Door(s)

**Door is cast-bronze and manually operated.** Its stainless-steel, bearing-mounted hinges will be on side of chamber specified. Hinges are adjustable for accurate gasket alignment. Radial arms, actuated by rotating a low-heat-conducting handwheel, exert an even pressure on the silicone-rubber sealing gasket. Gasket is replaceable without tools.

A **stainless-steel, sound-deadening cover** conceals holding arms and exterior parts. Microswitches prevent inadvertent start of cycle before doors are locked; **pressure lock(s)** keep door(s) from being opened during cycle. **Door(s) may be tightened but not opened while pressure is in chamber.**

### Vacuum System (Vacumatic Sterilizers Only)

**Prevacuum** -- A series of microcomputer-controlled and monitored vacuum/pressure pulses effectively condition loads of various size and density, reducing total sterilization time. Factory setting consists of three pressure pulses and four evacuations. Evacuation system includes a **condenser** and **water ejector**.

**Post-vacuum (Drying)** -- Following the exposure phase, chamber is exhausted and evacuation continues throughout the drying phase. At conclusion of drying phase, filtered air relieves the vacuum. **Air filter** is bacteria retentive.

### Chamber Drain System

Drain system is designed to prevent pollutants from entering into the water-supply system and sterilizer. **Steam-condensate system with water saver** converts steam to condensate and disposes condensate to waste. Water flow is regulated consistent with the amount of steam discharged. **Water supply shutoff valve** is behind service access door. A constant steam bleed across a temperature-sensing element (thermistor) in the chamber line provides improved air elimination and more accurate temperature sensing.

### Drying System (Gravity Sterilizers Only)

**Steam ejector** reduces chamber pressure during drying phase and draws air into chamber through a **bacteria-retentive filter**. This filtered air entrains and conducts odors and vapors from chamber to drain. Steam to ejector is microcomputer-controlled.

### Steam Source

Sterilizers are piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm<sup>2</sup>) dynamic. Sterilizer service lines terminate at fittings for connection to building service lines. Sterilizer steam supply line includes a strainer, shutoff and internal pressure regulator. Jacket condensate line includes a strainer, trap, and check valve. **Shutoff valve, jacket pressure and chamber pressure/vacuum gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

## INSTALLATION

Sterilizers are arranged for mounting as either cabinet-enclosed or recessed, as specified. Each sterilizer is equipped with a height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Sterilizer subframe has a synthetic-rubber gasket to ensure tight fit of cabinet panels to each other (freestanding units), or front panel to wall partition (recessed units). **Stainless-steel front panel** has service access door and height-adjustable kickplate. On freestanding units, stainless-steel side panels and a louvered top panel enclose the sterilizer body and piping.

### Optional Integral Steam Generator

Steam generator is electrically powered, automatically filled with water, and operates whenever sterilizer power is on. Includes **positive displacement water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feedwater line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator. A **flood fail-safe** feature is provided.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm<sup>2</sup>). Heaters operate on 208-240 or 480 volt, 50/60 Hz, 3-phase electric power. Additional voltages are available upon request. Nominal capacity of the generator heaters is 30 kw, when operated at 240V. Capacity is approximately 22.5 kw when operated at 208V. Controls operate on 120-volt, 50/60 Hz, single-phase electric power.

### Other Components

The following are furnished to obtain a complete working unit, ready for (but not including) connection to the building utility service lines.

- **Solenoid Valves** to simplify sterilizer piping. Valves are placed where needed and can be serviced individually.
- **Manual Valves** are bronze, angle type with renewable seats and synthetic discs or equivalent high-quality parts. They are hydrostatically tested at 350 psig (24.61 kg/cm<sup>2</sup>) or proven leakproof when tested at 100 psig (7.03 kg/cm<sup>2</sup>) air pressure with valve body submerged in water. Valve handles are low-heat conducting and easily replaceable.
- **Steam Pressure Regulator** operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm<sup>2</sup>). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253° or 273° F (122° or 134° C).
- **Thermostatic Steam Traps** are pressure and temperature compensated and have renewable **monel bellows** with matched stainless-steel plunger and seat.

**Piping and Electrical Connections** terminate within the confines of the sterilizer. Piping used to support other components is rigid brass.

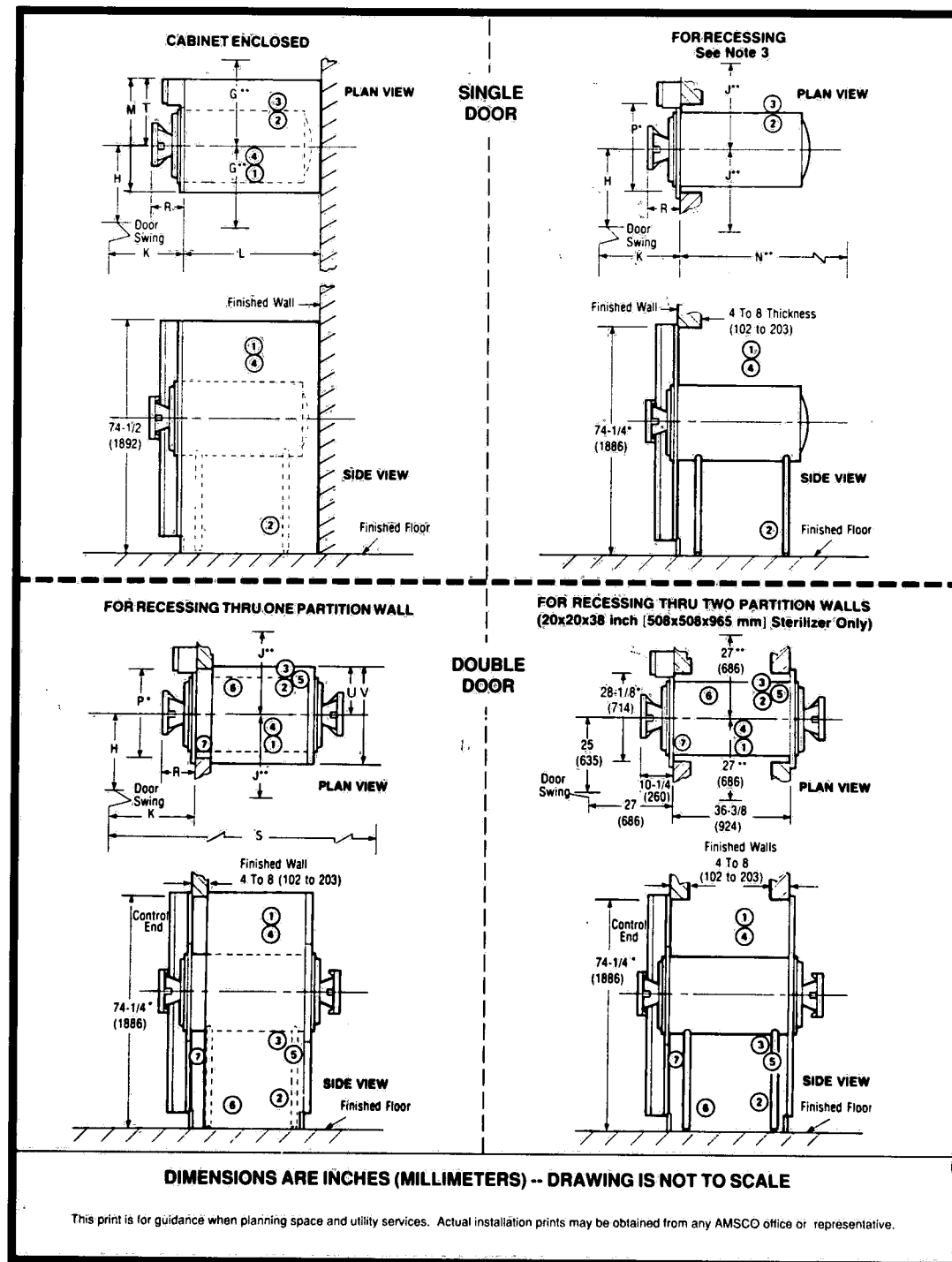
### Optional Material Handling Accessories

Accessories available include racks with shelves, instrument trays and (except for 16x16x26" units) loading cars. See separate product literature for details.

## 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. Coverage includes one year on parts (except expendables) and labor. AMSCO representatives can provide full details of the warranty program on request. The ASME pressure vessel (sterilizer chamber only, not the steam generator if equipped) is further warranted to the original owner against structural failure for a period of 15 years from the date of initial operation under normal use, operation and maintenance. This warranty does not extend to normal repairs, maintenance or adjustments required for the door closure mechanism.

\*Applies only to units sold in the USA and Canada. For details of the warranty on units sold elsewhere, contact the AMSCO International Regional Office serving your area.



CHAMBER SIZES		
	16x16x26 (406x406x660)	20x20x38 (508x508x965)
G	30 (762)	32 (813)
H	23 (762)	25 (635)
J	25** (635)	27** (686)
K	22 (559)	27 (686)
L	28-1/4 (718)	40-1/4 (1022)
M	31-1/2 (800)	35-1/2 (902)
N	40** (1016)	52** (1321)
P	24-1/8 (613)	28-1/8 (714)
R	10-1/4 (260)	10-1/4 (260)
S	69-7/16 (1764)	90-3/8 (2294)
T	18-1/2 (470)	20-1/2 (521)
U	13 (330)	15 (381)
V	26 (660)	30 (762)

\* Wall Opening  
\*\* Minimum Service Clearance

**OPERATING REQUIREMENTS**

**Steam and Electric Units:**

- COLD WATER --**  
Gravity Sterilizers - 3/8 NPT, 20 to 50 psig (1.4 to 3.5 kg/cm<sup>2</sup>) dynamic.  
Vacumatic Sterilizers - 3/4 NPT, 30 to 50 psig (2.1 to 3.5 kg/cm<sup>2</sup>) dynamic.
- DRAIN -- 1-1/2 ODT.**
- TERMINAL BOX -- 120 Volt, 50/60 Hz, Single-phase Service, 1 Amp (6 Amp with an Electric Steam Generator).**

**Steam Units Only:**

- STEAM SUPPLY -- 3/8 NPT, 50 to 80 psig (3.5 to 5.6 kg/cm<sup>2</sup>) dynamic, condensate free, between 97 and 100% saturated vapor.**

**Electric Units Only:**

- HOT WATER -- 3/8 NPT, 20 to 50 psig (1.4 to 3.5 kg/cm<sup>2</sup>) dynamic.**  
*NOTE: Cold water may be substituted but with a sacrifice on heat-up time.*
- DRAIN -- 1/2 ODT (For Generator).**
- GENERATOR HEATER TERMINAL BOX -- 208-240 or 480 Volt, 50/60 Hz, Three-phase Service.**  
... CHECK LOCAL CODES ...

**NOTES:**

- Pipe sizes shown indicate terminal outlet only for the equipment. Building service lines, provided by others, must supply the specified pressures and flow rates.
- Disconnect switches (with OFF position lockout; by others) should be installed in electric supply lines near the equipment.
- Access to the recessing area from the control end of the sterilizer is recommended.
- Clearances shown are minimal for installing and servicing the equipment.
- If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.
- Right-side door-swing clearances are shown. Clearances for left-side door swing are identical.
- Floor drain should be provided within confines of sterilizer framework.
- Vacumatic cold water supply temperature requirements are 50-70° F (10-21° C). Vacuum efficiency is reduced at water temperatures above 70° F (21° C).
- Water resistivity should not exceed 26K ohms and total water hardness should not exceed 60 PPM (approx. 3.5 grains).

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.

ENGINEERING DATA

SIZE/TYPE in. (mm)	HEATING	MAXIMUM OPERATING WEIGHT <sup>1</sup> lbs (kg)		HEAT LOSS BTU/hr at 70°F (21°C)							
				Single Door			Double Door				
				Cab't Enc	Recessed		Recessed One Wall		Recessed Two Walls		
		Single Door	Double Door	To Room	Front of Wall	Back of Wall	Front of Wall	Back of Wall	At Each End	Btw'n Walls	
16x16x26 (406x406x660) Gravity and Vac	Steam	1410 (637)	1410 (637)	4300	1600	2700	1600	3500	N/A	N/A	
	Electric	1410 (637)	N/A	6050	2300	3750	2300	4550	N/A	N/A	
20x20x38 (508x508x965) Gravity and Vac	Steam	2128 (966)	2128 (966)	7000	2500	4500	2500	5300	2500	2800	
	Electric			8750	3300	5450	3300	6250	3300	2950	

<sup>1</sup>Based on seismic calculations

SIZE/TYPE in. (mm)	UTILITIES CONSUMPTION						ELECTRICAL REQUIREMENTS (Amps)				
	Water <sup>1</sup>				Steam <sup>2</sup>		Electric				
	Cold		Hot <sup>3</sup>		Peak lb/hr (kg/hr)	Avg lb/hr (kg/hr)	Ster. Cntrl	Sim./Gen. Cntrl Only (Elec. Units)	Heaters (3 Ph) <sup>4</sup> Amps/Phase		
	Peak gpm (lpm)	Avg gph (lph)	Peak gph (lph)	Avg gph (lph)					120V	120V	208V 240V 480V
16x16x26 Gravity (406x406x660)	5 (19)	98 (371)	12 (45)	4 (15)	83 (38)	35 (16)	1.0	6.0	62.6	72.2	36.1
16x16x26 Vac (406x406x660)	15 (57)	164 (611)	12 (45)	10 (38)	83 (38)	70 (32)	1.0	6.0	62.6	72.2	36.1
20x20x38 Gravity (508x508x965)	5 (19)	98 (371)	16 (60)	8 (30)	116 (53)	49 (22)	1.0	6.0	62.6	72.2	36.1
20x20x38 Vac (508x508x965)	15 (57)	164 (611)	16 (60)	14 (53)	116 (53)	98 (44)	1.0	6.0	62.6	72.2	36.1

<sup>1</sup>At 20-50 psig (1.41-3.52 kg/cm<sup>2</sup>) for gravity units; 30-50 psig (2.11-3.52 kg/cm<sup>2</sup>) for vac units

<sup>2</sup>At 50-80 psig (3.52-5.62 kg/cm<sup>2</sup>)

<sup>3</sup>Hot water recommended for electrically powered units

<sup>4</sup>At 208V, nominal capacity of generator is 22.5 kw. At 240V, capacity is 30 kw

SPECIFICATION WORKSHEET

Item \_\_\_\_\_: Furnish an AMSCO Eagle 3000 Series sterilizer with Stage II control with interactive vacuum fluorescent display and four numerical cycle selection touch pads. Construct nickel clad chamber ☐ 16x16x26" or ☐ 20x20x38". Supply ☐ gravity model or ☐ vacuumatic model. Design control with microcomputer to control system functions, monitor system operations, and visually indicate and print chamber temperature, pressure, time, date and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator (except Double Door 16" units). Arrange sterilizer ☐ to be freestanding or ☐ for recessing into a partition wall or ☐ for recessing through two walls (20x20x38" double-door models only). Equip sterilizer with ☐ Utilities Control Valve Kit option. Equip sterilizer with the following Laboratory/Scientific Options\*: ☐ Pure Steam Piping, ☐ Pure Steam Piping with Stainless-Steel Electric Steam Generator, ☐ Door Interlocks, ☐ Door Interlocks with Cross Contamination Seals and ☐ Chamber Penetrations and Accessories.

\*See separate Tech Data Sheets for Specifications.

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, Troubleshooting, 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. Refer to Section 7, Component Repair, Replacement and Adjustment for service procedures and special features/adjustments.

2.2 COMPONENT IDENTIFICATION/FUNCTION

Become familiar with all control locations and functions before operating the sterilizer.

Located behind printer door (Figure 2-1):

- Sterilizer Power Switch - controls power to the sterilizer and (if equipped) steam generator.

Located behind the upper access door (Figure 2-2):

- Water Supply Valve - provides cold water supply to sterilizer; must be open for sterilizer operation.
- Steam Supply Valve - provides steam supply to sterilizer; must be open for sterilizer operation.
- HI-LO Steam Control Valve - regulates steam pressure. Factory settings are:  
HI - 30-32 psig for 270°F cycles  
LO - 18-20 psig for 250°F cycles

- Chamber Pressure/Vacuum and Jacket Pressure Gauges - show respective chamber pressure and steam pressure levels.

- Manual Control - used for manual operation of sterilizer. Must be set to OFF for automatic operation.

Located behind the lower access door (units with electric steam generator only):

- Generator Water-Supply Valve - must be open for normal operation.
- Generator Drain Valve - must be closed for normal operation.

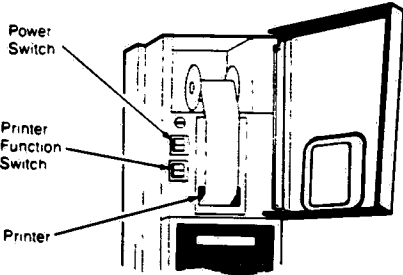


FIGURE 2-1 - Printer

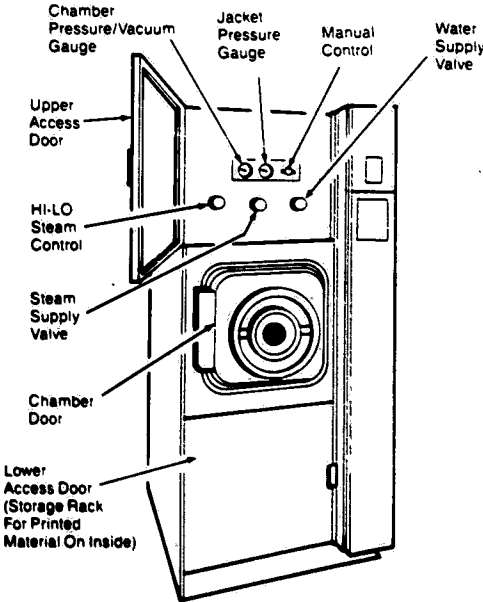


FIGURE 2-2 - Eagle 3000 Series Sterilizer

### Printer (Figure 2-1)

The printer records all cycle data on 2-1/4 inch wide single-ply thermal paper. See Section 4.3 for paper changing procedure. The printer rocker switch (located behind printer door) controls two printer functions, PRINT and PRINT VALUES.

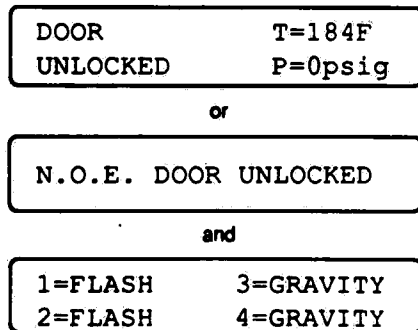
- **PRINT** - Pressing the top portion of the rocker switch generates a complete duplicate printout of the last cycle run (when unit is not in cycle), or (when unit is in cycle) a printout of current cycle phase and chamber conditions.
- **PRINT VALUES** - Pressing the bottom portion of the rocker switch, when unit is not in cycle, generates a printout of all currently set cycles and cycle values.

### Operating End Control Panel (Figure 2-3)

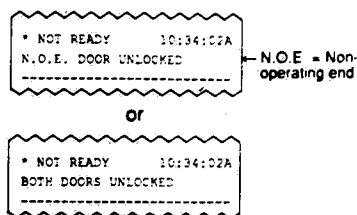
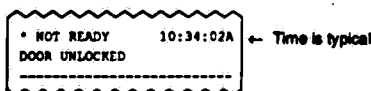
The operating end control panel is used to set cycles and cycle values, start/reset cycles, and display status and control messages.

- Cycles and cycle values are set using the cursor control touch pads accessible when sliding door is in raised position.
- Cycles are started or reset using the numbered touch pads and RESET touch pad accessible when sliding door is in lowered position.
- Cycle status and control messages are shown on a 2-line x 20-character display.

When not in cycle and sterilizer not in the READY mode (door[s] unlocked), the display alternates between the door-status message and the cycle menu as follows (time, temp and cycle menu example only):



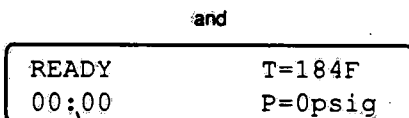
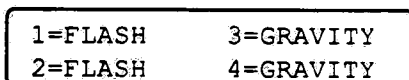
Printer prints:



If door(s) is locked and some abnormal out-of-cycle condition exists, display shows the condition. For example:



When not in cycle and sterilizer in the READY mode (door[s] locked), the display alternately shows available cycle selections and the READY message (typical only):



Time of day

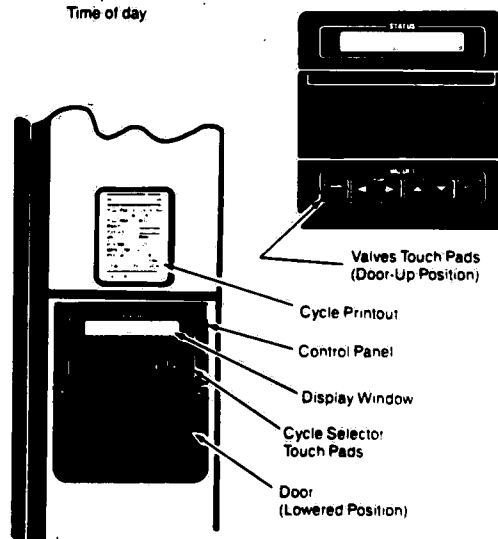


FIGURE 2-3 - Operating-End Control Panel

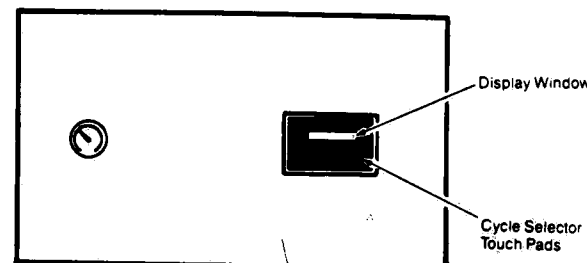
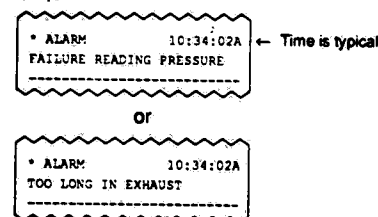


FIGURE 2-4 - Non-Operating End Control Panel

**Note:** To view cycle values, press and hold the corresponding cycle-selector touch pad.

When cycle is in progress, display shows cycle status and information. The printer prints any abnormal conditions. For example:



Abnormal conditions are also indicated by a pulsating buzzer. Buzzer can be silenced by pressing one of the cycle-selector (numbered) touch pads.

### Non-Operating End Control Panel (Double-Door Sterilizers Only) (Figure 2-4)

The non-operating end control panel features four cycle-selector touch pads and a RESET touch pad.

- Cycles can be started or reset using the four cycle-selector and the RESET touch pads. Cycle values cannot be changed from the non-operating end.
- Display shows, concurrently, the same cycle status and control messages as on operating end.

### Reset Function

The RESET touch pad is used to abort a cycle and put the control into a safe condition. Chamber pressure or vacuum is exhausted.

**Note:** If the wrong cycle selector touch pad is pushed when starting a cycle, proceed as follows:

1. Press RESET touch pad to abort cycle. Display shows "ABORT" and printer records the time RESET was pressed and prints "ABORT." Wait until display shows "READY."

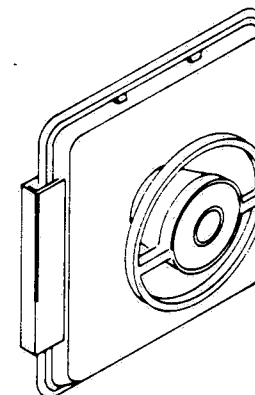


FIGURE 2-5 - Chamber Door

2. Press touch pad for the correct cycle. Printer records cycle selected and proceeds through correct cycle.

### Door Operation (Figure 2-5)

**Note:** Should the door at first not unlock, turn handwheel slightly clockwise and press the center black button. Then again turn handwheel counterclockwise and open door. Always turn handwheel as far as it will go to the left so that holding arms are completely retracted and will not strike door frame when door is opened or closed.

A handwheel locks and unlocks the door. Door can be swung open or closed from the unlocked position.

- To open door from locked position - rotate handwheel counterclockwise as far as it will go using normal hand pressure and swing door open.
- To close and lock door from open position - swing door closed and rotate handwheel clockwise as far as it will go using normal hand pressure.

### 2.3 STERILIZER CYCLES & CYCLE VALUES

The Series 3000 sterilizer control is programmed with factory-set cycles, as well as cycle and control values. The control defaults to these cycles and values if a battery failure occurs. The preset values can be changed to tailor the sterilizer to the operating environment in which it has been placed.

**Note:** If a battery failure occurs, operator-set cycles and values are lost. The factory set cycles, cycle values and control values then appear on the display when sterilizer power is switched ON. Cycles and values may be changed so that desired cycles can be run until battery failure is corrected. (Any cycle or value changes made during this time will only be retained as long as the sterilizer power remains ON.)

**Note:** If access code option has been set to ON, a four-digit access code must be correctly entered before cycles or values can be changed. See Section 2.4 for setting access codes.

#### Permanent Default Cycles and Cycle Values

Series 3000 sterilizers also have permanent default cycles and cycle values programmed into the control. These default values appear on display when changing cycles (see Table 2-1).

**TABLE 2-1 - PROGRAMMED PERMANENT DEFAULT VALUES**

Cycle	Sterilize Temp.	Sterilize Time	Dry Time
PREVACUUM*	270°F	4 min.	5 min.
GRAVITY	270°F	15 min.	30 min.
LIQUID	250°F	45 min.	0 min.
FLASH	270°F	10 min.	1 min.
EXPRESS*	270°F	4 min.	3 min.

#### Sterilizer Factory Settings

Gravity sterilizers are shipped with cycles and cycle values as shown in Table 2-2, and Vacumatic sterilizers are shipped with those shown in Table 2-3.

**TABLE 2-2 - FACTORY-SET CYCLES AND VALUES - GRAVITY STERILIZERS**

Touch Pad	Cycle	Sterilize Temp.	Sterilize Time	Dry Time
1	FLASH	270°F	3 min	1 min
2	FLASH	270°F	10 min	1 min
3	GRAVITY	270°F	15 min	30 min
4	GRAVITY	250°F	30 min	15 min

**TABLE 2-3 - FACTORY-SET CYCLES AND VALUES - VACAMATIC STERILIZERS**

Touch Pad	Cycle	Sterilize Temp.	Sterilize Time	Dry Time
1	EXPRESS	270°F	4 min	3 min
2	PREVAC	270°F	4 min	20 min
3	FLASH	270°F	3 min	1 min
4	FLASH	270°F	10 min	1 min

In addition, sterilizers are shipped with control values as shown in Table 2-4:

Any combination of up to four FLASH, GRAVITY and LIQUIDS can be set for the cycle selector touch pads (numbered 1 thru 4). For Vacumatic Sterilizers only, PREVAC and EXPRESS cycles can also be programmed for the numbered touch pads.

\*PREVACUUM and EXPRESS cycles are available on Vacumatic Sterilizers only.

**TABLE 2-4 - FACTORY-SET CONTROL VALUES**

Control Value	Gravity Units	Vacumatic Units
Print Intervals	C1P1 = 1 min C2P1 = 5 min C3P1 = 5 min C4P1 = 5 min	C1P1 = 2 min C2P1 = 2 min C3P1 = 2 min C4P1 = 2 min
Timing Alarms	Too Long in CHARGE - 20 min Too Long in EXHAUST - 5 min	Too Long in CHARGE - 20 min Too Long in EXHAUST - 5 min Too Long in VACUUM - 20 min
P3 and P2	P3 = 3 psig P2 = 1 psig	P3 = 3 psig P2 = 1 psig
Purge Time and Temp Overdrive	Purge = 1 min Overdrive = 3°F	Purge = 1 min Overdrive = 3°F
Overtemp and Undertemp	Overtemp = 20°F Undertemp = 2°F	Overtemp = 20°F Undertemp = 2°F
Prevac Pulses, P1 and V1	N/A	Pulses = 4 P1 = 26 psig V1 = 10 in.Hg
Express Pulses, P1 and V1	N/A	Pulses = 2 P1 = 26 psig V1 = 10 in.Hg

Cycle values can be changed within the following parameters:

- **Maximum Sterilize Temperature** setting is 285°F for all cycles except LIQUIDS (maximum setting is 250°F). Minimum setting for FLASH (also PREVAC and EXPRESS - Vacumatic units) cycles is 270°F. Cycles outside of these temperature ranges cannot be programmed. If an attempt is made to set temperatures outside the allowable ranges, display shows the following message:

INVALID VALUE SET!  
SEE OPERATORS MANUAL

- **Sterilize Temperature** can be set to the nearest degree; however, control and printout is to the nearest 1/10 degree.
- **Sterilize Times and Dry Times** can be set in one-minute increments (hospital usage units).

#### Change Sterilizer Cycles, Cycle Values and Control Values

1. Open the printer door and position the power switch to ON.
  - Display panel lights up.
  - Printer records the time power is turned on.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator, "PERFORM LEAK TEST?". To bypass press cycle-selector touch pad #2 for NO. Next display prompts, "PERFORM DART (BOWIE-DICK) TEST?". To bypass press cycle-selector touch Pad #2 for NO.

2. Close printer door and raise the sliding door to access the VALUES touch pads. Press the CHANGE VALUES touch pad to access the following sequence of display window messages where values can be changed:

#### Hospital and Laboratory Usage:

- **1st\*** - Cycle set for touch pad #1, its sterilize temperature, and sterilize and dry times (hrs:min - hospital usage; hrs:min:sec - laboratory usage).
- **2nd\*** - Cycle set for touch pad #2, its sterilize temperature, and sterilize and dry times (hrs:min - hospital usage; hrs:min:sec - laboratory usage).
- **3rd\*** - Cycle set for touch pad #3, its sterilize temperature, and sterilize and dry times (hrs:min - hospital usage; hrs:min:sec - laboratory usage).
- **4th\*** - Cycle set for touch pad #4, its sterilize temperature, and sterilize and dry times (hrs:min - hospital usage; hrs:min:sec - laboratory usage).

#### Hospital Usage Only:

- **5th** - Clock/calendar time and date.

**Note:** The following two displays appear only if the Automatic Utilities control feature is set to ON.

- **6th** - Automatic Utilities Control, day of week and days in week.
- **7th** - Automatic Utilities Control, shutdown and restart hours/minutes.

#### Laboratory Usage Only - Gravity Units:

- **5th** - Print intervals for all four cycles (set in one-minute increments, 0-99 minute range).
- **6th** - Timing alarms of Too Long in Charge or Exhaust (set in one-minute increments, 0-99 minute range).
- **7th** - P3 and P2 (set in 1/10 psig increments, 0-15 psig range).
- **8th** - Purge time (set in minutes and seconds, 0:0 to 99:99 range) and Temperature Overdrive (set in 1/10 degree increments; 0-9.9°F range).

\*These message displays do not appear if cycle is locked out by access code feature. Press CHANGE VALUES touch pad when NO is blinking to advance to first cycle that is not locked out.

- **9th** - Overtemperature and Undertemperature points (set in 1/10 degree increments, 0-99.9°F range for Overtemp and 0-9.9°F range for Undertemp).

- **10th** - Clock/calendar time and date.

**Note:** The following two displays appear only if the Automatic Utilities control feature is set to ON.

- **11th** - Automatic Utilities Control, day of week and days in week.
- **12th** - Automatic Utilities Control, shutdown and restart hours/minutes.

#### Laboratory Usage Only - Vacumatic Units:

- **5th** - Print intervals for all four cycles (set in one-minute increments, 0-99 minute range).
- **6th** - Timing alarms of Too Long in Charge, Exhaust or Vacuum (set in one-minute increments, 0-99 minute range).
- **7th** - Prevac Pulses (0-99 pulses), P1 (set in 1/10 psig increments, 0-35 psig range) and V1 (set in 1/10 in.Hg increments, 0-30 in.Hg range).
- **8th** - Express Pulses (0-99 pulses), P1 (set in 1/10 psig increments, 0-35 psig range) and V1 (set in 1/10 in.Hg increments, 0-30 in.Hg range).
- **9th** - P3 and P2 (set in 1/10 psig increments, 0-15 psig range).
- **10th** - Purge time (set in minutes and seconds, 0:0 to 99:99 range) and Temperature Overdrive (set in 1/10 degree increments; 0-9.9°F range).
- **11th** - Overtemperature and Undertemperature points (set in 1/10 degree increments, 0-99.9°F range for Overtemp and 0-9.9°F range for Undertemp).
- **12th** - Clock/calendar time and date.

**Note:** The following two displays appear only if the Automatic Utilities control feature is set to ON.

- **13th** - Automatic Utilities Control, day of week and days in week.
- **14th** - Automatic Utilities Control, shutdown and restart hours/minutes.

3. Change cycles or cycle values as follows:

- a. Press and release the CHANGE VALUES touch pad the same number of times as the cycle number to be changed (i.e. press and release once to change cycle for touch pad #1, twice to change cycle for touch pad #2, etc.). Cycle name blinks.



**TABLE 2-5 - MINIMUM STERILIZATION EXPOSURE PERIOD - WRAPPED AND UNWRAPPED GOODS**

Items	Sterilize Time 250°F (121°C)	Sterilize Time 270°F (132°C)	Dry Time Minutes
Dressings, wrapped in muslin or equivalent	30	15	30 <sup>(1)</sup>
Glassware, empty, inverted	15	3	0 <sup>(2)</sup>
Instruments, metal combined with suture, tubing or other porous materials (unwrapped)	20	10	0 <sup>(2)</sup>
Instruments, wrapped in double thickness muslin or equivalent	30	15	30 <sup>(1)</sup>
Linen packs (maximum size: 12"x12"x20", maximum weight 12 pounds)	30	-	30 <sup>(1)</sup>
Treatment trays wrapped in muslin or equivalent	30	15	30 <sup>(1)</sup>
Utensils, unwrapped	15	3	0 <sup>(2)</sup>
Utensils, wrapped in muslin or equivalent	30	15	30 <sup>(1)</sup>

<sup>1</sup> Dry time can vary for wrapped goods depending on pack density, instrument tray weight, pack preparation technique including type of wrapping material used, and sterilizer loading procedures (refer to Section 5).

<sup>2</sup> Dry time is not required for unwrapped goods, however, a dry time of one or two minutes will help reduce excess steam vapor when opening chamber door at end of cycle.

- Press the VALUE direction pad (up or down) to view the available cycles and release the VALUE pad when desired cycle is displayed. Cycle displayed (and the default values for that type of cycle) are now set for that cycle number.
- Press CURSOR direction pad (left or right) to move cursor (the blinking display position) to the digit (sterilize temperature, sterilize time or dry time) you wish to change.

- Increase or decrease the value by pressing the VALUE direction pad (up or down).

See Table 2-5, 2-6 or 2-7 for recommended sterilize temperature, sterilize time and dry time settings for various loads.

- Repeat steps a, b, c and d until all desired cycle; sterilize temperature, sterilize time and dry time settings have been made.

- Change clock/calendar time and date and other control values, if desired, as follows:

- Press and release the CHANGE VALUES touch pad to continue the sequence of displays.
- Move cursor to the digit you wish to change by pressing CURSOR direction pad (left or right).
- Increase or decrease the value by pressing the VALUE direction pad (up or down).

**TABLE 2-6 - MINIMUM STERILIZATION EXPOSURE PERIOD - UNWRAPPED GOODS FLASH CYCLE ONLY**

Items	Sterilize Time 270°F (132°C)	Dry Time Minutes
Instruments, metal, combined with suture, tubing or other porous materials (unwrapped)	10	0 <sup>(2)</sup>
Utensils, (unwrapped)	3	0 <sup>(2)</sup>

**TABLE 2-7 - MINIMUM RECOMMENDED EXPOSURE TIMES FOR FULL LOAD OF SQUARE-PAK FLASKED SOLUTIONS**

ASPF Size	Time (Minutes)	Temperature
75 ML	25	250°F (121°C)
250 ML	30	250°F (121°C)
500 ML	40	250°F (121°C)
1000 ML	45	250°F (121°C)
1500 ML	50	250°F (121°C)
2000 ML	55	250°F (121°C)

- Repeat steps a, b and c until all desired control value changes have been made.
- Press SAVE VALUES touch pad to record the new values and to advance control to the ready mode. Printout of all cycle values is generated.
  - Proceed to Section 2.5 to run the cycles now set.

## 2.4 SERVICE ADJUSTMENTS AND SPECIAL FEATURES

**WARNING: BURN AND SHOCK HAZARD - Sterilizer service adjustments should be performed only by qualified service technicians.**

Certain sterilizer control functions are service adjustable to adapt the sterilizer to a particular operation. See Section 7 for a listing of these features. Procedures for making these adjustments are found in Section 7.8.

### Automatic Duplicate Print

Sterilizer can be set to automatically furnish a duplicate printout of each cycle at the end of the cycle. First line will always read... DUPLICATE PRINT... and complete printout of cycle data will be furnished.

### Intermittent Buzzer When Cycle Complete

Sterilizer can be set so that the buzzer does not sound when cycle is complete. All additional warning buzzer alarms will still sound even when complete buzzer is set to OFF.

### Access Code To Set Cycle Values

**Note:** When Access Code function is set to OFF (service adjustment), no printouts or displays indicate the feature exists.

When Access Code function is enabled, the following message is displayed the first time the CHANGE VALUES touch pad is pressed (even if no cycles are locked-out):

DO YOU KNOW ACCESS  
CODE? NO

(NO is blinking on and off.)

Pressing the CHANGE VALUES touch pad while NO is blinking automatically advances control to first cycle that is not locked out. Cycles and cycle values may be changed for any cycle that is not locked out.

Pressing the VALUES "UP" direction pad changes NO to YES. Then, pressing the CHANGE VALUES touch pad while YES is blinking advances control to the following display message:

ENTER ACCESS CODE  
CODE IS 0000

(First digit is blinking.)

To enter the access code...

- Press VALUES "UP" direction pad (display counts up) the number of times equal to the first digit.
- Press CURSOR "RIGHT" direction pad to move cursor to the second digit.
- Press VALUES "UP" direction pad the number of times equal to the second digit.
- Press CURSOR "RIGHT" direction pad to move cursor to the third digit.
- Press VALUES "UP" direction pad the number of times equal to the third digit.
- Press CURSOR "RIGHT" direction pad to move cursor to the fourth digit.
- Press VALUES "UP" direction pad the number of times equal to the fourth digit.
- Press CHANGE VALUES touch pad to input the entered access code.

**Note:** If incorrect access code is entered, control advances to the first cycle that is not locked out. If all four cycles are locked out, control advances to the

CHANGE TIME AND DATE display. Press the SAVE VALUES touch pad to advance control to READY mode, then repeat the procedure and enter correct access code.

Once correct access code is entered, the following message is displayed:

CHANGE ACCESS CODE?  
NEW CODE = 0000

(First digit is blinking.)

To change the access code, repeat steps 1 thru 8. Then press CHANGE VALUES to advance the control.

Pressing the CHANGE VALUES touch pad immediately advances the control without changing the access code.

The following message is displayed:

CYCLES TO LOCKOUT= 0

(Cursor position "0" is blinking.)

**Note:** If a number of cycles are currently locked-out, that number appears in the message instead of "0."

Locked-out cycles are always in sequential order, i.e., if only one cycle is locked-out, it will be #1; if two are locked-out, they will be #1 and #2; etc.

Pressing the VALUES "UP" direction pad increases the number of locked-out cycles (1, 2, 3 or 4); pressing the VALUES "DOWN" direction pad decreases the number.

Pressing the CHANGE VALUES touch pad saves the setting and advances the control to cycle #1.

### Set Automatic Utilities Control Times (Optional)

**Note:** Automatic Utilities Control feature is normally set to OFF (service adjustment). No printouts or displays indicate that the feature exists. An optional kit must be installed to activate this feature.

Sterilizer can be set to automatically control utilities shutdown and restart times. The control automatically shuts off utilities when the SHUTDOWN set time is reached and turns them back on when the RESTART set time is reached. If a cycle is in progress when the SHUTDOWN time is reached, the utilities are not shut off until the cycle is complete.

The following conditions apply when the Automatic Utilities Control feature is in use:

- If the SHUTDOWN and RESTART times are identical or if SHUTDOWN time is set to zero, then no shutdown occurs.

- If the RESTART time is set to zero, no restart occurs until a cycle-select touch pad or the RESET touch pad is pressed.
- RESTART can be activated manually by pressing a cycle-select touch pad or pressing the RESET touch pad when in the SHUTDOWN phase.
- If a power failure occurs during SHUTDOWN, the control returns to the SHUTDOWN phase upon return of power.

When the control is in the SHUTDOWN phase the display shows (time/days for example only):

UTILITIES SHUTDOWN  
RESTART AT 00:00A

To set or change the control settings of the utilities shutdown feature proceed as follows:

1. Press the CHANGE VALUES touch pad until the control advances to the following display:

DAYS IN WEEK= 0  
DAY OF WEEK= 0

2. Enter the number of days in the week the utilities control is desired (i.e., 5 for Monday-Friday week; 7 for entire week, etc.).
3. Enter the number of the current day as it would be numbered in the week set in the previous step (i.e., Wednesday of a 5-day week would be 3, Friday would be 5, etc.).
4. Press and release the CHANGE VALUES touch pad to advance display to...

SHUTDOWN AT 00:00P  
RESTART AT 00:00A

5. Move cursor to the digit you wish to change by pressing CURSOR direction pad (left or right).
6. Increase or decrease the value by pressing the VALUE direction pad (up or down).
7. Press the SAVE VALUES touch pad to record the utility control times and to advance control to READY mode. Printout of cycle values with utility control times and cycle count is generated.

#### Laboratory Option Description

When the sterilizer is set for laboratory use the operator can select all values shown in Table 2-4 in addition to all the normal hospital values. Also, sterilize and dry time values are in hours, minutes and seconds instead of only minutes.

Values are set using the same procedure as hospital values.

Laboratory processes may require additional special sterilizer adjustments as follows:

#### • Set Sterilize Temperature Overdrive

Controls are factory set to control chamber temperature at 3°F (2°C) above the set temperature. This overdrive setting assures effective load temperature control and provides for the shortest possible cycle time. For special sterilizer applications this can be adjusted from 0.0-9.9°F.

#### • Undertemperature Recovery Function

**Note:** Resume-time option is **only** for use in the laboratory environment. It is **not** to be used in a hospital application.

The hospital usage sterilizer is factory set so that, if chamber temperature drops more than 2°F below set sterilize temperature and then set temperature is reattained, sterilize timer **resets** to full sterilize time.

For laboratory usage, the sterilizer is factory set so that, if chamber temperature drops more than 2°F below set sterilize temperature and then set temperature is reattained, sterilize timer **resumes** counting down remaining sterilize time.

#### • Steam Pressure Regulator (Sterilization at Temperatures Below 250°F)

The steam pressure regulator (HI-LO Valve) is factory set for 250°F and 270°F (121°C and 132°C) sterilization cycles. For sterilization temperature control below 250°F (121°C), such as laboratory processes, the LO setting of steam pressure regulator must be changed by a qualified service technician (see Section 7.26).

## 2.5 STERILIZER OPERATION

To operate sterilizer, refer to the appropriate paragraph for the cycle to be run. Refer to Section 2.3 if it is necessary to change cycles, cycle values or control values.

### Automatic Operation

#### FLASH CYCLE

**Note:** To view current cycle values, press and hold the corresponding number touch pad (1, 2, 3 or 4) for the cycle to be run (sterilizer power must be ON).

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.

2. Open the upper access door.

- a. Check that manual control is turned to OFF.
- b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
- c. Set HI-LO valve to HI for a 270°F (132°C) cycle.

3. For electric-steam generator units only, open lower access door and turn on steam generator water-supply valve.

4. Open the printer door and position the POWER switch to ON.

- Display panel lights up and alternately displays current cycles and status of the sterilizer door(s).
- The printer records the time power is turned ON.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator to perform a Vacuum Leak test cycle and a DART (Bowie-Dick) test cycle. If tests are desired, refer to operating instructions for those cycles later in this section. To bypass the tests, press touch pad #2 to indicate NO to both prompts.

5. Check paper roll. Do not operate printer without paper.

6. Close the printer door and check display for correct time and date.

7. Unlock and open chamber door.

- Display alternates between the DOOR UNLOCKED message and Cycle Select Menu.
- Printer prints time-of-day and door-unlocked status.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

8. Load the chamber.

9. Close and lock chamber door.

- Display shows current Cycle Select Menu for five seconds and then alternates between the READY message and the Menu.

**Note:** Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.

10. Check that jacket pressure has stabilized at 30-32 psig before starting cycle.

11. Press appropriate number touch pad (1, 2, 3 or 4) for a FLASH cycle twice within five seconds to

start cycle. As the sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figures 2-6 (Gravity sterilizers) and 2-7 (Vacumatic sterilizers). Printer generates printout as follows:

- FLASH... and start of cycle message and cycle parameters.
- Start of purge - when chamber air is purged with steam.
- Start of steam charge - when chamber is charged with steam.
- Start of sterilize phase - when chamber reaches set temperature.
- Chamber temperature, every minute (or selected print interval control value) - while chamber is controlled at set point plus overdrive.
- Start of exhaust.
- Start of dry.
- Start of vent (Gravity units) or air break (Vacumatic units).
- Cycle summary and end of cycle messages - after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).

12. Unlock and open chamber door.

- Control automatically resets to current cycle values.
- Display shows "DOOR UNLOCKED" and printer prints time door was unlocked and "DOOR UNLOCKED."

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

13. Remove load from chamber and if duplicate print was obtained, place with completed load.

### GRAVITY CYCLE (Wrapped & Unwrapped Goods)

**Note:** To view current cycle values, press and hold the corresponding number touch pad (1, 2, 3 or 4) for the cycle to be run (sterilizer power must be ON).

PURGE 1:00	T=200F P=0psig
CHARGE	T=240F P=6psig
STERILIZE 3:00	T=271F P=28psig
FAST EXHAUST	T=273F P=30psig
DRY 1:00	T=220F P=0psig
VENT	T=200F P=0psig
COMPLETE 00:00:00	T=200F P=0psig

**FIGURE 2-6 – Flash and Gravity Cycle Display Messages - Gravity Sterilizer**

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.
2. Open the upper access door.
  - a. Check that manual control is turned to OFF.
  - b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
  - c. Set HI-LO valve to HI for a 270°F (132°C) cycle or to LO for a 250°F (121°C) cycle.

PURGE 1:00	T=200F P=0psig
CHARGE	T=240F P=6psig
STERILIZE 3:00	T=271F P=28psig
FAST EXHAUST	T=273F P=30psig
DRY 1:00	T=220F P=0psig
AIR BREAK	T=200F V=2inHg
COMPLETE 00:00:00	T=200F P=0psig

**FIGURE 2-7 – Flash, Gravity and Warm-up Cycle Display Messages - Vacumatic Sterilizer**

3. For electric-steam generator units only, open lower access door and turn on steam generator water-supply valve.
4. Open the printer door and position the POWER switch to ON.

- Display panel lights up and alternately displays current cycles and status of the sterilizer.
- The printer records the time power is turned ON.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator to perform a Vacuum Leak test cycle and a DART (Bowie-Dick) test cycle. If tests are desired, refer to operating instructions for those cycles later in this section. To bypass the tests, press touch pad #2 to indicate NO to both prompts.

5. Check paper roll. Do not operate printer without paper.
6. Close the printer door and check display for correct time and date.
7. Unlock and open chamber door.

- Display alternates between the DOOR UNLOCKED message and Cycle Select Menu.
- Printer prints time-of-day and door-unlocked status.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

8. Load the chamber.

9. Close and lock chamber door.

- Display shows current Cycle Select Menu for five seconds and then alternates between the READY message and the Menu.

**Note:** Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.

10. Check that jacket pressure has stabilized at the following pressure before starting cycle:

- HI Setting - 30 to 32 psig for 270°F (132°C) cycles
- LO Setting - 18 to 20 psig for 250°F (121°C) cycles

11. Press appropriate number touch pad (1, 2, 3 or 4) for a GRAVITY cycle twice within five seconds to start cycle. As the sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figures 2-6 (Gravity sterilizers) and 2-7 (Vacumatic sterilizers). Printer generates printout as follows:

- GRAVITY... and start of cycle message and cycle parameters.
- Start of purge – when chamber air is purged with steam.
- Start of steam charge – when chamber is charged with steam.
- Start of sterilize phase – when chamber reaches set temperature.
- Chamber temperature, every five minutes (or selected print interval control value) – while chamber is controlled at set point plus overdrive.
- Start of exhaust.
- Start of dry.

- Start of vent (Gravity units) or air break (Vacumatic units).
- Cycle summary and end of cycle messages – after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).

12. Unlock and open chamber door.

- Control automatically resets to current cycle values.
- Display shows "DOOR UNLOCKED" and printer prints time door was unlocked and "DOOR UNLOCKED."

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

13. Remove load from chamber and if duplicate print was obtained, place with completed load.

#### **Liquids Cycle**

**WARNING: BURN HAZARD - When sterilizing liquids, to prevent personal injury or property damage resulting from bursting bottles and hot fluid, you must observe the following procedure:**

- *Use liquids cycle only. No other cycle is safe for processing liquids.*
- *Use only vented closures - do not use screw caps or rubber stoppers with crimped seal.*
- *Use only Type I borosilicate glass bottles - do not use ordinary glass bottles or any container not designed for sterilization.*
- *Avoid sudden full opening of door at end of cycle. Unlock sterilizer door and open it approximately one inch. Wait at least 10 minutes before unloading sterilizer.*
- *Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not remove bottles if any boiling or bubbling is present.*
- *Allow bottles to cool to the touch before attempting to move them from sterilizer cart to the storage area.*

**Note:** To view current cycle values, press and hold the corresponding number touch pad (1, 2, 3 or 4) for the cycle to be run (sterilizer power must be ON).

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.
2. Open the upper access door.
  - a. Check that manual control is turned to OFF.
  - b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
  - c. Set HI-LO valve to LO for a 250°F (121°C) cycle.
3. For electric-steam generator units only, open lower access door and turn on steam generator water-supply valve.

4. Open the printer door and position the POWER switch to ON.

- Display panel lights up and alternately displays current cycles and status of the sterilizer.

- The printer records the time power is turned ON.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator to perform a Vacuum Leak test cycle and a DART (Bowie-Dick) test cycle. If tests are desired, refer to operating instructions for those cycles later in this section. To bypass the tests, press touch pad #2 to indicate NO to both prompts.

5. Check paper roll. Do not operate printer without paper.

6. Close the printer door and check display for correct time and date.

7. Unlock and open chamber door.

- Display alternates between the DOOR UNLOCKED message and Cycle Select Menu.

- Printer prints time-of-day and door-unlocked status.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

8. Load the chamber.
9. Close and lock chamber door.

- Display shows current Cycle Select Menu for five seconds and then alternates between the READY message and the Menu.

**Note:** Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.

10. Check that jacket pressure has stabilized at 18-20 psig before starting cycle.

11. Press appropriate number touch pad (1, 2, 3 or 4) for a LIQUIDS cycle twice within five seconds to start cycle. As the sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-8. Printer generates printout as follows:

- LIQUID... and start of cycle message and cycle parameters.

- Start of purge - when chamber is purged with steam.

- Start of steam charge - when chamber is charged with steam.

- Start of sterilize phase - when chamber reaches set temperature.

- Chamber temperature, every five minutes (or selected print interval control value) - while chamber is controlled at set point plus overdrive.

- Start of slow exhaust.

- Start of vent.

- Cycle summary, end of cycle messages and "WARNING HOT LIQUIDS... OPEN DOOR 1 in. (3 cm) AND UNLOAD IN 10 MINUTES" - after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).

12. Unlock and open chamber door one inch and wait at least 10 minutes for all boiling and bubbling of solutions to stop.

- Printer prints time door was unlocked and "DOOR UNLOCKED."

- Display begins countdown from 10 minutes and alternately shows... UNLOAD IN... (time remaining) and... WARNING: HOT LIQUIDS.

- Buzzer sounds at end of 10 minutes and display shows... READY TO UNLOAD.

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

PURGE 1:00	T=140F P=0psig
CHARGE	T=230F P=7psig
STERILIZE 45:00	T=251F P=20psig
SLOW EXHAUST	T=253F P=20psig
alternates with	
WARNING HOT LIQUIDS	T=253F P=20psig
VENT	T=200F P=2psig
alternates with	
WARNING HOT LIQUIDS	T=200F P=2psig
COMPLETE 00:00:00	T=176F P=0psig
alternates with	
WARNING HOT LIQUIDS	T=176F P=0psig
UNLOAD IN 10:00	T=200F P=0psig
alternates with	
WARNING HOT LIQUIDS	T=200F P=0psig

FIGURE 2-8 - Liquids Cycle Display Messages

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

13. Remove load from chamber and if duplicate print was obtained, place with completed load.

#### EXPRESS CYCLE (Wrapped Instruments) - Prevacuum Sterilizers Only

The Express Cycle is intended for wrapped hard goods loads only, and provides protection against load recontamination (as opposed to the Flash cycle which is for unwrapped hard goods). It is identical to the Prevacuum Cycle except that two pressure/vacuum pulses are used, instead of four.

**Note:** To view current cycle values, press and hold the corresponding number touch pad (1, 2, 3 or 4) for the cycle to be run (sterilizer power must be ON).

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.

2. Open the upper access door.

- a. Check that manual control is turned to OFF.
- b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.

- c. Set HI-LO valve to HI for a 270°F (132°C) cycle.

3. For electric-steam generator units only, open lower access door and turn on steam generator water-supply valve.

4. Open the printer door and position the POWER switch to ON.

- Display panel lights up and alternately displays current cycles and status of the sterilizer.

- The printer records the time power is turned ON.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator to perform a Vacuum Leak test cycle and a DART (Bowie-Dick) test cycle. If tests are desired, refer to operating instructions for those cycles later in this section. To bypass the tests, press touch pad #2 to indicate NO to both prompts.

5. Check paper roll. Do not operate printer without paper.

6. Close the printer door and check display for correct time and date.
7. Unlock and open chamber door.
  - Display alternates between the DOOR UNLOCKED message and Cycle Select Menu.
  - Printer prints time-of-day and door-unlocked status.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

8. Load the chamber.
9. Close and lock chamber door.
  - Display shows current Cycle Select Menu for five seconds and then alternates between the READY message and the Menu.

**Note:** Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.
10. Check that jacket pressure has stabilized at 30-32 psig before starting cycle.
11. Press appropriate number touch pad (1, 2, 3 or 4) for a EXPRESS cycle twice within five seconds to start cycle. As the sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-9. Printer generates printout as follows:
  - EXPRESS... and start of cycle message and cycle parameters.
  - Start of purge – when chamber is purged with steam.
  - Start of pressure/vacuum pulses.
  - Pressure/Vacuum points – as pulse is repeated.
  - Start of steam charge – when chamber is charged with steam.
  - Start of sterilize phase – when chamber reaches set temperature.
  - Chamber temperature, every minute (or selected print interval control value) – while chamber is controlled at set point plus overdrive.
  - Start of exhaust.
  - Start of dry.
  - Start of air break.
  - Cycle summary and end of cycle messages – after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).

PURGE	T=140F
1:00	P=0psig

PULSE	T=240F
#X	P=20psig

CHARGE	T=260F
	P=26psig

STERILIZE	T=271F
4:00	P=28psig

FAST	T=274F
EXHAUST	P=28psig

DRY	T=200F
3:00	P=2psig

AIR	T=200F
BREAK	V=2inHg

COMPLETE	T=200F
00:00:00	P=0psig

**FIGURE 2-9 – Express and Prevac Cycle Display Messages**

12. Unlock and open chamber door.
  - Control automatically resets to current cycle values.
  - Display shows "DOOR UNLOCKED" and printer prints time door was unlocked and "DOOR UNLOCKED."

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

13. Remove load from chamber and if duplicate print was obtained, place with completed load.

#### **PREVACUUM CYCLE (Wrapped and Unwrapped Goods) - Prevacuum Sterilizers Only**

**Note:** To view current cycle values, press and hold the corresponding number touch pad (1, 2, 3 or 4) for the cycle to be run (sterilizer power must be ON).

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.
2. Open the upper access door.
  - a. Check that manual control is turned to OFF.
  - b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
  - c. Set HI-LO valve to HI for a 270°F (132°C) cycle.
3. For electric-steam generator units only, open lower access door and turn on steam generator water-supply valve.
4. Open the printer door and position the POWER switch to ON.
  - Display panel lights up and alternately displays current cycles and status of the sterilizer.
  - The printer records the time power is turned ON.

**Note:** On Vacumatic units only, when power to sterilizer is switched on, display prompts operator to perform a Vacuum Leak test cycle and a DART (Bowie-Dick) test cycle. If tests are desired, refer to operating instructions for those cycles later in this section. To bypass the tests, press touch pad #2 to indicate NO to both prompts.

5. Check paper roll. Do not operate printer without paper.

6. Close the printer door and check display for correct time and date.
7. Unlock and open chamber door.
  - Display alternates between the DOOR UNLOCKED and Cycle Select Menu.
  - Printer prints time-of-day and door-unlocked status.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

8. Load the chamber.
9. Close and lock chamber door.
  - Display shows current Cycle Select Menu for five seconds and then alternates between the READY message and the Menu.

**Note:** Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.
10. Check that jacket pressure has stabilized at 30-32 psig before starting cycle.
11. Press appropriate number touch pad (1, 2, 3 or 4) for a PREVACUUM cycle twice within five seconds to start cycle. As the sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-9. Printer generates printout as follows:
  - PREVACUUM... and start of cycle message and cycle parameters.
  - Start of purge – when chamber air is purged with steam.
  - Start of pressure/vacuum pulses.
  - Vacuum point – when vacuum is drawn on chamber.
  - Pressure point – when chamber is charged with steam.
  - Pressure/Vacuum points – as pulses are repeated.
  - Start of steam charge – when chamber is charged with steam.
  - Start of sterilize phase – when chamber reaches set temperature.
  - Chamber temperature, every minute (or selected print interval control value) – while chamber is controlled at set point plus overdrive.
  - Start of exhaust.

- Start of dry phase.
- Start of air break.
- Cycle summary and end of cycle messages – after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).

#### 12. Unlock and open chamber door.

- Control automatically resets to current cycle values.
- Display shows "DOOR UNLOCKED" and printer prints time door was unlocked and "DOOR UNLOCKED."

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

#### 13. Remove load from chamber and if duplicate print was obtained, place with completed load.

### VACUUM LEAK TEST CYCLE - Prevacuum Sterilizers Only

A VACUUM LEAK TEST CYCLE can only be run as the first cycle after positioning power switch to ON. If any cycle has been run after switching power ON, the leak test cycle cannot be started until power is switched OFF and then ON again. In this cycle the sterilizer automatically checks for vacuum leaks in the piping and door seal.

The measured leak rate (mm Hg per minute) is calculated by the control over a timed 10 minute period and included in the cycle printout.

**Note:** Cycle requires 30-35 minutes to complete.

1. Open the upper access door.
  - a. Check that manual control is turned to OFF.
  - b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
  - c. Set HI-LO valve to HI for a 270°F (132°C) cycle.
2. Open the printer door and position the POWER switch to ON.

#### 3. Unlock chamber door and check that chamber is empty, then close and lock chamber door(s).

**Note:** Wait until jacket pressure has stabilized (30 to 32 psig) before starting cycle.

Display(s) asks...

PERFORM LEAK TEST?

1=YES 2=NO

#### 4. Press cycle selector touch pad "1" to select the cycle.

Display shows... (for three seconds)

CHECK STEAM

then asks...

READY TO TEST?

1=YES RESET=CANCEL

**Note:** Pressing RESET advances sterilizer to READY mode.

#### 5. Press cycle selector touch pad "1" to start the cycle and sterilizer automatically progresses through Leak Test Cycle, displaying messages as shown in Figure 2-10 and generating printout as follows:

- Printer records cycle start and chamber is purged; printer records end of purge.
- Two vacuum and pressure pulses then occur and printer records each.
- Temperature rises to 270°F after the pressure pulses and when reached, unit begins to pull a vacuum for 10 minutes. (Printer records temperature and pressure at beginning of 10-minute vacuum time.)
- Printer records temperature and vacuum at end of evacuation time.
- Two minute stabilization period begins after 10-minute evacuation is completed.
- Ten minute leak test period begins after two minute stabilization is completed.
- Printer records calculated leak rate (mmHg per minute) after 10-minute leak time.
- Chamber is returned to atmospheric pressure, complete buzzer sounds and cycle summary and end of cycle messages are printed.

PERFORM LEAK TEST?

1=YES 2=NO

CHECK STEAM

READY TO START?

1=YES RESET=CANCEL

CLOSE THE DOOR(S).

PRESS 1 TO TEST

PURGE T=140F  
1:00 P=0psig

PULSE T=240F  
#X P=20psig

CHARGE T=260F  
P=25psig

LEAK TEST T=267F  
10:00 P=26psig

alternates with

LEAK TEST T=267F  
EVACUATING P=26psig

LEAK TEST T=140F  
STABILIZING V=26inHg

LEAK TEST T=156F  
0:00 V=26inHg

AIR T=163F  
BREAK V=22inHg

COMPLETE T=200F  
00:00:00 P=0psig

#### 6. Unlock and open chamber door.

- Control automatically resets to current cycle values.
- Display shows:

PERFORM DART TEST?  
(BOWIE-DICK) 1=Y 2=N

- Printer records time door is opened and prints "NOT READY...DOOR UNLOCKED."

**Note:** Printer automatically reprints complete cycle data if set for duplicate print (service adjustment). If not set for duplicate print and one is desired, press top of printer switch to generate a second printout. First line of duplicate printout always reads "DUPLICATE PRINT."

#### 7. File duplicate print in maintenance records.

**Note:** Sequential records of tests should be kept to detect if any major changes in leak rates are occurring. In this manner, maintenance can be scheduled to correct any loose fittings, bad gaskets, etc.

### DART (BOWIE-DICK) TEST CYCLE - Prevacuum Sterilizers Only

A DART (BOWIE-DICK) TEST CYCLE may only be run as the first or second cycle after positioning power switch to ON. Chamber must be at operating temperature when DART (BOWIE-DICK) TEST is performed. A VACUUM TEST or a WARM-UP cycle should be completed prior to performing DART (BOWIE-DICK) TEST. Tests such as the DART or Bowie-Dick are designed to document the removal of residual air from a sample challenge load and should be run before sterilizer use each day.

#### 1. Open upper access door and perform the following:

- a. Set HI-LO valve to HI for 270°F (132°C) cycle.
- b. Turn STEAM and WATER valves to ON. Steam enters jacket and begins to warm chamber.
- c. Check that STEAM and WATER valves are ON and that manual control is OFF.

#### 2. Unlock chamber door and check that chamber is empty, then close and lock chamber door.

**Note:** Wait until jacket pressure has stabilized (30 to 32 psig) before starting cycle.

#### 3. Position power switch to ON.

Display(s) asks...

PERFORM LEAK TEST?  
1=YES 2=NO

FIGURE 2-10 - Leak Test Cycle Display Messages

4. Press cycle selector touch pad number "2" for NO.  
The following message is displayed...

PERFORM DART TEST?  
(BOWIE-DICK) 1=Y 2=N

5. Press cycle selector touch pad number 1 for YES and display shows the following:

IS A WARMUP CYCLE  
REQUIRED? 1=Y 2=N

If a Warm-Up cycle is required (i.e., sterilizer is not at operating temperature), press cycle selector touch pad #1 for YES.

- Display shows

CHECK STEAM

then...

READY TO TEST?  
1=YES RESET=CANCEL

- If door(s) is open, display shows:

CLOSE THE DOOR(S).

- a. Close and lock door(s). Display then shows:

PRESS 1 TO TEST

- b. Press cycle selector touch pad #1 and sterilizer automatically runs a flash-type warm-up cycle with three-minute sterilize and one-minute dry times.

- At completion of warm-up cycle, display shows following message:

LOAD DART PACK  
PRESS 1 TO TEST

If a Warm-Up Cycle is not required (i.e., sterilizer is at operating temperature), press cycle selector touch pad number 2 for NO.

- Display shows following message:

LOAD DART PACK  
PRESS 1 TO TEST

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

6. Load DART or Bowie-Dick type test pack. Press cycle selector touch pad #1 to perform test cycle.

- If door(s) is open, display shows:

CLOSE THE DOOR(S).

- Close and lock door(s). Display then shows:

PRESS 1 TO TEST

Sterilizer automatically proceeds through a prevacuum test cycle with four pressure/vacuum pulses, a 3-1/2 minute sterilize and a 1-minute dry time.

7. Unlock and open door at end of cycle and check DART or Bowie-Dick type test pack for results. Keep a record of all results.

#### Manual Operation - Gravity or Liquids Cycle

Note: Control power must be OFF.

**WARNING: SLIPPING HAZARD - To avoid slippery floor conditions, immediately wipe up any spillage or condensation in sterilizer loading area.**

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.
2. Turn STEAM and WATER valves to ON. Turn MANUAL control (Figure 2-11) to JACKET CHARGE (units with auto-utilities and/or steam generator options only). Steam enters jacket and begins to warm chamber.

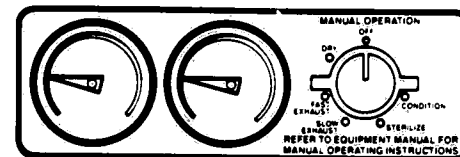


FIGURE 2-11 - Manual Control

**WARNING: BURN HAZARD - When sterilizing liquids, to prevent personal injury or property damage resulting from bursting bottles and hot fluid, you must observe the following procedure:**

- Use liquids cycle only. No other cycle is safe for processing liquids.
- Use only vented closures - do not use screw caps or rubber stoppers with crimped seal.
- Use only Type I borosilicate glass bottles - do not use ordinary glass bottles or any container not designed for sterilization.
- Avoid sudden full opening of door at end of cycle. Unlock sterilizer door and open it approximately one inch. Wait at least 10 minutes before unloading sterilizer.
- Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not remove bottles if any boiling or bubbling is present.
- Allow bottles to cool to the touch before attempting to move them from sterilizer cart to the storage area.

3. Select desired processing temperature from Table 2.5 or 2.7.

4. Set HI-LO valve to LO\* for a Liquids cycle, or to LO\* for a 250°F (121°C) Gravity cycle or HI for a 270°F (132°C) Gravity cycle.

5. Wait until jacket pressure has stabilized before starting a cycle.

6. Unlock and open chamber door.

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

7. Load the chamber.

8. Close and lock chamber door.

Note: Once chamber is pressurized, an integral pressure-actuated lock prevents door from being opened.

9. Position MANUAL control to CONDITION. Wait 60 seconds, then proceed to next step.

10. Turn selector to STERILIZE and wait until chamber reaches desired pressure.

11. Time the desired sterilization period and, when completed, proceed to step 14.a. if a Liquids cycle, 14.b. if a Gravity cycle (Wrapped Goods), or 14.c. if a Gravity cycle (Unwrapped Goods).

12. Cycles:

#### a. Liquids Cycle:

- 1) Turn selector to SLOW EXHAUST and keep it in this position until chamber pressure is atmospheric (0 psig).
- 2) Turn selector to OFF position (omit Dry phase).
- 3) Open door one inch and wait at least 10 minutes until bubbling and boiling of solutions has ceased.

#### b. Gravity Cycle (Wrapped Goods)

- 1) Turn selector to FAST EXHAUST and keep it in this position until chamber pressure is between 4 and 6 psig (0.28 and 0.42 kg/cm<sup>2</sup>).
- 2) Turn selector to DRY.
- 3) Time the desired dry period and when completed, turn selector to OFF.

#### c. Gravity Cycle (Unwrapped Goods)

- 1) Turn selector to FAST EXHAUST and keep it in this position until chamber pressure is atmospheric (0 psig).
- 2) Turn selector to OFF position (omit DRY phase).\*

**WARNING: BURN HAZARD - Sterilizer and rack/shelves are HOT after cycle is run. Always wear protective gloves and apron (also face shield if processing liquids) when removing a processed load. Protective gloves and apron should also be worn when reloading sterilizer following previous operation.**

13. Open door and unload chamber.

\* Chamber temperature when normal "LO" setting is used for manual operation is approximately 258°F (126°C). If temperatures precisely at or below 250°F (121°C) are required see Section 7.26.

\*\* Dry time is not required for unwrapped goods, however, a dry time of one or two minutes helps reduce excess steam vapor when opening chamber door at end of cycle.



## Section 3

### Principles of Operation

#### 3.1 GENERAL

Gravity and Vacumatic sterilizers are designed to efficiently sterilize single and full loads of fabrics, wrapped and unwrapped hard goods, and liquids. To accomplish this, the sterilizers use steam regulated at the most effective temperature and pressure for the particular load.

The gravity sterilizer offers three different sterilization cycles: Gravity, Liquids and Flash. These are conventional gravity-displacement cycles in which air is forced out of the chamber by steam entering it.

The vacumatic sterilizer offers the following cycles in addition to the three conventional gravity-displacement cycles: Prevacuum, Express, Bowie-Dick and Leak Test. The Prevacuum cycle incorporates an initial conditioning phase which consists of a series of pressure/vacuum pulses. The purpose of the cycle is to quickly and thoroughly condition the load, thus permitting a relatively short sterilization cycle for suitable materials.

The control system and piping arrangement described in this section are designed to efficiently and reliably accomplish the work of sterilization. The heart of the control system is a microcomputer that is preprogrammed to control all sterilizing cycles from beginning to end once preparatory actions have been taken.

All sterilizers are equipped with manually operated steam- and water-supply valves and electrical disconnects. These isolate the unit from the general supply lines when in an OFF position.

#### 3.2 MECHANICAL OPERATION

##### Gravity Cycle - Gravity Sterilizer (Figure 3-1)

In the Gravity cycle of the Gravity sterilizer, air is removed from the sterilizer chamber and its load by displacing it with steam. The steam gradually forces the air downward and out of the chamber.

During the PURGE phase at the beginning of the cycle, air in the chamber is quickly displaced by steam. The steam-to-chamber (S2) and fast-exhaust (S3) valves are open. At the same time the exhaust-cooling valve (S4) to the drain is open, which condenses the steam and keeps the drain temperature below 140°F. The flow-control valve (FC-2) has been adjusted to permit water flow at the optimum rate for the system. Because of flow resistance incorporated into the system design, chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the CHARGE and STERILIZE phases, S3 and S4 are closed. The chamber is thus effectively sealed and steam is forced in until set temperature is reached. S2 is controlled to maintain correct temperature in the chamber.

The EXHAUST phase of the cycle is initiated by closing S2 and opening S3 and S4. The effect of these actions is to condense the exhaust steam and maintain the drain temperature below 140°F.

The DRY phase of the cycle is initiated by opening the steam-to-ejector valve (S5). At the same time, S4 closes while S3 remains open. Because of the suction action of the ejector, air is continuously drawn through the vacuum break line and through the chamber to the drain. A vacuum level of 1 to 2 in.Hg is maintained in the chamber.

At the completion of the cycle, all valves are de-energized.

##### Gravity Cycle - Vacumatic Sterilizer (Figure 3-2)

In the Gravity cycle of the Vacumatic sterilizer, air is removed from the sterilizer chamber and its load by displacing it with steam. The steam gradually forces the air downward and out of the chamber.

During the PURGE phase at the beginning of the cycle, air in the chamber is quickly displaced by steam. Valves S2 and S3 are open. At the same time, S7 and S4 are open. Opening these valves accomplishes two purposes: 1) the cooling water is circulated through the heat exchanger, cooling the exhaust steam sufficiently to keep the drain temperature below 140°F; and, simultaneously, 2) the cooling water passing through the water ejector and heat exchanger flows at a rate sufficient to create a suction at the drain, thus increasing the rate of air and steam flow through the chamber. The flow-control valve (FC-6) has been adjusted to permit water flow at the optimum rate for the system. Because of flow resistance incorporated into the system design, chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the CHARGE and STERILIZE phases S3, S4, and S7 are closed. The chamber is thus effectively sealed and steam is forced in until desired pressure is reached. S2 is controlled to maintain correct temperature in the chamber.

The EXHAUST phase of the cycle is initiated by closing S2 and S1, and opening S3, S4, and S7. The combined effect of cooling water through the ejector is a suction at the chamber drain, and thus a rapid evacuation of the

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chamber. The function of S4 is to provide cooling only for the period of peak discharge; therefore the valve again closes when chamber pressure is reduced to 3 psig.

The DRY phase of the cycle again produces a vacuum in the chamber. The vacuum is produced by the combined action of steam condensing in the heat exchanger and the evacuating action of the water ejector. At the end of DRY, S3 and S7 shut off. The vacuum is broken through S1.

At the completion of the cycle, all valves except S3 are deenergized. S1, normally open, and S3 are the only valves open. Filtered air enters the chamber through S1 to break the vacuum.

### Liquids Cycle - Gravity and Vacumatic Sterilizers

The Liquids cycle is identical to the Gravity cycle until the EXHAUST phase. When the STERILIZE phase is complete, all solenoid valves are deenergized. Slow exhaust of the chamber is accomplished through the slow-exhaust line, which allows a slow bleed-out of the chamber. Slow exhaust rate is controlled by the flow-control valve (FC-1).

### Flash Cycle - Gravity and Vacumatic Sterilizers

The Flash cycle is identical to the Gravity cycle except that a shorter STERILIZE time and a DRY time of one minute are used. It is intended for processing unwrapped instruments only.

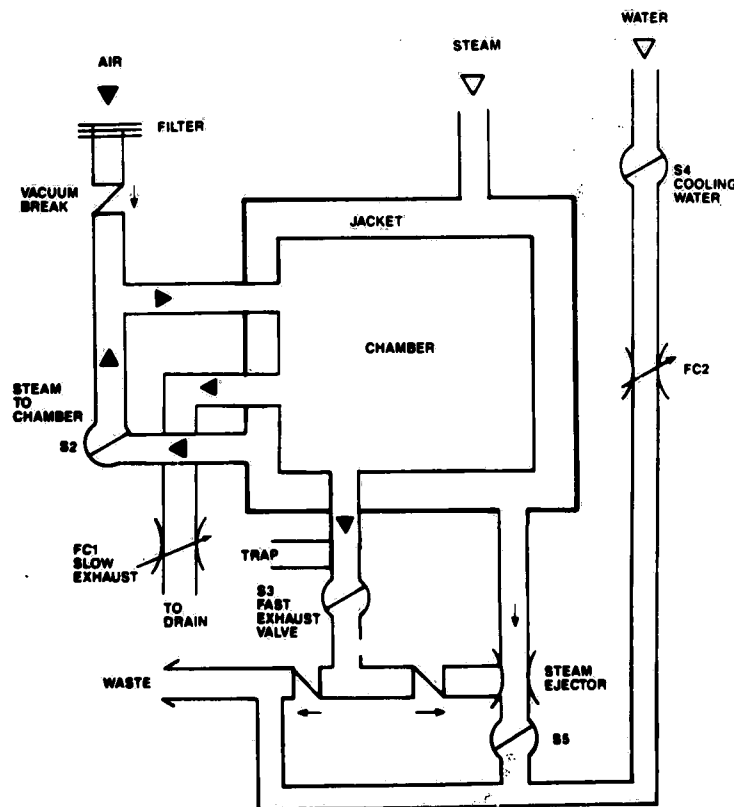


FIGURE 3-1 - Piping Diagram, Gravity Sterilizer

3-2  
704322-003

### Prevacuum Cycle - Vacumatic Sterilizer Only (Figure 3-2)

The Vacumatic sterilizer uses a special piping design to achieve high-speed, efficient sterilization. Its features are as follows:

During the PURGE at the beginning of the cycle, the air in the chamber is quickly displaced by steam. This is accomplished by simultaneously opening the steam-to-chamber valve (S2) and the fast-exhaust valve (S3). At the same time, the water-supply valve (S7) and exhaust-cooling valve (S4) are open. Opening these valves accomplishes two purposes: 1) the cooling water is circulated through the heat exchanger, cooling the

exhaust steam sufficiently to keep the drain temperature below 140°F; and, simultaneously, 2) the cooling water passing through the water ejector and heat exchanger flows at a rate sufficient to create a suction at the drain, thus increasing the rate of air and steam flow through the chamber. The flow-control valve (FC-6) has been adjusted to permit water flow at the optimum rate for the system. Because of flow resistance incorporated into the system design, chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the CONDITIONING phase of the Prevacuum cycle, a series of four vacuum/pressure pulses is created inside the chamber for efficient conditioning of the

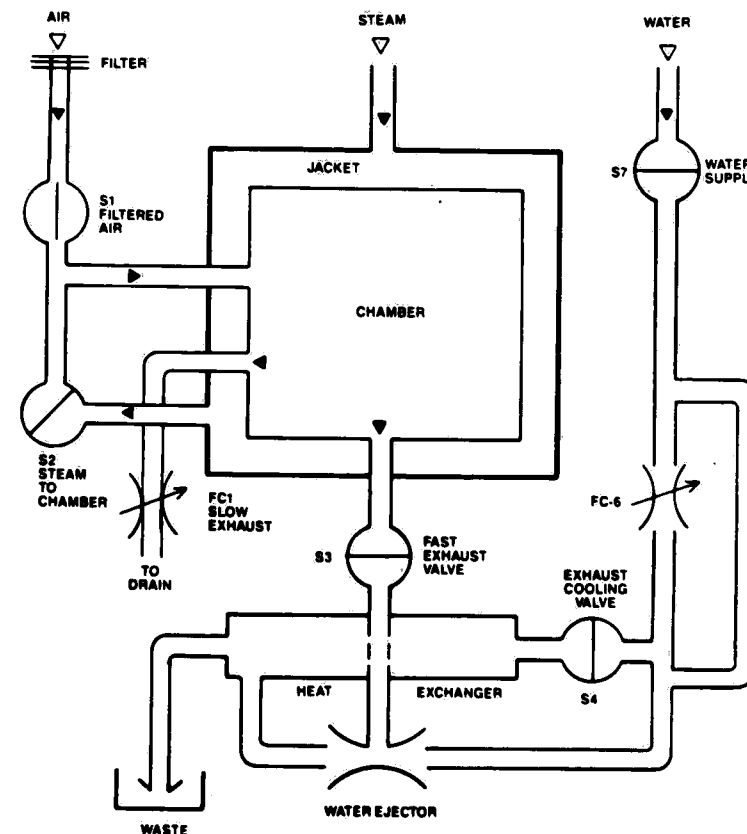


FIGURE 3-2 - Simplified Piping Diagram, Vacumatic Sterilizer

3-3  
704322-003

load. In the vacuum part of the phase, the normally open filtered-air valve (S1) is closed, preventing air from entering the chamber. S2 is also closed, preventing steam from entering the chamber. S3 and S7 remain open. The passage of cooling water through the ejector and the heat exchanger creates suction at the drain and produces a vacuum in the chamber. A minimum vacuum of 10 in.Hg must be achieved on each pulse.

During the pressure part of the CONDITIONING phase, S7, S4 and S3 are closed. Since S1 remains closed, the chamber is effectively sealed. S2 opens and steam is forced into the chamber to 26 psig pressure. The number of such vacuum/pressure pulses is determined by the microcomputer controls.

In the STERILIZE phase of the cycle, the chamber is again sealed as described above in the pressure part of the CONDITIONING phase. S2 is thermostatically controlled to maintain correct temperature/pressure in the chamber.

The EXHAUST phase of the cycle is initiated by closing S2 and opening S3, S7 and S4. S1 remains closed. The combined effect of cooling water through the ejector is a suction at the chamber drain, and thus a rapid evacuation of the chamber. The function of S4 is to provide cooling only for the period of peak discharge; therefore, the valve again closes when chamber pressure is reduced to 3 psig.

The DRY phase of the cycle again produces a vacuum in the chamber. The vacuum is produced by the combined action of steam condensing in the heat exchanger and the evacuating action of the water ejector. S7, S1 and S3 are on.

At the completion of the cycle, all valves except S3 are deenergized. S1, normally open, and S3 are the only valves open. Filtered air enters the chamber through S1 to break the vacuum.

### Express Cycle - Vacumatic Sterilizer Only

This cycle is identical to the Prevacuum cycle except that only two CONDITIONING pulses are used. It is intended for wrapped hardgoods only, where less air exists in load. This cycle also provides protection against load recontamination, as opposed to the FLASH cycle, where goods are not wrapped.

## 3.3 CONTROL

### Summary

The EAGLE 3000 control consists of two PC boards (the CONTROL board and the PRINTER board), a 40-character alphanumeric display module (two display modules for double-door units) and a touch panel with a number of touch-pad switches (two touch panels for double-door units). A 24-column thermal printer mounts on the Printer board.

Chamber drain temperature is sensed by a thermistor-type resistance element and chamber pressure is sensed by a strain-gauge type pressure transducer.

Additional inputs to the control column consist of a door-locked limit switch, rear panel touch pads (double-door units), and a boiler-flooded contact closure (for units with integral steam generator).

Refer to Figures 3-3 through 3-6 for the following discussion. Control hardware will be described first, followed by control programming.

### Control PC Board (Figure 3-4)

The Control PC board controls the entire system.

#### • Microcomputer, EPROM

An Intel 80C31, 8-bit CMOS microcomputer IC executes the program stored in an EPROM IC installed on the board at U10. Separate programmed EPROMs are used for Gravity and Vacumatic. The program in the EPROM is not altered by power interruptions, and is referred to as "nonvolatile" memory.

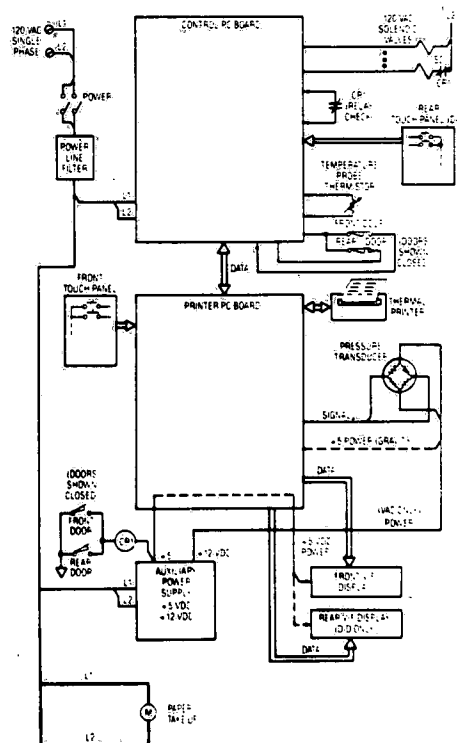


FIGURE 3-3 - Control System Block Diagram

The EPROM program capacity is 64 kilobytes. This is significantly larger than EAGLE/Printcon units and it runs significantly faster, at a 12-mHz microcomputer clock speed.

The microcomputer IC is configured conventionally. It generates 16 bit addresses (A0 thru A15) to select the external ICs and passes data, to and from the peripheral ICs on this board and the Printer board, on an 8-bit data bus (D0 thru D7). Like many Intel microcomputers, the lower 8 address bits, A0 thru A7, are multiplexed on a single port (P0.0 thru P0.7) with the 8 data bits D0 thru D7.

The microcomputer IC has a built-in serial port (P3.0 thru P3.4) which is wired to a serial connector on the Control board, however the serial channel is not used at the present time.

#### • Battery-Backed RAM/Clock

The data accumulated by the microcomputer IC, such as the STERILIZE and DRY times for the four cycles, cycle count, time, date, etc., are stored in a 2-kilobyte (2000 bytes, or 2K), battery-backed RAM/REAL-TIME CLOCK IC. This IC warrants some discussion. Normally, RAM-type memory is cleared when power is turned off (referred to as "volatile"

memory), but this IC contains a lithium battery inside the IC which retains the data stored there for up to ten years in the absence of power.

This IC also contains a real-time clock/calendar function which generates and updates the time and date. Because the IC battery has an average life of ten years and will eventually wear out, this IC is socketed for easy replacement.

The battery-backed RAM is possibly the most useful and powerful feature of this control. It eliminates the use of thumbwheels and Dip switches for making frequently changed cycle settings, and it allows the control to power up with an extensive picture, in memory, of the state of the sterilizer when it last powered down, either normally or on power failure. The control can then make a decision to proceed with the cycle, increasing productivity, or put the sterilizer in a safe condition, with warnings if required.

Should the battery fail, the default cycle settings (see Section 6, Table 6-4) are automatically loaded from the EPROM back into the RAM IC through the touch pads. The sterilizer operates normally until a new RAM IC is installed. The time and date are lost, and serve to remind the user that the battery in the IC is dead.

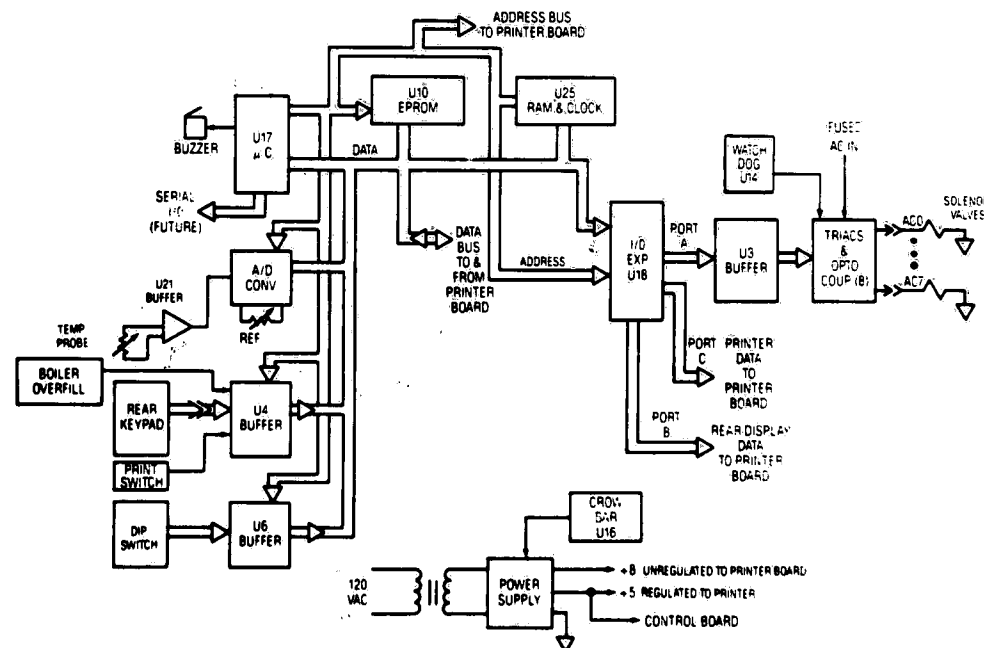


FIGURE 3-4 - Control PC Board Block Diagram

### • Temperature Probe Input

The chamber-drain temperature probe (thermistor) is connected to this PC board at connector P4. The thermistor exhibits a DECREASING resistance between its two wires when temperature increases. Figure 3-5 shows the approximate resistance for the thermistor probe versus temperature. More precise values, for troubleshooting purposes, are given in Section 6, Table 6-5.

**Note:** Although the probe response is nonlinear, the microcomputer program has a linearizing routine which it applies to the probe signal after A/D conversion.

The probe signal is buffered by op amp U21, and then applied to an 8-bit analog-to-digital converter (A/D) U8. The temperature signal, now in digital form, is read by the microcomputer IC. R10 adjusts the "zero" calibration of the temperature channel and R4 adjusts the "gain."

### • Digital Input/Output (I/O) Expander

IC U18, an Intel 82C55 CMOS I/O expander, provides 24 lines of digital I/O capability for the microcomputer, organized as three 8-bit ports, A thru C.

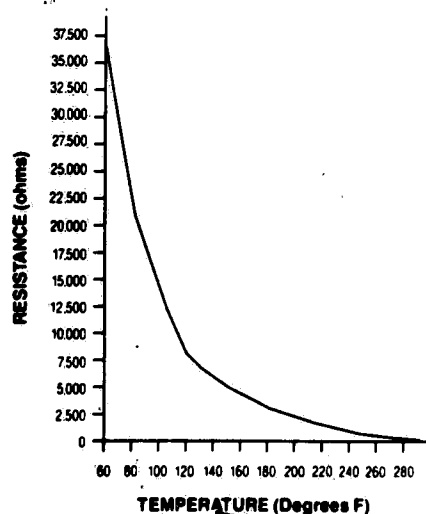


FIGURE 3-5 - Temperature vs. Resistance

The read/write port is selected by address lines A0 and A1, with data appearing at D0 thru D7.

Port A of this IC drives the circuitry for the 120-volt AC solenoid valves. The Control PC board has the capability of controlling up to eight solenoids or other 120-volt AC loads.

Each of the eight control lines from Port A (PA0 thru PA7) switches an opto-coupler IC (U9, U11, etc.) for isolation of the 120-VAC solenoid power from the DC power on the PC board. The opto-coupler in turn switches a triac, wired to its output (Q9, Q10, etc.), on and off to control the solenoid valve wired to the triac output. Opto-couplers incorporate "zero-crossing" turn-on to prevent transient signals from being generated.

Port C (PC0 thru PC7) of U18 sends data to the printer on the Printer PC board.

Port B (PB0 thru PB7) of U18 sends data to the rear display module on double-door sterilizers.

### • External Switch Inputs

Inputs to the Control board from external switches are termed "limit switch" (LS) inputs (LS1 thru LS11), even though, strictly speaking, some inputs are from touch pads, relay contacts, etc. These come into the board at plug P1.

**Note:** For board protection, all the LS inputs are shunted by zener diodes to DC common (D7 thru D18) to clamp the inputs to 8 volts maximum.

These switch inputs are summarized as follows:

1. Demand Print/Duplicate Print (LS10)
2. Print Values (LS11)
3. Boiler Overfill (flooded) Contacts (LS2)
4. CR1 (Door Switch Relay) Contacts (LS4)
5. Rear Control Panel Cycle Touch Pads (LS5 thru LS9)
6. Door Locked Contact (LS0 - Front; LS-1 - Rear)

All of the switch inputs are at 5 volts DC when the respective switch is open, and 0 volts DC when the switch is closed.

### • Watchdog IC

In order to prevent solenoid valves from energizing on failure of the microcomputer or associated ICs, the Control PC board incorporates a "watchdog" IC, U14. The microcomputer must continuously pulse the watchdog timer at intervals of less than one second, otherwise the watchdog IC turns off all of the opto-coupler ICs, which in turn causes all solenoid valves to shut off. The watchdog IC also attempts to restart the microcomputer by sending it a RESET pulse.

### • Door-Switch Steam Valve Lockout

To eliminate any possibility of the steam-to-chamber solenoid valve (S2) being energized due to a control failure when the door is open, relay CR1 coil is wired to the normally open contact of the door switch, and the AC neutral connection to S2 is wired through the normally open contact on CR1. Therefore, the AC neutral to S2 solenoid valve is completed only when the door is locked.

A set of CR1 relay contacts input to the control (LS4). This allows the control to check for CR1 failure by comparing the state of these contacts with the state of the door switch(es). That is, when the door is open, CR1 relay should be energized the the normally closed contacts to the control should be open.

### • On-Board Power Supply

An on-board power supply provides power to both the Control PC board and Printer PC board. The circuitry is straightforward. Transformer T1 steps 120 volts AC down to 20 volts AC. Diodes D3 and D4 provide full-wave rectification and capacitor C1 filters the diode output. This unregulated, 8-volt nominal DC voltage furnishes power to the Printer PC board 5-volt regulator.

The unregulated 8 volts DC is also applied to the input of the 5-volt regulator (VR1) on the Control PC board. The output of this regulator provides power for the ICs on the Control PC board and also certain portions of the Printer PC board.

### • Power Supply "Crowbar" Circuit

The power supply incorporates an overvoltage protection, or "crowbar" IC (U16). (The term "crowbar" comes from the analogy of dropping a crowbar across two power conductors, say two phases of 3-phase, 440 VAC.) If the output of regulator VR1 should exceed 5.75 volts, U16 turns on SCR Q1. Because Q1 is connected across the 8-volt DC unregulated supply, when Q1 turns on it dead-shorts the transformer and diodes, causing the 1/4-amp fuse (F2) in the control column to blow. This action protects the ICs on the Control PC board from overvoltage damage, i.e., a regulator failure will not cause extensive secondary damage to the board.

The microcomputer IC reads the 6-pole Dip switch S16 on the PC board which sets the various options described in sections 2 and 7, such as AM/PM versus Military Time, etc.

### Printer PC Board (Figure 3-6)

The Printer PC board operates under the control of the microcomputer on the Control PC board. The two boards are connected together by a 50-conductor ribbon cable. The Printer board incorporates a microcomputer IC, U4, which is completely dedicated to controlling the 24-column thermal printer mounted on the board. The 40-character alphanumeric display, also mounted to this board, receives data for display from it.

### • Printer Circuit Description

The printer circuit is composed of U2, U3 and U4, with associated resistors, capacitors, diodes, etc., and the printer itself.

The printer is a 24-column, thermal, dot-matrix type. Characters are formed by heating the thermal paper, causing it to blacken in patterns of small dots. Each character has a 5 (across) x 7 (down) dot matrix.

As mentioned, IC U4 is a microcomputer dedicated to operating the printer, with built in RAM and ROM memory. From the standpoint of the microcomputer on the Control PC board, the printer circuit appears as an 8-bit data port for writing data to be printed, a PRINTER READY signal (data cannot be sent to the printer too quickly), a STROBE signal (signals the printer to begin printing), and a RESET signal (halts printing and returns the print head to its home position).

Use of a dedicated printer control frees the main microcomputer on the Control PC board to do other, more important tasks.

IC U3 is wired as a free-running oscillator with an adjustable frequency. The output frequency of this oscillator directly controls the darkness of the printout. A unique feature of this circuit is that it is temperature-compensated by a small on-board thermistor, RT1. Changing temperatures inside the control column would otherwise cause the darkness of the printout to vary, i.e., darker at higher temperatures and lighter at lower temperatures.

There is a printout darkness which is the best compromise of printer life and legibility, greater darkness shortens printer life, lighter print is difficult to read. This is the reason that the control contains a "printer frequency adjust" routine. The frequency being adjusted is that of the U3 oscillator.

IC U4 accepts a 24-character string (8-bit ASCII) from the microcomputer on the Control PC board. It then prints this string as 7 rows of dots, advancing the paper by activating the printer motor. The print head travels along a shaft, also driven by the printer motor, with a spiral pattern cut into it, translating the rotary shaft motion to linear travel of the head. IC U2 acts as a buffer for the printer heaters. It amplifies low power signals from U4 to a level capable of handling the heater current. When the character string is printed, the IC U4 READY signal indicates to the Control PC board that the printer is available to print more characters.

The printer furnishes a motor speed input, designated TG (tachometer generator), to the microcomputer. The pulsating input permits the microcomputer to determine printhead speed and turn the motor on and off as required to maintain head speed. Without it, character dot spacing is inconsistent.

Because the printer circuit contains a number of signals switching at relatively high currents, it is a potential source of electrical noise. To reduce noise, this circuit is run from its own power supply and DC common, isolating it from other circuitry.

#### • Digital I/O Expander

As on the Control PC board, an 8255 I/O expander, U5 provides three 8-bit expansion ports for I/O. Port A (PA0 thru PA7) is used for displayed characters.

Port B interfaces with the 8-pole Dip switch (PB0 thru PB6).

Two bits of Port C control the display module. Three bits are DC outputs, none of which are used on this unit. One bit each on Ports B and C are limit switch inputs LS12 and LS13.

#### • Pressure Transducer Input

The pressure transducer interfaces with the Printer board. Voltage regulator VR2 supplies power to ICs U8 and U9, isolating them from the remaining circuitry.

The pressure transducer signal range is 0-50 mV DC, representing 0-50 psig. A section of U-2 amplifies the signal and sends it to U8, an 8 bit A/D converter, for conversion to digital form. Two adjustments, R26 for full scale and R25 for zero calibrate the pressure channel to the range of 0 psig to about 32 psig.

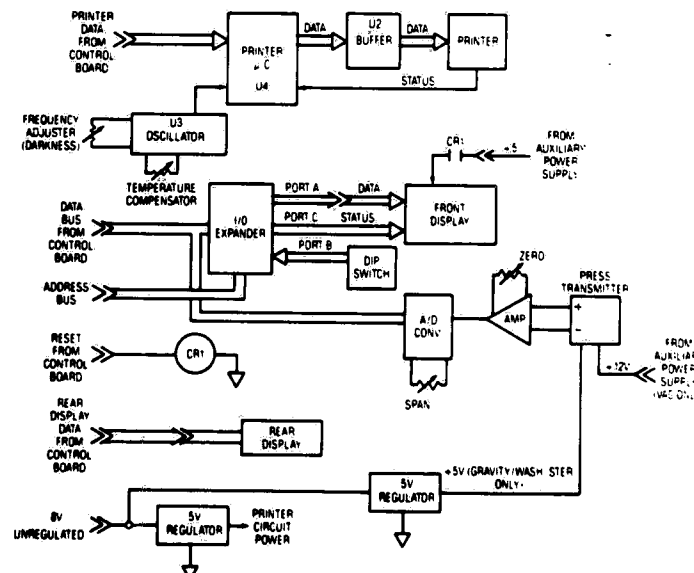


FIGURE 3-6 - Printer PC Board Block Diagram

#### • Touch Panel Inputs

Front Panel buttons connect to the Printer PC board at J11. Zener diodes D3-D14 provide spike protection. IC U1, a Schottky octal buffer, buffers the switches before touch pad signals connect to the main bus.

#### • Display Reset Circuit

Relay CR1 prevents random characters from appearing on the display(s) when a power failure or brown-out occurs. When this happens, CR1 coil deenergizes and cuts power to the display module(s) when its contacts open. This provides a power-up reset to the display module(s).

#### Auxiliary Power Supply

An auxiliary power supply is used to provide 5-volt power for the V-F display module and, for Vacumatic sterilizers only, the 12-volt DC power required for the pressure transducer.

The 5-volt output is rated at 6.0 amps maximum and the 12-volt output at 2.5 amps maximum. The power supply is an off-the-shelf design, and is treated as a black box in this application. Adjustments are available on the supply to trim voltage output settings. Troubleshooting is limited to checking the outputs for proper voltage and acceptable ripple.

The power supply incorporates overcurrent protection, known as "foldback current limiting," on both outputs.

That is, if the current exceeds the maximum rating, the power supply protects itself by shutting down until the short is cleared.

#### Display Module

The display module is a microprocessor-based, off-the-shelf display system containing all the necessary power conversion and formatting electronics to accept a string of 8-bit ASCII characters on two lines of 20 characters/line. It requires only a 5-volt power supply. A full set of upper/lower-case letters, numbers, and some special characters can be displayed as a 5 x 7 dot-matrix type character.

As with the printer, the display appears to the microprocessor as an 8-bit data port to which to send data. The display holds its BSY (busy) line at 0 volts to receive data and switches it to 5 volts when occupied with internal formatting and display. The microcomputer activates the WR (write) input to tell the display module to display the data sent.

The vacuum-fluorescent display technology used offers good brightness at reasonable power consumption, with long-life. However, because the power requirement exceeds the 5-volt power available on the Control PC board, the auxiliary power supply feeds the 5-volt power to the display module.

The display module contains a self-test routine which displays the entire character set (including characters from several foreign languages). The routine is selectable from Dip switch #1 on the 8-pole Dip switch on the Printer PC board. Service on the display is limited to checking the self-test routine as a means of isolating errant displays between the display module and the Printer PC board.

On double-door sterilizers, the same display module is also used at the non-operating end. It displays the same information that appears on the operating end.

#### Touch Panel (Display Overlay)

The cycle select, reset, and values changing touch pads are contained on a self-adhesive "display overlay" or "touch panel." The touch pads are of the type with very limited travel, thus the Control board beeper sounds whenever one of these pads is pressed. The touch pads come out to one connector, P14. The touch panel is easily replaced by peeling it off the control assembly.

On double-door units a second touch panel, identical to the front touch panel, is used at the non-operating end.

**Note:** The change values touch pads are purposely covered by sheet metal at the non-operating end so that cycle settings cannot be made from that end.

#### Pressure Transducer - Gravity Units

The Gravity pressure transducer is a strain-gauge type with an output signal referenced to local barometric pressure, and a working pressure of 0 to 50 psig. At

local pressure (i.e., with the chamber door open), the output is 0 mV DC. At 50 psig, the output is 50 mV DC. The gauge-type pressure transducer is used on these units because this type does not use vacuum level as an important cycle parameter, although it draws several inches of vacuum in the DRY phase. When in vacuum, the pressure display reads "P < 0" psig.

#### Pressure Transducer - Vacumatic Units

The Vacumatic pressure transducer is a strain-gauge type with an output signal referenced to zero absolute pressure (i.e., perfect vacuum) and a working range of 0 to 50 psia. At perfect vacuum, the output is 0 mV DC, and at 50 psia (approximately 35 psig), the output is 36 mV DC. Conversion to gauge readings is done in software. The display reflects changes in local barometric pressure.

#### Control Programming

Following is a description of the control program executed by the microcomputer.

#### • Power-Up Routines

On power-up the battery-backed RAM memory contains all the cycle settings, time, date and in cycle/out of cycle status of the machine when it was last powered down.

The control turns on AC6, auto-utilities/steam generator, and determines if the power failed in cycle. If so, it determines from RAM which cycle and what phase of the cycle it was in, and responds as follows:

1. Prints power-fail header.
2. LEAK TEST (Vacumatic units only) - restarts from beginning.
3. CONDITION - as follows:
  - a. PURGE - resumes cycle.
  - b. Vac PULSE (Vac units only) - restarts.
  - c. Pressure PULSE (Vac units only) - resumes cycle.
  - d. CHARGE - resumes cycle.
4. STERILIZE - resumes sterilize timing unless temperature has dropped below setpoint. If temperature has dropped below setpoint when power is restored, control restarts sterilize timer (in Hospital mode), or can resume sterilize timing (in Lab mode).
5. EXHAUST (above 3 psig) - resumes cycle.
6. DRY - resumes dry timer, continues cycle.
7. AIR BREAK - resumes cycle.
8. Liquids Cycle 10-minute wait - prevents a RESET and restarts wait time. If a RESET is attempted, displays and prints warning.

If there was no power interruption during a cycle, a normal start-up occurs as follows:

1. If one of the self-test Dip switches is set, it jumps to one of those routines, otherwise...
2. The normal power-up header is printed.
3. The auto-utilities solenoid valves are turned on if option is installed.
4. If pressure in the chamber exceeds 2 psig (fixed setpoint), the control turns on S3, S4 and, if a Vacumatic unit, S7, and waits for pressure to decrease. A warning is displayed (temp and pressure are typical):

PRESSURE T=223F  
IN CHAMBER P=4psig

along with door(s) status.

5. The control examines four sensor inputs for failure, and if a failure is detected, reacts as follows:

- a. Temperature probe signal greater than 290°F:

Prints...

\* ALARM  
FAILURE READING TEMP.

Displays...

\*ALARM!  
COMPONENT FAILURE

- b. Pressure transducer signal greater than 44 psig:

Prints...

\* ALARM  
FAILURE READING PRESSURE

Displays...

\*ALARM!  
COMPONENT FAILURE

- c. CR1 door switch relay:

Prints...

\* ALARM  
CR1 RELAY FAILURE

Displays...

\*ALARM!  
COMPONENT FAILURE

- d. Boiler (steam generator) flooded relay:

Prints...

\* ALARM  
BOILER FLOODED

Displays...

\*ALARM!  
BOILER FLOODED

Note: The sensor check starts on power up and continues in or out of cycle, except during the Purge phase.

6. If the SAVE VALUES and CHANGE VALUES pads are both pressed on power up, or if the battery IC is dead, the RAM memory is cleared of cycle settings and the default settings are loaded in from EPROM.

If unit is a Vacumatic sterilizer, the control then prompts the user to select or bypass the LEAK TEST cycle. If the LEAK TEST is bypassed, the control then prompts the user to select or bypass the DART (Bowie-Dick) cycle. If the DART cycle is bypassed, the control goes to the Out of Cycle routine (see following). If the DART cycle is selected, the control prompts the user to select or bypass a "warm-up" cycle prior to running the DART cycle.

Note: The LEAK TEST and DART cycles are ONLY available on power up and only on Vacumatic sterilizers.

If unit is a Gravity sterilizer, the control goes directly to the Out of Cycle routine.

#### • Out of Cycle Routine

1. The display alternates between showing the four cycle types currently programmed, and a second display showing current chamber temperature and pressure, time of day, and current status of the door(s)... either unlocked, or locked (READY).
2. If the PRINT rocker switch is pressed, a copy of the last cycle run is printed.
3. If the PRINT VALUES rocker switch is pressed, the current cycle settings are printed.
4. If the CHANGE VALUES touch pad is pressed, control enters the CHANGE VALUES routine,

allowing the operator to change cycle types, cycle settings, time, etc.

5. If a cycle touch pad (#1 thru #4) is pressed, front or rear (if double-door unit), cycle settings for that cycle are displayed for five seconds, or for as long as the button is held.
6. If a cycle touch pad (#1 thru #4), front or rear (if double-door unit), is pressed twice within five seconds, the cycle programmed to that touch pad starts.
7. If unit is set for the Auto-Utilities Shutdown option, control monitors the Auto-Utilities Shutdown time and, when reached, turns off the AC6 output for the utilities solenoid valves.

#### • In-Cycle Pressure/Vacuum Alarms

When any of the following alarms occurs, the buzzer at the control end (and, if a double-door unit, the non-operating end) of the sterilizer pulsates. If a cycle selector button at either end is pressed, the buzzer(s) is silenced, and the unit continues to try to achieve the temperature or pressure setpoint.

#### - TOO LONG IN EXHAUST

In the CONDITION phase, if the sterilizer takes too long (default time is 5 minutes) to exhaust pressure from the end of the PURGE phase, or from the P1 (PS-1 setting Vacumatic units only) down to the P2 (PS-2, default = 1 psig) setting, the TOO LONG IN EXHAUST alarm is printed.

#### - TOO LONG IN EVACUATION (Vacumatic Units Only)

If the sterilizer takes too long (default time is 20 minutes) to pull a vacuum from the end of the PURGE phase, or the P2 (PS-2) setting in CONDITION, down to the V1 (VS-1) setting (default = 10.0 in.Hg), the TOO LONG IN EVACUATION alarm is printed.

#### - TOO LONG IN CHARGE

If the sterilizer takes too long (default time is 20 minutes) in the CHARGE phase of CONDITION prior to reaching the set sterilizing temperature, the unit prints the TOO LONG IN CHARGE alarm, or too long to reach P1 (PS-1) in a vacuum pulse (for Vacumatic units only).

#### - TOO LONG IN FAST EXHAUST

If the sterilizer takes too long (default time is 5 minutes) to exhaust, from the beginning of the exhaust phase down to P3 (PS-3) setting, the TOO LONG IN FAST EXHAUST alarm is printed.

#### - TOO LONG IN SLOW EXHAUST

During a Liquids cycle, if the sterilizer takes more than one hour to reach the P3 (PS-3) setting (default is 3 psig) from the beginning of slow exhaust (end of sterilize phase), the TOO LONG IN SLOW EXHAUST alarm is printed.

#### - TOO LONG IN VENT

During a LIQUIDS cycle on Vacumatic and all Gravity unit cycles, if the sterilizer takes more than six minutes to exhaust from P3 (PS-3) setting (default is 3 psig) to the P2 (PS-2) setting (default is 1 psig), the TOO LONG IN VENT alarm is printed. During a FLASH or GRAVITY cycle on a Gravity unit only, if the sterilizer takes longer than 5 minutes to return to 0 psig after the DRY time times out, this alarm is printed.

#### - TOO LONG IN AIR BREAK (Vacomatics Only)

If the sterilizer takes more than 5 minutes to reach 2 in.Hg after the DRY time times out, the TOO LONG IN AIR BREAK alarm is printed.

#### • Undertemperature During Sterilize

If the chamber temperature drops more than 2°F below the set sterilizing temperature during STERILIZE (default setting), the sterilize timer is reset (hospital mode) or put on hold (lab mode) until the temperature recovers to set temperature. The display shows UNDERTEMP. The minimum temperature during the undertemp condition is printed.

#### • Overtemperature During Sterilize

If the chamber temperature exceeds the overtemperature setpoint, (default = 20.0°F), the sterilize timer is stopped until the temperature returns to within the overdrive setpoint. If the temperature returns to within the overdrive setting, the cycle continues. The maximum temperature reached during the overtemp condition is then printed.

#### • Boiler Flooded

Control monitors the integral steam generator throughout the cycle (refer to Section 3.5). If boiler-flooded condition occurs, alarm sounds, BOILER FLOODED is printed and cycle stops.

#### • Temperature-Reading Error

Control monitors for this condition throughout the cycle. If condition occurs, alarm sounds, FAILURE READING TEMP is printed and cycle halts. Unit will not return to READY until failure is corrected.

#### • Pressure-Reading Error

Control monitors for this condition throughout the cycle. If condition occurs, alarm sounds, FAILURE READING PRESSURE is printed and cycle halts. Unit will not return to READY until failure is corrected.

### • CR1 Relay Failure

Control monitors for this condition throughout the cycle. If condition occurs, alarm sounds, CR1 RELAY FAILURE is printed and cycle halts. Unit will not return to READY until failure is corrected.

### • Front Door or Rear Door Open

If either door switch deactuates during a cycle, alarm sounds, message is printed and cycle aborts. The control exhausts the chamber and returns to the NOT READY state.

### Self-Test Modes

If Dip switch #4 on either the Printer PC board or the Control PC board is set to ON when powering up, or is switched to ON followed by pressing the RESET touch pad, the control enters the Self-Test mode. It stays in this mode until the Dip switches are set to OFF, followed by cycling the power OFF and then ON, or by pressing RESET.

The control prints:

EAGLE 3000 GRAVITY  
E2GA00.ABS 7/10/88  
← or Vacumatic, as applicable  
← Program revision may vary

The control then checks the Dip switch #4 setting on each of the two boards to determine which of the following routines to enter:

### • Service Test Mode

If Dip switch #4 on the Printer PC board is ON and Dip switch #4 on the Control PC board is OFF, the control enters the Service Test mode. It remains in this mode until Dip switch #4 on the Printer PC board is positioned to OFF, followed by cycling the power OFF and then ON, or by pressing RESET.

The features of the Service Test mode are described in detail in Section 7.

### • Printer Frequency Adjustment

If Dip switch #4 on the Control PC board is ON and Dip switch #4 on the Printer PC board is OFF, the control enters the Printer Frequency Set mode. It remains in this mode until Dip switch #4 on the Control PC board is positioned to OFF, followed by cycling the power OFF and then ON, or by pressing RESET.

In this mode, the frequency of the free-running oscillator that controls printout darkness is displayed. The service technician can then adjust the printer darkness for optimum printer life. Refer to Section 7 for adjustment procedure.

### • Burn-In Test

If Dip switch #4 on both the Control and Printer PC boards is positioned to ON, the control enters the Burn-In Test mode. It remains in this mode until the

Dip switches are positioned to OFF, followed by cycling the power OFF and then ON, or by pressing RESET. The following is displayed...

\* BURN IN TEST \*  
\* EAGLE 3000 \*

and printout occurs...

BURN IN TEST  
10/12/88 10:23:04A ← Current date and time

The Burn-In Test sets a flag to clear and reload (from EPROM) the memory of the RAM IC with all the default (factory) settings. This procedure is not used in the field.

### • Manufacturing Burn-In

Burn-In can be performed from the touch panel by pressing and holding the CHANGE VALUES and SAVE VALUES touch pads while powering up without altering the Dip switches. The control prints:

MFG BURN IN AT 10:23:04A

The default settings are then loaded into RAM memory from EPROM. The control returns to normal operation.

## 3.4 CYCLE DESCRIPTIONS

Note: For graphic representations of the cycles and operation of the solenoid valves, see the cycle graphs on pages 6-2 through 6-6.

### Gravity Cycle - Gravity Sterilizers

If no numerical Cycle Selector touch pad is programmed for a Gravity cycle, operator must program a 250°F (121°C) or 270°F (132°C) gravity cycle with desired STERILIZE and DRY (if desired) times to one of the numbered pads (1 thru 4). After loading machine, door(s) must be locked. Display indication, DOOR UNLOCKED, goes off and display shows READY. Operator initiates cycle by pressing, twice, the numerical Cycle Selector touch pad programmed for the desired Gravity cycle.

1. During the PURGE phase of the cycle, the steam-to-chamber (S2), fast-exhaust (S3) and exhaust-cooling (S4) solenoid valves are energized (opened) in order to quickly displace the air in the chamber with steam. The 60-second purge timer begins to count down. Purge timer times out.
2. After the 60-second PURGE phase is completed, S3 and S4 close and the sterilizer begins to build pressure in the chamber. After proper temperature

is reached, the STERILIZE phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S3 and S4 turn off.
- When sterilizing temperature is reached, STERILIZE phase begins. The STERILIZE timer begins to count down from the preset time.
- When the chamber temperature is less than the overdrive setpoint (TS-2, default=3°F above setpoint), S2 turns on. When chamber temperature is greater than setpoint, S2 turns off. The control has a 1.5 second delay for turning S2 on and off thus preventing the solenoid from "chattering" (i.e., cycling on and off rapidly).

3. After the STERILIZE phase is complete, the sterilizer goes into the EXHAUST phase. The following sequence of actions occurs in the machine:

- Solenoid valve S2 turns off. Solenoid valves S3 and S4 turn on for fast exhaust.

If no DRY time was set...

- At 1 psig, display reads COMPLETE and solenoid valves S3 and S4 turn off.

If DRY time was set...

- When the chamber has exhausted to 3 psig, (pressure setpoint PS-3) the controller starts the DRY timer. At the same time, solenoid valve S4 turns off and S5 (steam-to-ejector) turns on and begins to evacuate the chamber. Chamber pressure during the drying period will vary from 0 to 2 in.Hg (vacuum).

- During this period air is drawn into the chamber through the bacteria-retentive filter and check valve. When the DRY timer times out, solenoid valves S3 and S5 turn off.

- When chamber pressure reaches 0 psig, control waits for 10 seconds, then buzzer begins to sound and display indicates COMPLETE. Solenoid valve S3 turns on.

4. Buzzer sounds for 60 seconds. When door is opened, buzzer stops, solenoid valve S3 turns off and display shows DOOR UNLOCKED.

### Gravity Cycle - Vacumatic Sterilizers

If no numerical Cycle Selector touch pad is programmed for a Gravity cycle, operator must program a 250°F (121°C) or 270°F (132°C) gravity cycle with desired STERILIZE and DRY (if desired) times to one of the numbered pads (1 thru 4). After loading machine, door(s) must be locked. Display indication, DOOR UNLOCKED, goes off and display shows READY. Operator initiates cycle by pressing, twice, the numerical Cycle Selector touch pad programmed for the desired Gravity cycle.

1. During the PURGE phase of the cycle, the S2, S3, S4 and S7 solenoid valves are energized (opened) in order to quickly displace the air in the chamber with steam. The 60-second purge timer begins to count down. Purge timer times out.

2. After the 60-second PURGE phase is completed, S3, S4 and S7 close and the sterilizer begins to build pressure in the chamber. After proper temperature and pressure are reached, the STERILIZE phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S3, S4 and S7 turn off.

- When sterilizing temperature is reached, STERILIZE phase begins. The STERILIZE timer begins to count down from the preset time.

- When the chamber temperature is less than the overdrive setpoint (TS-2, default=3°F above setpoint), S2 turns on. When chamber temperature is greater than setpoint, S2 turns off. The control has a 1.5 second delay for turning S2 on and off thus preventing the solenoid from "chattering" (i.e., cycling on and off rapidly).

3. After the STERILIZE phase is complete, the sterilizer goes into the EXHAUST phase. The following sequence of actions occurs in the machine:

- Solenoid valves S1 and S2 close. Solenoid valves S3, S4 and S7 open for fast exhaust. Chamber is quickly evacuated.

If no DRY time was set...

- When chamber pressure approaches atmospheric, solenoid valves S4, S3 and S7 close. S1 solenoid valve opens. Display indicates COMPLETE and buzzer begins to sound.

If DRY time was set...

- When the chamber has exhausted to 3 psig, pressure setpoint P3 (PS-3), the DRY timer starts and S4 closes. Chamber pressure during the drying period will be about 26 to 28 in.Hg.

- When the DRY timer times out, solenoid valves S3 and S7 close, and S1 opens. Chamber vacuum begins to break through S1.

- When chamber pressure is at least 2 in.Hg, buzzer begins to sound and display indicates COMPLETE. Solenoid valve S3 opens.

4. Buzzer sounds for 60 seconds. When door is opened, buzzer stops, solenoid valve S3 turns off and display shows DOOR UNLOCKED.

### Liquids Cycle

If no numerical Cycle Selector touch pad is programmed for a Liquids cycle, operator must program a 250°F (121°C) cycle with desired STERILIZE times to one of the numbered pads (1 thru 4). After loading machine,



door(s) must be locked. Display indication, DOOR UNLOCKED, goes off and display shows READY. Operator initiates cycle by pressing, twice, the numerical Cycle Selector touch pad programmed for a Liquids cycle.

1. During the PURGE phase of the cycle, solenoid valves S2, S3 and S4 (and on Vacamatic units, S7) are energized (opened) in order to quickly displace the air in the chamber with steam. The 60-second purge timer begins to count down. Purge timer times out.

2. After the 60-second PURGE phase is completed, S3 and S4 (and on Vacamatic units, S7) close and the sterilizer begins to build pressure in the chamber. After proper temperature and pressure are reached, the STERILIZE phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S3 and S4 (and on Vacamatic units, S7) close.

- When sterilizing temperature (250°F) is reached, STERILIZE phase begins. The STERILIZE timer begins to count down from the preset time.

- When the chamber temperature is less than the overdrive setpoint (TS-2, default=3°F above setpoint), S2 turns on. When chamber temperature is greater than setpoint, S2 turns off. The control has a 1.5 second delay for turning S2 on and off thus preventing the solenoid from "chattering" (i.e., cycling on and off rapidly).

3. After the STERILIZE phase is complete, the sterilizer goes into the EXHAUST phase. The following sequence of actions occurs in the machine:

- Solenoid valve S2 closes. Chamber exhausts slowly through the slow-exhaust needle valve.

- When the chamber has exhausted to 3 psig, pressure setpoint P3 (PS-3), the controller energizes S3 to quickly empty the chamber of remaining steam. WARNING HOT LIQUIDS is displayed.

4. When the chamber is exhausted to steam to 1 psig of pressure setpoint P2 (PS-2) this signals the end of the cycle. The following actions occur at the end of the cycle:

- At 1 psig, pressure setpoint P2 (PS-2), WARNING HOT LIQUIDS is displayed. Buzzer begins to sound for 5 seconds. The control waits for the door to be opened.

- When door is opened (only cracked open 1" for the first ten minutes following sterilization), display alternates between WARNING HOT LIQUIDS and UNLOAD time countdown.

- After 10 minutes, buzzer sounds for 2 seconds

indicating that it is safe to remove the load. Printer prints READY TO UNLOAD.

#### Flash Cycle

The Flash cycle is a Gravity cycle used for quick turnaround of unwrapped instruments. Because of the type of load, a minimal DRY time of one minute is used. A STERILIZE time of either three or ten minutes is used, depending on the type of load being processed.

The previous cycle descriptions for a Gravity cycle on a Gravity sterilizer or Vacamatic sterilizer apply to the Flash cycle for each unit respectively.

#### Prevacuum Cycle - Vacamatic Sterilizers Only

If no numerical Cycle Selector touch pad is programmed for a Prevacuum cycle, operator must program a 270°F (132°C) cycle with desired STERILIZE times to one of the numbered pads (1 thru 4). After loading machine, door(s) must be locked. Display indication DOOR UNLOCKED goes off and display shows READY. Operator initiates cycle by pressing, twice, the numerical Cycle Selector touch pad programmed for a Prevacuum Cycle.

1. During the PURGE phase of the cycle, the steam-to-chamber (S2), fast-exhaust (S3), exhaust-cooling (S4) and vacuum-water (S7) solenoid valves are energized (opened) in order to quickly displace the air in the chamber with steam. The 60-second purge timer begins to count down. Purge timer times out.

2. The second phase of the Prevacuum cycle consists of a series of four vacuum/pressure pulses. During this part of the conditioning phase, the chamber is alternately pressurized and then exhausted until a vacuum is drawn. This type of conditioning assures optimal utilization of the vacuum system for effective conditioning of loads that are appropriate for this method of sterilization. The following sequence of actions occurs in the machine:

- Solenoid valves S1 (filtered-air) and S2 close. The 1-minute vacuum timer begins timing when chamber pressure drops to the P2 (PS-2) setpoint, 1 psig.

- A vacuum is produced in the chamber. When 10 in. Hg vacuum in the chamber is achieved and the vacuum timer times out, S2 opens again to admit steam to the chamber to begin repressurizing. Simultaneously, solenoid valves S3, S4, and S7 close.

- When chamber is pressurized to 26 psig (P1 setpoint) S2 again closes and valves S3, S4 and S7 open to evacuate the chamber until a vacuum is again produced.

- The entire sequence is repeated until three pressure pulses and four evacuations have occurred.

3. After the fourth evacuation, the chamber is again pressurized and the STERILIZE phase of the cycle begins:

- S3, S4 and S7 close and S2 opens in order to build pressure in the chamber.

- When sterilizing temperature is reached, STERILIZE timer begins to count down. S1 is turned off.

- When the chamber temperature is less than the overdrive setpoint (TS-2, default=3°F above setpoint), S2 turns on. When chamber temperature is greater than setpoint, S2 turns off. The control has a 1.5 second delay for turning S2 on and off thus preventing the solenoid from "chattering" (i.e., cycling on and off rapidly).

4. After the STERILIZE phase is complete, the sterilizer goes into the EXHAUST phase. The following sequence of actions occurs in the machine:

- Solenoid valves S1 and S2 close. Solenoid valves S3, S4 and S7 open for fast exhaust. Chamber is quickly evacuated.

If DRY time was set...

- When the chamber has exhausted to 3 psig, pressure setpoint P3 (PS-3), the DRY timer starts and S4 closes. During the DRY period, a vacuum is drawn in the chamber.

- When the DRY timer times out, solenoid valves S3 and S7 close, and S1 opens.

- When chamber pressure reaches 2 in. Hg, buzzer begins to sound and display indicates COMPLETE. Solenoid valve S3 opens.

5. Buzzer sounds for 60 seconds. When door is opened, buzzer stops, solenoid valve S3 closes and display shows DOOR UNLOCKED.

If no DRY time was set, cycle completes the same as a Gravity Cycle.

#### Express Cycle (Vacamatic Units Only)

The Express cycle is identical to the Prevacuum cycle except that two CONDITIONING pressure/vacuum pulses are used instead of the four used for the Prevacuum cycle. This cycle is intended for wrapped hardgoods loads only, where less air exists in the load.

#### Leak Test Cycle (Vacamatic Units Only)

On Vacamatic units, a Vacuum Leak Test cycle is available on power-up to check for leaks. Control prints out the leak rate in mmHg/minute at the end of the cycle. Cycle is useful as a check when Bowie-Dick test packs or DART cartridges show signs of incomplete air removal, since the Bowie-Dick sheets or DART cartridges are sometimes faulty, or incorrect techniques have been used.

Current AMSCO standards call for the leak rate not to exceed 1 mmHg/minute.

The Leak Test cycle is essentially an Express cycle with a 10-minute hold period during the DRY phase, during which the control monitors the change in chamber vacuum. The cycle creates the same chamber conditions as those during normal usage.

Up until the Sterilize phase, the Leak Test cycle is identical to the Express cycle. Therefore, the following description covers only from the Charge phase on to the end of the cycle. The printout for the Leak Test cycle, as shown in Section 2, identifies that a Leak Test cycle is being run with the header "= LEAK TEST =."

When 270°F is reached during CHARGE, the chamber exhausts, and a vacuum is pulled with solenoid valves S3 and S7 on. S1 turns on to seal the chamber.

Counting down as in DRY, the Leak Test cycle pulls a vacuum for ten minutes with these solenoid valves on. The display shows EVACUATING. When the ten-minute timer times out, S3 and S7 shut off. A two-minute timer starts, and the display shows STABILIZING. This time is required to allow the chamber vacuum to stabilize after shutting off S3 and S7. At the end of two minutes, the control reads and stores the chamber vacuum level. A 10-minute timer is started. At the end of ten minutes, the chamber vacuum level is read again. The initial reading is subtracted from the final reading, yielding the vacuum leak over this 10-minute period. When divided by ten minutes, the leak rate is obtained. This is the value printed.

A normal AIR BREAK and CYCLE COMPLETE follows.

#### DART (Bowie-Dick) Test (Vacamatic Units Only)

To assure the effectiveness of air removal, prevacuum sterilizers are normally challenged daily by a special test pack (Bowie-Dick) or other devices (such as the AMSCO DART™) prior to running any prevacuum cycles. This practice should be considered mandatory, as mechanical air removal governs the sterilizing ability of prevacuum-type sterilizing cycles.

Many manufacturers of air-removal test sheets specify an exposure time at 270°F of 3:30. For this reason, the DART/Bowie-Dick cycle, with this exposure time pre-programmed, can be selected on power-up. This avoids having to set a special sterilize time at the beginning of the work day just for this test cycle.

The DART/Bowie Dick cycle is identical to the Prevacuum cycle previously described, with the exceptions that the exposure (STERILIZE) time is 3:30, and the DRY time is one minute, sufficient to remove residual moisture from a single Bowie-Dick test pack or DART.

#### Warm-Up Cycle (Vacamatic Units Only)

Prior to running a DART/Bowie-Dick cycle, the control gives the operator the option of running an empty

chamber "warm-up" cycle. This cycle heats up the chamber and piping components to normal temperatures to avoid excess condensation forming on the test pack or DART if the steam supply was just turned on. Such condensation would not be representative of the performance of the unit during the work shift.

The warm-up cycle is identical to a Flash cycle (described previously), with a three-minute sterilizing time. This cycle is identified on the printout as " = DART WARMUP =".

### 3.5 STEAM GENERATOR

Both Vacumatic and Gravity sterilizers are available with a built-in steam generator. Either a 30 kW (at 240 or 480 VAC) or a 22 kW (at 208 or 440 VAC) boiler is used.

One of two generator models is supplied; either the AS style model or the CHS style model. Models can be distinguished using information on the generator data plate.

The generator control circuit is enabled when the POWER switch on the Control is turned on. Water-fill and heater control are independent functions. Therefore, whenever the sterilizer is powered the generator is also powered. The generator is also powered through the manual control system. A pressure switch, set at 8 psig, monitors incoming water pressure when the manual control is activated; this water pressure is vented to drain and the resultant switch closure turns on the generator.

#### Water Fill

The water-fill circuit consists of four or two water-level probes installed at the top of the generator pressure vessel and wired to a PC board in the generator control box. The PC board in turn controls a pump and solenoid valve in the generator water feed line.

**AS Series generators** are equipped with four probes, designated A through D. Rods A and D are of the same length; A being the low water level cut off (disables heater if rod does not sense water), and rod D is a redundant failsafe control rod. Rod B maintains minimum water level under normal operation by causing the pump to turn on when fully exposed. Rod C monitors the high water level. If rod C is contacted by water, the water pump is shut off.

**CHS Series generators** are equipped with two probes. The longer probe is the low water level cut off (which disables heater if rod does not sense water). The shorter probe is the water level control rod, and it is housed in a baffle tube to prevent accidental pump control due to splashing or foaming. The single level probe operates in the same way -- when the water level reaches the probe, the pump shuts off. When the water level drops, exposing the

probe a time delay in the control board (approximately six seconds) is activated. If seven seconds pass, and the probe is still exposed, the pump activates, and fills chamber to the level of the probe.

A sightglass at the rear (AS Series) or front (CHS Series) of the generator provides a visual indication of proper water level, normally one inch from the top of the glass.

#### Heater Control

The heater CONTROL is enabled whenever the low water cut off control rod senses water. At that point the heaters are fully submerged, and the generator can safely be powered up. The CONTROL pressure switch, set at 75 psig, controls the electric heater contactor. Below 75 psig, this switch is closed, turning on the electric heater elements and producing steam. The switch shuts the electric heaters off at 75 psig. The SAFETY pressure switch, set at 85 psig, provides electric heater shutoff in the event of CONTROL pressure switch failure. On AS Series the individual switch's differential is not adjustable. On CHS series generators, switch differential can be adjusted. The CHS units have a manual reset SAFETY pressure switch. The generator will shut down if the pressure exceeds the switch setting. In such a case the switch must be manually reset.

A 100-psig pressure-relief valve (safety valve) protects the generator from overpressure in event of control failure.

#### Anti-flood Circuit

The anti-flood device is installed on Eagle 3000 sterilizers equipped with electric steam generators. Two different models of steam generator have been used; the AS model and the CHS model. The data plate on the generator will note which of the two models it is. Slight differences occur between the circuitry of the two models, so it is critical to determine which model you have and refer to the appropriate schematic.

The anti-flood device consists of:

- a control box assembly mounted either:
  - on the side of the generator control box in AS models,
  - -- or --
  - on top of the generator control box in CHS models,
- a normally closed (NC) solenoid valve in the generator steam outlet piping,
- and a water sensor in the generator steam outlet piping.

The anti-flood device is designed to monitor the steam outlet of the generator. In the event the steam outlet fills

with water -- due to some equipment malfunction -- the anti-flood device causes a NC solenoid valve, mounted in the generator steam outlet piping, to de-energize. When de-energized, this steam to jacket solenoid valve shuts off the steam outlet, thus preventing liquid from entering the sterilizer chamber.

Sterilizer operators are alerted to the flood condition in the following ways: The Eagle 3000 control sounds an audible alarm, prints out and displays the alarm message "ALARM BOILER FLOODED." If in cycle, the Eagle 3000 control aborts the cycle. The anti-flood box also has an indicating light to alert the operator that the circuitry has sensed the presence of water.

#### Circuit Description:

When the sterilizer is powered up, the anti-flood device is energized through L1 and L2 on the Warrick control board.

The sensing probe, located in the steam outlet piping, indicates either an open condition (no water in the piping) or a shorted condition (water in piping). The shorted condition sensed by the probe will be some resistance value, dependent on the actual resistance of the water. Resistance in this situation is never zero.

**Note:** The Warrick board sees this resistance change as a change in voltage potential. In normal operation the voltage measured across the probe and chassis ground is 10 VAC. When the probe senses water, the reduced resistance causes the voltage potential to drop to 6 VAC (AS Series) or 3 VAC (CHS Series) or less. When voltage falls below activation level, the Warrick board "recognizes" water in the piping. If water with very high resistance is fed to the generator (e.g., distilled water), voltage may not drop to 6 volts and therefore the anti-flood device will not function as intended.

The Warrick board, seeing an open condition from the probe (normal operation, no water), energizes the Warrick board relay and causes the NO contact to close. This action feeds 120 VAC to a control relay located in the anti-flood box:

- On AS models this relay is designated CR1 (see Schematic SK-880204).
- On CHS models the designation is 2CR (see Schematic: Optional CHS Series Electrical Steam Generator).

On both models the control relay's normally open (NO) contacts close, feeding a DC ground signal to the sterilizer control. Sterilizer wires 36 and 51 are connected to this NO contact (see sterilizer schematic). The sterilizer recognizes this DC ground signal as normal operation.

If water fills the steam to jacket piping, the probe senses the water and the Warrick control senses the lower resistance. A delay built into the Warrick board requires this lower resistance to be present for at least

3 to 7 seconds before tripping the alarm (the delay prevents false alarms caused by small amounts of condensate in the piping). If the board senses water for longer than the delay, the Warrick board trips and the relay on the Warrick board de-energizes, causing the relay to drop out. The DC ground signal fed to the sterilizer control through the NO contacts (relay CR1 on AS models, relay 2CR on CHS models) is lost, and the sterilizer control responds by aborting the cycle, sounding an audible alarm, and displaying and printing "ALARM BOILER FLOODED". The sterilizer control also turns off the AC6 output, which turns off the steam generator. The relay's NC contacts close, lighting a lamp mounted on the anti-flood box.

In this state, the NC steam to jacket valve is de-energized, preventing water from reaching the sterilizer chamber.

At this point the sterilizer and generator cannot be operated. Power to the unit must be shut off, and an investigation made to determine the cause of the problem.

After the equipment is repaired, the Eagle 3000 control power must be turned back on. Reset the generator anti-flood device by pressing the "RESET" button located on the anti-flood box.

**Note:** The Eagle 3000 sterilizer control can only be reset by cycling the power off and then back on. Pressing the reset button on the front panel of the Eagle 3000 sterilizer control will not reset the control or silence the alarm.

A test switch is available to check the circuitry during preventive maintenance. Pressing the test switch simulates the effect of water in the line. Hold the test switch in the depressed position for 3 to 7 seconds to ensure the anti-flood device is responding.

#### Piping Variations:

The AS model and the CHS model use different sensing probes and mounting arrangements as follows:

**AS model --** The sensing probe mounts into 1/2" x 3/8" coupling, which in turn mounts into a 1/2" nipple and a 1/2" x 1/2" x 1/2" tee (see Figure 3-8). The probe itself is a standard production Warrick sensor holder, part number P387337-663. The tip of the probe may or may not have a coupling installed. It is not necessary for the tip coupling to be present for the anti-flood device to function properly.

**CHS model --** The sensing probe mounts into a special 1/2" x 1/2" x 3/8" tee (see Figure 3-9). This tee is modified with a ground stud brazed into the side. The probe itself is a special Auburn brand probe, part number P764323-511.

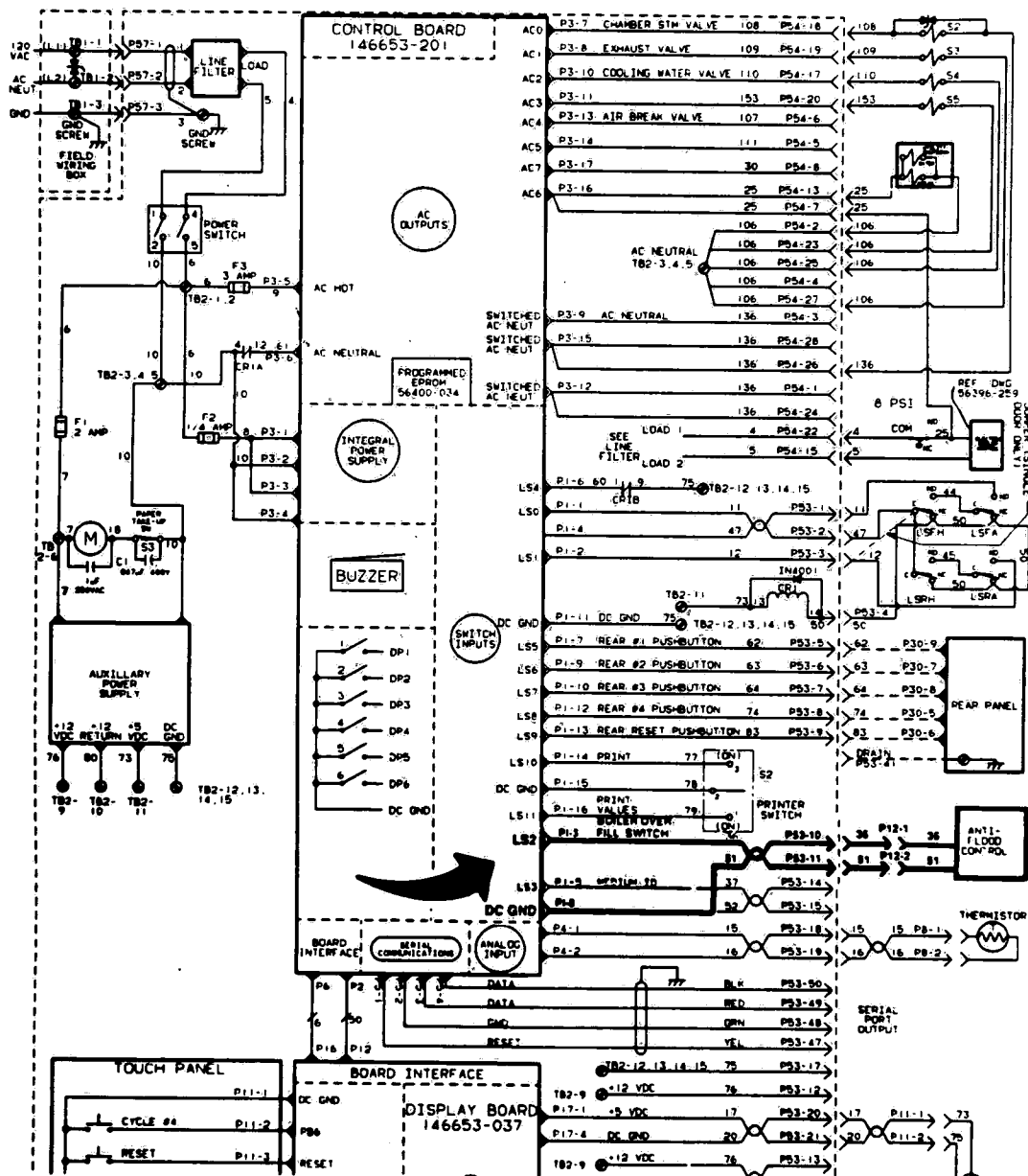


FIGURE 3-7 - Sterilizer Schematic

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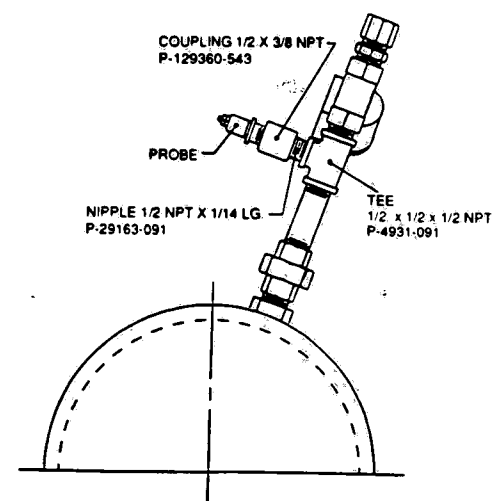


FIGURE 3-8 - AS Series Piping

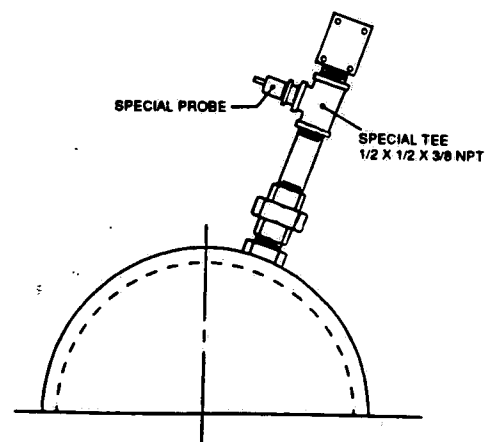


FIGURE 3-9 - CHS Series Piping

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## Section 4 Inspection and Maintenance

### 4.1 GENERAL

Maintenance procedures described in Sections 4.2 through 4.4 should be performed at regular intervals, as indicated. The frequency indicated is the minimum, and should be increased if usage of the sterilizer demands. Should a problem occur, refer to Section 6, Troubleshooting. Section 4.5 is a sample maintenance record which we suggest the Maintenance Department keep. Such a record proves helpful in ensuring proper maintenance.

**WARNING: BURN AND SHOCK HAZARD.** - Be sure to position power switch to OFF and wait until chamber cools to room temperature before starting any maintenance procedures.

### 4.2 ROUTINE INSPECTION

1. Inspect cabinetry for signs of damage or misaligned parts.
2. Check gauges and display 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 manual steam and water valves open, check lines and valves for leaks.
5. Clean lint and dirt from control system components.

### 4.3 PREVENTIVE MAINTENANCE

#### Daily

1. Clean chamber as follows:
  - a. Wash inside of chamber and loading equipment with a mild detergent solution such as AMSCO's Liqui-Jet\* or Sonic\* detergent.

**Note:** To keep your sterilizer and loading equipment looking like new, AMSCO recommends an occasional application of Pry Cream\* to the non-painted surfaces.

  - b. Rinse with tap water; dry with a lint-free cloth.
  - c. Remove chamber drain strainer (Figure 4-1). Clean out lint and sediment; reverse flush under running water.
  - d. Place strainer back in chamber drain.

**Note:** Flush drain whenever line becomes clogged or spillage occurs during a liquids processing cycle.

#### Weekly

1. Flush chamber drain as follows:
  - a. Turn off steam-supply valve. Wait until jacket pressure is zero.
  - b. Remove chamber drain strainer (Figure 4-1). Turn MANUAL control to FAST EXHAUST.
  - c. Rinse drain with hot solution of trisodium phosphate (two tablespoons to one quart of water).
  - or
  - Use a solution of 1/2 cup of AMSCO Sonic Detergent\* and one quart of hot water if trisodium phosphate is objectionable.
  - d. Wait five minutes.
  - e. Flush drain with one quart of hot water.
  - f. Place strainer back in chamber drain.
  - g. Turn MANUAL control to OFF.
2. Check control and status signals as follows:
  - a. Empty chamber and set cycle values for a one-minute gravity cycle.
  - b. Start cycle and observe gauges, display and printed tape for proper functioning. (On double-door units, also observe non-operating end control panel.)

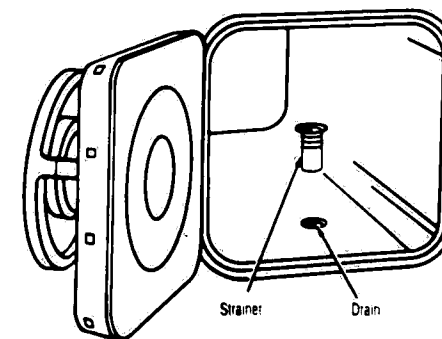


FIGURE 4-1 - Chamber Drain Strainer

\*Available from your AMSCO Representative

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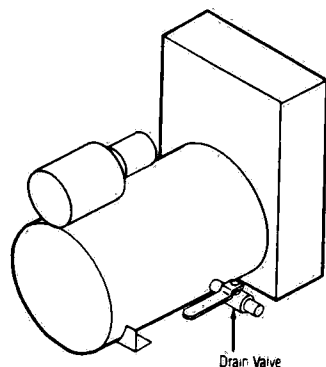


FIGURE 4-2 - Electric Steam Generator

- c. On units with electric steam generator, press and hold the TEST button on the anti-flood control box until light on box comes on (seven seconds). Verify BOILER FLOODED is shown on the display and printout. Then, press the RESET button on the anti-flood control box; turn control power OFF and ON to clear the alarm.
3. Flush Steam Generator. If sterilizer is equipped with optional steam generator.

Two methods can be used for flushing sediment and scale from the chamber and piping of the steam generator. Removal of this accumulated sediment ensures proper generator operation and increases the unit's service life.

The first and most efficient method of flushing a generator is pressure blow down; however, pressure blow down allows water heated to 212 degrees Fahrenheit to enter facility drain system. If local codes do not permit this, then it will be necessary to use the second and less effective method: cold flushing.

#### Pressure Blow Down:

**WARNING:** The following procedure flushes contaminants out of the steam generator in the most efficient way. However, during the procedure, water heated to 212 degrees Fahrenheit enters the facility drain system. It is extremely important to ensure the generator drain valve is connected to the drain system in a way that prevents personal injury during the blow down and that the facility drain is capable of handling water at this temperature.

It is recommended that pressure blow down be performed by maintenance personnel familiar with boiler operation and maintenance.

- a. At the end of the working day, while the generator is still operating, turn the sterilizer power switch OFF and close water supply valve to generator.
- b. Allow generator to cool, until pressure drops to 15 - 20 psig.
- c. Gradually open drain valve and allow generator to drain. Water exiting while the generator has been heated to 212 degrees Fahrenheit and steam vapors will be present, so ensure all necessary precautions have been taken to prevent injury, or damage to the floor drain system.
- d. When discharge is complete and generator is drained (note sight glass), (1) close drain valve, (2) open water supply valve, and (3) turn sterilizer power switch ON.
- e. When generator is refilled with water, turn off the sterilizer power switch -- unless further operation is desired.

#### Cold Flush

This procedure flushes cold water through the generator after it has cooled to down below 140 degrees Fahrenheit. Units with CHS designation on the generator data plate can be flushed efficiently using this method. Units with AS designation will not be flushed efficiently using this method, due to its piping configuration. Units with AS designation should be flushed using pressure blow down if possible.

- a. Position power switch to OFF.
- b. Open lower access door.
- c. Wait until generator pressure gauge indicates zero, then open the generator drain valve by turning valve handle counterclockwise 90 degrees (Figure 4-2).
- d. Position power switch to ON and flush generator for five minutes.
- e. Close drain valve. The generator refills with clean water.
- f. Position power switch to OFF.
- g. Close lower access door.

#### Monthly

Place a few drops of heavy machine oil (SAE 20 or 30 motor oil) on chamber door hinge pins, top and bottom (Figure 4-3). Work oil into hinge by opening and closing the door several times.

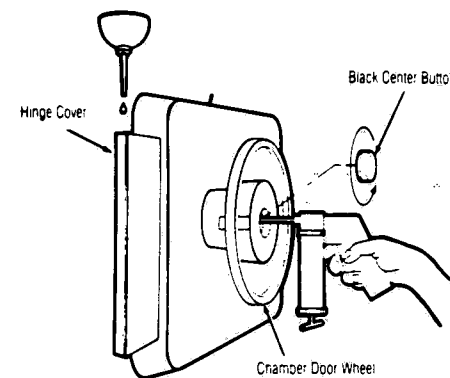


FIGURE 4-3 - Lubricating Chamber Door

#### Quarterly

1. Grease door post as follows:

- a. Unscrew the black button in the center of chamber door wheel to expose the door post grease fitting (Figure 4-3).
- b. Inject a high temperature grease (Neptune 7, AMSCO P-385220-091) into the fitting.
- c. Replace button.

2. Inspect door gasket. If it is brittle or has cracks, replace it (see "As Necessary," this section, for procedure).

3. Check safety valves (Figure 4-4 - Gravity units; Figure 4-5 - Vac units) as follows:

**Note:** Also check safety valve on electric steam generator, if applicable.

- a. Be sure sterilizer is cool.
- b. Visually inspect safety valves for accumulations of rust, scale and other foreign substances which would prevent free operation of the valve(s). The opening of any discharge piping must be clear and free from restrictions.

**WARNING: BURN HAZARD - Valve(s) is hot and steam will escape from safety valve(s). To prevent burns, wear gloves or use an extension device if it becomes necessary to operate try lever.**

- c. Follow operating instructions and allow chamber and, if applicable, steam generator to reach

operating pressure.

- d. With HI-LO valve set to HI and jacket at operating pressure, operate try lever or pull ring of safety valve. Release. Pressure will clear any dirt and reseal valve.

**Note:** Pressure should be at least 3/4 of rated safety valve pressure to allow for proper re-sealing.

**CAUTION: Avoid letting moisture get under insulation in chamber or generator (if applicable), as it will cause rusting of the outer jacket.**

- e. Check safety valves for steam leakage. If valve is leaking, operate the try lever several times to see if the leakage stops.
  - f. If leakage continues, discontinue operation of sterilizer until a qualified technician replaces the leaky safety valve.
4. Chemically clean steam generator (if supplied with sterilizer) as follows:

**Note:** Quarterly cleaning is minimum recommended frequency. If mineral deposits form rapidly - causing slow heatup - generator chamber should be cleaned more often to maintain it in peak condition. Water supply with 5 grains minimum hardness is recommended for electric steam generators to minimize scale buildup.

- a. Flush generator using one of the methods described above in step 3 of Daily Maintenance routine.
- b. Close drain valve and allow generator to fill to normal level. When normal level is reached, generator automatically shuts off water supply valve.
- c. Position power switch to OFF. Be sure steam-supply valve (on sterilizer upper valve panel) is closed. Disconnect steam outlet fitting at top of generator.
- d. Shut off water supply to the generator by closing the generator water-supply valve (behind lower access panel).
- e. Insert funnel at steam outlet fitting (just disconnected). Pour one pint of AMSCO Descaler\* very slowly into generator chamber through the funnel. (Follow directions supplied with AMSCO Descaler to obtain proper solution strength.) When pouring, be sure the fumes are removed by adequate ventilation, using an electric fan if necessary.
- f. Place pipe plug or other suitable closure in steam outlet connection. Keep the solution in the generator at least one hour.

\*Available from your AMSCO Representative

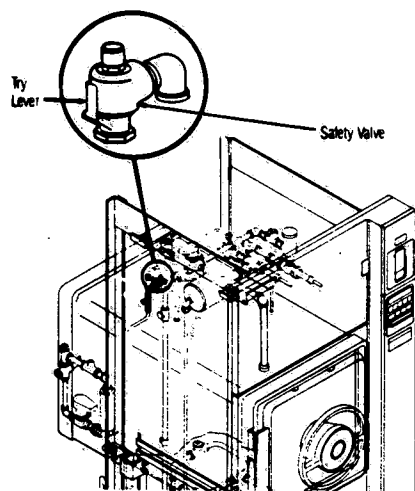


FIGURE 4-4 - Safety Valve - Gravity Unit

g. Turn on generator until 5 lbs pressure shows on pressure gauge. Shut off generator until steam pressure drops to zero. Open drain valve.

**CAUTION:** Opening drain valve at this point will allow water heated to nearly 212° F to enter drain system. If this is not acceptable, wait until generator has cooled before opening valve.

- h. Restore water supply to generator. Position power switch ON and allow generator to fill to normal level. Let stand for 5 minutes.
- i. Position power switch OFF and again open drain valve to drain generator.
- j. Flush generator using one of the methods described above in step 3 of Daily Maintenance routine.
- k. Shut off water-supply valve, drain generator, and shut off drain valve.

**CAUTION:** Opening drain valve at this point will allow water heated to nearly 212° F to enter drain system. If this is not acceptable, wait until generator has cooled before opening valve.

- l. Reconnect steam line fitting to steam outlet connection.
- m. Run through short cycle to check for proper operation.
5. Clean or replace sight glass on steam generator (if supplied with sterilizer) as follows:
  - a. With no pressure in generator, close top and bottom sight glass valves. AS Series: remove

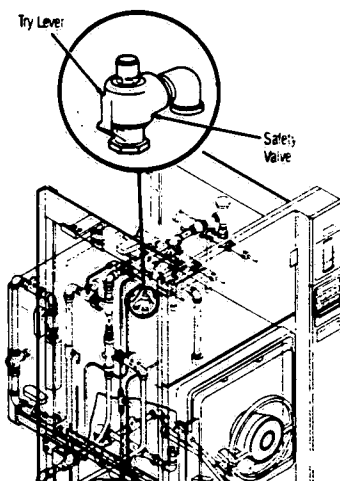


FIGURE 4-5 - Safety Valve - Vacumatic Unit

four vertical protective rods. CHS Series: remove two vertical protective rods.

- b. Loosen the two gland nuts holding the glass in place, and allow water to drain from sight glass into a cup. Slide gland nuts onto the glass - about an inch (25mm) from each end.
- c. Remove the glass by lifting it up and out of the lower fitting, and then pulling the bottom forward and downward to clear the upper fitting.

**CAUTION:** When replacing steam generator sight glass, do not overtorque gland nut or damage to glass will occur.

- d. Reverse the procedure to install new sight glass. Ensure that sight-glass valves are fully open when installation is completed.
6. Check for proper battery operation.
  - a. Turn power OFF and then ON again.
  - b. Verify that time and date settings were retained.

#### Semiannually

Remove cover from air filter (Figure 8-47) and inspect. Replace if necessary. Replacement may be required more often if sterilizer is in an area with a high dust level.

#### Yearly

1. Open and inspect the thermostatic steam traps. See Paragraph 7.19 for disassembly and cleaning instructions.
2. Physically descale steam generator (if supplied with sterilizer) as follows:

**Note:** Normally, descaling should be done once a year, however excessive scale formation due to poor water conditions may require more frequent descaling. Failure to descale adequately could result in slow heating or heater burnout.

**WARNING: SHOCK HAZARD - Always shut off all electric power to unit at wall disconnect switch before starting descaling procedure.**

- a. To assure pressure is at zero, open drain valve to drain unit.
- b. Remove generator control box access-cover.
- c. Disconnect heater leads, tagging them for reassembly.
- d. Disconnect heater head by removing the four or six bolts.
- e. Clean heating rods and inside of boiler chamber with a wire brush to remove heavy mineral deposits and scale.
- f. Replace heater head or flange assembly (Figure 8-58 or 8-60).
- g. Reconnect heater leads and turn on power to generator.
- h. With steam pressure in the generator, examine heater head gasket for leakage.
- i. If leakage is present, tighten bolts or, if necessary, replace gaskets.
- j. Replace generator control box access cover.
- k. Clean generator before placing in service (see Quarterly maintenance).
3. Descal steam generator (if supplied with sterilizer) water-level rods as follows:
  - a. Disconnect electric power supply to generator. Allow generator to cool to approximately room temperature.
  - b. Carefully identify all wires and electrode holders with small pieces of tape so that they can be returned to their original locations. Then remove the wires from electrode holders.
  - c. Remove electrode holders, complete with rods. Thoroughly clean rods of all lime and other deposits with a small wire brush.
  - d. Replace the rods and electrode holders in their original locations and tighten connections.
  - e. Reconnect wires to their respective electrode holders.

#### As Necessary

##### • Change Paper Roll

**Note:** Do not operate printer without paper.

1. Open printer door.
2. Grasp remaining paper and pull it upward and out of printer.
3. Remove take-up spindle from its drive mechanism by pulling it to the left.
4. Remove paper roll from take-up spindle and set empty take-up spindle aside (Figure 4-6).
5. Lower the platen and remove the lower paper spindle by pulling it straight forward.
6. Place new paper roll onto the lower spindle with the paper feeding downward from the back of the paper roll.

**Note:** Check that the paper roll is positioned correctly. Thermal printer will not print if the paper roll is inserted backwards. Do not use T.I. (Texas Instruments) paper.

7. Place lower spindle (with new paper roll) back into position by pressing from the front until it snaps into place (Figure 4-7).
8. Pull four or five inches of paper out from roll and tear the corners off the end.
9. Slide tab of paper roll into printer from the back (with platen still in down position) until it exits from front of printer.
10. Grasp tab of paper, pull up 10 to 12 inches of paper, and feed this paper through opening in platen.
11. Raise platen back up into position and snap in place under catch.
12. Insert tab of new paper roll into slot of take-up spindle and rotate spindle to secure paper in slot (Figure 4-8).
13. Press take-up spindle back onto the drive mechanism and allow motor to rotate spindle to verify paper is secured to take-up roll (Figure 4-9).
14. Close printer door.

##### • Install Chamber Door Gasket (Figure 4-10)

1. Remove old gasket and clean groove.
2. Clean replacement gasket with a damp cloth and mark gasket at four equidistant points to represent corners.

**Note:** The replacement gasket is sized to provide a tight fit.

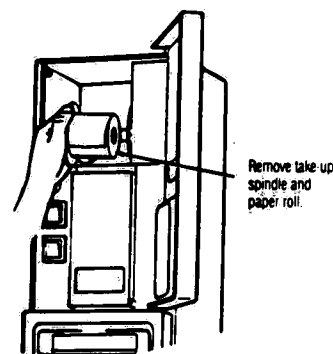


FIGURE 4-6 – Take-Up Spindle Removal

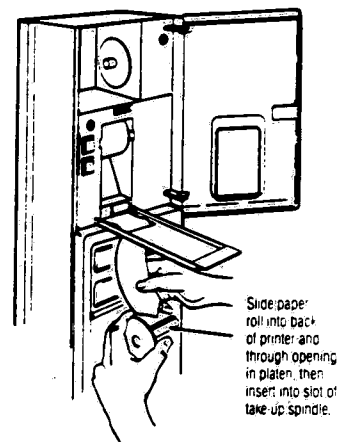


FIGURE 4-8 – Take-up Spindle Loading

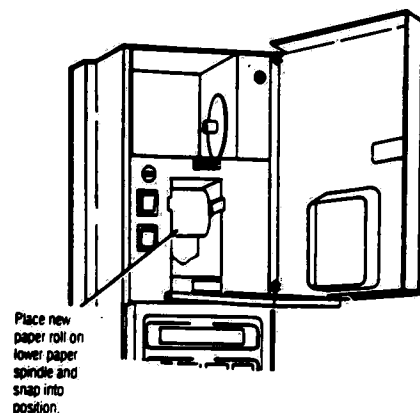


FIGURE 4-7 – New Paper Roll In Place

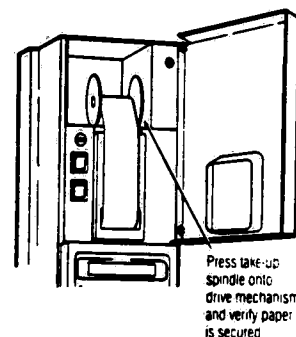


FIGURE 4-9 – Take-up Spindle In Place

3. Press gasket into the groove at the four corners a short section at a time without stretching it while doing so.

Should gasket appear too long... **DO NOT CUT IT**... start over again, compressing short sections into groove, until entire length is inserted.

**CAUTION:** Never use sharp tools to push gasket into groove.

4. To prevent gasket from sticking, spray the sealing surface of the door frame with Fluorocarbon Spray (P-752870-091, available from your local AMSCO representative).

#### 4.4 CLEANING

##### Daily

1. Remove chamber drain strainer (Figure 4-1). Clean out all lint and sediment, then reverse flush strainer under running water.

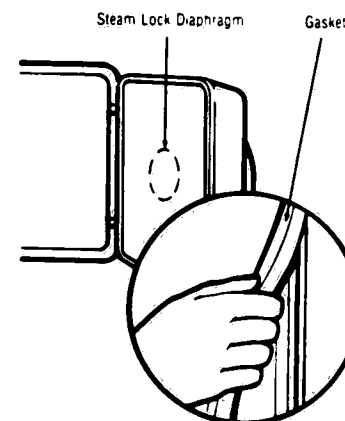


FIGURE 4-10 – Chamber Door Gasket

**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 Liqui-Jet® or Sonic Detergent\* (one part detergent to three parts water).
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, AMSCO Part 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 (Figure 8-44) and water (Figures 8-24, Grav., and 8-37, Vac) supply line strainers and clean out sediment.

##### As Necessary

**CAUTION:** When using AMSCO Stainless Steel Cleaner and Polish 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.

1. Use AMSCO Stainless Steel Cleaner and Polish on all stainless steel exterior surfaces of both the sterilizer 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.
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.
3. Flush chamber drain, as outlined under Weekly maintenance, if drain line becomes clogged or if spillage occurs during a liquids processing cycle.

\*Available from your AMSCO Representative



#### 4.5 PREVENTIVE MAINTENANCE GUIDE

EQUIPMENT: Eagle® 3000 Gravity and Prevacuum Sterilizers

This form is to be used as a preventive maintenance record and, along with Section 4 instructions, as a guide to performing preventive maintenance.

(Circle "X" in column when service is performed.)

SERVICE PERFORMED:	1	2	3	4	5	6
<b>1.0 PREPARATION FOR PREVENTIVE MAINTENANCE</b>						
1.1 Discuss equipment operation with department personnel.	X	X	X	X	X	X
1.2 Inspect printouts for signs of trouble.	X	X	X	X	X	X
1.3 Install test equipment.	X	X	X	X	X	X
1.4 When necessary, shut off building services and drain all lines.	X	X	X	X	X	X
<b>2.0 DOOR ASSEMBLY (EACH DOOR ON A DOUBLE-DOOR UNIT)</b>						
2.1 Inspect door for ease of operation.	X	X	X	X	X	X
2.2 Inspect condition of door gasket for wear and tear, replace as necessary	X	X	X	X	X	X
2.3 Inspect door alignment with end ring.	X	X	X	X	X	X
2.4 Lubricate hinge and hinge pins.	X	X	X	X	X	X
2.5 Inspect for loose screws and tighten.	X	X	X	X	X	X
2.6 Lubricate bearings and door post.	X		X		X	
2.7 Remove handwheel and door cover.	X		X		X	
2.7.1 Inspect and clean internal parts, replace if necessary.	X		X		X	
2.7.2 Inspect door lock mechanism for wear.	X		X		X	
2.7.3 Lubricate and rebuild door lock mechanism.	X		X		X	
2.7.4 Reinstall cover and handwheel.	X		X		X	
<b>3.0 EACH HAND VALVE</b>						
3.1 Inspect valve for smooth operation and proper valve seating.	X	X	X	X	X	X
3.2 Inspect packing of valve for leaks.	X	X	X	X	X	X
3.3 Rebuild valve.	X					
3.4 Run MANUAL cycle to test operation of multiport valve.	X	X	X	X	X	X
<b>4.0 EACH WATER, JACKET AND STEAM STRAINER</b>						
4.1 Inspect strainers for debris, clean as necessary.	X	X	X	X	X	X
<b>5.0 EACH STEAM TRAP</b>						
5.1 Inspect steam trap for proper operation.	X	X	X	X	X	X
5.2 Rebuild steam trap.		X				

#### 4.5 PREVENTIVE MAINTENANCE GUIDE (continued)

EQUIPMENT: Eagle® 3000 Gravity and Prevacuum Sterilizers

This form is to be used as a preventive maintenance record and, along with Section 4 instructions, as a guide to performing preventive maintenance.

(Circle "X" in column when service is performed.)

SERVICE PERFORMED:	1	2	3	4	5	6
<b>6.0 EACH GAUGE</b>						
6.1 Inspect each gauge for accuracy.	X	X	X	X	X	X
6.2 Replace gauge if required.	X	X	X	X	X	X
<b>7.0 EACH VALVE</b>						
7.1 Make internal inspection of each check valve.	X			X		
7.2 Replace or rebuild check valve if necessary.	X			X		
7.3 Inspect each solenoid valve for proper operation.	X	X	X	X	X	X
7.4 Rebuild solenoid valve.			X			
7.5 Inspect steam-control valve for proper operation.	X	X	X	X	X	X
7.6 Rebuild steam-control valve.					X	
7.7 Flush out each flow-control valve.	X	X	X	X	X	X
7.8 Reset flow-control valve to original marked setting.	X	X	X	X	X	X
<b>8.0 EACH VACUUM BREAKER</b>						
8.1 Inspect each vacuum breaker for proper operation.	X	X	X	X	X	X
8.2 Rebuild vacuum breaker.					X	
<b>9.0 AIR FILTER (CARTRIDGE TYPE)</b>						
9.1 Replace cartridge as required.	X	X	X	X	X	X
<b>10.0 CHAMBER DRAIN</b>						
10.1 Inspect strainer for debris.	X	X	X	X	X	X
<b>11.0 ELECTRIC STEAM GENERATOR (IF APPLICABLE)</b>						
11.1 Disconnect power to generator.	X	X	X	X	X	X
11.2 Inspect all wiring and connections for damage and fraying.	X	X	X	X	X	X
11.3 Clean water gauge glass, fitting and piping - replace washers and glass		X		X		X
11.4 Clean heating element and boiler chamber.		X				
11.5 Clean water-level control rods.		X				
11.6 Descale steam chamber.			X			X
11.7 Check anti-flood control for proper operation.	X	X	X	X	X	X
11.8 Check operation of pressure gauge.	X	X	X	X	X	X
11.9 Verify proper setting of pressure switches (control, safety and PS-1).	X	X	X	X	X	X

#### 4.5 PREVENTIVE MAINTENANCE GUIDE (continued)

EQUIPMENT: Eagle®3000 Gravity and Prevacuum Sterilizers

This form is to be used as a preventive maintenance record and, along with Section 4 instructions, as a guide to performing preventive maintenance.

(Circle "X" in column when service is performed.)

SERVICE PERFORMED:	1	2	3	4	5	6
<b>12.0 STAGE 2 CONTROL</b>						
12.1 Verify proper Dip switch settings on Control and Printer PC boards.	X	X	X	X	X	X
12.2 Inspect for proper operation of printer.	X	X	X	X	X	X
12.3 Inspect for proper operation of touch panel(s). Check all touch pads.	X	X	X	X	X	X
12.4 Verify that proper date and time are displayed; if not, reset.	X	X	X	X	X	X
12.5 Verify that paper takeup is working properly.	X	X	X	X	X	X
12.6 Check printout for darkness, missing dots, etc.	X		X		X	
12.7 Verify temperature and pressure readouts with potentiometer and pressure gauge. Adjust as required.	X			X		
12.8 Check for proper battery operation.	X	X	X	X	X	X
12.9 Check all service-settable values in Service Test mode for factory-recommended settings (purge time, overdrive, etc.).	X	X	X	X	X	X
12.10 Check that buzzer on Control PC board is functioning properly.	X	X	X	X	X	X
<b>13.0 FINAL TEST</b>						
13.1 Clean lint and dirt from components.	X	X	X	X	X	X
13.2 Inspect all wiring, terminals and socket connections for damage or fraying.	X	X	X	X	X	X
13.3 Inspect door switch for proper operation.	X	X	X	X	X	X
13.4 Run machine through each cycle to verify proper operation. Check all display messages and printouts.	X	X	X	X	X	X
13.5 Remove test printout (tape) and attach it to PMA.	X	X	X	X	X	X
13.6 Remove all test equipment installed for inspection.	X	X	X	X	X	X
13.7 Install any panel or cover removed during inspection.	X	X	X	X	X	X
13.8 Inspect area to ensure removal of all materials used during the inspection.	X	X	X	X	X	X

## Section 5 Field Test Procedure

5

### 5.1 GENERAL

Every sterilizer must be tested and inspected according to this procedure. Keep a record of the test. Each test must meet the standards of material, workmanship and performance set forth in this procedure. Refer to Section 7 should mechanical problems arise or adjustments be required.

Upon completion of test, printout is to be attached to the service order form.

### 5.2 TEST INSTRUMENTATION REQUIRED

1. Stopwatch
2. Calibrated compound pressure gauge (30" vacuum and 60 psig,  $\pm 0.5\%$  full scale accuracy)
3. Calibrated digital thermometer ( $1^\circ\text{F}$  resolution) with type 'T' thermocouple
4. Torque wrench, 0-50 ft-lbs
5. Digital voltmeter
6. Ammeter, 0-100 amps AC, clamp-on type
7. Calibrated absolute pressure gauge with ball valve for shutoff (Vacumatic units only)

### 5.3 CHECK FOR PROPER INSTALLATION

1. Check that sterilizer is level side-to-side by placing a level on the bottom of the end ring in door opening. Then check that it is level front-to-back by placing a level on angle brace supporting right side of shell. Adjust leveling feet accordingly to achieve level conditions. See Figure 5-1.

2. Open door to a  $45^\circ$  angle. When sterilizer is level, door should stay in this position. If door swings open or closed, recheck for sterilizer being level.

**Note:** Water poured into chamber should always flow to drain.

3. Check for proper hookup to required services, i.e., steam, water and electric (see Table 5-1).

AMSCO recommends that steam-supply line be installed with a drip leg and a steam trap to remove condensate (see tech data sheet for required trap capacity).

**Note:** Steam and water supply lines should be one size larger than the nominal pipe sizes on the sterilizer.

4. Verify that drain funnel is connected to building waste-line outlet (stubbing). See Figure 5-2.

TABLE 5-1 - STERILIZER CONNECTIONS

Plumbing Connections				
Connection	Nominal at Connection Point Pipe Size	Pressure (Dynamic) Range		
Steam Supply	3/8 NPT	50-80 psig		
Cold Water	3/8 NPT (Grav) 3/4 NPT (Vac)	20-50 psig (Grav) 30-50 psig (Vac)		
Waste	1-1/2 ODT	Flow capacity		
Hot or Cold Water*	3/8 NPT	20-50 psig		
Electrical Connections				
Connection	Volts	Phase	Frequency	Amps
Control	115	1	60 Hz	1.0
Electric Boiler* Control	115	1	60 Hz	4.5
Electric Boiler* Heaters	208/240 440/480	3	60 Hz	62/72 31/36

\*Electric steam generator units only.

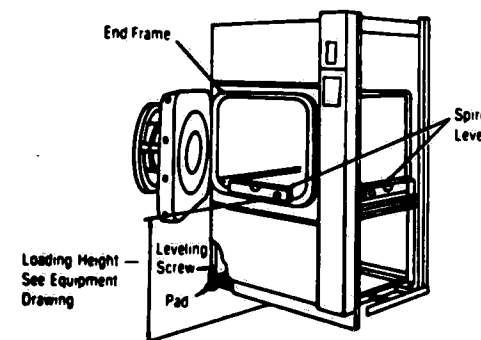


FIGURE 5-1 - Leveling the Sterilizer

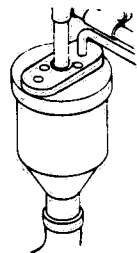


FIGURE 5-2 - Drain Connection

#### 5.4 INSTALL TEST EQUIPMENT

1. Install digital thermometer by bending thermocouple wire into a hook and attaching it to the temperature probe (1/2" to 1-1/2" from tip). It is not necessary to remove the probe. Run the lead through the door (between door gasket and end ring).
  2. Gravity units - connect the calibrated compound pressure gauge to the 1/2" NPT opening at left rear of sterilizer chamber (see Figure 5-3).
- Vac units - connect an absolute pressure gauge as described in Section 5.8.

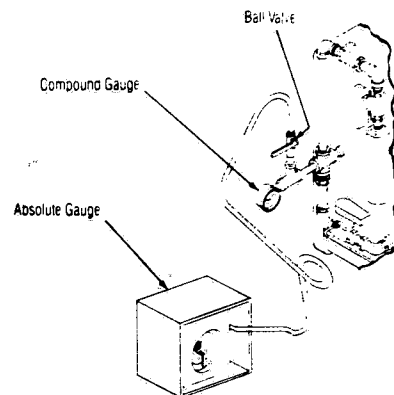


FIGURE 5-3 - Installing Test Gauges

- Note:** If door switch adjustment procedure is being made on a cold sterilizer, the adjustment must be rechecked after the sterilizer is hot to verify proper actuation of the door switch.
5. If testing a double door unit, repeat the above procedure for the non-operating end door. The only difference will be that the status display will indicate N.O.E. DOOR UNLOCKED.

#### 5.5 DOOR SWITCH ADJUSTMENT

1. Open printer door. Position power switch to ON. Open sterilizer door. . . display should show DOOR UNLOCKED.
2. Close door and turn handwheel four full turns. Door should be locked and display should show READY. Turn handwheel approximately two additional turns.
3. Remove center disc. Using a torque wrench on the steam-lock clutch rod, confirm that the torque is 20 ft-lbs on 16" units and 30 ft-lbs on 20" units. See Figure 5-4.
4. If DOOR UNLOCKED indication does not go out, adjust the door switch as follows:
  - a. Turn microswitch adjusting screw (Figure 5-5) clockwise until switch actuates and DOOR UNLOCKED message on display panel goes out. Continue to turn microswitch adjusting screw clockwise 1/4 turn.
  - b. Open door. Display should indicate DOOR UNLOCKED.
  - c. Close and lock the door using the same amount of torque as in Step 2 above. Door must lock and status display should indicate READY.

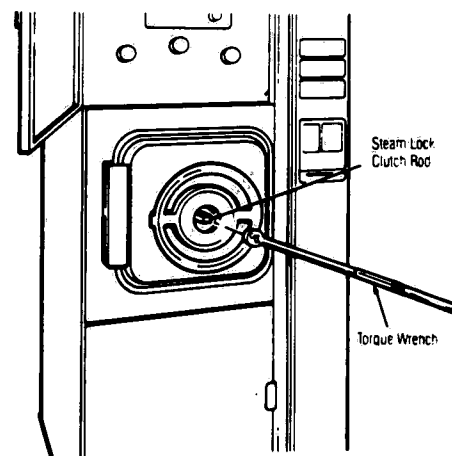


FIGURE 5-4 - Locking Door to Correct Torque

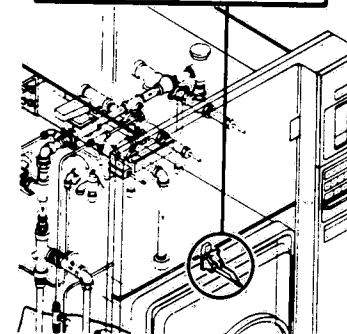
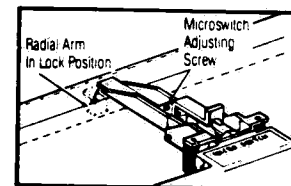


FIGURE 5-5 - Door Switch Adjustment

#### 5.6 ADJUSTMENT - COOLING WATER VALVES

The table below shows the factory settings of the unit's cooling water valves. See Figures 5-6 and 5-7 for valve locations.

**Note:** These settings are approximate only. Drain line temperature must be less than 140°F.

Adjustable Valves		Valve Setting
A	Jacket Trap Cooling FC-2	One turn open
B	Chamber Trap Cooling FC-12 (Gravity only)	One turn open
C	Exhaust Cooling FC-6	Approximately 45° from centerline of pipe
D	Constant Bleed FC-1	One-eighth turn open
E	Chamber Trap Cooling FC-3 (Vac only)	Two turns open

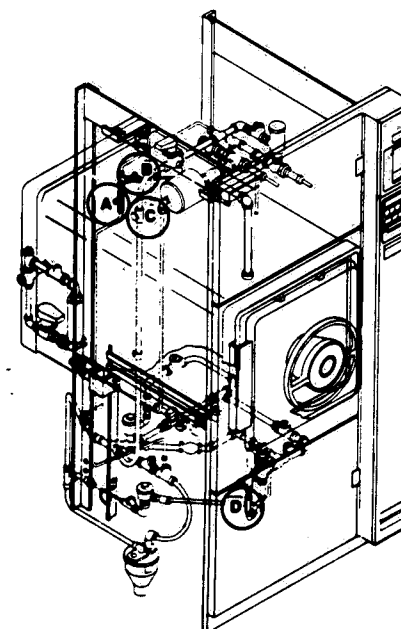


FIGURE 5-6 - Cooling Water Valves - Gravity Unit

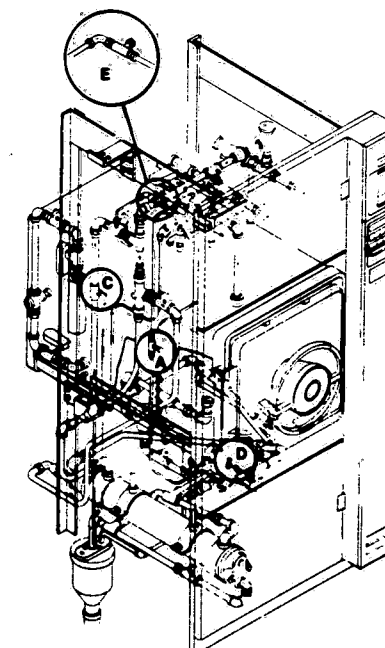


FIGURE 5-7 - Cooling Water Valves - Vac Unit

## 5.7 VALVE TESTS

**WARNING: BURN HAZARD** - Be careful of steam escaping from valves on sterilizer and steam generator. To prevent burns, wear gloves or use an extension device when operating try levers or inspecting for leaks.

### Jacket Safety Valve

1. Position manual valve to OFF.
2. Loosen set screw on stop rings of HI-LO valve so that rings revolve freely on adjusting screw.
3. Open both the main steam supply and the panel steam supply valves. Jacket should pressurize to 33 psig ( $\pm 1$  psig) in 5 minutes (direct-steam units) or 20 minutes (electric-steam units).

4. Adjust jacket pressure to rise until safety valve pops. Safety valve must open at 40 psig ( $\pm 2$  psig).

Adjust HI-LO valve as necessary (Turn adjusting screw clockwise to raise pressure; counterclockwise to lower.)

5. Repeat test. If valve does not pop within specified pressure, replace it.

### HI-LO Valve (Figure 5-8)

1. Set HI-LO valve to LO setting. Jacket pressure should drop to 20 psig ( $\pm 1$  psig). Adjust front locknut, if necessary, to regulate pressure.
2. Set HI-LO valve to HI setting. Jacket pressure should rise to 33 psig ( $\pm 1$  psig). Adjust rear locknut, if necessary, to regulate pressure.
3. Tighten set screw on locknuts.

### Slow Exhaust Needle Valve

1. Close slow exhaust needle valve completely (turn clockwise).
2. Open valve as indicated in Table 5-2.

**Note:** Opening the valve speeds up slow exhaust time; closing the valve lengthens slow exhaust time.

TABLE 5-2 - SLOW EXHAUST VALVE SETTINGS*	
Size	Number of Turns Open
16x16x26	1.5
20x20x38	2.5

\*Approximate only - make final adjustment while timing Liquids cycle exhaust rate. See Table 5-7.

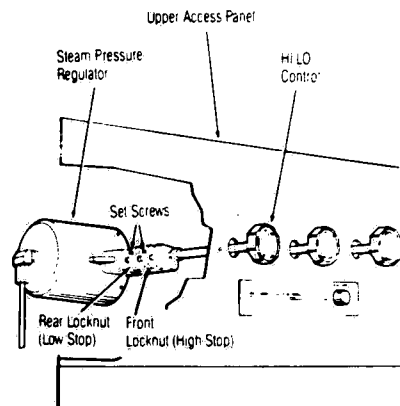


FIGURE 5-8 - Pressure Regulator Adjustment

### Solenoid Valves and Wiring

1. Position manual valve to OFF.
2. Open both the main water-supply and the valve panel water-supply valves. Do not open steam supply valve.
3. Position power supply to ON.
4. Enter Service Test mode on the control by setting Dip switch #4 on the Printer PC board to ON and pressing RESET. Press the SAVE VALUES touch pad twice. The display shows CHECK VALVES BY PRESSING PB'S.
5. Close and lock chamber door(s). (Solenoid S2 cannot be electrically energized with door open.)
6. Energize each solenoid valve by pressing the appropriate touch pads (Figure 5-9), one at a time. Lightly touch the top of the solenoid valve core with a small steel screw driver or a steel scribe. See Figure 5-10 and 5-11 for valve locations.

The screw driver must be attracted toward the core and vibrations must be felt.

7. If any of the solenoid coils do not receive the signal, check wire connections and the wiring harness.

The following coils should be checked:

- S1 - Vacuum Break Valve (Vacumatic only)
- S2 - Steam-to-Chamber Valve
- S3 - Chamber Drain Valve
- S4 - Cooling Water Valve
- S5 - Steam-to-Ejector Valve (Gravity only)
- S7 - Water-to-Ejector Valve (Vacumatic only)

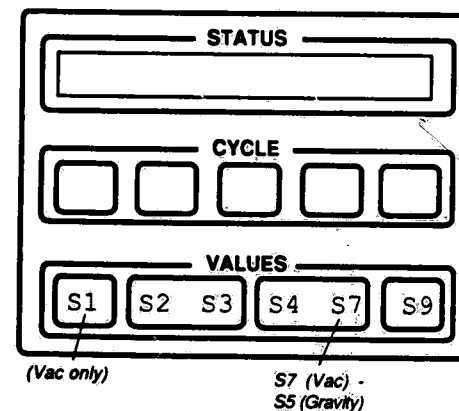


FIGURE 5-9 - Valve Control Touch Pads

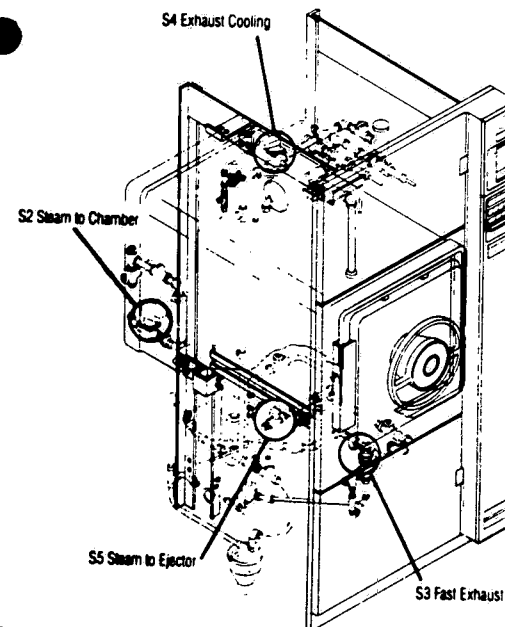


FIGURE 5-10 - Solenoid Valves (Gravity Unit)

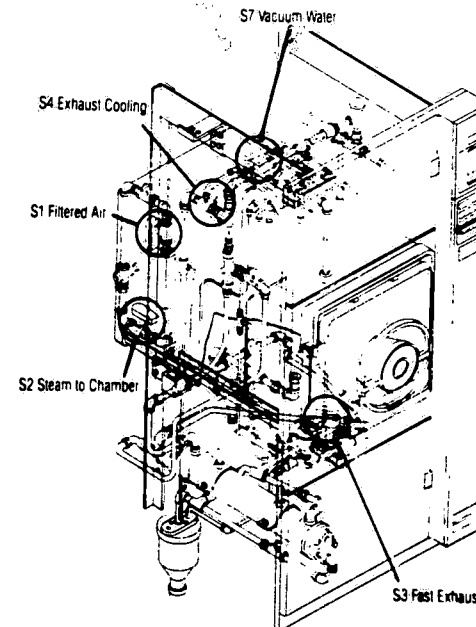


FIGURE 5-11 - Solenoid Valves (Vacumatic Unit)

**5.8 VACUUM LEAK TEST (Vacumatic Units Only)**  
**Note:** To protect the absolute pressure gauge, keep gauge shutoff valve closed any time there is pressure in the chamber (0 psig and up).

1. Disconnect the compound pressure gauge and connect an absolute pressure gauge to the 1/2" NPT opening at left rear of sterilizer chamber.
2. Close and lock door(s), making sure door switch is actuated. (Solenoid S2 cannot be electrically energized with door open.)
3. Close absolute pressure gauge shutoff valve.
4. Position power switch to ON.
5. Enter Service Test mode on the control by setting Dip Switch #4 on the Printer PC board to ON and pressing RESET. Press the SAVE VALUES touch pad twice. The display shows CHECK VALVES BY PRESSING PB'S.

6. Energize S2 (press appropriate touch pad) and charge chamber with steam to 30 psig. Wait two minutes. Turn off S2 (press touch pad again).

7. Energize S3, S7 and S1. A vacuum is drawn in the chamber. Open pressure gauge shutoff valve. A reading of 60 mmHg or better must be reached.

8. If 60 mmHg is not reached, turn off S3, S7 and S1, close pressure gauge shutoff valve and again energize S2 to charge the chamber to 30 psig.

9. Repeat steps 7 and 8 a maximum of four times if necessary. If a level of 60 mmHg absolute is not reached, a leak is present.

10. Examine system for leaks. Correct leaks.

11. Repeat steps 6 and 7 again. When 60 mmHg absolute pressure is reached, first turn off S3, then S7.

12. Using a stopwatch, begin timing leak rate, watching absolute pressure gauge. The leakage must not exceed 1 mmHg per minute for a total of 5 mmHg in a five-minute period. Close pressure gauge shutoff valve.

13. If leak rate exceeds these limits, conduct Leak Test using a leak detector to check leaks.

**Note:** Check S2, S1 and swing check valve, 3/8 NPT, on heat exchanger for leaks. These are not checked during leak test. During a chamber leak test, the chamber drain line check valve closes isolating downstream piping from test. Failures in this section of piping are usually due to cracked fittings or leaking joints. Visually inspect for these problems.

14. Turn all valves off to exhaust chamber.

15. Replace absolute pressure gauge with compound pressure gauge.

## 5.9 PRESSURE DOOR LOCK TEST

**Note:** Sterilizer must be at operating temperature.

1. Close and lock door(s), making sure door switch is actuated. (Solenoid S2 cannot be electrically energized with door open.)

2. Position power switch to ON.

3. Enter Service Test mode on the control by setting Dip Switch #4 on the Printer PC board to ON and pressing RESET. Press the SAVE VALUES touch pad twice. The display shows CHECK VALVES BY PRESSING PB'S.

4. Energize S2 (press appropriate touch pad) and charge chamber with steam to 6 psig. Turn off S2 (press touch pad again).

**WARNING: BURN HAZARD - Be careful of steam escaping from around door if lock is not activated. Wear gloves and face protection when testing door with pressure in chamber.**

5. Attempt to open door(s). Pressure door lock(s) must actuate before 6 psig.

6. Energize S3 to exhaust chamber and allow pressure to drop below 6 psig.

7. Attempt to open door(s). Lock(s) must deactuate when pressure is less than locking pressure.

8. Exhaust chamber completely and exit Service Test mode.

## 5.10 ELECTRIC STEAM GENERATOR (optional)

### Setup

1. Close generator drain valve. Open generator water-supply valve.

2. Open steam-supply valve on upper valve panel.

3. Position power switch to ON.

4. Set MANUAL valve to JACKET CHARGE position.

5. Record generator voltage and current. Check per Table 5-3.

6. Open generator drain line and bleed off excessive steam pressure.

7. Readjust "control" pressure switch to cut out at 70-75 psig. (Cut in pressure must have a differential of 5 to 10 psig for a maximum working pressure of 75 psig.)

8. With working pressure in generator, check for leaks.

**TABLE 5-3 - STEAM GENERATOR WATTAGE**

Nominal Voltage (VAC/PH)	Nominal Current (AMP/PH)	Nominal Wattage
208/240	62/72	22,300/30,000
440/480	31/36	22,300/30,000

### Low Water Cutoff

1. Turn on power to generator and allow unit to build to operating pressure.

2. Close generator water-supply valve and slowly open generator drain valve 1/2 turn.

3. Allow water to drain out.

4. Using ammeter, verify that power to heaters is deenergized (no current flow) when unit is drained.

5. Close generator drain valve and open generator water-supply valve.

6. Verify that power is returned to heaters as water fills reservoir.

## Pressure Switch Setting - Manual Cycle

**Note:** Pressure switch PS-1 allows steam generator to run if control failure occurs.

1. Set control power switch to OFF.

2. Close sterilizer water-supply valve (upper valve panel).

3. Turn manual valve to JACKET CHARGE position to bleed pressure from the pressure switch. Pressure switch is located on top of unit in cold-water line. Pump will come on.

4. Turn manual valve to OFF.

5. Open sterilizer water supply valve and slowly increase water pressure to 8 psig ( $\pm 2$  psig).

Steam generator pump motor should actuate at 8 psig ( $\pm 2$  psig).

7. Adjust as necessary.

## 5.11 CONTROL SETUP

1. Position power switch to OFF.

2. Remove front column cover and lower control panel to service position (see Section 7.1).

3. Check Control PC Board Dip switches for proper settings. Table 5-4 shows functions and factory settings for Control PC Board switches. For additional information, refer to Section 7.8.

4. Raise column up into place.

5. Check Printer PC Board Dip switches for proper settings. Table 5-5 shows functions and factory settings for Printer PC Board switches. For additional information, refer to Section 7.8.

6. Open printer door.

**TABLE 5-4 - DIP SWITCH SETTINGS: CONTROL PC BOARD**

Switch	Function	Position		Factory Setting
DP1	Temperature Units	ON="F"	OFF="C"	ON
DP2	Automatic Duplicate Print	ON=No Duplicate	OFF=Duplicate	ON
DP3	Usage	ON=Laboratory	OFF=Hospital	OFF*
DP4	Self-Test Bit 0			OFF
DP5	Time Units	ON=AM/PM	OFF=Military	ON
DP6	Pressure Units	ON=psig	OFF=Bars	ON

\*ON if Laboratory Sterilizer.

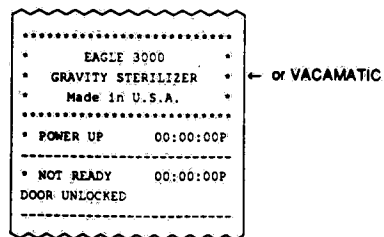
**TABLE 5-5 - DIP SWITCH SETTINGS: PRINTER PC BOARD**

Switch	Function	Position		Factory Setting
DP1	Display Self Test	ON=Test	OFF=Normal	OFF
DP2	Undertemp Recovery	ON=Restart	OFF=Resume	ON
DP3	Access Code	ON=Disabled	OFF=Enabled	ON
DP4	Self-Test Bit 1			OFF
DP5	Electric Steam Unit	ON=Electric	OFF=Direct	OFF*
DP6	Complete Buzzer	ON=Standard	OFF=Silenced	ON
DP7	Language Select	ON=Enabled	OFF=Disabled	OFF
DP8	Auto Shutdown	ON=Shutdown	OFF=No Shutdown	OFF

\*ON if electric-steam generator unit.

7. With chamber door open, position power switch to ON.

Verify that the following power-up message is printed:



Verify that the display shows the following:

#### Power-up Message

\* AMSCO \*  
\* EAGLE 3000 \*

#### then Door-unlocked Message

DOOR T=185F  
UNLOCKED P=0psig

#### alternating with Cycle-selection Touch Pad Settings...

1=FLASH 3=GRAVITY  
2=FLASH 4=GRAVITY

on Gravity units, or...

1=EXPRESS 3=FLASH  
2=PREVAC 4=FLASH

on Vacamatic units, after bypassing Leak Test and Dart cycles.

8. Close chamber door.

9. If necessary, adjust date and time.

- Press CHANGE VALUES touch pad. The display shows the cycle and cycle values set for Cycle #1.
- Press the CHANGE VALUES touch pad (four more times) until Date/Time display is shown, with the cursor (blinking) on the first digit of the date.
- Set correct time and date using the CURSOR and VALUE touch pads as follows:
  - Use the UP and DOWN ARROWS of the VALUE touch pad to increase or decrease this digit to the first digit of the current month.

- Use the RIGHT ARROW on the CURSOR touch pad to move to the next digit (second digit of the current month) and adjust to correct number.

- Using the CURSOR and VALUE touch pads, change the remaining digits of the Date/Time display to the correct settings.

- Move cursor to the AM/PM position and use the UP or DOWN ARROW to adjust setting.

- d. Press the SAVE VALUES touch pad.

- e. Current settings are printed... verify that they are correct.

10. Replace front control panel.

### 5.12 SENSOR CALIBRATION

Perform a Pressure and Temperature Calibration (refer to Sections 7.6 and 7.7, respectively, for procedures).

### 5.13 OPERATIONAL TEST

Run the following cycles and verify that cycle parameters are being met. Use a stopwatch to verify phase times.

**Note:** Time-of-day on display and printout examples is shown as 00:00:00, and date as 00/00/00, because they are completely dependent on when cycle is being run. Temperature and pressure displays/printouts are typical only and actual values may vary within the parameters of each cycle phase. Refer to Tables 5-6 through 5-10 in Section 5.19 for allowable limits.

#### FLASH Cycle

**Note:** On double-door units, the rear-door display should show the same data as shown on the front-end display.

#### • POWER UP

- Close, but do not lock, door.
- Position power switch to ON.
- Verify that power-up message is printed, and that display shows DOOR UNLOCKED message, alternating with Cycle Select Menu.
- Set HI-LO valve to HI.
- Program Cycle Select touch pad #1 for a FLASH cycle, setting values as follows:

STER TIME = 03 m  
DRY TIME = 01 m  
TEMP = 270°F

6. Press Cycle Select touch pad #1 once.

7. Press PRINT VALUES rocker switch.

Cycle values set for FLASH cycle should be printed as follows:

1. FLASH  
STER TEMP = 270°F  
STER TIME = 3 min  
DRY TIME = 1 min

8. Press Cycle Select touch pad #1 twice. Verify that cycle does not start with door unlocked.

9. Lock door. If a double-door unit, unlock opposite door.

10. Press Cycle Select touch pad #1 twice. Verify that cycle does not start with opposite door unlocked.

11. Lock opposite door.

12. Verify that display alternates between READY message and the Cycle Select Menu.

13. Press Cycle Select touch pad #1 twice.

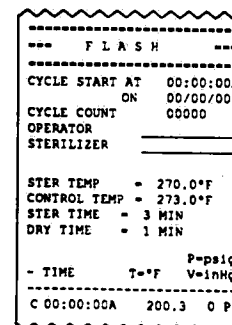
#### • PURGE

1. Verify display shows:

PURGE T=200F  
1:00 P=0psig

2. S2, S3 and S4 (and on Vacamatic units only, S7) should be on.

3. Verify printout.



"V-inHg" appears on Vac unit printouts only  
"P" (or "V") appears on Vac unit printouts only

4. Use stopwatch and verify one-minute purge time.

#### • CHARGE

1. S3 and S4 (and on Vacamatic units only, S7) should go off; S2 should stay on.

2. Verify display shows:

CHARGE T=240F  
P=6psig

3. Verify printout:

C 00:00:00A 240.5 6 F

4. Verify that chamber is charging with steam and charges until STERILIZE temperature setpoint is reached.

#### • STERILIZE

1. S2 should operate intermittently to control temperature at overdrive setpoint. Adjust jacket pressure if S2 does not turn off.

2. Verify display shows:

STERILIZE T=271F  
3:00 P=28psig

3. Verify printout:

S 00:00:00A 270.1 28 F

4. Wait for sterilizer timer to time out.

#### • FAST EXHAUST

1. S2 should go off; S3 and S4 (Gravity units) or S1, S3, S4 and S7 (Vacamatic units) should go on.

2. Verify display shows:

FAST T=273F  
EXHAUST P=30psig

3. Verify printout:

E 00:00:00A 273.2 30 P

4. Wait until display shows 3 psig.

#### • DRY

1. S4 should go off. S3 and S5 (Gravity units) or S1, S3 and S7 (Vacamatic units) should be on.

2. Verify display shows:

DRY T=220F  
1:00 P=0psig

3. Verify printout:

E 00:00:00A 220.7 2 P

4. Wait for dry timer to time out.

# • VENT (Gravity units only)

1. Verify display shows:

VENT	T=200F P=0psig
------	-------------------

2. Verify printout:

```
E 00:00:00A 200.1 2 P
```

3. S3 should be on, all other valves should be off (except auto-utilities shutdown valves, if option is installed).

4. Wait until chamber pressure is 0 psig.

# • AIR BREAK (Vacumatic units only)

1. Verify display shows:

AIR BREAK	T=200F V=2inHg
--------------	-------------------

2. Verify printout:

```
E 00:00:00A 200.1 2 V
```

3. S3 should be on, all other valves should be off.

4. Wait until vacuum is less than 2 in.Hg.

# • COMPLETE

1. Verify display shows:

COMPLETE	T=200F 00:00:00 P=0psig
----------	----------------------------

2. S3 should be on.

3. Verify printout:

```
Z 00:00:00A 200.4 0 P
LOAD 0000000
TEMP MAX=274.3°F
TEMP MIN=270.1°F

CONDITION = mm:ss
STERILIZE = mm:ss
EXHAUST = mm:ss
TOTAL CYCLE = mm:ss

- READY TO UNLOAD -
```

See Tables 5-6 and 5-8 for normal time ranges

4. Verify that intermittent buzzer sounds for one minute.

5. Verify that display continues to show COMPLETE message after buzzer stops.

6. Open door.

7. Verify printout:

```
* NOT READY 00:00:00A
DOOR UNLOCKED
```

# • READY

1. Close and lock door.

2. Verify display alternates between the READY message and the Cycle Select Menu.

3. Verify printout:

```
* READY 00:00:00A
```

4. Verify that cycle counter is incremented by one.

5. Press PRINT rocker switch to obtain a duplicate printout.

# LIQUIDS Cycle

# • POWER UP

1. Close and lock door.

2. Set HI-LO valve to LO.

3. Program Cycle Select touch pad #4 for a LIQUIDS cycle, setting values as follows:

STER TIME = 04 m  
TEMP = 250°F

4. Verify that display alternates between READY message and the Cycle Select Menu.

5. Press Cycle Select touch pad #4 twice.

# • PURGE

1. Verify display shows:

PURGE	T=140F 1:00 P=0psig
-------	------------------------

2. S2, S3 and S4 (and on Vacumatic units only, S7) should be on.

3. Verify printout:

```
--- LIQUID ---
CYCLE START AT 00:00:00A
ON 00/00/00

CYCLE COUNT 00000
OPERATOR
STERILIZER
STER TEMP = 250.0°F
CONTROL TEMP = 253.0°F
STER TIME = 4 MIN

P=psig
T=°F V=inHg

C 00:00:00A 145.6 0 P
```

4. Use stopwatch and verify one-minute purge time.

# • CHARGE

1. S3 and S4 (and on Vacumatic units only, S7) should go off; S2 should stay on.

2. Verify display shows:

CHARGE	T=230F P=7psig
--------	-------------------

3. Verify printout:

```
C 00:00:00A 230.4 7 P
```

4. Verify that chamber is charging with steam and charges until STERILIZE overdrive temperature is reached.

# • STERILIZE

1. Verify display shows:

STERILIZE	T=251F 4:00 P=20psig
-----------	-------------------------

2. Verify printout:

```
S 00:00:00A 250.1 20 P
```

3. Wait for sterilizer timer to time out.

# • SLOW EXHAUST

1. All valves should be off.

2. Verify display alternates between:

SLOW EXHAUST	T=253F P=20psig
-----------------	--------------------

and

WARNING HOT LIQUIDS	T=253F P=20psig
------------------------	--------------------

3. Verify printout:

```
E 00:00:00A 253.1 20 P
```

4. Time slow exhaust phase - it should take between four and seven minutes. Slow exhaust is done when chamber reaches 3 psig. If necessary, adjust slow-exhaust needle valve (see Table 5-7) and repeat cycle.

# • VENT

1. Verify display alternates between:

VENT	T=200F P=2psig
------	-------------------

and

WARNING HOT LIQUIDS	T=200F P=2psig
------------------------	-------------------

2. Verify printout:

```
E 00:00:00A 200.2 2 P
```

3. S3 should be on, all other valves should be off.

4. Wait until 0 psig is reached.

# • COMPLETE

1. Verify display alternates between:

COMPLETE	T=176F 00:00:00 P=0psig
----------	----------------------------

and

WARNING HOT LIQUIDS	T=176F P=0psig
------------------------	-------------------

2. Verify printout:

```
Z 00:00:00A 200.3 0 P
LOAD 0000000
TEMP MAX=254.3°F
TEMP MIN=250.1°F

CONDITION = mm:ss
STERILIZE = mm:ss
EXHAUST = mm:ss
TOTAL CYCLE = mm:ss

- WARNING -
- HOT LIQUIDS -
- OPEN DOOR 1in. (3cm) -
- AND UNLOAD IN 10 min. -
```

See Tables 5-7 and 5-9 for normal time ranges

3. Verify that buzzer sounds for five seconds.

4. S3 should still be on.

5. Verify that display continues to alternate between above two messages after buzzer stops.

6. Unlock and open door about one inch.



## • LIQUID COOL

1. Verify display alternates between:

```
UNLOAD IN      T=200F
10:00          P=0psig
```

and

```
WARNING        T=200F
HOT LIQUIDS    P=0psig
```

2. Verify printout:

```
+ DOOR OPEN  00:00:00 +
```

3. Wait 10 minutes until timer reaches 0:00.

4. Verify printout:

```
-----
-  READY TO UNLOAD  -
-----
```

5. Verify that buzzer sounds for two seconds.
6. Verify that display alternates between DOOR UNLOCKED message and Cycle Select Menu.

## • READY

1. Close and lock door.
2. Verify display alternates between READY message and Cycle Select Menu.
3. Verify printout:

```
+ READY  00:00:00A
```

4. Verify that cycle counter is incremented by one.
5. Press PRINT rocker switch to obtain a duplicate printout.

## PREVAC Cycle (Vacumatic Units Only)

Note: On double-door units, the rear-door display should show the same data as shown on the front-end display.

## • POWER UP

1. Close and lock door.
2. Set HI-LO valve to HI.
3. Program Cycle Select touch pad #2 for a PRE-VAC cycle, setting values as follows:

STER TIME = 04 m  
 DRY TIME = 02 m  
 TEMP = 270°F

4. Verify that display alternates between READY message and the Cycle Select Menu.

5. Press Cycle Select touch pad #2 twice.

## • PURGE

1. Verify display shows:

```
PURGE          T=140F
1:00           P=0psig
```

2. Verify printout:

```
-----
---  P R E V A C  ---
CYCLE START AT 00:00:00A
ON 00/00/00
CYCLE COUNT 00000
OPERATOR
STERILIZER
STER TEMP    = 270.0°F
CONTROL TEMP = 273.0°F
STER TIME    = 4 MIN
DRY TIME     = 2 MIN
              P=psig
- TIME       T=°F V=inHg
C 00:00:00A  140.1  C P
```

3. Use a stopwatch and start timing the one-minute purge.

4. S2, S3, S4 and S7 should be on.

5. When printout is as follows, stop timing:

```
C 00:00:00A  240.1  9 P
```

6. Purge time should be one minute.
7. S2 should go off and all other valves should stay on.

## • PULSES

1. Verify display shows:

```
PULSE          T=240F
#1             P=20psig
```

2. Wait until 2 psig is reached.
3. S4 should go off.
4. Wait approximately one minute until display shows vacuum is greater than 10 in.Hg. Verify printout:

```
C 00:00:00A  230.3  10 V
```

5. S3 and S7 should go off and S2 should go on.
6. Wait until display shows 26 psig and verify printout:

```
C 00:00:00A  265.0  26 P
```

7. S1, S3, S4 and S7 should go on and S2 should go off.
8. Verify that three more pulses occur, ending with S2 on.

## • CHARGE

1. Verify display shows:

```
CHARGE          T=265F
                P=26psig
```

2. Wait until STERILIZE temperature setpoint is reached. Verify printout:

```
S 00:00:00A  270.1  27 P
```

## • STERILIZE

1. Verify display shows:

```
STERILIZE       T=271F
4:00            P=28psig
```

2. Wait for sterilizer timer to time out.

## FAST EXHAUST

1. S2 should go off; S3, S4 and S7 should go on.
2. Verify display shows:

```
FAST            T=274F
EXHAUST         P=28psig
```

3. Verify printout:

```
E 00:00:00A  274.1  29 P
```

4. Wait until display shows 2 psig.

## • DRY

1. S1, S3, S4 and S7 should be on.
2. Verify display shows:

```
DRY             T=200F
2:00            P=2psig
```

3. Verify printout:

```
E 00:00:00A  200.3  2 P
```

4. Wait for dry timer to time out.

## • AIR BREAK

1. Verify display shows:

```
AIR             T=200F
BREAK           V=2inHg
```

2. Verify printout:

```
E 00:00:00A  200.2  20 V
```

3. Wait until display shows 0 psig.

## • COMPLETE

1. Verify display shows:

```
COMPLETE        T=200F
00:00:00        P=0psig
```

2. Verify printout:

```
2 00:00:00A  200.4  0 P
LOAD 0000000
TEMP MAX=274.1°F
TEMP MIN=270.1°F
CONDITION      = mm:ss
STERILIZE      = mm:ss
EXHAUST        = mm:ss
TOTAL CYCLE    = mm:ss
-----
-  READY TO UNLOAD  -
-----
```

See Table 5-10  
for normal time  
ranges

3. Verify that intermittent buzzer sounds for one minute.
4. Verify that display continues to show COMPLETE message after buzzer stops.
5. Open door.
6. Verify display shows:

```
DOOR            T=200F
UNLOCKED        P=0psig
```

## • READY

1. Close and lock door(s).
2. Verify the display shows:

```
READY           T=200F
00:00:00        P=0psig
```

### 3. Verify printout:

READY 00:00:00A

- Verify that cycle counter is incremented by one.
- Press PRINT rocker switch to obtain a duplicate printout.

### 5.14 AUTOMATIC LEAK TEST (Vacumatic Units Only)

- With door(s) unlocked, position power switch to ON.
- Verify that power-up message is printed and the display shows:

PERFORM LEAK TEST?  
1=YES 2=NO

- Select the LEAK TEST cycle by pressing Cycle Select touch pad #1.
- Verify that the display shows, for three seconds...

CHECK STEAM

then...

READY TO TEST?  
1=YES RESET=CANCEL

- Press Cycle Select touch pad #1 to start.
- Verify that display shows:

CLOSE THE DOOR(S).

- Lock door(s). Display shows:

PRESS 1 TO TEST

- Press Cycle Select touch pad #1 to start.
- Verify the printout, as follows...

```

--- LEAK TEST ---
CYCLE START AT 00:00:00A
ON 00/00/00
CYCLE COUNT 00000
OPERATOR
STERILIZER
P=psig
- TIME T=F V=InHg
C 00:00:00A 140.1 0 P
    
```

and the display...

PURGE T=140F  
1:00 P=0psig

- S2, S3, S4 and S7 should be on. After about one minute, S2 should go off and S1, S3, S4 and S7 should be on. Printout should occur:

C 00:00:00A 240.0 10 P

- After 2 psig is reached, S4 should go off. Wait one minute and until pressure is below 10 in.Hg. then check printout:

C 00:00:00A 240.2 12 V

- S3, S7 and S4 should be off, and S2 and S1 should be on. When pressure is above 26 psig, check printout:

C 00:00:00A 240.1 26 P

S1, S3, S4 and S7 should be on and S2 should go off.

- Verify that steps 10, 11 and 12 are repeated, producing a total of two prevac pulses.

- After two pulses, sterilizer should charge to 270°F. Verify that display shows...

CHARGE T=265F  
P=25psig

and that printout indicates...

L 00:00:00A 260.4 25 P

- S2 and S4 should be off, and S7, S1 and S3 should be on. Display should alternate between...

LEAK TEST T=267F  
10:00 P=26psig

and...

LEAK TEST T=267F  
EVACUATING P=26psig

- When 10 minutes have elapsed, all valves except S1 should be off. Verify that printout shows...

L 00:00:00A 165.0 28 V

and that display shows...

LEAK TEST T=140F  
STABILIZING V=26inHg

- Wait two minutes. Display should show...

LEAK TEST T=156F  
0:00 V=26inHg

and printout should occur...

L 00:00:00A 156.2 26 V

- Display timer should count up to 10 minutes. After 10 minutes, the following should be printed:

Leak rate is:  
0.5 mmHg per min.  
L 00:00:00A 165.1 26 V

All valves should be off and display should show:

AIR T=163F  
BREAK V=22inHg

- When pressure reaches 2 in.Hg. wait 10 seconds. Display should show...

COMPLETE T=200F  
00:00:00 V=0psig

and printout should occur...

Z 00:00:00A 160.0 0 P

Complete buzzer should pulse once every four seconds for one minute. Display should continue to show COMPLETE message.

- Unlock door. Printout should occur:

TOTAL CYCLE = mm:ss  
DOOR OPEN 00:00:00A

- Verify control prompts operator to run a DART (BOWIE-DICK) cycle.

PERFORM DART TEST?  
(BOWIE-DICK) 1=Y 2=N

Press #2.

### 5.15 MANUAL OPERATION

Note: Control power must be OFF. Set HI-LO valve to LO. Lock door(s).

Operate manual valve in sequence as follows (clockwise rotation):

- JACKET CHARGE (Electric Steam Generator Units Only)

Jacket should charge to 20±1 psig. Turn manual valve to CONDITION.

- CONDITION

Solenoid valves S2, S3 and S4 (Gravity units) or S2, S3 and S7 (Vacumatic units) should open. Purge should take place with approximately 5 to 15 psig steam pressure in chamber. After one minute, turn valve to STERILIZE.

- STERILIZE

Solenoid valve S2 should open. Chamber should be pressurized to approximately 20 psig. After five minutes, turn valve to SLOW EXHAUST.

- SLOW EXHAUST

All valves should remain closed and a slow exhaust should start. When pressure in the chamber reaches 12 psig, turn manual valve to FAST EXHAUST.

- FAST EXHAUST

Solenoid valves S3 and S4 (Gravity units) or S3 and S7 (Vacumatic units) should open and fast exhaust should start. When pressure in the chamber reaches 8 psig, turn manual valve to DRY.

- DRY

Solenoid valves S3 and S5 (Gravity units) or S3 and S7 (Vacumatic units) should open. A vacuum should be drawn in the chamber and air should be admitted through the vacuum break line. Check for obvious air flow at the inlet filter. Turn manual valve to OFF.

### 5.16 LOSS OF POWER TEST

- Turn main power supply off.
- Wait 10 seconds.
- Turn main power supply on.
- Verify that cycle #4 is set to a LIQUIDS cycle with a sterilize time of 4 minutes (as set in Section 5.13).
- If cycle is not properly set, memory test has failed and RAM/RTC should be replaced on the control board.

### 5.17 REAR PANEL SWITCH TEST (Double-Door Units)

Press PRINT VALUES. Take resulting printout of cycle settings to non-operating end. Then operate the Cycle Select touch pads on the rear panel as follows:

1. Close both doors and position power switch to ON.
2. Wait until display shows READY.
3. Press #1 touch pad on the rear panel. The cycle and cycle parameters should match the setting for touch pad #1 on the front panel.
4. Wait until display indicates READY.
5. Repeat this procedure for Cycle Select touch pads #2 through #4, making sure the settings match those for the printout.
6. Press RESET. \* N.O.E. RESET \* should be displayed momentarily.

### 5.18 BOILER -FLOODED SENSOR ALARM TEST (Electric Steam Generator Units Only)

1. With steam pressure in generator, position power switch to OFF.
2. Disconnect PUMP ON probe (black wire) from PC board inside generator electrical box.
3. Turn on water supply to generator.
4. Position power switch to ON.
5. Open generator drain valve and allow water to drain until pump turns on.
6. Close drain valve. Let water fill boiler until it is past the level visible in the sight glass.

Anti-flood circuit alarm lamp on the generator's small junction box should light. All generator power should be shut off. Sterilizer control should alarm and BOILER FLOODED should be printed and shown on the display.

7. Position power switch to OFF.
8. Open drain valve on boiler and drain water from boiler until it is visible halfway down the sight glass.

9. Reconnect black wire to PC board.
10. Reset anti-flood box and position power switch to ON.

**Note:** If anti-flood box does not reset, remove anti-flood probe and then reset box. Replace probe.

### 5.19 PERFORMANCE TEST

Upon satisfactory completion of the previous tests, the sterilizer should be subjected to the following charting cycles to assure conformance to applicable performance requirements. Each cycle must be tested for time and pressure in each phase.

**Note:** If shell is cold, run a three-minute FLASH cycle before charting cycles.

#### Gravity Units

Chart each of the following cycles:

Test Number	Cycle	Sterilize Time	Dry Time	Sterilize Temp
1	FLASH	3	1	270°F
2	LIQUIDS	4	-	250°F

See Tables 5-6 and 5-7 for performance requirements of each cycle.

#### Vacumatic Units

Chart each of the following cycles:

Test Number	Cycle	Sterilize Time	Dry Time	Sterilize Temp
1	FLASH	3	1	270°F
2	LIQUIDS	4	-	250°F
3	PREVAC	4	2	270°F

See Tables 5-8, 5-9 and 5-10 for performance requirements of each cycle.

When all testing is done, remove all test equipment. Replace drain line strainer and pipe plugs removed during testing.

TABLE 5-6 - FLASH CYCLE - GRAVITY STERILIZER

Phase	Valves Energized	Pressure	Times
Purge	S2,S3,S4	5-15 psig	1:00
Charge	S2	27-33 psig	2:00 max*
Sterilize	S2	27-33 psig	3:00
Fast Exhaust	S3,S4	3 psig max	1:00 max
Dry	S3,S5	5 in.Hg-0 psig	1:00
Vent	S3	2 in.Hg-0 psig	0:10-0:20

TABLE 5-7 - LIQUIDS CYCLE - GRAVITY STERILIZER

Phase	Valves Energized	Pressure	Times
Purge	S2,S3,S4	5-15 psig	1:00
Charge	S2	15-21 psig	2:00 max*
Sterilize	S2	15-21 psig	4:00
Slow Exhaust	None	3 psig	4:00-6:00 (16x16) 4:00-7:00 (20x20)
Vent	S3	0 psig	1:00 max

TABLE 5-8 - FLASH CYCLE - VACAMATIC STERILIZER

Phase	Valves Energized	Pressure	Times
Purge	S2,S3,S4,S7	5-15 psig	1:00
Charge	S2	27-33 psig	2:00 max*
Sterilize	S2	27-33 psig	3:00
Fast Exhaust	S1,S3,S4,S7	3 psig max	1:00 max
Dry	S1,S3,S7	24-30 in.Hg	1:00
Air Break	S3	2 in.Hg-0 psig	0:10-0:20

TABLE 5-9 - LIQUIDS CYCLE - VACAMATIC STERILIZER

Phase	Valves Energized	Pressure	Times
Purge	S2,S3,S4,S7	5-15 psig	1:00
Charge	S2	15-21 psig	2:00 max*
Sterilize	S2	15-21 psig	4:00
Slow Exhaust	None	2-3 psig	4:00-6:00 (16x16) 4:00-7:00 (20x20)
Vent	S3	0 psig	1:00 max

\*Allow two minutes extra for electric steam generator units.

TABLE 5-10 - PREVAC CYCLE - VACAMATIC STERILIZER

Phase	Valves Energized	Pressure	Times
Purge	S2,S3,S4,S7	5-15 psig	1:00
Vacuum 1	S1,S3,S4,S7	20-25 in.Hg/min	1:00-2:05
Pulse 1	S2	26-28 psig	1:00 max (16x16) 1:10 max (20x20)
Vacuum 2	S1,S3,S4,S7	20-25 in.Hg/min	1:00-2:05
Pulse 2	S2	26-28 psig	1:00 max (16x16) 1:10 max (20x20)
Vacuum 3	S1,S3,S4,S7	23-28 in.Hg/min	1:00-1:05 (16x16) 1:00-2:05 (20x20)
Pulse 3	S2	26-28 psig	1:00 max (16x16) 1:10 max (20x20)
Vacuum 4	S1,S3,S4,S7	23-28 in.Hg/min	1:00-2:05
Charge	S2	27-33 psig	1:00 max* (16x16) 1:10 max* (20x20)
Sterilize	S2	27-33 psig	4:00
Fast Exhaust	S1,S3,S4,S7	2 psig max	1:00 max
Dry	S1,S3,S7	25 in.Hg/min	2:00
Air Break	S3	2 in.Hg-0 psig	0:10-0:20

\*Allow two minutes extra for electric steam generator units.

## Section 6 Troubleshooting

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

### 6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, press RESET and operate sterilizer more than once in case reported problem is being caused by intermittent component malfunction.
2. Use cycle graphs, Figures 6-1 through 6-5, to follow the sterilization cycles through the various phases. The cycle graphs may also be used to check for correct operation of the solenoid valves which control the various phases.
3. Refer to Section 6.3 and the Troubleshooting Chart (Table 6-1) after the symptom has been verified.
4. Use the operational descriptions (Section 3) and electrical schematics (this section) as aids in understanding system operation and how the malfunction of a specific component would affect it.
5. Refer to the following guides for examples of what to look for and what to do when troubleshooting.

#### Steam and Water Supplies

- a. Be sure building-supply valves are fully open.
- b. Be sure supply pressure is the proper value and that it does not fluctuate. Be sure that gauge readings are accurate.
- c. Be sure steam supply is of the proper quality and that steam-supply line is trapped. This ensures condensate-free steam of between 97 and 100 percent saturated vapor.
- d. Check all valves and adjust, repair or replace as necessary.
- e. Clean supply strainers.
- f. Check thermostatic traps. Replace the elements if necessary.
- g. Inspect 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 signals: pressure, temperature, reset, cycle-select, door switches, etc. (see Table 6-2).
  - Output devices: solenoids, relays, displays, etc. (see Tables 6-2 and 6-3).
  - System logic circuit boards of the controller.
- b. All AC voltages are with respect to AC return and all DC voltages are with respect to DC common.
  - c. Check fuses first when supply voltage does not appear.

### 6.2 HOW TO USE CYCLE GRAPHS

The cycle graphs (Figures 6-1 thru 6-5) are representations of the operations of the cycles available with the sterilizer. They are intended to be used for two main purposes: 1) as an aid in understanding how the various cycles work, and 2) as an aid in troubleshooting. The upper graph on each page is a representation of chamber pressure and temperature variation during the separate phases of the cycle.

As an aid in troubleshooting, the graph should be used to, first, identify the point in the cycle where a malfunction occurs and, second, to check the operation of the valves which should be opened (energized) or closed (deenergized) during the phase where the problem occurs. If the malfunction is not in the valves, the Troubleshooting Chart (Table 6-1) should be used to check for other possible causes of the problem.

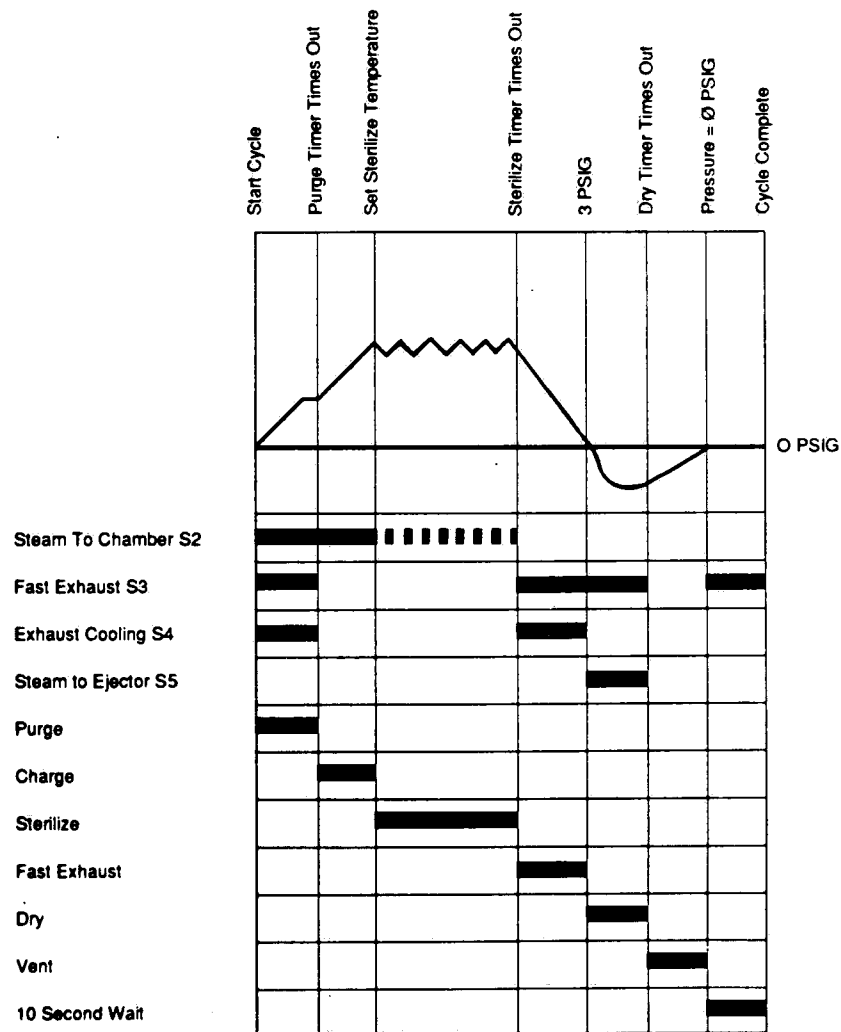


FIGURE 6-1 – Cycle Graph: Gravity and Flash Cycles - Gravity Sterilizer

6-2  
G- 3

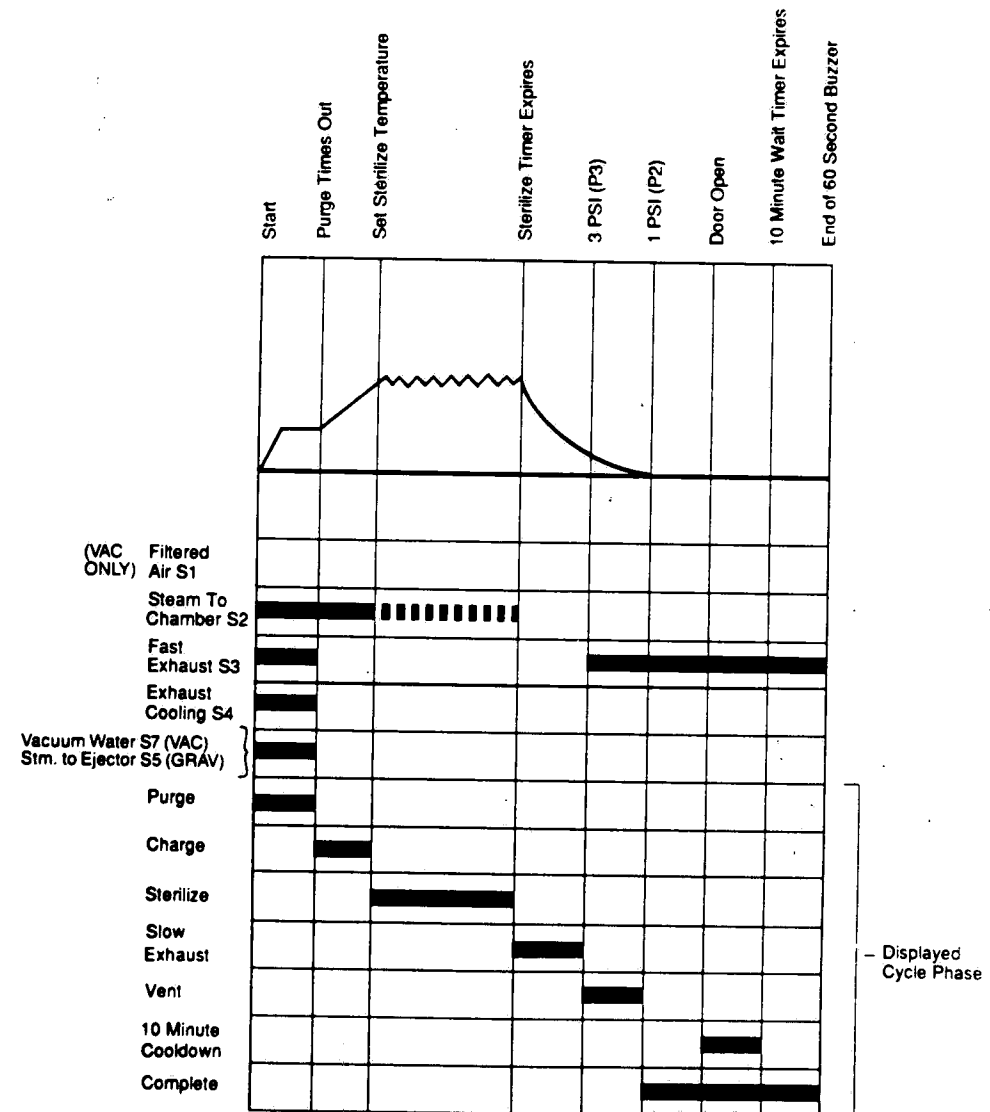


FIGURE 6-2 – Cycle Graph: Liquids Cycle - Gravity and Vacumatic Sterilizers

6-3  
G- 4

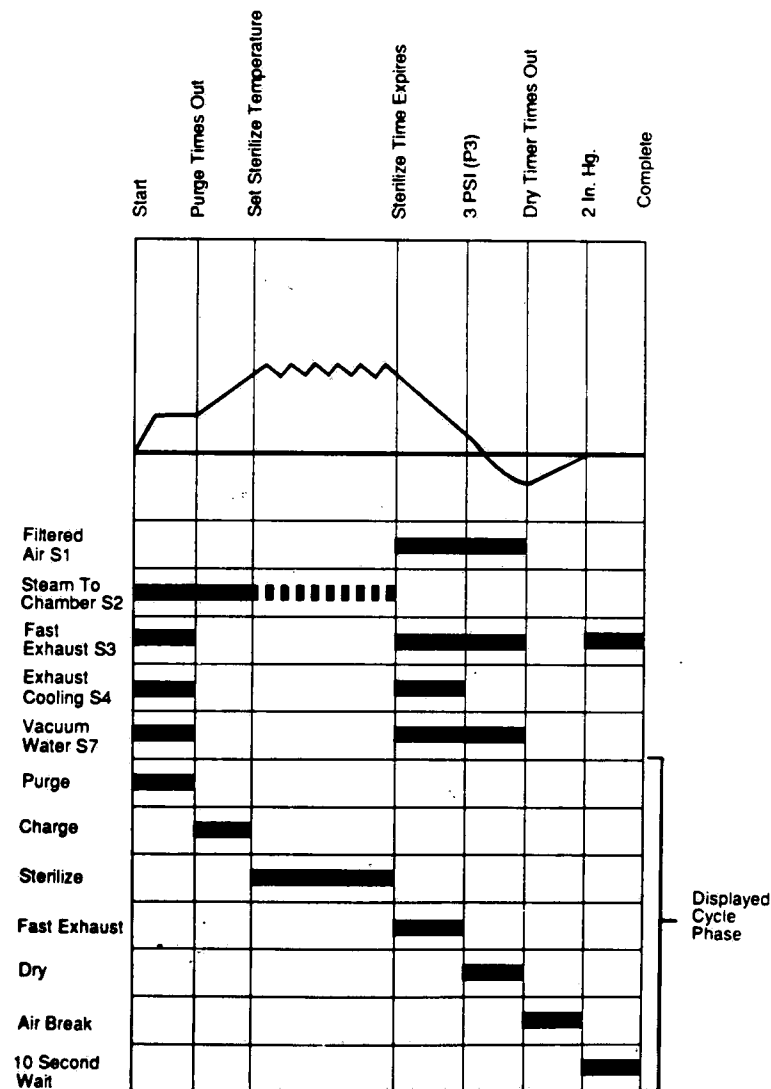
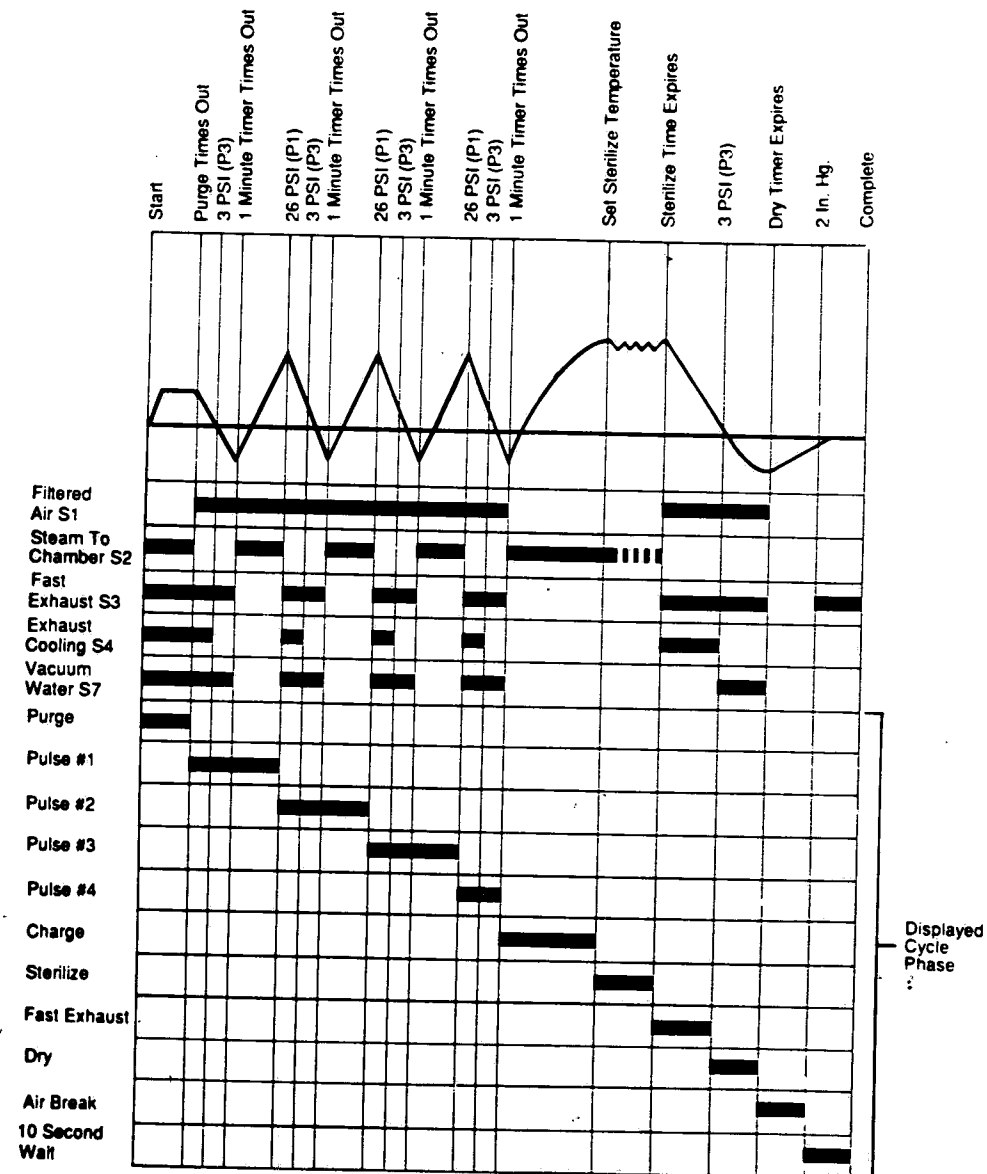


FIGURE 6-3 - Cycle Graph: Gravity, Flash and Dart Warm-up Cycles - Vacumatic Sterilizer

6-4  
G- 5



Note: The Express cycle is identical to the Prevacuum cycle, except that there are two Pressure/Vacuum pulses, rather than four.

FIGURE 6-4 - Cycle Graph: Prevacuum, Express and Bowie-Dick Cycles - Vacumatic Sterilizer

6-5  
G- 6

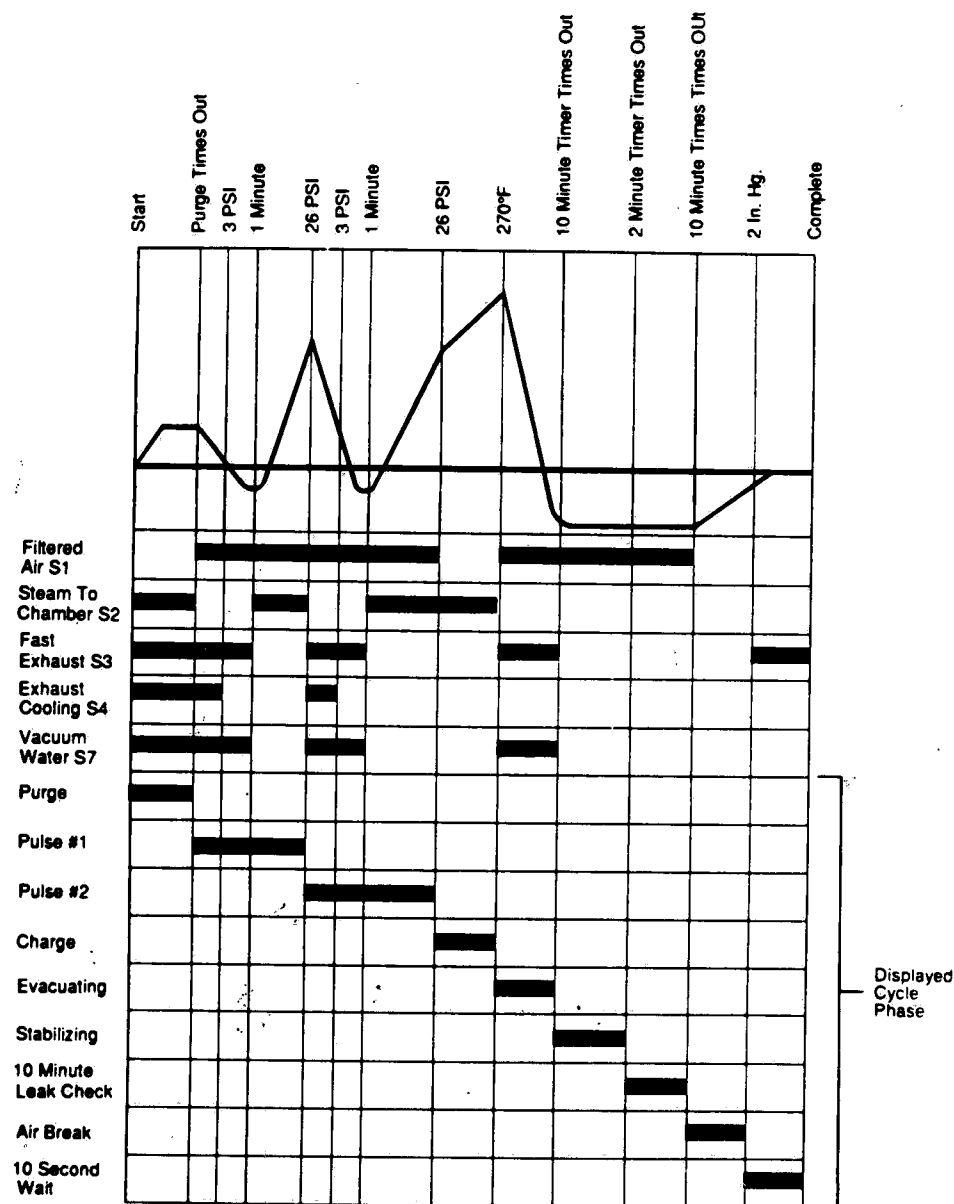


FIGURE 6-5 - Cycle Graph: Leak Test Cycle - Vacumatic Sterilizer

### 6.3 TROUBLESHOOTING CHART

Use the Troubleshooting Chart (Table 6-1) as follows:

#### • STATUS -

Select a symptom from this column that most nearly corresponds with the position to which the sterilizer cycle progressed before the trouble occurred.

#### • TROUBLE -

Select the problem you think is most appropriate to the particular trouble symptom. The examples are presented in cycle sequence.

#### • CAUSE/CORRECTION -

**Note:** If the symptom for a malfunction is established as mechanical, the electrical components may be omitted and vice versa.

This column lists the specific conditions that should be checked to isolate and correct the one causing the malfunction. The conditions are presented in the order in which they should be checked.

#### • WHERE IN MANUAL -

Location of applicable instructions and/or illustrations are provided in this area. The illustrations or instructions are identified by figure number, section or table number.

TABLE 6-1 - TROUBLESHOOTING			
Status	Trouble	Cause/Correction	Where To Find
1. Before beginning cycle.	1. When power is turned on, display shows SET PRINTER FREQ, or SERVICE TEST, or BURN-IN TEST.	1) Setting of #4 Dip switches on Control or Printer PC board in ON position. Place both to OFF for normal operation. 2) Defective Dip switch on Printer or Control PC board. Check Dip switches using Service Test (Section 7). If Dip switch(es) test bad, replace faulty board.	Sec. 7.8 Sec. 7.5
	2. Display has random characters. Printer operates, but printout is blank or has random characters.	1) Memory needs cleared. With power off, press and hold the CHANGE VALUES and SAVE VALUES pads while turning power on. This loads the default settings into memory (see Table 6-4). Then, change the default settings if required.	Sec. 7.15
	3. Normal display when power switch is turned on, but printer won't print.	1) Printer ribbon cable unplugged from Printer PC board. 2) Printer defective - replace. 3) Printer PC board defective - replace.	Fig. 8-12, #7 Sec. 7.3 Sec. 7.11
	4. Printer printout is erratic.	1) Disconnect the motor. If erratic operation is eliminated replace capacitor across paper take-up. Order and install kit P-764323-963.	
	5. Printer printout is light or blank.	1) Printer darkness out of adjustment. 2) Printer is defective - replace. 3) Printer paper loaded backwards.	Sec. 7.3 Sec. 7.3 Sec. 4.3
	6. Parts of characters on printout are missing.	1) Printer defective - replace. 2) Wrong type thermal paper. (Do not use T.I. paper.) 3) Printer PC board defective - replace. 4) Printer head dirty. Clean.	Sec. 7.3 - Sec. 7.11 Sec. 7.3



TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
1. Before beginning cycle (continued).	6. Control powers up with default values.	1) Memory IC battery dead - replace.	Sec. 7.15 Fig. 8-12, #32
	7. Display shows PRESSURE IN CHAMBER when power is turned on and won't clear. Chamber pressure gauge reads zero.	1) Pressure calibration on Printer PC board incorrect. 2) Pressure sensor defective. Replace and recalibrate Printer PC board.	Sec. 7.6 Fig. 8-49 & 8-50 Sec. 7.6
	8. Display says COMPONENT FAILURE, printer prints CR1 RELAY FAILURE.	1) CR1 relay unplugged or defective. Should be actuated when door is open, deactuated when door is closed. Check CR1 input, LS4, in Service Test mode; or, with power off check for continuity from P1-6 to DC common, TB2 terminal 12. 2) Defective door switch from COM to N.O. In Service Test mode, check door switch input, LS0 (and LS1 - rear door - for double-door units), or with power off and door locked, check for continuity from P1-1 to DC common, TB2-12. For double-door units, also check for continuity from P1-2 to DC common with the rear door locked. Replace Control PC board if door switch(es) test OK.	Fig. 8-10, #16  Fig. 8-19, #7
	9. On units with steam generator, control displays and prints ALARM BOILER FLOODED.	1) Steam generator water-fill valve is stuck open - repair or replace.	Sec. 7.8
	10. Can't start cycle, change values or reset control when touch pads pressed. Display shows READY when door is closed.	1) Bad touch panel. To confirm, test touch pad in question in Service Test mode. If touch panel common is bad, no touch pads will work and Service Test can't be entered. Confirm with ohmmeter on touch pad plug P-11, pin 1; continuity should be read to pin for the corresponding touch pad when it is pressed, e.g., RESET is P-11, pin 3. (See schematic.) 2) Touch panel unplugged.	Fig. 8-13, #4  Fig. 8-13, #4
	11. On units with auto-utilities shutdown option, pressure won't rise in jacket and no alarms are printed or displayed.	1) Auto-utilities solenoid (S9) not receiving power (units with auto-utilities shutdown option). Check for power at water and steam coils. Trace back to AC6 output on Control PC board, plug P3-6. Replace Control PC board if no 120 VAC present. 2) Auto-utilities steam solenoid valve defective. 3) Steam supply less than 50 psig minimum. 4) Steam line strainer plugged up. 5) Jacket trap malfunctioning - rebuild or replace. 6) Steam shutoff valve malfunctioning - rebuild or replace. 7) See Trouble 1-12.	Fig. 8-21  Fig. 8-21  Fig. 8-44, #1 Fig. 8-26, #9 Fig. 8-44, #3

TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
1. Before beginning cycle (continued).	12. On units with auto-utilities shutdown option, auto-utilities restart time on display has passed and steam and water did not come back on.	1) Work days programmed are less than 7 days. Will not restart on "off" days. Example, DAYS IN WEEK=5, utilities will not turn ON on days 6 and 7. If cycle needs to be run, press one of the four cycle selector buttons. After shutdown, control will not restart until DAY 1.	Sec. 2.4
	13. Display shows PRINTER TIME OUT, printer won't print. (Printer must print one line in less than three seconds.)	1) Paper jammed in printer - clear out jam. 2) Drag on paper roll - check. 3) Defective printer - replace printer. 4) Printer PC board defective - replace.	Sec. 4.3 Sec. 4.3 Sec. 7.3 Sec. 7.11
	14. Steam enters chamber with door open.	1) S2 valve failed (stuck open). 2) Manual control in Sterilize position. Must be in OFF position unless manual cycle is being run. 3) Manual multipoint valve failed - replace.	Fig. 8-22, #9 & 8-31, #10 Sec. 2.2 Fig. 8-29
	15. Unit prints ALARM FAILURE READING TEMP.	1) Defective temperature probe. 2) Control PC board out of calibration or defective.	Fig. 8-49 & 8-50 Sec. 7.7 & Fig. 8-12, #17
	16. Unit prints ALARM FAILURE READING PRESSURE. Display module lights up normally.	1) Defective pressure transducer. 2) Pressure transducer unplugged at P17. 3) Printer PC board out of calibration or defective. 4) (Vac only) Failure of auxiliary power supply 12-volt output.	Fig. 8-49 & 8-50 Fig. 8-49 & 8-50 Sec. 7.6 Sec. 7.12
	17. Display locks up with • AMSCO • EAGLE 3000	1) Printer unplugged. 2) Printer defective. 3) Printer PC board defective.	Fig. 8-12, #7 Sec. 7.3 Sec. 7.11
	18. On steam generator units, when power is turned on, pump comes on and never shuts off.	1) Water pressure to sterilizer turned off, causing pressure switch PS1 to turn on pump.	Sec. 2.2

TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
1. Before beginning cycle (continued).	19. Unable to start any cycle. Display and printout do not show READY when door(s) locked.	1) Door switch out of adjustment. 2) Door switch defective. Check continuity from COM to N.O. Should be less than 0.5 ohm at lowest ohm setting. If okay, proceed to next step. 3) Door switch input failure (LS0 - front, LS1 - rear) on Control PC board. Check LS0 and LS1 in Service Test mode while opening/closing door(s). If no response, replace Control PC board.	Sec. 7.25 Fig. 8-19,#7  Sec. 7.5 & Fig. 8-12,#17
2. During Condition phase.	1. Pressure and temperature do not rise. Normal cycle start information is printed.	1) Fuse F3 in control column blown. Measure solenoid valve coils for a short at plug P54 before replacing fuse. 2) CR1-A contacts defective, not allowing power to S2 solenoid valve. With power off, check continuity to AC neutral from P3-6. If no continuity, replace CR1. 3) Steam supply turned off. 4) Steam strainer plugged. 5) Steam regulator defective. 6) S2 solenoid valve bad or not receiving power. Check AC0 output from Control PC board to S2 (P3-7). There should be power at P3-7 throughout the Condition phase. Replace board if no power present and CR1 contacts OK.	Fig. 8-10,#13  Fig. 8-10,#16 & 8-12,#17  Sec. 2.2 Fig. 8-44,#1 Fig. 8-44,#6 Fig. 8-22,#9 & 8-31,#10
	2. Unit won't reach sufficient steam pressure to achieve set sterilize temperature and prints ALARM TOO LONG TO CHARGE.	1) S2 solenoid valve failure - rebuild or replace. 2) Control PC board failure. Check AC output to S2 (AC0, P3-7) during purge phase and charge phase (to 26 psig). 3) CR1 relay failure on normally-closed contacts to S2 neutral connection. 4) HI-LO steam regulator control knob in LO position for a 270°F. cycle. Set to HI position. 5) Steam regulator defective or out of adjustment - repair or replace. 6) Steam supply turned off. 7) Jacket trap failed, or strainer plugged. Jacket may be full of condensate. 8) Too-long-in-charge (TLIC) setpoint incorrect. 9) Safety pressure switch on steam generator is tripped. Switch must be manually reset.	Fig. 8-22,#9 & 8-31,#10 Fig. 8-12,#17  Fig. 8-10,#16  Sec. 2.2  Fig. 8-44,#6  Sec. 2.2 Fig. 8-26,#9  Sec. 7.5
3. During Condition phase of Prevacuum or Express cycle. (Vac only)	1. First vacuum pulse won't reach 10 in.Hg V1 (VS-1) setpoint and unit prints ALARM: TOO LONG TO EVACUATE.	1) S3 fast exhaust valve failed closed, or S3 not receiving signal from Control PC board. Check Control PC board output AC1 (P3-8) for 120 VAC to S3 from beginning of cycle until beginning of first pressure pulse to 26 psig. 2) S7 ejector water valve failed closed, or S7 not receiving signal from Control PC board. Check Control PC board AC5 output (P3-14) for 120 VAC to S7 below 3 psig setpoint P3 until beginning of first pressure pulse to 26 psig. 3) CK2 heat-exchanger check valve failed open. 4) CK5 water-inlet check valve failed closed. 5) CK6 ejector check valve failed closed.	Fig. 8-26,#17 & 8-12,#17  Fig. 8-24,#3 & 8-12,#17  Fig. 8-22,#29 Fig. 8-25,#6 Fig. 8-25,#8

TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
3. During Condition phase of Prevacuum or Express cycle. - Vac only (continued)	1. First vacuum pulse won't reach 10 in.Hg V1 (VS-1) setpoint and unit prints ALARM: TOO LONG TO EVACUATE (continued).	6) Heat exchanger leaks. 7) Piping between heat exchanger and CK6 check valve leaking. 8) Insufficient water pressure to ejector (must be 30 psig minimum). 9) Ejector fins clogged. 10) Water supplied to ejector too high in temperature (should be less than 85°F). 11) Insufficient steam to chamber. Check S2 solenoid valve. Check Control PC board output AC0 (P3-7) to S2 during Purge phase. 12) V1 (VS-1) setpoint was changed. Check V1 setpoint in Service Test mode (Section 7) and change if incorrect. Should be 10.0 in.Hg. 13) S4 solenoid valve failed, starving ejector of water. Valve should not receive power below 3 psig setpoint P3 on vacuum pull-down.	Fig. 8-22 Fig. 8-22  ..  Fig. 8-25,#6  Fig. 8-22,#9 & 8-12,#17  Sec. 7.5  Fig. 8-25,#17
	2. Unit won't reach 26 psig setpoint P1 (PS-1), and prints ALARM TOO LONG TO CHARGE.	1) S2 solenoid valve failed - rebuild or replace. 2) Control PC board failed. Check AC0 output to S2 (P3-7) during purge phase and charge phase (to 26 psig). 3) CR1 relay failure on normally-closed contacts to S2 neutral connection. With power off, check for continuity from P3-6 to AC neutral. Replace CR1 if no continuity. 4) Steam strainer plugged. 5) Steam supply turned off. 6) HI-LO steam regulator knob in LO position. 7) Jacket trap failed, or strainer plugged. Jacket may be full of condensate. 8) P1 (PS-1) setting not correct, should be 26.0 psig. Enter Service Test mode (Section 7) and check. 9) Too-long-in-charge (TLIC) setpoint incorrect. Check in Service Test mode.	Fig. 8-22,#9 Fig. 8-12,#7  Fig. 8-10,#16  Fig. 8-44,#1 Fig. 2-2 Sec. 2.2 Fig. 8-26,#9 & #4 Sec. 7.5  Sec. 7.5
	3. Number of conditioning pulses not correct.	1) Pulse setting not correct. Enter Service Test mode (Section 7) and change if necessary. Prevac cycle = 4 pulses. Express cycle = 2 pulses.	Sec. 7.5
4. During Sterilize phase of cycle.	1. Pressure too high and temperature too low during Sterilize phase.	1) Chamber drain steam trap failed closed, trapping air in chamber - rebuild or replace trap. 2) Chamber drain strainer plugged - remove and clean. 3) Chamber drain piping clogged. Flush out as described in Section 4.	Fig. 8-26,#32  Sec. 4.3 Sec. 4.3

TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
4. During Sterilize phase of cycle (continued).	2. Unit drops below set sterilize temperature. May print/ display UNDERTEMP.	1) Jacket pressure too high and temperature probe is responding to transient superheated temperatures. Reduce to minimum needed to insure proper opening of S2 solenoid valve (see step 2). This is best set while operating S2 manually in the Service Test mode (Section 7). Steam will be heard to enter chamber when valve is working properly.	Sec. 7.5
		2) Jacket pressure too low. S2 solenoid needs to have approximately 3 psig higher pressure in jacket than in chamber to ensure opening.	Sec. 5.7
		3) Overdrive value set too low. Standard setting is 3.0°F. Enter Service Test mode (Section 7) and check setting.	Sec. 7.5
		4) S2 valve failure - rebuild or replace.	Fig. 8-22,#9 & 8-31,#10
		5) Superheated steam temperatures from jacket pressure on empty chamber testing or with very lightly loaded chamber. Reduce jacket pressure as in step 1 above. If condition persists, there is no remedy with chamber empty. Condition should disappear with moderate to full chamber load.	--
		6) Power failed while in cycle.	--
5. During Slow Exhaust phase of Liquids cycle.	1. Excessively long slow exhaust time. Unit may print ALARM TOO LONG TO SLOW EXHAUST.	1) Slow exhaust needle valve plugged or not adjusted correctly. If not plugged, reset needle valve for a slow exhaust time, empty chamber, of 4-7 minutes.	Sec. 5.7
6. During a Prevacuum or Express cycle (Vac only).	1. Unit goes through cycle, but vacuum levels are poor (compared with levels expected in Field Test Procedure, Section 5).	1) S4 solenoid valve failed open, starving ejector. 2) S7 solenoid valve failed partially closed, starving ejector. 3) Check valve CK2 or CK6 failed partially closed. 4) Heat exchanger leaking. 5) Heat exchanger plugged. 6) Insufficient water pressure (must be 30 psig minimum). 7) Ejector fins clogged. 8) Water temperature too high. Should be below 85°F.	Fig. 8-25,#17 Fig. 8-24,#3 Fig. 8-22,#29 Fig. 8-23,#4 Fig. 8-23,#4 -- -- --
7. During a cycle.	1. Steam in area surrounding sterilizer.	1) S4 solenoid valve failed closed. S4 should receive power when unit is in purge or exhaust, above 3 psig setpoint. Check P3-10 for power. 2) Metering valve for S4 flow rate shut or too far closed. 3) Control PC board failure. Check S4 board output during dry phase or in Service Test mode. Should be on. 4) Water supply valve turned off. 5) Water strainer clogged.	Fig. 8-25,#17 Sec. 5.6 Fig. 8-12,#17 Sec. 2.2 --

TABLE 6-1 - TROUBLESHOOTING (continued)			
Status	Trouble	Cause/Correction	Where To Find
7. During a cycle (cont'd).	1. Steam in area surrounding sterilizer (cont'd).	6) When accompanied by loud popping noise, safety valve on jacket opening. Check jacket pressure and pressure regulator setting. If OK, replace safety valve. <b>Note:</b> If safety valve is defective, do not attempt to repair it. Replace with new valve.	Sec. 5.7
	2. Steam blows out around door.	1) Door gasket worn or defective - replace. 2) Door improperly shimmed - check. 3) Door not tightened sufficiently. Abort cycle, wait for pressure to exhaust, then restart. 4) Door switch out of adjustment.	Sec. 4.3 Sec. 7.17 Sec. 2.2 Sec. 7.25
	3. S2 steam-to-chamber solenoid valve makes a buzzing noise.	1) Defective return spring (too stiff). Install a new rebuild kit. 2) Low voltage to valve. Check voltage at coil. If not line voltage, isolate problem to loose wire, defective Control PC board AC output (AC0, P3-7), or relay CR1 N.C. contacts. 3) Valve improperly rebuilt, guide sleeve missing or parts not lubricated according to rebuilding instructions.	Fig. 8-22,#9 & 8-31,#10 Sec. 7.5 & Fig. 8-12,#17 --
	4. Steam and/or condensate leaking around door-lock clutch rod.	1) Steam lock diaphragm cracked or diaphragm gasket faulty - replace diaphragm or gasket. 2) Thrust bearing needs grease or is defective.	Fig. 8-17,#5 & #6 Fig. 8-17,#24
8. During Dry phase (Vac only).	1. Vacuum level during Dry phase fluctuates upward after reaching maximum vacuum level.	1) Heat exchanger not tilted enough to allow proper drainage - tilt exchanger 1/4 inch toward the operating end.	Fig. 8-23,#4
9. At end of cycle.	1. No beeper sounds at completion of cycle.	1) Dip switch #6 on Printer PC board turned OFF. Turn to ON position if end-of-cycle beeper is desired. If Dip switch was on, check the Dip switch in Service Test mode. If Dip switch checks OK, see next step. If Dip switch fails check, replace the Printer PC board. 2) Beeper defective on Control PC board - replace board.	Sec. 7.8 Fig. 8-12,#17
	2. Wrapped packs are wet, or excessive vapor in chamber when door is opened.	1) Check valve CK2 in drain line defective - replace. 2) S7 solenoid valve not fully opening. 3) Control PC board output for S7 not functioning correctly (AC5, P3-14). Check in condition and dry phases for 120 VAC. 4) Inadequate dry time for type of load. 5) Chamber steam baffle plate missing.	Fig. 8-22,#29 Fig. 8-24,#3 Fig. 8-12,#17 Sec. 2.3 Fig. 8-9,#9



**AMSCO  
SERVICE**

**EAGLE SERIES  
SMALL STERILIZERS GRAVITY AND VACAMATIC  
P-764322-694**

12/90

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TABLE 6-1 - TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
9. At end of cycle (cont'd).	2. Wrapped packs are wet, or excessive vapor in chamber when door is opened (cont'd).	6) Steam strainer partially clogged. 7) Water in jacket due to jacket trap failure. 8) Packs too large, dense, or heavy, chamber overloaded, or packs too close together. 9) Poor steam quality, boiler water carryover, inadequate trapping, uninsulated steam lines. 10) S4 solenoid failed open, or Control PC board S4 output AC2 (P3-10) energized in dry phase (should be off). Check that AC2 is off during dry phase. Note: See AMSCO Technique Manual MK-2085 for a complete discussion of wrapping and loading.	Fig. 8-44, #1 -- -- -- Fig. 8-25, #17 & Sec. 7.5
10. After a Liquids cycle.	1. Media boilover or stopper dislodgement.	1) P3 (PS-3) default setting of 3 psig too high for type of load. Change P3 setting in Service Test mode (hospital mode), or in CHANGE VALUES function (lab mode) from 3 psig to 1 psig.	Sec. 7.5
11. After LEAK TEST cycle (Vac only).	1. Unit prints a leak rate in excess of 1 mmHg/minute. Should be 1 mmHg/minute or less.	1) Defective door gasket - replace. 2) Loose or cracked pipe fittings. During 10-minute STABILIZING phase of Leak Test cycle, go over piping with Snoop™ liquid leak detector fluid, or similar, looking for fluid to be drawn into leaking fitting. 3) Drifting pressure transducer. Confirm leak rate using absolute pressure gauge covering 0-100 mmHg range. 4) See Trouble 3-1, steps 2 thru 9.	Sec. 4.3 -- Sec. 5.8 --
12. After a DART/Bowie-Dick cycle (Vac only).	1. Bowie-Dick test pack or DART shows apparent incomplete air removal.	1) Leak in piping. See Trouble 11-1, step 2. 2) Defective DART or Bowie-Dick test sheet. Repeat test with new sheet or different lot number. 3) Improper Bowie-Dick pack preparation or wraps used contain interfering substances such as detergent. Consult technique manuals and check laundering procedures or vendors of wrap. 4) Sterilizer needed warm-up. Run warm-up cycle before DART/Bowie-Dick test run. 5) Incoming air in steam supply.	-- -- -- Sec. 2.5 --
13. In or out of cycle (steam generator units).	1. Unit alarms BOILER FLOODED.	1) Steam generator water-fill valve is stuck open - repair or replace. 2) Control rods may be covered with scale causing pump to overflow - clean and reinstall. 3) Solid-state water level PC board in generator is faulty (CR1 should be on) - replace. 4) Water fed to generator is too pure, causing pump-off probe to not "see" water. Use water with 5 grains hardness. 5) Loose wire at probe connection, check P1-1, P1-2, P1-3 and P1-4.	Fig. 8-53 Fig. 8-53 Fig. 8-53 -- Fig. 8-53

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TABLE 6-1 - TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
13. In or out of cycle (steam generator units) (cont'd).	1. Unit alarms BOILER FLOODED (cont'd).	6) CR1 relay in anti-flood control faulty (should be on) - replace. 7) Loose wire at connection to sterilizer control. Check P1-8, P1-10, P12-1, P12-2, and also wires 36 and 51 in control column. 8) Anti-flood control box 1/4-amp fuse blown - replace. 9) Droplets of water in piping causing false alarm. Order P150828-193 and re-pipe generator piping. 10) Control PC board in control column faulty - replace.	Fig. 8-53 Fig. 8-53 Fig. 8-53 Fig. 8-12, #17
14. Miscellaneous.	1. Control intermittently locks up or becomes erratic when door is opened or closed, or when S2 solenoid valve operates, or when printing.	1) Variator noise suppressor across S2 coil missing or defective. Replace (not readily checked except for short). 2) Capacitor C1 missing from paper take-up microswitch, or has failed open - replace. 3) Diode across CR1 missing or defective.	Fig. 8-51 & 8-52 Fig. 8-14 Fig. 8-14
	2. Paper take-up runs continuously, even when microswitch is not actuated.	1) Microswitch defective or out of adjustment. 2) Microswitch wired incorrectly to normally open terminal. 3) C1 capacitor shorted. 4) Platen binding. Check for free movement of shoulder screws.	Fig. 8-12, #28 Fig. 8-12, #28 Fig. 8-14 Fig. 8-13, #3
	3. On electric-steam generator units, excessive noise from generator water-fill pump.	1) Flow-control valve (2 gpm) in line from water-fill solenoid to pump missing or defective - check and replace if necessary. 2) Generator water supply turned off.	Fig. 8-53 Fig. 2-2

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**TABLE 6-2 - DC INPUT/OUTPUT (I/O) SUMMARY**

DC I/O Drivers	Function	
Limit Switches	LS0 - Door Switch	Closed=Locked
	LS1 - Opposite Door Switch	Closed=Locked
	LS2 - Electric Boiler Overfill Switch	Closed=Not Full
	LS3 - Not Used	
	LS4 - CR1 Relay Check	
	LS5 - Opposite Door Touch Pad (Cycle #1)	Closed=Pushed
	LS6 - Opposite Door Touch Pad (Cycle #2)	Closed=Pushed
	LS7 - Opposite Door Touch Pad (Cycle #3)	Closed=Pushed
	LS8 - Opposite Door Touch Pad (Cycle #4)	Closed=Pushed
	LS9 - Opposite Door Touch Pad (Reset)	Closed=Reset
	LS10 - Print Switch	Closed=Print
	LS11 - Print Values Switch	Closed=Print value
Touch Pad Switches	PB0 - SAVE VALUES Touch Pad (P1-10)	
	PB1 - CHANGE VALUES Touch Pad (P1-11)	
	PB2 - Left Cursor Touch Pad (P1-8)	
	PB3 - Decrease Value Touch Pad (P1-9)	
	PB4 - Cycle #2 Touch Pad (P1-4)	
	PB5 - Cycle #3 Touch Pad (P1-5)	
	PB6 - Cycle #4 Touch Pad (P1-2)	
	PB7 - Cycle #1 Touch Pad (P1-7)	
	PB8 - Cursor Right Touch Pad (P1-12)	
	PB9 - Increment Value Touch Pad (P1-13)	
DC Drivers	DC0 - Rear Display data	
	DC1 - Rear Display data	
	DC2 - Rear Display data	
	DC3 - Rear Display data	
	DC4 - Rear Display data	
	DC5 - Rear Display data	
	DC6 - Rear Display data	
	DC7 - Rear Display data	
	DC8 - Cycle Complete Signal	
	DC9 - Power Door Inhibit	
	DC10 - Rear Buzzer	

**TABLE 6-3 - AC OUTPUT SUMMARY**

AC Drivers	
Gravity	Vacumatic
AC0 - S02 - Steam-to-Chamber Valve	AC0 - S02 - Steam-to-Chamber Valve
AC1 - S03 - Fast-Exhaust Valve	AC1 - S03 - Fast-Exhaust Valve
AC2 - S04 - Exhaust-Cooling Valve	AC2 - S04 - Exhaust-Cooling Valve
AC3 - S05 - Steam-to-Ejector	AC3 - Not Used
AC4 - Not Used	AC4 - S07 - Ejector Water
AC5 - Not Used	AC5 - S01 - Air Break Valve
AC6 - Not Used	AC6 - Not Used
AC7 - S09 - Utilities Shutdown	AC7 - S09 - Utilities shutdown

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**TABLE 6-4 - DEFAULT VALUES SUMMARY  
DEAD BATTERY IC...OR AFTER "MEMORY CLEAR" FUNCTION**

Gravity	Vacumatic
Cycle 1 - Flash - 270°F (132°C) for 3 minutes - 1-minute dry	Cycle 1 - Express - 270°F (132°C) for 4 minutes - 3-minute dry
Cycle 2 - Flash - 270°F (132°C) for 10 minutes - 1-minute dry	Cycle 2 - Prevacuum - 270°F (132°C) for 4 minutes - 20-minute dry
Cycle 3 - Gravity - 270°F (132°C) for 15 minutes - 30-minute dry	Cycle 3 - Flash - 270°F (132°C) for 3 minutes - 1-minute dry
Cycle 4 - Gravity - 250°F (121°C) for 30 minutes - 15-minute dry	Cycle 4 - Flash - 250°F (121°C) for 10 minutes - 1-minute dry
Overtemp - 20.0°F (12.0°C) above set sterilize temp	Overtemp - 20.0°F (12.0°C) above set sterilize temp
Overdrive - 3.0°F (1.5°C) above set sterilize temp	Overdrive - 3.0°F (1.5°C) above set sterilize temp
Undertemp - 2.0° (1.0°C) below set sterilizing temp	Undertemp - 2.0°F (1.0°C) below set sterilizing temp
P2 (PS-2) - 3.0 psig/0.20 bar pressure	P2 (PS-2) - 3.0 psig/0.20 bar pressure
P3 (PS-3) - 1.0 psig/0.08 bar pressure	P3 (PS-3) - 1.0 psig/0.08 bar pressure
TLIE - 20 minutes	TLIE - 5 minutes
TLIC - 20 minutes	TLIC - 20 minutes
	TLIV - 20 minutes
	Express conditioning pulses - 2
	Express P1 (PS-1) - 26.0 psig/1.94 bar pressure
	Express V1 (VS-1) - 10.0 in.Hg/0.22 bar vacuum
	Prevacuum conditioning pulses - 4
	Prevacuum P1 (PS-1) - 26.0 psig/1.94 bar pressure
	Prevacuum V1 (VS-1) - 10.0 in.Hg/0.22 bar vacuum

**TABLE 6-5 - TEMPERATURE PROBE  
RESISTANCE VERSUS TEMPERATURE**

Temperature Degrees F	Probe Resistance Ohms
60	36754
70	28521
80	22315
90	17598
100	13981
110	11188
120	8015
130	7311
140	5967
160	4045
180	2803
200	1983
210	1679
220	1429
230	1222
240	1048
250	903
264	852
270	678
274	642
280	591

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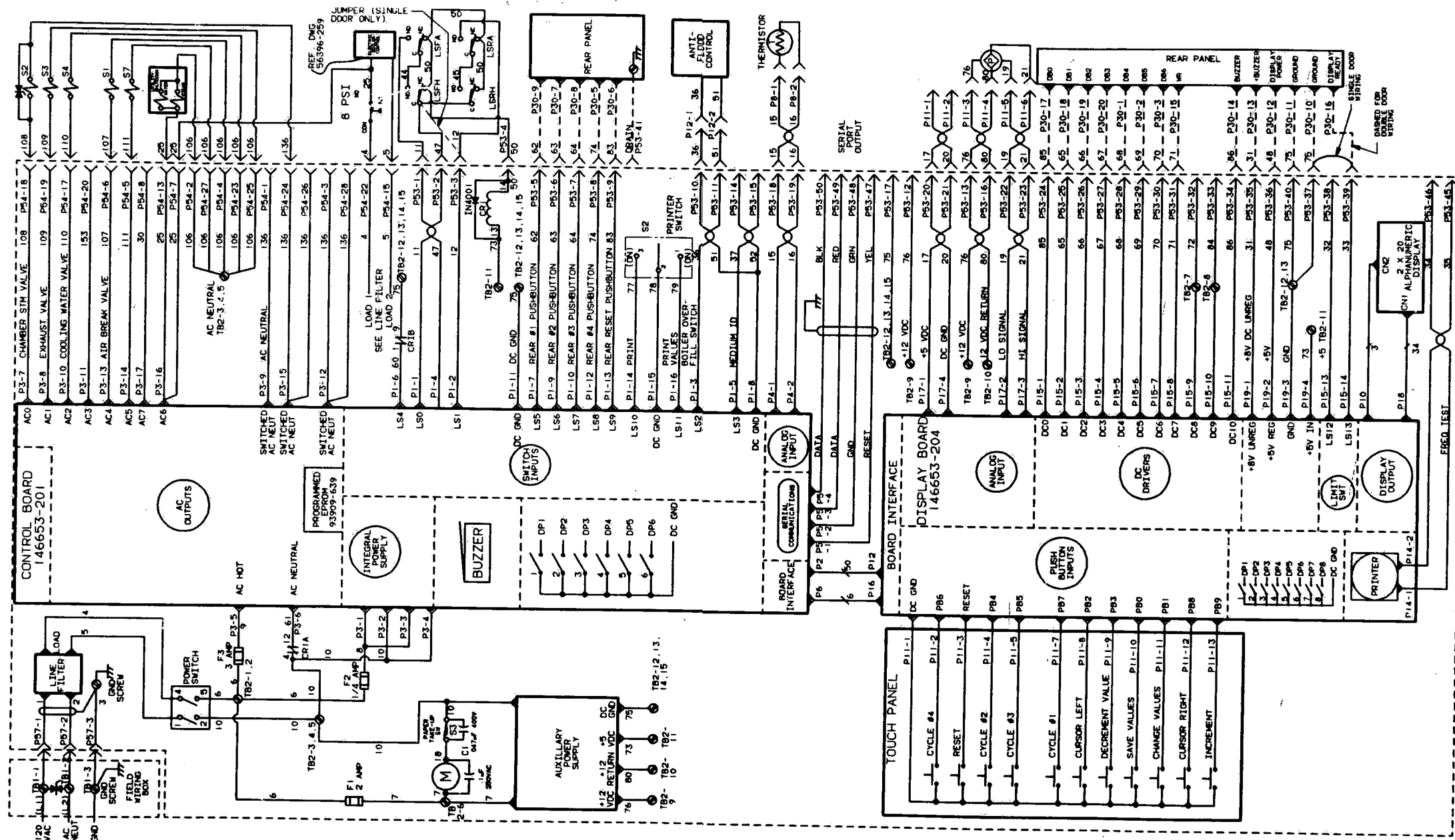
**TABLE 6-6 - SCHEMATIC REFERENCE LIST**

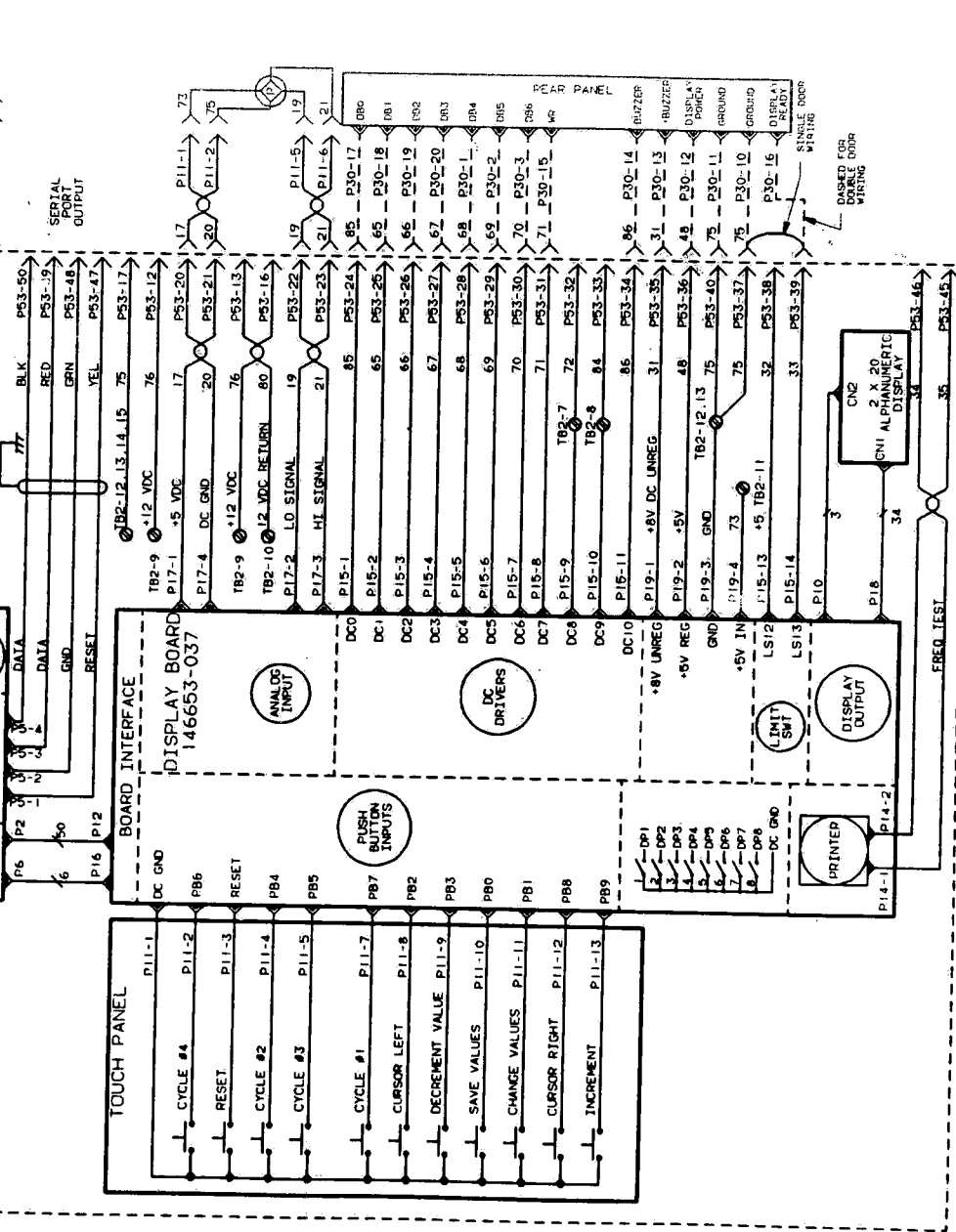
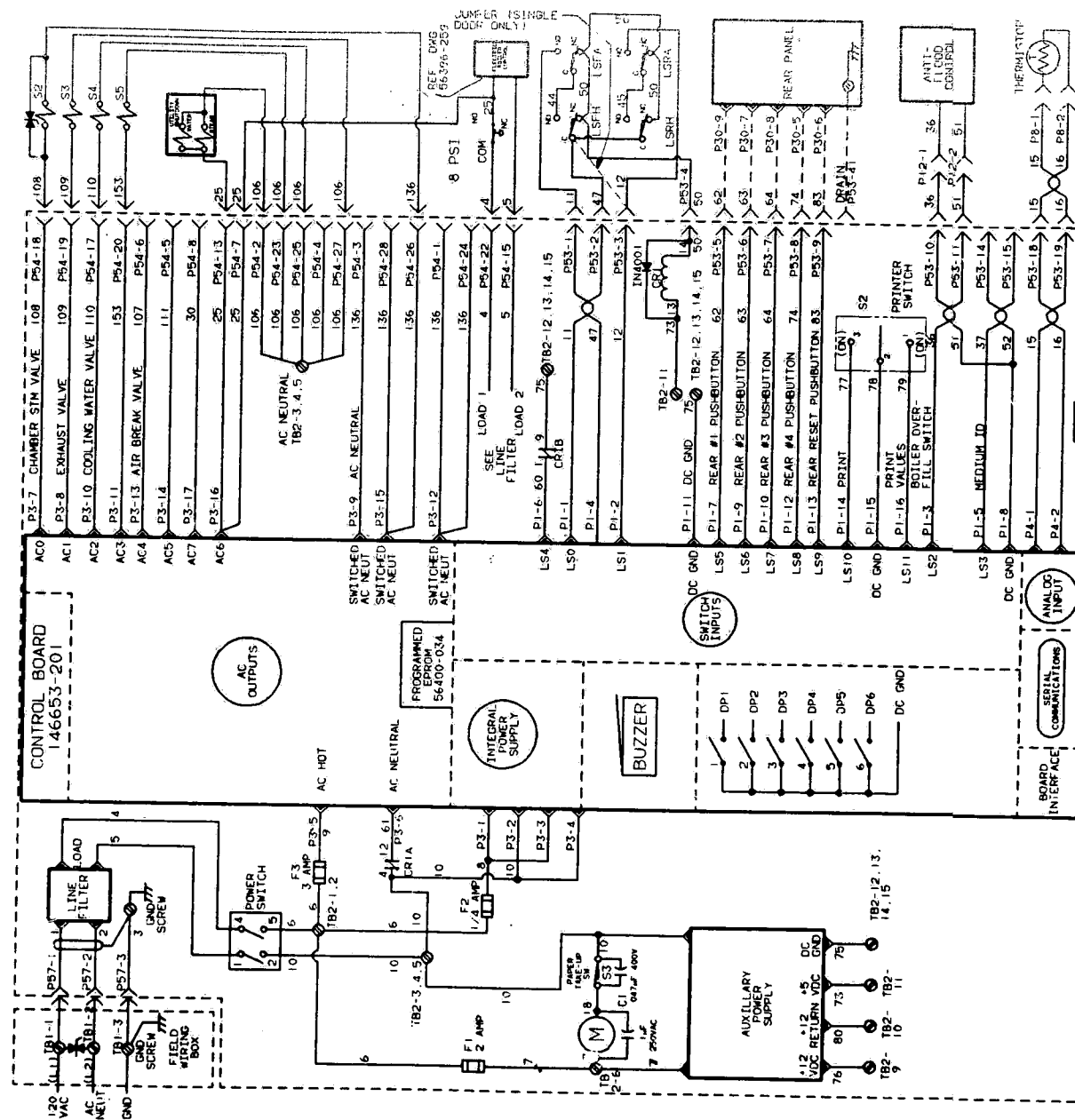
Listed below are reference drawings which are presented immediately after this table.

Title	Sheet	Reference Number
SYSTEM SCHEMATIC: Vacumatic Sterilizer	1 of 1	P-146653-480
SYSTEM SCHEMATIC: Gravity Sterilizer	1 of 1	P-146653-202
CONTROL PC BOARD ASSEMBLY	1 of 4 2 of 4 3 of 4 4 of 4	P-146653-201
PRINTER PC BOARD ASSEMBLY	1 of 3 2 of 3 3 of 3	P-146653-037
NON-OPERATING END PC BOARD ASSEMBLY	1 of 2 2 of 2	P-136807-138
TOUCH PANEL SCHEMATIC, Operating End	1 of 1	P-136806-685
OPTIONAL AS SERIES ELECTRIC STEAM GENERATOR SCHEMATIC	1 of 1	—
OPTIONAL AS SERIES ELECTRIC STEAM GENERATOR ANTI-FLOOD SCHEMATIC	1 of 1	SK-880204
OPTIONAL CHS SERIES ELECTRIC STEAM GENERATOR SCHEMATIC	1 of 1	—
OPTIONAL CHS SERIES ELECTRIC STEAM GENERATOR ANTI-FLOOD SCHEMATIC	1 of 1	—
WIRING ASSEMBLY, OPTIONAL ELECTRIC STEAM GENERATOR	1 of 1	P-146653-657
PIPING SCHEMATIC: Vacumatic Sterilizer	1 of 1	—
PIPING SCHEMATIC: Gravity Sterilizer	1 of 1	—
MASTER WIRE LIST	1 of 2 2 of 2	— —

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BILL OF MATERIAL CONTINUED:

1	129359-050	77	HEADER	U1	16 PIN
1	129357-549	78	HEADER STRAIGHT	U2	50 PINS
1	129360-550	79	HEADER STRAIGHT	U3	17 PINS
1	129357-567	80	CONNECTOR	U4	2 PIN
1	129357-572	81	CONNECTOR	U5	4 PIN
1	129360-426	82	CONNECTOR	U6	6 PIN
2	93902-422	84	HEADER, 12POS	H1, H2	
1	129357-237	85	SHUNT	LOW PROFILE	
1	129360-193	86	SWITCH, DIP	S16	6 POS
5	129360-200	87	TEST POINTS	TP1, TP5-TP8	
2	93909-145	91	SOCKET, CHIP CARRIER	FOR U17, U18	44 PIN PLCC
1	84219-001	92	SOCKET	FOR U25	24 PIN
1	129357-238	93	SOCKET	FOR U10	28 PIN
8	129357-575	95	HEAT SINK	FOR Q4-Q8, Q10-Q12	TRIACS
1	129360-192	96	HEAT SINK	FOR VR1	
2	93908-039	97	SCREW, SEMS	FOR VR1	#6-32 X 3/8"
1	93908-924	99	TRANSFORMER	T1	10V @ 2A PARALLEL
1	129357-533	100	Buzzer	BZ1	
1	129357-239	101	CRYSTAL	Y1	12 MHZ
1	90619-091	102	RING TERMINAL	#6 X 16-22 AWG	
1		103	WIRE, BLACK	3" LG, SEE NOTE #11	

REF. DESIGNATIONS		SPARKS		
LAST USED	NOT USED	TYPE	REF. DES.	QTY.
RN10	RN3	2.2K SIP	RN2	1
VR1		2.2K SIP	RN4	1
U6				
S16	S1-S15	100n SIP	RN8	1
U28	U27, U19			
C53	2.2K SIP			
R76	100n SIP			
Q13	Q2, Q3, Q9	DS26LS32	U23	3
D19	Q2, Q3, Q9	DS26LS31	U24	3
TP8	TP2, TP3, TP4	74LS14	U26	1
H2				
JP5				

QUANTITY	PART NUMBER	ITEM NO.	PART NAME	DESCRIPTION, MATERIAL	REF. DES.	QTY.
1	46653-201	1	CONTROL BOARD	(MAIN)		101-03-89
1	46653-213	2	DRILL SCHEDULE	(BARE BOARD)		
8	93909-141	3	TRIAC DRIVER	U1, U2, U5, U7, U9, U11, U13, U15	MOD3032	
3	129357-531	4	WIRE, BLACK	U3, U4, U6	74LS541	
1	93902-388	5	8 BIT A/D CONVERTER	U8	ADCC0804	
1	129360-184	6	OCTAL LATCH	U12	74HCT373	
1	129360-527	7	POWER SUPPLY SUPERVISOR	U14	DS1232	
1	129360-450	8	OVER-VOLTAGE DETECTOR	U16	3423	
1	129360-191	9	MICROCOMPUTER	U17	N80C31	
1	129360-447	10	PERIPHERAL INTERFACE	U18	N82C55	
2	129046-001	12	MAXIMUM COLLECTION	U20, U22	7406	
1	93902-386	13	DUAL OP AMP	U21	LM358N	
1	129357-177	14	QUAD LINE RECEIVER	U23	DS26LS32	
1	129357-176	15	QUAD LINE TRANSMITTER	U24	DS26LS31	
1	129360-549	16	BUFFER BOARD RN & L	U25	MK48T02B-25	
1	129356-080	17	HEX SCHMITT TRIGGER	U26	74LS14	
1	129359-193	18	SCHMITT TRIGGER AND	U28	74HCT132	
1	93909-597	21	INVERTER	Q1	MCR 69-1	
8	93902-393	22	TRIACS	Q4-Q8, Q10-Q12	MAC3030-8	
1	129357-908	23	TRANSISTOR	Q13 NPN	2N6426	
14	129360-188	26	DIODE, SUPPRESSOR	D1, D6-D18	P6KE8.2	
1	93902-385	27	VOLTAGE REF.	D2	LM332Z-2.5V	
2	129357-535	28	DIODE	D3, D4	MR500	
2	84157-001	29	DIODE	D5, D19	1N4001	
1	129360-526	32	VOLTAGE REGULATOR	VR1	LM323K OR 78T05K	
1	129360-006	36	TRIMMER/RESISTOR	R4	500n	
1	129360-005	37	TRIMMER/RESISTOR	R10	200n	
2	93900-340	38	RESISTOR	R1, R37	27.4n	
1	93900-329	39	RESISTOR	R2	562n	
1	93902-411	40	RESISTOR	R3	9.09K	
2	93902-410	41	RESISTOR	R5, R27	2.49K	
1	93900-337	42	RESISTOR	R6	909n	
1	93902-405	43	RESISTOR	R7	464n	
2	93900-319	44	RESISTOR	R8, R9	100K	
1	93900-318	45	RESISTOR	R11	100n	
6	93900-302	46	RESISTOR	R12, R17, R18, R38, R62, R72	10K	
9	93900-308	48	RESISTOR	R15, R19, R20, R22, R29, R30, R33, R42, R50	1K	
8	93902-402	49	RESISTOR	R21, R23, R24, R32, R34, R39, R45, R46	200n	
3	93900-310	50	RESISTOR	R40, R48, R71	2.21K	
1	93900-301	51	RESISTOR	R49	12.1K	
8	93441-035	52	RESISTOR	R53-R60	22n	
1	93900-343	53	RESISTOR	R75	1.10K	
1	93900-344	54	RESISTOR	R76	5.36K	
3	129330-004	55	RESISTOR NET	RN1, RN4, RN7	9 X 10K	
1	129357-573	56	RESISTOR NET	RN2	9 X 2.2K	
1	129357-574	57	RESISTOR NET	RN5	5 X 2.2K	
1	129360-540	58	RESISTOR NET	RN6	9 X 120n	
3	129360-190	59	RESISTOR NET	RN8, RN9, RN10	4 X 100n ISOLATED	
21	150822-822	63	CAPACITOR, CERAMIC	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100	0.1uF	
1	56396-698	64	CAPACITOR, CERAMIC	C10	10pF	
1	56396-697	65	CAPACITOR, CERAMIC	C28	5.1pF	
1	56396-704	66	CAPACITOR, CERAMIC	C35	.33uF	
1	56396-701	67	CAPACITOR, CERAMIC	C37	150pF	
8	93436-004	68	CAPACITOR, CERAMIC	C43-C50	0.1uF @ 500V	
2	56396-692	69	CAPACITOR, ELECTROLYTIC	C27, C42	1uF	
1	129360-542	70	CAPACITOR, ELECTROLYTIC	C33	15,000uF @ 25V	
2	56396-694	71	CAPACITOR, ELECTROLYTIC	C40, C41	10uF	
1	56396-695	72	CAPACITOR, ELECTROLYTIC	C52	47uF	

H1-EPROM JUMPERS	
EPROM TYPE	H1 PIN CONNECTION
*2716	1-2, 10-11, 4-5, 7-8
*2732	1-2, 10-11, 4-5, 7-8
2764	1-2, 10-11, 4-5, 7-8
27128	1-12, 10-11, 4-5, 7-8
27256	1-12, 10-3, 4-5, 7-8
27512	1-12, 10-3, 4-9, 7-6
*THESE EPROMS HAVE ONLY 24 PINS. PIN #1 OF THESE EPROMS GOES INTO PIN #3 OF THE SOCKET.	

H2-RESET JUMPERS	
FUNCTION	H2 PIN CONNECTION
HARD RESET, FASNET INPUT	1-12
HARD RESET, FASNET OUTPUT	1-2
HARD RESET, PUSH BUTTON INPUT	11-12
WATCHDOG CONNECTED	3-4
WATCHDOG DISABLED	3-10
WATCHDOG CONTINUOUS TIMEOUT	9-10
150ms WATCHDOG TIMEOUT	5-6
600ms WATCHDOG TIMEOUT	6-7
1.2 S WATCHDOG TIMEOUT	5-8

# NOTES:

1. THE HEADERS H1 & H2 ARE NUMBERED:

12	11	10	9	8	7
1	2	3	4	5	6

2. LINE THICKNESS AND SPACING SHOULD BE AS FOLLOWS:

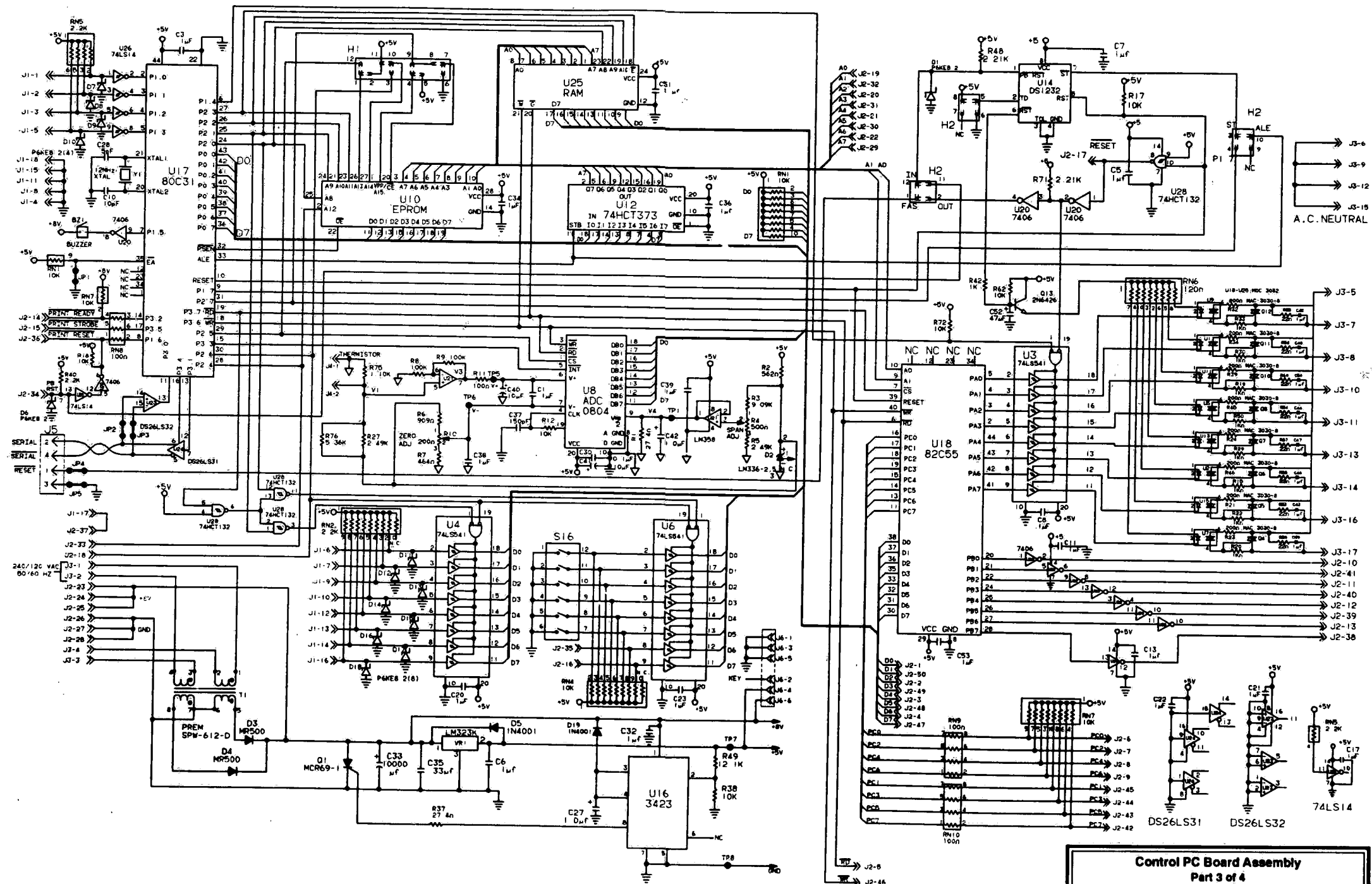
## A.C.

THE A.C. COMMON BUS LINE FROM J3-5 TO Q4 THRU Q8 AND Q10 THRU Q12 AND THE A.C. NEUTRAL FROM J3-6, J3-9, J3-12 AND J3-15 SHOULD HAVE A MINIMUM WIDTH OF 0.125" WITH A MINIMUM SPACING OF 0.0625". ALL OTHER A.C. LINES (FROM J3 TO Q4 THRU Q8 AND Q10 THRU Q12 AND FROM J3 TO THE TRANSFORMER) SHOULD HAVE A MINIMUM WIDTH OF 0.050" AND A SPACING OF 0.0625" MINIMUM.

## D.C

ALL +8 V.D.C., +5 V.D.C. AND GROUND MUST HAVE A MINIMUM WIDTH OF 0.050" WITH 0.015" MINIMUM SPACING. ALL LOGIC SIGNALS MUST HAVE MINIMUM WIDTH OF 0.015" WITH 0.015" MINIMUM SPACING.

3. MUST BE U.L. APPROVED.
4. REQUIREMENTS FOR ARTWORK LAYOUT:
  - COMPONENT SYMBOLIZATION FOR EACH COMPONENT.
  - DRILL SCHEDULE
  - SOLDER MASK
  - ARTWORK
5. REQUIREMENTS FOR P.C. BOARD ASSEMBLY:
  - COMPONENT SYMBOLIZATION
  - BOARD SHOULD BE 1 OZ COPPER AND 1 OZ PLATE, WITH SOLDER MASK OVER BARE COPPER (VACREL DRY FILM)...
  - BOARD THICKNESS SHOULD BE 0.062
6. VOLTAGE REGULATOR (VR1) MUST BE MOUNTED TO THE HEAT SINK (ITEM #96) WITH SCREWS (ITEM #97). FLOW SOLDER THE ASSEMBLY TO THE P.C. BOARD WITH THE REST OF THE PARTS. DO NOT MASK OFF EYELETS FOR MOUNTING SCREWS DURING WAVE SOLDERING.
7. EPROM U10 IS ADDED AT A HIGHER ASSEMBLY LEVEL. EPROM U10 IS PLUGGED INTO A 28 PIN SOCKET (ITEM #93). SEE TABLE AT LEFT FOR JUMPERING.
8. RAM U25 IS PLUGGED INTO A 24 PIN SOCKET (ITEM #92)
9. STAMP CURRENT REVISION LEVEL ON BOARD IN SPACE PROVIDED.
10. MOUNT CRYSTAL Y1 (ITEM 101) VERTICALLY WITH APPROX. 0.05" SPACING BETWEEN CRYSTAL AND BOARD. USE WASH AWAY SPACERS AS FOLLOWS:
  - DYNALLOY CATALOG NO. D548-AW-.055, OR
  - BIVAR CATALOG NO. 10-201-05.
11. WIRE SPEC: #22 AWG, SILVER COATED COPPER, 19/34 STRANDING, TEFLON INSULATION, 300 V, 105°C, U.L. & C.S.A. LABELS REQUIRED.
12. STRIP ONE END OF WIRE 5/16" AND ATTACH RING TERMINAL (ITEM #102). STRIP OTHER END 1/2". TWIST AND TIN. SOLDER TO TP8.



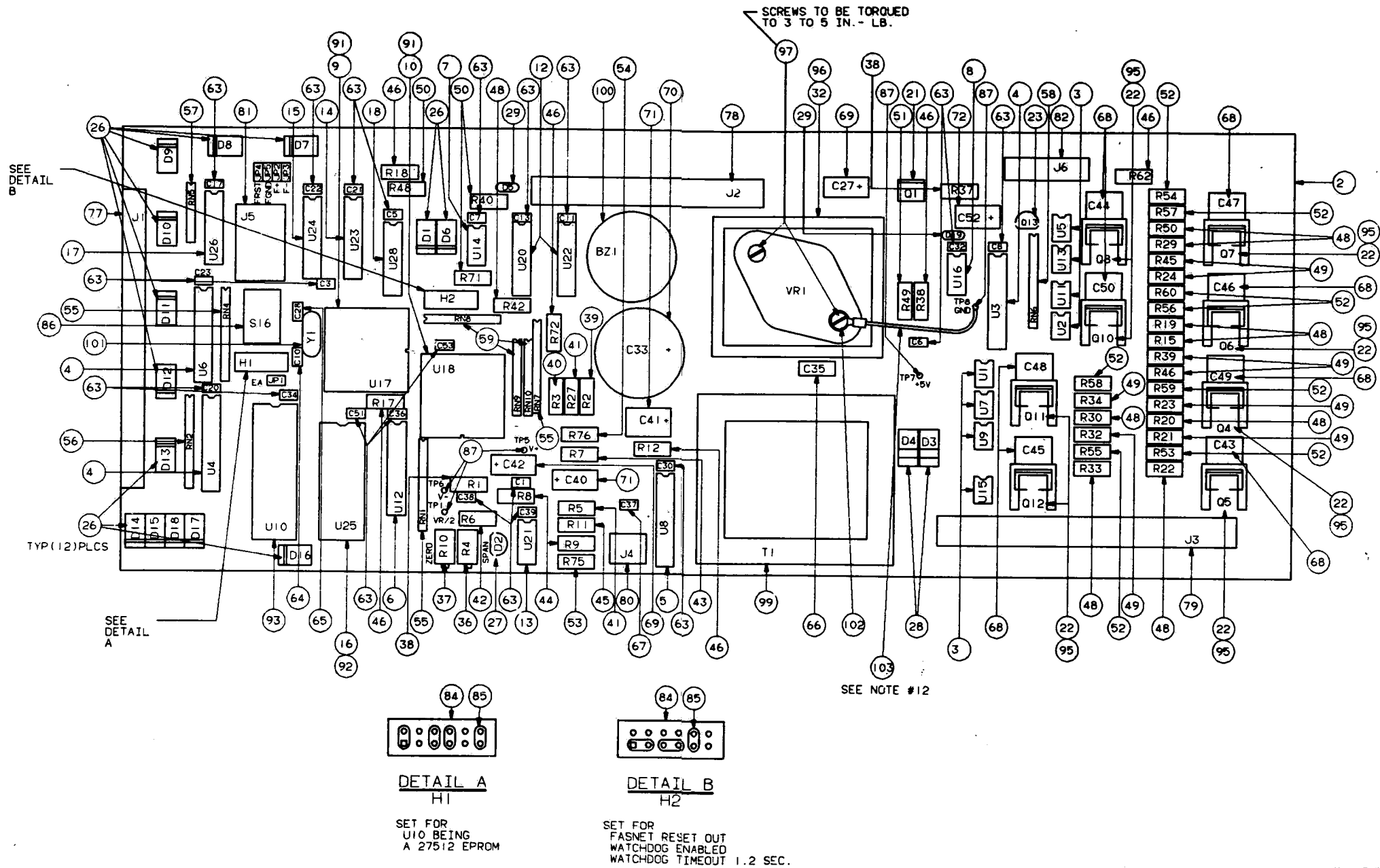
B- 1

B- 2

Control PC Board Assembly  
Part 3 of 4

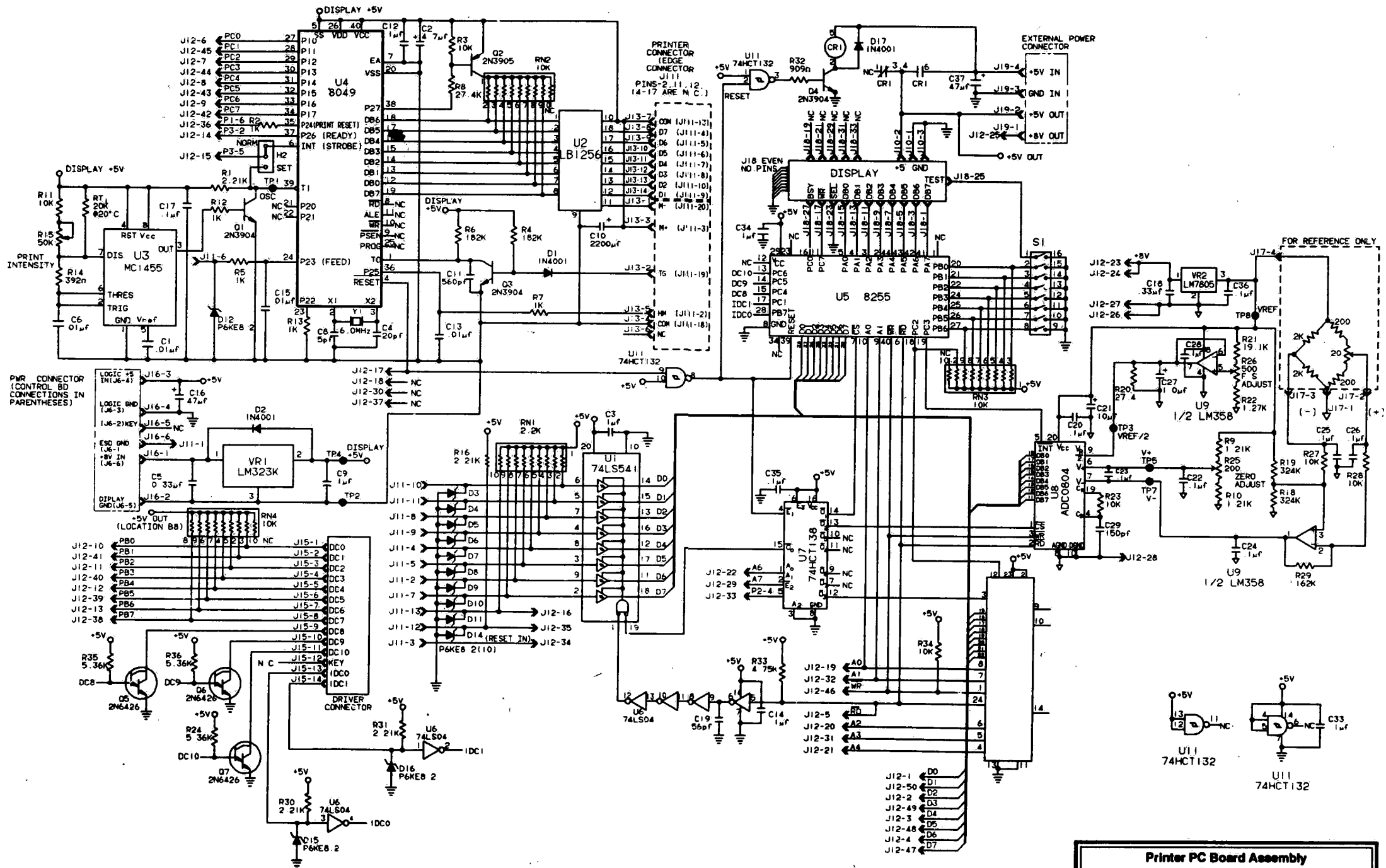
11/3/89

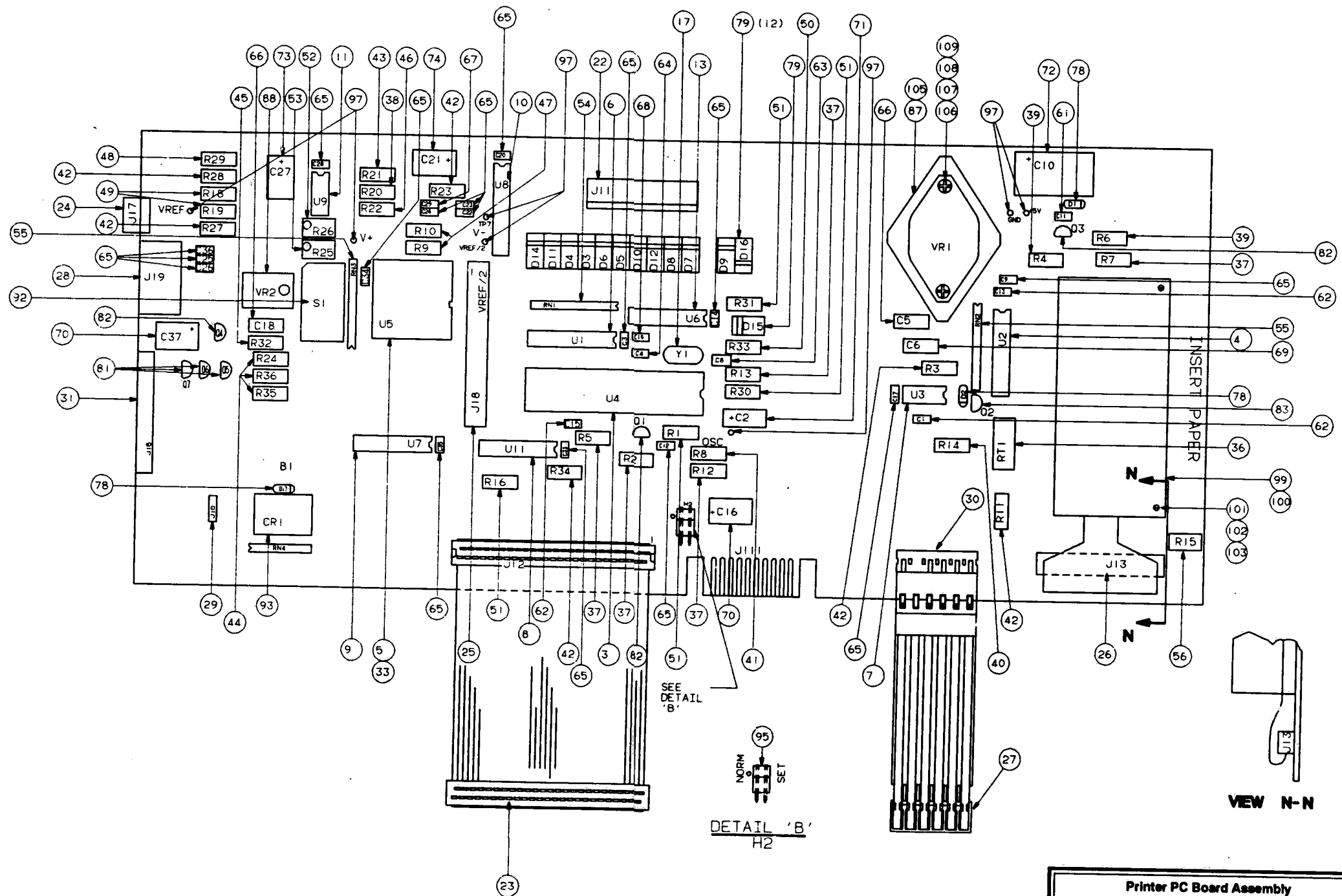
P- 146653-201

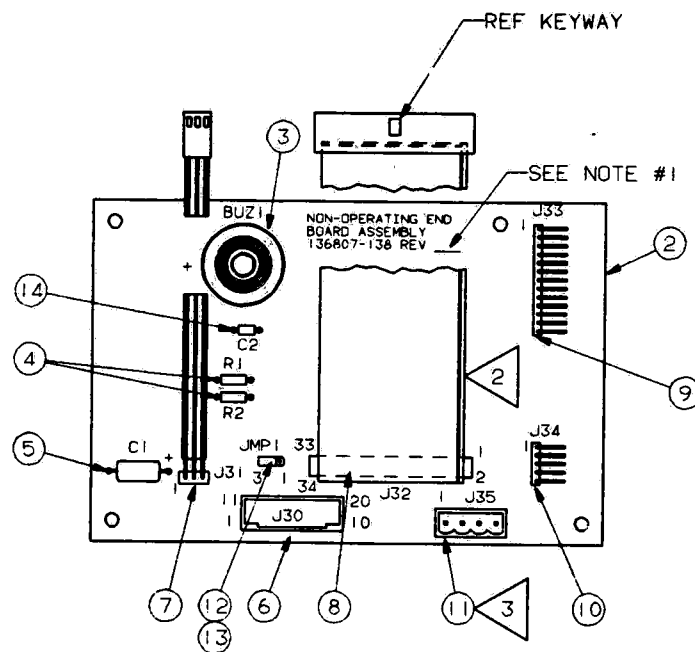






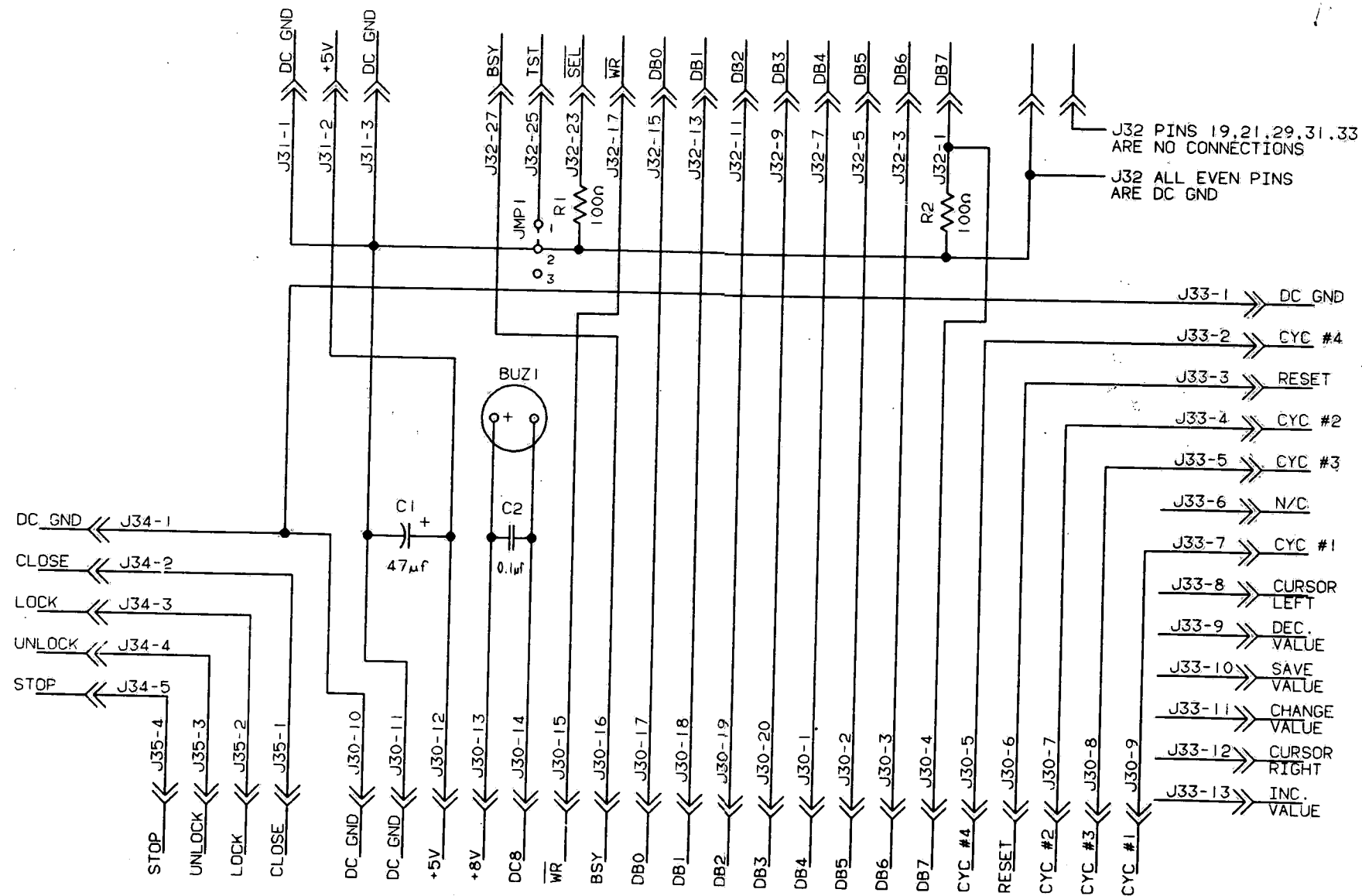






NOTE:

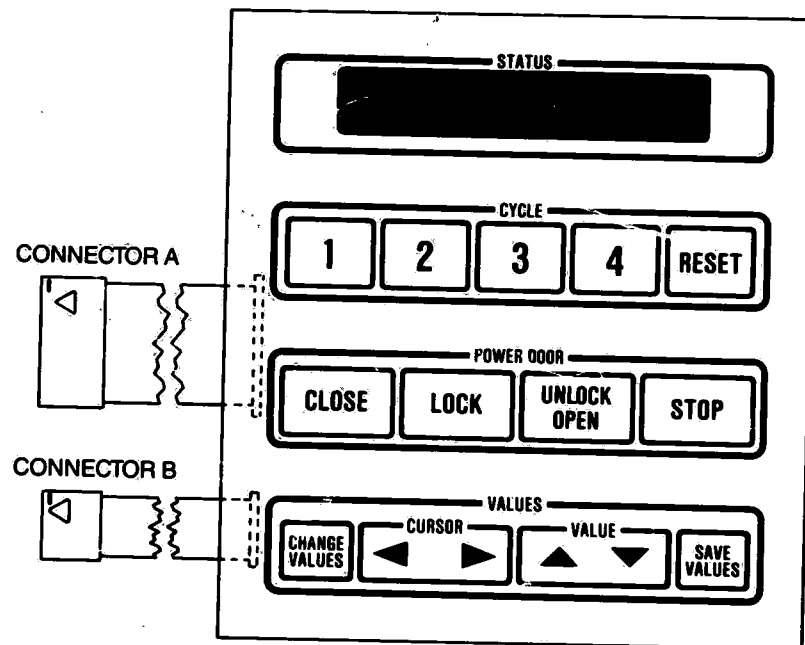
1. STAMP LATEST REVISION NUMBER USING APPROX. 14 PT. WHITE LETTERING.
2. BLUE LINE ON RIBBON CABLE TO BE POSITIONED TOWARD "1 & 2" NOTATION ON PC BOARD
3. HEADER (ITEM #11, J35) MUST BE POSITIONED PER THIS DWG TO ALLOW FOR PROPER CONNECTION OF MATING PART



B- 13

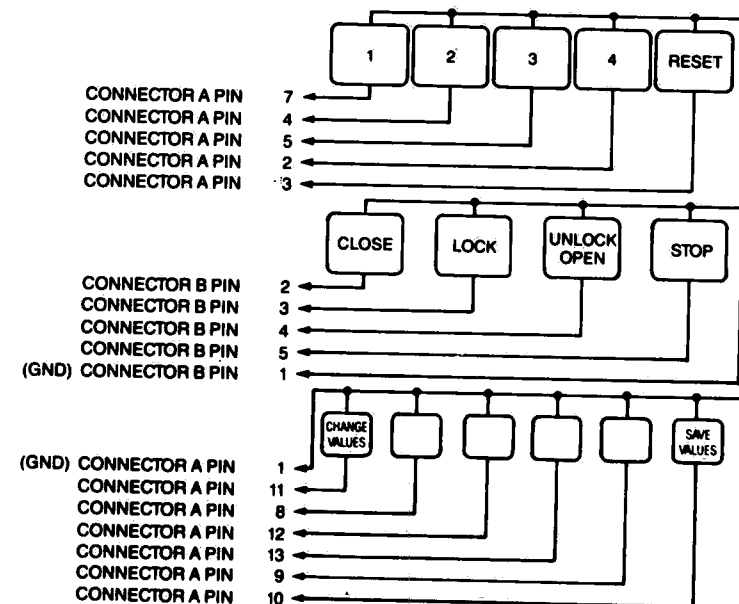
B- 14

Non - Operating End PC Board Assembly  
Part 2 of 2  
11/7/88 P- 136807-138



# NOTES:

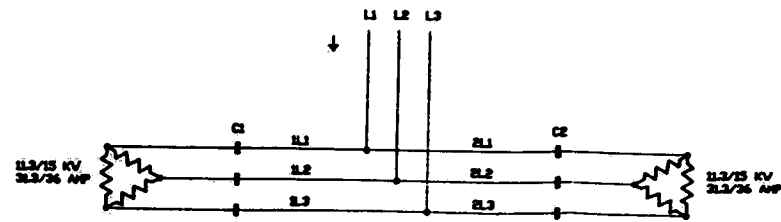
1. DISPLAY PANEL TO BE BLACK VELVET POLYCARBONATE SUB SURFACE PRINTED.
2. ALL GRAPHICS TO BE WHITE EXCEPT WHERE INDICATED.
3. INNER BORDERS AND "CURSOR" AND "VALUE" TO BE PMS 326.
4. ALL 9 REMAINING INNER BORDERS TO BE PMS 444.
5. "RESET" TO BE PMS 444.
6. DISPLAY WINDOW TO BE NON-TEXTURED. TO BE USED WITH 2 x 20 VACUUM FLUORESCENT DISPLAY. WINDOW TINT COLOR SAMPLE TO BE SUPPLIED BY AMSCO INDUSTRIAL DESIGN.
7. ADHESIVE APPLIED TO BACK SIDE EXCEPT WHERE INDICATED.
8. ARTWORK #AC-234; REV.0; DATE: 03-20-87; TO BE SUPPLIED BY AMSCO INDUSTRIAL DESIGN.
9. ALL EXPOSED EDGES MUST BE HEAT SEALED.



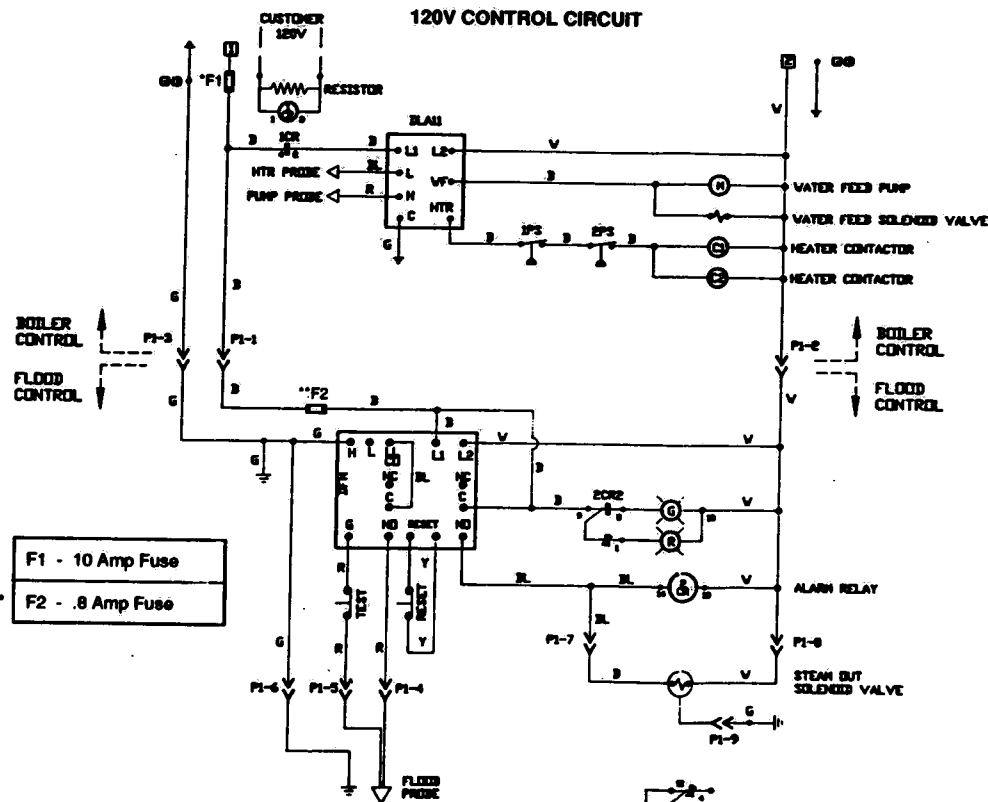




208/240V 3PH 60HZ



120V CONTROL CIRCUIT



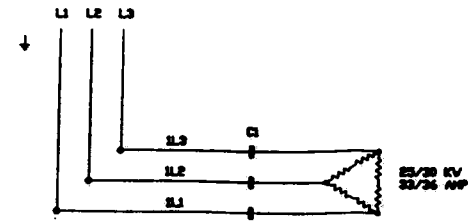
- \* F1 - 10 Amp Fuse
- \*\* F2 - .8 Amp Fuse

WIRE COLORS

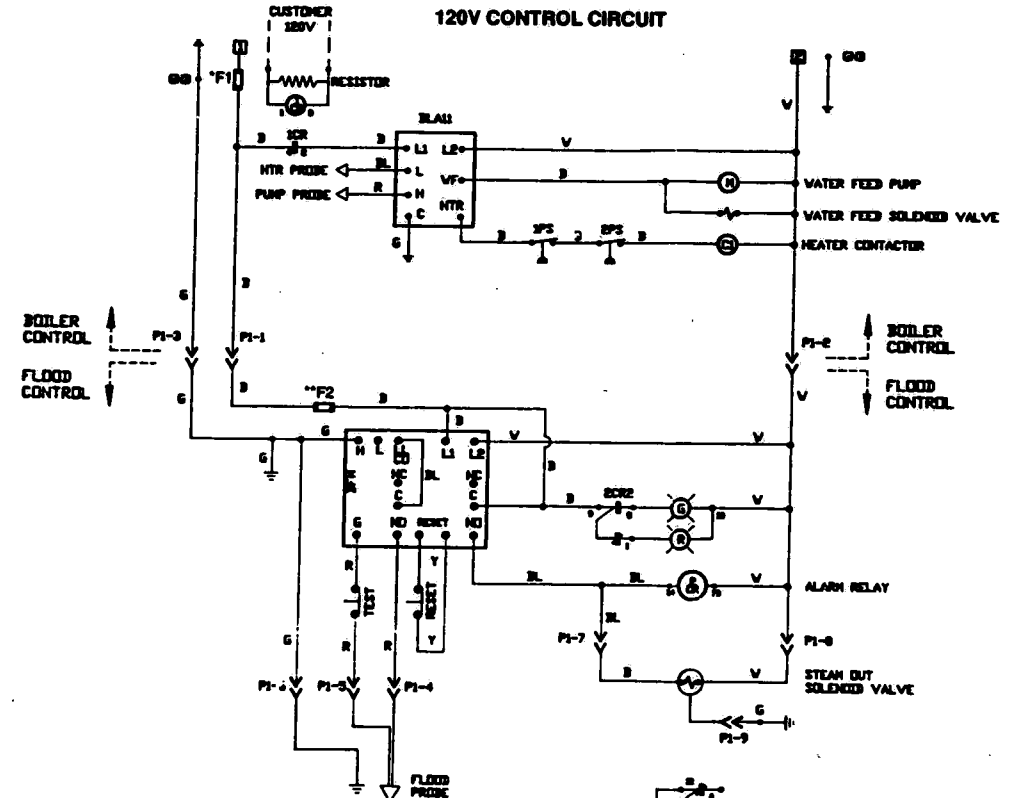
BLACK B  
WHITE V  
GREEN G  
RED R  
YELLOW Y  
BLUE BL

C- 7

440/480V 3PH 60HZ



120V CONTROL CIRCUIT



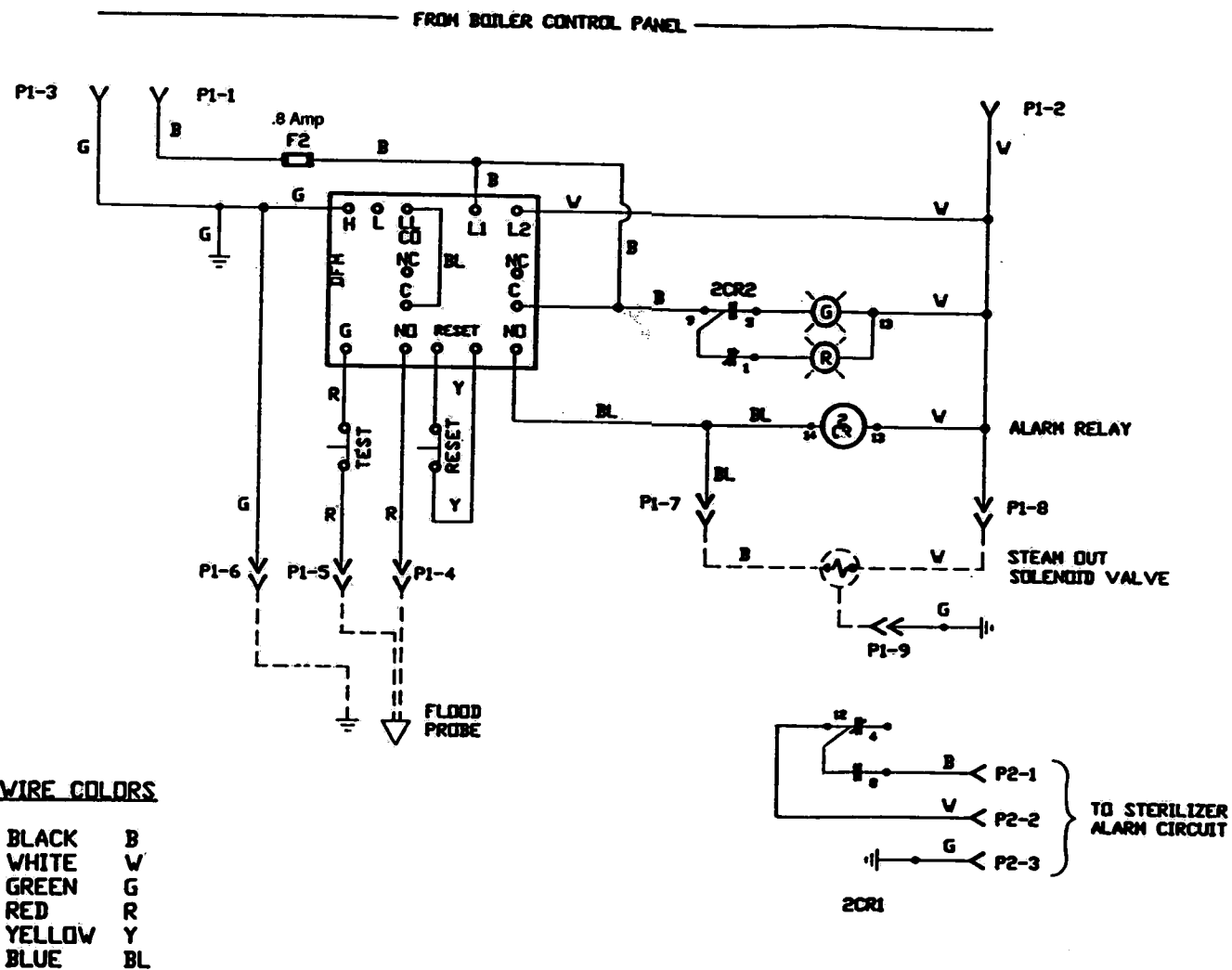
WIRE COLORS

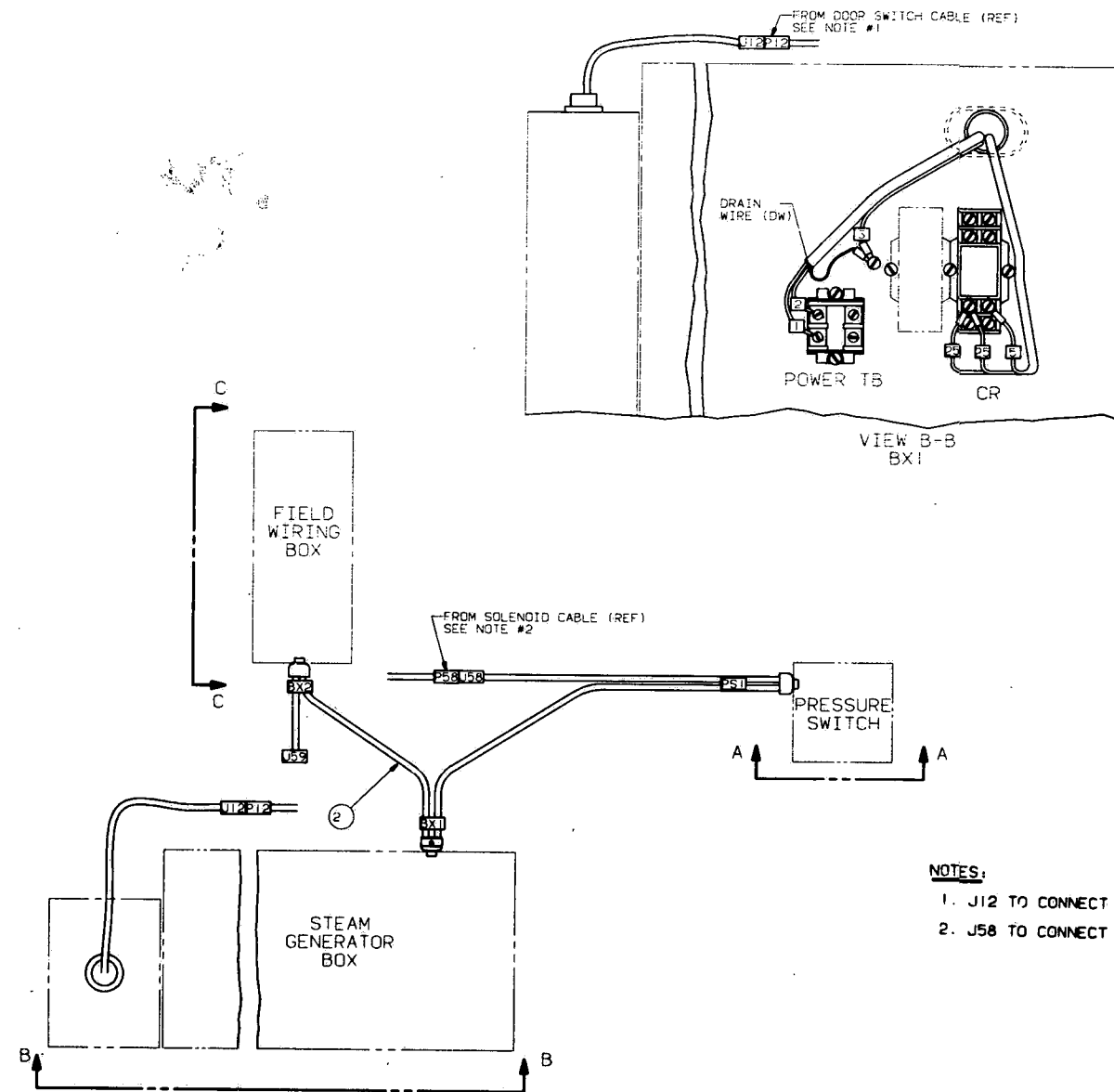
BLACK B  
WHITE V  
GREEN G  
RED R  
YELLOW Y  
BLUE BL

C- 8

Optional CHS Series Electric Steam Generator Schematic

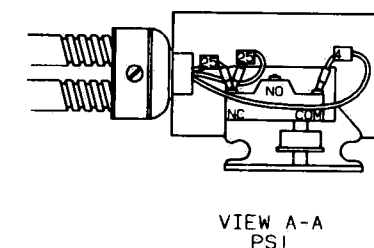
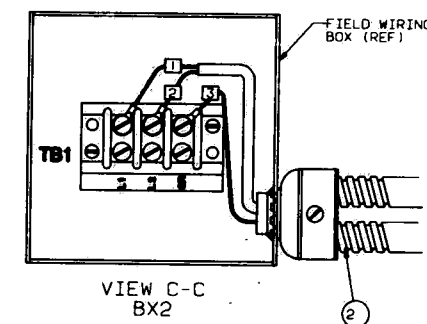






C- 11

WIRE LIST					
NO	COLOR	FROM	CONN. METH	TO	CONN. METH
1	RED	TB1-1 (BX2)	#8 RING	PWR TB (BX1)	TINNED
2	BLK	TB1-2 (BX2)	#8 RING	PWR TB (BX1)	TINNED
3	BLK	TB1-3 (BX2)	#8 RING	PWR TB (BX1)	TINNED
4	BLK	P58 REF	-----	PSI-COM	#8 RING
5	WHT	P58 REF	-----	CR (BX1)	#6 SPADE
25	YEL	P58 REF	-----	PSI-NC	#8 RING
25	YEL	PSI-NC	#8 RING	CR (BX1)	#6 SPADE
25	YEL	CR (BX1)	#6 SPADE	P59 REF	-----
DW	BARE	-----	-----	GND SCR (BX1)	#10 RING



**NOTES:**

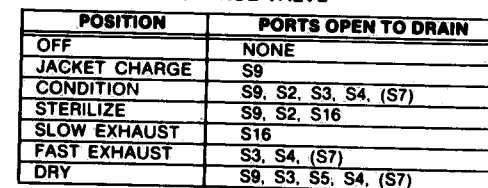
1. J12 TO CONNECT TO P12 ON DOOR SWITCH CABLE
2. J58 TO CONNECT TO P58 ON SOLENOID CABLE

**INACTUATED**  
04-06-89

**Wiring Assembly**  
**Optional Electric Steam Generator**  
4/6/89 P- 146653-657

C- 12





**NOTE: ALL ADJUSTMENTS ARE  
NOMINAL FACTORY SETTINGS**

**Piping Schematic - Gravity**  
**12/88**

WIRE NO.	COLOR	FROM	TO	REMARKS
1	RED	TB1-1 (BX2)	PWR TB (BX1)	ELEC. STM. GEN. UNIT ONLY
1	RED	TB1-1	LINE 1	
1	RED	P57-1	LINE 1	
2	BLACK	TB1-2 (BX2)	PWR TB (BX1)	ELEC. STM. GEN. UNIT ONLY
2	BLACK	TB1-2	LINE 2	
2	BLACK	P57-2	LINE 2	
3	BLACK	TB1-3 (BX2)	PWR TB (BX1)	ELEC. STM. GEN. UNIT ONLY
3	GREEN	TB1-3	GND SCR	
3	GREEN	P57-3	GND	
4	BLACK	P58 REF	PSI-COM	ELEC. STM. GEN. UNIT ONLY
4	BLACK	SW1-4	LOAD 1	
4	BLACK	P54-22	LOAD 1	
4	BLACK	----	----	
4	YELLOW	P58-6	P54-22	
4	BLACK	----	P54-22	
5	WHITE	P58 REF	CR (BX1)	ELEC. STM. GEN. UNIT ONLY
5	WHITE	P58-2	P54-15	
5	WHITE	P54-15	LOAD 2	
5	WHITE	SW1-1	LOAD 2	
5	WHITE	----	----	
5	WHITE	----	P54-15	
6	BLACK	----	----	
6	BLACK	SW1-5	TB2-2	
6	BLACK	TB2-1	F3-3 AMP	
6	BLACK	TB2-2	F2-1/4 AMP	
6	BLACK	TB2-2	F1-2 AMP	
7	BLACK	----	----	
7	BLACK	PAPER TAKE-UP MTR	#7 FREE HANGING	
7	BLACK	#7 FREE HANGING	TB2-6	
7	BLACK	F1-2 AMP	TB2-6	
7	BLACK	PWR SUP TRANS LUG 4	TB2-6	
8	BLACK	P3-1	P3-3	
8	BLACK	P3-1	----	
8	BLACK	P3-1	F2-1/4 AMP	
9	BLACK	P3-5	----	
9	BLACK	F3-3 AMP	P3-5	
10	WHITE	----	----	
10	WHITE	P3-2	P3-4	
10	WHITE	----	----	
10	WHITE	----	----	
10	WHITE	P3-4	----	
10	WHITE	----	----	
10	WHITE	SPLICE CONN.	SW3-COM	
10	WHITE	SPLICE CONN.	TB2-5	
10	WHITE	PWR SUP TRANS LUG 1	TB2-4	
10	WHITE	SPLICE CONN.	SW1-2	
10	WHITE	TB2-5	CR1-4	
11	RED	P53-REF	LSF-NO	
11	RED	P1-1	P53-1	TWISTED PAIR
47	BLACK	P1-4	P53-2	TWISTED PAIR
11	RED	P53-1	LSF	TWISTED PAIR
47	BLACK	P53-2	LSF	TWISTED PAIR
12	GRAY	P53-3	LSR	20 CONDUCTOR CABLE -SD ONLY
12	GRAY	P53-3	LSF	20 CONDUCTOR CABLE -SD ONLY
12	GRAY	P53-REF	LSF-COM	GRAVITY ONLY

D- 3

WIRE NO.	COLOR	FROM	TO	REMARKS
12	GRAY	P53-REF	LSR-NO	DD ONLY
12	GRAY	P1-2	P53-3	
12	GRAY	P53-REF	LSR-NO	DD ONLY
15	RED	P53-18	P8-1	TWISTED PAIR
16	BLACK	P53-19	P8-2	TWISTED PAIR
15	RED	P53-18	P4-1	TWISTED PAIR
16	BLACK	P53-19	P4-2	TWISTED PAIR
17	RED	P53-20	P11-1	TWISTED PAIR
20	BLACK	P53-21	P11-2	TWISTED PAIR
17	RED	P17-1	P53-20	TWISTED PAIR
20	BLACK	P17-4	P53-21	TWISTED PAIR
18	BLACK	----	----	
18	WHITE	SW3-NC	#18 FREE HANGING	
18	WHITE	#18 FREE HANGING	PAPER TAKE-UP MTR	
19	RED	P53-22	P11-5	TWISTED PAIR
21	BLACK	P53-23	P11-6	TWISTED PAIR
19	RED	P53-22	P17-3	TWISTED PAIR
21	BLACK	P53-23	P17-2	TWISTED PAIR
25	YELLOW	P58 REF	PSI-NC	ELEC. STM. GEN. UNIT ONLY
25	YELLOW	PSI-NC	CR (BX1)	ELEC. STM. GEN. UNIT ONLY
25	YELLOW	CR (BX1)	P58 REF	ELEC. STM. GEN. UNIT ONLY
25	YELLOW	P58-3	P54-7	
25	YELLOW	P3-16	P54-7	
30	YELLOW	P58-4	P54-8	
30	YELLOW	P3-17	P54-8	
31	GRAY	P53-35	P19-1	
31	BLACK 1	P53-35	P30-13	20 CONDUCTOR CABLE -DD ONLY
32	GRAY	P53-36	P15-13	
33	GRAY	P53-39	P15-14	
33	RED 1	P53-39	P30-16	20 CONDUCTOR CABLE -DD ONLY
34	GRAY	P14-1	P53-46	
35	GRAY	P14-2	P53-45	
36	RED	P53-10	P12-1	TWISTED PAIR
51	BLACK	P53-11	P12-2	TWISTED PAIR
36	RED	P1-3	P53-10	TWISTED PAIR
51	BLACK	P1-8	P53-11	TWISTED PAIR
37	RED	P1-5	P53-14	TWISTED PAIR
52	BLACK	P53-15	P1-8	TWISTED PAIR
47	GRAY	LSF	LSR	20 CONDUCTOR CABLE -DD ONLY
47	BLACK	P53-REF	LDF-COM	
47	GRAY	LSF-COM	LSR-COM	DD ONLY
48	BLACK 2	P53-36	P30-12	20 CONDUCTOR CABLE -DD ONLY
48	GRAY	P53-36	P19-2	
50	GRAY	P53-REF	LSF-NC	
50	GRAY	LSF	LSR	20 CONDUCTOR CABLE -DD ONLY
50	GRAY	P53-4	LSF	20 CONDUCTOR CABLE -DD ONLY
50	GRAY	P53-4	LSF	20 CONDUCTOR CABLE -SD ONLY
50	GRAY	P53-4	----	
50	GRAY	P53-4	CR1-14	
50	GRAY	LSF-NC	LSR-NC	DD ONLY
60	GRAY	P1-6	CR1-1	
60	GRAY	P1-6	----	
61	WHITE	P3-6	----	

D- 4

Master Wire List - 12/88  
Part 1 of 2

WIRE NO.	COLOR	FROM	TO	REMARKS
61	WHITE	P3-6	CR1-12	
62	RED 2	P53-5	P30-9	20 CONDUCTOR CABLE -DD ONLY
62	GRAY	P53-5	P1-7	
63	BLACK 3	P53-6	P30-7	20 CONDUCTOR CABLE -DD ONLY
63	GRAY	P53-6	P1-9	
64	RED 3	P53-7	P30-8	20 CONDUCTOR CABLE -DD ONLY
64	GRAY	P53-7	P1-10	
65	BLACK 4	P53-25	P30-18	20 CONDUCTOR CABLE -DD ONLY
65	GRAY	P53-25	P15-2	
66	RED 4	P53-26	P30-19	20 CONDUCTOR CABLE -DD ONLY
66	GRAY	P53-26	P15-3	
67	BLACK 5	P53-27	P30-20	20 CONDUCTOR CABLE -DD ONLY
67	GRAY	P53-27	P15-4	
68	RED 5	P53-28	P30-1	20 CONDUCTOR CABLE -DD ONLY
68	GRAY	P53-28	P15-5	
69	BLACK 6	P53-29	P30-2	20 CONDUCTOR CABLE -DD ONLY
69	GRAY	P53-29	P15-6	
70	RED 6	P53-30	P30-3	20 CONDUCTOR CABLE -DD ONLY
70	GRAY	P53-30	P15-7	
71	BLACK 7	P53-31	P30-15	20 CONDUCTOR CABLE -DD ONLY
71	GRAY	P53-31	P15-8	
72	GRAY	P53-27	TB2-7	
72	GRAY	P15-4	TB2-7	
72	GRAY	P53-32	----	
72	GRAY	P15-9	----	
73	GRAY	P19-4	TB2-11	
73	GRAY	TB2-11	CR1-13	
73	GRAY	PWR SUP OUTPUT 1 (+)	TB2-11	
73	GRAY	P19-4	----	
73	GRAY	----	----	
74	RED 7	P53-8	P30-5	20 CONDUCTOR CABLE -DD ONLY
74	GRAY	P1-12	P53-8	
75	BLACK 10	P53-40	P30-11	20 CONDUCTOR CABLE -DD ONLY
75	GRAY	P53-39	P53-37	20 CONDUCTOR CABLE -SD ONLY
75	BLACK 8	P53-37	P30-10	20 CONDUCTOR CABLE -DD ONLY
75	GRAY	PWR SUP OUTPUT (-)	TB2-15	
75	GRAY	P1-11	TB2-15	
75	GRAY	P19-3	TB2-15	
75	GRAY	P53-37	TB2-14	
75	GRAY	P53-17	TB2-14	
75	GRAY	P19-3	CR1-9	
75	GRAY	P53-40	TB2-14	
75	GRAY	P53-17	----	
75	GRAY	P19-3	----	
75	GRAY	P53-37	----	
75	GRAY	P1-11	----	
75	GRAY	----	----	

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WIRE NO.	COLOR	FROM	TO	REMARKS
75	GRAY	P53-40	----	
76	RED	P53-13	P11-3	TWISTED PAIR
80	BLACK	P53-16	P11-4	
76	GRAY	PWR SUP OUTPUT 2(+)	TB2-9	
76	GRAY	P53-12	TB2-9	
76	GRAY	P53-13	TB2-9	
76	GRAY	P53-12	----	
76	GRAY	P53-13	----	
77	GRAY	P1-14	SW2-3	
77	GRAY	P1-14	----	
78	GRAY	P1-15	SW2-2	
78	GRAY	P1-15	----	
79	GRAY	P1-16	SW2-1	
79	GRAY	P1-16	----	
80	GRAY	PWR SUP OUTPUT 2(-)	TB2-10	
80	GRAY	TB2-10	P53-16	
80	GRAY	P53-16	----	
83	RED 8	P53-9	P30-6	20 CONDUCTOR CABLE -DD ONLY
83	GRAY	P1-13	P53-9	
84	GRAY	P53-28	TB2-8	
84	GRAY	P15-5	TB2-8	
84	GRAY	P53-33	----	
84	GRAY	P15-10	----	
85	BLACK 9	P53-24	P30-17	20 CONDUCTOR CABLE -DD ONLY
85	GRAY	P53-24	P15-1	
86	RED 9	P53-34	P30-14	20 CONDUCTOR CABLE -DD ONLY
86	GRAY	P53-34	P15-11	
106	WHITE	SPLICE CONN.	TB2-4	
106	WHITE	S4	S5	GRAVITY ONLY
106	WHITE	S5	S3	GRAVITY ONLY
106	WHITE	S3	P54-25	GRAVITY ONLY
106	WHITE	P58-7	P54-2	
106	WHITE	S-7	S-4	VACAMATIC ONLY
106	WHITE	S-4	S-1	VACAMATIC ONLY
106	WHITE	S-1	S-2	VACAMATIC ONLY
106	WHITE	S-2	S-3	VACAMATIC ONLY
106	WHITE	----	P54-25	
106	WHITE	S-4	S-7	VACAMATIC ONLY
106	WHITE	S-4	S-1	VACAMATIC ONLY
106	WHITE	S-1	S-3	VACAMATIC ONLY
106	WHITE	S-3	P54-23	VACAMATIC ONLY
106	WHITE	----	P54-23	
106	WHITE	----	P54-2	
106	WHITE	----	P54-4	
106	WHITE	----	----	
106	WHITE	S-4	S-5	GRAVITY ONLY
106	WHITE	S-5	S-3	GRAVITY ONLY
106	WHITE	----	P54-27	
107	YELLOW	S-1	P54-REF	VACAMATIC ONLY
107	YELLOW	S-1	P54-6	VACAMATIC ONLY
107	YELLOW	P58-1	P54-6	GRAVITY ONLY
107	YELLOW	P3-13	P54-6	
108	YELLOW	P3-7	P54-18	
108	YELLOW	S-2	P54-REF	VACAMATIC ONLY

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WIRE NO.	COLOR	FROM	TO	REMARKS
108	YELLOW	S-2	P54-18	
108	YELLOW	S-2	P54-REF	GRAVITY ONLY
109	YELLOW	P3-8	P54-19	
109	YELLOW	S-3	P54-19	
109	YELLOW	S-3	P54-REF	VACAMATIC ONLY
109	YELLOW	S-3	P54-REF	GRAVITY ONLY
110	YELLOW	S-4	P54-REF	GRAVITY ONLY
110	YELLOW	P3-10	P54-17	
110	YELLOW	S-4	P54-17	
110	YELLOW	S-4	P54-REF	VACAMATIC ONLY
111	YELLOW	P3-14	P54-5	
111	YELLOW	P58-8	P54-5	GRAVITY ONLY
111	YELLOW	S-7	P54-REF	VACAMATIC ONLY
111	YELLOW	S-7	P54-5	VACAMATIC ONLY
111	YELLOW	S-7	P54-5	VACAMATIC ONLY
136	WHITE	P3-9	P54-1	
136	WHITE	P3-15	P54-24	
136	WHITE	P3-15	P54-26	
136	WHITE	P3-12	P54-3	
136	WHITE	P3-12	P54-28	
136	WHITE	P3-11	P54-20	
136	WHITE	S-2	P54-24	
136	YELLOW	S-2	P54-REF	GRAVITY ONLY
136	WHITE	S-3	P54-REF	VACAMATIC ONLY
153	YELLOW	S-5	P54-REF	GRAVITY ONLY
153	YELLOW	S-5	P54-20	GRAVITY ONLY
153	YELLOW	P58-1	P54-20	VACAMATIC ONLY
153	YELLOW	P3-11	P54-20	
BLK		P53-50	P5-4	
RED		P53-49	P5-3	
GRN		P53-48	P5-2	
YEL		P53-47	P5-1	
DW	BARE	----	GND SCR (BX1)	ELEC. STM. GEN. UNIT ONLY
DRAIN WIRE	----	P53-41	P30	20 CONDUCTOR CABLE -DD ONLY

Master Wire List - 12/88  
Part 2 of 2

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## SECTION 7

### Component Repair, Replacement and Adjustment

7

#### 7.1 GENERAL

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

#### 7.2 PREPARING CONTROL FOR SERVICE

The Stage 2 control pivots forward and down to a horizontal position for easy service (see Figures 7-1 and 7-2).

1. Remove the four hex socket screws (two at bottom and two at top) holding control panel in place. Set the front panel aside.
2. Using one hand to support the control assembly, remove the two hex socket screws (upper right and upper left) holding it in place.
3. Carefully lower control assembly forward and downward until it stops in a horizontal position. The control has stops to support it in this position.

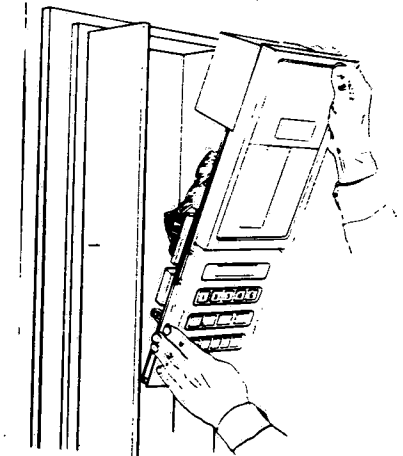


FIGURE 7-1 - Preparing Control for Service

#### 7.3 PRINTER

The lifetime of the printer is approximately 500,000 lines of print, depending on the darkness used. If a row of dots is missing or faint, check the printhead. . . it may merely be dirty. To test, cut a piece of "bond" paper to the width of the thermal paper and push it through the printer several times. The coarseness of the bond paper may restore the printer to normal.

##### Printer Replacement

Note: Refer to Figures 8-12 and 8-13 (Section 8) for the following procedure.

1. Lower control to the service position. Unplug all plugs from the Control PC board. Remove Control PC board, collecting all screws and standoffs.
2. Unplug all plugs from the Printer PC board. Remove the Printer PC board from its standoffs. Do not unplug or remove the Display module from the Printer PC board.
3. Remove and retain the two 1-64 screws and nuts holding printer to the PC board. Unplug the printer ribbon cable from the PC board.
4. Mount the new printer to the Printer PC board. Plug the printer ribbon cable into the jack on the board.

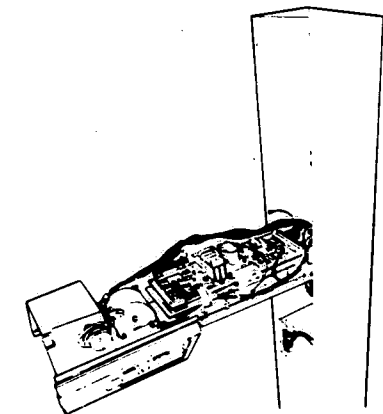


FIGURE 7-2 - Control in Service Position

5. Reinstall the Printer PC board. Reconnect all plugs.
6. Reinstall the Control PC board. Reconnect all plugs.
7. Adjust the printout darkness as described in the following procedure.

### Printout Darkness Adjustment

For maximum life, new printers must have the printout darkness adjusted. The control contains a "Printer Frequency," i.e., printer-darkness, adjustment routine. Adjust the printer-darkness as follows:

1. After printer replacement and with power OFF, unplug P14 from the Printer PC board and install the shorting jumper plug (special tool P-755715-866). (If the jumper plug is not available, unplug P14 and CAREFULLY short the two pins on the board together.) Turn power ON.
2. Enter the Printer Frequency routine by setting Dip switch #4 positions on both the Control and Printer PC boards to the ON position and pressing the RESET button.
3. Adjust R15 (accessible behind the platen) on the Printer PC board (Figure 7-3) while watching the display prompt: . .

\* SET PRINTER FREQ  
\* FREQ IS XX.X KHZ

XX.X is actual printer frequency.

4. Printer head resistance will be labeled on the printer as either A, B or C. Set printer frequency (according to letter on printer) as shown in Table 7-1.
5. Return Dip switch #4 settings on the Control and Printer PC boards to their normal (OFF) position and press RESET.
6. Position power switch to OFF. Remove the shorting jumper and reinstall the P14 cable.

### Printer Lubrication

If printer tends to drag, wipe guide shaft clean and apply Nyogel-744 lubricant (P-764321-985).

TABLE 7-1 - PRINTER HEAD RESISTANCE		
AMBIENT TEMP (°F)	PRINTER LETTER	DISPLAYED FREQUENCY
65	A	11.3 kHz
	B	12.4 kHz
	C	13.6 kHz
70	A	11.6 kHz
	B	12.7 kHz
	C	14.0 kHz
75	A	11.9 kHz
	B	13.0 kHz
	C	14.4 kHz
80	A	12.3 kHz
	B	13.4 kHz
	C	14.8 kHz
85	A	12.6 kHz
	B	13.8 kHz
	C	15.2 kHz

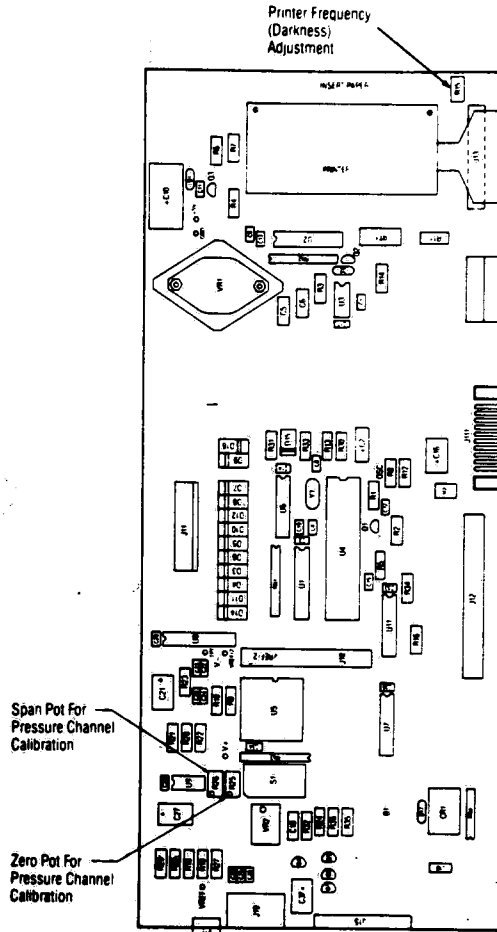


FIGURE 7-3 - Printer PC Board

### 7.4 DISPLAY MODULE

#### Self Test

The vacuum-fluorescent display module is tested by setting Dip switch #1 on the Printer PC board to the ON position. This invokes the display module's self-test feature, independent of the control. The display module displays its character set on six screens.

#### Replacement

1. Remove the Printer PC board as for printer replacement.

2. Unplug the three-pin power connector. Unplug the 34-pin data cable from display module and remove module from the four standoffs.
3. Plug power connector into new display module. Plug 34-pin data cable into new module. Mount new display and reinstall Printer PC board.

### 7.5 SERVICE TEST ROUTINE

The Service Test Routine allows service personnel to set certain cycle parameters, operate solenoid valves for test purposes, and check inputs to the control for proper operation. The sequence of the routine is:

1. Check/change cycle parameters.
2. Check AC outputs (solenoid valves).
3. Check Limit Switch and touch pad inputs.
4. Check Dip Switches.

To enter the Service Test mode, set Dip switch #4 on the Printer PC board to ON and press RESET.

If you are not familiar with changing settings using the CURSOR LEFT and RIGHT keys, and the VALUES UP and DOWN key, review the procedure for Changing Values in Section 2.3.

#### Changing Factory Settings

Do not change cycle pressure and vacuum setpoints, number of conditioning pulses, or too-long-in-step alarms unless the changed cycle has been qualified for consistent safety and sterilization. The standard factory settings are those qualified by AMSCO for consistent sterilization and safety.

If an EPROM IC on the Control PC board is changed, the settings should ALWAYS be checked, particularly if the revision level of the new IC is different (higher) than the old IC. Parameter settings are usually scrambled when changing revision levels.

After setting Dip switch #4 on the Printer PC board to ON and pressing RESET, the following is printed:

Note: The "Standard Settings" indicated are factory set and are reloaded into memory when the memory is cleared with the "Manufacturing Burn-in" function (see Section 7.15).

• EAGLE 3000 GRAVITY • ← or Vacumatic, as applicable  
• E2GA00.ABS 7/10/88 • ← Rev level/date (may vary)  
• SERVICE TEST 10:32:08A ← Current time  
RUN TIME IS 00000.2 hrs ← Run time since installation  
CYCLE COUNT IS 00000367 ← Current cycle count  
ACCESS CODE IS 1234 ← Current access code  
PUSH CVTB TO CHANGE ← Change Values touch pad  
PUSH SVTB TO ADVANCE ← Set Values touch pad

Step through each parameter display by pressing the CHANGE VALUES touch pad. Make changes using the cursor and UP and DOWN arrow pads. When done with changes, press SAVE VALUES touch pad, wait for the values printout to complete, then return Dip switch #4 on the Printer PC board to OFF and press RESET.

TABLE 7-2 - CYCLE PARAMETER DEFINITIONS

Parameter	Definition
TS-1	operator-set sterilizing temperature.
TLIC	Too Long in Charge, too long from start of charge to reach sterilizing set temperature, or 26 psig setpoint PS-1 (vac only).
TLIE	Too Long in Exhaust, too long to reach P3 setpoint (3 psi) in either prevac/express conditioning or exhaust phase.
TLIV	Too Long in Vacuum (evacuation - Vacumatic only), too long to reach V1 setpoint (10.0 in.Hg) in either prevac/express conditioning or dry phase.
P1	Pressure setpoint for prevac/express steam pulse in Condition phase, 26.0 psi. Same as Eagle/Printcon PS-1.
V1	Vacuum setpoint for prevac/express vacuum pulse-in Condition phase, 10.0 in.Hg. Same as Eagle/Printcon VS-1.
P2	Pressure setpoint for Liquids cycle, end of vent, or cycle complete on other cycles with no dry time, 1.0 psi. Same as Eagle/Printcon PS-2.
P3	Pressure setpoint for all cycles, begin Liquids fast exhaust, begin dry phase, others, 3.0 psig. Same as Eagle/Printcon PS-3.
Overdrive	S2 solenoid on/off control during sterilize, same as TS-2 setpoint for Eagle/Printcon. TS-2 = TS-1 + Overdrive.
Undertemp	Number of degrees below TS-1.
Overtemp	Number of degrees above TS-1.

Cycle parameters are defined in Table 7-2 and are more fully discussed in Section 3. Defaults are listed in Section 6, Table 6-4.

### Setting Cycle Parameters

#### • DISPLAY 1

SERVICE TEST  
GRAVITY ← or VACUMATIC

Press CHANGE VALUES to continue.

#### • DISPLAY 2

CYCLE CNT = 00000003  
RUN TIME = 00194.6

SETTING	FUNCTION	STANDARD SETTING
Cycle count	Cycle count log	As required
Run time	Run time log	As required

Run time represents the total time the sterilizer control has been powered up since build, and is extremely useful as a reliability indication.

Make changes as required, then press CHANGE VALUES to continue.



# • DISPLAY 3

## SERVICE SETTABLE VALUES

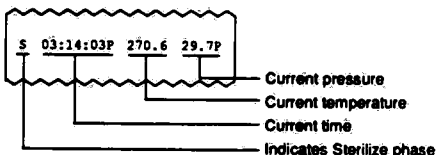
Press CHANGE VALUES to continue.

# • DISPLAY 4

C1PI=01m C3PI=05m  
C2PI=01m C4PI=05m

SETTING	FUNCTION	STANDARD SETTING
C1PI	Cycle 1 print interval	See below
C2PI	Cycle 2 print interval	See below
C3PI	Cycle 3 print interval	See below
C4PI	Cycle 4 print interval	See below

Cycle print interval refers to the frequency of status printing during the STERILIZE phase only. The "status line" has the format:



The print interval standard settings depend on the cycle type:

- Prevacuum = 1 min.
- Express = 1 min.
- Flash = 1 min.
- Gravity = 5 min.
- Liquids = 5 min.

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 5

TLIC=20m TLIV=20m  
TLIE=05m

SETTING	FUNCTION	STANDARD SETTING
TLIC	Too Long in Charge	20 min.
TLIE	Too Long in Exhaust	5 min.
TLIV	Too Long in Evacuation	20 min.

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 6

(PREVAC Cycle, Vacumatic Sterilizer Only)

PREVAC: P1=26.0psi  
PULSES=04 V1=10.0in

SETTING	FUNCTION	STANDARD SETTING
P1	PS-1 setpoint	26.0 psig
PULSES	No. of Condition pulses	4
V1	VS-1 setpoint	10.0 in.Hg

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 7

(EXPRESS Cycle, Vacumatic Sterilizer Only)

EXPRESS: P1=26.0psi  
PULSES=02 V1=10.0in

SETTING	FUNCTION	STANDARD SETTING
PULSES	No. of Condition pulses	2
P1	PS-1 setpoint	26.0 psig
V1	VS-1 setpoint	10.0 in.Hg

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 8

P3=03.0psig  
P2=01.0psig

SETTING	FUNCTION	STANDARD SETTING
P3	PS-3 setpoint	3.0 psi
P2	PS-1 setpoint	1.0 psi

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 9

PURGE=01.00  
OVERDRIVE=3.0F

SETTING	FUNCTION	STANDARD SETTING
Purge	Conditioning purge time	1:00
Overdrive	TS-2 setpoint	3.0°F (1.5°C)

Make changes as required, then press CHANGE VALUES to continue.

# • DISPLAY 10

OVERTEMP = 20.0F  
UNDERTEMP = 2.0F

SETTING	FUNCTION	STANDARD SETTING
Overtmp	Overtmp alarm setpoint	20.0°F (11.0°C)
Undertmp	Undertmp alarm setpoint	2.0°F (1.0°C)

Make changes as required.

This concludes the settings of the cycle parameters.

After the final screen has been displayed and either CHANGE VALUES or SAVE VALUES touch pad is pressed, the control prints out the settings for verification. Cycle settings for a Hospital-mode unit are printed as follows:

VALUES	
VACAMATIC STERILIZER	
10/11/88	10:44:25 A
1. FLASH	
STER TEMP = 270.0°F	
STER TIME = 3m	
DRY TIME = 1m	

The printout is repeated for cycles 2 through 4.

Cycle settings for a Lab-mode unit are printed as follows:

VALUES	
VACAMATIC STERILIZER	
10/11/88	10:44:25 A
1. FLASH	
STER TEMP = 270.0°F	
STER TIME = 0:03:00	
DRY TIME = 0:01:00	

If unit is a Vacumatic, cycle settings for PREVAC and EXPRESS cycles are printed as follows:

PREVAC:	
PULSES = 4	
P1 = 26.0 psig	
V1 = 10.0 inHg	
EXPRESS:	
PULSES = 2	
P1 = 26.0 psig	
V1 = 10.0 inHg	

Both Hospital-mode and Lab-mode units then print the control settings as follows:

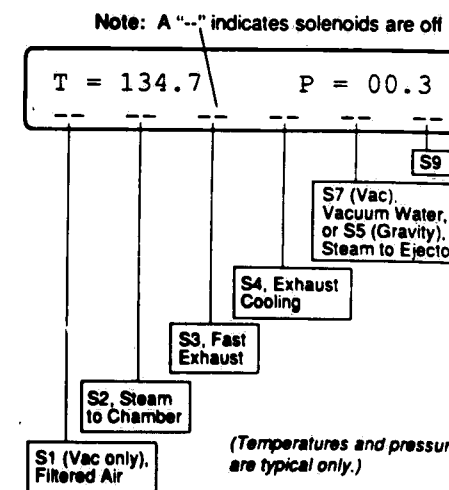
CONTROLS:	
P2 = 1.0 psig	
P3 = 3.0 psig	
C1PI = 1m	
C2PI = 1m	
C3PI = 5m	
C4PI = 5m	
TLIC = 20m	
TLIE = 5m	
TLIV = 20m	
PURGE = 1:00	
OVERDRIVE = 3.0°F	
OVERTEMP = 20.0°F	
UNDERTEMP = 1.0°F	
RUN TIME = 00:35.4 hrs	
UTILITIES:	
SHUTDOWN = 11:00 P	
RESTART = 07:30 A	
CYCLE COUNT=3428	

← If option is installed and DIP switch is set to Auto-Utilities position.

# Testing AC Outputs (Solenoid Valves)

Following the cycle-parameter setting routine, the Service Test proceeds to a routine for testing the solenoid valves. To bypass the cycle-parameter setting portion of the Service Test, press the SAVE VALUES button twice after entering the Service Test mode. A printout, as shown previously, of current cycle-parameter settings is generated.

At this point, if the door is not locked, the display shows temperature and pressure, and indicates that the door is open. When the door is locked, the display shows:



(Temperatures and pressures are typical only.)

The printer prints:

```
TEST 10/11/88 19:06:02A ← current date/time
P=psig
- TIME T=F V=inhg
```

Pressing certain touch pads on the panel turns valves on and off as shown in Figure 7-4.

For example, when the touch pad for S4 is pressed, the display indicates:

```
T = 134.7      P = 00.3
- - - - - S4 - - - -
```

If the touch pad for S4 is pressed again, S4 turns off and a "--" is displayed at that position on the display.

Manipulating the solenoid valves in this way makes voltage and piping checks on the valves convenient and easy.

A "demand" printout, useful for testing, troubleshooting or calibration, can be generated at any time during the routine simply by pressing the PRINT rocker switch. Printout appears as follows:

```

P=psig
- TIME T=F V=inhg
F 09:12:54A 235.7 09.4 ← Demand print
F 09:14:32A 272.3 32.8 ← Demand print

```

#### Testing Limit Switches

After the Solenoid Valve test, press the PRINT VALUES rocker switch to enter the Limit Switch test. The display shows, for ten seconds,

```
STANDBY . . .
EXHAUSTING
```

and S3, S4 and S5 (Gravity units) or S7 (Vacumatic units) turn on to dump any pressure left in the chamber from the solenoid valve test. The display then shows, for three seconds:

```
TEST 2 - LIMIT SW
```

The display then shows:

```
0123456789AB
00-00-----
```

where 0 = limit switch closed, and "-" = limit switch open.

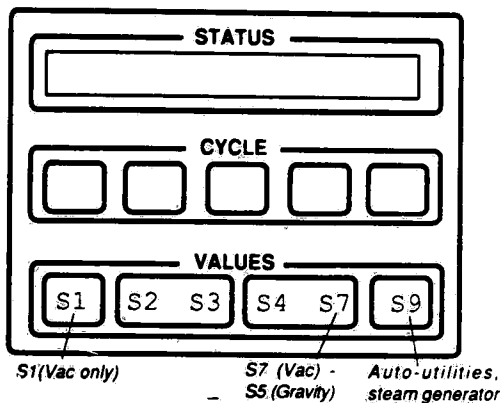
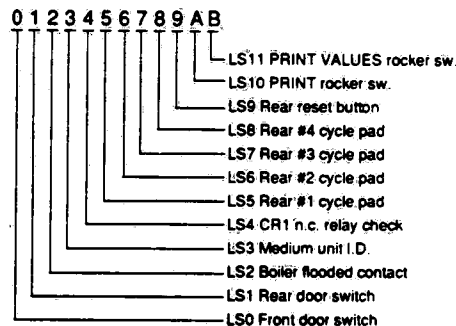


FIGURE 7-4 - Valve-Control Touch Pads

The "0"s shown here are typical. The display test is defined as:



The proper states of the Limit switches are shown in Table 7-3.

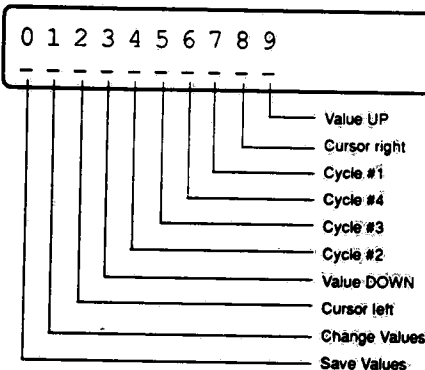
TABLE 7-3 - LIMIT SWITCH INDICATIONS		
LIMIT SWITCH	"0" DISPLAYED	"-" DISPLAYED
LS0	Door closed	Door open
LS1	Door closed	Door open
LS2	Boiler flooded	Boiler not flooded
LS3	Medium unit	Small unit
LS4	Door(s) closed	Door(s) open
LS5	Pressed	Not pressed
LS6	Pressed	Not pressed
LS7	Pressed	Not pressed
LS8	Pressed	Not pressed
LS9	Pressed	Not pressed
LS10	Pressed	Not pressed
LS11	Pressed	Not pressed

#### Front Panel Touch Pad Test

After the Limit switch test, press CHANGE VALUES to enter the Pushbutton (Touch Pad) test. The display shows, for three seconds:

```
TEST 3 - PUSHBUTTONS
```

The display then shows:



When a touch pad is pressed, a "P" (pushed) appears on the display as long as the pad is held, for example:

```
0123456789
- - - - - P -
```

#### DC Output Test

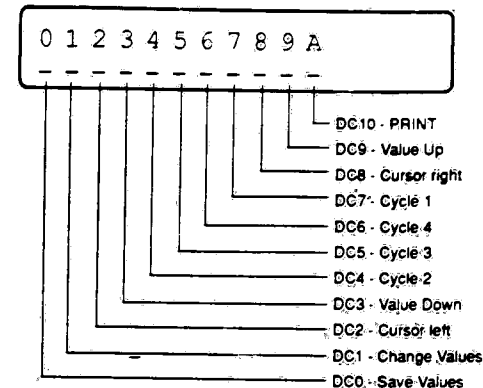
(Only on program Revisions 8 and below, Vac; Revisions 4 and below, Gravity)

Pressing certain keys on the front touch panel activates the DC outputs. On a single-door, small sterilizer, none of the DC outputs are used for anything and this test does not apply. Power-door and double-door units, however, use some or most of the DC outputs.

After the Touch Pad test, press the PRINT VALUES rocker switch to enter the DC output test. The display shows, for four seconds:

```
TEST 4 - DC OUTPUTS
```

The display then shows:



When the specified touch pad is pressed, a "D" appears under the DC driver on the display. For example, if Cycle 4 touch pad is pressed, DC6 output comes on and the display shows:

```
0123456789A
- - - - - D - - - -
```

Consult the machine schematic to determine the function of the particular DC output, then have a helper measure the voltage while the touch pad for the output is pressed. DC0 thru DC7 are 5 volts DC when not pressed, 0 volts when pressed. DC8 thru DC10 are 0 volts when not pressed, 5 volts when pressed.

#### Dip Switch Test

After the DC Output test, press the PRINT VALUES rocker switch to enter the Dip Switch test. The display shows, for four seconds:

```
TEST 5 - DIP SWS
```

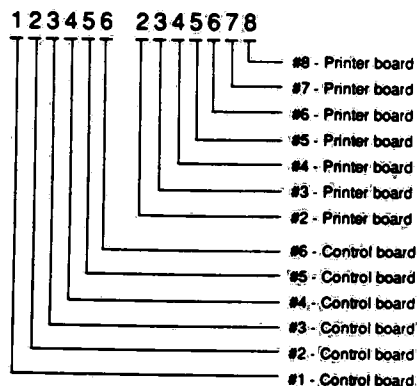
The display then shows:

```
123456 2345678
011001 0110001
```

(Note: "0"s and "1"s are typical only)

where the "0"s and "1"s are typical. "0" indicates that the Dip switch is positioned OFF, while "1" indicates that the switch is positioned ON.

Moving the positions of the Dip switches, ON and OFF, while watching the display allows testing of the Dip Switches for proper operation. The display definition is:



Note that Dip switch #1 on the Printer PC board is not shown on the display. It is the display module self-test and runs right to the display, bypassing the control. The control cannot read it.

#### Exiting Field Test Mode

To exit the Service Test mode, place Dip switch #4 on the Printer PC board to the OFF position and then press RESET. This sets the control to the normal operating mode.

**Note:** To return to the Solenoid Valve test portion of the routine instead of to normal operation, press the PRINT VALUES rocker switch at the end the Dip Switch test.

#### 7.6 PRESSURE CALIBRATION

Pressure calibration should be checked and adjusted routinely at the intervals specified in Section 4, Preventive Maintenance, and whenever the Printer PC board or the pressure transducer is replaced.

Pressure adjustments do not affect temperature calibration.

1. Install a calibrated compound pressure gauge, with appropriate reducing bushing, at the plugged fitting at the left rear of sterilizer, near the S2 solenoid. Gauge should be readable to 1/2 psi increments, and have a  $\pm 1\%$  full-scale accuracy.

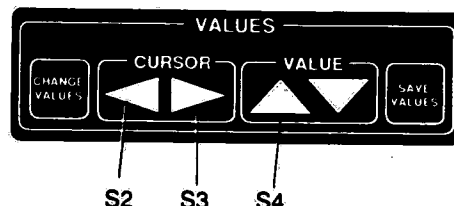
2. Enter the Service Test mode on the control by setting Dip switch #4 on the Printer PC board to ON and pressing RESET.

3. Press the SAVE VALUES touch pad twice. The display shows CHECK VALVES BY PRESSING PB'S. Note that the pressure is displayed to 0.1 psi resolution on this display.

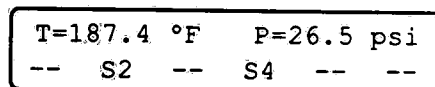
4. With the control-end door open, adjust R25 (ZERO) on the Printer PC board until the pressure display shows 0.0. R25 and R26 are located to the left of the eight-pole Dip switch on the Printer PC board (Figure 7-3).

5. Close and lock chamber door(s). (Solenoid S2 cannot be electrically energized with the doors open.)

6. Turn ON solenoids S2, S3 and S4 by pressing appropriate touch pads as shown below.

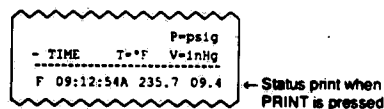


7. After about one minute, turn OFF S3 (press cursor right arrow pad again). Display appears as shown below.



Wait five minutes. After five minutes, the chamber is well-heated and the pressure display should be stabilized.

**Note:** A status printout can be obtained at any time by pressing PRINT (see below).



8. Adjust R26 (SPAN) on the Printer PC board (Figure 7-3), until the pressure on the display matches the compound gauge.

9. Exhaust the chamber by turning S2 OFF and S3 ON.

10. Repeat steps 4 thru 8 if R25 and R26 adjustments interact.

#### 7.7 TEMPERATURE CALIBRATION

As for pressure calibration, temperature calibration should be checked periodically, and whenever either the Control PC board or the temperature probe (thermistor assembly) is replaced.

Temperature adjustments do not affect the pressure calibration.

**Note:** Temperature adjustment requires a calibrated temperature indicating device, accurate to  $\pm 1$  degree F between 250° and 270°F. A digital thermometer with a thermocouple wire is best (AMSCO P-764322-757, pyrometer with type T thermocouple or equivalent).

1. Install the thermocouple wire through the plugged fitting in the chamber using a Conax-type fitting (P-309712-061) and appropriate reducing bushing.

**Note:** Installation through the door gasket is acceptable if a Conax fitting is not available.

2. Form the end of the thermocouple wire into a hook. Remove the chamber drain strainer and slide thermocouple wire onto the temperature probe in the chamber drain.

3. Lower Control to the horizontal service position to gain access to temperature pots R4 (SPAN) and R10 (ZERO) (Figure 7-5).

4. Enter the Service Test mode by setting Dip switch #4 on the Printer PC board to ON and pressing RESET.

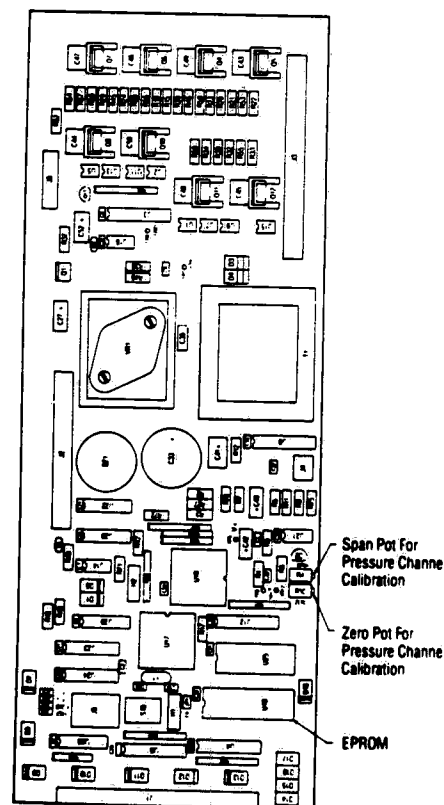


FIGURE 7-5 - Control PC Board

5. Press the SAVE VALUES touch pad twice. The display shows CHECK VALVES BY PRESSING PB'S. Note that the chamber temperature is displayed as 0.1 degree F on this display.

6. Pour a quart of warm water into chamber drain.

7. With the door(s) open, adjust R4 (SPAN) until the temperature on the display matches the temperature on the calibrated temperature indicator.

8. Close and lock chamber door(s). (Solenoid S2 cannot be electrically energized with the doors open.)

9. Turn ON solenoids S2, S3 and S4 by pressing appropriate touch pads (see Section 7.6, Pressure Calibration).

10. After about one minute, turn OFF S3.

Wait five minutes. After five minutes, the chamber is well-heated and the pressure display should be stabilized.

11. Adjust R10 (ZERO) on the Printer PC board (Figure 7-3), until the temperature on the display matches the temperature indicator.

12. Exhaust the chamber by turning S2 OFF and S3 ON.

13. Repeat steps 7 through 11 if R4 and R10 adjustments interact.

#### 7.8 DIP SWITCH SELECTABLE OPTIONS

Certain options for sterilizer operation are selected via Dip-switch settings on the Printer PC board (eight-pole) and the Control PC board (six-pole).

##### Setting the Printer PC Board Dip Switches

1. Remove the control front panel.

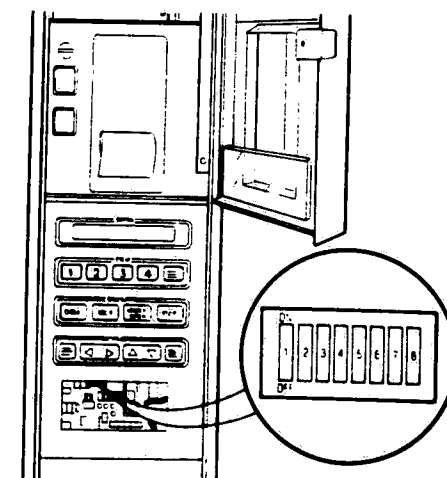


FIGURE 7-6 - Printer PC Board Dip Switches

2. Make the appropriate settings on the Dip switches (eight) which are then accessible through the cutout in the sheet metal (Figure 7-6).

#### Setting the Control PC Board Dip Switches

1. Remove the control front panel.
2. Lower the control to the service position.
3. Make the appropriate settings on the Dip switches (six) on the Control PC board (Figure 7-7).

Functions which can be adjusted by Dip-switch settings are summarized in Tables 7-4, 7-5 and 7-6.

#### Hospital Versus Lab Mode

Dip switch #3 on the Control PC board sets the unit to either Hospital or Laboratory Mode.

Cycle parameter settings vary between the two modes. Table 7-7 lists the operator-settable parameters and how they are configured in each mode.

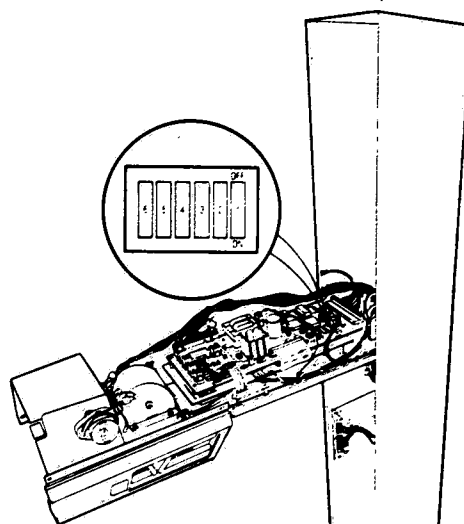


FIGURE 7-7 - Control PC Board Dip Switches

TABLE 7-4 - PRINTER PC BOARD

Dip Switch	Function
1	Display Self-test. When in OFF position, display shows the entire character set until Dip switch is reset to ON. ON = Display Self Test OFF = Normal
2	Undertemp Recovery Mode. Sets whether the sterilize timer resets when an under-temperature condition occurs, or resumes from the point of undertemp when sterilize temp is reattained. ON = Timer Reset OFF = Timer Resume
3	Access Code Enable. Sets control to lock out specified cycles, and to require entry of a four-digit "access code" in order to change cycle settings and values for locked-out cycles. ON = No Access Code OFF = Access Code
4	Self-test BH 1. Works in conjunction with Control PC board switch Dip switch #4. See Table 7-5.
5	Electric unit (Integral steam generator) select. This switch indicates, to the control, that a steam generator is present and that Anti-Flood input should be read. ON = Units w/stm gen. OFF = No stm. gen.
6	Cycle Complete Buzzer Control. Enables or disables the cycle complete buzzer, EXCEPT for Liquids cycle. ON = Buzzer on OFF = Buzzer off
7	Language Select. Enables or disables the Tri-Lingual (English, French, or Spanish) Language Selection Menu during the CHANGE VALUES operation. ON = Select language OFF = No language select
8	Auto-Utilities Shutdown (if option is installed). Enables or disables the Auto-Utilities Shutdown setting menu during the CHANGE VALUES operation. ON = Utilities shutdown OFF = No utilities shutdown

\*Revision 8 and up (Vac); Revision 5 and up (Gravity)

TABLE 7-5 - CONTROL PC BOARD

Dip Switch	Function
1	Temperature Units. Selects units of temperature display and printout to be either degrees Fahrenheit or Celsius. ON = degrees F OFF = degrees C
2	Duplicate Print ON/OFF. When duplicate print is turned on, a duplicate printout of each cycle is generated whenever cycle is completed or aborted. The printout has identical information, but may include blank lines. ON = No duplicate print OFF = Duplicate print
3	Laboratory or Hospital mode select. See Table 7-6 for a summary of the features of each mode. ON = Laboratory mode OFF = Hospital mode
4	Self-test BH 0. Works in conjunction with Printer PC board switch Dip switch #4. See Table 7-5.
5	Time Units. Selects units of time display and printout to be either Military or AM/PM. ON = AM/PM OFF = Military (24-hour)
6	Pressure Units. Selects units of pressure display and printout to be either psig or bars (absolute). ON = psig/in.Hg OFF = BARS

TABLE 7-6 - TEST BIT FUNCTIONS

FUNCTION	DP4 (Test BH 0) Control Board	DP4 (Test BH 1) Printer Board
Service Test	OFF	ON
Burn-in Test	ON	OFF
Print Frequency Set	ON	ON
Normal Mode	OFF	OFF

TABLE 7-7 - OPERATOR-SETTABLE PARAMETERS - HOSPITAL VS. LABORATORY MODES

FUNCTION	DESCRIPTION	
	Hospital Mode	Laboratory Mode
Sterilize temperature set	Settable in one-degree increments	Settable in one-degree increments
Sterilize time set	Settable in one-minute increments	Settable in hours, minutes and seconds, 0 - 99:99:99
Dry time set	Settable in one-minute increments	Settable in hours, minutes and seconds, 0 - 99:99:99
Overdrive	Not available (Fixed at 3 degrees above TS-1 in Sterilize)	0 - 9.9 degrees F above set temp.
Sterilize overtemp alarm	Not available	0 - 99.9 degrees F above set temp.
Undertemp alarm	Not available (Fixed at 2 degrees below TS-1)	0 - 9.9 degrees F under set temp.
Condition purge time	Not available (Fixed at 60 seconds)	0 - 99:99 mm.ss
Prevacuum pulses	Not available. (Fixed at 4 for Prevacuum cycle and 2 for Express cycle).	0 - 99 pulses for Prevacuum and Express cycles
Prevac P1 (PS1) setpoint Express P1 (PS1) setpoint	Fixed at 26.0 psig	0 - 35.0 psi
Prevac V1 (VS1) setpoint Express V1 (VS1) setpoint	Fixed at 10.0 in.Hg	0 - 99.9 in.Hg
P2 (PS2) setpoint	Fixed at 1.0 psig	0 - 15.0 psig
P3 (PS3) setpoint	Fixed at 3.0 psig	0 - 15.0 psig
Too Long in Charge Alarm	Fixed at 20 minutes	0 - 99 minutes
Too Long in Vacuum Alarm	Fixed at 20 minutes	0 - 99 minutes
Too Long in Exhaust Alarm	Fixed at 5 minutes	0 - 99 minutes
C1PI, C2PI, C3PI, C4PI	Fixed	0 - 99 minutes

Note: All of the settings in the Hospital mode designated "fixed" or "not available" can be altered in the Service Test mode for testing purposes.

#### 7.9 RECOMMENDED ELECTROSTATIC DAMAGE (ESD) PRECAUTIONS

Note: Following precautions should be taken whenever Printed Circuit Boards are being handled or replaced:

1. Always use an ESD safe container when transporting boards from one location to another.
2. No boards should be removed from their containers except at an approved static station or where personnel and machine are properly grounded.
3. At minimum, use a wrist strap grounded to the sterilizer when removing and/or replacing PC boards.

Note: Failure to follow the above precautions may result in electrostatic damage to the Printed Circuit Board. 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.

#### Return Policy:

1. Put defective board into static-proof plastic bag in which replacement board was shipped.
2. Place plastic bag (with defective board) into replacement part shipping carton.
3. Initiate service order and enclose a copy with defective board. Include the following information:
  - a. Reason for return (failure mode of equipment)
  - b. General condition of board
  - c. Quantity
  - d. Individual item identification (part number, serial number, etc.)
  - e. Serial number of machine from which board was removed plus run-time hours and cycle count of machine.
4. Wrap shipping carton with protective wrapper or cover (envelope, paper, box, etc.)

5. Return board (and all other microprocessor parts) to AMSCO SERVICE in Erie. Mark the package to the attention of the RETURNED MATERIALS SPECIALIST.

## 7.10 CONTROL PC BOARD REPLACEMENT

**CAUTION:** Observe the Electrostatic Precautions outlined in Section 7.9. Always wear a grounding wrist strap when removing or replacing PC boards or ICs.

**Important:** Before beginning board replacement, enter the Service routine (Section 7.5) and obtain a cycle count and run-time hours printout for entry into the memory of the new board. Also, generate a printout for the currently set cycles and cycle values, as this data will be lost when removing the old board.

1. Position power switch to OFF.
2. Lower the control to the service position. If the EPROM is to be reused, carefully lever it up, about 1/16 inch at a time, by alternately lifting either end of the IC. Put it aside in a safe place until reinstallation.
3. Unplug all plugs from the Control PC board. Plugs are either keyed, or have different numbers of pins so that reconnection can be done by inspection.
4. Using a pair of needle-nosed pliers, compress the spring of each standoff and gently lift the board upward so that it rides on the spring.
5. After compressing the springs on all standoffs, remove board from the control.
6. Install the new PC board, locking it in place on all the standoffs. Reinstall all plugs.
7. If installing a new EPROM, make sure that all pins engage the connectors on the board's IC socket.
  - a. Make sure that the EPROM is oriented correctly. When facing the machine from the front, the white dot on the chip label should be at the rear, right-hand corner of the socket. Check the Control board assembly drawing in Section 6 if there is any doubt.  
  
Another way to check is to make sure the semi-circular cutout at one end of the IC is to the right-hand end of the socket when facing the machine from the front.
  - b. Press down gently on the IC while watching the pins. Push, a little at a time, being careful that the pins slide into the socket without bending over (buckling). If in doubt, remove the IC and start over.  
  
**Note:** Sometimes the pins on a new IC are flared slightly outward. If so, carefully bend them so that they face straight downward.
8. After installing the IC, swing the control up to the normal position and install one of the upper hex screws finger-tight.

9. Clear the memory by pressing and holding both the CHANGE VALUES AND SAVE VALUES touch pads while positioning power switch to ON. The control prints...

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ahead of the normal power-up header.

10. Reenter the desired cycles and cycle values (from printout obtained before beginning procedure).
11. Enter the Service Test routine (Section 7.5) and make the following settings:

- a. Enter the current cycle count.
- b. Set the run-time hours to zero.
- c. Check the parameter settings, i.e., P1, P2, P3, etc., as clearing the memory returns these to their default settings from the EPROM. This is especially important for Laboratory applications where special cycles may be in use.

**Note:** If you are returning the board to AMSCO for repair or warranty credit, PLEASE note the run-time hours and cycle count or enclose a copy of the run time hours printout. This is of the greatest value to AMSCO for reliability calculations.

12. Perform a temperature calibration (Section 7.7).

## 7.11 PRINTER PC BOARD REPLACEMENT

1. Follow the procedure in Section 7.3, Printer Replacement. Adjust the printout darkness as necessary.
2. Perform a pressure calibration (Section 7.6).

## 7.12 AUXILIARY POWER SUPPLY SERVICE

When the auxiliary power supply proves defective, it is replaced as an assembly. There are no field-replaceable components. The part numbers (in Section 8) for the auxiliary power supply include the cables, pre-installed.

Certain measurements and adjustments can be made, as follows:

- **5-Volt Output** - Connect a voltmeter set to read 5 volts DC across the power supply + and - (common) terminals. Adjust the 5-volt output pot on the power supply to indicate 5.0 - 5.1 volts.

Set the voltmeter to read approximately 100 mV AC to check for "ripple." Maximum ripple should be less than 5 mV.

- **12-Volt Output** - Connect a voltmeter set to read 12 Volts DC across the 12-volt + and - (common) terminals.

Set the voltmeter to read approximately 100 mV AC to check for "ripple." Maximum ripple should be less than 5 mV.

## 7.13 NON-OPERATING END (REAR) DISPLAY SERVICE

The data displayed on the non-operating end should match the operating-end display. If bogus displays or garbage characters appear on the rear display, test as follows:

1. Remove display-panel cover.
2. Move jumper plug JMP-1 from the normal to the alternate position. This causes display to show the complete character set as explained in Section 7.4.

RETURN THE JUMPER to its normal position when done testing.

If the rear buzzer is not working, proceed as follows:

1. Have a helper activate the DC10 driver test in the DC Output portion of the Service Test routine (Section 7.5).
2. Check for +8 volts DC across the buzzer when DC10 driver is activated. If 8 volts is present, the buzzer is bad.

If the display is completely dark, check for +5 volts DC ( $\pm 0.1$  volt) across capacitor C1 on the rear board. If 5 volts is present, the display module is bad. If not, check the auxiliary power supply.

## 7.14 TOUCH PANEL REPLACEMENT

1. Position power switch to OFF.
2. Lower control assembly to service position.
3. Unplug touch panel from Printer PC board.
4. Peel touch panel off the control assembly.

**WARNING: HEALTH HAZARD - Vapors from solvents can be harmful. Use with adequate ventilation. Follow directions on the container.**

5. Using acetone, TCE, or a similar solvent, remove any adhesive left on the control assembly.
6. Plug new touch panel into Printer PC board. (The smaller connector is not used on this unit.)
7. Remove paper backing from the new touch panel. Turn power ON and center new touch panel over the display, then press it down into place.

## 7.15 CONTROL BOARD BATTERY-BACKED MEMORY IC REPLACEMENT

**Important:** Before beginning board replacement, obtain a cycle count printout for entry into the memory of the new IC. Also, obtain a printout of currently set cycles and cycle values, as this data will be lost when removing the old IC.

1. Position power switch to OFF.
2. Lower the control to the service position.
3. Remove the RAM IC U25 from the Control PC board as for EPROM replacement.

4. Install the new RAM IC, paying attention to the location of pin 1. When correctly installed, the semicircular cutout on one end of the IC will be facing toward IC U17, and away from the edge of the board.

5. Return control to normal position.
6. Clear the memory by pressing and holding both the CHANGE VALUES AND SAVE VALUES touch pads while positioning power switch to ON. The control prints...

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ahead of the normal power-up header.

7. The default cycle settings are loaded into the new RAM IC. Change these, if necessary, to match printout obtained before starting procedure. Also set date, time, etc.

## 7.16 CHAMBER DOOR ASSEMBLY

Some repairs can be made without removing the door from the sterilizer. For major repairs the door should be removed and placed on a clean, padded work bench or table.

### Removing Door From Hinges (Fig. 8-17)

1. With door open and supported, remove retaining rings (14) from each of the hinge pins.
2. Withdraw pins (15) and slide door and hinge assembly out of hinge body, saving any washers from door.
3. Place door on a clean, padded bench with door handle facing upward.
4. If necessary, take hinge body off door frame by removing the four capscrews.

### Disassembling Door (Fig. 8-16 and 8-17)

1. Turn chamber door handle to retract the door arms.
2. Turn button assembly (8-16, #10) counterclockwise until it disengages and remove it.
3. Remove setscrews (8-16, #9), handwheel, grease fitting (8-17, #27), screws, washers, handle nut (Fig. 8-17, #28), thrust ring assembly (Fig. 8-17, #26) and springs (Fig. 8-17, #40).
4. Remove self-tapping screws (Fig. 8-16, #14) and lift off chamber door cover (Fig. 8-16, #8).
5. If door cover brackets (Fig. 8-17, #16) are damaged, remove them by removing the self-tapping screws (Fig. 8-17, #18) which hold them in place. Replace brackets.
6. Remove any worn speednuts (Fig. 8-17, #17) and slip new speednuts over door cover brackets.
7. Remove hex-head screws, plain washers, lock-washers (Fig. 8-17, #11, 12, 13) and door hinge bracket (Fig. 8-17, #2) from the door.

8. Remove drive pin (Fig. 8-17, #25) from handle nut and bearing from recess in top socket plate (Fig. 8-17, #29).
9. Remove socket-head screws (Fig. 8-17, #23) and washers (Fig. 8-17, #39).
10. Slide top socket plate (Fig. 8-17, #29) forward and withdraw roll pins and washers.
11. Remove top socket plate and door arms.
12. If necessary loosen, but do not remove, the arm clip links and studs. Arm clip studs retain shims under the fulcrums which align the arms to seal door against door frame. If the arm clip studs must be removed, be sure that arm clip studs and shims are replaced in the same location during reassembly.
13. Remove bottom socket plate (Fig. 8-17, #30).
14. Turn door over and remove screws (Fig. 8-17, #7) holding door back cover in place.
15. Remove door back cover and gasket (Fig. 8-17, #6). Discard gasket.
16. Using a socket wrench, remove bolts (Fig. 8-17, #3) holding diaphragm cover in place.
17. Remove diaphragm cover (Fig. 8-17, #4), diaphragm (Fig. 8-17, #5) and gasket (Fig. 8-17, #6).
18. Pull out thrust plate (Fig. 8-17, #8), lock clutch (Fig. 8-17, #9) and lock clutch rod spring (Fig. 8-17, #10).

**CAUTION: The door post (8-18, #10) is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instruction for removing weld and rewelding.**

#### Cleaning and Inspection

1. Clean all working parts with a solvent (such as Stoddard solution) and remove all gum or grease from bearing and wear surfaces.
2. Wipe all parts dry with a clean, lint-free cloth.
3. Inspect all parts for wear, cracks, chipping or other damage.
4. Examine door post key, keyway and threads.
6. Examine diaphragm for breaks or distortion. Replace if necessary.
7. When steam lock diaphragm has been removed, always use a new diaphragm gasket when reassembling.

#### Reassembling Door (Fig. 8-17)

Lubricate parts indicated with Neptune-7 grease (P-385220-091).

1. Replace back cover, align and fasten with 12 drive screws.
2. Turn door over and replace any missing or damaged cover clips (16) and speed nuts (17).
3. Replace any arm clip studs and fulcrum blocks that may have been removed. Be sure that shims are replaced in their proper positions. Drive fulcrum blocks down with a wood block and mallet. Replace arm clip links (32 through 34).
4. Replace hinge assembly if it was removed.
5. Lubricate door post threads. Place two wooden blocks (about two inches thick) on door to hold bottom socket plate up. Slide bottom socket plate in position (30).
6. Set two keys (22) in door post and drive two roll pins (21) into top socket plate (29).
7. Place top socket plate over door post and position four corner arms and eight side arms on door. Secure top socket plate to bottom plate with six socket-head screws. Check arm movement for freedom.
8. Pack thrust bearing (24) and insert into socket plate. Replace drive pin (25). Lubricate handle nut (28) inside and outside. Screw onto door post.
9. Assemble thrust ring and springs (26) and position in nut. Screw nut all the way down, guiding ball thrust bearing onto nut. Fasten with two screws and washers (19 and 20).
10. Remove the two wooden blocks. Lower arms and check assembly for freedom of movement. Free up as necessary. Drive in grease fitting.
11. Raise arms and stand door on end. Try clutch rod (9) in post. Free up movement if necessary. Lubricate rod and insert it, with spring, into door. Engage thrust plate (8) and lubricate.  
**Note:** Graphited surface of gasket must go next to door casting.
12. Assemble diaphragm, gasket and cover (4, 5 and 6) and secure in place with nine screws.  
**Note:** Gaskets are cut to fit snugly and must be forced in. Push in a short section at a time. Do not stretch. If gasket seems to be too long, do not cut it, but remove it and start over, compressing short sections as they are inserted in the groove, to take up the full length.
13. Clean gasket groove and install new gasket.
14. After installing gasket, spray sealing surface of end ring with AMSCO Fluorocarbon Lubricant to prevent sticking.
15. Wipe door carefully with a clean cloth to remove excess grease.

#### Reassembling Door and Hinges to Sterilizer

1. Set door into place with door hinge between ears of hinge body.
2. Position and secure hinge pins with washers and retaining rings.
3. Center door on sterilizer body as follows:
  - a. Chalk surface of gasket and check position of gasket. Space between inner edge of gasket and edge of chamber opening should be uniform on all sides.
  - b. Check for full engagement of locking arms. Engagement of end ring should be uniform on all sides.

#### Door Alignment

After reassembling and centering door, make sure that door arms are engaged in door frame at least 1/4 inch with door tightened normally (approximately 30 ft.-lb. locking torque). Reshim door arms, if necessary, to obtain proper arm contact when door arms are in end frame. Shims required for procedure are as follows:

Part Number		Thickness
16x16 Door	20x20 Door	
P-150822-317	P-150822-320	0.005
P-150822-318	P-150822-321	0.010
P-150822-318	P-150822-321	0.015

Shimming procedure is as follows:

1. Tighten door to compress gasket in position.
2. Back off until door arms are loose. Then tighten door to approximately 8 ft.-lb. torque.
3. Check that all arms are tight. If any arm is loose, determine thickness of shim required to bring loose arm to a height that will make it as tight as the already tight arms.
4. Disengage arms, open door and install shims where required.
5. Close door. Tighten door to approximately 8 ft.-lb. torque and check all arms to ensure that they are of equal tightness. Repeat steps 3 and 4, if necessary, until all arms are equally tight.
6. Disengage arms and place an additional 0.010 shim under each corner arm.
7. Slowly tighten door while checking that corner arms engage and become tight before any other arms. If necessary, repeat prior steps until this requirement is met.

**Note:** When performing the adjustment in step 7, no more than one additional shim (of 0.005 thickness) is to be placed under a corner arm.

8. After shimming is complete, adjust arm clip links on the four bottom door arms and two arms opposite the hinge using the following procedure:

- a. Disengage door arms. Turn completely open.
- b. Loosen clip screws. While pressing door arm against fulcrum block, slide clip toward door post (UP) until it makes contact with door arm or reaches end of screw slot travel. Tighten clip screws.
- c. Check to be sure there is no interference between end of door arms and edge of end frame as door arms are being engaged.

#### Diaphragm Operation Check

After replacing and reassembling diaphragm, check that the door properly locks and unlocks under operating pressure. Door should lock between 1/2 and 6 psig rising steam pressure and unlock between 1/2 and 5 psig.

#### 7.17 AIR FILTER ASSEMBLY (Fig. 8-47)

The bacterial air filter contains a replaceable filter cartridge (3) that is made up of 16 filter discs separated by screens. The filter discs are of superfine glass wool that removes bacteria from the air entering the chamber.

The purpose of the bacterial air filter is to filter incoming air. The system is exposed to contamination whenever the filter or the air lines below the filter are opened. Keep these components as clean as possible when servicing.

**Note:** Pointed end of the filter element must be installed in air inlet side.

Remove head assembly (5) by unscrewing screws (1). Remove and inspect the filter cartridge (3). Clean the filter cover and body assembly by wiping with a soft cloth. Replace the filter cartridge if necessary. Reassemble the air filter.

#### 7.18 SOLENOID VALVES

**Note:** When installing new valves in any line, note the arrow stamped on the valve body or the words "IN" and "OUT" stamped at the inlet and outlet ports. A reversed valve cannot operate properly. To rebuild a defective valve, order the appropriate valve repair kit. The repair kit part number is found on the same parts list as the solenoid valve.

#### Principles of Operation

A solenoid valve is a combination of two basic functional units. . . 1) a solenoid (electromagnet) with its plunger (or core), and 2) a valve containing an orifice in which a disc or plug is positioned to stop or allow flow. The valve is opened or closed by movement of the

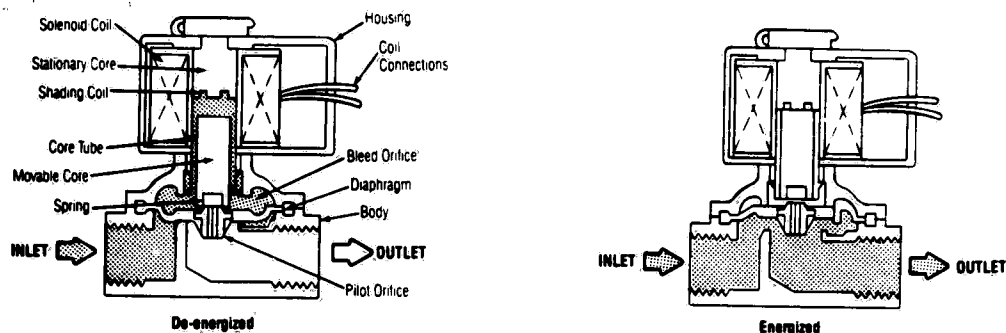


FIGURE 7-8 – Diaphragm-Type Solenoid Valve

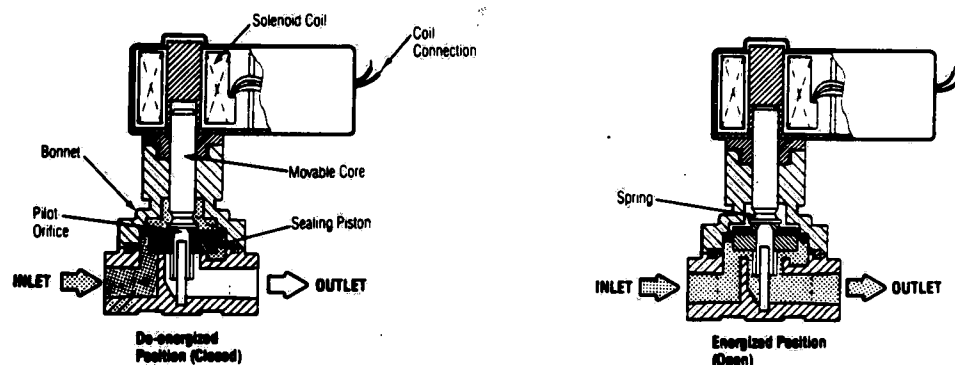


FIGURE 7-9 – Piston-Type Solenoid Valve

magnetic plunger (or core) which is drawn into the solenoid when the coil is energized. The solenoid is mounted directly on the valve body with the solenoid core attached to the valve stem.

The diaphragm-type solenoid valve (Fig. 7-8) has a pilot and a bleed orifice. It utilizes line pressure for operation. When the solenoid is energized, it opens the pilot orifice and releases pressure from the top of the valve piston or diaphragm to the outlet side of the valve. This results in an unbalanced pressure which causes the line pressure to lift the piston or diaphragm off the main orifice, thereby opening the valve. When the solenoid is deenergized, the pilot is closed and full line pressure is applied to the top of the piston or diaphragm through the bleed orifice, thereby providing a seating force for tight closure.

#### Testing

1. Energize the solenoid coil. A metallic click signifies solenoid operation. Absence of the click can indicate loss of power supply, defective oil or improper connection. Proceed as follows to correct:
  - a. Check voltage across the coil leads. When energized by the controller, it should be approximately 120 volts. When deenergized, it will be approximately 2 volts.
  - b. Check solenoid coil for open circuit or ground.
2. Energize and deenergize the coil. Check valve operation for proper opening and closing. A loud hum and sluggish operation indicate the coil is probably defective.

**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.

To replace a solenoid coil, disconnect the terminal wires and remove the top screw and cover. Lift off the coil and salvage any shim material around the pole piece. Shim must be replaced in new coil or vibration noise will occur. Slip new coil in place and shim so it fits tightly on the pole piece.

3. Inspect the valve for evidence of leakage. A worn valve seat will allow the valve to leak when closed. A damaged or worn seat cannot be repaired. The valve must be replaced if it leaks.

**Note:** When replacing a diaphragm, bonnet bolts should be torqued to 50 in/lbs on reassembly.

**Note:** When installing/repairing ASCO diaphragm- or piston-type valves, it will be necessary to separate solenoid base from valve bonnet to facilitate removal, repair and/or installation. When valve is reassembled, make sure no Teflon tape or pipe sealer is used between solenoid base and valve bonnet (see O-ring seal shown in Figure 7-10). When Teflon tape or pipe sealer is used it can find its way into core tube and inhibit proper travelling of core/disc. If core/disc does not seat correctly into copper ring at top inside of core tube, valve will emit an audible buzzing sound.

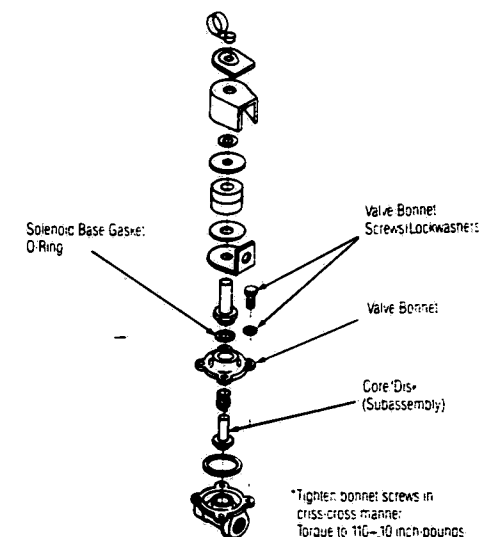


FIGURE 7-10 – ASCO Solenoid Valves

#### 7.19 STEAM TRAP (Fig. 8-45)

**CAUTION:** Allow thermostatic steam 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.

#### Disassembly

1. Unscrew and remove the cap (1) and attached diaphragm assembly (3). Use a hex socket wrench to unscrew and remove seat.
2. Wipe the parts clean, taking care to avoid damaging the diaphragm, seat and pointed diaphragm stem.
3. Wipe out the bowl (5) taking care that loose material does not enter the piping.
4. Test diaphragm for flexibility. (Unscrew from cap if necessary.) Examine solder joints for cracks or leaks. Dip diaphragm in boiling water and look for a noticeable expansion. An element in good condition will be difficult to stretch by hand and will return to its original condition quickly when released. Examine the seat for wear.

#### Reassembly

**Note:** Replace element and seat as a set. Repair kit part number is P-764080-001 (includes seat, element and gasket).

1. Use a hex socket wrench to screw seat in firmly.
2. Replace cap and attached diaphragm assembly, using a new gasket.

#### 7.20 STRAINERS

These should be opened for cleaning at least twice a year. Accumulation of sediment and rust will reduce pressure and flow. In extreme conditions, complete blockage may occur.

#### Disassembly

1. Remove hex plug and gasket.
2. Pull out strainer screen from body.
3. Scrape and polish all rust and residue from strainer screen and body. Use a wire brush or steel wool. Be sure that all perforations are clear by poking open with a wire. Replace screen if damaged, rusted or corroded.



### Reassembly

1. Insert screen into strainer body. Take care that no dirt or other particles remain in strainer body.
2. Replace and tighten hex plug. Use a new gasket if necessary.
3. Make sure that all pipe connections are tight after assembly.

### 7.21 CHECK VALVES

Repair of check valves is limited to cleaning of valve seats when foreign matter causes improper operation. When a valve becomes defective, the entire valve must be replaced.

### 7.22 VACUUM BREAKER

#### Disassembly

1. Unscrew and remove bonnet assembly.
2. Remove friction ring and air valve seat.
3. Remove assembled ballast and float.
4. Separate ballast and float.

Clean all rust and sediment from valve. Clean out drain holes in the float and ballast, and inspect for breaks or leaks. Replace parts as required. If the friction ring and air valve seat are not in perfect condition, they should be replaced.

#### Reassembly

1. Assemble ballast and float.
2. Slide float/ballast assembly into valve body, making sure that the assembly moves freely in valve body.
3. Insert air valve seat and friction ring.
4. Screw on bonnet assembly.
5. Test for leaks. There can be no water leakage at bonnet.

### 7.23 STEAM CONTROL VALVE, HI-LO (Fig. 8-48)

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

#### Disassembly

1. Remove pilot line fitting at top of valve. Turn adjusting screw (18) counterclockwise until spring is completely free of compression. Remove screw (12) and turn entire top assembly to align lugs on bonnet and syphon assembly (19) with notches on bottom plate. Lift off top assembly.
2. Remove four screws (3) fastening cover to bottom plate (13), lower spring plate (8), spring (7) and upper spring plate (6).

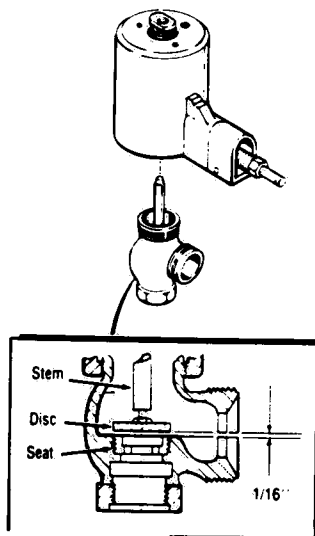


FIGURE 7-11 – Adjusting HI-LO Valve

3. Remove two screws (2), reinforcement (4) and bellows assembly (5).
4. Remove cotter pin (11). Pull out fork pivot pin (10) and remove fork (9).
5. Unscrew and remove syphon and bonnet assembly (19) from valve body. Also unscrew and remove valve seat (21).
6. Pull stem and disc assembly (20) from syphon. Carefully clean valve components. Carefully examine the bellows assembly and the syphon and bonnet assembly for cracks. Check valve seat and valve stem assembly for etching, scratches or other evidence of damage or leakage. Replace if worn or marred. Examine all parts for wear or damage. Replace as necessary.

#### Reassembly

1. Screw valve seat (21) into body, hex side down.
2. Replace stem and disc (20) in syphon (19) and screw bonnet onto body.
3. Position fork (9) on bottom plate (13). Insert pivot pin (10) and cotter pins.
4. Screw reinforcement (4) onto bellows and fasten to cover with two screws (2).

5. Set lower spring plate (8), spring (7), and top spring plate (6) in place. Make sure the lugs on the spring seat are properly positioned in the fork bearings.
6. Replace cover (1) and bellows (5), and secure cover with four screws (3).
7. Lower this entire assembly into position over the syphon, aligning the notches in the bottom plate with the lugs on the bonnet to allow the bottom plate to seat on the bonnet. Replace screw (2).
8. Turn adjusting screw (18) fully counterclockwise to remove all tension from the spring. Turn the stem protruding from the bellows to establish a clearance of 1/16 inch between seat and disc (Fig. 7-11). If valve was not removed from sterilizer, open side connection to see disc and seat.
9. Adjust high and low settings as described in Section 7.5.
10. Loosen nut (27) and back out screw (26) so that it does not contact adjusting fork (9). Turn adjusting screw (18) counterclockwise until minimum load, with no rattle, is obtained on spring.
11. Adjust screw (26) until it touches fork (9). Lock in place with nut (27).

### 7.24 VALVE ASSEMBLY, ANGLE (Fig. 8-46)

#### Cleaning and Inspection

1. Fully open valve and drive out roll pin to disconnect extension rod coupling.
2. Remove packing nut (3), gland (4) and bonnet nut (6). Remove bonnet assembly (2) from valve body and remove packing.
3. Examine valve seat (13) for scratches, nicks or wear. Remove and replace if necessary. Clean and inspect all components. Replace as necessary.

#### Reassembly

1. Lubricate stem threads with Molykote type "U" and replace disc holder assembly on stem.
2. Screw stem into bonnet and install new packing, forcing it into place with packing nut and gland.
3. Replace bonnet assembly on valve body and tighten bonnet and packing nuts. Tighten only enough to prevent leakage. Excessive tightening will make valve hard to operate.

### 7.25 DOOR SWITCH (Fig. 8-19)

**Note:** Chamber door must be closed and tightened to specified torque (Table 7-8) for door to withstand maximum pressure in chamber. Door switch is on top of chamber and permits sterilizer operation only when door is locked.

TABLE 7-8 – TORQUE REQUIREMENTS

Sterilizer Size	Torque
16x16	20 ft-lbs
20x20	30 ft-lbs

#### Adjustment

1. Using a torque wrench on the steam lock clutch rod (Fig. 8-17, #9), close and tighten door by applying appropriate torque as specified in Table 7-8.
2. Turn adjusting screw (Fig. 8-19, #1) clockwise until switch (Fig. 8-19, #7) is actuated. Then turn screw 1/4 turn clockwise.
3. Open door then close and tighten it by applying specified torque.
4. Check that switch is actuated before torque applied reaches specified value.
5. With switch adjusting screw properly set and door closed and tightened with specified amount of torque, start a 270°F (132°C) steam cycle.

**Note:** Do not disturb handwheel until leak test in step 6 is completed.

6. Using a metal mirror, check around door gasket for steam leaks. If door is not sealed, proceed as follows:
  - a. Determine if chamber door has to be adjusted and...
  - b. Determine if door gasket has to be replaced because it is cracked or worn.
7. To be sure that chamber has been exhausted, do not open chamber door until after the COMPLETE buzzer sounds.

### 7.26 ADJUSTMENT FOR STERILIZATION BELOW 250°F (121°C)

The HI-LO valve (steam pressure regulator) on this sterilizer was factory set for 250° and 270°F (121° and 132°C) sterilization cycles. If sterilization procedures routinely require temperature control below 250°F (121°C), i.e., laboratory procedures, the LO setting may be changed. Follow the procedure below:

1. If sterilizer is freestanding, remove a cabinet side panel for access to the HI-LO valve. If sterilizer is recessed, proceed to the area behind the recessing wall.
2. Remove adjusting screw cover.
3. Loosen setscrew on front locknut. Turn locknut until it is against the rear locknut (see Figure 7-12).



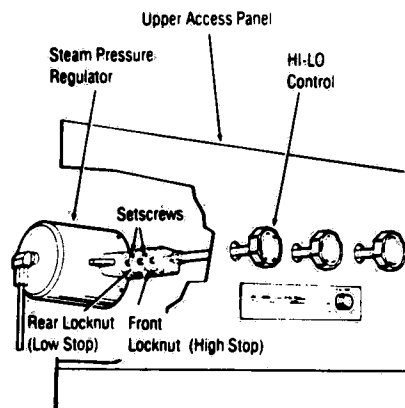
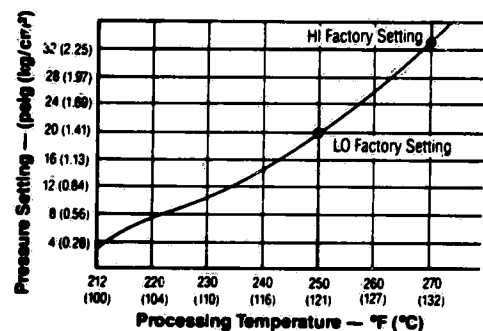


FIGURE 7-12 – Adjusting Pressure Regulator



Note: The jacket pressure/processing temperature relationships provided in this chart are guidelines for optimum performance of this EAGLE series sterilizer. They do not represent actual pressure/temperature ratios.

FIGURE 7-13 – Pressure Regulator Settings

- Using the chart shown in Fig. 7-13, adjust the HI-LO valve until jacket pressure as indicated on the jacket pressure gauge corresponds with the desired processing temperature.
- Following the instructions in Section 2.3, program one of the four touch pads for a GRAVITY or LIQUIDS cycle setting the STERILIZE TEMPERATURE to the desired new processing temperature.
- Following the instructions in Section 2.4, start the cycle and verify that chamber maintains temperature at new setpoint.

7. Steps 4, 5, and 6 will have to be repeated whenever a new LO temperature setting is desired. If temperature is not to be changed, turn locknut on HI-LO valve until it is against the stop on the bottom plate, then tighten set screw.

8. Replace the adjusting screw cover and, if applicable, cabinet side panel.

### 7.27 LABORATORY ACCOUNT LIQUID PROCESSING CYCLE CORRECTIONS

In liquid processing some laboratories are experiencing media boil-over, stopper dislodgement and excessively long exhaust times. Eliminate these situations by completing the following adjustments:

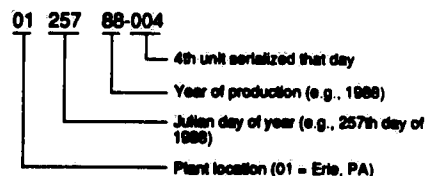
- Reset pressure setpoint P3 (PS-3) to actuate at 1 psig instead of 3 psig.
- Verify proper jacket pressure setting (e.g., 20 +4, -1 psig).
- Verify proper temperature control setting of 252-256°F (122-124°C).
- Readjust slow exhaust rate on an empty chamber (using 20-minute exposure) to a rate of from 4 to 7 minutes.

### 7.28 PRESSURE TRANSDUCER REPLACEMENT

Replacement of the transducer is straightforward. However, be careful when tightening the new transducer into the piping. DO NOT turn the transducer by the elastomeric boot because the connections under the boot will be broken. Use ONLY the hex-wrench fitting, cast into the transducer body, to turn the transducer into the piping. ALWAYS check the pressure calibration after replacement.

### 7.29 EAGLE 3000 SERIAL NUMBERING SCHEME

At times, due to design changes affecting interchangeability of components, it may become necessary to identify the particular configuration of sterilizer by its serial number. The serial numbering scheme is:



## SECTION 8 Exploded Views and Parts Lists

Assemblies and components of EAGLE 3000 sterilizers are illustrated and identified on the following pages. The part number, the description and the quantity required for each usage are 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

- Determine the function and application of the part required. Turn to the list of illustrations and select the most appropriate title. Note the illustration page number.
- Turn to the page indicated and locate the desired part on the illustration.
- From the illustration, obtain the index number assigned to the part desired. Refer to the accompanying description for specific information regarding the part.



Typical Indentation Example

No Indentation -  
part of top  
assembly

One Indentation -  
first subassembly,  
part of assembly  
under which it is  
indented

PANEL ASSEMBLY: Non Operating End, 16" .....  
PANEL ASSEMBLY: Non Operating End, 20" .....  
  
PANEL, Upper .....  
PANEL, Upper .....  
SPACER .....  
PANEL, Primary Control .....  
• LAMP (Box of 10) .....  
SCREW, Butress Head Socket, #8-32 x 3/8 .....  
WASHER, Flat .....  
SUPPORT, Panel and Gauge .....  
SUPPORT, Panel and Gauge .....

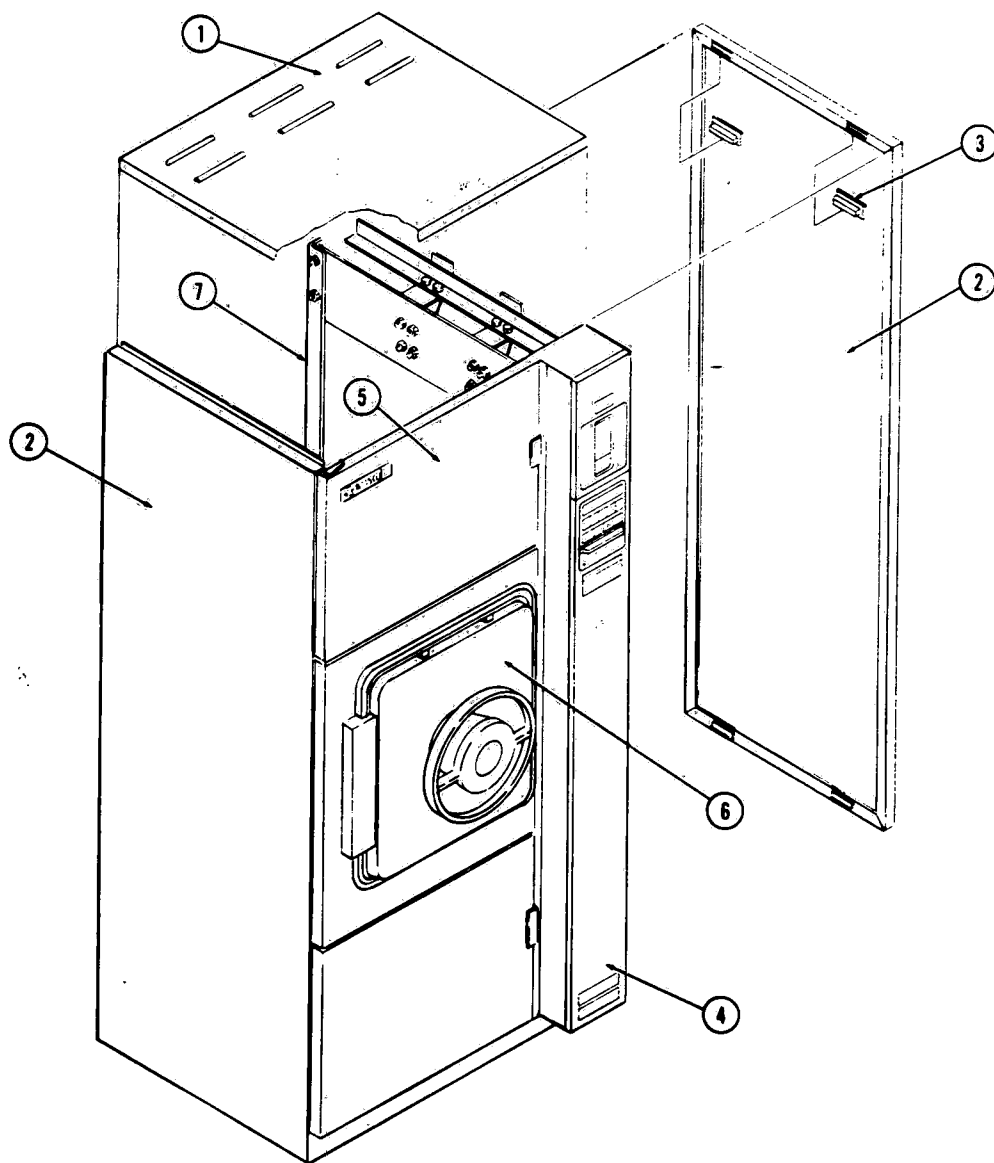


Figure 8-1. CABINET ASSEMBLY: Freestanding Sterilizer (Part 1 of 2)

8-2  
F- 1

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-1-	P 146441	002	CABINET ASSEMBLY: 16" Single Door, Freestanding (Part 1 of 2 units built before 4-89) .....	X			
	P 146653	606	CABINET ASSEMBLY: 16" Single Door, Freestanding (Part 1 of 2 units built after 4-89) .....		X		
	P 146441	006	CABINET ASSEMBLY: 20" Single Door, Freestanding (Part 1 of 2 units built before 4-89) .....			X	
	P 146653	608	CABINET ASSEMBLY: 20" Single Door Freestanding (Part 1 of 2 units built after 4-89) .....				X
1	P 136422	002	PANEL, Top .....	1		1	
	P 136423	002	PANEL, Top .....		1		1
2	P 93404	003	PANEL, Side .....	2		2	
	P 93404	004	PANEL, Side .....		2		2
3	P 84298	001	CATCH, Magnetic .....	8	8	8	8
4			CONTROL ASSEMBLY (Figures 8-10 and 8-11) .....	1	1	1	1
5			PANEL ASSEMBLY, Operating End (Figure 8-5) .....	1	1	1	1
6			COVER AND HANDWHEEL ASSEMBLY (Figure 8-16) .....	1	1	1	1
7			SIDE FRAME ASSEMBLY (Figure 8-4) .....	1	1	1	1

8-3  
F- 2

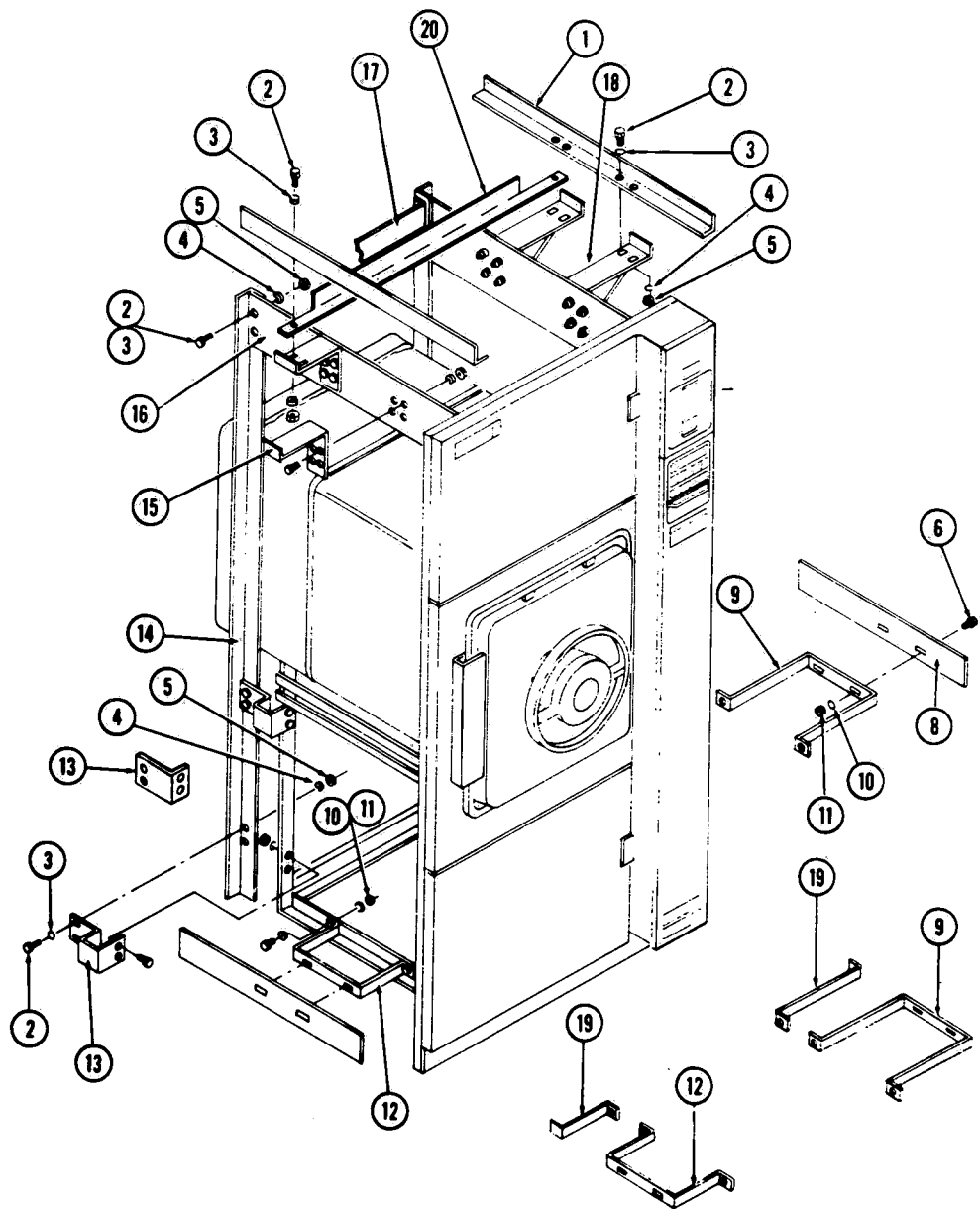


Figure 8-2A. CABINET ASSEMBLY: Freestanding Sterilizer (Part 2 of 2) (Units built before 4/89)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-2A-	P 146441	002	CABINET ASSEMBLY: 16" Single Door, Freestanding (Part 2 of 2 units built before 4-89)	X			
	P 146441	006	CABINET ASSEMBLY: 20" Single Door, Freestanding (Part 2 of 2 units built before 4-89)		X		
1	P 93896	083	SUPPORT, Top Panel	2			
	P 93896	084	SUPPORT, Top Panel		2		
2	P 150828	313	SCREW, Fig. Lock, 1/4-20 x 3/4	28		28	
3	P 10445	091	WASHER, Flat, 1/4	28		28	
4	P 76230	091	LOCKWASHER, 1/4	28		28	
5	P 3097	041	NUT, 1/4-20	18		18	
6	P 129360	012	SCREW, Fig. Lock, 3/8-16 x 1	20		22	
7							
8	P 93663	001	SUPPORT, Bottom	2			
	P 93663	002	SUPPORT, Bottom		2		
9	P 93665	002	BRACKET, Bottom, Long	1			
	P 93398	002	BRACKET, Bottom, Long		1		
10	P 52149	045	LOCKWASHER, External Tooth, 3/8	20		22	
11	P 3099	042	NUT, 3/8-16	20		22	
12	P 93665	001	BRACKET, Bottom, Short	1			
	P 93398	001	BRACKET, Bottom, Short		1		
13	P 93668	001	BRACKET, Main Support	4			
	P 93664	001	BRACKET, Main Support		4		
14	P 146628	001	SUPPORT, Rear Cabinet	2		2	
15	P 93896	089	HANGER ASSEMBLY, Short	2		2	
16	P 93896	088	SUPPORT, Top Attachment	2			
	P 93896	085	SUPPORT, Top Attachment		2		
17	P 93668	001	BRACKET, Top Attachment	1			
	P 93669	001	BRACKET, Top Attachment		1		
18	P 93896	090	HANGER ASSEMBLY, Long	2		2	
19	P 93399	001	BRACE, Bottom, Short		1		
	P 93399	002	BRACE, Bottom, Long		1		
20	P 93896	093	BRACE, Cross	2			
	P 93896	094	BRACE, Cross		2		

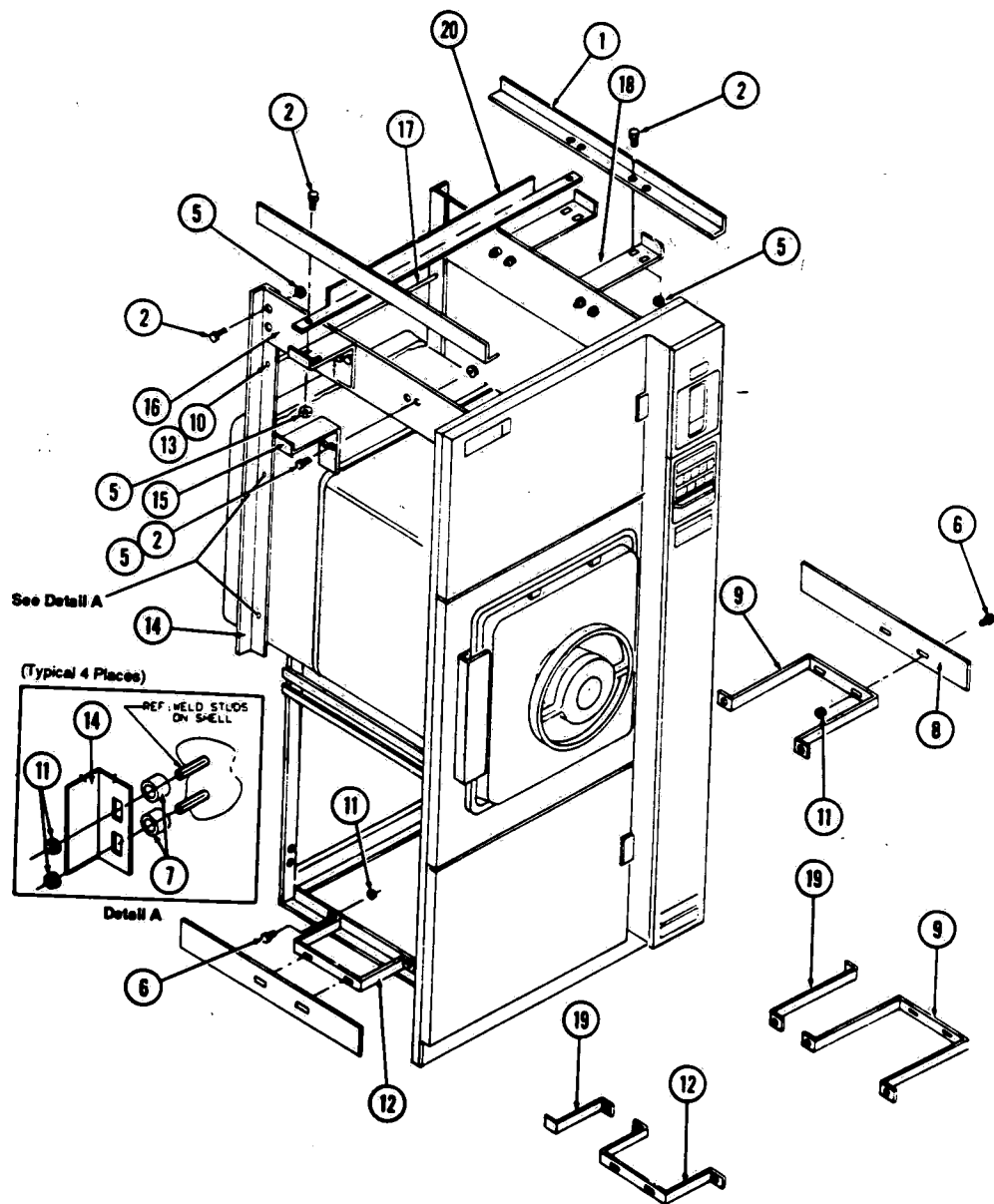


Figure 8-2B. CABINET ASSEMBLY - Freestanding (Part 2 of 2)(Units built after 4/89)

8-4B  
F- 5

FIG. & INDEX NO.	P	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-2B-	P	146653	606	CABINET ASSEMBLY: 16" Single Door, Freestanding (Part 2 of 2 units built after 4-89)	X		
	P	146653	608	CABINET ASSEMBLY: 20" Single Door, Freestanding (Part 2 of 2 units built after 4-89)		X	
1	P	93896	083	SUPPORT, Top Panel	2		
	P	93896	084	SUPPORT, Top Panel	2		
2	P	129360	011	SCREW, Fig. Lock, 1/4-20 x 5/8	22		
3	P						
4	P						
5	P	129360	015	NUT, Fig. Lock, 1/4-20	18		
6	P	129360	012	SCREW, Fig. Lock, 3/8-16 x 1	8		
7	P	150828	155	SPACER	8		
8	P	93663	001	SUPPORT, Bottom	2		
	P	93663	002	SUPPORT, Bottom	2		
9	P	93665	002	BRACKET, Bottom, Long	1		
	P	93398	002	BRACKET, Bottom, Long	1		
10	P	19681	045	LOCKWASHER, V2	2		
11	P	129360	014	NUT, Fig. Lock	16		
12	P	93665	001	BRACKET, Bottom, Short	1		
	P	93398	001	BRACKET, Bottom, Short	1		
13	P	13397	041	NUT, Hex 1/2-13	4		
	P	93664	001	BRACKET, Main Support	4		
14	P	134468	836	SUPPORT, Rear Cabinet	2		
15	P	93896	089	HANGER ASSEMBLY, Short	2		
16	P	93896	088	SUPPORT, Top Attachment	2		
	P	93896	085	SUPPORT, Top Attachment	2		
17	P	150828	133	BRACKET, Top Attachment	1		
	P	150828	138	BRACKET, Top Attachment	1		
18	P	93896	090	HANGER ASSEMBLY, Long	2		
19	P	93399	001	BRACE, Bottom, Short	1		
	P	93399	002	BRACE, Bottom, Long	1		
20	P	93896	093	BRACE, Cross	2		
	P	93896	094	BRACE, Cross	2		

8-5B  
F- 6

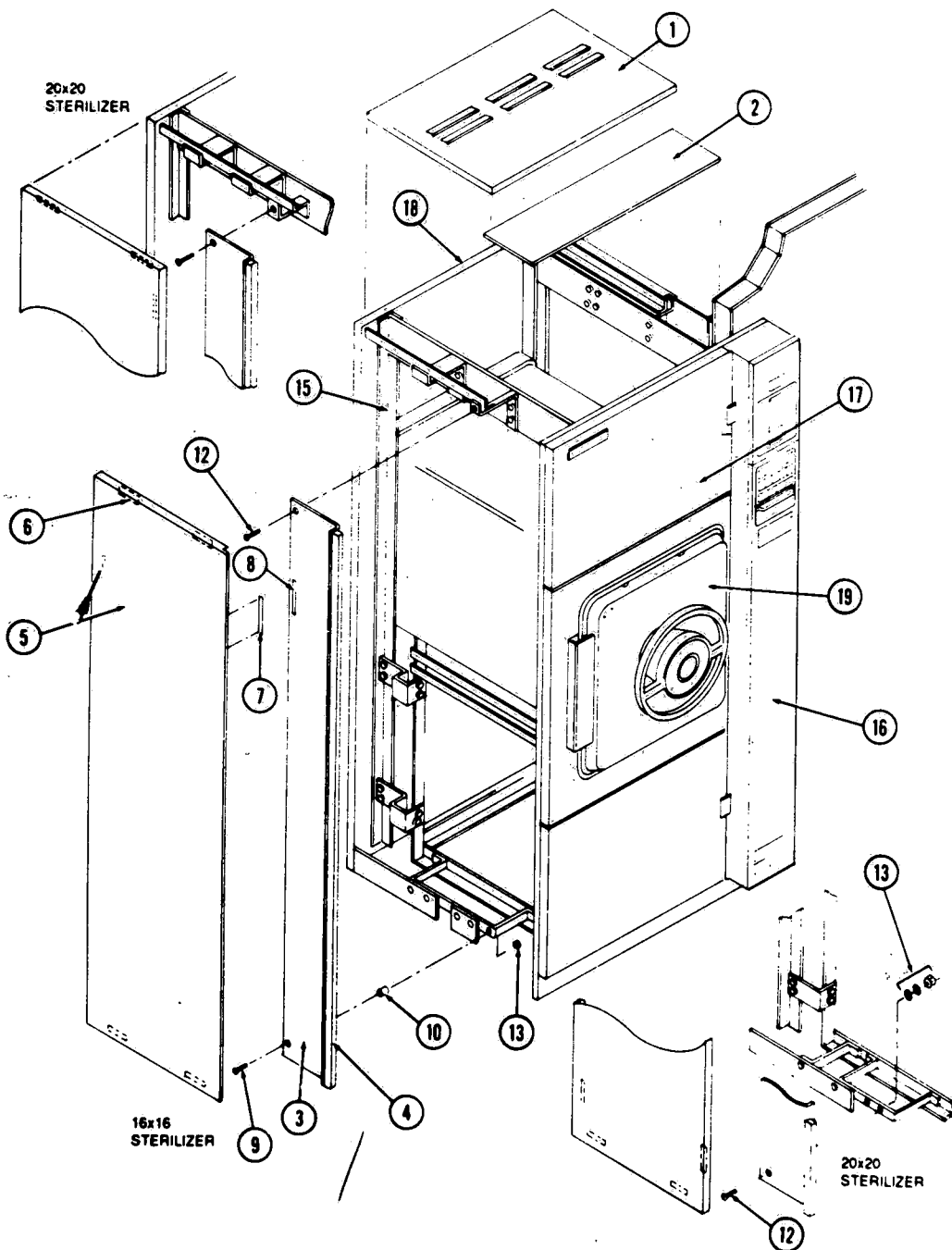


Figure 8-3. CABINET ASSEMBLY: Double Door, Recessed (Part 1 of 2)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-3-	P 146653	607	CABINET ASSEMBLY: 16" Double Door, Recessed (Part 1 of 2)				
	P 146653	609	CABINET ASSEMBLY: 20" Double Door, Recessed (Part 1 of 2)	X			
1	P 136422	001	PANEL, Top				
2	P 136423	001	PANEL, Top	1			
3	P 93415	001	FILLER		1		
4	P 93415	002	FILLER	1			
5	P 93401	001	PANEL, Extension		1		
6	P 93401	002	PANEL, Extension	2			
7	P 84297	001	STRIP, Sponge		2		
8	P 93404	001	PANEL, Side	2			
9	P 146339	014	PANEL, Side	2			
10	P 84298	001	CATCH, Magnetic		2		
11	P 129340	001	TAPE, Velcro, Wool Type	8			
12	P 129340	002	TAPE, Velcro, Hook Type	2			
13	P 38675	041	SCREW, Flat Head, 10-32 x 1-3/4	2			
14	P 129341	001	SPACER	2			
15	P 81668	015	SCREW, Flat Head, 10-32 x 3/4	2	4		
16	P 129360	016	NUT, Flg. Lock 10-32	4	4		
17			SIDE FRAME ASSEMBLY (Figure 8-4)	1	1		
18			CONTROL ASSEMBLY (Figure 8-10 or Figure 8-11)	1	1		
19			PANEL ASSEMBLY, Operating End (Figure 8-5)	1	1		
			PANEL ASSEMBLY, Non-Operating End (Figure 8-8)	1	1		
			COVER AND HANDWHEEL ASSEMBLY (Figure 8-16)	2	2		

\*Secure Velcro Fasteners to panels with Loctite Super Bonder 495 or equivalent.

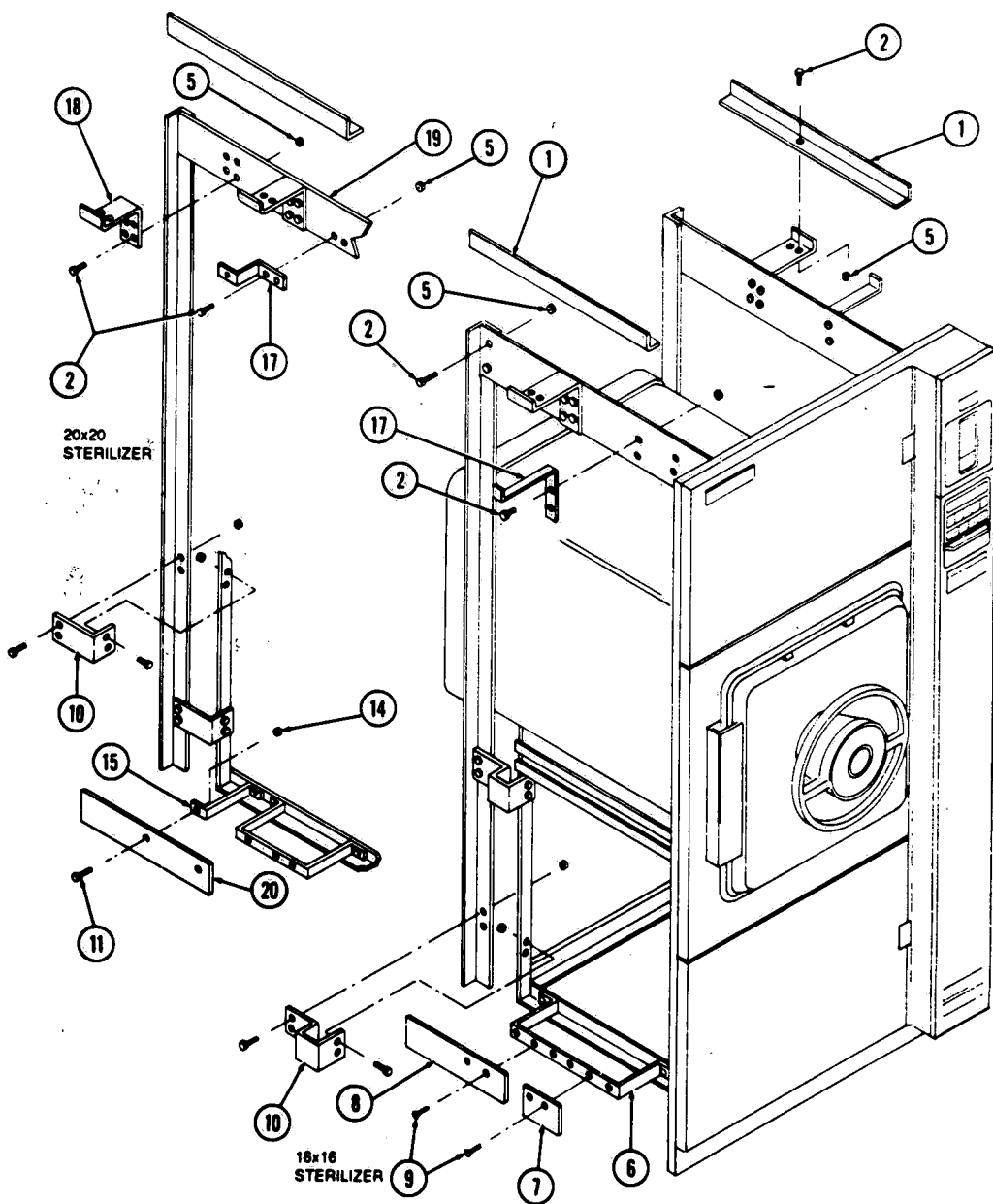


Figure 8-4. CABINET ASSEMBLY: Double Door, Recessed (Part 2 of 2)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-4-	P 146653	607	CABINET ASSEMBLY: 16" Double Door, Recessed, (Part 2 of 2)	X		
	P 146653	609	CABINET ASSEMBLY: 20" Double Door, Recessed, (Part 2 of 2)		X	
1	P 56396	214	SUPPORT, Top Panel, Right	1		
	P 56396	213	SUPPORT, Top Panel, Left	1		
	P 93896	086	SUPPORT, Top Panel		2	
2	P 129360	011	SCREW, Fig. Lock, 1/4-20 x 5/8	18	24	
3						
4						
5	P 129360	015	NUT, Fig. Lock, 1/4-20	18	24	
6	P 93666	001	BRACKET, Bottom	2		
	P 93398	001	BRACKET, Bottom		2	
7	P 84470	001	PLATE, Strike	2		
8	P 84471	001	PLATE, Strike	2		
9	P 43341	091	SCREW, Flat Head, #8-32 x 1/2	8		
10	P 93688	001	BRACKET, Main Support	4		
	P 93664	001	BRACKET, Main Support		4	
11	P 129360	012	SCREW, Fig. Lock, 3/8-16 x 1	4	10	
12						
13						
14	P 129360	014	NUT, Fig. Lock, 3/8-16	4	10	
15	P 93399	001	BRACE, Bottom		2	
16						
17	P 84075	001	BRACKET, Top	2		
	P 84075	003	BRACKET, Top		2	
18	P 93896	089	HANGER, Top	2	4	
19	P 93896	088	SUPPORT, Top Plate	2		
	P 93896	085	SUPPORT, Top Plate		2	
20	P 93663	003	SUPPORT, Bottom		2	

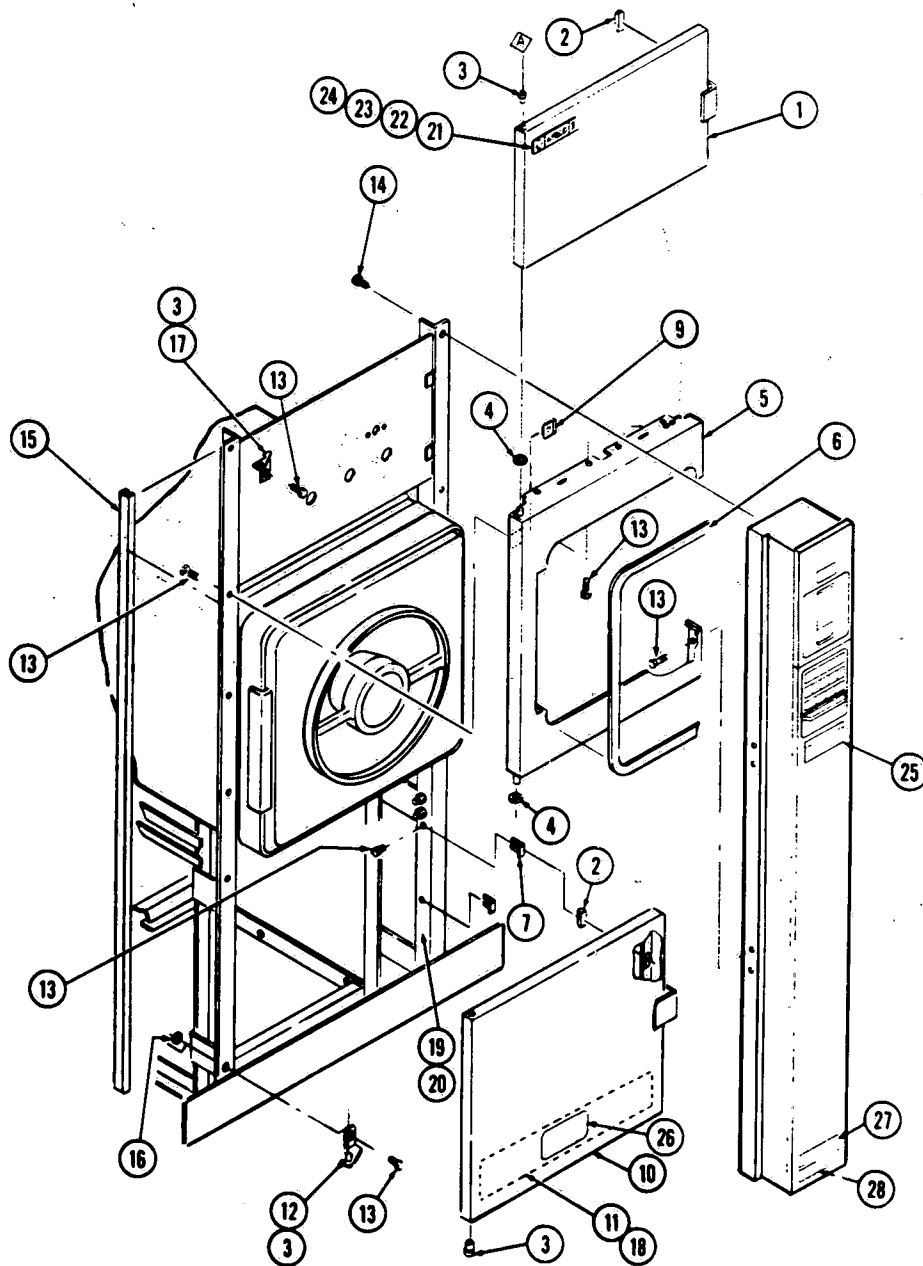


Figure 8-5. PANEL ASSEMBLY: Operating End

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-5-	P 146653	559	PANEL ASSEMBLY: Operating End, 16"	X		
	P 146653	560	PANEL ASSEMBLY: Operating End, 20"		X	
1	P 134468	773	PANEL ASSEMBLY, Upper Access	1		
2	P 134468	772	PANEL ASSEMBLY, Upper Access		1	
3	P 83920	001	CATCH, Magnetic	4	4	
4	P 84455	001	BEARING, Flange	4	4	
5	P 84457	001	WASHER	2	2	
6	P 143149	001	TRIM, Shell	1		
7	P 143148	001	TRIM, Shell		1	
8	P 90184	091	GASKET, Chamber Trim	1	1	
9	P 93702	001	STRIKE	4	4	
10	P 136769	001	STABILIZER (Not Shown)	1		
11	P 136769	002	STABILIZER (Not Shown)		1	
12	P 91924	091	NUT, Tinnerman	5	5	
13	P 134468	711	PANEL, Lower Access	1		
14	P 134468	770	PANEL, Lower Access		1	
15	P 93096	001	RACK, Manual (Not Shown)	1	1	
16	P 93701	001	HINGE ASSEMBLY	1	1	
17	P 129360	011	SCREW, Flange-lock, 1/4-20 x 5/8	22	22	
18	P 129360	013	SCREW, Flange-lock, 3/8-16 x 3/4	4	4	
19	P 93089	001	GASKET, Wall	2	2	
20	P 129360	015	NUT, Hex, 1/4-20	4	4	
21	P 93701	002	HINGE ASSEMBLY	1	1	
22	P 90169	045	Screw, Self Tapping Hex Hd, #10-32 x 3/8	3	3	
23	P 136769	001	Stabilizer 16" (not shown)	1		
24	P 136769	002	Stabilizer 20" (not shown)		1	
25	P 93908	486	DECAL (3011)			
26	P 93908	487	DECAL (3021)			
27	P 93908	488	DECAL (3013)			
28	P 93908	489	DECAL (3023)			
	P 150786	001	DECAL, Warning			
	P 89508	091	DECAL, Important			
	P 150822	531	DECAL, ESD			
	P 150784	001	DECAL, Caution Shock Hazard			

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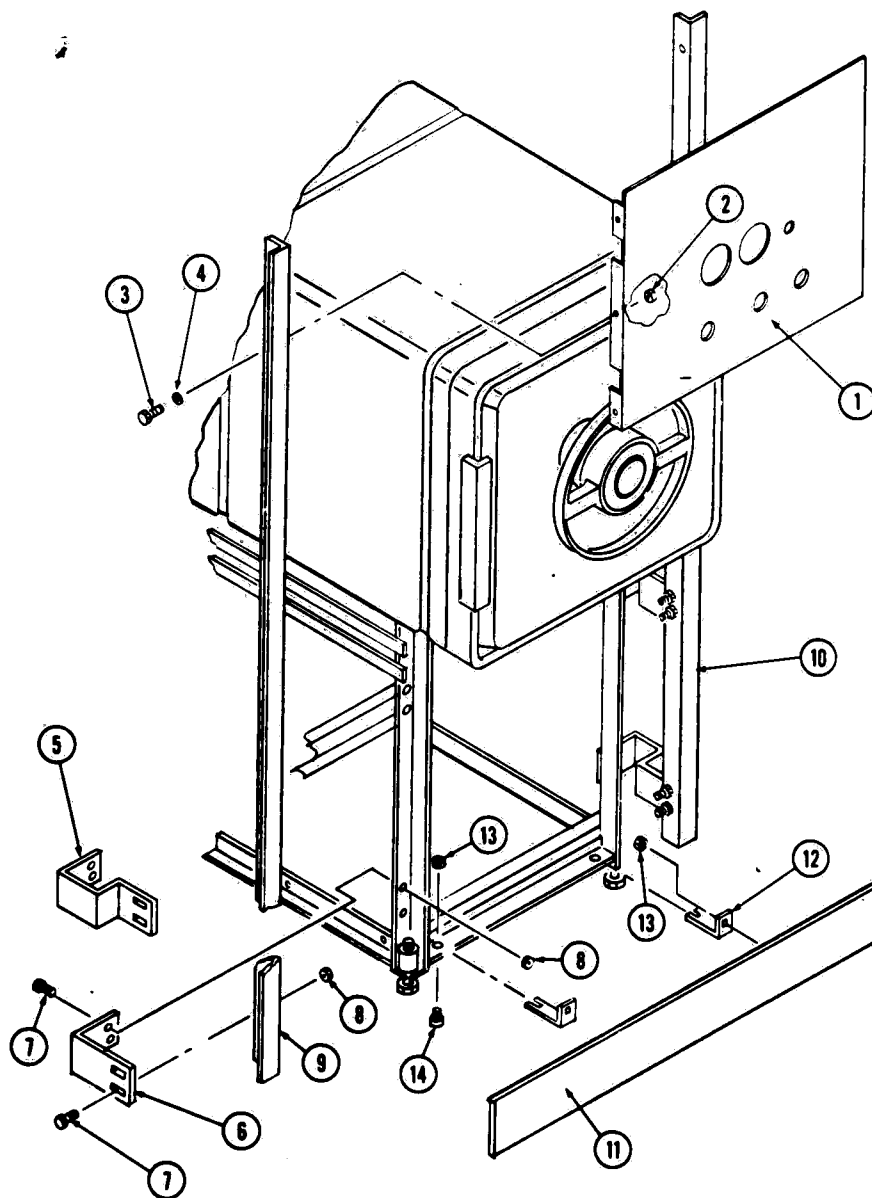


Figure 8-6. SUBPANELS: Operating End

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-6-			SUB PANELS: Operating End, 16" .....	X	
			SUB PANELS: Operating End, 20" .....		X
1	P 146649	005	PANEL ASSEMBLY, Valve (16") .....	1	
	P 146649	004	PANEL ASSEMBLY, Valve (20") .....		1
2	P 129360	016	NUT, Flange Lock, #10-32 .....	8	6
3	P 41012	061	SCREW, Socket Head, #10-32 x 1/2 .....	8	6
4	P 5511	041	WASHER, Flat, 7/16 OD x .195 ID .....	8	6
5	P 93688	002	BRACKET, Support .....	4	
6	P 93664	001	BRACKET, Support .....	4	
7	P 129360	012	SCREW, Flange Lock, 3/8-16 x 1 .....	16	16
8	P 129360	014	NUT, Flange Lock, 3/8-16 .....	16	16
9	P 146653	478	BRACKET, LH .....	1	1
10	P 146653	479	BRACKET, RH .....	1	1
11	P 93084	002	PANEL ASSEMBLY, Kick .....	1	
	P 93084	001	PANEL ASSEMBLY, Kick .....		1
12	P 84437	002	BRACKET, Kick Panel .....	2	2
13	P 129360	015	NUT, Hex, 1/4-20 .....	4	4
14	P 129360	011	SCREW, Flange Lock, 1/4-20 x 5/8 .....	22	22

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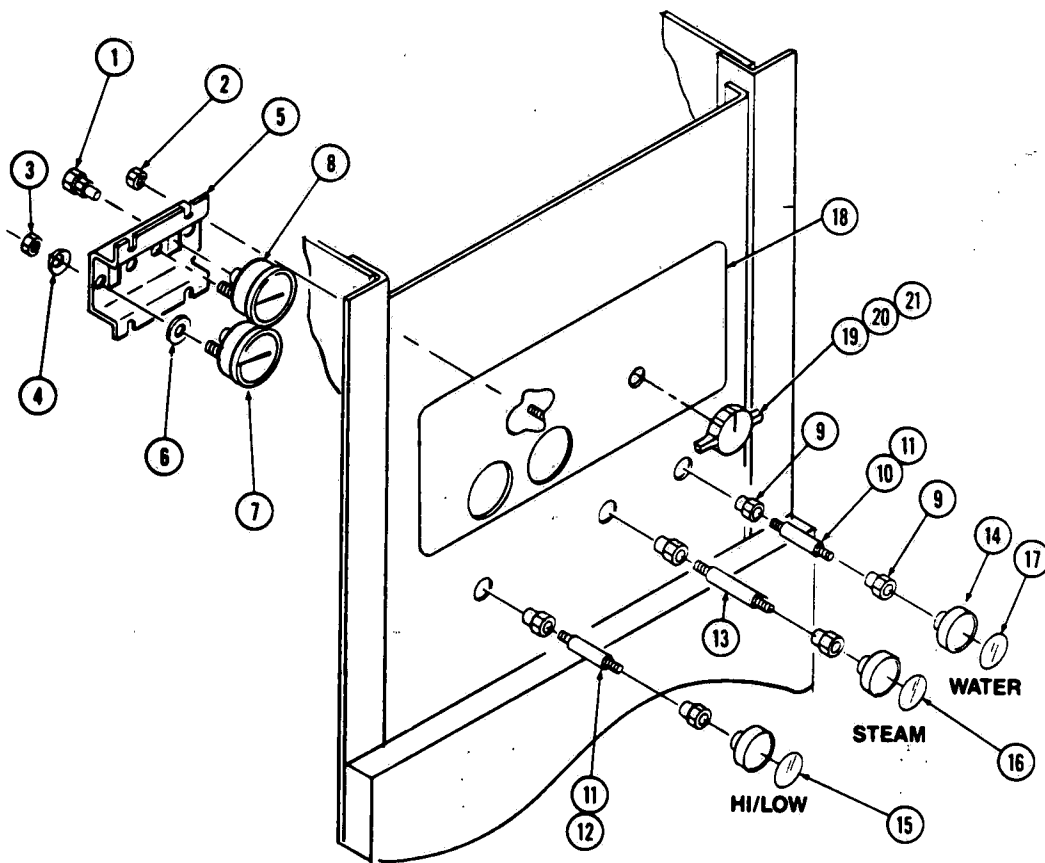


Figure 8-7. TOP CONTROL PANEL: Operating End

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-7-			TOP CONTROL PANEL: Operating End (Vacumatic) .....	X		
			TOP CONTROL PANEL: Operating End (Gravity) .....		X	
1 P	90594 091		FITTING, Straight, 1/8 O.D.T. x 1/8 N.P.T. Female .....	2	2	
2 P	129360 015		NUT, Flange 1/4-20 .....	4	4	
3 P	129360 016		NUT, Flange #10-32 .....	4	4	
4 P	129356 132		WASHER, Belleville .380 I.D. x .750 O.D. ....	4	4	
5 P	93900 052		BRACKET, Gauge .....	1	1	
6 P	5503 045		WASHER, Flat .437 I.D. x 1.00 O.D. x .083 Thk. ....	4	4	
7 P	90525 091		GAUGE, Chamber Pressure .....	1	1	
8 P	90730 091		GAUGE, Jacket Pressure .....	1	1	
9 P	8605 042		NUT, Valve .....	6	6	
10 P	51999 043		ROD, Extension .....	1		
11 P	83869 001		ROD, Extension .....		2	
12 P	83869 002		ROD, Extension .....	1		
13 P	51998 043		ROD, Extension .....	1	1	
14 P	54899 091		KNOB, Valve .....	3	3	
15 P	90576 091		DECAL, Steam Pressure, HI-LO .....	1	1	
16 P	90322 091		DECAL, Steam Supply .....	1	1	
17 P	90323 091		DECAL, Water Supply .....	1	1	
18 P	93900 048		Decal, Manual .....	1	1	
19 P	136760 001		Knob-Selector (See figure 8-29) .....	1	1	
20 P	129060 001		Insert-Knob-Decal .....	1	1	
21 P	43282 091		Screw, Set #10-32 .....	1	1	

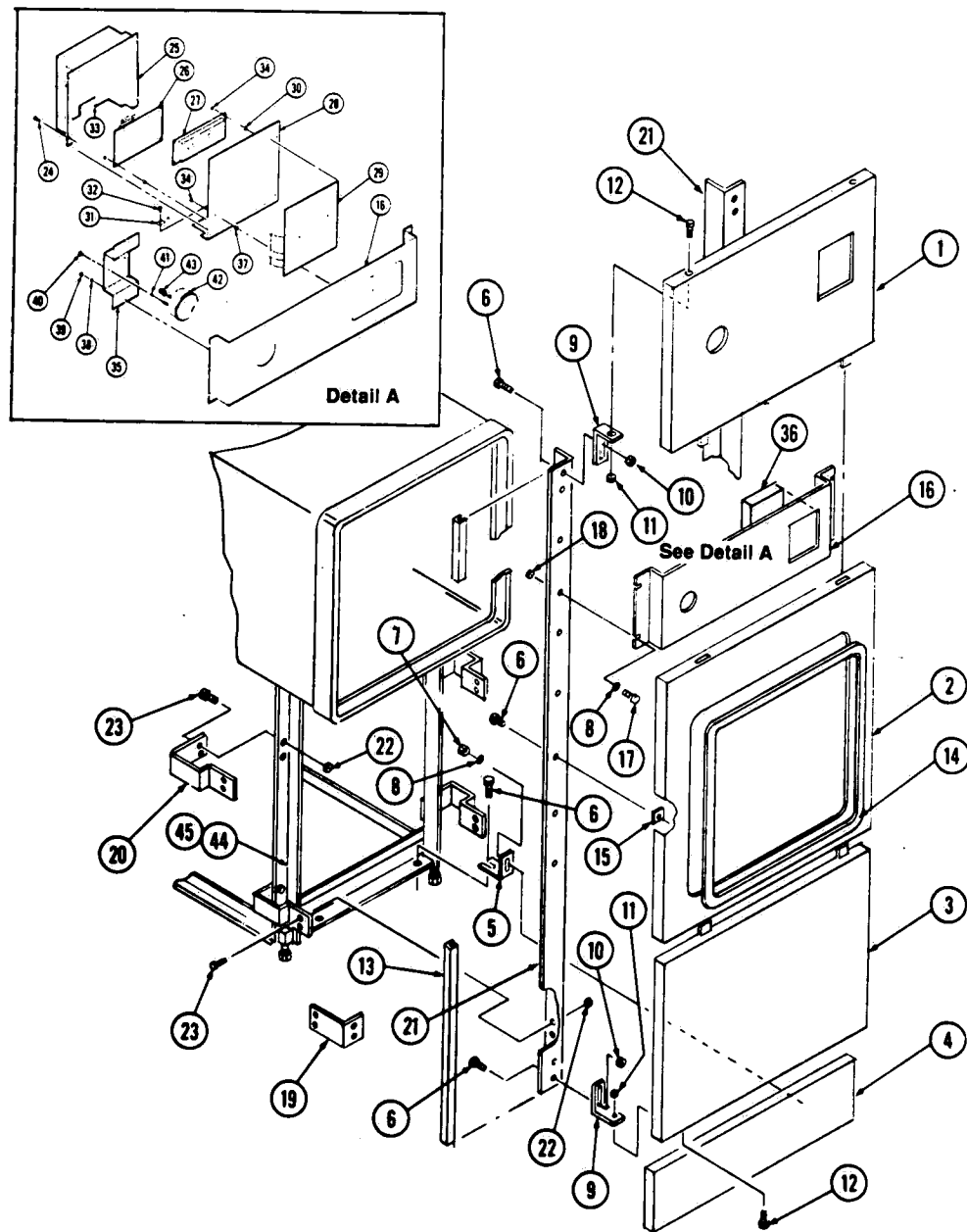


Figure 8-8. PANEL ASSEMBLY: Non-operating End

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-8-			PANEL ASSEMBLY: Non Operating End, 16" .....	X			
			PANEL ASSEMBLY: Non Operating End, 20" .....		X		
1	P 146653	679	PANEL, Upper .....	1			
	P 146653	682	PANEL, Upper .....				
2	P 146522	001	TRIM, Chamber .....	1	1		
	P 146525	001	TRIM, Chamber .....				
3	P 146520	001	PANEL, Lower .....	1	1		
	P 146523	001	PANEL, Lower .....				
4	P 93689	002	PANEL, Kick .....	1	1		
	P 93689	001	PANEL, Kick .....				
5	P 84437	001	BRACKET, Kick Panel .....	2	1		
	P 84437	002	BRACKET, Kick Panel .....				
6	P 129360	011	SCREW, Flange Lock, 1/4-20 x 5/8 .....	20	20		
7	P 129359	532	NUT, Hex Head #10-32 .....	2	2		
8	P 5511	041	WASHER, Flat, 7/16 x .195 x .047 .....	2	2		
9	P 84436	001	CLIP .....	4	4		
10	P 129359	533	NUT, Hex Head, 1/4-20 .....	8	8		
11	P 90198	045	NUT, Speed .....	4	4		
12	P 90562	061	SCREW, Self Tap #8 .....	4	4		
13	P 93089	001	GASKET, Wall .....	2	2		
14	P 90184	091	GASKET, Chamber Trim .....	1	1		
15	P 91924	091	NUT, Tinnerman, 1/4-20 .....	10	10		
16	P 146653	685	SUPPORT, Panel and Gauge, NOE .....	1	1		
17	P 41012	061	SCREW, Socket Head #10-32 x 1/2 .....	4	4		
18	P 129360	016	NUT, Flange Lock #10-32 .....	4	4		
19	P 56396	209	BRACKET .....	4	4		
20	P 93688	002	BRACKET .....	4	4		
21	P 146527	001	BRACKET, Main Support, NOE .....	2	2		
22	P 129360	014	NUT, Flange-Lock 3/8-16 .....	16	16		
23	P 129360	012	SCREW, Flange-Lock 3/8-16 x 1 .....	16	16		
24	P 93908	035	SCREW, Sems, #8-32 x 5/16 .....	4	4		
25	P 136807	146	COVER, Display, NOE .....	1	1		
26	P 136807	138	ASSEMBLY, PC Board .....	1	1		
27	P 93908	435	DISPLAY .....	1	1		
28	P 136807	135	ASSEMBLY, Plate .....	1	1		
29	P 136806	685	PANEL, Touch .....	1	1		
30	P 129360	821	SPACER .....	12	12		
31	P 90514	091	CLAMP .....	1	1		
32	P 93908	036	SCREW, Sems, #10-32 x 3/8 .....	1	1		
33	P 1201	520	GROMMET, Plastic Channel .....	A/R	A/R		
34	P R-4121	001	NUT, Lock, #4-40 .....	9	9		
35	P 93909	500	BRACKET, Gauge .....	1	1		
36	P 146653	684	ASSEMBLY, Display, NOE .....	1	1		
37	P 129360	821	SPACER .....	4	4		
38	P 17796	091	WASHER, Flat, #8 .....	2	2		
39	P 118440	045	NUT, Lock, #8-32 .....	2	2		
40	P 129360	016	NUT, Flange, #10-32 .....	2	2		
41	P 5511	091	WASHER, Flat, 7/16 OD x .195 ID x .047 .....	2	2		
42	P 90525	091	GAUGE, Chamber .....	1	1		
43	P 90594	091	FITTING, Straight, 1/8 O.D.T. x 1/8 N.P.T. .....	2	2		
44	P 136769	001	Stabilizer 16" (not shown) .....	1			
45	P 136769	002	Stabilizer 20" (not shown) .....		1		

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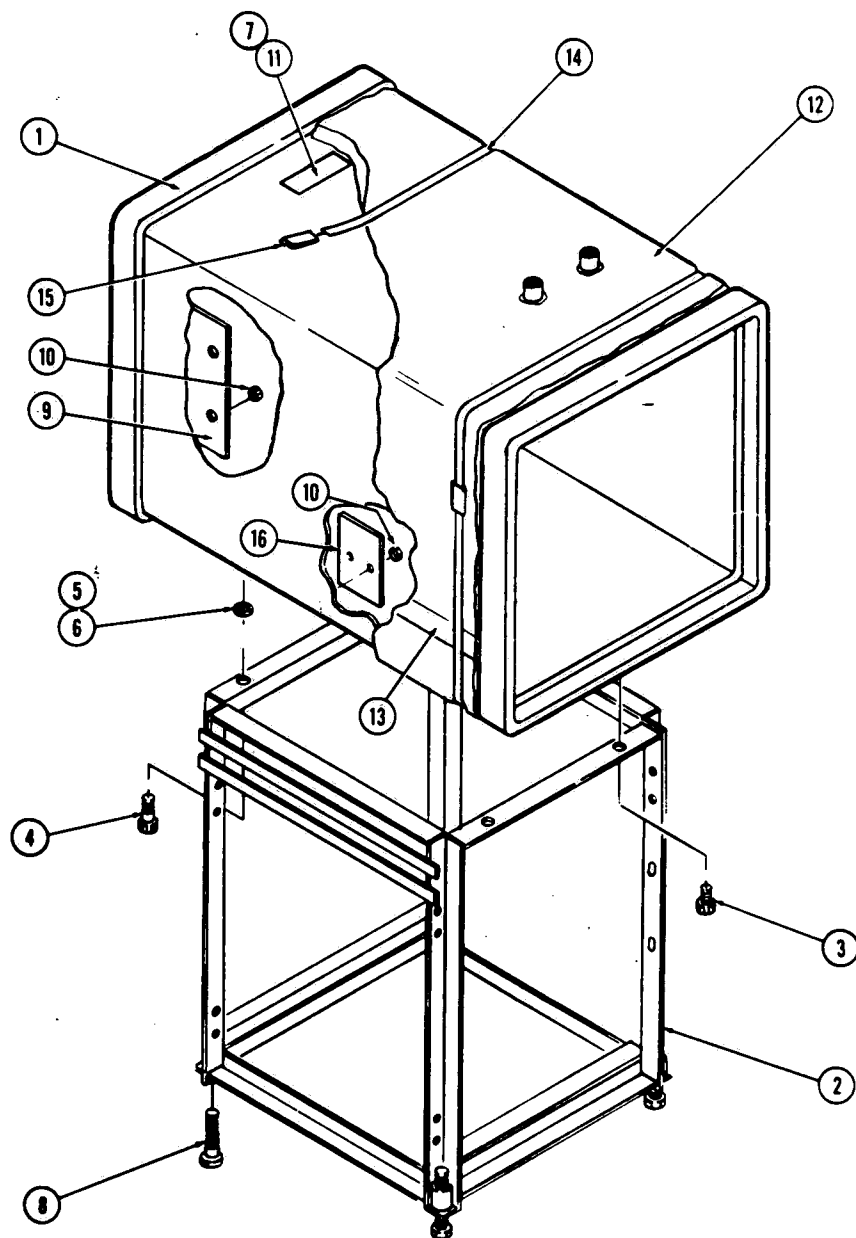


Figure 8-9. SHELL AND STAND ASSEMBLY

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-9.			SHELL AND STAND ASSEMBLY: 16 x 16 Sterilizer .....	X			
			SHELL AND STAND ASSEMBLY: 20 x 20 Sterilizer .....		X		
1	P 146444 001		SHELL, Weldment, Single Door .....	1			
	P 146447 001		SHELL, Weldment, Single Door .....		1		
	P 146445 001		SHELL, Weldment, Double Door .....	1			
	P 146448 001		SHELL, Weldment, Double Door .....		1		
2	P 136435 001		STAND, Weldment .....	1			
	P 136435 002		STAND, Weldment .....		1		
3	P 129360 013		SCREW, Flange Lock, 3/8-16 x 3/4 .....	2	2		
4	P 129360 809		SCREW, Flange Lock, 3/8-16 x 7/8 .....	2	2		
5	P 5503 045		WASHER, Flat, 1 OD x 13/32 ID x 3/32 THK .....		4		
6	P 90441 045		WASHER, Flat, 1 OD x 13/32 ID x 1/8 THK .....	2			
7	P 9448 045		SCREW, Drive, #4 x 1/4 (Not Shown) .....	2	2		
8	P 90407 045		SCREW, Square Head, 5/8-11 UNC x 4-1/2 .....	4	4		
9	P 56396 223		BAFFLE, Steam .....	1	1		
10	P 8648 061		NUT, Hex, 1/4-20 UNC .....	6	6		
11	P 90542 091		NAMEPLATE .....	1	1		
12	P 764184 091	*	INSULATION KIT .....	1	1		
13							
14							
15	P 32268 091		SEAL, Strap .....	2	2		
16	P 56396 443		BAFFLE .....	1	1		
	* P 764184 091		INSULATION KIT, Single Door .....	1	1		
	* P 764315 025		INSULATION KIT, Double Door .....	1	1		

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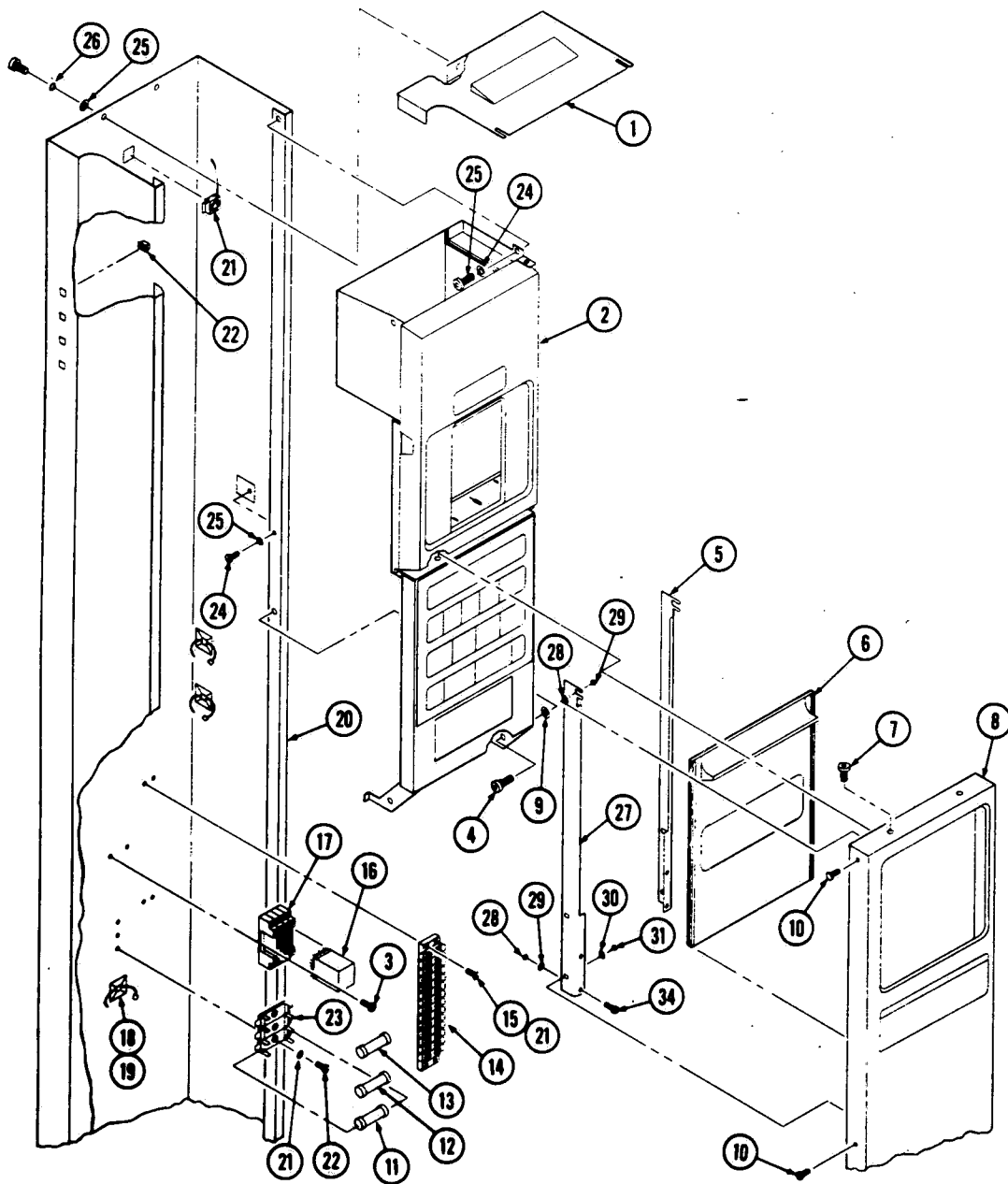


Figure 8-10. CONTROL COLUMN (Part 1 of 2)

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-10-			CONTROL COLUMN, Right Hand (1 of 2)	X	
			CONTROL COLUMN, Left Hand (1 of 2)		X
1 P	136806 426		COVER, Top	1	
2 P	136806 427		COVER, Top		1
3 P	93908 039		PC & BRACKET ASSEMBLY (Figure 8-12)		
4 P	93908 035		SCREW, SEMS #6-32 x 3/8"	2	2
5 P	93909 489		SCREW, Pan Head #8-32 x 5/16"	14	14
6 P	146653 600		ANGLE, Right Hand	1	1
7 P	129356 135		DOOR, Sliding	1	1
8 P	146653 594		SCREW, Button Head #8-32 x 3/8"	2	2
9 P	129359 467		PANEL, Front	1	1
10 P	23431 041		BLOCK, Threaded	2	2
11 P	764317 449		SCREW, Socket Head #10-32 x 3/8"	2	2
12 P	764317 819		FUSE, 2 Amp Slo-Blo (F1) (Box of 5)	1	1
13 P	764317 778		FUSE, 1/4 Amp Slo Blo (F2) (Box of 5)	1	1
14 P	136806 410		FUSE, 3 Amp Fast-Blo (F3) (Box of 5)	1	1
15 P	3984 041		HARNESS, TB2	1	1
16 P	93909 576		SCREW, Round Head #6-32 x 3/8"	2	2
17 P	150768 001		RELAY (CRI)	1	1
18 P	75954 091		SOCKET, Relay	1	1
19 P	129326 001		TIE, Wire	18	18
20 P	146653 227		MOUNT, Cable Tie	12	12
21 P	19684 061		HOUSING, Control	1	1
22 P	12451 041		LOCKWASHER	5	5
23 P	93908 525		SCREW, #6-32 x 1/2"	3	3
24 P	23431 041		BLOCK, Fuse	1	1
25 P	31705 045		SCREW, Socket Head #10-32 x 3/8"	12	12
26 P	5511 091		LOCKWASHER #10	15	15
27 P	93909 490		WASHER, Flat #10 .200 ID x .437 OD	10	10
28 P	26032 091		ANGLE, Left Hand	1	1
29 P	13794 041		WASHER, #4	8	8
30 P	81682 006		NUT, #4-40	8	8
31 P	2960 042		LOCKWASHER, #10	2	2
32 P	84449 001		NUT, Hex #10-32	2	2
33 P	93909 491		CATCH, Magnetic (Not Shown)	1	1
34 P	93908 031		BRACKET, Magnetic Catch (Not Shown)	1	1
			SCREW, SEMS #4-40 x 1/4" (Not Shown)	2	2

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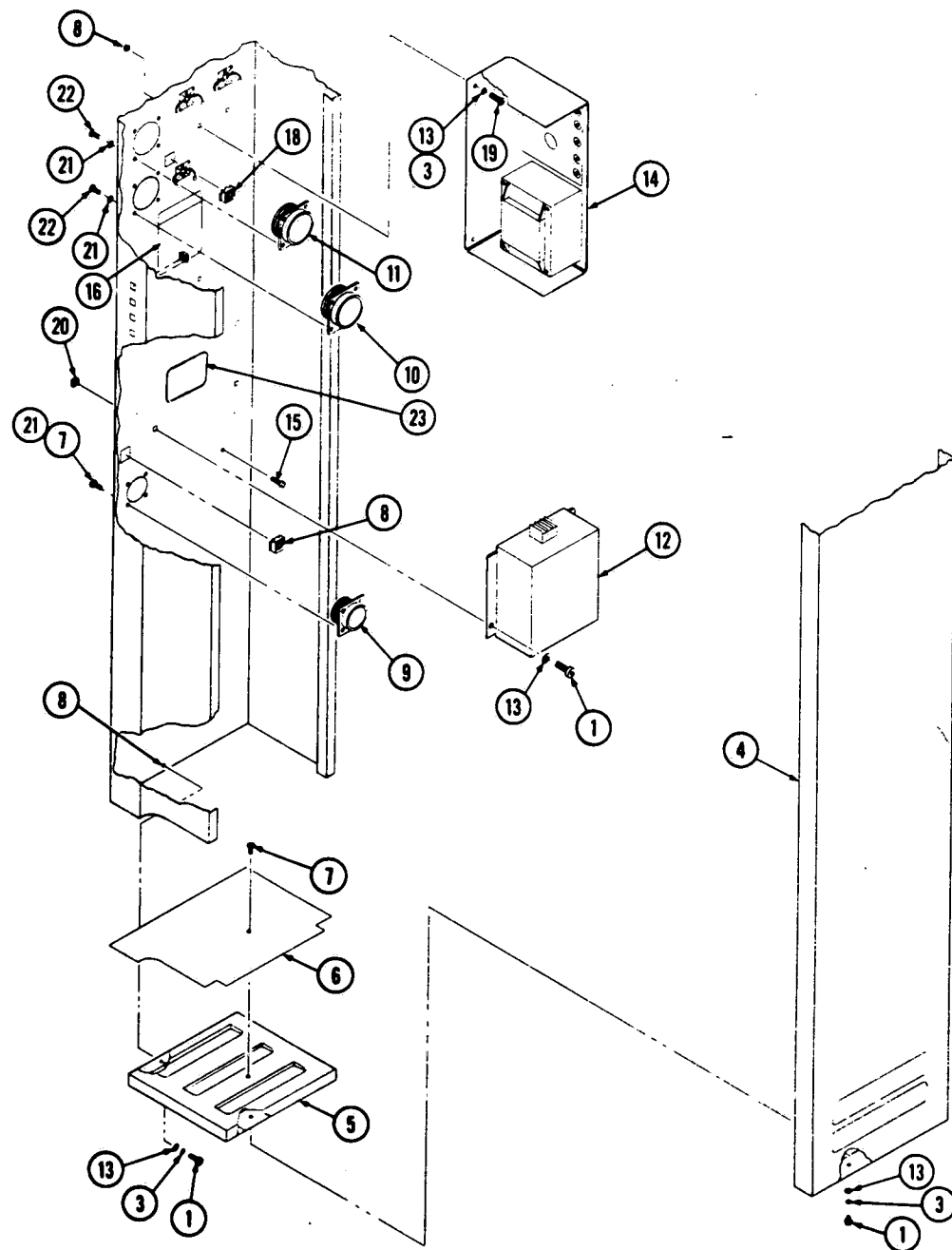


Figure 8-11. CONTRGL COLUMN (Part 2 of 2)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-11-			CONTROL COLUMN, Right Hand (2 of 2)	X			
			CONTROL COLUMN, Left Hand (2 of 2)		X		
1	P 23431	041	SCREW Socket Head Cap #10-32 x 3/8	10	10		
2							
3	P 5511	091	WASHER, Flat #10	6	6		
4	P 146653	594	PANEL, Bottom Front	1	1		
5	P 146653	214	PLATE, Bottom	1	1		
6	P 56374	001	SCREEN	1	1		
7	P 93908	035	SCREEN, Pan Head #8-32 x 5/16	7	7		
8	P 129352	069	NUT, Retainer #10-32	5	5		
9	P 136806	897	CABLE, Assembly P57	1	1		
	P 56396	140	• RECEPTACLE, P57 (3 Contact)	1	1		
	P 150822	180	• CONTACT, Pin	3	3		
10	P 146653	212	HARNESS, Assembly P54 (Figure 8-14)	1	1		
11	P 146653	485	HARNESS, Assembly P53 (Figure 8-15)	1	1		
12	P 93821	001	FILTER	1	1		
13	P 31705	045	LOCKWASHER, #10	4	4		
14	P 136807	141	POWER SUPPLY	1			
	P 136807	142	POWER SUPPLY		1		
15	P 129360	814	SCREW, Ground Green #10-32 x 1/2"	1	1		
16	P 129359	025	DECAL, Warning (Not Shown)	1	1		
17							
18	P 91924	091	NUT, Retainer 1/4-20	6	6		
19	P 41012	061	SCREW, Soc Hd, #10-32 x 1/2 lg	3	3		
20	P 129360	539	RIVNUT, #10-32	1	1		
21	P 129359	531	NUT, Keps, #8-32	12	12		
22	P 93908	037	SCREW, SSMS, #8-32 x 1/2 lg	8	8		
23	P 129359	025	DECAL, Warning				

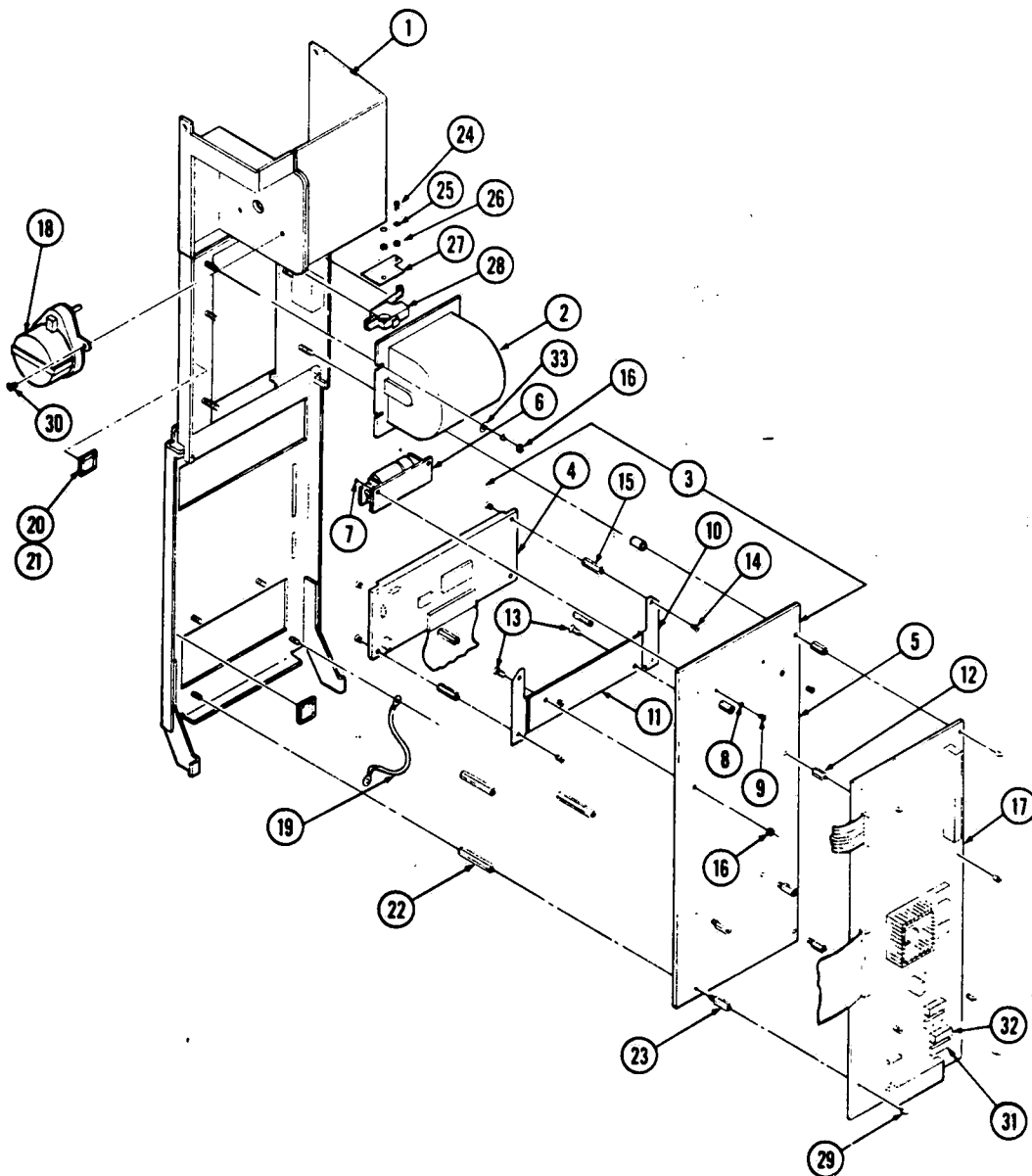


Figure 8-12. PC AND BRACKET ASSEMBLY (Part 1 of 2)

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-12			P/C & BRACKET ASSEMBLY: Small Sterilizer (1 of 2).....	X
1	P 146653 492		BRACKET, Mounting.....	1
2	P 136800 949		HOUSING, Paper.....	1
3	P 136806 844		DISPLAY BOARD ASSEMBLY.....	1
4	P 93908 435		• DISPLAY MODULE.....	1
5	P 146653 204		• BOARD, Printer.....	1
6	P 136806 843		• • PRINTER.....	1
7	P 129357 898		• • NUT, #1-64.....	1
8	P 129357 902		• • WASHER, Flat .084 ID x .219 OD.....	2
9	P 129357 897		• • SCREW, Round Head #1-64.....	2
10	P 93908 484		• PLATE.....	1
11	P 129359 500		• SEPARATOR, Fish Paper.....	1
12	P 129359 465		• STANDOFF, 1/2".....	1
13	P 93908 039		• SCREW, SEMS #6-32 x 3/8".....	2
14	P 93908 031		• SCREW, SEMS #4-40 x 1/4".....	8
15	P 129360 004		• STANDOFF #4-40 x 3/4.....	4
16	P 84121 002		• NUT, KEPS #6-32.....	1
17	P 146653 201		BOARD, Control (Less EPROM).....	1
18	P 93909 399		MOTOR, Gear.....	1
19	P 93909 390		WIRE, Ground.....	1
20	P 129326 001		MOUNT, Harness.....	2
21	P 75954 091		STRAP, Tie.....	2
22	P 129360 003		STANDOFF, #6-32 x 1-5/16".....	4
23	P 129359 465		STANDOFF, 1/2".....	4
24	P 90993 091		SCREW, Round Head #4-40 x 3/4".....	2
25	P 26032 091		WASHER, Flat #4.....	2
26	P 84121 001		NUT, KEPS #4-40.....	2
27	P 90124 091		SWITCH, Insulator.....	1
28	P 129359 463		SWITCH, Micro.....	1
29	P 93908 033		SCREW, SEMS #6-32 x 1/4".....	7
30	P 93908 031		SCREW, SEMS #4-40 x 1/4".....	4
31	P 56400 034		• EPROM, Gravity Sterilizer.....	1
	P 56400 035		• EPROM, Vacamatic Sterilizer.....	1
	P 93909 638		• EPROM, Gravity Sterilizer.....	1
	P 93909 639		• EPROM, Vacamatic Sterilizer.....	1
32	P 129360 549		BATTERY BACKED RAM & CLOCK IC.....	1
33	P 84114 002		WASHER, Flat, #6.....	4
*Units with Printer PC Board 146653-037 **Units with Printer PC Board 146653-204 ***Printer PC Board 146653-037 is N.L.A. Use 146653-204 and Order EPROM, Item 31, 93909-638 or 93909-639.				

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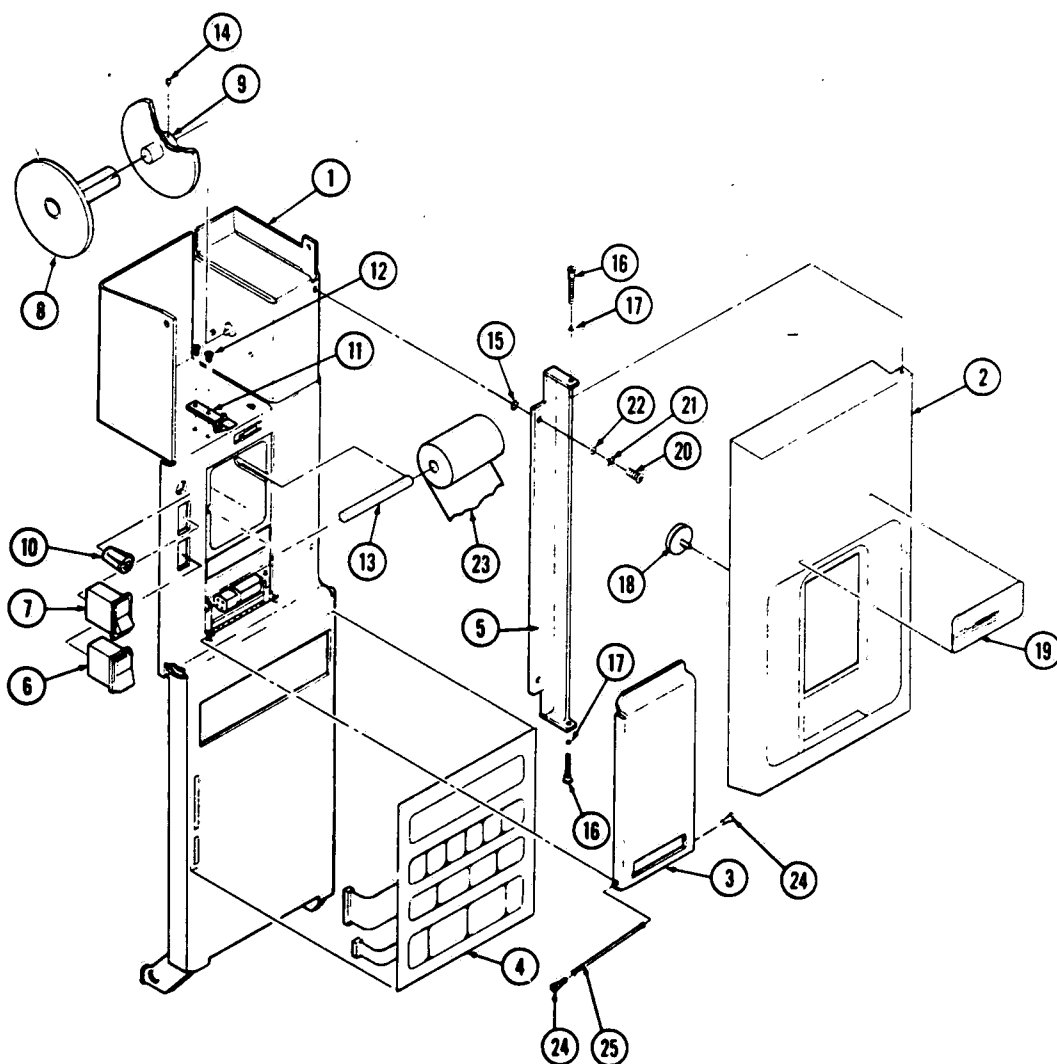


Figure 8-13. PC AND BRACKET ASSEMBLY (Part 2 of 2)

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FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-13-			P/C & BRACKET ASSEMBLY: Small Sterilizer (2 of 2) .....	X
1	P 146653 492		BRACKET, Mounting .....	1
2	P 146653 226		DOOR .....	1
3	P 93908 482		PLATEN .....	1
4	P 136806 685		PANEL, Touch .....	1
5	P 136806 411		BAR, Hinge .....	1
6	P 93908 901		SWITCH, Printer, Function .....	1
7	P 93902 846		SWITCH, Control .....	1
8	P 93908 002		SPOOL, Assembly .....	1
9	P 93908 001		STUD, Assembly .....	1
10	P 129356 001		CATCH, Magnetic .....	1
11	P 129360 448		CLIP .....	1
12	P 93908 031		SCREW, SEMS #4-40 x 1/4" .....	4
13	P 129357 884		SHAFT, Paper .....	1
14	P 129352 117		SCREW, Set, #5 x 3/16" .....	1
15	P 19677 041		LOCKWASHER, #10 .....	2
16	P 129359 489		SCREW, Shoulder, #4-40 x 1/8" x 29/64" .....	4
17	P 129139 002		WASHER, Flat, Fibre .....	2
18	P 93909 376		STRIKE .....	1
19	P 129359 478		NAMEPLATE, Stage 2 .....	1
20	P 129359 461		SCREW, Button Head, #10-32 x 1/2" .....	2
21	P 129352 069		NUT, Retaining, #10-32 .....	2
22	P 5511 041		WASHER, Flat, #10 .....	2
23	P 129359 008		PAPER, Roll (Box of 5 Rolls) .....	1
24	P 150828 190		NUT - ACORN .....	2
25	P 150828 189		ROD .....	1

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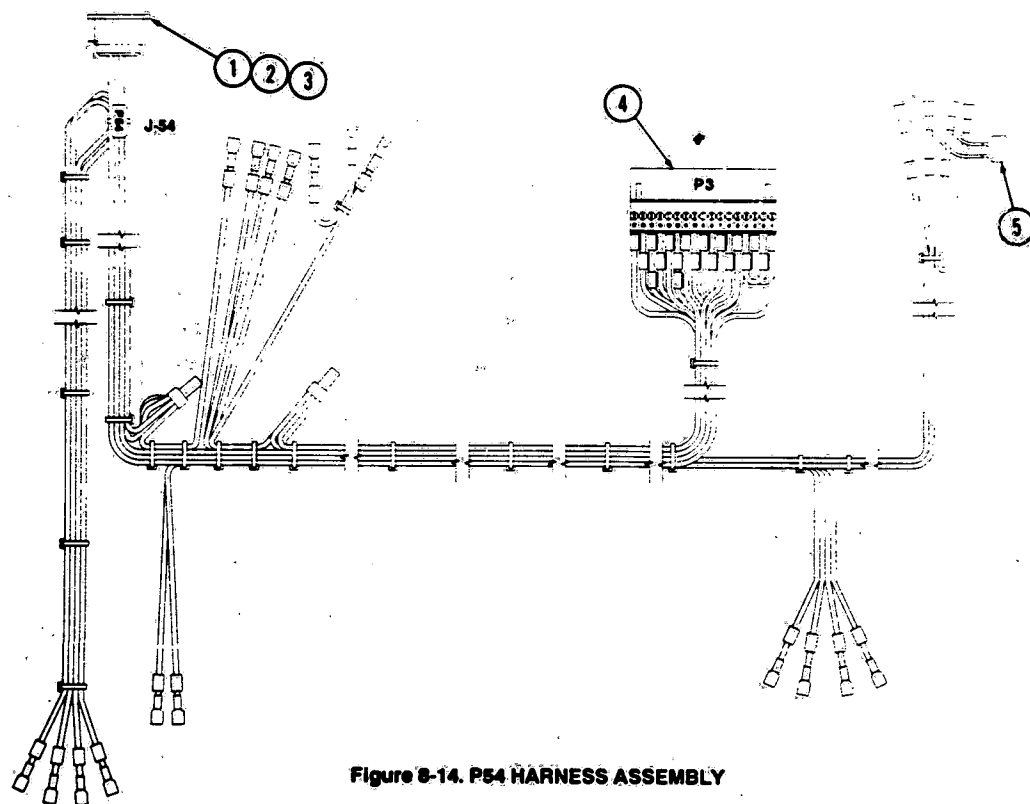


Figure 8-14. P54 HARNESS ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-14-	P 148853 212		HARNESS ASSEMBLY, P54 .....	X
1	P 83443 006		• RECEPTACLE, P54 (37 Position) .....	1
2	P 84461 002		• CONTACT, Socket (#24/20 AWG) .....	18
3	P 84198 004		• CONTACT, Socket (#18/16 AWG) .....	2
4	P 129357 804		• CONNECTOR, P3 .....	1
5	P 129360 183		• CAPACITOR, 0.047 ufd. ....	1

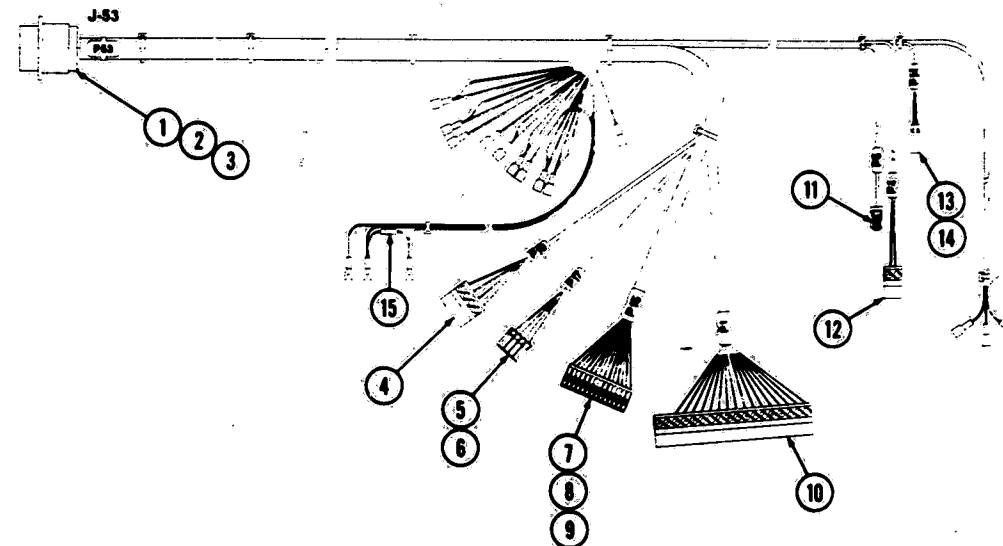


Figure 8-15. P53 HARNESS ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-15-	P 148853 485		HARNESS ASSEMBLY, P53 .....	X
1	P 83909 383		• RECEPTACLE, P53 (63 Position) .....	1
2	P 84247 001		• CONTACT, Pin (#22 GA. Wire) .....	42
3	P 129359 474		• CONTACT, Pin (Flat Oval Cordage) .....	4
4	P 129356 447		• PLUG, P19 (4 Pos. Connector) .....	1
5	P 129360 440		• CONNECTOR, P17 (4 Pos. Housing) .....	1
6	P 129360 441		• RELIEF COVER (4 Pos.) .....	1
7	P 129359 448		• HOUSING, P15 (14 Pos.) .....	1
8	P 129359 449		• RELIEF COVER (14 Pos.) .....	1
9	P 129359 445		• KEYING PLUG .....	1
10	P 129359 049		• PLUG, P1 (18 Pos.) .....	1
11	P 83909 478		• PLUG ASSEMBLY, P5 (4 Pos.) .....	1
12	P 129359 521		• PLUG, P4 (2 Pos. Connector) .....	1
13	P 129359 475		• HOUSING, P14 (2 Pos.) .....	1
14	P 129362 800		• CONTACT, Socket .....	2
15	P 84157 001		• DIODE, 1 Amp, 50 V. ....	1

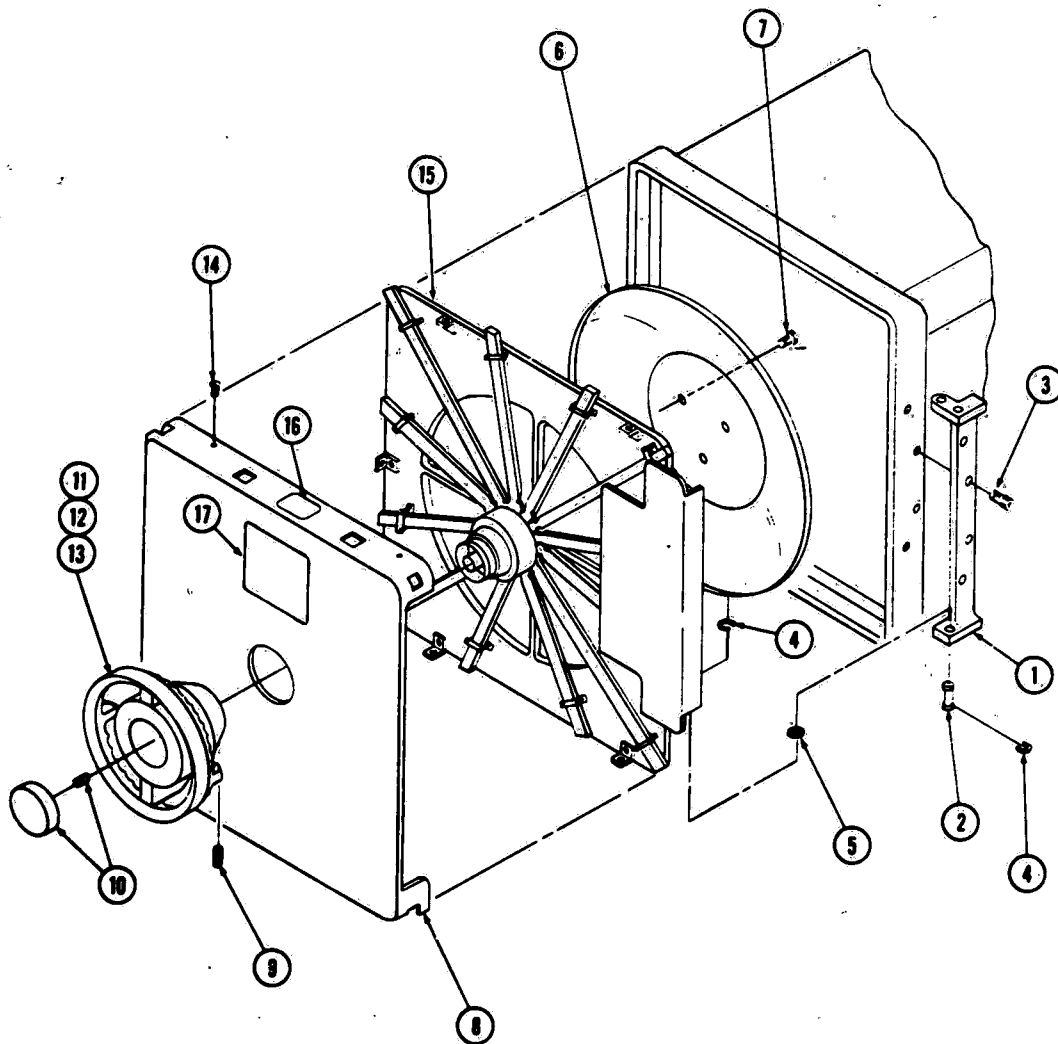


Figure 8-16. DOOR COVER AND HANDWHEEL ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-16			DOOR COVER AND HANDWHEEL ASSEMBLY: 16X16 Sterilizer ..	X		
			DOOR COVER AND HANDWHEEL ASSEMBLY: 20x20 Sterilizer ..		X	
1	P 90034	063	WELDMENT, Hinge .....	1		1
2	P 90119	063	WELDMENT, Hinge .....	2		2
3	P 90041	063	PIN, Hinge .....	4		4
4	P 43845	045	CAP SCREW, Socket Head .....	2		2
5	P 12706	045	RING, Retaining .....	1		1
6	P 79806	001	WASHER, Hinge .....	A/R	A/R	A/R
7	P 54474	063	COVER, Door Back .....	1		1
8	P 54476	063	COVER, Door Back .....	3		3
9	P 12283	041	SCREW, Round Head .....	1		1
10	P 139540	063	COVER, Chamber Door, Stainless Steel .....	3		3
11	P 149502	063	COVER, Chamber Door, Stainless Steel .....	1		1
12	P 51963	045	SET SCREW .....	1		1
13	P 93174	001	BUTTON, Assembly .....	1		1
14	P 136445	001	HANDWHEEL ASSEMBLY .....	1		1
15	P 146327	001	• HANDLE, Chamber Door .....	1		1
16	P 93647	001	• FACE PLATE .....	1		1
17	P 90562	061	SCREW, Self Tapping .....	5		9
			DOOR LOCK AND HINGE ASSEMBLY (Figure 8-17) .....	1		1
	P 129359	033	DECAL, Hot Surface .....			
	P 56396	846	DECAL, Burn Hazard .....			

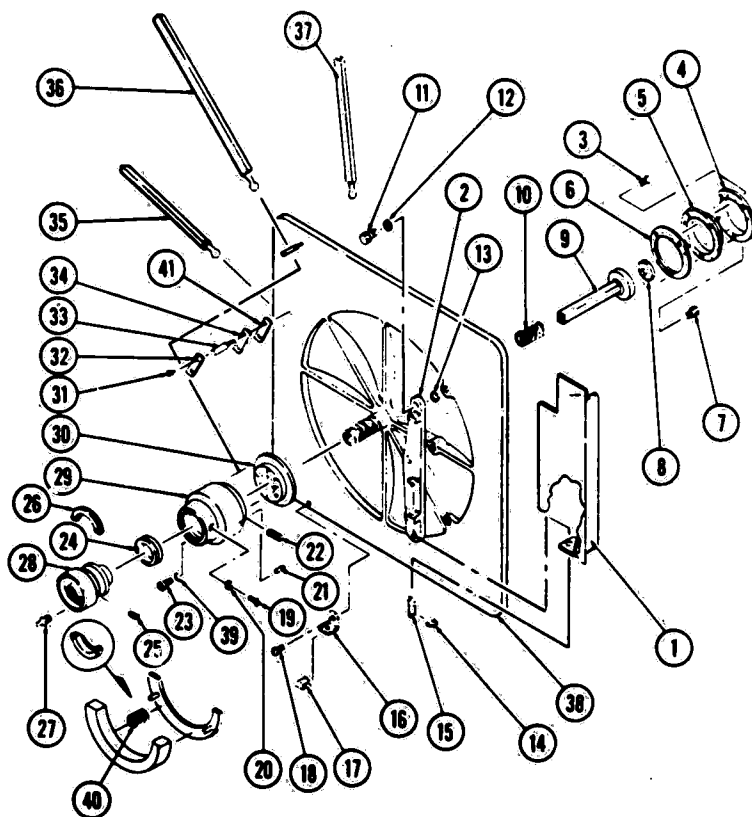


Figure 8-17. DOOR LOCK AND HINGE ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-17-	P 99172 091		DOOR LOCK AND HINGE ASSEMBLY: 16x16 Sterilizer .....	X			
	P 99201 091		DOOR LOCK AND HINGE ASSEMBLY: 20x20 Sterilizer .....		X		
1	P 93303 001		HINGE WELDMENT, Door .....	1			
	P 96096 063		HINGE WELDMENT, Door .....		1		
2	P 93300 001		DOOR HINGE BRACKET .....	1			
	P 134194 001		DOOR HINGE BRACKET .....		1		
3	P 4782 061		BOLT, Machine, Finished .....	9	9		
4	P 8624 091		COVER, Diaphragm .....	1	1		
5	P 7230 061		DIAPHRAGM .....	1	1		
6	P 7753 091		GASKET, Diaphragm .....	1	1		

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
7	P 74710 061		SCREW, Special .....	3	3		
8	P 8778 091		THRUST PLATE ASSEMBLY .....	1	1		
9	P 90363 091		ROD WELDMENT, Lock Clutch .....	1	1		
10	P 12267 061		SPRING, Lock Clutch Rod .....	1	1		
11	P 3858 041		SCREW, Hex Head .....	3			
	P 89257 041		SCREW, Hex Head .....		3		
12	P 3516 041		WASHER, Plain .....	3			
	P 17264 042		WASHER, Plain .....		3		
13	P 52149 045		WASHER, Shake Proof .....	3			
	P 52148 045		WASHER, Shake Proof .....		3		
14	P 12706 045		RING, Retaining .....	4	4		
15	P 24520 001		PIN, Hinge .....	2			
	P 89265 062		PIN, Hinge .....		2		
16	P 90440 061		BRACKET, Door Cover .....	5			
	P 150136 001		BRACKET, Door Cover .....		9		
17	P 90198 045		SPEED NUT .....	5	9		
18	P 90169 045		SCREW, Self Tapping .....	5	9		
19	P 10570 061		SCREW, Truss Head .....	2	2		
20	P 19678 045		LOCKWASHER .....	2	2		
21	P 22996 061		ROLL PIN .....	2	2		
22	P 8303 091		KEY, Door .....	2	2		
23	P 12264 042		SCREW, Socket Head .....	6	6		
24	P 6416 091		BEARING, Ball Thrust .....	1	1		
25	P 47598 061		DRIVE SCREW .....	13	13		
26	P 13194 091		THRUST RING ASSEMBLY .....	1	1		
27	P 90475 091		LUBE FITTING .....	1	1		
28	P 96102 091		NUT, Handle .....	1	1		
29	P 96181 056		PLATE, Top Socket .....	1	1		
30	P 11817 056		PLATE, Bottom Socket .....	1	1		
31	P 39863 091		SCREW, Round Head .....	24	24		
32	P 150365 001	1/2"	LINK, Arm Clip <i>150365-002 (1.5")</i> .....	12	12		
33	P 33429 001		STUD, Arm Clip .....	24			
	P 150135 001		STUD, Arm Clip .....		24		
34	P 33435 045		BLOCK, Fulcrum Arm Clip .....	12			
	P 150134 001		BLOCK, Fulcrum Arm Clip .....		12		
35	P 92634 001		ARM, Door .....	8			
	P 92633 001		ARM, Door .....		4		
36	P 55972 004		ARM, Door .....	4			
	P 55973 002		ARM, Door .....		4		
37	P 92633 002		ARM, Door .....	4			
38			DOOR ASSEMBLY (Figure 8-18) .....	1	1		
39	P 5596 041		LOCKWASHER .....	6	6		
40	P 12260 091		SPRING, Thrust Ring .....	4	4		
41	P 150822 317		SHIM, Door, .005 Thickness .....	A/R			
	P 150822 318		SHIM, Door, .010 Thickness .....	A/R			
	P 150822 319		SHIM, Door, .015 Thickness .....	A/R			
	P 150822 320		SHIM, Door, .005 Thickness .....		A/R		
	P 150822 321		SHIM, Door, .010 Thickness .....		A/R		
	P 150822 322		SHIM, Door, .015 Thickness .....		A/R		

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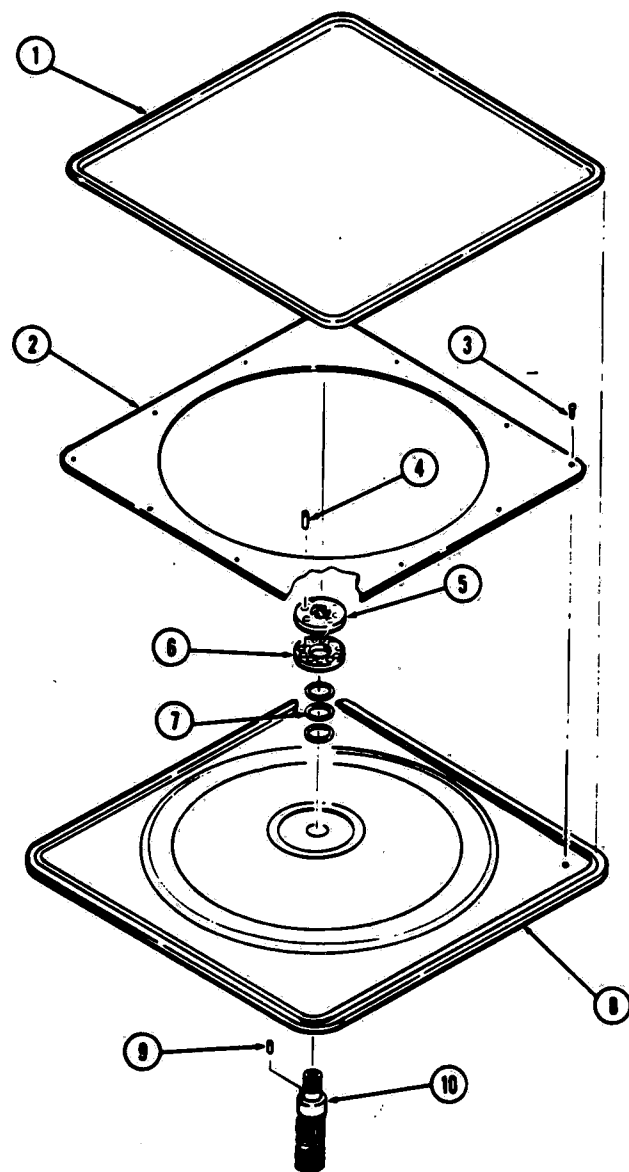


Figure 8-18. DOOR ASSEMBLY

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-18			DOOR ASSEMBLY: 16X16 Sterilizer .....	X			
			DOOR ASSEMBLY: 20x20 Sterilizer .....		X		
1	P 74367	091	GASKET .....	1			
	P 78767	091	GASKET .....		1		
2	P 54475	061	COVER, Door Back .....	1			
	P 97889	061	COVER, Door Back .....		1		
3	P 47598	061	DRIVE SCREW .....	13	13		
4	P 44604	061	ROLL PIN .....	2	2		
5	P 9083	091	RING, Lock Clutch .....	1	1		
6	P 22057	091	NUT, Door Post .....	1	1		
7	P 150330	001	SHIM, Door .....	A/R	A/R		
8	P 149505	091	DOOR .....	1			
	P 141105	001	DOOR .....		1		
9	P 36683	061	PIN .....	1	1		
10	P 22058	063	POST, Door .....	1	1		

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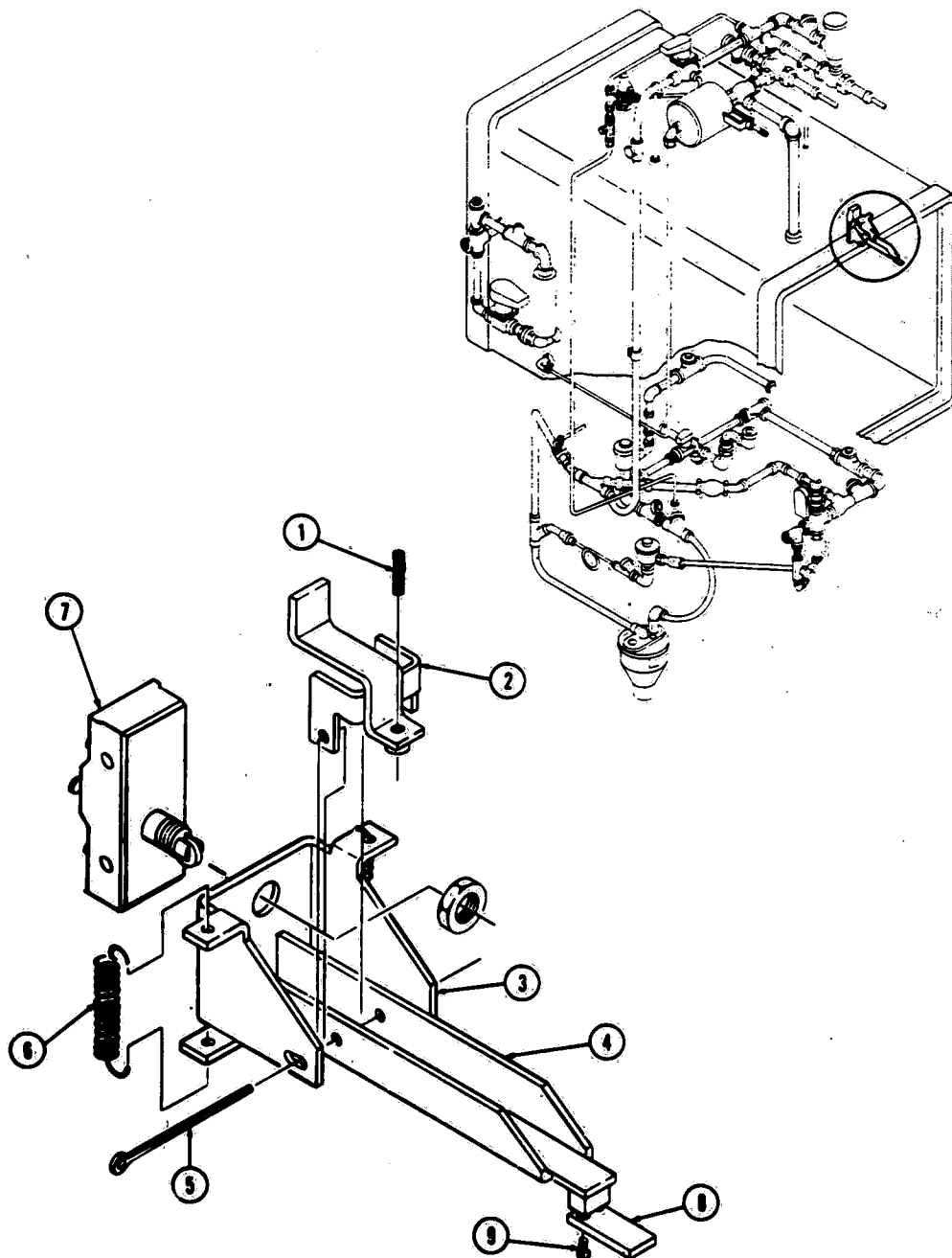


Figure 8-19. DOOR SWITCH ASSEMBLY

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-19-	P 136807	136	DOOR SWITCH ASSEMBLY .....	X
1	P 25542	091	SCREW, Socket Set, #10-24 x 7/8" .....	2
2	P 90706	045	LEVER, Weldment .....	1
3	P 56396	166	BRACKET .....	1
4	P 90748	045	ARM, Weldment .....	1
5	P 90593	061	PIN, Cotter .....	1
6	P 90751	061	SPRING .....	2
7	P 93909	494	SWITCH, Door .....	1
8	P 90891	045	EXTENSION, Switch (20 X 20 Oper. End & Non-Oper. End) .....	1
P 90888	045		EXTENSION, Switch (16 x 16 Non-Operating End Only) .....	1
9	P 4682	041	SCREW, Round Head #8-32 x 3/8 .....	2

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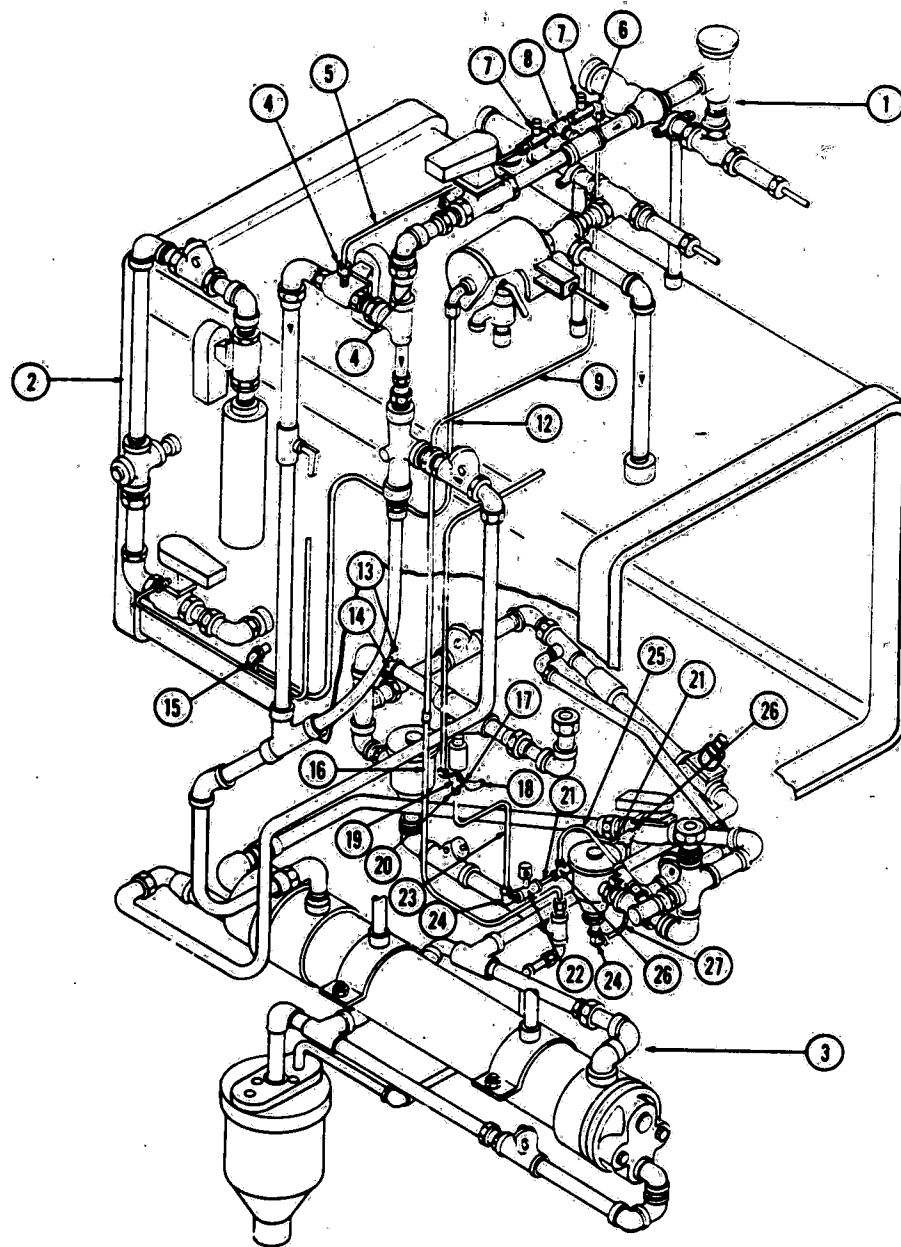


Figure 8-20. PIPING ASSEMBLY, Complete - Vacumatic

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-20-	P 146653	672	PIPING ASSEMBLY, Complete	X
1			PIPING SUBASSEMBLY, Top (Figure 8-21)	1
2			PIPING SUBASSEMBLY, Side (Figure 8-22)	1
3			PIPING SUBASSEMBLY, Bottom (Figure 8-23)	1
4	P 43289	091	FITTING, Compression, 1/8 N.P.T. x 1/4 O.D.T.	4
5	P R-915	103	TUBE, 1/4 O.D. x 13-3/16 for 16" VAC or 13-7/8 for 20" VAC	1
6	P 42510	091	ELL, Compression, 1/8 N.P.T. x 1/4 O.D.T.	1
7	P 83630	001	VALVE, Needle, 1/8 N.P.T.	2
8	P 46099	091	TEE, Compression, 1/4 O.D.T.	1
9	P R-915	103	TUBE, 1/4 O.D. x 4-9/32	1
10				
11	P R-915	103	TUBE, 1/4 O.D. x 24-7/16	1
12	P R-915	103	TUBE, 1/4 O.D. x 43-13/16	1
13	P 150822	279	PIPE SUPPORT, 1/4 N.P.T. x 1-1/4	1
14	P 75376	010	CLAMP, Pipe, 3/8 N.P.T.	2
15	P 41306	091	ELL, Compression, 1/4 N.P.T. x 1/4 O.D.T.	1
16	P R-915	103	TUBE, 1/4 O.D. x 33-1/8	1
17	P 28916	091	NIPPLE, 1/4 N.P.T. x 7/8	1
18	P 1619	091	ELL, Street, 1/4 N.P.T.	1
19	P 45060	091	CROSS, 1/4 N.P.T.	1
20	P 22711	091	FITTING, Compression, 5/16 O.D.T. x 1/4 N.P.T.	3
21	P R-915	163	TUBE, 5/16 O.D. x 3-15/16	2
22	P 83523	001	VALVE, Needle, 1/4 N.P.T.	1
23	P R-915	163	TUBE, 5/16 O.D. x 11-25/32	1
24	P 7033	091	ELL, Compression, 5/16 O.D.T. x 1/4 N.P.T.	2
25	P R-915	163	TUBE, 5/16 O.D. x 3-13/32	1
26	P 39227	091	TEE, Compression, 5/16 O.D.T.	2
27	P R-915	163	TUBE, 5/16 O.D. x 6-11/16	1

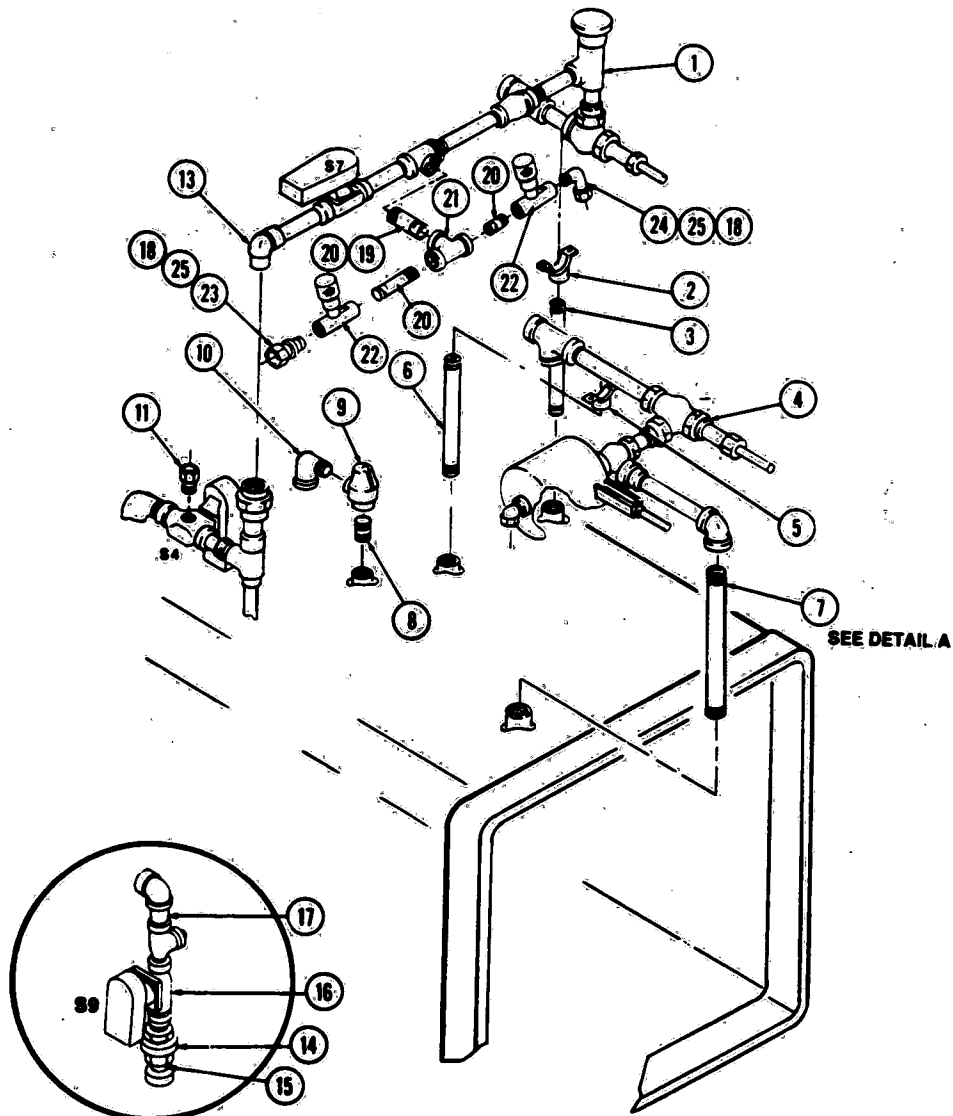


Figure 8-21. PIPING SUBASSEMBLY, Top - Vacumatic

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-21-			PIPING SUBASSEMBLY, Top .....	X
1 P	136648 001		WATER SUPPLY ASSEMBLY (Figure 8-24) .....	1
2 P	39590 010		CLAMP, Pipe, 3/4 .....	1
3 P	150822 292		NIPPLE, Steel, 1/4 N.P.T. x 8-1/2 .....	1
4 P	93708 001		STEAM SUPPLY ASSEMBLY (Figure 8-44) .....	1
5 P	75376 010		CLAMP, Pipe, 3/8 .....	1
6 P	150822 293		NIPPLE, Steel, 1/4 N.P.T. x 8-11/16 .....	1
7 P	29044 091		NIPPLE, 3/8 N.P.T. x 8-3/4 .....	1
8 P	836 042		BUSHING, Reducing, 3/4 x 1/2 N.P.T. ....	1
9 P	150527 001		VALVE, Safety, 1/2 N.P.T. ....	1
10 P	1636 091		ELL, Street, 3/4 N.P.T. ....	1
11 P	19514 091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	1
12 P	45407 091		ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T. ....	1
13 P	44507 091		ELL, Street, 7/8 O.D.T. ....	1
*Direct-Steam Units With Auto-Utilities Option, Item 7 is Replaced With Following:				
14 P	5266 091		UNION .....	1
15 P	21990 091		NIPPLE, 3/8 x 1-1/4 .....	1
16 P	83264 002		VALVE, Solenoid .....	1
P	764070 001		• REPAIR KIT .....	1
P	764070 002		• COIL .....	1
17 P	29021 091		NIPPLE, 3/8 x 3 .....	1
18 R	3500 735		TUBING 1/4 O.D.T. ....	A/R
19 P	939 091		BUSHING, Red, 1/4 N.P.T. x 1/8 N.P.T. ....	1
20 P	28899 091		NIPPLE, 1/8 N.P.T. x 2 .....	3
21 P	37862 091		TEE, 1/8 N.P.T. ....	1
22 P	83630 001		VALVE, Needle 1/8 N.P.T. ....	2
23 P	19514 091		FITTING, Comp. Str., 1/8 N.P.T. x 1/4 O.D.T. ....	1
24 P	42510 091		FITTING, Comp. EL., 1/8 N.P.T. x 1/4 O.D.T. ....	1
25 P	84371 001		INSERT TUBE, 1/4 O.D.T. ....	2

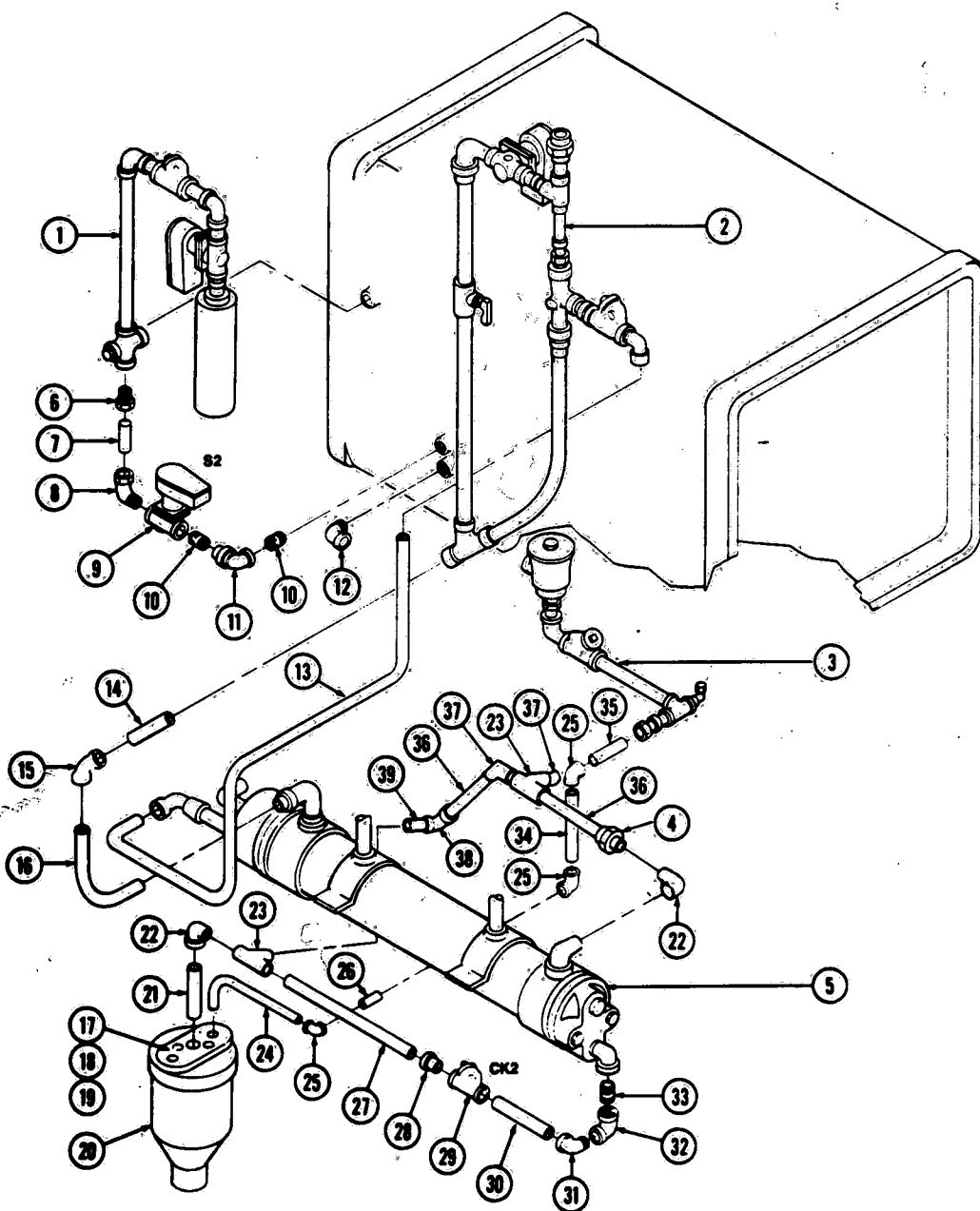


Figure 8-22. PIPING SUBASSEMBLY, Side - Vacumatic

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-22-			PIPING SUBASSEMBLY, Side - Vacumatic	X
1 P	136654 001		AIR BRAKE ASSEMBLY (Figure 8-24)	1
2 P	136655 001		EJECTOR ASSEMBLY (Figure 8-25)	1
3 P	136807 131		JACKET DRAIN ASSEMBLY (Figure 8-26)	1
4 P	91226 091		UNION, 7/8 O.D.T.	1
5 P	56396 231		EXCHANGER, Heat (Figure 8-23)	1
6 P	29931 091		FITTING, Compression, 5/8 O.D.T. x 1/2 N.P.T.	1
7 P	90273 091		TUBE, 5/8 O.D. x 3-1/2	1
8 P	40153 091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
9 P	150822 309		VALVE, Solenoid, 3/8 N.P.T. (S2) Piston Type	1
P	764317 687		• REPAIR KIT	1
P	764070 002		• COIL	1
P	150778 001		• VARISTOR (Not Shown)	1
10 P	29013 091		NIPPLE, 3/8 N.P.T. x 1	2
11 P	89153 091		ELL, Union, 3/8 N.P.T.	1
12 P	41306 091		ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T.	1
13 P	136656 001		TUBE, 5/8 O.D.	1
14 P	91238 091		TUBE, 7/8 O.D. x 4-3/8	1
15 P	84456 001		ELL, 45°, 7/8 O.D.T.	1
16 P	84453 003		TUBE, Water, 7/8 O.D.	1
17 P	56396 016		PLUG, 7/8	1
18 P	56396 017		PLUG, 1	1
19 P	56396 018		PLUG, 1-3/4	1
20 P	141198 006		ASSEMBLY, Funnel (Kit P-764316-212)	1
21 P	83373 006		TUBE, 7/8 O.D. x 4-7/16	1
22 P	44507 091		ELL, 90° Street, 7/8 O.D.T.	2
23 P	89384 091		"Y" BRANCH, 7/8 O.D.T.	2
24 P	129360 546		TUBE, 5/8 O.D.	1
25 P	90212 091		ELL, Solder, 5/8 O.D.T.	3
26 P	90276 091		TUBE, 5/8 x 1-13/16 Lg.	1
27 P	89391 091		TUBE, 5/8 x 10	1
28 P	39072 091		FITTING, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
29 P	5424 091		VALVE, Check, 3/8 N.P.T. (CK2)	1
P	74335 091		• DISC	1
30 P	29025 091		NIPPLE, 3/8 N.P.T. x 4	1
31 P	1631 091		ELL, Street, 3/8 N.P.T.	2
32 P	1630 091		ELBOW, 3/8 N.P.T.	1
33 P	29013 091		NIPPLE, 3/8 x 1	1
34 P	90283 091		TUBE, 5/8 x 5-3/8	1
35 P	90260 091		TUBE, 5/8 O.D.T. x 2 Lg.	1
36 P	91188 091		TUBE, 7/8 O.D.T. x 5 Lg.	2
37 P	89721 091		ELL, Street, 7/8 O.D.T., 45°	2
38 P	44495 091		ELL, 90°, 7/8 O.D.T.	1
39 P	80030 091		TUBE, 7/8 O.D.T. x 1-5/8 Lg.	1

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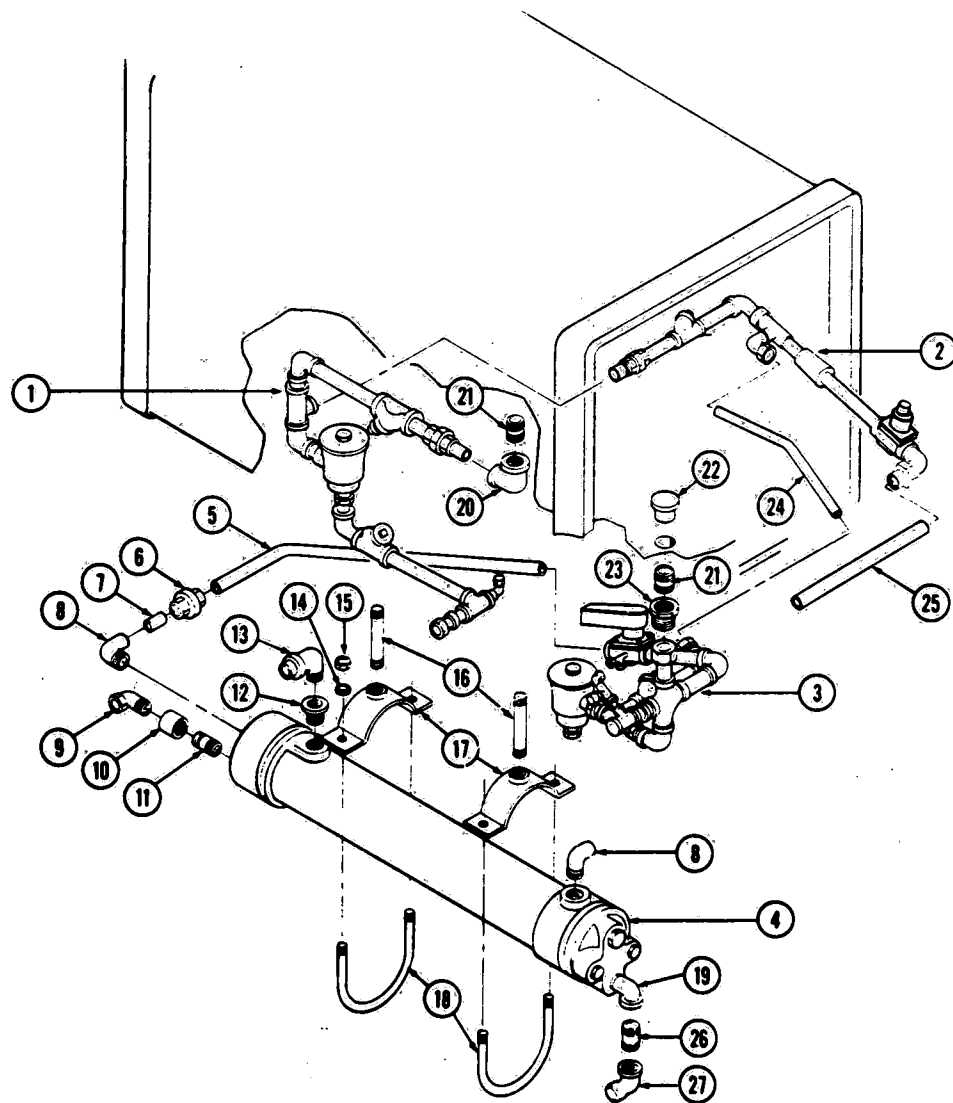


Figure 8-23. PIPING SUBASSEMBLY, Bottom - Vacuum

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
1	P 136807	131	JACKET DRAIN ASSEMBLY (Figure 8-26)	1
2	P 136806	681	STEAM EJECTOR ASSEMBLY (Figure 8-27)	1
3	P 146653	677	CHAMBER DRAIN ASSEMBLY (Figure 8-26)	1
4	P 56396	231	HEAT EXCHANGER	1
5	P 93709	002	TUBE, Exhaust, 7/8 O.D.	1
6	P 91226	091	UNION, 7/8 O.D.T.	2
7	P 89400	091	TUBE, 7/8 O.D. x 1-5/8	1
8	P 89996	091	ELBOW, 7/8 O.D. x 1 N.P.T.	1
9	P 23972	091	ELL, Compression, 1/2 N.P.T. x 5/8 O.D.T.	1
10	P 118384	091	COUPLING, Red, 1" N.P.T. x 1/2 N.P.T.	1
11	P 29357	091	NIPPLE, 1" N.P.T. x 2-1/4	1
12	P 841	042	BUSHING, Red, 1 N.P.T. x 3/4 N.P.T.	1
13	P 91230	091	ELL, Union, 7/8 O.D.T. x 3/4 N.P.T.	1
14	P 19679	041	LOCKWASHER, 5/16	4
15	P 3098	045	NUT, Hex, 5/16-18	4
16	P 150822	301	SUPPORT, Pipe, 3/4 N.P.T. x 7-3/4	2
17	P 93161	001	STRAP	2
18	P 93163	001	"U" BOLT	2
19	P 1631	091	ELBOW, Street, 3/8 N.P.T.	1
20	P 7461	091	ELBOW, Red, 3/4 N.P.T. x 3/8 N.P.T.	1
21	P 29291	091	NIPPLE, 3/4 x 1-1/4	2
22	P 56396	427	SCREEN ASSEMBLY	1
23	P 1747	091	THREAD END, 3/4 N.P.T.	1
24	P 93909	497	TUBE, Ejector, 5/8 O.D.	1
25	P 84460	001	TUBE, 7/8 O.D. x 8-5/8 Lg	1
26	P 29013	091	NIPPLE, 3/8 N.P.T. x 1	1
27	P 1630	091	ELBOW, 3/8 N.P.T.	2

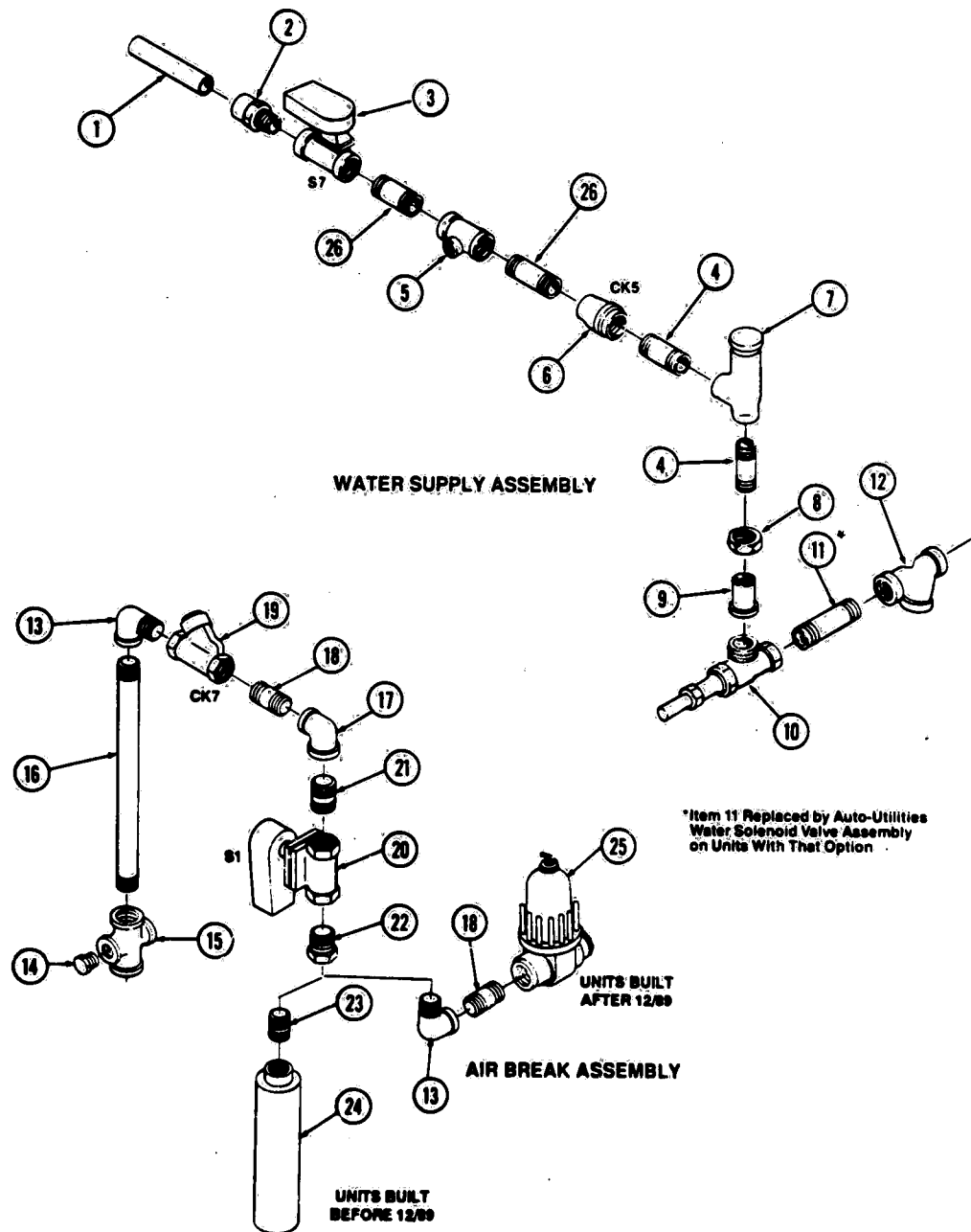


Figure 8-24. WATER SUPPLY AND AIR BREAK ASSEMBLIES - Vcamatic

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-24-	P 136648 001		WATER SUPPLY ASSEMBLY .....	X
1	P 91238 091		TUBE, 7/8 O.D. x 4-3/8 .....	1
2	P 91158 091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T. ....	1
3	P 83261 002		VALVE, Solenoid, 3/4 N.P.T. (S-7) .....	1
	P 764072 001		• KIT, Valve Repair .....	1
	P 764072 002		• COIL, 120 V., 60 Hz., 110 V., 50 Hz. ....	1
4	P 29295 091		NIPPLE, 3/4 N.P.T. x 2-1/4 .....	4
5	P 75040 091		TEE, 3/4 x 3/4 x 1/4 N.P.T. ....	1
6	P 83870 001		VALVE, Check, 3/4 N.P.T. (CK5) .....	1
7	P 77023 001		VACUUM BREAKER, 3/4 N.P.T. ....	1
	P 752735 091		• KIT, Repair Sloan Type V-370-A 3/4 N.P.T. ....	1
	P 764323 804		• KIT, Repair Zurn/Wilkins Type #30 3/4 N.P.T. ....	1
8	P 2903 091		NUT, Union .....	1
9	P 4248 091		SPUD, Female, 3/4 N.P.T. ....	1
10	P 26907 091		VALVE, Angle, 3/4 N.P.T. ....	1
11	P 29299 091		NIPPLE, 3/4 N.P.T. x 3-1/4 (Units w/o Auto-Utilities) .....	1
12	P 47708 091		STRAINER, 3/4 N.P.T. ....	1
	P 754616 091		• SCREEN, Stainless Steel .....	1
8-24-	P 136654 001		AIR BREAK ASSEMBLY .....	X
13	P 1634 091		ELL, Street, 1/2 N.P.T. ....	1
14	P 38404 091		PLUG, Pipe, 1/2 N.P.T. ....	1
15	P 150822 333		CROSS, 1/2 N.P.T. ....	1
16	P 29203 091		NIPPLE, 1/2 N.P.T. x 11-1/4 Lg. ....	1
17	P 1625 091		ELL, 3/4 N.P.T. x 1/2 N.P.T. ....	1
18	P 29166 091		NIPPLE, 1/2 N.P.T. x 2" Lg. ....	1
19	P 150822 354		VALVE, Swing, Check 1/2 N.P.T. (CK7) .....	1
	P 764319 608		• DISC, Teflon, Renewal .....	A/R
20	P 84444 002		VALVE, Solenoid, 3/4 N.P.T. (S-1) .....	1
	P 764078 001		• KIT, Valve Repair .....	1
	P 764078 002		• COIL, 120 V., 60 Hz., 110 V., 60 Hz. ....	1
21	P 29222 091		NIPPLE, 3/4 N.P.T. x 1-1/2 Lg. ....	1
22	P 836 042		BUSHING, Reducer, 3/4 N.P.T. x 1/2 N.P.T. ....	1
23	P 29162 091		NIPPLE, 1/2 N.P.T. x 1" Lg. ....	1
24	P 93180 001		FILTER, Air (Figure 8-47) (units built before 12/89) .....	1
25	P 93909 592		FILTER, Air (units built after 12/89) .....	1
	P 129360 802		• FILTER, Element .....	1
26	P 29294 091		NIPPLE, 3/4 N.P.T. x 2 N.P.T. ....	2
*Units With Auto-Utilities Option, Item 11 is Replaced With Following:				
	P 83261 002		VALVE, Solenoid .....	1
	P 764072 001		• REPAIR KIT .....	1
	P 764072 002		• COIL .....	1
	P 29290 091		NIPPLE, 3/4 x 1 .....	1
	P 21990 091		ELL, Compression .....	1

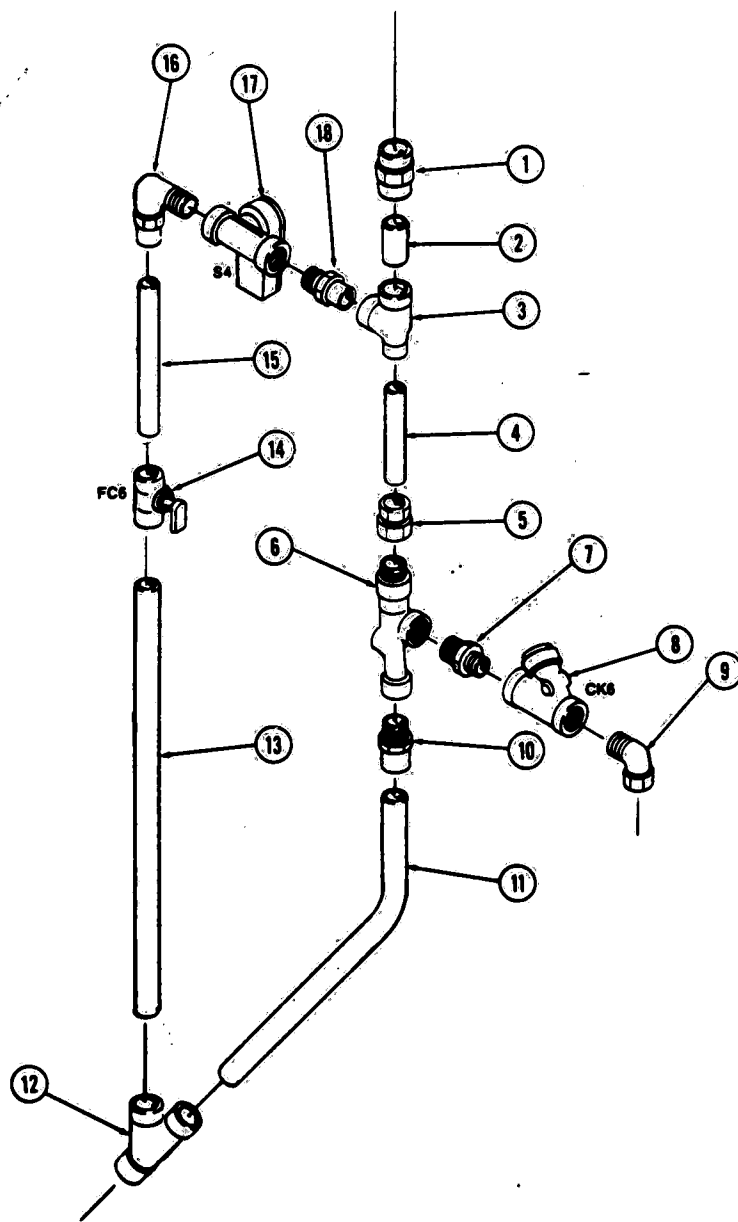


Figure 8-25. EJECTOR ASSEMBLY - Vacumatic

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-25-	P 136655	001	EJECTOR ASSEMBLY .....	X
1	P 91226	091	UNION, 7/8 O.D.T. ....	1
2	P 91248	091	TUBE, 7/8 O.D. x 2 .....	1
3	P 44847	091	TEE, 7/8 x 5/8 x 7/8 O.D.T. ....	1
4	P 90276	091	TUBE, 5/8 O.D. x 4-3/8 .....	1
5	P 30948	091	FITTING, 5/8 O.D.T. x 1/2 N.P.T. ....	1
6	P 83924	001	EJECTOR, 1/2 N.P.T. ....	1
7	P 84459	001	REDUCER, 1/2 x 3/8 N.P.T. ....	1
8	P 5424	091	VALVE, Check, 3/8 N.P.T. (CK6) .....	1
	P 74335	091	• DISC .....	1
9	P 40153	091	ELL, 5/8 O.D.T. x 3/8 N.P.T. ....	1
10	P 91156	091	FITTING, 7/8 O.D.T. x 1/2 N.P.T. ....	1
11	P 84462	001	TUBE, 7/8 O.D. ....	1
12	P 89384	091	FITTING, "Y", 7/8 O.D.T. ....	1
13	P 84460	002	TUBE, 7/8 O.D. x 13 .....	1
14	P 83629	001	FLOW CONTROL VALVE, 7/8 O.D.T. (FC6) .....	1
15	P 84460	001	TUBE, 7/8 O.D. x 8-5/8 .....	1
16	P 91230	091	ELL, Union, 7/8 O.D.T. x 3/4 N.P.T. ....	1
17	P 83261	002	VALVE, Solenoid, 3/4 N.P.T. (S-4) .....	1
	P 764072	001	• KIT, Valve Repair .....	1
	P 764072	002	• COIL, 120 V., 60 Hz., 110 V., 50 Hz. ....	1
18	P 91159	091	FITTING, 7/8 O.D.T. x 3/4 N.P.T. ....	1

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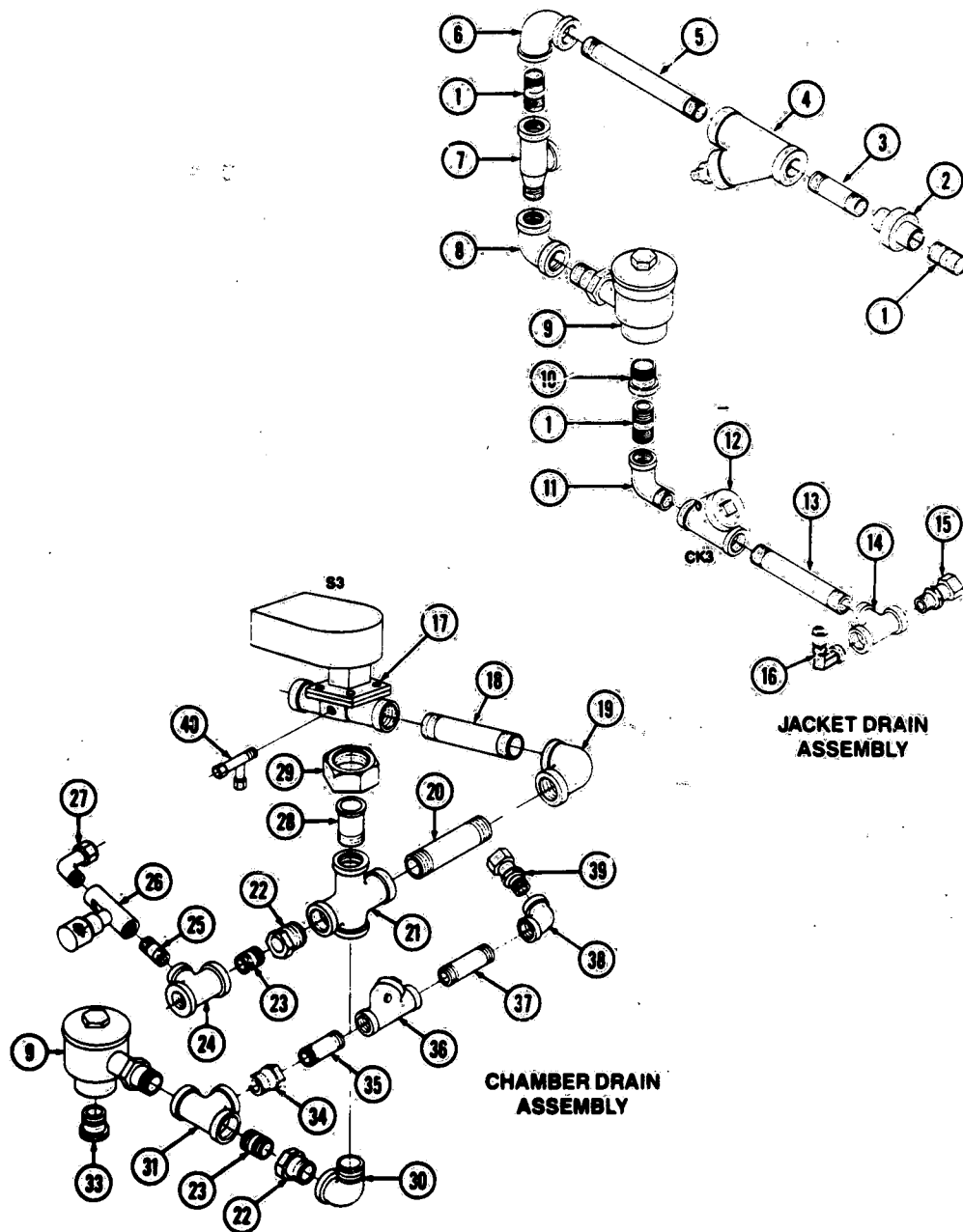


Figure 8-26. DRAIN ASSEMBLIES - Vacumatic

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-26-	P 136807	131	JACKET DRAIN ASSEMBLY .....	X
1	P 29013	091	NIPPLE, 3/8 N.P.T. x 1" Lg. ....	3
2	P 5266	091	UNION, 3/8 N.P.T. ....	1
3	P 29016	091	NIPPLE, 3/8 N.P.T. x 1-3/8" Lg. ....	1
4	P 47671	091	STRAINER, 3/8 N.P.T. ....	1
	50341	091	SCREEN .....	1
	28447	091	"O" RING .....	1
5	P 29028	091	NIPPLE, 3/8 N.P.T. x 4-3/4" Lg. ....	1
6	P 1630	091	ELBOW, 3/8 N.P.T. ....	1
7	P 78387	091	TEE, Street, 3/8 N.P.T. ....	1
8	P 1622	091	ELL, Reducing, 3/8 N.P.T. x 1/2 N.P.T. ....	1
9	P 129222	001	TRAP, Steam, 1/2 N.P.T. ....	2
	764080	001	* REPAIR KIT .....	
10	P 837	091	BUSHING, Red, 1/2 N.P.T. x 3/8 N.P.T. ....	1
11	P 1631	091	ELBOW, Street, 3/8 N.P.T. ....	1
12	P 5424	091	VALVE, Check, 3/8 N.P.T. (CK3) ....	1
	74335	091	DISC .....	1
13	P 29023	091	NIPPLE, 3/8 N.P.T. x 3-1/2" Lg. ....	1
14	P 4901	091	TEE, 3/8 x 1/8 x 3/8 N.P.T. ....	1
15	P 43289	091	FITTING, Street, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	1
16	P 40153	091	ELBOW, Compression, 5/8 O.D.T. x 3/8 N.P.T. ....	1
8-26-	P 146653	677	CHAMBER DRAIN ASSEMBLY .....	X
17	P 83228	002	VALVE, Solenoid, 3/4 N.P.T. (S3) ....	1
	P 764070	001	* REPAIR KIT .....	1
	P 764070	002	* COIL .....	1
18	P 29301	091	NIPPLE, 3/4 N.P.T. x 3-3/4" Lg. ....	1
19	P 1635	091	ELBOW, 90°, 3/4 N.P.T. ....	1
20	P 29300	091	NIPPLE, 3/4 N.P.T. x 3-1/2" Lg. ....	1
21	P 1345	091	CROSS, 3/4 N.P.T. ....	1
22	P 836	042	BUSHING, Red, 3/4 N.P.T. x 1/2 N.P.T. ....	2
23	P 29162	091	NIPPLE, 1/2 N.P.T. x 1" Lg. ....	2
24	P 4912	091	TEE, Reducing, 1/2 x 1/2 x 1/4 N.P.T. ....	1
25	P 28917	091	NIPPLE, 1/4 N.P.T. x 1" Lg. ....	1
26	P 83523	001	VALVE, Needle, 1/4 N.P.T. ....	1
27	P 7033	091	ELL, Compression, 5/16 O.D.T. x 1/4 N.P.T. ....	1
28	P 4247	091	SPUD, Male, 3/4 N.P.T. ....	1
29	P 2903	091	NUT, Union, 3/4 N.P.T. ....	1
30	P 1636	091	ELBOW, 90°, Street, 3/4 N.P.T. ....	1
31	P 4931	091	TEE, 1/2 N.P.T. ....	1
32				
33	P 78053	042	BUSHING, Red, 1/2 N.P.T. x 1/4 N.P.T. ....	1
34	P 837	091	BUSHING, Red, 1/2 N.P.T. x 3/8 N.P.T. ....	1
35	P 29015	091	NIPPLE, 3/8 N.P.T. x 1-1/2" Lg. ....	1
36	P 5424	091	VALVE, Check, 3/8 N.P.T. ....	1
	74335	091	* DISC .....	1
37	P 29017	091	NIPPLE, 3/8 N.P.T. x 2" Lg. ....	1
38	P 1630	091	ELBOW, 90°, 3/8 N.P.T. ....	1
39	P 39072	091	FITTING, Street, Compression, 5/8 O.D.T. x 3/8 N.P.T. ....	1
40	P 6774	091	TEE, Comp, 5/16 O.D.T. x 1/8 N.P.T. ....	1

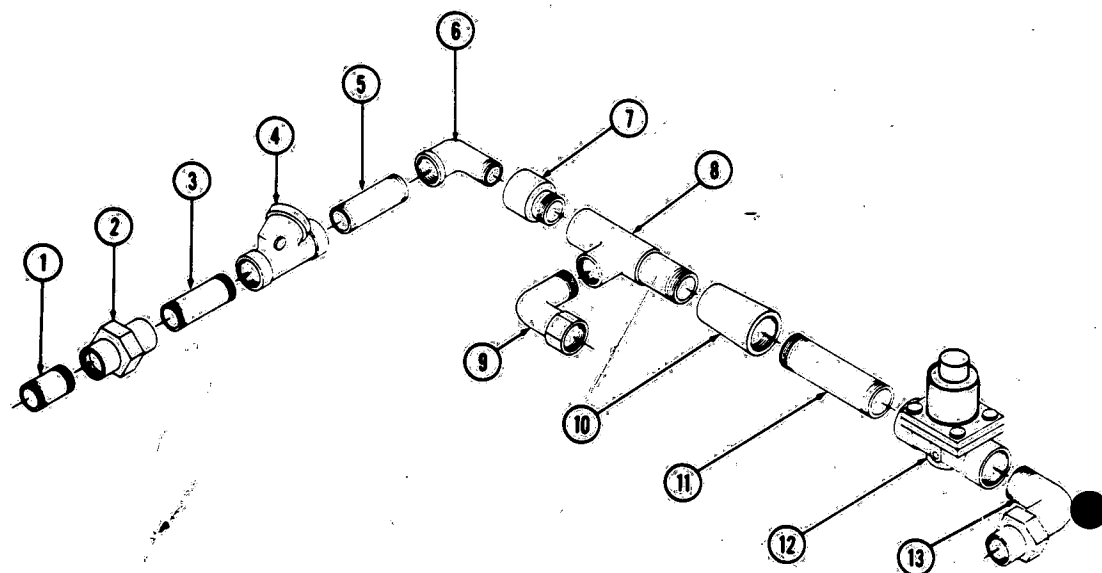


Figure 8-27. STEAM EJECTOR ASSEMBLY - Vacumatic

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FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-27-	P	136806	681		STEAM EJECTOR ASSEMBLY .....	X			
1	P	29013	091		NIPPLE, Brass, 3/8 x 1" Lg. ....	1			
2	P	5266	091		UNION, 3/8 N.P.T. ....	1			
3	P	29016	091		NIPPLE, Brass, 3/8 x 1-3/4" Lg. ....	1			
4	P	5424	091		VALVE, Check, 3/8 N.P.T. ....	1			
		74335	091		* DISC .....	1			
5	P	29015	091		NIPPLE, Brass, 3/8 x 1-1/2 Lg. ....	1			
6	P	1631	091		ELBOW, 90°, Street, 3/8 N.P.T. ....	1			
7	P	129360	780		NOZZLE, 3/4 N.P.T. x 3/8 N.P.T. ....	1			
8	P	129360	779		EJECTOR, 3/4 N.P.T. x 1/2 N.P.T. ....	1			
9	P	23972	091		ELL, Compression, 5/8 O.D.T. x 1/2 N.P.T. ....	1			
10	P	3531	091		COUPLING, Red, 3/4 N.P.T. x 1/2 N.P.T. ....	1			
11	P	29297	091		NIPPLE, Brass, 3/4 x 2-3/4 Lg. ....	1			
12	P	83228	002		VALVE, Solenoid, 3/4 N.P.T. (w/o Coil) ....	1			
	P	764070	001		* REPAIR KIT .....	1			
13	P	91230	091		ELBOW, 90, Union, 7/8 O.D.T. x 3/4 N.P.T. ....	1			

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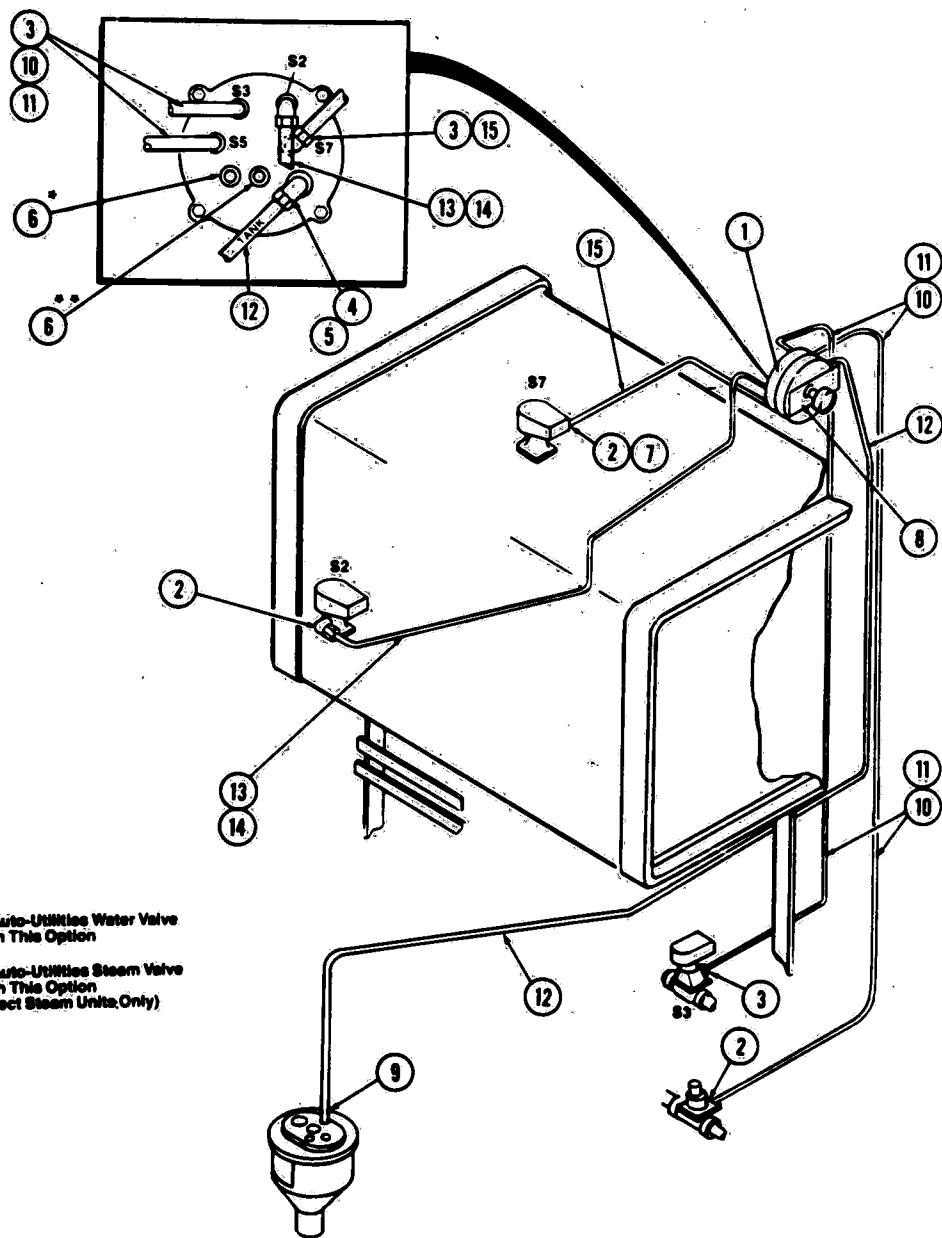


Figure 8-28. MANUAL VALVE PIPING - Vacumatic

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-28-			MANUAL VALVE PIPING: 16x16 Vacumatic .....	X	
			MANUAL VALVE PIPING: 20x20 Vacumatic .....		X
1	P 136807	139	VALVE, Manual Multiport (See Fig. 8-29) .....	1	1
2	P 42510	091	ELL., Compression, 1/4 ODT x 1/8 NPT .....	2	2
3	P 43289	091	FITTING, Compression, 1/4 ODT x 1/8 NPT .....	4	4
4	P 45530	091	ELL., Compression, 3/8 ODT x 3/8 NPT .....	1	1
5	P 84371	002	INSERT, Tube, 3/8 (Not Shown) .....	2	2
6	P 3439	091	PLUG, Pipe .....	6	6
7	P 84371	001	INSERT, Tube, 1/4 (Not Shown) .....	1	1
8	P 93900	048	DECAL, Manual .....	1	1
9	P 77299	091	TIES, Wire .....	6	6
10	R-915	103	TUBING (S3 & S5), Copper, 1/4 ODT x .030 Wall x 11'10" LG .....	A/R	
11	R-915	103	TUBING (S3 & S5), Copper, 1/4 ODT x .030 Wall x 12'4" LG .....		A/R
12	R-3500	736	TUBING, Multiport to Drain, 3/8 ODT x 6'8" LG .....	A/R	A/R
13	R-915	103	TUBING (S2), Copper, 1/4 ODT x .030 Wall x 56-1/4" LG .....	A/R	
14	R-915	103	TUBING (S2), Copper, 1/4 ODT x .030 Wall x 72-1/4" LG .....		A/R
15	R-3500	735	TUBING (S7), 1/4 ODT x 12" LG .....	A/R	A/R

POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9-S16
CONDITION	S9-S2-S3-S4-(S7)-S16
STERILIZE	S9-S2-S16
SLOW EXHAUST	S16
FAST EXHAUST	S3-S4-(S7)-S16
DRY	S9-S3-S5-S4-(S7)-S16

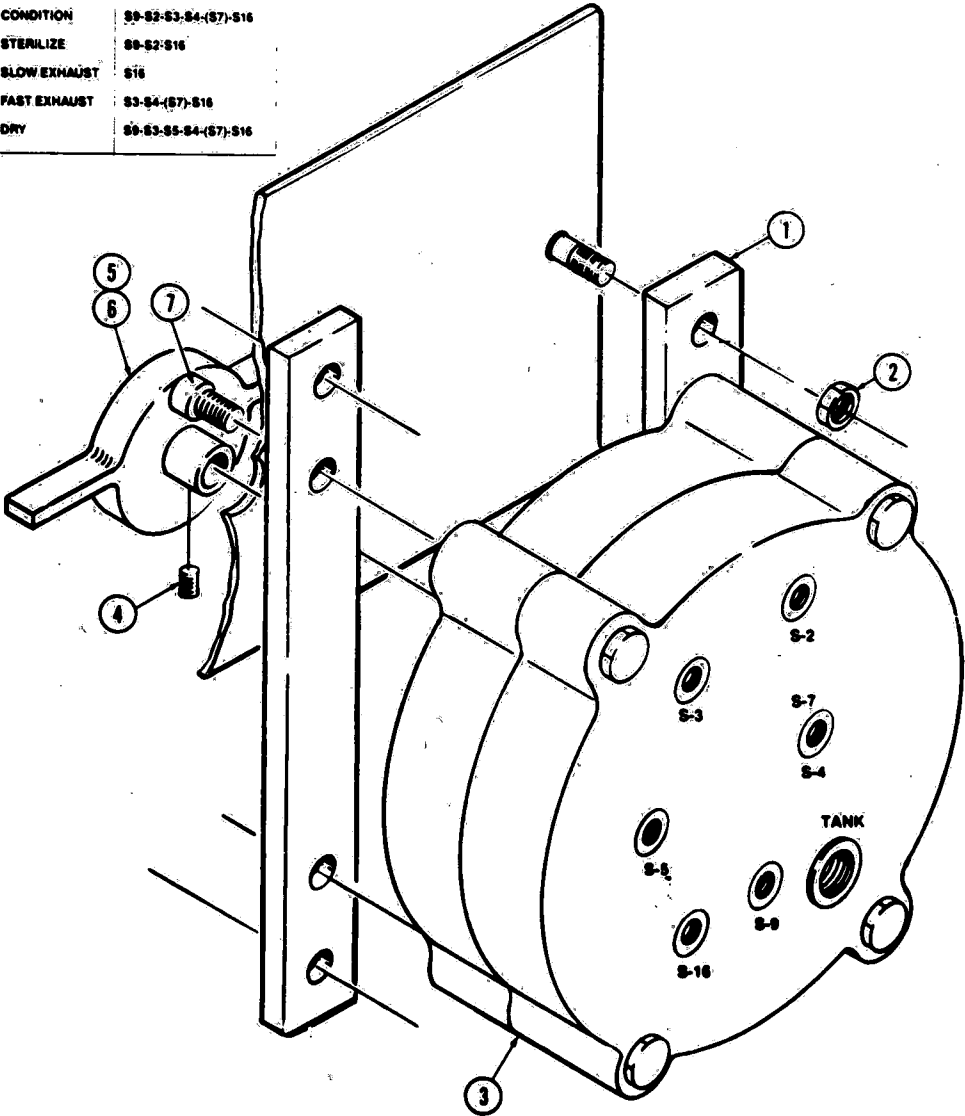


Figure 8-29. MANUAL VALVE - Vacumatic and Gravity

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-29-					MANUAL VALVE, Vacumatic/Gravity .....	X			
1	P	129061	001		PLATE, Mounting .....	2			
2	P	129360	015		NUT, Flange, 1/4-20 .....	4			
3	P	136807	139		VALVE, Manual Multiport .....	1			
4	P	43282	091		SCREW, Set .....	1			
5	P	136760	001		KNOB, Selector .....	1			
6	P	129060	001		INSERT, Knob (Decal) .....	1			
7	P	79253	045		SCREW, Socket Head, 1/4-20 x 1/2 .....	4			

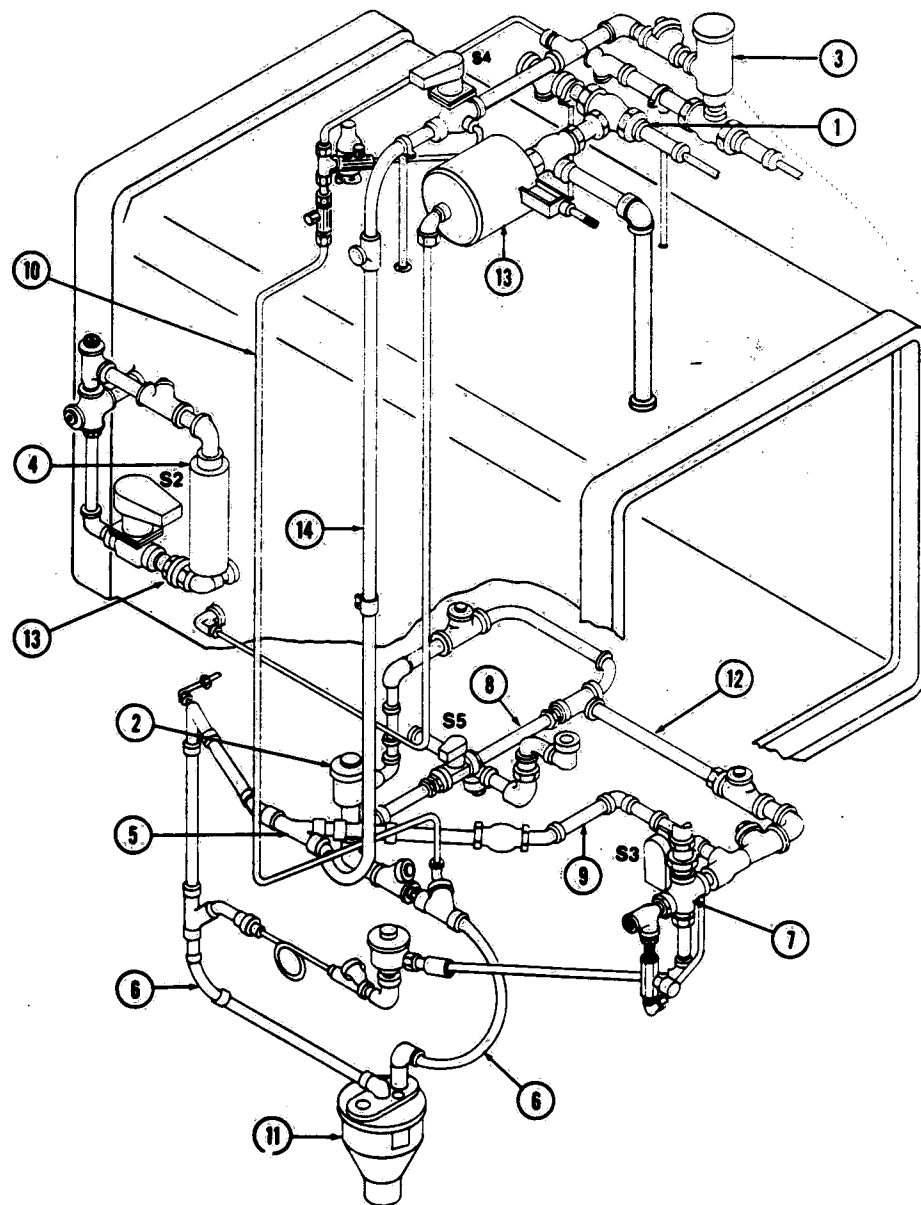


Figure 8-30. PIPING ASSEMBLY, Complete - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-30-			PIPING ASSEMBLY, Complete - 16x16 Gravity .....	X		
			PIPING ASSEMBLY, Complete - 20x20 Gravity .....		X	
1	P 93708	001	STEAM SUPPLY ASSEMBLY (Figure 8-44) .....	1	1	
2	P 134466	001	JACKET STEAM RETURN (Figure 8-36) .....	1	1	
3	P 136673	001	WATER SUPPLY VALVE ASSEMBLY (Figure 8-37) .....	1	1	
4	P 93715	001	AIR FILTER ASSEMBLY (Figure 8-38) .....	1	1	
5	P 56396	002	CONDENSER PIPING ASSEMBLY (Figure 8-39) .....	1	1	
6	P 136671	001	DRAIN TUBE ASSEMBLIES (Figure 8-40) .....	1	1	
7	P 136805	019	CHAMBER DRAIN ASSEMBLY (Figure 8-41) .....	1	1	
8	P 134468	001	EJECTOR PIPING ASSEMBLY (Figure 8-42) .....	1	1	
9	P 56394	001	FITTING ASSEMBLY (Figure 8-42) .....	1	1	
10			CONDENSER PIPING (Figure 8-32) .....	1	1	
11			CHAMBER DRAIN AND EJECTOR PIPING (Figure 8-33) .....	1	1	
12	P 136805	062	LOWER PIPING ASSEMBLY (Figure 8-34) .....	1	1	
13			STEAM, AIR AND WATER SUPPLIES (Figure 8-31) .....	1	1	
14	P 93716	001	WATER CONDENSER ASSEMBLY (8-35) .....	1		
	P 93716	002	WATER CONDENSER ASSEMBLY (8-35) .....		1	



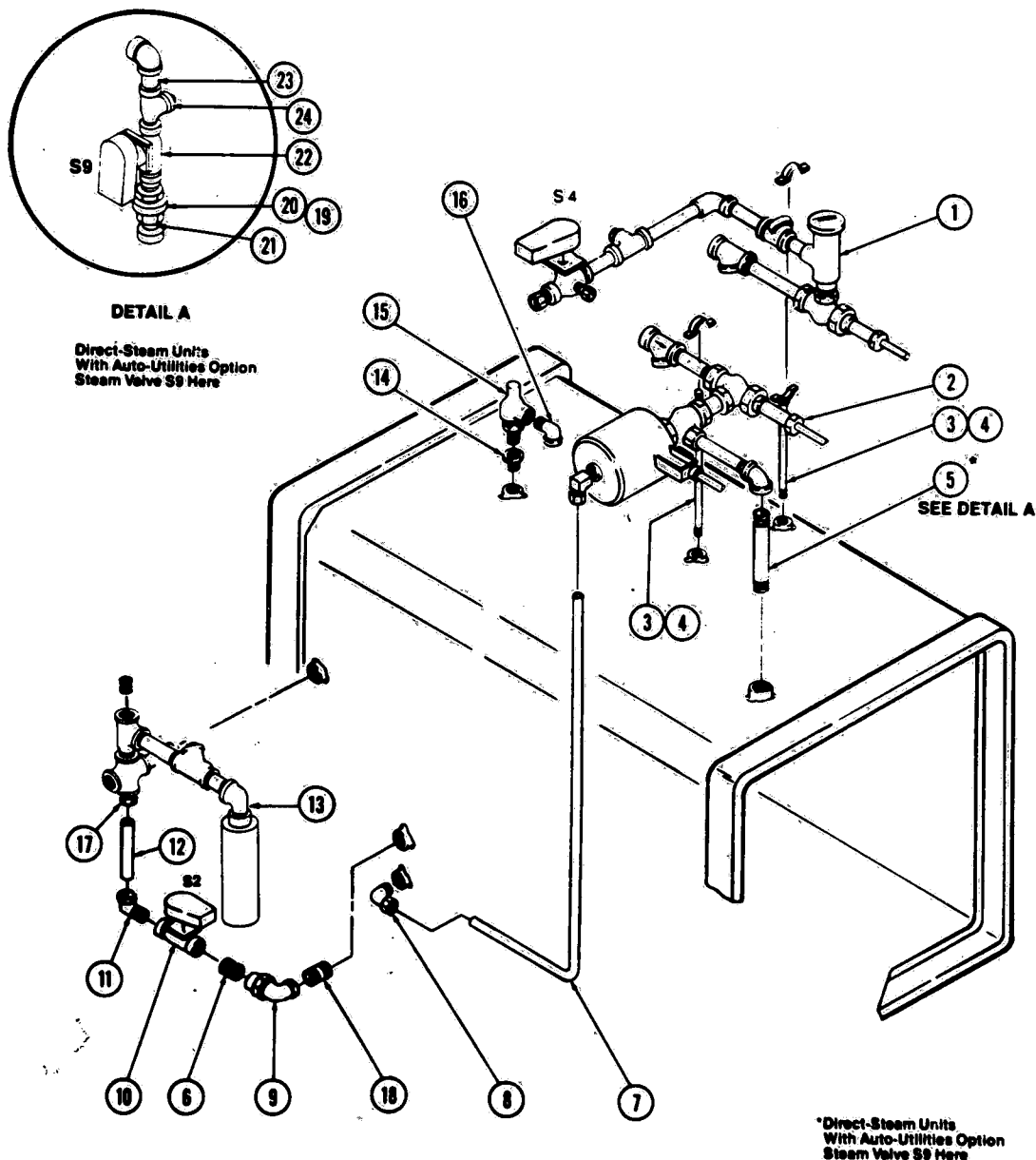


Figure 8-31. STEAM, AIR AND WATER SUPPLIES - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-31-			AIR, STEAM AND WATER SUPPLIES: 16 X 16 Gravity .....	X	
			AIR, STEAM AND WATER SUPPLIES: 20 X 20 Gravity .....		X
1 P	136673 001		WATER SUPPLY ASSEMBLY (Figure 8-24) .....	1	1
2 P	93708 001		STEAM SUPPLY ASSEMBLY (Figure 8-44) .....	1	1
3 P	75376 010		CLAMP, Pipe, 3/8 .....	2	2
4 P	150822 293		NIPPLE, Steel, 1/4 N.P.T. x 8-11/16 .....	2	2
5 P	29044 091		NIPPLE, 3/8 N.P.T. x 8-3/4 .....	1	1
6 P	29013 091		NIPPLE, 3/8 N.P.T. x 1" .....	1	1
7	R-915 103		TUBE, 1/4 O.D. x 1/4 N.P.T. .....	1	
	R-915 103		TUBE, 1/4 O.D. x 41-13/32 .....		1
8 P	41306 091		ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T. ....	1	1
9 P	89153 091		ELL, Union, 3/8 N.P.T. ....	1	1
10 P	150822 309		VALVE, Solenoid, Steam, 3/8 N.P.T. (S2) .....	1	1
	764317 687		REPAIR KIT .....	1	1
	764070 002		COIL .....	1	1
	150778 001		VARIATOR (Not Shown) .....	1	
11 P	40153 091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T. ....	1	1
12 P	90274 091		TUBE, 5/8 O.D. x 3-5/8 .....	1	1
13 P	93715 001		AIR FILTER ASSEMBLY (Figure 8-38) .....	1	1
14 P	836 042		BUSHING, Reducing, 3/4 x 1/2 N.P.T. ....	1	1
15 P	150527 001		VALVE, Safety, 1/2 N.P.T. ....	1	1
16 P	1636 091		ELL, Street, 3/4 N.P.T. ....	1	1
17 P	29931 091		FITTING, 5/8 O.D.T. x 1/2 N.P.T. ....	1	1
18 P	29013 091		NIPPLE, 3/8 N.P.T. x 1" Long .....	1	1
* Direct-Steam Units With Auto-Utilities Option, Item 5 is Replaced With Following:					
19 P	4201 091		FEMALE-SPUD, 3/8 N.P.T. ....	1	
20 P	90130 091		UNION .....	1	
21 P	29013 091		NIPPLE, 3/8 x 1 .....	2	
22 P	150822 309		VALVE, Solenoid .....	1	
	764317 687		REPAIR KIT .....	1	
	764070 002		COIL .....	1	
23 P	29015 091		NIPPLE, 3/8 x 1-1/2 .....	1	
24 P	76387 091		TEE, Street, 3/8 N.P.T. ....	1	

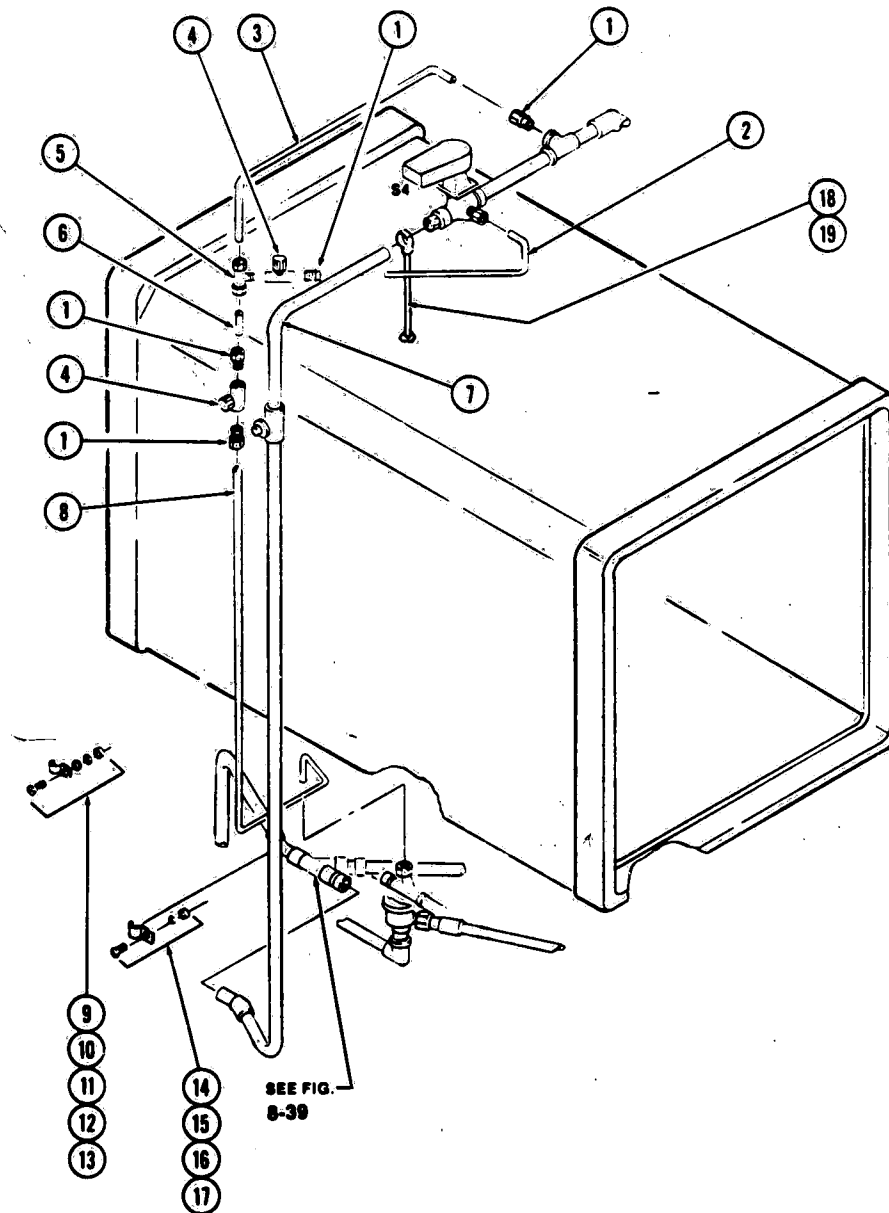


Figure 8-32. CONDENSER PIPING - Gravity

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-32-			CONDENSER PIPING: 16 x 16 Gravity	X	
			CONDENSER PIPING: 20 x 20 Gravity		X
1 P	19514 091		FITTING, 1/4 O.D.T. x 1/8 N.P.T.	4	4
2	R-915 103		TUBE, 1/4 O.D. x 7-25/32	1	1
3	R-915 103		TUBE, 1/4 O.D. x 10-7/8	1	1
4 P	83630 001		VALVE, Needle, 1/8 N.P.T.	2	2
5 P	42581 091		TEE, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1	1
6 P	90340 091		TUBE, 1/4 O.D. x 2-3/8	1	1
7 P	93716 001		WATER CONDENSER PIPING ASSEMBLY (Figure 8-35)	1	1
	93716 002		WATER CONDENSER PIPING ASSEMBLY (Figure 8-35)		1
8	R-915 103		TUBE, 1/4 O.D. x 48-7/8	1	
	R-915 103		TUBE, 1/4 O.D. x 56-7/8		1
9 P	26270 091		CLAMP	1	1
10 P	3986 041		SCREW, #8-32 x 1/2	1	1
11 P	5561 091		WASHER, Flat	1	1
12 P	90991 091		LOCKWASHER	1	1
13 P	3038 041		NUT, Hex, #8-32	1	1
14 P	90513 091		CLAMP, Tube, 5/8	1	1
15 P	41805 044		SCREW, Hex Head, #10-32 x 5/8	1	1
16 P	76801 045		LOCKWASHER	1	1
17 P	2959 041		NUT, #10-32	1	1
18 P	27422 051		NIPPLE, 1/4 N.P.T. x 1-1/4 N.P.T.	1	1
19 P	4906 091		TEE, 1/4 N.P.T.	1	1
20 P	22711 042		FITTING, 5/16 O.D.T. x 1/4 N.P.T.	2	2
21	R-915 163		TUBE, 5/16 O.D. x 8-5/32	1	1
22 P	83523 001		VALVE, Needle, 1/4 N.P.T.	1	1
23 P	7033 091		ELL, 5/16 O.D.T. x 1/4 N.P.T.	1	1
24	R-915 163		TUBE, 5/16 O.D. x 16-7/32	1	
	R-915 163		TUBE, 5/16 O.D. x 18-7/32		1
25 P	75376 010		CLAMP, Pipe, 3/8	1	1
26 P	150822 294		NIPPLE, 1/4 N.P.T. x 12	1	1
	764320 668		WATER LINE REPLACEMENT KIT (Plastic Type) (Not Shown)	A/R	A/R

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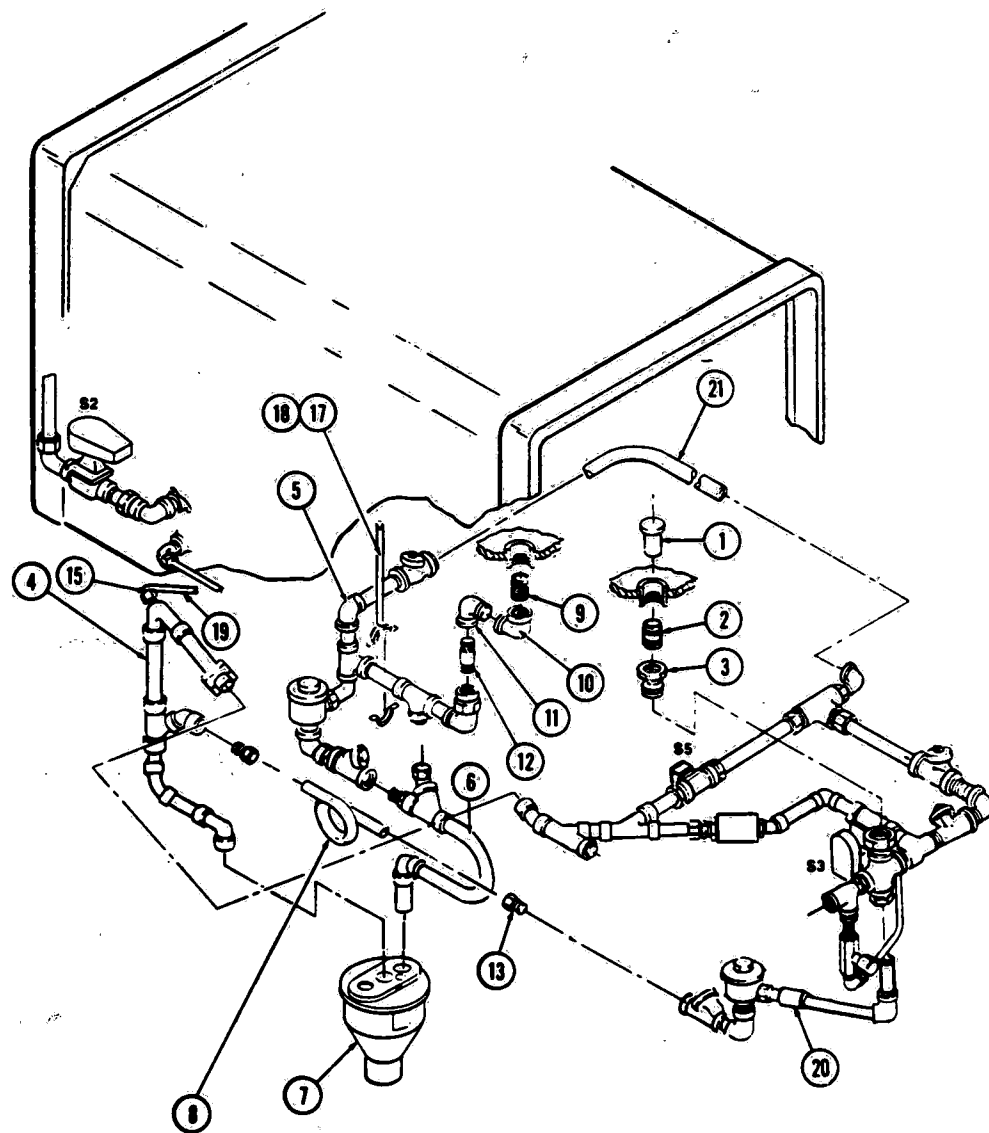


Figure 8-33. CHAMBER DRAIN AND EJECTOR PIPING - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-33-			CHAMBER DRAIN & EJECTOR PIPING .....	X
1 P	56396 427		SCREEN, Chamber Drain .....	1
2 P	29291 091		NIPPLE, 3/4 N.P.T. x 1-1/4 .....	1
3 P	1747 091		END, Thd., 3/4 N.P.T. ....	1
4 P	136671 001		DRAIN TUBE ASSEMBLY (Figure 8-40) .....	1
5 P	134466 001		JACKET STEAM RETURN ASSEMBLY (Figure 8-36) .....	1
6 P	93717 001		DRAIN TUBE ASSEMBLY (Figure 8-40) .....	1
7 P	764316 212		FUNNEL ASSEMBLY .....	1
P	56396 016		• PLUG, 7/8 Dia. ....	1
P	56396 017		• PLUG, 1 Dia. ....	1
P	56396 018		• PLUG, 1-3/8 Dia. ....	1
P	141198 006		• FUNNEL & CAP ASSEMBLY .....	1
P	141198 003		• • FUNNEL .....	1
P	56396 012		• • CAP, Funnel .....	1
P	15272 091		• • SCREW, Hex Set, 1/4-20 .....	2
P	78881 045		• • SCREW, Self Tap, 6-32 x 1/2 .....	2
8	R-915 210		TUBE, 3/8 O.D. x 17-1/4 .....	1
9 P	29292 091		NIPPLE, 3/4 N.P.T. x 1-1/2 .....	1
10 P	7461 091		ELL, Reducing, 3/4 x 3/8 N.P.T. ....	1
11 P	1631 091		ELL, Street, 3/8 N.P.T. ....	1
12 P	29022 051		NIPPLE, 3/8 N.P.T. x 3-1/4" .....	1
13 P	30947 091		FITTING, Straight, 3/8 O.D.T. x 3/8 N.P.T. ....	2
14				
15 P	52697 091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	1
16				
17 P	75376 010		CLAMP, Pipe, 3/8 .....	1
18 P	150822 290		NIPPLE, 1/4 N.P.T. x 6-7/8 .....	1
19	R-915 103		TUBE, Copper, 1/4 O.D.T. x 21-1/2 .....	1
20 P	136805 062		PIPING ASSEMBLY, Lower (Figure 8-34) .....	1
21 P	150822 025		TUBE, 5/8 O.D.T. ....	1

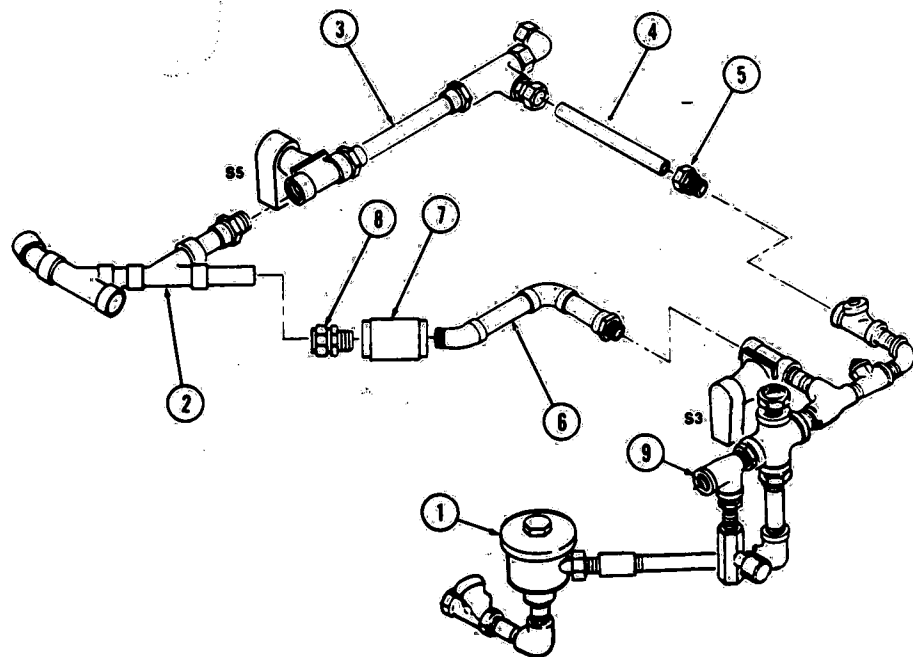


Figure 8-34. LOWER PIPING ASSEMBLY - Gravity

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-34-	P 136805	062	LOWER PIPING ASSEMBLY - Gravity .....	X
1	P 136805	019	CHAMBER DRAIN PACKAGE (Figure 8-41) .....	1
2	P 56396	002	PIPING ASSEMBLY, Condenser (Figure 8-32) .....	1
3	P 134468	001	PIPING ASSEMBLY, Ejector (Figure 8-42) .....	1
4	P 91759	091	TUBE, 5/8 O.D.T. x 7' .....	1
5	P 39072	091	ADAPTER, 5/8 O.D.T. x 3/8 N.P.T. ....	1
6	P 56394	001	FITTING ASSEMBLY (Figure 8-42) .....	1
7	P 83870	001	VALVE, Check, 3/4 N.P.T. ....	1
8	P 30005	091	FITTING, Straight, 3/4 N.P.T. x 7/8 O.D.T. ....	1
9	P		PACKAGE, Sensing Line (See Figure 8-49) .....	1

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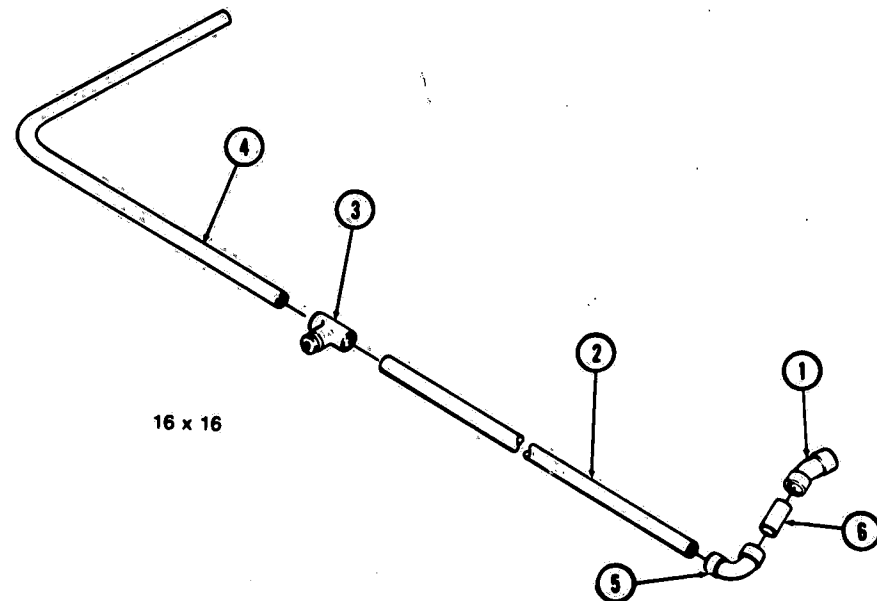
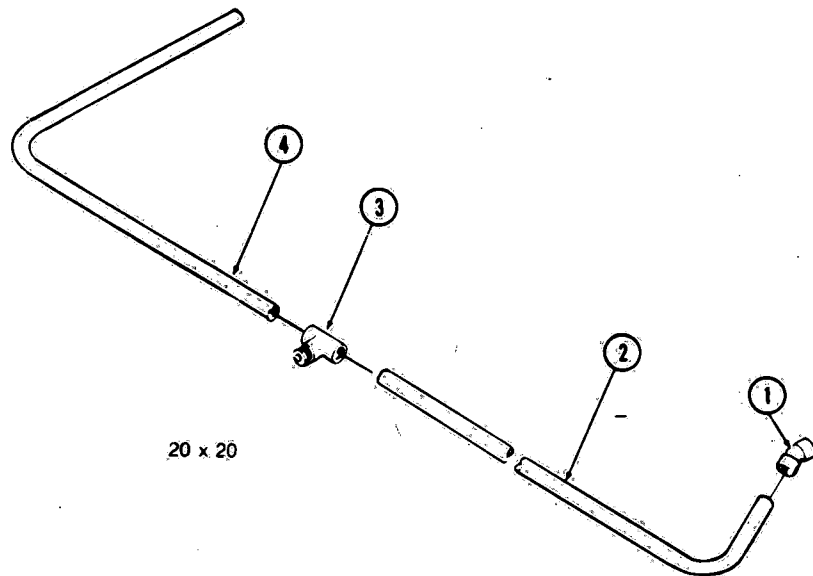


Figure 8-35. WATER CONDENSER ASSEMBLY - Gravity

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FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-35-	P	93716	001	WATER CONDENSING ASSEMBLY, 16x16 - Gravity .....				
	P	93716	002	WATER CONDENSING ASSEMBLY, 20x20 - Gravity .....	X			X
	1	P	89269	091 ELL, 45°, 5/8 O.D.T. ....	1	1		
	2	P	90294	091 TUBE, 5/8 O.D.T. x 31' ....	1			
	3	P	93041	008 TUBE, 5/8 O.D.T. ....		1		
	4	P	78658	091 VALVE, Flow Control, 5/8 O.D.T. ....	1	1		
	4	P	83448	002 TUBE, 5/8 O.D. ....			1	
		P	83448	001 TUBE, 5/8 O.D. ....	1			
	5	P	90212	091 ELL, 90°, 5/8 O.D.T. ....	1			
	6	P	89781	091 TUBE, 5/8 O.D.T. x 1-1/16' ....	1			

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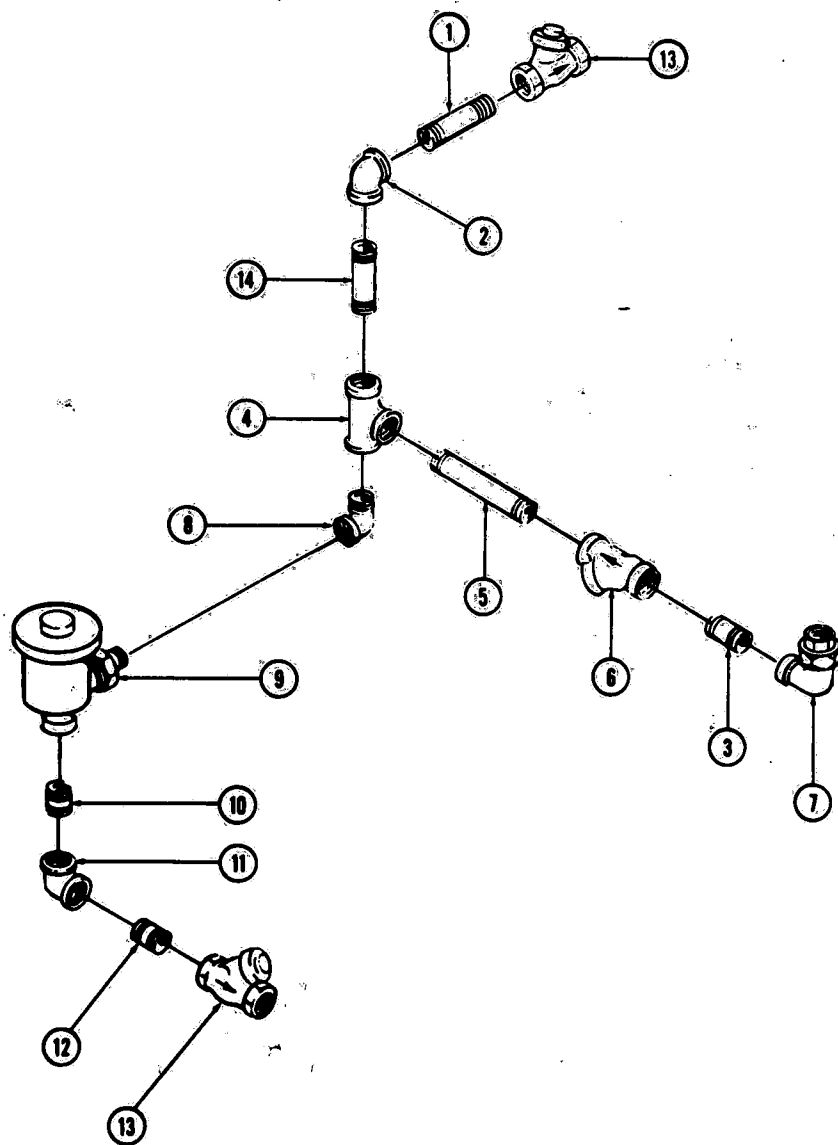
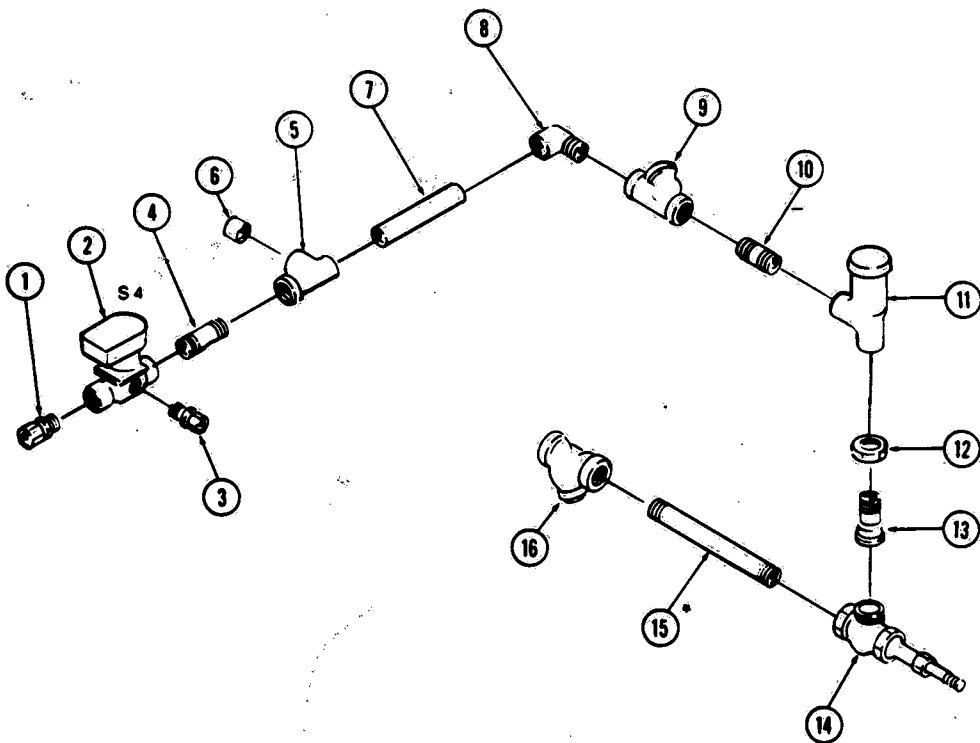


Figure 8-36. JACKET STEAM RETURN PIPING ASSEMBLY - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-36-	P 134466	001	JACKET STEAM RETURN PIPING ASSEMBLY - Gravity	X
1	P 29017	091	NIPPLE, 3/8 N.P.T. x 2"	1
2	P 1630	091	ELL, 3/8 N.P.T.	1
3	P 29015	091	NIPPLE, 3/8 N.P.T. x 1-1/2"	1
4	P 4915	091	TEE, 3/8 N.P.T. x 1/2 N.P.T. x 3/8 N.P.T.	1
5	P 29024	091	NIPPLE, 3/8 N.P.T. x 3-3/4"	1
6	P 47671	091	STRAINER, 3/8 N.P.T.	1
7	P 89153	091	ELL, Union, 3/8 N.P.T.	1
8	P 1634	091	ELL, Street, 1/2 N.P.T.	1
9	P 129222	001	TRAP, Steam, 1/2 N.P.T.	1
Q	764080	001	• KIT, Repair	1
10	P 29162	091	NIPPLE, 1/2 N.P.T. x 1"	1
11	P 1622	091	ELL, Reducer, 1/2 N.P.T. x 3/8 N.P.T.	1
12	P 29013	091	NIPPLE, 3/8 N.P.T. x 1"	1
13	P 5424	091	VALVE, Check, 3/8 N.P.T.	2
	P 74335	091	• DISC	1
14	P 29016	091	NIPPLE, 3/8 N.P.T. x 1-3/4"	1



\*Item is Replaced by Auto-Utilities  
Water Solenoid Valve Assembly  
on Units With That Option

Figure 8-37. WATER SUPPLY VALVE ASSEMBLY - Gravity

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-37-	P 136673	001	WATER SUPPLY VALVE ASSEMBLY - Gravity .....	X
1	P 39072	091	FITTING, Straight, 3/8 N.P.T. x 5/8 O.D.T. ....	1
2	P 83263	002	VALVE, Solenoid, 3/8 N.P.T., ASCO - Water (S4) .....	1
	P 764073	001	• REPAIR KIT .....	1
	P 764072	002	• COIL .....	1
3	P 19514	091	FITTING, Straight, 1/8 N.P.T. x 1/4 O.D.T. ....	1
4	P 29015	091	NIPPLE, 3/8 N.P.T. x 1-1/2 .....	1
5	P 90467	091	TEE, 3/8 N.P.T. x 5/8 O.D.T. x 5/8 O.D.T. ....	1
6	P 89808	091	COUPLING, 5/8 O.D.T. x 1/8 N.P.T. ....	1
7	P 90262	091	TUBE, 5/8 O.D. x 1-1/4" .....	1
8	P 90217	091	ELL, 3/8 N.P.T. x 5/8 O.D.T. ....	1
9	P 5424	091	VALVE, Check, 3/8 N.P.T. ....	1
	P 74335	091	• DISC .....	1
10	P 29013	091	NIPPLE, 3/8 N.P.T. x 1" .....	1
11	P 90233	091	VACUUM BREAKER, 3/8 N.P.T. ....	1
	P 752477	091	• REPAIR KIT (Watts, 288A 3/8 N.P.T.) .....	1
12	P 2901	091	NUT, Union, 3/8 .....	1
13	P 4076	091	SPUD, Male, 3/8 N.P.T. ....	1
14	P 5654	091	VALVE, Angle, 3/8 N.P.T. ....	1
	Q 754361	001	• RENEWAL PARTS PACKAGE .....	1
15	P 29035	091	NIPPLE, 3/8 N.P.T. x 6-1/2" (Units w/o Auto-Utilities) .....	1
16	P 47670	091	STRAINER, 3/8 N.P.T., Water .....	1
	P 756249	091	• SCREEN .....	1
	P 756250	091	• "O" RING .....	1
*Units With Auto-Utilities Option, Item 15 is Replaced With Following:				
	P 83261	002	VALVE, Solenoid .....	1
	P 764072	001	• REPAIR KIT .....	1
	P 764072	002	• COIL .....	1
	P 29290	091	NIPPLE, 3/4 x 1 .....	1
	P 21990	091	ELL, Compression .....	1

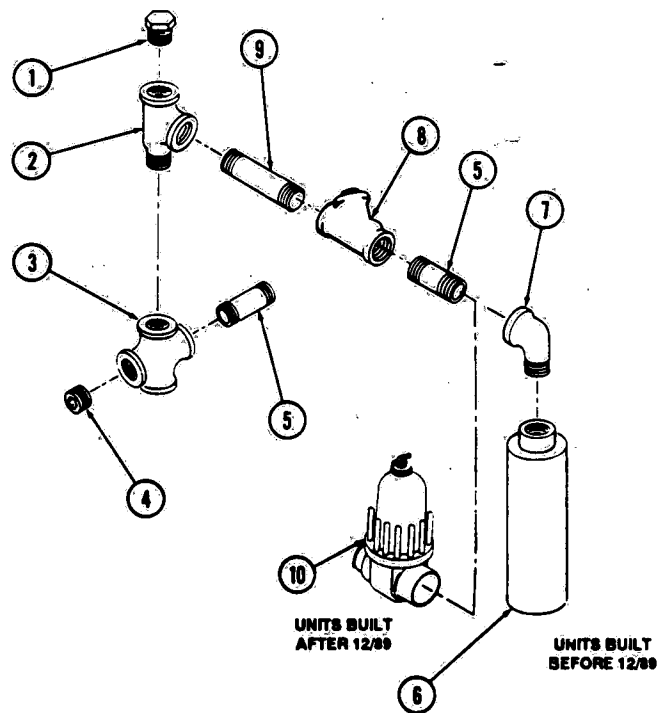


Figure 8-38. AIR FILTER ASSEMBLY - Gravity

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-38-	P 93715	001	AIR FILTER ASSEMBLY .....	X
1	P 3442	091	PLUG, Pipe, 1/2 N.P.T. ....	1
2	P 91154	091	TEE, Street, 1/2 N.P.T. ....	1
3	P 150822	333	CROSS, 1/2 N.P.T. ....	1
4	P 38404	091	PLUG, Pipe, 1/2 N.P.T. ....	1
5	P 29163	091	NIPPLE, 1/2 N.P.T. x 1-1/4 ....	2
6	P 93160	001	FILTER, 1/2 N.P.T. (Figure 8-49) (Units built before 12/89) ....	1
7	P 1634	091	ELL, Street, 1/2 N.P.T. ....	1
8	P 150822	354	VALVE, Swing Check, 1/2 N.P.T. ....	1
	P 764319	608	• DISC, Teflon Renewal .....	A/R
9	P 29177	091	NIPPLE, 1/2 N.P.T. x 4-3/4 ....	1
10	P 93909	592	FILTER, Air (Units built after 12/89) ....	1
	P 129360	802	• FILTER, Element .....	A/R

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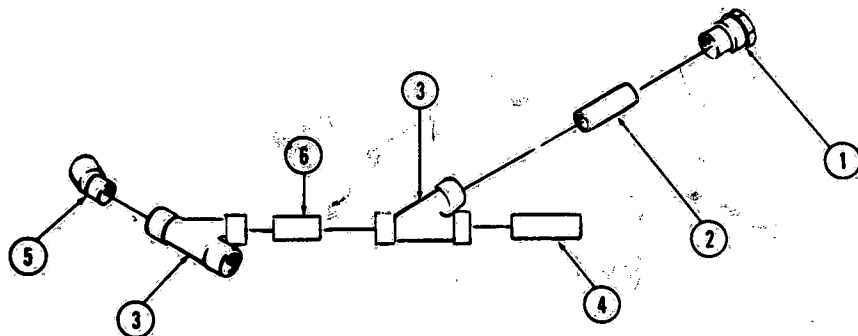


Figure 8-39. CONDENSER PIPING ASSEMBLY - Gravity

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FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-39-	P	56396	002		CONDENSER PIPING ASSEMBLY .....	X			
1	P	91158	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T. ....	1			
2	P	83449	002		TUBE, 7/8 O.D.T. x 2-1/4 .....	1			
3	P	89384	091		"Y" BRANCH, 7/8 O.D.T. ....	2			
4	P	89566	091		TUBE, 7/8 O.D.T. x 3-1/4 .....	1			
5	P	89721	091		ELL, 45°, 7/8 O.D.T. ....	1			
6	P	89520	091		TUBE, 7/8 O.D. x 1-3/4 .....	1			

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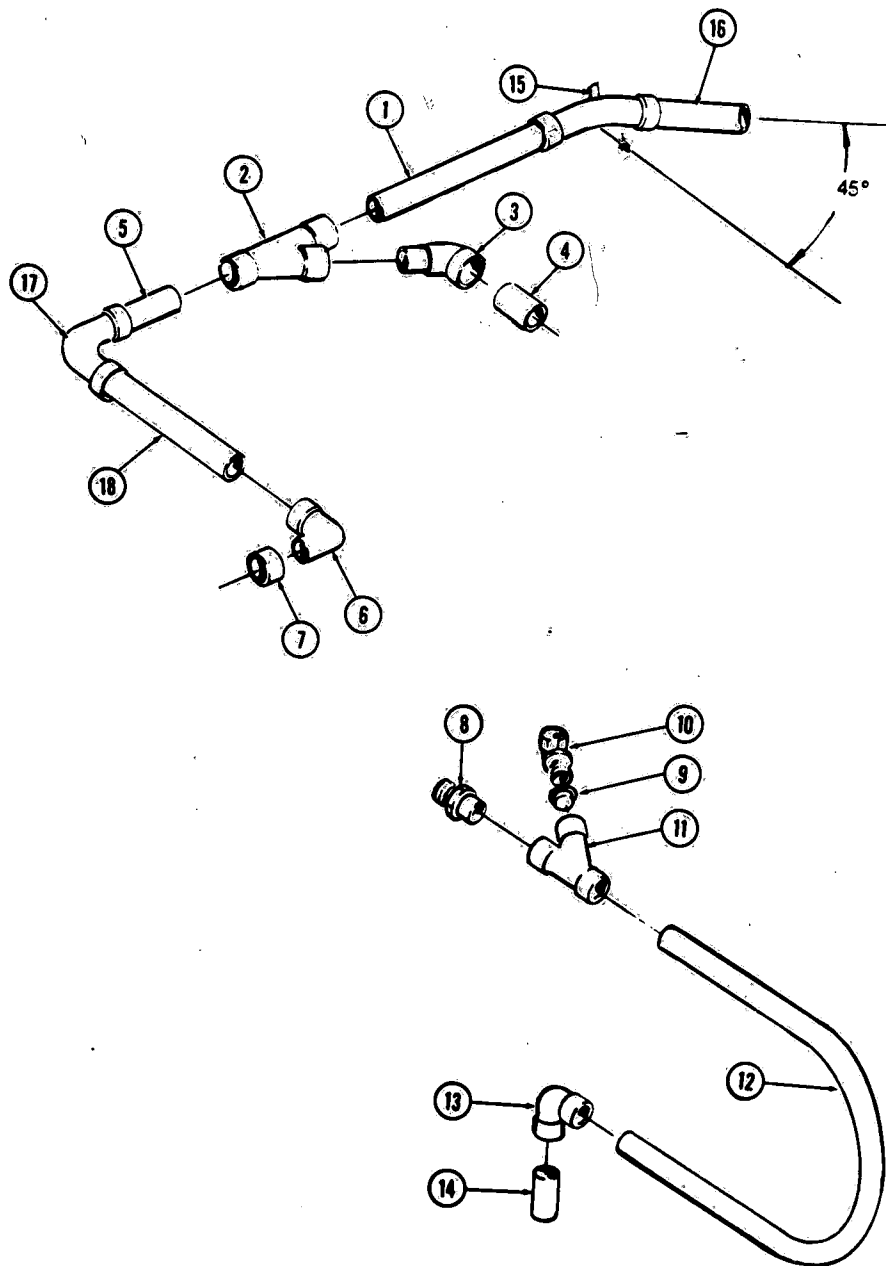


Figure 8-40. DRAIN TUBE ASSEMBLIES - Gravity

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Rev. 12/80

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-40-	136671	001	DRAIN TUBE ASSEMBLIES - Gravity .....	X			
1 F	91384	091	TUBE, 7/8 O.D.T. x 6' Lg. ....	1			
2 P	89384	091	"Y" BRANCH, 45°, 7/8 O.D.T. ....	1			
3 P	89721	091	ELL, 45°, 7/8 O.D.T. ....	1			
4 P	89385	091	COUPLING, 7/8 O.D.(F) x 3/8 N.P.T. ....	1			
5 P	83449	001	TUBE, 7/8 O.D.T. x 2-1/2 Lg. ....	1			
6 P	44507	091	ELL, 7/8 O.D.T. ....	1			
7 P	91317	091	COUPLING, 1-1/8 x 7/8 O.D.T. ....	1			
P	93717	001	ASSEMBLY, Drain Tube .....	X			
8 P	90209	091	ADAPTER, 5/8 O.D.T. x 3/8 N.P.T. ....	1			
9 P	89808	091	COUPLING, 5/8 O.D.T. x 1/8 N.P.T. ....	1			
10 P	21990	091	ELL, 1/4 O.D.T. x 1/8 N.P.T. ....	1			
11 P	83377	001	"Y" BRANCH, 5/8 O.D.T. ....	1			
12 P	93909	596	TUBE, 5/8 O.D. ....	1			
13 P	90212	091	ELL, 5/8 O.D.T. ....	1			
14 P	90262	091	TUBE, 5/8 O.D. x 1-1/4 ....	1			
15 P	129356	509	TEE, 7/8 O.D.T. x 1/8 N.P.T. x 7/8 O.D.T. ....	1			
16 P	150500	001	TUBE, 7/8 O.D.T. x 4-13/16 Lg. ....	1			
17 P	44495	091	ELL 90 deg. 7/8 O.D.T. ....	1			
18 P	91248	091	TUBE, 7/8 O.D.T. x 2' Lg. ....	1			

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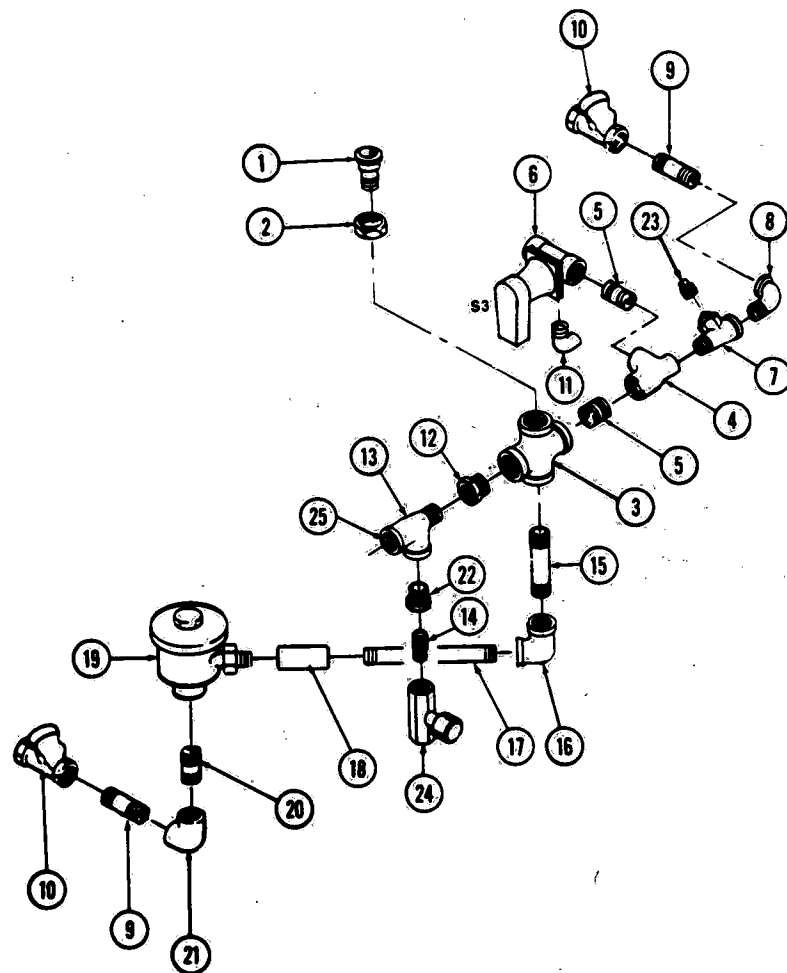
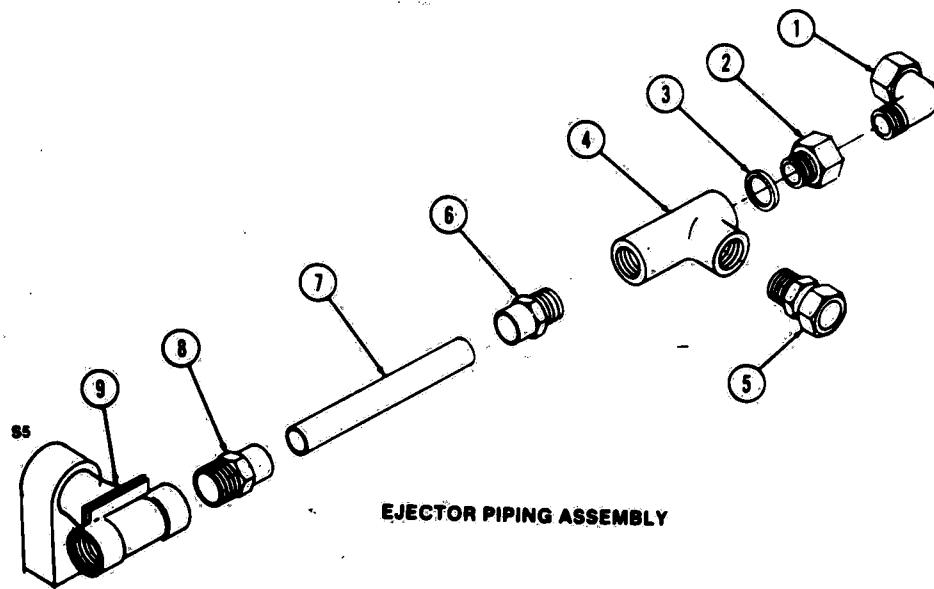
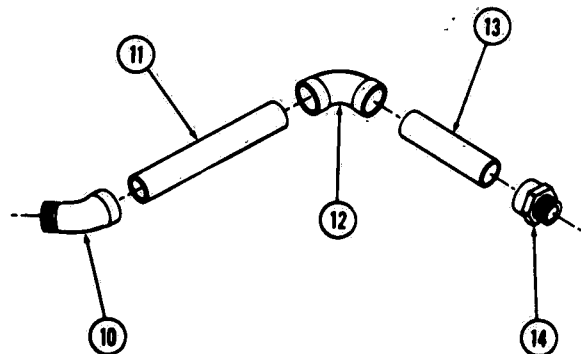


Figure 8-41. CHAMBER DRAIN ASSEMBLY - Gravity

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-41-	P 136805	019	CHAMBER DRAIN ASSEMBLY.....	X
1	P 2903	091	UNION, Nut 3/4.....	1
2	P 4247	091	SPUD, Male 3/4 N.P.T. ....	1
3	P 1345	091	CROSS, 3/4 N.P.T. Cross .....	1
4	P 4920	091	TEE, 3/4 N.P.T. x 3/8 N.P.T. x 3/4 N.P.T. ....	1
5	P 29292	091	NIPPLE, 3/4 N.P.T. x 1-1/2' Lg. ....	2
6	P 83228	002	VALVE, Solenoid, 3/4 N.P.T. - Steam (S3) .....	1
	P 764070	001	• REPAIR KIT .....	1
	P 764070	002	• COIL .....	1
7	P 78387	091	TEE, Street, 3/8 N.P.T. ....	1
8	P 1631	091	ELL, Street, 3/8 N.P.T. ....	1
9	P 29013	091	NIPPLE, 3/8 N.P.T. x 1' Lg. ....	2
10	P 5424	091	VALVE, Check, 3/8 N.P.T. ....	2
	P 74335	091	• DISC .....	1
11	P 6750	091	ELL, Compression, 90°, 1/8 N.P.T. x 5/16 O.D.T. ....	1
12	P 836	042	BUSHING, Reducing, 3/4 N.P.T. x 1/2 N.P.T. ....	2
13	P 91154	091	TEE, Street, 1/2 N.P.T. ....	1
14	P 28917	091	NIPPLE, 1/4 N.P.T. x 1' Lg. ....	1
15	P 29165	091	NIPPLE, 1/2 N.P.T. x 1-3/4' Lg. ....	1
16	P 1633	091	ELL, 1/2 N.P.T. ....	1
17	P 29188	091	NIPPLE, 1/2 N.P.T. x 7-1/2' Lg. ....	1
18	P 1313	091	COUPLING, 1/2 N.P.T. ....	1
19	P 129222	001	TRAP, 1/2 N.P.T. ....	1
	P 764080	001	• REPAIR KIT .....	1
20	P 29162	091	NIPPLE, 1/2 N.P.T. x 1' Lg. ....	1
21	P 1622	091	ELL, Reducing, 3/8 x 1/2 N.P.T. ....	1
22	P 76053	042	BUSHING, Reducing, 1/2 N.P.T. x 1/4 N.P.T. ....	1
23	P 3441	091	PLUG, Pipe, 3/8 N.P.T. ....	1
24	P 83523	001	VALVE, Needle, 1/4 N.P.T. ....	1
25	P		PACKAGE, Sensing Line (See Fig. 8-49). ....	1



EJECTOR PIPING ASSEMBLY



FITTING ASSEMBLY

Figure 8-42. EJECTOR PIPING AND FITTING ASSEMBLIES - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-42-	P 134468 001		EJECTOR PIPING ASSEMBLY - Gravity .....	X
1	P 40153 091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T. ....	1
2	P 25546 042		NOZZLE, 3/8 N.P.T. 3/8-18 .....	1
3	P 7841 091		GASKET .....	1
4	P 25900 042		EJECTOR, 3/4-18 x 1/2 N.P.T. ....	1
5	P 29931 091		FITTING, Compression, 1/2 N.P.T. x 5/8 O.D.T. ....	1
6	P 83374 001		ADAPTER, 1/2 N.P.T. x 7/8 O.D.T. ....	1
7	P 91307 091		TUBE, 7/8 O.D. ....	1
8	P 91158 091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T. ....	1
9	P 83228 002		VALVE, Solenoid, 3/4 N.P.T. (SS) .....	1
	P 764070 001		• REPAIR KIT .....	1
	P 764070 002		• COIL .....	1
	P 56394 001		FITTING ASSEMBLY .....	X
10	P 89271 091		ELL, 45°, 7/8 O.D.T. x 3/4 N.P.T. ....	1
11	P 150822 306		TUBE, 7/8 O.D. x 4' .....	1
12	P 44495 091		ELBOW, 7/8 O.D.T. ....	1
13	P 80030 091		TUBE, 7/8 O.D.T. x 1-5/8" .....	1
14	P 91158 091		ADAPTER, 3/4 N.P.T. x 7/8 O.D.T. ....	1
*When replacing the diaphragm, the bonnet bolts should be tightened to 50 in./lb. torque. Do not overtighten.				

\*To Auto-Utilities Water Valve.  
With This Option

\*\*To Auto-Utilities Steam Valve.  
With This Option  
(Direct Steam Units Only)

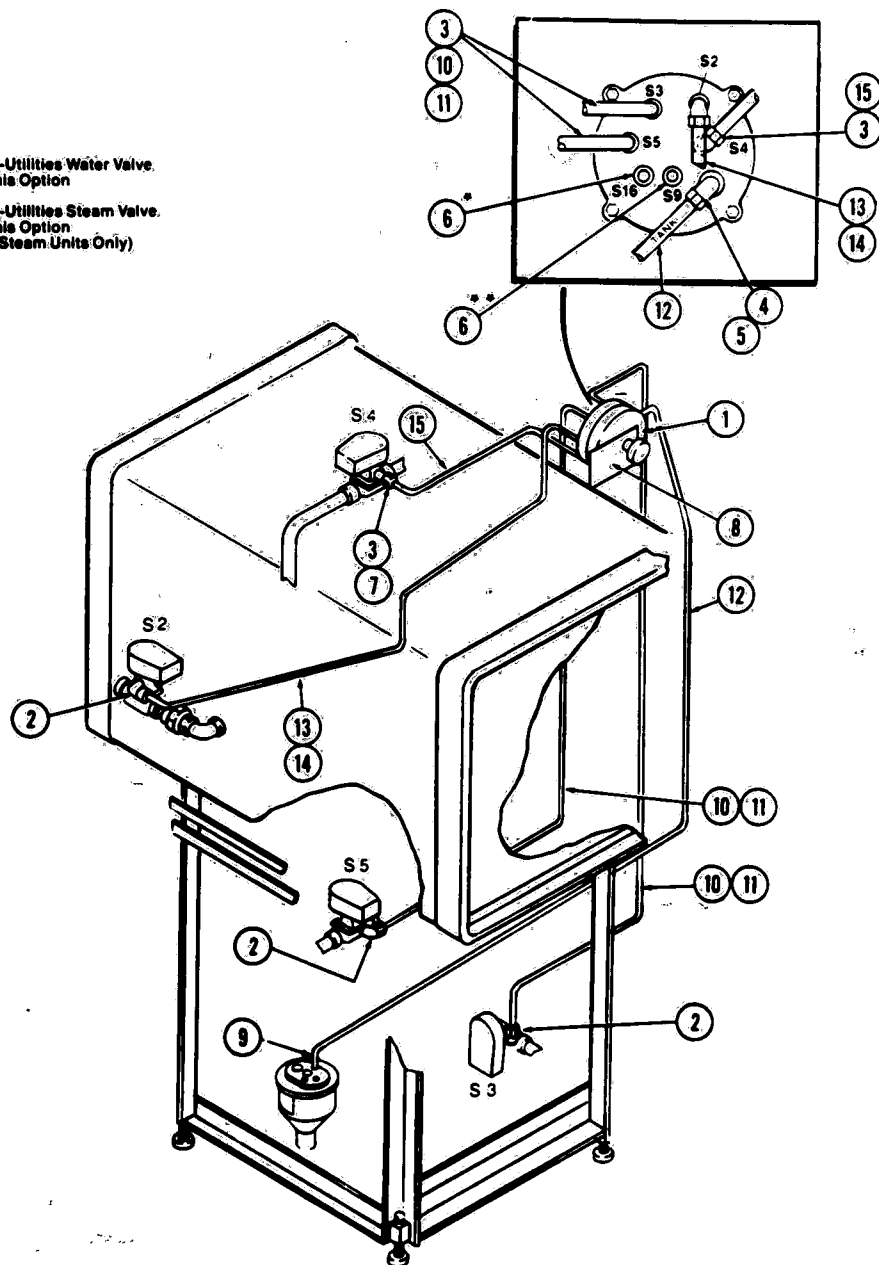


Figure 8-43. MANUAL VALVE PIPING - Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-43-			MANUAL VALVE PIPING: 16x16 Gravity .....	X		
			MANUAL VALVE PIPING: 20x20 Gravity .....		X	
1	P 136807	139	VALVE, Manual (Figure 8-29) .....	1	1	
2	P 42510	091	ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	3	3	
3	P 43289	091	FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	5	5	
4	P 45530	091	ELL, Compression, 3/8 O.D.T. x 3/8 N.P.T. ....	1	1	
5	P 84371	002	INSERT, Tube, 3/8 (Not Shown) .....	1	1	
6	P 3439	091	PLUG, Pipe (units without Auto-utilities option) .....	4	4	
7	P 84371	001	INSERT, Tube, 1/4 (Not Shown) .....	2	2	
8	P 93900	048	DECAL, Manual .....	1	1	
9	P 77299	091	TIES, Wire .....	6	6	
10	R-915	103	TUBING (S3 & S5), Copper, 1/4 O.D.T. x .030 Wall x 9'4" Lg. ....	A/R		
11	R-915	103	TUBING (S3 & S5), Copper, 1/4 O.D.T. x .030 Wall x 10'2" Lg. ....		A/R	
12	R-3500	736	TUBING Multiport to Drain, 3/8 O.D.T. x 6'8" Lg. ....	A/R	A/R	
13	R-915	103	TUBING (S2), Copper, 1/4 O.D.T. x .030 Wall x 56-1/4" Lg. ....	A/R		
14	R-915	103	TUBING (S2), Copper, 1/4 O.D.T. x .030 Wall x 72-1/4" Lg. ....		A/R	
15	R-3500	735	TUBING (S4), 1/4 O.D.T. x 8" Lg. ....	A/R	A/R	

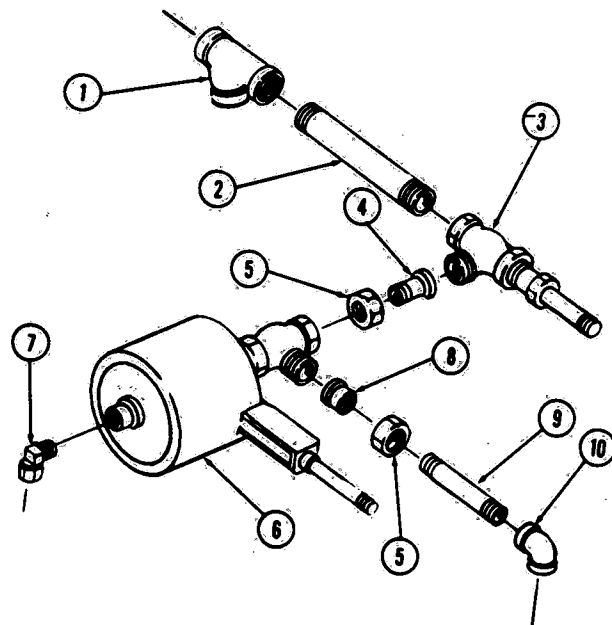


Figure 8-44. STEAM SUPPLY ASSEMBLY - Vacumatic and Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-44-	P 93708	001	STEAM SUPPLY ASSEMBLY .....	X
1	P 47671	091	STRAINER, Steam, 3/8 N.P.T. ....	1
	P 50341	091	• SCREEN .....	1
	P 28447	091	• "O" RING .....	1
2	P 29028	091	NIPPLE, 3/8 N.P.T. x 4-3/4 .....	1
3	P 5654	051	VALVE, Angle, 3/8 N.P.T. (Figure 8-46) .....	1
4	P 4076	091	SPUD, Male, 3/8 N.P.T. ....	1
5	P 2901	091	NUT, Union .....	2
6	P 20661	091	VALVE, Steam Control, 3/8 N.P.T. (Figure 8-48) .....	1
7	P 21990	091	ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T. ....	1
8	P 4201	091	SPUD, Female, 3/8 N.P.T. ....	1
9	P 29024	091	NIPPLE, 3/8 N.P.T. x 3-3/4 .....	1
10	P 1630	091	ELL, 3/8 N.P.T. ....	1

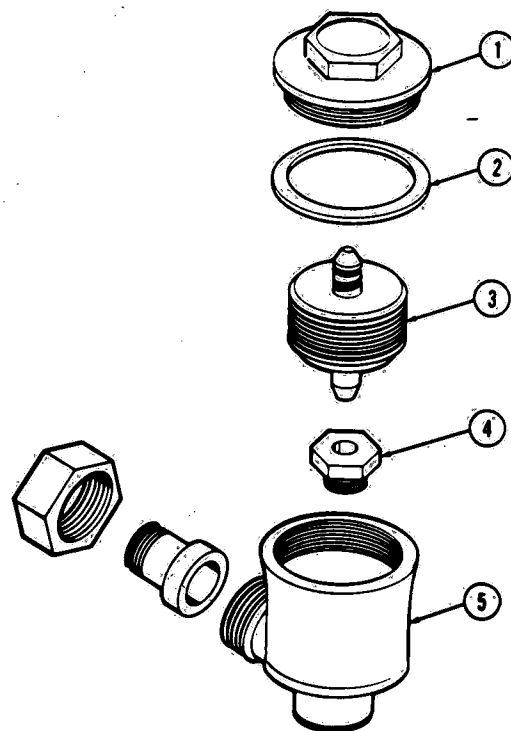


Figure 8-45. STEAM TRAP - Vacumatic and Gravity

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-45-	P	129222	001		STEAM TRAP .....	1		
	P	764080	001		KIT, Repair, 1/2 N.P.T. (includes items 2, 3, 4) .....	A/R		
	1	764315	209		CAP .....	1		
	2				GASKET .....	1		
	3				DIAPHRAGM ASSEMBLY .....	1		
4					SEAT .....	1		
5					BODY .....	1		

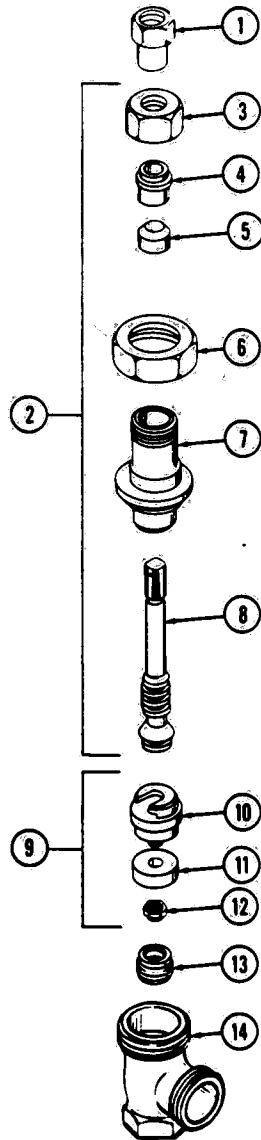


Figure 8-48. UNION ANGLE VALVE - Vacumatic and Gravity

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-46-	P 5654 091		UNION ANGLE VALVE: Steam Supply, 3/8	X		
	P 26907 091		UNION ANGLE VALVE: Water Supply, 3/4		X	
	P 754361 001		KIT, Repair, 3/8 N.P.T.	1		
	P 754361 003		KIT, Repair, 3/4 N.P.T.		1	
	1 P 8605 051		NUT, Wheel	1	1	
	2 P 53915 091		VALVE STEM AND BONNET ASSEMBLY	1		
	3 P 53917 091		VALVE STEM AND BONNET ASSEMBLY		1	
	4 P 48431 091		• NUT, Packing	1	1	
	5 P 48432 091		• GLAND, Packing	1	1	
	6 P 8784 091		• PACKING	1	1	
	7 P 5683 091		• NUT, Bonnet	1		
	8 P 25566 091		• NUT, Bonnet		1	
	9 P 53912 091		• BONNET, Valve	1		
	10 P 53913 091		• BONNET, Valve		1	
	11 P 53911 091		• STEM, Valve	1	1	
	12 P 25347 091		DISC HOLDER ASSEMBLY	1		
	13 P 25567 091		DISC HOLDER ASSEMBLY		1	
	14 P 150576 001		• DISC HOLDER	1		
	P 25568 091		• DISC HOLDER		1	
	P 25345 091		• DISC, Teflon	1		
	P 25569 091		• DISC, Teflon		1	
	P 5680 091		• NUT, Disc	1		
	P 2927 091		• NUT, Disc		1	
	P 5685 061		SEAT, Valve	1		
	P 22425 061		SEAT, Valve		1	
	P 5669 091		BODY, Valve	1		
	P 22427 091		BODY, Valve		1	

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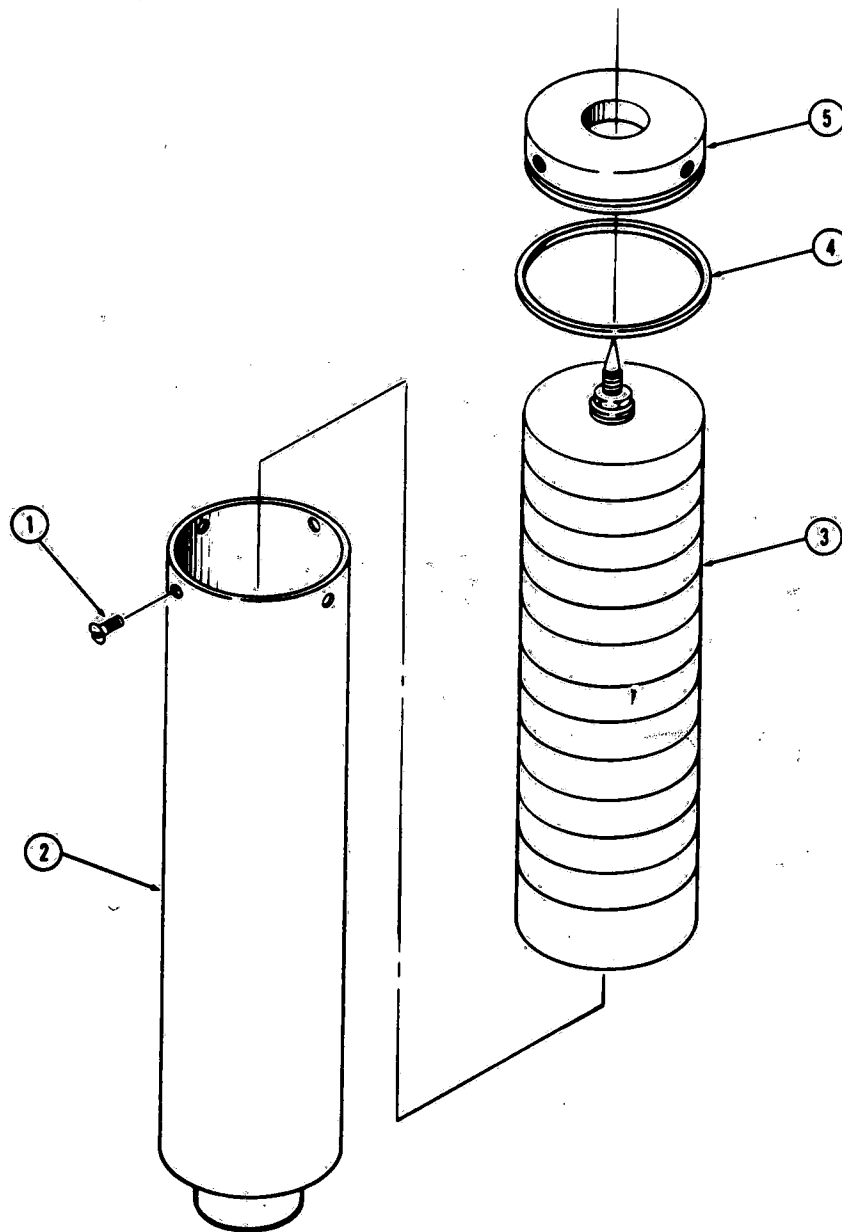


Figure 8-47. FILTER ASSEMBLY - Vacumatic and Gravity

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-47-	P	93160	001		FILTER ASSEMBLY (Units built before 12/89) .....	X			
1	P	12283	041		SCREW, Round Head, #10-32 x 1/4 .....	4			
2	P	93159	001		TUBE ASSEMBLY .....	1			
3	P	23953	091		CARTRIDGE, Filter .....	1			
4	P	41301	091		"O" RING .....	1			
5	P	83900	001		HEAD .....	1			

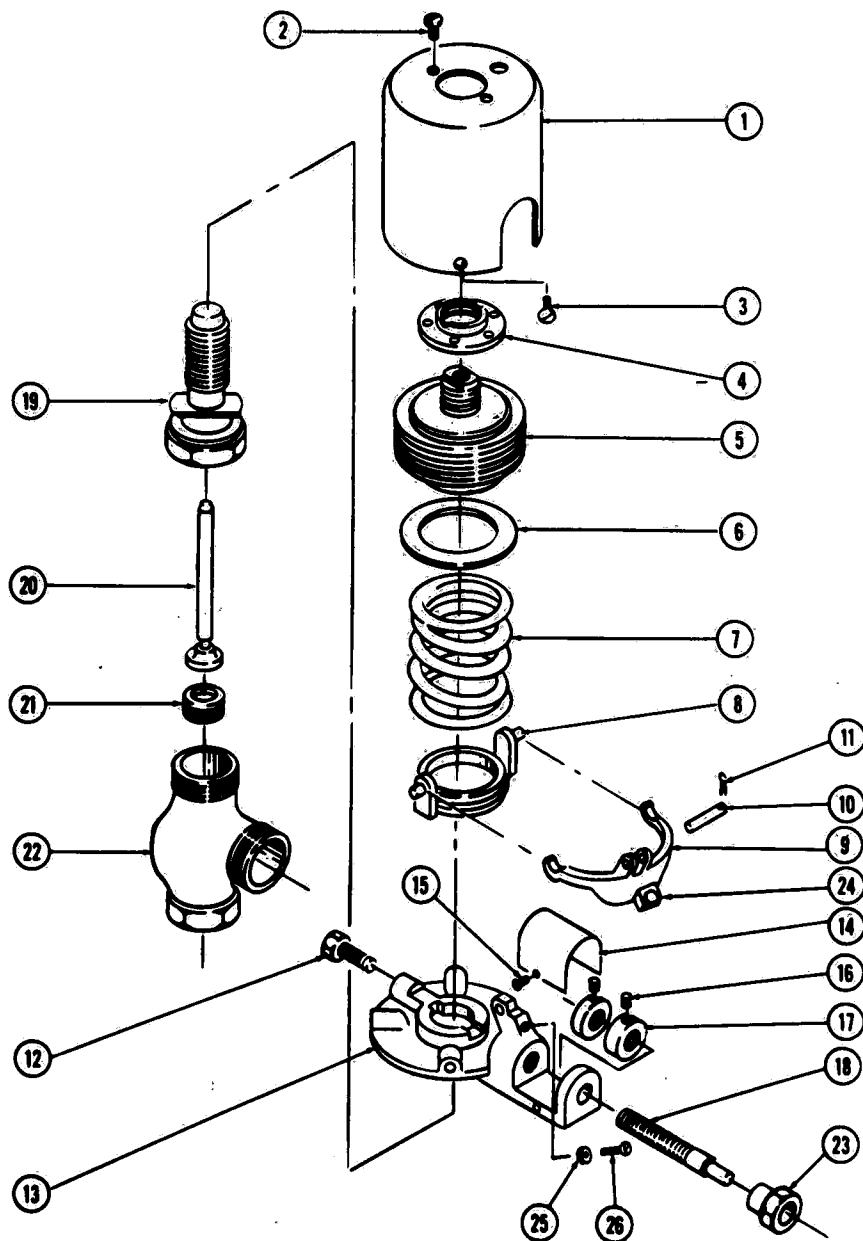


Figure 8-48. STEAM CONTROL VALVE, HI-LO - Vacumatic and Gravity

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-48-	P 20661	091	STEAM CONTROL VALVE, HI-LO	X
	P 754359	001	KIT, Valve Repair	1
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 9172	091	REINFORCEMENT	1
5	P 35880	091	BELLOWS ASSEMBLY	1
6	P 35911	061	PLATE, Top Spring	1
7	P 19947	045	SPRING	1
8	P 12474	042	PLATE, Lower Spring	1
9	P 14976	091	FORK, Adjusting	1
10	P 11890	061	PIN, Fork Pivot	1
11	P 8897	091	COTTER PIN	2
12	P 12471	041	SCREW, 1/4-20 x 1-1/2	1
13	P 20658	042	BOTTOM PLATE	1
14	P 20662	061	COVER, Adjusting Screw	1
15	P 12534	061	SCREW, #8-32 x 1/4	2
16	P 101585	041	SETSCREW, Allen Head, #10-32 x 1/4	2
17	P 20659	091	LOCK NUT	2
18	P 20657	061	SCREW, Adjusting	1
19	P 26836	091	SYLPHON AND BONNET ASSEMBLY	1
20	P 28265	091	VALVE STEM ASSEMBLY	1
21	P 5685	061	SEAT, Valve	1
22	P 5669	091	BODY, Valve	1
23	P 8605	043	NUT, Wheel	1
24	P 2299	045	INSERT	1
25	P 2959	041	NUT	1
26	P 9315	041	SCREW	1

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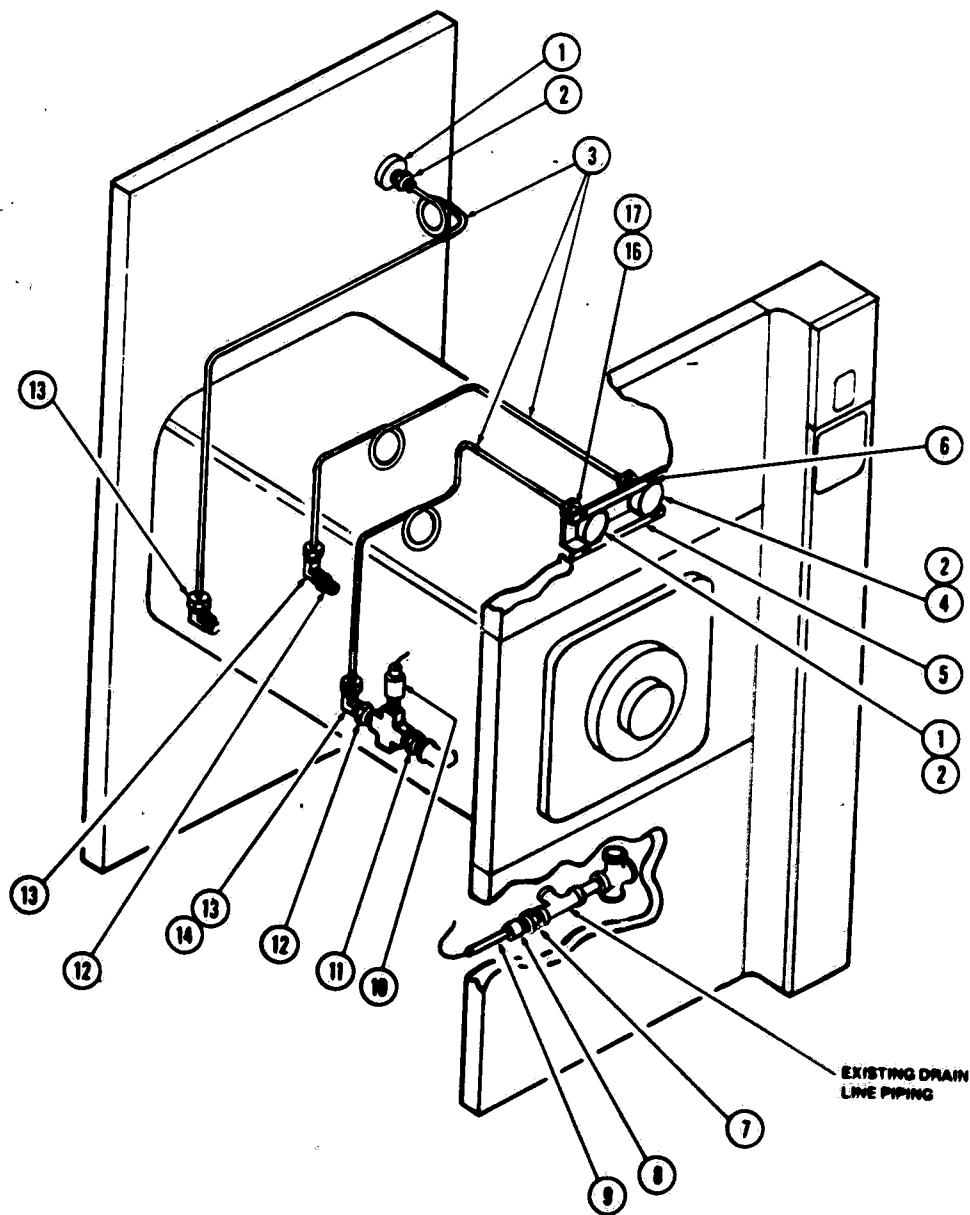


Figure 8-49. SENSING LINE PACKAGE - Vacumatic

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-49	P 136806	419	SENSING LINE PACKAGE - Vacumatic, Single Door	X	
	P 136806	420	SENSING LINE PACKAGE - Vacumatic, Double Door		X
1	P 90525	081	GAUGE, Chamber	1	1
2	P 90584	081	FITTING, Straight, 1/8 O.D.T. x 1/8 N.P.T. (Female)	2	3
3	P R-915	043	TUBING, 1/8 O.D.T. x 60	1	2
4	P 90730	081	GAUGE, Jacket	1	1
5	P 93900	052	BRACKET, Gauge	1	1
6	P 129360	015	NUT, Flange, 1/4-20	4	4
7	P 150822	845	BUSHING, Thermal, 1/8 O.D.T. x 1/4 N.P.T.	1	1
8	P 150822	801	BUSHING, Support	1	1
9	P 93908	517	THERMISTOR ASSEMBLY	1	1
10	P 93908	907	TRANSUCER ASSEMBLY	1	1
11	P 20344	081	FITTING, Straight, 1/8 O.D.T. x 1/8 N.P.T. (Male)	1	1
12	P 839	081	BUSHING, Reducing, 1/4 N.P.T. x 1/8 N.P.T.	1	1
13	P 26181	081	ELL, Compression, 1/8 o.d.t. x n.p.t. (Single door units)	2	3
14	P 50588	081	TEE, Compr. 1/8 O.D.T. x 1/8 N.P.T. x 1/8 O.D.T. (Dbl. dr. units)	1	1
15	P 8511	081	WASHER - FLAT	2	2
16	P 129360	016	NUT - FLANGE # 10-32	4	6
17	P 129356	132	WASHER - BELLEVILLE	4	6

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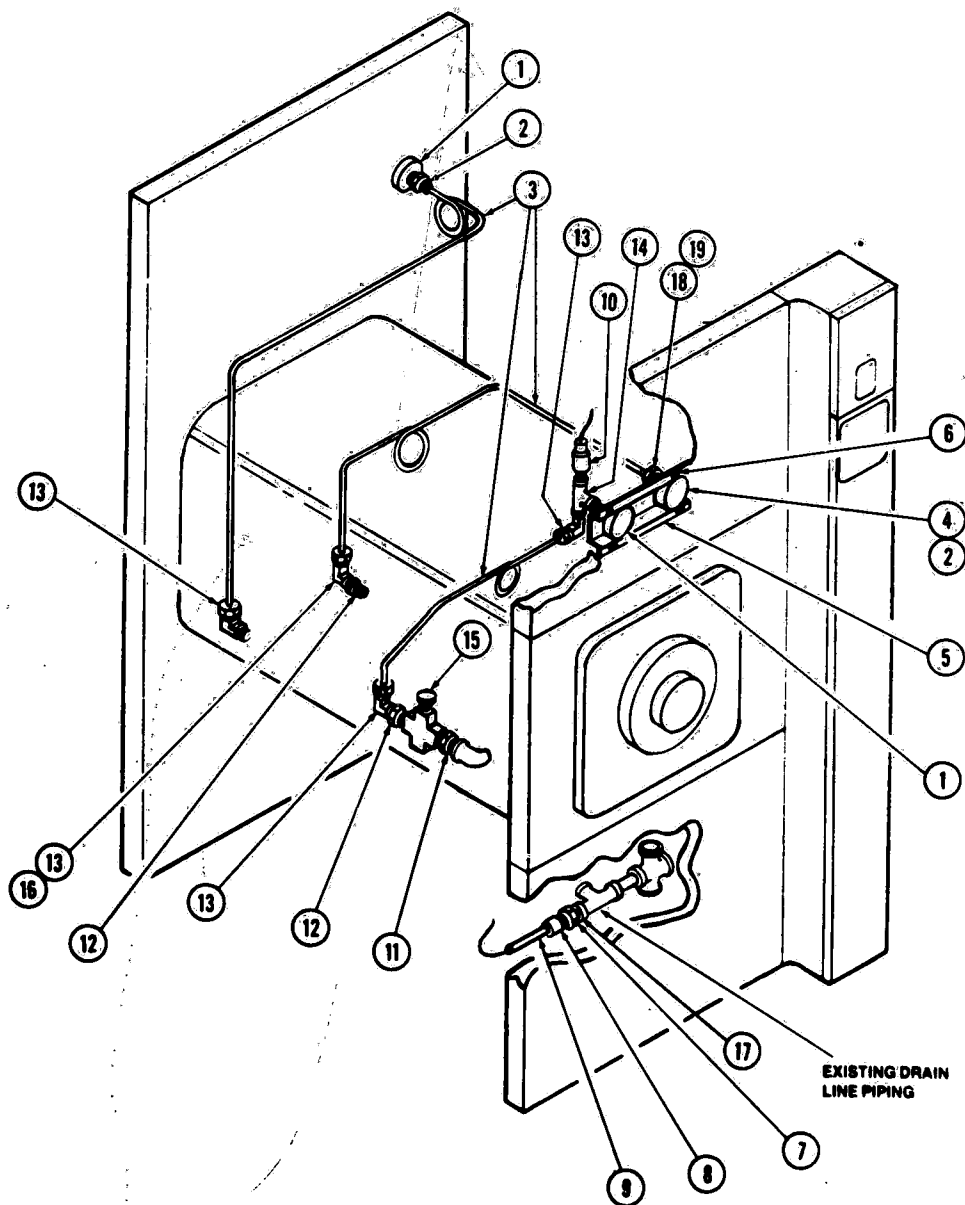


Figure 8-50. SENSING LINE PACKAGE- Gravity

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-50	P 136807	265	SENSING LINE PACKAGE - Gravity, Single Door	X	
	P 136807	266	SENSING LINE PACKAGE - Gravity, Double Door		X
1	P 90525	091	GAUGE, Chamber		1
2	P 90594	091	FITTING, Straight, 1/8 O.D.T. x N.P.T. (Female)	2	3
3	P R-915	043	TUBING, 1/8 O.D.T. x 60	1	2
4	P 90730	091	GAUGE, Jacket	1	1
5	P 93900	052	BRACKET, Gauge	1	1
6	P 129360	015	NUT, Flange, 1/4-20	4	4
7	P 150822	845	BUSHING, Thermal, 1/8 O.D.T. x 1/4 N.P.T.	1	1
8	P 150822	801	BUSHING, Support	1	1
9	P 93908	517	THERMISTER ASSEMBLY	1	1
10	P 93909	644	TRANSDUCER ASSEMBLY	1	1
11	P 20344	091	FITTING, Straight, 1/8 O.D.T. x N.P.T. (Male)	1	1
12	P 939	091	BUSHING, Reducing, 1/4 N.P.T. x 1/8 N.P.T.	1	1
13	P 26181	091	ELL, Compression, 1/8 O.D.T. x 1/8 N.P.T. Single Door Units	2	3
14	P 37862	091	TEE, 1/8 N.P.T.	1	1
15	P 3440	091	PLUG, 1/4 N.P.T.	1	1
16	P 50589	091	TEE - COMPRESSION, 1/8 O.D.T. x 1/8 N.P.T. x 1/8 O.D.T. Dbl. Dr.	1	1
17	P 150822	802	BUSHING, Reducing	1	1
18	P 129360	016	NUT, Flange #10-32	2	6
19	P 129356	132	WASHER - BELLEVILLE	4	6

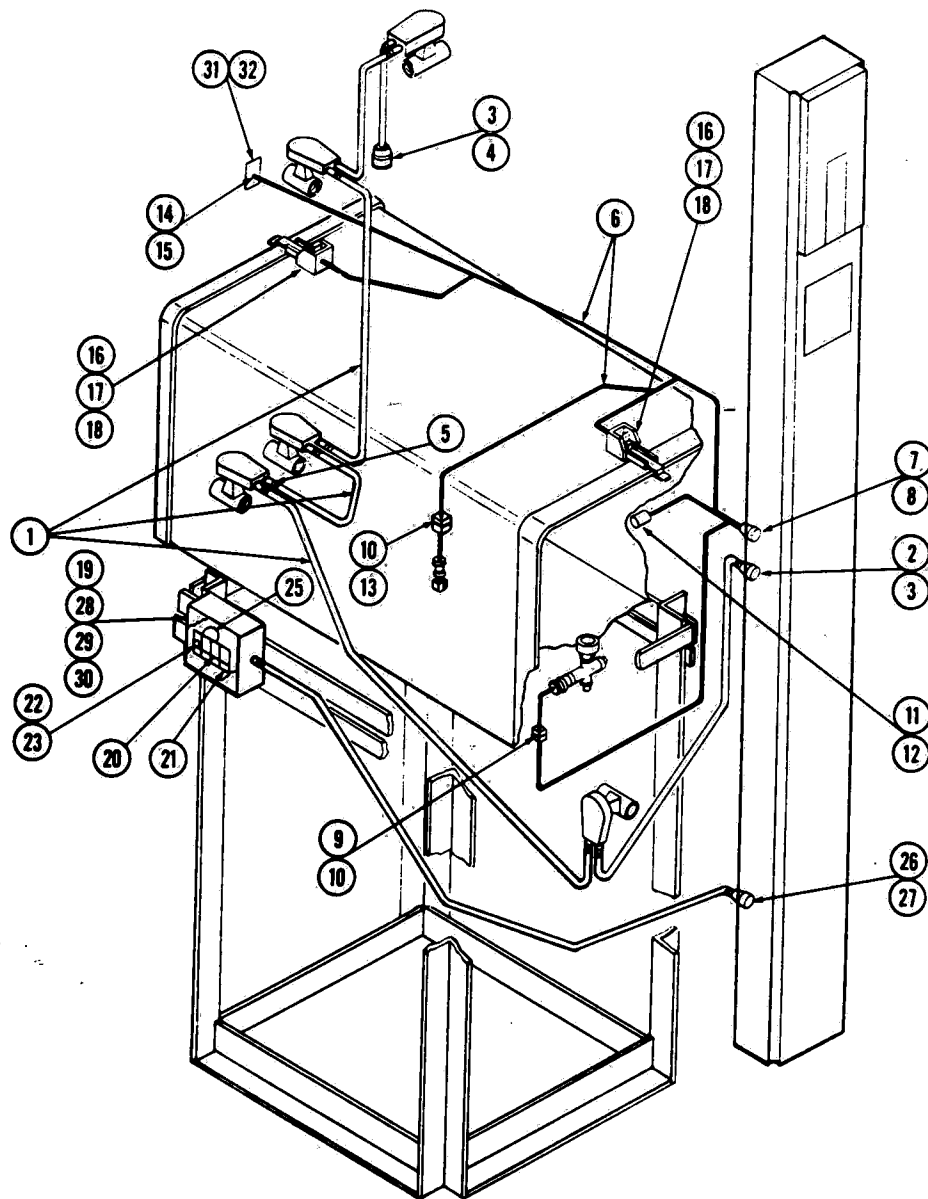


Figure 8-51A. WIRING ASSEMBLY - Vacamatic (Units built before 12/89)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-51-	P		FINAL WIRING ASSEMBLY, Vacamatic, SD	X			
	P		FINAL WIRING ASSEMBLY, Vacamatic, DD		X		
1	P	136807 052	CABLE ASSEMBLY, Solenoids	1	1		
2	P	93838 006	• PLUG, P54 (37 Pos.)	1	1		
3	P	129261 003	• CONTACT, Pin	18	18		
4	P	129360 533	• RECEPTACLE, P58 (9 Pos.)	1	1		
5	P	150778 001	VARIATOR (S2)	1	1		
6	P	146653 476	CABLE ASSEMBLY, Door Switch (SD)	1			
	P	146653 477	CABLE ASSEMBLY, Door Switch (DD)	1			
7	P	93909 384	• PLUG, P53 (63 Pos.)	1	1		
8	P	84475 001	• CONTACT, Socket	14	34		
9	P	129117 001	• HOUSING, P8 (2 Pos.Plug)	1	1		
10	P	129039 003	• CONTACT, Socket	8	8		
11	P	129116 001	• HOUSING, P12 (6 Pos.Pin)	1	1		
12	P	129113 003	• CONTACT, Pin	2	2		
13	P	129119 001	• HOUSING, P11 (6 Pos. Plug)	1	1		
14	P	93900 028	• HOUSING, P30 (20 Pos. Receptacle)	1	1		
15	P	84187 003	• CONTACT, Socket		19		
16	P	136807 136	DOOR SWITCH ASSEMBLY (Figure 8-16)	1	2		
17	P	16451 042	CAPSCREW, Socket Head (10-32 x 5/8)	2	4		
18	P	118442 045	NUT, Lock (10-32)	2	4		
19	P	136806 849	POWER BOX ASSEMBLY	1	1		
20	P	90746 091	• STRIP, Terminal	1	1		
21	P	129360 828	• MARKER, Terminal Strip	1	1		
22	P	42603 091	• SCREW, Round Head (6-32 x 7/8)	2	2		
23	P	150822 181	• NUT, Fig Lock #6-32	2	2		
24	P						
25	P	93908 906	• VARIATOR ASSEMBLY	1	1		
26	P	56396 090	• PLUG, P57 (Class A)	1	1		
27	P	150822 181	• CONTACT, Socket	3	3		
28	P	3950 048	SCREW, Round Head (1/4-20 x 5/8)	2	2		
29	P	129353 295	WASHER, Flat	2	2		
30	P	129359 533	NUT, Keps (1/4-20)	2	2		
31	P	146653 684	DISPLAY ASSEMBLY, N.O.E. (Figure 8-8)		1		
32	P	84121 001	NUT, Lock (4-40)		4		

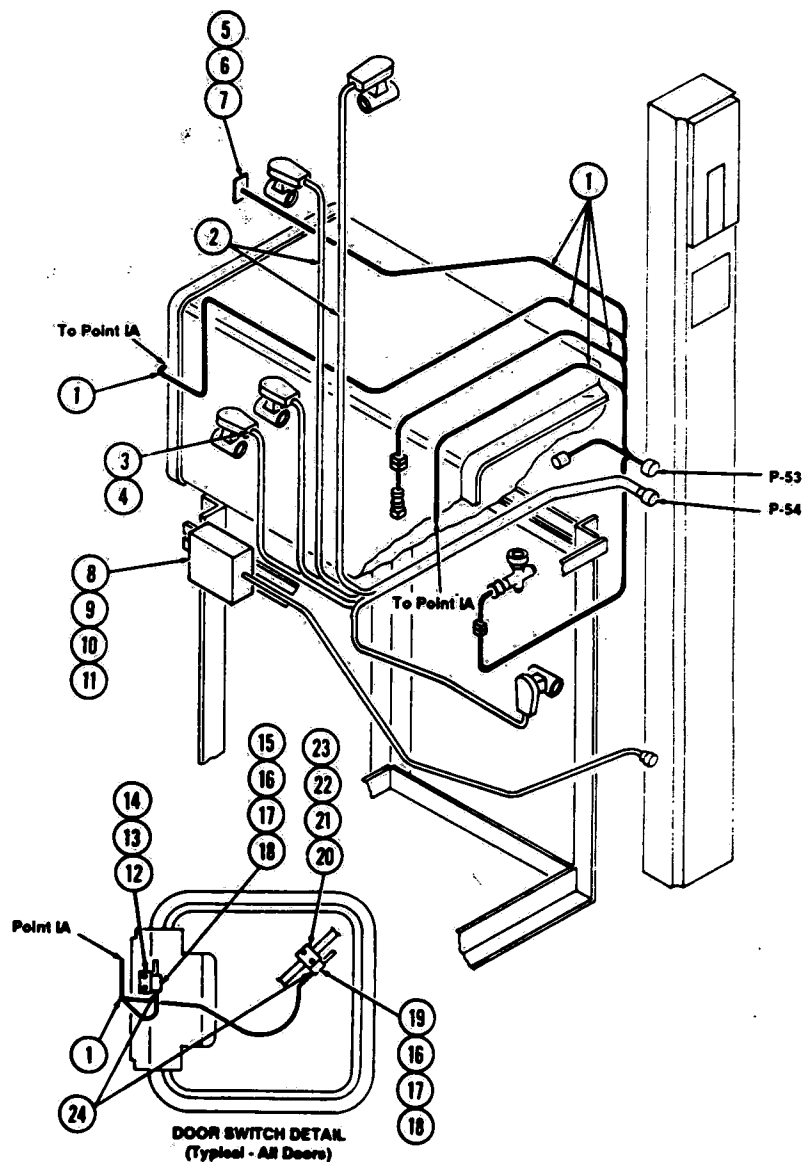


Figure 8-51B. WIRING ASSEMBLY - Vacamatic (Units built after 12/89)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-51B-	P 141198	491	FINAL WIRING ASSEMBLY, Vacamatic, SD	X		
	P 141198	492	FINAL WIRING ASSEMBLY, Vacamatic, DD		X	
1	P 141198	481	CABLE ASSEMBLY, Door Switch, SD	1		
	P 141198	482	CABLE ASSEMBLY, Door Switch, DD		1	
2	P 136807	257	CABLE ASSEMBLY, Solenoid - Vac	1	1	
3	P 150778	001	VARISTOR, S2	1	1	
4	P 30627	091	CLAMP, Cable	5	5	
5	P 146653	684	DISPLAY ASSEMBLY, N.O.E.		1	
6	P 84121	001	NUT, Lock, #4-40		4	
7	P 129360	821	SPACER, .116 I.D. x 3/16" O.D. x 13/64 Lg		4	
8	P 136806	849	POWER BOX ASSEMBLY	1	1	
9	P 129359	533	NUT, Keps, 1/4-20	2	2	
10	P 3950	048	SCREW, Rd. Hd., 1/4-20 x 5/8" Lg	2	2	
11	P 129353	295	WASHER, Flat, .281 x .562 x .050	2	2	
12	P 150828	352	BRACKET, Hinge	1	2	
13	P 3037	041	NUT, Hex, #6-32	2	4	
14	P 19675	041	WASHER, Lock, #6	2	4	
15	P 129359	316	SWITCH	1	2	
16	P 13794	041	NUT, Hex, #4-40	4	8	
17	P 30743	045	WASHER, #4 Ext. Tooth	4	8	
18	P 90712	041	SCREW, #4-40	4	8	
19	P 150828	355	SWITCH	1	2	
20	P 150828	353	BRACKET, Door	1	2	
21	P 19677	041	WASHER, Lock, #10	2	4	
22	P 150828	354	U-BOLT	1	2	
23	P 8647	061	NUT, Hex, #10-32	2	4	
24	P 91694	091	TERM., Q.D., .020 x .187 x 22/18 wire	6	12	

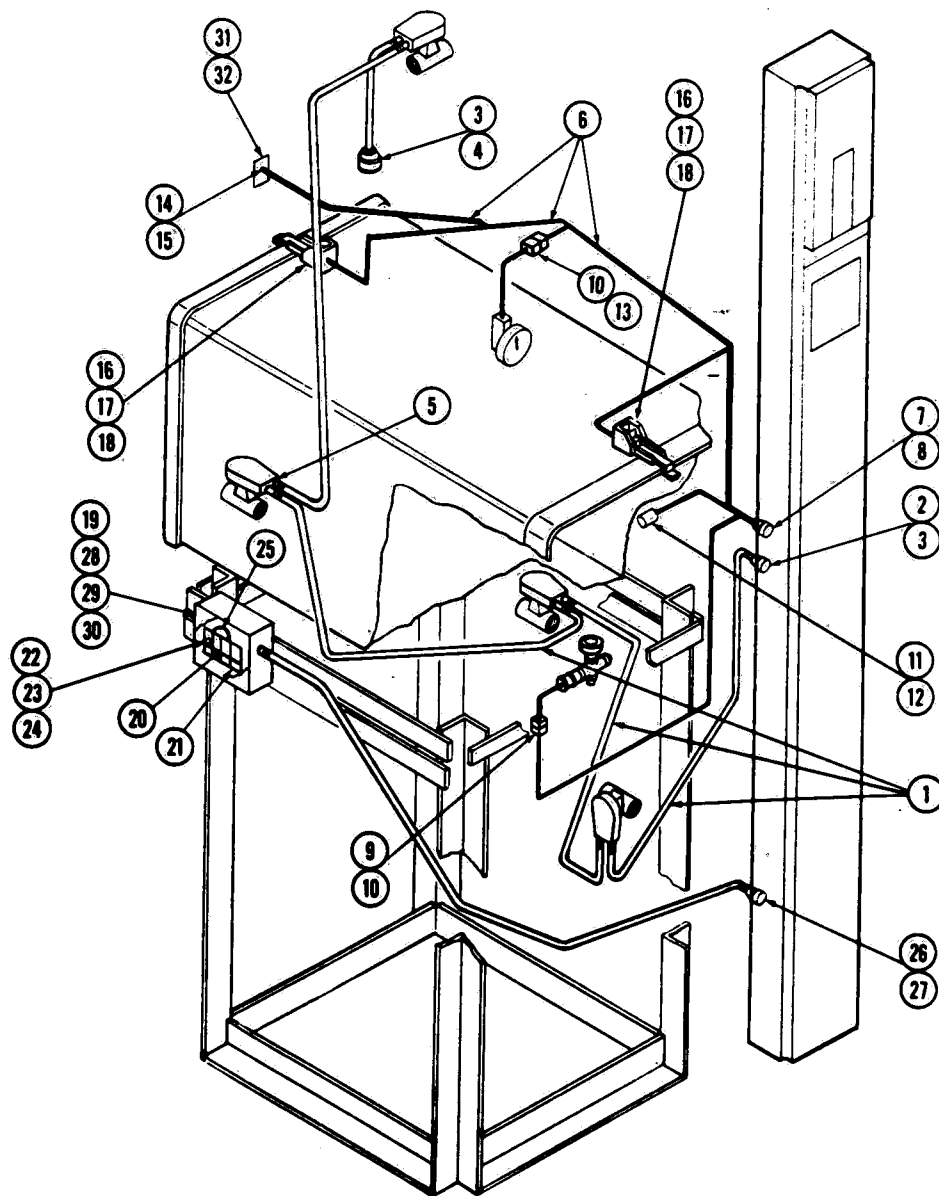


Figure 8-52A. WIRING ASSEMBLY - Gravity (Units built before 12/89)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-52-	P		FINAL WIRING ASSEMBLY, Gravity, SD	X	
	P		FINAL WIRING ASSEMBLY, Gravity, DD		X
	1 P	136807 051	CABLE ASSEMBLY, Solenoids	1	1
	2 P	93838 006	• PLUG, P54 (37 Pos.)	1	1
	3 P	129261 003	• CONTACT, Pin	19	19
	4 P	129360 533	• RECEPTACLE, P58 (9 Pos.)	1	1
	5 P	150778 001	VARISTOR (S2)	1	1
	6 P	146653 476	CABLE ASSEMBLY, Door Switch (SD)	1	
	7 P	146653 477	CABLE ASSEMBLY, Door Switch (DD)		1
	8 P	93909 384	• PLUG, P53 (63 Pos.)	1	1
	9 P	84475 001	• CONTACT, Socket	14	34
	10 P	129117 001	• HOUSING, P8 (2 pos. Plug)	1	1
	11 P	129039 003	• CONTACT, Socket	8	8
	12 P	129116 001	• HOUSING, P12 (6 Pos. Pin)	1	1
	13 P	129113 003	• CONTACT, Pin	2	2
	14 P	129119 001	• HOUSING, P11 (6 Pos. Plug)	1	1
	15 P	93900 028	• HOUSING, P30 (20 Pos. Receptacle)		1
	16 P	84187 003	• CONTACT, Socket		19
	17 P	136807 136	DOOR SWITCH ASSEMBLY (Figure 8-16)	1	2
	18 P	16451 042	CAPSCREW, Socket Head (10-32 x 5/8)	2	4
	19 P	118442 045	NUT, Lock (10-32)	2	4
	20 P	136806 849	POWER BOX ASSEMBLY	1	1
	21 P	90746 091	• STRIP, Terminal	1	1
	22 P	129360 828	• MARKER, Terminal Strip	1	1
	23 P	42603 091	• SCREW, Round Head (6-32 x 7/8)	2	2
	24 P	150822 181	• NUT, Fig Lock #6-32	2	2
	25 P	93908 906	• VARISTOR ASSEMBLY	1	1
	26 P	56396 090	• PLUG, P57 (Class A)	1	1
	27 P	150622 181	• CONTACT, Socket	3	3
	28 P	3950 048	SCREW, Round Head (1/4-20 x 5/8)	2	2
	29 P	129353 295	WASHER, Flat	2	2
	30 P	129359 533	NUT, Keps (1/4-20)	2	2
	31 P	146653 684	DISPLAY ASSEMBLY, N.O.E. (Figure 8-8)		1
	32 P	84121 001	NUT, Lock (4-40)		4

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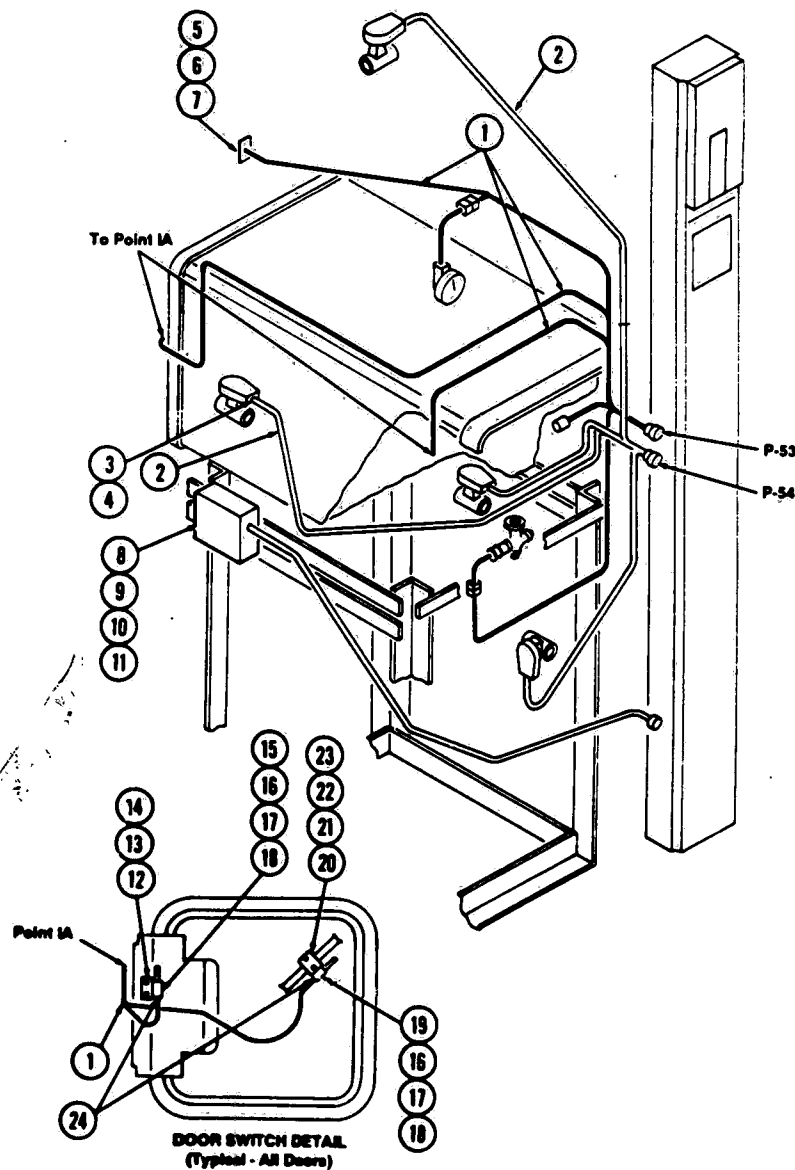


Figure 8-52B. WIRING ASSEMBLY - Gravity (Units built after 12/89)

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-52B-	P 141198	522	FINAL WIRING ASSEMBLY, Gravity, SD	X			
	P 141198	523	FINAL WIRING ASSEMBLY, Gravity, DD		X		
1	P 141198	520	CABLE ASSEMBLY, Door Switch, SD	1			
	P 141198	521	CABLE ASSEMBLY, Door Switch, DD		1		
2	P 136807	256	CABLE ASSEMBLY, Solenoid - Gravity	1	1		
3	P 150778	001	VARISTOR, S2	1	1		
4	P 30627	091	CLAMP, Cable	4	4		
5	P 146653	684	DISPLAY ASSEMBLY, N.O.E.		1		
6	P 84121	001	NUT, Lock, #4-40		4		
7	P 129360	821	SPACER, .116 I.D. x 3/16" O.D. x 13/64 Lg.		4		
8	P 136806	849	POWER BOX ASSEMBLY	1	1		
9	P 129359	533	NUT, Keps, 1/4-20	2	2		
10	P 3950	048	SCREW, Rd. Hd., 1/4-20 x 5/8" Lg.	2	2		
11	P 129353	295	WASHER, Flat, .281 x .562 x .050	2	2		
12	P 150828	352	BRACKET, Hinge	1	2		
13	P 3037	041	NUT, Hex, #6-32	2	4		
14	P 19675	041	WASHER, Lock, #6	2	4		
15	P 129359	316	SWITCH	1	2		
16	P 13794	041	NUT, Hex, #4-40	4	8		
17	P 30743	045	WASHER, #4 Ext. Tooth	4	8		
18	P 90712	041	SCREW, #4-40	4	8		
19	P 150828	355	SWITCH	1	2		
20	P 150828	353	BRACKET, Door	1	2		
21	P 19677	041	WASHER, Lock, #10	2	4		
22	P 150828	354	U-BOLT	1	2		
23	P 8647	061	NUT, Hex, #10-32	2	4		
24	P 91694	091	TERMINAL, Q.D., .020 x .187 x 22/18 wire	6	12		

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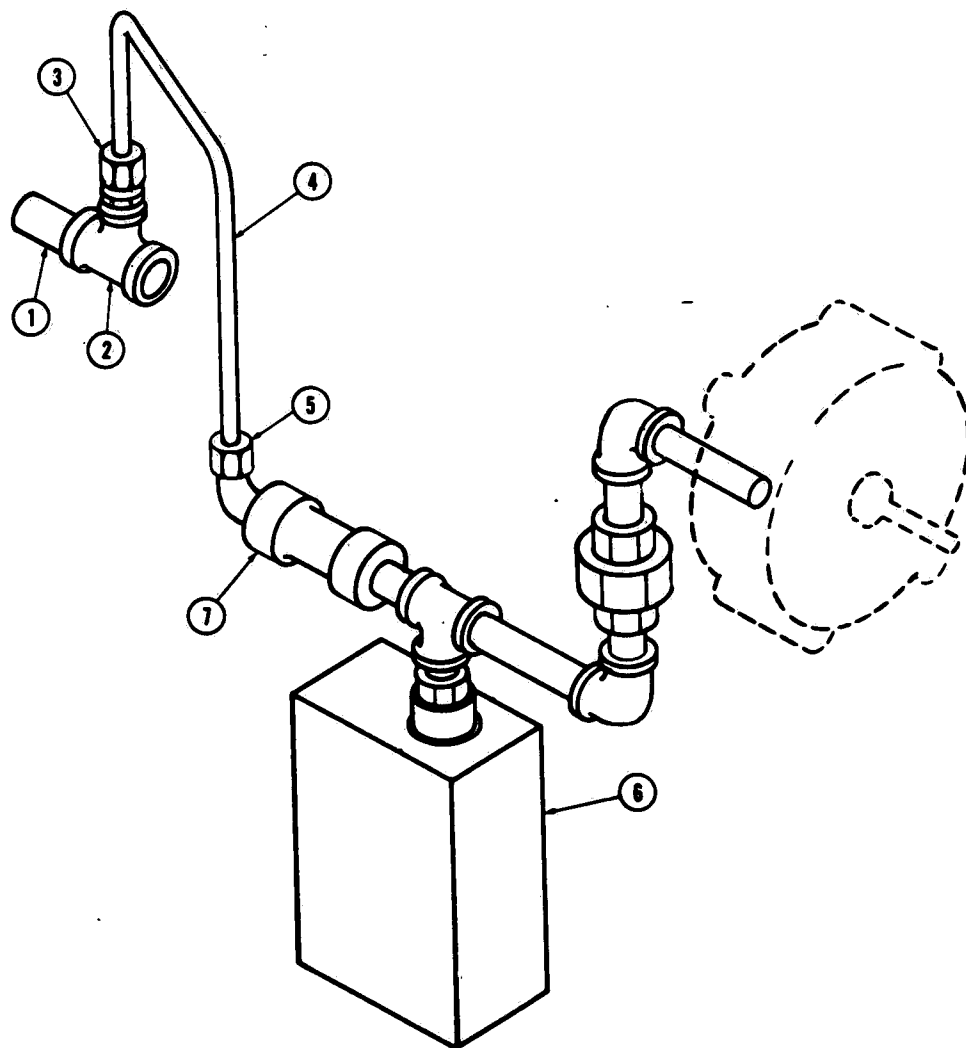


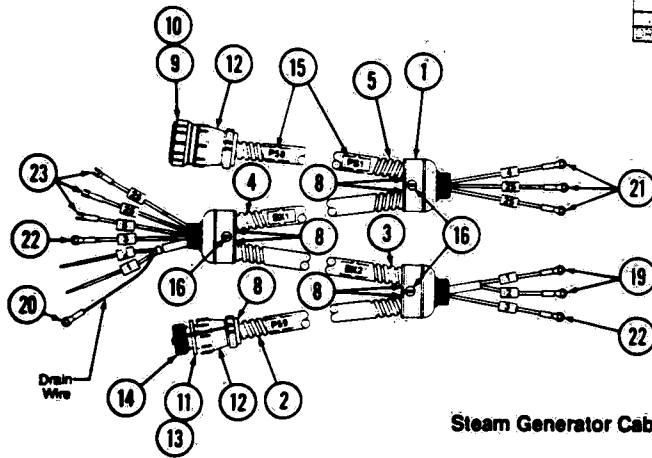
Figure 8-53. STERILIZER UPPER PIPING, (Units Equipped With Optional Electric Steam Generator)

FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-53-				UPPER PIPING ASSEMBLY, Gravity W/Steam Generator .....	X		
				UPPER PIPING ASSEMBLY, Vacumatic W/Steam Generator .....		X	
1	P	29291	091	NIPPLE, 3/4 N.P.T. x 1-1/4' Long .....		1	
1	P	29014	091	NIPPLE, 3/8 N.P.T. x 1-1/4' Long .....	1		
2	P	4910	091	TEE, Reducing, 3/8 N.P.T. x 3/8 N.P.T. x 1/4 N.P.T. ....	1		
	P	75040	091	TEE, 3/4 N.P.T. x 3/4 N.P.T. x 1/4 N.P.T. ....		1	
3	P	34218	091	FITTING, Compression, Straight, 1/4 O.D.T. x 1/4 N.P.T. ....	1	1	
4		R-915	103	TUBE, 1/4 O.D.T. x 7-1/2' Long .....	1	1	
5	P	45407	091	ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T. ....	1	1	
6	P	83909	394	SWITCH, Pressure, 1/4 N.P.T. ....	1	1	
7	P	89018	091	VALVE, Flow Control, 1/4 N.P.T. ....	1	1	

**Figure 8-84. STEILIZER LOWER PIPING (Units Equipped With Optional Electric Steam Generator)**

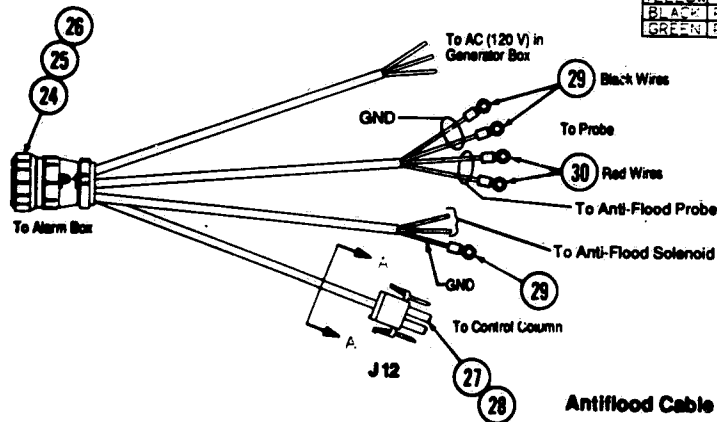
FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-54-			STERILIZER LOWER PIPING ASSEMBLY, UNITS W/STEAM GENERATOR: Vacuumatic and Gravity	
			10-16 Vacuumatic W/Steam Generator	X
			20-20 Vacuumatic W/Steam Generator	X
			10-16 Gravity W/Steam Generator	X
			20-20 Gravity W/Steam Generator	X
1	P 40150	091	ELL, Male, Compression, 5/8 O.D.T. x 3/8 NPT	2
2	P 136697	075	TUBE, Steam	2
	P 136697	074	TUBE, Steam	2
3	P 44400	091	ELL, Steam, Solid, 5/8 O.D.T. x 1/2 NPT	2
4	P 77621	091	VACUUM BREAKER, 1/2 NPT	2
	P 757015	091	* KIT, Repair, Steam Type V-370A	2
	P 764323	094	* KIT, Repair, Steam Type No 00	2
5	P 50211	091	ADAPTER, Solid, 5/8 O.D.T. x 1/2 NPT	2
6	P 50559	460	TUBE, 5/8 O.D. x 33 1/4" Long	2
7	P 136697	140	TUBE, Water	2
8	P 125060	096	BLOCK, Tube Support	2
9	P 50510	091	CLAMP, Pipe	2
10	P 4005	041	SCREW, Round Head, #1/4-20 x 1-3/4" Long	2
	P 4002	041	SCREW, Round Head, #1/4-20 x 1" Long	2
11	P 125059	533	NUT, KEPS, #1/4-20	2
12	P 50718	091	ELL, Male, Compression, 3/8 O.D.T. x 1/2 NPT	2
13	P 50662	590	VALVE, Ball, 3/4", 1/2 NPT	2
14	P 50627	091	UNION, Solid, 5/8 O.D.T. x 1/2 NPT	2
	P 50625	091	UNION, Solid, 5/8 O.D.T.	2
15	P 136714	204	TUBE, 5/8 O.D. x 1-7/8" Long	2
16	P 50212	091	ELL, Solid, 5/8 O.D.T.	2
17	P 5015		TUBE, Solid, 5/8 O.D. x 25-13/16" Long	2
18	P 50669	465	TUBE, Solid	2
	P 50669	466	TUBE, Solid	2
	P 50669	577	TUBE, Solid	2
	P 50669	578	TUBE, Solid	2
	P 50669	091	ADAPTER, Solid, 5/8 O.D.T. x 3/8 NPT	2
19	P 47071	091	STRAINER, 3/8 NPT	2
20	P 29501	091	STRAIGHT MALE COMPRESSION, 5/8 O.D.T. x 1/2 NPT	2
21	P 50601	045	UNION, #1/2"	2
22	P 125060	541	NUT, KEPS, #1/2"	2
23	P 4005	051	SCREW, Round Head, 1/4-20 x 1-1/4" Long	2
24	P 135000	010	ROD, Exhaust, 7-1/4" Lg	2
25	P 50300	045	COUPLING, Water Seal	2
26	P 50400	051	KNOS VALVE	2
27	P 10500	091	SCREW SET, #10-32 x 3/4" Lg	2
28	P 40000	051	PIN GOUTER, 1-3/4" Lg	2
29	P 5000	042	NUT, VALVE	2
30	P 125060	595	DECAL, Generator Water Supply	2

WIRE TERMINATION SHEET									
WIRE NO.	WIRE SIZE	WIRE COLOR	WIRE LENGTH	WIRE TYPE	WIRE TERMINATION	WIRE TERMINATION	WIRE TERMINATION	WIRE TERMINATION	WIRE TERMINATION
1	18	Black	47	18	18	18	18	18	18
2	18	Black	47	18	18	18	18	18	18
3	18	Black	47	18	18	18	18	18	18
4	18	Black	47	18	18	18	18	18	18
5	18	Black	47	18	18	18	18	18	18
6	18	Black	47	18	18	18	18	18	18
7	18	Black	47	18	18	18	18	18	18
8	18	Black	47	18	18	18	18	18	18
9	18	Black	47	18	18	18	18	18	18
10	18	Black	47	18	18	18	18	18	18
11	18	Black	47	18	18	18	18	18	18
12	18	Black	47	18	18	18	18	18	18
13	18	Black	47	18	18	18	18	18	18
14	18	Black	47	18	18	18	18	18	18
15	18	Black	47	18	18	18	18	18	18
16	18	Black	47	18	18	18	18	18	18
17	18	Black	47	18	18	18	18	18	18
18	18	Black	47	18	18	18	18	18	18
19	18	Black	47	18	18	18	18	18	18
20	18	Black	47	18	18	18	18	18	18
21	18	Black	47	18	18	18	18	18	18
22	18	Black	47	18	18	18	18	18	18
23	18	Black	47	18	18	18	18	18	18
24	18	Black	47	18	18	18	18	18	18
25	18	Black	47	18	18	18	18	18	18
26	18	Black	47	18	18	18	18	18	18
27	18	Black	47	18	18	18	18	18	18
28	18	Black	47	18	18	18	18	18	18
29	18	Black	47	18	18	18	18	18	18
30	18	Black	47	18	18	18	18	18	18



Steam Generator Cable

COLOR	FROM	CONN. MET.	TO	CONN. MET.
BLACK	P-1	ITEM 3	GROUND	ITEM 1
RED	P-2	ITEM 3	GROUND	ITEM 2
RED	P-3	ITEM 3	GROUND	ITEM 3
BLACK	P-4	ITEM 3	GROUND	ITEM 4
BLACK	P-5	ITEM 3	GROUND	ITEM 5
YELLOW	P-6	ITEM 3	24 V	ITEM 6
GREEN	P-7	ITEM 3	24 V	ITEM 7
BLACK	P-8	ITEM 3	24 V	ITEM 8
WHITE	P-9	ITEM 3	24 V	ITEM 9
YELLOW	P-10	ITEM 3	24 V	ITEM 10
BLACK	P-11	ITEM 3	24 V	ITEM 11
BLACK	P-12	ITEM 3	24 V	ITEM 12
GREEN	P-13	ITEM 3	24 V	ITEM 13



Antiflood Cable

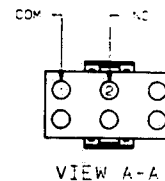


Figure 8-55. CABLE ASSEMBLIES, (Units With AS Series Optional Electric Steam Generator Only)

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-55-			CABLE ASSEMBLIES.	
			Units With AS Series Optional Electric Steam Generator .....	X
P	136807	054	STEAM GENERATOR CABLE .....	X
1	P	18000	091 CONNECTOR, Double-1/2 .....	3
2	P	89813	091 CONDUIT, Flex, 3/8 x 12" Long .....	1
3	P	150107	001 CONDUIT, Flex, 1/2 x 32" Long .....	1
4	P	79201	091 CONDUIT, Flex, 1/2 x 60" Long .....	1
5	P	80272	091 CONDUIT, Flex, 1/2 x 20" Long .....	1
6			WIRE, Yellow, 46'-11" Long .....	1
7			WIRE, White, 18'-4" Long .....	1
8	P	150122	001 BUSHING, 1/2" .....	8
9	P	93838	001 PLUG, 9 Position, P58 .....	1
10	P	129261	004 CONTACT, Socket .....	7
11	P	129360	533 RECEPTACLE, 9 Position, P59-Free Hanging .....	1
12	P	150475	985 CLAMP, Cable .....	2
13	P	129261	003 PIN, Contact .....	5
14	P	129360	528 CAP, Sealing .....	1
15	P	150822	003 MARKER, Tie .....	5
16	P	31697	041 SCREW, Round Head, #10-24 x 1-1/4" Long .....	3
17			CABLE, 2 Cond., 3'-11" Long .....	1
18			WIRE, Green, 3'-9" Long .....	1
19	P	14591	091 TERMINAL, Ring, #8 Stud x 16-14 Wire .....	2
20	P	19522	091 TERMINAL, Ring, #10 Stud x 22-18 Wire .....	1
21	P	14865	091 TERMINAL, Ring, #8 Stud x 22-18 Wire .....	3
22	P	14592	091 TERMINAL, Ring, #10 Stud x 16-14 Wire .....	2
23	P	118177	091 TERMINAL, Spade, #6 Stud x 22-18 Wire .....	3
			ANTI-FLOOD CABLE .....	X
24			PLUG, Amp #206037-1 .....	1
25			SOCKET, Contact, Amp #86101-4, Series 1 .....	16
26			CLAMP, Amp #206322-1 .....	1
27			HOUSING, Plug, Amp #1-480704-0 .....	1
28			SOCKET, Contact, Amp #350689-2 .....	2
29			TERMINAL, Ring, #8 x 22-18 AWG .....	3
30			TERMINAL, Ring, #10 x 22-18 AWG .....	2

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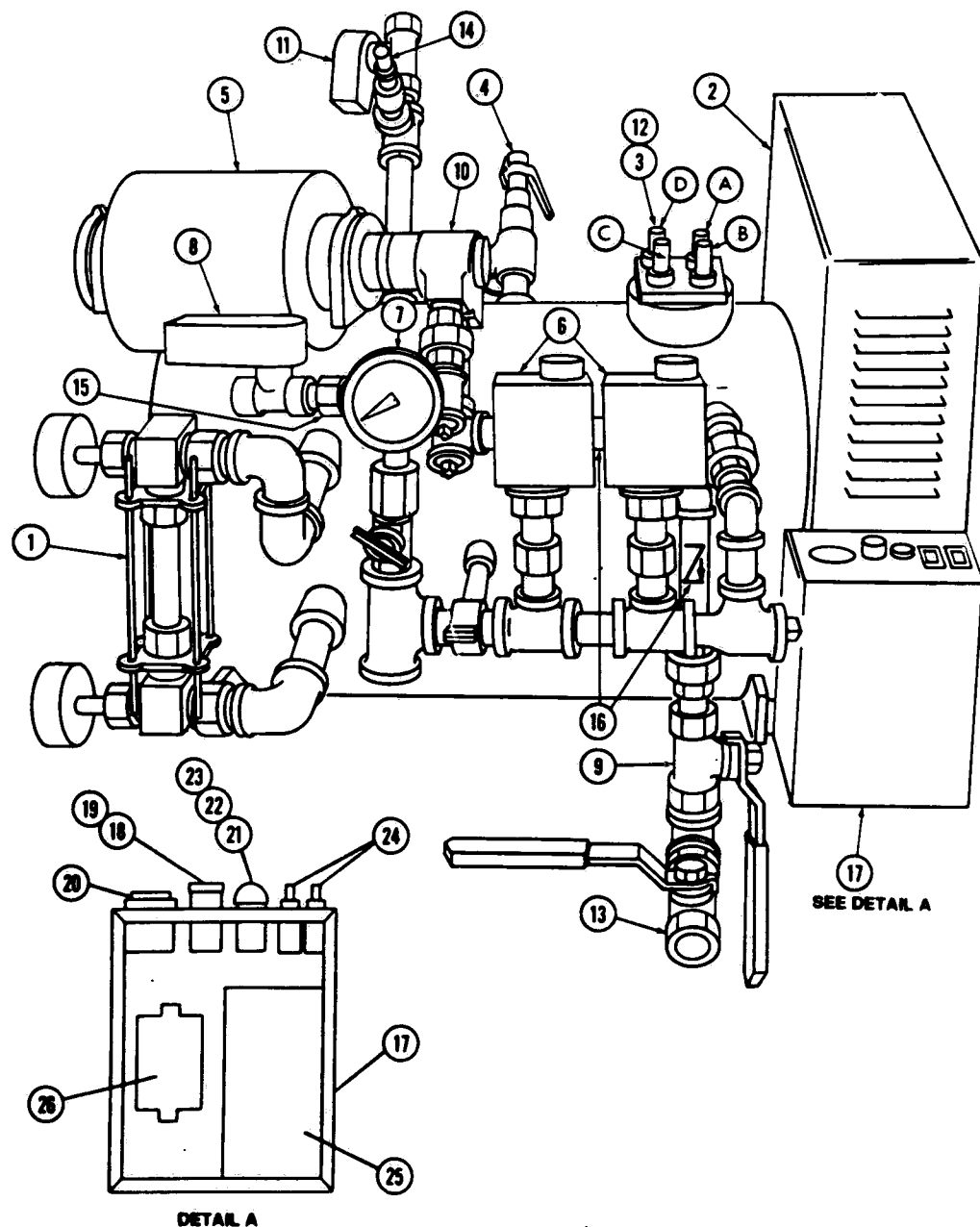


Figure 8-56. OPTIONAL ELECTRIC STEAM GENERATOR, AS SERIES

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-56-			OPTIONAL ELECTRIC STEAM GENERATOR, AS SERIES .....	X
1			WATER LEVEL SIGHT GLASS ASSEMBLY (Figure 8-57) .....	1
2			CONTROLLER (Figure 8-58) .....	1
3 P	764316	748	CONTROL RODS (Set of 4) .....	1
4 P	75421	091	SAFETY VALVE .....	1
5 P	764319	901	MOTOR, 115/230 V, 50/60 Hz. ....	1
6 P	764319	305	SWITCH, Pressure .....	2
7 P	750467	091	GAUGE, Pressure .....	1
8 P	764319	693	VALVE, Solenoid .....	1
9 P	764317	863	VALVE, Ball (Union) .....	2
10 P	764319	902	PUMP, Rotary Vane .....	1
11 P	101006	805	VALVE, Solenoid, 1/2 N.P.T. ....	1
	101006	863	• KIT, Repair .....	1
12 P	756383	091	HOLDER, Electrode .....	4
13 P	764321	222	VALVE, Ball .....	1
14 P	387337	663	PROBE, Spark Plug .....	1
15 P	76044	042	VALVE, Flow Control .....	1
16 P	764320	492	VALVE, Check, Ball Cone .....	2
17 P	764322	883	CONTROL BOX ASSEMBLY, Anti-Flood .....	1
18 P	764322	898	• FUSEHOLDER .....	1
19 P	764317	819	• FUSE (Box of 10) .....	1
20 P	93443	002	• PLUG, Receptacle .....	1
21 P	764322	900	• SOCKET, Light .....	1
22 P	764317	708	• LIGHT (Box of 10) .....	1
23 P	764322	901	• LENS .....	1
24 P	764322	899	• SWITCH, Pushbutton .....	2
25 P	764322	896	• PC BOARD ASSEMBLY .....	1
26 P	129360	019	• RELAY .....	1
*Note: Rods to have following lengths:				
A 5-1/4"				
B 4-1/2"				
C 4"				
D 5-1/4"				

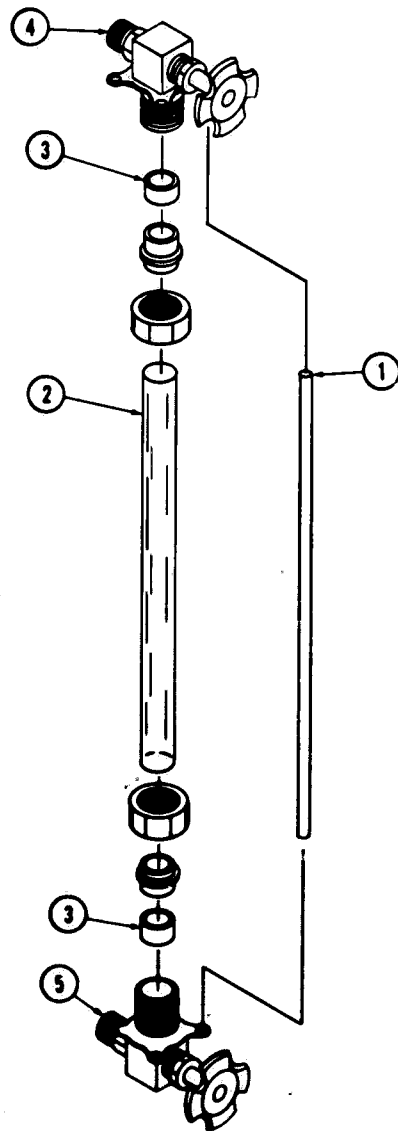


Figure 8-57. WATER LEVEL SIGHT GLASS ASSEMBLY,  
(Optional Electric Steam Generator, AS Series & CHS Series)

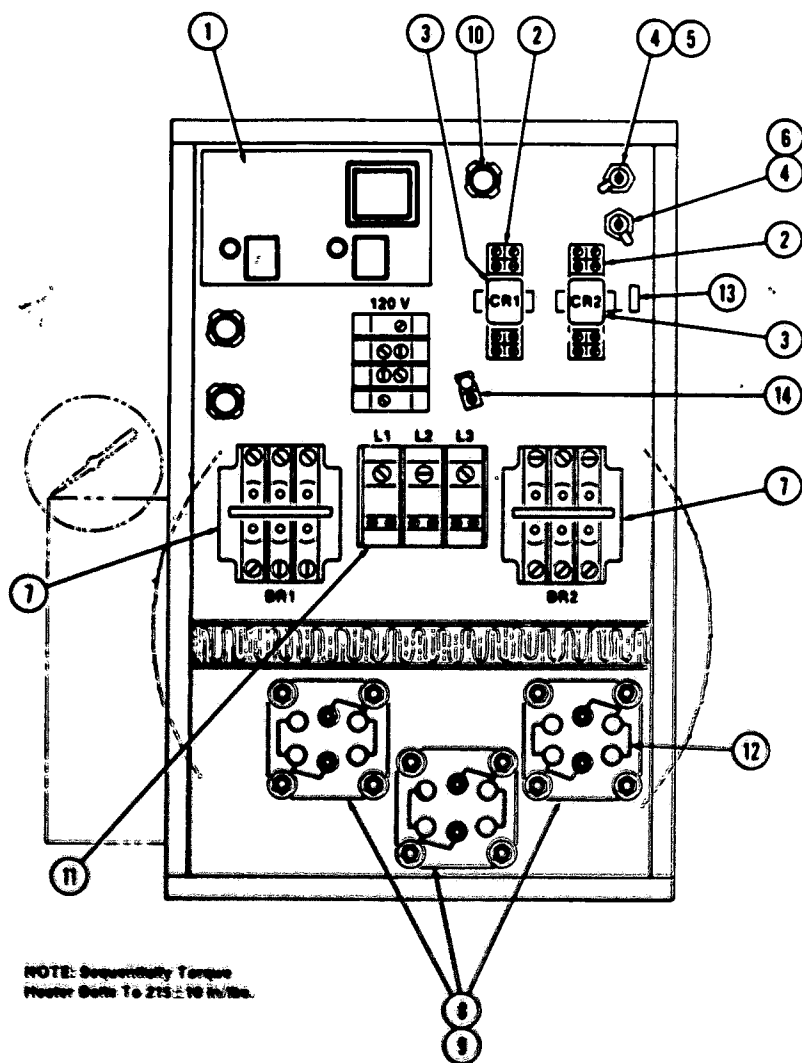
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FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-57-				WATER LEVEL SIGHT GLASS ASSEMBLY, Optional Electric Steam Generator AS Series ..... CHS Series .....	X		X	
	1	P	764323	711	ROD, Guard .....	4		
		P	764323	327	ROD, Guard .....		4	
	2	P	764322	879	GLASS, Sight, 7-1/4" Lg. (Set of Two, With 8 Washers) .....	1		
		P	764322	543	GLASS, Sight, 6-1/2" Lg. (Set of Two, With 8 Washers) .....		1	
	3	P	764322	052	SEAL, Rubber .....	2	2	
	4	P	764320	899	TOP VALVE ASSEMBLY .....	1	1	
	5	P	764320	900	BOTTOM VALVE ASSEMBLY .....	1	1	

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NOTE: Sequentially Torque  
Heater Bolts To 275 ± 10 in/lbs.

(View shown with cover removed)

Figure 8-58. CONTROLLER, Optional Electric Steam Generator, AS Series

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-58-			CONTROLLER: Optional Electric Steam Generator, AS Series .....	X
1 P	755715 735		PRINTED CIRCUIT BOARD .....	1
2 P	84412 001		SOCKET, Relay .....	2
3 P	84413 001		RELAY, Plug-In, 120 VAC .....	2
4 P	91713 091		FUSEHOLDER .....	2
5 P	764317 462		FUSE, 1 AMP .....	1
6 P	764317 772		FUSE, 10 AMP .....	1
7 P	759747 001		CONTACTOR, Heater, 50 AMP .....	2
8 P	764322 460		HEATER, 9.75 KW, 208/230 V .....	3
9 P	764322 662		HEATER, 9.75 KW, 440 V .....	3
10 P	764317 713		GASKET, Heater (Set of 3) .....	1
11 P	764321 200		CABLE ASSEMBLY, Generator to Control Column .....	1
12 P	764322 684		BLOCK, Terminal .....	1
13 P	128318 001		JUMPER STRIP .....	24
14 P	764323 333		RESISTOR .....	1
			LUG, Grounding .....	1

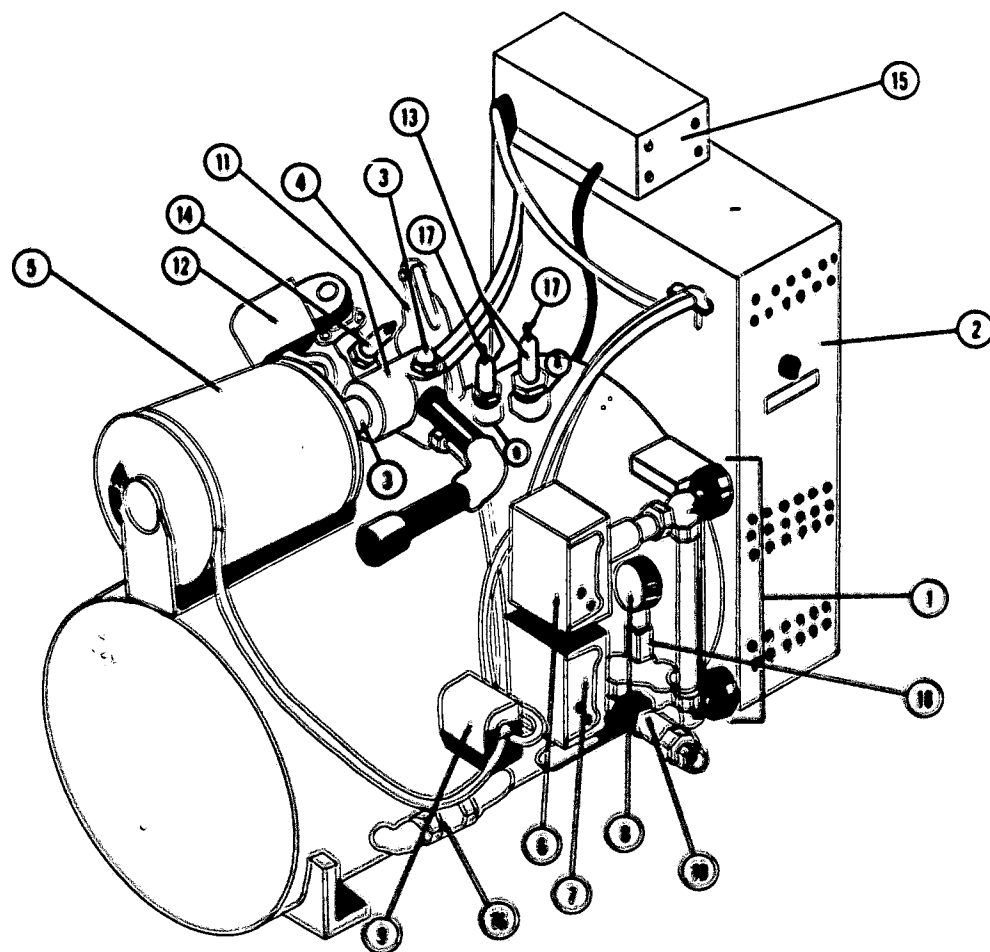
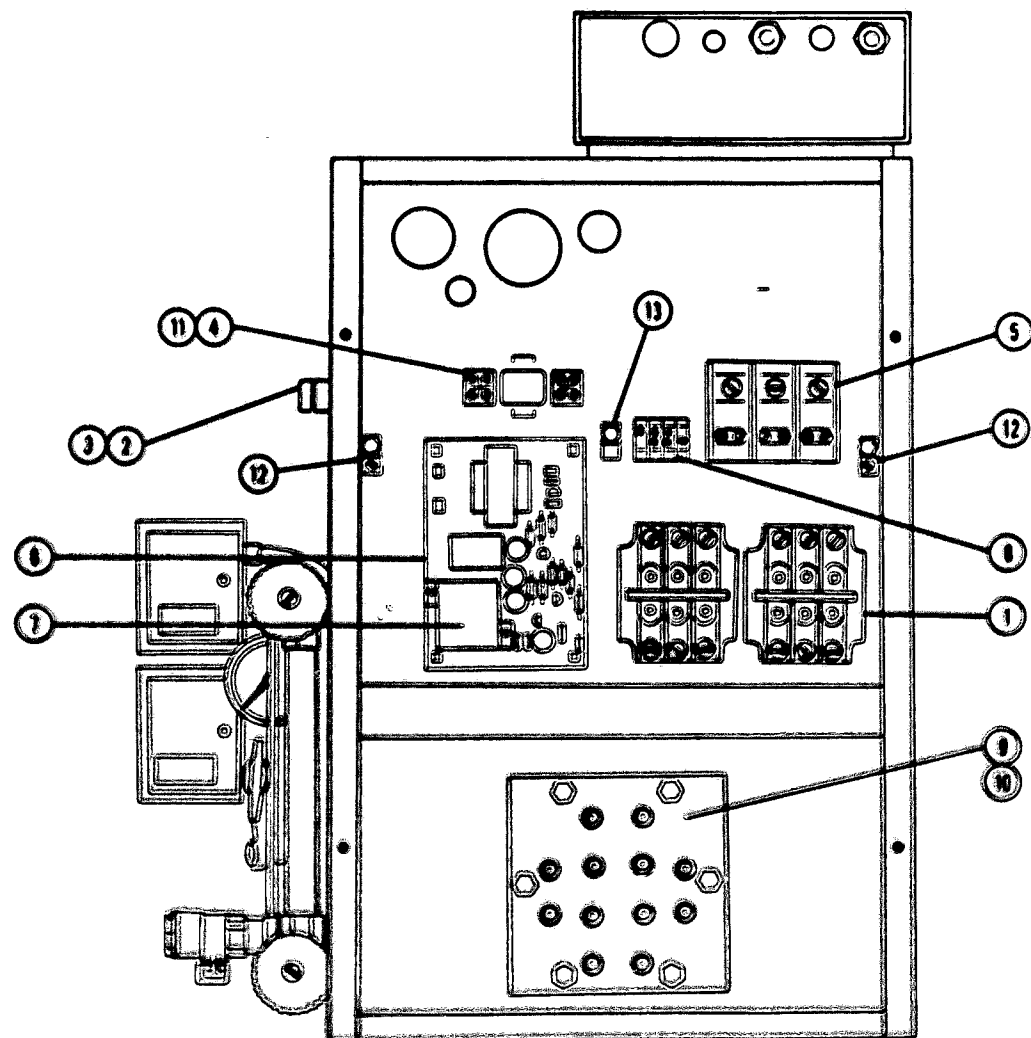


Figure 8-58. OPTIONAL ELECTRIC STEAM GENERATOR, CHS SERIES

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-59-			OPTIONAL ELECTRIC STEAM GENERATOR, CHS SERIES .....	X
1			WATER LEVEL SIGHT GLASS ASSEMBLY (See Fig. 8-57) .....	1
2			CONTROL PANEL (See Fig. 8-60) .....	1
3	P 764323	491	CLAMP, Pump Mounting .....	1
4	P 764323	459	VALVE, Safety .....	1
5	P 764323	487	MOTOR, 1/4 H.P. 120V .....	1
6	P 764323	471	PRESSURE CONTROL, High Level (Manual Reset) .....	1
7	P 764323	470	PRESSURE CONTROL, Operating .....	1
8	P 764323	430	GAUGE, Pressure .....	1
9	P 764323	548	VALVE, Solenoid Water Feed, 1/4" .....	1
10	P 764323	595	* KIT, Repair .....	1
11	P 764323	514	VALVE, Ball, 1/2" .....	1
12	P 101006	805	PUMP .....	1
13	P 101006	863	VALVE, Solenoid 1/2" Steam .....	1
14	P 764323	515	* KIT, Repair .....	1
15	P 764323	511	PROBE, Water Level .....	2
16	P 764323	321	PROBE, Anti-Flood .....	1
17	P 764321	287	CONTROL BOX, Anti-Flood (See Fig. 8-61) .....	1
18	P 764323	396	VALVE, Check .....	1
			CONTROL RODS "A" & "B" (See Fig. 8-62) .....	1
			VALVE, Ball, 1/4" .....	1
			* NOTE: Rods are of the following lengths: A = 4-2/8" Lg. B = 5-1/2" Lg.	



Note: Separately Torque Header Bolts to 22.9 lbs

Figure 8-60. CONTROLLER, Optional Electric Steam Generator, CHS Series

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-60-			CONTROLLER, Optional Electric Steam Generator, CHS Series ,...	X
1	P 764323 555	*	CONTACTOR, Power, 50A, 120 V Coil	*
2	P 764323 525		FUSE HOLDER	1
3	P 764323 556		FUSE, 10 Amp.	1
4	P 764323 557		RELAY, Control, 120V Coil	1
5	P 764323 446		TERMINAL BLOCK, Power Dist.	1
6	P 764323 558		CONTROL, Water Feed & LWCO	1
7	P 764323 859		RELAY, Plug-in Pump Motor	1
8	P 150461 001		TERMINAL BLOCK, Control Circuit	1
9	P 764323 549		HEATER, 208/240V 30 kW, Three Phase	1
9	P 764323 550		HEATER, 440/480V 30 kW, Three Phase	1
10	P 764323 527		GASKET, Heater	1
11	P 764323 341		RESISTOR	1
12	P 764323 333		LUG, Grounding	2
13	P 764323 332		LUG, Grounding	1
* NOTE: One Contactor required for 440/480V, Three Phase Two Contactors required for 208/240V, Three Phase				



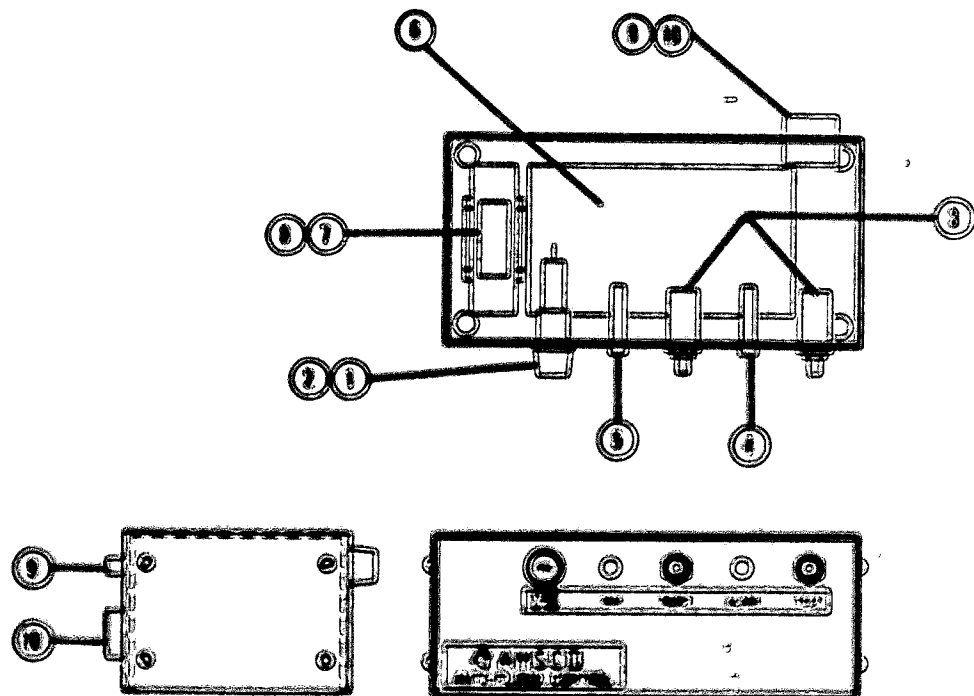


Figure 8-61. ANTI-FLOOD CONTROL, Optional Electric Steam Generator, OHS Series

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-61-	P 764023 321		ANTI-FLOOD CONTROL, Optional Electric Steam Generator OHS Series	X
1	P 764023 525		FUSE HOLDER	1
2	P 764023 524		FUSE, 5 Amp	1
3	P 764023 326		SWITCH, Momentary, On-Off, NO	1
4	P 764023 328		PILLOT LIGHT, Amber	1
5	P 764023 329		PILLOT LIGHT, Green	1
6	P 764023 552		CONTROL BOARD	1
7	P 764023 324		RELAY, Signal	1
8	P 764023 553		RELAY, BEO	1
9	P 764023 323		WIRING HARNESS	1
10	P 764023 322		WIRING HARNESS	1
NOTE: This assembly is a flood control assembly for the control board and is not a flood control assembly for the control board and is not a flood control assembly for the control board and is not a flood control assembly for the				



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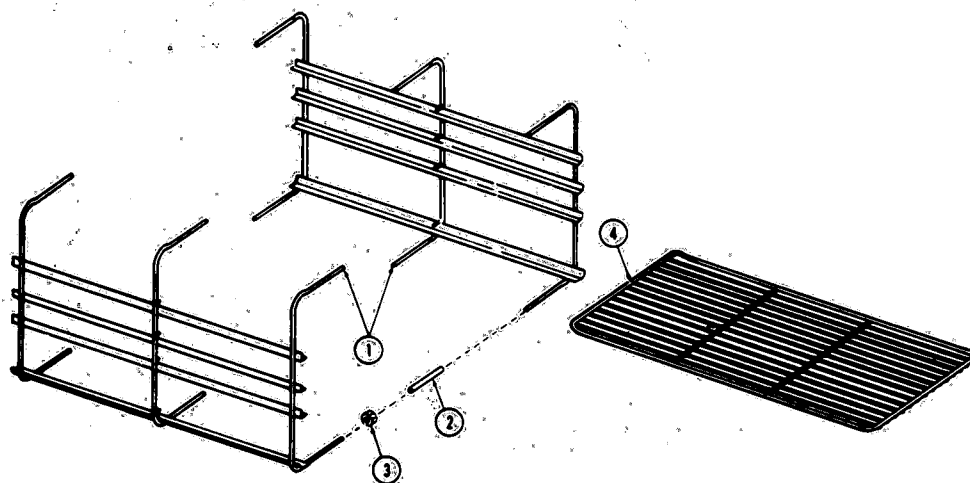


FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-62-			OPTIONAL RACK AND SHELVES, 16x16 Sterilizer .....	X		
			OPTIONAL RACK AND SHELVES, 20x20 Sterilizer.....		X	
1	P 134468 834		• RACK WELDMENT, R.H. ....	1		
1	P 134468 835		• RACK WELDMENT, L.H. ....	1		
1	P 134468 832		• RACK WELDMENT, R.H. ....		1	
1	P 134468 833		• RACK WELDMENT, L.H. ....		1	
2	P 91291 062		• RACK RETAINING TUBE .....	4	6	
3	P 8849 061		• NUT, Hex, 1/4-28 .....	8	12	
4	P 134468 844		SHELF, Chamber, 15 x 22" .....	2		
				or 3		
	P 134468 845		SHELF, Chamber, 19 x 34" .....		2	
					or 3	

Figure 8-62. OPTIONAL RACK AND SHELVES

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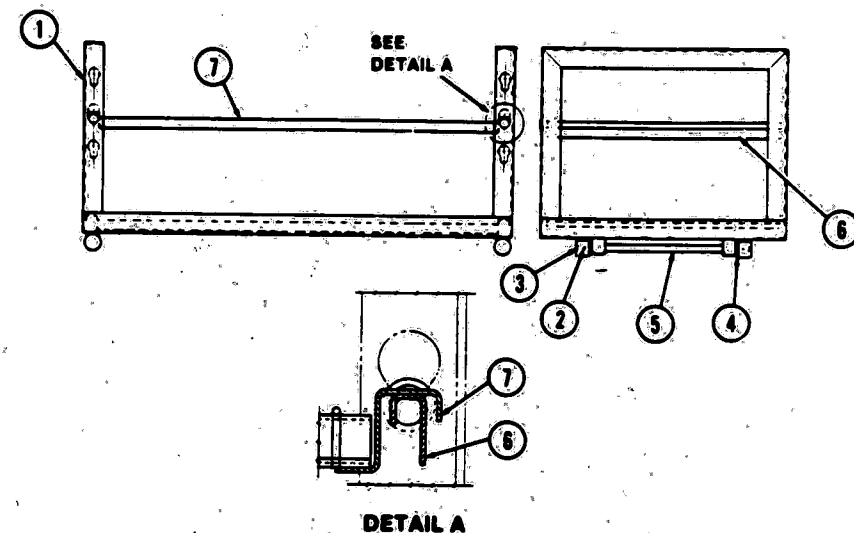


FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-63-	P 134468 826		OPTIONAL LOADING CAR ASSEMBLY, 20x20 Sterilizer .....	X		
1	P 134468 825		FRAME .....	1		
2	P 24956 061		ROLL PIN .....	4		
3	P 150828 135		WHEEL .....	4		
4	P 30417 091		BUSHING .....	4		
5	P 150828 134		AXLE .....	2		
6	P 56396 912		SUPPORT, Shelf Weldment .....	2		
7	P 141196 375		SHELF ASSEMBLY .....	2		
8	P 56396 930		TRACK, Chamber (Not Shown) .....	2		

Figure 8-63. OPTIONAL LOADING CAR ASSEMBLY

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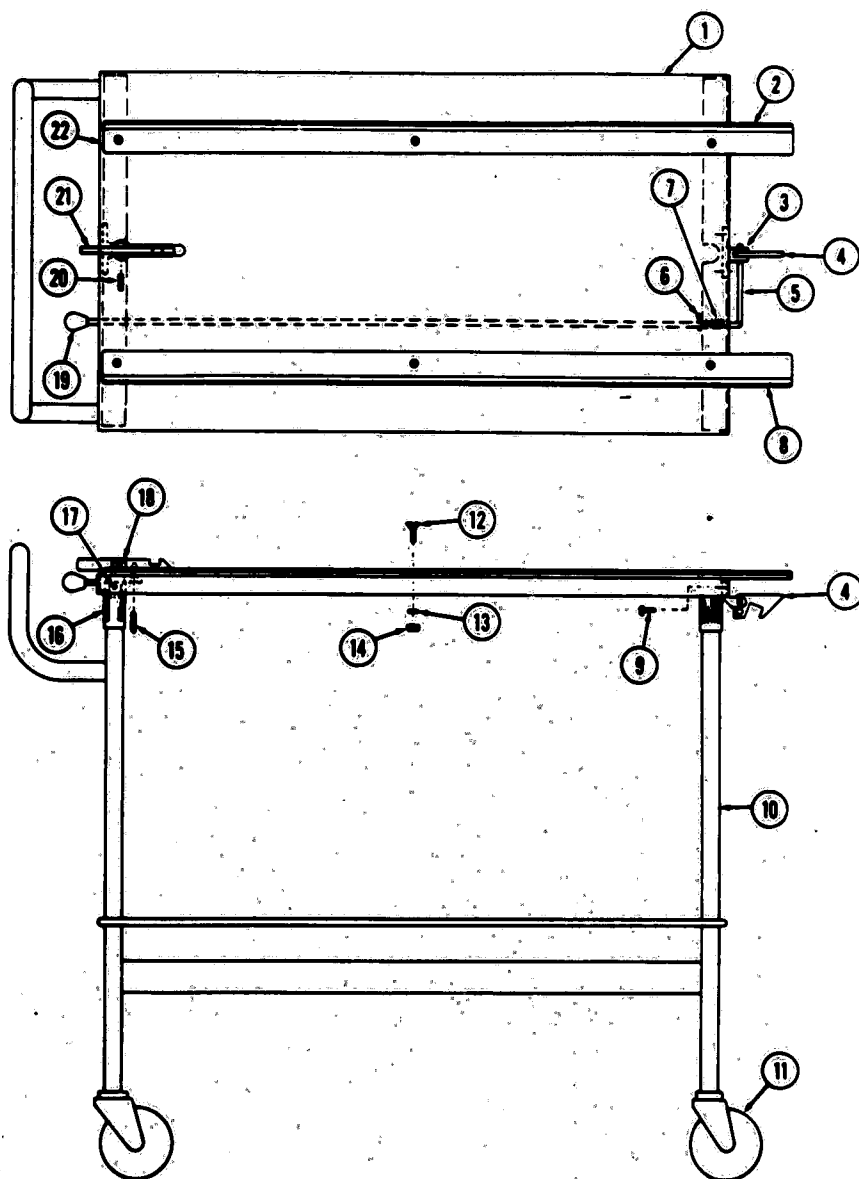


Figure 8-64. OPTIONAL TRANSFER CARRIAGE ASSEMBLY

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-64-	P 139693	001	OPTIONAL TRANSFER CARRIAGE ASSEMBLY, 20x20 Sterilizer	X
1	P 30459	063	TOP	1
2	P 30444	063	TRACK, Right Hand	1
3	P 30440	051	CATCH BLOCK	1
4	P 30447	063	CATCH, Door Frame	1
5	P 30449	061	CATCH ROD	1
6	P 23597	061	COTTER PIN	1
7	P 30458	061	SPRING	1
8	P 30445	063	TRACK, Left Hand	1
9	P 3999	041	SCREW, 1/4-20 x 5/8	4
10	P 139692	063	STAND ASSEMBLY	1
11	P 20542	091	CASTER	4
12	P 12549	062	SCREW, 1/4-20 x 5/8	6
13	P 18686	061	LOCKWASHER	6
14	P 8648	061	HEX NUT	6
15	P 30457	061	SPRING, Lock Lever	1
16	P 30446	052	ADJUSTING COLLAR	4
17	P 4772	045	SCREW, Set, 1/4-20 x 1/4	4
18	P 30448	051	BLOCK, Lock Lever	1
19	P 14918	091	KNOB	1
20	P 24268	061	ROLL PIN	2
21	P 30415	063	LOCK LEVER	1
22	P 30441	061	ANGLE ASSEMBLY	2

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