AMSCO Maintenance Manual

EAGLE® 3000 SERIES
Washer/Sterilizer

(1/89) **P-764322-697**

AMSCO | AMERICAN STERILIZER COMPANY · · AMSCO 4072 · ERIE · PENNSYLVANIA 16514
Printed in U.S.A.

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List of Illustrations

List of Illustrations (continued)

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 - Washer/sterilizer service adjustments should be performed only by qualified service technicians.

WARNING: EXPLOSION AND BURN HAZARD - This washer/sterilizer is not designed to process liquids. To prevent personal injury or property damage resulting from bursting bottles and hot fluids, you must not use this machine to sterilize liquids.

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

WARNING: BURN HAZARD - Washer/sterilizer rack/shelves are HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

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.

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

WARNING: BURN HAZARD - Be careful of steam escaping from valves on washer/sterilizer. 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.

CAUTION: Do not turn MANUAL control valve to PURGE or CHARGE & STERILIZE positions with door open!

CAUTION: Avoid letting moisture get under insulation in chamber, as it will cause rusting.

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

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

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.

Summary of Safety Precautions (continued)

CAUTION: Certain failures may allow water to enter chamber. If WATER IN CHAMBER is displayed with the door(s) closed, proceed as follows: SLOWLY begin to unlock door. If water leaks past the door gasket, relock door. Position the MANUAL control to DRAIN and attempt to drain the water from the chamber. Wait until no more water is draining to the waste funnel. If no water drains, remove the chamber-drain valve pilot line while still in the MANUAL DRAIN mode. This should drain the chamber.

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.

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 washer/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.

AMSCO

Eagle®3000 Series Washer/Sterilizer/Decontaminator

Series 3012 Single Door and Double Door

TECH DATA

Washer/Sterilizer/Decontaminator

DESCRIPTION

Eagle 3000 Series Washer/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 Washer/Sterilizers use heated, agitated water and spray rinses for WASH cycles. Steam under pressure is used as the sterilizing agent for STERILIZE cycles. Available cycles are:

- WASH -- for washing surgical instruments
- WASH/STERILIZE -- for washing, then sterilizing surgical instruments
- FLASH (Sterilize) -- for sterilizing surgical instruments

Any combination of these three cycles may be programmed for the four numerical cycle selector touch pads.

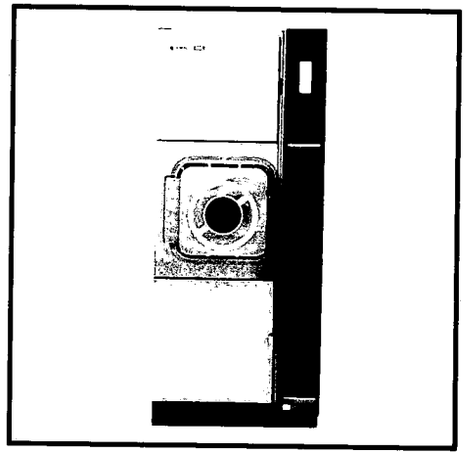
Chamber Sizes

Washer/Sterilizer units come with interior dimensions of 16x16x26 inches (406x406x660 mm). Offering includes choice of single-door (cabinet or recessed) or double-door (recessed one wall) units.

Standards

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

- **Federal Specification GG-S-1341A** 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.



Typical only -- some details may vary

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Series 3012
- ☐ Single Door
- ☐ Double Door

Door Hinge, Single Door
- ☐ Right Side
- ☐ Left Side

Door Hinge, Double Door (Operating End First)
- ☐ Right/Left
- ☐ Right/Right
- ☐ Left/Right
- ☐ Left/Left

Mounting
- ☐ Cabinet Enclosed
- ☐ Recessed
- ☐ Recessed Through One Wall (Double Door Only)

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Surgical Inst. Trays

Item No. _____

Location(s) _____

_____

_____

See Tech Data Sheet SD-325

Because of American Sterilizer Company's continuing program of research and development, all specifications and descriptions are subject to change without notice. This data is intended for the exclusive use of AMSCO customers, including architects or designers. Reproduction in whole or in part by others is prohibited.

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- **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 36 psig (2.53 kg/cm²) .
- **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.

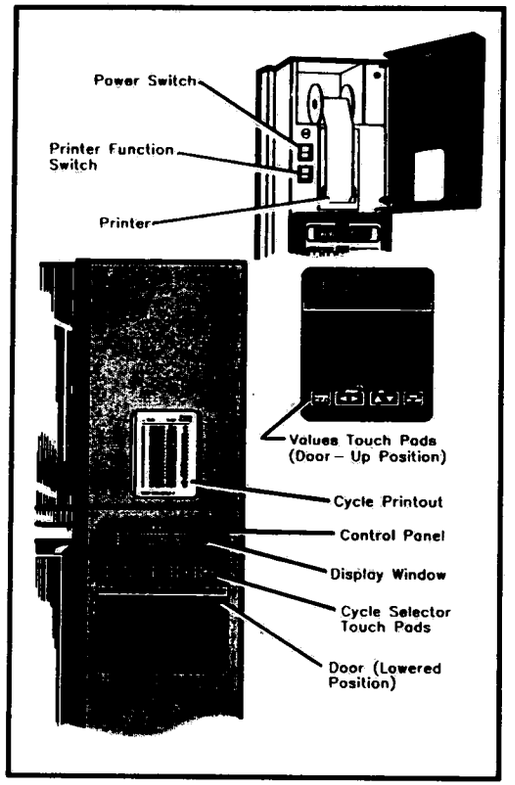
DESIGN FEATURES

Stage 2™ Control

Microcomputers monitor and control system operations and functions. Cycle progresses automatically through phases of WASH cycle and/or condition, sterilize, exhaust and dry phases of STERILIZE cycle. 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 sterilize-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.



Stage 2 Control Column

- **Display Window** features a 2-line x 20-character vacuum fluorescent display. It shows sterilizer status, time (time of day, wash time, 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 wash time, sterilize time and temperature, and dry time values for each cycle, can be programmed. **Washer/Sterilizers** have **three** types of cycles available. . .FLASH, WASH and WASH/STERILIZE. 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.

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).
   - **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).
   - **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).
   - **Time Display and Printout Units** — Permits selection of either **Standard AM/PM** or **Military**.
   - **Sterilize Temperature Overdrive, Overtemperature Point, Undertemperature Point** and **Chamber Pressure Points are all service adjustable.**

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.

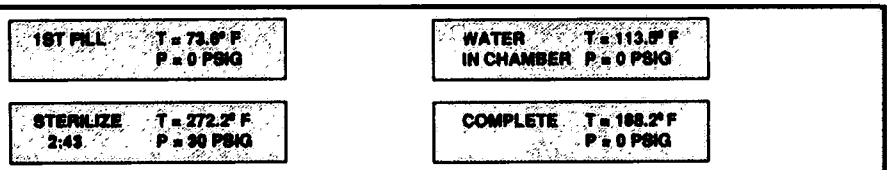
Control Board circuits monitor sterilizer functions and include an A/D converter, a watchdog timer to protect A/C output, and an on-board power supply circuit. Quartz crystals maintain precision timing. A **thermistor** senses temperature and a strain-gauge-type **pressure transducer** senses pressure. These signals, converted into electrical impulses, provide accurate control inputs and readouts throughout the entire cycle. 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.

Manual Control

STERILIZE function only may be operated manually (without electric power) using a single programming wheel. (Automatic control is not functional in this mode.) Manual control includes a DOOR UNLOCK position for use in the event of a power loss during an automatic cycle.



Control Monitoring and Communication

SPECIFICATION WORKSHEET

Item_____: Furnish an AMSCO Eagle 3000 Series Washer/Sterilizer/Decontaminator with Stage II control with interactive vacuum fluorescent display and four numerical cycle selection touch pads. Construct nickel clad chamber 16x16x26". 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. Supply ☐ single door unit or ☐ double door unit. Arrange sterilizer ☐ to be freestanding or ☐ for recessing into a partition wall (single door) or ☐ for recessing through wall (double-door).

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 forms the sterilizer shell. The inside of the 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. Shell exterior 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)** and electromechanical lock(s) keep door(s) from being opened during cycle. **Door(s) may be tightened but not opened while pressure is in chamber.**

Washing System

An **automatic spray rinse** occurs at the beginning and end of each WASH cycle. **Adjustable detergent injector** automatically supplies the desired amount of detergent during the wash-agitate phase of the cycle. **Jet compressors** force steam into the chamber to heat and agitate the water.

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.

Exhaust System

System 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^2). 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** and chamber pressure/vacuum **gauge** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

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 body, ball type with stainless-steel ball and stem. Seat and seal are constructed of reinforced TFE. They are pressure rated at 125 psig (8.79 kg/cm^2) for saturated steam. 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/cm²). Secondary pressure is factory set at 32 psig (2.25 kg/cm²) and controlled by a phosphor-bronze diaphram. This setting is for sterilizer operation at 273° F (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 and instrument trays. See separate product literature for details.

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.

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 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.*

```
========================
===  WASH/STERILIZE  ===
========================
CYCLE START AT  3:51:52P
             ON  5/03/88

CYCLE COUNT       02465
OPERATOR      ------------
STERILIZER    ------------
LOAD              50303

   STER TEMP = 270.0°F
CONTROL TEMP = 273.0°F
  WASH TIME =  7:30
  STER TIME =  3:00
  DRY  TIME =  1:00


- TIME      T=°F  P=psig
------------------------
R  3:51:52P <65.0     0
W  3:59:27P  75.1     0
W  4:07:07P 112.7     0
R  4:10:22P 112.7     0
C  4:12:07P  91.7     0
C  4:13:07P 200.0    10
```

```
S  4:13:30P 270.1   27
S  4:14:30P 273.2   29
S  4:15:30P 273.4   29
S  4:16:30P 273.4   29
E  4:16:32P 273.2   29
E  4:17:02P 221.1    3
E  4:18:02P 214.0    0
Z  4:18:12P 212.5    0

TEMP MAX=273.8°F
TEMP MIN=270.1°F

      WASH =21:15
 CONDITION = 1:23
 STERILIZE = 3:02
   EXHAUST = 1:40

TOTAL CYCLE =27:20

======================
=  READY TO UNLOAD   =
======================

DOOR OPEN     4:19:07P
```

Typical Printout, Wash/Sterilize Cycle

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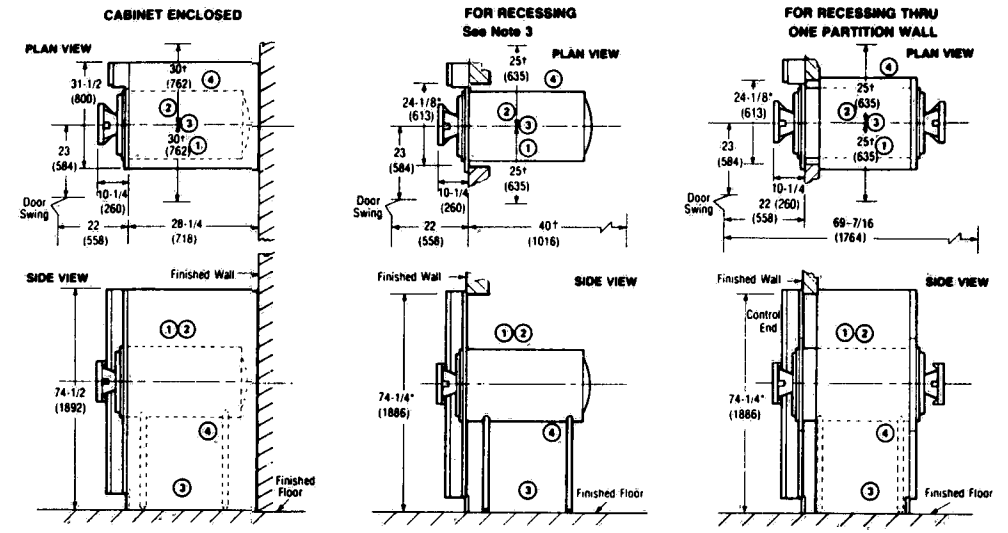

† Minimum Service Clearance * Wall Opening

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

OPERATING REQUIREMENTS

① COLD WATER — 1/2NPT, 20 to 50 psig (1.4 to 3.5 kg/cm²) dynamic, approximately 5 gr. hardness.

② STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.5 to 5.6 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor.

③ DRAIN — 2 ODT (without P-trap in place).

④ TERMINAL BOX — 120 Volt, 50/60 Hz, One Amp Single-phase Service for controls.
. . . CHECK LOCAL CODES . . .

NOTES:

1. Pipe sizes shown indicate terminal outlets. Building service lines to and from the equipment should be increased one pipe size to ensure optimum equipment performance.
2. Disconnect switches (with OFF position lockout; by others) should be installed in electric supply lines near the equipment.
3. Access to the recessing area from the control end of the sterilizer is recommended.
4. Clearances shown are minimal for installing and servicing the equipment.
5. Clearance in front of each sterilizer door should be 38-inches (965 mm) for convenient withdrawal of shelves from the chamber.
6. Right-side door-swing clearances are shown. Clearances for left-side door swing are identical.
7. Floor drain should be provided within confines of sterilizer framework.

TYPE	OPERATING WEIGHT Lbs. (Kgs)	UTILITIES CONSUMPTION				HEAT LOSS BTU at 70 F (21 C)		
		Water		Steam				
		Peak gpm (lpm)	Ave. gph (lph)	Peak lbs/hr (kg/hr)	Ave. lbs/hr (kg/hr)	Cabinet Enclosed	Recessed	
							Front of Wall	Behind Wall
Single Door	1410 (637)	15 (57)	166 (628)	100 (47)	56 (27)	4300	1600	2700
Double Door	1410 (637)	15 (57)	166 (628)	100 (47)	56 (27)	N/A	1600	3500

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

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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 washer/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.

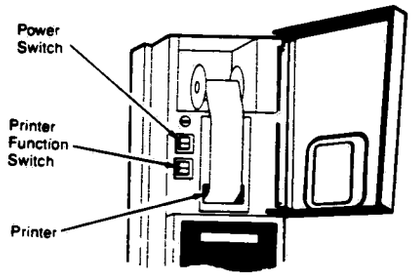

FIGURE 2-1 – Printer

2.2 COMPONENT IDENTIFICATION/FUNCTION

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

- **Sterilizer Power Switch** - located behind the printer door (Figure 2-1), this switch controls power to the sterilizer and sterilizer control.

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

- **Water Supply Valve** - provides cold water supply to washer/sterilizer; must be open for washer/sterilizer operation.
- **Steam Supply Valve** - provides steam supply to washer/sterilizer; must be open for washer/sterilizer operation.
- **Chamber Pressure Gauge** - shows chamber steam pressure level.
- **Manual Control** - used for manual operation of washer/sterilizer. Must be set to OFF for automatic operation.

Printer (Figure 2-1)

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 rocker switch generates a complete 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.

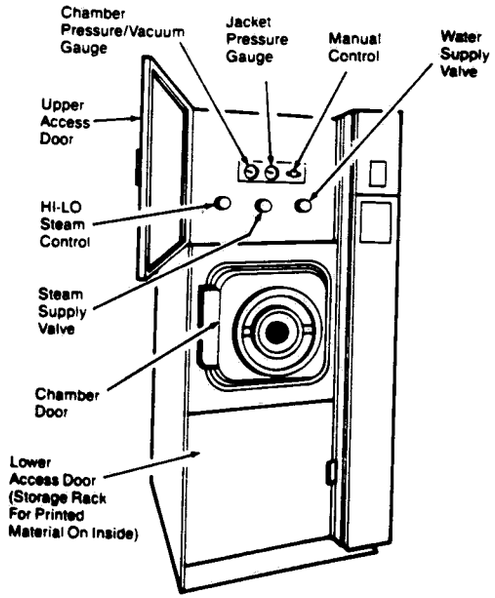

FIGURE 2-2 – Eagle 3000 Series Washer/Sterilizer

- **Print Values** - Pressing the bottom portion of 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 start cycles, and to set cycles and cycle values.

- 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 and RESET touch pads 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 washer/sterilizer **not** in the READY mode (door[s] locked), the display alternates between the door-status message and the cycle menu. For example (typical only):

```
DOOR              T=125F
UNLOCKED          P=0psig
```

and

```
1=WS              3=FLASH
2=FLASH           4=WASH
```

Printer prints (time is typical)

```
* NOT READY       10:34:02A   ← Time is typical
DOOR UNLOCKED
-------------------------
```

or

```
* NOT READY       10:34:02A
N.O.E. DOOR UNLOCKED          ← N.O.E. = Non-operating end, double-door units
-------------------------
```

or

```
* NOT READY       10:34:02A
BOTH DOORS UNLOCKED           ← Double-door units
-------------------------
```

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

```
WATER             T=078F
IN CHAMBER        P=0psig
```

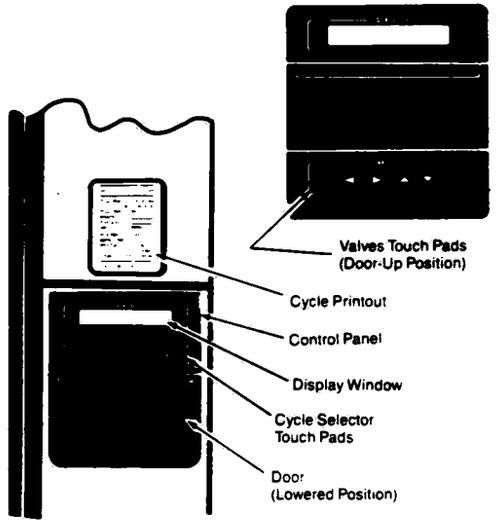

FIGURE 2-3 – Operating-End Control Panel

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

```
1=WS              3=FLASH
2=FLASH           4=WASH
```

and

```
READY             T=125F
00:00:00A         P=0psig
```

Time of day

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 (time is typical):

```
* ALARM           10:34:02A
FAILURE READING PRESSURE
-------------------------
```

or

```
* ALARM           10:34:02A
TOO LONG IN EXHAUST
-------------------------
```


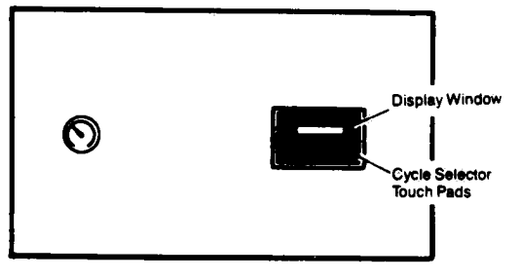

FIGURE 2-4 – Non-Operating End Control Panel

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 Units) (Figure 2-4)

The non-operating end control panel features four cycle-selector touch pads and a RESET touch pad. Display window concurrently shows the same message as shown in display window on the operating end of the sterilizer. Cycle values **cannot** be changed from the non-operating end.

- Cycles can be **started** using the four cycle-selector touch pads, **or reset** using the RESET touch pad.
- Cycle status and control messages are concurrently shown on a 2-line x 20-character display.

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 you push the wrong cycle-selector touch pad when starting a cycle, proceed as follows:

1. Press RESET touch pad to abort cycle. Display shows "ABORT" and printer records time RESET was pressed and prints "ABORT." Wait until display shows "READY."
2. Wait until display shows READY (pressure and water are purged from chamber).
3. Press touch pad for correct cycle twice within five seconds. Printer records cycle selected and unit proceeds through correct cycle.

Door Operation (Figure 2-5)

Note: Should the door not at first 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.

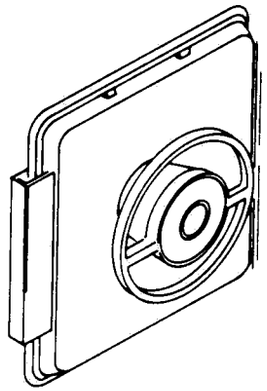

FIGURE 2-5 – Chamber Door

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

2.3 WASHER/STERILIZER CYCLES & CYCLE VALUES

The Series 3000 washer/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 washer/sterilizer to the operating environment in which it has been placed.

Note: If a battery failure should occur, operator-set cycles and cycle values are lost. The factory-set cycles, cycle values and control values then appear on the display when the washer/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 washer/sterilizer power remains ON.)

Note: If access code feature 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 washer/sterilizers also have permanent default cycles and cycle values programmed into the control. These default values appear on the display when changing cycles (see Table 2-1).

TABLE 2-1 – PROGRAMMED PERMANENT DEFAULT VALUES

Cycle	Wash Time	Sterilize Temp.	Sterilize Time	Dry Time
WS*	8:30 min	270°F	3 min	1 min
FLASH	N/A	270°F	10 min	1 min
WASH	8:30 min	N/A	N/A	N/A

**WS represents Wash/Sterilize cycle.*

Washer/Sterilizer Factory Settings

Series 3000 Washer/Sterilizers are shipped with factory-set cycles and cycle values as shown in Table 2-2.

Any combination of up to four FLASH, WASH/STERILIZE, or WASH cycles can be set for the cycle-selector touch pads (numbered 1, 2, 3, and 4). For example:

- One FLASH, one WASH/STERILIZE, and two WASH Cycles. . .**or**
- Two WASH and two FLASH Cycles. . .**or**
- Four WASH/STERILIZE Cycles

Note: Sterilize temperature can be set to the nearest degree; however, control and printout is to the nearest 1/10 degree. **Maximum** setting is 285°F for FLASH cycles with a **minimum** setting of 270°F; cycles outside this temperature range cannot be programmed. If an attempt is made to set temperatures outside the allowable range, display shows the following message:

```
INVALID VALUE SET!
SEE OPERATORS MANUAL
```

WASH Time, STERILIZE Time and **DRY Time** are set and displayed in minutes and seconds.

Change Washer/Sterilizer Cycles and Cycle Values

1. Open the printer door and position the power switch to ON.
   - Display panel lights up.
   - The printer records the time power is turned ON.
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 sequency of display window messages where values can be changed:
   - **1st*** - Cycle set for touch pad #1, its wash time, sterilize temperature, and sterilize and dry times.
   - **2nd*** - Cycle set for touch pad #2, its wash time, sterilize temperature, and sterilize and dry times.

TABLE 2-2 – FACTORY-SET CYCLES AND CYCLE VALUES

Touch Pad	Cycle	Wash Time	Sterilize Temp.	Sterilize Time	Dry Time
1	WS*	8:30 min	270°F	3 min	1 min
2	FLASH	N/A	270°F	3 min	1 min
3	FLASH	N/A	270°F	10 min	1 min
4	WASH	8:30 min	N/A	N/A	N/A

**WS represents Wash/Sterilize cycle.*

   - **3rd*** - Cycle set for touch pad #3, its wash time, sterilize temperature, and sterilize and dry times.
   - **4th*** - Cycle set for touch pad #4, its wash time, sterilize temperature, and sterilize and dry times.
   - **5th** - Clock/calendar time and date .
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 touch pad #2, etc.). Cycle name blinks.
   b. Press the VALUE direction pad (up or down) to view the available cycles (FLASH, WS or WASH) and release the VALUE touch pad when desired cycle is displayed. The cycle displayed (and the default values for that type of cycle) are now set for that cycle number.
   c. Press CURSOR direction pad (left or right) to move cursor (the blinking display position) to the digit (wash time, sterilize temperature, sterilize time or dry time) you wish to change.
   d. Increase or decrease the value by pressing the VALUE direction pad (up or down).

      See Table 2-3 for recommended sterilize temperature, sterilize time and dry time settings for various loads. Recommended wash time is 8-1/2 minutes.

   e. Repeat steps a, b, c and d until all desired cycle, wash time, sterilize temperature, sterilize time and dry time changes have been made.
   f. Press the SAVE VALUES touch pad to record the new values and to advance control to the ready mode. A printout of **all** new values will be furnished.
4. Proceed to Section 2.5 to run the cycles now set.

**These message displays will 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.*

TABLE 2-3 – MINIMUM STERILIZATION EXPOSURE PERIOD - UNWRAPPED GOODS FLASH CYCLE

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

** 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.*

2.4 SERVICE ADJUSTMENTS AND SPECIAL FEATURES

WARNING: BURN AND SHOCK HAZARD - Washer/sterilizer service adjustments should be performed only by qualified service technicians.

Certain washer/sterilizer control functions are service-adjustable to adapt the washer/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

Washer/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

Washer/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** to automatically advances control to first cycle that is not locked-out. Cycle values may be changed for any cycle that is not locked out.

Pressing the VALUES "UP" direction-arrow touch 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.)

Enter access code as follows:

1. Press VALUES "UP" direction pad (display counts up) the number of times equal to the first digit.
2. Press CURSOR "RIGHT" direction pad to move cursor to the second digit.
3. Press VALUES "UP" direction pad the number of times equal to the second digit.
4. Press CURSOR "RIGHT" direction pad to move cursor to the third digit.
5. Press VALUES "UP" direction arrow touch pad the number of times equal to the third digit.
6. Press CURSOR "RIGHT" direction pad to move cursor to the fourth digit.
7. Press VALUES "UP" direction pad the number of times equal to the fourth digit.
8. 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 one cycle is locked out, it will be #1; if two cycles 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.

Setting the Clock and Calendar

1. Open the printer door and position the power switch to ON.
   - Display panel lights up.
   - The printer records the time the power is turned ON.
2. Close the printer door and raise the sliding door over the touch pad panel to access the VALUES touch pads.

   Note: If access code feature is enabled, bypass code by pressing CHANGE VALUES touch pad when NO is blinking.
3. Check display for correct time and date. To change either:
   a. Press and release the CHANGE VALUES touch pad until the time and date are displayed.
   b. Move cursor (the blinking display position) to the digit you wish to change by pressing CURSOR direction pad (left or right).
   c. Increase or decrease the value (of blinking digit) by pressing the VALUE direction pad (up or down).
   d. Repeat steps b and c until correct time and date are set.
   e. Press SAVE VALUES pad to record the new time and date and to advance control to READY mode. Printout of cycle values and new time and date will be furnished.

2.5 WASHER/STERILIZER OPERATION

Operate washer/sterilizer by referring to the appropriate paragraph in this section for the cycle to be run. Refer to Section 2.3 if it is necessary to change cycles or cycle values.

Automatic Operation: Flash Cycle

WARNING: EXPLOSION AND BURN HAZARD - This washer/sterilizer is not designed to process liquids. To prevent personal injury or property damage resulting from bursting bottles and hot fluids, you must not use this machine to sterilize liquids.

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

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.
3. 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 the power is turned ON.
4. Check paper roll. Do not operate printer without paper.
5. Close printer door and check display for correct time and date.

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

6. 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 - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

7. Load the chamber.
8. 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.
9. Press the appropriate number touch pad (1, 2, 3 or 4) for a FLASH cycle twice **within five seconds** to start cycle. As the washer/sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-6 (temperatures and pressures are typical). 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 (3 psig).
   - Start of vent.
   - Cycle summary and end-of-cycle messages - after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).
10. 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 now 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 (Print) to obtain one. First line of duplicate printout always reads DUPLICATE PRINT.

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

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

Automatic Operation: Wash Cycle

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

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 values to ON.
3. Open the lower access door.
   a. Check detergent level (approximately four ounces are required for each wash cycle) in detergent tank (Figure 2-7).

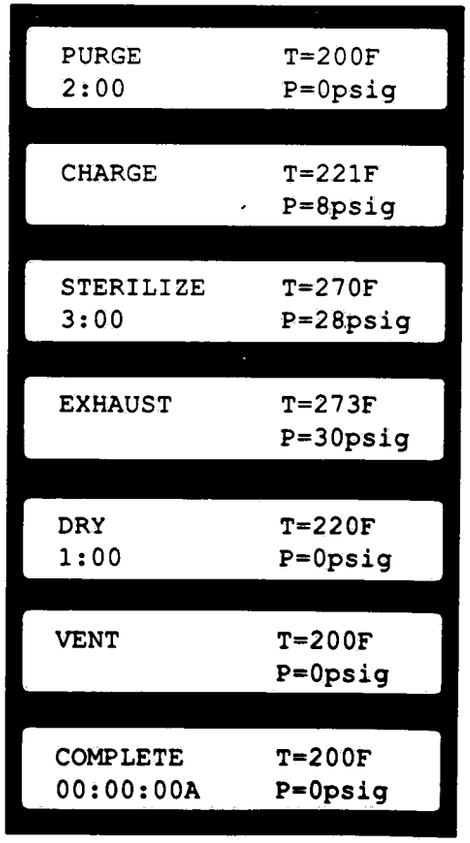

FIGURE 2-6 – Flash Cycle Display Messages

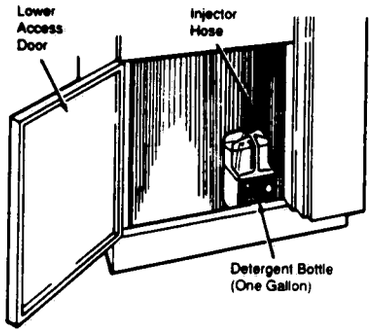

FIGURE 2-7 – Detergent Container

b. Check that strainer on end of injector hose is clean.

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 the power is turned ON.
5. Check paper roll. Do not operate printer without paper.
6. Close the printer door and check display for correct time and date.

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

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 - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/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. Press the appropriate number touch pad (1, 2, 3 or 4) for a WASH cycle twice **within five seconds** to start cycle. As the washer/sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-8 (temperatures and pressures are typical). Printer generates printout as follows:
    - WASH. . .and start of cycle message and cycle parameters.
    - Start of RINSE - when 1st RINSE begins.
    - Start of WASH - Air/Steam mixture is injected into chamber to agitate water/detergent solution and wash timer begins to count down.
    - End of WASH.
    - Cycle summary and end-of-cycle messages - complete buzzer sounds (service-adjustable to silence).
11. 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 now 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 (Print) to obtain one. First line of duplicate printout always reads DUPLICATE PRINT.

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

12. Remove load from chamber and, if duplicate printout was obtained, place with completed load.

AUTOMATIC OPERATION: WASH/STERILIZE CYCLE

WARNING: EXPLOSION AND BURN HAZARD - This washer/sterilizer is not designed to process liquids. To prevent personal injury or property damage resulting from bursting bottles and hot fluids, you must not use this machine to sterilize liquids.

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

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.
3. Open the lower access door.
   a. Check detergent level (approximately four ounces are required for each wash cycle).
   b. Check that strainer on end of injector hose is clean.
4. Open printer door and position 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 the power is turned ON.
5. Check paper roll. Do not operate printer without paper.
6. Close the printer door and check display for correct time and date.

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

7. Unlock and open chamber door.
   - Display alternates between the DOOR UNLOCKED message and Cycle Select Menu.

WATER IN CHAMBER	T=66F P=0psig	PREWASH	T=66F P=0psig
1ST RINSE	T=66F P=0psig	WASH 8:30	T=135F P=0psig
1ST DRAIN	T=66F P=0psig	2ND DRAIN	T=120F P=0psig
1ST FILL	T=66F P=0psig	2ND RINSE	T=66F P=0psig
DETERGENT	T=66F P=0psig	3RD DRAIN	T=66F P=0psig
2ND FILL	T=66F P=0psig	COMPLETE 00:00:00A	T=74F P=0psig

FIGURE 2-8 – Wash Cycle Display Messages

WATER IN CHAMBER	T=66F P=0psig
1ST RINSE	T=66F P=0psig
1ST DRAIN	T=66F P=0psig
1ST FILL	T=66F P=0psig
DETERGENT	T=66F P=0psig
2ND FILL	T=66F P=0psig
PREWASH	T=80F P=0psig
WASH 8:30	T=135F P=0psig
2ND DRAIN	T=120F P=0psig
2ND RINSE	T=66F P=0psig
3RD DRAIN	T=66F P=0psig
PURGE 2:00	T=200F P=28psig
CHARGE	T=221F P=8psig
STERILIZE 3:00	T=270F P=28psig
EXHAUST	T=273F P=30psig
DRY 1:00	T=220F P=0psig
VENT	T=200F P=0psig
COMPLETE 00:00:00A	T=200F P=0psig

FIGURE 2-9 – Wash /SterilizeCycle Display Messages

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

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/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. Press the appropriate number touch pad (1, 2, 3 or 4) for a WASH/STERILIZE cycle twice **within five seconds** to start cycle. As the washer/sterilizer automatically progresses through the cycle, cycle status messages are displayed as shown in Figure 2-9 (temperatures and pressures are typical). Printer generates printout as follows:
    - WASH/STERILIZE. . .and start of cycle message and cycle parameters.
    - Start of RINSE - when 1st RINSE begins.
    - Start of WASH - Air/Steam mixture is injected into chamber to agitate water/detergent solution and wash timer begins to count down.
    - End of WASH.
    - 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.
    - Cycle summary and end-of-cycle messages - after chamber is vented to atmospheric pressure and complete buzzer sounds (service-adjustable to silence).
11. 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 now 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 (Print) to obtain one. First line of duplicate printout always reads DUPLICATE PRINT.

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

12. Remove load from chamber and, if duplicate printout was obtained, place with completed load.

Manual Operation: Flash Cycle Only (Unwrapped Goods)

WARNING: EXPLOSION AND BURN HAZARD - This washer/sterilizer is not designed to process liquids. To prevent personal injury or property damage resulting from bursting bottles and hot fluids, you must not use this machine to sterilize liquids.

1. Check that chamber drain strainer is clean and in place and that chamber interior is clean.
2. Open printer door and verify that POWER switch is set to OFF.
3. Open upper access door and turn STEAM and WATER valves to ON.
4. If door was locked before beginning cycle, turn MANUAL control (Figure 2-10) counterclockwise to CHAMBER DRAIN for approximately three minutes. This drains the chamber of any residual water.

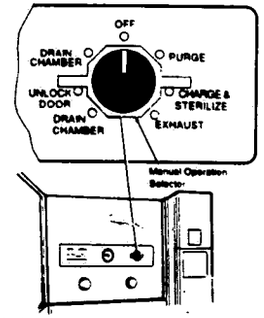

FIGURE 2-10 – Manual Control

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

5. Unlock and open chamber door.

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

6. Load the chamber.
7. Close and lock chamber door.

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

8. Turn MANUAL control to PURGE. Wait 60 seconds, then proceed to next step.
9. Turn selector to CHARGE & STERILIZE and wait until chamber reaches desired pressure (approximately 30-33 psig).
10. Time the desired sterilization period after desired pressure is reached (refer to Table 2-3) and when completed, turn selector to EXHAUST.
11. Keep selector in EXHAUST until chamber pressure is atmospheric (0 psig), then turn selector to DOOR UNLOCK.

WARNING: BURN HAZARD - Washer/sterilizer and rack/shelves will be HOT after cycle is run. Always wear protective gloves and apron when removing a processed load. Protective gloves and apron should also be worn when reloading washer/sterilizer following previous operation.

12. Open door and unload chamber.
13. When chamber is unloaded, turn MANUAL control to OFF.

Section 3
Principles of Operation

3.1 GENERAL

The Eagle 3000 Washer/sterilizer is designed to efficiently process unwrapped hard goods, glass and rubber items through either a wash-only, a sterilize-only, or a combination wash/sterilize cycle. For sterilization, the machine uses steam regulated at the most effective temperature and pressure for the particular load. For washing, the machine uses a spray rinse, followed by a wash/agitate phase and then a second spray rinse. During the wash/agitate phase, the chamber is filled with water which is then agitated by a mixture of pressurized steam and air.

The control system and piping package described in this section are designed to efficiently and reliably accomplish the work of sterilization and washing. The heart of the control system is a microcomputer which is pre-programmed to control all sterilizing and washing cycles from beginning to end. All solenoid valves are the normally-closed type.

The washer/sterilizer is 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 CYCLE DESCRIPTIONS

Three types of cycles can be run on the washer/sterilizer: a **WASH-only** cycle; a **STERILIZE-only** (or **FLASH** cycle), and a combined **WASH/STERILIZE** cycle. Refer to Figure 3-1, Piping Diagram to clarify the following cycle descriptions.

Wash-Only Cycle

When unit is not in cycle, door-lock solenoid SA1 energizes and, through a connecting cable, disengages a locking pawl in the door. This allows the door to be opened and closed. Double-door units have locking cables for both doors attached to SA1.

Refer to Section 3.3 for other functions performed when the washer/sterilizer is not in cycle.

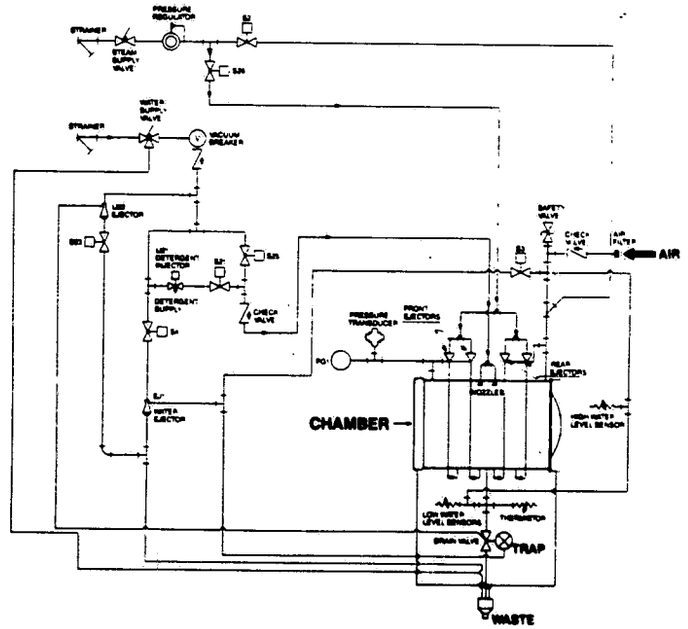

FIGURE 3-1 – Piping Diagram, Washer-Sterilizer

When the door(s) is closed and the cycle-selector touch pad for the WASH cycle is pressed twice within five seconds (READY on display and printout), the cycle begins. SA1 deenergizes, engaging the locking pawls and locking the door(s). This prevents the door(s) from being opened with water in the chamber. Door(s) remain locked throughout the cycle.

If the cycle is selected from the rear door (non-operating) end, the control prints, in addition to the normal cycle start information, CYCLE SELECTED FROM NOE.

- 1ST RINSE

The display alternates between 1ST RINSE and WATER IN CHAMBER throughout the phase.

Note: At this point in the cycle, the control displays the WATER IN CHAMBER message without reading the water-level probe.

Solenoid valve S25 energizes and allows water to flow to the spray nozzles in the chamber. Solenoid valve S3 opens to vent the chamber, i.e., air exits as it is replaced by water.

After 15 seconds, solenoid valve S23 opens. Water flows through ejector IJ22, which is a venturi device. This assembly is a pilot operator for the chamber-drain valve CV21.

The pilot-operated chamber-drain valve, CV21, operates as follows: water, flowing through the ejector, creates a suction on the IJ22 line connected to the chamber-drain valve, pulling on the diaphragm inside the valve and causing it to open. When S23 is off, water pressure from the suction port of the ejector forces the diaphragm closed.

The load is rinsed and the rinse water drains from the chamber through the drain valve. This continues for two minutes.

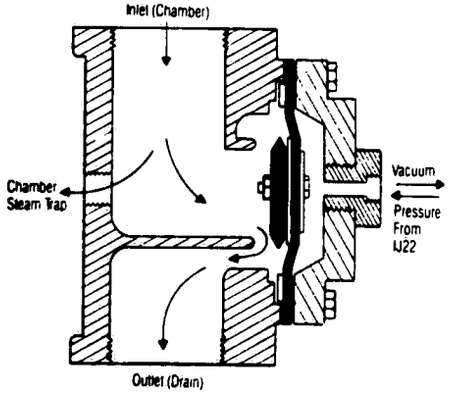

FIGURE 3-2 – Chamber Drain Valve (CV-21)

The control reads the low-water-level probe **15 seconds** after beginning the 1st Rinse phase. If the probe **does not sense water**, the control displays and prints, WATER SENSOR FAILURE/SEE OPERATORS MANUAL. As a result of the alarm condition, S25 closes while S23 remains open. Rinse water drains from the chamber. A pulsating audible alarm sounds and the cycle halts.

- 1ST DRAIN

At the end of the 1st Rinse, S25 closes. S23 remains on, holding the chamber-drain valve open to drain out the remaining rinse water. To assist venting for proper draining, S3 remains on. The air filter and the check valve provide venting during the drain phase. Display alternates between 1ST DRAIN and WATER IN CHAMBER.

Unit drains for a fixed time of 20 seconds. No time-out alarms are active during this phase.

- 1ST FILL

S23 goes off. The line from IJ22 to the chamber-drain valve is now pressurized, closing the chamber-drain valve. S25 comes on, allowing water to enter the chamber. S3 remains on to provide air venting. The 1st Fill lasts for a fixed time of 30 seconds, at the end of which the chamber is partially filled with water. No time-out alarms are active in this phase. Display alternates between 1ST FILL and WATER IN CHAMBER.

- DETERGENT INJECT

S3 remains on, S25 shuts off. The detergent injector solenoid valve IJ21 and solenoid valve S21 go on. IJ-21 pulls soap from a container using a venturi mechanism. S21 opens to provide the water flow necessary to create suction. IJ21 is adjustable to control the amount of soap used. The soap/water mixture enters the chamber through nozzles at the top. Approximately four ounces of detergent are used.

This phase lasts for 15 seconds. Then IJ21 and S21 shut off. Display alternates between DETERGENT and WATER IN CHAMBER.

If water temperature is below 68°F (20°C) (set wash temperature minus 7°F) during this phase, S26 steam valve comes on to heat the water. No time-out alarms are active during this phase.

- 2ND FILL

S3 remains on. S25 comes on, allowing water to flow into the chamber. S26 will come on if the water temperature is below 70°F (21°C) (set wash temperature minus 5°F) again heating the water. S26 venturi action is described in detail in the Prewash phase below. The 2nd Fill phase continues until the high-water-level probe senses water. At this point, the chamber is about two-thirds full. S3 shuts off, S25 and S26 remain on for eight more seconds, then unit proceeds to the Prewash phase. Display alternates between 2ND FILL and WATER IN CHAMBER.

If, after **10 minutes**, the high-water-level probe shows no water, the control prints *ALARM TOO LONG IN FILL, and sounds a pulsating alarm. The unit continues to fill, printing the alarm at 10-minute intervals.

- PREWASH

S3 remains closed. The Prewash phase mixes and heats the wash water. Solenoid valve S26 is on for the entire Prewash phase.

S26 feeds four venturi-type ejectors. Steam pressure, passing through the ejectors, creates a suction at the ejector throats connected to the top of the chamber at ports B-1 and B-4. The steam, now mixed with air pulled into the ejectors, passes to four nozzles at the bottom of the chamber. The steam/air mixture from these bottom nozzles heats and agitates the chamber water over and around the load contents, aiding the washing action.

During the Prewash phase, solenoid valve S25 comes on for three seconds, at 30-second intervals, to maintain the water level.

The Prewash phase continues for two minutes. It then continues until water temperature reaches set wash temperature, °75F (°24C). If after four minutes the wash water is still not at set wash temperature, unit continues on to the Wash phase. Display alternates between PREWASH and WATER IN CHAMBER.

- WASH

S26 remains on for the Wash phase. The water is agitated and heated. Maximum water temperature reached is generally 130°F-140°F (54°C-60°C). When temperature exceeds 130°F (54°C), S25 and S23 turn on together for three seconds, then off for ten seconds, simultaneously adding cooler water while draining out some of the hot wash water. This action provides water temperature control. If temperature is below 130°F, S25 turns on for one second at 30-second intervals to refill the chamber.

The Wash phase continues for the time set by the operator. The factory setting is 8 minutes, 30 seconds. The time counts down on the display which alternates between WASH and WATER IN CHAMBER.

- 2ND DRAIN

When the Wash phase times out, S25 and S26 go off. The wash water drains out of the machine by gravity unless the power drain option is activated by the setting of Dip switch #8 on the Printer PC board. Display alternates between 2ND DRAIN and WATER IN CHAMBER.

– **Gravity Drain**

The gravity drain (factory setting) takes three to four minutes. S23 turns on. The chamber-drain valve opens and S3 turns on. The chamber vents. An eight-minute timer starts and control monitors the low-water-level probe signal LS3. If the low-water-level probe shows water after **eight minutes**, the control prints *ALARM TOO LONG IN DRAIN, and sounds a pulsating alarm.

– **Power Drain**

The power drain turns off S3 and turns on S2 for 1.5 seconds at one second intervals if chamber pressure is less that 1 psig. If pressure is greater than 1 psig, the control waits until pressure drops below 1 psig before turning on S2. This action continues for 90 seconds. After 90 seconds, the control begins monitoring the low-water-level probe signal LS3.

Note: Some drain systems may not be able to handle the higher power drain flow rates.

S25 turns on for three seconds at nine-second intervals to cool the load, preventing any waste material in the wash water from being baked onto the load by steam from S2.

A five-minute timer starts at the beginning of the power drain phase. If, after **five minutes**, the low-water-level probe shows water, the control prints *ALARM TOO LONG IN DRAIN and sounds a pulsating alarm.

After the initial alarm, the unit continues to drain for five more minutes. If, at the end of five minutes, the chamber is not drained, the alarm prints again and the unit waits an additional five minutes to drain. This action repeats until the unit drains or an operator aborts the cycle.

- 2ND RINSE

Solenoid valves S25, S23 and S3 turn on. The load rinses for one minute with rinse water draining through the chamber-drain valve. S3 again vents the chamber. This phase continues for one minute. Display alternates between 2ND RINSE and WATER IN CHAMBER.

- 3RD DRAIN

Following the Second Rinse, a gravity or power drain takes place, depending on the setting of Dip switch #8 on the Printer PC board. Display alternates between 3RD DRAIN and WATER IN CHAMBER.

If a **gravity drain**, a one-minute timer starts and S23 and S3 turn on to drain the rinse water.

If a **power drain**, a 15-second timer starts and S23 turns on. If chamber pressure is less than 4 psig, S2 turns on for two seconds at 1.5-second intervals to force water out of the chamber.

(In a Wash-Sterilize cycle, the control proceeds from this point directly to the Purge phase.)

At the end of one minute (gavity drain), or 15 seconds (power drain), the chamber continues to drain for five more seconds, then checks the low-water-level probe, high-water-level probe, and chamber pressure.

If either probe shows water, or chamber pressure is greater than 1 psig, the control waits an additional five seconds. This sequence repeats until both probes show no water and chamber pressure is less than 1 psig. If these three conditions are met, the cycle is complete.

If, after **two minutes,** one of these conditions is not met, the unit prints "ALARM TOO LONG IN DRAIN and continues to attempt to drain, repeating the action just described until all three conditions are met or an operator aborts the cycle.

- CYCLE COMPLETE

The unit displays COMPLETE and the printer prints cycle summary information. S23 and S3 open to drain any residual water left in the chamber. The control checks the water-level probes and the chamber pressure again. If the probes show no water, and the pressure is less than 1 psig, the control turns on SA1 door lock solenoid, unlocking the door(s). Otherwise, SA1 holds off and the control waits for pressure and water to drain.

The control turns on the cycle-complete pulsating buzzer, if it is enabled (Dip switch #6 on the Printer PC board).

The control then waits until one of the doors is opened or one of the cycle-selector touch pads is pressed.

If the duplicate print feature is enabled (Dip switch #2 on the Control PC board), the control now prints out a duplicate copy of the complete cycle.

Flash Cycle

The Flash cycle is a gravity air-removal type of sterilizing cycle, suitable for sterilizing unwrapped surgical instruments.

- PURGE

The FLASH cycle begins with an air PURGE phase. Solenoids S2, S3 and S4 turn on. S2 allows steam to enter the chamber. The steam exits through the S3 fast-exhaust valve. S4 (exhaust-cooling) lets water flow to the chamber-drain piping to condense the steam from S3 and to cool the condensate to temperatures that will not harm drain lines. This PURGE quickly pushes most of the air out of the chamber and heats it to reduce condensation later in the cycle. Display indicates PURGE.

At the end of the preset PURGE time (settable in Service Test mode, default is two minutes), S3 closes and the cycle continues to the CHARGE phase. The chamber pressure at the end of the Purge phase is typically 10-15 psig.

- CHARGE

Solenoid valves S2 and S4 remain on. S2 continues to admit steam to the chamber while S4 cools, to a safe temperature, the condensate leaving the chamber via the steam trap. Display indicates CHARGE.

When the air and condensate have been forced out of the chamber, the steam trap closes and the chamber temperature rises to 270°F (132°C), the default sterilizing temperature. When the sterilizing temperature is reached, the cycle enters the STERILIZE phase. Chamber pressure is typically 30-33 psig.

If the unit does not reach 270°F (132°C) within **30 minutes** after beginning the CHARGE phase, the unit prints "ALARM TOO LONG IN CHARGE and sounds the buzzer intermittantly. It continues to attempt to reach sterilizing temperature. Unlike the Gravity and Vacamatic Eagle 3000 units, this "too long to charge" time is not adjustable.

- STERILIZE

Solenoid valve S2 remains on if chamber temperature is **less than** the overdrive setpoint (default is 3°F above set sterilizing temperature). When chamber temperature exceeds the "overdrive" temperature setting, S2 turns off. Display indicates STERILIZE.

The control then regulates chamber temperature at 273°F for the remainder of the set sterilize time by cycling S2 on and off. S2 turns on and off alternately for a **minimum** of 1.5 seconds to prevent the solenoid valve from "chattering," i.e., cycling on and off too rapidly.

The unit monitors for overtemperature and undertemperature conditions during the STERILIZE phase. Both of these alarm setpoints are settable in the Service Test mode. The default setting for undertemperature is 2°F (1°C) below set sterilizing temperature, and for overtemperature is 9.9°F (5.5°C) above set sterilizing temperature.

If either condition (overtemperature or undertemperature) occurs, the sterilize timer is put on hold until temperature either falls below the overdrive setpoint, or increases to the set sterilizing temperature. The display and printout indicate UNDERTEMP or OVERTEMP. When the temperature recovers, control prints the minimum temperature during the alarm for an undertemperature, and the maximum temperature during the alarm for an overtemperature condition.

For an undertemperature condition, the control reads Dip switch #2 on the Printer PC board. If if is set to ON, the sterilize timer resumes timing; if it is set to OFF, the sterilize timer resets (standard setting), and the STERILIZE phase starts over from the beginning.

The printer prints a status line at one-minute print intervals (default setting).

At the end of the set Sterilize time, the unit enters the EXHAUST phase.

- EXHAUST

S2 turns off. Solenoids S3 and S4 turn on. Chamber steam pressure exhausts through S3 while S4 cools the exhaust vapors. Display indicates EXHAUST.

When chamber pressure reaches 3 psig, the internal pressure setpoint, the DRY phase begins (PS-2 is not settable).

If unit does not exhaust to 3 psig within **five minutes,** control prints "ALARM TOO LONG IN EXHAUST, and sounds the buzzer intermittantly. Control restarts the EXHAUST phase and prints the alarm message every five minutes until 3 psig is reached or the cycle is aborted.

- DRY

Solenoids S3 and S4 remain on throughout the DRY phase. S3 vents the chamber while S4 provides water to an ejector. The ejector suction port pulls a small vacuum on the chamber (3-4 in.Hg) to remove hot vapors and to help condensate "flash" off load.

Unit continues in the DRY phase for the set dry time. Display indicates DRYING.

At the end of the set dry time, unit enters the VENT phase.

- VENT

S3 remains on and S4 goes off. During VENT the control waits until chamber pressure is below 1 psig. This always occurs when dry time is set, however the control uses this sepoint to accommodate cycles with no dry time. When 1 psig is reached, the control starts a 10-second wait timer with S3 on to vent the remaining pressure. Unit then proceeds to the COMPLETE phase. There is no alarm time on this phase. Display indicates VENT.

- COMPLETE

S23 turns on and S3 remains on. These valves are open to exhaust any pressure accumulated when moisture "flashes" off the load and chamber walls. Display indicates COMPLETE.

SA1 does not energize if chamber pressure exceeds 1psig or if either of the water-level probes shows water.

Wash/Sterilize Cycle

The Wash/Sterilize cycle is a combination of the Wash-Only and the Sterilize-Only (or FLASH) cycles. The preceding cycle descriptions for these two cycles apply to the Wash/Sterilize cycle with one exception. At the end of the 15-second power drain (or the one-minute gravity drain) during the 3rd Drain phase, the control enters directly into the Purge phase, skipping the additional two-minute maximum drain.

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 pads (two touch panels for double-door units). A 24-column thermal printer is mounted on the Printer board.

Chamber-drain temperature is sensed by a thermistor-type temperature probe, 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 two water-level sensors.

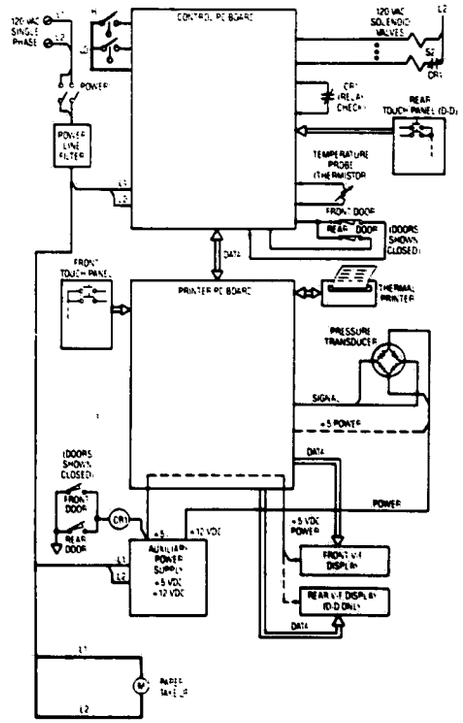

FIGURE 3-3 – Control System Block Diagram

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. The program in the EPROM is not altered by power interruptions, and is referred to as "nonvolatile" memory.

  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 WASH, STERILIZE and DRY times for the three 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.

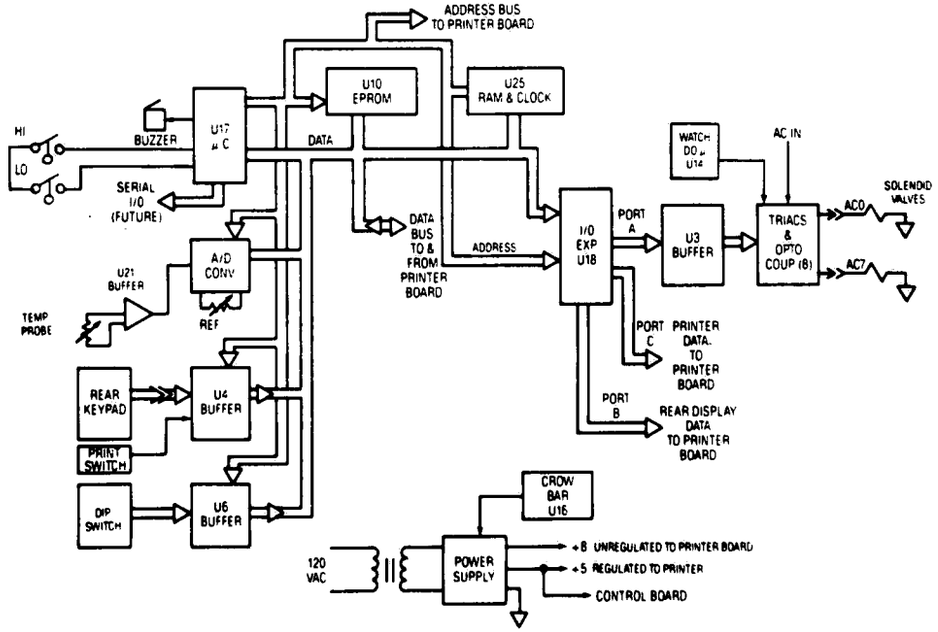

FIGURE 3-4 – Control PC Board Block Diagram

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) are **automatically** loaded from the EPROM back into the RAM IC through the keypad. 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.

- **Temperature Probe Input**

  The chamber-drain temperature probe (thermistor) is connected to the 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.

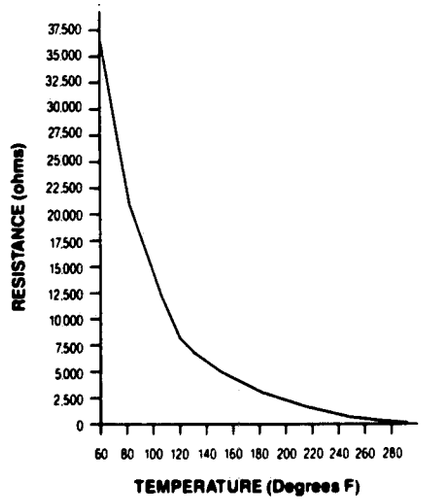

FIGURE 3-5 – Temperature vs. Resistance

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 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.

  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. The 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. CR1 (Door Switch Relay) Contacts (LS4)
  4. Rear Control Panel Cycle Touch Pads (LS5 thru LS9)
  5. Door Locked Contact (LS0 - front; LS1 - rear)
  6. High-water-level (LS3) and Low-water-level (LS2) probes.

7. Rear-door buttons (LS5 thru LS9) on double-door sterilizers.

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

- **Watchdog IC**

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 steam or water entering the chamber with the door open because of control failure, relay CR1 coil is wired to the normally open contact of the door switch. The AC neutral connection to solenoid valves S2, S21, S25, S26 and IJ21 is wired through the normally open contact on CR1. Therefore, the AC neutral to these valves 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 and the normally closed contacts to the control should be open.

The conditions that trigger a CR1 failure alarm are described later in the **Control Programming** section.

- **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 through a 50-conductor ribbon cable. The Printer PC 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 mounts to this board and 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 7 (down) x 5 (across) 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 control. 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.

- **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.

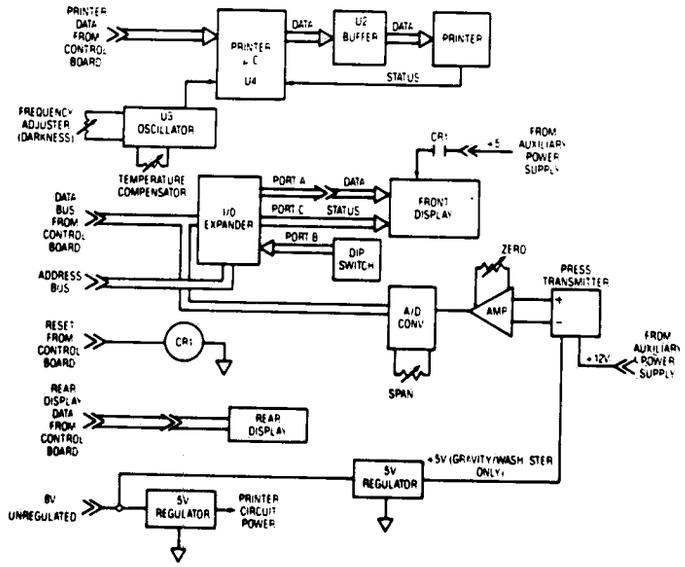

FIGURE 3-6 – Printer PC Board Block Diagram

- **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 (both display modules on double-door units) and for the pressure transducer.

On the washer/sterilizer, the 12-volt output supplies power for the two water level probes.

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 PC 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

The Washer/sterilizer pressure transducer is a strain-gauge type with an output signal referenced to local barometric pressure, and a working pressure of 0-50 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" pressure.

Water-Level Sensing Probes

The Eagle 3000 washer/sterilizer uses two identical water-level sensing probes. The **low-water-level** probe determines when the wash water is drained from the chamber. The **high-water-level** probe determines when the chamber is filled with water during the second (main) water fill.

Solid-state circuits within the probes sense the presence of water. The auxiliary power supply provides the required +12 volts. The probe output is an open collector transistor which uses a resistor on the Control PC board input, pulled up to +5 volts DC, as a load. When there is no water at the probe, the probe output is 0 volts DC. When water appears at the probe, the output switches to 5 volts DC. The probe terminal definitions are:

1. "+" – Power Supply, 9-30 volts.
2. "–" – DC common (for power supply and signal output.)
3. "S" – Signal output: 0 volts = no water; 5 volts = water.
4. "T" – Probe self-test: When TEST terminal is grounded to DC common, the SIG terminal switches to 5 volts DC if probe is working properly. This tests the probe electronic circuitry.

Control Programming

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

Note: Before powering 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.

- **Power-Up Routines**

  On power-up, the control determines if 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. For the following cycle phases, **resumes** phase and continues:
   a. 1st Rinse
   b. 1st Drain
   c. 1st Fill
   d. Detergent
   e. 2nd Fill
   f. Prewash
   g Wash
   h. 2nd Drain
   i. Charge
   j. Dry
   k. Exhaust
3. For the following cycle phases, **restarts** phase timer and continues:
   a. Purge
   b. 2nd Rinse
   c. Sterilize
   d. 3rd Rinse
4. Vent – completes venting and continues cycle.

If there was no power interruption during a cycle, or if RESET was pressed, 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 (see **Self-Test Modes** later in this section), otherwise. . .
2. The normal power-up header is printed.
3. If the pressure in the chamber exceeds 1 psig (internal PS1 setpoint), the control turns on S3 and S4, turns off SA1 (locking door[s]), and waits for the pressure to decrease below 1 psig. The warning buzzer sounds, control prints (time is typical). . .

   with door(s) locked. . .

```
* WARNING          10:34:02A
PRESSURE IN CHAMBER
```

   with door(s) unlocked. . .

```
* ALARM            10:34:02A
PRESSURE IN CHAMBER
WITH DOOR UNLOCKED
```

   Display shows (temperatures and pressures typical). . .

```
PRESSURE        T=95F
IN CHAMBER      P=4psig
```

   alternating with door status:

```
DOOR            T=95F
UNLOCKED        P=4psig
```

   or. . .

```
N.O.E. DOOR     T=95F
UNLOCKED        P=4psig
```

   or. . .

```
BOTH DOORS      T=95F
UNLOCKED        P=4psig
```

   Note: If door(s) is **unlocked** when pressure returns to 0 psig, control waits 10 seconds before shutting off S3 and S4. If door(s) is **locked**, control waits one minute before turning off S3 and S4.

4. If either water level probe is sensing water, the control turns off SA1, locking the door(s), and turns on S23 and S3 to drain the water.

   Prints, with door(s) locked. . .

```
* ALARM            10:34:02A
WATER IN CHAMBER
```

Prints, with door(s) unlocked...

```
* ALARM          10:34:02A
WATER IN CHAMBER
WITH DOOR UNLOCKED
```

Displays...

```
WATER          T=69F
IN CHAMBER     P=0psig
```

along with door(s) status (temperature and pressure typical). When water level sensors detect no water, the control waits 10 seconds, then turns off S23 and S3 and turns on SA1.

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          10:34:02A
FAILURE READING TEMP
```

   b. Pressure transducer signal greater than 39 psig:

   Prints...

```
* ALARM          10:34:02A
FAILURE READING PRESSURE
```

   c. CR1 door switch relay:

   Prints...

```
* ALARM          10:34:02A
CR1 RELAY FAILURE
```

   d. Water level probes (high-level probe is wet and low-level probe is dry):

   Prints...

```
* ALARM          10:34:02A
WATER SENSOR FAILURE
```

   Displays (for two seconds)...

```
*ALARM!        T=000F
               P=0psig
```

   then...

```
COMPONENT      T=000F
FAILURE        P=0psig
```

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

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

- **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).

   If chamber temperature is less than 65°F (18°C), it is displayed as "T< 65°F" or "T < 18°C."

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 touch pad 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. The sensor checks previously described run continuously. Checks for pressure and water-in-chamber run continuously, even when unit is not in cycle.

Component Failure and Door Switch Alarms

The control monitors components during operation and, if a failure is detected, sounds an audible alarm, prints the type of failure, and terminates the cycle.

Any audible alarm, in or out of cycle, can be silenced by pressing a cycle-selector touch pad on the front or the rear (double-door units) of the washer/sterilizer.

- **Door Switch**

The control monitors the door switch inputs (LS0, front door) and (LS1, rear door), throughout the cycle. If either switch opens, an alarm sounds, and the cycle is automatically aborted. The control exhausts/drains the chamber and returns unit to the NOT READY state.

- **Temperature Probe**

If the temperature probe senses a temperature greater than 290°F (143°C, an alarm sounds and cycle halts. Unit will not return to READY until failure is corrected.

- **Water-Level Probes**

If the high-water-level probe senses water and the low-water-level probe does not, this points to a failure of one of the probes. The cycle halts. Unit will not return to READY until failure is corrected.

- **Pressure Transducer**

If the pressure transducer senses a chamber pressure of 39 psig, an audible alarm sounds and the cycle halts. Unit will not return to READY until failure is corrected.

- **CR1 Relay Failure**

Normally the CR1 contact input to the control (LS4) is closed when the front-door switch input (LS0) is closed. For double-door units, LS4 is closed only when **both** LS0 and LS1 (rear-door switch) are closed.

If the CR1 relay contact input to the control (LS4) is **closed** and the front-door switch input (LS0) is **open**...or if LS4 is **closed** and the rear-door switch input (LS1) is **open**...or if LS-4 is **open** and the door switch(es) are both **closed**...the control generates the CR1 relay failure alarm and the cycle halts. Unit will not return to READY until failure is corrected.

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:

```
*  WASHER - STERILIZER  *
*  E2WA03.ABS 10/12/88  *
```

← 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 postioined to ON, the control enters the Burn-In Test mode. It remains in this mode until the Dip swtiches 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 3012       *
```

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 swtiches. 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.

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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.

Available from your AMSCO Representative

Note: Flush drain whenever line becomes clogged.

Weekly

1. Flush chamber drain as follows:
   a. Turn steam supply valve to OFF.

CAUTION: Do not turn MANUAL control valve to PURGE or CHARGE & STERILIZE positions with door open!

   b. Remove chamber drain strainer (Figure 4-1). Turn MANUAL control ***COUNTERCLOCKWISE*** to CHAMBER DRAIN.
   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.
   d. Flush drain with one quart of hot water.
   e. Place strainer back in chamber drain.
   f. Turn MANUAL control ***CLOCKWISE*** to OFF.
2. Check control and status signals as follows:
   a. Empty chamber and set cycle values for a one-minute sterilize cycle.

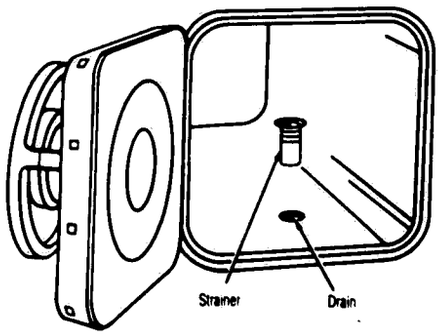

FIGURE 4-1 – Chamber Drain Strainer

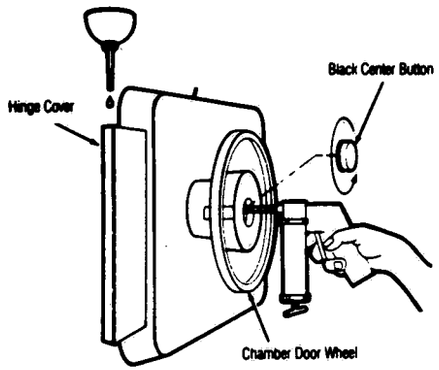

FIGURE 4-2 – Lubricating Chamber Door

b. Start cycle and observe gauges, display and printed tape for proper functioning. (On double-door units, also observe non-operating end control panel.)

Monthly

Place a few drops of heavy machine oil (SAE 20 or 30 motor oil) on chamber door hinge pins, top and bottom (Figure 4-2). Work oil into hinge by opening and closing the door several times.

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 4-2).
   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 4-3) as follows:
   a. Be sure washer/sterilizer is cool.
   b. Inspect safety valve for accumulations of rust, scale and other foreign substances which would prevent free operation of the valve. The opening of any discharge piping must be clear and free from restrictions.

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

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

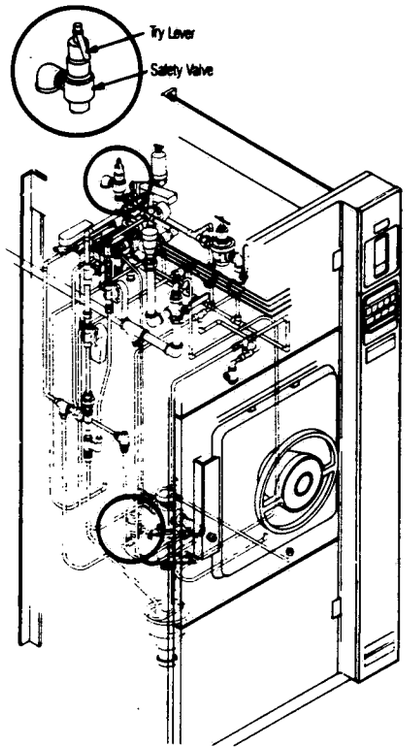

FIGURE 4-3 – Safety Valve and Steam Trap

c. Follow operating instructions and allow chamber to reach operating pressure.

CAUTION: Avoid letting moisture get under insulation in chamber, as it will cause rusting.

d. Check safety valve for steam leakage. If valve is leaking, operate the try lever several times to see if the leakage stops.

e. If leakage continues, discontinue operation of washer/sterilizer until a qualified technician replaces the leaky safety valve.

Yearly

1. Open and inspect the thermostatic steam trap. See Paragraph 7.20 for disassembly and cleaning instructions.

As Necessary

- **Change Paper Roll**

Note: Do not operate printer without paper.

1. Open printer door.

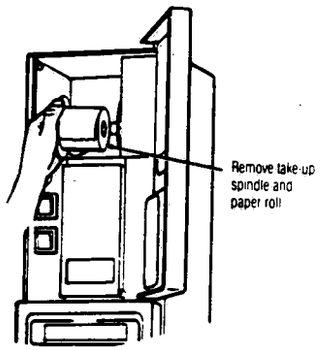

FIGURE 4-4 – Take-Up Spindle Removal

2. Grasp and pull remaining paper **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 4-4).
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 4-5).
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 under catch.
12. Insert tab of new paper roll into slot of take-up spindle and allow motor to rotate the spindle to secure paper in slot (Figure 4-6).
13. Press take-up spindle back onto the drive mechanism and rotate to verify paper is secured to take-up roll (Figure 4-7).
14. Close printer door.

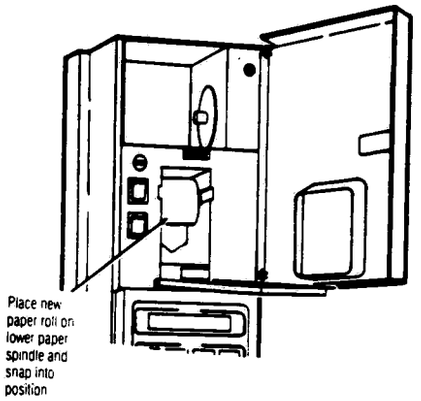

FIGURE 4-5 – New Paper Roll in Place

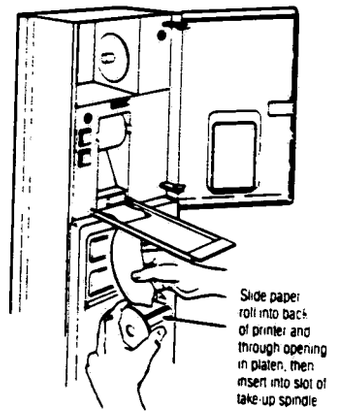

FIGURE 4-6 – Take-up Spindle Loading

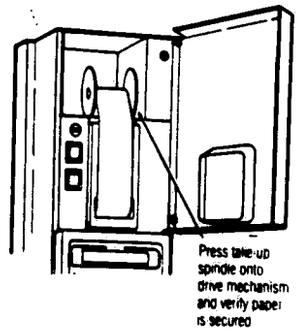

FIGURE 4-7 – Take-up Spindle In Place

- **Install Chamber Door Gasket** (Figure 4-8)

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.**
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).

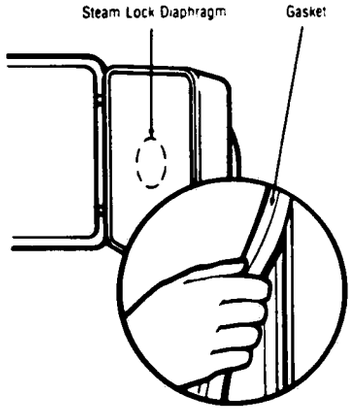

FIGURE 4-8 – Chamber Door Gasket

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.

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 chamber and items with tap water and dry items 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 8-22) and water (Figure 8-23) 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 Washer/Sterilizer**

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
1.0 PREPARATION FOR PREVENTIVE MAINTENANCE						
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
2.0 DOOR ASSEMBLY (EACH DOOR ON A DOUBLE-DOOR UNIT)						
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	
3.0 EACH HAND VALVE						
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 Run MANUAL cycle to test operation of multiport valve.						X
4.0 EACH WATER AND STEAM STRAINER						
4.1 Inspect strainers for debris, clean as necessary.	X	X	X	X	X	X
5.0 EACH STEAM TRAP						
5.1 Inspect steam trap for proper operation.	X	X	X	X	X	X
5.2 Rebuild steam trap.				X		
6.0 EACH GAUGE						
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

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
7.0 EACH VALVE						
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
8.0 EACH VACUUM BREAKER						
8.1 Inspect each vacuum breaker for proper operation.	X	X	X	X	X	X
8.2 Rebuild vacuum breaker.					X	
9.0 AIR FILTER (CARTRIDGE TYPE)						
9.1 Replace cartridge as required.	X	X	X	X	X	X
10.0 CHAMBER DRAIN						
10.1 Inspect strainer for debris.	X	X	X	X	X	X
10.2 Rebuild drain valve.		X				
10.3 Flush chamber drain line.	X	X	X	X	X	X
11.0 WASHER/STERILIZER COMPONENTS						
11.1 Detergent injector.						
11.1.1 Check injector plastic tubing for cleanliness.	X	X	X	X	X	X
11.1.2 Inspect strainer for debris.	X	X	X	X	X	X
11.1.3 Inspect for proper amount of detergent injection.		X		X		X
11.2 Inspect and clean chamber steam spray nozzles.	X	X	X	X	X	X
11.3 Inspect and clean each water level sensor probe.	X	X	X	X	X	X
12.0 STAGE 2 CONTROL						
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

4.5 PREVENTIVE MAINTENANCE GUIDE (continued)
EQUIPMENT: **Eagle® 3000 Washer/Sterilizer**

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
12.0 STAGE 2 CONTROL (continued)						
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 board is functioning properly.	X	X	X	X	X	X
13.0 FINAL TEST						
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 Test manual flash cycle.	X	X	X	X	X	X
13.6 Remove test printout (tape) and attach it to PMA.	X	X	X	X	X	X
13.7 Remove all test equipment installed for inspection.	X	X	X	X	X	X
13.8 Install any panel or cover removed during inspection.	X	X	X	X	X	X
13.9 Inspect area to ensure removal of all materials used during the inspection.	X	X	X	X	X	X

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Section 5
Field Test Procedure

5.1 GENERAL

Every washer/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.

5.2 TEST INSTRUMENTATION REQUIRED

1. Stopwatch
2. Calibrated compound pressure gauge (0-50 psig, ±0.5% full scale accuracy)
3. Calibrated digital thermometer (1°F resolution) with type 'T' thermocouple
4. Torque wrench, 0-50 ft-lbs
5. Digital voltmeter
6. 1000 ml graduated cylinder

5.3 CHECK FOR PROPER INSTALLATION

1. Check that washer/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.

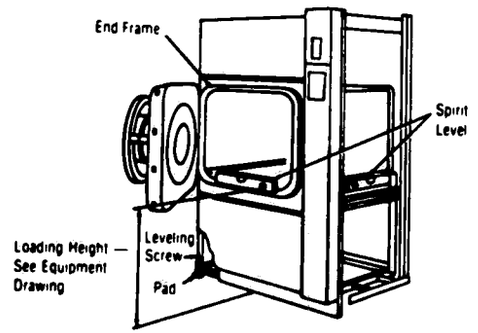


FIGURE 5-1 – Leveling the Washer/Sterilizer

TABLE 5-1 – STERILIZER CONNECTIONS

Plumbing Connections				
Connection	Nominal at Connection Point Pipe Size		Pressure (Dynamic) Range	
Steam Supply	1/2 NPT		50-80 psig	
Cold Water	1/2 NPT		30-50 psig	
Waste	5/8, 7/8 ODT		Flow capacity	
Electrical Connections				
Connection	**Volts**	**Phase**	**Frequency**	**Amps**
Control	115	1	60 Hz	1.0

2. Open door to a 45° 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.

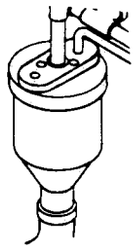


FIGURE 5-2 – Drain Connection

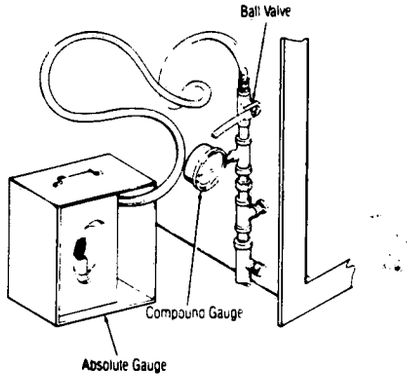


FIGURE 5-3 – Installing Test Gauges

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. Connect the calibrated compound pressure gauge to the 1/8" NPT opening at front center of washer/sterilizer chamber (see Figure 5-3).
3. Open upper access door and position MANUAL control valve to OFF.

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 status 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. 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.

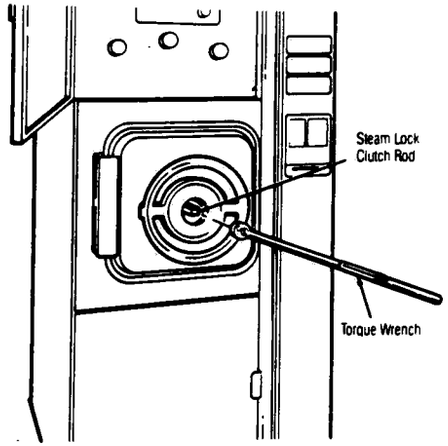


FIGURE 5-4 – Locking Door to Correct Torque

   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.

   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.

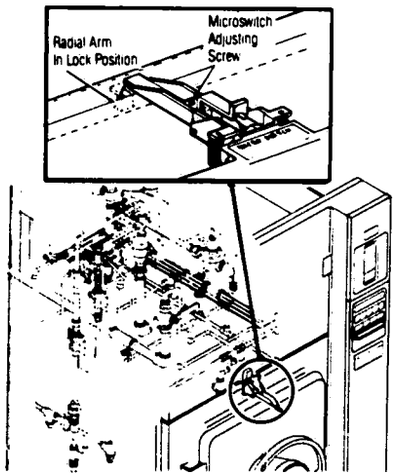


FIGURE 5-5 – Door Switch Adjustment

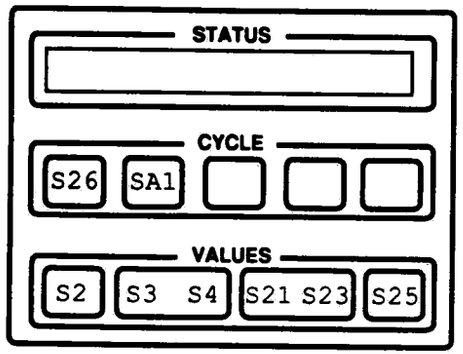


FIGURE 5-6 – Valve Control Touch Pads

5.6 VALVE TESTS

Note: This procedure calls for individual solenoid valves to be manually turned on and off in the Service Test mode. If unsure how to activate this feature, review Section 7 before proceeding.

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

Safety Valve Test and Regulator Adjustment

1. Position manual valve to OFF
2. Make sure steam-supply pressure is set to 50-80 psig (65 pisg preferred). Open both the main steam and water supply valves and the panel steam and water supply valves
3. Enter Service Test mode on the control by setting Dip swithc #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. Close and lock door(s). (Solenoid S2 cannot be electrically energized with door(s) open.)
5. Energize solenoid valve S2 by pressing the appropriate touch pad (Figure 5-6). Steam flows into the chamber.
6. Slowly turn steam-regulator adjusting screw (Figure 5-7) clockwise to increase pressure in chamber. The safety valve must pop at 36 psig (±2 psig).
7. Turn off S2 and open S3 to exhaust the chamber.
8. Repeat test twice. If valve does not pop within specified pressure, replace it.
9. Turn on solenoid valve S2.

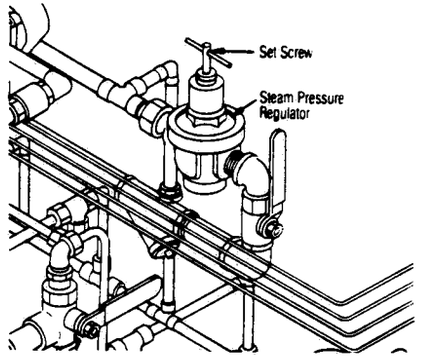


FIGURE 5-7 – Pressure Regulator Adjustment

10. Wait until chamber pressure has stabilized. Adjust the steam-control valve to produce 32 psig (±1 psig) in the chamber.
11. Turn off S2. Turn on solenoid valves S3 and S4 to exhaust the chamber.
12. After chamber is exhausted, turn off S3 and S4.

    Note: Make sure drain valve on the air filter is closed.

Door-Lock Solenoid Adjustment

Note: The door-lock solenoid is located behind manual valve panel at the upper right corner.

1. Close and lock door(s) to 20 ft-lbs (+0.5/-2.0 ft-lbs) torque.
2. Energize solenoid valve SA1 (press appropriate touch pad). If necessary, rotate cable adjuster until door handwheel can be turned in the counterclockwise (unlock) direction.
3. Turn off solenoid valve SA1. Test door handwheel. It should not turn (in the counterclockwise direction) past the locking stop on the internal door gear. Adjust cable adjuster if necessary.
4. Tighten cable-adjuster locknut and apply a drop of Loctite 222.

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. Energize solenoid valve SA1 (press appropriate touch pad).

4. Energize S2 and charge chamber with steam to 6 psig. Turn off S2.

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. DO NOT fully open door.
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. DO NOT fully open door.
8. Exhaust chamber completely.

Detergent Injector Valve Adjustment

1. Set water-supply pressure to 35 psig.
2. Fill a 1000 ml graduated cylinder with 900 ml of AMSCO Sonic Detergent (water can be used in place of detergent).
3. Place the plastic tube connected to IJ-21 in the graduated cylinder.
4. Turn on solenoid valve S23 (chamber-drain) by pressing the appropriate touch pad.
5. Energize S21(IJ-21) until the plastic tube is filled with detergent.
6. Using a stopwatch, open S21(IJ-21) for 15 seconds. Check detergent level in cylinder. The injector should have used 120 ml (±5 ml) of detergent. (If water was used instead of detergent the usage would be 170 ml, +/-5 ml.)
7. Adjustment of detergent consumption is made at IJ-21. Turn the adjusting screw on the knurled handle clockwise to decrease (counterclockwise to increase) amount of detergent used.
8. Repeat test to verify proper adjustment.
9. Energize S25 (water-spray) for approximately 30 seconds to rinse detergent from the chamber.
10. Turn off solenoid valves S21(IJ-21), S25 and S23.
11. Apply a drop of Loctite 222 on the IJ-21 adjusting screw.

Valve Disabling when Door Opened Test

1. Turn off steam and water supply valves.
2. Position power switch to ON.
3. Close and lock chamber door(s).
4. Energize solenoid valves S2, S21, S25 and S26 by pressing the appropriate touch pads.
5. Test these valves by lightly touching the top of each valve core with a small steel screw driver or a steel scribe. See Figure 5-8 for valve locations.

   The screw driver must be attracted toward the core and vibrations must be felt.
6. Open door.
7. Test the valves again to verify that they are off (deenergized).
8. If any of the solenoid coils are not energized with door(s) locked, or are energized with door(s) open, check wire connections, then the wiring harness.
9. Exit Service Test mode.

5.7 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 5-2 shows functions and factory settings for Control PC Board switches. For additional information, refer to Section 7-8.
4. Raise control up into place.

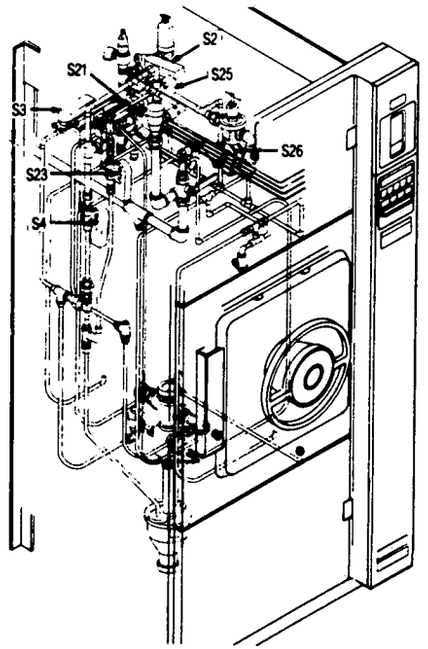


FIGURE 5-8 – Solenoid Valves

TABLE 5-2 – DIP SWITCH SETTINGS: CONTROL PC BOARD

Switch	Function	Position		Factory Setting
DP1	Temperature Units	ON=°F	OFF=°C	ON
DP2	Duplicate Print	ON=No Duplicate	OFF=Duplicate	ON
DP3	Not Used			OFF
DP4	Self-Test Bit 0			OFF
DP5	Time Units	ON=AM/PM	OFF=Military	ON
DP6	Pressure Units	ON=psig	OFF=Bars	ON

TABLE 5-3 - 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	Not Used			OFF
DP6	Complete Buzzer	ON=Standard	OFF=Silenced	ON
DP7	Language Select	ON=Enabled	OFF=Disabled	OFF
DP8	Not Used			OFF

5. Check Printer PC Board Dip switches for proper settings. Table 5-3 shows functions and factory settings for Printer PC Board switches. For additional information, refer to Section 7-8.
6. Open printer door.
7. With chamber door open, position power switch to ON.

   Verify that the following power-up message is printed:

```
**********************
*     EAGLE 3000     *
*  WASHER STERILIZER *
*    Made in U.S.A.  *
**********************
* POWER UP      00:00:00P
----------------------
* NOT READY     00:00:00P
DOOR UNLOCKED
----------------------
```

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=WS              3=FLASH
2=FLASH           4=WASH
```

8. Close chamber door.
9. If necessary, adjust date and time.
   a. Press CHANGE VALUES touch pad. The display shows the cycle and cycle values set for Cycle #1.
   b. 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.
   c. 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.

5.8 SENSOR CALIBRATION

Note: See Figures 7-3 and 7-6 for potentiometer locations.

1. Prepare control for service (refer to Section 7.2).
2. 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.
3. With door open turn pot R25 (ZERO) on the Printer PC board until 0.0 psig is displayed.
4. For temperature calibration, adjust pot R10 (ZERO) pot at 270°F and pot R4 (SPAN) at 70-100°F on Control PC board.
5. For pressure calibration, adjust pot R25 (ZERO) at 0 psig and adjust pot R26 (SPAN) on the Printer PC board at pressure-regulator setting.
6. Close and lock door(s). Turn on solenoid valves S25 and S26 (press appropriate touch pads) and allow chamber to fill with water for 30 seconds. After 30 seconds, check digital thermometer reading. If digital thermometer does not read between 70°F and 100°F, continue to purge chamber with steam (S26) or water (S25) until temperature is in this range. Once this range is reached, adjust pot R4 (SPAN) on the Control PC board until temperature agrees with the calibrated thermometer within ±1°F.
7. Turn on S3, S4 and S2 for 30 seconds, then turn off S3 and S4. Chamber should charge to pressure-regulator setting. Let pressure stabilize for five minutes.
8. When chamber temperature has stabilized, adjust pot R10 (ZERO) on the Control PC board until displayed temperature matches thermometer reading within ±1°F.
9. Adjust pot R26 (SPAN) on the Printer PC board until displayed pressure is within 0.5 psig of calibrated gauge.
10. Turn on S3 and S4 to exhaust chamber. When 0 psig is reached, open door.
11. Pressure should read 0 psig (+0.5, -0 psig). Temperature displayed should match thermometer ±1°F.
12. If readings are not within these limits, repeat procedure.

5.9 OPERATIONAL TEST

Run the following cycles with an empty chamber, 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 5-4 through 5-6 in Section 5.13 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**
  1. Close, but do not lock, door.
  2. Position power switch to ON.
  3. Verify that power-up message is printed, and that display shows DOOR UNLOCKED message, alternating with Cycle Select Menu.
  4. Program Cycle Select touch pad #2 for a FLASH cycle, setting values as follows:

     STER TIME = 03 m
     DRY TIME = 01 m
     TEMP = 270°F

5. Press Cycle Select touch pad #2 once.
6. Press PRINT VALUES rocker switch.

   Cycle values set for FLASH cycle should be printed as follows:

```
2.  FLASH
  STER TEMP = 270.0°F
  STER TIME = 03:00
   DRY TIME = 01:00
 ------------------------
```

7. Press Cycle Select touch pad #2 twice. Verify that cycle does not start with door unlocked.
8. Lock door. If a double-door unit, unlock opposite door.
9. Press Cycle Select touch pad #2 twice. Verify that cycle does not start with opposite door unlocked.
10. Lock opposite door.
11. Verify that display alternates between READY message and the Cycle Select Menu.
12. Press Cycle Select touch pad #1 twice.

- **PURGE**
  1. Verify display shows:

```
PURGE          T=200F
2:00           P=0psig
```

  2. S2, S3 and S4 should be on.
  3. Verify printout:

```
------------------------
---   F L A S H      ---
------------------------
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    = 3:00
DRY TIME     = 1:00

- TIME      T=°F   P=psig
------------------------
C 00:00:00A   200.3   0
```

  4. Use stopwatch and verify two-minute purge time.

- **CHARGE**
  1. S3 should go off; S2 and S4 should stay on.
  2. Verify display shows:

```
CHARGE         T=221F
               P=8psig
```

  3. Verify printout:

```
C 00:00:00A   220.5   8
```

  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=270F
3:00           P=28psig
```

  3. Verify printout:

```
S 00:00:00A   270.1   28
```

  4. Wait for sterilizer timer to time out.

- **EXHAUST**
  1. S2 should go off; S3 and S4 should go on.
  2. Verify display shows:

```
EXHAUST        T=273F
               P=30psig
```

  3. Verify printout:

```
E 00:00:00A   273.2   30
```

  4. Wait until display shows 3 psig.

- **DRY**
  1. S3 and S4 should be on.
  2. Verify display shows:

```
DRY            T=220F
1:00           P=0psig
```

3. Verify printout:

```
E 00:00:00A   220.7   2
```

4. Wait for dry timer to time out.

- **VENT**

1. Verify display shows:

```
VENT              T=200F
                  P=0psig
```

2. Verify printout:

```
E 00:00:00A   200.1   0
```

3. S3 should be on, all other valves should be off.
4. Wait 10 seconds.

- **COMPLETE**

1. Verify display shows:

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

2. SA1, S3 and S23 should be on.
3. Verify printout:

```
Z 00:00:00A 200.4     0
LOAD              0000000
TEMP MAX=274.1°F
TEMP MIN=270.1°F
CONDITION         = mm:ss   ← See Table 5-4 for
STERILIZE         = mm:ss     normal time
EXHAUST           = mm:ss     ranges
TOTAL CYCLE       = mm:ss
--------------------------
-    READY TO UNLOAD    -
--------------------------
```

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.

WASH Cycle

- **POWER UP**

1. Close and lock door.
2. Program Cycle Select touch pad #4 for a WASH cycle, setting values as follows:

   WASH TIME = 8:30

3. Verify that display alternates between READY message and the Cycle Select Menu.
4. Press Cycle Select touch pad #4 twice.

- **CYCLE START AND 1ST RINSE**

1. Verify that cycle starts.
2. Verify printout:

```
--------------------------
---      W A S H      ---
--------------------------
CYCLE START AT   00:00:00A
          ON     00/00/00
CYCLE COUNT      00000
OPERATOR         _________
STERILIZER       _________

WASH TIME        = 8:30

- TIME       T=°F   P=psig
--------------------------
R 00:00:00A   66.3     0
```

3. Verify display alternates between. . .

```
WATER IN          T=66F
CHAMBER           P=0psig
```

and

```
1ST RINSE         T=66F
                  P=0psig
```


4. Verify that door is locked, SA1 is OFF, and that door cannot be opened.
5. S23, S25 and S3 should be on.
6. Wait two minutes.

- **1ST DRAIN**

1. Verify display alternates between. . .

```
WATER IN          T=66F
CHAMBER           P=0psig
```

and

```
1ST DRAIN         T=66F
                  P=0psig
```

2. S25 goes off. S23 and S3 remain on.
3. Wait 20 seconds.

- **1ST FILL**

1. Verify display alternates between. . .

```
WATER IN          T=66F
CHAMBER           P=0psig
```

and

```
1ST FILL          T=66F
                  P=0psig
```

2. S23 goes off. S25 comes on and S3 remains on
3. Wait 30 seconds.

- **DETERGENT**

1. Verify that S21, IJ21 and S3 are on.
2. Verify display alternates between. . .

```
WATER IN          T=66F
CHAMBER           P=0psig
```

and

```
DETERGENT         T=66F
                  P=0psig
```

3. S26 will go on if temperature drops below 68°F.
4. Wait 15 seconds.

- **2ND FILL**

1. Verify that S21 and IJ21 go off while S25 and S3 are on.
2. S26 will go on if temperature is less than 70°F.
3. Verify display alternates between. . .

```
WATER IN          T=66F
CHAMBER           P=0psig
```

and

```
2ND FILL          T=66F
                  P=0psig
```

4. Wait at most three minutes until chamber fills with water.

- **PREWASH (at most - 4 minutes)**

1. Verify that S25 goes off and S26 goes on.
2. Verify display alternates between:

```
WATER IN          T=89F
CHAMBER           P=0psig
```

and

```
PREWASH           T=89F
                  P=0psig
```

3. Verify that S25 goes on every 30 seconds and stays on for about three seconds.
4. Verify that S26 is on during entire phase.

   This phase should last at least two minutes and until chamber temperature shows 76°F, but not more than four minutes.

- **WASH**

1. Verify display alternates between:

```
WATER IN          T=76F
CHAMBER           P=0psig
```

and

```
WASH              T=76F
8:30              P=0psig
```

2. Verify S26 is on during entire phase and that temperature steadily increases.

3. Verify wash timer is shown on display, counting down.
4. Verify printout:

```
W   time    76.5   0
```

5. Verify that S25 turns on for one second every 30 seconds.
6. Wait until wash timer times out.

   Note: If temperature is greater than 130°F, S25 and S23 will go on for three seconds, then go off for ten seconds.

- **2ND DRAIN (at most - 8 minutes)**

1. Verify printout:

```
W   time    120.2   0
```

2. Verify that S23 and S3 are on, and that S25 and S26 go off (gravity drain).
3. Verify display alternates between. . .

WATER IN	T=120F
CHAMBER	P=0psig

and

2ND DRAIN	T=120F
	P=0psig

4. Wait until chamber is empty (**eight minutes maximum**).

- **2ND RINSE**

1. Verify printout:

```
R   time    75.3   0
```

2. Verify display alternates between. . .

WATER IN	T=75F
CHAMBER	P=0psig

and

2ND RINSE	T=75F
	P=0psig

3. Verify that S25, S23 and S3 are on.
4. Wait about one minute until rinse is complete.

- **3RD DRAIN (at most - 1 minute)**

1. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

3RD DRAIN	T=66F
	P=0psig

2. Verify that S3 and S23 are on.
3. Wait until chamber is empty.

- **COMPLETE**

1. When chamber is empty, verify that all valves go off except S23 and S3.
2. Verify printout:

```
2   time    116.1   0
LOAD 0000000
TOTAL WASH  26:07
```

3. Verify that total wash time is less than 28 minutes for an empty-chamber cycle.
4. Verify display shows:

COMPLETE	T=74F
00:00:00A	P=0psig

5. Verify that buzzer sounds (pulses every five second)s.
6. Verify printout:

```
----------------------
-   READY TO UNLOAD   -
----------------------
```

7. Buzzer goes off after one minute. Verify that display continues to show complete message after buzzer stops.
8. Verify that SA1 is on.
9. Press WASH cycle-select touch pad and verify that another cycle cannot be run.

- **DOOR OPEN**

1. Verify that door can be opened.

2. Verify display alternates between DOOR UNLOCKED message and Cycle Select Menu.
3. Press top of PRINT rocker switch and verify that printer reprints cycle data completely, and that the first line of print readsDUPLICATE PRINT.
4. Verify display shows DUPLICATE PRINT.
5. Unlock door.

- **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.

WASH/STERILIZE Cycle

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. Program Cycle Select touch pad #1 for a WASH/STERILIZE (WS) cycle, setting values as follows:

   WASH TIME = 8:30
   STER TIME = 3:00
   DRY TIME = 1:00

4. Verify that display alternates between READY message and the Cycle Select Menu.
5. Press Cycle Select touch pad #1 twice.

- **CYCLE START AND 1ST RINSE**

1. Verify that cycle starts.
2. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

1ST RINSE	T=66F
	P=0psig

3. Verify printout:

```
----------------------
---   WASH/STERILIZE   ---
----------------------
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
WASH TIME      = 8:30
STER TIME      = 3:00
DRY TIME       = 1:00

- TIME        T=°F   P=psig
----------------------
R 00:00:00A    66.2     0
```

4. Verify that door is locked, SA1 is OFF, and that door cannot be opened.
5. S23, S25 and S3 should be on.
6. Wait two minutes.

- **1ST DRAIN**

1. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

1ST DRAIN	T=66F
	P=0psig

2. S25 goes off. S23 and S3 remain on.
3. Wait 20 seconds.

- **1ST FILL**

1. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

1ST FILL	T=66F
	P=0psig

2. S23 goes off. S25 comes on and S3 remains on

3. Wait 30 seconds.

DETERGENT

1. Verify that S21, IJ21 and S3 are on.
2. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

DETERGENT	T=66F
	P=0psig

3. S26 will go on if temperature drops below 68°F.

- **2ND FILL**

1. Verify that S21 and IJ21 go off while S25 and S3 are on.
2. S26 will go on if temperature is less than 70°F.
3. Verify display alternates between. . .

WATER IN	T=66F
CHAMBER	P=0psig

and

2ND FILL	T=66F
	P=0psig

4. Wait at most three minutes until chamber fills with water.

- **PREWASH (at most - 4 minutes)**

1. Verify that S25 goes off and S26 goes on.
2. Verify display alternates between:

WATER IN	T=66F
CHAMBER	P=0psig

and

PREWASH	T=66F
	P=0psig

3. Verify that S25 goes on every 30 seconds and stays on for about three seconds.
4. Verify that S26 is on during entire phase.

   This phase should last at least two minutes and until chamber temperature shows 76°F, but **not more than four minutes**.

- **WASH**

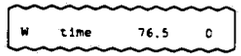
1. Verify display alternates between:

WATER IN	T=76F
CHAMBER	P=0psig

and

WASH	T=76F
8:30	P=0psig

2. Verify S26 is on during entire phase and that temperature steadily increases.
3. Verify wash timer is shown on display, counting down.
4. Verify printout:

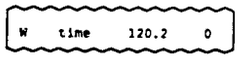


5. Verify that S25 turns on for one second every 30 seconds.
6. Wait until wash timer times out.

   Note: If temperature is greater than 130°F, S25 and S23 will go on for three seconds, then go off for ten seconds.

- **2ND DRAIN (at most - 8 minutes)**

1. Verify printout:



2. Verify that S23 and S3 are on, and that S25 and S26 go off.
3. Verify display alternates between:

WATER IN	T=66F
CHAMBER	P=0psig

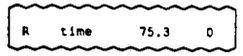
and

2ND DRAIN	T=66F
	P=0psig

4. Wait until chamber is empty (**eight minutes maximum**).

- **2ND RINSE**

1. Verify printout:



2. Verify display alternates between:

WATER IN	T=75F
CHAMBER	P=0psig

and

2ND RINSE	T=75F
	P=0psig

3. Verify that S25, S23 and S3 are on.
4. Wait about one minute until rinse is complete.

- **3RD DRAIN (at most - 1 minute)**

1. Verify display alternates between:

WATER IN	T=66F
CHAMBER	P=0psig

and

3RD DRAIN	T=66F
	P=0psig

2. Verify that S3 and S23 are on.
3. Wait at most one minute for chamber to empty.

- **PURGE**

1. Verify display shows:

PURGE	T=200F
2:00	P=0psig

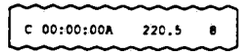
2. S2, S3 and S4 should be on.
3. Use stopwatch and verify two-minute purge time.

- **CHARGE**

1. S3 should go off; S2 and S4 should stay on.
2. Verify display shows:

CHARGE	T=221F
	P=8psig

3. Verify printout:



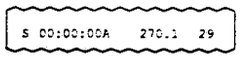
4. Verify that chamber is charging with steam and charges until STERILIZE temperature setpoint is reached.

- **STERILIZE**

1. S2 should operate intermittently to control temperature at overdrive setpoint. Adjust pressure regulator if S2 does not turn off
2. Verify display shows:

STERILIZE	T=270F
3:00	P=29psig

3. Verify printout:



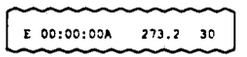
4. Wait for sterilizer timer to time out.

- **EXHAUST**

1. S2 should go off; S3 and S4 should go on.
2. Verify display shows:

EXHAUST	T=273F
	P=30psig

3. Verify printout:



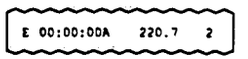
4. Wait until display shows 3 psig.

- **DRY**

1. S3 and S4 should be on.
2. Verify display shows:

DRY	T=220F
1:00	P=0psig

3. Verify printout:



4. Wait for dry timer to time out.

- **VENT**

1. Verify display shows:

```
VENT              T=200F
                  P=0psig
```

2. Verify printout:

```
E 00:00:00A   200.1   0
```

3. S3 should be on, all other valves should be off.
4. Wait 10 seconds.

- **COMPLETE**

1. Verify display shows:

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

2. S3, S23 and SA1 should be on.
3. Verify printout:

```
Z 00:00:00A 200.4      0
LOAD              0000000
TEMP MAX=274.1°F
TEMP MIN=270.1°F
WASH              = mm:ss
CONDITION         = mm:ss
STERILIZE         = mm:ss
EXHAUST           = mm:ss
TOTAL CYCLE       = mm:ss
-------------------------
=    READY TO UNLOAD    =
-------------------------
```

← See Table 5-6 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.

5.10 MANUAL OPERATION

Note: Control power **must** be OFF.

After door(s) is **closed** and **locked**, operate manual valve in sequence as follows:

1. **PURGE**

   Solenoid valves S2, S3 and S4 should open. Purge should take place with approximately 5 to 15 psig steam pressure in chamber. Verify that door cannot be opened. After one minute, turn valve to STERILIZE.

2. **STERILIZE**

   Solenoid valve S2 should open. Chamber should be pressurized to approximately 30 psig. Verify that door cannot be opened. After three minutes, turn valve to EXHAUST.

3. **EXHAUST**

   Solenoid valves S3 and S4 should open and fast exhaust should start. When pressure in the chamber reaches 8 psig, turn manual valve to DRAIN.

4. **DRAIN**

   Solenoid valves S23 should open. Water drains from chamber. Verify that door cannot be opened.

5. **DOOR OPEN**

   All solenoid valves should be off. Open door.

6. **DRAIN**

   Solenoid valves S23 should open. Close door.

7. **OFF**

   Door should be locked.

5.11 LOSS OF POWER TEST

1. Set cycle-selector touch pad #4 to a Flash cycle with an 8-minute sterilize and a 2-minute dry time.
2. Turn main power supply off.
3. Wait 10 seconds.
4. Turn main power supply on.

5. Verify that cycle #4 remains set as programmed.
6. If cycle is not properly set, memory test has failed and RAM/RTC should be replaced on the control board.
7. Reprogram cycle #4 to desired settings.

5.12 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 on the printout.
6. Press RESET. * N.O.E. RESET * should be displayed momentarily.

5.13 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.

Chart each of the following cycles:

See Tables 5-4, 5-5 and 5-6 for performance requirements of each cycle.

Test Number	Cycle	Wash Time	Sterilize Time	Dry Time
1	FLASH	N/A	3	1
2	WASH	8:30	N/A	N/A
3	W/S	8:30	3	1

TABLE 5-4 – FLASH CYCLE

Phase	Components Energized	Times
Purge	S2,S3,S4	2:00
Charge	S2,S4	1:00 max
Sterilize	S2 (intermittent)	3:00
Exhaust	S3,S4	Until P=2 psig 1:00 max
Dry	S3,S4	1:00
Vent	S3	0:10-0:20
Complete	SA1, S3,S23	–

TABLE 5-5 – WASH CYCLE

Phase	Components Energized	Times
1st Rinse	S3,S23,S25	2:00
1st Drain	S3,S23	0:28-0:32
1st Fill	S3,S25	0:28-0:32
Detergent	S3,S21,IJ21 S26 (intermittent)	0:14-0:16 or until 115-125 ml det. injected 3:00 max
2nd Fill	S3,S25	3:00 max
Prewash	S26	At least 2 min. then until 76°F water temp. or for 2 more min.
Wash/Agitate	S26	Wash timer counts down
2nd Drain (Gravity) or 2nd Drain (Power)	S3,S23 / S23,S25, S2 (intermittent)	8:00 max / 5:00 max
2nd Rinse	S3,S23,S25	1:00
3rd Drain (Gravity) or 3rd Drain (Power)	S3,S23 / S2,S23 S2 (intermittent)	2:00 max / 0:20-0:40
Complete	SA1,S3,S23	–

TABLE 5-6 – WASH/STERILIZE CYCLE		
Phase	**Components Energized**	**Times**
1st Rinse	S3,S23,S25	2:00
1st Drain	S3,S23	0:28-0:32
1st Fill	S3,S25	0:28-0:32
Detergent	S3,S21,U21 S26 (intermittent)	0:14-0:16 or until 115-125 ml det. injected 3:00 max
2nd Fill	S3,S25	3:00 max
Prewash	S26	At least 2 min. then until 76°F water temp, or for 2 more min.
Wash/Agitate	S26	Wash timer counts down
2nd Drain (Gravity)	S3,S23	8:00 max
or		
2nd Drain (Power)	S23,S25, S2 (intermittent)	5:00 max
2nd Rinse	S3,S23,S25	1:00
3rd Drain (Gravity)	S3,S23	2:00 max
or		
3rd Drain (Power)	S2,S23 S2 (intermittent)	0:20-0:40
Purge	S2,S3,S4	2:00
Charge	S2,S4	1:00 max
Sterilize	S2 (intermittent)	3:00
Exhaust	S3,S4	Until P=2 psig 1:00 max
Dry	S3,S4	1:00
Vent	S3	0:10-0:20
Complete	SA1,S3,S23	–

Section 6
Troubleshooting

6

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

6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, press RESET and operate sterilizer more than once in case reported problem is being caused by periodic component malfunction.
2. Use cycle graphs, Figures 6-1 through 6-3, to follow the 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 trap. 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 (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 6-3) are representations of the operations of the cycles available with the washer/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 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.

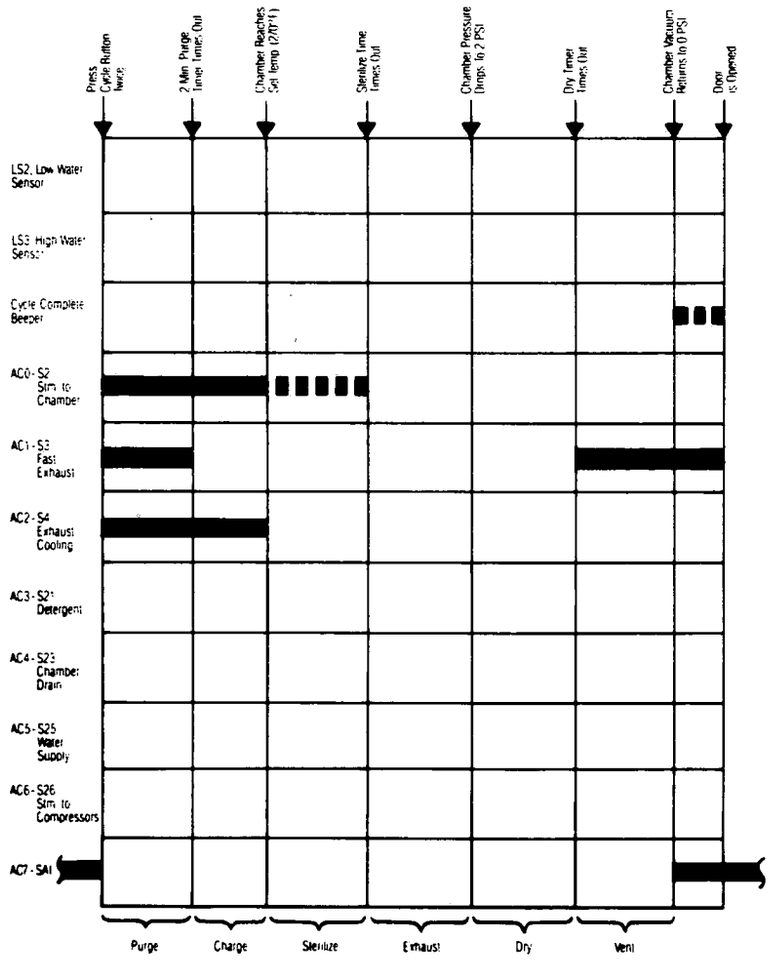


FIGURE 6-1 – Cycle Graph: Flash Cycle

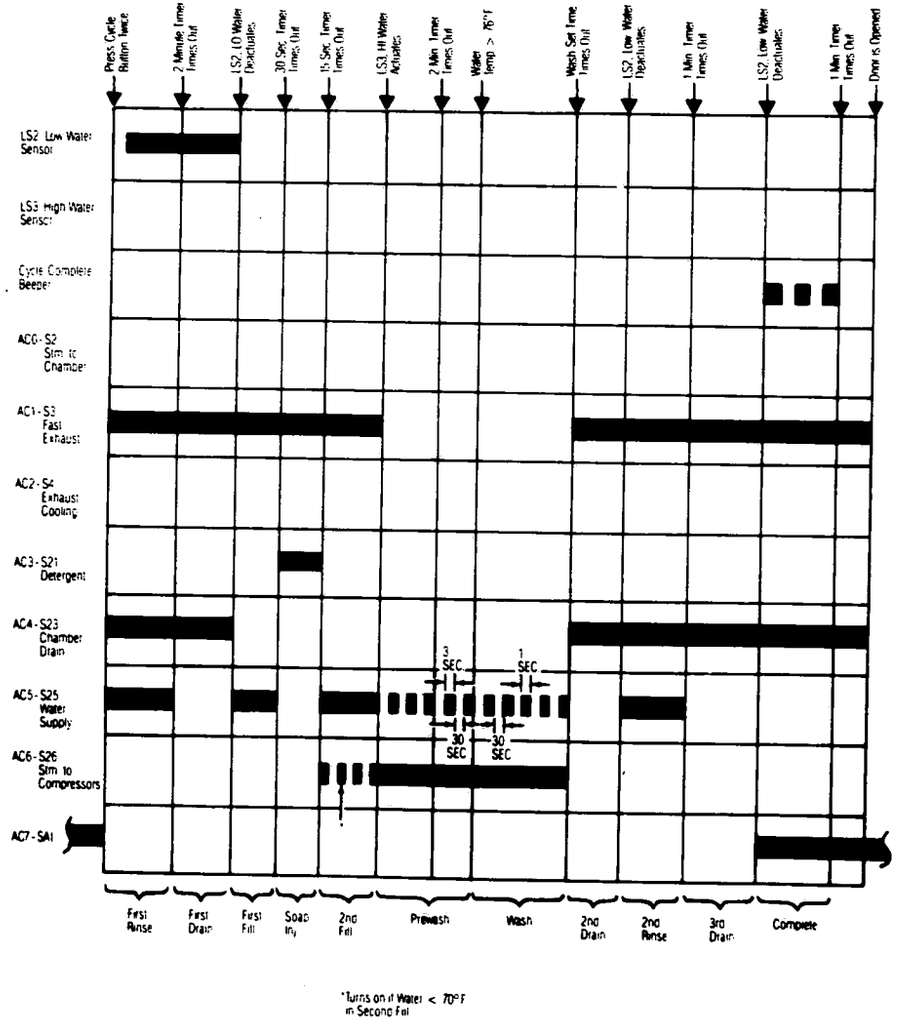


FIGURE 6-2 – Cycle Graph: Wash-Only Cycle

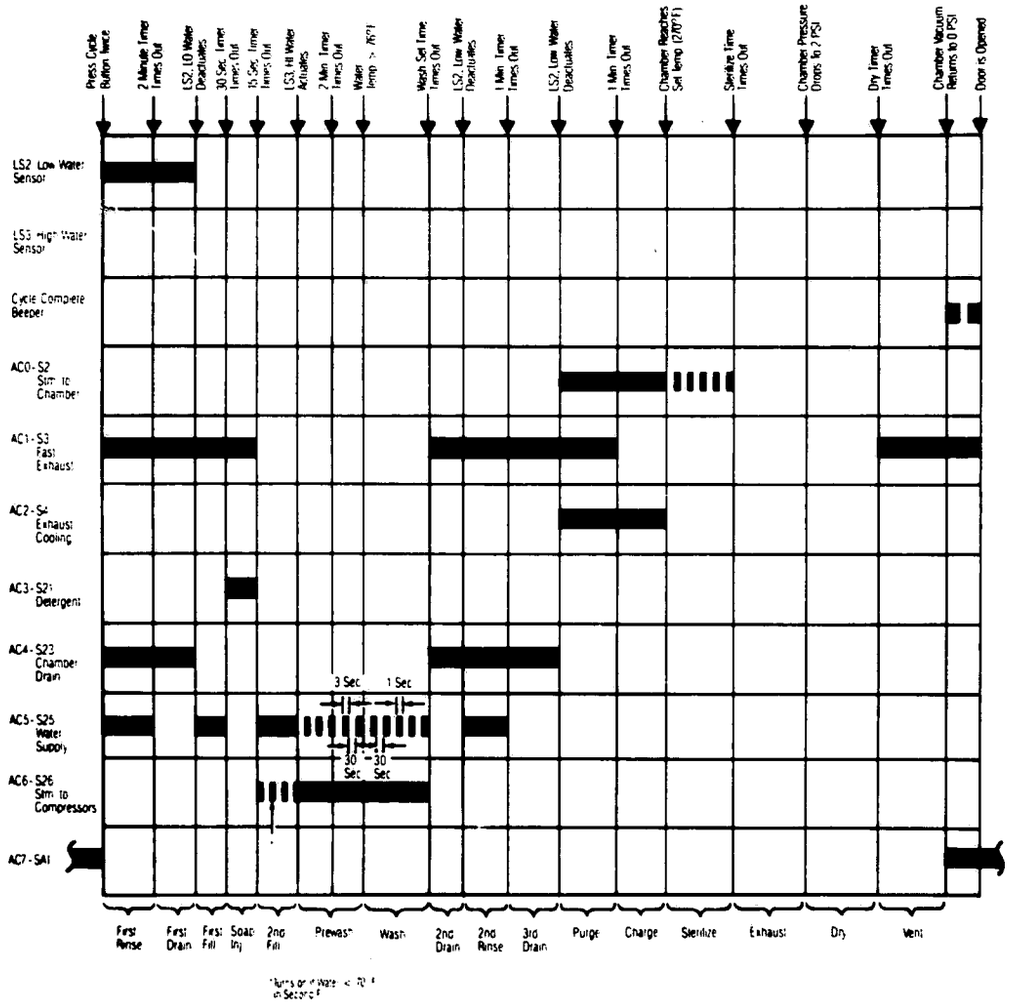


FIGURE 6-3 – Cycle Graph: Wash/Sterilize Cycle

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 washer/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, paragraph or table number.

CAUTION: Certain failures may allow water to enter chamber. If WATER IN CHAMBER is displayed with the door(s) closed, proceed as follows: SLOWLY begin to unlock door. If water leaks past the door gasket, relock door. Position the MANUAL control to DRAIN and attempt to drain the water from the chamber. Wait until no more water is draining to the waste funnel. If no water drains, remove the chamber-drain valve pilot line while still in the MANUAL DRAIN mode. This should drain the chamber.

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, SERVICE TEST, or BURN-IN TEST.	1) Setting of #4 Dip switches on Control and/or Printer PC boards in ON position. Place both to OFF for normal operation.	Sec. 7.8
	2. 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,#6 Sec. 7.3 Sec. 7.11 & Fig. 8-12,#6
	3. Printout is light or blank.	1) Printer darkness out of adjustment. 2) Printer defective - replace. 3) Printer paper loaded backwards.	Sec. 7.3 Sec. 7.3 Sec. 4.3
	4. Parts of characters on printout missing.	1) Printer defective - replace. 2) Wrong type of thermal paper. Do not use T.I. (Texas Instruments) 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 (cont'd).	5. Display shows PRESSURE IN CHAMBER when power turned on - won't clear. Chamber pressure gauge reads zero.	1) Pressure calibration on Printer PC board incorrect. 2) Pressure transducer defective - replace.	Sec. 7.6 Fig. 8-33,#7
	6. Time and date not retained when power last turned off. Default cycle settings on display.	1) Battery dead in battery-backed RAM IC - replace IC.	Sec. 7.15
	7. Display shows PRINTER TIME OUT and printer won't print. (Printer must print one line in less than three seconds.)	1) Paper jammed in printer - clear jam. 2) Paper roll dragging - check. 3) Defective printer - replace. 4) Printer PC board defective - replace.	Sec. 4.3 Sec. 4.3 Sec. 7.3 Sec. 7.11 & Fig. 8-12,#6
	8. Unit prints and displays WATER IN CHAMBER. (See Caution before proceeding.)	1) Faulty drain valve CV21. If water is staying in the chamber, CV21 is not opening. 2) Faulty IJ22 ejector (plugged). 3) Faulty S23 solenoid valve (leaking). 4) Faulty low-water-level probe (LS2). 5) Faulty Control PC board. Check limit switch inputs for probes LS2 and LS3 in Service Test mode. 6) Faulty S25 valve (leaking).	Fig. 8-24,#35 Fig. 8-24,#2 Fig. 8-24,#8 Fig. 8-24,#39 Sec. 7.5 Fig. 8-23,#15
	9. Unit prints and displays PRESSURE IN CHAMBER (i.e., more than 1 psia)	1) Faulty S2 solenoid valve. 2) Faulty S26 solenoid valve. 3) Faulty pressure sensor. 4) Printer PC board out of calibration or faulty.	Fig. 8-28,#22 Fig. 8-28,#25 Fig. 8-33,#7 Sec. 7.6
	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. Example, RESET is P-11, pin 3. (See schematic). 2) Touch panel unplugged.	Fig. 8-13,#4 Fig. 8-13,#4

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TABLE 6-1 – TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
1. Before beginning cycle (cont'd).	11. 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 rear door locked. Replace Control PC board if door switch(es) test OK.	Sec. 7.5 & Fig. 8-10,#16 Sec. 7.5 & Fig. 8-20,#7
	12. 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. 7.24 Fig. 8-20,#7 Sec. 7.5 & Fig. 8-12,#17
	13. Steam enters chamber with door open.	1) S-2 valve failed (stuck open). 2) Manual control in sterilize position. 3) Manual control valve failed.	Fig. 8-28,#22 Sec. 2.2 Fig. 8-30,#1
	14. 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
	15. Display locks up with • AMSCO • • EAGLE 3000 •	1) Printer unplugged. 2) Printer defective. 3) Printer PC board defective.	Fig. 8-12,#6 Sec. 7.3 Sec. 7.11 & Fig. 8-12,#6
2. Before beginning cycle or during cycle.	1. Unit prints "ALARM FAILURE READING TEMP.	1) Defective temperature probe. 2) Control PC board out of calibration or defective.	Fig. 8-33,#13 Sec. 7.7 & Fig. 8-12,#17
	2. 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.	Fig. 8-33,#7 Fig. 8-33,#7 Sec. 7.6

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TABLE 6-1 – TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
2. Before beginning cycle or during cycle (cont'd).	3. Unit prints *ALARM WATER SENSOR FAILURE and displays COMPONENT FAILURE. High water level probe senses water when low water level probe does not. (See Caution before proceeding.)	1) High-water-level probe unplugged or defective. 2) Low-water-level probe defective. 3) Chamber drain valve diaphragm leaking. 4) Large amount of condensate in incoming steam. 5) Control PC board defective.	Fig. 8-25,#13 Fig. 8-24,#39 Fig. 8-24,#35 -- Fig. 8-12,#17
3. During a cycle.	1. Steam in area surrounding sterilizer.	1) S4 solenoid valve failed closed. S4 should be open when unit is in purge or exhaust phase, above 3 psig setpoint. Check P3-10 for power. 2) Control PC board failure. Check S4 board output during dry phase or in Service Test mode. Should be on. 3) Water-supply valve turned off. 4) Water strainer clogged. 5) Safety valve opening, making loud popping noise. Check chamber pressure and pressure regulator setting. If OK, replace safety valve. Note: **If safety valve is defective,** do not attempt to repair it. **Replace with new valve.**	Fig. 8-24,#19 Sec. 7.5 Sec. 2.2 Fig. 8-23,#32 Sec. 5.6 & Fig. 8-22,#6
	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, and restart. 4) Door lock switch out of adjustment.	Sec. 4.3 Sec. 7.18 -- Sec. 7.24
	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 no line voltage, isolate problem to loose wire, defective Control PC board AC output (AC-0, P3-7), or relay CR-1 N.C. contacts. 3) Valve improperly rebuilt, guide sleeve missing or parts not lubricated according to rebuilding instructions.	Fig. 8-28,#22 Sec. 7.5 Fig. 8-28,#22
	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.	Sec. 7.18 & Fig. 8-17, #5&6 Fig. 8-17,#24

TABLE 6-1 – TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
4. Wash cycle, first rinse.	1. Unit displays and prints WATER SENSOR FAILURE SEE OPERATORS MANUAL.	1) Water strainer plugged. 2) Water-supply valve not turned on. 3) Vacuum breaker float stuck closed. 4) Check valve between S25 and chamber spray nozzles stuck closed. 5) Defective 12-volt output on auxiliary power supply. 6) S-25 solenoid valve not receiving power. Check S25 signal and AC5 output from Control PC board in Service Test mode, or during 1st rinse. Replace board if no signal present. If signal present, proceed to next step. 7) S25 solenoid not opening - rebuild or replace. 8) Chamber drain strainer plugged - remove and clean. 9) Low-water-level probe defective. In Service Test mode,pour a quart of water down chamber drain while checking LS2 input. 10) Fuse F3 in control column blown.	Fig. 8-23,#32 Sec. 2.2 Fig. 8-23,#38 Fig. 8-23,#18 Fig. 8-11,#14 Sec. 7.5 Fig. 8-23,#15 Sec. 4.3 Sec. 7.5 & Fig. 8-24,#39 Fig. 8-10,#13
5. Wash cycle, prewash and wash phases.	1. Water temperature did not rise during prewash and wash. Poor cleaning action.	1) Solenoid valve (S-26) not opening. Disassemble and inspect. Rebuild if required. 2) Steam strainer clogged. 3) Steam-supply valve turned off. 4) Steam pressure regulator bad. 5) S26 not getting signal from Control PC board. Check in Service test mode or prewash/wash phase. If signal not present, replace Control PC board.	Fig. 8-28,#25 Fig. 8-22,#28 Sec. 2.2 Fig. 8-22,#23 Sec. 7.5, Fig. 8-28,#25 & 8-12, #17
6. Wash cycle, 2nd fill phase.	1. Unit prints *ALARM TOO LONG IN FILL.	1) Water strainer partially clogged. 2) Water pressure to unit too low. Must be 30 psig minimum (dynamic). 3) Chamber-drain valve not closed. Disassemble and rebuild if necessary. If OK, proceed to next step. 4) S23 solenoid leaking. Must be closed to hold chamber-drain valve closed. 5) Check valve between S25 and chamber stuck closed.	Fig. 8-23,#32 -- Fig. 8-24,#35 Fig. 8-24,#8 Fig. 8-23,#18
7. Wash cycle, 2nd drain.	1. Unit prints *ALARM TOO LONG IN DRAIN (See Caution before proceeding.)	1) IJ22 defective (no suction on CV21 drain valve). 2) S23 defective (not opening), or not receiving signal from Control PC board. 3) Chamber-drain valve CV21 defective. 4) Chamber-drain strainer clogged. 5) Lo-water-level probe defective. Check in Service Test mode. 6) Air-inlet check valve stuck closed. 7) Air filter element clogged.	Fig. 8-24,#2 Fig. 8-24,#8 Fig. 8-24,#35 Sec. 4.3 Sec. 7.5 Fig. 8-22,#4 Fig. 8-22,#18

TABLE 6-1 – TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
8. After wash-only or wash/sterilize cycle.	1. Poor cleaning action. Normal wash-water temperature was achieved (130-140°F.)	1) Detergent container empty, suction tube out of container, or strainer clogged.	Sec. 2.5
		2) Injector IJ21 or S21 not turning on. Check for power to IJ-21/S-21 in Service Test mode. If power is OK, check for 4 ounces of soap or 10 ounces of water pulled through IJ21 suction tube in 15 seconds. If no power, replace Control PC board. If no suction, rebuild or replace IJ21 or S21.	Sec. 7.5 & Fig. 8-23,#6
9. During condition phase of sterilize cycle.	1. Pressure and temperature do not rise.	1) Fuse F3 in control column blown. Measure solenoid valve coils for a short at plug P54 before replacing fuse.	Fig. 8-10,#13
		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.	Fig. 8-10,#16
	2. Unit won't reach sufficient steam pressure to achieve set sterilizing temperature and prints *ALARM TOO LONG TO CHARGE.	1) S2 solenoid valve failure - rebuild or replace.	Fig. 8-28,#22
		2) Control PC board failure. Check AC output to S2 (AC0, P3-7) during purge phase and charge phase.	Fig. 8-12,#17
		3) CR-1 relay failure on normally-closed contacts to (S-2) neutral connection.	Fig. 8-10,#16
		4) Steam regulator defective or out of adjustment - repair or replace.	Sec. 5.6 & Fig. 8-22,#23
		5) Steam supply turned off.	Sec. 2.2
10. During charge phase of sterilize cycle.	1. Steam around drain funnel. Set sterilize temperature not achieved.	1) Chamber-drain valve defective.	Fig. 8-24,#35
		2) Steam trap defective (open).	Fig. 8-28,#14
		3) S23 leaking. Must be closed to hold chamber-drain valve closed.	Fig. 8-24,#8
		4) Incoming water pressure too low to hold chamber-drain valve closed - check.	--
		5) Water strainer plugged - remove and clean.	Fig. 8-23,#32
11. During sterilize phase of sterilize cycle.	1. Steam coming out of air filter.	1) Air-inlet check valve stuck open - replace.	Fig. 8-22,#4
	2. Unit drops below set sterilize temperature. May print/display UNDERTEMP.	1) Steam regulator pressure too high and temperature probe is responding to transient superheated temperatures. Reduce to minimum needed to ensure proper opening of S2 solenoid valve. This is best set while operating S2 manually in the Service Test mode. Steam can be heard entering the chamber when valve is working properly.	Sec. 5.6
		2) Steam regulator pressure too low. S2 solenoid needs approximately 3 psig higher in jacket than chamber to ensure opening.	Sec. 5.6
		3) OVERDRIVE value set too low. Standard setting is 3.0°F. Enter Service Test mode and check setting.	Sec. 7.5
		4) S2 valve failure - rebuild or replace.	Fig. 8-28,#22

TABLE 6-1 – TROUBLESHOOTING (continued)

Status	Trouble	Cause/Correction	Where To Find
11. During sterilize phase of sterilize cycle (cont'd).	2. Unit drops below set sterilize temperature. May print/display UNDERTEMP (cont'd).	5) Superheated steam temperatures from line pressure on empty-chamber testing or with very lightly loaded chamber. Reduce regulator 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.	Sec. 5.6
	3. Pressure too high and temperature too low during sterilize.	1) Chamber-drain steam trap failed closed, trapping air in chamber. - rebuild or replace trap.	Fig. 8-28,#14
		2) Chamber-drain strainer plugged - remove and clean.	Sec. 4.3, Fig. 8-28,#16 & Fig. 4-1
12. During exhaust phase of sterilize cycle.	1. Loud popping noise.	1) S4 solenoid not opening. Check S4 signal in Service Test mode. Rebuild or replace S4 if signal is okay.	Fig. 8-24,#19 & Sec. 7.5
	2. Unit prints *ALARM TOO LONG IN EXHAUST.	1) S3 not receiving power. Check in Service Test mode.	Sec. 7.5
		2) S3 defective.	Fig. 8-28,#4
	3. 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 set to ON, check the Dip switch in the Service Test mode. If Dip switch checks OK, proceed to step 2. If Dip switch is bad, replace the Printer PC board.	Sec. 7.8
		2) Beeper defective on Control PC board - replace board.	Fig. 8-12,#17
13. Complete phase of any cycle.	1. Unit displays COMPLETE but door cannot be opened.	1) Pressure out of calibration.	Sec. 7.6
		2) Pressure transducer bad.	Fig. 8-33,#7
		3) SA1 door-lock solenoid not receiving power. Check in Service Test mode.	Sec. 7.5
		4) Door-locking linkage out of adjustment.	Fig. 8-31
		5) High-water sensor showing water.	Fig. 8-25,#13
		6) Low-water sensor showing water.	Fig. 8-24,#39
14. Miscellaneous.	1. Control intermittently locks up or becomes erratic when door is opened or closed, when S2 solenoid valve operates, or when printing.	1) Varistor noise suppressor across S2 coil missing or defective. - replace (not readily checked except for short).	Fig. 8-32,#27
		2) Capacitor C1 missing from paper take-up microswitch or has failed open - replace.	Fig. 8-14,#5
		3) Diode across CR1 relay is missing or defective.	Fig. 8-15,#15
	2. Paper take-up runs continuously, even when microswitch is not actuated.	1) Microswitch defective or out of adjustment.	Fig. 8-12,#28
		2) Microswitch wired incorrectly to normally open terminal.	Fig. 8-12,#28
		3) C1 capacitor shorted.	Fig. 8-14
		4) Platen binding. Check for free movement on shoulder screws.	Fig. 8-13,#3

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 - Low Water Sensor Switch	Closed=No Water
	LS3 - High Water Sensor Switch	Closed=No Water
	LS4 - CR1 Relay Check	Closed=OK
	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 Bus	
	DC1 - Rear Display Data Bus	
	DC2 - Rear Display Data Bus	
	DC3 - Rear Display Data Bus	
	DC4 - Rear Display Data Bus	
	DC5 - Rear Display Data Bus	
	DC6 - Rear Display Data Bus	
	DC7 - Rear Display Data Bus	
	DC8 - Not Used	
	DC9 - Not Used	
	DC10 - Rear Buzzer	

TABLE 6-3 – AC DRIVER OUTPUT SUMMARY

AC0 - S02 - Steam-to-Chamber Valve
AC1 - S03 - Fast-Exhaust Valve
AC2 - S04 - Exhaust-Cooling Valve
AC3 - S21 - Detergent Injector
AC4 - S23 - Chamber Drain Valve
AC5 - S25 - Water-Supply Valve
AC6 - S26 - Steam-to-Compressor Valve
AC7 - SA1 - Door Interlock

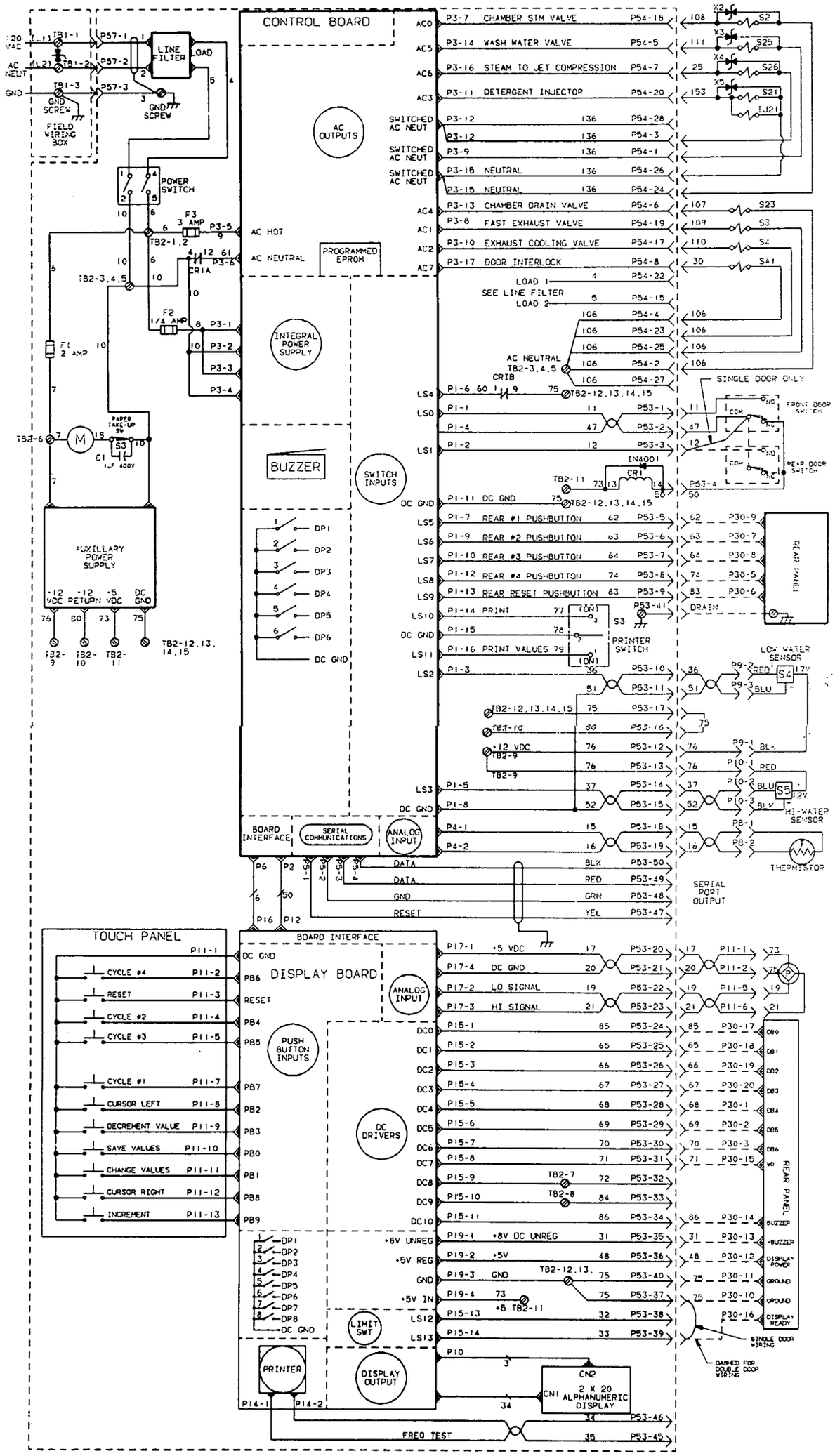
TABLE 6-4 – DEFAULT VALUES SUMMARY DEAD BATTERY IC. . .OR AFTER "MEMORY CLEAR" FUNCTION

Cycle 1 - Wash/Sterilize - 8:30 minutes wash - 270°F (132°C) sterilize for 3 minutes - 1-minute dry
Cycle 2 - Flash - 270°F (132°C) for 3 minutes - 1-minute dry
Cycle 3 - Flash - 270°F (132°C) for 10 minutes - 1-minute dry
Cycle 4 - Wash - 8:30 minutes wash
Overtemp - 9.9°F (5.5°C) above set sterilize temp
Overdrive - 3.0°F (1.5°C) above set sterilize temp
Undertemp - 2.0°F (1.0°C) below set sterilizing temp
Wash Time - 8:30 minutes
Wash Temperature - 75°F (24°C)

TABLE 6-5 – SCHEMATIC REFERENCE LIST

Listed below are reference drawings which are presented immediately after this table.

Title	Sheet	Reference Number
SYSTEM SCHEMATIC: Washer/Sterilizer	1 of 1	P-146653-203
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
PIPING SCHEMATIC: Washer/Sterilizer	1 of 1	—
MASTER WIRE LIST	1 of 2 2 of 2	— —



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System Schematic - Washer/Sterilizer

7/08/88 P-146553-203

BILL OF MATERIAL CONTINUED:

			1	129359-050	77	HEADER	J1	18 PIN
			1	129357-549	78	HEADER STRAIGHT	J2	50 PINS
			1	129360-550	79	HEADER STRAIGHT	J3	17 PINS
			1	129357-567	80	CONNECTOR	J4	2 PIN
			1	129357-572	81	CONNECTOR	J5	4 PIN
			1	129360-426	82	CONNECTOR	J6	6 PIN
					83			
			2	93902-422	84	HEADER, 12POS	H1, H2	
			7	129357-237	85	SHUNT	LOW PROFILE	
			1	129360-193	86	SWITCH, DIP	S16	6 POS
			5	129360-200	87	TEST POINTS	TP1, TP5-TP8	
					88			
					89			
					90			
			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
					94			
			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"
					98			
			1	93908-924	99	TRANSFORMER	T1	10V @ 2A PARALLEL
			1	129357-533	100	BUZZER	BZ1	
			1	129357-239	101	CRYSTAL	Y1	12 MHZ

REF. DESIGNATIONS		SPARES		
LAST USED	NOT USED	TYPE	REF. DES.	QTY.
RN10	RN3	2.2K SIP	RN2	1
VR1		2.2K SIP	RN4	1
J6				
S16	S1-S15	100Ω SIP	RN8	1
U28	U27, U19			
C53	[illegible]			
R76	[illegible]			
Q13	Q2, Q3, Q9	DS26LS32	U23	3
D19	[illegible]	DS26LS31	U24	3
TP8	TP2, TP3, TP4,	74LS14	U26	1
H2				
JP5				

QUANTITY			PART NUMBER	ITEM NO	PART NAME	DESCRIPTION, MATERIAL		REV NO	REVISION DATE
		X	146653-201	1	CONTROL BOARD	(MAIN)		9	04-28-88
		1	146653-213	2	DRILL SCHEDULE	(BARE BOARD)			
		8	93909-141	3	TRIAC DRIVER	U1, U2, U5, U7, U9, U11, U13, U15	MOC3032		
		3	129357-531	4	OCTAL LATCHED INVERTING BUFFER	U3, U4, U6	74LS541		
		1	93902-388	5	8 BIT A/D CONVERTER	U8	ADC0804		
		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		
				11					
		2	129046-001	12	HEX OPEN COLLECTOR INVERTER	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	BATTERY BACKED RAM & CLOCK	U25	MK48T02B-25		
		1	129356-050	17	HEX SCHMITT TRIGGER	U26	74LS14		
		1	129359-193	18	SCHMITT TRIGGER NAND	U28	74HCT132		
				19					
				20					
		1	93909-597	21	THYRISTOR, REVERSE BLOCK DIODE	Q1	MCR 69-1		
		8	93902-393	22	TRIACS	Q4-Q8, Q10-Q12	MAC3030-8		
		1	129357-908	23	TRANSISTOR	Q13 NPN	2N6426		
				24					
				25					
		14	129360-188	26	DIODE, SUPPRESSOR	D1, D6-D18	P6KE8.2		
		1	93902-385	27	VOLTAGE REF.	D2	LM336Z-2.5V		
		2	129357-535	28	DIODE	D3, D4	MR500		
		2	84157-001	29	DIODE	D5, D19	1N4001		
				30					
				31					
		1	129360-526	32	VOLTAGE REGULATOR	VR1	LM323K OR 78T05K		
				33					
				34					
				35					
		1	129360-006	36	TRIMMER/RESISTOR	R4	500Ω		
		1	129360-005	37	TRIMMER/RESISTOR	R10	200Ω		
		2	93900-340	38	RESISTOR	R1, R37	27.4Ω		
		1	93900-329	39	RESISTOR	R2	562Ω		
		1	93902-411	40	RESISTOR	R3	9.09K		
		2	93902-410	41	RESISTOR	R5, R27	2.49K		
		1	93900-337	42	RESISTOR	R6	909Ω		
		1	93902-405	43	RESISTOR	R7	464Ω		
		2	93900-319	44	RESISTOR	R8, R9	100K		
		1	93900-318	45	RESISTOR	R11	100Ω		
		6	93900-302	46	RESISTOR	R12, R17, R18, R38, R42, R72	10K		
				47					
		9	93900-308	48	RESISTOR	R15, R19, R20, R22, R29, R30, R33, R42, R50	1K		
		6	93902-402	49	RESISTOR	R21, R23, R24, R32, R34, R39, R45, R46	200Ω		
		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	22Ω		
		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 120Ω		
		3	129360-190	59	RESISTOR NET	RN8, RN9, RN10	4 X 100Ω ISOLATED		
				60					
				61					
				62					
		21	150822-822	63	CAPACITOR, CERAMIC	[illegible]	0.1μf		
		1	56396-698	64	CAPACITOR, CERAMIC	C10	10pf		
		1	56396-697	65	CAPACITOR, CERAMIC	C28	5.1pf		
		1	56396-704	66	CAPACITOR, CERAMIC	C35	.33μf		
		1	56396-701	67	CAPACITOR, CERAMIC	C37	150pf		
		8	93436-004	68	CAPACITOR, CERAMIC	C43-C50	0.1μf @ 500V		
		2	56396-692	69	CAPACITOR, ELECTROLYTIC	C27, C42	1μf		
		1	129360-542	70	CAPACITOR, ELECTROLYTIC	C33	15,000μf @ 25V		
		2	56396-694	71	CAPACITOR, ELECTROLYTIC	C40, C41	10μf		
		1	56396-695	72	CAPACITOR, ELECTROLYTIC	C52	47μf		
				73					
				74					
				75					
				76					

Control PC Board Assembly
Part 1 of 4
4/28/88 P-146653-201

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 CONTINOUS 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 ASSEMBY TO THE P.C. BOARD WITH THE REST OF THE PARTS. DO NOT MASK OFF EYELETS FOR MOUNTING SCREWS DURING WAVE SOLDERING.

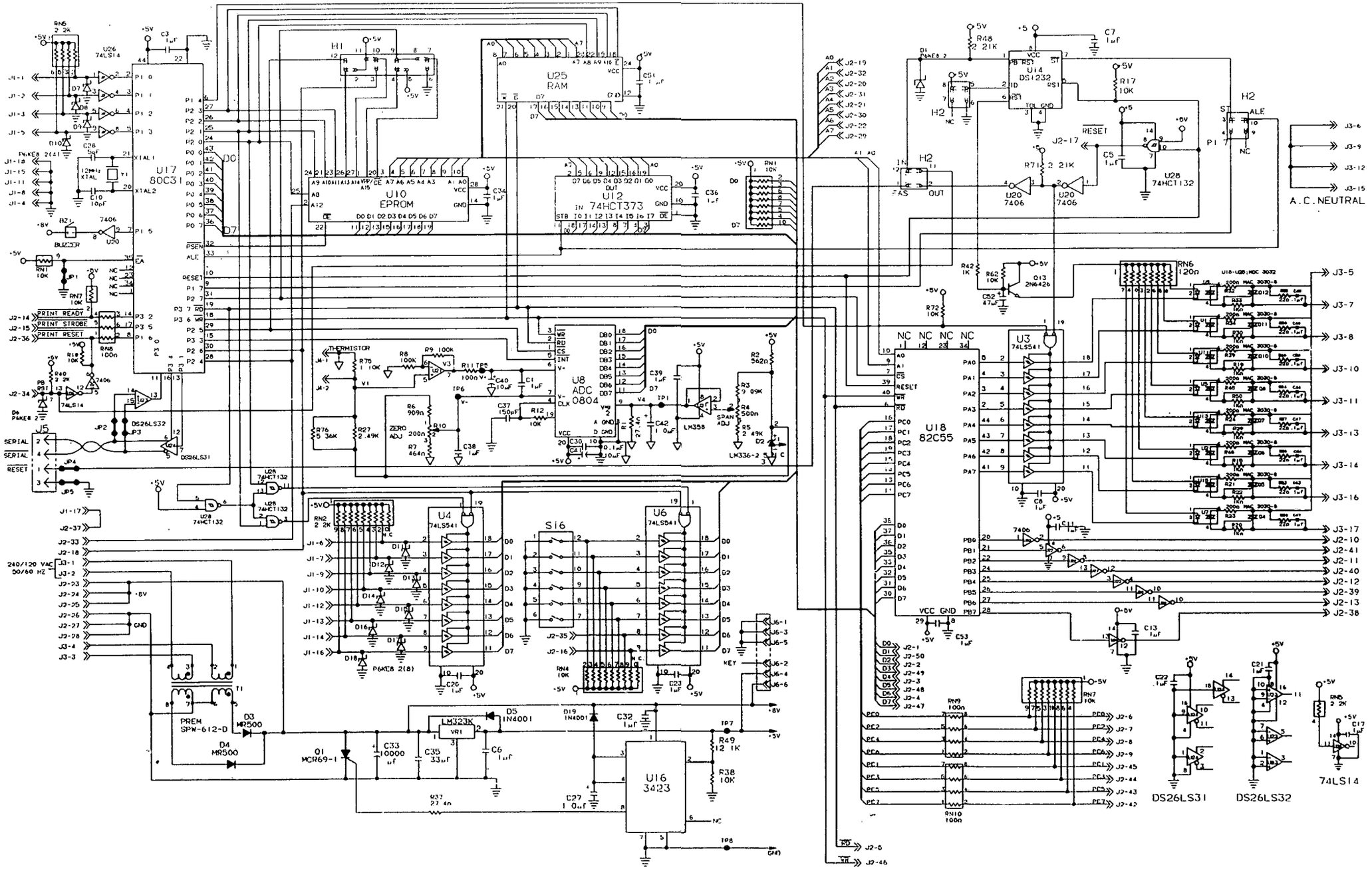
7. EPROM U10 IS ADDED AT A HIGHER ASSEMBLY LEVEL. EPROM U10 IS PLUGGED INTO A 28 PIN SOCKET (ITEM #93). SEE TABLE AT LEFT FOR JUMPERING.

8. RAM U25 IS PLUGGED INTO A 24 PIN SOCKET (ITEM #92)

9. STAMP CURRENT REVISION LEVEL ON BOARD IN SPACE PROVIDED.

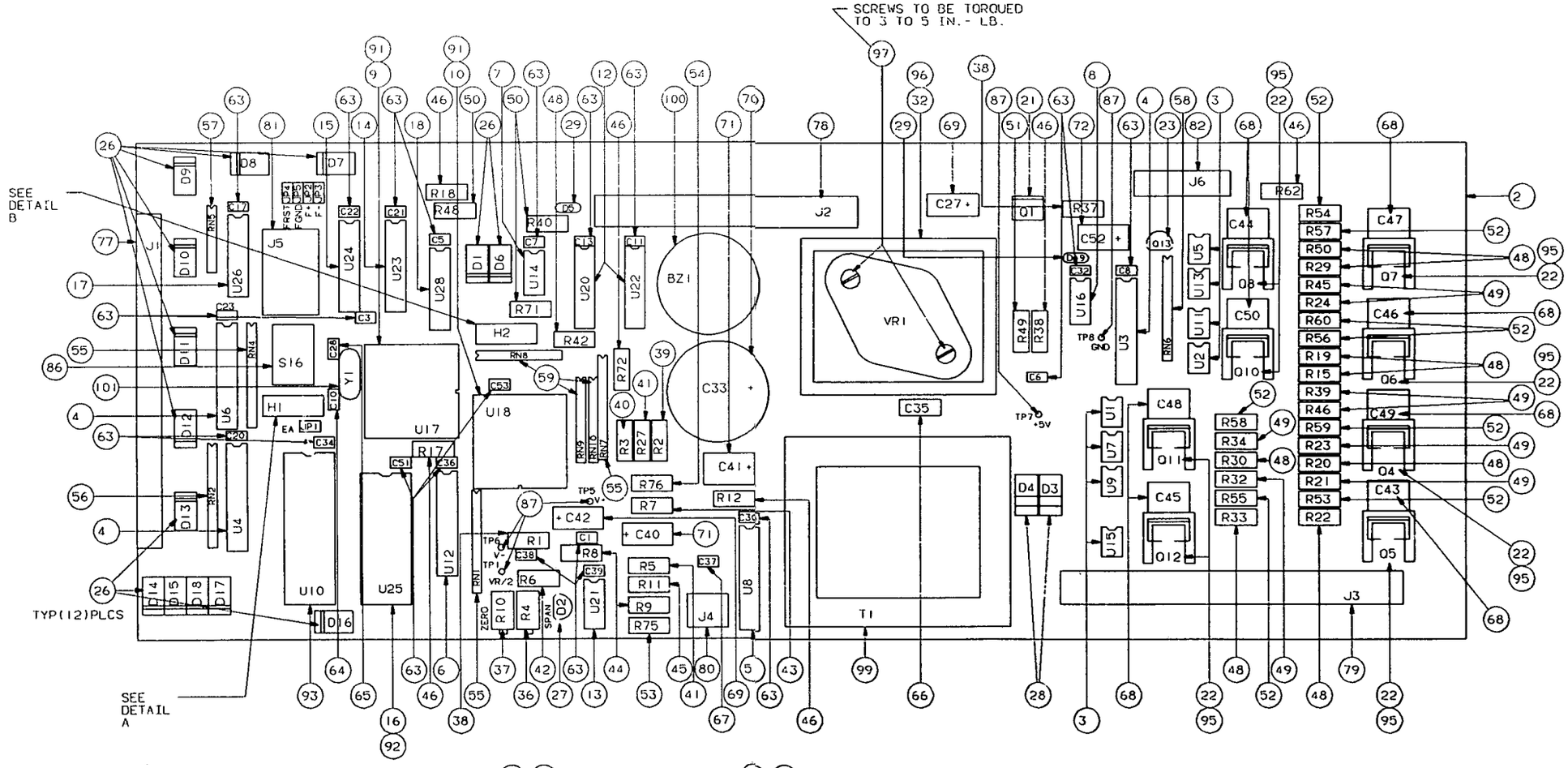
10. MOUNT CRYSTAL Y1 (ITEM 101) VERTICALLY WITH APPROX. 0.05" SPACING BETWEEN CRYSTAL AND BOARD. USE WASH AWAY SPACERS AS FOLLOWS:
    -DYNALOY CATALOG NO. D548-AW-.055, OR
    -BIVAR CATALOG NO. TO-201-05.

Control PC Board Assembly
Part 2 of 4
4/28/88 P-146653-201



Control PC Board Assembly
Part 3 of 4

4/28/88 P-146653-201



Control PC Board Assembly
Part 4 of 4

4/28/88 P-146653-201

NOTES:

1. MUST BE U.L. APPROVED.

2. REQUIREMENTS FOR ARTWORK LAYOUT:
   - COMPONENT SYMBOLIZATION
   - DRILL SCHEDULE
   - SOLDER MASK
   - ARTWORK

3. REQUIREMENTS FOR P.C. BOARD ASSEMBLY:
   - COMPONENT SYMBOLIZATION
   - SOLDER MASK

4. STAMP CURRENT REVISION LEVEL ON BOARD IN SPACE PROVIDED.

5. MOUNT CRYSTAL Y1, ITEM 17, VERTICALLY WITH APPROX. .05" SPACING BETWEEN CRYSTAL AND BOARD. USE WASH AWAY SPACERS AS FOLLOWS:
   -DYNALOY CATALOG NO. D548-AW-.055, OR
   -BIVAR CATALOG NO. TO-201-05.

6. HEAT SINK, ITEM #105, IS TO BE MOUNTED TO BOARD AND VOLTAGE REGULATOR, ITEM #87, IS TO BE MOUNTED TO HEAT SINK WITH SCREWS, ITEM #106, LOCKWASHERS, ITEM #108, AND NUTS, ITEM #107. USE WHITE SILICON GREASE - DOW CORNING CORP. #340, GE #G641 OR CASTEL #A-800 - BETWEEN REGULATOR AND HEAT SINK.

7. FINGER TIGHTEN SCREW, ITEM #102, WASHER, ITEM #103, AND NUT, ITEM #101. THEN TIGHTEN SCREW OR NUT AN ADDITIONAL 1/4 TO 1/2 TURN AND APPLY EPOXY (HYSOL 0151).

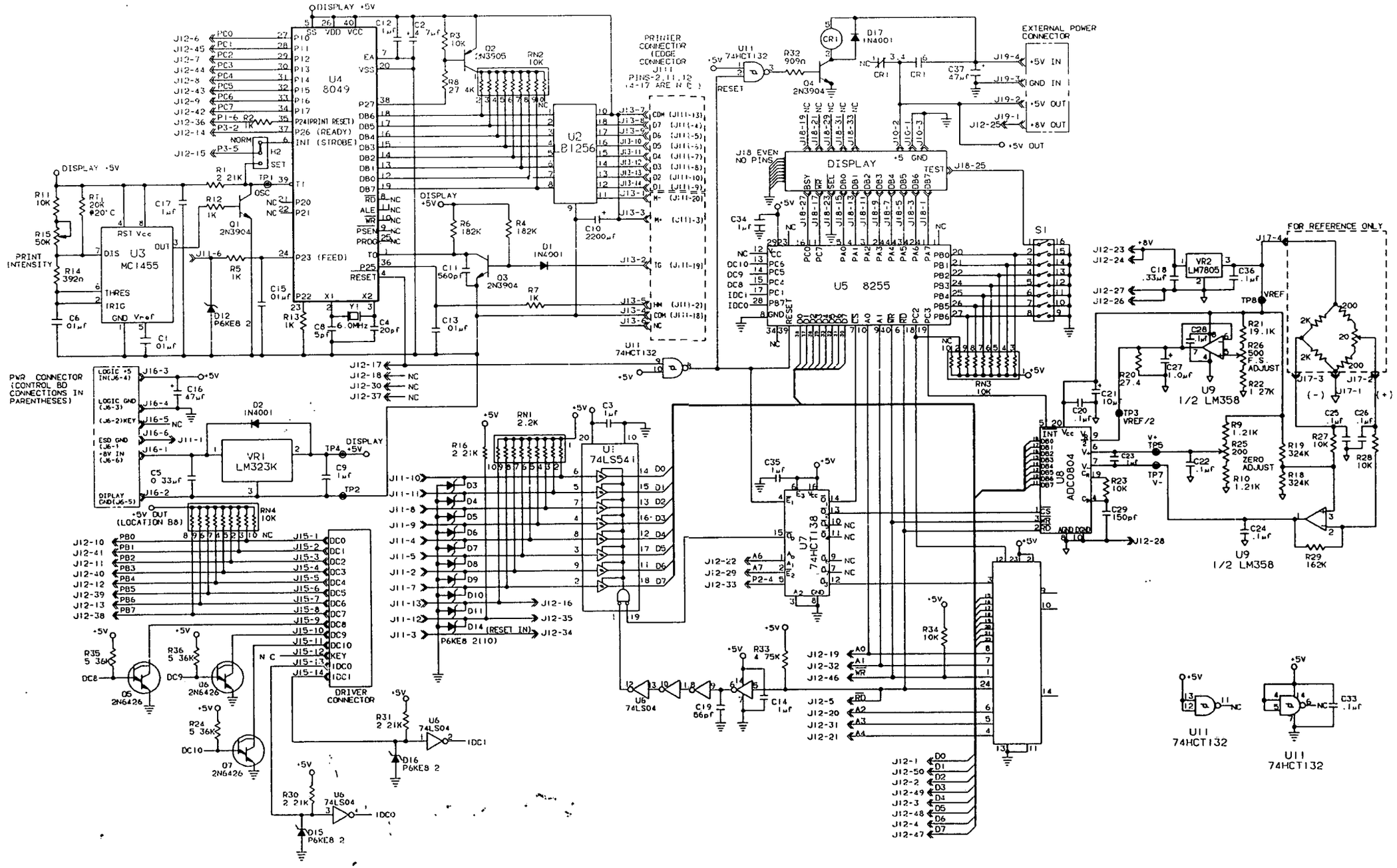
8. LOCATIONS MARKED TP6, U10, C32, C30, C31, Y2, B1, & H1 ON BOARD ARE TO REMAIN EMPTY.

REF. DESIGNATIONS		SPARES		
LAST USED	NOT USED	TYPE	REF. DES.	QUANTITY
U11	U10	SCHMITT TRIGGER NAND	U11	2
C37	C7, C30-C32	10K SIP	RN2	1
R36	R17	10K SIP	RN3	1
RN3				
J19	J14			
TP8	TP6			
D17				
VR2				
Y1				
S1				
Q7				
H2	H1			
RT1				

QUANTITY	PART NUMBER	ITEM NO	PART NAME	DESCRIPTION, MATERIAL
		76		
		77		
3	84157-001	78	DIODE	D1, D2, D17 1N4001
13	129360-188	79	DIODE, SUPPRESSOR	D3-D12, D14-D16 P6KE8.2
		80		
3	129357-908	81	TRANSISTOR, NPN	Q5, Q6, Q7 2N6426
3	129357-534	82	TRANSISTOR, NPN	Q1, Q3, Q4 2N3904
1	84171-003	83	TRANSISTOR, PNP	Q2 2N3905
		84		
		85		
		86		
1	129360-526	87	VOLTAGE REGULATOR	VR1 LM323K(78T05K) 3 AMP 5V
1	129357-246	88	VOLTAGE REGULATOR	VR2 LM7805CT 1 AMP 5V
		89		
		90		
		91		
1	129360-198	92	DIP SWITCH	S1 8 POS. SPST
1	93909-144	93	RELAY	CR1
		94		
1	129360-024	95	HEADER	H2 2 PIN
		96		
7	129360-200	97	TEST POINTS	TP1-TP5, TP7, TP8
		98		
1	136806-643	99	PRINTER	MTP201-24BJ
1	129357-737	100	SPACER	UNDER PRINTER
2	129357-898	101	NUT	#1-64 FOR PRINTER
2	129357-897	102	SCREW, RD. HD.	#1-64 THD. FOR PRINTER
2	129357-902	103	WASHER, FLAT	.084 ID X .219 OD FOR PRINTER
		104		
1	129360-548	105	HEAT SINK	TO-3 FOR VR1
2	81669-007	106	SCREW	#6 X 3/8"LG. FOR HEAT SINK
2	129360-432	107	NUT	#6 FOR HEAT SINK
2	81683-001	108	WASHER, LOCK	#6 FOR HEAT SINK

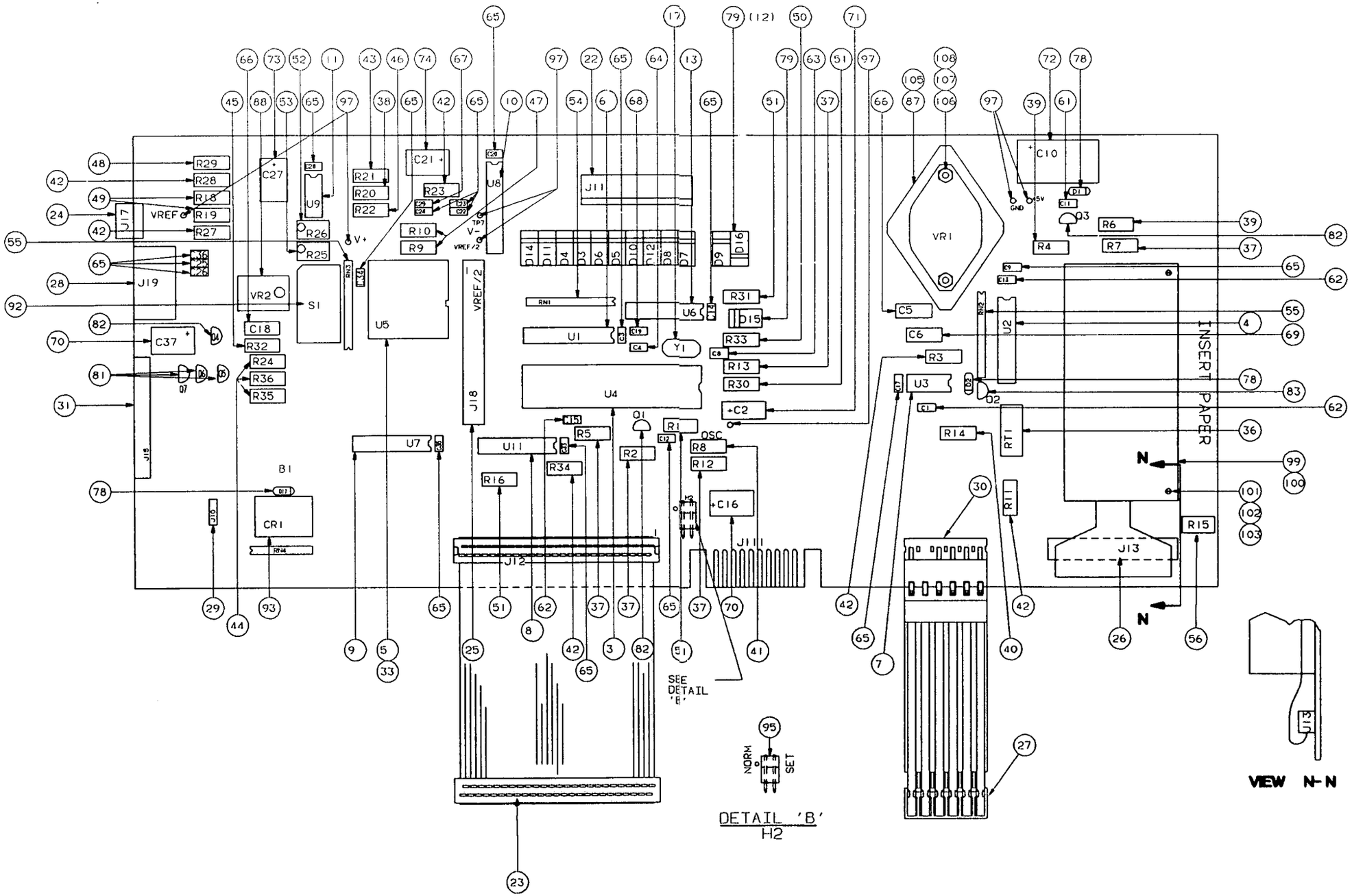
QUANTITY	PART NUMBER	ITEM NO	PART NAME	DESCRIPTION, MATERIAL	REV NO	REVISION DATE
X	146653-037	1	PRINTER BOARD		2	07-14-88
1	136807-130	2	DRILL SCHEDULE	(BARE BOARD)		
1	129357-519	3	MICROPROCESSOR	U4 UPD-8049		
1	93902-387	4	PRINTER DRIVER I.C.	U2 LB-1256		
1	129360-447	5	PERIPHERAL INTERFACE	U5 N82C55A		
1	129357-531	6	OCTAL LINE DRIVER/RECEIVER	U1 74LS541		
1	93902-420	7	TIMING CIRCUIT	U3 MC1455P1		
1	129359-193	8	SCHMITT TRIGGER NAND	U11 74HCT132		
1	129359-192	9	3-TO-8 LINE DECODER	U7 74HCT138		
1	93902-388	10	8 BIT A/D CONVERTER	U8 ADC0804		
1	93902-386	11	DUAL OP AMP	U9 LM358N		
		12				
1	129356-090	13	HEX BUFFER	U6 74LS04		
		14				
		15				
		16				
1	129356-091	17	CRYSTAL	Y1 6 MHZ		
		18				
		19				
		20				
		21				
1	129357-555	22	CONNECTOR	J11 (OPERATOR PANEL)		
1	93909-598	23	CONNECTOR	J12 (EXPANSION)		
1	129360-429	24	CONNECTOR	J17 (TRANSDUCER)		
1	93908-443	25	CONNECTOR	J18 (DISPLAY) 34 PIN		
1	129360-547	26	CONNECTOR	J13 (PRINTER)		
1	93909-146	27	CABLE ASS'Y	P16 (POWER)		
1	129359-446	28	CONNECTOR	J19 (EXT. POWER)		
1	93908-998	29	CONNECTOR	J10		
1	129360-427	30	HEADER, POST	J16		
1	129360-431	31	HEADER, POST	J15		
		32				
1	93909-145	33	SOCKET, CHIP CARRIER	FOR U5 44 PIN PLCC		
		34				
		35				
1	129360-199	36	THERMISTOR	RT1		
5	93900-308	37	RESISTOR 1%	R2, R5, R7, R12, R13 1K		
1	93900-340	38	RESISTOR 1%	R20 27.4Ω		
2	93902-416	39	RESISTOR 1%	R4, R6 182KΩ		
1	93902-404	40	RESISTOR 1%	R14 392Ω		
1	93900-309	41	RESISTOR 1%	R8 27.4KΩ		
6	93900-302	42	RESISTOR 1%	R3, R11, R23, R27, R28, R34. 10KΩ		
1	93900-345	43	RESISTOR 1%	R21 19.1K		
3	93900-344	44	RESISTOR 1%	R24, R35, R36 5.36K		
1	93900-337	45	RESISTOR 1%	R32 909Ω		
1	93900-353	46	RESISTOR 1%	R22 1.27K		
2	93902-407	47	RESISTOR 1%	R9, R10 1.21KΩ		
1	93900-341	48	RESISTOR 1%	R29 162KΩ		
2	93900-342	49	RESISTOR 1%	R18, R19 324KΩ		
1	93900-307	50	RESISTOR 1%	R33 4.75KΩ		
4	93900-310	51	RESISTOR 1%	R1, R16, R30, R31 2.21K		
1	129357-523	52	TRIMMER/RESISTOR	R26 (ZERO) 500Ω		
1	129357-522	53	TRIMMER/RESISTOR	R25 (OFFSET) 200Ω		
1	129357-573	54	RESISTOR NET	RN1 2.2K		
3	129330-004	55	RESISTOR NET	RN2, RN3, RN4 9 X 10KΩ		
1	150822-800	56	TRIMPOT	R15 50KΩ		
		57				
		58				
		59				
		60				
1	56396-702	61	CAPACITOR, CERAMIC	C11 560pf		
3	56396-703	62	CAPACITOR, CERAMIC	C1, C13, C15 .01μF, X7R		
1	56396-697	63	CAPACITOR, CERAMIC	C8 5.1pf		
1	56396-699	64	CAPACITOR, CERAMIC	C4 18pf		
16	150822-822	65	CAPACITOR, CERAMIC	C2, C3, C12, C14, C17, C20, C22-C24, C28, C30-C32 .1μF		
2	56396-704	66	CAPACITOR, CERAMIC	C5, C18 .33μF		
1	56396-701	67	CAPACITOR, CERAMIC	C29 150pf		
1	56396-700	68	CAPACITOR, CERAMIC	C19 56pf		
1	56396-705	69	CAPACITOR, CERAMIC	C6 .01μF, COG		
2	56396-695	70	CAPACITOR, ELECTROLYTIC	C16, C37 47 μF		
1	56396-693	71	CAPACITOR, ELECTROLYTIC	C2 4.7μF		
1	129357-524	72	CAPACITOR, ELECTROLYTIC	C10 2200μF		
1	56396-692	73	CAPACITOR, ELECTROLYTIC	C27 1.0μF		
1	56396-694	74	CAPACITOR, ELECTROLYTIC	C21 10 μF		
		75				

Printer PC Board Assembly
Part 1 of 3
7/14/88 P-146653-037

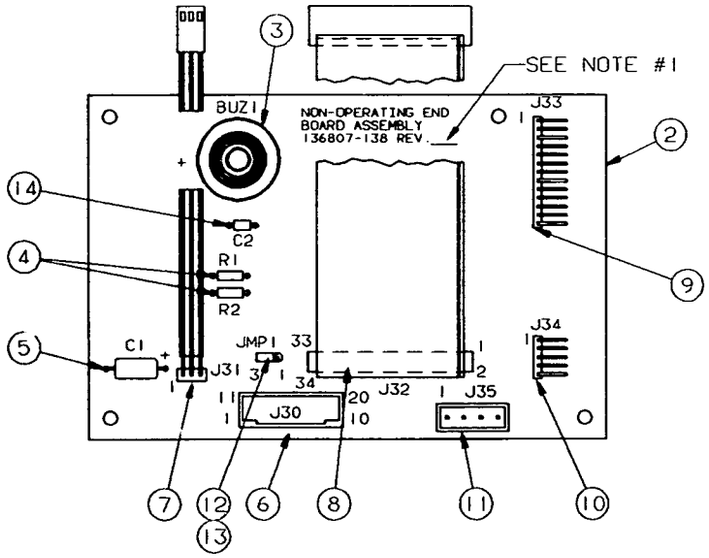


Printer PC Board Assembly
Part 2 of 3

7/14/88 P-146653-037



Printer PC Board Assembly
Part 3 of 3
7/14/88

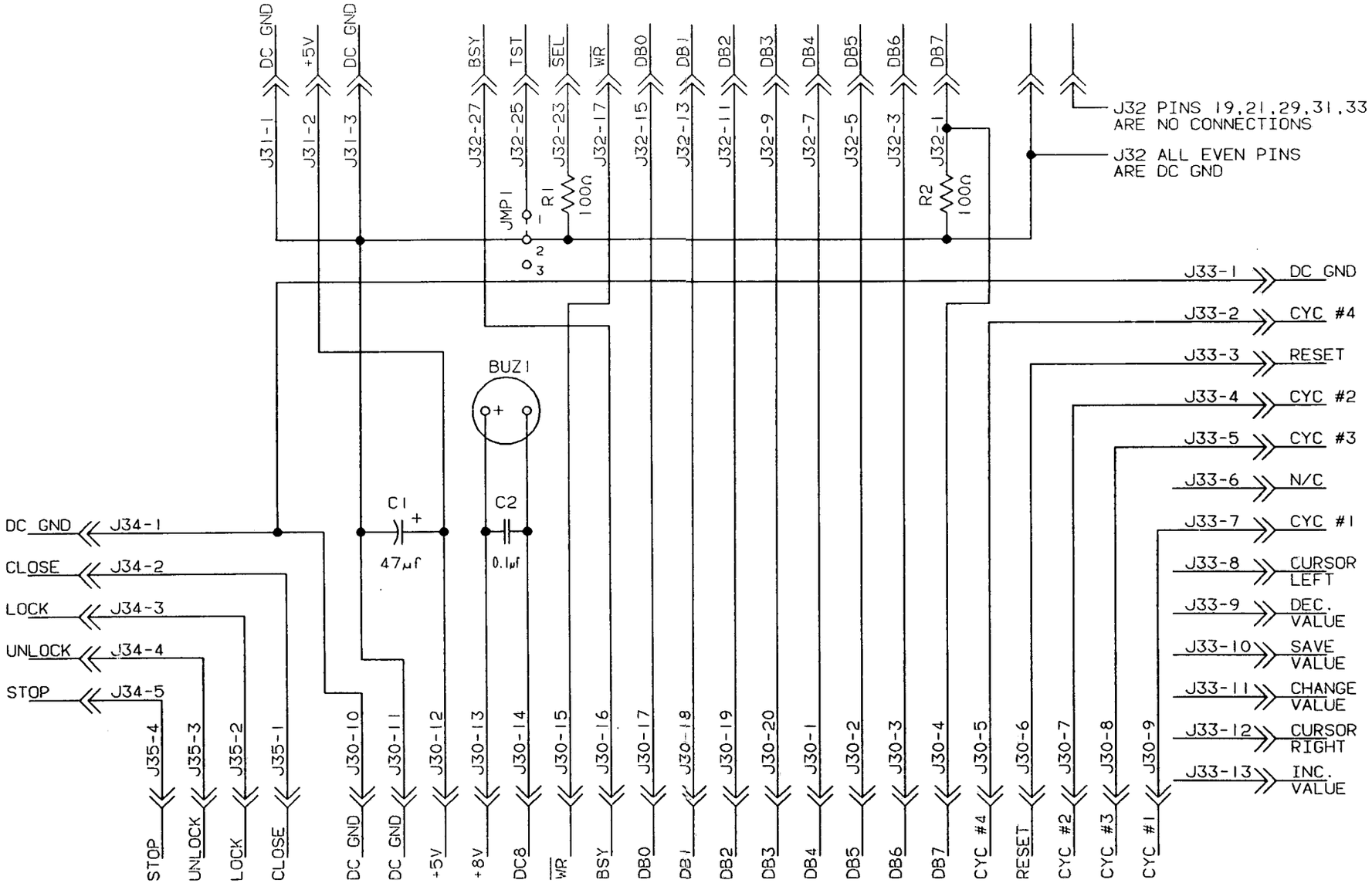


QUANTITY				PART NUMBER	ITEM NO	PART NAME	DESCRIPTION, MATERIAL	REV NO	REVISION DATE
			XXX	136807-138	1	N.O.E BOARD	ASSEMBLY	2	10-03-88
			1	136807-137	2	N.O.E BOARD			
			1	129357-533	3	BUZZER	BUZ1		
			2	93900-102	4	RESISTOR	R1,R2 100Ω		
			1	56396-695	5	CAPACITOR	C1 47μf		
			1	84232-007	6	HEADER	J30 20 POS.		
			1	93908-998	7	CONN. ASS'Y.	J31 3 POS.		
			1	93908-443	8	HARNESS,INTERNAL	J32 34 POS.		
			1	129357-555	9	HEADER,RIGHT ANGLE	J33 13 POS.		
			1	129360-811	10	HEADER,RIGHT ANGLE	J34 5 POS.		
			1	129360-810	11	HEADER	J35 4 POS.		
			1	129359-444	12	HEADER	JMP1 3 POS.		
			1	129357-237	13	SHUNT			
			1	150822-822	14	CAPACITOR, CERAMIC	C2 0.1μf		

NOTE:

1. STAMP LATEST REVISION NUMBER USING APPROX. 14 PT. WHITE LETTERING.

Non-Operating End PC Board Assembly
Part 1 of 2
10/03/88 P-136807-138



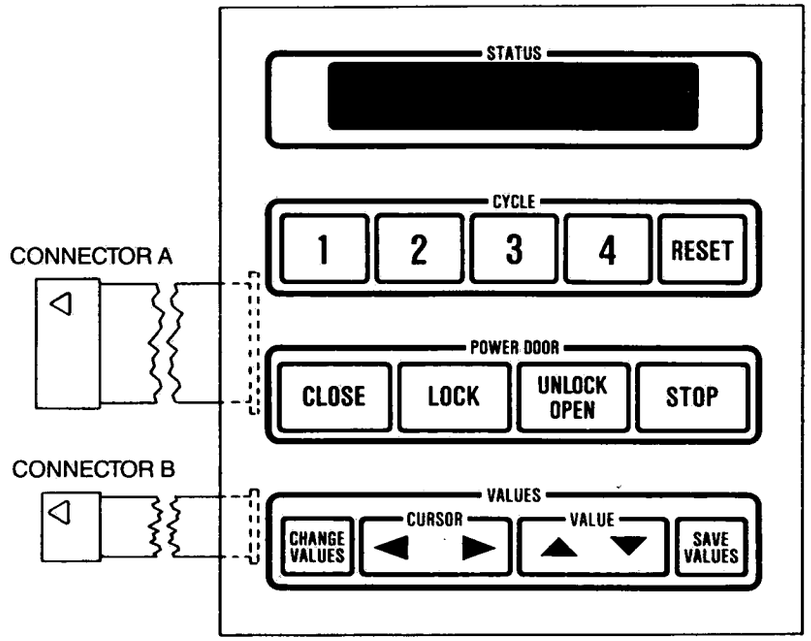
Non-Operating End PC Board Assembly
Part 2 of 2
10/03/88 P-136807-138

AMSCO SERVICE

EAGLE 3000 SERIES WASHER/STERILIZER P-764322-698

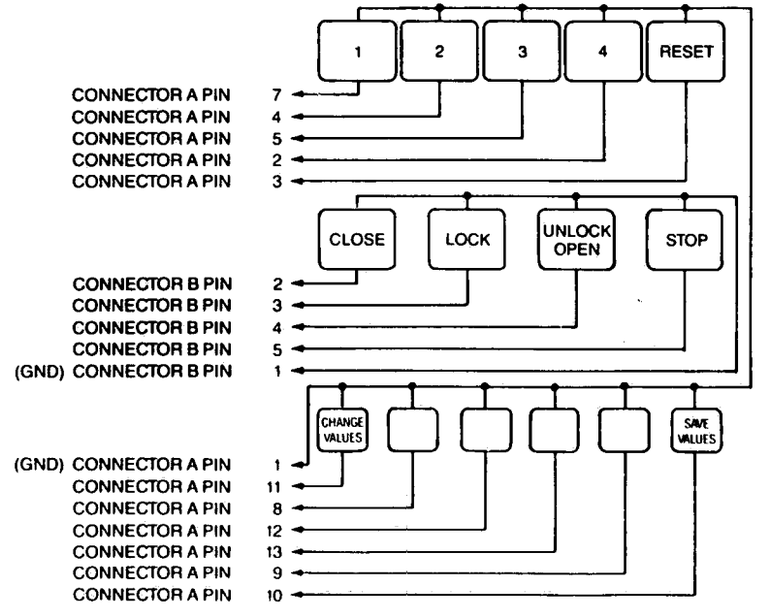
1/89

1 of 2



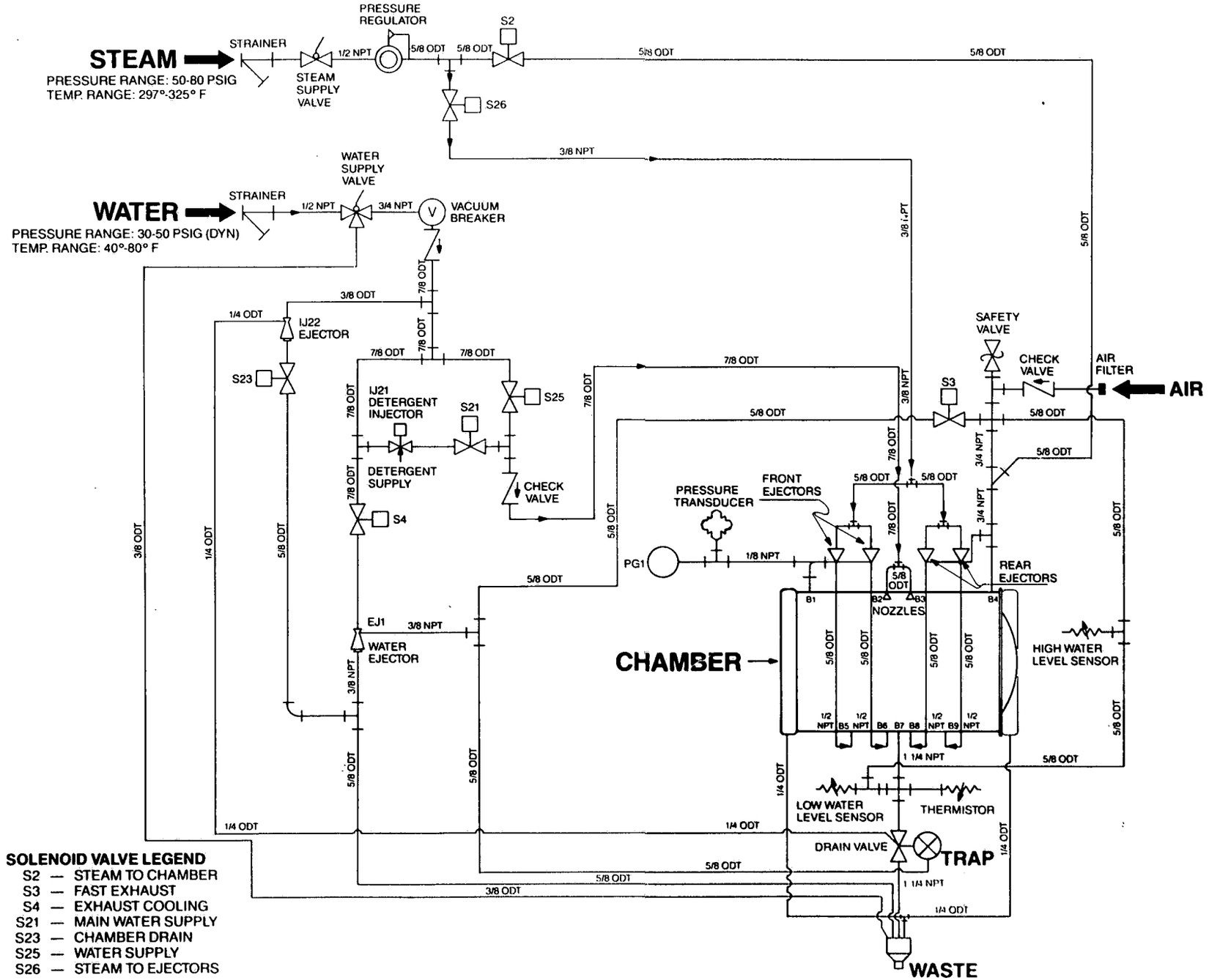
NOTES:

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.



Touch Panel Schematic, Operating End

5/23/88 P-136806-685



Piping Schematic - Washer/Sterilizer
12/88

WIRE NO.	COLOR	FROM	TO	REMARKS
1	RED	P57-1	LINE 1	
1	BLACK	P57-1	- - - -	2 CONDUCTOR CABLE
1	BLACK	P57-1	L1	
2	BLACK	P57-2	LINE 2	
2	RED	P57-2	- - - -	2 CONDUCTOR CABLE
2	RED	P57-2	L2	
3	GREEN	P57-3	GND	
3	GREEN	P57-3	- - - -	
3	GREEN	P57-3	L3	
3	GREEN	L3	GND	
4	BLACK	SW1-4	LOAD 1	
4	BLACK	P54-22	LOAD 1	
4	BLACK	- - - -	- - - -	
4	BLACK	- - - -	P54-22	
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 47	RED BLACK	P1-1 P1-4	P53-1 P53-2	TWISTED PAIR
11 47	RED BLACK	P53-1 P53-2	LSF LSF	TWISTED PAIR
12	GRAY	P53-3	LSR	DD ONLY
12	GRAY	P53-3	LSF	SD ONLY
12	GRAY	P1-2	P53-3	
15 16	RED BLACK	P53-18 P53-19	P8-1 P8-2	TWISTED PAIR
15 16	RED BLACK	P53-18 P53-19	P4-1 P4-2	TWISTED PAIR
17 20	RED BLACK	P53-20 P53-21	P11-1 P11-2	TWISTED PAIR

WIRE NO.	COLOR	FROM	TO	REMARKS
17 20	RED BLACK	P17-1 P17-4	P53-20 P53-21	TWISTED PAIR
18	BLACK	- - - -	- - - -	
18	WHITE	SW3-NC	#18 FREE HANGING	
18	WHITE	#18 FREE HANGING	PAPER TAKE-UP MTR	
19 21	RED BLACK	P53-22 P53-23	P11-5 P11-6	TWISTED PAIR
19 21	RED BLACK	P53-22 P53-23	P17-3 P17-2	TWISTED PAIR
25	YELLOW	P3-16	P54-7	
25	BLACK	P54-7	S26	
30	YELLOW	P3-17	P54-8	
30	BLACK	P54-8	SA1	
31	GRAY	P53-35	P19-1	
31	BLACK 1	P53-35	P30-13	20 CONDUCTOR CABLE - DD ONLY
32	GRAY	P53-38	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 51 76	RED BLACK WHITE	P53-10 P53-11 P53-12	P9-2 P9-3 P9-1	3 CONDUCTOR CABLE
36 51	RED BLACK	P1-3 P1-8	P53-10 P53-11	TWISTED PAIR
37 52 76	RED BLACK WHITE	P53-14 P53-15 P53-13	P10-2 P10-3 P10-1	3 CONDUCTOR CABLE
37 52	RED BLACK	P1-5 P53-15	P53-14 P1-8	TWISTED PAIR
47	GRAY	LSF	LSR	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	DD ONLY
50	GRAY	P53-4	LSF	DD ONLY
50	GRAY	P53-4	LSF	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	- - - -	
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 CONDUCTRO 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	

WIRE NO.	COLOR	FROM	TO	REMARKS
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	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	P53-17	P53-16	SD ONLY
75	GRAY	P53-37	P53-39	SD ONLY
75	GRAY	P53-37	TB2-14	
75	GRAY	P53-40	TB2-14	
75	GRAY	P53-17	- - - -	
75	GRAY	P19-3	- - - -	
75	GRAY	P53-37	- - - -	
75	GRAY	P1-11	- - - -	
75	GRAY	- - - -	- - - -	
75	GRAY	P53-40	- - - -	
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	

Master Wire List - 12/88
Part 1 of 2

WIRE NO.	COLOR	FROM	TO	REMARKS
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	P54-25	S3	
106	WHITE	SPLICE CONN.	TB2-4	
106	WHITE	- - - -	P54-25	
106	WHITE	- - - -	P54-23	
106	WHITE	P54-23	S4	
106	WHITE	- - - -	P54-2	
106	WHITE	P54-2	S23	
106	WHITE	- - - -	P54-4	
106	WHITE	P54-4	SA1	
106	WHITE	- - - -	- - - -	
106	WHITE	- - - -	P54-27	
107	YELLOW	P3-13	P54-6	
107	BLACK	P54-6	S23	
108	YELLOW	P3-7	P54-18	
108	BLACK	P54-18	PS2	
109	BLACK	P54-19	S3	
109	YELLOW	P3-8	P54-19	
110	YELLOW	P3-10	P54-17	
110	BLACK	P54-17	S4	
111	YELLOW	P3-14	P54-5	
111	BLACK	P54-5	S25	
136	WHITE	P3-9	P54-1	
136	WHITE	P54-1	S25	
136	WHITE	P3-15	P54-24	
136	WHITE	P54-24	S2	
136	WHITE	P3-15	P54-26	
136	WHITE	P54-26	S21	
136	WHITE	P3-12	P54-3	
136	WHITE	P54-3	S26	
136	WHITE	P3-12	P54-28	
136	WHITE	P3-11	P54-20	
136	WHITE	- - - -	U21	
153	BLACK	P54-20	S21	
153	BLACK	- - - -	U21	
	BLK	P53-50	P5-4	
	RED	P53-49	P5-3	
	GRN	P53-48	P5-2	

WIRE NO.	COLOR	FROM	TO	REMARKS
	YELLOW	P53-47	P5-1	
DRAIN	- - - -	- - - -		
DRAIN WIRE	- - - -	P53-41		

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7

SECTION 7
Component Repair, Replacement and Adjustment

7.1 GENERAL

This section includes instructions for the disassembly, repair and replacement of selected washer/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 (Figure 7-1)

The Stage 2 control pivots forward and down to a horizontal position for easy service.

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.

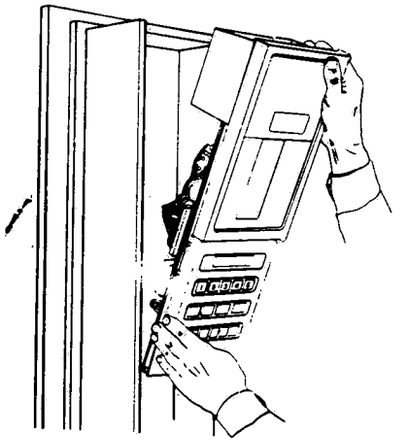


FIGURE 7-1 – Preparing Control for Service

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 the 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.

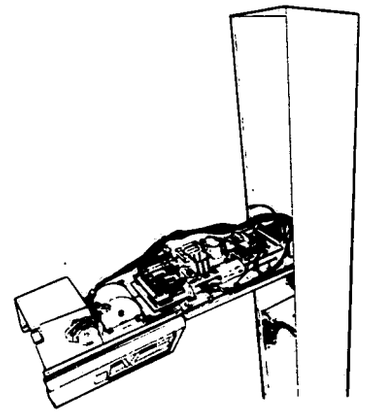


FIGURE 7-2 – Control in Service Position

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, 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.)
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

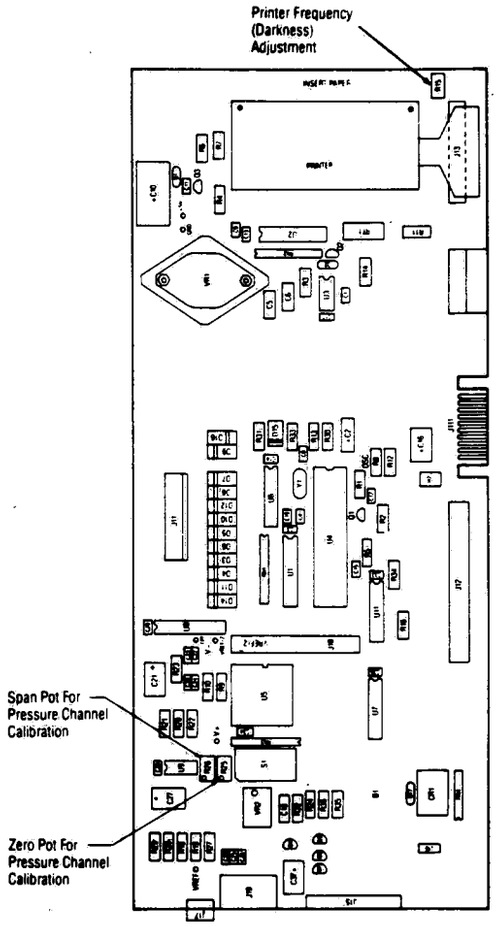


FIGURE 7-3 – Printer PC Board

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 keys, review the procedure for **Changing Values** in Section 2.3.

Changing Factory Settings

Do not change cycle temperature setpoints 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 WASHER-STER *   <- Rev level/date (may vary)
*   E2WA03.ABS 7/10/88   *
* 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 CVPB TO CHANGE       <- Change Values touch pad
  PUSH SVPB 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.

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.

TABLE 7-2 – CYCLE PARAMETER DEFINITIONS

Parameter	Definition
TS-1	Operator-set sterilizing temperature.
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.

Setting Cycle Parameters

- **DISPLAY 1**

```
SERVICE TEST
WASHER-STERILIZER
```

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 built, 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**

```
WASH TEMP = 075F
PURGE = 2:00
```

SETTING	FUNCTION	STANDARD SETTING
Wash Temp	Wash water temperature control in WASH phase	75°F (24°C) settable from 60-120°F (16-49°C)
Purge	Conditioning steam purge time	2:00 min

Use cursor keys to change values if desired. Press CHANGE VALUES to continue.

- **DISPLAY 5**

```
OVERTEMP = 9.9F
UNDERTEMP = 2.0F
```

SETTING	FUNCTION	STANDARD SETTING
Undertemp	Undertemp alarm setpoint	2.0°F (1.0°C)
Overtemp	Overtemp alarm setpoint	9.9°F (5.5°C)

Use cursor keys to change values if desired. Press CHANGE VALUES to continue.

- **DISPLAY 6**

```
OVERDRIVE = 3.0F
```

SETTING	FUNCTION	STANDARD SETTING
Overdrive	TS-2 setpoint	3.0°F (1.5°C)

Use cursor keys to change values if desired.

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:

```
        V A L U E S
    WASHER/STERILIZER
10/11/88      10:44:25 A   ← current time/date
1.  FLASH                  ← type of cycle is typical
  STER TEMP = 270.0°F
  STER TIME = 03:00        ← default settings shown
   DRY TIME = 01:00
 -------------------------
  WASH TIME = 8:30         ← wash only format
 -------------------------
  WASH TIME = 8:30         ← wash/sterilize format
  STER TEMP = 270°F
  STER TIME = 03:00
   DRY TIME = 01:00
 -------------------------
```

Control settings are then printed as follows:

```
CONTROL:
 WASH TEMP = 75°F
PURGE TIME = 2:00
 OVERDRIVE = 3.0°F
  OVERTEMP = 9.9°F
 UNDERTEMP = 2.0°F
  RUN TIME = 00635.4 hrs
 -------------------------
```

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.

Display shows, for five seconds:

```
* CHECK VALVES
BY PRESSING PBs
```
← "PBs" short for touch pads

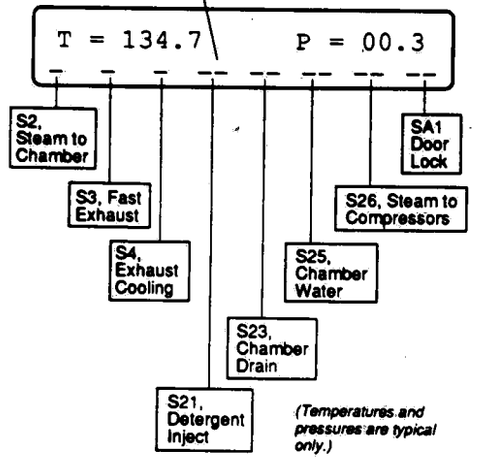
At this point, if the door is not locked, the display shows:

```
T = 134.7        P = 00.3
PLEASE CLOSE DOOR!
```

. . .where temperature and pressure are in units as selected by Dip switch setting.

When the door is locked, the display shows:

Note: A "--" indicates solenoids are off



(Temperatures and pressures are typical only.)

The printer prints:

```
TEST  10/11/88 19:06:02A   ← current date/time
- TIME     T=°F  P=psig
 -------------------------
```

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 S23 is pressed, the display indicates:

```
T = 134.7        P = 00.3
_  _  _  __ 23  __ __ __
```

If the touch pad for S23 is pressed again, S23 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:

```
-  TIME     T=°F  P=psig
 -------------------------
F 09:12:54A 235.7 09.4   ← Demand print
F 09:14:32A 272.3 32.8   ← Demand print
```

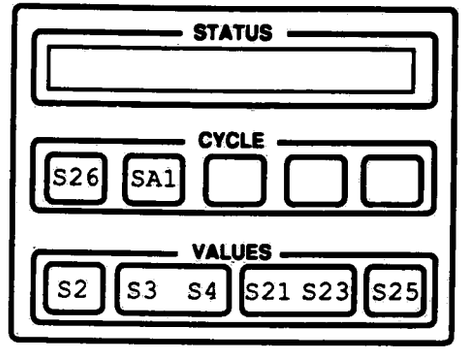


FIGURE 7-4 – Valve-Control Touch Pads

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/DRAINING
```

and S3, S23 and S4 turn on to dump any water or pressure left in the chamber from the solenoid valve test. The display then shows, for three seconds:

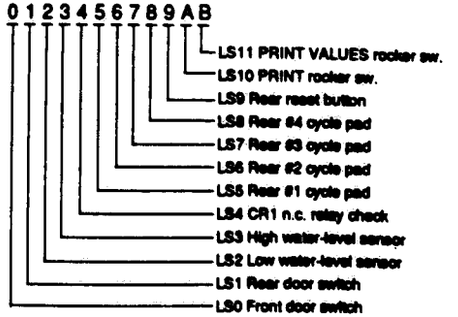
```
TEST 2 - LIMIT SW
```

The display then shows:

```
0123456789AB
00-00-------
```

where 0 = limit switch closed, and "-" = limit switch open.

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	No water sensed	Water sensed
LS3	No water sensed	Water sensed
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:

```
0 1 2 3 4 5 6 7 8 9
- - - - - - - - - -
```

- Value UP
- Cursor right
- Cycle #1
- Cycle #4
- Cycle #3
- Cycle #2
- Value DOWN
- Cursor left
- Change Values
- Save Values

When a touch pad is pressed, a "P" (pushed) appears on the display as long as the pad is held, for example:

```
0 1 2 3 4 5 6 7 8 9
- - - - - - - - P -
```

DC Output Test

(Only on program Revisions 0.3 and below)

Pressing certain keys on the front touch panel activates the DC outputs. On a single-door unit, none of the DC outputs are used for anything and this test does not apply. 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:

```
0 1 2 3 4 5 6 7 8 9 A
- - - - - - - - - - -
```

- DC10 - PRINT
- DC9 - Value Up
- DC8 - Cursor right
- DC7 - Cycle 1
- DC6 - Cycle 4
- DC5 - Cycle 3
- DC4 - Cycle 2
- DC3 - Value Down
- DC2 - Cursor left
- DC1 - Change Values
- DC0 - Save Values

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:

```
0 1 2 3 4 5 6 7 8 9 A
- - - - - - 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:

```
1 2 3 4 5 6  2 3 4 5 6 7 8
0 1 1 0 0 1  0 1 1 0 0 0 1
```

(Note: "0"s and "1"s are typical only)

where the "0"s and "–"s are typical. "0" indicates that the Dip switch is positioned ON, while "–" indicates that the switch is positioned OFF.

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:

```
123456 2345678
```

- #8 - Printer board
- #7 - Printer board
- #6 - Printer board
- #5 - Printer board
- #4 - Printer board
- #3 - Printer board
- #2 - Printer board
- #6 - Control board
- #5 - Control board
- #4 - Control board
- #3 - Control board
- #2 - Control board
- #1 - Control board

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.

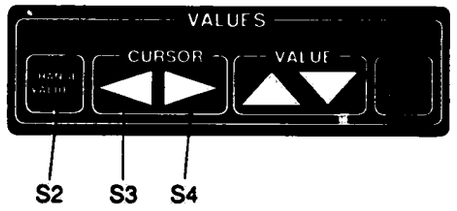
Note: To return to the Solenoid Valve test portion of the routine instead of to normal operation, press the PRINT VALUES rocker switch at the end the Dip Switch test.

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 tee (Fig. 8-28, #34). Disconnect rear gauge on double-door units. Gauge should be readable to 1/2 psig increments, and have a ±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.

```
T=187.4          P=26.5
2  -  4  --  --  --  --  --
```

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).

```
-  TIME     T=°F  P=psig
-------------------------
F 09:12:54A 235.7  09.4
```

← Status print when PRINT is pressed

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.

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 ±1 degree F between 250° and 270°F. A digital thermometer with a thermocouple wire is best (AMSCO P-762116-001, Doric Trendicator 400A with type T thermocouple or equivalent).

1. Install the thermocouple wire through the plugged plugged tee (Fig. 8-28, #34) using a Conax-type fitting (P-382782-091) and appropriate reducing bushing. Disconnect rear gauge on double-door units.

   Note: Installation through the door gasket is acceptable if a Conax fitting is not available.

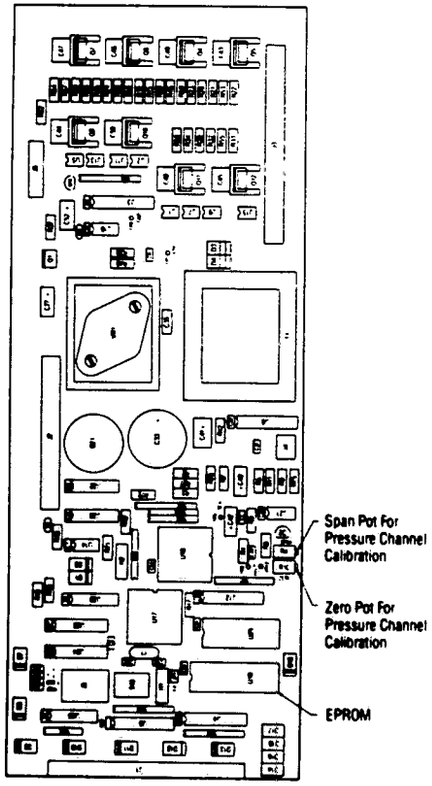


FIGURE 7-5 – Control PC Board

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.
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. Close and lock door(s). Operate valves S25 and S26 to add about two gallons of water into the chamber, in the range of 70-100°F. Adjust R4 (SPAN) until the temperature on the display matches the temperature on the calibrated temperature indicator. Then use S23 to drain water from chamber.
7. Close and lock chamber door(s). (Solenoid S2 cannot be electrically energized with the doors open.)
8. Turn ON solenoids S2, S3 and S4 by pressing appropriate touch pads (see Section 7.6, **Pressure Calibration**)
9. After about one minute, turn OFF S3.

   Wait five minutes. After five minutes, the chamber is well-heated and the temperature display should be stabilized.

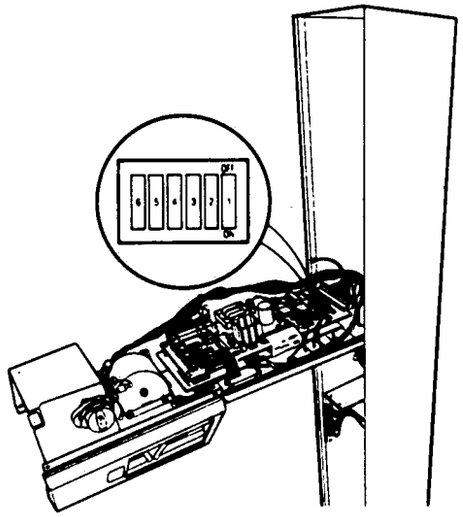


FIGURE 7-6 – Printer PC Board Dip Switches

10. Adjust R10 (ZERO) on the Printer PC board (Figure 7-3), until the temperature on the display matches the temperature indicator.
11. Exhaust the chamber by turning S2 OFF and S3 ON.

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.
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.

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 temperature 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 Bit 1.** Works in conjunction with Control PC board switch Dip switch #4. See Table 7-5.
5	Not used
6	**Cycle Complete Buzzer Control.** Enables or disables the cycle complete buzzer. 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	**Drain Enable.** If drain piping can accommodate higher flows, power drain option drains wash water with steam pressure assist. ON = Power drain OFF = No power drain

Revision 4 and above only

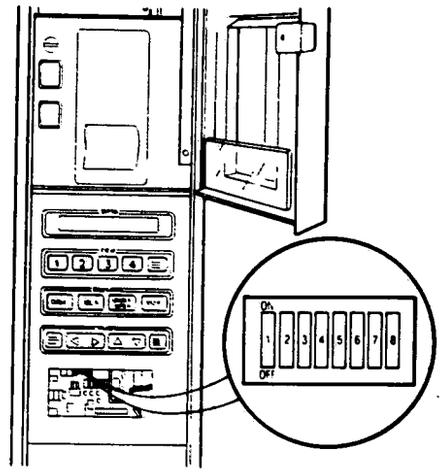


FIGURE 7-7 – Control PC Board Dip Switches

Table 7-5 – CONTROL PC BOARD

Dip Switch	Function
1	**Temperature Units.** Selects units of temperature display and printout to be either degrees Farenheit or Celcius. 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	Not used
4	**Self-test Bit 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 Bit 0) Control Board	DP4 (Test Bit 1) Printer Board
Service Test	OFF	ON
Burn-In Test	ON	OFF
Print Frequency Set	ON	ON
Normal Mode	OFF	OFF

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 preceding 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.

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 may 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 semicircular 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. . .

   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., overdrive, etc., as clearing the memory returns these to their default settings from the EPROM.

    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**. A new printer is supplied with PC board. 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 number (in Section 8) for the auxiliary power supply includes 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 it's 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 (+/- 0.1 volt) across capacitor C1 on the rear board. If 5 volts is present, the display module is bad.

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.

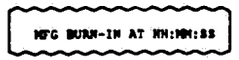
WARNING: HEALTH HAZARD - Vapors from solvents can be harmful. Use with adequate ventilation. Follow directions on the container.

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 for entry into the memory of the new IC. Also, obtain a printout for the 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. . .

   ahead of the normal power-up header.

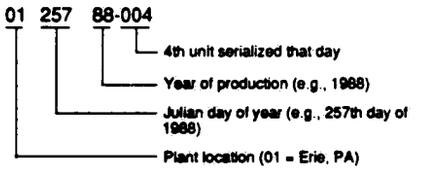
7. The default cycle settings are loaded into the new RAM IC. Change these, if necessary, to match printout obtained before starting procedure. Also check date, time, etc., and change if necessary.

7.16 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.

7.17 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 washer/sterilizer by its serial number. The serial numbering scheme is:



7.18 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, lockwashers (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 (8-19, #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. Assembly 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 20 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
P-150822-317	0.005
P-150822-318	0.010
P-150822-318	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.

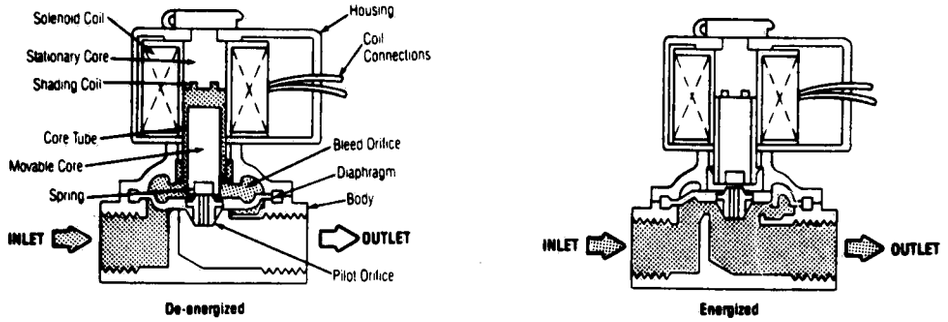


FIGURE 7-8 – Diaphragm-Type Solenoid Valve

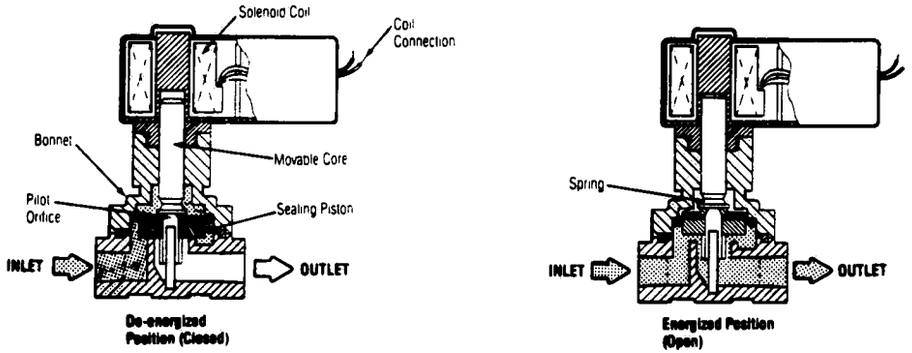


FIGURE 7-9 – Piston-Type Solenoid Valve

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

7.19 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 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 may 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.

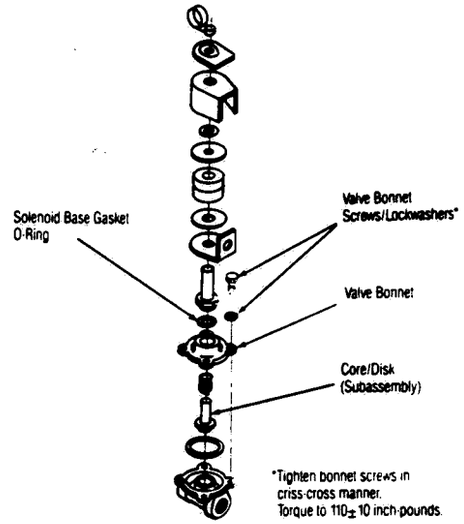


FIGURE 7-10 – ASCO Solenoid Valves

7.20 STEAM TRAP (Fig. 8-47)

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.

7.21 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.

7.22 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.

7.23 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.

7.24 DOOR SWITCH (Fig. 8-19)

Note: Chamber door must be closed and tightened to 20 ft-lbs for door to withstand maximum pressure in chamber. Door switch is on top of chamber and permits sterilizer operation only when door is locked.

Adjustment

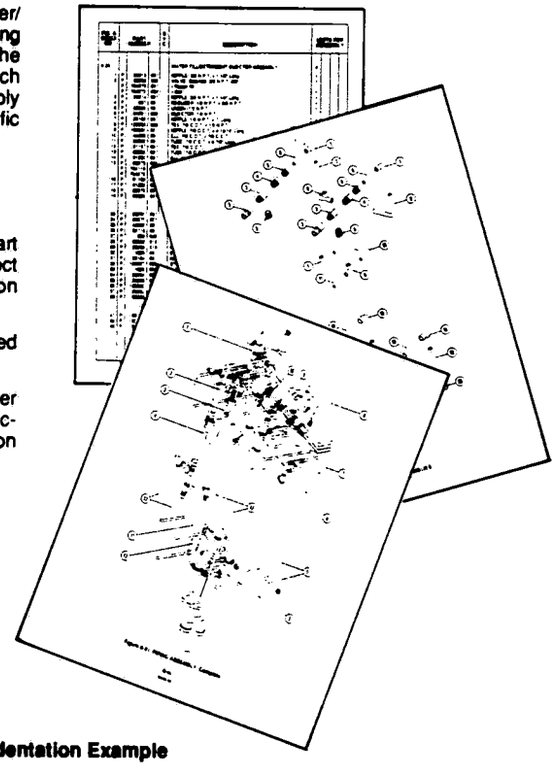
1. Using a torque wrench on the steam lock clutch rod (Fig. 8-17, #9), close and tighten door by applying appropriate torque as specified in Table 7-7.
2. Turn adjusting screw (Fig 8-19, #1) clockwise until switch (Fig., 8-19, #7) is actuated. Then turn screw 1/4 turn clockwise.
3. Open door then close 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 and display and pressure gauge indicate zero pressure.

8

SECTION 8
Exploded Views and Parts Lists

Assemblies and components of EAGLE 3000 washer/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

1. 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.
2. Turn to the page indicated and locate the desired part on the illustration.
3. From the illustration, obtain the index number assigned to the part desired. Refer to the accompanying description for specific information regarding the part.

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
PANEL, Upper
SPACER
PANEL, Primary Control
• LAMP (Box of 10)
SCREW, Buttress Head Socket, #8-32 x 3/8
WASHER, Flat
SUPPORT, Panel and Gauge
GAUGE, Chamber Pressure
• LENS
TRIM, Chamber

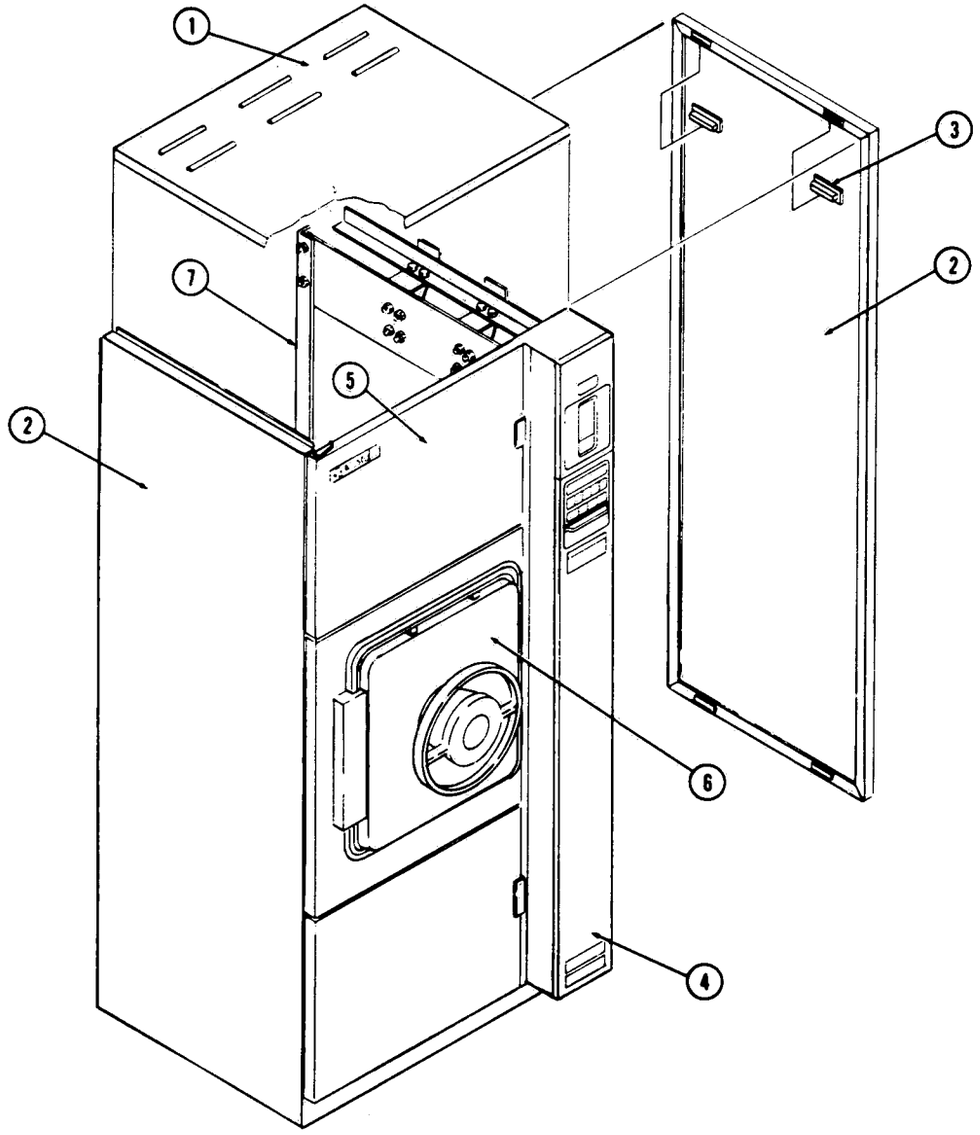


Figure 8-1. CABINET ASSEMBLY: Freestanding Washer/Sterilizer (Part 1 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-1-	P	146441	011		CABINET ASSEMBLY: Single Door, Freestanding (Part 1 of 2)	X
1	P	136422	002		PANEL, Top	1
2	P	93404	003		PANEL, Side	2
3	P	84298	001		CATCH, Magnetic	8
4					CONTROL ASSEMBLY (Figure 8-10)	1
5					PANEL ASSEMBLY, Operating End (Figure 8-5)	1
6					COVER AND HANDWHEEL ASSEMBLY (Figure 8-16)	1
7					SIDE FRAME ASSEMBLY (Figure 8-2)	1

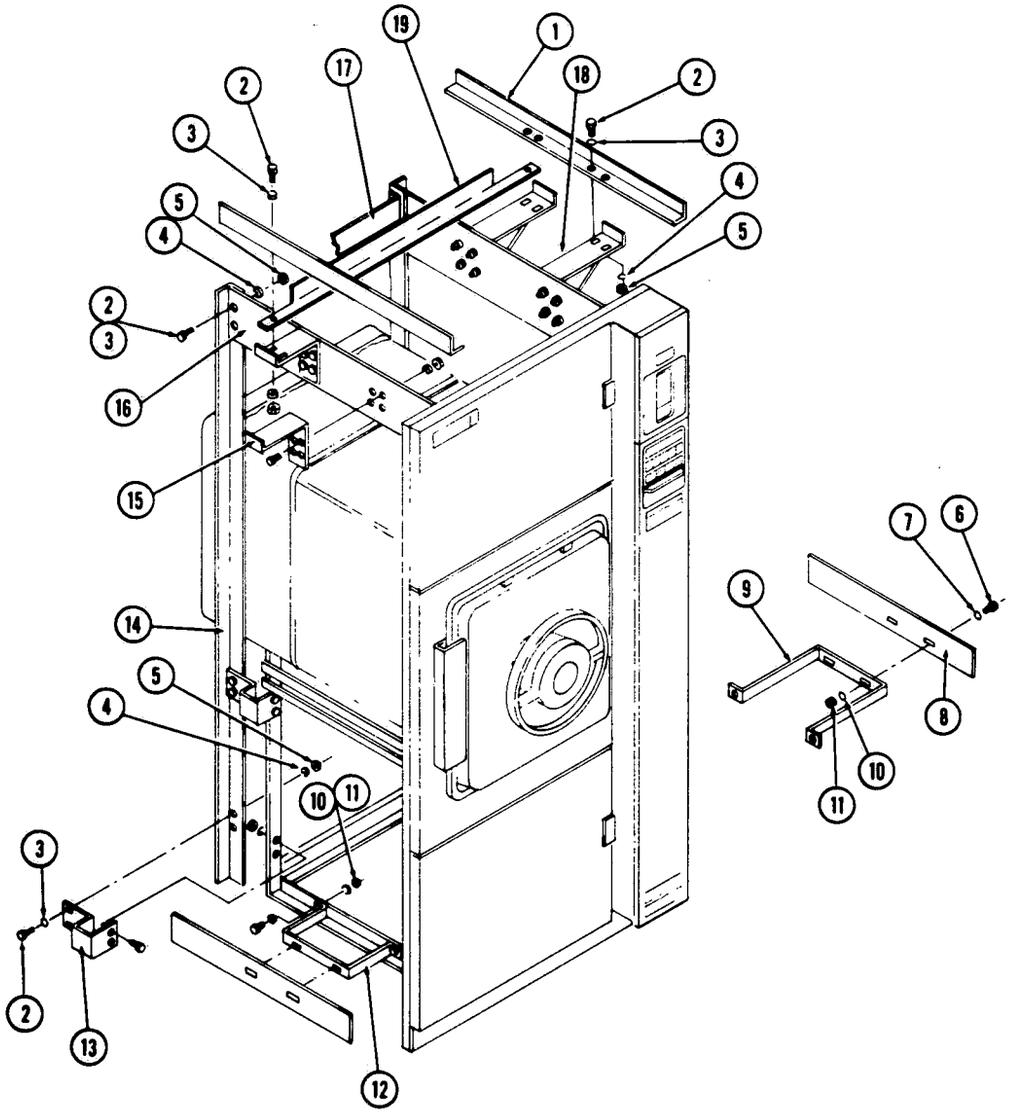


Figure 8-2. CABINET ASSEMBLY: Freestanding Washer/Sterilizer (Part 2 of 2)

C- 1

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-2-	P	146441	011		CABINET ASSEMBLY: Single Door, Freestanding (Part 2 of 2)	X
1	P	93896	083		SUPPORT, Top Panel	2
2	P	81667	015		SCREW, Hex Head, 1/4-20 x 3/4	28
3	P	10445	091		WASHER, Flat, 1/4	28
4	P	76230	091		LOCKWASHER, 1/4	28
5	P	3097	041		NUT, 1/4-20	18
6	P	31838	042		SCREW, Hex Head, 3/8-16 x 1	20
7	P	5503	045		WASHER, 3/8	20
8	P	93663	001		SUPPORT, Bottom	2
9	P	93665	002		BRACKET, Bottom, Long	1
10	P	52149	045		LOCKWASHER, External Tooth, 3/8	20
11	P	3099	042		NUT, 3/8-16	20
12	P	93665	001		BRACKET, Bottom, Short	1
13	P	93688	001		BRACKET, Main Support	4
14	P	146628	001		SUPPORT, Rear Cabinet	2
15	P	93896	089		HANGER ASSEMBLY, Short	2
16	P	93896	088		SUPPORT, Top Attachment	2
17	P	93668	001		BRACKET, Top Attachment	1
18	P	93896	090		HANGER ASSEMBLY, Long	2
19	P	93896	093		BRACE, Cross	2

C- 2

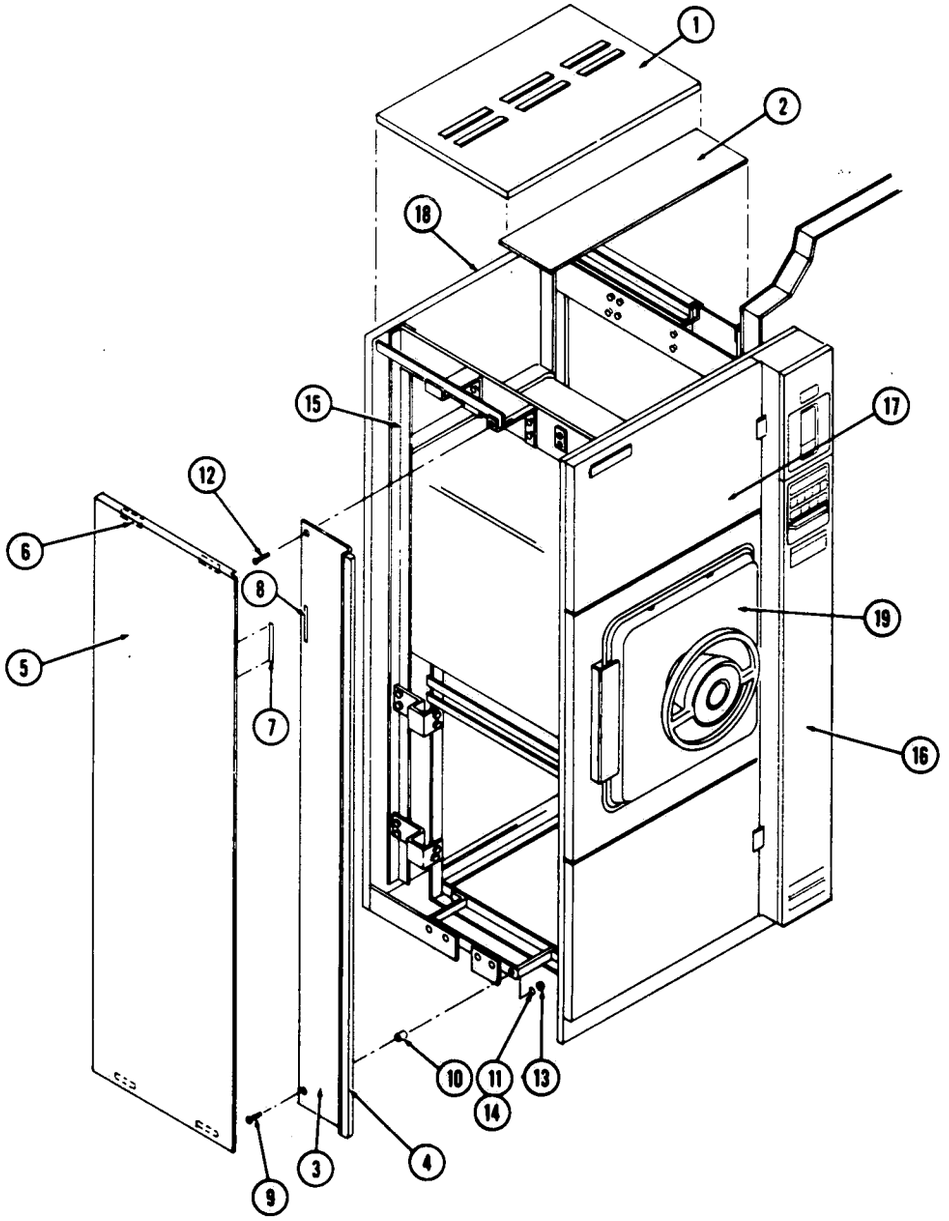


Figure 8-3. CABINET ASSEMBLY: Double Door, Recessed (Part 1 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-3-	P	146441	012		CABINET ASSEMBLY: Double Door, Recessed (Part 1 of 2)	X
1	P	136422	001		PANEL, Top	1
2	P	93415	001		FILLER	1
3	P	93401	001		PANEL, Extension	2
4	P	84297	001		STRIP, Sponge	2
5	P	93404	001		PANEL, Side	2
6	P	84298	001		CATCH, Magnetic	8
7	P	129340	001	*	TAPE, Velcro, Wool Type	2
8	P	129340	002	*	TAPE, Velcro, Hook Type	2
9	P	38675	041		SCREW, Flat Head, 10-32 x 1-3/4	2
10	P	129341	001		SPACER	2
11	P	31705	045		LOCKWASHER, #10, Internal Tooth	4
12	P	12175	045		SCREW, Flat Head, 10-32 x 1-1/4	2
13	P	2960	042		NUT, 10-32	4
14	P	5511	041		WASHER, Flat	4
15					SIDE FRAME ASSEMBLY (Figures 8-2 and 8-3)	1
16					CONTROL ASSEMBLY (Figure 8-10)	1
17					PANEL ASSEMBLY, Operating End (Figure 8-5)	1
18					PANEL ASSEMBLY, Non-Operating End (Figure 8-8)	1
19					COVER AND HANDWHEEL ASSEMBLY (Figure 8-16)	2

**Secure Velco fasteners to panels with Loctite Super Bonder 495 or equivalent.*

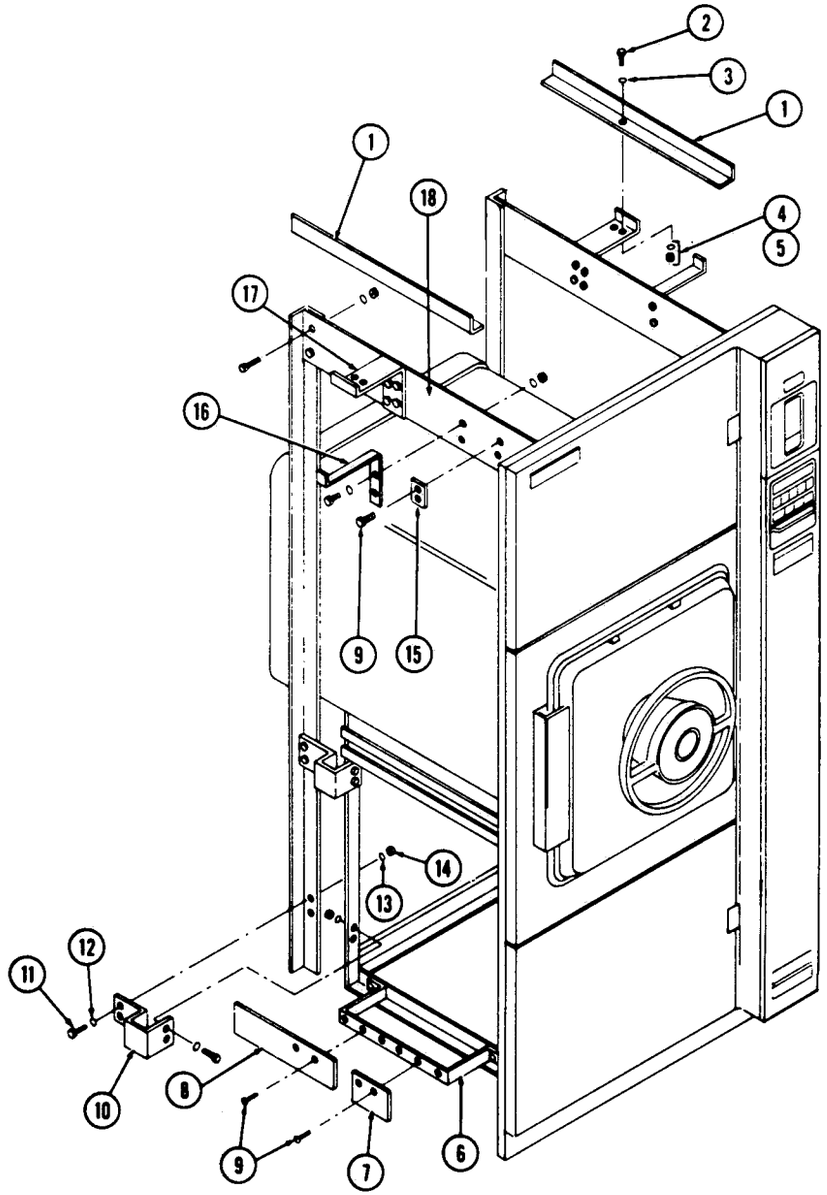


Figure 8-4. CABINET ASSEMBLY: Double Door, Recessed (Part 2 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-4-	P	146441	012		CABINET ASSEMBLY: 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
2	P	81667	015		SCREW, Hex Head, 1/4-20 x 3/4	28
3	P	10445	091		WASHER, Flat, 1/4	28
4	P	76230	091		LOCKWASHER, 1/4	18
5	P	3097	041		NUT, Hex, 1/4-20	8
6	P	93666	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	16
10	P	93688	001		BRACKET, Main Support	4
11	P	31838	042		SCREW, Hex Head Cap, 3/8-16 x 1	4
12	P	5503	045		WASHER, Flat, 3/8	4
13	P	52149	045		LOCKWASHER, External Teeth	4
14	P	3099	042		NUT, Hex, 3/8-16	4
15	P	84469	001		PLATE, Strike	4
16	P	84075	001		BRACKET, Top	2
17	P	93896	089		HANGER, Top	2
18	P	93896	088		SUPPORT, Top Plate	2

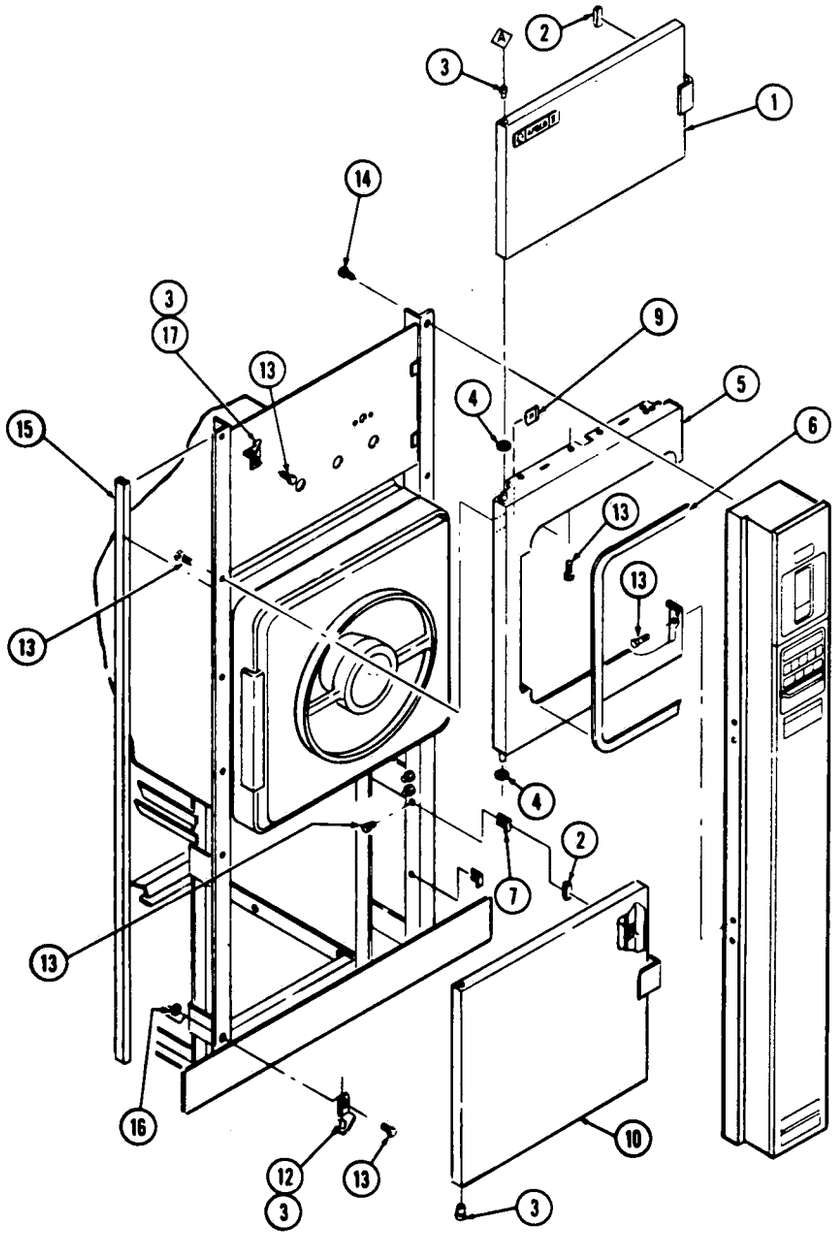


Figure 8-5. PANEL ASSEMBLY: Operating End

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-5-	P	146653	559		PANEL ASSEMBLY: Operating End	X
1	P	134468	773		PANEL ASSEMBLY, Upper Access	1
2	P	83920	001		CATCH, Magnetic	4
3	P	84455	001		BEARING, Flange	4
4	P	84457	001		WASHER	2
5	P	143149	001		TRIM, Shell	1
6	P	90184	091		GASKET, Chamber Trim	1
7	P	93702	001		STRIKE	4
8	P	136769	001		STABILIZER (Not Shown)	1
9	P	91924	091		NUT, Tinnerman	5
10	P	134468	711		PANEL, Lower Access	1
11	P	93096	001		RACK, Manual (Not Shown)	1
12	P	93701	001		HINGE ASSEMBLY	1
13	P	129360	011		SCREW, Flange-lock, 1/4-20 x 5/8	22
14	P	129360	013		SCREW, Flange-lock, 3/8-16 x 3/4	4
15	P	93089	001		GASKET, Wall	2
16	P	129360	015		NUT, Hex, 1/4-20	4
17	P	93701	002		HINGE ASSEMBLY	1

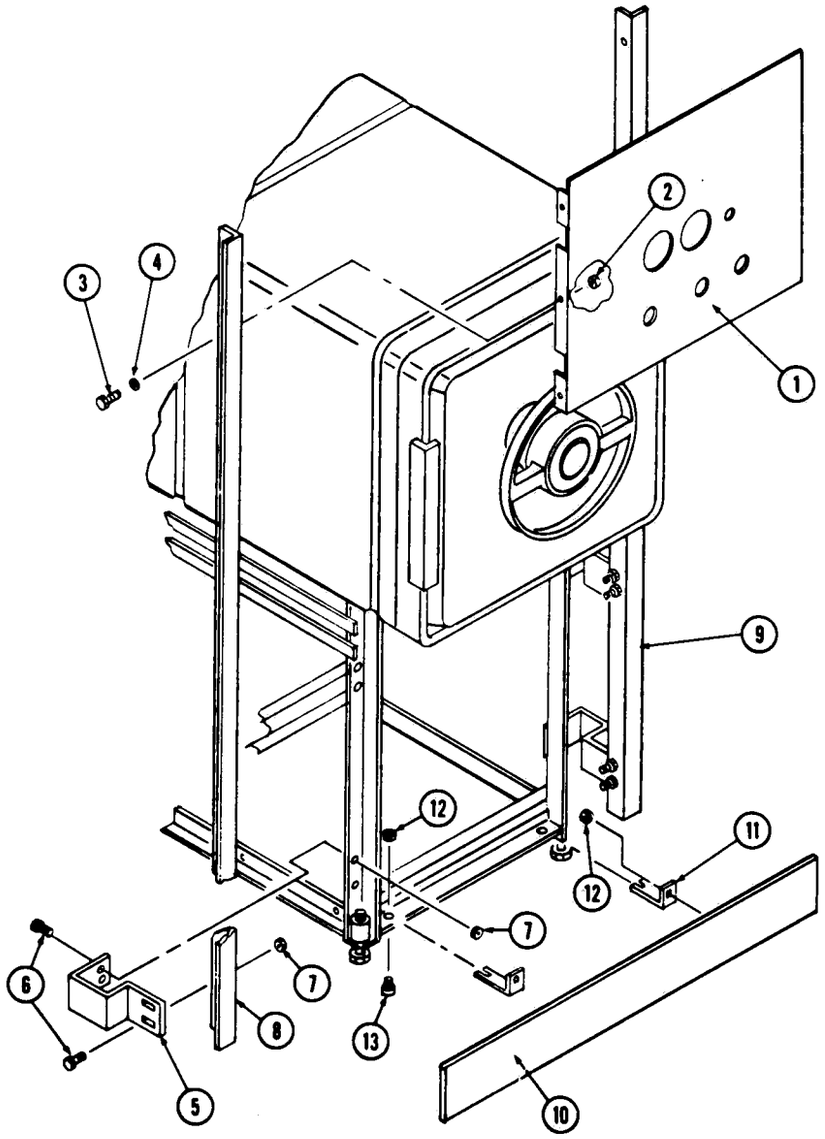


Figure 8-6. SUBPANELS: Operating End

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-6-					SUB PANELS: Operating End	X
1	P	146649	005		PANEL ASSEMBLY, Valve (16")	1
2	P	129360	016		NUT, Flange Lock, #10-32	8
3	P	41012	061		SCREW, Socket Head, #10-32 x 1/2	8
4	P	5511	041		WASHER, Flat, 7/16 OD x .195 ID	8
5	P	93688	002		BRACKET, Support	4
6	P	129360	012		SCREW, Flange Lock, 3/8-16 x 1	16
7	P	129360	014		NUT, Flange Lock, 3/8-16	16
8	P	146653	478		BRACKET, LH	1
9	P	146653	479		BRACKET, RH	1
10	P	93084	002		PANEL ASSEMBLY, Kick	1
11	P	84437	002		BRACKET, Kick Panel	2
12	P	129360	015		NUT, Hex, 1/4-20	4
13	P	129360	011		SCREW, Flange Lock, 1/4-20 x 5/8	22

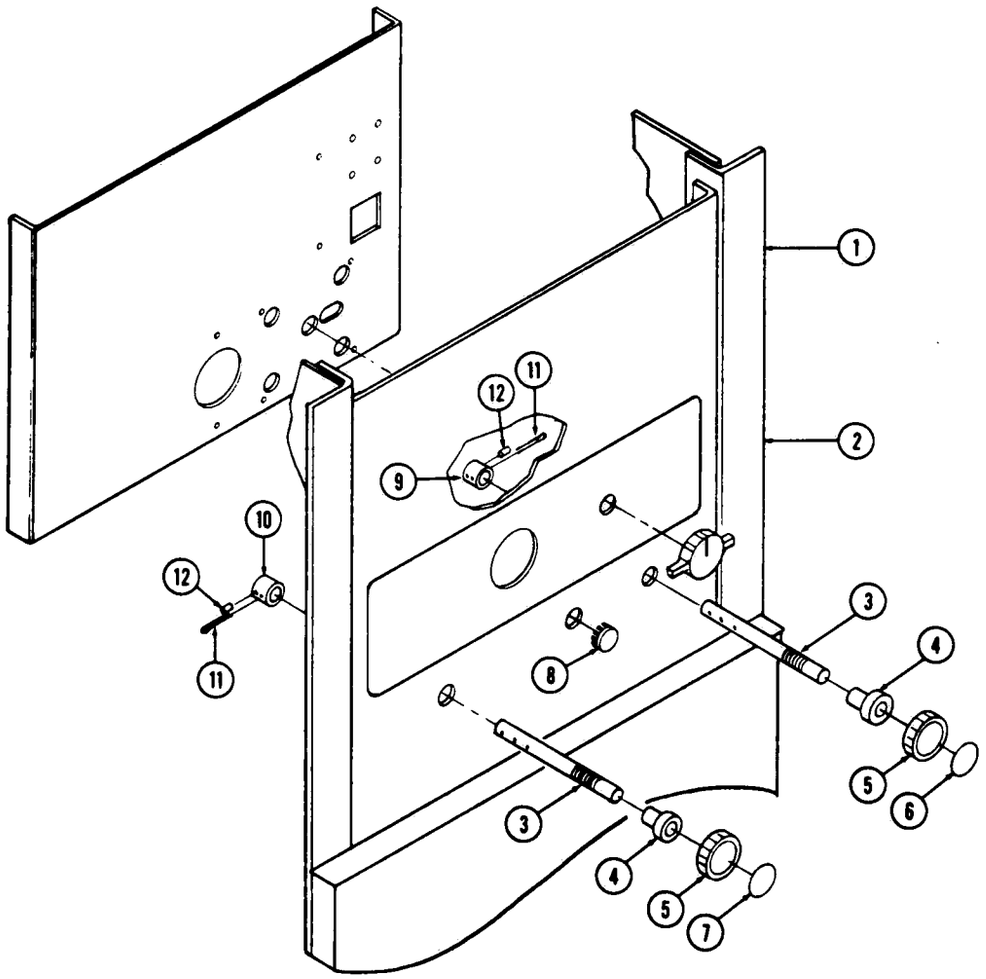


Figure 8-7. TOP CONTROL PANEL: Operating End

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-7-				TOP CONTROL PANEL: Operating End	X
1	P	146649 004		VALVE PANEL ASSEMBLY	1
2	P	136806 833		DECAL, Manual Cont. Washer/Sterilizer	1
3	P	129359 462		ROD, Valve Extension	2
4	P	8605		NUT, Valve Handwheel	2
5	P	54899		KNOB, Valve	2
6	P	90322		DECAL, Steam Supply Valve Handle	1
7	P	90323 091		DECAL, Water Supply Valve Handle	1
8	P	129356 138		PLUG, Button	1
9	P	52309		COUPLING, Valve Stem	1
10	P	129360 804		COUPLING, Valve Stem	1
11	P	46038		COTTER PIN	2
12	P	10583		SCREW, Set	2
13	P	136807 255		PANEL, Weldment (Figure 8-31)	1
14				KNOB	1

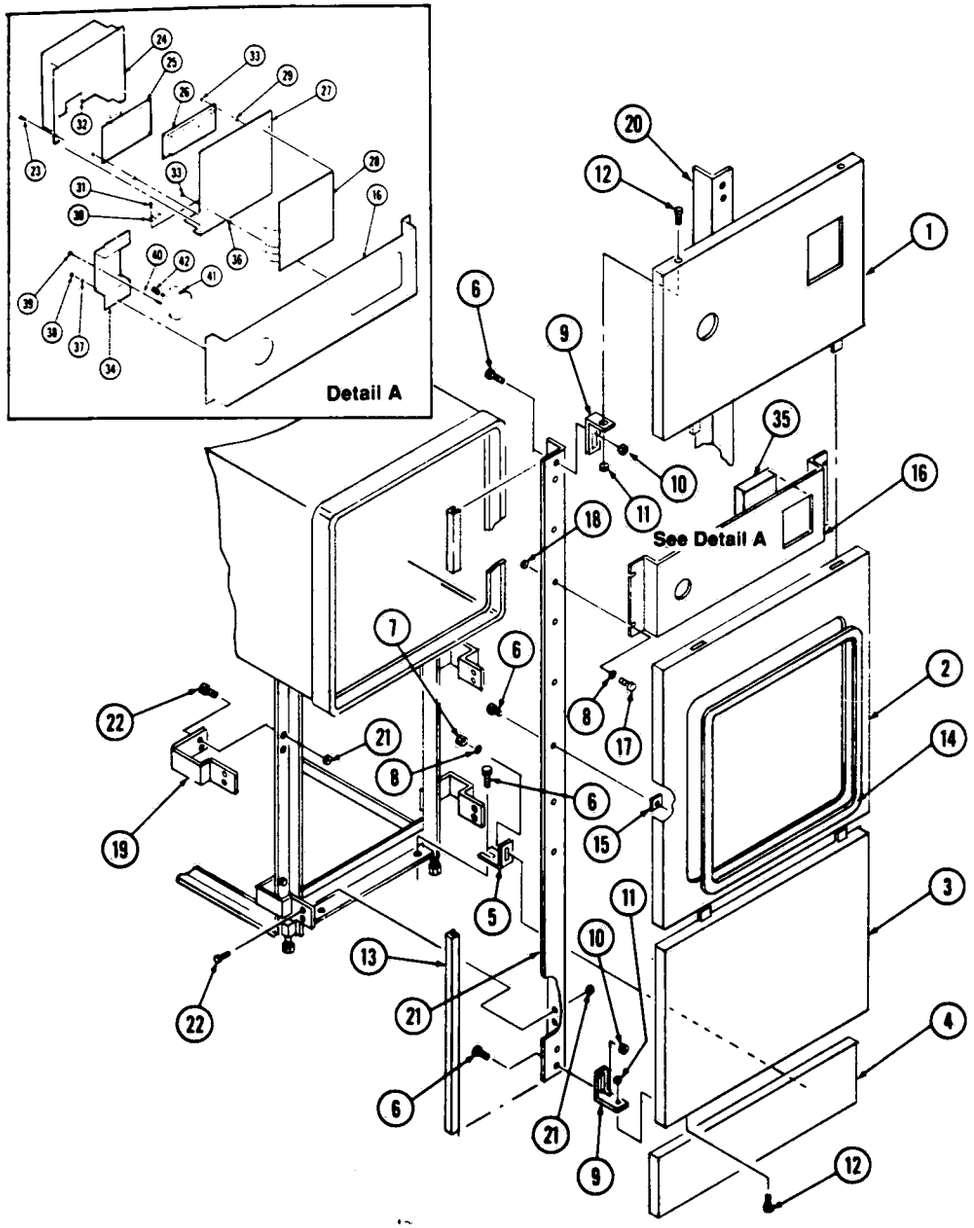


Figure 8-8. PANEL ASSEMBLY: Non-operating End

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-8-					PANEL ASSEMBLY: Non Operating End	X
1	P	146653	679		PANEL, Upper	1
2	P	146522	001		TRIM, Chamber	1
3	P	146520	001		PANEL, Lower	1
4	P	93689	002		PANEL, Kick	1
5	P	84437	001		BRACKET, Kick Panel	2
6	P	129360	011		SCREW, Flange Lock, 1/4-20 x 5/8	20
7	P	129359	532		NUT, Hex Head #10-32	2
8	P	5511	041		WASHER, Flat, 7/16 x .195 x .047	2
9	P	84436	001		CLIP	4
10	P	129359	533		NUT, Hex Head, 1/4-20	8
11	P	90198	045		NUT, Speed	4
12	P	90562	061		SCREW, Self Tap #8	4
13	P	93089	001		GASKET, Wall	2
14	P	90184	091		GASKET, Chamber Trim	1
15	P	91924	091		NUT, Tinnerman, 1/4-20	10
16	P	146653	685		SUPPORT, Panel and Gauge, NOE	1
17	P	41012	061		SCREW, Socket Head #10-32 x 1/2	4
18	P	129360	016		NUT, Flange Lock #10-32	4
19	P	93688	002		BRACKET	4
20	P	146527	001		BRACKET, Main Support, NOE	2
21	P	129360	014		NUT, Flange-Lock 3/8-16	16
22	P	129360	012		SCREW, Flange-Lock 3/8-16 x 1	16
23	P	93908	035		SCREW, Sems, #8-32 x 5/16	4
24	P	136807	146		COVER, Display, NOE	1
25	P	136807	138		ASSEMBLY, PC Board	1
26	P	93908	435		DISPLAY	1
27	P	136807	135		ASSEMBLY, Plate	1
28	P	136806	685		PANEL, Touch	1
29	P	129360	821		SPACER	12
30	P	90514	091		CLAMP	1
31	P	93908	036		SCREW, Sems, #10-32 x 3/8	1
32	P				GROMMET, Plastic Channel	A/R
33	P	84121	001		NUT, Lock, #4-40	9
34	P	93909	500		BRACKET, Gauge	1
35	P	146653	684		ASSEMBLY, Display, NOE	1
36	P	129360	821		SPACER	4
37	P	17796	091		WASHER, Flat, #8	2
38	P	118440	045		NUT, Lock, #8-32	2
39	P	129360	016		NUT, Flange, #10-32	2
40	P	5511	091		WASHER, Flat, 7/16 OD x .195 ID x .047	2
41	P	90525	091		GAUGE, Chamber	1
42	P	90594	091		FITTING, Straight, 1/8 ODT x 1/8 NPT	2

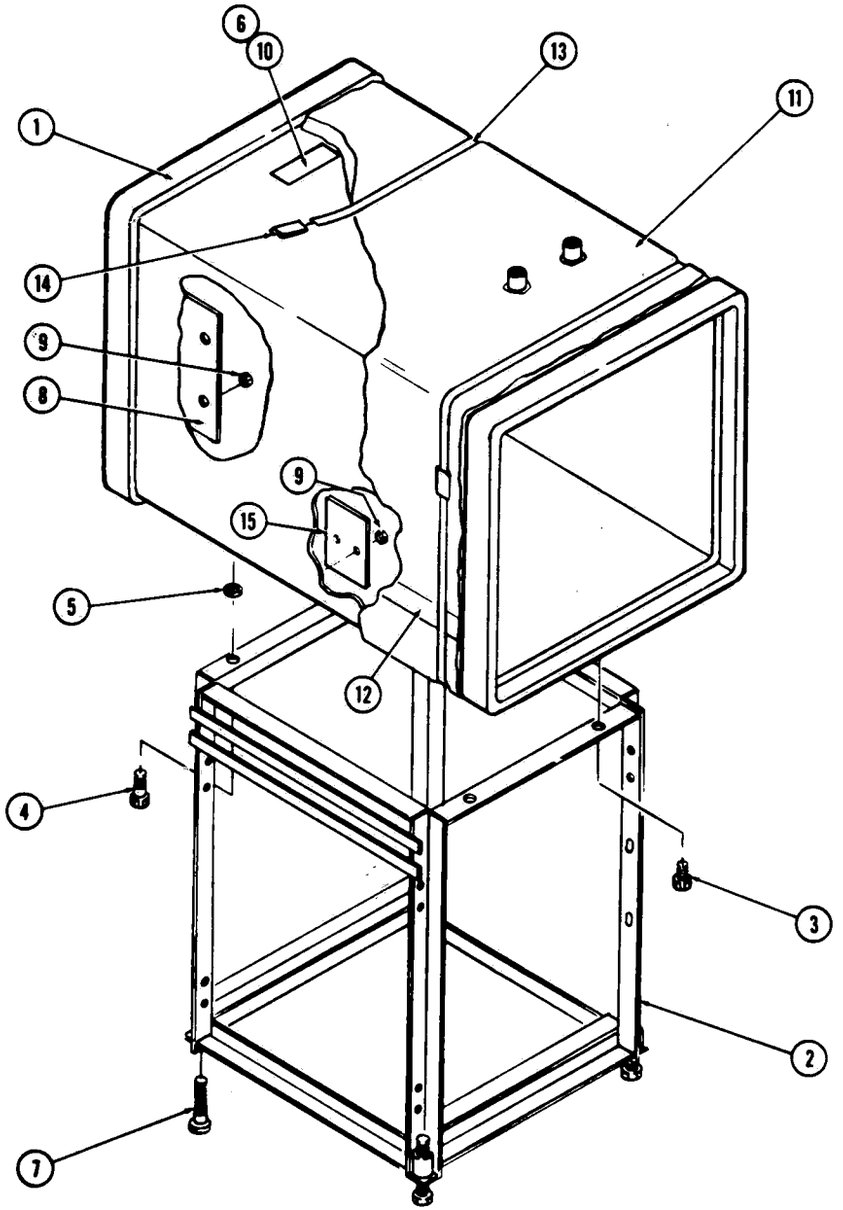


Figure 8-9. SHELL AND STAND ASSEMBLY

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-9-					SHELL AND STAND ASSEMBLY	X
1	P	146653	586		SHELL, Weldment, Single Door	1
	P	146653	587		SHELL, Weldment, Double Door	1
2	P	136435	001		STAND, Weldment	1
3	P	129360	013		SCREW, Flange Lock, 3/8-16 x 3/4	2
4	P	129360	809		SCREW, Flange Lock, 3/8-16 x 7/8	2
5	P	90441	045		WASHER, Flat, 1 OD x 13/32 ID x 1/8 THK	2
6	P	9448	045		SCREW, Drive, #4 x 1/4 (Not Shown)	2
7	P	90407	045		SCREW, Square Head, 5/8-11 UNC x 4-1/2	4
8	P	56396	223		BAFFLE, Steam	1
9	P	8648	061		NUT, Hex, 1/4-20 UNC	6
10	P	90542	091		NAMEPLATE	1
11					INSULATION	1
12					TAPE	1
13					STRAP	2
14	P	32268	091		SEAL, Strap	2
15	P	56396	443		BAFFLE	1

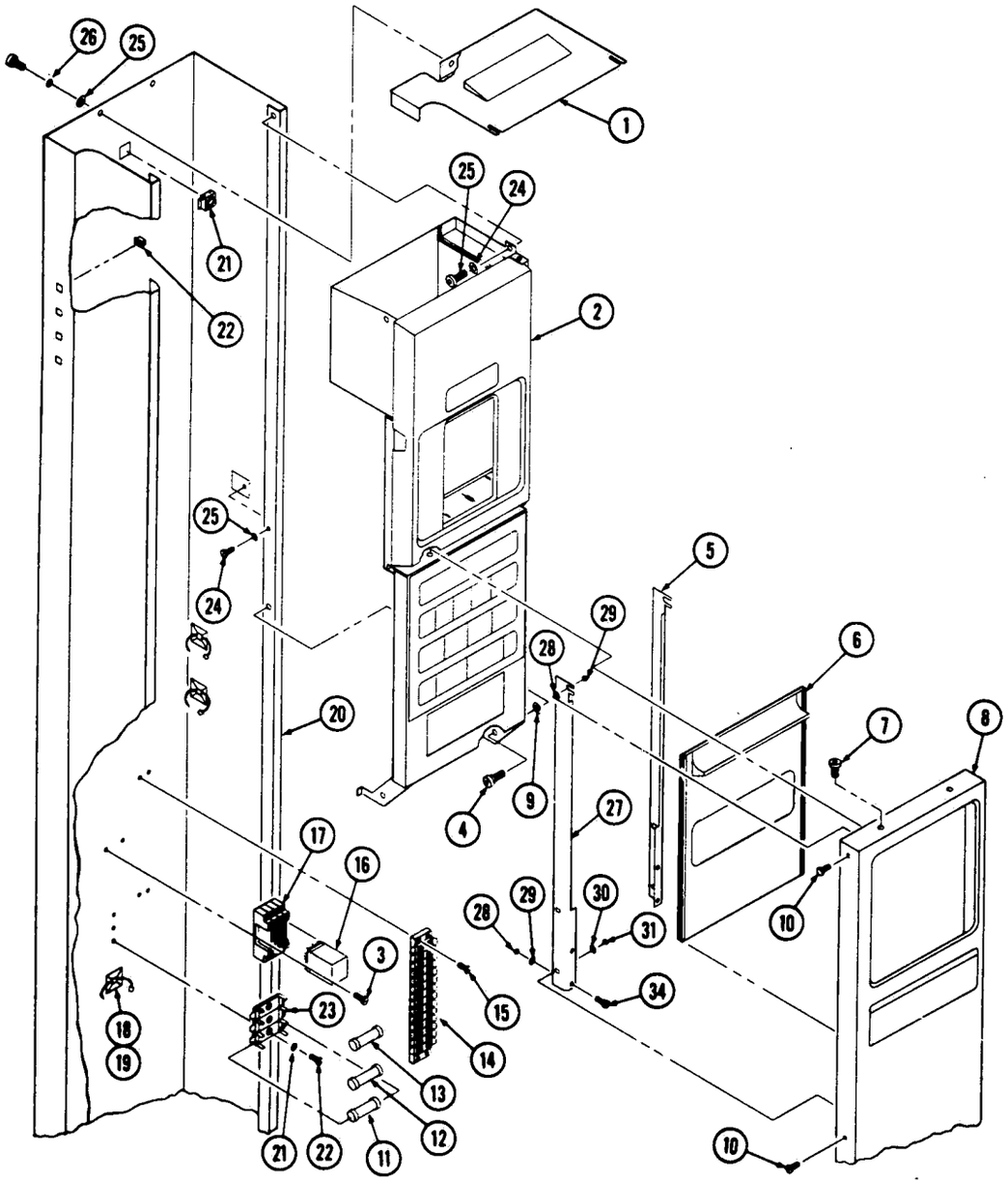


Figure 8-10. CONTROL COLUMN (Part 1 of 2)

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			
	P	136806	427		COVER, Top		1		
2					PC & BRACKET ASSEMBLY (Figure 8-12)				
3	P	93908	039		SCREW, SEMS #6-32 x 3/8"	2	2		
4	P	93908	035		SCREW, Pan Head #8-32 x 5/16"	14	14		
5	P	93909	489		ANGLE, Right Hand	1	1		
6	P	146653	600		DOOR, Sliding	1	1		
7	P	129356	135		SCREW, Button Head #8-32 x 3/8"	2	2		
8	P	146653	594		PANEL, Front	1	1		
9	P	129359	467		BLOCK, Threaded	2	2		
10	P	23431	041		SCREW, Socket Head #10-32 x 3/8"	2	2		
11	P	764317	449		FUSE, 2 Amp Slo-Blo (F1) (Box of 5)	1	1		
12	P	764317	819		FUSE, 1/4 Amp Slo Blo (F2) (Box of 5)	1	1		
13	P	764317	778		FUSE, 3 Amp Fast-Blo (F3) (Box of 5)	1	1		
14	P	136806	410		HARNESS, TB2	1	1		
15	P	3984	041		SCREW, Round Head #6-32 x 3/8"	2	2		
16	P	93909	576		RELAY, CRI	1	1		
17	P	150768	001		SOCKET, Relay	1	1		
18	P	75954	091		TIE, Wire	18	18		
19	P	129326	001		MOUNT, Cable Tie	12	12		
20	P	146653	227		HOUSING, Control	1	1		
21	P	19684	061		LOCKWASHER	5	5		
22	P	12451	041		SCREW, #6-32 x 1/2"	3	3		
23	P	93908	525		BLOCK, Fuse	1	1		
24	P	23431	041		SCREW, Socket Head #10-32 x 3/8	12	12		
25	P	31705	045		LOCKWASHER #10	15	15		
26	P	5511	091		WASHER, Flat #10 .200 ID x .437 OD	10	10		
27	P	93909	490		ANGLE, Left Hand	1	1		
28	P	26032	091		WASHER, #4	8	8		
29	P	13794	041		NUT, #4-40	6	8		
30	P	81682	006		LOCKWASHER, #10	2	2		
31	P	2960	042		NUT, Hex #10-32	2	2		
32	P	84449	001		CATCH, Magnetic (Not Shown)	1	1		
33	P	93909	491		BRACKET, Magnetic Catch (Not Shown)	1	1		
34	P	93908	031		SCREW, SEMS #4-40 x 1/4" (Not Shown)	2	2		

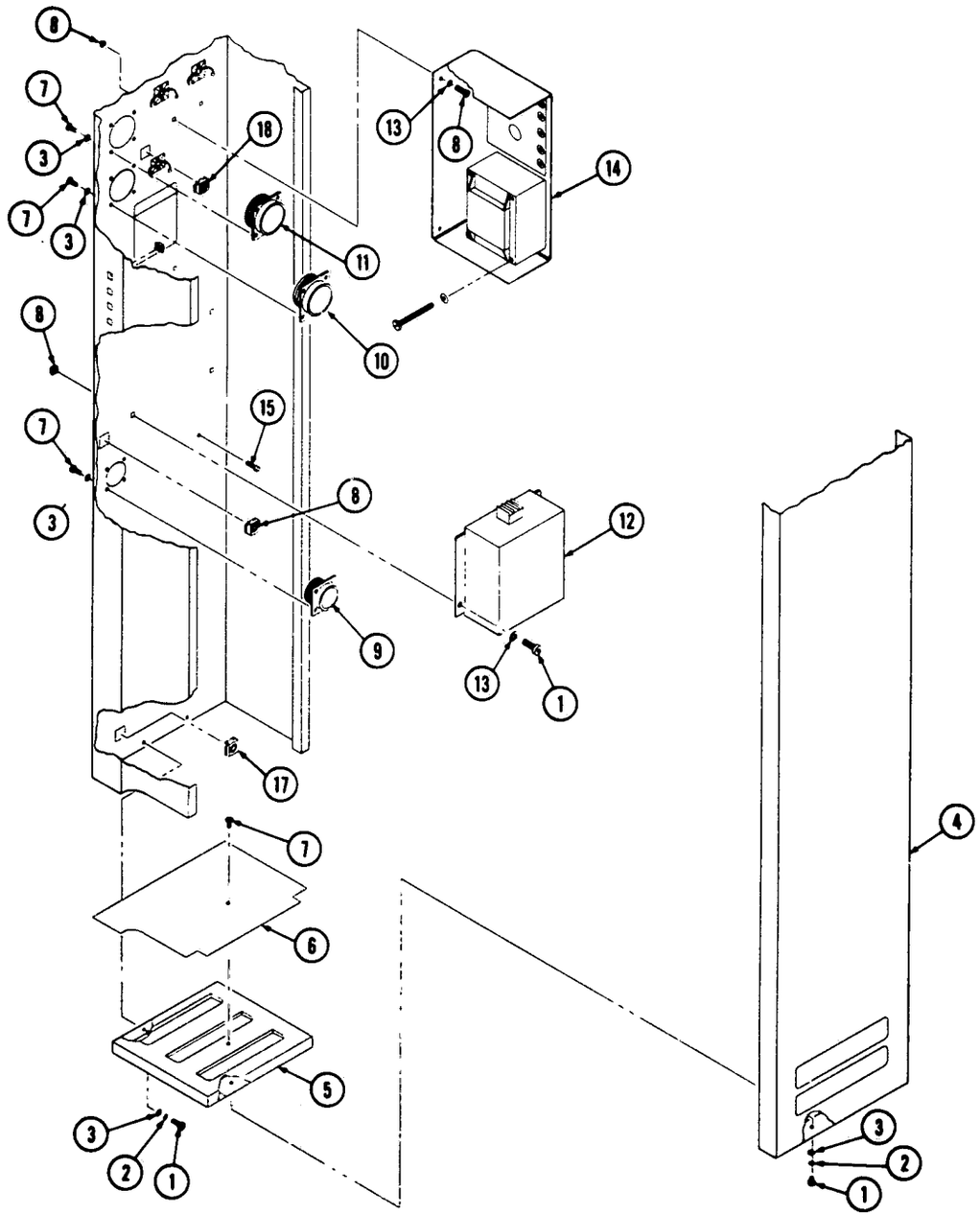


Figure 8-11. CONTROL COLUMN (Part 2 of 2)

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		SCREEN, Socket Head Cap #10-32 x 3/8	10	10		
2	P	19684	061		LOCKWASHER, #6	6	6		
3	P	5511	091		WASHER, Flat #10	6	6		
4	P	146653	594		PANEL, Bottom Front	1	1		
5	P	136588	002		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, Right Hand	1			
	P	136807	142		POWER SUPPLY, Left Hand		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	P	129352	090		NUT, Retainer 3/8-16	5	5		
18	P	91924	091		NUT, Retainer 1/4-20	6	6		

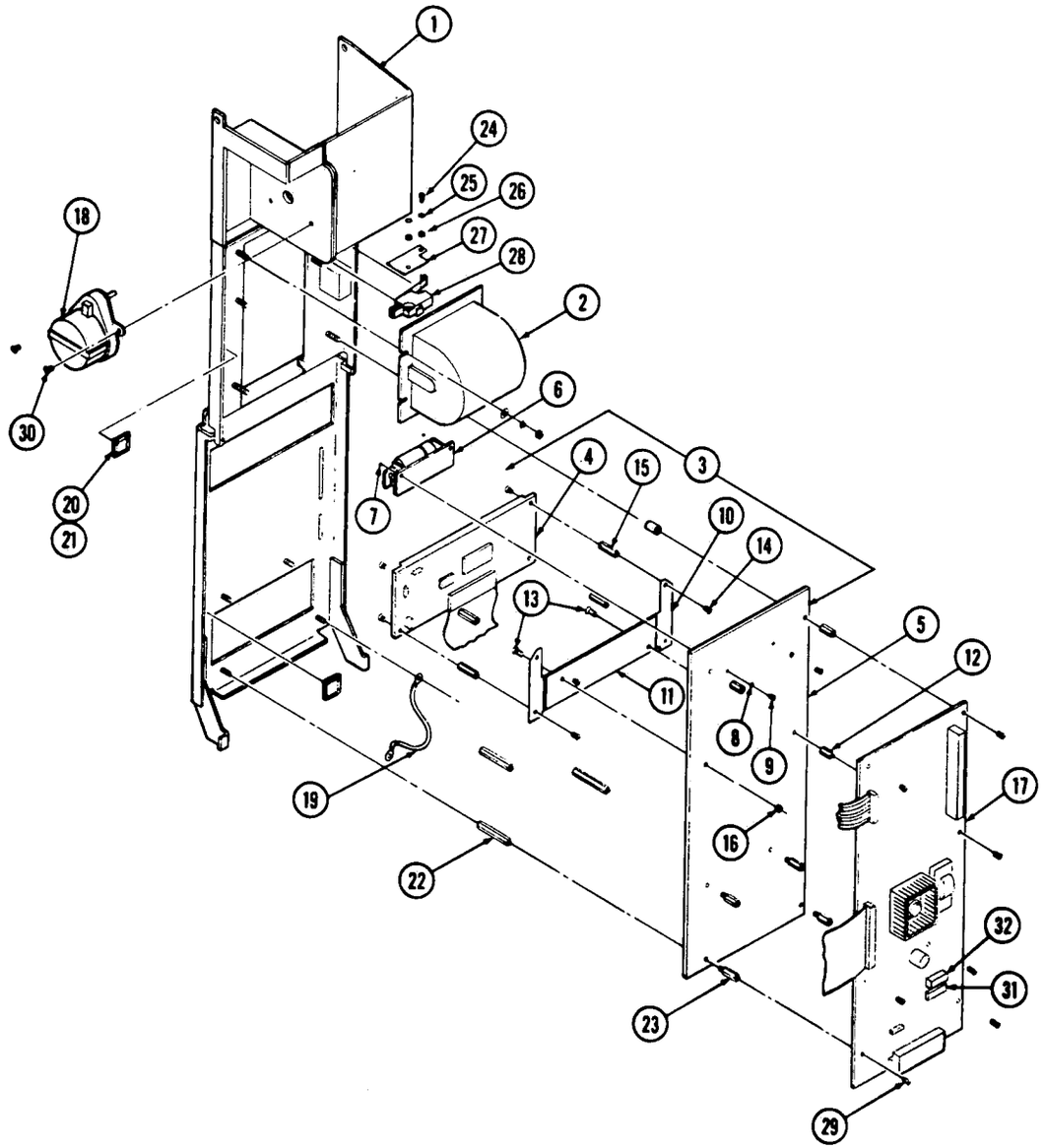


Figure 8-12. PC AND BRACKET ASSEMBLY (Part 1 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-12					P/C & BRACKET ASSEMBLY: (Part 1 of 2)	X
1	P	146653	492		BRACKET, Mounting	1
2	P	136800	949		HOUSING, Paper	1
3	P				DISPLAY BOARD ASSEMBLY	1
4	P	93908	435		• DISPLAY	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	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	036		EPROM, Programmed (units w/-037 Printer Board)	1
	P	93909	640		EPROM, Programmed (units w/-204 Printer Board)	1
32	P	129360	549		IC, Battery-backed Ram and Clock	1

** Printer PC Board 146653-037 is no longer available. Use 146653-204 and order EPROM 93909-640 when replacing a 146653-037 Printer Board.*

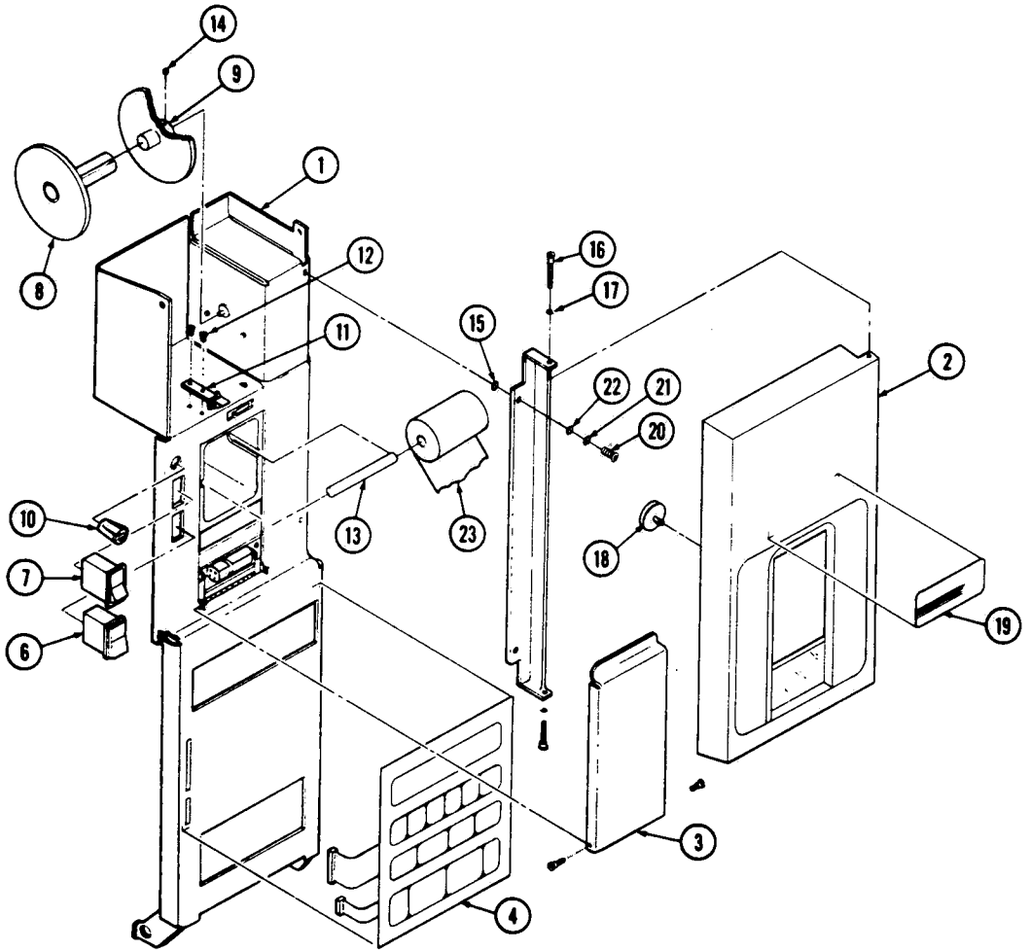


Figure 8-13. PC AND BRACKET ASSEMBLY (Part 2 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-13-					P/C & BRACKET ASSEMBLY: (Part 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		ROLL, Paper (Box of 5)	1

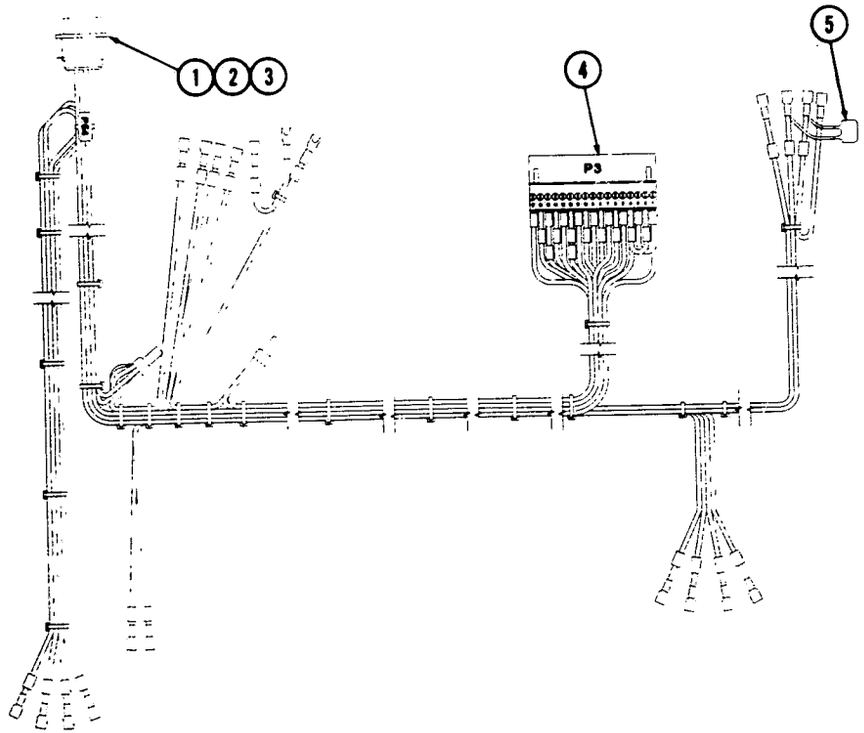


Figure 8-14. P54 HARNESS ASSEMBLY

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-14-	P	146653 212		HARNESS ASSEMBLY, P54	X
1	P	93443 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 904		• CONNECTOR, P3	1
5	P	129360 183		• CAPACITOR, 0.047 ufd.	1

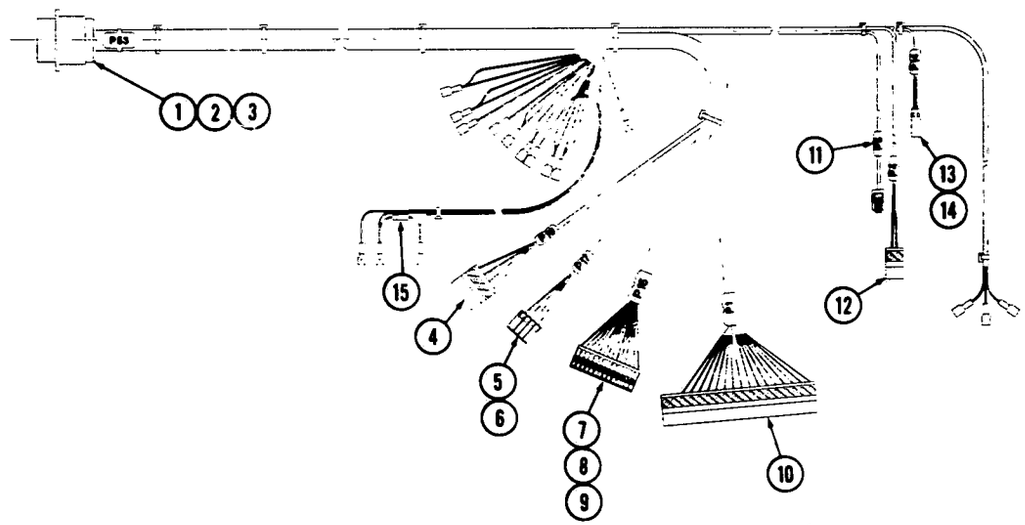


Figure 8-15. P53 HARNESS ASSEMBLY

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-15-	P	146653 485		HARNESS ASSEMBLY, P53	X
1	P	93909 383		• RECEPTACLE, P53 (53 Position)	1
2	P	84247 001		• CONTACT, Pin (#22 GA. Wire)	42
3	P	129359 474		• CONTACT, Pin (Flat Oval Cordage)	4
4	P	129359 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	93909 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	129352 600		• CONTACT, Socket	2
15	P	84157 001		• DIODE, 1 Amp, 50 V.	1

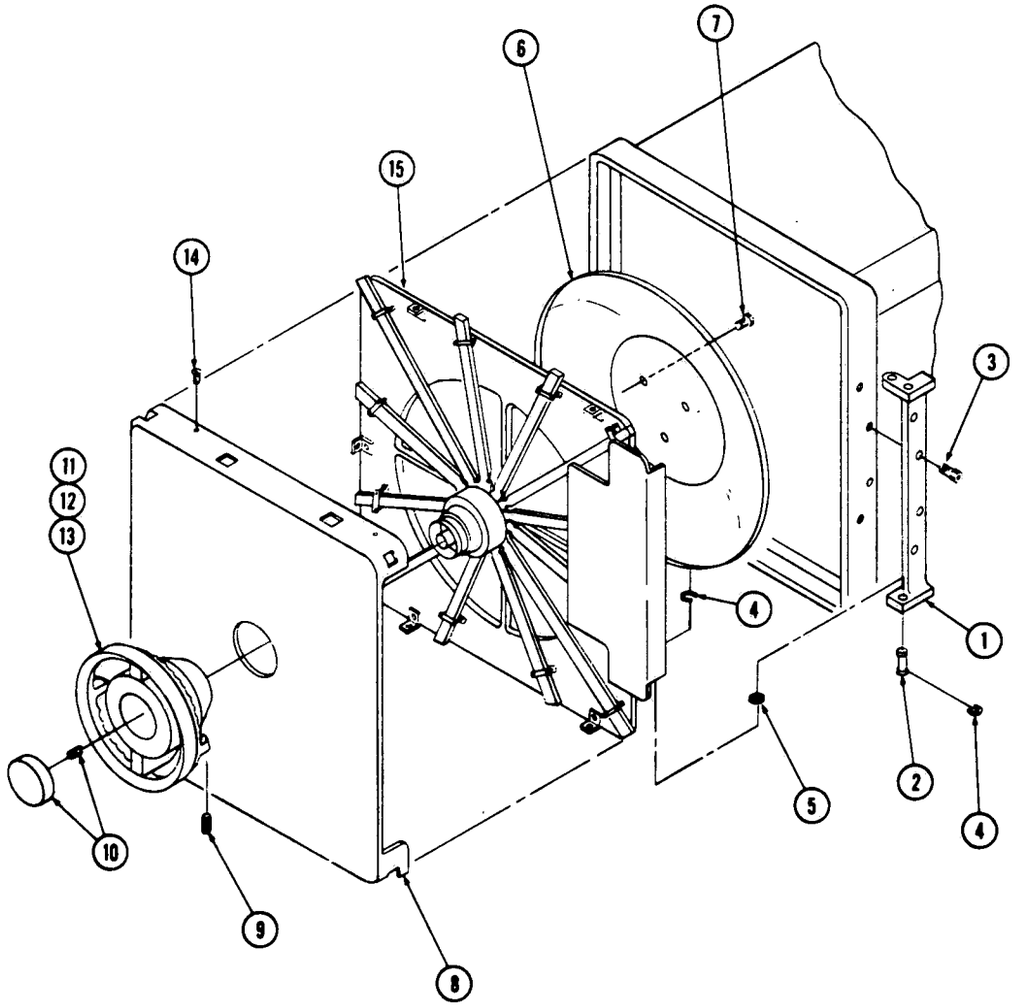


Figure 8-16. DOOR COVER AND HANDWHEEL ASSEMBLY

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-16					DOOR COVER AND HANDWHEEL ASSEMBLY	X
1	P	90034	063		WELDMENT, Hinge	1
2	P	90041	063		PIN, Hinge	2
3	P	43845	045		CAP SCREW, Socket Head	4
4	P	12706	045		RING, Retaining	2
5	P	79806	001		WASHER, Hinge	A/R
6	P	54474	063		COVER, Door Back	1
7	P	12283	041		SCREW, Round Head	3
8	P	139540	063		COVER, Chamber Door, Stainless Steel	1
9	P	51963	045		SET SCREW	3
10	P	93174	001		BUTTON, Assembly	1
11	P	136445	001		HANDWHEEL ASSEMBLY	1
12	P	146327	001		• HANDLE, Chamber Door	1
13	P	93647	001		• FACE PLATE	1
14	P	90562	061		SCREW, Self Tapping	5
15					DOOR LOCK AND HINGE ASSEMBLY (Figure 8-17)	1

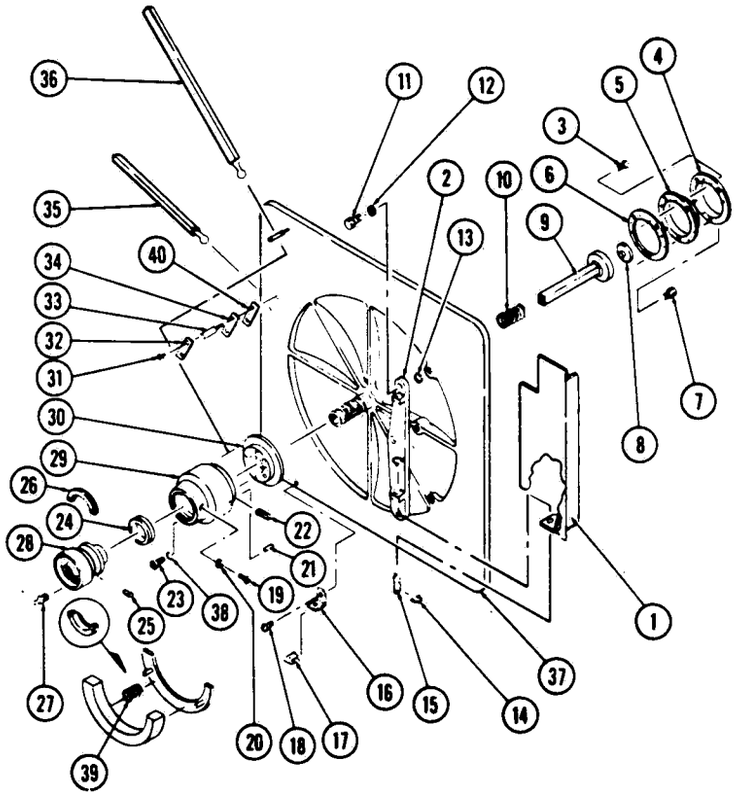


Figure 8-17. DOOR LOCK AND HINGE ASSEMBLY (Part 1 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-17-	P	99172	091		DOOR LOCK AND HINGE ASSEMBLY	X
1	P	93303	001		HINGE WELDMENT, Door	1
2	P	93300	001		DOOR HINGE BRACKET	1
3	P	4782	061		BOLT, Machine, Finished	9
4	P	6624	091		COVER, Diaphragm	1
5	P	7230	061		DIAPHRAGM	1
6	P	7753	091		GASKET, Diaphragm	1
7	P	74710	061		SCREW, Special	3
8	P	8778	091		THRUST PLATE ASSEMBLY	1
9	P	90363	091		ROD WELDMENT, Lock Clutch	1
10	P	12267	061		SPRING, Lock Clutch Rod	1
11	P	3858	041		SCREW, Hex Head	3
12	P	3516	041		WASHER, Plain	3
13	P	52149	045		WASHER, Shake Proof	3
14	P	12706	045		RING, Retaining	4
15	P	24520	001		PIN, Hinge	2
16	P	90440	061		BRACKET, Door Cover	5
17	P	90198	045		SPEED NUT	5
18	P	90169	045		SCREW, Self Tapping	5
19	P	10570	061		SCREW, Truss Head	2
20	P	19678	045		LOCKWASHER	2
21	P	22996	061		ROLL PIN	2
22	P	8303	091		KEY, Door	2
23	P	12264	042		SCREW, Socket Head	6
24	P	6416	091		BEARING, Ball Thrust	1
25	P	47598	061		DRIVE SCREW	13
26	P	13194	091		THRUST RING ASSEMBLY	1
27	P	90475	091		LUBE FITTING	1
28	P	96102	091		NUT, Handle	1
29	P	96181	056		PLATE, Top Socket	1
30	P	11817	056		PLATE, Bottom Socket	1
31	P	39863	091		SCREW, Round Head	24
32	P	150365	001		LINK, Arm Clip	12
33	P	33429	001		STUD, Arm Clip	24
34	P	33435	045		BLOCK, Fulcrum Arm Clip	12
35	P	92634	001		ARM, Door	8
36	P	55972	004		ARM, Door	4
37					DOOR ASSEMBLY (Figure 8-18)	1
38	P	5596	041		LOCKWASHER	6
39	P	12260	091		SPRING, Thrust Ring	4
40	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

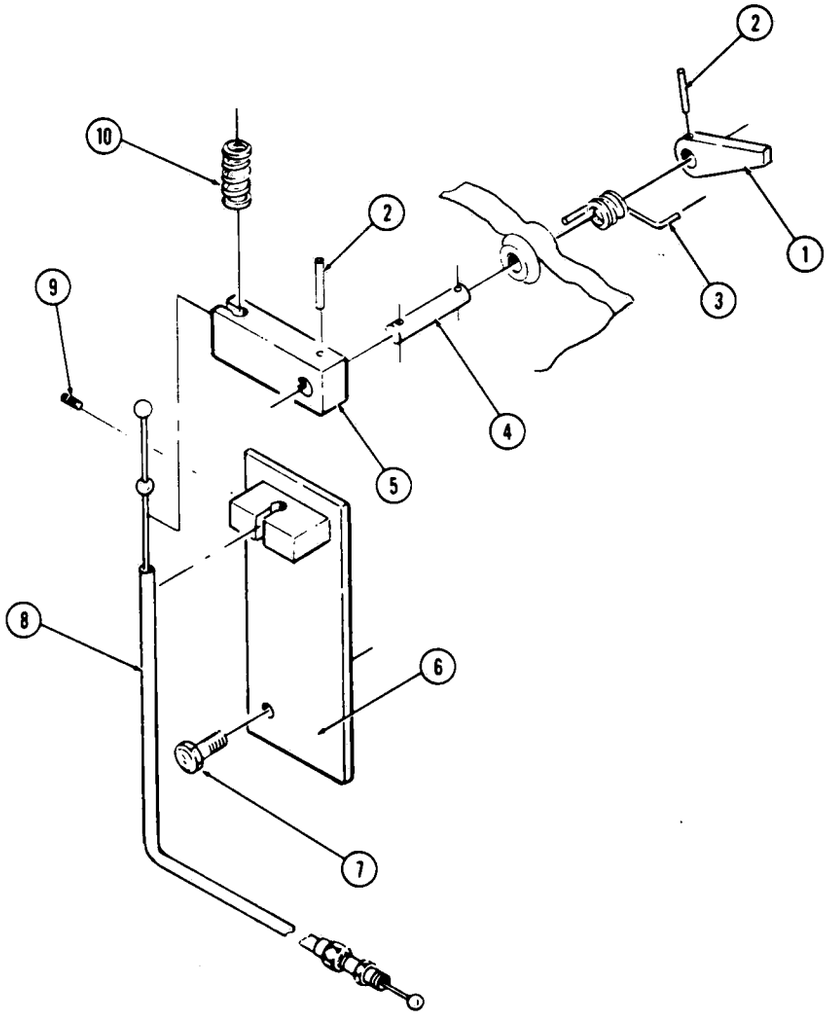


Figure 8-18. DOOR LOCK AND HINGE ASSEMBLY (Part 2 of 2)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-18-					DOOR LOCK AND HINGE ASSEMBLY (Part 2 of 2)	X
1	P	91578	061		PAWL	1
2	P	43227	061		ROLL PIN	2
3	P	150828	055		SPRING, Torsion	1
4	P	129120	001		SHAFT, Pawl	1
5	P	129122	001		ACTUATOR, Door Cable	1
6	P	93891	001		BRACKET, Mounting	1
7	P	31838	042		SCREW, Hex Head, 3/8 x 1	1
8	P	93805	001		CABLE ASSEMBLY	1
9	P	34518	061		SET SCREW	1
10	P	83878	001		SPRING, Compression	1

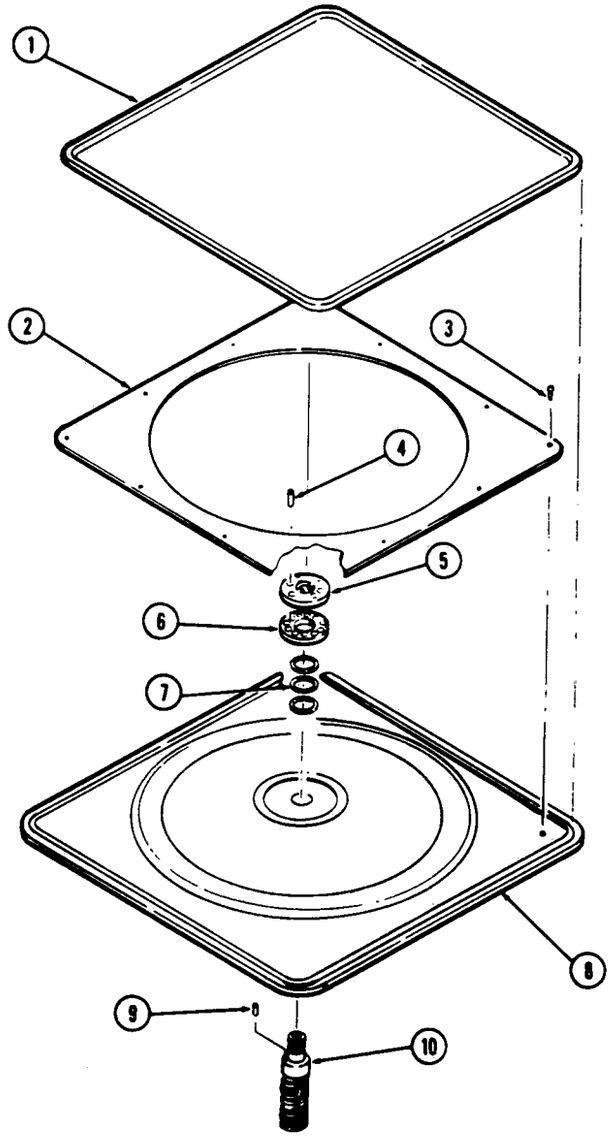


Figure 8-19. DOOR ASSEMBLY

FIG. & INDEX NO.		PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-19-					DOOR ASSEMBLY	X
1	P	74367	091		GASKET	1
2	P	54475	061		COVER, Door Back	1
3	P	47598	061		DRIVE SCREW	13
4	P	44604	061		ROLL PIN	2
5	P	9083	091		RING, Lock Clutch	1
6	P	22057	091		NUT, Door Post	1
7	P	150330	001		SHIM, Door	A/R
8	P	149505	091		DOOR	1
9	P	36683	061		PIN	1
10	P	22058	063		POST, Door	1

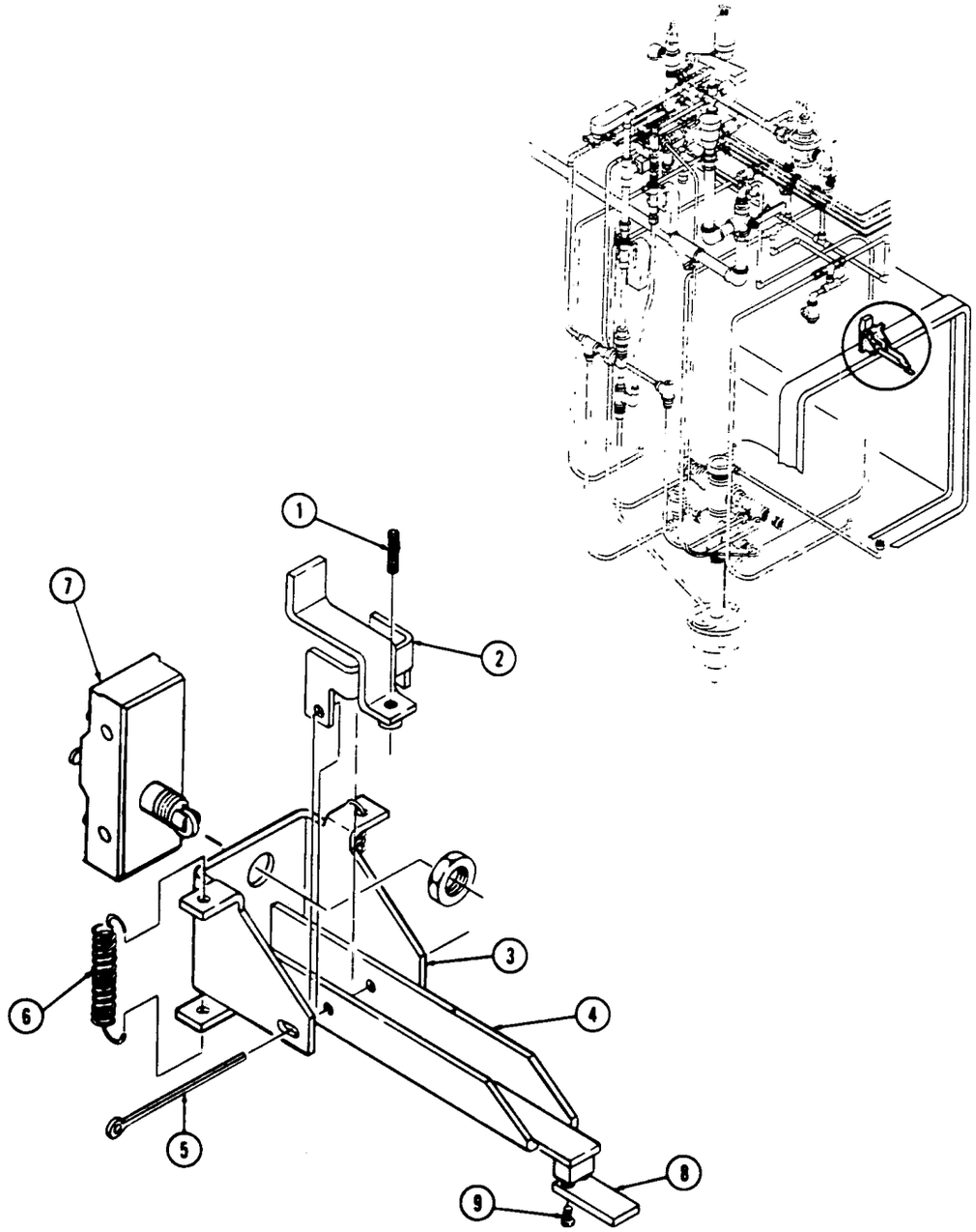


Figure 8-20. DOOR SWITCH ASSEMBLY

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-20-	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 Sensor	1
8	P	90891 045		EXTENSION, Switch (Operating End Only)	1
	P	90888 045		EXTENSION, Switch (Non-Operating End Only)	1
9	P	4682 041		SCREW, Round Head #8-32 x 3/8	2

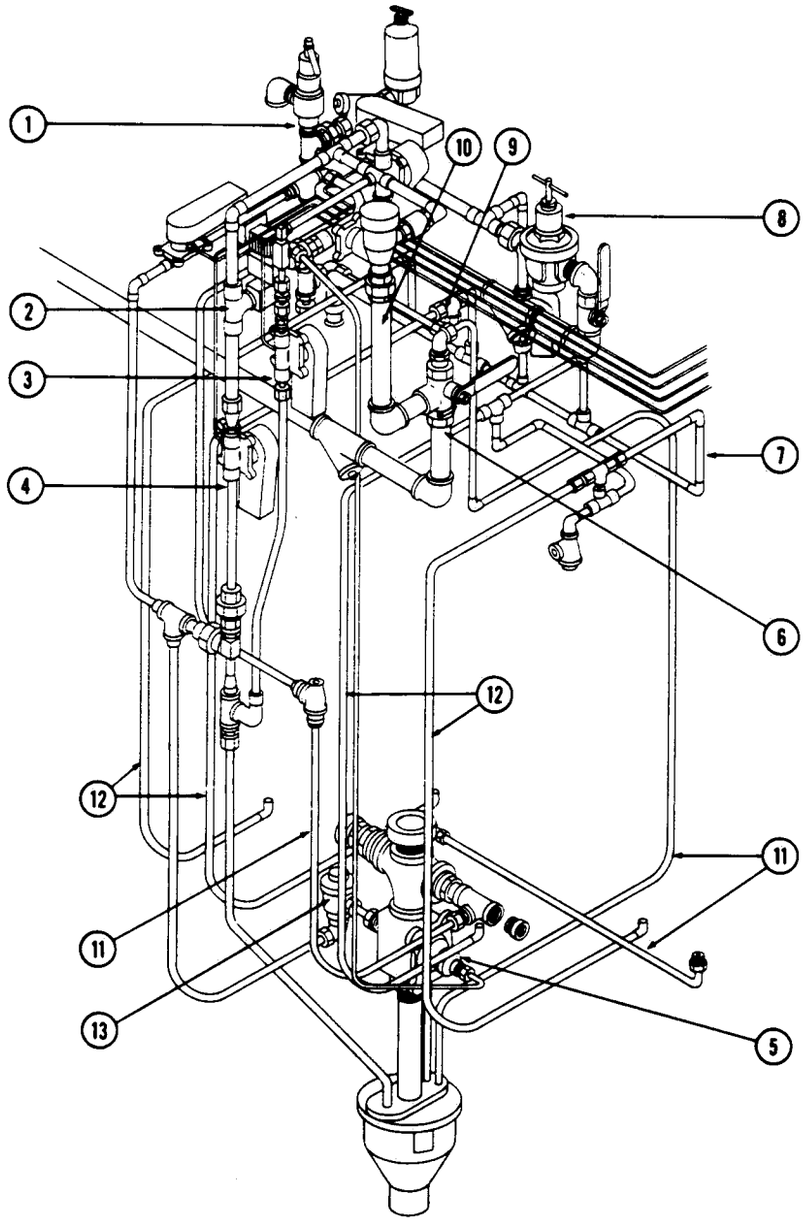


Figure 8-21. PIPING ASSEMBLY, Complete

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-21-				PIPING ASSEMBLY, Complete	X
1	P	93908 903		STEAM ASSEMBLIES (Figure 8-22)	1
2	P	136806 683		INJECTOR ASSEMBLY, Water Fill & Injector (Figure 8-23)	1
3	P	93900 509		DRAIN LINE OPERATOR ASSEMBLY (Figure 8-24)	1
4	P	136806 684		LINE ASSEMBLY, Vapor Removal (Figure 8-24)	1
5	P	93908 773		DRAIN LINE ASSEMBLY (Figure 8-24)	1
6	P	136806 693		LINE ASSEMBLY, Water Supply (Figure 8-23)	1
7	P	136806 697		EJECTOR ASSEMBLY, Front (Figure 8-27)	1
8	P	136806 686		VALVE ASSEMBLY, Steam Control (Figure 8-22)	1
9	P	136806 698		EJECTOR ASSEMBLY, Rear (Figure 8-27)	1
10				WATER SUPPLY ASSEMBLY (Figure 8-23)	1
11				DRAIN LINE ASSEMBLIES (Figure 8-25)	1
12				EJECTOR ASSEMBLIES, Complete (Figure 8-26)	1
13				STEAM TRAP (Figure 8-29)	1

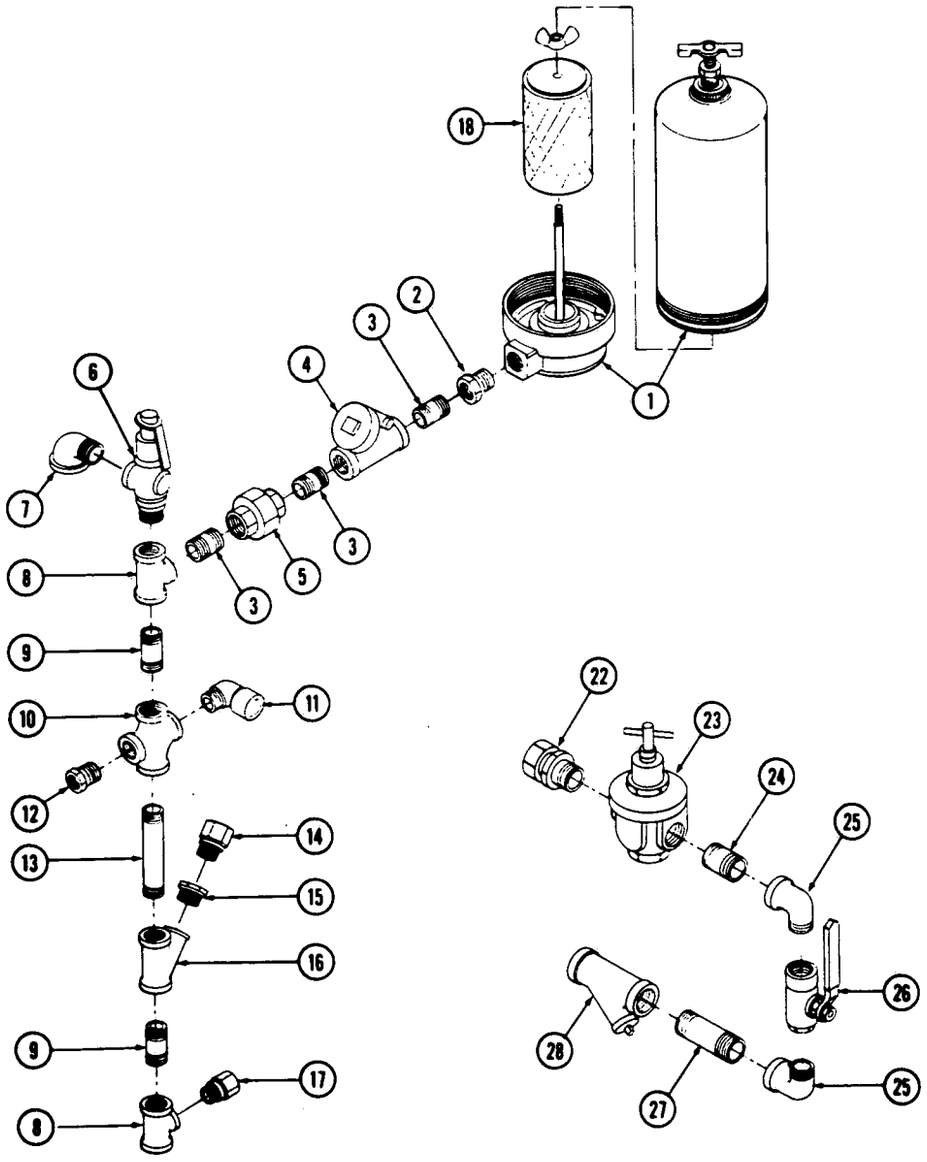


Figure 8-22. STEAM ASSEMBLIES

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-22-					CHAMBER STEAM INLET ASSEMBLY	X
1	P	93909	593		AIR INLET ASSEMBLY	1
2	P	837	091		BUSHING, Reducing, 1/2 N.P.T. x 3/8 N.P.T.	1
3	P	29013	091		NIPPLE, 3/8 N.P.T. x 1" Long	3
4	P	5424	091		VALVE, Check, 3/8 N.P.T.	1
	P	74335	091		• Disc	1
5	P	5266			UNION, 3/8 N.P.T., Brass	1
6	P	84342	001		VALVE, Safety, 3/4 N.P.T.	1
7	P	1639	091		ELL, Street, 1 N.P.T.	1
8	P	4923	091		TEE, Reducing, 3/4 N.P.T. x 3/4 N.P.T. x 1/2 N.P.T.	2
9	P	29292	091		NIPPLE, 3/4 N.P.T. x 2" Long	2
10	P	129070	001		CROSS, Pipe, 1/2 N.P.T. x 3/4 N.P.T.	1
11	P	23972	091		ELL, Compression, 1/2 N.P.T. x 5/8 O.D.T.	1
12	P	837	091		BUSHING, Reducing, 1/2 N.P.T. x 3/8 N.P.T.	1
13	P	29302	091		NIPPLE, 3/4 N.P.T. x 4" Long	1
14	P	39072	091		FITTING, Compression, 3/8 N.P.T. x 5/8 O.D.T.	1
15	P	6209	091		BUSHING, Reducing, 3/4 N.P.T. x 3/8 N.P.T.	1
16	P	82262	001		"Y" BRANCH, 45°, 3/4 N.P.T.	1
17	P	29931	001		FITTING, Compression, 1/2 N.P.T. x 5/8 O.D.T.	1
18	P	129360	802		FILTER ELEMENT	1
					STEAM CONTROL VALVE ASSEMBLY	X
22	P	29931	091		FITTING, Compression, 5/8 O.D.T. x 1/2 N.P.T.	1
23	P	93902	816		REGULATOR, 1/2 N.P.T.	1
24	P	29162	091		NIPPLE, 1/2 N.P.T. x 1" Long	1
25	P	1634	091		ELBOW, Street, 1/2 N.P.T.	2
26	P	93902	921		VALVE, Ball, 1/2 N.P.T.	1
27	P	29184	091		NIPPLE, 1/2 N.P.T. x 6-1/2" Long	1
28	P	129357	906		STRAINER, 1/2 N.P.T.	1
	P	764320	891		• Screen	1

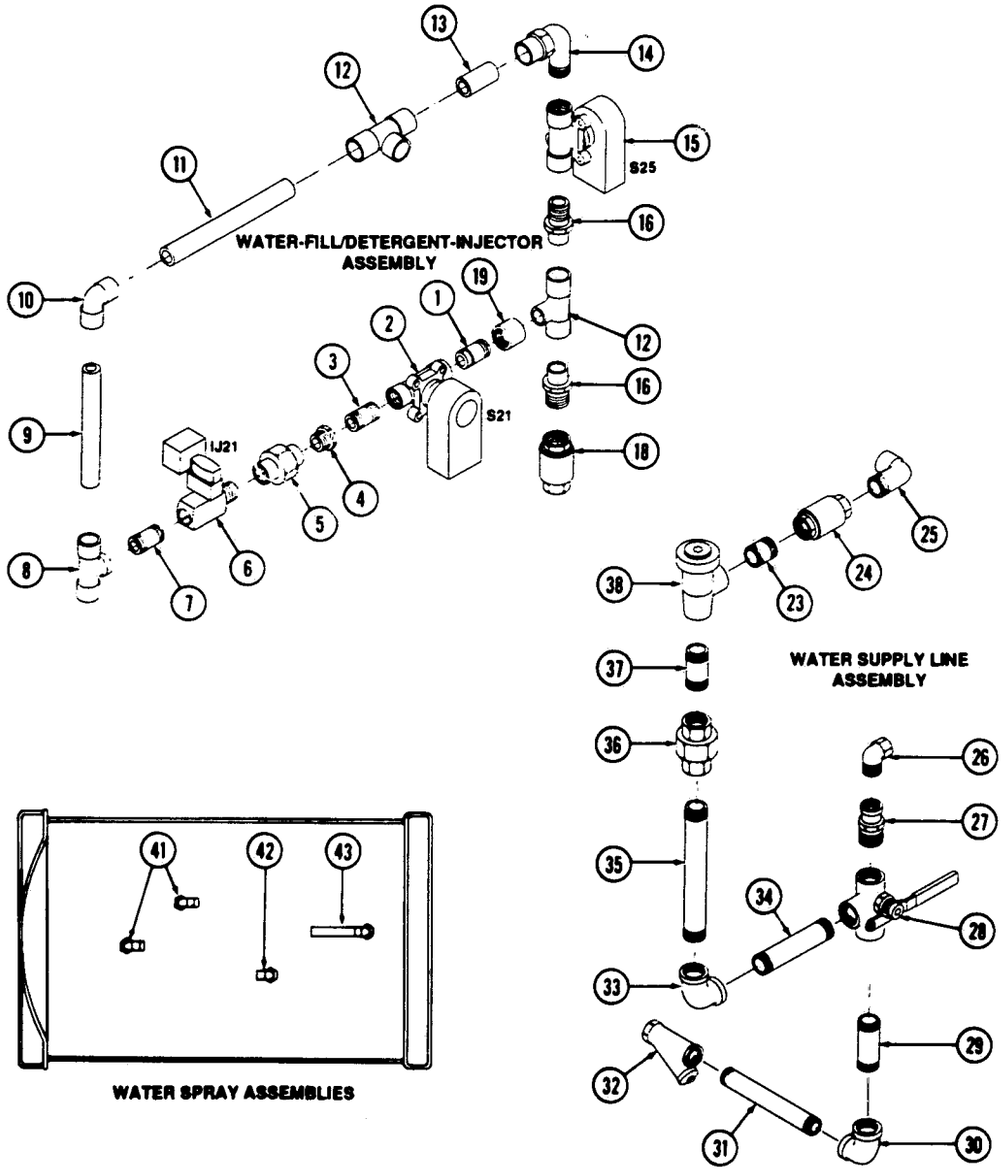


Figure 8-23. PIPING ASSEMBLIES

FIG. & INDEX NO.		PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-23-					WATER FILL/DETERGENT INJECTOR ASSEMBLY	X
1	P	29015	091		NIPPLE, 3/8 N.P.T. x 1-1/2" Long	1
2	P	83263	002		VALVE, Solenoid, 3/8 N.P.T. (S21)	1
	P	764073	001		• Repair Kit	1
	P	764072	002		• Coil	1
3	P	29014	091		NIPPLE, 3/8 N.P.T. x 1-1/4" Long	1
4	P	837	091		REDUCER, 1/2 N.P.T. x 3/8 N.P.T.	1
5	P	89990	091		UNION, 1/2 N.P.T.	1
6	P	84331	002		INJECTOR, 1/2 N.P.T. (IJ21)	1
	P	764320	891		• Screen	1
7	P	29162	091		NIPPLE, 1/2 N.P.T. x 1" Long	1
8	P	129356	508		TEE, 7/8 O.D.T. x 1/2 N.P.T.	1
9	P	150500	001		NIPPLE, 7/8 O.D.T. x 4-13/16" Long	1
10	P	44495	091		ELL, 7/8 O.D.T. x 7/8 O.D.T.	1
11	P	89560	091		TUBE, 7/8 O.D.T. x 6-7/8" Long	1
12	P	91157	091		TEE, 7/8 O.D.T.	2
13	P	80030	091		TUBE, 7/8 O.D.T. x 1-5/8" Long	1
14	P	91230	091		ELL, Union, 7/8 O.D.T. x 3/4 N.P.T.	1
15	P	83875	002		VALVE, Solenoid, 3/4 N.P.T. (S25)	1
	P	764118	001		• Repair Kit	1
	P	764072	002		• Coil	1
16	P	91159	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	2
17					NOT USED	
18	P	83870	001		VALVE, Check, 3/4 N.P.T.	1
19	P	89385	091		BUSHING, Fl., 7/8 O.D.T. x 3/8 N.P.T.	2
					WATER SUPPLY LINE ASSEMBLY	X
23	P	29290	091		NIPPLE, 3/4 N.P.T. x 1" Long	1
24	P	83870	001		VALVE, Check, 3/4 N.P.T.	1
25	P	44500	091		ELBOW, Solder, 3/4 N.P.T. x 7/8 O.D.T.	1
26	P	30718	091		ELBOW, Compression, 1/2 N.P.T. x 3/8 O.D.T.	1
27	P	836	042		REDUCER, 3/4 N.P.T. x 1/2 N.P.T.	1
28	P	93902	919		VALVE, Ball, 3/4 N.P.T., 3 Port	1
29	P	29296	019		NIPPLE, 3/4 N.P.T. x 2-1/2" Long	1
30	P	1625	091		ELBOW, 3/4 N.P.T. x 1/2 N.P.T.	1
31	P	29184	091		NIPPLE, 1/2 N.P.T. x 6-1/2	1
32	P	129357	906		STRAINER, 1/2 N.P.T.	1
	P	761695	001		• TUBE, Detergent Pick-up	1
	P	761696	001		• STRAINER	1
33	P	1635	091		ELBOW, 3/4 N.P.T.	1
34	P	29294	091		NIPPLE, 3/4 N.P.T. x 2" Long	1
35	P	29308	091		NIPPLE, 3/4 N.P.T. x 5-1/2" Long	1
36	P	129232	001		UNION, 3/4 N.P.T.	1
37	P	29292	091		NIPPLE, 3/4 N.P.T. x 1-1/2" Long	1
38	P	93908	897		BREAKER, Vac., 3/4 N.P.T.	1
					WATER SPRAY ASSEMBLIES	X
41	P	93773	002		WATER SPRAY	2
42	P	93773	001		WATER SPRAY	1
43	P	93773	003		WATER SPRAY	1

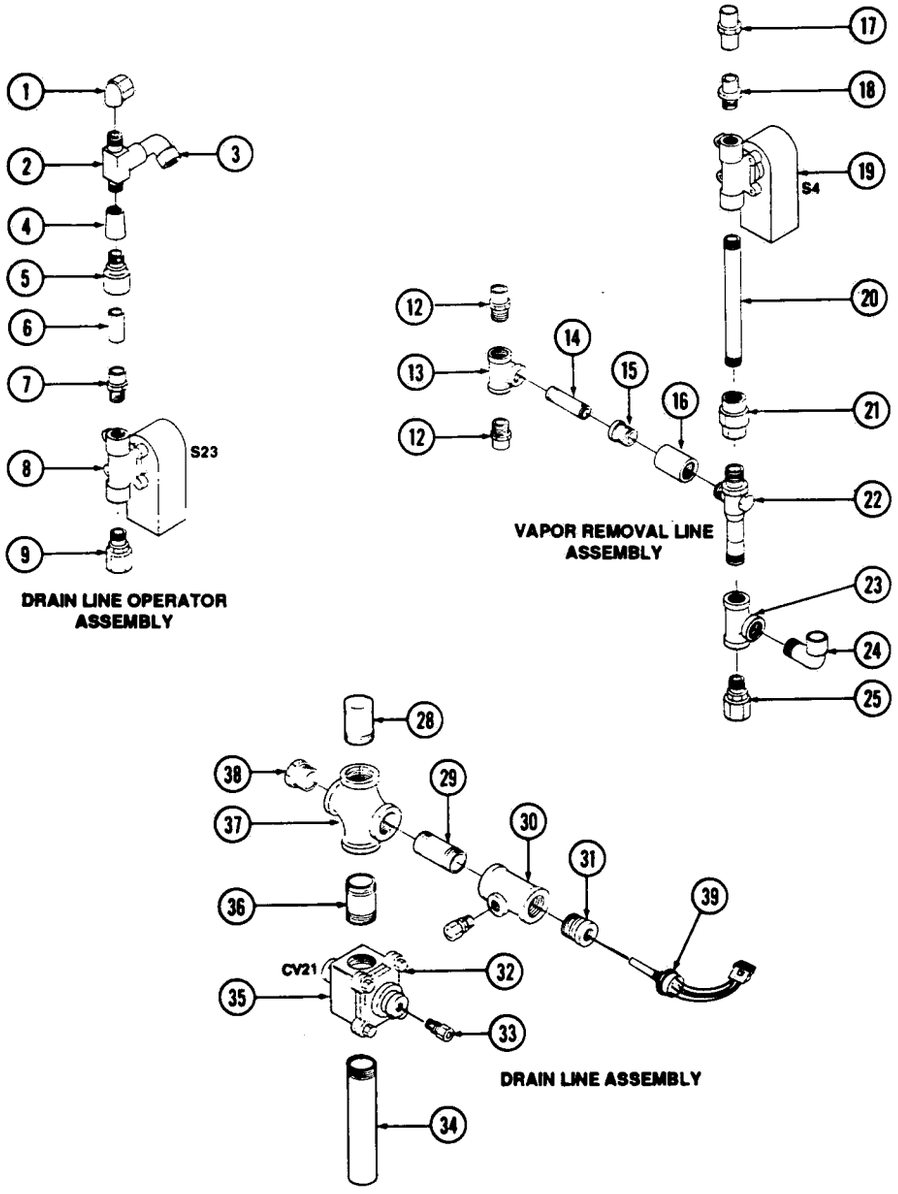


Figure 8-24. DRAIN ASSEMBLIES

FIG. & INDEX NO.		PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-24-					DRAIN LINE OPERATOR ASSEMBLY	X
1	P	80901	091		ELL, Compression, 1/8 N.P.T. x 3/8 O.D.T.	1
2	P	84318	001		INJECTOR	1
3	P	41306	091		ELL, Compression, 1/4 N.P.T. x 1/4 O.D.T.	1
4	P	9014	091		COUPLING, 1/8 N.P.T. x 1/4 N.P.T.	1
5	P	20229	091		FITTING, Compression, 1/4 N.P.T. x 1/2 O.D.T.	1
6	P	32063	091		TUBE, 1/2 O.D. x 1-3/16" Long	1
7	P	90242	091		ADAPTER, 1/2 O.D.T. x 3/8 N.P.T.	1
8	P	83263	002		VALVE, Solenoid, 3/8 N.P.T. (S23)	1
	P	764073	001		• Repair Kit	1
	P	764072	002		• Coil	1
9	P	39072	091		FITTING, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
					VAPOR REMOVAL LINE ASSEMBLY	X
12	P	90208	091		ADAPTER, 3/8 N.P.T. x 5/8 O.D.T.	2
13	P	4928	091		TEE, Pipe, 3/8 N.P.T.	1
14	P	29018	091		NIPPLE, Br., 3/8 N.P.T. x 2-1/4	1
15	P	837	091		BUSHING, Reducing, 1/2 N.P.T. x 3/8 N.P.T.	1
16	P	118372	091		COUPLING, 1/2 N.P.T. x 1/2 N.P.T.	1
17	P	91226	091		UNION, 7/8 O.D.T.	1
18	P	129356	510		ADAPTER, 7/8 O.D.T. x 3/8 N.P.T.	1
19	P	83263	002		VALVE, Solenoid, 3/8 N.P.T. (S4)	1
	P	764073	001		• Repair Kit	1
	P	764072	002		• Coil	1
20	P	29038	091		NIPPLE, Br., 3/8 N.P.T. x 7-1/4	1
21	P	5266	091		UNION, 3/8 N.P.T.	1
22	P	129357	512		EJECTOR, 1/2 N.P.T.	1
23	P	4931	091		TEE, Pipe, 1/2 N.P.T.	1
24	P	44499	091		ELL, Solder, 1/2 N.P.T. x 5/8 O.D.T.	1
25	P	81060	001		CONN., Compression, 1/2 N.P.T. x 5/8 O.D.T.	1
					DRAIN LINE ASSEMBLY	X
28	P	39597	091		NIPPLE, 1-1/4 N.P.T. x 1-3/4" Long	1
29	P	29359	091		NIPPLE, 1 N.P.T. x 2-3/4" Long	1
30	P	4935	091		TEE, Reducing, 1 x 1 x 1/2 N.P.T.	1
31	P	129359	497		BUSHING, Reducing, 1 N.P.T. x 1/4 N.P.T.	1
32	P	29931	091		CONNECTOR, Compression, 5/8 O.D.T. x 1/2 N.P.T.	1
33	P	19514	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1
34	P	129359	470		NIPPLE, 1-1/4 N.P.T. x 4-3/8	1
35	P	83885	001		VALVE, Drain, 1-1/4 N.P.T. (CV21)	1
	P	764189	001		• Repair Kit	1
36	P	79444	091		NIPPLE, 1-1/4 N.P.T. x 2-1/4	1
37	P	51758	091		CROSS, Reducing, 1-1/4 N.P.T. x 1 N.P.T.	1
38	P	6263	091		BUSHING, Reducing, 1 N.P.T. x 1/2 N.P.T.	1
39	P	93908	519		DETECTOR, Liquid Level	1

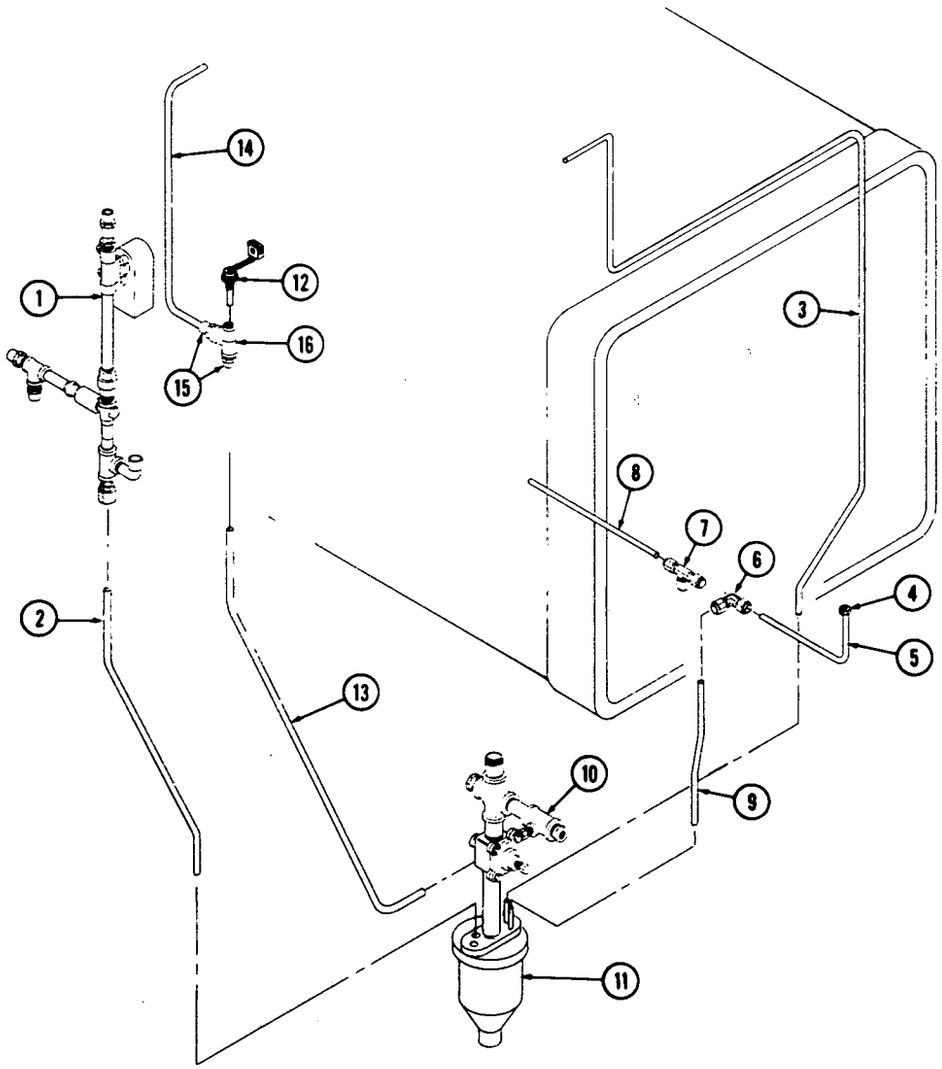


Figure 8-25. DRAIN LINE ASSEMBLY

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-25-					DRAIN ASSEMBLIES	X
1	P	136806	684		LINE ASSEMBLY (Figure 8-24)	1
2	P	93908	893		TUBE	1
3					TUBE, 3/8 O.D. x 64-25/32" Long	1
4					CONNECTOR	1
5	P	93612	001		TUBE, 1/4 O.D.	1
6	P	46682	091		ELL, Compression, 1/4 O.D.	1
7	P	46097	091		TEE, Compression, 1/4 O.D. (on double door only)	1
8					TUBE, 1/4 O.D. (on double door only)	1
9	P	93908	864		TUBE, 1/4 O.D.	1
10	P	93780	001		DRAIN ASSEMBLY (Figure 8-24)	1
11	P	141198	005		FUNNEL AND CAP ASSEMBLY	1
					• FUNNEL, Drain, 2 O.D.	1
					• CAP, Funnel	1
					• SCREW, Hex Set, 1/4-20	2
					• SCREW, Self Tap, 6-32 x 1/2	2
12	P	93908	519		DETECTOR, Liquid Level (High Level)	1
13	P	93908	895		TUBE	1
14	P	136806	692		TUBE	1
15	P	90211	091		ADAPTOR, Tube	1
16	P	4911	091		TEE, 1/2 x 1/4 x 1/2	1

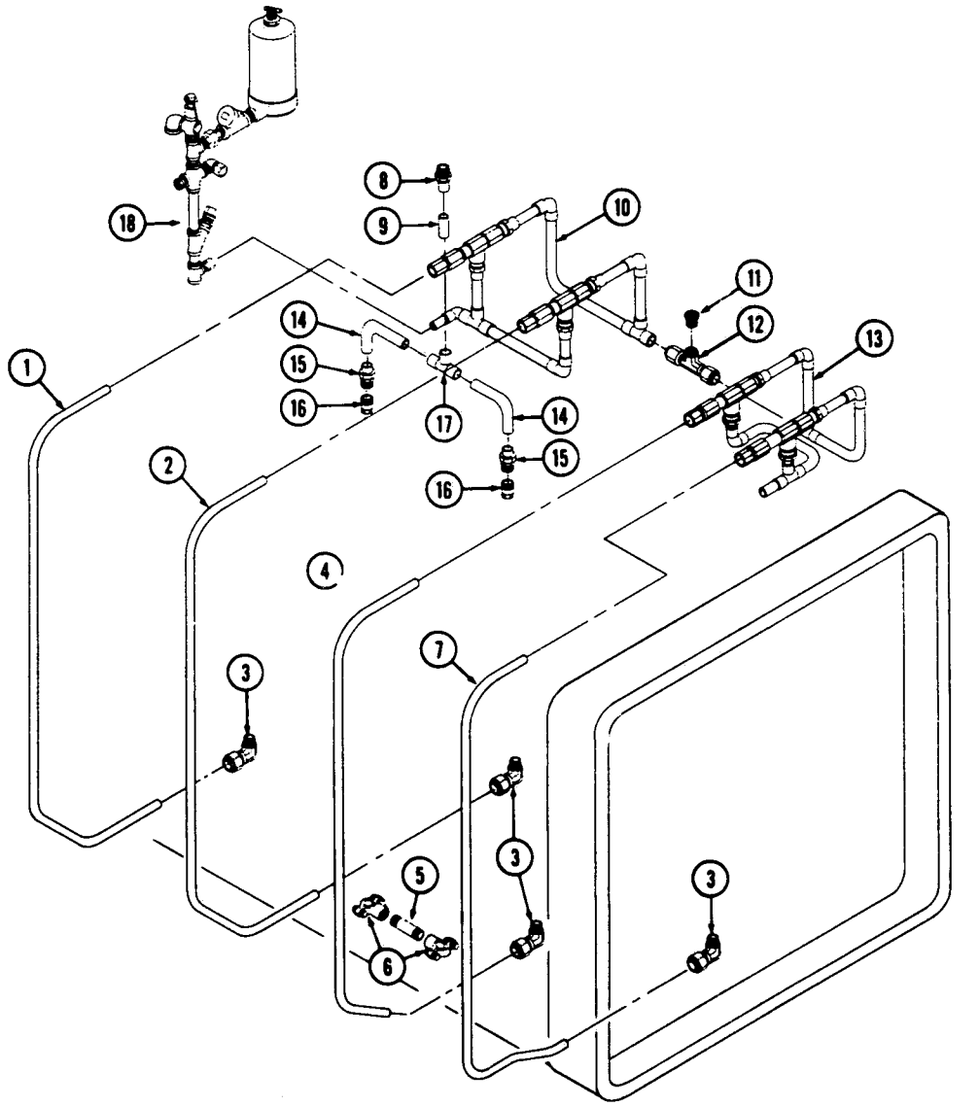
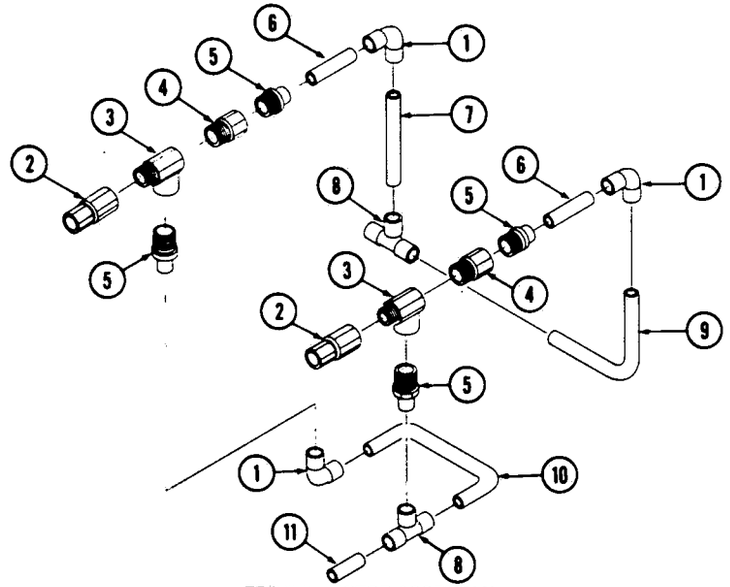
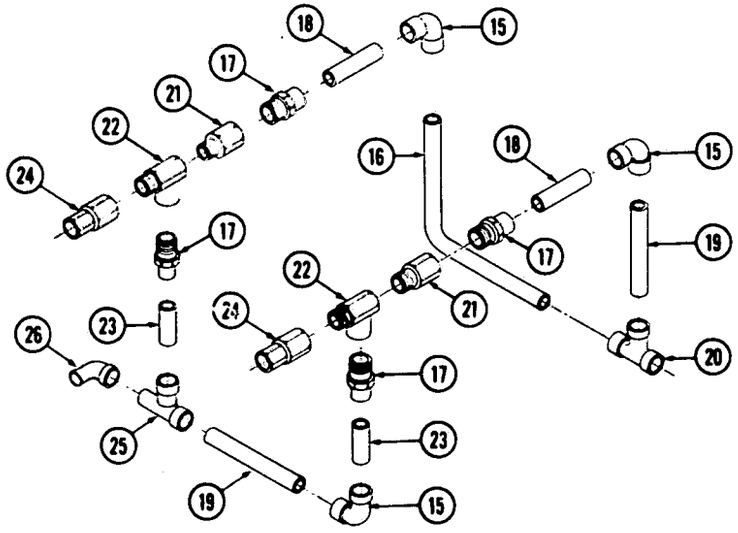


Figure 8-26. EJECTOR ASSEMBLIES, Complete

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-26-				EJECTOR ASSEMBLIES	X
1	P 136806	847		TUBE, Ejector	1
2	P 136806	846		TUBE, Ejector	1
3	P 81064	001		FITTING, Ell, 5/8 O.D.T. x 1/2 N.P.T.	4
4	P 136806	700		TUBE, Ejector	1
5	P 28927	091		NIPPLE, 1/4 N.P.T. x 3-1/2" Long	1
6	P 75376	010		CLAMP	4
7	P 136806	699		TUBE, EJECTOR	1
8	P 91158	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	1
9	P 89556	091		TUBE, 7/8 O.D. x 3-1/4" Long	1
10	P 136806	698		REAR EJECTOR ASSEMBLY (Figure 8-26)	1
11	P 837	091		BUSHING, Reducing, 1/2 N.P.T., 3/8 N.P.T.	1
12	P 76708	091		TEE, Compression, 5/8 O.D.T. x 5/8 O.D.T. x 1/2 N.P.T.	1
13	P 136806	697		FRONT EJECTOR ASSEMBLY (Figure 8-26)	1
14	P 93909	492		TUBE	2
15	P 90227	091		UNION, Solder, 1/2 O.D. x 1/2 N.P.T.	2
16	P 83876	001		NOZZLE, Water	2
17	P 91162	091		TEE, Solder, 1/2 x 1/2 x 3/4	1
18	P 93908	903		CHAMBER STEAM INLET ASSEMBLY (Figure 8-22)	1



FRONT EJECTOR ASSEMBLY



REAR EJECTOR ASSEMBLY

Figure 8-27. EJECTOR ASSEMBLIES

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-27-					FRONT EJECTOR ASSEMBLY	X
1	P	90212	091		ELBOW, 5/8 O.D.T.	3
2	P	30948	091		FITTING, 1/2 N.P.T. x 5/8 O.D.T.	2
3	P	93909	627		EJECTOR	2
4	P	93909	626		NOZZLE, Steam	2
5	P	90211	091		ADAPTER, 5/8 O.D.T. x 1/2 N.P.T.	4
6	P	44832	091		TUBE, 5/8 O.D.T. x 1-7/8" Long	2
7	P	44835	091		TUBE, 5/8 O.D.T. x 3" Long	1
8	P	90221	091		TEE, 5/8 O.D.T.	2
9	P	93909	142		TUBE, 1/2 O.D.T.	1
10	P	129360	195		TUBE, 5/8 O.D.T.	1
11	P	90263	091		TUBE, 5/8 O.D.T. x 1-1/2	1
					REAR EJECTOR ASSEMBLY	X
15	P	90212	091		ELL, 5/8 O.D.T.	3
16	P	93909	143		TUBE, 5/8 O.D.	1
17	P	90211	091		ADAPTER, 5/8 O.D.T. x 1/2 N.P.T.	4
18	P	90263	091		TUBE, 5/8 O.D.T. x 1-1/2" Long	2
19	P	44835	091		TUBE, 5/8 O.D. x 3" Long	1
20	P	90221	091		TEE, 5/8 O.D.T.	1
21	P	93909	626		NOZZLE, Steam	2
22	P	93909	627		EJECTOR	2
23	P	90266	091		TUBE, 5/8 O.D. x 2" Long	2
24	P	30948	091		FITTING, 1/2 N.P.T. x 5/8 O.D.T.	2
25	P	89780	091		TEE, Street, 5/8 O.D.T.	1
26	P	90214	091		ELL, Street, 5/8 O.D.T.	1

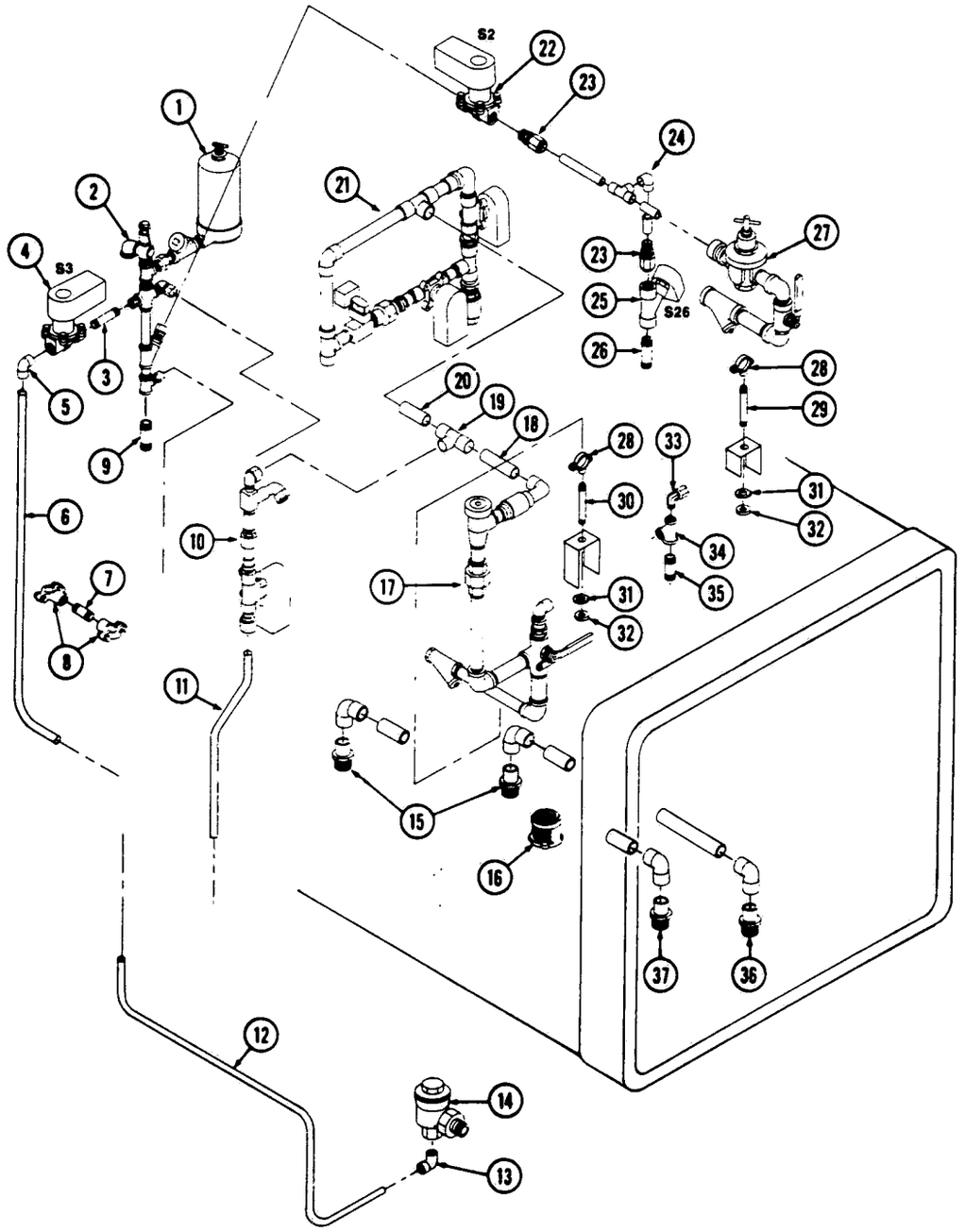


Figure 8-28. STEAM AND WATER SUPPLY ASSEMBLIES

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-28-					STEAM & WATER ASSEMBLIES	1
1	P	93909	593		AIR INLET ASSEMBLY	1
2	P	93908	903		CHAMBER STEAM INLET ASSEMBLY (Figure 8-22)	1
3	P	29038	091		NIPPLE, 3/8 N.P.T. x 7-1/4" Long	1
4	P	83264	002		VALVE, Solenoid, 3/8 N.P.T. (S3)	1
	P	764070	001		• Repair Kit	
	P	764070	002		• Coil	
5	P	40153	091		FITTING, Ell, 3/8 N.P.T. x 5/8 O.D.T.	2
6	P	93908	892		TUBE	1
7	P	28927	091		NIPPLE, 1/4 N.P.T. x 3-1/2" Long	1
8	P	75376	010		CLAMP	2
9					NIPPLE	1
10	P				DRAIN LINE OPERATOR ASSEMBLY (Figure 8-24)	1
11					TUBE*, 1/4 O.D., 56-1/2" Long	1
12	P	136806	845		TUBE	1
13	P	81064	001		ELL, Compression, 1/2 N.P.T. x 5/8 O.D.T.	1
14	P	129222	001		TRAP, Steam (Figure 8-29)	1
15	P	93773	002		WATER SPRAY	2
16	P	29903	042		STRAINER, Chamber	1
17	P	136806	693		WATER SUPPLY LINE ASSEMBLY (Figure 8-23)	1
18	P	89559	091		TUBE, 7/8 O.D. x 3-14" Long	1
19	P	89671	091		TEE, Reducing, 7/8 O.D.T. x 7/8 O.D.T. x 3/8 O.D.T.	1
20	P	83227	007		TUBE, 7/8 O.D. x 2-5/16" Long	1
21	P	136806	683		WATER FILL/DETERGENT INJECTOR ASSEMBLY (Figure 8-23)	1
22	P	150822	309		VALVE, Solenoid, 3/8 N.P.T. (S2)	1
	P	764317	687		• Repair Kit	
	P	764070	002		• Coil	
23	P	39072	091		FITTING, Strainer, 3/8 N.P.T., 5/8 O.D.T.	2
24	P	93908	800		SUPPLY LINE, Chamber Steam**	1
25	P	84430	002		VALVE, Solenoid, 3/8 N.P.T. (S26)	1
	P	764077	001		• Repair Kit	
	P	764077	002		• Coil	
26	P	29021	092		NIPPLE, 3/8 N.P.T. x 3" Long	1
27	P	136806	686		STEAM CONTROL VALVE ASSEMBLY (Figure 8-22)	1
28	P	39589	010		CLAMP, Pipe	2
29	P	150822	297		PIPE SUPPORT, 1/4 N.P.T. x 5-3/4" Long	1
30	P	150822	295		PIPE SUPPORT, 1/4 N.P.T. x 3-1/4" Long	1
31	P	52148	045		LOCKWASHER, 9/16 I.D.	4
32	P	129091	001		LOCKNUT, Pipe, 1/4 N.P.T.	4
33	P	81064	001		FITTING, Ell, 5/8 O.D.T. x 1/2 N.P.T.	5
34	P	4922	091		TEE, Reducing, 3/4 N.P.T. x 1/2 N.P.T. x 1/2 N.P.T.	1
35	P	29290	091		NIPPLE, 3/4 N.P.T. x 1" Long	1
36	P	93773	003		WATER SPRAY	1
37	P	93773	001		WATER SPRAY	1

Item 11 to be 1/4 O.D. x .030 Wall Soft Copper Tube, ASTM B280
**Trim Tubing When Necessary*

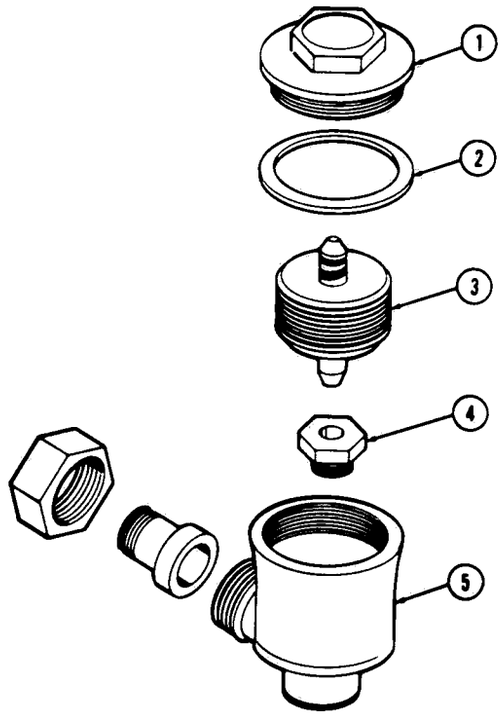
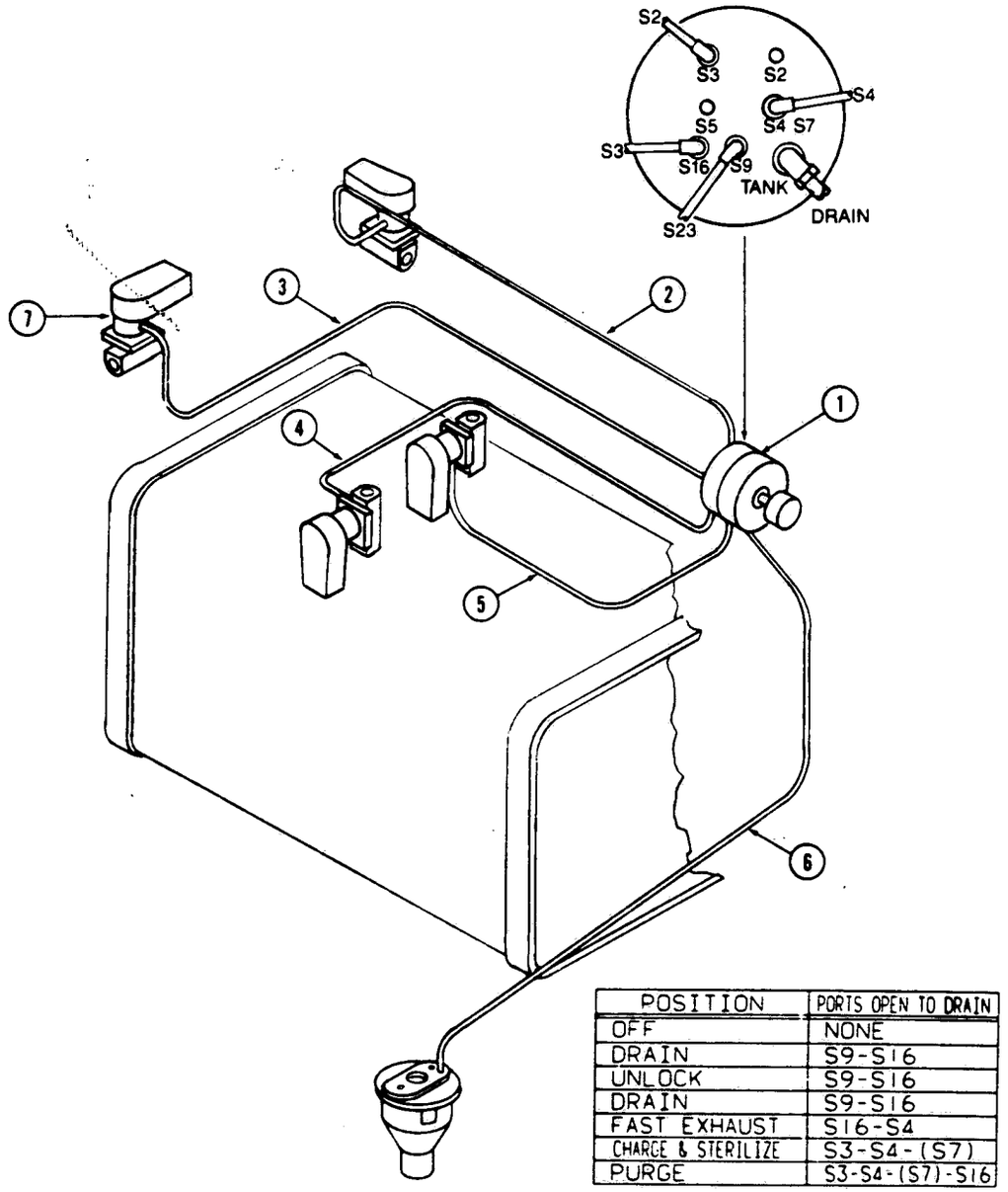


Figure 8-29. STEAM TRAP

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-29-	P	129222	001		STEAM TRAP	1
	P	764080	001		KIT, Repair, 1/2 N.P.T. (includes items 2, 3, 4)	A/R
1	P	764315	209		CAP	1
2					GASKET	1
3					DIAPHRAGM ASSEMBLY	1
4					SEAT	1
5					BODY	1



POSITION	PORTS OPEN TO DRAIN
OFF	NONE
DRAIN	S9-S16
UNLOCK	S9-S16
DRAIN	S9-S16
FAST EXHAUST	S16-S4
CHARGE & STERILIZE	S3-S4-(S7)
PURGE	S3-S4-(S7)-S16

Figure 8-30. MANUAL VALVE PACKAGE

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-30-					MANUAL VALVE PACKAGE	X
1	P	146649	004		PANEL, Valve Assembly	1
2	P	136806	833		DECAL, Manual Count. Washer/Sterilizer	1
3	P	129359	462		ROD, Valve Extension	2
4	P	8605			NUT, Valve Handwheel	2
5	P	54899			KNOB, Valve	2
6	P	90322			DECAL, Steam Supply Valve Handle	1
7	P	90323	091		DECAL, Water Supply Valve Handle	1
8	P	129356	138		PLUG BUTTON	1
9	P	52309			COUPLING, Valve Stem	1
10	P	129360	804		COUPLING, Valve Stem	1
11	P	46038			COTTER PIN	2
12	P	10583			SCREW, Set	2
13	P	136807	255		PANEL, Weldment (Figure 8-31)	1
14					KNOB	1

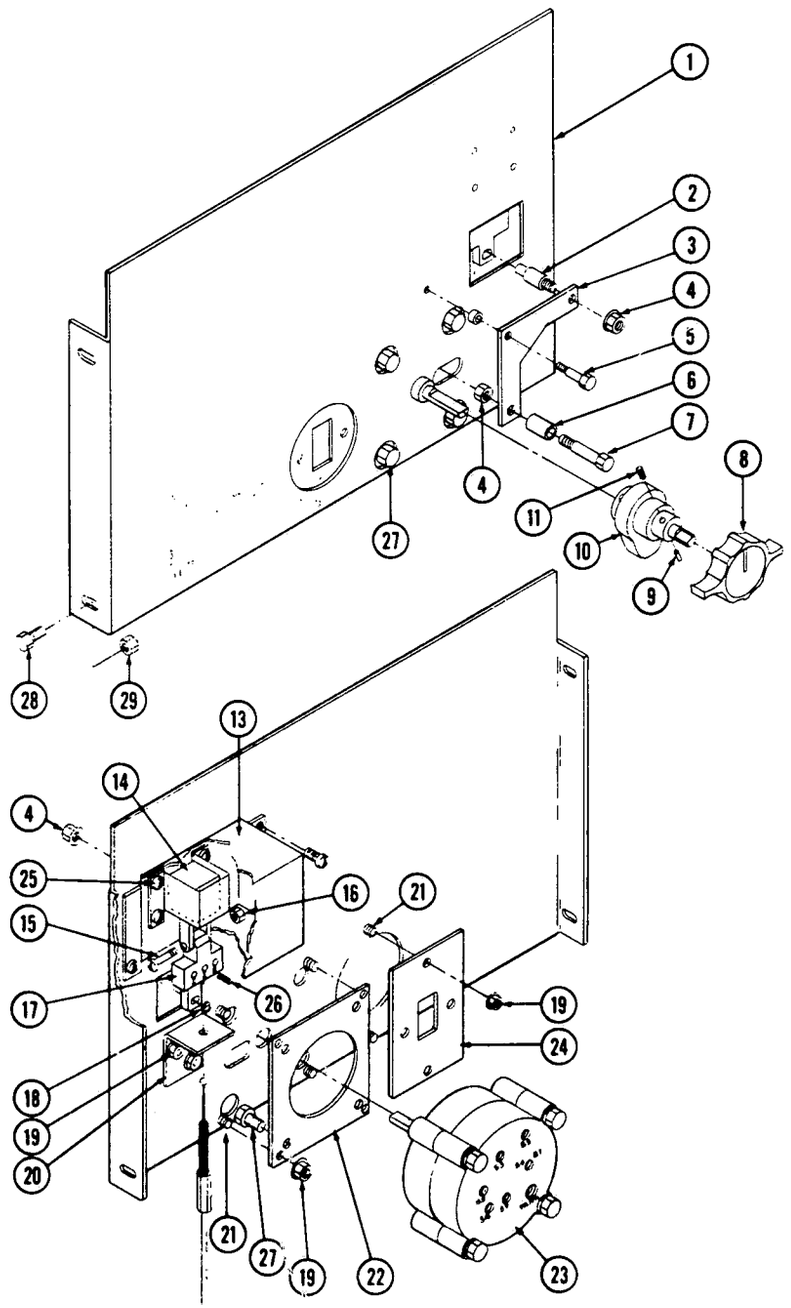


Figure 8-31. MOUNTING PANEL ASSEMBLY - Multi-port Valve

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-31-					MOUNTING PANEL ASSEMBLY, Multiport Valve	X
1	P	146653	588		PANEL, Back	1
2	P	129360	028		SPACER	1
3	P	93908	921		LINK, Actuator	1
4	P	129359	532		NUT, KEPS, #10-32	6
5	P	129357	080		SCREW, Shoulder, #10-32 x 1/4 Dia. x 1/4" Long	1
6	P	129360	021		ROLLER	1
7	P	129357	079		SCREW, Shoulder, #10-32 x 1/4 Dia. x 5/8" Long	1
8					KNOB	1
9	P	47383	091		PIN, Roll, 1/16	1
10	P	136806	832		CAM	1
11	P	42617	045		SCREW, Set, #6-32 x 1/4	1
12	P	48781	091		WASHER, Teflon, 17/64 I.D. x 1/2 O.D. x 3/32" Thick	1
13	P	93908	918		COVER, Solenoid	1
14	P	56396	014		SOLENOID	1
15	P	9315	041		SCREW, Round Head, #10-32 x 1-1/4	1
16	P	2959	041		NUT, Hex, #10-32	1
17	P	93908	920		ACTUATOR, Solenoid	1
18	P	129360	536		RING, Retaining Circular Push-On 1/4" Shaft	1
19	P	129360	016		NUT, Flange, #10-32	8
20	P	93909	632		ANGLE, Cable Mount	1
21	P	150475	915		STUD, Weld, #10-32 x 3/8"	8
22	P	93909	635		PLATE, Manual Valve	1
23	P	136806	677		VALVE, Multiport	1
24	P	93909	634		PLATE, Gauge	1
25	P	93908	036		SCREW, SEMS, #10-32 x 3/8	6
26	P	31799	091		SCREW, Set, 5/16-18 x 5/16	1
27					BOLT, Multiport Valve Mounting	4
28					SCREW, Panel Mounting	4
29					NUT, Panel Mounting	4

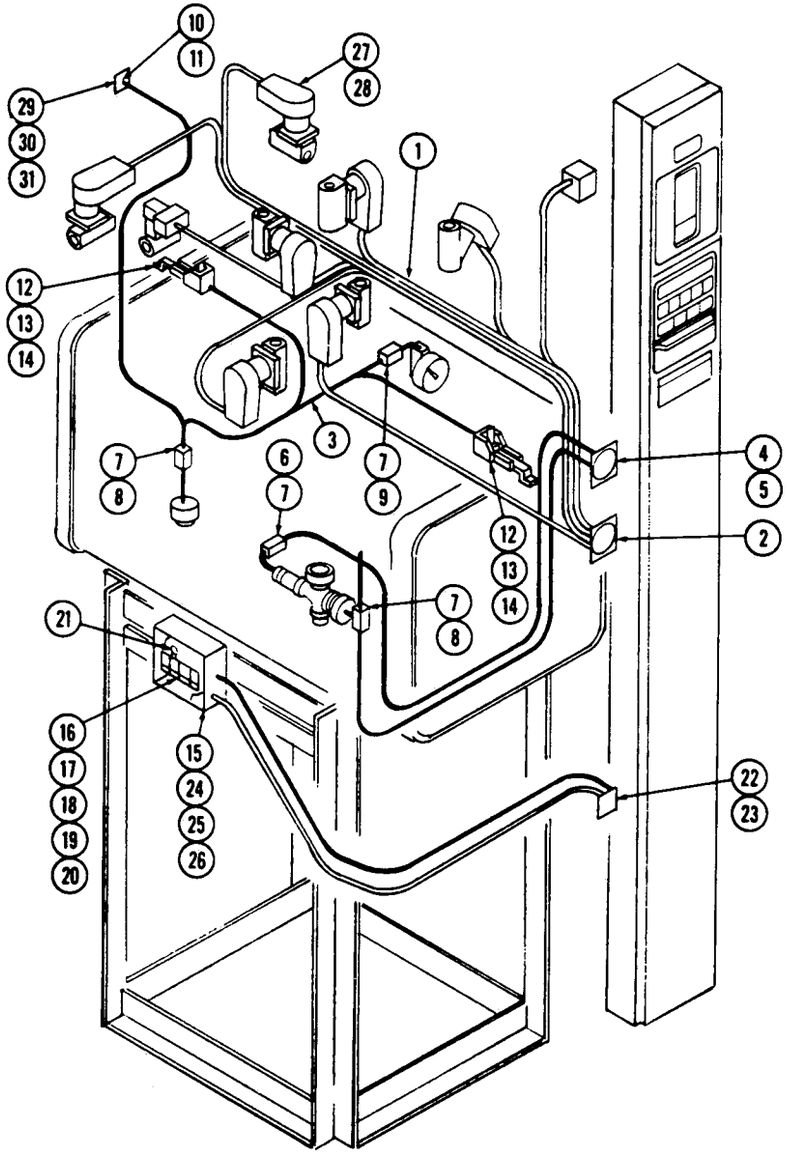


Figure 8-32. FINAL WIRING ASSEMBLY

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-32	P	146653	567		FINAL WIRING ASSEMBLY, Single Door	X			
	P	146653	568		FINAL WIRING ASSEMBLY, Double Door		X		
1	P	136806	424		CABLE ASSEMBLY, Solenoid	1	1		
2	P	93838	006		• PLUG, P54 (37 Pos)	1	1		
3	P	146653	483		CABLE ASSEMBLY, Door Switch (Single Door)	1			
	P	146653	484		CABLE ASSEMBLY, Door Switch (Double Door)		1		
4	P	93909	384		• PLUG, P53 (63 Pos)	1	1		
5	P	84475	001		• CONTACT, Socket (22 AWG)	20	38		
6	P	129117	001		• HOUSING, Plug, P8 (2 Pos)	1	1		
7	P	129039	003		• CONTACT, Socket (18 AWG)	12	12		
8	P	129115	001		• HOUSING, Plug, P9 & P10 (4 Pos)	2	2		
9	P	129119	001		• HOUSING, Plug, P11 (6 Pos)	1			
10	P	93900	028		• HOUSING, Receptacle, P30 (20 Pos)		1		
11	P	84187	003		• CONTACT, Receptacle (22/26 AWG)		19		
12	P	136807	136		DOOR SWITCH ASSEMBLY (Figure 8-20)	1	2		
13	P	16451	042		SCREW, Socket, 10-32 x 5/8	2	4		
14	P	118442	045		NUT, Lock, 10-32	2	4		
15	P	136806	849		POWER BOX ASSEMBLY	1	1		
16	P	90746	091		• STRIP, Terminal	1	1		
17	P	82647	001		• MARKER, Strip	1	1		
18	P	42603	091		• SCREW, Round Head, 6-32 x 7/8	2	2		
19	P	19684	061		• Lockwasher	2	2		
20	P	3037	041		• NUT, Hex, 6-32	2	2		
21	P	93908	906		• VARISTOR ASSEMBLY	1	1		
22	P	56396	090		• PLUG, P57	1	1		
23	P	150822	181		• CONTACT, Socket	3	3		
24	P	3950	048		SCREW, Round Head, 14-20 x 5/8	2	2		
25	P	129353	295		WASHER, Flat	2	2		
26	P	129359	533		NUT, KEPS, 14-20	2	2		
27	P	150778	001		VARISTOR (S2, S26, S21, S25, IJ21)	5	5		
28					SLEEVE, Insulation, Braided Glass Fiber/Vinyl Covered, NEMA VS-1, Grade B, Size 14, .064/.072 I.D.	A/R	A/R		
29	P	146653	684		TOUCH PANEL ASSEMBLY, NOE (Figure 8-8)		1		
30	P	129360	821		SPACER		4		
31	P	84121	001		NUT, Lock,4-40		4		

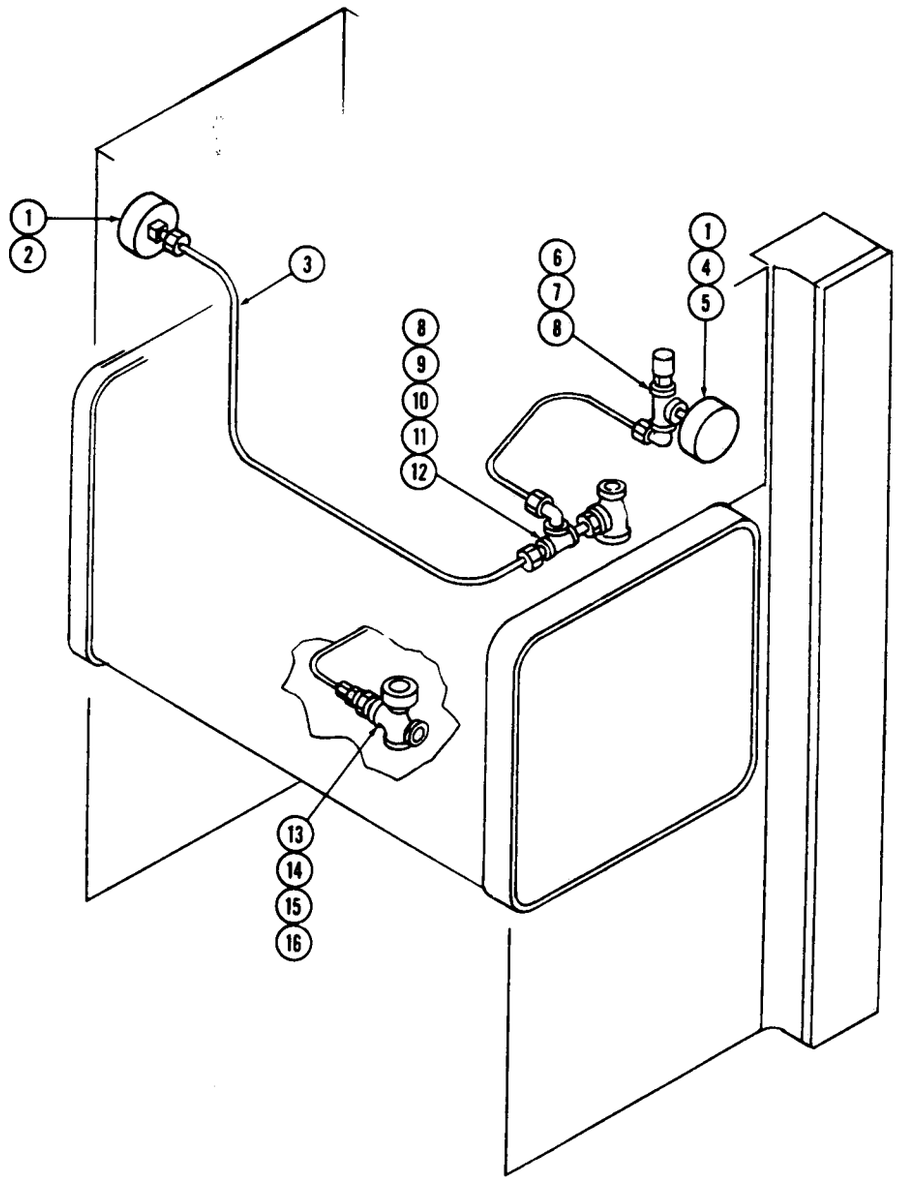


Figure 8-33. SENSING LINE PACKAGE

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY				
8-33-					SENSING LINE PACKAGE					
					Single Door	X				
					Double Door		X			
1	P	90525	091		GAUGE, Chamber	1				
2	P	90594	091		FITTING, Straight	1				
3					TUBING*, 1/8 O.D.T. x 60" Long		1			
4	P	129360	016		NUT, Flange, #10-32		2			
5	P	5511	091		WASHER, Flat, 7/16 O.D. x .195 I.D. x .047	2	4			
6	P	26181	091		ELL, Compression, 1/8 O.D.T. x 1/8 N.P.T.	1				
7	P	93908	521		TRANSDUCER ASSEMBLY (Pressure)	1	1			
8	P	37862	091		TEE, 1/8 N.P.T.	2	2			
9	P	33447	042		BUSHING, Reducing, 1/2 N.P.T. x 1/8 N.P.T.	1	1			
10	P	50589	091		TEE, Compression, 1/8 O.D.T. x 1/8 N.P.T. x 1/8 O.D.T.		1			
11	P	28899	091		NIPPLE, 1/8 N.P.T. x 1" Long	1	1			
12	P	3439	091		PLUG, 1/8 N.P.T.	1	1			
13	P	93908	517		THERMISTOR ASSEMBLY (Temperature)	1	1			
14	P	150822	845		BUSHING, Therm., 1/8 O.D.T. x 1/4 N.P.T.	1	1			
15	P	150822	802		BUSHING, Probe, 1/2 N.P.T. x 1/2 N.P.T.	1	1			
16	P	150822	801		BUSHING, Support	1	1			

Tubing to be 1/8 O.D. T. x .030 wall, soft annealed copper tube ASTM B280, trim to size as needed.

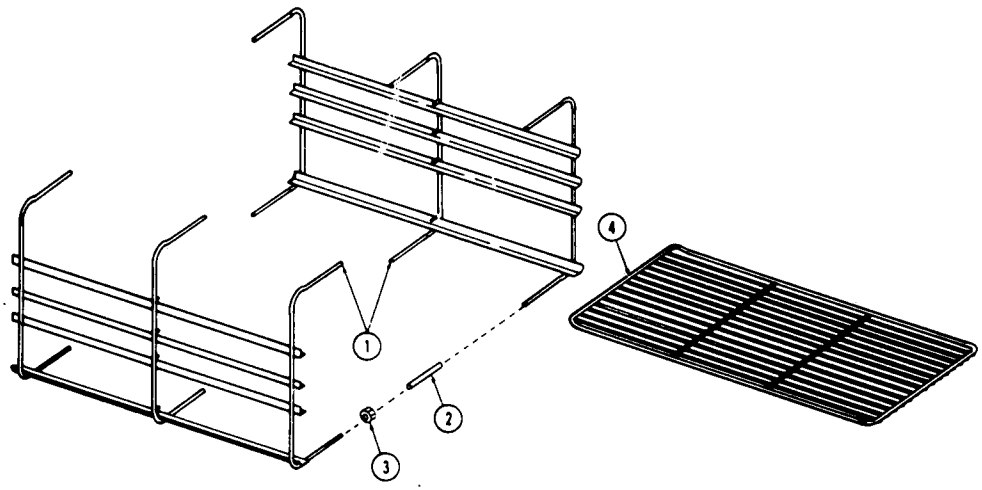


FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-34-					OPTIONAL RACK AND SHELVES	X
	P	136800	011		RACK ASSEMBLY	1
1	P	136800	035		• RACK WELDMENT, R.H.	1
	P	136800	036		• RACK WELDMENT, L.H.	1
2	P	91291	062		• RACK RETAINING TUBE	4
3	P	8649	061		• NUT, Hex, 1/4-28	8
4	P	139537	068		SHELF, Chamber, 15 x 22"	2 or 3

Figure 8-34. OPTIONAL RACK AND SHELVES

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