AMSCO Maintenance Manual



Eagle Series

EAGLE® 2000 AND 2300 SERIES
Universal Gravity/Isothermal
Small Sterilizer

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SUMMARY OF SAFETY PRECAUTIONS

The following are personnel (WARNINGS) and equipment (CAUTIONS) **safety precautions** to be observed when operating or servicing this unit. This is a summary listing of safety precautions appearing in the text. Carefully read them before proceeding to use or service the unit. The precautions are repeated where applicable throughout the manual. 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.

WARNINGS:

WHEN OPERATING A LIQUIDS CYCLE YOU MUST OBSERVE THE PRECAUTIONS LISTED IN PARAGRAPH 2.4. FAILURE TO FOLLOW THESE PRECAUTIONS COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

SUDDEN FULL OPENING OF THE DOOR FOLLOWING A LIQUIDS STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, EXERCISE CAUTION WHEN OPENING AND UNLOADING THE STERILIZER.

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

WHEN CHECKING SAFETY VALVE(S), BE CAREFUL IF STEAM IS ESCAPING. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.

ALWAYS SHUT OFF ELECTRIC POWER TO STERILIZER AT WALL DISCONNECT SWITCH BEFORE STARTING ANY MAINTENANCE PROCEDURE.

DO NOT INSERT FUSES IN LIVE CIRCUITS. VOLTAGES PRESENT IN THE OPTIONAL STEAM GENERATOR ARE DANGEROUS AND MAY BE FATAL IF CONTACTED.

CAUTIONS:

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

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.

When troubleshooting and 28-VDC output is not present, make a short circuit test between pins 6 and 2 of receptacle J10 on Mother Board before connecting new power supply. If short circuit is found it must be isolated and repaired prior to connecting new power supply.

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

SUMMARY OF SAFETY PRECAUTIONS (Continued)

Recorders should be handled with care, and caution should be exercised when making changes to ensure against kinking or compressing the capillary system. The bulb, tubing and pressure element are filled with fluid approved by the Scientific Instrument Makers Association and form a sealed system. This system must never be broken. Even the most minute leak will render it inoperative. Excess capillary should be formed into an 8-inch diameter coil and properly supported by taping to any smooth unheated surface.

The chamber door post (Fig. 8-22, 10) is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instructions for removing weld and rewelding.

Solenoid valves on this machine 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.

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

When servicing steam pressure regulator, handle syiphon and bellows assembly gently to avoid damage.

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

Take necessary precautions to keep washers or screws from dropping into the control column.

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

120 VAC is present on Platen Microswitch terminals of units manufactured after 6/85 when sterilizer POWER is ON. Turn POWER to OFF before replacing switch.

SECTION 1

SECTION 1

GENERAL INFORMATION

1.1 APPLICATION AND DESIGN

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

The following information should be included in this section:

2000 Series: SD-250
SD-251
SD-350
SD-351

2300 Series: SD-377
SD-378
SD-381
SD-382

Accessories: SD-325

AMSCO

Eagle® 2000 SERIES SMALL STERILIZERS
Gravity Laboratory/Isothermal
• steam • single door • electric

TECH DATA

Small Steam Sterilizer (SINGLE DOOR)

DESCRIPTION

Microcomputer controlled sterilizer; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Gravity — for sterilizing liquids in flasks with vented closures at 212° to 250° F (100° to 121° C); also heat- and moisture-stabile goods at 212° to 280° F (100° to 138° C).

Laboratory/Isothermal — in addition to the above gravity cycles, offers a further option of processing heat-coagulable and heat-sensitive materials at the lower temperatures of 170° to 212° F (78° to 100° C).

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

Every sterilizer meets applicable requirements of the following standards and carries the appropriate symbol:

Underwriters Laboratories, Incorporated, and Canadian Standards Association . . . also includes optional steam generator.

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Inner shell, including door, is constructed to withstand working pressure of **35 psig** (2.53 kg/cm²).

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

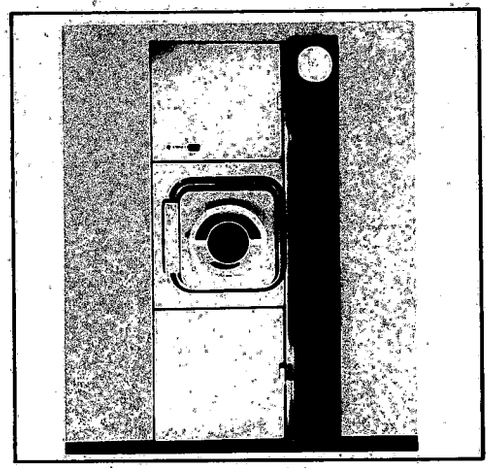
Federal Specification GG-S-1340A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Series
☐ **2011:** Gravity, 16x16x26"
☐ **2012:** Laboratory/Isothermal, 16x16x26"
☐ **2021:** Gravity, 20x20x38"
☐ **2022:** Laboratory/Isothermal, 20x20x38"

Power System
☐ Steam
☐ Electric
☐ 200, ☐ 230, ☐ 460 Volts

Door Hinge
☐ On Left Side
☐ On Right Side

Mounting
☐ For Recessing
☐ Cabinet Enclosed

Materials Handling Accessories*
☐ Rack and Shelves
☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____
Location(s) _____

Because of American Sterilizer Company's continuing program of research and development, all specifications and descriptions are subject to change without notice.
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Printed in U.S.A.

DESIGN FEATURES

Eagle-Eye™ Vertical Control Column

Controls are conveniently located . . . not exposed to the heat, vapor and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge.

Microcomputer monitors and controls system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust, (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

- **Quartz-crystal based timing.** Microcomputer uses inputs from thumbwheel switches to accurately set exposure and drying times. Set times are displayed as **digital readouts.** Selected times are not changeable once a cycle has started. Timing automatically resets upon completion or resetting of cycle. Automatic reset eliminates need to reprogram timers between repeated cycles. If chamber temperature drops 2° F (1.1° C) below set value, during exposure period, timing resets and STERILIZE phase indicator blinks for remainder of phase.
- **Cycle Monitoring.** Chamber door must be locked pressure-tight to initiate a cycle. If unlocked, status light alerts operator. Once selected, cycle is **locked into** microcomputer. Should chamber fail to reach set sterilizing temperature, microcomputer **visually and audibly** alerts operator.

  Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

  Microcomputer **maintains its memory** during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After power failure in excess of 20 milliseconds, operator must reset control power. Visual and audible signals will then indicate that a cycle was interrupted by the power failure.
- **Program boards** are keyed, plug-in type with printed circuits. Boards are **coated** for increased dielectric strength. Service is readily accomplished from front of sterilizer. For diagnostic purposes, light emitting diodes **(LEDs)** indicate presence of signal to associated valves or other electrically operated devices.

Auto-Lume panels light up only when power is on. Top panel gives **cycle status;** center panel, Sterilize and Dry time **digital readouts;** bottom panel features lighted **cycle selectors.** Time readouts are large, easy-to-see LEDs that first indicate set times and then, as the cycle progresses, count down remaining time. Cycle selectors require positive force to actuate, eliminates unintentional cycle selections. Selected cycle is clearly indicated, others locked out.

Indicator-Recorder-Controller provides **thermostatic temperature control.** Continually indicates chamber temperature. Signals microcomputer when temperature is at set point; also if chamber temperature drops below set value during exposure period. Indicating scale is reversible with Celsius and Fahrenheit markings. Sensor is in chamber drain line. Temperature is recorded on a synchronous motor-driven, 6-inch diameter chart using a **pressure-sensitive cartridge type pen.** The chart has both English and metric markings. Six cartridges and one hundred charts are furnished.

Gauges. Jacket pressure and chamber pressure/vacuum gauges are beneath the indicator-recorder-controller for easy viewing. Scales are graduated in both English and metric.

Secondary controls are behind a sliding door beneath the Auto-Lume panels. Included are **power switches,** one to isolate entire unit and a second to isolate only the controls; gravity or iso **cycle selector switch** if applicable; **circuit breaker; thumbwheel switches** for Sterilize and Dry times; **cycle monitor (non-resettable)** to count number of sterilizing cycles for programming preventive maintenance; and **cycle reset** in case incorrect cycle is selected.

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

Designed to **prevent pollutants** from entering water-supply system and sterilizer. **Steam condensate system with Water-Saver** converts steam to condensate and disposes condensate to waste. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door.

Drying System

Steam ejector reduces chamber pressure during drying phase, 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 controlled by the **microcomputer.**

Manual Control

Sterilizer is manually operable (without electric power) by a single programming wheel.

Optional Material Handling Accessories

Includes racks with shelves, instrument trays and if 20x20x38" sterilizer, loading cars . . . **all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

TECHNICAL DATA

Controls

Microcomputer is a totally self-sufficient 8-bit parallel computer fabricated on a single silicon chip using N-channel, silicon gate, metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large scale integrated (LSI) circuits.

Power supply requirement is 120 volts, 60 Hz, single phase. Integral power supply provides regulated 5 VDC for use in the logic circuits; also unregulated 28 VDC for the cycle-indicating lamps. Solenoid valves and indicator-recorder-controller operate on 120 VAC.

Jacket and Chamber Assembly

Monel door frame supports and conceals ends of door-holding arms when door is locked . . . presents a smooth surface for door gasket contact.

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

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

Cast-bronze, manually operated door has stainless-steel, bearing mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gasket** is pressed against door frame by handwheel-actuated radial holding arms. Gasket is replaceable with tools. Sound-deadened, stainless-steel cover conceals holding arms and door exterior. **Microswitch** prevents inadvertent start of cycle before door is locked; **pressure lock** keeps door from being opened during cycle. **Door may be tightened but not opened while pressure is in chamber.**

Steam Source

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door.

Integral steam generator (optional), electrically powered, automatic water filling type, operates whenever sterilizer power is on. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feed-water line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 200-, 230-, or 460-volt (as specified), 60 Hz, 3-phase electric power. Additional voltages are available upon request. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 15 kw for a 16x16x26 inch (406x406x660 mm) sterilizer; 20 kw for a 20x20x38 inch (508x508x965 mm) sterilizer.

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 they are needed and can be serviced individually.

Manual Valves bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 250° or 270° F (121° or 132° C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

INSTALLATION

Sterilizer arranged for mounting as a cabinet-enclosed model, or for recessing, as specified. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures tight fit of cabinet panels to each other (free-standing units), or front panel to wall partition (recessed units). Stainless-steel front panel has service access door and height-adjustable kickplate. Inside of the access door contains a rack for instructional materials. Top and side panels (only free-standing units) enclose the sterilizer body and piping. Top panel is louvered. All panels are stainless steel.

WARRANTY*

The American Sterilizer Company warrants that each sterilizer is carefully tested, inspected and leaves the factory in proper working condition, free of visible defects. 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.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

**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.*

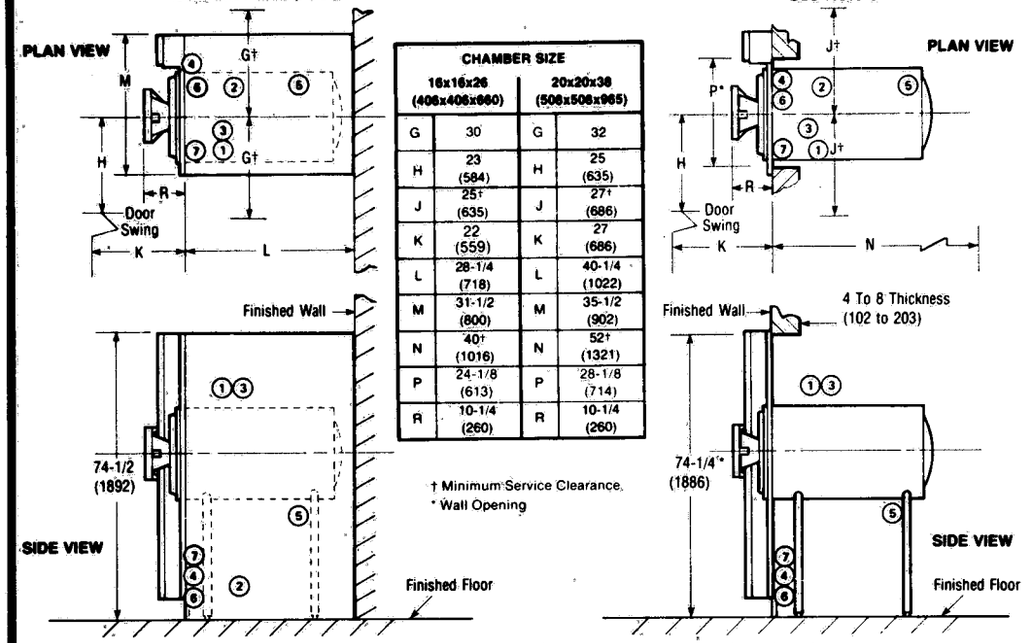
ENGINEERING DATA

SIZE in. (mm)	OPERATING WEIGHT** lbs (kg)		UTILITIES CONSUMPTION					ELECTRICAL REQUIREMENTS							HEAT LOSS BTU/hr at 70° F (21° C)		
			Water†			Steam††		Amps							Cabinet Enclosed	Recessed	
			Cold		Hot*	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Steam Units		Electric Units					To Room	Front of Wall	Behind Wall
	Steam Powered	Electrically Powered	Peak gpm (lpm)	Avg. gph (lph)	Avg. gph (lph)			Ster. Con. 120 V		Sterilizer Controls 120 V	Generator Controls 120 V	Heaters					
								Grav.	Lab/Iso			200 V	230 V	460 V			
16x16x26 (406x406x660)	1160 (527)	1440 (654)	5 (19)	98 (371)	4 (15)	83 (38)	35 (16)	0.6	0.8	5.5	8	52	52	18	4300	1600	2700
20x20x38 (508x508x965)	1990 (903)	2270 (1030)	5 (19)	98 (371)	8 (30)	116 (53)	49 (22)	0.6	0.8	5.5	8	52	52	18	7000	2500	4500

†At 20-50 psig (1.41-3.52 kg/cm²) *††At 50-80 psig (3.52-5.62 kg/cm²)* **Hot water recommended for electrically powered sterilizers.*
***Based upon chamber filled with water.*

SPECIFICATION WORKSHEET

Item _____: Furnish an AMSCO Eagle Series sterilizer per Tech Data Sheet SD-250. Construct chamber ☐ 16x16x26" or ☐ 20x20x38". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to monitor system operations and control system functions. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator. Arrange sterilizer ☐ to be free standing or ☐ for recessing into a partition wall.



CHAMBER SIZE	16x16x26 (406x406x660)		20x20x38 (508x508x965)
G	30	G	32
H	23 (584)	H	25 (635)
J	25† (635)	J	27† (686)
K	22 (559)	K	27 (686)
L	28-1/4 (718)	L	40-1/4 (1022)
M	31-1/2 (800)	M	35-1/2 (902)
N	40† (1016)	N	52† (1321)
P	24-1/8 (613)	P	28-1/8 (714)
R	10-1/4 (260)	R	10-1/4 (260)

† Minimum Service Clearance.
* Wall Opening

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

OPERATING REQUIREMENTS

Steam and Electric Units:

(1) COLD WATER — ⅜ NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

(2) DRAIN — 1½ ODT

Steam Units Only:

(3) STEAM SUPPLY — ⅜ NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

(4) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Electric Units Only:

(5) HOT WATER — ⅜ NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

Note: Cold water may be substituted but with a sacrifice on heat-up time.

(6) DRAIN — ½ ODT (For generator)

(7) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 200-, 230- or 460-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.
6. Right-hand door-swing clearances shown. Clearances for left-hand door swing are identical.
7. Floor drain should be provided within confines of sterilizer framework.

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

AMSCO

Eagle® 2000 SERIES SMALL STERILIZERS

Gravity Laboratory/Isothermal

• steam • double door • electric

TECH DATA

Small Steam Sterilizer (DOUBLE DOOR)

DESCRIPTION

Microcomputer controlled sterilizer; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Gravity — for sterilizing liquids in flasks with vented closures at 212° to 250° F (100° to 121° C); also heat- and moisture-stabile goods at 212° to 280° F (100° to 138° C).

Laboratory/Isothermal — in addition to the above gravity cycles, offers a further option of processing heat-coagulable and heat-sensitive materials at the lower temperatures of 170° to 212° F (78° to 100° C).

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

Every sterilizer meets applicable requirements of the following standards and carries the appropriate symbol:

Underwriters Laboratories, Incorporated, and Canadian Standards Association . . . also includes optional steam generator.

ASME Code, Section VIII, Division I for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Shell and door is constructed to withstand working pressure of 42 psig (2.95 kg/cm²) for 16x16x26" and 40 psig (2.81 kg/cm² for 20x20x38" sterilizers.

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

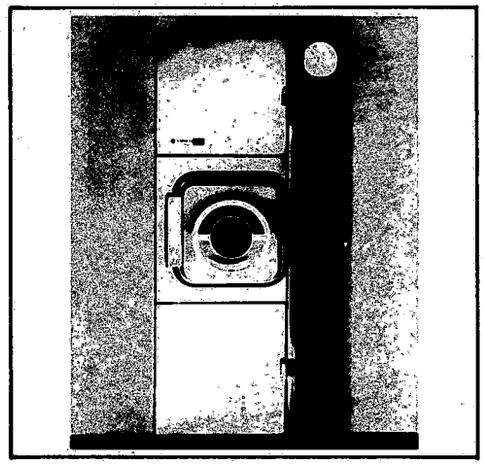
Federal Specification GG-S-1340A performance requirements for both high and low temperature processing.

Seismic Stress Calculations—Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Series
- ☐ 2011: Gravity, 16x16x26"
- ☐ 2012: Laboratory/Isothermal, 16x16x26"
- ☐ 2021: Gravity, 20x20x38"
- ☐ 2022: Laboratory/Isothermal, 20x20x38"

Power System
- ☑ Steam
- ☐ Electric (20x20x38" Sterilizer Only)
  - ☐ 208 Volts ☐ 240 Volts
  - ☐ 480 Volts

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

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

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
- ☐ Surgical Instrument Trays

*See separate product literature

Item No. _____

Location(s) _____

_____

_____

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Printed in U.S.A.

DESIGN FEATURES

Eagle-Eye™ Vertical Control Column

Controls are conveniently located . . . not exposed to the heat, vapor and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge.

Microcomputer monitors and controls system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust, (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

- **Quartz-crystal based timing.** Microcomputer uses inputs from thumbwheel switches to accurately set exposure and drying times. Set times are displayed as **digital readouts.** Selected times are not changeable once a cycle has started. Timing automatically resets upon completion or resetting of cycle. Automatic reset eliminates need to reprogram timers between repeated cycles. If chamber temperature drops 2° F (1.1° C) below set value, during exposure period, timing resets and STERILIZE phase indicator blinks for remainder of phase.

- **Cycle Monitoring.** Chamber doors must be locked pressure-tight to initiate a cycle. If unlocked, status lights alert operator. Once selected, cycle is **locked into** microcomputer. Should chamber fail to reach set sterilizing temperature, microcomputer **visually and audibly** alerts operator.

  Throughout entire liquids cycle, **WARNING** lights alert operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

  Microcomputer **maintains its memory** during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After power failure in excess of 20 milliseconds, operator must reset control power. Visual and audible signals will then indicate that a cycle was interrupted by the power failure.

- **Program boards** are keyed, plug-in type with printed circuits. Boards are **coated** for increased dielectric strength. Service is readily accomplished from front of sterilizer. For diagnostic purposes, light emitting diodes **(LEDs)** indicate presence of signal to associated valves or other electrically operated devices.

Auto-Lume panels light up only when power is on. Top panel gives **cycle status;** center panel, Sterilize and Dry time **digital readouts;** bottom panel features lighted **cycle selectors.** Time readouts are large, easy-to-see LEDs that first indicate set times and then, as the cycle progresses, count down remaining time. Cycle selectors require positive force to actuate, eliminates unintentional cycle selections. Selected cycle is clearly indicated, others locked out.

Non-operating End Controls include **cycle selectors** through which previous cycle can be repeated, **status lights** indicating the cycle phase and **warning lights** for door status and hot liquids cycle.

Indicator-Recorder-Controller provides **thermostatic temperature control.** Continually indicates chamber temperature. Signals microcomputer when temperature is at set point; also if chamber temperature drops below set value during exposure period. Indicating scale is reversible with Celsius and Fahrenheit markings. Sensor is in chamber drain line. Temperature is recorded on a synchronous motor-driven; 6-inch diameter chart using a **pressure-sensitive cartridge type pen.** The chart has both English and metric markings. Six cartridges and one hundred charts are furnished.

Gauges. Jacket pressure and chamber pressure/vacuum gauges are beneath the indicator-recorder-controller for easy viewing. Scales are graduated in both English and metric. A chamber pressure/vacuum gauge is on the non-operating end.

Secondary controls are behind a sliding door beneath the Auto-Lume panels. Included are **power switches,** one to isolate entire unit and a second to isolate only the controls; gravity or iso **cycle selector switch** if applicable; **circuit breaker; thumbwheel switches** for Sterilize and Dry times; **cycle monitor (non-resettable)** to count number of sterilizing cycles for programming preventive maintenance; and **cycle reset** in case incorrect cycle is selected.

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

Designed to **prevent pollutants** from entering water supply system and sterilizer. **Steam-condensate system with water saver** converts steam to condensate and disposes condensate to waste. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door.

Drying System

Steam ejector reduces chamber pressure during drying phase, 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 controlled by the **microcomputer.**

Manual Control

Sterilizer is manually operable (without electric power) by a single programming wheel. (Note: Units with optional steam generator require electric power for generator.)

Optional Material Handling Accessories

Includes racks with shelves, instrument trays and if 20x20x38" sterilizer, loading cars . . . **all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

TECHNICAL DATA

Controls

Microcomputer is a totally self-sufficient 8-bit parallel computer fabricated on a single silicon chip using N-channel, silicon-gate, metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large scale integrated (LSI) circuits.

Power supply requirement is 120 volts, 60 Hz, single phase. Integral power supply provides regulated 5 VDC for use in the logic circuits; also unregulated 28 VDC for the cycle-indicating lamps. Solenoid valves and indicator-recorder-controller operate on 120 VAC.

Jacket and Chamber Assembly

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

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

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

Cast-bronze, manually operated doors have stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gaskets** are pressed against door frames by handwheel-actuated radial holding arms. Gaskets are replaceable without tools. Sound-deadened, stainless-steel covers conceal holding arms and door exteriors. **Microswitches** prevent inadvertent start of cycle before doors are locked; **pressure locks** keep doors from being opened during cycle. **Doors may be tightened but not opened while pressure is in chamber.**

Steam Source

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door.

Integral steam generator (optional), electrically powered, automatic water-filling type, operates whenever sterilizer power is on. Available only on 20x20x38 inch (508x508x965 mm) sterilizer. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feed-water line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 208-, 240-, or 480-volt (as specified), 60-Hz, 3-phase electric power. Additional voltages are available upon request. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 20 kw.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 250° or 270° F (121° or 132° C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

INSTALLATION

Sterilizer arranged for mounting through one or two (20x20x38 inch [508x508x965 mm] only) partition walls. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures tight fit of cabinet panels to each other and to wall partition(s) as required. All panels are stainless steel. Front and back panels have service access doors and height-adjustable kickplates. Inside of each access door contains a rack for instructional materials. A model for recessing through one wall has side panels and a louvered top panel to 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.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

**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.*

ENGINEERING DATA

SIZE in. (mm)	OPERATING WEIGHT** lbs (kg)		UTILITIES CONSUMPTION					ELECTRICAL REQUIREMENTS							HEAT LOSS BTU/hr at 70° F (21° C)			
			Water†			Steam††		Amps							Thru One Wall		Thru Two Walls	
			Cold		Hot*	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Steam Units		Electric Units					Front of Wall	Room Back of Wall	At Each End	Between Walls
	Steam Powered	Electrically Powered	Peak, gpm (lpm)	Avg. gph (lph)	Avg. gph (lph)			Ster. Con. 120 V Grav.	Ster. Con. 120 V Lab/Iso	Sterilizer Controls 120 V	Generator Controls 120 V	Heaters 208 V	Heaters 240 V	Heaters 480 V				
16x16x26 (406x406x660)	1360 (617)	N/A	5 (19)	96 (372)	N/A	83 (38)	35 (16)	0.6	0.8	N/A	N/A	N/A	N/A	N/A	1600	3500	N/A	N/A
20x20x38 (508x508x965)	2240 (912)	2520 (1003)	5 (19)	96 (372)	8* (30)	116 (53)	49 (22)	0.6	0.8	5.5	8	52	52	18	2500	5300	2500	1700

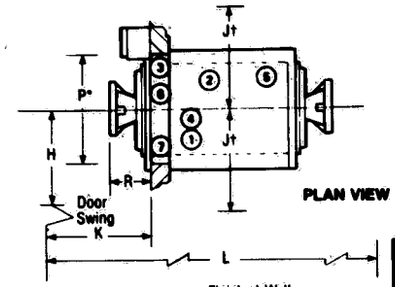
**Hot water recommended for optional electric steam generator.* *†At 20-50 psig (1.41-3.52 kg/cm²)* *††At 50-80 psig (3.52-5.62 kg/cm²)*
***Based upon chamber filled with water*

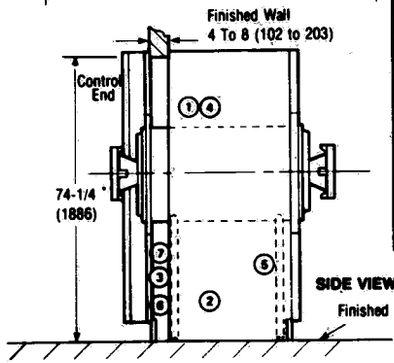
SPECIFICATION WORKSHEET

Item _____ : Furnish an AMSCO Eagle Series sterilizer per Tech Data Sheet SD-251. Construct chamber ☐ 16x16x26" or ☐ 20x20x38". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to monitor system operations and control system functions. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator*. Arrange sterilizer ☐ for recessing through one wall or ☐ for recessing through two walls.*

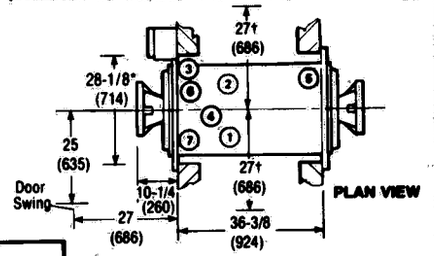
**For 20x20x38" units only.*

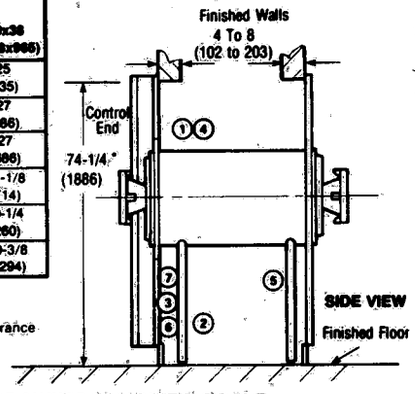
FOR RECESSING THRU ONE PARTITION WALL





FOR RECESSING THRU TWO PARTITION WALLS (20x20x38 Inch [508x508x965 mm] Sterilizer Only)





CHAMBER SIZE			
	16x16x26 (406x406x660)		20x20x38 (508x508x965)
H	23 (584)	H	25 (635)
J	25 (635)	J	27 (686)
K	22 (559)	K	27 (686)
P	24-1/8 (613)	P	28-1/8 (714)
R	10-1/4 (260)	R	10-1/4 (260)
L	80-3/8 (2040)	L	90-3/8 (2294)

†Minimum Service Clearance
*Wall Opening

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

OPERATING REQUIREMENTS

Steam and Electric Units:

(1) COLD WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness.

(2) DRAIN — 1-1/2 ODT.

(3) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Steam Units Only:

(4) STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

Electric Units Only:

(5) HOT WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

Note: Cold water may be substituted but with a sacrifice on heat-up time.

(6) DRAIN — 1/2 ODT (For generator)

(7) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 208-, 240- or 480-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.

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.

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

AMSCO

Eagle® 2000 SERIES SMALL STERILIZERS with Printcon™

Gravity • *steam* **Laboratory/Isothermal** • *single door* • *electric*

TECH DATA

Small Steam Sterilizer (SINGLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer with digital-printer and state-of-the-art control system; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Gravity — for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stabile goods at 212 to 275 F (100 to 135 C).

Laboratory/Isothermal — in addition to the above gravity cycles, offers a time/temperature option of processing heat-coagulable and heat-sensitive materials at the lower temperatures of 170 to 212 F (78 to 100 C).

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

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

Underwriters Laboratories Incorporated, and Canadian Standards Association listing . . . also includes optional steam generator.

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Shell and door constructed to withstand working pressure of 42 psig (2.95 kg/cm²) for 16x16x26" and 40 psig (2.81 kg/cm²) for 20x20x38" sterilizers.

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

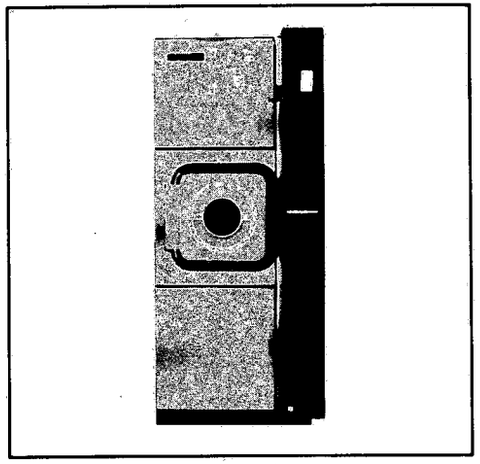
Federal Specification GG-S-1340A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Series
- ☐ **2011:** Gravity, 16x16x26"
- ☐ **2012:** Laboratory/Isothermal, 16x16x26"
- ☐ **2021:** Gravity, 20x20x38"
- ☐ **2022:** Laboratory/Isothermal, 20x20x38"

Power System
- ☐ Steam
- ☐ Electric
  - ☐ 208 Volts
  - ☐ 240 Volts
  - ☐ 480 Volts

Door Hinge
- ☐ On Left Side
- ☐ On Right Side

Mounting
- ☐ For Recessing
- ☐ Cabinet Enclosed

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____

Location(s) _____

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.
®AMSCO — 1982-1987

Printed in U.S.A.

DESIGN FEATURES

Eagle® 2000 with Printcon™

Preprogrammed sterilizer with digital readouts and computer-generated printed records. Eagle microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning; sterilizing, exhaust (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

Eagle-Eye™ Vertical Control Column (Figure 1)

Controls are neatly arranged in a vertical column conveniently located at the side of the sterilizer . . . not exposed to the continuous heat, vapor, and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge. Salient features include:



Figure 1. Eagle Eye Vertical Control Column.

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

- **Temperature** is set on three-digit thumbwheel switch. During cycle actual temperature is displayed and printed. If selected temperature is outside allowable range, 150-295 F (65-146 C), buzzer sounds until an allowable temperature is selected. Temperature is locked in and cannot be changed once cycle is started.
- **Pressure** is continuously displayed and printed at programmed cycle transition points.
- **Time** (in hours and minutes, am/pm) and **Date** (month, day, year) are displayed by touching Time or Date switches.

Printcon provides easy-to-read **permanent printed record** of all pertinent cycle data, providing assurance to operator that cycle parameters have been met. **Alphanumeric printer** documents date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and any deviations which might jeopardize sterilization process. One- or two-ply paper is available for the printer. With two-ply paper, an average day's record can be automatically stored, which can then be saved for future documentation; the second copy torn off and placed with each sterilizer load. (A sample printout is shown in **Figure 2**.)

2. **Auto-Lume panels** light when power is on. Top panel gives **cycle status**; center panel, **sterilize** and **dry times**; bottom panel, **cycle selectors**.

- **Status** lights show each phase of sterilizer operation. Light visually alerts operator if door is unlocked. Operator is visually and audibly alerted if temperature setpoint is not reached or if temperature drops below setpoint during Sterilize phase.
- **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.
- **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber door must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary controls** are behind a sliding door beneath the Auto-Lume panels. Included are **power switches**, one to isolate entire unit and a second to isolate only the controls; gravity or iso **cycle selector switch** if applicable; **circuit breaker**; **thumbwheel switches** for Sterilize and Dry times; **cycle monitor (non-resettable)** to count number of sterilizing cycles for programming preventive maintenance; **cycle reset** in case incorrect cycle is selected; and operating instructions.

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TECHNICAL DATA

Automatic Control

Programmed instructions (cycle and printer) are contained in 8-bit parallel **microcomputers**, each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure (see **Figure 3**).

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

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3.**)

Display panels include large, easy-to-see **LED digital readouts,** visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. **Motorized take-up** simplifies tape replacement and will store up to one entire roll. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **lithium coin cell battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

Monel door frame supports and conceals ends of door-holding arms when door is locked . . . presents a smooth surface for door gasket contact.

Hot-rolled carbon-steel shells, welded one within the other, form the sterilizer steam jacket. Inside of inner shell and chamber backhead are **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 double faced with aluminum foil. It is held in place by pressure-sensitive tape, aluminum straps and clips. Sterilizer jacket (including backhead) is painted prior to being insulated.

Cast-bronze, manually operated door has stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gasket** is pressed against door frame by handwheel-actuated radial holding arms. Gasket is replaceable without tools. Sound-deadened, stainless-steel cover conceals holding arms and door exterior. Microswitch prevents inadvertent start of cycle before door is locked; **pressure lock** keeps door from being opened during cycle. **Door may be tightened but not opened while pressure is in chamber.**

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

Integral steam generator (optional), electrically powered, automatic water filling type, operates whenever sterilizer power is on. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feedwater line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 208-, 240-, or 480-volt (as specified), 60 Hz, 3-phase electric power. Additional voltages are available upon request. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 15 kw for a 16x16x26 inch (406x406x660 mm) sterilizer; 20 kw for a 20x20x38 inch (508x508x965 mm) sterilizer.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

Optional Material Handling Accessories

Include racks with shelves, instrument trays and if 20x20x38-inch sterilizer, loading cars . . . **all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting as a cabinet-enclosed model, or for recessing, as specified. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures 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. Inside of the access door contains a rack for instructional materials. On freestanding units, stainless steel side panels and a louvered painted aluminum 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 (sterilizer chamber only, not the steam generator if equipped) is further warranted to the original owner against structural failure for a period of 15 years from the date of initial operation under normal use, operation and maintenance. This warranty does not extend to normal repairs, maintenance or adjustments required for the door closure mechanism.

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

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

ENGINEERING DATA

SIZE in (mm)	OPERATING WEIGHT** lbs (kg)		UTILITIES CONSUMPTION						ELECTRICAL REQUIREMENTS							HEAT LOSS BTU hr. at 70° F. (21° C)		
			Water†			Steam††			Amps							Cabinet Enclosed	Recessed	
			Cold		Hot*	Peak lbs hr (kg hr)	Avg lbs hr (kg hr)		Steam Units	Electric Units						To Room	Front of Unit	Behind Unit
	Steam Powered	Electrically Powered	Peak gpm (lpm)	Avg gph (lph)	Avg gph (lph)				Ster. Con. 120 V Grav	Ster. Con. 120 V Pulse 120	Sterilizer Controls 120 V	Generator Controls 120 V	Heaters (3 Ph) 208 V	Heaters (3 Ph) 240 V	Heaters (3 Ph) 480 V			
16x16x26 (406x406x660)	1180 (527)	1440 (654)	5 (19)	90 (371)	4 (15)	83 (38)	35 (16)		0.6	0.6	5.5	8	50/Ph	50/Ph	25/Ph	4300	1600	2700
20x20x38 (508x508x965)	1880 (803)	2270 (1030)	5 (19)	90 (371)	8 (30)	116 (53)	48 (22)		0.6	0.6	5.5	8	50/Ph	50/Ph	25/Ph	7000	2500	4500

†At 20-50 psig (1.41-3.52 kg/cm²) *Hot water recommended for electrically powered sterilizers.
††At 50-80 psig (3.52-5.62 kg/cm²) **Based upon chamber filled with water.

SPECIFICATION WORKSHEET

Item _____: Furnish an AMSCO Eagle Series sterilizer with Printcon per Tech Data Sheet SD-350. Construct chamber ☐ 16x16x26" **or** ☐ 20x20x38". Supply ☐ gravity model **or** ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source **or** ☐ steam supplied from an integral electric steam generator. Arrange sterilizer ☐ to be freestanding **or** ☐ for recessing into a partition wall.

```
--------------------
   CYCLE COMPLETE

  LOAD(03) ---------
STERILIZER ---------
  OPERATOR ---------

  STERILIZE   30 MIN
TOTAL CYCLE   32 MIN

Z 12:34P  78.3  0.1P
E 12:34P  78.3  0.1P
S 12:04P  78.0  1.8P
C 12:02P  36.2  0.1P

    TIME TEMP. PRES.
           °C   ENG.

ISOTHERMAL  AT 078°C
CYCLE START  2-1-82
--------------------
```

to be filled in by operator

phase times run

cycle complete
exhaust pressure
sterilize phase
condition phase

temperature in Celsius, pressure in English

cycle type and temperature selected

Figure 2. Typical Printout.

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

Power On Message

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

Temperature drops 2 F Below Setpoint

```
--------------------
POWER ON AT  2-1-82
  9:34A 120.5 10.4P
--------------------
```

Power Restored After Power Failure

```
--------------------
ABORT:   DOOR OPEN
*  9:58A 243.3 12.7P
--------------------
```

Door Opened During Cycle

```
--------------------
ABORT:  RESET BUTTON
*12:12A 279.4 22.2P
--------------------
```

Reset Button Pressed

```
--------------------
ABORT:  TEMP SENSOR
*  3:45A 386.8 10.0P
--------------------
```

Temperature Sensor Failure

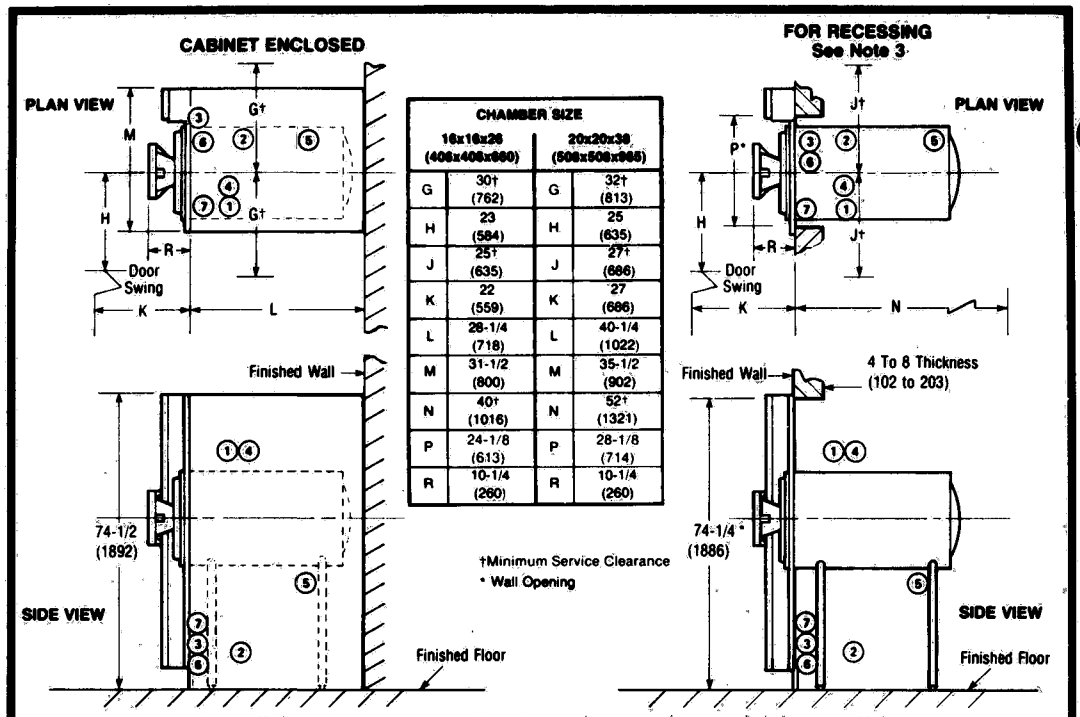
```
--------------------
ALARM:     TOO LONG
*  1:45P 265.9 20.4P
--------------------
```

Condition Phase Too Long

```
--------------------
ABORT:  PRES SENSOR
*11:55A 270.0 41.3P
--------------------
```

Pressure Sensor Failure

Figure 3. Control Monitoring and Communication.



CHAMBER SIZE	16x16x26 (406x406x660)		20x20x38 (508x508x965)
G	30† (762)	G	32† (813)
H	23 (584)	H	25 (635)
J	25† (635)	J	27† (686)
K	22 (559)	K	27 (686)
L	28-1/4 (718)	L	40-1/4 (1022)
M	31-1/2 (800)	M	35-1/2 (902)
N	40† (1016)	N	52† (1321)
P	24-1/8 (613)	P	28-1/8 (714)
R	10-1/4 (260)	R	10-1/4 (260)

†Minimum Service Clearance
* Wall Opening

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

OPERATING REQUIREMENTS

Steam and Electric Units:

1. COLD WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness
2. DRAIN — 1-1/2 ODT
3. TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Steam Units Only:

4. STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

Electric Units Only:

5. HOT WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

   Note: Cold water may be substituted but with a sacrifice on heat-up time.

6. DRAIN — 1/2 ODT (For generator)
7. TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 208-, 240- or 480-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.

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.

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

AMSCO

Eagle® 2000 SERIES SMALL STERILIZERS with Printcon™

Gravity **Laboratory/Isothermal**

• *steam* • *double door* • *electric*

TECH DATA

Small Steam Sterilizer (DOUBLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer with **digital-printer** and **state-of-the-art control system**; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Gravity — for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stabile goods at 212 to 280 F (100 to 138 C).

Laboratory/Isothermal — in addition to the above gravity cycles, offers a further option of processing heat-coagulable and heat-sensitive materials at the lower temperatures of 170 to 212 F (78 to 100 C).

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

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

Underwriters Laboratories Incorporated, and Canadian Standards Association listing . . . also includes optional steam generator.

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Shell and door is constructed to withstand working pressure of 42 psig (2.95 kg/cm²) for 16x16x26" and 40 psig (2.81 kg/cm² for 20x20x38" sterilizers.

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

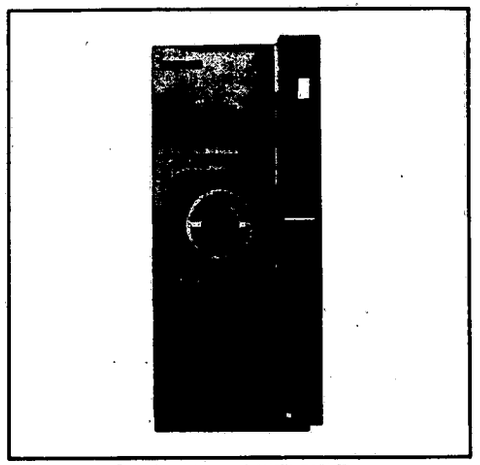
Federal Specification GG-S-1348A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Series

- ☐ **2011:** Gravity, 16x16x26"
- ☐ **2012:** Laboratory/Isothermal, 16x16x26"
- ☐ **2021:** Gravity, 20x20x38"
- ☐ **2022:** Laboratory/Isothermal, 20x20x38"

Power System

- ☐ Steam
- ☐ Electric (20x20x38" Sterilizer Only)
  - ☐ 208 Volts ☐ 240 Volts
  - ☐ 480 Volts

Door Hinge (Operating End First)

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

Mounting

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

Materials Handling Accessories*

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

**See separate product literature*

Item No. _____

Location(s) _____

_____

_____

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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Printed in U.S.A.

DESIGN FEATURES

Eagle® 2000 with Printcon™

Preprogrammed sterilizer with digital readouts and computer-generated printed records. Eagle microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

Eagle-Eye™ Vertical Control Column (Figure 1)

Controls are neatly arranged in a vertical column conveniently located at the side of the sterilizer . . . not exposed to the continuous heat, vapor, and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge. Salient features include:

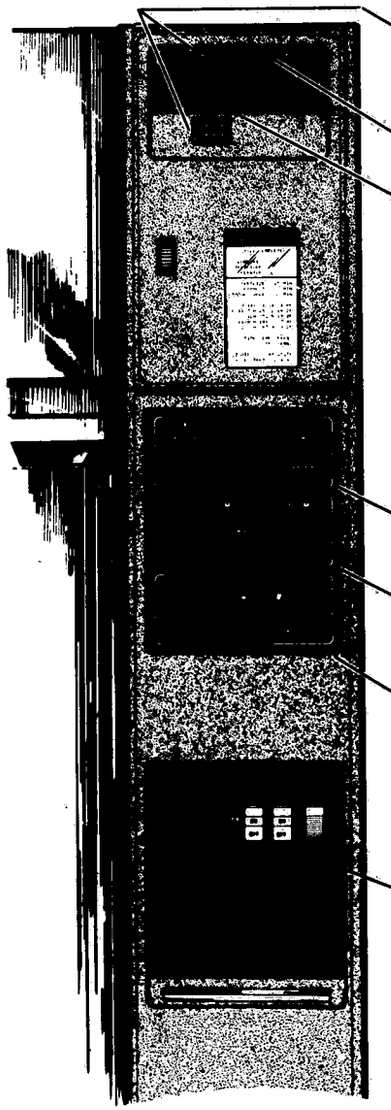


Figure 1. Eagle Eye Vertical Control Column.

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

• **Temperature** is set on three-digit thumbwheel switch. During cycle actual temperature is displayed and printed. If selected temperature is outside allowable range, 150-295 F (65-146 C), buzzer sounds until an allowable temperature is selected. Temperature is locked in and cannot be changed once cycle is started.

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

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

Printcon provides easy-to-read **permanent printed record** of all pertinent cycle data, providing assurance to operator that cycle parameters have been met. **Alphanumeric printer** documents date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and any deviations which might jeopardize sterilization process. One- or two-ply paper is available for the printer. With two-ply paper, an average day's record can be automatically stored, which can then be saved for future documentation; the second copy torn off and placed with each sterilizer load. (A sample printout is shown in **Figure 2.**)

2. **Auto-Lume panels** light when power is on. Top panel gives **cycle status**; center panel, **sterilize** and **dry times**; bottom panel, **cycle selectors.**

• **Status** lights show each phase of sterilizer operation. Light visually alerts operator if a door is unlocked. Operator is visually and audibly alerted if temperature setpoint is not reached or if temperature drops below setpoint during Sterilize phase.

• **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.

• **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber doors must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary controls** are behind a sliding door beneath the Auto-Lume panels. Included are **power switches**, one to isolate entire unit and a second to isolate only the controls; gravity or iso **cycle selector switch** if applicable; **circuit breaker; thumbwheel switches** for Sterilize and Dry times; **cycle monitor (non-resettable)** to count number of sterilizing cycles for programming preventive maintenance; **cycle reset** in case incorrect cycle is selected; and operating instructions.

Non-operating End Controls include Gravity and Liquids **cycle selectors** through which previous cycle can be repeated, **status lights** indicating the cycle phase and **warning lights** for door status and hot liquids cycle.

TECHNICAL DATA

Automatic Control

Programmed instructions (cycle and printer) are contained in 8-bit parallel **microcomputers**, each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure (see **Figure 3**).

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

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3.**)

Display panels include large, easy-to-see **LED digital readouts**; visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. **Motorized take-up** simplifies tape replacement and will store up to one entire roll. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **lithium coin cell battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

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

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

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

Cast-bronze, manually operated doors have stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gaskets** are pressed against door frames by handwheel-actuated radial holding arms. Gaskets are replaceable without tools. Sound-deadened, stainless-steel covers conceal holding arms and door exteriors. Microswitches prevent inadvertent start of cycle before doors are locked; **pressure locks** keep doors from being opened during cycle. **Doors may be tightened but not opened while pressure is in chamber.**

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

Integral steam generator (optional); electrically powered, automatic water filling type, operates whenever sterilizer power is on. Available only on 20x20x38-inch (508x508x965 mm) sterilizer. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feed-water line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 208-, 240-, or 480-volt (as specified), 60 Hz, 3-phase electric power. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 20 kw.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

Optional Material Handling Accessories

Include racks with shelves; instrument trays and if 20x20x38-inch sterilizer; loading cars . . . **all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting through one or two (20x20x38 inch [508x508x965 mm] only) partition walls. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures tight fit of cabinet panels to each other and to wall partition(s) as required. All panels are stainless-steel. Front and back panels have service access doors and height-adjustable kickplates. Inside of each access door contains a rack for instructional materials. A model for recessing through one wall has side panels and a louvered top panel to 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.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

**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.*

ENGINEERING DATA

SIZE in. (mm)	OPERATING WEIGHT** lbs (kg)		UTILITIES CONSUMPTION				ELECTRICAL REQUIREMENTS								HEAT LOSS BTU/hr at 70° F (21° C)			
			Water†			Steam††	Amps								Thru One Wall		Thru Two Walls	
			Cold		Hot*		Steam Units		Electric Units						Front of Unit	Room Each of Unit	At Each End	Between Units
	Steam Powered	Stack-Ability Powered	Peak gpm (lpm)	Avg. gph (lph)	Peak gpm (lpm)	Avg. gph (lph)	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Steam Controls 120 V	Auto-Flow Valve	Electronic Controls 120 V	Heaters						
									Conv.	Low Temp			208 V	240 V	480 V			
16x16x26 (406x406x660)	1360 (617)	N/A	5 (19)	99 (372)	N/A		63 (30)	35 (16)	0.6	0.6	N/A	N/A	N/A	N/A	N/A	1600	3500	N/A	N/A
20x20x38 (508x508x965)	2240 (912)	2520 (1000)	5 (19)	99 (372)	8* (30)		116 (53)	49 (22)	0.6	0.6	5.5	8	52	52	18	2500	5300	2900	1700

**Hot water recommended for optional electric steam generator.*
***Based upon chamber filled with water*
†At 20-50 psig (1.41-3.52 kg/cm²)
††At 50-80 psig (3.52-5.62 kg/cm²)

SPECIFICATION WORKSHEET

Item _____: Furnish an AMSCO Eagle Series sterilizer with Printcon per Tech Data Sheet SD-351. Construct chamber ☐ 16x16x26" or ☐ 20x20x38". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator.* Arrange sterilizer ☐ for recessing through one wall or ☐ for recessing through two walls.*

**For 20x20x38" units only.*

```
--------------------
   CYCLE COMPLETE

  LOAD(03) ---------
STERILIZER ---------
  OPERATOR ---------

  STERILIZE   30 MIN
TOTAL CYCLE   32 MIN

Z 12:34P  78.3  0.1P
E 12:34P  78.3  0.1P
S 12:04P  78.0  1.8P
C 12:02P  36.2  0.1P

    TIME TEMP. PRES.
         °C   ENG.

ISOTHERMAL  AT 078°C
CYCLE START  2-1-82
--------------------
```

to be filled in by operator

phase times run

cycle complete
exhaust: pressure
sterilize phase
condition phase

temperature in Celsius, pressure in English

cycle type and temperature selected

Figure 2. Typical Printout.

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

Power On Message

```
--------------------
POWER ON AT  2-1-82
  9:34A 120.5 10.4P
--------------------
```

Power Restored After Power Failure

```
--------------------
ABORT:  RESET BUTTON
* 12:12A 279.4 22.2P
--------------------
```

Reset Button Pressed

```
--------------------
ALARM:      TOO LONG
*  1:45P 265.9 20.4P
--------------------
```

Condition Phase Too Long

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

Temperature drops 2°F Below Setpoint

```
--------------------
ABORT:     DOOR OPEN
*  9:58A 243.3 12.7P
--------------------
```

Door Opened During Cycle

```
--------------------
ABORT:   TEMP SENSOR
*  3:45A 306.8 10.0P
--------------------
```

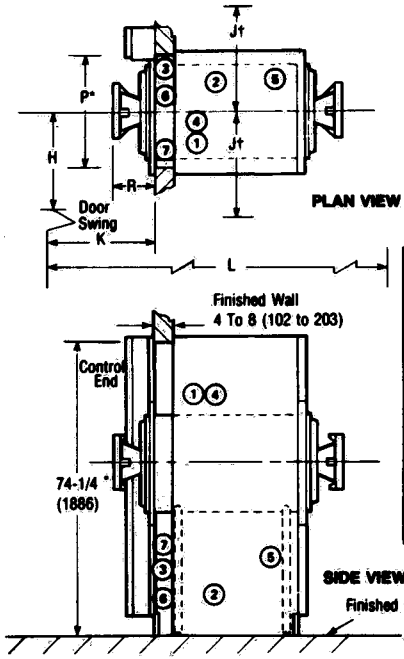
Temperature Sensor Failure

```
--------------------
ABORT:   PRES SENSOR
* 11:55A 270.0 41.3P
--------------------
```

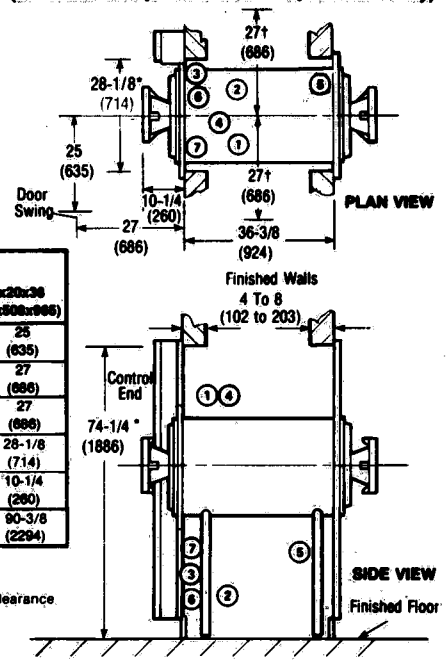
Pressure Sensor Failure

Figure 3. Control Monitoring and Communication.

FOR RECESSING THRU ONE PARTITION WALL



FOR RECESSING THRU TWO PARTITION WALLS
(20x20x38 Inch [508x508x965 mm] Sterilizer Only)



CHAMBER SIZE	16x16x26 (406x406x660)		20x20x36 (508x508x965)
H	23 (584)	H	25 (635)
J	25 (635)	J	27 (686)
K	22 (559)	K	27 (686)
P	24-1/8 (613)	P	28-1/8 (714)
R	10-1/4 (260)	R	10-1/4 (260)
L	80-3/8 (2040)	L	90-3/8 (2294)

†Minimum Service Clearance
*Wall Opening

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

OPERATING REQUIREMENTS

Steam and Electric Units:

(1) COLD WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness.

(2) DRAIN — 1-1/2 ODT.

(3) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Steam Units Only:

(4) STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

Electric Units Only:

(5) HOT WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

Note: Cold water may be substituted but with a sacrifice on heat-up time.

(6) DRAIN — 1/2 ODT (For generator)

(7) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 208-, 240- or 480-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.

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.

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

AMSCO | AMERICAN STERILIZER COMPANY • 2424 WEST 23rd STREET • ERIE • PENNSYLVANIA 16514

AMSCO

Eagle® 2300 SCIENTIFIC SERIES SMALL STERILIZERS with Printcon™

Gravity • *steam* **Laboratory/Isothermal** • *single door* • *electric*

TECH DATA

Small Steam Sterilizer (SINGLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer with **digital-printer** and **state-of-the-art control system**; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Eagle 2300 is designed for scientific, research laboratories.

Gravity - for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stable goods at 212 to 280 F (100 to 138 C); and for decontaminating supplies after laboratory procedures.

Laboratory/Isothermal - in addition to the above gravity cycles, offers processing heat-coagulable and heat-sensitive solutions and media at the lower temperatures of 170 to 212 F (78 to 100 C); fractional sterilization; pasteurization; and inspissation.

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

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

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 or U-3, as applicable, is furnished. Inner shell, including door, is constructed to withstand working pressure of 35 psig (2.53 kg/cm²).

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

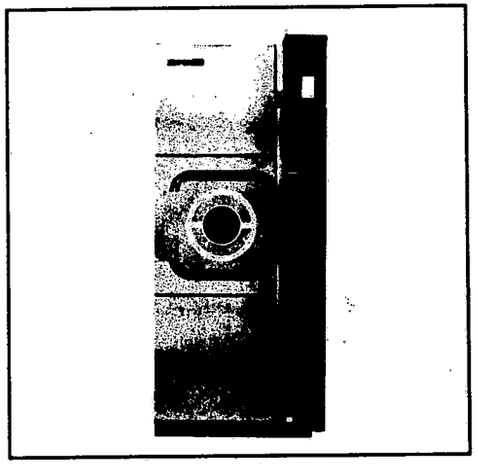
Federal Specification GG-S-1240A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Chamber Size
- ☐ Gravity, 16x16x26"
- ☐ Laboratory/Isothermal, 16x16x26"
- ☐ Gravity, 20x20x38"
- ☐ Laboratory/Isothermal, 20x20x38"

Power System
- ☐ Steam
- ☐ Electric
  - ☐ 200, ☐ 230, ☐ 460 Volts

Option
- ☐ Compressed - Air Solution Cooling*
- ☐ Automatic Shutdown Device*
- ☐ Extra Chamber Penetrations*
- ☐ Pure Steam Piping*

Door Hinge
- ☐ On Left Side
- ☐ On Right Side

Mounting
- ☐ For Recessing
- ☐ Cabinet Enclosed

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____

Location(s) _____

_____

_____

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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Printed in U.S.A.

DESIGN FEATURES

Eagle® 2300 with Printcon™

Preprogrammed sterilizer with digital readouts and computer-generated printed records. Eagle microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

Eagle-Eye™ Vertical Control Column (Figure 1)

Controls are neatly arranged in a vertical column conveniently located at the side of the sterilizer . . . not exposed to the continuous heat, vapor, and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge. Salient features include:

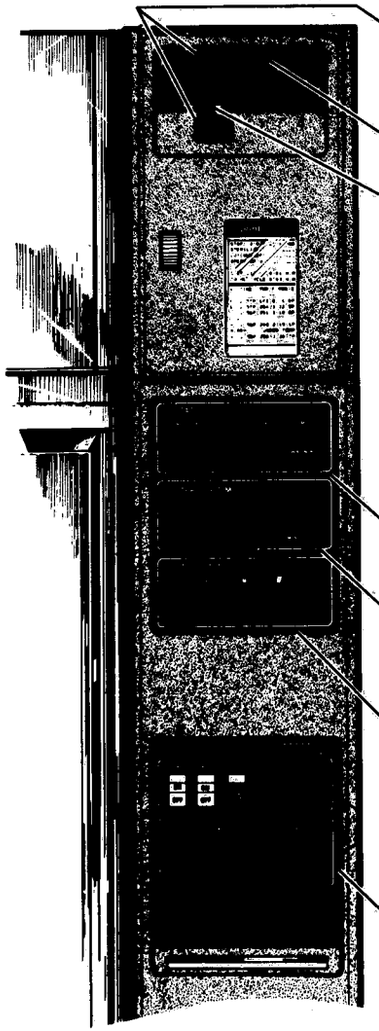


Figure 1. Eagle-Eye Vertical Control Column.

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

• **Temperature** is set on three-digit thumbwheel switch. During cycle actual temperature is displayed and printed. If selected temperature is outside allowable range, 150-295 F (65-146 C), buzzer sounds until an allowable temperature is selected. Temperature is locked in and cannot be changed once cycle is started.

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

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

Printcon provides easy-to-read **permanent printed record** of all pertinent cycle data, providing assurance to operator that cycle parameters have been met. **Alphanumeric printer** documents date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and deviations which might jeopardize sterilization process. **The Eagle 2300 printout** may, with a service adjustment, provide the printing of time, temperature, and pressure at **scheduled intervals** throughout the exposure phase. Print interval is adjustable in 30-second increments from 30 seconds to 49 minutes, 30 seconds. One- or two-ply paper is available for the printer. With two-ply paper, cycle's record can be automatically stored, which can then be saved for future documentation; the second copy torn off and placed with each sterilizer load. (A sample printout is shown in **Figure 2.**)

2. **Auto-Lume panels** light when power is on. Top panel gives **cycle status**; center panel, **sterilize** and **dry times**; bottom panel, **cycle selectors**.

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

• **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. **Sterilize time** displays when in cycle. **Dry time** displays (momentarily) when operator makes selection, or (continuously) when in Dry phase of cycle. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.

• **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber door must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary Controls** are behind a sliding door beneath the Auto-Lume panels. Included are **cycle monitor** (non-resettable) to count number of sterilizing cycles for programming preventive maintenance; **power switches**, one to isolate the entire unit and a second one to isolate only the controls; **circuit breaker**; **cycle reset** button (in case incorrect cycle is selected); two sets of **thumbwheel switches** for setting Sterilize and Dry times (up to 99 hours and 99 minutes); and operating instructions.

TECHNICAL DATA

Automatic Control

Programmed instructions (cycle and printer) are contained in 8-bit parallel **microcomputers,** each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure (see **Figure 3**).

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

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3.**)

Display panels include large, easy-to-see **LED digital readouts,** visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. Motorized take-up simplifies tape replacement and provides **automatic tape storage.** Maximum length of stored record is 15 feet. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **silver oxide battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

Monel door frame supports and conceals ends of door-holding arms when door is locked . . . presents a smooth surface for door gasket contact.

Hot-rolled carbon-steel shells, welded one within the other, form the sterilizer steam jacket. Inside of inner shell and chamber backhead are **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 double-faced with aluminum foil. It is held in place by pressure-sensitive tape, aluminum straps and clips. Sterilizer jacket (including backhead) is painted prior to being insulated.

Cast-bronze, manually operated door has stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gasket** is pressed against door frame by handwheel-actuated radial holding arms. Gasket is replaceable without tools. Sound-deadened, stainless-steel cover conceals holding arms and door exterior. Microswitch prevents inadvertent start of cycle before door is locked; **pressure lock** keeps door from being opened during cycle. **Door may be tightened but not opened while pressure is in chamber.**

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

Integral steam generator (optional): electrically powered, automatic water filling type, operates whenever sterilizer power is on. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feedwater line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 200-, 230-, or 460-volt (as specified), 60 Hz, 3-phase electric power. Additional voltages are available upon request. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 15 kw for a 16x16x26 inch (406x406x660 mm) sterilizer; 20 kw for a 20x20x38 inch (508x508x965 mm) sterilizer.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

OPTIONAL CONTROLS AND CYCLES

Compressed-Air Solution Cooling*

Cycle facilitates processing of media-filled, screw-capped borosilicate glass containers. The load is cooled via filtered, compressed air circulating off the rapidly cooled chamber walls and exiting through the drain plumbing.

Automatic Shutdown Device*

Automatic shutoff enables added productivity.

Pure Steam Piping*

All pipes, fittings, and valves leading to and from both the steam source and the sterilizer chamber are constructed from 300- series stainless steel.

Chamber Penetrations*

Capped openings to chamber to facilitate insertion of test equipment and instrumentation leads.

Optional Material Handling Accessories

Include racks with shelves, instrument trays and if 20x20x38-inch sterilizer, loading cars . . . **all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting as a cabinet-enclosed model, or for recessing, as specified. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures 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. Inside of the access door contains a rack for instructional materials. Top and side panels (only freestanding units) enclose the sterilizer body and piping. Top panel is louvered. All panels are stainless steel.

WARRANTY

The American Sterilizer Company warrants that each sterilizer is carefully tested, inspected and leaves the factory in proper working condition, free of visible defects. Coverage includes one year on parts (except expendables) and 90 days on labor. AMSCO representatives can provide full details of the warranty program upon request.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

*See separate product literature for further details.

ENGINEERING DATA

SIZE in. (mm)	OPERATING WEIGHT** lbs (kg)		UTILITIES CONSUMPTION										HEAT LOSS BTU/hr. at 70 F (21 C)		
			Water+			Steam++		Electricity — Amps					Cabinet Enclosed	Recessed	
			Cold		Hot*				Optional Steam Generator						
	Steam Powered	Electrically Powered	Peak gpm (lpm)	Avg. gph (lph)	Avg. gph (lph)	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Sterilizer Controls 120 V	Controls 120 V	Heaters 200V	Heaters 230V	Heaters 460V	To Room	Front of Wall	Behind Wall
16x16x26 (406x406x660)	1160 (527)	1440 (654)	5 (19)	98 (371)	4 (15)	83 (38)	35 (16)	3	8	45	45	25	4300	1600	2700
20x20x38 (508x508x965)	1990 (903)	2270 (1030)	5 (19)	98 (371)	8 (30)	116 (53)	49 (22)	3	8	60	60	30	7000	2500	4500

+At 20-50 psig (1.41-3.52 kg/cm²) *Hot water recommended for electrically powered sterilizers.
++At 50-80 psig (3.52-5.62 kg/cm²) **Based upon chamber filled with water.

SPECIFICATION WORKSHEET

Item_____; Furnish an AMSCO Eagle 2300 Series sterilizer with Printcon per Tech Data Sheet SD-377. Construct chamber ☐ 16x16x26" **or** ☐ 20x20x38". Supply ☐ gravity model **or** ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source **or** ☐ steam supplied from an integral electric steam generator. Arrange sterilizer ☐ to be freestanding **or** ☐ for recessing into a partition wall.

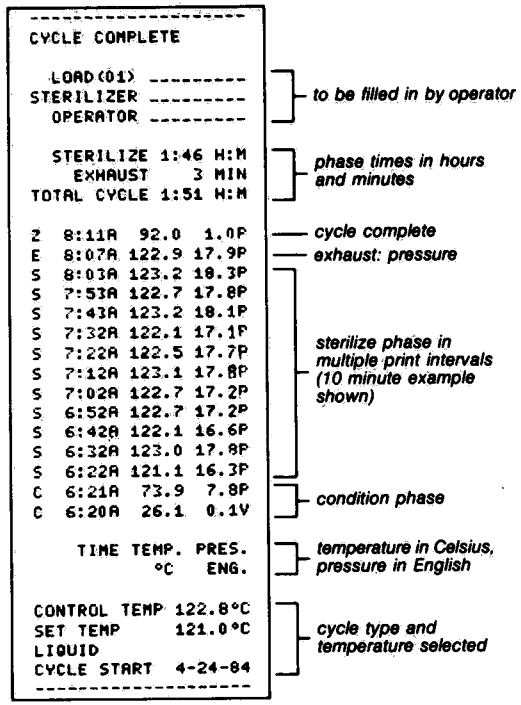


Figure 2. Typical Printout.

POWER ON AT 4-24-84
9:01A 68.4 0.0P

Power On Message

POWER ON AT 4-24-84
9:34A 120.5 10.4P

Power Restored After Power Failure

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

Reset Button Pressed

ALARM: TOO LONG
* 1:45P 265.9 20.4P

Condition Phase too long

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

Temperature Drops 2 F Below Setpoint

ABORT: DOOR OPEN
* 9:58A 243.3 12.7P

Door Opened During Cycle

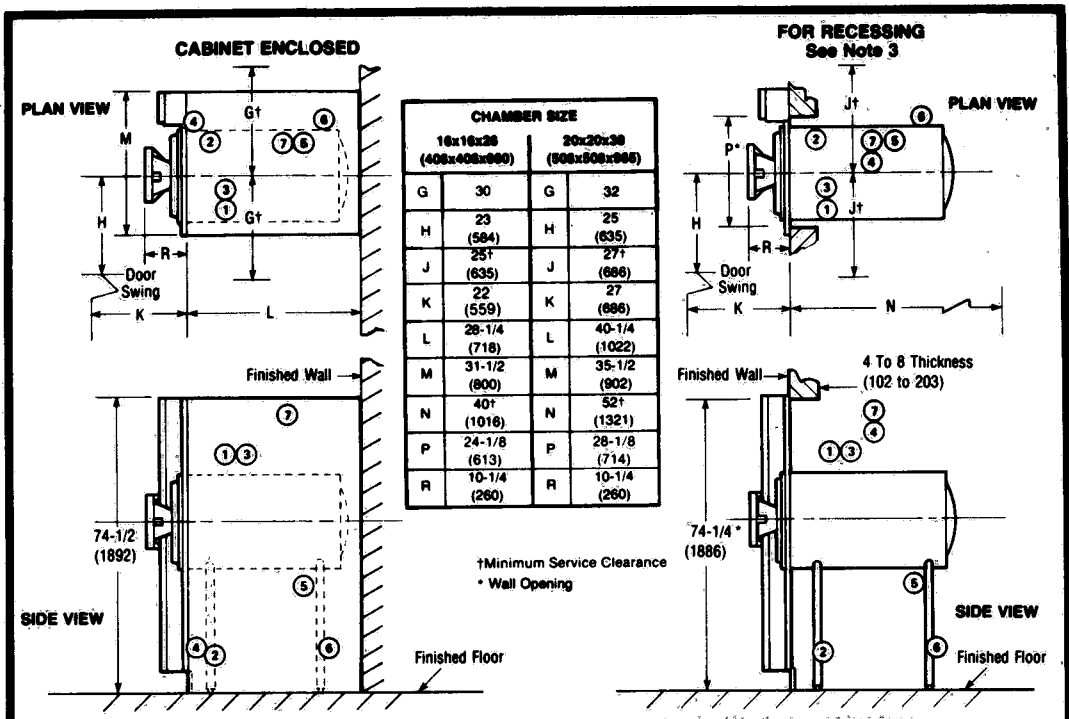
ABORT: TEMP SENSOR
* 3:45A 306.8 10.0P

Temperature Sensor Failure

ABORT: PRES SENSOR
*11:55A 270.0 41.3P

Pressure Sensor Failure

Figure 3. Control Monitoring and Communication.



CHAMBER SIZE	16x16x26 (406x406x660)	20x20x38 (508x508x965)
G	30	32
H	23 (584)	25 (635)
J	25† (635)	27† (686)
K	22 (559)	27 (686)
L	28-1/4 (718)	40-1/4 (1022)
M	31-1/2 (800)	35-1/2 (902)
N	40† (1016)	52† (1321)
P	24-1/8 (613)	28-1/8 (714)
R	10-1/4 (260)	10-1/4 (260)

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

OPERATING REQUIREMENTS

Steam and Electric Units:

(1) COLD WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

(2) DRAIN — 1-1/2 ODT

Steam Units Only:

(3) STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

(4) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Electric Units Only:

(5) HOT WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

Note: Cold water may be substituted but with a sacrifice on heat-up time.

(6) DRAIN — 1/2 ODT (For generator)

(7) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 200-, 230- or 460-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.

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.

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

AMSCO

Eagle® 2300 SCIENTIFIC SERIES SMALL STERILIZERS with Printcon™

Gravity **Laboratory/Isothermal**

• *steam* • *double door* • *electric*

TECH DATA

Small Steam Sterilizer (DOUBLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer with **digital-printer** and **state-of-the-art control system**; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Eagle 2300 is designed for scientific, research laboratories.

Gravity - for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stabile goods at 212 to 280 F (100 to 138 C); and for decontaminating supplies after laboratory procedures.

Laboratory/Isothermal - in addition to the above gravity cycles, offers processing heat-coagulable and heat-sensitive solutions and media at the lower temperatures of 170 to 212 F (78 to 100 C); fractional sterilization; pasteurization; and inspissation.

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

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

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 or U-3, as applicable, is furnished. Inner shell, including doors, is constructed to withstand working pressure of 35 psig (2.53 kg/cm²).

ASME Code, Section 1, Part PMB for power boilers . . . if optional steam generator is supplied. Boiler will withstand working pressure of 100 psig (7.03 kg/cm²).

Federal Specification GG-S-1348A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

ASTM Specification A240 for stainless steel, alloy 302 or 304 if welded, alloy 201, 202, 302 or 304 if not welded.

ASTM Specification B88 for seamless, copper tubing.

ASTM Specification B43 or B135, alloy 1 for seamless, red brass tubing.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Chamber Size
- ☐ Gravity, 16x16x26"
- ☐ Laboratory/Isothermal, 16x16x26"
- ☐ Gravity, 20x20x38"
- ☐ Laboratory/Isothermal, 20x20x38"

Power System
- ☐ Steam
- ☐ Electric (20x20x38" Sterilizer Only)
  - ☐ 200, ☐ 230, ☐ 460 volts

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

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

Option
- ☐ Compressed - Air Solution Cooling*
- ☐ Automatic Shutdown Device*
- ☐ Cross Contamination Seal*
- ☐ Door Interlock and Light*
- ☐ Extra Chamber Penetrations*
- ☐ Pure Steam Piping*

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____
Location(s) _____
_____
_____

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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Printed in U.S.A.

DESIGN FEATURES

Eagle® 2300 with Printcon™

Preprogrammed sterilizer with digital readouts and computer-generated printed records. Eagle microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

Eagle-Eye™ Vertical Control Column (Figure 1)

Controls are neatly arranged in a vertical column conveniently located at the side of the sterilizer . . . not exposed to the continuous heat, vapor, and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge. Salient features include:

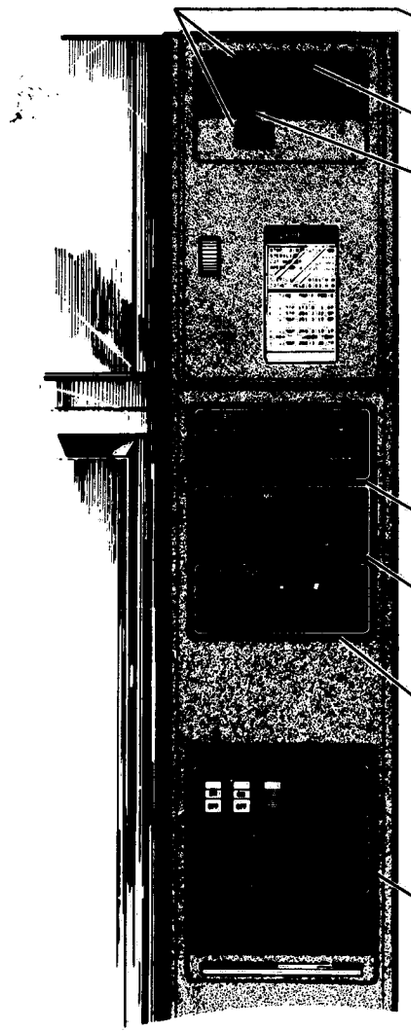


Figure 1. Eagle-Eye Vertical Control Column.

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

• **Temperature** is set on three-digit thumbwheel switch. During cycle actual temperature is displayed and printed. If selected temperature is outside allowable range, 150-295 F (65-146 C), buzzer sounds until an allowable temperature is selected. Temperature is locked in and cannot be changed once cycle is started.

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

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

Printcon provides easy-to-read **permanent printed record** of all pertinent cycle data, providing assurance to operator that cycle parameters have been met. **Alphanumeric printer** documents date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and deviations which might jeopardize sterilization process. **The Eagle 2300 printout** may, with a service adjustment, provide the printing of time, temperature, and pressure at **scheduled intervals** throughout the exposure phase. Print interval is adjustable in 30-second increments from 30 seconds to 49 minutes, 30 seconds. One- or two-ply paper is available for the printer. With two-ply paper, an average day's record can be automatically stored, which can then be saved for future documentation; the second copy torn off and placed with each sterilizer load. (A sample printout is shown in **Figure 2.**)

2. **Auto-Lume panels** light when power is on. Top panel gives **cycle status**; center panel, **sterilize** and **dry times**; bottom panel, **cycle selectors**.

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

• **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. **Sterilize time** displays when in cycle. **Dry time** displays (momentarily) when operator makes selection, or (continuously) when in Dry phase of cycle. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.

• **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber doors must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary Controls** are behind a sliding door beneath the Auto-Lume panels. Included are **cycle monitor** (non-resettable) to count number of sterilizing cycles for programming preventive maintenance; **power switches**, one to isolate the entire unit and a second one to isolate only the controls; **circuit breaker**; **cycle reset** button (in case incorrect cycle is selected); two sets of **thumbwheel switches** for setting Sterilize and Dry times (up to 99 hours and 99 minutes); and operating instructions.

Non-operating End Controls include Gravity and Liquids **cycle selectors** through which previous cycle can be repeated, **status lights** indicating the cycle phase and **warning lights** for door status and hot liquids cycle.

TECHNICAL DATA

Automatic Control

Programmed instructions (cycle and printer) are contained in 8-bit parallel **microcomputers,** each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure (see **Figure 3**).

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

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3.**)

Display panels include large, easy-to-see **LED digital readouts,** visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. Motorized take-up simplifies tape replacement and provides **automatic tape storage.** Maximum length of stored record is 15 feet. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **silver oxide battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

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

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

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

Cast-bronze, manually operated doors have stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Hinges are adjustable for accurate gasket alignment. **Silicone-rubber sealing gaskets** are pressed against door frames by handwheel-actuated radial holding arms. Gaskets are replaceable without tools. Sound-deadened, stainless-steel covers conceal holding arms and door exteriors. Microswitches prevent inadvertent start of cycle before doors are completely closed; **pressure locks** keep doors from being opened during cycle. **Doors may be tightened but not opened while pressure is in chamber.**

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

Integral steam generator (optional), electrically powered, automatic water filling type, operates whenever sterilizer power is on. Available only on 20x20x38-inch (508x508x965 mm) sterilizer. Includes **turbine-type feed-water pump** powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feed-water line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam between 75 and 80 psig (5.27 and 5.62 kg/cm²). Heaters operate on 200-, 230-, or 460-volt (as specified), 60 Hz, 3-phase electric power. Additional voltages are available upon request. Controls operate on 120-volt, 60-Hz, single-phase electric power. Nominal capacity of the heaters is 20 kw.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

OPTIONAL CONTROLS AND CYCLES

Compressed-Air Solution Cooling*

Cycle facilitates processing of media-filled, screw-capped borosilicate glass containers. The load is cooled via filtered, compressed air circulating off the rapidly cooled chamber walls and exiting through the drain plumbing.

Automatic Shutdown Device*

Automatic shutoff enables added productivity.

Pure Steam Piping*

All pipes, fittings, and valves leading to and from both the steam source and the sterilizer chamber are constructed from 300- series stainless steel.

Door Interlocks and Lights*

Mechanism prevents both sterilizer doors (double door units only) from opening simultaneously, under routine operating conditions. Door interlocks may be specified as a single option or included as part of the Cross Contamination Seal Package.

Cross Contamination Seal*

Arrangement (double door units only) prevents passage of airborne micro-organisms through room wall opening on non-operating end of sterilizer. Provides positive, safe separation of "clean" and "contaminated" goods-processing areas. Includes door interlocks and light.

Chamber Penetrations*

Capped openings to chamber to facilitate insertion of test equipment and instrumentation leads.

Optional Material Handling Accessories

Include racks with shelves, instrument trays and if 20x20x38-inch sterilizer, loading cars...**all constructed of Monel;** and carriages of stainless steel. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting through one or two (20x20x38 inch [508x508x965mm] only) partition walls. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures tight fit of cabinet panels to each other and to wall partition(s) as required. All panels are stainless-steel. Front and back panels have service access doors and height-adjustable kickplates. Inside of each access door contains a rack for instructional materials. A model for recessing through one wall has side panels and a louvered top panel to 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 90 days on labor. AMSCO representatives can provide full details of the warranty program upon request.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

*See separate product literature for further details.

ENGINEERING DATA

Size in. (mm)	Operating Weight** lbs (kg)		Utilities Consumption										Heat Loss BTU/Hr at 70° F (21° C)			
			Water*			Steam††		Electricity — Amps					Thru One Wall		Thru Two Walls	
			Cold		Hot				Optional Steam Generator							
	Steam Powered	Electrically Powered	Peak gpm (lpm)	Avg. gph (lph)	Avg. gph (lph)	Peak lbs/hr — (kg/hr)	Avg. lbs/hr (kg/hr)	Sterilizer Controls	Controls	Heaters 200V	Heaters 230V	Heaters 460V	Front of Work	Back of Work	At Each End	Between Walls
16x16x28 (406x406x680)	1380 (617)	N.A.	5 (19)	98 (372)	N.A.	83 (38)	35 (16)	3	N/A	N/A	N/A	N/A	1600	3500	N/A	N/A
20x20x38 (508x508x965)	2240 (912)	2520 (1003)	5 (19)	98 (372)	6* (30)	116 (53)	49 (22)	3	8	60	60	30	2500	5300	2500	1700

*Hot water recommended for optional electric steam generator. **Based upon chamber filled with water. †At 20-50 psig (1.41-3.52 kg/cm²). ††At 50-80 psig (3.52-5.62 kg/cm²).

SPECIFICATION WORKSHEET

Item_____: Furnish an AMSCO Eagle 2300 Series sterilizer with Printcon per Tech Data Sheet SD-378. Construct chamber ☐ 16x16x26" or ☐ 20x20x38". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator* Arrange sterilizer ☐ for recessing through one wall or ☐ for recessing through two walls.*

*For 20x20x38" units only.

```
--------------------
CYCLE COMPLETE

  LOAD(01) ---------
STERILIZER ---------
  OPERATOR ---------

  STERILIZE 1:46 H:M
    EXHAUST    3 MIN
TOTAL CYCLE 1:51 H:M

Z  8:11A  92.0  1.0P
E  8:07A 122.9 17.9P
S  8:03A 123.2 18.3P
S  7:53A 122.7 17.8P
S  7:43A 123.2 18.1P
S  7:32A 122.1 17.1P
S  7:22A 122.5 17.7P
S  7:12A 123.1 17.8P
S  7:02A 122.7 17.2P
S  6:52A 122.7 17.2P
S  6:42A 122.1 16.6P
S  6:32A 123.0 17.8P
S  6:22A 121.1 16.3P
C  6:21A  73.9  7.8P
C  6:20A  26.1  0.1V

     TIME TEMP. PRES.
          °C   ENG.

CONTROL TEMP 122.8°C
SET TEMP     121.0°C
LIQUID
CYCLE START  4-24-84
--------------------
```

to be filled in by operator

phase times in hours and minutes

cycle complete

exhaust: pressure

sterilize phase in multiple print intervals (10 minute example shown)

condition phase

temperature in Celsius, pressure in English

cycle type and temperature selected

Figure 2. Typical Printout.

```
--------------------
POWER ON AT 4-24-84
  9:01A  68.4  0.0P
--------------------
```

Power On Message

```
--------------------
POWER ON AT 4-24-84
  9:34A 120.5 10.4P
--------------------
```

Power Restored After Power Failure

```
--------------------
ABORT:  RESET BUTTON
* 12:12A 279.4 22.2P
--------------------
```

Reset Button Pressed

```
--------------------
ALARM:      TOO LONG
* 1:45P 265.9 20.4P
--------------------
```

Condition Phase too long

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

Temperature Drops 2 F Below Setpoint

```
--------------------
ABORT:    DOOR OPEN
*  9:58A 243.3 12.7P
--------------------
```

Door Opened During Cycle

```
--------------------
ABORT:   TEMP SENSOR
*  3:45A 306.8 10.0P
--------------------
```

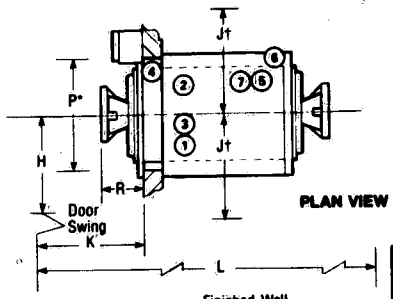
Temperature Sensor Failure

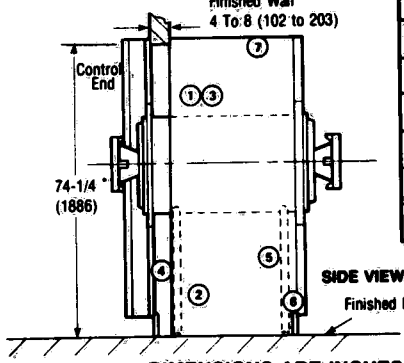
```
--------------------
ABORT:   PRES SENSOR
* 11:55A 270.0 41.3P
--------------------
```

Pressure Sensor Failure

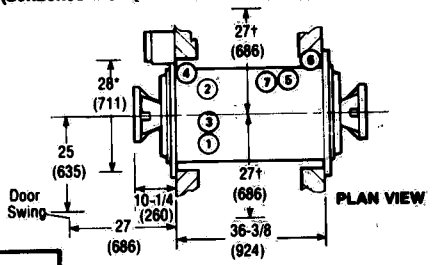
Figure 3. Control Monitoring and Communication.

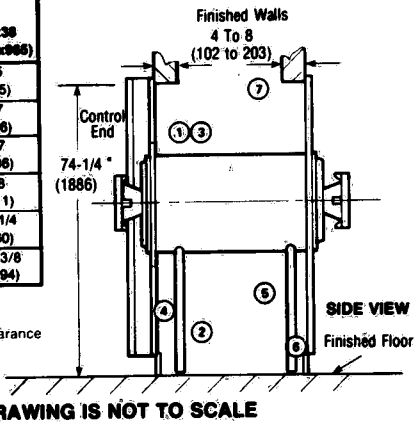
FOR RECESSING THRU ONE PARTITION WALL





FOR RECESSING THRU TWO PARTITION WALLS (20x20x38 inch [508x508x965 mm] Sterilizer Only)





CHAMBER SIZE	16x16x26 (406x406x660)	20x20x38 (508x508x965)
H	23 (584)	25 (635)
J	25 (635)	27 (686)
K	22 (559)	27 (686)
P	24 (610)	28 (711)
R	10-1/4 (260)	10-1/4 (260)
L	80-3/8 (2040)	90-3/8 (2294)

†Minimum Service Clearance
*Wall Opening

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

OPERATING REQUIREMENTS

Steam and Electric Units:

(1) COLD WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

(2) DRAIN — 1-1/2 ODT

Steam Units Only:

(3) STEAM SUPPLY — 3/8 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

(4) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

Electric Units Only:

(5) HOT WATER — 3/8 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness

Note: Cold water may be substituted but with a sacrifice on heat-up time.

(6) DRAIN — 1/2 ODT (For generator)

(7) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls. 200-, 230- or 460-V, 60-Hz, Three-phase Service for generator heaters.

. . . 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 (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. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.

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.

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

AMSCO

Eagle® 2300 SCIENTIFIC SERIES MEDIUM STERILIZERS with Printcon™

Gravity **Laboratory/Isothermal**

• *single door*

TECH DATA

Medium Steam Sterilizer (SINGLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer with digital-printer and state-of-the-art control system; two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Eagle 2300 is designed for scientific, research laboratories.

Gravity - for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stable goods at 212 to 280 F (100 to 138 C); and for decontaminating supplies after laboratory procedures.

Laboratory/Isothermal - in addition to the above gravity cycles, offers processing heat-coagulable and heat-sensitive solutions and media at the lower temperatures of 170 to 212 F (78 to 100 C); fractional sterilization; pasteurization; and inspissation.

Chamber Sizes

Interior dimensions are 24x36x36 inches (610x914x914 mm), 24x36x48 inches (610x914x1219 mm) or 24x36x60 inches (610x914x1524 mm), as specified.

Standards

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

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Inner shell, including door, is constructed to withstand working pressure of 40 psig (2.81 kg/cm²).

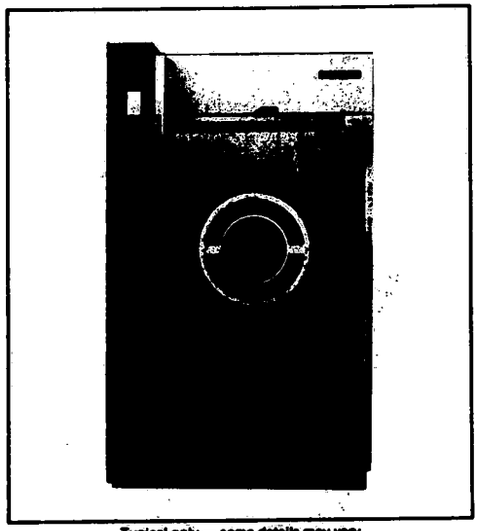
Federal Specification GG-S-1349A performance requirements for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

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.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Chamber Size
- ☐ Gravity, 24 x36 x36"
- ☐ Laboratory/Isothermal, 24 x36 x36"
- ☐ Gravity, 24 x36 x48"
- ☐ Laboratory/Isothermal, 24 x36 x48"
- ☐ Gravity, 24 x36 x60"
- ☐ Laboratory/Isothermal, 24 x36 x60"

Door Operation
- ☐ Manual ☐ Power

Door Hinge
- ☐ Right Side
- ☐ Left Side

Mounting
- ☐ For Recessing
- ☐ Cabinet Enclosed

Option
- ☐ Seismic Tie-down Kit
- ☐ Compressed - Air Solution Cooling*
- ☐ Automatic Shutdown Device*
- ☐ Extra Chamber Penetrations*
- ☐ Pure Steam Piping*

Materials Handling Accessories*
- ☐ Rack and Shelves (36 and 48" Long Only)
- ☐ Loading Car and Carriage
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____

Location(s) _____

_____

_____

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DESIGN FEATURES

Eagle® 2300 with Printcon™

Preprogrammed sterilizer with digital readouts and computer-generated printed records. Eagle microcomputers monitor and control system operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or if liquids, adjustable slow with accelerator) and drying phases. Completion of cycle indicated visually; also audibly for 90 seconds.

Eagle-Eye™ Vertical Control Column (Figure 1)

Controls are neatly arranged in a vertical column conveniently located at the side of the sterilizer . . . not exposed to the continuous heat, vapor, and condensate resulting from the sterilization process. For easy access, column is on side opposite door hinge. Salient features include:

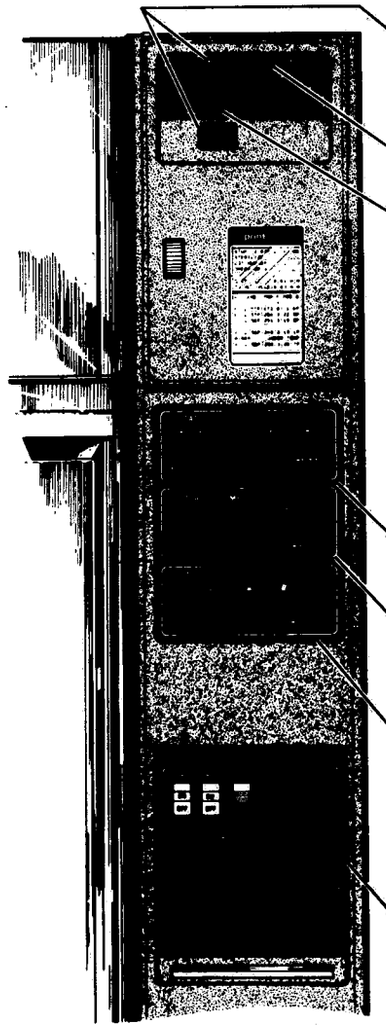


Figure 1. Eagle-Eye Vertical Control Column.

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

• **Temperature** is set on three-digit thumbwheel switch. During cycle actual temperature is displayed and printed. If selected temperature is outside allowable range, 150-295 F (65-146 C), buzzer sounds until an allowable temperature is selected. Temperature is locked in and cannot be changed once cycle is started.

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

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

Printcon provides easy-to-read **permanent printed record** of all pertinent cycle data, providing assurance to operator that cycle parameters have been met. **Alphanumeric printer** documents date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and deviations which might jeopardize sterilization process. **The Eagle 2300 printout** may, with a service adjustment, provide the printing of time, temperature, and pressure at **scheduled intervals** throughout the exposure phase. Print interval is adjustable in 30-second increments from 30 seconds to 49 minutes, 30 seconds. One- or two-ply paper is available for the printer. With two-ply paper, an average day's record can be automatically stored, which can then be saved for future documentation; the second copy torn off and placed with each sterilizer load. (A sample printout is shown in **Figure 2.**)

2. **Auto-Lume panels** light when power is on. Top panel gives **cycle status**; center panel, **sterilize** and **dry times**; bottom panel, **cycle selectors.**

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

• **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. **Sterilize time** displays when in cycle. **Dry time** displays (momentarily) when operator makes selection, or (continuously) when in Dry phase of cycle. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.

• **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber door must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary Controls** are behind a sliding door beneath the Auto-Lume panels. Included are **cycle monitor** (non-resettable) to count number of sterilizing cycles for programming preventive maintenance; **power switches,** one to isolate the entire unit and a second one to isolate only the controls; **circuit breaker; cycle reset** button (in case incorrect cycle is selected); two sets of **thumbwheel switches** for setting Sterilize and Dry times (up to 99 hours and 99 minutes); and operating instructions.

TECHNICAL DATA

Automatic Control

Programmed instructions (cycle and printer) are contained in 8-bit parallel **microcomputers**, each fabricated on a single silicon chip using N-channel silicon gate metal-oxide semiconductor (MOS) process. This fabrication represents today's "state-of-the-art" technology in large-scale integrated (LSI) circuits. **Cycle memory** is maintained during power outages of up to 20 milliseconds . . . eliminates necessity of reinitiating cycle following routine power switchovers. After 20 milliseconds operator must reset control power. Visual and audible signals then indicate that cycle was interrupted. Printout records failure (see **Figure 3**).

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

Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3.**)

Display panels include large, easy-to-see **LED digital readouts,** visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. Motorized take-up simplifies tape replacement and provides **automatic tape storage.** Maximum length of stored record is 15 feet. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **silver oxide battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

Monel door frame supports and conceals ends of door-holding arms when door is locked . . . presents a smooth surface for door gasket contact.

Hot-rolled carbon-steel shells, welded one within the other, form the sterilizer steam jacket. Inside of inner shell and chamber backhead are **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 double faced with aluminum foil. It is held in place by pressure-sensitive tape, aluminum straps and clips. Sterilizer jacket (including backhead) is painted prior to being insulated.

Door. Nickel-clad (0.025-inch [0.63 mm] thick, nominal), hot-rolled carbon steel. Manually operable or power driven, as specified. Stainless-steel, sound-deadened cover conceals holding arms and exterior parts. Stainless-steel, bearing-mounted hinge on either side of chamber, as specified. Door adjustable for accurate gasket alignment. Radial arms exert even pressure on silicone-rubber sealing gasket. Microswitch prevents inadvertent start of cycle before door is locked; **pressure lock** keeps door from being opened during cycle. **Door may be tightened but not opened while pressure is in chamber.**

- **Manual Door.** Radial arms actuated by rotating a low-heat-conducting handwheel.
- **Power Door.** Opened and closed by a fused, motorized mechanism with magnetic slip clutch (for overload protection). Radial arms positioned by socket plate assembly run by motorized mechanism with gear reducer and overload protection. Door stops automatically if obstruction is encountered while operating, in addition a separate stop button is provided. Power-driven door is also manually operable.

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

OPTIONAL CONTROLS AND CYCLES

Compressed-Air Solution Cooling*

Cycle facilitates processing of media-filled, screw-capped borosilicate glass containers. The load is cooled via filtered, compressed air circulating off the rapidly cooled chamber walls and exiting through the drain plumbing.

Automatic Shutdown Device*

Automatic shutoff enables added productivity.

Pure Steam Piping*

All pipes, fittings, and valves leading to and from both the steam source and the sterilizer chamber are constructed from 300- series stainless steel.

Chamber Penetrations*

Capped openings to chamber to facilitate insertion of test equipment and instrumentation leads.

Optional Material Handling Accessories

Include racks with shelves, instrument trays and loading cars . . . **all constructed of Monel;** and carriages with a painted-steel finish. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting as a cabinet-enclosed model, or for recessing, as specified. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures 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. Inside of the access door contains a rack for instructional materials. Top and side panels (only freestanding units) enclose the sterilizer body and piping. Top panel is louvered. All panels are stainless steel. **Casters and lifting lugs** facilitate transporting and positioning sterilizer. A **Seismic Tie-down Kit** is available for seismic installation of all medium Eagle sterilizers, if required.

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 90 days on labor. AMSCO representatives can provide full details of the warranty program upon request.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

*See separate product literature for further details.

ENGINEERING DATA

SIZE in. (mm)	OPERATING WEIGHT* lbs (kg)	UTILITIES CONSUMPTION						HEAT LOSS BTU/hr at 70 F (21 C)		
		Water†		Steam††		Electricity — Amps (120 Volts, Single Phase)		Cabinet Enclosed	Recessed	
		Peak gpm (lpm)	Avg. gph (lph)	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Manual Door Model	Power Door Model		Front of Wall	Behind Wall
24x36x36 (610x914x914)	3700 (1680)	15 (57)	280 (1060)	112 (51)	112 (51)	3	20	12550	5000	7500
24x36x48 (610x914x1219)	4575 (2077)	15 (57)	284 (1075)	148 (67)	148 (67)	3	20	14650	5000	9600
24x36x60 (610x914x1524)	5250 (2384)	15 (57)	288 (1090)	185 (84)	185 (84)	3	20	16800	5000	11800

Based upon chamber filled with water
†At 20-50 psig (1.41-3.52 kg/cm²)
††At 50-80 psig (3.52-5.62 kg/cm²)

SPECIFICATION WORKSHEET

Item_____; Furnish an AMSCO Eagle 2300 Series sterilizer with Printcon per Tech Data Sheet SD-381. Construct chamber ☐ 24x36x36" or ☐ 24x36x48" or 24x36x60". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on steam from an independent source. Arrange sterilizer ☐ to be freestanding or ☐ for recessing into a partition wall.

```
--------------------
CYCLE COMPLETE

  LOAD(01) ----------
STERILIZER ----------
  OPERATOR ----------

  STERILIZE 1:46 H:M
    EXHAUST     3 MIN
TOTAL CYCLE 1:51 H:M

Z  8:11A  92.0   1.0P
E  8:07A 122.9  17.9P
S  8:03A 123.2  18.3P
S  7:53A 122.7  17.8P
S  7:43A 123.2  18.1P
S  7:32A 122.1  17.1P
S  7:22A 122.5  17.7P
S  7:12A 123.1  17.8P
S  7:02A 122.7  17.2P
S  6:52A 122.7  17.2P
S  6:42A 122.1  16.6P
S  6:32A 123.0  17.8P
S  6:22A 121.1  16.3P
C  6:21A  73.9   7.8P
C  6:20A  26.1   0.1V

    TIME TEMP. PRES.
           °C   ENG.

CONTROL TEMP 122.8°C
SET TEMP     121.0°C
LIQUID
CYCLE START  4-24-84
--------------------
```

to be filled in by operator

phase times in hours and minutes

cycle complete

exhaust: pressure

sterilize phase in multiple print intervals (10 minute example shown)

condition phase

temperature in Celsius, pressure in English

cycle type and temperature selected

Figure 2. Typical Printout.

```
--------------------
POWER ON AT 4-24-84
  9:01A  68.4   0.0P
--------------------
```

Power On Message

```
--------------------
POWER ON AT 4-24-84
  9:34A 120.5  10.4P
--------------------
```

Power Restored After Power Failure

```
--------------------
ABORT:  RESET BUTTON
* 12:12A 279.4  22.2P
--------------------
```

Reset Button Pressed

```
--------------------
ALARM:      TOO LONG
* 1:45P 265.9  20.4P
--------------------
```

Condition Phase too long

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

Temperature Drops 2 F Below Setpoint

```
--------------------
ABORT:     DOOR OPEN
*  9:58A 243.3  12.7P
--------------------
```

Door Opened During Cycle

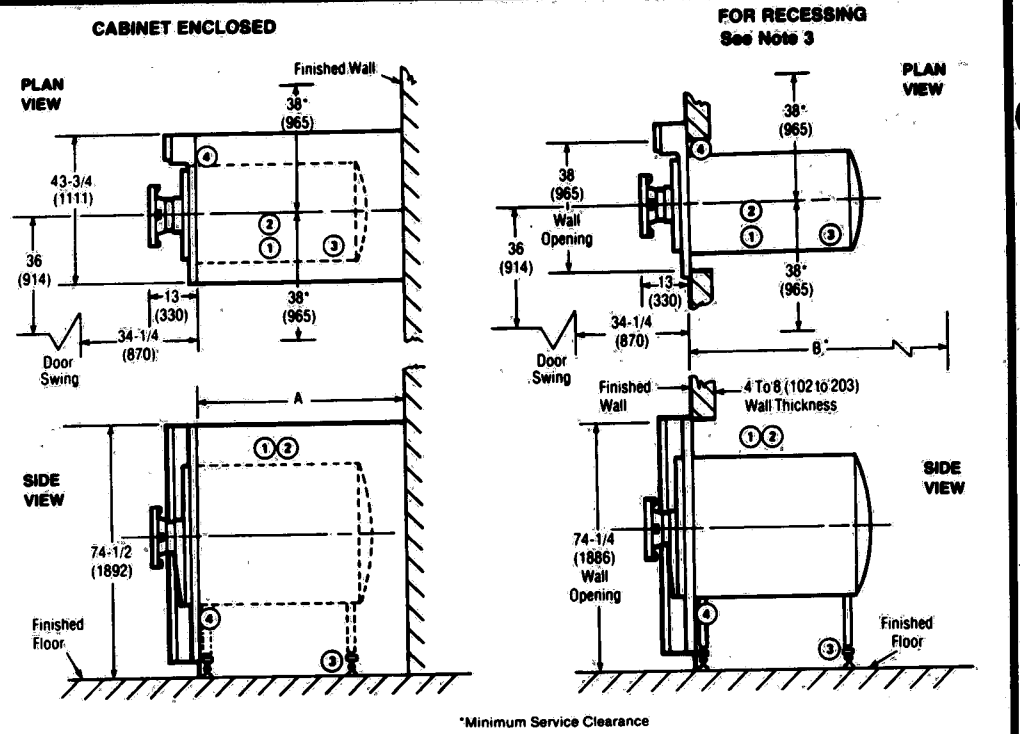
```
--------------------
ABORT:   TEMP SENSOR
*  3:45A 386.8  10.0P
--------------------
```

Temperature Sensor Failure

```
--------------------
ABORT:   PRES SENSOR
* 11:55A 270.0  41.3P
--------------------
```

Pressure Sensor Failure

Figure 3. Control Monitoring and Communication.



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

CHAMBER SIZE	A	B*
24x36x36 (610x914x914)	49-1/4 (1251)	62-1/8 (1578)
24x36x48 (610x914x1219)	62-1/2 (1587)	74 (1880)
24x36x60 (610x914x1524)	73-1/2 (1867)	89 (2261)

OPERATING REQUIREMENTS

1. COLD WATER — 3/4 NPT, 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness
2. STEAM SUPPLY — 3/4 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor
3. DRAIN — 2 ODT
4. TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls and, if furnished, power door

. . . 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 (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 sterilizer, for loading purposes, should equal
   - length of sterilizer plus 12 inches (305 mm), if shelves will be used.
   - twice the length of sterilizer, if loading car and carriage will be used.
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.

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

AMSCO

Eagle® 2300 SCIENTIFIC SERIES MEDIUM STERILIZERS with Printcon™

Gravity **Laboratory/Isothermal**

• *double door*

TECH DATA

DESCRIPTION

Microcomputer-controlled sterilizer with **digital-printer** and **state-of-the-art control system**: two types, both use steam under pressure as the sterilizing agent and operate by the gravity air-removal principle.

Types and Uses

Eagle 2300 is designed for scientific, research laboratories.

Gravity - for sterilizing liquids in flasks with vented closures at 212 to 254 F (100 to 122 C); also heat- and moisture-stabile goods at 212 to 280 F (100 to 138 C); and for decontaminating supplies after laboratory procedures.

Laboratory/Isothermal - in addition to the above gravity cycles, offers processing heat-coagulable and heat-sensitive solutions and media at the lower temperatures of 170 to 212 F (78 to 100 C); fractional sterilization; pasteurization; and inspissation.

Chamber Sizes

Interior dimensions are 24x36x48 inches (610x914x1219 mm) or 24x36x60 inches (610x914x1524 mm), as specified.

Standards

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

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Inner shell, including doors, is constructed to withstand working pressure of 40 psig (2.81 kg/cm²).

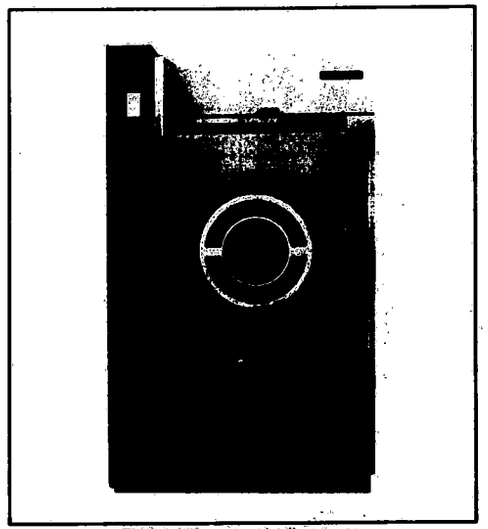
Federal Specification for both high and low temperature processing.

Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

ASTM Specification for stainless steel, alloy 302 or 304 if welded, alloy 201, 202, 302 or 304 if not welded.

ASTM Specification for seamless, copper tubing.

ASTM Specification or , alloy 1 for seamless, red brass tubing.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Chamber Size
- ☐ Gravity, 24x36x48"
- ☐ Laboratory/Isothermal, 24x36x48"
- ☐ Gravity, 24x36x60"
- ☐ Laboratory/Isothermal, 24x36x60"

Door Operation
- ☐ Manual ☐ Power

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

Mounting
- ☐ For Recessing Through One Wall
- ☐ For Recessing Through Two Walls

Option
- ☐ Seismic Tie-down Kit
- ☐ Compressed - Air Solution Cooling*
- ☐ Automatic Shutdown Device*
- ☐ Cross Contamination Seal*
- ☐ Door Interlock and Light*
- ☐ Extra Chamber Penetrations*
- ☐ Pure Steam Piping*

Materials Handling Accessories*
- ☐ Rack and Shelves (48" Long Only)
- ☐ Loading Car and Carriage
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____

Location(s) _____

_____

_____

Medium Steam Sterilizer (DOUBLE DOOR)

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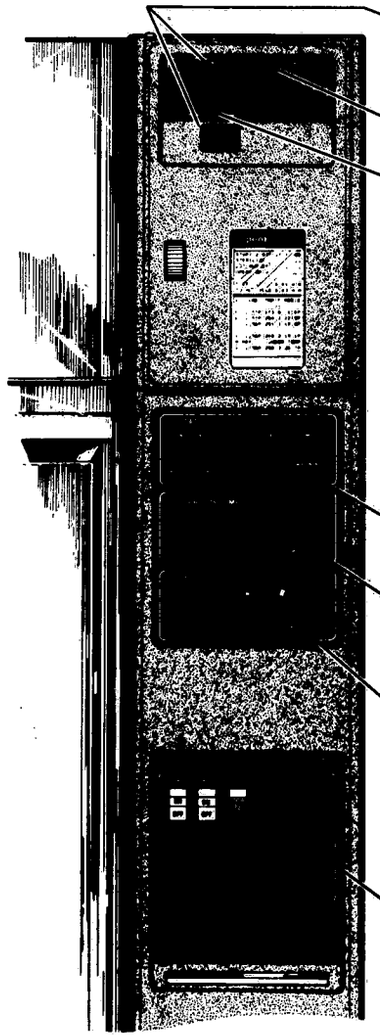


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• **Status** lights show each phase of sterilizer operation. Light visually alerts operator if door is unlocked. Operator is visually and audibly alerted if temperature setpoint is not reached or if temperature drops below setpoint during Sterilize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

• **Sterilize Time** and **Dry Time** are locked in and cannot be changed once cycle is started. **Sterilize time** displays when in cycle. **Dry time** displays (momentarily) when operator makes selection, or (continuously) when in Dry phase of cycle. Timers automatically reset upon completion of cycle, eliminating need for resetting between repeated cycles. Timers also reset if sterilize temperature drops 2 F (1.1 C) below set point during exposure period.

• **Cycle Select** buttons require positive force to actuate, eliminating unintentional cycle selections. (Chamber doors must be locked pressure-tight to initiate a cycle.) Selected cycle is clearly indicated, others locked out. Throughout entire liquids cycle, **WARNING** light alerts operator to **HOT LIQUIDS** in chamber. Following cycle, light **begins flashing** when chamber door is cracked open for cooling period. **Buzzer** again sounds to indicate end of required **10-minute** cooling period. Pressing RESET button eliminates warning signal.

3. **Secondary Controls** are behind a sliding door beneath the Auto-Lume panels. Included are **cycle monitor** (non-resettable) to count number of sterilizing cycles for programming preventive maintenance; **power switch**, one to isolate the entire unit and a second one to isolate only the controls; **circuit breaker**; **cycle reset** button (in case incorrect cycle is selected); two sets of **thumbwheel switches** for setting Sterilize and Dry times (up to 99 hours and 99 minutes); and operating instructions.

Non-operating End Controls include Gravity and Liquids **cycle selectors** by which previous cycle can be repeated, **status lights** indicating the cycle phase and **warning lights** for door status and hot liquids.

TECHNICAL DATA

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Pressure and vacuum set points are service adjustable. Pressure and temperature sensor failure will sound an alarm and a message will be printed. (See **Figure 3**.)

Display panels include large, easy-to-see **LED digital readouts,** visible legends and touch-sensitive switches. Time readouts first indicate set times and then, as cycle progresses, count down remaining time. Temperature readout can be in either Fahrenheit or Celsius. Display of pressure/vacuum can be in either English or metric. Temperature and pressure/vacuum can be shown with or without decimal places.

Alphanumeric Impact Printer produces characters within a **five-by-seven dot matrix.** Maximum 20 characters per line are printed on **2-3/8-inch-wide paper tape.** Tape exits from an opening flush with the surface of the control panel. Motorized take-up simplifies tape replacement and provides **automatic tape storage.** Maximum length of stored record is 15 feet. Black ink ribbon is contained in a compact, **easy-to-change cartridge.** Proper inking of ribbon is assured by a re-inking roll within the cartridge. Printer rated speed is 108 lines per minute. **Data is automatically printed** at the beginning and end of each cycle and at all transition points. Three tape rolls and two ink cartridges are furnished.

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

Power Supply. Sterilizer requires 120 VAC, 50/60 Hz, single phase. Integral power supply provides regulated voltage levels for lamps, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. The Printcon system includes a three-volt **silver oxide battery** to continuously maintain correct time and date without external power. Battery life is approximately one year.

Manual Control (Gravity Cycles Only)

Sterilizer is manually operable (without electric power) by a single programming wheel. (Printcon function is not operational in this mode.)

Jacket and Chamber Assembly

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

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

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

Doors. Nickel-clad (0.025-inch [0.63 mm] thick, nominal), hot-rolled carbon steel. Manually operable or power driven, as specified. Stainless-steel, sound-deadened covers conceal holding arms and exterior parts. Stainless-steel, bearing-mounted hinges on either side of chamber, as specified. Doors adjustable for accurate gasket alignment. Radial arms exert even pressure on silicone-rubber sealing gasket. Microswitches prevent inadvertent start of cycle before doors are completely closed; **pressure locks** keeps doors from being opened during cycle. **Doors may be tightened but not opened while pressure is in chamber.**

- **Manual Doors.** Radial arms actuated by rotating a low-heat-conducting handwheel.
- **Power Doors.** Each door opened and closed by a fused, motorized mechanism with magnetic slip clutch (for overload protection). Radial arms positioned by socket plate assembly run by motorized mechanism with gear reducer and overload protection. Doors stop automatically if obstruction is encountered while operating, in addition a separate stop button is provided. Power-driven doors are also manually operable.

Isothermal Processing (Laboratory/Isothermal Model Only)

If isothermal mode is selected, chamber jacket is not heated. Chamber temperature is maintained by circulation of steam/air mix. Automatic cycle control and monitoring is same as for gravity cycles.

Chamber Drain System

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. Regulates waterflow consistent with amount of steam discharged. Water supply **shutoff valve** is behind service access door. A constant steam bleed across the temperature sensing element (RTD) in the chamber line provides improved air elimination and more accurate temperature sensing.

Drying System

System ejector reduces chamber pressure during drying phase, 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

Sterilizer is piped, valved and trapped to receive steam delivered at 50 to 80 psig (3.52 to 5.62 kg/cm²). 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** is behind service access door. Jacket pressure and chamber pressure/vacuum **gauges** are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

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 they are needed and can be serviced individually.

Manual Valves. Bronze, angle type with renewable Monel seats and synthetic discs or equivalent high-quality parts. Hydrostatically tested at 350 psig (24.61 kg/cm²) or proven leakproof when tested at 100-psig (7.03 kg/cm²) air pressure with valve body submerged in water. Low-heat-conducting, easily replaceable handles.

Steam Pressure Regulator operates on supply pressure of 50 to 80 psig (3.52 to 5.62 kg/cm²). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253 or 273 F (122 or 134 C).

Thermostatic Steam Traps pressure and temperature compensated. Renewable **Monel bellows** with matched stainless-steel plunger and seat.

Baffle shields steam supply opening inside the chamber.

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

OPTIONAL CONTROLS AND CYCLES

Compressed-Air Solution Cooling*

Cycle facilitates processing of media-filled, screw-capped borosilicate glass containers. The load is cooled via filtered, compressed air circulating off the rapidly cooled chamber walls and exiting through the drain plumbing.

Automatic Shutdown Device*

Automatic shutoff enables added productivity.

Pure Steam Piping*

All pipes, fittings, and valves leading to and from both the steam source and the sterilizer chamber are constructed from 300- series stainless steel.

Door Interlocks and Lights*

Mechanism prevents both sterilizer doors (double door units only) from opening simultaneously, under routine operating conditions. Door interlocks may be specified as a single option or included as part of the Cross Contamination Seal Package.

Cross Contamination Seal*

Arrangement (double door units only) prevents passage of airborne micro-organisms through room wall opening on non-operating end of sterilizer. Provides positive, safe separation of "clean" and "contaminated" goods-processing areas. Includes door interlocks and light.

Chamber Penetrations*

Capped openings to chamber to facilitate insertion of test equipment and instrumentation leads.

Optional Material Handling Accessories

Include racks with shelves, instrument trays and loading cars . . . **all constructed of Monel;** and carriages with a painted-steel finish. See separate product literature for details.

INSTALLATION

Sterilizer arranged for mounting through one or two partition walls. Includes height-adjustable, steel floor stand with cadmium-plated pads and leveling screws. Subframe with synthetic-rubber gasket ensures tight fit of cabinet panels to each other and to wall partition(s) as required. All panels are stainless-steel. Front and back panels have service access doors and height-adjustable kickplates. Inside of each access door contains a rack for instructional materials. A model for recessing through one wall has side panels and a louvered top panel. **Casters and lifting lugs** facilitate transporting and positioning sterilizer. A **Seismic Tie-down Kit** is available for seismic installation of all medium Eagle sterilizers, if required.

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 90 days on labor. AMSCO representatives can provide full details of the warranty program upon request.

OPTIONAL PREVENTIVE MAINTENANCE AGREEMENT

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

*See separate product literature for further details.

ENGINEERING DATA

SIZE in. (mm)	WEIGHT* lbs (kg)	UTILITIES CONSUMPTION						HEAT LOSS BTU/hr at 70° F (21° C)			
		Water†		Steam ††		Electricity — Amps (120 Volts, Single Phase)		Thru One Wall		Thru Two Walls	
		Peak gpm (lpm)	Avg. gph (lph)	Peak lbs/hr (kg/hr)	Avg. lbs/hr (kg/hr)	Manual Door Model	Power Door Model	Front of Wall	Room Back of Wall	At Each End	Between Walls
24x36x48 (610x914x1219)	4875 (2213)	15 (57)	284 (1075)	148 (67)	148 (67)	3	20	5000	13800	5000	8600
24x36x60 (610x914x1524)	5550 (2520)	15 (57)	288 (1090)	185 (84)	185 (84)	3	20	5000	16500	5000	10500

*Based upon chamber filled with water. †At 20-50 psig (1.41-3.52 kg/cm²)
††At 50-80 psig (3.52-5.62 kg/cm²)

SPECIFICATION WORKSHEET

Item_____; Furnish an AMSCO Eagle 2300 Series sterilizer with Printcon per Tech Data Sheet SD-382. Construct chamber ☐ 24x36x48" or ☐ 24x36x60". Supply ☐ gravity model or ☐ laboratory/isothermal model. Design control with microcomputer to control system functions; monitor system operations; and visually indicate and print chamber temperature, pressure, time, date, and daily cycle number. Equip sterilizer to operate on ☐ steam from an independent source or ☐ steam supplied from an integral electric steam generator. Arrange sterilizer ☐ for recessing through one wall or ☐ for recessing through two walls.

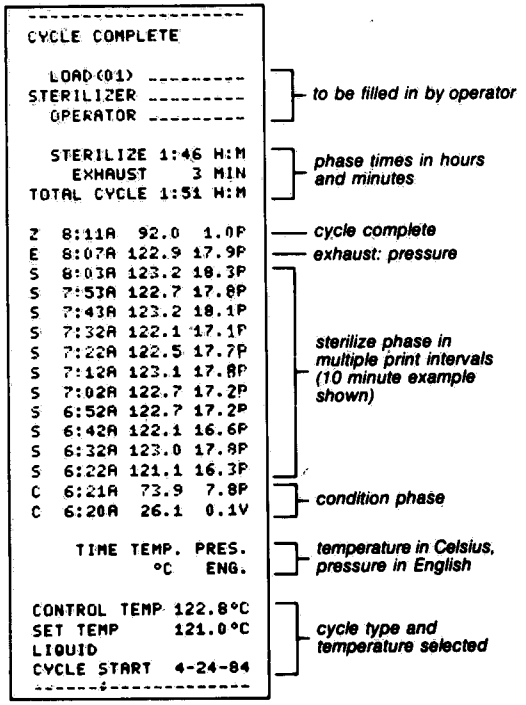


Figure 2. Typical Printout.

POWER ON AT 4-24-84
9:01A 68.4 0.0P

Power On Message

POWER ON AT 4-24-84
9:34A 120.5 10.4P

Power Restored After Power Failure

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

Reset Button Pressed

ALARM: TOO LONG
* 1:45P 265.9 20.4P

Condition Phase too long

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

Temperature Drops 2 F Below Setpoint

ABORT: DOOR OPEN
* 9:58A 243.3 12.7P

Door Opened During Cycle

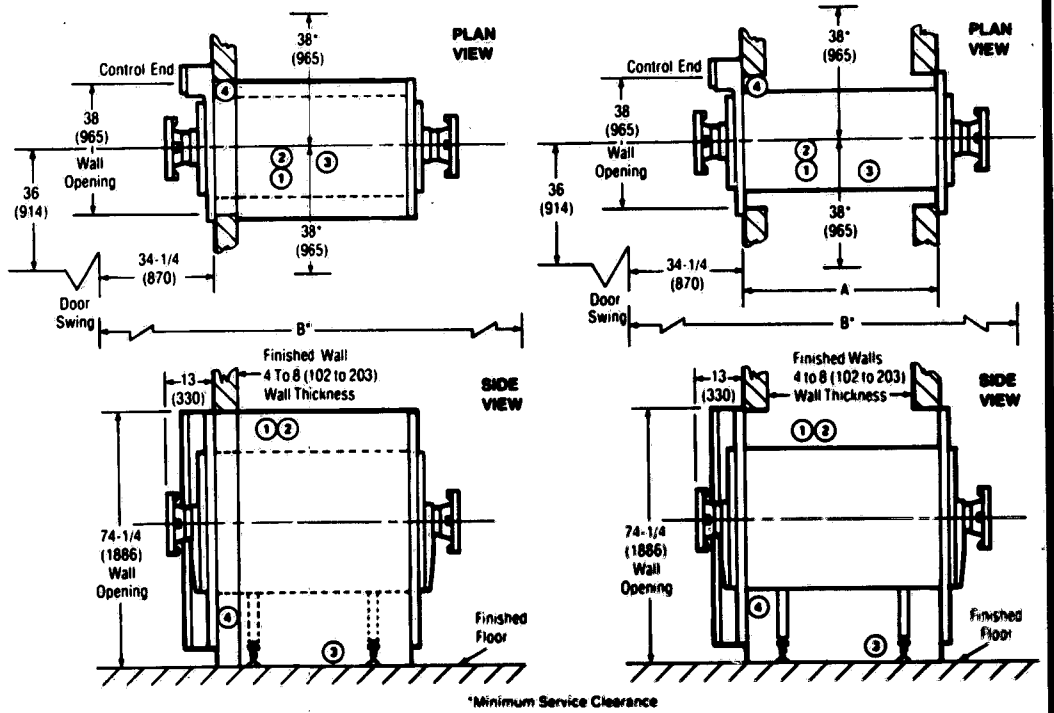
ABORT: TEMP SENSOR
* 3:45A 386.8 10.0P

Temperature Sensor Failure

ABORT: PRES SENSOR
* 11:59A 270.0 41.3P

Pressure Sensor Failure

Figure 3. Control Monitoring and Communication.



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

CHAMBER SIZE	A	B*
24x36x48 (610x914x1219)	61-3/4 (1568)	130-1/4 (3308)
24x36x60 (610x914x1524)	76 (1930)	144-1/2 (3670)

OPERATING REQUIREMENTS

1. COLD WATER — 3/4 NPT 20 to 50 psig (1.41 to 3.52 kg/cm²) dynamic, approximately 5 gr. hardness
2. STEAM SUPPLY — 3/4 NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor
3. DRAIN — 2 ODT
4. TERMINAL BOX — 120-V, 60-Hz, Single-phase Service for controls and, if furnished, power doors

. . . 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 (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 at each end of sterilizer, for loading purposes, should equal
   - length of sterilizer plus 12 inches (305 mm), if shelves will be used.
   - twice the length of sterilizer, if loading car and carriage will be used.
6. Right-side door-swing clearances are shown. Clearances for left-side door swing are identical.
7. Wall opening dimensions for non-operating end are identical to those for control end.
8. Floor drain should be provided within confines of sterilizer framework.

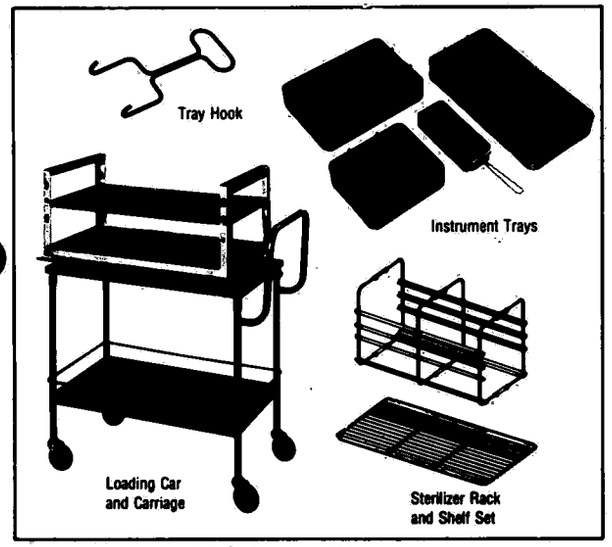
This print is for guidance when planning space and utility services. Actual installation prints may be obtained from any AMSCO office or representative.

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AMSCO

MATERIAL HANDLING ACCESSORIES
• for small sterilizers and aerators

TECH DATA



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THE EQUIPMENT BEING SPECIFIED.

Sterilizer Size
- ☐ 16x16x26" (406x406x660 mm)
- ☐ 20x20x38" (508x508x965 mm)

Accessories
- ☐ Bottom Shelf
- ☐ Rack and 2 Shelves
- ☐ Rack and 3 Shelves
- ☐ Loading Car Qty: ___
- ☐ Carriage Qty: ___

☐ **Instrument Tray(s)**

Qty:
- ___ 9" (229 mm) Long Instrument Tray
- ___ 15" (381 mm) Long Instrument Tray
- ___ 20-1/2" (521 mm) Long Instrument Tray
  - ___ Tray Hooks (Pair)
- ___ Emergency Tray
  - ___ Extra Handle for Emergency Tray
- ___ 9-1/2" (241 mm) Long x 3-1/2" (89 mm) Deep Instrument (Container Inner) Tray
- ___ 9-1/2" (241 mm) Long x 1-3/4" (44 mm) Deep Instrument (Container Inner) Tray
- ___ 20-1/2" (521 mm) Long x 3-1/2" (89 mm) Deep Instrument (Container Inner) Tray
- ___ 20-1/2" (521 mm) Long x 1-3/4" (44 mm) Deep Instrument (Container Inner) Tray

Item No. _____
Location(s) _____

LOADING CAR AND CARRIAGE

For loading and unloading 20x20x38" (508x508x965 mm) sterilizers or 24x28x38" (610x711x965 mm) aerators, and for transferring goods to and from processing areas.

- **Loading Car.** Welded-Monel framework with two removable shelves of welded-Monel sheet metal and wire. Upper shelf is adjustable to three heights. Car axles turn on Teflon® bearings impregnated with glass. Wheels are flanged brass. Chamber track assembly has welded-Monel tracks and crossbraces.
- **Carriage.** Welded stainless steel with four swivel casters and neoprene tires. Includes loading car tracks, height-adjustable to align with tracks in sterilizer or aerator chamber.

  Bottom of carriage has a stainless-steel shelf with guard rails. The rails and shelf reinforce the carriage legs.

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Carriage is held to the sterilizer or aerator door frame by a hand-operated latch. Loading car is secured to the carriage by a spring-loaded latch. Latches are operated from the handle-end of the carriage.

SHELF SETS (STERILIZERS ONLY)

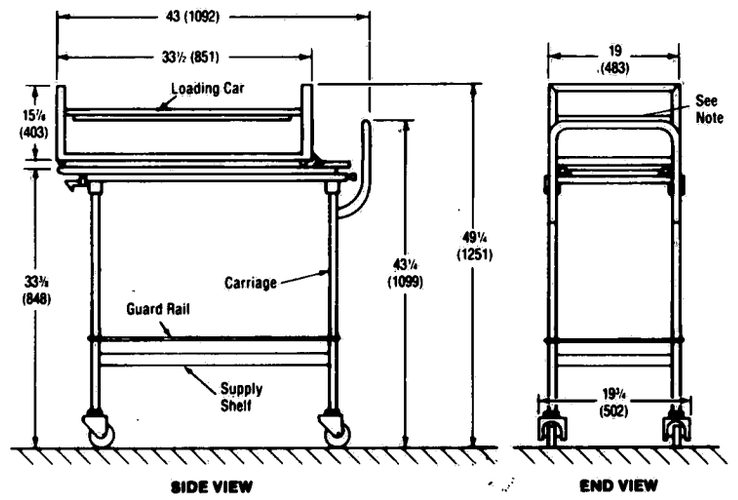
Provide loading efficiency for a variety of mixed or single item loads. Shelves are completely removable for processing bulk loads.

- **Rack With Two or Three Full-Length Shelves:** Rack is welded Monel. Angle guides support the shelves. Stops allow each shelf to be withdrawn approximately halfway. Each shelf is welded Monel, suitably reinforced and designed to allow free passage of sterilant.
- **Bottom Shelf:** Includes a frame, supports and crossbraces of welded Monel wire rod. Supports keep the rack off the chamber floor.

INSTRUMENT TRAYS

For sterilizing, storing and transporting individual or sets of instruments. Perforated bottoms allow sterilant penetration and prevent trapped air. Bottoms are recessed to reduce wetting of outer wrappers.

- **Surgical Trays:** Welded Monel. Each tray has carrying handles which, when not in use, fold inward parallel to the top of the tray. All trays are 10-1/2" (267 mm) wide x 3" (76 mm) deep. Three lengths are available: 20-1/2" (521 mm), 15" (381 mm), or 9" (229 mm). Optional hooks fasten to tray handles for ease of transporting trays.
- **Emergency Tray:** For sterilizing and transporting "forgotten," dropped, or emergency surgical instruments. Tray is 9-1/2" long x 4" wide x 1-3/4" deep (241x102x44 mm). Stainless-steel construction with a wire-mesh bottom. Furnished with an easily removed, sterilizable handle which can be attached without touching the tray.
- **Surgical Instrument (Container Inner) Trays:** Trays are constructed of welded Monel with perforated bottoms (1/8" perforations accommodate use of Instrument Fixation System) and can be used as surgical instrument or sterilization container inner trays. Unique handle design allows aseptic presentation of contents. All trays are 9-1/2" (241 mm) wide and are available in four length/depth combinations: 9-1/2" long x 3-1/2" deep (241x89 mm), 9-1/2" long x 1-3/4" deep (241x44 mm), 20-1/2" long x 3-1/2" deep (521x89 mm), 20-1/2" long x 1-3/4" deep (521x44 mm).



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

NOTE: Car has removable (non-adjustable) bottom shelf and upper shelf adjustable to 3 heights.

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

SECTION 2

OPERATING INSTRUCTIONS (IRC)

2.1 GENERAL

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

NOTE: If there is a discrepancy between the operating instructions in this manual and those in the Equipment Manual, follow the Equipment Manual.

Figure 2-2 shows the location of the various controls for units with an Indicator-Recorder-Controller. For units with Printcon, see paragraphs 2.9 through 2.15 and Figure 2-5.

2.2 BEFORE OPERATING THE EQUIPMENT

1. Be sure that chamber drain strainer is clean and in place and that chamber interior is clean (para. 4.4).

2. Open the upper access door.

a. If sterilizer has manual control, make sure it is turned to OFF.

b. Turn STEAM and WATER valves to ON. Steam is admitted to the jacket (if a steam-powered unit) and will begin to warm chamber. If HI-LO valve is on HI, jacket pressure will stabilize at 32 psig; if on LO, it will stabilize at 20 psig.

3. Open the door on the secondary control panel and position the POWER and CONTROL switches to ON. Primary control panel will light up. If electrically heated unit, the steam generator will begin to heat. If door(s) is open, status light DOOR UNLOCKED (and OPPOSITE DOOR UNLOCKED, for double-door units) will be on. STERILIZE TIME and DRY TIME digital readouts will agree with settings on thumbwheel switches on secondary panel. Cycle selectors will be dimly lit.

4. If the sterilizer is a Laboratory/Isothermal model, position GRAVITY/ISO switch to desired function. GRAVITY for Gravity or Liquids cycle; ISO for Laboratory/Isothermal cycle.

5. Install a new paper chart on the Indicator-Recorder-Controller at the beginning of each day.

6. Review paragraph 2.7, "Control Monitoring and Communication," in order to identify the cause of any abnormal condition during a sterilization cycle.

7. If a double-door unit, review paragraph 2.8 to become familiar with the controls on the non-operating end.

8. If a Gravity sterilizer, or if a GRAVITY function was selected on a Laboratory/Isothermal sterilizer, wait until jacket pressure, as indicated by jacket pressure gauge, has stabilized before starting a cycle. (**NOTE:** Steam does not enter jacket when GRAVITY/ISO switch is in ISO position.)

NOTE: In case of inadvertent, incorrect cycle selection, operator should press cycle RESET pushbutton on secondary panel. Overload circuit breaker, RE-CIRKIT, is also located on the secondary panel, beside cycle RESET. Other abnormal conditions which require cycle reset are described in paragraph 2.7, "Control Monitoring and Communications Systems."

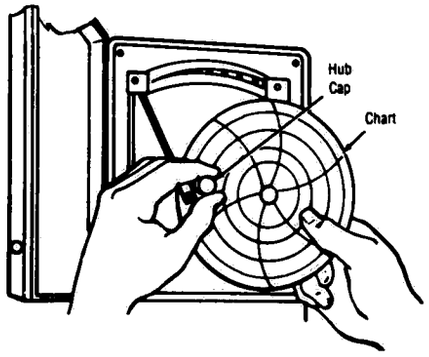
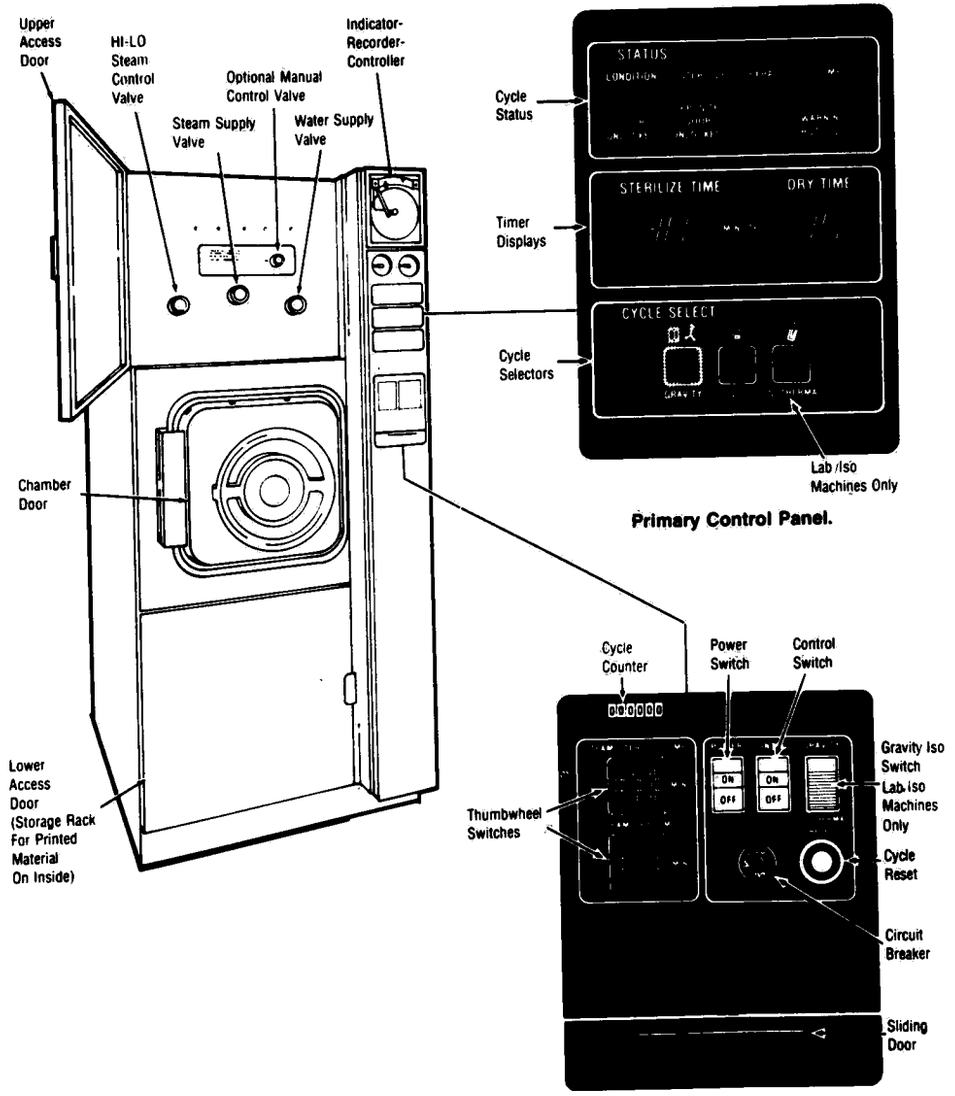


Figure 2-1. CHANGING THE CHART.



Primary Control Panel.

Secondary Control Panel.

Figure 2-2. CONTROL LOCATIONS: Operating End.

2.3 AUTOMATIC OPERATION: GRAVITY CYCLE

1. Follow instructions in paragraph 2.2, "Before Operating The Equipment."

2. Refer to Table 2.1 and select the desired sterilizing temperature. Open the upper access door and turn HI-LO valve to HI for the 270° F (132° C) sterilizing cycle, or to LO for the 250° F (121° C) sterilizing cycle.

NOTE: For cycle temperatures below 250° F (121° C), refer to paragraph 7.15.

3. Open the door on the secondary control panel.

a. Be sure CONTROL and POWER switches are ON. Primary control panel should be lit.

NOTE: Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

b. Dial the correct exposure period (Table 2.1) on STERILIZE TIME thumbwheel switches.

NOTE: For items not listed in Table 2.1, time required will depend upon material and wrapping (if applicable). If there is any question, contact manufacturer of the material for the recommended procedure.

c. Dial the desired drying period on DRY TIME thumbwheel switches. For wrapped goods, 15 minutes is recommended. For unwrapped goods, drying time is not required, however, a minimum of 02 minutes will eliminate excess steam vapors prior to opening chamber door.

4. Set the yellow pointer on the indicator-recorder-controller to 270° F (132° C) or to 250° F (121° C).

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door ... turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, as indicated by chamber pressure gauge, an integral pressure-actuated lock will prevent door from being opened.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

7. Touch GRAVITY cycle selector. Light comes on to full brightness. Status light CONDITION comes on.

8. After condition phase is complete, STERILIZE light comes on and stays on for the duration of the STERILIZE phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

TABLE 2-1. MINIMUM STERILIZATION EXPOSURE PERIOD — WRAPPED AND UNWRAPPED GOODS GRAVITY CYCLE ONLY.

ITEMS	TEMPERATURE SETTING	
	250° F (121° C) MINUTES	270° F (132° C) MINUTES
Dressing, wrapped in paper, muslin, or equivalent	30	15
Glassware, empty, inverted	15	3
Instruments, metal only, any number (unwrapped)	15	3
Instruments, metal, combined with suture, tubing or other porous materials (unwrapped)	20	10
Instruments, wrapped in double thickness muslin, or equivalent	30	15
Linen packs (maximal size: 12"x12"x20"; maximal weight 12 pounds)	30	—
Treatment trays, wrapped in muslin, paper, or equivalent	30	15
Utensils, unwrapped	15	3
Utensils, wrapped in muslin, paper, or equivalent	30	15

9. When STERILIZE timer times out, EXHAUST light comes on. Chamber exhausts to atmospheric pressure. If a drying period was selected, DRY TIME digital readout begins to count down when chamber is exhausted to 3 psig. Chamber continues to be exhausted until a vacuum is drawn in the chamber. If zero DRY TIME was selected, cycle proceeds to next step.

10. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds for 90 seconds or until door is opened. Open chamber door (see step 5), load may be removed from the sterilizer.

11. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on.

2.4 AUTOMATIC OPERATION: LIQUIDS CYCLE

WARNING: TO PREVENT POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE RESULTING FROM BURSTING BOTTLES AND HOT FLUID, YOU MUST FOLLOW THE PROCEDURE LISTED BELOW.

1. Use only vented closures – do not use screw caps or rubber stoppers with crimped seal.

2. Use only Type I borosilicate (Pyrex) glass bottles – do not use ordinary glass jugs or any container not designed for sterilization.

3. Use sterilizer "Liquids" cycle. No other cycle is safe for liquid sterilization.

4. At end of cycle, open sterilizer door, no more than 1/2 inch. Wait 10 minutes before unloading sterilizer.

5. Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not move bottles if any boiling or bubbling is present.

6. Bottles should be cool to touch before attempting to move them from sterilizer loading car or shelves to the storage area.

1. Follow instructions in paragraph 2.2, "Before Operating The Equipment."

NOTE: For cycle temperatures below 250° F (121° C), refer to paragraph 7.15.

2. Open the upper access door and turn HI-LO valve to LO. Verify that STEAM and WATER valves are on.

3. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel should be lit.

NOTE: Set time will be displayed on the primary control panel; however, during a LIQUIDS cycle, controller automatically disregards any DRY time setting and blanks out that portion of the display. Once the cycle is started, the STERILIZE time will be locked in and cannot be changed.

b. Set STERILIZE TIME thumbwheels to appropriate time ... see Table 2.2. (**NOTE:** For a laboratory process, the time required will depend upon the specific preparation and volume ...larger volumes normally require longer processing times.)

4. Set the yellow pointer on the indicator-recorder-controller to 250° F (121° C).

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring the ends of the holding arms inward so that they will not strike the door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

7. Touch LIQUIDS cycle selector. Light comes on to full brightness. Status light CONDITION comes on; also WARNING HOT LIQUIDS light comes on.

8. After condition phase is completed, STERILIZE panel light comes on and stays on for the duration of the sterilize phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

9. When sterilize timer times out, EXHAUST light comes on and chamber exhausts slowly.

10. When exhaust phase is completed. COMPLETE light comes on and buzzer begins to sound.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

11. Crack the door open (see step 5) **about 1/2"** and leave it cracked for at least 10 minutes.

12. Unlocking the door will stop buzzer and cause DOOR UNLOCKED light to come on. WARNING HOT LIQUIDS light will remain on, but will begin to flash ... continuing for 10 minutes. At the end of 10 minutes, buzzer will again sound and WARNING HOT LIQUIDS light will stay on, but will stop flashing. Buzzer sounds for two minutes or until RESET button is pushed.

13. Open chamber door, load may now be removed from sterilizer. Pressing RESET button on secondary control panel resets control and turns WARNING HOT LIQUIDS light off.

TABLE 2-2. MINIMUM RECOMMENDED EXPOSURE TIMES FOR FULL LOAD OF SQUARE-PAK® FLASKED SOLUTIONS 250° F (121° C) TEMPERATURE SETTING.

ASPF SIZE	TIME (MINUTES)
75 ML	25
250 ML	30
500 ML	40
1000 ML	45
1500 ML	50
2000 ML	55

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2.5 AUTOMATIC OPERATION: LABORATORY/ISOTHERMAL CYCLE (Models 2012 and 2022 only)

1. Follow instructions in paragraph 2.2, "Before Operating The Equipment."

2. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel should be lit. If the jacket is pressurized from an earlier Gravity or Liquids cycle, wait until the jacket pressure reduces to approximately 0 psig before proceeding.

b. Dial the desired exposure period on STERILIZE TIME thumbwheel switches.

NOTE: Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

3. Set the yellow pointer on the indicator-recorder-controller to desired temperature (range is 170° to 212° F [78° to 100° C]).

4. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

5. Close and lock the door ... turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

6. Touch ISOTHERMAL cycle selector. Light comes on to full brightness. Status light CONDITION comes on.

7. After condition phase is completed, STERILIZE panel light comes on and stays on for the duration of the STERILIZE phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

8. When sterilize timer times out, EXHAUST light comes on and chamber exhausts slowly.

9. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds for 90 seconds or until door is opened. Load may be removed from the sterilizer.

10. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on.

2.6 MANUAL OPERATION: GRAVITY (WRAPPED OR UNWRAPPED GOODS) OR LIQUIDS CYCLE

NOTE: Manual control is an optional feature on this sterilizer. The following procedure can be performed only if this sterilizer is so equipped. (An isothermal cycle cannot be achieved manually.) Also, if sterilizer has an integral steam generator, a manual cycle cannot be oeprated without electrical power.

1. Follow steps 1, 2 and 8 in paragraph 2.2, "Before Operating The Equipment." If there is electricity to the sterilizer, positioning POWER switch on secondary control panel at ON will energize the Recorder. The CONTROL switch, however, must be positioned at OFF when using manual operation.

2. Open the upper access door.

NOTE: For wrapped or unwrapped goods not listed in Table 2.1, time required will depend upon material and wrapping (if applicable). If there is any question, contact manufacturer of the material for the recommended procedure. For laboratory processing of liquids, the time required will depend upon the specific preparation and volume ... larger volumes normally require longer processing times.

3. Determine desired processing temperature (270° F [132° C] or 250° F [121° C] for Gravity cycle; 250° F [121° C] for Liquids cycle). As a reminder, the yellow pointer on the indicator-recorder-controller may be positioned to this temperature.

4. Set HI-LO valve as follows:

a. **For 250° F (121° C) operation** — refer to paragraph 7.15 for instructions on loosening front stop on pressure regulator; then turn valve counterclockwise until jacket pressure gauge reads between 15 and 18 psig (1.056 and 1.267 kg/cm²).

NOTE: If normal "LO" setting is used for manual operation, chamber temperature will be approximately 258° F (126° C).

b. **For 270° F (132° C) operation** — set HI-LO valve so that pressure gauge reads between 28 and 30 psig (1.971 and 2.112 kg/cm²).

WARNING: WHEN OPERATING A LIQUIDS CYCLE YOU MUST OBSERVE THE PRECAUTIONS LISTED IN PARAGRAPH 2.4. FAILURE TO FOLLOW THESE PRECAUTIONS COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring the ends of the holding arms inward so that they will not strike the door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to right as far as it will go using normal hand pressure. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. a. For **Laboratory/Isothermal** model sterilizers, turn Manual Operation selector to Jacket Charge and wait for jacket pressure to stabilize.

7. b. For **Gravity** model sterilizers, wait for jacket pressure to stabilize.

8. Turn the Manual Operation selector to Condition and wait for sixty seconds. Proceed to step 9.

9. After Condition phase, turn selector to Sterilize. When chamber temperature reaches desired temperature, begin timing. After correct sterilization period, proceed to next step.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A LIQUIDS STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

9. a. **If a Liquids cycle, turn selector to Slow Exhaust and keep it in this position until chamber pressure is atmospheric (0 psig).** Then turn selector to Off position, **omitting** the Dry phase. Crack the door open **about 1/2''** and wait for at least 10 minutes.

b. **If a Gravity cycle,** you may either (1) turn the selector to the Fast Exhaust position until chamber pressure is atmospheric and then turn to Off; or (2) turn selector to the Dry position, if a drying period for wrapped goods is desired, and then to Off.

10. Load may be removed from the sterilizer.

2.7 CONTROL MONITORING AND COMMUNICATION SYSTEMS

To ensure the validity of the sterilizing process, the automatic control continually monitors the cycle. Should one of the following conditions occur, you will be notified as indicated.

CONDITION NO. 1: Sterilizer did not complete conditioning phase in preset time.

INDICATION: CONDITION light on primary control panel flashes and buzzer sounds intermittently.

OPERATOR SHOULD:

1. Touch cycle selector to stop buzzer (sterilizer will continue to operate).

2. Refer to Section 6, TROUBLESHOOTING, to see if problem can be determined and corrected without interrupting cycle (e.g., HI-LO valve is incorrectly set).

3. If problem cannot be corrected so that conditioning phase can be completed (i.e., chamber reaches set sterilizing temperature), press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure.

4. When chamber is at atmospheric pressure:

a. If a Liquids cycle was in progress, crack door open 1/2'' and wait for at least 10 minutes.

b. Correct problem.

c. Reprocess load.

CONDITION NO. 2: Temperature drops 2° F below set point after initially reaching set point.

INDICATION: STERILIZE light on primary control panel flashes and STERILIZE timer display resets.

OPERATOR SHOULD:

1. Let cycle continue to completion if sterilizing temperature is reestablished.

2. If condition happens repeatedly, refer to Section 6, TROUBLESHOOTING, to see if problem can be determined and corrected without interrupting cycle.

3. If problem cannot be corrected so that sterilizing phase can be completed, press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure.

4. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open 1/2''** and wait for at least 10 minutes.

b. Correct problem.

c. Reprocess load.

CONDITION NO. 3: Cycle started, but chamber door not sufficiently tightened to keep door lock switch actuated.

INDICATION: DOOR UNLOCKED light(s) on primary control panel comes on and buzzer sounds intermittently.

OPERATOR SHOULD:

1. Press cycle RESET button on secondary control panel. **Do not** proceed further until chamber is at atmospheric pressure.

2. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open about 1/2''** and wait for at least 10 minutes.

b. Check door and door switch operation.

c. Reprocess load.

CONDITION NO. 4: Loss of electricity.

INDICATION: Primary control panel goes dark.

OPERATOR SHOULD:

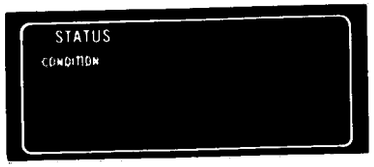
1. Wait until power is restored to sterilizer; then position CONTROL switch (on secondary control panel) to ON. Buzzer will sound intermittently.

2. Press cycle RESET button, but **do not** proceed until chamber is at atmospheric pressure.

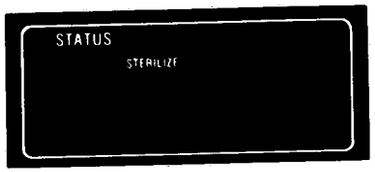
3. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open about 1/2''** and wait for at least 10 minutes, then reprocess load.

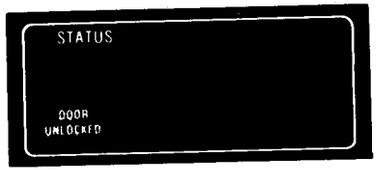
b. Other cycles, load may be reprocessed right away.



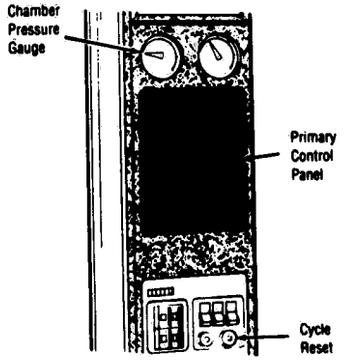
No. 1 — Condition Phase Too Long.



No. 2 — Sterilizing Temperature Drops.



No. 3 — Chamber Door Switch Not Made.



No. 4 — Loss of Electricity.

Figure 2-3. MONITORS AND ALARMS.

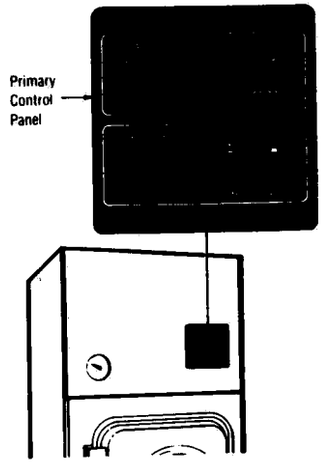


Figure 2-4. NON-OPERATING END PRIMARY CONTROL PANEL.

2.8 CONTROLS AND SIGNALS FOR DOUBLE-DOOR STERILIZERS

The following controls will be found on the non-operating end of the sterilizer:

1. Cycle selectors: **GRAVITY** and **LIQUIDS.** If you wish to repeat the previous gravity or liquids cycle, and all preparatory actions (para. 2.2) have been made, you may do this from the non-operating end by touching the appropriate selector.

2. Status lights: These indicate the cycle phase which is currently in progress: CONDITION, STERILIZE, EXHAUST. COMPLETE.

3. Warning lights: DOOR UNLOCKED, OPPOSITE DOOR UNLOCKED, WARNING HOT LIQUIDS.

OPERATING INSTRUCTIONS (PRINTCON)

2.9 BEFORE OPERATING THE EQUIPMENT (PRINTCON)

Figure 2-5 shows the location of the various controls.

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

2. Open the upper access door.

   a. Be sure manual control is turned to OFF.

   b. Turn STEAM and WATER valves to ON.

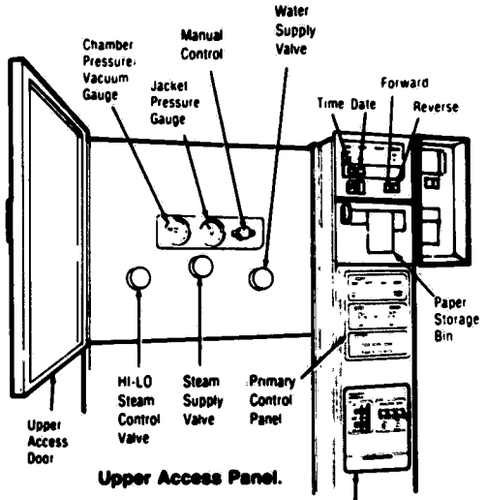
3. Open the door on the secondary control panel and position the POWER and CONTROL switches to ON. Primary control panel lights up and all LEDs on the Printcon display light momentarily for a lamp test to assure the operator that the system is functioning. The printer records the time and date when the power is turned on. If electrically heated unit, the steam generator will begin to heat.

4. Check for correct time and date by pressing the "Time" or "Date" pushbutton. To change either, press the "Forward" or "Reverse" pushbutton until the correct time/date is displayed.

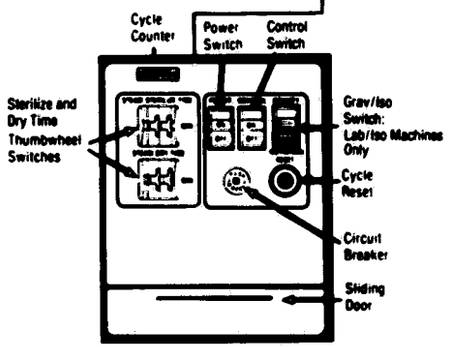
5. Check paper roll. A colored warning stripe will appear on the paper when the roll is near its end. A single ply roll lasts approximately two months and double ply rolls one month. See paragraph 7.17 "Changing Paper," if replacement is necessary.

6. Check the printout to assure that the inked ribbon cartridge is providing adequate ink. A fresh cartridge should last approximately 3 to 4 months. See paragraph 7.17 "Changing The Inked Ribbon Cartridge," if replacement is necessary.

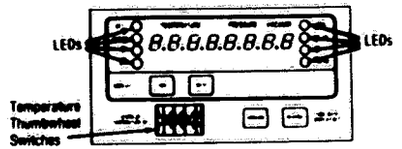
NOTE: The visual display and printout of printer can optionally be set to indicate temperature in degrees Fahrenheit or Celsius and pressure can be either in English (PSI gauge and inches Hg) or metric (kg/cm² gauge and mm Hg). LEDs on display indicate which units are being displayed. The display of temperature and (English) pressure can be either single precision (no decimal) or extended precision (one decimal). Metric pressure shows one or two decimal places. Metric vacuum shows no decimal places. See paragraph 7.17 "Changing Units of Display" if a change is desired.



Upper Access Panel.



Secondary Control Panel.



LED Displays.

Figure 2-5. CONTROL LOCATIONS: Operating End.

7. If the sterilizer is a Laboratory/Isothermal model, position GRAVITY/ISO switch to desired function. GRAVITY for Gravity or Liquids cycle; ISO for Laboratory/Isothermal cycle.

8. Review paragraphs 2.7 and 2.14, "Control Monitoring and Communication Systems," in order to identify the cause of any abnormal condition during a sterilization cycle.

9. If a double-door unit, review paragraph 2.8 to become familiar with the controls on the non-operating end.

10. If GRAVITY function was selected, wait until jacket pressure has stabilized before starting a cycle. (**Note:** Steam does not enter jacket when GRAVITY/ISO switch is in ISO position.)

11. Pressure display should read zero when the sterilizer door is open. If it does not, simply press the RESET button on the secondary control panel.

12. Capacity of paper tape storage bin will allow accumulation of approximately 20 feet of single ply paper tape. It cannot store the entire roll or both copies of double ply paper tape. Refer to instructions in paragraph 7.18 for correct useage.

2.10 AUTOMATIC OPERATION: GRAVITY CYCLE (PRINTCON)

1. Follow instructions in paragraph 2.9, "Before Operating The Equipment."

2. Refer to Table 2-1 and select the desired sterilizing temperature. Open the upper access door and turn HI-LO valve to HI for the 270 F (132 C) sterilizing cycle, or to LO for the 250 F (121 C) sterilizing cycle.

NOTE: For cycle temperature below 250 F (121 C), refer to paragraph 7.15.

3. Open the door on the secondary control panel.

   a. Be sure the POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit.

   b. Dial the correct exposure period (Table 2-1) on STERILIZE TIME thumbwheel switches.

   c. Dial the desired drying time on the thumbwheel switches. For wrapped goods, dry time can vary (usually between 5 and 20 minutes) depending on pack density, instrument tray weight, pack preparation technique including type of wrapping material used, and sterilizer loading procedures. For unwrapped goods, drying time is not required, however, a minimum of 02 minutes will eliminate excess steam vapors prior to opening chamber door. Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

4. Using the thumbwheel switch on the Printcon unit, set the sterilize temperature to 270 F (132 C) or 250 F (121 C). This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If selected temperature is outside the selected range, 150-295 F (65-146 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

NOTE: Printcon is calibrated to control the temperature at approximately 3 F (1.7 C) above the thumbwheel setpoint. This overdrive feature assures effective load temperature control and provides for the shortest possible cycle time. However, for special applications, this overdrive is adjustable. Refer to paragraph 7.17, "Adjusting the Sterilize Temperature Overdrive."

5. Open chamber door and load sterilizer. The printer records the time the door is opened and prints "DOOR OPEN." Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door . . . turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Touch GRAVITY cycle selector. Light comes on to full brightness. Status light CONDITION comes on. The printed record will show the time the CONDITION phase begins and the temperature and pressure transition points. It will also show the time, temperature, and pressure at the end of the purge in the CONDITION phase of the cycle. See Figure 2-23.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

8. After condition phase is completed, STERILIZE light comes on and stays on for the duration of the STERILIZE phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached. The printed record will show the time the STERILIZE phase begins, the temperature and the pressure.

9. When sterilize timer times out, EXHAUST light comes on. Chamber exhausts to atmospheric pressure. If a drying period was selected, DRY TIME digital readout begins to count down. If zero DRY TIME was selected, cycle proceeds to next step. The printed record will show the time the EXHAUST phase begins and the temperature and pressure transition points. It will also show the time, temperature, and pressure at the end of the DRY TIME.

10. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds. Open chamber door. Load may be removed from the sterilizer. The printed record will show the time the cycle finished, the sterilize and dry time, and the total cycle time.

11. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on. The printer records the time the door is opened and prints "DOOR OPEN."

12. If two ply paper is used in the printer, tear off duplicate record and place with the completed load.

2.11 AUTOMATIC OPERATION: LIQUIDS CYCLE (PRINTCON)

WARNING: TO PREVENT THE POSSIBILITY OF PERSONAL INJURY FROM BURSTING BOTTLES AND HOT FLUID, USE ONLY BOROSILICATE (PYREX) FLASKS WITH VENTED CLOSURES FOR STERILIZING LIQUIDS.

- **SEE WARNINGS IN PARAGRAPH 2.4.**

1. Follow instructions in paragraph 2.9, "Before Operating the Equipment."

2. Open the upper access door and turn HI-LO valve to LO.

NOTE: For cycle temperatures below 250 F (121 C), refer to paragraph 7.15.

3. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit.

b. Set STERILIZE timer thumbwheels to appropriate time . . . see Table 2-2. (**Note:** For a laboratory process, the time required will depend upon the specific preparation and volume . . . larger volumes normally require longer processing times.) Set time will be displayed on the primary control panel; however, during a LIQUIDS cycle, controller automatically disregards any DRY time setting and blanks out that portion of the display. Once the cycle is started, the STERILIZE time will be locked in and cannot be changed.

4. Using the thumbwheel switch on the Printcon unit, set the sterilizer temperature to 250 F (121 C). This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If selected temperature is outside the allowable range, 150-295 F (65-146 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

NOTE: Printcon is calibrated to control the temperature at approximately 3 F (1.7 C) above the thumbwheel setpoint. This overdrive feature assures effective load temperature control and provides for the shortest cycle time. However, for special applications, this overdrive is adjustable. Refer to paragraph 7.17, "Adjusting the Sterilize Temperature Overdrive."

5. Open chamber door and load sterilizer. The printer records the time the door is opened and prints "DOOR OPEN." Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button; then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Touch LIQUIDS cycle selector. Light comes on to full brightness. Status light CONDITION comes on; also WARNING HOT LIQUIDS light comes on. The printed record will show the time the CONDITION phase begins and the temperature and pressure transition points. It will also show the time, temperature, and pressure at the end of the purge in the CONDITION phase of the cycle. See Figure 3-21.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

8. After condition phase is completed, STERILIZE light comes on and remains on for the duration of the sterilize phase. Steam STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached. The printed record will show the time the STERILIZE phase begins and the temperature and pressure transition points.

9. When sterilize timer times out, EXHAUST light comes on and chamber exhausts slowly. The printed record will show the time the EXHAUST phase begins, the temperature and pressure.

10. When exhaust phase is completed, COMPLETE light comes on and buzzer begins to sound. The printed record will show the time the cycle finished, the sterilize time, exhaust time, and the total cycle time.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

11. Crack the door open **about 1/2"** and leave it cracked for at least 10 minutes. The printer records the time the door is opened and prints "DOOR OPEN."

12. Unlocking the door will stop buzzer and cause DOOR UNLOCKED light to come on. WARNING HOT LIQUIDS light will remain on, but will begin to flash . . . continuing for 10 minutes. At the end of 10 minutes, buzzer will again sound and WARNING HOT LIQUIDS light will stay on, but will stop flashing.

13. Open chamber door, load may now be removed from sterilizer. Press RESET button on secondary control panel to reset control and turn WARNING HOT LIQUIDS light off. The printer will record the time the reset button was depressed and will print "ABORT: RESET BUTTON."

14. If two ply paper is used in the printer, tear off the duplicate record and place with the completed load.

2.12 AUTOMATIC OPERATION: LABORATORY/ ISOTHERMAL CYCLE (PRINTCON)

(Models 2012 and 2022 only)

1. Follow instructions in paragraph 2.9, "Before Operating The Equipment."

2. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit. If the jacket is pressurized from an earlier Gravity or Liquids cycle, wait until the jacket pressure reduces to approximately 0 psig before proceeding.

b. Dial the desired exposure period on the STERILIZE TIME thumbwheel switches. Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

3. Using the thumbwheel switch on the Printcon unit, set the desired temperature. This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If the selected temperature is outside the allowable range, 170-212 F (78-100 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

4. Open chamber door and load sterilizer. The printer records the time the door is opened and prints "DOOR OPEN." Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to brings ends of holding arms inward so that they will not strike door frame when door is opened or closed.

5. Close and lock the door. Turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off.

6. Touch ISOTHERMAL cycle selector. Light comes on to full brightness. Status light CONDITION comes on. The printed record will show the time the CONDITION phase begins and the temperature and pressure transition points.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on: status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

7. After condition phase is completed, STERILIZE light comes on and stays on for the duration of the EXPOSURE phase. STERILIZE TIME digital readout begins to count down when desired temperature is reached. The printed record will show the time the EXPOSURE phase begins, the temperature and the pressure.

8. When sterilize timer times out, EXHAUST light comes on and chamber exhausts slowly. The printed record will show the time the EXHAUST phase begins and the temperature and pressure transition points.

9. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds. Open chamber door. Load may be removed from the sterilizer. The printed record will show the time the cycle finished, the exposure time, and the total cycle time.

10. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on. The printer records the time the door is opened and prints "DOOR OPEN."

11. If two ply paper is used in the printer, tear off duplicate record and place with the completed load.

2.13 MANUAL OPERATION: GRAVITY (WRAPPED OR UNWRAPPED GOODS) OR LIQUIDS CYCLE (PRINTCON)

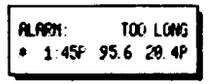
NOTE: Manual control is a feature on this sterilizer. However, if the sterilizer has an integral steam generator, a manual cycle cannot be operated without electrical power.

If the sterilizer does not have an integral steam generator, it may be operated during electrical power failure by following the instructions in paragraph 2.6, "Manual Operation." Begin STERILIZE phase timing when the desired chamber pressure as indicated by the chamber pressure gauge is reached. Refer to Figure 7-12 for pressure and temperature relationships.

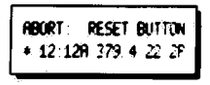
In cases where it is necessary to operate the sterilizer manually because it will not automatically advance to the next phase and electric power is available, the POWER and CONTROL switches may be left on. The digital display of temperature and pressure can then be used for STERILIZE phase timing.

2.14 CONTROL MONITORING AND COMMUNICATION SYSTEMS (PRINTCON)

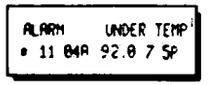
In addition to the monitors and messages outlined in paragraph 2.7 and Figure 2-3, Printcon units print the following messages:



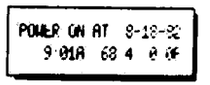
No. 1 — Condition Phase Too Long.



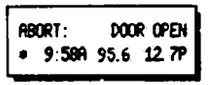
The RESET button is pressed.



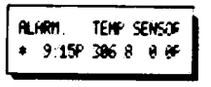
No. 2 — Sterilizing Temperature Drops. (Set Point is 271°F)



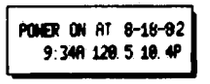
The power is turned on.



No. 3 — Chamber Door Switch Not Made.



Temperature sensor failure is detected.



No. 4 — Power Restored After Power Failure.



Pressure sensor failure is detected.

Figure 2-6. PRINTCON MESSAGES.

2.15 CONTROL AND SIGNALS FOR DOUBLE-DOOR STERILIZERS (PRINTCON)

See paragraph 2.8 and Figure 2-4.

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SECTION 3

PRINCIPLES OF OPERATION

3.1 GENERAL

The Gravity and Laboratory/Isothermal model sterilizers are designed to efficiently sterilize single and full loads of fabrics, wrapped and unwrapped hard goods, and solutions. To accomplish this, the sterilizers use steam, regulated at the most effective temperature and pressure for the particular load. The Laboratory/Isothermal model has the additional capability, by means of the Isothermal cycle, of processing heat-sensitive loads.

The control system and the piping packages, described below, are designed to accomplish the work of sterilization efficiently and reliably. The heart of the control system is a microcomputer which is preprogrammed to control all sterilizing cycles from beginning to end, once the preparatory actions have been taken.

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

3.2 THEORETICAL PRINCIPLES OF OPERATION: MECHANICAL

NOTE: The material in Sections 3.2 through 3.5 applies to Printcon units except that the temperature switches have been replaced with **a resistance thermal detector (RTD) probe,** the pressure/vacuum switches have been replaced with **a pressure transducer,** and the recorder (IRC) has been replaced with **the Printcon (DPC) unit.** For greater detail, see paragraphs 3.6 and 3.7.

Gravity Cycle

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

During the "purge" at the beginning of the cycle, the air in the chamber is quickly displaced by steam. On the Laboratory/Isothermal model sterilizer, the isothermal piping is sealed off by keeping closed solenoid valves S-8 (steam-to-ejector), S-10 (ejector bypass) and opening solenoid valve S-9 (steam-to-jacket). On both Gravity and Isothermal sterilizers, steam-to-chamber (S-2) and fast exhaust (S-3) valves are open. At the same time, the water supply valve S-4 to the drain is open, which condenses the steam and keeps the drain temperature below 140° F. Flow control valve FC-2 is manually adjusted to permit water flow at the optional rate for the system. Because of flow resistance incorporated into the system design, the chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the "charge" and "sterilize" phases. fast exhaust (S-3) and exhaust cooling (S-4) valves are closed. The chamber is thus effectively sealed and steam is forced in until desired pressure is reached. Steam-to-chamber valve S-2 is thermostatically controlled by temperature switch TS-2 to maintain correct temperature/pressure in the chamber.

The exhaust phase of the cycle is initiated by closing steam-to-chamber valve (S-2), and opening the fast exhaust (S-3) and exhaust cooling (S-4) valves. The effect of these actions is to condense the exhaust steam and maintain the drain temperature below 140° F.

The dry phase of the cycle is initiated by opening the steam-to-ejector (dry) valve (S-5). All other valves remain as they were during the exhaust phase. Because of the evacuating action of the ejector, air is continuously drawn through the vacuum break line and through the chamber to the drain. A vacuum level of 1-2" Hg is maintained in the chamber.

At the completion of the cycle, all valves are deenergized. All valves, except S-1, filtered air, are normally closed. Thus valve S-1 is the only one open. Filtered air enters the chamber through S-1 to break the vacuuum.

Liquids Cycle

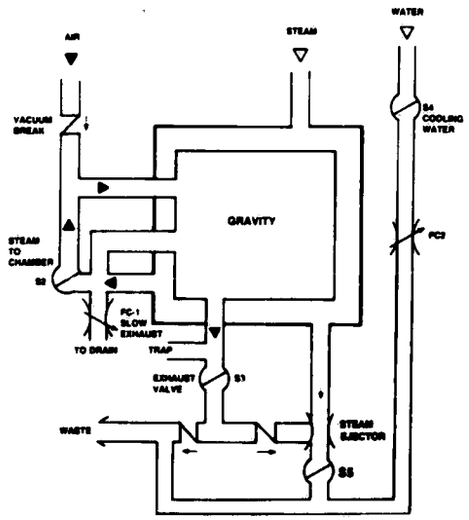
The Liquids cycle is identical to the Gravity cycle until the exhaust phase. When the sterilize phase of the cycle is complete, all solenoid valves are deenergized. Slow exhaust of the chamber is accomplished through the slow exhaust line (see diagram, Fig. 3-1), which allows a slow bleed out of the chamber. Slow exhaust rate is controlled by the manually set flow control valve, FC-1.

Isothermal Cycle (Models 2012 and 2022 only)

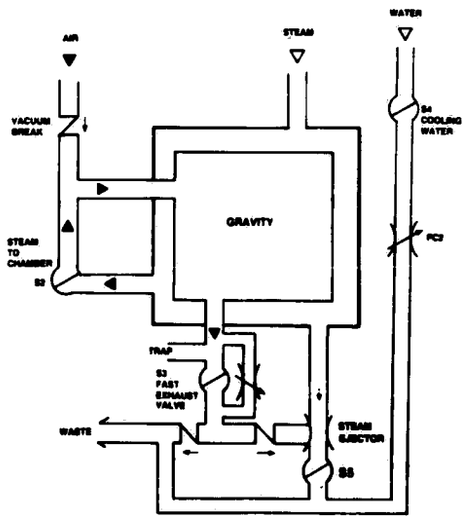
The Laboratory/Isothermal Model Sterilizer utilizes a special piping design to achieve processing of heat-sensitive and heat-coagulable materials at temperatures of 170° to 212° F (78° to 100° C).

With the Iso/Gravity switch in the Iso position, steam-to-jacket solenoid valve (S-9) is closed and steam-to-ejector valve (S-5) is opened. The jacket is therefore exhausted of steam. Steam-to-chamber (S-2), fast exhaust (S-3) and exhaust cooling (S-4) solenoid valves are also closed.

During the conditioning phase, steam-to-iso-ejector (S-8) and ejector bypass (S-10) valves are open. The function of S-10 is to decrease come-up time during this phase. Steam passes through the ejector to the chamber. As the steam passes through the chamber, a suction is created at the ejector throat. This suction draws the mixture of steam and condensate from the chamber drain, where the temperature-sensing bulb is located. The mixture of steam and condensate drawn from the chamber mixes with the incoming steam and is passed to the chamber.



WITH ROUND CHART RECORDER.

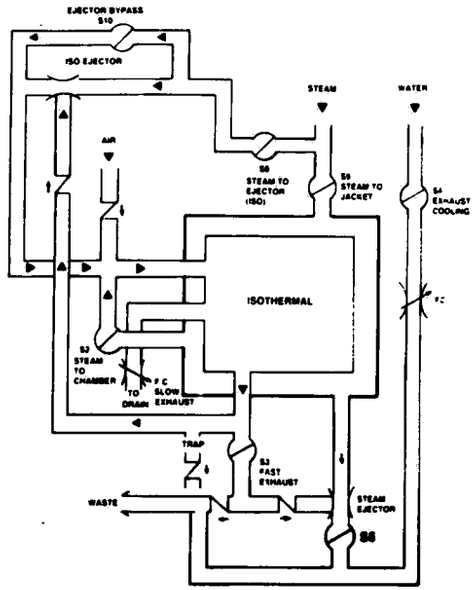


WITH PRINTCON UNIT.

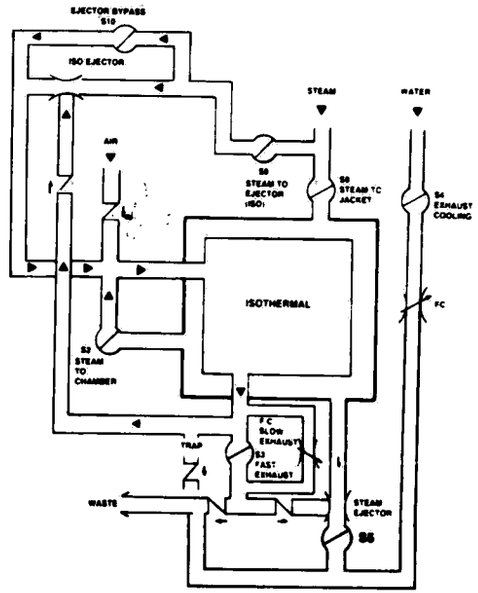
Figure 3-1. PIPING DIAGRAM: Gravity Sterilizer.

Chamber temperature continues to increase until thermostatic control temperature, as sensed by the recorder bulb in the drain, is reached. TS-2 contacts close, and solenoid valve S-8 (steam-to-ejector) closes. Automatic control of S-8, between open and closed, continues throughout the cycle. The isothermal nozzle flow capacity, together with the steam and condensate flow from the chamber across the recorder bulb, gives the required temperature control in the chamber. The steam trap continuously removes condensate from the chamber when there is no suction action present.

At the completion of the sterilize phase, steam-to-ejector valve closes and fast exhaust valve S-3 opens. Chamber pressure is reduced to 1 psig, when buzzer sounds.



LABORATORY/ISOTHERMAL STERILIZER WITH ROUND-CHART RECORDER.



LABORATORY/ISOTHERMAL STERILIZER WITH PRINTCON UNIT.

Figure 3-2. PIPING DIAGRAM: Laboratory/Isothermal Sterilizer.

3.3 CONTROLS

The microcomputer monitors system operations and controls system functions. Input signals are from the control panel's pushbuttons and switches, from the timer settings and from the system temperature, pressure and vacuum switches. Output signals from the controller are to the panel display lights, to indicate status or warning signals, and to the piping solenoid valves, to operate the sterilizer through the phases of each cycle. The printed circuit boards have LEDs to indicate the presence of an output to the associated solenoid valve.

Temperature set point is made manually on the indicator-recorder-controller (IRC). Temperature switches within the IRC maintain chamber temperature for the duration of the sterilizing phase. During the cycles, the controller automatically switches on and off the appropriate solenoid valves to maintain correct chamber pressure/temperature. By means of the slow exhaust needle valve, which is open throughout every cycle, there is a constant bleed of steam from the chamber. At the end of the cycles, pressure switches provide inputs to the controller, which in turn actuates the fast exhaust system at the appropriate point. If a drying phase is selected a slight vacuum will be drawn in the chamber drain line. A vacuum switch senses when the chamber pressure is again near normal, and the output from the controller actuates the COMPLETE signal and sounds the buzzer. During the parts of the cycle when steam is being disposed to waste, water to the condenser is automatically turned on to convert the steam to condensate.

3.4 CYCLE DESCRIPTIONS

Preparatory actions: WATER and STEAM valves must be opened manually. HI-LO valve (steam regulator) must be set to HI or LO position. Main power switch and control power switch, both on the secondary panel, must be in the ON position. When power is on, the cycle selectors are dimly lit. (**NOTE:** For graphic representations of the cycles and operation of the solenoid valves, see the cycle graphs on pages 6-2 through 6-4).

Liquids Cycle

HI-LO valve must be set to LO. Operator selects sterilizing temperature, 250° F (121° C), on indicator-recorder-controller (IRC), sets STERILIZE time, and, if applicable, selects GRAVITY on GRAVITY/ISO switch. After loading machine, door(s) must be locked. Panel status light DOOR UNLOCKED goes off (limit switch LS-2 transfers). Operator touches LIQUIDS cycle selector. The cycle light will come on to full brightness.

1. During the condition (or purge) phase of the cycle, both steam-to-chamber solenoid valve (S-2) and fast exhaust (S-3) are open in order to quickly displace the air in the chamber with steam. The following sequence of actions occurs in the machine:

- Panel light CONDITION comes on; also WARNING HOT LIQUIDS light comes on. The following solenoid valves are energized (opened): S-2 (steam-to-chamber), S-3 (fast exhaust), S-4 (exhaust cooling). The sixty-second purge timer begins to time. Purge timer times out.

2. After the sixty-second condition phase is completed, the fast exhaust and exhaust cooling valves are closed and the sterilizer begins to build pressure in the chamber. After proper temperature and pressure are reached, the sterilizing phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S-3 (fast exhaust) and S-4 (exhaust cooling) close. When sterilizing temperature (250° F) is reached, temperature switch TS-1 (normally open) closes, completing a circuit to the controller. CONDITION light goes out, STERILIZE light comes on. The STERILIZE timer begins to count down from the pre-set time. When the chamber temperature rises approximately 4 degrees above set point, temperature switch TS-2 (normally open) closes. The signal, processed by the controller, results in closing steam-to-chamber solenoid valve S-2. When the chamber temperature decreases to near set point, TS-2 contacts open, and S-2 (steam-to-chamber) again opens. S-2 and TS-2 cycle in this way for the duration of the sterilizing cycle.

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

- Solenoid valve S-2 (steam-to-chamber) closes. STERILIZE light goes out, EXHAUST light comes on. Chamber exhausts slowly through the slow exhaust needle valve. When the chamber has exhausted to 3 psig, pressure switch PS-3 drops out. As soon as this happens, the controller energizes fast exhaust solenoid valve S-3 to quickly empty the chamber of remaining steam.

4. When the chamber is exhausted of steam to 1 psig of pressure, this signals the end of the cycle. The following actions occur at the end of the cycle:

- At 1 psig, pressure switch PS-2 drops out. EXHAUST light goes out, COMPLETE light comes on, WARNING HOT LIQUIDS light stays on. Buzzer begins to sound and continues for 90 seconds or until door is opened. When door is opened (only cracked open 1/2" for the first ten minutes following sterilization), buzzer is turned off, DOOR UNLOCKED light turns on, and WARNING HOT LIQUIDS light starts flashing. After 10 minutes, buzzer again sounds and WARNING light stops flashing, but stays on. LIQUIDS cycle light, COMPLETE light, WARNING HOT LIQUIDS light and solenoid valve S-3 (fast exhaust) all stay on until control is reset.

Gravity Cycle

Operator selects GRAVITY on GRAVITY/ISO switch (if applicable), selects sterilizing temperature (usually 250° F [121° C] or 270° F [132° C]) on indicator-recorder-controller, and sets STERILIZE and DRY (if desired) timers. HI-LO valve must be set according to desired temperature. After loading the machine, door must be locked. Panel status light DOOR UNLOCKED goes off. Operator touches GRAVITY cycle selector. The cycle light will come on to full brightness.

1. During the condition (or purge) phase of the cycle, both steam-to-chamber solenoid valve (S-2) and fast exhaust solenoid valve (S-3) are open in order to quickly displace the air in the chamber with steam. The following sequence of actions occurs simultaneously in the machine:

- Panel light CONDITION comes on. The following solenoid valves are energized (opened): S-2 (steam-to-chamber), S-3 (fast exhaust), S-4 (exhaust cooling). The sixty-second purge timer begins to time. Purge timer times out.

2. After the sixty-second condition phase is completed, the fast exhaust (S-3) and exhaust cooling (S-4) valves are closed and the sterilizer begins to build pressure. After proper temperature and pressure are reached, the sterilizing phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S-3 (fast exhaust) and S-4 (exhaust cooling) close. When sterilizing temperature is reached, temperature switch TS-1 contacts close, and the STERILIZE timer begins to count down from the pre-set time. When the chamber temperature rises approximately 4 degrees above set point, temperature switch TS-2 (normally open) closes. The signal, processed by the controller, results in closing steam-to-chamber solenoid valve S-2. When the chamber temperature decreases again to near set point, TS-2 contacts open, and S-2 (steam-to-chamber) again opens. S-2 (steam-to-chamber) and TS-2 cycle in this way for the duration of the sterilizing cycle.

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

If no DRY time was set ...

- Solenoid valve S-2 (steam-to-chamber) closes. STERILIZE light goes out, EXHAUST light comes on. Solenoid valves S-3 (fast exhaust) and S-4 (exhaust cooling) open for fast exhaust. At 1 psig, COMPLETE light comes on, EXHAUST light goes out, solenoid valves S-3 (fast exhaust) and S-4 (exhaust cooling) close.

If a DRY time was set ...

- Solenoid valve S-2 (steam-to-chamber) closes. STERILIZE light goes out, EXHAUST light comes on. Solenoid valves S-3 (fast exhaust) and S-4 (exhaust cooling) open for fast exhaust. When chamber pressure decreases to 3 psig, pressure switch PS-3 drops out. When this happens, the controller starts the DRY timer. At this same time, solenoid valve S-5 (steam-to-ejector) opens and begins to evacuate the chamber. Chamber pressure during the drying period will vary from 0-2" Hg (vacuum). During this period air is drawn into the chamber through the bacteria-retentive filter and check valve. When the dry timer times out, solenoid valves S-3 (fast exhaust), S-4 (exhaust cooling), S-5 (steam-to-ejector) close. When chamber pressure is at least 2" Hg., as sensed by vacuum switch VS-2, buzzer begins to sound, COMPLETE light comes on, and EXHAUST light goes out. Solenoid valve S-3 (fast exhaust) opens.

4. Buzzer sounds for 90 seconds or until door is opened. When door is opened, buzzer stops, COMPLETE light goes out, GRAVITY light goes out, solenoid valve S-3 (fast exhaust) closes, and DOOR UNLOCKED light comes on.

Isothermal Cycle (Laboratory/Isothermal Model Only)

Operator selects sterilizing temperature on indicator-recorder-controller, sets STERILIZE timer, and selects ISO on GRAVITY/ISO switch. (When ISO switch is pushed, solenoid S-9, steam-to-jacket valve, closes, and solenoid S-5, jacket steam-to-ejector, opens.) If the jacket is hot from an earlier gravity cycle, operator must wait until jacket cools to at least 140° F (60° C) before beginning cycle. After loading machine, door must be locked. Panel status light DOOR UNLOCKED goes off. Operator touches ISOTHERMAL cycle selector. The cycle light will come on to full brightness.

1. In order to heat the chamber quickly during the condition (or purge) phase of the cycle, both steam-to-ejector valve (S-8) and ejector bypass valve (S-10) are open. The following sequence of actions occurs in the machine.

- Panel light CONDITION comes on. Solenoid valve S-8 (steam-to-ejector) and S-10 (ejector bypass) remain open until chamber temperature is about 10° F below set point. When chamber reaches this temperature, temperature switch TS-1 contacts close.

2. When chamber temperature reaches set point, temperature switch TS-2 contacts close. When this happens, CONDITION light goes off, STERILIZE light comes on, and STERILIZE timer begins to time. Chamber temperature is maintained by cycling solenoid valve S-8 (steam-to-ejector) with temperature switch TS-2.

3. STERILIZE timer times out: STERILIZE panel light goes out, EXHAUST light comes on; steam-to-ejector valve, S-8, closes; fast exhaust solenoid valve, S-3, opens when chamber pressure reaches 3 psig, as sensed by pressure switch PS-3. When chamber pressure reaches 1 psig, pressure switch PS-2 drops out, EXHAUST light goes out and COMPLETE light comes on.

4. Buzzer sounds for 90 seconds or until door is opened. When door is opened, buzzer stops, COMPLETE light goes out, ISOTHERMAL light goes out, solenoid valve S-3 (fast exhaust) closes, and DOOR UNLOCKED light comes on.

Cycle Monitoring and Communications

1. If the sterilizer fails to reach sterilizing temperature within 75 minutes for isothermal cycle or within 60 minutes for gravity or liquids cycle, the operator will be notified as follows:

- When the internal timer times out, the CONDITION light flashes and the audible alarm sounds intermittently. The sterilizer, however, will continue to attempt to reach temperature. The buzzer will continue to sound until (1) a cycle selector is pressed (silences buzzer and resets 35 minute timer); or (2) temperature is finally reached (cycle continues normally); or (3) RESET button is pressed (cycle is aborted).

2. If the chamber temperature falls 2° F below set point (temperature switch TS-1 contacts open) during a sterilization cycle, the sterilizer will go through the following actions:

- STERILIZE timer (internal) resets to beginning. Panel status light STERILIZE blinks. If chamber temperature again rises to set point (TS-1 contacts close), STERILIZE light continues to blink to indicate normal cycle has been interrupted. Cycle will not continue if set temperature is not re-established.

3. If after a cycle has started, the door lock switch opens, the sterilizer will go through the following abort phase:

- DOOR UNLOCKED light comes on and audible alarm sounds intermittently. All solenoid valves will close, and any pressure in the chamber will bleed out through the slow exhaust needle valve. Alarm will continue sounding until RESET button is pushed.

4. If there is a loss of supply power to the sterilizer while a cycle is in progress and then a later restoration of power, the sterilizer will go through the following abort phase:

- When power is restored and CONTROL switch is reset, the audible alarm will sound. All solenoid valves will close, and any pressure in the chamber will bleed out through the slow exhaust needle valve. Alarm will continue sounding until RESET button is pushed.

3.5 FUNCTIONAL DESCRIPTION OF THE EAGLE MICROCOMPUTER CONTROLLER

The Eagle controller is built up from three major modules, a power supply assembly, a mother board assembly, and a printed circuit board set. The printed circuit board set consists of one or two boards, depending on the sterilizer model. Printed circuit board (PCB) 146586 is used on the Gravity sterilizer; PCB 146586 and PCB 146588 are used on the Laboratory/Isothermal sterilizer. To better understand the operation of the Eagle control, a functional description of each module and each of the printed circuit boards follows.

Power Supply: IRC Units (Figure 6-9)

The power supply used in the Eagle Series controls provides the control with 3 amps — 5 volts direct current (VDC) and 2 amp — 28 VDC required by the system. This power supply can be shown as eight blocks for the 5-VDC supply (Figure 3-3) and five blocks for the 28 VDC supply (Figure 3-4).

The 5-VDC supply operates as follows: voltage from the full-wave rectifier (CR201 and CR202) is filtered by the RC network R201 and C101. This filter circuit supplies the bulk voltage (approximately 14 volts) to the series pass transistor Q101 which drops and regulates the output voltage to the required 5 volts. As the output voltage tries to vary from 5 volts, due to load and line variations, the regulating amplifier A401 senses this change and turns Q101 on or off as required to maintain the output at 5 volts. If the output voltage rises above 5 volts, to an unsafe point of approximately 6.5 volts, the overvoltage circuit, comprised of 1/2 A403, Z402, R436, R428, R425, R427, R437, R426 and R424, feeds back an output to switch Q405 to turn it on. This transistor provides a gating current to SCR401 through R413. SCR401 switches the control switch (CB-1), on the secondary control panel, to off.

When the 5 VDC output drops below approximately 4.7 volts, the undervoltage circuit (comprises of 1/2 A403, Z401, C405, R414, R420, R421, R419, R417, R416, R418, C407, R422 and adjustment dot R423) feeds back an output to switch Q406 to turn it on. This transistor provides the current through R412 to gate SCR401.

SCR401 switches the control switch (CB-1) on the secondary control panel, to off.

Three adjustable pots are mounted on the printed circuit board and sealed. They are as follows: R430 is a current limit level adjustment. R433 is an output voltage level adjustment. And R423 is the undervoltage setpoint adjustment.

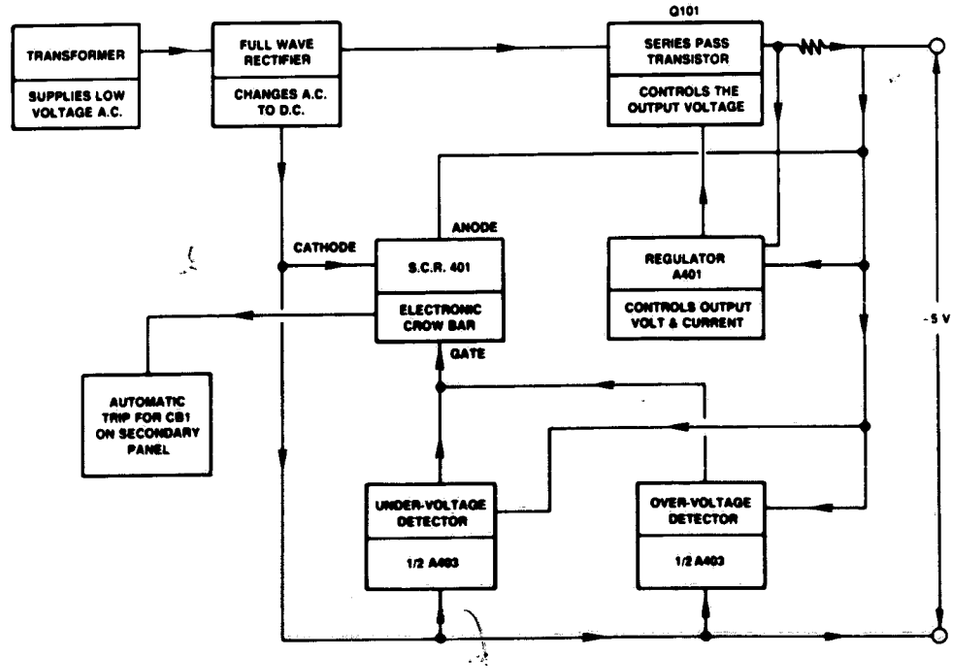


Figure 3-3. EAGLE 5-VOLT POWER SUPPLY.

The 28-volt supply is not a regulating supply, but does limit the output to approximately 28 volts. This is done to increase lamp life.

Operation of the 28-volt supply is as follows. Voltage from the full wave rectifier (CR301 and CR302) is filtered by the RC network of R301 and C104. This filtered voltage feeds the output through a time delay "slow-turn-on-circuit" comprised of Q102, Q402, R405, R404, R403, CR403 and C402. The time delay of about 400 milliseconds allows the microcomputer to gain control of the system before the 28 VDC is supplied to the display circuits. The 28 VDC is clipped (limited) at 28 volts by the Z404 Zener diode. Thus the 28-volt supply will not be able to exceed approximately 28 VDC.

Mother Board

The mother board assembly contains a large printed circuit board (PCB) that provides the base for the sterilizer connectors (J1, J2, J3, J4) and the interface to these connectors for communications with the rest of the sterilizer. The mother board also contains the connectors (B1, B2, B3), as required, and the interboard interface connections for the plug-in printed circuit boards. Power, from the power supply, is brought into the assembly via J10 and J11 and distributed throughout the assembly by the main PCB.

CPU Printed Circuit Board — 146586 (Fig. 6-7)

The CPU printed circuit board (PCB) is required for all of the Eagle sterilizers. It contains the microcomputer, A1, support circuits, input buffers and drivers, output buffers and drivers, and the data bus required to communicate with the other two boards. Figure 3-5 is a diagram of the CPU printed circuit board.

The 8048 microcomputer is the heart of the Eagle control system. The system is made to march to the beat of the 8048 oscillator or clock pulse generator (crystal controlled at 3 MHz). The program (sequence of steps to be carried out on all Eagle machines) is contained, in part, in the 1K program memory of the 8048. This program is executed by the control and timing circuits of the 8048 microcomputer. While the program is running, the CPU in the microcomputer will make logical decisions based upon the input information that it receives from the data bus, port 1 or port 2.

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

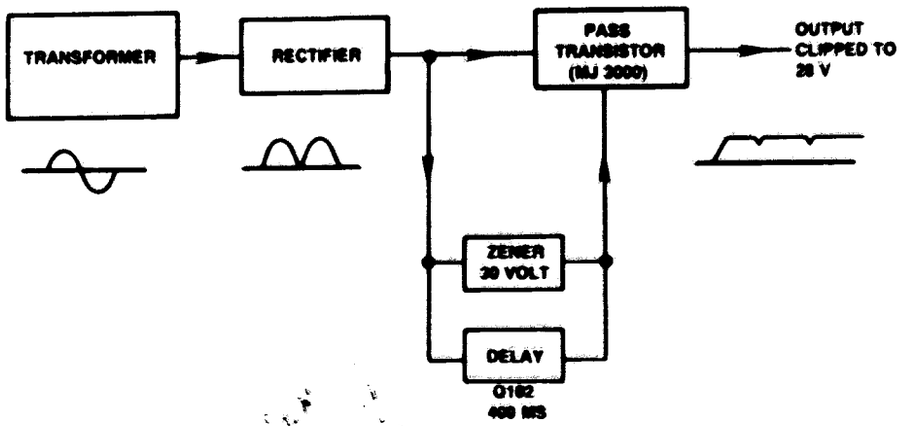


Figure 3-4. EAGLE 28-VOLT POWER SUPPLY.

There are many elements to control and sense in an Eagle sterilizer. The number exceeds the capability of the microprocessor alone; therefore, additional electronic components must be added to expand the following:

(1) Program memory.
(2) Data memory.
(3) Input/output capacity of the 8048.

Input/Output (I/O) capacity is expanded by the use of an 8243. The I/O expanders only pass or accept signals when the microcomputer calls their attention; that is, enables them. On board one (1) there are three such 8243's, A2, A3, and A4.

A3 is used to pass the appropriate signals to a digital display (output) of the elapsed time (sterilize or dry) during the phases of a cycle.

A2 operates in a similar fashion as A3. Its output signals drive Darlington pairs (XR2203) capable of passing 600 ma of current which are used to turn on the various incandescent lamps required by the sterilizer. A2 also drives, via an LED, triac drivers (MOC3011). The drivers provide proper signals to turn on triacs which in turn operate AC loads (120 VAC) such as solenoid valves. The optical coupling found in these drivers also serves to isolate the 120 VAC power circuits from the low voltage logic circuits.

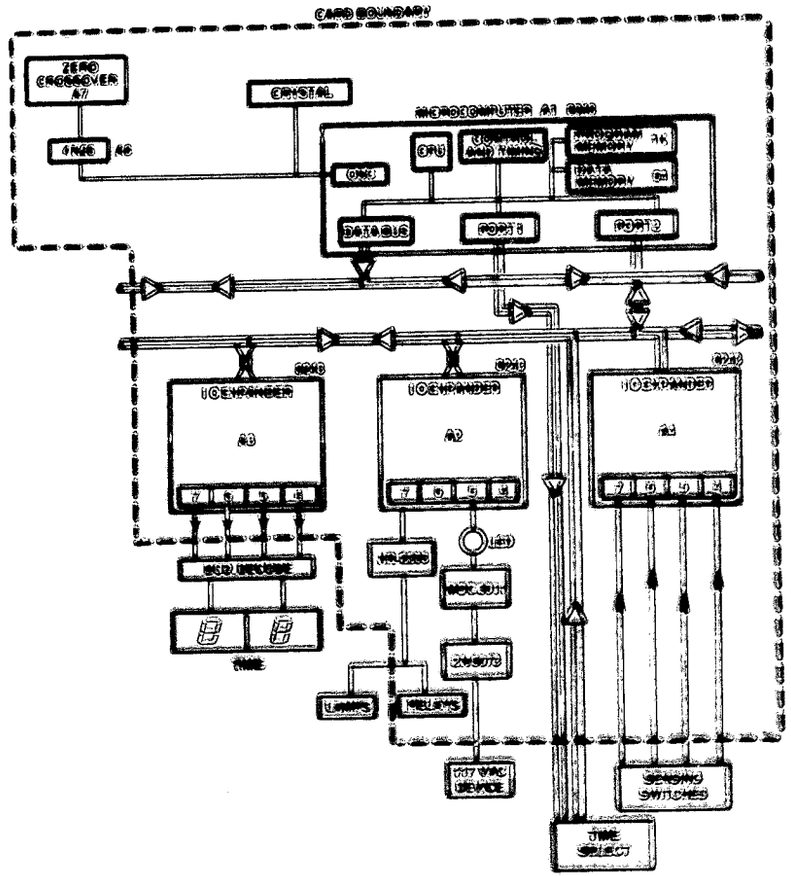


Figure 3-5. CPU PRINTED CIRCUIT CARD 146586.

A4 is used as an input device for the various sensing switches in the system.

Desired sterilize and dry times are set up by the use of thumb-wheel switches which, upon request, provide input data to the microcomputer via ports 1 and 2.

The supporting circuits are an external crystal and a zero cross-over network. The crystal, C1 and C2, determines the frequency of the controls operation. This crystal is also the time base for the sterilizer timers. The zero cross-over network (ZCN) consists of A7, C4, R4, A8, C5, R5, and R6. The ZCN prevents the computer from actuating a 120 VAC device during peak voltage of the sine wave. The ZCN monitors the 120 VAC and when the voltage level is at the zero voltage points of the sine wave, it enables the computer output. The ZCN's function is to reduce live transients from being generated which might interfere with the computer operation. These transients might generate false signals should they occur. Another supporting circuit consists of Q9, C13, and R29. This circuit delays the activation of the triac outputs until the computer has gained control. It serves the same function as the delay circuit in the 28-volt power supply.

I/O #1 Printed Circuit Board — 146588 (Fig. 6-8)

The Eagle control system is provided with further expansion capabilities by the addition of the I/O #1 PCB. It expands the data memory (RAM) by 256 bytes and the input/output capacity by 16 with the addition of an 8155 (A1). The microcomputer can pull from an additional 2,000 program instructions from the 8355 (A2) which increases the program capability. Figure 3-6 is a functional diagram of this PCB. The 8355 (A2) also increases the number of input/output channels by 16.

The input and output drivers function the same as those on the CPU Board.

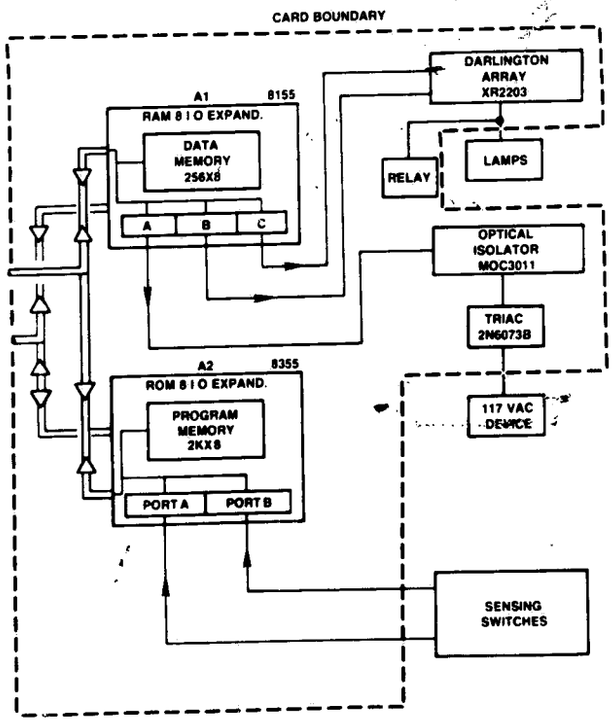


Figure 3-6. I/O #1 PRINTED CIRCUIT BOARD 146588.

PRINCIPLES OF OPERATION (PRINTCON)

3.6 GENERAL (PRINTCON)

The Eagle 2000 series with **Printcon** contains an enhanced version of the microcomputer control system previously described. State-of-the-art components and methods are used to measure temperature and pressure **in place of the round-chart recorder and pressure/vacuum switches.** This is the key difference between **Printcon** and the older system. Maintenance is reduced, and the accuracy of the control system is increased. Other than changes to accommodate these new measuring elements, the piping arrangement of the sterilizer remains the same.

Convenience of operation is increased by the digital display of temperature and pressure, the easily understood printed record, and thumbwheel selection of the sterilizing temperature.

Overview of the Printcon Control System

A comparison of the Eagle with PRINTCON system to the Eagle and Round chart recorder system will aid in understanding the Printcon control system. As shown in Fig. 3-7, both systems utilize the same Eagle card-cage control chassis. Note that in **both** systems, the card-cage control regulates the solenoid valves and monitors the cycle select pushbuttons, sterilize and dry times, door switch(es) and reset buttons. The Printcon system has an additional PC board with its own microcomputer and a stored program geared to interface with the card-cage controller.

In the round chart recorder (IRC) system, the card-cage control was fed by a number of pressure, vacuum and temperature switches, **each switch having a separate input wire** to this control. Since the integrated circuits within the control accept only TTL-COMPATIBLE input signals (0 volts = OFF, 5 volts = ON), each switch

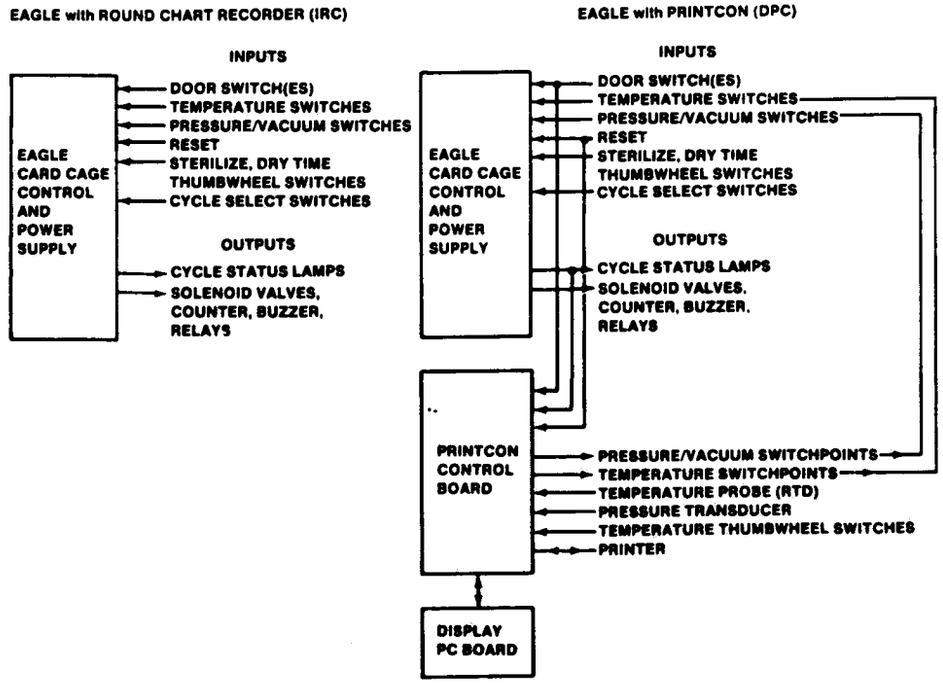


Figure 3-7. CONTROL COMPARISON.

was wired to the control as shown in Fig. 3-8. The control typically opens one or more solenoid valves and monitors a specific switch input line until that line changed from 5 volts to 0 volts (or from 0 volts to 5 volts). As an example, during the EXHAUST phase of a gravity steam cycle, the fast exhaust solenoid valve is energized to allow steam to evacuate the chamber. During the time when the chamber pressure is dropping, the control monitors the input line from PS-2 pressure switch to activate (open) at 1 psig. When the switch opens (and the input voltage rises to 5 volts), the control activates the buzzer to end the cycle.

On the Printcon system, the same switch input wires on the card-cage control are now wired to the main Printcon PC board. Instead of a mechanically activated switch opening and closing, however, a Printcon output transistor saturates (0 volts output) or cuts off (5 volts output) in response to a command from the microcomputer IC on the main Printcon PC board (Fig. 3-8). The microcomputer issues this command when it determines that the chamber pressure, vacuum or temperature is equal to the value selected for the setpoint (e.g., 1 psig).

Continuing to consider the Printcon control system as the combination of two microcomputer systems, the last important point to note in the overview is that the main Printcon PC board must be able to detect selection of a cycle, cycle phase changes (i.e. from STERILIZE to EXHAUST, etc.) and cycle irregularities (i.e. excessive CONDITION time, etc). This is accomplished by wiring certain card-cage outputs into the main Printcon PC board as shown in Fig. 3-8.

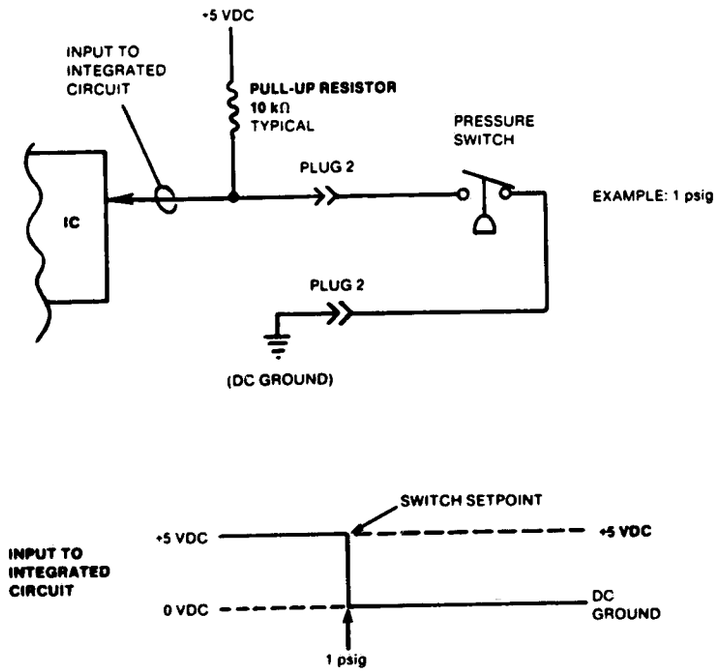


Figure 3-8. TYPICAL SWITCH INPUT.

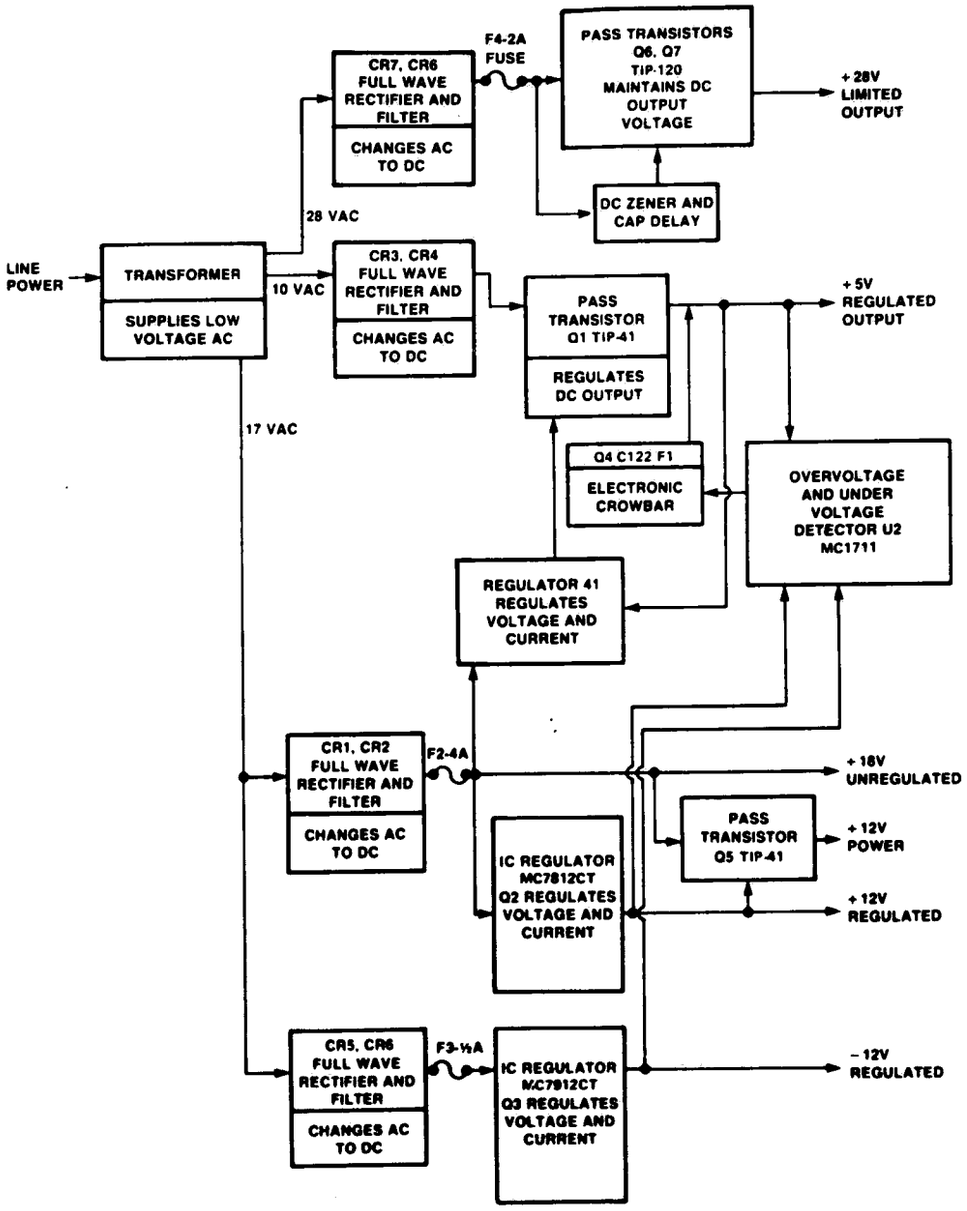


Figure 3-9. PRINTCON REGULATED POWER SUPPLY.

3.7 FUNCTIONAL DESCRIPTION OF THE PRINTCON MICROCOMPUTER CONTROLLER

The Printcon control system is built up from five major modules: a power supply assembly, a mother board/card cage assembly, a plug-in printed circuit board set, a display printed circuit assembly, and a digital printer controller assembly. The first three modules assemble into a controller nearly identical to that of earlier Eagle sterilizers. The only difference is in the power supply. The last two modules are in the Printcon assembly which replaces the round-chart recorder in the control column. A description by function of each component follows.

Printcon Power Supply (Figure 3-9)

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

+5 volts direct current (VDC) at 2.5 amp voltage regulated with current limit and electronic crowbar over- and under-voltage protection (Figure 3-10).

+12 VDC at 0.1 amp, voltage regulated (Figure 3-11).

+12 VDC at 1.5 amp, voltage regulated (Figure 3-11).

-12 VDC at 0.1 amp, voltage regulated (Figure 3-12).

+18 VDC at 0.5 amp, unregulated (Figure 3-13).

+28 VDC at 1.5 amp, zener regulated (Figure 3-14).

These voltage outputs are generated as follows:

1. For the 5 VDC power supply, voltage from the full wave rectifier (CR3 and CR4) is filtered by C2. This filter circuit provides voltage to series pass transistor Q1 which drops the output voltage to 5 volts. Regulating amplifier U1 turns Q1 on and off as it senses voltage fluctuations due to load and line variations. An electronic crowbar (SCR Q4) provides protection from unsafe voltage levels. Dual comparator U2 fires SCR Q4 when the voltage level is greater than 6.5 volts or less than 4.7 volts. When SCR Q4 fires, the 5 VDC output is clamped to approximately 2 VDC by CR10 and Q4. The primary circuit breaker is also tripped by CR9 and Q4. Potentiometer (pot) R2 permits adjustment of the 5 VDC foldback current limit setpoint. Clockwise rotation of R2 lowers the current limit setpoint. Pot R7 permits adjustment of the 5 VDC output voltage. Clockwise rotation of R7 lowers the output voltage. (Figure 3-10.)

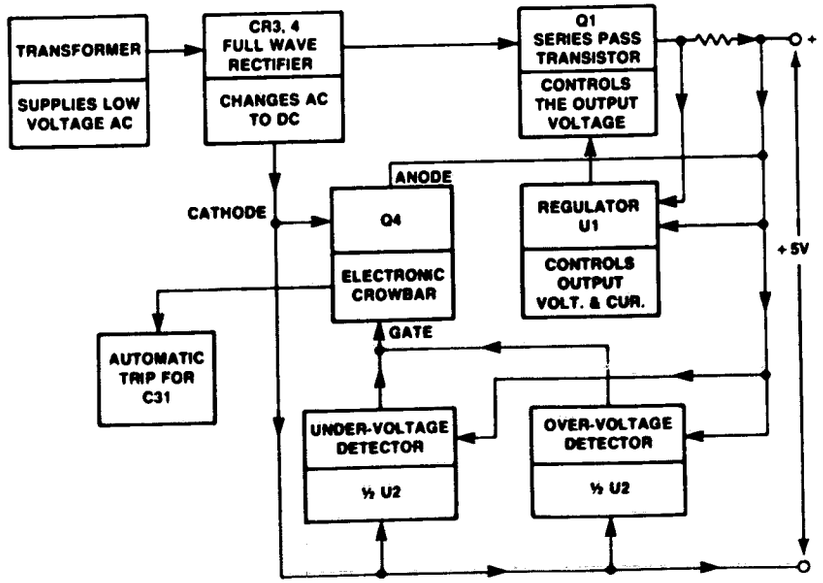


Figure 3-10. PRINTCON 5-VOLT POWER SUPPLY.

2. The +12 VDC regulated output is supplied by the +18 VDC unregulated circuit. The unregulated +18 VDC supplies the integrated circuit regulator Q2 which regulates the output voltage (Figure 3-11, Point B).

3. The +12 VDC power output is also supplied by the unregulated +18 VDC power supply. Series pass transistor Q5 uses the +12 VDC regulated supply as a reference to regulate the +12 VDC power output (Figure 3-11, Point A).

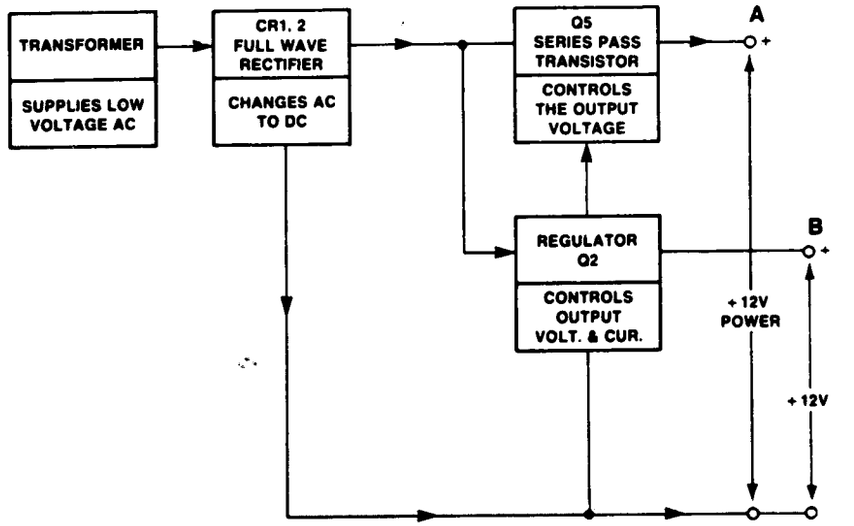


Figure 3-11. PRINTCON 12-VOLT POWER SUPPLY.

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

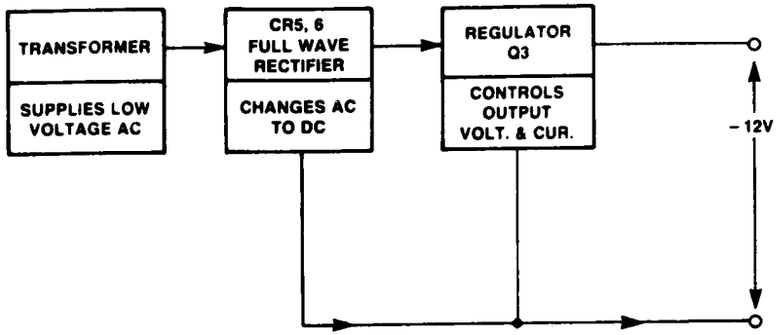


Figure 3-12. PRINTCON -12 VOLT POWER SUPPLY.

5. The +18 VDC unregulated power supply operates as follows: voltage from the full wave rectifier (CR1 and CR2) is filtered by C1. This filter circuit provides unregulated +18 VDC, through fuse F2, and is the supply for the -12 VDC regulated output, the +12 VDC power output, and the +5 VDC regulating amplifier U1. (Figure 3-13.)

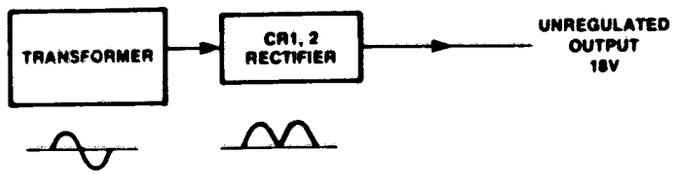


Figure 3-13. PRINTCON 18-VOLT POWER SUPPLY.

6. The +28 VDC power supply operates as follows: Voltage from the full wave rectifier (CR7 and CR8) is filtered by C5. This filtered circuit provides voltage to series pass transistors Q6 and A7 through fuse A4. The series pass transistors operate in parallel and are equalized by R11 and R12. The base reference voltage is provided by R13 and zener Z4, near 28 volts. R13 and C10 provide a slight delay on power turn on. (Figure 3-14.)

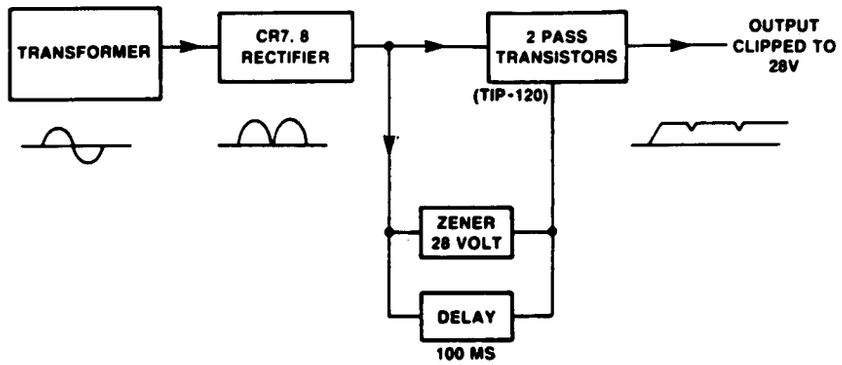


Figure 3-14. PRINTCON 28-VOLT POWER SUPPLY.

Motherboard/Card-Cage Assembly

This assembly is identical to that used on Eagles with round-chart recorders. Refer to Section 3.5 for a description.

CPU Printed Circuit Board — 146586

This assembly is identical to that used on Eagles with round-chart recorders. Refer to Section 3.6 for a functional description. For the **Printcon** application, some of the sensing switches shown in Fig. 3-5 are replaced by control lines from the **Printcon** assembly.

I/O #1 Printed Circuit Board — 146588

This assembly is identical to that used on Eagles with round-chart recorders. Refer to Section 3.6 for a functional description. For the **Printcon** application, some of the sensing switches shown in Fig. 3-5 are replaced by control lines from the **Printcon** assembly.

Digital Printer Control Board — 146651

The Digital Printer Control printed circuit (PC) board contains the necessary circuitry to:

1. Translate the pressure transducer and temperature probe signals into digital (binary) values.

2. Monitor the **primary panel** signals to detect selection of a cycle and cycle status including alarms and aborts.

3. Control the alphanumeric printer.

4. Send temperature, pressure, time and date data to the Digital Display PC board.

5. Monitor vacuum, pressure and temperature settings on the Digital Display PC board.

6. Send the temperature, vacuum, and pressure transition point commands to the Eagle controller.

Figure 3-15 is a block diagram of the Digital Printer Control board. As on CPU printed circuit board 146586, a **microcomputer IC** is used to control the sequence of operation of this board. It pulls program instructions from IC's A1, A2 and A5. These last IC's also contain input and output lines for control and monitoring of various devices such as the temperature thumbwheels and digital display.

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

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

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

This digital code is now in the form required for input to the microcomputer. As an indication of the extreme resolution of the A/D converter, the 12 level code allows 2^{12} or 4,096 distinct output combinations across the analog input range. The pressure transducer measures 0-50 psia, so that A/D converter resolution exceeds 0.02 psi.

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

Display option and temperature control switch bank S1 on the main Printcon PC board allows selection of Fahrenheit or Celsius temperature display/printing; selection of English (psig & inches Hg) or metric (kg/cm^2 & mm Hg) pressure for display/printing. In addition, an optional decimal point of resolution may be displayed for temperature and pressure (printing is always with extended precision). The next switch gives selection of pressure transducer. This switch should always be in the ON position. Three switches in this bank control the temperature overdrive function in the STERILIZE phase for GRAVITY and LIQUIDS cycles. These switches provide eight temperature settings varying from 0 F to 3.75 F above the sterilizing temperature set on the thumbwheels. Steam-to-chamber solenoid control is at this offset temperature, while STERILIZE timing begins at the temperature set into the thumbwheels. **BDC** (binary-coded decimal) **rotary switches S2 and S3** allow setting of the proper year for display and printing. If set to 80, no year will be used. See Section 7 for more information on setting these switches.

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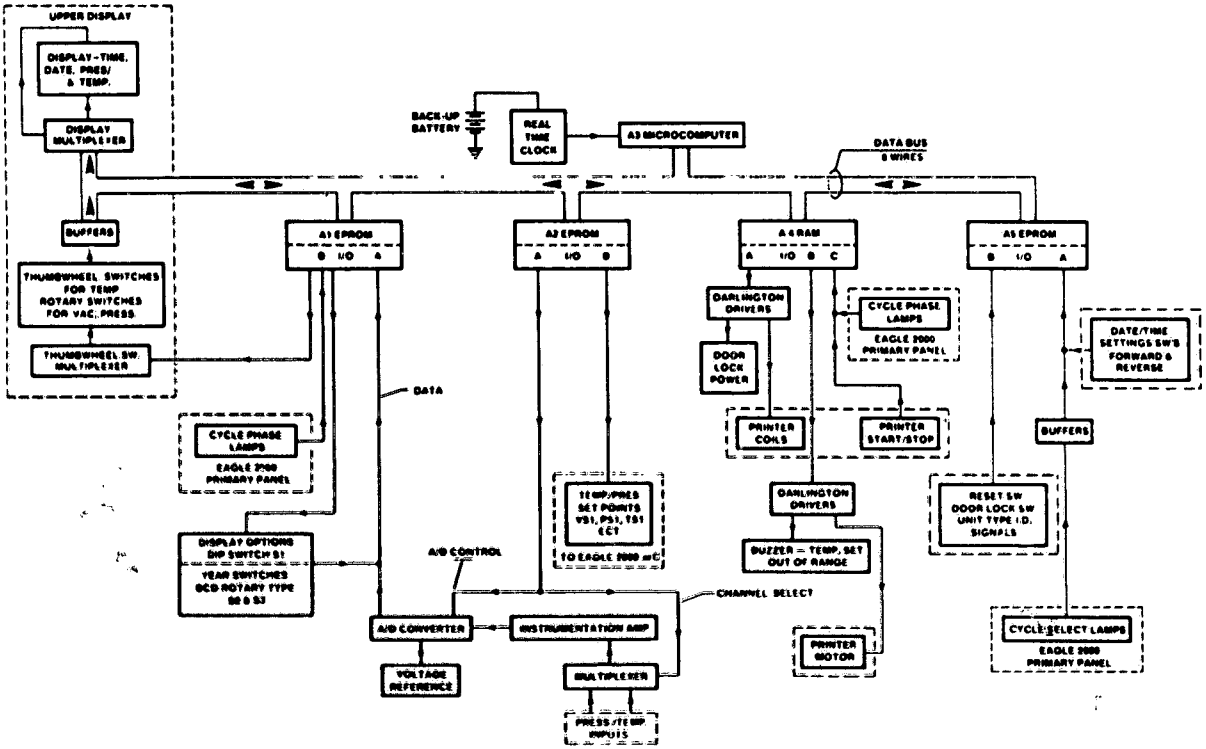


Figure 3-15. PRINTCON BLOCK DIAGRAM: Main Printcon P C Board.

G-11

G-12

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

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

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

Temperature and pressure input circuits: Temperature is sensed by a **resistive temperature probe.** The probe degree has a resistance of 100 ohms at 0 C, and increases about 0.39 ohms for every degree C that the temperature increases. By connecting the probe as part of a voltage divider circuit, an output voltage exactly related to temperature is obtained. (Figures 3-16 and 3-17.)

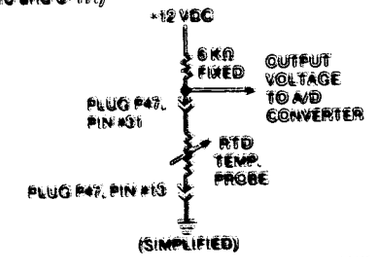


Figure 3-16. TEMPERATURE PROBE SCHEMATIC.

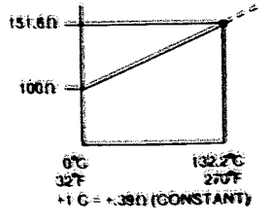


Figure 3-17. TEMPERATURE VS. RESISTANCE CHARACTERISTICS.

The pressure transducer also exhibits a resistance change in response to a pressure change, and is termed a **strain gauge** type. The illustration below shows the internal configuration and output voltage. (Figures 3-18 and 3-19.)

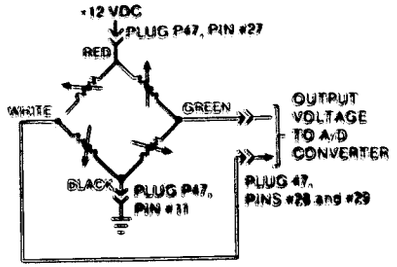


Figure 3-18. PRESSURE TRANSDUCER SCHEMATIC.

Figure 3-18 is an application of the **Wheatstone Bridge** configuration. The four resistors will vary in resistance in response to a pressure change, and are chosen so that at 0 psia, the output voltage is zero. At 50 psia (full scale) the output voltage is 36 millivolts.

NOTE: Princon is programmed to measure and store the value of the pressure transducer output each time the **RESET** button is pressed **with the door(s) open.** The control will then use this value for gauge pressure and vacuum measurements in cycle. This same action will occur each time the power is turned ON **with the doors open.** If power is turned ON with the door(s) closed and locked, the control will assume an ambient pressure of 14.7 psia (29.92 in. Hg). The same applies if **RESET** is pressed with the door(s) closed and locked.

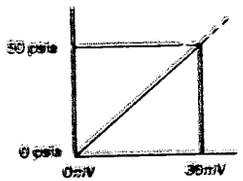


Figure 3-19. PRESSURE VS. TRANSDUCER OUTPUT CHARACTERISTICS.

DIGITAL DISPLAY PC BOARD 146633-001

A block diagram of this PC board is presented in Figure 3-20. The microcomputer presents changeable temperature, pressure, and other information for display to this PC board on the data bus. Note that the data bus is bi-directional, and the microcomputer from time to time will read the data bus for pressure, vacuum and temperature set-points. The control bus will activate the decoder/driver, latch, or switch select control IC when fresh data is at hand or needed. J46 connector also interfaces the time, date, forward and reverse touch switches on the display panel overlay.

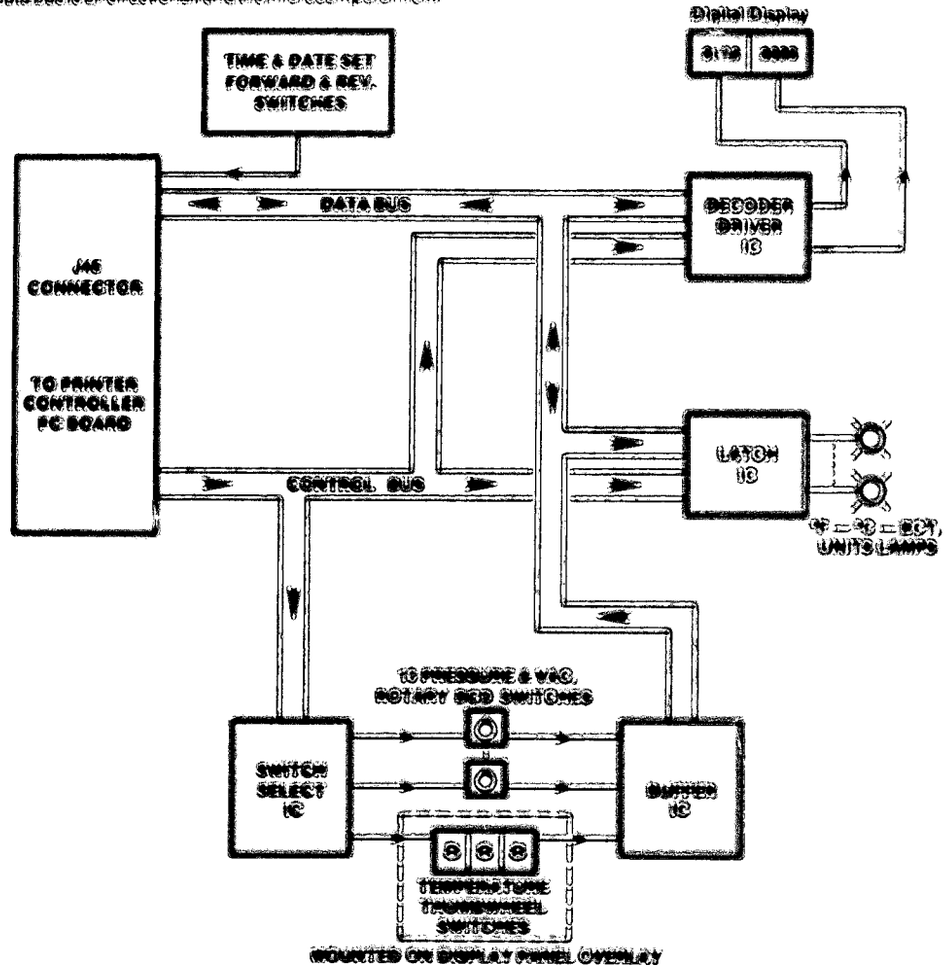


Figure 3-20. DIGITAL DISPLAY BLOCK DIAGRAM.

AMSCO SERVICE

EAGLE 2000 SERIES - UNIVERSAL GRAVITY/ISOTHERMAL SMALL RECTANGULAR STERILIZER P-764083-002



INTERPRETING THE PRINTED CYCLE RECORDS

Printed cycle records for normal steam sterilization cycles are presented in Figures 3-21, 3-22, and 3-23. The letters in the left hand most column represent the various phases of the cycle, as follows:

C — Condition
S — Sterilize
E — Exhaust
Z — Complete

Note how these printed lines correspond to changes in the cycle graph. This graph represents the pressure changes occurring in the chamber.

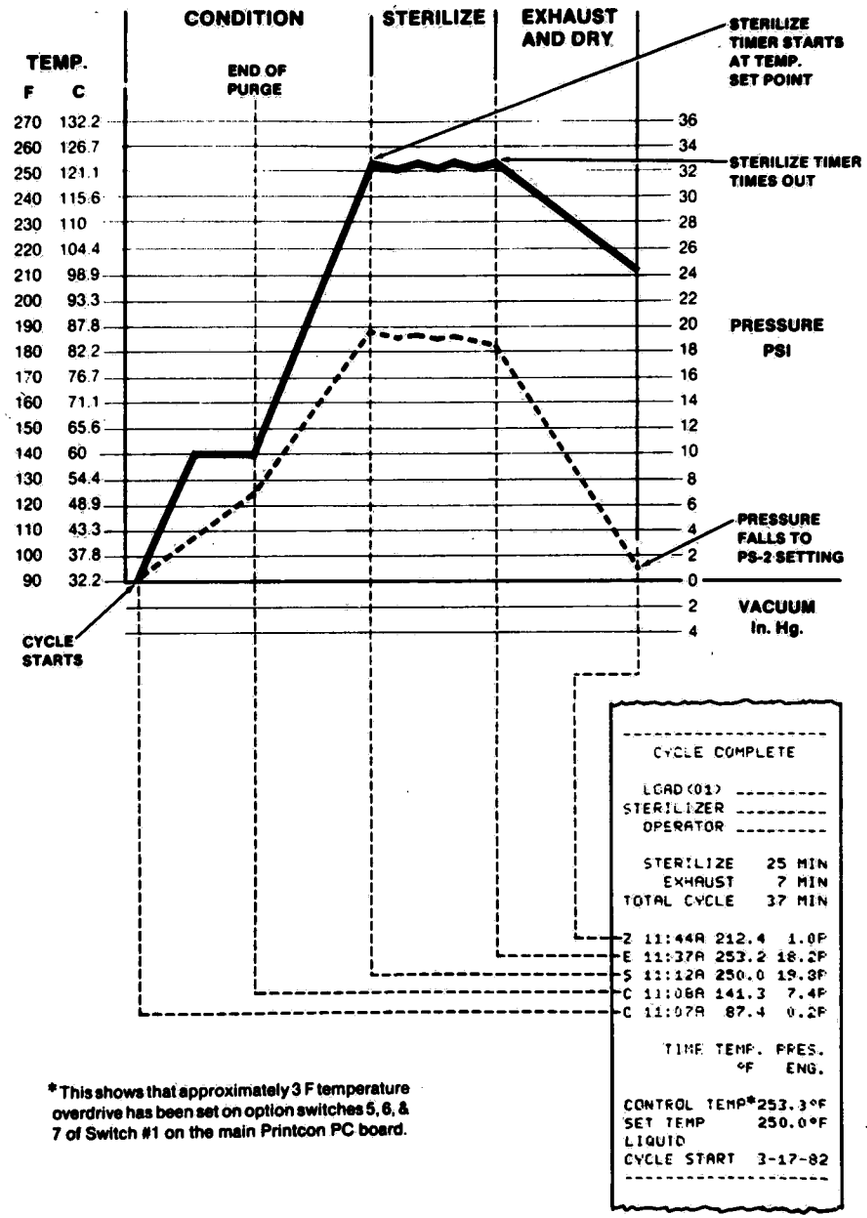
On a typical line; C 11:08A 141.3 7.4P

11:08A indicates the time at which this event occurred — 11:08 a.m.

141.3 is the temperature at this time.

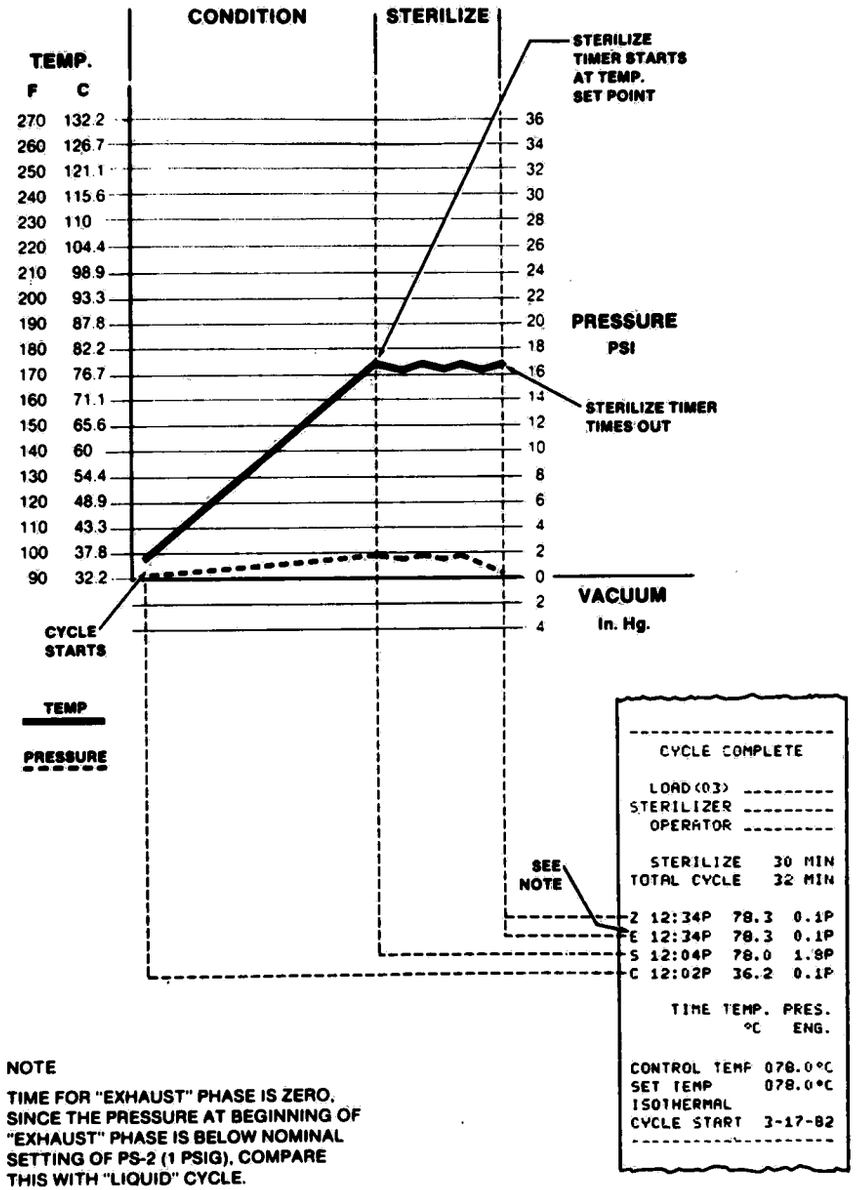
7.4P is the pressure achieved at this time.

The rest of the printed record is self-explanatory as are the printed cycle alarms. A summary of the proper and possible records printed out is presented in Section 2.



*This shows that approximately 3 F temperature overdrive has been set on option switches 5, 6, & 7 of Switch #1 on the main Printcon PC board.

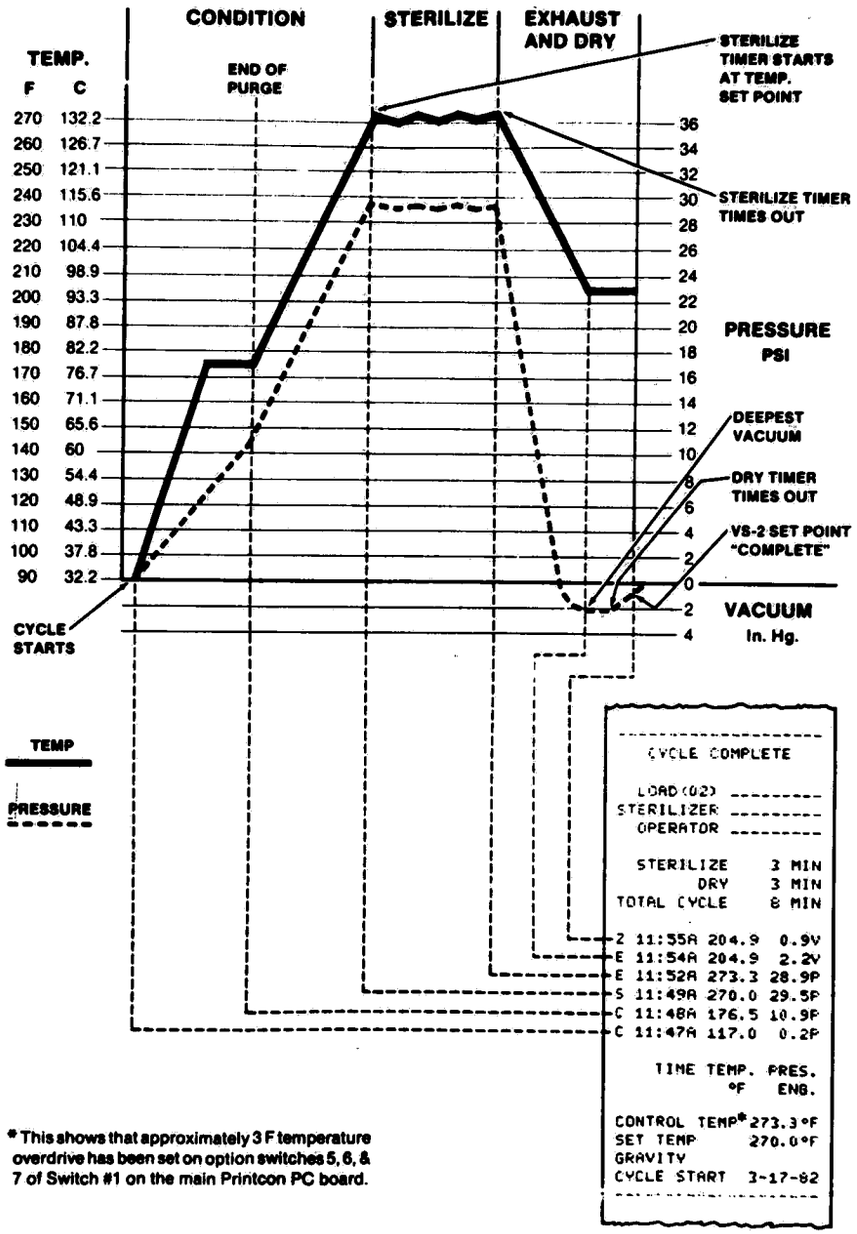
Figure 3-21. PRINTED CYCLE RECORD: Liquid Cycle (Units with Printcon)



NOTE

TIME FOR "EXHAUST" PHASE IS ZERO, SINCE THE PRESSURE AT BEGINNING OF "EXHAUST" PHASE IS BELOW NOMINAL SETTING OF PS-2 (1 PSIG). COMPARE THIS WITH "LIQUID" CYCLE.

Figure 3-22. PRINTED CYCLE RECORD: Isothermal Cycle (Units with Printcon)



*This shows that approximately 3 F temperature overdrive has been set on option switches 5, 6, & 7 of Switch #1 on the main Printcon PC board.

Figure 3-23. PRINTED CYCLE RECORD: Gravity Cycle (Units with Printcon)

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SECTION 4

INSPECTION AND MAINTENANCE

4.1 GENERAL

Maintenance procedures described in paragraphs 4.2 through 4.5 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. Paragraph 4.6 is a sample maintenance record which we suggest the Maintenance Department keep. Such a record will prove helpful in ensuring proper maintenance.

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

4.2 ROUTINE INSPECTION

1. Inspect cabinetry for signs of damage or misaligned parts.

2. Check the gauges and recorder or Printcon 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. Check recorder chart or printout for inked record after each cycle. Refer to Section 7.

2. Check the door gasket. Replace it if it has become deformed, brittle, or cracked. See paragraph 7.3.

Weekly

1. Watch the sterilizer as it goes through each phase of a complete cycle and check that all indicating lights are working. If a lamp needs replacement, refer to paragraph 7.12.

2. Flush chamber drain line as follows:

a. Remove chamber drain screen (Fig. 8-27, 2).

b. Rinse drain with hot solution of trisodium phosphate (two tablespoons to one quart of water). If the use of trisodium phosphate is objectionable, use a solution of 1/2 cup of AMSCO Sonic Detergent* (P-41591-091) and one quart of hot water.

c. Wait five minutes.

d. Then flush with one quart of hot water.

e. Place the strainer back in the chamber drain.

Available from your local AMSCO representative.

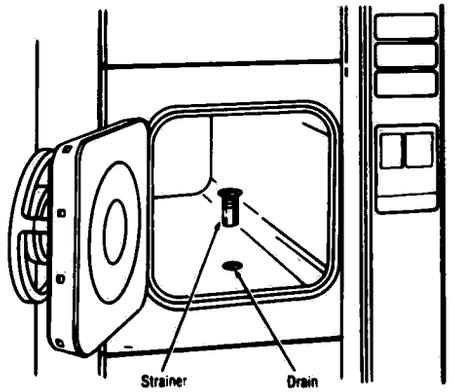


Figure 4-1. LOCATION OF CHAMBER DRAIN STRAINER.

3. For sterilizers supplied with a steam generator, flush the generator weekly as follows:

a. For LB15AS and LB20AS non-solid state generators shipped before 2/85 (Fig. 8-54):

1) Shut off POWER switch located on the secondary control panel. Wait until generator pressure gauge indicates zero.

2) Open generator drain valve (behind lower access door). Drain generator for five minutes.

3) Close drain valve and turn on POWER switch. The generator will refill with clean water.

b. For LB20AS solid state generator shipped after 2/85 (Fig. 8-83):

1) Position POWER switch, on secondary control panel, to OFF.

2) After generator pressure gauge indicates zero, open generator drain valve (behind lower access door).

3) Position POWER switch to ON and flush generator for five minutes.

4) Close drain valve. The generator will refill with clean water.

5) Position POWER switch to OFF.

Monthly

1. Place a few drops of heavy machine oil (SAE 20 or 30) on door hinge pin. Work oil into hinge by opening and closing door several times.

Quarterly

1. See Figure 4-2. Unscrew the button in center of chamber door (Figure 8-20, 10) to expose the door post grease fitting. Inject a high temperature grease such as Neptune 7* (Mfgr. Ore-Lube Corp., College Point, NY 11356) or one of equal quality into the fitting. Replace button.

2. Check jacket safety valve and, for Isothermal unit, chamber safety valve (see Figure 4-3) as follows: (**NOTE:** Also check safety valve on electro-steam generator if generator is provided.)

a. Be sure sterilizer is cool.

b. Inspect safety valves for accumulations of rust, scale and other foreign substances which would prevent free operation of the valve(s). The opening of any discharge piping must be clear and free from restrictions.

**Also available from your local AMSCO representative . . . ask for part P-385220-091.*

c. Operate try lever or pull ring several times. The lever should move freely and return to its closed position after each operation.

d. Follow operating instructions and allow chamber and, if applicable, steam generator to reach operating pressure.

WARNING: BE CAREFUL OF STEAM ESCAPING FROM SAFETY VALVE(S). TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.

e. Check safety valves for steam leakage. If valve is leaking, operate the try lever several times to see if the leakage stops. **Avoid letting moisture get under insulation in chamber or generator (if applicable), as it will cause rusting of the outer jacket.**

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

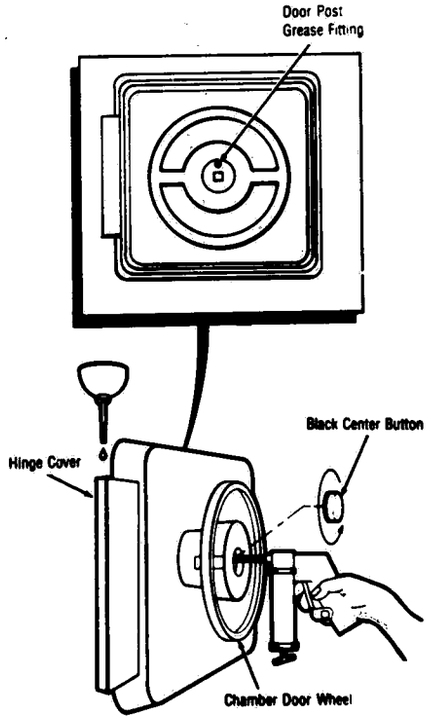


Figure 4-2. LUBRICATING CHAMBER DOOR.

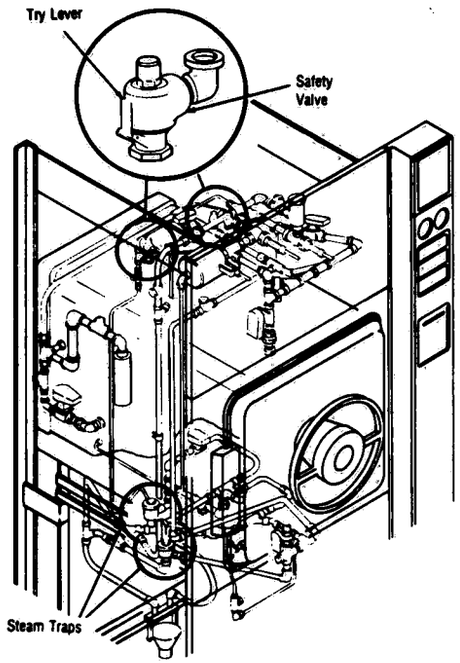


Figure 4-3. LOCATION OF STEAM TRAPS AND SAFETY VALVE(S).

3. Clean steam generator (if supplied with sterilizer) as follows:

NOTE: Quarterly cleaning is minimum recommended frequency. If mineral deposits form rapidly — causing slow heatup — generator chamber should be cleaned more often to maintain it in peak condition. Water supply with 5 grains minimum hardness is recommended for electric steam generators to minimize scale buildup. Also, check wiring to ensure that wire #44A is connected with red wire to fuse and wire #41A is connected with yellow wire to common at terminal block or protective fusing circuit is bypassed.

a. For LB15AS and LB20AS non-solid state generators shipped before 2/85:

1) Position the POWER switch, on secondary control panel, to OFF. Wait until generator pressure gauge indicates zero.

2) Open generator drain valve (behind lower access door) by turning handle to left and allow generator to empty completely. With the valve still open, turn POWER switch on. This will allow water to flow through the generator to flush out loose sediment. Allow flushing action to continue several minutes.

3) Close drain valve and allow generator to fill to normal level. When normal level is reached, generator will automatically cut off water supply valve.

4) Turn POWER switch off. Be sure STEAM supply valve (behind upper access door) is closed. Disconnect steam fitting at top of generator.

5) Shut off water supply to the generator by closing the sterilizer water supply valve (behind upper access door).

6) Insert funnel into open line at top of generator and pour 1/2 gallon (1.9 liters) AMSCO Descaler* solution, **very slowly**, into generator chamber. (Follow directions supplied with AMSCO Descaler to obtain proper solution strength.) When pouring, be sure the fumes are removed by adequate ventilation, using an electric fan if necessary.

7) Keep the solution in the generator at least one hour, depending on amount of scale to be removed.

8) Open drain valve and allow generator to drain completely. Close generator drain valve.

9) Open water supply valve. Turn POWER switch on, and allow generator to fill to normal level.

10) When generator has again filled, turn POWER switch off and again open generator drain valve to flush the generator chamber. Close the drain valve.

11) Reconnect steam line fitting.

12) Repeat steps 2) and 3) to drain and flush generator thoroughly. Generator is then ready for operation.

b. For LB20AS solid state generator shipped after 2/85:

1) Position the POWER switch, on secondary control panel, to OFF. Wait until generator pressure gauge indicates zero.

2) Drain generator by turning generator drain valve handle (behind lower access door) counterclockwise 90°. Drain until sight glass (at back of generator) is empty of water, then, with drain valve still open, position POWER switch to ON. This will flush out loose sediment.

**Available from your local AMSCO representative.*

3) Close drain valve and allow generator to fill to normal level. When normal level is reached, generator will automatically cut off water supply valve.

4) Position POWER switch to OFF. Be sure steam supply valve (behind upper access door) is closed. Disconnect steam outlet fitting at top of generator.

5) Shut off water supply to the generator by closing the sterilizer water supply valve (behind upper access door).

6) Insert funnel at steam outlet fitting (just disconnected). Pour 1 pint AMSCO Descaler* **very slowly** into generator chamber through the funnel. (Follow directions supplied with AMSCO Descaler to obtain proper solution strength.) When pouring, be sure the fumes are removed by adequate ventilation, using an electric fan if necessary.

7) Place pipe plug or other suitable closure in steam outlet connection. Keep the solution in the generator at least one hour.

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

9) Restore water supply to generator. Turn power switch on and allow generator to fill to normal level. Let stand for 5 minutes.

10) Turn power switch off and again open drain valve to drain generator.

11) With drain valve still open, open water supply valve. Fill generator with clean water and allow it to flush for 10 minutes.

12) Shut off water supply valve, drain generator, and shut off drain valve.

13) Reconnect steam line fitting to steam outlet connection.

14) Run through short cycle to check for proper operation.

4. Clean or replace sight glass on steam generator (if supplied with sterilizer) as follows:

a. With no pressure in generator, rotate locknut clockwise (from top); allow water to drain from sight glass into a cup.

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b. When sight glass is empty, close the drain by rotating locknut counterclockwise. If this action adequately cleans glass, proceed no further. If glass requires changing, proceed through following steps.

c. Close top and bottom sight glass valves and locknut. Remove the two vertical protective rods.

d. Loosen the two gland nuts which hold the glass in place, and slide them onto the glass — about an inch (25mm) from each end.

e. Remove the glass by lifting it up and out of the lower fitting, and then pulling the bottom forward and downward to clear the upper fitting.

f. Reverse the procedure to install new sight glass.

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

Semiannually

5. Remove cover from air filter (Fig. 8-34, 1) and inspect. Replace if necessary. Replacement may be required more often if sterilizer is in area with high dust level.

Yearly

6. Open and inspect the thermostatic steam traps. See paragraph 7.6 for disassembly and cleaning instructions.

7. Descale steam generator (for units with integral steam generator).

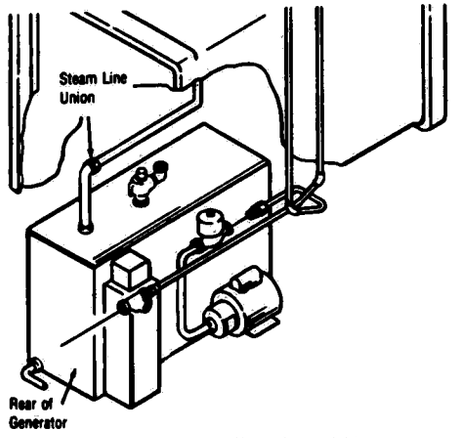


Figure 4-4. STEAM GENERATOR.

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

WARNING ALWAYS SHUT OFF ELECTRIC POWER TO STERILIZER AT WALL DISCONNECT SWITCH BEFORE STARTING THE FOLLOWING PROCEDURE.

a. Assure pressure is zero by opening drain valve to drain unit.

b. Remove access door cover to generator control box.

c. Disconnect heater leads.

d. Disconnect heater head assembly by removing the four hex nuts; remove and set aside.

e. Replace heater head assembly (Fig. 8-55 or 8-82).

f. Reconnect heater leads and turn on power to the generator.

g. With steam pressure in the generator, examine heater head gasket for leakage.

h. If leakage is present, tighten head nuts or — if necessary — replace gaskets.

i. Replace access cover to generator control box.

j. Clean generator (refer to page 4-3) before placing in service.

8. Clean water level control (for LB15AS and LB20AS non-solid state generators shipped before 2/85). The three rods controlling the chamber water level are contained within the control head located on top of the generator cabinet. These rods are connected to generator electrical control circuit. Clean the water level control as follows:

a. Disconnect the electric power source from the generator; allow it to cool to approximately room temperature.

b. Remove the four screws from the cover of the water level control head.

c. Remove the cover.

d. Carefully identify both wires and spark plugs with small pieces of tape so that they can be returned to their original locations. Then remove the wires from the spark plugs.

e. Remove the spark plugs, complete with rods, from the control head. Thoroughly clean rods of all lime or other deposits with a small wire brush. Then replace the rods and spark plugs in their original locations and tighten connections.

f. Reconnect wires to their respective spark plugs and return cover.

9. Clean electro rods (for LB20AS solid state generators shipped after 2/85):

a. Disconnect the electric power source from the generator; allow it to cool to approximately room temperature.

b. Carefully identify both wires and spark plugs with small pieces of tape so that they can be returned to their original locations. Then remove the wires from the spark plugs.

c. Remove the spark plugs, complete with rods. Thoroughly clean rods of all lime or other deposits with a small wire brush. Then replace the rods and spark plugs in their original locations and tighten connections.

d. Reconnect wires to their respective spark plugs.

4.4 CLEANING

Daily

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

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

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

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

Monthly

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

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

3. Spray sealing surface on door frame(s) with **AMSCO Fluorocarbon Spray** (also included in Door Frame Kit, see above) to prevent gasket(s) from sticking.

4. Open steam and water supply line strainers (Figs. 8-32 and 8-33) 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 if drain line becomes clogged or if spillage occurs during a liquids processing cycle.

a. Remove the chamber drain strainer.

b. Rinse drain with hot solution of trisodium phosphate (two tablespoons to one quart of tap water).

or

If the use of phosphate is objectionable, use a solution of 1/2 cup of **AMSCO Sonic Detergent** (P-41591-091) and one quart of hot tap water.

c. Wait five minutes, then flush drain with one quart of hot tap water.

d. Replace the strainer.

4.5 PRINTCON CONTROL PREVENTIVE MAINTENANCE FREQUENCY

Perform the following operations after the number of cycles indicated have been run. Also refer to Paragraph 4.6 for more information.

1. Change ink cartridge ..... 300 cycles
   (Paragraph 7.17)
2. Lubricate metal shaft ends of upper pinch roller ..... 300 cycles
   (Figure 8-65)
3. Check calibration ..... 900 cycles
   (Paragraph 7.23)
4. Change battery ..... Yearly
   (Paragraph 7.19)
5. Set year switches ..... Yearly
   (Paragraph 7.19)

4.6 PREVENTIVE MAINTENANCE GUIDE

EQUIPMENT: **Eagle® 2000 And 2300 Series Small Gravity/Isothermal Sterilizers**
This form is to be used as a preventive maintenance record and, along with **Section 4** *instructions, as a guide to performing preventive maintenance.*

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

SERVICE PERFORMED:	1	2	3	4	5	6
1.0 PREPARATION FOR PREVENTIVE MAINTENANCE						
1.1 Discuss equipment operation with department personnel.	X	X	X	X	X	X
1.2 Inspect charts/printouts for signs of trouble.	X	X	X	X	X	X
1.3 Install new chart (IRC Units) for test purposes.	X	X	X	X	X	X
1.4 Install test equipment.	X	X	X	X	X	X
1.5 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 (GATE/GLOBE/ANGLE/MULTIPORT*)						
3.1 Inspect valve for smooth operation and proper valve seating.	X	X	X	X	X	X
3.2 Inspect packing of valve for leaks.	X	X	X	X	X	X
3.3 Rebuild valve.	X					
3.4 Run manual cycle to test operation of Multiport valve. Rebuild as necessary.						X
4.0 EACH WATER, JACKET 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 Calibrate or replace gauge if required.	X	X	X	X	X	X

4.6 PREVENTIVE MAINTENANCE GUIDE (Continued)

EQUIPMENT: **Eagle™ 2000 And 2300 Series Small Gravity/Isothermal Sterilizers**
This form is to be used as a preventive maintenance record and, along with **Section 4** *instructions, as a guide to performing preventive maintenance.*

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

SERVICE PERFORMED:	1	2	3	4	5	6
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
7.6 Rebuild the steam control valve.					X	
7.7 Flush out each flow control valve.	X	X	X	X	X	X
7.8 Reset flow control valve to original marked setting.	X	X	X	X	X	X
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
11.0 ELECTRIC STEAM GENERATOR						
11.1 Disconnect power to generator.	X	X	X	X	X	X
11.2 Inspect all wiring and connections for damage and fraying.	X	X	X	X	X	X
11.3 Check fuses and fuse clips.	X	X	X	X	X	X
11.4 Clean water gauge glass, fitting and piping — replace washers and glass.		X		X		X
11.5 Clean heating element and boiler chamber.		X				
11.6 Clean water level control.		X				
11.7 Flush out steam chamber.			X		X	
12.0 IRC CONTROL						
12.1 Check chart drive and switches TS-1 and TS-2 in recorder for proper adjustment.		X		X		X
12.2 Inspect inking system for proper marking.	X	X	X	X	X	X
12.3 Check settings on pressure and vacuum switches. Readjust as required.	X	X	X	X	X	X

4.6 PREVENTIVE MAINTENANCE GUIDE (Continued)

EQUIPMENT: **Eagle® 2000 And 2300 Series Small Gravity/Isothermal Sterilizers**
This form is to be used as a preventive maintenance record and, along with **Section 4** *instructions, as a guide to performing preventive maintenance.*

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

SERVICE PERFORMED:	1	2	3	4	5	6
13.0 PRINTCON CONTROL						
13.1 Inspect proper settings of pressure and vacuum settings on BCD switches.	X	X	X	X	X	X
13.2 Verify proper settings of main PC Board.	X	X	X	X	X	X
13.3 Ensure proper operation of printer when unit is initially turned on.	X	X	X	X	X	X
13.4 Inspect for proper operation of all temperature thumbwheels.	X	X	X	X	X	X
13.5 Verify that proper reset message is printed when reset button is pressed.	X	X	X	X	X	
13.6 Verify that proper date and time are displayed, if not reset.	X	X	X	X	X	X
13.7 Ensure that paper feed switch is operating properly.	X	X	X	X	X	X
13.8 Inspect for proper operation of paper take-up.	X	X	X	X	X	X
13.9 Verify printed record quality.	X		X		X	
13.10 Verify temperature and pressure readouts with potentiometer and pressure gauge.	X			X		
13.11 Check for proper battery operation.	X	X	X	X	X	X
13.12 Change battery.	X			X		
14.0 FINAL TEST						
14.1 Clean lint and dirt from components.	X	X	X	X	X	X
14.2 Inspect all wiring, terminals, and socket connections for damage or fraying.	X	X	X	X	X	X
14.3 Rotate thumbwheel switches 0 through 9 to ensure primary panel LEDs are operating properly.	X	X	X	X	X	X
14.4 Inspect door switch for proper operation.	X	X	X	X	X	X
14.5 Run machine through each cycle to verify proper operation. Check all LEDs.	X	X	X	X	X	X
14.6 Test manual gravity cycle (if applicable).	X	X	X	X	X	X
14.7 Inspect and clean chart recorder (IRC Units).	X	X	X	X	X	X
14.8 Remove test chart/tape and attach it to PMA. Install a new chart (IRC Units).	X	X	X	X	X	X
14.9 Remove all test equipment installed this inspection.	X	X	X	X	X	X
14.10 Install any panel or cover that was removed during the inspection.	X	X	X	X	X	X
14.11 Police area to ensure removal of all materials used during inspections.	X	X	X	X	X	X

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SECTION 5

FIELD TEST PROCEDURE

5.1 GENERAL

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

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

Refer to paragraph 5.11 for testing sterilizers with Printcon.

5.2 TEST INSTRUMENTATION REQUIRED

1. Potentiometer and thermocouple leads.

2. Calibrated compound test gauge (30'' vacuum and 100 psig).

3. Digital voltmeter (LED test light may be substituted on units with IRC).

4. Spirit level.

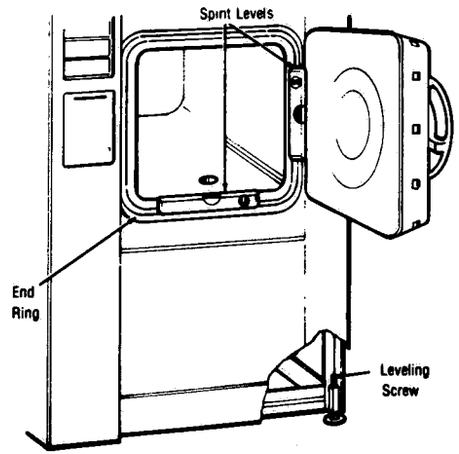


Figure 5-1. LEVELING THE STERILIZER.

5.3 CHECK FOR PROPER INSTALLATION

1. Assure sterilizer shell is level (front to back) by placing a level on the vertical face of the end ring (at the hinge side). Assure sterilizer shell is level (side to side) by placing a level on the horizontal surface of the end ring. Adjust leveling feet accordingly to achieve level conditions. See Figure 5-1.

2. Open door approximately half way. With sterilizer shell level, door will remain in this position. If door swings open or closed, recheck for sterilizer being level.

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

3. Check for proper hookup to required services, i.e., steam, water, and electrical.

TABLE 5-1. STERILIZER CONNECTIONS.

Plumbing Connections	Nominal Pipe Size at Connection Point	Pressure (Dynamic) Range
Steam Supply	3/8 N.P.T.	50-80 PSIG
Cold Water	3/8 N.P.T.	20-50 PSIG
Waste	1-1/2 O.D. Funnel	flow capacity

Electrical Connections	Volts	Frequency	Phase	Amps
Controls	115	60 Hz.	1	5

5.4 ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE (Fig. 5-2)

	Adjustable Valves	Valve Setting
A	Jacket Trap Cooling FC-2	1/2 to 1 turn open.
B	Chamber Trap Cooling FC-3	1/2 to 1 turn open.
C	Exhaust Cooling FC-6 (Lab/Iso) or FC-4 (Gravity)	Approximately 45° From Centerline of tube.
D	Slow Exhaust Valve FC-1 (Lab/Iso) or FC-5 (Gravity)	Two turns open.

NOTE: Laboratory/Isothermal model sterilizer shown. Adjustable valves are in the same relative position on the Gravity model sterilizer.

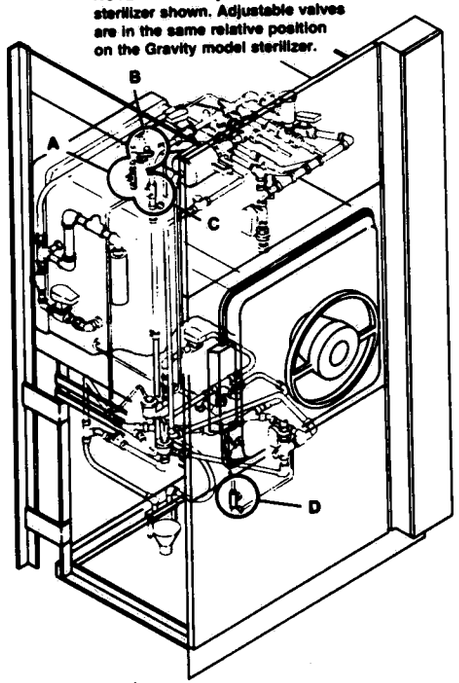


Figure 5-2. ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE.

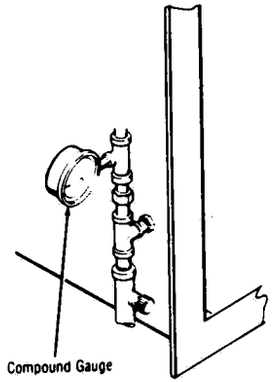


Figure 5-3. GAUGE INSTALLATION.

5.5 INSTALLATION OF POTENTIOMETER LEADS

Install potentiometer leads in chamber drain line through chamber drain screen fitting. The thermocouple junction must be in contact with the recorder bulb or on PRINTCON units, the RTD.

5.6 INSTALLATION OF COMPOUND PRESSURE GAUGE

Install the compound pressure gauge into the opening on right front side of sterilizer shell. See Figure 5-3.

5.7 DOOR SWITCH ADJUSTMENT FOR DOOR WITH NEW GASKET

1. Using a torque wrench on the steam lock clutch rod, close and lock door to approximately 20 ft lbs torque for 16x16 door and 30 ft lbs torque for a 20x20 door (back off approximately 1 turn from set torque). The DOOR UNLOCKED light on primary panel should go out. See Figure 5-4.

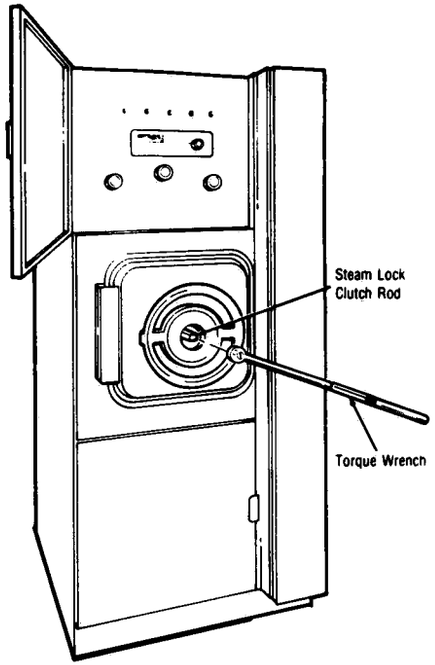


Figure 5-4. LOCKING DOOR TO CORRECT TORQUE.

2. If DOOR UNLOCKED light fails to go out use the following procedure to adjust the door switch.

a. Turn microswitch adjusting screw clockwise until switch actuates and DOOR UNLOCKED light on primary panel goes out. Continue to turn microswitch adjusting screw clockwise 1/4 turn.

b. Open door and reclose it to the same amount of torque used in step (1) to verify door switch actuator and DOOR UNLOCKED light goes out.

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 the proper actuation of the door switch.

5.8 SAFETY VALVE TEST (no pressure on jacket).

WARNING: BE CAREFUL OF STEAM ESCAPING FROM SAFETY VALVE. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE WHEN OPERATING THE TRY LEVER.

1. Operate try lever to check for freedom of movement.

2. Visually observe for indications of previous leakage (rust stains and/or scale formations).

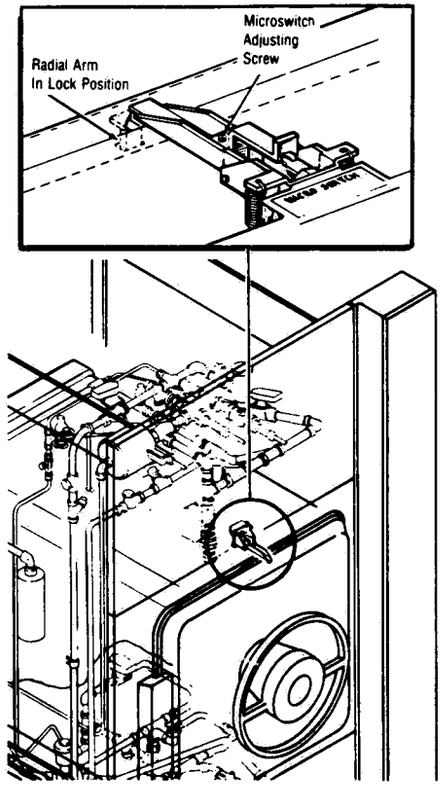


Figure 5-5. DOOR SWITCH ADJUSTMENT.

5.9 ADJUSTMENT OF PRESSURE SWITCHES

All units:

1. Adjust steam pressure regulator to control jacket pressure at 20 to 21 psig. After adjustment is made, lock low stop. See Figure 5-6. Adjust the HI stop to regulate the jacket at 32 to 34 psig. Lock the HI stop.

Units with IRC only:

2. Close slow exhaust valve and then open slow exhaust valve 2.5 turns.

3. Close and lock door.

4. Set orange (top) pointer on recorder to 250° F (121° C).

5. Set sterilize time to 1 minute and dry time to 0 minutes. Set GRAV/ISO switch to GRAVITY.

NOTE: Refer to cycle graph for liquids cycle.

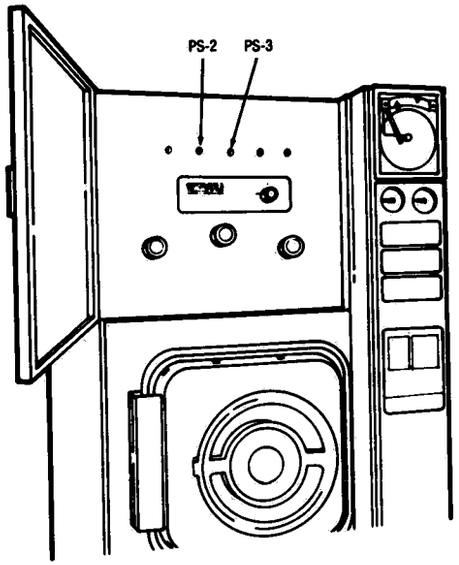


Figure 5-7. ADJUSTMENT OF PRESSURE SWITCHES.

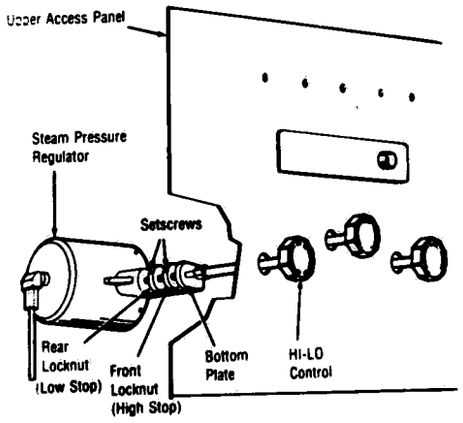


Figure 5-6. ADJUSTING PRESSURE REGULATOR

6. Depress the LIQUIDS cycle button.

7. After the sterilize phase has completed and control has advanced to slow exhaust, observe calibrated compound pressure gauge. When chamber pressure reaches 3 psig adjust PS-3 (Figure 5-7) to open the fast exhaust valve (S-3) (LED-12). When chamber exhausts to 1 psig adjust PS-2 to turn on the COMPLETE light and the buzzer (LED-18).

8. Press RESET button on control panel and initiate another LIQUIDS cycle as in step 6.

9. When cycle advances to slow exhaust, observe the compound pressure gauge to assure proper setting of PS-3 at 3 psig and PS-2 and 1 psig.

NOTE: Make sure PS-3 and PS-2 function properly before proceeding to the next step.

5.10 OPERATIONAL CHECKS (IRC Units)

TABLE 5-2. LIQUIDS CYCLE.

This table is to be used as a quick reference in checking the operation of the liquids cycle. Included are times of the various phases of the cycle, and chamber pressures and temperatures.

Initial Setup:

1. Make certain WATER and STEAM supply valves are on.
2. Adjust steam pressure regulator to the stop on the LO setting. Jacket pressure should be controlled at 20 (+1) psig.
3. Set sterilize temperature to 250 F (121 C).
4. Laboratory/Isothermal model sterilizers **only**: Set GRAVITY/ISO switch (secondary panel) to GRAVITY.
5. Set STERILIZE timer to 5 minutes.
6. Check panel to assure that DOOR UNLOCKED light is on. On double door units. OPPOSITE DOOR UNLOCKED light must also be illuminated when rear door is opened.
7. Close and lock door(s). DOOR UNLOCKED light(s) must be extinguished when door is properly tightened.

NOTE: After cycle has started and has progressed to STERILIZE phase, wait for a minute and then test the operation of the chamber undertemperature monitor by moving the yellow IRC pointer to a position 2° F (1° C) above the temperature indicated by the orange pointer. STERILIZE timer should reset to time set on thumbwheel switches and STERILIZE light on the cycle status panel should begin to blink. Return yellow pointer to 250° F (121° C). Timer will start timing again, STERILIZE light will continue to blink.

8. Touch LIQUIDS cycle selector. Only minimal pressure should be required to actuate the switch. Cycle status should illuminate CONDITION. Begin timing.

Phase	Sterilizer Condition	Time		Reference: If Sterilizer Conditions Are Not As Indicated, See TROUBLE/ SHOOTING CHART, Item no:
		16x16	20x20	
Charge Jacket	Jacket must charge to 20 +1, -0 psig			2.H
Condition (Purge) Panel Light: CONDITION	Chamber pressurizes to about 10 psig. Solenoid valves S-2 (D-13)*, S-3 (D-12), S-4 (D-16), open.	1 min.	1 min.	2.H, 3.B
Come-up time Panel Light: CONDITION	Solenoid valves S-3 (D-12), S-4 (D-16), close. Chamber temperature rises to 250° F, pressure to 20 +1, -0 psig.	4 – 1 min.	5 + 1 min.	3.C
Sterilize Panel Light: STERILIZE	Chamber temperature at 252-256° F, pressure at 20 psig. Solenoid valve S-2 (D-13) cycles to maintain pressure/temperature.	5 min.	5 min.	3.C, 3.D, 3.E, 3.F
Slow Exhaust Panel Light: EXHAUST	Solenoid valve S-2 (D-13) closes. Chamber exhausts slowly through slow exhaust valve. At chamber pressure 3 psig, S-3 (D-12) opens for fast exhaust for remaining steam.	5 +2 -0	6 +2 -0	5.A
Complete Panel Light: COMPLETE	At 1 psig, buzzer (D-18) sounds for 90 seconds or until door is opened. When door is opened, S-3 closes. WARNING HOT LIQUIDS light comes on and blinks for ten minutes.	90 sec.	90 sec.	6.A, 6.B

*LED NO. ON CONTROL BOARD

TABLE 5-3. GRAVITY CYCLE.

This table is to be used as a quick reference in checking the operation of the gravity cycle. Included are times of the various phases of the cycle, chamber pressures and temperatures.

Initial Setup:

1. Follow steps for "Initial Setup" of Liquids Cycle, except set both STERILIZE and DRY times to 5 minutes.
2. Initiate a GRAVITY cycle.
3. This cycle should be identical to the LIQUIDS cycle until the EXHAUST phase of the cycle is reached.

Phase	Sterilizer Condition	Time		Reference: If Sterilizer Conditions Are Not As Indicated, See TROUBLE-SHOOTING CHART, Item no.
		16x16	20x20	
Charge Jacket	Jacket must charge to 20 +1, -0 psig.			2.H
Condition (Purge) Panel Light: CONDITION	Chamber pressurizes to about 10 psig. Solenoid valves S-2 (D-13)*, S-3 (D-12), S-4 (D-16) open.	1 min.	1 min.	2.H, 3.B
Come-up time Panel Light: CONDITION	Solenoid valve S-3 (D-12), S-4 (D-16) close. Chamber temperature rises to 250° F, pressure to 20 +1, -0 psig.	4 – 1 min.	5 + 1 min.	3.C
Sterilize Panel Light: STERILIZE	Chamber temperature at 252-256° F, pressure at 20 psig. Solenoid valve S-2 (D-13) cycles to maintain pressure/temperature.	5 min.	5 min.	3.C, 3.D, 3.E, 3.F
Fast Exhaust Panel Light: EXHAUST	Solenoid valve S-2 (D-13) closes. Solenoid valves S-3 (D-12) and S-4 (D-16) open. Chamber pressure decreases to 3 psig, the DRY timer begins.	N/A	N/A	4.A
Dry Panel Light: EXHAUST	Solenoid valve S-5 (D-14) opens. Chamber continues exhausting until a vacuum is pulled on the chamber. Vacuum will be about 0-2 " Hg.	5 min.	5 min.	4.A
Complete Panel Light: COMPLETE	Solenoid valves S-3 (D-12), S-4 (D-16) and S-5 (D-14) close. When chamber pressure reaches 1 Hg, buzzer (D-18) sounds for 90 seconds or until door is opened.	90 sec.	90 sec.	6.A, 6.B

*LED NO. ON CONTROL BOARD

TABLE 5-4. ISOTHERMAL CYCLE (LABORATORY/ISOTHERMAL MODEL STERILIZERS).

This table is to be used as a quick reference in checking the operation of the Isothermal cycle. Included are times of the various phases of the cycle, and chamber pressures and temperatures.

Initial Setup:

1. Make certain WATER and STEAM supply valves are on.
2. Set the GRAVITY/ISO switch (secondary panel) to GRAVITY. The steam-to-jacket solenoid S-9 (LED-16) will close. The steam-to-ejector solenoid S-5 (LED-14) will open and exhaust the steam from the jacket.
3. Let the jacket to cool to 140° F (+5°).
4. Set STERILIZE TIME to 10 minutes.
5. Check panel to assure that DOOR UNLOCKED light is on. On double door units, OPPOSITE DOOR UNLOCKED light must also be illuminated when rear door is opened.
6. Set the processing temperature to 172 F (83 C).
7. Close and lock the door. DOOR UNLOCKED light must be extinguished when door is properly tightened.
8. Touch ISOTHERMAL cycle selector. Only minimal pressure should be required to actuate the switch. Cycle status should illuminate CONDITION. Begin timing.

Phase	Sterilizer Condition	Time (Minutes)	Reference: If Sterilizer Not As Indicated, See TROUBLESHOOTING CHART, Item no.:
Condition Panel Light: CONDITION	Solenoid valves S-8 (D-17), and S-10 (D-18) are open. Chamber begins heating and continues in CONDITION phase until temperature set point is reached. At about 10°F below set point. S-10 (D-18) closes.	2 max.	3.A, 3.B
Sterilize Panel Light: STERILIZE	Chamber temperature reaches set point. Solenoid valve S-8 (D-17) cycles to maintain drain temperature at 172° F (78° C) +2.	10	3.C, 3.D, 3.E, 3.F
Exhaust Panel Light: EXHAUST	Solenoid valve S-8 (D-17) closes, solenoid valve S-3 (D-12) opens.	N/A	5.A
Complete Panel Light: COMPLETE	At completion of cycle, solenoid valve S-3 (D-12) closes. Buzzer (D-18) sounds for 90 seconds or until door is opened.	1-1/2	6.A, 6.B

FIELD TEST PROCEDURE (PRINTCON)

5.11 PROCEDURE

Gravity or Isothermal Models

1. Check for proper installation as per paragraph 5.3.

2. Adjust cooling water valves and slow exhaust valve as per paragraph 5.4 and Fig. 5-2. NOTE: The slow exhaust setting is preliminary.

3. Install potentiometer thermocouple lead in metal-to-metal contact with the temperature probe (from 1/2" to 1-1/2" of the tip). Run the lead through the door (between the door gasket and end ring).

4. Install a calibrated compound pressure gauge at the chamber gauge fitting after disconnecting the chamber gauge. This gauge should have 1/2 psig and 1/2 inch Hg. minimum resolution. Psig full scale should be 50 to 100 psig.

5. Verify door switch adjustment as per paragraph 5.7.

6. Test the safety valve as per paragraph 5.8.

7. Adjust the steam pressure regulator as per paragraph 5.9, step 1.

8. Open the display overlay door by unfastening the self-tapping screw at the top right of the door.

Check the pressure and vacuum switches for the following settings:

PS-2 : 02 (1 psig)
PS-3 : 06 (3 psig)
VS-2 : 04 (2 in. Hg)

Close the display overlay door and replace the screw.

9. Check service switch No. 1 on the main Printcon PC board for the following settings. (See Section 7, if necessary, for access instructions):

Temperature — °F (#1 OFF)
Pressure — English (#2 OFF)
Display precision — Extended (#3 ON)
Transducer — Strain gauge — (#4 ON)
Temperature overdrive — Normal (#5 OFF, #6 and #7 ON)

Set sterilize temperature to 270 F.

10. Open control end door. Turn POWER and CONTROL switches ON. All lamps and digits on the Printcon display panel will come on for a 3 second lamp test. DOOR UNLOCKED lamp must come on. Pressure display should read 0.0.

The following must be printed (with appropriate date, time, temperature, and pressure):

```
                DOOR OPEN
  2:37P  76.0   0.0P
--------------------
POWER ON AT  4-01-82
  2:37P  76.0   0.0P
--------------------
```

The following must be displayed:

a. Actual and F lamps ON, on Printcon display.

b. Sterilize/dry time displays must match thumbwheel settings. The DOOR OPEN message will be printed as shown above.

Double door units — DOOR UNLOCKED lamp must be on at both ends. Open opposite door. OPPOSIDE DOOR UNLOCKED lamp must come on at both ends.

11. Try to start all cycles. No cycle should start with the door(s) open.

12. Rotate all time setting thumbwheels. The time displayed must match the thumbwheel setting.

13. Change the temperature setting by 1 F. The new set point must be displayed for 2 seconds and the SET lamp must be on.

14. Check all temperature thumbwheel digits to insure that the display matches the setting.

15. Press the RESET button. The following must be printed (with appropriate time and physical data):

```
              RESET BUTTON
*  2:37P  76.0   0.5V
```


16. Set the time and date if not correct. Turn CONTROL switch OFF and then ON again. If battery is functioning correctly, time and date will be retained.

17. Check paper feed switch. Forward position continuously feeds paper through printer. Center position is off. Rear position runs take up motor until the paper platen is depressed (microswitch activates).

18. Check paper take-up mechanism. Feed paper through pinch rollers (units before 6/85) or onto paper take-up spool (units after 6/85). Paper must not wander side-to-side. Platen microswitch must activate and shut off take-up motor when the paper is drawn taut. Run at least 20 feet of paper into the take-up mechanism. Paper should feed smoothly and coil up in the coil or on the spool.

19. Check printed record quality. Quality of print-out (or top copy) should conform to the examples in this procedure. Check for compressed digits (indicates printer motor speed too slow, or a drag on the paper roll).

20. Close and lock door(s). Start any cycle. Immediately abort it with the RESET button. This message must be printed.

```
ABORT:  RESET BUTTON
*  2:37P  76.1   0.0P
C  2:37P  76.0   0.0P
```

21. Start any cycle. Immediately turn the CONTROL power OFF and then ON again. The POWER ON message must be printed. An intermittent buzzer will sound.

```
--------------------
POWER ON AT  4-01-82
  2:38P  76.1   0.2V
--------------------
```

22. Set the HI-LO valve to HI. Adjust the rear stop ring so that the jacket maintains 33 ±1 psig pressure.

23. With the door(s) opened, turn power OFF and then ON again. Then close and lock doors. Set the sterilize temperature to 295 F. Initiate a GRAVITY cycle. Wait until the timed steam purge is completed and the pressure has risen to the regulator setting and stabilized. The temperature displayed should agree with the potentiometer to within +1 F. The pressure displayed should agree with the pressure gauge to within 0.5 psig. If not, adjust potentiometer P3 on the main Printcon PC board until these pressures agree. Then, adjust P9 for temperature, if necessary.

Abort the cycle with the RESET button and exhaust the chamber through the manual control. When exhausted to less than 1 psig, open the door and let all vapors escape. **With the door open,** turn power OFF and then ON again. Restart a 295 F GRAVITY cycle. With the pressure and temperature stabilized as before, the pressure should agree with the gauge to within 0.5 psig. If not, a realignment of the main Printcon PC board is indicated.

NOTE: A properly calibrated Printcon control is likely to be more accurate than the measuring devices. Therefore, the measuring devices should be calibrated against NBS (National Bureau of Standards) traceable equipment and the inaccuracies of the measuring devices should be known (via a calibration report sheet).

24. Disconnect the measuring devices and reconnect the chamber gauge.

NOTE: If the above accuracy results are not obtainable, refer to Paragraph 7.24. **"Printcon Calibration Procedure".**

25. Close and lock the door(s). Set STERILIZE and DRY times to 5 minutes each. Set the temperature thumbwheels to 250 F. Initiate a GRAVITY cycle. Reference Table 5-3 for proper valve actuation and correct phase times. The printer must print cycle information at the following times:

a. Start of cycle.

b. End of 1 minute purge.

c. Start of STERILIZE phase.

d. Start of EXHAUST phase.

e. End of EXHAUST phase.

f. Door open.

Refer to **Section 3** for the correct format.

26. Repeat for a 250 F Liquids cycle. Refer to Table 5-2.

Adjust the slow exhaust valve as necessary to obtain 4-6 minutes exhaust time from start of EXHAUST phase to PS-3 set-point (3 psig factory set). (S3 solenoid will open.)

27. Repeat for a 172 F Isothermal cycle except set a 10 minute sterilize time. Refer to Table 5-4.

NOTE: Component degradation which may not cause an actual control alarm is evidenced by:

a. Slow charge time to temperature set-point.

b. Excessive temperature make-ups in the STERILIZE phase.

c. Excessively rapid or slow EXHAUST time.

d. Calibration inaccuracies in the Printcon control.

28. Start a 250 F GRAVITY cycle, with 5 minute sterilize time set. After the STERILIZE phase is achieved, turn off the steam supply (use knob on valve panel) at 247.9 F, the following must occur:

a. STERILIZE lamp flashes.

b. The timer resets.

c. The following format is printed:

```
5  2:41P 250.0 21.3P
*  2:41P 244.1 21.3P
ALARM:    UNDER TEMP
*  2:41P 247.9 21.3P
```

Temperature falls 0.1 F under 248 F. These two lines are printed.

Reopen steam valve. As soon as 250 F is re-established, the lowest temperature reached during the alarm condition is printed.

29. Check all positions of the Manual control knob for proper operation — door(s) closed and locked.

SECTION 6

SECTION 6

TROUBLESHOOTING

This section contains detailed information for locating and correcting the cause of sterilizer malfunctions. Table 6-1 is for sterilizers with IRC units. For sterilizers with Printcon (DPC) units, use Table 6-2.

6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, use the RESET Button and operate sterilizer more than once in case reported problem is being caused by periodic component malfunction.

2. Use the cycle graphs, Figures 6-1 through 6-3, in order to follow the sterilization cycles through the various phases. The cycle graphs may also be used to check for correct operation of the solenoid valves which control the various phases.

3. Refer to paragraph 6.3 and the TROUBLESHOOTING CHARTS (Tables 6-1 and 6-2) after the symptom has been verified.

4. Use the operational descriptions (Section 3), electrical schematics as aids in understanding system operation and how the malfunction of a specific component would affect it.

5. Refer to the following guides for example of what to look for and what to do when troubleshooting.

Steam & Water Supplies

a. Be sure the building-supply valves are fully open.

b. Be sure the supply pressure is the proper value and that it does not fluctuate. Be sure that gauge readings are accurate.

c. Be sure the steam supply is of the proper quality and that the steam-supply line is well drained. This will ensure condensate-free steam of between 97 and 100 percent saturated vapor.

d. Check all valves and adjust, repair or replace as necessary.

e. Clean the supply strainers.

f. Check the drain thermostatic traps; replace the elements if necessary.

g. Inspect the entire system; correct all leaks.

Electronic/Electrical System

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

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

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

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

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

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

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

On the outside surface of the pin, there is a thin piece of metal sprung outward which locks the pin into the housing. Using a sharp-pointed object such as a pin or needle, push the metal spring inward while gently pulling on the appropriate wire. The pin will slide out of the socket. When installing a new pin, first give the metal spring a slight bend outward to assure its locking capacity.

Pins in plugs P1, P2, P5, P10, P11, P48, P53, and P54 seldom need replacement. However, if replacement of pins is necessary, a special pin extraction tool is required. Contact AMSCO Service Co. for details.

6.2 HOW TO USE THE CYCLE GRAPHS

The cycle graphs (Figs. 6-1, 6-2 and 6-3) are representations of the operations of the cycles available with the sterilizer. They are intended to be used for two main purposes: (1) as an aid in understanding how the various cycles work; (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. The LEDs (light emitting diodes), located on the printed circuit boards behind the front panel, are identified with the corresponding output device. When a solenoid valve, for example, is actuated (energized), the LED will be on.

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 should be used to check for other possible causes of the problem.

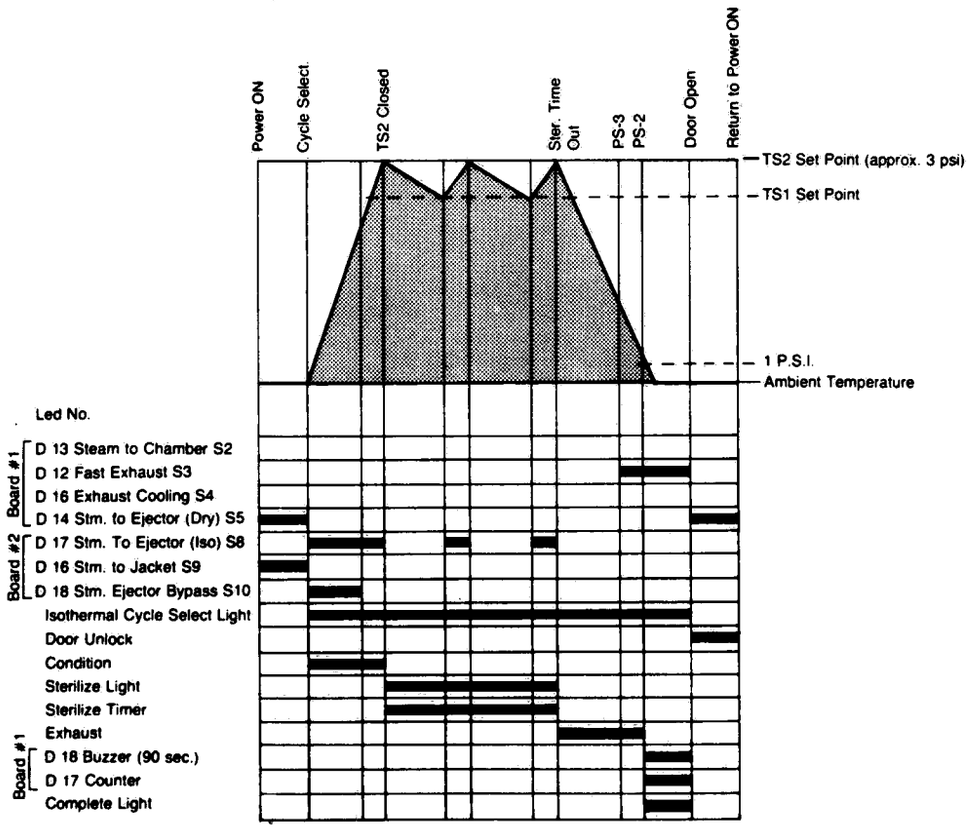
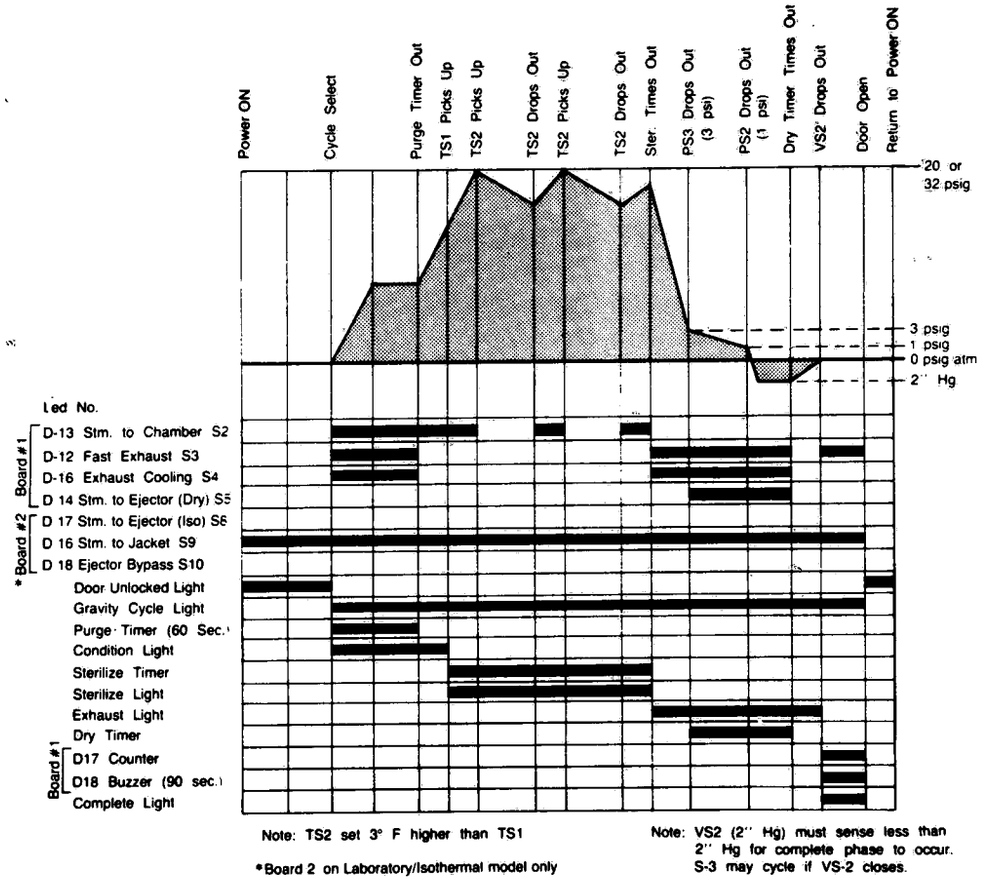


Figure 6-1. CYCLE GRAPH: Isothermal Cycle.

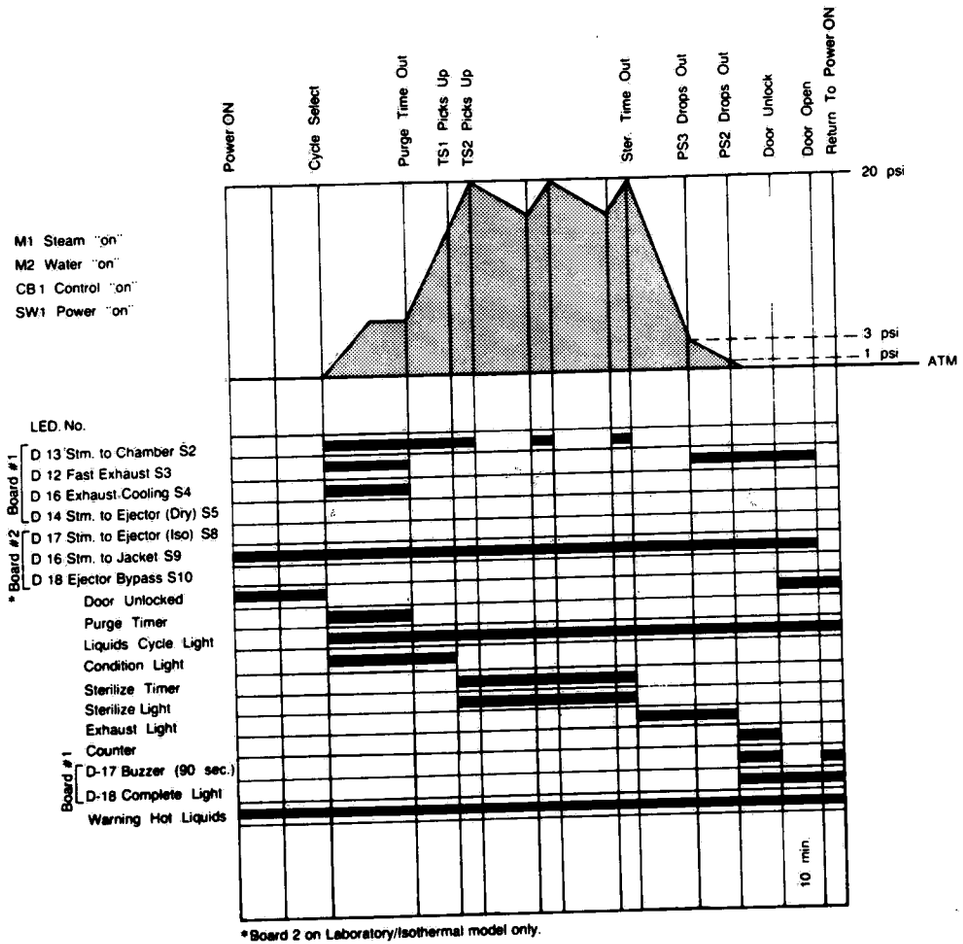


Note: TS2 set 3° F higher than TS1

*Board 2 on Laboratory/Isothermal model only

Note: VS2 (2" Hg) must sense less than 2" Hg for complete phase to occur. S-3 may cycle if VS-2 closes.

Figure 6-2. CYCLE GRAPH: Gravity Cycle.



*Board 2 on Laboratory/Isothermal model only.

Figure 6-3. CYCLE GRAPH: Liquids Cycle.

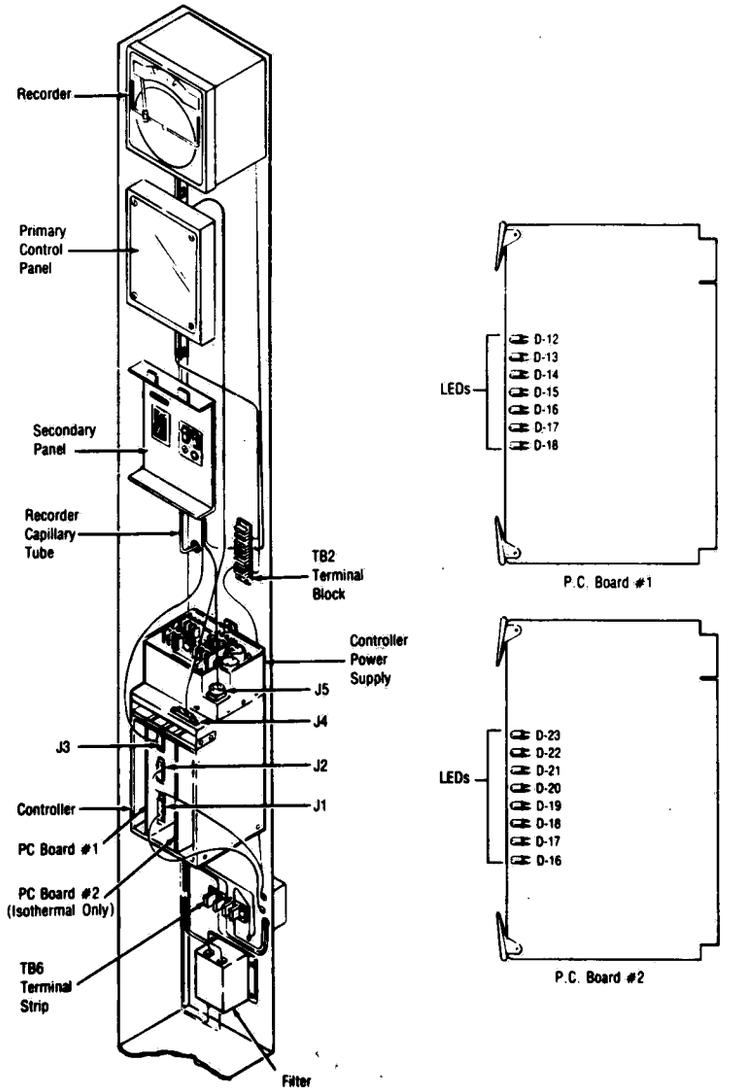


Figure 6-4. CIRCUIT BOARDS WITH LEDs.

6.3 THE TROUBLESHOOTING CHART — EXPLANATION OF ITS CONTENTS

COLUMN HEADING	EXPLANATION
OPERATIONAL STATUS	Select a symptom from this column that most nearly corresponds with the position to which the sterilizer cycle progressed before the trouble occurred.
TROUBLE	Select the problem you think is most appropriate to the particular trouble symptom. The examples are presented in cycle sequence.
POSSIBLE CAUSE AND/OR 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 TO FIND ITEMS IN MANUAL	Location of applicable instructions and/or illustrations are provided in this area. The illustrations are identified by figure number, paragraph or table number.

TABLE 6-1. TROUBLESHOOTING CHART (IRC)

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Before beginning cycle	1. A. No 120 facility power	1) Check main power source or check 120 VAC between TB6 terminals 1 and 2 — connect or turn on. **NOTE:** If facility power will not reset, isolate and repair short between facility power source and sterilizer.	Fig. 8-49
		2) Circuit breaker CB-2 (RESET circuit breaker on secondary panel) tripped — push to reset. **NOTE:** If breaker will not reset, see item 1.B under TROUBLE in this table.	Fig. 8-49
		3) Control switch CB-1 (CONTROL switch on secondary panel) tripped — reset to ON. **NOTE:** If switch will not remain on, see item 1.C in this table.	Fig. 8-49
		4) Power switch SW-1 (POWER switch on secondary panel) off or defective — turn on; with facility power removed, check switch with ohmmeter and replace if necessary.	Fig. 8-16, 14 or Fig. 8-18, 21
		5) Defective line filter (PF-1).	Fig. 8-11, 11

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued		5 a) Check 120 VAC between filter contacts Load 1 and Line 2 with CB-2 tripped. Replace filter if necessary.	Fig. 8-49
		5 b) Check zero VAC between filter contacts Load-2 and Line-2 with CB-2 energized. Replace filter if necessary.	Fig. 8-49
	1. B. Circuit breaker CB-2 (reset circuit breaker on secondary panel) will not reset	1) Short circuit. With CB-1 off, try to reset CB-2. If CB-2 resets, see next step below, 1.B.2. If CB-2 does **not** reset, see step 1.B.6.	Fig. 8-49
		2) With CB-1 on, remove P1 and try to reset CB-2. If CB-2 resets, see step 1.B.5. If CB-2 does **not** reset, see next step, 1.B.3. Replace P1.	Fig. 8-49
		3) With CB-2 off, remove PC board 1 from controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does **not** reset, see next step, 1.B.4.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
		4) With CB-2 off, disconnect P5 from power supply. Try to reset CB-2. If CB-2 resets, replace power supply. If CB-2 does **not** reset, isolate and repair short between P5 and CB-1.	Fig. 8-49
		5) With CB-2 off, disconnect P1 from controller. Try to reset CB-2. If CB-2 resets, isolate and repair short between P1 and a solenoid valve, the counter, or the buzzer. If CB-2 does **not** reset, see next step, 1.B.6.	Fig. 8-49 Fig. 8-16 or 8-18
		6) With CB-2 off, remove PC board 1 from the controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does **not** reset, reinstall PC board 1, and see next step, 1.B.7.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
		7) Lab/Iso Model Only — With CB-2 off, remove PC board 2 from controller. Try to reset CB-2. If CB-2 resets, replace board 2. If CB-2 does **not** reset, replace controller power supply.	Fig. 8-49 Fig. 8-15, 15 Para. 7.12

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued		8) Disconnect wire #1 connecting CB-2 and TB3 terminal 1. Try to reset CB-2 with CB-1 off. If CB-2 resets, isolate and repair short in recorder circuits. If CB-2 does **not** reset, replace CB-2.	Fig. 8-49 Fig. 8-16, 7 or Fig. 8-18, 8
	1. C. Control switch CB-1 will not set to ON	1) Control switch CB-1 defective. With CB-1 off, disconnect connector P5 from power supply. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace CB-1. If CB-1 can be positioned on, see 1.C.2 below, and reconnect P5 with CB-1 off.	Fig. 8-49 Fig. 8-16, 13 or Fig. 8-18, 12
		2) Short circuit on 5 VDC buss, or defective power supply.	
		2 a) With CB-1 off, disconnect PC boards 1 and 2 (Isothermal Model only) and disconnect connector P3 from controller. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace power supply. If CB-1 can be positioned on, see next step, 1.C.2b.	Fig. 8-49 Fig. 8-15, 1 Para. 7.12
		2 b) With CB-1 off, replace PC board 1. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 1. If CB-1 can be positioned on, see next step, 1.C.2c.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
		2 c) Lab/Iso Model Only — With CB-1 off, reconnect PC board 2. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 2. If CB-1 can be positioned on, see next step, 1.C.2d.	Fig. 8-49 Fig. 8-15, 15
		2 d) With CB-1 off, reconnect P3 to controller. Disconnect P16 from primary panel. Try to position CB-1 on. If CB-1 **cannot** be positioned on, isolate and repair short between P3 pin 27 and other wire in the same harness. If CB-1 can be positioned on, replace primary panel.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12
2. Before beginning cycle; POWER & CONTROL switches on	2. A. Primary panel remains completely dark	1) Loss of all power — see TROUBLE item 1. A. for checks and remedies.	
		2) P5 on control power supply disconnected or pins loosely connected — check and reconnect.	Fig. 8-49

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		3) P16 disconnected or loosely connected — reconnect.	Fig. 8-10, 24
		4) Control power supply defective — check for 5 VDC and 28 VDC and replace power supply if necessary.	Fig. 8-15, 1
		5) Disconnect P16 from primary panel. Check 28 VDC between pins 35 and 14. Check 5 VDC between pins 24 and 14. If voltages check good, replace primary panel. If voltages are not present, repair P16 wire harness.	Fig. 8-10, 24
	2. B. Primary panel remains dark except for timer	1) Loss of 28-VDC. Check 28-VDC power supply output. Check 28 volt fuse.	Fig. 8-15, 1
		CAUTION: If output is not present, make short circuit test between pins 6 and 2 of receptacle J10 on Mother Board before connecting new power supply. If short circuit is found it must be isolated and repaired prior to connecting new supply.	Fig. 8-15
		2) Open circuit. Disconnect P16 from panel and check 28 VDC between pins 35 and 14. If voltage check good, replace primary panel. If voltage is not present, repair P16 wire harness.	Fig. 8-10, 24 Para. 7.12
	2. C. One or more legends on primary panel fail to light	1) Lamp burned out. Check with ohmmeter, and replace if necessary.	Fig. 8-10, 24 Para. 7.12
		2 a) Primary panel logic card defective. Check voltage across lamp socket. If it is 28 VDC, replace primary panel. If it is zero, see step below, 2.C.2b.	Fig. 8-10, 24 Para. 7.12
		2 b) Reinstall lamp and check VDC from lamp socket to TB2, terminals 3, 4, or 5. If it is zero, replace primary panel. If it is 28 VDC, see step below, 2.C.2c.	Fig. 8-49
		2 c) Disconnect P3 from controller. Check VDC between J3, pin 28 and pin applicable for malfunctioning lamp. If it is zero, replace primary panel. If it is 28 VDC, see step below, 2.C.3.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		3) Disconnect P16 from primary panel and check continuity between P16 and P3 on pins applicable for malfunctioning lamp. If okay, replace primary panel. Otherwise isolate and repair open in cable.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12
	2. D. One or more legends on primary panel lit when should be off	1) Control system did not reset — push cycle RESET pushbutton. **NOTE:** If system does not reset see TROUBLE symptom 2.F below.	Fig. 8-49
		2) Primary panel logic card defective. Disconnect P3 from controller. If light goes out, replace primary panel. If light remains on, see next step, 2.D.3.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12
		3) Short circuit. Isolate and repair short in either wire harness or primary panel. Disconnect P16 from primary panel as required. Replace primary panel if necessary.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12
	2. E. Incorrect timer display	1) See Timer Display Checkout and Correction Charts, paragraph 6.4, following this Troubleshooting Chart.	Table 6-4
	2. F. Unable to reset system	1) Open circuit. Disconnect P4 from controller and make continuity check between pins 8 and 1 with RESET button (CB-2) pressed and released. If continuity is present with switch actuated, replace controller PC board 1. If continuity is not present, see next step, 2.F.2.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
		2) Make continuity check across contacts of RESET switch (CB-2). If continuity is present, isolate and repair open in P4 wire harness. If continuity is not present, replace switch.	Fig. 8-17 or Fig. 8-19
	2. G. Unable to select cycle	1) No DOOR LOCKED signal.	
		1 a) Adjust or replace door lock switch as required.	Fig. 8-23 Para. 5.7
		1 b) Disconnect P2 from controller and check continuity between Pin J and TB2 terminals 3, 4, or 5. If continuity is present, replace controller PC board 1. If continuity is not present, see next step, 2.G.1c.	Fig. 8-49 Fig. 8-15, 8

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		1 c) Check continuity across contacts of door lock switch(es). If continuity is present, isolate and repair open in P2 wire harness. If continuity is not present, adjust or replace door lock switch as required.	Fig. 8-23 Para. 7.13
		2) Controller PC board 1 defective. Disconnect P3 from controller and check continuity between pin applicable to specific switch and TB2 terminal 3, 4, or 5. If continuity is present, replace controller PC board 1. If continuity is not present, see next step, 2.G.3.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
		3) Cycle select switch defective or open wire. Disconnect P16 from primary panel and check continuity between J16 pin applicable to specific switch and pin 34. If continuity is present, isolate and repair open in P3 wire harness. If continuity is not present, replace primary panel.	Fig. 8-49 Fig. 8-10, 24 Para. 7.12
	2. H. Jacket pressure does not rise to required level	1) Steam supply less than 50 psig minimum — check supply pressure and increase if necessary.	Fig. 8-25, 2
		2) HI-LO steam control valve malfunctioning — adjust, repair, or replace as necessary.	Fig. 8-32, 6 Para. 7.10
		3) Manual STEAM supply valve malfunctioning — repair or replace, as necessary.	Fig. 8-32, 3 Para. 7.11
		4) Jacket return steam trap malfunctioning — replace.	Fig. 8-31, 11 Para. 7.6
		5) Steam supply strainer plugged — clean.	Fig. 8-32, 1 Para. 7.7
		6) Lab/Iso Model Only — Jacket steam supply valve (S-9) not operating correctly (should be open) — repair or replace valve; check wiring to valve, repair if necessary; check D16 LED on PC board 2, replace board if light not on; if light is on, replace board 2, or complete control assembly.	Fig. 7-10 Fig. 8-28, 2 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		7) Electric steam generator (if supplied) not operating correctly — possible causes and corrections are as follows:	

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		7 a) Building water supply valve closed — open.	
		7 b) Strainer in generator water supply line clogged — clean.	Fig. 8-54, 25
		7 c) Check valve in water inlet line defective — replace.	Fig. 8-53, 6 or 7
		7 d) Generator liquid level fuse defective — replace.	Fig. 8-55, 1
		7 e) Heating element fuses or fuse connections defective — replace.	Fig. 8-55, 5
		7 f) Points, connections, or magnetic contactor is defective — repair or replace.	Fig. 8-55, 4
		7 g) Heating element is defective — replace.	Fig. 8-55, 5
		7 h) Water-level switch is defective — replace.	Fig. 8-57
		7 i) Relay in water-level control is defective — replace.	Fig. 8-57, 6
		7 j) Hot water solenoid valve is clogged or defective — clean or replace.	Fig. 8-53, 4 Para. 7.5
	2. I. Steam enters chamber while door is open	1) Manual operating valve (if supplied) improperly adjusted or malfunctioning — turn valve to OFF; adjust, repair, or replace multiport valve.	Fig. 8-46 Fig. 7-10
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be closed) — check valve for leak, replace if necessary; check D13 LED on PC board 1, replace board if LED on.	Fig. 8-25, 11 Para. 7.5 Fig. 8-15, 8 Para. 7.12
3. During a cycle	3. A. Jacket pressure not zero on an isothermal cycle (Laboratory/Isothermal model only)	1) Jacket supply valve (S-9) not operating correctly (should be closed) — check valve for leak, repair or replace; check D16 LED on PC board 2, replace board if LED on; disconnect J1 from control assembly and observe valve: if valve closes, either replace circuit board or entire control assembly; if valve remains open, recheck (1) immediately above, or look for short in wiring to valve.	Fig. 7-10 Fig. 8-28, 2 Para. 7.5 Fig. 8-15, 15 Para. 7.12

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued	3. B. Chamber temperature does not rise to recorder setting	1) Settings on recorder and HI-LO valve do not correspond — set recorder and valve properly.	Section 2
		2) Settings on recorder and generator (if supplied) pressure switch do not correspond — set recorder and switch properly.	Fig. 8-53, 3
		3) Chamber drain solenoid valve (S-3) not operating correctly (should be closed). Repair or replace valve — check manual operation. Check LED D-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-38, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		4) Chamber drain line or strainer plugged — clean line or strainer.	Fig. 8-38
		5) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-38, 14. Para. 7.6
	3. C. Steam does not enter chamber in sterilize phase	1) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open).	Fig. 7-10 Fig. 8-25, 11
		1 a) Repair or replace valve.	Para. 7.5
		1 b) Check wiring to valve — repair or replace.	
		1 c) Check LED D-13 on PC board 1 — should be on. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		1 d) 1b and 1c ok — replace PC board 1.	Fig. 8-15, 8
		2) Steam-to-ejector solenoid valve (S-8) not operating correctly (Laboratory/Isothermal model only) — valve should be open.	Fig. 7-10 Fig. 8-28, 6
		2 a) Repair or replace valve.	Para. 7.5
		2 b) Check wiring to valve — repair or replace.	
		2 c) Check LED D-17 on PC board 2 — should be on. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		2 d) 1b and 1c ok — replace PC board 1.	Fig. 8-15, 8

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		3) No pressure in chamber jacket (check pressure gauge) — see 2. H. above, "Jacket pressure does not rise ..."	
		4) Isothermal ejector plugged — repair or replace.	Fig. 8-28, 15
	3. D. Chamber pressure does not rise during sterilize phase	1) Chamber drain valve (S-3) not closed or leaking. Repair or replace valve — check manual operation. Check LED-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-38, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open). See 3.C.1, above.	Fig. 7-10 Fig. 8-25, 11 Para. 7.5
		3) No pressure in jacket. See 2.H, above.	
	3. E. Chamber pressure and temperature drop during cycle	1) Steam supply pressure erratic — check steam supply.	
		2) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-38, 14 Para. 7.6
		3) Chamber drain solenoid valve (S-3) not operating correctly (should be closed). Repair or replace valve — check manual operation. Check LED-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-38, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		4) Electric steam generator (if supplied) not operating correctly — see 2. H., above, step 7.	
	3. F. Pressure too high, temperature too low during sterilize phase	1) Air trapped in chamber because of clogged strainer or drains — clean strainer inside chamber, flush and clean drain line and traps.	Fig. 8-38, 3 Para. 4.3
		2) Chamber trap defective — replace element.	Fig. 8-38, 14 Para. 7.6
	3. G. Steam blows out around door during sterilize phase	1) Door gasket worn or defective — replace.	Fig. 8-22, 1 Para. 7.3
	3. H. Excessive steam in area during cycle	1) Strainer in cold water line clogged — clean.	Fig. 8-33, 16 Para. 7.7

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		2) Insufficient flow through cooling water flow control valve — clean, adjust, repair or replace flow control valve.	Para. 5.4
		CAUTION: If safety valve is found to be defective, do not attempt to repair. Replace with new valve.	
		3) Safety valve popping or bleeding — check for source of excessive pressure.	Fig. 8-25, 16
		4) Leaking steam valve — check valves and piping for leaks, repair.	Fig. 8-42 Para. 7.11
		5) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 7-10 Fig. 8-33, 2
		5 a) Repair or replace valve.	Para. 7.5
		5 b) Check wiring to valve — repair or replace.	
		5 c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		5 d) 5b and 5c ok — replace PC board 1.	Para. 7.12
	3. I. Steam and/or condensate leaking around door lock clutch rod	1) Steam lock diaphragm cracked or diaphragm gasket faulty — replace diaphragm or gasket.	Fig. 8-21, 5 Para. 7.3
	3. J. Safety valve pops or bleeds excessively	1) HI-LO steam control valve improperly adjusted or malfunctioning — adjust, repair, or replace valve.	Fig. 8-40 Para. 7.15 Para. 7.10
		2) Safety valve defective — replace.	Fig. 8-25, 16
4. During "DRY" part of Exhaust phase — Gravity cycle only	4. A. Dry timer does not start and cooling water valve (S-4) does not close in exhaust phase	1) Pressure switch PS-3 defective or malfunctioning — reset to 3 psig or replace.	Para. 7.14
		2) Disconnect P2 from controller and check continuity between pin L and TB2 terminals 3, 4, or 5 — If ok, replace PC board 1. Otherwise, isolate and repair wiring or replace switch.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
4. Continued	4. B. Dry timer starts and cooling water valve closes immediately after sterilize phase	Refer to Step A.	
5. During Exhaust phase of Liquids cycle	5. A. Slow exhaust too rapid — solutions spill or pop caps	1) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-38, 14 Para. 7.6
		2) Slow exhaust valve malfunctioning — clean, adjust, repair or replace valve.	Para. 5.4
		3) Pressure switch PS-3 misadjusted or defective — reset to 4 psig or replace.	Para. 7.14
		4) Open or shorted wire — disconnect P2 from controller, check continuity between pin L and TB2 terminals 3, 4, or 5. If okay, replace PC board 1. Otherwise isolate and repair wiring or replace switch.	Fig. 8-49 Fig. 8-15, 8 Para. 7.12
6. At end of cycle	6. A. Cycle fails to reach COMPLETE after exhaust completed, or signals COMPLETE too soon	1) Pressure switch PS-2 or vacuum switch VS-2 defective — reset, respectively, to 2 psig or 2" Hg or replace.	Para. 7.14
		2) Open or shorted wire — disconnect P2 from controller and check continuity of pressure and vacuum switch circuits, i.e., between pins T and K and applicable TB-2 terminals. See electrical schematic for test points.	Fig. 8-49
	6. B. Buzzer does not sound when COMPLETE light is on	1) Buzzer defective — check voltage across buzzer, replace if necessary.	Fig. 8-16, 4 or Fig. 8-18, 5
		2) Open wire — disconnect P1 from control and check continuity between pin W and TB3 terminal 2. Isolate and repair.	Fig. 8-17 or Fig. 8-19
		3) P.C. board defective — check D-18 LED on board; replace PC board 1 if LED does not come on at end of cycle.	Fig. 8-15, 8 Para. 7.12
	6. C. Doors can be unlocked but cannot be opened when the buzzer sounds	1) Vacuum in chamber caused by faulty check valve in vacuum break line — replace check valve.	Fig. 8-34, 6
		2) Vacuum break line plugged — clean or replace plugged components in line.	Fig. 8-34

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		3) Vacuum switch VS-2 out of adjustment or defective — reset VS-2 to 0-1" Hg, or replace.	Para. 7.14
	6. D. Excessive steam when door is opened or excessive effort needed to unlock door when buzzer sounds	1) Pressure switch PS-2 out of adjustment or defective — reset PS-2 to 1-2 psig or replace.	Para. 7.14
	6. E. Goods are wet after completion of "Gravity" cycle, or excessive vapor in chamber when door is opened	1) Vacuum break line plugged — clean or replace filter.	Fig. 8-34, 1 Para. 7.4
		2) Check valve in drain line defective — replace.	Fig. 8-38, 18
		3) Steam ejector solenoid valve (S-5) not operating correctly (should be open for drying time).	Fig. 7-10 Fig. 8-31, 2
		3 a) Repair or replace valve.	Para. 7.5
		3 b) Check wiring to valve — repair or replace.	
		3 c) Check LED D-14 on PC board 1 — should be on for drying time. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		3 d) 3b and 3c ok — replace PC board 1.	Fig. 8-15, 8
		4) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 7-10 Fig. 8-33, 2
		4 a) Repair or replace valve.	Para. 7.5
		4 b) Check wiring to valve — repair or replace.	
		4 c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		4 d) 4b and 4c ok — replace PC board 1.	Para. 7.12
	6. F. Water in chamber or door channel at end of cycle	1) Chamber drain valve (S-3) not operating correctly (should be open during exhaust and dry).	Fig. 7-10 Fig. 8-38, 3

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		1 a) Repair or replace valve.	Para. 7.5
		1 b) Check wiring to valve — repair or replace.	
		1 c) Check LED D-12 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		1 d) 1b and 1c ok — replace PC board 1.	
		2) Steam ejector solenoid valve (S-5) not operating correctly (should be open for drying time). See 6.E.3, above.	Fig. 7-10
		3) Cold chamber floor caused by condensate accumulating in lower jacket — check return line strainer and clean if necessary; check operation of jacket return trap and replace trap if necessary; check for back pressure on return steam line, locate source and eliminate.	Fig. 8-31, 8 & 11 Para. 7.6 Para. 7.7
		4) Chamber floor not pitched toward drain — see leveling procedure, paragraph 5.3.	
		5) Drains plugged or clogged — see drain cleaning procedure, paragraph 4.3.	
		6) Chamber steam trap does not open — replace trap element.	Fig. 8-38, 14 Para. 7.6
		7) Steam not "dry" — check steam quality.	
		8) Drain line check valve defective — replace.	Fig. 8-38, 18
	6. G. Cycle counter fails to update on cycle complete	1) Counter defective — check voltage across counter and replace, if necessary.	Fig. 8-16, 15 or Fig. 8-18, 20
		2) Open wire — disconnect P1 from control and check continuity between pin P and TB3 terminal 2. Isolate and repair open.	Fig. 8-49 Fig. 8-17 or Fig. 8-19
		3) PC board 1 defective — check D-17 LED on board: replace board if LED does not come on at end of cycle.	Fig. 8-15, 8 Para. 7.12

TABLE 6-1. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
7. Miscellaneous	7. A. Continuous sounding buzzer whenever machine is turned on	1) Excessive current leakage from triac — bend buzzer clapper away from coil until buzzing stops.	Fig. 8-16, 4

TABLE 6-2. TROUBLESHOOTING CHART (PRINTCON).

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Before beginning cycle	1. A. No 120 facility power — primary panel and digital display completely blank	1) Check main power source or check 120 VAC between TB6 terminals 1 and 2 — connect or turn on. **NOTE:** If facility power will not reset, isolate and repair short between facility power source and sterilizer.	Fig. 8-77
		2) Circuit breaker CB-2 (RESET circuit breaker on secondary panel) tripped — push to reset. **NOTE:** If breaker will not reset, see item 1. B under TROUBLE in this table.	Fig. 8-77
		3) 125 volt fuse in power supply (F402) blown — check.	Fig. 8-15
		4) Power switch SW-1 (POWER switch on secondary panel) off or defective — turn on; with facility power removed, check switch with ohmmeter and replace if necessary.	Fig. 8-16, 14 or Fig. 8-18, 21
		5) Defective line filter (PF-1).	Fig. 8-61, 11
		5 a) Check 120 VAC between filter contacts Load 1 and Line 2 with CB-2 tripped. Replace filter if necessary.	Fig. 8-77
		5 b) Check zero VAC between filter contacts Load-2 and Line-2 with CB-2 energized. Replace filter if necessary.	Fig. 8-77
	1.B. Circuit breaker CB-2 (reset circuit breaker on secondary panel) will not reset	1) Short circuit. With CB-1 off, try to reset CB-2. If CB-2 resets, see next step below, 1.B.2. If CB-2 does not reset, replace CB-2.	Fig. 8-77

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued		2) With CB-1 on, remove P1 and try to reset CB-2. If CB-2 resets, see step 1.B.5. If CB-2 does **not** reset, see next step, 1.B.3. Replace P1.	Fig. 8-77
		3) With CB-2 off, remove PC board 1 from controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does **not** reset, see next step, 1.B.4.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12
		4) With CB-2 off, disconnect P5 from power supply. Try to reset CB-2. If CB-2 resets, replace power supply. If CB-2 does **not** reset, isolate and repair short between P5 and CB-1.	Fig. 8-77
		5) With CB-2 off, disconnect P1 from controller. Try to reset CB-2. If CB-2 resets, isolate and repair short between P1 and a solenoid valve, the counter, or the buzzer. If CB-2 does **not** reset, see next step, 1.B.6.	Fig. 8-77 Fig. 8-16 or 8-18
		6) With CB-2 off, remove PC board 1 from the controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does not reset, reinstall PC board 1, and see next step, 1.B.7.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12
		7) Lab/Iso Model Only — With CB-2 off, remove PC board 2 from controller. Try to reset CB-2. If CB-2 resets, replace board 2. If CB-2 does **not** reset, replace controller power supply.	Fig. 8-77 Fig. 8-15, 15 Para. 7.12
	1.C. Control switch CB-1 will not set to ON	1) Control switch CB-1 defective. With CB-1 off disconnect connector P5 from power supply. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace CB-1. If CB-1 can be positioned on, see 1.C.2 below, and reconnect P5 with CB-1 off.	Fig. 8-77 Fig. 8-16, 13 or Fig. 8-18, 12
		2) Short circuit on 5 VDC bus, or defective power supply.	Fig. 8-77
		2a) With CB-1 off, disconnect PC boards 1 and 2, disconnect P3 connector from controller and unplug P48 connector from main Printcon PC board. Try to position CB-1 on. If CB-1 **cannot** be positioned on, proceed to step 1.C.3). If CB-1 can be positioned on, see next step, 1.C.2b).	Fig. 8-77 Fig. 8-15, 1 Para. 7.12

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued		2b) With CB-1 off, replace PC board 1. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 1. If CB-1 can be positioned on, see next step, 1.C.2c.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12
		2c) Lab/Iso Model Only — With CB-1 off, reconnect PC board 2. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 2. If CB-1 can be positioned on, see next step, 1.C.2d.	Fig. 8-77 Fig. 8-15, 15
		2d) With CB-1 off, reconnect P3 to controller. Try to position CB-1 on. If CB-1 **cannot** be positioned on, isolate and repair short between P3 pin 27 and other wire in the same harness. If harness checks good, replace primary panel. If CB-1 can be positioned on, see next step 1.c.2e.	Fig. 8-77 Fig. 8-10B, 13 Para. 7.12
		2e) Short circuit on 5 VDC bus within digital display PC board. Reconnect P48 plug to main Printcon PC board. Disconnect plug P45 at main Printcon PC board. If CB-1 will set to on, replace the display PC board; if CB-1 will **not** be positioned to on, see next step, 1.C.2f.	Fig. 8-64, 3 and 11
		2f) Short circuit on 5 VDC bus within main Printcon PC board. Unplug plug P48 from main Printcon board. If CB-1 will set to on, replace this board.	Fig. 8-64, 3
		3) Fuse F3 (125 V, 1/2 A) in power supply blown — check. If OK, replace power supply.	Fig. 8-65
2. Before beginning cycle; POWER & CONTROL switches on	2.A. Primary panel remains completely dark	1) Loss of all power — see TROUBLE item 1.A. for checks and remedies.	
		2) P5 on control power supply disconnected or pins loosely connected — check and reconnect.	Fig. 8-77
		3) P16 disconnected or loosely connected — reconnect.	Fig. 8-61, 13
		4) Control power supply defective — check for 5 VDC and 28 VDC and replace power supply if necessary.	Fig. 8-15, 1
		5) Disconnect P16 from primary panel. Check 28 VDC between pins 35 and 14. Check 5 VDC between pins 24 and 14. If voltages check good, replace primary panel. If voltages are not present, repair P16 wire harness.	Fig. 8-61, 13

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued	2.B. Primary panel remains dark except for timer numbers	1) Loss of 28 VDC. Check 28 VDC power supply output at test-point 4 (TP-4) in power supply. Check fuse F4 in power supply and replace if necessary.	Fig. 8-15, 1
		CAUTION: If outout is not present, make short circuit test between pins 6 and 2 of receptacle J10 on Mother Board before connecting new power supply. If short circuit is found it must be isolated and repaired prior to connecting new supply.	Fig. 8-15, 4
		2) Open circuit. Disconnect P16 from panel and check 28 VDC between pins 35 and 14. If voltage check good, replace primary panel. If voltage is not present, repair P16 wire harness.	Fig. 8-61, 13 Para. 7.12
		3) Defective power supply. Replace.	
	2.C. Printcon display is dark, and Printcon buzzer sounds	1) P45 connector on display PC board disconnected or loosely connected — reconnect.	Fig. 8-64, 11
		2) Power Supply F2 fuse blown — replace.	Fig. 7-29
	2.D. One or more legends on primary panel fail to light	1) Lamp burned out. Check with ohmmeter, and replace if necessary.	Fig. 8-61, 13 Para. 7.12
		2a) Primary panel logic card defective. Check voltage across lamp socket. If it is 28 VDC, replace primary panel. If it is zero, see step below, 2.D.2b.	Fig. 8-61, 13 Para. 7.12
		2b) Reinstall lamp and check voltage from lamp socket to TB2, terminals 3, 4, or 5. If it is zero, replace primary panel. If it is 28 VDC, see step below, 2.D.2c.	Fig. 8-77
		2c) Disconnect P3 from controller. Check voltage between J3, pin 28 and pin applicable for malfunctioning lamp. If it is zero, replace primary panel. If it is 28 VDC, see step below, 2.D.3.	Fig. 8-77 Fig. 8-61, 13 Para. 7.12

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		3) Disconnect P16 from primary panel and check continuity between P16 and P3 on pins applicable for malfunctioning lamp. If okay, replace primary panel. Otherwise isolate and repair open in cable.	Fig. 8-61, 13 Para. 7.12
	2.E. One or more legends on primary panel lit when should be off	1) Control system did not reset — push cycle RESET pushbutton. **NOTE:** If system does not reset, see TROUBLE symptom 2.F below.	Fig. 8-77
		2) Primary panel logic card defective. Disconnect P3 from controller. If light goes out, replace primary panel. If light remains on, see next step, 2.E.3.	Fig. 8-77 Fig. 8-61, 13 Para. 7.12
		3) Short circuit. Isolate and repair short in either wire harness or primary panel. Disconnect P16 from primary panel as required. Replace primary panel if necessary.	Fig. 8-77 Fig. 8-61, 13 Para. 7.12
	2.F. Missing segment of digital LED on digital display panel on "power up" lamp test.	1) Burned out. Replace display PC board.	Fig. 8-64, 11
	2.G. Digital display is blank, printer is inoperative, and cycle will not run.	1) P48 unplugged from main Printcon PC board — reconnect.	Fig. 8-64, 3
		2) See step 2.C.2) above.	
	2.H. Incorrect timer display ("Sterilize" or "Dry")	1) See Timer Display Checkout and Correction Charts, paragraph 6.4, following this Troubleshooting Chart.	Table 6-4
	2.I. Temperature display does not match thumbwheel switch when changed	1) Temperature thumbwheel(s) shorted or open, or series diode open or shorted. See Temperature Thumbwheel checkout.	Para. 6.5
		2) Component failure on display PC board. Replace PC board.	Fig. 8-64, 11 Table 6-8
	2.J. Buzzer sounds and set temperature is continuously displayed	1) Temperature setting incorrect — reset temperature thumbwheel switches.	Section 2

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		2) J52/P52 connector on the display PC board disconnected or loosely connected — reconnect.	Table 6-8 Fig. 8-64, 11
		3) If display does not match thumbwheel setting, see 2.I above.	
	2.K. ALARM: TEMP SENSOR printed when power is turned on, buzzer sounds intermittently, and 306.8 F is displayed	1) Temperature probe or cable shorted — unplug P47 from jack on main Printcon PC board. Measure resistance between pins 13 and 31 on the plug. At 70-80 F, resistance should be 115-120 ohms. If okay, proceed.	Table 6-8 Fig. 8-64, 3 Fig. 8-74, 9 Note #1, Pg. 6-38
		2) Plug P47 is miswired.	
		3) Component failure on main Printcon PC board — replace.	Fig. 8-64, 3 Table 6-8
		4) Position 4 of Service Switch is in OFF position.	Para. 7.20
	L. ALARM: PRES SENSOR printed when power is turned on and buzzer sounds intermittently	1) Temperature probe or cable open. See 2.K.1 above.	Table 6-8 Fig. 8-74, 9
		2) Extreme misalignment of main Printcon PC Board — check alignment.	
		3) J47 unplugged from main Printcon PC Board.	
		4) Component failure on main Printcon PC Board — replace.	Table 6-8
		5) Pressure sensor or cable shorted or open — measure output.	Fig. 8-74, 10
		6) Position 4 of Service Switch is in OFF position.	Para. 7-20

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued	2.M. Unable to reset system	1) Open circuit. Disconnect P4 from controller and make continuity check between pins 8 and 1 with RESET button (CB-2) pressed and released. If continuity is present with switch actuated, replace controller PC board 1. If continuity is **not** present, see next step.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12
		2) Make continuity check across contacts of RESET switch (CB-2). If continuity is present, isolate and repair open in P4 wire harness. If continuity is **not** present, replace switch.	Fig. 8-67 or Fig. 8-68
		3) Printer malfunction.	
		4) Temperature probe or pressure transducer malfunction.	
	2.N. Unable to select cycle	1) See 2.J. above.	
		2) No DOOR LOCKED signal.	
		2a) Adjust or replace door lock switch as required.	Fig. 8-23 Para. 5.7
		2b) Disconnect P2 from controller and check continuity between Pin J and DC common (TP7, Power Supply). If continuity is present, replace controller PC board 1. If continuity is **not** present, see next step.	Fig. 8-77 Fig. 8-15, 8
		2c) Check continuity across contacts of door lock switch(es). If continuity is present, isolate and repair open in P2 wire harness. If continuity is not present, adjust or replace door lock switch as required.	Fig. 8-23 Para. 7.13
		3) Controller PC board 1 defective. Disconnect P3 from controller and check continuity between pin applicable to specific switch and DC common (TP7, Power Supply) while pressing switch. If continuity is present, replace controller PC board 1. If continuity is not present, see next step.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		4) Cycle select switch defective or open wire. Disconnect P16 from primary panel and check continuity between J16 pin applicable to specific switch and pin 34 while pressing switch. If continuity is present, isolate and repair open in P3 wire harness. If continuity is not present, replace primary panel.	Fig. 8-77 Fig. 8-10 Para. 7.12
		5) See 2.K through 2.M above.	
	2.O. Cycle will not run. Reset not printed out	1) P40 unplugged from main Printcon PC board — reconnect.	Table 6-8
	2.P. Jacket pressure does not rise to required level	1) Steam supply less than 50 psig minimum — check supply pressure and increase if necessary.	Fig. 8-34
		2) HI-LO steam control valve malfunctioning — adjust, repair, or replace as necessary.	Fig. 8-34, 6 Fig. 8-40
		3) Manual STEAM supply valve malfunctioning — repair or replace, as necessary.	Fig. 8-46
		4) Jacket return steam trap malfunctioning — replace.	Fig. 8-33, 11 Para. 7.6
		5) Steam supply strainer plugged — clean.	Fig. 8-32, 1 Para. 7.7
		6) Lab/Iso Model Only — Jacket steam supply valve (S-9) not operating correctly (should be open) — repair or replace valve; check wiring to valve, repair if necessary; check D16 LED on PC board 2, replace board if light not on; if light is on, replace board 2. **NOTE:** GRAVITY/ISOTHERMAL switch must be in the GRAVITY position.	Fig. 7-10 Fig. 8-28, 2 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		7) Electric steam generator (if supplied) not operating correctly — possible causes and corrections are as follows:	Fig. 8-53
		7a) Building water supply valve closed —open.	

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		7b) Strainer in generator water supply line clogged — clean.	Fig. 8-54, 25
		7c) Check valve in water inlet line defective — replace.	Fig. 8-53, 6 or 7
		7d) Generator liquid level fuse defective — replace.	Fig. 8-57, 1
		7e) Heating element fuses or fuse connections defective — replace.	Fig. 8-57, 5
		7f) Points, connections, or magnetic contactor is defective — repair or replace.	Fig. 8-57, 4
		7g) Heating element is defective — replace.	Fig. 8-57, 7
		7h) Water-level switch is defective — replace.	Fig. 8-57
		7i) Relay in water-level control is defective — replace.	Fig. 8-57, 6
		7j) Hot water solenoid valve is clogged or defective — clean or replace.	Fig. 8-53, 4 Para. 7.5
	2.Q. Steam enters chamber while door is open	1) Manual operating valve improperly adjusted or malfunctioning — turn valve to OFF; adjust, repair, or replace multiport valve.	Fig. 8-46 Fig. 7-10
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be closed) — check check valve for leak, replace if necessary; check D13 LED on PC board 1, replace board if LED on.	Fig. 8-25, 11 Para. 7.5 Fig. 8-15, 8 Para. 7.12
	2.R. "ERROR 1" message is printed when power is turned on	1) A/D converter failure on main Printcon PC board.	Table 6-8
		1a) F3, -12 VDC fuse is open in power supply — check fuse continuity and replace if necessary. If fuse is ok, proceed.	Fig. 8-15, 1
		1b) Component failure on main Printcon PC board — replace board.	Table 6-8

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued	2.S. "ERROR 2" message is displayed momentarily on each attempt to print. and intermittent buzzer sounds.	1) Printer status signal lost.	
		1a) Drag on paper roll — check.	
		1b) F2, +18 volt fuse open in power supply — check fuse for continuity and replace if necessary. If fuse is ok, see 2.S.1c.	Fig. 8-15, 1
		1c) J42 printer connector unplugged or poor contact — check connector on both ends for proper contact and solid connections. If ok, see 2.S.1d.	Table 6-8
		1d) Printer defective — replace.	Fig. 8-65, 22
		2) Printer motor speed adjustment incorrect — adjust potentiometer P10 on main Printcon PC board fully clockwise.	Table 6-8
3. During a cycle	3.A. Jacket pressure not zero on an isothermal cycle (Laboratory/Isothermal model only)	1) Jacket supply valve (S-9) not operating correctly (should be closed) — check valve for leak, repair or replace; check D16 LED on PC board 2, replace board if LED on; disconnect J1 from control assembly and observe valve: if valve closes, either replace circuit board or entire control assembly; if valve remains open, recheck (1) immediately above, or look for short in wiring to valve.	Fig. 7-10 Fig. 8-28, 2 Para. 7.5 Fig. 8-15, 15 Para. 7.12
		2) Jacket trap defective — check.	Fig. 8-31, 11
		3) Jacket strainer plugged — check.	Fig. 8-31, 8
	3.B. Chamber temperature does not rise to Printcon setting, proper message is printed at the start of the cycle.	1) Settings on Printcon and HI-LO valve do not correspond — set Printcon and valve properly.	Section 2
		2) Settings on Printcon and generator (if supplied) pressure switch do not correspond — set Printcon and switch properly.	Fig. 8-53, 3
		3) Chamber drain solenoid valve (S-3) not operating correctly (should be closed). Repair or replace valve — check manual operation. Check LED D-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-73, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		4) Slow exhaust bleed valve too far open — check and reset if necessary.	Fig. 8-73, 26
		5) Chamber drain line or strainer plugged — clean line or strainer.	Fig. 8-73

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		6) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-73, 14 Para. 7.6
		7) Loss of continuity in wire #131 (TS-1).	
		8) TS-1 output drive failure on main Printcon PC board. Wire #131 should switch from 5 VDC to 0 VDC when setting on temperature thumbwheels is achieved.	Table 6-8
		9) Temperature circuitry on main Printcon PC board not correctly adjusted — check.	Table 6-8
		10) TS-1 input failure on Eagle CPU PC board. Check step 7 above before replacing.	Fig. 8-15, 8
		11) Faulty temperature probe — replace.	Fig. 8-74, 9
	3.C. Chamber temperature does not rise to Printcon setting. no message is printed at the start of the cycle. condition lamp and proper solenoids are on.	1) Component failure on main Printcon PC board — replace.	Table 6-8
	3.D. Steam does not enter chamber in sterilize phase	1) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open).	Fig. 7-10 Fig. 8-25, 11
		1a) Repair or replace valve.	Para. 7.5
		1b) Check wiring to valve — repair or replace.	
		1c) Check LED D-13 on PC board 1 — should be on if TS-1 is at 5VDC. Replace board if LED not on. See 3.B.8 and 3.B.10 above.	Fig. 8-15, 8 Para. 7.12
		1d) 1b and 1c ok — replace PC board 1.	Fig. 8-15, 8
		2) Steam-to-ejector solenoid valve (S-8) not operating correctly (Laboratory/Isothermal model only) — valve should be open.	Fig. 7-10 Fig. 8-28, 6
		2a) Repair or replace valve.	Para. 7.5
		2b) Check wiring to valve — repair or replace.	

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		2c) Check LED D-17 on PC board 2 — should be on. Replace board if light not on. (Iso only)	Fig. 8-15, 8 Para. 7.12
		2d) 1b and 1c ok — replace PC board 1.	Fig. 8-15, 8
		3) No pressure in chamber jacket (check pressure gauge) — see 2.S. above, "Jacket pressure does not rise . . ."	
		4) Isothermal ejector plugged — repair or replace.	Fig. 8-28, 15
	3.E. Chamber pressure does not rise during sterilize phase	1) Chamber drain valve (S-3) not closed or leaking. Repair or replace valve — check manual operation. Check LED-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-73, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open). See 3.C.1, above.	Fig. 7-10 Fig. 8-25, 11 Para. 7.5
		3) No pressure in jacket. See 2.S, above.	
		4) See 3.B and 3.D above.	
	3.F. Chamber pressure and temperature drop during cycle	1) Steam supply pressure erratic — check steam supply.	
		2) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-73, 14 Para. 7.6
		3) Chamber drain solenoid valve (S-3) not operating correctly (should be closed). Repair or replace valve — check manual operation. Check LED-12 — if on, replace PC board 1.	Fig. 7-10 Fig. 8-73, 3 Para. 7.5 Fig. 8-15, 8 Para. 7.12
		4) Electric steam generator (if supplied) not operating correctly — see 2.R., above, step 7.	
	3.G. Pressure too high, temperature too low during sterilize phase	1) Air trapped in chamber because of clogged strainer or drains — clean strainer inside chamber, flush and clean drain line and traps.	Fig. 8-73 Para. 4.3
		2) Chamber trap defective — replace element.	Fig. 8-73, 14 Para. 7.6
		3) Improper loading technique or equipment.	

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued	3.H. Steam blows out around door during sterilize phase	1) Door gasket worn or defective — replace.	Fig. 8-22, 1 Para. 7.3
	3.I. Excessive steam in area during cycle	1) Strainer in cold water line clogged — clean.	Fig. 8-33, 16 Para. 7.7
		2) Insufficient flow through cooling water flow control valve — clean, adjust, repair or replace flow control valve.	Para. 5.4
		CAUTION: If safety valve is found to be defective, do not attempt to repair. Replace with new valve.	
		3) Safety valve popping or bleeding — check for source of excessive pressure.	Fig. 8-25, 16
		4) Leaking steam valve — check valves and piping for leaks, repair.	Fig. 8-32 Para. 7.11
		5) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 7-10
		5a) Repair or replace valve.	Para. 7.5
		5b) Check wiring to valve — repair or replace.	
		5c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		5d) 5b and 5c ok — replace PC board 1.	Para. 7.12
	3.J Steam and/or condensate leaking around door lock clutch rod	1) Steam lock diaphragm cracked or diaphragm gasket faulty — replace diaphragm or gasket.	Fig. 8-21, 5 Para. 7.3
	3.K. Safety valve pops or bleeds excessively	1) HI-LO steam control valve improperly adjusted or malfunctioning — adjust, repair, or replace valve.	Fig. 8-40 Para. 7.15 Para. 7.10
		2) Safety valve defective — replace.	Fig. 8-25, 16

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued	3.L. Chamber temperature will not reach CONTROL TEMP. SET TEMP is achieved and CONTROL TEMP is properly printed	1) Regulator on steam line set too low — adjust.	Fig. 8-32
		2) Short to DC Common in Wire #133 (TS-2) — check.	Table 6-8
		3) TS-2 output short on main Printcon PC board. Pin 4, plug 40 should be at 5 VDC until CONTROL TEMP is reached.	Table 6-8
		4) TS-2 input short on Eagle CPU board (146586-XXX)	Fig. 8-15. 8
	3.M. Chamber is **not** controlled at CONTROL TEMP ±1 F. CONTROL TEMP is properly printed.	1) Loss of continuity in wire #133 (TS-2).	Table 6-8
		2) TS-2 input failure on Eagle CPU board (146586-XXX)	Fig. 8-15. 8
		3) TS-2 output failure on main Printcon PC board. Pin 4, plug 40 must switch from 5 VDC to 0 VDC when CONTROL TEMP is achieved, and LED 22, board 1 (S2) will go off.	Table 6-8
4. During "DRY" part of Exhaust phase — Gravity cycle only	4.A. Dry timer does not start and cooling water valve (S-4) does not close in exhaust phase	1) PS-3 setting incorrect — should be 6.	Table 6-8
		2) Loss of continuity in wire #114 (PS-3).	Table 6-8
	4.B. Dry timer starts and cooling water valve closes immediately after sterilize phase	1) See step 4.A.	
5. During Exhaust phase of Liquids cycle	5.A. Slow exhaust too rapid — solutions spill or pop caps	1) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-73, 14 Para. 7.6
		2) Slow exhaust valve malfunctioning — clean, adjust, repair or replace valve.	Para. 5.4
		3) PS-3 setting incorrect — should be 6.	
		4) Open or shorted wire — Disconnect P2 from controller, check continuity between pin L and TB2 terminals 3, 4, or 5. If okay, replace PC board 1. Otherwise isolate and repair wiring.	Fig. 8-77 Fig. 8-15, 8 Para. 7.12

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
5. Continued	5.B. Slow exhaust too fast or too slow (Liquids and Isothermal Cycles only)	1) Clogged slow exhaust valve — flush drain line thoroughly.	
		2) Slow exhaust valve malfunctioning or plugged — adjust, repair or replace valve.	Fig. 8-73, 26
		3) PS-3 setting incorrect — should be 6.	
		4) Loss of continuity in wire #114 (PS-3).	Table 6-8
		5) PS-3 output drive failure on main Printcon PC board. Wire #114 should be at 5 VDC until pressure is below 3 psi, should drop to 0 VDC at 3 psi and below. Extract wire #114 from P40-7 and touch to DC ground. If cycle now advances, replace main Printcon PC board. If cycle does **not** advance, see 5.B.6 below.	Table 6-8
		6) PS-3 input failure on Eagle CPU PC boards — replace board.	Fig. 8-15, 8
	5.C. Cycle stuck in exhaust phase	1) PS-2 setting incorrect — should be 2.	Table 6-8
		2) PS-2 output drive failure on main Printcon PC board. Wire #113 should be at 5 VDC until pressure is below 1 psi, should drop to 0 VDC at 1 psi and below. Extract wire #113 from P40-5 and touch to DC ground. If cycle now advances, replace main Printcon PC board. If cycle does **not** advance, see 5.C.3 below.	Table 6-8
		3) PS-2 input failure on Eagle CPU PC boards — replace board.	Fig. 8-15, 8
6. At end of cycle	6.A. Cycle fails to reach COMPLETE after exhaust completed, or signals COMPLETE too soon (liquids cycle or gravity with no dry time or isothermal cycle)	1) PS-2 setting incorrect (set too low) — should be 2.	Table 6-8
		2) See 5.C.2 and 5.C.3 above.	

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued	6.B. Buzzer and Cycle COMPLETE will not come on at end of dry time (Gravity cycle only)	1) VS-2 setting incorrect — should be 4.	Table 6-8
		2) VS-2 output drive failure on main Printcon PC board. Wire #116 should be at 0 VDC until 2 inches or less vacuum attained — switches to 5 VDC.	Table 6-8 Fig. 8-64, 3
		3) VS-2 input failure on Eagle CPU PC board.	
	6.C. Buzzer does not sound when COMPLETE light is on	1) Buzzer defective — check voltage across buzzer, replace if necessary.	Fig. 8-16, 4 or Fig. 8-18, 5
		2) Open wire — disconnect P1 from control and check continuity between pin W and TB3 terminal 2. Isolate and repair.	Fig. 8-67 or Fig. 8-68
		3) PC board defective — check D-18 LED on board; replace PC board 1 if LED does not come on at end of cycle.	Fig. 8-15, 8 Para. 7.12
	6.D. Doors can be unlocked but cannot be opened when the buzzer sounds	1) Vacuum in chamber caused by faulty check valve in vacuum break line — replace check valve.	Fig. 8-30
		2) Vacuum break line plugged — clean or replace plugged components in line.	Fig. 8-30
		3) VS-2 setting incorrect — should be 4.	Table 6-8
	6.E. Excessive steam when door is opened or excessive effort needed to unlock door when buzzer sounds	1) PS-2 setting incorrect (set too high) — should be 2.	Table 6-8
		2) Pressure circuitry on main Printcon PC board out of calibration — check.	Table 6-8
	6.F. Goods are wet after completion of "Gravity" cycle, or excessive vapor in chamber when door is opened	1) Vacuum break line plugged — clean or replace filter.	Fig. 8-30 Para. 7.4
		2) Check valve in drain line defective — replace.	Fig. 8-73
		3) Wet steam — check quality.	

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		4) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 7-10 Fig. 8-33, 2
		4a) Repair or replace valve.	Para. 7.5
		4b) Check wiring to valve — repair or replace.	
		4c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		4d) 4b and 4c ok — replace PC board 1.	Para. 7.12
	6.G. Water in chamber or door channel at end of cycle	1) Chamber drain valve (S-3) not operating correctly (should be open during exhaust and dry).	Fig. 7-10 Fig. 8-73, 3
		1a) Repair or replace valve.	Para. 7.5
		1b) Check wiring to valve — repair or replace.	
		1c) Check LED D-12 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		1d) 1b and 1c ok — replace PC board 1.	
		2) Steam ejector solenoid valve (S-5) not operating correctly (should be open for drying time). See 6.F.4, above.	Fig. 7-10
		3) Cold chamber floor caused by condensate accumulating in lower jacket — check return line strainer and clean if necessary; check operation of jacket return trap and replace trap if necessary; check for back pressure on return steam line, locate source and eliminate.	Fig. 8-31, 8 & 11 Para. 7.6 Para. 7.7
		4) Chamber floor not pitched toward drain — see leveling procedure.	Para. 5.3
		5) Drains plugged or clogged — see drain cleaning procedure.	Para. 4.3
		6) Chamber steam trap does not open — replace trap element.	Fig. 8-73, 14 Para. 7.6

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		7) Steam not "dry" — check steam quality.	
		8) Drain line check valve defective — replace.	Fig. 8-73, 18
	6.H. Cycle counter fails to update on cycle complete	1) Counter defective — check voltage across counter and replace, if necessary.	Fig. 8-16, 15 or Fig. 8-18, 20
		2) Open wire — disconnect P1 from control and check continuity between pin P and TB3 terminal 2. Isolate and repair open.	Fig. 8-77 Fig. 8-67 or Fig. 8-68
		3) PC board 1 defective — check D-17 LED on board: replace board if LED does not come on at end of cycle.	Fig. 8-15, 8 Para. 7.12
7. Miscellaneous	7.A. Continuous sounding "cycle complete" buzzer whenever machine is turned on	1) Excessive current leakage from triac — replace PC board #1.	Fig. 8-16, 4 & Fig. 8-15, 8
	7.B. Pressure displayed is more than +2 PSI different than chamber gauge	1) Pressure circuitry on main Printcon PC board out of alignment — check.	Table 6-8
		2) Faulty chamber pressure gauge — replace.	Fig. 8-74
		3) Faulty sensor — replace.	Fig. 8-74
	7.C. Pressure and temperature readings are non-linear (i.e. accurate at certain points but not others.)	1) P2, gain adjustment setting incorrect.	Table 6-8
		2) P1, converter reference setting incorrect.	Table 6-8
	7.D. Two or more adjacent columns on printed record are blank	1) Printer hammer coil(s) open or shorted — replace printer. 2) Printer driver circuit failure on main Printcon PC board.	Fig. 8-65, 22
	7.E. Illegible printed record	1) Binding of mechanical linkage in printer — replace printer.	Fig. 8-65, 22
	7.F. Paper is advanced but is entirely blank	1) Printer coil connector is unplugged from P20/J20 connector — reconnect.	Fig. 8-64

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
7. Continued	7.G. Time or date not displayed	1) J51/P51 connector unplugged from display panel overlay — reconnect.	Fig. 8-64, 16
	7.H. Continuous display of time or date	1) Time or date display pushbutton on display panel shorted — replace.	Fig. 8-64, 11
	7.I. Automatic advance of display when time or date pressed.	1) Forward switch on display panel shorted — replace panel.	Fig. 8-64, 11
	7.J. Automatic reverse of display when time or date pressed.	1) Reverse switch on display panel shorted — replace panel.	Fig. 8-64, 11
	7.K. Cannot advance time or date.	1) Forward switch on display panel open — replace panel.	Fig. 8-64, 11
	7.L. Cannot reverse time or date.	1) Reverse switch on display panel open — replace panel.	Fig. 8-64, 11
	7.M. Paper will not be taken up.	1) Misalignment of take-up assembly — check.	Para. 7.18
		2) Take-up motor open — replace motor.	Fig. 8-65, 12
		3) Paper advance toggle switch failure — replace toggle switch.	Fig. 8-65, 28
		4) Platen switch failure (open) — replace platen switch.	Fig. 8-65, 14
		5) Take-up motor fuse blown (1/32 amp. —check)	Fig. 8-65
	7.N. Pinch rollers run continuously (units before 6/85)	1) Platen switch out of adjustment — check.	Para. 7.18
		2) Misalignment of take-up assembly — check.	
		3) Platen switch failure (closed) — replace	Fig. 8-65, 14
	7.O. Continuous paper feed	1) Paper advance toggle switch is in "paper advance" position — turn off paper advance.	Fig. 8-65, 28
		2) Paper advance toggle switch failure — replace switch.	Fig. 8-65, 28

TABLE 6-2. CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
7. Continued	7.P. Display and printout show incorrect date	1) Year switch incorrectly set — check setting. 2) Year switch failure on main Printcon PC board — replace board.	Table 6-8 Table 6-8 Fig. 8-64, 3
	7.Q. Temperature indication is incorrect, pressure is correct	1) Calibration misalignment or component failure on main Printcon PC board — recalibrate or replace board. 2) Faulty temperature sensor — replace	Fig. 6-14 and Fig. 8-64, 3 Note 1, Pg. 6-38
	7.R. Erratic Temperature Pressure display	1) Units manufactured before 6 85. loss of DC ground or capacitor bypass. 2) Units manufactured after 6/85. add jumper wire.	Para. 7.18 Para. 7.18

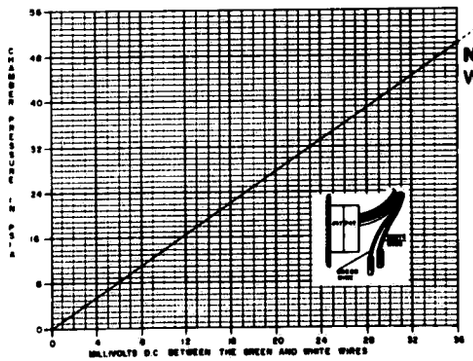
NOTE 1: Use these formulas to calculate temperature probe (RTD) resistance at a given temperature.

a) For temperature in Celsius:
Probe resistance (ohms) = 100 + 0.385 x temperature.

b) For temperature in Fahrenheit:
Probe resistance (ohms) = 100 + 0.214 x (temperature-32).

NOTE 2: The Table below shows the response of the strain gauge pressure transducer (in mVDC) to any given chamber pressure (in psia).

NOTE 3: PSIG = PSIA -14.7



NOTE: NOMINAL MAXIMUM WORKING PRESSURE IS 50 psia.

TABLE 6-3. STRAIN GAUGE PRESSURE TRANSDUCER RESPONSE.

6.4 TIMER DISPLAY CHECKOUT AND CORRECTION CHARTS

1. Between cycles the primary panel timer displays can be checked by rotating the appropriate thumbwheel switches on the secondary panel. Before beginning the checkouts below, first push the RESET button to assure that the incorrect timer display is not caused by failure to reset the control system.

2. If **part of a number** fails to illuminate, rotate the appropriate thumbwheel switch and verify the segment failure. Correct by replacing the primary panel.

3. If an **entire number** fails to illuminate, disconnect P4 from controller and jump pin 38 of plug 4 to DC Common — TB-2; 3, 4, or 5*. Check for proper functioning of each display segment by following this procedure: Carefully jump, one at a time, the P4 connector pins (as listed in Table 6-4) to ground (TB2 terminals 3, 4, or 5, as applicable). Compare the segments actually illuminated with the pattern which should be indicated (pattern A, B, C, or D). If the pattern actually illuminated differs from the pattern illustrated, perform a continuity check of the wire. If the wire is good, then the primary panel must be replaced.

**For PRINTCON units, use test point TP7 at power supply.*

TABLE 6-4. TEST PATTERNS — STERILIZE AND DRY TIMER DISPLAY.

P4 Connector Pin	"STERILIZE" or "HOURS"* DISPLAY, 10's digit, (IC1), should indicate pattern:	"STERILIZE" or "HOURS"* DISPLAY, unit's digit (IC2), should indicate pattern:	"DRY" or "MINUTES"* DISPLAY, 10's digit (IC3), should indicate pattern:	"DRY" or "MINUTES"* DISPLAY, unit's digit (IC4), should indicate pattern:
26 27 28 29	A B C D			
30 31 32 33		A B C D		
34 35 36 37			A B C D	
18 17 16 15				A B C D

**Eagle 2300 Units.*

TEST PATTERNS FOR CORRECTLY FUNCTIONING DIGITAL DISPLAYS



A B C D

4. If an **entire number** fails to illuminate, check for correct functioning of the thumbwheel switches by following this procedure: Disconnect P3 and P4 from the controller. Make the following continuity check across the thumbwheel switches, according to the switch settings indicated in Table 6-4. Place the negative lead on P4-3 or P4-20. If the continuity is bad, replace the appropriate thumbwheel switch and/or repair the open circuit in the wire harness. If the continuity check is good, replace controller Board 1.

TABLE 6-5. CONTINUITY CHECK — STERILIZE AND DRY TIME THUMBWHEEL SWITCHES.

STERILIZE TIME THUMBWHEEL	
Switch Setting	Continuity Path to P4-3 From Pins
01	P3-1
02	P3-2
03	P3-1 and P3-2
04	P3-3
05	P3-1 and P3-3
06	P3-2 and P3-3
07	P3-1. P3-2 and P3-3
08	P3-4
09	P3-1 and P3-4
10	P4-9
20	P4-10
30	P4-9 and P4-10
40	P4-11
50	P4-9 and P4-11
60	P4-10 and P4-11
70	P4-9. P4-10 and P4-11
80	P4-12
90	P4-9 and P4-12
00	NONE

DRY TIME THUMBWHEEL	
Switch Setting	Continuity Path to P4-20 From Pins
01	P3-1
02	P3-2
03	P3-1 and P3-2
04	P3-3
05	P3-1 and P3-3
06	P3-2 and P3-3
07	P3-1, P3-2 and P3-3
08	P3-4
09	P3-1 and P3-4
10	P4-9
20	P4-10
30	P4-9 and P4-10
40	P4-11
50	P4-9 and P4-11
60	P4-10 and P4-11
70	P4-9, P4-10 and P4-11
80	P4-12
90	P4-9 and P4-12
00	NONE

6.5 TEMPERATURE THUMBWHEEL CHECKOUT

1. Turn power off. Open display panel overlay. Unplug temperature thumbwheel ribbon cable from display PC board at jack J52 (lower left, display board). Refer to Tables 6-6 and 6-7 during the checkout.

2. Check for open diodes and switch closures. Use the black lead of the digital multimeter on the appropriate switch "common". Rotate one switch at a time and check for proper continuity* through that switch and diode.

3. Check all four switch leads (8, 4, 2, 1) at each switch position (0, 1 . . . 9).

4. Check for diode shorts by placing red lead of meter on "common" terminal and repeating above. No continuity should be found curing this portion of test in any switch position.

**Proper continuity will be 1000 ohms or less using the 10 k ohm full scale setting.*

Figure 6-5. TEMPERATURE THUMBWHEEL SWITCHES: Wiring.

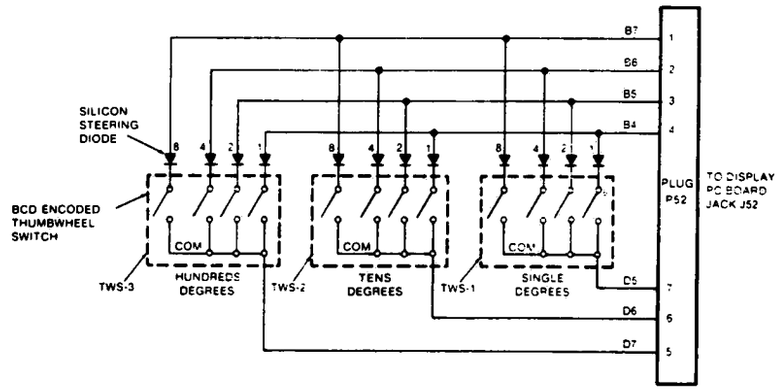


TABLE 6-6. SWITCH CHECKOUT CHART.

Setting	Continuity To Appropriate Common From These Wires*
0	None
1	B4
2	B5
3	B4 and B5
4	B6
5	B6 and B4
6	B6 and B5
7	B6. B5 and B4
8	B7
9	B7 and B4

**Circuit to all other wires must be open.*

TABLE 6-7. COMMONS.

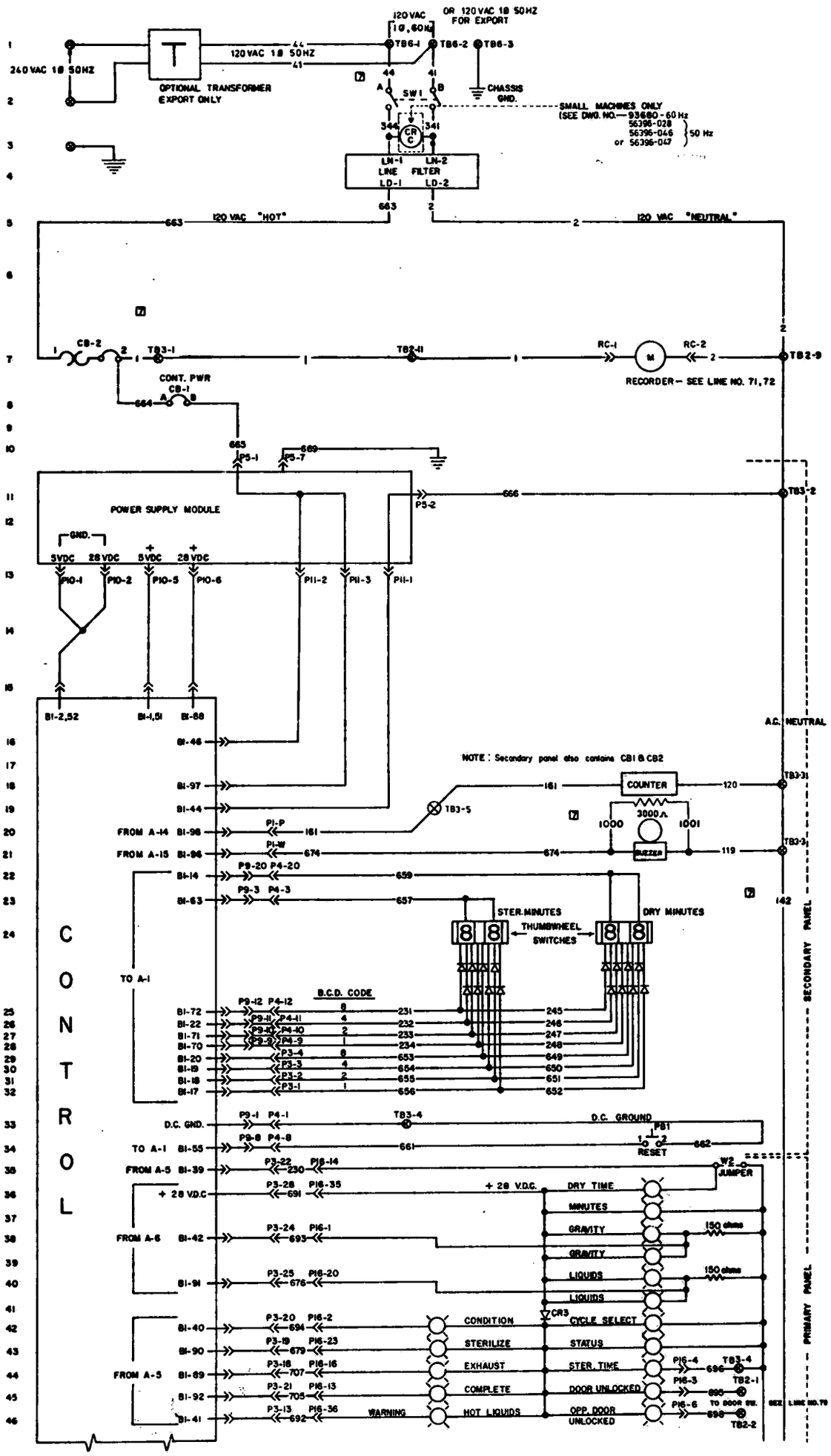
SWITCH	COMMON
TWS-3	D7
TWS-2	D6
TWS-1	D5

TABLE 6-8. SCHEMATIC REFERENCE LIST.

The following drawings have been grouped together for convenience. They are:

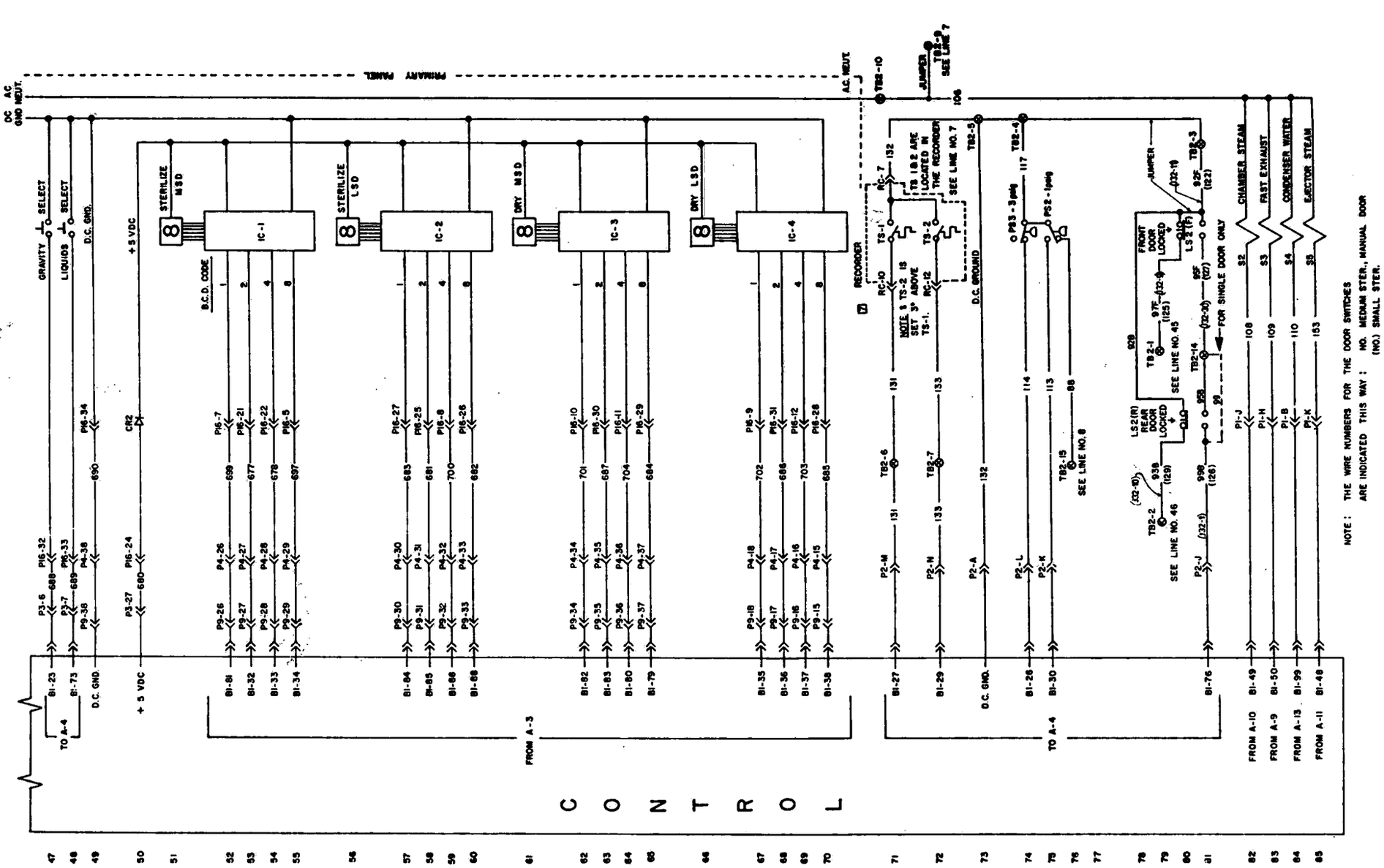
Title	Sheet	Reference
ELECTRICAL SCHEMATIC: Gravity Sterilizer (IRC)	1 of 2 2 of 2	146620
ELECTRICAL SCHEMATIC: Laboratory/Isothermal Sterilizer (IRC)	1 of 2 2 of 2	146621
PIPING SCHEMATIC: Gravity Sterilizer (IRC)	1 of 1	SK-760614
PIPING SCHEMATIC: Laboratory/Isothermal Sterilizer (IRC)	1 of 1	SK-760613
ELECTRICAL SCHEMATIC: Gravity Sterilizer (Printcon)	1 of 2 2 of 2	146649-041
ELECTRICAL SCHEMATIC: Laboratory/Isothermal Sterilizer (Printcon)	1 of 2 2 of 2	146649-042
PIPING SCHEMATIC: Gravity Sterilizer (Printcon)	1 of 1	—
PIPING SCHEMATIC: Laboratory/Isothermal Sterilizer (Printcon)	1 of 1	—
MASTER WIRE LIST: Gravity/Isothermal/Vacamatic Sterilizers	1 of 1	150822-261
ELECTRICAL SCHEMATIC: Optional Steam Generator (Non-Solid State Control)	1 of 1	93680
ELECTRICAL SCHEMATIC: Optional Steam Generator (Solid State Control)	1 of 1	56396-259
PRINTED CIRCUIT BOARD: Basic	1 of 2 2 of 2	146586
PRINTED CIRCUIT BOARD: Expander	1 of 2 2 of 2	146588
PC ASSEMBLY: Power Supply (IRC)	1 of 2 2 of 2	146599
PC ASSEMBLY: Power Supply (Printcon)	1 of 2 2 of 2	146633-051
MAIN PRINTCON PC BOARD	1 of 4 2 of 4 3 of 4 4 of 4	146651-001
PRINTCON DIGITAL DISPLAY PC BOARD	1 of 2 2 of 2	146633-081
PRINTED CIRCUIT BOARD: Primary Panel (OE)	1 of 2	134468-444
PRINTED CIRCUIT BOARD: Primary Panel (OE)	2 of 2	
PRINTED CIRCUIT BOARD: Primary Panel (NOE)	1 of 2	136640-001
PRINTED CIRCUIT BOARD: Primary Panel (NOE)	2 of 2	

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ELECTRICAL SCHEMATIC:
Gravity Sterilizer (1 of 2)
(Units with Indicator-Recorder)

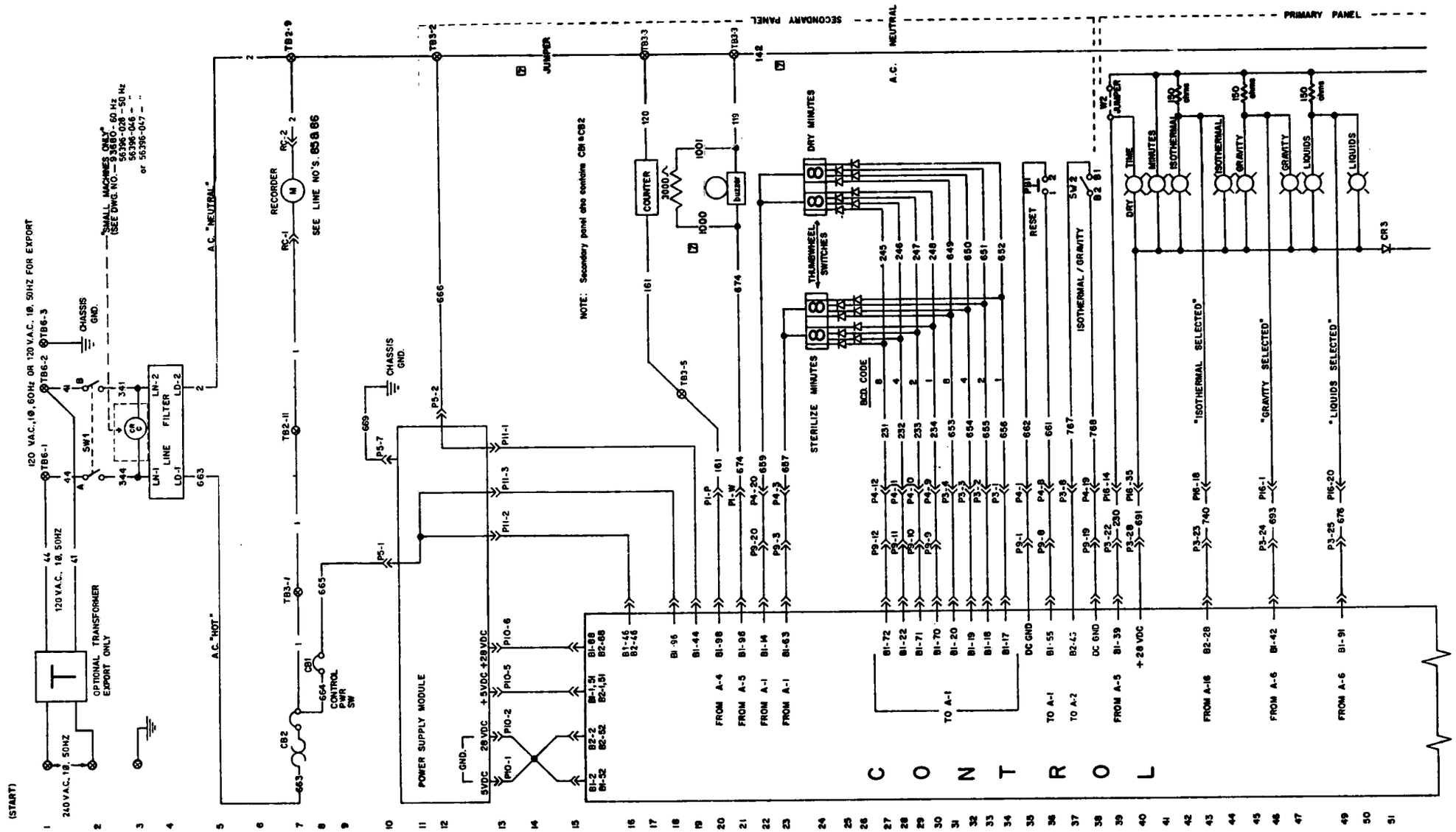
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(4/13/82)



ELECTRICAL SCHEMATIC:
Gravity Sterilizer (2 of 2)
(Units with Indicator-Recorder)

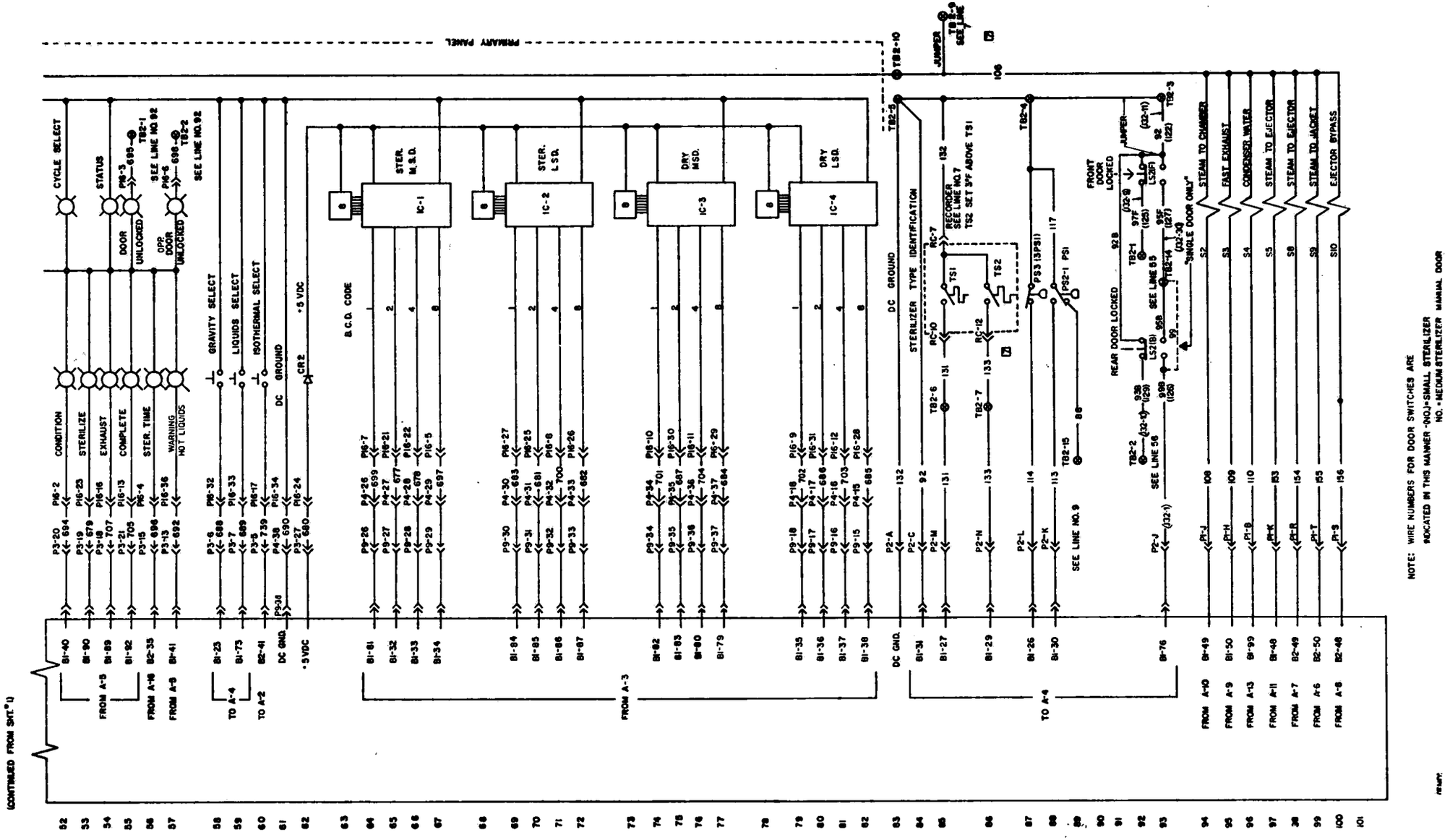
Rev. 6/82

DWG. NO. 146621
(4/13/82)



ELECTRICAL SCHEMATIC:
Laboratory/Isothermal Sterilizer (1 of 2)
(Units with Indicator-Recorder)

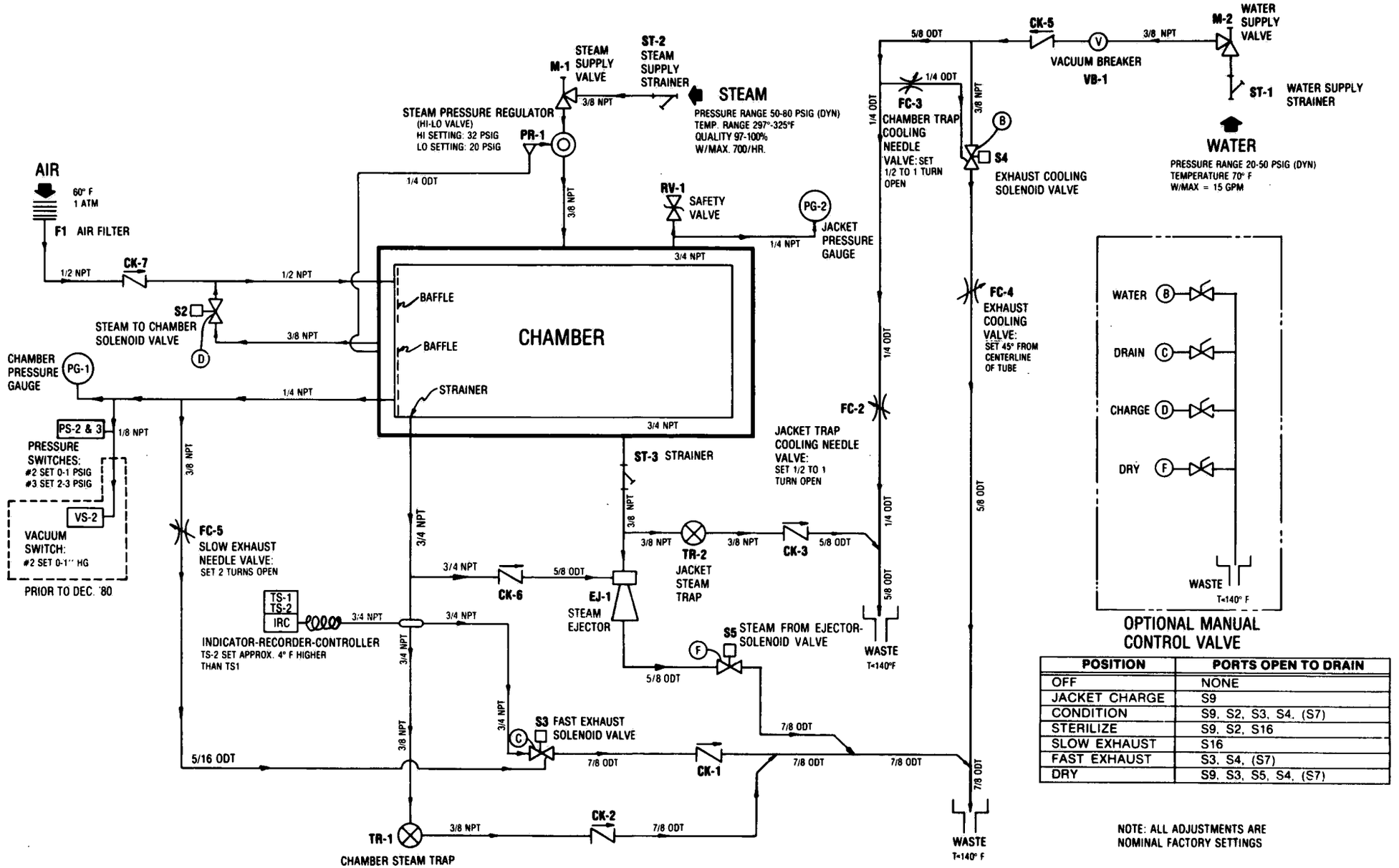
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(4/13/82)



ELECTRICAL SCHEMATIC:
Laboratory/Isothermal Sterilizer (2 of 2)
(Units with Indicator-Recorder)

Rev. 6/82

DWG. NO. SK-760614



OPTIONAL MANUAL CONTROL VALVE

POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

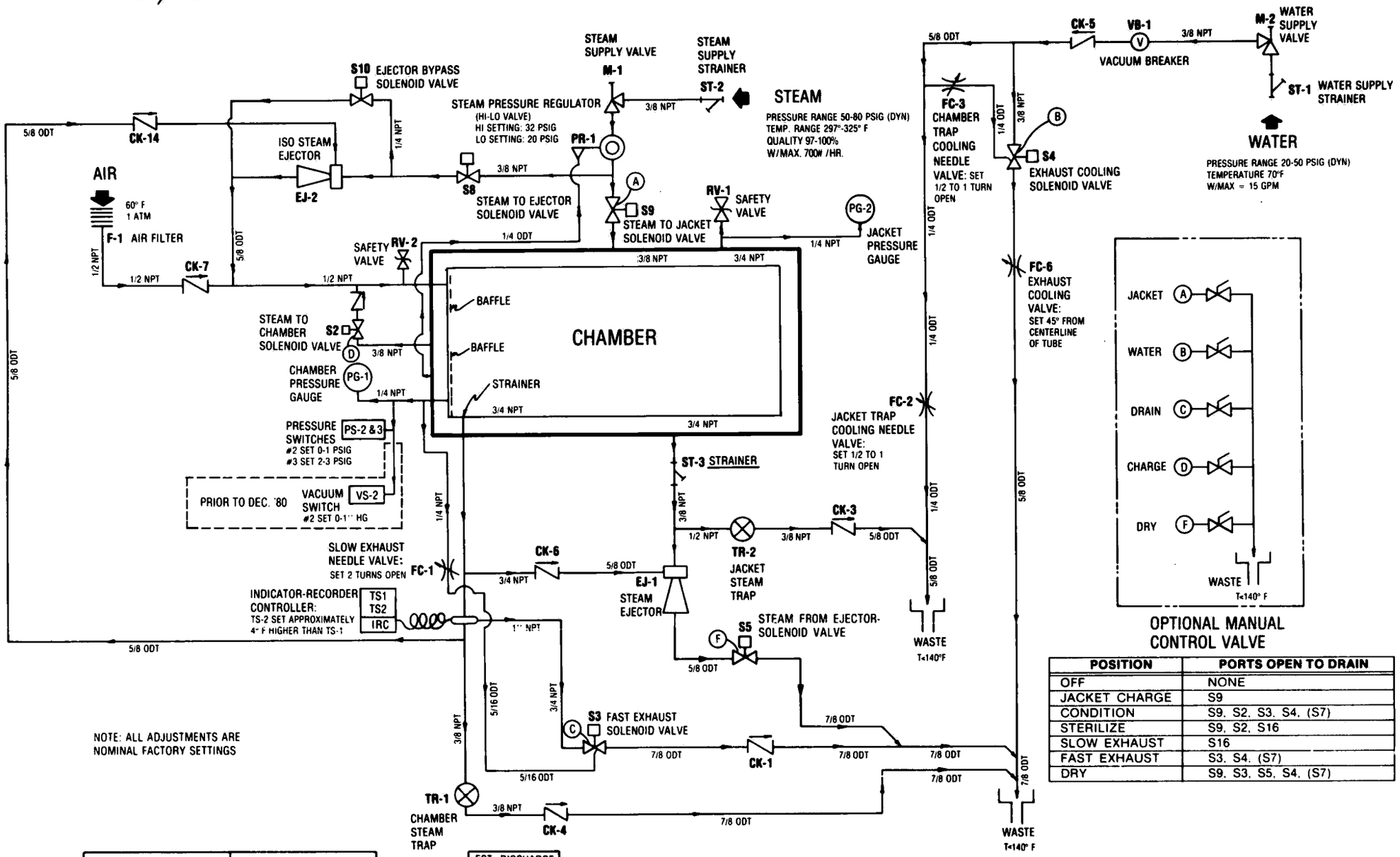
NOTE: ALL ADJUSTMENTS ARE NOMINAL FACTORY SETTINGS

SHELL SIZE	VOL FT³	AE	17 PSIG 250° F FULL CHARGE STEAM	17 PSIG 250° F EST. CHARGE TIME	30 PSIG 270° F FULL CHARGE STEAM	30 PSIG 270° F EST. CHARGE TIME	EST. VAC BREAK TIME 60° F 1ATM	EST. DISCHARGE TIME TO 0 PSIG 250° F	EST. DISCHARGE TIME TO 0 PSIG 270° F
16X16X26	3.8	.00211	.28	3.68 22.08 F.L.	.38	4.01 24.06 F.L.		5.17 15.51F.L.	7.03 21.09F.L.
20X20X38	8.8	.00211	.65	8.52 51.12 F.L.	.90	9.28 55.68 F.L.		11.97 35.91F.L.	16.28 48.84F.L.

PIPING SCHEMATIC: Gravity Sterilizer (Units with Indicator-Recorder)

Rev. 7/87

DWG. NO.SK-760613



OPTIONAL MANUAL CONTROL VALVE

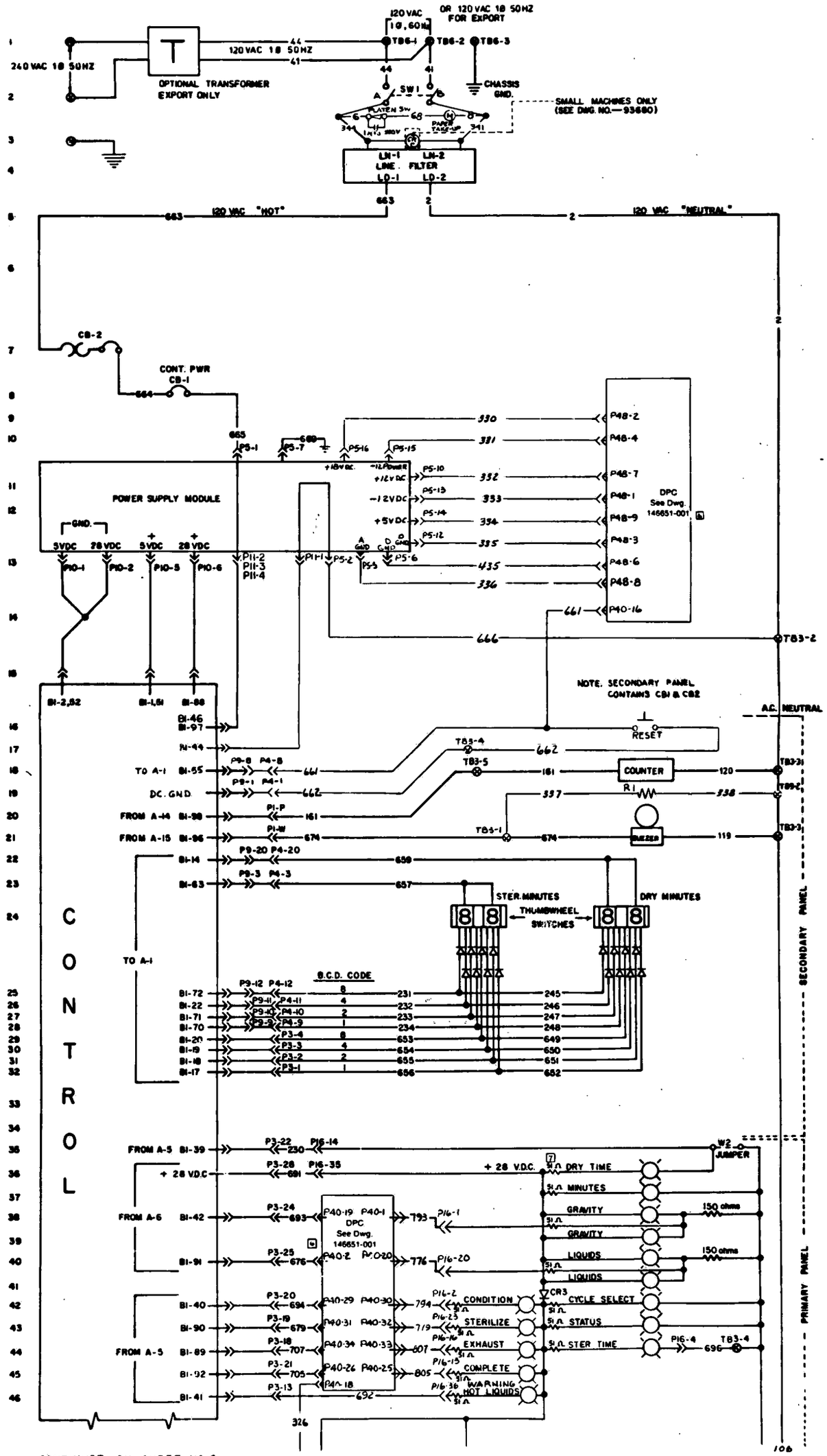
POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

NOTE: ALL ADJUSTMENTS ARE NOMINAL FACTORY SETTINGS

SHELL SIZE	VOL FT³	AE	17 PSIG 250° F FULL CHARGE STEAM	17 PSIG 250° F EST. CHARGE TIME	30 PSIG 270° F FULL CHARGE STEAM	30 PSIG 270° F EST. CHARGE TIME	EST. VAC BREAK TIME 60° F 1ATM	EST. DISCHARGE TIME TO 0 PSIG 250° F	EST. DISCHARGE TIME TO 0 PSIG 270° F
16X16X26	3.8	.00211	.28	3.68 22.08 F.L.	.38	4.01 24.06 F.L.		5.17 15.51F.L.	7.03 21.09F.L.
20X20X38	8.8	.00211	.65	8.52 51.12 F.L.	.90	9.28 55.68 F.L.		11.97 35.91F.L.	16.28 48.84F.L.

PIPING SCHEMATIC:
Laboratory/Isothermal Sterilizer
(Units with Indicator-Recorder)

DWG. NO. 146649-041
(4/30/87)

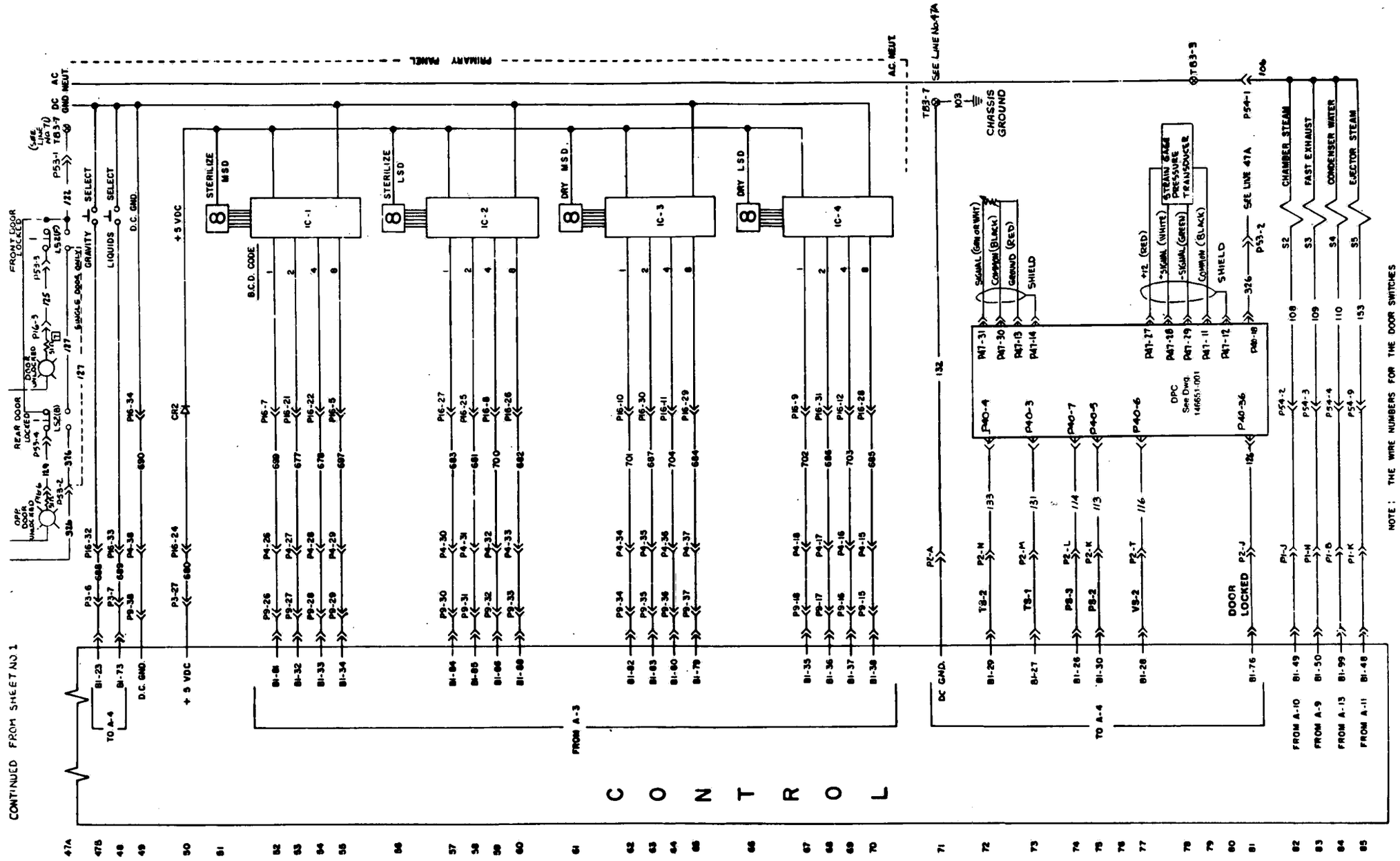


F-11

F-12

ELECTRICAL SCHEMATIC:
Gravity Sterilizer (1 of 2)
(Units with Printron)

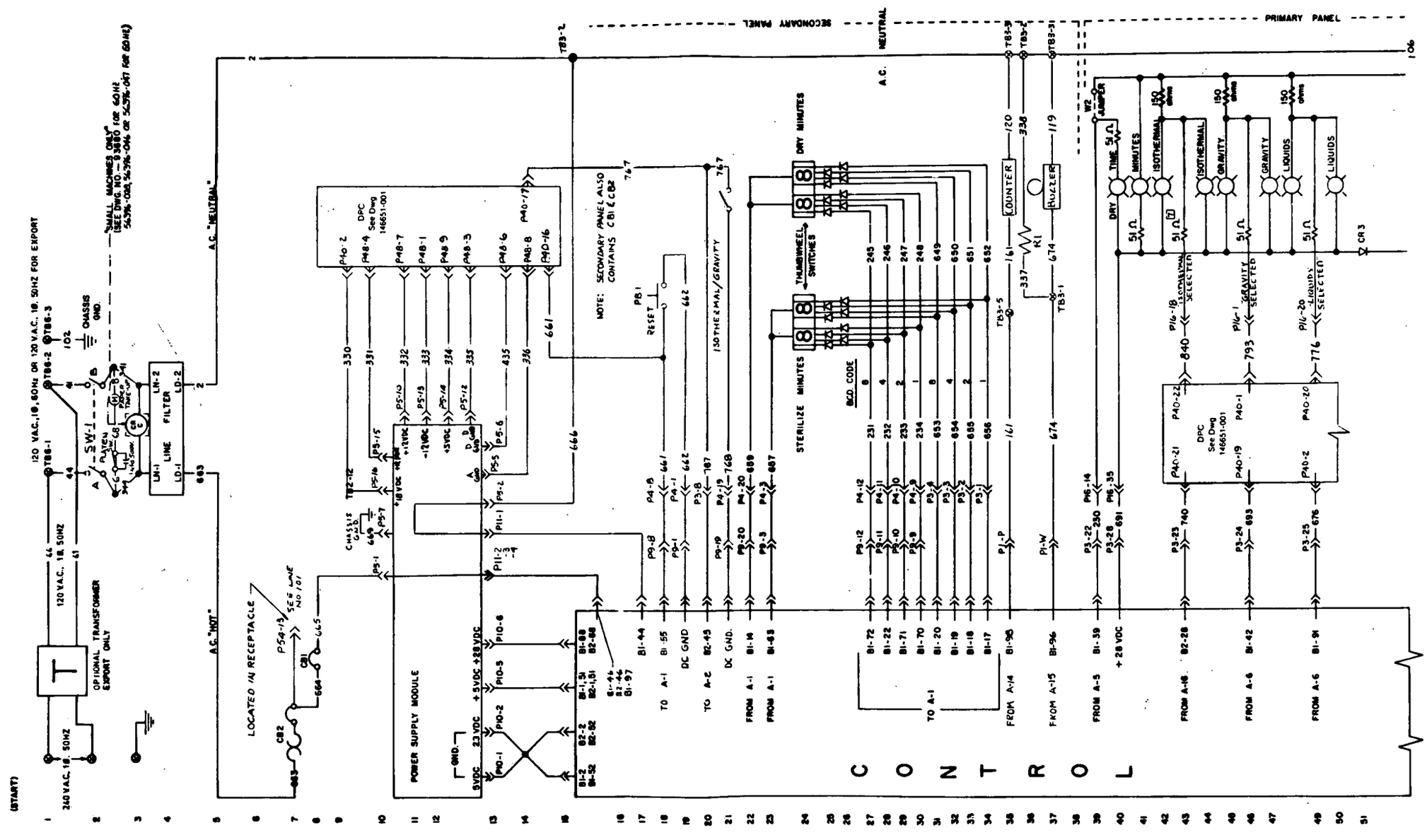
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(4/30/87)



ELECTRICAL SCHEMATIC:
Gravity Sterilizer (2 of 2)
(Units with Printcon)

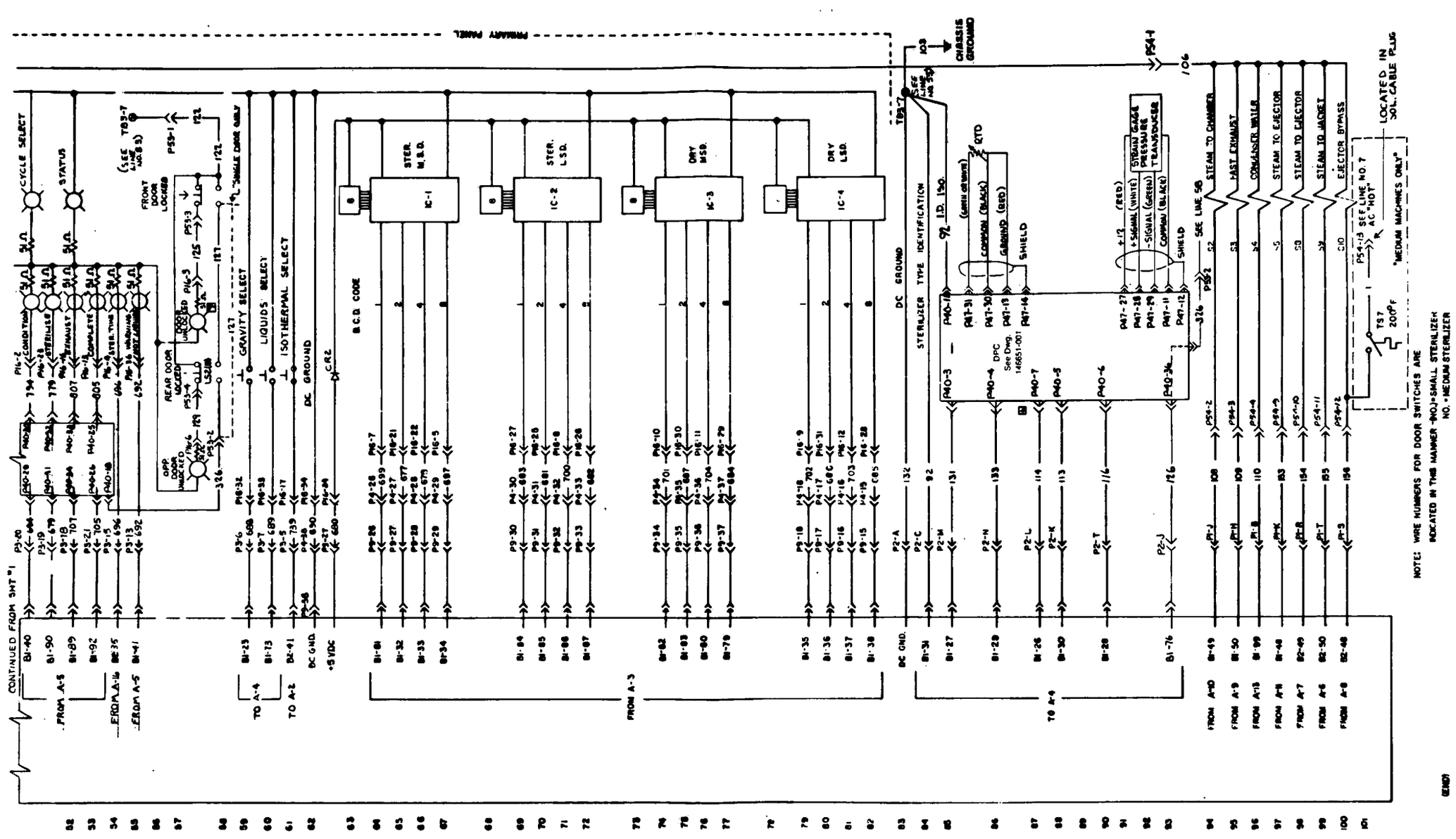
Rev. 7/87

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(4/30/87)

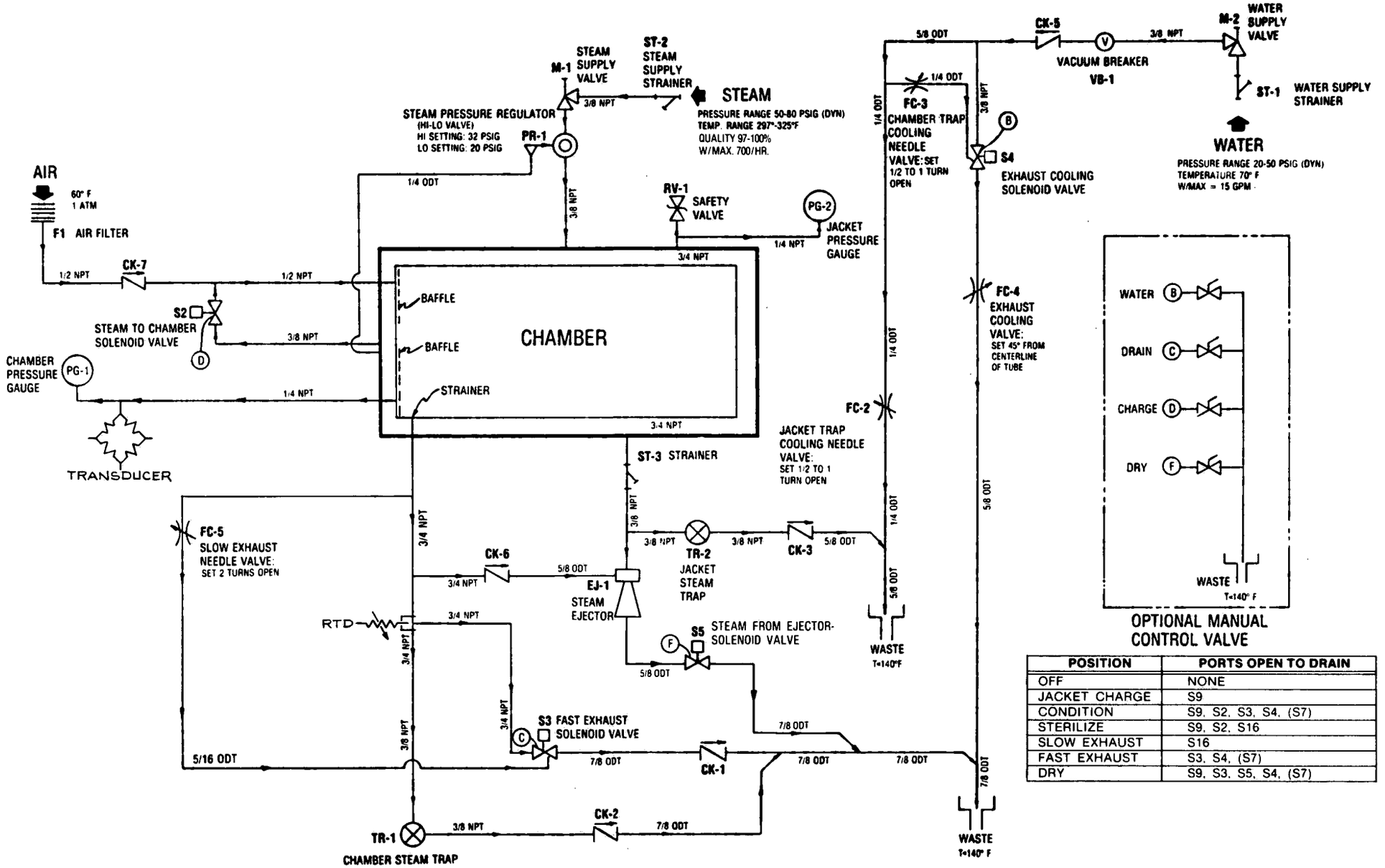


ELECTRICAL SCHEMATIC:
Laboratory/Isothermal Sterilizer (1 of 2)
(Units with Printcon)

Rev. 7/87



ELECTRICAL SCHEMATIC:
Laboratory/Isothermal Sterilizer (2 of 2)
(Units with Printcon)



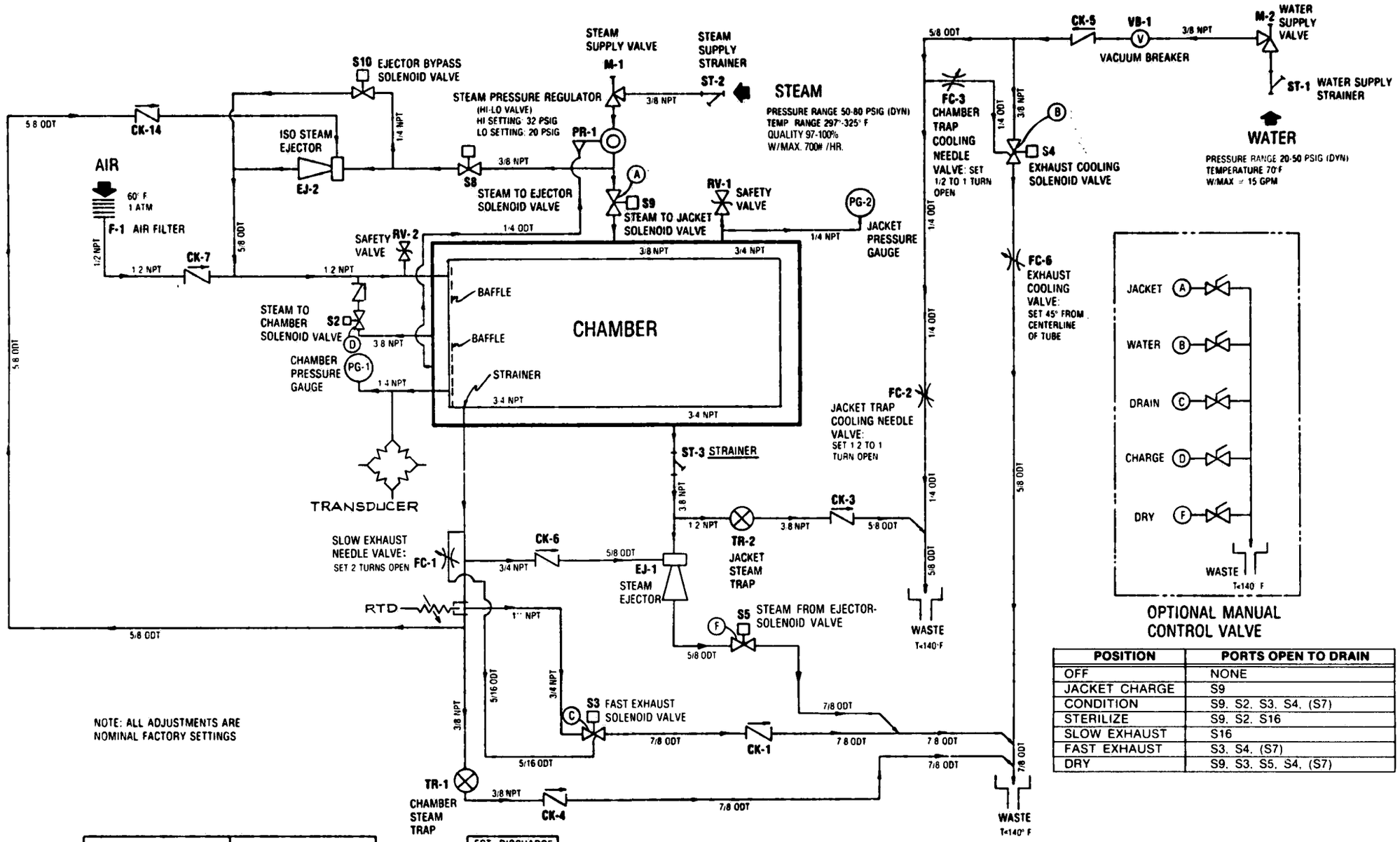
OPTIONAL MANUAL CONTROL VALVE

POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

SHELL SIZE	VOL FT³	AE	17 PSIG 250° F FULL CHARGE STEAM	17 PSIG 250° F EST. CHARGE TIME	30 PSIG 270° F FULL CHARGE STEAM	30 PSIG 270° F EST. CHARGE TIME	EST. VAC BREAK TIME 60° F 1ATM	EST. DISCHARGE TIME TO 0 PSIG 250° F	EST. DISCHARGE TIME TO 0 PSIG 270° F
16X16X26	3.8	.00211	.28	3.68 22.08 F.L.	.38	4.01 24.06 F.L.		5.17 15.51F.L.	7.03 21.09F.L.
20X20X38	8.8	.00211	.65	8.52 51.12 F.L.	.90	9.28 55.68 F.L.		11.97 35.91F.L.	16.28 48.84F.L.

NOTE: ALL ADJUSTMENTS ARE NOMINAL FACTORY SETTINGS

PIPING SCHEMATIC: Gravity Sterilizer (Units with Printcon)



POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

NOTE: ALL ADJUSTMENTS ARE NOMINAL FACTORY SETTINGS

SHELL SIZE	VOL FT³	AE	17 PSIG 250° F FULL CHARGE STEAM	17 PSIG 250° F EST. CHARGE TIME	30 PSIG 270° F FULL CHARGE STEAM	30 PSIG 270° F EST. CHARGE TIME	EST. VAC BREAK TIME 60° F 1ATM	EST. DISCHARGE TIME TO 0 PSIG 250° F	EST. DISCHARGE TIME TO 0 PSIG 270° F
16X16X26	3.8	.00211	.28	3.68	.38	4.01		5.17	7.03
				22.08 F.L.		24.06 F.L.		15.51F.L	21.09F.L
20X20X38	8.8	.00211	.65	8.52	.90	9.28		11.97	16.28
				51.12 F.L.		55.68 F.L.		35.91F.L	48.84F.L

PIPING SCHEMATIC:
Laboratory/Isothermal Sterilizer
(Units with Printcon)

DWG. NO. 150822-261
(9-26-85)

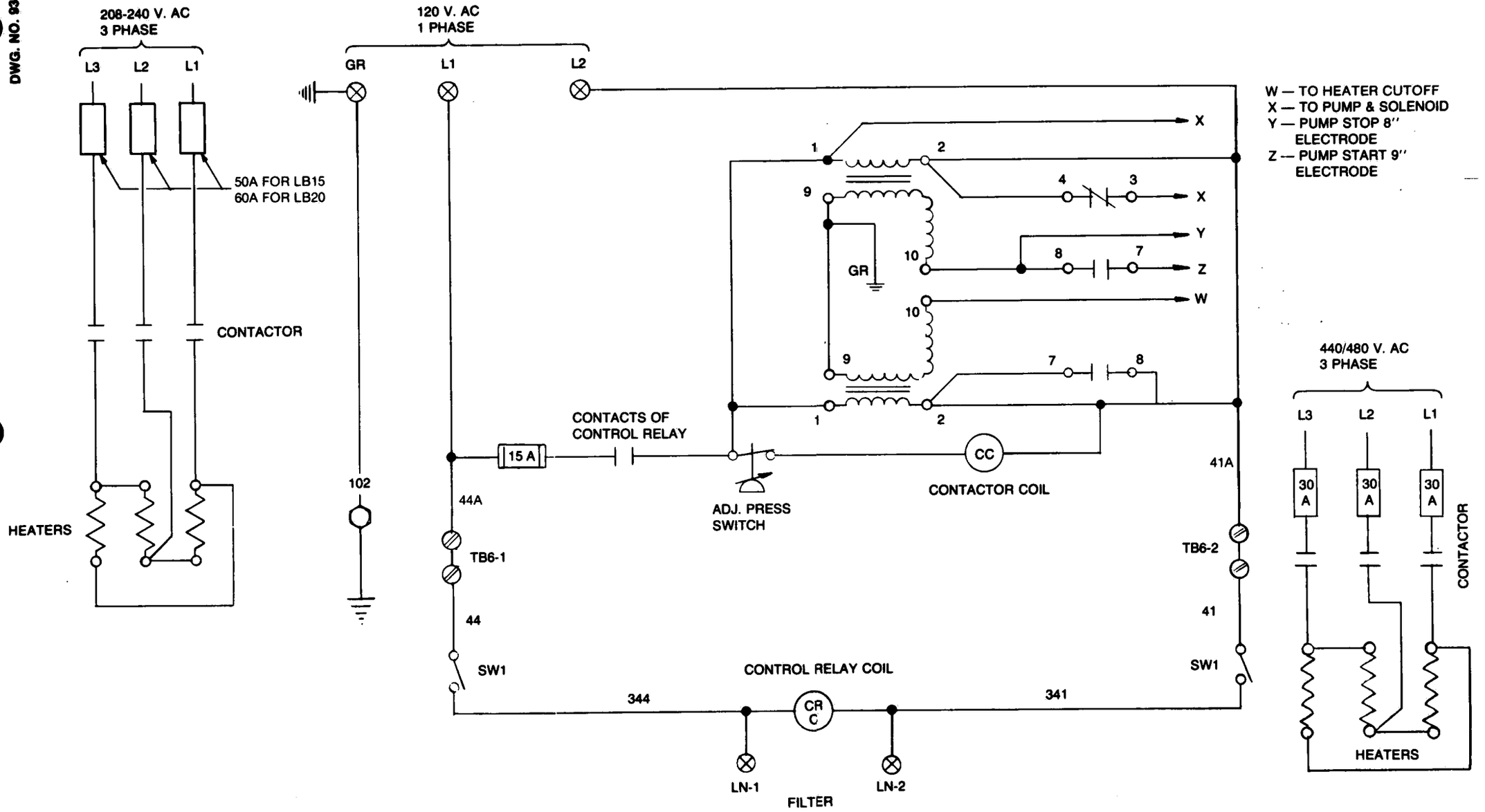
WIRE NO.	COLOR	FROM	CONNECTION METHOD	TO	CONNECTION METHOD	REMARKS
1	BLK	CB2-2	QUICK-CONN	TB3-1	RING TERM	
1	"	TB3-1	RING TERM	TB2-11	"	
1	"	TB2-11	"	RC-1	PIN-FEMALE	
1	"	TB2-11	"	TS7-COM	RING TERM	ISO ONLY
2	WHITE	FILTER/LD2	QUICK-CONN	TB3-2	"	
2	JUMPER	TB3-2	RING TERM	TB3-3	"	
2	WHITE	TB2-9	"	RC1-2	PIN-FEMALE	
41	"	TB6-2	"	SW1-B	QUICK-CONN	
44	BLK	TB6-1	"	SW1-A	"	
87	BROWN	PS2-NC	QUICK-CONN	VS2-COM	"	VAC. ONLY
88	"	PS2-NC	"	TB2-15	RING TERM	ISO & GRAV/ISO ONLY
88	"	VS2-COM	"	TB2-15	"	VAC. ONLY
92	VIOLET	TB2-5	RING TERM	P2-C	PIN-FEMALE	ISO ONLY-STER. I.D.
92	"	TB2-5	"	P2-D	"	VAC. ONLY-STER. I.D.
92F/122	"	LSF-COM1A	"	TB2-3	RING TERM	
92B/122	"	LSB-NC1A	"	TB2-4	"	DBL. DOOR ONLY
93B/129	TAN	LSB-COM1A	"	TB2-2	"	" " "
95F/127	"	LSF-NO1B	"	TB2-14	"	
95B/127	GRAY	LSB-COM1B	"	TB2-14	"	DBL. DOOR ONLY
97F/125	VIOLET	LSF-NC1A	"	TB2-1	"	
99F/127	TAN	TB2-14	"	P2-J	PIN-FEMALE	SGL. DOOR ONLY
99B/126	TAN	LSB-NO1B	"	P2-J	"	DBL. DOOR ONLY
102	GREEN	TB6-3	"	CHASSIS GND	RING TERM	
106	WHITE	S9	SPLICE-CONN	S8	SPLICE-CONN	ISO ONLY
106	"	S8	"	S10	"	" "
106	"	S10	"	S4	"	ISO ONLY
106	"	S4	"	S2	"	
106	"	S7	"	S1	"	VAC. ONLY
106	"	S1	"	S2	"	" "
106	"	S2	"	S5	"	ISO, GRAV/ISO ONLY
106	"	S2	"	S3	"	
106	"	S3	"	TB2-15	RING TERM	
107	YELLOW	S1	"	P1-D	PIN-MALE	VAC. ONLY
108	YELLOW	S2	SPLICE-CONN	P1-J	PIN-MALE	VAC. ONLY
109	"	S3		P1-H	"	
110	"	S4		P1-B	"	
111	"	S7		P1-M	"	VAC. ONLY
112	BROWN	PS1-NC	QUICK-CONN	P2-J	PIN-FEMALE	VAC. ONLY
113	"	PS2-NO	"	P2-K	"	
114	"	PS3-COM	"	P2-L	"	
115	"	VS1-COM	"	P2-R	"	VAC. ONLY
116	"	VS2-NC	"	P2-T	"	" "
117	VIOLET	VS1-COM	"	PS-3	QUICK-CONN	" "
117	"	PS3-COM	"	PS-2	"	
117	"	PS2-COM	"	TB2-14	RING TERM	
117	"	PS2-COM	"	PS1-COM	QUICK-CONN	VAC. ONLY
117	"	PS1-COM	"	TB2-14	RING TERM	" "
119	WHITE	BUZZER	"	TB3-3	"	
120	WHITE	COUNTER	"	TB3-2	"	
131	ORANGE	P2-M	PIN-FEMALE	TB2-6	RING TERM	
131	ORANGE	TB2-6	RING TERM	RC1-10	PIN-FEMALE	
132	VIOLET	P2-A	PIN-FEMALE	TB2-5	RING TERM	
132	"	TB2-5	RING TERM	RC1-7	PIN-FEMALE	
133	ORANGE	P2-N	PIN-FEMALE	TB2-7	RING TERM	
133	"	TB2-7	RING TERM	RC1-12	PIN-FEMALE	
142	WHITE	TB3-2	"	TB2-10	RING TERM	
153	YELLOW	S5	SPLICE-CONN	P1-K	PIN-MALE	ISO ONLY

WIRE NO.	COLOR	FROM	CONNECTION METHOD	TO	CONNECTION METHOD	REMARKS
154	"	S8	"	P1-R	"	" "
155	"	S9	"	P1-T	"	" "
156	"	S10	"	TS7-NO	RING TERM	" "
156	"	TS7-NO	RING TERM	P1-S	PIN-MALE	" "
161	BLK	COUNTER	SPLICE-CONN	TB3-5	RING TERM	
161	BLK	TB3-5	RING TERM	P1-P	PIN-MALE	
185	"	CB1-C	QUICK-DIS	TB3-6	RING TERM	
185	"	TB3-6	RING TERM	TB2-12	"	
206	GRAY	P25-1	PIN-FEMALE	P23-21	PIN-FEMALE	DBL. DOOR ONLY
207	"	" -2	"	" -10	"	DBL. DOOR ONLY
208	"	" -3	"	" -13	"	" " "
209	"	" -4	"	" - 7	"	" " "
210	GRAY	P25-5	PIN-FEMALE	P23-15	PIN-FEMALE	DBL. DOOR ONLY
211	"	" -6	"	" - 9	"	" " "
212	"	" -7	"	" - 5	"	" " "
213	"	" -8	"	" -24	"	" " "
214	"	" -9	"	" - 1	"	" " "
215	"	" -10	"	" -18	"	" " "
216	"	" -11	"	" - 3	"	" " "
217	"	" -12	"	" - 8	"	" " "
218	"	" -13	"	" -25	"	" " "
219	"	" -14	"	" -20	"	" " "
220	"	" -15	"	" -14	"	" " "
221	"	" -16	"	" -23	"	" " "
222	"	" -17	"	" - 6	"	" " "
223	"	" -18	"	" -19	"	" " "
225	"	" -20	"	" -17	"	" " "
226	"	" -21	"	" -12	"	" " "
229	"	" -24	"	" -28	"	" " "
230	BLK	P16-14	PIN-FEMALE	P3-22	PIN-MALE	
231	"	SWC-8	SOLDER	P4-12	"	
232	"	SWC-4	"	P4-11	"	
233	"	SWC-2	"	P4-10	"	
234	"	SWC-1	"	P4-9	"	
245	"	SWA-8	"	SWC-8	SOLDER	
246	"	SWA-4	"	SWC-4	"	
247	"	SWA-2	"	SWC-2	"	
248	"	SWA-1	"	SWC-1	"	
285	BLK	P5-12	PIN FEMALE	TB2-14	RING TERM	SMALLS ONLY
288	BLK	P5-14	PIN FEMALE	TB2-13	RING TERM	SMALLS ONLY
285	BLK	P5-12	PIN FEMALE	TB2-20	RING TERM	MEDIUMS
288	BLK	P5-14	PIN FEMALE	TB2-19	RING TERM	MEDIUMS
341	WHITE	SWB-NO	QUICK-DIS	FILTER/LN-2	QUICK-DIS	
341	"	FILTER/LN-2	"	TB5-13	RING TERM	PWR. DOOR ONLY
344	BLK	SWA-NO	"	FILTER/LN-1	QUICK-DIS	
649	"	SWD-8	SOLDER	SWB-8	SOLDER	
650	"	SWD-4	"	SWB-4	"	
651	"	SWD-2	"	SWB-2	"	
652	"	SWD-1	"	SWB-1	"	
653	"	SWD-8	"	P3-4	PIN-MALE	
654	"	SWD-4	"	P3-3	"	
655	"	SWD-2	"	P3-2	"	

WIRE NO.	COLOR	FROM	CONNECTION METHOD	TO	CONNECTION METHOD	REMARKS
656	BLK	SWD-1	SOLDER	P3-1	PIN-MALE	
657	"	SWA-C	"	P4-3	"	
659	"	SWC-C	"	P4-20	"	
661	"	PB1-1	SPLICE-CONN	P4-8	"	
662	"	PB-2	"	P4-1	"	SPLICE-CONN ON ISO ONLY
663	"	CB2-1	QUICK-DIS	FILTER/LD-1	QUICK-DIS	
664	"	CB2-2	"	CB1-A	"	
665	"	CB1-B	"	P5-1	PIN-FEMALE	
666	"	TB3-2	RING TERM	P5-2	"	
669	GREEN	CHASSIS GND	"	P5-7	"	
670	BLK	CB1-C	QUICK-DIS	P5-8	"	
671	"	CB1-D	"	P5-9	"	
674	"	BUZZER	"	P1-W	PIN-MALE	
675	"	P16-19	PIN-FEMALE	P3-23	"	VAC. ONLY
676	"	" -20	"	P3-25	"	
677	"	" -21	"	P4-27	"	
678	"	" -22	"	P4-28	"	
679	"	" -23	"	P3-19	"	
680	"	" -24	"	P3-27	"	
681	"	" -25	"	P4-31	"	
682	"	" -26	"	P4-33	"	
683	"	" -27	"	P4-30	"	
684	"	" -29	"	P4-37	"	
685	"	" -28	"	P4-15	"	
686	"	" -31	"	P4-17	"	
687	"	" -30	"	P4-35	"	
688	"	" -32	"	P3-6	"	
689	"	" -33	"	P3-7	"	
690	"	" -34	"	P3-38	"	
691	"	" -35	"	P3-28	"	
692	"	" -36	"	P3-13	"	
693	"	" - 1	"	P3-24	"	
694	"	" - 2	"	P3-20	"	
695	"	" - 3	"	TB2-1	RING TERM	
696	"	" - 4	"	P3-15	PIN-MALE	ISO
696	"	" - 4	"	TB3-4	RING TERM	GRAVITY
697	BLK	P16-5	PIN-FEMALE	P4-29	PIN-MALE	
698	"	" -6	"	TB2-2	RING TERM	
699	"	" -7	"	P4-26	PIN-MALE	
700	"	" -8	"	P4-32	"	
701	"	" -10	"	P4-34	"	
702	"	" -9	"	P4-18	"	
703	"	" -12	"	P4-16	"	
704	"	" -11	"	P4-36	"	
705	"	" -13	"	P3-21	"	
706	"	" -15	"	P3-5	"	VAC. ONLY
707	"	" -16	"	P3-18	"	
739	"	" -17	"	P3-5	"	ISO ONLY
740	"	" -18	"	P3-23	"	" "
767	"	SW2-B1	QUICK-DIS	P3-8	"	" "
768	"	SW2-B2	"	P4-19	"	" "
1000	"	BUZZER	SPLICE-CONN	3KΩ Res	SPLICE-CONN	
1001	"	BUZZER	"	3KΩ Res	"	

MASTER WIRE LIST:
Gravity/Isothermal/Vacamatic Sterilizers
(Units with Indicator-Recorder)

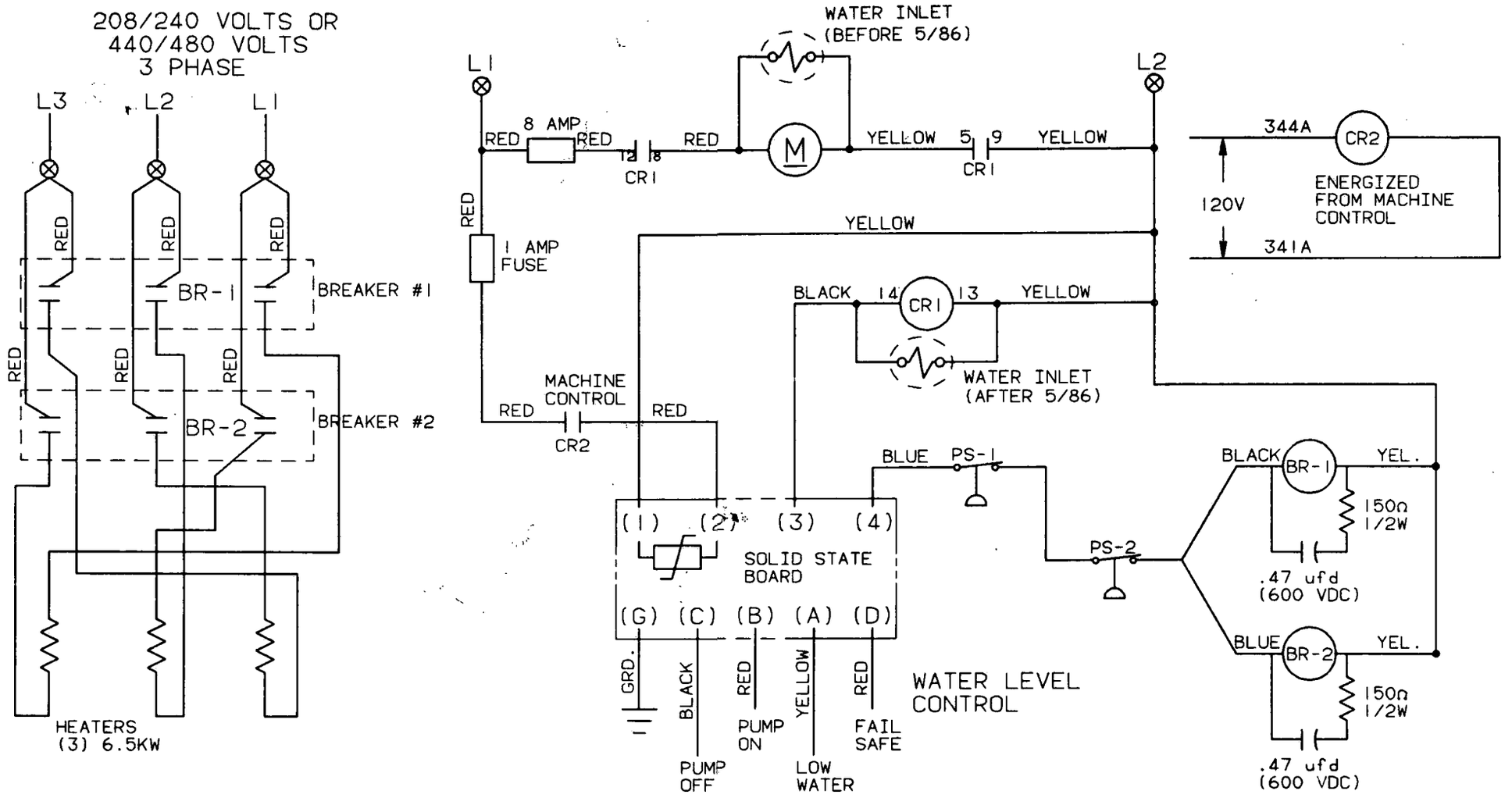
DWG. NO. 93680



ELECTRICAL SCHEMATIC,
Optional Steam Generator.

Rev. 6/83

DWG. NO. 56396-259



ELECTRICAL SCHEMATIC

Electro-Steam Generator
Solid State Control

Rev. 7/87

AMSCO SERVICE

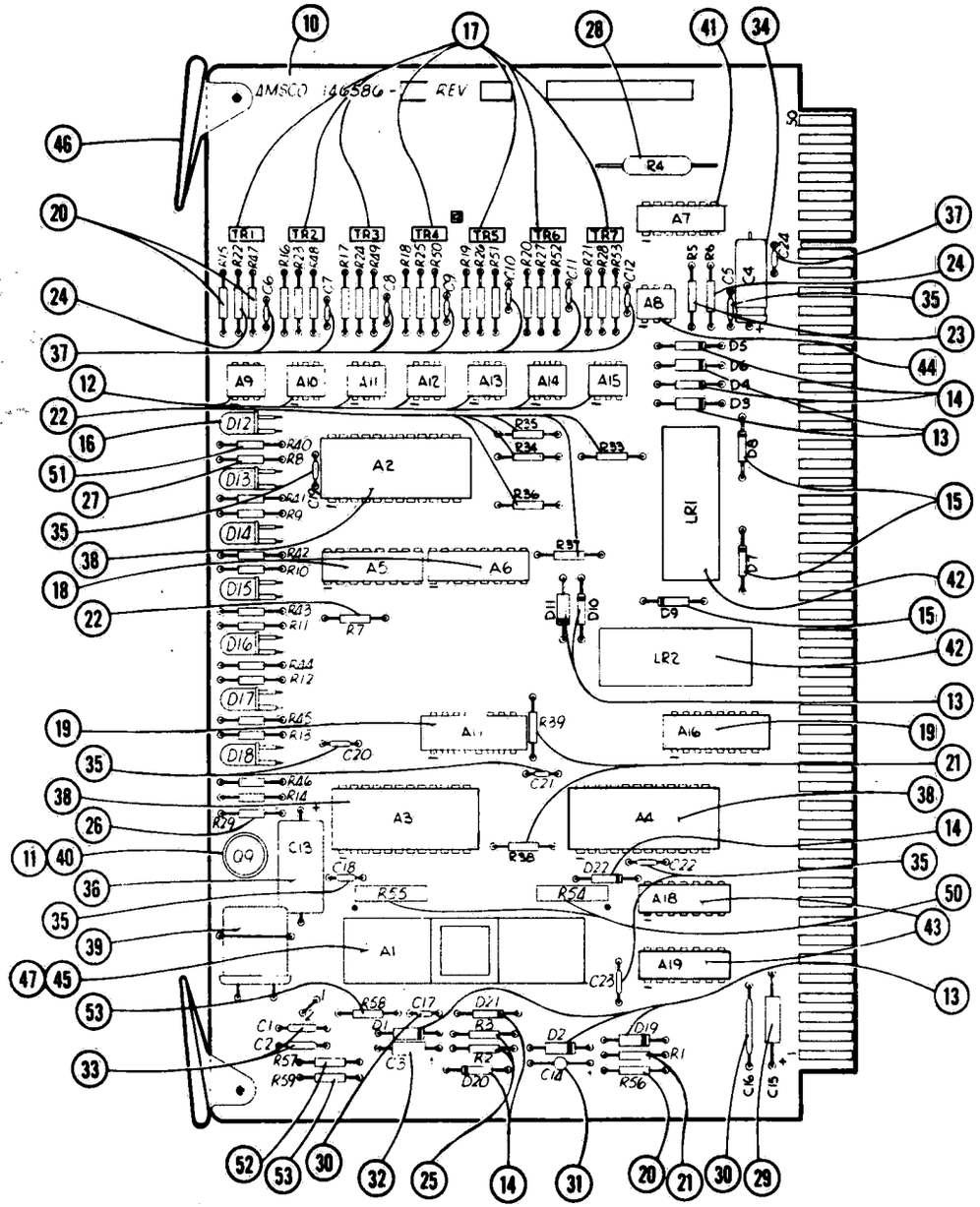
EAGLE 2000 SERIES - UNIVERSAL
GRAVITY/ISOTHERMAL SMALL RECTANGULAR
STERILIZER P-764083-002

7/87

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DWG. NO. 146586
(10/15/82)

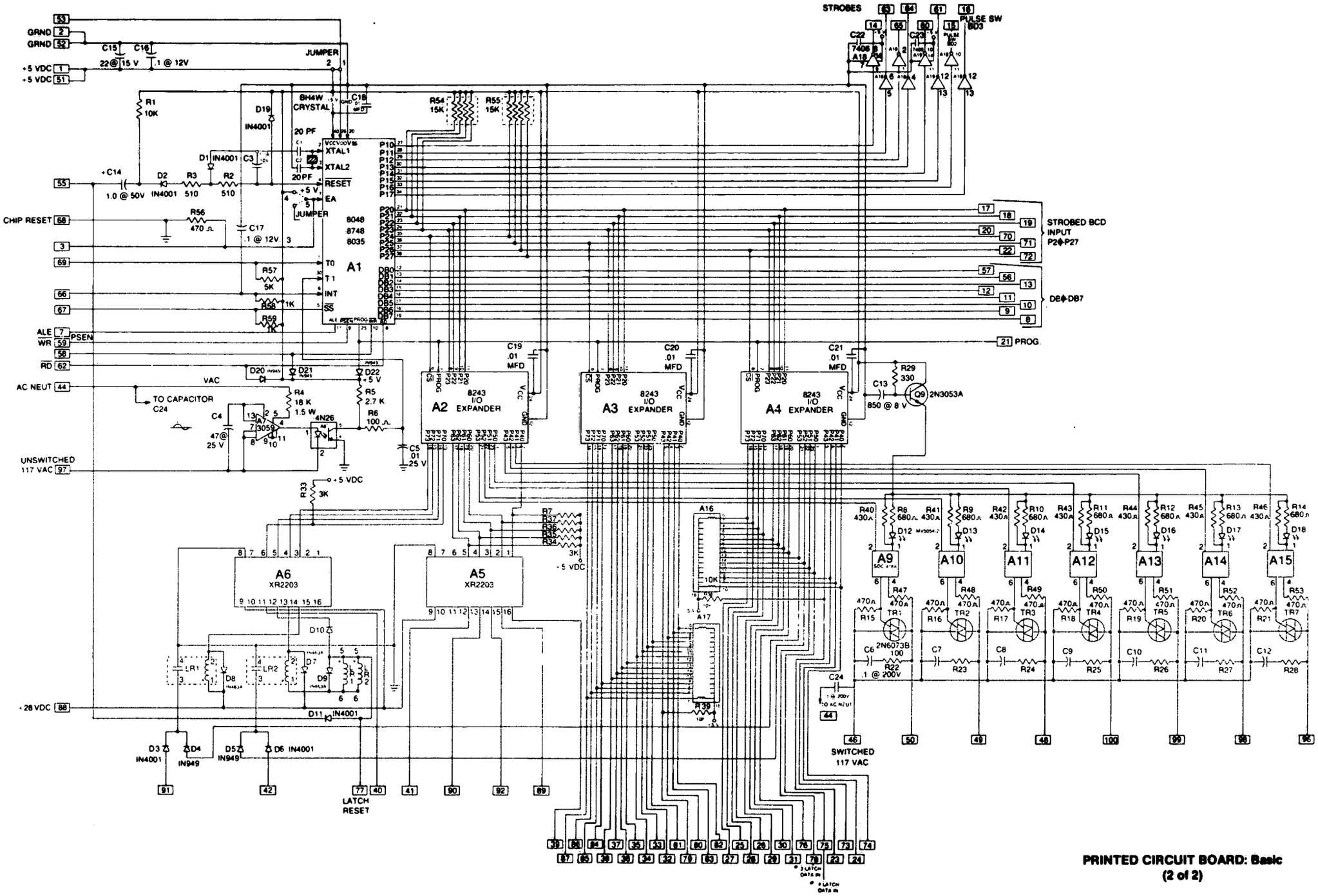


QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
	1	NOT USED	
	2	NOT USED	
	3	NOT USED	
	4	NOT USED	
	5	NOT USED	
	6	NOT USED	
	7	NOT USED	
	8	NOT USED	
1	10	P/C CARD & DRILL ASSY.	
1	11	PAD, TRANSISTOR	
7	12	IC SOC 418 A	TRIAC DRIVER A9-A15
7	13	RECTIFIER, IN4001	D1, D2, D3, D6, D10, D11, D19
5	14	DIODE, IN949	D4, D5, D20-D22
3	15	RECTIFIER, IN463A	D7, D8, D9
7	16	LAMP, SOLID STATE	MV 5054-2 L.E.D., D12-D18
7	17	TRIAC, 2N6073B	TR1-TR7
2	18	TRANSISTOR, XR2203	DARLINGTON - A5, A6
2	19	RESISTOR, NETWORK	916C103X2PE A16, A17
15	20	RESISTOR	470 OHMS 1/4W 5% CARBON, R15-R21, R47-R53, R56
3	21	RESISTOR	10K 1/4W 5% CARBON, R1, R38, R39
6	22	RESISTOR	3K 1/4W 5% CARBON, R7, R33-R37
1	23	RESISTOR	2.7K 1/4W 5% CARBON, R5
8	24	RESISTOR	100 OHMS 1/4W 5% CARBON, R6, R22-R28
2	25	RESISTOR	510 OHMS 1/4W 5% CARBON, R2, R3
1	26	RESISTOR	330 OHMS 1/4W 5% CARBON, R29
7	27	RESISTOR	680 OHMS 1/4W 5% CARBON, R8-R14
1	28	RESISTOR	18K 1.5W 10%, CARBON, R4
1	29	CAPACITOR	22µf @ 15V TANTALUM-C15
2	30	CAPACITOR	0.1µf @ 12V CERAMIC DISC-C16, C17
1	31	CAPACITOR	1.0µf @ 50V TANTALUM-C14
1	32	CAPACITOR	1.0µf @ 10V TANTALUM-C3
2	33	CAPACITOR	20pf @ 500V CERAMIC DISC-C1, C2
1	34	CAPACITOR	47µf @ 25V TANTALUM, C4
7	35	CAPACITOR	0.01µf @ 25V CERAMIC DISC-C5, C18, C23
1	36	CAPACITOR	850µf @ 8V TANTALUM-C13
8	37	CAPACITOR	0.1µf @ 200 WVDC CERAMIC DISC-C6-C12, C24
3	38	EXPANDER, I/O	8243 A2, A3, A4
1	39	CRYSTAL, 3MHZ	
1	40	TRANSISTOR,	2N3053A Q9
1	41	IC 3059	A7
2	42	RELAY, LATCH	LR1, LR2
2	43	IC-7406	INVERTER HEX BUFFER/DRIVER-A18, A19
1	44	IC, 4N26	OPTO ISO TRANS., A8
1	45	DIP SOCKET	40 PIN A1
2	46	PULL, CARD	
1	47	MICROCOMPUTER	
	48	NOT USED	
	49	NOT USED	
2	50	RESISTOR NETWORK	15K BY 5 R54, R55
7	51	RESISTOR	430 OHMS 1/4W 5% R40-R46
1	52	RESISTOR	5.1K OHMS 1/4W 5% R57
2	53	RESISTOR	1K OHMS 1/4W 5% R58, R59

PRINTED CIRCUIT BOARD: Basic
(1 of 2)

Rev. 11/83

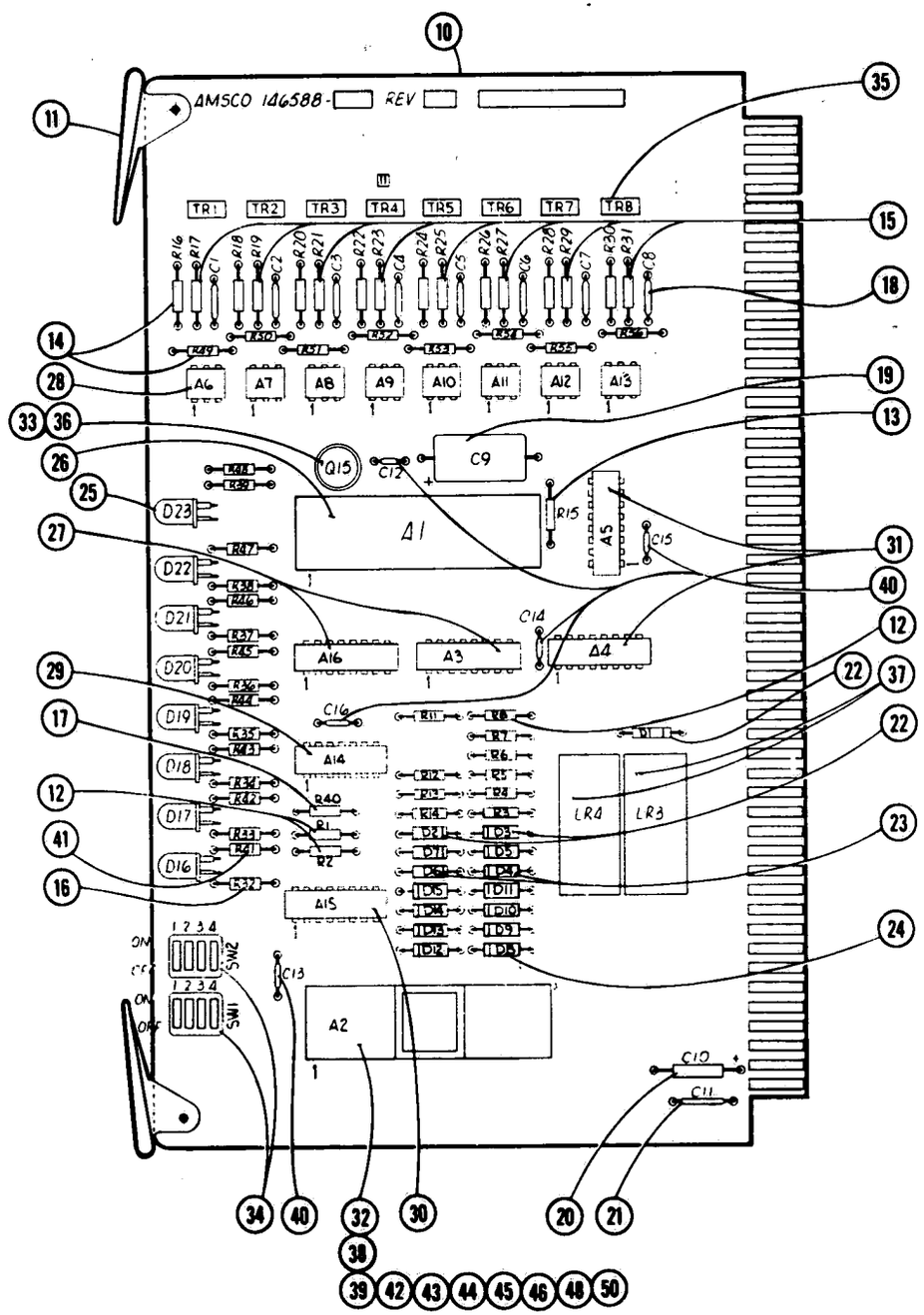
DWG. NO. 146586
(10/15/82)



PRINTED CIRCUIT BOARD: Basic
(2 of 2)

Rev. 11/83

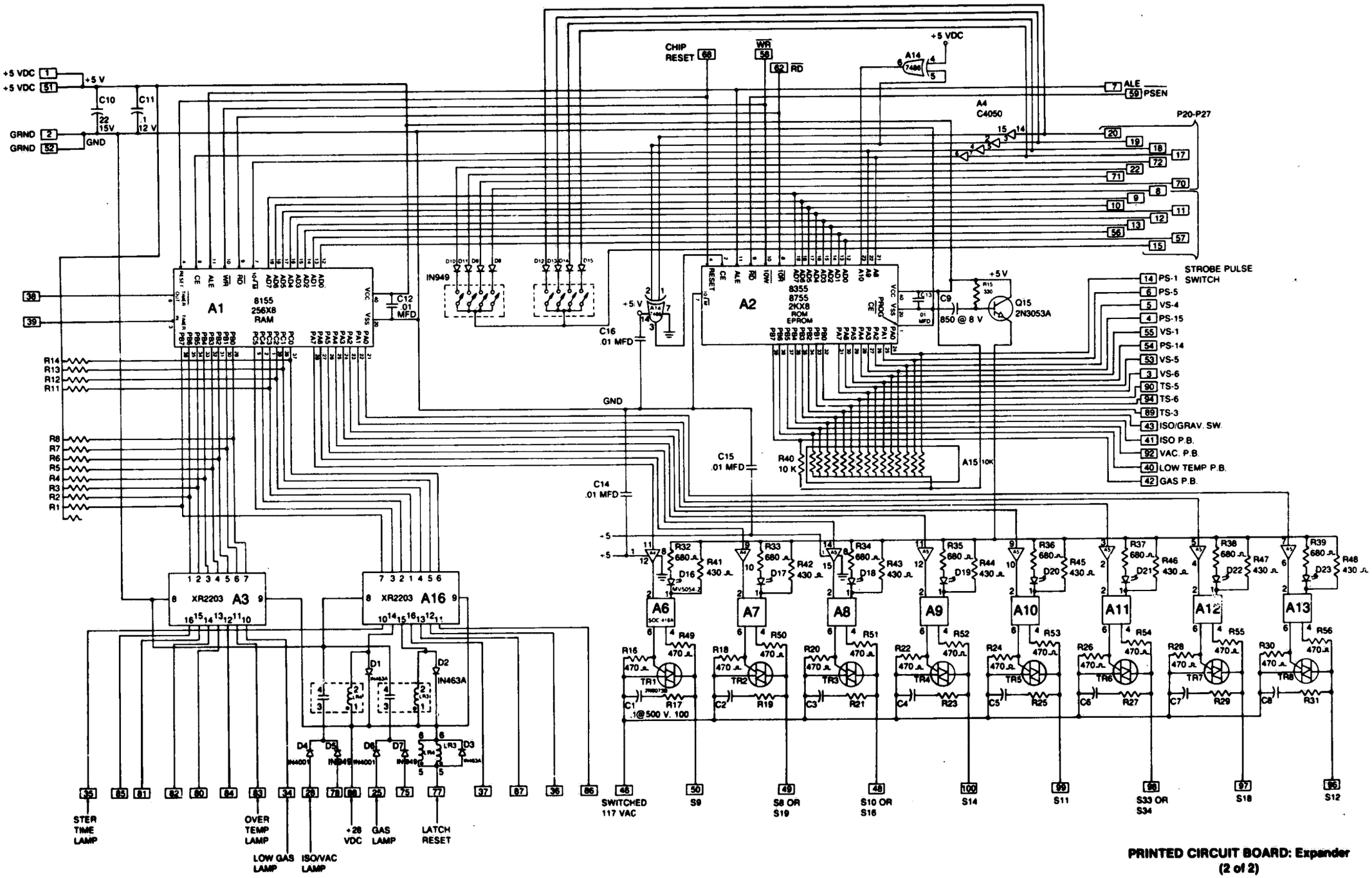
DWG. NO. 146588
(7/29/86)



QTY.											ITEM NO.	NAME	DESCRIPTION, MATERIAL
										X	1	P/C CARD ASSY.	VAC & GAS
									X		2	P/C CARD ASSY.	PULSTAR 2000(CRW),PULSTAR 3000(HCW)
								X			3	P/C CARD ASSY.	EAGLE 2200
							X				4	P/C CARD ASSY.	PULSTAR 5000
						X					5	P/C CARD ASSY.	
					X						6	P/C CARD ASSY.	
				X							7	P/C CARD ASSY.	
			X								8	P/C CARD ASSY.	
1	1	X	1	1	1	1	1	1	1	1	9	COMMON PARTS LIST	
		1									10	P/C CARD & DRILL SCHD.	
		2									11	PULL, CARD	
		12									12	RESISTOR, 3K OHMS	1/4W 5%, R1-R8, R11-R14
		1									13	RESISTOR,330 OHMS	1/4W 5%, R15
		16									14	RESISTOR, 470 OHMS	1/4W 5%, R16, R18, R20, R22, R24, R26, R28, R30, R49-R56
		8									15	RESISTOR, 100 OHMS	1/4W 5%, R17, R19, R21, R23, R25, R27 R29, R31
		8									16	RESISTOR, 680 OHMS	1/4W 5%, R32-R39
		1									17	RESISTOR, 10K OHMS	1/4W 5%, R40
		8									18	CAPACITOR, .1μf, 500V	C1-C8
		1									19	CAPACITOR, 850μf, 8V	C9
		1									20	CAPACITOR, 22μf, 15V	C10
		1									21	CAPACITOR, .1μf, 12V	C11
		3									22	DIODE	IN463A, D1, D2, D3
		2									23	DIODE	IN4001, D4, D6
											24	DIODE	IN949, D5, D7, D8-D15
		8									25	L.E.D.	MV5054-2 D16-D23
		1									26	MOS RAM, 8155(H)	A1
		2									27	DARLINGTON, XR2203	A3, A16
		8									28	OPTOISO TRIAC	SOC 418A A6-A13
		1									29	QUAD EX-OR	A14
		1									30	RESISTOR, NETWORK	916C103X2PE A15
		2									31	BUFFER, CMOS	CD4050BC A4, A5
		1									32	DIP SOCKET, 40 PIN	A2
		1									33	TRANSISTOR	2N3053A Q15
		2									34	SWITCH, 16 POS HEX	SW1, SW2
		8									35	TRIAC, 2N6073B	TR1-TR8
		1									36	PAD, TRANSISTOR	Q15
		2									37	RELAY, LATCH	LR3, LR4
		1								1	38	BIT ROM	8355/8755-A2
									1		39	BIT-ROM	8355/8755-A2
		5									40	CAPACITOR	0.01 MF @ 25V C12-C16
		8									41	RESISTOR	430 OHMS 1/4W 5% R41-R48
							1				42	BIT-ROM	
						1					43	BIT-ROM	
								1			44	BIT-ROM	8355/8755-A2
				1							45	BIT-ROM	8755A-A2
			1								46	BIT-ROM	8755A
		X									47	P/C CARD ASSY.	
		1									48	BIT-ROM	8755A-A2
X											49	P/C CARD ASSY.	GAS MOD
1											50	BIT-ROM	8755A-A2

PRINTED CIRCUIT BOARD: Expander
(1 of 2)

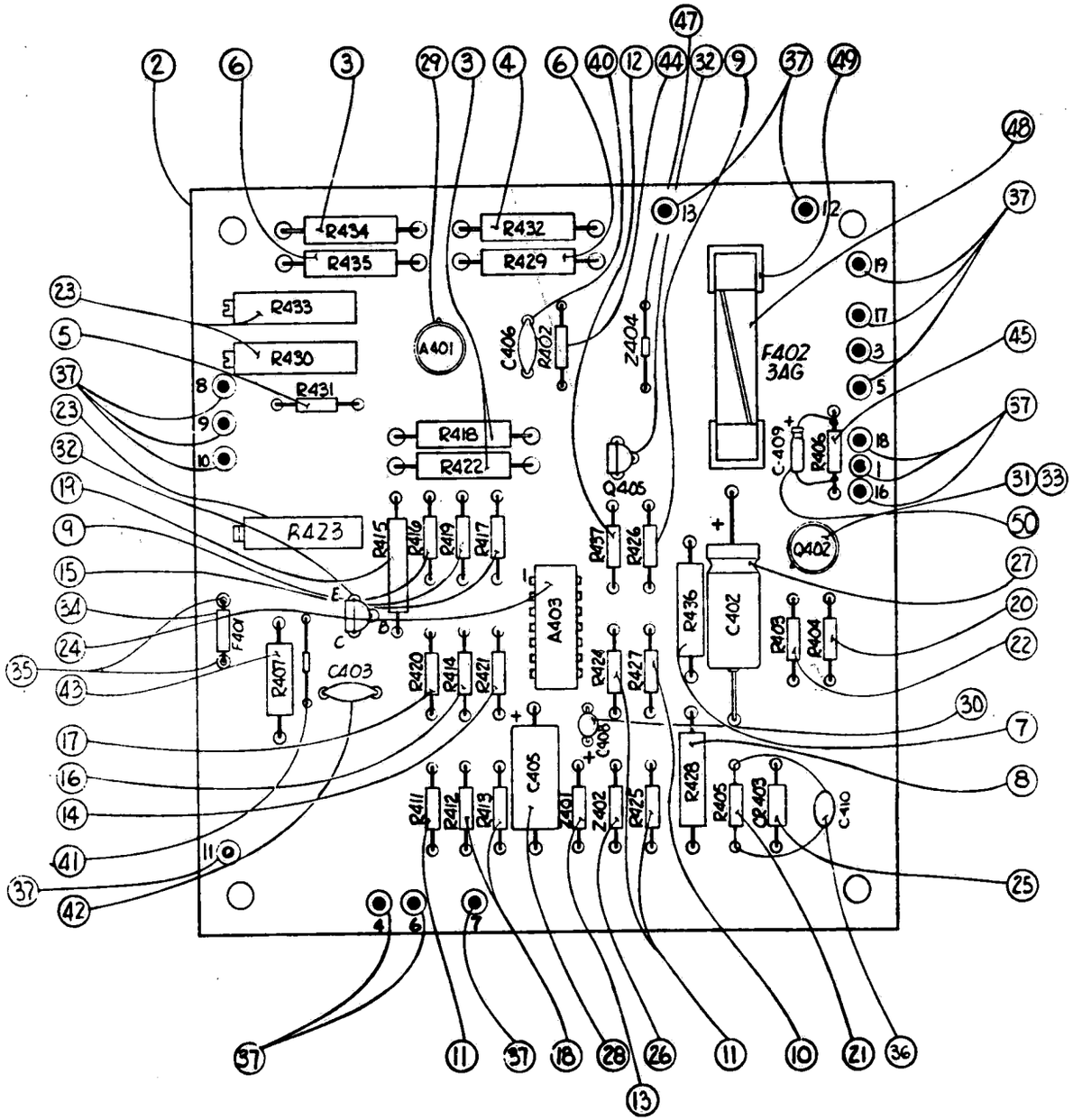
DWG. NO. 146588
(7/29/86)



PRINTED CIRCUIT BOARD: Expander (2 of 2)

Rev. 3/87

DWG. NO. 146599
(7-22-85)



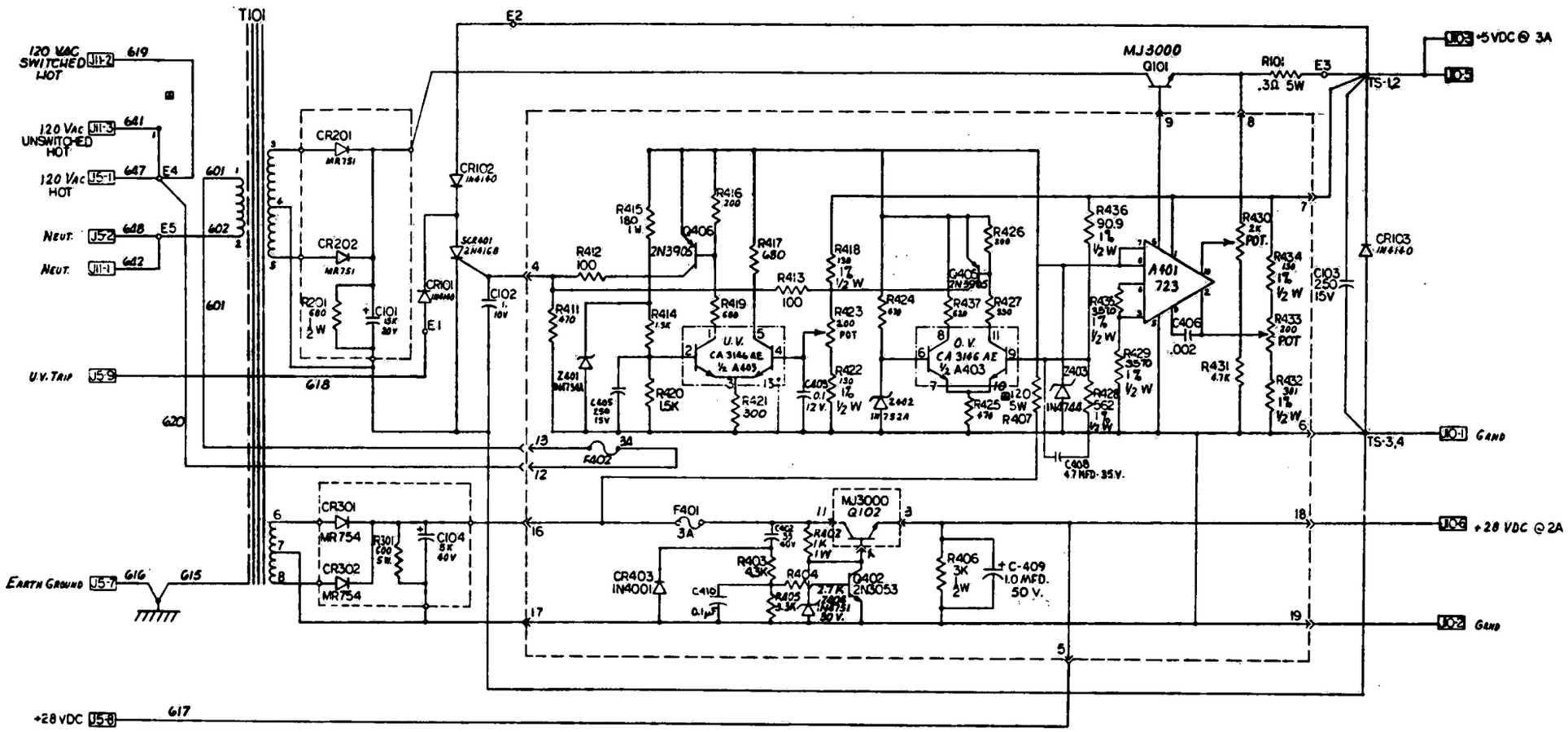
QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
1	2	P/C CARD	
1	3	RESISTOR, 130 OHMS	1% 1/2 W.M.F., R434
1	4	RESISTOR, 301 OHMS	1% 1/2 W.M.F., R432
1	5	RESISTOR, 47K OHMS	5% 1/4 W.C.C., R431
2	6	RESISTOR, 750 OHMS	1% 1/2 W.M.F., R429, R435
1	7	RESISTOR, 9.09 OHMS	1% 1/2 W.M.F., R436
1	8	RESISTOR, 562 OHMS	1% 1/2 W.M.F., R428
2	9	RESISTOR, 200 OHMS	5% 1/4 W.C.C., R416, R426
1	10	RESISTOR, 390 OHMS	5% 1/4 W.C.C., R427
3	11	RESISTOR, 470 OHMS	5% 1/4 W.C.C., R411, R424, R425
1	12	RESISTOR, 430 OHMS	5% 1/4 W.C.C., R437
1	13	DIODE, ZENER	IN4734A, Z401
1	14	RESISTOR, 300 OHMS	5% 1/4 W.C.C., R421
2	15	RESISTOR, 680 OHMS	5% 1/4 W.C.C., R419
1	16	RESISTOR, 1.3K OHMS	5% 1/4 W.C.C., R414
1	17	RESISTOR, 1.5K OHMS	5% 1/4 W.C.C., R420
2	18	RESISTOR, 100 OHMS	5% 1/4 W.C.C., R412, R413
1	19	RESISTOR, 180 OHMS	5% 1 W., C.C., R415
1	20	RESISTOR, 2.7K OHMS	5% 1/4 W.C.C., R404
1	21	RESISTOR, 3.3K OHMS	5% 1/4 W.C.C., R405
1	22	RESISTOR, 4.3K OHMS	5% 1/4 W.C.C., R403
2	23	POTENTIOMETER	200 OHMS, R423, R433
1	24	I.C.	CA3146AE. A403
1	25	DIODE	IN4001, CR403
1	26	DIODE, ZENER	IN752A, Z402
1	27	CAPACITOR, ELEC.	33 MFD 40V, C402
1	28	CAPACITOR, ELEC.	250 MFD 15 VDC, C405
1	29	I.C.	723 A401
1	30	CAPACITOR	4.7 MFD, 35V, C408
1	31	TRANSISTOR	2N3053 Q402
2	32	TRANSISTOR	2N3905, Q405, Q406
1	33	PAD, TRANSISTOR	
1	34	FUSE, 3 AMP	F401
2	35	TERMINAL, SOCKET	
1	36	CAPACITOR	C410
15	37	PIN, FORMED	
1	38	RESISTOR, 178 OHMS	1% 1/2 W.M.F., R422
1	39	RESISTOR, 82.5 OHMS	1% 1/2 W.M.F., R418
1	40	CAPACITOR, DISC.	.002 MFD 1KV, C406
1	41	DIODE, ZENER	IN4744, Z403
1	42	CAPACITOR	.1MFD 12VDC C403
1	43	RESISTOR	750 OHMS 3W R407
1	44	RESISTOR	1K 1W R402
1	45	RESISTOR	3K 1/2W R406
1	46	POTENTIOMETER	2K R 430
1	47	DIODE, ZENER	IN4751A 30V Z404
1	48	FUSE	3AG F402
2	49	CLIP, FUSE	
1	50	CAPACITOR	1.0 MFD, 50V, C409

P/C ASSEMBLY, Power Supply (Part 1 of 2)
(Units with Indicator-Recorder)

Rev. 2/86

DWG. NO. 146599
(7-22-85)

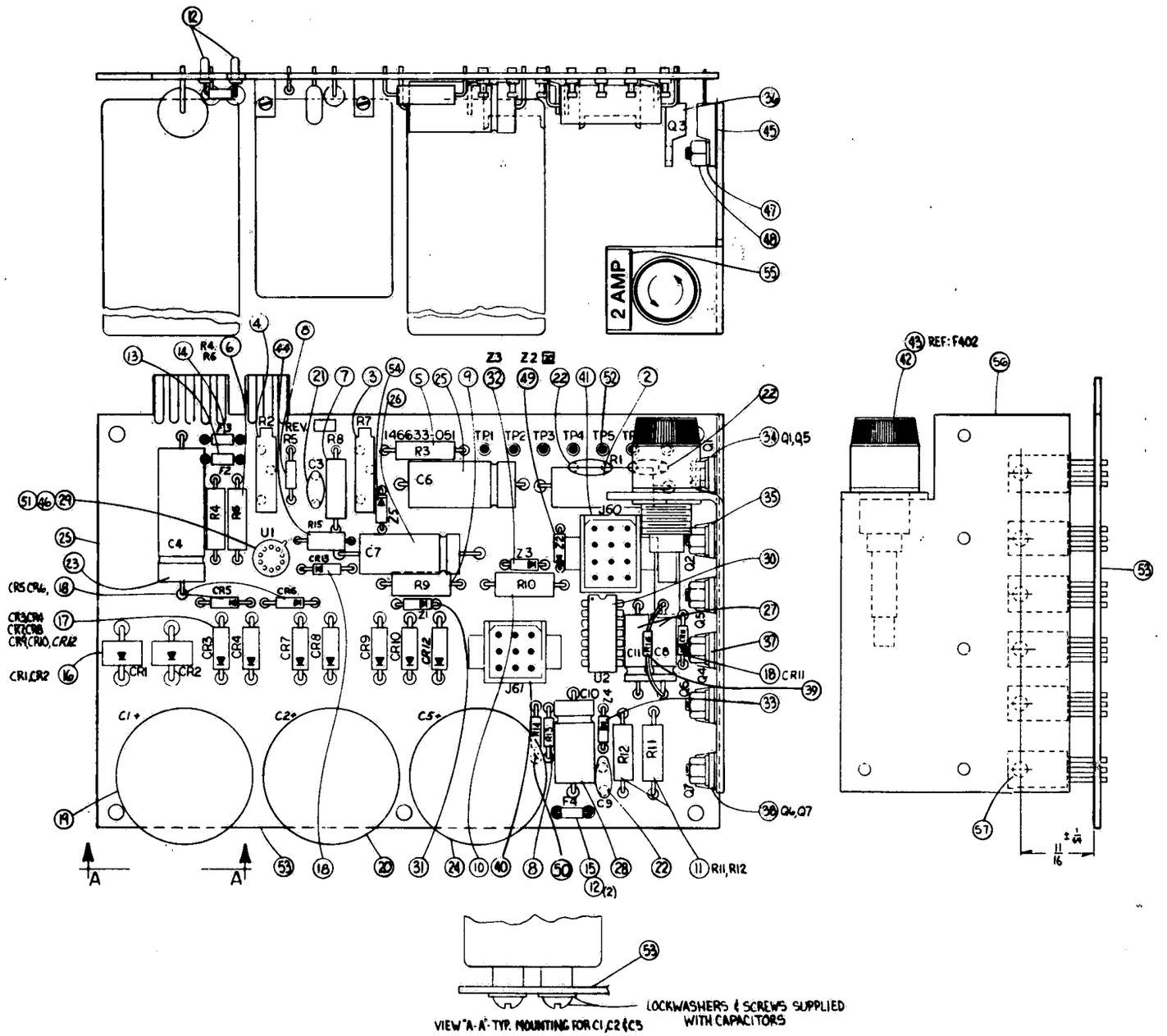
NOTE:
1. ALL RESISTORS ¼ W UNLESS OTHERWISE NOTED.



P/C ASSEMBLY, Power Supply (Part 2 of 2)
(Units with Indicator-Recorder)

Rev. 2/86

DWG. NO. 146633-051
(01/30/71)

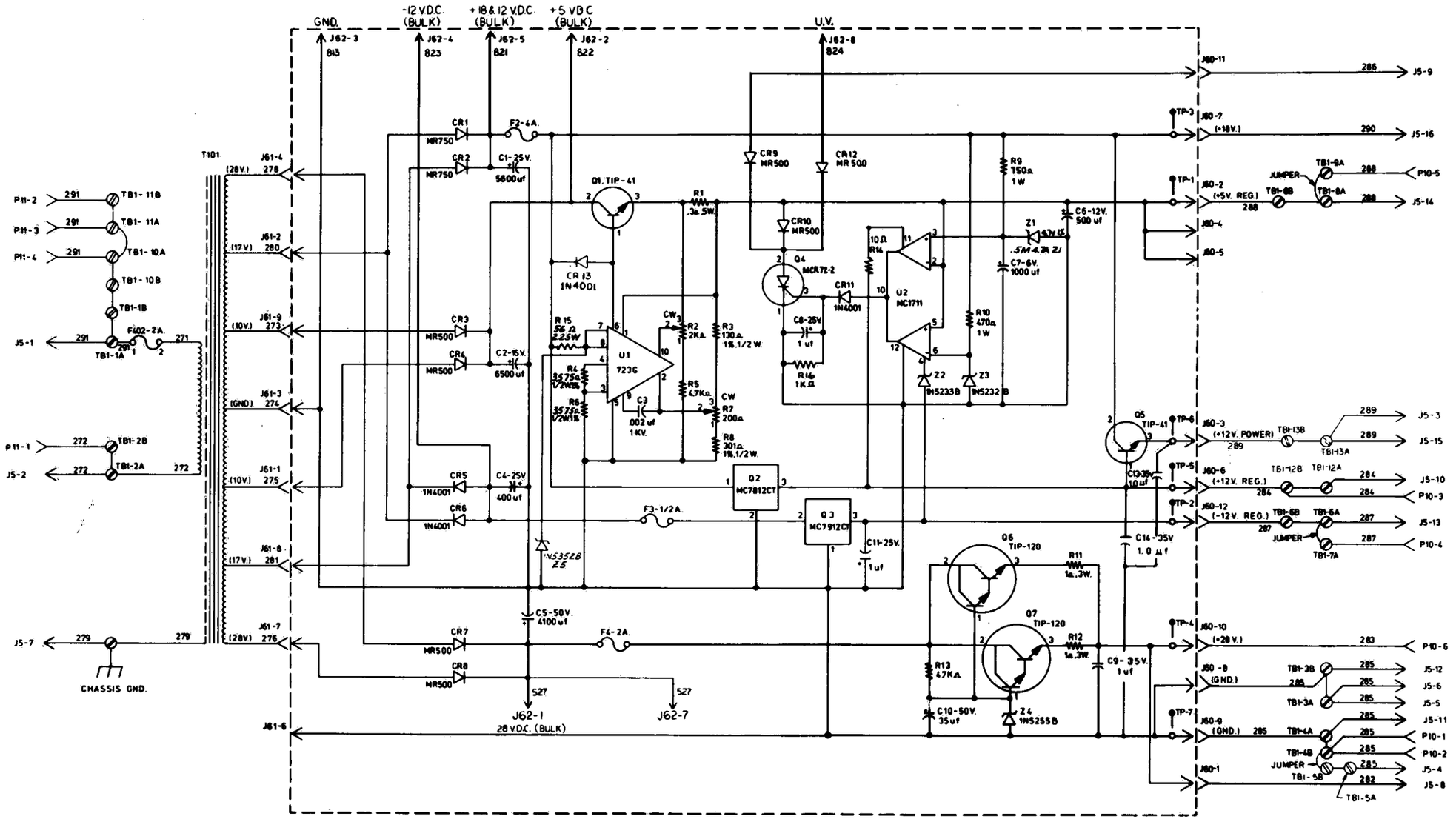


QTY.	ITEM NO.	DESCRIPTION
X	1	BOARD, POWER SUPPLY P.C. ASSEMBLY
1	2	RESISTOR 5 W.W.W., 3Ω R1
1	3	POT., 200Ω R7
1	4	POT, 2KΩ R2
1	5	RESISTOR, 1/2 W.M.F., 130Ω R3
2	6	RESISTOR, 1/2 W.M.F., 3570Ω R4, R6
1	7	RESISTOR, 1/2 W.M.F., 301Ω R8
2	8	RESISTOR, 1/4 W.C.C., 4.7KΩ R5, R13
1	9	RESISTOR, 1 W.C.C., 750Ω R9
1	10	RESISTOR, 1 W.C.C., 470Ω R10
2	11	RESISTOR, 3 W.W.W., 1Ω R11, R12
6	12	TERMINAL, SPRING SOCKET
1	13	PICOFUSE, 4A, F2
1	14	PICOFUSE, 1/2A, F3
1	15	PICOFUSE, 2A, F4
2	16	RECTIFIER, 6A POWER, CR1, CR2
7	17	RECTIFIER, 3A POWER, CR3, CR4, CR7, CR8, CR9, CR10, CR12
4	18	RECTIFIER, 1A, CR5, CR6, CR11, CR13
1	19	CAPACITOR, 5600 μFD, 25V, C1
1	20	CAPACITOR, 6500 μFD, 15V, C2
1	21	CAPACITOR, .002 μFD, 1KV, C3
3	22	CAPACITOR, 1 μFD, 35 VDC, C9, C13, C14
1	23	CAPACITOR, 470 μFD, 25V, C4
1	24	CAPACITOR, 4100 μFD, 50V, C5
1	25	CAPACITOR, 470 μFD, 16V, C6
1	26	CAPACITOR, 1000 μFD, 10V, C7
2	27	CAPACITOR, 1 μFD, 50V, C8, C11
1	28	CAPACITOR, 33 μFD, 50V, C10
1	29	REGULATOR, POS. VOLTAGE, U1
1	30	COMPARATOR, DUAL DIFFER., U2
1	31	DIODE, 4.7V, ZENER, 1%, Z1
1	32	DIODE, 5.6V, ZENER, 5%, Z3
1	33	DIODE, 28V, ZENER, 5%, Z4
2	34	TRANSISTOR POWER, Q1, Q5
1	35	REGULATOR, 12V POSITIVE, Q2
1	36	REGULATOR, 12V NEGATIVE, Q3
1	37	THYRISTOR REV. BLOCK TRIODE, Q4
2	38	TRANSISTOR, POWER, Q6, Q7
1	39	RESISTOR, 1/4 W, 1KΩ, R16
1	40	HEADER PIN, PC MOUNTING, J61
1	41	HEADER PIN, PC MOUNTING, J60
1	42	FUSEHOLDER
1	43	FUSE, 2A, F402
1	44	RESISTOR, 56 Ω 2-1/4 W, R15
6	45	INSULATOR
1	46	HEATSINK
6	47	BUSHING, NYLON INSULATING
6	48	NUT #4-40 HEX
1	49	DIODE 6.0V ZENER, Z2
1	50	RESISTOR, 1/2 W, C.C. 10Ω, R14
1	51	SOCKET (USED WITH U1 ITEM #29)
7	52	TERMINAL TEST POINT
1	53	BOARD BARE POWER SUPPLY P.C. — DRILL SCHEDULE
1	54	DIODE, 15V ZENER 5% Z5
1	55	DECAL — 2 AMP
1	56	HEAT SINK
6	57	SCREW, FLAT HD. #4-40 X 5/16

P/C ASSEMBLY, Power Supply
(Part 1 of 2)
(Units with Printcon)

Rev. 7/87

DWG. NO. 146633-051
(91/32/71)

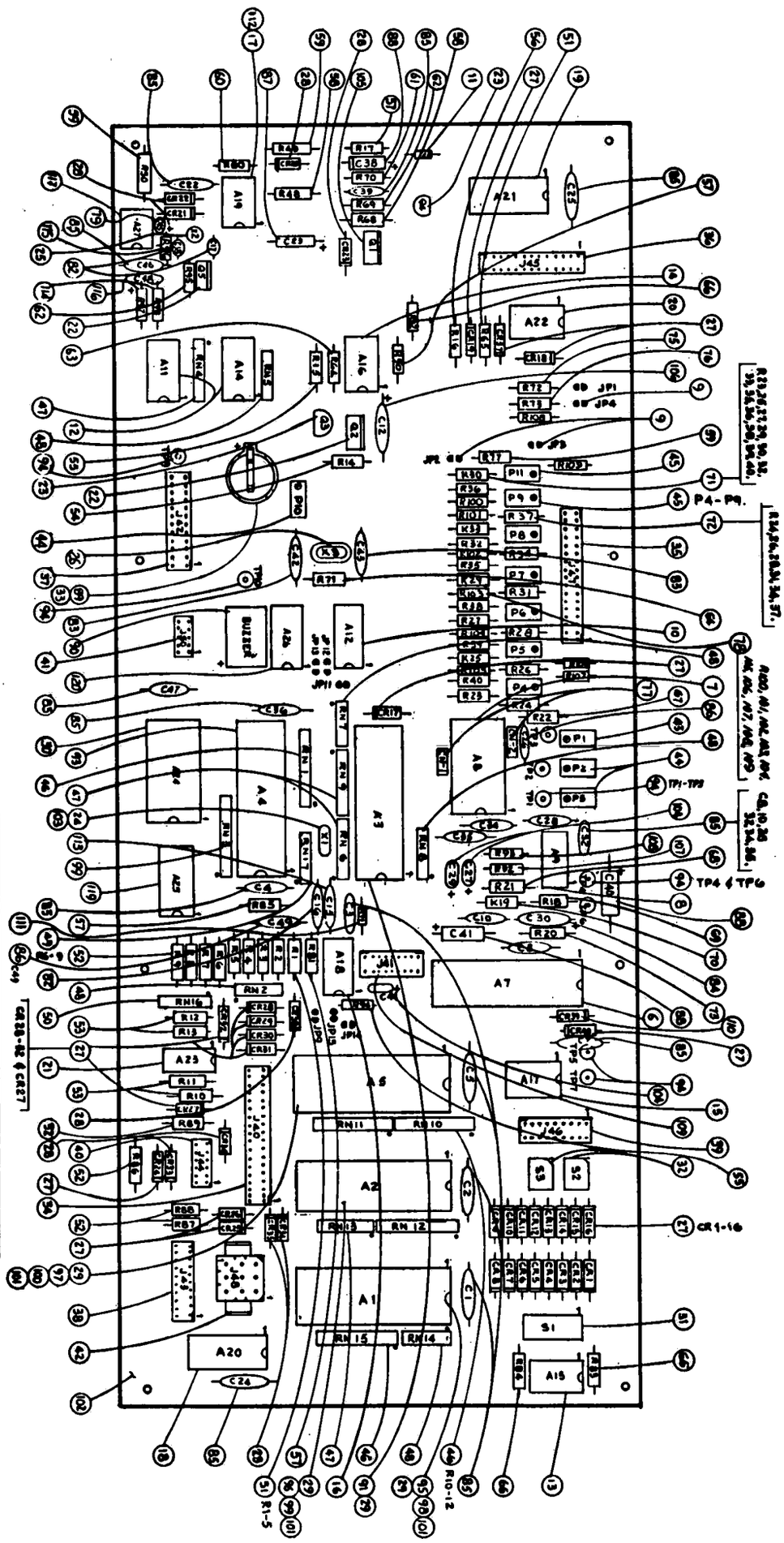


UNLESS OTHERWISE NOTED, ALL RESISTORS ARE 1/4 WATT.

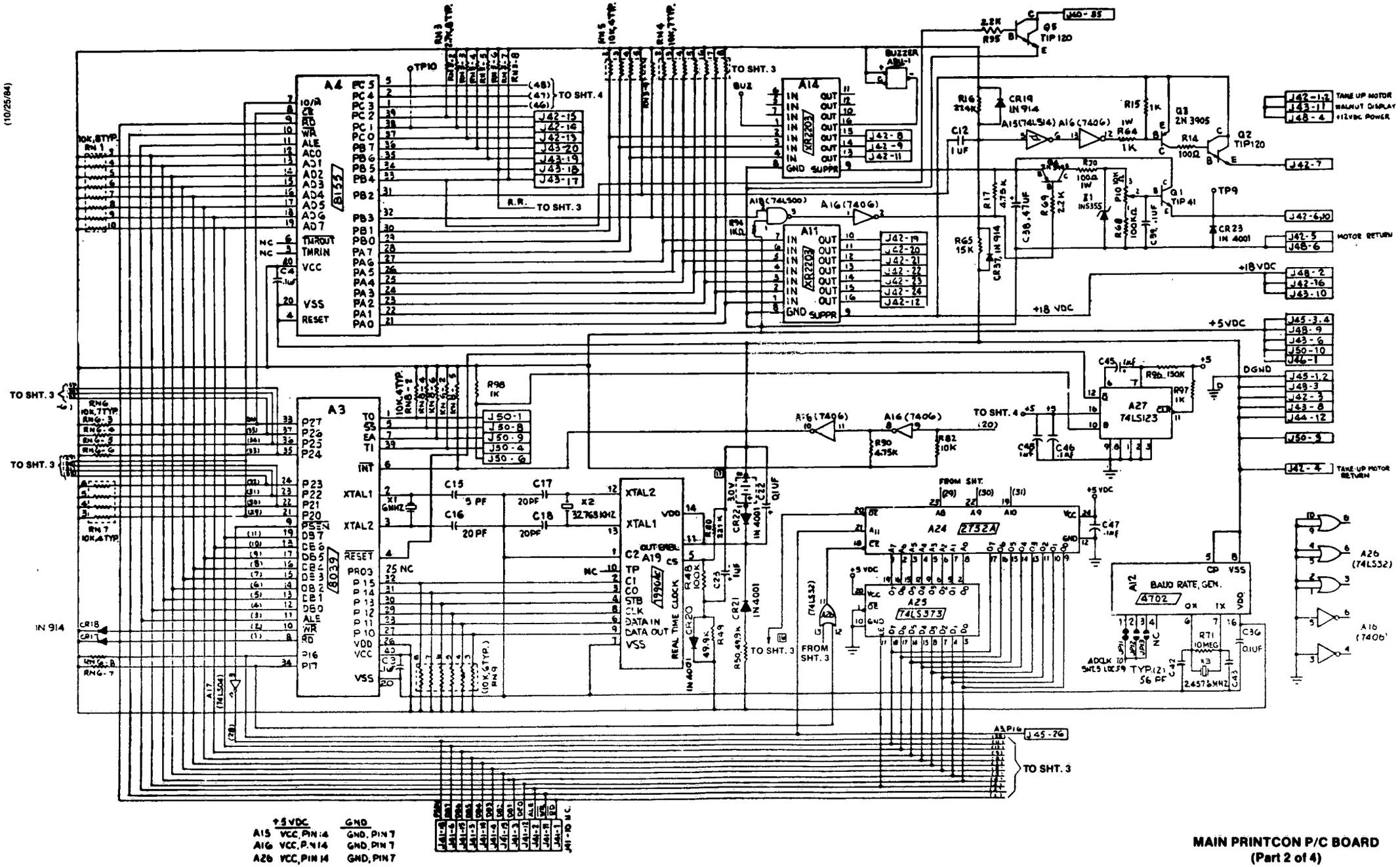
P/C ASSEMBLY, Power Supply
(Part 2 of 2)
(Units with Printcon)

DWG NO. 146651-001
(10/25/84)

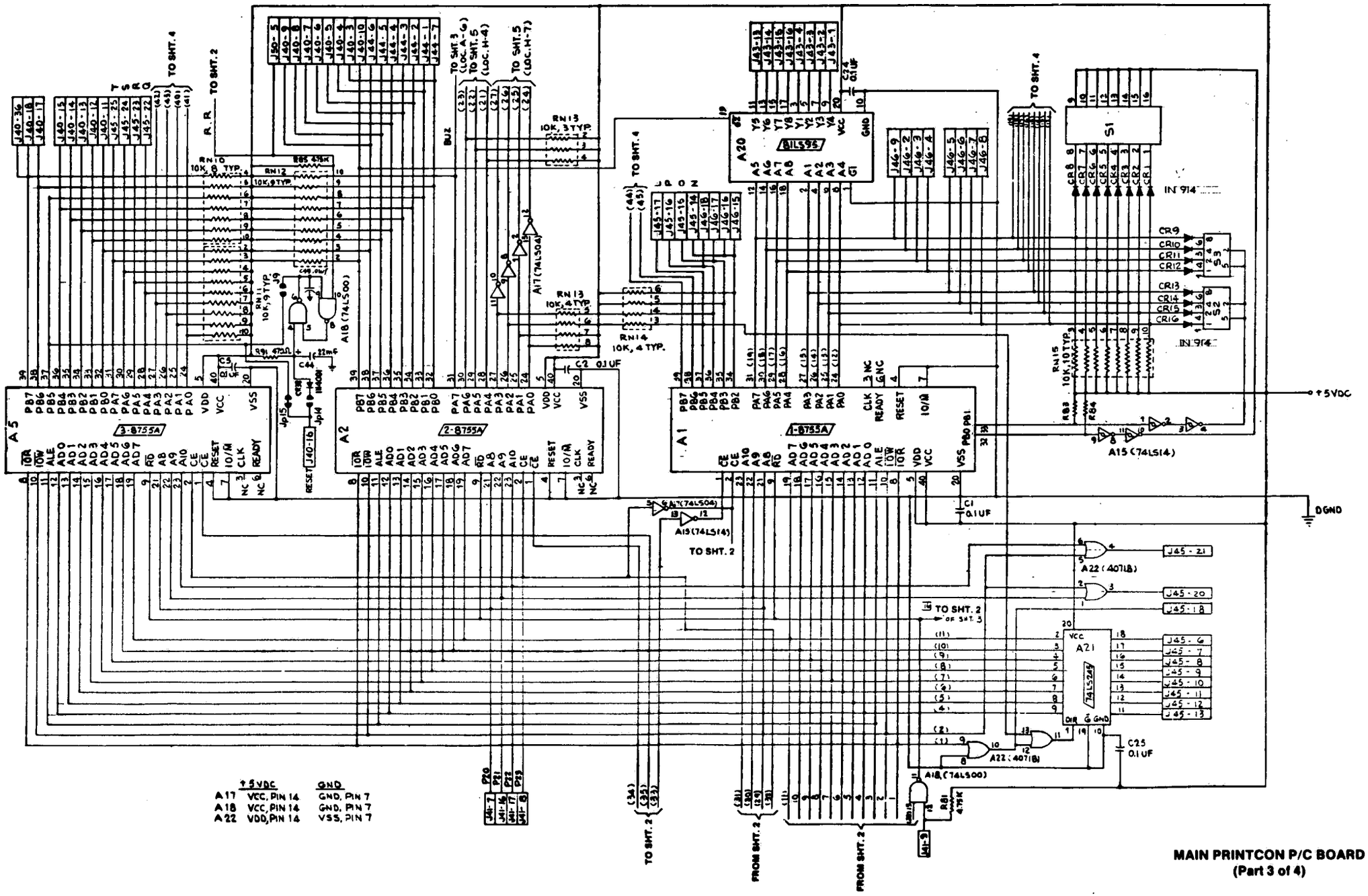
QTY	ITEM NO	PART NAME	DESCRIPTION, MATERIAL
R		DIGITAL PRINTER ASSY	PARTS LIST
	5	NOT USED	
1	6	40 PIN DIP IC	AD 7550 BD A/D CONVERTER (A7)
1	7	28 PIN DIP IC	AD 7507 JN ANALOG MUX (A8)
1	8	14 PIN DIP IC	AD 521 KD DIFFER AMP (A9)
3	9	WIRE, JUMPER	
1	10	16 PIN DIP IC	HDJ-4702-9 BIT RATE GEN (A12)
1	11	ZENER DIODE	IN5355 18V ZENER (Z1)
2	12	16 PIN DIP IC	4N2003 OR DARLINGTON ARRAY (A11, 14)
1	13	14 PIN DIP IC	DM74LS14N HEX SCHMIDT TRIGGER (A15)
1	14	14 PIN DIP IC	7406N HEX INVER HV/O.C. (A16)
1	15	16 PIN DIP IC	DM74LS04N, HEX INVER LOW POWER SCHOTTY (A17)
1	16	14 PIN DIP IC	DM74LS00NQUAD 2 INPUT, NAND GATE, LOW POWER SCHOTTY (A18)
1	17	14 PIN DIP IC	MPD 1990 A/C REAL TIME CLOCK (A19)
1	18	20 PIN DIP IC	DM81LS95N OCTAL DRIVER (A20)
1	19	20 PIN DIP IC	74LS245 OCTAL BUS TRANSCEIVER (A21)
1	20	14 PIN DIP IC	CD4071B QUAD 2-INPUT OR GATE (A22)
1	21	14 PIN DIP IC	LM339N QUAD COMPARATOR (A23)
2	22	TRANSISTOR	TIP 120 DARLINGTON (NPN) Q2, Q5
2	23	TRANSISTOR	2N 3905 (PNP), Q3 & Q4
1	24	CRYSTAL	8.0 MHZ (X1)
1	25	CRYSTAL	32.768 KHZ (X2)
1	26	CRYSTAL	2.4576 MHZ (X3)
30	27	DIODE	IN914 CR1-19 CR24 THRU 32, 37, 40
9	28	DIODE	IN4001 CR20-23, 33-36, 38
4	29	SOCKET	40 PIN DIP (A1, 2, 3 & 5)
1	30	SOCKET	24 PIN DIP (A24)
1	31	SWITCH	8 POS ROCKER DIP (S1) GRAYHILL 76SB08S
2	32	SWITCH	10 POS ROTARY BCD DIP (S2, S3) EECO 230002 G
1	33	HOLDER BATTERY	2 PIN
1	34	CONNECTOR	36 PIN S P D R HEADER (J40)
1	35	CONNECTOR	34 PIN S P D R HEADER (J47)
1	36	CONNECTOR	26 PIN S P D R HEADER (J45)
1	37	CONNECTOR	24 PIN S P D R HEADER (J42)
1	38	CONNECTOR	20 PIN S P D R HEADER (J43)
1	39	CONNECTOR	18 PIN S P D R HEADER (J48)
1	40	CONNECTOR	12 PIN S P D R HEADER (J44)
1	41	CONNECTOR	10 PIN S P D R HEADER (J50)
1	42	CONNECTOR	9 PIN S P M & L HEADER (J46)
1	43	POTENTIOMETER	3299 W 1K CERMET (P1)
3	44	POTENTIOMETER	3299 W 10K CERMET (P2, P3, P10)
7	45	POTENTIOMETER	3299 W 100Ω CERMET (P4-P9, P11)
5	46	RESISTOR NETWORK	10KΩ, 9 RESISTOR SIP (RN 1, 10, 11, 12 & 15)
4	47	RESISTOR NETWORK	10KΩ, 7 RESISTOR SIP (RN 4, 6, 9, 13)
5	48	RESISTOR NETWORK	10KΩ, 5 RESISTOR SIP (RN 2, 5, 7 & 8 & 14)
1	49	RESISTOR NETWORK	4.7KΩ, 5 RESISTOR SIP (RN 17)
1	50	RESISTOR NETWORK	470KΩ, 5 RESISTOR SIP (RN 16)
8	51	RESISTOR	15KΩ, 1% MF 1/8 W (R1-R5 & R85)
8	52	RESISTOR	332KΩ, 1% MF 1/8 W (R6-R9 & R86-89)
4	53	RESISTOR	1 MEGΩ, 1% MF 1/8 W (R10-R13)
1	54	RESISTOR	100Ω, 1% MF 1/8 W (R14)
2	55	RESISTOR	1KΩ, 1% MF 1/8 W (R15) (R94)
1	56	RESISTOR	27.4KΩ, 1% MF 1/8 W (R16)
4	57	RESISTOR	4.75KΩ, 1% MF 1/8 W (R17, 80, 81, 85)
2	58	RESISTOR	100KΩ, 1% MF 1/8 W (R48 & R88)
3	59	RESISTOR	49.9KΩ, 1% MF 1/8 W (R 49 & R50 & R77)
1	60	RESISTOR	221KΩ, 1% MF 1/8 W (R60)
1	61	RESISTOR	100Ω, 5% 1W (R70)
2	62	RESISTOR	2.2KΩ, 1% MF 1/4 W (R66, R95)
1	63	RESISTOR	1Ω, 5% 1W (R64)
1	64	RESISTOR	10 MEGΩ, 5% CC 1/8 W (R71)
	65	NOT USED	
3	66	RESISTOR	10KΩ, 1% MF, 1/8 W (R82-84)
1	67	RESISTOR	100KΩ, 1% 25 PPM/°C TC MF 1/8 W (R22)
1	68	RESISTOR	2.5KΩ, 1% 25 PPM/°C TC MF 1/8 W (R21)
1	69	RESISTOR	4.53KΩ, 1% 25 PPM/°C TC MF 1/8 W (R18)
1	70	RESISTOR	4.99KΩ, 1% 25 PPM/°C TC MF 1/8 W (R19)
12	71	RESISTOR	6.04KΩ, 1% 25 PPM/°C TC MF 1/8 W (R23, 25, 27, 29, 30, 32, 33, 35, 36, 38, 39 & 40)
6	72	RESISTOR	75Ω, 1% 25 PPM/°C TCMF 1/4 W (R24, 26, 28, 31, 34 & 37)
1	73	RESISTOR	5.1 MEG, 5% MF 1/8 W R96
	74	NOT USED	
1	75	RESISTOR	30.9KΩ, 0.1% 25 PPM/°C TCMF 1/8 W (R72)
1	76	RESISTOR	280Ω, 0.1% 25 PPM/°C TCMF 1/8 W (R73)
2	77	CAPACITOR NETWORK	01μF 50V CN-1 CN-2
10	78	RESISTOR	1K R100 THRU R109
1	79	CAPACITOR	1uF 35V (C45)
	80	NOT USED	
	81	NOT USED	
3	82	CAPACITOR	20PF 500V MICA C16-18
2	83	CAPACITOR	56PF 300V MICA C42 & C43
1	84	CAPACITOR	.0022μF 600V POLYPROPALENE C30
19	85	CAPACITOR	1μF 25V CERAMIC C1-5, C7, C9, C10, C22, C24, C25, C28, C32, C34-C36, C39, C46, C47
2	86	CAPACITOR	.01μF 25V CERAMIC C26, C49
1	87	CAPACITOR	1μF 50V ALUMINUM (C23)
3	88	CAPACITOR	47μF 35V ALUMINUM C38, C40 & C41
1	89	BATTERY	MEMORY BACKUP 150822-351
1	90	BUZZER	5VDC
1	91	40 PIN DIP IC	P8039-8 CPU (A3)
	92	NOT USED	
1	93	40 PIN DIP IC	P8155, RAM & I/O (A4)
9	94	TEST POINT	(TP1-TP7, TP9, TP10)
1	95	40 PIN DIP IC	8355/8755 ROM EAGLE 2000 A1
1	96	40 PIN DIP IC	8355/8755 ROM EAGLE 2000 A2
1	97	40 PIN DIP IC	8355/8755 ROM EAGLE 2000 A5
	98	NOT USED	
1	99	RESISTOR NETWORK	2.7KΩ, 9 RESISTOR SIP (RN-3)
	100	NOT USED	
	1 1	NOT USED	
1	102	DRILL SCHEDULE	PC BOARD
1	103	MOUNT	DISCRETE COMPONENT
3	104	CAPACITOR	22μF 35V TANTALUM C27, C29, C44
1	105	TRANSISTOR	TIP41 (NPN) POWER (Q1)
1	106	CAPACITOR	1μF, 50V BIPOLAR (C12)
1	107	RESISTOR	1.33K 1% 25 PPM/°C TC MF 1/8W (R92)
1	108	RESISTOR	20.0K 1% 25 PPM/°C TC MF 1/8W (R93)
1	109	CONNECTOR	18 PIN SPDR HEADER (UNSHROUDED) (J41)
1	110	DIODE	HP5082-2811 (IN5713) SCHOTTKY CR39
2	111	RESISTOR	470Ω, 1/4 W, 5% C.C. (R91) (RX3)
1	112	SOCKET	14 PIN DIP (A19)
1	113	CAPACITOR	5 pF, 500 V MICA (C-15)
2	114	RESISTOR	1KΩ, 1/4 W, C.C. (R97, R98)
1	115	RESISTOR	150KΩ 1/4 W, C.C. (R96)
1	116	CAPACITOR	1μF, 10 V TANT (C48)
1	117	16 PIN DIP I C	74LS121 A27)
	118	NOT USED	
1	119	20 PIN DIP I C	74LS373 (A25)
1	120	14 PIN DIP I C	74LS32 (A26)



MAIN PRINTCON P/C BOARD
(Part 1 of 4)


A4
A3
A14
A11
A27
74LS123
A24
2732A
A25
74LS373
A12
BAUD RATE GEN.
4702
A26
(74LS32)
A16
(7406)
A15(74LS14)
A17
(74LS04)
A19
19964
8155
8039
XR2207
TO SHT. 3
TO SHT. 4
FROM SHT.
+5 VDC
+18 VDC
DGND
TP10
TP9
BUZZER
Q5 TIP 120
Q3 2N 3905
Q2 TIP120
Q1 TIP 41
Z1 IN5355
CR19 IN 914
CR23 IN 4001
CR37, IN 914
IN 914
IN 4001
TAKE UP MOTOR
WALNUT DISPLAY
+12VDC POWER
MOTOR RETURN
TAKE-UP MOTOR RETURN
REAL TIME CLOCK
BUZ
R.R.
TO SHT. 3
TO SHT. 4
TO SHT. 3
FROM SHT.
TO SHT. 3
+5 VDC
GND
A15 VCC, PIN 14
GND, PIN 7
A16 VCC, PIN 14
GND, PIN 7
A26 VCC, PIN 14
GND, PIN 7
MAIN PRINTCON P/C BOARD
(Part 2 of 4)

DWG NO. 146851-001
(10/25/84)

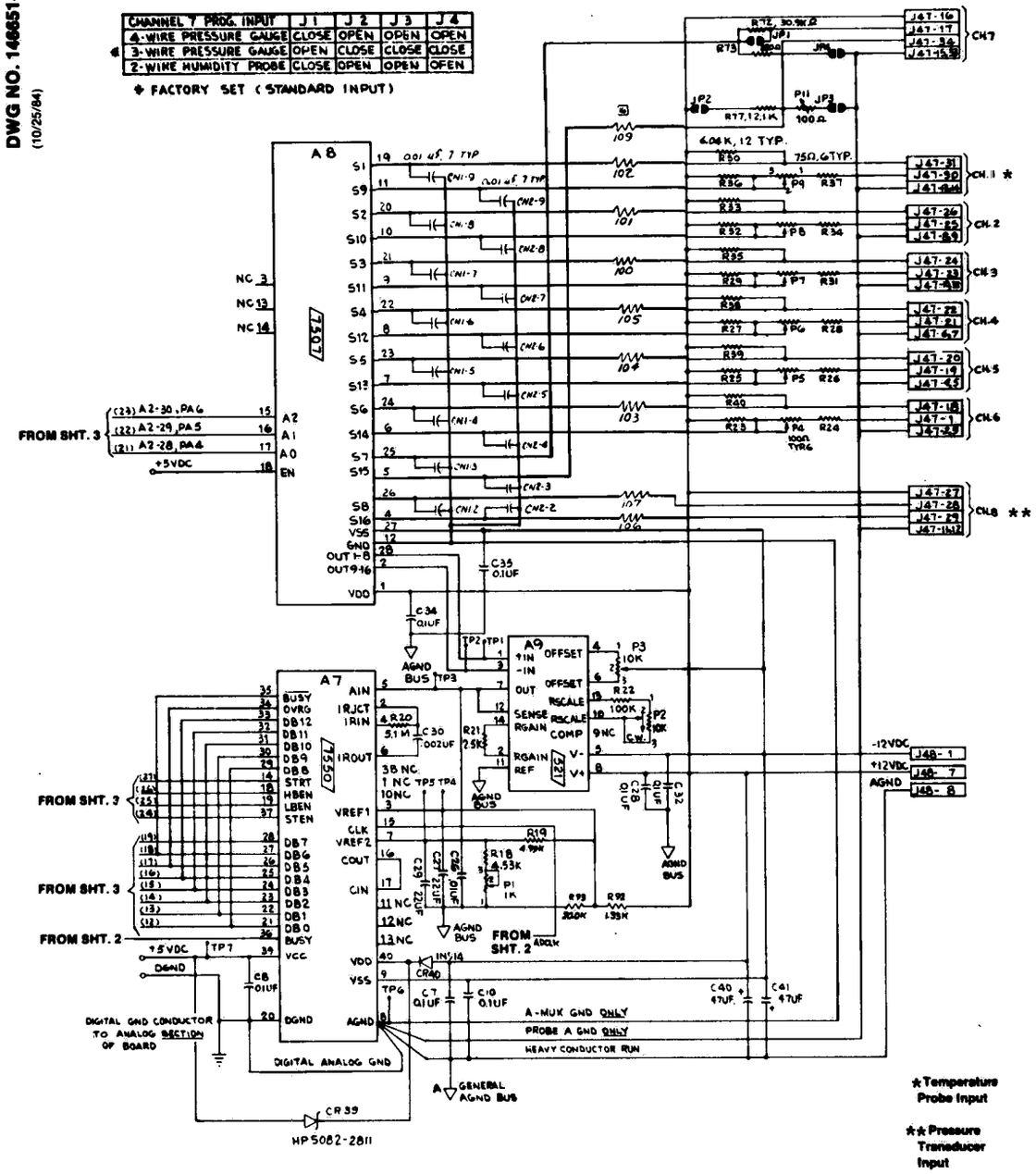


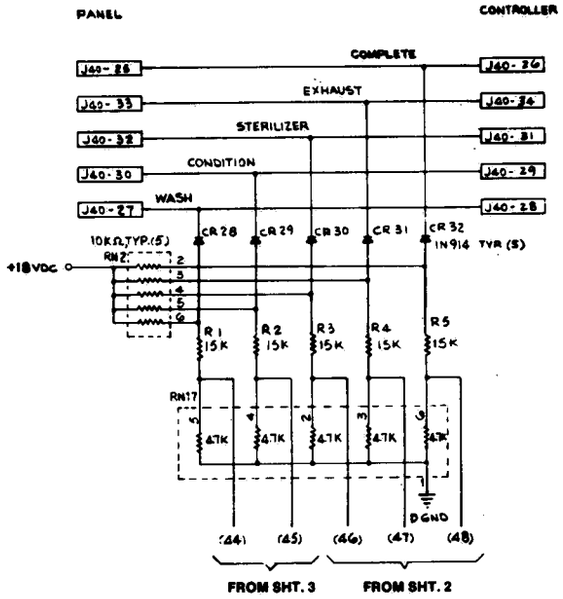
MAIN PRINTCON P/C BOARD
(Part 3 of 4)

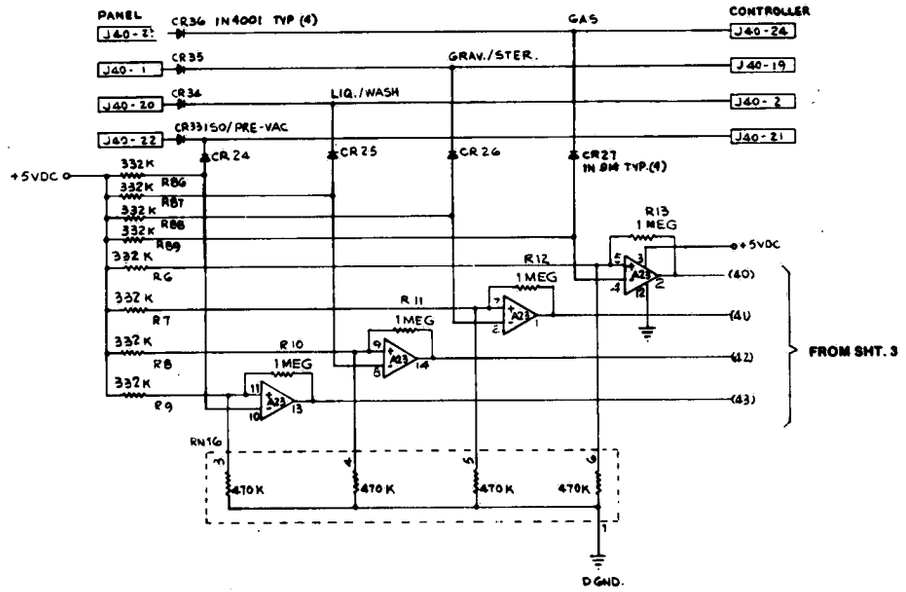
DWG NO. 146651-001
(10/25/84)

CHANNEL 7 PROG. INPUT	J1	J2	J3	J4
4-WIRE PRESSURE GAUGE	CLOSE	OPEN	OPEN	OPEN
3-WIRE PRESSURE GAUGE	OPEN	CLOSE	CLOSE	CLOSE
2-WIRE HUMIDITY PROBE	CLOSE	OPEN	OPEN	OPEN

◆ FACTORY SET (STANDARD INPUT)

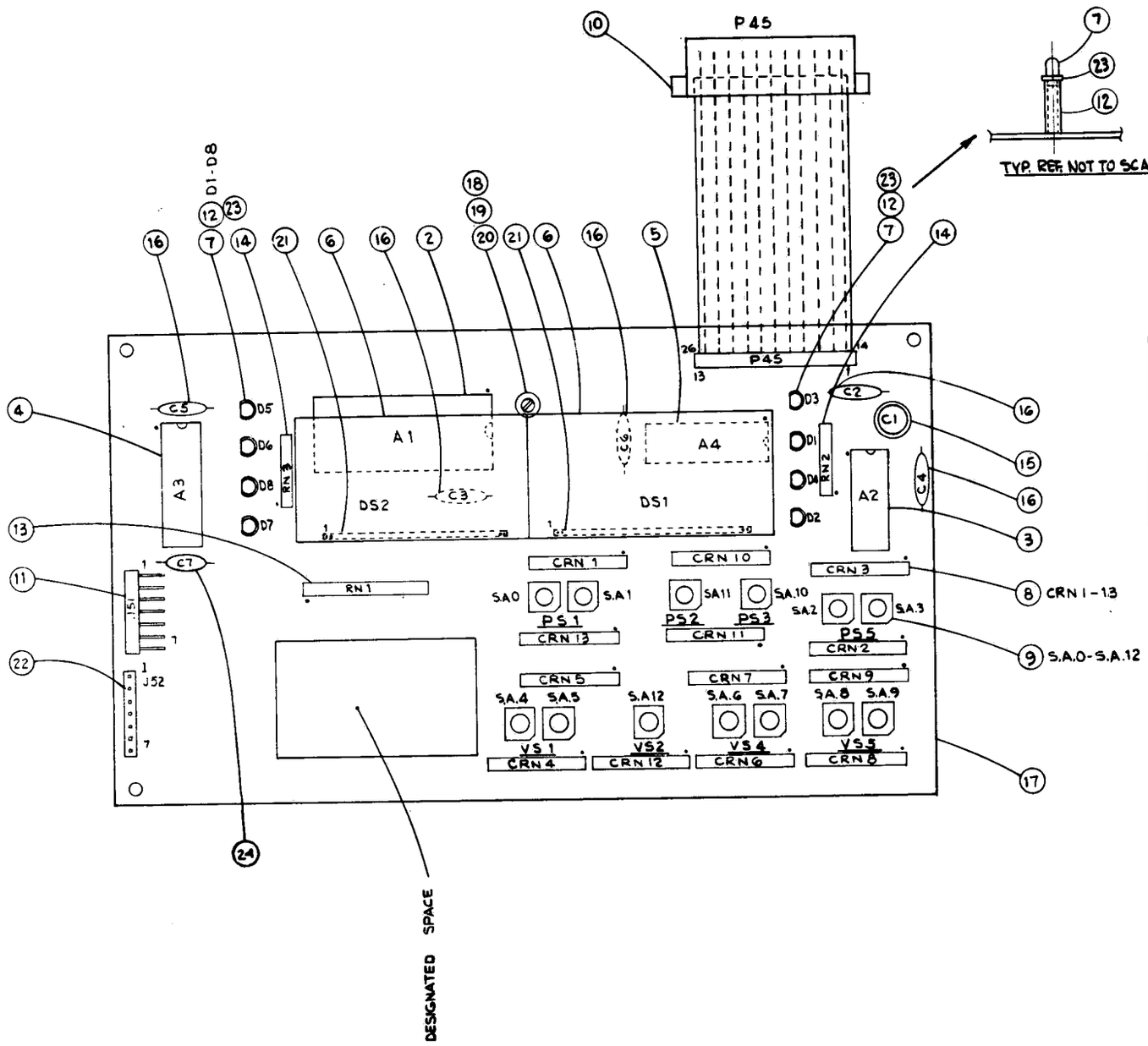






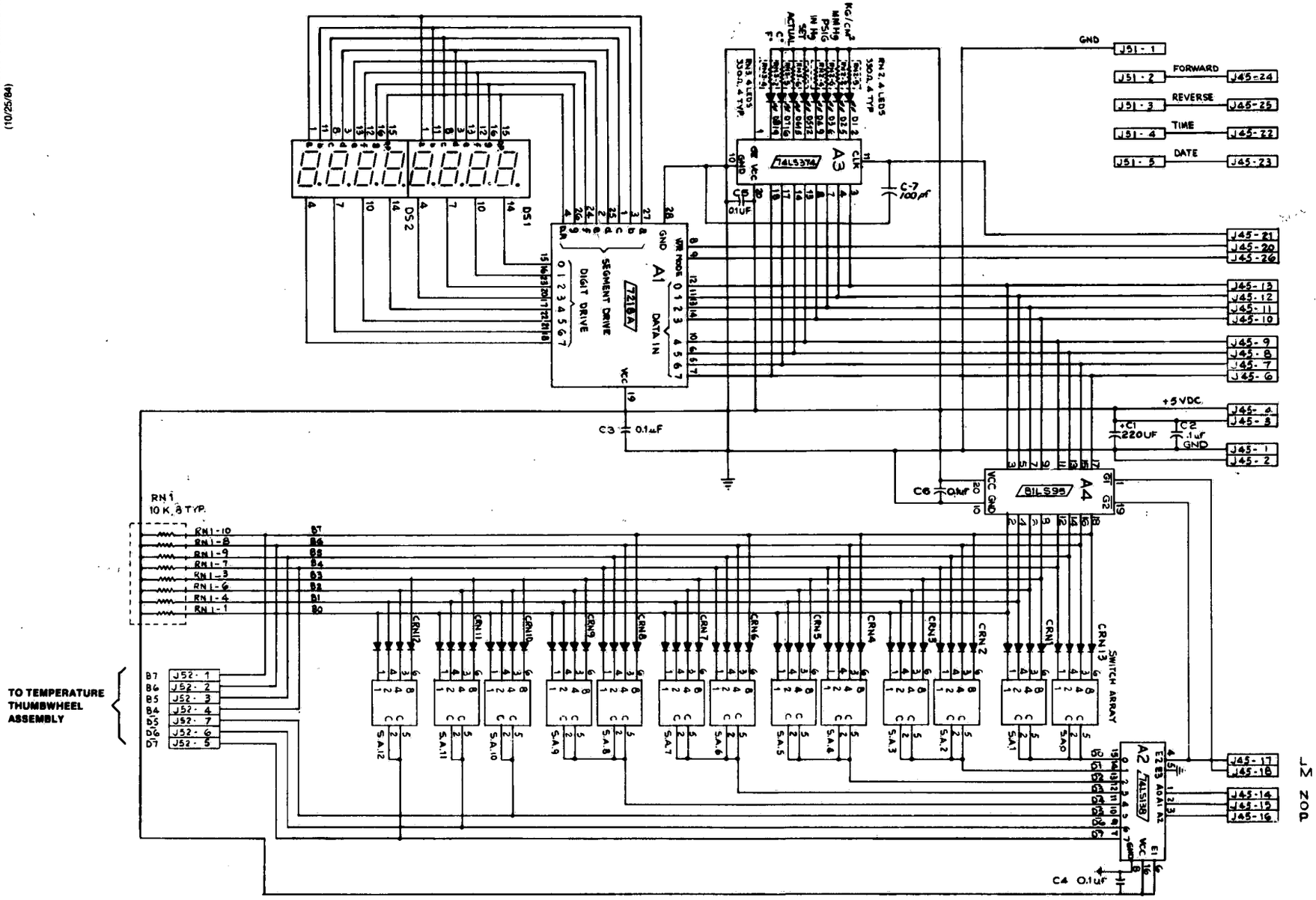
MAIN PRINTCON P/C BOARD
(Part 4 of 4)

DWG. NO. 146633-001
(10/25/84)



QTY.	ITEM NO.	PART NAME	DESCRIPTION, MATERIAL
X	1	DIGITAL PRINTER	DISPLAY BOARD
1	2	28 PIN DIP IC	7218A, 8 DIGIT 7 SEG. DISPLAY DRIVER (A1)
1	3	16 PIN DIP IC	74 LS 138 DECODER/MULTIPLEXER (A2)
1	4	20 PIN DIP IC	74LS374 OCTAL D-TYPE LATCH (A3)
1	5	20 PIN DIP IC	8ILS 95 TRI-STATE OCTAL BUZZER (A4)
2	6	DISPLAY	QUAD — 7 SEG. DISPLAY (DS1 & DS2)
8	7	LED	SOLID STATE INDICATOR LED, RED (D1-D8)
13	8	DIODE NETWORK	CRN1-13 (SIMILAR TO IN4150)
13	9	SWITCH	10 POS. ROTARY BCD DIP (S.A.0.-S.A.12) EECO 24008G
1	10	CABLE ASSEMBLY	9" (J45)
1	11	CONNECTOR	7 POS. S.R. R.A. HEADER
8	12	L.E.D. MOUNT	NYLON, .675 HIGH
1	13	RESISTOR	10K, 9 NETWORK SIP RN1
2	14	RESISTOR	330Ω, 5 NETWORK SIP RN2.3
1	15	CAPACITOR	220μF, 10V ALUM. C1
5	16	CAPACITOR	.1μ, 25V CERAMIC C2-C6
1	17	PC BOARD	
1	18	SUPPORT	NYLON
2	19	WASHER	FLAT, NYLON
1	20	SCREW	#6-32 X 3/8 SELF TAPPING
2	21	CONNECTOR	16 POS. S.R. HEADER
1	22	HEADER	7 POS. S.R. HEADER
8	23	BUSHING	INSULATION
1	24	CAPACITOR	100μF, 1000V, CERAMIC C-7

PRINTCON DIGITAL DISPLAY
PC/BOARD (Part 1 of 2)



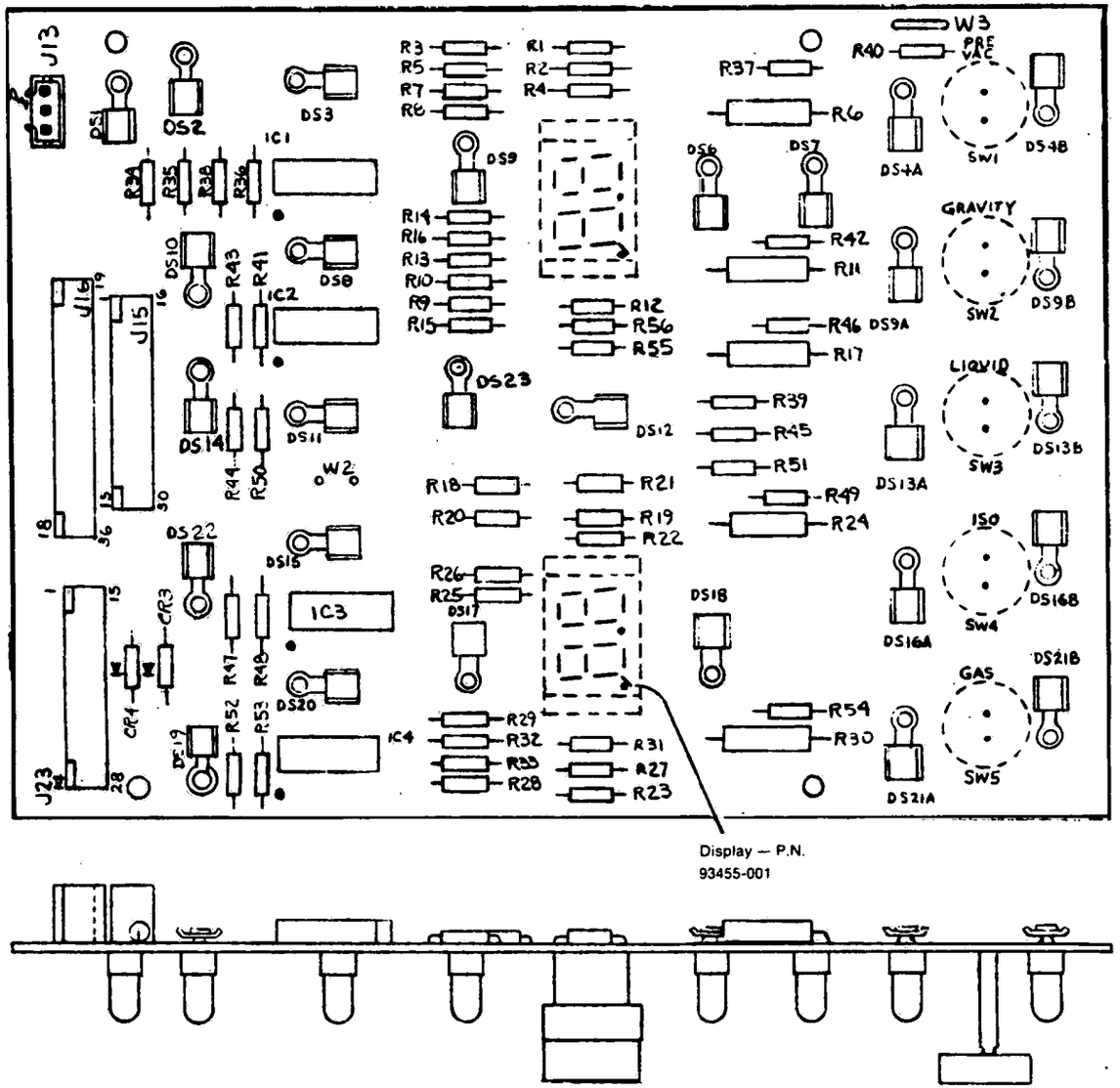
NOTE : SWITCH ARRAY GROUPING

MSD	LSD	FUNCTION
S.A.0	S.A.1	PS1
S.A.2	S.A.3	PS5
S.A.4	S.A.5	VS1
S.A.6	S.A.7	VS4
S.A.8	S.A.9	VS5
	S.A.10	PS3
	S.A.11	PS2
	S.A.12	VS2

BX BINARY BIT (x=0→7)
DX DIGIT STROBE (x=0→7) ACTIVE LOW

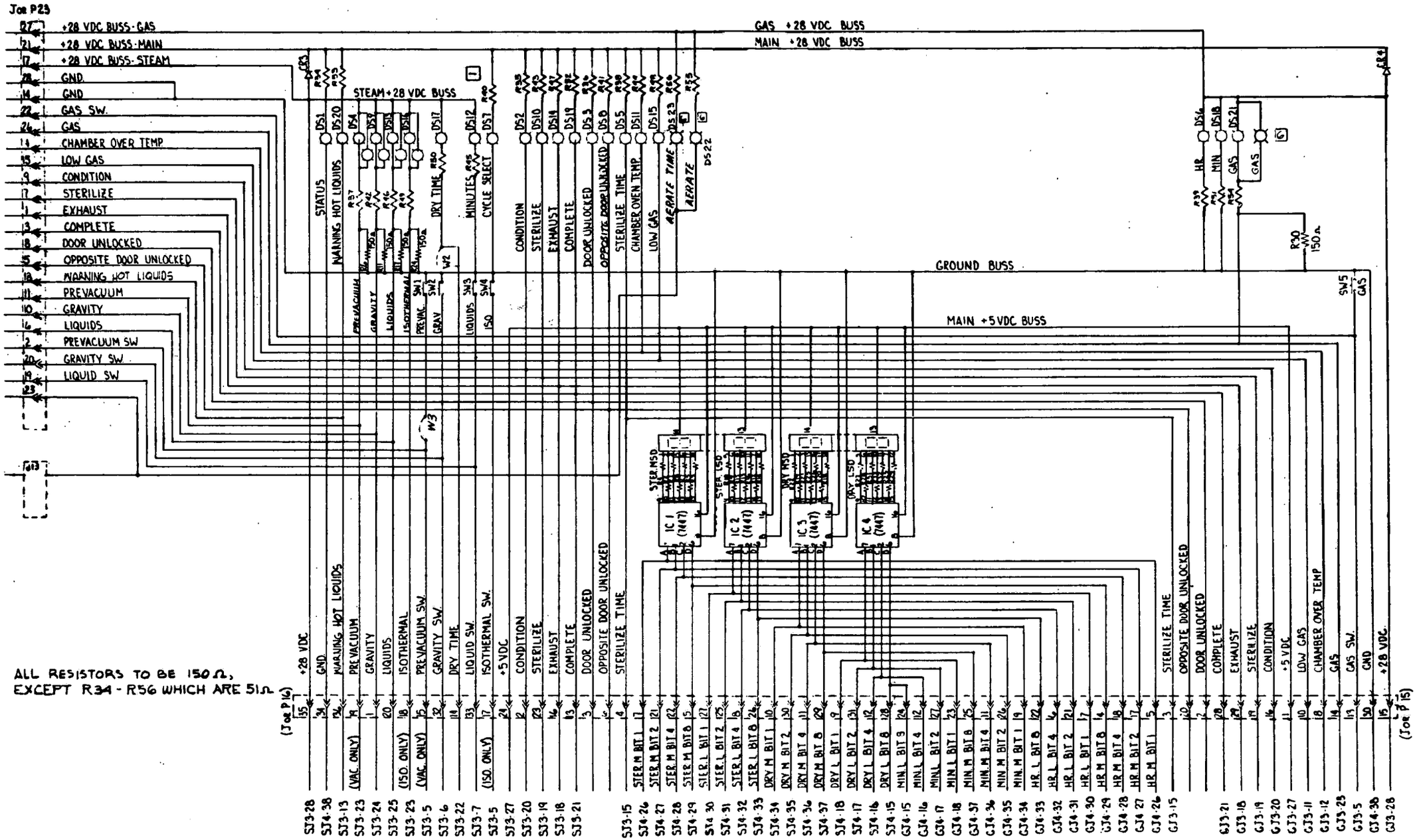
PRINTCON DIGITAL DISPLAY
PC/BOARD (Part 2 of 2)

DWG. NO. 134468-444
(91/32/97)



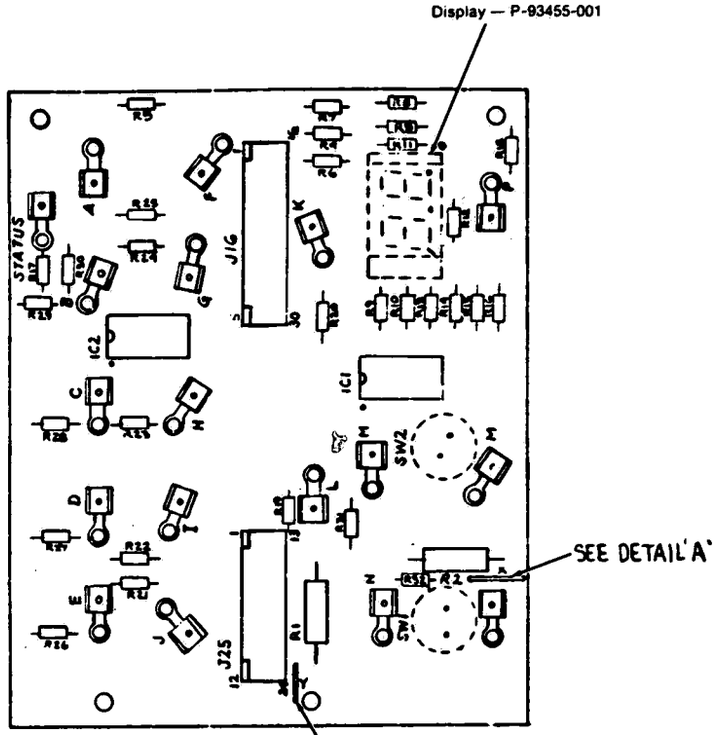
PRIMARY PANEL SCHEMATIC (PC Board)
Operating End (Part 1 of 2)

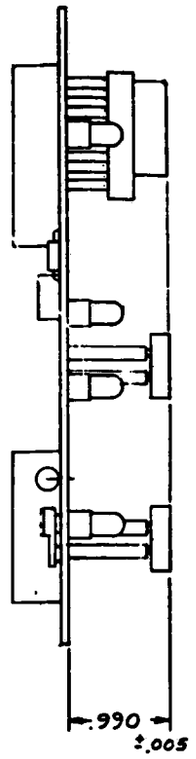
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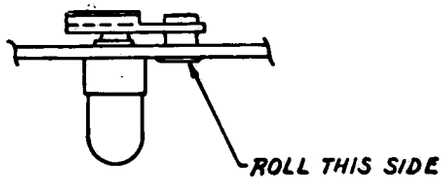


PRIMARY PANEL SCHEMATIC
Operating End (Part 2 of 2)

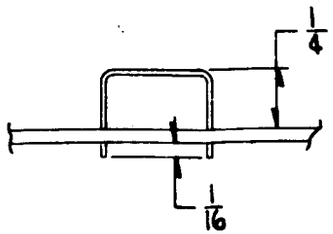
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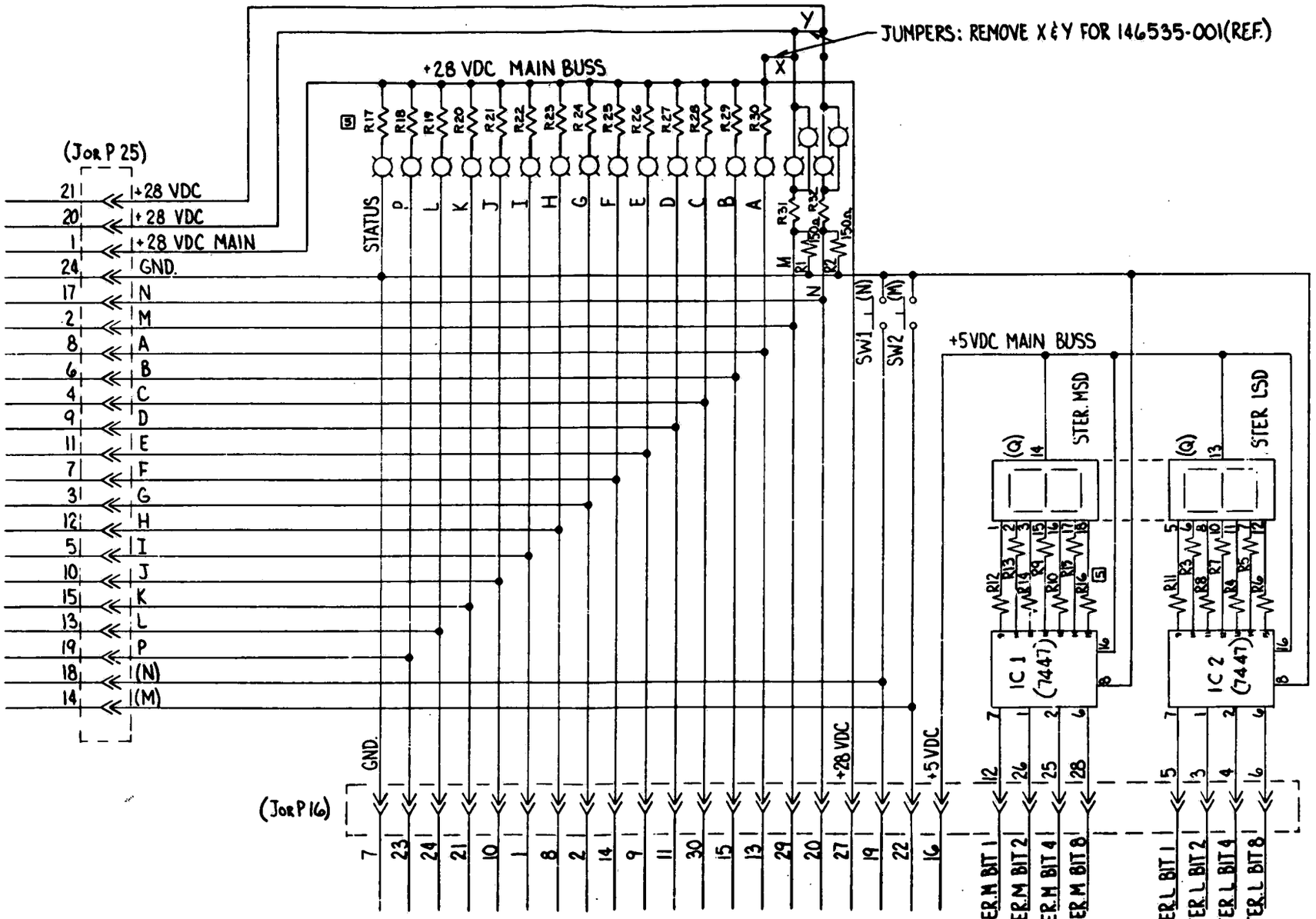
ENLARGED VIEW
OF LAMP MOUNTING



DETAIL "A" (TYP. 2 PLACES)
JUMPER FORMATION

PRIMARY PANEL SCHEMATIC (PC Board)
Non-Operating End (Part 1 of 2)

DWG. NO. 136640-001
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PRIMARY PANEL SCHEMATIC
Non-Operating End (Part 2 of 2)

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SECTION 7

COMPONENT REPAIR AND REPLACEMENT

7.1 GENERAL

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

7.2 INDICATOR-RECORDER-CONTROLLER
(Figs. 8-13 and 8-14)

NOTE: The backing plate is hinged to the case, for access to the internal components, such as the drive motor (1), reed switches (3), and adjusting screws. To gain access, open the door, loosen the captive screw located at the lower right hand corner of the backing plate, and swing the plate out.

Starting Ink Flow (Fig. 8-13)

1. Lift pen by loosening hub cap (4).

2. Remove cap from ink cartridge pen tip (6).

3. Insert a small piece of paper under the pen and move it slightly back and forth to initiate flow. If necessary, moisten pen tip.

Changing The Chart (Fig. 8-13)

1. Unscrew the hub cap (4). This cap retains a spring loaded wire bracket (2), which acts as a pen lifter. Hold this bracket while unscrewing cap.

2. With hub and pen away from the chart, lift chart (3) off hub, and remove.

3. Slip new chart under pen arm and locate on hub. Replace hub cap loosely.

4. Rotate chart until pen rests on proper time arc. Press chart flat against dial plate.

5. Tighten hub cap firmly, taking care that chart remains in proper position.

Replacing Ink Cartridge (Fig. 8-13)

1. Lift ink cartridge (6) from chart by loosening hub cap.

2. Grasp cartridge near tip end.

3. Pull straight off, with a steady pull. Be careful not to distort pen arm.

4. Support pen arm with one hand. Slide cartridge into engagement with clip.

5. Holding pen arm, slide cartridge onto the arm, until the tip boss is properly positioned against the end of the arm.

Adjustment of Temperature Control (Fig. 8-14 and 7-1)

1. Turn adjusting screws on reed switches (3) clockwise to increase temperature settings, counterclockwise to reduce settings. (TS-1 controls timer actuator, TS-2 controls steam to chamber.)

2. Adjusting screw on pen arm (4) is used to make minor corrections in pen setting.

Removal and Replacement (Fig. 8-10 and 7-1)

CAUTION: Recorders should be handled with care, and caution should be exercised when making changes to ensure against kinking or compressing the capillary system. The bulb, tubing and pressure element are filled with a fluid approved by the Scientific Instrument Makers Association and form a sealed system. This system must never be broken. Even the most minute leak will render it inoperative. Excess capillary should be formed into an 8-inch diameter coil and properly supported by taping to any smooth unheated surface.

Removing Recorder

1. Remove primary panel ... see paragraph 7.12.

2. Open chart back-up plate (see note above).

3. Make sure power is off. Disconnect electrical leads by pulling the plug at the bottom of the recorder, behind the gauges.

4. Disconnect capillary tube from chamber drain tee behind control console. (USE CARE!)

5. Remove capillary from three clips (Fig. 8-10, 23) at rear of console.

6. Remove the two mounting screws at rear of the case.

7. Remove recorder, gently feeding the capillary and its bulb through the grommet.

Replacing the Recorder

1. **Carefully** direct the capillary tube and bulb behind the primary and secondary panels, through the grommet above the controller, to the chamber drain tee.

2. Plug connector into socket on recorder. Position recorder and replace the two screws and washers which were removed.

3. Replace the capillary beneath the three clips.

4. Reconnect the bulb into chamber drain tee.

5. Secure any wires which were loosened.

6. Replace primary panel.

7.3 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. 8-21)

1. With door open and supported, remove the retaining rings (14) and hinge washers from each of the hinge pins.

2. Withdraw the pins (15) and slide the door and hinge assembly out of the hinge body.

3. Place the door on a clean padded bench with the chamber door handle facing upward.

4. If it is necessary to remove the hinge body, remove the four capscrews that fasten it to the door frame.

Disassembling Door

1. Turn the chamber door handle to retract the chamber door arms.

2. Turn the button assembly (Fig. 8-20, 11) counterclockwise until it disengages and remove it.

3. Remove setscrews (9), handwheel, grease fitting (Fig. 8-21, 7), screws, washers, handle nut (8), thrust ring assembly (26), and spring.

4. Remove the self-tapping screws (Fig. 8-20, 15) and lift off the chamber door cover (8).

5. If door cover brackets (Fig. 8-21, 16) are damaged, remove them by removing the self-tapping screws (18) which hold them in place.

6. Remove any worn speednuts (17) and slip new speednuts over the door cover brackets.

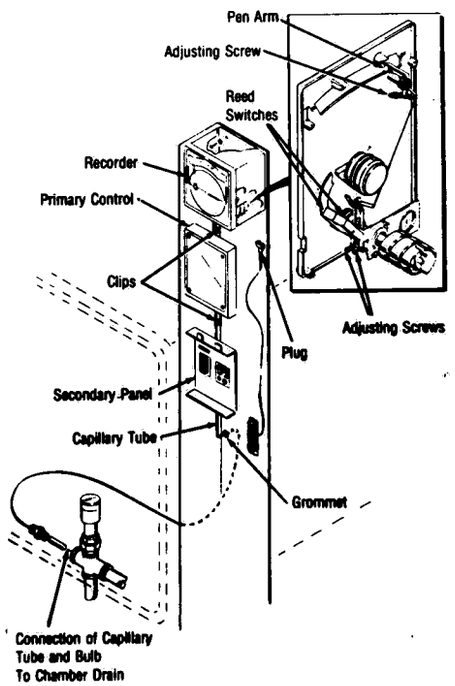


Figure 7-1. REPLACING THE RECORDER.

7. Remove the retaining rings (14) and withdraw the door hinge pins (15).

8. Slip the door hinge (1) out of the door hinge bracket (2).

9. Remove hex head screws, plain washers, lockwashers (11, 12, 13) and door hinge bracket (2) from the door.

10. Remove drive pin (25) from handle nut and bearing from recess in top socket plate (29).

11. Remove socket head screws (23) and washers (38).

12. Slide the top socket plate (29) forward and withdraw the roll pins and washers.

13. Remove the top socket plate and the door arms.

14. If necessary, loosen, but do not remove the arm clip links and studs. Arm clip studs retain shims which align the arms to seal the door against the 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.

15. Remove the bottom socket plate (30).

16. Turn the door over and remove the screws (8-18, 7) holding door back cover in place.

17. Remove door back cover (6) and the gasket. Discard the gasket.

18. Using a socket wrench, remove the screws (8-21, 3) holding the diaphragm cover in place.

19. Remove the diaphragm cover (4), diaphragm (5) and gasket (6).

20. Pull out the thrust plate (8), lock clutch (9) and lock clutch rod spring (10).

CAUTION: The door post (Fig. 8-22, 10) is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instructions for removing weld and reweiding.

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.

5. Excessive wear may cause the closing mechanism to jam. If necessary, replace parts to make handwheel action smooth.

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

Lubricate parts indicated with Neptune-7 grease (P/N 385220-091).

1. Replace back cover, align, and secure with 12 drive screws.

2. Turn door over, and replace any missing or damaged cover clips and speed nuts (Fig. 8-21, 16, 17).

3. Replace any arm clip studs and fulcrum blocks which 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 (Fig. 8-21, 31 thru 34).

4. Replace hinge assembly, if removed.

5. Lubricate door post threads, and place two wood blocks about 2 inches thick on the door, to hold the bottom socket plate up. Slide bottom socket plate in position (Fig. 8-19, 30).

6. Set two keys (Fig. 8-21, 22) in door post, and drive two roll pins (8-21, 21) into socket plate (Fig. 8-21, 29).

7. Place top socket plate over door post, and position four corner arms and eight side arms to door. Secure top socket plate to bottom plate with six socket-head screws. Check arm movement for freedom.

8. Pack thrust bearing (Fig. 8-21, 24) and insert into socket plate. Replace drive pin (Fig. 8-21, 25). Lubricate wheel nut (Fig. 8-21, 28) inside and outside, and screw onto door post.

9. Assemble thrust ring and springs (Fig. 8-21, 26) and position in nut. Screw nut all the way down, guiding the ball thrust bearing onto nut. Secure with two screws and washers (Fig. 8-21, 19, 20).

10. Remove the two wood blocks. Lower arms, and check assemblage for freedom of movement. Free up as necessary. Drive grease fitting in.

11. Raise arms, and stand door on end. Try clutch rod (Fig. 8-21, 9) in post. Free movement if necessary. Lubricate rod, and insert it with spring into door. Engage thrust plate (Fig. 8-21, 8), and lubricate.

NOTE: Graphited face of gasket is next to door casting.

12. Assemble diaphragm, gasket, and cover (Fig. 8-21, 4, 5, 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 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.

NOTE: Proper centering of door in the field is best accomplished as follows:

1. Center door on sterilizer body.

2. 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.

3. Check for full engagement of locking arms. Engagement in end ring should be uniform for all arms.

Door Alignment

After reassembling and centering the door, ensure that door arms are engaged in door frame at least 1/4 inch with door normally tightened (approximately 30 ft-lb locking torque). Reshim door arms, if necessary, to obtain proper arm contact when door arms are in end frame. 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. Ensure that all arms are tightened. If any arm is loose, determine thickness of shim required to bring loose arm to a height that will cause it to be as tight as the existing 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 this equal tightness requirement is met.

6. Disengage arms and place an additional .010 shim under each corner arm.

7. Slowly tighten door while checking to ensure that the corner arms engage and become tight before any other arm. If necessary, repeat prior steps until this requirement is met.

NOTE: Use the following shims:

39910 — .005
39911 — .010
39912 — .015

To meet the requirements of step 7, the maximum additional shim permitted under a corner arm is .005.

Diaphragm Operation Check

After replacing and reassembling the diaphragm, ensure that the door properly locks and unlocks under operating pressure. Door lock should actuate at 6 psig and should deactuate at less than 6 psig chamber pressure.

Handwheel Faceplate Check

Black faceplate located in center of handwheel may fall off.

Check faceplate. If faceplate is loose or has fallen off, return faceplate to unit as follows (see Figure 8-20):

1. Rough surfaces of both faceplate and handwheel using Scotch-Brite® pad or light sandpaper. Remove any residue from surfaces with clean cloth.

2. Apply contact cement* by brushing it on in light, even coat on both surfaces.

3. Allow glue to dry for five to ten minutes.

4. Press faceplate onto handwheel with firm, even pressure.

NOTE: If faceplate needs replaced, order and install P-93647-001.

**3M Company Scotch Grip® Contact Cement #1357 (R-5300-840; comes in pint jar) has been approved by Engineering for this procedure.*

7.4 AIR FILTER ASSEMBLY (Fig. 8-41)

The bacterial air filter contains a replaceable filter cartridge (3) that is made up of 16 filter discs separated by screens. The filter discs are superfine glass wool that removes bacteria from entering air.

The purpose of the bacterial air filter is to filter incoming air. The system is exposed to contamination whenever the filter or air lines below the filter are opened. Keep these components as clean as possible when servicing.

NOTE: Pointed end of the filter element must be installed in air inlet side.

Remove the cover assembly (1) by unscrewing the screws (3). Remove and inspect the filter cartridge (2). Clean the filter cover and body assembly by wiping with a soft cloth. Replace the filter cartridge, if necessary. Reassemble the air filter.

7.5 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. Observe applicable cautions on parts lists pertaining to valve rebuilding.

Principle of Operation

A solenoid valve is a combination of two basic functional units — (1) a solenoid (electro-magnet) 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 valves have the solenoid mounted directly on the valve body with the solenoid core attached to the valve stem.

Direct-acting Valve (Fig. 7-2): In direct-acting valves, the solenoid core is mechanically connected to the valve disc and directly opens or closes the orifice, depending on whether the solenoid is energized or deenergized.

Internal pilot-operated Valve (Fig. 7-3): This valve has a pilot, a bleed orifice, and utilizes the 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 solenoid is de-energized the pilot orifice 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.

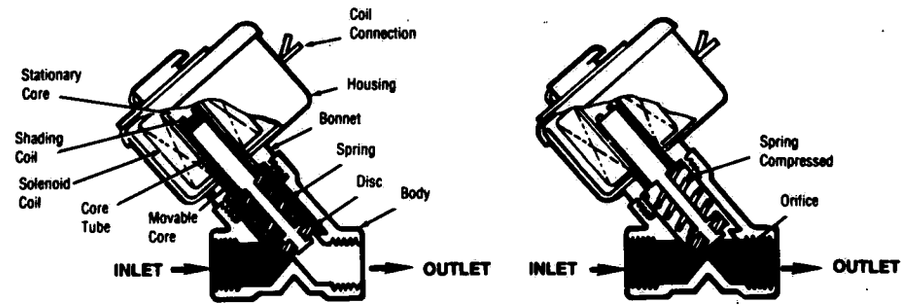


Figure 7-2. DIRECT-ACTING SOLENOID VALVE.

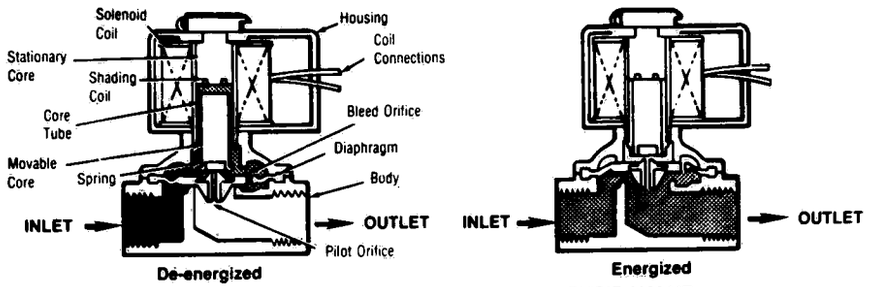


Figure 7-3. INTERNAL PILOT-OPERATED SOLENOID VALVE.

Testing

1. Energize the solenoid coil. A metallic click signifies solenoid operation. Absence of the click can indicate loss of power supply, defective coil 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 de-energized, it will be approximately 1 volt.

   b. Check solenoid coil for open circuit or ground.

2. Energize and de-energize the coil. Check valve operation for proper opening and closing. A loud hum and sluggish operation indicate the coil is probably defective.

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.

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.

3. Inspect the valve for evidence of leakage. A worn valve seat or ruptured diaphragm will allow the valve to leak when closed. A damaged or worn seat cannot be repaired; the valve must be replaced if it leaks. A valve having a ruptured diaphragm may be rebuilt.

NOTE: When installing/repairing Asco diaphragm or piston valves, it may be necessary to separate solenoid base from valve bonnet to facilitate removal, repair and/or installation. When valve is reassembled, ensure no teflon tape or pipe sealer is used between solenoid base and valve bonnet (see O-ring seal shown in Figure 7-3B). When teflon tape or pipe sealer is used it can find its way into core tube and inhibit proper traveling 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.

7.6 STEAM TRAP (Fig. 8-43)

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

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. A very fine grade of sandpaper may be used cautiously to smooth mating surfaces of the seat and 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.

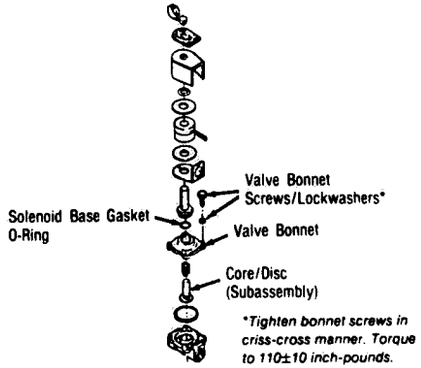


Figure 7-3B. ASCO SOLENOID VALVE.

Reassembly

NOTE: Use new parts as necessary. Repair kit part number is P-764080-001.

1. Screw seat in firmly. (Use hex socket wrench.)

2. Replace cap and diaphragm assembly, using a new gasket.

7.7 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 certain that all pipe connections are tight after assembly.

7.8 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.

7.9 VACUUM BREAKER

Disassembly

a. Unscrew and remove bonnet assembly.

b. Remove friction ring and air valve seat.

c. Remove assembled ballast and float.

d. 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. No water leakage at bonnet is permissible.

7.10 STEAM CONTROL VALVE, HI-LO (Fig. 8-40)

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

Disassembly

1. Remove pilot line fitting at top of valve. Turn adjusting screw (18) counterclockwise until spring is completely free of compression. Remove screw (12) and turn entire top assembly to align lugs on bonnet and syphon assembly (19) with notches on bottom plate. Lift top assembly off.

2. Remove four screws which secure cover to bottom plate (13), lower spring plate (8), spring (7), and upper spring plate (6).

3. Remove two screws (2), reinforcement (4), and bellows assembly (5).

4. Remove cotter pin (11), pull out fork pivot pin (10), and remove fork (9).

5. Unscrew and remove syphon and bonnet assembly (19) from valve body; also unscrew and remove valve seat (21).

6. Pull stem and disc assembly (20) from sylphon. Carefully clean valve components. Carefully examine the bellows assembly, and the sylphon and bonnet assembly for cracks. Check valve seat and valve stem assembly for etching, scratches, or other evidence of damage or leakage. Replace if worn or marred. Examine all other parts for wear or damage. Replace as necessary.

Reassembly

1. Screw valve seat (21) into body. (Hex side down.)

2. Replace steam and disc (20) in sylphon (18), and screw bonnet onto body.

3. Position fork (9) on bottom plate (13). Insert pivot pin (10) and cotter pins.

4. Screw reinforcement (4) onto bellows, and fasten to cover with two screws (2).

5. Set lower spring plate (8), spring (7), and upper spring seat (6) in place. See that the lugs on the spring seat are properly positioned in the fork bearings.

6. Replace cover (1) and bellows (5), and secure cover with the four screws (3).

7. Lower this entire assemblage into position over the sylphon, aligning the notches in the bottom plate with the lugs on the bonnet, to allow the bottom plate to seat on the bonnet. Replace screw (12).

8. Turn adjusting screw (18) fully counterclockwise, to remove all tension from the spring. Turn the stem protruding from the bellows to establish a clearance of 1/16 inch between the seat and the disc (Fig. 7-4). If valve was not removed from sterilizer, open side connection to see disc and seat.

9. Adjust high and low settings according to paragraph 7.15.

10. Loosen nut (25) and back out screw (26) to ensure that it does not contact adjusting fork (9). Turn adjusting screw (18) counterclockwise until minimum load with no rattle is obtained on spring.

11. Adjust screw (26) until it bottoms on fork (9). Lock in place with nut (25).

7.11 VALVE ASSEMBLY, ANGLE (Fig. 8-42)

Cleaning And Inspection

1. Open valve fully, and disconnect extension rod coupling by driving out roll pin.

2. Remove packing nut (3), gland (4), and bonnet nut (6). Remove bonnet assembly (2) from valve body and remove packing.

3. Unscrew stem (8) from bonnet. Remove disc holder (10) from stem and install new disc.

4. Examine valve seat (13) for scratches, nicks, or wear. Remove and replace if necessary. Clean and inspect all components; replace as necessary.

Reassembly

1. Lubricate stem threads with Molykote Type "U", and replace disc holder assembly on stem.

2. Screw stem into bonnet, and install new packing, forcing it into place with packing nut and gland.

3. Replace bonnet assembly on valve body, and tighten bonnet and packing nuts. Tighten only enough to prevent leakage. Excessive tightening will make valve hard to operate.

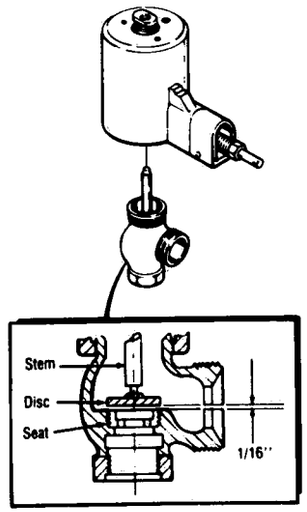


Figure 7-4. HI-LO VALVE ADJUSTMENT.

7.12 CONTROL COLUMN

The primary and secondary control panels, controller, and other components in the control column are made accessible for servicing by removing the front panel. See Figure 7-5.

1. Remove two #10-32 socket head screws from bottom of panel.

2. Open recorder door. Remove the two #8-32 button head screws thus exposed from top of panel.

3. Lift off panel and set aside. All internal components are now accessible for maintenance and servicing.

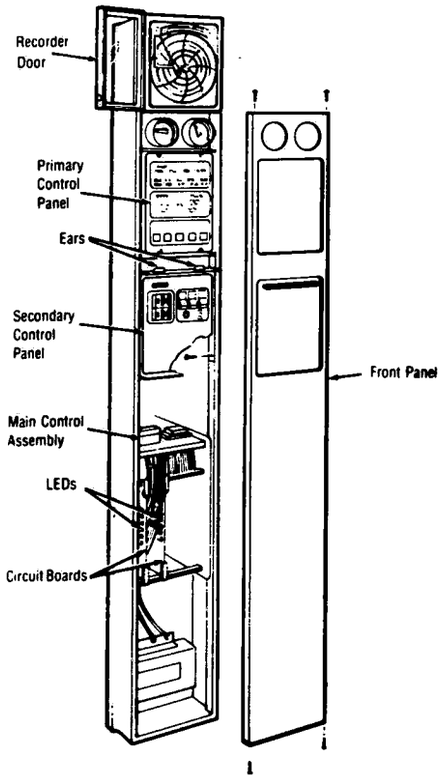


Figure 7-5. CONTROL CONSOLE.

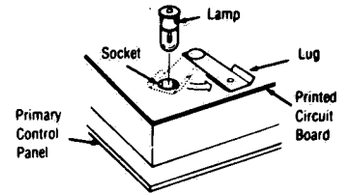


Figure 7-6. LAMP REPLACEMENT.

4. The primary control panel is held in place by four screws. Take out these screws to remove the panel for control servicing.

a. The light bulbs are removed by moving the retainer aside and lifting out the bulb. See Figure 7-6.

b. If the entire primary control is to be replaced, replacement (P-146645-226) or repaired (P-764193-033) control (Fig. 8-10, 24) must be modified as follows, according to whether the sterilizer is a Gravity or Laboratory/Isothermal type.

For a **Gravity** sterilizer, clip and remove R-6 and R-24. See Fig. 7-7.

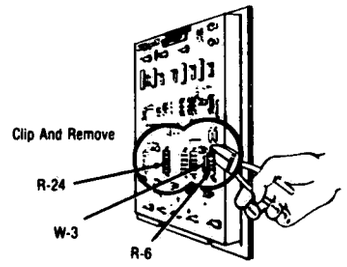


Figure 7-7. CLIP AND REMOVE R-24, R-6, WIRE W-3 (Gravity Model Sterilizers).

For a **Laboratory/Isothermal** sterilizer, clip and remove R-6. See Fig. 7-8.

5. The secondary control panel is held in position by two screws, located behind the panel at the bottom. Remove these screws, swing bottom of panel forward and down to disengage ears at top. Lift panel away, being careful of the wires attached thereto. The controller and its printed circuit cards are now exposed.

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

6. The printed circuit boards in the controller are removed by lifting the card pulls to disengage the contacts from the socket, and pulling the card straight out. See Figure 7-9. Use both card pulls simultaneously, to ensure starting the card straight. This prevents damage to the socket contacts. The controller itself is held in position by a single screw, located at the top. Unplug the two cables from controller, remove screw, and slide controller forward on its rails. For removal of Indicator-Recorder-Controller, refer to paragraph 7.2.

NOTE: All Isothermal sterilizers shipped after 6/15/81 have a new Motherboard assembly (see Fig. 8-15). Ensure P1, P2 and P3 are plugged into J1-A, J2-A and J3-A respectively on Motherboard.

After replacing a printed circuit board, the following **must** be adhered to:

a. Put defective board into static-proof plastic bag in which replacement board was shipped.

b. Place plastic bag (with defective board) into replacement part shipping carton.

c. Initiate service order and enclose a copy with defective board. Include the following information:

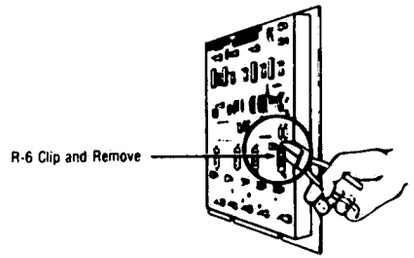


Figure 7-8. CLIP AND REMOVE R-6 (Laboratory/Isothermal Model Sterilizers).

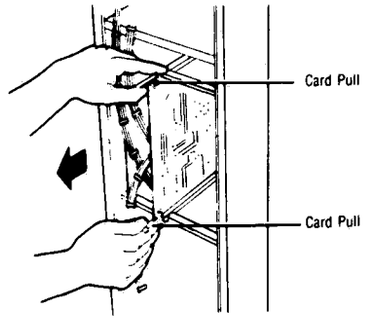


Figure 7-9. REMOVING A PRINTED CIRCUIT CARD.

1) reason for return (failure mode of equipment)

2) general condition of board

3) quantity

4) individual item identification (part number, serial number, etc.)

5) serial number of machine from which board was removed plus cycle count of machine.

d. Wrap shipping carton with protective wrapper or cover (envelope, paper. box, etc.).

e. Return board (and all other microprocessor parts) to AMSCO Service Company, attention: Returned Materials Coordinator.

This procedure must be followed to avoid inadvertent damage by static electricity.

NOTE: Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation.

7.13 DOOR SWITCH (Fig. 8-23)

NOTE: Chamber door must be closed and tightened to specified torque (Table 7-1) for door to withstand maximum pressure in chamber. Door switch is on top of chamber and permits sterilizer operation when door is locked.

Adjustment

1. Using a torque wrench on the steam lock clutch rod (Fig. 8-21, 9), close and tighten the chamber door by applying the appropriate torque specified in Table 7-1.

TABLE 7-1

Sterilizer Size	Torque
16 x 16 20 x 20	20 foot-pounds 30 foot-pounds

2. Turn adjusting screw (Fig. 8-23, 1) clockwise until switch (7) is actuated. Then turn screw 1/4 turn clockwise.

3. Open door then close and tighten it by applying the specified torque.

4. Check that switch is actuated before torque applied reached 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 does not seal,

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 the chamber door until after the "end-of-cycle" buzzer stops.

7.14 ADJUSTMENT OF PRESSURE SWITCHES

1. Adjust steam pressure regulator to control jacket pressure at 20 psig. After adjustment is made. lock low stop. See Figure 7-11.

2. Close slow exhaust valve and then open slow exhaust valve 2.5 turns.

3. Close and lock door.

4. Set orange (top) pointer on recorder to 250° F (121° C).

5. Set STERILIZE time to 1 minute and DRY time to 0 minutes. Set GRAVITY/ISO switch to GRAVITY.

NOTE: Refer to cycle graph for liquids cycle.

6. Depress the LIQUIDS cycle button.

7. After the sterilize phase has completed and control has advanced to slow exhaust, observe calibrated compound pressure gauge. When chamber pressure reaches 3 psig adjust PS-3 (Figure 5-7) to open the fast exhaust valve (S-3) (LED-12). When chamber exhausts to 1 psig adjust PS-2 to turn on the COMPLETE light and the buzzer (LED-18).

8. Press RESET button on control panel and initiate another liquids cycle as in step 6.

9. When cycle advances to slow exhaust. observe the compound pressure gauge to assure proper setting of PS-3 at 3 psig and PS-2 and 1 psig.

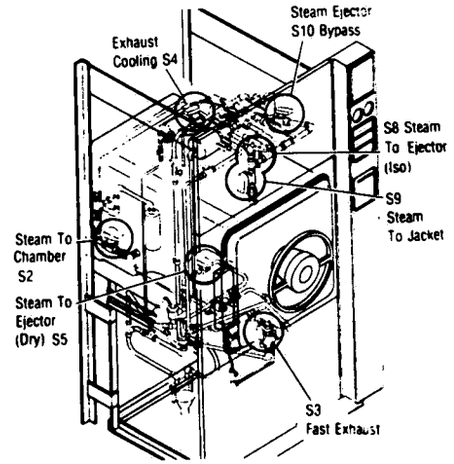


Figure 7-10. LOCATION OF SOLENOID VALVES.

7.15 ADJUSTMENT FOR STERILIZATION BELOW 250° F (121° C)

The HI-LO valve (steam pressure regulator) on this sterilizer was factory set for 250° and 270° F (121° and 132° C) sterilization cycles. If sterilization procedures routinely require temperature control below 250° F (121° C) i.e., laboratory procedures, the LO setting may be changed. Follow the procedure below.

1. If a freestanding sterilizer, remove a cabinet side panel for access to the HI-LO valve; if a recessed model, proceed to the area behind the recessing wall.

2. Remove adjusting screw cover (Fig. 7-11).

3. Loosen setscrew on front locknut; turn locknut until it is against the rear locknut.

4. Follow instructions in paragraph 2.2, "Before Operating the Equipment."

5. Using the following chart (Fig. 7-12), adjust the HI-LO valve until jacket pressure as indicated on the jacket pressure gauge corresponds with the desired processing temperature.

6. Follow cycle instructions starting with step 3 of paragraph 2.3 if a Gravity cycle; paragraph 2.4 if a Liquids cycle, except set the yellow pointer on the indicator-racorder-controller for the desired processing temperature.

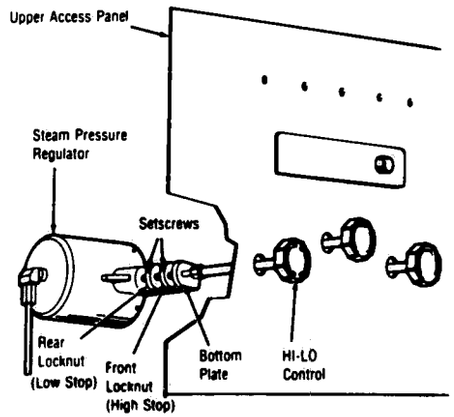


Figure 7-11. ADJUSTING PRESSURE REGULATOR.

NOTE: At lower settings the indicator-recorder-controller will maintain chamber temperature at a slightly higher than set temperature ... if necessary, wait until cycle reaches the sterilize phase and readjust the yellow pointer until the recorder chart indicates the exact temperature.

7. Steps 4, 5, and 6 will have to be repeated for each new temperature. If temperature is not to be changed, turn locknut on HI-LO valve until it is against the stop on the bottom plate, then tighten the setscrew.

8. Replace the adjusting screw cover and, if applicable, the cabinet side panel.

7.16 STEAM GENERATOR (ONLY FOR STERILIZERS SO EQUIPPED)

NOTE: In some cases, older style (non solid-state) AS15 and AS20 Electro-steam generators' pressure drops to 20 or less pounds during initial purge of cycle CONDITION phase. This situation places sterilizer in stall condition while waiting for generator heaters to produce enough steam for STERILIZE phase. Order and install Purge Eliminator Kit (P-764321-035). Kit interrupts power to solenoids S-3 (Fast Exhaust) and S-4 (Exhaust Cooling) during cycle CONDITION phase to eliminate purge. This action enables generator to maintain steam pressure and continue with STERILIZE phase.

Water-level Control, Charles F. Warrick

1. General — Repair of the electric water-level control is limited to replacement of entire relay assembly, control head, TG relays, or spark plug electrodes complete with level-measuring rods. The electrodes can be removed as described in the Water-level Control cleaning procedures.

NOTE: The jacket pressure/processing temperature relationships provided in this chart are guidelines for optimum performance of this Eagle Series sterilizer. They do not represent actual pressure/temperature ratios.

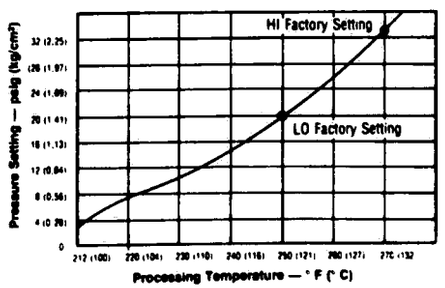


Figure 7-12. PRESSURE REGULATOR SETTINGS.

2. Complete Electric Relay Assembly Replacement (Fig. 8-57).

a. Tag and disconnect electrical leads from relay box (5) to control head (1), water-inlet solenoid (Fig. 8-53, 4) and electric panel box.

b. Remove relay assembly box and replace with new unit. Reconnect tagged disconnected leads to their numbered positions on the two TG relays.

c. Operate the generator through several flush-and-fill cycles. If proper water level or cutoff action is not obtained, check to make certain that connections have been made to the properly numbered locations. These are clearly shown in the wiring diagrams.

3. TG Relay Replacement (Fig. 8-57, 6).

a. Tag and loosen connecting wires.

b. Remove relay by loosening four hold-down screws.

c. Replace with new relay and reconnect wires to correct locations which are numbered for convenience.

Check Valves (Fig. 8-53)

Repair of the check valves (6, 7) is limited to cleaning valve seats when foreign matter is the cause of improper operation. The spring-loaded check valve (6) can be cleaned without removing the valve body from the generator plumbing; however, the flapper check valve (7) must be removed for cleaning. When a valve of either type becomes defective, the entire valve must be replaced.

Water-level Sight Glass Replacement (Fig. 8-56)

1. Remove the sight glass guards (1).

2. Loosen the glass pipe retaining collars (2) on the top and bottom valves.

3. Carefully remove broken glass from the openings of the valves and clean the openings thoroughly.

4. Place retaining collars on the new glass pipe and then slide metal washer (4) over the ends of the pipe.

5. Slip new rubber seals (5) over each end of the pipe and position about 1 inch (2.5 cm) in from each end.

6. Carefully fit one end of the glass pipe into the bottom valve on the generator. Seat this end as far as possible; then lift back out approximately 1/4 inch (.625 cm) in order to slide the other end of the glass pipe into the top valve. Make sure that the glass pipe fits approximately 1/4 inch (.625 cm) into the top valve.

7. Slide the rubber seals and metal washers into the valve openings and secure with the retaining collars (2). Tighten the collars carefully to avoid breaking the glass pipe. Tighten the collars only enough to create a watertight seal.

Electrical System Repairs (Fig. 8-55)

1. Fuse Replacement. When a fuse failure occurs, always locate the cause of the failure before replacing the fuse. Do not, under any circumstances, replace a blown fuse with one of a higher rating. When doubt exists as to the correct value, refer to the applicable schematic wiring diagram. If a short circuit caused the failure, make sure that the line is cleared before replacing the fuse. Poor contacts on, near, or in the fuse will cause fuse failures. Very often the fuse will indicate when a poor contact exists. A discolored fuse cap or fuse clip is a positive sign of poor contact of the fuse with the clip. If fuse caps or clips are discolored, brighten them with emery cloth. A fuse which can be easily inserted into its spring clips or can be rotated easily after it is inserted indicates insufficient contact pressure. Remove the fuse from the clip and squeeze the clips together.

WARNING: DO NOT INSERT FUSES IN LIVE CIRCUITS. VOLTAGES PRESENT IN THE STEAM GENERATOR ARE DANGEROUS AND MAY BE FATAL IF CONTACTED.

2. Heating Element Replacement.

a. Allow the generator to cool completely and disconnect electrical power source from the generator.

b. Carefully tag each lead and note the position of the strapping bars on the heating element terminals so they can be returned to their original positions on the new element.

c. Remove the leads from the heating element terminals.

d. Remove the four bolts which secure the heating element to the boiler and carefully slide the heating element out of the boiler.

e. Install the new heating element and gasket in the boiler, with the nameplate of the element rotated toward the bottom.

f. Install the four mounting bolts and alternately tighten them.

g. Reconnect the wires to the heating element terminals. Check wiring connections against applicable schematic wiring diagram.

h. Perform an operational check to ensure proper operation before returning the generator to service.

3. Magnetic Contactor. Repair of the magnetic contactor, other than routine point cleaning, is limited to replacement of the coil or point set. Replace the entire magnetic contactor if any other parts are defective.

Pressure-Differential Switch Adjustment

The pressure-differential switch is normally set at the factory to suit the particular application of the steam generator. If the pressure-differential setting must be changed, turn the adjusting screw (located on top of the controller) until the pressure setting indicator on the front of the controller is at the desired control pressure set point.

7.17 POWER SUPPLY ADJUSTMENT (IRC)

NOTE: During this adjustment procedure when 5 VDC supply is adjusted close to undervoltage trip point (+0.05 volt or less), nearby machinery switching may cause CB-1 to trip. To ensure this does not occur, shut down nearby machinery for duration of this procedure.

This procedure requires a digital voltmeter with 0.01 VDC resolution.

1. Turn control power (CB-1) off.

2. Connect DVM to ground post of capacitor C101 (-) and to terminal post E2 (+). Refer to Figure 7-13.

3. Using pot R433 on power supply PC Board, lower voltage output until CB-1 trips; note trip voltage.

4. Turn pot R433 two turns in opposite direction.

5. If trip voltage was higher than 4.74 to 4.76 volts, turn pot R423 two turns clockwise. If lower, proceed to **step 6.**

a. Reset CB-1 and using pot R433, lower output voltage until CB-1 trips; note trip voltage.

b. Repeat **steps 3 through 5** until CB-1 trips within range of 4.74 to 4.76 volts.

6. If trip voltage is lower than 4.74 to 4.76 volts, adjust pot R433 for 4.75 volts and turn pot R423 counterclockwise until CB-1 trips.

a. Turn pot R433 two turns counterclockwise and reset CB-1.

b. Adjust pot R433 for an output of 5.15 volts.

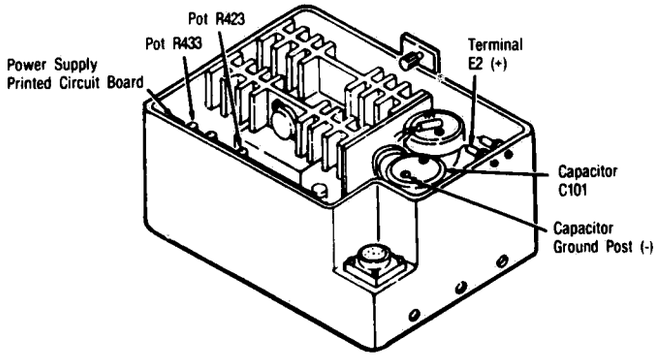


Figure 7-13. POWER SUPPLY ADJUSTMENT (IRC).

7.18 PRINTCON PRINTER

Two printer assembly styles are in use. Units manufactured before 6/85 use a 12 VDC gearmotor to drive carbon copy into a collection coil. Units manufactured after 6/85 use a 120 VAC gearmotor to pull copy onto a spool.

Changing Paper (Figs. 7-14, 7-15 and 7-16)

NOTE: Printcon is designed to use 2-3/8 inch wide, one- or two-ply paper tape as supplied by AMSCO. Paper tape supplies must not be stored in areas of high humidity or temperature.

1. Open printer door. Swing printer assembly forward and downward and allow it to rest in service position.

2. If one ply of paper has been inserted into daily record storage area it will be necessary to remove it before continuing. Refer to paragraph, **"Removing Stored Daily Record*".**

3. Using thumb and index finger, grasp paper spool and raise it upward.

4. Slide the empty paper spool toward the right and off the spindle.

5. Insert fresh paper roll onto spindle with loose end or ends of paper in back of roll going downward.

6. Insert loose end of one-ply roll or both ends of two-ply roll into paper slot. Using index finger of left hand, operate paper advance toggle switch to the forward position (toward the operator). Lower paper roll and spindle. If necessary, operate paper advance toggle switch again until the paper is drawn taut. Turn off paper advance.

7. Swing printer assembly upward and back into operating position.

Automatic Paper Storage* (Fig. 7-17)

NOTE: Capacity of storage bin is 20 feet of single ply paper tape. AMSCO suggests that when using two-ply paper, the inner ply **only** should be inserted into the storage area for a permanent record. The outer ply can be torn off and placed with each sterilized load.

1. Using the paper advance wheel on the left side of the upper paper slot, advance paper until it extends 2 to 3 inches below lower paper slot.

2. Insert end of paper tape between motorized pinch rollers and allow to draw tight. The paper advance toggle switch must be in the rear position (away from the operator) to operate the motorized pinch rollers.

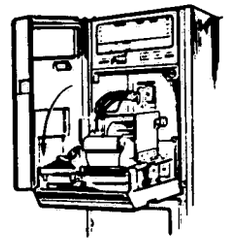


Figure 7-14. PRINTER IN LOWERED POSITION*.

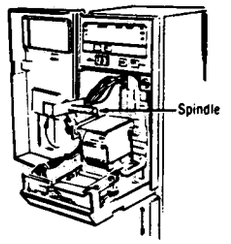


Figure 7-15. SPINDLE IN RAISED POSITION*.

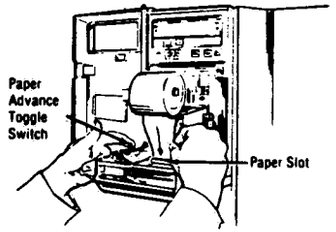


Figure 7-16. INSERTING PAPER*.

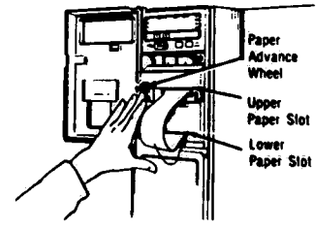


Figure 7-17. INSERTING PAPER INTO AUTOMATIC PAPER STORAGE AREA.

**Units manufactured before 6/85.*

Automatic Paper Storage (Units After 6/85)

NOTE: AMSCO suggests that when using two-ply paper, inner ply **only** should be inserted into storage area for a permanent record. Outer ply can be torn off and placed with each sterilizer load.

1. Open door on secondary control panel and position POWER switch to OFF.

2. Using paper advance thumbwheel on left side of upper paper slot, advance paper until it extends 6 to 8 inches below lower paper slot (Fig. 7-17).

3. Insert tape end into lower slot until entire 6 to 8 inches is inserted.

4. Swing printer assembly forward and downward and allow it to rest in service position.

5. Grasp end of tape, fold two corners to form a **V** and fully insert end into slot of paper take-up spool (Fig. 7-17A).

6. Position POWER switch to ON. Paper take-up spool will advance paper until taut.

7. Swing printer assembly upward and back into operating position.

Removing Stored Daily Record*
(Figs. 7-18, 7-19 and 7-20)

1. Open printer door. Crease the paper tape with a fingernail and tear tape as straight as possible. Allow trailing end of paper to enter rollers and storage area.

2. Swing the printer assembly forward and downward and allow it to rest in the service position.

3. Using thumb and index finger, grasp knob on storage area door and open door downward. Daily record is now easily removed from the right.

4. Close storage area door. Return printer assembly upward and back to the operating position.

5. Using the paper advance wheel on the left side of the upper paper slot, advance paper until it extends 2 to 3 inches below lower paper slot.

6. Insert end of paper tape between motorized rollers and allow to draw tight. Close door.

**Units manufactured before 6/85.*

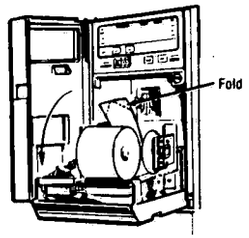


Figure 7-17A. FOLD PAPER TAPE (Units After 6/85).

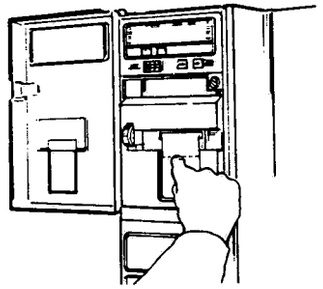


Figure 7-18. CREASING PAPER TAPE*.

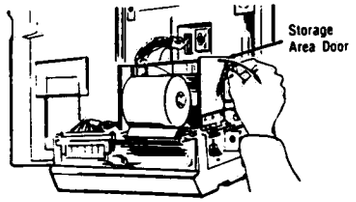


Figure 7-19. OPENING STORAGE AREA*.

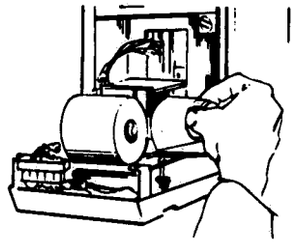


Figure 7-20 REMOVING STORED DAILY RECORD*.

Removing Stored Record (Units After 6/85)

Printcon is capable of storing an entire roll of paper; however, stored record may be removed at any time.

1. Open door on secondary control panel and position POWER switch to OFF.

2. Open printer door. Using paper advance thumbwheel on left side of the upper paper slot, advance paper until it extends 3 to 4 inches below lower paper slot or until all information on tape has been advanced.

3. Tear or cut paper tape.

4. Swing printer assembly forward and downward and allow it to rest in service position.

5. Position POWER switch to ON. Tape will advance onto take-up spool. Position power switch to OFF when tape is completely advanced.

6. To remove take-up spool, release tension on spring-loaded retaining clip and lift spool from unit (Fig. 7-20A).

7. Remove spool end plate and slide paper from spindle.

8. Replace spool end plate and return spool to spring-loaded clips.

9. Refer to paragraph **"Automatic Paper Storage (Units After 6/85)"** to reload spool.

Changing The Inked Ribbon Cartridge (Fig. 7-21)

1. Tear off loose end of paper and open door to the left.

2. Remove old cartridge by placing index finger behind cartridge and pulling forward.

3. Install new cartridge, with ribbon above loose end of paper, by placing it into position and snapping it into place with thumbs of each hand.

4. Close door.

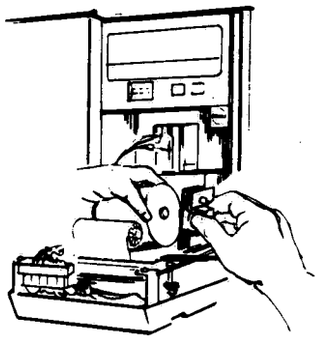


Figure 7-20A. REMOVING STORED RECORD (Units After 6/85).

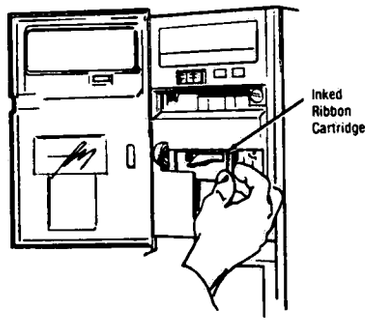


Figure 7-21. REMOVING INKED RIBBON CARTRIDGE.

Printer Replacement (Fig. 7-23 and 8-65 or 7-23A and 8-65A)

1. Open unit outer door.

2. Tilt printer assembly forward to service position. Remove two #6-32 screws and washers holding silver anodized cover in place.

3. Remove cover by disengaging it from pivot shoulder screws.

4. Unsolder wire #11 (units before 6/85) or wire #119 (units after 6/85) from printer.

5. Pivot assembly back to operating position and disconnect J1 and J2 connectors (plugged into J20 receptacle mounted on upper left edge of printer mounting plate).

6. Printer can now be disassembled by removing three 1/4-20 hex nuts — two on right and one on left end of printer.

7. Reconnect wire #11 (units before 6/85) or wire #119 (units after 6/85) when new printer is installed.

8. For units shipped before 6/85, adjust printer (see Paragraph **"Printer Assembly Inspection and Adjustment"**).

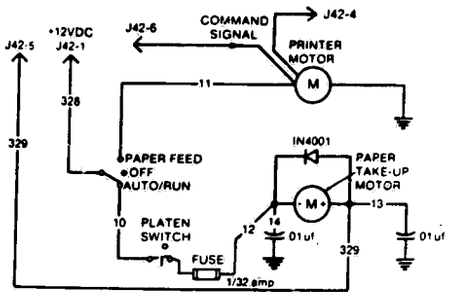


Figure 7-22. SWITCH AND MOTOR SCHEMATIC (Units Before 6/85).

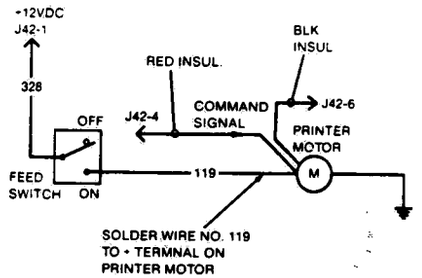


Figure 7-22A. SWITCH AND MOTOR SCHEMATIC (Units After 6/85).

Paper Advance Toggle Switch Replacement (Fig. 7-23 and 8-65 or 7-23A and 8-65A)

1. Open unit outer door.

2. Tilt printer assembly forward to service position. Remove two #6-32 screws holding silver cover in position. Remove cover by disengaging from pivot shoulder screws.

3. Unsolder all wire connections to switch. Remove locking nut and washers from toggle side to remove.

4. See Figure 7-22 or 7-22A to rewire new switch.

5. For units shipped before 6/85, adjust switch (see Paragraph **"Printer Assembly Inspection and Adjustment"**).

Platen Microswitch Replacement (Fig. 7-23 and 8-65 or 7-23A and 8-65A)

CAUTION: 120 VAC is present on microswitch terminals of units manufactured after 6/85 when sterilizer POWER is ON. Turn POWER OFF.

1. Open unit outer door.

2. Tilt printer assembly forward to service position. Remove two #6-32 screws and washers from printer mounting plate anchoring silver cover in place.

3. Remove two #6 x 1/4 self-tapping screws on right-hand side of printer take-up unit located 5/8 inch forward of printer mounting plate on 31/32 inch centers.

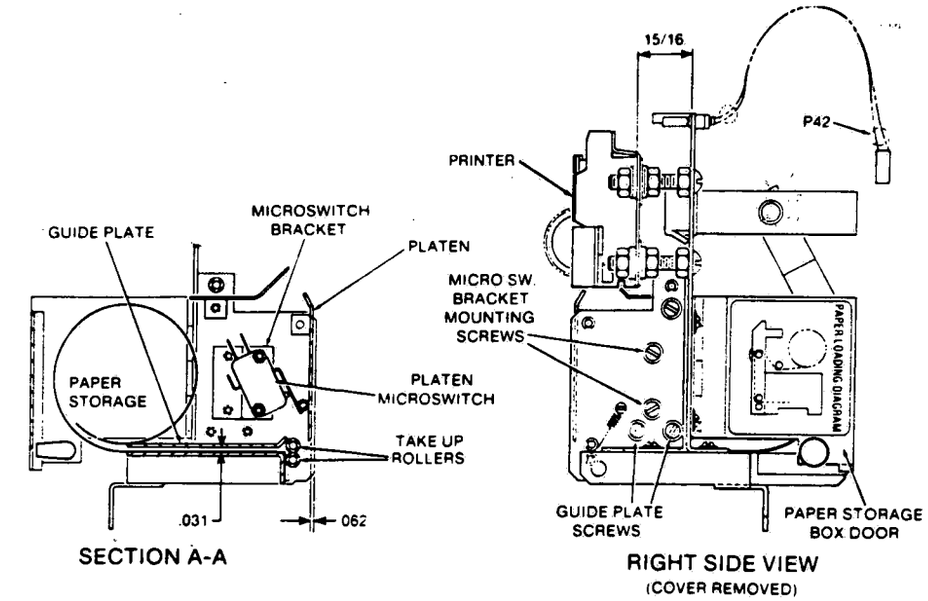
4. Swing platen open to expose switch and mount.

5. Reach in with fingers and pull switch assembly out and disconnect two wires with "fast-on" connectors from switch tabs.

6. Switch and mount are now free. Disengage switch from mount by removing two #4-40 hex nuts.

7. See Figure 7-22 or 7-22A to rewire new switch.

8. For units shipped before 6/85, adjust printer (see Paragraph **"Printer Assembly Inspection and Adjustment"**).



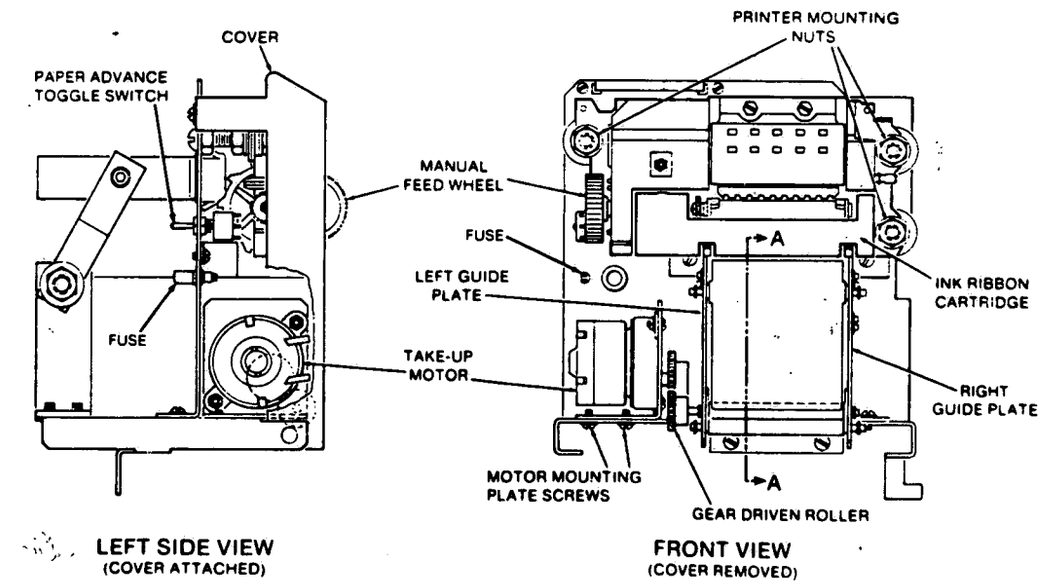


Figure 7-23. PRINTCON PRINTER ASSEMBLY (Units Before 6/85).

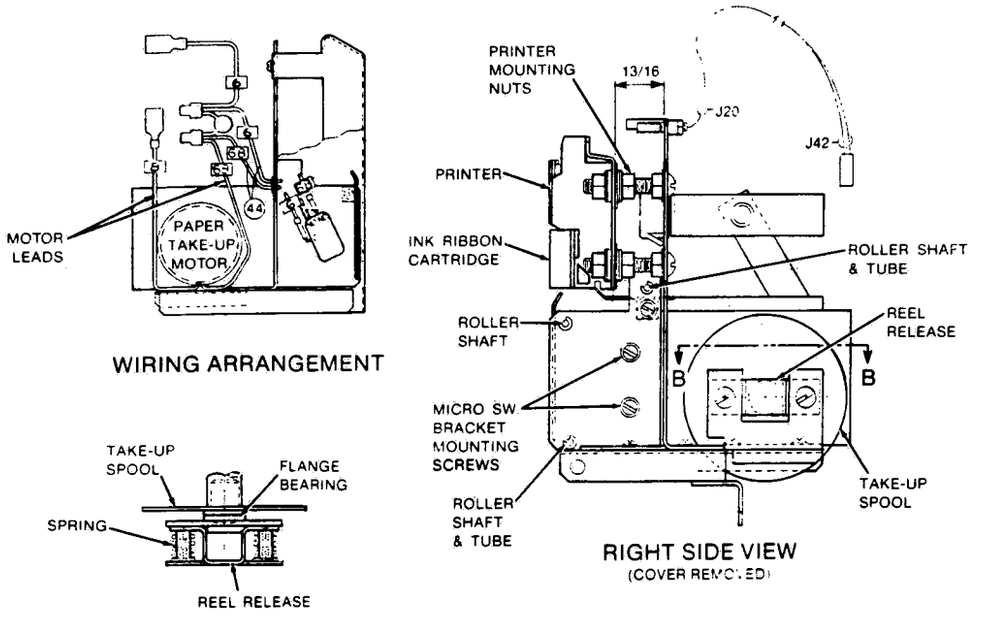


Figure 7-23A. PRINTCON PRINTER ASSEMBLY (Units After 6/85).

Take-Up Motor Replacement* (Figs. 7-22 and 8-65)

1. To replace take-up motor, complete printer take-up assembly must be removed. Tilt assembly forward and disconnect J42 plug from main Printcon PC Board. Also remove two #6-32 screws and washers that hold silver anodized cover in place.

2. Disengage slots from pivot shoulder screws and remove silver cover.

3. Pivot unit back to upright position and remove slot head shoulder screws and washers.

4. Disassemble printer take-up assembly from Printcon housing.

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

5. To remove take-up motor, unscrew two #6-32 screws from bottom of unit.

6. Unsolder wire connections and remove motor and motor mount.

7. Disassemble motor from motor mount by unscrewing two #4-40 nuts and screws holding them together.

8. Replace motor. Rewire motor as shown in Figure 7-22.

9. Adjust motor using following procedure.

Printer Assembly Inspection and Adjustment* (Figs. 7-22 and 8-65)

Whenever any of following components are replaced, they must be aligned and/or adjusted to ensure smooth paper advance and take-up.

- Printer.
- Paper Advance Toggle Switch.
- Platen Microswitch.
- Take-up Motor.

Dismount unit from control column and remove it to a bench.

1. Unplug P42 from main Printcon PC Board. Unfasten two 10-32 shoulder screws upon which asembly pivots. Remove printer assembly.

2. Remove paper roll.

Paper Coil and Guideplate Clearance*

1. Open paper storage area door and inspect for 1/32 (.031) inch clearance between paper coil and guideplate. If this dimension is not correct, unfasten take-up motor (with motor attached). Left-side adjustment screws are now accessible.

2. Loosen four adjustment screws (two on each side) on right and left side plates. Using a 1/32 (.031 or .032) inch feeler gauge for clearance between paper coil and guideplates, adjust guidepath position and then tighten down.

3. Remount take-up motor mount and motor.

Microswitch Activation Adjustment*

1. Lift platen and observe screws which mount microswitch bracket to right side plate. Loosen them slightly.

2. Adjust microswitch position so that trip point is audible when platen is parallel to and about 1/16 inch below ends of side plates.

3. Tighten screws securely.

Printer Alignment With Take-up Mechanism*

If printer has been replaced, it must be correctly aligned with take-up mechanism.

1. Verify that printer standoff is 15/16 inches between printer mount plate and printer itself. Correct if necessary.

2. Slightly loosen three 1/4-20 nuts which secure printer. Dismount take-up motor plate (with motor attached) from mounting base. Carefully allow motor assembly to rest to one side. This will free white nylon gear attached to upper pinch roller.

3. Remove ink ribbon cartridge. Cut approximately 6 feet of paper from a roll. Only one ply is needed for adjustment process.

4. Using printer manual paper feed wheel, start paper through printer until about 8 inches of paper extends past printer roller. Pull this section tightly with even tension along surface of this printer roller.

NOTE: Do **not** allow paper to buckle at any point during adjustment process.

**Units manufactured before 6/85.*

5. Lay end of 8 inch section of paper across pinch rollers of take-up mechanism. Observe paper alignment with right and left side guide plates on take-up assembly adjacent to printer until paper is centered in take-up guide channel.

6. Using 6 inch rule (or similar measuring device), measure distance between printer roller and take-up assembly upper pinch roller. Adjust printer assembly location until rollers are equidistant at right and left. Recheck paper alignment in guide channel.

7. When proper lateral and parallel alignment is achieved, hold printer assembly in place and tighten securing nuts. Start end of 8 inch paper section into pinch rollers by turning nylon gear on upper roller. Continue paper take-up in this fashion and observe track of paper. When proper printer/take-up alignment is achieved, paper will remain seated in guide channel without buckling and without riding up either right or left side guide plate. If necessary, readjust and recheck.

8. Remove remaining portion of paper from printer and take-up assembly. Install ink ribbon cartridge. Remount take-up motor mount and motor to motor mounting base. Reinstall cover. Connect P42 to main Printcon PC Board and mount printer assembly in control column. Install a new roll of one- or two-ply paper and, under power take-up, ensure that operation is correct.

Erratic Temperature/Pressure Display

1. Units manufactured before 6/85:

Erratic display operation because of loss of DC ground or capacitor bypass. Proceed as follows:

a. Verify +12 and -12 ±0.5 VDC at power supply. If voltage is not steady, replace power supply. If voltage is steady, proceed to next step.

b. Remove cover from Printer Assembly. Ensure motor mounting screws (also serve as grounding screws) are intact and that both capacitors are secured. If screw or nut has backed off, secure using Loctite 242 (P-764320-823). Return cover. If screw and capacitors are connected and problem persists, proceed to next step.

c. Turn take-up motor switch to TAKE-UP. If situation stops, ensure switch remains in this position. If situation continues, proceed to next step.

d. Remove temperature probe from mounting clip or chamber drain. If situation stops, probe is bad and needs replaced. If situation continues, return probe to clip and proceed to next step.

e. Install jumper from DC GND side of RESET button to ground stud behind secondary control (refer to unit schematic for wiring detail). If problem persists after installing jumper, contact Service Field Engineering.

2. Units manufactured after 6/85:

Erratic temperature reading is being displayed when unit is idle or at sterilizing temperature. Add a jumper wire (labeled #103) from secondary panel chassis ground (see Figure 8-67 or 8-68) to TB3-7 (control DC ground).

7.19 PRINTCON DIGITAL DISPLAY

Display Panel Overlay Replacement

1. Open the outer door of the unit.

2. Remove #6 x 1/4 self tapping screw from top of upper right-hand corner of display panel door. This will allow opening door with left-hand swing.

3. Next, disconnect ribbon cable connections from panel PC board mounted directly behind panel door — one connector from PC board and one connector from thumbwheel switch.

4. Remove #4-40 nut from display panel door hinge stud at bottom left corner of display door. Remove hinge stud upward and out. Display panel door may now be removed.

5. Reverse the procedure to install a new Display Panel Overlay.

Temperature Thumbwheel Replacement (Fig. 8-64)

1. Follow steps 1 through 3 in the procedure outlined in "Display Panel Overlay Replacement."

2. Thumbwheel switch is extracted from assembly by removing the #4-40 nuts and washers from the two mounting studs assembled to display bracket assembly.

3. Reverse the procedure to install a new thumbwheel switch.

Display PC Board Replacement (Fig. 8-64)

1. Follow procedure outlined in "Display Panel Overlay Replacement."

2. The display PC board is removable by first disconnecting the ribbon cable connector P45 from the main Printcon PC board.

3. Tilt the printer assembly forward to the service position. This permits access to the opening in the upper rear of Printcon housing where P45 is plugged into the main Printcon PC board which is mounted on the back side of Printcon housing.

4. Display PC board can now be removed by disengaging the three circuit board supports.

5. Reverse the procedure to install a new Display PC Board.

Printcon Rotary BCD Switches: Digital Display Board

Rotary switches to control pressure, temperature purge times and print intervals are located on Printcon digital display board. Refer to Figure 7-24 for appropriate settings.

NOTE: VS4 (Purge Time) and VS5 (Print Intervals) are used on Eagle 2300 Series units. PS5 (special) is used for special non-standard functions; for standard units it **must** be set to 0-0.

PS2 PRESSURE
psig = setting ÷ 2

Setting SA11	psig
0	0.0
1	0.5
*2	1.0
3	1.5
4	2.0
5	2.5
6	3.0
7	3.5
8	4.0
9	4.5

PS3 PRESSURE
psig = setting ÷ 2

Setting SA10	psig
0	0.0
1	0.5
2	1.0
3	1.5
4	2.0
5	2.5
*6	3.0
7	3.5
8	4.0
9	4.5

VS2 VACUUM
in.Hg. = setting ÷ 2

Setting SA12	in.Hg.
0	0.0
1	0.5
2	1.0
3	1.5
*4	2.0
5	2.5
6	3.0
7	3.5
8	4.0
9	4.5

*=Recommended Initial Settings

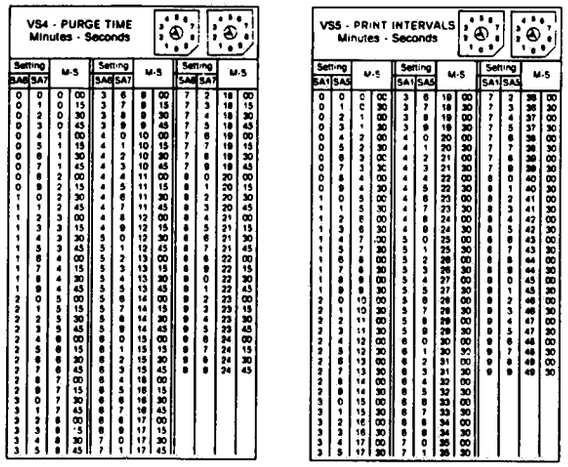


Figure 7-24. ROTARY BCD SWITCHES.

7.20 MAIN PRINTCON PC BOARD

Changing The Battery (Figs. 7-25 and 8-64)

NOTE: Existing battery (RAY-O-VAC DP24-2-42; P-129356-038) is No Longer Available. When replacing RAY-O-VAC battery, order and install Battery Adapter Assembly (P-150822-349). Assembly plugs into Printcon Board in same fashion as RAY-O-VAC battery. Replace battery as follows:

1. Turn POWER switch OFF and open top door on Printcon column.

2. Swing printer assembly forward and downward. Allow it to rest in service position.

3. Remove and discard old battery from Printcon board (note polarity).

4. Install new battery. **Note:** To ensure correct connection, observe notched (see Fig. A) corner of battery. This positive terminal (Pin #1) and inserts into positive socket of receptacle (upper left-hand corner of socket). Although no danger exists if battery is incorrectly installed, clock and calendar will not function when machine is off.

5. Return printer assembly to operating position. Close door.

6. Turn POWER switch ON and reset time and date if necessary.

7. If necessary to replace new battery (Lithium coin cell), proceed as follows:

a. Turn POWER switch to OFF and open top door on Printcon column.

b. Swing printer assembly forward and downward. Allow it to rest in service position.

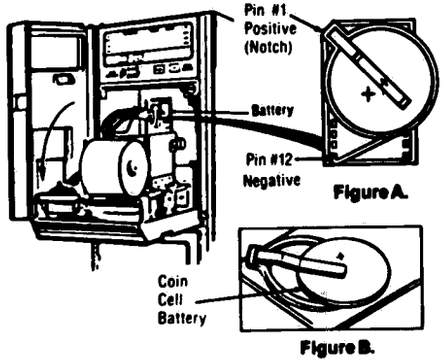


Figure 7-25. CHANGING THE BATTERY.

c. Carefully remove battery adapter assembly (P-150822-349) from Printcon board. Ensure no bent or broken pins by pulling assembly straight out (no twisting, rocking or prying).

d. Remove coin cell (see Fig. B) from holder and install replacement cell (P-150822-351).

e. Reinstall adapter assembly in Printcon board.

f. Return printer assembly and close door.

g. Turn POWER switch ON and reset time.

Changing Units of Display (Figs. 7-26, 7-27 and Table 7-2)

1. The visual display and printing of temperature can be either in degrees Fahrenheit or Celsius. To make this adjustment, locate service switch No. 1 on the Printcon control printed circuit board. Using a pencil or pen point, turn the switch to the alternate position. Return printer assembly upward and back to operating position. Close door.

2. The display and printing of pressure can be either in English (PSI gauge and inches Hg vacuum) or metric (kg/cm^2 gauge and millimeters Hg vacuum). To make this adjustment follow the procedure in step one and turn service switch No. 2 to alternate position.

3. The display of temperature and English pressure can be either single precision (no decimal places showing) or extended precision (one decimal place showing). Metric pressure shows one or two decimal places. Metric vacuum always shows no decimal place. To make this adjustment follow the procedure in step one and turn service switch No. 3 to alternate position.

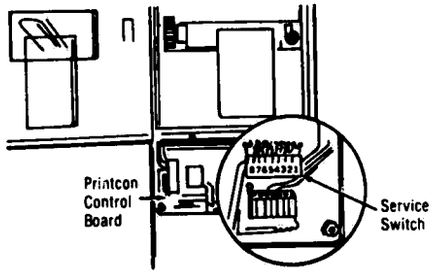


Figure 7-26. LOCATING SERVICE SWITCH.

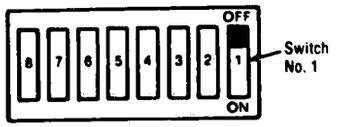


Figure 7-27. SERVICE SWITCH.

Adjusting The Sterilize Temperature Overdrive (Gravity Unit only) (Figs. 7-26, 7-27 and Table 7-2)

For special sterilizer applications, the temperature overdrive may be adjusted in increments of approximately 1/2 degree F. For example, if the temperature thumbwheel setpoint is at 270 F (132 C), the actual control temperature can be from 270 F to 273.8 F (132 C to 134.3 C) depending on how service switches, 5, 6 & 7 of switch No. 1 are set. Refer to Table 7-2 for overdrive settings.

TABLE 7-2. SERVICE SWITCH OPTION SETTINGS.

Feature	Switch No(s).	Setting
Temperature in Fahrenheit	1	OFF
Temperature in Celsius	1	ON
Pressure (English) psig & in. Hg vacuum	2	OFF
Pressure (Metric) Kg/cm^2 & mm Hg vacuum	2	ON
Single precision	3	OFF
Extended precision	3	ON
Prussure Transducer	4	ON
Temperature Overdrive (Gravity Units Only)		
TS2 TS1	5, 6, & 7	5 OFF, 6 OFF, 7 OFF
TS2 = TS1 + 0.5 F	5, 6, & 7	5 ON, 6 OFF, 7 OFF
TS2 = TS1 + 1.1 F	5, 6, & 7	5 OFF, 6 ON, 7 OFF
TS2 = TS1 + 1.6 F	5, 6, & 7	5 ON, 6 ON, 7 OFF
TS2 = TS1 + 2.2 F	5, 6, & 7	5 OFF, 6 OFF, 7 ON
TS2 = TS1 + 2.7 F	5, 6, & 7	5 ON, 6 OFF, 7 ON
TS2 = TS1 + 3.3 F*	5, 6, & 7	5 OFF, 6 ON, 7 ON
TS2 = TS1 + 3.8 F	5, 6, & 7	5 ON, 6 ON, 7 ON
Spare Switch	8	Unused

*Initial factory setting (for Gravity Sterilizers only).

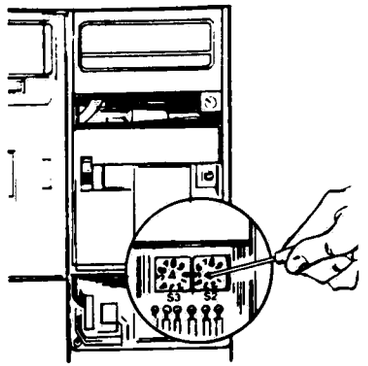


Figure 7-28. LOCATING ROTARY SWITCHES S2 AND S3.

Setting The Year Switches (Fig. 7-28)

1. Remove the front panel of the control column. Remove the primary display panel.

2. The year as shown on the Printcon display does **not** automatically change on December 31st. It must be set annually. To make this adjustment locate rotary switches S2 and S3 on the Printcon control printed circuit board. Using a small screwdriver, turn the pointer to the desired digits (example: for 1982, set S3 at 8 and S2 at 2).

3. If no year display is needed, the switches may be set as follows: set S3 at 8 and S2 at 0. The month and date will still be displayed, but no year will be shown or printed.

Main Printcon PC Board Replacement (Fig. 8-64)

CAUTION: This PC Board contains static-sensitive components. Handle accordingly.

1. Open the outer door of the Printcon unit. The entire unit must be removed from the control column.

2. Remove the front cover panel from the column by taking two cap screws out of the top of the cover and two #10-32 screws out of the bottom.

3. Take off the primary panel by removing four #8-32 mounting screws and washers. It is not necessary to disconnect P16 from the primary panel if care is exercised.

4. Tilt the primary panel forward and reach through the primary panel mounting bracket to disconnect P40 and P48 connections. Disconnect green ground wire #103 from printer assembly bottom.

NOTE: Plug P16 (from primary panel) and plug P40 (from main Printcon PC board) are identical in construction. Proper identification must be observed at reassembly. Plugs are labeled on the harness and must be installed on the correct PC board.

5. Remove the four #8-32 Printcon unit mounting screws located two on each side of the unit. Access to the top two screws must be made by opening the display door at the top of the unit. Printer unit must be tilted forward to remove the lower two screws.

6. Printcon unit can now be removed from the column. Main Printcon PC board is removed from the unit by extracting the eight #6-32 mounting screws and standoffs.

7. Reverse the procedure to install a new main Printcon PC board.

7.21 PRINTCON PRESSURE TRANSDUCER REPLACEMENT (Figs. 8-74 and 8-75 or 8-76)

1. Open the outer door of the Printcon unit.

2. Tilt the printer assembly forward to access the P47 connector plugged into the main Printcon PC board.

3. Disconnect P47 and note the cable that exits through the rear of control column to the pressure transducer on its mounting bracket. Extract the transducer cable pins from P47. Note the color coding of the wires. Pull the cable through the column. See paragraph 6.1 for pin extraction.

4. Remove transducer from piping.

5. Mount new transducer.

6. Run the transducer cable through the cable clamp. Install the new cable into plug P47. Reconnect P47. Refer to Fig. 6-12 or Fig. 6-13 when rewiring.

7.22 PRINTCON TEMPERATURE PROBE (RTD) REPLACEMENT (Figs. 8-74, 8-75 or 8-76, and 6-12 or 6-13)

1. Follow procedure outlined in pressure transducer replacement in gaining access to P47 connector. Select temperature probe (RTD) cable and extract cable pins of P47 from this cable. Pull the cable through the column. See paragraph 6.1 for pin extraction.

2. Free cable from any supports or ties to sterilizer. Then, disassemble probe from chamber drain by unscrewing 1/4 NPT probe fitting pointing upward into chamber drain.

3. Reassemble in reverse order.

7.23 REPLACEMENT OF PRINTCON POWER SUPPLY FUSES

If fuse replacement is necessary, refer to Figure 7-29 for locations of these fuses.

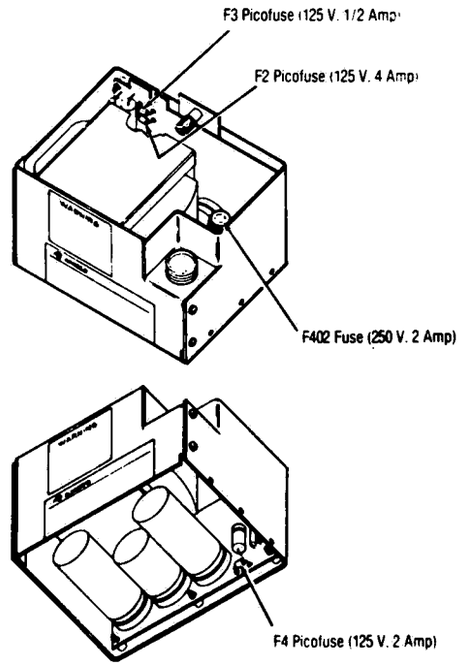


Figure 7-29. POWER SUPPLY FUSE LOCATIONS.

7.24 PRINTCON FIELD CALIBRATION

Special Tools and Documents Required:

NOTE: The measuring devices should be calibrated against NBS (National Bureau of Standards) traceable equipment and the inaccuracies of the measuring devices should be known (via a calibration report sheet).

1. Calibrated compound pressure gauge — resolution to 1/2 PSIG or greater. (AMSCO P-764317-627 or equivalent) 100 PSIG and 30 in Hg.

2. Calibrated potentiometer — resolution to 1 F (Doric 400 A with type T thermocouple or equal).

3. Digital voltmeter or multimeter with 1mv DC resolution (B&K 2800 or equal).

NOTE: All adjustments in this procedure should be verified whenever the main Printcon PC board is replaced. If the temperature probe (RTD) is replaced, check the temperature calibration. If the pressure transducer is replaced, first check the pressure calibration. Then, because temperature accuracy is affected by pressure adjustments, check the temperature **after** adjusting the pressure.

Procedure:

1. With control power OFF, remove front panel of control column. Remove primary panel mounting screws and unplug primary panel.

2. Check service switch No. 1 on the Printcon control PC board for the following settings:

#1 — OFF (Fahrenheit)
#2 — OFF (English pressure)
#3 — ON (Display tenths)
#4 — ON (Strain Gauge input)
#5 — OFF
#6 — ON
#7 — ON
#8 — not used

3. Remount the primary panel and secure by hand-tightening mounting screws.

4. Locate test points TP4, TP5 and TP6 on the Printcon control PC board.

Connect the negative lead of the voltmeter to TP6.

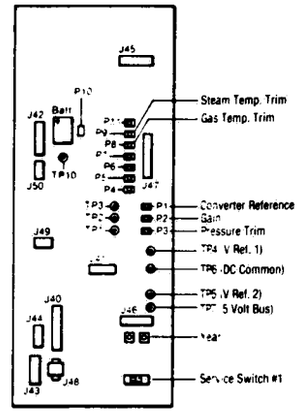


Figure 7-30. TEST POINT AND POTENTIOMETER LOCATIONS: Main Printcon PC Board.

With power on, measure the voltage at TP4. This will be around 10 VDC. Now measure the voltage at TP5 and adjust potentiometer **P1** until this voltage is **exactly** 1/2 of the voltage measured at TP4.

IMPORTANT: This setting was made at the factory and should not require readjustment. However, if adjustment is necessary, follow the instructions carefully as this setting greatly affects overall accuracy.

5. Install the compound pressure gauge to the chamber gauge connection at the side of the chamber. Leave the chamber gauge disconnected.

6. With the control end door open, manually actuate the door lock switch. Exercise caution because **the "cycle inhibit" feature is defeated** by this action. While holding the lock actuated, turn the control power ON. Adjust potentiometer **P3** on the main Printcon PC board until the pressure display reads 0.0 exactly.

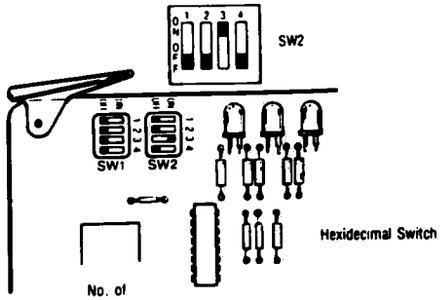
7. Release the door lock switch. Turn power OFF then ON with the door open. Close and lock the chamber door(s). Set the HI-LO regulator valve to HI. Set sterilize temperature on the temperature thumbwheels to 295 F. Sterilize time is not applicable on this step. Start a GRAVITY cycle. After the 60 second purge has timed out, the pressure and temperature will rise to the regulator setting trying to achieve 295 F. When the regulator setting is achieved, the pressure will stabilize. Observe the Printcon pressure reading and adjust potentiometer **P2** on the main Printcon control PC board until this reading matches exactly the compound gauge. Press the RESET button to abort the cycle.

NOTE: This adjustment of **P2** affects the adjustment of **P3** made in step 6. Therefore, steps 6 and 7 must be repeated until **P2** adjustment is no longer required at high pressure (to within 0.5 psig). At the end of step 7, exhaust the chamber through the EXHAUST position on the MANUAL control knob.

IMPORTANT: The following step must **always** be performed **after** steps 6 and 7.

8. Remove the chamber drain strainer. Install the potentiometer thermocouple lead in metal-to-metal contact with the temperature probe in the chamber drain (1/2" from the tip). Initiate the same type cycle as in step 7, and wait until the Printcon **temperature** display stabilizes at the regulator setting. Adjust potentiometer **P9** on the main Printcon PC board until the Printcon temperature display exactly agrees with the potentiometer reading. Press RESET to abort the cycle. Exhaust the chamber through the MANUAL control knob.

9. This concludes the calibration procedure. Remove the measuring devices and reconnect the chamber gauge. Restore the service switch No. 1 settings on the main Printcon PC board to the display options desired by the customer.



No. of Pulses Desired

	1	2	3	4
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
Factory Setting ▶ 4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0

Switch No. and Position
1 = ON
0 = OFF

Figure 7-31. DIP SWITCH SETTINGS: Eagle 2300.

7.25 PRINTCON POWER SUPPLY ADJUSTMENT (Fig. 8-15)

1. Refer to Functional Description, Paragraph 3.7.

2. Adjust pot R7 for 5.05-5.12 VDC at test point TP1.

3. With 5 volt output loaded to 3 amps (1.67Ω), adjust pot R2 until circuit breaker CB1 just trips.

4. Remaining voltages are not adjustable. They must be within following tolerances:

Output	Tolerance	Maximum Ripple (p-p)
-12	-11.40-12.60	0.02
+12	11.40-12.60	0.02
+12p	10.70-12.50	0.05
+18	16.30-24.50	—
+28	24.60-30.80	0.20

7.26 SERIES 2300 I/O #1 PC BOARD DIP SWITCH SETTING (Fig. 7-31)

1. **Dip Switch #1 (SW1):**

This switch selects/deselects cycle pushbutton on primary panel. Switch is factory set but may have to be set if board is replaced. Cycle versus switch number is as follows:

Isothermal	Pos. #1
Liquid	Pos. #2
Gravity	Pos. #3
Pre-vac	Pos. #4

NOTE: Setting particular switch ON deselects cycle.

2. **Dip Switch #2 (SW2):**

This switch (Positions 1, 2 and 3) selects number of VAC pulses during conditioning on a VACAMATIC machine. Number of pulses can vary from 0 to 7 (see Figure 7-31). Position 4 is used to determine TOO LONG IN STEP alarm setting. For small and medium units, position 4 is set to OFF; ensure switch setting when replacing board.

7.27 LABORATORY ACCOUNT LIQUID PROCESSING CYCLE CORRECTIONS

In liquid processing some laboratories are experiencing media boil-over, stopper dislodgement and excessively long exhaust times. Eliminate these situations by completing following adjustments:

1. Reset pressure switch PS-3 (Figure 5-7) to actuate at 1 PSIG instead of 3 PSIG.

2. Verify proper jacket pressure setting (e.g., 20 +4,-1 PSIG).

3. Verify proper temperature control setting of 122-124 C (252-256 F).

4. Readjust slow exhaust rate (after setting PS-3 to 1 PSIG) on an empty chamber (using 20-minute exposure) to following:

   a. 16 x 20 inch Sterilizers = 4 to 7 minutes

   b. 24 x 36 inch Sterilizers = 5 to 8 minutes

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SECTION 8

EXPLODED VIEWS AND PARTS LISTS

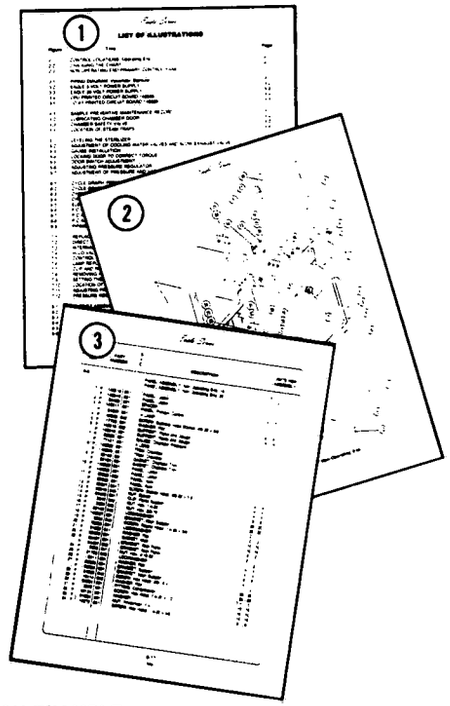
Assemblies and components of Eagle 2000 sterilizers are illustrated and identified on the following pages. The part number, the description and the quantity required for each usage is given. Each indentation in the description represents the assembly level. The UNITS PER ASSEMBLY column is specific for the given assembly or subassembly level.

HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN

(1) Determine the function and application of the part required. 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 — (1st subassembly) Part of above item with no indentation

PANEL ASSEMBLY: Non Operating End, 16'' .....
PANEL ASSEMBLY: Non Operating End, 20'' .....

PANEL, Upper .....
PANEL, Upper .....
SPACER .....
PANEL, Primary Control .....
• LAMP .....
SCREW, Buttress Head Socket, #8-32 x 3/8 .....
WASHER, Flat .....

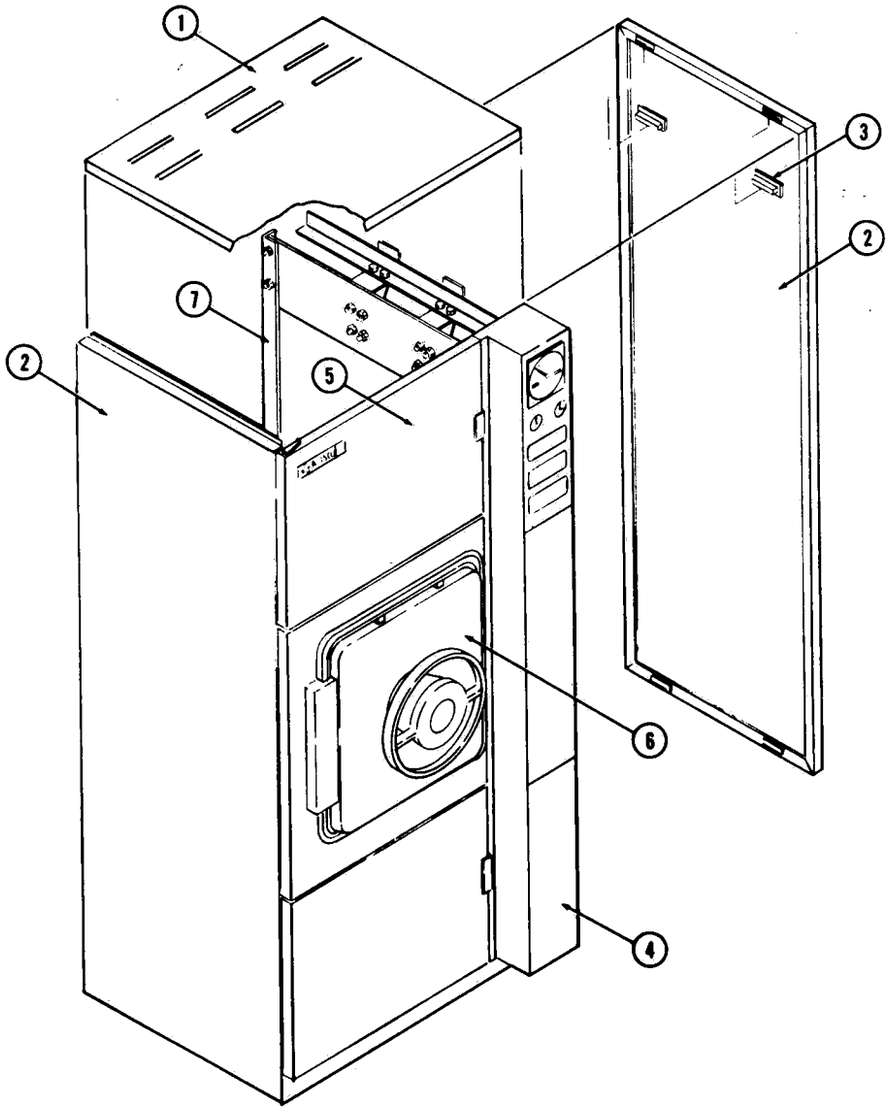


Figure 8-1. CABINET ASSEMBLY: Freestanding Sterilizer.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR RECORDER:				
8-1-					CABINET ASSEMBLY: 16" Single Door, Freestanding	X			
					CABINET ASSEMBLY: 20" Single Door, Freestanding		X		
					UNITS WITH PRINTCON:				
					CABINET ASSEMBLY: 16" Single Door, Freestanding			X	
					CABINET ASSEMBLY: 20" Single Door, Freestanding				X
1	P	136422	002		PANEL, Top	1			
	P	136423	002		PANEL, Top		1	1	
2	P	93404	003		PANEL, Side	2			1
	P	93404	004		PANEL, Side		2	2	
3	P	84298	001		CATCH, Magnetic	8	8		2
4					CONTROL COLUMN ASSEMBLY (See Fig. 8-10, -11, and -12)	1	1	8	8
					CONTROL COLUMN ASSEMBLY (See Fig. 8-61, -62, and -63)			1	1
5					PANEL ASSEMBLY, Operating End (See Fig. 8-5)	1	1	1	1
6					COVER AND HANDWHEEL ASSEMBLY (See Fig. 8-20)	1	1	1	1
7					SIDE FRAME ASSEMBLY (See Fig. 8-2)	1	1	1	1
	P	146441	002		KIT, Cabinet Assembly: 16" Single Door	*		*	
	P	146441	006		KIT, Cabinet Assembly: 20" Single Door		*		*

*Optional cabinet conversion kit used where recessed units are to be converted to freestanding units.

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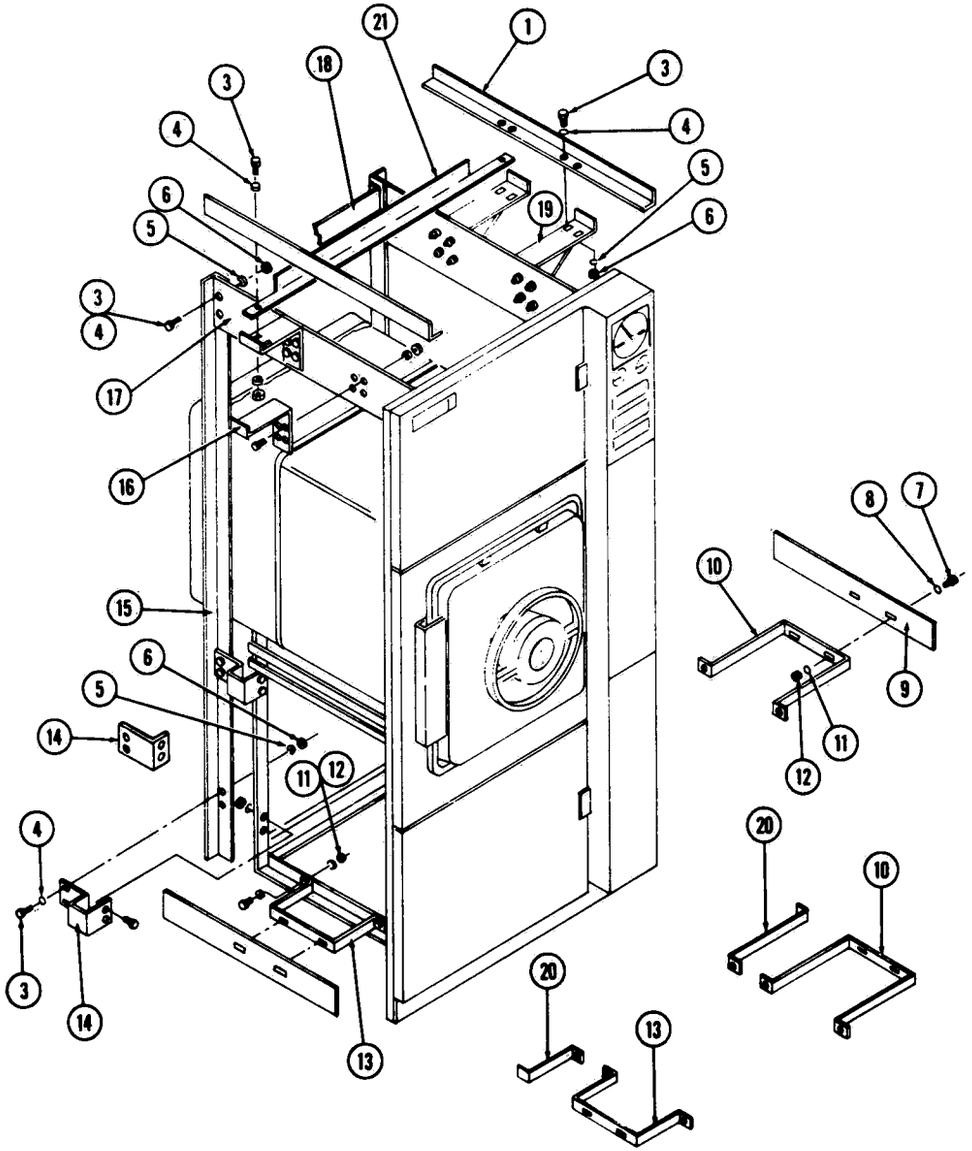


Figure 8-2. SIDE FRAME ASSEMBLY: Freestanding Sterilizer.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-2-					SIDE FRAME ASSEMBLY: 16" Single Door, Freestanding	X			
					SIDE FRAME ASSEMBLY: 20" Single Door, Freestanding		X		
1	P	93896	083		SUPPORT, Top Panel	2			
	P	93896	084		SUPPORT, Top Panel		2		
2					NOT USED	—	—		
3	P	3848	051		SCREW, Hex Head, 1/4-20 x 3/4	28	28		
4	P	3515	041		WASHER, Flat, 1/4	28	28		
5	P	76230	091		LOCKWASHER, 1/4	28	28		
6	P	3097	041		NUT, 1/4-20	18	18		
7	P	31838	042		SCREW, Hex Head, 3/8-16 x 1	20	22		
8	P	10414	042		WASHER, 3/8	20	22		
9	P	93663	001		SUPPORT, Bottom	2			
	P	93663	002		SUPPORT, Bottom		2		
10	P	93665	002		BRACKET, Bottom, Long	1			
	P	93398	002		BRACKET, Bottom, Long		1		
11	P	89809	061		LOCKWASHER, Stainless Steel, Internal Tooth	20	22		
12	P	3099	042		NUT, 3/8-16	20	22		
13	P	93665	001		BRACKET, Bottom, Short	1			
	P	93398	001		BRACKET, Bottom, Short		1		
14	P	93688	001		BRACKET, Main Support	4			
	P	93664	001		BRACKET, Main Support		4		
15	P	146628	001		SUPPORT, Rear Cabinet	2	2		
16	P	93896	089		HANGER ASSEMBLY, Short	2	2		
17	P	93896	088		SUPPORT, Top Attachment	2			
	P	93896	085		SUPPORT, Top Attachment		2		
18	P	93668	001		BRACKET, Top Attachment	1			
	P	93669	001		BRACKET, Top Attachment		1		
19	P	93896	090		HANGER ASSEMBLY, Long	2	2		
20	P	93399	001		BRACE, Bottom, Short		1		
	P	93399	002		BRACE, Bottom, Long		1		
21	P	93896	093		BRACE, Cross	2			
	P	93896	094		BRACE, Cross		2		

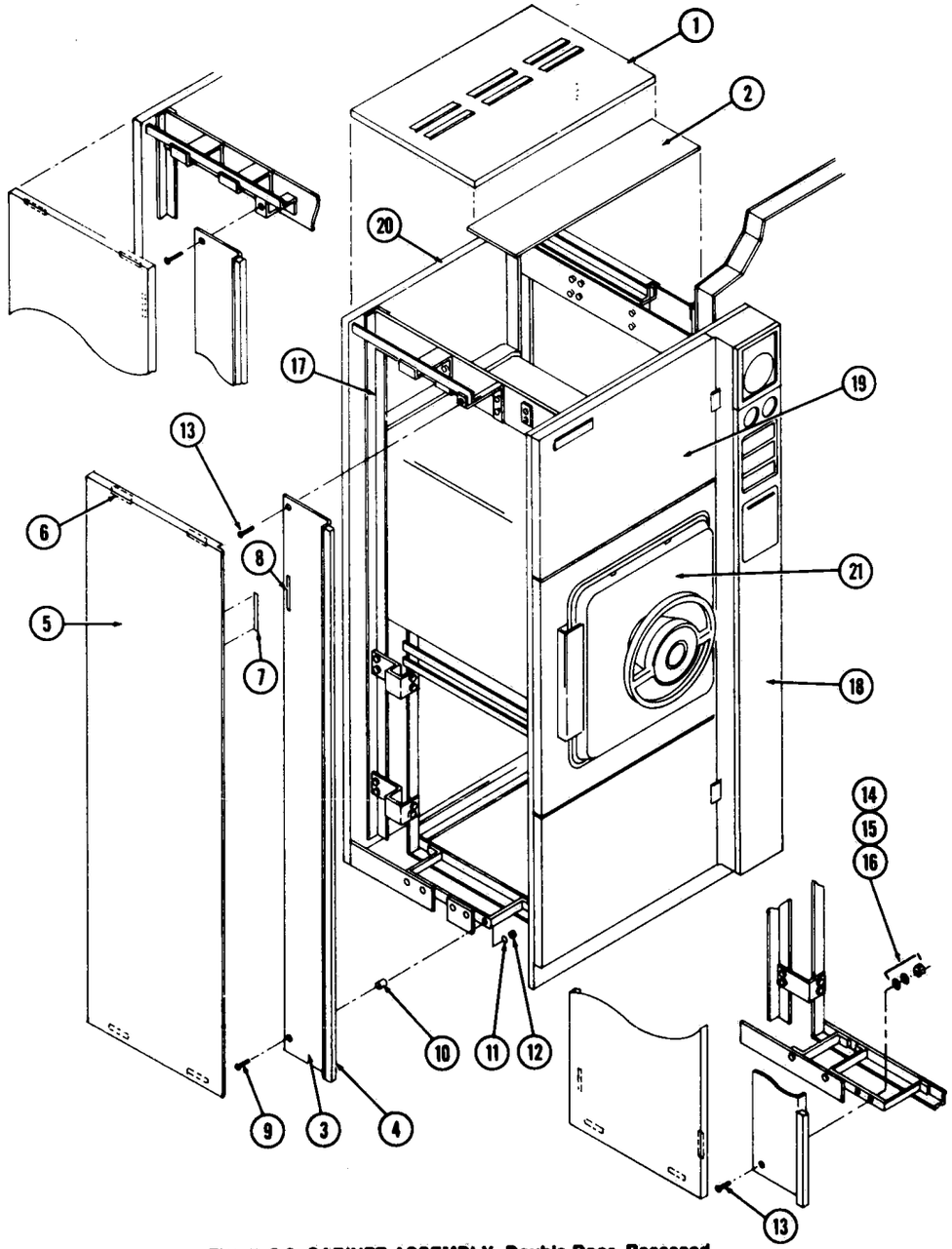


Figure 8-3. CABINET ASSEMBLY: Double Door, Recessed.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-3-	P	146641	004		CABINET ASSEMBLY: 16'' Double Door, Recessed	X			
	P	146641	008		CABINET ASSEMBLY: 20'' Double Door, Recessed		X		
1	P	136422	001		PANEL, Top	1			
	P	136423	001		PANEL, Top		1		
2	P	93415	001		FILLER	1			
	P	93415	002		FILLER		1		
3	P	93401	001		PANEL, Extension	2			
	P	93401	002		PANEL, Extension		2		
4	P	84297	001		STRIP, Sponge	2	2		
5	P	93404	001		PANEL, Side	2			
	P	146339	014		PANEL, Side		2		
6	P	84298	001		CATCH, Magnetic	8	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	19677	041		LOCKWASHER, #10	2			
12	P	2960	042		NUT, 10-32	2			
13	P	42656	091		SCREW, Flat Head, 1/4-20 x 1	2	4		
14	P	76230	091		LOCKWASHER, 1/4	2	4		
15	P	3097	041		NUT, 1/4-20	2	4		
16	P	3515	041		WASHER, Flat, 1/4	2	4		
17					SIDE FRAME ASSEMBLY (See Fig. 8-4)	1	1		
18					CONTROL ASSEMBLY (See Fig. 8-10 or 8-61)	1	1		
19					PANEL ASSEMBLY, Operating End (See Fig. 8-6)	1	1		
20					PANEL ASSEMBLY, Non-Operating End (See Fig. 8-8)	1	1		
21					COVER AND HANDWHEEL ASSEMBLY (See Fig. 8-20)	2	2		

†Secure Velcro fasteners to panels with Loctite Super Bonder 495 or equivalent.

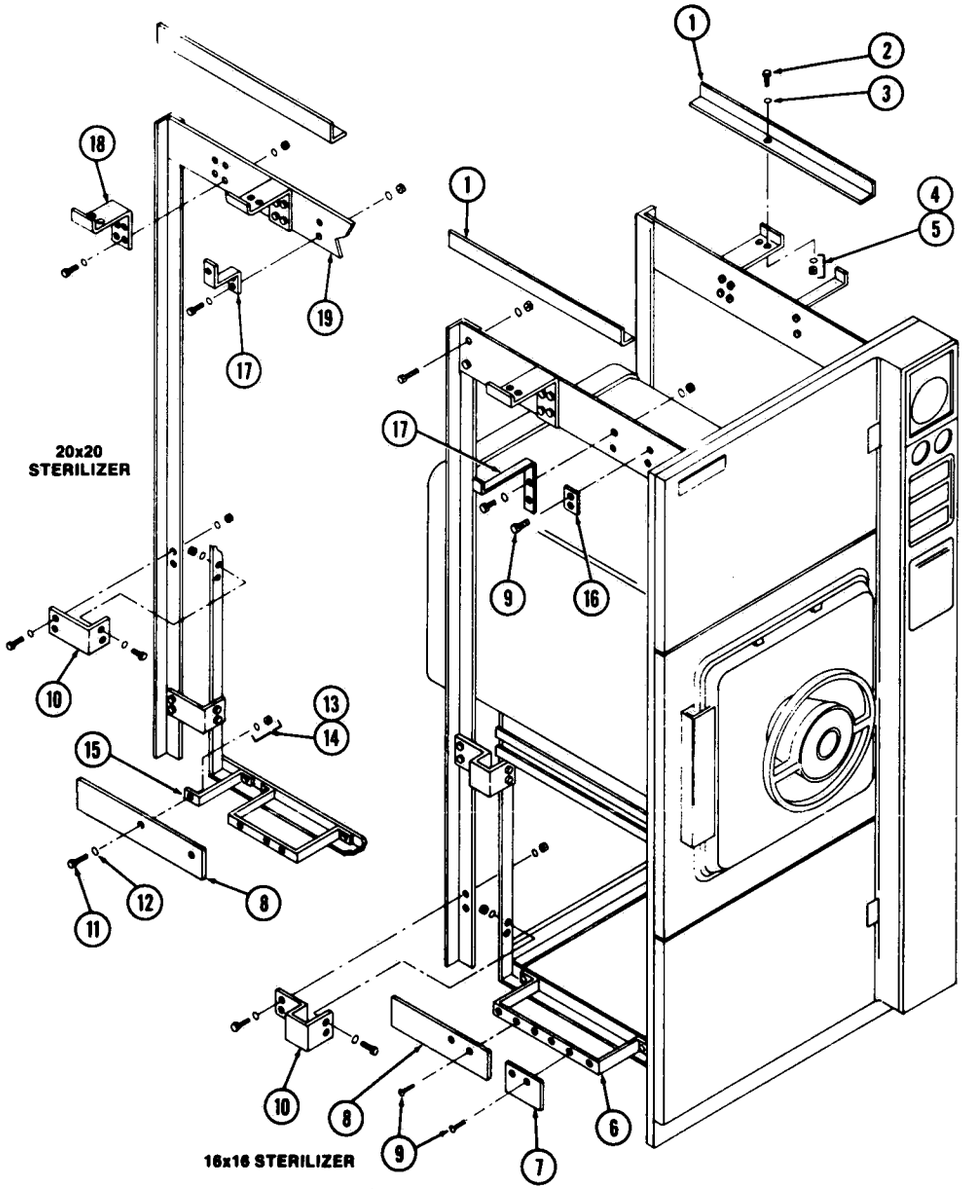


Figure 8-4. SIDE FRAME ASSEMBLY: Recessed Sterilizer.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-4-					SIDE FRAME ASSEMBLY: 16'' Double Door, Recessed	X			
					SIDE FRAME ASSEMBLY: 20'' Double Door, Recessed		X		
1	P	93896	087		SUPPORT, Top Panel	2			
	P	93896	086		SUPPORT, Top Panel		2		
2	P	3848	051		SCREW, Hex Head, 1/4-20 x 3/4	8	28		
3	P	3515	041		WASHER, Flat, 1/4	8	28		
4	P	76230	091		LOCKWASHER, 1/4	10	28		
5	P	3097	041		NUT, Hex, 1/4-20	18	20		
6	P	93666	001		BRACKET, Bottom	2	32		
	P	93398	001		BRACKET, Bottom		2		
7	P	84470	001		PLATE, Strike	2			
8	P	84471	001		PLATE, Strike	2			
	P	93663	003		SUPPORT, Bottom		2		
9	P	43341	091		SCREW, Flat Head, #8-32 x 1/2	16	8		
10	P	93688	001		BRACKET, Main Support	4			
	P	93664	001		BRACKET, Main Support		4		
11	P	31838	042		SCREW, Hex Head Cap, 3/8-16 x 1	4	6		
12	P	10414	042		WASHER, Flat	4	6		
13	P	89809	061		LOCKWASHER, Stainless, Internal Tooth Type	4	6		
14	P	3099	042		NUT, Hex, 3/8-16	4	6		
15	P	93399	001		BRACE, Bottom		2		
16	P	84469	001		PLATE, Strike	4	4		
17	P	84075	001		BRACKET, Top	2			
	P	84075	003		BRACKET, Top		2		
18	P	93896	089		HANGER, Top	2	4		
19					SUPPORT, Top Plate	2			
					SUPPORT, Top Plate		2		

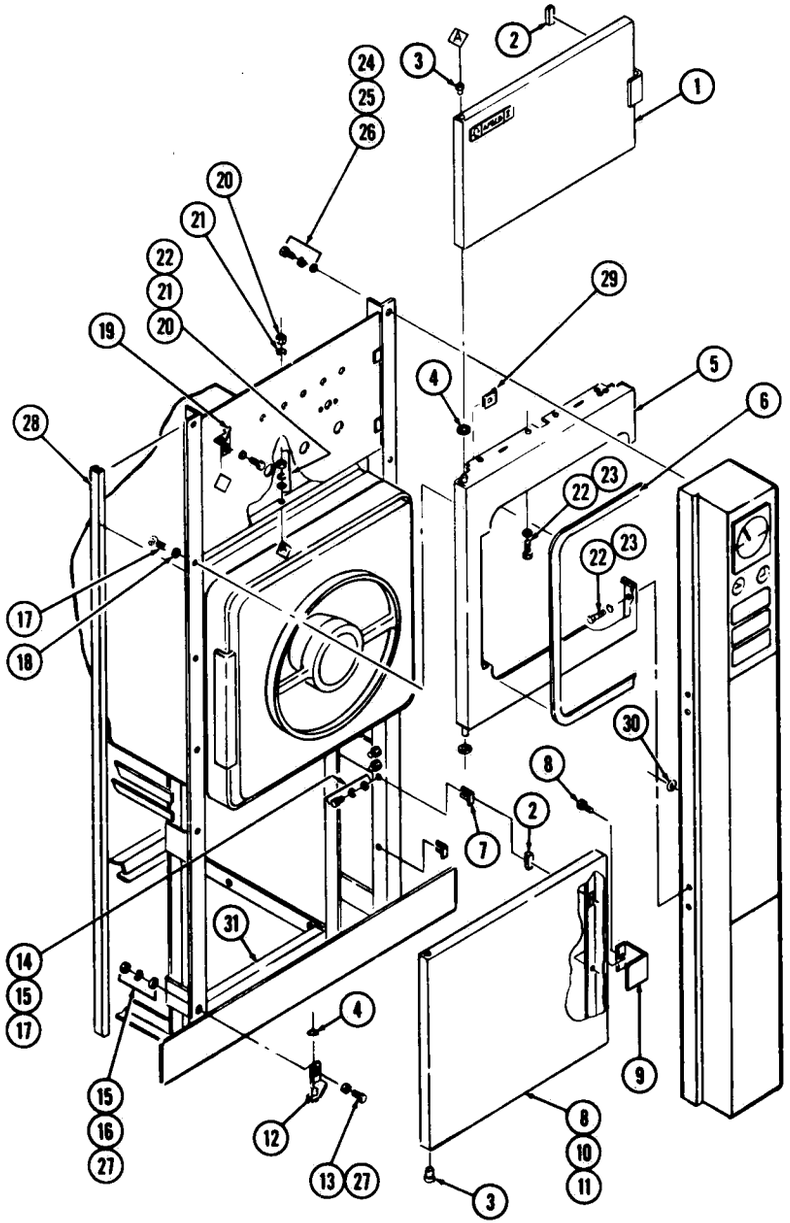


Figure 8-5. PANEL ASSEMBLY: Operating End.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-5-					PANEL ASSEMBLY: Operating End, 16"	X			
					PANEL ASSEMBLY: Operating End 20"		X		
1	P	143146	002		PANEL ASSEMBLY, Upper Access	1			
	P	143146	001		PANEL ASSEMBLY, Upper Access		1		
2	P	83920	001		CATCH, Magnetic	4	4		
3	P	84455	001		BEARING, Flange	4	4		
4	P	84457	001		WASHER	2	2		
5	P	143149	001		TRIM, Shell	1			
	P	143148	001		TRIM, Shell		1		
6	P	90183	091		GASKET, Chamber Trim	1			
	P	90184	091		GASKET, Chamber Trim		1		
7	P	93702	001		STRIKE	4	4		
8	P	91620	061		SCREW, Self Tap, #10-32 x 3/8	8	8		
9	P	93095	001		HANDLE	2	2		
10	P	136302	002		PANEL, Lower Access	1			
	P	136302	001		PANEL, Lower Access		1		
11	P	93096	001		RACK, Manual (Not Shown)	1	1		
12	P	93701	001		HINGE ASSEMBLY	1	1		
13	P	10572	061		SCREW, Hex Head, 1/4-20 x 5/8	4	4		
14	P	49134	061		WASHER, Flat	17	17		
15	P	19678	045		LOCKWASHER	18	18		
16	P	3097	041		NUT, Hex, 1/4-20	8	8		
17	P	3846	041		SCREW, Hex Head, 1/4-20 x 1/2	11	11		
18	P	17589	045		WASHER, Flat	9	9		
19	P	93701	002		HINGE ASSEMBLY	1	1		
20	P	2960	042		NUT, Hex, #10-32	14	14		
21	P	19677	041		LOCKWASHER	14	14		
22	P	5511	041		WASHER, Flat	14	14		
23	P	41012	061		SCREW, Socket Head Cap, #10-32 x 1/2	12	12		
24	P	3857	045		SCREW, Hex Head Cap, 3/8-16 x 1/2	5	5		
25	P	25832	041		LOCKWASHER	5	5		
26	P	10456	091		WASHER, Shim, 11/16 x 25/32 x 1/32	5	5		
27	P	10445	091		WASHER, Flat	4	4		
28	P	93089	001		GASKET, Wall	2	2		
29	P	91924	091		NUT, Tinnerman	5	5		
30	P	43754	045		WASHER	1	1		
31	P	136769	001		STABILIZER (Not Shown)	1			
	P	136769	002		STABILIZER (Not Shown)		1		

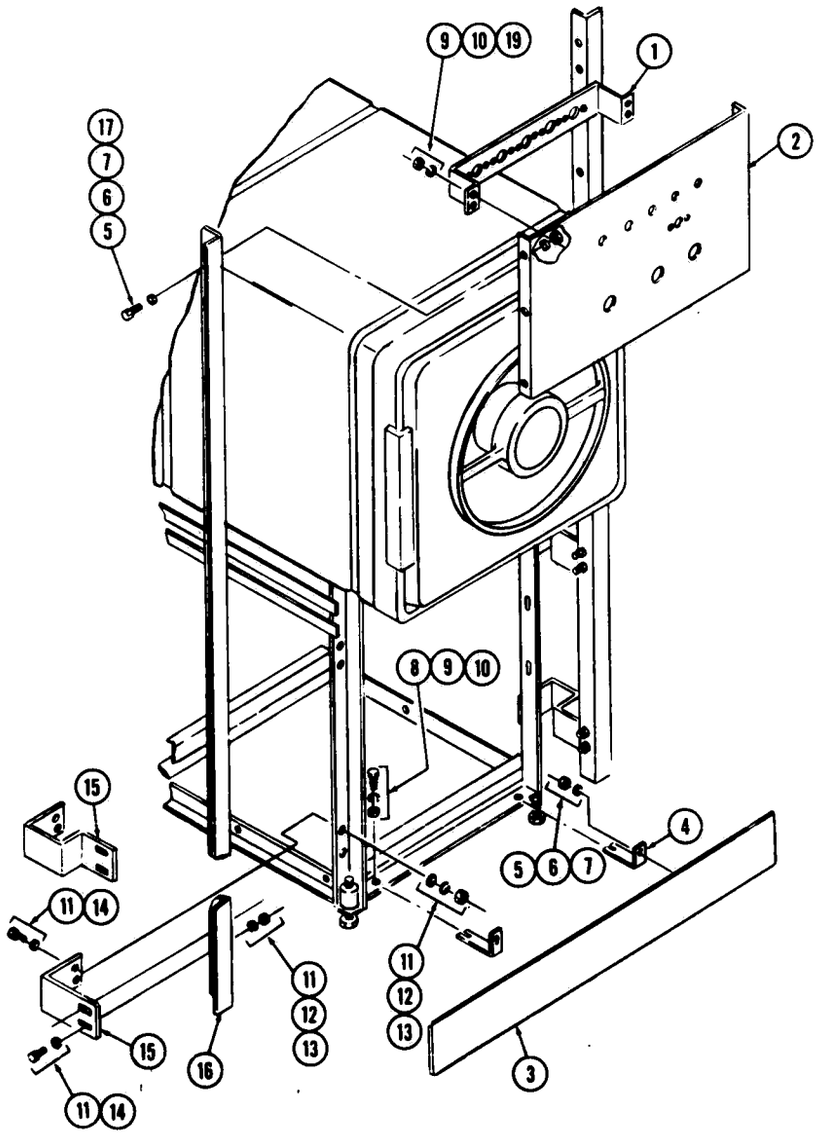


Figure 8-6. SUB PANELS: Operating End.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-6-					SUB PANELS: Operating End, 16"	X			
					SUB PANELS: Operating End, 20"		X		
					UNITS WITH PRINTCON:				
					SUB PANELS: Operating End, 16"			X	
					SUB PANELS: Operating End, 20"				X
1	P	93092	001		SUPPORT, Switch	1	1		
2	P	146153	002		PANEL ASSEMBLY, Valve, See Fig. 8-7	1			
	P	146153	001		PANEL ASSEMBLY, Valve, See Fig. 8-7		1		
	P	146649	005		PANEL ASSEMBLY, Valve, See Fig. 8-7			1	
	P	146649	004		PANEL ASSEMBLY, Valve, See Fig. 8-7				1
3	P	93084	002		PANEL, Kick	1		1	
	P	93084	001		PANEL, Kick		1		1
4	P	84437	002		BRACKET, Kick Panel	2	2	2	2
5	P	2960	042		NUT, Hex, #10-32	2	2	2	2
6	P	19677	041		LOCKWASHER, #10	2	2	2	2
7	P	5511	041		WASHER, Flat	2	2	2	2
8	P	3846	041		SCREW, Hex Head Cap, 1/4-20 x 1/2	2	2	2	2
9	P	19678	045		LOCKWASHER	2	2	2	2
10	P	10445	091		WASHER, Flat	2	2	2	2
11	P	10456	091		WASHER, Shim 11/16 x 25/64 x 1/32	16	16	16	16
12	P	19680	041		LOCKWASHER, 3/8	16	16	16	16
13	P	3099	042		NUT, Hex, 3/8-16	16	16	16	16
14	P	31838	042		SCREW, Hex Head Machine, 3/8-16 x 1	16	16	16	16
15	P	93688	002		BRACKET, Support	4		4	
	P	93664	001		BRACKET		4		4
	P	146649	101		BRACKET, R.H.			1	1
	P	146649	102		BRACKET, L.H.			1	1
16	P	143145	001		BRACKET, R.H.	1	1		
	P	143145	002		BRACKET, L.H.	1	1		
17	P	41012	061		SCREW, Socket Head Cap, #10-32 x 1/2	6	6	12	12
18	P	17589	045		WASHER, Flat	6	6	6	6
19	P	3097	041		NUT, Hex, 1/4-20	8	8	8	8

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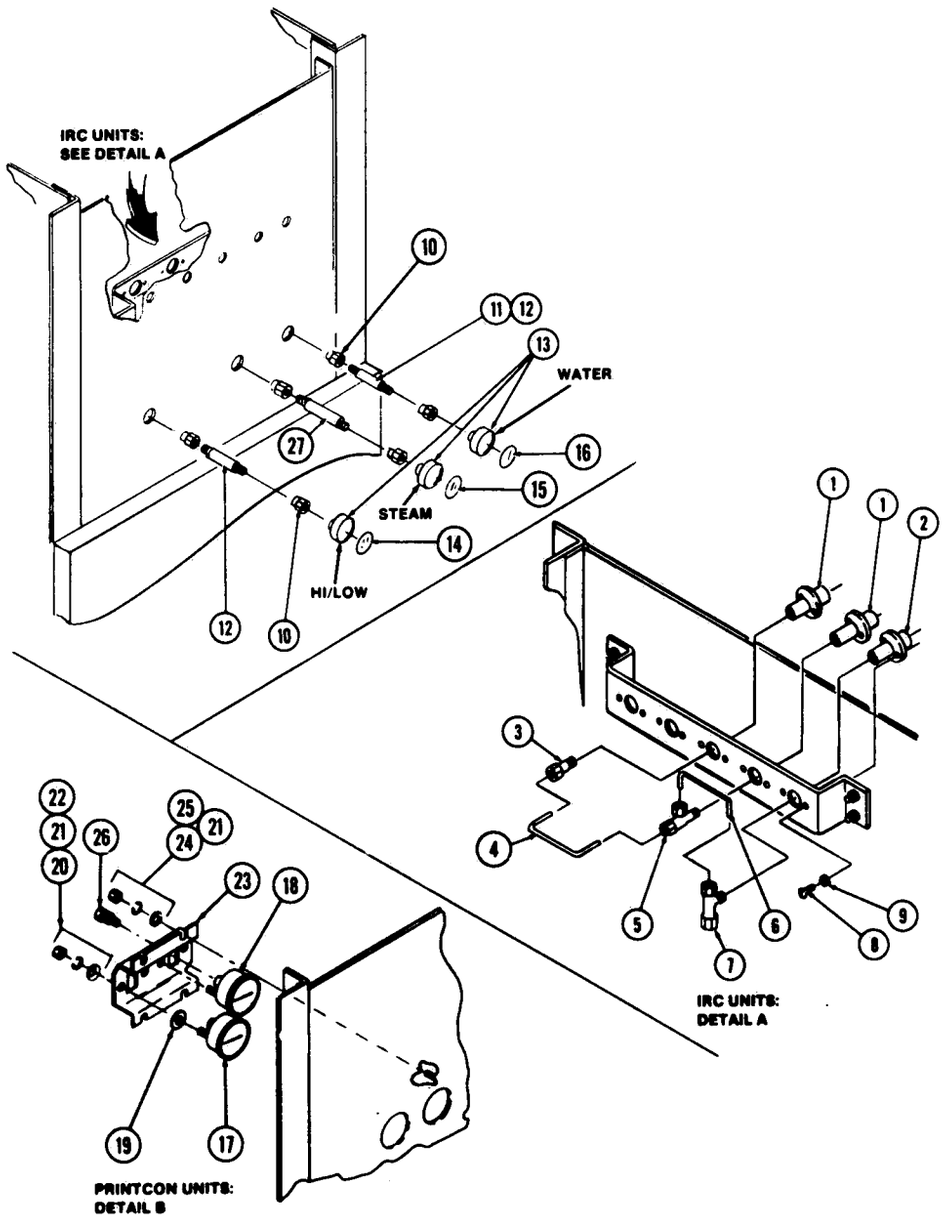


Figure 8-7. TOP CONTROL PANEL: Operating End.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-7-					TOP CONTROL PANEL: Operating End Units with Indicator-Recorder Units with Printcon	X	X		
1	P	83865	001		SWITCH, Pressure	2			
2	P	83866	001		SWITCH, Vacuum (Isothermal Unit Only)	1			
3	P	43289	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1			
4	P	83888	001		TUBE	1			
5	P	78285	091		TEE, Male Run	1			
6	P	83887	001		TUBE	1			
7	P	42581	091		FITTING, Tube	1			
8	P	3984	041		SCREW, #6-32 x 3/8	6			
9	P	5469	041		WASHER, Flat	6			
10	P	8605	042		NUT, Valve	6	6		
11	P	83869	003		ROD, Extension, 4"	1			
12	P	83869	001		ROD, Extension, 3-7/32"	1	2		
13	P	54899	091		KNOB, Valve	3	3		
14	P	90576	091		DECAL, Steam Pressure, HI-LO	1	1		
15	P	90322	091		DECAL, Steam Supply	1	1		
16	P	90323	091		DECAL, Water Supply	1	1		
17	P	90525	091		GAUGE, Chamber Pressure		1		
18	P	90730	091		GAUGE, Jacket Pressure		1		
19	P	5503	045		WASHER, Flat		4		
20	P	129356	132		WASHER, Belleville		4		
21	P	19678	045		WASHER, Lock		4		
22	P	2960	042		NUT, Hex #10-32		4		
23	P	93900	052		BRACKET, Gauge		1		
24	P	10445	091		WASHER, Flat		1		
25	P	3097	041		NUT, Hex 1/4-20		1		
26	P	90594	091		FITTING, Compression, 1/8 O.D.T. x 1/8 N.P.T.		2		
27	P	51998	043		ROD, Extension, 5"	1	1		

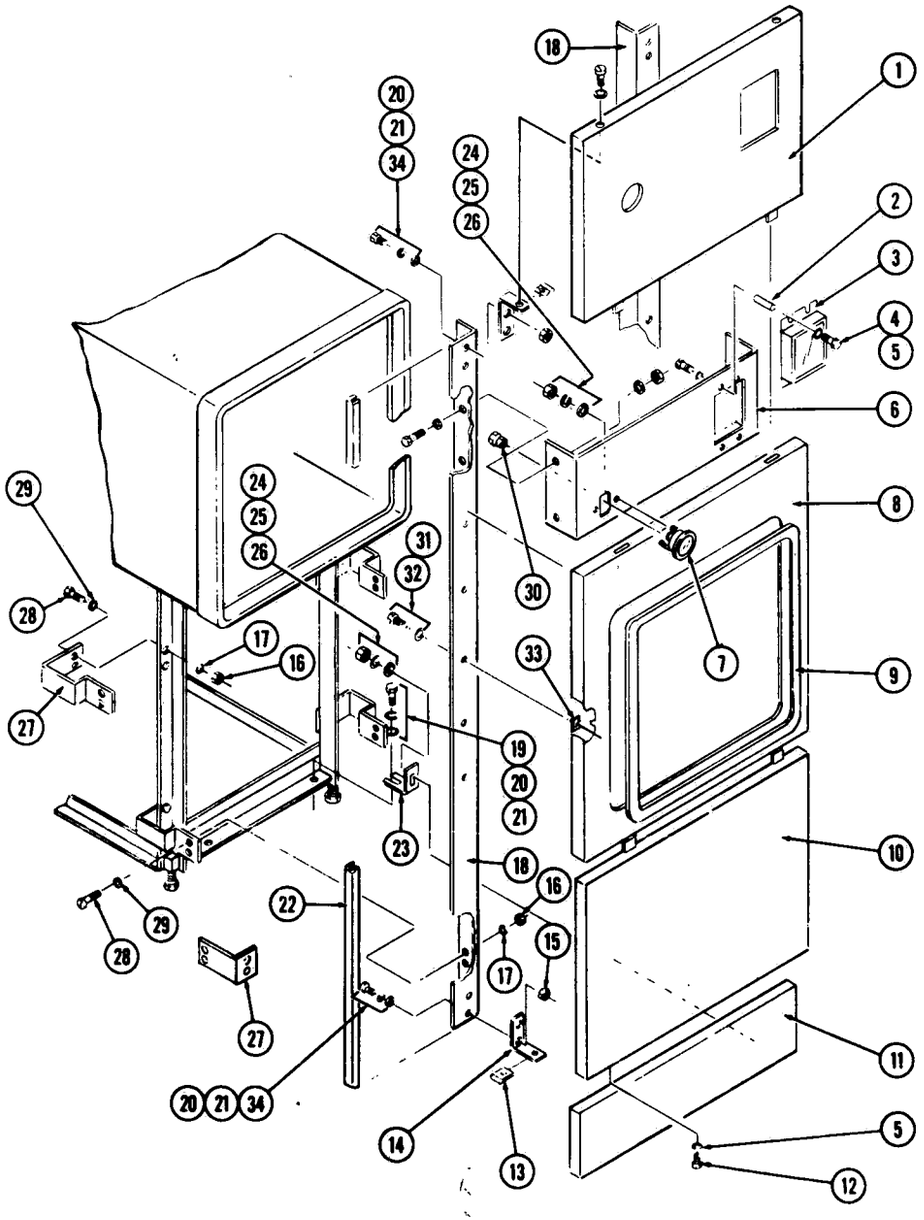


Figure 8-8: PANEL ASSEMBLY, Non-Operating End.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-8-					PANEL ASSEMBLY: Non Operating End, 16''	X			
					PANEL ASSEMBLY: Non Operating End, 20''		X		
1	P	146518	001		PANEL, Upper	1			
	P	146519	001		PANEL, Upper		1		
2	P	84438	001		SPACER	4	4		
3	P	146517	001		PANEL, Primary Control	1	1		
	P	764317	536		• LAMP (Box of 12)	A/R			
4	P	45323	042		SCREW, Buttress Head Socket, #8-32 x 3/8	8	8		
5	P	17796	091		WASHER, Flat	16	16		
6	P	146516	002		SUPPORT, Panel and Gauge	1			
	P	146516	001		SUPPORT, Panel and Gauge		1		
7	P	90525	091		GAUGE, Chamber Pressure	1	1		
	P	77121	091		• LENS	1	1		
8	P	146522	001		TRIM, Chamber	1			
	P	146525	001		TRIM, Chamber		1		
9	P	90183	091		GASKET, Chamber Trim	1			
	P	90184	091		GASKET, Chamber Trim		1		
10	P	146520	001		PANEL, Lower	1			
	P	146523	001		PANEL, Lower		1		
11	P	93689	002		PANEL, Kick	1			
	P	93689	001		PANEL, Kick		1		
12	P	50527	061		SCREW, Socket Head, #8-32 x 1/2	4	4		
13	P	90918	045		NUT, Speed	4	4		
14	P	84436	001		CLIP, Panel Support	4	4		
15	P	3040	042		NUT, Hex, 1/4-20	8	8		
16	P	3099	042		NUT, Hex, 3/8-16	20	20		
17	P	52149	045		LOCKWASHER	20	20		
18	P	146527	001		BRACKET, Main Support	2			
19	P	3950	048		SCREW, Round Head, 1/4-20 x 5/8	2	2		
20	P	76230	091		LOCKWASHER	10	10		
21	P	31599	041		WASHER, Flat	10	10		
22	P	93089	001		GASKET, Wall	2	2		
23	P	84437	001		BRACKET, Kick Panel	2			
	P	84437	002		BRACKET, Kick Panel		2		
24	P	2959	041		NUT, Hex, #10-32	4	4		
25	P	31705	045		LOCKWASHER	4	4		
26	P	5511	091		WASHER, Flat	6	6		
27	P	93688	001		BRACKET, Support	4			
	P	93664	001		BRACKET, Main Support		4		
28	P	31838	042		SCREW, Hex Head, 3/8-16 x 1	20	20		
29	P	10414	042		WASHER, Flat	20	20		
30	P	90594	091		FITTING, Compression	1	1		
31	P	3846	061		SCREW, Hex Head, 1/4-20 x 1/2	10	10		
32	P	49134	061		WASHER	10	10		
33	P	91924	091		NUT, Tinnerman, 1/4	10	10		
34	P	10572	061		SCREW, Hex Head, 1/4-20 x 5/8	8	8		

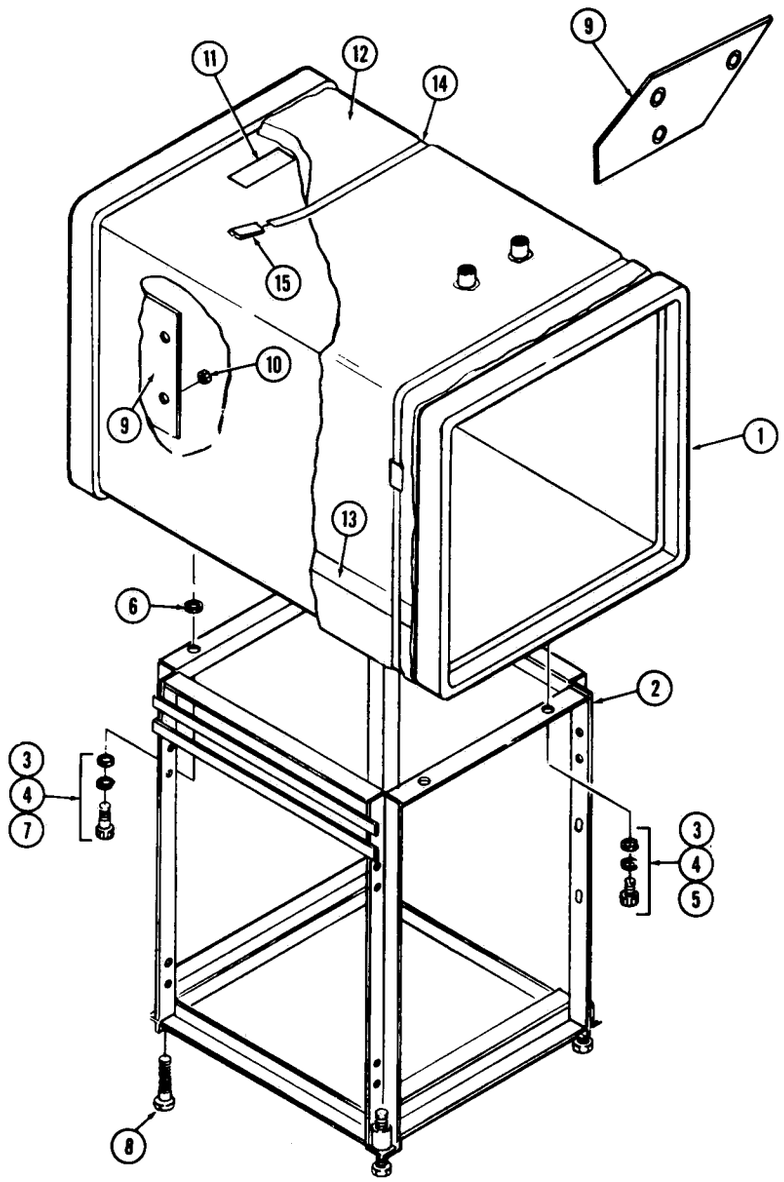


Figure 8-9. SHELL AND STAND ASSEMBLY.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-9-					SHELL AND STAND ASSEMBLY: 16x16 Gravity Model	X			
					SHELL AND STAND ASSEMBLY: 20x20 Gravity Model		X		
					SHELL AND STAND ASSEMBLY: 16x16 Isothermal Model			X	
					SHELL AND STAND ASSEMBLY: 20x20 Isothermal Model				X
1	P	146444	001		SHELL, Weldment, Single Door	1		1	
	P	146447	001		SHELL, Weldment, Single Door		1		1
	P	146445	001		SHELL, Weldment, Double Door	1		1	
	P	146448	001		SHELL, Weldment, Double Door		1		1
2	P	136435	001		STAND, Weldment	1		1	
	P	136435	002		SHELL, Weldment		1		1
3	P	5503	045		WASHER, Flat, 1 O.D. x 13/32 I.D. x 3/32 Thk.	4	8	4	8
4	P	19687	061		WASHER, Lock (3/8)	4	4	4	4
5	P	12439	045		SCREW, Socket Head, 3/8-16 UNC x 3/4	2	2	2	2
6	P	90441	045		WASHER, Flat, 1 O.D. x 13/32 I.D. x 1/8 Thk.	2		2	
7	P	16383	045		SCREW, Socket Head, 3/8-16 UNC x 1	2	2	2	2
8	P	90407	045		SCREW, Square Head, 5/8-11 UNC x 4-1/2	4	4	4	4
9	P	93293	SUB		BAFFLE, Steam (SUB: P-56396-223)	1	1		
	P	136674	001		BAFFLE, Steam			1	1
10	P	150231	SUB		NUT, Hex, 1/4-20 UNC (SUB: P-8648-061)	6	6	6	6
11	P	90542	091		NAMEPLATE	1	1	1	1
12					INSULATION	1	1	1	1
13					TAPE	1	1	1	1
14					STRAP	2	2	2	2
15	P	32268	091		SEAL, Strap	2	2	2	2
16	P	93832	SUB		BAFFLE, Transducer (Printcon only) — Not Shown (SUB: P-56396-225)	1	1	1	1

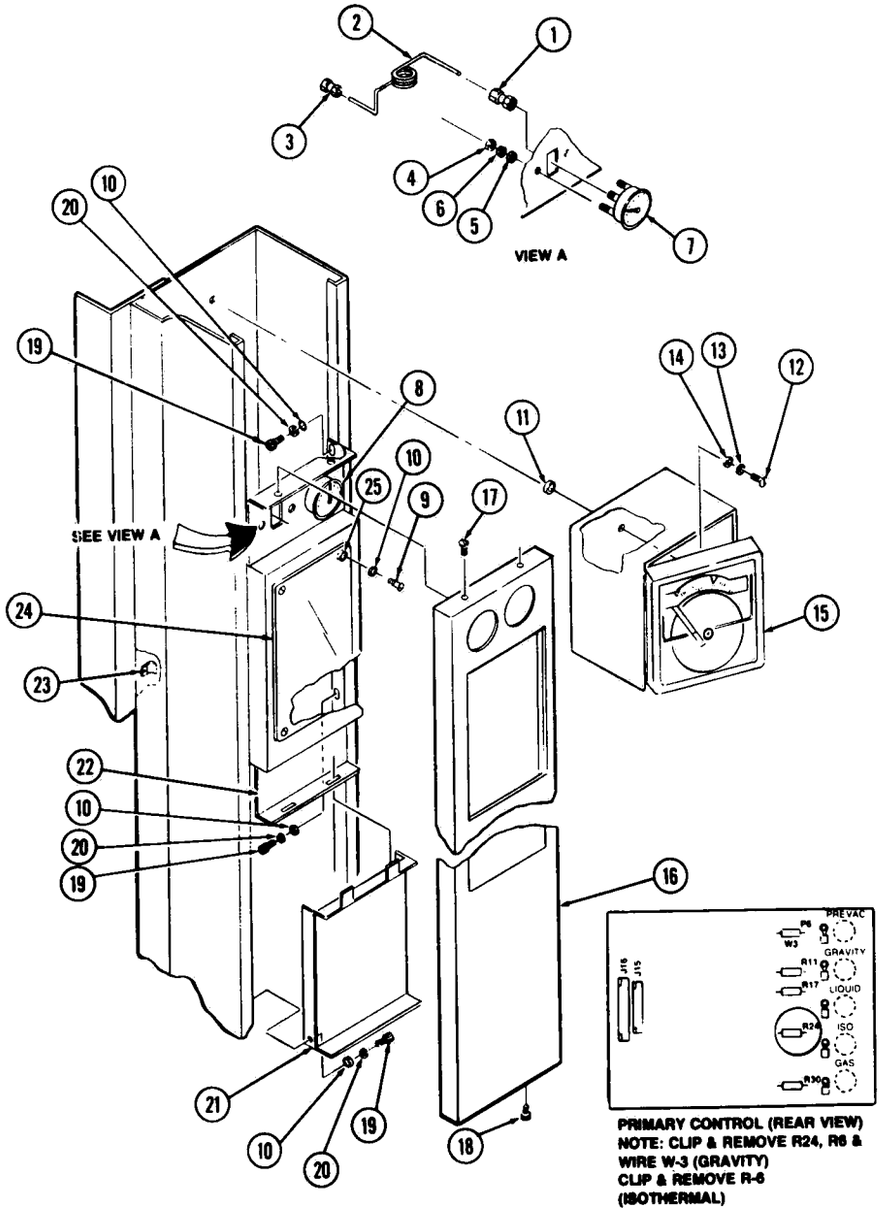


Figure 8-10. CONTROL COLUMN (Part 1 of 3). (Units with Indicator-Recorder)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY	
					UNITS WITH INDICATOR-RECORDER:		
8-10-					CONTROL COLUMN: Gravity (Part 1 of 3)	X	
					CONTROL COLUMN: Isothermal (Part 1 of 3)		X
1	P	90594	091		COUPLING, Compression, 1/8 O.D.T. x 1/8 N.P.T.	2	2
2	P	89053	091		TUBING, 1/8 O.D. x 40	1	1
3	P	129276	001		FITTING, Bulkhead, 1/8 O.D.T.	2	2
4	P	2959	041		NUT, Hex, #10-32	4	4
5	P	31705	045		LOCKWASHER	4	4
6	P	5511	091		WASHER, Flat	4	4
7	P	90525	091		GAUGE, Chamber Pressure	1	1
	P	77121	091		• LENS	1	1
8	P	90730	091		GAUGE, Jacket Pressure	1	1
	P	77121	091		• LENS	1	1
9	P	78025	042		SCREW, Button Head Socket, #8-32 x 7/8	4	4
10	P	17796	091		WASHER, Flat	10	10
11	P	84391	001		SPACER, Recorder	2	2
12	P	4001	041		SCREW, Round Head, 1/4-20 x 7/8	2	2
13	P	26962	061		LOCKWASHER	2	2
14	P	31599	041		WASHER, Flat	2	2
15	P	83518	001		RECORDER (See Fig. 8-13)	1	1
16	P	146483	002		FRONT PANEL ASSEMBLY	1	1
17	P	45323	042		SCREW, Button Head Socket, #8-32 x 3/8	2	2
18	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3/8	2	2
19	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	6	6
20	P	79588	001		LOCKWASHER	6	6
21	P	146490	001		PANEL, Secondary Assembly, Gravity (See Fig. 8-16)	1	
	P	146491	001		PANEL, Secondary Assembly, Isothermal (See Fig. 8-18)		1
22	P	146484	001		PANEL, Mounting	1	1
23	P	451283	001		CLIP, Locking, Capillary	3	3
24	P	146163	SUB		CONTROL, Primary (SUB: P-146645-226)	1	1
	P	764193	SUB		REPAIRED UNIT (SUB: P-764193-033)	1	1
	P	764317	536		• LAMP (Box of 10)	A/R	
25	P	84390	001		SPACER, Primary Control	4	4

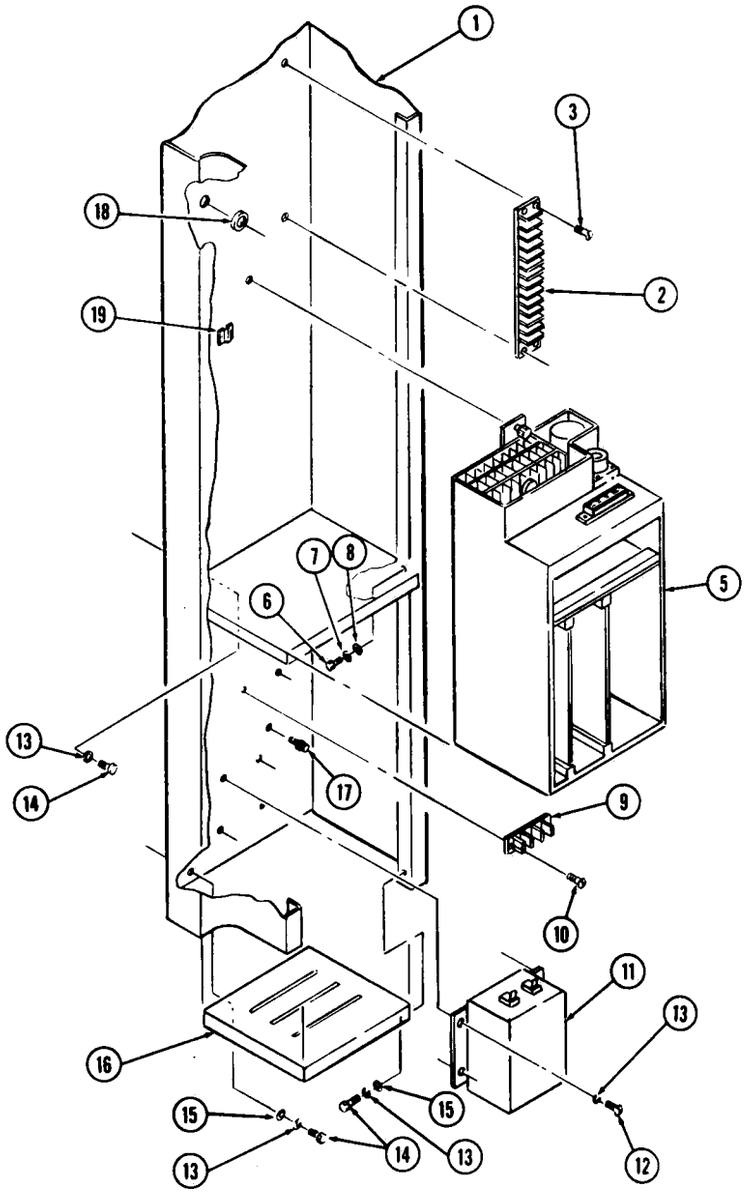


Figure 8-11. CONTROL COLUMN (Part 2 of 3). (Units with Indicator-Recorder)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY	
			UNITS WITH INDICATOR-RECORDER		
8-11-			CONTROL COLUMN: Gravity (Part 2 of 3)	X	
			CONTROL COLUMN: Isothermal (Part 2 of 3)		X
1	P 146485 001		HOUSING ASSEMBLY	1	1
2	P 41560 091		BLOCK, Terminal	1	1
3	P 3964 041		SCREW, Round Head, #6-32 x 5/8	2	2
4	P 136759 001		SUPPORT, Controller	1	1
5			MAIN CONTROL ASSEMBLY: Gravity (See Fig. 8-15)	1	
			MAIN CONTROL ASSEMBLY: Isothermal (See Fig. 8-15)		1
6	P 50527 061		SCREW, Socket Head Cap, #8-32 x 1/2	2	2
7	P 79588 001		LOCKWASHER	2	2
8	P 17796 091		WASHER, Flat	2	2
9	P 90746 091		STRIP, Terminal	1	1
10	P 9661 041		SCREW, #10-32 x 5/8	2	2
11	P 93821 001		FILTER	1	1
12	P 4682 041		SCREW, Round Head, #10	6	6
13	P 31705 045		LOCKWASHER	10	10
14	P 23431 041		SCREW, Socket Head Cap, #10-32 x 3/8	6	6
15	P 5511 091		WASHER, Flat	4	4
16	P 136588 002		PLATE, Bottom	1	1
17	P 82675 001		SCREW, Green Ground, #10-32	1	1
18	P 24582 091		GROMMET	1	1
19	P 431152 091		HOLDER, Wire	8	8

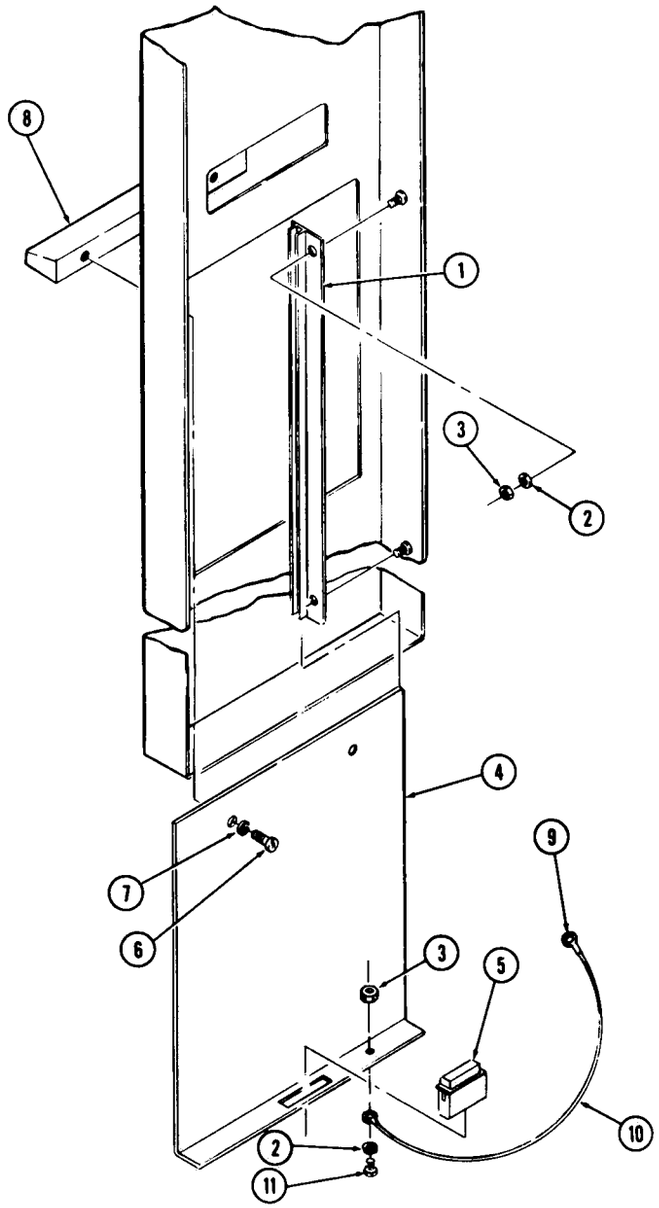


Figure 8-12. CONTROL COLUMN (Part 3 of 3). (Units with Indicator-Recorder)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-12-					CONTROL COLUMN (Part 3 of 3)	X
1	P	84394	001		SLIDE, Door	2
2	P	5469	041		WASHER, Flat	5
3	P	3037	041		NUT, Hex, #6-32	5
4	P	93662	001		DOOR	1
5	P	83920	001		CATCH, Magnetic	1
6	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2
7	P	79588	001		LOCKWASHER	2
8	P	84393	001		HANDLE	1
9	P	19521	091		TERMINAL, #6 Ring x 16-22 AWG	2
10					WIRE, Green	1
11	P	50705	041		SCREW, Flat Head, #6-32 x 5/16	1

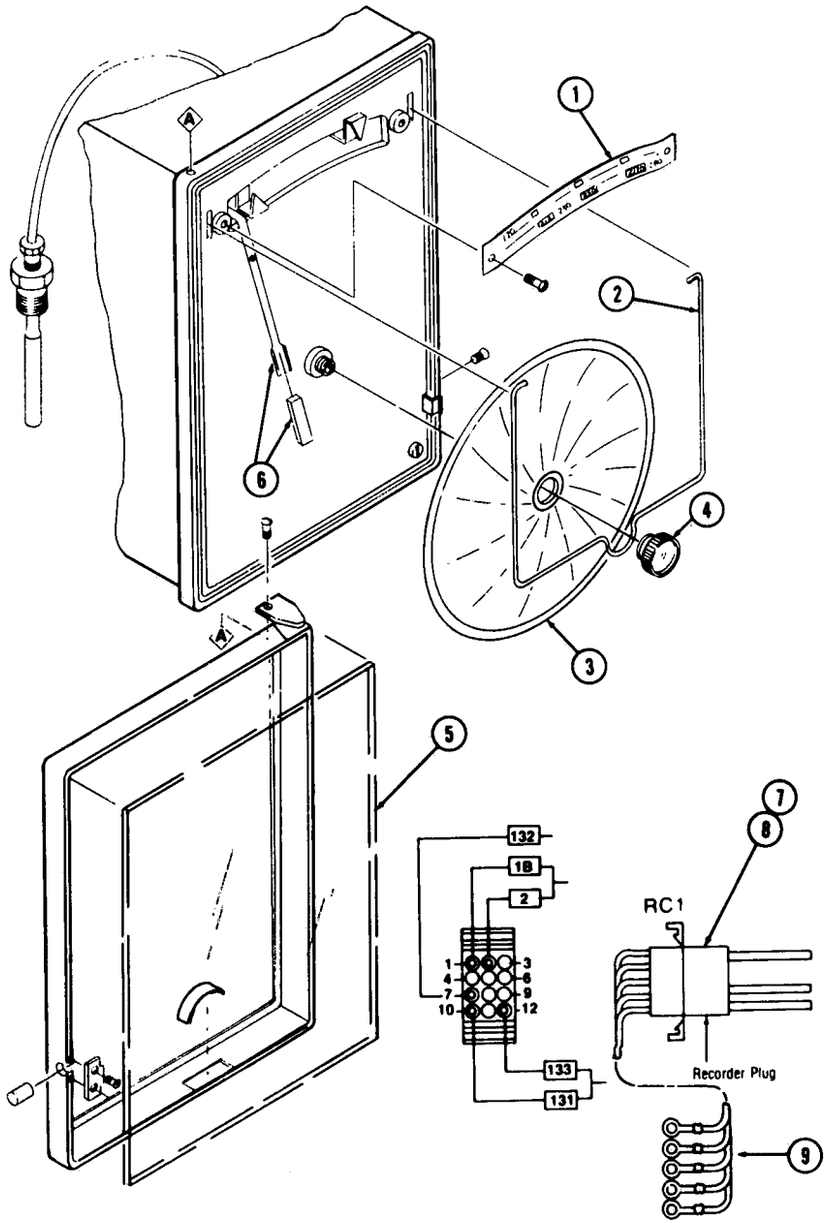


Figure 8-13. INDICATOR-RECORDER-CONTROLLER (Part 1 of 2).

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-13-	P	83518	001		INDICATOR-RECORDER-CONTROLLER (Part 1 of 2)	X
1	P	93711	001		SCALE, Temperature	1
2	P	764315	320		LIFTER, Pen	1
3	P	93707	001		CHART, Recording (Box of 100)	A/R
4	P	764315	319		HUB, Chart	1
5	P	76960	091		GLASS, Door	1
	P	751364	091		• TAPE. Door Glass	A/R
6	P	764315	403		ARM with 6 Red Ink Cartridges	1
7	P	84381	001		CONNECTOR	5
8	P	84382	001		TERMINAL, Pin	5
9	P	19521	091		TERMINAL. #6 Ring x 16-22 AWG	

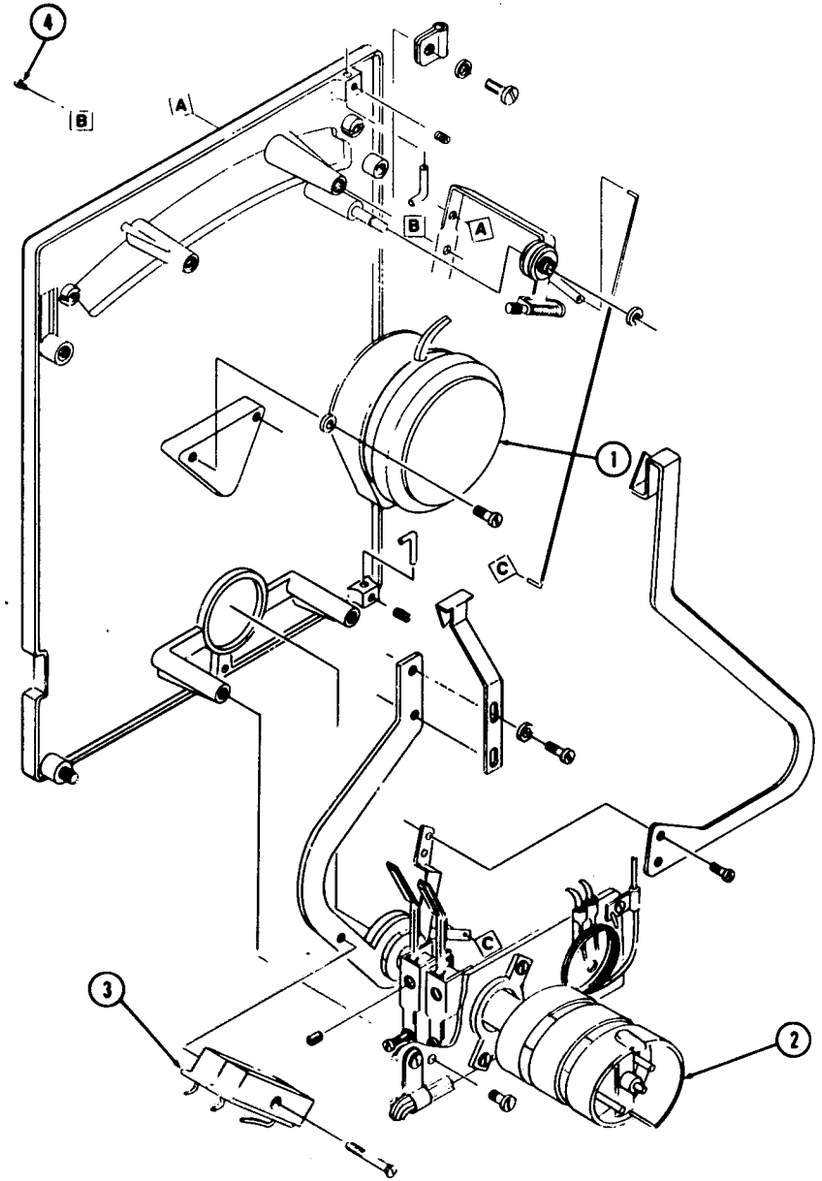
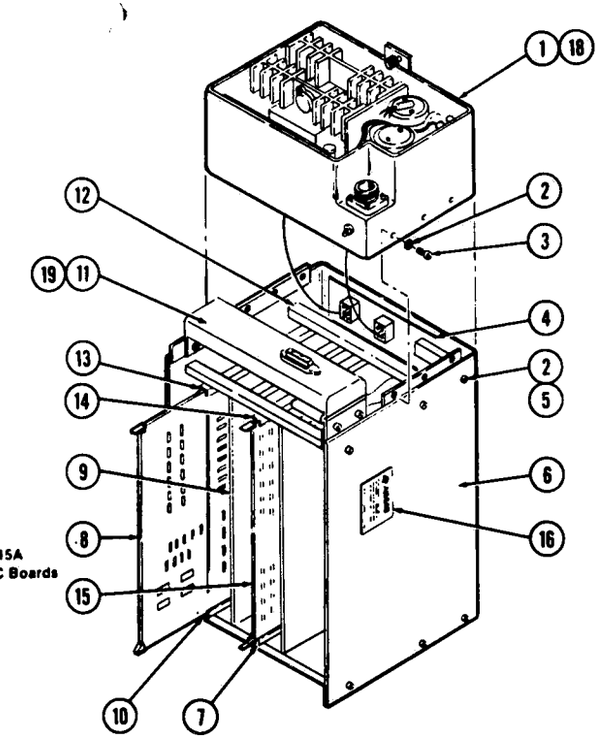


Figure 8-14. INDICATOR-RECORDER-CONTROLLER (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-14-	P	83518	001		INDICATOR-RECORDER-CONTROLLER (Part 2 of 2)	X
1	P	764315	336		MOTOR, Chart Drive	1
2	P	764315	325		THERMAL SYSTEM ASSEMBLY, (20 Foot Copper)	1
	P	764315	326		THERMAL SYSTEM ASSEMBLY, (20 Foot Stainless)	1
3	P	78878	091		SWITCH, Reed*	2
	P	752094	091		• ARM AND MAGNET*	2
4	P	750002	091		SCREW, Pen Arm	1
						1

*Used on recorder with Model Number 563240W-060-221-111-120. If recorder is Model Number 563240W-062-221-111-120 use the following:
P-764316-560 SWITCH, Reed
P-764316-561 ARM AND MAGNET



See Figure 8-15A
To Identify PC Boards

Figure 8-15. MAIN CONTROL ASSEMBLY.

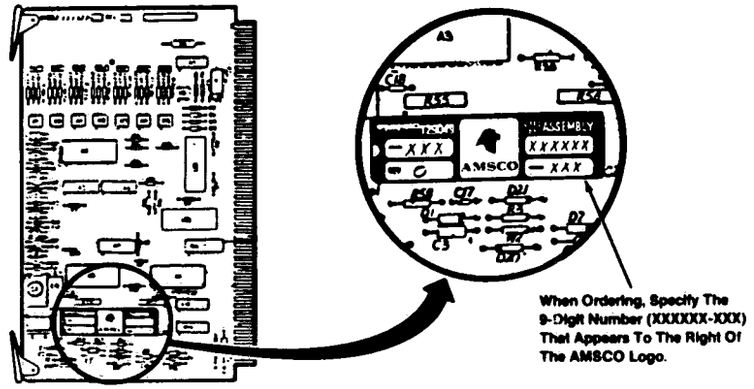


Figure 8-15.A. IDENTIFYING PC BOARD PART NUMBERS.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-15-					MAIN CONTROL ASSEMBLY Units with Indicator-Recorder (Manufactured Before 9/26/85) Units with Printcon Units with Indicator-Recorder (Manufactured After 9/26/85)	X	X	X	
1	P	764320	963		POWER SUPPLY ASSEMBLY (Repaired P-764193-004)	1			
	P	764317	835		• FUSE, (F401) 3 Amp - 125 Volt (Box of 5)	1			
	P	764317	778		• FUSE, (F402) 3 Amp - 250 Volt (Box of 5)	1			
2	P	84116	002		LOCKWASHER, #6	22	30	30	
3	P	40357	001		SCREW, Self Tapping, #6 x 1/4	10	18	18	
4	P	760244	004		MOTHER BOARD ASSEMBLY, Isothermal	1	1	1	
	P	764193	009		• REPAIRED, Isothermal Mother Board Assembly	1	1	1	
	P	760244	001		MOTHER BOARD ASSEMBLY, Gravity	1	1	1	
	P	764193	006		• REPAIRED, Gravity Mother Board Assembly	1	1	1	
5	P	84117	002		SCREW, Pan Head, #6-32 x 5/16	12	12	12	
6	P	93762	001		CHASSIS	1	1	1	
7	P	84225	001		GUIDE, Card	6	4	4	
8					NOT USED				
9	P	84667	001		PLATE, Side	1	2	2	
10	P	84226	001		TAB, Locking	9	6	6	
11	P	136714	001		RECEPTACLE BRACKET ASSEMBLY	1			
12	P	129030	001		BAR, PC Board, Guide	4	4	4	
13	P	83528	001		TAB, ID Locking, CPU	1	1	1	
14	P	83528	007		TAB, ID Locking, I/O 1	1	1	1	
15					NOT USED				
16	P	129352	050		PLATE, Identification	1	1	1	
17	P	136800	561		HEAT SINK (Not Shown)		1	1	
18	P	146645	042		POWER SUPPLY ASSEMBLY (Repaired P-764193-027)		1	1	
	P	764317	833	•	• FUSE, 2 Amp, 125 V (F4)		1	1	
	P	764317	834	•	• FUSE, Pico, 4 Amp, 125 V (F2)		1	1	
	P	764317	836	•	• FUSE, Pico, 1/2 Amp, 125 V (F3)		1	1	
	P	764317	449	•	• FUSE, Cartridge, Slo-Blo, 2 Amp, 250 V (F402)		1	1	
19	P	93900	045		RECEPTACLE BRACKET ASSEMBLY		1	1	
				•	Box of Five.				

8-15A IDENTIFYING PC BOARD PART NUMBERS

To order repaired PC Boards, cross reference part number identified from Figure 8-15A to corresponding part number below:

New PC Board Part Number	Factory Repaired PC Board Part Number
P-146586-001	P-764193-001
P-146586-006	P-764193-025
P-146586-007	P-764193-030
P-146588-001	P-764193-002
P-146586-005	P-764193-026
P-146588-007	P-764193-031
P-146588-054	P-764193-043

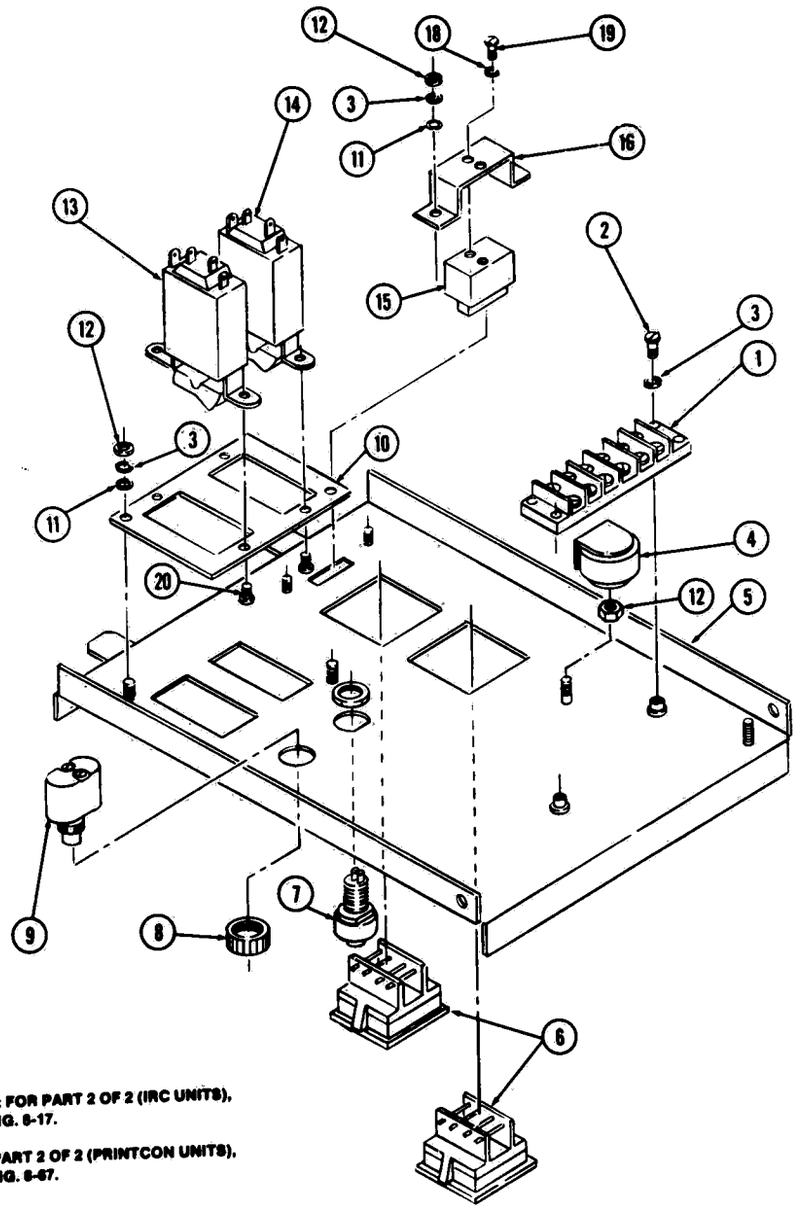
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NOTE: FOR PART 2 OF 2 (IRC UNITS), SEE FIG. 8-17.

FOR PART 2 OF 2 (PRINTCON UNITS), SEE FIG. 8-67.

Figure 8-16. SECONDARY CONTROL PANEL: Gravity Model (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-16-					**UNITS WITH INDICATOR-RECORDER:** SECONDARY CONTROL PANEL, Gravity Model (Part 1 of 2)	X			
					UNITS WITH PRINTCON: SECONDARY CONTROL PANEL, Gravity Model (Part 1 of 2) (See figure 8-67 for part 2 of 2)		X		
1	P	89174	091		BLOCK, Terminal	1			
	P	90627	091		BLOCK, Terminal		1		
2	P	3960	041		SCREW, Round Head, #6-32 x 1/2	2	2		
3	P	18131	091		LOCKWASHER, #6	6	6		
4	P	83933	002		BUZZER	1	1		
5	P	146478	002		PANEL, Secondary	1			
	P	146649	100		PANEL, Secondary		1		
6	P	136315	002		SWITCH, Thumbwheel, 2 Switch Assembly	2	2		
7	P	84400	001		BREAKER, Circuit, CB2	1	1		
8	P	44155	091		GUARD, Button	1	1		
9	P	48070	091		SWITCH, Pushbutton, PB1	1	1		
10	P	93757	001		SPACER, Breaker	1	1		
11	P	17589	045		WASHER, Flat	4	4		
12	P	3037	041		NUT, Hex	5	5		
13	P	84386	001		BREAKER, Circuit, CB1	1	1		
14	P	129022	001		SWITCH, Rocker, SW1	1	1		
15	P	84362	002		COUNTER	1	1		
16	P	93737	001		BRACKET, Counter	1	1		
17					NOT USED				
18	P	30743	045		LOCKWASHER	2	2		
19	P	17658	041		SCREW, #4-40 x 3/16	2	2		
20	P	27741	041		SCREW, Flat Head, #6-32 x 3/16	4	4		

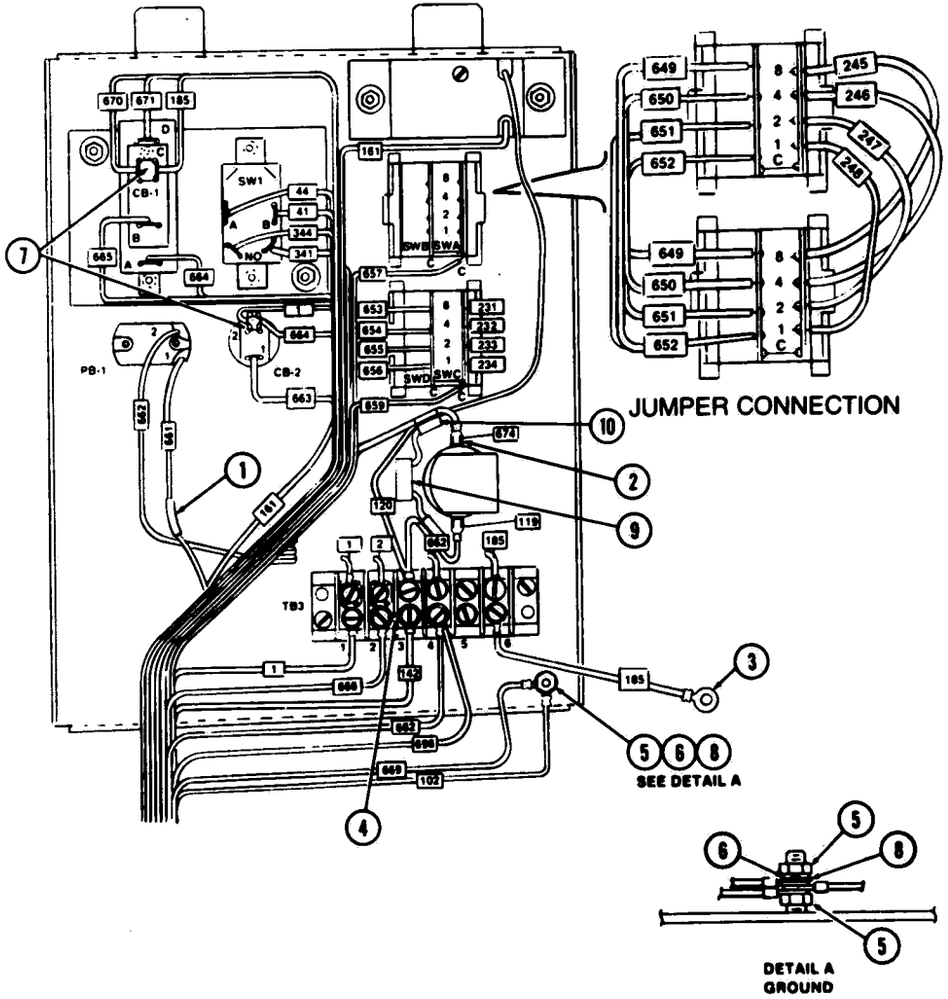
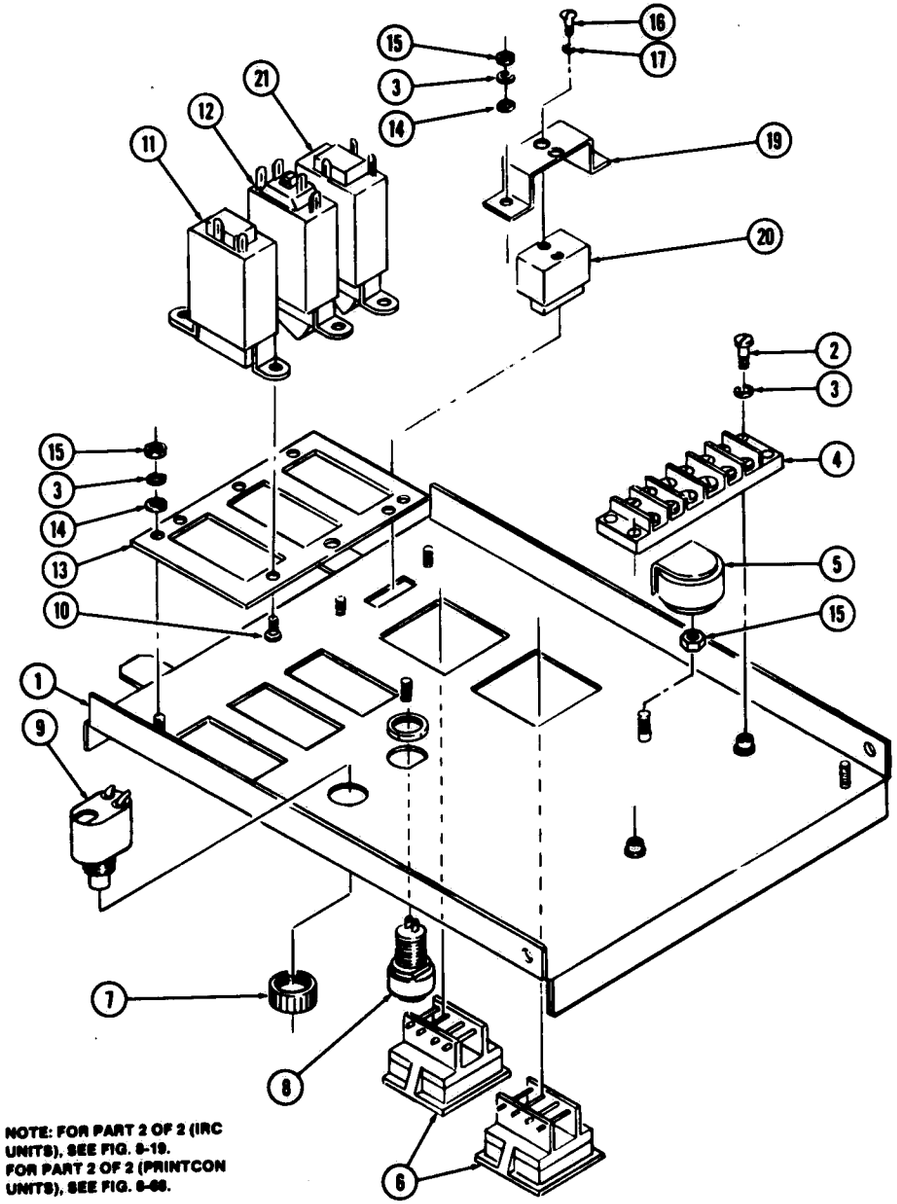


Figure 8-17. SECONDARY CONTROL PANEL: Gravity Model (Part 2 of 2). (Units with Indicator-Recorder)

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-17-					SECONDARY CONTROL PANEL: Gravity Model (Part 2 of 2)	X
1	P	129352	049		CONNECTOR, Butt	1
2	P	91694	091		RECEPTACLE, 3/16 Lug x #18-22 Wire	2
3	P	90619	091		TERMINAL, Wire, 6 Ring x # 22-18 Wire	12
4	P	84123	001		JUMPER, Terminal Block	1
5	P	3037	041		NUT, Hex, #6-32	2
6	P	18131	091		LOCKWASHER, #6	1
7	P	32118	091		ADAPTER, Terminal	2
8	P	17589	045		WASHER, Flat	1
9	P	129318	001		RESISTOR, 3000 Ohm	1
10	P	150822	015		SPLICE, Electro-Tap	2



NOTE: FOR PART 2 OF 2 (IRC UNITS), SEE FIG. 8-19.
FOR PART 2 OF 2 (PRINTCON UNITS), SEE FIG. 8-66.

Figure 8-18. SECONDARY CONTROL PANEL: Isothermal Model (Part 1 of 2).

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-18-					SECONDARY CONTROL PANEL: Isothermal Model (Part 1 of 2)	X			
					UNITS WITH PRINTCON:				
					SECONDARY CONTROL PANEL: Isothermal Model (Part 1 of 2)		X		
1	P	146481	002		PANEL, Secondary	1			
	P	146649	116		PANEL, Secondary		1		
2	P	3960	041		SCREW, Round Head, #6-32 x 1/2	2	2		
3	P	18131	091		LOCKWASHER	6	6		
4	P	89174	091		BLOCK, Terminal	1			
	P	90627	091		BLOCK, Terminal		1		
5	P	83933	002		BUZZER	1	1		
6	P	136315	002		SWITCH, Thumbwheel	2	2		
7	P	44155	091		GUARD, Button	1	1		
8	P	84400	001		BREAKER, Circuit, CB2	1	1		
9	P	48070	091		SWITCH, Pushbutton, PB1	1	1		
10	P	27741	041		SCREW, Flat Head, #6-32 x 3/16	6	6		
11	P	84148	001		SWITCH, Rocker, SW2	1	1		
12	P	84386	001		BREAKER, Circuit, CB1	1	1		
13	P	93758	001		SPACER, Breaker and Switch	1	1		
14	P	17589	045		WASHER, Flat	4	4		
15	P	3037	091		NUT, Hex	5	5		
16	P	17658	041		SCREW, #4-40 x 3/16	2	2		
17	P	30743	045		LOCKWASHER	2	2		
18					NOT USED				
19	P	93737	001		BRACKET, Counter	1	1		
20	P	84362	002		COUNTER	1	1		
21	P	129022	001		SWITCH, Rocker (SW-1)	1	1		

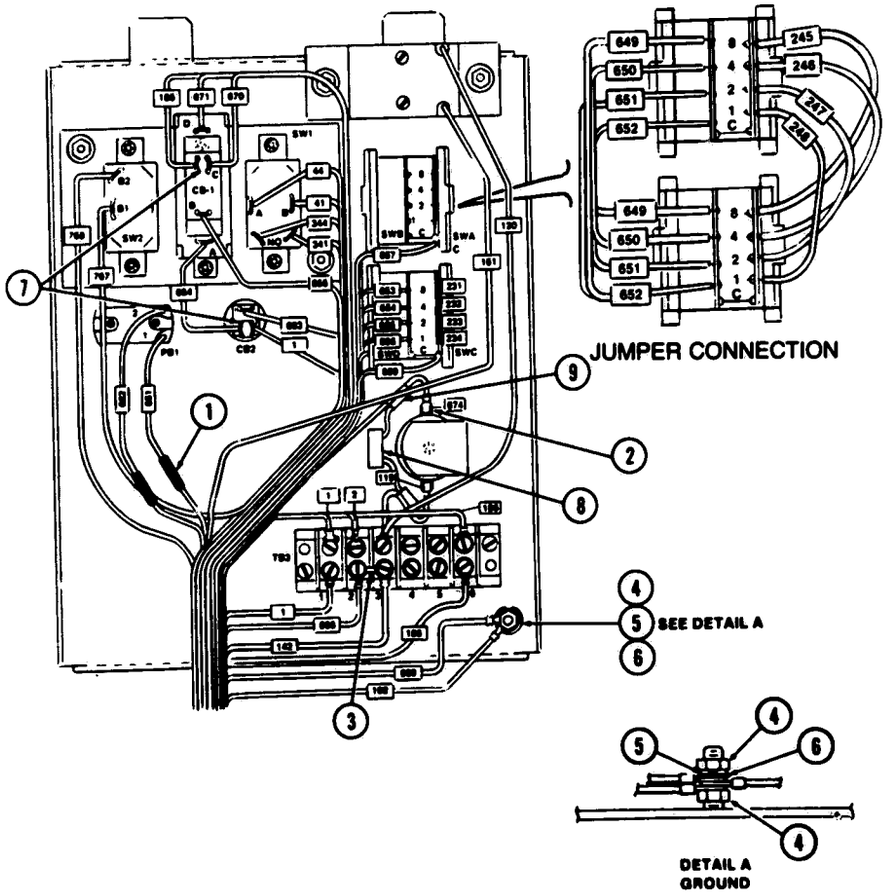


Figure 8-19. SECONDARY CONTROL PANEL: Isothermal Model (Part 2 of 2). (Units with Indicator-Recorder)

FIG. & INDEX NO.		PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-19-					SECONDARY CONTROL PANEL: Isothermal Model (Part 2 of 2) .	X
	1	P	129352	049	CONNECTOR, Butt	2
	2	P	91694	091	RECEPTACLE, 1/4 Lug x #18-22 Wire	2
	3	P	84123	001	JUMPER, Terminal Block	1
	4	P	3037	041	NUT, Hex, #6-32	2
	5	P	18131	091	LOCKWASHER, #6	1
	6	P	17589	045	WASHER, Flat	1
	7	P	32118	091	ADAPTER, Terminal	2
		P	14590	091	TERMINAL, Wire, #6 Ring x #14-16 Wire	5
		P	90619	091	TERMINAL, Wire, #6 Ring x #18-22 Wire	11
	8	P	129318	001	RESISTOR, 3000 Ohm	1
	9	P	150822	015	SPLICE, Electro-Tap	2

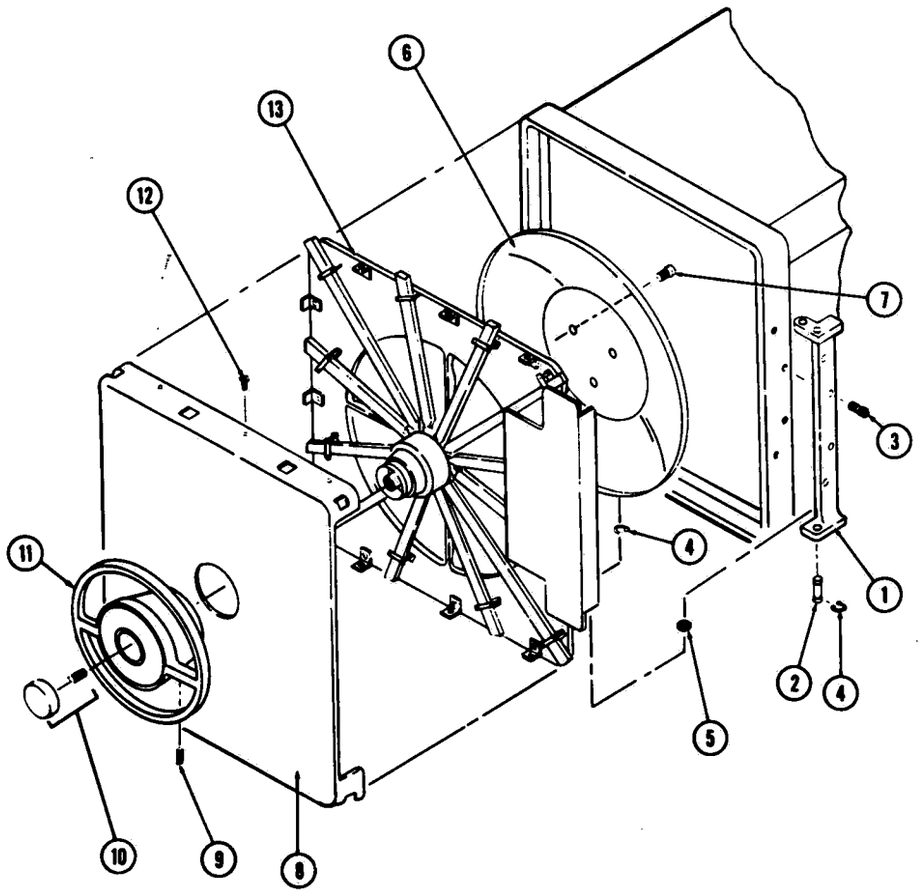


Figure 8-20. COVER AND HANDWHEEL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY				
8-20-					COVER AND HANDWHEEL ASSEMBLY: 16x16 Sterilizer	X				
					COVER AND HANDWHEEL ASSEMBLY: 20x20 Sterilizer		X			
1	P	90034	063		WELDMENT, Hinge	1				
	P	90119	063		WELDMENT, Hinge		1			
2	P	90041	063		PIN, Hinge	2	2			
3	P	43845	045		CAP SCREW, Socket Head	4	4			
4	P	12706	045		RING, Retaining	2	2			
5	P	79806	001		WASHER, Hinge	A/R	A/R			
6	P	54474	063		COVER, Door Back	1				
	P	54476	063		COVER, Door Back		1			
7	P	12283	041		SCREW, Round Head	3	3			
8	P	139540	063		COVER, Chamber Door, Stainless Steel	1				
	P	149502	063		COVER, Chamber Door, Stainless Steel		1			
9	P	51963	045		SET SCREW	3	3			
10	P	93174	001		BUTTON, Assembly	1	1			
11	P	136445	001		HANDWHEEL ASSEMBLY.	1	1			
	P	146327	001		• HANDWHEEL	1	1			
	P	93647	001		• FACE PLATE (Not Shown)	1	1			
12	P	90562	061		SCREW, Self Tapping	9	5			
13					DOOR LOCK AND HINGE ASSEMBLY (Refer to Fig. 8-21)	1	1			

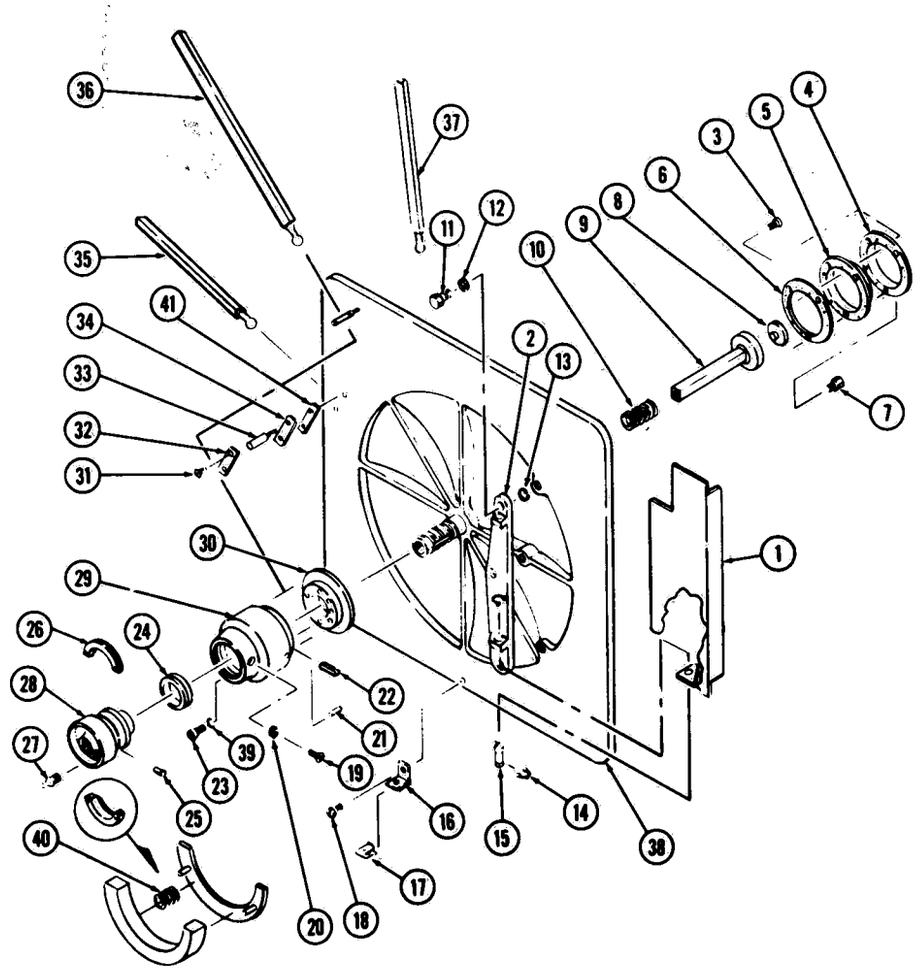


Figure 8-21. DOOR LOCK AND HINGE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-21-	P	760265	258		DOOR LOCK AND HINGE ASSEMBLY: 16x16 Sterilizer	X			
	P	760265	260		DOOR LOCK AND HINGE ASSEMBLY: 20x20 Sterilizer		X		
1	P	93303	001		HINGE WELDMENT, Door	1			
	P	96096	063		HINGE WELDMENT, Door		1		
2	P	93300	001		DOOR HINGE BRACKET	1			
	P	134194	001		DOOR HINGE BRACKET		1		
3	P	4782	061		BOLT, Machine, Finished	9	9		
4	P	6624	042		COVER, Diaphragm	1	1		
5	P	7230	061		DIAPHRAGM	1	1		
6	P	7753	091		GASKET, Diaphragm	1	1		
7	P	74710	061		SCREW, Special	3	3		
8	P	8778	091		THRUST PLATE ASSEMBLY	1	1		
9	P	90363	091		ROD WELDMENT, Lock Clutch	1	1		
10	P	12267	061		SPRING, Lock Clutch Rod	1	1		
11	P	3858	041		SCREW, Hex Head	3			
	P	89257	041		SCREW, Hex Head		3		
12	P	3516	041		WASHER, Plain	3			
	P	17264	042		WASHER, Plain		3		
13	P	52149	045		WASHER, Shake Proof	3			
	P	52148	045		WASHER, Shake Proof		3		
14	P	12706	045		RING, Retaining	4	4		
15	P	24520	042		PIN, Hinge	2			
	P	89265	001		PIN, Hinge		2		
16	P	90440	061		BRACKET, Door Cover	9			
	P	150136	001		BRACKET, Door Cover		5		
17	P	90198	045		SPEED NUT		5		
18	P	90169	045		SCREW, Self Tapping	9	5		
19	P	10570	061		SCREW, Truss Head	2	2		
20	P	19678	045		LOCKWASHER	2	2		
21	P	22996	061		ROLL PIN	2	2		
22	P	8303	091		KEY, Door	2	2		
23	P	12264	042		SCREW, Socket Head	6	6		
24	P	6416	091		BEARING, Ball Thrust	1	1		
25	P	47598	061		DRIVE SCREW	13	13		
26	P	13194	091		THRUST RING ASSEMBLY	1	1		
27	P	90475	091		LUBE FITTING	1	1		
28	P	96102	091		NUT, Handle	1	1		
29	P	96181	056		PLATE, Top Socket	1	1		
30	P	11817	056		PLATE, Bottom Socket	1	1		
31	P	39863	091		SCREW, Round Head	24	24		
32	P	150365	001		LINK, Arm Clip	12	12		
33	P	33429	001		STUD, Arm Clip	24			
	P	150135	001		STUD, Arm Clip		24		
34	P	33435	045		BLOCK, Fulcrum Arm Clip	12			
	P	150134	001		BLOCK, Fulcrum Arm Clip		12		
35	P	92634	001		ARM, Door	8			
	P	92633	001		ARM, Door		4		
36	P	55972	004		ARM, Door	4			
	P	55973	002		ARM, Door		4		
37	P	92633	002		ARM, Door		4		
38	P	759261	500	*	DOOR ASSEMBLY, Rebuilt	1			
	P	759261	600	*	DOOR ASSEMBLY, Rebuilt		1		

* Assembly includes lock and radial arms but does not include hinge.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-21- 39	P 5596 041		LOCKWASHER	6	6		
40	P 12260 091		SPRING, Thrust Ring	4	4		
41	P 150822 317		SHIM, Door Arm (.005 Thick)	X			
	P 150822 320		SHIM, Door Arm (.005 Thick)		X		
	P 150822 318		SHIM, Door Arm (.010 Thick)	X			
	P 150822 321		SHIM, Door Arm (.010 Thick)		X		
	P 150822 319		SHIM, Door Arm (.015 Thick)	X			
	P 150822 322		SHIM, Door Arm (.015 Thick)		X		

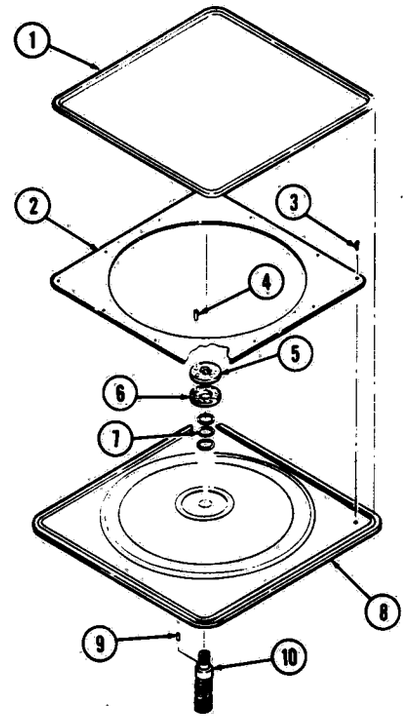


Figure 8-22. DOOR ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-22-	P 760265 257		DOOR ASSEMBLY: 16x16	X			
	P 760265 259		DOOR ASSEMBLY: 20x20		X		
1	P 74367 091		GASKET	1			
	P 78767 091		GASKET		1		
2	P 54475 061		COVER, Door Back	1			
	P 97889 061		COVER, Door Back		1		
3	P 47598 061		DRIVE SCREW	13	13		
4	P 44604 061		ROLL PIN	2	2		
5	P 9083 091		RING, Lock Clutch	1	1		
6	P 22057 091		NUT, Door Post	1	1		
7	P 150330 001		SHIM, Door (.015 Thick)	A/R	A/R		
8	P 149505 091		DOOR	1			
	P 141105 001		DOOR		1		
9	P 2893 061		PIN	1	1		
10	P 22058 091		POST, Door	1	1		

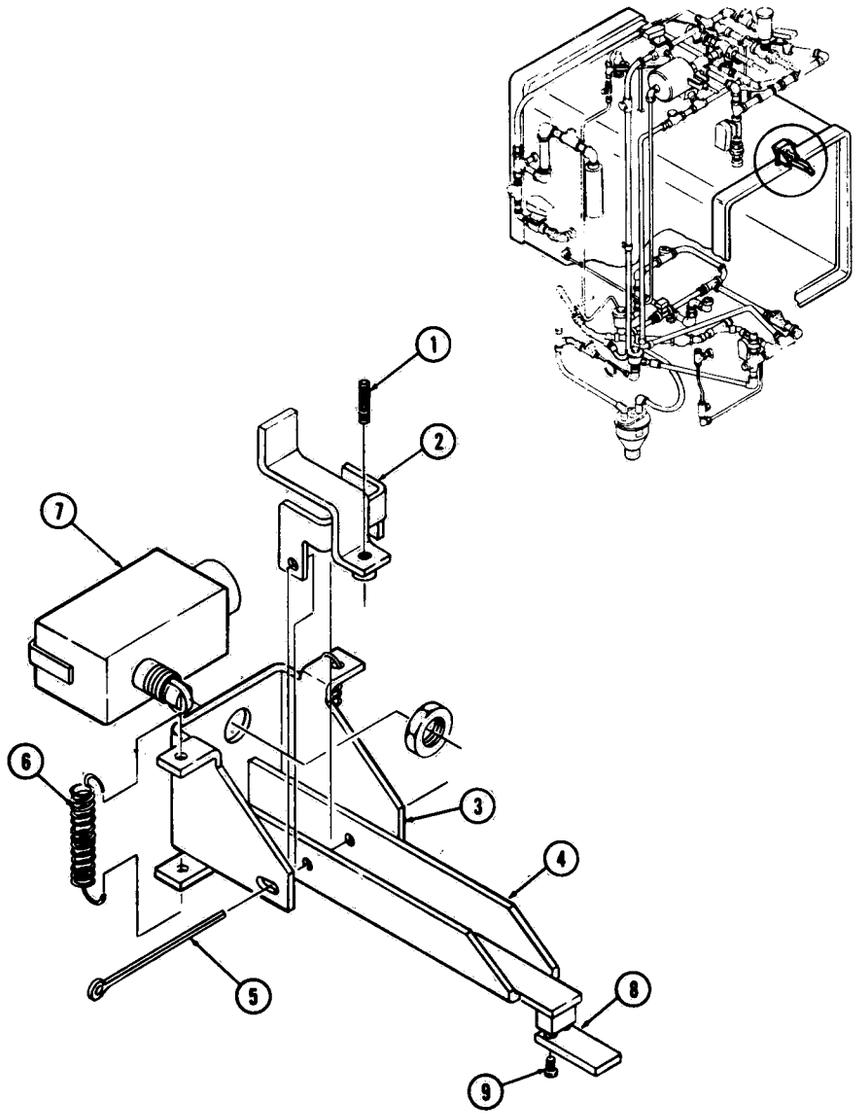


Figure 8-23. DOOR SWITCH ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-23-	P	136475	001		DOOR SWITCH ASSEMBLY	X
1	P	25542	091		SCREW, Socket Set	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	90752	091		SWITCH	1
8	P	90891	045	*	EXTENSION, Switch	1
	P	90888	045		EXTENSION, Switch	1
9	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2

*Special part for 16x16 Gravity/Isothermal Sterilizer used on non-operating end door only.

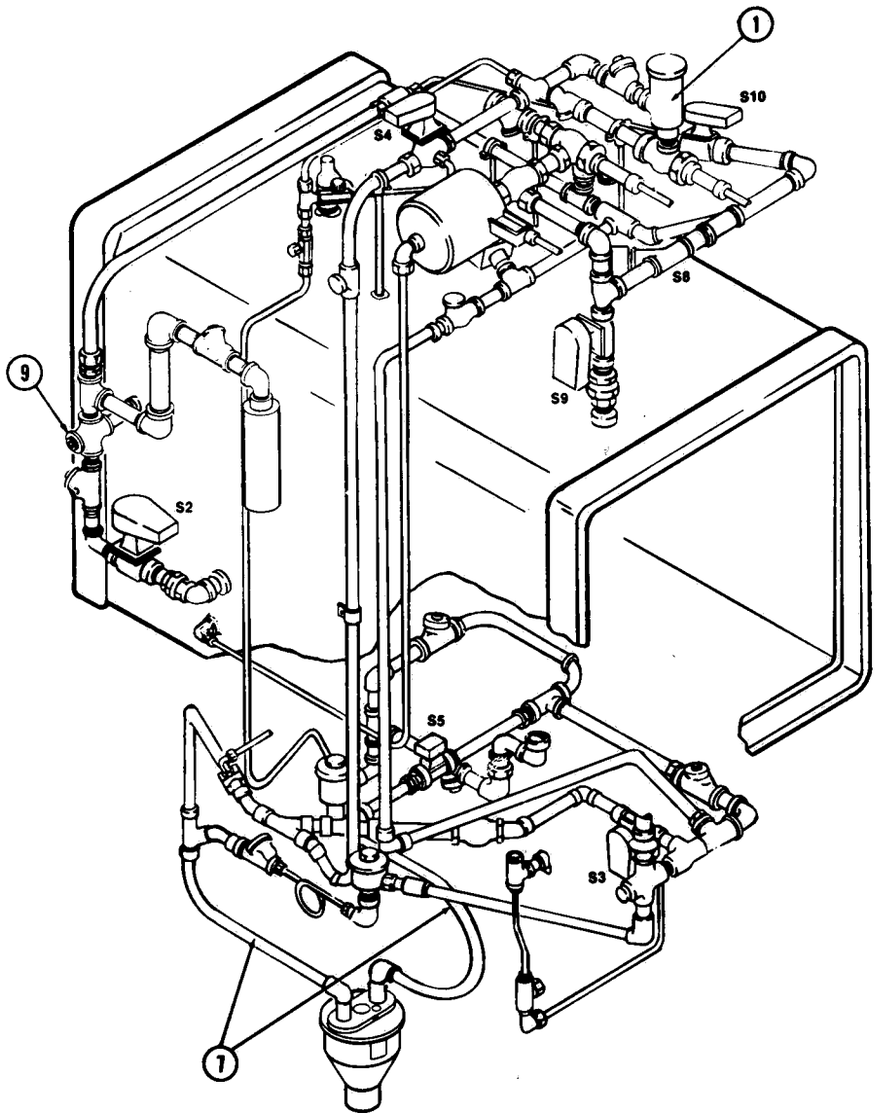


Figure 8-24. PIPING ASSEMBLY: Complete. (Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-24		146550			PIPING ASSEMBLY, Complete	X
1	P	136673	001		WATER PIPING (See Fig. 8-25 and 8-33)	1
2	P	93708	001		STEAM PIPING (See Fig. 8-25 and 8-32)	1
3					ISOTHERMAL PIPING (See Fig. 8-28 and 8-29)	1
4	P	134466	001		JACKET STEAM RETURN (See Fig. 8-31)	1
5					JACKET DRAIN (See Fig. 8-37)	1
6	P	134467	001		CHAMBER DRAIN (See Fig. 8-27 and 8-38)	1
7					DRAIN ASSEMBLIES (See Fig. 8-27, 8-71, 8-36 and 8-37)	1
8	P	56396	002		CONDENSER PIPIN (See Fig. 8-26, 8-27, 8-71 and 8-35)	1
9	P	93715	001		AIR BREAK PIPING (See Fig. 8-25 and 8-34)	1

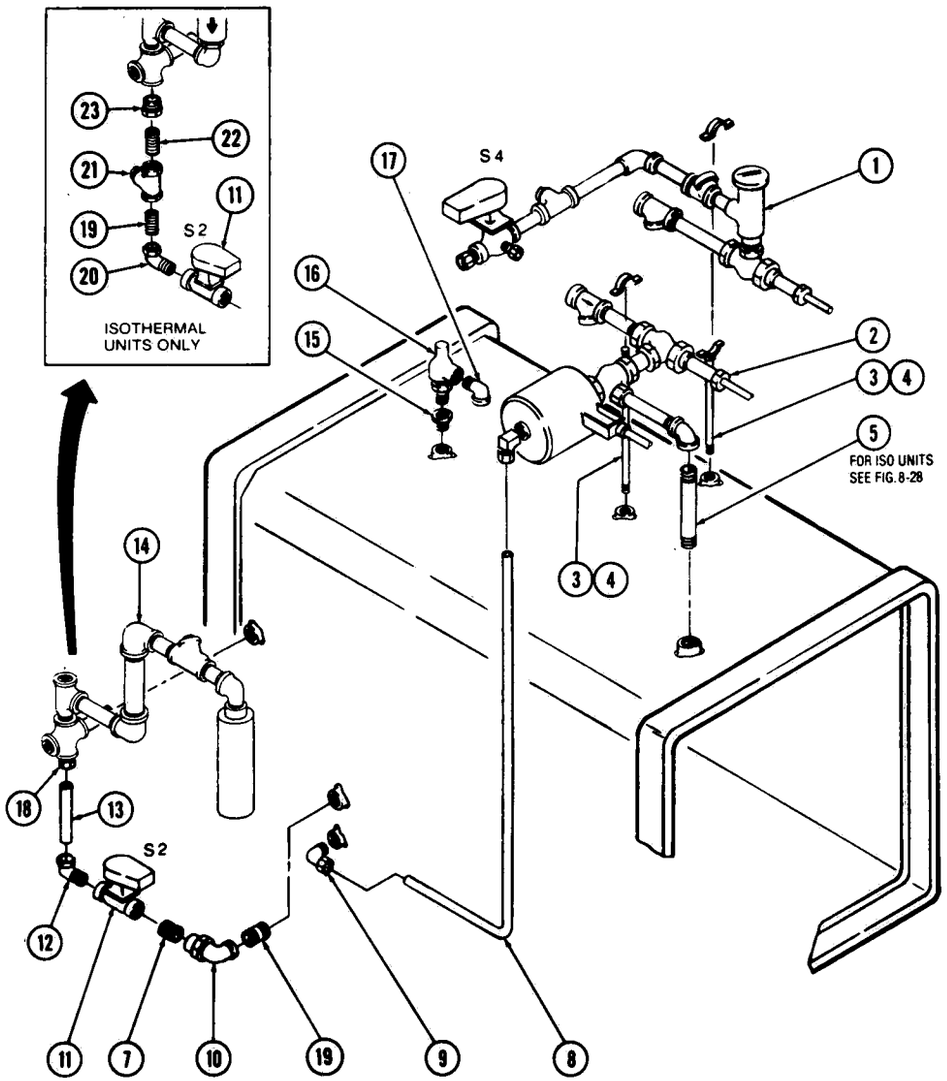


Figure 8-25. STEAM, AIR, AND WATER SUPPLIES.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-25-			AIR, STEAM AND WATER SUPPLIES, 16x16 Gravity	X			
			AIR, STEAM AND WATER SUPPLIES, 20x20 Gravity		X		
			AIR, STEAM AND WATER SUPPLIES, 16x16 Isothermal			X	
			AIR, STEAM AND WATER SUPPLIES, 20x20 Isothermal				X
1	P 136673 001		WATER SUPPLY ASSEMBLY (See Fig. 8-33)	1	1	1	1
2	P 93708 001		STEAM SUPPLY ASSEMBLY (See Fig. 8-32)	1	1	1	1
3	P 75376 010		CLAMP, Pipe, 3/8	2	2	2	2
4	P 150822 293		NIPPLE, Steel, 1/4 N.P.T. x 8-11/16	2	2	2	2
5	P 29044 091		NIPPLE, 3/8 N.P.T. x 8/34	1	1		
6	P		NOT USED				
7	P		NOT USED				
8			TUBE, 1/4 O.D. x 29-13/32	1			
			TUBE, 1/4 O.D. x 41-13/32		1		
9	P 41306 091		ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T.	1	1	1	1
10	P 89153 091		ELL, Union, 3/8 N.P.T.	1	1	1	1
11	P 83264 SUB		VALVE, Solenoid, Steam, 3/8 N.P.T. (SUB: P-150822-309)	1	1	1	1
	P 764070 SUB		• KIT, Repair (SUB: P-764317-687)	1	1	1	1
	P 764070 002		• COIL	1	1	1	1
12	P 40153 091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1	1		
13	P 90274 091		TUBE, 5/8 O.D. x 3-5/8	1	1		
14	P 93715 001		AIR FILTER ASSEMBLY (See Fig. 8-34)	1	1	1	1
15	P 836 042		BUSHING, Reducing, 3/4 x 1/2 N.P.T.	1	1	1	1
16	P 150527 001		VALVE, Safety, 1/2 N.P.T.	1	1	1	1
17	P 1636 091		ELL, Street, 3/4 N.P.T.	1	1	1	1
18	P 29931 091		FITTING, 5/8 O.D.T. x 1/2 N.P.T.	1	1		
19	P 29014 091		NIPPLE, 3/8 N.P.T. x 1-1/4	1	1	2	2
20	P 1631 091		ELL, Street, 3/8 N.P.T.			1	1
21	P 5424 091		VALVE, Check, 3/8 N.P.T.			1	1
22	P 29015 091		NIPPLE, 3/8 N.P.T. x 1-1/2			1	1
23	P 837 091		BUSHING, Reducer, 1/2 N.P.T. x 3/8 N.P.T.			1	1

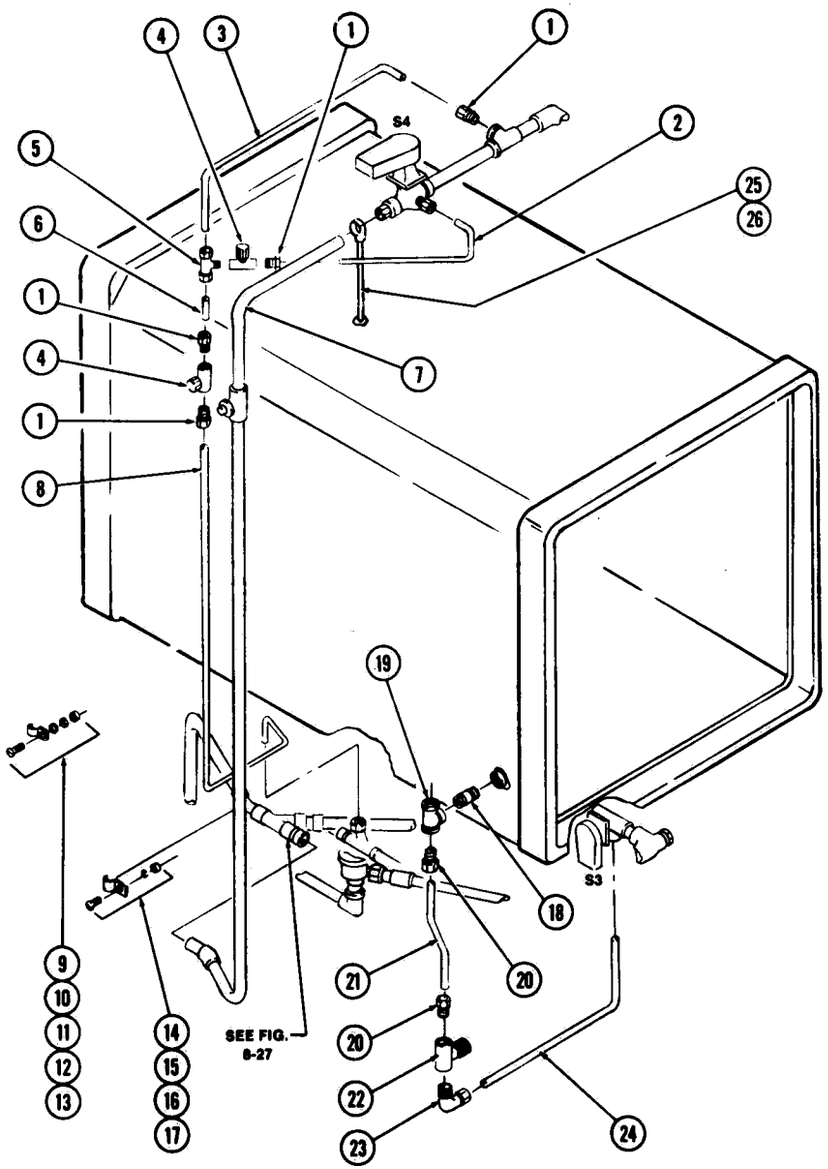


Figure 8-26. CONDENSER PIPING. (Units With Indicator Recorder)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-26-					CONDENSER PIPING: 16x16 Gravity	X			
					CONDENSER PIPING: 20x20 Gravity		X		
					CONDENSER PIPING: 16x16 Isothermal			X	
					CONDENSER PIPING: 20x20 Isothermal				X
1	P	19514	091		FITTING. 1/4 O.D.T. x 1 8 N.P.T.	4	4	4	4
2					TUBE. 1/4 O.D. x 7-25 32	1	1	1	1
3					TUBE. 1/4 O.D. x 10-7 8	1	1	1	1
4	P	83630	001		VALVE. Needle. 1 8 N.P.T.	2	2	2	2
5	P	42581	091		TEE. Compression. 1 4 O.D.T. x 1/8 N.P.T.	1	1	1	1
6	P	90340	091		TUBE. 1 4 O.D. x 2-3 8	1	1	1	1
7	P	93716	001		WATER CONDENSER PIPING ASSEMBLY (See Fig. 8-30)	1			
	P	93716	002		WATER CONDENSER PIPING ASSEMBLY (See Fig. 8-30)		1		
8					TUBE. 1 4 O.D. x 48-7 8	1			
					TUBE. 1/4 O.D. x 56-7 8		1		
9	P	26270	091		CLAMP	1	1	1	1
10	P	3986	041		SCREW. #8-32 x 1 2	1	1	1	1
11	P	5561	091		WASHER. Flat	1	1	1	1
12	P	90991	091		LOCKWASHER	1	1	1	1
13	P	3038	041		NUT. Hex. #8-32	1	1	1	1
14	P	90513	091		CLAMP. Tube. 5 8	1	1	1	1
15	P	41805	044		SCREW. Hex Head. #10-32 x 5/8	1	1	1	1
16	P	76801	045		LOCKWASHER	1	1	1	1
17	P	2959	041		NUT. #10-32	1	1	1	1
18	P	27422	051		NIPPLE. 1/4 N.P.T. x 1-1 4	1	1	1	1
19	P	4906	091		TEE. 1/4 N.P.T.	1	1	1	1
20	P	22711	042		FITTING. 5/16 O.D.T. x 1/4 N.P.T.	2	2	2	2
21					TUBE. 5/16 O.D. x 8-5 32	1	1	1	1
22	P	83523	001		VALVE. Needle. 1 4 N.P.T.	1	1	1	1
23	P	7033	091		ELL. 5.16 O.D.T. x 1 4 N.P.T.	1	1	1	1
24					TUBE. 5/16 O.D. x 16-7 32	1			
					TUBE. 5/16 O.D. x 18-7 32		1		
25	P	75376	010		CLAMP. Pipe. 3-8	1	1	1	1
26	P	150822	294		NIPPLE. 1/4 N.P.T. x 12	1	1	1	1
	P	764320	668		WATER LINE REPLACEMENT KIT (Not Shown)	AR	AR	AR	AR

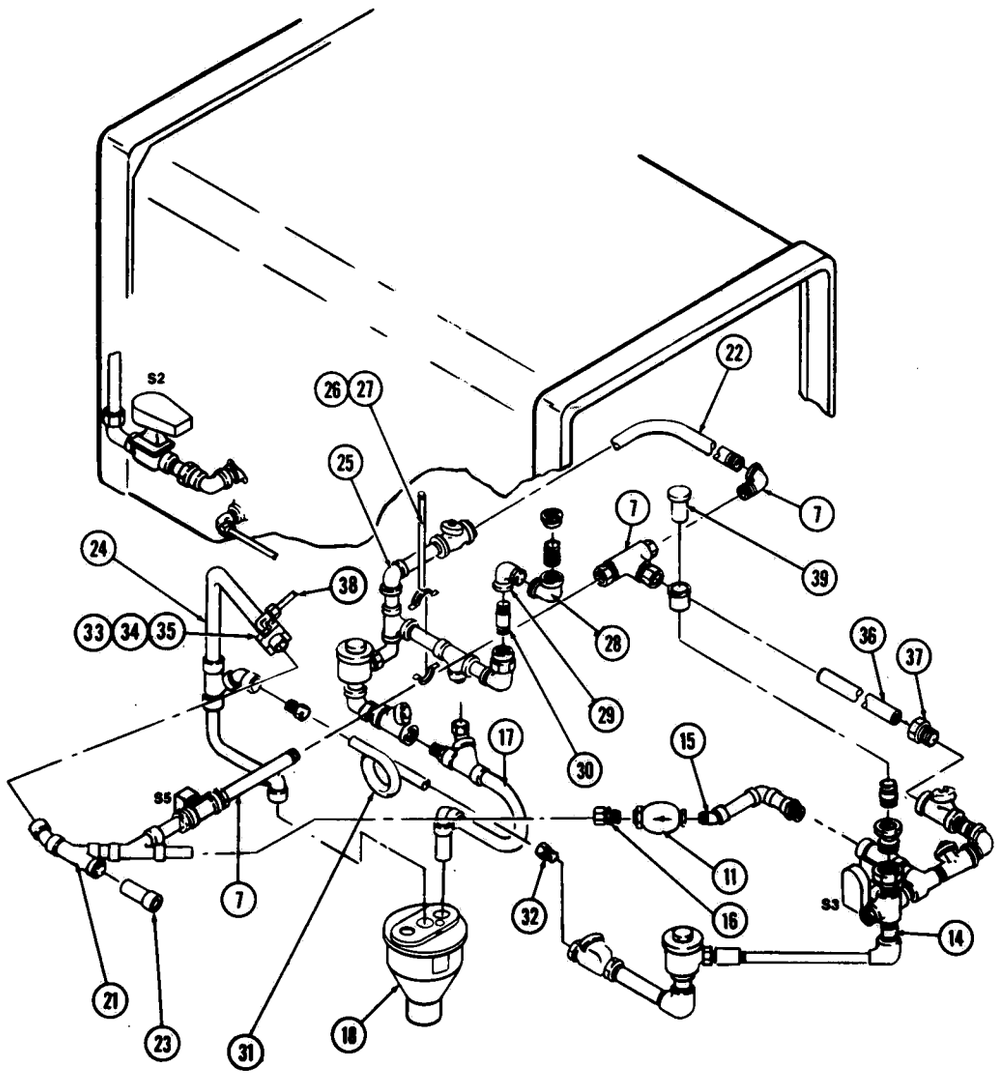


Figure 8-27. CHAMBER DRAIN AND EJECTOR PIPING.
(Units With Indicator Recorder)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-27-					CHAMBER DRAIN AND EJECTOR PIPING: 16x16 Gravity	X			
					CHAMBER DRAIN AND EJECTOR PIPING: 20x20 Gravity		X		
					CHAMBER DRAIN AND EJECTOR PIPING: 16x16 Isothermal			X	
					CHAMBER DRAIN AND EJECTOR PIPING: 20x20 Isothermal				X
1	P	29292	051		NIPPLE, 3/4 N.P.T. x 1-1/2	1	1	1	1
2	P	93294	001		SCREEN, Chamber Drain	1	1	1	1
3					NOT USED				
4					NOT USED				
5					NOT USED				
6					NOT USED				
7	P	134468	001		EJECTOR ASSEMBLY (See Fig. 8-39)	1	1	1	1
8					NOT USED				
9					NOT USED				
10					NOT USED				
11	P	44317	091		VALVE, Check, 3/4 N.P.T.	1	1	1	1
12	P	29291	091		NIPPLE, 3/4 N.P.T. x 1-1/4	1	1	1	1
13	P	1747	091		END, Thread, 3/4 N.P.T.	1	1	1	1
14	P	134467	001		CHAMBER DRAIN ASSEMBLY (See Fig. 8-38)	1	1	1	1
15	P	56394	001		FITTING ASSEMBLY (See Fig. 8-39)	1	1	1	1
16	P	30005	091		FITTING, Straight, 7/8 O.D.T. x 3/4 N.P.T.	1	1	1	1
17	P	93717	001		DRAIN TUBE ASSEMBLY (See Fig. 8-37)	1	1	1	1
18	P	764316	212		FUNNEL ASSEMBLY	1	1	1	1
	P	141198	003		• FUNNEL, 1 1/2 O.D.	1	1	1	1
	P	56396	012		• CAP	1	1	1	1
	P	56396	016		• PLUG, 7/8 Dia.	1	1	1	1
	P	56396	017		• PLUG, 1 Dia.	1	1	1	1
	P	56396	018		• PLUG, 1-3/8 Dia.	1	1	1	1
	P	15272	091		• SCREW, Hex Set, 1/4-20	2	2	2	2
	P	78881	045		• SCREW, Self Tap, 6-32 x 1/2	2	2	2	2
21	P	56396	002		CONDENSER PIPING (See Fig. 8-35)	1	1	1	1
22	P	150822	025		TUBE	1	1		
23	P	150822	041		NOZZLE ASSEMBLY	1	1		
24	P	136671	001		DRAIN TUBE ASSEMBLY (See Fig. 8-36)	1	1	1	1
25	P	134466	001		JACKET STEAM RETURN ASSEMBLY (See Fig. 8-31)	1	1	1	1
26	P	75376	010		CLAMP, Pipe, 3/8	1	1	1	1
27	P	150822	290		SUPPORT, 1/4 N.P.T. x 6-7/8	1	1	1	1
28	P	7461	091		ELL, Reducing, 3/4 x 3/8 N.P.T.	1	1	1	1
29	P	1631	091		ELL, Street, 3/8 N.P.T.	1	1	1	1
30	P	29022	051		NIPPLE, 3/8 N.P.T. x 3-1/4	1	1	1	1
31					TUBE, 3/8 O.D. x 17-1/4	1	1	1	1
32	P	30947	091		FITTING, Straight, 3/8 O.D.T. x 3/8 N.P.T.	2	2	2	2
33	P	150822	039		CLAMP, Saddle	1	1		
34	P	43041	091		ELL, Compression	1	1		
35	P	837	091		BUSHING, Reducing, 1/2 N.P.T. x 3/8 N.P.T.	1	1	1	1
36	P	91759	091		TUBE, 5/8 O.D.T. x 7"	1	1	1	1
37	P	39072	091		ADAPTER, 5/8 O.D.T. x 3/8 N.P.T.	1	1	1	1
38	R	915	103		TUBE, Copper, 1/4 O.D.T. x .030 Wall	2FT	2FT		
39	P	93294	001		CHAMBER DRAIN SCREEN	1	1	1	1

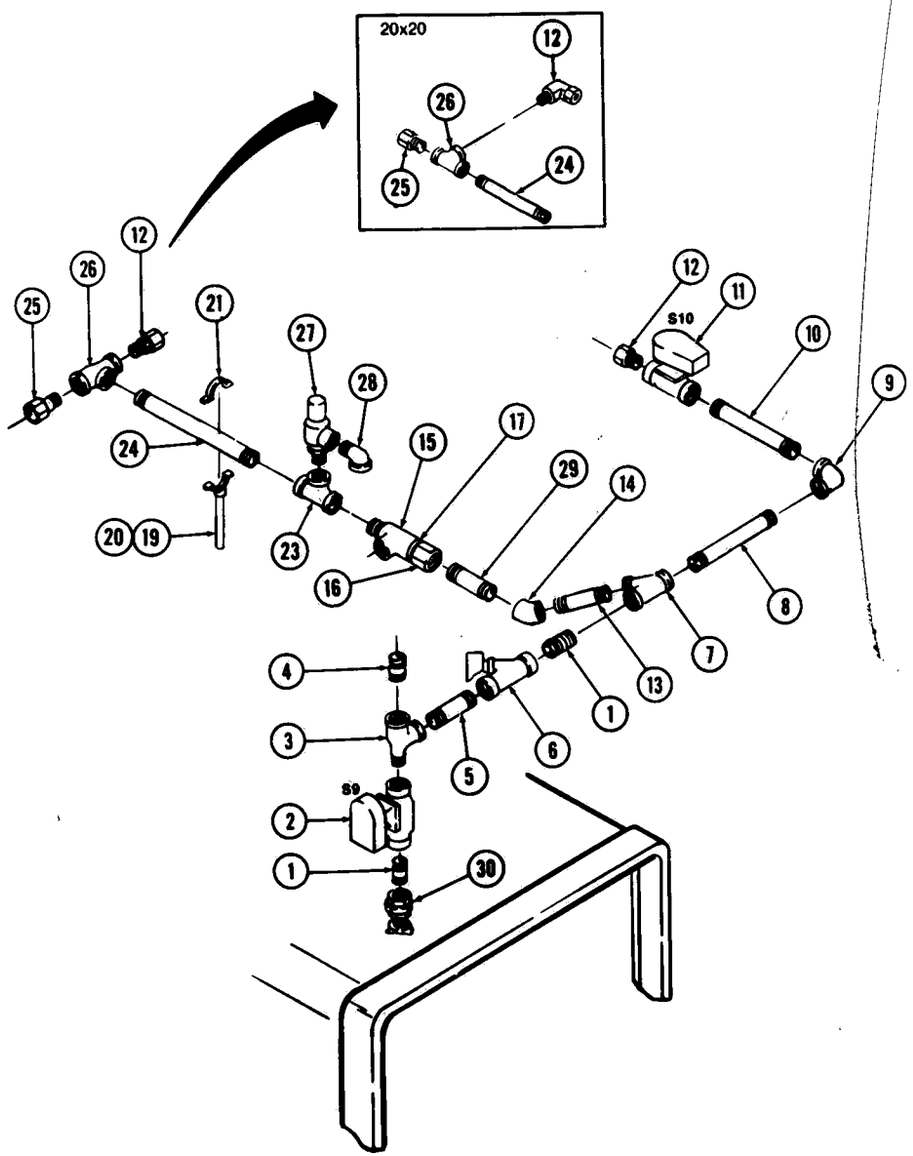


Figure 8-28. ISOTHERMAL ADD-ON (Part 1 of 2).

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-28-					ISOTHERMAL PIPING ADD-ON (Part 1 of 2): 16x16	X			
					ISOTHERMAL PIPING ADD-ON (Part 1 of 2): 20x20		X		
1	P	29013	051		NIPPLE, 3/8 N.P.T. x 1	2	2		
2	P	83264	002		VALVE, Solenoid, Steam, 3/8 N.P.T.	1	1		
	P	764070	001	*	• KIT, Repair	1	1		
	P	764070	002		• COIL	1	1		
3	P	78387	091		TEE, Street, 3/8 N.P.T.	1	1		
4	P	29015	051		NIPPLE, 3/8 N.P.T. x 1-1/2	1	1		
5	P	29016	051		NIPPLE, 3/8 N.P.T. x 1-3/4	1	1		
6	P	84430	002		VALVE, Solenoid, Steam, 3/8 N.P.T.	1	1		
	P	764077	001		• KIT, Repair	1	1		
	P	764077	002		• COIL	1	1		
7	P	4928	091		TEE, 3/8 N.P.T.	1	1		
8	P	29029	091		NIPPLE, 3/8 N.P.T. x 5	1	1		
9	P	1620	091		ELL, Reducing, 3/8 x 1/4 N.P.T.	1	1		
10	P	28928	051		NIPPLE, 1/4 N.P.T. x 3-3/4	1	1		
11	P	83540	002		VALVE, Solenoid, 1/4 N.P.T.	1	1		
	P	764076	001		• KIT, Repair	1	1		
	P	764076	002		• COIL	1	1		
12	P	34218	091		FITTING, 1/4 O.D.T. x 1/4 N.P.T.	2	1		
	P	41306	091		FITTING, Ell, 1/4 N.P.T. x 1/4 O.D.T.		1		
13	P	29022	051		NIPPLE, 3/8 N.P.T. x 3-1/4	1	1		
14	P	1754	091		ELL, 45°, 3/8 N.P.T.	1	1		
15	P	25900	042		EJECTOR	1	1		
16	P	129224	001		NOZZLE	1	1		
17	P	7841	091		GASKET	1	1		
18					NOT USED				
19	P	52144	091		NIPPLE, Steel, 1/4 N.P.T. x 2-1/2	1	1		
20	P	78787	091		BUSHING, 1/4 N.P.T.	1	1		
21	P	39589	010		CLAMP, Pipe, 1/2	1	1		
22					NOT USED				
23	P	4931	091		TEE, 1/2 N.P.T	1	1		
24	P	29193	091		NIPPLE, 1/2 N.P.T. x 8-3/4	1			
	P	29205	091		NIPPLE, 1/2 N.P.T. x 11-3/4		1		
25	P	35298	091		FITTING, 3/4 O.D.T x 1/2 N.P.T.	1	1		
26	P	4911	091		TEE, 1/2 x 1/4 x 1/2 N.P.T.	1			
	P	4912	091		TEE, 1/2 x 1/2 x 1/4 N.P.T. (See Fig. 8-29)		1		
27	P	150527	001		VALVE, Safety, 1/2 N.P.T.	1	1		
28	P	1636	091		ELL, Street, 3/4 N.P.T.	1	1		
29	P	29019	091		NIPPLE, 3/8 N.P.T. x 2-1/2	1	1		
30					UNION ASSEMBLY				
	P	2901	091		• NUT, Union	1	1		
	P	4201	091		• SPUD, Female	1	1		
	P	90130	091		• SEAT, Union	1	1		

*When replacing the diaphragm, the bonnet bolts should be tightened to 50 in./lb. torque. Do not overtighten.

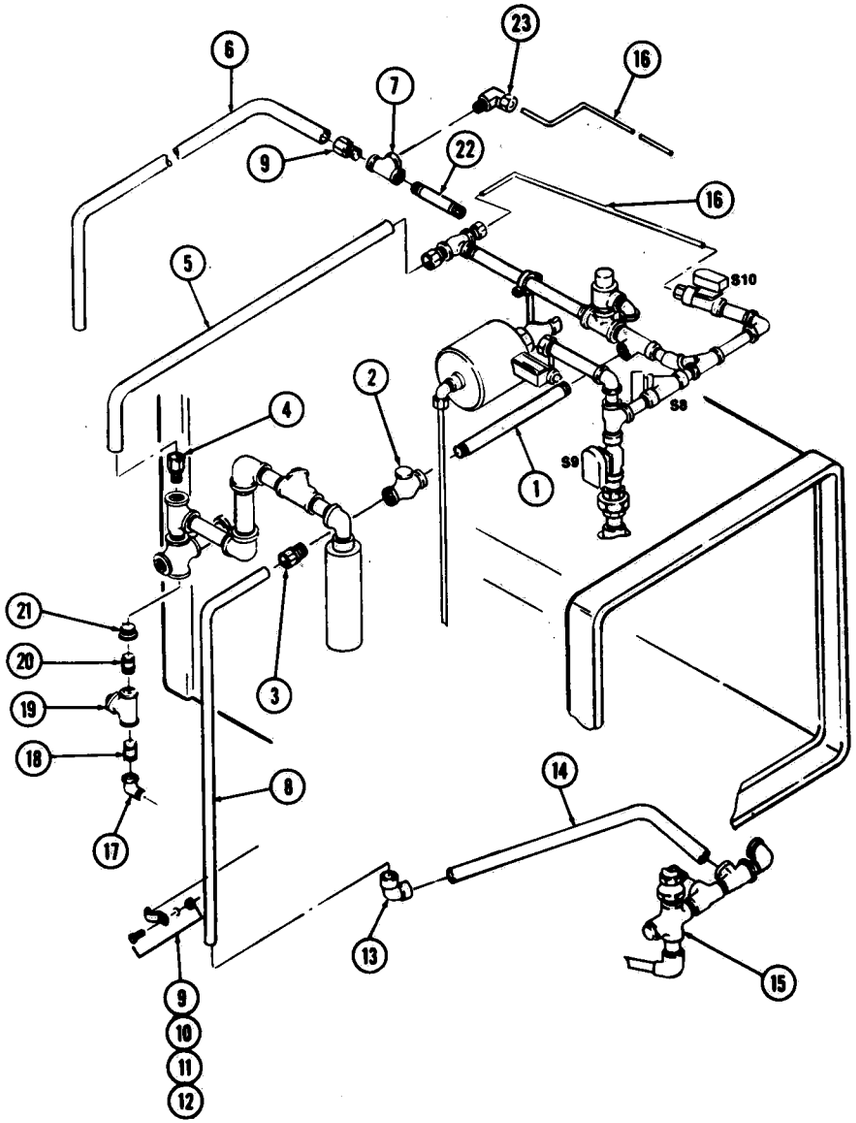
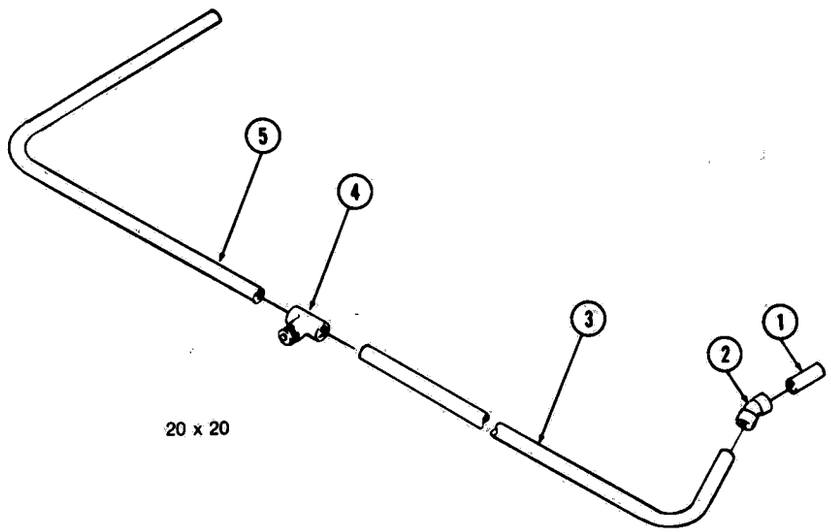
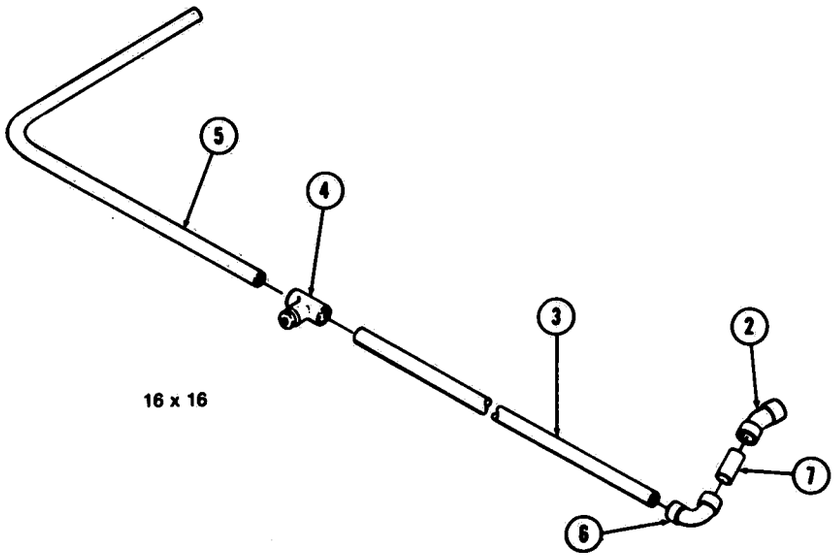


Figure 8-29. ISOTHERMAL PIPING ADD-ON (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-29-					ISOTHERMAL PIPING ADD-ON (Part 2 of 2): 16x16	X			
					ISOTHERMAL PIPING ADD-ON (Part 2 of 2): 20x20		X		
1	P	29190	051		NIPPLE, 1/2 N.P.T. x 8	1	1		
2	P	41998	091		VALVE, Check, 1/2 N.P.T.	1	1		
	P	44727	091		• DISC, Viton "A"	1	1		
3	P	29931	091		FITTING, 5/8 O.D.T. x 1/2 N.P.T.	1	1		
4	P	35298	091		FITTING, 3/4 O.D.T. x 1/2 N.P.T.	1	2		
5	P	93042	001		TUBE, 3/4 O.D.T.	1			
6	P	93043	001		TUBE, 3/4 O.D.T.		1		
7	P	4912	091		TEE, 1/2 x 1/2 x 1/4 N.P.T		1		
	P	4911	091		TEE, 1/2 x 1/4 x 1/2 N.P.T.	1			
8	P	93041	006		TUBE, 5/8 O.D.	1			
	P	93041	007		TUBE, 5/8 O.D.		1		
9	P	90513	091		CLAMP, Tube, 5-8 O.D.T.	1	1		
10	P	41805	044		SCREW, Hex Head, #10-32 x 5/8	1	1		
11	P	76801	045		LOCKWASHER, #10	1	1		
12	P	3959	041		NUT, #10-32	1	1		
13	P	90212	091		ELL, 5/8 O.D.T.	1	1		
14	P	129226	001		TUBE, 5/8 O.D.T	1	1		
15					CHAMBER DRAIN ASSEMBLY (See Fig. 8-38 or 8-71)				
16					TUBE, 1/4 O.D.T. x 17-13/32	1			
					TUBE, 1/4 O.D.T., 18-9/16		1		
17	P	1631	091		ELL,Street, 3/8 N.P.T.	1	1		
18	P	29014	051		NIPPLE, 3/8 N.P.T. x 1-1/4	1	1		
19	P	5424	091		VALVE, Check, 3/8 N.P.T.	1	1		
	P	74335	091		• DISC	1	1		
20	P	29015	051		NIPPLE, 3/8 N.P.T. x 1-1/2	1	1		
21	P	837	091		BUSHING,Reducing, 1/2 x 3/8 N.P.T.	1	1		
22	P	29205	051		NIPPLE, 1/2 N.P.T. x 11-3/4		1		
	P	29193	091		NIPPLE, 1/2 N.P.T. x 8-3/4	1			
23	P	41306	091		FITTING, Ell, 1/4 O.D.T. x 1/4 N.P.T.		1		



20 x 20



16 x 16

Figure 8-30. WATER CONDENSER ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY				
8-30-	P	93716	001		WATER CONDENSING ASSEMBLY, 16x16	X				
	P	93716	002		WATER CONDENSING ASSEMBLY, 20x20		X			
1	P	90266	091		TUBE, 5/8 O.D. x 2			1		
2	P	89269	091		ELL, 45°, 5/8 O.D.T.	1	1			
3	P	89546	091		TUBE, 5/8 O.D. x 31-1/4	1				
	P	93041	008		TUBE, 5/8 O.D.			1		
4	P	78658	091		VALVE, Flow Control, 5/8 O.D.T.	1	1			
5	P	83448	002		TUBE, 5/8 O.D.			1		
	P	83448	001		TUBE, 5/8 O.D.	1				
6	P	90212	091		ELL, 90°, 5/8 O.D.T.	1				
7	P	89781	091		TUBE, 5/8 O.D.T. x 1-1/16	1				

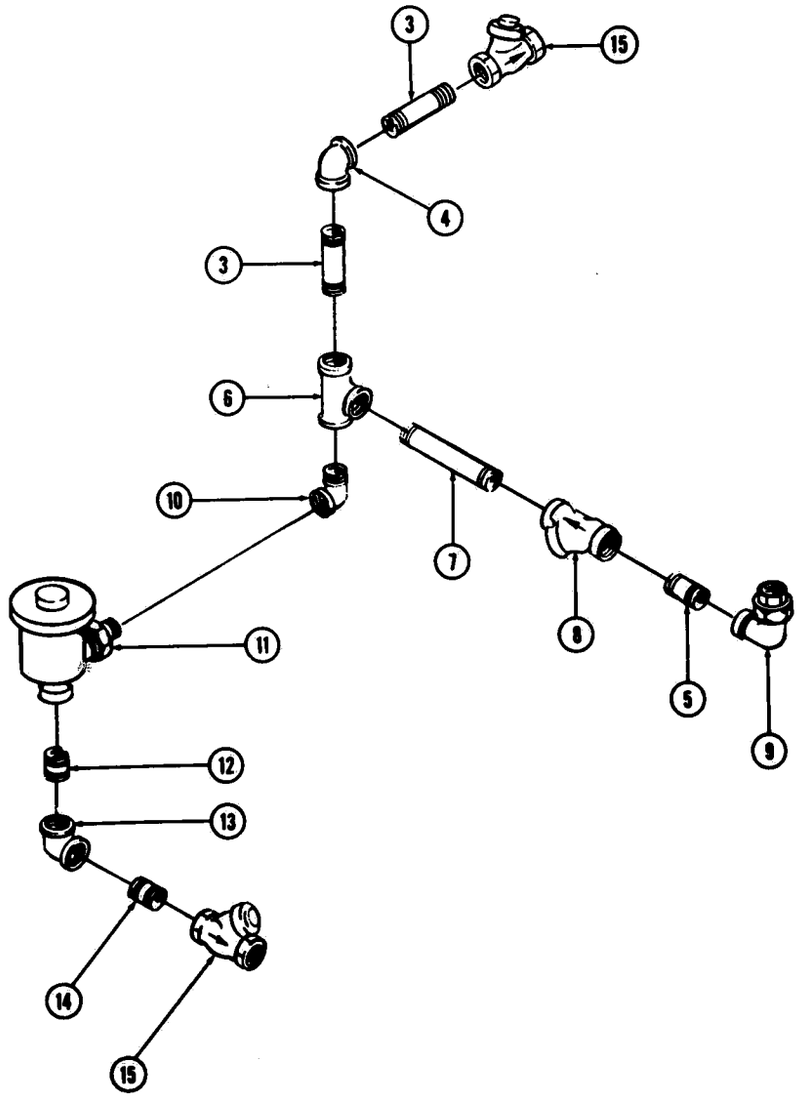


Figure 8-31. JACKET STEAM RETURN PIPING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-31-	P	134466	001		JACKET STEAM RETURN PIPING ASSEMBLY	X
1					NOT USED	
2					NOT USED	
3	P	29017	091		NIPPLE, 3/8 N.P.T. x 2	2
4	P	1630	091		ELL, 3/8 N.P.T.	1
5	P	29015	051		NIPPLE, 3/8 N.P.T. x 1-1/2	1
6	P	4915	091		TEE, 1/2 x 3/8 x 3/8 N.P.T.	1
7	P	29024	091		NIPPLE, 3/8 N.P.T. x 3-3/4	1
8	P	47671	091		STRAINER, 3/8 N.P.T.	1
9	P	89153	091		ELL, Union, 3/8 N.P.T.	1
10	P	1634	091		ELL, Street, 1/2 N.P.T.	1
11	P	129222	001		TRAP, Steam, 1/2 N.P.T.	1
	Q	764080	001		• KIT, Repair	1
12	P	29162	091		NIPPLE, 1/2 N.P.T. x 1	1
13	P	1622	091		ELL, Reducing, 1/2 x 3/8 N.P.T.	1
14	P	29021	051		NIPPLE, 3/8 N.P.T. x 3	1
15	P	5424	091		VALVE, Check, 3/8 N.P.T.	2

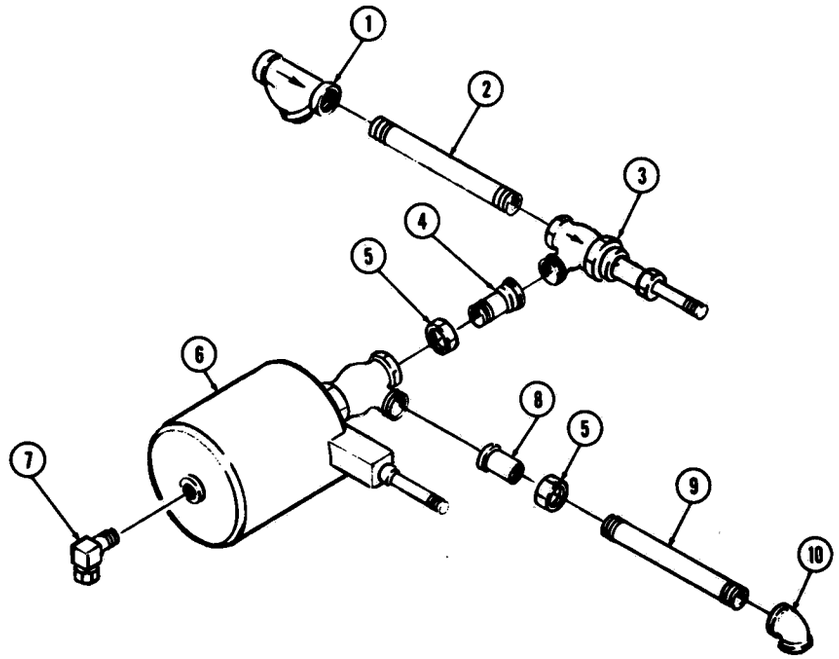


Figure 8-32. STEAM SUPPLY ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-32-	P	93708	001		STEAM SUPPLY ASSEMBLY	X
1	P	47671	091		STRAINER, Steam, 3/8 N.P.T.	1
	P	50341	091		• SCREEN	1
	P	28447	091		• "O" RING	1
2	P	29028	051		NIPPLE, 3/8 N.P.T. x 4-3/4	1
3	P	5654	051		VALVE, Angle, 3/8 N.P.T. (See Fig. 8-42)	1
4	P	4076	051		SPUD, Male, 3/8 N.P.T.	1
5	P	2901	051		NUT, Union	2
6	P	20661	091		VALVE, Steam Control, 3/8 N.P.T. (See Fig. 8-40)	1
7	P	21990	091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1
8	P	4201	091		SPUD, Female, 3/8 N.P.T.	1
9	P	29024	091		NIPPLE, 3/8 N.P.T. x 3-3/4	1
10	P	1630	091		ELL, 3/8 N.P.T.	1

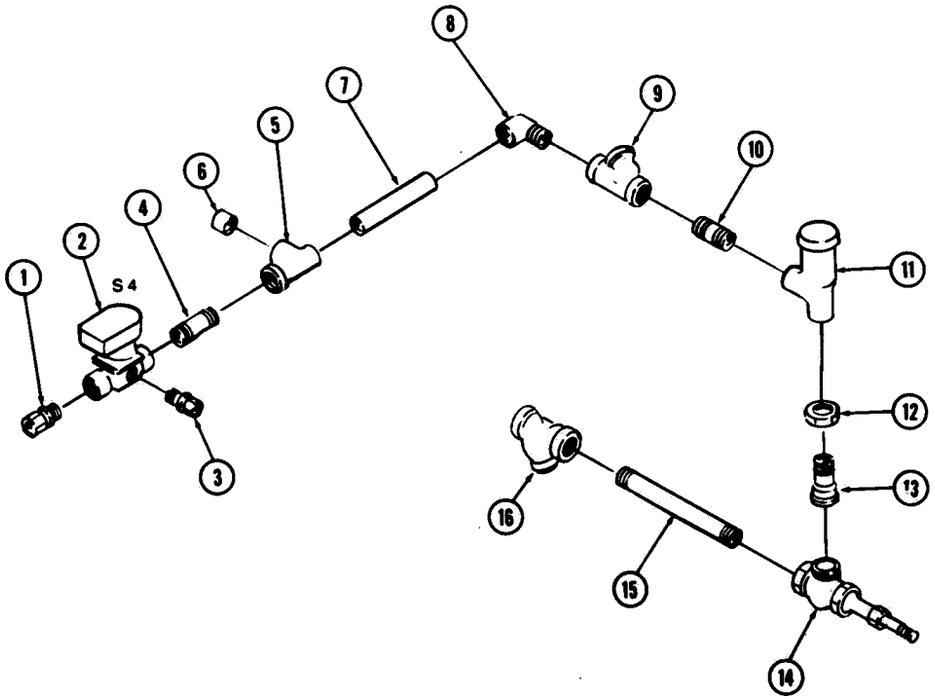


Figure 8-33. WATER SUPPLY VALVE ASSEMBLY.

FIG. & INDEX NO.		PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-33-	P	136673	001		WATER SUPPLY VALVE ASSEMBLY	X
1	P	39072	091		FITTING, Straight, 5/8 O.D.T. x 3/8 N.P.T.	1
2	P	83263	002		VALVE, Solenoid, Water, 3/8 N.P.T.	1
	P	764073	001		• REPAIR KIT	1
	P	764072	002		• COIL	1
3	P	19514	091		FITTING, 1/4 O.D.T. x 1/8 N.P.T.	1
4	P	29015	051		NIPPLE, 3/8 N.P.T. x 1-1/2	1
5	P	90467	091		TEE, 3/8 N.P.T. x 5/8 x 5/8 O.D.T.	1
6	P	89808	091		COUPLING, 5/8 O.D.T. x 1/8 N.P.T.	1
7	P	90262	091		TUBE, 5/8 O.D. x 1-1/4	1
8	P	90217	091		ELL, 5/8 O.D.T. x 3/8 N.P.T.	1
9	P	5424	091		VALVE, Check, 3/8 N.P.T.	1
	P	74335	091		DISC	1
10	P	29013	051		NIPPLE, 3/8 N.P.T. x 1	1
11	P	90233	091		VACUUM BREAKER, 3/8 N.P.T.	1
	P	752477	091		• REPAIR KIT	1
12	P	2901	051		NUT, Union	1
13	P	4076	051		SPUD, Male, 3/8 N.P.T.	1
14	P	5654	051		VALVE, Angle, 3/8 N.P.T.	1
	Q	754361	001		• RENEWAL PARTS PACKAGE	1
15	P	29035	051		NIPPLE, 3/8 N.P.T. x 6-1/2	1
16	P	47670	091		STRAINER, Water, 3/8 N.P.T.	1
	P	756249	091		• SCREEN	1
	P	756250	091		• "O" RING	1

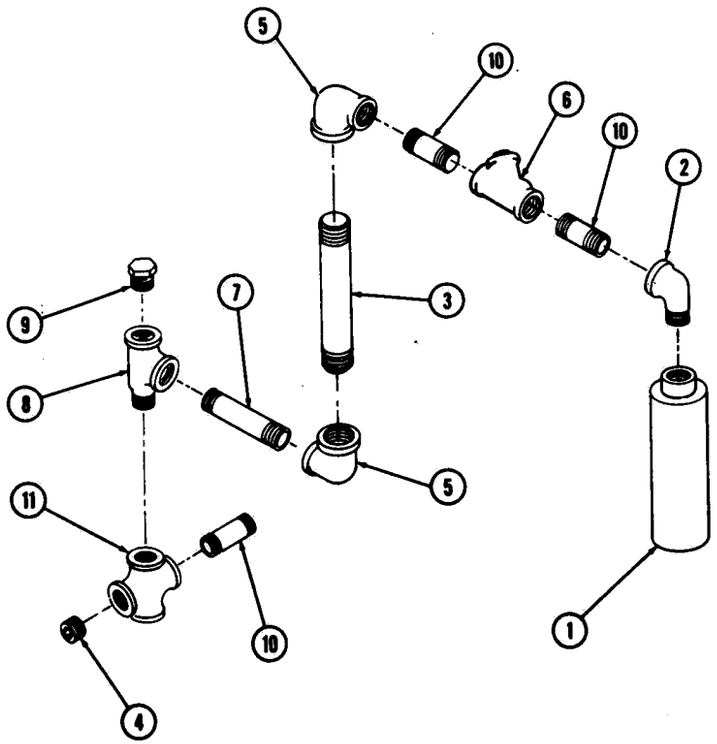


Figure 8-34. AIR FILTER ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-34-	P	93715	001		AIR FILTER ASSEMBLY	X
1	P	93160	001		FILTER, 1/2 N.P.T. (See Fig. 8-41)	1
2	P	1634	091		ELL, Street, 1/2 N.P.T.	1
3	P	29304	091		NIPPLE, 3/4 N.P.T. x 4-1/2	1
4	P	38404	091		PLUG, Pipe, 1/2 N.P.T.	1
5	P	1625	091		ELL, Reducing, 3/4 N.P.T. x 1/2 N.P.T.	2
6	P	150822	354		VALVE, Swing Check, 1/2 N.P.T. (See Below)	1
	P	764319	608		• DISC, Teflon Renewal	A/R
7	P	29168	091		NIPPLE, 1/2 N.P.T. x 2-1/2	1
8	P	91154	091		TEE, Street, 1/2 N.P.T.	1
9	P	3442	091		PLUG, Pipe, 1/2 N.P.T.	1
10	P	29163	091		NIPPLE, 1/2 N.P.T. x 1-1/4	3
11	P	150822	333		CROSS, 1/2 N.P.T.	1
	P	764319	576		KIT, to replace poppet check valve with swing check for units manufactured prior to 2/84.	

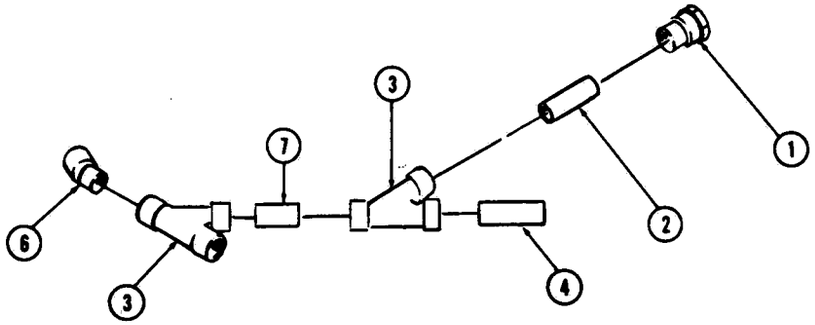


Figure 8-35. CONDENSER PIPING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-35-	P	56396	002		CONDENSER PIPING ASSEMBLY	A
1	P	91158	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	1
2	P	83449	002		TUBE, 7/8 O.D.T x 2-1/4	1
3	P	89384	091		"Y" BRANCH, 7/8 O.D.T.	2
4	P	89566	091		TUBE, 7/8 O.D.T. x 3-1/4	1
5					NOT USED	
6	P	89721	091		ELL, 45°, 7/8 O.D.T.	1
7	P	89520	091		TUBE, 7/8 O.D. x 1-3/4	1

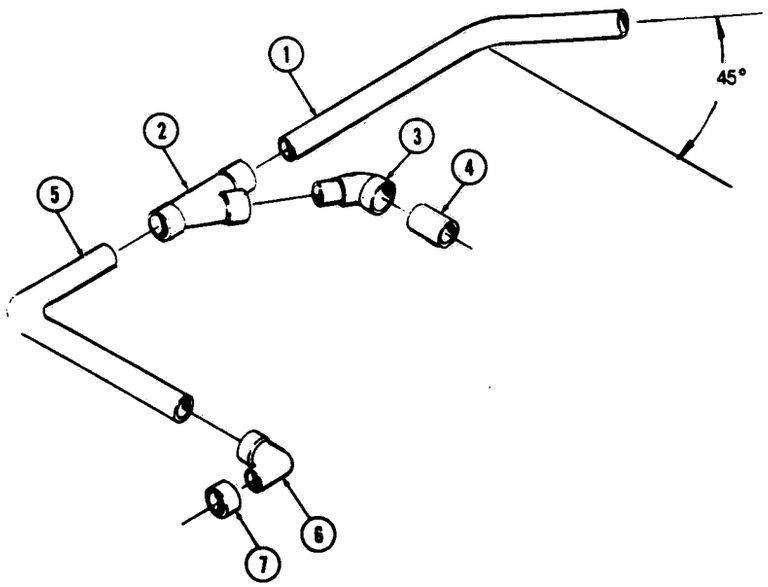


Figure 8-36. DRAIN TUBE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-36-	P	136671	001		DRAIN TUBE ASSEMBLY	X
1	P	92957	005		TUBE, 7/8 O.D.	1
2	P	89384	091		"Y" BRANCH, 7/8 O.D.T.	1
3	P	89721	091		ELL, 45°, 7/8 O.D.T.	1
4	P	89385	091		COUPLING, 7/8 O.D.T. x 3/8 N.P.T.	1
5	P	93090	007		TUBE, 7/8 O.D.	1
6	P	44507	091		ELL, 7/8 O.D.T.	1
7	P	91317	091		COUPLING, 1-1/8 x 7/8 O.D.T.	1

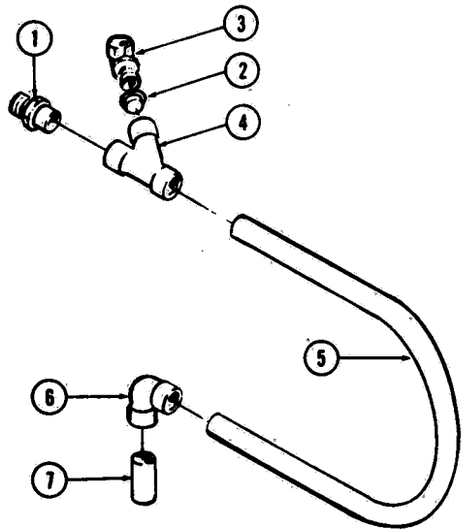


Figure 8-37. DRAIN TUBE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-37-	P	93717	001		DRAIN TUBE ASSEMBLY	X
1	P	90209	091		ADAPTER, 5/8 O.D.T. x 3/8 N.P.T.	1
2	P	89808	091		COUPLING, 5/8 O.D.T. x 1/8 N.P.T.	1
3	P	21990	091		ELL, 1/4 O.D.T. x 1/8 N.P.T.	1
4	P	83377	001		"Y" BRANCH, 5/8 O.D.T.	1
5	P	83445	002		TUBE, 5/8 O.D.	1
6	P	90212	091		ELL, 5/8 O.D.T.	1
7	P	90262	091		TUBE, 5/8 O.D. x 1-1/4	1

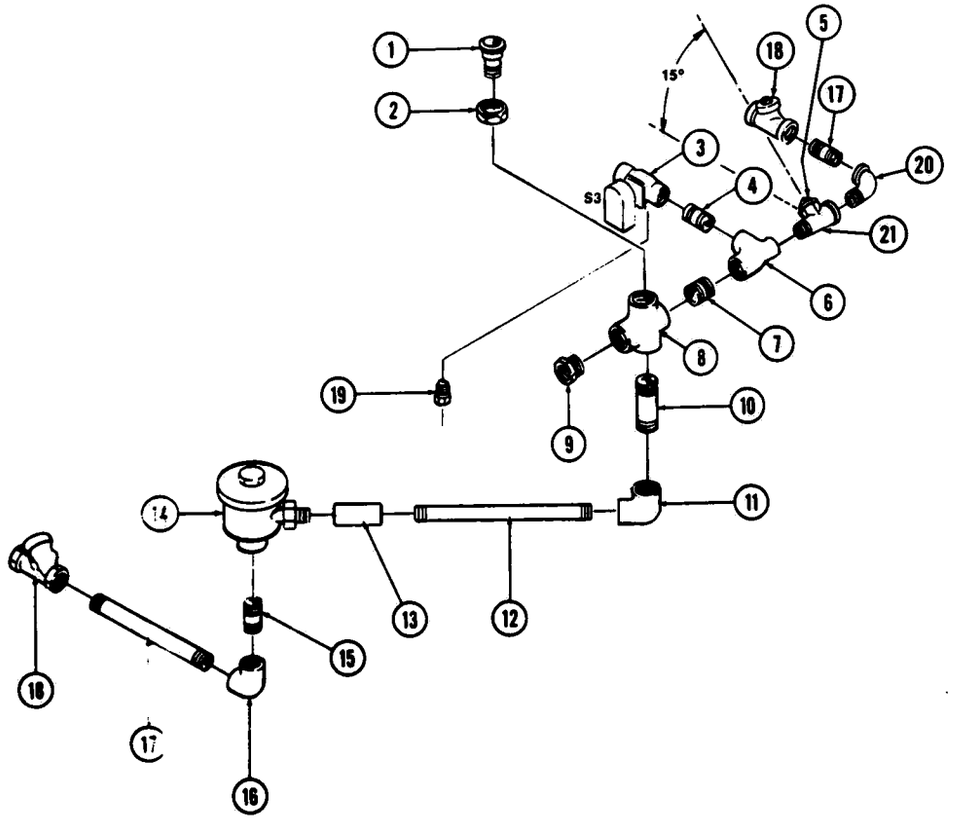
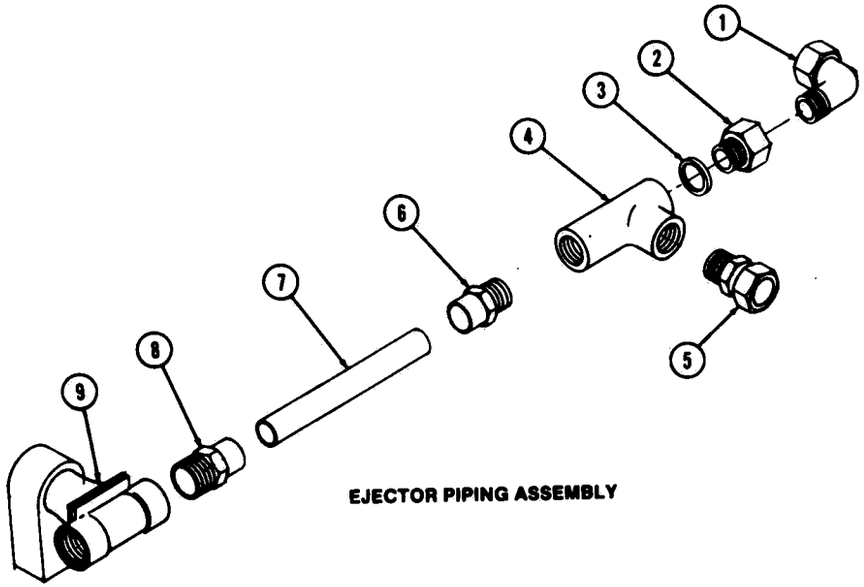


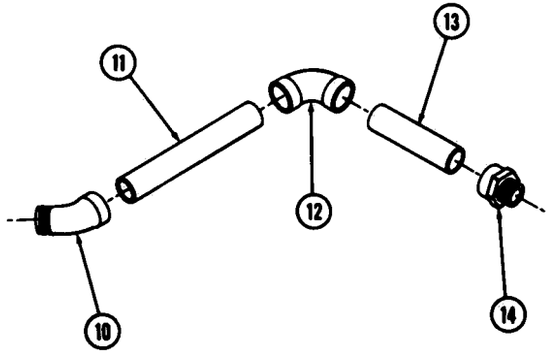
Figure 8-38. CHAMBER DRAIN ASSEMBLY.
(Units With Indicator Recorder)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-38-	P	134467	001		CHAMBER DRAIN ASSEMBLY	X
1	P	4247	091		SPUD, Male, 3/4 N.P.T.	1
2	P	2903	091		NUT, Union, 3/4	1
3	P	83228	002		VALVE, Solenoid, Steam, 3/4 N.P.T.	1
	P	764070	001	*	• REPAIR KIT	1
	P	764070	002		• COIL	1
4	P	29291	091		NIPPLE, 3/4 N.P.T. x 1-1/4	1
5	P	3441	091		PLUG, Pipe, 3/8 N.P.T.	1
6	P	4933	091		TEE, 1 x 3/8 x 3/4 N.P.T.	1
7	P	29354	091		NIPPLE, 1 N.P.T. x 1-1/2	1
8	P	1350	091		CROSS, 1 x 1 x 3/4 x 3/4 N.P.T.	1
9	P	6263	091		BUSHING, Reducing, 1 x 1/2 N.P.T.	1
10	P	29297	091		NIPPLE, 3/4 N.P.T. x 2-3/4	1
11	P	1625	091		ELL, Reducing, 3/4 x 1/2 N.P.T.	1
12	P	29189	091		NIPPLE, 1/2 N.P.T. x 7-3/4	1
13	P	1313	091		COUPLING, 1/2 N.P.T.	1
14	P	129222	001		TRAP, 1/2 N.P.T. (See Fig. 8-43)	1
15	P	29162	091		NIPPLE, 1/2 N.P.T. x 1	1
16	P	1622	091		ELL, Reducing, 1/2 x 3/8 N.P.T.	1
17	P	29014	051		NIPPLE, 3/8 N.P.T. x 1-1/4	2
18	P	5424	091		VALVE, Check, 3/8 N.P.T.	2
	P	74335	091		• DISC	1
19	P	6695	091		FITTING, Straight, 5/16 O.D.T. x 1/8 N.P.T.	1
20	P	1631	091		ELL, Street, 3/8 N.P.T.	1
21	P	78387	091		TEE, Street, 3/8 N.P.T.	1

*When replacing the diaphragm, the bonnet bolts should be tightened to 50 in./lb. torque. Do not overtighten.



EJECTOR PIPING ASSEMBLY



FITTING ASSEMBLY

Figure 8-39. EJECTOR PIPING AND FITTING ASSEMBLIES.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-39-	P	134468	001		EJECTOR PIPING ASSEMBLY	X
1	P	40153	091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
2	P	25546	042		NOZZLE, 3/8 N.P.T. x 3/8-18	1
3	P	7841	091		GASKET	1
4	P	25900	042		EJECTOR, 3/4-18 x 1/2 N.P.T.	1
5	P	29931	091		FITTING, Compression, 3/8 O.D.T. x 1/2 N.P.T.	1
6	P	83374	001		ADAPTER, 7/8 O.D.T. x 1/2 N.P.T.	1
7	P	91307	091		TUBE, 7/8 O.D.	1
8	P	91158	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	1
9	P	83228	002		VALVE, Solenoid, 3/4 N.P.T. (S5)	1
	P	764070	001	•	• REPAIR KIT	1
	P	764070	002		• COIL	1
	P	56394	001		FITTING ASSEMBLY	X
10	P	89271	091		ELL, 45° , 7/8 O.D.T. x 3/4 N.P.T.	1
11	P	150822	306		TUBE, 7/8 O.D. x 4	1
12	P	44495	091		ELBOW, 7/8 O.D.T.	1
13	P	91248	091		TUBE, 7/8 O.D.T. x 2	1
14	P	91158	091		ADAPTER, 3/4 N.P.T. x 7/8 O.D.T.	1

*When replacing the diaphragm, the bonnet bolts should be tightened to 50 in./lb. torque. Do not overtighten.

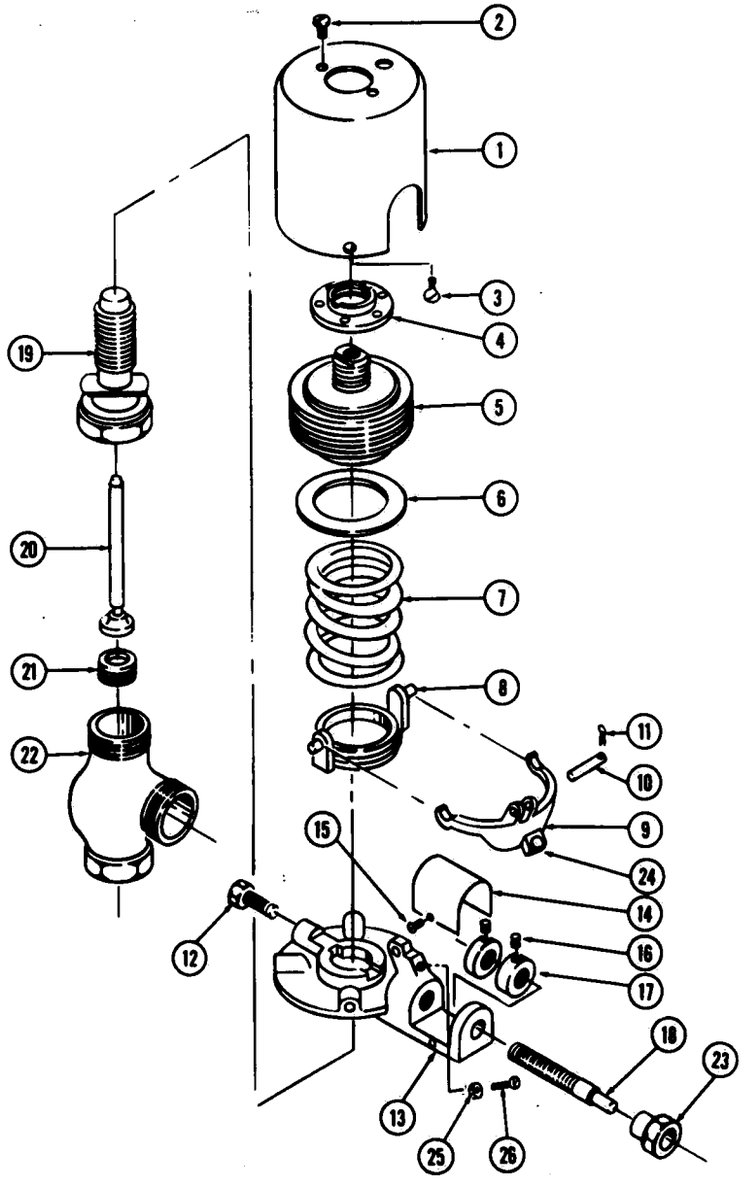


Figure 8-40. STEAM CONTROL VALVE.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-40-	P	20661	091		STEAM CONTROL VALVE, HI-LO	X
	P	754359	001	*	KIT, Valve Repair	A/R
1	P	22349	045		COVER	1
2	P	9276	041		SCREW, #8-32 x 3/16	2
3	P	3969	041		SCREW, 1/4-20 x 1/4	4
4	P	9172	091		REINFORCEMENT	1
5	P	35880	091		BELLOWS ASSEMBLY	1
6	P	35911	061		PLATE, Top Spring	1
7	P	19947	045		SPRING	1
8	P	12474	042		PLATE, Lower Spring	1
9	P	14976	091		FORK, Adjusting	1
10	P	11890	061		PIN, Fork Pivot	1
11	P	8897	091		COTTER PIN	2
12	P	12471	041		SCREW, 1/4-20 x 1-1/2	1
13	P	20658	042		BOTTOM PLATE	1
14	P	20662	061		COVER, Adjusting Screw	1
15	P	12534	061		SCREW, #8-32 x 1/4	2
16	P	10585	041		SETSCREW, Allen, #10-32 x 1/4	2
17	P	20659	091		LOCK NUT, Split	2
18	P	20657	061		SCREW, Adjusting	1
19	P	26836	051		SYLPHON AND BONNET ASSEMBLY	1
20	P	28265	091		VALVE STEM ASSEMBLY	1
21	P	5685	061		SEAT, Valve	1
22	P	5669	091		BODY, Valve	1
23	P	8605	043		NUT, Wheel	1
24	P	2299	045		INSERT	1

*Valve repair kit includes parts 2, 3, 5, 19, 20 and 21.

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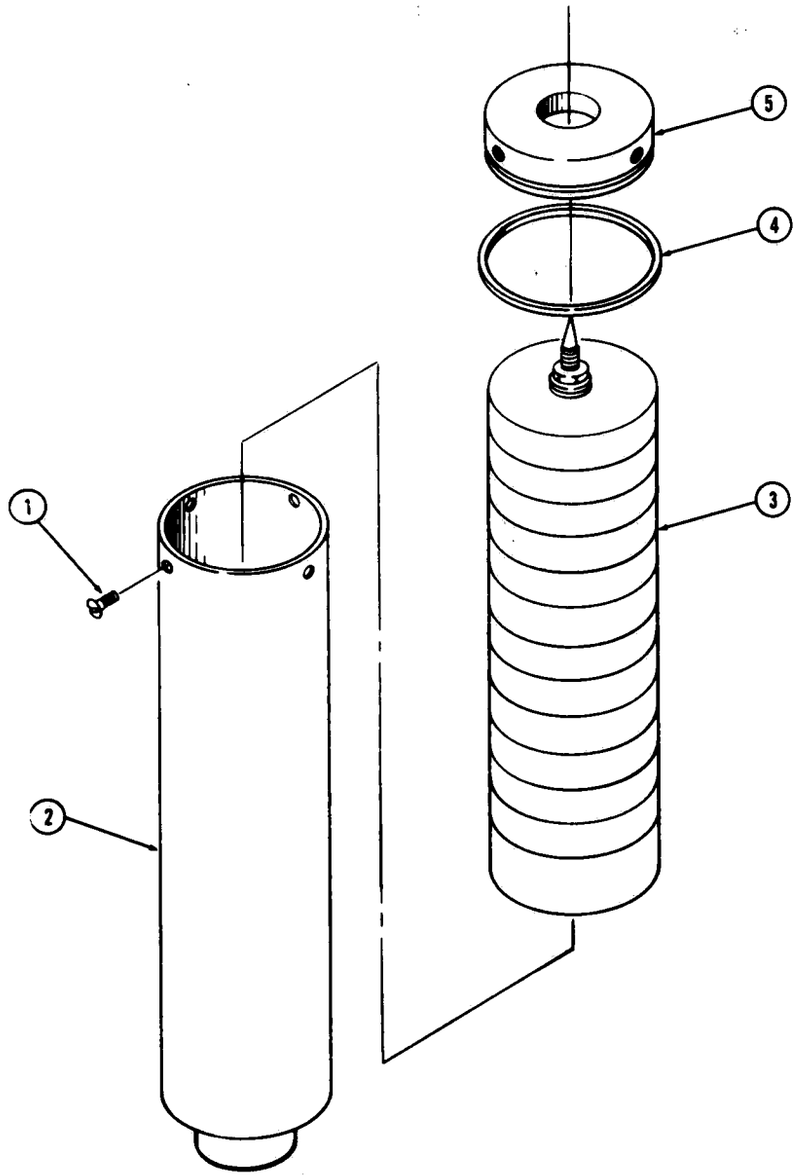


Figure 8-41. FILTER ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-41-	P	93160	001		FILTER ASSEMBLY	X
1	P	12283	041		SCREW, Round Head, #10-32 x 1/4	4
2	P	93159	001		TUBE ASSEMBLY	1
3	P	23953	091		CARTRIDGE, Filter	1
4	P	41301	091		"O" RING	1
5	P	83900	001		HEAD	1

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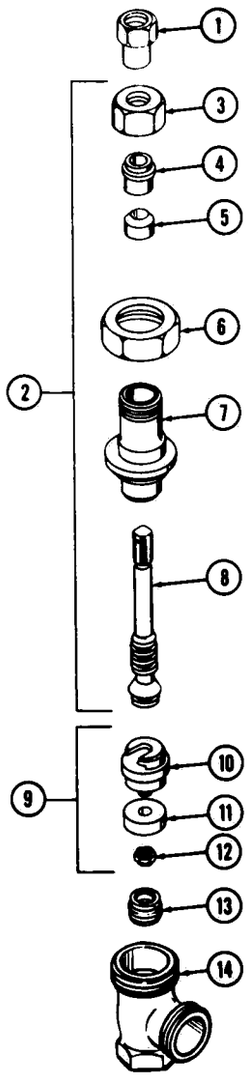


Figure 8-42. UNION ANGLE VALVE.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-42-	P	5654 051		UNION ANGLE VALVE: (3/8)	X
	P	754361 001	*	• REPAIR KIT	A/R
1	P	8605 051		NUT, Wheel	1
2	P	53915 091		VALVE STEM AND BONNET ASSEMBLY	1
3	P	48431 091		• NUT, Packing	1
4	P	48432 091		• GLAND, Packing	1
5	P	8784 091		• PACKING	1
6	P	5683 091		• NUT, Bonnet	1
7	P	53912 091		• BONNET, Valve	1
8	P	53911 051		• STEM, Valve	1
9	P	25347 091		DISC HOLDER ASSEMBLY	1
10	P	150576 001		• DISC HOLDER	1
11	P	25345 091		• DISC, Teflon	1
12	P	5680 091		• NUT, Disc	1
13	P	5685 061		SEAT, Valve	1
14	P	5669 091		BODY, Valve	1

*Valve repair kit includes parts 5, 8, 9 and 13.

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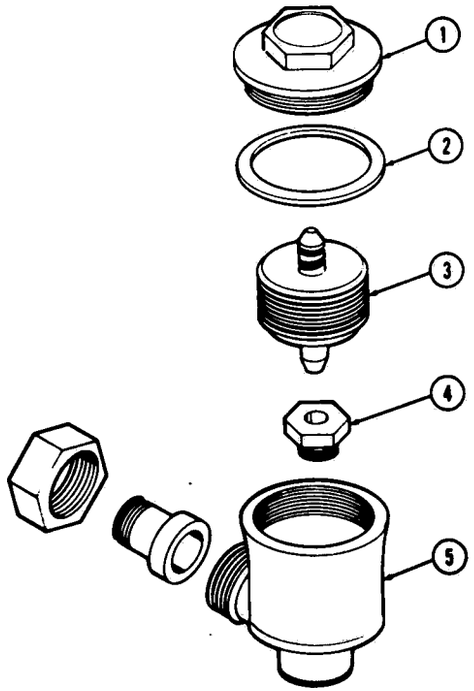


Figure 8-43. STEAM TRAP.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-43-	P	129222	001		STEAM TRAP	1
	P	764080	001		KIT, Repair, 1/2 N.P.T. (incl. items 2, 3, 4)	A/R
1		764315	209		CAP	1
2					GASKET, NLA, Use Kit	1
3					DIAPHRAGM ASSEMBLY, NLA, Use Kit	1
4					SEAT, NLA, Use Kit	1
5					BODY	1

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POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

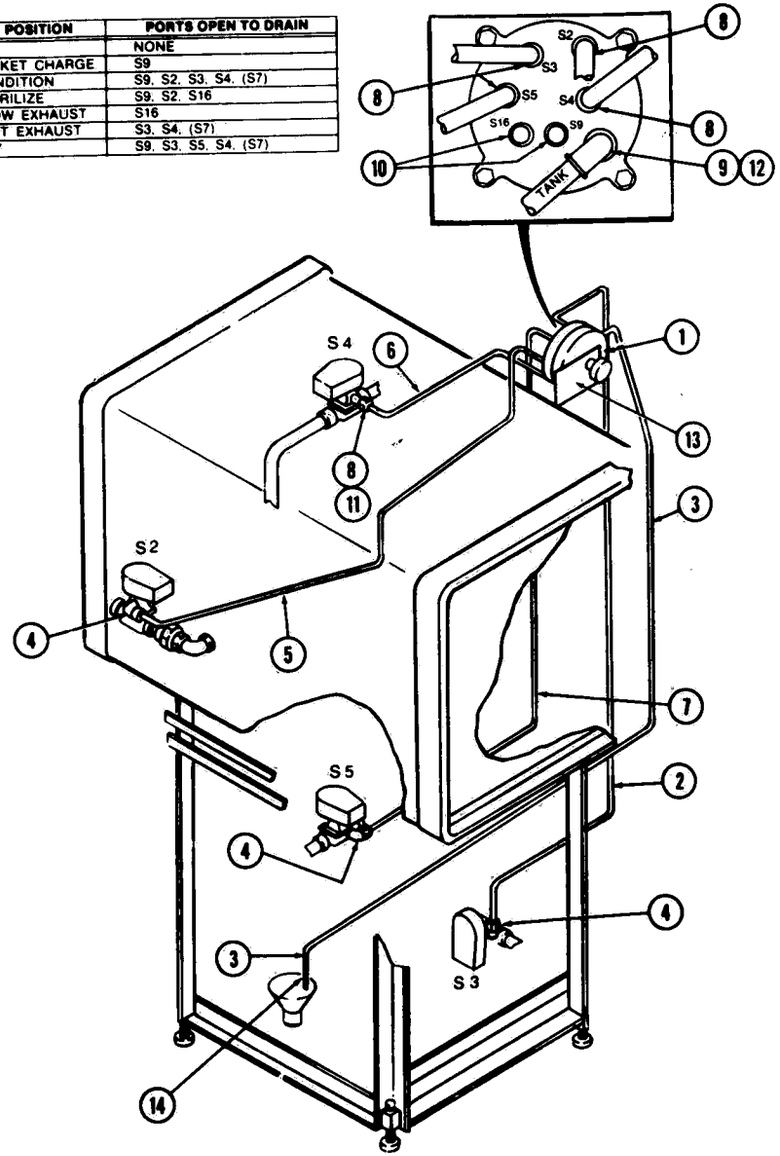


Figure 8-44. OPTIONAL MANUAL VALVE PIPING: Gravity Model.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-44-					**UNITS WITH INDICATOR RECORDER:**				
					OPTIONAL MANUAL VALVE PIPING: 16x16 Gravity Model	X			
					OPTIONAL MANUAL VALVE PIPING: 20x20 Gravity Model		X		
					UNITS WITH PRINTCON:				
					OPTIONAL MANUAL VALVE PIPING: 16x16 Gravity Model			X	
					OPTIONAL MANUAL VALVE PIPING: 20x20 Gravity Model				X
1	P	136726	001		VALVE, Manual Multiport (See Fig. 8-46)	1	1	1	1
2	R	915	103	*	TUBE, S3, 1/4 O.D. x 58	1		1	
	R	915	103	*	TUBE, S3, 1/4 O.D. x 64		1		1
3	R	3500	736	*	TUBE, Drain, 3/8 O.D. x 80	1	1	1	1
4	P	42510	091		ELL, Compression, 1/4 O.D. x 1/8 N.P.T.	3	3	3	3
5	R	915	103	*	TUBE, S2, 1/4 O.D. x 50-17/64	1		1	
	R	915	103	*	TUBE, S2, 1/4 O.D. x 66-17/64		1		1
6	R	3500	735	*	TUBE, S4, 1/4 O.D. x 8"	1	1	1	1
7	R	915	103	*	TUBE, S5, 1/4 O.D. x 54	1		1	
	R	915	103	*	TUBE, S5, 1/4 O.D. x 58		1		1
8	P	43289	091		FITTING, Compression, 1/4 O.D. x 1/8 O.P.T.	5	5	5	5
9	P	45530	091		ELL, Compression, 3/8 O.D.T. x 1/8 N.P.T.	1	1	1	1
10	P	3439	091		PLUG, Pipe	4	4	4	4
11	P	84371	001		INSERT, Tube, 1/4	2	2	2	2
12	P	84371	002		INSERT, Tube, 3/8	1	1	1	1
13	P	136727	001		DECAL, Manual	1	1	1	1
	P	93900	047		DECAL, Manual			1	1
14	P	77299	091		WIRE TIES, Short	6	6	6	6

*TUBING (Order By The Foot)
R-3500-735 SYNFLEX, 1/4" O.D. x .180 I.D.
R-915-103 COPPER, 1/4" O.D. x .030 Wall
R-3500-736 SYNFLEX, 3/8" O.D. x .275 I.D.

POSITION	PORTS OPEN TO DRAIN
OFF	NONE
JACKET CHARGE	S9
CONDITION	S9, S2, S3, S4, (S7)
STERILIZE	S9, S2, S16
SLOW EXHAUST	S16
FAST EXHAUST	S3, S4, (S7)
DRY	S9, S3, S5, S4, (S7)

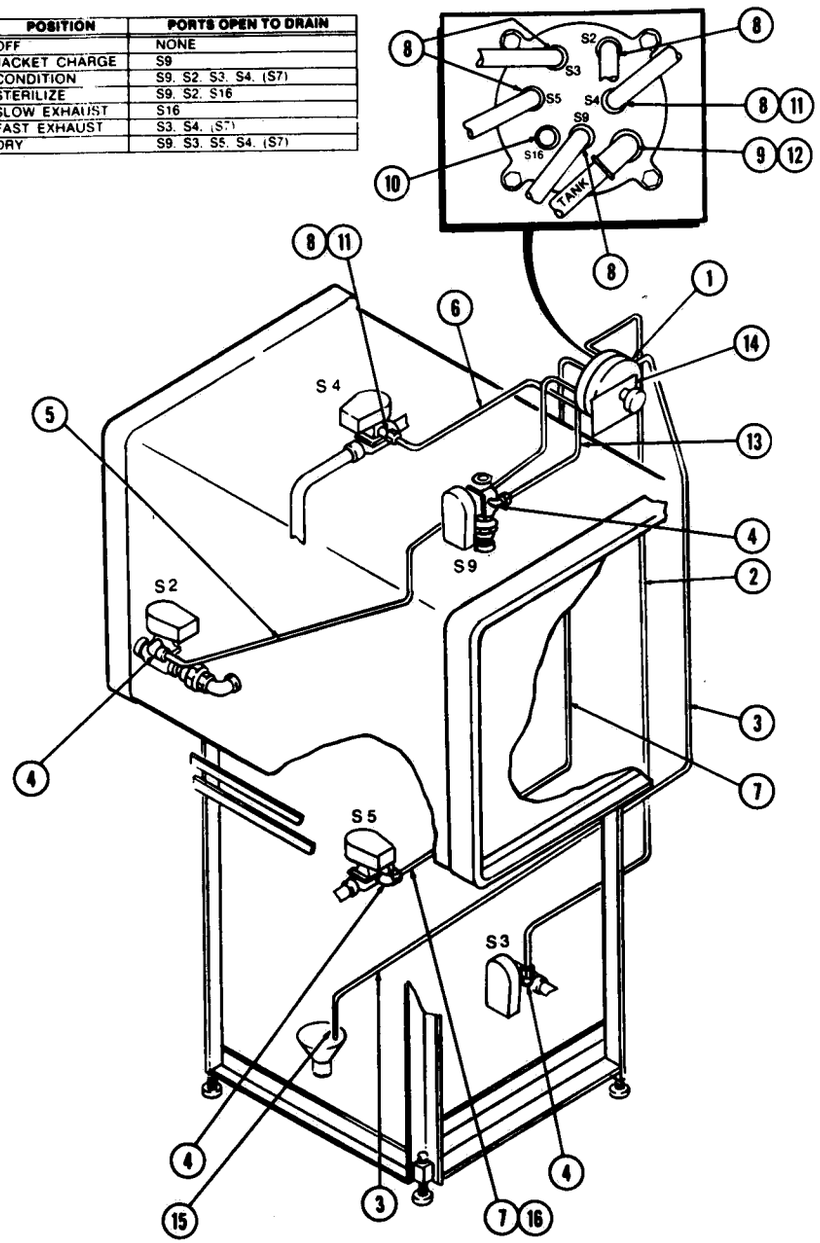


Figure 8-45. OPTIONAL MANUAL VALVE PIPING: Isothermal Model.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-45-					**UNITS WITH INDICATOR RECORDER:**				
					OPTIONAL MANUAL VALVE PIPING: 16x16				
					Isothermal Model	X			
					OPTIONAL MANUAL VALVE PIPING: 20x20				
					Isothermal Model		X		
					UNITS WITH PRINTCON:				
					OPTIONAL MANUAL VALVE PIPING: 16x16				
					Isothermal Model			X	
					OPTIONAL MANUAL VALVE PIPING: 20x20				
					Isothermal Model				X
1	P	136726	001		VALVE, Manual Multiport (See Fig. 8-46)	1	1	1	1
2	R	915	103	*	TUBE, S3, 1/4 O.D. x 58	1		1	
	R	915	103	*	TUBE, S3, 1/4 O.D. x 64		1		1
3	R	3500	736	*	TUBE, Drain, 3/8 O.D. x 80	1	1	1	1
4	P	42510	091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T.	4	4	4	4
5	R	915	103	*	TUBE, S2, 1/4 O.D. x 50-17/64	1		1	
	R	915	103	*	TUBE, S2, 1/4 O.D. x 66-17/64		1		1
6	R	3500	735	*	TUBE, S4, 1/4 O.D. x 8"	1	1	1	1
7	R	915	103	*	TUBE, S5, 1/4 O.D. x 54	1		1	
	R	915	103	*	TUBE, S5, 1/4 O.D. x 58		1		1
8	P	43289	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N..T.	6	6	6	6
9	P	45530	091		ELL, Compression, 3/8 O.D.T. x 1/8 N.P.T.	1	1	1	1
10	P	3439	091		PLUG, Pipe	4	4	4	4
11	P	84371	001		INSERT, Tube, 1/4	2	2	2	2
12	P	84371	002		INSERT, Tube, 3/8	1	1	1	1
13	R	915	103	*	TUBE, S9, Copper, 1/4 O.D. x 18-27/32	1	1	1	1
14	P	136727	002		DECAL, Manual	1	1	1	1
	P	93900	048		DECAL, Manual			1	1
15	P	77299	091		WIRE TIES, Short	6	6	6	6

*TUBING (Order By The Foot)
R-3500-735 SYNFLEX, 1/4" O.D. x .180 I.D.
R-915-103 COPPER, 1/4" O.D. x .030 Wall
R-3500-736 SYNFLEX, 3/8" O.D. x .275 I.D.

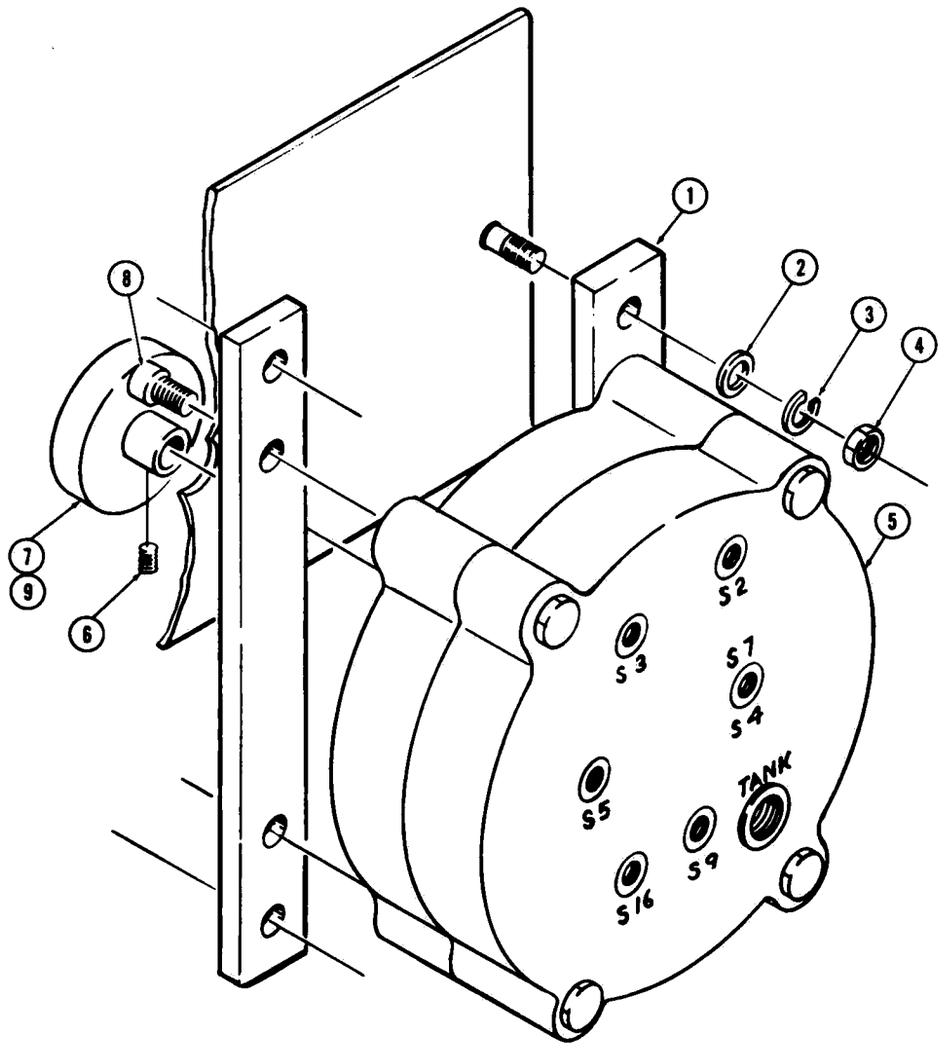


Figure 8-46. OPTIONAL MANUAL VALVE.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-46-					OPTIONAL MANUAL VALVE	X
1	P	129061	001		PLATE, Mounting	2
2	P	10445	091		WASHER, Flat	4
3	P	19678	045		LOCKWASHER	4
4	P	3097	041		NUT, Hex	4
5	P	136726	001		VALVE, Manual Multi-Port	1
6	P	43282	091		SCREW, Set	1
7	P	136760	001		KNOB, Selector	1
8	P	79253	045		SCREW, Socket Head, 1/4-20 x 1/2	4
9	P	129060	001		INSERT, Knob	1
	P	764315	599		KIT, Manual Valve Addition, Gravity And Isothermal Units (16 x 16 and 20 x 20)	

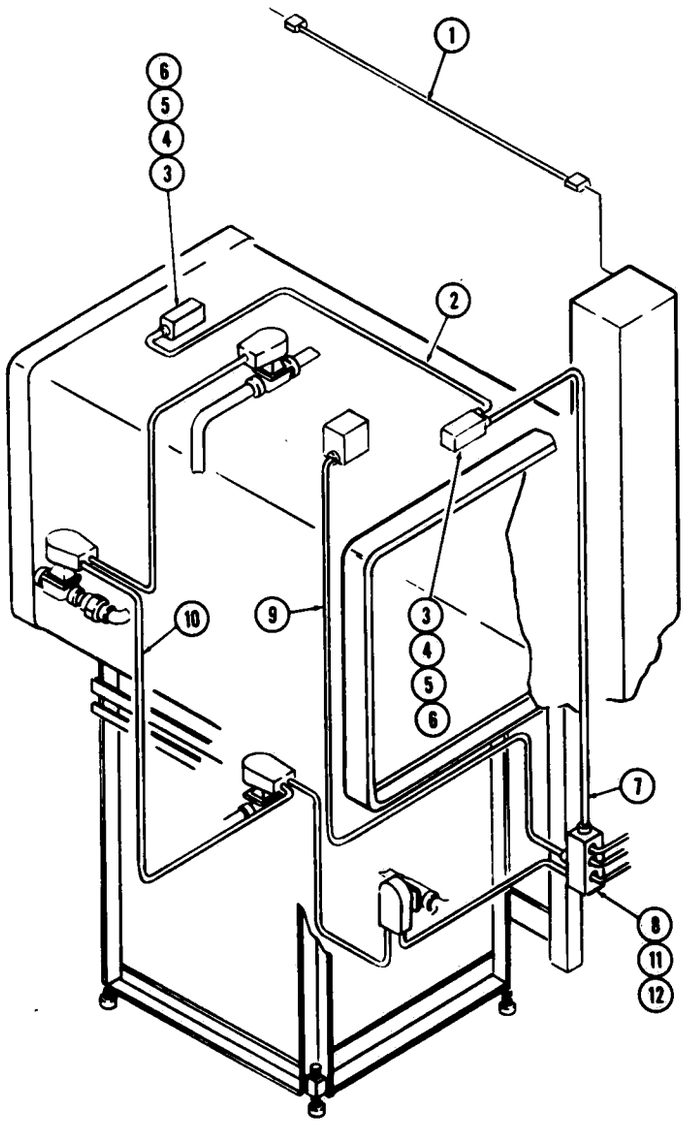


Figure 8-47. WIRING ASSEMBLY: Gravity Models. (Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY				
					UNITS WITH INDICATOR-RECORDER:					
8-47-					WIRING ASSEMBLY: Gravity, Single Door Models	X				
					WIRING ASSEMBLY: Gravity, Double Door Models		X			
1	P	136752	SUB		HARNESS ASSEMBLY (SUB: P-146649-103) (See Fig. 8-50)		1			
2	P	136548	001		CABLE, Door Switch, Double Door		1			
3	P	136475	001		ASSEMBLY, Door Switch (See Fig. 8-23)	1	2			
4	P	90168	045		SCREW, Hex Head, Self Tapping, #10 x 5/16	2	4			
5	P	90891	045		EXTENSION, Switch	1	2			
	P	90888	045	*	EXTENSION, Switch		1			
6	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2	4			
7	P	93643	001		CABLE, Door Switch, Single Door	1				
8	P	93617	001		BOX, Junction (See Fig. 8-48)	1	1			
9	P	93657	002		CABLE, Pressure and Vacuum Switch	1	1			
10	P	136571	001		CABLE, Solenoid	1	1			
11	P	129084	001		BOX, Adapter		1			
12	P	3985	041		SCREW, Round Head, #6-32 x 3/4		2			
13	P	18131	091		LOCKWASHER		2			

*Special part for 16x16 Sterilizer used on non-operating end door only.

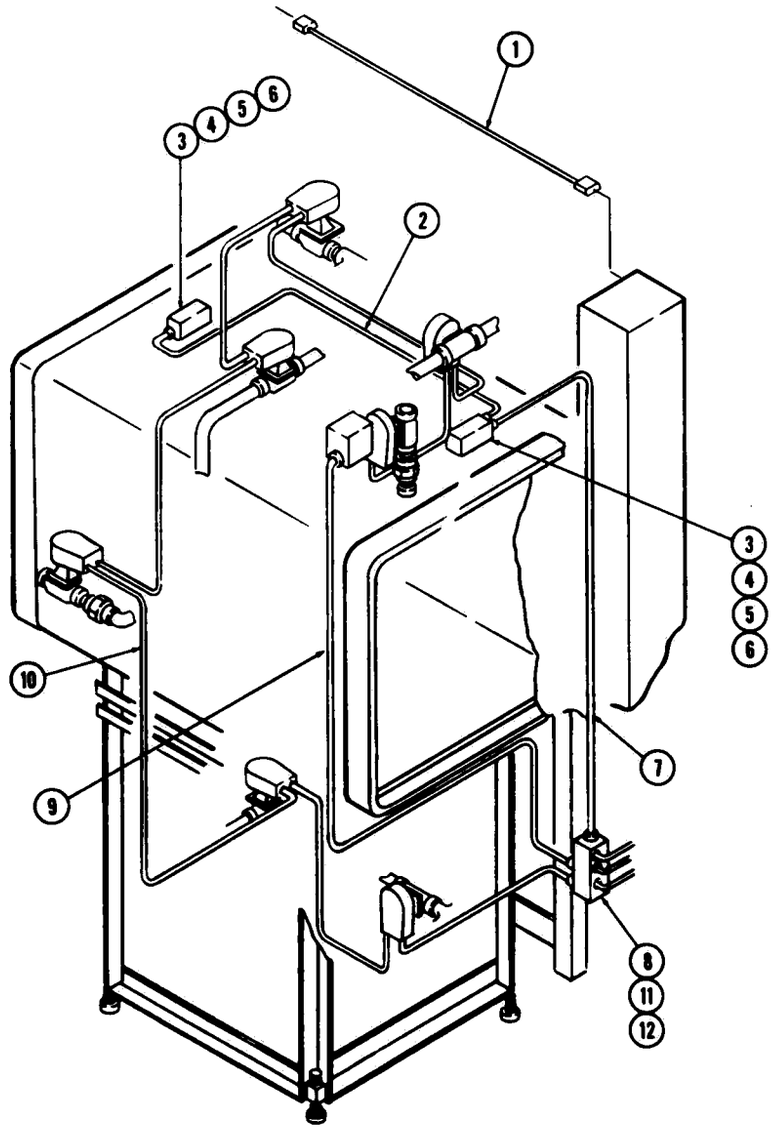


Figure 8-48. WIRING ASSEMBLY: Isothermal Models. (Units With Indicator Recorder)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-48-					WIRING ASSEMBLY: Isothermal, Single Door Models	X			
					WIRING ASSEMBLY: Isothermal, Double Door Models		X		
1	P	136752	SUB		HARNESS ASSEMBLY (SUB: P-146649-103) (See Fig. 8-50)		1		
2	P	136548	001		CABLE, Door Switch, Double Door		1		
3	P	136475	001		ASSEMBLY, Door Switch (See Fig. 8-23)	1	2		
4	P	90168	045		SCREW, Hex Head, Self Tapping, #10 x 5/16	2	4		
5	P	90891	045		EXTENSION, Switch	1	2		
	P	90888	045	*	EXTENSION, Switch		1		
6	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2	4		
7	P	93643	001		CABLE, Door Switch, Single Door	1			
8	P	93617	001		BOX, Junction (See Fig. 8-48)	1	1		
9	P	93657	001		CABLE, Pressure and Vacuum Switch	1	1		
10	P	136565	001		CABLE, Solenoid	1	1		
11	P	15361	042		SCREW, Round Head, #10-32 x 1/4	2	6		
12	P	31705	045		LOCKWASHER, #10	2	6		

*Special part for 16x16 Sterilizer used on non-operating end door only.

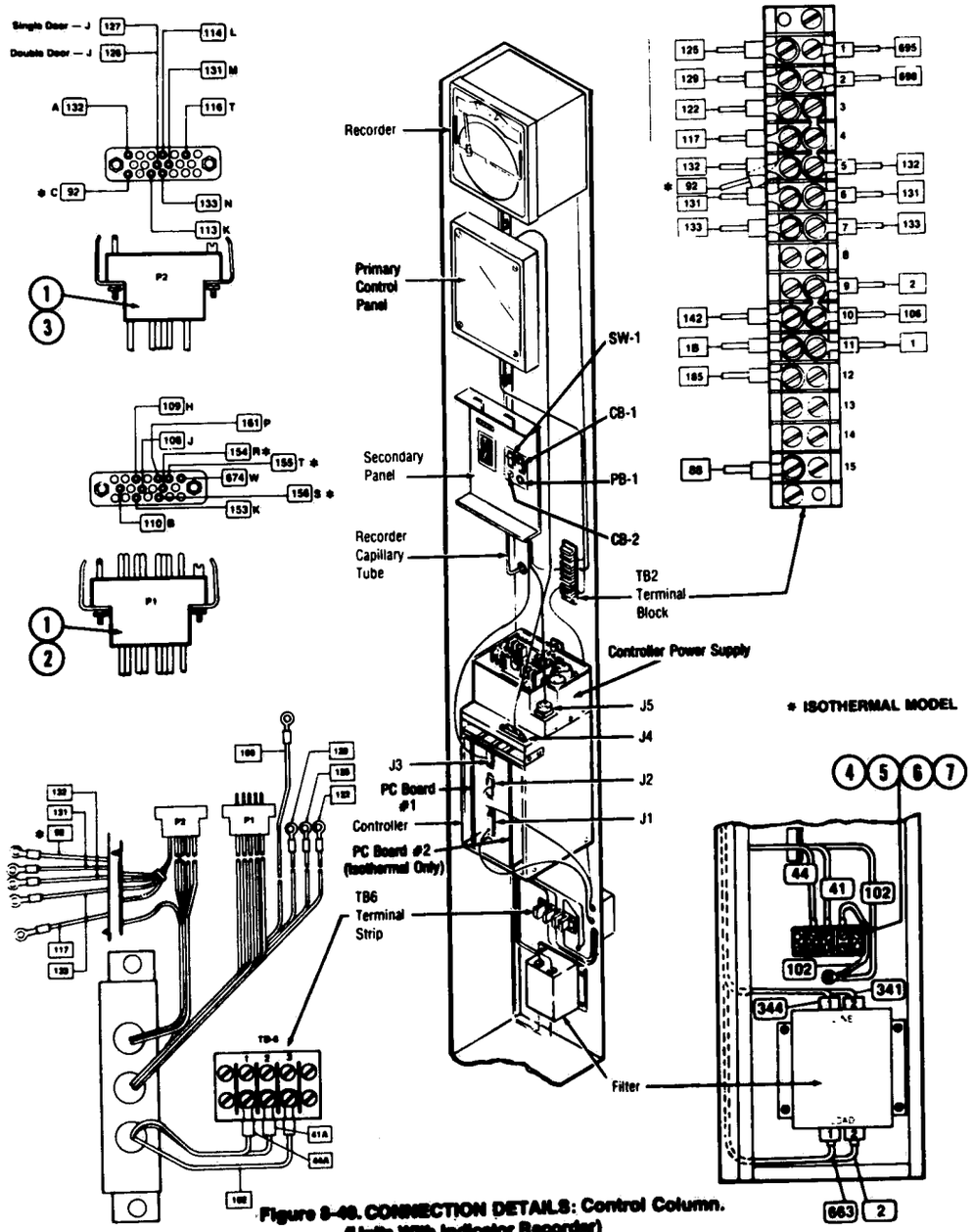


Figure 8-49. CONNECTION DETAILS: Control Column. (Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH INDICATOR-RECORDER:				
8-49-					CONNECTION DETAILS: Control Column, Gravity	X			
					CONNECTION DETAILS: Control Column, Isothermal		X		
1	P	93829	001		BLOCK, P1 and P2	2	2		
2	P	150822	042		PIN, Contact, P1	6	7		
3	P	84198	002		SOCKET, Contact, P2	8	9		
4	P	19522	091		TERMINAL, Wire, #10 Ring x 16-22 AWG	1	1		
5	P	82675	001		SCREW, Green, Ground. #10-32 x 3/8	1	1		
6	P	14865	091		TERMINAL, Wire, #8 Ring x 18-22 AWG	1	1		
7					WIRE, Green	1	1		

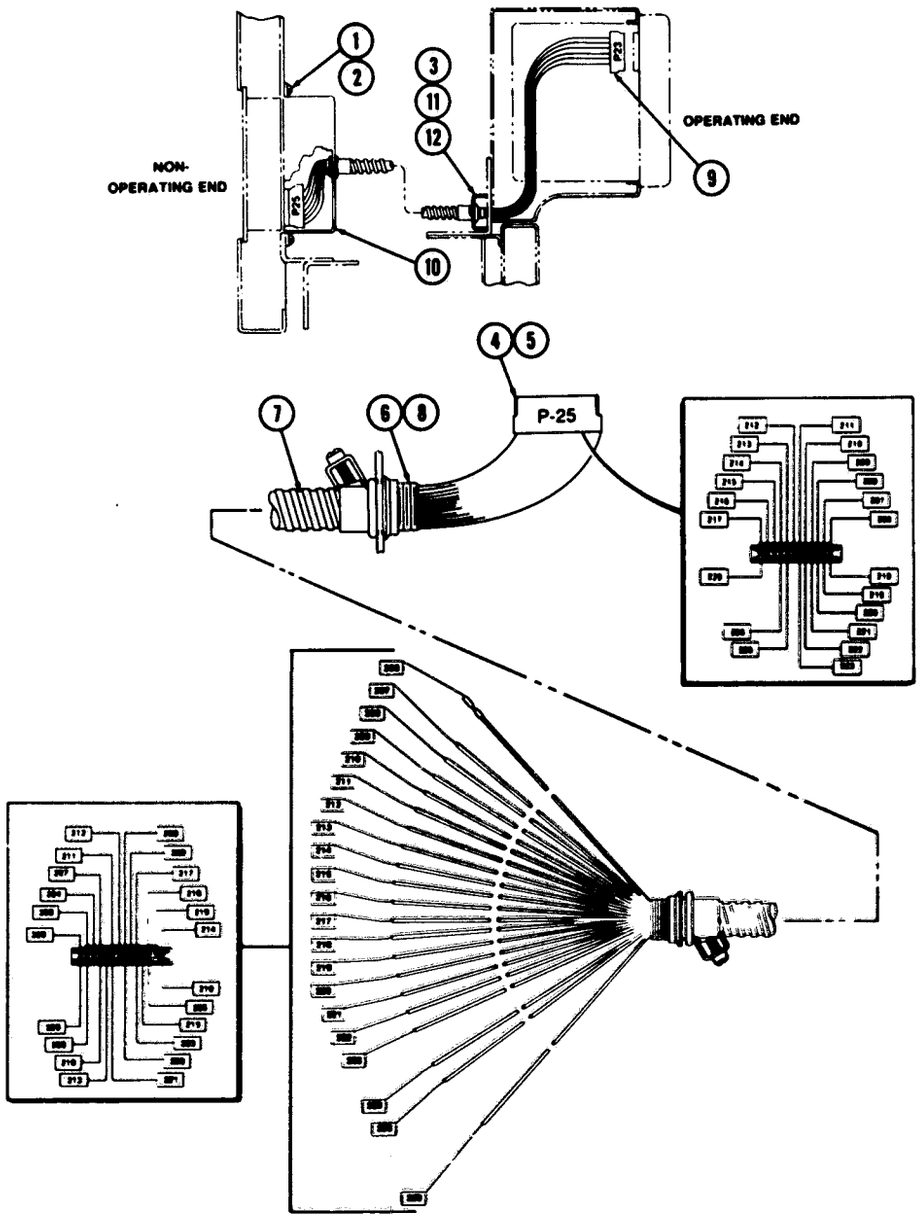


Figure 8-50. HARNESS ASSEMBLY.
(Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-50-	P 136752	SUB		HARNESS ASSEMBLY: Primary Panel, Double Door (SUB P-146649-103)	X
1	P 15361	042		SCREW, Round Head, #10-32 x 1/4	4
2	P 31705	045		LOCKWASHER	4
3	P 129130	001		BRACKET, Mounting	1
4	P 84229	006		HOUSING, Receptacle, P-25	1
5	P 84187	002		CONTACT	#2
6	P 150030	001		CONNECTOR, Straight, 1/2	2
7	P 91666	091		CONDUIT, Flexible, 1/2 x 50	1
8	P 150122	001		BUSHING, Anti-Short	2
9	P 84229	006		HOUSING, Receptacle, P-23	1
10	P 129084	001		BOX, Adapter	1
11	P 3986	041		SCREW, Round Head, #6-32 x 3/4	2
12	P 18131	091		LOCKWASHER, #6	2

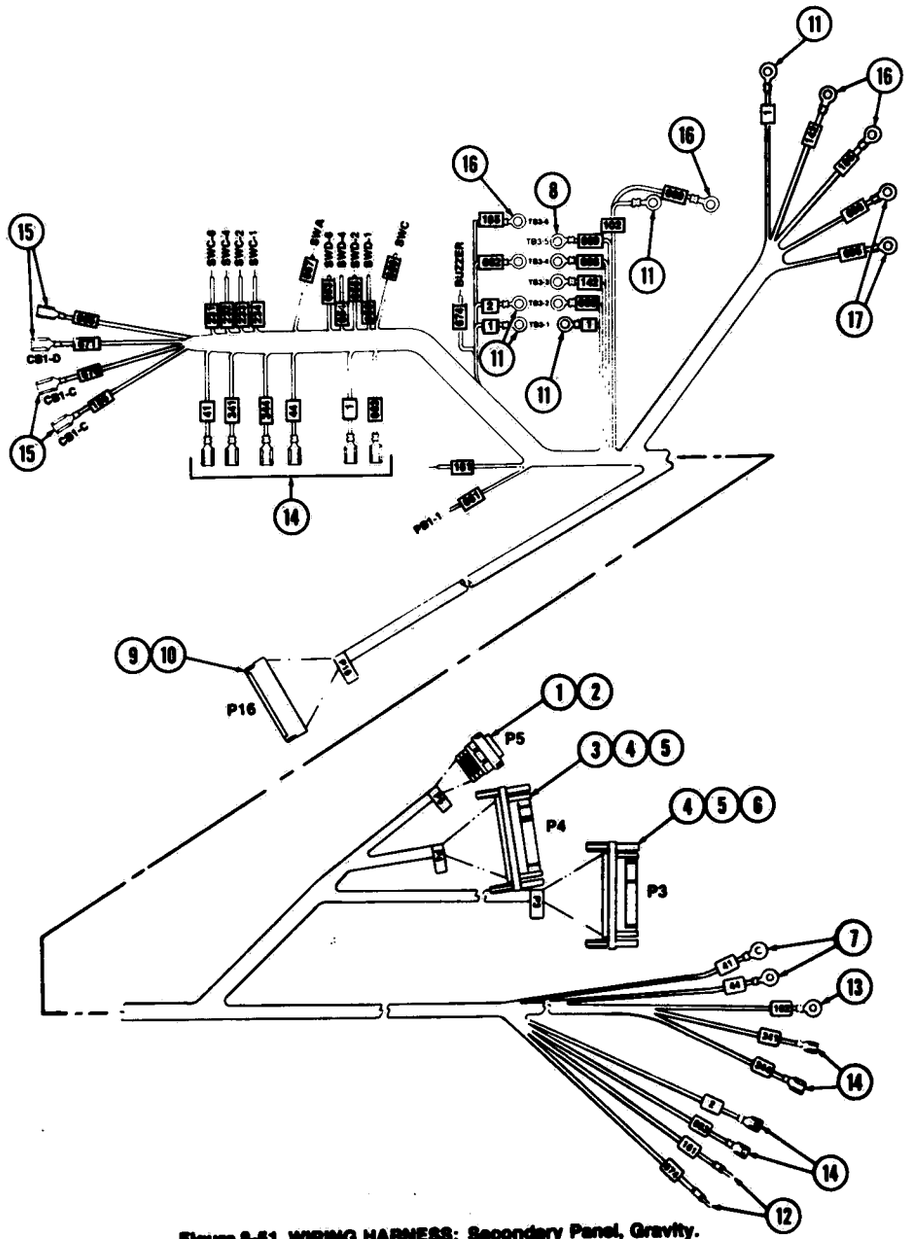


Figure 8-51. WIRING HARNESS: Secondary Panel, Gravity. (Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
				UNITS WITH INDICATOR-RECORDER:	
8-51-	P	146490 001		WIRING HARNESS: Secondary Panel, Gravity	X
1	P	93838 001		PLUG, 9-Position, P5	1
2	P	84198 004		CONTACT, Socket, P5	5
3	P	84205 002		HOUSING, Pin 38-Position, P4	1
4	P	84207 002		PIN, Contact, P3 and P4	43
5	P	84192 001		JACK SCREW, Female, P3 and P4	4
6	P	84205 001		HOUSING, Pin, 28-Position, P3	1
7	P	14591 091		TERMINAL, Wire, #8 Ring x #14-16 Wire	2
8				NOT USED	
9	P	84229 002		HOUSING, Connector, 36-Position, P16	1
10	P	84187 003		CONTACT, P-16	34
11	P	14590 091		TERMINAL, Wire, #6 Ring x #14-16 Wire	5
12	P	150822 043		PIN, Contact	2
13	P	14592 091		TERMINAL, #10 Ring x 14-16 AWG	1
14	P	32119 091		RECEPTACLE, 1/4 Lug x 14-16 AWG	12
15	P	90695 091		RECEPTACLE, 1/4 Lug x 18-22 AWG	4
16	P	90619 091		TERMINAL, #6 Stud x 18-22 AWG	12
17	P	129278 001		TERMINAL, #6 Stud, 22-26 AWG	4

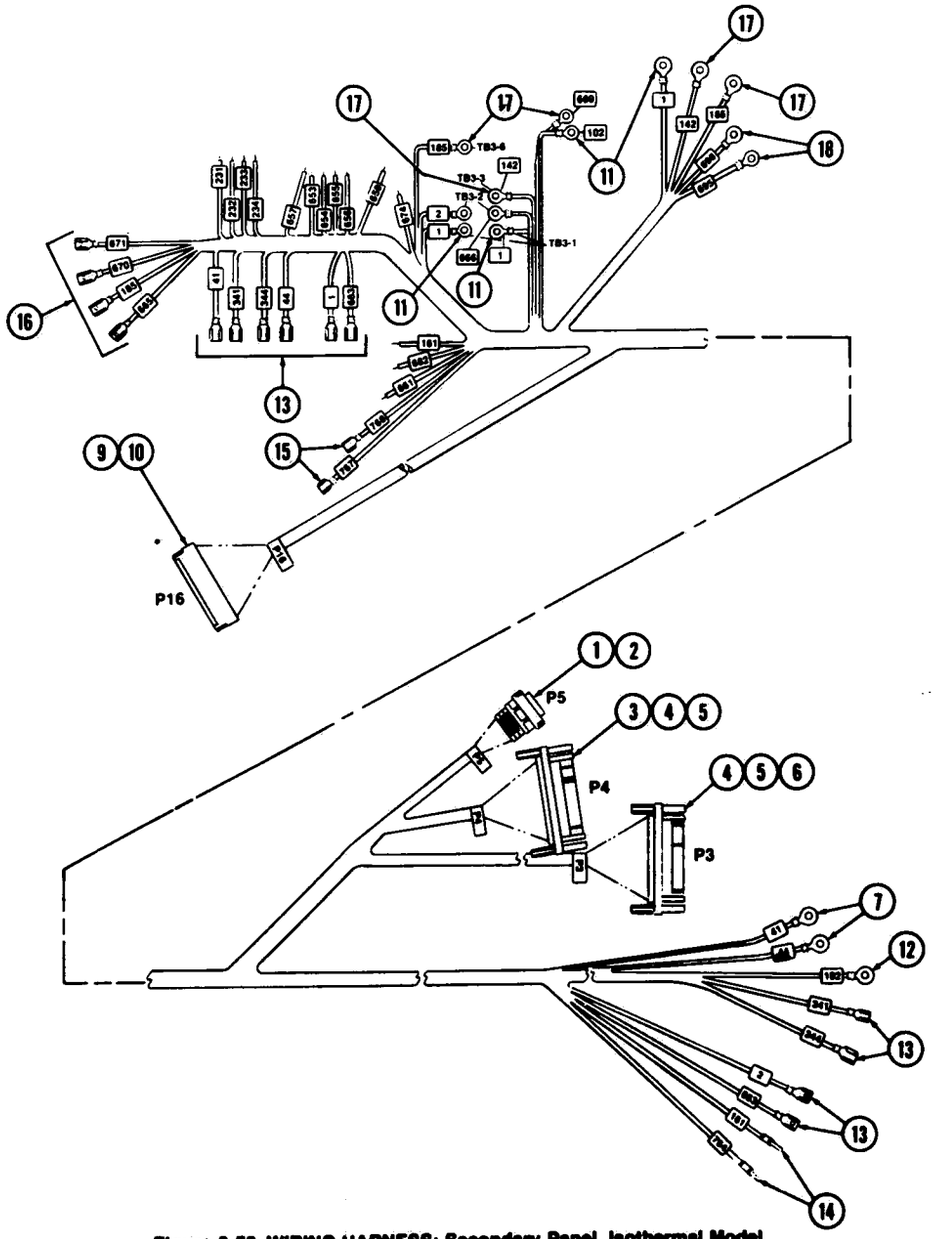


Figure 8-52. WIRING HARNESS: Secondary Panel, Isothermal Model. (Units With Indicator Recorder)

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH INDICATOR-RECORDER:	
8-52-	P	146491	001		WIRING HARNESS: Isothermal Model Secondary Panel	X
1	P	84188	001		PLUG, 9-Position, P5	1
2	P	84198	004		CONTACT, Socket, P5	5
3	P	84205	002		HOUSING, Pin, 38-Position, P4	1
4	P	84207	002		CONTACT, P3 and P4	46
5	P	84192	001		JACK SCREW, Female, P3 and P4	4
6	P	84205	001		HOUSING, Pin, 28-Position, P3	1
7	P	14591	091		TERMINAL, Wire, #8 Ring x #14-16 AWG	2
8					NOT USED	
9	P	84229	002		HOUSING, Connector, 36-Position, P16	1
10	P	84187	003		CONTACT, P16	34
11	P	14590	091		TERMINAL, Wire, #6 Ring x #14-16 AWG	5
12	P	14592	091		TERMINAL, Wire, #10 Ring x 14-16 AWG	1
13	P	32119	091		RECEPTACLE, 1/4 Lug x 14-16 AWG	12
14	P	150822	043		CONTACT, Pin	2
15	P	84402	001		RECEPTACLE, 1/4 Lug x 24 AWG	2
16	P	90695	091		RECEPTACLE, 1/4 Lug x 18-22 AWG	4
17	P	90619	091		TERMINAL, #6 Ring x 18-22 AWG	11
18	P	129278	001		TERMINAL, #6 Stud x 22-26 AWG	2

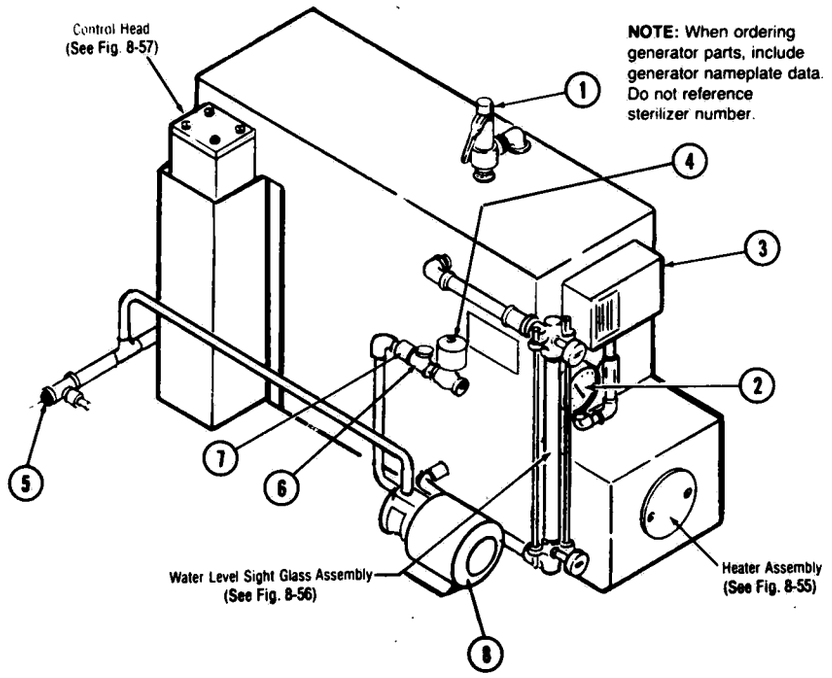


Figure 8-53. OPTIONAL ELECTRO-STEAM GENERATOR. (Non-Solid State Control)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-53-	P	54699	091		ELECTRO-STEAM GENERATOR, 200/230 Volt Heaters, 15 kw (16x16 Sterilizer)	X			
	P	54700	091		ELECTRO-STEAM GENERATOR, 460 Volt Heaters,15 kw (16x16 Sterilizer)		X		
	P	54701	091		ELECTRO-STEAM GENERATOR, 200/230 Volt Heaters, 20 kw (20x20 Sterilizer)			X	
	P	54702	091		ELECTRO-STEAM GENERATOR, 400 Volt Heaters, 20 kw (20x20 Sterilizer)				X
1	P	77053	091		VALVE, Safety (85 psig), 1/2" NPT	1	1	1	1
2	P	750467	091		GAUGE, Pressure (0-160 psi)	1	1	1	1
3	P	764055	001		PRESSURE CONTROL, Honeywell L604N-1009	1	1	1	1
4	P	759742	SUB		VALVE, Solenoid (120 Volt)(SUB: P-759742-003)	1	1	1	1
	P	764315	SUB		• KIT, Repair (SUB: P-764317-381)	1	1	1	1
	P	764072	002		• COIL	1	1	1	1
5	P	40521	SUB		VALVE, Manual Drain (SUB: P-92254-001)	1	1	1	1
6	P	751368	091		VALVE, Spring-loaded Check 3/8"	1	1	1	1
7	P	75426	091		VALVE, Flapper, Union Check 3/8"	1	1	1	1
8	P	750816	091		MOTOR AND PUMP ASSEMBLY	1	1	1	1
	P	750155	091		• SEAL ASSEMBLY	A/R	A/R	A R	A/R
9	P	751377	091		• IMPELLER KIT (Includes Seal Assembly)	A/R	A/R	A R	A/R
	P	764321	035		PURGE ELIMINATOR KIT (See Paragraph 7.16)	A/R	A/R	A R	A/R
	P	750708	001		MAINTENANCE MANUAL, Electro-Steam Generator (Not Shown)	A/R	A/R	A R	A/R

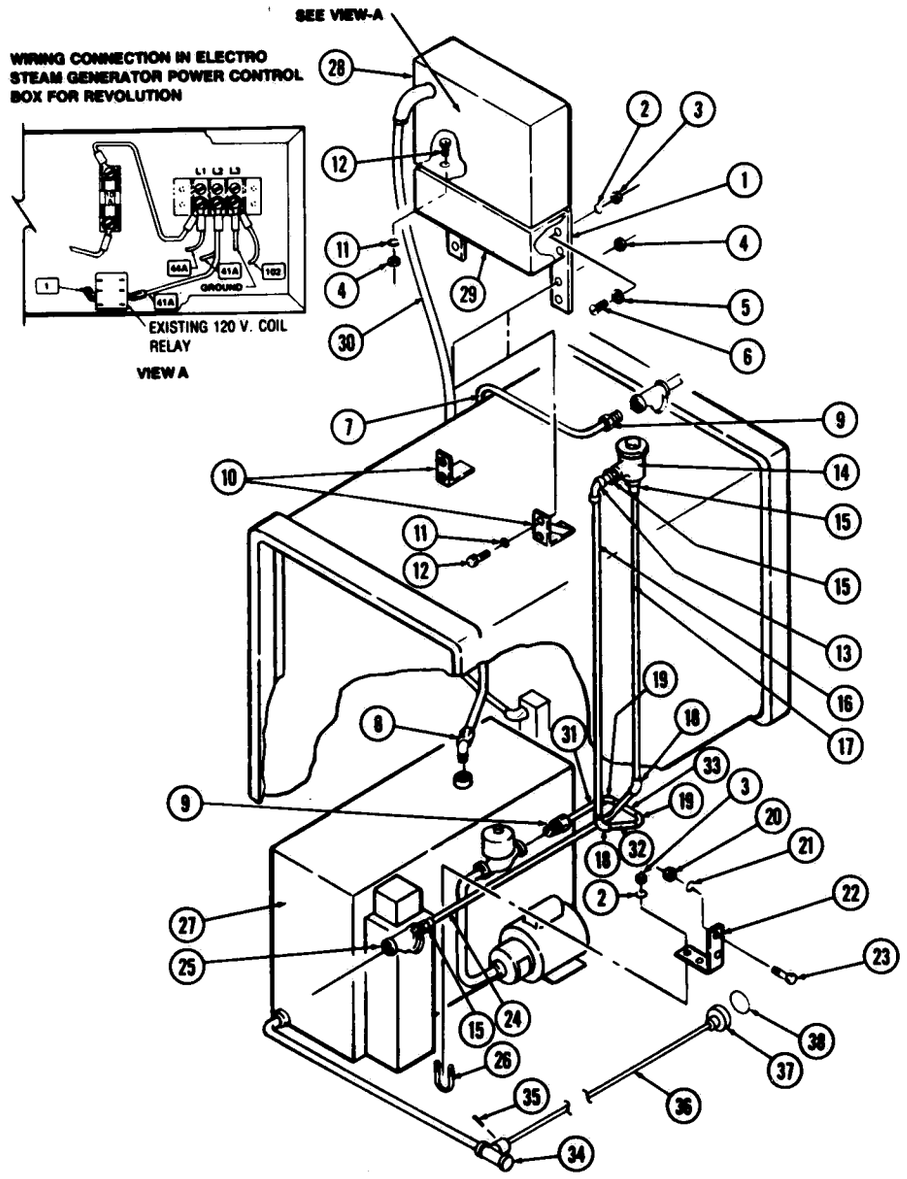
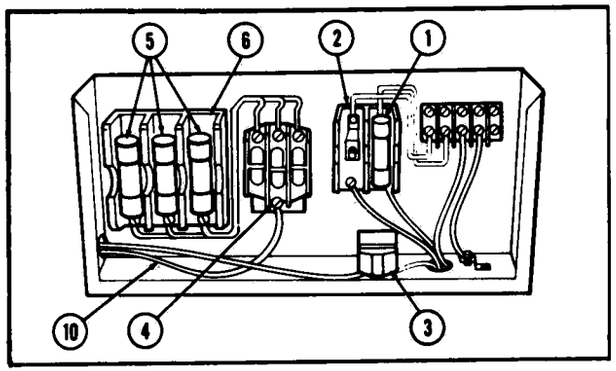


Figure 8-54. STEAM GENERATOR PIPING.
(Non-Solid State Control)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-54-					STEAM GENERATOR PIPING: 16x16 Gravity Model	X			
					STEAM GENERATOR PIPING: 20x20 Gravity Model		X		
					STEAM GENERATOR PIPING: 16x16 Isothermal Model			X	
					STEAM GENERATOR PIPING: 20x20 Isothermal Model				X
1	P	136262	001		WELDMENT, Switch Box	1	1	1	1
2	P	19685	061		LOCKWASHER	6	6	6	6
3	P	3039	041		NUT, Hex	6	6	6	6
4	P	3043	041		NUT, 5/16-18	6	6	6	6
5	P	17589	045		WASHER, Flat	4	4	4	4
6	P	39644	048		SCREW, #10-24	4	4	4	4
7	P	135265	002		TUBE, Steam Supply	1		1	
	P	136265	001		TUBE, Steam Supply		1		1
8	P	81064	001		FITTING, Ell, 1/2 NPT x 5/8 ODT	1	1	1	1
9	P	39072	091		FITTING, Straight	1	2	1	2
10	P	93049	001		BRACKET	2	2	2	2
11	P	19691	061		LOCKWASHER	6	6	6	6
12	P	30538	041		SCREW, Hex Head, 5/16-18 x 3/4	6	6	6	6
13	P	90217	091		ELL, 3/8 NPT x 5/8 ODT	1	1	1	1
14	P	90233	091		VACUUM BREAKER	1	1	1	1
	P	752477	091		• REPAIR KIT	A/R	A/R	A/R	A/R
15	P	90208	091		ADAPTER, 3/8 NPT x 5/8 ODT	3	3	3	3
16	P	83464	002		TUBE, 5/8 OD x 34-3/8	1		1	
	P	83464	003		TUBE, 5/8 OD x 39-1/4		1		1
17	P	83464	001		TUBE, 5/8 OD x 29-3/4	1		1	
	P	90400	091		TUBE, 5/8 OD x 31-3/4		1		1
18	P	89269	091		ELL, 45°, 5/8 ODT	2	2	2	2
19	P	90212	091		ELL, 90°, 5/8 OD	2	2	2	2
20	P	3040	042		NUT, Hex, 1/4-20 x 1	6	6	6	6
21	P	19686	061		LOCKWASHER, 1/4	6	6	6	6
22	P	93053	001		BRACKET	1	1	1	1
23	P	4002	041		SCREW, Round Head	4	4	4	4
24	P	93051	001		TUBE, 5/8 OD	1		1	
	P	93051	002		TUBE, 5/8 OD		1		1
25	P	47671	091		STRAINER, 3/8 NPT — Water	1	1	1	1
26	P	90301	045		U-BOLT	1	1	1	1
27					STEAM GENERATOR (See Fig. 8-53)	1	1	1	1
28					• CONTROL BOX (See Fig. 8-55)	1	1	1	1
29					• LIQUID LEVEL CONTROL (See Fig. 8-57)	1	1	1	1
30	P	146506	001		CABLE ASSEMBLY	1	1	1	1
31		90266	091		TUBE, 5/8 ODT x 2"	1	1	1	1
32	P	89245	091		TUBE, 5/8 ODT x 3-1/4"			1	
	P	90279	091		TUBE, 5/8 ODT x 4-3/4"	1			1
33	P	89391	091		TUBE, 5/8 ODT x 10"	1	1	1	1
34	P	45524	045		COUPLING	1	1	1	1
35	P	46038	061		PIN, Cotter	2	2	2	2
36	P	45502	043		ROD, 23-3/4"	1		1	
	P	45505	043		ROD, 29-3/4"		1		1
37	P	54899	091		KNOB	1	1	1	1
38	P	90833	091		DECAL	1	1	1	1



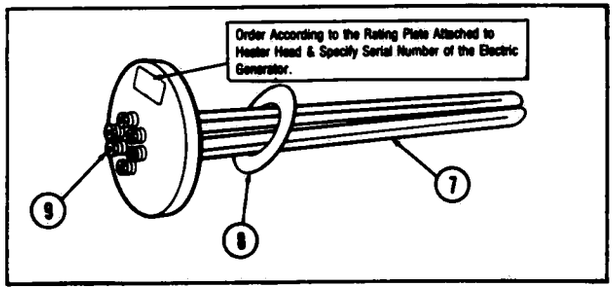


Figure 8-55. ELECTRIC COMPONENTS, OPTIONAL ELECTRO-STEAM GENERATOR.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-55-					ELECTRICAL COMPONENTS FOR ELECTRO-STEAM GENERATOR	X
1	P	764317	769		FUSE, Control Circuit (15 A; Box of 5)	1
2		18277	091		HOLDER, Fuse (15 A)	1
3	P	37606	091		RELAY	1
4	P	759745	001		CONTACTOR, 30 A, 120 V (41INB 30 AF)	
	P	759080	091		• POINTS	
	P	759749	001		• COIL, 120 V	
	P	759747	001		CONTACTOR, 50 A, 120 V (42CE 35 AF)	
	P	759081	091		• POINTS	
	P	759749	001		• COIL, 120 V	
	P	759252	091		CONTACTOR, 50 A, 220 V (42CE 35 AG)	
	P	759081	091		• POINTS	
	P	759079	091		• COIL, 220 V	
5	P	764317	774		FUSE, Heater, 5" (30 A, 600 V; Box of 5)	A/R
	P	764317	820		FUSE, Heater, 5-1/2" (40 A, 600 V; Box of 5)	A/R
	P	764317	838		FUSE, Heater, 5-1/2" (50 A, 250 V; Box of 5)	A/R
	P	764317	770		FUSE, Heater, 3" (60 A, 250 V; Box of 5)	A/R
6	P	752480	091		HOLDER, Fuse (30 & 40 A)	A/R
	P	750400	091		HOLDER, Fuse (50 & 60 A)	A/R
7	P	752709	091		HEATING ELEMENT, 15 kw (208 V)	A/R
	P	77318	091		HEATING ELEMENT, 15 kw (240 V)	A/R
	P	761728	001		HEATING ELEMENT, 15 kw (360 V)	A/R
	P	754749	091		HEATING ELEMENT, 15 kw (480 V)	A/R
	P	78826	091		HEATING ELEMENT, 20 kw (208 V)	A/R
	P	75425	091		HEATING ELEMENT, 20 kw (240 V)	A/R
	P	754278	091		HEATING ELEMENT, 20 kw (360 V)	A/R
	P	750382	091		HEATING ELEMENT, 20 kw (480 V)	A/R
8	P	75423	091		GASKET, Heater Head (Set of 3)	1
9	P	759078	091		JUMPERS, NUTS AND WASHERS, Heater Terminal	1
10	P	764319	975		RE-WIRE KIT	A/R

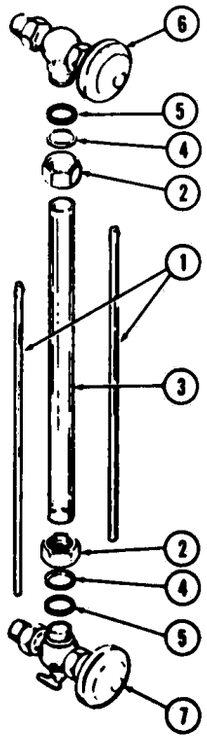


Figure 8-56. WATER-LEVEL SIGHT GLASS ASSEMBLY, OPTIONAL ELECTRO-STEAM GENERATOR.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-56-	P 764316 317		SIGHT GLASS ASSEMBLY	X
1	P 757717 091		ROD, Guard	2
2	P 761847 001		COLLAR, Retaining	2
3	P 75424 091		GLASS, Sight (Set of two with 12 washers) 12'' Long	1
4	P 752612 091		WASHER, Metal	2
5	P 751847 091		SEAL, Rubber	2
6	P 750363 091		TOP VALVE ASSEMBLY	1
7	P 750363 002		BOTTOM VALVE ASSEMBLY	1

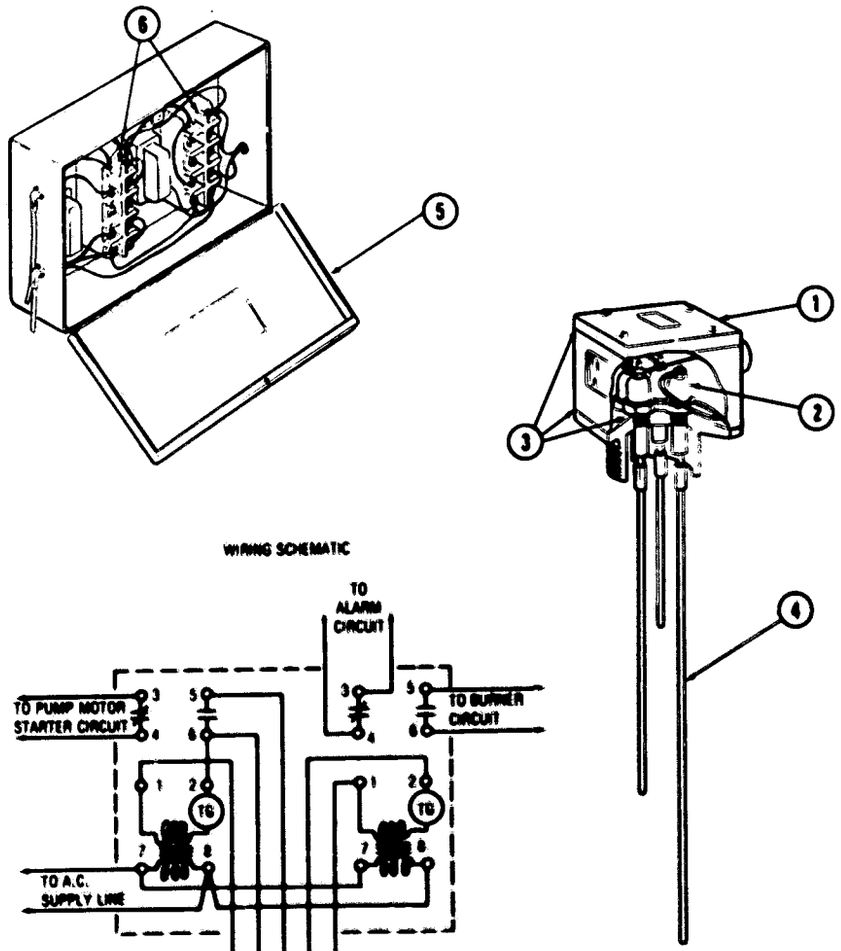
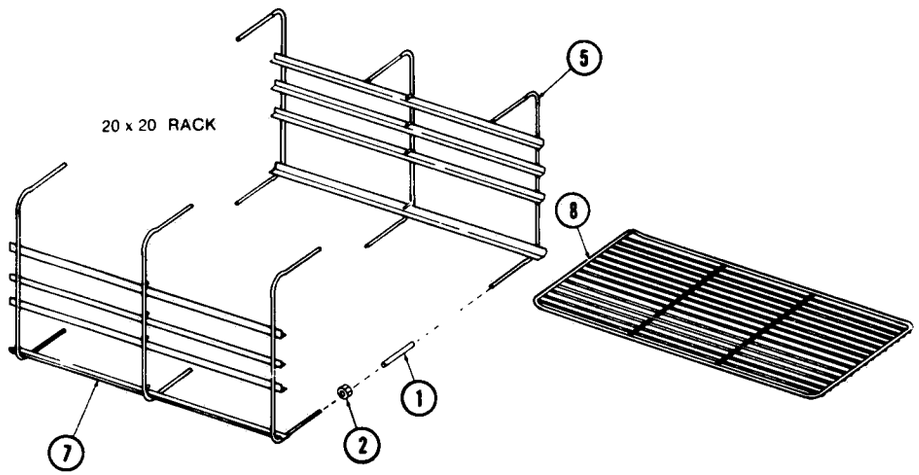


Figure 8-57. WATER-LEVEL CONTROL, OPTIONAL ELECTRO-STEAM GENERATOR.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-57			WATER-LEVEL CONTROL	*
1	P 752476 001		CONTROL HEAD	1
2	P 756363 001		• SPARK PLUG (Electrode Holder)	1
3	P 753089 001		• GASKET KIT (Includes Electrode, Housing and Cover Gaskets)	1
4	P 750409 001		• ROD, Control (Set of three Brass Rods) 11" Long	3
5	P 756744 001		RELAY BOX, Level Control (120 Volt)	1
6	P 74473 001		• RELAY (120 Volt)	2



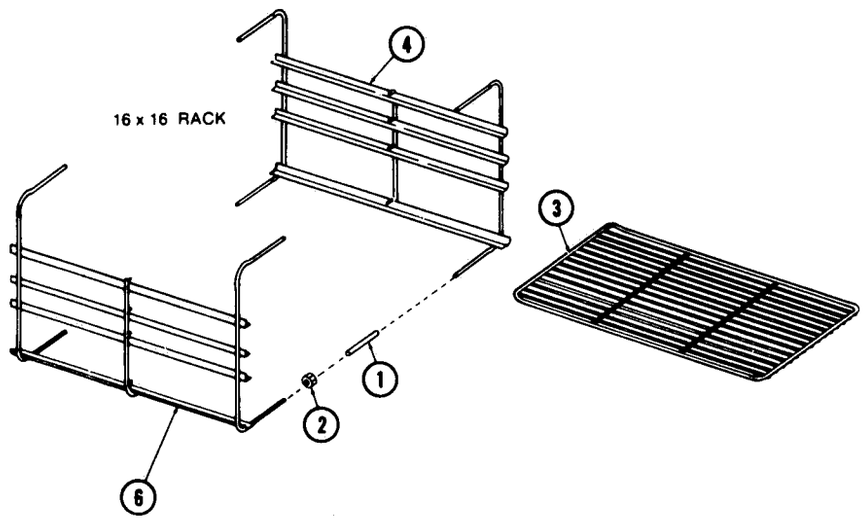


Figure 8-58. OPTIONAL RACK AND SHELVES.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-58-			OPTIONAL RACK AND TWO SHELVES. 16 x 16 Sterilizer	X			
			OPTIONAL RACK AND THREE SHELVES. 16 x 16 Sterilizer		X		
			OPTIONAL RACK AND TWO SHELVES. 20 x 20 Sterilizer			X	
			OPTIONAL RACK AND THREE SHELVES. 20 x 20 Sterilizer				X
1	P 91291 062		TUBE. Rack Retaining	4	4	6	6
2	P 8649 061		NUT, Hex Monel, 1/4-28	8	8	12	12
3	P 139537 068		WELDMENT. Chamber Shelf (15x22)	2	3		
4	P 136800 035		WELDMENT. Rack. R.H.	1	1		
5	P 136800 032		WELDMENT. Rack. R.H.			1	1
6	P 136800 036		WELDMENT. Rack. L.H.	1	1		
7	P 136800 033		WELDMENT. Rack. L.H.			1	1
8	P 139573 068		WELDMENT. Chamber Shelf (19x34)			2	3

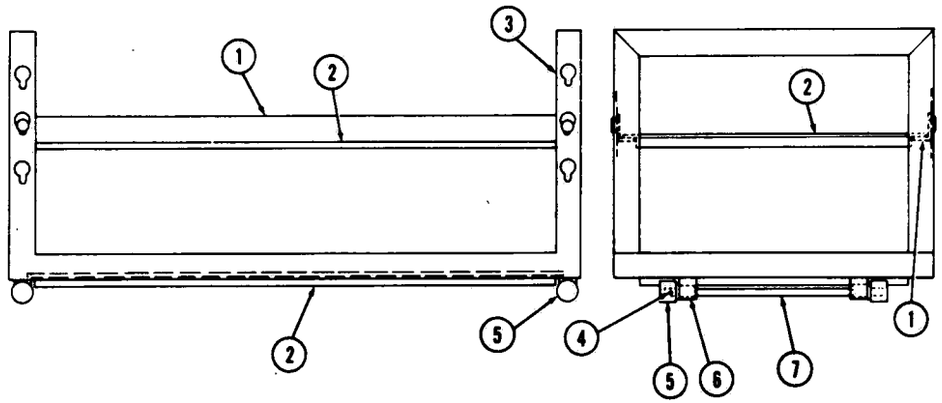


Figure 8-59. OPTIONAL LOADING CAR ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-59-			OPTIONAL LOADING CAR ASSEMBLY. 20x20 Sterilizer	1
1	P 30420 063		ANGLE	2
2	P 30422 063		SHELF	2
3	P 30414 063		FRAME	1
4	P 24956 061		ROLL PIN	4
5	P 30418 061		WHEEL	4
6	P 30417 091		BUSHING	4
7	P 30416 061		AXLE	2
8	P 56396 270		CHAMBER TRACK ASSEMBLY (Not Shown)	1

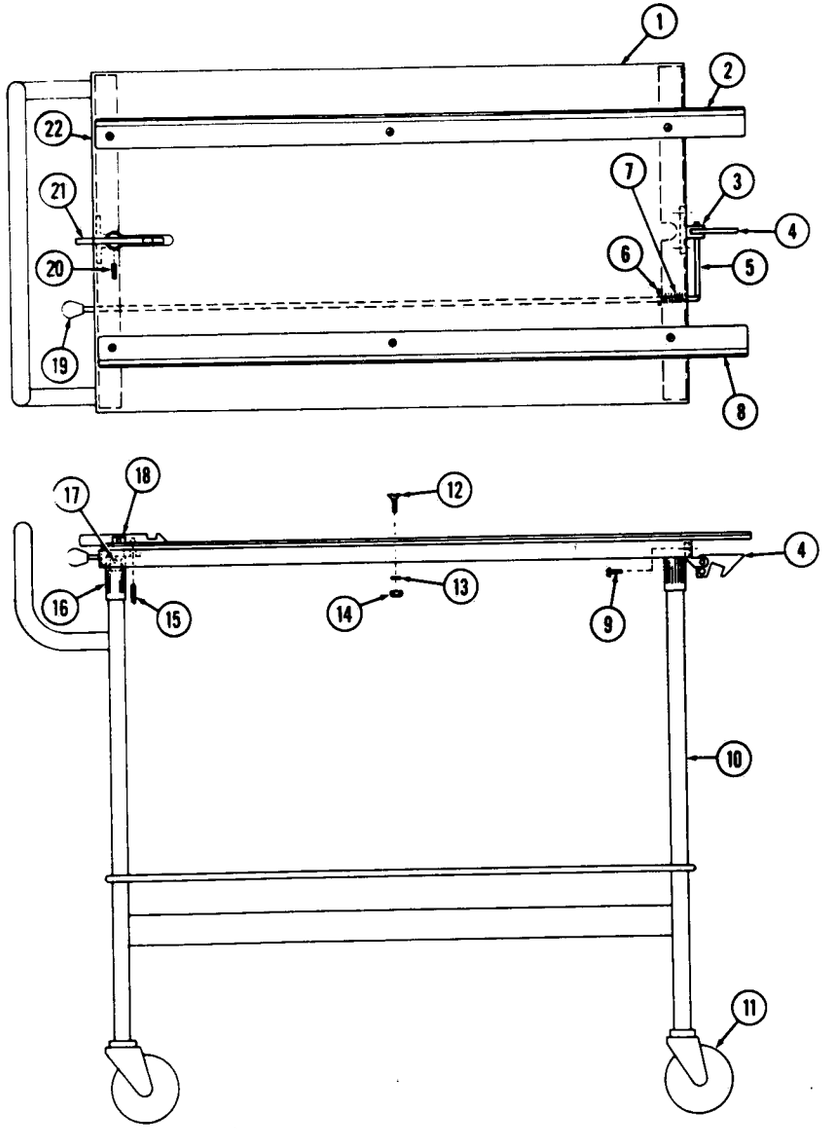


Figure 8-60. OPTIONAL TRANSFER CARRIAGE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-60-					OPTIONAL TRANSFER CARRIAGE ASSEMBLY. 20x20 Sterilizer	X
1	P	30459	063		TOP	1
2	P	30444	063		TRACK, Right Hand	1
3	P	30440	051		CATCH BLOCK	1
4	P	30447	063		CATCH, Door Frame	1
5	P	30449	061		CATCH ROD	1
6	P	759943	001		COTTER PIN	1
7	P	30458	061		SPRING	1
8	P	30455	063		TRACK, Left Hand	1
9	P	3999	041		SCREW, 1/4-20 x 5/8	4
10	P	139692	063		STAND ASSEMBLY	1
11	P	20542	091		CASTER	4
12	P	12549	062		SCREW, 1/4-20 x 5/8	6
13	P	19686	061		LOCKWASHER	6
14	P	8648	061		HEX NUT	6
15	P	30457	061		SPRING, Lock Lever	1
16	P	30446	052		ADJUSTING COLLAR	4
17	P	4772	045		SCREW, Set, 1/4-20 x 1/4	4
18	P	30448	051		BLOCK, Lock Lever	1
19	P	14918	091		KNOB	1
20	P	24268	061		ROLL PIN	2
21	P	30415	063		LOCK LEVER	1
22	P	30441	061		ANGLE ASSEMBLY	2

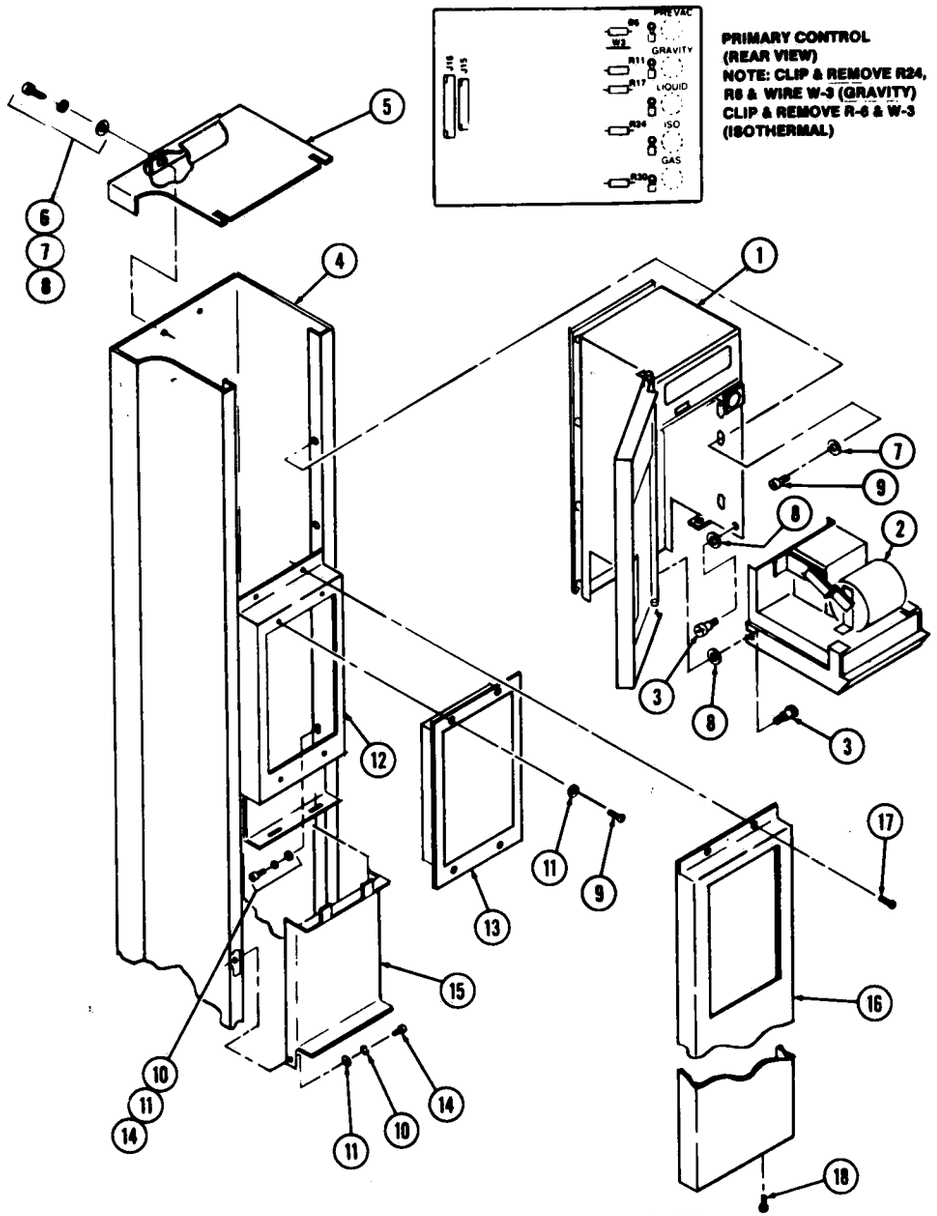


Figure 8-61. CONTROL COLUMN (Part 1 of 3)
(Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY	
					UNITS WITH PRINTCON:		
8-61-					CONTROL COLUMN: Gravity (Part 1 of 3)	X	
					CONTROL COLUMN: Isothermal (Part 1 of 3)		X
1					PRINTCON HOUSING ASSEMBLY (See Fig. 8-64)	1	1
2					PRINTCON PRINTER ASSEMBLY (See Fig. 8-65)	1	1
3	P	129356	032		SCREW, Shoulder, #10-32	2	2
4	P	146649	040		HOUSING, Control	1	1
5	P	134449	001		COVER, Top, Right Hand Column	1	1
	P	134449	002		COVER, Top, Left Hand Column	1	1
6	P	81672	002		SCREW, Socket Head Cap, #10-32 x 1/4	2	2
7	P	31705	045		LOCKWASHER, #10	2	2
8	P	5511	091		WASHER, Flat, #10	2	2
9	P	45323	042		SCREW, Button Socket Head, #8-32 x 3/8	8	8
10	P	79588	001		LOCKWASHER, #8	6	6
11	P	17796	091		WASHER, Flat, #8	14	14
12	P	146649	006		PANEL, Mounting	1	1
13	P	146645	226		CONTROL, Primary (Repaired P-764193-033)	1	1
	P	764317	536		• LAMP (Box of 10)	A/R	A/R
14	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	6	6
15	P	146649	073		PANEL, Secondary Assembly, Gravity (See Fig. 8-16)	1	
	P	146649	074		PANEL, Secondary Assembly, Isothermal (See Fig. 8-18)		1
16	P	146649	011		PANEL ASSEMBLY, Front	1	1
17	P	129356	135		SCREW, Button Head Socket, #8-32 x 3/8 (Black)	2	2
18	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3/8	2	2

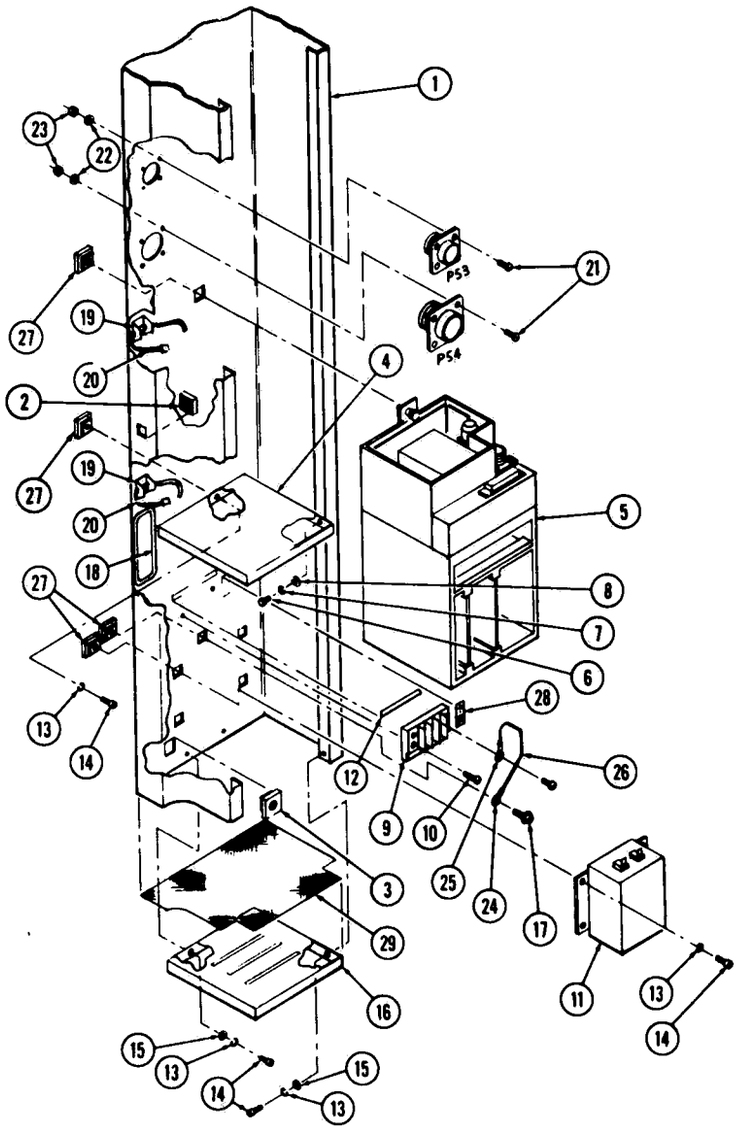


Figure 8-62. CONTROL COLUMN (Part 2 of 3)
(Units with Printcon)

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH PRINTCON:				
8-62-					CONTROL COLUMN: Gravity (Part 2 of 3)	X			
					CONTROL COLUMN: Isothermal (Part 2 of 3)		X		
1					HOUSING, Control (Ref. Only)				
2	P	91924	091		NUT, Tinnerman, 1/4-20	6	6		
3	P	129352	090		NUT, Tinnerman, 3/8-16	4	4		
4	P	136759	001		SUPPORT, Controller	1	1		
5					MAIN CONTROL ASSEMBLY: Gravity (See Fig. 8-15)	1			
					MAIN CONTROL ASSEMBLY: Isothermal (See Fig. 8-15)		1		
6	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1 2	2	2		
7	P	79538	001		LOCKWASHER, #8	2	2		
8	P	17796	091		WASHER, Flat, #8	2	2		
9	P	90746	091		STRIP, Terminal	1	1		
10	P	9661	041		SCREW, #10-32 x 5/8	2	2		
11	P	93821	001		FILTER	1	1		
12	P	82647	001		STRIP, Marker	1	1		
13	P	31705	045		LOCKWASHER, #10	10	10		
14	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3 8	10	10		
15	P	5511	091		WASHER, Flat, #10	4	4		
16	P	136588	002		PLATE, Bottom	1	1		
17	P	82675	001		SCREW, Green Ground, #10-32	1	1		
18	P	150733	001		GROMMET	1	1		
19	P	129326	001		HOLDER, Wire	11	11		
20	P	75954	091		TIE, Wire	28	28		
21	P	3984	041		SCREW, Round Head, #6-32 x 3/8	8	8		
22	P	5469	041		WASHER, Flat, #6	8	8		
23	P	3037	041		NUT, Hex, #6-32	8	8		
24	P	19522	091		TERMINAL, Wire #10 Ring x 16-22 AWG	1	1		
25	P	14865	091		TERMINAL, Wire #8 Ring x 22-18 AWG	1	1		
26					WIRE, Green	1	1		
27	P	129352	069		NUT, Tinnerman, #10-32	8	8		
28					TAPE, Label (Dymo or equiv.)	AR	AR		
29	P	56374	001		SCREEN	1	1		

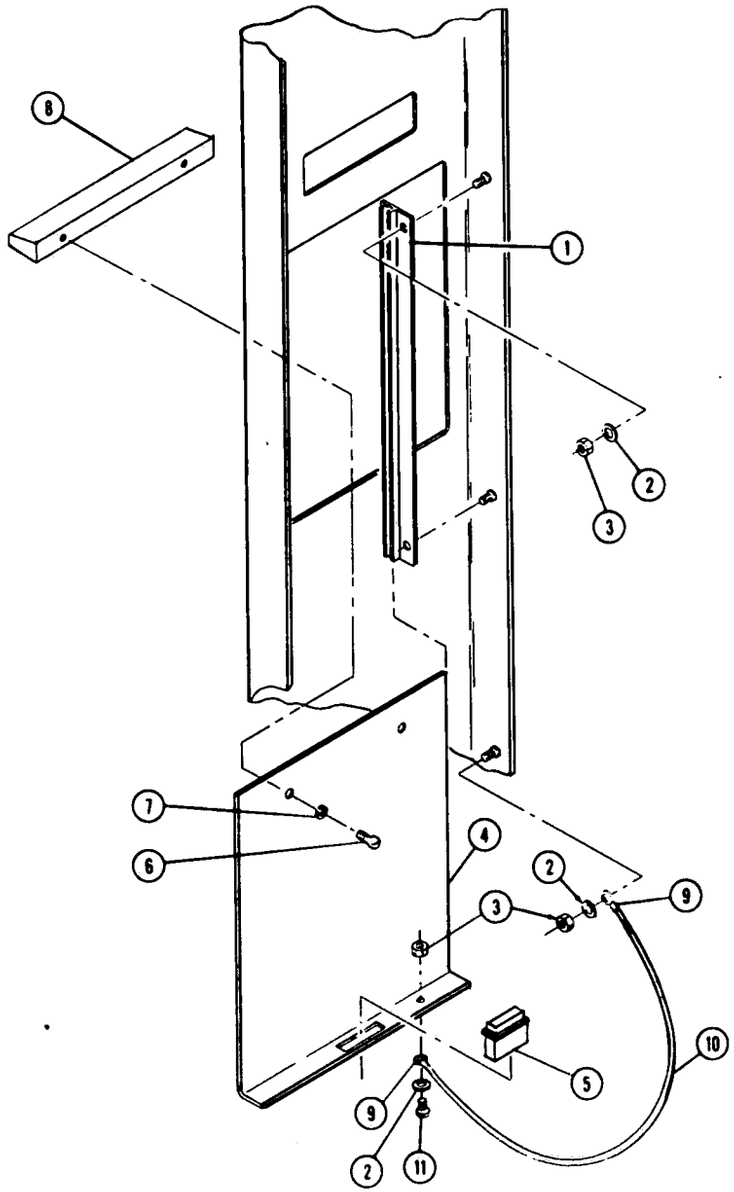


Figure 8-63. CONTROL COLUMN (Part 3 of 3)
(Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-63-					CONTROL COLUMN (Part 3 of 3)	X
1	P	84394	001		SLIDE, Door	2
2	P	5469	041		WASHER, Flat, #6	6
3	P	3037	041		NUT, Hex, #6-32	6
4	P	93662	001		DOOR	1
5	P	83920	001		CATCH, Magnetic	1
6	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2
7	P	79588	001		LOCKWASHER, #8	2
8	P	84393	001		HANDLE	1
9	P	90619	091		TERMINAL, #6 Ring x 18-22 AWG	2
10					WIRE, Green, 15" Lg.	1
11	P	50705	041		SCREW, Flat Head, #6-32 x 5/16	1

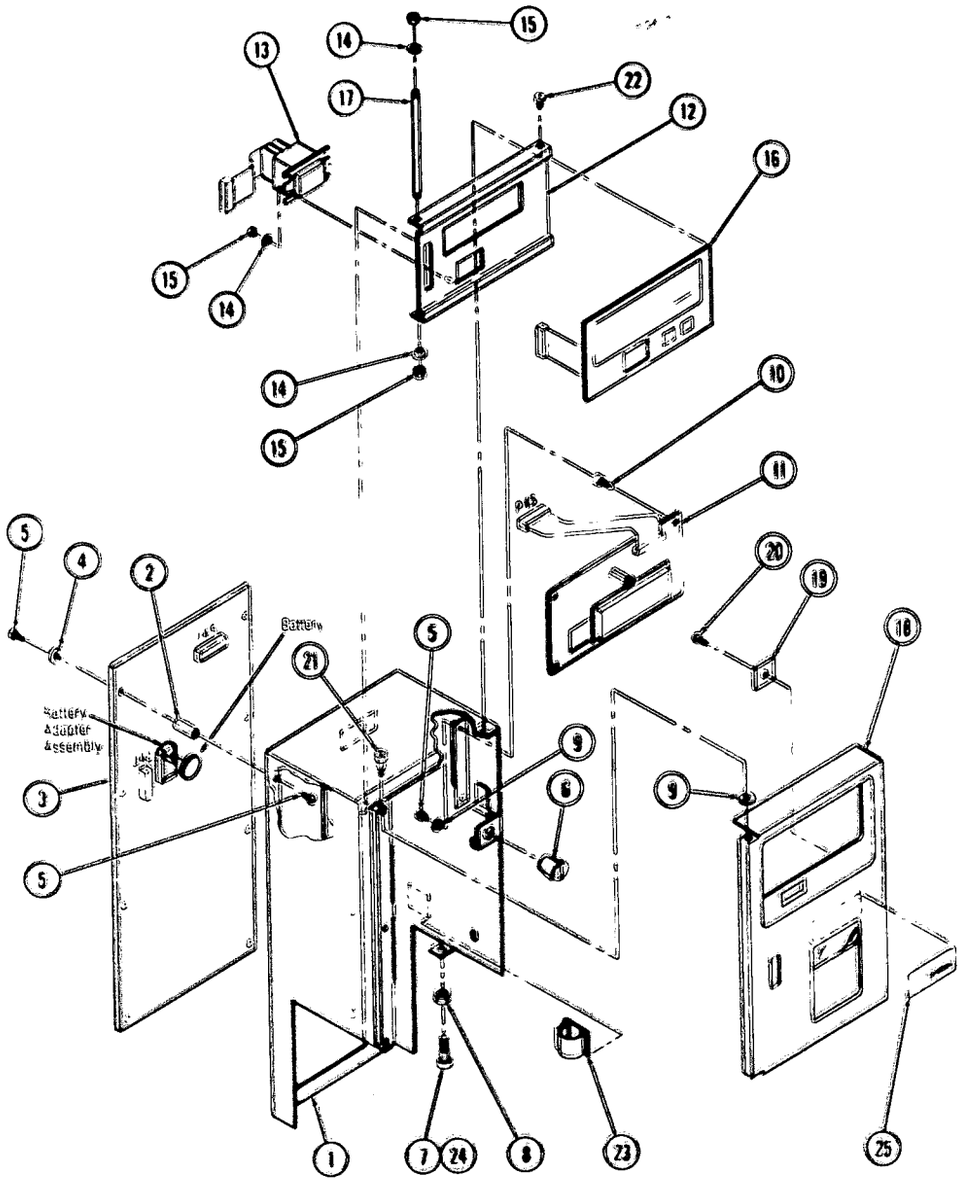


Figure 8-64. PRINTCON HOUSING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-64-				PRINTCON HOUSING ASSEMBLY	A
1	P	146649	001	HOUSING Modem	1
2	P	129056	003	STAND-OFF	3
3	P	146651	001	P C BOARD ASSEMBLY Printcon Control (Repaired P-7611-8-025)	1
	P	129056	NLA	* BATTERY Clamp Cork (SUB Consult P- 5022-35)	1
	P	150622	349	* BATTERY Consult w Adapter Assembly	A/R
4	P	129052	004	WASHER Flat #6 Nylon	3
5	P	12451	041	SCREW Rd Hd #6-32 x 1/4	3
6	P	129056	001	CATCH Magnetic	1
7	P	41012	051	SCREW Socket Head #10-32 x 1/2	2
8	P	2959	041	NUT Hex #10-32	2
9	P	6469	041	WASHER Flat #6	3
10	P	84147	001	SUPPORT Circuit Board	1
11	P	146653	001	DISPLAY BOARD ASSEMBLY Digi Print (Repaired P-7611-8-029)	1
12	P	99900	001	DISPLAY BRACKET ASSEMBLY	1
13	P	99900	022	SWITCH Thumbwheel	1
14	P	84114	001	WASHER Flat #4	4
15	P	13794	041	NUT Hex #4-40	4
16	P	136805	004	PANEL Overlay Display	1
17	P	129056	023	STUD	1
18	P	146649	003	DOOR Print Display	1
19	P	129056	002	STRIKE	1
20	P	82340	001	SCREW Flathead Self Tapping #6 x 5/16	4
21	P	129056	006	SCREW Shoulder #4-40 x 1/8	2
22	P	40057	045	SCREW Self Tapping #6 x 1/4	1
23	P	150639	001	CLIP Cable	1
24	P	5300	040	WASHER	AR
25	P	129056	042	LABEL Printcon	1

*Units manufactured prior to 27 August 1984 will require the Adapter Assembly P-5022-349 to be used with Battery Pack P-24

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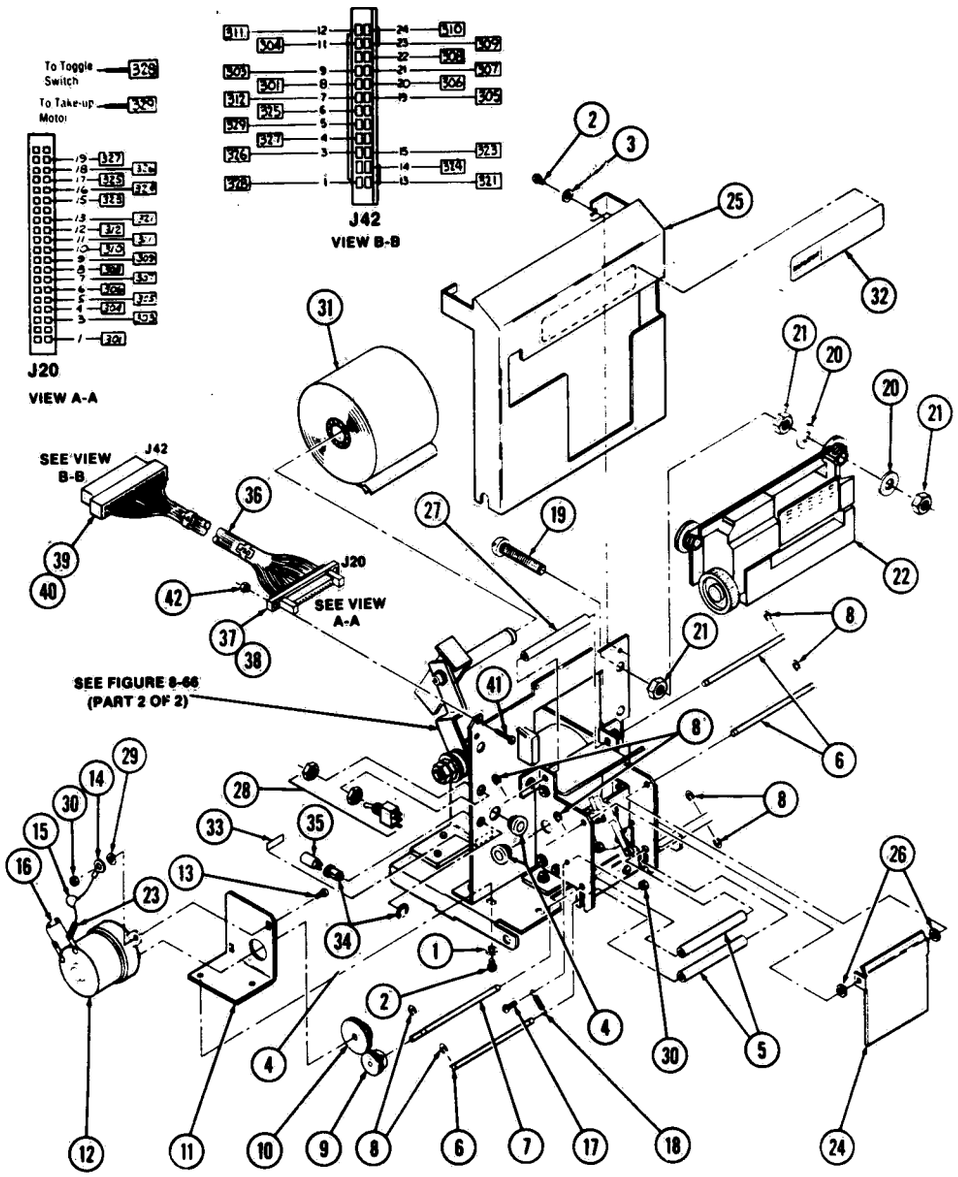


Figure 8-65. PRINTCON PRINTER ASSEMBLY, Units Before 6/85 (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-65-					PRINTCON PRINTER ASSEMBLY, Units Before 6/85 (Part 1 of 2)	X
1	P	18131	091		LOCKWASHER, #6	2
2	P	12451	041		SCREW, Rd. Hd., #6-32 x 1/4	8
3	P	5469	091		WASHER, Flat, #6	2
4	P	77797	091		BUSHING, Snap	2
5	P	129356	015		ROLLER	2
6	P	129356	016		SHAFT, Roller	3
7	P	129356	024		SHAFT, Drive Roller	1
8	P	45301	091		E-RING	6
9	P	129356	028		GEAR, Drive Roller	1
10	P	129356	027		GEAR, Motor Shaft	1
11	P	129356	017		MOUNT, Motor	1
12	P	129356	029		MOTOR, Take-up	1
13	P	17659	041		SCREW, Round Head, #4-40 x 1/4	2
14	P	90619	091		TERMINAL, Ring, #5 Stud, 22-16 Wire	1
15	P	93437	001		CAPACITOR, .01 microfarad	2
16	P	84157	001		DIODE, IN 4001	1
17	P	13334	091		SCREW, Round Head, #4-40 x 3/8	2
18	P	129356	008		SPRING, Extension	2
19	P	4004	041		SCREW, Round Head, #1/4-20 x 1-1/2	3
20	P	31599	041		WASHER, Flat, 1/4	6
21	P	3040	042		NUT, Hex	9
22	P	136800	081		PRINTER	1
	P	129356	118		• CARTRIDGE, Inked Ribbon (Box of 2)	AR
23					INSULATION, .064 I.D. x 1-1/4	2
24	P	129356	020		PLATEN	1
25	P	136805	009		COVER	1
26	P	129352	094		WASHER, Flat, #6 Nylon	2
27	P	129352	115		TUBE, Roller	1
28	P	129356	131		SWITCH, Toggle, SPDT	1
29	P	84114	001		WASHER, Flat, #4	2
30	P	13794	041		NUT, Hex, #4-40	4
31	P	129356	116	**	PAPER, 1-Ply (Box of 3)	AR
	P	129356	117	**	PAPER, 2-Ply (Box of 3)	AR
32	P	150822	345		DECAL, Information	1
33	P	92615	015		DECAL, 1/32 Amp	1
34	P	150822	382		HOLDER, Micro-fuse	1
35	P	150822	381		MICROFUSE, 1/32 Amp	1
36	P	136805	058		CABLE ASSEMBLY, Printer, J20 to J42	1
37	P	150822	364		• PIN, Contact	17
38	P	150822	335		• PLUG, Housing, 40 Pos. Double Row	1
39	P	84229	005		• HOUSING, Receptacle, 24 Pos. Double Row	1
40	P	84187	003		• CONTACT, Receptacle	19
41	P	150824	124		SCREW, Rd. Hd. 2-56 x 3/4	2
42	P	10370	045		NUT, Hex, 2-56	2

**AMSCO recommends using 2-ply paper.

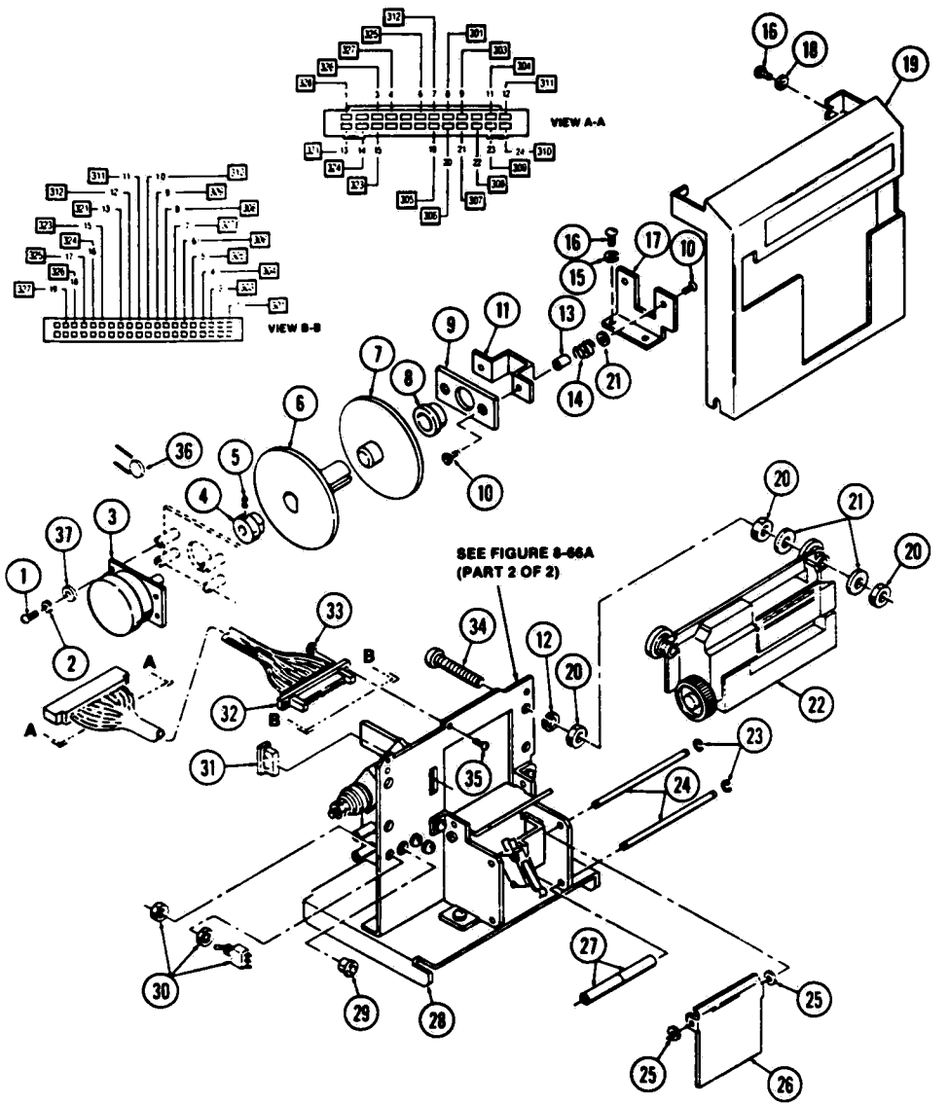


Figure 8-65A. PRINTCON PRINTER ASSEMBLY, Units After 6/85 (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-65A-	P	141198	171		PRINTCON PRINTER ASSEMBLY, Units After 6/85 (Part 1 of 2)	X
1	P	90993	091		SCREW, Round Head, #4-40 x 3/4	4
2	P	81682	003		LOCKWASHER, #4	4
3	P	41269	091		MOTOR	1
4	P	150822	480		STUD, Drive	1
5	P	129352	117		SETSCREW, #5-40	1
6	P	93896	077		SPOOL, Drive End	1
7	P	56396	300		SPOOL, Idler End	1
8	P	129352	662		BEARING, Flange	1
9	P	150822	543		RETAINER	1
10	P	38698	041		SCREW, Flat Head, #8-32 x 1/4	4
11	P	150822	546		RELEASE, Reel	1
12	P	26962	061		LOCKWASHER	3
13	P	150822	541		SPACER	2
14	P	129352	659		SPRING	2
15	P	18131	091		LOCKWASHER	2
16	P	12451	041		SCREW, Round Head, #6-32 x 1/4	4
17	P	150822	542		SUPPORT	1
18	P	5469	041		WASHER, Flat, #6	4
19	P	134468	531		COVER	1
20	P	3040	042		NUT, Hex, 1/4-20	9
21	P	31599	041		WASHER, Flat, 1/4	8
22	P	136800	081		PRINTER	1
23	P	45301	091		E-RING	6
24	P	129356	016		SHAFT, Roller	3
25	P	129352	094		WASHER, Nylon, #6	2
26	P	129356	020		PLATEN	1
27	P	129352	115		TUBE, Roller	4
28					FRAME ASSEMBLY, Printer (See Fig. 8-66A)	1
29	P	77797	091		BUSHING, Snap	2
30	P	129356	131		SWITCH, Toggle (SPDT)	1
31	P	150475	014		CATCH, Magnetic	1
32	P	134468	530		CABLE ASSEMBLY	1
33	P	10370	045		NUT, Hex, #2-56	2
34	P	4004	041		SCREW, Round Head, 1/4-20 x 1-1/2	3
35	P	150824	124		SCREW, Round Head, #2-56 x 3/4	2
36	P	150777	001		CAPACITOR, .01μfd	1
37	P	84114	001		WASHER, Flat, #4	4
	P	611962	769	*	REPLACEMENT KIT	A/R

*To replace printers on units manufactured before 6/85.

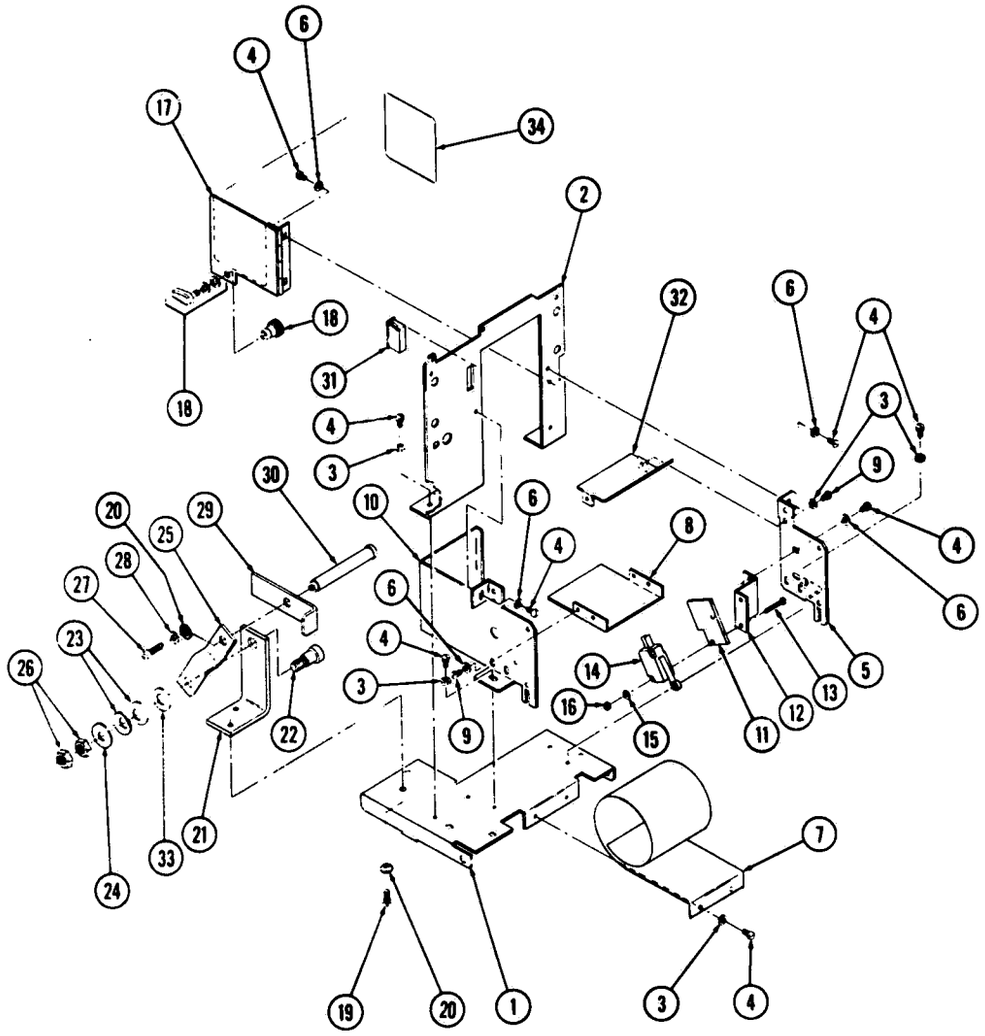


Figure 8-66. PRINTCON PRINTER ASSEMBLY, Units Before 6/85 (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-66-			PRINTCON PRINTER ASSEMBLY, Units Before 6/85 (Part 2 of 2)	X
1	P 136805	012	BASE, Mounting	1
2	P 136805	011	PLATE, Printer Mount	1
3	P 18131	091	LOCKWASHER, #6	9
4	P 12451	041	SCREW, Rd. Hd., #6-32 x 1/4	11
5	P 93900	039	SIDE PLATE, Right Hand	1
6	P 5469	091	WASHER, Flat, #6	8
7	P 93900	009	COIL	1
8	P 93900	018	PLATE, Guide	1
9	P 77074	045	SCREW, Self Tapping, #8-18 x 3/8	2
10	P 136805	014	SIDE PLATE, Left Hand	1
11	P 90124	091	INSULATOR	1
12	P 129356	014	MOUNT, Switch	1
13	P 90993	091	SCREW, Round Head, #4-40 x 3/4	2
14	P 129356	SUB	SWITCH, Roller (Platen Microswitch) (SUB: P-150822-343)	1
15	P 84114	001	WASHER, Flat, #4	2
16	P 13794	041	NUT, Hex, #4-40	2
17	P 93900	005	DOOR ASSEMBLY	1
18	P 129356	009	ARROWHEAD LATCH	1
19	P 12539	061	SCREW, Round Head, #10-32 x 3/8	2
20	P 5511	091	WASHER, Flat, #10	3
21	P 93900	040	ANGLE, Pivot	1
22	P 150044	001	SCREW, Shoulder, 3/8 Dia. x 3/8 Lg. x 5/16-18	1
23	P 129356	132	WASHER, Belleville Spring, .38 I.D. x .75 O.D.	2
24	P 36690	051	WASHER, Flat, .328 I.D. x .812 O.D. x .062 Thick	1
25	P 129356	112	ARM, Pivot	1
26	P 19172	061	NUT, Hex Jam, 5/16-18	2
27	P 33061	061	SCREW, Socket Head, #10-32 x 3/8	1
28	P 19685	061	LOCKWASHER, #10	1
29	P 129356	110	STOP	1
30	P 129356	111	SPINDLE	1
31	P 150475	014	CATCH, Magnetic	1
32	P 93900	010	PLATE, Paper-Feed	1
33	P 10412	042	WASHER, Flat, 3/8	1
34	P 93900	002	LABEL, Paper Loading Diagram	1

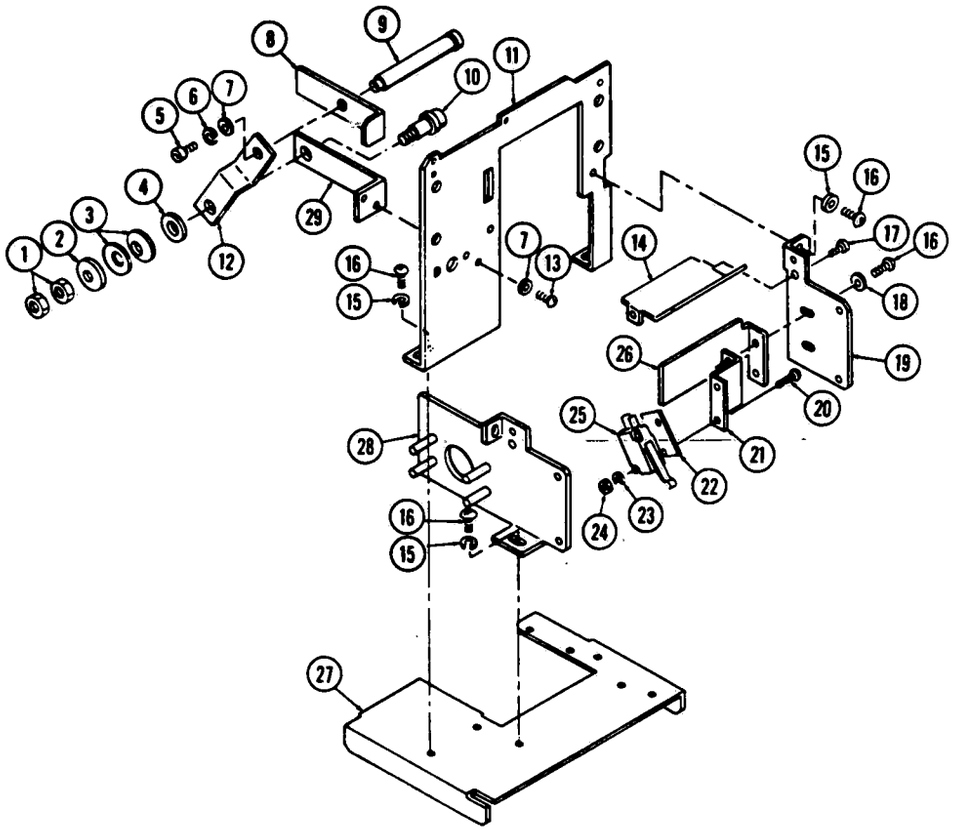


Figure 8-66A. PRINTCON PRINTER ASSEMBLY, Units After 6/85 (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-66A-					PRINTCON PRINTER ASSEMBLY, Units After 6/85 (Part 2 of 2)	X
1	P	19172	061		NUT, Jam, 5/16-18	2
2	P	36690	051		WASHER, Flat	1
3	P	129356	132		WASHER, Belleville	2
4	P	10412	042		WASHER, Flat	1
5	P	33061	061		SCREW, Socket Head, #10-32 x 5/8	1
6	P	19685	061		LOCKWASHER, #10	1
7	P	5511	091		WASHER, Flat, #10	3
8	P	129356	110		STOP	1
9	P	150822	540		SPINDLE	1
10	P	150044	001		SCREW, Shoulder, 5/16-18	1
11	P	134468	528		PLATE, Mounting	1
12	P	129356	112		ARM, Pivot	1
13	P	12539	061		SCREW, Round Head, #10-32 x 3/8	2
14	P	93900	010		PLATE, Paper Feed	1
15	P	18131	091		LOCKWASHER, #6	7
16	P	12451	041		SCREW, Round Head, #6-32 x 1/4	7
17	P	77074	045		SCREW, Self-tapping, #8-18 x 3/8	2
18	P	5469	041		WASHER, Flat, #6	2
19	P	56396	298		SIDE, RH	1
20	P	90993	091		SCREW, Round Head, #4-40 x 3/4	2
21	P	129356	014		MOUNT, Switch	1
22	P	90124	091		INSULATOR	1
23	P	81682	003		LOCKWASHER, #4	2
24	P	13794	041		NUT, Hex, #4-40	2
25	P	150822	343		SWITCH, Roller Arm	1
26	P	150822	544		SHIELD	1
27	P	134468	527		BASE, Printer	1
28	P	56396	297		SIDE, LH	1
29	P	56396	299		ANGLE, Pivot	1

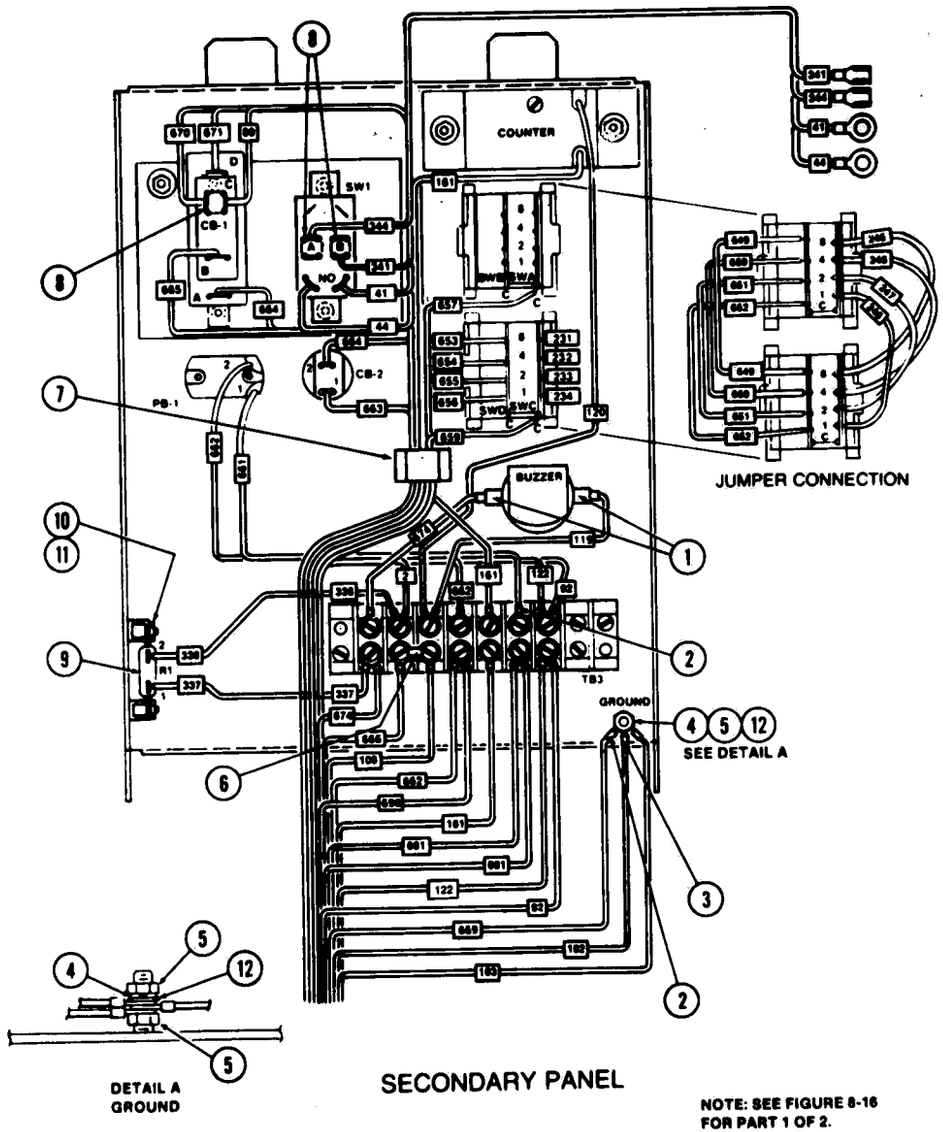


Figure 8-67. SECONDARY CONTROL PANEL: Gravity (Part 2 of 2). (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
				UNITS WITH PRINTCON:	
8-67-	P	146649	073	SECONDARY CONTROL PANEL: Gravity Model (Part 2 of 2)	X
1	P	91694	091	RECEPTACLE, 3/16 Lug x #18-22 Wire	2
2	P	90619	091	TERMINAL, Wire, #6 Ring x #18-22 Wire	13
3	P	14590	091	TERMINAL, Wire, #8 Stud x #16-14 Wire	3
4	P	18131	091	LOCKWASHER, #6	1
5	P	3037	041	NUT, Hex, #6-32	2
6	P	84123	001	JUMPER, Terminal Block	1
7	P	431152	091	CLIP	1
8	P	32118	091	ADAPTER, Terminal	3
9	P	129318	001	RESISTOR, 3 kΩ, R1	1
10	P	13794	041	NUT, Hex	2
11	P	26032	091	WASHER, Flat	2
12	P	17589	045	WASHER, Flat	1

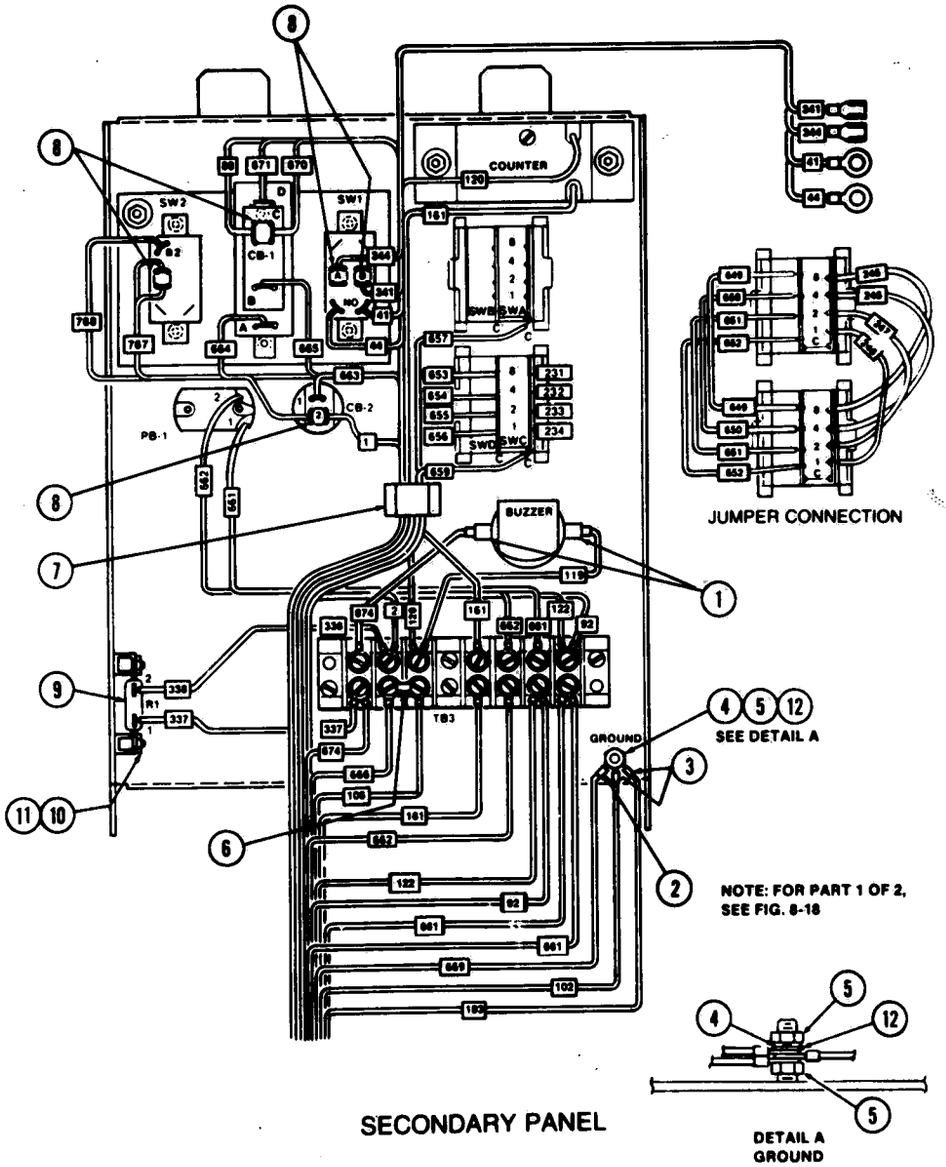


Figure 8-68. SECONDARY CONTROL PANEL: Isothermal Model (Part 2 of 2). (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-68-	P	146649	074		SECONDARY CONTROL PANEL: Isothermal Model (Part 2 of 2)	X
1	P	91694	091		RECEPTACLE, 3/16 Lug x #18-22 Wire	2
2	P	90619	091		TERMINAL, Wire, #6 Ring x #18-22 Wire	13
3	P	14590	091		TERMINAL, Wire, #8 Stud x #16-14 Wire	5
4	P	18131	091		LOCKWASHER, #6	1
5	P	3037	041		NUT, Hex, #6-32	2
6	P	84123	001		JUMPER, Terminal Block	1
7	P	431152	091		CLIP	1
8	P	32118	091		ADAPTER, Terminal	5
9	P	129318	001		RESISTOR, 3 kΩ, R1	1
10	P	13794	041		NUT, Hex	2
11	P	26032	091		WASHER, Flat	2
12	P	17587	045		WASHER, Flat	1

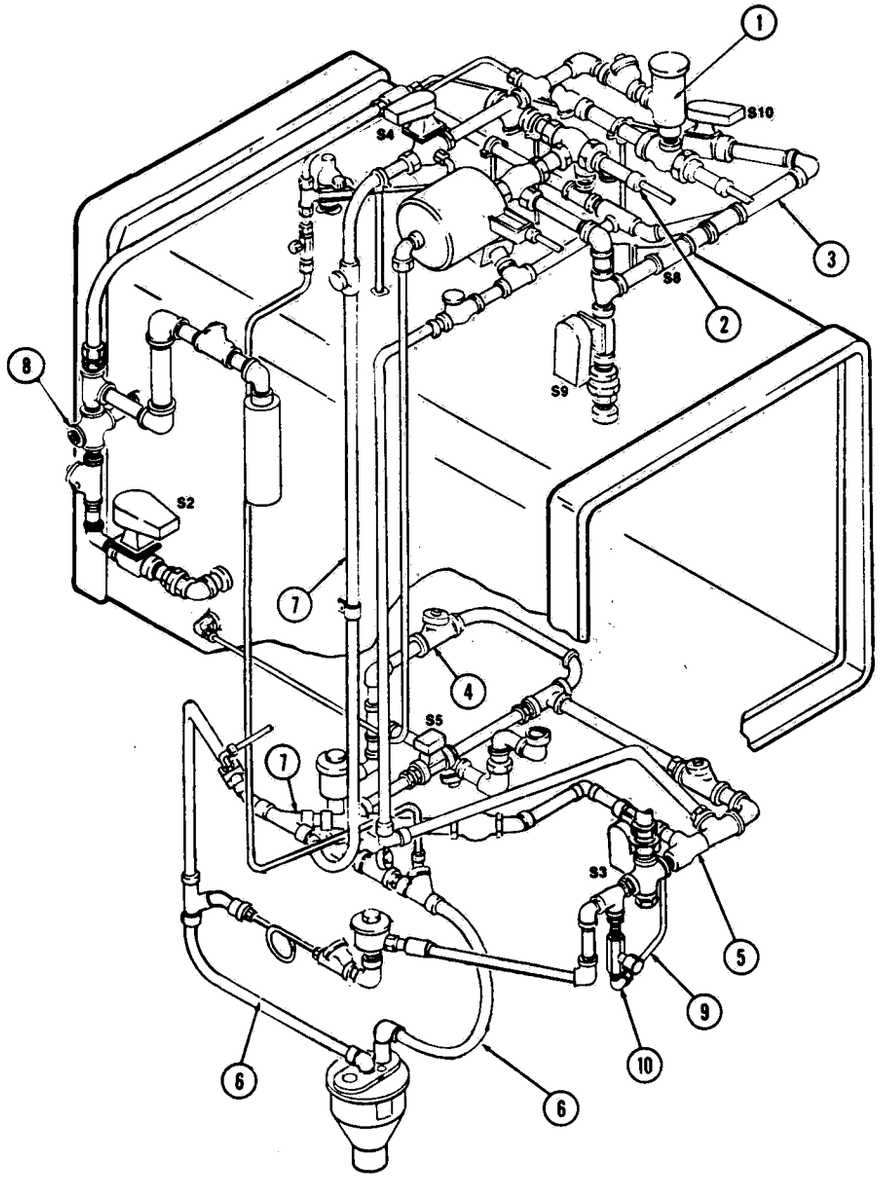


Figure 8-69. PIPING ASSEMBLY: Complete. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
				UNITS WITH PRINTCON:	
8-69-	146649			PIPING ASSEMBLY, Complete	X
1	P 136673	001		WATER PIPING (See Fig. 8-25 and 8-33)	1
2	P 93708	001		STEAM PIPING (See Fig. 8-25 and 8-32)	1
3				ISOTHERMAL PIPING (See Fig. 8-28 and 8-29)	1
4	P 134466	001		JACKET STEAM RETURN (See Fig. 8-31)	1
5	P 136805	019		CHAMBER DRAIN (See Fig. 8-73)	1
6				DRAIN ASSEMBLIES (See Fig. 8-71, 8-36 and 8-37)	1
7	P 56396	002		CONDENSER PIPING (See Fig. 8-76, 8-77 and 8-35)	1
8	P 93715	001		AIR BREAK PIPING (See Fig. 8-25 and 8-34)	1
9	P			TUBE, 5/16 O.D. x 8-7/16	1
10	P 7033	091		ELL, Compression, 5/16 O.D.T. x 1/4 N.P.T.	1

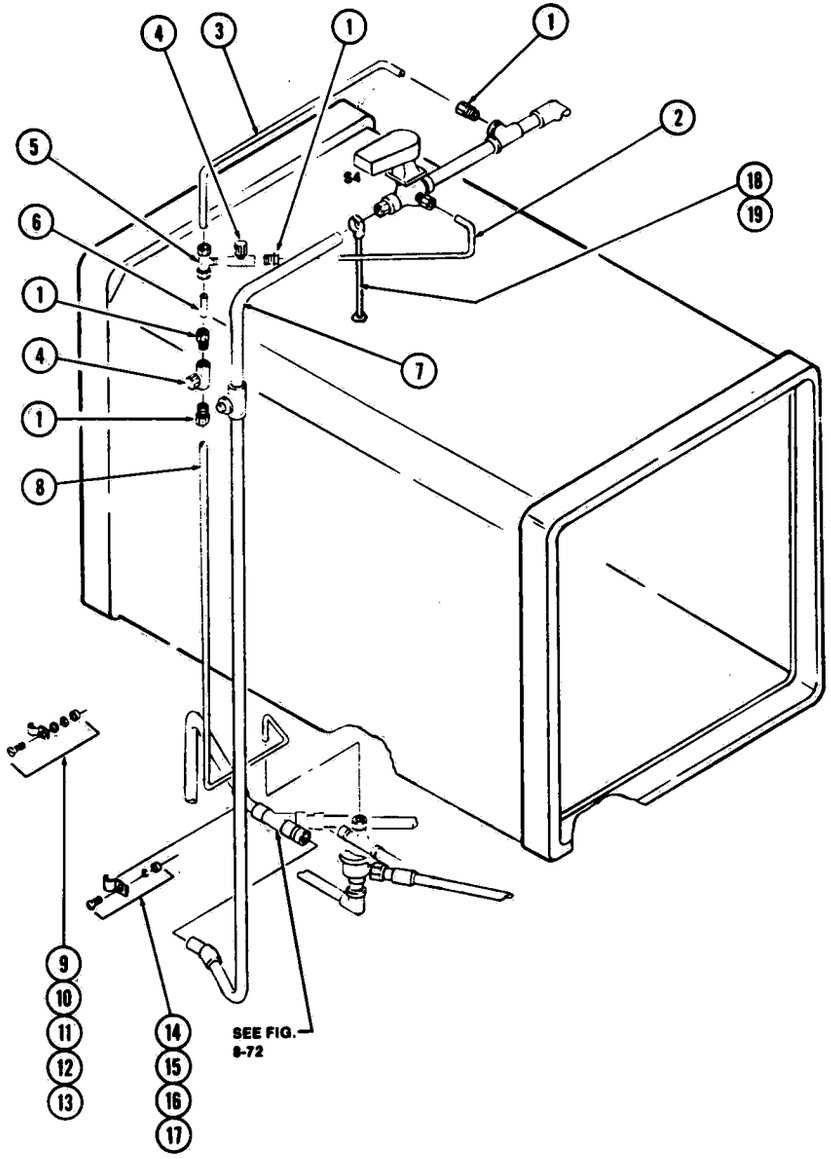


Figure 8-70. CONDENSER PIPING. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH PRINTCON:				
8-70-					CONDENSER PIPING: 16x16 Gravity	X			
					CONDENSER PIPING: 20x20 Gravity		X		
					CONDENSER PIPING: 16x16 Isothermal			X	
					CONDENSER PIPING: 20x20 Isothermal				X
1	P	19514	091		FITTING, 1/4 O.D.T. x 1/8 N.P.T.	4	4	4	4
2					TUBE, 1/4 O.D. x 7-25/32	1	1	1	1
3					TUBE, 1/4 O.D. x 10-7/8	1	1	1	1
4	P	83630	001		VALVE, Needle, 1/8 N.P.T.	2	2	2	2
5	P	42581	091		TEE, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1	1	1	1
6	P	90340	091		TUBE, 1/4 O.D. x 2-3/8	1	1	1	1
7	P	93716	001		WATER CONDENSER PIPING ASSEMBLY (See Fig. 8-30)	1			
	P	93716	002		WATER CONDENSER PIPING ASSEMBLY (See Fig. 8-30)		1		
8					TUBE, 1/4 O.D. x 48-7/8	1			
					TUBE, 1/4 O.D. x 56-7/8		1		
9	P	26270	091		CLAMP	1	1	1	1
10	P	3986	041		SCREW, #8-32 x 1/2	1	1	1	1
11	P	5561	091		WASHER, Flat	1	1	1	1
12	P	90991	091		LOCKWASHER	1	1	1	1
13	P	3038	041		NUT, Hex, #8-32	1	1	1	1
14	P	90513	091		CLAMP, Tube, 5/8	1	1	1	1
15	P	41805	044		SCREW, Hex Head, #10-32 x 5/8	1	1	1	1
16	P	76801	045		LOCKWASHER	1	1	1	1
17	P	2959	041		NUT, #10-32	1	1	1	1
18	P	75376	010		CLAMP, Pipe, 3/8	1	1	1	1
19	P	150822	294		NIPPLE, 1/4 N.P.T. x 12, Steel	1	1	1	1

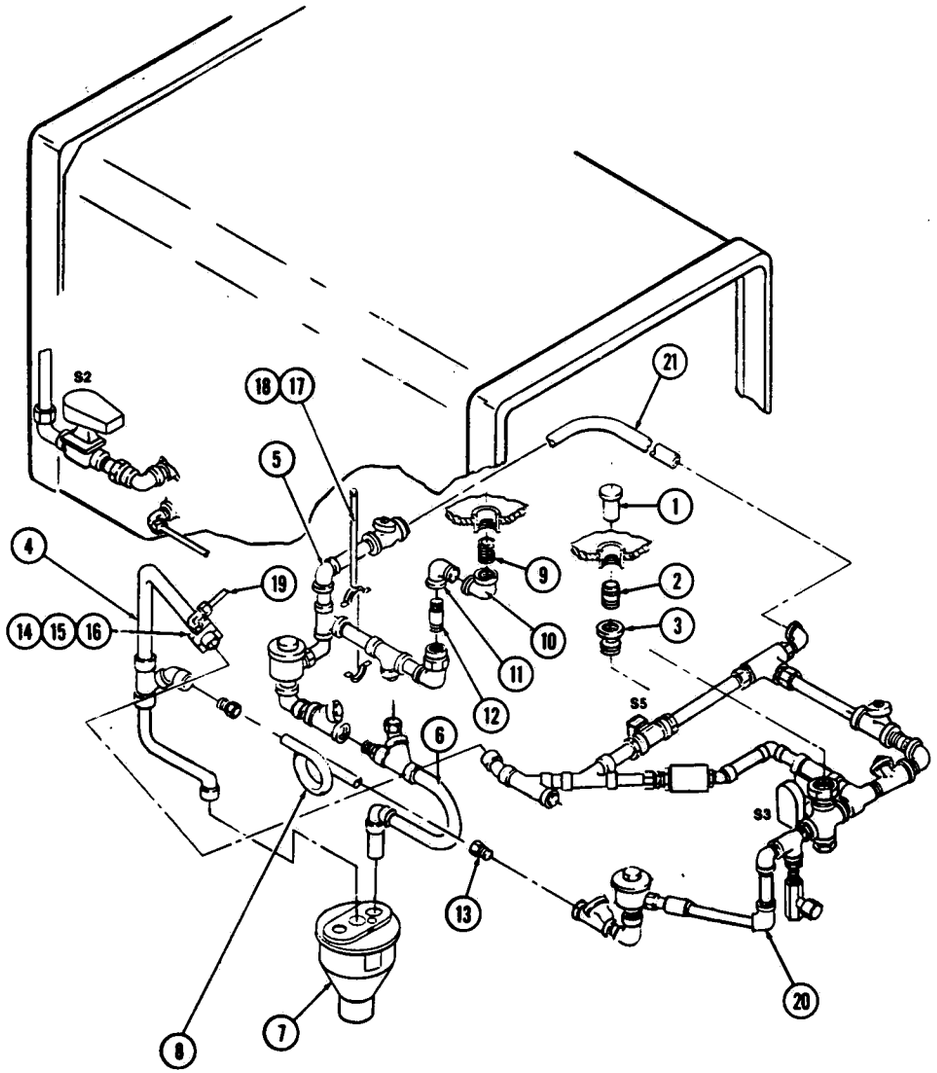


Figure 8-71. CHAMBER DRAIN AND EJECTOR PIPING. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-71-					CHAMBER DRAIN & EJECTOR PIPING	X
1	P	93294	001		SCREEN, Chamber Drain	1
2	P	29291	091		NIPPLE, 3/4 N.P.T. x 1-1/4	1
3	P	1747	091		END, Thd., 3/4 N.P.T.	1
4	P	136671	001		DRAIN TUBE ASSEMBLY (See Fig. 8-36)	1
5	P	134466	001		JACKET STEAM RETURN ASSEMBLY (See Fig. 8-31)	1
6	P	93717	001		DRAIN TUBE ASSEMBLY (See Fig. 8-37)	1
7	P	764316	212		FUNNEL ASSEMBLY	1
	P	56396	016		• PLUG, 7/8 Dia.	1
	P	56396	017		• PLUG, 1 Dia.	1
	P	56396	018		• PLUG, 1-3/8 Dia.	1
	P	141198	006		• FUNNEL & CAP ASSEMBLY	1
	P	141198	003		• • FUNNEL	1
	P	56396	012		• • CAP, Funnel	1
	P	15272	091		• • SCREW, Hex Set, 1/4-20	2
	P	78881	045		• • SCREW, Self Tap, 6-32 x 1/2	2
8					TUBE, 3/8 O.D. x 17-1/4	1
9	P	29292	091		NIPPLE, 3/4 N.P.T. x 1-1/2	1
10	P	7461	091		ELL, Reducing, 3/4 x 3/8 N.P.T.	1
11	P	1631	091		ELL, Street, 3/8 N.P.T.	1
12	P	29022	051		NIPPLE, 3/8 N.P.T. x 3-1/4"	1
13	P	30947	091		FITTING, Straight, 3/8 O.D.T. x 3/8 N.P.T.	2
14	P	150822	039		CLAMP, Saddle	2
15	P	43041	091		ELL, Compression	1
16	P	837	091		BUSHING, Reducing, 1/2 N.P.T. x 3/8 N.P.T.	1
17	P	75376	010		CLAMP, Pipe, 3/8	1
18	P	84375	008		NIPPLE, 1/4 N.P.T. x 6-7/8	1
19					TUBE, Copper, 1/4 O.D.T. x 21-1/2	1
20	P	136805	062		PIPING ASSEMBLY, Lower (See Fig. 8-72)	1
21	P	83372	002		TUBE, 5/8 O.D.T.	1

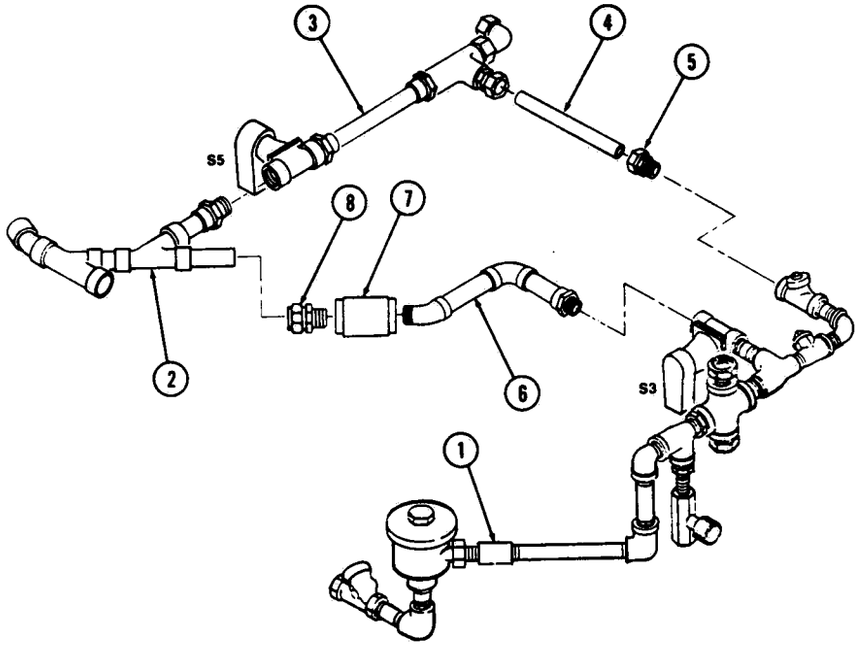


Figure 8-72. LOWER PIPING ASSEMBLY. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
			UNITS WITH PRINTCON:	
8-72-			LOWER PIPING ASSEMBLY	X
1	P 136805 019		CHAMBER DRAIN PACKAGE (See Fig. 8-73)	1
2	P 56396 002		PIPING ASSEMBLY, Condenser (See Fig. 8-35)	1
3	P 134468 001		PIPING ASSEMBLY, Ejector (See Fig. 8-30)	1
4	P 91759 091		TUBE, 5/8 O.D.T. x 7	1
5	P 39072 091		ADAPTER, 5/8 O.D.T. x 3/8 N.P.T.	1
6	P 56394 001		FITTING ASSEMBLY (See Fig. 8-39)	1
7	P 44317 091		VALVE, Check, 3/4 N.P.T.	1
8	P 30005 091		FITTING, STR., 3/4 N.P.T. x 7/8 O.D.T.	1

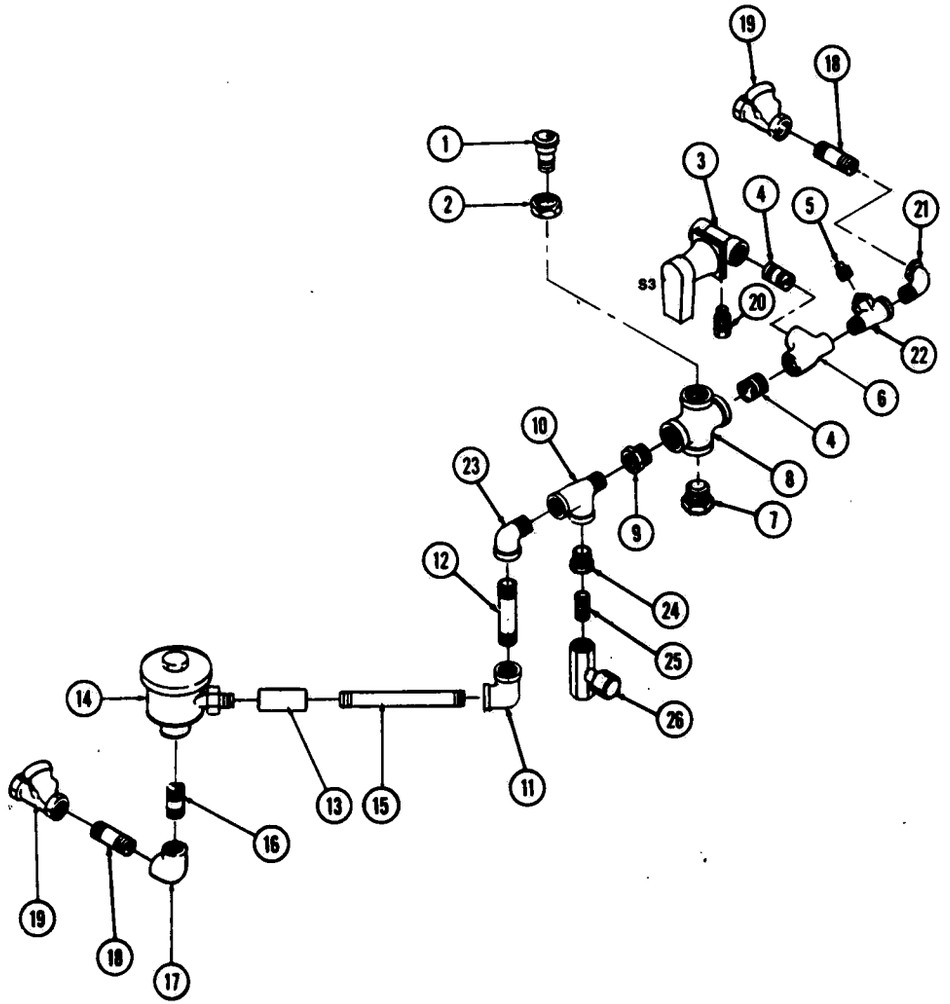
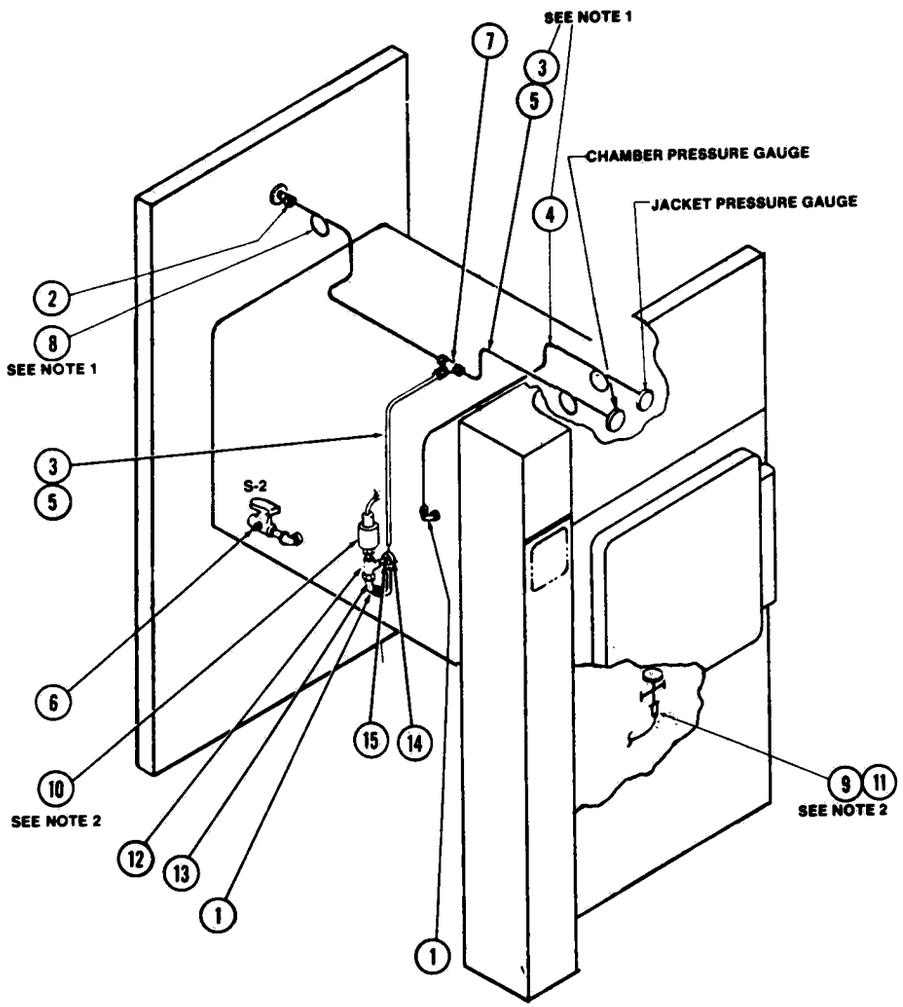


Figure 8-73. CHAMBER DRAIN ASSEMBLY. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-73-	P	136805	019		CHAMBER DRAIN ASSEMBLY	X
1	P	4247	091		SPUD, Male, 3/4 N.P.T.	1
2	P	2903	091		NUT, Union, 3/4	1
3	P	83228	002		VALVE, Solenoid, Steam, 3/4 N.P.T.	1
	P	764070	001	*	• REPAIR KIT	1
	P	764070	002		• COIL	1
4	P	25292	091		NIPPLE, 3/4 N.P.T. x 1-1/2	2
5	P	3441	091		PLUG, Pipe, 3/8 N.P.T.	1
6	P	4920	091		TEE, 3/4 x 3/8 x 3/4 N.P.T.	1
7	P	22472	091		BUSHING, reducing, 3/4 x 1/4 N.P.T.	1
8	P	1345	091		CROSS, 3/4 N.P.T.	1
9	P	836	042		BUSHING, Reducing, 3/4 x 1/2 N.P.T.	1
10	P	91154	091		TEE, Street, 1/2 N.P.T.	1
11	P	1633	091		ELL, 1/2 N.P.T.	1
12	P	29170	091		NIPPLE, 1/2 N.P.T. x 3	1
13	P	1313	091		COUPLING, 1/2 N.P.T.	1
14	P	129222	001		TRAP, 1/2 N.P.T. (See Fig. 8-43)	1
15	P	29178	091		NIPPLE, 1/2 N.P.T. x 5	1
16	P	29162	091		NIPPLE, 1/2 N.P.T. x 1	1
17	P	1622	091		ELL, Reducing, 1/2 x 3/8 N.P.T.	1
18	P	29013	041		NIPPLE, 3/8 N.P.T. x 1-1/4	2
19	P	5424	091		VALVE, Check, 3/8 N.P.T.	2
	P	74335	091		• DISC	1
20	P	3439	091		PLUG, Pipe, 1/8 N.P.T.	1
21	P	1631	091		ELL, Street, 3/8 N.P.T.	1
22	P	78387	091		TEE, Street, 3/8 N.P.T.	1
23	P	1634	091		ELL, Street, 1/2 N.P.T.	1
24	P	76053	042		BUSHING, Reducing, 1/2 x 1/4 N.P.T.	1
25	P	28917	091		NIPPLE, 1/4 N.P.T. x 1	1
26	P	83523	001		VALVE, Needle, 1/4 N.P.T.	1

*When replacing the diaphragm, the bonnet bolts should be tightened to 50 in./lb. torque. Do not overtighten.



NOTE:
1 — MAKE ALL COILS ON SENSING LINES APPROX. 2-1/2" DIA.

2 — FOR WIRING TERMINATIONS OF PART 9 & PART 10 SEE FIG. 8-75.

Figure 8-74. SENSING LINE PACKAGE. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH PRINTCON:				
8-74-					SENSING LINE PACKAGE • 16x16 & 20x20 Gravity & Gravity/Isothermal Single Door	X			
					SENSING LINE PACKAGE • 16x16 & 20x20 Gravity & Gravity/Isothermal Double Door ...		X		
1	P	26181	091		ELL, 1/8 O.D.T. x 1/8 I.P.S.	2	2		
2	P	90594	091		COUPLING, 1/8 O.D.T. x 1/8 N.P.T.		1		
3					TUBE, 1/8 O.D.T. x 26		2		
4					TUBE, 1/8 O.D.T. x 52	1	1		
5					TUBE, 1/8 O.D.T. x 44	1			
6	P	3439	091		PLUG, Pipe, 1/8 N.P.T.	2	2		
7	P	129356	113		TEE, 1/8 O.D.T.		1		
8					TUBE, 1/8 O.D.T. x 40		1		
9	P	56396	211	*	RTD, Temp.	1	1		
10	P	56396	215	*	TRANSDUCER, Press.	1	1		
11	P	150822	452		FITTING, 1/8 O.D.T. x 1/4 N.P.T.	1	1		
12	P	4906	091		TEE, 1/4"	1	1		
13	P	939	091		BUSHING, Reducer, 1 4 N.P.T. x 1/8 N.P.T.	2	2		
14	P	849	091		BUSHING, Reducing, 3/8 x 1/4 (Not Shown)	1	1		
15	P	27422	091		NIPPLE	1	1		
16	P	1618	091		ELL, 1/4 N.P.T. (Not Shown)	1	1		

*These items are supplied with contact pins P/N 84187-002 crimped on the electrical cable ready to install to plug P47.

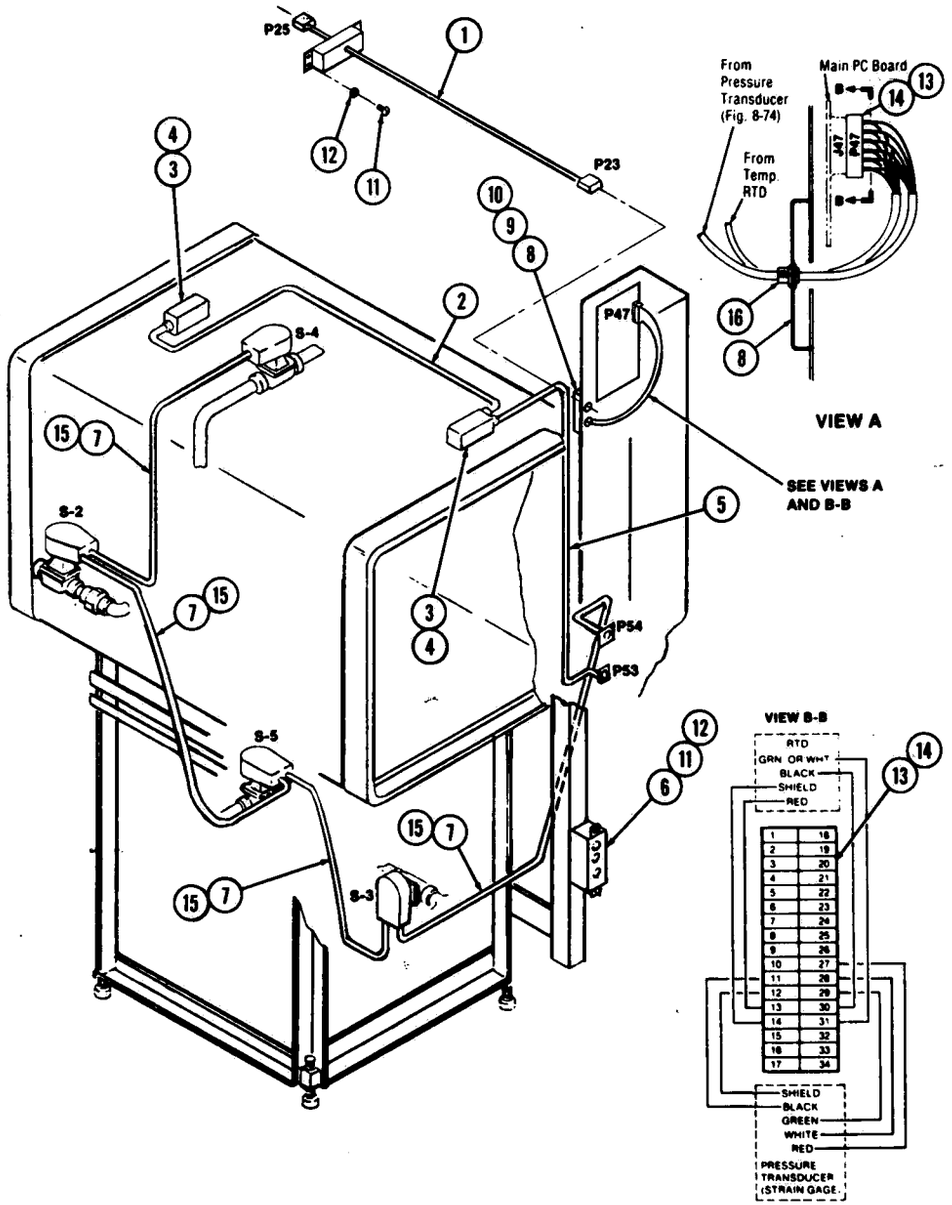


Figure 8-75. FINAL WIRING ASSEMBLY: Gravity Models (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH PRINTCON:				
8-75-					WIRING ASSEMBLY: Gravity, Single Door Models	X			
					WIRING ASEMBLY: Gravity, Double Door Models		X		
1	P	146649	104		HARNESS ASSEMBLY, Double Door		1		
2	P	136805	016		CABLE, Door Switch, Double Door		1		
3	P	136475	001		ASSEMBLY, Door Switch (See Fig. 8-23)	1	2		
4	P	90168	045		SCREW, Hex Head, Self Tapping, #10 x 5/16	2	4		
5	P	93900	011		CABLE, Door Switch, Single Door	1			
6	P	93617	001		BOX, Junction (See Fig. 8-76)	1	1		
7	P	136805	021		CABLE, Solenoid	1	1		
8	P	129084	001		BOX, Adapter	1			
9	P	3985	041		SCREW, Round Head, #6-32 x 3/4	2	2		
10	P	18131	091		LOCKWASHER	2	2		
11	P	15361	042		SCREW, Round Head, #10-32 x 1/4	2	6		
12	P	31705	045		LOCKWASHER, #10	2	6		
13	P	93900	026		HOUSING, Receptacle P47	1	1		
14	P	84187	003		CONTACT, Socket	9	9		
15	P	18538	091		SPLICE CONNECTOR	8	8		
16	P	91354	045		CLAMP, Cable	1	1		

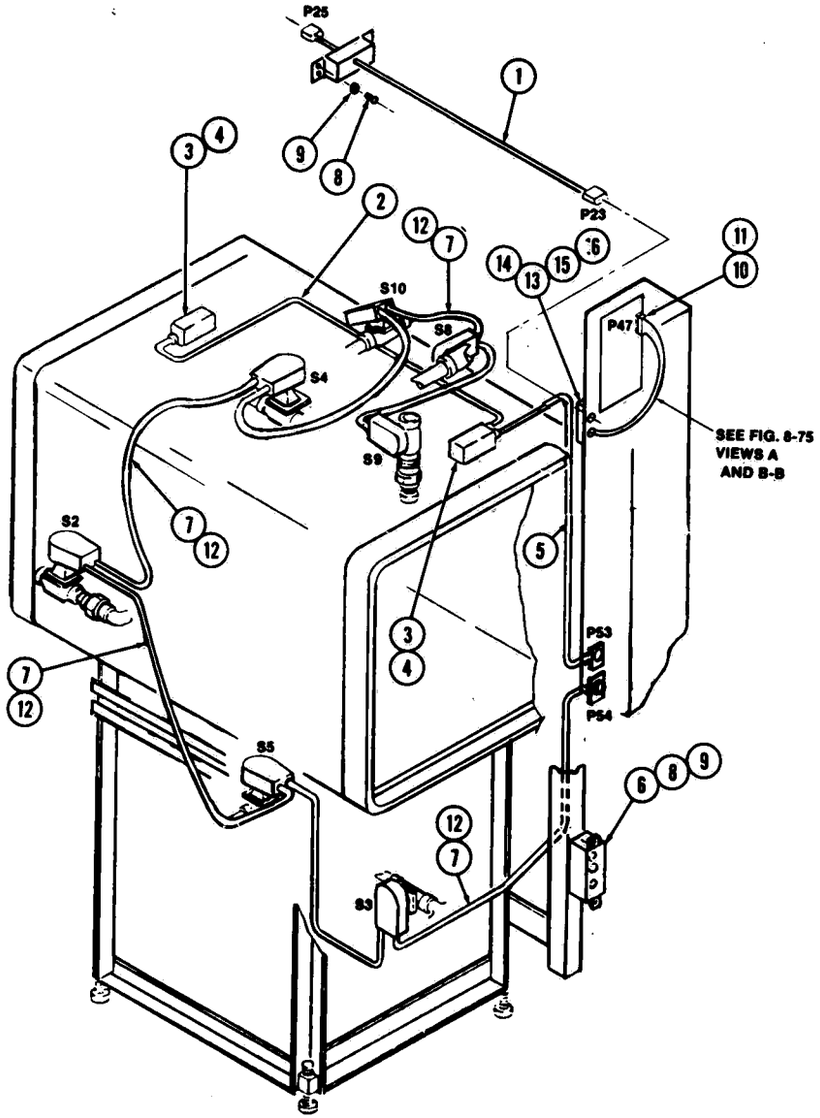


Figure 8-76. FINAL WIRING ASSEMBLY: Isothermal Models. (Units with Printcon)

Add. 6/82

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
					UNITS WITH PRINTCON:				
8-76-					WIRING ASSEMBLY: Isothermal, Single Door Models	X			
					WIRING ASSEMBLY: Isothermal, Double Door Models		X		
1	P	146649	104		HARNESS ASSEMBLY, Double Door		1		
2	P	136805	016		CABLE, Door Switch, Double Door		1		
3	P	136475	001		ASSEMBLY, Door Switch (See Fig. 8-23)	1	2		
4	P	90168	045		SCREW, Hex Head, Self Tapping, #10 x 5/16	2	4		
5	P	93900	011		CABLE, Door Switch, Single Door	1			
6	P	93617	001		BOX, Junction	1	1		
7	P	136805	020		CABLE, Solenoid	1	1		
8	P	15361	042		SCREW, Round Head, #10-32 x 1/4	2	6		
9	P	31705	045		LOCKWASHER, #10	2	6		
10	P	93900	026		HOUSING, Receptacle, J47	1	1		
11	P	84187	003		CONTACT, Socket	9	9		
12	P	18538	091		CONNECTOR, Splice	14	14		
13	P	129084	001		BOX, Adapter	1	1		
14	P	91354	045		CLAMP, Cable	1	1		
15	P	3985	041		SCREW, Round Head, #6-32 x 3/4	2	2		
16	P	18131	091		LOCKWASHER, #6	2	2		

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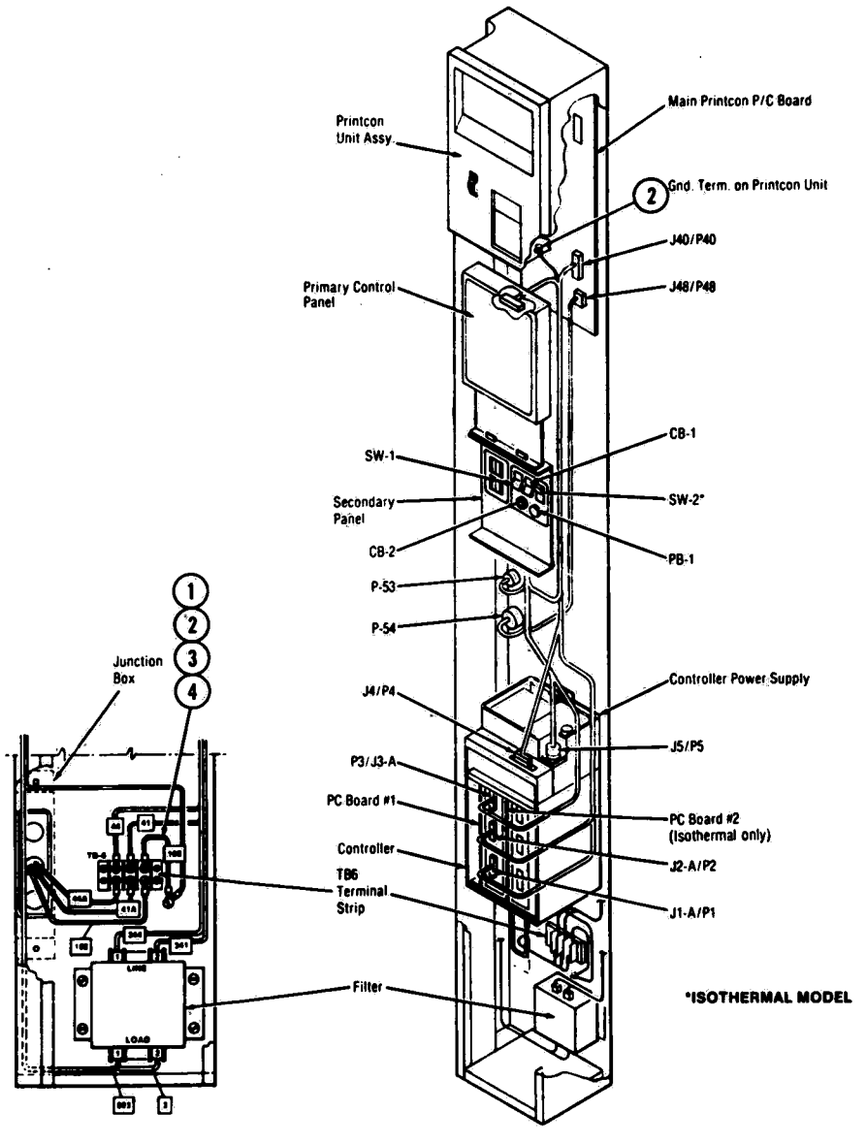


Figure 8-77. CONNECTION DETAILS: Control Column with Printcon.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
				UNITS WITH PRINTCON:	
8-77-				CONNECTION DETAILS: Control Column	X
1	P	19522 091		TERMINAL, Wire, #10 Ring x 16-22 AWG	1
2	P	82675 001		SCREW, Green, Ground, #10-32 x 3/8	2
3	P	14865 091		TERMINAL, Wire, #8 Ring x 18-22 AWG	1
4				WIRE, Green	1

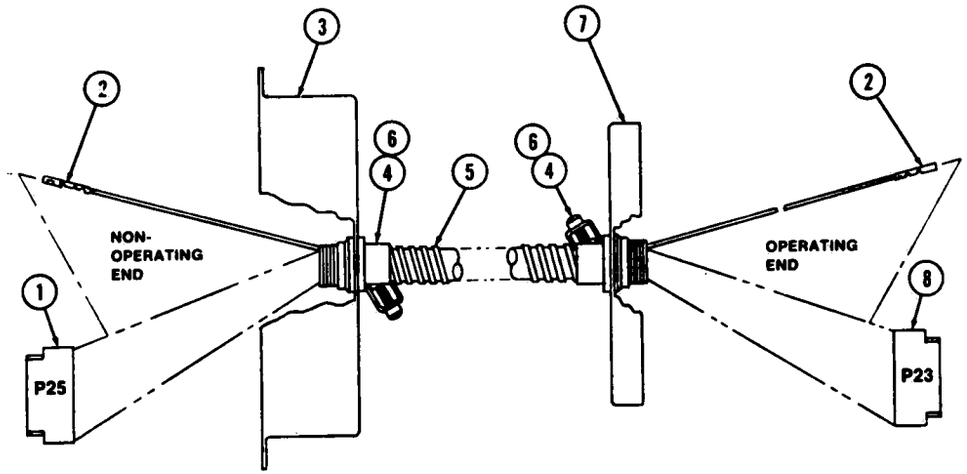


Figure 8-78. HARNESS ASSEMBLY (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-78-					**UNITS WITH PRINTCON:**	
					HARNESS ASSEMBLY, Double Door Primary Panel	X
1	P	84229	005		HOUSING, Receptacle, P25	1
2	P	84187	003		CONTACT	42
3	P	136798	001		ENCLOSURE	1
4	P	150030	001		CONNECTOR, Straight, 1/2 Conduit	2
5	P	91666	091		CONDUIT, Flex, 1/2 x 50	1
6	P	150122	001		BUSHING, Anti-Short	2
7	P	129084	001		BOX, Adapter	1
8	P	84229	006		HOUSING, Receptacle, P23	1

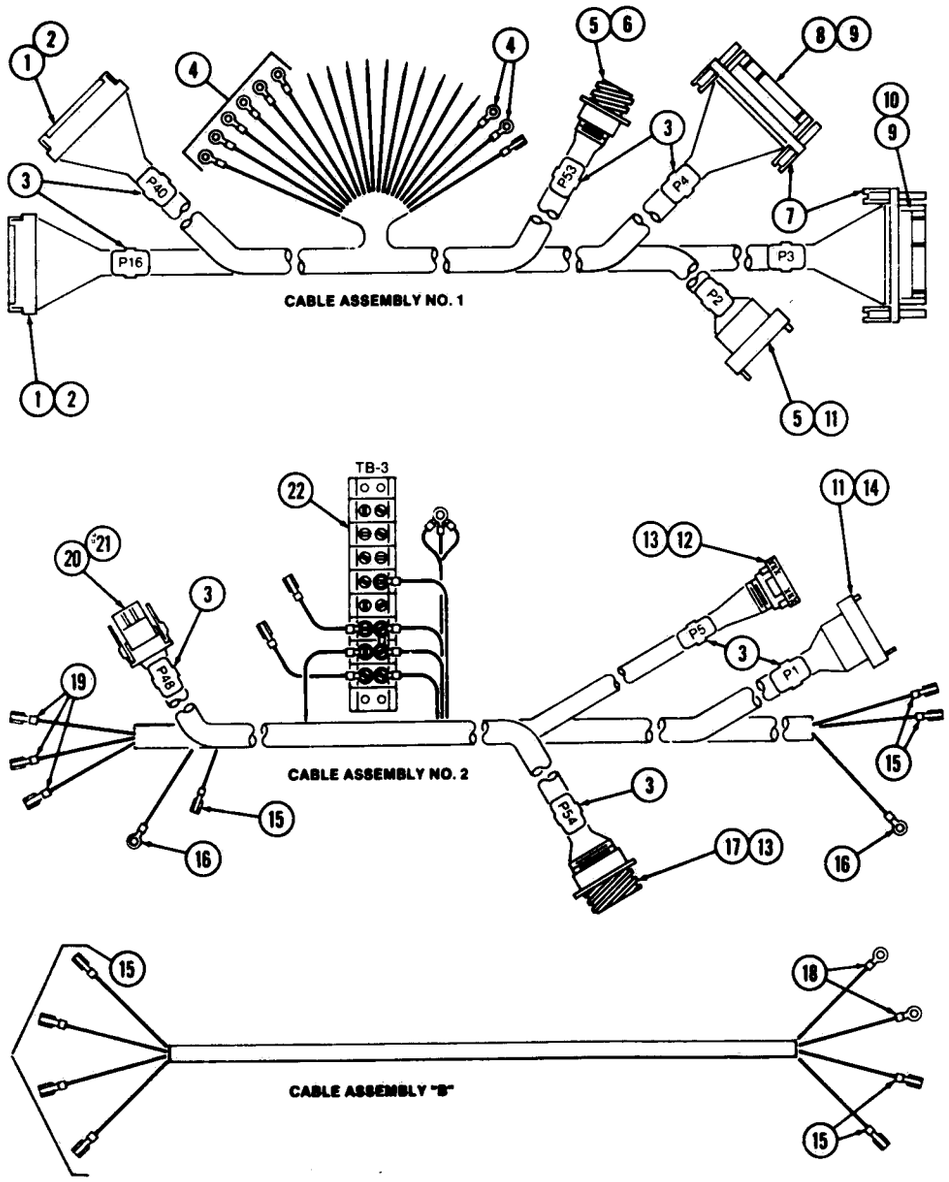


Figure 8-79. HARNESS ASSEMBLY: Secondary Panel, Gravity. (Units With Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-79-					HARNESS ASSEMBLY: Secondary Panel, Gravity	X
1	P	84187	003		CONTACT, Socket, P16 and P40	60
2	P	84229	002		HOUSING, Connector, 36 Position, P16 & P40	2
3	P	150822	003		MARKER, Tie	10
4	P	129278	001		TERMINAL, Wire, #6 Ring x 22-26 AWG	8
5	P	150822	030		CONTACT, Socket, P2 and P53	16
6	P	93443	005		RECEPTACLE, 14 Position, P53	1
7	P	84192	001		JACKSCREW, Female	4
8	P	84205	002		HOUSING, Pin, 38 Position, P4	1
9	P	84207	002		PIN, Contact, P3 and P4	43
10	P	84205	001		HOUSING, Pin, 28 Position, P3	1
11	P	93829	001		BLOCK, P1 and P2	2
12	P	93838	002		PLUG, 16 Position, P5	1
13	P	84198	004		SOCKET, Contact, P5 and P54	19
14	P	150822	043		PIN, Contact, P1	7
15	P	32119	091		RECEPTACLE, 1/4 Lug x 14-16 AWG	9
16	P	14592	091		TERMINAL, #10 Ring x 14-16 AWG	2
17	P	93443	006		RECEPTACLE, 37 Position, P54	1
18	P	14591	091		TERMINAL, Wire, Ring x 14-16 AWG	2
19	P	90695	091		RECEPTACLE, 1/4 Lug x 18-22 AWG	5
20	P	129352	121		HOUSING, Socket, 9 Position, P48	1
21	P	84220	002		CONTACT, Socket, P48	8
22	P	90627	091		BLOCK, Terminal, 8 Position, 15 A	1

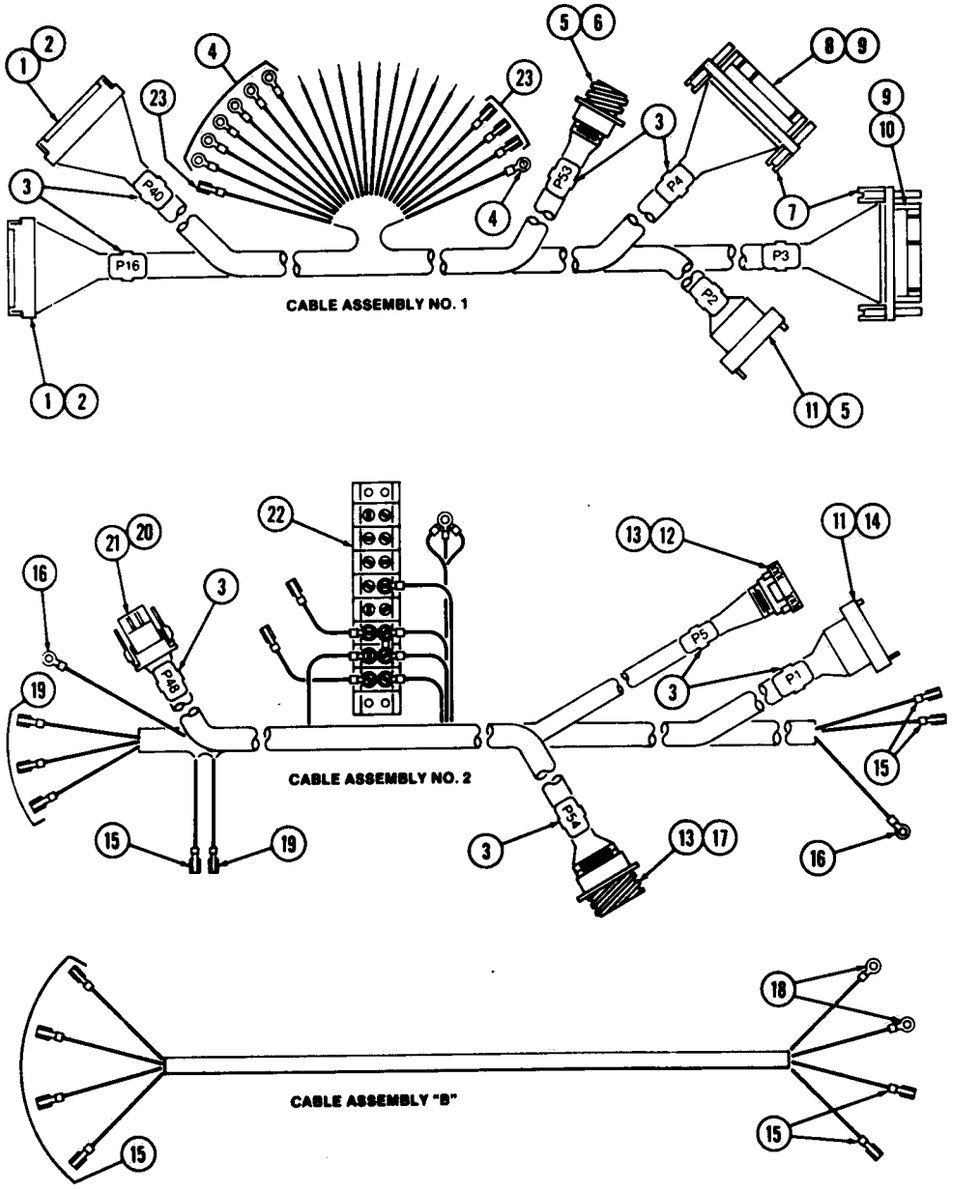


Figure 8-80. HARNESS ASSEMBLY: Secondary Panel, Isothermal. (Units with Printcon)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
					UNITS WITH PRINTCON:	
8-80-					HARNESS ASSEMBLY: Secondary Panel, Isothermal	X
1	P	84187	003		CONTACT, Socket, P16 and P40	59
2	P	84229	002		HOUSING, Connector, 36 Position, P16 & P40	2
3	P	150822	003		MARKER, Tie	10
4	P	129278	001		TERMINAL, Wire, #6 Ring x 22-26 AWG	7
5	P	150822	030		CONTACT, Socket, P2 and P53	14
6	P	93443	005		HOUSING, Receptacle, 14 Position, P53	1
7	P	84192	001		JACKSCREW, Female	4
8	P	84205	002		HOUSING, Pin, 38 Position, P4	1
9	P	84207	002		PIN, Contact, P3 and P4	46
10	P	84205	001		HOUSING, Pin, 28 Position, P3	1
11	P	93829	001		BLOCK, P1 and P2	2
12	P	93838	002		PLUG, 16 Position, P5	1
13	P	84198	004		SOCKET, Contact, P5 and P54	22
14	P	150822	043		PIN, Contact, P1	9
15	P	32119	091		RECEPTACLE, 1/4 Lug x 14-16 AWG	9
16	P	14592	091		TERMINAL, #10 Ring x 14-16 AWG	2
17	P	93443	006		HOUSING, Receptacle, 37 Position, P54	1
18	P	14591	091		TERMINAL, Wire, Ring x 14-16 AWG	2
19	P	90695	091		RECEPTACLE, 1/4 Lug x 18-22 AWG	6
20	P	129352	121		HOUSING, Socket, 9 Position, P48	1
21	P	84220	002		CONTACT, Socket, P48	8
22	P	90627	091		BLOCK, Terminal, 8 Position, 15 A	1
23	P	84402	001		RECEPTACLE, 1/4 Lug x #24-26 AWG	4

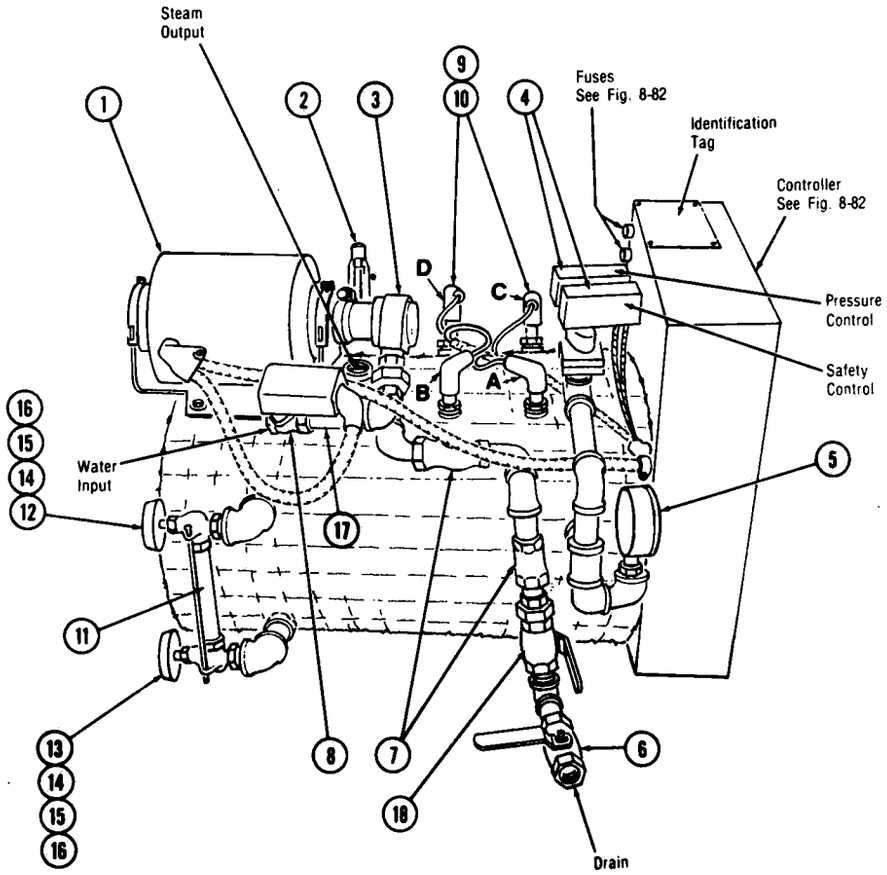
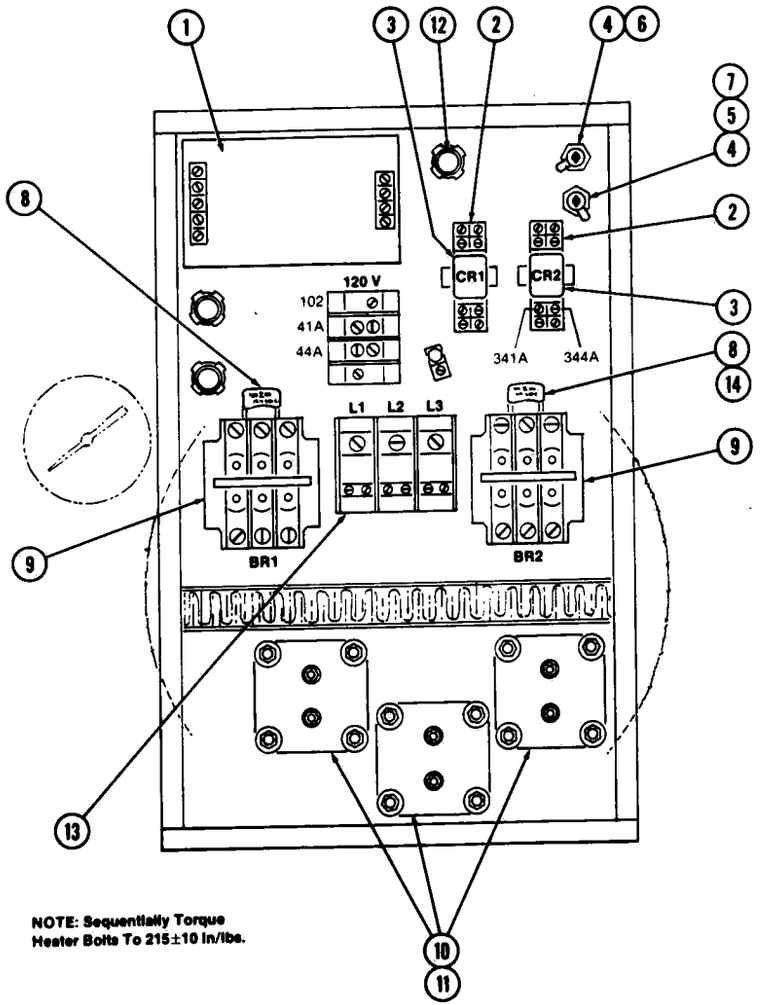


Figure 8-81. ELECTRO-STEAM GENERATOR, Solid State.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-81-					ELECTRO STEAM GENERATOR, Solid State	X
1	P	764319	901		MOTOR, 115/230 V, 50/60 Hz	1
2	P	75421	091		VALVE, Safety, 100 psi	1
3	P	764319	902		PUMP, Rotary Vane	1
4	P	764319	305		SWITCH, Pressure	2
	P	764320	389		SWITCH, Pressure, Manual Reset	1
5	P	750467	091		GAUGE, Pressure	1
6	P	764317	863		VALVE, Ball, 1/2 NPT	2
7	P	764320	492		VALVE, Check, Ball Cone	1
8	P	764319	693		VALVE, Solenoid, 120 VAC	1
9	P	764319	905		PROBE, Spark Plug	4
10	P	764316	748		ELECTRO-RODS (Set of Four)	1
11	P	764321	195		GLASS, Gauge	1
12	P	750363	091		VALVE, Top	1
13	P	750363	002		VALVE, Bottom	1
14	P	761847	001		COLLAR, Retaining	1
15	P	752612	091		WASHER, Metal	1
16	P	751847	091		SEAL, Rubber	1
17	P	76044	042		VALVE, Flow Control	1
18	P	764321	222		VALVE, Union Ball, 3/8 NPT	1



NOTE: Sequentially Torque Heater Bolts To 215±10 In/lbs.

(View shown with cover removed.)

Figure 8-82. STEAM GENERATOR CONTROLLER.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-82-					STEAM GENERATOR CONTROLLER	X
1	P	764320	418		PRINTED CIRCUIT BOARD (Repaired P-764321-224)	1
2	P	84412	001		SOCKET, Relay	2
3	P	84413	001		RELAY, Plug-In, 120 VAC	2
4					FUSEHOLDER	2
5	P	764320	604		FUSE, Eight Amp	1
6	P	764317	462		FUSE, One Amp	1
7	P	764317	772		FUSE, Ten Amp (After 4/1/87)	1
8	P	764320	233		CAPACITOR, .47μfd, 600 VDC	2
9	P	759747	001		CONTACTOR, Heater, Fifty Amp	2
10	P	764319	903		HEATER, 6.5 KV, 208/230 V	3
	P	764319	916		HEATER, 6.5 KV, 440 V	3
11	P	764317	713		GASKET, Heater (Set of Three)	1
12	P	56396	236		CABLE ASSEMBLY, Generator to Control Column	1
13	P	764321	200		BLOCK, Terminal	1
14	P	93811	043		RESISTOR, 150Ω, 1/2 Watt	1

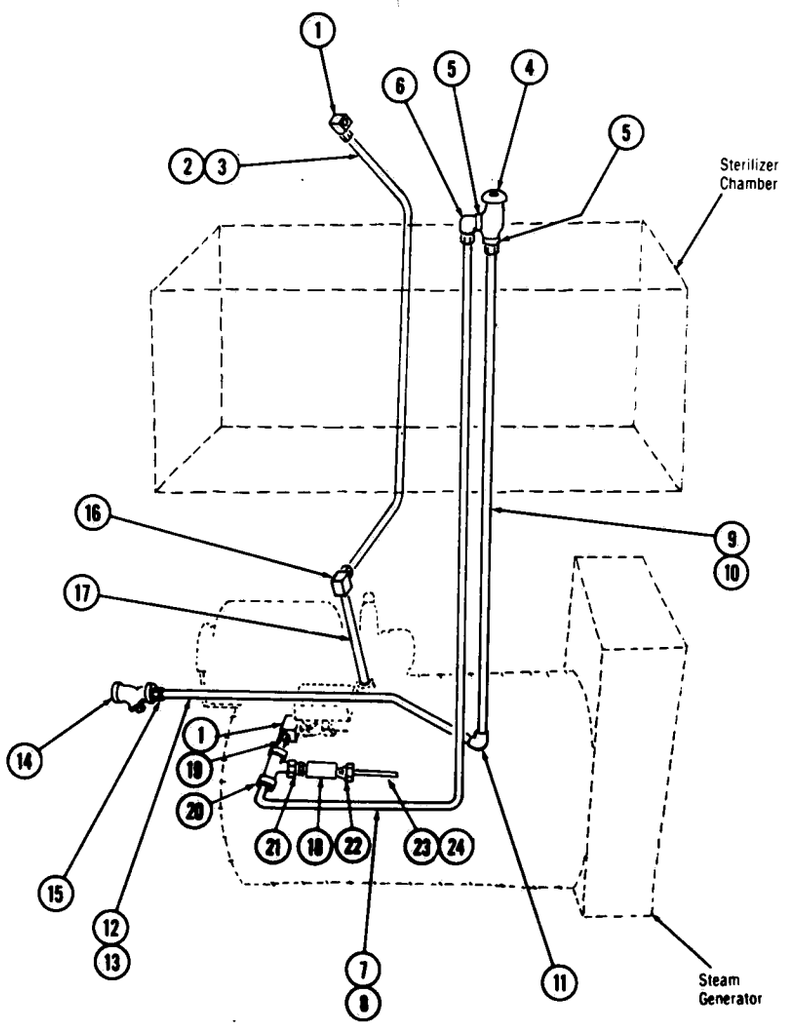


Figure 8-83. GENERATOR STEAM AND WATER PIPING.
(Solid State Control Generator)

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-83-					GENERATOR STEAM AND WATER PIPING				
	P	141245	501		16x16 Sterilizer	X			
	P	141245	502		20x20 Sterilizer		X		
1	P	81165	001		ELBOW, Comp., Male, 3/8 NPT x 5/8 ODT	2	2		
2	P	134468	410		TUBE, Steam Line, 5/8 ODT	1			
3	P	134468	411		TUBE, Steam Line, 5/8 ODT		1		
4	P	90233	091		VACUUM BREAKER, 3/8 NPT	1	1		
5	P	90208	091		ADAPTER, 3/8 NPT x 5/8 ODT	2	2		
6	P	90214	091		ELBOW, 5/8 ODT	1	1		
7	P	134468	412		TUBE, Water, 5/8 ODT	1			
8	P	134468	413		TUBE, Water, 5/8 ODT		1		
9	P	89546	091		TUBE, Water, 5/8 ODT	1			
10	P	89464	002		TUBE, Water, 5/8 ODT		1		
11	P	90212	091		ELBOW, 5/8 ODT	1	1		
12	P	134468	414		TUBE, Water, 5/8 ODT	1			
13	P	134468	415		TUBE, Water, 5/8 ODT		1		
14	P	47671	091		STRAINER, 3/8 NPT	1	1		
15	P	39072	091		FITTING, Comp., 3/8 NPT x 5/8 ODT	1	1		
16	P	76707	091		ELBOW, Comp., Female, 1/2 NPT x 5/8 ODT	1	1		
17	P	29174	091		NIPPLE, 1/2 NPT x 4	1	1		
18	P	150822	523		VALVE, Flow Control	1	1		
19	P	90266	091		TUBE, Water, 5/8 ODT	1	1		
20	P	30249	091		FITTING, Comp., 5/8 ODT x 5/8 ODT x 1/2 NPT	1	1		
21	P	79798	001		BUSHING, Reducing, 1/2 x 3/8 NPT	1	1		
22	P	45565	091		FITTING, Comp., 1/4 NPT x 1/4 ODT	1	1		
23	P	42501	092		TUBE, Nylaflow, 1/4 ODT	1	1		
24	P	84371	001		TUBE, Insert, 1/4 ODT	1	1		

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SECTION 9

EAGLE® 2300 SCIENTIFIC UNITS

9.1 GENERAL

The 2300 series is similar to the 2000 series with Printcon™ except for some hardware and program changes. This section will provide these differences and refer the user to pertinent sections (noting any changes) of this manual. The 2300 series is **only** available with Printcon™ control: therefore, any paragraphs or figures in the Indicator-Recorder-Controller (IRC) should be disregarded. Before beginning any procedures, review **SUMMARY OF SAFETY PRECAUTIONS** at beginning of this manual.

9.2 GENERAL INFORMATION

Use Tech Data SD-377, SD-378, SD-381 and SD-382 found in **Section 1** of this manual.

9.3 OPERATING INSTRUCTIONS

NOTE: This Paragraph replaces **Section 2** located in the front of this manual. If there is a discrepancy between the operating instructions in this section and those in the Equipment Manual, follow the Equipment Manual.

Figure 9-1 shows the location of the various controls.

9.3.1 Before Operating The Equipment

1. Verify chamber drain strainer is clean and in place and that chamber interior is clean *(Paragraph 4.4)*.

2. Open upper access door.

   a. Ensure manual control is turned to OFF.

   b. Turn STEAM and WATER valves to ON. Steam is admitted to jacket and will begin to warm chamber. If HI-LO valve is on HI, jacket pressure will stabilize at 32 psig; if on LO, it will stabilize at 20 psig.

3. Open secondary control panel door and position POWER and CONTROL switches to ON. Primary control panel lights up and all LEDs on Printcon display light momentarily for a lamp test to ensure operator that system is functioning. Printer records time and date power is turned ON.

4. Position GRAVITY/ISO switch to desired function. GRAVITY for Gravity or Liquids cycle; ISO for Laboratory/ Isothermal cycle.

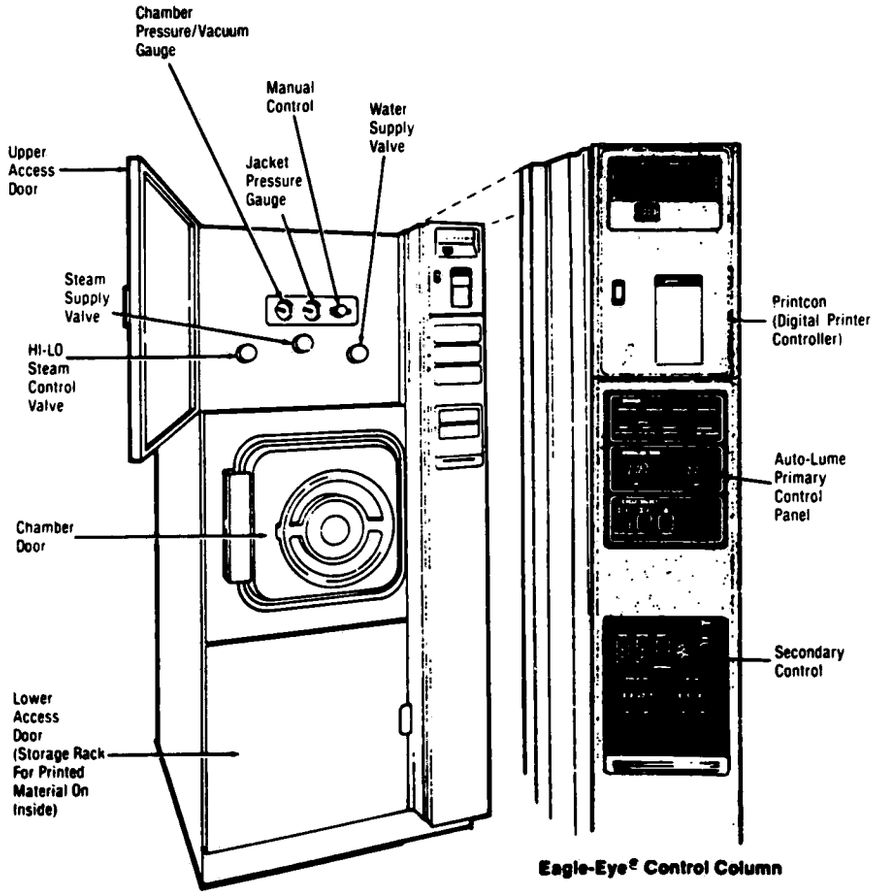
5. Check for correct time and date by pressing the TIME or DATE pushbutton. To change either, press the FORWARD REVERSE pushbutton until the correct time/date is displayed.

6. Check paper roll. A colored warning stripe will appear on the paper when the roll is near its end. A single ply roll lasts approximately two months and double ply rolls one month. See *Paragraph 7.18, Changing Paper*, if replacement is necessary.

7. Check the printout to assure that the inked ribbon cartridge is providing adequate ink. A fresh cartridge should last approximately 3 to 4 months. See *Paragraph 7.18, Changing The Inked Ribbon Cartridge*, if replacement is necessary.

NOTE: The visual display and printout of printer can optionally be set to indicate temperature in degrees Fahrenheit or Celsius and pressure can be either in English (PSI gauge and inches Hg vacuum) or metric (kg/cm^2 gauge and mm Hg). LEDs on display indicate which units are being displayed. The display of temperature and (English) pressure can be either single precision (no decimal) or extended precision (one decimal). Metric pressure shows one or two decimal places. Metric vacuum shows no decimal places. See *Paragraph 7.20, Changing Units of Display*.

Unit is factory set so that during STERILIZE phase, time, temperature and pressure are printed out at one-minute intervals. This can be changed, however, so that the printing of time, temperature and pressure can be done at continuous intervals throughout STERILIZE phase. The time of interval is adjustable in 30-second increments with a total range from 30-seconds to 49 minutes, 30 seconds. See *Paragraph 9.8, Changing Sterilize Printout Intervals*.



Eagle-Eye® Control Column

Figure 9-1. CONTROL LOCATIONS: Operating End.

8. Review *Paragraph 9.3.6, Control Monitoring and Communication Systems,* in order to identify the cause of any abnormal condition during a sterilization cycle.

9. If a double-door unit, review *Paragraph 9.3.7* to become familiar with the controls on the non-operating end.

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

11. Pressure display should read zero when the sterilizer door is open. If it does not, simply press the RESET button on the secondary control panel.

9.3.2 Automatic Operation: Laboratory/Isothermal Cycle

1. Follow instructions in *Paragraph 9.3.1, Before Operating the Equipment.*

2. Open door on secondary control panel.

a. Ensure POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit. If jacket is pressurized from an earlier Gravity or Liquids cycle, wait until pressure reaches 0 psig before proceeding.

b. Dial the desired exposure period on STERILIZE TIME thumbwheel switches.

NOTE: Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

3. Using the thumbwheel switch on the Printcon unit, set the sterilize temperature to desired setpoint. This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If selected temperature is outside the allowable range, 170-212 F (78-100 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

NOTE: Printcon is calibrated to control the temperature at approximately 3 F (1.7 C) above the thumbwheel setpoint. This overdrive feature ensures effective load temperature control and provides for the shortest possible cycle time. However, for special applications, this overdrive feature is adjustable. Refer to *Paragraph 7.20, Adjusting the Sterilize Temperature Overdrive.*

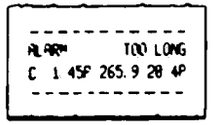
4. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

5. Close and lock the door . . . turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

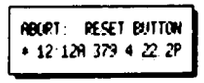
6. Position GRAVITY/ISOTHERMAL switch to ISOTHERMAL. Light comes on to full brightness. Status light CONDITION comes on. Printed record will show time CONDITION phase begins and temperature and pressure transition points.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

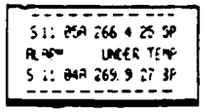
7. After condition phase is completed, STERILIZE light comes on and remains on for the duration of the sterilize phase. Steam STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached. The printed record will show the time the STERILIZE phase begins and the temperature and pressure. Unit is factory set so that time, temperature and pressure are printed out at one-minute intervals. However, this setting can be changed. The printout time interval is adjustable in 30-second increments with a total range from 30-seconds to 49 minutes, 30 seconds. See *Paragraph 9.8, Changing Sterilize Printout Intervals.*



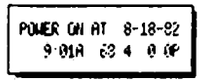
No. 1 — Condition Phase Too Long.



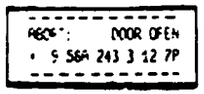
The RESET button is pressed.



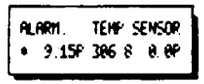
No. 2 — Sterilizing Temperature Drops.



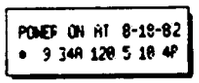
The power is turned on.



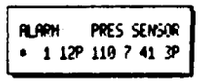
No. 3 — Chamber Door Switch Not Made.



Temperature sensor failure is detected.



No. 4 — Power Restored After Power Failure.



Pressure sensor failure is detected.

Figure 9-2. PRINTCON MESSAGES.

8. When sterilize timer times out, EXHAUST light comes on. Steam DRY TIME digital readout begins to count down. The printed record will show the time the EXHAUST phase begins and the temperature and pressure transition points.

9. When dry timer times out, air is admitted to the chamber to relieve the vacuum. When vacuum is sufficiently relieved, COMPLETE light comes on, and buzzer sounds. Open chamber door (step 4). Sterilized goods may be removed from the machine. The printed record will show the time the cycle finished, the sterilize and dry time, and the total cycle time.

10. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on. The printer records the time the door is opened and prints "DOOR OPEN."

11. If two ply paper is used in the printer, tear off the duplicate record and place with the completed load.

9.3.3 Automatic Operation: Gravity Cycle

1. Follow instructions in *Paragraph 9.3.1, Before Operating The Equipment.*

2. Refer to Table 9-1 and select the desired sterilizing temperature. Open the upper access door and turn HI-LO valve to HI for the 270 F (132 C) sterilizing cycle, or to LO for the 250 F (121 C) sterilizing cycle.

NOTE: For cycle temperatures below 250 F (121 C), refer to paragraph 7.15.

3. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit.

b. Dial the correct exposure period (Table 9-1) on STERILIZE TIME thumbwheel switches.

c. Dial the desired drying time on the thumbwheel switches. This time will be displayed for 5 seconds on primary control panel. Following this 5 seconds, panel will return to sterilize time unless dry time is changed again. For wrapped goods, dry time can vary (usually between 5 and 20 minutes) depending on pack density, instrument tray weight, pack preparation technique including type of wrapping material used, and sterilizer loading procedures (refer to Section 3). For unwrapped goods, drying time is not required, however, a minimum of 02 minutes will eliminate excess steam vapors prior to opening chamber door. Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

4. Using the thumbwheel switch on the Printcon unit, set the sterilize temperature to 250 F (121 C) or 270 F (132 C). This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If selected temperature is outside the allowable range, 150-295 F (65-146 C), the buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

NOTE: Printcon is calibrated to control the temperature at approximately 3 F (1.7 C) above the thumbwheel setpoint. This overdrive feature ensures effective load temperature control and provides for the shortest possible cycle time. However, for special applications, this overdrive feature is adjustable. Refer to *Paragraph 7.20, Adjusting the Sterilize Temperature Overdrive.*

5. Open chamber door and load sterilizer. Turn handwheel counterclockwise. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Touch GRAVITY cycle selector. Light comes on to full brightness. Status light CONDITION comes on. The printed record will show the time the CONDITION phase begins and the temperature and pressure transition points.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on: status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

8. After condition phase is completed, STERILIZE light comes on and remains on for the duration of the sterilize phase. Steam STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached. The printed record will show the time the STERILIZE phase begins and the temperature and pressure. Unit is factory set so that time, temperature and pressure are printed out at one-minute intervals. However, this setting can be changed. The printout time interval is adjustable in 30-second increments with a total range from 30-seconds to 49 minutes, 30 seconds. See *Paragraph 9.8, Changing Sterilize Printout Intervals.*

9. When sterilize timer times out, EXHAUST light comes on. Chamber exhausts to atmospheric pressure. If a drying period was selected, DRY TIME digital readout begins to count down. If zero DRY TIME was selected, cycle proceeds to next step. The printed record will show the time the EXHAUST phase begins and the temperature and pressure transition points.

10. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds. Open chamber door **(step 5)**, load may be removed from the sterilizer. The printed record will show the time the cycle finished, the sterilize and dry time, and the total cycle time.

11. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on. The printer records the time the door is opened and prints "DOOR OPEN."

12. If two ply paper is used in the printer, tear off duplicate record and place with the completed load.

9.3.4 Automatic Operation: Liquids Cycle

WARNING: TO PREVENT THE POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE RESULTING FROM BURSTING BOTTLES AND HOT FLUID, YOU MUST FOLLOW THE PROCEDURE LISTED BELOW:

- *Use only vented closures — do not use screw caps or rubber stoppers with crimped seal.*
- *Use only Type I borosilicate (Pyrex) glass bottles — do not use ordinary glass jugs or any container not designed for sterilization.*
- *Use sterilizer LIQUIDS cycle. No other cycle is safe for liquid sterilization.*
- *At end of cycle, open sterilizer door, no more than 1/2 inch. Wait 10 minutes before unloading sterilizer.*
- *Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not move bottles if any boiling or bubbling is present.*
- *Bottles should be cool to touch before attempting to move them from sterilizer loading car or shelves to the storage area.*

1. Follow instructions in *Paragraph 9.3.1, Before Operating The Equipment.*

2. Refer to Table 9-2 and select the desired sterilizing temperature. Open the upper access door and turn HI-LO valve to LO.

NOTE: For cycle temperatures below 250 F (121 C), refer to *Paragraph 7.15.*

3. Open the door on the secondary control panel.

TABLE 9-1. MINIMUM STERILIZATION EXPOSURE PERIOD — WRAPPED AND UNWRAPPED GOODS GRAVITY CYCLE ONLY.

ASPF SIZE	TIME (MINUTES)
75 ML	25
250 ML	30
500 ML	40
1000 ML	45
1500 ML	50
2000 ML	55

TABLE 9-2. MINIMUM RECOMMENDED EXPOSURE TIMES FOR FULL LOAD OF SQUARE-PAK® FLASKED SOLUTIONS 250° F (121° C) TEMPERATURE SETTING.

ITEMS	TEMPERATURE SETTING	
	250° F (121° C) MINUTES	270° F (132° C) MINUTES
Dressing, wrapped in paper or muslin	30	15
Glassware, empty, inverted	15	3
Instruments, metal only, any number (unwrapped)	15	3
Instruments, metal, combined with suture, tubing or other porous materials (unwrapped)	20	10
Instruments, wrapped in double thickness muslin or equal	30	15
Linen packs (maximal size: 12"x12"x20"; maximal weight 12 pounds)	30	—
Treatment trays, wrapped in muslin or equal	30	15
Utensils, unwrapped	15	3
Utensils, wrapped in muslin or equal	30	15

a. Be sure the POWER and CONTROL switches are ON. Primary control panel and Printcon display should be lit.

b. Set STERILIZE time thumbwheels to appropriate time . . . see Table 9-2. **(Note:** For a laboratory process, time required will depend upon specific preparation and volume . . . larger volumes normally require longer processing times.) Set time will be displayed on the primary control panel; however, during a LIQUIDS cycle, controller automatically disregards any DRY time setting. Once the cycle is started, the STERILIZE time will be locked in and cannot be changed.

4. Using the thumbwheel switch on the Printcon unit, set the sterilize temperature to 250 F (121 C). This setpoint will be displayed for about 3 seconds before the chamber drain temperature is redisplayed. If selected temperature is outside the allowable range, 150-295 F (65-146 C), a buzzer sounds until an allowable temperature is selected. This temperature is locked in and cannot be changed once the cycle is started.

NOTE: Printcon is calibrated to control the temperature at approximately 3 F (1.7 C) above the thumbwheel setpoint. This overdrive feature ensures effective load temperature control and provides for the shortest possible cycle time. However, for special applications, this overdrive feature is adjustable. Refer to *Paragraph 7.20. Adjusting the Sterilize Temperature Overdrive.*

5. Open chamber door and load sterilizer. Turn handwheel counterclockwise. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Touch LIQUIDS cycle selector. Light comes on to full brightness. Status light CONDITION comes on; also WARNING HOT LIQUIDS light comes on. The printed record will show the time the CONDITION phase begins and the temperature and pressure transition points.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin. The printer will record the time the RESET button was depressed and will print "ABORT: RESET BUTTON" on the tape. It will then record the new cycle data.

8. After condition phase is completed, STERILIZE light comes on and remains on for the duration of the sterilize phase. Steam STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached. The printed record will show the time the STERILIZE phase begins and the temperature and pressure. Unit is factory set so that time, temperature and pressure are printed out at one-minute intervals. However, this setting can be changed. The printout time interval is adjustable in 30-second increments with a total range from 30-seconds to 49 minutes, 30 seconds. See *Paragraph 9.8. Changing Sterilize Printout Intervals.*

9. When sterilize timer times out. EXHAUST light comes on and chamber exhausts slowly. The printed record will show the time the EXHAUST phase begins and the temperature and pressure.

10. When exhaust phase is completed, COMPLETE light comes on and buzzer begins to sound. The printed record will show the time the cycle finished, the sterilize time, and the total cycle time.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

11. Crack the door open (see step 5) **about 1/2"** and leave it cracked for at least 10 minutes.

12. Unlocking the door will stop buzzer and cause DOOR UNLOCKED light to come on. WARNING HOT LIQUIDS light will remain on, but will begin to flash . . . continuing for 10 minutes. At the end of 10 minutes, buzzer will again sound and WARNING HOT LIQUIDS light will stay on, but will stop flashing.

13. Open chamber door, load may now be removed from sterilizer. Press RESET button on secondary control panel to reset control and turn WARNING HOT LIQUIDS light off. The printer records the time the RESET button is depressed and prints "ABORT: RESET BUTTON."

14. If two ply paper is used in the printer, tear off duplicate record and place with the completed load.

9.3.5 Manual Operation: Gravity (Wrapped or Unwrapped Goods) or Liquids Cycle

NOTE: Manual control is a feature on this sterilizer. However, an isothermal cycle cannot be achieved manually. Also, if unit has an integral steam generator, manual cycle cannot be operated without electric power.

1. Follow **steps 1, 2 and 9** in *Paragraph 9.3.1, Before Operating The Equipment.* The CONTROL switch must be positioned at OFF when using manual operation.

2. Open the upper access door.

3. Determine desired processing temperature (270 F [132 C)] or 250 F [121 C] for Gravity cycle; 250 F [121 C] for Liquids cycle). See Table 9-1 or 9-2.

4. Set HI-LO valve as follows:

a. **For 250 F (121 C) operation —** refer to paragraph 7.15 for instructions on loosening front stop on pressure regulator; then turn valve counterclockwise until jacket pressure gauge reads between 15 and 18 psig (1.056 and 1.267 kg/cm²).

NOTE: If normal LO setting is used for manual operation, chamber temperature will be approximately 250 F (126 C).

b. **For 270 F (132 C) operation —** set HI-LO valve so that jacket pressure gauge reads between 28 and 30 psig (1.971 and 2.112 kg/cm²).

NOTE: See Figure 7-12 for pressure and temperature relationships.

WARNING: WHEN OPERATING A LIQUIDS CYCLE YOU MUST OBSERVE THE PRECAUTIONS LISTED IN PARAGRAPH 9.3.4. FAILURE TO FOLLOW THESE PRECAUTIONS COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

5. Open chamber door and load sterilizer. Turn handwheel counterclockwise. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Turn the Manual Operation selector to Condition and wait for sixty seconds. Proceed to **step 8.**

8. After Condition phase, turn selector to STERILIZE. When chamber reaches desired pressure, begin timing. After correct sterilization period, proceed to next step.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

9. **If a Liquids cycle, turn selector to SLOW EXHAUST and keep it in this position until chamber pressure is atmospheric (0 psig).** Then turn selector to OFF position, **omitting** the DRY phase. Crack the door open **about 1/2"** and wait for at least 10 minutes.

If a Gravity cycle, turn the selector to the FAST EXHAUST position until chamber pressure is between 4 and 6 psig (0.28 and 0.42 kg/cm²). If the load consists of wrapped goods, turn the selector to the DRY position. Begin timing. After drying period, turn selector to OFF position. If the load is unwrapped goods, turn selector directly to OFF position.

10. Load may be removed from the sterilizer.

9.3.6 Control Monitoring and Communication Systems

To ensure the validity of the sterilizing process, the automatic control continually monitors the cycle. Should one of the following conditions occur, you will be notified as indicated (Figure 9-2).

CONDITION NO. 1: Sterilizer did not complete conditioning phase in preset time.

INDICATION: CONDITION light on primary control panel flashes, buzzer sounds intermittently and a **permanent record is printed.**

OPERATOR SHOULD:

1. Touch cycle selector to stop buzzer (sterilizer will continue to operate).

2. Refer to **Section 6, TROUBLESHOOTING** to see if problem can be determined and corrected without interrupting cycle (e.g., HI-LO valve is incorrectly set).

3. If problem cannot be corrected so that conditioning phase can be completed (i.e., chamber reaches set sterilizing temperature), press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure. The printer records the time the RESET button is depressed and prints "ABORT: RESET BUTTON."

4. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open 1/2"** and wait for at least 10 minutes. The printer records the time the door is opened and prints "DOOR OPEN."

b. Correct problem.

c. Reprocess load.

CONDITION NO. 2: Temperature drops 2 F below set point.

INDICATION: STERILIZE light on primary control panel flashes, STERILIZE timer display resets and a **permanent record is printed.**

OPERATOR SHOULD:

1. Let cycle continue to completion if sterilizing temperature is reestablished.

2. If condition happens repeatedly, refer to **Section 6, TROUBLESHOOTING** to see if problem can be determined and corrected without interrupting cycle.

3. If problem cannot be corrected so that sterilizing phase can be completed, press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure. The printer records the time the RESET button is depressed and prints "ABORT: RESET BUTTON."

4. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open 1/2"** and wait for at least 10 minutes. The printer records the time the door is opened and prints "DOOR OPEN."

b. Correct problem.

c. Reprocess load.

CONDITION NO. 3: Cycle started, but chamber door not sufficiently tightened to keep door lock switch actuated.

INDICATION: DOOR UNLOCKED light(s) on primary control panel comes on, buzzer sounds intermittently and a **permanent record is printed.**

OPERATOR SHOULD:

1. Press cycle RESET button on secondary control panel. **Do not** proceed further until chamber is at atmospheric pressure. The printer records the time the RESET button is depressed and prints "ABORT: RESET BUTTON."

2. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress. **crack door open 1/2"** and wait for at least 10 minutes. The printer records the time the door is opened and prints "DOOR OPEN."

b. Correct problem.

c. Reprocess load.

CONDITION NO. 4: Loss of electricity.

INDICATION: Primary control panel goes dark.

OPERATOR SHOULD:

1. Wait until power is restored to sterilizer; then position CONTROL switch (on secondary control panel) to ON. Buzzer will sound intermittently and a **permanent record is printed.**

2. Press cycle RESET button, but **do not** proceed until chamber is at atmospheric pressure. The printer records the time the RESET button is depressed and prints "ABORT: RESET BUTTON."

3. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open 1/2"** and wait for at least 10 minutes. The printer records the time the door is opened and prints "DOOR OPEN."

b. Other cycles, load may be reprocessed right away.

Additional printouts are provided whenever:

1. The RESET button is pressed.

2. The power is turned ON.

3. Temperature sensor failure is detected.

4. Pressure sensor failure is detected.

9.3.7 Controls and Signals for Double-Door Sterilizers

The following controls will be found on the non-operating end of the sterilizer:

1. Cycle selectors: **GRAVITY** and **LIQUIDS.** If you wish to repeat the previous gravity or liquids cycle, and all preparatory actions *(Paragraph 9.3.1)* have been made, you may do this from the non-operating end by touching the appropriate selector.

2. Status lights: These indicate the cycle phase which is currently in progress: CONDITION, STERILIZE, EXHAUST, COMPLETE.

3. Warning lights: DOOR UNLOCKED, OPPOSITE DOOR UNLOCKED, WARNING HOT LIQUIDS.

9.4 PRINCIPLES OF OPERATION

1. Use the instructions found in **Section 3** located previous to this section, noting Printcon paragraphs.

2. Replace Figure 3-21 with Figure 9-3.

9.5 INSPECTION AND MAINTENANCE

1. Use the instructions found in **Section 4** of this manual.

9.6 FIELD TEST PROCEDURE

NOTE: This Paragraph replaces **Section 5** of this manual.

Every sterilizer must be tested and inspected according to this procedure on initial start-up or whenever an adjustment or repair has been made. Keep a record of the test on the recorder chart or printout. Each test must meet the standards of material, workmanship and performance set forth in this procedure. Potentiometer must be used on each test. Refer to **Section 7,** should mechanical problems arise or adjustments be required.

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

NOTE: Voltmeter indications referred to in this procedure are approximations. A variance of 0.5 volts is acceptable.

1. Test Instrumentation Required:

   a. Potentiometer and thermocouple leads.

   b. Calibrated compound test gauge (30" vacuum and 100 psig).

   c. Calibrated absolute pressure gauge (0-100 mm Hg) with ball valve.

   d. Voltmeter or LED test light.

   e. Spirit level.

2. Check for proper installation as per *Paragraph 5.3.*

3. Adjust cooling water valves and slow exhaust valve as per *Paragraph 5.4* and Fig. 5-2. **Note:** The slow exhaust setting is preliminary.

4. Install potentiometer thermocouple lead in metal-to-metal contact with the temperature probe (from 1/2" to 1-1/2" of the tip). Run the lead through the door (between the door gasket and end ring).

5. Install a calibrated absolute pressure gauge and manual shut-off valve to chamber gauge fitting after removing compression fitting and reducing bushing (Fig. 8-74). This gauge should have 1 mm Hg resolution and a 0-100 mm Hg range.

6. Verify door switch adjustment as per *Paragraph 5.7.*

7. Test the safety valve as per *Paragraph 5.8.*

8. Adjust the steam pressure regulator as per *Paragraph 5.9,* **steps 1 through 3.**

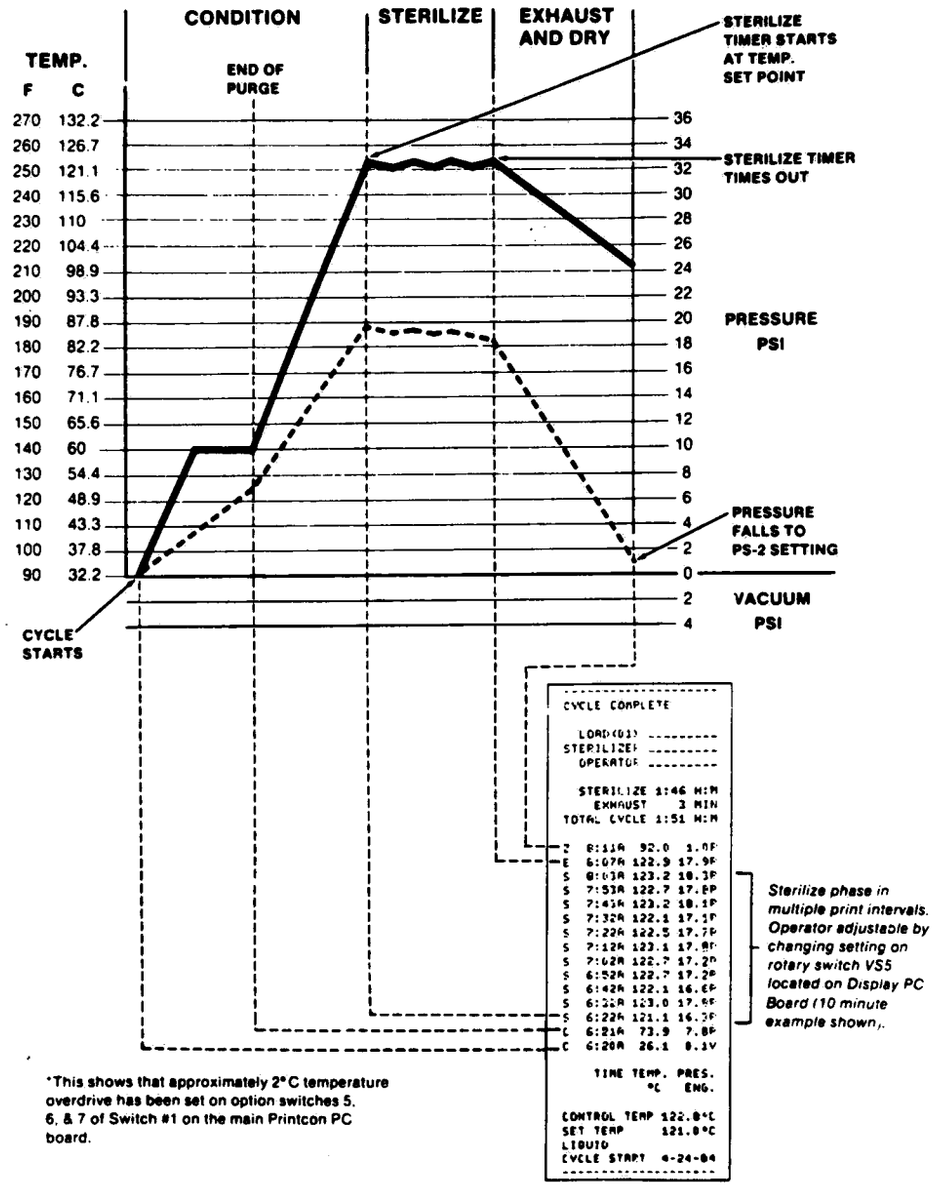
9. Set the HI-LO valve to HI. Adjust the rear stop ring so that the jacket maintains 33 ±1 psig pressure.

10. Open the display overlay door by unfastening the self-tapping screw at the top right of the door.

Check the pressure and vacuum rotary BCD switches for the following settings:

PS-1: 52 (26 psig)	VS-1: 20 (10 in. Hg)
PS-2: 02 (1 psig)	VS-2: 04 (2 in. Hg)
PS-3: 06 (3 psig)	VS-4: 04 (Purge time: 1 minute)*
PS-5: 00 (Machine type; standard)	VS-5: 02 (Print interval 1 minute)*

**See Paragraph 9.8.*



*This shows that approximately 2°C temperature overdrive has been set on option switches 5, 6, & 7 of Switch #1 on the main Printcon PC board.

Figure 9-3. PRINTED CYCLE RECORD: Liquid Cycle.

Close the display overlay door and replace the screw.

11. Check the service switch on the main Printcon PC board for the following settings. (See **Section 7,** if necessary, for access instructions):

Temperature — °F (#1 OFF)
Pressure — English (#2 OFF)
Display precision — Extended (#3 ON)
Transducer — Strain gauge — (#4 ON)
Temperature overdrive — Normal (#5 OFF, #6 and #7 ON)

Check the alternate positions on #1, #2 and #3 for proper digital display. Set sterilize temperature to 270 F.

12. Open control end door. Turn POWER and CONTROL switches ON. All lamps and digits on the Printcon display panel will come on for a 3 second lamp test. DOOR UNLOCKED lamp must come on. **Pressure display should read 0.0.**

The following must be printed (with appropriate date, time, temperature, and pressure):

```
                DOOR OPEN
  2:37P    76.0  0.0P
--------------------
POWER ON AT     4-01-82
  2:37P    76.0  0.0P
--------------------
```

The following must be displayed:

a. Actual and F lamps ON.

b. Sterilize time displays must match thumbwheel settings. The DOOR OPEN message will be printed as shown above.

c. Cycle selectors for Liquids, Isothermal, and Gravity cycles (at half illumination.)

Double door units — DOOR UNLOCKED lamp must be on at both ends. Open opposite door. OPPOSITE DOOR UNLOCKED lamp must come on at both ends.

13. Try to start all cycles. No cycle should start with the door(s) open.

14. Rotate sterilize time setting thumbwheels. Time displayed must match thumbwheel setting and STERILIZE must light on panel. Rotate dry time thumbwheel settings. Time displayed must match thumbwheel setting and DRY must light on panel for five seconds. Display will return to sterilize time.

15. Change the temperature setting by 1 F. The new set point must be displayed for 2 seconds and the SET lamp must be on. Check all temperature thumbwheel digits to ensure that the display matches the setting.

16. Press the RESET button. The following must be printed (with appropriate time and physical data):

```
                RESET BUTTON
*   2:37P    76.0  0.5V
```

17. Set the time and date if not correct. Turn CONTROL switch OFF and then ON again. If battery is functioning correctly, time and date will be retained.

18. Check paper advance toggle switch. Forward position continuously feeds paper through printer. Center position is off. Rear position runs take-up motor until the paper platen is depressed (microswitch activates).

19. Check paper take-up mechanism. Feed paper through pinch rollers (units before 6/85) or onto take-up spool (units after 6/85). Paper must not wander side-to-side. Platen microswitch must activate and shut off take-up motor when the paper is drawn taut. Run at least 20 feet of paper into the take-up mechanism. Paper should bleed smoothly and coil up in the coil.

20. Check printed record quality. Quality of printout (or top copy) should conform to the examples in this procedure. Check for compressed digits (indicates printer motor speed too slow, or a drag on the paper roll).

21. Close and lock door(s). Start any cycle. Immediately abort it with the RESET button. This message must be printed.

```
 ABORT:    RESET BUTTON
*  2:37P    76.1  0.0P
C  2:37P    76.0  0.0P
```

22. Start any cycle. Immediately turn the CONTROL power OFF and then ON again. The POWER ON message must be printed. An intermittent buzzer will sound.

```
--------------------
POWER ON AT   4-01-82
  2:38P    76.1  0.2V
--------------------
```


23. Set the sterilize temperature to 295 F. Initiate a GRAVITY cycle. Wait until the timed steam purge is completed and the pressure has risen to the regulator setting and stabilized. The temperature displayed should agree with the potentiometer to within ±1 F. The pressure displayed should agree with the pressure gauge to within 0.5 psig. If not, adjust potentiometer P2 on the main Printcon CP board until these pressures agree. Then, adjust P9 for temperature, if necessary.

Abort the cycle with the RESET button and exhaust the chamber through the manual control. When exhausted to less than 1 psig, open the door and let all vapors escape. **With the door open,** turn power OFF and then ON again. Restart a 295 F GRAVITY cycle. With the pressure and temperature stabilized as before, the pressure should agree with the gauge to within 0.5 psig. If not, a realignment of the main Printcon PC board is indicated.

NOTE: A properly calibrated Printcon control is likely to be more accurate than the measuring devices. Therefore, the measuring devices should be calibrated against NBS (National Bureau of Standards) traceable equipment and the inaccuracies of the measuring devices should be known (via a calibration report sheet).

24. Perform the chamber vacuum leak test as outlined in *Paragraph 5.10.* Then, disconnect the measuring devices and reconnect the chamber gauge.

NOTE: If the above accuracy results are not obtainable, refer to the *Printcon Calibration Procedure* in **Section 7** of this manual.

25. Close and lock the door(s). Set STERILIZE and DRY times to 5 minutes each. Set the temperature thumbwheels to 250 F. Initiate a GRAVITY cycle. Reference Table 5-3 for proper valve actuation and correct phase times. The printer must print cycle information at the following times:

a. Start of cycle.

b. End of purge (time is settable)

c. Start of STERILIZE phase. Data, depending on setting of VS-5, will be printed at set time intervals throughout STERILIZE phase.

d. Start of EXHAUST phase.

e. End of EXHAUST phase.

f. Door open.

Refer to **Section 3** for the correct format. Check to make sure that the STERILIZE temperature is maintained between 252.5 F and 253.5 F.

26. Repeat for a 250 F LIQUIDS cycle. Refer to Table 5-2. Check printout for correct format as shown in **Section 3.**

Adjust the slow exhaust valve as necessary to obtain 5-7 minutes exhaust time from start of EXHAUST phase to PS-3 set-point (3 psig factory set). (S3 solenoid will open.)

27. Repeat for a 172 F ISOTHERMAL sterilization cycle except set a 4 minute sterilize time. Refer to Table 5-4. Check printout for correct format as shown in **Section 3.**

NOTE: Component degradation which may not cause an actual control alarm is evidenced by:

a. Slow charge time to temperature set-point.

b. Excessive temperature make-ups in the STERILIZE phase.

c. Excessively rapid or slow EXHAUST time.

d. Calibration inaccuracies in the Printcon control.

e. Chamber vacuum leaks.

28. Start a 250 F GRAVITY cycle, with 5 minute sterilize time set. After the STERILIZE phase is achieved, turn off the steam supply (use knob on valve panel). At 247.9 F, the following must occur:

a. STERILIZE lamp flashes.

b. The timer resets.

c. The following format is printed:

```
    S    2:41P  250.0  21.9P
    *    2:41P  244.1  21.9P
    ALARM:          UNDER TEMP
    *    2:41P  247.9  21.9P
```

Temperature falls 0.1 F under 240 F. These two lines are printed.

Reopen steam valve. As soon as 250 F is reestablished, the lowest temperature reached during the alarm condition is printed.

29. Check all positions of the Manual control knob for proper operation — door(s) closed and locked.

9.7 TROUBLESHOOTING

1. Use the instructions found in **Section 6** of this manual, noting Printcon paragraphs.

2. Use Table 6-2 for Troubleshooting Chart. **Note:** For references to Printcon control column and components Illustrated Parts Breakdown (IPB) (Figures 8-15, 8-16, 8-44, 8-45, 8-46, 8-50, 8-55 and 8-57) refer instead to appropriate IPB found following *Paragraph 9.9.*

3. The schematics listed in Table 6-8 refer both to IRC and Printcon 2000 units. Refer only to the schematics listed below and disregard the remainder.

- PIPING SCHEMATIC: Printcon
- PRINTED CIRCUIT BOARD: Basic 146586
- PRINTED CIRCUIT BOARD: Expander 146588
- PC ASSEMBLY: Power Supply (Printcon) 146633-051

4. The following schematics are pertinent to the 2300 units only and can be found following the IPB Figures of this Section.

- ELECTRICAL SCHEMATIC, Eagle 2300 Gravity/Isothermal 146645-575
- MAIN PRINTCON PC BOARD, Eagle 2300 146654-002

9.8 COMPONENT REPAIR, REPLACEMENT, AND ADJUSTMENT

1. Use the instructions found in **Section 7** of this manual, especially noting Printcon paragraphs while disregarding IRC Paragraphs.

NOTE: Conditioning Pulses for Eagle 2300 Units may vary from 0-7, while Eagle 2000 Units may vary from 0-15 *(Paragraph 7.12).*

2. *Paragraph 7.19, Printcon Digital Display,* describes procedures for the Secondary Panel and Display Printed Circuit Board. Two additional adjustments capable on Eagle 2300 Units are: Changing Sterilize Printout Intervals and Changing Unit Purge Times. The respective procedures for the above adjustments are as follows:

a. **Changing Sterilize Printout Intervals**

1) Open the unit outer door.

2) Remove the #6 x 1/4 self tapping screw from the upper right-hand corner of the display panel door. This permits door opening with a left-hand swing.

3) Locate VS 5. VS 5 is used to set the print interval in 30 second increments during EXPOSURE phase. **Example:** VS 5 set to 10 will produce a 5 minute print interval; while VS 5 set to 29 will produce 14 minute-30 second print intervals, etc.

4) Close display panel door and refasten with screw.

5) Close the outer door.

b. **Changing Unit Purge Times**

1) Open the unit outer door.

2) Remove the #6 x 1/4 self tapping screw from the upper right-hand corner of the display panel door. This permits door opening with a left-hand swing.

3) Locate VS 4. VS 4 is used to set the purge time in 15 second increments during conditioning. **Example:** VS 4 set to 4 will produce one second purge; while VS 4 set to 99 will produce a 24 minute, 45 second purge.

4) Close display panel door and refasten with screw.

5) Close the outer door.

NOTE: In any of the procedures presented in **Section 7** reference Printcon Control Column or associated components Illustrated Parts Breakdown (IPB) (Figures 8-15, 8-16, 8-18, 8-61, 8-62, 8-63, 8-67, 8-68, 8-77 or 8-78), refer instead to appropriate IPB found following *Paragraph 9.9.*

9.9 EXPLODED VIEWS AND PARTS LISTS

1. Use the Illustrated Parts Breakdowns (IPBs) found in **Section 8** located previous to this Section, noting the following exceptions:

a. Since Eagle 2300 Series are supplied only with Printcon controls, disregard IRC IPBs:

- Figures 8-10, 8-11, 8-12, 8-13, 8-14, 8-15, 8-16, 8-17, 8-18, 8-19, 8-24, 8-47, 8-48, 8-49, 8-50, 8-51, and 8-52.

b. Since the Eagle 2300 Printcon Control is designed to handle more versatile scientific cycles, the control hardware has changed somewhat. Disregard the following Printcon IPBs (note appropriate IPBs following this paragraph):

- Figures 8-15, 8-16, 8-18, 8-61, 8-62, 8-63, 8-64, 8-65*, 8-66*, 8-67, 8-68, 8-77 and 8-78.

**Figures 8-65A and 8-66A are applicable to Eagle 2300 Series.*

2. Use the following Eagle 2300 Control IPBs as aids in troubleshooting and repair.

- Figure 9-4. CONTROL COLUMN, Eagle 2300 (Part 1 of 3).
- Figure 9-5. CONTROL COLUMN, Eagle 2300 (Part 2 of 3).
- Figure 9-6. CONTROL COLUMN, Eagle 2300 (Part 3 of 3).
- Figure 9-7. MAIN CONTROL ASSEMBLY, Eagle 2300.
- Figure 9-8. SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 1 of 2).
- Figure 9-9. SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 2 of 2).
- Figure 9-10. SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 1 of 2).
- Figure 9-11. SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 2 of 2).
- Figure 9-12. PRINTCON HOUSING ASSEMBLY, Eagle 2300.
- Figure 9-13. HARNESS ASSEMBLY, Secondary Panel, Eagle 2300 Gravity/Isothermal.
- Figure 9-14. CONNECTION DETAILS, Eagle 2300 Control Column.

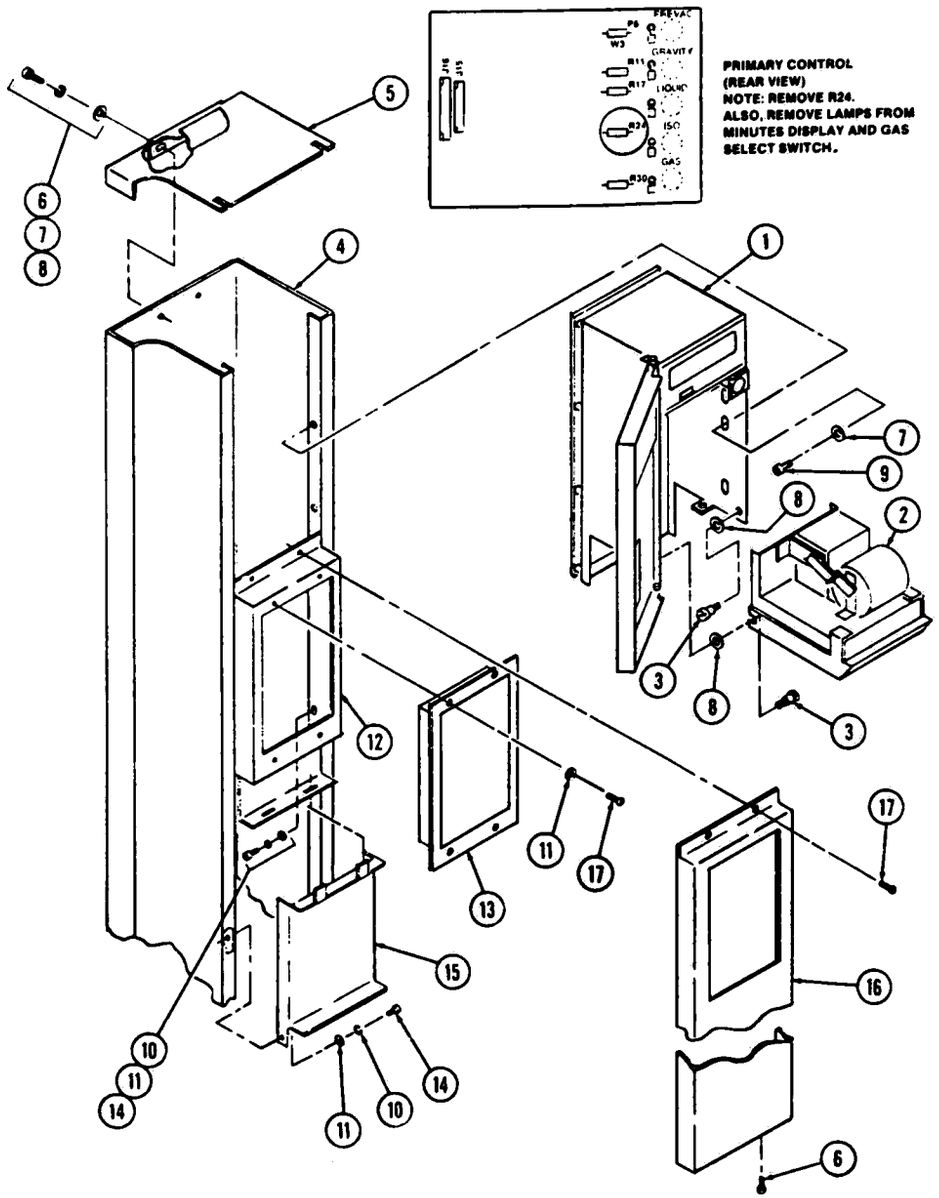


Figure 9-4. CONTROL COLUMN, Eagle 2300 (Part 1 of 3).

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
9-4-					CONTROL COLUMN, Eagle 2300 (Part 1 of 3)	X
1					PRINTCON HOUSING ASSEMBLY (See Fig. 9-12)	1
2	P	141198	171		PRINTCON PRINTER ASSEMBLY (See Figs. 8-65A and 8-66A)	1
3	P	150822	336		SCREW, Shoulder, #10-32	2
4	P	146649	040		HOUSING, Control	1
5	P	134449	001		COVER, RH Top	1
	P	134449	002		COVER, LH Top	1
6	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3/8	4
7	P	31705	045		LOCKWASHER, #10	6
8	P	5511	091		WASHER, Flat, #10	4
9	P	45323	042		SCREW, Button Socket Head, #8-32 x 3/8	4
10	P	79588	001		LOCKWASHER, #8	6
11	P	17796	091		WASHER, Flat, #8	10
12	P	146649	006		PANEL, Mounting	1
13	P	146645	226		CONTROL, Primary	1
	P	764317	536		• LAMP (Box of 10)	26
	P	764193	033		• REPAIRED, Primary Control	1
14	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	6
15	P	146645	569		PANEL, Secondary Assembly	1
16	P	146649	011		PANEL ASSEMBLY, Front	1
17	P	129356	135		SCREW, Button Head Socket, #8-32 x 3/8 (Black)	2

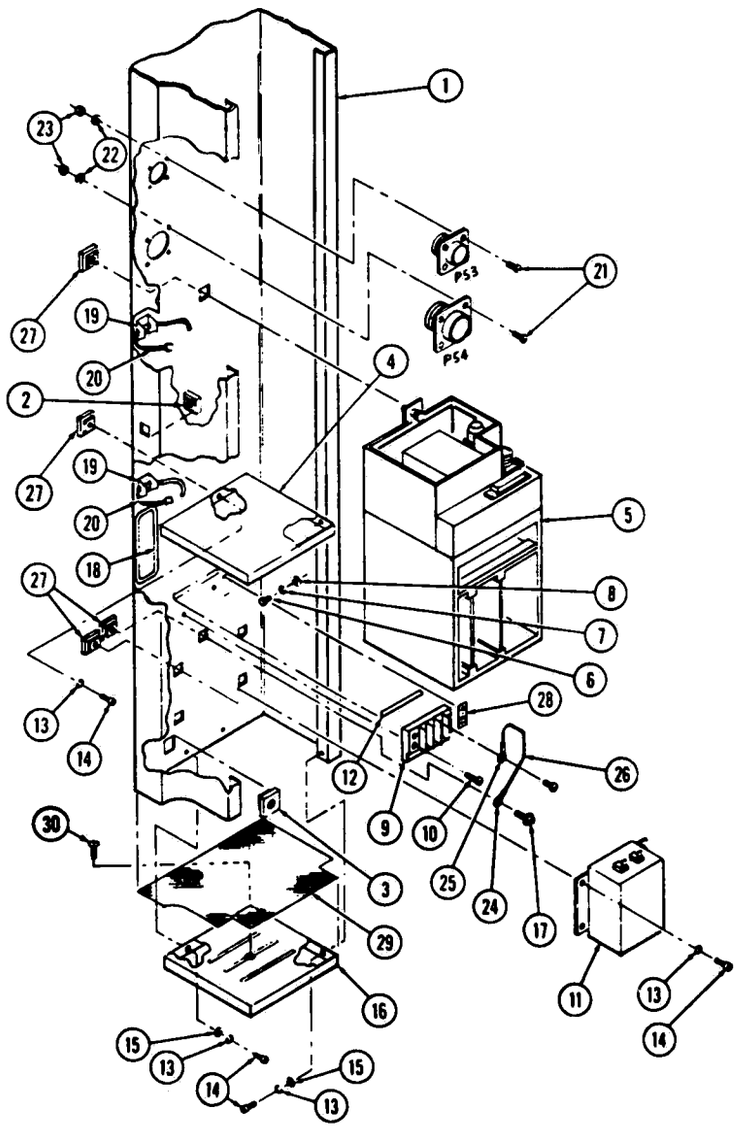


Figure 9-5. CONTROL COLUMN, Eagle 2300 (Part 2 of 3).

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
9-5-					CONTROL COLUMN, Eagle 2300 (Part 2 of 3)	X
1					HOUSING, Control	REF
2	P	91924	091		NUT, Tinnerman, 1/4-20	6
3	P	129352	070		NUT, Tinnerman, 3/8-16	4
4	P	136759	001		SUPPORT, Controller	1
5					MAIN CONTROL ASSEMBLY (See Fig. 9-7)	1
6	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	2
7	P	79588	001		LOCKWASHER, #8	2
8	P	17796	091		WASHER, Flat, #8	2
9	P	90746	091		STRIP, Terminal	1
10	P	9661	041		SCREW, Round Head, #10-32 x 5/8	2
11	P	93821	001		FILTER	1
12	P	82647	001		STRIP, Marker	1
13	P	31705	045		LOCKWASHER, #10	10
14	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3/8	10
15	P	5511	091		WASHER, Flat, #10	4
16	P	136588	002		PLATE, Bottom	1
17	P	82675	001		SCREW, Green Ground, #10-32	1
18	P	150783	001		GROMMET	1
19	P	129326	001		HOLDER, Wire	11
20	P	75954	091		TIE, Wire	28
21	P	3984	041		SCREW, Round Head, #6-32 x 3/8	8
22	P	5469	041		WASHER, Flat, #6	8
23	P	3037	041		NUT, Hex, #6-32	8
24	P	19522	091		TERMINAL, Wire, #10 Ring x 16-22 AWG	1
25	P	14865	091		TERMINAL, Wire, #8 Ring x 22-18 AWG	1
26					WIRE, Green	1
27	P	129352	069		NUT, Tinnerman, #10-32	8
28					TAPE, Label (Dymo or equiv.)	AR
29	P	56374	001		SCREW	1
30	P	4682	041		SCREW, Round Head, #8-32 x 3/8	1

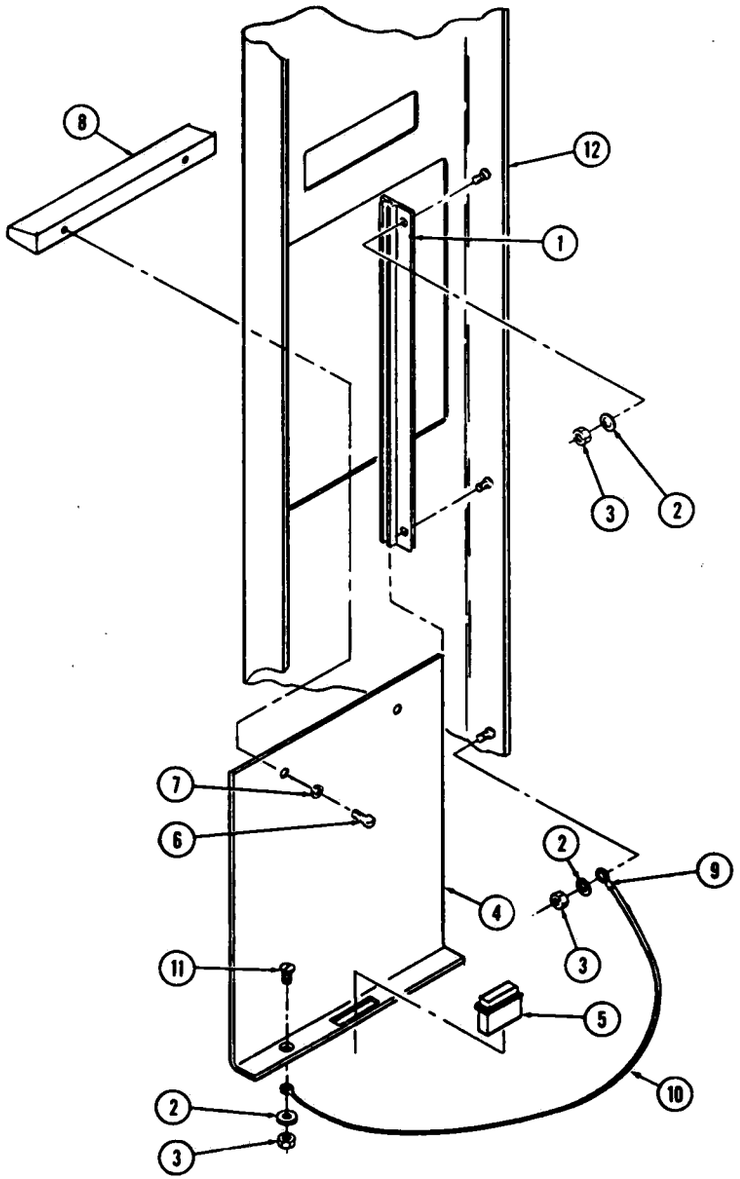
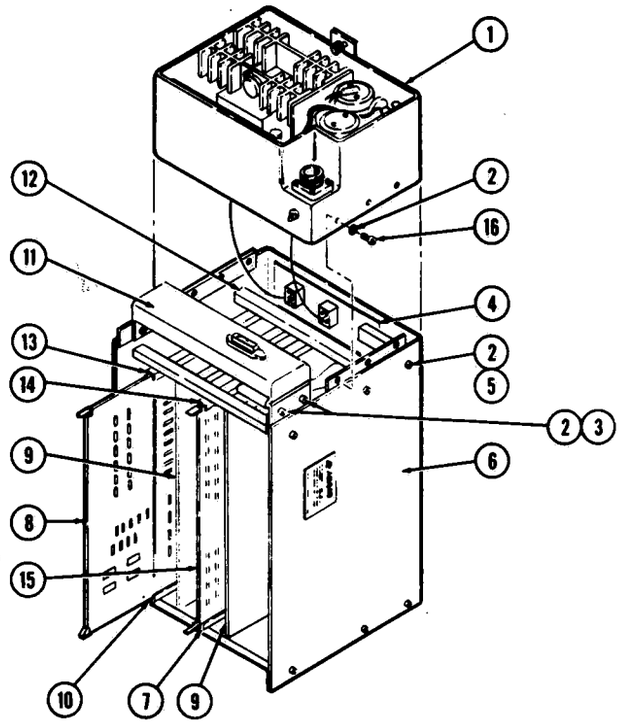


Figure 9-6. CONTROL COLUMN, Eagle 2300 (Part 3 of 3).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
9-6-					CONTROL COLUMN, Eagle 2300 (Part 3 of 3)	X
1	P	84394	001		SLIDE, Door	2
2	P	5469	041		WASHER, Flat, #6	6
3	P	3037	041		NUT, Hex, #6-32	6
4	P	93662	001		DOOR	1
5	P	83920	001		CATCH, Magnetic	1
6	P	4682	041		SCREW, Round Head, #8-32 x 3/8	2
7	P	79588	001		LOCKWASHER, #8	2
8	P	84393	001		HANDLE	1
9	P	90619	091		TERMINAL, #6 Ring x 18-22 AWG	2
10					WIRE, Green, 15 inches	1
11	P	50705	041		SCREW, Flat Head, #6-32 x 5/16	1
12					PANEL ASSEMBLY, Front, Manual Door	REF
					PANEL ASSEMBLY, Front, Power Door	REF



See Figure 9-7A To Identify PC Boards

Figure 9-7. MAIN CONTROL ASSEMBLY, Eagle 2300.

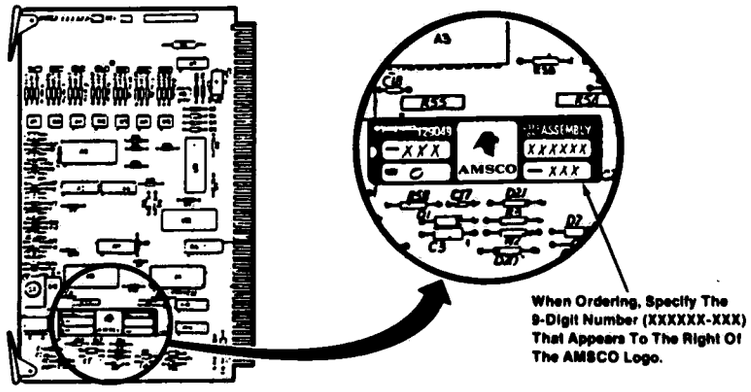


Figure 9-7A. IDENTIFYING PC BOARD PART NUMBERS.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY
9-7-					MAIN CONTROL ASSEMBLY, Eagle 2300	X
1	P	146645	042		POWER SUPPLY ASSEMBLY	1
	P	764193	027		• REPAIRED, Power Supply Assembly	1
	P	764317	833	*	• FUSE, 2 Amp, 125 V (F4)	1
	P	764317	834	*	• FUSE, Pico, 2 Amp. 125 V (F2)	1
	P	764317	836	*	• FUSE, Pico, 1/2 Amp, 125 V (F3)	1
	P	764317	449	*	• FUSE, Cartridge, Slo-Blo, 2 Amp, 250 V (F402)	1
2	P	84116	002		LOCKWASHER, #6	20
3	P	150822	727		SCREW, Self Tapping, #6 x 1/4	5
4	P	760244	004		MOTHERBOARD ASSEMBLY, Isothermal	1
	P	764193	009		• REPAIRED, Isothermal Motherboard Assembly	1
	P	760244	001		MOTHERBOARD ASSEMBLY, Gravity	1
	P	764193	006		• REPAIRED, Gravity Motherboard Assembly	1
5	P	84117	002		SCREW, Pan Head, #6-32 x 5/16	10
6	P	93762	001		CHASSIS	1
7	P	84225	001		GUIDE, PC Board	6
8	P	146586	051		PC Board, CPU (See Figure 9-7A)	1
9	P	84467	001		PLATE, Side	2
10	P	84226	001		TAB, Locking	9
11	P	93900	045		RECEPTACLE BRACKET ASSEMBLY	1
12	P	129030	001		BAR, PC Board Guide	4
13	P	83528	001		TAB, ID Locking (CPU)	1
14	P	83528	007		TAB, ID Locking (I/O 1)	1
15	P	146588	051		PC BOARD, I/O 1 (See Figure 9-7A)	1
16	P	150822	728		SCREW, Hex Head, #6 x 3/8 (Cad. or Zinc Plated)	3
17	P	136800	561		HEAT SINK (Not Shown)	
18	P	83528	008		TAB, ID Locking (I/O 2; Not Shown)	1
19					PC BOARD (I/O 2; Not Shown)	1
					Some units will require an I/O 2 PC Board (Item 19)	
9-7A					IDENTIFYING PC BOARD PART NUMBERS	
					To order new or repaired PC Boards, note part number identified in Figure 9-7A.	

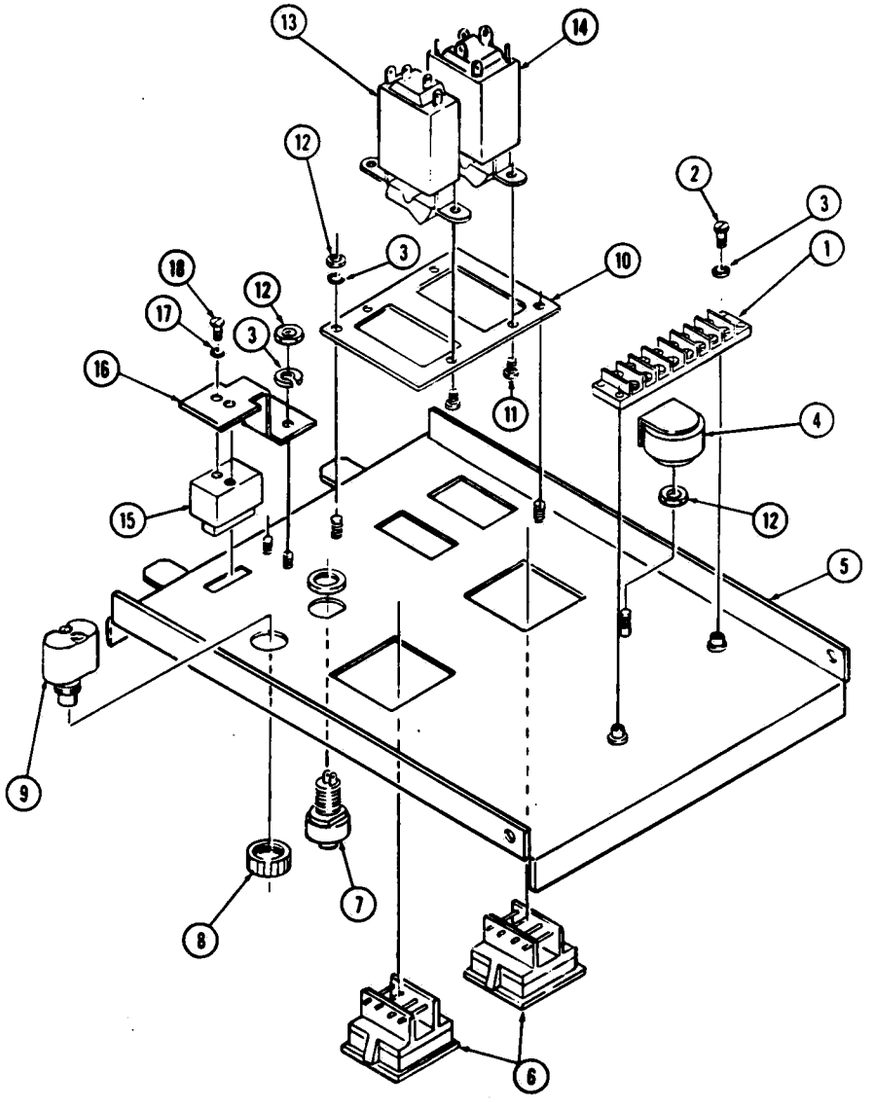


Figure 9-8. SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
9-8-	P	146645	569		SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 1 of 2)	X
1	P	90627	091		BLOCK, Terminal, 15 Amp, 8 Point	1
2	P	3960	041		SCREW, Round Head, #6-32 x 1 2	2
3	P	18131	091		LOCKWASHER, #6	6
4	P	83933	002		BUZZER	1
	P	764316	608		• KIT, Buzzer Resistor (See Fig. 9-9)	1
5	P	146645	568		PANEL, Secondary	1
6	P	136315	001		SWITCH, Thumbwheel, 4 Switch Assembly	2
7	P	84400	001		BREAKER, Circuit (CB-2)	1
8	P	44155	091		GUARD, Button	1
9	P	48070	091		SWITCH, Pushbutton (CB-1)	1
10	P	93757	001		SPACER, Breaker	1
11	P	27741	041		SCREW, Flat Head, #6-32 x 3/16	4
12	P	3037	041		NUT, Hex, #6-32	5
13	P	84386	001		BREAKER, Circuit (PB-1)	1
14	P	129022	001		SWITCH, Rocker (SW-1)	1
15	P	84362	002		COUNTER	1
16	P	93749	001		BRACKET, Counter	1
17	P	30743	045		LOCKWASHER, #4	2
18	P	17658	041		SCREW, Round Head, #4-40 x 3/16	2

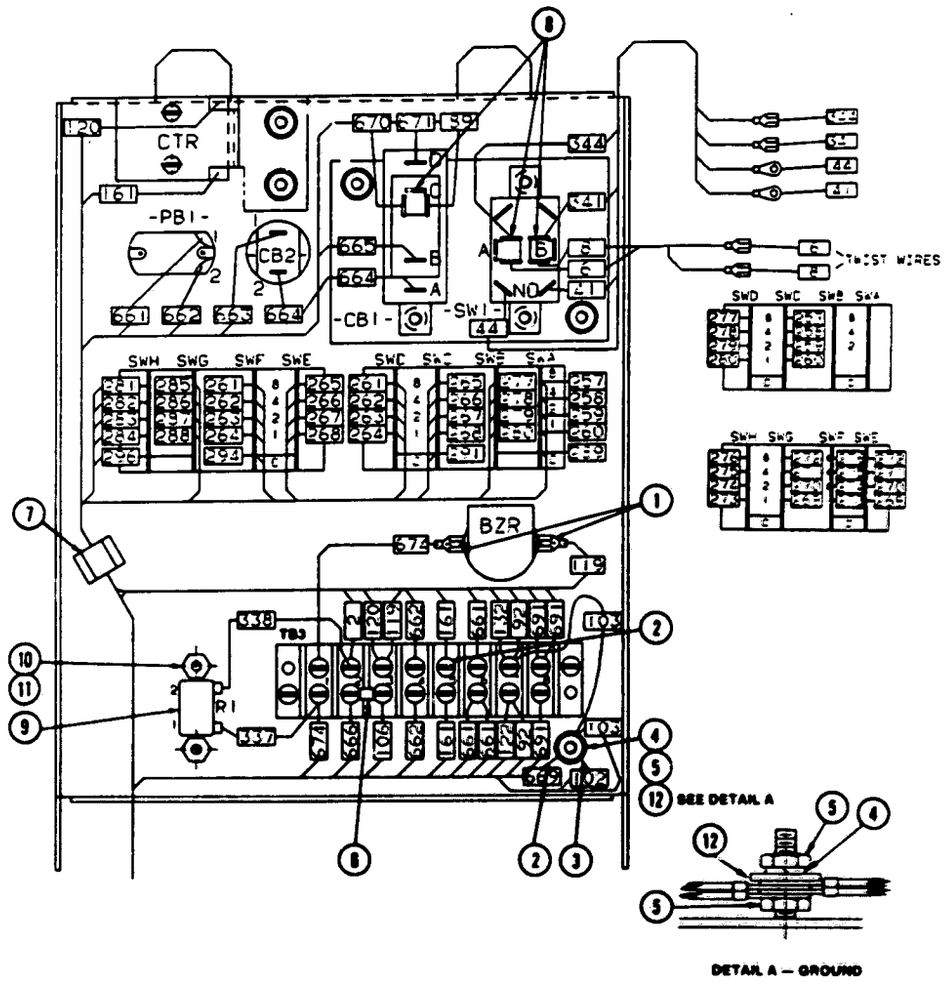


Figure 9-9. SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
9-9-	P 146645	569		SECONDARY CONTROL PANEL, Eagle 2300 Gravity (Part 2 of 2)	*
1	P 91694	091		RECEPTACLE, 3/16 Lug x #18-22 Wire	2
2	P 90619	091		TERMINAL, Wire, #6 Ring x #18-22 Wire	AR
3	P 14592	091		TERMINAL, Wire, #10 Stud x #16-14 Wire	2
4	P 18131	091		LOCKWASHER, #6	1
5	P 3037	041		NUT, Hex, #6-32	2
6	P 84123	001		JUMPER, Terminal Block	1
7	P 431152	091		CLIP	1
8	P 32116	091		ADAPTER, Terminal	3
9	P 129316	001		RESISTOR, 3 kΩ, ¼t	1
10	P 13794	041		NUT, Hex, #4-40	2
11	P 26002	091		WASHER, Flat	2
12	P 17589	045		WASHER, Flat	1

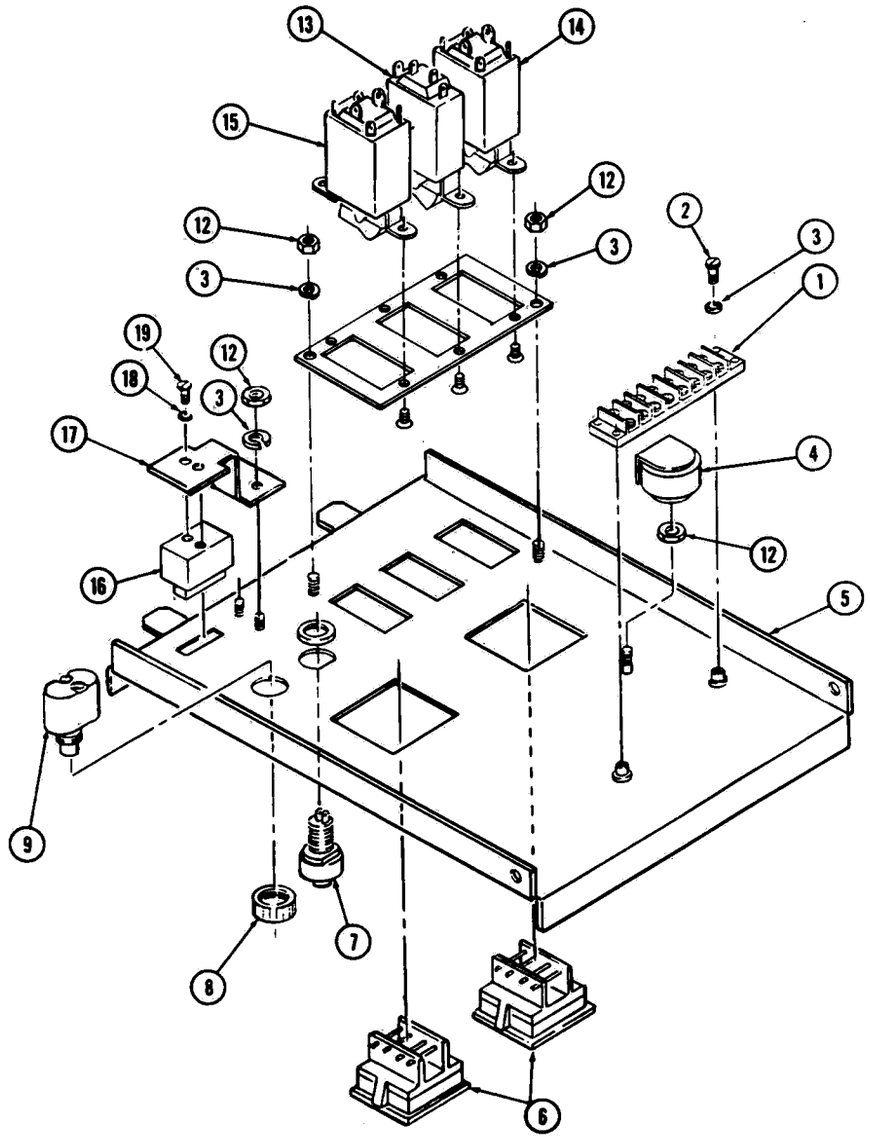


Figure 9-10. SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
9-10-	P	146645	571		SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 1 of 2)	X
1	P	90627	091		BLOCK, Terminal, 15 Amp, 8 Point	1
2	P	3960	041		SCREW, Round Head, #6-32 x 1/2	2
3	P	18131	091		LOCKWASHER, #6	6
4	P	83933	002		BUZZER	1
	P	764316	608		• KIT, Buzzer Resistor (See Fig. 9-11)	1
5	P	146645	570		PANEL, Secondary	1
6	P	136315	001		SWITCH, Thumbwheel, 4 Switch Assembly	2
7	P	84400	001		BREAKER, Circuit (CB-2)	1
8	P	44155	091		GUARD, Button	1
9	P	48070	091		SWITCH, Pushbutton (CB-1)	1
10	P	93758	001		SPACER, Breaker	1
11	P	27741	041		SCREW, Flat Head, #6-32 x 3/16	6
12	P	3037	041		NUT, Hex, #6-32	7
13	P	84386	001		BREAKER, Circuit (PB-1)	1
14	P	129022	001		SWITCH, Rocker (SW-1)	1
15	P	84148	001		SWITCH, Rocker, DPDT (SW-2)	1
16	P	84362	002		COUNTER	1
17	P	93749	001		BRACKET, Counter	1
18	P	30743	045		LOCKWASHER, #4	2
19	P	17658	041		SCREW, Round Head, #4-40 x 3/16	2

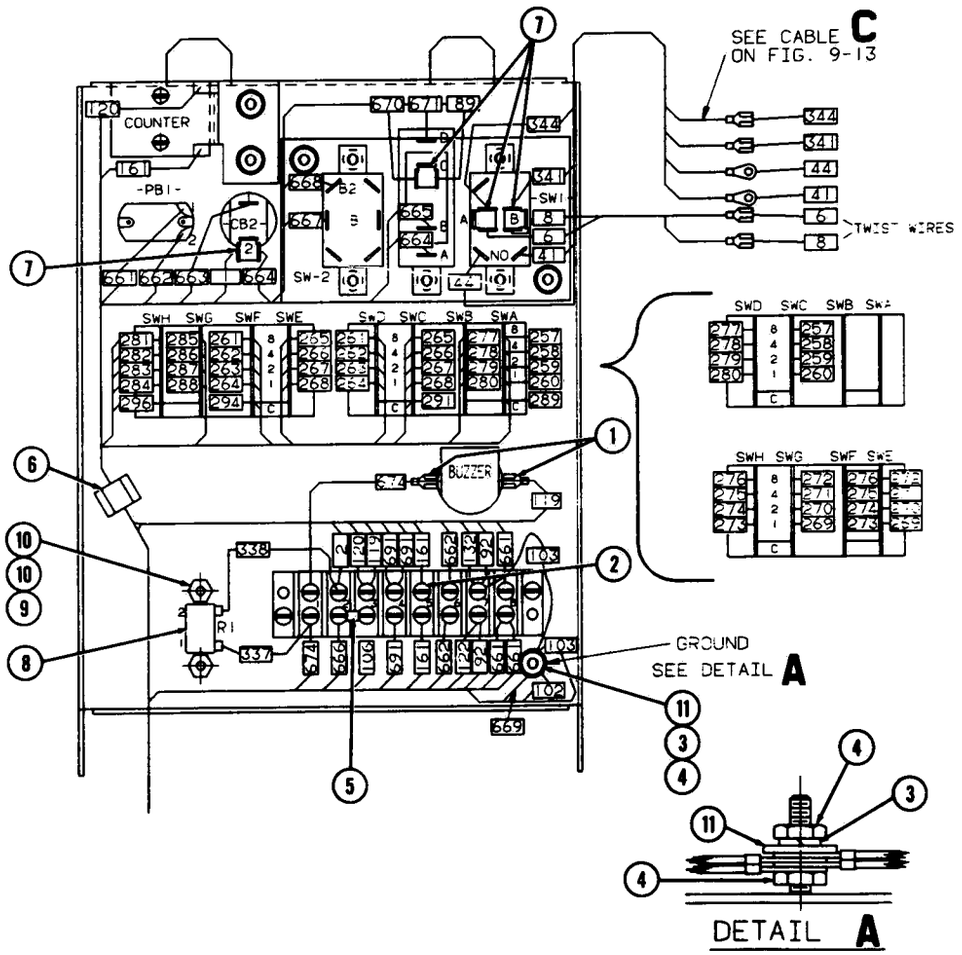


Figure 9-11. SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
9-11-	P	146645	571		SECONDARY CONTROL PANEL, Eagle 2300 Isothermal (Part 2 of 2)	X
1	P	91694	091		RECEPTACLE, 3/16 Lug x #18-22 Wire	2
2	P	90619	091		TERMINAL, Wire, #6 Ring x #18-22 Wire	15
3	P	18131	091		LOCKWASHER, #6	1
4	P	3037	041		NUT, Hex, #6-32	2
5	P	84123	001		JUMPER, Terminal Block	1
6	P	431152	091		CLIP	1
7	P	32118	091		ADAPTER, Terminal	4
8	P	129318	001		RESISTOR, 3 kΩ, R1	1
9	P	13794	041		NUT, Hex, #4-40	2
10	P	26032	091		WASHER, Flat	4
11	P	17589	045		WASHER, Flat	1

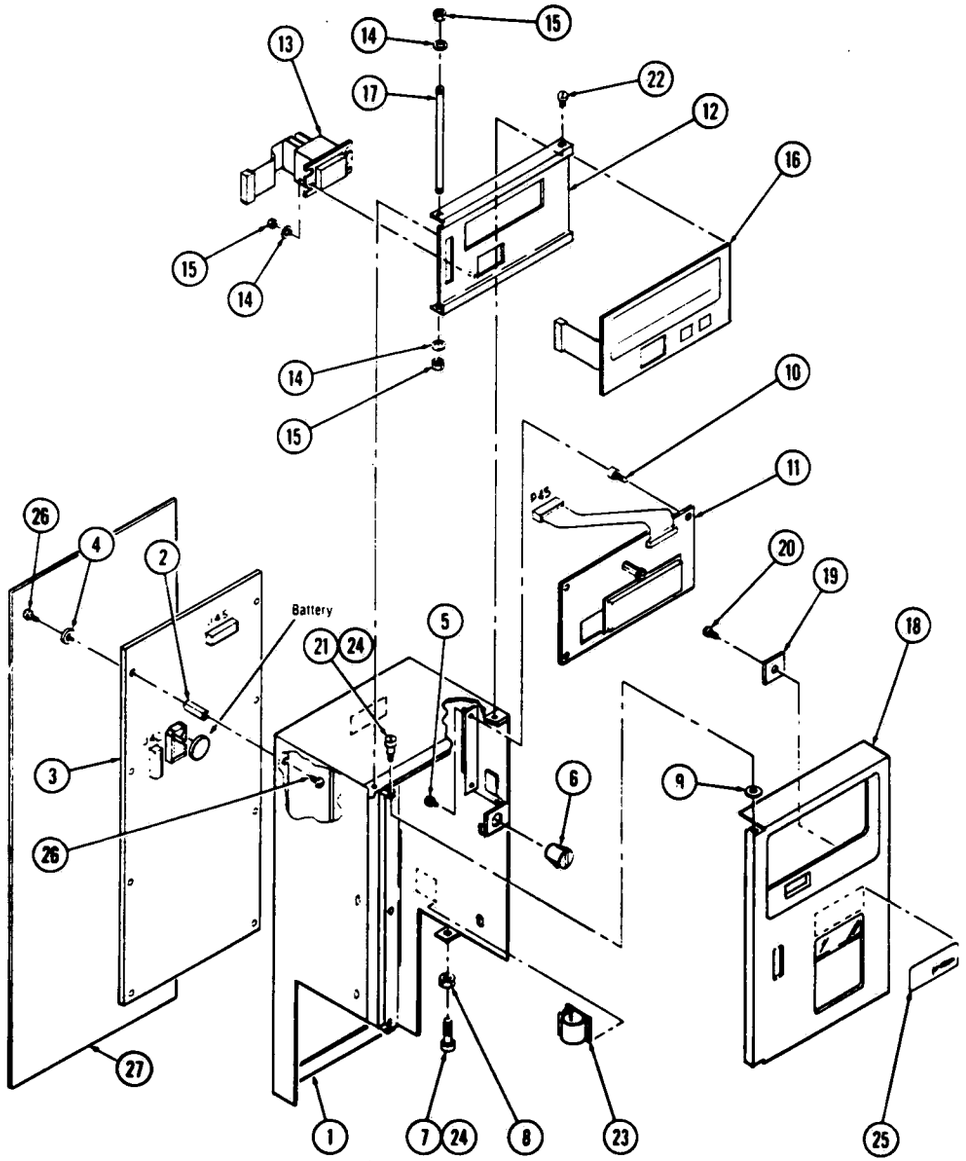


Figure 9-12. PRINTCON HOUSING ASSEMBLY, Eagle 2300.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
9-12-	P	146645	624		PRINTCON HOUSING ASSEMBLY, Eagle 2300	X
1	P	146649	111		HOUSING, Weldment	1
2	P	129356	033		STAND-OFF	8
3	P	146654	001		P/C BOARD ASSEMBLY, Printcon Control	1
					• P/C BOARD ASSEMBLY, Repaired	1
	P	150822	351		• BATTERY, Coincell	1
4	P	129352	094		WASHER, Flat, #6 Nylon	8
5	P	12451	041		SCREW, Round Head, #6-32 x 1/4	8
6	P	129356	001		CATCH, Magnetic	1
7	P	41012	061		SCREW, Socket Head, #10-32 x 1/2	2
8	P	2959	041		NUT, Hex, #10-32	2
9	P	5469	041		WASHER, Flat, #6	2
10	P	84147	001		SUPPORT, Circuit Board	3
11	P	146633	061		DISPLAY BOARD ASSEMBLY, Digital Printer	1
	P	764193	029		• DISPLAY BOARD ASSEMBLY, Repaired	1
12	P	93900	001		DISPLAY BRACKET ASSEMBLY	1
13	P	93900	022		SWITCH, Thumbwheel	1
14	P	84114	001		WASHER, Flat, #4	4
15	P	13794	041		NUT, Hex, #4-40	4
16	P	136805	004		PANEL, Overlay Display	1
17	P	129356	023		STUD	1
18	P	146649	009		DOOR, Printer Display	1
19	P	129356	002		STRIKE	1
20	P	82340	001		SCREW, Flat Head Self Tapping, #6 x 5/16	1
21	P	129356	006		SCREW, Shoulder, #4-40 x 1/8	2
22	P	40357	045		SCREW, Self Tapping, #6 x 1/4	1
23	P	150539	001		CLIP, Cable	1
24	P	5300	640		VIBRATITE	AR
25	P	129356	142		LABEL, Printcon	1
26	P	3984	041		SCREW, Round Head, #6-32 x 3/8	16
27	P	150822	611		PAD, Anti-Static	1

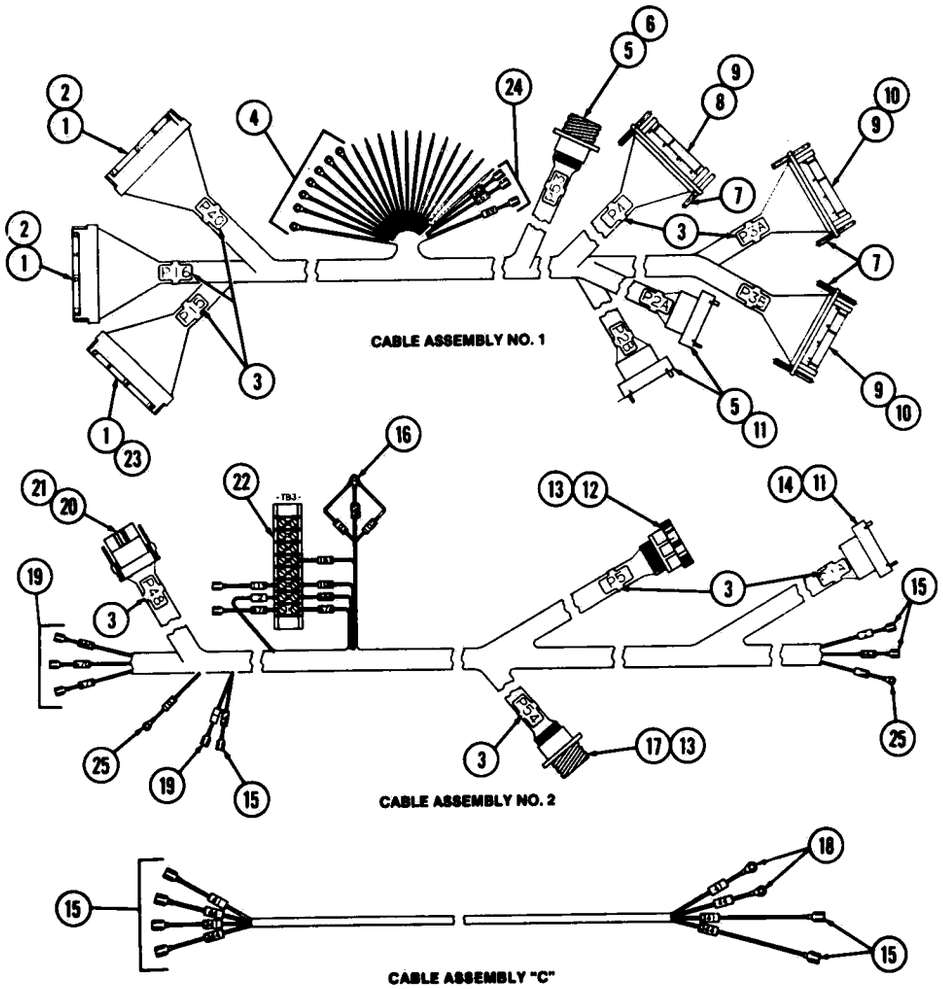


Figure 9-13. HARNESS ASSEMBLY, Secondary Panel, Eagle 2300 Gravity/Isothermal.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
9-13-					HARNESS ASSEMBLY, Eagle 2300 Secondary Panel	X
1	P	84187	003		CONTACT, Socket, P15, P16 and P40	65
2	P	84229	002		HOUSING, Connector, 36 Position, P16 and P40	2
3	P	150822	003		MARKER, Tie	10
4	P	129278	001		TERMINAL, Ring, #6 Stud x 22-26 AWG	10
5	P	150822	030		CONTACT, Socket, P2, P2B and P53	15
6	P	93443	005		RECEPTACLE, 14 Position, P53	1
7	P	84192	001		JACKSCREW, Female	6
8	P	84205	002		HOUSING, Pin, 38 Position, P4	1
9	P	84207	002		PIN, Contact, P3, P3B and P4	48
10	P	84205	001		HOUSING, Pin, 28 Position, P3 and P3B	2
11	P	93829	001		BLOCK, P1A, P2 and P2B	3
12	P	93838	002		PLUG, 16 Position, P5	1
13	P	84198	004		SOCKET, Contact, P5 and P54	22
14	P	150822	043		PIN, Contact, P1A	9
15	P	32119	091		TERMINAL, Quick Disconnect, 1/4 Lug x 14-16 AWG	9
16	P	14590	091		TERMINAL, Ring, #6 Stud x 14-16 AWG	3
17	P	93443	006		RECEPTACLE, 37 Position, P54	1
18	P	14591	091		TERMINAL, Ring, #8 Stud x 14-16 AWG	2
19	P	90695	091		TERMINAL, Quick Disconnect, 1/4 Lug x 18-22 AWG	8
20	P	129352	121		HOUSING, Socket, 9 Position, P48	1
21	P	84220	002		CONTACT, Socket, P48	8
22	P	90627	091		BLOCK, Terminal, 8 Position, 15 A	1
23	P	84229	001		RECEPTACLE, 30 Position, P15	1
24	P	84402	001		TERMINAL, Quick Disconnect, 1/4 Lug x 24-26 AWG	3
25	P	14592	091		TERMINAL, Ring, #10 Stud x 14-16 AWG	2

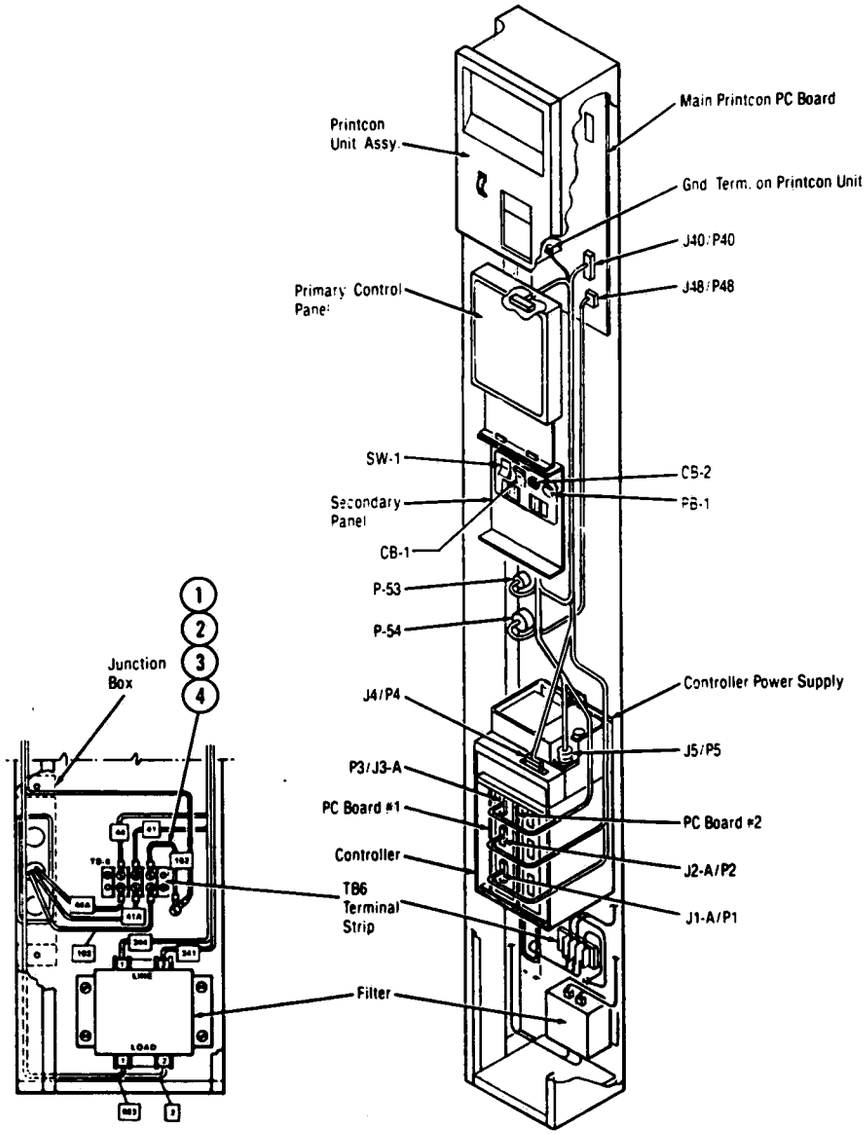
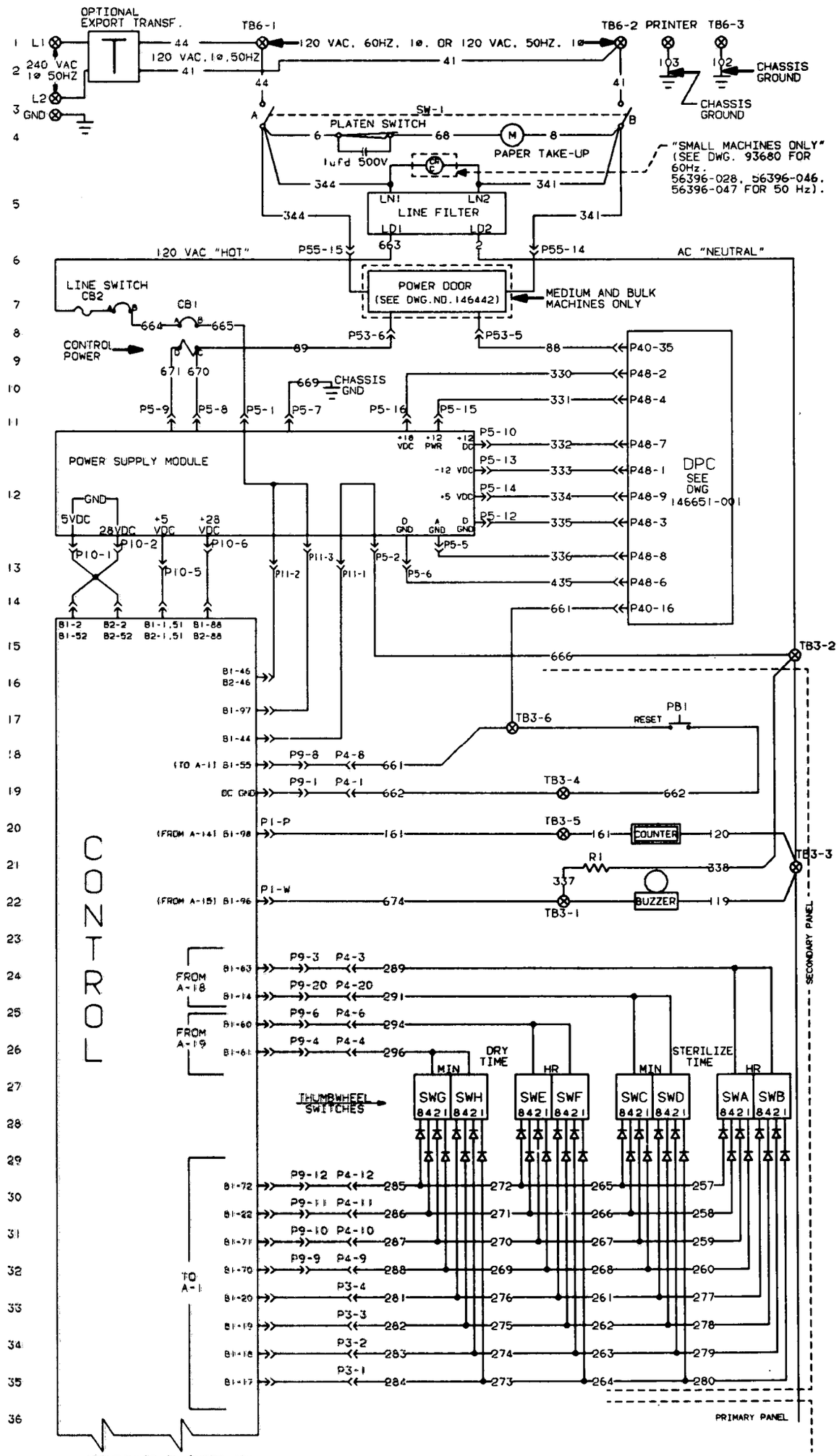


Figure 9-14. CONNECTION DETAILS, Eagle 2300 Control Column.

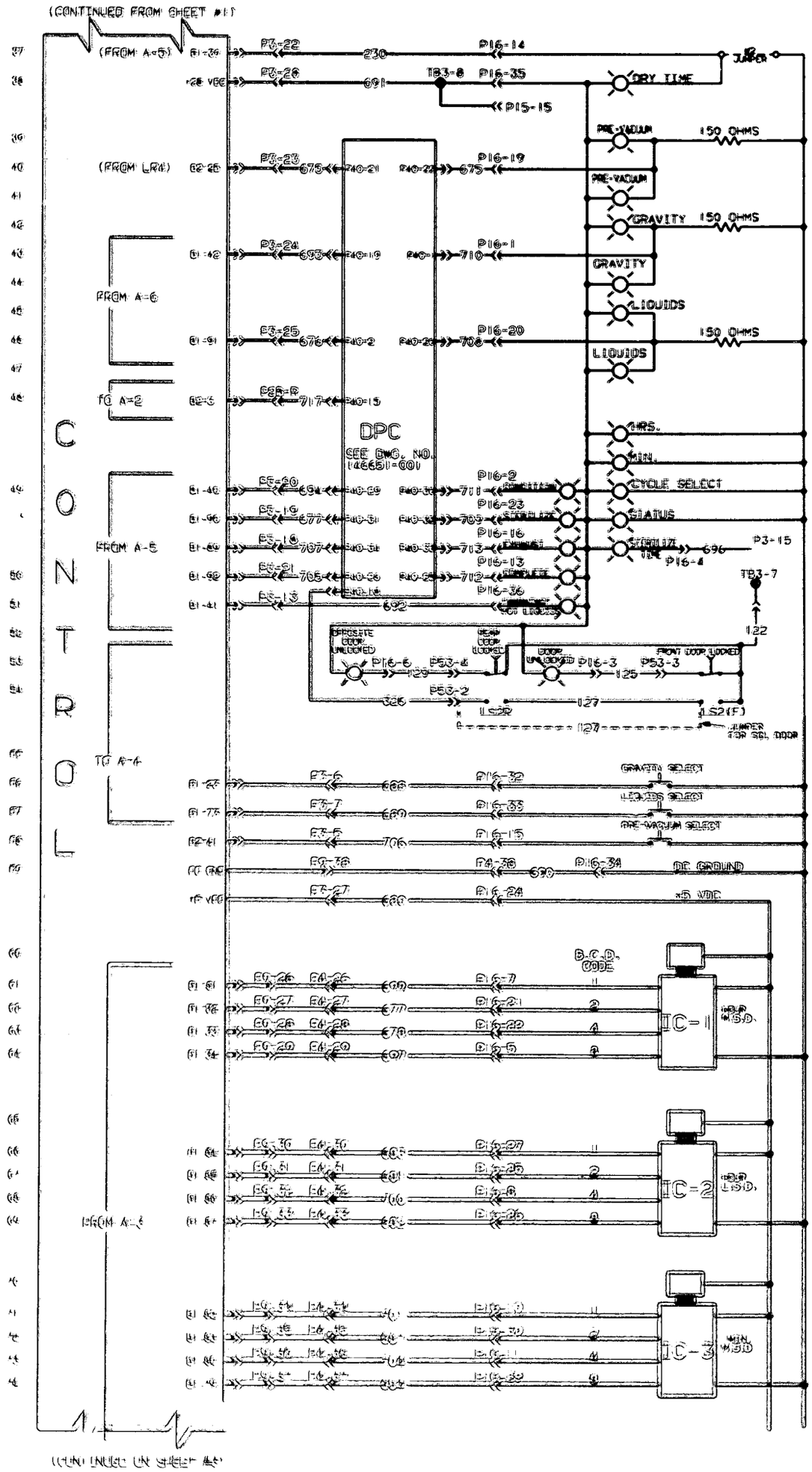
FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY				
9-14-				CONNECTION DETAILS, Control Column, Manual Door	X				
				CONNECTION DETAILS, Control Column, Power Door		X			
1	P	19522 091		TERMINAL, Wire, #10 Ring x 16-22 AWG	1	1			
2	P	82675 001		SCREW, Green Ground, #10-32 x 3/8	1	1			
3	P	14865 091		TERMINAL, Wire, #8 Ring x 18-22 AWG	1	1			
4				WIRE, Green	1	1			

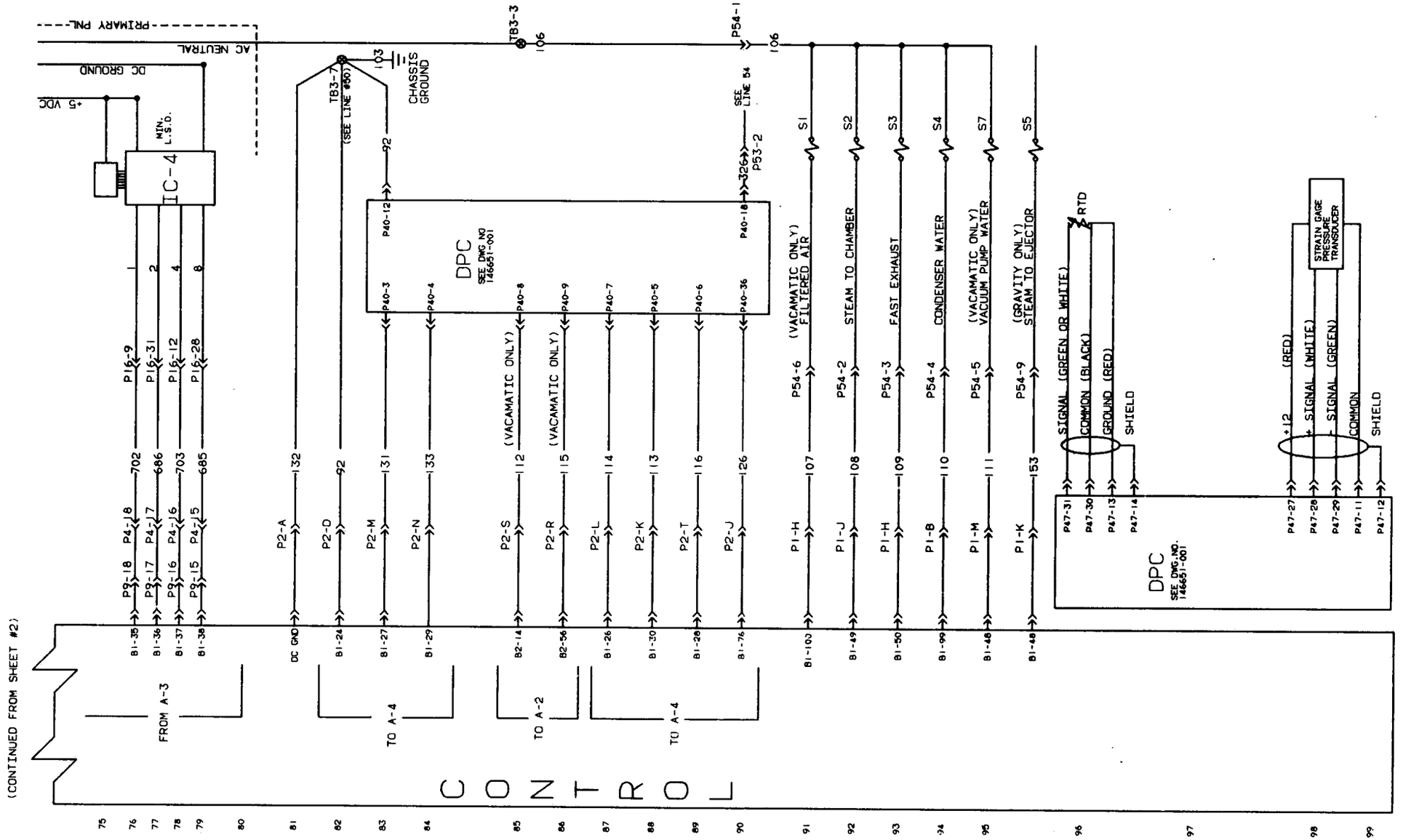


F-11

F-12

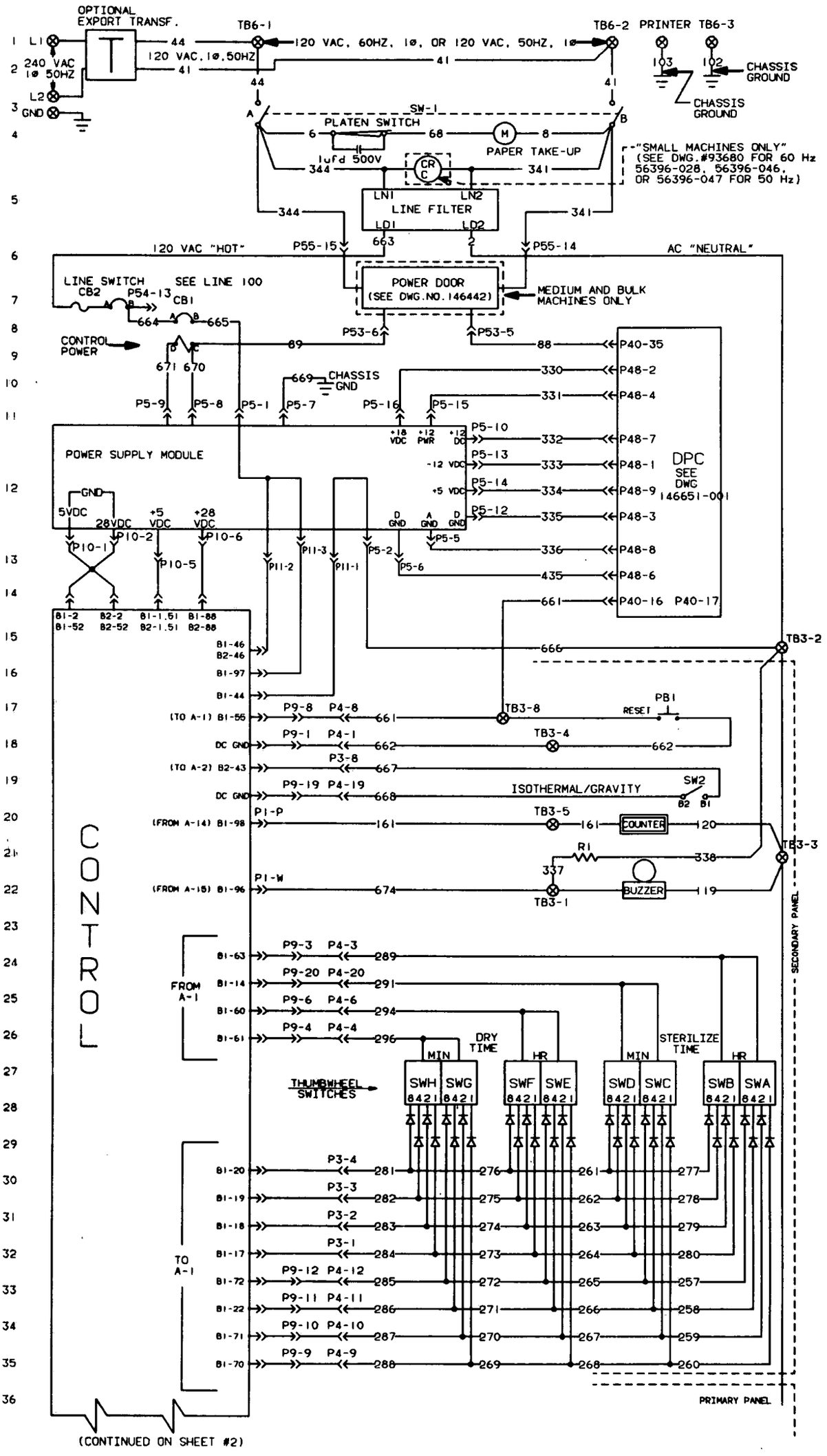
ELECTRICAL SCHEMATIC, Eagle 2300 Vacumatic and Gravity (Part 1 of 3)

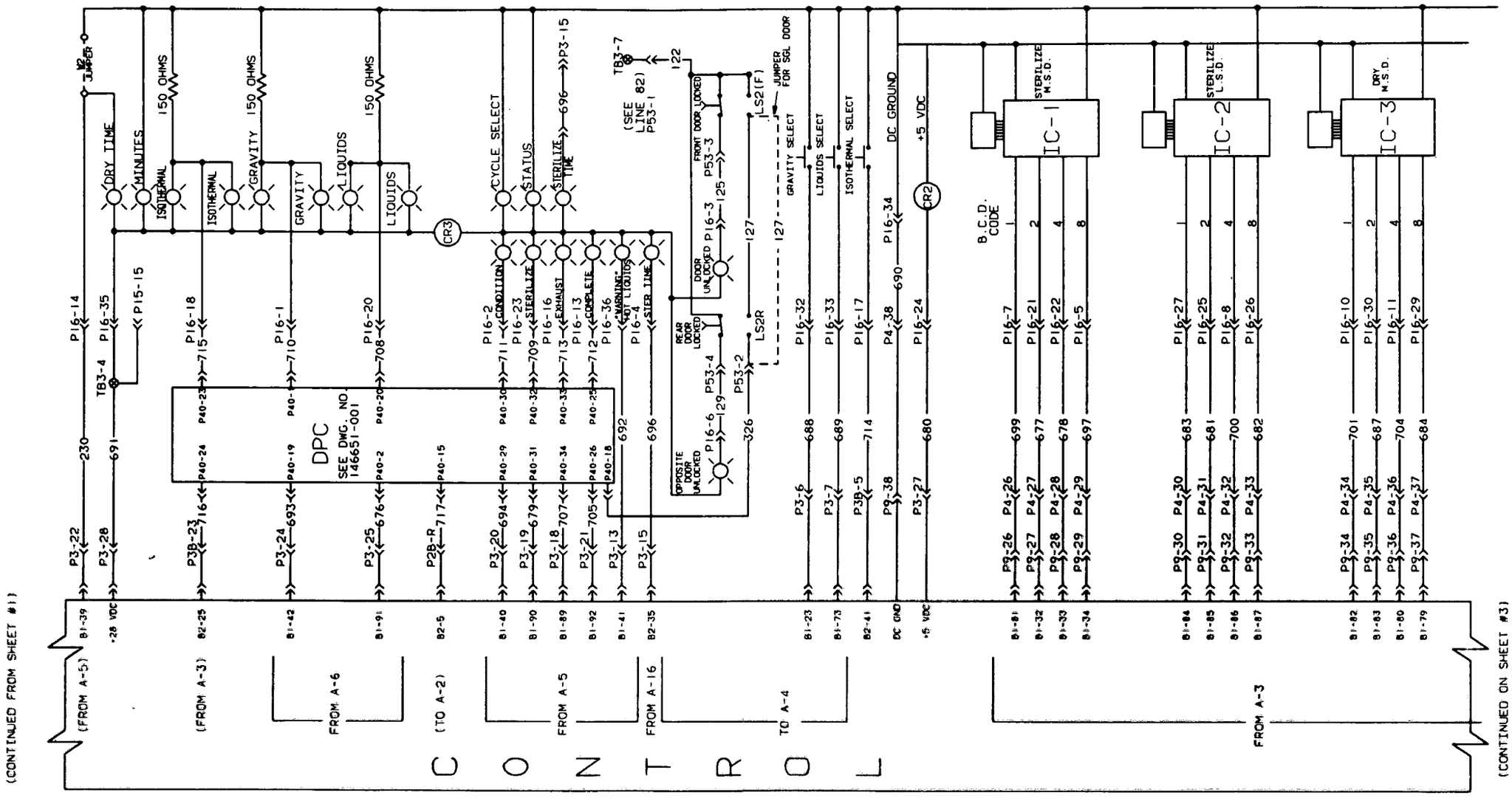

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FROM A-6
TO A-2
DPC
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FROM A-5
TO A-4
FROM A-5
(CONTINUED ON SHEET #13)
CONTROL
DRY TIME
PRE-VACUUM
150 OHMS
GRAVITY
LIQUIDS
HRS.
MIN.
CYCLE SELECT
STATUS
JUMPER
TB3-7
122
P3-15
696
OPPOSITE DOOR UNLOCKED
REAR DOOR LOCKED
FRONT DOOR LOCKED
125
127
LS2(F)
JUMPER FOR SGL DOOR
GRAVITY SELECT
LIQUIDS SELECT
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DC GROUND
+5 VDC
B.C.D. CODE
IC-1
IC-2
IC-3
LSD
MSD



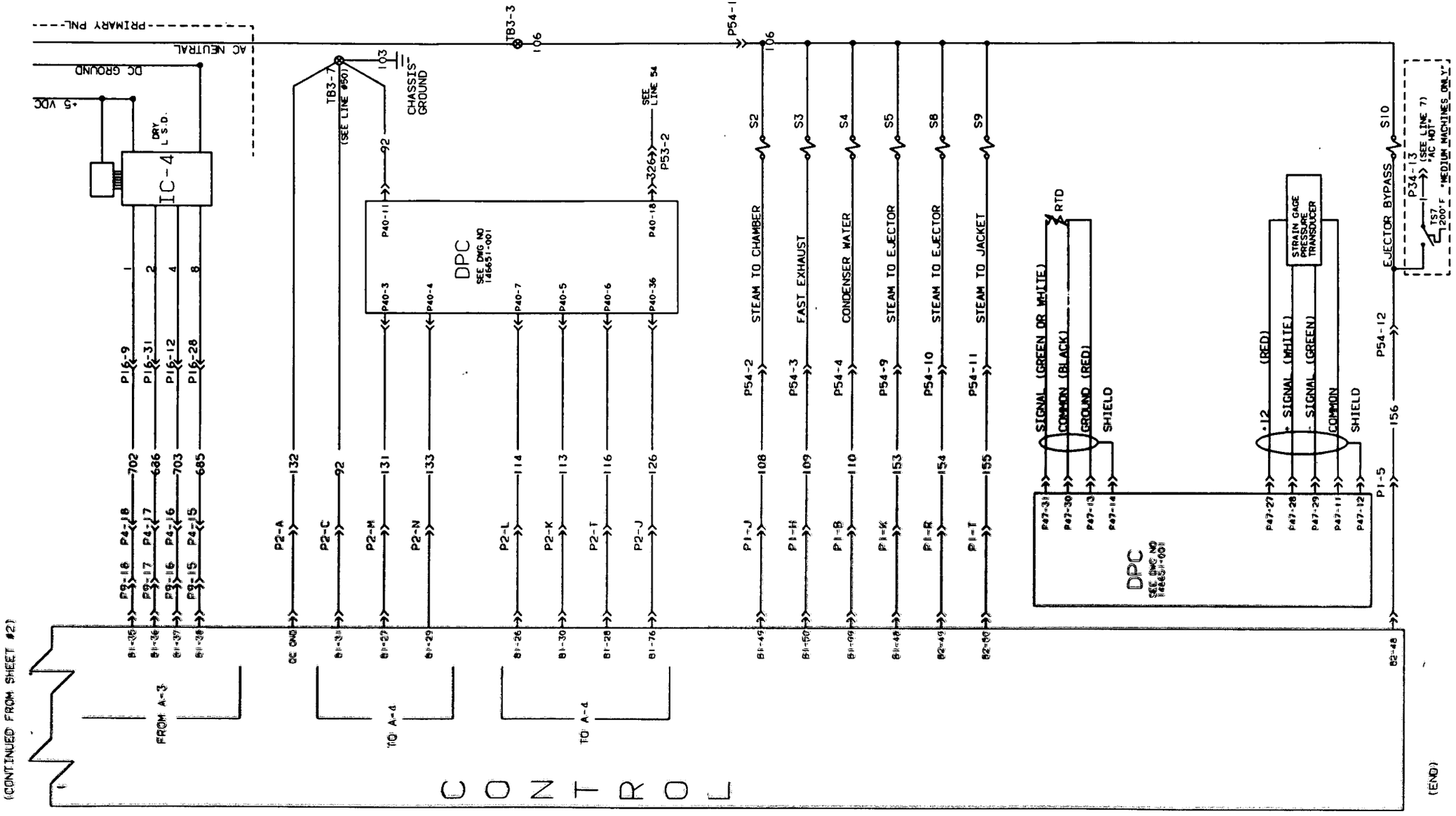
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Vacamatic and Gravity (Part 3 of 3)

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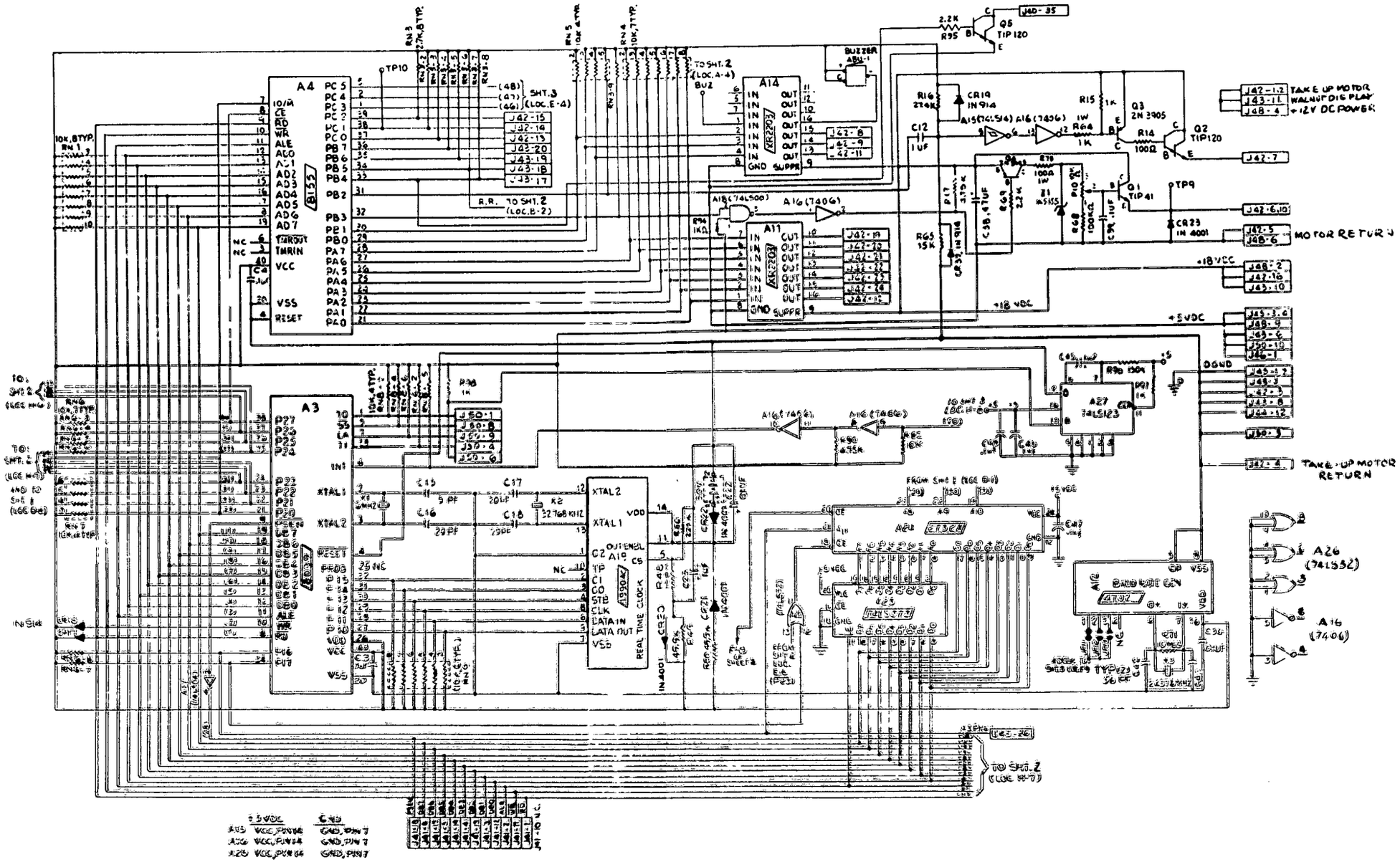




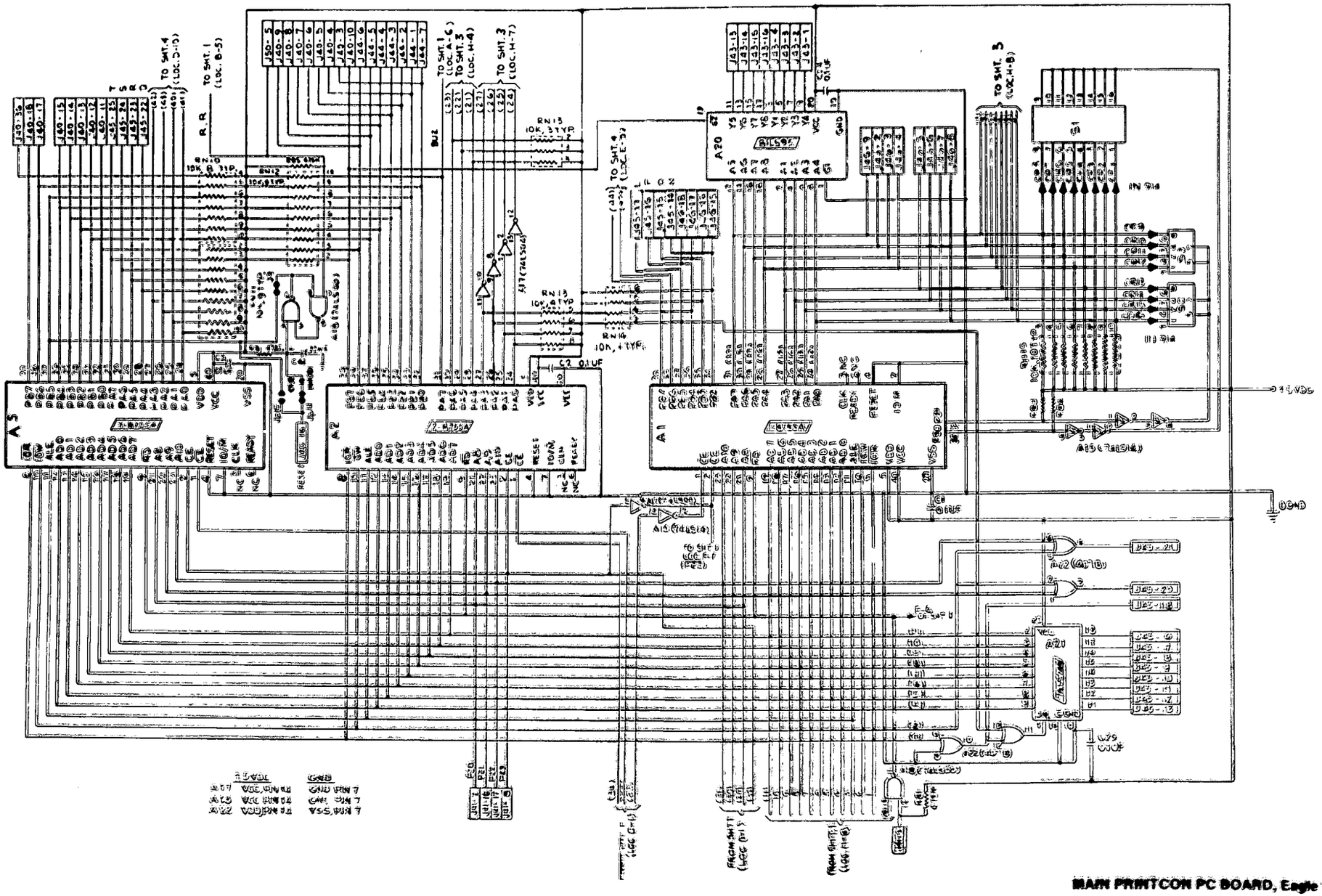
ELECTRICAL SCHEMATIC, Eagle 2300
Isothermal (Part 2 of 3)



ELECTRICAL SCHEMATIC, Eagle 2300
Isothermal (Part 3 of 3)



MAIN PRINTCON PC BOARD, Eagle 2300
(Part 1 of 4)



MAIN PRINTCON PC BOARD, Eagle 2300
(Part 2 of 4)

DWG. NO. 140854-002

AMSCO SERVICE

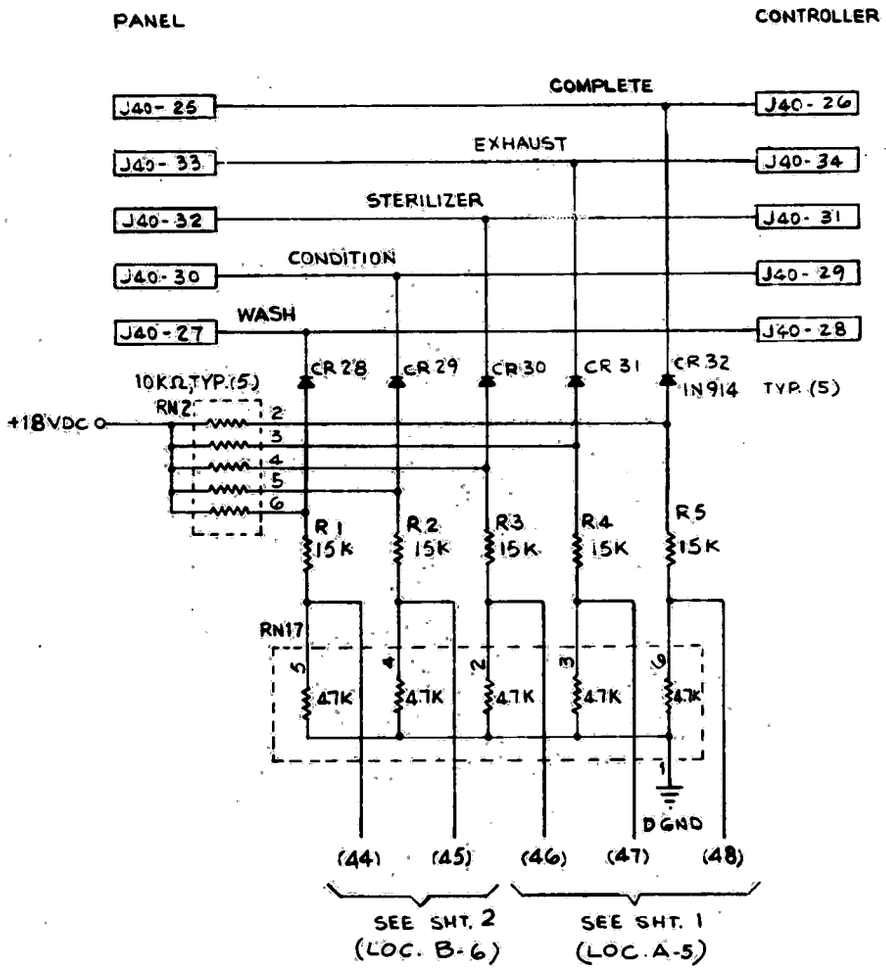
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GRAVITY/ISOTHERMAL SMALL RECTANGULAR
STERILIZER P-764083-002

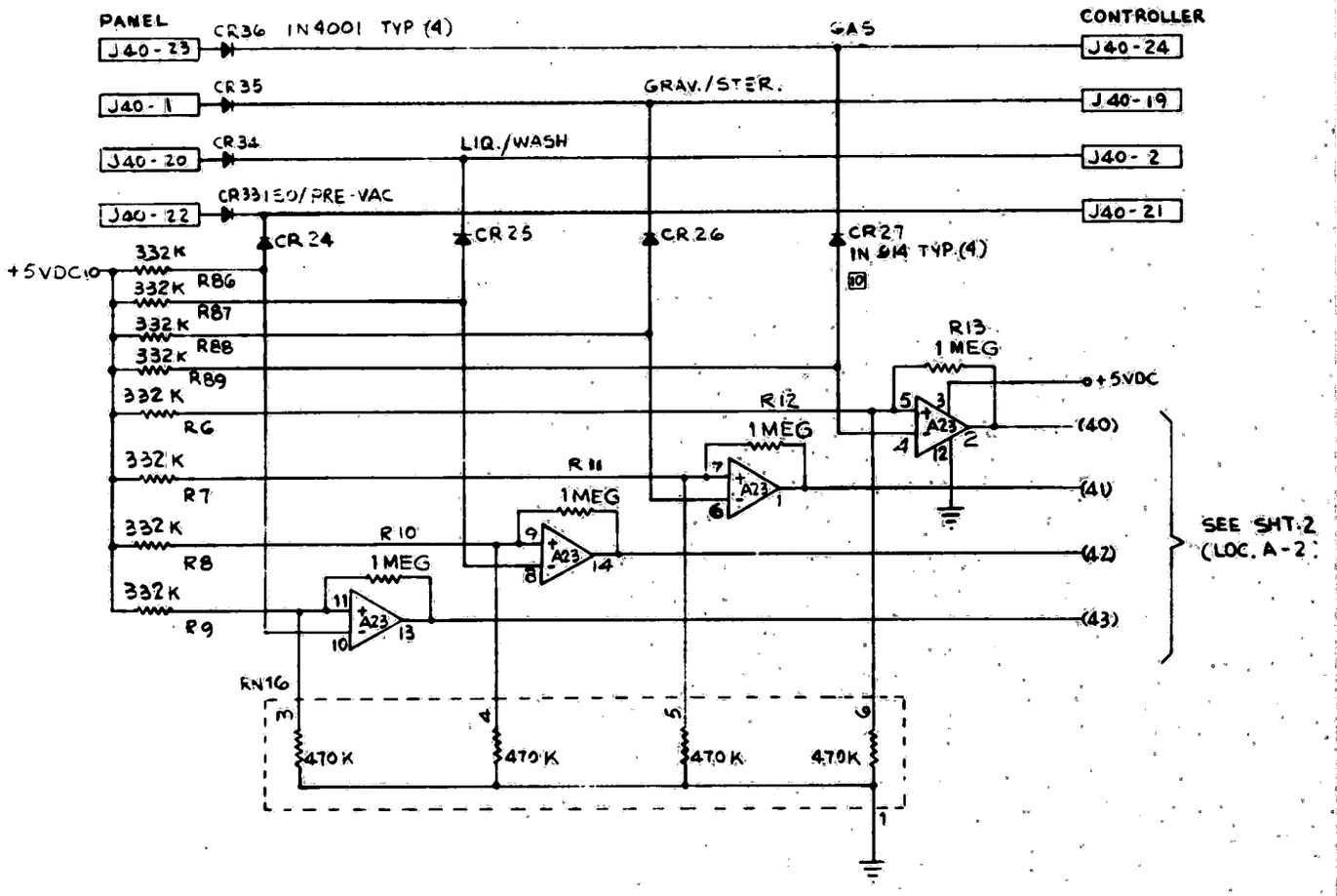
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5 of 6



DWG. NO. 149654-002
(7/29/86)





MAIN PRINTCON PC BOARD, Eagle 2300
(Part 4 of 4)

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