

AMSCO Maintenance Manual



Eagle® 2400 Series

**AWCC 2400 TERMINAL STERILIZER
with PRINTCON™**

1/89

P-129360-733

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SUMMARY OF SAFETY PRECAUTIONS

The following is a summary of safety precautions which must be observed when operating or servicing this sterilizer. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to equipment. 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 performed or the possible hazardous consequences of each way.

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

WARNING!

- » Avoid personal injury from door closing. Do not reach into the sterilizer unless the door is blocked open with the safety bar attached behind the front panel. Also ensure wing panel is in the open position (power off).
- » Press the facility and control power off and wait until chamber cools to room temperature before starting any maintenance operations.
- » Repairs and adjustments should be attempted only by experienced persons fully acquainted with this equipment. Use of inexperienced, unqualified persons to work on the equipment or the installation of unauthorized parts could cause personal injury or result in costly damage.
- » When performing the required quarterly check of safety valves, be careful of escaping steam. To prevent burns, wear gloves or use an extension device if it becomes necessary to operate the try lever.
- » Ensure that the jacket pressure gauge shows no pressure in the jacket before loosening any piping entering the jacket.

SUMMARY OF SAFETY PRECAUTIONS (cont.)

CAUTION!

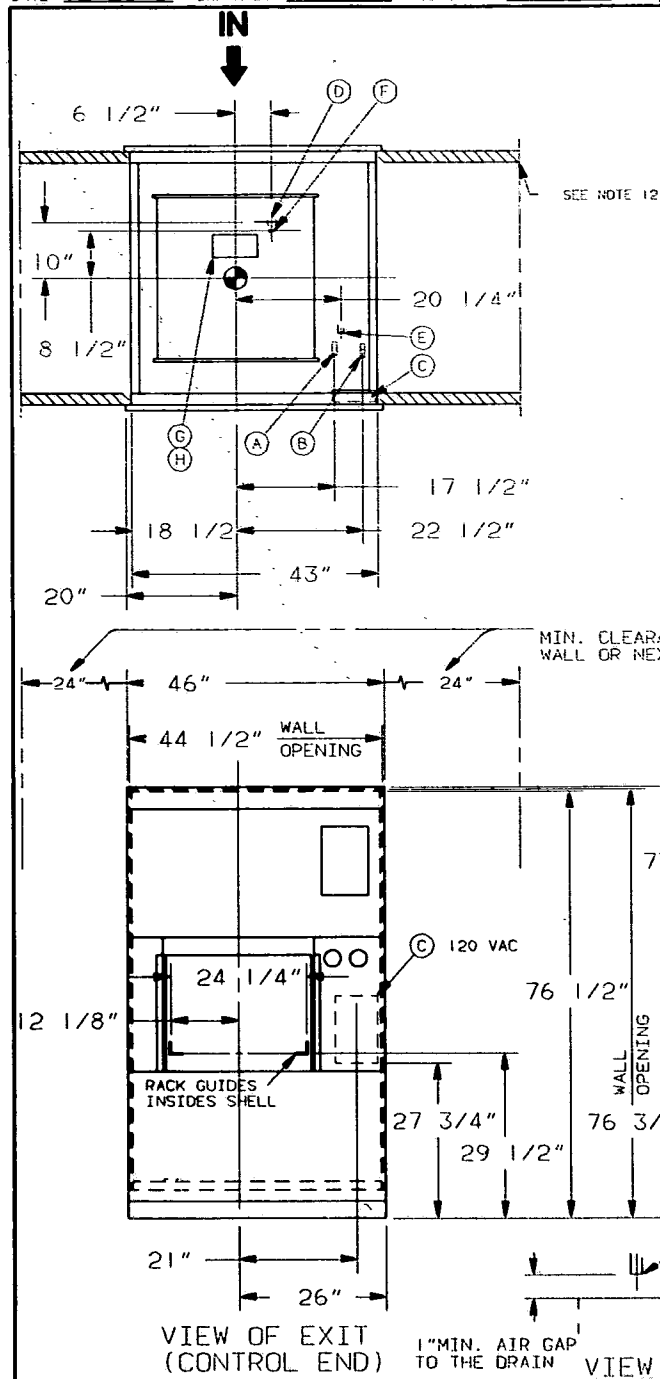
- » Never use a wire brush, abrasives, or steel wool on door and chamber assembly.
- » When using AMSCO Stainless-Steel Cleaner and Polish or AMSCO Pry Cleaner, rub in a back-and-forth motion (in same direction as the surface grain). Do not rub with a rotary or circular motion. Do not use these cleaners on plastic or painted surfaces. Follow directions on containers.
- » To prevent door lift mechanism failure, use only AMSCO approved parts when making repairs. The door lift mechanism requires special cable and supporting hardware for safe operation. When replacing door lifting cable, be sure cable does not twist, overlap, nor rub against itself. A twist in cable at door end can result in crossed cable at cylinder end.
- » All items must be contained in square of rack. Protruding items can cause damage to item or unit.
- » 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.
- » Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge. PC Boards contains static sensitive components; handle by card pulls or edges only.

SECTION 1

GENERAL INFORMATION

1.1 APPLICATION AND DESIGN

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



LEGEND

- A STEAM INLET-3/4"NPT SEE NOTE 1 1, 2, 3 & 4
 B WATER INLET-1"NPT SEE NOTE 1 2, 2, 3, 4 & 5
 C ELECTRIC CONTROL POWER SEE NOTE 1 4 1, 8 & 9
 D WASTE OUTLET-1-3/8"ODT SEE NOTE 10
 E AIR-1/2"NPT SEE NOTE 1 3
 F JACKET TRAP WASTE OUTLET - 1/2" ODT
 H ELECTRIC INTERLOCK WITH HORIZONTAL RACK TRANSPORTER SEE NOTE 1 4 2 & 9
 I HEAT LOSS OF MACHINE RECESSED IN WALL SEE NOTE#11
 1 7,500 BTU/HR BETWEEN TWO WALLS
 2 2,250 BTU/HR THROUGH DOOR AT EACH END

INSTALLATION SPECIFICATIONS

INSTALLATION SPECIFICATION IS LISTED AS ENGINEERING AND INSTALLATION GUIDES REFERENCED COMPONENTS AND SERVICES CONNECTIONS ARE NOT FURNISHED AS PART OF EQUIPMENT UNLESS UNDER WRITTEN AGREEMENT WITH AMSCO

1 UTILITIES

ROUGHING-IN AS INDICATED SHOULD BE STUBBED THROUGH FLOOR OR CEILING, AS REQUIRED, TO ALLOW FOR PIPE AND CONDUIT COUPLING. PIPING BETWEEN STERILIZER TERMINALS & WALL OR FLOOR OUTLETS IS NOT FURNISHED BY AMSCO

- 1.1 STEAM SUPPLY [A] 50-80 PSIG DYNAMIC, 97 TO 100% VAPOR QUALITY, 103 LBS/HR PEAK CONSUMPTION
- 1.2 WATER SUPPLY [B] 60-80 PSIG DYNAMIC, 6.5 GPM PEAK CONSUMPTION, 55 GALS PER CYCLE REQUIRED
- 1.3 AIR SUPPLY [E] 75-100 PSIG (4.92 kg/cm²) WITH DEW POINT 50-55°F (10-13°C) 2 SCFM PEAK FLOW, FILTERED
- 1.4 ELECTRICAL
 - 1.4.1 CONTROL [C]-120 VAC 1 PHASE 60HZ 12.5 AMP [INCLUDES 1/3 HP MTR]
 - 1.4.2 HORIZONTAL RACK TRANSPORTER INTERLOCK WHEN APPLICABLE [H]-5 #14 AWG WIRES FOR HRT AND 2 #14 AWG WIRES FOR TAKEAWAY HRT SEE DWG. 56399-152 FOR INTERCONNECTIONS
- 2 PIPE SIZES LISTED UNDER LEGEND INDICATE THE EQUIPMENT TERMINATION SIZE ONLY. SIZE PIPING TO EQUIPMENT AT LEAST ONE SIZE LARGER. DEPENDENT ON LENGTH OF PIPE RUN FROM PRESSURE REGULATING STATION FOR STEAM LINE AND MAIN WATER HEADERS TO INSURE ADEQUATE SUPPLY SERVICE PRESSURE AND DEMAND FLOW AT EQUIPMENT TERMINALS. INCLUDE EFFECT OF COINCIDENT DRAW OF MULTIPLE UNIT INSTALLATIONS
- 3 PROVIDE PIPING, SHUT OFF VALVE, PIPE PLUGGED TEE AND UNION IN STEAM AND WATER SUPPLY CONNECTION BETWEEN EQUIPMENT AND STUB-OUTS. PLUGGED TEE CAN LATER BE USED FOR TEST PRESSURE GAUGE CONNECTION. ARRANGE CONNECTION PIPING TO ALLOW ACCESS TO MACHINE COMPONENT AND ELECTRICAL CONTROL PANEL.
- 4 RECOMMEND PROVISION OF BLOW DOWN VALVE AT EACH STEAM AND WATER STRAINER TO ENABLE STRAINER CLEAN OUT.
5. PROVIDE HYDRAULIC SHOCK SUPPRESSOR AT WATER INLET CONNECTION B.
6. PROVIDE AUX BACK FLOW PREVENTER WHEN REQ'D BY LOCAL PLUMBING AUTHORITY
7. BLOW DOWN BUILDING STEAM & WATER SUPPLY LINES BEFORE FINAL CONNECTION TO EQUIPMENT
8. PROVIDE GROUPED OR GANGED CIRCUIT PROTECTION AND DISCONNECT FOR CONTROL POWER [C] AS REQ'D BY NEC AND LOCAL CODES.
9. PROVIDE CONDUIT AND WIRING BETWEEN EQUIPMENT TERMINALS AND STUB-OUTS OR DISCONNECTS.
10. DRAIN AT [D] & [F]- VIEW K-K. SIZE TAKE AWAY DRAINS FOR COINCIDENT DISCHARGING AT MULTIPLE EQUIPMENT INSTALLATIONS
11. PROVIDE ADEQUATE VENTILATION AND LIGHTING FOR ROOM. RECOMMEND A [6"H x 36"W] GRILLED OPENING IN CURTAIN WALL ABOVE EQUIPMENT DOORS FOR VENTING OF VAPOR WHEN EQUIPMENT DOOR IS OPEN.
12. MAXIMUM WALL THICKNESS, WHEN NECESSARY, IS 2". PROVIDE ACCESS DOORS TO EQUIPMENT.
13. SEE AMSCOMATIC STERILIZER INSTALLATION INSTRUCTIONS [129360-319] FOR ADDITIONAL INFORMATION AT TIME OF INSTALLATION
14. AMSCO ASSUMES NO RESPONSIBILITY FOR CHANGES MADE NECESSARY THROUGH FAILURE TO OBSERVE THIS SPECIFICATION. SPECIFICATIONS AND DESCRIPTIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)
 ALSO REFER TO GENERAL NOTES APPLICABLE TO EQUIPMENT DRAWINGS
 PART NO. 626979-009

AMSCO
 AMERICAN STERILIZER COMPANY
 ERIE, PENNSYLVANIA, U.S.A.

EQUIPMENT, ROUGH-IN,
 INSTALLATION DWG:
 2400 AMSCOMATIC
 TERMINAL STERILIZER

SHT. 1 OF 1
 EQUIPMENT DRAWING NO.
 136806-954

ITEM _____
 LOCATION(S) _____

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SECTION 2

OPERATING INSTRUCTIONS

2.1 GENERAL

The following instructions are intended to guide maintenance personnel when: (1) instructing operators in techniques designed to ensure optimum equipment performance; and (2) verifying the validity of operator complaints. See *Section 6, TROUBLESHOOTING*, if the 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.

2.2 CONTROL INFORMATION

Control Panel (See Fig. 2-2)

The control panel consists of three parts... **Secondary Control Panel**, **Primary Control Panel** and **Printcon Display Panel**. Following is a brief description of the various switches and displays. It is important that you review this list and the accompanying illustrations, and become familiar with the controls before operating the equipment.

Secondary Control Panel (See Fig. 2-1)

- ① POWER SWITCH — toggles sterilizer power ON or OFF.
- ② CYCLE START — starts automatic cycle (before starting cycle, code indication is 88 [not ready] ... after CYCLE START is pressed code indication is 89 - [ready]).
- ③ CYCLE ABORT — aborts cycle, causes unit to drain and returns unit to the not ready state (Code 88).

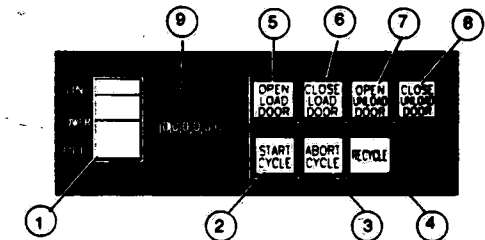


Figure 2-1. SECONDARY CONTROL PANEL

Note: The following controls are for use by qualified service technicians and should not be used by operators. Their functions can only be initiated from the *not ready* (Code 88) state.

- ④ RECYCLE — causes unit to recycle so that technician can test hydraulic controls.
- ⑤ OPEN LOAD DOOR — opens unlocked load door or, if door is locked, unlocks door. When pressed with load door open, cycles load table.
- ⑥ CLOSE LOAD DOOR — closes open load door or, if both doors are closed, locks doors.
- ⑦ OPEN UNLOAD DOOR — opens unlocked unload door or, if door is locked, unlocks door. When pressed with unload door open, cycles unload table.
- ⑧ CLOSE UNLOAD DOOR — closes open unload door or, if both doors are closed, locks doors.
- ⑨ CYCLE COUNTER — shows the number of cycles the sterilizer has completed since it was built.

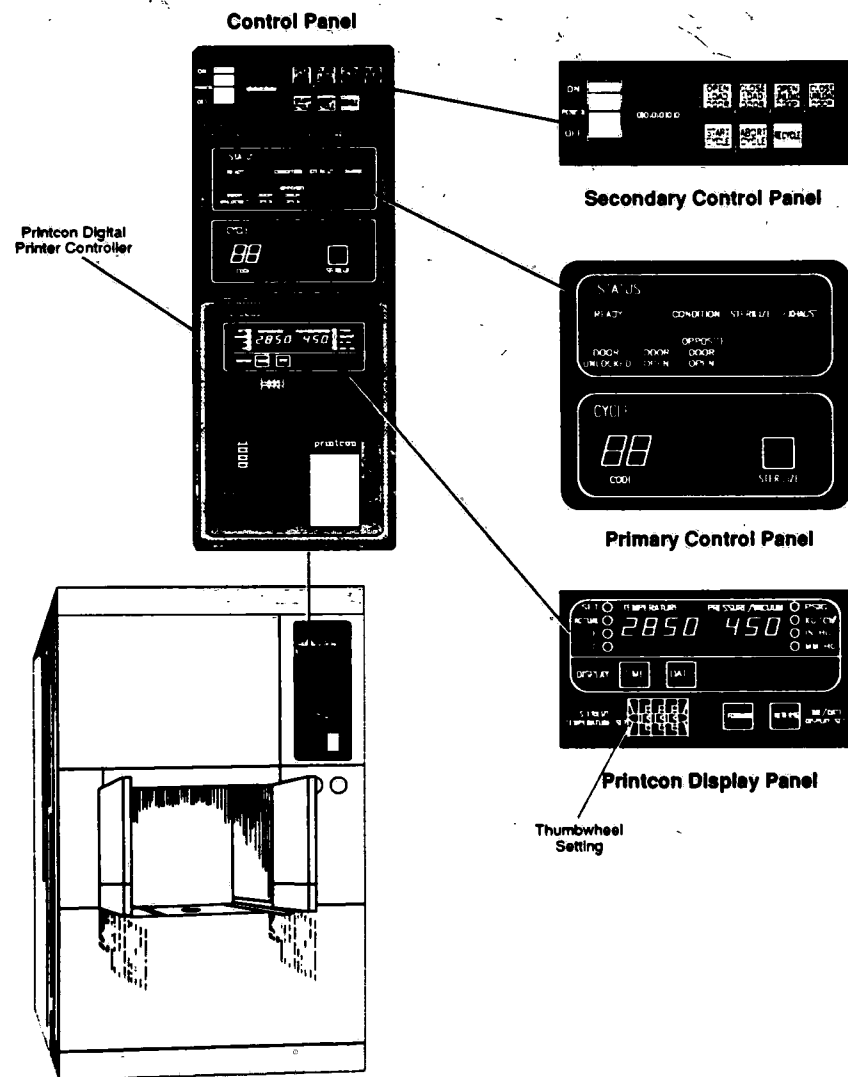


Figure 2-2. AMSCOMATIC SERIES 2400 TERMINAL STERILIZER

2-2

A- 13

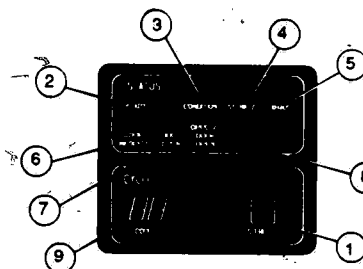


Figure 2-3. Primary Control Panel

Primary Control Panel

- ① **STERILIZE INDICATOR** — lights when cycle is in progress.

CYCLE STATUS INDICATORS:

Note: Display of code numbers to correspond with status indicators is optional and must be set by a qualified service technician. Sterilizer, as shipped, displays only *ready*, *not ready* and *error* code numbers.

- ② **READY** — sterilizer is in *ready* state (Code 89), waiting for a load to process.
- ③ **CONDITION** — automatic cycle is in progress, either in *purge* (Code 10) or *steam-charge* (Code 11) phase.
- ④ **STERILIZE** — automatic cycle is in progress, unit has reached set temperature and *sterilize* phase has begun (Code 12).
- ⑤ **EXHAUST** — automatic cycle is in progress and is either in *exhaust* (Code 13), *evacuate* (Code 14), *air break* (Code 15), or *complete* (Code 16) state.
- ⑥ **DOOR UNLOCKED** — doors are not fully locked.
- ⑦ **DOOR OPEN** — on *LOAD* end indicates *LOAD* door is open, on *UNLOAD* end indicates *UNLOAD* door is open.
- ⑧ **OPPOSITE DOOR OPEN** — on *LOAD* end indicates *UNLOAD* door is open, on *UNLOAD* end indicates *LOAD* door is open.
- ⑨ **CODE** — displays sterilizer codes. Unit is factory-set to display *ready*, *not ready* and *error* code numbers. Control can be set to also display cycle-status codes; contact your AMSCO service representative. See Table 2-1 for code listing.

TABLE 2-1. STATUS AND ERROR CODES

CODE	STATUS/ERROR
00	Computer Initializing
10	Purge Phase
11	Steam Charge Phase
12	Sterilize Phase
13	Exhaust Phase*
14	Dry Phase
15	Air Break*
16	Cycle Complete
20-25	Doors opening, closing, locking or unlocking*
30-32, 37, 39, 50-52, 59	Load or unload arms loading or unloading baskets*
33	Basket filled too high**
38, 53	Basket overfilled or jammed on load or unload table**
54	Unload table full**
77	Wing panel ajar; basket overfilled or spilling**
88	Not ready - time and date can be set
89	Ready - unit is idle and waiting for basket - CYCLE ABORT returns control to Code 88
99	Abort in process

* Intermittent buzzer sounds on error. Contact qualified service technician.

** See Paragraph 4.3, Load/Unload Failure for corrective action.

2-3

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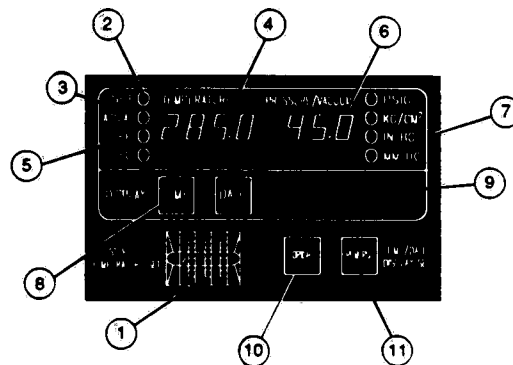


Figure 2-4. PRINTCON DISPLAY PANEL

Printcon Display Panel

- ① THUMBWHEEL SWITCHES — for making temperature settings. During temperature selection, the SET light ② comes on and TEMPERATURE display ④ shows the temperature being dialed on the thumbwheel switches. Approximately three seconds after temperature setting is complete the ACTUAL light ③ comes on and TEMPERATURE display ④ shows actual chamber temperature.
- ⑤ °F/°C — applicable light comes on depending on how temperature is being displayed. Factory setting is for temperature display in degrees Fahrenheit. Setting can be altered, by a qualified service technician, to display degrees Celsius.
- ⑥ PRESSURE/VACUUM — displays pressure or vacuum (depending on cycle phase) in either English or metric. Factory setting is for pressure display in PSIG and vacuum display in IN HG. Setting can be altered, by a qualified service technician, to display pressure in KG/CM² and vacuum in MM HG. Appropriate indicator ⑦ lights up to show properties of current display.
- ⑧ TIME — when pressed at any time, in or out of cycle, causes display to show current time. When pressed in conjunction with FORWARD ⑩ or REVERSE ⑪ allows setting of new time.
- ⑨ DATE — when pressed at any time, in or out of cycle, causes display to show current date. When pressed in conjunction with FORWARD ⑩ or REVERSE ⑪ allows setting of new date.

Note: New time settings can only be made when unit is in the *not ready* state (Code 88).

Note: New date settings can only be made when unit is in the *not ready* state (Code 88). Setting a new year requires a service adjustment and should only be done by a qualified service technician.

2.3 Cycle Printouts (See Fig. 2-5)

The Printcon Control generates a printed record of all pertinent cycle information. Following is an explanation of the various features of the printout:

- ① SET TEMP is the temperature set using the thumbwheel switches on the Printcon Display Panel. CONTROL TEMP is the upper temperature control extreme. The control maintains a temperature between the SET TEMP and CONTROL TEMP during the sterilize phase.
- ② "C" indicates the CONDITION phase of the cycle. Time, temperature and pressure (P) or vacuum (V) are indicated.
- ③ "S" indicates the STERILIZE phase of the cycle. Time, temperature and pressure are indicated. The STERILIZE phase normally lasts one minute at a set temperature of 285° F.

Note: Temperature and pressure readings should be observed by the operator during this portion of the cycle to ensure that the temperature range is between 285° F and 288° F, and that pressure is between 41 and 45 PSIG. If temperature and pressure are not within these ranges, contact a qualified service technician for adjustment.

- ④ "E" indicates the EXHAUST phase of the cycle. Time, temperature and pressure (P) or vacuum (V) are indicated.
- ⑤ "Z" indicates the cycle is complete.
- ⑥ Printout indicates the TIME in minutes:seconds (M:S) for each phase of the cycle as well as total cycle time.
- ⑦ Printout provides space for operator to record load and sterilizer number, and operator initials.

Note: The visual display and of printer can be optionally set to indicate temperature in degrees Fahrenheit or Celsius and pressure in either English (PSI gauge and inches Hg vacuum) 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. These adjustments must be made by a qualified service technician.

CYCLE COMPLETE				
LOAD(01)	---	---	---	---
STERILIZER	---	---	---	---
OPERATOR	---	---	---	---
CONDITION	4:38	M:S		
STERILIZE	1:01	M:S		
EXHAUST	6:31	M:S		
TOT. CYCLE	12:35	M:S		
Z	4:11P	220.6	0.9V	
E	4:11P	217.7	27.1V	
E	4:07P	221.6	27.0V	
E	4:04P	229.0	0.9P	
E	4:04P	286.5	43.0P	
S	4:03P	285.0	42.4P	
C	4:02P	165.9	21.1V	
C	4:02P	239.7	26.6P	
C	4:01P	172.1	21.1V	
C	4:01P	245.0	26.5P	
C	4:01P	185.9	16.6V	
C	4:00P	247.6	26.4P	
C	4:00P	204.8	5.6V	
C	3:59P	258.2	26.5P	
C	3:58P	143.8	0.0P	
TIME TEMP. PRES.				
°F ENG.				
CONTROL TEMP	287.2° F			
SET TEMP	285.0° F			
PREVACUUM				
CYCLE START	6-15-88			
DOOR UNLK				
	3:56P	139.4	0.0P	
POWER ON AT	6-15-88			
	3:56P	139.4	0.0P	

Figure 2-5. TYPICAL CYCLE PRINTOUT

WARNING!

- Avoid personal injury from door closing. Do not reach into the sterilizer unless wing panel is in the open position and the door is blocked open with the safety bar attached behind the front panel.

2.4 OPERATING INSTRUCTIONS

The information in this section will provide optimum equipment performance if followed carefully. It will not, however, compensate for failure to observe and understand the parameters of the sterilizing process. Refer to Section 8 for proper sterilizing techniques.

2.4.1 BEFORE OPERATING THE EQUIPMENT

1. Be sure to turn ON the building STEAM, WATER, and AIR valves.
2. Open door to secondary control panel. Position POWER switch to ON (Fig. 2-6).

Primary control panel lights up and Printcon display panel lights momentarily to assure the operator that system is functioning properly. Chamber doors unlock, unload door opens, and the printer records time and date power is turned ON.

The unit is now in the *not ready* state (Code 88). In this state the time and date can be set/changed and the doors can be manually operated.

3. Clean the chamber drain strainer as follows:

- Place wing panels in open position.
- Block chamber door open with safety bar (see Fig. 2-8).
- Remove chamber drain strainer (See Fig. 2-7). Clean out lint and sediment and reverse flush under running water.
- Place strainer back in chamber drain.

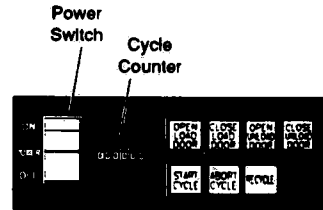


Figure 2-6. SECONDARY CONTROL PANEL

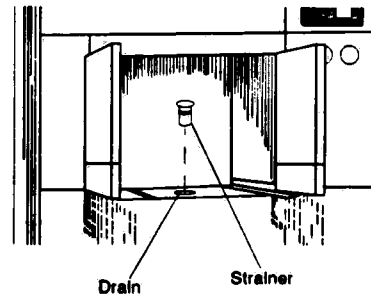


Figure 2-7. CLEAN CHAMBER DRAIN STRAINER

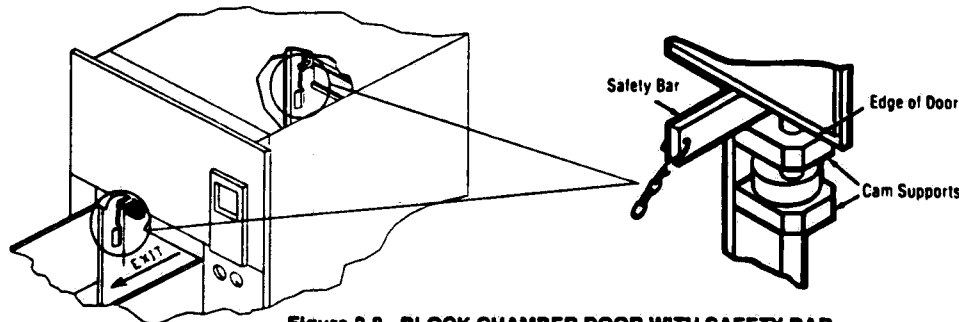


Figure 2-8. BLOCK CHAMBER DOOR WITH SAFETY BAR

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WARNING!

- Avoid personal injury from door closing. Do not reach into the sterilizer unless wing panel is in the open position and the door is blocked open with the safety bar attached behind the front panel.

CAUTION!

- All items must be contained in square of rack. Protruding items can cause damage to item or unit.

4. Check for correct time and date by pressing TIME and then DATE. To change either, press FORWARD or REVERSE while still pressing TIME or DATE until the correct time or date is displayed.
5. Check paper roll. Paper has a colored warning stripe to indicate when the roll is near its end. If colored stripe is visible, change the paper. . . see paragraph 5.5.1, Changing Paper.
6. Check printout to make sure printing is dark enough. If printing is too light, change the ribbon cartridge. . . see paragraph 5.5.4, Changing the Inked Ribbon Cartridge.
7. Check sterilize temperature setting. . . it should be set at 285° F (126° C). If it is not, make this setting using the thumbwheel switches.

If you attempt to set a temperature outside the allowable range, 150-295° F (65-132° C), a buzzer sounds until an allowable temperature is set. The set temperature is locked in and cannot be changed once cycle is started.

IMPORTANT: To assure sterility when processing at temperature settings other than 285° F, the time setting must be changed. This requires a service adjustment. If temperature settings other than 285° F are desired, contact a qualified service representative to set a corresponding sterilization time.

2.4.2 Automatic Operation

1. Follow instructions in paragraph 2.4.1, Before Operating the Equipment.
2. Check to make sure POWER switch is ON. Primary control panel should be lit. Sterilizer is on but not yet ready for cycle (Code 88).

Note: If there is an error condition during the cycle, the primary control panel displays a two-digit code. The sterilizer is factory-set to display only error codes. If a service adjustment has been made to activate the option of displaying all codes, then the appropriate codes for all phases are displayed. During an alarm condition, a buzzer also sounds. For a complete list of codes, see Table 2-1.

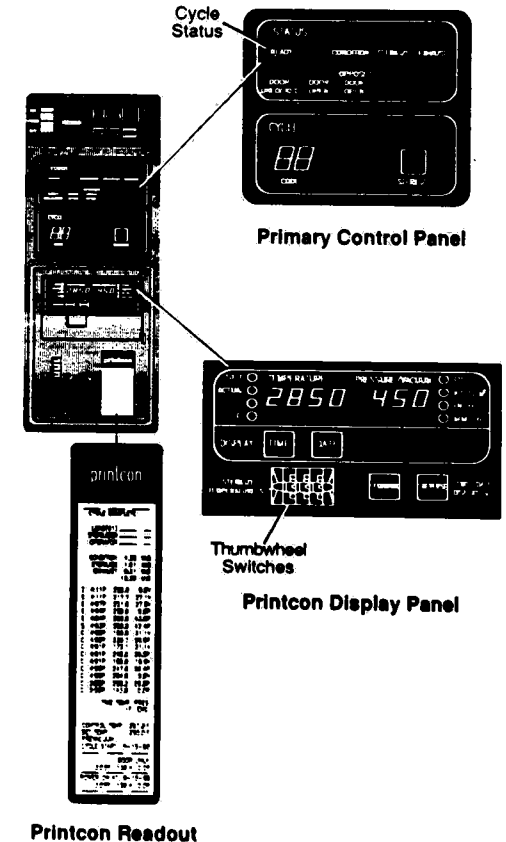


Figure 2-9. CONTROL PANEL

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3. Check that racks are loaded properly according to recommendations in Section 8.

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

5. Press START CYCLE button.

When the START CYCLE button is pressed, the doors automatically close and lock. The sterilizer is in the ready state (Code 89). When a basket arrives, the load door opens and the basket is loaded, then the load door closes and locks. The READY light goes off and the STERILIZE cycle starts.

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

As cycle progresses, panel displays codes and printer prints time, temperature and pressure at each phase.

After the STERILIZE cycle is complete, both doors unlock. The unload door opens and the basket is unloaded. After the basket is unloaded, the unload door closes and the READY light comes on. The sterilizer is now ready to accept another basket.

Note: If power is turned off with a basket in the chamber, it is automatically reprocessed when power is turned back on.

2.4.3 Load/Unload Failure

Note: See Table 2-1 for a complete listing of codes.

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

- Part of load touching top-hinged panel (Code 33)
- Rack jammed on load table (Code 38)
- Load arm jammed (Code 32)
- Inlet door open after admitting rack (Code 24)
- Inlet door not open (Code 22)
- Wing panel ajar (Code 77)

Remove any obstruction. To proceed with cycle, press START CYCLE button.

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

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

Remove any obstruction. To proceed with cycle, press START CYCLE button.

2.4.4 At End Of Day

1. Wait until last rack has been discharged and unloading door is closed.
2. Be sure READY light is on.
3. Press POWER to OFF.

SECTION 3

PRINCIPLES OF OPERATION

3.1 GENERAL

The Amscomatic 2400 Terminal Sterilizer is designed for high-volume sterilization of wrapped loads using a prevacuum-type cycle. Loading and unloading of the baskets containing the items to be processed proceeds automatically once the baskets are placed on the loading feeder table. The Amscomatic 2400 sterilizer will interface to automatic loading equipment such as the Amsco Horizontal Rack Transporter or the Amsco Pawl Bar Feeder.

3.2 HYDRAULIC SYSTEM GENERAL

Refer to hydraulic schematic 135380 (following Section 6).

The hydraulic system is of straightforward design. The motor/pump assembly, item 1, draws hydraulic fluid from a sump tank, item 2. The hydraulic fluid is pressurized by the pump to 260 psig for hydraulic operations. A relief valve, item 16, limits the pump pressure to this figure. The 4-way solenoid valves, items 8, control the direction of travel of the various hydraulic cylinders.

The two diverter valves, items 9, are actuated by the locking cylinders and prevent the doors from raising unless they are unlocked.

The flow control valves, items 10, set the rate at which the doors descend when closing.

Pressure switches PS1 and PS2, referred to as "hydraulic backpressure switches", have a nominal 50 psig setpoint. When the loading/unloading cylinders are at the end of their travel outward, the pressure ahead of the cylinder piston drops to zero. When this occurs, the pressure switches signal the control to retract the arm. This feature eliminates the need to have limit switches inside the chamber.

3.3 LOADING OPERATION

3.3.1 OPERATOR PANELS

The Operator Panel on the exit (unload) side is the interface between the operator and the sterilizer.

The operator panel is composed of status indicators and digital displays, pushbuttons, and power ON/OFF switch.

Status Indicators and Digital Displays

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

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

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

Message Codes

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

Pushbuttons

The switches on the secondary panel allow the operator to select other states and functions. There are four pushbuttons labeled: OPEN LOAD DOOR, CLOSE LOAD DOOR, OPEN UNLOAD DOOR, and CLOSE UNLOAD DOOR. These allow the operator to manually control the operation of the doors. There are also three more pushbuttons labeled: START CYCLE, ABORT CYCLE, and RECYCLE. The CYCLE START is used by the operator to

initiate a cycle. The CYCLE ABORT will abort any phase the control may be in (including the door operations), and return to the NOT READY (see paragraph 3.3) state. The RECYCLE SWITCH is used to clear the chamber and to operate the hydraulic mechanisms. All the pushbuttons except CYCLE ABORT are disabled in the READY state and in CYCLE.

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

Set Times

Sterilize time is set to 60 seconds (rotary BCD switches on the Printcon display PC board set to 60).

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

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

3.3.2 AMSCOMATIC OPERATION

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

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

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

With both doors now locked and the rack loaded in the chamber, the cycle will start.

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

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

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

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

3.3.3 MANUAL DOOR OPERATION

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

There are four pushbuttons to initiate door operations as follows:

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

When the door close switch is activated the appropriate door will close. To lock the doors, both doors must be closed and then activate either door close switch and both doors will lock. When the door open switch is activated both doors will unlock and appropriate door will open. Manual door operation is inhibited when the machine is in the READY state

or during a cycle. Once in the READY state, activating the ABORT CYCLE switch will set the sterilizer in the NOT READY state.

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

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

DOOR COMPONENTS DESCRIPTION

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

3.3.4 DOOR VALVES AND LIMIT SWITCHES

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

3.3.5 DETAILED DOOR OPERATION

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

• Unlocking (CODE 20)

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

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

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

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

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

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

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

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

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

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

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

• **Locking (CODE 21)**

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

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

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

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

Notes:

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

Figure 3-1. LOAD OPERATION TIMING DIAGRAM.

TABLE 3-1. LOAD COMPONENTS DESCRIPTION.

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

Figure 3-2. DOOR OPERATION TIMING DIAGRAM.

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

Notes:

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

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3.4 STERILIZING CYCLE

Refer to the Piping Schematic, 136806-957 (following Section 6) for this discussion.

1. With a basket on the load table, press CYCLE START. Prevac light is on at this time.

2. The automatic cycle proceeds as follows:

a. A basket on the load table is loaded into the chamber.

b. Purge (CODE 10)

1) The condition light is on.

2) The steam to chamber (V8), water supply (V9), and chamber drain (V7) valves are open. Steam entering the chamber forces the majority of the air out of the chamber through V7. V9 valve cools the steam as it passes through the heat exchanger.

3) The sterilizer is in the purge state for 30 seconds.

c. Steam and Pressure - First Time (CODE 11)

1) When previous state times out, the chamber drain (V7) and water supply (V9) valves close.

2) The steam to chamber valve (V8) remains open until chamber pressure reaches 26 psi. Steam begins to penetrate to the centers of the packs.

d. Exhaust and Vacuum - First Time (CODE 11)

1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply (V9) valves open.

2) The sterilizer is in this state for 45 seconds.

When V8 closes, water flowing into the heat exchanger from V9 will cause a vacuum to be drawn on the chamber by the "ejector" (a venture device). The cooling of the chamber steam in the heat exchanger increases the vacuum level.

The vacuum removes air from the centers of the packs. This sequence of steam purge and vacuum pull-down is repeated four times for complete air removal. The removal of air from the packs is absolutely essential to assure complete sterility.

e. Steam and Pressure - Second Time (CODE 11)

1) Same as Steam and Pressure - First Time.

f. Exhaust and Vacuum - Second Time (CODE 11)

1) Same as Exhaust and Vacuum - First Time

g. Steam and Pressure - Third Time (CODE 11)

1) Same as Steam and Pressure - First Time.

h. Exhaust and Vacuum - Third Time (CODE 11)

1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply (V9) valves open.

2) The vacuum timer is set at 15 minutes and the sterilizer must pull to 21" Hg. vacuum in this time.

3) If 21" Hg. vacuum is not reached in 15 minutes, an alarm sounds.

i. Steam and Pressure - Fourth Time (CODE 11)

1) Same as Steam and Pressure - First Time.

j. Exhaust and Vacuum - Fourth Time (CODE 11)

1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply (V9) valves open.

2) The vacuum timer is set at 15 minutes and the sterilizer must pull to 21" Hg. vacuum in this time.

3) If 21" Hg. vacuum is not reached in 15 minutes, an alarm sounds.

At the end of the fourth vacuum, the air will be completely removed from the centers of the packs, thus assuring that steam will penetrate all pack areas for a complete microorganism kill.

k. Steam and Pressure - Fifth Time (CODE 11)

1) When 21" Hg. vacuum is reached, the chamber drain (V7) and water supply (V9) valves close. The steam to chamber valve (V8) opens.

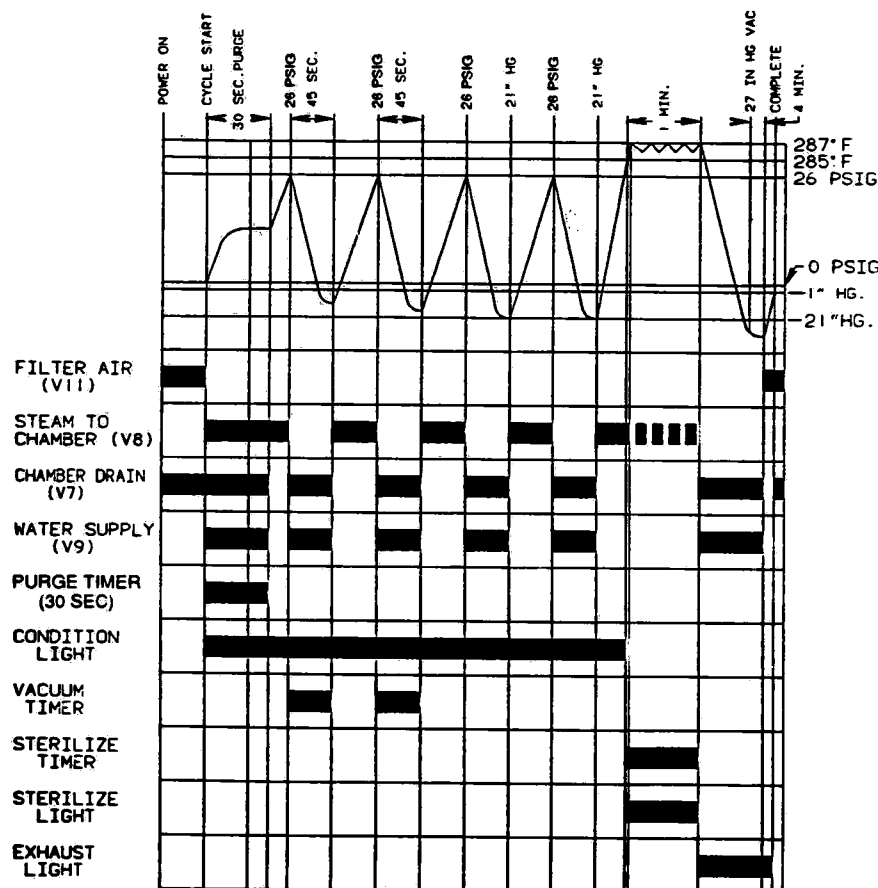


Figure 3-3. CYCLE GRAPH.

I. Sterilize (CODE12)

- 1) When the temperature reaches 285° F, the sterilize state is reached.
- 2) The condition light shuts off and the sterilize light is on.
- 3) The sterilize timer is set at 1 minute. The chamber temperature will be controlled at 287° F in this time. One minute exposure to this steam temperature assures complete sterility of the packs.

m. Exhaust and Vacuum - Fifth Time (Dry) (CODE 13)

- 1) When sterilize state is completed, the steam to chamber valve (V8) closes. The chamber drain (V7) and water supply (V9) valves open.
- 2) The exhaust light is on. The sterilize light is off.
- 3) When 27" Hg. vacuum is reached, a 4-minute timer is started (CODE 14). The load will dry for 4 minutes, assuring removal of external moisture.

4) This state is completed when the timer times out.

n. Vacuum Break and Ready (CODE15)

- 1) When dry state is complete, the filtered air (V11) valve opens. The chamber drain (V7) and water supply (V9) valves are closed.
- 2) When 1" Hg. vacuum is remaining in the chamber, the filtered air (V11) remains open and chamber drain valve (V7) is opened. The cycle is complete, the sterilizer is ready to unload the basket and load another. End of cycle record prints (CODE16).

3) See paragraph 3.5 (Loading and Unloading Operation).

4) Exhaust light is off.

Additional Design Features:

1. A temperature switch (thermoswitch) on the condenser outlet directly controls valve V13. If the temperature of the jacket trap condensate exceeds 140° F, the thermoswitch turns on V13, supplying cooling water to the condenser. The cooling water is metered to reduce consumption by a needle valve.
2. A needle valve piped between the chamber drain and the heat exchanger provides a small, constant bleed of steam past the temperature probe (RTD) during the STERILIZE phase. This provides better temperature control.
3. A constant water bleed around valve V9, metered by a needle valve serves to cool the steam flowing through the RTD bleed needle valve during the STERILIZE phase.

3.5 UNLOADING OPERATION

When the sterilizer has completed processing the load, the doors will unlock. The unload door will open if the unload table full switch (LS4) is not active. If the rack on unload table is active, then the unload table is full. The unit will sound an alarm, and Message CODE 51 will be displayed indicating that a rack is on the unload table. The unit will wait in this state until the rack is removed from the unloading table before proceeding with its cycle. See paragraph 3.3.5 for details of door operation.

Once the unload door is open, the unload extend arm solenoid (S9) will be pulsed on. This will set the Extend/Retract valve to the extend position (CODE 56). When the unload HBP (Hydraulic Back Pressure) pressure switch (PS2) is activated, the retract-unload-arm solenoid (S10) will be pulsed on. This will set the Extend/Retract valve to the retract position and the rack will be unloaded (CODE 57). When the rack-removed- (CODE 58) switch (LS22) is activated, then deactivated, and the unload-arm-retracted (LS20) is also activated the unload door will close. The sterilizer is now ready to accept another rack and the READY indicator will turn on (See Table 3-2, Unloading Operation Timing Diagram).

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

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

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

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

Conveyor Interface

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

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

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

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

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

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

Notes:

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

Figure 3-4. UNLOAD OPERATION TIMING DIAGRAM.

TABLE 3-2. UNLOAD COMPONENTS DESCRIPTION.

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

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3.6 FUNCTIONAL DESCRIPTION OF THE MICROCOMPUTER CONTROL

Refer to the block diagram of Figure 3-5. The control system is made up of two major assemblies: The PRINTER/PRIMARY CONTROL ASSEMBLY mounted on the unloading end of the unit; and the CONTROL BOX ASSEMBLY at the side of the unit.

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

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

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

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

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

Main Printcon PC Board

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

1. Translate the pressure transducer and temperature probe signals into digital (binary) values.
2. Monitor the primary panel signals to detect selection of a cycle and cycle status indicating alarms and aborts.
3. Control the alphanumeric printer.

4. Send temperature, pressure, time and date data to the Digital Display PC Board.

5. Monitor vacuum, pressure and temperature settings on the Digital Display PC Board.

6. Send the temperature, vacuum, and pressure transition point commands to the Eagle controller.

Figure 3-6 is a block diagram of the Main Printcon PC Board. As on CPU Printed Circuit Board 146586 (see paragraph this section), a microcomputer IC is used to control the sequence of operation of this board. It pulls program instructions from IC's A1, A2 and A5. These last IC's also contain input and output lines for control and monitoring of various devices such as the temperature thumbwheels and digital display.

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

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

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

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

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

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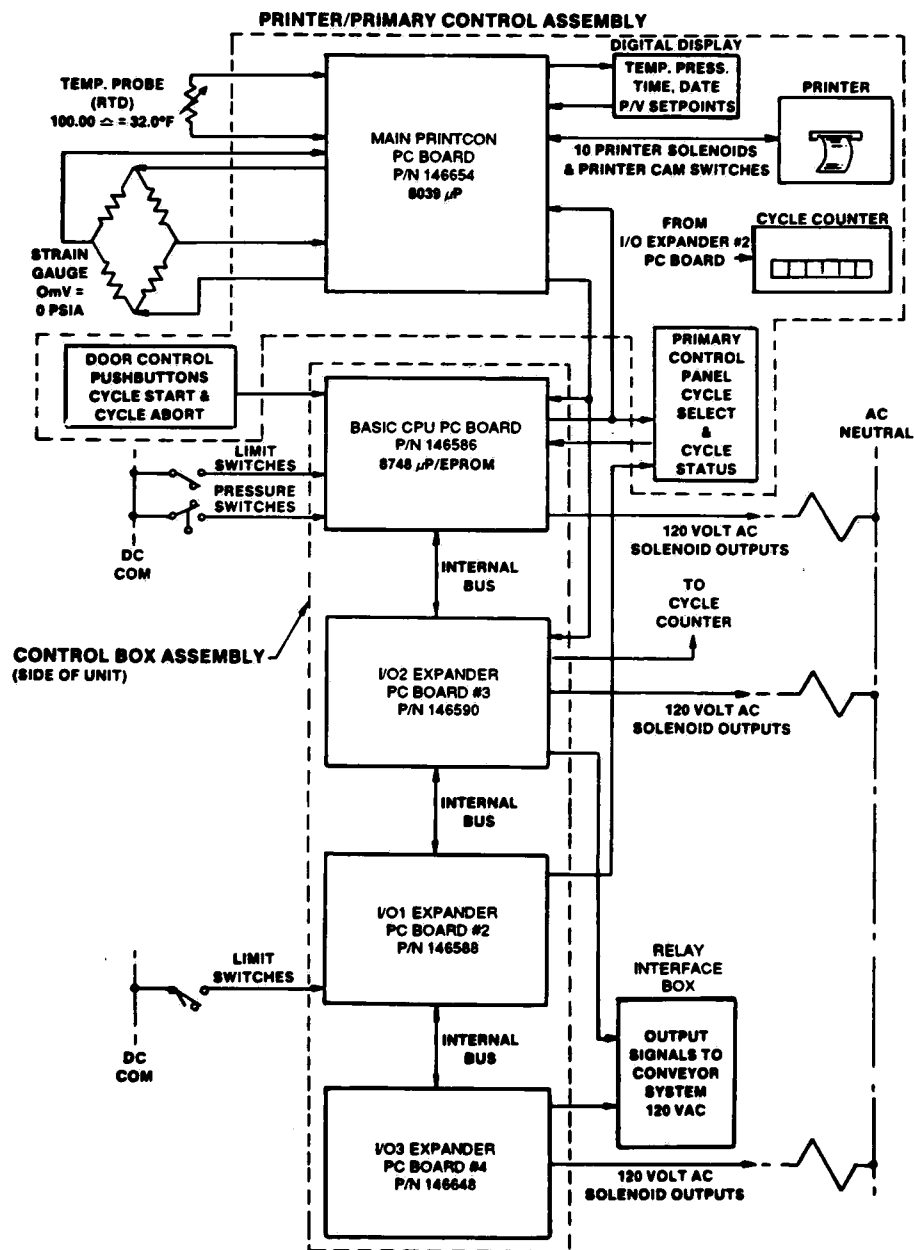
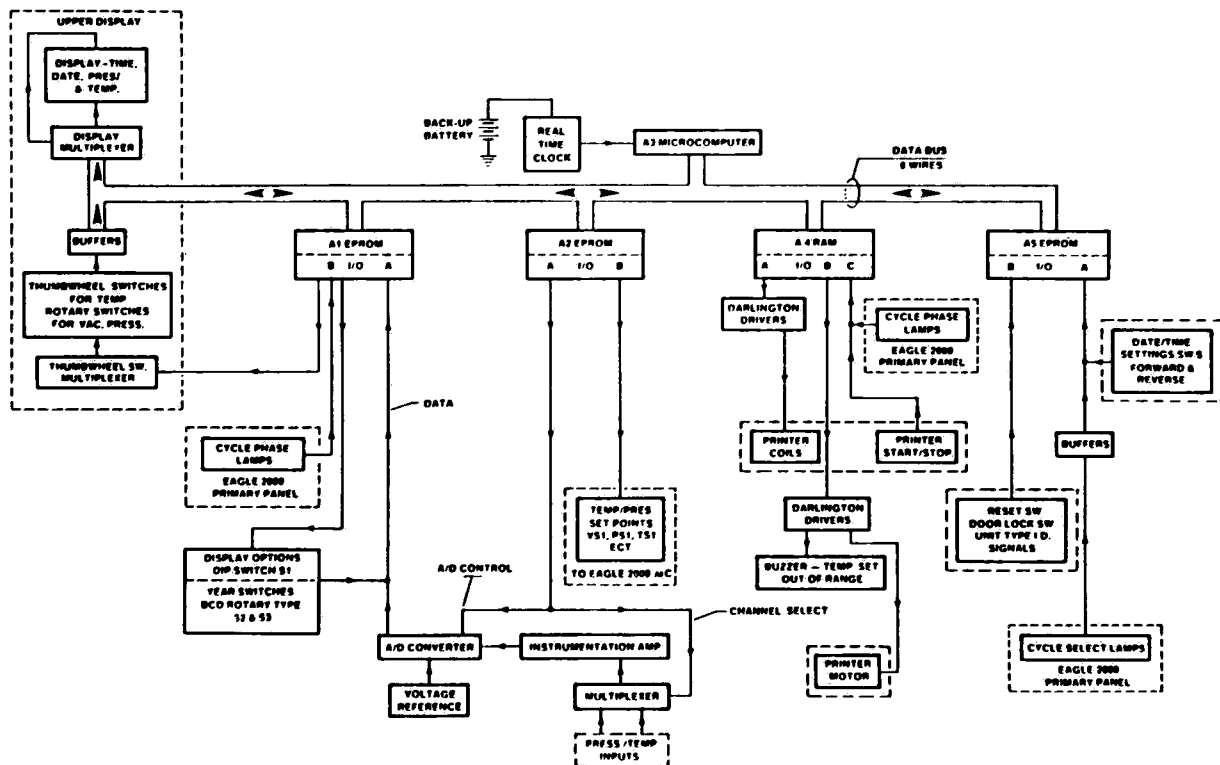


Figure 3-5. CONTROL BLOCK DIAGRAM.

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Figure 3-6. PRINTCON BLOCK DIAGRAM:
Main Printcon PC Board.



Display option and temperature control switch bank S1 on the Main Printcon PC Board allows selection of Fahrenheit or Celsius temperature display/printing; selection of English (psig and inches Hg) or metric (kg/cm² and mm Hg) pressure for display/printing. In addition, an optional decimal point of resolution may be displayed for temperature and pressure (printing is always with extended precision). The next switch gives selection of pressure transducer. This switch should always be in the ON position. **BDC** (binary-coded decimal) rotary switches S2 and S3 allow setting of the proper year for display and printing. If set to 80, no year will be used. See Section 7 for more information on setting these switches.

Via the input lines on IC's A1 and A5, this PC board will monitor for a cycle pushbutton (STERILIZE) to be pressed. This PC board will always provide the vacuum, pressure and temperature setpoint 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 Figure 2-5 for a typical cycle printout.

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

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

Temperature and pressure input circuits: Temperature is sensed by a resistive temperature probe. The probe degree has a resistance of 100 ohms at 0°C, and increases about 0.39 ohms for every degree C that the temperature increases. By connecting the probe as part of a voltage divider circuit, an output voltage exactly related to temperature is obtained (see Figures 3-7 and 3-8).

The pressure transducer also exhibits a resistance change in response to a pressure change, and is termed a strain gauge type (see Figures 3-9 and 3-10). Fig. 3-9 shows the internal configuration and output voltage of the pressure transducer, which is also an

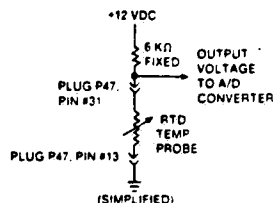


Figure 3-7. TEMPERATURE PROBE SCHEMATIC.

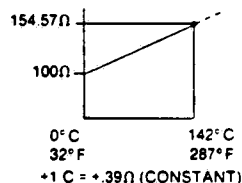


Figure 3-8. TEMPERATURE VS. RESISTANCE CHARACTERISTIC.

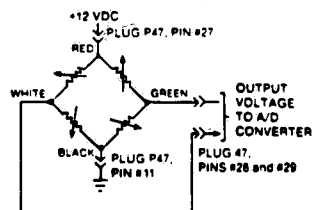


Figure 3-9. PRESSURE TRANSDUCER SCHEMATIC.

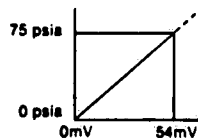


Figure 3-10. PRESSURE VS. TRANSDUCER OUTPUT CHARACTERISTIC.

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

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

Digital Display PC Board

A block diagram of this PC board is presented in Figure 3-11. The microcomputer presents changeable temperature, pressure, and other information for display to this PC board on the data bus. Note that the data bus is bi-directional, and the microcomputer from time to time will read the data bus for pressure, vacuum and temperature set-points. The control box will activate the decoder/driver, latch, or switch select control IC when fresh data is at hand or needed. J45 connector also interfaces the time, date, forward and reverse touch switches on the display panel overlay.

CPU Printed Circuit Board #1 (P-146586; Refer To Figure 3-12)

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

Actions to be carried out by the unit originate in the microcomputer. These actions or signals are sent to the data bus, port 1 or port 2. Hence, as one can see, information can either enter or leave the ports and

data bus under the precision guidance of the control and timing of the microcomputer. The computer also contains a data memory (RAM) capable of storing 64 bytes of information. The RAM is used to store changeable data, i.e., timer inputs.

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

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

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

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

The supporting circuits are an external crystal and a zero cross-over network. The crystal, C1 and C2, determines the frequency of the control's operation. This crystal is also the time base for the timers. The zero cross-over network (ZCN) consists of A7, C4, R4, R8, C5, R5, and R6. The ZCN prevents the computer from actuating a 120 VAC device during peak voltage of the sine wave. The ZCN monitors the 120 VAC and when the voltage level is at the zero voltage point of the sine wave, it enables the computer output. The ZCN's function is to reduce live transients from being generated which might interfere with the computer operation. These transients might generate false signals should they occur. Another supporting circuit consists of Q9, C13, and R29. This circuit delays the activation of the triac outputs for a few hundred milliseconds until the microcomputer has gained control of the system.

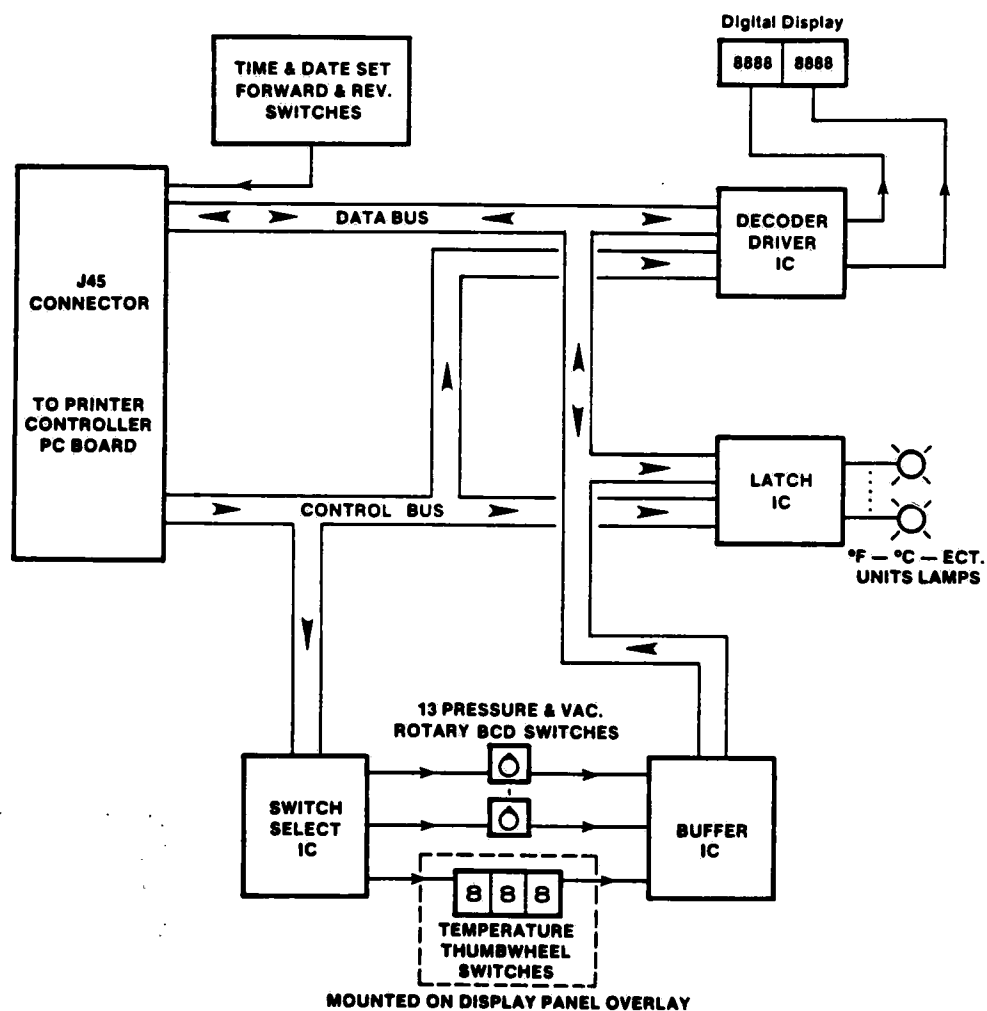


Figure 3-11. DIGITAL DISPLAY BOARD BLOCK DIAGRAM.

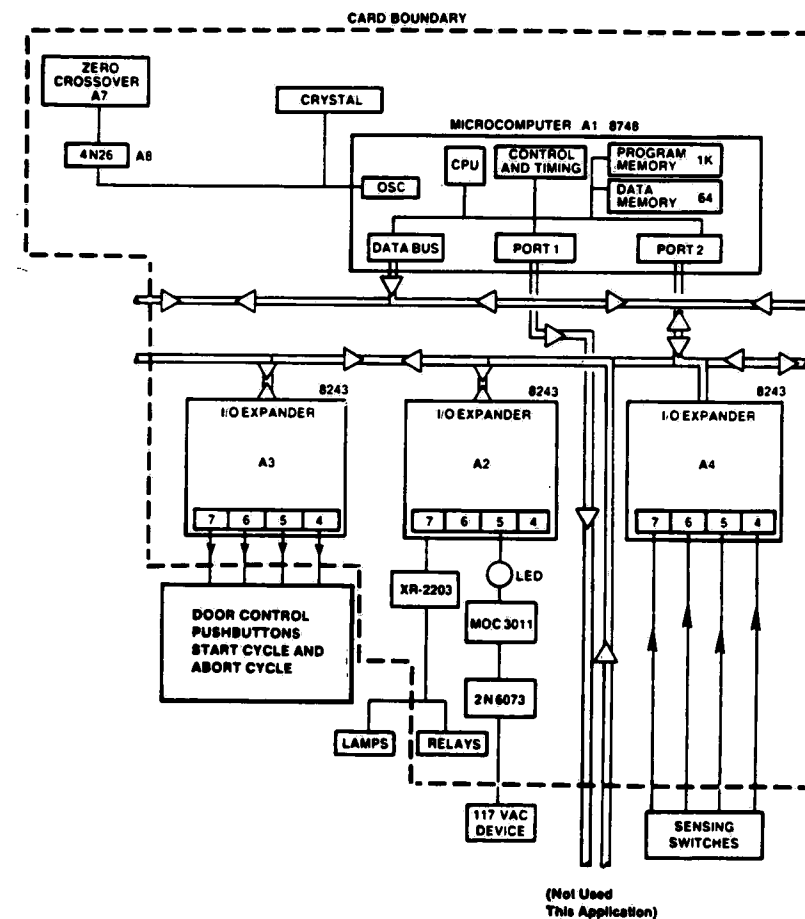


Figure 3-12. BASIC CPU PRINTED CIRCUIT BOARD #1.

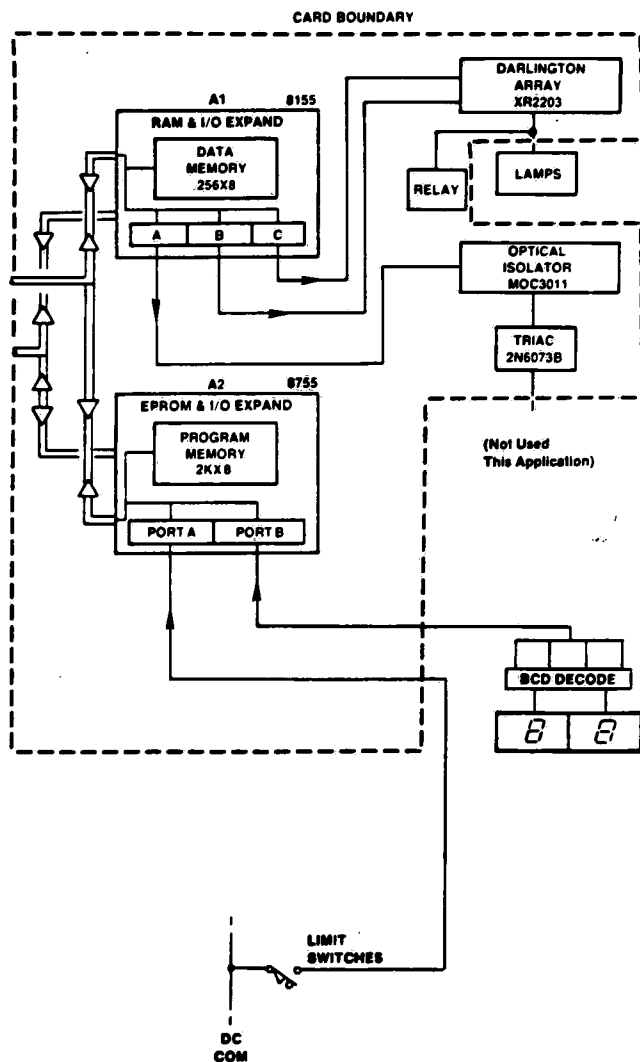


Figure 3-13. I/O1 PRINTED CIRCUIT BOARD #2.

I/O1 Printed Circuit Board #2 (P-126588; Refer To Figure 3-13)

The I/O1 PC Board is required to control the unit. It contains the A1 support circuits, input buffers and drivers, output buffers and drivers and the data bus required to communicate with the Basic PC Board.

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

I/O2 Printed Circuit Board #3 (P-126590; Refer To Figure 3-14)

This PC Board also increases program capability by an additional 2,048 bytes of program instruction, and increases input/output capacity by adding 15 more output channels and a single 4-20 milliamp proportional control output (not used on this unit). It is basically the same as the 8755 portion of I/O1 PC Board #2.

I/O3 Printed Circuit Board #4 (P-146648; Refer To Figure 3-15)

This PC Board also increases program capability by an additional 2,048 byte of program instruction, and increases input/output capacity by adding 15 more output channels. It is basically the same as the 8755 portion of I/O1 PC Board #2.

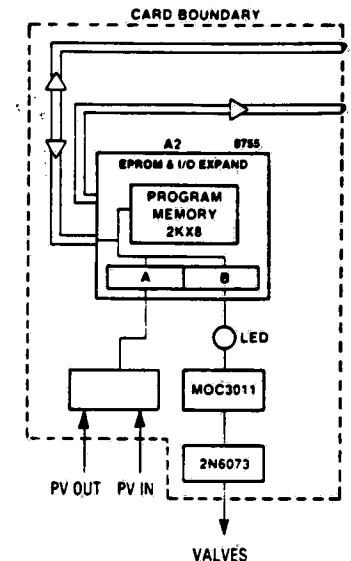


Figure 3-14. I/O2 PRINTED CIRCUIT BOARD #3.

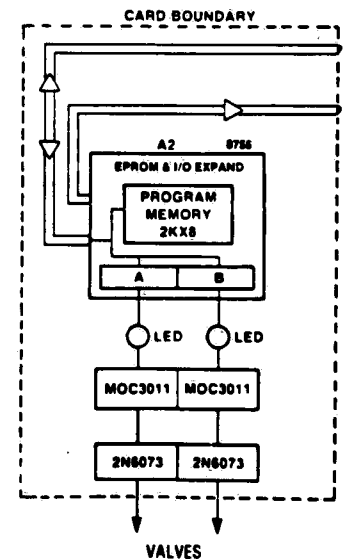


Figure 3-15. I/O3 PRINTED CIRCUIT BOARD #4.

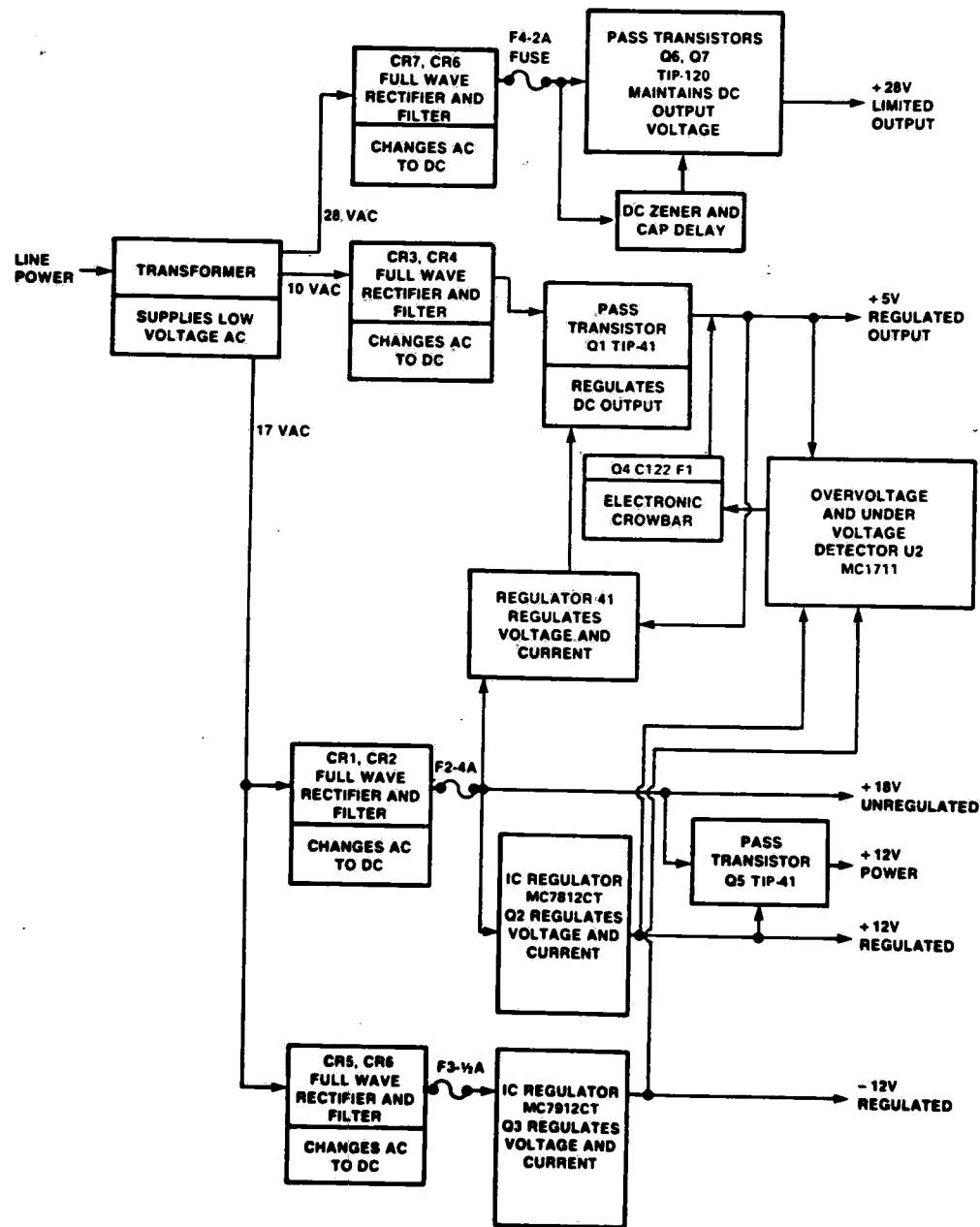


Figure 3-16. PRINTCON REGULATED POWER SUPPLY.

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Printcon Power Supply (See Figure 3-16)

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

+5 volts direct current (VDC) at 2.5 amp voltage regulated with current limit and electronic crowbar over- and under-voltage protection (Figure 3-17).

+12 VDC at 0.1 amp, voltage regulated (Figure 3-18).

+12 VDC at 1.5 amp, voltage regulated (Figure 3-18).

-12 VDC at 0.1 amp, voltage regulated (Figure 3-19).

+18 VDC at 0.5 amp, voltage unregulated.

+28 VDC at 1.5 amp, zener regulated.

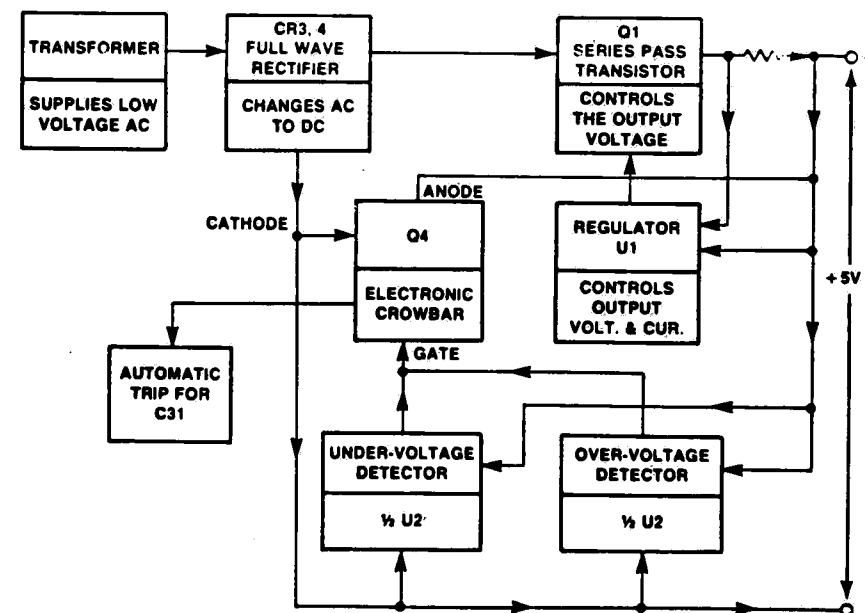


Figure 3-17. PRINTCON 5-VOLT POWER SUPPLY.

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These voltage outputs are generated as follows:

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

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

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

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

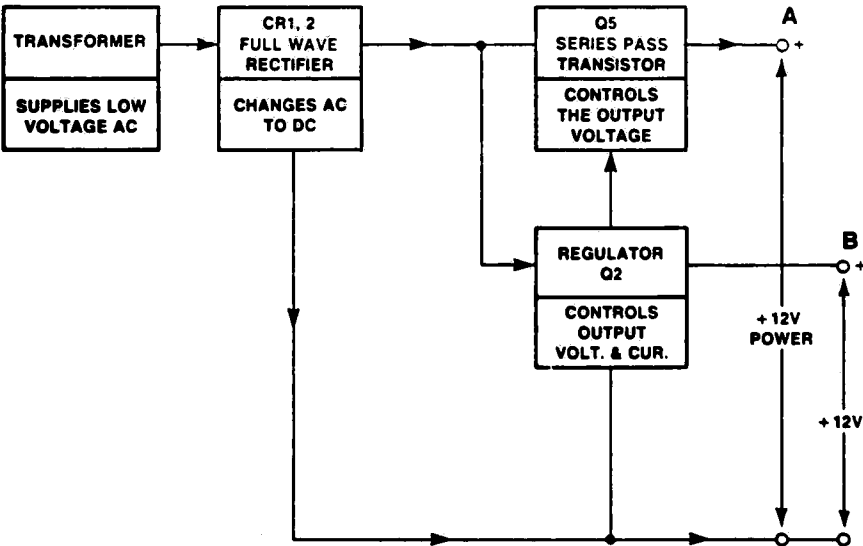


Figure 3-18. PRINTCON 12-VOLT POWER SUPPLY.

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 3-19).

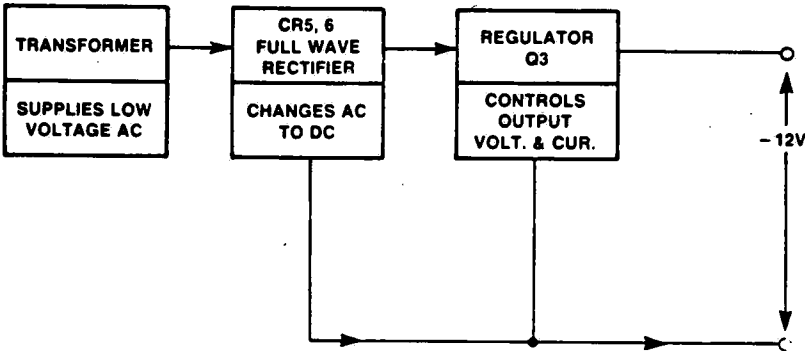


Figure 3-19. PRINTCON -12-VOLT POWER SUPPLY.

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 3-20).

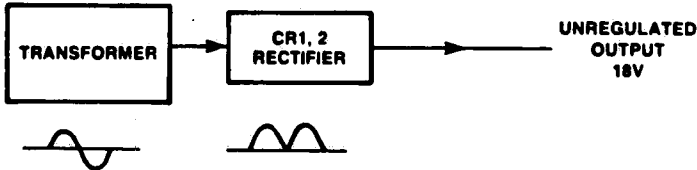


Figure 3-20. PRINTCON 18-VOLT POWER SUPPLY.

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 3-21).

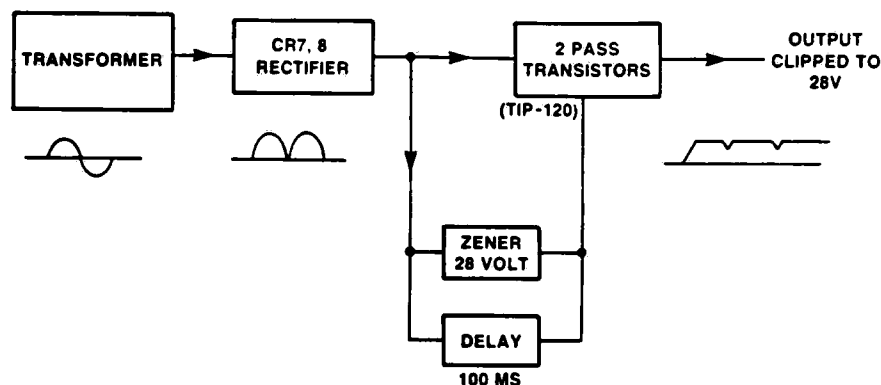


Figure 3-21. PRINTCON 28-VOLT POWER SUPPLY.

SECTION 4

INSPECTION AND MAINTENANCE

WARNING!

- » Press the facility and control power off and wait until chamber cools to room temperature before starting any maintenance operations.
- » To avoid injury from door closing, do not reach into the sterilizer unless the door is blocked open with the safety bar attached behind the front panel. Also ensure wing panel is in the out position (power off).
- » When performing the required quarterly check of safety valves, be careful of escaping steam. To prevent burns, wear gloves or use an extension device if it becomes necessary to operate the try lever.
- » Ensure that the jacket pressure gauge shows no pressure in the jacket before loosening any piping entering the jacket.
- » Never use a wire brush, abrasives, or steel wool on door and chamber assembly.

CAUTION!

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

4.1 GENERAL

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

4.2 ROUTINE INSPECTION

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

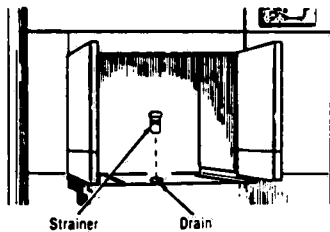


Figure 4-1.

LOCATION OF CHAMBER DRAIN STRAINER.

4.3 PREVENTIVE MAINTENANCE

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

Daily

1. Clean out the chamber drain (see Figure 4-1).
 - a. Turn POWER to ON. Door will open.
 - b. Open wing panel and block door open using safety bar. Turn POWER to OFF.
 - c. Remove the chamber drain strainer and clean it (see paragraph 4.5).
 - d. Rinse the drain with a solution of 1/2 cup of AMSCO Sonic Detergent and one quart of hot water.
 - e. Wait five minutes.
 - f. Flush the drain with one quart of hot water.
 - g. Replace the chamber drain strainer.
 - h. Inspect the interior of the chamber for any objects which may have fallen out of the racks during previous cycles.
2. Check the control and status signals as follows:
 - a. Watch the unit operate through a complete cycle. Check for burned-out lamps on the primary control and display panels.

b. Check the cycle tape for acceptable darkness of print. Make sure that all columns are legible. Swing the printer assembly down and check for an adequate supply of paper remaining.

3. Check the area around both doors during the STERILIZE phase for steam leaks. Refer to the door adjustment procedures if necessary.

4. Check the time and date on the control for proper settings.

Weekly

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

*Manufactured by *Never-Seez Compound Corporation*.

Monthly

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

Quarterly

1. Open and clean all traps. Replace element or seat if necessary.
2. Clean steam supply strainer.
3. Check steam control valve.
4. Clean steam and water supply strainers.
5. Clean filter on air supply if provided.
6. Run a complete cycle using temperature and pressure instrumentation. Check for proper vacuum, pressure and temperature levels.

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

9. Inspect the chamber safety valve as follows:

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

Yearly

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

4.4 PRINTCON MAINTENANCE FREQUENCY CHART

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

4.5 CLEANING

Daily

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

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

2. Wash chamber interior and loading equipment with a mild detergent solution such as AMSCO Liqui-Jet or AMSCO Sonic Detergent.

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

Monthly

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

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

3. Spray sealing surface on door frame(s) with AMSCO Fluorocarbon Spray (also included in Door Frame Kit, see above) to prevent gasket(s) from sticking.

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

As Necessary

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

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

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

SECTION 5

FIELD TEST PROCEDURE

WARNING!

- » Press the facility and control power off and wait until chamber cools to room temperature before starting any maintenance operations.
- » Repairs and adjustments should be attempted only by experienced persons fully acquainted with this equipment. Use of inexperienced, unqualified persons to work on the equipment or the installation of unauthorized parts could cause personal injury or result in costly damage.
- » To avoid injury from door closing, do not reach into the sterilizer unless the door is blocked open with the safety bar attached behind the front panel. Also ensure wing panel is in the out position (power off).
- » Ensure that the jacket pressure gauge shows no pressure in the jacket before loosening any piping entering the jacket.

5.1 GENERAL

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

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

5.2 TEST EQUIPMENT REQUIRED AND INSTALLATION (See Figure 5-1)

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

1. Digital potentiometer with 1 degree F resolution. Doric model 400A or equal.

2. Compound pressure gauge (30 inches vacuum and 100 PSIG; 1% F.S. accuracy minimum; resolution to 1/2 PSIG).
3. 8-inch piece of 2x4.

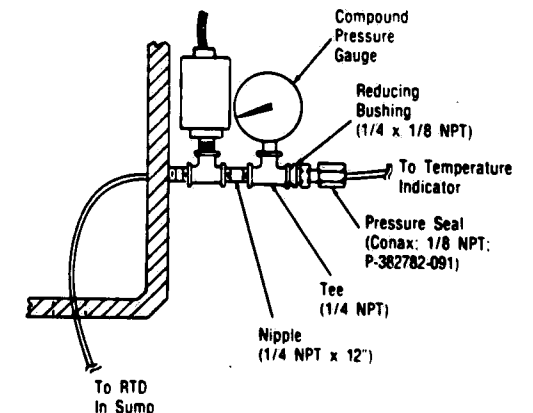


Figure 5-1. INSTALLATION OF TEST EQUIPMENT.

4. Pressure gauge, 0 - 200 PSIG minimum range (air supply).

5. Stop watch.

6. Spirit level.

7. 6-foot straight edge.

8. Safety bars for doors. These were provided with the unit at shipment.

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

10. Absolute pressure gauge, 0-100 mm Hg. with 1 mm Hg. increments, with shutoff valve.

5.3 PRELIMINARY

1. Make sure hydraulic sump is full of oil. If not, add oil (transmission fluid Type "A") until it is approximately 1/2" below the return line inlet to the sump.

2. Check the alignment of the hydraulic lift cylinders with the overhead pulley. Bend mounting brackets if necessary. Make sure the lift cylinders are fully extended with door down.

3. Check adjusting screws on air valve manifold. Adjusting screws should be backed out until the stop is reached.

5.4 CHECK FOR PROPER DOOR OPERATION

1. Make sure that no baskets are on the loading and unloading tables or in the chamber.

2. Check the level of oil in the hydraulic sump. If low, add enough oil (transmission fluid type "A") until the level is about 1/2-inch below the return line inlet to the sump.

3. Turn the control POWER switch ON. Observe a 2-3 second Lamp Test of all leads on the temperature/pressure display, changing to actual chamber temperature and pressure. The unload end door must open. CODE 88 must be displayed on the primary control panel. The printer will print POWER ON followed by the date, time, temperature and pressure. When the unload end door unlocks, the message DOOR UNLK will print.

4. Operate, in turn, all four of the door control pushbuttons and check for proper operation of the doors, as follows:

- Repeat the above steps for the LOAD push-buttons.

- Press the CLOSE UNLOAD DOOR button. Only unload end door should close.

- Again press the CLOSE UNLOAD DOOR button and ensure that both doors lock. The DOORS UNLOCKED lamp on the primary control panel must go out.

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

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

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

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

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

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

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

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

12. Check the hydraulic pump pressure during a door operation and, if necessary, adjust the pump relief valve to 260 PSIG \pm 10 PSIG within five minutes of start-up. (See Fig. 8-30)

5.5 FEEDER TABLE CHECK

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

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

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

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

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

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

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

8. Press the OPEN LOAD DOOR pushbutton.

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

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

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

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

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

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

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

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

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

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

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

5.6 CHECK CALIBRATION OF TEMPERATURE AND PRESSURE

1. With steam, air, electric and water supplied to the sterilizer, turn the power ON.

NOTE: Code 00 will be displayed for 2.5 seconds as all hydraulic valves are pulsed to ensure proper setting. All PRINTCON lamps come on briefly as a lamp test. Also, POWER ON record must be printed.

2. Verify that STERILIZE switches on opposite end panel are off.

3. Keep the unload door from opening by inserting an 8-inch piece of 2" x 4" board.

4. Adjust P3 (pressure offset adjust) on the Printcon board until the display reads 0.0 psi \pm .5.

NOTE: The control stays in this state for about 35 seconds. If the pressure is still not calibrated at this time, press cycle start and repeat Steps 2, 3, and 4.

5. Press and OPEN UNLOAD DOOR pushbutton switch to open the unload door and verify that the display reads 0.0 psi \pm .5.

6. Set the temperature select thumbwheel to 295° F.

NOTE: Code 88 must be displayed before starting.

7. Start a sterilize cycle by pressing CYCLE START, simulate a basket by actuating basket switch (LS11) on load table.

8. Adjust pressure regulator to approximately 45 psi and allow temperature to stabilize. PRINTCON indicated temperature must be within 1° of digital thermometer. PRINTCON indicated pressure must be within 1 psi of calibrated gauge.

9. Press CYCLE ABORT to abort the cycle.

10. Wait for code "88" to display. Press recycle (blue) to remove load.

11. Wait for code "88", then turn main power switch OFF.

12. Disconnect power from unit, verify that machine main power switch/circuit breaker trips off. Reconnect power and ensure that circuit breaker resets properly.

5.7 OPERATIONAL TEST -- STERILIZE CYCLE

Machine Cycle

NOTE: Electric, water, steam and air must be supplied to sterilizer. SET PRINTCON THUMBWHEEL to 285° F. Verify that main power is on. The filtered air valve (V11) and chamber drain valve (V7) are open at this time. All other valves are closed.

1. With a basket on the load table, press CYCLE START. Prevac light is on at this time.

2. Insure proper automatic operation of the sterilizer as follows:

a. A basket on the load table is loaded into the chamber (See Operation Tests: Loading and Unloading) and each of the FOLLOWING CYCLE SEQUENCES MUST BE VERIFIED:

b. PURGE (CODE 10)

- 1) The condition light is on.
- 2) The steam to chamber (V8), water supply (V9), and chamber drain (V7) valves are open.
- 3) The sterilizer is in the purge state for 30 seconds.

c. Steam and Pressure -- First Time (CODE 11)

- 1) When previous state times out, the chamber drain (V7) and water supply (V9) valves close.
- 2) The steam to chamber valve (V8) remains open until chamber pressure reaches 26 psi.

d. Exhaust and Vacuum -- First Time (CODE 11)

- 1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply (V9) valves open.

- 2) The sterilizer is in this state for 45 seconds.

e. Steam and Pressure -- Second Time (CODE 11)

- 1) Same as Steam and Pressure -- First Time

f. Exhaust and Vacuum -- Second Time (CODE 11)

- 1) Same as Exhaust and Vacuum -- First Time

g. Steam and Pressure -- Third Time (CODE 11)

- 1) Same as Steam and Pressure -- First Time

h. Exhaust and Vacuum -- Third Time (CODE 11)

- 1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply (V9) valves open.

- 2) The vacuum timer is set at 15 minutes and the sterilizer must pull to 21" Hg. vacuum in this time.

- 3) If 21" Hg. vacuum is not reached in 15 minutes, an alarm sounds.

i. Steam and Pressure -- Fourth Time (CODE 11)

- 1) Same as Steam and Pressure -- First Time

j. Exhaust and Vacuum -- Fourth Time (CODE 11)

- 1) When chamber pressure reaches 26 psi, the steam to chamber valve (V8) closes and the chamber drain (V7) and water supply valves open.

- 2) The vacuum timer is set at 15 minutes and the sterilizer must pull to 21" Hg. vacuum in this time.

- 3) If 21" Hg. vacuum is not reached in 15 minutes, an alarm sounds.

k. Steam and Pressure -- Fifth Time (CODE 11)

- 1) When 21" Hg. vacuum is reached, the chamber drain (V7) and water supply (V9) valves close. The steam to chamber valve opens.

l. Sterilize (CODE 12)

- 1) When the temperature reaches 285° F, the sterilize state is reached.

- 2) The condition light shuts off, and the sterilize light is on.

- 3) The sterilize timer is set at 1 minute. The chamber temperature will be controlled at 287° F in this time.

m. Exhaust and Vacuum -- Fifth Time (Dry) (CODE 13)

- 1) When sterilize state is completed, the steam to chamber valve (V8) closes. The chamber drain (V7) and water supply (V9) valves open.

- 2) The exhaust light is on. The sterilize light is off.

- 3) When 27" Hg. vacuum is reached, a 4-minute timer is started (CODE 14).

- 4) This state is completed when the timer times out.

n. Vacuum Break and Ready (CODE 15)

- 1) When dry state is complete, the filtered air (V11) valve opens. The chamber drain (V7) and water supply valves (V9) valves are closed.

- 2) When 1" Hg. vacuum is remaining in the chamber, the filtered air (V11) valve remains open and the chamber drain valve (V7) is opened. The cycle is complete and the sterilizer is ready to unload the basket and load another. End of cycle record prints (CODE 16).

- 3) See Para. 5.8, Operational Test -- Automatic Loading and Unloading.

- 4) Exhaust light is off.

5.8 OPERATIONAL TEST -- INTERFACE SIGNALS

Verify AC outputs under the following conditions by measuring voltage at TB13 terminals (120 VAC).

1. The STERILIZER-IS-ON indicator is on when the power switch is ON (TB13-10).

2. RACK-ON-UNLOAD-TABLE indicator is on when the EXIT TABLE FULL switch (LS4) is actuated (TB13-2).

3. The RACK-ON-LOAD-TABLE indicator is on when BASKET-IN-PLACE switch (LS11) is actuated (TB13-4).

4. The INLET-DOOR-NOT-OPEN indicator is on when the BASKET-IN-PLACE switch is not actuated AND when inlet door is closed (TB13-14).

Final cycles

1. Set SW2, bit 1 on Board 2 to ON. This will inhibit in cycle codes except for errors.

2. Conduct three consecutive STERILIZE cycles. (Use the Machine Cycle description on page 5-4 as a guide.)

3. Retain the printouts as part of the test record. Print unit serial number on PRINTCON record.

NOTE: It is a requirement of this procedure that three consecutive cycles be run without adjustment.

Final Checks

1. Remove test gauge and thermocouple from the chamber. Replace any pipe plugs removed during testing.

2. All steam and water piping to be completely blown out to prevent freezing. The unit should be operated through all phases so that all lines are completely blown out.

3. Unlock doors.

4. Shut off services and disconnect sterilizer from test block.

5. Remove paper supply roll, printed record and ribbon cartridge.

6. Clean the drain line strainer.

7. Verify hydraulic sump is full of oil. If necessary, add oil (transmission fluid type A) until it is approximately 1/2" below the return inlet to the sump. Check the entire hydraulic system for leaks. Eliminate all leaks by correctly tightening or replacing the fitting.

5.9 OPERATIONAL TEST--AUTOMATIC LOADING AND UNLOADING

Start the operational tests for the loading and unloading feeders with the doors open, the main power switch OFF, loading/unloading feeder piston heads in the fully retracted position, and no basket in the AMSCOMATIC

or on the feeders. Verify the following sequence of operations:

Load

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

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

3. When a basket arrives, its presence is detected by the BASKET ON THE LOAD TABLE switch (LS11). Slide a basket onto the loading feeder plate until the front edge of the basket is approximately 1/4" beyond the front edge of the feeder plate. The BASKET-IN-PLACE switch (LS11), located near the front edge of the feeder plate, will close, signaling the load door to open by pulsing the OPEN LOAD DOOR solenoid (S6).

4. The load door attempts to open. CODE 22 is displayed during opening. If the LOAD DOOR OPEN switch (LS14) is not closed in 35 seconds, CODE 22 is displayed continuously along with buzzer until door is closed.

5. When the load door is opened, the LOAD DOOR OPEN limit switch (LS14) will close. The EXTEND LOAD ARM solenoid (S11) is pulsed ON to load the basket into the chamber and CODE 30 is displayed.

6. If the BASKET TOO HIGH switch (LS15) is closed while the basket is being loaded, CODE 33 is displayed, an alarm sounds, and the load arm retracts.

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

8. If, after 35 seconds following the extension of the load arm, the LOAD HBP switch (PS1) is not closed, the load arm retracts, and alarm sounds, and CODE 37 is displayed to indicate the LOAD HBP is not working properly.

9. Also during loading, if the LOAD HYDRAULIC BACK PRESSURE switch (PS1) is closed while the BASKET ON THE LOAD TABLE switch is closed, the door remains open, an alarm sounds, and CODE 38 is displayed to indicate that a basket is jammed.

10. After the basket is loaded, the LOAD ARM RETRACT solenoid (S12) is pulsed on, the load arm retracts from the chamber, and CODE 31 is displayed.

11. If after 35 seconds following the retraction of the load arm, the LOAD ARM RETRACTED switch (LS6) is not closed, the alarm sounds and CODE 32 is displayed, indicating that the load arm is not working properly.

12. With the LOAD EXTEND/RETRACT ARM in the extreme retract position, the piston head will close the LOAD ARM RETRACTED limit switch (LS6). This action will initiate the closing of the load door (LS3).

13. The door proceeds to close until the LOAD DOOR CLOSED switches (LS3 and LS8) are closed. If these switches are not closed within 35 seconds, an alarm sounds and CODE 24 is displayed.

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

14. Similarly, when the unload door closes, the UNLOAD DOOR CLOSED switches (LS2 and LS9) are actuated. If these switches are not made within 1 minute, an alarm sounds and CODE 25 is displayed.

15. With both doors closed and basket loaded, solenoid S4 is pulsed ON (in automatic cycle), operating the locking mechanism until the DOORS LOCKED switches (LS1, LS21, LS5, and LS10) are actuated. If these switches are not actuated within 35 seconds, an alarm sounds and CODE 21 is displayed. CODE 88 is then displayed when cycle start is pushed.

16. Following the exhaust phase, CODE 16 is displayed to indicate the completion of the sterilize cycle. CODE 89 is then displayed.

Unload

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

2. After the doors are unlocked, the LOAD DOOR UNLOCKED switch (LS12) and UNLOAD DOOR UN-

LOCKED switch (S7) are closed. If these switches are not closed within 35 seconds, CODE 20 is displayed.

NOTE: In an error condition, the control continues to unlock for 35 seconds or until the ABORT button (CODE 99) is pushed, which initiates the locking procedure.

3. After unlocking, the unload door proceeds to open (solenoid S2 pulsed) if the UNLOAD TABLE FULL switch (LS4) is not closed. If a basket is on this switch (LS4 close), the sterilizer sounds an alarm and CODE 54 is displayed.

4. If the unload table is not full (LS4 open), the unload door proceeds to open until the UNLOAD DOOR OPEN limit switch (LS13) is closed. If this switch is not closed within 35 seconds, an alarm sounds and CODE 23 is displayed. Hydraulic pump is turned off after 35 seconds.

5. When the unload door opens, the EXTEND UNLOAD ARM solenoid (S9) is pulsed. This sets the EXTEND/RETRACT valve to the extend position. The unload arm extends into the chamber to unload a basket and CODE 50 is displayed.

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

7. If, after 35 seconds following the extension of the unload arm, the UNLOAD HBP switch PS2 is not closed, the alarm sounds, CODE 59 is displayed, and the arm retracts.

8. If the HBP switch PS2 is closed properly, the UNLOAD ARM RETRACT solenoid (S10) is pulsed ON, the unload arm retracts, and CODE 51 is displayed.

9. As the unload arm retracts, the BASKET REMOVED switch (LS22) is closed. If after 35 seconds following the retraction of the unload arm, the UNLOAD ARM RETRACTED switch (LS20) is not closed, the procedure is repeated 3 times if the arm is not retracted. The alarm sounds and CODE 52 is displayed, indicating the unload arm is not working properly. The sterilizer is now ready to accept another basket and the READY indicator turns ON.

10. Press ABORT CYCLE switch to return to NOT READY state.

5.10 NEEDLE VALVE ADJUSTMENT

1. The RTD constant-bleed needle valve (For location, see Piping Schematic) is to be set at 1/8 turn open.

2. Open the needle valve piped around valve V9 two turns open. Place a thermocouple in the sump discharge line to measure the temperature of the water discharged to waste.

3. Close the jacket trap cooling needle valve (For location, see Piping Schematic).

4. Start a cycle with a 295 degree set temperature. Wait until the steam purge has completed during CODE 11, and the pressure has stabilized. Now, adjust the needle valve bypassing V9 until the waste water temperature is 137-140° F.

NOTE: The temperature should not fall below 137° F. This indicates excessive water consumption.

5. Abort the cycle. Reset the sterilizing temperature to 285.

6. Adjust the jacket trap cooling needle valve to full open. With the unit out of cycle, remove the cover from the temperature switch located on the condenser outlet. Adjust the temperature switch so that the waste water temperature is in the range of 137-140° F. Clockwise raises the temperature setting. Fine adjustment to the temperature can be done with the needle valve.

5.11 VACUUM LEAK TEST

1. Install an absolute pressure gauge to the chamber with a shutoff valve ahead of the gauge to protect it against positive. 0-100 mm Hg. absolute with 1 mm/Hg. increments is the required range.

2. With power off, remove I/O2 PC Board (Board #3) from the card cage and set DIP switch SW2 from all OFF to #1 and #4 ON. Replace the PC board. This will set the dry time to 94 minutes, giving ample time to run the leak test.

3. Start a cycle and let it proceed into the dry phase. When the chamber has vacuum, open the shutoff valve to the absolute pressure gauge. Wait until the vacuum level stops increasing. The sterilizer should be capable of 30 mm Hg. or greater vacuum. Shut off the main power switch, and observe the vacuum leak rate over a 5 minute period. The leak rate should not exceed 7.5 mm Hg. over 5 minutes.

4. When through with the leak rate test, reset DIP switch SW2 on I/O2 PC Board to all OFF, and remove the vacuum gauge.

SECTION 6

TROUBLESHOOTING

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

6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, use the RECYCLE button and operate the unit more than once in case reported problem is being caused by periodic component malfunction.

2. Use the timing diagrams, status codes, valve actuation sequence chart and cycle graph to follow the cycles through the various phases and to check for correct operation of the solenoid valves which control the various phases.

3. Use the operational descriptions (Section 3) and electrical schematics (Section 6) as aids in understanding system operation and how the malfunction of a specific component would affect it.

4. Refer to the following guides for example of what to look for and what to do when troubleshooting.

Steam & Water Supplies

a. Be sure the building-supply valves are fully open.

b. Be sure the supply pressure is the proper value and that it does not fluctuate. Be sure that gauge readings are accurate.

c. Be sure the steam supply is of the proper quality and that the steam-supply line is well drained. This will ensure condensate-free steam of between 97 and 100% saturated vapor.

d. Check all valves and adjust, repair or replace as necessary.

e. Clean the supply strainers.

f. Check the drain thermostatic traps; replace the elements if necessary.

g. Inspect the entire system; correct all leaks.

Electronic/Electrical System

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

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

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

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

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

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

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

• On the outside surface of the pin, there is a thin piece of metal sprung outward which locks the pin into the housing. Using a sharp-pointed object such as a pin or needle, push the metal spring inward while gently pulling on the appropriate wire. The pin will slide out of the socket. When installing a new pin, first give the metal spring a slight bend outward to assure its locking capacity.

• Pins in plugs P1, P2, P5, P10, P11, P48, P53, and P54 seldom need replacement. However, if replacement of pins is necessary, a special pin extraction tool (P-764317-221) is required. Order through AMSCO Service Company.

Status/Error Codes

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

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

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

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

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

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

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
1. Condition, LED for valve V8 on.	11	Pressure did not reach 26 PSI setpoint in 5 minutes; or did not reach 285° F in 5 minutes. 1) Steam-to-chamber valve V8 not opening, or V8 air pilot solenoid bad. 2) Steam strainer clogged. 3) Steam pressure regulator defective. 4) Pressure transducer defective. 5) Main Printcon PC Board out of calibration.
2. Condition, LED for valve V9 on.	11	Vacuum did not reach 21" Hg. in 15 minutes. 1) Chamber drain valve V7 or V7 air pilot Solenoid not working. 2) Water supply strainer clogged. 3) Check valve CK-3 sticking closed. 4) Ejector plugged. 5) Leak in piping or door gasket. 6) Water supply valve V9 or V9 air pilot solenoid not working.
3. Exhaust	13	Vacuum did not reach 27" Hg. in 15 minutes after reaching atmosphere. (Same probable causes as for failure to reach 21" Hg. above)
4. Exhaust	15	Vacuum did not break to 2" Hg. at end of dry phase, within 5 minutes. 1) Air supply valve V11 or V11 air pilot solenoid not working. 2) Air filter plugged. 3) Main Printcon PC Board out of calibration.

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

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
5. Unlocking doors	20	Limit switches LS12 (load) and LS7 (unload) doors unlocked) did not activate in 15 seconds. 1) Low hydraulic oil level. 2) Dual solenoid S1/S4 not working. 3) Limit switch(es) out of adjustment or defective. 4) Defective seal(s) on locking cylinder. 5) No AC signal from Basic PC Board to solenoid S1. 6) Basic PC Board not responding to one or both LS12 or LS7 signals.
6. Locking doors	21	Limit switches LS1 and LS21 (load) or LS5 and LS10 (unload) (doors unlocked) did not activate in 15 seconds. 1) Low hydraulic oil level. 2) Dual solenoid S1/S4 not working. 3) Limit switch(es) out of adjustment or defective (LS1, LS2, LS5 or LS10). 4) Defective seal(s) on locking cylinder. 5) No AC signal to S4 coil from Basic PC Board. 6) Relay CR3 defective. 7) Basic PC Board not responding to CR3 signal.
7. Load door opening	22	Limit switch LS14 (door open) did not activate within one minute. 1) Low hydraulic oil level. 2) Dual solenoid S3/S6 not working. 3) Limit switch (LS14) out of adjustment or defective. 4) Defective seal(s) on lift cylinder. 5) Diverter valve out of adjustment or defective. 6) No AC signal to S3/S6 from Basic PC Board. 7) LS14 input failure on I/O1 Expander (PC Board #2).
8. Unload door opening	23	Limit switch LS13 (door open) did not activate within one minute. 1) Low hydraulic oil level. 2) Dual solenoid S2/S5 not working. 3) Limit switch out of adjustment or defective. 4) Defective seal(s) on lift cylinder. 5) Diverter valve out of adjustment or bad. 6) No AC signal from Basic PC Board to S2. 7) Filter or strainer on hydraulic system clogged.

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

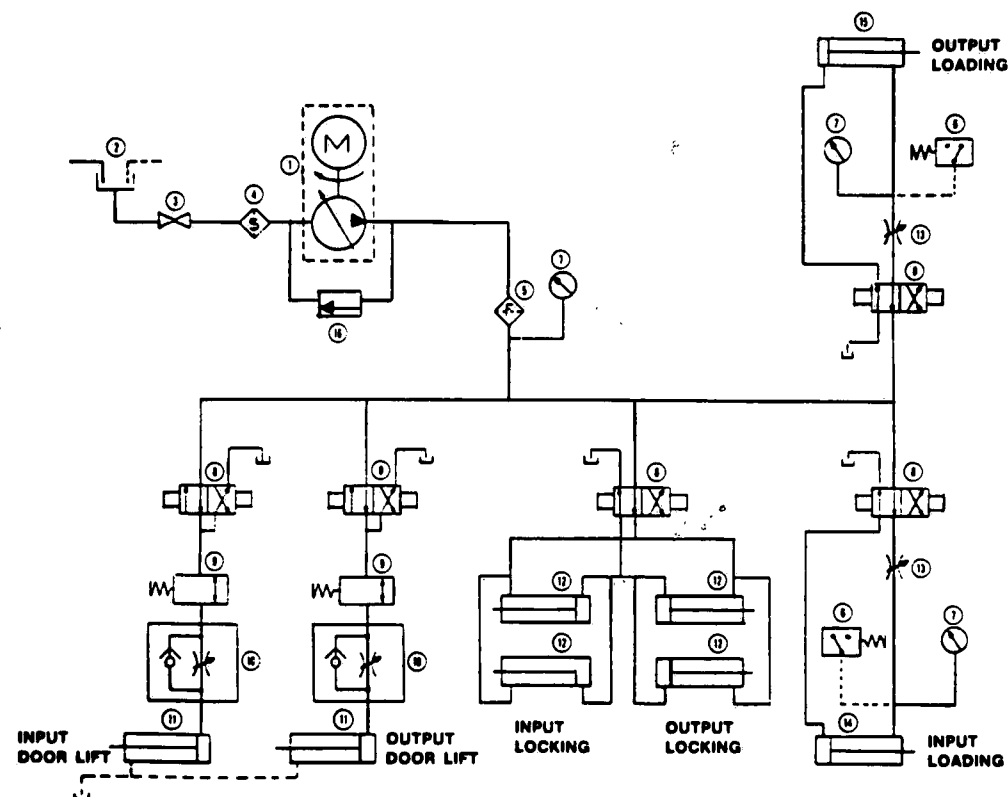
MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
9. Load door closing	24	Limit switches LS3 and LS8 (door closed) did not activate within one minute. 1) Dual solenoid S3/S6 not working. 2) No AC signal to S3 from Basic PC Board. 3) Flow control valve closed too far or clogged.
10. Unload door closing	25	Limit switch LS9 and LS2 (door closed) did not activate within one minute. 1) No AC signal from Basic PC Board to solenoid S5. 2) Dual solenoid S2/S5 not working. 3) One or both limit switches out of adjustment or bad. 4) Flow control valve closed too far or clogged. 5) Basic PC Board not responding to limit switch input.
11. Load arm retracting	32	Limit switch LS6 (load arm retracted) did not activate within one minute. 1) No AC signal to solenoid S12 from Basic PC Board. 2) Dual solenoid S11/S12 not working. 3) LS6 out of adjustment or defective. 4) Basic PC Board not responding to LS6 signal. 5) Low hydraulic oil level.
12. Basket is loading	33	Limit switch LS15 (basket too high) is activated. 1) Limit switch LS15 defective. 2) LS15 input failure on I/O1 Expander (PC Board #2).
13. Basket is loading	38	Pressure switch PS1 and limit switch LS11 are both activated indicating that basket probably jammed. 1) LS11 jammed or defective. 2) PS1 out of adjustment.

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

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
14. Basket is loading	39	Pressure switch PS1 (hydraulic back pressure) did not activate in time. 1) Piston traveling too slow — check needle valve adjustment. 2) PS1 switch out of adjustment. 3) Seals on cylinder leaking. 4) Basic PC Board not responding to PS1 signal. 5) No AC signal from I/O Expander #3 to solenoid S11. 6) Dual solenoid S11/S12 not working. 7) Low hydraulic oil level.
15. Basket is unloading	52	Limit switch LS20 (unload arm retracted) did not activate after arm successfully extended, three attempts were made. 1) LS20 out of adjustment or defective. 2) Dual solenoid S9/S10 not working. 3) No AC signal from I/O Expander #3 to solenoid S9. 4) I/O1 Expander (PC Board #2) not responding to LS20 signal.
16. Basket is unloading	53	Limit switch LS22 (basket removed) did not activate in three tries. 1) LS22 out of adjustment or defective 2) I/O1 Expander (PC Board #2) not responding to LS22 signal.
17. Basket is unloading	54	Limit switch LS4 (basket on unload table) being held activated after three tries to move basket beyond this switch. 1) LS4 jammed or defective. 2) Basic PC Board false response on LS4 input line.

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

MACHINE OPERATION	ERROR CODE	MEANING AND PROBABLE FAILURES
18. Basket is unloading	59	Pressure switch PS2 (hydraulic back pressure) did not activate within one minute. 1) Piston traveling too slow — check needle valve adjustment. 2) PS2 out of adjustment. 3) Leaking seals on cylinder. 4) Basic PC Board not responding to PS2 signal. 5) No AC signal from I/O3 Expander (PC Board #4) to solenoid S9. 6) Dual solenoid S9/S10 not working.
19. Any phase or idle	77	One or both wing panel limit switches are activated. Not a failure unless both wing panels are actually closed. 1) A wing panel switch is defective. 2) Broken wiring to switch. 3) Basic PC Board defective input line.
20. Out of cycle	88	Machine is in the NOT READY condition. Not a failure as such. Press the START CYCLE button to restart automatic cycling.
21. Any phase	99	An ABORT procedure is in process. Let continue to CODE 88 condition.
22. Any Phase	..	No AC power to any solenoid valves. 1) Fuse F403 in power supply blown.

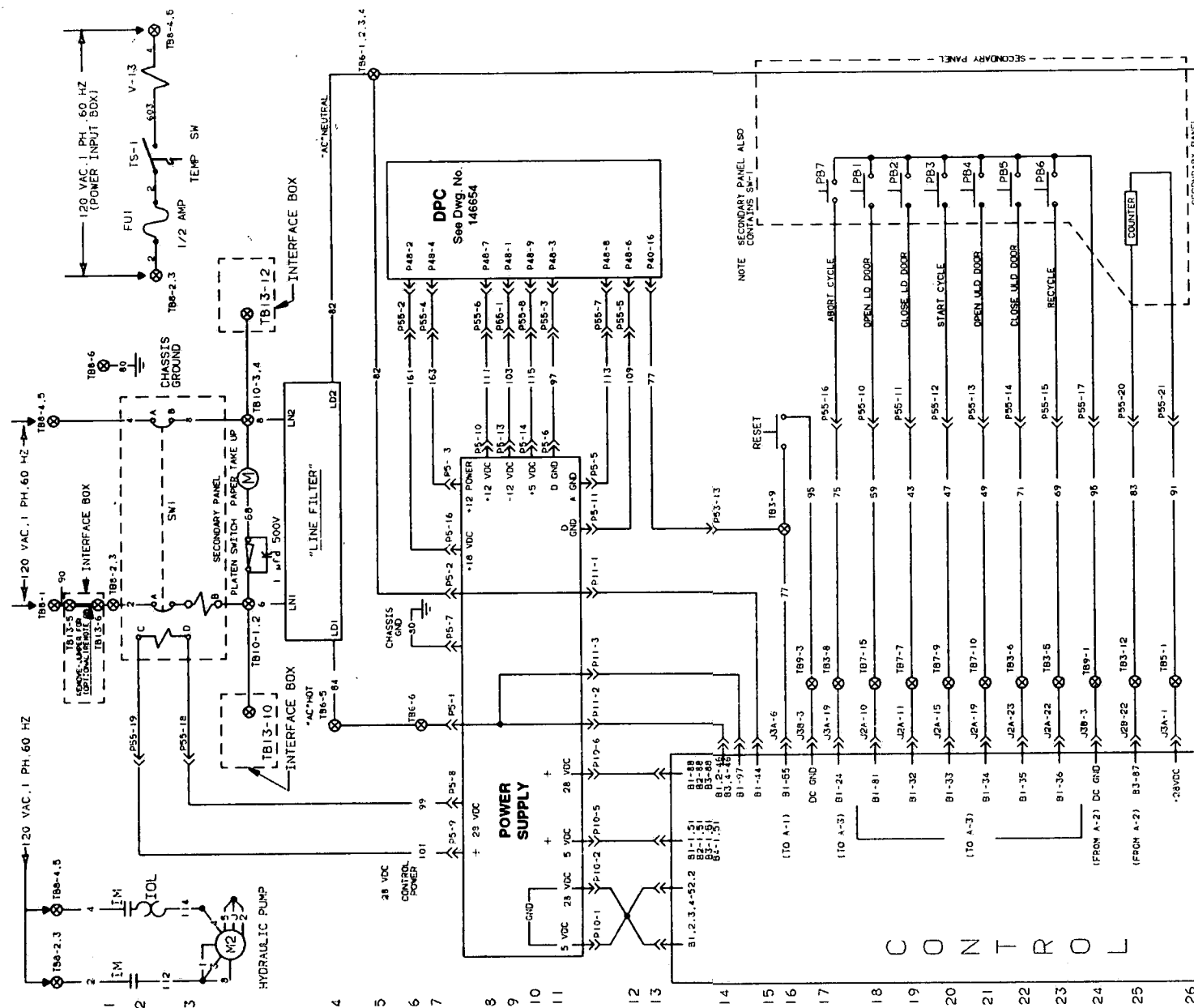


KEY	QUANTITY	DESCRIPTION
1	1	Motor & Pump Assembly
2	1	Sump Assembly
3	1	Ball Valve
4	1	Strainer
5	1	Filter
6	2	Pressure Switch (PS1: PS2)
7	3	Pressure Gauge
8	5	Control Valve, Dual Coil (S1-S6, S9-S12)
9	2	Diverter Valve
10	2	Flow Control Valve
11	2	Door Lift Cylinder
12	4	Door Lock Cylinder
13	2	Needle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

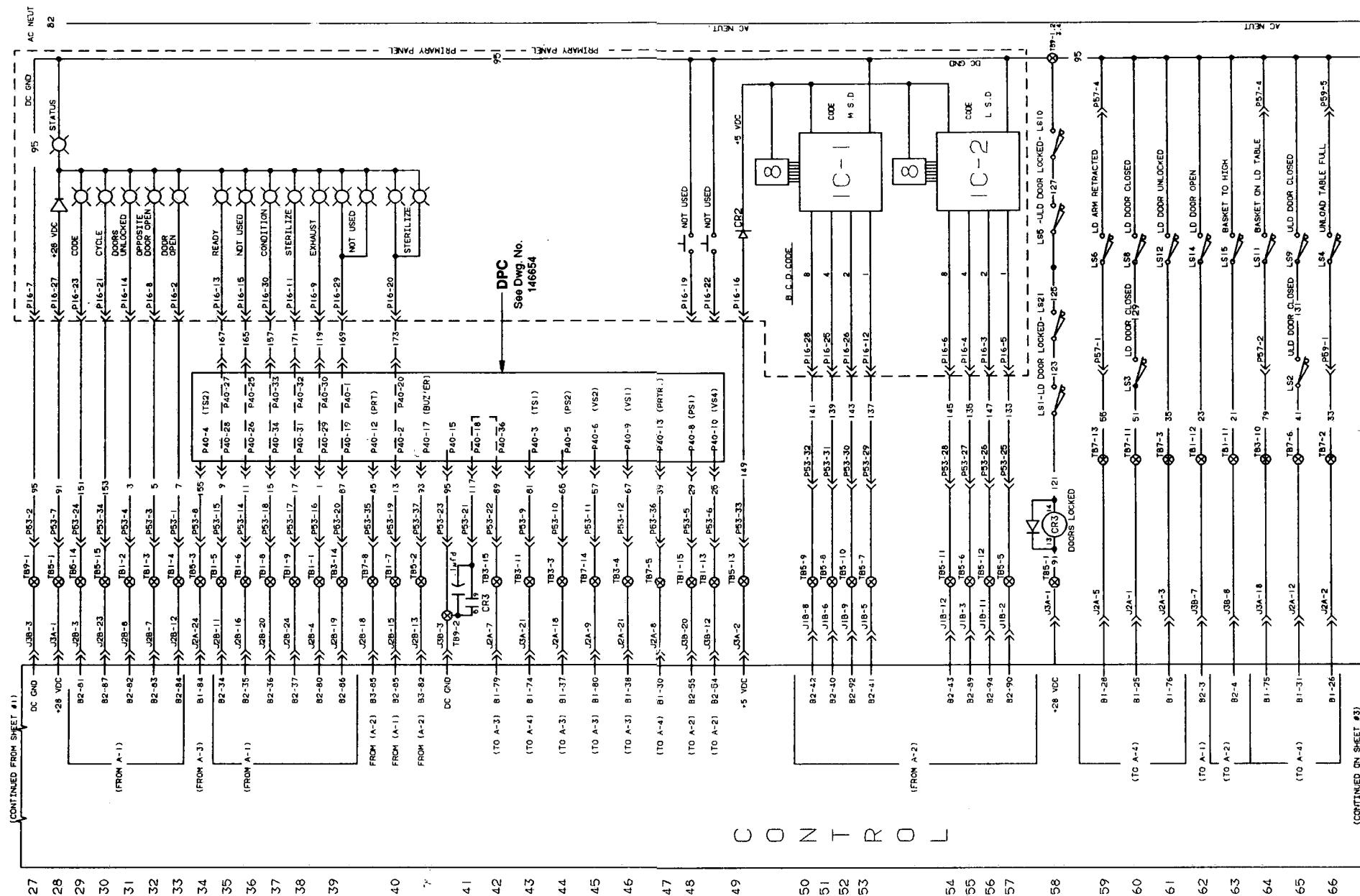
Figure 6-1. HYDRAULIC PIPING SCHEMATIC.

TABLE 6-2. SCHEMATIC REFERENCE LIST.

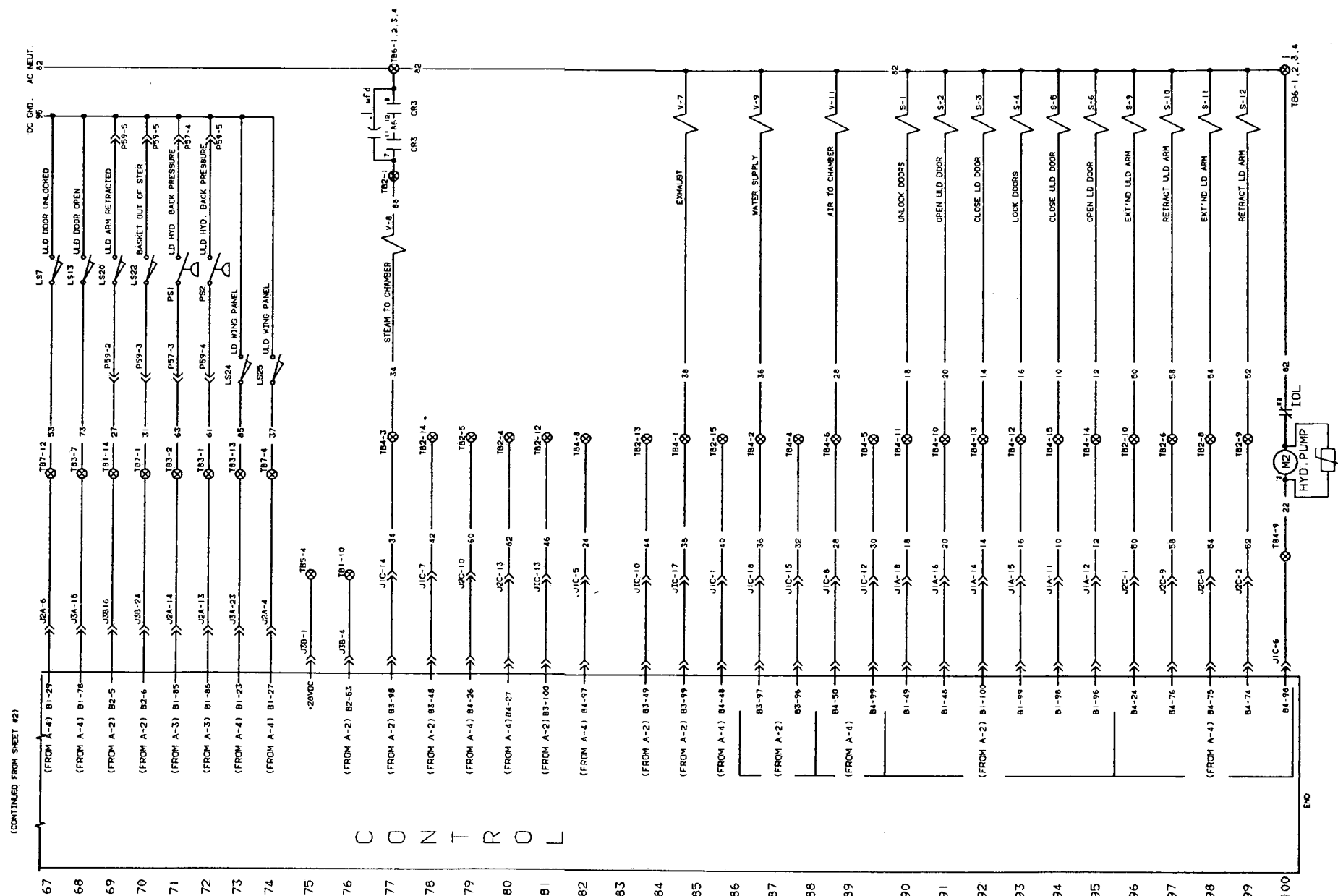
Title	Sheet	Reference
ELECTRICAL SCHEMATIC: Amscomatic Terminal Sterilizer	1 of 4	136806-955
	2 of 4	
	3 of 4	
	4 of 4	
PIPING SCHEMATIC	1 of 1	136806-957
PRINTED CIRCUIT BOARD #1: Basic CPU	1 of 2	146586
	2 of 2	
PRINTED CIRCUIT BOARD #2: I/O1 Expander	1 of 2	146588
	2 of 2	
PRINTED CIRCUIT BOARD #3: I/O2 Expander	1 of 2	146590
	2 of 2	
PRINTED CIRCUIT BOARD #4: I/O3 Expander	1 of 2	146648
	2 of 2	
MAIN PRINTCON PC BOARD	1 of 3	146654
	2 of 3	
	3 of 3	
PC ASSEMBLY: Power Supply	1 of 2	141198-309
	2 of 2	
PRINTCON DIGITAL DISPLAY PC BOARD	1 of 2	146633-081
	2 of 2	

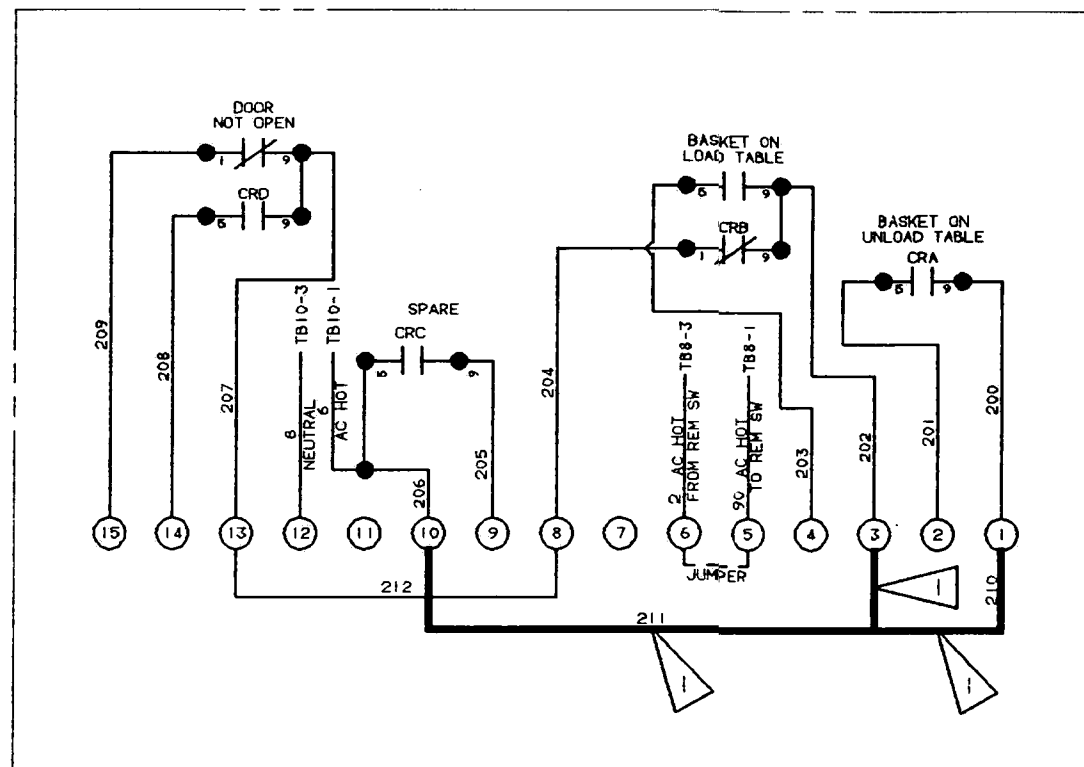


**ELECTRICAL SCHEMATIC:
AMSCOMATIC TERMINAL STERILIZER
(Part 1 of 4)**



ELECTRICAL SCHEMATIC: AMSCOMATIC TERMINAL STERILIZER (Part 2 of 4)

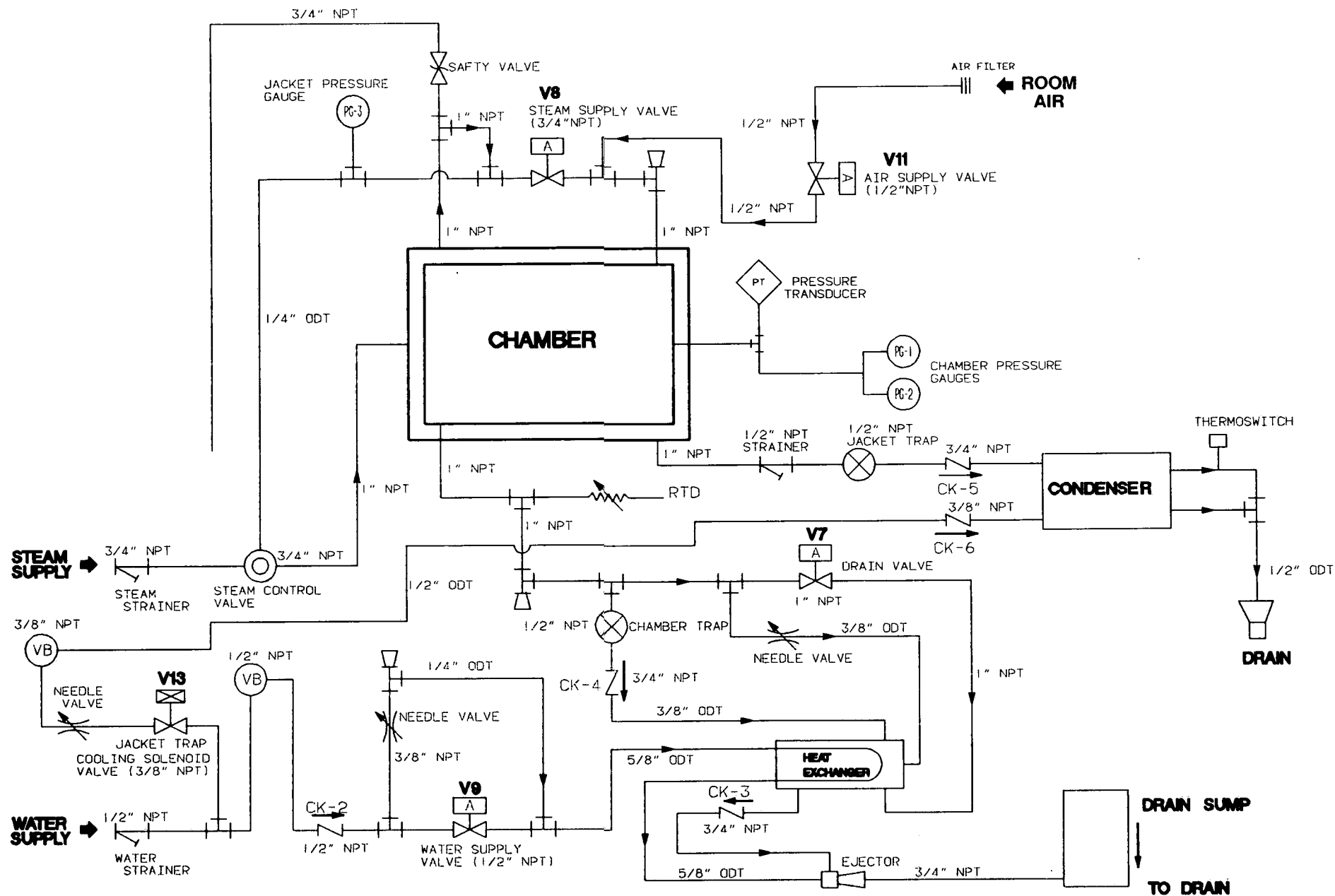




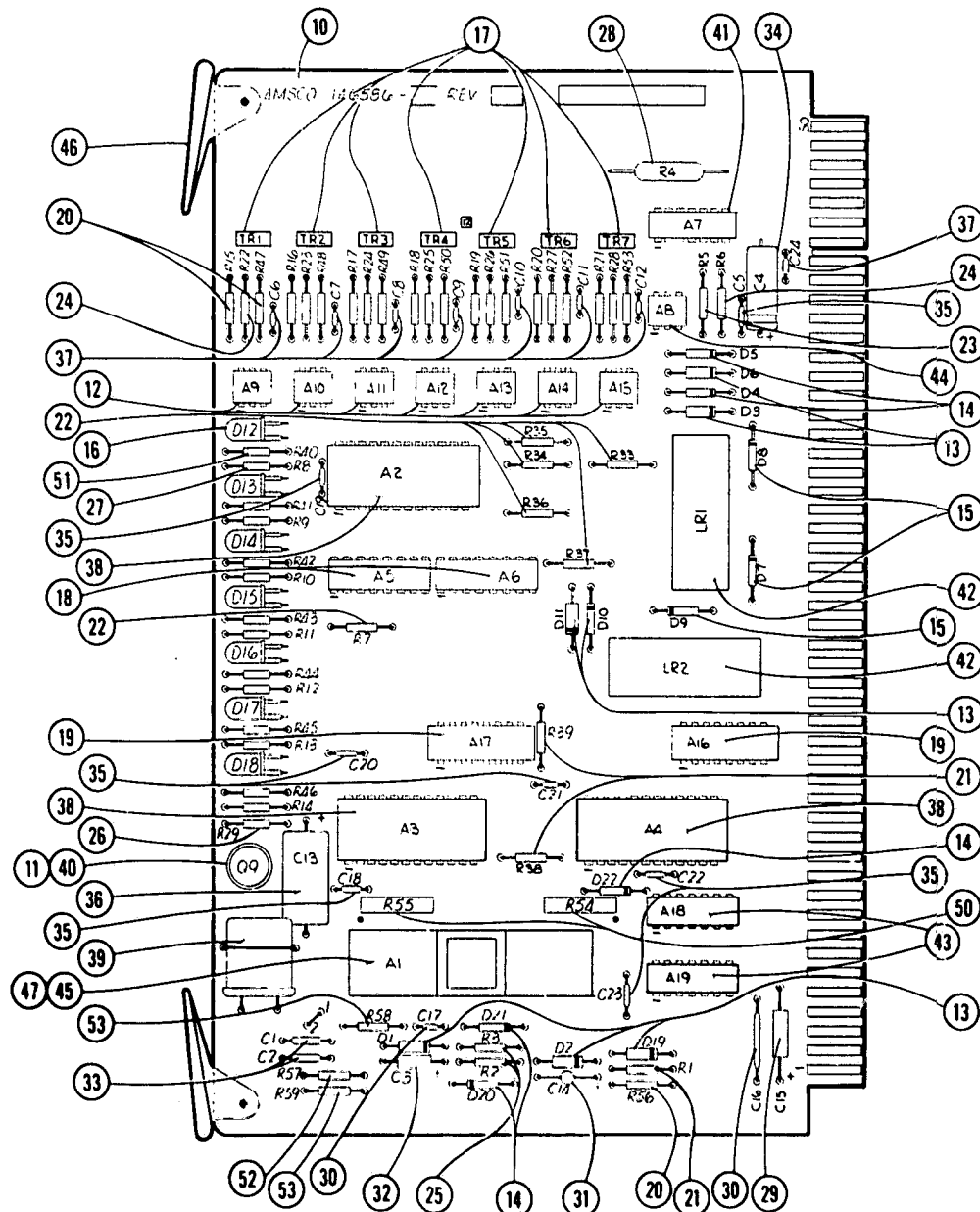
NOTES:

1 REMOVE 'RED' JUMPER TO CONNECT TO ACCESSORIES
REQUIRING CONTACTS INSTEAD OF 120 VOLT FEED.

ELECTRICAL SCHEMATIC:
AMSCOMATIC TERMINAL STERILIZER
(Part 4 of 4)

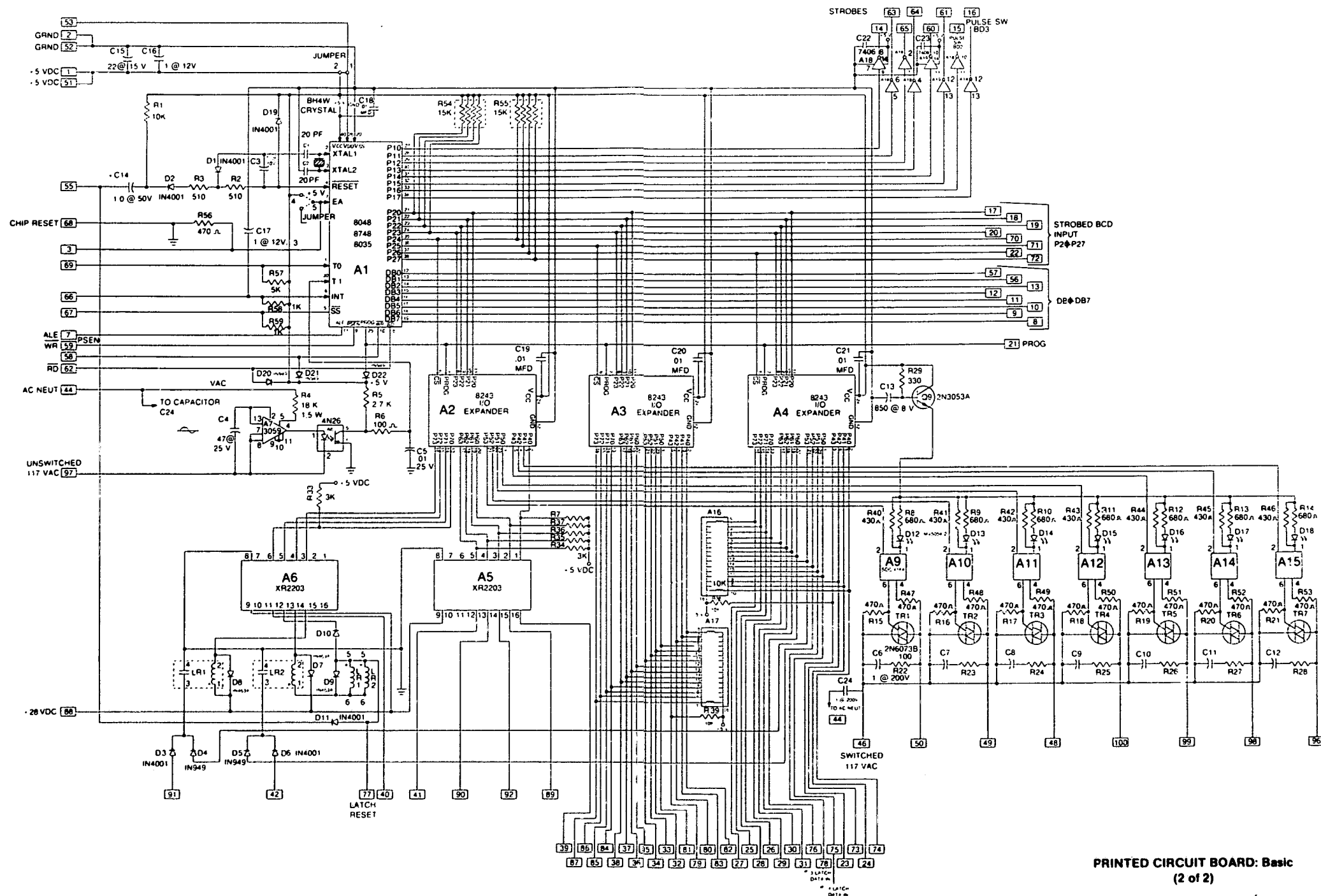


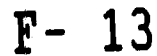
PIPING SCHEMATIC:
AMSCOMATIC TERMINAL STERILIZER



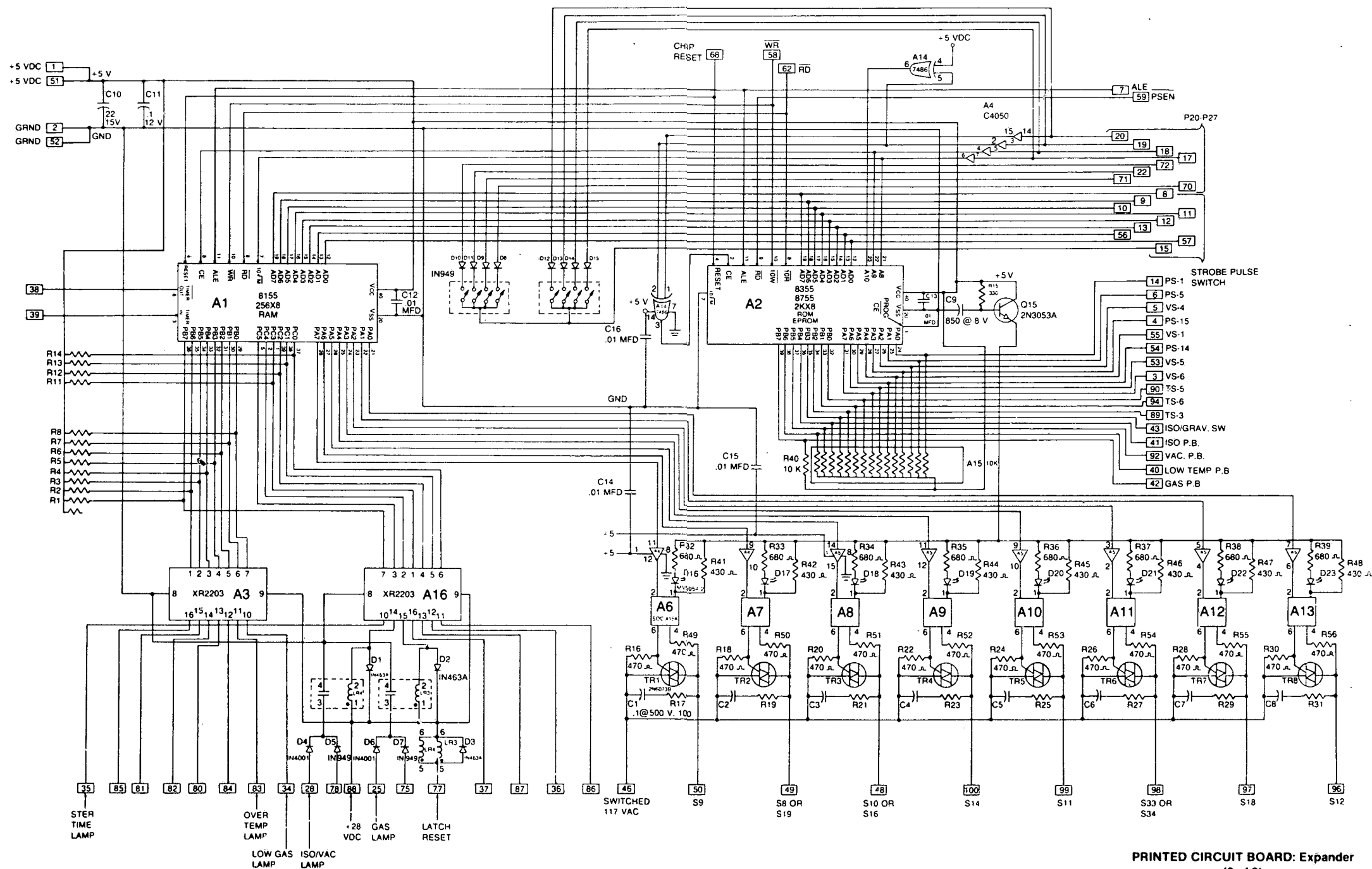
QTY.	ITEM NO.	NAME	DESCRIPTION, MATERIAL
	1	NOT USED	
	2	NOT USED	
	3	NOT USED	
	4	NOT USED	
	5	NOT USED	
	6	NOT USED	
	7	NOT USED	
	8	NOT USED	
1	10	P/C CARD & DRILL ASSY.	
1	11	PAD, TRANSISTOR	
7	12	IC SOC 418 A	TRIAC DRIVER A9-A15
7	13	RECTIFIER, IN4001	D1, D2, D3, D6, D10, D11, D19
5	14	DIODE, IN949	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	22 μ f @ 15V TANTALUM-C15
2	30	CAPACITOR	0.1 μ f @ 12V CERAMIC DISC-C16, C17
1	31	CAPACITOR	1.0 μ f @ 50V TANTALUM-C14
1	32	CAPACITOR	1.0 μ f @ 10V TANTALUM-C3
2	33	CAPACITOR	20 μ f @ 500V CERAMIC DISC-C1, C2
1	34	CAPACITOR	47 μ f @ 25V TANTALUM, C4
7	35	CAPACITOR	0.01 μ f @ 25V CERAMIC DISC-C5, C18, C23
1	36	CAPACITOR	850 μ f @ 8V TANTALUM-C13
8	37	CAPACITOR	0.1 μ f @ 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

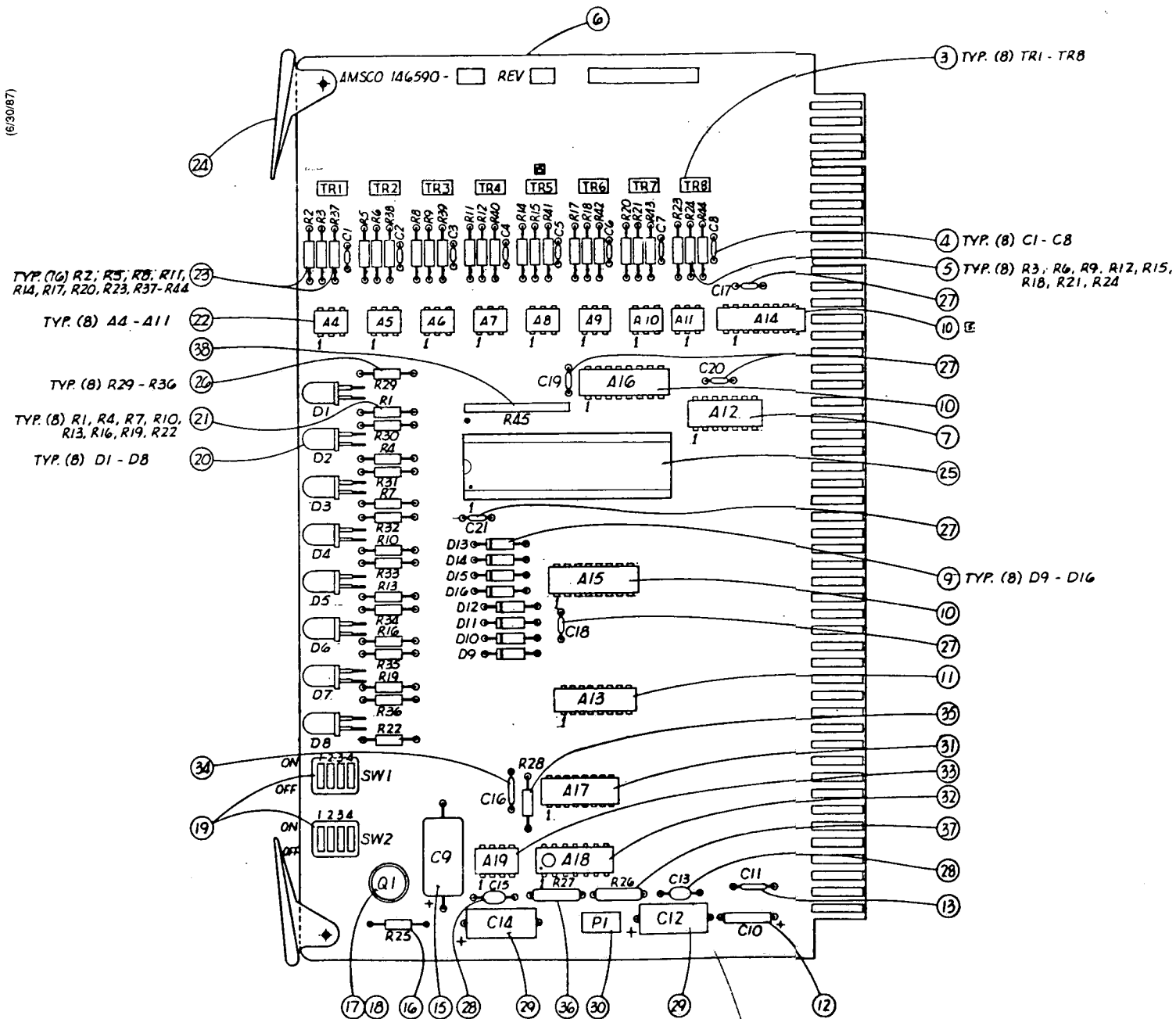
PRINTED CIRCUIT BOARD: Basic
(1 of 2)



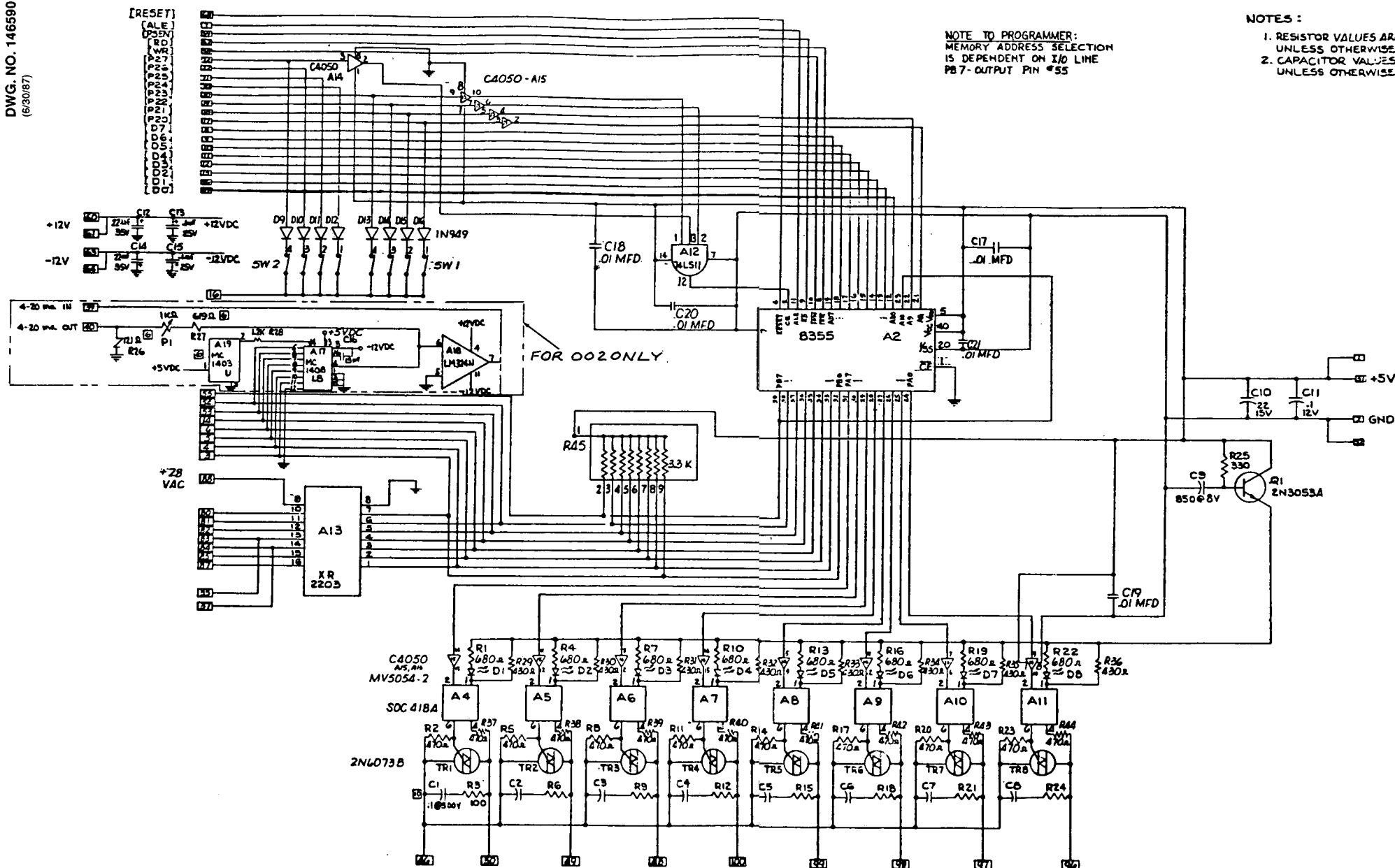


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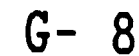




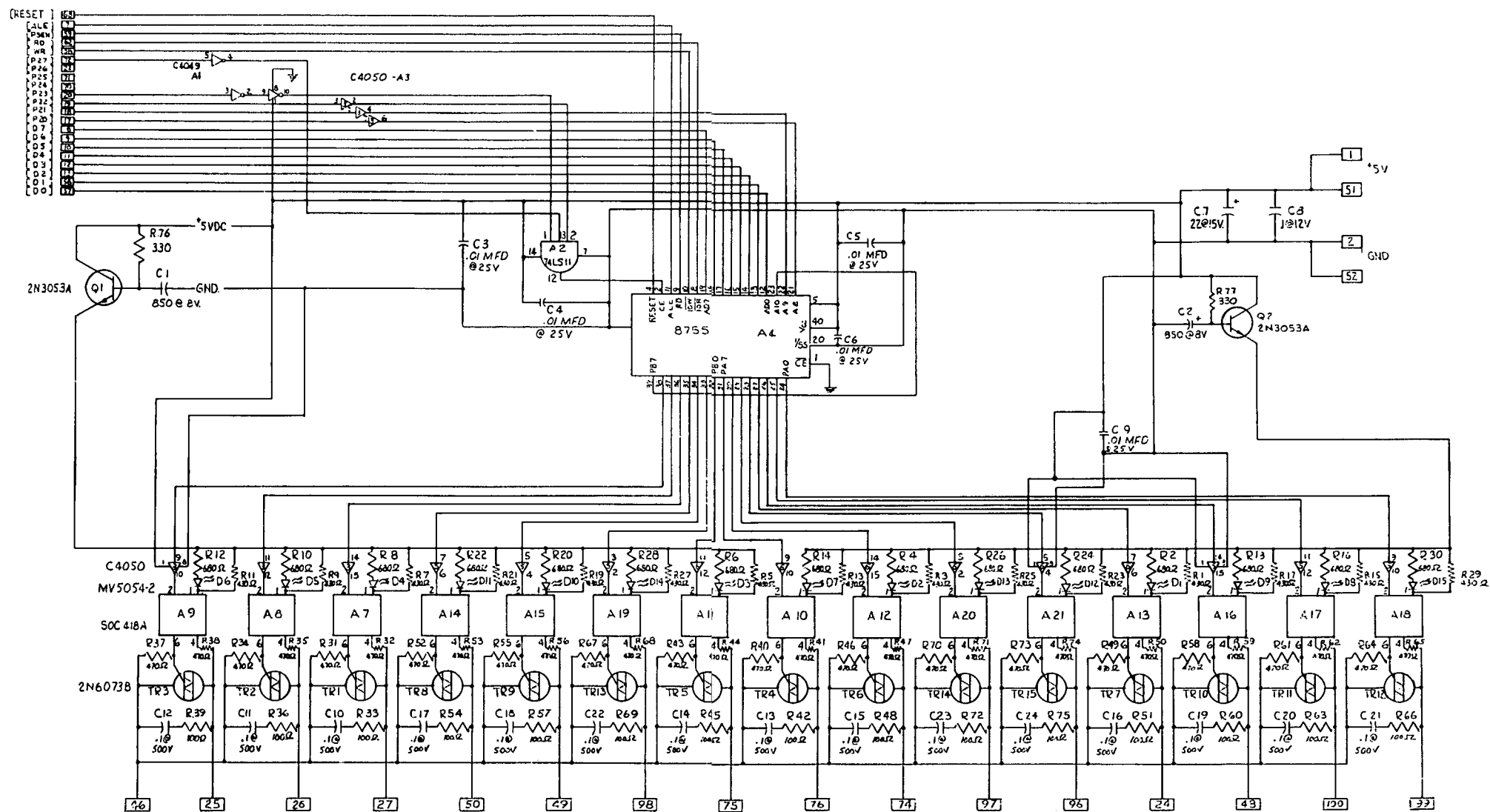
QTY.	REV	NAME	DESCRIPTION MATERIAL
1	X	PC ASSY.	COMBINATION STEAM & GAS
2	X	PC ASSY.	UNPROGRAMMED CHIP
3	8	TRIAC, 2N6073B	TRI - TR8
4	8	CAPACITOR	.1uf, 500 V, C1 - C8
5	8	RESISTOR, 100R	1/4 W 5% R3, R6, R9, R12, R15, R18, R21, R24
6	1	PC CARD & DRILL	SCHEDULE
7	1	GATE, TRIPLE	SN74LS11 A12 3INPUT POS AND
8	1	DIODE 1N949	D9-D16
9	3	HEX BUFFER	C4050 A15, A16, A14
10	1	DARLINGTON	XR2203 A13
11	1	CAPACITOR	22uf, 15 V, C10
12	1	CAPACITOR	.1uf, 12 V, C11
13	1	CAPACITOR	850uf, 8V, C9
14	1	RESISTOR, 330R	1/4 W 5% R25
15	1	TRANSISTOR	2N3053A Q1
16	1	PAD, TRANSISTOR	Q1
17	2	SWITCH, 16 POS	HEX SW1, SW2
18	8	LAMP, MV50542	L.E.D. D1 - D8
19	8	RESISTOR, 680R	1/4 W 5% R1, R4, R7, R10, R13, R16, R19, R22
20	8	TRIAC, OPTO. ISO	SOCA18A A4 - A11
21	10	RESISTOR, 470R	1/4 W 5% R2, R5, R8, R11, R14, R17, R20, R23
22	2	PULL CARD	1 R37-R44
23	1	SOCKET, LOW PROFILE 40 PIN D.I.P.	
24	8	RESISTOR, 430R	1/4 WCC 5% R29 - R36
25	5	CAPACITOR	.01uf @ 25V C17 - C21
26	2	CAPACITOR	.01uf @ 100V C13, C15
27	2	CAPACITOR	22uf @ 35V C12, C14
28	1	POTENTIOMETER	1K P1
29	1	DA CONVERTER	MC1408 L8 A17
30	1	QUAD OP AMP	LM324N A18
31	1	REFERENCE, 5V	MC1403U A19
32	1	CAPACITOR	15 PF @ 1000V C16
33	1	RESISTOR	1.2 K 1/4 WCC 5% R28
34	1	RESISTOR	619 1/4 WME 5% R27
35	1	RESISTOR	121 1/4 WME 5% R26
36	1	RESISTOR NETWORK	3.3K BY 9 R45



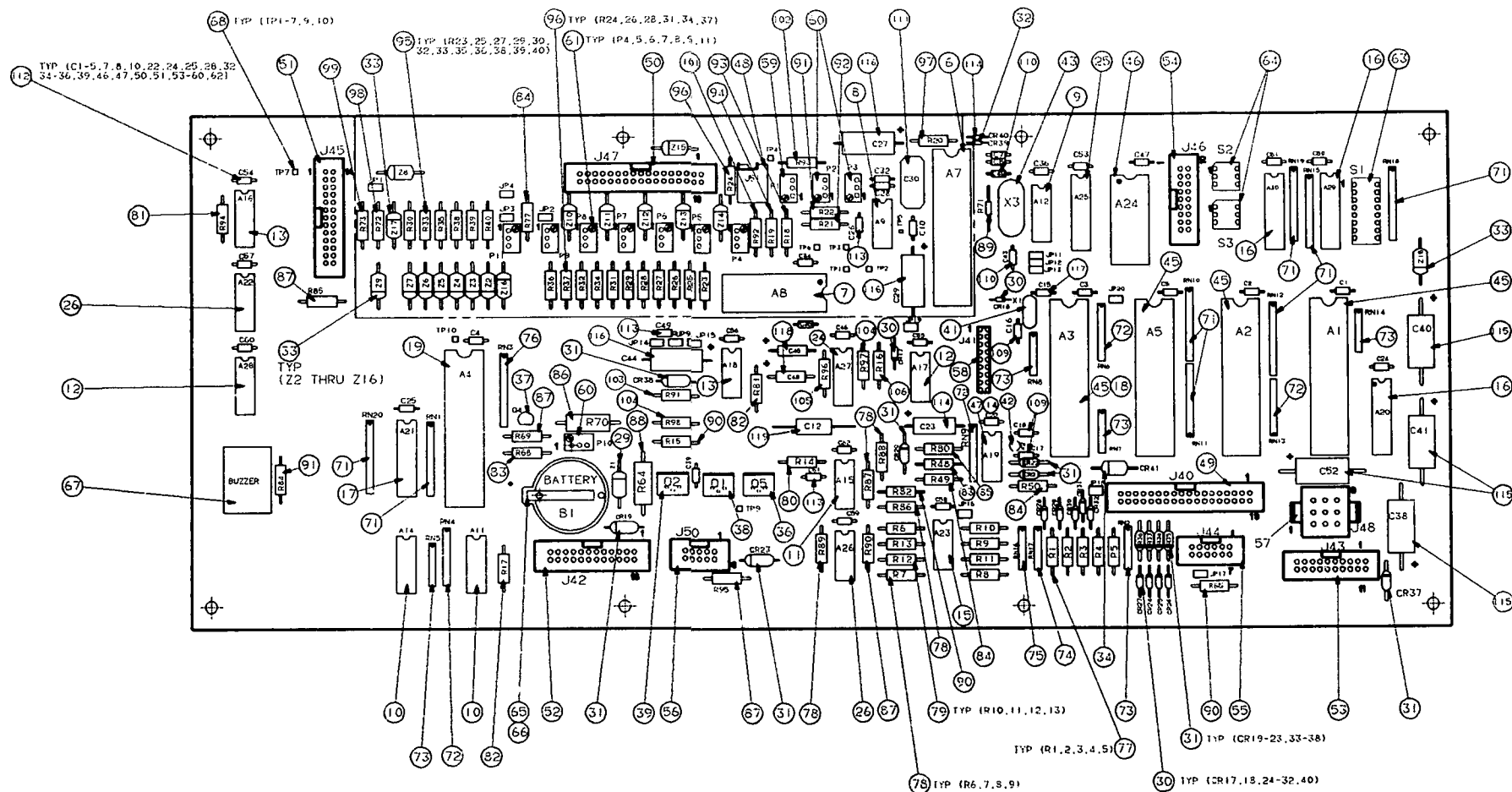
- NOTES :
1. RESISTOR VALUES ARE OHMS UNLESS OTHERWISE SPECIFIED
 2. CAPACITOR VALUES ARE MICROFARADS UNLESS OTHERWISE SPECIFIED



PRINTED CIRCUIT BOARD #4
(Part 1 of 2)

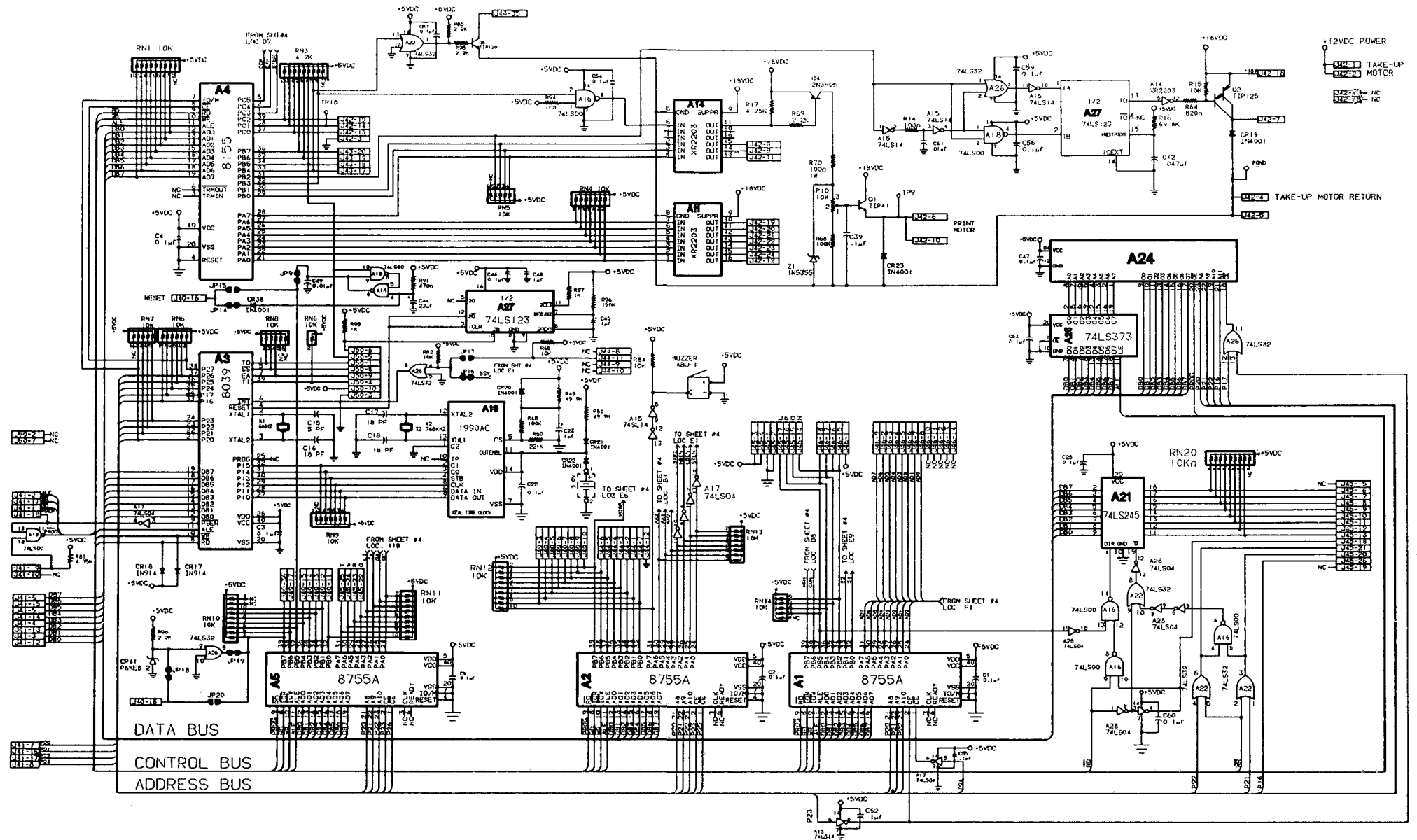


PRINTED CIRCUIT BOARD #4
(Part 2 of 2)



MAIN PRINTCON P/C BOARD

(Part 1 of 3)



MAIN PRINTCON P/C BOARD
(Part 2 of 3)



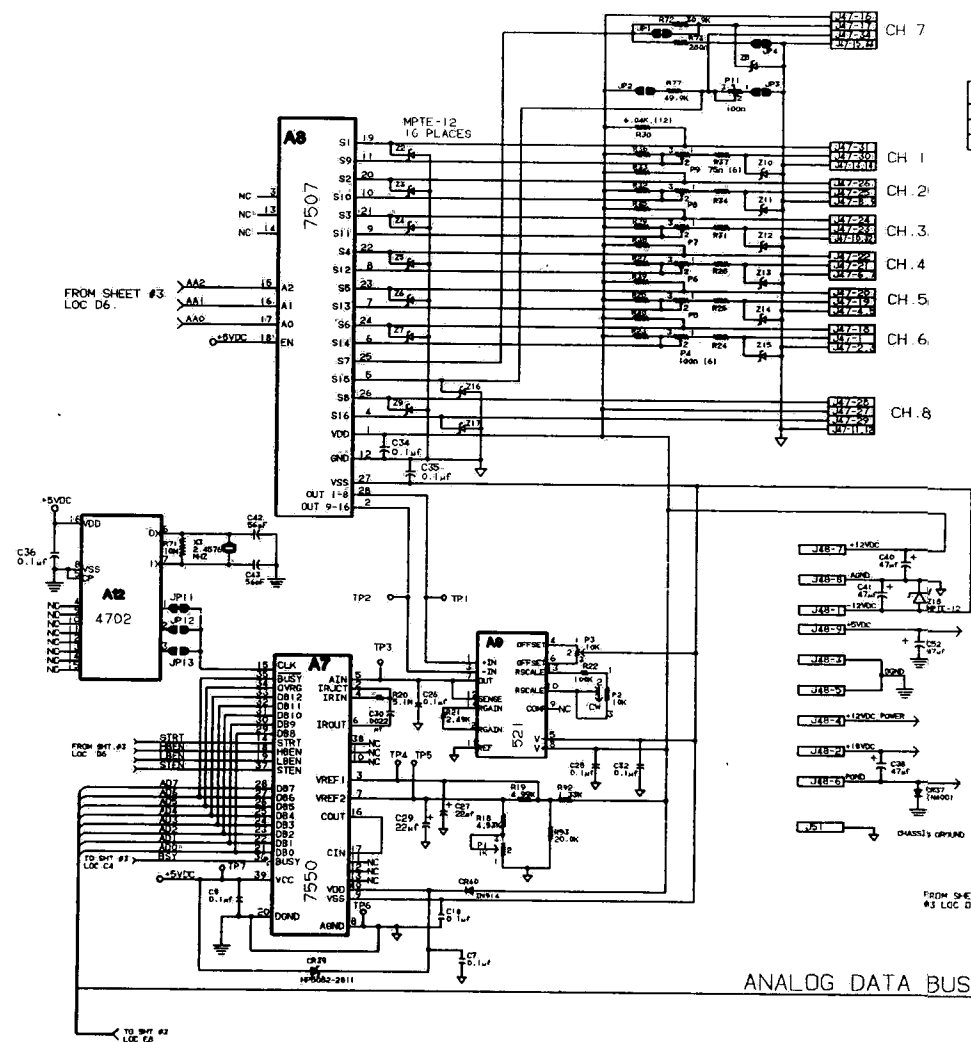
**AMSCO
SERVICE**

**EAGLE 2400 SERIES
AWCC 2400 TERMINAL STERILIZER WITH PRINTCON
P-764322-909**

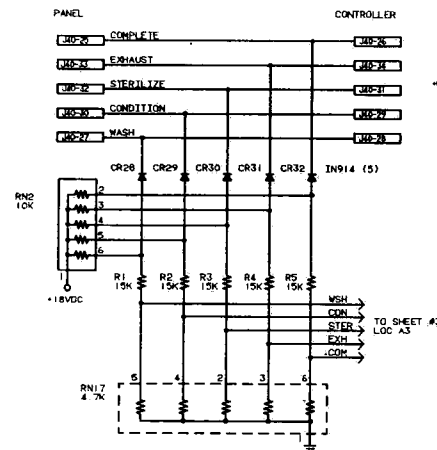
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1 of 2

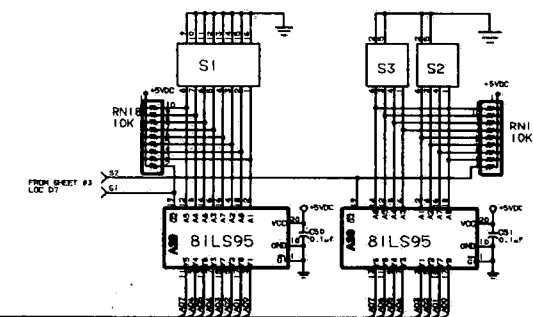
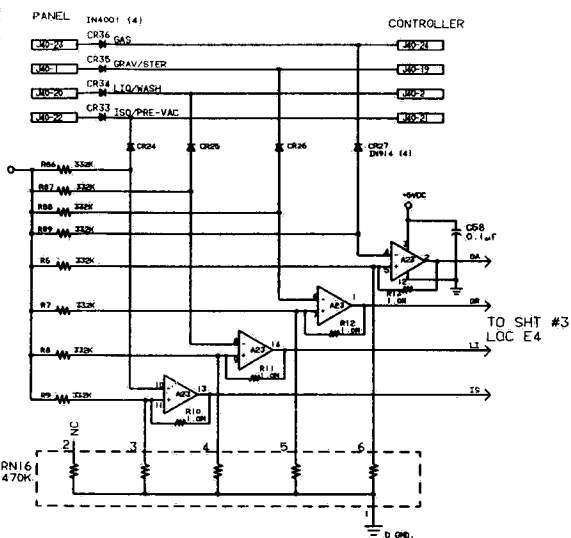
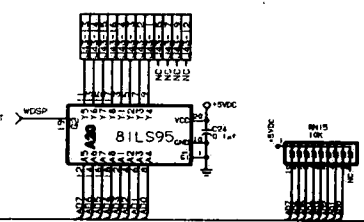


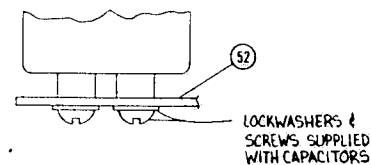
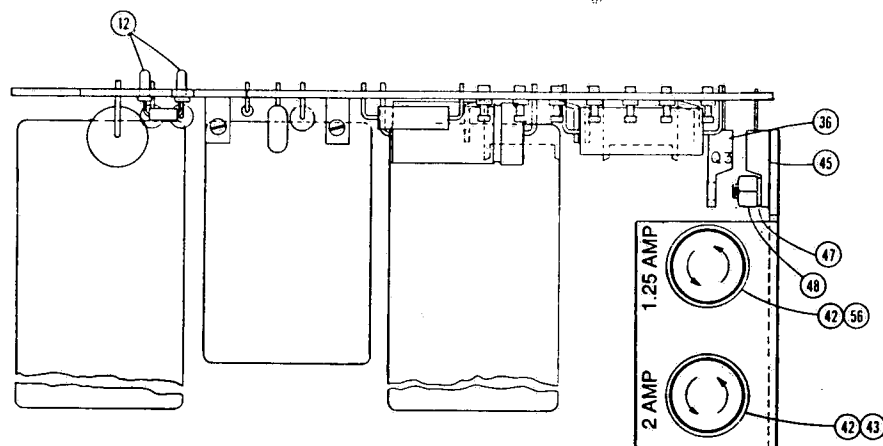


CHANNEL 7 PRGG. INPUT	JP1	JP2	JP3	JP4
4-WIRE PRESSURE GAUGE	CLOSE	OPEN	OPEN	OPEN
3-WIRE PRESSURE GAUGE	OPEN	CLOSE	CLOSE	CLOSE
2-WIRE HUMIDITY PROBE	CLOSE	OPEN	OPEN	OPEN

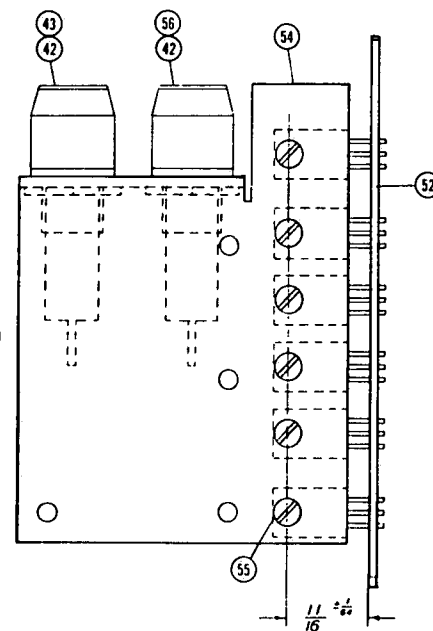
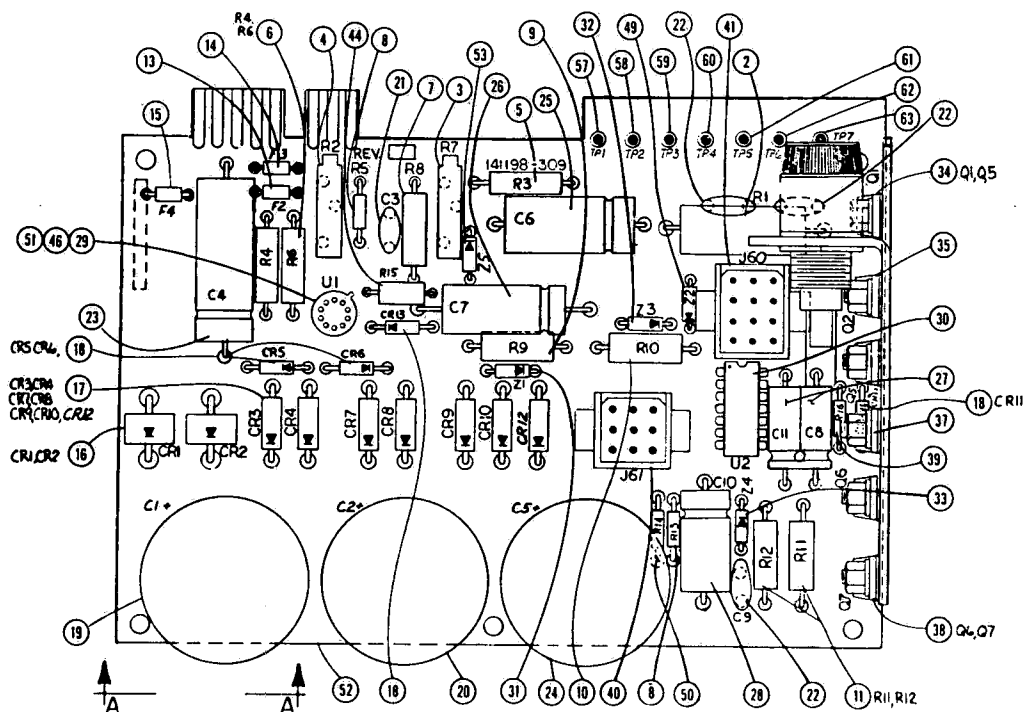


WALNUT DISPLAY CR28-11 → +12VDC POWER
CR28-10 → +18VDC
CR28-9 → +5VDC
CR28-8 → GND

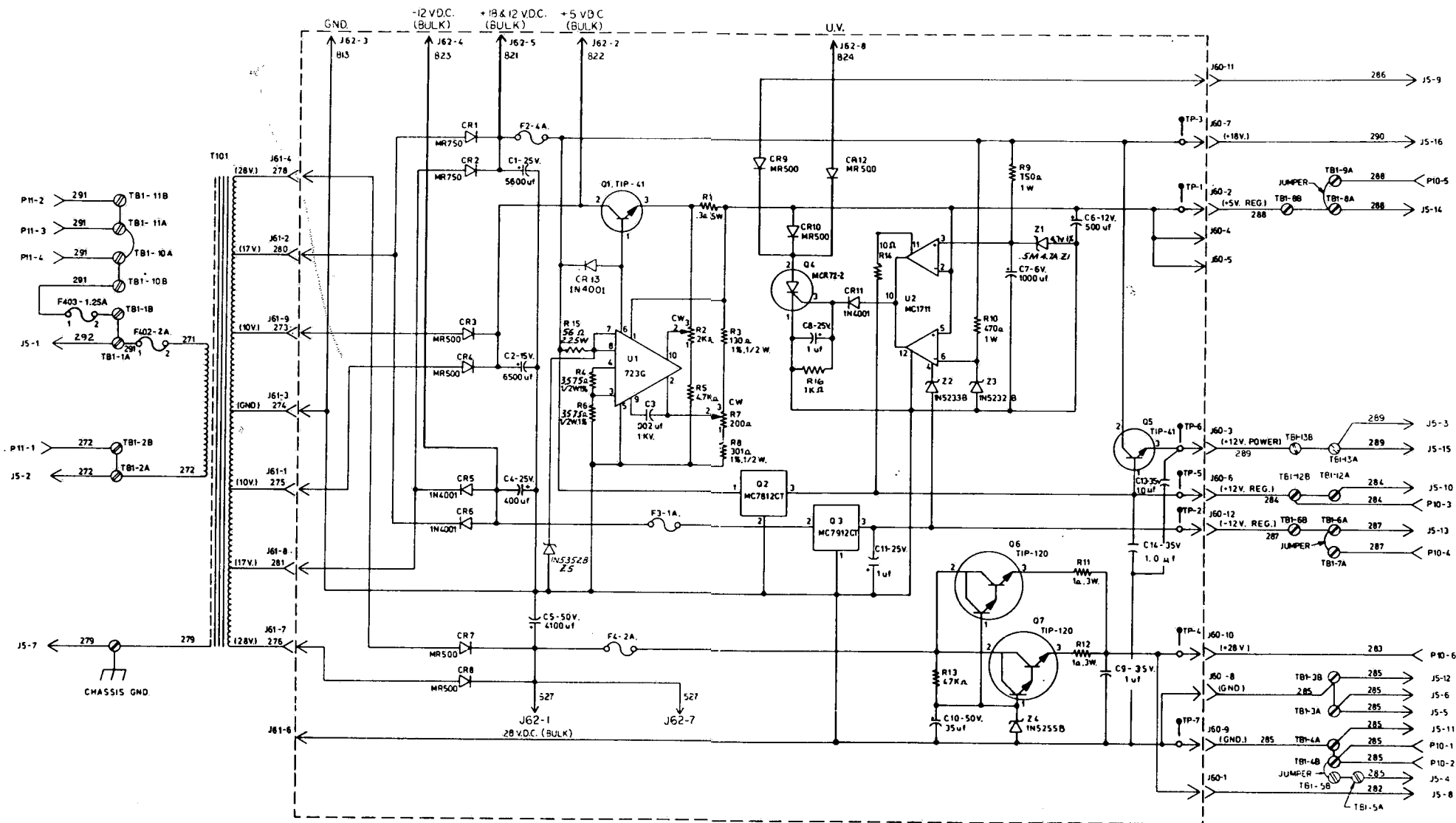


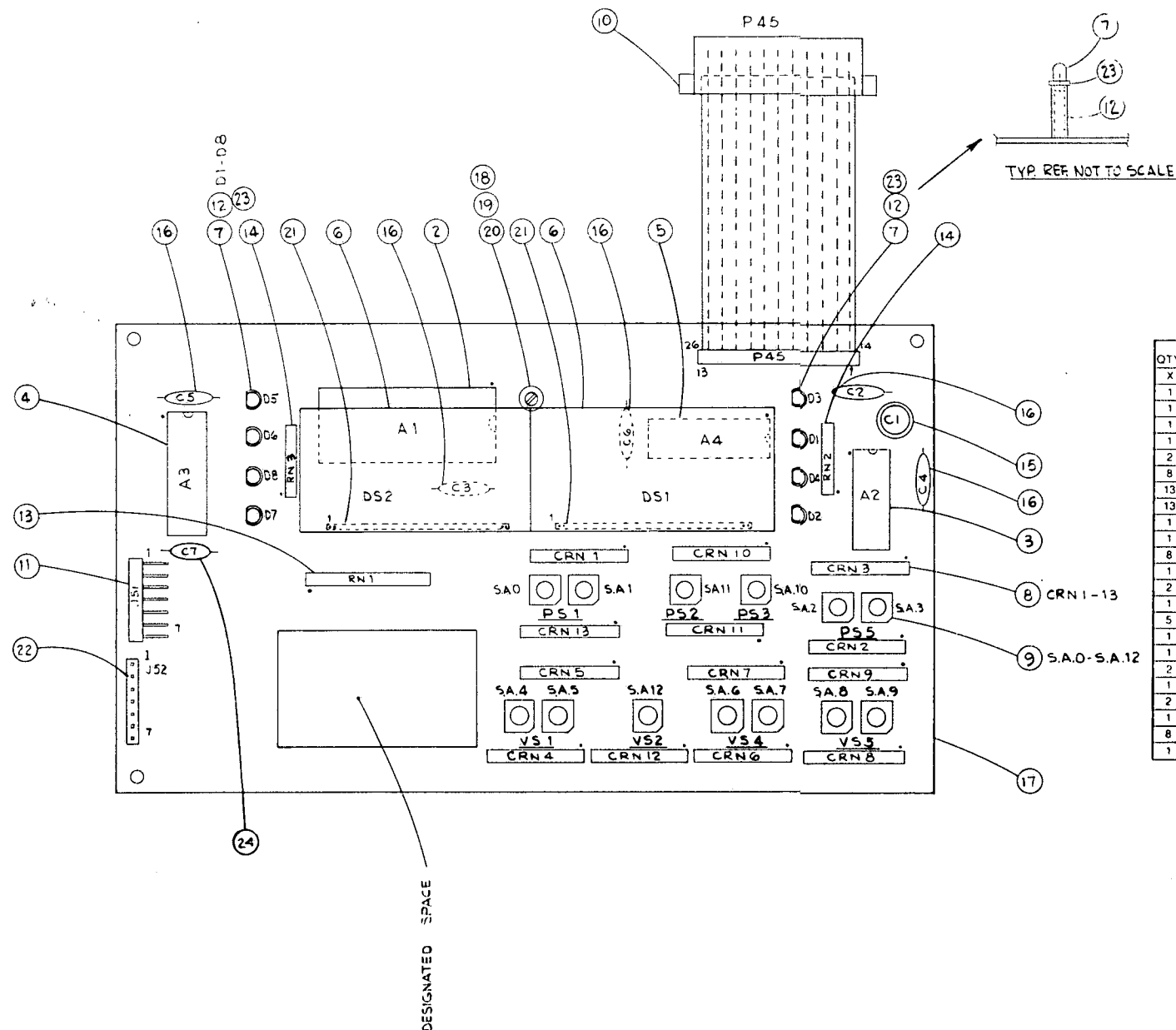


VIEW "A-A" TYP. MOUNTING FOR C1, C2, C5



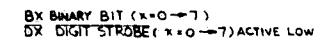
QTY.	ITEM NO.	DESCRIPTION
X	1	BOARD, POWER SUPPLY P.C. ASSEMBLY
1	2	RESISTOR 5 W.W.W., 3Ω R1
1	3	POT., 200Ω R7
1	4	POT., 2KΩ R2
1	5	RESISTOR, 1/2 W.M.F., 130Ω R3
2	6	RESISTOR, 1/2 W.M.F., 3570Ω R4, R6
1	7	RESISTOR, 1/2 W.M.F., 301Ω R8
2	8	RESISTOR, 1/4 W.C.C., 4.7KΩ R5, R13
1	9	RESISTOR, 1 W.C.C., 750Ω 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, 1A, 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, 5600μFD, 25V, C1
1	20	CAPACITOR, 6500μFD, 15V, C2
1	21	CAPACITOR, .002μFD, 1KV, C3
3	22	CAPACITOR, 1μFD, 35 VDC, C9, C13, C14
1	23	CAPACITOR, 470μFD, 25V, C4
1	24	CAPACITOR, 4100μFD, 50V, C5
1	25	CAPACITOR, 470μFD, 16V, C6
1	26	CAPACITOR, 1000μFD, 10V, C7
2	27	CAPACITOR, 1μFD, 50V, C8, C11
1	28	CAPACITOR, 33μFD, 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, 56Ω 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)
1	52	BOARD, BARE POWER SUPPLY P.C. -- DRILL SCHEDULE
1	53	DIODE, 15V ZENER 5% Z5
1	54	HEAT SINK
6	55	SCREW, FLAT HD. #4-40 x 5/16
1	56	FUSE, 1.25A, F403
1	57	TEST POINT, RED - TP1
1	58	TEST POINT, GREEN - TP2
1	59	TEST POINT, YELLOW - TP3
1	60	TEST POINT, VOILET - TP4
1	61	TEST POINT, ORANGE - TP5
1	62	TEST POINT, GRAY - TP6
1	63	TEST POINT, WHITE - TP7





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	74HCT139 DECODER/DEMULPLEXER (A2)
1	4	20 PIN DIP IC	74LS374 OCTAL D-TYPE LATCH (A3)
1	5	20 PIN DIP IC	81LS95 TRI-STATE OCTAL BUFFER (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 1N4150)
13	9	SWITCH	10 POS. ROTARY BCD DIP (S.A.O.-S.A.12) EECO 24008G
1	10	CABLE ASSEMBLY	7.5" (M45)
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 RN 2,3
1	15	CAPACITOR	220μF, 10V ALUM. C1
5	16	CAPACITOR	.1μF, 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
P/C BOARD (Part 1 of 2)



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SECTION 7

COMPONENT REPAIR, REPLACEMENT AND ADJUSTMENT

7.1 GENERAL

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

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

7.2 CHAMBER DOOR ASSEMBLY

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

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

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

7.2.1 Door Removal

(See Figures 8-18, 8-19 and 8-20).

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

4. Remove collar from cylinder.

5. Remove actuator from limit switch.

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

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

8. Pull out on the bottom of the door so that it clears the gears on the corner of the locking mechanism. Turn the POWER switch ON and press CLOSE LOAD DOOR or CLOSE UNLOAD DOOR as applicable. Guide the door as it lowers until it is resting on the loading or unloading unit. **Note:** To regulate speed at which door lowers, adjust the cylinder flow control valve (see Figure 8-28).

9. Turn POWER switch OFF.

10. Remove remaining clamp from door cable.

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

12. Reassemble door as follows:

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

7.2.2 Door Gasket Replacement (See Figure 8-20)

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

2. Remove gasket and gasket bars from door.

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

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

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

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

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

7. Tighten gasket bars alternately until almost snug.

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

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

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

7.2.3 Door Shimming Procedure (See Figure 8-20)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CAUTION: To prevent door lift mechanism failure, use only AMSCO approved parts when making repairs. The door lift mechanism requires special cable and supporting hardware for safe operation. When replacing door lifting cable, be sure cable does not twist, overlap, nor rub against itself. A twist in cable at door end can result in crossed cable at cylinder end.

1. Raise door.
2. Position safety bar in trough under center of door width.
3. Lower door onto safety bar.
4. Turn off electrical power to unit.

5. Remove and discard door lift and safety cables by loosening or removing saddle clamps and cable clamps.
6. Refer to Figures 7-1 and 7-2 and connect one end of door lifting cable to cleat that is away from you.

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

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

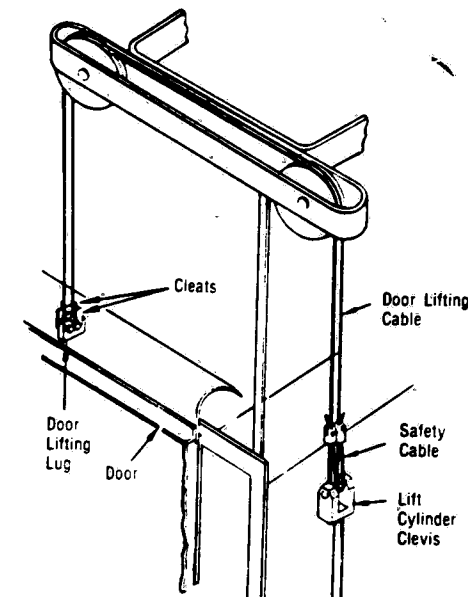


Figure 7-1. ROUTING DOOR LIFTING CABLE.

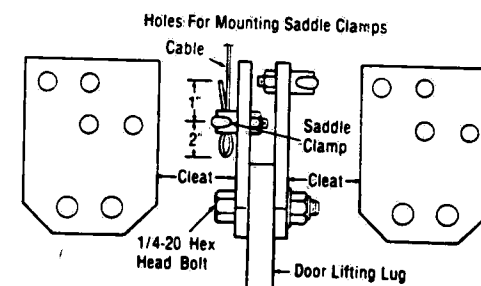


Figure 7-2. ATTACHING DOOR CABLE TO CLEATS.

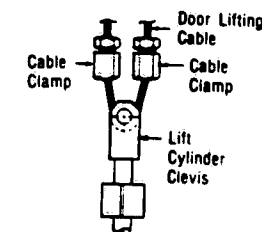


Figure 7-3. CONNECTING DOOR LIFTING CABLE.

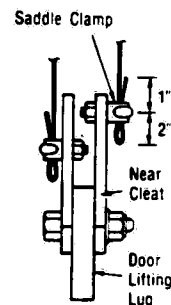


Figure 7-4. MOUNTING SADDLE CLAMPS.

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

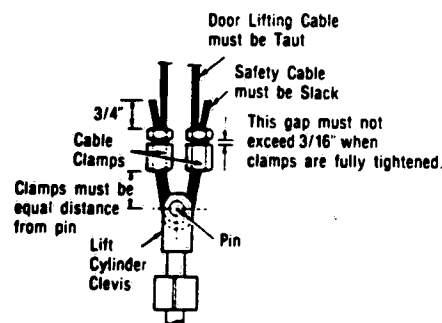


Figure 7-5. ATTACHING SAFETY CABLE.

7.2.5 Limit Switch Actuator Rod Adjustment

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

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

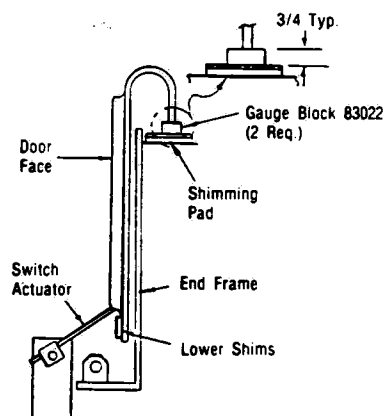


Figure 7-6. ADJUSTMENT OF DOOR LIMIT SWITCHES.

7.3 LOCKING CYLINDERS (See Figures 8-19 and 8-32)

7.3.1 Replacement

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

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

7.3.2 Clevis Adjustment

1. Close and lock the doors. Ensure that the locking shaft keys are parallel (or just beyond) to the sterilizer.
2. Loosen the hydraulic lines to relieve pressure (be prepared to catch the residual oil) and remove the clevis link pin.
3. Push in on the locking cylinder rod until it is completely depressed in the cylinder.
4. Ensure that the actuator is keyed in the proper position to the locking shaft and that the pin connecting the actuator and the connection link is in place.
5. Adjust the clevis until the holes are in line with the one in the connection link.
6. Insert the pin through the clevis and the connection link. Install the snap rings.
7. For new cylinder installations, install the drip pan and connect the hydraulic lines in the manner they were removed.
8. Tighten all fittings and then press the applicable OPEN DOOR pushbutton to unlock and open the door. Examine the entire assembly for proper installation.
9. Operate the door several times to ensure no binding and that the connection link does not go beyond clear center when the door is in the unlocked position. If necessary, lock the door and readjust the clevis by turning it clockwise several times.

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

7.3.3 Diverter Valve Adjustment

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

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

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

7.4 STEAM TRAP (See Figure 8-22)

Cleaning and Inspection

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

1. Unscrew and remove the cap and element. Use a hex socket wrench to unscrew and remove seat.
2. Wipe the parts clean, taking care to avoid damage to the diaphragm, seat and pointed diaphragm stem. A very fine grade of sandpaper may be used (cautiously) to smooth mating surfaces of the seat and stem.
3. Wipe out the bowl. Do not allow loose material to enter the piping.
4. Test diaphragm for flexibility. Examine soldered joints for cracks or leaks; dip it in boiling water and look for expansion. An element in good condition will be difficult to stretch by hand and will return to original condition quickly when released.
5. Reassemble steam trap in reverse order of disassembly. Install a new element if required. Make certain that all pipe fittings are tight after assembly.

7.5 STEAM CONTROL VALVE (See Figure 8-25)

Cleaning and Inspection

1. Disconnect pilot line at top of control valve. Remove valve from sterilizer.
2. Turn adjusting screw counterclockwise until all compression is out of spring.
3. Remove the 1/4-20 setscrew opposite the adjusting screw and turn top assembly until lugs on syphon and bonnet assembly line up with notches in bottom plate. Remove top assembly from valve body.
4. Remove the four 1/4-20 screws which secure cover to bottom plate; remove cover. Remove bellows assembly and reinforcement from cover.

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

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

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

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

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

7.6 HYDRAULIC CONTROL VALVE (See Figures 8-27 and 8-29)

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

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

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

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

7.7 LOADING OR UNLOADING UNIT CYLINDER TRAVEL (See Figures 8-6 and 8-7)

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

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

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

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

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

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

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

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

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

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

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

11. When both feeders are verified to be working properly, check, using a straight edge, that the riser valve seal is below the basket guide tracks (allow

approximately 1/4 inch clearance). Adjust as required. If difficulty is encountered, these adjustments can be more easily made after the machine has heated up.

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

7.8 PNEUMATIC BALL VALVE

7.8.1 General

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

7.8.2 Removal of Seats and Stem Seal

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

2. Remove valve from line.

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

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

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

6. Place new stem seal on stem, position stem in body, place new thrustwasher over stem, install follower (small metal washer) over stem. Position two Belleville washers (cupped) on stem with concave surfaces facing one another. Assemble the drive key, flat side up, and stem nut. To prevent the stem from turning, insert a wood or plastic dowel through the ball port and tighten the nut until the Belleville washers beneath the drive key have just become fully compressed (flattened). Initially, the nut will spin freely as it is run onto the stem. After the nut contacts the drive key, further tightening will be accompanied by a progressive increase in torque as the Belleville washers are deflected. When the Belleville washers become flattened (are fully deflected), the torque will increase sharply; further tightening should not be attempted as damage to the stem and/or stem seal may result.

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

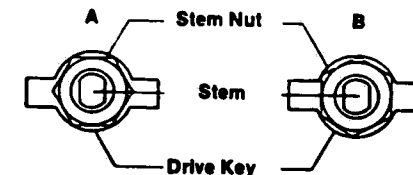


Figure 7-7. HEX/DRIVE KEY RELATIONSHIP.

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

9. Test valve.

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

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

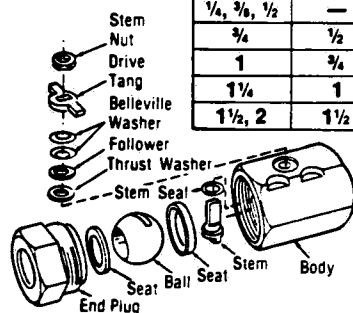


Figure 7-8. PNEUMATIC BALL VALVE.

7.8.3 Actuator

1. Remove the actuator from the valve by loosening the two hex head capscrews.
2. Remove fillister head screws, position indicator housing, retaining ring, position indicator, thrust-washer and thrustbearing.
3. Gently push the upper shaft of the pinion assembly until pinion slides out through bottom of actuator.
4. Remove the four socket head capscrews numbered in Figure 7-9 and disconnect spring module from actuator body.
5. Gasket — If endcap gasket adheres to actuator body or spring module, carefully remove it so as to avoid damage.

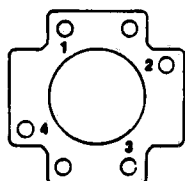


Figure 7-9. VALVE ACTUATOR NAMEPLATE.

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

CAUTION: Some solvents may distort O-rings.

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

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

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

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

11. Reinstall the pistons as follows:

- a. Position the actuator on a table so the Gemini nameplate is on the left.
- b. Orient the first piston so the head goes in first and the tail is on the right.
- c. Press the piston into the actuator cavity being careful not to pinch the piston O-ring. Push piston until it contacts the back wall of the actuator.
- d. The second piston enters the actuator body cavity *tail first* with the tail on the left. This piston should be pushed flush with the top of the actuator body cavity.

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

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

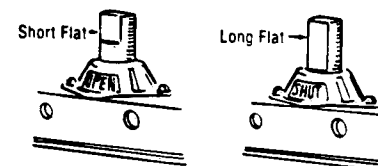


Figure 7-10. PINION ASSEMBLY ORIENTATION.

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

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

13. Replace the thrustbearing, thrustwasher, position indicator and retaining ring (flat side up).

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

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

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

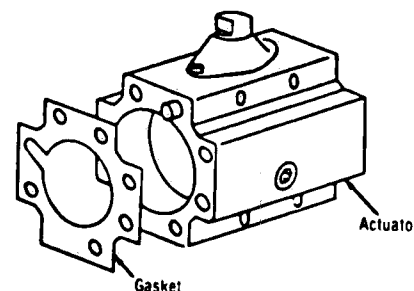


Figure 7-11. GASKET REPLACEMENT.

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

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

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

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

19. Grasp spring assembly and remove from booster cylinder.

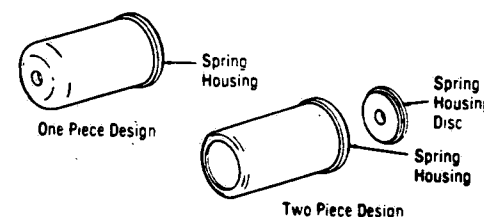


Figure 7-12. SPRING HOUSING DESIGNS.

20. Remove O-ring from booster piston.

21. Loosen assembly bolt in spring cartridge assembly.

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

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

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

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

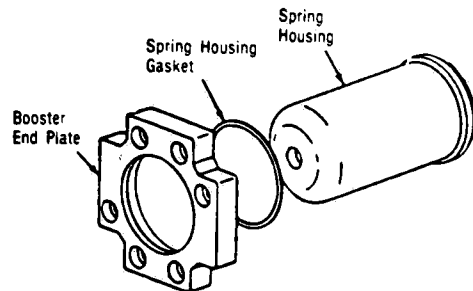


Figure 7-13. SPRING HOUSING/BOOSTER END PLATE ORIENTATION.

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

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

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

27. Place booster gasket onto booster cylinder over spring.

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

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

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

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

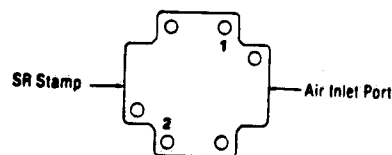


Figure 7-14. SOCKET-HEAD CAPSCREW LOCATIONS.

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

7.8.4 Remounting Pneumatic Actuators

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

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

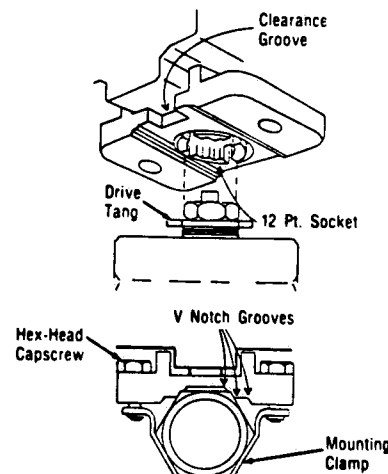


Figure 7-15. PNEUMATIC ACTUATOR REASSEMBLY.

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

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

7.9 3-WAY SOLENOID VALVE (AIR) (See Figure 7-17)

Valve Disassembly, Repair, And Reassembly

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

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

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

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

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

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

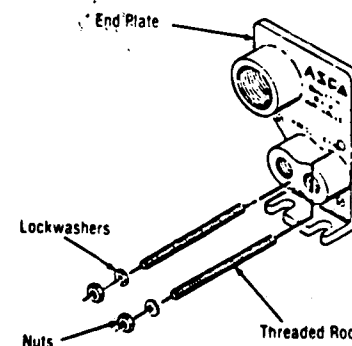


Figure 7-16. DISASSEMBLING 3-WAY SOLENOID VALVES.

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

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

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

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

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

9. Remove insert by using a pair of pliers on the head of the screw. Remove three gaskets, disc holder, disc and disc spring. Tag disc spring to ensure proper reassembly. When replacing disc holder in insert, do not use the hole used by the machine screw for insert removal.

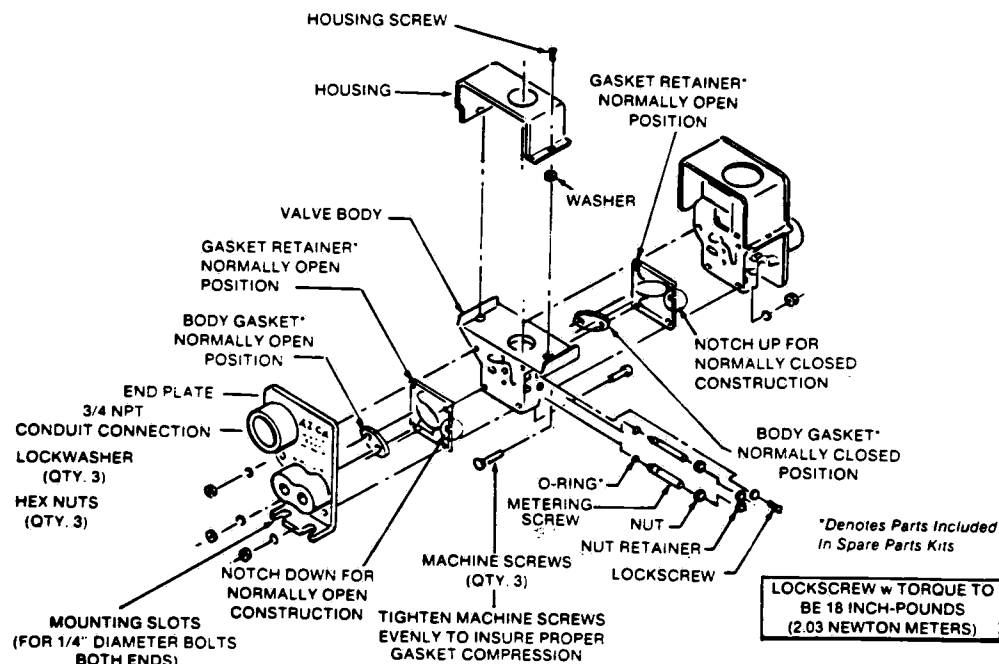
10. Reassemble in reverse order of disassembly, paying careful attention to Figure 7-17.

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

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

13. Torque solenoid bonnet to 90 ±10 inch-pounds.

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



INSTRUCTIONS FOR POSITIONING BODY GASKET AND GASKET RETAINER

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

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

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

UNIVERSAL CONSTRUCTION: BODY GASKET AND GASKET RETAINER MAY BE POSITIONED FOR EITHER NORMALLY CLOSED OR NORMALLY OPEN OPERATION AS DESIRED.

IMPORTANT: ONLY UNIVERSAL CONSTRUCTION VALVES MAY BE USED FOR NORMALLY CLOSED OR NORMALLY OPEN OPERATION. NORMALLY CLOSED VALVES CANNOT BE USED FOR NORMALLY OPEN OPERATION OR VICE-VERSA UNLESS INTERNAL PARTS OF THE VALVE ARE CHANGED.

Figure 7-17. 3-WAY SOLENOID VALVE GASKET RETAINER POSITION.

7.10 PRINTER ASSEMBLY

(See Figure 8-12)

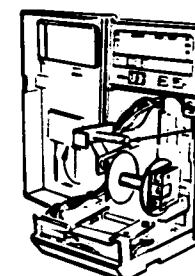
7.10.1 Changing Paper (See Figure 7-18)

NOTE: Printcon is designed to use 2-3/8 inch wide, one-ply paper tape as supplied by AMSCO. Paper tape supplies must not be stored in areas of high humidity or temperature.

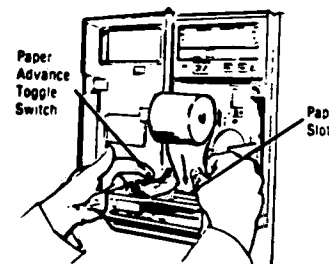
A colored bar will appear on the paper tape indicating that the roll is near the end and should be replaced.



Printer In Lowered Position



Spindle In Raised Position



Inserting Paper

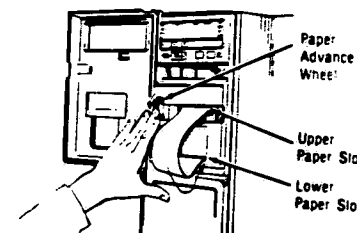
1. Open printer door. Swing printer assembly forward and downward and allow it to rest in service position.

2. If paper has been inserted into the record storage area, it will be necessary to remove the stored record before continuing. Refer to paragraph 7.13.3, *Removing Stored Record*.

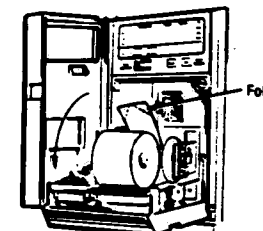
3. Raise front paper spindle.

4. Remove empty paper spool by sliding it to the right.

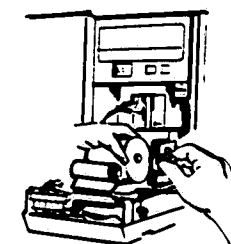
5. Slide fresh paper roll onto spindle with loose end or ends of paper behind the roll going downward.



Inserting Paper Into Automatic Paper Storage Area



Fold Paper Tape



Removing Stored Record

Figure 7-18. CHANGING PAPER.

6. Insert loose end of roll into paper slot. Using index finger of left hand, advance paper by pushing paper advance toggle switch forward. Turn off paper advance. Lower paper spindle. If necessary, operate paper advance again until paper is drawn taut. Turn off paper advance.

7. Swing printer assembly upward and back into operating position.

NOTE: Refer to paragraph 7.10.2, *Automatic Paper Storage* if paper storage is desired.

7.10.2 Automatic Paper Storage

1. Open door on secondary control panel and position POWER switch to OFF.

2. Using the paper advance thumbwheel on the left side of the upper paper slot, advance paper until it extends 6 to 8 inches below the lower paper slot.

3. Insert the end of the paper tape into the lower paper slot until full 6 to 8 inches is inserted.

4. Swing printer assembly forward and downward and allow it to rest in the service position.

5. Grasp end of the paper tape, fold the two corners to form a V and fully insert the end into the slot of paper take-up spool.

6. Position the POWER switch to ON. Paper take-up spool will take up the paper until taut.

7. Swing printer assembly upward and back into operating position.

7.10.3 Removing Stored Record

Printcon is capable of storing an entire roll of paper, however stored record may be removed at any time.

1. Open door on secondary control panel and position the POWER switch to OFF.

2. Open printer door. Using the paper advance thumbwheel on the left side of the upper paper slot, advance paper until it extends 3 to 4 inches below the lower paper slot or until all information on the tape has been advanced.

3. Tear or cut the paper tape.

4. Swing printer assembly forward and downward and allow it to rest in the service position.

5. Position the POWER switch to ON. Paper will advance onto paper take-up spool. Position the power switch to OFF when paper is completely advanced.

6. To remove paper take-up spool, release tension on spring-loaded retaining clip and lift spool from unit.

7. Remove spool end plate and slide paper from spindle.

8. Replace spool end plate and return spool to spring-loaded clip.

9. Refer to paragraph 7.10.2, *Automatic Paper Storage* to reload spool.

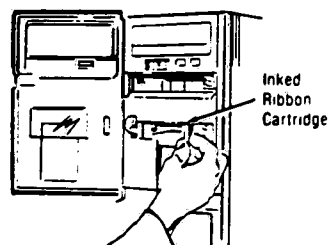


Figure 7-19. REMOVING INKED RIBBON CARTRIDGE.

7.10.4 Changing Inked Ribbon Cartridge (See Figure 7-19)

1. Tear off loose end of paper and open door to the left.

2. Remove old cartridge by placing index finger behind cartridge and pulling upward and forward.

3. Install new cartridge, with ribbon above loose end of paper, by placing it into position and snapping it into place with thumbs of each hand.

4. Close door.

7.10.5 Printer Replacement (See Figures 8-12, 8-15 and 8-16)

1. Open the outer door of the unit.

2. Tilt the printer assembly forward to service position and remove the two #6-32 screws and washers from the back of the printer mounting plate that anchor the silver anodized cover.

3. Remove the cover by disengaging it from the pivot shoulder screws.

4. Pivot the assembly back to the operating position and disconnect J1 and J2 connectors which are plugged into the J20 receptacle mounted on the upper left edge of the printer mounting plate.

5. Printer can now be disassembled by removing the three 1/4-20 hex nuts — two on the right end and one on the left end of the printer. Clip the black wire from the toggle switch off the old printer and solder it to the new printer (wire #11).

6. Upon reassembly, verify that the printer stand-off is 15/16 inch between the printer mount plate and the printer itself. Correct if necessary.

7.10.6 Microswitch Activation Adjustment

1. Lift up the platen and observe the screws which mount the microswitch bracket to the right side plate. Loosen them slightly.

2. Adjust the microswitch position so that the trip point is audible when the platen is parallel to and about 1/16 inch below the ends of the side plate.

3. Tighten the screws securely.

7.11 PRIMARY CONTROL PANEL (Cycle Status) (See Figure 8-12)

1. Remove the metal bracket which covers the primary control panel.

2. Remove the primary control panel by unfastening four hex socket head screws.

3. This allows the primary control panel to be unplugged and removed for lamp replacement.

4. Carefully swing the lug away from the base of the lamp to be changed and remove the lamp (see Figure 7-20).

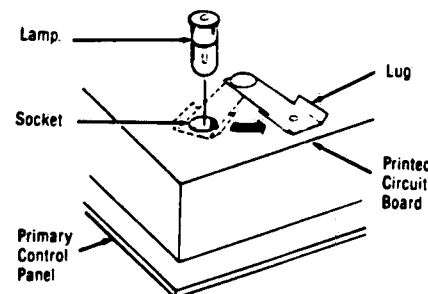


Figure 7-20. LAMP REPLACEMENT.

7.12 DIGITAL DISPLAY (See Figure 8-12 & 8-13)

7.12.1 Display Panel Overlay Replacement

1. Open the outer door of the unit.

2. Remove #6 x 1/4 self tapping screw from top of upper right-hand corner of display panel door. This will allow opening door with left-hand swing.

3. Next, disconnect ribbon cable connections from panel PC Board mounted directly behind panel door — one connector from PC Board and one connector from thumbwheel switch.

4. Remove #4-40 nut from display panel door hinge stud at bottom left corner of display door. Remove hinge stud upward and out. Display panel door may now be removed.

5. Reverse the procedure to install a new Display Panel Overlay.

7.12.2 Temperature Thumbwheel Replacement

1. Follow steps 1 through 3 in the procedure outlined in *Display Panel Overlay Replacement*.

2. Thumbwheel switch is extracted from assembly by removing the #4-40 nuts and washers from the two mounting studs attached to display bracket assembly.

3. Reverse the procedure to install a new thumbwheel switch.

7.12.3 Display PC Board Replacement

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

NOTE: Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation. To avoid damage, the precautions listed below should be taken whenever printed circuit boards are being handled or replaced:

- Always use an ESD safe container when transporting boards from one location to another.

- Do not remove a board from container except at an approved static station or where machine and personnel are properly grounded.

- At the very minimum, use a wrist strap grounded to sterilizer when removing and/or replacing boards.

1. Follow procedure outlined in *Display Panel Overlay Replacement*.

2. The display PC Board is removable by first disconnecting the ribbon cable connector P45 from the main Printcon PC Board.

3. Tilt the printer assembly forward to the service position. This permits access to the opening in the upper rear of Printcon housing where P45 is plugged

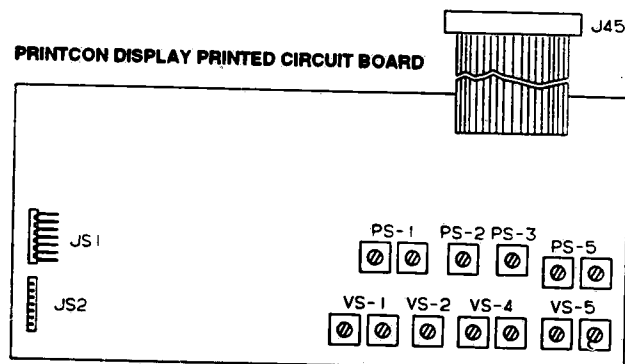
into the main Printcon PC Board which is mounted on the back side of Printcon housing.

4. Display PC Board can now be removed by disengaging the three circuit board supports.

5. Reverse the procedure to install a new Display PC Board.

7.12.4 Printcon Rotary BCD Switches: Digital Display Board

Rotary switches to control pressure and temperature are located on the Printcon Digital Display Board. See Figure 7-21 for setting these switches.



SET TRANSITION POINT SWITCHES ACCORDING TO THE FOLLOWING DIAGRAMS

SWITCH	SETTING	TRANSITION POINT ON FUNCTION
PS-1	52	26 PSI. @ EACH CONDITIONING PRESSURE PULSE - STARTS VACUUM PULSE. (0 THRU 99 = 0 THRU 49.5 PSIG; EACH UNIT = .5 PSI)
PS2	2	1 PSI. @ THE START OF EVACUATION (0 THRU 9 = 0 THRU 4.5 PSIG; EACH ONE = 0.5 PSIG)
PS3	-	NOT USED
PS5	-	NOT USED
VS-1	42	21 IN. HG. @ THE END OF THE THIRD & FOURTH VACUUM PULSE (00 THRU 59 = 0 THRU 29.5 EACH UNIT = 0.5 IN. HG.)
VS-2	2	1 IN. HG. @ THE END OF AIR BREAK (0 THRU 9 = 0 THRU 4.5 IN. HG.; EACH UNIT = 0.5 IN. HG.)
VS-4	54	27 IN. HG. (0 THRU 80 = 0 THRU 30 IN. HG. EACH UNIT = 0.5 IN. HG.)
VS-5	06	60 SECONDS, STERILIZE TIME (0 THRU 99 = 99 SECONDS)

Figure 7-21. PRINTCON DIGITAL DISPLAY PC BOARD SWITCH SETTINGS.

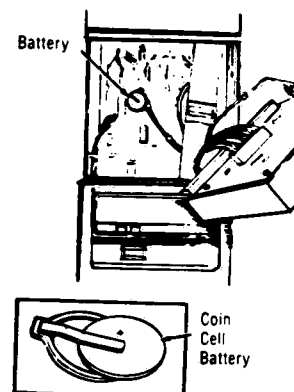


Figure 7-22. CHANGING THE BATTERY.

7.13 MAIN PRINTCON PC BOARD (See Figure 8-12) and DWG. NO. 146654 in Section 6)

7.13.1 Changing The Battery (See Figure 7-22)

1. If necessary to replace battery (Lithium coin cell), proceed as follows:

- Turn POWER switch to OFF.
- Remove bottom screws on primary panel and lift up off catches. (Carefully remove two electrical connections and set panel aside.)
- Remove battery from holder and install replacement battery.
- Return printer assembly and closed door.
- Turn POWER switch ON and reset time and date if necessary.

7.13.2 Changing Units of Display (Refer to Table 7-1)

1. The visual display and printing of temperature can be either in degrees Fahrenheit or Celsius. To make this adjustment, locate the service switch on the Printcon Control Printed Circuit Board (for location, see Figure 7-24). Using a pencil or pen point, turn switch #1 to the alternate position. Return printer assembly upward and back to operating position. Close door.

TABLE 7-1. PRINTCON SERVICE SWITCH SETTINGS.

Feature	Switch No(s).	Setting.
Temperature in FAHRENHEIT	1	OFF
Temperature in CELSIUS	1	ON
Pressure (English) in PSIG; Vacuum in IN HG	2	OFF
Pressure (Metric) in KG/CM ² ; Vacuum in MM HG	2	ON
Single precision	3	OFF
Extended precision	3	ON
Capacitance Transducer: BESCO 5v = 50 psia	4	OFF
Strain Gauge Transducer: SENSOTEC 36 mv = 50 psia	4	ON
Temperature Overdrive	5, 6 & 7	5 OFF, 6 OFF, 7 OFF
TS2 = TS1	5, 6 & 7	5 ON, 6 OFF, 7 OFF
TS2 = TS1 + 0.5 F	5, 6 & 7	5 OFF, 6 ON, 7 OFF
TS2 = TS1 + 1.1 F	5, 6 & 7	5 ON, 6 ON, 7 OFF
TS2 = TS1 + 1.6 F	5, 6 & 7	5 OFF, 6 OFF, 7 ON
TS2 = TS1 + 2.1 F	5, 6 & 7	5 ON, 6 OFF, 7 ON
TS2 = TS1 + 2.7 F	5, 6 & 7	5 OFF, 6 ON, 7 ON
TS2 = TS1 + 3.2 F	5, 6 & 7	5 ON, 6 ON, 7 ON
TS2 = TS1 + 3.8 F	5, 6 & 7	5 ON, 6 ON, 7 ON
Spare Switch	8	Unused

2. The display and printing of pressure can be either in English (PSI gauge and inches Hg vacuum) or metric (kg/cm² gauge and millimeters Hg). To make this adjustment follow the procedure in step one and turn service switch #2 to alternate position.

3. The display of temperature and English pressure can be either single precision (no decimal places showing) or extended precision (one decimal place showing). Metric pressure shows one or two decimal places. Metric vacuum always shows no decimal place. To make this adjustment follow the procedure in step one and turn service switch #3 to alternate position.

7.13.3 Adjusting Temperature Overdrive

For special applications, the temperature overdrive may be adjusted in increments as shown in Table 7-1. For example, if the temperature thumbwheel setpoint is at 270 F (132 C), the actual control temperature can be from 270 F to 273.8 F depending on how service switches, 5, 6 and 7 of switch #1 are set.

7.13.4 Setting The Year Switches

1. The LED year as shown on the Printcon display and printout does not automatically change on December 31st. It must be set annually. To make this adjustment locate rotary switches S2 and S3 on the Printcon Control Printed Circuit Board. Using a small screwdriver, turn the pointer to the desired digits (example: for 1985, set S3 at 8 and S2 at 5).

2. If no year display is needed, the switches may be set as follows: set S3 at 8 and S2 at 0. The month and date will still be displayed, but no year will be shown or printed.

7.13.5 Printcon PC Board Replacement

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

NOTE: Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation. To avoid damage, the precautions listed below should be taken whenever printed circuit boards are being handled or replaced:

- Always use an ESD safe container when transporting boards from one location to another.

- Do not remove a board from container except at an approved static station or where machine and personnel are properly grounded.

- At the very minimum, use a wrist strap grounded to sterilizer when removing and/or replacing boards.

1. Open the outer door of the Printcon unit. The entire unit must be removed from the control column.

2. Remove the front cover panel from the column by taking two cap screws out of the top of the cover and two #10-32 screws out of the bottom.

3. Take off the primary panel by removing four #8-32 mounting screws and washers. It is not necessary to disconnect P16 from the primary panel if care is exercised.

4. Tilt the primary panel forward and reach through the primary panel mounting bracket to disconnect P40 and P48 connections. Disconnect green ground wire #103 from Printer assembly bottom.

NOTE: Plug P16 (from primary panel) and plug P40 (from main Printcon PC Board) are identical in construction. Proper identification must be observed at reassembly. Plugs are labeled on the harness and must be installed on the correct PC Board.

5. Remove the four #8-32 Printcon unit mounting screws located two on each side of the unit. Access to the top two screws must be made by opening the display door at the top of the unit. Printer unit must be tilted forward to remove the lower two screws.

6. Printcon unit can now be removed from the column. Main Printcon PC Board is removed from the unit by extracting the eight #6-32 mounting screws and standoffs.

7. Reverse the procedure to install a new main Printcon PC Board.

7.14 PRESSURE TRANSDUCER REPLACEMENT

1. Remove the metal bracket which covers the primary control panel.

2. Remove the primary control panel.

3. This gives access to plug P47 on the upper right section of the main Printcon PC Board. Unplug P47. Identify the cable coming from the pressure transducer (usually red) and then extract all pins of this cable from plug P47.

4. Loosen the cable clamp at the rear of the control box which secures the pressure and temperature probe cables. Cut the tie-wraps inside the control assembly securing the pressure transducer cable. Pull the pressure sensor cable out of the control assembly.

5. Cut the tie-wraps which secure the pressure transducer cable to the frame of the machine.

6. Remove the pressure transducer from the piping. Mount the new transducer. Run the cable into the control assembly through the cable clamp. Install the pins of the cable into plug P47 following the electrical schematic in Section 6. Install new tie-wraps to secure the cable inside the control assembly and along the frame of the machine.

7. Check the pressure calibration as outlined in paragraph 7.17 of this Section.

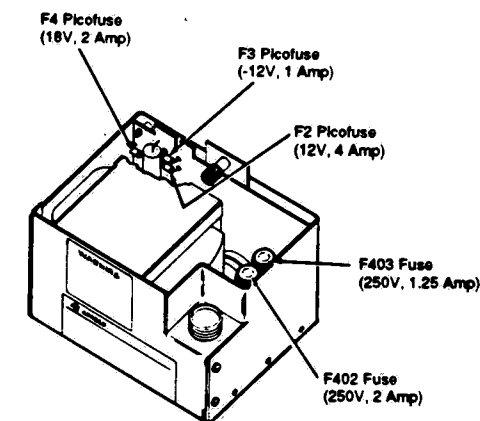


Figure 7-23. POWER SUPPLY FUSE LOCATIONS.

7.16 REPLACEMENT OF PRINTCON POWER SUPPLY FUSES

If fuse replacement is necessary, refer to Figure 7-23 for locations of these fuses. (See Figure 8-11 for fuse part numbers.)

7.17 FIELD CALIBRATION OF CONTROL

7.17.1 Special Tools And Equipment Required

NOTE: The measuring devices should be calibrated against NBS (National Bureau of Standards) traceable equipment and the inaccuracies of the devices should be known via a calibration report sheet.

1. Compound pressure gauge, resolution to 1/2 PSI, 50 PSI full scale minimum.

2. Potentiometer, resolution to 1 degree F, Doric 400A with type T thermocouple wire, or equal.

3. Digital voltmeter or multimeter, resolution to 1 mV DC, B & K model 2800 or equal.

7.15 TEMPERATURE PROBE REPLACEMENT

1. Follow the instructions outlined in the pressure transducer replacement to gain access to plug P47 on the main Printcon PC Board.

2. Free the cable from any supports or ties to the sterilizer. Remove the cable from the control assembly, and remove the probe from the sump.

3. Install a new temperature probe and compression fitting in the sump bushing. Run the cable into the control assembly through the cable clamp at the rear of the assembly. Follow the electrical schematic in Section 6 of this manual to install the new pins into plug P47. Install new tie-wraps in place of ones which were cut.

4. Check the temperature calibration as outlined in paragraph 7.17 of this Section.

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

5. Tee, 1/4 NPT.

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

7. 8-inch piece of 2 x 4.

NOTE: All adjustments in this procedure should be checked whenever the main Printcon PC Board (P-146651-032) is replaced. If the temperature probe is replaced, check the temperature calibration only. If the pressure sensor is replaced, first check the pressure calibration. Then, because the temperature accuracy is affected by pressure adjustments, check the temperature after adjusting the pressure.

7.17.2 Procedure

1. Install the compound pressure gauge and potentiometer as shown in Figure 5-1 of the Field Test Procedure. Use a piece of autoclaving tape to tape the thermocouple wire to the temperature probe.

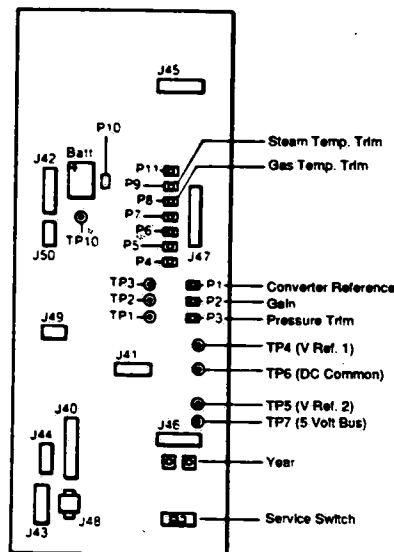
2. Check the Service Switch (SW1, 8 pole dual in-line) on the main Printcon PC Board for the following settings:

- #1 — off (Fahrenheit temp)
- #2 — off (English units for pressure/vacuum)
- #3 — on (display tenths on temperature & pressure)
- #4 — on (strain gage input)
- #5 — off
- #6 — on
- #7 — on
- #8 — not used

3. Remove the metal bracket securing the primary control panel to the control assembly. Unfasten the four mounting screws for the primary control panel. Throughout the calibration procedure, leave the primary control panel plugged in. Carefully let the cable support control panel while adjustments are made through panel mounting area.

4. Locate test points TP4, TP5, and TP6 on the main Printcon PC Board (see Figure 7-24).

5. Connect the negative lead of the voltmeter to TP6. Turn the control power on. Measure and make a note of the voltage at TP4. This will be approximately 10 volts DC. Now measure the voltage at TP5 and adjust potentiometer P1 until this voltage is exactly 1/2 of the voltage measured at TP4.



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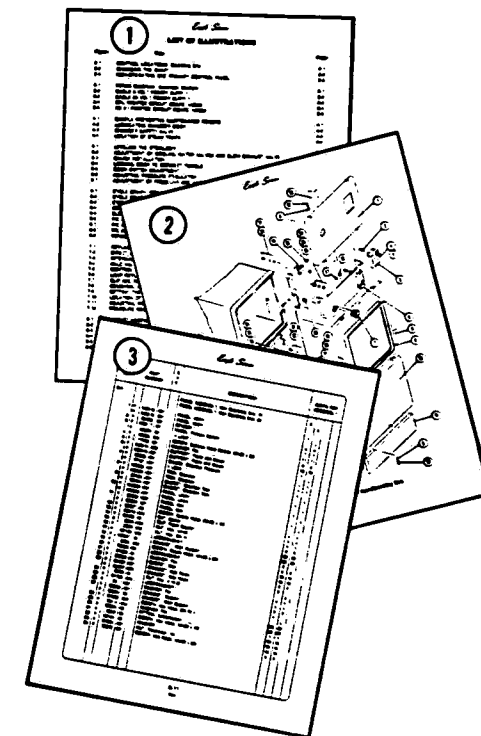
SECTION 8

ILLUSTRATED PARTS BREAKDOWN

Eagle 2400 Terminal Sterilizer assemblies and components are illustrated and identified on the following pages. The part number, description and quantity required for each usage is given. Each indentation in the description represents the assembly level. The UNITS PER ASSEMBLY column is specific for the given assembly or subassembly level.

HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN:

1. Determine the function and application of the part required. 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, Butress Head Socket, #8-32 x 3/8
WASHER, Flat

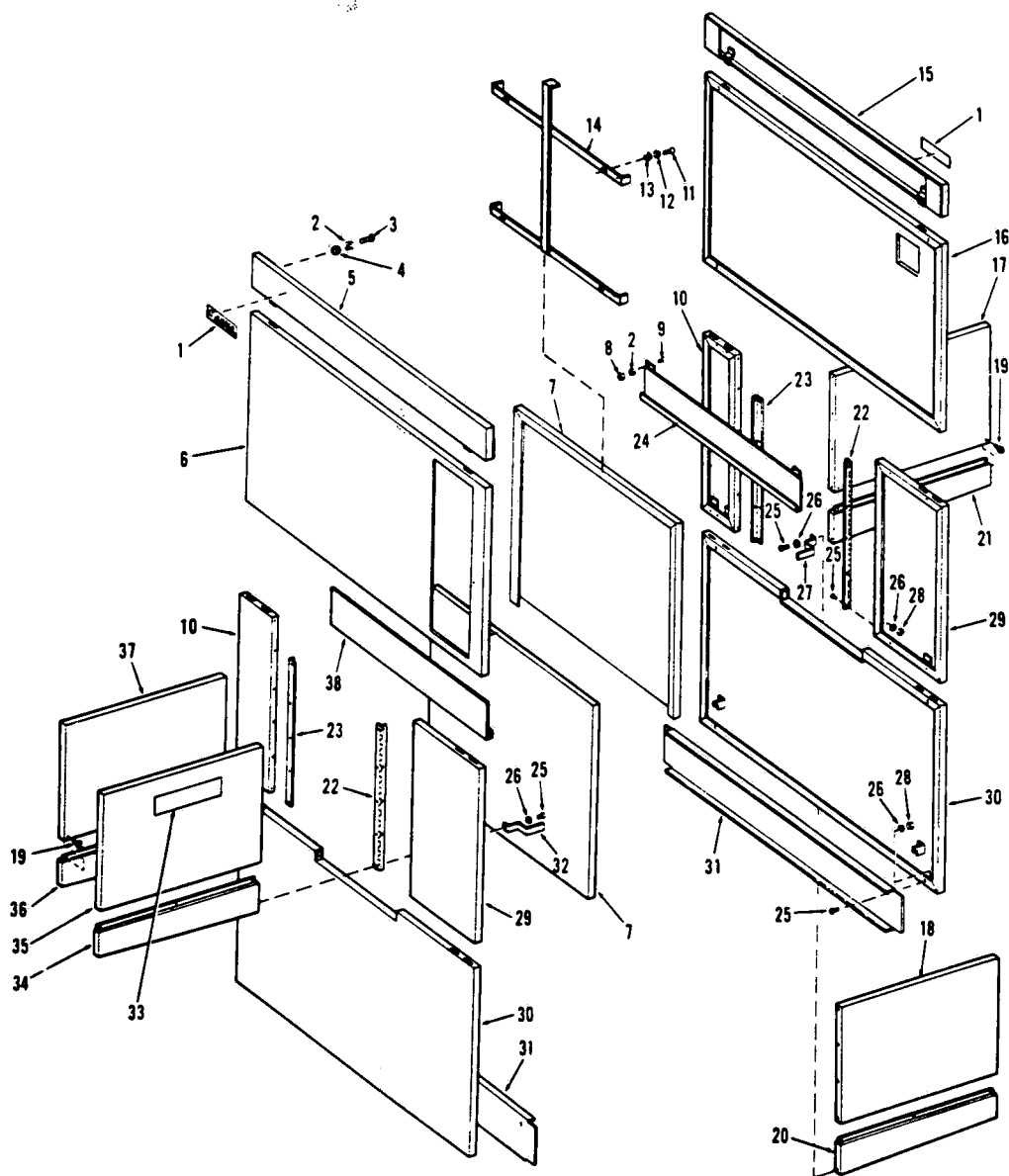


Figure 8-1. EXTERNAL PANELS AND TRIM.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-1-	P 639172	030	EXTERNAL PANELS AND TRIM	1
1	P 617100	436	NAMEPLATE	2
2	P 19677	041	LOCKWASHER	24
3	P 9661	041	SCREW, Round head (#10-32 x 5/8)	20
4	P 5511	041	WASHER, Flat	20
5	P 617100	361	PANEL, Top unload	1
6	P 626973	982	PANEL, Upper unload	1
7	P 617100	428	COVER, Door	2
8	P 2959	041	NUT, Hex (#10-32)	6
9	P 9282	041	SCREW, Flat head (#10-32 x 3/8)	6
10	P 54751	010	PANEL	2
11	P 3984	041	SCREW (#6-32 x 3/8)	8
12	P 19675	041	LOCKWASHER (#6)	16
13	P 5469	041	WASHER (#6)	16
14	P 135226	045	SUPPORT	2
15	P 617100	360	PANEL, Top load	1
16	P 626973	984	PANEL, Upper load	1
17	P 134468	401	PANEL, Top RH load	1
18	P 134468	402	PANEL, Top LH load	1
19	P 90169	045	SCREW, Self tap (#10 x 3/8)	12
20	P 134468	404	PANEL, Bottom LH load	1
21	P 134468	403	PANEL, Bottom RH load	1
22	P 56396	196	HINGE	2
23	P 56396	198	ANGLE	2
24	P 51699	010	PANEL, Trim load	1
25	P 4682	041	SCREW, Round head (#8-32 x 3/8)	42
26	P 19676	041	LOCKWASHER (#8)	42
27	P 92004	001	ACTUATOR, Load	1
28	P 3153	041	NUT, Hex (#8-32)	22
29	P 54762	010	PANEL	2
30	P 54850	010	PANEL, Bottom	2
31	P 98045	010	PANEL, Kick	2
32	P 92003	001	ACTUATOR, Unload	1
33	P 150689	001	LABEL, Warning	2
34	P 134468	397	PANEL, Bottom RH unload	1
35	P 134468	393	PANEL, Top RH unload	1
36	P 134468	399	PANEL, Bottom LH unload	1
37	P 134468	395	PANEL, Top LH unload	1
38	P 51700	010	PANEL, Trim unload	1

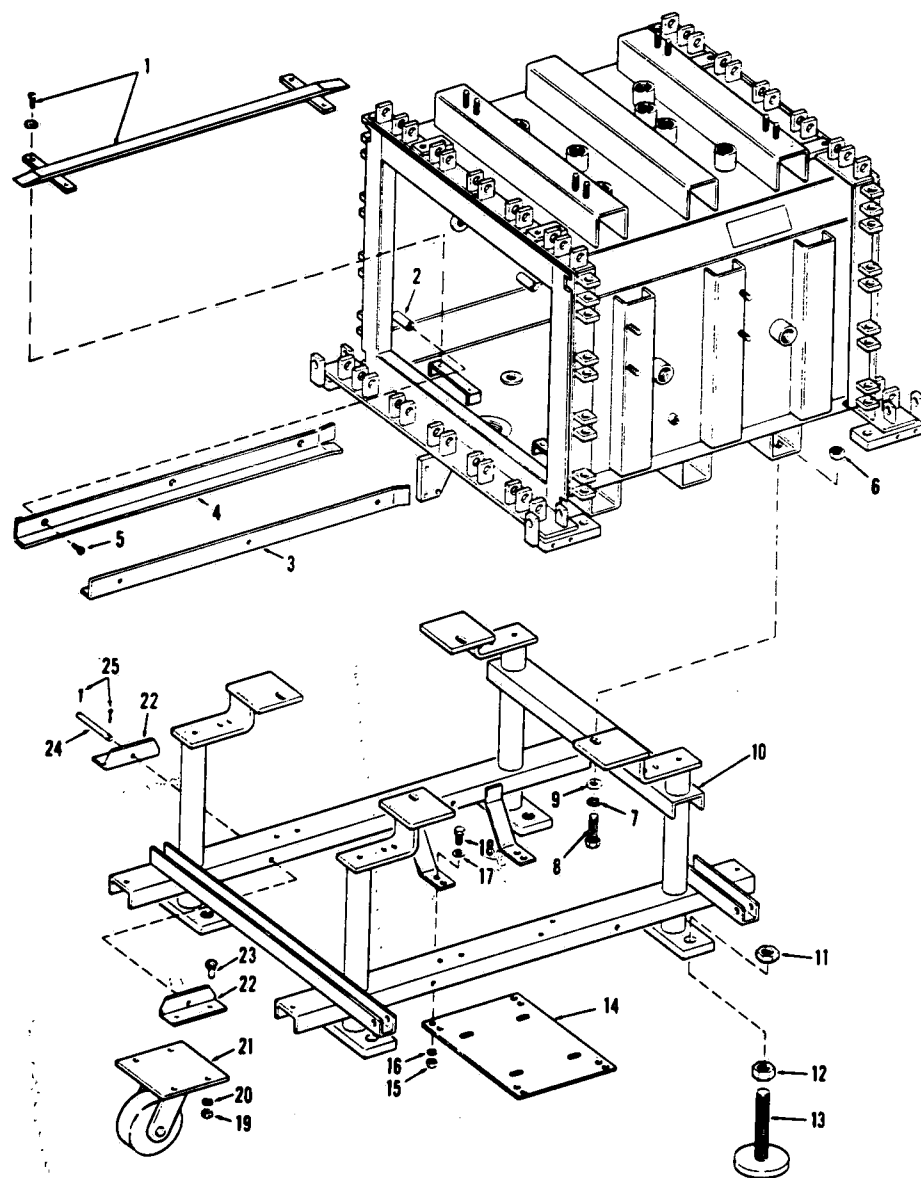


Figure 8-2. SHELL AND STAND ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-2-			SHELL AND STAND ASSEMBLY	1
1	P 78349 061		GUIDE PACKAGE, Feeder unit	1
	P 136806 917		SHELL ASSEMBLY	1
2	P 51294 061		. SUPPORT, Rail	6
3	P 51652 063		. ANGLE, Support, left hand	1
4	P 51651 063		. ANGLE, Support, right hand	1
5	P 51580 061		. SCREW, Flat head (1/4-20 x 3/8)	6
6	P 3099 042		NUT	8
7	P 19687 061		LOCKWASHER (3/8)	4
8	P 15339 045		SCREW (3/8-16 x 1-1/4)	4
9	P 5503 045		WASHER	4
	P 98036 091		STAND ASSEMBLY	1
10	P 98163 010		. FRAME	1
11	P 3123 045		. NUT, Hex jam	4
12	P 3107 045		. NUT, Hex	4
13	P 91054 045		. FOOT, Leveling	4
14	P 51756 010		. PLATE	1
15	P 3099 042		. NUT	4
16	P 19580 041		. LOCKWASHER	8
17	P 17263 042		WASHER	8
18	P 31838 042		. CAPSCREW, Hex head (3/8-16 x 1)	8
	P 91057 091		. CASTER ASSEMBLY, Stand	4
19	P 3101 091		. . NUT, Hex	4
20	P 19681 045		. . LOCKWASHER	4
21	P 91058 091		. . CASTER	1
22	P 91059 010		. . ANGLE	2
23	P 3872 091		. . BOLT, Hex head	4
24	P 91287 045		. ROD, Caster	4
25	P 3185 091		. COTTER PIN	8

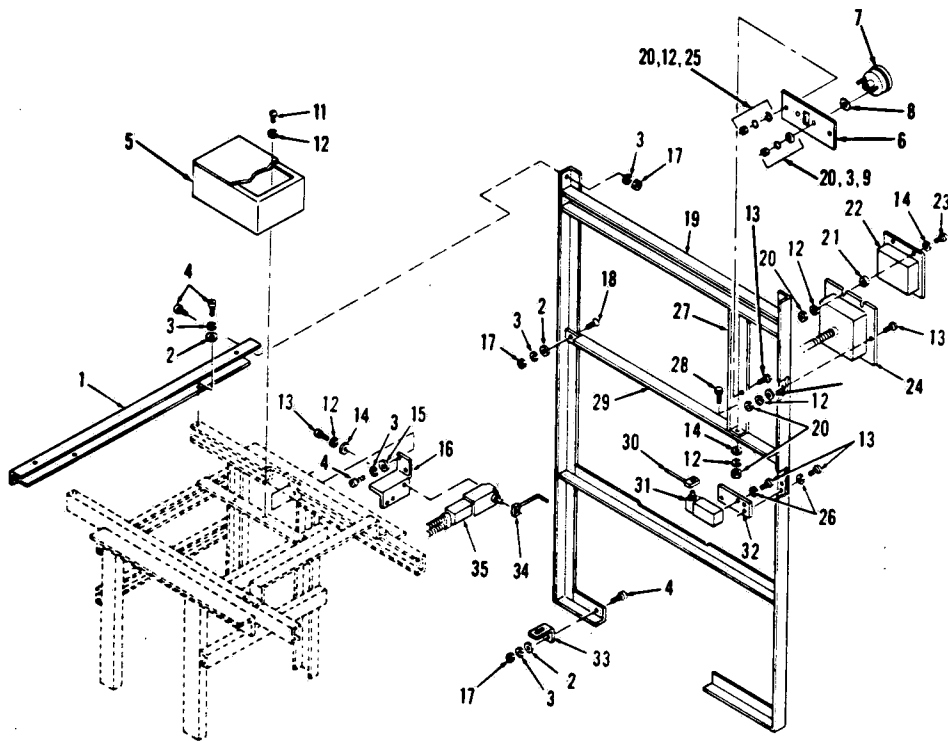


Figure 8-3. FRAME AND CONTROLS: Load End.

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-3-			FRAME AND CONTROLS: Load End	1
1	P 54796 010		SUPPORT, Frame	2
2	P 3515 041		WASHER (1/4)	6
3	P 19678 045		LOCKWASHER (1/4)	14
4	P 13411 091		SCREW, Socket head (1/4-20 x 5/8) ...	12
5	P 141212 072		BOX, Interface	1
6	P 93909 694		BRACKET, Gauge, Non-Operating End	1
7	P 90525 091		GAUGE, Chamber Pressure	1
8	P 5503 045		WASHER, Flat	2
9	P 129356 132		WASHER, Bellville	2
10			NOT USED	
11	P 9313 041		SCREW, Round head (#10-32 x 5/16) ...	2
12	P 19677 041		LOCKWASHER (#10)	10
13	P 9316 041		SCREW, Round head (#10-32 x 3/4) ...	8
14	P 17589 045		WASHER	6
15	P 31599 041		WASHER	2
16	P 97168 010		BRACKET, Switch	1
17	P 3040 042		NUT, Hex (1/4-20)	8
18	P 3978 056		SCREW, Flat head (1/4-20 x 5/8)	2
19	P 146653 832		FRAME ASSEMBLY	1
20	P 2960 042		NUT, Hex (#10-32)	8
21	P 150825 367		SPACER	4
22	P 134471 039		PRIMARY PANEL	1
23	P 9315 041		SCREW, Round head (#10-32 x 1-1/4) ..	4
24	P 134471 063		HARNESS ASSEMBLY	1
25	P 24488 091		WASHER	2
26	P 18131 091		LOCKWASHER (#10)	4
27	P 93909 266		SUPPORT	1
28	P 9661 041		SCREW, Round head (#10-32 x 5/8)	2
29	P 55333 010		SUPPORT, Cross	1
30	P 80988 091		LEVER, Switch	1
31	P 80978 001		SWITCH, Limit	1
32	P 150658 001		SUPPORT, Switch	1
33	P 81147 001		SUPPORT	2
34	P 80984 091		ACTUATOR, Switch	1
35	P 134471 050		SWITCH AND WIRING ASSEMBLY	1

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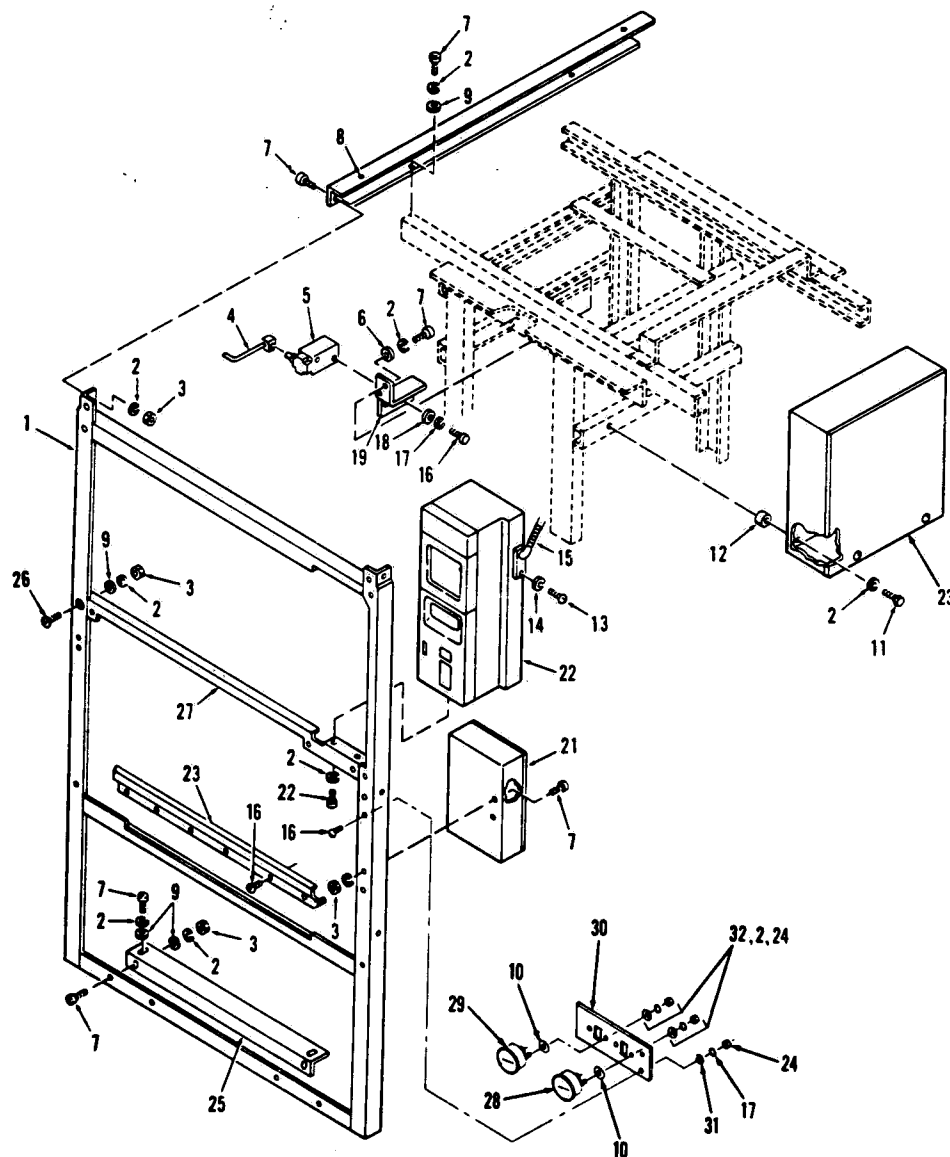


Figure 8-4. FRAME AND CONTROLS: Unload End.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-4-			FRAME AND CONTROLS: Unload End	1
1	P 146653	833	FRAME ASSEMBLY	1
2	P 19678	045	LOCKWASHER, 1/4	24
3	P 3040	042	NUT, Hex, 1/4-20	10
4	P 80984	091	ACTUATOR, Switch	1
5	P 56399	126	SWITCH AND WIRING ASSEMBLY	1
6	P 31599	041	WASHER, Flat	2
7	P 13411	091	SCREW, Socket Head, 1/4-20 x 5/8	16
8	P 54796	010	SUPPORT, Frame	2
9	P 3515	041	WASHER, Flat, 1/4	8
10	P 5503	045	WASHER, Flat	4
11	P 45606	091	SCREW, Hex Head, 1/4-20 x 1-3/4	4
12	P 81132	001	SPACER	4
13	P 3985	041	SCREW, Round Head, #6-32 x 3/4	2
14	P 84116	002	LOCKWASHER, #6	2
15	P 134471	063	HARNESS ASSEMBLY	1
16	P 9613	041	SCREW, Round Head, #10-32 x 3/4	6
17	P 19677	041	LOCKWASHER, #10	2
18	P 17589	045	WASHER	2
19	P 97168	010	BRACKET, Switch	1
20	P 93908	939	CONTROL PACKAGE	1
21	P 146653	834	• POWER INPUT BOX ASSEMBLY (See Fig. 8-8)	1
22	P 146653	836	• PRIMARY PRINTER CONTROL ASSEMBLY (See Fig. 8-12)	1
23	P 146653	909	• CONTROL BOX ASSEMBLY, Processor (See Fig. 8-10)	1
24	P 2960	042	NUT, Hex, #10-32	4
25	P 54844	010	SUPPORT, Panel	1
26	P 3978	056	SCREW, Flat Head, 14-20 x 5/8	2
27	P 56399	133	SUPPORT, Cross	1
28	P 90525	091	GAUGE, Chamber Pressure	1
29	P 90730	091	GAUGE, Jacket Pressure	1
30	P 93909	695	BRACKET, Gauge	1
31	P 24488	091	WASHER, Flat	2
32	P 129356	132	WASHER, Belleville	4

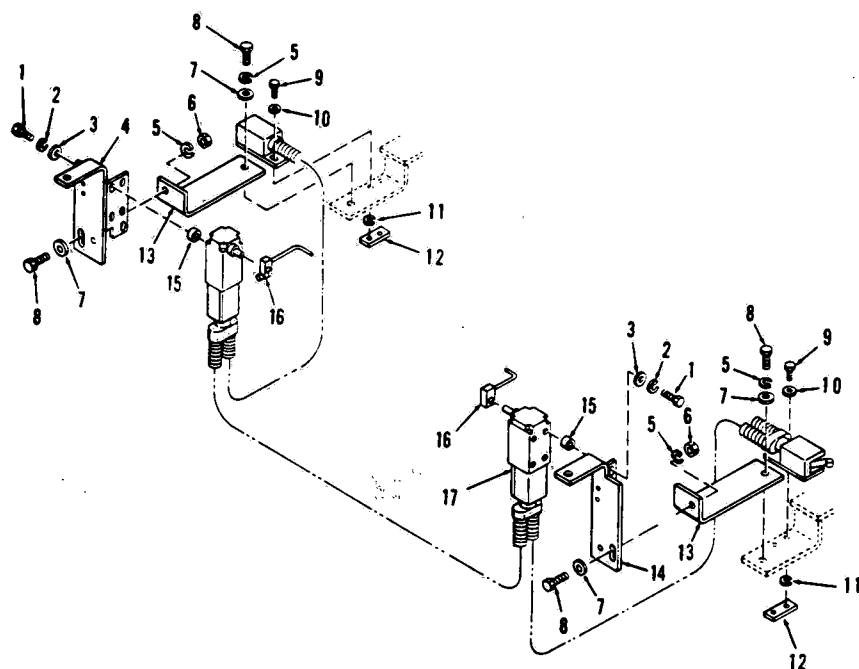


Figure 8-5. LOAD AND UNLOAD SWITCHES.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-5-					LOAD SWITCHES	1		
					UNLOAD SWITCHES		1	
1	P	9316	041		SCREW, Round head (#10-32 x 3/4)	4	4	
2	P	19677	041		LOCKWASHER (#10)	4	4	
3	P	17589	045		WASHER	4	4	
4	P	56368	001		PLATE, Support RH	1	1	
5	P	19680	041		LOCKWASHER (3/8)	4	4	
6	P	3099	042		NUT, Hex (3/8-16)	2	2	
7	P	17263	042		WASHER	4	4	
8	P	31838	042		SCREW, Hex head (3/8-16 x 1)	4	4	
9	P	3987	041		SCREW (#8-32 x 3/4)	4	4	
10	P	32403	061		WASHER	4	4	
11	P	19676	041		LOCKWASHER (#8)	4	4	
12	P	80011	045		TWIN NUT	2	2	
13	P	56366	001		SUPPORT	2	2	
14	P	56370	001		PLATE, Support LH	1	1	
15	P	10453	042		WASHER, Flat	4	4	
16	P	80984	091		ACTUATOR, Switch	2	2	
17	P	141212	045		SWITCH AND WIRING ASSEMBLY	1		
	P	141212	040		SWITCH AND WIRING ASSEMBLY		1	

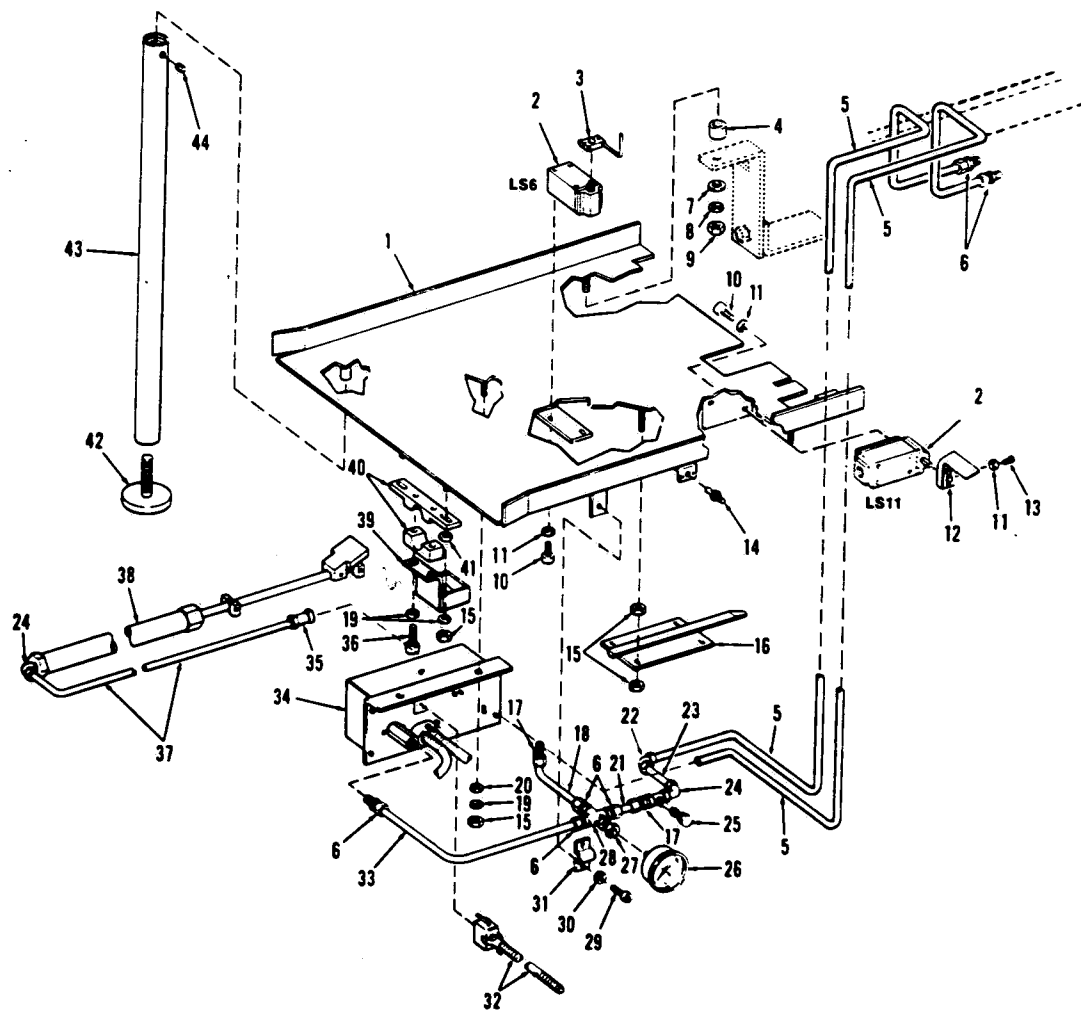


Figure 8-6. LOADING UNIT.

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FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-6-	P 630938 068		LOADING UNIT (1 Basket exit)	1		
	P 630938 069		LOADING UNIT (2 Basket exit)		1	
	P 630938 070		LOADING UNIT (3 Basket exit)			1
			(Incl. unloading unit - See Fig. 8-7)			
1	P 134385 001		PAN, Loading	1	1	1
2	P 80978 001		SWITCH, Limit	2	2	2
3	P 80984 091		ARM, Oper	1	1	1
4	P 76446 045		SPACER	2	2	2
5	P RM915 103		TUBE (1/4 x .03 x 108)	2	2	2
6	P 45565 091		FITTING, Comp (1/4 ODT x 1/4 IPS)	6	6	6
7	P 17263 042		WASHER, Flat	2	2	2
8	P 19680 041		LOCKWASHER (3/8)	2	2	2
9	P 3099 042		NUT, Hex (3/8-16)	2	2	2
10	P 15287 041		SCREW (#10-32 x 1/2)	4	4	4
11	P 19677 041		LOCKWASHER (#10)	6	6	6
12	P 81029 063		ACTUATOR, Limit switch	1	1	1
13	P 16451 042		SCREW (#10-32 x 5/8)	2	2	2
14	P 51783 045		STUD	2	2	2
15	P 3097 041		NUT, Hex (1/4-20)	14	14	14
16	P 76644 061		GUIDE ASSEMBLY, Loading end	1	1	1
17	P 43289 091		FITTING, Comp (1/4 ODT x 1/8 IPS)	2	2	2
18	P 76652 091		TUBE (1/4 OD)	1	1	1
19	P 19678 045		LOCKWASHER	18	18	18
20	P 5503 045		WASHER, Flat	2	2	2
21	P 76654 091		TUBE (1/4 OD)	1	1	1
22	P 81066 001		ELL, Comp (1/4 ODT)	1	1	1
23	P 90340 091		TUBE	1	1	1
24	P 42510 091		ELL, Comp (1/4 ODT x 1/8 IPS)	2	2	2
25	P 91382 091		VALVE, Needle	1	1	1
26	P 54797 091		GAUGE	1	1	1
27	P 939 042		BUSHING, Red. (1/4 IPS x 1/8 IPS)	1	1	1
28	P 45060 091		CROSS (1/4 IPS)	1	1	1
29	P 4672 041		SCREW (#6-32 x 5/16)	2	2	2
30	P 19675 041		LOCKWASHER (#6)	2	2	2
31	P 76655 061		CLAMP, Tube	1	1	1
32	P 626973 896		CABLE ASSEMBLY, Loading end	1	1	1
33	P 76653 091		TUBE, Press. switch (1/4 OD)	1	1	1
34	P 630938 077		CONTROL ASSY, Load end- (See Fig. 8-9)	1	1	1
35	P 51902 091		COUPLING, Tube to tube (1/4 ODT)	1	1	1
36	P 4003 051		SCREW (1/4-20 x 1-1/4)	4	4	4
37	P RM915 103		TUBE (1/4 OD x 0.3 x 58)	1	1	1
38	P 98129 091		CYLINDER ASSEMBLY (See Fig. 8-31)	1	1	1
39	P 97037 031		PAN, Oil	1	1	1
40	P 51929 042		CLAMP	2	2	2
41	P 5474 051		WASHER	4	4	4
42	P 51924 010		FOOT ASSEMBLY	2	2	2
43	P 56363 001		LEG ASSEMBLY	2	1	1
44	P 31276 061		SETSCREW (#10-32 x 1/2)	6	6	6

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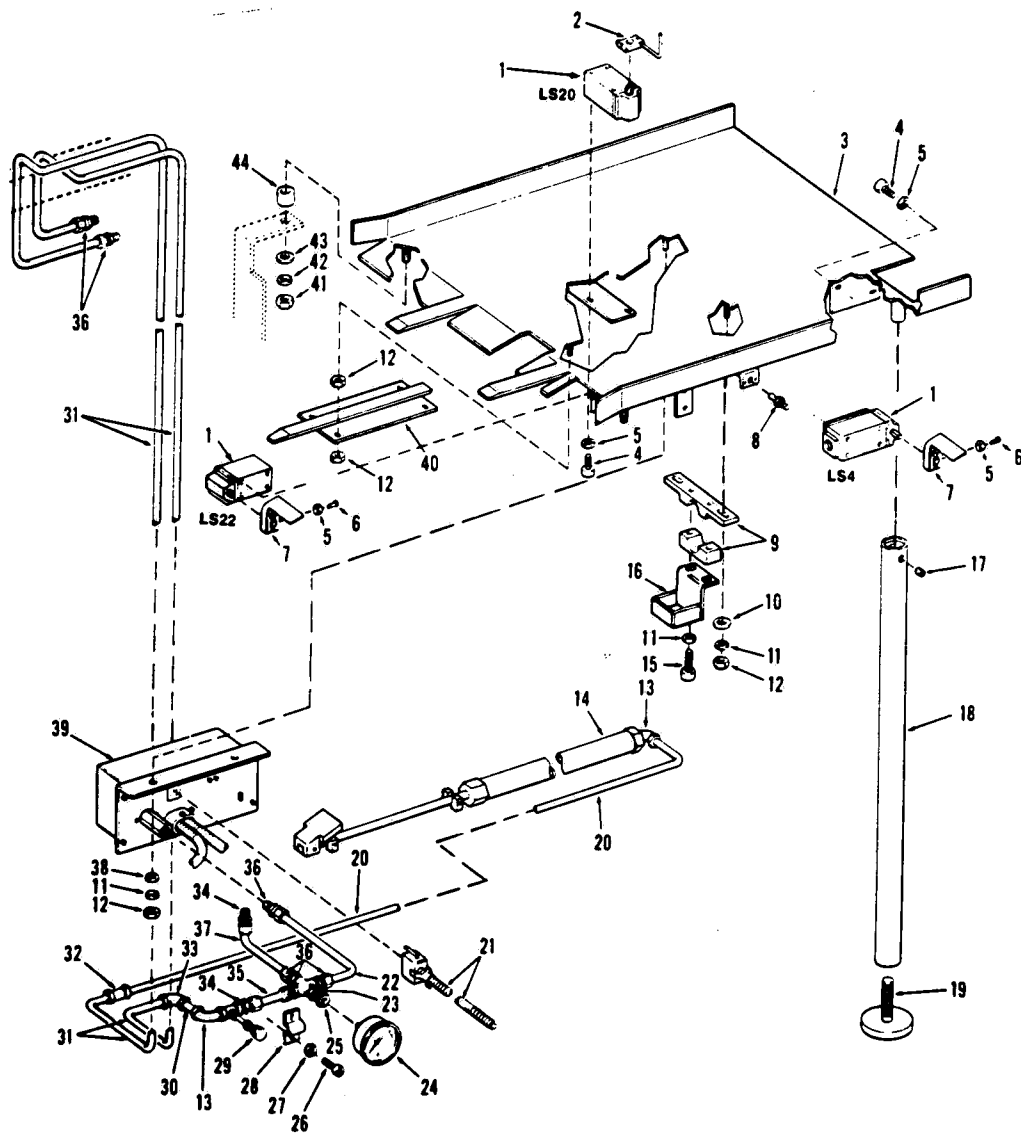


Figure 8-7. UNLOADING UNIT.

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-7-			UNLOADING UNIT (1 Basket exit)	1		
			UNLOADING UNIT (2 Basket exit)		1	
			UNLOADING UNIT (3 Basket exit)			1
1	P 80978	001	SWITCH, Limit	3	3	3
2	P 80984	091	ARM, Oper	1	1	1
3	P 134381	001	PAN, Unloading	1		
	P 134382	001	PAN, Unloading		1	
	P 134381	001	PAN, Unloading			1
4	P 15287	041	SCREW (#10-32 x 1/2)	6	6	6
5	P 19677	041	LOCKWASHER (#10)	10	10	10
6	P 16451	042	SCREW (#10-32 x 5/8)	4	4	4
7	P 81028	063	ACTUATOR, Limit switch	2	2	2
8	P 51783	045	STUD	2	2	2
9	P 51929	042	CLAMP	2	2	2
10	P 5474	051	WASHER	4	4	4
11	P 19678	045	LOCKWASHER (1/4)	18	18	18
12	P 3097	041	NUT, Hex (1/4-20)	14	14	14
13	P 42510	091	ELL, Comp (1/4 ODT x 1/8 IPS)	2	2	2
14	P 98490	091	CYLINDER ASSEMBLY (See Fig. 8-31)	1	1	1
15	P 4003	051	SCREW (1/4-20 x 1-1/4)	4	4	4
16	P 97037	031	PAN, Oil	1	1	1
17	P 31276	061	SETSCREW (#10-32 x 1/2)	6	6	6
18	P 98092	010	LEG ASSEMBLY		1	
	P 98087	010	LEG ASSEMBLY			1
19	P 51924	010	FOOT ASSEMBLY	2	2	2
20	P RM915	103	TUBE (1/4 OD x .030 x 58)	1	1	1
21	P 626973	897	CABLE ASSEMBLY, Rear	1	1	1
22	P 76656	091	TUBE, Press. switch (1/4 OD)	1	1	1
23	P 45060	091	CROSS (1/4 IPS)	1	1	1
24	P 54797	091	GAUGE	1	1	1
25	P 939	042	BUSHING, Red. (1/4 IPS x 1/8 IPS)	1	1	1
26	P 4672	041	SCREW (#6-32 x 5/16)	2	2	2
27	P 19675	041	LOCKWASHER (#6)	2	2	2
28	P 76655	061	CLAMP, Tube	1	1	1
29	P 91382	091	VALVE, Needle	1	1	1
30	P 90340	091	TUBE (1/4 OD)	1	1	1
31	P RM915	103	TUBE (1/4 OD x .030 x 115)	2	2	2
32	P 51902	091	COUPLING, Tube to tube (1/4 ODT)	1	1	1
33	P 81066	001	ELL, Comp (1/4 ODT)	1	1	1
34	P 43289	091	FITTING, Comp (1/4 ODT x 1/8 IPS)	2	2	2
35	P 76702	091	TUBE (1/4 OD)	1	1	1
36	P 45565	091	FITTING, Comp (1/4 ODT x 1/4 IPS)	6	6	6
37	P 76652	091	TUBE (1/4 OD)	1	1	1
38	P 5503	045	WASHER, Flat	2	2	2
39	P 630938	078	CONTROL ASSY (See Fig. 8-9)	1		
	P 630938	079	CONTROL ASSY (See Fig. 8-9)		1	1
40	P 76640	061	GUIDE ASSEMBLY, Unloading end	1	1	1
41	P 3099	042	NUT, Hex (3/8-16)	2	2	2
42	P 19680	041	LOCKWASHER (3/8)	2	2	2
43	P 17263	042	WASHER, Flat	2	2	2
44	P 76446	045	SPACER	2	2	2

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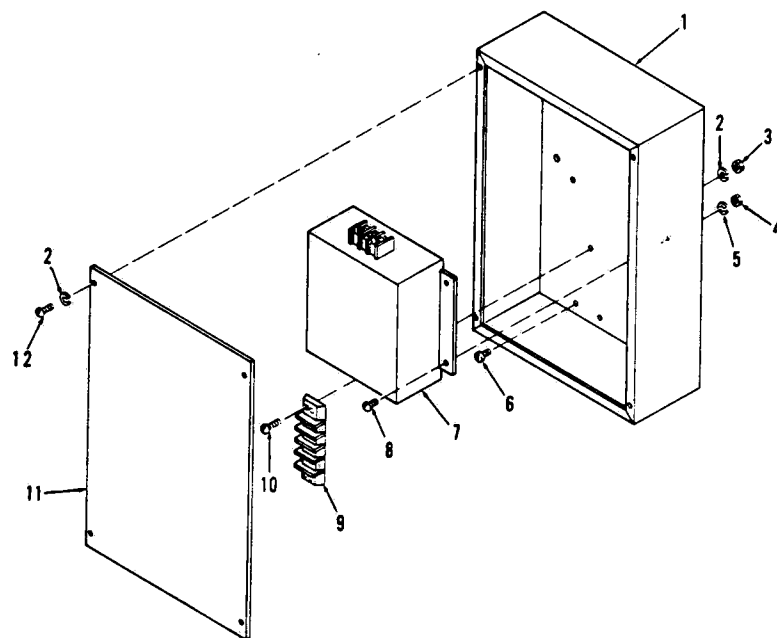


Figure 8-8. POWER INPUT BOX.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-8-	P 626973	890	POWER INPUT BOX	1
1	P 626973	892	BOX, Power input	1
2	P 19676	041	LOCKWASHER (#8)	6
3	P 3038	041	NUT, Hex (#8-32)	2
4	P 43287	091	NUT, Hex (#10-24)	4
5	P 81682	006	LOCKWASHER (#10)	4
6	P 82675	001	SCREW, Ground (#10-32)	1
7	P 93821	001	FILTER, 250 VAC-60 Hz-10 amp	1
8	P 3929	045	SCREW, Round head (#10-24 x 1/2)	4
9	P 39091	091	STRIP, Terminal	1
10	P 3987	041	SCREW, Round head (#8-32 x 3/4)	2
11	P 617100	367	COVER	1
12	P 9288	041	SCREW, Round head (#8-32 x 1/2)	4

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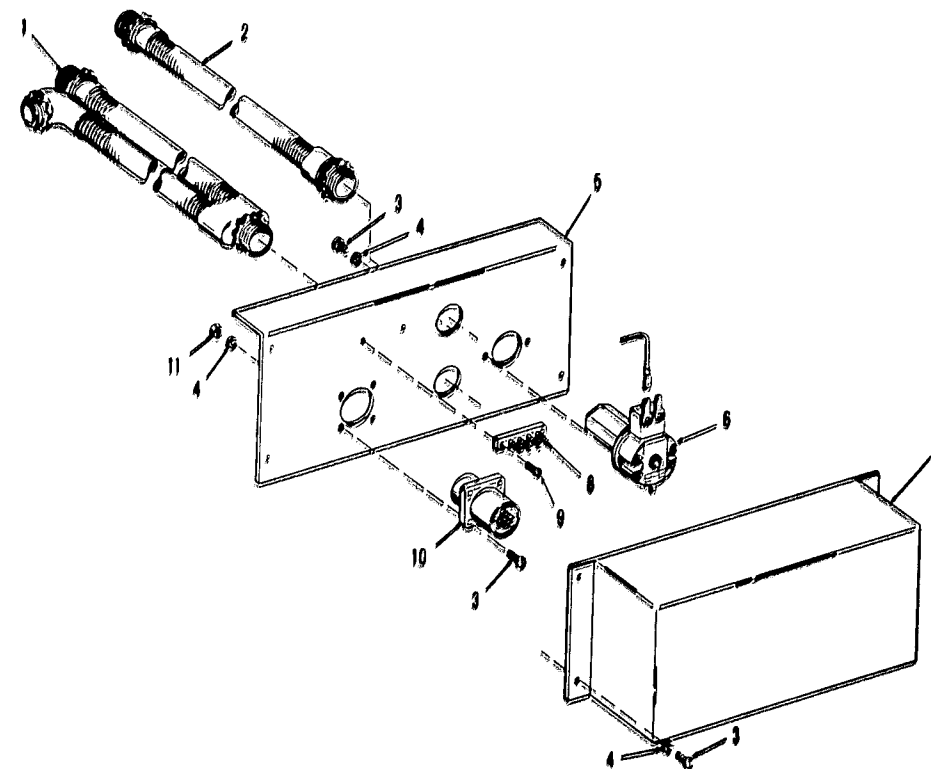


Figure 8-9. CONTROL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-9-	P 630938	077	CONTROL ASSEMBLY, Load end	1
	P 630938	078	CONTROL ASSEMBLY, Unload end (short) ..	1
	P 630938	079	CONTROL ASSEMBLY, Unload end (long) ..	1
1	P 626973	896	CABLE ASSEMBLY	1
	P 626973	898	CABLE ASSEMBLY	1
	P 626973	899	CABLE ASSEMBLY	1
2	P 626973	897	CABLE ASSEMBLY	1
3	P 3984	041	SCREW (#6-32 x 3/8)	10
4	P 19676	041	LOCKWASHER (#6)	10
5	P 626973	896	PLATE, Control	10
6	P 83662	001	SWITCH, Pressure	1
7	P 626973	894	COVER	1
8	P 84094	001	TERMINAL STRIP	1
9	P 21711	042	SCREW (#6-40 x 7/16)	2
10	P 93443	002	RECEPTACLE	1
11	P 3037	041	NUT (#6-32)	4

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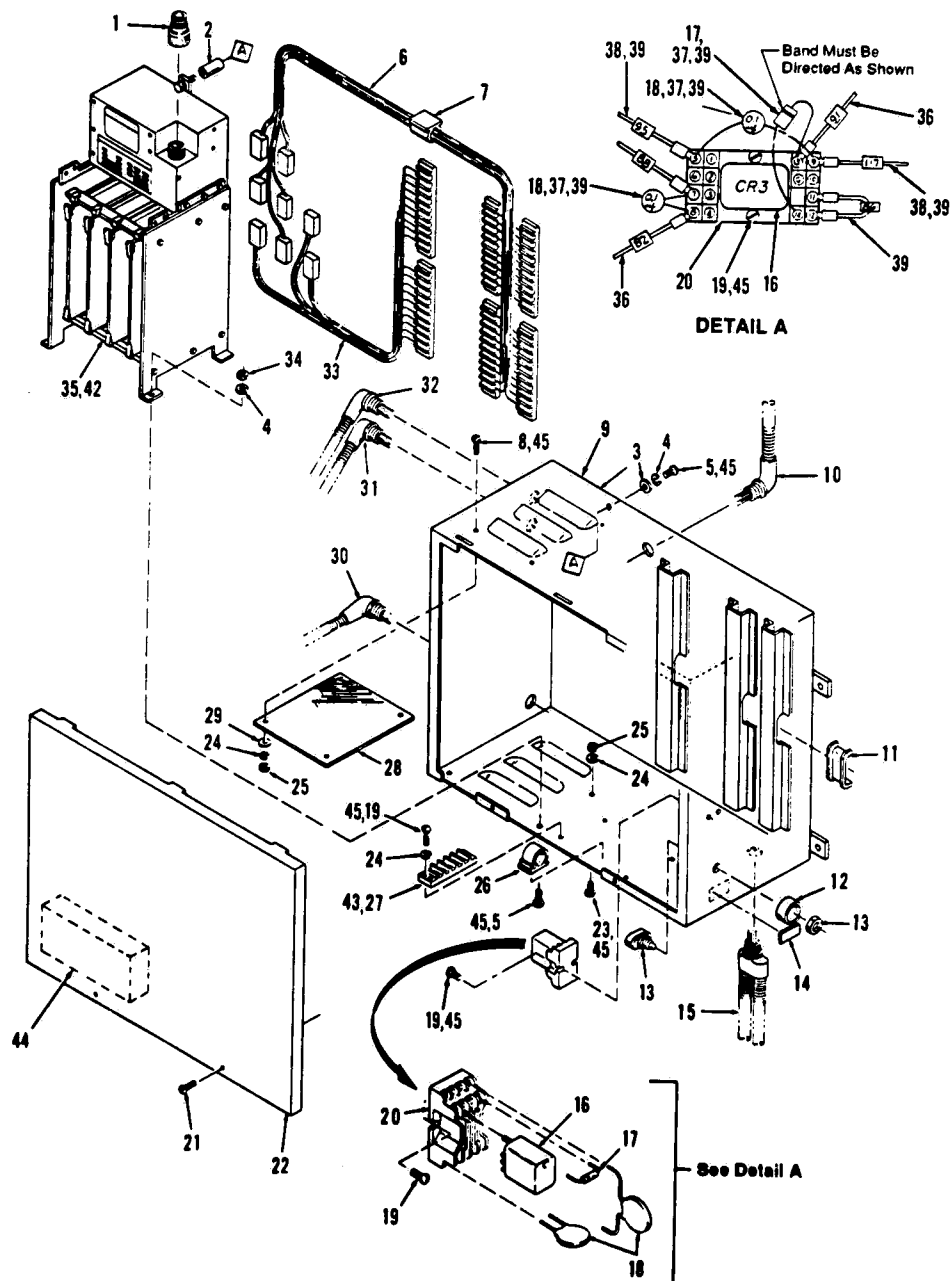


Figure 8-10. CONTROL BOX ASSEMBLY, Processor.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-10-	P 146653	909	CONTROL BOX ASSEMBLY, Processor	1
1	P 93838	002	PLUG, P5	1
2	P 150825	347	STANDOFF	1
3	P 5511	041	WASHER, Flat	1
4	P 19685	061	LOCKWASHER, #10	3
5	P 9298	041	SCREW, Round Head, #10-32 x 1/2	3
6	P 134471	041	HARNESS, DC	1
7	P 431152	091	CLIP	10
8	P 3984	041	SCREW, Round Head, #6-32 X 3/8	4
9	P 134471	038	CONTROL BOX, Weldment	1
10	P 56399	140	CABLE, Interface	1
11	P 150783	001	GROMMET, Caterpillar	3
12	P 44155	091	GUARD, Button	1
13	P 48070	091	SWITCH, Pushbutton	1
14	P 150825	366	DECAL, Reset	1
15	P 134471	053	CABLE ASSEMBLY, Feeders, P57, P59	1
16	P 80928	091	RELAY	1
17	P 84157	001	RECTIFIER, 1.0A-50V	1
18	P 150777	001	CAPACITOR, Ceramic Disc	2
19	P 78881	045	SCREW, Pan Head, Self Tapping, #6-32 x 1/2	18
20	P 150768	001	SOCKET, Relay	1
21	P 24840	061	SCREW, Round Head, #10-32 x 1/2	2
22	P 56399	125	COVER, Control Box	1
23	P 3960	041	SCREW, Round Head, #6-32 x 1/2	1
24	P 19675	041	LOCKWASHER, #6	21
25	P 3037	041	NUT, Hex, #6-32	7
26	P 451283	091	MOUNT, Cable	6
27	P 89174	091	BLOCK, Terminal, 6 Position	2
28	P 150825	348	SCREEN, Control Box	1
29	P 5469	041	WASHER, Flat	4
30	P 56399	128	CABLE ASSEMBLY, Power Supply - Processor	1
31	P 134471	043	CABLE ASSEMBLY, P53	1
32	P 134471	042	CABLE ASSEMBLY, P55	1
33	P 134471	040	HARNESS, AC	1
34	P 2960	042	NUT, Hex, #10-32	2
35	P 136806	956	MAIN CONTROL ASSEMBLY (See Figure 8-11)	1
36	P 129278	001	TERMINAL, Ring, #6 Stud, 22-26 AWG	4
37			SLEEVE, Insulator	A/R
38	P 90619	091	TERMINAL, Ring, #6 Stud, 18-22 AWG	11
39	P 118177	091	TERMINAL, Spade, #6 Stud, 18-22 AWG	10
40	P 77299	091	TIE, Cable (Not Shown)	10
41	P 129261	002	SOCKET, Contact (Not Shown)	3
42	P 129352	066	KEY, Insert in J1A-10, J1B-1, J2B-10, J2C-17, J3A-5, J3B-15, J3C-6	7
43	P 91945	041	CLIP, Jumper	4
44	P 150822	611	PAD, Anti-static	1
45			THREAD-LOCKER (Loctite #222 or Perma-Bond #LM113)	A/R

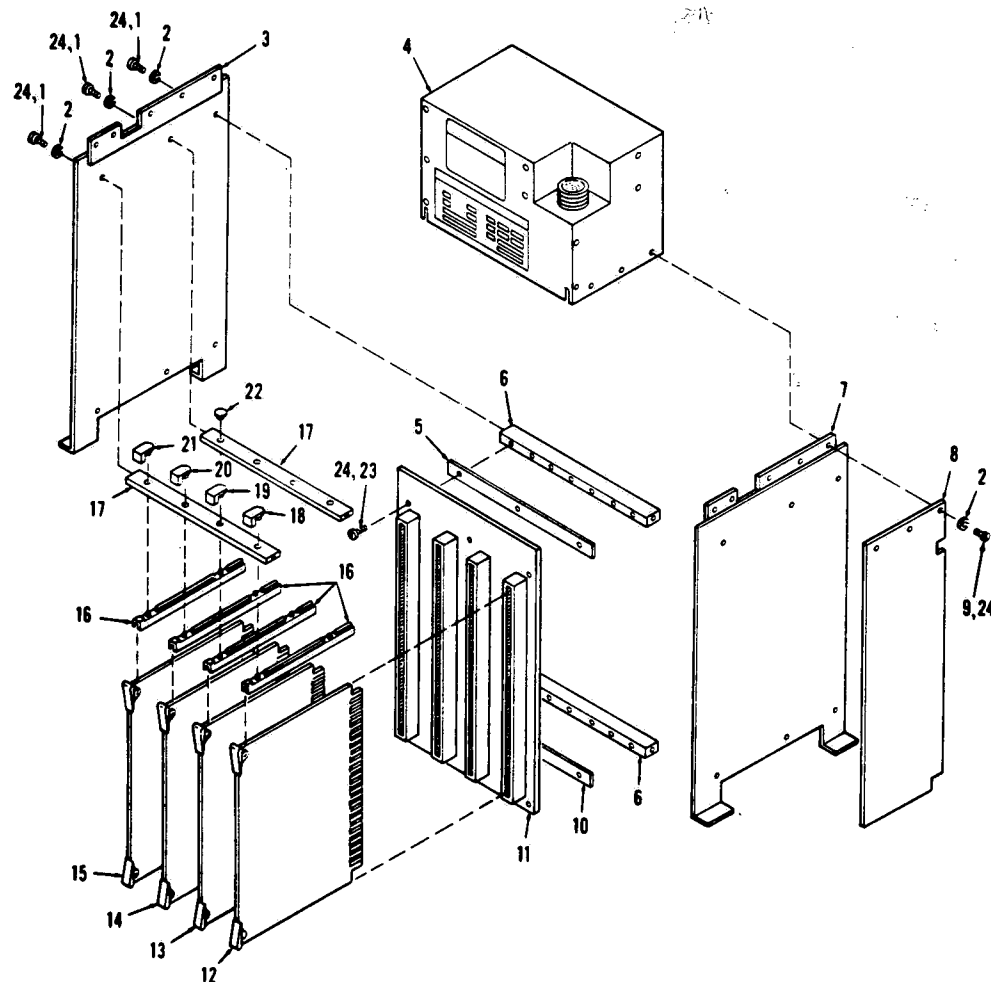


Figure 8-11. MAIN CONTROL ASSEMBLY.

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FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-11-	P 136806	956	MAIN CONTROL ASSEMBLY	X
1	P 84117	003	SCREW, Pan Head, #6-32 x 3/8	12
2	P 84116	002	LOCKWASHER, #6	18
3	P 136795	002	SIDE PLATE, LH	1
4	P 141198	310	POWER SUPPLY ASSEMBLY	1
	P 82924	001	• FUSE, 2 Amp, Pico, 18V, F4 (Pkg. of 5)	1
	P 82924	002	• FUSE, 4 Amp, Pico, 12V, F2 (Pkg. of 5)	1
	P 82924	005	• FUSE, 1 Amp, Pico, -12V, F3 (Pkg. of 5)	1
	P 89372	091	• FUSE, 2 Amp, 250V, F402 (Pkg. of 5)	1
	P 129359	135	• FUSE, 1-1/4 Amp, 250V, (Pkg. of 5)	1
5	P 129138	003	STRIP, Insulator	1
6	P 84468	001	RAIL, Mother Board	1
7	P 136795	001	SIDE PLATE, RH	1
8	P 136800	561	HEAT SINK, External	1
9	P 40357	045	SCREW, Self Tapping, #6 x 1/4	1
10	P 129138	001	STRIP, Insulator	6
11	P 146633	031	MOTHER BOARD ASSEMBLY	1
12	P 146648	001	PC BOARD ASSEMBLY, #4 (I/O3)	1
13	P 146590	008	PC BOARD ASSEMBLY, #3 (I/O2)	1
14	P 146588	076	PC BOARD ASSEMBLY, #2 (I/O1)	1
15	P 146586	076	PC BOARD ASSEMBLY, #1 (Basic CPU)	1
16	P 84225	001	GUIDE, PC Board	1
17	P 129257	001	BAR, Card Guide	8
18	P 83528	009	TAB, I.D., Locking (I/O3)	4
19	P 83528	008	TAB, I.D., Locking (I/O2)	1
20	P 83528	007	TAB, I.D., Locking (I/O1)	1
21	P 83528	001	TAB, I.D., Locking (CPU)	1
22	P 84226	001	TAB, Locking	1
23	P 84117	001	SCREW, Pan Head, #6-32 x 1/4	12
24			THREAD-LOCKER (Loctite #222 or Perma-Bond #LM113)	6
				A/R

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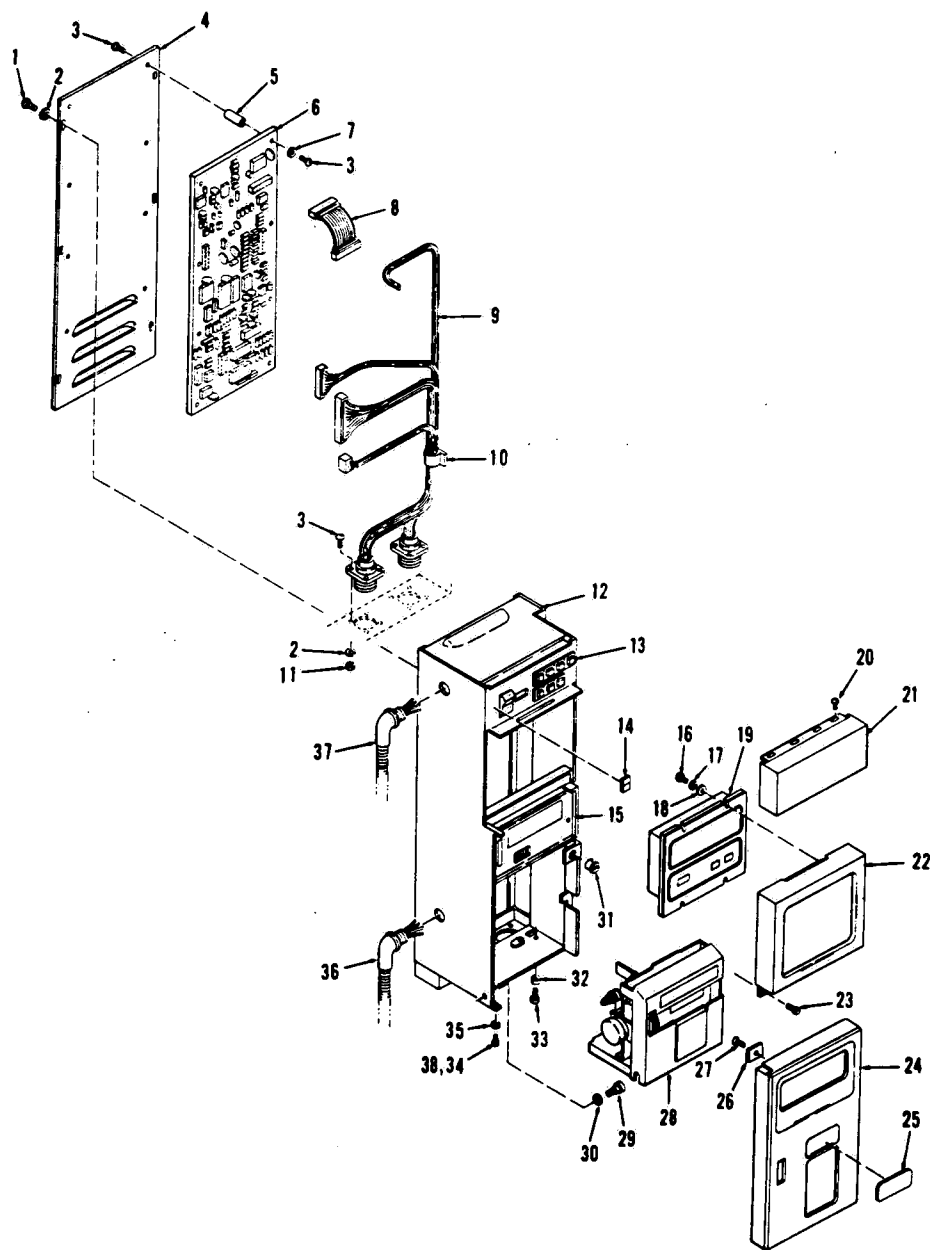


Figure 8-12. PRIMARY PRINTER CONTROL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-12-	P 146653	836	PRIMARY PRINTER CONTROL ASSEMBLY	X
1	P 12451	041	SCREW, Round Head, #6-32 x 1/4	6
2	P 19675	041	LOCKWASHER, #6	14
3	P 3984	041	SCREW, Round Head, #6-32 x 3/8	24
4	P 136806	975	PLATE, Support	1
5	P 129356	033	STANDOFF	8
6	P 146654	011	PC BOARD ASSEMBLY	1
7	P 150822	351	• BATTERY, Coin Cell	1
8	P 129352	094	WASHER, Flat, #6 (Nylon)	8
9	P 56399	135	CABLE ASSEMBLY, Flat Flex	1
10	P 136806	921	HARNESS, DC	1
11	P 150539	001	CLIP, Cable	4
12	P 3037	041	NUT, Hex, #6-32	8
13	P 141212	053	HOUSING, Control, Weldment	1
14	P 129360	752	SECONDARY CONTROL PANEL (See Figure 8-14)	1
15	P 90623	045	DECAL, Circuit Breaker	1
16	P 19676	041	DISPLAY PANEL (See Figure 8-13)	1
17	P 17796	091	SCREW, Round Head, #8-32 x 5/16	4
18	P 134471	039	LOCKWASHER, #8	4
19	P 764317	536	WASHER, Flat, #8	4
20	P 47760	091	CONTROL, Primary	1
21	P 56399	138	• LAMP (Box of 10)	1
22	P 134471	067	SCREW, Hex Socket, #4-40 x 1/4	4
23	P 129356	135	COVER, Secondary, Weldment	1
24	P 146649	009	COVER, Primary, Weldment	1
25	P 129356	142	SCREW, Hex Socket, Blk., #8-32 x 3/8	2
26	P 129356	002	DOOR, Printer Display	1
27	P 82340	001	LABEL, Printcon	1
28	P 141198	171	STRIKE	1
29	P 150822	336	SCREW, Flat Head, Self Tapping, #6 x 5/16	1
30	P 5511	091	PRINTER ASSEMBLY, Printcon (See Figure 8-15 & 8-16)	1
31	P 129356	001	SCREW, Shoulder, #10-32	2
32	P 2959	041	WASHER, Flat, #10	2
33	P 16451	042	CATCH, Magnetic	1
34	P 129356	006	NUT, Hex, #10-32	2
35	P 5469	041	SCREW, Hex Socket, #10-32 x 5/8	2
36	P 56399	141	SCREW, Shoulder, #4-40 x 1/8	2
37	P 56399	127	WASHER, Flat, #6	2
38	R 5300	640	CABLE ASSEMBLY, Printer Take-up	1
			CABLE ASSEMBLY, Power Supply	1
			NYLOC	A/R

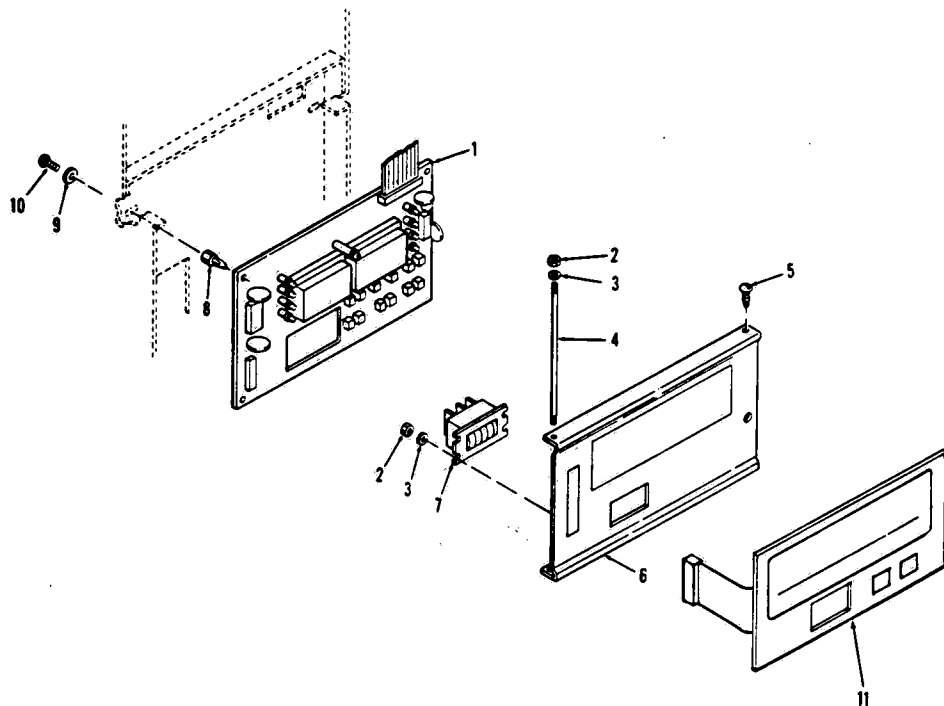


Figure 8-13. DISPLAY PANEL.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-13-			DISPLAY PANEL	X
1 P	146633 081		BOARD, PC Digital Display	1
2 P	13794 041		NUT, Hex, #4-40	4
3 P	84114 001		WASHER, Flat, #4	4
4 P	129356 023		STUD	1
5 P	40357 045		SCREW, Self Tap, #6 x 1/4	1
6 P	93900 001		BRACKET, Display	1
7 P	93900 022		SWITCH, Thumbwheel	1
8 P	84147 001		SUPPORT	3
9 P	5469 041		WASHER, Flat, #6	3
10 P	12451 041		SCREW, Round Head, #6-32 x 1/4	3
11 P	136805 004		PANEL, Overlay, Display	1

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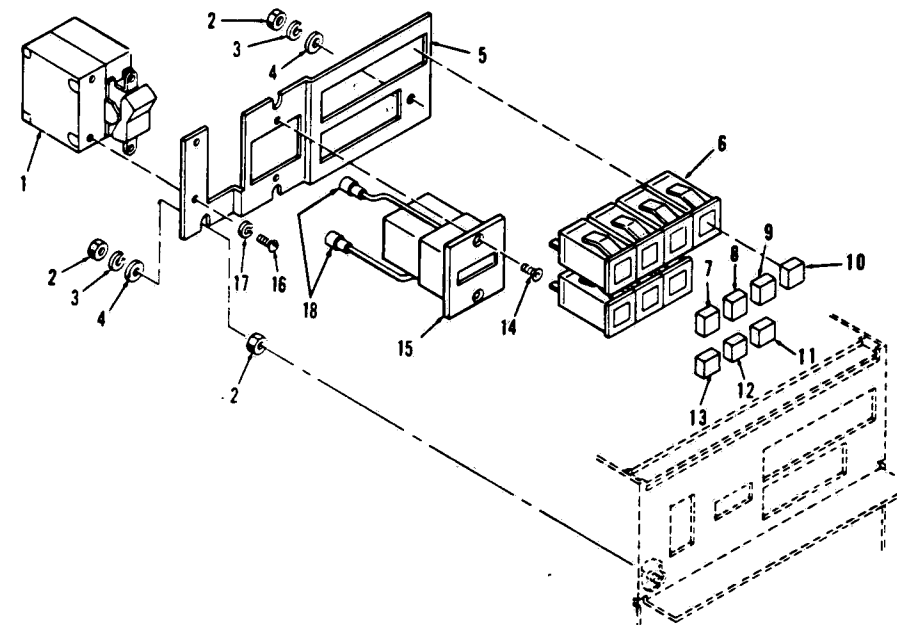


Figure 8-14. SECONDARY CONTROL PANEL.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-14-			SECONDARY CONTROL PANEL	X
1 P	150475 991		CIRCUIT BREAKER	1
2 P	3153 041		NUT, Hex, #8-32	7
3 P	19676 041		LOCKWASHER, #8	4
4 P	17796 091		WASHER, Flat, #8	4
5 P	134471 062		PLATE, Mounting	1
6 P	129352 168		SWITCH, Pushbutton	7
7 P	150825 362		LENS, Open Load Door	1
8 P	150825 361		LENS, Close Load Door	1
9 P	150825 360		LENS, Open Unload Door	1
10 P	150825 359		LENS, Close Unload Door	1
11 P	150825 356		LENS, Recycle	1
12 P	150825 357		LENS, Abort Cycle	1
13 P	150825 358		LENS, Start Cycle	1
14 P	84119 001		SCREW, Flat Head, #6-32 x 1/4	2
15 P	56399 139		COUNTER, DC	1
16 P	12451 041		SCREW, Round Head, #6-32 x 1/4	2
17 P	19675 041		LOCKWASHER, #6	2
18 P	93896 300		RECEPTACLE, Faston-Tab	2

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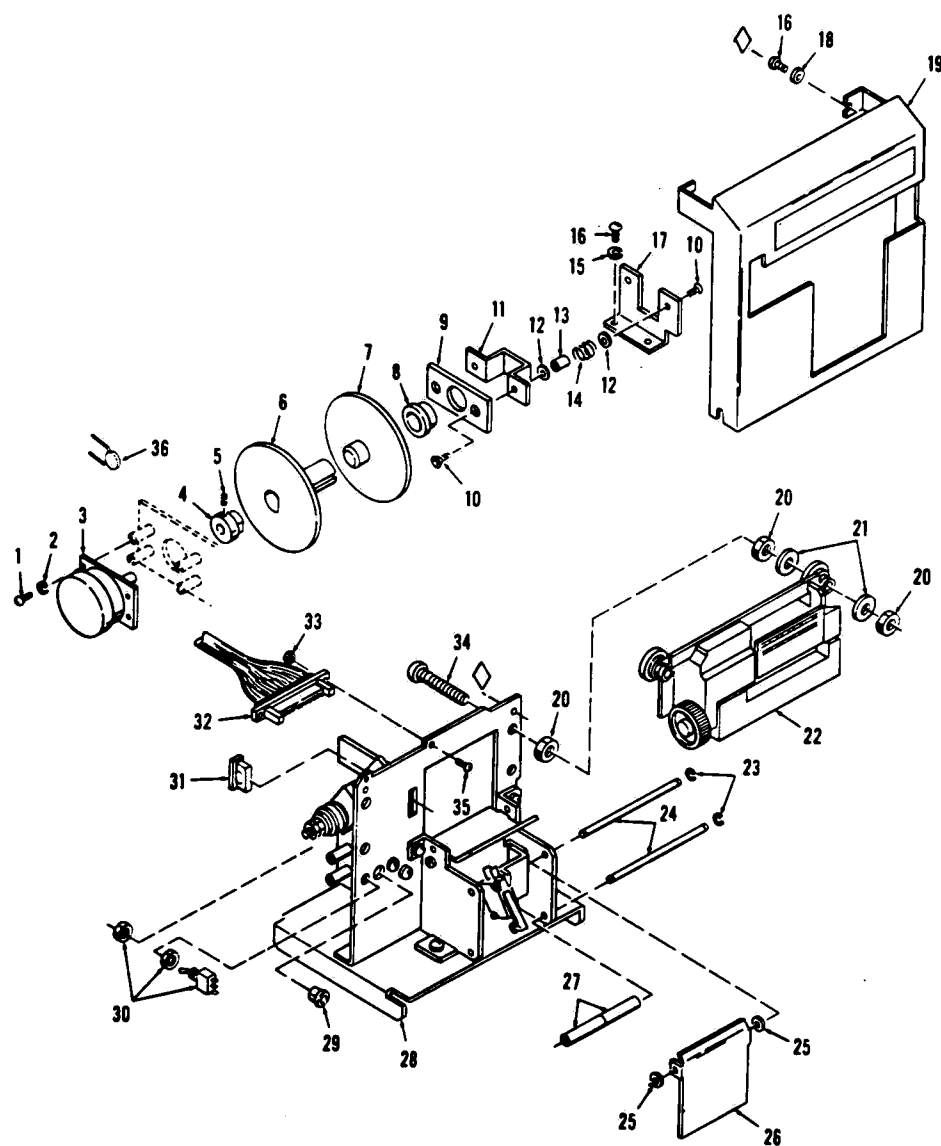


Figure 8-15. PRINTER FRAME ASSEMBLY (Part 1 of 2).

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FIG. & INDEX NO.	P	PART NUMBER	DESCRIPTION	UNITS PER ASSEMBLY
8-15-	P	630938 021	PRINTER FRAME ASSEMBLY (Part 1 of 2).....	X
1	P	90993 091	SCREW, Round Head, #4-40 x 3/4.....	4
2	P	81682 003	LOCKWASHER, #4.....	4
3	P	41269 091	MOTOR.....	1
4	P	611962 718	STUD, Drive.....	1
5	P	129352 117	SET SCREW, #5-40.....	1
6	P	93896 077	SPOOL, Drive End.....	1
7	P	617100 431	SPOOL, Idler End.....	1
8	P	129352 662	BEARING, Flange.....	1
9	P	611962 715	RETAINER.....	1
10	P	38698 041	SCREW, Flat Head, #8-32 x 1/4.....	4
11	P	611962 721	RELEASE, Reel.....	1
12	P	17796 091	WASHER.....	4
13	P	611962 720	SPACER.....	2
14	P	129352 659	SPRING.....	2
15	P	18131 091	LOCKWASHER.....	2
16	P	12451 041	SCREW, Round Head, #6-32 x 1/4.....	6
17	P	611962 716	SUPPORT.....	1
18	P	5469 041	WASHER, Flat, #6.....	4
19	P	626979 012	COVER.....	1
20	P	3040 041	NUT, Hex, 1/4-20.....	9
21	P	31599 041	WASHER, Flat, 1/4.....	6
22	P	136800 081	PRINTER.....	1
	P	129356 116	• PAPER, Single Ply (Box of 3 Rolls).....	1
	P	129356 118	• CARTRIDGE, Inked Ribbon (Box of 2).....	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	P	77797 091	FRAME ASSEMBLY, Printer (Fig. 8-16).....	1
29	P	129356 131	BUSHING, Snap.....	2
30	P	150475 014	SWITCH, Toggle, SPDT.....	1
31	P	626973 979	CATCH, Magnetic.....	1
32	P	10370 045	CABLE ASSEMBLY.....	1
33	P	4004 041	NUT, Hex, #2-56.....	2
34	P	150824 124	SCREW, Round Head, 1/4-20 x 1-1/2.....	3
35	P		SCREW, Round Head, #2-56 x 3/4.....	2

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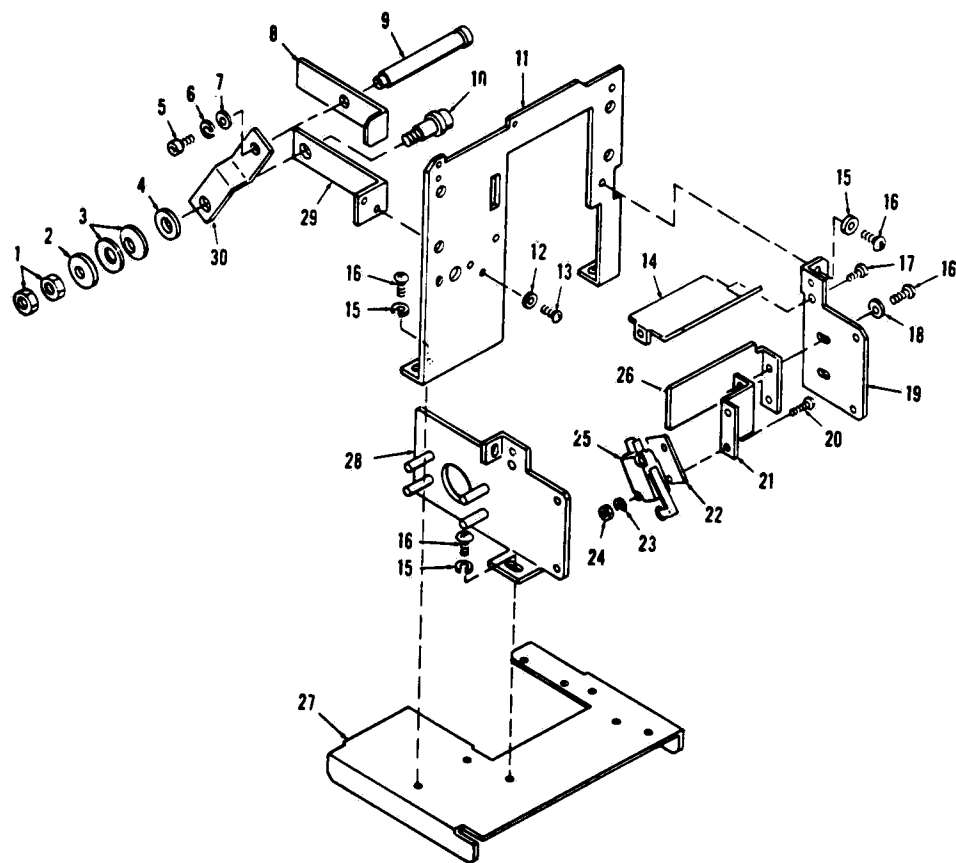


Figure 8-16. PRINTER FRAME ASSEMBLY (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-16-				PRINTER FRAME ASSEMBLY (Part 2 of 2).	1		
1	P	19172	061	NUT, Jam (5/16-18)	2		
2	P	36690	051	WASHER, Flat	1		
3	P	129356	132	WASHER, Belleville	2		
4	P	10412	042	WASHER, Flat	1		
5	P	33061	061	SCREW, Socket head (#10-32 x 5/8) ...	1		
6	P	19685	061	LOCKWASHER (#10)	1		
7	P	5511	091	WASHER, Flat (#10)	1		
8	P	129356	110	STOP	1		
9	P	611962	719	SPINDLE	1		
10	P	150044	001	SCREW, Shoulder (5/16-18)	1		
11	P	626973	997	PLATE, Mounting	1		
12	P	5511	091	WASHER, Flat (#10)	2		
13	P	12539	061	SCREW, Round head (#10-32 x 3/8)	2		
14	P	93900	010	PLATE, Paper feed	1		
15	P	18131	091	LOCKWASHER (#6)	8		
16	P	12451	041	SCREW, Round head (#6-32 x 1/4)	7		
17	P	77074	045	SCREW, Self-tapping (#8-18 x 3/8) ...	2		
18	P	5469	041	WASHER, Flat (#6)	2		
19	P	617100	432	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)	1		
25	P	150822	343	SWITCH, Roller arm	2		
26	P	611962	722	SHIELD	1		
27	P	626973	996	BASE, Printer	1		
28	P	617100	433	SIDE, LH	1		
29	P	617100	430	ANGLE, Pivot	1		
30	P	129356	112	ARM, Pivot	1		

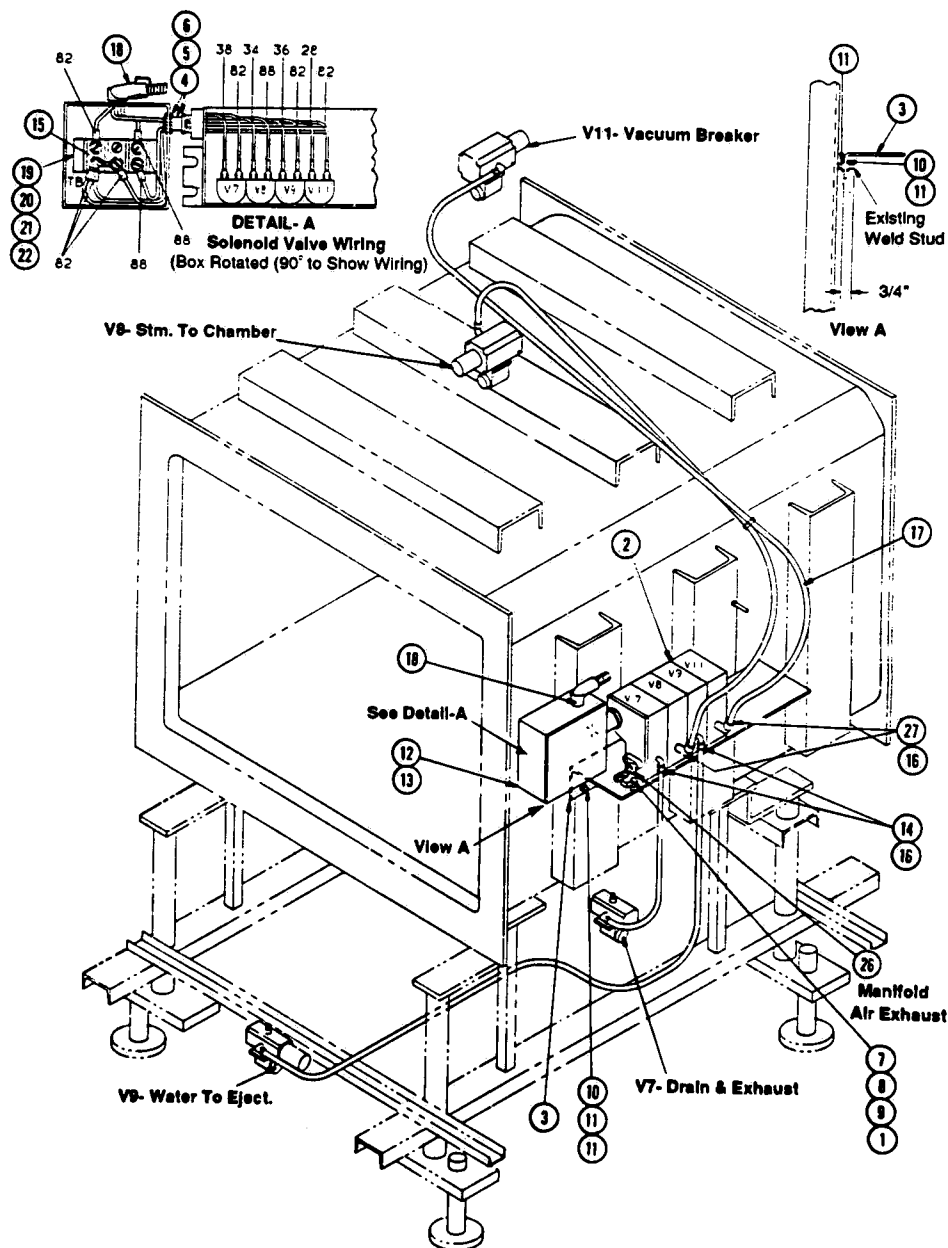


Figure 8-17. MANIFOLD ARRANGEMENT, Air Actuated Solenoid Valve.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-17-	P 146653	374	MANIFOLD ARRANGEMENT, Air Act'd. Solenoid Valve	X
1	P 31599	041	WASHER, Plain, 1/4	4
2	P 764317	658	VALVES, 3-Way Manifold Assembly	1
	P 764317	593	• VALVE, Individual	4
	P 764317	594	• KIT, Valve Repair	4
	P 136806	972	• COIL	4
3	P 136806	972	BRACKET, Valves	1
4	P 150476	985	BUSHING, Reducing, 3/4 NPT x 1/2	1
5	P 150667	001	NIPPLE, Close, 1/2 NPT x 1-1/4	1
6	P 8681	091	LOCKNUT, Conduit, 1/2	2
7	P 3848	091	SCREW, Cap. Hex, 1/4-20 x 3/4	4
8	P 19678	045	LOCKWASHER, 1/4 Spring, Light	4
9	P 3097	041	NUT, Hex, 1/4-20	4
10	P 81682	008	LOCKWASHER, Spring, Regular	2
11	P 2947	046	NUT, Hex, 5/16-18	4
12	P 90754	091	BOX	1
13	P 22614	091	COVER	1
14	P 21990	091	ELL. 90° COMPRESSION, 1/4 ODT x 1/8 NPT	6
15	P 89590	041	JUMPER	1
16	P 84371	001	INSERT	8
17	P 136806	958	TUBING, Nylon, 1/4 OD x 12-8	1
18	P 90746	091	CABLE ASSEMBLY, "K"	1
19	P 3987	041	TERMINAL, Strip	1
20	P 19676	041	SCREW, Round Head, 8-32 x 3/4	4
21	P 3038	041	LOCKWASHER, #8	4
22	P 90695	091	NUT, Hex, #8-32	4
23	P 14865	091	NOT USED	4
24	P 77774	091	TERMINAL, Quick Disconnect, 1/4 x .032	4
25	P 52697	091	TERMINAL, Ring, #8 22/18	4
26	P 31599	041	STRAINER, Nipple, 1/4 NPT	1
27			FITTING, 45°, 1/4 ODT x 1/8 NPT	2
28			THREAD-LOCKER (Loctite #222 or PermaBond #LM113)	A/R
29			WASHER, Plain, 1/4	4

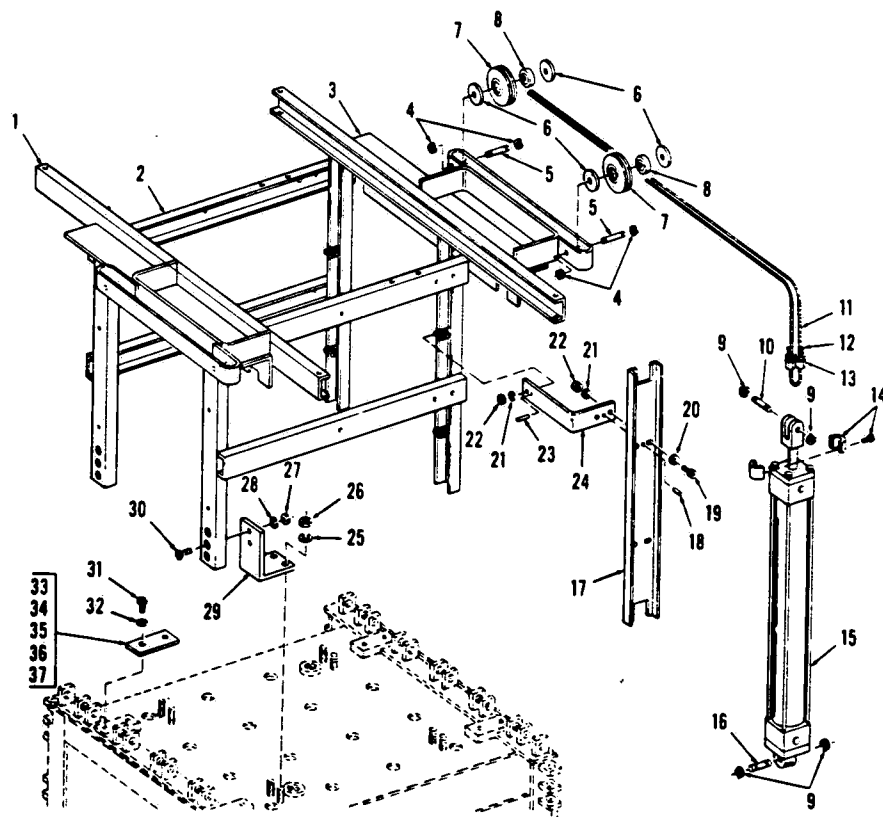


Figure 8-18. DOOR PACKAGE (Part 1 of 3).

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-18-	P 99096	091	DOOR PACKAGE (Part 1 of 3).....	1
	P 98059	010	SUPERSTRUCTURE DOOR LIFT	1
1	P 98060	091	. SUPPORT, Entrance	1
2	P 51588	091	. CHANNEL, Horizontal	4
3	P 98061	091	. SUPPORT, Exit	1
4	P 31952	091	SNAP RING	8
5	P 51628	045	SHAFT	4
6	P 10456	091	WASHER	20
	P 56317	001	PULLEY ASSEMBLY	4
7	P 56316	001	. PULLEY	4
8	P 150684	001	. BEARING	4
9	P 42639	091	RING, Retaining	8
10	P 51639	061	PIN	4
11	P 150686	001	CABLE, 123" Long	2
12	P 150687	001	CABLE, Safety (9" Long)	2
13	P 150666	001	CLAMP, Wire	4
14	P 81049	091	COLLAR, Split	2
15	P 81050	001	CYLINDER LIFT	2
	P 754819	091	. KIT, Seal	1
16	P 51629	061	SHAFT PIN	2
17	P 54768	045	GUIDE, Roller	4
18	P 45685	061	ROLLPIN (3/16 x 1/2)	8
19	P 12176	041	SCREW, Socket head (1/4-20 x 3/4)	16
20	P 49134	061	WASHER, Flat	16
21	P 19686	061	LOCKWASHER (1/4)	32
22	P 3097	041	NUT (1/4-20)	32
23	P 47979	061	ROLLPIN (3/16 x 1-1/4)	8
24	P 51595	010	SUPPORT GUIDE	8
25	P 19687	061	LOCKWASHER (3/8)	8
26	P 3099	042	NUT (3/8-16)	8
27	P 3098	045	NUT (5/16-18)	8
28	P 19681	045	LOCKWASHER (5/16)	8
29	P 51811	010	SUPPORT	4
30	P 38363	052	SCREW, Flat head (5/16-18 x 2)	8
31	P 23431	041	SCREW, Socket head (#10-32 x 3/8)	8
32	P 46115	091	LOCKWASHER (#10)	8
33	P 51753	061	SHIM (0.093 Thk)	A/R
34	P 51754	061	SHIM (0.062 Thk)	A/R
35	P 51755	061	SHIM (0.031 Thk)	A/R
36	P 51872	061	SHIM (0.010 Thk)	A/R
37	P 51871	061	SHIM (0.015 Thk)	A/R

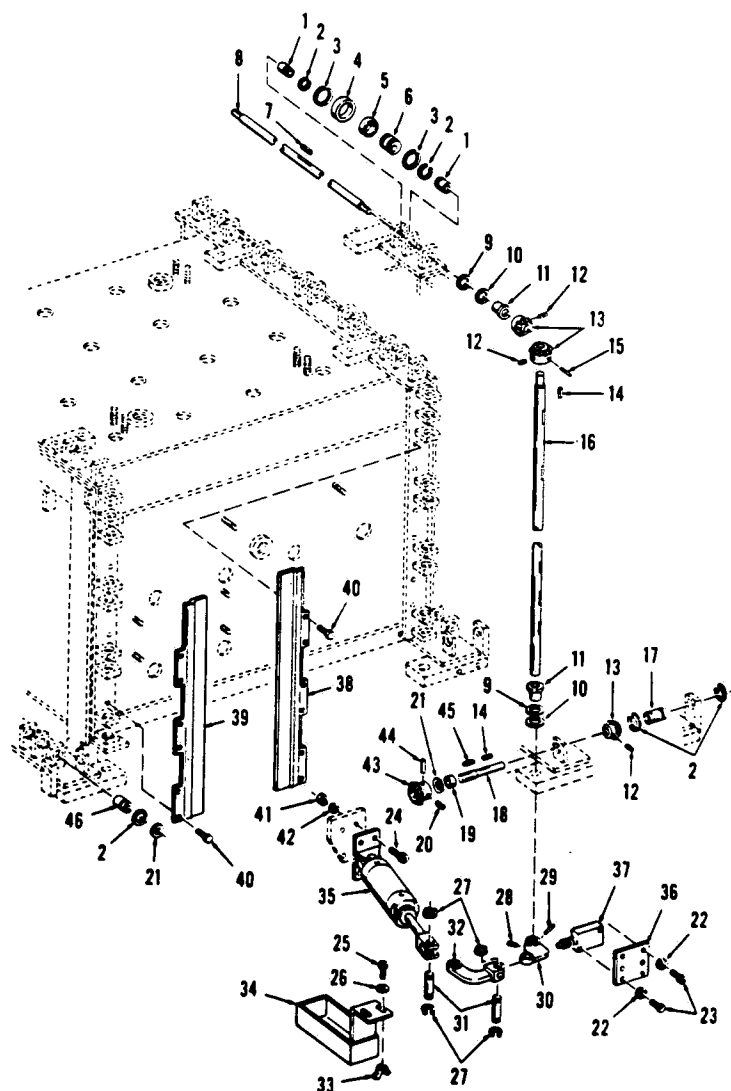


Figure 8-19. DOOR PACKAGE (Part 2 of 3).

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-19-	P 99096	091	DOOR PACKAGE (Part 2 of 3).....	1
1	P 51673	091	BUSHING, Oilite	72
2	P 51680	001	RING, Retaining	84
	P 51679	091	CAM ROLLER ASSEMBLY	36
3	P 46040	091	. SNAP RING	2
4	P 51618	045	. ROLLER, Cam	1
5	P 51611	091	. BUSHING, Oilite	1
6	P 51592	045	. CAM	1
7	P 81078	006	KEY (1/8 x 5/8)	36
8	P 54773	045	SHAFT, Top and bottom	4
9	P 81030	061	SHIM (0.010 Thk)	A/R
10	P 81031	061	SHIM (0.015 Thk)	A/R
11	P 51658	091	BUSHING, Flange oilite	12
12	P 4772	045	SETSCREW (1/4-20 x 1/4)	16
13	P 51594	045	GEAR	16
14	P 17277	091	KEY (1/8 x 7/8)	16
15	P 43259	091	SETSCREW (#6-32 x 3/16)	16
16	P 54772	045	SHAFT, Side	4
17	P 51625	091	BUSHING, Oilite	4
18	P 51593	045	SHAFT, Short	4
19	P 51681	091	BUSHING, Oilite	4
20	P 31892	091	SETSCREW (5/16-18 x 1/4)	8
21	P 150235	001	SHIM (0.010 Thk)	A/R
22	P 19686	061	LOCKWASHER (1/4)	8
23	P 12176	041	SCREW, Socket head (1/4-20 x 3/4)	8
24	P 3851	042	SCREW	8
25	P 3998	041	SCREW, Round head (1/4-20 x 1/2)	8
26	P 49134	061	WASHER, Flat	8
27	P 42639	091	RING, Retaining	16
28	P 10583	091	SETSCREW (#10-32 x 3/16)	4
29	P 43229	061	ROLLPIN	4
30	P 51589	043	ACTUATOR	4
31	P 51639	061	PIN	8
32	P 51635	043	LINK	4
33	P 3097	041	NUT (1/4-20).....	8
34	P 97037	031	PAN, Oil	4
35	P 51584	091	CYLINDER LOCK (See Fig. 8-32).....	4
36	P 51524	091	SUPPORT, Valve	2
37	P 51605	091	VALVE, Diverter	2
38	P 54769	045	GUIDE, Roller, left hand	2
39	P 54770	045	GUIDE, Roller, right hand	2
40	P 20821	061	SCREW (#10-32 x 3/16)	24
41	P 3098	045	NUT (5/16-18)	8
42	P 19681	045	LOCKWASHER (5/16)	8
43	P 51621	045	GEAR	8
44	P 33456	061	SETSCREW (#8-32 x 3/16)	8
45	P 12704	091	KEY (3/16)	12
46	P 51624	091	BUSHING	4

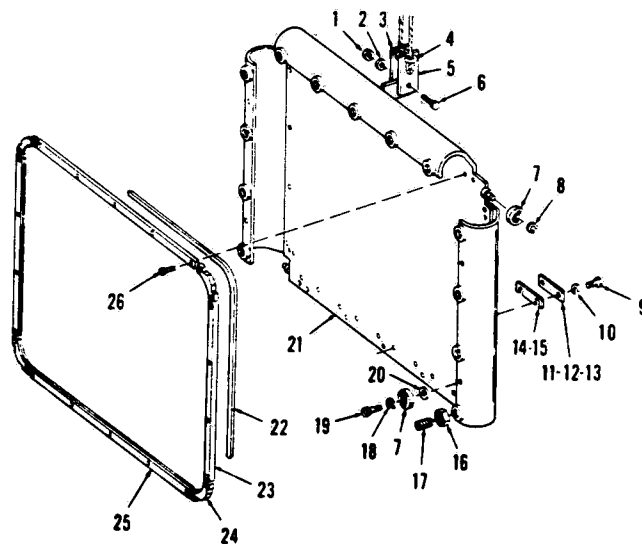


Figure 8-20. DOOR PACKAGE (Part 3 of 3).

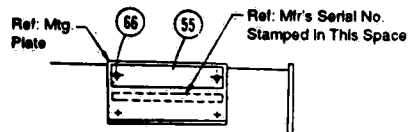
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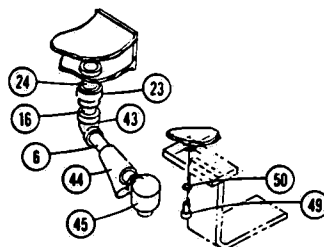
FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-20-	P 99096	091	DOOR PACKAGE (Part 3 of 3).....	1
1	P 118443	045	NUT, Lock (#1/4-20)	2
2	P 10445	091	WASHER, Flat (1/4)	2
3	P 118441	045	NUT, Lock (#10-24)	8
4	P 18933	091	CABLE CLAMP	4
5	P 150635	001	CLEAT, Lifting	4
6	P 150773	001	SCREW, Hex (#1/4-20 x 1-1/2)	2
7	P 81055	001	ROLLER	16
8	P 42641	091	RING, Retaining	8
9	P 23431	041	SCREW, Socket head (#10-32 x 3/8)	20
10	P 46115	091	LOCKWASHER (#10)	20
11	P 51753	061	SHIM (0.093 Thk)	A/R
12	P 51754	061	SHIM (0.062 Thk)	A/R
13	P 51755	061	SHIM (0.031 Thk)	A/R
14	P 51872	061	SHIM (0.010 Thk)	A/R
15	P 51871	061	SHIM (0.015 Thk)	A/R
16	P 81173	001	NUT, Hex	26
17	P 81208	001	SCREW, Socket head	26
18	P 19687	061	LOCKWASHER (3/8)	8
19	P 16868	041	SCREW, Socket head (3/8-16 x 7/8)	8
20	P 43754	045	WASHER	8
21	P 99053	010	DOOR	2
22	P 756124	091	GASKET KIT (includes gasket bar mounting screws)	2
23	P 51586	091	GASKET BAR, Side	4
24	P 51512	001	GASKET BAR, Corner	8
25	P 51585	091	GASKET BAR, Top and bottom	4
26	P 46705	061	SCREW, Socket head (1/4-28)	52

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VIEW B



VIEW A
JACKET RETURN LINE

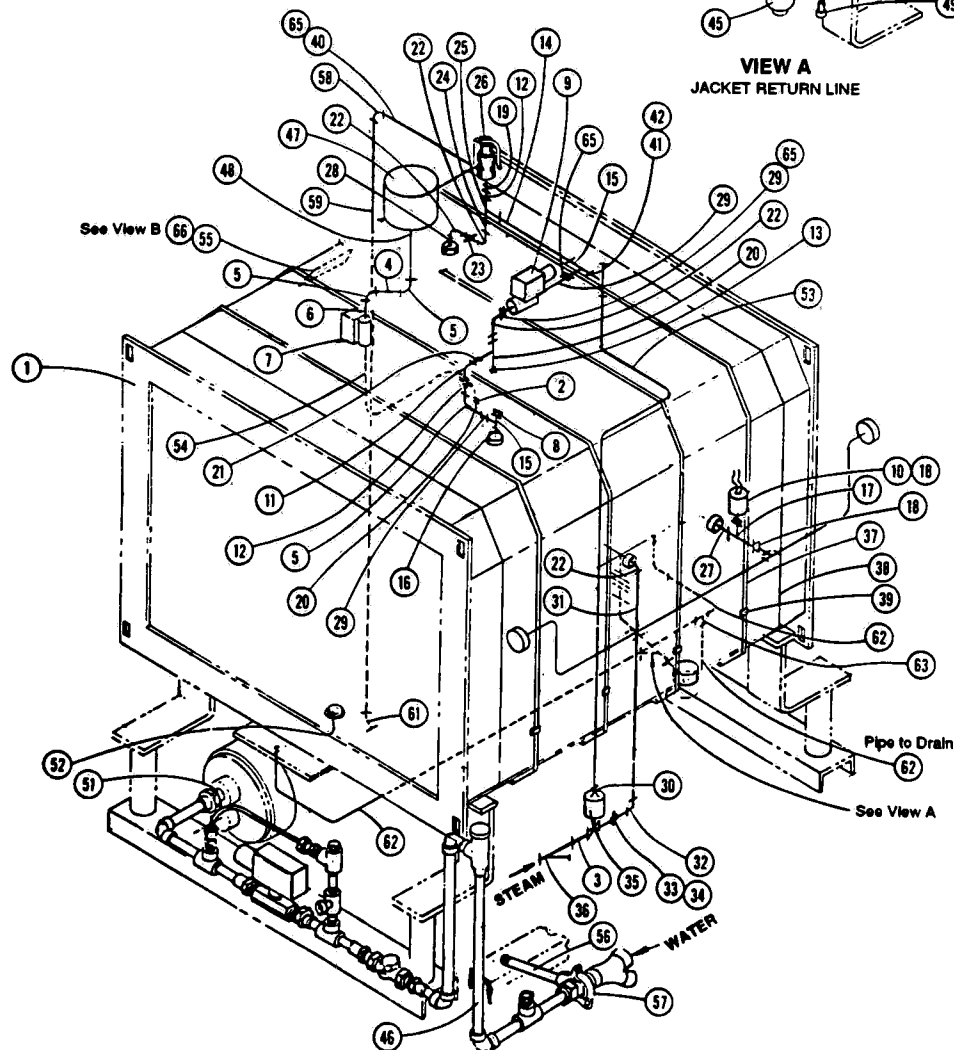


Figure 8-21. SHELL PIPING ASSEMBLY.

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-21-	P 146653	827	SHELL PIPING ASSEMBLY	X
1	P 136806	917	SHELL ASSEMBLY (See Fig. 8-2)	1
2	P 836	042	REDUCER, 3/4 to 1/2 NPT	1
3	P 29292	091	NIPPLE	1
4	P 29176	091	NIPPLE, 1/2 NPT x 4-1/2	1
5	P 1633	091	ELL, 1/2 NPT	2
6	P 29166	091	NIPPLE, 1/2 NPT x 2	2
7	P 150822	928	VALVE, Ball, 1/2 NPT	1
	P 764317	587	• KIT, Valve Repair	1
	P 764317	578	• KIT, Actuator Repair	1
8	P 3441	091	PLUG, Pipe, 3/8 NPT	1
9	P 150822	929	VALVE, Ball, 3/4 NPT	1
	P 764317	588	• KIT, Valve Repair	1
	P 764317	578	• KIT, Actuator Repair	1
10	P 56396	215	TRANSDUCER, Pressure	1
11	P 89986	091	UNION, Ell, 3/4 NPT	1
12	P 29292	091	NIPPLE, 3/4 NPT x 1-1/2	2
13	P 3443	091	PLUG, Pipe, 3/4 NPT	2
14	P 29362	091	NIPPLE, 1 NPT x 3-1/2	1
15	P 5027	091	TEE, 1 x 3/8 x 1 NPT	2
16	P 29356	091	NIPPLE, 1 NPT x 2	3
17	P 4931	091	TEE, 1/2 NPT	1
18	P 76053	042	BUSHING, Reducing, 1/2 to 1/4 NPT	2
19	P 1314	091	COUPLING, 3/4 NPT	1
20	P 4938	091	TEE, 1 x 3/4 x 3/4 NPT	1
21	P 29298	091	NIPPLE, 3/4 NPT x 3	1
22	P 1639	091	STREET, Ell, 1 NPT	4
23	P 5283	091	UNION, 1 NPT	2
24	P 29371	091	NIPPLE, 1 NPT x 5-3/4	2
25	P 4941	091	TEE, 1 x 3/4 x 1 NPT	1
26	P 51653	091	VALVE, Safety, 3/4 NPT	1
27	P 29162	091	NIPPLE, 1/2 NPT x 1	1
28	P 29354	091	NIPPLE, 1 NPT x 1-1/2	1
29	P 29293	091	NIPPLE, 3/4 NPT x 1-3/4	3
30	P 43289	091	FITTING, Compression	1
31	P 33588	091	NIPPLE, 1 NPT x 17-1/2	1
32	P 1637	091	ELBOW, 1 NPT x 3/4	1
33	P 4247	091	SPUD, Male, 3/4 NPT	1
34	P 2903	091	NUT, Union, 3/4 NPT	1
35	P 54780	091	STEAM CONTROL VALVE ASSEMBLY (See Fig. 8-25)	1
36	P 41389	091	STRAINER, 3/4 NPT	1
	P 751552	091	• Screen	1
37			STRAPPING, 106" Length	1
38			INSULATION, 24 x 106	1
39	P 32268	091	STRAP, Lock	1
40	P 29332	091	NIPPLE, 3/4 NPT x 11-1/2	1
41	P 6223	091	BUSHING, Reducing, 3/8 x 1/8 NPT	1
42	P 42581	091	TEE, Compression, 1/8 NPT X 1/4 ODT	1
43	P 7491	091	ELBOW, 1 to 1/2 NPT	1
44	P 47709	091	STRAINER, 1/2 NPT	1
	P 750890	091	• Screen	1
45	P 22713	042	TRAP, Steam, 1/2 NPT	1
	P 754357	006	• KIT, Repair	1

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-21-			(Continued)	
46 P	93909 264		WATER SUPPLY LINE ASSEMBLY (See Fig. 8-23)	1
47 P	91173 091		FILTER, Air	1
48 P	29174 091		NIPPLE, 1/2 NPT x 4	1
49 P	16868 041		SCREW, 3/8-16 x 7/8	4
50 P	19687 061		LOCKWASHER, 3/8	4
51 P	49123 091		REDUCER, 1-1/2 to 1/2 NPT	1
52 P	48733 042		STRAINER	1
53			TUBE, 1/4 OD x 48	1
54 P	29177 091		NIPPLE, 1/2 NPT x 4-3/4	1
55 P	90542 091		ASME PLATE	1
56 P	48774 091		NIPPLE, Solid, 1/4 NPT x 9	1
57 P	39589 010		CLAMP, Pipe, 1/2	1
58 P	1635 091		ELBOW, 3/4 NPT	1
59 P	41383 091		NIPPLE, 3/4 NPT x 56-1/4	1
60			TUBING, 3/4 OD x 30 (Not Shown)	1
61 P	1744 091		ELL, 45°, 3/4 NPT	1
62			TUBING, 1/2 OD, 84	1
63 P	30981 091		TEE, Compression, 1/2 ODT	1
64 P	142683 001		BAFFLE, Installation (Not Shown)	1
65 P	841 042		BUSHING, Reducing, 1 x 3/4 NPT	3
66 P	9448 045		SCREW, Drive	2

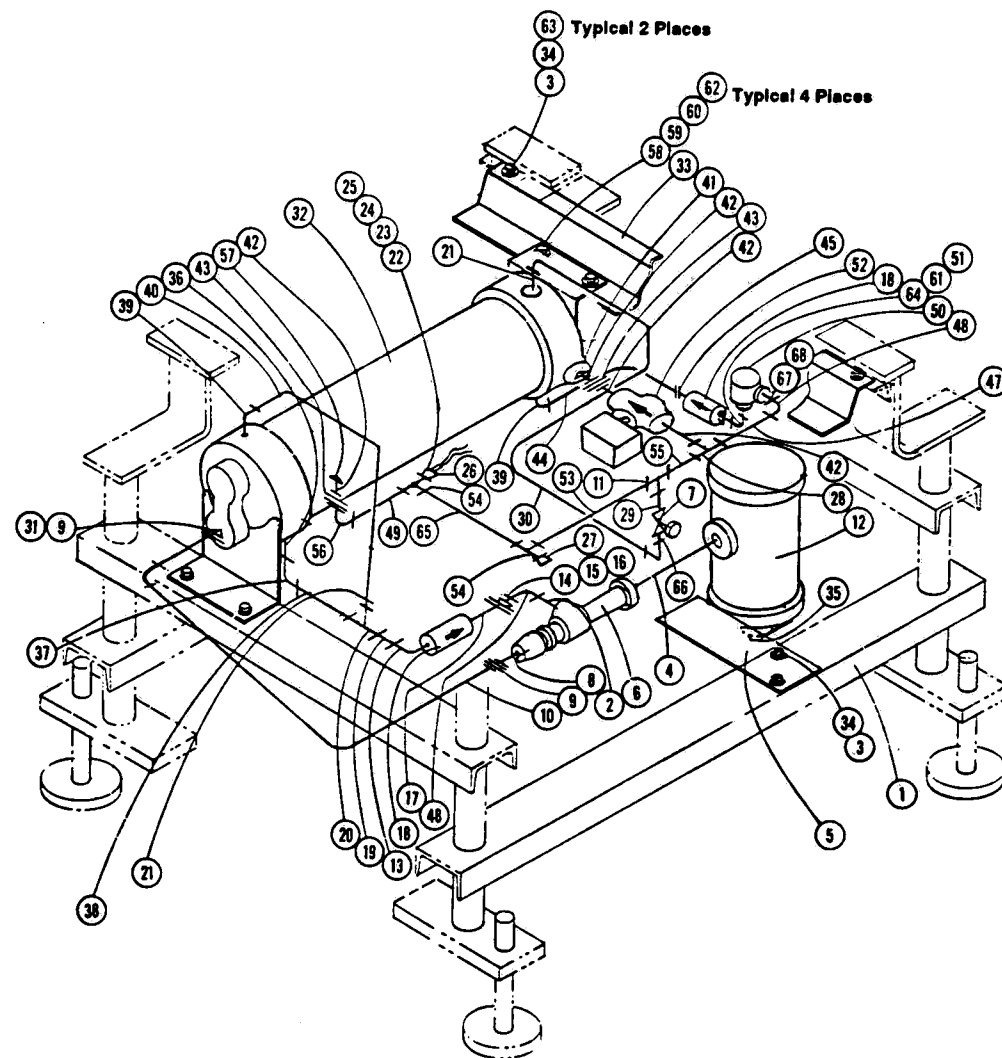


Figure 8-22. STAND PIPING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-22-			STAND PIPING ASSEMBLY	X
1	P 98036 091		STAND ASSEMBLY (See Fig. 8-2)	1
2	P 29295 091		NIPPLE, 3/4 NPT x 2-1/4	1
3	P 19678 045		LOCKWASHER, 1/4	4
4	P 29315 091		NIPPLE, 3/4 NPT x 7-1/4	1
5	P 51565 010		SUPPORT	1
6	P 51616 091		EXHAUSER, Water Jet	1
7	P 83256 001		VALVE, 3/8 NPT	1
8	P 3531 091		COUPLING, Reducer, 3/4 to 1/2	1
9	P 90227 091		UNION, 3/8 ODT x 1/2 NPT	2
10	P 51567 091		TUBE, Water	1
11	P 4934 091		TEE, Reducing, 1 x 1 x 3/8 NPT	1
12	P 54754 091		SUMP	1
13	P 1636 091		ELL, Street, 3/4 NPT	1
14	P 4247 091		SPUD, Male, 3/4 NPT	1
15	P 1747 091		THREAD, End, 3/4 NPT	1
16	P 2903 091		NUT, Union, 3/4 NPT	1
17	P 29291 091		NIPPLE, 3/4 NPT x 1-1/4	1
18	P 129360 277		VALVE, Check, 3/4 NPT	2
19	P 29294 091		NIPPLE, 3/4 NPT x 2	1
20	P 4924 091		TEE, 3/4 x 3/4 x 3/8 NPT	1
21	P 78293 091		FITTING, Compression, Straight, 3/8 NPT x 3/8 ODT	2
22	P 56396 211		R.T.D. PROBE ASSEMBLY	1
23	P 150822 845		BUSHING, RTD Probe	1
24	P 150822 802		BUSHING, Probe	1
25	P 150822 801		BUSHING, Support	1
26	P 6263 091		REDUCER, 1 NPT x 1/2 NPT	1
27	P 3444 091		PIPE, Plug, 1 NPT	1
28	P 4941 091		TEE, Reducing, 1 x 3/4 x 1 NPT	1
29	P 29013 091		NIPPLE, 3/8 NPT x 1	1
30			TUBE, Copper, Soft, 3/8 ODT x .030 Wall, 5 Ft.	1
31	P 49123 091		REDUCER, 1-1/2 to 1/2 NPT	1
32	P 51373 091		HEAT EXCHANGER	1
33	P 51579 010		SUPPORT	1
34	P 2792 045		SCREW, 1/4-20 x 1/2	4
35	P 3441 091		PIPE, Plug, 3/8 NPT	1
36	P 32667 091		NIPPLE, 1-1/2 NPT x 2	1
37	P 7498 091		ELBOW, 1-1/2 to 3/4 NPT	1
38	P 29298 091		NIPPLE, 3/4 NPT x 3	1
39	P 45530 091		ELL, Compression Fitting, 3/8 ODT x 3/8 NPT	2
40	P 54798 091		TUBE, 3/8 ODT	1
41	P 33738 091		REDUCER, 1-1/2 to 1 NPT	1
42	P 29354 091		NIPPLE, 1 NPT x 1-1/2	4
43	P 5283 091		UNION, 1 NPT	2
44	P 51590 091		TUBE, 3/8 ODT	1
45	P 129360 727		VALVE, 1 NPT	1
	P 764317 589		• KIT, Valve Repair	1
	P 764317 579		• KIT, Actuator Repair	1
46	P 1638 091		ELL, 1 NPT	1
47	P 29300 091		NIPPLE, 3/4 NPT x 3-1/2	1
48	P 1635 091		ELBOW, 3/4 NPT	2
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FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-22-			(Continued)	
49	P 29354 091		NIPPLE, 1 NPT x 1-1/2	1
50	P 22713 042		TRAP, Steam, 1/2 NPT	1
51	P 836 091		REDUCER, 3/4 to 1/2 NPT	1
52	P 81058 001		FITTING, Straight, 1/2 NPT x 3/8 ODT	1
53			NIPPLE, Brass, Sched. 40, 1 NPT, 2 Ft.	1
54	P 4942 091		TEE, 1 NPT	2
55	P 29379 091		NIPPLE, 1 NPT x 7-3/4	1
56	P 1639 091		ELBOW, Street, 1 NPT	1
57	P 850 042		REDUCER, 1-1/4 to 1 NPT	1
58	P 16383 045		SCREW, Socket Head Cap, 3/8-16 x 1	4
59	P 19680 041		LOCKWASHER, 3/8	4
60	P 3099 042		NUT, Hex 3/8-16	4
61	P 29166 091		NIPPLE, 1/2 NPT x 2	2
62	P 17263 042		WASHER, Flat, 3/8 Nom.	4
63	P 3515 041		WASHER, 1/4 Nom.	2
64	P 1633 091		ELL, 1/2 NPT	1
65	P 29374 091		NIPPLE, 1 NPT x 6-1/2	1
66	P 46367 091		ELL, Compression, 3/8 ODT	1
67	P 29162 091		NIPPLE, 1/2 NPT x 1	1
68	P 118372 091		COUPLING, 1/2 NPT	1

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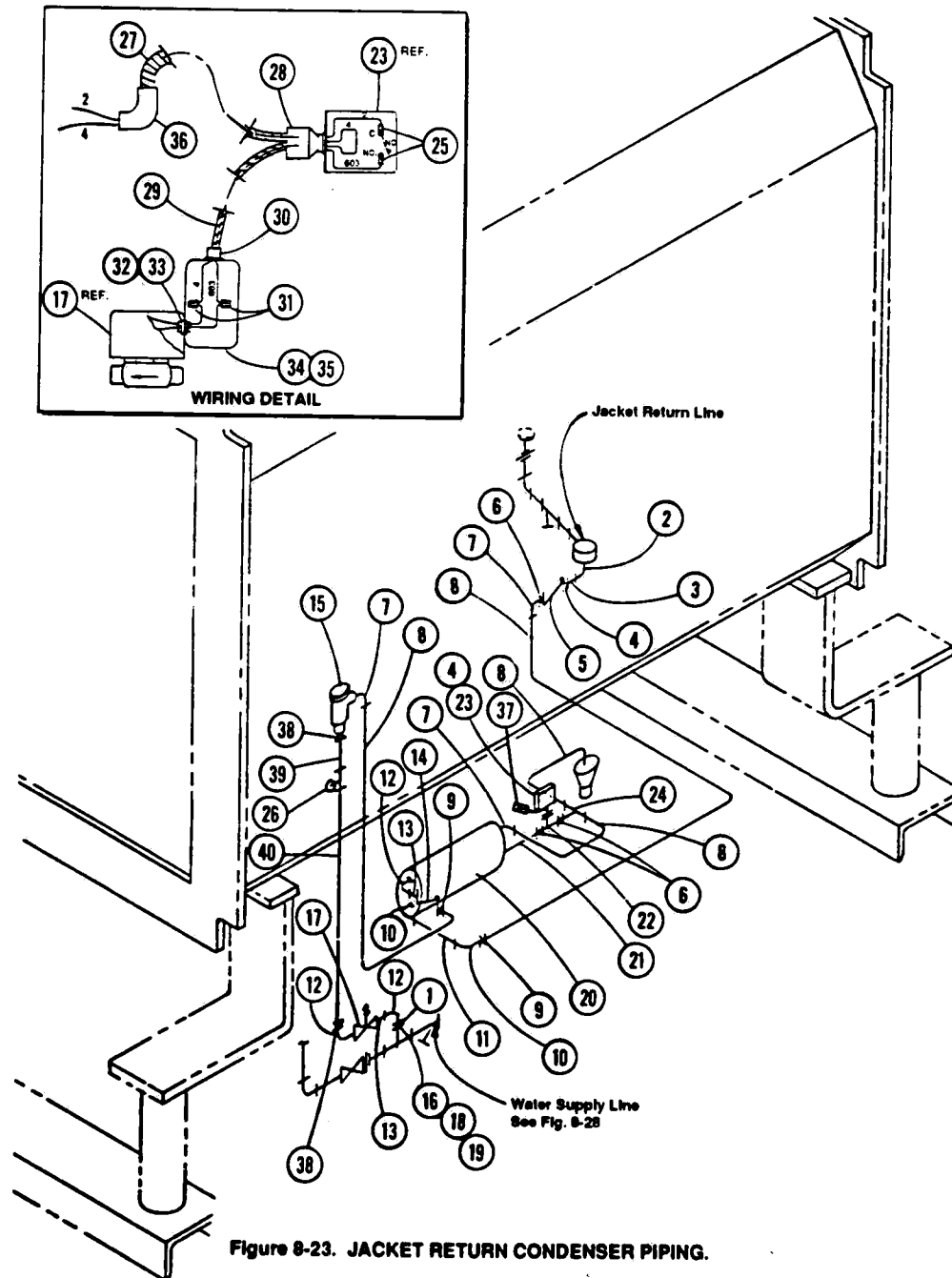


Figure 8-23. JACKET RETURN CONDENSER PIPING.

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-23-	P 146653	829	JACKET RETURN CONDENSER PIPING	X
1	P 29013	091	NIPPLE, 3/8 NPT x 1	1
2	P 1634	091	ELL. Strainer, 1/2 NPT	1
3	P 29164	091	NIPPLE, 1/2 NPT x 1-1/2	1
4	P 129360	392	NIPPLE	2
5	P 129360	277	VALVE, Check, 3/4 NPT	1
6	P 6209	091	BUSHING, Reducing, 3/8 x 3/4 NPT	3
7	P 13659	091	ELL. Compression, 3/8 NPT x 1/2 ODT	3
8			TUBE, Copper, 1/2 OD, 10 Ft.	1
9	P 13658	091	FITTING, Compression, 3/8 NPT x 1/2 ODT	2
10	P 1630	091	ELBOW, 3/8 NPT	2
11	P 29018	091	NIPPLE, 3/8 NPT x 2-1/4	1
12	P 1631	091	ELL. Strainer, 3/8 NPT	3
13	P 29014	091	NIPPLE, 3/8 NPT x 1-1/4	2
14	P 5424	091	VALVE, Check, 3/8 NPT	1
15	P 74335	091	• Disc	1
16	P 77022	091	VACUUM BREAKER, 3/8 NPT	1
17	P 83263	002	SPUD, Union, 3/8 NPT, Female	1
	P 764073	001	VALVE, Solenoid, 3/8 NPT	1
	P 764072	002	• KIT, Valve Repair	1
18	P 1626	091	• COIL	1
19	P 2901	091	UNION, Thread End, 3/8 NPT	1
20	P 96061	091	NUT, Union, 3/8 NPT	1
21	P 29016	091	CONDENSOR	1
22	P 4932	091	NIPPLE, 3/8 NPT x 1-3/4	1
23	P 93909	696	TEE, 3/4 NPT	1
24	P 20610	091	SWITCH, Temperature	1
25	P 14865	091	TEE, Compression, 1/2 ODT x 3/8 NPT	1
26	P 89076	091	TERMINAL, #8 Stud	2
27	P 91560	091	VALVE, Needle, 1/4 NPT	1
28	P 18000	091	CONDUIT, Flexible, 3/8 ID	1
29	P 90822	091	DUPLEX, Connector, 3/8 Flexible	1
30	P 90331	091	CONDUIT, Flex, 3/8 ID	1
31	P 31299	091	CONNECTOR, Conduit, Straight, For 3/8 Flexible	1
32	P 31299	091	WIRE NUT, Small	2
33	P 8681	091	NIPPLE, Close, 1/2 Conduit	1
34	P 23345	091	LOCKNUT, 1/2 Conduit	7
35	P 23346	091	BOX, Conduit	1
36	P 18001	091	COVER, Box	1
37	P 608855	001	ELBOW, Conduit Connector, 3/8 Flexible	1
38	P 849	091	TAG	1
39	P 28921	091	BUSHING, Reducing, 3/8 X 1/4 NPT	2
40	P 28943	091	NIPPLE, 1/4 NPT x 2	1
			NIPPLE, 1/4 NPT x 7-1/2	1

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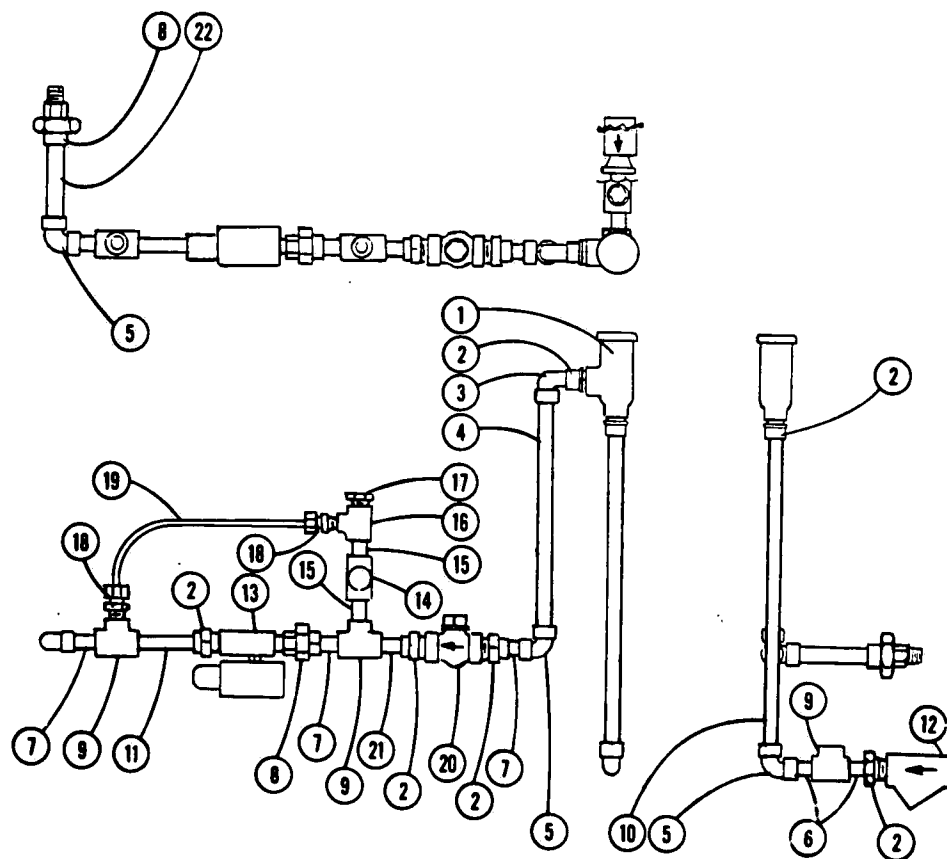


Figure 8-24. WATER SUPPLY LINE.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-24-			WATER SUPPLY LINE	X
1 P	77021 091		VACUUM BREAKER	1
2 P	90211 091		ADAPTOR, 1/2 NPT x 5/8 ODT	6
3 P	90214 091		ELBOW, Street, 1/2 NPT x 5/8 ODT	1
4 P	90335 091		TUBE, 5/8 ODT x .049 W x 8-1/2	1
5 P	90212 091		ELBOW, 5/8 ODT	3
6 P	84350 003		TUBE, 5/8 ODT x .049 W x 3-3/4	2
7 P	90266 091		TUBE, 5/8 ODT x .049 W x 2	3
8 P	90227 091		UNION, 1/2 NPT x 5/8 ODT	2
9 P	45282 091		TEE, 1/2 ODT x 1/2 ODT x 3/8 NPT	3
10 P	78329 091		TUBE, 5/8 ODT x .049 x 12-1/2	1
11 P	90284 091		TUBE, 5/8 ODT x .049 x 5-7/8	1
12 P	47709 091		STRAINER, 1/2 NPT	1
	750890 091		• Screen	1
13 P	150822 928		VALVE, 1/2 NPT	1
	764317 587		• KIT, Valve Repair	1
	764317 578		• KIT, Actuator Repair	1
14 P	83256 001		VALVE, Needle, 3/8 NPT	1
15 P	29017 091		NIPPLE, 3/8 NPT x 2	2
16 P	4928 091		TEE, 3/8 NPT	1
17 P	3441 091		PLUG, Pipe	1
18 P	77936 042		FITTING, Compression, 1/4 ODT x 3/8 NPT	2
19			TUBE, Copper, Soft, 1/4 ODT x .030 Wall x 2 Ft.	1
20 P	150822 712		VALVE, Check, 1/2 NPT	1
21 P	44835 091		TUBE, 5/8 ODT x .049 x 3	1
22 P	84350 003		TUBE, 5/8 ODT x .049 x 3-3/4	1

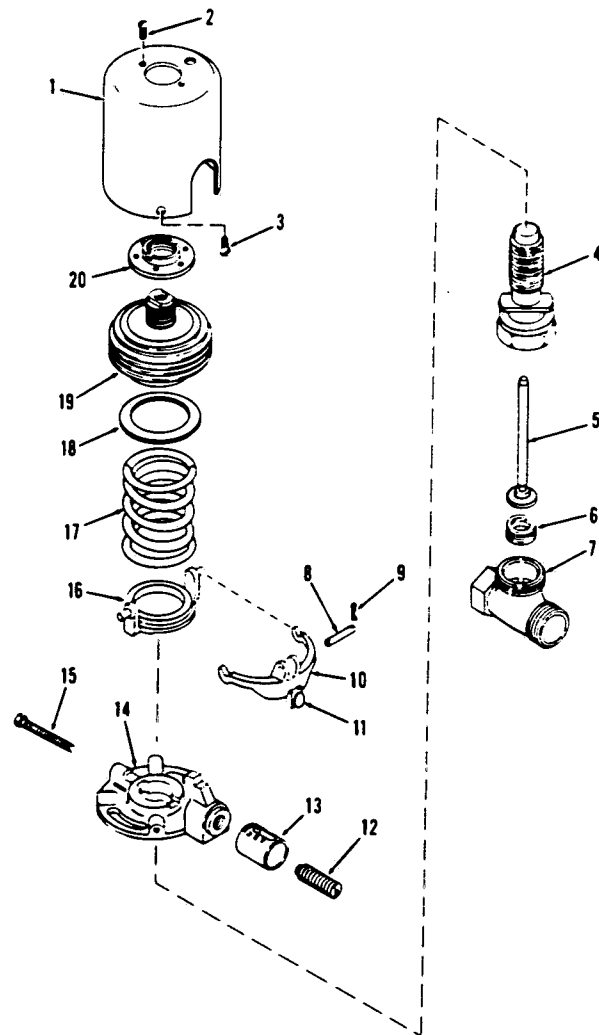


Figure 8-25. STEAM CONTROL VALVE.

FIG. & INDEX NO.	P	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-25-	P	54780	091	STEAM CONTROL VALVE	1
1	P	22349	045	COVER	1
2	P	9276	041	SCREW (8-32 x 3/16)	2
3	P	3969	041	SCREW (1/4-20 x 1/4)	4
4	P	26837	091	SYLPHON AND BONNET ASSEMBLY	1
5	P	28267	091	STEM ASSEMBLY	1
6	P	22425	061	SEAT, Valve	1
7	P	22433	091	BODY, Globe valve	1
8	P	11890	061	PIN, Pivot	1
9	P	8897	091	COTTER PIN	2
10	P	14976	091	FORK ADJ	1
11	P	2299	045	INSERT	1
12	P	11417	045	SCREW, Pressure adjust	1
13	P	31273	044	SLEEVE, Indicator	1
14	P	11887	042	PLATE, Bottom	1
15	P	12471	041	SCREW (1/4-20 x 1-1/2)	1
16	P	12474	001	SEAT, Lower spring	1
17	P	51657	045	SPRING	1
18	P	35911	061	SEAT, Top spring	1
19	P	35880	091	BELLOWS	1
20	P	9172	091	REINFORCEMENT	1

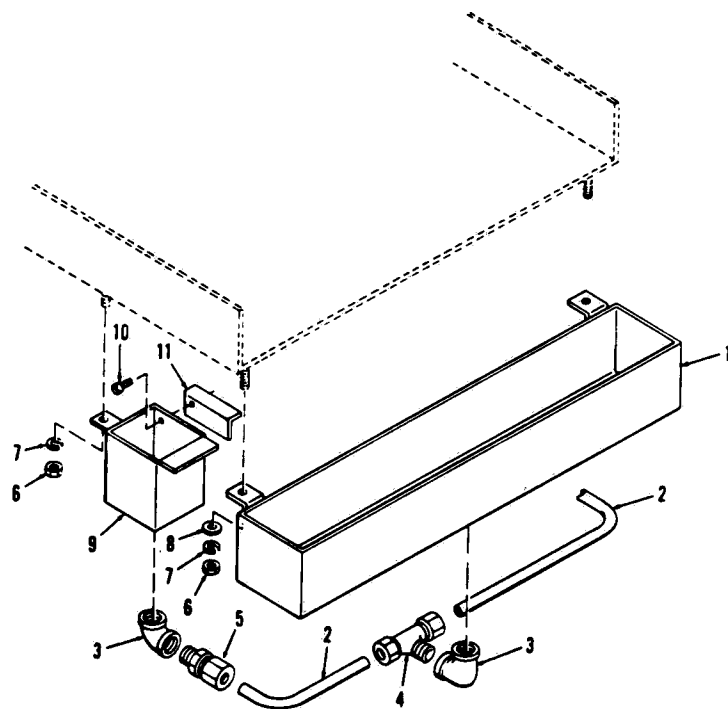


Figure 8-26. EXTERNAL DRAIN.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-26-	P 134301	001	EXTERNAL DRAIN	1
1	P 56129	001	EXTENSION	1
2	P 915	315	TUBE (1/2 OD) (B88)	A/R
3	P 7461	091	ELL (3/4 x 3/8 NPT)	2
4	P 20610	091	TEE, Comp (1/2 ODT x 1/2 ODT x 3/8 NPT)	1
5	P 13658	091	FITTING, Connector (1/2 ODT x 3/8 NPT)	1
6	P 3097	041	NUT (1/4-20)	5
7	P 19678	045	LOCKWASHER (1/4)	5
8	P 10445	091	WASHER, Flat	2
9	P 56131	001	PAN	1
10	P 90170	045	SCREW, Tapping (#8 x 5/16)	1
11	P 150177	001	GUARD	1

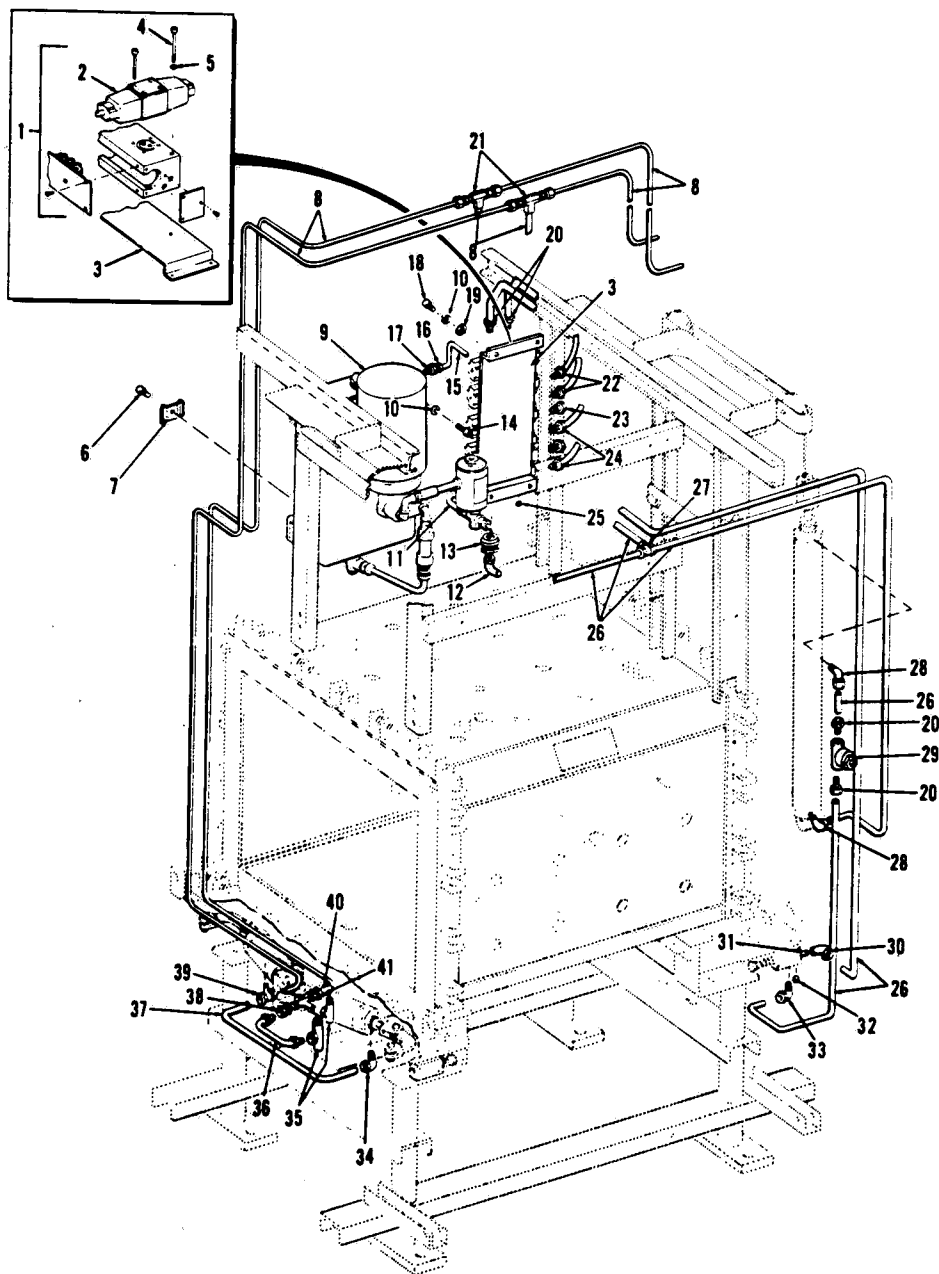


Figure 8-27. HYDRAULIC SYSTEM.

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FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-27-	P 163733	001	HYDRAULIC SYSTEM	1
1	P 146194	001	VALVE PACKAGE	1
2	P 763890	001	VALVE ASSEMBLY (See Fig. 8-29).....	5
3	P 93296	001	PLATE, Mounting	1
4	P 83779	001	SCREW, Socket hd; 1/4-20 x 3-1/2	2
5	P 10436	041	LOCKWASHER, 1/4	4
6	P 33708	041	SCREW, Flat head (#10-32 x 5/8)	10
7	P 81107	001	CLAMP, Tube	11
8			TUBE (1/4 OD x .030 wall copper - ASTM B280)	A/R
9	P 99055	091	HYDRAULIC SUPPLY (See Fig. 8-30).....	1
10	P 19686	061	LOCKWASHER	8
11	P 136291	001	TUBE, Supply	1
12	P 91060	091	CONNECTOR, 1/2 Conduit (90°)	1
13	P 37754	091	BUSHING, Reducing (1-1/4 x 1/2)	1
14	P 45613	091	SCREW, Socket head (1/4-20 x 1-1/2) ..	4
15	P 93295	001	TUBE, Return	1
16	P 45477	091	FITTING (3/8 ODT x 1/4 IPS)	1
17	P 849	091	BUSHING, Reducing (3/8 x 1/4)	1
18	P 41992	061	SCREW, Socket head (1/4-20 x 5/8)	4
19	P 49134	061	WASHER, Flat	4
20	P 78293	091	FITTING, Comp (3/8 ODT x 3/8 IPS)	6
21	P 46097	091	FITTING, Comp tee (1/4 ODT)	2
22	P 45565	091	FITTING, Comp (1/4 ODT x 1/4 IPS)	6
23	P 20580	042	PLUG, Pipe (1/4 IPS)	2
24	P 78292	091	FITTING, Comp (3/8 ODT x 1/4 IPS)	2
25	P 5896	048	PLUG, Pipe (3/8 IPS)	2
26			TUBE, (3/8 OD x .032 Wall soft copper - ASTM B88)	A/R
27	P 78295	091	FITTING, Compression tee (3/8 ODT) ...	1
28	P 45530	091	FITTING, Comp ell (3/8 ODT x 3/8 IPS).	4
29	P 81051	001	VALVE, Flow control	2
30	P 81065	001	FITTING, Comp ell (3/8 ODT x 1/4 IPS).	2
31	P 28925	091	NIPPLE (1/4 x 3)	2
32	P 48511	061	PLUG, Pipe (1/8-27)	2
33	P 46055	091	FITTING, Comp ell (3/8 ODT x 1/4 IPS).	2
34	P 42510	091	FITTING, Comp ell (1/4 ODT x 1/8 IPS).	2
35	P 40008	091	ELL, Street (1/8 IPS)	4
36	P 81072	001	HOSE ASSEMBLY	2
37	P 51665	091	TUBE	2
38	P 81071	001	ADAPTER, Straight (1/8 NPT)	2
39	P 42581	091	FITTING, Comp tee (1/4 ODT x 1/8 IPS).	2
40	P 81067	001	FITTING, Comp straight (1/4 ODT x 1/8 IPS)	2
41	P 81069	001	TEE, Pipe (1/8 NPT)	2
	P 13522	091	TUBE, Oil funnel	1
	P 13523	091	TUBE, Oil fill	1

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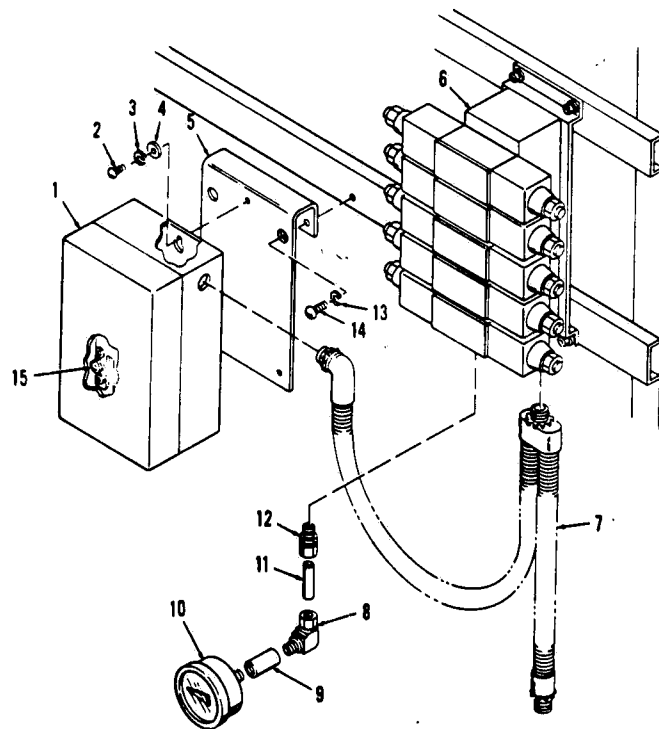


Figure 8-28. HYDRAULIC MOTOR STARTER ARRANGEMENT.

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FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY		
8-28-				HYDRAULIC MOTOR STARTER ARRANGEMENT .	1		
1	P	617100	402	STARTER, Motor	1		
2	P	129062	001	SCREW, Round head (#10-32 x 3/8)	3		
3	P	76801	045	LOCKWASHER (#10)	3		
4	P	20844	061	WASHER (#10)	3		
5	P	617100	491	BRACKET	1		
6	P	146194	001	VALVE PACKAGE (See Fig. 8-29).....	1		
7	P	626973	969	CABLE ASSEMBLY	1		
8	P	42510	091	ELL, Comp (1/4 ODT x 1/8 NPT)	1		
9	P	1306	091	COUPLING (1/8 NPT)	1		
10	P	54797	091	GAUGE, Pressure	1		
11	P	80221	091	TUBE (1/4 x 2)	1		
12	P	77936	042	FITTING, Comp (3/8 NPT x 1/4 ODT) ...	1		
13	P	19678	045	LOCKWASHER (1/4)	2		
14	P	3947	041	SCREW, Round head (1/4-20 x 1)	2		
15	P	611962	685	HEATER COIL (5.6-6.25 AMP)	1		

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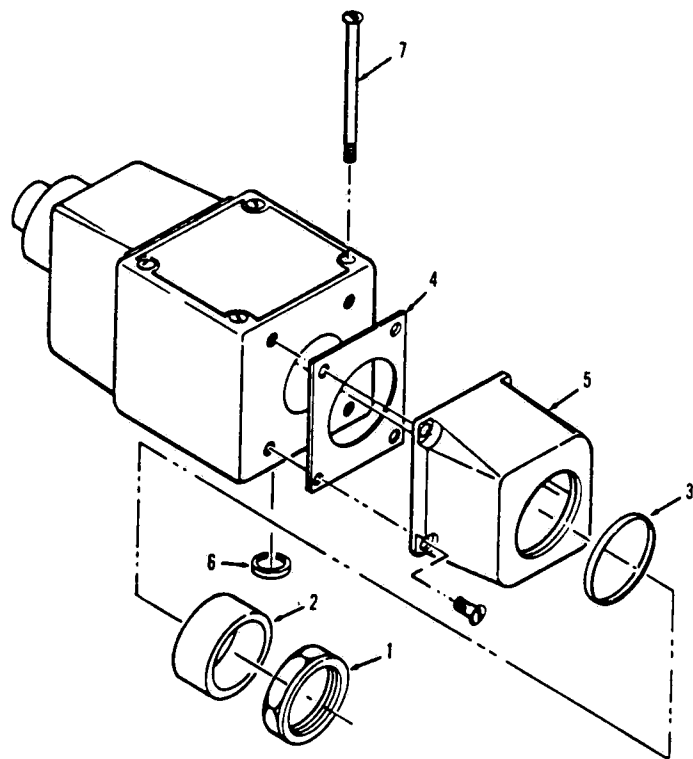


Figure 8-29. VALVE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-29-	P 763890	001	VALVE ASSEMBLY	1
1	P 762624	001	KIT, Valve repair (includes 1 thru 7)	A/R
2			. NUT, Coil retaining	2
3			. COLLAR	2
4			. "O" RING, Coil	2
5			. GASKET, Coil	2
6			. COIL ASSEMBLY	2
7			. "O" RING	4
			. BOLT KIT	1

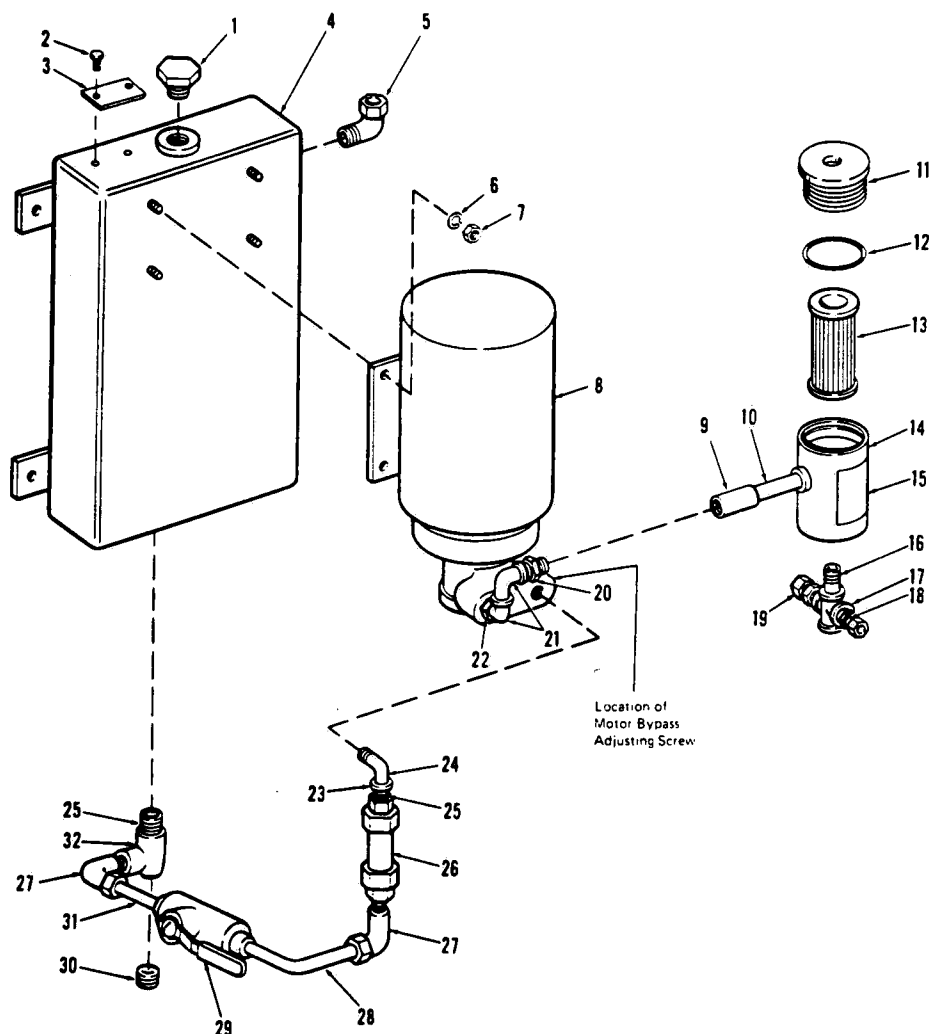


Figure 8-30. HYDRAULIC SUPPLY PACKAGE.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-30-	P 99055 091		HYDRAULIC SUPPLY PKG (With ball valve)	1
1	P 51599 042		CAP, Oil fill	1
2	P 13289 091		SCREW, Drive (#6 x 3/8)	2
3	P 81321 091		PLATE, Caution	1
4	P 98052 010		SUMP ASSEMBLY	1
5	P 45530 091		FITTING, Ell	1
6	P 19686 061		LOCKWASHER (1/4)	4
7	P 3097 041		NUT (1/4)	4
8	P 51596 091		MOTOR AND PUMP ASSEMBLY	1
	P 752137 091		. MOTOR ONLY	1
	P 752136 091		. PUMP ONLY	1
	P 764319 998		. SHAFT OIL SEAL	1
	P 757067 001		. PUMP GASKET (SHIM) SILVER .0005" THK.	*
	P 757067 002		. PUMP GASKET (SHIM) AMBER .001" THK ..	*
	P 757067 004		. PUMP GASKET (SHIM) RED .002" THK	*
	P 757067 005		. PUMP GASKET (SHIM) GREEN .003" THK ...	*
	P 757067 006		. PUMP GASKET (SHIM) TAN .004" THK	*
	P 757067 007		. PUMP GASKET (SHIM) BLUE .005" THK ...	*
9	P 1310 091		COUPLING	1
10	P 28925 091		NIPPLE (1/4 x 3)	1
	P 56276 001		OIL FILTER ASSEMBLY	1
11	P 56271 001		. CAP, Filter	1
12	P 150501 001		. O-RING	1
13	P 50697 091		. FILTER	1
14	P 56270 001		. CASE, Filter	1
15	P 150502 001		. LABEL	1
16	P 27422 091		NIPPLE (1/4 x 1-1/4)	1
17	P 45060 091		CROSS (1/4)	1
18	P 45565 091		FITTING, Straight (1/4 ODT x 1/4 IPS)	1
19	P 78292 091		FITTING, Straight (3/8 ODT x 1/4 IPS)	1
20	P 43648 091		VALVE, Check	1
21	P 1619 091		ELL, Street (1/4)	2
22	P 76053 091		REDUCER (1/2 to 1/4)	1
23	P 837 091		REDUCER (1/2 x 3/8)	1
24	P 1634 091		ELL, Street (1/2)	1
25	P 29014 091		NIPPLE (3/8 x 1-1/4)	2
26	P 42542 091		STRAINER	1
27	P 81165 001		ELBOW, MALE (5/8 ODT x 3/8 IPS)	2
28	P 81166 001		TUBE (5/8 ODT)	1
29	P 81164 001		VALVE, Ball	1
30	P 5896 048		PLUG, Pipe (3/8)	1
31	P 91411 091		TUBE (5/8 ODT)	1
32	P 4928 042		TEE (3/8)	1
*As required to maintain end clearance of .001".				

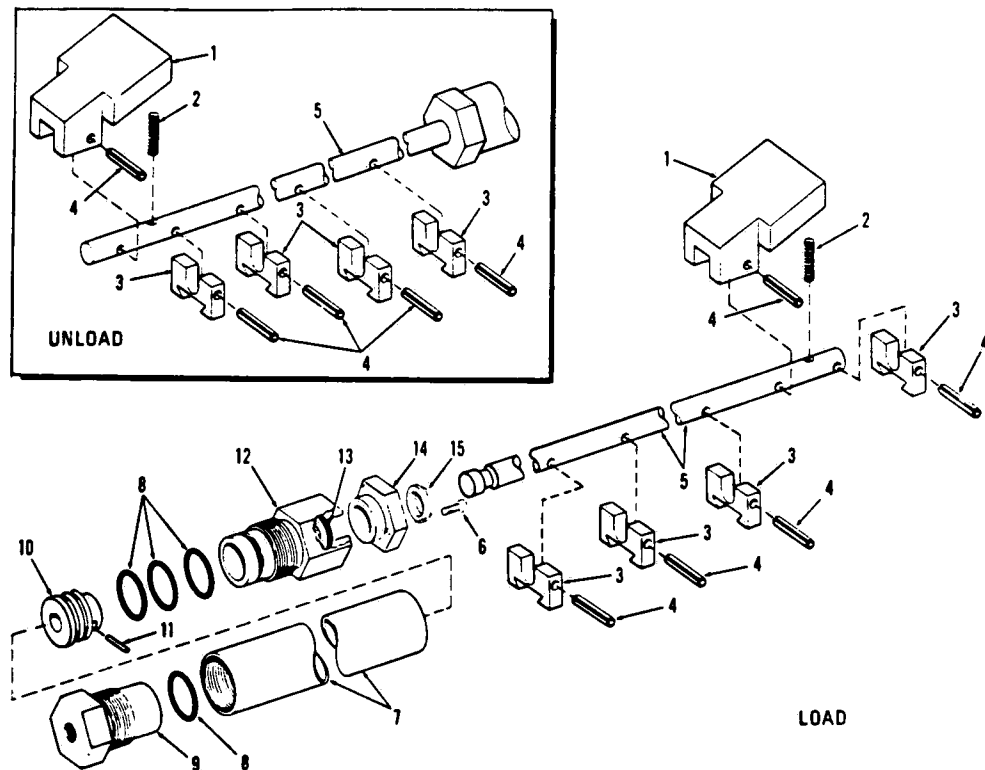


Figure 8-31. CYLINDER ASSEMBLY: Loading and Unloading.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY		
8-31-	P	98129	091		CYLINDER, Loading	1		
	P	98490	091		CYLINDER, Unloading		1	
	1	P	51331	034	END, Piston	1	1	
	2	P	76465	045	SPRING	1	1	
	3	P	76633	061	DOVETAIL	4	4	
	4	P	47979	061	PIN, Roll (3/16 x 1-1/4)	5	5	
	5	P	55988	001	ROD, Piston loading	1		
		P	55989	001	ROD, Piston unloading		1	
	6	P	50527	061	SCREW (#8-32 x 1/2)	3	3	
	7	P	76635	010	BODY, Cylinder	1		
		P	51281	010	BODY, Cylinder		1	
	8	P	45959	091	"O" RING	4	4	
	9	P	51269	091	END, Cylinder body	1	1	
	10	P	79822	001	HEAD, Piston	1	1	
	11	P	42617	045	SCREW, Set (#6-32 x 1/4)	1	1	
	12	P	135759	002	END CYLINDER	1	1	
13	P	82101	001		SEAL	1	1	
14	P	135759	001		CAP, End	1	1	
15	P	82102	001		RING, Wiper	1	1	
16	P	757703	091		SEAL KIT - Not shown	1	1	

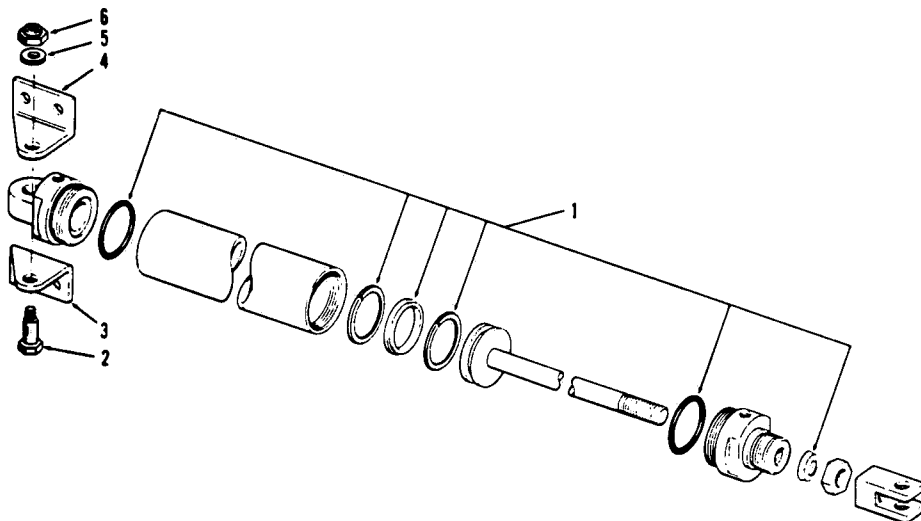


Figure 8-32. LOCKING CYLINDER.

FIG. & INDEX NO.		PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY				
8-32-	P	51584	091	LOCKING CYLINDER	1				
1	P	752640	091	SEAL, Kit	1				
2	P	150437	001	SCREW, Shoulder	1				
3	P	150435	001	BRACKET, LH	1				
4	P	150436	001	BRACKET, RH	1				
5	P	5503	045	WASHER, Plain	1				
6	P	52151	091	NUT	1				

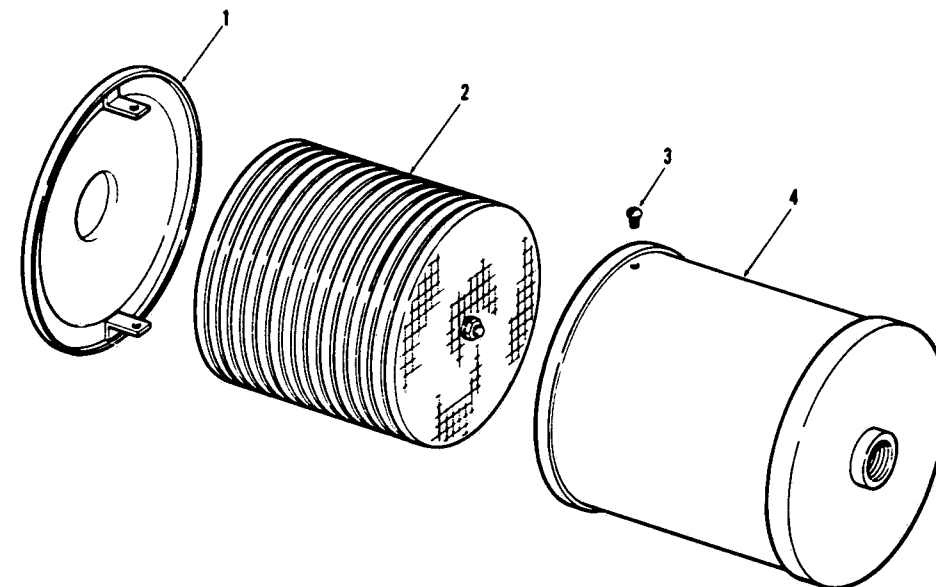


Figure 8-33. AIR FILTER ASSEMBLY.

FIG. & INDEX NO.		PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY				
8-33-	P	91173	091	AIR FILTER ASSEMBLY.....	1				
1	P	91368	091	COVER ASSEMBLY.....	1				
2	P	91367	091	CARTRIDGE ASSEMBLY.....	1				
3	P	12283	041	SCREW, Round head (#10-32 x 1/4).....	2				
4	P	96526	091	BODY ASSEMBLY.....	1				



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