GENERAL PURPOSE STEAM STERILIZER

PSS11 / PRI-MATIC® 100 CONTROL

OPERATOR MANUAL

UNIVERSITY OF CALIFORNIA - DAVIS

STERILIZER MODEL NUMBER:	**PSS11-B-MESD**
STERILIZER JOB / SERIAL NUMBER:	**18622**
STERILIZER NATIONAL BOARD NUMBER:	**3548**
CONTROLLER SERIAL NUMBER:	**9K903-00209**
PRINTER TYPE:	**CYBERTECH**
PRINTER SERIAL NUMBER:	**3577**
HMI/OIT SOFTWARE VERSION:	**2.00**
HMI/OIT(S) SERIAL NUMBER(S)	**717211-00091**
BOILER MODEL NUMBER OR N/A:	**ES36AF3-PRI**
BOILER SERIAL NUMBER OR N/A:	**ESA199190-W18**

February 26, 2019

General Purpose Cover
Manual Version 1.00
Software Version 2.000
January 15, 2019

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PRIMUS Sterilizer Company, LLC, Omaha, NE 68138

This General Purpose Steam Sterilizer Operator Manual includes six parts:

General Information
Installation
User
Process, Programming, & Parameters
Factory Acceptance Test
Maintenance

Once installation of a new PRIMUS General Purpose sterilizer with *PRI-Matic® 100 Control* is complete, the user is urged to conduct validation studies according to accepted standards (e.g. FDA cGMP, ANSI) and document the effectiveness of user selected cycle parameters for <u>each</u> type of load to be sterilized.

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PRIMUS GENERAL PURPOSE STERILIZER

PSS11 / PRI-MATIC® 100 CONTROL

PART I

GENERAL INFORMATION

January 15, 2019

Part I: GENERAL INFORMATION MANUAL
Manual Version 1.00
SW 2.000

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Section 1.0 General Information

This manual contains general information about a PRIMUS General Purpose sterilizer with PRI-Matic® 100 Control. This sterilizer is specifically designed to process goods using only the cycles as specified in the user manual. If there is any doubt about a specific material or product, we suggest that you contact the manufacturer of the product for the recommended sterilization technique.

1.1 Warranty

This sterilizer is not designed to process flammable liquids or liquids in containers that are not designed for sterilization. Any alteration of the sterilizer, which affects its operation, will void the warranty and could violate state and local regulations and jeopardize insurance coverage. Failure to perform suggested maintenance may cause the warranty to be null and void. Refer to the following PRIMUS Sterilizer Equipment Warranty for further clarification on what is covered.

LIMITATIONS AND LIABILITY AND INDEMNITY

IN NO CASE WHETHER AS A RESULT OF A BREACH OF CONTRACT, BREACH OF WARRANTY OR TORT (INCLUDING PRIMUS' OR CUSTOMER'S WILLFUL ACT OR NEGLIGENCE OR STRICT LIABILITY) SHALL PRIMUS OR CUSTOMER BE LIABLE TO THE OTHER FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES INCURRED BY THE OTHER, INCLUDING, BUT NOT LIMITED TO, LOSS OF REVENUE, PROFITS OR GOODWILL. HOWEVER, NOTHING CONTAINED IN THIS AGREEMENT IS INTENDED TO RELIEVE EITHER PRIMUS OR CUSTOMER FROM CLAIMS, LIABILITY, DAMAGES OR EXPENSES RESULTING FROM BODILY INJURY, INCLUDING DEATH, OR FROM PROPERTY DAMAGE INCURRED DUE TO THE WILLFUL ACTS, THE NEGLIGENCE OF OR THE STRICT LIABILITY OF THAT PARTY.

PRIMUS AGREES TO DEFEND, INDEMNIFY AND HOLD CUSTOMER HARMLESS FROM ANY AND ALL CLAIMS, LIABILITY, DAMAGES OR EXPENSES DUE TO PERSONAL INJURIES, INCLUDING DEATH, TO EMPLOYEES OF PRIMUS AND CUSTOMER AND TO THIRD PARTIES AND FOR PROPERTY DAMAGE TO THE EXTENT OF THE WILLFUL ACTS OF THE NEGLIGENCE OF PRIMUS OR THE STRICT LIABILITY OF PRIMUS CAUSED BY THE ACTS OR OMISSIONS OF PRIMUS. CUSTOMER AGREES TO DEFEND, INDEMNIFY AND HOLD PRIMUS HARMLESS FROM ANY AND ALL CLAIMS, LIABILITY, DAMAGES OR EXPENSES DUE TO PERSONAL INJURIES, INCLUDING DEATH, TO EMPLOYEES OF CUSTOMER AND PRIMUS AND TO THIRD PARTIES AND FROM PROPERTY DAMAGE TO THE EXTENT OF THE WILLFUL ACTS OR THE NEGLIGENCE OF CUSTOMER OR THE STRICT LIABILITY OF CUSTOMER CAUSED BY THE ACTS OR OMISSIONS OF CUSTOMER.

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WARRANTY: USA and CANADA

PRIMUS STERILIZER COMPANY EQUIPMENT WARRANTY

PRIMUS Sterilizer Company, LLC (PRIMUS) makes the following warranty to the original owner with respect to its products:

•**WARRANTY**: All PRIMUS manufactured equipment and products are fully warranted against defects in materials and workmanship under normal use and operation for one year from the installation and start up of the equipment or eighteen months from the date of delivery, whichever occurs first.

PRIMUS Sterilizer pressure vessels are warranted against defects in materials and workmanship under normal use and operation for fifteen years. PRI-Furb™ models carry a one (1) year parts warranty on components only. In all cases the warranty is valid where the sterilizer is maintained under a continuous PRIMUS Preventative Maintenance Service Contract. Where the sterilizer is not continuously maintained under PRIMUS Preventative Maintenance Contract, warranty may be null and void. A steam source quality check will be required in all cases to eliminate the presence of chlorides which will void all warranty coverages if thresholds above 0.8ppm are found.

Unless otherwise specified, service labor required to repair or replace parts will be provided upon request, without further charge for a period of 1 year from the start of the warranty period. Thereafter all repair costs shall be borne by the Purchaser. This warranty does not extend to any equipment or products which have been subjected to misuse, neglect, accident or improper installation or application, or which have been serviced or altered by persons not authorized by PRIMUS.

PRIMUS' sole liability and the Purchaser's sole remedy under this warranty is limited to repair or replacement of the defective equipment or product at PRIMUS' option. Repair or replacement of the defective equipment or product will be provided at Purchaser's facility, or at PRIMUS' plant by an authorized representative of PRIMUS. Replaced parts shall become the property of PRIMUS. All returns must be made under a 'Return Materials Authorization' (RMA) assigned by PRIMUS. PRIMUS shall not be liable for special, indirect or consequential damage or expense.

This warranty does not cover damage or defects caused by the following: Use of parts other than PRIMUS authorized parts, Acts of God, Labor disputes, Utility malfunction, errors in installation of the equipment; accidents; abuse; misuse; tampering; alteration; modification; improper service; chlorides and corrosive chemicals; or lack of documented preventive maintenance as specified by the maintenance manual.

No waiver or modification of any provisions of this warranty will be binding upon PRIMUS unless agreed to, in writing, by a duly authorized official of PRIMUS. PRIMUS does not authorize any person or company to create any warranty obligations on its behalf.

This warranty sets forth the only warranty applicable to PRIMUS equipment and parts. No other representation or warranty on the part of PRIMUS, expressed or implied, shall apply to equipment or parts, or their performance, all such warranties (including any warranty of merchantability or fitness for any purpose) being hereby disclaimed. PRIMUS shall in no event be liable in respect to loss of business or profits on any similar or dissimilar consequential or incidental damages or losses arising out of, or in connection with, this equipment.

**This warranty does not cover repair or replacement of expendable service parts, including but no limited to, doors seals, lubricants, valve kits, lamps, fuses, gaskets and filters.

F1077 PRIMUS Equipment Warranty 1.70

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WARRANTY: INTERNATIONAL

PRIMUS STERILIZER COMPANY EQUIPMENT WARRANTY (Excluding USA and Canada)

PRIMUS Sterilizer Company, LLC (PRIMUS) makes the following warranty to the original owner with respect to its products:

•**WARRANTY**: All PRIMUS manufactured equipment and products are fully warranted against defects in materials and workmanship under normal use and operation for one year from the installation and start up of the equipment or eighteen months from the date of delivery, whichever occurs first.

PRIMUS Sterilizer pressure vessels are warranted against defects in materials and workmanship under normal use and operation for ten years. PRI-Furb™ models carry a one (1) year parts warranty on components only. In all cases the warranty is valid where the sterilizer is maintained under a continuous PRIMUS Preventative Maintenance Service Contract. Where the sterilizer is not continuously maintained under PRIMUS Preventative Maintenance Contract, warranty may be null and void. A steam source quality check will be required in all cases to eliminate the presence of chlorides which will void all warranty coverages if thresholds above 0.8ppm are found.

Unless otherwise specified, service labor required to repair or replace parts will be provided by International Dealer. This warranty does not extend to any equipment or products which have been subjected to misuse, neglect, accident or improper installation or application, or which have been serviced or altered by persons not authorized by PRIMUS.

PRIMUS' sole liability and the Purchaser's sole remedy under this warranty is limited to repair or replacement of the defective equipment or product at PRIMUS' option. Repair or replacement of the defective equipment or product will be provided at Purchaser's facility, or at PRIMUS' plant by an authorized representative of PRIMUS. Replaced parts shall become the property of PRIMUS. All returns must be made under a 'Return Materials Authorization' (RMA) assigned by PRIMUS. PRIMUS shall not be liable for special, indirect or consequential damage or expense.

This warranty does not cover damage or defects caused by the following: Use of parts other than PRIMUS authorized parts, Acts of God, Labor disputes, Utility malfunction, errors in installation of the equipment; accidents; abuse; misuse; tampering; alteration; modification; improper service; chlorides and corrosive chemicals; or lack of documented preventive maintenance as specified by the maintenance manual.

No waiver or modification of any provisions of this warranty will be binding upon PRIMUS unless agreed to, in writing, by a duly authorized official of PRIMUS. PRIMUS does not authorize any person or company to create any warranty obligations on its behalf.

This warranty sets forth the only warranty applicable to PRIMUS equipment and parts. No other representation or warranty on the part of PRIMUS, expressed or implied, shall apply to equipment or parts, or their performance, all such warranties (including any warranty of merchantability or fitness for any purpose) being hereby disclaimed. PRIMUS shall in no event be liable in respect to loss of business or profits on any similar or dissimilar consequential or incidental damages or losses arising out of, or in connection with, this equipment.

**This warranty does not cover repair or replacement of expendable service parts, including but no limited to, doors seals, lubricants, valve kits, lamps, fuses, gaskets and filters.

F2400 PRIMUS Equipment Warranty (Excluding USA and Canada) 1.00

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Software Certification Statement

SOFTWARE CERTIFICATION

by

PRIMUS Sterilizer Company, LLC

The delivered software for the PRI-MATIC ® PSS11 IDEC MicroSmart™ sterilizer has been developed following industry standard processes, and procedures. The software is fully documented from the requirement phase through design, implementation and system integration. Backup copies of the software and its related documentation are maintained. The software has been subjected to multiple levels of testing from module to end product. The testing is supported by a Software Test Description containing test cases, and test data with expected and actual results. Any problems encountered during development have been corrected and the software has been subjected to complete and thorough regression testing. We certify that the delivered software is factory validated and was developed with an official authorized license.

Jim Fry, President & CEO

1.3 Service Agreement

The cost-effective way to prevent costly downtime due to equipment malfunction is with regularly scheduled maintenance performed by factory authorized qualified technicians. PRIMUS offers extended service agreements to provide regular maintenance of your sterilizer that will help correct little problems before they become big ones.

PRIMUS service combines the precise maintenance program and factory-trained technicians to assure you of maximum productivity. Technicians thoroughly inspect, clean, adjust, and provide all necessary maintenance to keep your sterilizer performing according to factory specifications.

A service agreement with PRIMUS will ensure that the sterilizer will be warranted for fifteen years.

1.4 Safety Precautions

The following is a summary of how WARNINGS and CAUTIONS are denoted in this manual. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to the equipment. These precautions are found throughout the document where they are applicable. Carefully read the manual before proceeding to use or service the unit.

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IN THIS MANUAL WARNINGS DRAW ATTENTION TO THE POTENTIAL FOR DANGER TO PERSONNEL. AS DEMONSTRATED HERE, THE ENTIRE WARNING NOTATION IS EMPHASIZED BY THE ICON TO THE LEFT AND BOLD, CAPITAL PRINT.

IN THIS MANUAL, CAUTIONS DRAW ATTENTION TO THE POTENTIAL FOR DAMAGE TO EQUIPMENT. AS DEMONSTRATED HERE, THE CAUTION INFORMATION IS EMPHASIZED BY THE ICON TO THE LEFT AND CAPITAL PRINT.

1.5 Bibliography

ASME (American Society of Mechanical Engineers) Section VIII, Division 1

Association for the Advancement of Medical Instrumentation; AAMI Standards and Recommended Practices, Volume 1 Sterilization; Arlington VA, 1992

Association for the Advancement of Medical Instrumentation; AAMI Standards and Recommended Practices, Volume 1S, Sterilization Supplemental; Arlington VA, 1994

National Fire Protection Association, National Electrical Code; ANSI/NFPA 70. Boston, 1990.

NPC - National Plumbing Code

Perkins, John J.; Principles and Methods of Sterilization in Health Sciences; Charles C. Thomas Co., 1970

Russel, A.D.; Hugo, W.B.; Ayliffe, G.A.J.; Principles and Practice of Disinfection, Preservation, and Sterilization; Blackwell Scientific, Boston, 1982.

United States Pharmacopoeia Convention Inc., United States Pharmacopoeia: XXII Revision. Rockville MD. USP, 1990.

1.6 Glossary

ABSOLUTE PRESSURE	-	Pressure that is measured when the reference baseline is 0 kPa (0) psia and not atmospheric pressure.
BS EN 285	-	BS EN 285 Sterilization – Steam Sterilizers – Large Sterilizers is the title of the British Standard European Norms adopted standard for Steam Sterilizers.
CALIBRATION	-	Must be performed on PRIMUS steam sterilizers at the conclusion of Installation and Commissioning at the user's site.
EFFLUENT CONFIGURATION	-	The sterilizer is configured to ensure that all effluent is maintained within the sterilizer chamber until the end of exposure (sterilization phase).
HEPA	-	High-Efficiency Particulate Arrestor – A HEPA filter is used in the sterilizer Chamber Air supply line.
HMI		HMI is the abbreviation for a Human Machine Interface. The HMI is the display that is used as the user interface. HMI is frequently interchanged with Operator Interface Terminal (OIT) and/or with Operator Panel.
NIST	-	National Institute of Standards and Testing
OPERATOR	-	Person or persons charged with day-to-day operation of the sterilization equipment.
P-2A	-	A manufacturer's data report for all types of electric boilers as required by the Provisions of the ASME Code Rules, Section 1.
PARAMETER	-	Quantities or constant values that vary with the circumstances of application. Parameters are selected from menus that are accessible on the hmi interface screen.
SATURATED STEAM	-	Saturated steam is water in its gaseous phase. Maximum partial pressure of steam as a gas which can be admitted to an environment at a given temperature before the steam changes state from a gas to a liquid.
U-1	-	A manufacturer's data report for pressure vessels as required by the Provisions of the ASME Code Rules, Section VIII, Division 1. This form is filed with the National Board of Boiler and Pressure Vessel Inspectors.
VALIDATION	-	A documented process, designed or approved by the user or the user's agent as evidence that a sterilizer is capable of providing successful sterilization for a process designed by the user. Usually motivated by regulatory standards that may be applicable to the user's sterilization processing.

1.7 Acronym List

cGMP	-	Current Good Manufacturing Practices
EN 285	-	BS EN 285 Standard
E-Stop	-	Emergency Stop
FAT	-	Factory Acceptance Test
GMP	-	Good Manufacturing Practices
I/O	-	Input/Output
LED	-	Light Emitting Diode
PLC	-	Programmable Logic Controller
SRS	-	Software Requirements Specification
STD	-	Software Test Description

1.8 Manufacturer's Records

Refer to Appendix A, Manufacturer's Records, for the manufacturer's records applicable to this unit.

PRIMUS GENERAL PURPOSE STERILIZER

PSS11 / PRI-MATIC® 100 CONTROL

PART II

INSTALLATION INSTRUCTIONS

January 15, 2019

Part II Installation PRI-MATIC
Manual Version 1.00
Software Version 2.00

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PART II INSTALLATION MANUAL

ALL SERVICE AND MAINTENANCE IS TO BE PERFORMED BY QUALIFIED PRIMUS AUTHORIZED TECHNICIANS WHO ARE KNOWLEDGEABLE AND TRAINED IN THE APPROPRIATE DISCIPLINES AND PROCEDURES DESCRIBED IN THE MANUAL

SECTION 1.0 SAFETY PRECAUTIONS

The following is a summary of how WARNINGS and CAUTIONS are denoted in this manual. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to the equipment. These precautions are found throughout the document where they are applicable. Carefully read the manual before proceeding to use or service the unit.

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SECTION 2.0 PRE-INSTALLATION

2.1 Review Installation Requirements

We recommend you review the installation information below prior to beginning the installation of the sterilizer. Be sure to check the Occupational Health and Safety Act, National Electric Code as well as local electric and plumbing codes for any special requirements that may pertain to the installation of this sterilizer. Refer to the Uncrating Instructions attached to the sterilizer to ensure the machine is not damaged during uncrating.

Unpack the front panel and assemble to the sterilizer. Four (4) Allen-head trim screws are provided for attaching the panels to the frame. Refer to the layout drawing; Part VI Maintenance Manual, Section 6.0.

2.2 Examine Equipment

Inventory all delivered equipment against the packing list. Check all boxes and wrapping materials prior to removal. Any damage should be promptly reported to the transportation company responsible for delivery and to PRIMUS Sterilizer Company, LLC. Should you determine an item is missing, notify PRIMUS **immediately**.

2.3 Review Drawings

Installation personnel should review, and thoroughly familiarize themselves with the Equipment Arrangement, P&ID, Electrical, and Bioseal Layout drawings prior to installing the sterilizer.

2.4 Pre-Installation Inspection

The following items should be checked prior to installing the sterilizer. Refer to Equipment Arrangement drawing, Section 6.0: Drawings, of Part VI, Maintenance Manual for the utility specifications.

Access Clearance

If this sterilizer is installed next to other equipment, shutoff valves and disconnect switches must be placed to allow service shut off to one piece of equipment at a time. All such valves and switches should be clearly labeled as to which piece of equipment they service.

Utility Service Lines

Check the Equipment Arrangement Diagram for supply line sizes, pressure and other utility requirements for your PRIMUS Sterilizer.

Water Supply - Backflow prevention is by others, check local codes for requirements. The sterilizer is not equipped with a vacuum breaker or backflow prevention device.

Shutoff valves, capable of being locked in OFF position should, be installed in steam and water supply lines near the sterilizer. This will enable the sterilizer to be serviced without shutting off the building supply.

Disconnect switches, capable of being locked in the OFF position, must also be installed in electric supply lines near the sterilizer.

IMPORTANT: Sizes shown are for terminal connections only. Building drain lines must be sized to provide for specified pressure and flow rates.

Electrical

Sterilizer Controls: A separate terminal box for electric service to the sterilizer controls.

Vacuum Pump: A separate terminal box for electric service to vacuum pump

Building Steam Supply Line

Verify that the building steam supply line is well drained so as to provide condensate free steam between 97 and 100% saturated vapor to the sterilizer. The customer shall provide a trap in the steam line, before the shutoff valve, to remove condensate. The customer also shall supply a reliable gauge on the same system of the connections.

Since steam supply lines carry steam and condensate, additional steam line draining and separation of liquid may be required.

Refer to the utilities service requirements on the Equipment Arrangement drawing.

Pure Steam: Sanitary tri-clamp service connection.

DO NOT SUPPLY SUPER HEATED STEAM. IT IS HAZARDOUS AND IT DOES NOT CONTRIBUTE TO THE HUMIDIFICATION NECESSARY FOR THE STEAM STERILIZATION PROCESS.

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Cold Water	When using water of greater hardness than recommended on the General Arrangement diagram, a water-softening filter should be installed in the water line servicing the sterilizer. Refer to the Equipment Arrangement drawing for the water flow rates. Backflow prevention is by others, check local codes for requirements. The sterilizer is not equipped with a vacuum breaker or backflow prevention device.
WFI Water Supply (as applicable)	WFI Water Supply (as applicable)
Sterilizer Drain Termination	Install a sloping pipe (usually a minimum 1/8” slope per foot), with reduced bore, from the sterilizer outlet to the drain. An atmospherically vented drain is required.
Generator Drain (For units with a generator only)	The generator drain is on the side or bottom of the generator depending on the size of the Boiler. NOTE: If a hot blown-down is performed on the generator, the drain line must be connected to a receiver capable of withstanding 212°F (100°C) water. If a cold blow-down is performed, the connection to a standard drain is acceptable. See user’s manual for more information about blowing down integral generator.
Instrument Air	Instrument air is required for air actuated valves.
Process Air	Process compressed air is required for the optional Air-Over phase.

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SECTION 3.0 STERILIZER INSTALLATION

3.1 Stabilizing and Leveling

Recessed Models:

a. Move the sterilizer into position. Refer to the architect's approved drawings for location and vessel orientation.

b. If additional vertical clearance is required to move the unit into the wall opening, lower the vessel by screwing the feet into the frame.

c. Place the metal footpads provided under the adjustable feet to distribute the point loads, and stabilize the sterilizer. If seismic anchoring is required a drawing will be provided. The installation instructions are attached to the drawing.

d. Adjust the feet by screwing them in or out of the frame until the sterilizer frame is level and centered in the wall opening. Use a carpenter's bubble level on both front-to-rear and side-to-side frame members. Repeat the process periodically, during the installation.

NOTE

If transfer carriages are used, be sure to compensate for the height of the transfer carriages.

e. Position the anchor plates as depicted in the drawing and anchor to the floor through the holes provided in the plates.

Cabinet Models:

a. Move the sterilizer into position. Refer to the Installation Diagram and Specifications Drawing ("Equipment Arrangement") or drawings provided and approved by the customer's architect.

b. Adjust the height of the sterilizer, and anchor as outlined above under Recessed Models.

3.2 Installing a Vertical Single Door Unit

NOTE

It is critical to the overall operation of all PRIMUS sterilizer door(s) that the sterilizer be level in all directions.

WARNING

LACERATION HAZARD - USE A SPECIALLY DESIGNED TOOL TO HOLD THE BANDING STRAP WHILE IT IS BEING CUT. THIS WILL HELP AVOID INJURIES TO EYES AND HANDS WHEN THE STRAPS ARE CUT AND TENSION IS RELEASED. ALWAYS WEAR PROTECTIVE EYE GOGGLES WHEN CUTTING STEEL BANDS.

CAUTION

PROTECTIVE PLASTIC COVERING SHOULD BE REMOVED SLOWLY TO REDUCE THE LEVEL OF STATIC DISCHARGE.

a. Remove the banding straps from the door. The door assembly consists of the door, the counter balance, the counter balance guide shafts the cable and pulley, and the door switch assemblies.

b. Adjust frame counter balance assembly for the door to provide free, smooth, and level movement along the counter balance guide shafts.

c. Open the door counter weight housing and ensure the lead shot is evenly distributed.

d. Adjust the door switch assembly to provide for 1/64" of travel beyond closure of the door switch contacts.

3.2.1 Cabinet Enclosed

a. If the cabinet panel support brackets are not assembled on the frame, assemble them with the nuts, bolts and washers provided. Refer to the layout drawings.

b. Unpack and assemble the front and side panels, using fastening hardware provided.

c. Adjust the panel-mounting studs to provide flush connection of all panels.

3.2.2 Recessed

Move sterilizer backward into the wall opening until panel-trim gaskets fit tight against face wall.

3.3 Double Vertical Door Unit

Refer to the installation instructions in paragraph 3.2, for single vertical door and repeat for both doors.

3.3.1 Cabinet Enclosed

Attach framing for cabinet sides and hang the panels.

3.3.2 Recessed

Move sterilizer backward into the wall opening until panel-trim gaskets fit tight against face wall.

3.4 Double Horizontal Door Unit

NOTE On double door units, if the unit has outriggers they must be installed on the sterilizer **before** opening the door(s).

NOTE Repeat these steps for both doors. (The following steps are only required when the sterilizer is shipped partially disassembled per customer special instructions)

a. Carefully remove the two trolleys from the door, making note of how the spacers and the trolley halves separate, so that they can be reassembled the same way they were removed.

b. Attach the I-Beam to the sterilizer with the four bolts, lock washers, and flat washers provided. Line up the marks on the I-beam bracket and the sheet aluminum shell. Hand tighten the bolts, do not tighten at this time.

c. Attach the two trolleys, with the holes for the two ¼"-20 bolts facing the back of the sterilizer. Push the bolt through the two halves and put the nut on the backside. Do not over-tighten. Install a cotter pin to secure in place.

d. Remove the banding straps from door(s).

e. Lock the two nuts on the trolleys, and screw the stud into the door, thus raising the door until the pins are centered in the holes.

f. Door should be ready to open.

g. Loosen the two brass door guides on the bottom of the door. Attach the bottom track to the sterilizer frame with the two bolts provided. Line up the marks on the frame and the bottom of the track bracket. Move the track down and adjust the two track guides until they are in the track approximately ¼" - ½". Tighten the four bolts.

h. Attach the air cylinder bracket to the trolleys using the four bolts provided.

Attach the air cylinder to the bracket using the pin and hitch pin provided with the hardware. The two air lines are marked. Attach accordingly. The door switches are marked so that they can only be installed one way. Connect as indicated. Once the door switches are installed, apply power to the sterilizer to enable adjustment.

Open the sterilizer door all the way. Disconnect the air supply to the sterilizer. Utilize the “DOOR OPEN (CYL)” input on the DIGITAL INPUTS screen in the SERVICE menu on the HMI (Described in Part III User Manual). The Door Open input status column should be green and display a “1” indicating the Door Open switch is met. If the Door Open input status does not indicate it is on, loosen the proximity switch on the air cylinder and slide it along the cylinder until the input status changes. Some trial and error is to be expected, but position the proximity switch so that the Door Open input is on when the door is fully open. Tighten the proximity switch and ensure that the proximity switch is still positioned correctly.

i. Repeat step “h.” with the door close relay. Close the door all the way and observe the input related to "DOOR CLOSED (CYL)". Also, ensure the roller switch attached to the door pin bar is also met when the door is fully closed. This switch is represented as “DOOR CLOSED (FRAME)” on the DIGITAL INPUTS screen.

j. The door should move freely. If it does not, inspect and locate areas of binding and adjust as necessary. Note that the bottom track has two adjusting bolts that move the track in and out.

k. The 1/2 -13 bolts on the door should have been preset at the time of manufacture. If further adjustment is required, adjust when the sterilizer is cold. Leave 0.035" clearance between each pin and bolt.

l. Keep the I-beam and bottom track clear of obstructions, and lubricate the bottom track with grease or graphite.

3.4.1 Recessed (one or two walls)

a. Move sterilizer through one or both wall openings until the fascia panel fits tight against the face of the wall. Install the second fascia panel.

b. Refer to the Equipment Arrangement Diagram provided in Part VI, Maintenance Manual, for the proper placement of the fascia panels.

3.5 BioSeal Extension Installation

Refer to the BioSeal Extension Installation drawing for the panel layout.

3.6 Connecting Utilities (with boiler)

Refer to the Piping and Instrumentation Diagram and connect the cold water supply directly to the water strainer located on the sterilizer. If the optional steam boiler is used, WFI water should be connected directly to the feed pump on the boiler.

TO ENSURE PROPER OPERATION OF AN AUXILIARY BOILER, CONSIDERATION SHOULD BE GIVEN TO THE EFFECTIVENESS OF THE BOILER'S WATER LEVEL CONTROL, WHEN TREATED, OR D.I. (DEIONIZED) WATER IS SUPPLIED TO THE BOILER. ENSURE THAT THE TYPE OF LOW WATER LEVEL CONTROL DEVICE IS SUITABLE FOR USE WITH HIGH RESISTANCE, DEIONIZED WATER. D.I. WATER SYSTEMS WORK MOST EFFICIENTLY WITH FLOAT TYPE LEVEL CONTROLS. BEFORE OPERATING THE STERILIZER/BOILER SYSTEM, ALWAYS REFER TO THE MANUAL THAT IS SUPPLIED BY THE MANUFACTURER OF THE BOILER.

IN SOME BOILER SYSTEMS, CERTAIN BOILER CLEANING PRODUCTS WILL CAUSE DAMAGE TO THE SHEATHS OF BOILER HEATING ELEMENTS. REFER TO THE MANUAL, SUPPLIED BY THE MANUFACTURER OF THE BOILER, FOR COMPATIBILITY OF BOILER COMPONENTS AND BOILER WATER TREATMENT COMPOUNDS

HIGH CAPACITY RESIN WATER SOFTENERS MAY CAUSE DETERIORATION OF STEEL AND OTHER EQUIPMENT COMPONENTS. IF SOFT WATER IS PROVIDED, DO NOT OVER SOFTEN WATER.

If the sterilizer is fitted with a steam generator (boiler), refer to the boiler manual provided in Part I, General Information. The boiler requires a dedicated circuit as specified on its data plate. Refer to the tags on the sterilizer's electrical boxes and the electrical drawing for the correct wiring connections.

TO AVOID POTENTIAL SHOCK HAZARDS. PROVIDE A SECURE ELECTRICAL GROUND FOR THE VACUUM PUMP AND OPTIONAL BOILER ACCORDING TO NATIONAL ELECTRIC CODE (NFPA70) STANDARDS.
SERVICE WIRING TO BOILER SHOULD BE IN ACCORDANCE WITH LOCAL CODES OR N.E.C. REQUIREMENTS.
REFER TO THE WIRING DIAGRAM IN PART VI, MAINTENANCE MANUAL.

Always use properly sized wiring.

NOTE

CAUTION

USERS LIVING IN AREAS WITH FREQUENT SEVERE THUNDERSTORMS MAY CONSULT AN ELECTRICAL SERVICE CONTRACTOR REGARDING INSTALLATION OF LIGHTNING/SURGE PROTECTORS.

WARNING

IMPROPER ELECTRICAL POWER CONNECTION, SUBSTITUTION OF COMPONENTS, OR MODIFICATIONS TO WIRING SYSTEMS SHALL VOID THE WARRANTY, AND MAY LEAD TO DANGEROUS OPERATING CONDITIONS.

3.6.1 Steam

The effectiveness of steam sterilization is dependent on the character and quality of the steam used. Steam generators based on evaporation from high-pressure hot water, should not be used since the steam produced is of inferior quality for sterilization purposes.

Since the steam comes in physical contact with the goods to be sterilized, it should be free of additives, rust flakes, solid particles such as welding pellets, or other foreign matter.

Condensate should not be present. The customer shall provide a trap in the steam line, just ahead of the shutoff valve, to remove condensate.

The sterilant for steam sterilization is medium pressure, saturated "clean" steam supplied with dynamic stability at 50-80#. Since steam supply lines carry steam and condensate, additional steam line draining and separation of liquid may be required.

Refer to the utilities service requirements on the Equipment Arrangement drawing, and connect the sterilizer chamber supply to a medium pressure clean steam supply line psig, regulated at ± 5 psig.

Connect the sterilizer jacket supply to a building medium pressure steam supply line.

Should the steam supply line be inadequately vented (dead leg), or supplied from a long branch, customer must properly install a condensate trap to allow the condensate to separate and drain into a waste or condensate return line.

The steam supply pipes must slope toward the sterilizer at a minimum of 1/8" per foot. Refer to the National Plumbing Code, or local codes to assure a proper installation in your location.

A connection should be provided on the steam supply line adjacent to the sterilizer to enable steam to be sampled for the presence of undissolved gases, wetness, and contaminants.

When small steam generators are used, the water supply pressure must be 10 psig greater than the boiler operating pressure to maintain the proper water level in the electric boiler. Lack of sufficient water can result in boiler FAILURE. Keep feed water valves open at all times during operation.

During operation, keep drain valves closed. Pump and boiler should be separated by separate check valves to avoid damage to the pump.

The pressure relief safety valve(s) shall not be supplied with a discharge line extension that is of smaller bore size than the inlet of the safety valve. If discharge piping is added, it must be supported so that strain is not placed on the safety valve.

3.6.2 Air

For sterilizers requiring air, instrument quality air should be supplied.

3.6.3 Water

Refer to the Equipment Arrangement Drawing for the water flow rate.

Connect the sterilizer to a cold water supply line, refer to the General Arrangement Diagram for water hardness. When using water of greater hardness, a water-softening filter should be installed in the water line serving the sterilizer.

3.6.4 Electrical

INSTALLATION OF PROPER ELECTRICAL SERVICES IS THE RESPONSIBILITY OF THE PURCHASER. A QUALIFIED ELECTRICIAN SHALL MAKE POWER CONNECTION. STERILIZERS WITH OPTIONAL BOILER OR VACUUM PUMP SHALL BE PROVIDED WITH TWO POWER SOURCES. STERILIZERS WITH BOTH OPTIONS SHALL REQUIRE THREE POWER SOURCES.

Refer to the boiler manufacturer's Installation, Operation and Maintenance Manual provided for instruction on electrical installation requirements.

Refer to the electrical drawing schematic to identify input connections.

3.6.5 Drain

Sterilizers equipped with more than one wastewater outlet should have them all separately piped to the floor drain. Check local regulations regarding waste drain requirements, such as wastewater temperature, etc.

The drain outlet from recessed sterilizers should terminate within the utility area. The drain outlet from cabinet sterilizers should terminate within the cabinet space.

A minimum diameter of 4" is recommended for the floor drain. Run a sloping pipe (usually a minimum 1/8" slope per foot), with unreduced bore, from the sterilizer outlet to the drain. This sterilizer requires an atmospherically vented drain.

The sterilizer must have an air break between the drainpipe and the floor drain. **The sterilizer CANNOT be hard piped to the drain.**

The drain pipe(s) should terminate not closer than ½" above the highest liquid level of the water trap in the drain.

3.7 Connecting Utilities (no boiler)

3.7.1 Steam

Refer to paragraph 3.6.1 above for installation instructions.

3.7.2 Air

For sterilizers requiring air, instrument quality air should be supplied via a 1/8" service connection at 25CFM at 80-110 psig.

3.7.3 Water

Refer to the Equipment Arrangement Drawing for the water flow rate.

Connect the sterilizer to a cold water supply line capable of dynamic supply pressure of 50 - 110 psig, with a water hardness not to exceed the recommendation on the General Arrangement diagram. When using water of greater hardness, a water-softening filter should be installed in the water line serving the sterilizer.

Temperature of the water supply should not exceed 70° F. If the optional vacuum pump is used, water temperature should generally not exceed 60° F, so that the pump achieves maximum sealing efficiency.

3.7.4 Electrical

INSTALLATION OF PROPER ELECTRICAL SERVICES IS THE RESPONSIBILITY OF THE PURCHASER. A QUALIFIED ELECTRICIAN SHALL MAKE POWER CONNECTION.

Connect the primary sterilizer control service to a dedicated electrical disconnect (breaker) located in the same space as the equipment.

The sterilizer control contains a microcontroller, thus connecting the control to the same service as the vacuum pump, or optional electric boiler will result in unsatisfactory operation of the sterilizer electronics. Refer to the Electrical drawing for the location of the primary electric service input connections on the sterilizer.

3.7.5 Drain

Sterilizers equipped with more than one wastewater outlet should have them all separately piped to the floor drain. Check local regulations regarding waste drain requirements, such as wastewater temperature, etc.

The drain outlet from recessed sterilizers should terminate within the utility area. The drain outlet from cabinet sterilizers should terminate within the cabinet space.

A minimum diameter of 4" is recommended for the floor drain. Run a sloping pipe (usually a minimum 1/8" slope per foot), with unreduced bore, from the sterilizer outlet to the drain. This sterilizer requires an atmospherically vented drain.

The sterilizer must have an air break between the drainpipe and the floor drain. **The sterilizer CANNOT be hard piped to the drain.**

The drain pipe(s) should terminate not closer than ½" above the highest liquid level of the water trap in the drain.

3.8 Installation Checklist

The following items are to be checked after installation:

	ACCEPT		INITIAL	DATE
	YES	NO		
a. **Utilities**				
1. Water Supply				
Backflow prevention device installed				

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	ACCEPT		INITIAL	DATE
	YES	NO		
Water Pressure measured (spec is 50-110 psig, static and dynamic)				
Supply piping adequately sized				
Shut-offs located nearby				
2. Steam Supply				
Supply is adequately trapped				
Supply pressure measured (spec 50-80 psig, static and dynamic)				
Supply piping adequate size				
Shut-offs located nearby				
3. Electrical Power				
Voltage per spec				
Shut-offs located nearby				
4. Waste				
Pipes sloped properly				
b. **Units checks**				
Unit Level.				
Door(s) open and close smoothly				
Door switches adjusted correctly				
Chamber strainer(s) in place				
Rack and shelves/loading cart operates properly and interfaces properly				
All piping checked for tightness				
All displays function properly				
c. **Cycle Operations**				
Unit powers up correctly				
Leak Test cycle run				
Sterilize Filter cycle run (optional)				
Typical cycle run (Utilize pre-programmed cycles or reference Part V Factory Acceptance Test for example runs)				

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PRIMUS GENERAL PURPOSE STERILIZER

PRI-MATIC® 100 CONTROL

PART III

USER MANUAL

January 15, 2019

Part III USER MANUAL
Manual Version 1.00
SW Version 2.00

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Printed in the United States of America

General Purpose Steam Sterilizer Operator Manual includes six parts:
General Information
Installation
User
Process, Programming, & Parameters
Factory Acceptance Test
Maintenance

Once installation of a new PRIMUS General Purpose sterilizer with PRI-Matic™ Control is complete, the user is urged to conduct validation studies according to accepted standards (e.g. FDA cGMP, ANSI) and document the effectiveness of user selected cycle parameters for each type of load to be sterilized. Reference the Part IV, Maintenance Manual for a description of alarms, and maintenance functions (manual operations, cycle parameters, calibration procedures, set date/time and change cycle names).

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SECTION 1.0 INTRODUCTION

This manual provides user information for the PRIMUS General Purpose sterilizer with PRI-Matic® 100 Control as it relates to the sterilizer functionality. PRIMUS General Purpose sterilizers are provided with brass and copper piping with optional sanitary piping available.

1.1 Background

The PRIMUS General Purpose sterilizer has been designed for a wide range of sterilizing applications suitable for the laboratory industry. Quality materials and workmanship have been incorporated in the chamber, piping and controls to provide a sterilizer that exceeds industry standards and meets end user specifications. These sterilizers are designed for fully automatic, computer controlled operations, with vacuum or gravity air displacement cycles for processing of textiles, wrapped or unwrapped instruments, vented glassware and liquids in flasks, culture media, infant formula, laboratory supplies, pharmaceutical products, and other temperature and moisture stable materials.

The IDEC MicroSmart FC6A, with its operating software, is designed to provide sterilizer functionality as described in this User's Manual, the Process, Programming, & Parameters Manual and the Maintenance Manual. The IDEC HG3G High Performance touch screen provides the user interface for sterilizer status, current phase name of the process, real time data, parameter settings and maintenance functions. The combination of the FC6A PLC controller and the HG3G HMI make up the core of the with PRI-Matic® 100 controls package.

Visual indicators aid in monitoring all cycle phases. Visual and audible alarm and cycle completion annunciators are provided.

Information for single door, double door, powered, hinged, and non-powered door sterilizers is included in this manual. These differences are delineated along with other sterilizer options where applicable.

1.2 Purpose

The purpose of this User's Manual is to present important information on the use of the PRIMUS General Purpose Sterilizer that is necessary for the safe operation of the sterilizer. This manual provides user information for the physical sterilizer and the HMI interface as it relates to sterilizer functionality.

Specific details for the project are provided in the following documents:

- software design specification (provided only if GMP/GAMP Documentation option is selected)
- hardware design specification (provided only if GMP/GAMP Documentation option is selected
- functional specification (provided only if GMP/GAMP Documentation option is selected)
- piping and electrical diagrams.

SECTION 2.0 STERILIZER DESCRIPTION

This section provides a high-level description and is intended to introduce the reader to the major components and sub-systems of the sterilizer.

2.1 Construction

The following sub-sections provide a description of the major sub-assemblies of the sterilizer.

2.1.1 Frame

The vessel is secured to a welded structural frame. The frame is constructed of stainless steel and covered with corrosion resistant paint, unless otherwise specified by customer. It is mounted on threaded leveling screws with supplemental steel weight distribution footpads.

2.1.2 Chamber

The sterilizer features an 316L SS (stainless steel) rectangular, horizontal, completely jacketed chamber, with fully radiused longitudinal corners that are all fully welded and mirror polished to provide the most hygienic, long lasting appearance and durability available. The chamber has a full length steam baffle and two drains positioned in the chamber to maximize steam distribution and cross flow within the chamber. The vessel is constructed in accordance with ASME Section VIII, Division 1 for unfired pressure vessels, and so stamped.

2.1.3 Jacket

The jacket is constructed of 304 SS or 316L SS if specified and is mounted to the chamber over channel supports designed to achieve uniform distribution of steam. The jacket enables the stabilization of temperature around the chamber thereby reducing the time required to bring the chamber up to sterilization temperatures, providing superior temperature distribution, and preventing the formation of condensation on the chamber walls. The jacket is constructed in accordance with ASME Section VII, Division 1 for unfired pressure vessels, and so stamped.

2.1.4 Doors

Sterilizers have either single or double doors. They are equipped with manual or hydraulically powered vertical sliding door(s), pneumatically powered horizontal sliding door(s), or partially pneumatically powered hinged doors. Horizontal door models are available with door(s) that slide from left-to-right, or right-to-left. Construction from mirror polished 316L stainless steel provides ease of cleaning and uniform quality for all chamber surfaces. Safety conscious engineering prevents the door from opening while the chamber is under pressure. Double Door models, with BioSeal option, use door interlock software safeguards to prevent cross contamination through the chamber. All doors are sealed with a continuous silicone O-Ring gasket, recessed within the chamber head ring. The gasket is retracted automatically after a cycle for single door units. For double door units, the gasket is retracted when the door is opened.

2.1.5 Insulation

Superior heat loss reduction is achieved with one-inch fiberglass insulation overlaid with 0.05-inch aluminum sheet metal. The aluminum wrapped insulation system eliminates wet, sagging insulation.

2.1.6 Piping, Fittings and Valves

The product contact circuit is defined as piping, fittings and valves that are involved with the supply of steam or air to the chamber. If required, all sterilant piping in the product contact circuit is composed of stainless steel, with high quality, flanged, sanitary fittings otherwise, brass piping and valves are implemented. Piping exterior to the product contact circuit includes rigid brass, and flared copper. Plastic tubing is used for air lines exterior to the product contact circuit. Fittings are appropriately sized brass. If required, sanitary pipe clamps (Tri-Clamp) are used where sanitary cGMP procedures require frequent maintenance access to process piping to allow ease of routine cleaning and maintenance. All thermostatic, non-proprietary steam traps are industrial grade. All steam and water valves are of brass construction, except as noted above, with appropriate pressure and temperature ratings. Electrically operated solenoid valves are stainless steel or brass, as explained above, properly rated for applicable steam, fluid, or gas operation. Safety valves or rupture disks are provided in separately supplied chambers (e.g., jacket and chamber) and are ASME approved, preset by the manufacturer, and are so stamped.

2.1.7 Vacuum System

Rapid evacuation of chamber air, steam, and condensate is achieved with a water ejector provided as standard equipment with PRIMUS Sterilizers. Liquid ring vacuum pumps may be provided as an option and are standard on sterilizers that are greater than 75 cubic feet. Both the ejector and the optional vacuum pump are capable of air evacuation to a "deep" vacuum (e.g. 2 PSIA) in the chamber. Effluent discharge temperature is further reduced by a dual pass, coil bundle, heat exchanger before entering the vacuum pump. The discharge temperature is further reduced by cool water at the floor drain (Drain Quench)

The standard vacuum pump system can be replaced by the optional the PRI-Saver™ TRVPS, which is designed to save 90% of the water required in operating the vacuum pump.

The PRI-Saver™ TRVPS takes the service liquid that enters the vacuum pump and discharges into the recirculation tank. The service liquid from the tank is then cooled using a heat exchanger that is separate from the sterilizer's heat exchanger. The cooled service liquid is returned to the vacuum pump. The recirculation tank has its own fill system to replace the small amount water lost during operation.

The complete package includes a liquid ring vacuum pump, motor, separator,

heat exchanger, and accessories. All the components are mounted on a frame skid for ease of installation.

Note: the facility must have a recirculated chilled water system for the TRVPS to function.

2.1.8 Air Filtration

PRIMUS sterilizers are supplied with a general purpose 0.3 micron (optional 0.2 micron) primary air inlet filter to the chamber. A 316L stainless steel, sanitary, T-type filter housing can be provided for this filter. It is rated for use in steam, water and air applications and provides chamber air filtration. If compressed air to the chamber is not specified, a 0.3-micron pre-filter is installed in line with the primary air inlet filter. As an option, filter sterilization is provided as a separate cycle.

2.1.9 Controls

The IDEC MicroSmart FC6A and related software is designed to provide sterilizer operation. The software is configured for the MicroSmart FC6A. The FC6A memory is backed up by an external battery, which provides for maintaining of program and data during power failure. The FC6A, relays, and other related control devices are enclosed in NEMA-rated, shielded enclosures. The HG3G HMI is the user interface and provides for the ability to control the sterilizer, display alarms, perform maintenance functions, and view process variables. If the sterilizer is a double door unit, there will be a HG3G HMI on both sides of the sterilizer. Screens for both HG3G HMIs are the same and as such, all references to screens are “HMI” throughout this document. As a standard feature, a supervisor lockout prevents unauthorized access to maintenance functions.

2.1.10 Network Information

Each unit is given a default set of IP addresses for the standard networked control components. The default IP address are as follows:

The IP address of the PLC is set to 192.168.000.100.

The IP address of the “A” side HMI is set to 192.168.000.101.

The IP address of the “B” side HMI is set to 192.168.000.102.

If it is a single door unit, the single HMI follows the A side HMI IP address convention. IP address can be changed from the default settings if needed. Contact the automation department at PRIMUS Sterilizer for information.

2.1.11 Instrumentation and Sensors

The pressure transducer or transmitter used is a high quality, high reliability, high accuracy and low maintenance device. Similar devices may be supplied on the jacket as an option. All gauges are high quality, accurate devices. Resistance Temperature Devices (RTD) are standard for all sterilizer temperature control and witness devices. Three (3) wire type RTD load probes are optional.

2.2 Safety Features

The following safety features are described as they relate to the PRIMUS General Purpose sterilizer.

2.2.1 Door Pins

On horizontal sliding doors, security of the door is maintained by multiple stainless steel pins, which slide into stainless steel receivers integral of the sterilizer chamber. Pins and receivers are aligned along both vertical edges of the door. The number of pins, their physical size and the pin receivers for each door are a function of the vessel size. Vertical doors slide up and down in milled grooves in the stainless steel headring.

The chambers and door mechanisms are hydro-tested at 2.5 times the operating pressure rating of 45 PSIG.

2.2.2 Door Limit and Gasket Pressure Switches

The sterilizer software will only allow a cycle to start if the door closed frame switch indicates a fully closed door and the gasket pressure switch indicates a fully sealed (inflated) gasket. To provide redundancy for power door sterilizers, there is an additional limit switch on the power door cylinder that must indicate a fully closed door. Double door sterilizers with a BioSeal require both doors to be closed and sealed and all stipulations outlined in Section 3.5 to be met before a cycle can be started.

2.2.3 Powered Door Adjustments (Horizontal Power Doors Only)

For sterilizers with horizontal powered doors, door closing and opening speed and pressure is fully adjustable providing for smooth operation of the doors.

2.2.4 Rupture Disk and Relief Valves (Option P5 Only)

The PRIMUS General Purpose sterilizer can be equipped with a rupture disk for the chamber so that if the pressure exceeds the burst rating of the rupture disk, the rupture disk will burst, relieving the chamber pressure and signaling the controls system. The jacket is equipped with a relief valve to relieve excessive jacket pressure.

SECTION 3.0 STERILIZER USER FUNCTIONS

The following describes the sterilizer functions for PRIMUS General Purpose sterilizers that are necessary for daily operation of the sterilizer. The steam sterilizer (reference Figure 3.0-1, Sterilizer Control Layout and Product Flow) uses an IDEC MicroSmart FC6A processor and an IDEC HG3G panel for the human-machine interface (HMI).

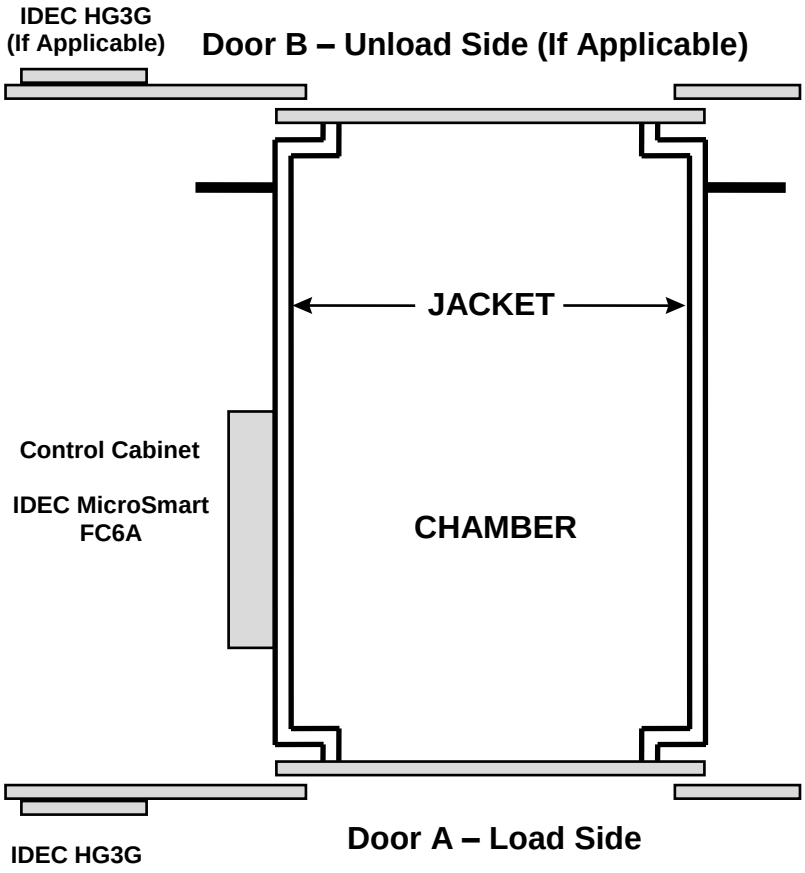

Figure 3.0-1 General Sterilizer Control Layout

3.1 Door Operation

3.1.1 Manual Door

The door is manually controlled and assisted by a counter weight.

ERROR MONITORING: The door operation is monitored by a door frame switch which registers as on when the door is closed. A failure alarm is triggered if the closed-door input signal from the frame switch is lost during an active cycle.

3.1.2 Power and Hinged Door

For power doors, each door is controlled entirely by the control system. Power for the door movement is dependent on the door type which is outlined in Section 2.1.4. The unsealing, opening, and closing of the door is started by the operator using the door operation buttons in the MORE screen. There is no login required to operate the doors.

Figure 3.0-2 OPEN DOOR / CLOSE DOOR Buttons – Power Door

CLOSING: The CLOSE DOOR button is in view and operates only when there is no active cycle and the door is not fully closed. The button must be pressed continuously which serves as a safety requirement to close the door. If the button is released before the door is fully closed, the door will automatically reverse and return to the fully open position.

OPENING: The OPEN DOOR button is in view and operates only when there is no active cycle, the door is not fully open, and the BioSeal requirements in Section 3.3 are met (if applicable). The button requires a single momentary press to start the opening process. If the door is sealed, the door seal will automatically retract using the vacuum system before the door opens. As a safety feature, the OPEN DOOR button will not initiate the door to open when there is pressure in the chamber.

ERROR MONITORING: The door operation is monitored by a frame switch and limit switches on the door cylinder. A failure alarm is triggered if the expected movement is not performed within the required normal time and if the closed-door input signal from the door frame or cylinder switch is lost during an active cycle.

3.1.2.2 Mushroom Button/Kick Panel

If the power door sterilizer is equipped with a mushroom button and/or a kick panel, the unsealing, opening, and closing of the door can be initiated by either applicable switch in addition to the control provided through the HMI.

Both switches will act as an OPEN DOOR button or CLOSE DOOR button depending on the current state of the door. When the door is fully closed, the switches will act as an OPEN DOOR button. When the door is fully opened, the switches will act as a CLOSE DOOR button. The same operational requirements outlined in Section 3.1.2 apply to the two switch states.

3.2 Door Gasket Operation

3.2.1 Single Door

The door gasket automatically seals when a cycle has been started and unseals when a cycle is completed. Automatic unseal after a cycle is canceled if there is pressure in the chamber, there is steam in the chamber, or if the chamber condensate signal is active (if applicable). If the automatic unseal of the gasket is canceled or unsuccessful, the gasket can be retracted using the OPEN DOOR button on the MORE screen. If it is a manual door unit, the button will display RETRACT GASKET instead of OPEN DOOR.

Figure 3.0-3 RETRACT GASKET Button - Manual Door

3.2.2 Double Door

The door gasket automatically seals five (5) seconds after the door has been closed. The gasket unseals automatically when the OPEN DOOR button has been pressed. If it is a manual door unit, the button will display RETRACT GASKET A/B instead of OPEN DOOR.

3.3 BioSeal Requirements and Door Allowances

BioSeal door operation is restricted in accordance with the BioSeal requirements. The software determines the BioSeal door allowances based on the seal status of the doors, the contamination of the chamber, the success of the cycle, and the type of cycle run.

To open either the load or unload door, the opposite side door must be closed and sealed. To open the unload side door, the chamber must not be considered contaminated. In order for the chamber to be considered decontaminated, a non-maintenance cycle must be completed successfully. For an effluent configuration, the chamber must be decontaminated prior to the start of a maintenance cycle.

The chamber is immediately deemed as contaminated when the load side door has been opened at least once after completion of a successful cycle. A cycle is deemed successful only if there are no critical alarms (See section 9.0 and Part IV Process, Programming & Parameters manual for more details) that occur during the cycle process and the process has not been stepped or aborted by a user (Section 7.0).

The following is a list of possible cycle scenarios and their door allowances:

A successful non-maintenance cycle is completed:

Both the load and unload door may be opened

An unsucessful non-maintenance cycle is completed:

If the chamber is contaminated, only the load side door may be opened

If the chamber is decontaminated, only the unload side door may be opened*

A failed or successful maintenance cycle is completed:

If the chamber is contaminated, only the load side door may be opened

If the chamber is decontaminated, only the unload side door may be opened*

* A decontaminated chamber at the end of an unsuccessful non-maintenance cycle or at the end of a maintenance cycle indicates the load side door was never opened prior to the start of cycle (sterilizer was loaded on the “unload” side). Upon opening and closing the unload side door after cycle completion, the load side may be opened once more.

If at any time the BioSeal requirements need to be overridden, the authorization override state can be activated to allow a door to open.

3.4 Authorization Key Switch & Button

The authorization key switch and button serve as an override feature that requires administrative review. The authorization key switch and button act in parallel to one antoher and can both place the system into the authorization override state

The authorization button can be accessed from all panels under the CONFIGURATION tab (requires an administrative level login to access). The authorization key switch is located on the sterilizer fascia (“A” side if double door unit). Turning the authorization key switch to the “on” position and back to the “off” position will deactivate the authorization override state.

The override conditions are detailed below:

Overide BioSeal requirements and/or effluent lockout conditions and open door (as long as the opposite door is closed and sealed and not in operation)

Advance exhaust phase.

Lockout cycle start.

Figure 3.0-4 Authorization Override Button & Message

3.5 Automatic Boiler Blowdown Operation

The boiler is active and will produce steam as long as the sterilizer remains in an “on” state. For the automatic blowdown of the boiler to occur, the boiler must be put into “Sleep Mode” by pressing the SLEEP MODE button (Section 3.6) on the MAIN screen. Once in an inactive state, the water will drain from the boiler until a limit of 17 PSIG is reached. At this limit, a pressure switch in the boiler control box triggers the blowdown function. The boiler can alternatively be placed in an inactive state by pressing in the emergency stop button on the fascia or by triggering manual mode on the electric boiler output in the SERVICE tab (Section 6.5.3.4).

3.6 Sleep Mode

The sterilizer can be placed into “Sleep Mode” by pressing the SLEEP MODE button on the MAIN screen (Section 6.1). “Sleep Mode” shuts down any steam sources provided by PRIMUS (i.e. boiler, steam to steam generator, etc.) and turns off the steam to the jacket.

Figure 3.0-5 SLEEP MODE Button

Upon pressing the SLEEP MODE button, a screen with a 5 second countdown will display prior to the sterilizer entering “Sleep Mode”. Pressing anywhere on the screen during this countdown will cancel the action.

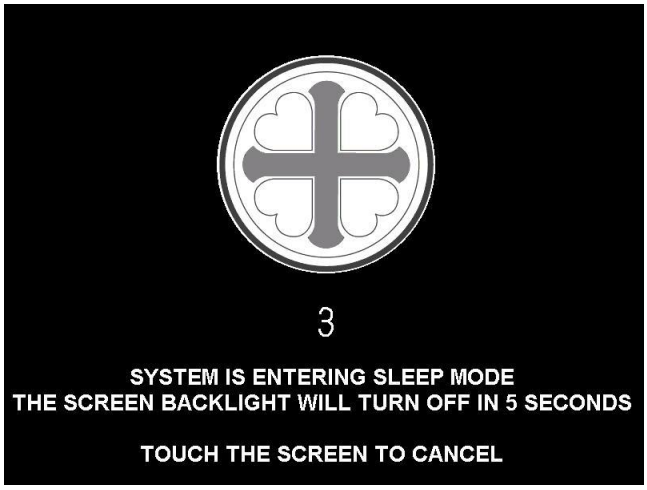

Figure 3.0-6 SLEEP MODE DELAY Screen

When the 5 second countdown is completed, the system enters the “Sleep Mode” and the backlight of the HMI will turn off. Touching anywhere on the display will activate the backlight and display the “Sleep Mode” screen. An additional touch of the screen will deactivate “Sleep Mode” and the sterilizer will become fully operational.

Figure 3.0-7 SLEEP MODE Screen

A Sterilizer Auto On/Off feature is also available for scheduled shutdowns of the sterilizer (Section 6.5.5).

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SECTION 4.0 INSTRUMENTS

4.1 Control Side

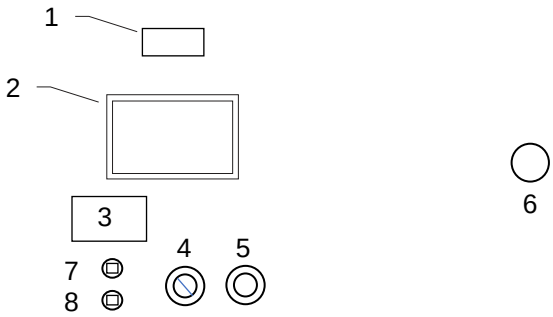

Figure 4.0-1 Control Side Instrumentation Layout

1. Chamber Pressure Digital Display (Sanitary units only)
2. Operator Control HMI
3. Panel Mount Printer (If specified)
4. Authorization Key Switch
5. E-Stop
6. Mushroom Button (If specified)
7. USB port for cycle Datastore (Section 6.5.3.7.4)
8. Ethernet port (If specified)

NOTE: This is a generic layout of the sterilizer instruments and is not to scale. Final placement of instruments may differ from graphic shown.

4.2 Non-Control side (Double Door Units Only)

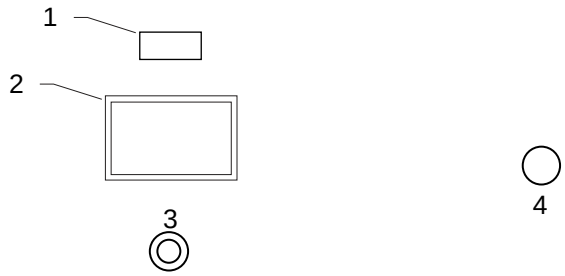

Figure 4.0-2 Non-Control Side Instrumentation Layout

1. Chamber Pressure Digital Display (Sanitary units only)
2. Operator Control HMI
3. E-Stop
4. Mushroom Button (If specified)

NOTE: This is a generic layout of the sterilizer instruments and is not to scale. Final placement of instruments may differ from graphic shown.

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SECTION 5.0 OPERATOR INTERFACE

The operator interface is an IDEC HG3G High Performance HMI. It serves as the interface between the operator and the process. Different levels of security are provided to restrict access to specific personnel and for operation documentation.

Figure 5.0-1 IDEC HG3G HMI Display

Via the HMI, the operator selects a cycle, starts and monitors the process, handles and acknowledges alarms, and operates the doors.

Information messages and alarms appear on the display of the operator HMI.

5.1 SCREEN LAYOUT

The display provides a status bar at the top, an array of control buttons along the bottom, and a message box directly above the buttons. These features are globally displayed on all screens.

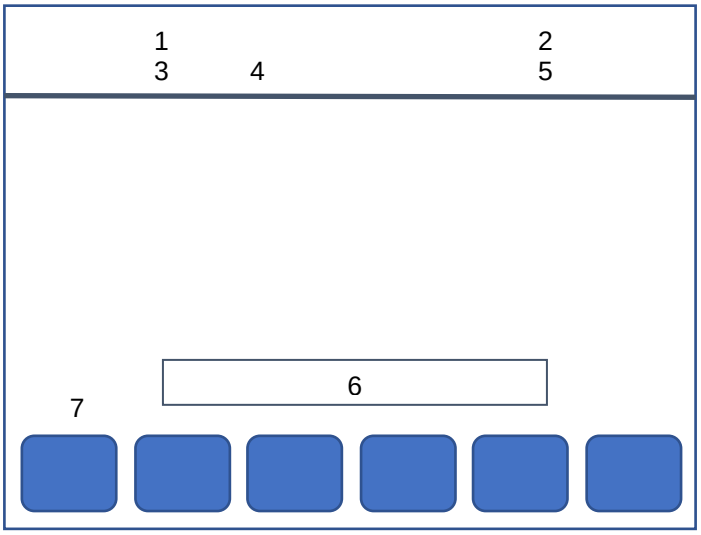


Figure 5.0-2 Screen Layout

1 Name of current cycle

2 Cycle time remaining and cycle status indicator

3 Phase step and name

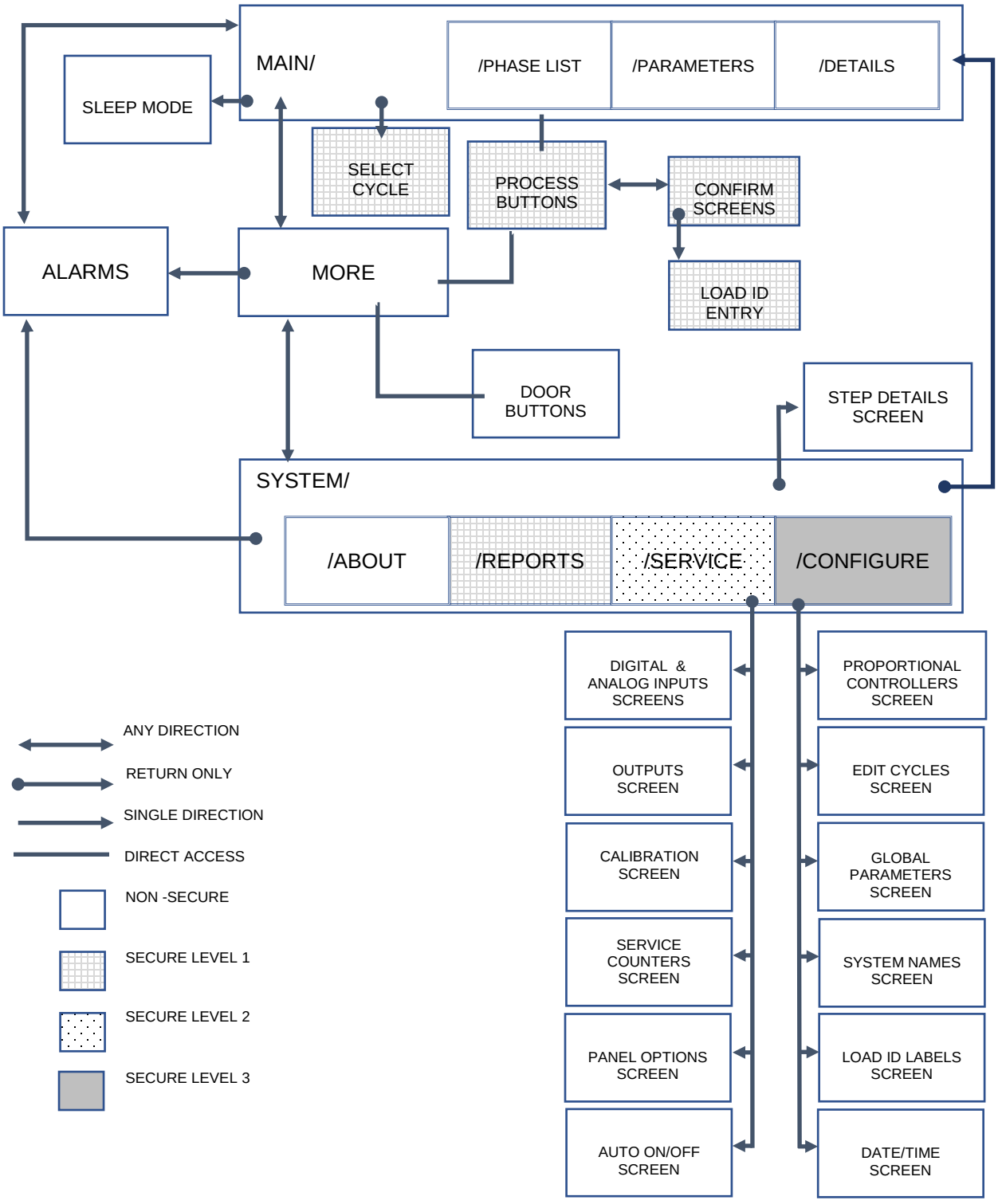
4 Time in current phase

5 HMI date and time

6 Information and active alarm messages

7 User name

5.2 HMI MENU FLOW



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5.3 USER SECURITY

When the machine is turned on a default user is logged in with rights to view process values, acknowledge alarms in idle, and control door operation.* In addition to this, three other security levels with passwords are defined as follows:

Operator (8)

An Operator can select cycles, enter batch information, start and handle a cycle process, print reports, and acknowledge alarms during a cycle. In the SYSTEM screen, the operator has access to the ABOUT and REPORTS tabs.

Technician (3)

In addition to Operator functions, a Technician can access panel settings, calibration, service counters, data storage settings, and maintenance functions. In the SYSTEM screen, the operator has access to the ABOUT, REPORTS, and SERVICE tabs.

Administrator (2)

In addition to Technician functions, an Administrator can access cycle parameters, global parameters, proportional controllers, system date, time, and name settings, and user setup. In the SYSTEM screen, the operator has access to the ABOUT, REPORTS, SERVICE and CONFIGURE tabs.

*The Default user can be given Operator level permissions by changing the OPERATOR LOGIN REQUIRED global parameter (See section 6.5.4.4 and Part IV Process, Programming, & Parameters Manual).

Usernames

Operator

OPR# (Where # is a number from 1-8)

Technician

TCH# (Where # is a number from 1-3)

Administrator

ADM# (Where # is a number from 1-2)

Default Passwords

The default password upon shipment for each user is a copy of the user ID displayed in the login popup window. For example, username: OPR3; password: OPR3.

5.3.1 Login

After pressing the LOGIN button, the “Login” popup window appears.

The window displays an on screen alphanumeric keyboard as well as a user ID in the upper left-hand corner. Use the arrow keys next to the user ID to select the user to login as. After selecting the user ID, enter the corresponding password and press the “ENT” key to log in.

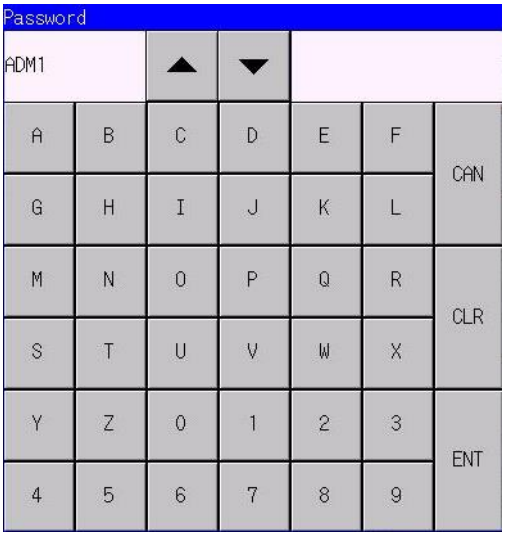

Figure 5.0-3 Login Popup Window

5.3.2 Logout

The logout button logs out the current user. 10 minutes of inactivity will also log out the user automatically.

5.3.3 User Security Settings

Only the administrator level login has access to the user security settings. User password and configuration can be edited from the USER SECURITY screen (Section 6.5.7).

SECTION 6.0 HMI BASE SCREEN DESCRIPTIONS

6.1 MAIN SCREEN

The MAIN screen is automatically loaded when the unit is powered on or when a user is logged out. The MAIN screen is the central hub of the HMI and provides access to all other HMI menu screens. Users can LOGIN and LOGOUT from the MAIN screen as described in Sections 5.3.1 and 5.3.2. The operational process buttons described in Section 7.0 can be accessed from the MAIN screen if an Operator or higher-level user is logged in. The SLEEP MODE button, as described in Section 3.6 is located on the MAIN screen. The ALARMS screen, Section 6.2, can be accessed from the MAIN screen. The MAIN screen also displays graphic indicators for both active and completed cycles. The full description of these indicators can be found in Section 10.0

For double door units, the HMI location (Side A or B) is displayed in the upper right corner of the MAIN screen.

The following sections detail the three tabs that can be navigated between on the MAIN screen.

Figure 6.0-1 MAIN Screen

6.1.2 PHASE LIST / CYCLE

The PHASE LIST tab displays the selected cycle's phase information and provides a highlight that indicates the current phase the sterilizer is in. The phase information displayed includes the current phase step, the phase name, and the time in the current phase.

If the simple cycle selection option is turned on in the PANEL OPTIONS screen described in Section 6.5.3.7, the CYCLE tab displays when the sterilizer is in idle mode. The CYCLE tab displays the first four (4) cycles as buttons on the MAIN screen. These cycle selection buttons replace the phase list until the cycle is started.

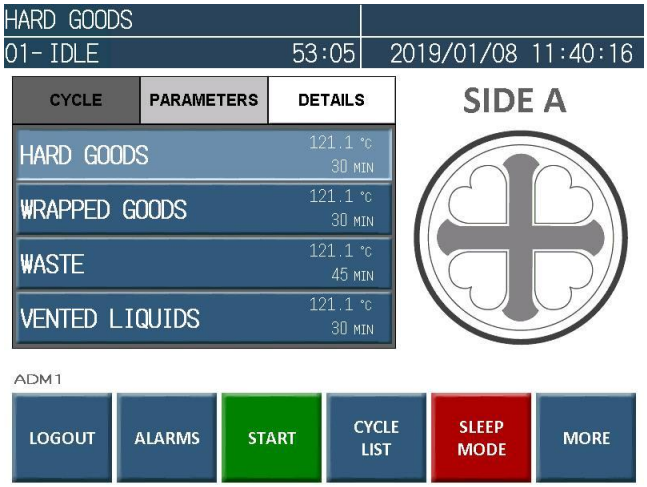

Figure 6.0-2 MAIN Screen CYCLE Tab

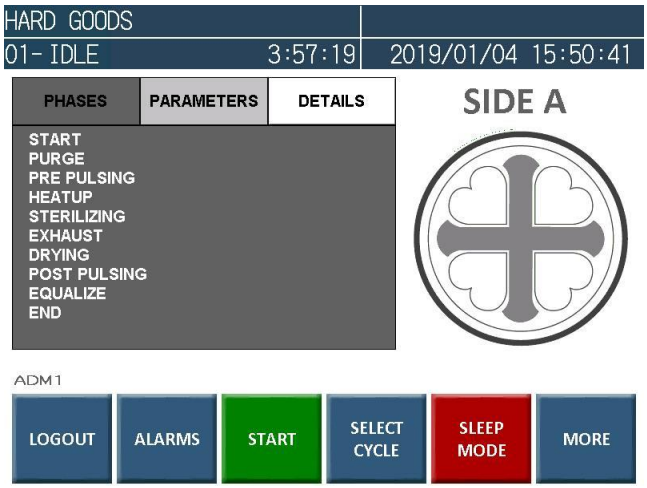

Figure 6.0-3 MAIN Screen PHASE LIST Tab

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6.1.3 CYCLE PARAMETERS

The CYCLE PARAMETERS tab displays the current cycle type and all process cycle parameter values.

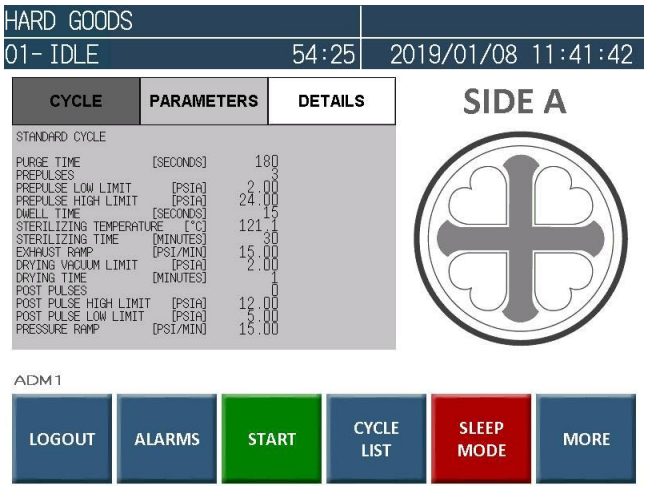

Figure 6.0-4 MAIN Screen CYCLE PARAMETERS Tab

6.1.4 DETAILS

The DETAILS tab displays the current process temperatures, the chamber and atmospheric reference pressures, the chamber theoretical pressure (CHAMBER T/P) and the load probe accumulated F0. If the load probe option is not active, the load temperature and load probe F0 will not display. The LOAD PROBE OPTION global parameter determines if the load probe is active (See section 6.5.4.4 and Part IV Process, Programming, & Parameters Manual).

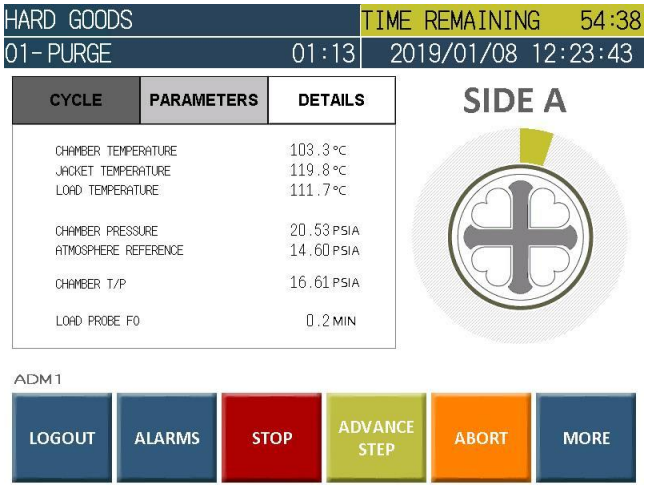

Figure 6.0-5 MAIN Screen DETAILS Tab

6.2 ALARMS SCREEN

On the ALARMS screen is the alarm log where all alarms are automatically registered. The alarm log contains information about the last 128 alarms. The log lists all alarms, the time the alarm occurred, and the time that the alarm was acknowledged. Alarms are sorted by the time the alarm occurred. Also included on the ALARMS screen is a description of the alarm currently active.

From the ALARMS screen, alarms may be silenced and acknowledged. The process may also be resumed or aborted from the ALARMS screen following the acknowledgement of an active alarm. See section 9.0 and Part IV Process, Programming, & Parameters Manual for information on alarm handling.

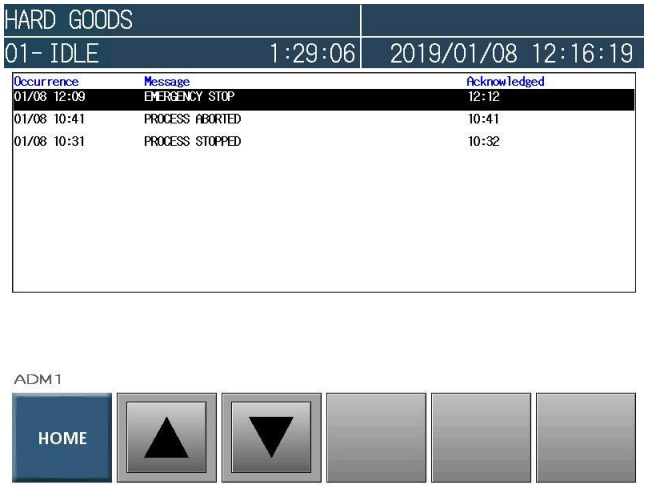

Figure 6.0-6 ALARMS Screen

6.3 CYCLE LIST

The CYCLE LIST screen displays all thirty (30) cycle slots available to the user. The cycles are sorted in numerical order and are identified by their given cycle name. The cycle name is inputted by the user in the EDIT CYCLES screen (Section 6.5.4.3).

Figure 6.0-7 CYCLE LIST

6.4 MORE SCREEN

The MORE screen provides a running trend graph of the general process temperatures and pressure. The door operation buttons will operate the door on which side the HMI is configured to be located. The operational process buttons (Section 7.0) can be accessed from the MORE screen if an Operator or higher-level user is logged in. This screen also provides access to the SYSTEM screen (Section 6.5).

Figure 6.0-8 MORE Screen

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The door operation buttons are displayed according to conditions that allow the function. Refer to Sections 3.1 - 3.2 for more information.

Figure 6.0-9 Door Operation Buttons

6.5 SYSTEM SCREEN

The SYSTEM screen provides access to higher levels of the system control and configuration. Depending on the level of security detailed in Section 5.3, tab buttons will be provided to access the ABOUT, REPORTS, SERVICE and CONFIGURE menus. The SYSTEM screen also provides access to the AUTO ON/OFF and STEP DETAILS screens. All screens are detailed in the subsections on the following pages.

For double door units, the HMI location (Side A or B) is displayed on the sidebar of the SYSTEM screen. Single door units do not display a HMI location.

6.5.1 ABOUT

The ABOUT tab provides general information and details of the system. This tab requires no security to view.

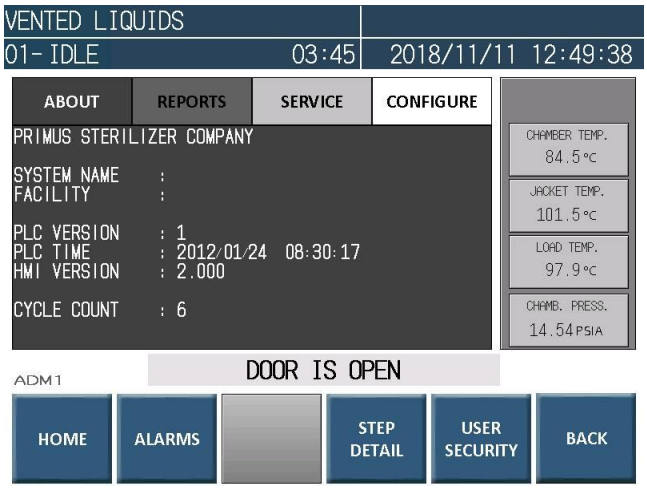

Figure 6.0-10 ABOUT Screen

6.5.2 REPORTS

This tab requires level 1 security and provides the operator the ability to print a calibration report, a global parameters report, and a cycle parameters report. It also provides the ability to reprint the previously ran cycle.

The calibration report lists the current calibration values for all analog inputs.

The global parameters report prints the parameters values for all adjustable global parameters.

The cycle parameters report will print the currently selected cycles adjustable parameters and values.

The reprint cycle report will print a copy of the cycle report from the previously ran cycle. The previous cycle print is stored (up to 900 lines) in the controller memory and is only available to re-print during IDLE. The reprint function is also possible using the feature on the thermal printer if one is installed.

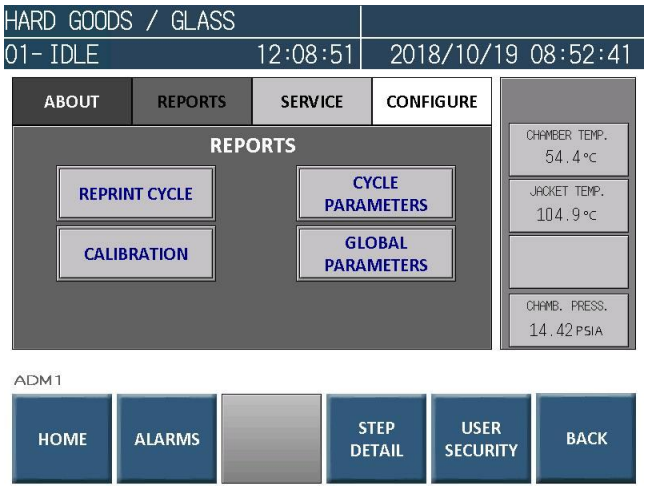

Figure 6.0-11 REPORTS Screen

The CANCEL PRINT button is displayed when printing is active. The printing is cancelled when pressed.

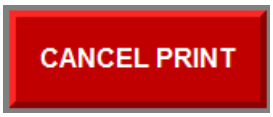

Figure 6.0-12 CANCEL PRINT Button

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6.5.3 SERVICE

This tab requires level 2 security and provides a technician the ability to perform service functions, calibrations, and non-process and service related configurations.

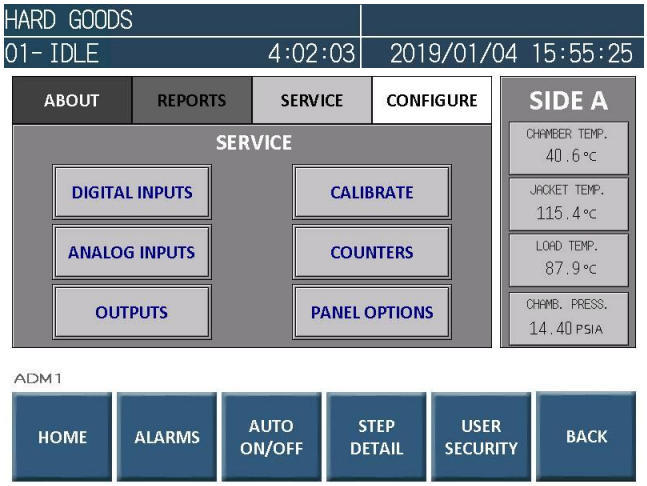

Figure 6.0-13 SERVICE Screen

6.5.3.2 DIGITAL INPUTS

The DIGITAL INPUTS menu provides the list and status of all digital inputs. The status is highlighted in green when the input is on and the bit changes from 0 to 1. Reference the electrical diagrams provided for the digital input connections.

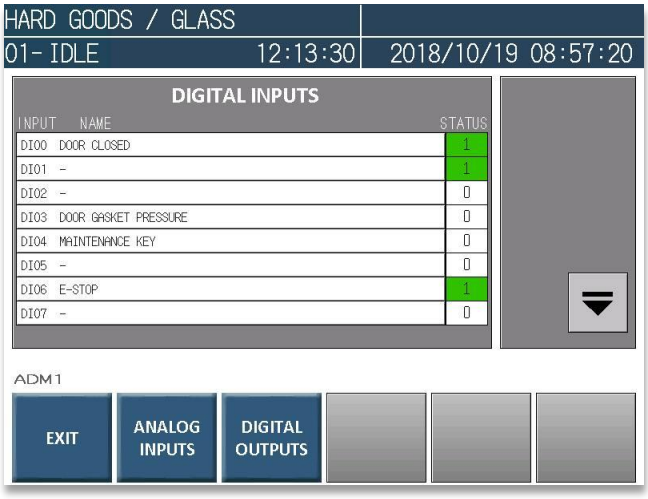

Figure 6.0-14 DIGITAL INPUTS Screen

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6.5.3.3 ANALOG INPUTS

The ANALOG INPUTS menu provides the list of all analog inputs. The SCALE column lists each input before the calibration values are calculated. The VALUE column lists each input that is adjusted after the calibration values are calculated

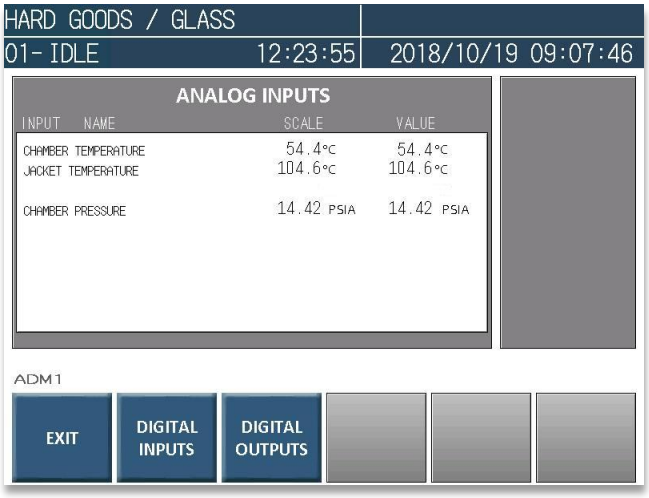

Figure 6.0-15 ANALOG INPUTS Screen

6.5.3.4 OUTPUTS

The OUTPUTS menu provides the list and status of all digital outputs. An indication of the status of each output highlighted in green.

The ability to manually control each output is provided. The manual control provides 2 levels. The preset control is highlighted in yellow for each manual change. The preset control is not active until the SEND button is pressed. An indication for each manually activated output is highlighted in red. The CLEAR ALL button will appear if any output is manually controlled. If pressed, all manually controlled outputs are returned to automatic mode.

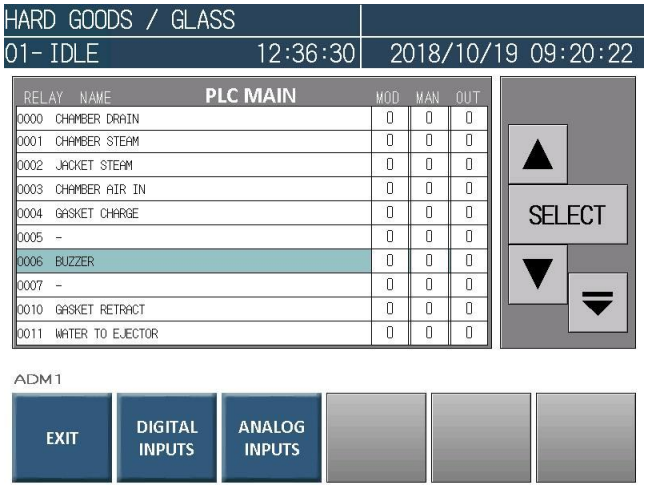

Figure 6.0-16 DIGITAL OUTPUTS Screen

When the output is selected, a sub menu is displayed. The MANUAL/AUTO button will set the mode and the MANUAL OFF/ON button will set the status.

Figure 6.0-17 DIGITAL OUTPUTS Sub Menu

When any these buttons are pressed, the output status bits are highlighted in yellow and a send button is displayed to activate the command. Multiple outputs can be changed before using the SEND button to activate manual control.

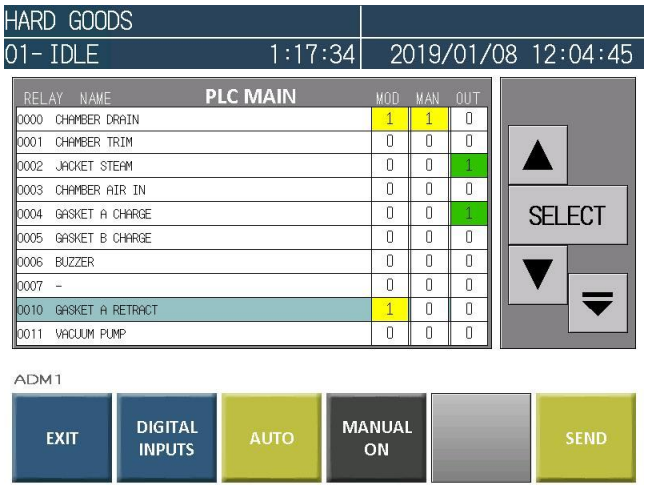

Figure 6.0-18 DIGITAL OUTPUTS SEND Button

When the output is in manual control, the status bits of the output is highlighted in red. A TOGGLE button appears which provides a direct momentary change to the manual on/off control by pressing the button. When released, the output returns to the set status.

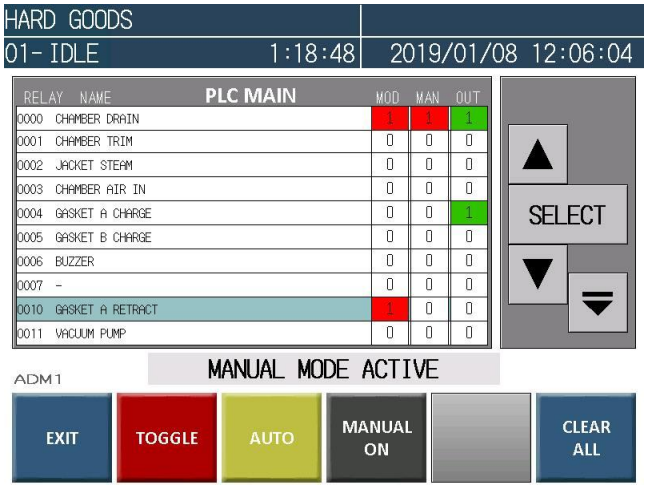

Figure 6.0-19 DIGITAL OUTPUTS TOGGLE Button

Reference the electrical diagrams provided for the output connections.

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6.5.3.5 CALIBRATION

The CALIBRATION menu provides a technician with the option to perform manual calibration adjustments or an automatic procedure to calibrate multiple inputs of the same type. Only one of the two functions can be performed at a time.

6.5.3.5.1 MANUAL CALIBRATION

The MANUAL CALIBRATION screen lists each analog input.

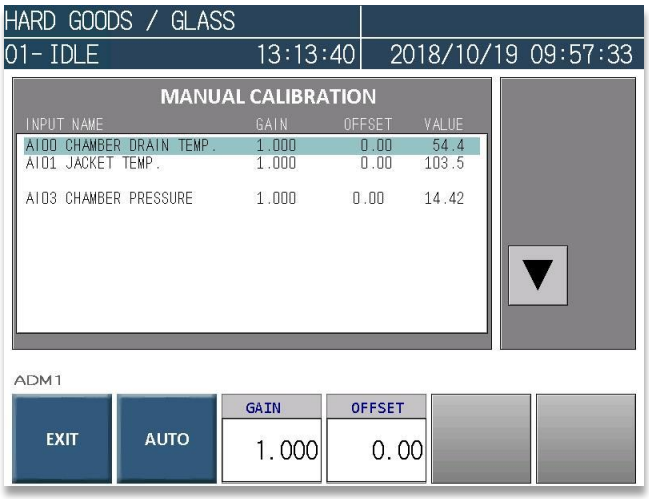

Figure 6.0-20 MANUAL CALIBRATION screen

The GAIN and OFFSET values of the highlighted analog input are displayed and can be changed.

The GAIN is the relation to the set scale of the input's range (ex. 0°C – 150°C) and the "real world" value indicated by an independent source. This number should not deviate far from 1.000.

The OFFSET changes all values along the entire range of the scale. Example: If the OFFSET is set to -1.00, instead of AI00 reading 54.4°C, it will read 53.4°C. This number should not deviate far from 0.00.

When a change is made to any of the input calibrations, an indication highlighted in yellow is provided for each change. The change will not take effect until the SAVE button is pressed.

Figure 6.0-16 SAVE button

6.5.3.5.2 AUTOMATIC CALIBRATION

The AUTOMATIC CALIBRATION screen lists each analog input. One or multiple analog inputs may be selected to be included in the automatic calibration procedure. This provides the user the ability to calibrate multiple temperature inputs or calibrate multiple pressure inputs at the same time. Temperature and pressure analog inputs may not be selected and calibrated at the same time.

The automatic calibration procedure will perform a calculation comparing the “real world” temperature (or pressure) independent source to the scaled inputs in the controller. The calculation is automatic and accurately adjusts the necessary Gain and Offset values to match the analog input to the independent source. It is recommended that the independent source is certified for accuracy, and electronically displayed to the 100th value. It is **not** advised to use analog needle gauges or mercury/spirit filled thermometers

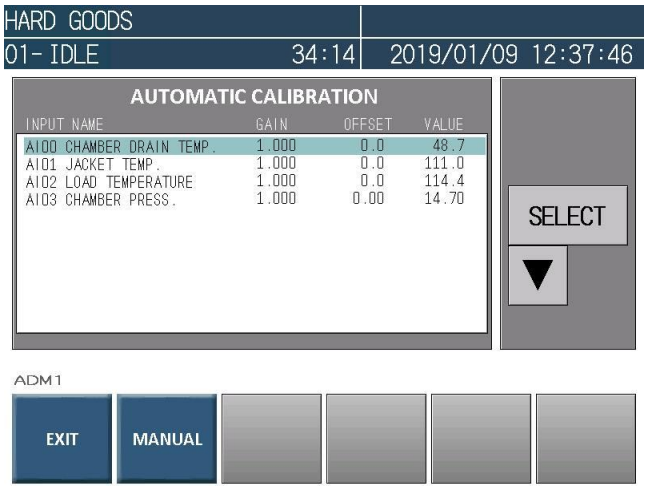

Figure 6.0-21 AUTO CALIBRATION Screen

Use the select button to add the input for the automatic calibration. After selecting one or more inputs for calibration, the START CALIB. button is displayed to continue with the procedure.

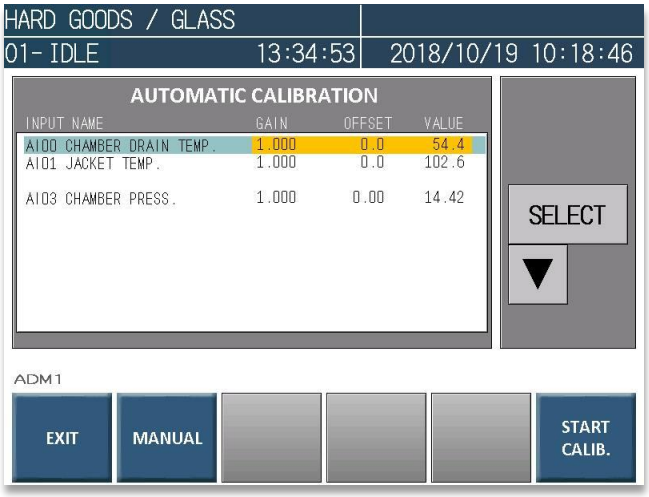

Figure 6.0-22 START CALIB. Button

Once the START CALIB. button is pressed, the LOW REFERENCE value may entered using the stabilized temperature/pressure value fom an accurate independent source. When the independent source has stabilized at the inputted low reference value, press SET LOW REF to set the LOW REFERENCE value. The CANCEL button can be pressed at any time and will stop the calibration procedure and reset the selections.

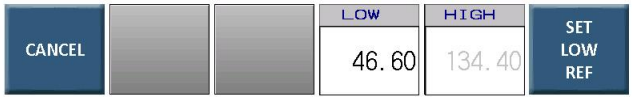

Figure 6.0-23 SET LOW REF Button

If an acceptable low reference value was entered, a HIGH REFERENCE value may be entered using the stabilized temperature/pressure value from an accurate independent source. When the independent source has stabilized at the inputted high reference value, press SET HIGH REF to set the HIGH REFERENCE value.

The BACK TO LOW REF button provides the ability to re-input the low reference value if a mistake was made when setting.

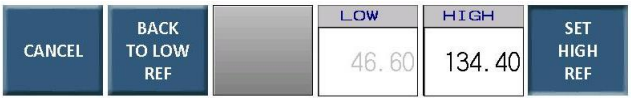

Figure 6.0-24 SET HIGH REF BUTTON

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If an acceptable high reference value was entered, the CALC button is displayed to complete the process and calculate the new GAIN and OFFSET values for each of the inputs selected for the procedure.

The BACK TO HIGH REF button provides the ability to re-input the high reference value if a mistake was made when setting.

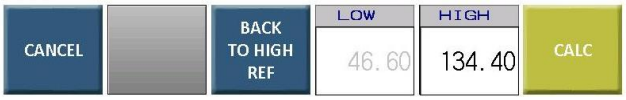

Figure 6.0-25 CALC Button

6.5.3.6 SERVICE COUNTERS

The SERVICE COUNTERS screen provides a list of valve cycle counters that the technician can configure limits for preventive maintenance scheduling. These counters will increment each time the valve output is activated. A limit value is entered to provide a message “SERVICE COUNTER EXCEEDED” if the counters exceed the limit. The service message is displayed only and has no affect or restriction of the process. The highlighted service counter can be reset to 0 by pressing the RESET COUNTER button. All service counters may be reset by highlighting the CLEAR ALL COUNTERS option and pressing the RESET COUNTER button.

A cycle counter is also provided as a limit for scheduling maintenance.

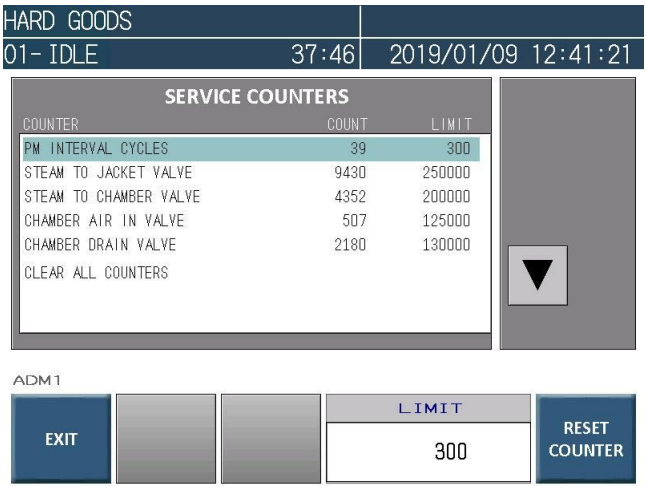

Figure 6.0-26 SERVICE COUNTERS Screen

6.5.3.7 PANEL OPTIONS

The PANEL OPTIONS screen provides the technician configuration settings of the HMI. These settings are non-process related.

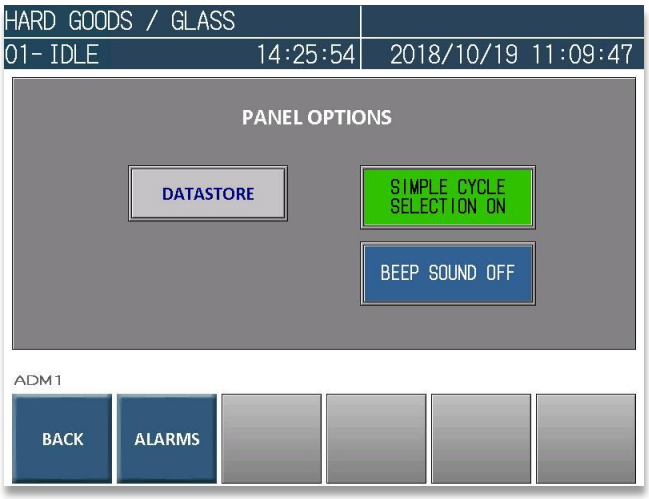

Figure 6.0-27 PANEL Screen

6.5.3.7.2 SIMPLIFIED CYCLE SELECTION

The SIMPLIFIED CYCLE SELECT option will provide the first 4 cycle selections as buttons on the main HOME screen.

6.5.3.7.3 BEEP SOUND

An audible signal of a button press can be turned on. There are two different options for the audible signal:

BEEP SOUND ON will provide the full default audible signal when a button is pressed. This may prove useful in loud environments.

BEEP SOUND SHORT will provide the default audible signal at half the length of time when a button is pressed.

6.5.3.7.4 DATASTORE

The datastore function provides a historian capture of process values for service and diagnostic purposes.

The datastore function is active when DATASTORE ACTIVE is set to YES. The LOGGING INTERVAL setting controls the frequency at which the data is captured and logged.

The DATA TO USB button will open the DATA TO USB popup window and allow the ability to transfer the datalog files to a USB memory flash drive plugged into the USB port of the sterilizer fascia. Insertion of a USB drive into the fascia will also automatically open the DATA TO USB popup window.

The REMOVE USB button will allow the user to properly remove the USB drive without getting an error message on the display.

The REMOVE SD CARD button will allow the user to properly remove the SD Card from the panel without getting an error message on the display.

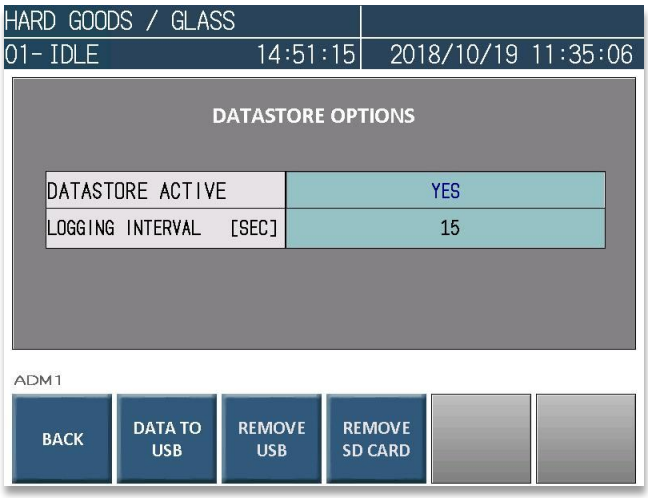

Figure 6.0-28 DATASTORE OPTIONS Screen

The datastore feature saves process information for each cycle run onto an SDHC card that can be inserted into the HMI SD card slot. Each cycle run is saved as a comma-separated values (CSV) file named 'Cycle_"Cycle #"_YYMMDD' (e.g. Cycle_015_180224). These CSV files are then stored into a folder named 'HGDATA01\DATALOG' on the SDHC card. The information saved on the SDHC card is then copied over to a USB drive that is inserted into the USB port on the sterilizer fascia when the transfer process occurs.

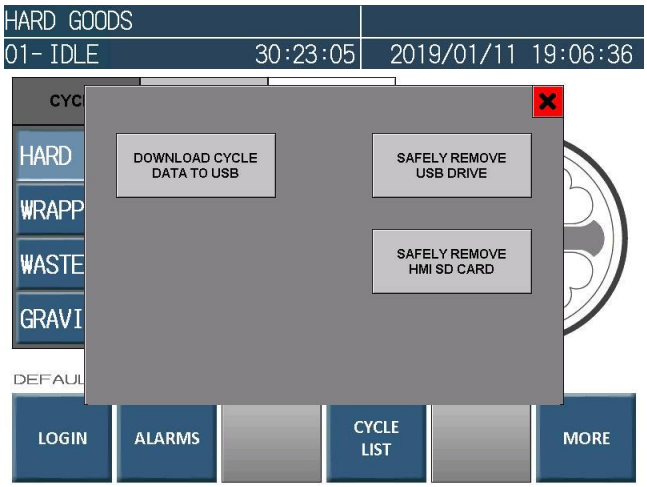

Figure 6.0-29 DATA TO USB Window

The DATA TO USB window provides the ability to copy the datastore CSV files from the SDHC card in the HMI to a USB drive inserted into the USB port on the sterilizer fascia. If a USB drive is inserted in the port, the DOWNLOAD CYCLE DATA button will appear. Pressing this button will initiate the data transfer process and popup a HMI system window prompting the user if they want to perform a File Copy Function. Pressing "RUN" will transfer all datastore CSV files on the SDHC card to the USB drive.

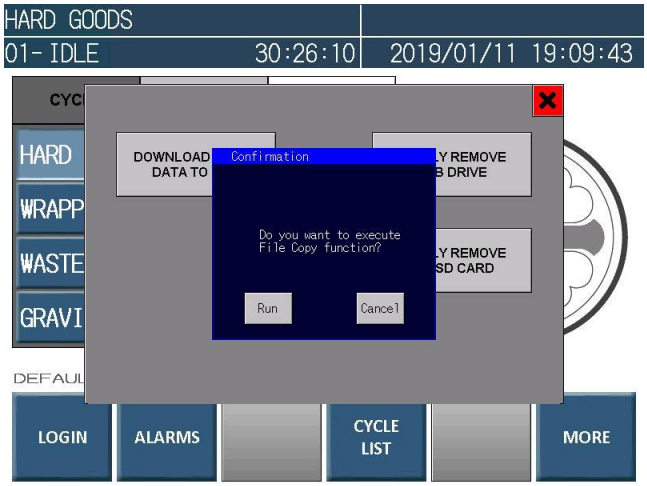

Figure 6.0-30 DATA TO USB HMI File Copy System Window

The status of the copy function is indicated near the bottom of the DATA TO USB window in flashing text. The download process may be terminated at any time by pressing and holding the HOLD TO CANCEL DOWNLOAD button.

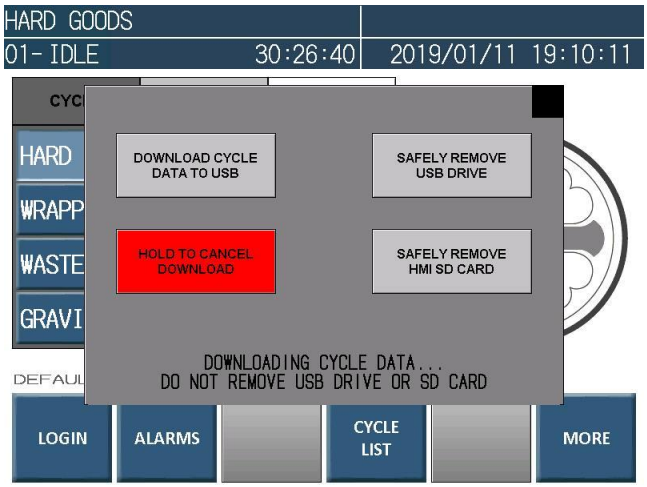

Figure 6.0-31 DATA TO USB Downloading Indicator Message

Upon completion of the download, an HMI system window will popup informing the user the file copy function is complete. If the file copy is unsuccessful, the popup will inform the user that an error occurred during the copy process. Pressing ACK will close the popup window.

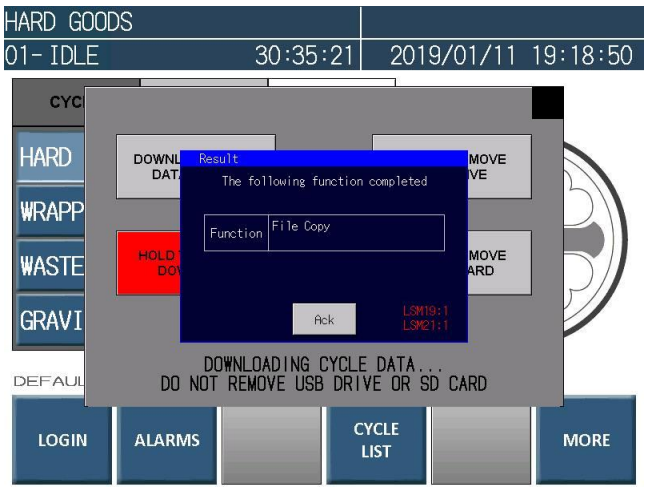

Figure 6.0-32 DATA TO USB HMI File Copy Completed System Window

The CSV files are copied into a folder named CYCLE_DATA on the USB drive. If the CYCLE_DATA folder does not currently exist on the USB drive, the system will create one on the drive prior to copying the files

To prevent data corruption on the USB drive and SDHC card, the reading of the data storage devices must be stopped before they are removed from the HMI or USB port. To properly remove either device, press the SAFELY REMOVE button that corresponds to the device that is being disconnected. The SAFELY REMOVE buttons are located both in the DATASTORE OPTIONS screen as well as the DATA TO USB window. After a safe remove is performed, the storage device that was removed must be reinserted for the system to actively read the device again.

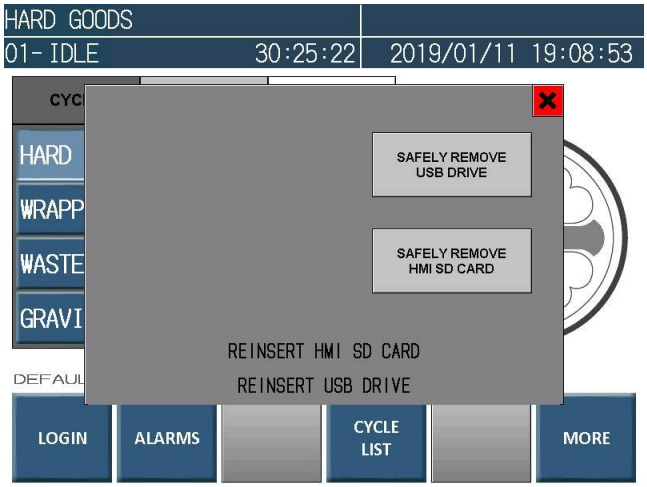

Figure 6.0-33 DATA TO USB SDHC Card and USB Safely Removed

Note: The SDHC and USB drive must be formatted to the specifications below to work properly.

The SDHC card must be of FAT32 file format and have between 2GB and 32GB of storage capacity. A standard SD card may also be used if the capacity is less than 2GB and it is FAT16 formatted.

The USB drive must have a capacity of less than 32GB and be FAT32 or FAT16 formatted.

The file formats specified (FAT32 and FAT16) are the typical file formats for the range of storage capacities given for each device.

6.5.4 CONFIGURE

This tab requires level 3 security and provides an administrator the ability to configure the process parameters.

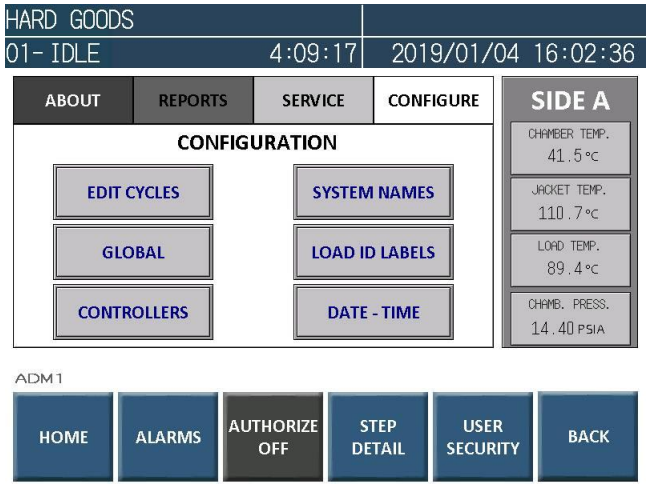

Figure 6.0-34 CONFIGURE Screen

6.5.4.2 PROPORTIONAL CONTROLLERS

The PROPORTIONAL CONTROLLERS screen provides a list of each proportional controller. Each controller can be adjusted and monitored. There is an indication of the activation and output status highlighted in green.

Figure 6.0-35 PROPORTIONAL CONTROLLERS Screen

The OFFSET, P BAND and TIMER values are adjustable. See Part IV Process, Programming, & Parameters Manual for a full description of the proportional controller adjustments.

A running trend graph automatically adjusting to the ranges of the controller is provided to monitor the effect of the settings. The ZOOM IN and ZOOM OUT buttons affect the scale of the X and Y graph axes.

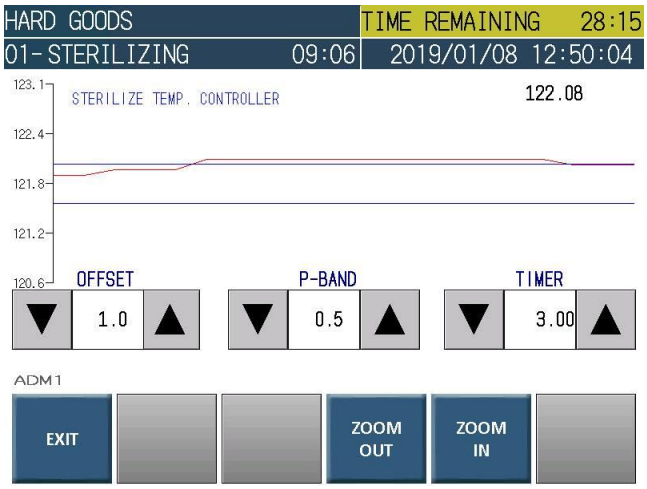

Figure 6.0-36 OFFSET, P-BAND and TIMER Screen

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6.5.4.3 EDIT CYCLES

The EDIT CYCLES menu provides the list of available cycles that can be customized by the administrator. The SELECT button is used to select a cycle and display the EDIT CYCLES screen.

Figure 6.0-37 EDIT CYCLES Menu Screen

By selecting a recipe, the EDIT button is displayed.

Figure 6.0-38 EDIT CYCLE Button

The option to copy a highlighted recipe is also available. Once the COPY button is pressed, the button will disappear indicating that the copied recipe is ready to be pasted into an edited recipe.

In the EDIT cycle screen, the recipe can be cleared (deleted) or modified. Use the up and down arrows to access the cycle type, recipe name, and available parameters. Select and edit each parameter by pressing the value to the right of the description. A sub menu will appear with the input option to change the parameter value that was selected.

If a cycle is saved with values, the cycle parameters may be printed directly from the EDIT CYCLE screen.

The PASTE feature is available if the COPY button was pressed before editing. This will load all parameters from the copied recipe to the edit.

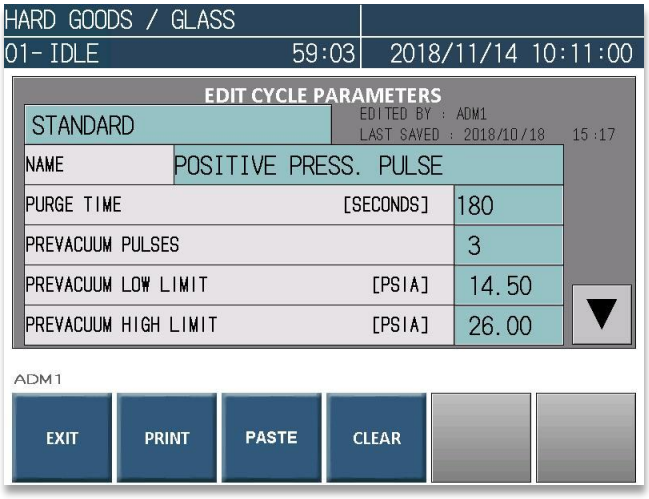

Figure 6.0-39 EDIT CYCLE PARAMETERS Screen

If any change to a cycle is detected, the SAVE button is provided. The change is not made to the cycle until the SAVE button is pressed. If the EXIT button is pressed before saving the change, the edit is cancelled.

Figure 6.0-40 EDIT CYCLE PARAMETERS Save Button

A list of pre-load cycles is provided by pressing the cycle type button at the top of the EDIT CYCLE PARAMETERS screen. These pre-loaded cycles include factory default parameters configured to optimize the sterilizer operation and help provide the necessary results for sterilization assurance* and maintenance.

* Sterilization assurance can only be verified by using the appropriate biological indicator.

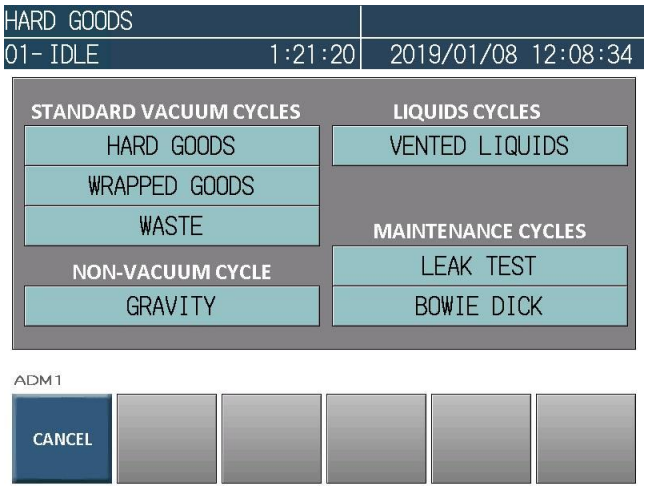

Figure 6.0-41 EDIT CYCLE PARAMETERS Pre-Loaded Cycles

6.5.4.4 GLOBAL PARAMETERS

The GLOBAL PARAMETERS menu provides the list of the available parameters detailed in Part IV Process, Programming, & Parameters Manual. Each parameter is a direct edit with no save option.

Figure 6.0-42 GLOBAL PARAMETERS Screen

6.5.4.5 LOAD ID LABELS

The LOAD ID LABELS menu provides the list of available load ID labels that can be customized. The load ID label will appear on the print if there is any information associated with the label on the LOAD ID ENTRY screen (Section 7.1.1).

Figure 6.0-43 LOAD ID LABELS Menu Screen

6.5.4.6 SYSTEM NAMES

The SYSTEM NAMES menu provides two entries for configuring the name of the facility or company and the name of the sterilizer or system. These two entries will appear in the header of each print report and in the ABOUT screen.

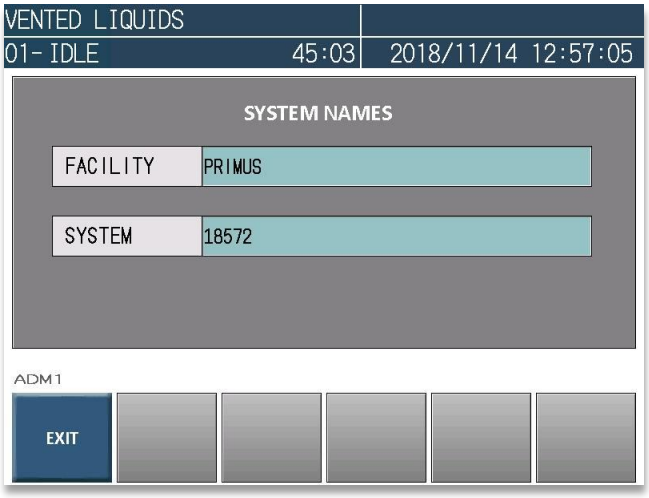

Figure 6.0-44 SYSTEM NAMES Screen

6.5.4.7 DATE / TIME

The DATE / TIME menu provides a comparison of the PLC and HMI times. Static numerical entries are provided to manually update and synchronize the date and time according to the values entered. Press UPDATE to update the clock to the numerical values entered.

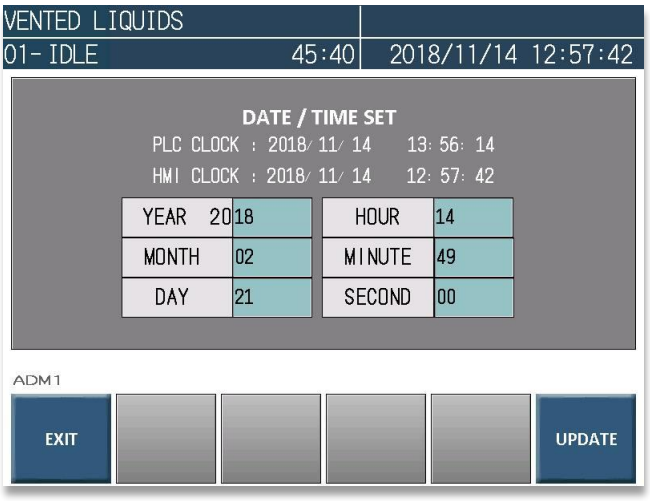

Figure 6.0-45 DATE / TIME Screen

6.5.5 AUTO ON/OFF

The AUTO ON/OFF screen provides the ability to automatically activate and deactivate “Sleep Mode” (Section 3.6) at specific times during the week.

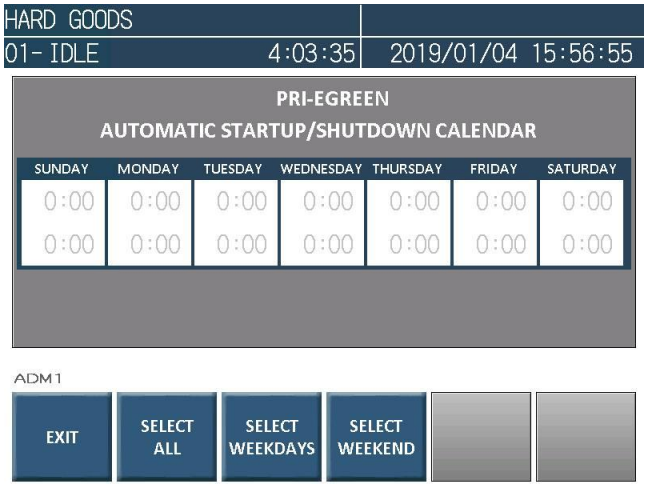

Figure 6.0-46 AUTO ON/OFF Screen

A calendar of the week is provided for configuration of the automatic startup and shutdown features. Days of the week may be selected by either touching the calendar directly, or by utilizing the selection buttons across the bottom of the screen. Days of the week can be deselected by touching the calendar day again or by utilizing the DESELECT ALL button.

Upon the selection of any day, a subset of buttons will appear to activate or deactivate the automatic startup and shutdown features as well as set the applicable times.

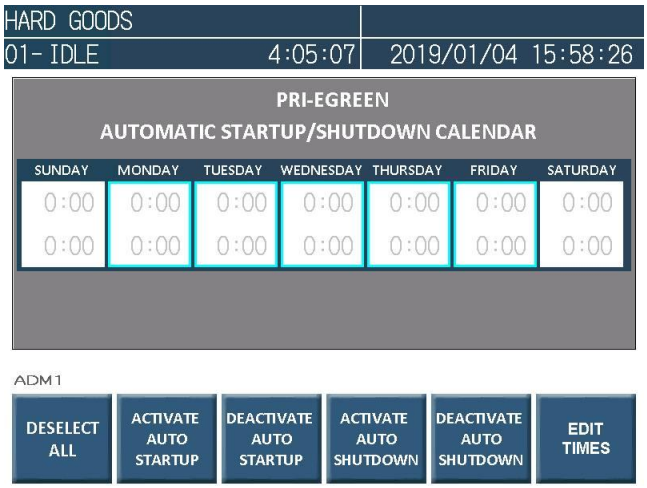

Figure 6.0-47 AUTO ON/OFF Configuration Buttons

The automatic startup and automatic shutdown features may be activated or deactivated for all days selected by pressing the corresponding button. Upon activation, the automatic startup and shutdown times will be displayed in green and red text respectively. If the options are not active, the times will be displayed in grayscale.

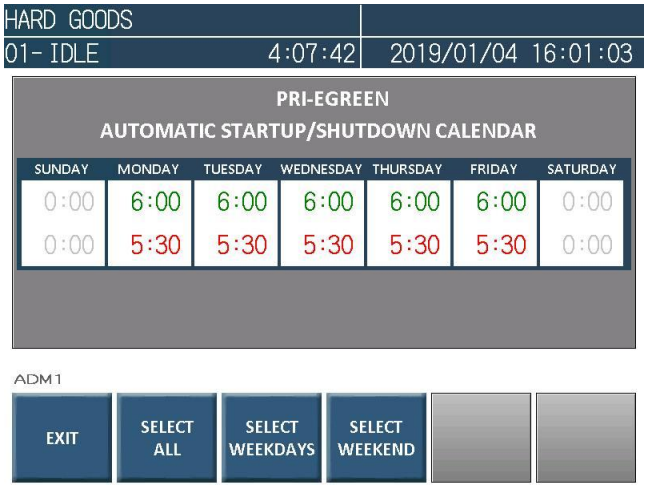

Figure 6.0-48 AUTO ON/OFF Activated

The automatic startup and shutdown times may be edited by pressing the EDIT TIMES button when one or more days have been selected. When the EDIT TIMES button is pressed, a sub menu will appear that allows you to edit the automatic startup and shutdown times for all days selected. The automatic startup and studown times are adjusted by selecting and changing the ON HOUR, ON MIN, OFF HOUR, and OFF MIN numerical inputs. The times are copied and set for the selected days when the SAVE button is pressed.

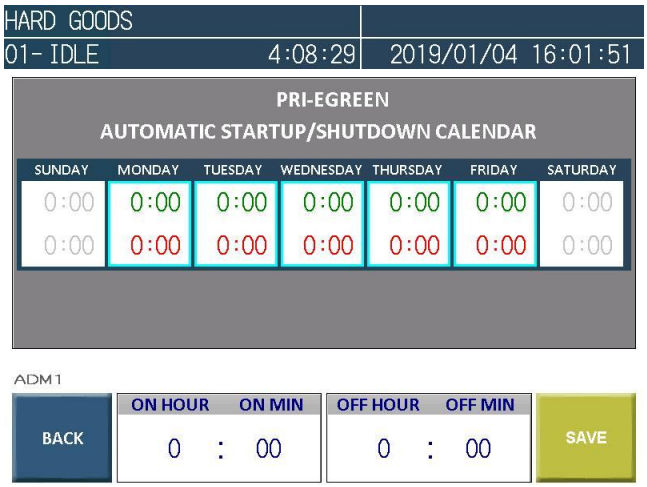

Figure 6.0-49 AUTO ON/OFF EDIT TIMES Screem

The sterilizer will not automatically enter “Sleep Mode” when a cycle is active. Rather, the automatic shutdown will occur once the cycle is fully complete.

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6.5.6 STEP DETAIL

The STEP DETAIL screen provides the user a description of the current status of the software, the advance condition of the current step, and the timeout condition of the current phase.

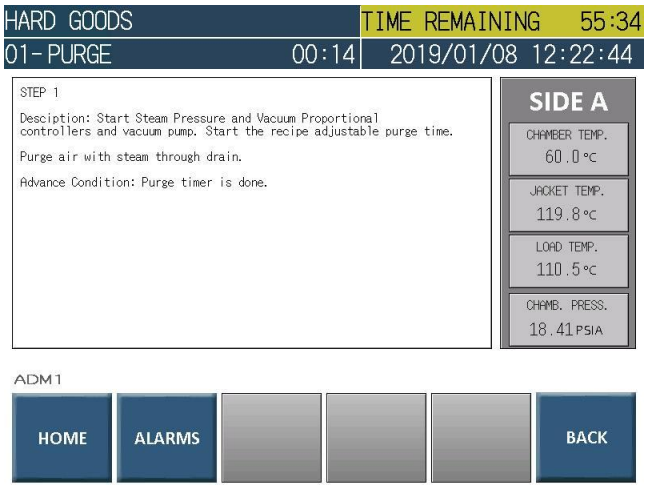

Figure 6.0-50 STEP DETAIL Screen

6.5.7 USER SECURITY

See important notes at the end of this section prior to utilizing the USER SECURITY screen.

The USER SECURITY screen can be utilized to change the user name and passwords of User IDs 3-15. The screen may also be used to add, delete, and edit the security groups of User IDs 5 – 15. The maximum number of total users cannot exceed 15.

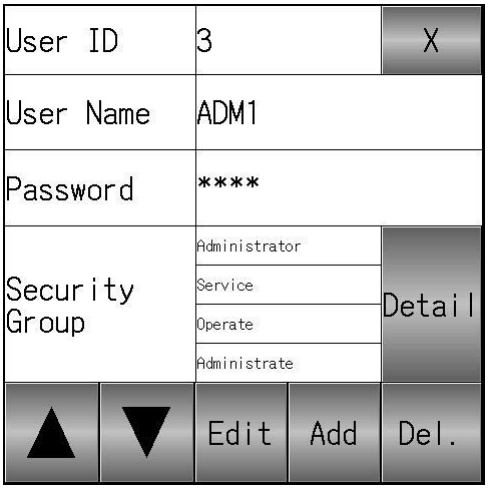

Figure 6.0-51 USER SECURITY Screen

The arrow keys may be used to navigate between the User IDs. The EDIT button is used to make changes to the currently selected user ID. The User Name and Password fields may be changed by touching the corresponding text after the EDIT button has been pressed. The Security Groups may be modified by pressing the CHANGE button after the EDIT button has been pressed.

The security groups required for each user security level laid out in section 5.3 are as follows:

- Operator Required Security Group: Operate
- Technician Required Security Group: Service, Operate
- Administrator Required Security Groups: Administrator, Administrate, Service, Operate

To add a new user, press the Add button and setup the User Name, Password, and Security Groups. To delete the currently selected User ID, press the Del. Button. The system comes with 13 User IDs utilized as identified in section 5.3 (User IDs 3-15) as well as 2 additional users that are required by the system and should not be modified (User IDs 1-2). In order to add a new user to the system, at least one user (User IDs 5-15) must first be deleted to bring the total users below 15.

Notes:

User IDs 1 and 2 should never be edited or deleted. These User IDs are crucial for system operation and factory adjustment purposes.

Do not delete, or attempt to add, an Administrator level user (User IDs 3 and 4). The Administrator level user requires the Adminstrate level security group which cannot be assigned through the USER SECURITY screen. Only Technician and Operator level users should be added and/or deleted.

SECTION 7.0 OPERATIONAL PROCESS BUTTONS

Figure 7.0-1 OPERATIONAL PROCESS BUTTONS

START

The START button is provided only in IDLE when there are no restrictions to start a cycle.

RESUME

The RESUME button is provided after all alarms have been acknowledged and none are active and the system is still in an alarm state. This function serves to reset the system. If a cycle is active, an indication and which user pressed the button is printed.

ADVANCE

The ADVANCE (next step) button is provided during an active cycle only when stepping is allowed. This function will advance the phase step by one for each press of the button. An indication that the process was stepped and which operator pressed the button is printed after each manual step. NOTE: The button is accessibly by level 2 security only.

ABORT

The ABORT button is provided during an active cycle only when the function is allowed. This function will bring advance the process to either post treatment or equalization depending on whether steam has entered the chamber. This function also serves to resume the process after an alarm. A warning alarm and an indication on which user pressed the button is printed and displayed.

STOP

The STOP button is provided during an active cycle only and when there are no active alarms. This function is similar to the E-Stop button in that it will stop the process and cause a critical alarm. The exception is that the stop is software controlled with no electrical interlocks. The identity of the operator is printed as part of the alarm description.

7.1 CONFIRM POPOP WINDOW

The confirm popup window is a secondary level to allow the operator to cancel the operational process button command. It also provides details of the command.

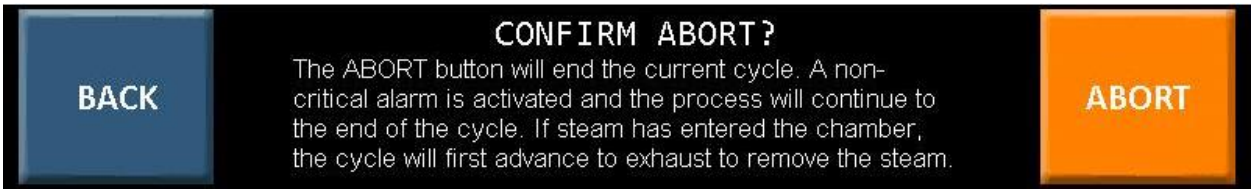

Figure 7.0-2 CONFIRM POPUP WINDOW

7.1.1 CONFIRM POPUP WINDOW - START

In addition to the command details provided and the ability to cancel the operational process, the confirm START popup window includes the LOAD ID ENTRY button. This button navigates the user to the LOAD ID ENTRY screen (Section 7.1.2) in which the user can add additional labels to the printed report prior to the start of a cycle.

Figure 7.0-3 CONFIRM POPUP WINDOW – START

7.1.2 LOAD ID ENTRY

The LOAD ID ENTRY screen provides the user the ability to label the print report with additional load information. Alphanumeric characters and symbols can be entered into each load ID entry position by pressing the box next to the load ID entry label. Empty load ID entry positions, even those with labels, will not be printed. Batch entry labels are entered in the LOAD ID LABELS screen (Section 6.5.4.5).

For the load ID entry information shown below, the load information on the printed report would look like the following:

PRODUCT # : 12634

CODE # : 115

The “LOAD #” is not included as the load ID entry position is blank.

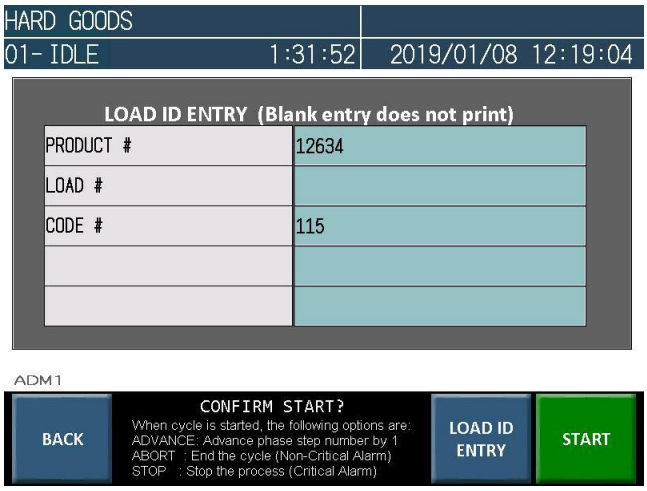

Figure 7.0-4 LOAD ID ENTRY Screen

SECTION 8.0 OPERATION

8.1 Program Start

The user must have Operator or higher security permissions to start a cycle. The Default user can be given Operator permissions by setting the OPERATOR LOGIN REQUIRED global parameter to NO (See section 6.5.4.4 and Part IV Process, Programming, & Parameters Manual)

8.2 Information Messages

Information messages may be used in all phases and are used to provide instructions or indicate conditions. The messages are displayed on all screens except in the case of an active alarm where the alarm message overlays the information message.

8.2.1 Prevented Start Messages

The messages are associated with conditions that will prevent a cycle from starting.

The start button is not displayed until all preventive information messages are cleared

Messages are displayed on the operator panels

8.2.2 Service Messages

The messages are constantly active in standby when the condition is active.

The messages do not prohibit the start of a process.

8.2.3 Process Information Messages

The messages are displayed only on the operating panel.

SECTION 9.0 ALARMS

If a critical fault occurs, in standby or during a process, the system enters an alarm state. The current process is stopped and output signals from the control system maintain settings for the safety of personnel, the unit, and the load.

A warning alarm allows the process to continue.

9.1 Alarm Occurance

The events below take place when an alarm occurs.

A. An audible signal sounds

B. The screen displayed in semi-opaque red.

C. An alarm banner appears with the name of the alarm triggered.

D. ALARM screen button flashes and text changes to ACTIVE ALARM

Figure 9.0-1 Active Alarm Banner

9.2 Alarm Handling

Touching the panel when the red semi-opaque screen is active will silence the alarm signal takes the user directly to the ALARMS screen. There is also a silence button in the ALARMS screen. Depressing and retracting the E-Stop button on the fascia will also silence any active alarms if the HMI is disabled.

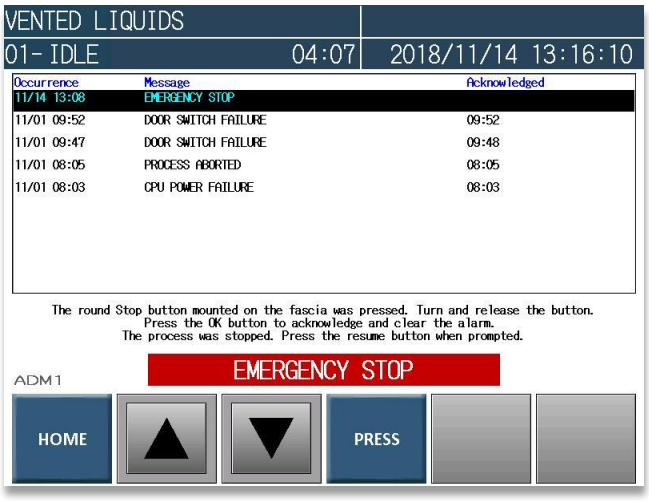

Figure 9.0-2 ALARMS Screen With Active Alarm

If an alarm occurs:

Read the alarm banner and the alarm description message in the ALARMS screen on the HMI. The alarm description message provides a description of the alarm, what to check that generally causes the alarm, and how to acknowledge the alarm.

Press anywhere on the HMI to silence the alarm. The screen stops flashing red, the ALARMS screen appears, and the audible signal stops.

In the alarm screen, acknowledge the alarm(s) using the OK button. Alarms can only be acknowledged if they are no longer active.

Login is necessary to clear alarms during an active cycle if the default user does not have operator privileges. Logout occurs after 15 minutes of screen inactivity.

9.3 After a Critical Alarm

The process stops and goes to alarm phase.

All media to chamber and jacket are shut off.

Pumps and motors are stopped.

The chamber drain is closed.

Critical functions expected to be up during an active alarm is executed during the alarm if required. (e.g. door seal(s)).

While the alarm is active and unacknowledged, the user may use the Advance Step button to advance a single step through the current phase (if conditionally allowed).

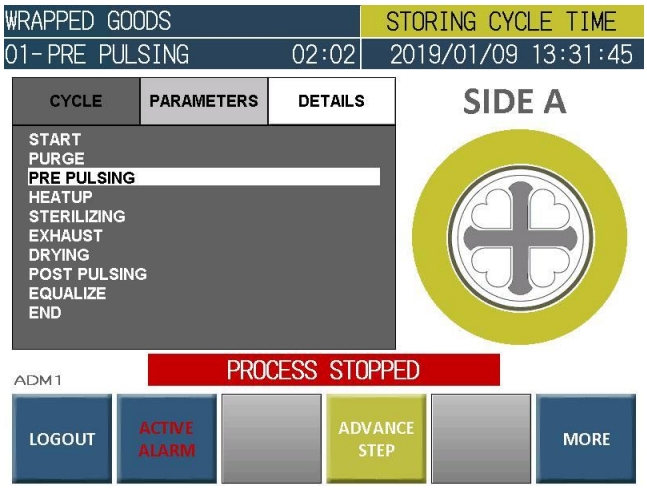

Figure 9.0-3 HOME Screen With Active Alarm

After alarm acknowledgement, the sterilizer waits for the operator to decide how to proceed.

There are 2 alternatives of action:

1. **Abort cycle**: If steam has entered the chamber during the pre-treatment phases, or the heating or sterilizing phases are active, the processes will jump to post treatment. Otherwise, the cycle will advance to Equalization.

2. **Resume cycle:** (continue from current location)

Figure 9.0-4 HOME Screen With Acknowledged Alarm

Alarm is always reset in Standby. The alarm is reset and the process fault indicator light is deactivated with the alarm button.

A "Cycle Not Acceptable" text will be recorded at the end of the cycle report if a critical alarm occurs during the cycle process.

SECTION 10.0 PROCESS ACTIVE AND COMPLETE INDICATORs

Cycle time remaining and status indication is provided on the main screen as a circle graph and on all screens as highlighted text in upper right corner of the status bar.

10.1 Active Cycle Indicators

The circle graph and the cycle time remaining are highlighted in yellow. The time remaining value is based on the run time of a previously ran successful cycle with the same parameters. If a cycle has never been successfully run at least once, or the process parameters of the cycle have been changed, the status bar will display “STORING CYCLE TIME” and the circle graph will be static.

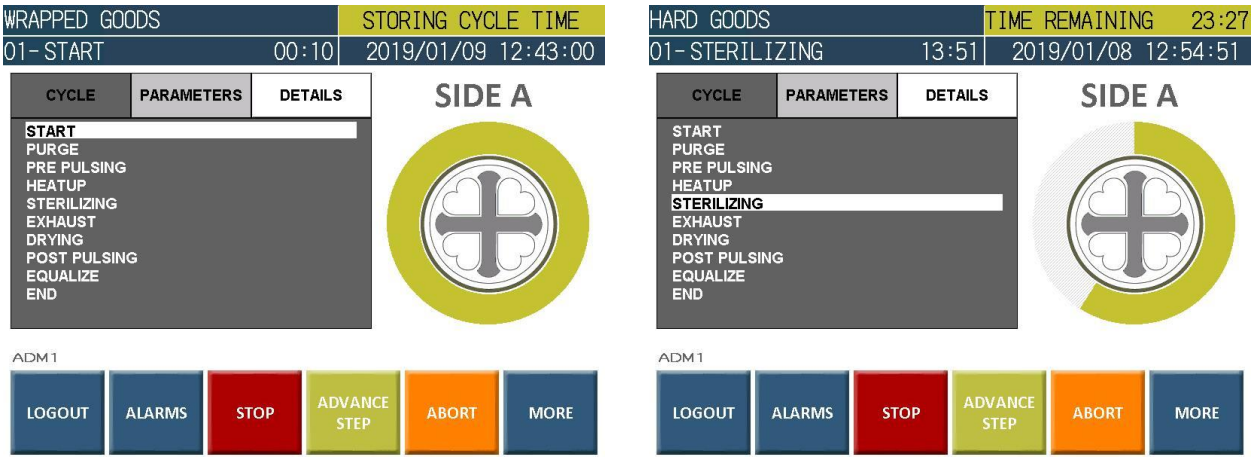

Figure 10.0-1 Active Cycle – Storing Cycle Time & Cycle Time Remaining

10.2 Completed Cycle Indicators

If the cycle is completed successfully, the circle graph is highlighted in static green and the upper right corner of the status bar flashes green while displaying CYCLE COMPLETE. If the cycle is completed unsuccessfully, the circle graph is highlighted in static red and the upper right corner of the status bar flashes red while displaying CYCLE COMPLETE. The CYCLE COMPLETE banner will remain until a door has been opened or another cycle has been started.

A cycle is deemed “successful” only if there are no critical alarms (See section 9.0 and Part IV Process, Programming, & Parameters Manual) that occur during the process and the process has not been stepped or aborted by a user (Section 7.0). The graph indicates the completion time compared to the previously stored run time.

Figure 10.0-2 Cycle Completed Successfully Indicator

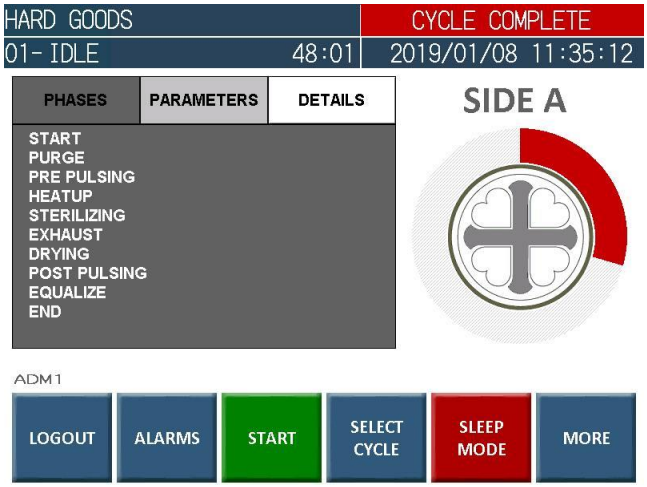

Figure 10.0-3 Cycle Completed Unsuccessfully Indicator

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PRIMUS GENERAL PURPOSE STERILIZER

PSS11 / PRI-MATIC 100® CONTROL

PART IV

PROCESS, PROGRAMMING, & PARAMETERS MANUAL

(WATER EJECTOR VACUUM SYSTEM)

January 15, 2019

Part IV: PROCESS, PROGRAMMING, & PARAMETERS MANUAL
Manual Version 1.00
SW Version 2.00

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Printed in the United States of America

This Steam Sterilizer Operator Manual includes six parts:
General Information
Installation
User
Process, Programming, & Parameters
Factory Acceptance
Maintenance

Once installation of a new PRIMUS General Purpose sterilizer with PRI-Matic™ Control is complete, the user is urged to conduct validation studies according to accepted standards (e.g. FDA cGMP, ANSI) and document the effectiveness of user selected cycle parameters for each type of load to be sterilized. Reference the Part VI, Maintenance Manual for a description of alarms, and maintenance functions (manual operations, cycle parameters, calibration procedures, set date/time and change cycle names).

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LIST OF FIGURES

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SECTION 1.0 INTRODUCTION

1.1 Purpose

The purpose of this Process is to provide a general overview of the sterilization process, the underlying programming of the system, and the parameters for the PRIMUS General Purpose sterilizer with a water ejector vacuum system and PRI-Matic® 100 Control. The document also details the features that will provide the best environment for efficient steam sterilization.

Specific details for the project are provided in the following documents:

- software design specification (provided only if GMP/GAMP Documentation option is selected)
- hardware design specification (provided only if GMP/GAMP Documentation option is selected
- functional specification (provided only if GMP/GAMP Documentation option is selected)
- piping and electrical diagrams.

1.2 Air Removal and Vacuum Using a Water Ejector

The steam sterilization cycle emphasizes the removal of air from the sterilizer chamber before heating to sterilization temperature. Air removal is essential to creating a saturated steam environment throughout the chamber and load. Some types of loads and products can trap air which will prevent exposing all surfaces to steam. The use of prepulses with substantial vacuum limits will help remove air efficiently and help allow steam to penetrate throughout the load.

To remove air, a vacuum is created using a water ejector. A water ejector requires a constant flow of pressurized water through the ejector to create a vacuum on another port connection of the ejector. This vacuum port is connected to the sterilizer's chamber drain.

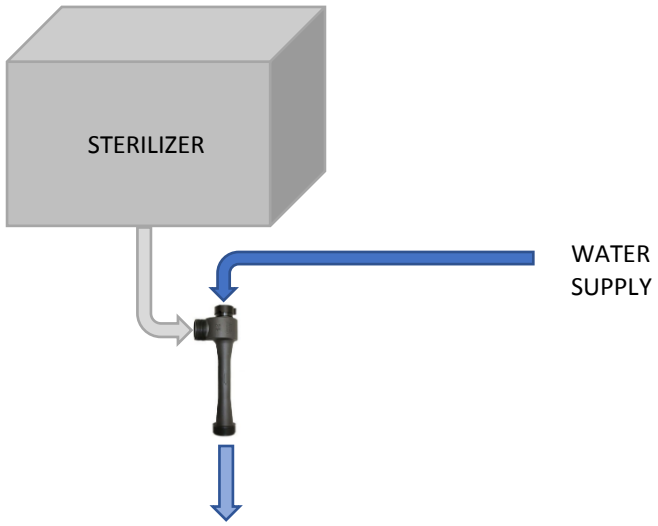

Figure 1.0-1 Water Ejector Vacuum System Representation

The water ejector works best when there is very little air in the chamber. To achieve this, all cycles start by purging steam into the chamber to remove as much of the ambient air as possible and to fill the void left behind with steam. This replacement of air with steam allows the water ejector to work more efficiently. A series of both negative (vacuum) and positive pressure pulses can then be used to continue with the air removal process.

1.3 Effluent Piping Configuration

If the sterilizer is piped in the effluent configuration, the chamber contamination status controls the valve actuated when a request is made to activate the “drain valve”. If the chamber is considered contaminated, the large vent valve is actuated upon requests to open the “drain valve”. If the chamber is considered decontaminated, the chamber drain valve is actuated upon requests to open the “drain valve”. The small vent valve is activated when there is pressure in the chamber or when the large vent valve is actuated.

The chamber is considered decontaminated if the process has not been advanced or aborted prior to the completion of the sterilization phase. The chamber is consider contaminated immediately when the load door is unsealed.

1.4 Factory Values

Throughout the course of this document, there will be various instances of values listed that represent “factory values”. These are parameters, setpoints, ramp rates, etc. that are coded into the software and cannot be directly edited by the end user. Any underlined values throughout the document represent these said factory values.

Although the factory values listed throughout this document are considered standard, they are subject to change dependent on the performance needs of the equipment. If alterations to said factory values are needed in the field, they can be made by contacting the Controls Engineering department at PRIMUS Sterilizer Company, LLC.

SECTION 2.0 STANDARD STEAM STERILIZATION CYCLE

The standard steam sterilization cycle is the primary universal sterilization cycle for sterilizing various non-liquids products. It uses adjustable parameters that the administrator can use to develop cycles to accommodate the different physical properties of product loads. Although the standard cycle can handle liquids after sterilizing, this cycle is not intended to be used for vented containers with liquids.

2.1 Standard Cycle Parameters

PARAMETER DESCRIPTION	RANGE	HARD GOODS	WRAPPED GOODS	WASTE	GRAVITY
PURGE TIME (SEC)	0 – 600	120*	120*	180*	240*
PREPULSES	0 - 99	3	3	3	0
PREPULSE LOW LIMIT (PSIA)	1.20 – 14.00	4.00	4.00	4.00	14.00
PREPULSE HIGH LIMIT (PSIA)	14.00 – 26.00	24.00	24.00	24.00	26.00
DWELL TIME (SEC)	0 – 9999	15	15	15	60
STERILIZING TEMPERATURE (°C)	100.0 – 138.0	121.1	121.1	121.1	121.1
STERILIZING TIME (MIN)	0 – 540	30	30	45	30
EXHAUST RAMP (PSI/MIN)	0.5 – 29.0	15.00	8.00	2.00	15.00
DRY VACUUM LIMIT (PSIA)	1.20 – 13.00	4.00	4.00	12.50	4.00
DRYING TIME (MIN)	0 – 300	10	15	10	5
PRESSURE RAMP (PSI/MIN)	0.50 – 30.00	15.00	8.00	15.00	15.00

Figure 2.0-1 Standard Cycle Pre-Programmed Parameters

* Purge Time parameter may need to be increased for large volume chambers. Reference the attached Part V Factory Acceptance Test for parameters specific to the unit.

2.1.1 PURGE TIME

The purge time is an important parameter that starts the air removal process. The set time determines how long the system will displace air in the chamber through the introduction of steam and activation of the vacuum system. If incorrectly set, the creation of a vacuum may not be sufficient to complete the air removal and create the proper saturation steam environment.

2.1.2 PREPULSES

The prepulse count determines the number of vacuum/positive pulses the load will be subjected to. Prepulses ensure that the air is physically removed, and that the void is replaced with steam and circulated throughout the load. Each pulse removes a percentage of air from the chamber.

2.1.3 PREPULSE LOW LIMIT

The prepulse low limit is the required vacuum limit that must be reached on the third and any subsequent pulses. This parameter can help enhance the removal of air by setting it as low as the water ejector can physically create a vacuum in a timely manner.

2.1.4 PREPULSE HIGH LIMIT

The prepulse high limit is the required pressure limit when steam is entering the chamber on the positive slope of the pre-pulse.

2.1.5 DWELL (EQUILIBRIUM) TIME

The dwell time allows for a stabilization period between heatup and sterilizing. This can be set to 0 or set to an extended time to allow for the theoretical or anticipated heating of interior surfaces that are not monitored by the standard chamber temperature probe.

2.1.6 STERILIZING TEMPERATURE

The sterilization temperature is the critical setting for sterilization assurance.

2.1.7 STERILIZING TIME

The sterilization time is the critical setting for sterilization assurance.

2.1.8 EXHAUST RAMP RATE

The exhaust ramp controls how quickly the chamber is depressurized after completion of the sterilization phase. This parameter is critical for wrapped goods, packs, or waste that has liquified during sterilization. Slowing the exhaust ramp will help minimize damage to packs and liquid boil over.

2.1.9 DRY VACUUM LIMIT

The dry vacuum limit helps enhance drying by efficiently flashing off the remaining moisture in a deep vacuum. Some items such as liquified waste should not have a deep vacuum. Setting this parameter to 10 PSIA or higher will prevent a vacuum from forming by allowing air to flow in and replace any steam/air removed by the vacuum sytsem in the chamber.

2.1.10 DRYING TIME

The drying time is the period that is necessary for all moisture to be removed from the load. More porous loads or wrapped goods will require the most drying time. Waste materials generally do not need drying and require a minimum time to remove excess steam before the cycle ends.

2.1.11 PRESSURE RAMP

The pressure ramp is the increase and decrease rate of pressure throughout the cycle except for the exhaust phase. It can help minimize bag and packet ruptures if the ramp is slower.

Note: Sterilization assurance can only be verified by using the appropriate biological indicator.

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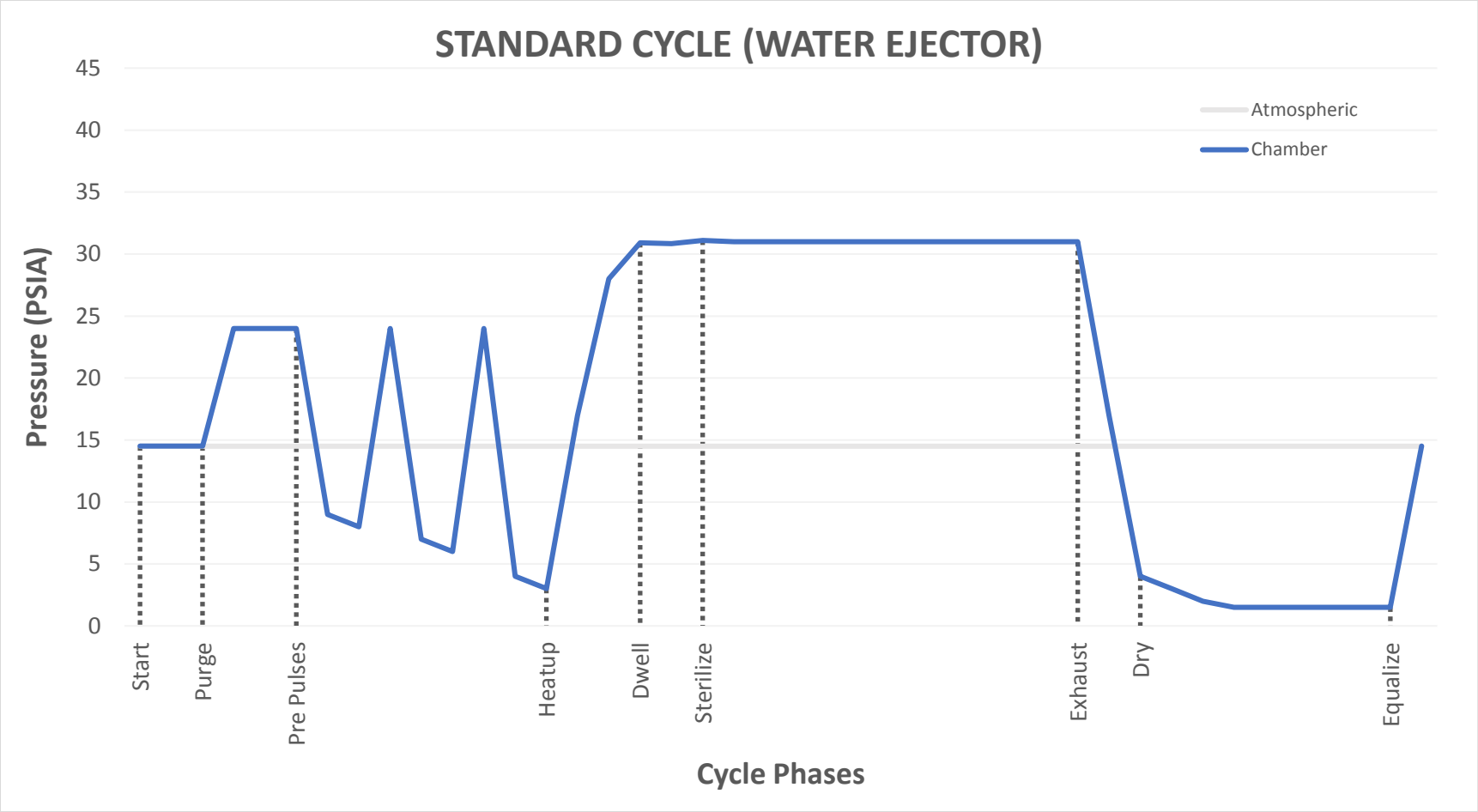

Figure 2.0-2 Standard Cycle Graphical Representation

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SECTION 3.0 VENTED LIQUIDS STEAM STERILIZATION CYCLE

The vented liquids steam sterilization cycle uses adjustable parameters that the administrator can use to develop cycles for vented liquid loads.

3.1 Vented Liquids Cycle Parameters

PARAMETER DESCRIPTION	RANGE	VENTED LIQUIDS
PURGE TIME (SEC) *	0 – 600	180
DWELL TIME (SEC)	0 – 9999	30
STERILIZING TEMPERATURE (°C)	100.0 – 135.0	121.1
STERILIZING TIME (MIN)	0 – 540	30
REQUIRED AF0 (MIN) **	0 – 999	0
EXHAUST RAMP (PSI/MIN)	0.50 – 5.00	1.00
COOL AIR PULSE TIME (MIN)	3 – 300	10
PRESSURE RAMP (PSI/MIN)	0.50 – 30.00	15.00
PRESSURE RAMP (PSI/MIN)	0.50 – 30.00	15.00

Figure 3.0-1 Vented Liquids Cycle Pre-Programmed Parameters

* Purge Time parameter may need to be increased for large volume chambers. Reference the attached Part V Factory Acceptance Test for parameters specific to the unit.

**AF0 minute = Load Temperature at 121°C for 1 minute. Option is ignored if global parameter LOAD PROBE OPTION is set to NO. A value of 0 deactivates the option

3.1.2 PURGE TIME

The purge time is an important parameter that starts the air removal process. The set time determines how long the system will displace air in the chamber through the introduction of steam and activation of the vacuum system. If incorrectly set, the creation of a vacuum may not be sufficient to complete the air removal and create the proper saturation steam environment.

3.1.3 DWELL (EQUILIBRIUM) TIME

The dwell time allows for a stabilization period between heatup and sterilizing. This can be set to 0 or set to an extended time to allow for the theoretical or anticipated heating of the liquid load that is not monitored by the standard chamber temperature probe.

3.1.4 STERILIZING TEMPERATURE

The sterilization temperature is the critical setting for sterilization assurance.

3.1.5 STERILIZING TIME

The sterilization time is the critical setting for sterilization assurance.

3.1.6 REQUIRED AF0

The Required AF0 parameter is the lethality measurement based on the liquid load temperature. A load probe must be installed and the LOAD PROBE ACTIVE global parameter must be on for this parameter to be active. If the parameter is set above 0.00 and the accumulated F0 of the load temperature exceeds the parameter, the cycle will advance before the sterilization time is completed. This parameter can help minimize liquid loads exposed to excessive heat and time and shorten vented liquids type cycles.

3.1.7 EXHAUST RAMP RATE

The exhaust ramp controls how quickly the chamber is depressurized after completion of the sterilization phase. This parameter critical to help prevent liquids from boiling over. It is recommended to not exhaust liquids too fast after sterilizing. Excessive boiling and flashing of the liquid load may cause loss of liquids. It may also be necessary and sometimes difficult to clean the chamber after a spill.

3.1.8 COOL AIR TIME

The cool air time controls the length of time that excess steam is removed from the chamber.This period is necessary after a liquid exhaust since a deep vacuum cannot be established on liquid loads to remove steam.

3.1.9 PRESSURE RAMP

The pressure ramp is the increase and decrease rate of pressure throughout the cycle except for the exhaust phase.

Note: Sterilization assurance can only be verified by using the appropriate biological indicator.

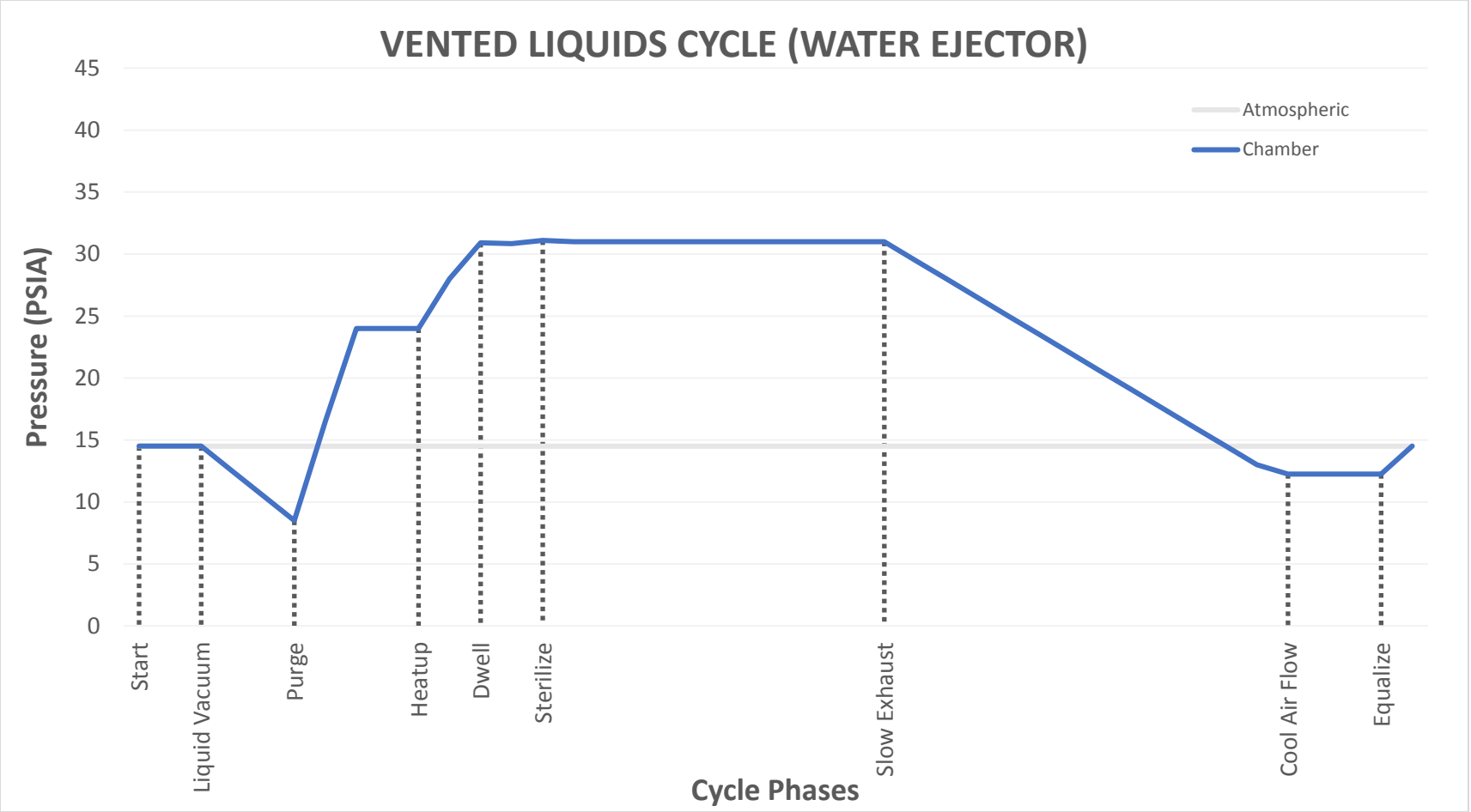

Figure 3.0-2 Vented Liquids Cycle Graphical Representation

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SECTION 4.0 LEAK TEST CYCLE

The Leak Test Cycle is used to determine the integrity of an autoclave's chamber and plumbing system. The test pulls a deep vacuum within the chamber and, once the chamber pressure has stabilized, measures the amount of vacuum depth lost over a given period of time. A purge and multiple pre pulses are utilized to provide the ability to reach deep vacuum levels in the chamber.

4.1 Leak Test Cycle Parameters

PARAMETER DESCRIPTION	RANGE	LEAK TEST
LEAK TEST TIME (MIN)	1 – 120	10
LEAK AMOUNT (PSI)	.05 – 3.00	0.2

Figure 4.0-1 Leak Test Cycle Pre-Programmed Parameters

4.1.2 LEAK TEST TIME

The leak test time determines the period of time that the test is performed over.

4.1.3 LEAK AMOUNT

The leak amount is the total amount of pressure that may be lost over the period of the leak test before it is considered a "failed" test.

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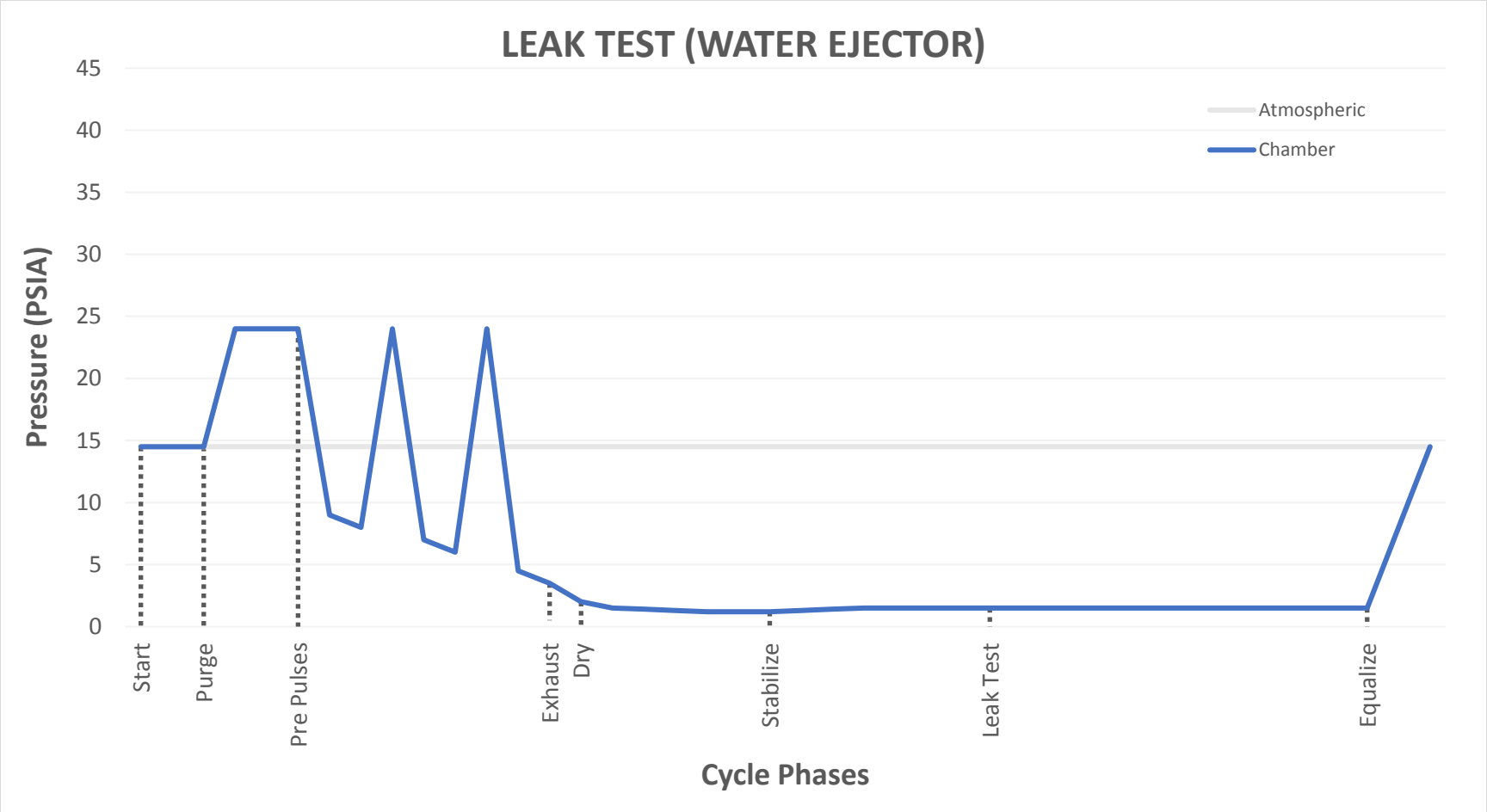

Figure 4.0-2 Leak Test Cycle Graphical Representation

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SECTION 5.0 BOWIE DICK TEST CYCLE

The Bowie Dick Test Cycle demonstrates proper air removal from the chamber of an autoclave by measuring steam penetration through the use of a Bowie Dick test pack. It is a sensitive and rapid means of detecting air leaks, inadequate air removal, inadequate steam penetration, and non-condensable gases (e.g., air or gas from boiler additives). Insufficient air removal can defeat sterilization and result in nonsterile loads if undetected.

5.1 Bowie Dick Test Cycle Parameters

PARAMETER DESCRIPTION	RANGE	BOWIE DICK TEST
PURGE TIME (SEC)*	0 – 600	120
PREPULSES	0 - 99	3
STERILIZING TEMPERATURE (°C)	100.0 – 138.0	121.1
STERILIZING TIME (MIN)	0 – 540	10
DRY VACUUM LIMIT (PSIA)	1.20 – 7.00	5.00
DRYING TIME (MIN)	0 – 300	5

Figure 5.0-1 Bowie Dick Test Cycle Pre-Programmed Parameters

* Purge Time parameter may need to be increased for large volume chambers. Reference the attached Part V Factory Acceptance Test for parameters specific to the unit.

5.1.2 PURGE TIME

The purge time is an important parameter that starts the air removal process. The set time determines how long the system will displace air in the chamber through the introduction of steam and activation of the vacuum system. If incorrectly set, the creation of a vacuum may not be sufficient to complete the air removal and create the proper saturation steam environment.

5.1.3 PREPULSES

The prepulse count determines the number of vacuum/positive pulses the load will be subjected to. Prepulses ensure that the air is physically removed, and that the void is replaced with steam and circulated throughout the load. Each pulse removes a percentage of air from the chamber.

5.1.4 DWELL (EQUILIBRIUM) TIME

The dwell time allows for a stabilization period between heatup and sterilizing. This can be set to 0 or set to an extended time to allow for the theoretical or anticipated heating of interior surfaces that are not monitored by the standard chamber temperature probe.

5.1.5 STERILIZING TEMPERATURE

The sterilization temperature is the critical setting for sterilization assurance.

5.1.6 STERILIZING TIME

The sterilization time is the critical setting for sterilization assurance.

5.1.7 DRY VACUUM LIMIT

The dry vacuum limit helps enhance drying by efficiently flashing off the remaining moisture in a deep vacuum.

5.1.8 DRYING TIME

The drying time is the period that is necessary for all moisture to be removed from the load. Bowie Dick Test packs do not need to be excessively dried to provide accurate results.

Note: Sterilization assurance can only be verified by using the appropriate biological indicator.

Note: See Standard Cycle for graphical representation.

SECTION 6.0 PHASE DESCRIPTIONS

6.1 IDLE

The IDLE phase is the active phase when no cycle is executed.

6.1.1 Cycle End Audible Signal

The signal to turn on the alarm buzzer output is turned at the start of IDLE indicating that the cycle is complete. This signa is on only for the first several seconds of when the IDLE phase is first activated. The output on time is based on a factory adjustable parameter.

6.1.2 Chamber Pressure Equalization

Chamber pressure is controlled and maintained near ambient atmosphere pressure.

6.1.3 Door control

See Part III User Manual for details pertaining to the door control in IDLE.

6.1.4 Cycle Parameter Editing and Selection

Cycles can only be selected in IDLE. All cycle parameter edits will not take effect during a cycle.

6.1.5 Automatic Calibration

Automatic calibration is allowed only in IDLE.

6.1.6 Report Printing

Printing reports is only allowed in IDLE.

6.1.7 Jacket heating

Jacket heat control uses a dead band control between a hysteresis based on an adjustable global parameter. Jacket heating control is **de-activated** during the following conditions:

- After a cycle is completed until a door is opened (unless a factory adjustable override bit is activated; is deactivated by default)
- Global parameter JACKET ACTIVE IN IDLE option is turned off.
- Jacket temperature is above the JACKET IDLE HIGH TEMPERATURE global parameter for the high end of the hysteresis band.

- Jacket temperature is above 135°C.
- Jacket temperature is not at least 3°C or less than currently selected cycle sterilization temperature.
- An invalid recipe with no parameters is selected.
- Sterilizer is put into “Sleep mode” either by the press of the SLEEP MODE button or by the automatic shutdown feature
- The sterilizer is in an alarm state
- When the door is open (If a factory adjustable override bit is deactivated; is activated by default).

6.1.8 Cycle Start Conditions and Restrictions

The process is started by means of the START button on the HMI.

Process start is prevented if conditions are not ideal for running a successful cycle. An information message is provided. The following conditions prevent a cycle from starting:

- The authorization override is active.
- The rupture disk circuit is open (option).
- A cycle with no inputted parameters is selected.
- Printing is active.
- Door(s) is (are) not closed.
- An alarm condition is active or system is still in an alarm state.
- An active door operation is occurring.
- Jacket temperature is not up to the required JACKET IDLE LOW TEMPERATURE while the jacket is conditioning.
- Jacket temperature is more than 3°C above the cycle sterilization temperature.
- Monitored utilities are below the required pressure threshold (option).
- A maintenance cycle is selected on an effluent bioseal unit with a contaminated chamber.

6.2 START

Iniciates cycle logging, cycle phase sequence, performs tests of door seal(s), and conditions jacket up to required setpoint.

The phase advances once the jacket reaches the required setpint and holds it for the length of time determined by the JACKET CONDITION global parameter. The timer defaults to 5 seconds if the global parameter value is less than 5.

6.3 PURGE

Removes air from the chamber and preheats external surfaces using a continuous flow of steam slightly above atmospheric pressure. Purging is necessary when using a water ejector to remove much of the ambient air before creating a vacuum. When used for preheating, steam will not penetrate containers that have filter and paper barriers because of the trapped air within the container. Preheating helps to minimize condensate buildup.

The phase advances when the PURGE TIME cycle parameter is met.

6.4 PRE PULSES

Remove air from the chamber and load using staggered vacuum pulses and replace the void with steam.

If the PREPULSE LOW LIMIT parameter is set to a deep vacuum, the first two negative pulses will use a fixed vacuum level due to the limitations of the water ejector when air is still present in the chamber and load. The 3rd and subsequent pulses will use the adjustable parameter limit as the vacuum limit. The fixed vacuum limits are as follows:

- 1st negative pulse – 9.0 PSIA
- 2nd negative pulse – 9.0 PSIA
- 3rd+ negative pulse – 4.5 PSIA (Applicable for Leak Test and Bowie Dick Test cycles only)

If the adjustable PREPULSE LOW LIMIT parameter is set above the fixed vacuum limits, the process will continue when the adjustable parameter is met. This may be used in the case of setting the pressure limit parameters to use little to no vacuum for exceptional cases.

The phase advances when the pulse count reaches the PREPULSES cycle parameter value.

6.5 LIQUID VACUUM

Remove air from the chamber for up to 180 seconds and replace with steam. Vacuum limit is restricted to the theoretical pressure of the liquid based off the temperature of the load probe (if active).

The phase advances after the 180 second timer is complete or if the chamber vacuum pressure reaches the theoretical pressure of the liquid (if load probe is active).

6.6 HEATUP

Increase steam pressure to within 3°C of sterilization setpoint and then slowly ramp the temperature into sterilization. The DWELL TIME parameter may be utilized to allow loads to equalize with chamber temperature prior to advancing into the STERILIZING phase.

The phase advances when all process temperatures are above the STERILIZATION TEMPERATURE parameter and any applicable DWELL TIME has been met.

6.7 STERILIZING

Maintain chamber temperature above sterilization set point.

The phase advances when the STERILIZING TIME parameter is met, or, the load probe F0 accumulation value is greater than the REQUIRED AF0 parameter (liquids cycle only; load probe must be active; REQUIRED AF0 parameter is greater than 0)

6.8 EXHAUST

Depressurize the chamber according to the ramp rate and remove the steam through the drain valve.

The phase advances when chamber pressure reaches the DRY VACUUM LIMIT cycle parameter.

6.9 LIQUID EXHAUST

Slowly depressurize the chamber according to the ramp rate and remove the steam through the drain valve.

The phase advances when the chamber pressure is below 12.25 PSIA and the load probe temperature is below 95°C (If load probe is active).

6.10 DRYING

Continue to pull a vacuum on the chamber after the exhaust phase to enhance drying of load. If the DRY VACUUM LIMIT parameter is set above 10.00 PSIA, air will be introduced to prevent formation of a deep vacuum. This feature can be utilized to cools loads which can not be subjected to deep vacuums, such as a load that liquifies during the sterilization phase.

The phase advances when the DRYING TIME cycle parameter is met, or, if cycle is aborted, when the 180 second minimum dry time is met.

6.11 COOL AIR FLOW

To help improve cooling and remove residual steam vapor, provide continuous flow of air and vacuum competing to maintain a slight vacuum of 12.25 PSIA.

The phase advances when the COOL AIR TIME cycle parameter is met and a 180 second minimum cool air time is complete.

6.12 PRESSURE EQUALIZE

Equalize the pressure in the chamber and confirm that the chamber pressure is stabilized.

The phase advances when the chamber is within 0.75 PSI of the atmospheric reference pressure for 30 seconds.

6.13 DRAIN CLEANING (Option)

Apply water to drain strainer to backflush debris from drain.

The phase advances when a 30 second timer is complete.

6.14 STABILIZING

Stabilize the vacuum in the chamber for 5 minutes prior to the commencement of the leak test.

The phase advances when the 5 minute timer is complete.

6.15 LEAK TEST

Test for any air leaks into the chamber.

The phase advances when the LEAK TEST TIME cycle parameter is met.

6.16 END

End the process, print an end report, and prepare for IDLE phase.

The phase advances after a 5 second timer is complete.

SECTION 7.0 GLOBAL PARAMETERS

The global parameters are values that are used universally for all processes and cycles types.

PARAMETER DESCRIPTION	RANGE	DEFAULT
JACKET CONTROL		
JACKET ACTIVE IN IDLE	YES/NO	YES
JACKET IDLE LOW TEMPERATURE (°C)	100.0 – 118.0	100.0
JACKET IDLE HIGH TEMPERATURE (°C)	104.0 – 120.0	105.0
JACKET CONDITIONING [SEC]	0 - 6000	30
TIMEOUTS		
COOLING TIMEOUT (MIN)	1 - 300	90
HEAT TIMEOUT (MIN)	1 - 120	30
PRESSURE TIMEOUT (MIN)	1 - 120	30
STERILIZATION TIMEOUT (SEC)	1 - 9000	300
VACUUM TIMEOUT (MIN)	1 - 300	30
PRINT CONTROL		
LOG INTERVAL NON CRITICAL (SEC)	5-9999	60
LOG INTERVAL CRITICAL (SEC)	5-9999	60
HIGHLIGHT TURNPOINTS	YES/NO	YES
PRINTER TYPE 0=32 1=80	32/80	32
COLOR (TYPE 80 ONLY)	YES/NO	NO
ETHERNET PRINTING ACTIVE	YES/NO	NO
PRINTER 1 IP ADRESS	N/A	0.0.0.0
PRINTER 2 ACTIVE	YES/NO	NO
PRINTER 2 IP ADDRESS	N/A	0.0.0.0
LOAD PROBE		
LOAD PROBE OPTION	YES/NO	NO
OPERATION		
TEMPERATURE UNITS	°C /°F	°C
OPERATOR LOGIN REQUIRED	YES/NO	YES
UTILITIES OFF IDLE HOURS*	0 - 99	0

Figure 7.0-1 Global Parameters Defaults

* A value of 0 disables the option

7.2 Jacket Control

The following options pertain to the control of the sterilizer jacket.

7.2.1 JACKET ACTIVE IN IDLE

This option provides the option to either keep the jacket heated during idle or to shut off the jacket function to conserve utility resources.

7.2.2 Jacket Idle Low and High Temperature

If the jacket is heated during idle, the idle low and high temperatures provide a dead band control to help provide a saturated steam environment in the jacket and to minimize jacket valve maintenance.

7.2.2.1 JACKET IDLE LOW TEMPERATURE

The jacket heat control will turn on when the temperature drops below this limit

7.2.2.2 JACKET IDLE HIGH TEMPERATURE

The jacket heat control will turn off when the temperature increases to this limit.

7.2.3 JACKET CONDITIONING

This option controls the amount of time the jacket “conditions” after reaching the desired temperature setpoint in the START phase. The short time period allows the jacket temperature to equalize prior to the start of any preconditioning.

7.3 Timeouts

The timeout parameters provide the ability to set the period of time until a timeout alarm is triggered when a condition is not met.

7.3.1 COOLING TIMEOUT

The cooling timeout timer is active in phases in which liquids are being cooled. The timer is active in the LIQUID EXHAUST, AIR OVER and JACKET COOLING phases.

7.3.2 HEAT TIMEOUT

The jacket heating and the heatup to sterilizing uses the heat timeout timer. The timer is active in the START and HEATUP phases.

7.3.3 PRESSURE TIMEOUT

The pressure timeout timer is active in phases with pressure limits. The timer is active in the PREPULSES, LIQUID VACUUM, and PRESSURE EQUALIZE phases.

7.3.4 STERILIZATION TIMEOUT

During sterilization, if one of the process temperatures drops below set point, the sterilization timeout timer begins accumulating time. If all process temperatures are above set point, the timer value is held. The accumulated value of the timer is used to trigger a timeout alarm. The timer is used in the STERILIZING phase.

7.3.5 VACUUM TIMEOUT

The vacuum timeout timer is active in phases with vacuum limits. The timer is active in the PREPULSES, LIQUID VACUUM, and EXHAUST phases.

7.4 Print Control

The following options detail the user's ability to change how the cycle report is printed.

7.4.1 LOG INTERVAL NON-CRITICAL

The non-critical log interval is the time between the automatic logging of the process values during the non-sterilization phases.

7.4.2 LOG INTERVAL CRITICAL

The critical log interval is the time between the automatic logging of the process values during the sterilization phases.

7.4.3 HIGHLIGHT TURN POINTS

Turn points are printed when phase changes occur, or when critical pressure and/or temperatures are met during the process. These logged values will be recorded at any time and are separate from the automatic print intervals. The highlight option replaces the space " " characters between the process value columns with underline "_" characters. This helps differentiate the logline from the automatic intervals.

7.4.4 PRINTER TYPE 0=32 1=80

The 32 character print provides a print with no page extra page header and numbers. This option should be used when printing through a standard kiosk thermal or impact printer.The 80 character option provides a print with extra page headers and page numbers. This option should be used when printing through a standard office printer.

7.4.5 COLOR (TYPE 80 ONLY)

The color option will provide a red font color for highlighting alarms messages. This option should only be used when printing through a standard office printer.

7.4.6 ETHERNET PRINTING ACTIVE

The PLC provides TCP socket messaging using Raw Telnet protocol for the print output. The system is configured with 2 communication options for dual print outputs. The active options allow for one or both ports to be active. This option should be active if printing to a standard office printer or server over ethernet.

7.4.7 PRINTER 1 IP ADDRESS

Enter the IP address of the server or printer that will retrieve the print data via TCP using the Raw Telnet protocol. The port utilized for the TCP communication is 9100, a port commonly used by printer manufacturers for raw TCP communication.

7.4.8 PRINTER 2 ACTIVE

This parameter activates the second TCP communication option if the print data needs to be ouput to an additional server or printer.

7.4.9 PRINTER 2 IP ADDRESS

Enter the IP address of an additional server or printer that will retrieve the print data via TCP using the Raw Telnet protocol. The port utilized for the TCP communication is 9100, a port commonly used by printer manufacturers for raw TCP communication.

7.5 Load Probe

The following settings pertain to the optional chamber load probe.

7.5.1 LOAD PROBE OPTION

The load probe option provides the ability to add or remove the load probe RTD input from the system. When the option is off, the system ignores the load probe RTD input, removes it from the process, and prevents the analog input error. When the option is on, the load probe input is included as a process temperature and the system will error if the load probe RTD input drops out.

7.6 Operation

The following settings pertain to the general operation of the sterilizer.

7.6.1 TEMPERATURE UNITS

This option controls the temperature units displayed on the HMI and printed on cycle reports. The two temperature units available are Celcuis and Fahrenheit.

7.6.2 OPERATOR LOGIN REQUIRED

The operator login required option allows for cycle operation and alarm acknowledgment without the need to login. The higher level security restrictions remain in place when the operator login requirement is disabled.

7.6.3 UTILITIES OFF IDLE HOURS

The utilities off idle hours option provides the ability to shutdown the unit after a specific number of hours sitting idle. Setting the option to a value of “0” disables the feature.

SECTION 8.0 I/O SENSING AND CONTROL

8.1 Digital Inputs

The digital inputs on the PLC base and any applicable digital input modules are relayed directly to internal relay tags. No interlock conditions are applied. Reference the electrical diagrams provided and/or the digital inputs screen on the HMI for the digital input connections.

8.2 Analog Inputs

The analog sensors wired to the analog input module can be of a mixture of variable resistance, variable voltage, and variable current anolog sensors.Temperature is typically measured via RTD sensors (variable resistance) while pressure can be either a variable voltage or variable current signal depending on the application. Reference the electrical diagrams and major electrical list provided for the specific analog input sensor types.

8.2.1 Scaled Value

Input card analog values are configured and scaled by the card configuration. The scaled inputs are provided as a real number to the PLC at ¼ second intervals. The scaled inputs are calculated to an adjusted process tag based on calibration.

The raw analog values are read and adjusted by the analog input channel configuration and provided as real numbers to the PLC at ¼ second intervals. These real numbers represent the scaled value, or the input value prior to calibration adjustments.

8.2.2 Adjusted Value

The scaled values are then adjusted using the set calibration values. This final value is the adjusted value.

8.2.3 Calibration

The calibration of each analog input is based on the GAIN and OFFSET. These parameters can be manually and automatically adjusted. The default gain and offset values to scale are 1.0 for the GAIN and 0 for the OFFSET.

The GAIN is the relation to the set scale of the input's range (ex. 0°C – 150°C) and the "real world" value indicated by an independent source. This number should not deviate far from 1.000.

The OFFSET changes all values along the entire range of the scale. The offset is added to the scaled inputs after multiplying the gain. The offset should be close to the value of 0.

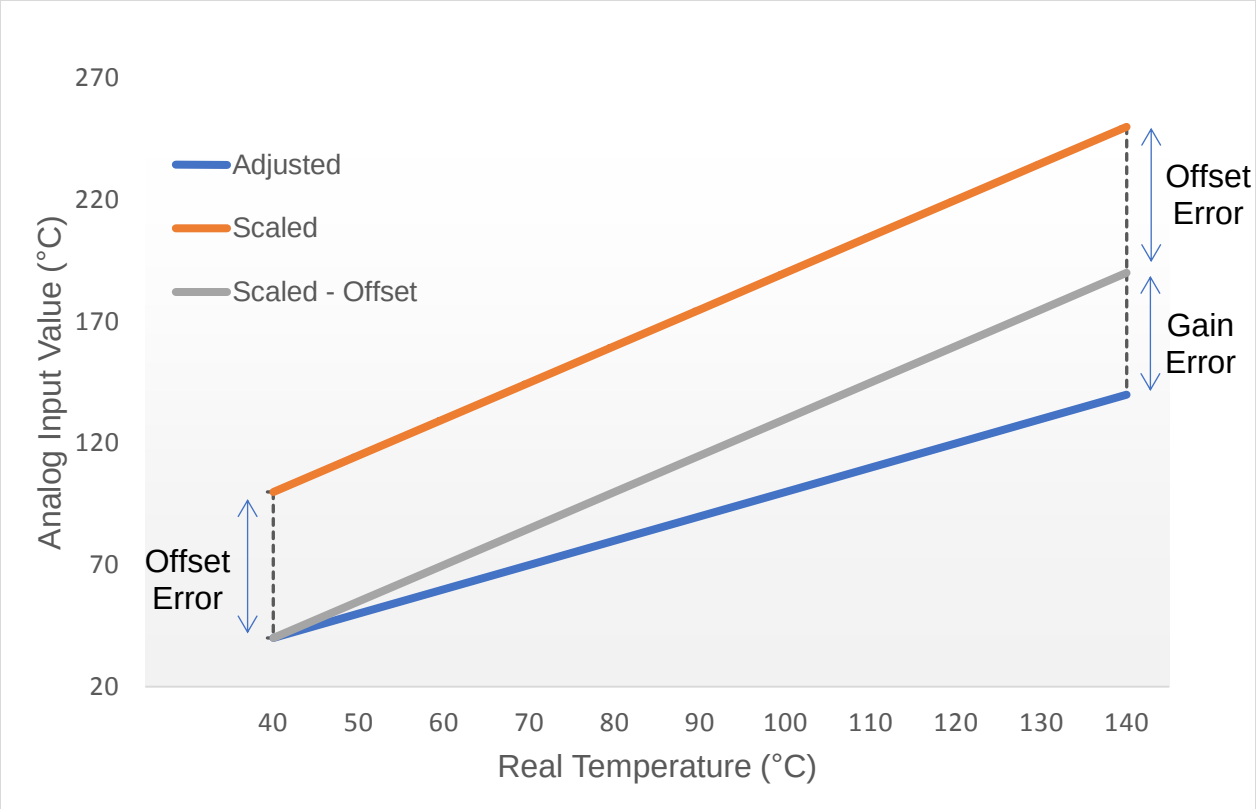

Figure 8.0-1 GAIN and OFFSET Adjustment Example

8.2.3.2 Automatic Calibration

Automatic calibration allows multiple inputs to be adjusted and compared to low and high "real world" references entered during the procedure.

SCALED_LOW & SCALED_HIGH *= Value of each device on the display when GAIN is set to 1.00 and the OFFSET is set to 0.*

LOW_REF & HIGH_REF *= The 2 references provided by an independent source.*

The auto calibration records these four values. When the low reference is entered, the SCALED_LOW and LOW_REF values are stored. When the high reference is entered, the SCALED_HIGH and the HIGH_REF values are stored. When finalized, the following calculations are performed for each device:

GAIN *= (SCALED_HIGH – SCALED_LOW) / (HIGH_REF – LOW_REF)*

OFFSET *= ((SCALED_HIGH * LOW_REF) – (HIGH_REF * SCALED_LOW)) / (LOW_REF – HIGH_REF)*

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8.2.3.3 Manual Calibration

Manual calibration provides direct adjustment to the GAIN and OFFSET values. This can help with mid-point or critical adjustments such as the sterilization temperature. It is generally recommended to adjust primarily the offset value. Any gain adjustments require procedural calculations for accuracy.

8.2.4 Process Temperature Comparator

The process temperatures are the inputs that are required to meet the critical temperature limits of the standard sterilization process. Unless specified that only one temperature is required to meet a limit, the comparing of the process temperatures will be used. Either the lowest or highest temperature in the group is considered the value that must meet a condition.

8.2.4.1 Process Temperature Inputs

The following inputs are considered process temperature inputs by default:

- Chamber Drain RTD
- Load Probe RTD (If set to active in Global Parameters)

8.3 Outputs

The output control relays all conditional results from the PLC logic to the relay outputs on the PLC base and any applicable relay outputs modules. As with the analog input routine, the output routine is slowed to ¼ second intervals in which the outputs will not turn on and off faster than the ¼ second rate.

Reference the electrical diagrams provided and/or the ouputs screen on the HMI for the specific listing of outputs.

8.3.1 Output Interlocks

All aplicable steam to chamber outputs are interlocked by the door switch(es) and gasket pressure input(s) in the software. To activate the output(s), the door(s) must be closed and sealed.

All applicable steam to gasket outputs are interlocked by the door switch(es) in the software. To activate the output(s) output card bits, the door(s) must be closed.

For power door units, all applicable open door ouputs are interlocked by the “pressure in chamber” bit in the software.The pressure in chamber bit is high when there is greater than 0.75 PSIG of pressure in the chamber.

All ouputs, excluding the gasket charge and buzzer ouputs, are interlocked via the emergency stop push button. This is both a hardwired and software interlock to provide redundancy.

8.3.2 Ouputs in Alarm State

Some outputs such as door control and indicator outputs remain active during an alarm. Media controlled outputs, motors, and other safety regulated outputs will be deactivated. The output card signal is controlled using programming logic with an alarm bit used in series for outputs that are deactivated.

8.3.3 Manual Ouput Control

The manual control logic for each output bypasses the automated trigger and alarm bit restrictions. The manual control can be accessed by technician or higher level users only. The process to manually activate an output requires 2 steps. The first is to set a preliminary setting of the selected output(s) and the second is to send the request to execute the control. A single clear all manual control will put the entire system back into automatic status.

Manual control does not bypass the software interlocks described previously.

Manual control is handled strictly from programming logic and no processor forces are enabled.

SECTION 9.0 ALARMS

Alarm or fault conditions are divided into two categories: Critical and Warning.

9.1 Critical Alarms

Critical alarms will cause the control system to enter a static state where most outputs are deactivated. If in cycle and if safety conditions are met, manual step advance is allowed

9.1.1 After a critical alarm

The process stops and the sterilizer enters an alarm state.

All media to chamber and jacket are shut off.

Pumps and motors are stopped (Except for external independently control components such as a boiler or steam generator).

The chamber drain is closed. A check valve in the secondary drain line prevents any flow reverse if there is a vacuum in the chamber.

Critical ouputs remain active in an alarm state (e.g. door seal and buzzer)

The sterilizer waits for the user to decide how to proceed. There are 3 alternatives of action:

- Abort cycle (Advance to post treatment if steam has entered the chamber during the cycle or to equalization if no steam has entered).
- Resume cycle (Continue process from current cycle phase and step)
- Advance cycle (Advance one phase step. Advancing cycle will not place the sterilizer back into normal operation; system will remain in alarm state unitl resumed or aborted)

At the end of the cycle, the printed cycle report will include “CYCLE NOT ACCEPTABLE” if any critical alarm has occurred at any time during the process. The operator must make the final determination on the sterility of the load.

9.1.2 Critical alarm list

9.1.2.1 EMERGENCY STOP

The alarm is activated when the red Emergency Stop button located on the sterilizer fascia is depressed. When the Emergency Stop button is depressed, power to all outputs electrically interlocked through the Emergency Stop switch is cut off.

9.1.2.2 PROCESS STOPPED BY [User ID]

The alarm is activated when a user presses the STOP button on the HMI display.The process STOP button enables the user to halt the process from the panel. This is similar to the Emergency Stop button with the exception that the electrical interlocks remain in place and that the user's ID is recorded.

9.1.2.3 VACUUM TIMEOUT

The alarm is activated when there is a failure to meet the vacuum limits in an allowed time period (VACUUM TIMEOUT global parameter) within the following phases

- PRE PULSES
- EXHAUST

9.1.2.4 PRESSURE TIMEOUT

The alarm is activated when there is a failure to meet the pressure limits in an allowed time period (PRESSURE TIMEOUT global parameter) within within the following phases:

- PRE PULSES
- LIQUID VACUUM
- PRESSURE EQUALIZE

9.1.2.5 HEAT TIMEOUT

If the jacket temperature has not reached the required set point within the required time period (HEATUP TIMEOUT global parameter) the alarm will be activated in the following phase:

- START

If all process temperatures have not reached sterilization temperature within the required time period (HEAT TIMEOUT global parameter) the alarm will be activated in the following phase:

- HEATUP

9.1.2.6 STERILIZATION TIMEOUT

If one of the process temperatures drops below the sterilization temperature for an accumulated time (STERILZATION TIMEOUT global parameter) the alarm will be activated in the following phase:

- STERILIZING

9.1.2.7 COOLING TIMEOUT

If the temperature and pressure remains above the required limits for a time period (COOLING TIMEOUT global parameter) the alarm will be activated in the following phase:

- LIQUID EXHAUST

9.1.2.8 LOW TEMPERATURE

If the process control temperature probe goes below sterilizing set point, the alarm will be activated. This alarm is active during the sterilization phase only after a 15 second equilibration timer is completed at the start of the phase. The equilibration timer is reduced if the dwell time is used in the HEATUP phase. If the dwell time exceeds 15 seconds, the equilibration timer is set to 0. The alarm occurs only once per process.

9.1.2.9 HIGH TEMPERATURE

If the process control temperature probe goes above sterilizing set point by 3°C , the alarm will be activated. This alarm is active during the sterilization phase only after a 15 second timer is completed at the start of the phase. The alarms occur only once per process.

9.1.2.10 HIGH CHAMBER PRESSURE

If chamber pressure exceeds 50 psia at any time

OR

If during the sterilizing phase the pressure rises above the theoretical pressure (calculated from temperature) [sterilizing control temperature + 3°C] , the alarm will be activated.

9.1.2.11 DOOR SWITCH FAILURE

The alarm is activated if one of the following occur:

- During a cycle if any of the door closed switches on the door provide an incorrect signal for more than 5 seconds.
- If any of the door closed switch signals are not correct while opening the door 10 seconds after the gasket is retracted.
- If the door open switch signal is not correct 10 seconds after the start of closing the door.
- If the door does not complete the opening/closing process within 90 seconds.

9.1.2.12 DOOR SEAL FAILURE

The alarm is activated if any of the following conditions are met:

- If the doors have constant air or steam supply and the doors sealed input drops out for more than 5 seconds during an active cycle.
- If the door seal input signal is on after retracting the door seal for 45 seconds during opening.
- If the door seal input signal does not turn on after 90 seconds during the door seal test in the START phase.

9.1.2.13 CPU POWER FAILURE

The control system has been without main power or the function switch on the PLC was set to “0”.

- This alarm can only be activated when running a process.
- The alarm is activated with no delay when power is restored.

9.1.2.14 HIGH JACKET TEMPERATURE

If the temperature of the jacket temperature is more than 3°C over the recipe sterilization set point limit or over the maximum allowable 142°C, the alarm will be activated.

9.1.2.15 WATER IN DRAIN Alarm (Option)

The alarm is activated if the condensate level in the drain is above the sensor for more than 30 seconds during an active cycle.

9.1.2.16 RUPTURE DISK FAIL

The alarm is activated if the rupture disk input circuit is open or disconnected. Excessive pressure in the chamber will cause the rupture disk to burst and the circuit to open.

9.1.2.17 PLC MEMORY LOSS

The alarm is activated if the data register containing the lifetime cycle count equals 0. This would indicate a loss of memory to the PLC.

9.1.2.18 AI FAILURE

If the control system detects any of the analog sensors have driven off scale (e.g. open or closed circuit) then a failure alarm will be activated. The alarms occur only once per process. Analog input failure alarm is also monitored in IDLE. The alarm text depends on which analog input channel the faulty sensor is connected to (e.g. AI00 RTD FAILURE)

9.2 Warning Alarms

Warning alarms are only activated during a cycle.

9.2.1 After a warning alarm

The cycle will proceed normally.

The process is considered complete with no interruption or failure.

9.2.2 Warning alarm list

9.2.2.1 CYCLE ABORTED BY [USER ID]

The alarm is activated when a user presses the ABORT button on the HMI display.The process abort button on the display enables the user to end the process from the panel. The user's ID is recorded.

9.2.2.2 LEAK RATE TEST FAILURE

If the pressure increases above 4.5 PSIA during the STABILIZE phase, the warning will be activated.

OR

If the total leak amount during an automatic leak rate test is greater than the cycle adjustable LEAK RATE parameter.

SECTION 10.0 PROPORTIONAL CONTROLLERS

Most of the temperature and pressure control is handled using proportional controllers. These controllers use a standardized structured logic to provide a configurable activation of both digital and analog outputs. There are two types of controllers, increase and decrease. The increase controller uses a high target and the controller output causes an increase in temperature or pressure. The decrease controller uses a low target and the controller output causes a decrease in temperature or pressure.

The two controllers are identical except for a few logic instruction calculations. Each controller form uses the following logic components (Words in bold refers to other controller components):

10.1 Jacket Temperature Controller:

This increase proportional control drives the steam supply valve to the chamber jacket. The final set point for this controller is the Sterilization set point plus the offset (Default is -1°C). The input variable is the Jacket Temperature. The default ramp rate is 25°C/Minute. This proportional control is activated during when the controller trigger is activated at the start of all phases that require jacket heat. The initial settings for the controller are provided in the START phase.

10.2 Sterilizing Temperature Controller:

This increase proportional control drives the steam supply (trim if precise temp control) valve to the chamber. The final set point for this controller is the Sterilization set point plus the offset (Default 1°C). The input variable is the Chamber Temperature. The factory ramp rate is 2°C/Minute.

10.3 Air Pressure Controller:

This increase proportional control drives the filtered air supply valve to the chamber. The final set point for this controller varies by using either cycle adjustable parameters or hard coded values plus offset (Default 1 PSI). The input variable is the Chamber pressure. The ramp rate varies from cycle parameter adjustable to hard coded values.

10.4 Steam Pressure Controller:

This increase proportional control drives the steam (boost if precise temp control) valve to the chamber. The final set point for this controller varies by using either cycle adjustable parameters or hard coded values plus offset (Default 1 PSI).The input variable is the Chamber pressure The ramp rate varies from cycle parameter adjustable to hard coded values.

10.5 Vacuum Controller:

This decrease proportional control drives the chamber drain valve. The final set point for this controller varies by using either cycle adjustable parameters or hard coded values plus offset (Default -1 PSI).The input variable is the Chamber pressure The ramp rate varies from cycle parameter adjustable to hard coded values.

10.6 Proportional Functions

10.6.1 Input Variable

The input variable is the analog input value for the controller.

Example: Air pressure controller input variable is the chamber pressure analog input value.

10.6.2 Preset Target

The preset target is the initial value that is used for the **maximum target** adjustment.

Example: Sterilizing temperature controller preset target is the STERILIZATION TEMPERATURE cycle parameter.

10.6.3 Offset

The offset is used as either a negative or positive value from the **preset target** value to calculate the **maximum target** value for the controller.

Example: Sterilizing temperature controller default offset is 1°C.

10.6.4 Maximum Target

The maximum target is the extent that the controller will reach when ramping. It is calculated by adding the **offset** to the **preset**. This value will never exceed the minimum and maximum operational limits of the sterilizer. (0-138°C for temperature / 0-50.00 psia for pressure)

Example: If the preset target for the sterilizing temperature controller is 121.1°C (based on the STERILIZATION TEMPERATURE parameter), the maximum target would be 121.1°C + 1°C offset = 122.1°C maximum target.

10.6.5 Ramp Value

The ramp value is provided each time a controller is activated. This value represents the rate of (temperature/pressure) (increase/decrease) per minute. This ramp rate may be hard coded or loaded from an adjustable value.

Example: The factory ramp rate for the sterilization temperature controller is 2°C/minute.

10.6.6 Proportional Timer

The Proportional Timer is a repeating timer that is activated with the controller. The timer range is adjustable from 3 to 6 seconds. The controller uses this timer for several purposes.

- The running accumulation value provides a comparison to the output value of the controller calculation to determine the amount of time a digital output is turned on and off.
- The timer preset value is used for calculating the controller output based on the **output percentage**.
- The timer provides the interval for the **ramp** rate increase or decrease **adjustment** of the **set point** target.

10.6.7 Adjustment

To get the adjustment value, first, 60 seconds is divided by the Timer preset value.

Example: 60 seconds / 3 second Proportional Timer = 20.

The result is then used to divide the ramp rate into the intervals per minute to determine the adjustment value.

Example: 2°C/minute / 20 = 0.1 °C increase every timed interval

The adjustment value is added to the set point target after each proportional time interval.

10.6.8 P Band

The P Band is the length of the range that the proportional **percentage output** value is calculated. The range is adjustable from 0.2 to 2.0.

10.6.9 Set Point

The set point is the current end target value used to calculate the proportional **error** value and **Start Point** in relation to the **P Band**. The set point value will adjust to a new value after each timed interval based on the ramp value. The set point will never exceed the **Maximum Target** value.

10.6.10 Start Point

The Start point is calculated by subtracting (increase control) or adding (decrease control) the **P Band** from the **Set Point**. The Start point is used to start the **percentage output** calculation.

Formula: Start Point = Set Point +/- P Band

10.6.11 Error

The Error is the value is the difference between the **Set Point** and the **input variable**. This value is only calculated when the **input variable** is within the **P Band** (**Start Point** and **Set Point**).

Formula: Error = Set Point – Input Variable

10.6.12 Percentage Output

When the **input variable** is within the **P Band**, the Percentage Output is calculated by dividing the **Error** value by the **P Band** which provides the percentage output. If the **input variable** is outside the **P Band**, depending on whether the control is decreasing or increasing, the percentage output is either 0% or 100%.

Note: The Percentage Output can be used to directly control an analog output.

Formula: Percentage = Error/P Band

10.6.13 Output

The Output value is directly compared to the **proportional timer** accumulated value. This is calculated by multiplying the timer preset value by the **Percentage Output** value.

*Example: 3 second Prop Timer * 0.5 (Percentage Output value) = 1.5 Seconds*

This value is used for digital output control. The output value is compared to the timer accumulated value. When output value is greater than the minimum accumulation of a ½ second after the timer resets, the digital output trigger is latched. If the output value is less than the accumulated value of the timer, the output trigger is unlatched.

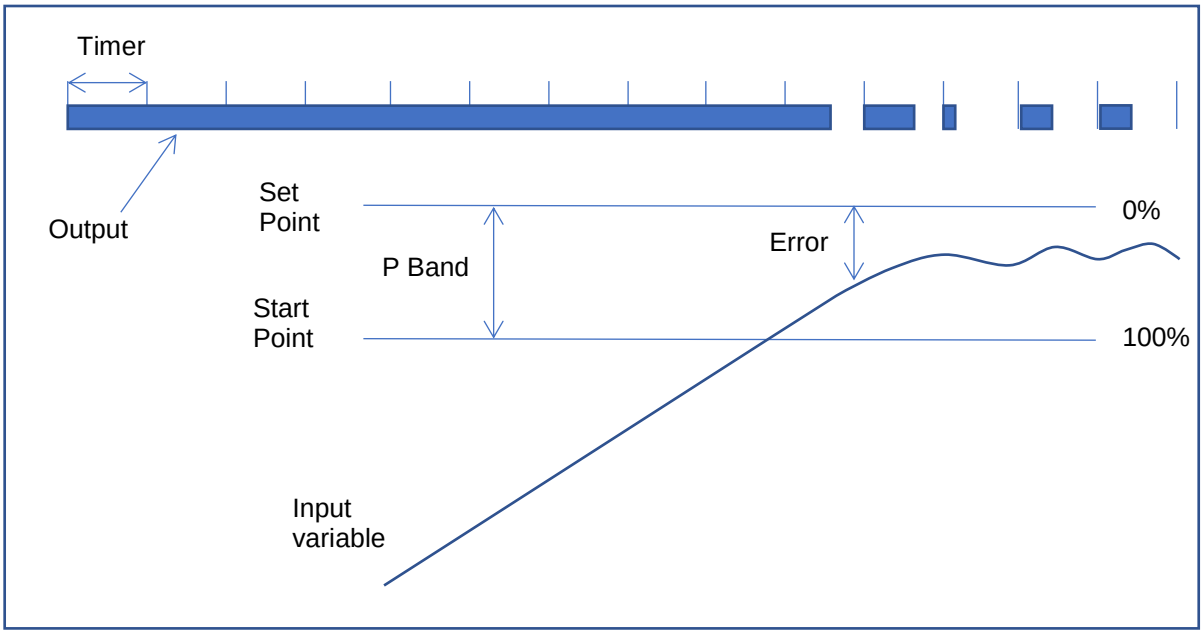

Figure 10.0-1 Proportional Band Representation

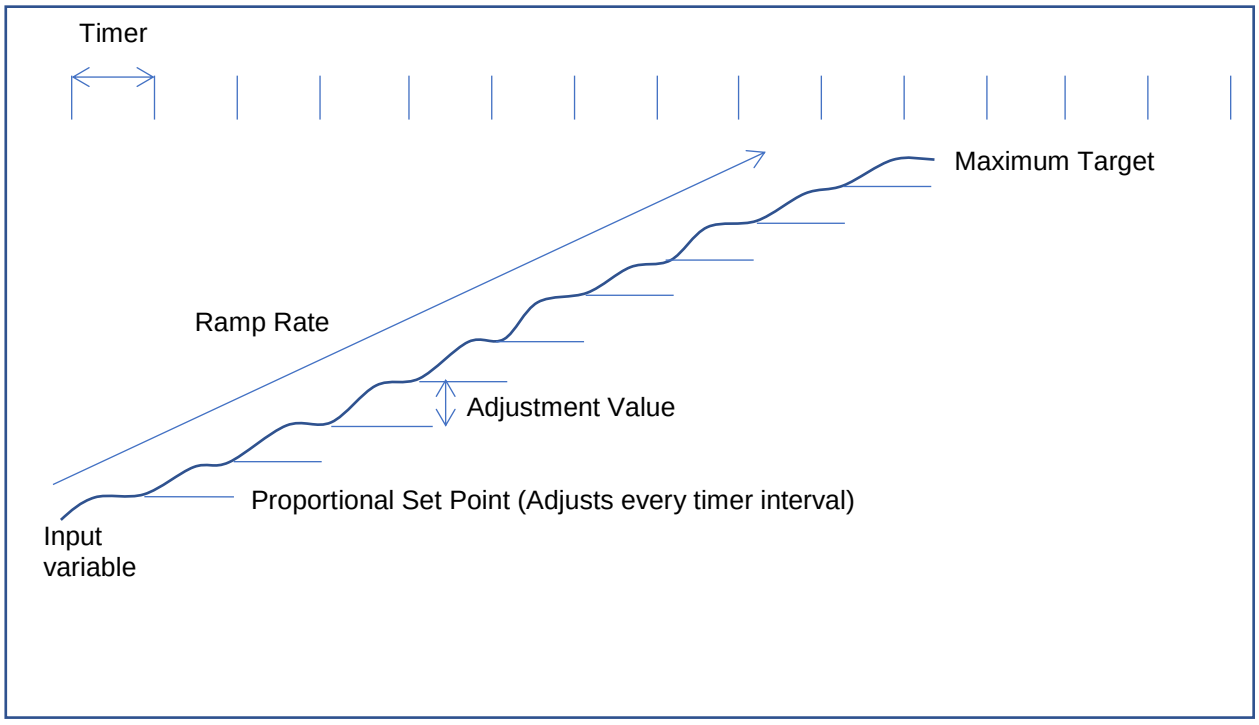

Figure 10.0-2 Proportional Ramp Representation

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SECTION 11.0 CALCULATIONS

11.1.1 F0 Value

The F0 value is calculated for each temperature defined in the F0 function. Each F0 value is updated every second and the calculation is started when the temperature is greater than 100°C . The F0 contribution value is calculated based on the following algorithm:

F0 = 10 (T - 121.11) / 10 / 60

Where T = product temperature in °C

11.1.2 Temperature to pressure conversion

The pressure is calculated using the following formula:

*P = (((2.71828 ** ((77.345 + (0.0057 * (T + 273.15))) - (7235.0 / (T + 273.15)))) / ((T + 273.15) ** 8.2)) / 100000.0) * 14.554*

Where T = chamber temperature in °C and P = theoretical pressure in PSIA.

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PRIMUS GENERAL PURPOSE STERILIZER

PSS11 / PRI-MATIC® 100 CONTROL

PART VI

MAINTENANCE MANUAL

January 15, 2019

Part VI MAINTENANCE MANUAL
Manual Version 1.00
SW Version 2.000

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Printed in the United States of America

General Purpose Steam Sterilizer Operator Manual includes six parts

General Information
Installation
User
Process, Programming, & Parameters
Factory Acceptance
Maintenance

Once installation of a new PRIMUS General Purpose sterilizer with PRI-Matic® Control is complete, the user is urged to conduct validation studies according to accepted standards (e.g. FDA cGMP, ANSI) and document the effectiveness of user selected cycle parameters for <u>each</u> type of load to be sterilized.

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SECTION 1.0 INTRODUCTION

1.1 Purpose

The purpose of this Maintenance Manual is to present important information on the use of the PRIMUS General Purpose Sterilizer relating to maintenance functionality (e.g., preventive maintenance scheduling, hardware adjustments, and alarm troubleshooting). This manual provides maintenance related information for both the physical sterilizer and the PRI-Matic® 100 Control system.

Specific details for the project are provided in the following documents:

- software design specification (provided only if GMP/GAMP Documentation option is selected)
- hardware design specification (provided only if GMP/GAMP Documentation option is selected
- functional specification (provided only if GMP/GAMP Documentation option is selected)
- piping and electrical diagrams.

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SECTION 2.0 Preventive Maintenance

This section describes maintenance procedures for the Sterilizer and the optional Boiler. Preventive maintenance and failures resulting from a lack of preventive maintenance are not covered under warranty. Refer to Part 1, General Information, for full details.

2.1 Sterilizer

Maintenance procedures described in this section should be performed regularly at the intervals indicated to provide the longest useful life possible for your sterilizer. Refer to the maintenance log for daily, weekly, quarterly, annually, and as needed. For units with optional steam generator (boiler) refer to the additional maintenance recommendations in Appendix A, Manufacturer's Records. Refer to the recommended spare parts list for any replacement parts needed and call your service representative.

WHEN REMOVING ANY EQUIPMENT COVERS, OR ENTERING THE CHAMBER FOR MAINTENANCE, SHUT OFF ALL UTILITIES, AND ALLOW THE STERILIZER AND PIPES TO COOL PRIOR TO PERFORMING MAINTENANCE. CHECK SURFACE TEMPERATURES BEFORE ATTEMPTING WORK. USE HEAT RESISTANT PROTECTIVE CLOTHING AUTHORIZED BY THE SAFETY OFFICER EMPLOYED BY THE OWNER.

DO NOT USE STEEL WIRE BRUSHES OR STEEL WOOL ON THE SURFACES OF THE CHAMBER OR THE CHAMBER DOOR. IF INTENSIVE CLEANING IS REQUIRED, USE NYLON BRUSHES OR CLEANING PADS, SUCH AS 3M SCOTCHBRITE®, OR EQUIVALENT.

WHEN CHECKING VESSEL SAFETY VALVES, AVOID THE DISCHARGE OUTLET OF THE SAFETY VALVE WHEN OPERATING THE PRESSURE RELEASE LEVER. THE HANDLE OF THE PRESSURE RELIEF VALVE MAY BE HOT. CARE SHOULD BE TAKEN TO AVOID BURNS WHEN TEST OPERATING THESE VALVES.

Maintenance Required	Daily	Weekly	Quarterly	Annually	As Needed
Clean Chamber and remove spill residue and staining	X				
If optional pin traps are used, remove and inspect for accumulation of residue such as, paper, fabric, or other materials. THIS IS VERY IMPORTANT FOLLOWING ANY BREAKAGE OF GLASS OR LOAD CONTAINERS.	X				
Remove and clean shelving, transfer carts, and loading equipment. A mild cleaning solution is recommended. If stubborn stains remain us detergent or a cleaner for stainless steel. Be sure to rinse thoroughly.		X			
Clean exterior stainless steel surfaces with Stainless Steel Polish which can be provided by PRIMUS under Spare Parts, Section 9.		X			
Inspect the pneumatic lines, switches, and cylinder components. Remove lint and dirt from the areas.			X		
Test door operates smoothly. Horizontal power doors move on an overhead beam/trolley assembly. The cylindrical lugs on the door (s) should mate smoothly with the tabs on the vessel. Wheel bearings in the trolley assemblies are sealed and do not require lubrication. Adjust the trolley assembly only if necessary.			X		
Remove the door gasket. Determine the need for replacement or reseating. To remove gasket, insert a flat blade screwdriver between the gasket groove and the gasket. Gently remove the gasket by prying it forward from the groove. NOTE: Take care not to nick or gouge the gasket when removing. When a portion of the gasket is out of the groove, carefully pull the remainder from the groove. Irregular retraction of the gasket into the gasket groove may be due to an aging gasket. Inspect the entire circumference for cuts, nicks, gouges or irregularities caused by wear. Ensure gasket is still pliable. Replace gasket if damage or wear is evident. If no damage is determined, rinse with clean water and dry with lint-free cloth.			X		X

Maintenance Required	Daily	Weekly	Quarterly	Annually	As Needed
If reusing, reverse the gasket so that the sides that faced the head rings will now face the doors. Gasket grooves should be cleaned with detergent and a cloth. Allow time to dry. Clean the inside surface of the door where the gasket contact is made. On vertical sliding door units, the door guide assembly may need to be removed. Reinstall gasket, locating the seam of the door gasket and placing seam of gasket in the top of the groove. Pressing it into the head ring groove, working from the side, top and bottom. Equally, distribute the excess and use your fingers to press the gasket as deeply as possible into the door gasket groove.				X	
Test (operate) steam pressure relief valves by lifting the test lever on the valve. For your safety, identify the discharge path from the valve before proceeding with the test. It should be routed into a discharge pipe. If not, make sure no one is in the path of the steam discharge.			X		
Remove and clean strainers that may be located in the supply lines. Refer to the piping schematic for locations. It is critical that the strainers remain clean. Remove the metal strainer from the holder. Clean inside and outside using compressed air or a brush and mild detergent. Replace strainer in the holder. Replace strainer cap by turning clockwise until it is securely seated.			X		
Check the pressure of the incoming steam. If the optional steam regulator is used, readjust the steam supply regulator to meet PRIMUS Sterilizer Company, LLC installation specifications found **in the Installation Manual.**			X		
Check the pressure of the incoming water supply. If necessary, readjust supply regulators service booster system to meet PRIMUS Sterilizer Company, LLC installation specifications found **in the Installation Manual**.			X		
Sterilizers with optional air operated gasket, check the pressure of the incoming air supply. Readjust if necessary the supply regulators to			X		

Maintenance Required	Daily	Weekly	Quarterly	Annually	As Needed
meet PRIMUS Sterilizer Company, LLC installation specifications found **in the Installation Manual**.					
Inspect all pipes fittings, valves, and connections for visible evidence of leaks or corrosion. CONTACT YOUR PRIMUS STERILIZER COMPANY, LLC AUTHORIZED SERVICE REPRESENTATIVE FOR ANY NECESSARY REPAIR.			X		
Check all solenoid valves for internal and external leaks. Verify the flow is not impeded and smooth, "snappy" operation. Install repair kit as needed.			X		X
Inspect and "tap" all check valves. Replace as necessary.			X		X
Replace the air filter(s) and O-ring gasket. The assembly must be air-tight. Refer to PRIMUS cGMP Sterilizer PRI-Matic® Controls System Manufacturers' Component manual for the manufacture's information regarding this sterilizer's air filtration.					X
Clean all exterior surfaces of the cabinet.			X		
Sterilizers with an optional pressure regulator are to be tested for correct and consistent steam operating pressures after the regulator. Examine PRIMUS cGMP Sterilizer PRI-Matic® Controls System Manufacturers' Component manual for manufacturer's information regarding the optional pressure regulator.					
Run test cycles and verify proper timing, cycle progression, and operation of the Operator Panel(s), and the audible alarm.			X		
Replace the Over Pressure Rupture Disc. Refer to the manufacturer's instructions in PRIMUS cGMP Sterilizer PRI-Matic® Controls System Manufacturers' Component manual.				X	

Maintenance Required	Daily	Weekly	Quarterly	Annually	As Needed
Standard General Purpose sterilizers are provided with a liquid ring type vacuum booster pump. Inspect pump for signs of fluid leakage onto the pump or from the pump. Signs of fluid loss should be investigated and corrected. If fluid deposits or pooling is found near pump's electrical box, immediate action should be taken. Disconnect electrical power to the sterilizer. Make sure you disconnect all power, since the vacuum pump electrical supply should be on a separate breaker from the breaker that supplies power to the electrical controls. Remove the cover from the box to check for signs of moisture and corrosion. If the cover is removed, tighten as necessary all connections on the electrical terminal block. Replace the cover and assure tight seal. Repair sources of leaking onto or from the pump.				X	
Verify the presence of a secure electrical ground.				X	
Inspect the entire assembly for steam, water, or (as applicable) air leaks.				X	
Clean the sterilizer's mechanical space.				X	
Perform a complete calibration for the sterilizer using the calibration procedures. The user determines the frequency of calibrations; however, this period should not be greater than one year. PRIMUS Sterilizer Company, LLC recommends that sterilizers subject to validation and cGMP standards, be revalidated at one-year intervals.					X
Inspect the inside surfaces of the chamber for deposits of scale. If scale is present, use a cleaner and de-scaler solution according to the directions on the container. While the rate of scale accumulation varies between facilities, PRIMUS Sterilizer Company, LLC recommends that a regular schedule for descaling be adopted according to individual user requirements.				X	
Install new steam trap kit when a steam trap fails.					X

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2.2 Boiler

Maintenance Required	Daily	Weekly	Quarterly	Annually	As Needed
Optional boiler units refer to the boiler manufacturer's instructions. Qualified personnel should provide all boiler maintenance. (See Appendix A, Manufacturer's Records)					X
 **TURN OFF THE ELECTRICAL POWER SWITCH TO THE UNIT BEFORE REMOVING ANY COVERS FOR MAINTENANCE OR PROCEEDING WITH THE BOILER BLOW DOWN PROCEDURE.**					
Check the condition of heating elements.				X	
Inspect all boiler pressure controls.		X			
 **ALLOW THERMOSTATIC TRAPS TO COOL BEFORE REMOVING COVERS. SINCE THERE IS NOTHING TO LIMIT ITS EXPANSION, THE DIAPHRAGM ON THE INSIDE MAY RUPTURE OR FATIGUE IF TRAP IS OPENED WHEN HOT.**					
If the user added a vacuum breaker in the cold-water supply to sterilizer, consider cleaning the vacuum breaker.					X
 **FOR ELECTRICAL MAINTENANCE, DISCONNECT ELECTRICAL POWER TO THE STERILIZER PRIOR TO REMOVING ANY ELECTRICAL COVERS. VOLTAGES PRESENT ARE DANGEROUS AND MAY BE FATAL IF CONTACTED.**					

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SECTION 3.0 TROUBLESHOOTING GUIDE

The following table is provided showing possible problems resulting from functional or mechanical problems. Conditions are shown in italics in the ALARM/PROBLEM column. Multiple RECOMMENDED RESPONSE(s) are provided where more than one PROBABLE CAUSE is shown for a specific ALARM/PROBLEM.

ALARM/PROBLEM	PROBABLE CAUSE	RECOMMENDED RESPONSE
EMERGENCY STOP	Emergency Stop button on fascia is depressed	Pull out Emergency Stop button on fascia
	24VDC signal to PLC input is lost	Check for 24VDC signal at PLC E-Stop input
PROCESS STOPPED BY [User ID] *Enabled In Cycle Only*	STOP button on HMI was pressed during an active cycle	Acknowledge the alarm on the sterilizer HMI and press the RESUME or ABORT button
PROCESS ABORTED BY [User ID] *Enabled In Cycle Only*	ABORT button on HMI was pressed during an active cycle	Acknowledge the alarm on the sterilizer HMI
VACUUM TIMEOUT *Enabled In Cycle Only*	Defective water to ejector valve, chamber drain valve, PRI-Saver pump, or open output circuit.	Check and repair if necessary
	Vacuum pump too hot.	Check cooling water to heat exchanger and service water to pump head.
	Vacuum air break requires adjustment	Adjust air break.
	Incorrect pressure calibration	Check pressure value and re-calibrate if necessary.
	Incorrect PRESSURE RAMP or EXHAUST RAMP RATE parameter	Correct parameter value
	Incorrect timeout parameter	Correct global parameter
PRESSURE TIMEOUT *Enabled In Cycle Only*	Defective steam valve or air valve or open output circuit.	Check and repair if necessary
	Incorrect atmospheric reference.	Check if atmospheric reference is within the typical value for the local area.
	Incorrect PRESSURE RAMP parameter	Correct parameter value
	Incorrect timeout parameter	Correct global parameter

ALARM/PROBLEM	PROBABLE CAUSE	RECOMMENDED RESPONSE
HEAT TIMEOUT *Enabled In Cycle Only*	Defective chamber steam valve or open output circuit if occurs in HEATUP phase. Defective jacket steam valve or open output circuit if occurs in START phase. Incorrect timeout parameter	Check and repair if necessary Check and repair if necessary Correct global parameter.
STERILIZING TIMEOUT *Enabled In Cycle Only*	Defective steam valve or open output circuit. Incorrect calibration.	Check and repair if necessary Check and correct calibration values
COOLING TIMEOUT *Enabled In Liquid Cycle Only*	Defective chamber drain valve, water to ejector valve, or open output circuit. Incorrect timeout parameter. Incorrect load probe calibration. Incorrect pressure sensor calibration	Check and repair if necessary Correct global parameter. Check and correct calibration values. Check and correct calibration values.
LOW TEMPERATURE *Enabled In Cycle Only*	Defective steam valve or open output circuit. Low steam supply pressure Previous alarm occurred during sterilization	Check and repair if necessary. Check steam supply pressure and flow. Acknowledge and abort or resume cycle.
HIGH TEMPERATURE *Enabled In Cycle Only*	Defective steam valve or open output circuit. High steam supply pressure Empty chamber	Check and repair if necessary Check steam supply pressure and flow. Use at least a load cart or large container for minimum load size

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ALARM/PROBLEM	PROBABLE CAUSE	RECOMMENDED RESPONSE
HIGH CHAMBER PRESSURE	Defective steam valve or open circuit	Check and repair if necessary
	Insufficient air removal during pre-treatment.	Check cycle parameters.
	Air leak to chamber.	Check door seals. Perform leak test cycle.
	High steam supply Pressure	Check steam supply pressure.
	Excessive condensate in drain	Check constant bleed valve and/or monitor drain condensate sensor (if applicable)
	Incorrect pressure calibration	Check pressure value at high end operation scale.
DOOR A SWITCH FAILURE DOOR B SWITCH FAILURE	Door switch(es) out of adjustment or broken	Adjust or replace as needed
	Door movement is restricted.	Check for obstruction. Check if door gasket is fully retracted. Check if air to door cylinder.
DOOR A SEAL FAILURE DOOR B SEAL FAILURE	Door seal pressure switch out of adjustment or broken.	Adjust or replace as needed
	Door seal/unseal and/or gasket drain valve defective	Check, repair or replace.
	Low air pressure	Adjust/fix as needed

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ALARM/PROBLEM	PROBABLE CAUSE	RECOMMENDED RESPONSE
CPU POWER FAILURE *Enabled In Cycle Only*	Power outage or machine turn off. Processor switch placed in “0” position during cycle.	Ensure constant power to sterilizer control box Make sure processor switch is set to “1” position.
HIGH JACKET TEMPERATURE	Defective jacket steam valve or open output circuit. Jacket steam trap defective High steam supply pressure	Check and repair if necessary Check and repair if necessary Check supply pressure.
WATER IN DRAIN *(Only if Chamber Condensate Alarm option selected)*	Bleed valve in secondary drain line is closed or clogged. Excessive water in steam supply Water spill or boil-over from load Defective sensor Cold liquid load when entering sterilization phase	Check adjustment of flow when chamber is pressurized with steam Check facility steam supply trap. Check load configuration and cycle exhaust ramp rate. Check and repair if necessary If load probe not in use, ensure proper DWELL TIME to heat up liquid load prior to sterilization phase
RUPTURE DISK FAIL *Enabled In Cycle Only*	Excessive pressure caused the Rupture Disc to burst Input circuit is open or disconnected	Ensure chamber is at ambient, determine cause of rupture and correct - replace the rupture disc Check wire connection.

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ALARM/PROBLEM	PROBABLE CAUSE	RECOMMENDED RESPONSE
LEAK TEST FAIL *Enabled In Leak Test Cycle Only*	Gasket media is leaking into chamber or gasket is not properly sealing. Leak in process piping connection points. Leak at any entry points to chamber.	Check gasket integrity and repair if necessary. Check and repair if necessary. Check and repair if necessary.
PLC MEMORY LOSS	Short circuit in PLC wiring caused memory dump Battery in PLC is below voltage threshold and power to control box has been turned off	Check wiring for possible short circuit in PLC wiring; contact PRIMUS for reloading PLC memory Check PLC battery voltage; Replace battery; contact PRIMUS for reloading PLC memory
AI"XX" FAIL *Where "XX" is the number of the analog input that has faulted.*	Incorrect wiring to the PLC module. Input circuit is open or disconnected. Defective RTD/pressure sensor.	Check wiring of corresponding RTD/Pressure transmitter using the supplied electrical drawings. Check and replace if necessary

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SECTION 4.0 SATURATED STEAM TABLE

The following table provides pressure/temperature correlation for use in determination of cycle parameters.

ALTITUDE IN FEET		(Sea Level)	1000	2000	3000	4000	5000
INCHES OF HG		29.92	28.92	27.92	26.92	25.92	24.92
	PSIA	14.70	14.21	13.72	13.21	12.74	12.24
TEMPERATURE(S)		PSIG	PSIG	PSIG	PSIG	PSIG	PSIG
100.0°C = 212.0°F	14.70	00.00	00.49	00.98	01.47	01.96	02.45
105.0°C = 221.0°F	17.86	03.16	03.65	04.14	04.64	05.13	05.62
110.0°C = 230.0°F	20.78	06.08	06.57	07.06	07.55	08.04	08.54
115.0°C = 239.0°F	24.52	09.82	10.31	10.81	11.30	11.79	12.28
120.0°C = 248.0°F	28.80	14.10	14.59	15.08	15.57	16.06	16.55
121.1°C = 250.0°F	29.83	15.13	15.62	16.11	16.60	17.09	17.58
125.0°C = 257.0°F	33.67	18.97	19.46	19.95	20.44	20.93	21.42
130.0°C = 266.0°F	39.18	24.48	24.97	25.46	25.96	26.45	26.94
132.2°C = 270.0°F	41.86	27.16	27.65	28.14	28.63	29.12	29.61
135.0°C = 275.0°F	49.60	32.20	32.69	33.18	33.67	34.16	34.66
140.0°C = 284.0°F	54.42	39.72	40.21	40.70	41.19	41.68	42.17

NOTES:

- 1 Atmosphere @ Sea Level = 14.70 PSIA = 29.92 Inches of Hg.
- 0.06804 Atmospheres = 1.0 PSIA = 0.01414 Inches of Hg.
- 0.0342 Atmosphere = 0.4912 PSIA = 1 Inch Hg.
- Each 1000 Ft. of altitude$_1$ = 1 Inch of Hg Displacement$_2$.
- All Hg expressed @ 0.0°C.

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SECTION 5.0 SPARE PARTS

Listed below are recommended spare parts for maintenance back up. Additional parts can be ordered from PRIMUS Sterilizer Company, LLC. 1-402-344-4200 or www.primus-sterilizer.com.

PRIMUS P/N	QTY	DESCRIPTION
400027	2	SOLENOID,AIR,STACKING,3-WAY
400045	1	VALVE,SAFETY,SS,3/4x1,45#
400049	1	VALVE,CHECK,BALL-CONE,SS,1/2
400058	1	VALVE,CHECK,SWING,BR,3/4
400061	1	SAN.VALVE,CHECK,316SS,1.5
400063	1	FILTER,AIR,0.2,10"
400071	1	VALVE,NEEDLE,1/4,STM
400080	1	VALVE,CHECK,SWING,316SS,3/4
400099	1	RUPTURE DISC,316SS,43PSIG@300F
400104	1	SAN.FILTER,AIR,0.2,10"
400135	1	VALVE,CHECK,SS,1/4T,1/3#,INLINE
400187	1	VALVE,AIR,DOUBLE,3-WAY,1/16OR
400195	1	SAN.VALVE,CHECK,316SS,1/2
400288	1	VALVE,CHECK,1/2,316SS,1/2lb CRACK
400300	1	RTD ELEMENT,SINGLE,216"LEAD
400466	1	SWITCH,PROX,CAPACITIVE,30MM/DC
400477	1	SWITCH,LIQUID LEVEL TUNING
400563	1	SAN,TRANSMITTER,PRESS1.5,SMART
400589	1	SAN.VALVE,PNEU,SS,1/2,SPRING-CLOSE
400590	1	SAN.VALVE,PNEU,SS,1,NC FDA
400599	1	RTD ELEMENT,DBL,216"LEAD,1/4
400651	1	VALVE,CHECK,BALL-CONE,SS,1/4 INLINE
400675	1	SAN,VALVE,CHECK,316SS,1
400694	1	TRAP,THERMATIC,BR,1/2,10-125psi
400740	1	RUPTURE DISC,316SS,100PSIG@300F

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PRIMUS P/N	QTY	DESCRIPTION
400758	1	VALVE,SAFETY,BR,1",100#
400784	1	SAN.VALVE,BLOCK,BOOST/TRIM,1/2x1
400792	1	LOAD PROBE,ASSEMBLY,216" LEAD
463264	1	VALVE,SOL,BR,3/4",STM,AIR
463265	1	VALVE,SOL,BR,1/4",STM,WTR,AIR
463267	1	VALVE,SOL,SS,1/2",STM
463276	1	VALVE,PNEU,SS,1/2",STM,AIR,WTR
463277	1	VALVE,PNEU,SS,3/4",STM,AIR,WTR
463284	1	VALVE,SOL,BR,3/4",WATER
463316	1	VALVE,PNEU,BR,N/O,1/2",STM,AIR,WTR
463792	1	VALVE,DIAPH,SOL,BR,1/2",STM,AIR
500286	1	SWITCH,TEMP,BR,SETTING 110R
500847	1	SWITCH,PRESS,SS,SETTING 60R/YP
500848	1	SWITCH,PRESS,SS,SETTING 20R/YP
500851	1	SWITCH,PRESS,BR,SETTING 30R/YP
500146	1	SWITCH ASSY,SPDT,5A,125VAC
500138	1	BUZZER ASSY,24V
500139	6	FUSE,1/2AMP,TIME-DELAY,250V
500140	2	FUSE,2AMP,250V,FAST-ACTING
500141	2	FUSE,3AMP,250V,FAST-ACTING
500142	2	FUSE,3/4AMP,250V,FAST-ACTING
800107	1	POLISH,SS,15 OZ. CAN
800040	2	PAPER,PRINTER, 5 PACK,IMPACT
800401	2	PAPER, PRINTER, 5 PACK,THERMAL
**	2	GASKET,DOOR,MTL #5

***See your Major Plumbing List for the components installed on your machine.**

**** CALL or See our website**

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SECTION 6.0 DRAWINGS

This section provides all drawings, diagrams, and major plumbing and electrical lists for the sterilizer.

6.1 Equipment Arrangement

6.2 Piping and Instrumentation Diagram

6.3 Major Plumbing List

6.4 Electrical Diagram

6.5 Major Electrical List

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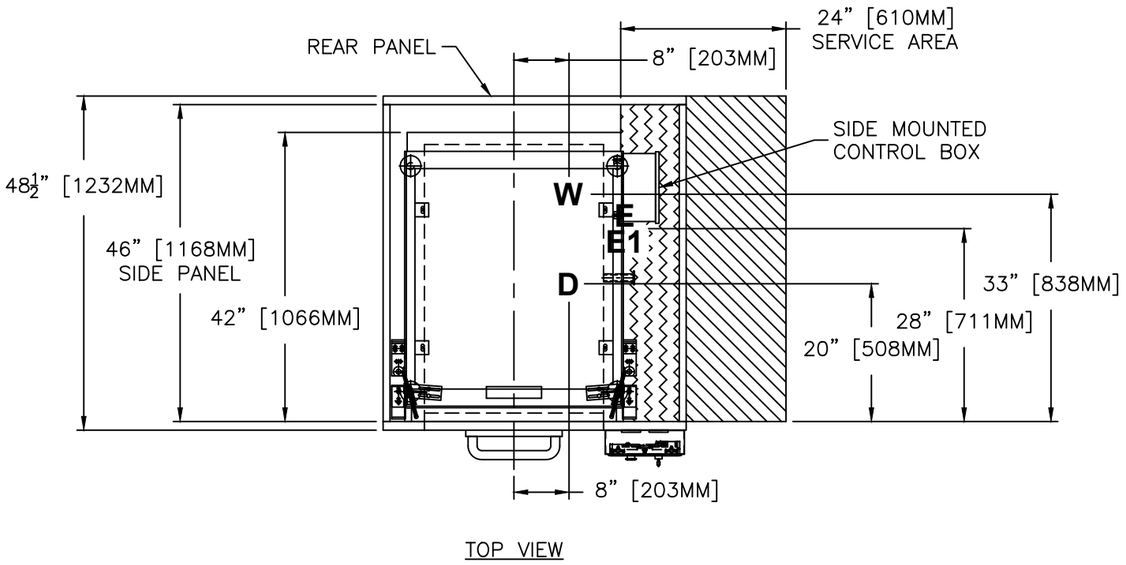
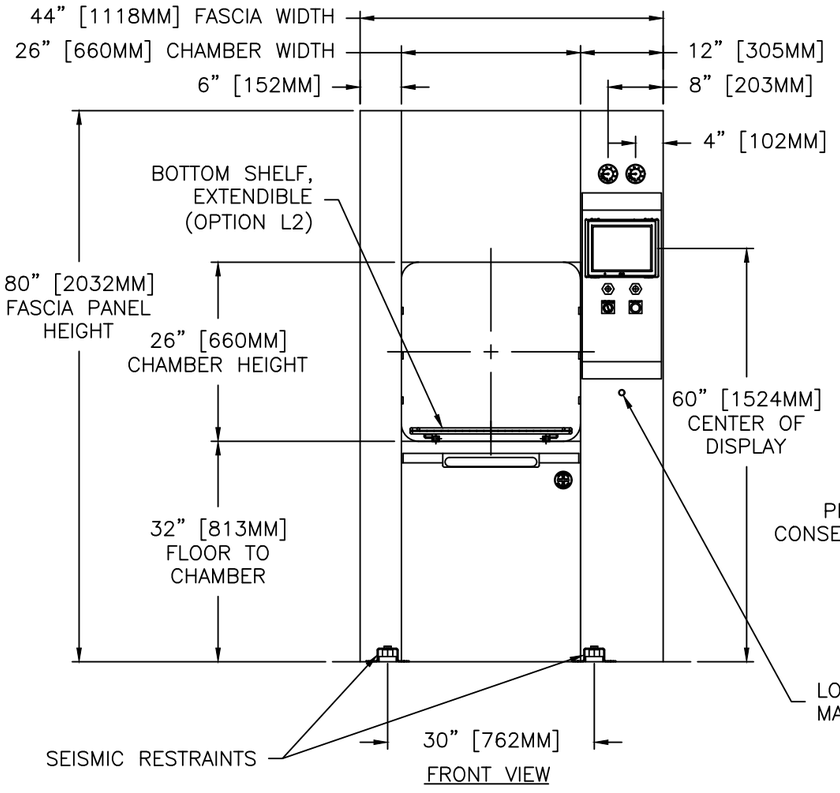
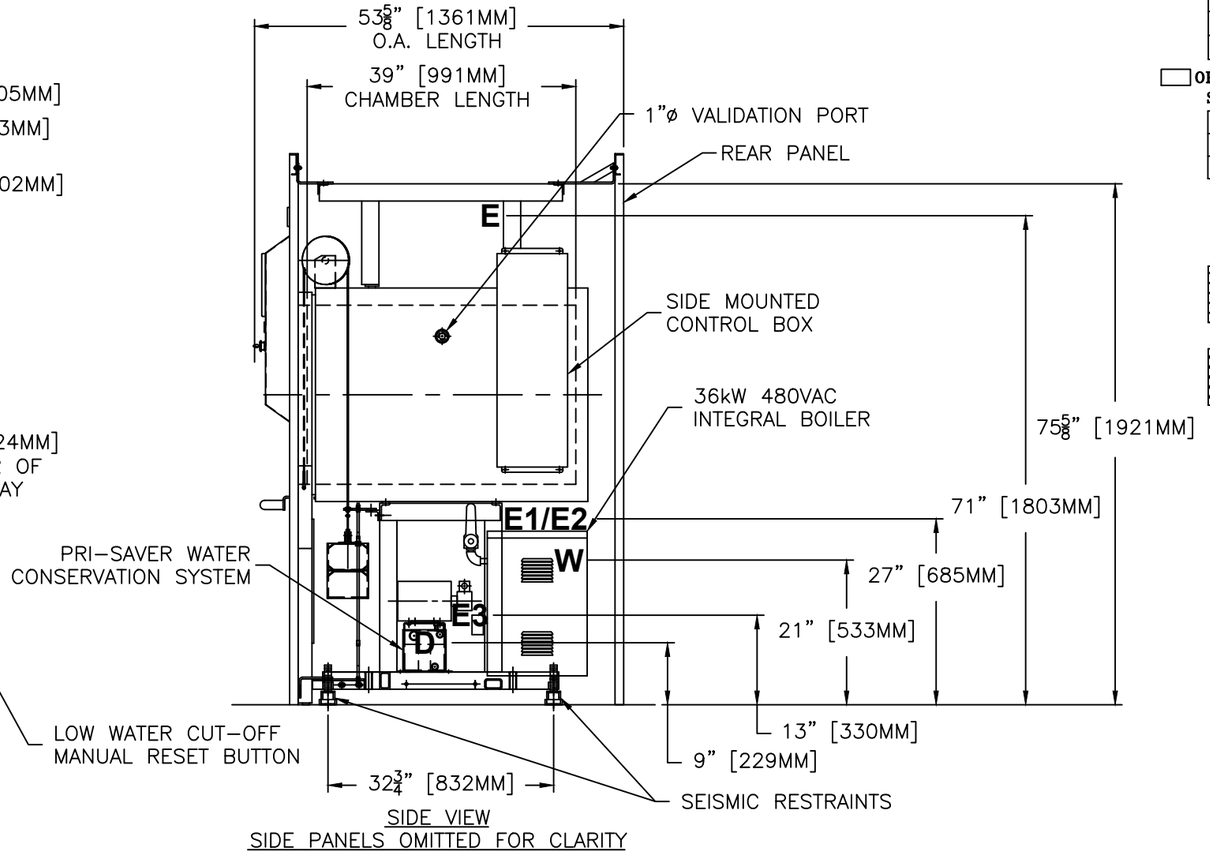
Info@primus-sterilizer.com
www.primus-sterilizer.com



TOP VIEW



FRONT VIEW



SIDE VIEW
SIDE PANELS OMITTED FOR CLARITY

WATER QUALITY INFORMATION

For best results, the feed water supply should be evaluated prior to initial startup by a reputable water conditioning company. If the mineral content exceeds the following recommended limits, various external treatment processes (water softener, water conditioning etc.) may be used to correct the problem.

Note: An analysis of the on-site boiler feed water should be made by a recognized and reliable water treatment company to ascertain the existing condition and treatment required.

RECOMMENDED FEED WATER QUALITY

HARDNESS, ppm – 8-85 (-.05-5gpg)
P-ALKALINITY, ppm – 85-410 (-5 -24gpg)
T-ALKALINITY, ppm – 200-500 (-7 -30 gpg)
pH (strength of alkalinity) – 8 – 11.4

Blow down boiler on at least a once a day basis. If boiler water or feed water are outside the above limits, a more frequent blow down program may be required.

RECOMMENDED LIMITS WITHIN A BOILER

TOTAL DISSOLVED SOLIDS, ppm – 3500
TOTAL ALKALINITY, ppm – 850
SUSPENDED SOLIDS, ppm – 300
SILICA (SIO 2), ppm – 125
SULFITE (SO 3), ppm – 25-50
PHOSPHATE, ppm – 30-60
P-ALKALINITY AS CaCO 3, ppm – 900
IRON, ppm – 2

UTILITY SERVICES

W	Cold Water Supply: 3/4" NPT, less than 70° F; 50-70 PSIG dynamic; 10 GPM
D	Sterilizer Drain: 3/4" NPT; Min. 2" floor drain required.
E	Electrical to sterilizer controls: 110 VAC, 60 HZ. 1ø, 10 AMPS Provide dedicated circuit to sterilizer controls of quality suitable for computer.
E1	Electrical to boiler controls: 110 VAC, 60 HZ. 1ø, 10 AMPS Provide dedicated circuit to boiler controls.
E2	Electrical to boiler: Power circuit for boiler heating element.
E3	Electrical to water conservation pump: 110 VAC, 60 HZ. 1ø, 10 AMPS Provide dedicated circuit to water conservation pump.

[X] OPTIONAL INTEGRAL ELECTRIC STEAM BOILER – 36KW

E1 ELECTRICAL TO BOILER CONTROLS

Service to Boiler Controls: 110 VAC, 10 AMPS. (Do not use the 110 VAC dedicated electrical circuit provided for sterilizer controls.)

E2 ELECTRICAL TO BOILER HEATING ELEMENT
(Allow 24" service access at heating element side of boiler)

	MODEL	UTILITIES
	EB1B	208 VAC, #1 AGW*, 4 WIRE, 3ø, 100 AMPS
	EB2B	240 VAC, #2 AGW*, 4 WIRE, 3ø, 87 AMPS
X	EB3B	480 VAC, #6 AWG*, 4 WIRE, 3ø, 44 AMPS
	EBO	AUTOMATIC BOILER BLOW DOWN
X	LWC	LOW WATER CUTOFF, MANUAL RESET

***Wire sizes shown for reference only. Check local codes.**

[ ] OPTIONAL STEPPING TRANSFORMER

	E1A	STEPPING TRANSFORMER, FROM 220V TO 110V
	E1B	STEPPING TRANSFORMER, FROM 480V TO 110V
	E1C	STEPPING TRANSFORMER, FROM 480/240/120, 1ø, 0.5KVA

[ ] OPTIONAL ELECTRIC VACUUM PUMP 2 HP (In lieu of standard Water Ejection Vacuum)
SPECIFY VOLTAGE

E4		208 VAC, 3ø, 7.5 AMPS
E4		240 VAC, 3ø, 6.8 AMPS
E4		480 VAC, 3ø, 3.4 AMPS

TYPICAL ACCEPTED RANGES

Service access space

Typical floor drain and ancillary equipment area.

REV	DESCRIPTION	BY	DATE
	REVISIONS		

THESE DRAWINGS ARE:
[ ] FOR APPROVAL
[ ] FOR INFORMATION ONLY
[X] AS BUILT
[ ] DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UNIVERSITY OF CALIDORNIA, DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616
CUSTOMER PO# TBD

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

TITLE
GENERAL ARRANGEMENT FOR PRIMUS STEAM STERILIZER (SINGLE DOOR, W/CAB 2 SIDES, INTEGRAL BOILER & PRI-SAVER)

DRAWN BY:	RAL
DATE:	12/14/18
CHECKED BY:	RLD
DATE:	12/14/18
APPROVED BY:	RLD
DATE:	12/14/18
SCALE:	N.T.S.
JOB NO:	18622
MODEL:	PSS11-B-MESD
STERILIZER SERIAL NO:	18622
SIZE:	26X26X39

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST. SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622A
REV:

SYMBOL LEGEND

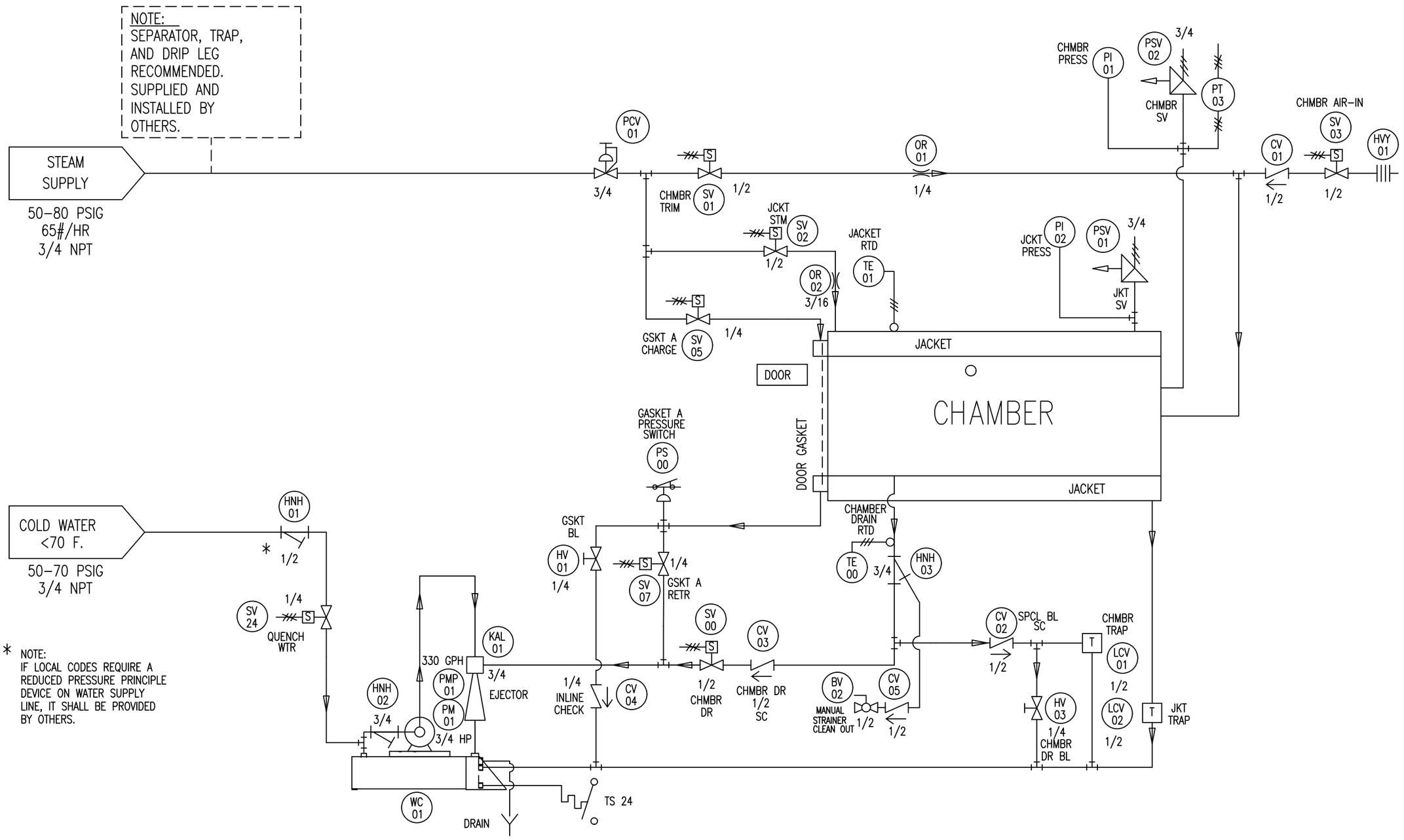
- CV 101 — CHECK VALVE
- HNH 101 — STRAINER
- HV 101 — HAND VALVE
- HVY 101 — FILTER
- KAL 101 — EJECTOR
- LCV 101 — T — TRAP
- PI 101 — PRESSURE INDICATOR
- PS 112 — PRESSURE SWITCH
- PSV 101 — PRESSURE SAFETY VALVE
- SV 101 — S — SOLENOID VALVE
- TE 101 — RESISTANCE TEMPERATURE DEVICE
- PT 101 — PRESSURE ELEMENT
- PCV 101 — PRESSURE REGULATOR
- OR 101 — RESTRICTOR
- TS 124 — TEMPERATURE SENSOR

NOTE:
SEPARATOR, TRAP, AND DRIP LEG RECOMMENDED. SUPPLIED AND INSTALLED BY OTHERS.

STEAM SUPPLY
50–80 PSIG
65#/HR
3/4 NPT

COLD WATER
<70 F.
50–70 PSIG
3/4 NPT

* NOTE:
IF LOCAL CODES REQUIRE A REDUCED PRESSURE PRINCIPLE DEVICE ON WATER SUPPLY LINE, IT SHALL BE PROVIDED BY OTHERS.



REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☐ DRAFT

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UNIVERSITY OF CALIFORNIA, DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616
CUSTOMER PO# TBD

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

TITLE
PIPING & INSTRUMENTATION DIAGRAM
W/JACKET PRESSURE GAUGE, 36KW INTEGRAL BOILER, BOILER BLOWDOWN, WATER RECIRCULATION, DRAIN LINE STRAINER & DRAIN WATER QUENCH

DRAWN BY: RAL	JOB NO: 18622
DATE: 12/13/18	
CHECKED BY: RLD	MODEL: PSS11–B–MESD
DATE: 12/13/18	
APPROVED BY: RAL	ELEC DWG: 18622
DATE: 12/13/18	
SCALE: N.T.S.	SIZE: 26X26X39
DRAWING NO.: 18622P	REV:

PRIMUS
STERILIZER COMPANY, LLC
6565 SOUTH 118th ST.
OMAHA, NE 68137
PH. (402) 344–4200
FAX (402) 344–4242

PRIMUS

MAJOR PLUMBING LIST
JOB 18622
UNIVERSITY OF CALIFORNIA, DAVIS
PSS11-B-MESD

TAG/ID	PRIMUS PART #	DESCRIPTION	FUNCTION
BV001	400110	VALVE,BALL,MANUAL,BR,1/2	BOILER STM OUT
BV02	400110	VALVE,BALL,MANUAL,BR,1/2	MANUAL STRAINER CLEAN OUT
CV01	402057	VALVE, CHECK, SWING, BR, 1/2, W EPDM DISC	AIR IN
CV02	402057	VALVE, CHECK, SWING, BR, 1/2, W EPDM DISC	SPECIAL BLEED
CV03	402057	VALVE, CHECK, SWING, BR, 1/2, W EPDM DISC	CHAMBER DRAIN
CV04	400235	VALVE, CHECK, INLINE, BR, 1/4	GASKET RETRACT CHECK
CV05	402057	VALVE, CHECK, SWING, BR, 1/2, W EPDM DISC	MANUAL STRAINER CLEAN OUT
HNH01	600093	STRAINER,"Y",BR,1/2,50x50	STRAINER- WATER IN
HNH02	602094	STRAINER,"Y",BR,3/4,20X20	CONSERVATION STRAINER
HNH03	602094	STRAINER,"Y",BR,3/4,20X20	DRAIN LINE STRAINER
HV01	400071	VALVE, NEEDLE 1/4, BR	GASKET A BLEED
HV03	400071	VALVE, NEEDLE 1/4, BR	CHAMBER BLEED
HVY01	400062	FILTER, AIR, 0.3,10	FILTER ELEMENT
KAL01	400028	EJECTOR,SS,3/4"	EJECTOR
LCV01	400694	TRAP,THERMATIC,BR,1/2,10-125	CHAMBER TRAP
LCV02	400694	TRAP,THERMATIC,BR,1/2,10-125	JACKET TRAP
OR01	602683	3/16",BR,ORIFICE DRILLED TO 1/4"	STEAM TO CHAMBER
OR02	600640	3/16",BR,ORIFICE	STEAM TO JACKET
PCV01	400979	PRESSURE REGULATOR,BR,3/4",7-60PSI	REGULATED STEAM IN
PI01	401302	GAUGE, PRESS, CHAMBER, 30HG-60PSI	CHAMBER PRESSURE GAUGE A
PI02	401301	GAUGE, PRESS, JACKET, 30HG-60PSI	JACKET PRESSURE GAUGE
PM001	400074	1/4 HP, ELCTRIC MOTOR	MOTOR FOR FEED WATER PUMP
PM01	400809	MOTOR,FEED WATER,3/4HP,120V	CONSERVATION MOTOR
PMP001	400072	BR, FEED WATER PUMP,100PSI	FEED WATER PUMP FOR BOILER
PMP01	400600	PUMP,ROTARY VANE,CARBNATOR MNT	CONSERVATION PUMP
PS00	500287	SWITCH, PRESS, BR, SETTING, 1/8	GASKET A PRESSURE SWITCH

DWG: 18622P
Date: 12/14/18
Rev:
Date:
Drawn by: RAL

parts@primus-sterilizer.com
www.primus-sterilizer.com
402-344-4200

PRIMUS

MAJOR PLUMBING LIST
JOB 18622
UNIVERSITY OF CALIFORNIA, DAVIS
PSS11-B-MESD

TAG/ID	PRIMUS PART #	DESCRIPTION	FUNCTION
PSV01	400040	VALVE, SAFETY, BR, 3/4X1, 45#	JACKET SAFETY RELIEF
PSV02	400040	VALVE, SAFETY, BR, 3/4X1, 45#	CHAMBER PRESSURE RELIEF
PT03	400998	PRESSURE TRANSDUCER (PSS11)	CHAMBER PRESSURE TRANSDUCER
SV05	400825	VALVE, SOL, BR, 1/4",STM, WTR, AIR, N/C	GASKET A CHARGE
SV07	400825	VALVE, SOL, BR, 1/4",STM, WTR, AIR, N/C	GASKET A RETRACT
SV01	400701	VALVE, SOL, BR, 1/2", HP STM, N/C	CHAMBER TRIM
SV02	400825	VALVE, SOL, BR, 1/4",STM, WTR, AIR, N/C	JACKET STEAM
SV03	400719	VALVE, SOL, BR, 1/2", LPSTM, NC, 0DI	CHAMBER AIR IN
SV00	400719	VALVE, SOL, BR, 1/2", LPSTM, NC, 0DI	CHAMBER DRAIN
SV24	400825	VALVE, SOL, BR, 1/4",STM, WTR, AIR, N/C	QUENCH WATER
TE01	400142	RTD ELEMENT SINGLE 72"	JACKET RTD
TE00	400322	RTD ELEMENT SINGLE 144"	CHAMBER RTD
TS24	500286	SWITCH,TEMP,BR,SETTING 110R	DRAIN TEMPERATURE SWITCH
WC01	G1256W2	WATER CONSERVATION TANK FOR 26X26X39	CONSERVATION TANK

DWG: 18622P
Date: 12/14/18
Rev:
Date:
Drawn by: RAL

parts@primus-sterilizer.com
www.primus-sterilizer.com
402-344-4200

ELECTRICAL CONNECTION REQUIREMENTS & CONSUMPTION

1. SINGLE POINT 120VAC, 60HZ, SINGLE PHASE, 10 AMP CONTROL CIRCUIT FOR CONNECTION TO CONTROL BOX TO BE SUPPLIED AND INSTALLED BY OTHERS.

2. FULL-LOAD-AMPERAGE (FLA) OF CONTROL BOX AND COMPONENTS: 5 AMPS

3. BRANCH CIRCUIT PROTECTION (BCP) WITH MAXIMUM RATING OF 15 AMPS OR LESS TO BE SUPPLIED AND INSTALLED BY OTHERS IN EACH UNGROUNDED CONDUCTOR TO THE CONTROL CIRCUIT. BCP MUST CONSIST OF ONE OF THE FOLLOWING:

   3.1. AN INVERSE-TIME OR INSTANTANEOUS-TRIP CIRCUIT BREAKER WHICH COMPLIES WITH THE REQUIREMENTS IN THE STANDARD FOR MOLDED-CASE CIRCUIT BREAKERS, MOLDED-CASE SWITCHES, AND CIRCUIT-BREAKER ENCLOSURES, UL 489.

   3.2. A BRANCH CIRCUIT FUSE WHICH COMPLIES WITH THE STANDARD FOR LOW-VOLTAGE FUSES - PART 1: GENERAL REQUIREMENTS, 248-1, AND THE APPLICABLE PARTS OF THE UL 248 SERIES.

4. ELECTRICAL DISCONNECT FOR THE CONTROL BOX IS PROVIDED AS A ROTARY SWITCH MOUNTED ON ENCLOSURE. DISCONNECT FOR ALL OTHER CONTROL CIRCUITS TO BE SUPPLIED AND INSTALLED BY OTHERS IN ACCORDANCE TO UL 508A.

CONTROL BOX WIRING GENERAL NOTES

1. ALL 120 VAC WIRING INSIDE CONTROL BOX, UNLESS STATED OTHERWISE IN THE GENERAL NOTES, SHALL BE SINGLE 18 AWG CONDUCTOR. HOT IS BLACK (501021), NEUTRAL IS WHITE (501023) AND GROUND IS GREEN (501204).

2. 120 VAC WIRING IN JUNCTION BOX TO CONTROL BOX SHALL BE 3 CONDUCTOR 14 AWG CABLE (501035). 120 VAC HOT TERMINATES AT DISCONNECT SWITCH, NEUTRAL AND GROUND TERMINATE AT TERMINAL BLOCKS.

3. 120 VAC HOT FROM DISCONNECT SWITCH TO CIRCUIT BREAKER SHALL BE SINGLE 14 AWG BLACK CONDUCTOR (501030).

4. 24 VDC WIRING INSIDE CONTROL BOX SHALL BE SINGLE 18 AWG CONDUCTOR. HOT IS YELLOW (501020), COMMON IS GREY (501022) AND GROUND IS GREEN (501204).

5. 5 VDC WIRING INSIDE CONTROL BOX SHALL BE SINGLE 18 AWG CONDUCTOR. HOT IS RED (501033), COMMON IS BLUE (501032) AND GROUND IS GREEN (501204).

6. ALL POWER WIRING CONNECTED TO FC6A MODULES (R161, R081, J4CN1) SHALL BE SINGLE 20 AWG CONDUCTOR. 120 VAC HOT IS BLACK (501034), 24 VDC HOT IS YELLOW (501025), 24 VDC COMMON IS GREY (501026), AND GROUND IS GREEN (501027).

7. STANDARD SOLENOID VALVES SHALL BE 3 CONDUCTOR 18 AWG CABLE (501040). REFERENCE THE COMPONENT WIRING SCHEME FOR CONNECTION DETAILS.

8. NON-SANITARY PRESSURE SWITCHES AND TEMPERATURE SWITCHES SHALL BE 3 CONDUCTOR 18 AWG CABLE (501040). REFERENCE THE COMPONENT WIRING SCHEME FOR CONNECTION DETAILS.

9. DOOR SWITCHES & PRESSURE TRANSDUCER SHALL BE 4 CONDUCTOR 22 AWG CABLE (500048).

10. ANY MULTI CONDUCTOR CABLING THAT HAS NOT BEEN SPECIFIED IN THE GENERAL NOTES SHALL BE MARKED ACCORDING TO THE MULTI CONDUCTOR CABLE SYMBOLS.

11. ALL TERMINAL BLOCKS SHALL FOLLOW THE DEFINED TERMINAL BLOCKS COLOR CODE.

COMPONENT WIRING SCHEME		
TYPE	WIRE #	CONNECTION #
TEMP / PRESS. SWITCH	#1	CONTACT #1 / COM
TEMP / PRESS. SWITCH	#2	CONTACT #3 / N.O.
SOLENOID VALVE	#1	CONTACT #1
SOLENOID VALVE	#2	CONTACT #2
SOLENOID VALVE	G/Y	GROUND

TERMINAL BLOCKS COLOR CODE	
WIRE TYPE	COLOR
120 VAC HOT	BLACK / ORANGE
120 VAC NEUTRAL	ORANGE
24 VDC +	YELLOW
24 VDC COMMON	GREY
5 VDC +	RED
5 VDC COMMON	BLUE
GROUND	GREEN / ORANGE

MULTICONDUCTOR CABLE SYSMBOLS

A 12 — 12 CONDUCTOR 18 AWG CABLE (501038)
WIRE NUMBER USED (STAMPED ON WIRE)
SIDE OF MACHINE

A 7 — 7 CONDUCTOR 18 AWG CABLE (501037)
WIRE NUMBER USED (STAMPED ON WIRE)
SIDE OF MACHINE

A 5 — 5 CONDUCTOR 18 AWG CABLE (501041)
WIRE NUMBER USED (STAMPED ON WIRE)
SIDE OF MACHINE

A 4 — 4 CONDUCTOR 18 AWG CABLE (501042)
WIRE NUMBER USED (STAMPED ON WIRE)
SIDE OF MACHINE

A 3 — 3 CONDUCTOR 18 AWG CABLE (501040)
WIRE NUMBER USED (STAMPED ON WIRE)
SIDE OF MACHINE

REV	DESCRIPTION	BY	DATE
	REVISIONS		

THESE DRAWINGS ARE:
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- ☐ DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

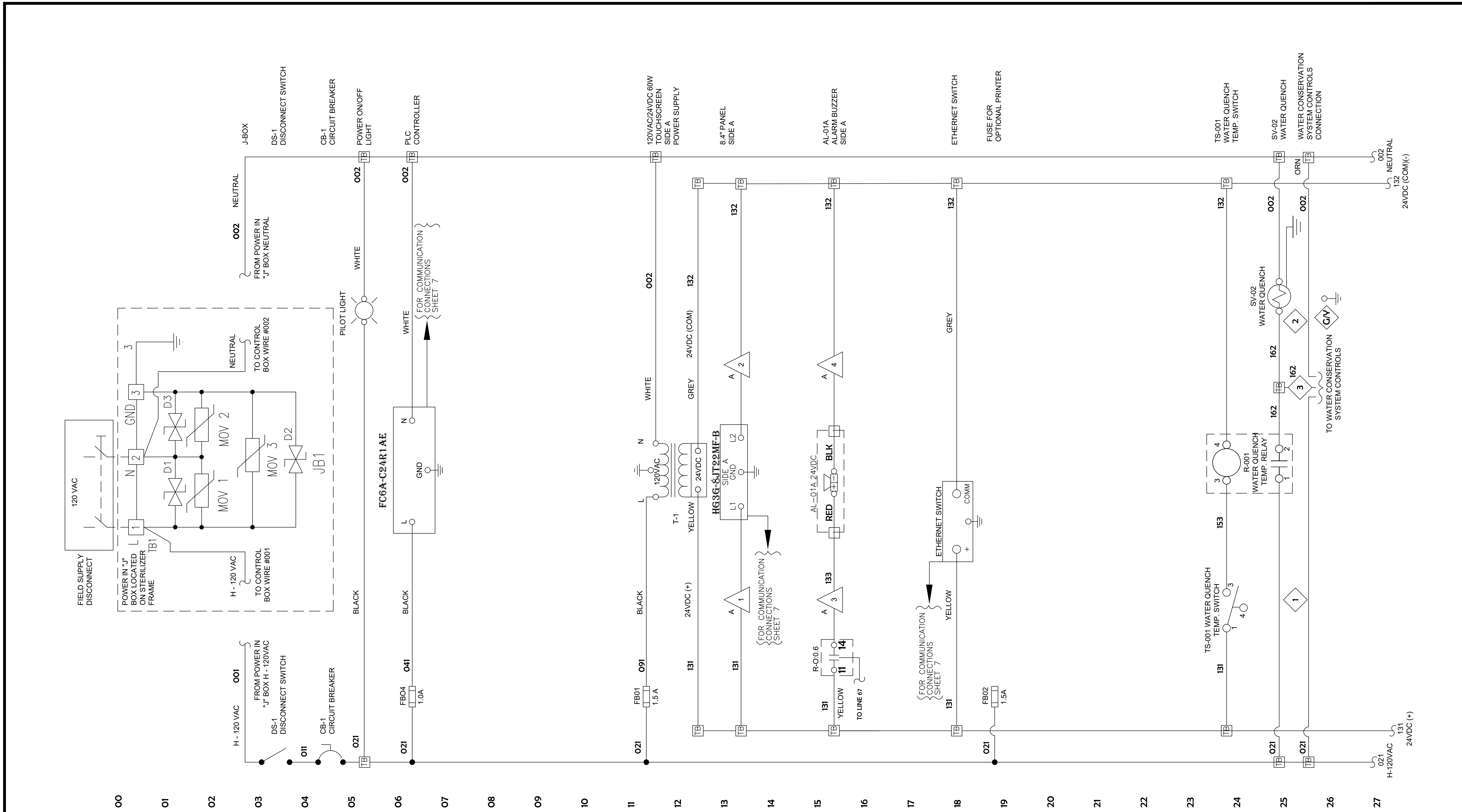
DRAWN BY: DTS — DATE: 1/8/19
CHECKED BY: IV — DATE: 1/8/19
APPROVED BY: PH — DATE: 1/8/19
SCALE: N.T.S.

JOB NO: 18622
MODEL: PSS11-B-MESD
STERILIZER SERIAL NO: V2.000
SIZE: 26X26X39

TITLE: ELECTRICAL DIAGRAM
GENERAL NOTES AND UTILITY REQUIREMENTS, PAGE 1 OF 10

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622E-1
REV:



REV	DESCRIPTION	BY	DATE
	REVISIONS		

THESE DRAWINGS ARE:
- [ ] FOR APPROVAL
- [ ] FOR INFORMATION ONLY
- [x] AS BUILT
- [ ] DRAFT

EQUIPMENT NO: ____
SPECIFICATION NO: ____
FLOOR NO: ____
ROOM NO: ____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TITLE
ELECTRICAL DIAGRAM
CONTROL SYSTEM, PAGE 2 OF 10

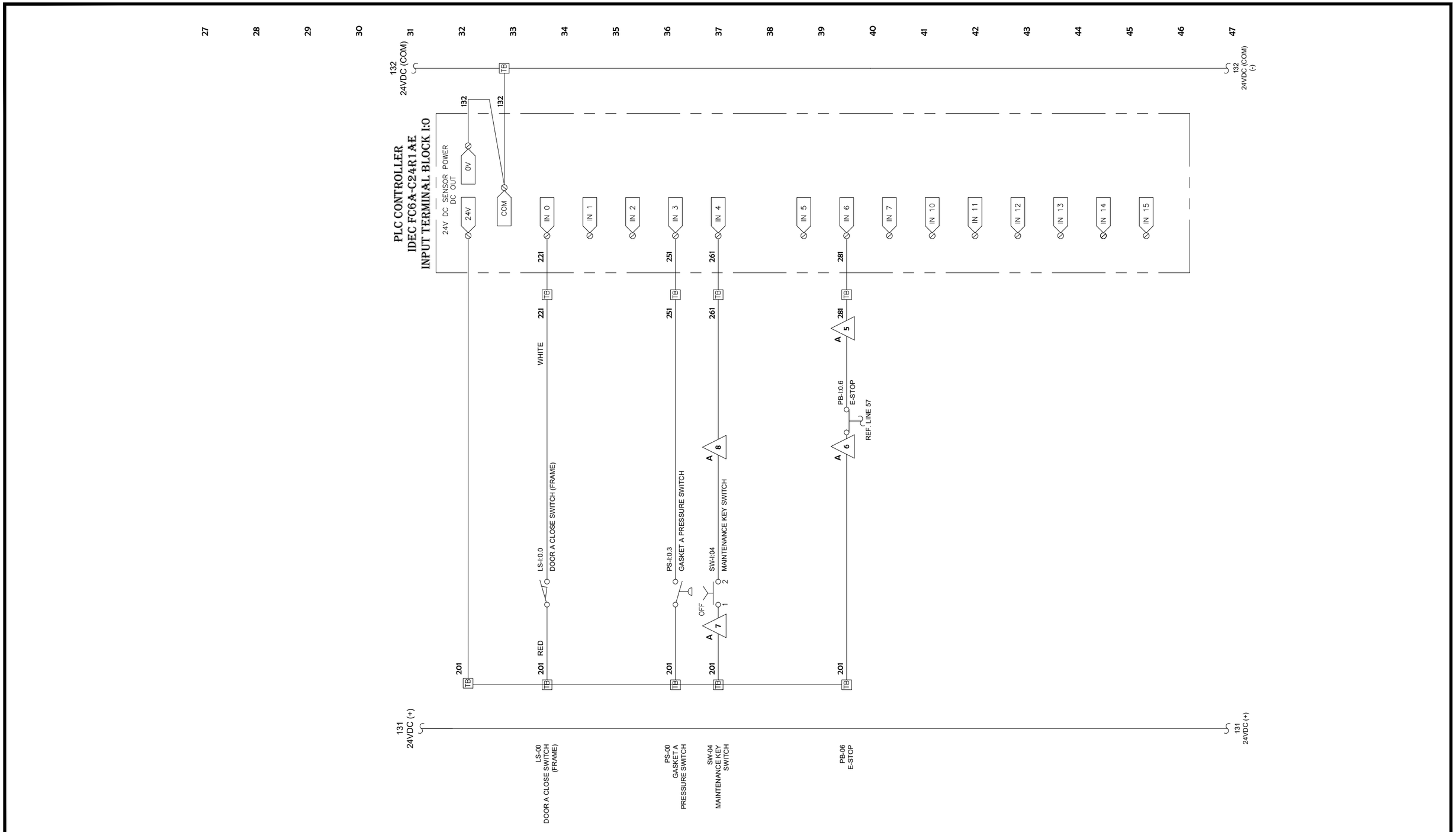
TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

DRAWN BY: DTS
DATE: 1/8/19
CHECKED BY: IV
DATE: 1/8/19
APPROVED BY: PH
DATE: 1/8/19
SCALE: N.T.S.

JOB NO: 18622
MODEL: PSS11-B-MESD
STERILIZER SERIAL NO: V2.000
SIZE: 26X26X39

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622E-2
REV:



REV	DESCRIPTION	BY	DATE
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SPECIFICATION NO: _____
FLOOR NO: _____
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CUSTOMER INFORMATION:

UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)

.X	±.03
.XX	±.010
.XXX	±.005
FRACTION	±1/16
ANGLES	±0°30'

DRAWN BY:	DTS
DATE:	1/8/19
CHECKED BY:	IV
DATE:	1/8/19
APPROVED BY:	PH
DATE:	1/8/19
SCALE:	N.T.S.

JOB NO:	18622
MODEL:	PSS11-B-MESD
STERILIZER SERIAL NO:	V2.000
SIZE:	26X26X39

TITLE
ELECTRICAL DIAGRAM
PLC DIGITAL INPUTS, PAGE 3 OF 10

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622E-3
REV:

REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☐ DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TITLE
ELECTRICAL DIAGRAM
PLC DIGITAL OUTPUTS, PAGE 4 OF 10

TOLERANCES (UNLESS OTHERWISE SPECIFIED)

.X	±.03
.XX	±.010
.XXX	±.005
FRACTION	±1/16
ANGLES	±0°30'

DRAWN BY:	DTS
DATE:	1/8/19
CHECKED BY:	IV
DATE:	1/8/19
APPROVED BY:	PH
DATE:	1/8/19
SCALE:	N.T.S.
JOB NO:	18622
MODEL:	PSS11-B-MESD
STERILIZER SERIAL NO:	V2.000
SIZE:	26X26X39
DRAWING NO.:	18622E-4
REV:	

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
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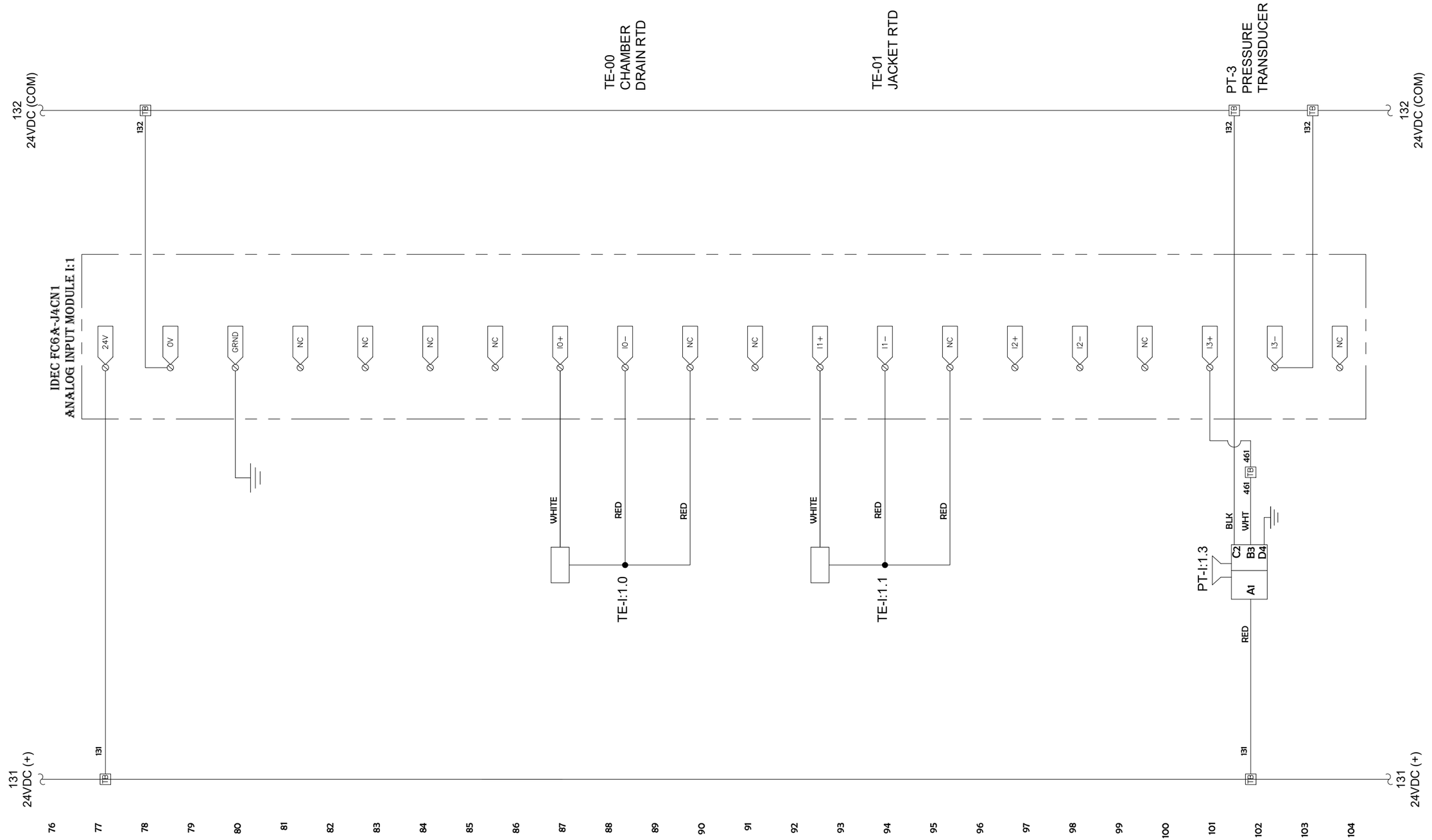

REV	DESCRIPTION	BY	DATE
	REVISIONS		

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EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

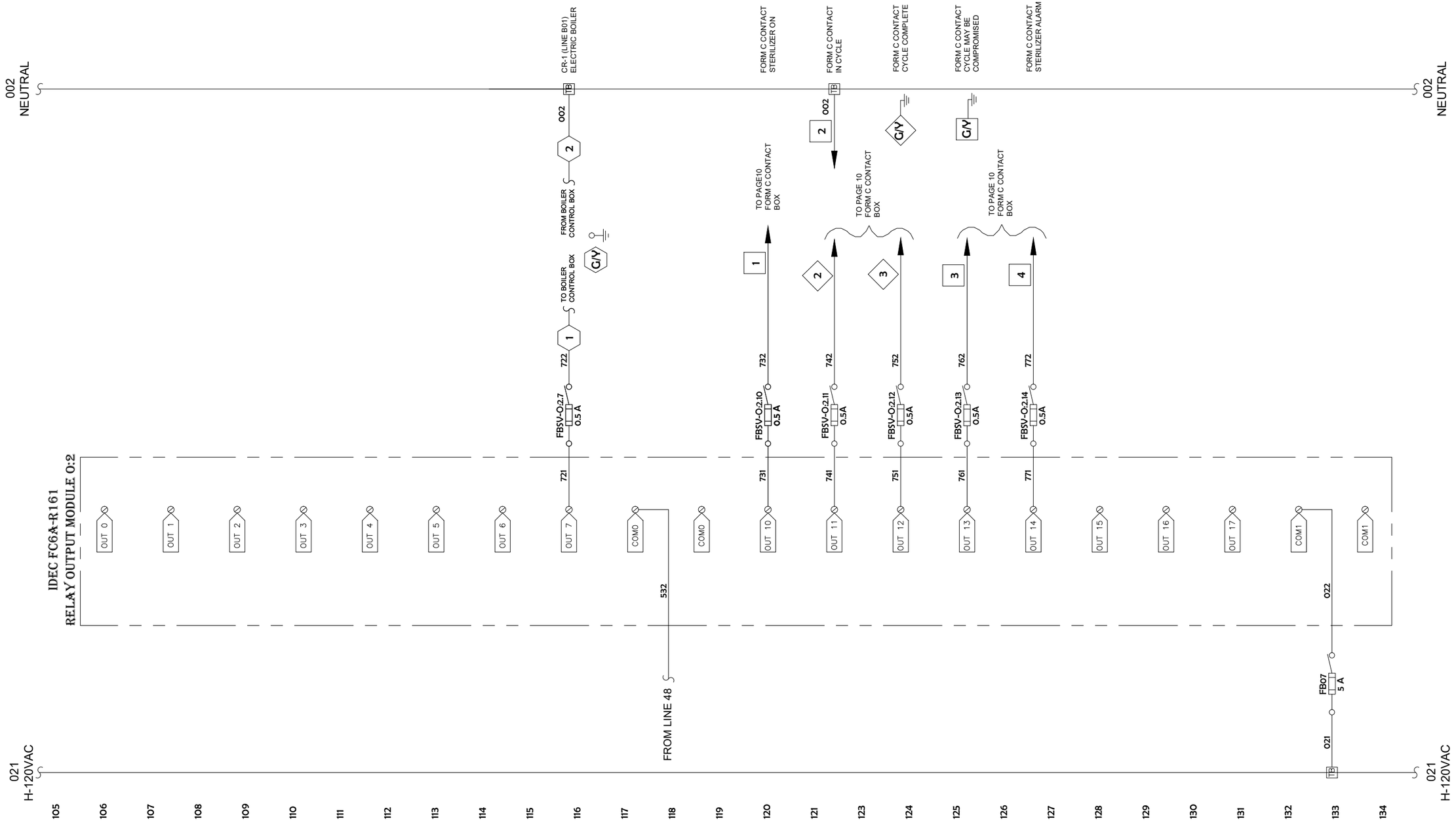
TITLE
ELECTRICAL DIAGRAM
ANALOG INPUT MODULE, PAGE 5 OF 10

DRAWN BY: DTS
DATE: 1/8/19
CHECKED BY: IV
DATE: 1/8/19
APPROVED BY: PH
DATE: 1/8/19
SCALE: N.T.S.

JOB NO: 18622
MODEL: PSS11-B-MESD
STERILIZER SERIAL NO: V2.000
SIZE: 26X26X39

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622E-5
REV:



REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☐ DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

DRAWN BY: DTS
DATE: 1/8/19
CHECKED BY: IV
DATE:
APPROVED BY: PH
DATE:
SCALE: N.T.S.

JOB NO: 18622
MODEL: PSS11-B-MESD
STERILIZER SERIAL NO: V2.000
SIZE: 26X26X39

TITLE
ELECTRICAL DIAGRAM
RELAY OUTPUT MODULE, PAGE 6 OF 10

DRAWING NO.: 18622E-6
REV:

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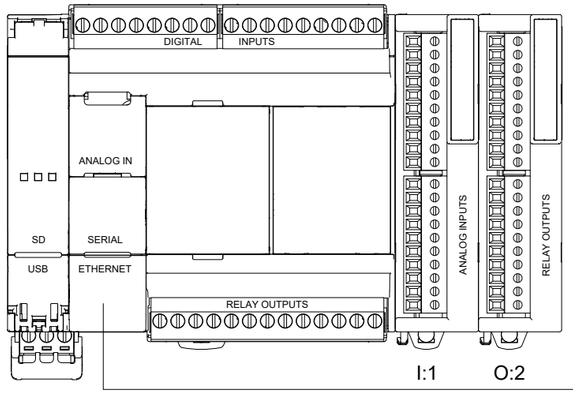
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

CONTROL BOX

FC6A-C24R1AE

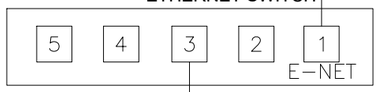


FC6A-J4CN1 ANALOG INPUTS

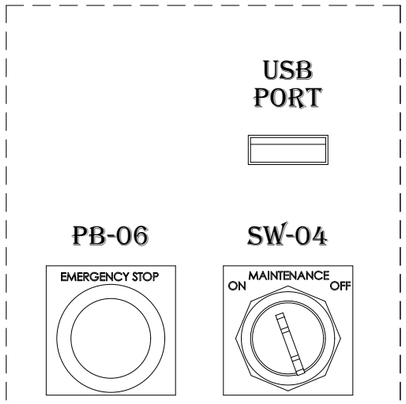
FC6A-R161 RELAY OUTPUTS

I:1 O:2

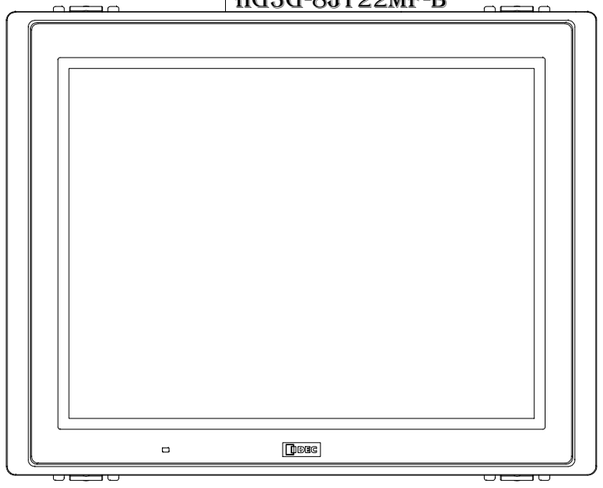
ETHERNET SWITCH



SIDE A



HG3G-8JT22MF-B



REV	DESCRIPTION	BY	DATE
	REVISIONS		

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EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

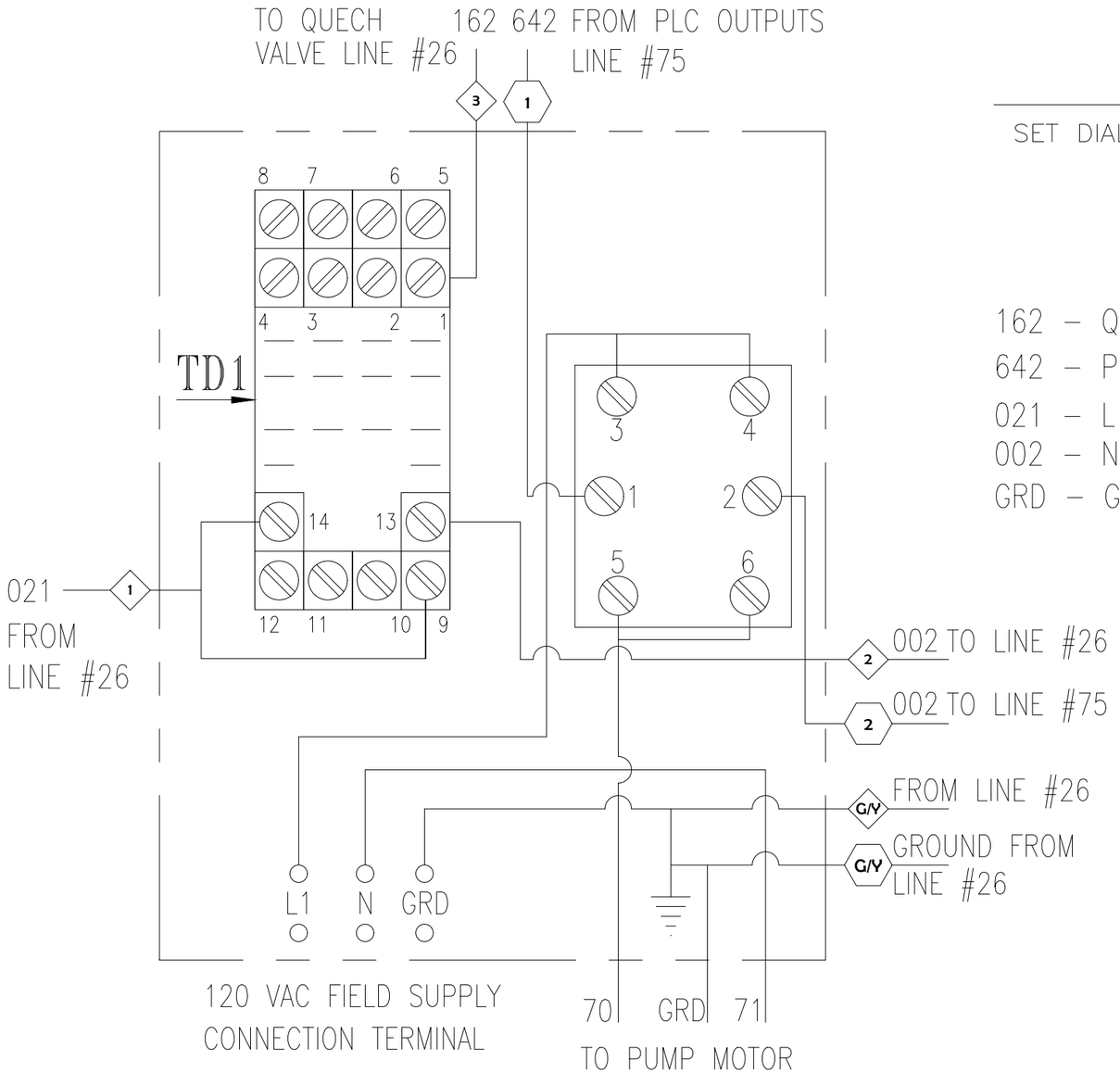
DRAWN BY: DTS
DATE: 1/8/19
CHECKED BY: IV
DATE: 1/8/19
APPROVED BY: PH
DATE: 1/8/19
SCALE: N.T.S.

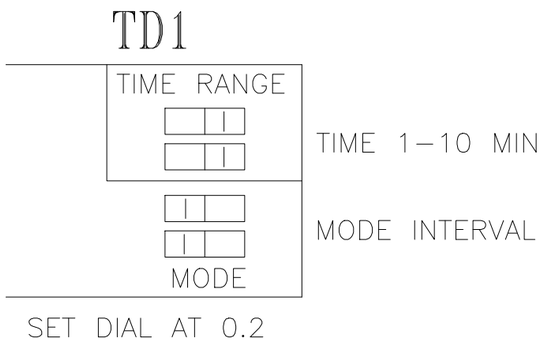
JOB NO: 18622
MODEL: PSS11-B-MESD
STERILIZER SERIAL NO: V2.000
SIZE: 26X26X39

TITLE
ELECTRICAL DIAGRAM
CONTROL SYSTEM BLOCK DIAGRAM, PAGE 7 OF 10

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST., SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

DRAWING NO.: 18622E-7
REV:





162 – QUENCH WIRE FROM CONTROL BOX
642 – PLC OUTPUT 0:11 FROM CONTROL BOX
021 – L FROM CONTROL BOX
002 – N FROM CONTROL BOX
GRD – GROUND

REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☐ DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

DRAWN BY: DTS	JOB NO: 18622
DATE: 1/8/19	
CHECKED BY: IV	MODEL: PSS11–B–MESD
DATE: 1/8/19	
APPROVED BY: PH	STERILIZER SERIAL NO: V2.000
DATE: 1/8/19	
SCALE: N.T.S.	SIZE: 26X26X39

TITLE
ELECTRICAL DIAGRAM
PRI–SAVER WATER RECIRCULATION SYSTEM, PAGE 8 OF 10

PRIMUS
STERILIZER COMPANY, LLC
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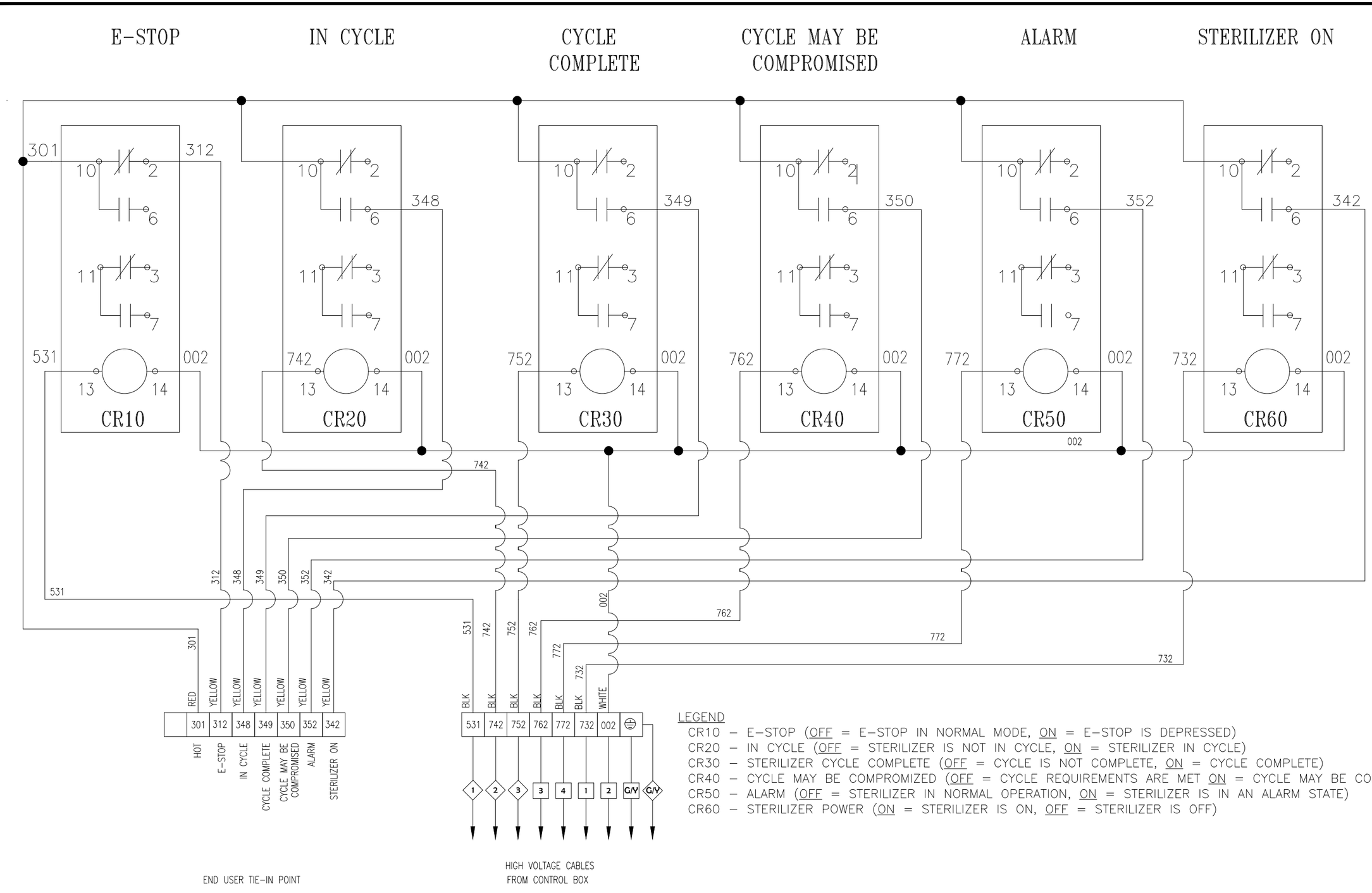
OMAHA, NE 68138
PH. (402) 344–4200
FAX (402) 344–4242

DRAWING NO.: 18622E–8
REV:



LEGEND

CR10 – E-STOP (OFF = E-STOP IN NORMAL MODE, ON = E-STOP IS DEPRESSED)
CR20 – IN CYCLE (OFF = STERILIZER IS NOT IN CYCLE, ON = STERILIZER IN CYCLE)
CR30 – STERILIZER CYCLE COMPLETE (OFF = CYCLE IS NOT COMPLETE, ON = CYCLE COMPLETE)
CR40 – CYCLE MAY BE COMPROMIZED (OFF = CYCLE REQUIREMENTS ARE MET ON = CYCLE MAY BE COMPROMIZED)
CR50 – ALARM (OFF = STERILIZER IN NORMAL OPERATION, ON = STERILIZER IS IN AN ALARM STATE)
CR60 – STERILIZER POWER (ON = STERILIZER IS ON, OFF = STERILIZER IS OFF)

REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☐ DRAFT

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SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

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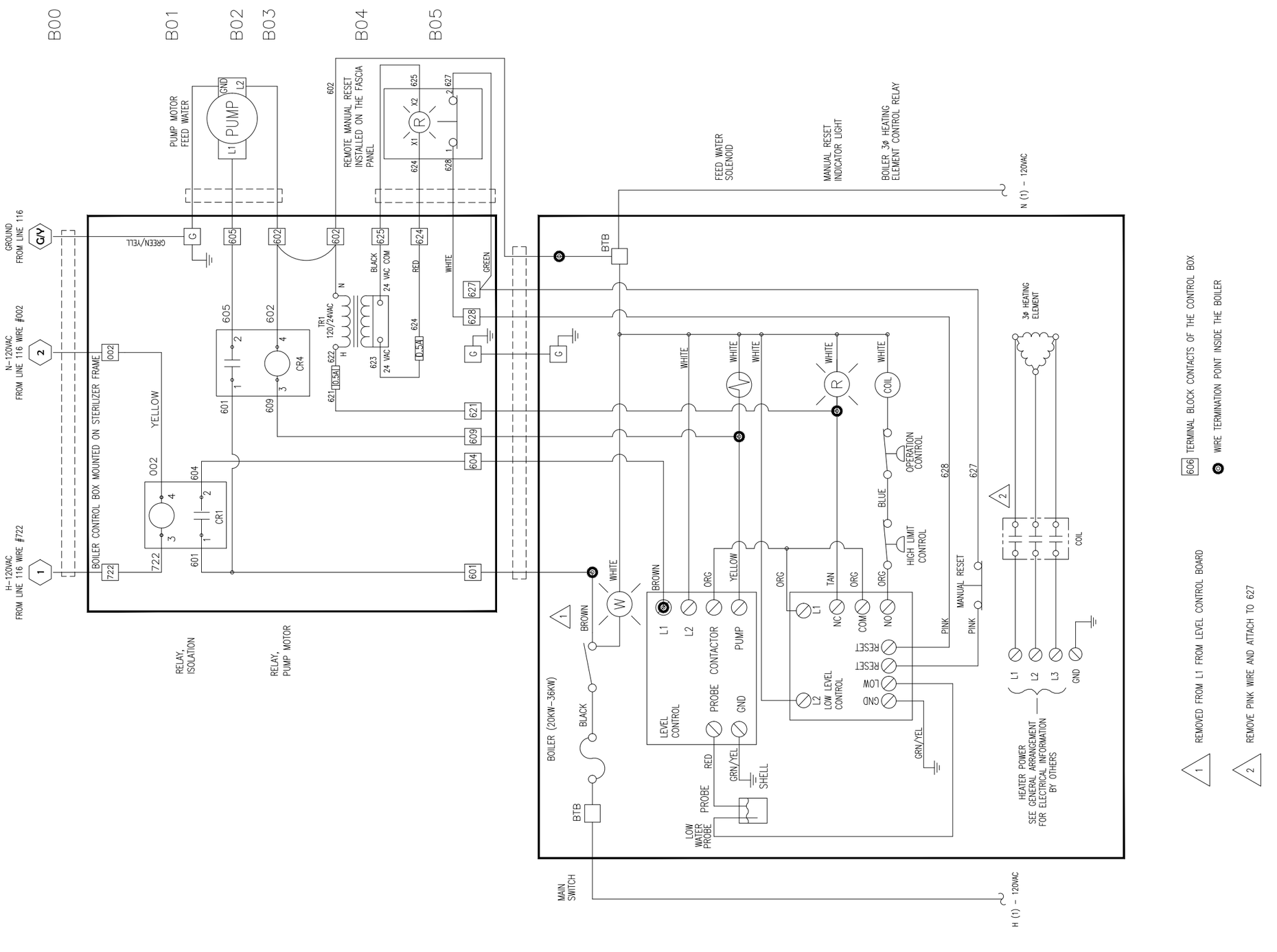
DATE:	1/8/19
CHECKED BY:	IV
DATE:	
APPROVED BY:	PH
DATE:	
SCALE:	N.T.S.
JOB NO:	18622
MODEL:	PSS11-B-MESD
STERILIZER SERIAL NO:	V2.000
SIZE:	26X26X39
DRAWING NO.:	18622E-9
REV:	

TITLE
ELECTRICAL DIAGRAM
FORM C CONTACT CONTROL BOX, PAGE 9 OF 10

PRIMUS
STERILIZER COMPANY, LLC
117 SOUTH 25th ST.
OMAHA, NE 68131
PH. (402) 344-4200
FAX (402) 344-4242



REV	DESCRIPTION	BY	DATE
	REVISIONS		

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- ☒ AS BUILT
- ☐ DRAFT

EQUIPMENT NO: _____
SPECIFICATION NO: _____
FLOOR NO: _____
ROOM NO: _____

CUSTOMER INFORMATION:
UC DAVIS
631 KLEIBER HALL DRIVE
DAVIS, CA 95616

TOLERANCES (UNLESS OTHERWISE SPECIFIED)
.X ±.03
.XX ±.010
.XXX ±.005
FRACTION ±1/16
ANGLES ±0°30'

TITLE
ELECTRICAL DIAGRAM
INTEGRAL BOILER W/MANUAL RESET & AUTOMATIC BLOW DOWN, PAGE 10 OF 10

DRAWN BY:	DTS
DATE:	1/8/19
CHECKED BY:	IV
DATE:	1/8/19
APPROVED BY:	PH
DATE:	1/8/19
SCALE:	N.T.S.
JOB NO:	18622
MODEL:	PSS11-B-MESD
STERILIZER SERIAL NO:	V2.000
SIZE:	26X26X39
DRAWING NO.:	18622E-10
REV:	

PRIMUS
STERILIZER COMPANY, LLC
8719 S. 135th ST. SUITE 300
OMAHA, NE 68138
PH. (402) 344-4200
FAX (402) 344-4242

MAJOR ELECTRICAL LIST
JOB 18622
UC DAVIS
PSS11-B-MESD

LINE	PRIMUS P/N	MFR.	MFR. P/N	DESCRIPTION	FUNCTION
1	200017	PRIMUS	200017	J-BOX ASSEMBLY	POWER IN "J" BOX
3	501045	SCHNEIDER	VLS3P016D1	ROTARY DISCONNECT SWITCH,3P,16A	DISCONNECT SWITCH
3	501046	SCHNEIDER	VLSH1S5R	ROTARY DISCONNECT SWITCH,3P,16A,HANDLE	DISCONNECT SWITCH HANDLE
4	501047	PHEONIX	TMC81C07A	CB,1P,7AMP,277/480VAC,125VDC	7 AMP CIRCUIT BREAKER
5	501054	SCHNEIDER	XB7EV04GP	PILOT LIGHT, RED 120V 22MM	POWER ON/OFF INDICATOR
6	500933	IDEC	FC6A-C24R1AE	IDEC MICROSMART FC6A PLC	PLC CONTROLLER
12	500617	OMRON	S8VK-G06024	POWER SUPPLY, AC 100-240V 50/60 HZ IN, 24VDC 2.5A OUT, 60W, DIN MOUNT	60W, 24VDC POWER SUPPLY
13	500980	IDEC	HG3G-8JT22MF-B	8.4" COLOR IDEC SCREEN	8.4" HMI
15	501066	SCHNEIDER	RSZE1S35M	SOCKET,RELAY,DIN MOUNT,4PDT	ALARM BUZZER RELAY SOCKET
15/67	501067	SCHNEIDER	RSB1A12OF7	RELAY,GP,4PDT,120V	ALARM BUZZER RELAY
15	500137	ICC	BR2818L-24	BUZZER ELEMENT,24V	ALARM BUZZER
18	500923	HIRSCHMAN	SPIDER 5TX	AB-E-NET SWITCH 5 PORT	SWITCH, ETHERNET
24	500836	CRYDOM	DR-OAC	RELAY, I/O MODULE DIN MOUNTED	RELAY, WATER QUENCH
24	500286	NASON	TM-1A-110R/HR	SWITCH,TEMP,BR,SETTING 110R	SWITCH, TEMPERATURE, WATER QUENCH
25	400825	ASCO	SC8263G300	VALVE,SOL,BR,1/4,STM/WTR,N/C	SOLENOID VALVE, WATER QUENCH
34	500146	HONEYWELL	2AC59	SWITCH,LIMIT, DOOR	SWITCH, LIMIT, DOOR "A" CLOSED FRAME
36	500287	NASON	SM-U2A-10R/HR/EP	SWITCH,PRESS,BR,SETTING 10R/EP	SWITCH, PRESSURE, GASKET "A"
37	500092	ALLEN BRADLEY	800TH33A	AB-MAINTENANCE LOCK OUT KEY	SWITCH, AUTHORIZATION KEY
39/48	500168	ALLEN BRADLEY	880H-FRXT6A5	AB-PUSH BUTTON,2POS PUSH-PULL	E-STOP SIDE A
48/39	500168	ALLEN BRADLEY	880H-FRXT6A5	AB-PUSH BUTTON,2POS PUSH-PULL	E-STOP SIDE A
53	400719	ASCO	SC8222G94	VALVE,SOL,BR,1/2,LPSTM,N/C,0DI	SOLENOID VALVE, CHAMBER DRAIN
55	400701	ASCO	SU8220G406	VALVE,SOL,BR,1/2,HP STM,N/C	SOLENOID VALVE, CHAMBER TRIM
57	400825	ASCO	SC8263G300	VALVE,SOL,BR,1/4,STM/WTR,N/C	SOLENOID VALVE, JACKET STEAM
59	400719	ASCO	SC8222G94	VALVE,SOL,BR,1/2,LPSTM,N/C,0DI	SOLENOID VALVE, CHAMBER AIR IN
63	400825	ASCO	SC8263G300	VALVE,SOL,BR,1/4,STM/WTR,N/C	SOLENOID VALVE, GASKET A CHARGE
67/15	501067	SCHNEIDER	RSB1A12OF7	RELAY,GP,4PDT,120V	ALARM BUZZER RELAY
73	400825	ASCO	SC8263G300	VALVE,SOL,BR,1/4,STM/WTR,N/C	SOLENOID VALVE, GASKET "A" RETRACT
76	500935	IDEC	FC6A-J4CN1	IDEC, FC6A, ANALOG INPUT MODULE	ANALOG INPUT MODULE
88	400322	SENSORTEC	RBBJL-KW04A-00-0144B(009/019)	RTD ELEMENT,SGL,144" LEAD	RTD, CHAMBER DRAIN
94	400142	SENSORTEC	RBBJL-KW04A-00-0072B	RTD ELEMENT,SGL,72"LEAD,1/4	RTD, JACKET

ELECTRICAL DIAGRAM: 18622E
DRAWN BY: DTS
DATE: 01-08-2019
REV DATE: N/A

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402.344.4200

102	400998	BARKSDALE	423-H3-03-A	TRANSDUCER,PRESS,0-50psia,1/4"	PRESSURE TRANSDUCER
105	500934	IDEC	FC6A-R161	IDEC, FC6A, RELAY OUTPUT MODULE, 16PT	RELAY OUTPUT MODULE
WATER CONSERVATION SYSTEM					
N/A	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	WATER CONSERVATION RELAY TIMER SOCKET
N/A	500775	OMRON	H3YN-4	TIMER,120v,1S/10S/1M/10MIN,	WATER CONSERVATION RELAY TIMER
N/A	500153	POTTER & BRUMFIELD	PRD-7AGO-120	RELAY,120VAC COIL, 30A, 240VAC, 2 N.O. CONTACT	WATER CONSERVATION PUMP MOTOR RELAY
FORM C CONTACT BOX					
CR10	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C E-STOP POWER SOCKET
CR10	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C E-STOP POWER RELAY
CR20	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C IN CYCLE SOCKET
CR20	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C IN CYCLE RELAY
CR30	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C CYCLE COMPLETE SOCKET
CR30	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C CYCLE COMPLETE RELAY
CR40	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C CYCLE COMPROMISED SOCKET
CR40	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C CYCLE COMPROMISED RELAY
CR50	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C ALARM SOCKET
CR50	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C ALARM RELAY
CR60	500130	TYCO	27E894	RELAY,SOCKET,4PDT,5A	FORM C STERILIZER ON SOCKET
CR60	500131	POTTER & BRUMFIELD	KHAU-17A12-120	RELAY,GP,4PDT,120V,SOLDER TERM	FORM C STERILIZER ON RELAY
INTEGRAL BOILER WITH MANUAL RESET					
B01	400458	OPTO 22	120A10	RELAY, SOLID STATE, 120/120V	RELAY, BOILER
B02	400074	DAYTON	6K160E	MOTOR, FEED WATER, 1/4HP, 120V	BOILER WATER IN
B03	400458	OPTO 22	120A10	RELAY, SOLID STATE, 120/120V	RELAY, BOILER PUMP
B04	500463	WHITE RODGERS	6WU91	TRANSFORMER, STANDARD CHASSIS MOUNT W/LEADS 24 VAC	BOILER, TRANSFORMER
B05	500464	BACO	L12AL10	SWITCH, 22MM PANEL CUTOUT PUSH BUTTOM, LOW WATER CUTOFF	LOW WATER CUTOFF SWITCH

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402.344.4200

B05	800821	BACO	333EARL11	SWITCH, PANEL, N/C, CONTACT BLOCK WITH LED	LOW WATER CUTOFF SWITCH

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www.primus-sterilizer.com
402.344.4200

PRIMUS GENERAL PURPOSE STERILIZER

PRI-MATIC® 100 CONTROL

APPENDIX A

MANUFACTURER'S RECORDS

APPENDIX A - PRI-MATIC® 100
Manual Version 1.00
SW REV 2.000

PRIMUS Sterilizer Company, LLC
8719 South 135th Street, Suite 300 Omaha, NE 68138
TEL: (402) 344-4200; FAX: (402) 344-4242
Info@primus-sterilizer.com
www.primus-sterilizer.com

PRIMUS Sterilizer Company, LLC, Omaha, NE 68138

Printed in the United States of America

General Purpose Steam Sterilizer Operator Manual includes six parts:

General Information
Installation
User
Process, Programming, & Parameters
Factory Acceptance
Maintenance

Once installation of a new PRIMUS General Purpose sterilizer with PRI-Matic® 100 Control is complete, the user is urged to conduct validation studies according to accepted standards (e.g. FDA cGMP, ANSI) and document the effectiveness of user selected cycle parameters for <u>each</u> type of load to be sterilized.

PRIMUS Sterilizer Company, LLC
8719 South 135th Street, Suite 300, Omaha, NE 68138
TEL: (402) 344-4200; FAX: (402) 344-4242
Info@primus-sterilizer.com
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TABLE CONTENTS

Page

PRIMUS Sterilizer Company, LLC
8719 South 135th Street, Suite 300, Omaha, NE 68138
TEL: (402) 344-4200; FAX: (402) 344-4242
Info@primus-sterilizer.com
www.primus-sterilizer.com

APPENDIX A. Manufacturer's Records

10.1 Heat Records

Manufacturer's heat records are provided where applicable for sanitary fittings. Heat records provide a record of the components of the stainless used in the development of the sanitary fittings.

10.2 U-1

A Form U-1 Manufacturer's Data Report for Pressure Vessels that registers this unit with the National Board of Boiler and Pressure Vessel Inspectors follows.

10.3 Boiler Manual/Form P-2A

If your sterilizer has an optional steam generator installed, then the manufacturer's Installation, Operation, and Maintenance Manual and the Form P-2A Manufacturer's Data Report for all Types of Electric Boilers specific to your unit will follow.

10.4 Miscellaneous

This section contains any other manufacturer's warranty or instruction manuals pertinent to your sterilizer.

18622 Job No.

262639SD Unit Size

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS

As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by **PRIMUS Sterilizer Company, LLC, 3707 North Main Street, Great Bend, Kansas, 67530** (Name and address of Manufacturer)

2. Manufactured for **STOCK** (Name and address of Purchaser)

3. Location of installation **N/A** (Name and address)

4. Type **Horizontal** (Horizontal, vertical, or sphere) | **JACKETED VESSEL** (Tank, separator, jkt. vessel, heat exch., etc.) | **18622** (Manufacturer's serial number)

N/A (CRN) | **3380W11** (Drawing number) | **3548** (National Board number) | **2018** (Year built)

5. ASME Code, Section VIII, Div. 1 | **2017/ N/A** [Edition and Addenda, if applicable (date)] | **N/A** (Code Case Number) | **N/A** [Special Service per UG-120(d)]

Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multichamber vessels.

6. Shell: (a) Number of course(s) **1** (b) Overall length **3' 1.375"**

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	29" x 29"	3' 1.375"	SA240-316L	.135	0	7	NONE	70%	7	N/A	N/A	N/A	N/A

Body Flanges on Shells

No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location	Bolting			
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

7. Heads: (a) **N/A** (Material spec. number, grade or type) (H.T. - time and temp.) (b) **N/A** (Material spec. number, grade or type) (H.T. - time and temp.)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Body Flanges on Heads

	Location	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Bolting			
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
(a)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A

8. Type of jacket **TYPE 1** Jacket closure **(d-1) AND (e-2)** (Describe as ogee & weld, bar, etc.)

If bar, give dimensions; if bolted, describe or sketch **N/A**

9. MAWP **45 psi** (Internal) **N/A** (External) at max. temp. **300 °F** (Internal) **N/A** (External) Min. design metal temp. **-20 °F** at **45 psi**

10. Impact test **NO - PER UHA 51** at test temperature of **N/A** [Indicate yes or no and the component(s) impact tested]

11. Hydro., pneu., or comb. test pressure **Hydro. at 90 psi** Proof test **NO**

Items 12 and 13 to be completed for tube sections.

12. Tubesheet **N/A** [Stationary (material spec. no.)] | **N/A** [Diameter (subject to press.)] | **N/A** (Nominal thickness) | **N/A** (Corr. allow.) | **N/A** Attachment (welded or bolted)

N/A [Floating (material spec. no.)] | **N/A** (Diameter) | **N/A** (Nominal thickness) | **N/A** (Corr. allow.) | **N/A** (Attachment)

13. Tubes **N/A** (Material spec. no., grade or type) | **N/A** (O. D.) | **N/A** (Nominal thickness) | **N/A** (Number) | **N/A** [Type (Straight or U)]

FORM U1

Manufactured by **PRIMUS Sterilizer Company, LLC, 3707 North Main Street, Great Bend, Kansas, 67530**

Manufacturer's Serial No. **18622** CRN **N/A** National Board No. **3548**

Items 14-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell: (a) No. of course(s) **1** (b) Overall length **3' 3"**

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	26" x 26"	3' 3"	SA240-316L	.187	0	1	NONE	70	7	N/A	N/A	N/A	N/A

Body Flanges on Shells

No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location	Bolting			
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

15. Heads: (a) **SA240-316L** (Material spec. number, grade or type) (H.T. - time and temp.) (b) **SA240-316L** (Material spec. number, grade or type) (H.T. - time and temp.)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)	DOOR	.750	0	N/A	N/A	N/A	N/A	N/A	29"x31"			N/A	None	N/A
(b)	END	.750	0	N/A	N/A	N/A	N/A	N/A	29"x29"			N/A	None	N/A

Body Flanges on Heads

	Location	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Bolting			
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

16. MAWP **45 psi** (Internal) **45 psi** (External) at max. temp. **300 °F** (Internal) **300 °F** (External) Min. design metal temp. **-20 °F** at **45 psi**.

17. Impact test **NO - PER UHA 51** at test temperature of **N/A**.
[Indicate yes or no and the component(s) impact tested]

18. Hydro., pneu., or comb. test pressure **Hydro. at 59 psi** Proof test **NO**

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material		Nozzle Thickness		Reinforcement Material	Attachment Details		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
INLET	3	3/4"	COUPLING	SA182-316L		3000#	0		UW16.1(C)		CHAMBER
OUTLET	1	3/4"	COUPLING	SA182-316L		3000#	0		UW16.1(C)		CHAMBER
INLET	6	3/4"	COUPLING	SA182-316L		3000#	0		UW16.1(C)		JACKET
OUTLET	2	3/4"	COUPLING	SA182-316L		3000#	0		UW16.1(C)		JACKET
INLET	2	1"	COUPLING	SA182-316L		3000#	0		UW16.1(C)		CHAMBER

20. Supports: Skirt **No** (Yes or no) Lugs **N/A** (Number) Legs **N/A** (Number) Others **N/A** (Describe) Attached **N/A** (Where and how)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report (list the name of part, item number, Manufacturer's name, and identifying number):

N/A

22. Remarks

***NON-CIRCULAR DESIGN IN ACCORDANCE WITH APPENDIX 13 FIGURE 13-2(a)**

FORM U1

Manufactured by **PRIMUS Sterilizer Company, LLC, 3707 North Main Street, Great Bend, Kansas, 67530**

Manufacturer's Serial No. **18622** CRN **N/A** National Board No. **3548**

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. U Certificate of Authorization Number **23910** Expires **February 20, 2019**

Date 11/28/2018 Name **PRIMUS Sterilizer Company, LLC** (Manufacturer) Signed (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by

The Hartford Steam Boiler Inspection and Insurance Company, of Hartford, CT

have inspected the pressure vessel described in this Manufacturer's Data Report on **November 28, 2018**, and state that,

to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11/28/2018 Signed (Authorized Inspector) Commissions: **14983, KS709, IA1701, MO0499, NE103562** (National Board Authorized Inspector Commission number)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements made in this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. U Certificate of Authorization Number _____ Expires _____

Date _____ Name _____ (Assembler) Signed _____ (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and employed by

_____,

have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items _____, not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. The described vessel was inspected and subjected to a pressure test of _____. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ (Authorized Inspector) Commission _____ (National Board Authorized Inspector Commission number)

SUSSMAN ELECTRIC BOILERS

ES30A - ES36A - HP30A
Electric Steam Generators
Installation, Operation and Maintenance Manual

Model No. ES36AF3-PRI *Power Circuit Voltage* 480 VAC

Generator Serial No. ESA11991901-W18 *Control Circuit Voltage* 120 VAC

National Board No 115330 *Amps* 44/12 *Phase* 3/1 *Cy* 50/60

IMPORTANT: *This data file contains the National Board Registration Certificate approving your generator. It must be kept near the generator at all times.*

Products Covered by this Manual

Model	KW Range	Steam Rate	BHP	Design Pressure	Max. Work Pressure*
ES 30A	30	90 lbs./hr	3.0	100 PSIG	85 PSIG
ES 36A	36	108 lbs./hr	3.6	100 PSIG	85 PSIG
HP30A	30	90 lbs./hr	3.0	100 PSIG	85 PSIG

*Line water pressure must be a minimum of 10 PSIG higher than generator operating pressure or you will require high pressure water feed w/motor and pump.

PN 100600 6.15

SUSSMAN ELECTRIC BOILERS

A Division of Sussman-Automatic Corporation
43-20 34th Street, Long Island City, NY 11101 • 718-937-4500 • 1-800 238-3535
Fax: 718-937-4676 • www.sussmanboilers.com • Email: seb@sussmancorp.com

Standard Features

- LIQUID LEVEL / LWCO CONTROLLER
  The electronic controller automatically maintains proper water level, and shuts off the generator when water supply in the boiler drops below a safe operating level.
- WATER LEVEL SIGHT GLASS
  Allows constant observation of water level while boiler is in operation.
- ON-OFF SWITCH
  Complete with pilot light, for switching on the generator.
- INTEGRAL ELECTRICAL CONTROL
  Magnetic contactors energize the elements and are integrally mounted in the control unit.
- BLOWDOWN/DRAIN VALVE
  Facilitates emptying the pressure vessel during blowdown/drain sequence.
- J-BOX for motor/pump connection.
- LONG LIFE HEATING ELEMENTS
  Industrial grade, heavy duty stainless steel heating elements equipped with one piece resistance welded terminations for added strength and safety.
- OPERATING PRESSURE CONTROL
  Operates automatically to maintain steam pressure within generator.
- MANUAL RESET PRESSURE CONTROL
  Provides high limit pressure cut-out with manual reset.
- STEAM SAFETY VALVE
  ASME Code valve, automatically opens to reduce pressure should excessive steam cause pressure build-up.
- STEAM PRESSURE GAUGE
  Allows visual observation of steam pressure over full range.
- ENERGY SAVING AND MINIMUM MAINTENANCE
  Fully insulated pressure vessel minimizes heat loss and maximizes energy savings.
- EASY CONTROL MAINTENANCE
  All controls and components are easily accessible. Fully-louvered openings avoid component heat build-up.
- RUGGED CONSTRUCTION
  Performance is insured for all typical industrial applications.

Meeting Code Requirements

- Pressure vessel rated at 100PSIG to ASME Section I, Code M and National Board registered.
- UL listed, cUL certified built to NEC.
- Units are trimmed at 100PSIG as standard. 15PSIG trim also available.
- Incoming water line pressure must be 10 PSIG greater than generator operating pressure. If not, a motor/pump must be used. Specify Sussman ES 38002A high pressure water feed motor/pump system.
- When ordering specify Model No., KW, Volts/PH and motor/pump if required.
- Water Connection is 1/4" NPT.

Installation

CAUTION ***Refer to National and all applicable Local Codes for specific installation requirements.***

NOTE: Reference heating element clearance requirements for particular boiler to allow for removal of elements. Standard minimum suggested clearance is 21 inches.

1. The boiler should be mounted on a solid level foundation.
2. All piping should be installed by a licensed plumber.
3. When any type water feed other than a pump feed is used, the existing water supply pressure must be 10 PSIG greater than boiler operating pressure to assure water supply maintains proper water level in boiler. Lack of water can result in improper boiler operation. Keep feed water valves open at all times during normal operation.
4. Connect steam line with customer supplied outlet valve to boiler steam outlet.
5. During normal operation, keep drain valve closed.
6. If pump and boiler are plumbed within 30 ft (pipe length), a minimum of two check valves are required on boiler to avoid damage to pump.

NOTE: THE SAFETY VALVE SHALL NOT BE PLUMBED WITH A DRAIN LINE SIZED LESS THAN THE OUTLET SIZE OF THE SAFETY VALVE.

Wiring

CAUTION ***Ground boiler according to National Electric Code requirements to avoid shock. Use proper sized wire. Power wiring to boiler should be in accordance with Local and N.E.C. requirements following wiring diagram supplied. Wire size specified adjacent to field wiring terminal block(s). Use 90˚C copper wire only.***

Purchaser should use a disconnect switch employing circuit breakers or fuses between the main power source and the boiler.

CAUTION ***Boilers are susceptible to lightning damage because of plumbing water lines. Industrial type lightning/surge protectors should be installed according to the manufacturer's recommendation at your service entrance. Consult your contractor or electrical dealer.***

1. The unit is pre-wired and tested. Connect control circuit voltage at the control circuit terminal block.
2. With the main power off, make sure that all wiring terminations are tight to avoid arcing, carbonizing and/or overheating of contacts.

WARNING ***Substitution of components or modification of wiring systems voids the warranty and may lead to dangerous operating conditions.***

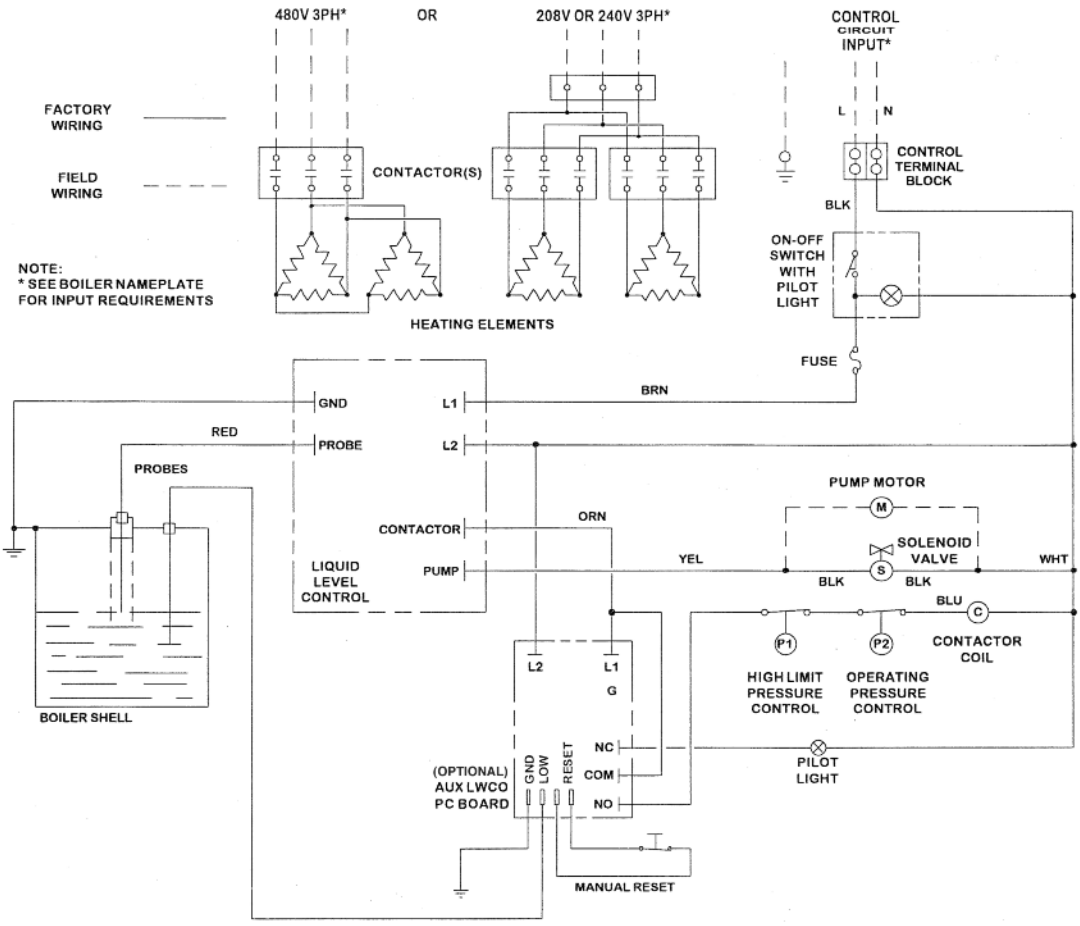
3. Instructions for water feed control system (i.e. motor and pump or solenoid feed).
   a. Check the voltage of the motor or solenoid before making electrical connection.

WARNING b. ***The water feed circuit should be wired to the junction box provided***.

c. Motors rated greater than 1/3HP or are not 120VAC single phase require the use of suitable motor starter.

d. Amperage/Wire Size – For correct sizing refer to the label on the boiler located next to the field wiring terminals. This label states the wire size (AWG or MCM), minimum temperature rating (90˚C) and conductor material (copper only). Deviation from this information may result in improper or unsafe boiler operation.

Wiring Diagram ES 30A, ES 36 A, HP 30A Electric Boilers



Pre-Operation Check - All Boilers

IWCO/PUMP CONTROL, OPERATION AND TESTING

1. All valves for incoming water supply are to be fully opened. Main disconnect switch to be in "ON" position. Boiler switch to be in "ON" position. Since boiler will be empty, pump (or solenoid) will be energized allowing boiler to fill with water. Control will allow for automatic reaching of proper water level. Contactors will be energized, applying voltage to heating elements.
2. Pump Switch Operation – At this point, water should be visible approximately halfway up sight glass. Slowly open drain valve located at bottom of boiler. Water level will fall, allowing low water cutoff/pump control to energize feed water system. Close drain valve for proper operation.
3. Low Water Cut-Out Switch Performance. Open drain valve completely. Maintain this condition until water level falls within gauge glass enough to cause low water cut-out switch to de-energize heating elements. Contactor will be in the de-energized state at this time. Close the drain valve. For automatic resetting type low water cut-out switches, feed system will return water level to normal. Boiler is now qualified for proper low water cut-out and normal liquid-level operating conditions.

PRESSURE CONTROLS OPERATION AND TESTING

NOTE: ALL ES STEAM BOILERS ARE PROVIDED WITH ONE HI-LIMIT PRESSURE CONTROL AND ONE OPERATING PRESSURE CONTROL.

1. All pressure controls are equipped with a screw allowing for setting of the desired operational and hi-limit pressures. To reduce pressure setting, rotate screw in direction which allows indicator to point to a lower pressure setting.

NOTE: IT IS RECOMMENDED THAT THE HI-LIMIT CONTROL BE SET 1O PSIG ABOVE DESIRED NORMAL OPERATION PRESSURE.

2. A differential pressure can be obtained on all automatic re-setting operating pressure controls in the same manner as operating pressure control is set. Differential indicated pressure below the main operating maximum pressure the pressure control will reset.
3. Pressure Control Operating Check – Close steam outlet valve (by customer) and adjust operating pressure control to a low pressure setting. Set hi-limit control at 10 PS1G above that setting. Switch boiler on to allow for steam pressure build-up. Pressure gauge reading will build and the operating pressure control will shut off boiler at its pressure setting. Re-setting of operating pressure control is accomplished by bleeding off pressure through steam outlet valve (by customer) and allowing pressure to drop below set point.
4. Hi-limit Pressure Control Check – See item 3 above but, in doing so, assure for this test purpose only, that the operating control is set above the pressure setting of the hi-limit control. The hi-limit trip will de-energize the contactors. Resetting of the hi-limit occurs after bleeding steam to reduce pressure inside the boiler.

! CAUTION ***TO AVOID IMPROPER OR UNSAFE CONDITIONS, INSURE OPERATING PRESSURE CONTROL IS RESET TO PROPER DESIRED BOILER OPERATING PRESSURE.***

Operation

! CAUTION ***ONLY WITH MAIN DISCONNECT "OFF", TIGHTEN ALL ELECTRICAL CONNECTIONS BEFORE ENERGIZING BOILER TO PREVENT ARCING, CARBONIZING OF CONTACTS AND/OR OVERHEATING.***

1. Turn on water supply. Turn main switch on. Turn boiler switch to ON position. When water appears approximately halfway up the gauge glass, the pump or solenoid feed will automatically shut off and the contactors will switch on.
2. Operation of Low Water Cut-Off – The boiler is equipped with a probe type liquid level control which is coupled to an electronic controller (pc board).

IMPORTANT NOTE: If the boiler is equipped with an AUX LWCO, it can be tested by holding down the reset button for 5 seconds.

3. The automatic reset operating pressure control has a visual pressure adjustment. The top screw of the control adjusts the scale in the large indicator window. By turning the screw, the pressure setting can be adjusted. Selection of desirable pressure is very easily made. Some pressure controls have an additional screw for adjustment of pressure differential (OFF/ON pressure operating range) which is factory set at the maximum allowable rating.
4. Close steam outlet valve. Boiler will build up to desired pressure and shut off automatically.
5. High Pressure Control – This control will de-energize the boiler should pressure within the boiler exceed the set pressure.
6. Slowly open steam outlet valve and use steam as needed.
7. Boiler should be blowndown daily (see blowdown instructions on page 6).

Blowdown

Blowdown is an essential part of boiler operation. It is one of the best preventative maintenance steps you can take. Make sure a blowdown schedule is established and followed regularly.

In hard water areas, blowdown is necessary at least once a day. In soft water areas, once a week. If there is a particular problem which applies to your own local water condition other than mineral content, take this into consideration in determining which schedule is to be followed.

1. At the end of the working day, while boiler is still operating, turn switch to the OFF position and close water supply valve. De-energize wall mounted safety switch.
2. It is preferable to connect the blowdown valve directly into a drainage system when allowed by local codes. If this is done, the boiler can be discharged at operating pressure. Consult local plumbing codes before doing so.
3. If blowing-down into a receptacle, allow pressure to decrease to 15-20 PSIG before opening blowdown valve.
4. When discharge is complete and boiler is drained:
   1. Close the blowdown valve
   2. Open water supply valve;
   3. Put boiler switch in the ON position
   4. Close wall mounted safety switch.
5. When refilling is complete, turn off the boiler switch unless further operation is desirable.
6. If you have been supplied with a Manual Reset Low Water Control as required in some states, the reset button on the control must be pushed before boiler will begin developing pressure. (Do not push reset until boiler has filled with water.)

Maintenance

CAUTION ***HAZARD OF ELECTRICAL SHOCK. DISCONNECT ALL POWER BEFORE WORKING ON BOILER.***

Sussman Electric Steam boilers are designed for years of trouble-free performance. To establish a good preventative maintenance program, we suggest that the building maintenance person or engineer familiarize themselves with these simple rules.

1. The sight glass should be checked daily to ensure that boiler has adequate water.
2. A monthly inspection should be made of the internal wiring. All electrical connections should be checked for tightness. A check for water leaks should also be made and any loose fittings immediately tightened.
3. Every four months, the low water cut-off and pump control should be checked to insure that it is functioning properly.
4. Every four months, the probe and isolator should be checked for deposits and cleaned, if necessary. This is accomplished by removing the inspection plate, removing the probe (with a standard socket wrench) cleaning and replacing.
5. Every four months, the heating elements should be removed. If scale has begun to form, the element should be cleaned and the boiler should be drained and flushed.

NOTE: NEW BOLTS AND GASKET SHOULD BE USED WHEN RE-INSTALLING THE ELEMENT TO ASSURE PROPER SEALING.

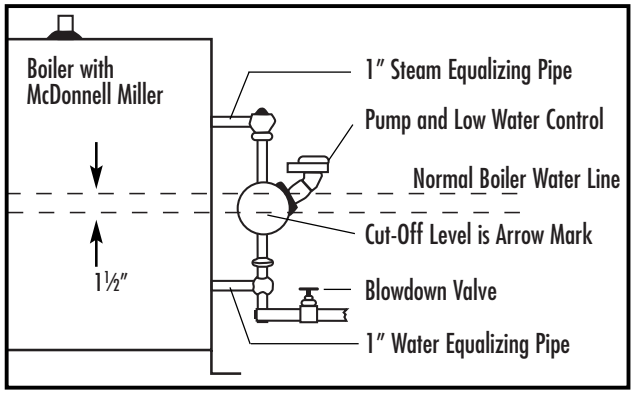
Element Replacement

READ INSTRUCTIONS COMPLETELY BEFORE STARTING WORK

CAUTION Before Installing your new elements be sure the McDonnell Miller low water cut-off and aux. low water cutoff (if supplied) is operating properly. The float chamber and lower equalizer column of the MM control must be completely clear of sludge or other foreign matter. Failure to do this may cause the immediate burn-out of the new elements. If the unit is probe equipped, check condition of the probes and isolator.

All elements are thoroughly checked before shipment. The manufacturer cannot be responsible for burn-outs caused by a faulty low water cut-off.

The lower equalizer column can best be examined by breaking the unions on either side and then visually and manually examining the piping with your finger or probes to see if it is clear and clean.



1. Disconnect boiler from electric power supply at main safety switch or fuse panel. Then turn boiler switch to "OFF" position.
2. Close water supply valve on incoming water supply line. Drain boiler completely of water.
3. Open boiler door to access heating element.
4. Disconnect wire (electric) leads connecting element to main power system of boiler. Again, note wire connections to facilitate re-assembly. Proceed to remove and discard (6) bolts from flange.

IMPORTANT: Note the wire connections to facilitate re-assembly (see wiring schematic). Remove and discard six (5/16"-18) bolts from flange. Do not reuse these bolts.

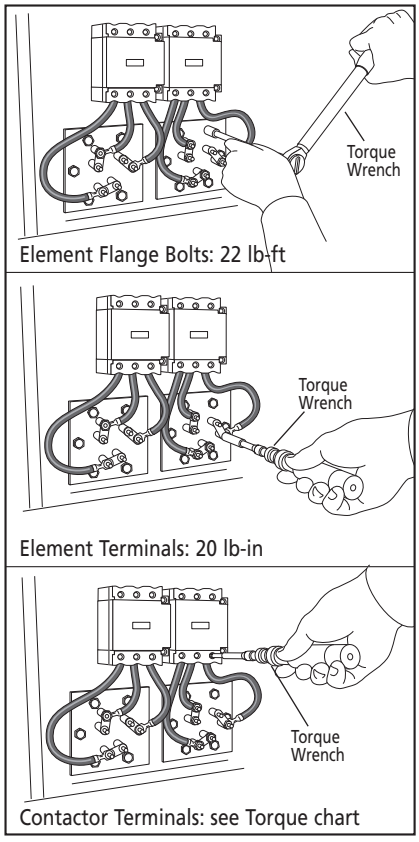
5. Thoroughly clean boiler flange of all foreign material. Be certain no part of old gasket remains on flange.
6. Apply "Slic-Tite" Gasket Compound (or equal) to both surfaces of new gasket supplied with replacement element. Proceed to install element flange assembly with gasket between boiler flange and element flange. In doing this, be careful to align flange holes so element wire connection terminals on element assembly are in line with previously disconnected wire leads to facilitate easy connections.

NOTE: Observe markings on element flange. Install element marking "TOP" on top.

7. Use only new element flange bolts. Tighten all (6) element flange bolts to a torque value of 22 lb-ft each (see illustration).
8. Connect all wires to the terminals. Tighten all element terminals to a torque value of 20 lb-in each (see illustration). Make sure all wires are clean and bright to assure good electrical contact.
9. Check that the wires are correctly connected to the contactor terminals and are tightened to the torque listed on the contactor. Make sure all wires are clean and bright to assure good electrical contact.
10. Open water valve to allow water supply to reach boiler feed mechanism.
11. As boiler automatically refills, observe the new flange assembly for possible leaks. If water is noticed, the bolts must be re-tightened. Before doing this, turn the boiler off at the main fuse safety switch.
12. When boiler reaches working pressure, check flange assembly again for leaks.

CAUTION Follow maintenance instructions provided with the boiler.

Torque Values:

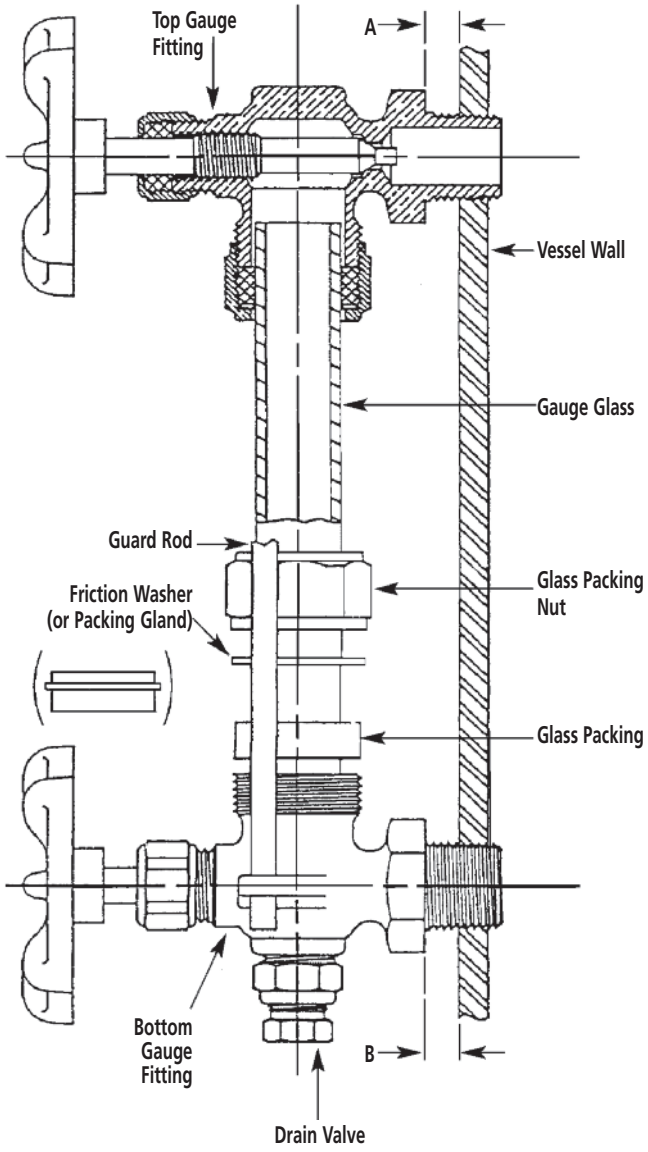


For Illustrative Purposes Only.
Power wiring shown in approximate factory-installed location

TORQUE VALUES	
Element Flange Bolts	22 lb-ft
Element Terminals	20 lb-in
Contactor Terminals	Tighten to torque specified on contactor

Gauge Glass Installation

IMPORTANT NOTE: *Read all warnings and instructions before performing installation or maintenance. Safety glasses and gloves should be worn at all times when working with or examining water gauge glass and connections. Pressure in generator to be at zero before proceeding. Improper installation or maintenance of gauge glass and connections can cause immediate or delayed breakage resulting in bodily injury and/or property damage.*



1. Apply Teflon tape or pipe dope to pipe threads. Install top gauge fitting (fitting without a drain valve) into the uppermost tapping. Wrench tighten the fitting until it is snug and the glass outlet is pointing at five o'clock (about 1/8 turn from its final downward vertical position).
2. Install the bottom gauge fitting (the fitting with a drain valve) until it is snug and the glass outlet is pointing directly upward. Verify top and bottom fittings are threaded into the tappings the same number of turns (distance A= distance B).
3. Remove glass packing nut, friction washer (or packing gland, depending upon the model), and glass packing from the fittings, and place them, in the same order, on to both ends of the gauge glass. Push both packings about an inch up the gauge glass.
4. Gently insert one end of the glass into the top gauge fitting. Keeping the glass inside the top fitting, gently rotate the top gauge fitting clockwise until vertically aligned with the bottom gauge, then insert glass into bottom fitting until glass bottoms out on the shoulder inside the bottom fitting.
5. Carefully raise glass about 1/16" and slide lower glass packing down until the glass packing contacts the lower gauge fitting. DO NOT allow the glass to remain in contact with any metal!
6. Carefully slide upper glass packing up as far as possible.
7. Hand tighten both glass packing nuts, then tighten 1/2 turn more by wrench. Tighten only enough to prevent leakage. DO NOT OVER TIGHTEN!
   If any leakage should occur, tighten lightly, a quarter turn at a time, checking for leakage after each turn.

IMPORTANT NOTE: *Read all warnings and instructions before performing installation or maintenance.*

WARNING ***Safety glasses and gloves should be worn at all times when working with or examining water gauge glass and connections.***

Pressure in generator to be at zero before proceeding.

Improper installation or maintenance of gauge glass and connections can cause immediate or delayed breakage resulting in bodily injury and/or property damage.

Gauge Glass Installation - Use and Care

DO NOTs

DO NOT use glass if it contains any scratches, chips, or any other visible signs of damage.
DO NOT reuse any tubular glass or glass packings.
DO NOT subject gauge glass to bending or torsional stresses.
DO NOT over tighten glass packing nuts.
DO NOT allow glass to touch any metal parts.
DO NOT exceed the recommended pressure of the gauge or gauge glass.
DO NOT clean the gauge or gauge glass while pressurized or in operation.

DO's

DO verify proper gauge has been supplied.
DO examine gauge glass and packings carefully for damage before installation.
DO install protective guards and utilize automatic ball checks where necessary to help prevent injury in case of glass breakage.
DO inspect the gauge glass daily, keep maintenance records, and conduct routine replacements.
DO protect glass from sudden changes in temperatures such as drafts, water spray, etc.

MAINTENANCE

Examine the gauge glass regularly for any signs of clouding, scratching, erosion, or corrosion. The glass should be inspected daily until the need for replacement becomes apparent. This will help establish the routine inspection and routine replacement schedules.

CLEANING

Use commercial non-abrasive glass cleaners to keep glass clean. Use diluted acids such as Hydrochloric (muriatic) acid when regular cleaners do not seem to work. Do not use wire brushes or any other abrasive materials which could scratch the glass.

INSPECTION

Examine the surface of the glass for scratches, corrosion, chips, cracks, surface flaws, or nicks. To do this, shine a very bright concentrated light at an angle of about 45 degrees. A defective glass will glisten as the light strikes imperfections. Glass which appears cloudy or roughened, and will not respond to cleaning, should be replaced.

STORING

Keep gauge glass in original packaging until ready to install.

Water Quality Information for Carbon Steel Boilers

FOR OPTIMUM RESULTS, THE FEEDWATER SUPPLY SHOULD BE TESTED PRIOR TO INITIAL STARTUP, IF THE MINERAL CONTENT EXCEEDS THE FOLLOWING RECOMMENDED LIMITS, VARIOUS EXTERNAL TREATMENT PROCESSES (WATER SOFTENER, REVERSE OSMOSIS, ETC,) MAY BE USED TO CORRECT THE PROBLEM.

NOTE: AN ANALYSIS OF THE ON-SITE BOILER FEEDWATER MUST BE MADE BY A RECOGNIZED AND RELIABLE WATER TREATMENT COMPANY TO ASCERTAIN THE EXISTING CONDITION AND TREATMENT REQUIRED.

RECOMMENDED FEEDWATER QUALITY

HARDNESS, ppm	8 – 85 (~0.5 – 5 gpg)
P-ALKALINITY, ppm	85 – 410 (~5 – 24 gpg)
T-ALKALINITY, ppm	200 – 500 (~7 – 0 gpg)
pH (strength of alkalinity)	8.0 – 11.4
SPECIFIC RESISTIVITY	~50k Ω cm (50,000 ohm-centimeter)

BLOW DOWN BOILER ON AT LEAST A ONCE A DAY BASIS. IF BOILER WATER OR FEEDWATER ARE OUTSIDE THE ABOVE LIMITS, A MORE FREQUENT BLOWDOWN IS REQUIRED.

RECOMMENDED LIMITS WITHIN A BOILER

TOTAL DISSOLVED SOLIDS, ppm	3500
TOTAL ALKALINITY, ppm	850
SUSPENDED SOLIDS, ppm	300
SILICA ($Si0_2$), ppm	125
SULFITE (SO_3), ppm	25–50
PHOSPHATE, ppm	30–60
P-ALKALINITY AS $CaCO_3$, ppm	900
IRON, ppm	2

WATER QUALITY CAN AFFECT EFFICIENCY OR RESULT IN BOILER DAMAGE IF NEGLECTED. BOILER FEEDWATER CONTAINS IMPURITIES IN SOLUTION AND SUSPENSION. THESE IMPURITIES CONCENTRATE IN THE BOILER SINCE THE STEAM GENERATED IS ESSENTIALLY PURE. THE CONCENTRATION OF THESE IMPURITIES INCREASES AS MORE FEEDWATER IS INTRODUCED INTO THE BOILER AND STEAM IS PRODUCED. IF THE SUSPENDED SOLIDS ARE ALLOWED TO CONCENTRATE BEYOND CERTAIN LIMITS, A DEPOSIT OR "SCALE" WILL FORM ON THE BOILER INTERNAL SURFACES. THIS DEPOSIT CAN INTERFERE WITH PROPER BOILER OPERATION AND CAUSE BOILER FAILURE.

THE CONCENTRATION OF THESE IMPURITIES IS GENERALLY CONTROLLED BY THE FEEDWATER QUALITY AND BY BLOWDOWN. BLOWDOWN REFERS TO REMOVING A PORTION OF THE BOILER WATER WITH HIGH SOLIDS CONCENTRATION AND REPLACING IT WITH MAKEUP WATER OF A LOWER CONCENTRATION.

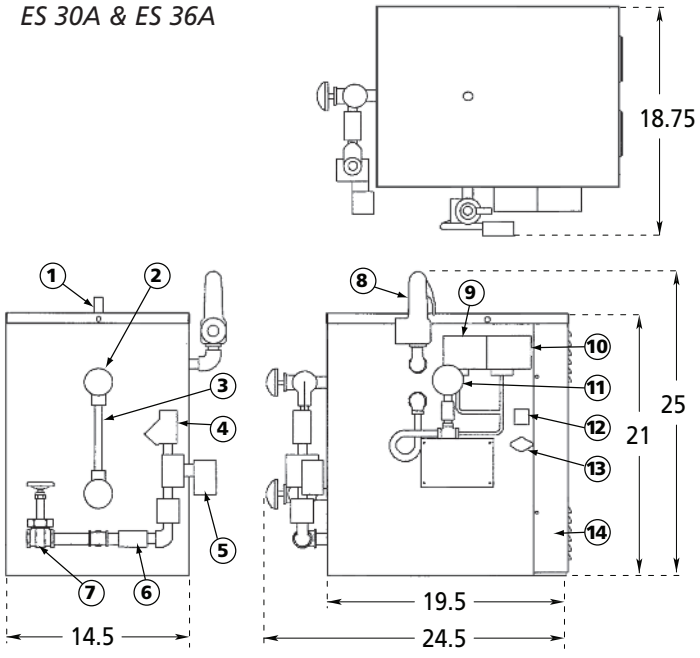
Spare Parts List

90229	Probe Plug
92830	On-Off Switch with Pilot Light
93806A	Strainer 1/4" HP30A
99007	Contactor, 60 AMP, 3 Pole 240V
99031	Water Solenoid 1/2"120V ES30A/36A
99032	Water Solenoid 1/2"240V ES30A/36A
99042	Water Solenoid 1/4"120V HP30A
99042C	Water Solenoid 1/4" 240V HP30A
99074-1	7⅞" Gauge Glass w/ (2) 99174C O-Ring
99075	Contactor, 60 amp; 3 Pole, 120V
99123	Strainer 1/2" ES30A/36A
99128R	Pressure Control Operating 0-100 PSIG
99130R	Pressure Control Hi Limit 0-100 PSIG w/Reset Button on Rise
99136	Safety Valve 100PSIG, 1/2" NPT

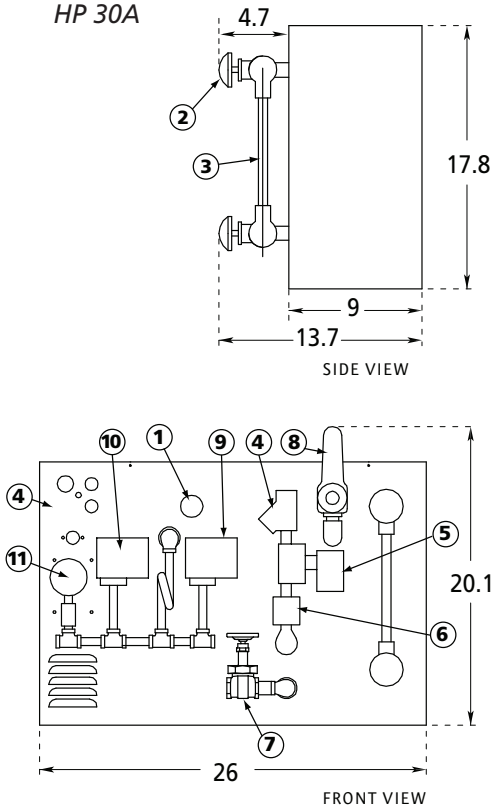
99162	Check Valve 3/8" HP30A
99167	Check Valves 1/2" ES30A/36A
99173C	Gauge Valve Set
99178B	Drain Gate Valve 1/2" ES30A/36A & HP30A
99197	Pressure Gauge 160 PSIG, 2-1/2" NPT
99807F	1/4 Probe Rod 5-Inch
100706	8 amp Fuse
100378	Probe Isolator
100412A	Liquid Level Control Board; 120V
100412C	Liquid Level Control Board; 240V
102124	Ball Valve Steam 3/8" HP30A
103036	Ball Valve Steam - 1" ES30A/36A
103540	Boiler Gasket Kit, 99096; 99547B, 99088 Gasket; Bolts & Compound

Component Identification Dimensional Information *(in inches)*

ES 30A & ES 36A



HP 30A



Item	Description
1	Steam Outlet
2	Gauge Glass Valves
3	Gauge Glass Tube
4	Water Feed Strainer
5	Water Solenoid Valve
6	Check Valve
7	Drain Valve

Item	Description
8	Safety Valve
9	Hi Limit Pressure Control
10	Operating Pressure Control
11	Pressure Gauge
12	On-Off Switch
13	Control Circuit Fuse
14	Access Panel

SUSSMAN ELECTRIC BOILERS

A Division of Sussman-Automatic Corporation

43-20 34th Street, Long Island City, NY 11101 • 718-937-4500 • 1-800 238-3535
Fax: 718-937-4676 • www.sussmanboilers.com • Email: seb@sussmancorp.com

SUSSMAN AUTOMATIC ES30A BOILER INSPECTION CHECKLIST

Model # ES36AF3-PRI Cust: PRIMUS STERILIZER CO INC // GREAT BEND KS

Order # 494985 Volt/Ph/Hz 480/3/60

Serial Number	National Bd	Serial Number	National Bd #
ESA1199190-W18	115330		

SEQ	CHARACTERISTIC TO BE INSPECTED	REJ	RWK	ACC
1	Shell Marking: a) NB# b)Pressure 100 c) Code Letter M			✓
2	Nameplate data: a)Model No. b) Serial # c)Voltage 480d) phase 3 e) KW 36 f) Power Amps 44 g) Control Voltage 120 h) Control Amps 12			✓
3	UL label (c) CSA stamp N/A CRN K7558.5 N/A a) ASME Code M b) NB # c)MAWP 100 psi d) trim 100 psi			✓
4	Pressure Controls: Operating a)Type RANCO b) Range 0-100/set@80psi c)Label Manual reset Hi Limit a)Type RANCO b) Range 0-100/set@90psi c)Label			✓
5	Pressure Gauge: a) Range 0-160 b) Ball Value c) Marked for Export d) Clean free of marks/dirt			✓
6	Feed System: a) 1/2 strainer b)1/2 NPT Solenoid c) 1/2 Check value (2) d) 1/2" Blowdown Gate			✓
7	Gauge Assy a) 1/2 NPT			✓
8	Level Control Board a) P/N 100412A b) Glass Sleeving c) probe tightness			✓
9	Gnd Lug: a) standard - tightness & label b)screw & cup washer			✓
10	Elementa)Qty 2b)KW 18 c)Volt 480/3 d)Pin Nuts e) Bolts 22 ft-lbs f)Resist 12.5			✓
11	Power Block a)label none			✓
12	Contactors: a)Qty 1 b) 50A c) 110V Coil torque 25lbs-in			✓
13	Power Circuit wiring a) size 8 b) CSA for Canada c) Field Wire Label 8			✓
14	Control Circuit wiring a) 16AWG b) color c) 12 amp fuse w/label			✓
15	Tightness of components: a) Mechanical b) Electrical			✓
16	a) Wiring Diagram b) Caution Labels c) Control Volts d) Control Switch e) Blk Important f) Manual Blow-down g) LWCO Probe h) NB # i) Made In USA J) Glass Gauge K) burn hazard L) Pump Connection 1HP			✓
17)	Safety Valve: Conbro 1/2" NPT a) Code Stamp NB/V b) pressure 100 psi c) capacity 423			✓
18	Workmanship a) jacket b) paint c) rivets			✓
19	Hi Pot Per QCI 502 1200V for 1 sec OK			✓
20	Hyrostatic Test per QCI 504			✓
21	Data Pack a) P2A completed b) Instruction Booklet			✓
22	Nameplate With E stamp applied a) E (ASME) b) 100 psi c) 36KW d) 120 pph e) S/N f)Yr 2018			✓
23	////// ES81017MR = L-W-3-C-1-A-30-A / cut –off aux LWCO w/ man reset			✓
24	MBA81600 –SN: 11825 auto blowdown valve			N/A
25	Special PO:44037-00 //			✓

Final Inspection By: A.U Date: 9/24/18

Verified By [signature] Date: 09-24-2018

REV1.0 6/6/96

Model # ES36AF3-PRI Cust: PRIMUS STERILIZER CO INC // GREAT BEND KS

Order # 494985 Volt/Ph/Hz 480/3/60

Serial Number	National Bd	Serial Number	National Bd #
ESA1199190-W18	115330		

SHELL MFR R&R // COLUMBIA // REIMERS//TDC

Part II---To be completed by Manufacturer responsible for the Completed Boiler
16

ITEM	PIPING				VAL VES			
	SIZE	SCH	SPEC	BOLTED,THREADED OR WELDED	SIZE	TYPE	RATINGS	NO.
(a) Steam pipe	1	40	SA-53	THD				
(b) Feed Water	1/2	40	SA-53	THD	STOP 1/2	BALL	250	1
Feed Water					CHECK1/2	SPR	125	1
(c) Blowoff	1/2	40	SA-53	THD	1/2	GATE	125	1

17. Safety Valve(s) No. 1 Size 1/2 Set Press 100 Total Capacity lb/hr 423
18. Heating Elements Installed: Quantity 2 KW Total 36
19. Electrodes: Quantity _____ KW Total _____
20. Hydrostactic Test of Completed Boiler 100 psig

Sussman
CAS 30C

FORM P-2A MANUFACTURERS' DATA REPORT FOR ALL TYPES OF ELECTRIC BOILERS

As Required by the Provisions of the ASME Code Rules, Section I

PART I ---- To Be Completed by the Manufacturer of the Boiler Pressure Vessel

1. Manufactured by TDC Manufacturing, Inc., 155 Route 61 South, Schuylkill Haven, PA 17972
(Name and address of manufacturer of boiler pressure vessel)

2. Manufactured for Sussman Automatic Corp, 43-20 34th Street, Long Island City, NY 11101
(Name and address of purchaser)

3. Location of Installation Unknown
(Name and address)

4. Type Resistance Element (Resistance element, electrode) Boiler No. 115330 (Manufacturer's Serial No.) D5257.6C (CRN)

991304-2 Rev. A (Drawing No.) 115330 (National Board No.) 2018 Year Built

5. The chemical and physical properties of all parts meet the requirements of Material Specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design conforms to Section I of the ASME Boiler and Pressure Vessel Code 2017 (Year)
Addenda to _____ (Date) (if applicable), and Code Cases None (Numbers).

Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors are attached for the following items of this report:

-
(Name of part, item number, manufacturer's name, and identifying designator)

6. Shells or drums:

1	SA-285C	1/4"	12"	18"	-	-
(No.)	(Material spec., gr.)	(Thickness (in))	(Diameter (ID))	(Length, inside)	(Diameter (ID))	(Length, inside)

7. Joints:

Welded	100%	-	1
(Long (seamless, welded))	(Efficiency (as compared to seamless))	(Girth (seamless, welded))	(No. of shell courses)

8. Heads: SA-285C, ½" Thick Flat
(Material Spec. No.: thickness---flat, dished, ellipsoidal --- radius of dish)

9. Other Parts. 1. Element Flange (2) 2. Angle Attachment Brackets (2) 3. Grounding Stud
(Brief Description --- i.e. dome, boiler piping, etc.)

1. SA-106B, 4" Double Extra Strong Seamless Pipe, 0.674" thick
2. 11 GA x 2 x 2.880", CRS (Attached to Bottom outside Shell)
3. 1/4"-20 x 1 Hex Head Plated Bolt (Attached to Outside of Top Head)
(Material Spec., Grade, size, material thickness, MAWP)

10. Openings: (a) Steam (1) 1" Tapped Opening, Top Head (No., size, and type) (b) Pressure Relief Valve (1) ½" Half Coup, SA-105, Class 3000, Shell (No., size, and type)
(c) Blowoff (1) ¾" Half Coup, SA-105, Class 3000 Shell (No., size, and type) (d) Feed (1) ½" Half Coup, SA-105, Class 3000, Shell (No., size, type, and location)
(e) Manholes: No. - Size _____ Location _____
(f) Handholes: No. - Size _____ Location 1
(g) Elements/Electrodes: No. 2 Size 3.125" Location Front, Lower Shell

11. Boiler Supports: No. Self Supported Type - (Saddles, legs, lugs) Attachment - (Bolted or welded)

12. MAWP 100 psi Based on PG31 (Code, para, and/or formula)

13. Shop Hydrostatic Test 300 psig 14. Maximum Designed Steaming Capacity 126 lb / hr

15. Remarks Tapped Openings
(2) 3/8" NPT Top Head
(1) 1" NPT Bottom Head
1) Product design provided by Sussman-Automatic Corp.
2) Calculations and design based on 36 KW total maximum input
3) Relief valve supplied by Sussman-Automatic Corp

CERTIFICATE OF COMPLIANCE OF BOILER PRESSURE VESSEL

We certify that this boiler pressure vessel meets the requirements of Section I of the ASME Boiler and Pressure Vessel Code.
Our Certificate of Authorization No. 18,959 to use the (S) or (M) "M"
Designator expires September 8, 2018

Date 05/03/2018 Signed _____ Name TDC Manufacturing, Inc.
(Authorized Representative) Marc Barbe (Manufacturer of boiler pressure vessel)

FORM P-2A

Manufactured by TDC Manufacturing, Inc., 155 Route 61 South, Schuylkill Haven, PA 17972 Page 2 of 3

Manufacturer's Serial No. 115330 CRN D5257.6C National Board No. 115330

CERTIFICATE OF SHOP INSPECTION OF BOILER PRESSURE VESSEL

Boiler pressure vessel made by TDC Manufacturing, Inc. at 155 Rt. 61 South, Schuylkill Haven, PA 17972
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by OneCIS Insurance Company
have inspected parts of this boiler pressure vessel referred to as data items 1 – 15 and have examined Manufacturer's Partial Data reports for Items _____ and state that, to the best of my knowledge and belief, the manufacturer has constructed this boiler pressure vessel in accordance with the applicable sections of the ASME BOILER AND PRESSURE VESSEL CODE.
By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the boiler pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 05/03/2018

Patrick M. Rose (Authorized Inspector) Commission NB # 11179 (National Board Authorized Inspector Commission Number)

Part II – To Be Completed by the Manufacturer Responsible for the Completed Boiler

16.

Item	Piping				Valves			
	Size	Sch.	Spec	Bolted, Threaded or Welded	Size	Type	Rating	No.
(a) Steam Pipe	1"	40	SA-53	THREADED				
(b) Feed Water	1/2"	80	SB-43	THREADED	Stop 1/2"	BALL	250	1
Feed Water					Check 1/2"	SPRING	125	2
(c) Blowoff	1/2"	80	SB-43	THREADED	1/2"	GATE	125	1

17. Pressure Relief Valve(s) No. 1 Size 1/2" Set Press 100 Total Capacity lb /hr 423

18. Heating Elements Installed: Quantity 2 Total Power Input 36

19. Electrodes: Quantity _____ Total Power Input _____

20. Hydrostatic Test of Completed Boiler 100 psig MAWP of completed boiler 100 psig

21. Serial No. Assigned by Manufacturer responsible for Completed Boiler ESA1199190-W18

CERTIFICATE OF COMPLIANCE OF COMPLETED BOILER

We certify that this completed boiler conforms to the requirements of Section I of the ASME BOILER AND PRESSURE VESSEL CODE.
Our Certificate of Authorization No. 14,958 to use the (S) or (M), or (E) _____
Designator expires JANUARY 15,2021
Date Sept 21/2018 Signed _____ Name SUSSMAN-AUTOMATIC CORPORATION (Assembler)
(check one) ☐ Authorized Representative
☒ Certified Individual

CERTIFICATE OF SHOP INSPECTION OF COMPLETED BOILER

Boiler made by _____ at _____
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by _____ of _____
and have inspected the completed boiler and have examined Manufacturer's Partial Data reports for _____
and state that, to the best of my knowledge and belief, the manufacturer has constructed this boiler in accordance with the applicable sections of the ASME BOILER AND PRESSURE VESSEL CODE.
By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the boiler pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____

_____ Commission _____
(Authorized Inspector) (National Board Authorized Inspector Commission Number)

FORM P-2A

Manufactured by TDC Manufacturing, Inc., 155 Route 61 South, Schuylkill Haven, PA 17972 Page 3 of 3

Manufacturer's Serial No. 115330 CRN D5257.6C National Board No. 115330

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE OF THE COMPLETED BOILER

We certify that the field assembly of the completed electric boiler identified on this form conforms to the requirements of Section I of the ASME BOILER AND PRESSURE VESSEL CODE.

Our Certificate of Authorization No. _____ to use the (S) or (E) _____ Designator expires _____

Date _____ Signed _____ Name _____

(check one) ☐ Authorized Representative ☐ Certified Individual (Assembler)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION BY ASSEMBLER OF THE COMPLETED BOILER

BOILER FIELD ASSEMBLED BY _____ at _____

I, the undersigned, as an authorized Certified Individual representing and employed by _____ have examined this Manufacturer's Data Report (including any Manufacturer's partial data reports) and have compared the documentation with the described field assembled electric boiler. The completed field assembled boiler was inspected by me and subjected to a hydrostatic test of _____ psi. To the best of my knowledge and belief I state that the electric boiler identified in this report has been constructed, assembled, inspected and tested by the Assembler in accordance with the applicable section(s) of the ASME BOILER AND PRESSURE VESSEL CODE.

Date _____ Signed _____ Assembler _____

(Certified Individual)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION BY AN AUTHORIZED INSPECTOR OF THE COMPLETED BOILER

BOILER FIELD ASSEMBLED BY _____ at _____

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by _____ of _____ have inspected the completed field assembled electric boiler, have examined the Manufacturer's Partial Data Reports for _____ and state that, to the best of my knowledge and belief, the Assembler has constructed, assembled, and tested this boiler in accordance with the applicable section(s) of the ASME BOILER AND PRESSURE VESSLE CODE.

By signing this certificate, neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the boiler described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ Commission _____

(Authorized Inspector) (National Board Authorized Inspector Commission Number)

SUSSMAN AUTOMATIC CORPORATION

Sussman Automatic Corporation 43-20 34th Street, Long Island City, NY 11101
Telephone: 718-937-4500 ext. 1277 / Fax: 718-752-0973

CERTIFICATE OF CONFORMANCE

THIS IS TO CERTIFY THAT THE MATERIALS AND PARTS SUPPLIED BY SUSSMAN AUTOMATIC WO# 494985 FOR MODEL ES36AF3-PRI SN: ESA1199190-W18 ASSOCIATED PARTS COMPLY WITH THE SPECIFICATIONS REQUIREMENT OF YOUR PURCHASE ORDER # 44037-00

COMPLIANCE HAS BEEN DETERMINED BY TESTING AND/OR INSPECTIONS IN ACCORDANCE WITH THE APPLICABLE COMPANY SPECIFICATIONS AND/OR QUALITY CONTROL STANDARDS.

HONG W. WONG
QUALITY ASSURANCE MANAGER

DATE: 09/21/2018

SUSSMAN ITEM #	EQUIPMENT USED	TRACEABLITY #	CAL DUE
T306	FLUKE MODEL 177	80611-K02	06/16/2019
T335	PRESSURE GAUGE 0-160 PSIG digital	71010-E03	10/16/2018
T304	HYPOT TESTER 3705	71010-E01	10/14/2018
T131	TORQUE WRENCH 10-100 LBF.FT	71010-E07	10/11/2018
T155	THERMOMETER/DIAL 50-300 DEG. F	71010-E03	10/16/2018
T113	TORQUE DRIVER 0-50 LBF.IN	71010-E04	10/11/2018
T413	TORQUE DRIVER 0-30 LBF.IN	780611-K07	06/21/2019

QER 122D SUSSMAN BOILER TEST AND INSPECTION SHEET

Model No# ES36AF3-PRI

Customer PRIMUS STERILIZER CO INC

Serial Number ESA1199190-W18

National Board 115330

SEQ	CHARACTERISTIC INSPECTED AND/OR TESTED	REJ	RWK	ACC
1.0	Dielectric Test			✓
2.0	Markings			✓
3.0	Safety Valve			✓
4.0	Water Level			✓
5.0	Contactors			✓
6.0	High Pressure Cut-Off			✓
7.0	Operating Pressure Cutoff			✓
8.0	Low Water Cutoff			✓
9.0	Auxillary Low Water Cutoff			✓
10.0	Hydrostatic Test			✓
11.0	Element Testing			✓
12.0	Assembly is air, water and steam tight			✓
13.0	Labels			✓
14.0	Workmanship			✓
15.0	Data Pack			✓
16.0	Boiler Options			✓

Tested by RAYNER GALVAN Rayner Galvan Date 09/21/2018

Inspected by ADONAY UBIERA Adony Ubiera Date 09/21/2018

Certified Inspector HONG W. WONG Date 09/21/2018

MANUFACTURER'S/INSTALLING CONTRACTOR'S REPORT FOR ASME CSD-1

CERTIFICATION AND REPORTING (CG-500) CONTROL AND SAFETY DEVICES

UNIT MANUFACTURER
Name **SUSSMAN ELECTRIC BOILERS**
Address **43-20 34TH STREET LIC, NY** Zip **11101**
Telephone **718-937-4500** FAX **718-752-0953**

UNIT IDENTIFICATION (Boiler)
Manufacturer's Model # **ES36AF3-PRI** Year Built **2018**
ASME # **14958** Nat. Bd. # **115330**
UL # **E39621** AGA # _____
Jurisdiction _____

STEAM
Max. W.P. **100** psig
Valve Cap **120** PPH

HOT WATER
Max. W.P. _____ psig
Max. temp _____ deg. F
Min. Safety Relief Valve Cap _____ PPH or Btu

BOILER UNIT DECRIPTION (TYPE) **ELECTRIC**
If Modular (no. of Modules) **N/A**
BOILER UNIT CAPACITY **3.6 BHP**

Burner-Manufacturer N/A Model N/A
UL or AGA # N/A Serial N/A

FUELS (as shipped) **ELECTRIC**

INSTALLATION LOCATION (if known)
Customer Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ FAX _____

	Manufacturer	Model #	Operational Test Performed Date
OPERATING CONTROLS			
Low-Water Fuel Cutoff			
CW-120 (a), CW-140	**AMETEK-NCC**	**LSM-NS168-120**	**09/21/2018**
Forced Circulation			
CW-210(A)	**N/A**	**N/A**	**N/A**
Steam Pressure			
CW-310 (b)	**RANCO**	**016**	**09/21/2018**
Water Temperature			
CW-410 (b)	**N/A**	**N/A**	**N/A**
SAFETY CONTROLS			
Low-Water Fuel Cutoff			
CW-120 (a), CW-120(b),			
CW-130, CW140	**PROTODESIGN**	**LW-3-C-1-A-30-A**	**09/21/2018**
Forced Circulation			
CW-210(b)	**N/A**	**N/A**	**N/A**
High Steam Pressure Unit			
CW-310(c)	**RANCO**	**016**	**09/21/2018**
Fuel Safety Shutoff Valve, Main			
CF-180(b)(2), CF-180(b)(3)	**N/A**	**N/A**	**N/A**
Pilot Safety Shutoff Valve			
CW-180(2), CW-180(3)	**N/A**	**N/A**	**N/A**
Atomizing Medium Switch			
CF-450(b)	**N/A**	**N/A**	**N/A**
Combustion Air Switch			
CF-220	**N/A**	**N/A**	**N/A**
High Gas Pressure			
CF-162	**N/A**	**N/A**	**N/A**
Low Gas Pressure			
CF-162	**N/A**	**N/A**	**N/A**
Low Oil Pressure			
CF-450(a)	**N/A**	**N/A**	**N/A**
High Oil Temperature			
CF-450(c)	**N/A**	**N/A**	**N/A**
Low Oil Temperature			
CF-450(d)	N/A	N/A	N/A
Purge Air Flow			
CF-210	**N/A**	**N/A**	**N/A**
Flame Safeguard (primary)			
CF-310, CF-320	**N/A**	**N/A**	**N/A**
Flame Detector			
CF-310, Cf-320	**N/A**	**N/A**	**N/A**
LOW FIRE START			
Low Fire Start Switch			
CF-610	**N/A**	**N/A**	**N/A**

SAFETY OR SAFETY RELIEF VALVES(S)
CW-510, CW-520
Manufacturer **CONBRACO**
Model: **29-202-21**
Size **1/2" X 1"**
Capacity **423** PPH/Btu/hr

OPERATIONAL TEST PERFORMED DATE
09/21/2018

Representing Equipment Manufacturer's Name HONG W. WONG QUALITY ASSURANCE MANAGER

Signature _____

Date 09/21/2018

Representing Installing Contractor's Name _____

Signature _____

Date _____

GENERAL NOTE: Units with capacities of 400,000 Btuh or less comply with Part CR-110 and Cr200

WO 494983

QER 122A SUSSMAN AUTOMATIC BOILER TEST PROCEDURE

Model No# ES36AF3-PRI PSI 100 National Board 115330

SEQ	CHARACTERISTIC TO BE INSPECTED	REJ	RWK	ACC
1.0	Hypot test completed a) 120VAC Hypot@ 1200VAC b) 208VAC Hypot@ 1200VAC c) 240VAC Hypot@ 1200VAC d) 415VAC Hypot@ 2100VAC e) 380VAC Hypot@ 2000VAC f) 480VAC Hypot@ 2200VAC g) 600VAC Hypot@ 2400VAC			
2.0	Check shell for NB# 115330 CRN# R0910.517890YTN / R0911.5123467890YTN / K2827.5 K6793.129684			
3.0	Install safety valve a) PSI 100 b) PPH 423 CAP c) Size 1/2"			
4.0	Install fuses if required a) 99314 250VAC 60A 1) CU1250AB1/C1 CU1400AB1/C1 208V/240V SINGLE PHASE ONLY 2) CU-2000 to CU-4500 208V or 240V 3) ES30 to ES36 208/240V SINGLE PHASE ONLY 4) ES48 to ES180 208V/240V 5) ES85 to ES180 208V/240V b) 99316 600VAC 60A 1) CU-3000 to CU-4500 480V and 600V 2) ES72 to ES180 480V and 600V 3) HU205F3, HU310F3, HU475F3, HU550F3 c) Install 10A(240V)/12A(120V) fuse for MBA, ES20A, ES24A, ES30A, ES36A, HP30A			
5.0	Pressure Decay Test: Pressure should not change in one minute after it has stabilized. a) 100 PSI: Pressurize boiler to 80 PSI with air. b) 15 PSI: Pressurize boiler to 10 PSI with air.			
6.0	a) Connect power to boiler b) Connect water to inlet of solenoid or check valve c) Connect CRS hose to steam outlet d) Connect power light to pump connection if no solenoid is installed e) Turn water on f) Turn main power on g) Turn on boiler switch h) Solenoid turns on or power light turns on i) Contactors are de-energized			
7.0	Water level shuts off at correct level a) Solenoid shuts off or power light shuts off (skip to step d) if no AUX LWCO is installed) b) If 81017MR is installed, light shuts off c) Push 81017MR reset button d) Contactors are energized			
8.0	a) Check element(s) for correct amp draw b) Check element(s) for leaks/pin holes c) Check for proper installation			
9.0	High limit pressure a) Bypass operating control b) Manual reset trips 1) 90 PSIG for ES 2) 13.5 PSIG for CU 3) 80 PSIG for MBA, ES24A, HP30A, ES30A ES36A c) Boiler turns off			
10.0	Reconnect operating control			
11.0	Operating control pressure a) Boiler switches off 1) ES/SSB @ 80 PSIG 2) CU @ 7 PSIG 3) MBA, ES24A, HP30A, ES30A @ 60PSIG ES36A			
12.0	Drain water slightly to force pump on. Contactors de-energize		N/A	
13.0	At correct water level solenoid or power light shuts off and contactors energize (for 81017MR installations press reset button to energize boiler)			
14.0	Check high water cutoff (CU only)			
15.0	Check D-1 operation (CU only)			

QER 122A SUSSMAN AUTOMATIC BOILER TEST PROCEDURE

16.0	Check blowdown operation (if installed) N/A			
17.0	Allow boiler to reach max. steam			
18.0	Connect air to boiler			
19.0	Check for leaks a) No air leaks b) No water leaks c) No steam leaks			
20.0	Blowdown boiler to remove all water			
21.0	a) Turn of boiler switch b) Shut down main power c) Disconnect main power from boiler d) Shut off water supply e) Disconnect water supply from boiler f) Disconnect CRS hose from steam outlet g) Apply test & inspected label h) Forward boiler to packing area			
	Options and Special instructions			
22.0	Transformer a) Install transformer fuses 1) 1/4kVA, all voltages a) Use **600V/1A** (qty. 2), **250V/2A** (qty. 1) 2) 1/2kVA a) 208V/240V: use **600V/2A** (qty. 2), **250V/5A** (qty. 1) b) 480V/600V: use **600V/1A** (qty. 2), **250V/5A** (qty. 1) 3) 3/4kVA a) 208V/240V: use **600V/3A** (qty. 2), **250V/10A** (qty. 1) b) 480V/600V: use **600V/2A** (qty. 2), **250V/10A** (qty. 1) 4) 1.0 kVA a) 208V/240V: use **600V/4A** (qty. 2), **250V/10A** (qty. 1) b) 480V/600V: use **600V/2A** (qty. 2), **250V/10A** (qty. 1) 5) 1.5 kVA a) 208V/240V: use **600V/10A** (qty. 2), **250V/15A** (qty. 1) b) 480V/600V: use **600V/3A** (qty. 2), **250V/15A** (qty. 1) 6) 2.0 kVA a) 208V/240V: use **600V/10A** (qty. 2), **250V/20A** (qty. 1) b) 480V/600V: use **600V/4A** (qty. 2), **250V/20A** (qty. 1) b) For 208V/240V transformers to be tested with fuses installed, no control power required c) For 480V/600V transformers to be tested without fuses installed and connect control power to boiler d) Transformer Test (see QER 122H): 480V: 52.5-57.5V, 600V: 42-46V			
23.0	Sequencer a) Set #2 switch to 135 b) Set #5 switch to Proportional c) Set #3 switch to Delay Switch d) Set number of stages and switches per qty. of contactors 1) 2 contactors: #5 on 2) 3 contactors: #5 and #4 on 3) 4 contactors: #6 on (MAX setting) e) Set 2200 ohm in the middle (12 o'clock position) f) Set Honeywell control so contactors and light turn on in sequence Energizing sequence: Light 1 on, light 2 on, light 3 on, light 4 on De-energizing sequence: Light 4 off, light 3 off, light 2 off, light 1 off			

Tested by R-V

Date 9/21/2018

Boiler Traveler Fo

PRIMUS STERILIZER
Customer

Start Production Date
9-28

494985
WO

Delivery Date
11530

ES36AF3-PR1
Product

National Board Number

Options

OK COPY

01Y	Description
	CU 1- D1
	CU 2- D1
	81600-1
	81600-2
	81600-3

01Y	Description
	99117
1	81017MR
	100442
	Transformer kW

9-4-18	Start	Stop	Total	Inspected & Accepted
Mechanical	3:00	3:50		
9-6-18	7:20	8:30		
Emp CLAUDIO				
Electrical 9-20-18	9:30AM	1:00PM		
Emp Morton. H				
Testi 9/21/2018	12:00	1:55PM		
Emp R-V				
Pack Andrew	9:00AM			9-24-18
	2:45PM		3:15PM	

Emp._____

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

EFFECTIVE: 7/24/2017

PART #	DESCRIPTION
STEAM SAFETY VALVES	
99136	100 PSIG 1/2" NPT (ES12 to ES72)
99137	100 PSIG 1" NPT (ES84 to ES180)
99132	15 PSIG 1/2" NPT (ES12 to ES48, HU40 to HU140)
99297V	15 PSIG 3/4" NPT (ES60 to ES72, HU175 to HU205)
99141	15 PSIG 1" NPT (ES84 to ES100, HU250 to HU310)
99142	15 PSIG 1-1/2" NPT (ES135 to ES180, HU410 to HU550)
PRESSURE CONTROLS	
99113R	PRESSURE CONTROL 0-15 PSIG
99128R	PRESSURE CONTROL 0-90 PSIG
99130R	PRESSURE CONTROL 0-90 PSIG W/RESET
99373	PRESSURE CONTROL PROPORTIONAL 5-150 PSIG
99374	PRESSURE CONTROL PROPORTIONAL 0-15 PSIG
99969R	PRESSURE CONTROL 0-15 PSIG W/MANUAL RESET
FB023	PIGTAIL 1/4" NPT 180°
MOTORS & PUMPS	
103535	1/3 HP MOTOR/PUMP 120/1(ES12-ES72)
103535C	1/3 HP MOTOR/PUMP 240/1
99157	1/2 HP MOTOR/PUMP 15V or 230V 60 HZ (ES100-ES180)
99160	1/3 HP MOTOR/PUMP for use with Condensate Return System 115V or 230V 60 HZ (ES12 to ES72)
PARTS FOR CONDENSATE RETURN	
39011-FB	FLOAT FOR 17 GALLON TANK (C.R.S.)
39010-F	FLOAT VALVE
38083V-TANK	CONDENSATE TANK ONLY - 17 GALLON
SOLENOIDS	
99031	WATER SOLENOID COMPLETE 1/2" 120V 50/60 HZ
99032	WATER SOLENOID COMPLETE 1/2" 240V 50/60 HZ
MISCELLANEOUS VALVES & PRESSURE GAUGES	
99123	1/2" STRAINER
99162	CHECK VALVE - SPRING 3/8"
99167	CHECK VALVE - SPRING 1/2"
99169	CHECK VALVE - SPRING 3/4"
99178	BALL VALVE 1/2" STEAM
99178B	GATE VALVE 1/2" STEAM
99806	BALL VALVE 1/4" STEAM
99182	GATE VALVE 3/4" STEAM
99184	GATE VALVE 1" STEAM
99197	PRESSURE GAUGE 0-160 PSIG
99290	PRESSURE GAUGE 0-30 PSIG

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

PART #	DESCRIPTION
TERMINAL BLOCK & FUSES	
99207	TERMINAL BLOCK, 3 POLE 150 AMP (ES12 to ES18)
99264-6	FUSE - 10 AMP 250V
99209B	FUSE CUT OUT 1 POLE
99314	POWER CIRCUIT FUSE 250V 60 A (ES72 to ES180)
99315	FUSE BLOCK for 99314
99316	POWER CIRCUIT FUSE 600V 60 A (ES72 to ES180)
99317	FUSE BLOCK for 99316
99545	TERMINAL BLOCK for CONTROL CIRCUIT
99593	TERMINAL BLOCK (215A) for 5 CONTACTORS
99594	TERMINAL BLOCK (325A) for 6 CONTACTORS
99596	TERMINAL BLOCK (575A) for 10 CONTACTORS
MISCELLANEOUS	
92827	TOGGLE SWITCH
92829	PILOT LIGHT
92830	BOILER ON/OFF SWITCH W/PILOT LIGHT
100442-6	MULTISTAGE STEP SEQUENCER
99348	AUX LWCO RESET SWITCH
99363	RELAY DPDT - 120V
BOILER GASKET, FLANGE & BOLTS	
99095	BLANK FLANGE 4-1/2 x 4-1/2 (ES Series)
99096	GASKET
99547B	ELEMENT BOLT (QTY of 1)
99547	ELEMENT BOLT (QTY of 6)
99088	SLIC TITE
99524-6T	18" #6 WIRE W/TERMINAL END
99524	#6 WIRE (per ft.)
97116	RING TERM
103540	BOILER GASKET KIT
AUTOMATIC BLOWDOWN SYSTEM	
103662	TIME CLOCK - 120V, 60 HZ
99353	DELAY TIMER RELAY 130 BOARD
103661	MOTOR DRIVEN BALL VALVE - 120V 1" NPT

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

PART #	DESCRIPTION
PARTS FOR MM150 AUTOMATIC FEED CONTROL & LOW WATER CUTOFF	
103914	MICRO SWITCH ASSEMBLY
SA150-11	FLOAT & ROD
SA150-14	HEAD GASKET
SA150-106R	BELLOW ASSEMBLY WITH GASKET
99114	LOW WATER CUTOFF & AUTOMATIC WATER FEEDER, MM150 RAINGE 0-100 PSIG (ES SERIES)
SOLID STATE PROBE TYPE LOW WATER CUTOFF & WATER FEED CONTROLS	
90229	SPARK PLUG
90229-1	ELECTRODE
99807B	STAINLESS STEEL PROBE ROD
99807C	STAINLESS STEEL PROBE ROD
100378	PROBE ISOLATOR
103127	DUAL PROBE PC BOARD
90225E	THREE PROBE PC BOARD
90243	RELAY FOR 9-242A
90241MRT	AUXILIARY LWCO BOARD - MRT
99807-11	STAINLESS STEEL PROBE ROD - 11 INCH

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

PART #	KW	VOLTAGE/PHASE
29031A	3	120/1
29031C	3	240/1
29063B	6	208/3
29063C	6	240/3
29063F	6	480/3
29093B	9	208/3
29093C	9	240/3
29093F	9	480/3
39121B	12	208/1
39121C	12	240/1
39123B	12	208/3
39123C	12	240/3
39123D	12	380/3
39123E	12	415/3
39123F	12	480/3
39123G	12	600/3
39181B	18	208/1
39181C	18	240/1
39183B	18	208/3
39183C	18	240/3
39183D	18	380/3
39183E	18	415/3
39183F	18	480/3
39183G	18	600/3
39201B	20	208/1
39201C	20	240/1
39203B	20	208/3
39203C	20	240/3
39203D	20	380/3
39203E	20	415/3
39203F	20	480/3
39203G	20	600/3
39223B	22.5	208/3
39223C	22.5	240/3
39223F	22.5	480/3
39223G	22.5	600/3
39243B	24	208/3
39243C	24	240/3
39243F	24	480/3

Elements shipped with gasket, bolts and sealing compound.

PUR101166 Rev. 9.17

Prices are FOB, Long Island City NY. Prices are subject to change without notice.

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

BOILER MODEL #	Total KW	ELEMENTS			
		QTY	KW	QTY	KW
ES-12	12	1	12		
ES-18	18			1	18
ES-24	24	2	12		
ES-30	30	1	12	1	18
ES-36	36			2	18
ES-48	48	1	12	2	18
ES-60	60	2	12	2	18
ES-72	72			4	18
ES-85	84	1	12	4	18
ES-100	108			6	18
ES-135	144			8	18
ES-160	157.5			7	22.5
ES-180	180			8	22.5

ELEMENT PART NO. 39 X X X

Volts
A - 120
B - 208
C - 240
D - 380
E - 415
F - 480
G - 600

Phase
1 - Single Phase
3 -Three Phase

KW
12 - 12KW
18 - 18KW
22 - 22.5KW

Example: 39183B - 18kW, 3 Phase, 208 Volts

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

QUANTITY AND AMPS								
	VOLTS/PHASE							
BOILER	208/1	240/1	208/3	240/3	380/3	415/3	480/3	600/3
ES12	1-75	1-60	1-50	1-50	1-50	1-50	1-50	1-50
ES18	*	*	1-60	1-50	1-50	1-50	1-50	1-50
ES24	2-75	2-60	2-50	2-50	1-50	1-50	1-50	1-50
ES30	--	--	2-60	2-50	1-50	1-50	1-50	1-50
ES36	--	--	2-60	2-50	1-60	1-60	1-50	1-50
ES48	--	--	3-60	3-50	2-50	2-50	2-50	2-50
ES60	--	--	4-60	4-50	2-50	2-50	2-50	2-50
ES72	--	--	4-60	4-50	2-60	2-60	2-50	2-50
ES84	--	--	1-50, 4-60	5-50	3-60	Factory	3-50	3-50
ES100	--	--	6-60	6-50	3-60	3-60	3-50	3-50
ES135	--	--	8-60	8-50	4-60	4-60	4-50	4-50
ES160	--	--	7-75	7-60	4-75	4-75	4-60	4-50
ES180	--	--	8-75	8-60	4-75	4-75	4-60	4-50

* For ES18, single phase, 208V and 240V use P/N 99006B, 50 A-4 Pole Contactor

CONTACTOR PART NUMBER SELECTION:

	VOLTS: 208/240/480/600	VOLTS: 346 / 380 / 415
AMPS	CONTROL CIRCUIT: 120V COIL	CONTROL CIRCUIT: 240V COIL
50	P/N 99003	P/N 99001
60	P/N 99075	P/N 99007
75	P/N 102206-1	P/N 102206

Example: For ES72 240V 3 phase, there are 4 contactors, 50 amps each (Part Number is 99003, 120V Coil).

CONTACTOR PART NUMBER	DESCRIPTION
103834	PUMP CONTACTOR 120V 1 POLE
103834C	PUMP CONTACTOR 240V 1 POLE
99001	CONTACTOR 50 AMP RATING 230V 50/60 HZ
99003	CONTACTOR 50 AMP RATING 120V 50/60 HZ (208 AND 480)
99006B	CONTACTOR 50 AMP RATING 4 POLE 120V 50/60 HZ
99007	CONTACTOR 60 AMP RATING 240V 50/60 HZ
102206-1	CONTACTOR 75 AMP RATING 120V 50/60 HZ
102206	CONTACTOR 75 AMP RATING 240V 50/60 HZ
99075	CONTACTOR 60 AMP RATING 120V 50/60 HZ

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

MODEL #	VALVE ASSEMBLY	GLASS TUBE	LENGTH
MBA3-MBA20	99173C	99080-1	9-3/4" - 9-7/8"
ES12-ES18	99173C	99074-1	7-3/4" - 7-7/8"
ES24-ES72	99173C	99080-1	9-3/4" - 9-7/8"
ES100-ES180	99173C	99081-1	11-3/4" - 11-7/8"
CRS	99173C	99074-1	7-7/8"
BDT	99173C	99082-1	10-1/4"

NOTE:

1. Gauge glass tube and valve assembly is sold separately
2. Glass tube includes 2 (washer) gaskets P/N 99174CV
3. Glass tube is 5/8 in. diameter Pyrex

PART #	DESCRIPTION
GAUGE GLASS	
99074-1	7-3/4" GLASS WITH (2) O-RINGS GASKETS (ES12 to ES18, ES24A)
99080-1	9-3/4" GLASS WITH (2) O-RINGS (ES-24 to ES-72, MBA)
99081-1	11-3/4" GLASS WITH (2) O-RINGS (ES-100 to ES-180)
99082-1	10-1/4" Pyrex GLASS WITH (2) O-RINGS (BDT)
99173C	GAUGE GLASS ASSEMBLY 1/2" x 1-3/4" (MBA, ES, HU Series)
99174CV	GAUGE GLASS VITON O-RING GASKET
99174B	GAUGE GLASS BRASS WASHER

SUSSMAN 'ES, HU and MBA' SERIES PARTS LIST

PART #	DESCRIPTION
90229	SPARK PLUG
92830	ON-OFF SWITCH WITH PILOT LIGHT
99042	WATER SOLENOID 1/4" 120V
99042C	WATER SOLENOID 1/4" 240V
99080-1	9-3/4" GAUGE GLASS WITH (2) O-RINGS
99173C	GAUGE VALVE SET
99136	SAFETY VALVE 100 PSI, 1/2" NPT
99132	SAFETY VALVE 15 PSI, 1/2" NPT
99197	PRESSURE GAUGE 160 PSI
99130R	PRESSURE CONTROL HI-LIMIT W/RESET BUTTON 0-90 PSI
99128R	PRESSURE CONTROL OPERATING 0-90 PSI
100706-1	FUSE 10 AMP
99807F	1/4" PROBE ROD 5-INCH
99075	CONTACTOR 60 AMP 3 POLE, 120V
99007	CONTACTOR 60 AMP 3 POLE, 240V
100412A	LIQUID LEVEL CONTROL BOARD, 120V
100412C	LIQUID LEVEL CONTROL BOARD, 240V
100378	PROBE ISOLATOR
103540	BOILER GASKET KIT 99096, 99547B, 99088 GASKETS, BOLTS & COMPOUND
102188	RELAY FOR 100412A & 100412C

PRIMUS Sterilizer Company, LLC

8719 South 135th Street Suite 300 - Omaha, Nebraska 68138
Phone (402) 344-4200 - Fax (402) 344-4242
info@primus-sterilizer.com www.primus-sterilizer.com

PO 44703-00
INV 16829

INSTALLATION VERIFICATION

One (1) Installation Verification Must Be Completed Per Job/Serial #

STERILIZER JOB/SERIAL # 18622 END USER UC DAVIS DATE 3/5/20

PERFORMED BY: MIKE MCVAY (Name) LABWORKS EQUIPMENT SERVICE, INC. (Company)

- [x] **Equipment installed per the submittal drawings or General Arrangement (GA) drawings**
- [x] **Installation Qualification Checklist or Installation Checklist** (as applicable) **is complete**
- [ ] **Return Material Authorization (RMA) form submitted and all defective parts returned to PRIMUS**
- [x] **Take installation photos of front and service area of sterilizer. Submit to PRIMUS via email**

If the above checklist CANNOT be completed or if you or the end user has other concerns, please note them below and contact Dave Schall at (402) 344-4200 ext. 1212 or dschall@primus-sterilizer.com immediately.
This completed form along with the applicable Installation Qualification Checklist or Installation Checklist MUST be e-mailed to PRIMUS at info@primus-sterilizer.com within five (5) days of the final installation.

Comments

490 VAC 50 AMP FUSES ELEMENTS # 44ACA
INCOMING WATER # 40 psi. They will add booster pump.

Date 3/5/20 **End User Signature**

Installer Signature

Installer Print Name MIKE MCVAY **Print Name & Title** KEVIN ROBERTS, MANAGER

Phone (530) 219-6564

E-mail kwroberts@ucdavis.edu

FOR PRIMUS USE ONLY (For Authorization)

Dave Schall **Date** 3-12-20