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Thermo
ELECTRON CORPORATION

8600 Series
Forma -86C ULT Freezer

Operating and Maintenance Manual

Manual No: 7018602 Rev. 6

Read This Instruction Manual.

Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.

Model	Capacity in Cubic Feet	Voltage
8602	13	230
8603	13	120
8604	17	120
8605	17	230
8606	23	230
8607	28	230
8656	23	120
Double Door Units		
8690	23	120
8691	13	230
8692	13	120
8693	17	120
8694	17	230
8695	23	230
Red Cell Storage		
8627	13	230

MANUAL NUMBER 7018602

REV	ECR/ECN	DATE	DESCRIPTION	By
6	22562	3/14/05	Modified software to allow alarms within 5C of set point	aks
5	22518	12/7/04	Changed battery mounting bracket	aks
--	--	9/24/04	Added backup system instructions for red cell model 8627	aks
4	22362	9/13/04	Changed micro board	aks
--	--	5/12/04	Additional vacuum relief information	aks
3	22216/22217/22179	3/17/04	Added models 8656 and 8690/PM updates/updated schematics	aks
2	21886	9/22/03	Vacuum relief port	aks
--	21800	9/8/03	Revised refrigeration schematics	aks
1	21795	8/12/03	Revised BUS operation instructions	aks
--	21396/21425	6/19/03	Revised parts drawings	aks
--	21605	5/8/03	Wrong power alarm modifications	aks
--	21526	5/8/03	Solenoid valve mounting bracket	aks
0	FR-1698	3/26/03	New Release	aks

Important operating and/or maintenance instructions. Read the accompanying text carefully.

Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.

Hot surface(s) present which may cause burns to unprotected skin or to materials which may be damaged by elevated temperatures

Extreme temperature hazards, hot or cold. Use special handling equipment or wear special, protective clothing.

- √ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- √ Always dissipate extreme cold or heat and wear protective clothing.
- √ Always follow good hygiene practices.
- √ Each individual is responsible for his or her own safety.

Do You Need Information or Assistance on Thermo Electron Corporation Products?

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1-740-373-4189	FAX
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Our **Sales Support** staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or make arrangements to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

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Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

Thermo Electron Corporation
Controlled Environment Equipment
Millcreek Road, PO Box 649
Marietta, OH 45750

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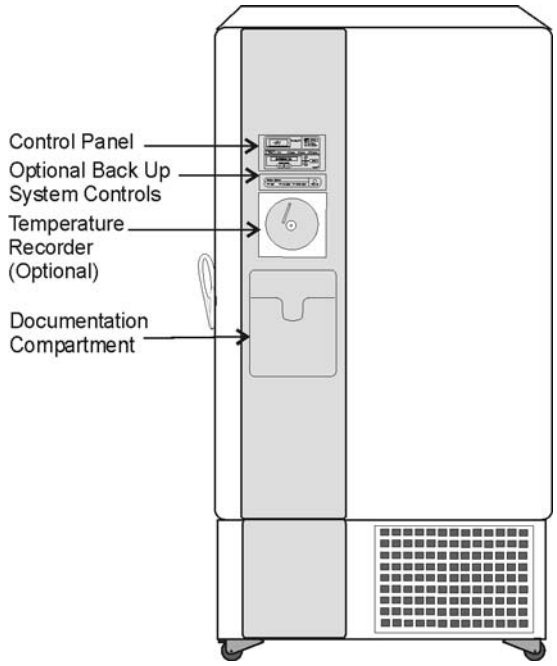


Figure 1-1
Model 8600 Series Front

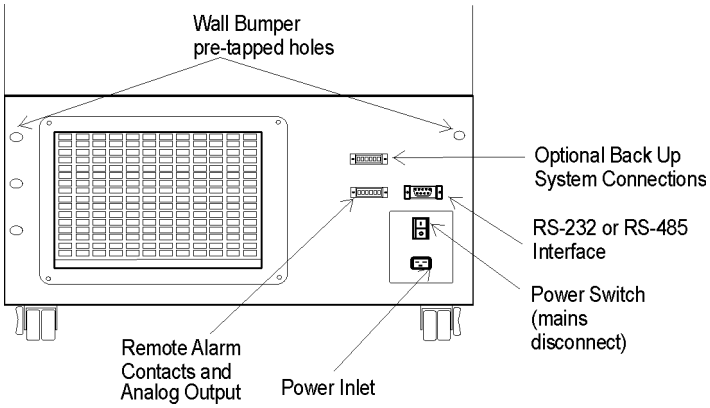


Figure 1-2
Model 8600 Series Rear

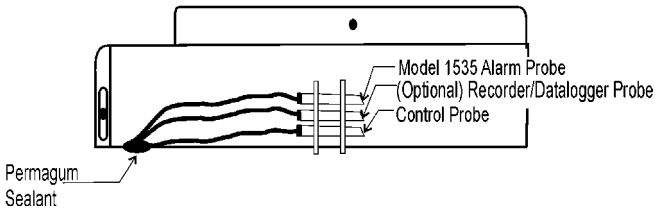


Figure 1-3
Chamber Probe(s)

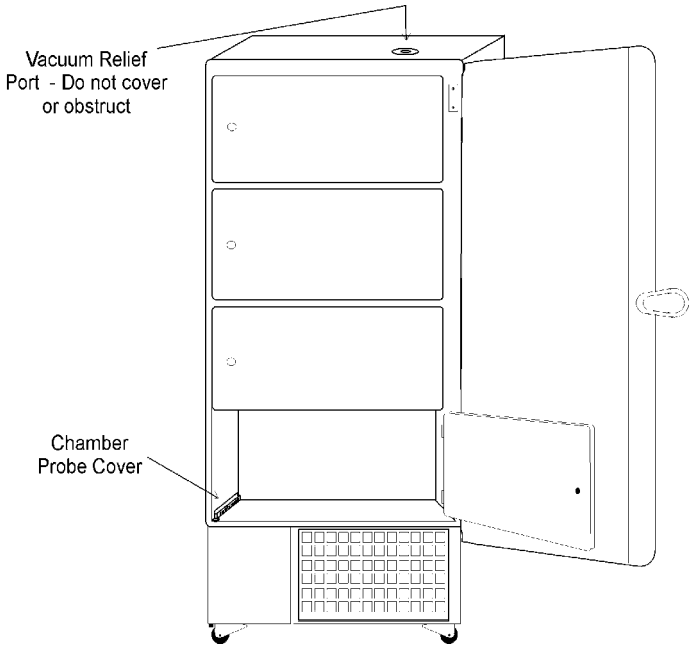


Figure 1-4
Vacuum Relief and Probe Cover Location

1.1 Freezer Components

Figure 1-1

- Control Panel - keypad, displays and indicators.
- BUS (Optional Back Up System) panel.
- Optional temperature recorder - 7 day, one pen or datalogger.
- Documentation compartment - storage of user's manual and other documentation.

Figure 1-2

- Remote alarm contacts and selectable analog output connection - 0-1V, 4-20mA (default), 0-5V.
- Power inlet for power cord connection.
- Optional BUS connections for probe and solenoid.
- RS-232 (default) or RS-485 interface.
- Power Switch (mains disconnect).

Figures 1-3 and 1-4

- Vacuum relief port - pressure equalization port.
- Probe cover - houses control, optional recorder, datalogger or 1535 alarm probes.

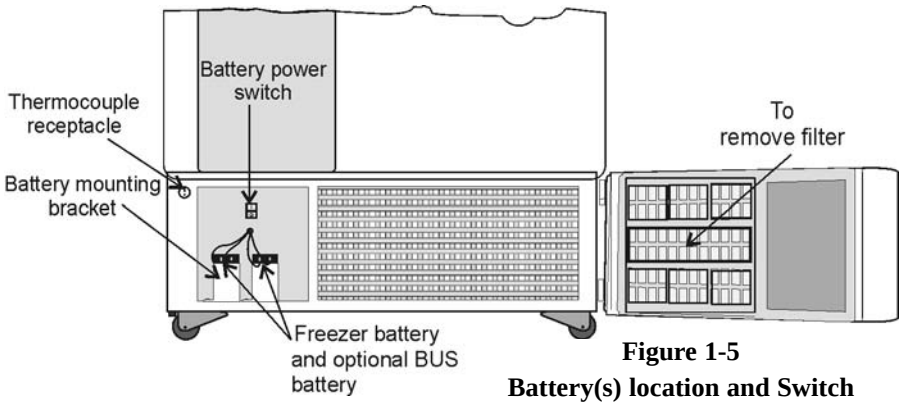


Figure 1-5

- Battery mounting bracket(s).
- Battery power switch (freezer and BUS).
- Freezer battery.
- Optional BUS battery.
- Freezer filter location.

Figure 1-5
Battery(s) location and Switch

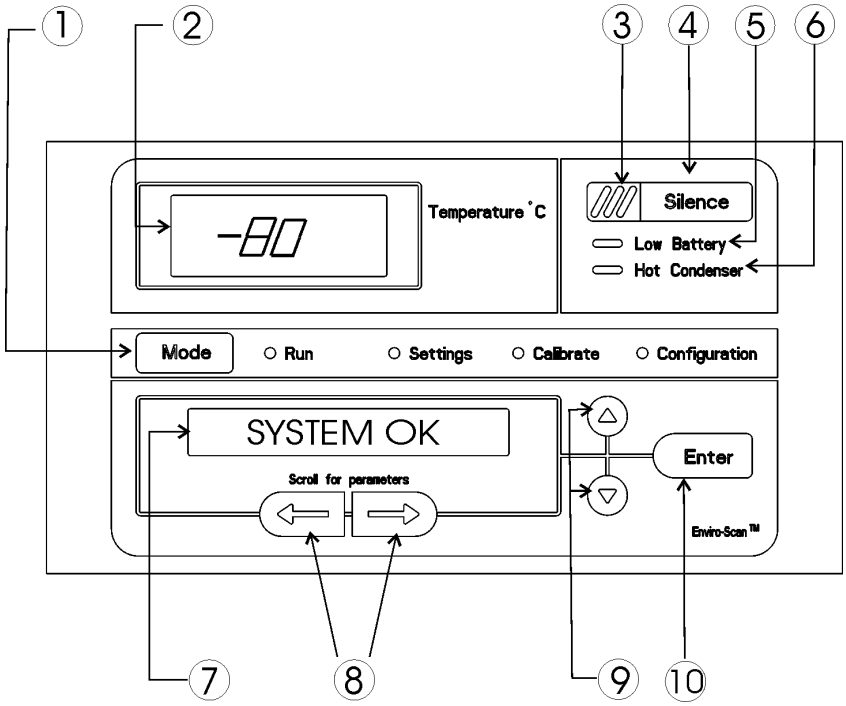


Figure 1-6, Control Panel

1.2 Control Panel Keys, Displays and Indicators (See Figure 1-6)

1. **Mode** Select Switch - Used to select Run, Settings, Calibrate and System Configuration Modes.

   Mode Select Indicators -

   Run: Run Menu

   Settings: Set Points Menu

   Calibrate: Calibrate Menu

   Configuration: Configuration Menu
2. **Temperature Display** - Displays temperature in degrees Celsius.
3. **Alarm Indicator** - Light pulses on/off during an alarm condition of the cabinet.
4. **Silence** - Silences the audible alarm.
5. **Low Battery** - indicates a low battery condition of the freezer battery.
6. **Hot Condenser** - indicates a hot condenser condition.
7. **Message Center** - displays system status and alarms.
8. **Scroll for Parameters Arrows** - moves the operator through the choices of the selected mode.
9. **Up and Down Arrows** - Increases or decreases values, toggles between choices.
10. **Enter** - Stores the value into computer memory.

1.3 Operation of the Keypad

The 8600 Series freezer has four basic modes which allow freezer setup: Run, Settings, Calibrate and Configuration.

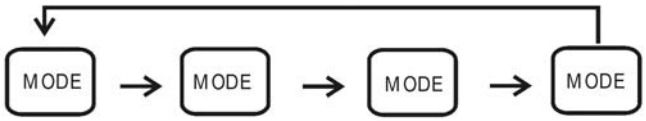
Run is the default mode which the freezer will normally be in during operation.

Settings is used to enter system set points for freezer operation.

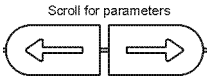
Calibrate is used to calibrate various system parameters.

Configuration allows for custom setup of various options.

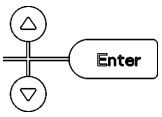
The chart below shows the selections under each of the modes.



RUN	SETTINGS	CALIBRATE	CONFIGURATION
Default Mode *SYSTEM OK*	Control Set Point	Control Probe	High Alarm Test
LINE VOLTAGE	High Alarm Set Point	Optional Sample Probe	Low Alarm Test
COMPENSATED VOLTAGE	Low Alarm Set Point		System Battery Test
HSHX TEMPERATURE	Optional Back Up System Set Point		BUS Battery Test
			Display Temperature
			Clear High Stage Alarm
			Set Access Code
			RS485 Address
			BUS type CO_2 or LN_2



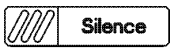
Scroll for Parameters Arrows: Steps the operator through the parameters of SETTINGS, CALIBRATE and CONFIGURATION Modes. The right arrow goes to the next parameter, the left arrow returns to the previous parameter.



Up Arrow: Increases or toggles the parameter value that has been selected in the SETTINGS, CALIBRATE, and CONFIGURATION Modes.

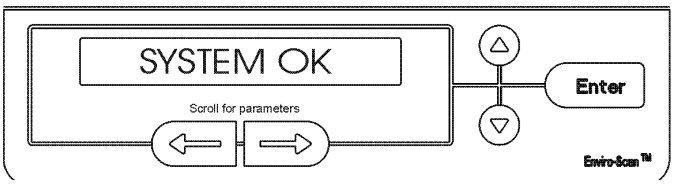
Enter: Must press Enter key to save to memory all changed values.

Down Arrow: Decreases or toggles the parameter values that have been selected in the SETTINGS, CALIBRATE and CONFIGURATION Modes.



Silence Key: Press to silence the audible alarm. See Section 4 for alarm ringback times.

1.4 Displays



Message Center: Displays the system status (Mode) at all times. Displays SYSTEM OK during normal operation, or alarm messages if the system detects an alarm condition. See Section 4.1- Alarms.

1.5 Installing the Freezer

If tipped more than 45°, allow the unit to set upright for 24 hours before start up.

To remove the freezer from the pallet, use the 7/16" wrench to remove all the bolts securing the shipping bracket to the pallet.

Remove the shipping bracket. Remove the ramp boards from the pallet and place the slotted end over the ramp brackets on the pallet. The support blocks on the ramps will be facing down. Before moving the freezer, make sure the casters are unlocked and moving freely. Align the caster with the ramp boards. Use adequate personnel to roll the freezer off the pallet.

The freezer can be easily pushed to the desired approved location, described in Section 1.5.a. If necessary, the doors and lower front panel may be opened to move the unit through tight openings. When the freezer is in position, set the front caster brakes.

The freezer must not be moved with the product load inside.

a. Choosing the Location

Locate the freezer on a firm, level surface in an area with an ambient temperature between 18°C and 32°C. Provide ample room to reach the mains disconnect switch (power switch) located on the rear of the freezer.

For proper ventilation and airflow, a minimum clearance of 5" at the rear and top and a clearance of 8" on the side of the freezer is required. Allow adequate space in the front of the freezer for door opening.

b. Installing the Wall Bumpers

The parts bag, located inside the cabinet, contains the following parts.

Quantity	Stock #	Description	Purpose
2	510016	1/4-20 x 5-1/2" Bolt	Wall Bumper
2	380520	Neoprene Cap	Cap Protector

Install the bolts into the pre-tapped holes on the back of the compressor section. Install a neoprene cap on each bolt. Refer to Figure 1-2 for the locations of the pre-tapped holes.

c. Installing the Shelves

Install the shelf clips into the shelf pilasters (front and back) at the desired shelf level. Install the shelves in the cabinet onto the clips.

NOTE: On units having the optional 5 inner door option, refer to the instructions accompanying the inner door kit.

d. RS-232 Communications

The 8600 series freezer has a data communications interface. The factory default setting is RS-232.

The wiring identification for the interface is shown in Figure 1-7. One nine pin, sub "D" style connector is located on the back of the freezer. See Figure 1-2 for the location of the connector on the freezer.

RS-232 INTERFACE RECEPTACLE

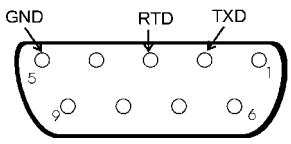


Figure 1-7

The freezer transmits temperature information every 60 minutes. A standard DB9 serial extension cable can be used to connect the freezer to serial device. Some serial devices may require a null modem adapter.

Data format:

Baud	1200
Data bits	8 (7 bit ASCII with leading zero)
Start bits	1
Stop bits	2
Parity	none

The data transfer sequence is transmitted in the following format. X refers to numerical temperature data.

(NUL) (-) XXX (SP) C (SP) (OVERTEMP) (SP) (LF) (CR) (EOT) (SP) (UNDER TEMP)

The words "OVER TEMP" or "UNDER TEMP" are transmitted when an alarm condition exists along with the temperature. If no alarm condition exists, spaces will be sent. A total of 20 characters will be sent.

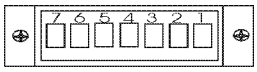
SP - Space
CR - Carriage return
NUL - Null character (00)
LF - Line feed
EOT - End of text (4)

Note: The RS232 is not compatible with Model 1535 Monitor/Alarm System.

e. Remote Alarm Contacts and Analog Output

The 8600 series freezer has remote alarm contacts and analog output. The remote alarm provides a NO (normally open) output, a NC (normally closed) output and COM (common). The contacts will trip on a power outage, high temperature alarm or low temperature alarm. Figure 1-8 shows the remote contacts in alarm state.

The analog output function allows the freezer to output signals representing the temperature of the freezer cabinet. The factory default setting is 4-20 mA. Refer to figure 1-9 for output specifications.



REMOTE CONTACTS/ANALOG OUTPUT
PIN# 1 Analog Output +
PIN# 2 Analog Output -
PIN# 3 Not Connected
PIN# 4 Not Connected
PIN# 5 Normally Closed
PIN# 6 Common.
PIN# 7 Normally Open

CONTACT RATING: 1A @ 30V
CONTACTS IN ALARM STATE

Figure 1-8

	4-20 mA	0-1V	0-5V
Temperature	-100 to +50°C	-100 to +50°C	-100 to +50°C

Figure 1-9

IMPORTANT USER INFORMATION

Caution! Stored product should be protected by an activated alarm system capable of initiating a timely response 24 hours/day. Alarms provide interconnect for centralized monitoring.

f. Attaching the Power Cord

Insert the power cord into the power inlet module. Place the retaining bracket (p/n 195763) over the connector. Tighten retaining screws to secure.

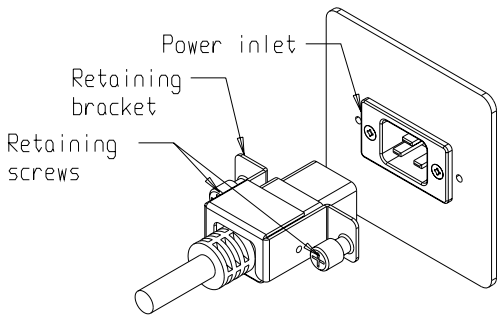


Figure 1-10

g. Connecting the Unit to Electrical Power

See the serial tag on the side of the unit for electrical specifications or refer to the electrical schematics in this manual.

The freezer should be operated on a dedicated grounded service. Check the voltage rating on the serial tag of the unit and compare it with the outlet voltage. Then, with the power switch turned off, plug the line cord into the wall outlet.

First, turn on the freezer power switch. Then open the lower front door by grasping the bottom left corner. Locate the battery switch and turn it on. See Figure 1-5. During initial freezer start-up, the system battery may require charging and the Low Battery message may appear in the message center.

Assure the battery switch is turned on. The rechargeable batteries require 36 hours to charge at initial start-up. A "Low Battery" alarm may occur until the batteries are fully charged. Should a power failure occur during the initial start-up period, the electronics will have limited operation.

1.6 Freezer Start-Up

With the freezer properly installed and connected to power, system set points can be entered. The following set points can be entered in Settings mode: Control temperature, high temperature alarm set point, low temperature alarm set point, and (optional) BUS set point. Default settings are shown in the table below. See Chart 1-1 for more detail.

Control Set Point	-80°C
High Temperature Alarm	-70°C
Low temperature alarm	-90°C
Optional BUS Set Point	-60°C

If the set point is changed and the low temperature and high temperature alarms are set 10° from the set point, the alarm set points will be adjusted automatically to maintain a distance of at least 10° from set point.

a. Setting the Operating Temperature

All 8600 Series freezers have an operating temperature range of -50°C to -86°C, depending on ambient temperature. The freezer is shipped from the factory with a temperature set point of -80°C. To change the operating temperature set point:

1. Press the Mode key until the Settings indicator lights.

2. Press the right arrow until “SET PT = -XX” is displayed in the message center.
3. Press the up/down arrow key until the desired temperature set point is displayed.
4. Press Enter to save the set point.
5. Press the Mode key until the Run indicator lights for Run mode or press the right/left arrow keys to go to next/previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

b. Setting the High Temperature Alarm

The high temperature alarm will activate an audible/visual warning when the freezer chamber temperature has reached or exceeded the high temperature alarm set point.

To set the high temperature alarm set point:

1. Press the Mode key until the Set indicator lights.
2. Press the right arrow until “HI ALM = -XX” is displayed in the message center.
3. Press the up or down arrow key until the desired high temperature alarm set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Note: The high alarm set point must be set at least 5°C from the control set point.

At initial start-up, the high temperature alarm is disabled until the cabinet reaches set point or 12 hours elapse.

c. Setting the Low Temperature Alarm

The low temperature alarm will activate an audible/visual warning when the freezer chamber temperature has reached or decrease below the low temperature alarm set point.

To set the low temperature alarm set point:

1. Press the Mode key until the Settings indicator lights.
2. Press the right arrow until “LO ALM = -XX” is displayed in the message center.
3. Press the up or down arrow key until the desired low temperature alarm set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Note: The low alarm set point must be set at least 5°C from the control set point.

d. Access Code

An access code of 000 is required to access the Settings, Calibrate or Configuration modes. If the access code is not at the default 000, you can not leave RUN mode without entering a code. See section 3.1.d for instructions on modifying the access code.

1.7 Run Mode

The Run mode is the default mode for the freezer. The run mode will display the cabinet temperature on the temperature display and ‘SYSTEM OK’ on the message center under normal operating conditions. In addition, the Run mode allows display of the following information:

LINE VOLTAGE

COMPENSATED VOLTAGE

HSHX TEMPERATURE (heat exchanger temperature)

This information is scrolled individually by pressing the right arrow key. In each case, the message center returns to SYSTEM OK in 10 seconds if no keys are pressed.

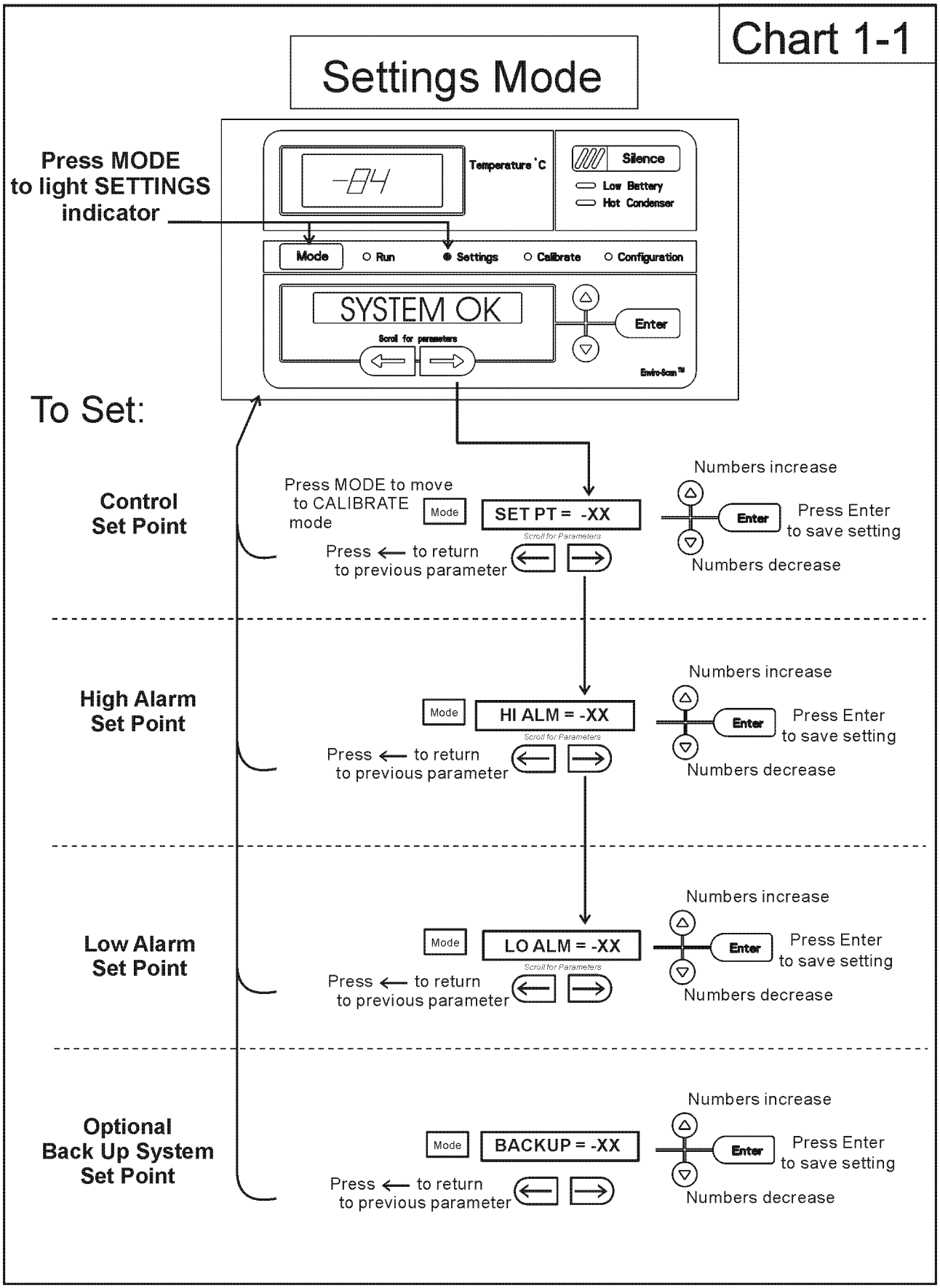


Chart 1-1
Settings Mode
Press MODE to light SETTINGS indicator
Temperature °C
Silence
Low Battery
Hot Condenser
Mode
Run
Settings
Calibrate
Configuration
SYSTEM OK
Scroll for parameters
Enter
Enviro-Scan™
To Set:
Control Set Point
Press MODE to move to CALIBRATE mode
Mode
SET PT = -XX
Scroll for Parameters
Press ← to return to previous parameter
Numbers increase
Enter
Press Enter to save setting
Numbers decrease
High Alarm Set Point
Mode
HI ALM = -XX
Scroll for Parameters
Press ← to return to previous parameter
Numbers increase
Enter
Press Enter to save setting
Numbers decrease
Low Alarm Set Point
Mode
LO ALM = -XX
Scroll for Parameters
Press ← to return to previous parameter
Numbers increase
Enter
Press Enter to save setting
Numbers decrease
Optional Back Up System Set Point
Mode
BACKUP = -XX
Press ← to return to previous parameter
Numbers increase
Enter
Press Enter to save setting
Numbers decrease

Section 2 - Calibrate

2.1 Calibrate Mode

Once the freezer has stabilized, the control or sample probe may need to be calibrated. Calibration frequency is dependent on use, ambient conditions and accuracy required. A good laboratory practice would require at least an annual calibration check. On new installations, all parameters should be checked after the stabilization period.

Before making any calibration or adjustments to the unit, it is imperative that all reference instruments be properly calibrated.

a. Calibrating the Control Probe

Plug a type T thermocouple reader into the receptacle located inside the lower door (see Figure 1-5). Compare the control temperature set point to the temperature of the measuring device. See Chart 2-1 at the end of this section for more detail.

1. Press the Mode key until the Calibrate indicator lights.
2. Press the right arrow until “CONT T = -XX.X” appears in the message center.
3. Press up/down arrow to match the display to calibrated instrument.
4. Press Enter to store calibration.
5. Press the Mode key to return to Run or the right/left arrow to go to next/previous parameter.

b. Calibrating the Optional Sample Probe

For freezers with the optional sample probe, place the calibrated instrument in the center of the sample bottle. The bottle should contain an appropriate medium and the measuring instrument should be centered in the bottle.

1. Press the Mode key until the Calibrate indicator lights.
2. Press the right arrow until “SAMP T = -XX.X” appears in the message center.
3. Press up/down arrow to match display to calibrated instrument.
4. Press Enter to store calibration.
5. Press the Mode key to return to Run or the right/left arrow to go to next/previous parameter.

See Chart 2-1 for calibration process functions.

Temperature Stabilization Periods

Startup - Allow 12 hours for the temperature in the cabinet to stabilize before proceeding.

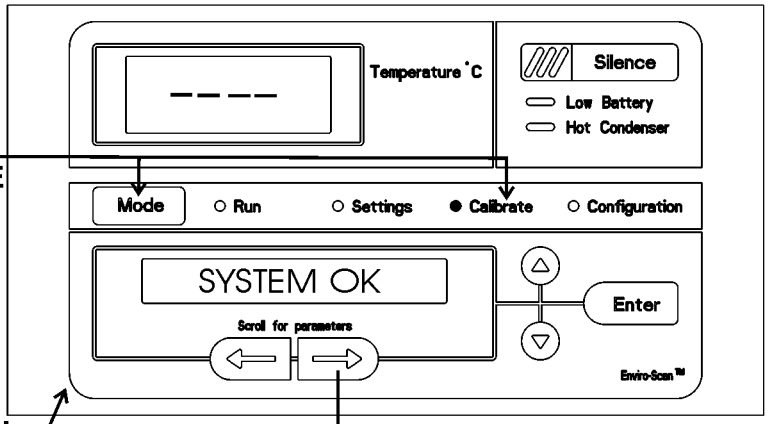
Already Operating - Allow at least 2 hours after the display reaches set point for temperature to stabilize before proceeding.

During calibration, the temperature display will not be available.

If no keys are pressed for approximately five minutes while in calibration mode, the system will reset to Run mode.

Chart 2-1

Calibrate Mode



Press MODE to light CALIBRATE indicator

To Calibrate:

Control Probe

Press MODE to move to CONFIGURATION mode

Mode

CONT T = -XX.X

Scroll for Parameters

Press ← to return to previous parameter

Numbers increase

Enter

Press Enter to save setting

Numbers decrease

Optional Sample Probe

Mode

SAMPT = -XX.X

Scroll for Parameters

Press ← to return to previous parameter

Numbers increase

Enter

Press Enter to save setting

Numbers decrease

Section 3 - Configuration

3.1 Configuration Mode

The Configuration Mode is used for testing and custom setup of the freezer. The configuration functions listed and described below may not be necessary in all applications, but are available if needed. See Chart 3-1 for more detail.

a. High Alarm Test

The high alarm test is used to verify the high alarm will activate, should the freezer temperature equal or exceed the high alarm set point.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until HI ALRM TEST is displayed in the message center.
3. Press Enter to initiate the test.

The temperature on the display will begin to increase until the high alarm set point has been reached. The audible alarm will sound and the alarm indicator will flash. Press the Silence key to silence the alarm.

b. Low Alarm Test

The low alarm test is used to verify the low alarm will activate, should the freezer temperature equal or become less than the low alarm set point.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until LO ALRM TEST is displayed in the message center.
3. Press Enter to initiate the test.

The temperature on the display will begin to decrease until the low alarm set point has been reached. The audible alarm will sound and the alarm indicator will flash. Press the Silence key to silence the alarm.

c. System Battery Test

To test the charge of the freezer battery:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until SYS BAT TEST is displayed in the message center.
3. Press Enter to initiate the test.

TESTING BATT will display during the testing period. Upon completion of the test the message center will display BATT GOOD or BATT FAIL When a test is failed, the audible alarm will sound, the alarm indicator and the Low Battery indicator will light. Press the Silence key and the alarm indicator will go off. The Low Battery light will stay on until a future battery test is performed and passed.

d. BUS Battery Test

To test the charge of the BUS battery:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until BUS BAT TEST is displayed in the message center.
3. Press Enter to initiate the test.

TESTING BATT will display during the testing period. Upon completion of the test the message center will display BBAT GOOD or BBAT FAIL When a test is failed, the audible alarm will sound, the alarm indicator and the Low Battery indicator will light. Press the Silence key and the alarm indicator will go off. The Low Battery light will stay on until a future battery test is performed and passed.

e. Display Temperature

This function, only available on freezers with the optional sample probe, allows the user to select which temperature is displayed in the temperature display window. The options are CONTROL or SAMPLE.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until DISP CONTROL or DISP SAMPLE is displayed in the message center.
3. Press up/down arrow to toggle between the two display selections.
4. Press Enter to save.

If control probe is selected, the temperature display will be on continuously. If sample probe is selected, the temperature display will be preceded with a letter ‘S’.

f. Clear High Stage Alarm

Should a high stage alarm occurred, it may become necessary to the clear the alarm condition after the condition has been corrected.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until CLR HS ALARM is displayed in the message center.
3. Press Enter to clear the alarm.

g. Setting an Access Code

To set the Access Code:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until “SET ACC CODE” is displayed in the message center.
3. Press Enter.
4. The message center will display ACC CODE = 000. Press the up/down arrow until the desired access code is displayed (000 - 999). Press the left/right arrow to select digit 1, 2, 3.

The left and right arrow keys are used to move from the first through the third digits within the access code.

5. Press Enter to save the setting
6. Press the Mode key until the Run indicator lights.A 3-digit Access Code can be entered to avoid unauthorized personnel from changing the set points, calibration, or configuration. A setting of 000 will bypass the access code. The factory setting is 000.

h. RS485 Address

If the freezer is configured for RS-485 communications, it will need to have a unique identification address. This address is set through the Configuration mode.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until RS485ADDR is displayed in the message center.
3. Press Enter. The message center will display 485 ADDR XX.
4. Press up/down arrow to select the appropriate address for the freezer (1 - 24).
4. Press Enter to save.

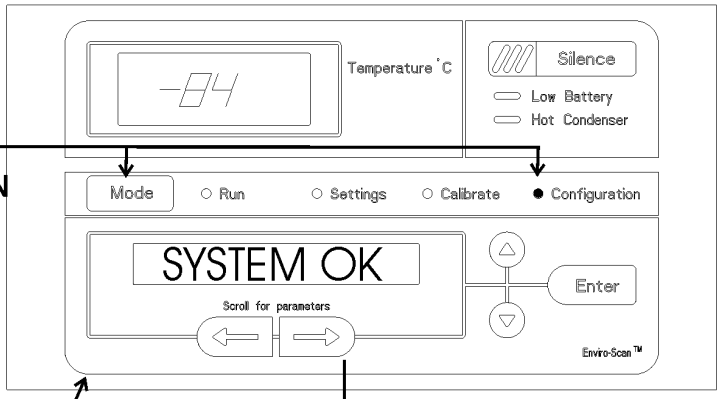
i. Back Up System Type

This function, which is only available on freezers with the optional BUS (back up system), allows the user to select which type of gas is injected into the freezer chamber. The options are CO_2 and LN_2.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until BUS TYPE CO2 or BUS TYPE LN2 is displayed in the message center.
3. Press up/down arrow to toggle between the two display selections.
4. Press Enter to save.

Chart 3-1

Configuration Mode



Press MODE to light CONFIGURATION indicator

To Configure:

Press MODE to move to RUN mode

High Alarm Test

Mode | **HI ALRM TEST** | Scroll for Parameters | **Enter**

Press ← to return to previous parameter

Press Enter to initiate test

Low Alarm Test

Mode | **LO ALRM TEST** | Scroll for Parameters | **Enter**

Press ← to return to previous parameter

Press Enter to initiate test

System Battery Test

Mode | **SYS BAT TEST** | Scroll for Parameters | **Enter**

Press ← to return to previous parameter

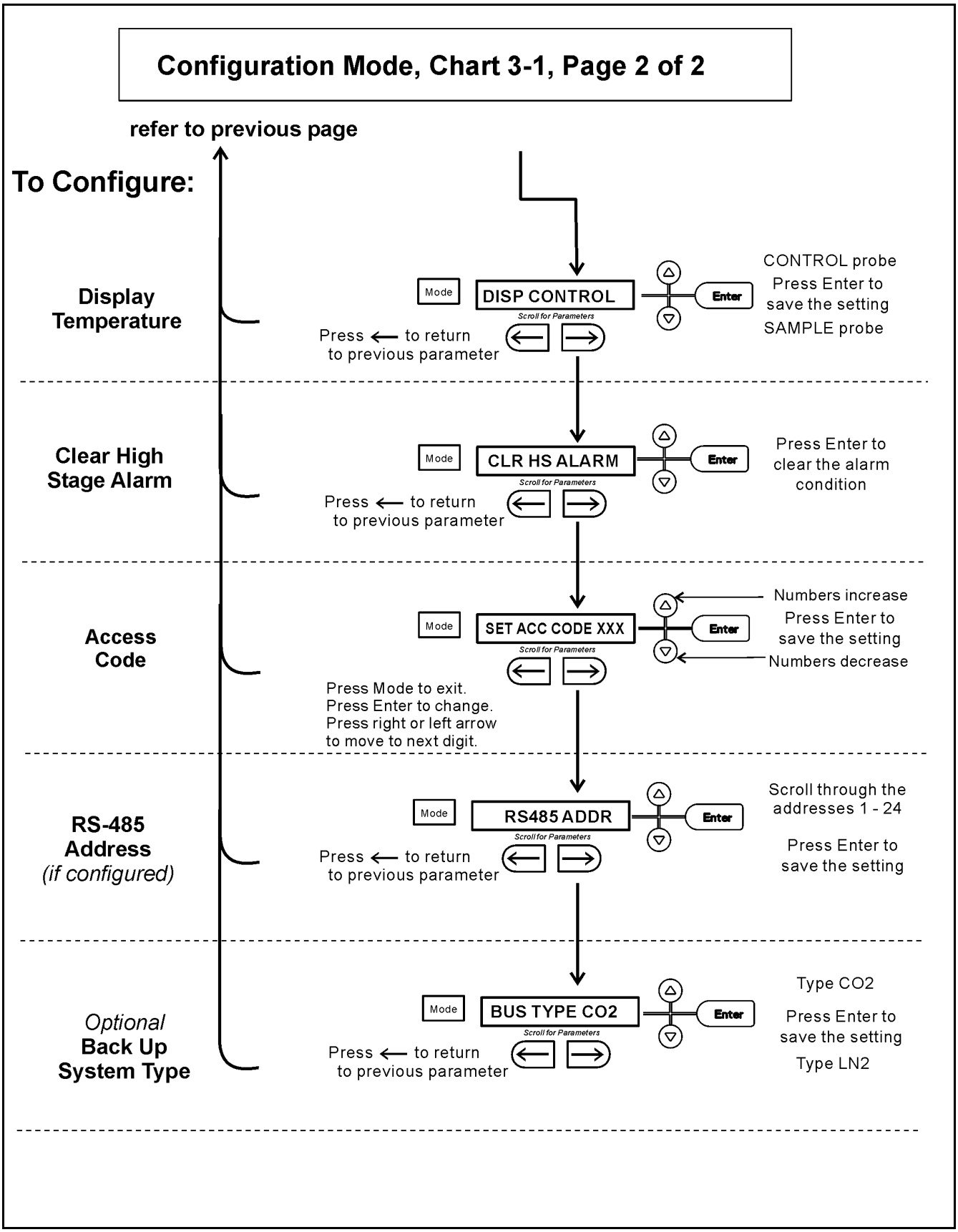
Press Enter to initiate test

Optional **BUS Battery Test**

Mode | **BUS BAT TEST** | Scroll for Parameters | **Enter**

Press ← to return to previous parameter

Press Enter to initiate test


Configuration Mode, Chart 3-1, Page 2 of 2
refer to previous page
To Configure:
Display Temperature
Mode
DISP CONTROL
Enter
Scroll for Parameters
Press ← to return to previous parameter
CONTROL probe
Press Enter to save the setting
SAMPLE probe
Clear High Stage Alarm
Mode
CLR HS ALARM
Enter
Scroll for Parameters
Press ← to return to previous parameter
Press Enter to clear the alarm condition
Access Code
Mode
SET ACC CODE XXX
Enter
Scroll for Parameters
Numbers increase
Press Enter to save the setting
Numbers decrease
Press Mode to exit.
Press Enter to change.
Press right or left arrow to move to next digit.
RS-485 Address (if configured)
Mode
RS485 ADDR
Enter
Scroll for Parameters
Press ← to return to previous parameter
Scroll through the addresses 1 - 24
Press Enter to save the setting
Optional Back Up System Type
Mode
BUS TYPE CO2
Enter
Scroll for Parameters
Press ← to return to previous parameter
Type CO2
Press Enter to save the setting
Type LN2

Section 4 - Alarms

4.1 Alarms

The Model 8600 Series freezer alarm system is shown in the table below. When an alarm is active, the message appears in the LED message center. Press the Silence key to disable the audible alarm for the ringback period. The visual alarm will continue until the freezer returns to a normal condition. The alarms are momentary alarms only. When an alarm condition occurs and then returns to normal, the freezer automatically clears the alarm condition and the message center.

Description	Message	Delay	Ringback	Relay
No alarm condition exists	SYSTEM OK	----	----	----
Power Failure	POWER FAIL	1 min.	15 min.	Yes
High Temperature Alarm	TEMP IS HIGH	1 min.	15 min.	Yes
Low Temperature Alarm	TEMP IS LOW	1 min.	15 min.	Yes
Door Ajar	DOOR IS OPEN	1 min.	15 min.	No
Low Battery*	LOW BATTERY	1 min.	12 hours	No
Control Probe Failure - see 4.2	PROBE 1 FAIL	1 min.	15 min.	No
Heat Exchanger Probe Failure - see 4.2	PROBE 2 FAIL	1 min.	15 min.	No
Condenser Probe - see 4.2	PROBE 3 FAIL	1 min.	15 min.	No
Sample Probe Failure (optional) - see 4.2	PROBE 4 FAIL	1 min.	15 min.	No
High Stage System Failure	HS SYST FAIL	1 min.	15 min.	No
Condenser Hot Condition	HOT CONDENSR	1 min.	none	No
Wrong Power	WRONG POWER	0 min.	none	No
Filter Needs Cleaning	CLEAN FILTER	0 min.	3 months	No
Gasket Needs Cleaning	CLEAN GASKET	0 min.	3 months	No
Voltage Compensation	VCOMPEN FAIL	0 min.	15 min.	No
Micro Board Failure	MICRO FAIL	0 min.	15 min.	No

All alarm delays and ringback times are ±30 seconds.
***The automatic battery test runs 12 hours after initial start-up, then every 12 hours thereafter. A user initiated battery test can be performed from the configuration menu. See Section 3.1.c.**

a. Wrong Power Alarm

If a 230 V freezer is connected to a 120 V power source or a 120 V freezer is connected to a 230 V power source, the electronics will detect that an incorrect power source has been connected to the freezer. Under this condition, the fans and compressors will not turn on and an audible and visual alarm will occur along with the "WRONG POWER" message in the LED message center.

The “WRONG POWER” alarm may also occur if the battery switch is turned on prior to applying power to the freezer. The audible and visual alarms will remain until the freezer is connected to the correct power source.

b. High Stage System Failure Alarm

This condition is created when the high stage compressor and fans run for 30 minutes and are not capable of cooling the interstage heat exchanger to the proper temperature. Under this condition, the high stage compressor and fans will turn off after 30 minutes and an audible and visual alarm will occur along with the "HS SYST FAIL" message in the LED message center.

c. Voltage Compensation Alarm

If the freezer is compensating for high or low line voltage, the system will measure the compensated AC voltage. If the voltage is incorrect, the unit will stop attempting to compensate, and the compressors will run on direct line voltage. Under this condition, the message center will display “VCOMPEN FAIL”.

d. Multiple Alarms

When multiple alarm conditions occur, active messages are displayed in the message center one at a time, updating at 5 second intervals. Pressing Silence during multiple alarms causes all active alarms to be silenced and to ring back in 15 minutes.

e. Micro Board Failure Alarm

A communications failure has occurred with the micro board. Contact Technical Services for replacement.

4.2 Probe Failure Alarms

The microprocessor in 8600 series freezers continually scans all probes including the control probe, heat exchanger probe, condenser probe and optional sample probe to ensure that they are operating properly. Should an error be detected, the "PROBE # FAIL" alarm will occur as described in 4.1 above. If an error is detected with the control probe (PROBE 1 FAIL), the high and low stage compressors will run continuously. As a result, the cabinet temperature will decrease until it reaches the lowest temperature that the refrigeration system can maintain. If an error is detected with the heat exchanger probe (PROBE 2 FAIL), the freezer will cycle properly at its temperature set point using a 5 minute step start between the high and low stage compressors. If an error is detected with the condenser probe (PROBE 3 FAIL) or optional sample probe (PROBE 4 FAIL), there is no impact on the performance of the freezer. However, the hot condenser alarm may also occur when the condenser probe fails. Contact the Technical Services Department (1-888-213-1790) or your local distributor.

Section 5 - Maintenance

5.1 Cleaning the Cabinet Exterior

Avoid the excessive use of water around the control area due to the risk of electrical shock. Damage to the controls may also result.

Wipe down the freezer exterior using soap and water and a general use laboratory disinfectant. Rinse thoroughly with clean water and dry with a soft cloth.

5.2 Cleaning the Air Filter (minimum four times a year*)

1. Open the front lower door by grasping the bottom left corner.
2. Locate the grille on the door. See Figure 1-5. Grasp the middle of the grille material and gently pull out to remove.
3. Wash the filter material using water and a mild detergent.
4. Dry by pressing between two towels.
5. Install the filter back into the grille and attach the grille.

* The clean filter alarm occurs every three months as a reminder to clean the air filter. Depending upon environmental conditions, the filter may need to be cleaned or replaced more frequently. If the filter becomes torn or excessively dirty, a replacement can be purchased. Order part number 760203.

5.3 Cleaning the Condenser (minimum yearly*)

1. Open the front lower door by grasping the bottom left corner. See Figure 1-5.
2. Using a vacuum cleaner, exercising care to not damage the condenser fins, clean the condenser.

* Depending upon environmental conditions, the condenser may need to be cleaned more frequently.

a. Cleaning the Water-cooled Condenser

The water-cooled condenser can be cleaned-in-place by using the CIP procedure. Cleaning solutions can be used, depending on type of deposits or build-up to be removed.

Do not use liquids that are corrosive to stainless steel or the brazing material (copper or nickel).

CIP (Clean-In-Place) Procedure

1. Disconnect the unit from the water supply.
2. Drain the unit.
3 . Rinse with fresh water and drain the unit again.
4. Fill with fresh water.
5. Add cleaning agent (solution and concentration dependent on deposits or build-up).
6. Circulate cleaning solution (if feasible).
7. Drain the cleaning solution.
8. Add and circulate a passivating liquid for corrosion inhibition of plate surfaces.
9. Drain this liquid.
10. Rinse with fresh water and drain.
11. Reconnect the water supply and fill the unit.
12 . Return to service.

5.4 Defrosting the Chamber

1. Remove all product and place it in another freezer.
2. Turn the unit off and disconnect it from the power source.
3. Turn off the battery switch (see figure 5-8).
4. Open all of the doors and place towels on the chamber floor.
5. Allow the frost to melt and become loose.
6. Remove the frost with a soft cloth.
7. After defrosting is complete, clean the interior with a non-chloride detergent. Rinse thoroughly with clean water and dry with a soft cloth.
8. Plug unit in and turn power switch on.
9. Turn the battery power switch to the on position.
10. Allow the freezer to operate empty overnight before reloading the product.

5.5 Cleaning the Door Gasket (minimum monthly*)

Using a soft cloth, remove any frost build-up from the gasket and door(s). The Clean Gasket alarm occurs every three months as a reminder to remove frost build-up from the gasket and door(s). Press the Silence key to disable the audible alarm.

*The door gasket may need to be cleaned more frequently if dirt or excessive frost build-up prevents the door from closing properly.

5.6 Cleaning the Vacuum Relief Port (minimum monthly*)

The exterior door gasket provides an excellent seal that protects product, provides an energy efficient thermal barrier to keep cold air in and room temperature air out and reduces frost build up on the inner doors.

Because the door gasket seals so well, a vacuum can be created after a door opening. Warm air enters the cabinet, cools and contracts, creating a vacuum that pulls the door in tightly against the seal.

To equalize the pressure inside the cabinet after a door opening requires 1.5-3.0 cu.ft. of ambient air to be drawn into the cabinet. The amount of air required to equalize the pressure varies depending on the cabinet size, cabinet temperature, duration of door opening, inventory volume and the temperature/humidity of the ambient air. The unit is designed with a "vacuum relief port" that allows the pressure to be equalized.

The time required to draw 1.5-3.0 cu.ft. of air into the cabinet depends on two factors,

a) the size and number of paths available for the air to enter the cabinet, and

b) the pressure difference between the internal cabinet and the ambient room.

Cabinets with the vacuum relief port operating normally, (i.e. vacuum relief port is not iced over) will require a minimum of 30 seconds up to a maximim of 120 seconds for the cabinet to equalize. This is also a good indication that the exterior door is well sealed.

The vacuum relief port requires routine maintenance. It will ice over unless preventive measures are taken. If the vacuum relief port becomes iced over, the freezer will take several hours to equalize pressure.

To open the door if a vacuum lock occurs:

1. Unlatch the handle of the freezer (figure 5-1).
2. Press on the vacuum relief mechanism (figure 5-2). If there is a noticeable sound of air exchange, then continue to hold down on the mechanism until the door opens. If the door fails to open, continue to the next step.

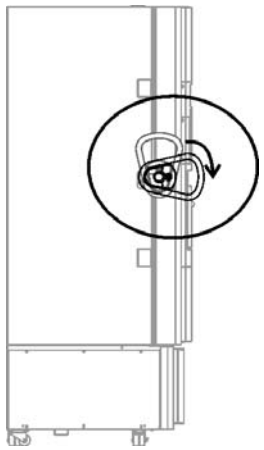


Figure 5-1

Do not leave the freezer unattended while the door is unlatched. The vacuum could release resulting in a door opening and product loss.

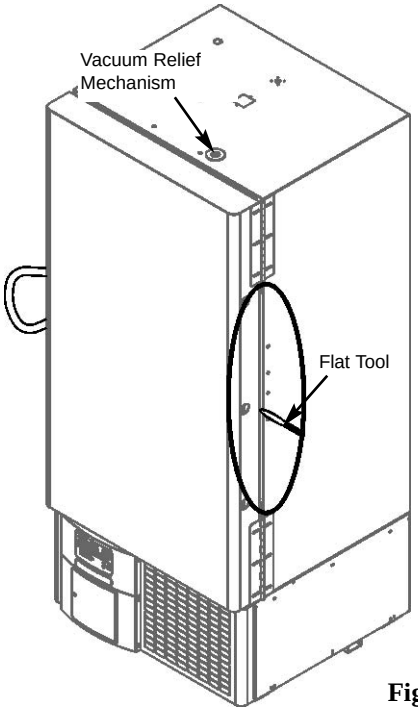


Figure 5-2

3. On the HINGED side of freezer (figure 5-2), slide part number 402058 tool or a non-metallic flat object such as a ruler, tongue depresser or plastic putty knife carefully between the door gasket and door until only the end of the tool handle is showing (Figure 5-3). There will be a noticeable sound of air exchange that could last a few minutes.
4. As the air pressure equalizes, the door releases.

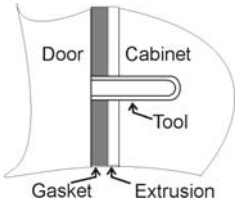


Figure 5-3

Vacuum Relief Port Maintenance

1. Once the door has opened, inspect the vacuum relief port for ice. Remove inventory racks or any obstructions from the top shelf to view the port. If no ice is found inside the tube, order a replacement check valve from the Technical Services department. Order part number 1950024.
2. To clean ice from the vacuum relief port:

   If no screw is present, gently pry the check valve free. Remove and inspect the valve for ice and clean. Carefully remove all ice from the tube with a screwdriver that has a shank of at least six inches. Make sure the tube is completely clear.
3. Verify the vacuum relief mechanism is moving freely. Depress the valve and release. The valve should drop approximately 1/2" and return to its original position when released. If the valve fails to spring back, it is defective. Contact the Technical Services department for a replacement. Clean any existing sealant from the exterior top. Replace the check valve, securing it with two drops of silicone sealant.

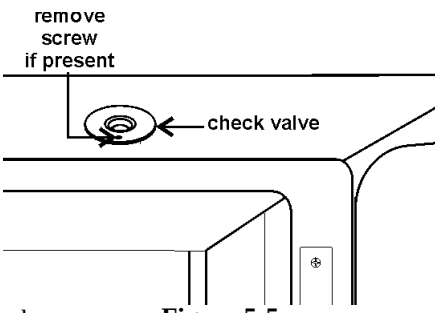


Figure 5-5

4. **If a screw is present**, remove the screw holding the check valve in place. Remove and inspect the valve for ice and clean. Carefully remove all ice from the tube with a screwdriver that has a shank of at least six inches. Make sure the tube is completely clear.

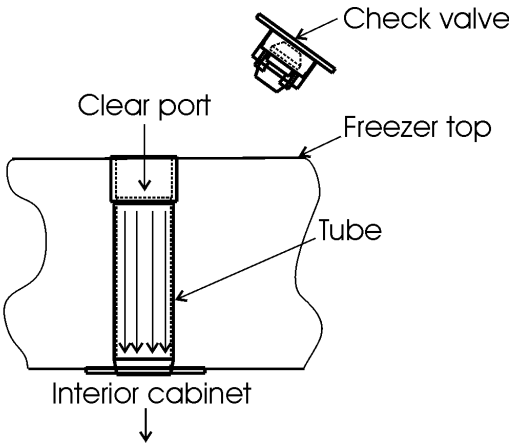


Figure 5-6

5. Verify the vacuum relief mechanism is moving freely. Depress the valve and release. The valve should drop approximately 1/2" and return to its original position when released. If the valve fails to spring back, it is defective. Contact the Technical Services department for a replacement. Replace the check valve and screw to secure.

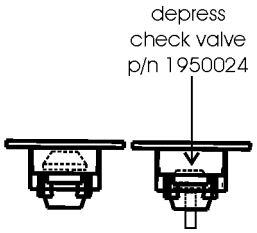


Figure 5-7

6. Inspect the port from the interior and follow the routine maintenance guidelines.

If the check valve is not secured to the freezer exterior, it could dislodge during a door closing.

Routine Maintenance

Observe the inner side of port with each door opening for frost and ice build-up. It may be necessary to remove inventory racks from the top shelf to view the port. Remove any frost with a soft dry cloth. Verify the vacuum relief mechanism moves freely. If the tube should become clogged with ice, it must be cleaned. **Make sure during cleaning that the vacuum relief tube is completely free of ice to prevent rapid ice formation.** Other factors that can affect the performance of the vacuum relief port include: high ambient temperature, high humidity conditions and frequent door openings. Maintenance should be performed weekly or as needed.

Failure to maintain the vacuum relief port may result in excessive ice build up inside the tube, clogging the port, and inability to open the door. The vacuum relief port may need to be cleaned more often with frequent door openings and high humidity environments.

5.7 Replacing the Battery(s)

1. To gain access to the battery, open the lower door by grasping the bottom left corner. The battery is rectangular in shape, located on the front left corner of the compressor compartment and is secured in place by a mounting bracket.
2. Directly above the battery(s) is the battery power switch. Turn the battery power switch to the off position.
3. Disconnect the battery connections
4. Remove the tape securing the battery.
5. Remove the old battery and install the new battery.
6. Reconnect the battery (red to positive and black to negative).
7. Turn on the battery power switch.
8. Close lower panel door.

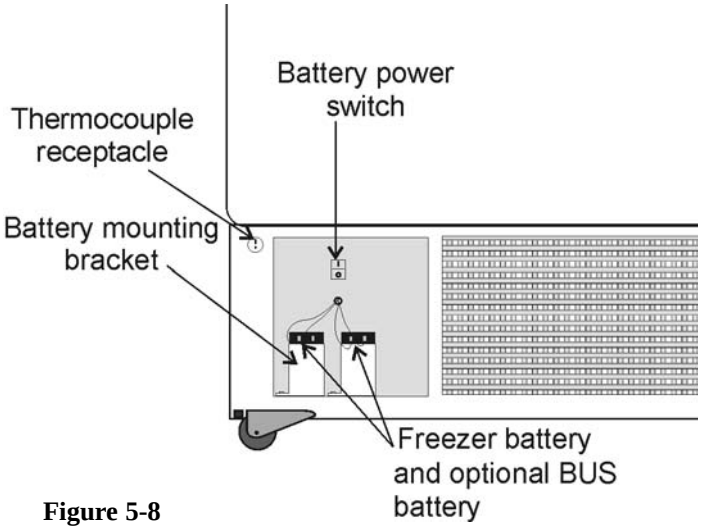


Figure 5-8

The % of charge can vary depending on the age, usage and condition of the battery. For a consistent and dependable charge, replace the battery every 2 years. Replacement batteries must be rechargeable and are available from Thermo. Refer to the parts list for stock number and description of the replacement batteries. Dispose of the used batteries in a safe manner and in accordance with good environmental practices.

5.8 Preparing the Unit for Storage

Defrost the unit as described in Section 5.4. This will prepare the unit for storage. Turn off the battery power switch. Turn off the freezer power switch. Disconnect power to the battery(s) and to the freezer.

If the unit has been in service, turn it off and disconnect the power cord connector before proceeding with any maintenance.

Thermo
ELECTRON CORPORATION

PREVENTIVE MAINTENANCE
Freezers

Your equipment has been thoroughly tested and calibrated before shipment. Regular preventive maintenance is important to keep your unit functioning properly. The operator should perform routine cleaning and maintenance on a regular basis. For maximum performance and efficiency, it is recommended that the unit be checked and calibrated periodically by a qualified service technician.

The following is a condensed list of preventive maintenance requirements. See the specified section of the instruction manual for further details.

We have qualified service technicians, using NIST traceable instruments, available in many areas. For more information on Preventive Maintenance or Extended Warranties, please contact us at the number below.

Cleaning and calibration adjustment intervals are dependent upon use, environmental conditions and accuracy required.

Tips:
- Fill an upright by starting at the bottom near the probe and add racks to one shelf at a time. Allow freezer to recover to set point between shelves.
- Fill a chest by starting at the left side near the probe. Filling with room temperature racks will result in a long pull-down time.
- Fill unit with frozen product to help overall performance; frozen water jugs, for example.
- Always make certain the vacuum relief port is free of frost and ice, to allow for timely re-entry into the freezer after a door opening.

•Millcreek Road, Box 649 •Marietta, Ohio 45750 USA •740-373-4763
•USA and Canada 888-213-1790 •Telefax: 740-373-4189 •email: service@thermoforma.com

Preventive Maintenance for 8600 Series Freezers

Refer to Manual Section	Action	Monthly	Yearly	Every 2 Years
--	Verify ambient temperature, <90°F	☑		
--	* Adjust door handle for firm latching, as needed	☑		
Figure 1-4 for probe location 5.5, 5.6	Check and clean probe cover, vacuum relief port, gaskets, hinges, and inner doors of ice and snow	☑ *More frequent cleaning may be required, depending on use and environmental conditions*		
5.2	Check air filter. Clean or replace as needed	☑		
1.7, 3.1.a	Check alarm back-up battery	☑		** Replace
--	Check condenser fan motor for unusual motor noise or vibration		☑	
2	* Verify and document calibration, at the minimum, annually		☑	
5.3	* Clean condenser compartment and wipe off condenser		☑	

* Qualified service technicians only
** Dispose of properly, according to all state and federal regulations

To minimize ice build-up inside of freezer:
- Locate the freezer away from drafts or heating/cooling vents
- Keep the number of door openings to a minimum
- Minimize the length of time door is open
- Make sure door latches securely after opening

Section 6 - Factory Installed Options

6.1 BUS - Back Up System (195875, 195877)

Before installation of BUS components, make sure the power to the freezer is disconnected, the battery switch is turned off and the freezer has warmed to ambient temperature.

The built-in BUS (back up system) will keep the freezer chamber temperature below the critical level in the event of a power or equipment failure. If power to the freezer fails, or temperature increases to the back up alarm set point, the BUS injects liquefied gas into the chamber to keep the chamber temperature within the specified range.

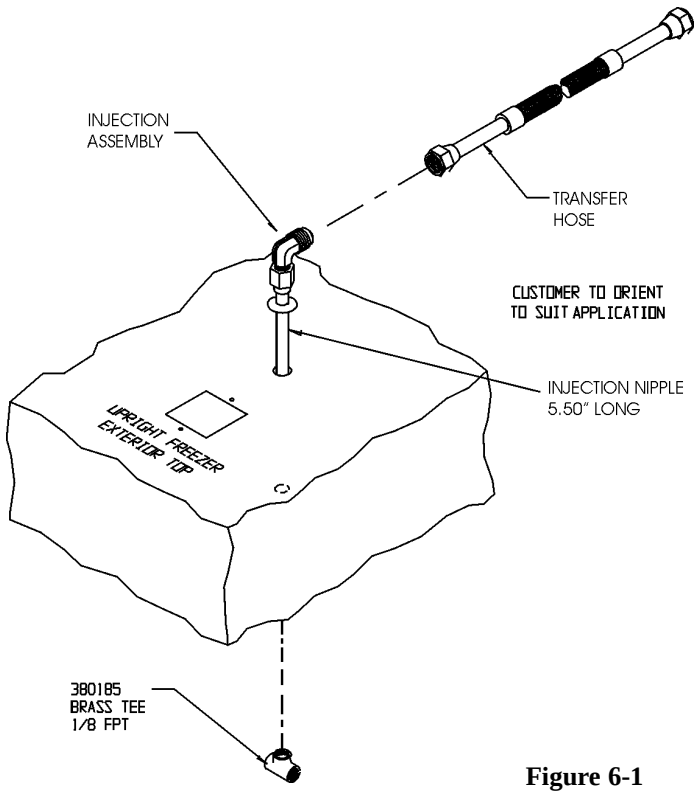


Figure 6-1

The BUS operates on an internal 12-volt, rechargeable battery which is kept charged during normal operation by the integral battery charger.

a. Installing the vent stack, solenoid and injection assembly

Model 8627 Red cell unit only - To gain access to the vent, remove the two screws (one on each side) securing the top of the inventory system. Remove the top from the unit.

1. Install the injection assembly through the 1/2" pre-punched hole, directly behind the 2" vent stack hole in the center of the chamber ceiling. **Note:** Cover the open end of injection assembly with tape to keep insulation from entering the nipple.
2. Slide 3/8" flatwasher over open end of nipple.
3. Insert the covered end of the injection assembly through the exterior hole.
4. Remove the tape covering from the end of the nipple and install the 1/8" NPT brass tee on the open end of the nipple. Place permagum sealant between the brass tee and the interior top.
5. Remove the two Phillips head screws securing the metal bracket on the vent stack assembly.
6. Install the vent stack through the opening and secure it to the top of the freezer, using screws.
7. Go to the interior and seal around the end of the vent stack with permagum.

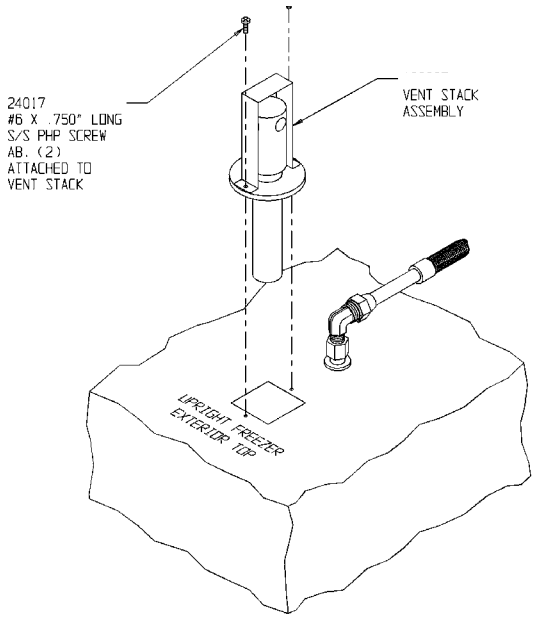


Figure 6-2

8. Install the transfer hose connecting one end to the injection assembly, the other end to the solenoid valve. Install the solenoid valve to the supply source. The solenoid mounting bracket is not required and may be discarded.

When selecting a CO_2 supply cylinder, it must be equipped with a siphon tube.

b. Installing the Temperature Probe

9. Locate the 0.500" pre-punched hole in the upper left hand back corner of the chamber ceiling. Remove the tie wrap securing the coiled probe/solenoid harness. Uncoil the probe lead and run the probe tip (approximately 12") down through 0.500" porthole (Figure 6-4).
10. As shown in Figure 6-3, thread the small tie wrap through the openings in the front of the bracket. Secure the probe on the back of the bracket with the tie wrap.

    Model 8627 Red cell unit only - Remove the two plastic plugs from the tapped holes found on the inventory system top. Mount the probe bracket to the exterior top of the inventory system at the back left corner. Reinstall the top of the inventory system. Align the grooves in the top with the side panels of the upper compartments. A rocking motion may be required to seat the top properly. Secure the top with two screws.
11. Tap #8-32 the two pre-punched holes located on the interior left wall of the freezer. Mount the bracket. Figure 6-4 shows the Back-Up probe mounted on the interior left side wall of the freezer.

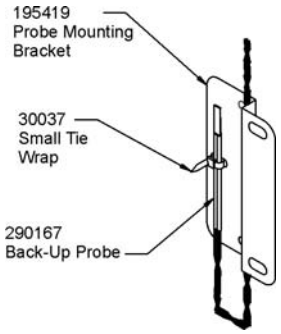


Figure 6-3

c. Connecting the probe/solenoid harness

12. Remove the four screws on the freezer back panel and use them to mount the tie wrap anchors as shown in Figure 6-5. Secure the probe wire with tie wraps.
13. Plug the solenoid/probe connector into the BUS connection and secure with a screw on the right and left side. The connector is keyed.
14. Loosen the terminal screws on the solenoid. Slide the spade lug connectors under the screws and tighten to secure.
15. Connect power to the freezer. Leave the back-up battery switch at the OFF position. Turn the freezer on. The Inject light on the BUS control panel will illuminate but no injection will occur. The Low Battery indicator may also illuminate. Once the freezer has stabilized at the operating temperature, turn the battery switch on.

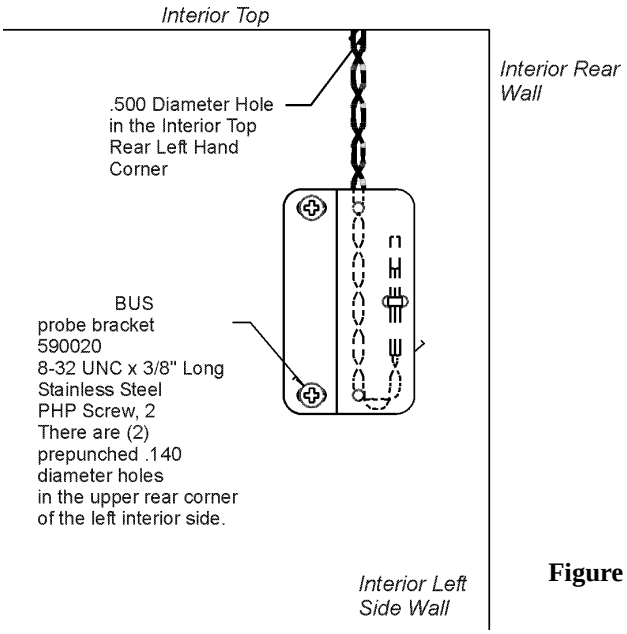


Figure 6-4

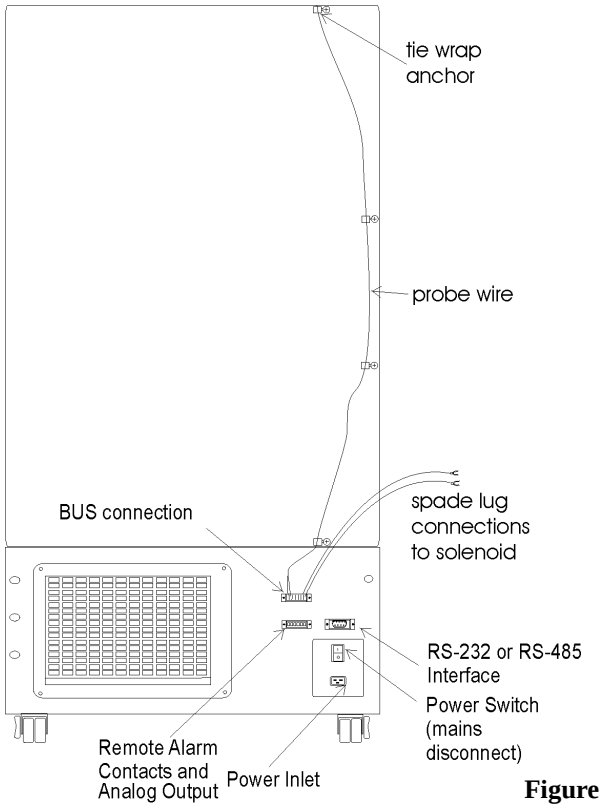


Figure 6-5

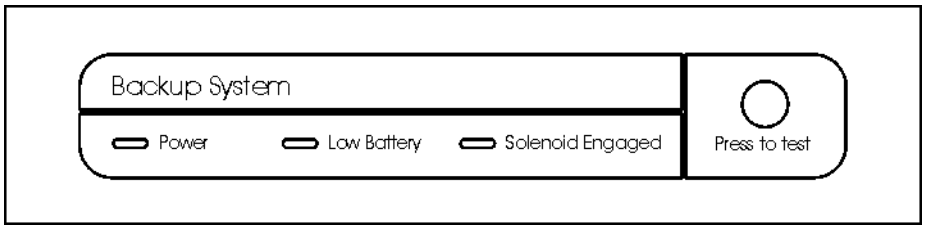


Figure 6-6

d. BUS Control Panel (see figure 6-6)

WARNING! When activated, this unit injects liquid nitrogen or carbon dioxide. Liquid Nitrogen can cause serious freezing (frostbite) if it comes in contact with unprotected skin or eyes. Nitrogen suppresses oxygen levels and may cause suffocation if area is not well ventilated. Refer to Appendix A for the proper handling of liquid LN_2.

Carbon Dioxide gas suppresses oxygen levels and may cause suffocation if area is not well ventilated. Refer to "Handling Liquid CO_2 in Appendix B of this manual.

Power - indicates the unit has AC power.

Low Battery - battery charge is low. The battery needs replaced or recharged.

Solenoid Engaged - BUS has opened the solenoid so it can inject gas (CO_2 or LN_2).

Press-To-Test - Activates the solenoid and injects LN_2 or CO_2 into the freezer chamber as long as the button is depressed. The solenoid engaged indicator should light. If the Low Battery indicator lights during the test, replace the BUS battery. **Note: solenoid will not engage if door is open.**

e. Setting the Optional BUS Set Point

The optional back up system is designed to inject CO_2 or LN_2 into the freezer compartment if the temperature rises above back up system set point. To set the BUS set point:

1. Press the Mode key until the Settings indicator lights.
2. Press the right arrow until "BACKUP = -XX" is displayed in the message center.
3. Press the up or down arrow key until the desired BUS set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Changing the operating temperature set point can affect the BUS set point. The BUS set point will self adjust to maintain a temperature of at least 10°C above the operating temperature set point.

The BUS set point can not be set any colder than the high temperature alarm set point. (See section 1.6.b). If the back-up system is installed with CO_2, then -65°C is the coldest BUS set point that can be used (if the cabinet set point is -75°C or colder).

f. Cleaning the Vent Stack

Routinely check the vent stack for frost or ice build-up. The type of frost that forms in the vent stack is generally very soft and may be easily removed with a bristle brush or soft cloth. if ice build-up has occurred, a complete defrost may occasionally be required. See section 5.4 for freezer defrost instructions.

g. Disconnecting the Fitting Assembly and Transfer Hose

To disconnect the freezer back-up from the gas supply:

1. Close the supply valve.
2. Depress the test button on the Back-Up System control box to remove the gas from the line.
3. Slowly disconnect the fitting assembly from the supply (in the event that any gas remains in the line).

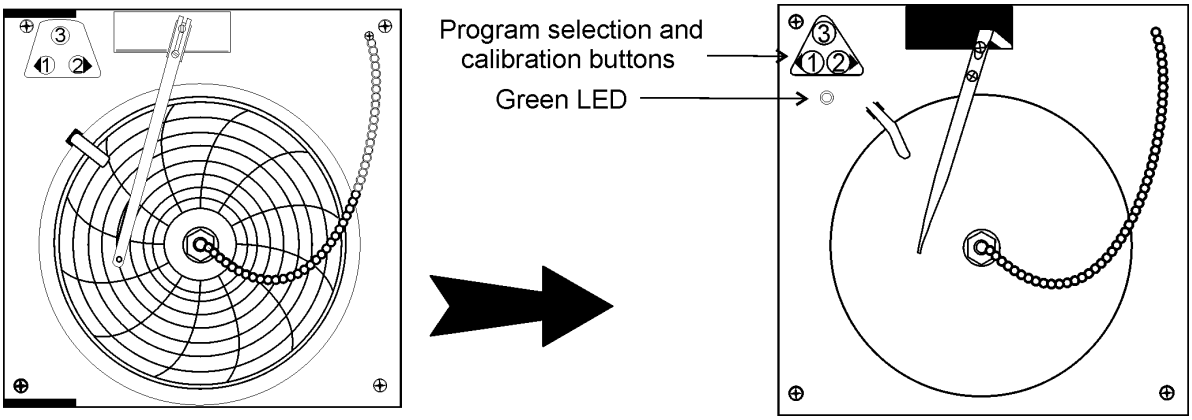


Figure 6-7
Recorder Details

6.2 Chart Recorder

a. Installing the chart paper

1. Open the glass door of the recorder and press button #3 until the pen begins to move outward.
2. Unscrew the knob at the center of the chart and remove the paper.
3. Install the new chart paper, position the paper to the correct time line and replace the knob.
4. Remove the cap from the felt pen and press button #3.

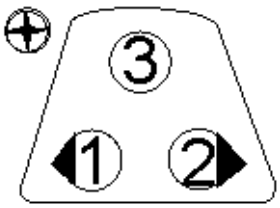


Figure 6-8
Recorder Buttons

b. Recorder Calibration

Changing the recorder range:

The chart recorder contains eight temperature ranges and is factory-programmed for the freezer.

1. Press and hold button #3 for one second, then let the pen move off the chart paper.
2. Press and hold for five seconds either button #1 or button #2.
3. Release the button and the green LED will begin to flash. Count the number of flashes to determine the present program setting.
4. To change the program setting, press the left or right arrows to increase or decrease the count.
5. When the desired program number is flashing, press button #3 to bring the pen arm back onto the chart. Recording will begin in the new program.

Program	From	To
1	-40	30°C
2	0	60°C
3	-100	38°C
4	-5	50°C
5	0	100°C
6	-100	200°C
7	-115	50°C
8	-10	70°C

Calibrating the chart recorder:

The recorder must be in service for 24 hours before performing the following calibration procedure.

1. Place an accurate thermometer in the chamber next to the recorder probe.
2. Temperature probes for the recorder are located in the left front corner of the freezer chamber (Figure 1-4).
3. After about three minutes, compare the thermometer reading with the chart recorder reading.
4. If an adjustment is necessary, press the #1 button to move the pen to the left or the #2 to move the pen to the right. The button must be held about five seconds before the pen begins to move. Release the button when the pen position matches the thermometer.

NOTE: The felt-tip pen on the recorder requires periodic replacement. Usually the ink will appear to fade before replacement becomes necessary. Additional pen tips may be purchased. Refer to Parts List, Section 8.

6.3 Datalogger

Dataloggers and ELPRO evaluation software provide monitoring and documentation of temperature and alarm conditions. The dataloggers have a memory capacity of 64,000 measured values or data points. Temperature is measured, stored and displayed. Alarm conditions are recorded. Optional evaluation software permits data to be downloaded to a PC. A variety of statistical information is provided through calculations, analysis, graphs and printed reports. Refer to the ELPRO documentation for operating instructions for the datalogger.

6.4 Water-cooled Condenser (195145, 195611)

The water-cooled condenser is a factory installed option and requires a qualified technician at freezer installation. The installation should include proper adjustment of the regulating valve, which controls the discharge pressure. Specifications for this option are displayed in figure 6-9.

Water Source	**Tower**	**City**
Water Pressure	Not to exceed 150 psig	
Water Temperature Range	Not to exceed 29.4C (85F)	
Inlet Connection	0.5” compression	
Outlet Connection	0.5” compression	
Flow Rate Required	3.0 gallons (11.4 liters) per minute	1.0 gallon (3.8 liters) per minute
Drain Required	No (return line is required)	Yes

Figure 6-9

6.5 Five Inner Door Option (189405, 189406, 189407, 195642)

The five inner door option is factory installed. The freezer is converted to accommodate four adjustable specimen shelves with the fifth “shelf” as the bottom of the freezer chamber.

Specifications

Model	8602/8627*red cell*	8603	8604	8605	8606
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient				
Exterior Dimensions	33.3"W x 77.8"H x 31.0" 84.6 x 197.6 x 78.7 cm	33.3"W x 77.8"H x 31.0" 84.6 x 197.6 x 78.7 cm	33.3"W x 77.8"H x 37.0" 84.6 x 197.6 x 94.0 cm	33.3"W x 77.8"H x 37.0" 84.6 x 197.6 x 94.0 cm	40.8"W x 77.8"H x 37.0" 103.6 x 197.6 x 94.0 cm
Interior Dimensions	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 25.3" 58.4 x 130.8 x 64.3 cm	23.0"W x 51.5"H x 25.3" 58.4 x 130.8 x 64.3 cm	30.6"W x 51.5"H x 25.3" 77.7 x 130.8 x 64.3 cm
Capacity	13.0 cu. ft. (368.1 liters)	13.0 cu. ft. (368.1 liters)	17.3 cu. ft. (489.9 liters)	17.3 cu. ft. (489.9 liters)	23.0 cu. ft. (651.3 liters
Refrigeration	Two 1 HP (2545 BTUH each)				
Insulation	Non-CFC, foamed-in-place urethane: 5.0" (12.7 cm) cabinet; 4.5" (11.4 cm) door				
Electrical	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC
Breaker Requirements	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker
Shipping Weight Motor	712 lbs. (323.0 kg)	712 lbs. (323.0 kg)	795 lbs. (360.6 kg)	795 lbs. (360.6 kg)	900 lbs. (408.2 kg)

Model	8607	8656	8690	8691	8692
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient				
Exterior Dimensions	46.8"W x 77.8"Hx37.0" 118.9x197.6x94.0cm	40.8"W x 77.8"H x 37.0" 103.6x197.6x94.0cm	40.8"W x 77.8"H x 37.0" 103.6 x 197.6 x 94.0 cm	33.3"W x 77.8"H x 31.0" 84.6 x 197.6 x 78.7 cm	33.3"W x 77.8"H x 31.0" 84.6 x 197.6 x 78.7 cm
Interior Dimensions	36.6"Wx51.5"Hx27.0" 93.0x130.8x68.6cm	30.6"Wx51.5"Hx25.3" 77.7x130.8x64.3cm	30.6"W x 51.5"H x 25.3" 77.7 x 130.8 x 64.3 cm	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm
Capacity	28.0 cu. ft. (792.8 liters)	23.0 cu. ft. (651.3 liters	23.0 cu. ft. (651.3 liters	13.0 cu. ft. (368.1 liters)	13.0 cu. ft. (368.1 liters)
Refrigeration	Two 1 HP (2545 BTUH each)				
Insulation	Non-CFC, foamed-in-place urethane: 5.0" (12.7 cm) cabinet; 4.5" (11.4 cm) door				
Electrical	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V
Breaker Requirements	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker
Shipping Weight Motor	980 lbs. (444.5 kg)	900 lbs. (408.2 kg)	900 lbs. (408.2 kg)	712 lbs. (323.0 kg)	712 lbs. (323.0 kg)

*Compressors may not cycle off with cabinet running at -86C in a 32C ambient.

Specifications

Model	8693	8694	8695
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient		
Exterior Dimensions	33.3”W x 77.8”H x 37.0” 84.6 x 197.6 x 94.0 cm	33.3”W x 77.8”H x 37.0” 84.6 x 197.6 x 94.0 cm	40.8”W x 77.8”H x 37.0” 103.6 x 197.6 x 94.0 cm
Interior Dimensions	23.0”W x 51.5”H x 25.3” 58.4 x 130.8 x 64.3 cm	23.0”W x 51.5”H x 25.3” 58.4 x 130.8 x 64.3 cm	30.6”W x 51.5”H x 25.3” 77.7 x 130.8 x 64.3 cm
Capacity	17.3 cu. ft. (489.9 liters)	17.3 cu. ft. (489.9 liters)	23.0 cu. ft. (651.3 liters
Refrigeration	Two 1 HP (2545 BTUH each)		
Insulation	Non-CFC, foamed-in-place urethane: 5.0” (12.7 cm) cabinet; 4.5” (11.4 cm) door		
Electrical	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC	230V,50/60Hz, 12.0FLA Operating Range: 208VAC-240VAC
Breaker Requirements	20 amp, 120V, Dedicated Circuit, 20 amp Time Delay Breaker	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker	15 amp, 230V, Dedicated Circuit, 15 Amp Time Delay Breaker
Shipping Weight Motor	795 lbs. (360.6 kg)	795 lbs. (360.6 kg)	900 lbs. (408.2 kg)

*Compressors may not cycle off with cabinet running at -86C in a 32C ambient.

Certifications

Declaration of Conformity is available from the factory

Safety Specifications

Indoor Use Only

Altitude - up to 2,000 meters

Temperature - 5°C to 40°C

Humidity - maximum RH 80% for temperatures up to 31°C, decreasing linearly to 50% RH at 40°C

Mains Supply Fluctuations - Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage

Installation Category II [1]

Pollution Degree 2 [2]

Class of Equipment I

---

1 Installation category (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500V for a 230V supply and 1500V for a 120V supply.

2 Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
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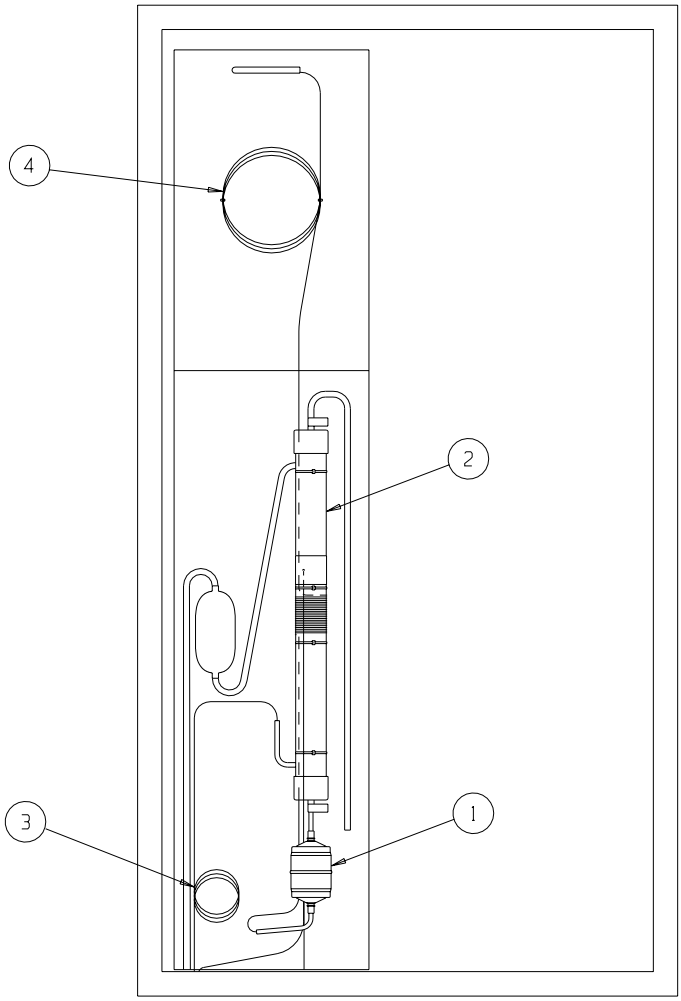


BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	209016	DRYER
2	211039	HEAT EXCHANGER
3	227927	HIGH STAGE CAP. TUBE
4	227928	LOW STAGE CAP. TUBE

MODEL/PART NAME: 8600 UP-RIGHT FREEZER

DWG TITLE: HEAT EXCHANGER ASSEMBLY

DWN: PDK	CAD: PDK	APPD:	DATE: 12-04-02	SCALE: NTS

MATERIAL: N/A

PAINT COLOR: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±, .XXX=±

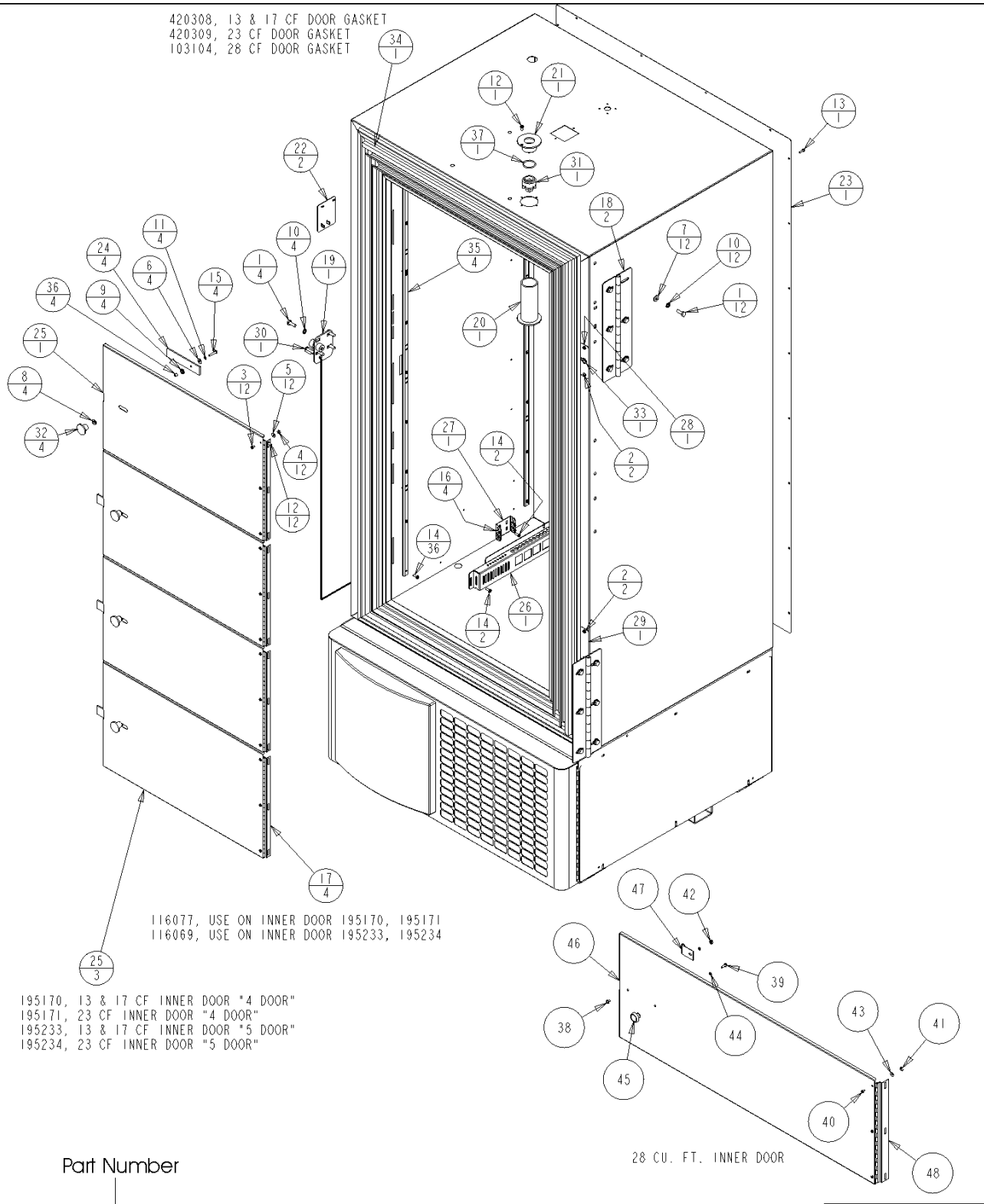
DRAWING NUMBER 8602-205-1

SIZE B

Upright Freezer Heat Exchanger Assembly

8602-205-1-B Rev. 0
Page 1 of 1

ThermoForma
BOX 649, MARIETTA, OHIO 45750



Part Number

1
3

Quantity

Upright Freezer Cabinet Assembly

8602-200-1-B Rev. 2
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	11-07-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	06-05-03	PDK	PDK	LDN	ADDED VACUUM RELIEF PORT
2	FR-1698	09-19-03	JDL	PDK	AMS	ADDED SCREW TO VACUUM RELIEF PORT

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	20003	1/4-20 X 3/4 SS HH CAP SCREW
2	22053	#8-32 X 1/2 SS PHP SCREW
3	22115	#6-32 X 1/4 SS PHP SCREW
4	23009	#6-32 SS HEX NUT
5	23020	#6 SS FLAT WASHER
6	23021	#8 SS FLAT WASHER
7	23023	1/4 SS FLAT WASHER
8	23043	NYLON FLAT WASHER
9	23044	1/4" NYLON SHOULDER WASHER
10	23062	1/4 SS EXT TOOTH LOCKWASHER
11	23080	#8 SS SPRING LOCKWASHER
12	24032	#8-32 X 3/8 SS PHP SCREW F POINT
13	24041	#6-32 X 1/2 SS PHP SCREW F POINT
14	24042	#8-32 X 1/2 SS PHP SCREW F POINT
15	59008	#8-32 X 7/8 SS PHP SCREW
16	114020	5/8" X 1/2" ID GROMMET
17	116077	FRONT PANEL HINGE
18	116092	EXTERIOR FREEZER DOOR HINGE
19	121069	FREEZER CAM LATCH STRIKE
20	180266	VACUUM RELIEF BODY
21	180268	VACUUM RELIEF PORT EXTERIOR CAP - SNAP IN
22	180312	CAM LATCH STRIKE COVER
23	189921	EXTERIOR BACK 13 & 17
24	195169	LATCH TAB
25	195170	13/17 CU. FT. INNER DOOR
26	195866	PROBE GUARD
27	195867	PROBE MOUNT
28	195874	CABINET CABLE COVER PLATE
29	195879	CABINET CABLE BLANK COVER PLATE
30	195900	SINGLE DOOR SWITCH ASSY.
31	247016	CHECK VALVE
32	285658	BLACK PLASTIC KNOB
33	330010	1/2" SPLIT SNAP BUSHING
34	420308	13 & 17 CU. FT. SINGLE DOOR FRAME GASKET
35	500177	PILSATER STRIPS
36	515083	1/4 DIA. X 1/4L SS SPACER
37	PART of 247016	SILICONE O-RING
38	22051	#8-32 X 1/4 SS PHP SCREW
39	22053	#8-32 X 1/2 SS PHP SCREW
40	22115	#6-32 X 1/4 SS PHP SCREW
41	23009	#6-32 SS HEX NUT
42	23010	#8-32 SS HEX NUT
43	23020	#6 SS FLAT WASHER
44	23080	#8 SS SPRING LOCKWASHER
45	120400	BLACK PLASTIC KNOB
46	195511	28 CU. FT. INNER DOOR
47	195602	LATCH TAB
48	116090	FRONT PANEL HINGE

Thermo
ELECTRON CORPORATION
Box 649, Marietta, Ohio 45750

MODEL/PART NAME: 8600 UP-RIGHT FREEZER

DWG TITLE: 8602 UP-RIGHT FREEZER ASSEMBLY

DWN: PDK	CAD: PDK	APPD:MAH	DATE: 10-30-02	SCALE: 0.094

MATERIAL: N/A

PAINT: N/A

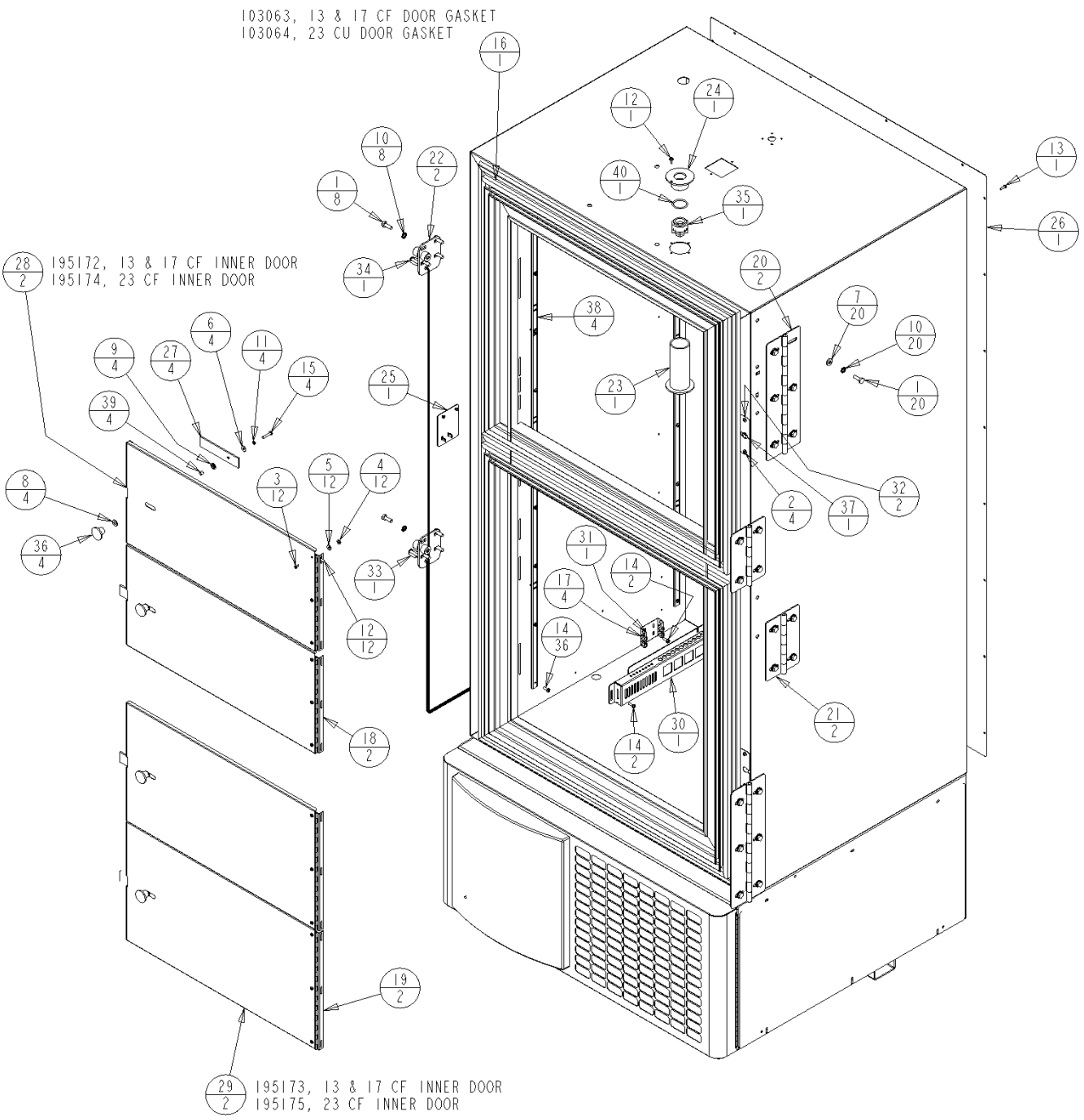
TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.xxx=±

DRAWING NUMBER: 8602-200-1

SIZE: B

Upright Freezer Cabinet Assembly

8602-200-1-B Rev. 2
Page 2 of 2



Part Number

1
3

Quantity

Upright Freezer
Cabinet
Assembly
Double Door

8602-200-2-B Rev. 2
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	11-07-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	06-05-03	PDK	PDK	LDN	ADDED VACUUM RELIEF PORT
2	FR-1698	09-19-03	JDL	PDK	AKS	ADDED SCREW TO VACUUM RELIEF PORT

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	20003	1/4-20 X 3/4 SS HH CAP SCREW
2	22053	#8-32 X 1/2 SS PHP SCREW
3	22115	#6-32 X 1/4 SS PHP SCREW
4	23009	#6-32 SS HEX NUT
5	23020	#6 SS FLAT WASHER
6	23021	#8 SS FLAT WASHER
7	23023	1/4 SS FLAT WASHER
8	23043	NYLON FLAT WASHER
9	23044	1/4" NYLON SHOULDER WASHER
10	23062	1/4 SS EXT TOOTH LOCKWASHER
11	23080	#8 SS SPRING LOCKWASHER
12	24032	#8-32 X 3/8 SS PHP SCREW F POINT
13	24041	#6-32 X 1/2 SS PHP SCREW F POINT
14	24042	#8-32 X 1/2 SS PHP SCREW F POINT
15	59008	#8-32 X 7/8 SS PHP SCREW
16	103063	DOUBLE DOOR FRAME GASKET
17	114020	5/8" X 1/2" ID GROMMET
18	116069	FRONT PANEL HINGE
19	116077	FRONT PANEL HINGE
20	116092	EXTERIOR FREEZER DOOR HINGE
21	116093	EXTERIOR FREEZER DOOR HINGE
22	121069	FREEZER CAM LATCH STRIKE
23	180266	VACUUM RELIEF BODY
24	180268	VACUUM RELIEF PORT EXTERIOR CAP - SNAP IN
25	180312	CAM LATCH STRIKE COVER
26	189921	EXTERIOR BACK 13 & 17
27	195169	LATCH TAB
28	195172	13/17 CU. FT. INNER DOOR, TOP
29	195173	23 CU. FT. INNER DOOR, TOP
30	195866	PROBE GUARD
31	195867	PROBE MOUNT
32	195874	CABINET CABLE COVER PLATE
33	195901	BOTTOM DOOR SWITCH ASSY.
34	195902	TOP DOOR SWITCH ASSY.
35	247016	CHECK VALVE
36	285658	BLACK PLASTIC KNOB
37	330010	1/2" SPLIT SNAP BUSHING
38	500177	PILSATER STRIPS
39	515083	1/4 DIA. X 1/4L SS SPACER
40	PART of 247016	SILICONE O-RING

MODEL/PART NAME: 8600 UP-RIGHT FREEZER

DWG TITLE: 8691 UP-RIGHT FREEZER ASSEMBLY

DWN: PDK	CAD: PDK	APPD: MAH	DATE: 10-30-02	SCALE: 0.094

MATERIAL: N/A

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.XXX=±

DRAWING NUMBER 8602-200-2

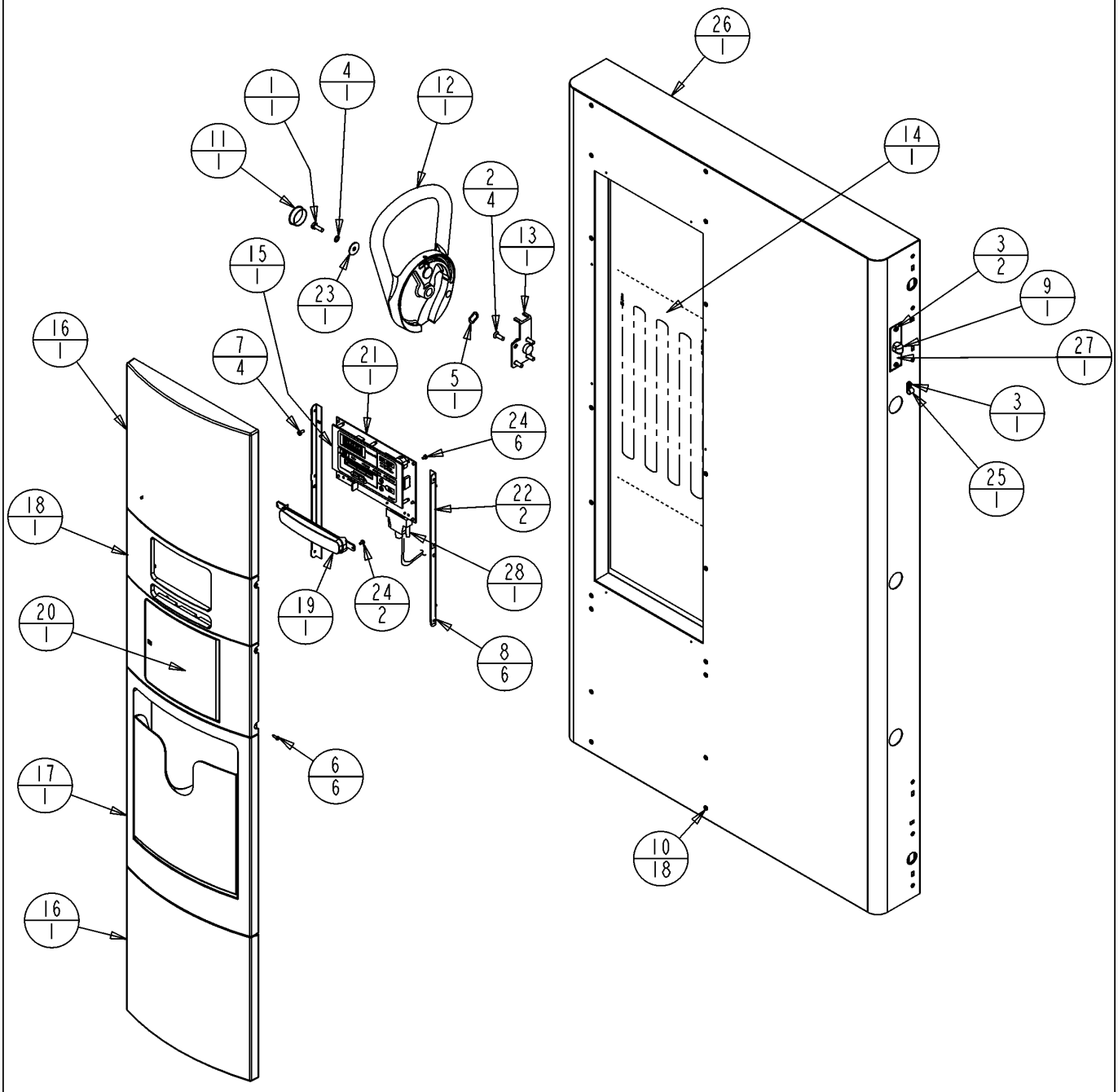
SIZE B

Upright Freezer Cabinet Assembly Double Door

8602-200-2-B Rev. 2

Thermo ELECTRON CORPORATION
Box 649, Marietta, Ohio 45750

195771, 23 CU. FT. UPRIGHT FREEZER DOOR "8600"
195772, 28 CU. FT. UPRIGHT FREEZER DOOR "8600"



Part Number

7 / 3

Quantity

Upright Freezer Door Assembly Single Door

8602-201-1-B Rev. 2
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	10-30-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	06-06-03	DHG	PDK	LDN	REVISED CONTROL PANEL FASTENERS
2	FR-1776	03-08-04	AT	pdk	AKS	CORRECTED CONTROL PANEL STK NUMBER

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	20003	1/4-20 X 3/4 SS HH CAP SCREW
2	20058	#1/4-20 X 3/4 SS FHP UC SCREW
3	22053	#8-32 X 1/2 SS PHP SCREW
4	23033	1/4 SS INTERNAL TOOTH LOCK WASHER
5	23057	5/8 WAVE WASHER
6	24016	#6 X 1/2" SS PHP SCREW AB POINT
7	24032	#8-32 X 3/8 SS PHP SCREW F POINT
8	25040	#6 U SPEED NUT STL. STL.
9	30033	RIGHT ANGLE STRAIN RELIEF
10	111028	TINNERMAN TUBULAR SPEED CLIP
11	117038	1-3/8" DIA. THERMO WHITE HOLE PLUG
12	121068	121068 FINISHED HANDLE/LATCH ASSEMBLY
13	121075	CAM LATCH MOUNT
14	132115	HEATER, 5W, 14VDC
15	140367	CONTROL PANEL ASSEMBLY
16	180301	THERMO CONTROL CENTER BLANK PANEL
17	180304	THERMO DATA STORAGE POCKET ASSEMBLY
18	180305	CONTROL CENTER DISPLAY BEZEL
19	180306	THERMO BACK-UP SYSTEM BLANK PANEL
20	180308	THERMO CONTROL CENTER RECORDER BLANK
21	191659	FREEZER DISPLAY BOARD
22	195837	MOUNTING ANGLE FOR 180305
23	510305	1" OD FLAT WASHER
24	590027	#6-32 X 1/4 SS PHP EXT SEMS SCREW
25	600085	5/16 NYLON CABLE CLAMP
26	195770	13 & 17 CU. FT. UPRIGHT FREEZER DOOR "8600"
27	195830	UPRIGHT DOOR WIREWAY COVER PLATE
28	430336	15 FT, RS-232 CABLE 25 POS.

MODEL/PART NAME: ULT UP-RIGHT SERIES FREEZER

DWG TITLE: 8600 SINGLE DOOR BOM ASSEMBLY

DWN: PDK	CAD: PDK	APPD: MAH	DATE: 10-30-02	SCALE: 0.094

MATERIAL: N/A

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.XXX=±

DRAWING NUMBER 8602-201-1

SIZE B

Upright Freezer Door Assembly Single Door

8602-201-1-B Rev. 2

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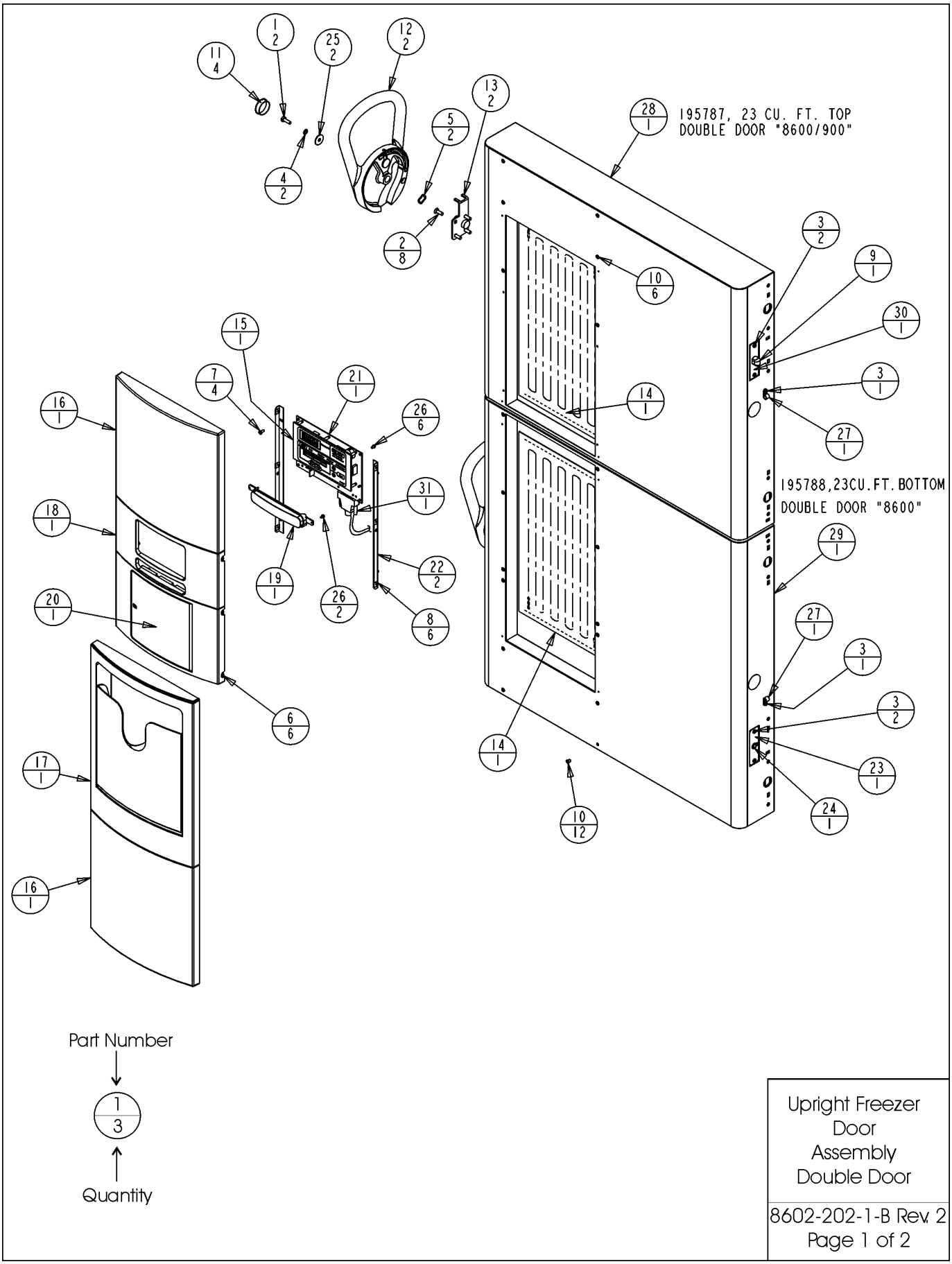
ELECTRON CORPORATION
Controlled Environment Equipment
Box 649, Marietta, Oh 45750


195787, 23 CU. FT. TOP DOUBLE DOOR "8600/900"
195788,23CU.FT.BOTTOM DOUBLE DOOR "8600"
Part Number
Quantity
Upright Freezer Door Assembly Double Door
8602-202-1-B Rev. 2
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	11-05-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	06-06-03	DHG	PDK	LDN	REVISED CONTROL PANEL FASTENERS
2	FR-1776	03-09-04	AT	pdk	AKS	CORRECTED CONTROL PANEL STK NUMBER

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	20003	1/4-20 X 3/4 SS HH CAP SCREW
2	20058	#1/4-20 X 3/4 SS FHP UC SCREW
3	22053	#8-32 X 1/2 SS PHP SCREW
4	23033	1/4 SS INTERNAL TOOTH LOCK WASHER
5	23057	5/8 WAVE WASHER
6	24016	#6 X 1/2" SS PHP SCREW AB POINT
7	24032	#8-32 X 3/8 SS PHP SCREW F POINT
8	25040	#6 U SPEED NUT STL. STL.
9	30033	RIGHT ANGLE STRAIN RELIEF
10	111028	TINNERMAN TUBULAR SPEED CLIP
11	117038	1-3/8" DIA. THERMO WHITE HOLE PLUG
12	121068	121068 FINISHED HANDLE/LATCH ASSEMBLY
13	121075	CAM LATCH MOUNT
14	132114	HEATER, 3W, 14VDC
15	140367	CONTROL PANEL ASSEMBLY
16	180301	THERMO CONTROL CENTER BLANK PANEL
17	180304	THERMO DATA STORAGE POCKET ASSEMBLY
18	180305	CONTROL CENTER DISPLAY BEZEL
19	180306	THERMO BACK-UP SYSTEM BLANK PANEL
20	180308	THERMO CONTROL CENTER RECORDER BLANK
21	191659	FREEZER DISPLAY BOARD
22	195837	MOUNTING ANGLE FOR 180305
23	195874	CABINET CABLE COVER PLATE
24	330010	1/2" SPLIT SNAP BUSHING
25	510305	1" OD FLAT WASHER
26	590027	#6-32 X 1/4 SS PHP EXT SEMS SCREW
27	600085	5/16 NYLON CABLE CLAMP
28	195785	13/17 CF TOP DOUBLE DOOR "8600/900"
29	195786	13/17 CF BOTTOM DOUBLE DOOR "8600"
30	195830	UPRIGHT DOOR WIREWAY COVER PLATE
31	430336	15 FT, RS-232 CABLE 25 POS.

MODEL/PART NAME: ULT UP-RIGHT SERIES FREEZER

DWG TITLE: 8600 DOUBLE DOOR BOM ASSEMBLY

DWN: PDK	CAD: PDK	APPD: MAH	DATE: 11-05-02	SCALE: 0.094

MATERIAL: N/A

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.XXX=±

DRAWING NUMBER 8602-202-1

SIZE B

Upright Freezer Door Assembly Double Door

8602-202-1-B Rev. 2

Thermo
ELECTRON CORPORATION
Controlled Environment Equipment
Box 649, Marietta, Oh 45750

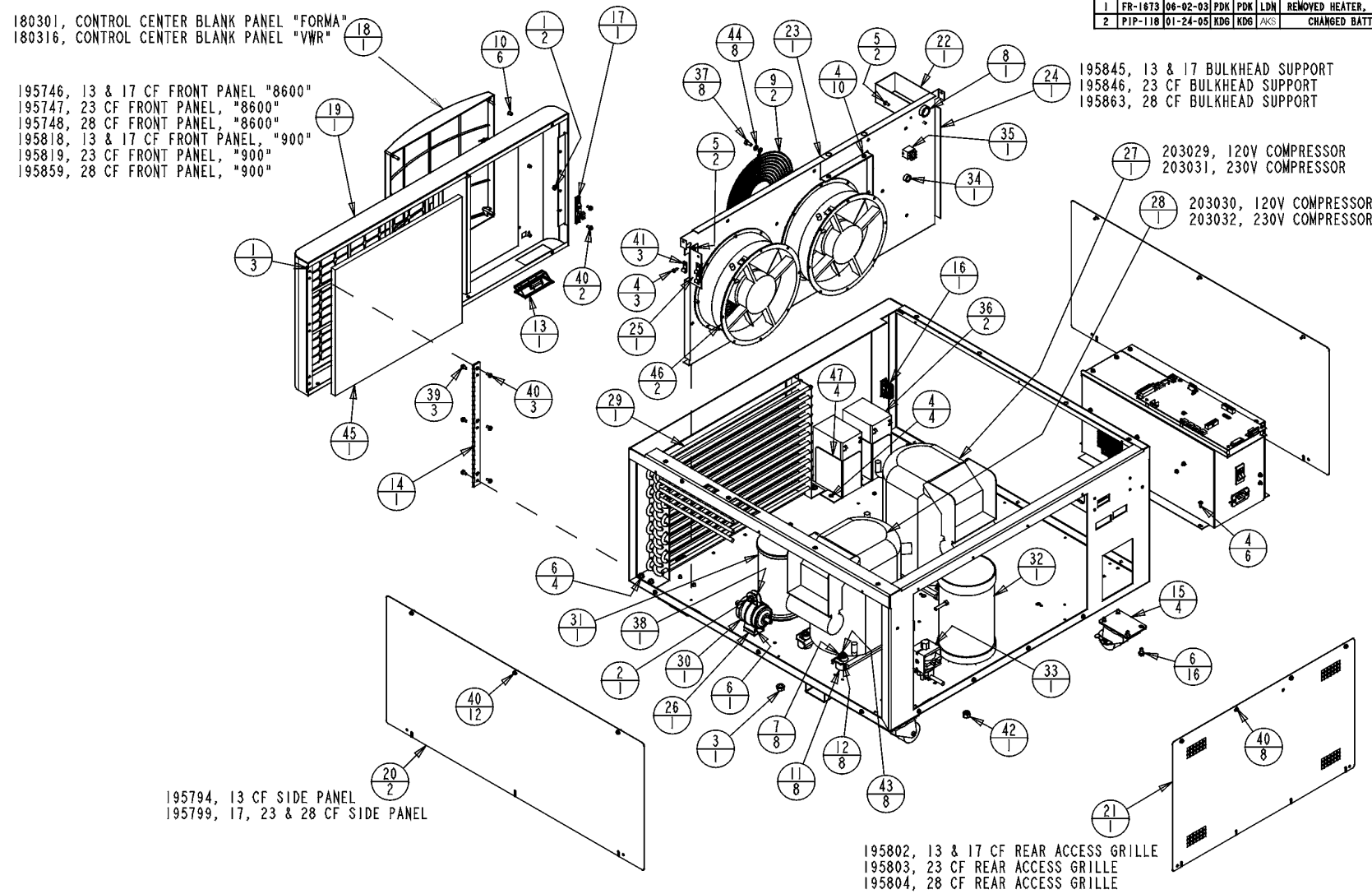
BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	23002	#8-32 ZP LKWASH HEX NUT
2	23011	1/4-20 ZP LKWASH HEX NUT
3	23013	3/8-16 ZP LKWASH HEX NUT
4	24030	#8 X 1/2" TEKS SCREW
5	24032	#8-32 X 3/8 SS PHP SCREW F POINT
6	24038	1/4-20 X 1/2 SELF TAPPING SCREW
7	24049	1/4 ZP FLAT WASHER
8	30016	1" SNAP BUSHING
9	108020	10" WIRE FAN GUARD
10	111028	TINNERMAN TUBULAR SPEED CLIP
11	114033	COMPRESSOR MOUNTING FOOT
12	114034	COMPRESSOR MOUNTING SLEEVE
13	115032	BLACK ABS PLASTIC PULL
14	116115	FRONT PANEL HINGE
15	120011	DUAL WHEEL CASTER
16	121071	LATCH CATCH, PART OF 121071 ASSEMBLY
17	121071	LATCH KEEPER, PART OF 121071 ASSEMBLY
18	180301	THERMO CONTROL CENTER BLANK PANEL
19	195746	13&17 CU. FT. UR FRZ BASE FRONT PNL,760&8600
20	195799	SIDE PANEL 17, 23 AND 28 CU. FT. UPRIGHT
21	195802	13/17 REAR ACCESS GRILLE
22	195829	MULLION/DOOR SWITCH WIRE COVER
23	195844	UR FRZ FAN BULKHEAD
24	195845	13&17 CU. FT. FAN BULKHEAD SUPPORT
25	195882	REFRIGERATION LINE SUPPORT BRACKET
26	200126	2" RIGID HANGER
27	203031	230V HIGH STAGE COMPRESSOR
28	203032	230V LOW STAGE COMPRESSOR
29	204009	REFRIGERATION CONDENSER
30	209020	LIQUID LINE FILTER DRYER WITH ACCESS PORT
31	214006	OIL SEPARATOR
32	214018	10.000" H X 5.000" DIA. EXPANSION TANK
33	220626	120V - 50/60 HZ SOLENOID VALVE
34	330002	5/8" SNAP BUSHING
35	360248	MINI SNAP-IN POWER SWITCH
36	400159	SEALED LEAD ACID BATTERY - 12 VOLT - 7.2 Ah
37	510035	#12-24 X 1/2 SS HH CAP SCREW
38	550043	1/4-20 X 1"L ZP CARRIAGE BOLT
39	590020	#8-32 X 3/8 SS PHP EXT SEMS SCREW
40	590029	#8-32 X 3/8 SS PHP EXT SEMS SCREW W/PATCH
41	600080	1/4 ALUM CLAMP W/LINER
42	610053	3/8-16 NYLON INSERT LOCK NUT
43	680008	1/4-20 X 1-3/4 SELF TAPPING SCREW
44	730087	#12 SS EXT TOOTH LOCKWASHER
45	760203	AIR FILTER
46	900113	10" TUBEAXIAL FAN, 115V
47	1950074	BATTERY MOUNTING BRACKET

Exploded Parts
Model: 8600 Series
-86C
Upright Freezers

8602-203-1-B Rev. 2
Page 1 of 2

0	N/A	12-11-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	06-02-03	PDK	PDK	LDN	REMOVED HEATER, REVISED HARDWARE
2	PIP-118	01-24-05	KDG	KDG	AKS	CHANGED BATTERY MOUNTING



MODEL/PART NAME: 8600 UP-RIGHT FREEZER

DWG TITLE: 8605 UP-RIGHT FREEZER ASSEMBLY

DWN: PDK	CAD: PDK	APPD: MAH	DATE: 10-30-02	SCALE: 0.094

MATERIAL: N/A

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.XXX=±

DRAWING NUMBER: 8602-203-1

SIZ: B

Exploded Parts
Model: 8600 Series
-86C
Upright Freezers

8602-203-1-B Rev. 2

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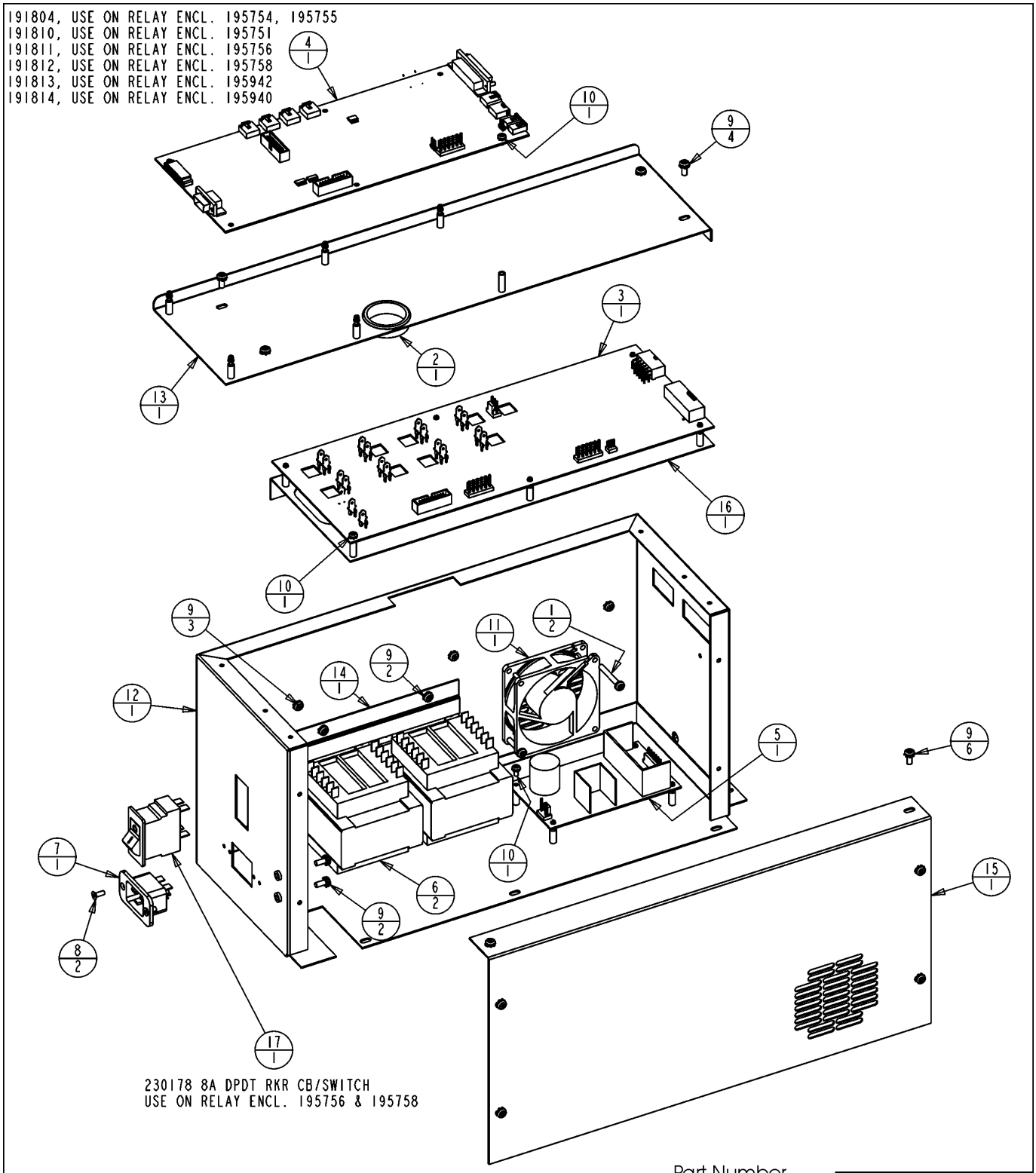
Box 649, Marietta, Oh 45750



1. COMMON TO: 195751, 195754, 195755, 195756, 195758, 195940 & 195942

Part Number
1/3
Quantity

230 Volt
Relay Enclosure
Assembly

8602-204-1-B Rev. 4
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	12-02-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	03-06-03	DHG	KDG	LDN	MADE COMMON TO 195940 & 195942
2	FR-1789	07-28-04	ADT	KDG	LDN	CHG. MICRO BOARD FOR VACUUM RELIEF
3	PIP-111	08-02-04	TJ	KDG	LDN	REMOVED 114031 GROMMET EDGING
4	FR-1806	08-23-04	JDL	KDG	AKS	SPECIFIED AMPERAGE OF CB SWITCHES

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	22143	#8-32 x 1-1/4 SS PHP SCREW
2	30077	1-1/2" SNAP BUSHING
3	191658	HIGH VOLTAGE BOARD 230V
4	191804	MICRO BOARD (-86 HIGH END)
5	400165	SWITCHER BOARD
6	420090	175V TRANSFORMER
7	460169	POWER INLET, 16/20A
8	490009	#6-32 X 3/8 SS FHP UC SCREW
9	590020	#8-32 X 3/8 SS PHP EXT SEMS SCREW
10	590027	#6-32 X 1/4 SS PHP EXT SEMS SCREW
11	900134	TUBEAXIAL FAN, 30 CFM, 12V
12	195631-16-1	RELAY ENCLOSURE SPOTWELD SUB-ASSEMBLY
13	195631-16-4	RELAY ENCLOSURE COVER/191656 SUPPORT
14	195631-31-3	TRANSFORMER HOLD DOWN
15	195631-31-5	RELAY ENCLOSURE COVER (MAIN)
16	195730-16-1	191658 SUPPORT BRACKET SUB-ASSEMBLY
17	230184	15A DPDT SWITCH/CIRCUIT BKR

MODEL/PART NAME: RELAY ENCLOSURE ASSEMBLY

DWG TITLE: 230 VOLT RELAY ENCLOSURE ASSY (HIGH END)

DWN: DHG	CAD: DHG	APPD: MAH	DATE: 07-26-01	SCALE: 0.250

MATERIAL: -

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=± .xxx=±

DRAWING NUMBER: 8602-204-1

SIZE: B

230 Volt Relay Enclosure Assembly

8602-204-1-B Rev. 4

Page 2 of 2

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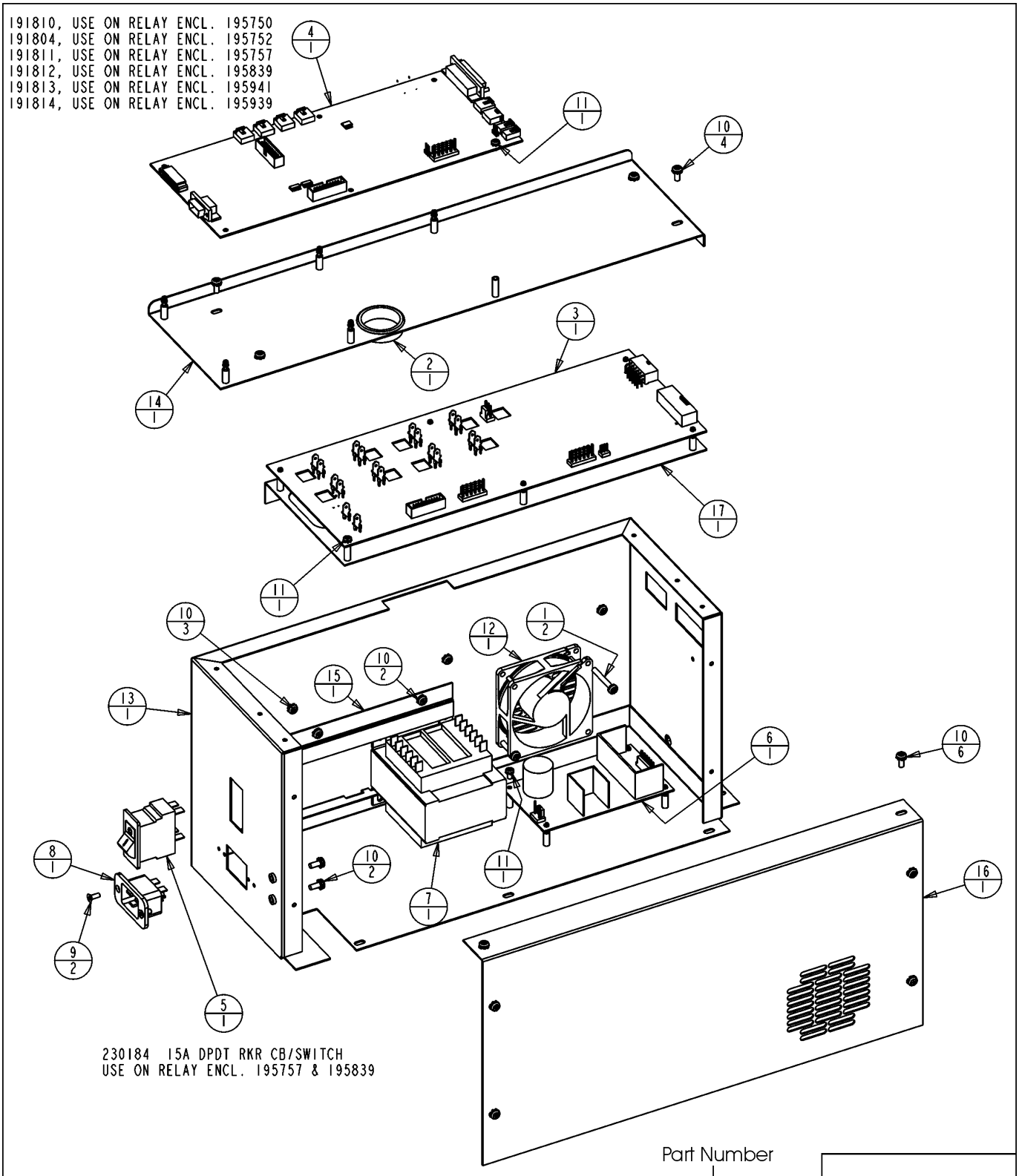
Controlled Environment Equipment
Box 649, Marietta, Oh 45750



1. COMMON TO: 195750, 195752, 195757, 195839, 195939 & 195941

Part Number → 13 ← Quantity

120 Volt
Relay Enclosure
Assembly

8602-204-2-B Rev. 4
Page 1 of 2

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	12-02-02	PDK	PDK	MAH	RELEASED FOR PRODUCTION
1	FR-1673	03-06-03	DHG	KDG	KDG	MADE COMMON TO 195939 & 195941
2	FR-1789	07-28-04	ADT	KDG	LDN	CHG. MICRO BOARD FOR VACUUM RELIEF
3	PIP-111	08-02-04	TJ	KDG	LDN	REMOVED 114031 GROMMET EDGING
4	FR-1806	08-23-04	JDL	KDG	AKS	SPECIFIED AMPERAGE OF CB SWITCHES

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	22143	#8-32 x 1-1/4 SS PHP SCREW
2	30077	1-1/2" SNAP BUSHING
3	191680	HIGH VOLTAGE BOARD 120V
4	191810	MICRO BOARD (-86 LOW END)
5	230183	20A DPDT SWITCH/CIRCUIT BKR
6	400165	SWITCHER BOARD
7	420065	175V TRANSFORMER
8	460169	POWER INLET, 16/20A
9	490009	#6-32 X 3/8 SS FHP UC SCREW
10	590020	#8-32 X 3/8 SS PHP EXT SEMS SCREW
11	590027	#6-32 X 1/4 SS PHP EXT SEMS SCREW
12	900134	TUBEAXIAL FAN, 30 CFM, 12V
13	195631-16-1	RELAY ENCLOSURE SPOTWELD SUB-ASSEMBLY
14	195631-16-4	RELAY ENCLOSURE COVER/191656 SUPPORT
15	195631-31-3	TRANSFORMER HOLD DOWN
16	195631-31-5	RELAY ENCLOSURE COVER (MAIN)
17	195730-16-1	191658 SUPPORT BRACKET SUB-ASSEMBLY

MODEL/PART NAME: RELAY ENCLOSURE ASSEMBLY

DWG TITLE: 120 VOLT RELAY ENCLOSURE ASSY (LOW END)

DWN: DHG	CAD: DHG	APPD: MAH	DATE: 07-26-01	SCALE: 0.250

MATERIAL: -

PAINT: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.xxx=±

DRAWING NUMBER 8602-204-2

SIZE B

120 Volt Relay Enclosure Assembly

8602-204-2-B Rev. 4

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Box 649, Marietta, Oh 45750

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
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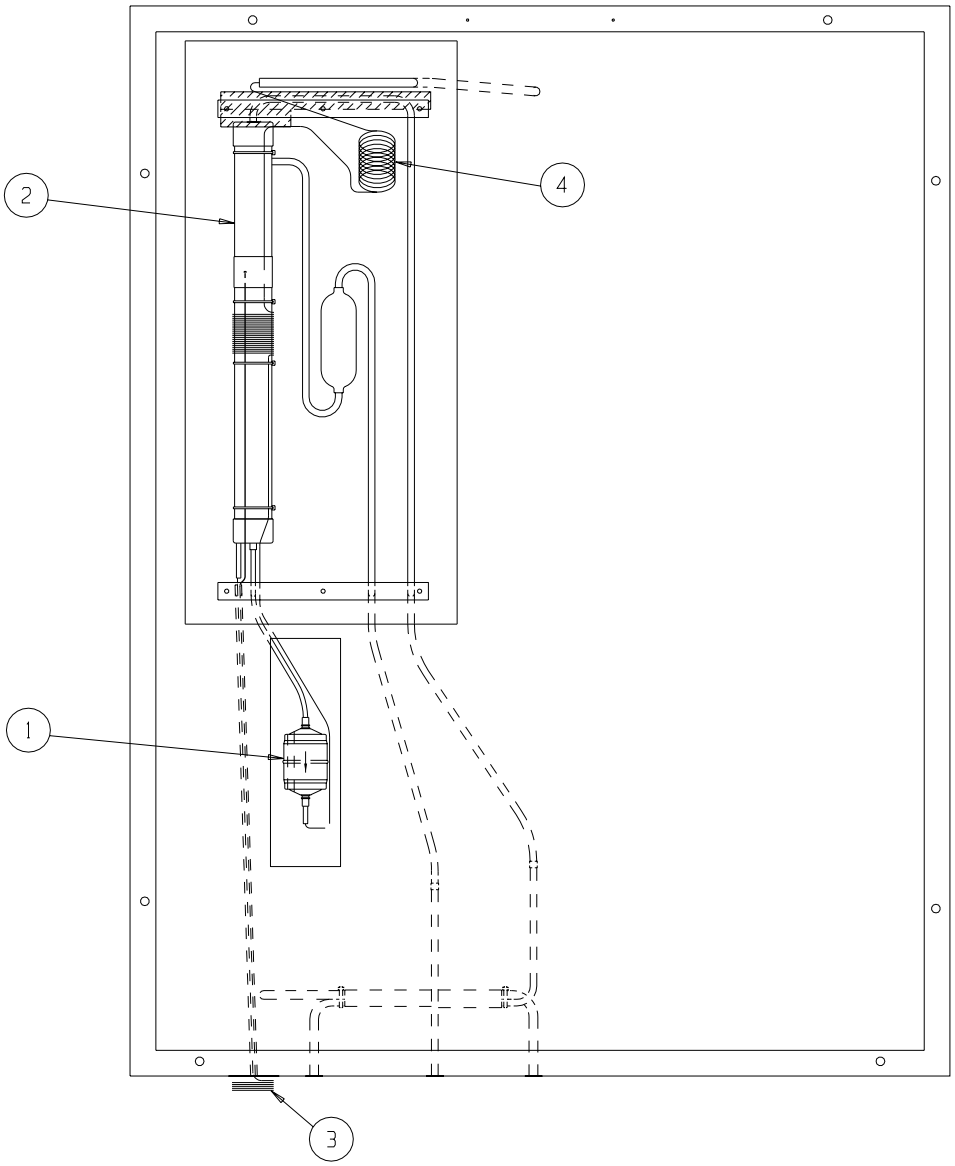

BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESCRIPTION
1	209016	DRYER
2	211041	HEAT EXCHANGER
3	227927	HIGH STAGE CAP. TUBE
4	227928	LOW STAGE CAP. TUBE

MODEL/PART NAME: 8600 UP-RIGHT FREEZER

DWG TITLE: 28 CF HEAT EXCHANGER ASSEMBLY

DWN: PDK	CAD: PDK	APPD:	DATE: 12-04-02	SCALE: NTS

MATERIAL: N/A

PAINT COLOR: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=± .XXX=±

DRAWING NUMBER 8602-205-2

SIZE B

28 cu. ft. Upright Freezer Heat Exchanger Assembly

8602-205-2-B Rev. 0
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ThermoForma
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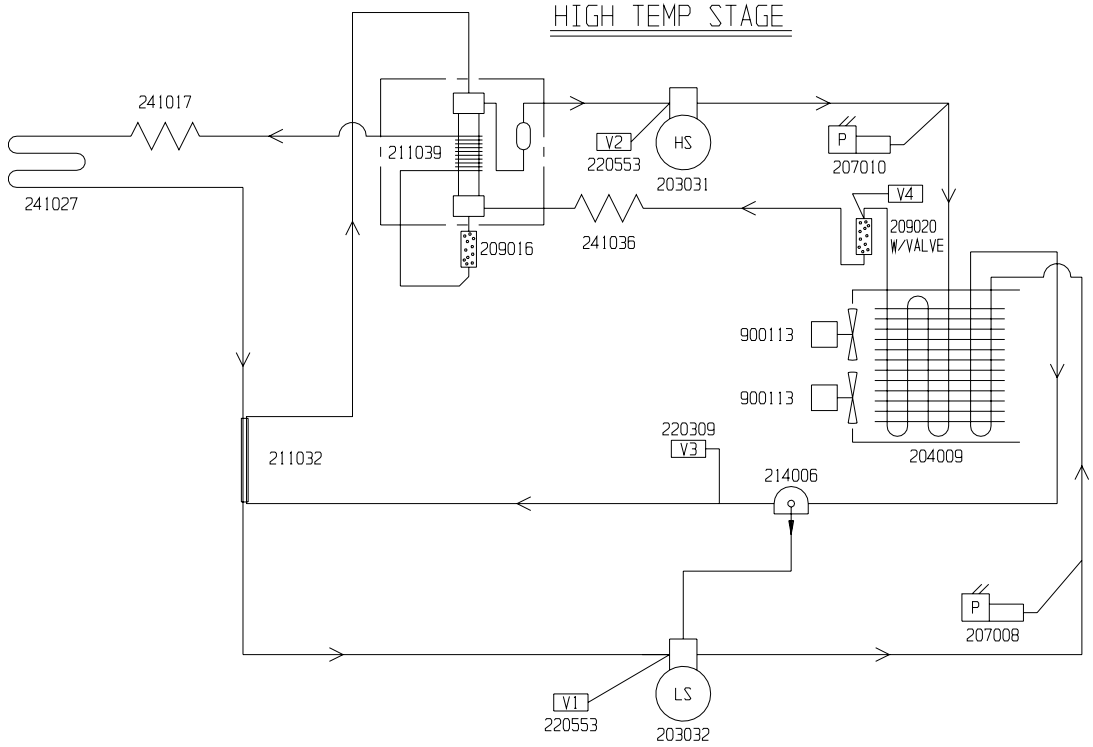

CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-290 0.5 OZ. (14g) MAX, ; VAC TO 20"
R-508B 13 OZ (369g) ± 1/4 OZ.(7g) OR
20" TO 147 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 702, 902, 991, 8602, 8627, 8691, 5702 & 5602 13 CU. FT. FREEZERS (230 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
3	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553
2	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
1	FR-1664	12-17-02	MAH	KDG	MAH	CHANGED 900111 FANS TO 900113
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

DATE 05-14-02	DWN MAH	CAD KDG	APPD MAH / SCALE NONE
CUSTOMER			
JOB TITLE -86°C 13 CU. FT. UPRIGHT FREEZERS (230 V)			
DWG TITLE REFRIGERATION SCHEMATIC			
LOCATION	JOB NUMBER	DRAWING NUMBER 8602-90-0-B	

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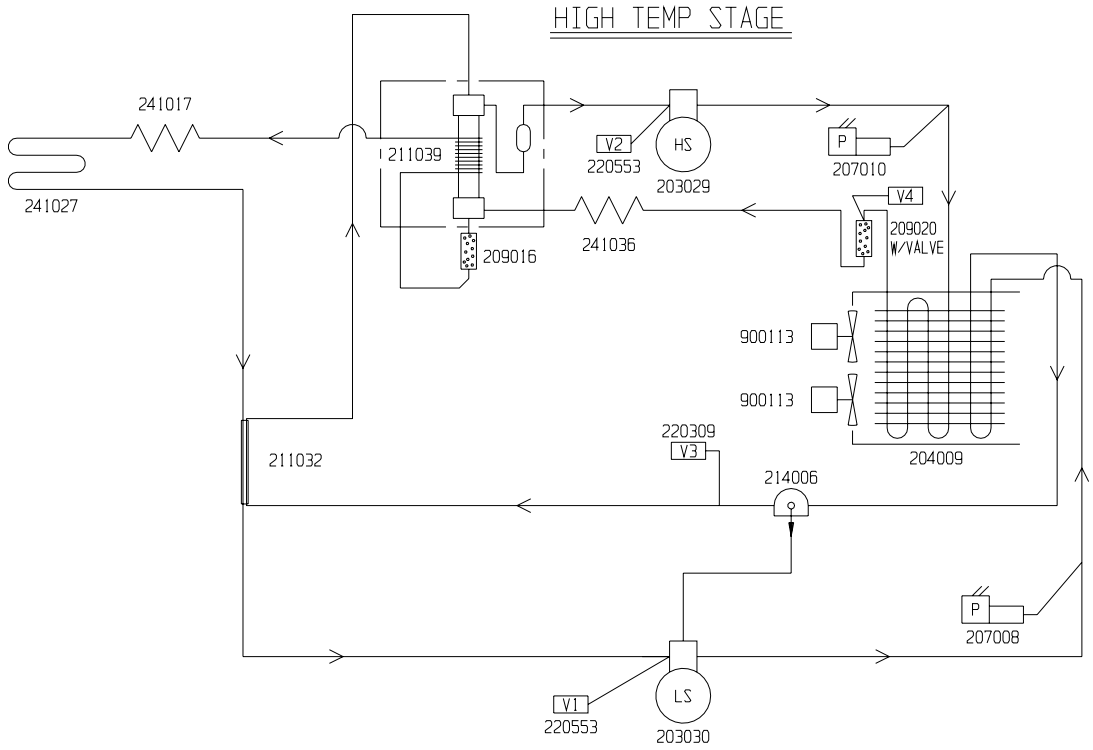

CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-290 0.5 OZ. (14g) MAX, ; VAC TO 20"
R-508B 13 OZ (369g) ± 1/4 OZ.(7g) OR
20" TO 147 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 703, 903, 992, 8603, 8692, 5703 & 5603 13 CU. FT. FREEZERS (120 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
2	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553
1	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

DATE 05-14-02	DWN MAH	CAD KDG	APPD MAH	SCALE NONE
CUSTOMER				
JOB TITLE -86°C 13 CU. FT. UPRIGHT FREEZERS (120 V)				
DWG TITLE REFRIGERATION SCHEMATIC				
LOCATION	JOB NUMBER	DRAWING NUMBER 8603-90-0-B		

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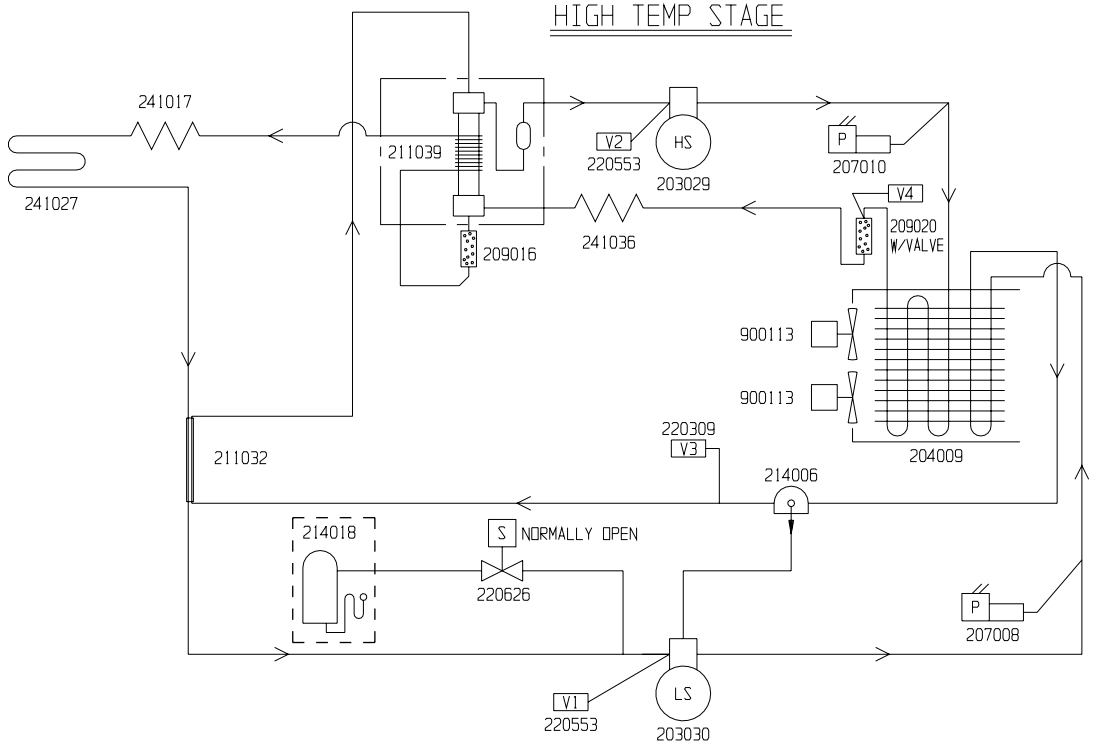


CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

17 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

17 CUFT UNITS: R-290 0.8 OZ. (23g) MAX, ; VAC TO 2 PSIG
R-508B 15.0 OZ (425g) ± 1/4 OZ.(7g) OR
2 PSIG TO 123 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

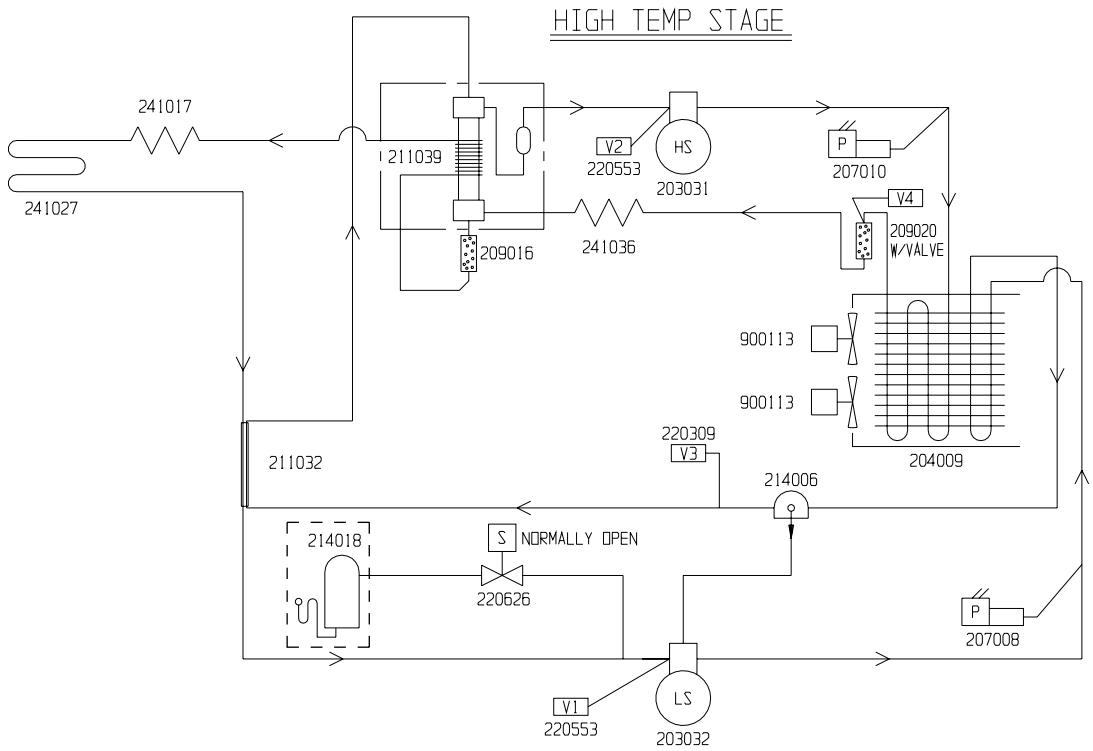
* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 704, 904, 993, 8604, 8693, 5704 & 5604 17 CU. FT. FREEZERS (120 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
4	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553
3	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
2	FR-1615	11-05-02	MAH	KDG	MAH	CHG'D. L/S CHARGES & REMOVE TANK
1	FR-1615	10-02-02	DHG	KDG	MAH	REMOVE CAP TUBING TO EXP. TANK
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

DATE 05-14-02	DWN MAH	CAD KDG	APPD MAH	SCALE NONE
CUSTOMER				
JOB TITLE -86°C 17 CU. FT. UPRIGHT FREEZERS (120 V)				
DWG TITLE REFRIGERATION SCHEMATIC				
LOCATION	JOB NUMBER	DRAWING NUMBER 8604-90-0-B		

Thermo ELECTRON CORPORATION



CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

17 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

17 CUFT UNITS: R-290 0.9 OZ. (26g) MAX, ; VAC TO 3 PSIG
R-508B 15 OZ (425g) ± 1/4 OZ.(7g) OR
3 PSIG TO 134 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 705, 905, 994, 8605, 8694, 5705 & 5605 17 CU. FT. FREEZERS (230 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
4	FR-1729	08-27-03	RDS	KDG		220554 ROTOLOCK VALVE TO 220553
3	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
2	FR-1664	12-17-02	MAH	KDG	MAH	CHANGED 900111 FANS TO 900113
1	FR-1615	10-02-02	DHG	KDG	LDN	REMOVE CAP TUBING TO EXP. TANK
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

DATE 05-14-02 | DWN MAH | CAD KDG | APPD MAH | SCALE NONE

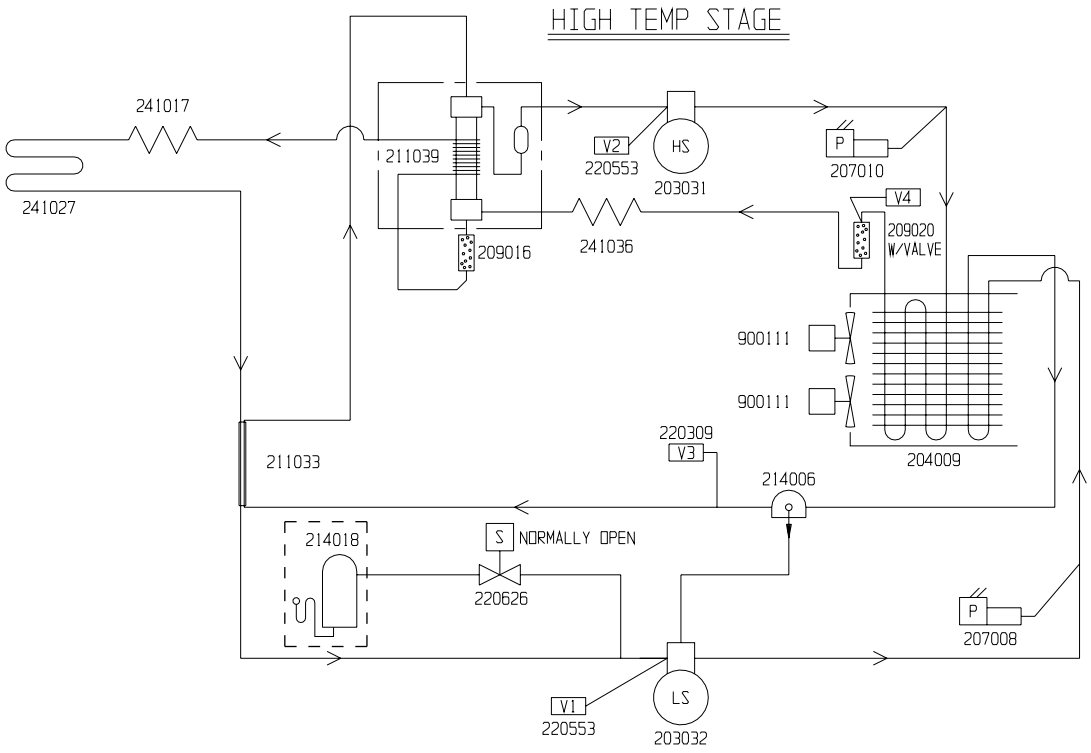
CUSTOMER

JOB TITLE -86°C 17 CU. FT. UPRIGHT FREEZERS (230 V)

DWG TITLE REFRIGERATION SCHEMATIC

LOCATION	JOB NUMBER	DRAWING NUMBER
		8605-90-0-B

Thermo ELECTRON CORPORATION



CASCADE REFRIGERATION

HIGH TEMP. STAGE REFRIGERANT: R-404A, 24 OZ. (680g) ±1/2 OZ. (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL COMPRESSOR, 24 OZ.(710ml)

LOW TEMP. STAGE REFRIGERANT: R-290 1.0 OZ. (28g) MAX. ; VAC TO 5 PSIG
R-508B 17.3 OZ. (490g) ± 1/4 OZ. (7g)
OR 5 PSIG TO 152 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 706, 906, 995, 8606, 8695, 5706 & 5606 23 CU.FT. FREEZERS (230 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
4	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553
3	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
2	FR-1664	12-17-02	MAH	KDG	MAH	CHANGED 900111 FANS TO 900113
1	FR-1615	10-02-02	DHG	KDG	LDN	REMOVE CAP TUBING TO EXP. TANK
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

DATE 05-14-02 | DWN MAH | CAD KDG | APPD MAH | SCALE NONE

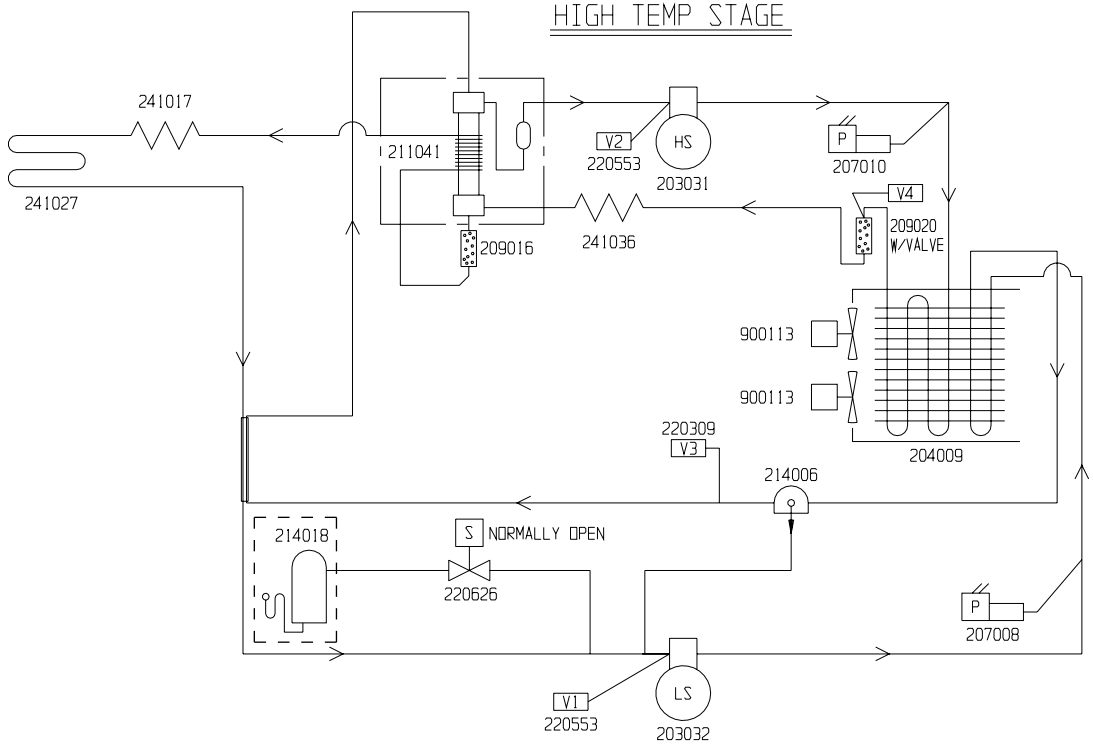
CUSTOMER

JOB TITLE -86°C 23 CU. FT. UPRIGHT FREEZERS (230 V)

DWG TITLE REFRIGERATION SCHEMATIC

LOCATION	JOB NUMBER	DRAWING NUMBER
		8606-90-0-B

Thermo ELECTRON CORPORATION



CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

28 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

28 CUFT UNITS: R-290 1.0 OZ. (28g) MAX, ; VAC TO 4 PSIG
R-508B 17.7 OZ (502g) ± 1/4 OZ.(7g) OR
4 PSIG TO 144 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 8607, 907 28 CU. FT. FREEZERS (230 V)

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
4	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553
3	N/A	01-07-03	MAH	PDK	MAH	CORRECTED COMPRESSOR STOCK NUMBERS
2	FR-1664	12-17-02	MAH	KDG	MAH	CHANGED 900111 FANS TO 900113
1	FR-1615	10-02-02	DHG	KDG	LDN	REMOVE CAP TUBING TO EXP. TANK
0	N/A	07-22-02	MAH	KDG	MAH	RELEASED FOR PRODUCTION

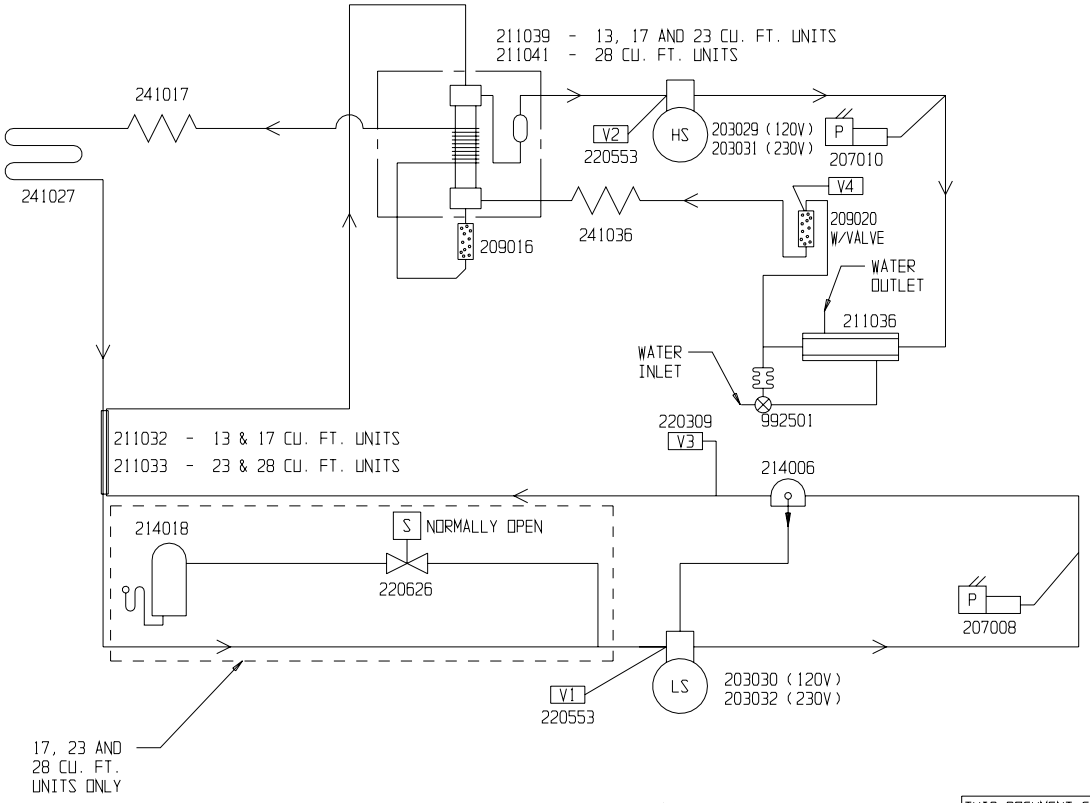
DATE 05-14-02	DWN MAH	CAD KDG	APPD MAH	SCALE NONE
CUSTOMER				
JOB TITLE -86°C 28 CU. FT. UPRIGHT FREEZERS (230 V)				
DWG TITLE REFRIGERATION SCHEMATIC				
LOCATION	JOB NUMBER	DRAWING NUMBER 8607-90-0-B		

Thermo ELECTRON CORPORATION

DRAWING NUMBER: 195964-90-1-B

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	N/A	01-23-03	DHG	DHG	MAH	RELEASED FOR PRODUCTION
1	FR-1729	08-27-03	RDS	KDG	MAH	220554 ROTOLOCK VALVE TO 220553

HIGH TEMP STAGE



LOW TEMP STAGE

COMMON TO: 195965

CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-404A 24 OZ. (680gr) ±1/2 OZ (14gr)
17 CUFT UNITS: R-404A 24 OZ. (680gr) ±1/2 OZ (14gr)
23 CUFT UNITS: R-404A 24 OZ. (680gr) ±1/2 OZ (14gr)
28 CUFT UNITS: R-404A 24 OZ. (680gr) ±1/2 OZ (14gr)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER
OIL COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

13 CUFT UNITS: R-290 0.5 OZ. (14gr) MAX, ; VAC TO 20"
R-508B 13 OZ (369gr) ± 1/4 OZ.(7gr) OR
20" TO 147 PSIG ± 3 PSIG

17 CUFT UNITS: R-290 0.8 OZ. (23gr) MAX, ; VAC TO 2 PSIG
(120 VOLTS) R-508B 13.4 OZ (380gr) ± 1/4 OZ.(7gr) OR
2 PSIG TO 123 PSIG ± 3 PSIG

17 CUFT UNITS: R-290 0.9 OZ. (26gr) MAX, ; VAC TO 3 PSIG
(230 VOLTS) R-508B 15 OZ (425gr) ± 1/4 OZ.(7gr) OR
3 PSIG TO 134 PSIG ± 3 PSIG

23 CUFT UNITS: R-290 1.0 OZ. (28gr) MAX, ; VAC TO 5 PSIG
R-508B 17.3 OZ (490gr) ± 1/4 OZ.(7gr) OR
5 PSIG TO 152 PSIG ± 3 PSIG

28 CUFT UNITS: R-290 1.0 OZ. (28gr) MAX, ; VAC TO 4 PSIG
R-508B 17.7 OZ (502gr) ± 1/4 OZ.(7gr) OR
4 PSIG TO 144 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

***SET WATER REGULATING VALVE FOR 170 PSIG

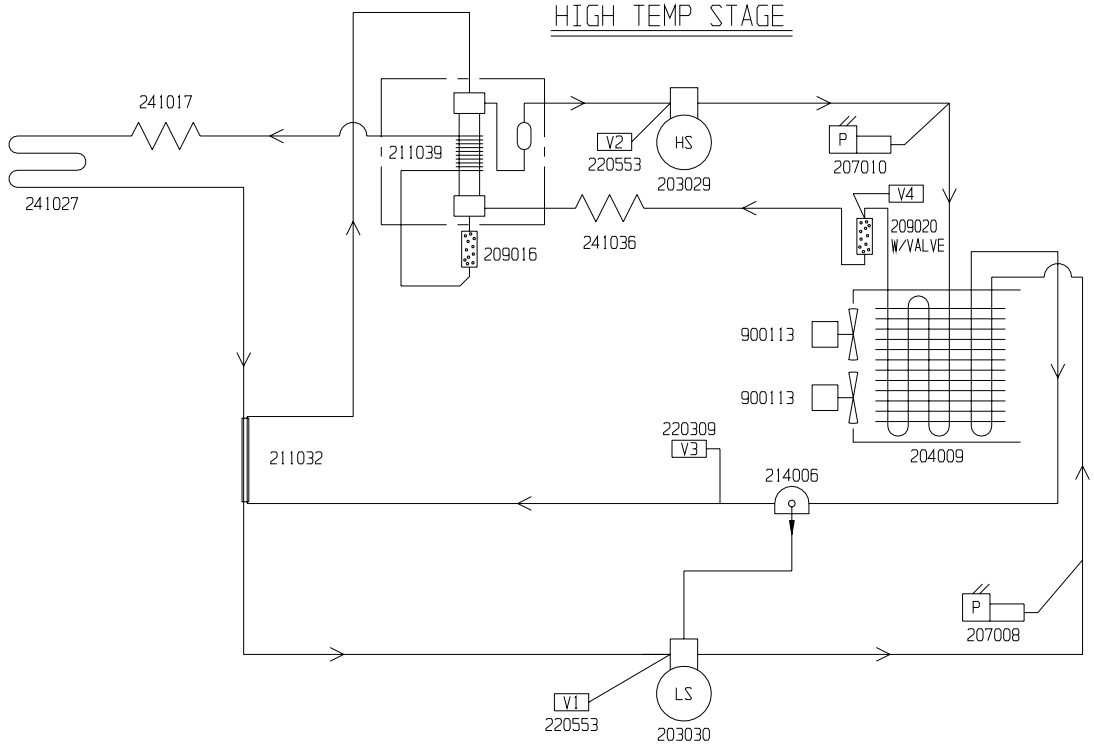
* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

Thermo ELECTRON CORPORATION

MODEL/PART NAME: -86°C 13, 17, 23 & 28 CU. FT. UPRIGHT H2O COOLED					
DWG TITLE: FREEZER REFRIGERATION SCHEMATIC					
DWN: DHG	CAD: DHG	APPD: MAH	DATE: 01-23-03	SCALE: NONE	
MATERIAL: N/A					
PAINT COLOR: N/A					
TOLERANCE UNLESS OTHERWISE SPECIFIED ANGLES: DECIMAL: .XX=± .XXX=±			DRAWING NUMBER 195964-90-1		SIZE B

DRAWING NUMBER: 8656-90-0-B

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	FR-1776	03-09-04	ADT	pdk	LDN	RELEASED FOR PRODUCTION



CASCADE REFRIGERATION

HIGH TEMPERATURE STAGE REFRIGERANT:

23 CUFT UNITS: R-404A 24 OZ. (680g) ±1/2 OZ (14g)

HIGH TEMPERATURE STAGE OIL: MOBILE EAL ARCTIC 22CC POLYOL ESTER OIL
COMPRESSOR, 24 OZ.(710ml)

LOW TEMPERATURE STAGE REFRIGERANT:

23 CUFT UNITS: R-290 0.9 OZ. (14g) MAX, ; VAC TO 4 PSIG
R-508B 15 OZ (369g) ± 1/4 OZ.(7g) OR
4 PSIG TO 133 PSIG ± 3 PSIG

LOW TEMPERATURE STAGE OIL: ZEROL 150T WITH 2% ADDITIVE
COMPRESSOR: 24 OZ.(710ml)
OIL SEPARATOR: 15 OZ. (444ml)

* ALL PSIG MEASUREMENTS WHEN SYSTEM IS AT 23°C

1. COMMON TO: 756, 956, 990, 8656, 8690, 5756 & 5656 23 CU. FT. FREEZERS (120 V)

Thermo
ELECTRON CORPORATION
Controlled Environment Equipment
Box 649, Marietta, Oh 45750

MODEL/PART NAME: -86° 23 CU. FT. UP-RIGHT FREEZERS (120 VOLT)

DWG TITLE: REFRIGERATION SCHEMATIC

DWN: ADT	CAD: pdk	APPD:	DATE: 03-09-04	SCALE: NONE

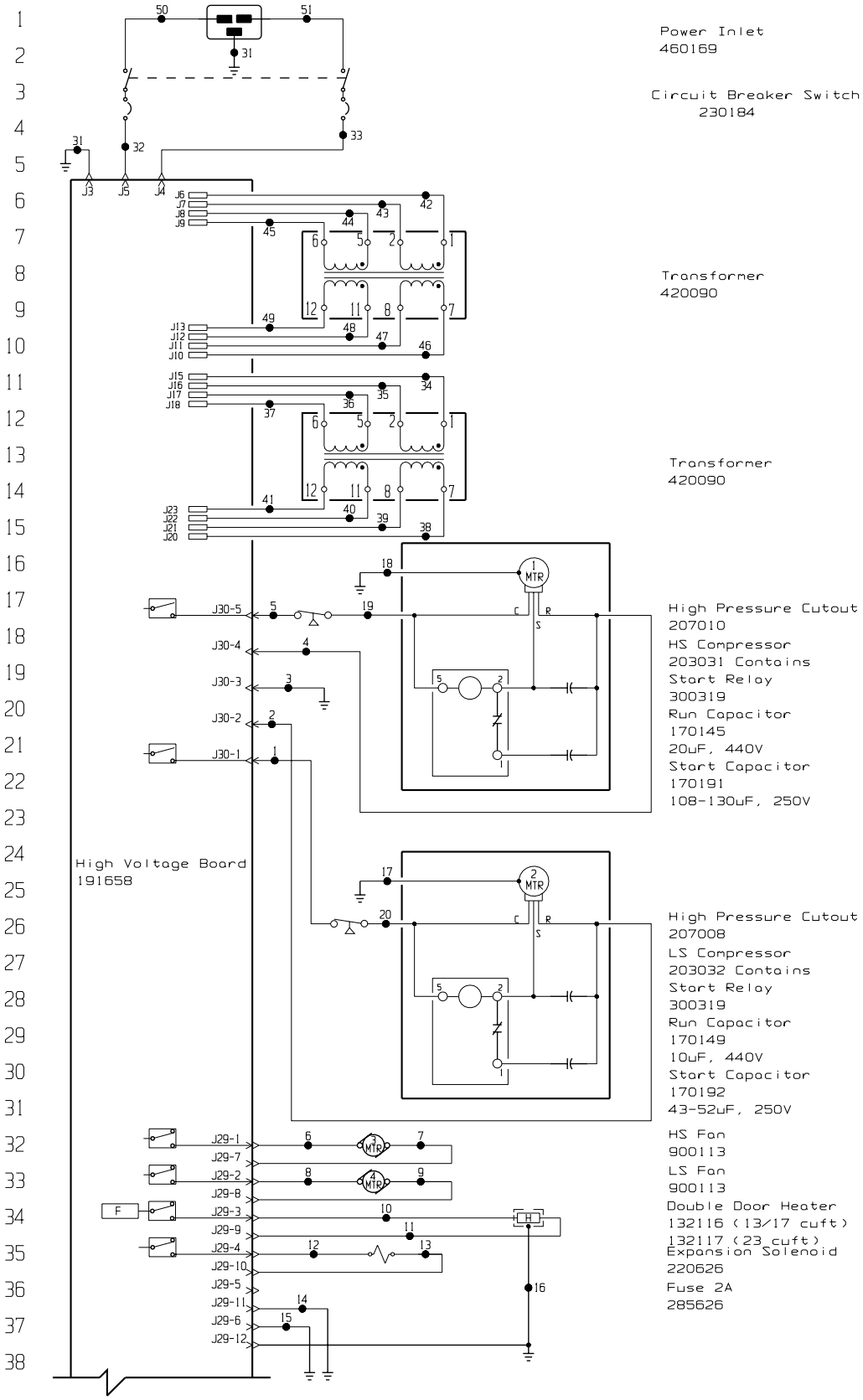
MATERIAL: N/A

PAINT COLOR: N/A

TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=±
.XXX=±

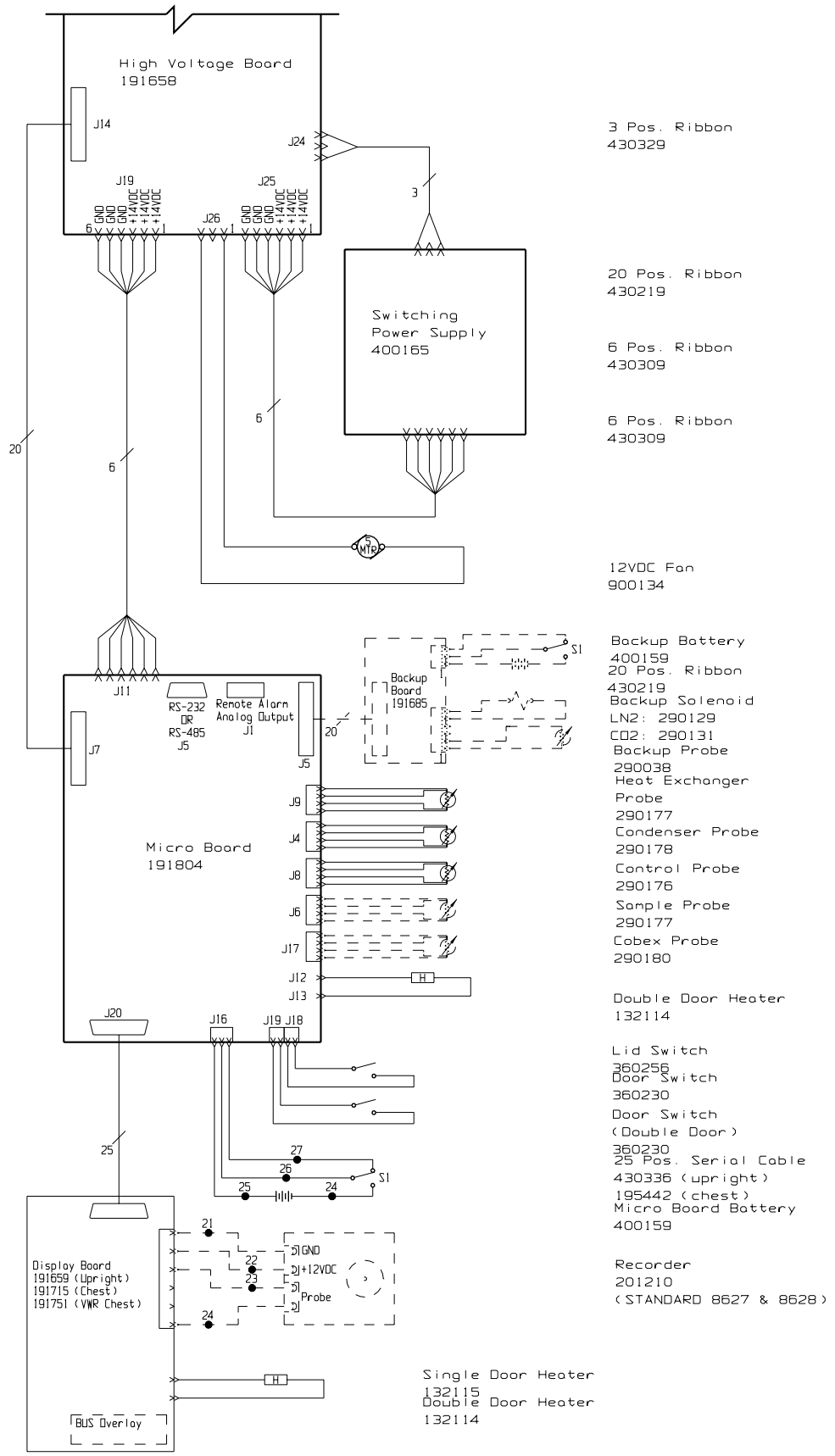
DRAWING NUMBER: 8656-90-0

SIZE: B



Models:
5602,5605,5606,5612
5619,5620,8602,8605
8606,8607,8612,8619
8620,8627,8628,8691
8694,8695

8602-70-1-D Rev.5
Page 1 of 3



Models:
5602, 5605, 5606, 5612
5619, 5620, 8602, 8605
8606, 8607, 8612, 8619
8620, 8627, 8628, 8691
8694, 8695

8602-70-1-D Rev.5
Page 2 of 3

WIRE #	COLOR	GAUGE
1	BLK	14
2	RED	14
3	GRN/YEL	14
4	RED	14
5	BLK	14
6	BLK	18
7	BLK	18
8	BLK	18
9	BLK	18
10	BLK	18
11	BLK	18
12	BLK	18
13	BLK	18
14	GRN/YEL	18
15	GRN/YEL	18
16	GRN/YEL	18
17	GRN/YEL	14
18	GRN/YEL	14
19	BLK	14
20	BLK	14
21	BLK	18
22	RED	18
23	BLK	18
24	RED	18

WIRE #	COLOR	GAUGE
25	RED	18
26	BLK	18
27	BLK	18
28	BLK	18
29		
30		
31	GRN/YEL	14
32	BLK	14
33	BLU	14
34	BLK	14
35	BLU	14
36	BLK	14
37	BLU	14
38	BLK	14
39	BLU	14
40	BLK	14
41	BLU	14
42	BLK	14
43	BLU	14
44	BLK	14
45	BLU	14
46	BLK	14
47	BLU	14
48	BLK	14
49	BLU	14
50	BLK	14
51	BLU	14

Uprights

SIZE	THERMO	THERMO	VWR
13	8602	8691	5602
17	8605	8694	5605
23	8606	8695	5606
28	8607		
13	8627		

Chests

SIZE	THERMO	VWR
12.7	8612	5612
17	8619	5619
20	8620	5620
20	8628	

REMOTE CONTACTS/ANALOG OUTPUT
PIN# 1 Analog Output +
PIN# 2 Analog Output -
PIN# 3 Not Connected
PIN# 4 Not Connected
PIN# 5 Normally Closed
PIN# 6 Common.
PIN# 7 Normally Open

CONTACT RATING: 1A @ 30V
CONTACTS IN ALARM STATE

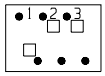
RS-232 SPECIFICATION

BAUD = 1200
PARITY = N
BITS = 8
STOP BITS = 2

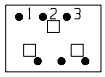
RS-232 PORT
PIN# 2 TXD
PIN# 3 RXD
PIN# 5 GND

SW1 Settings for Analog Output

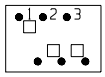
4-20mA Output



0-1V Output

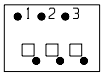


0-5V Output

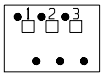


SW2 Settings for Communication Output

RS-485



RS-232



1. Schematic represents single & double door upright models and chest models. All heaters are on uprights only. Expansion solenoid on 17, 23 & 28 uprights only.
2. Door switches shown in open position.
3. Battery switch shown in the OFF position.
4. Circuit breaker switch shown in OFF position.
5. Options and acessories shown in dashed lines.

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
5	FR-1789	08-14-04	ADT	KDG	AKS	CHANGED MICRO BOARD 191656 TO 191804
4	FR-1771	02-18-04	RDS	pdk	LDN	REVISED START CAPACITORS
3	FR-1698	05-07-03	HCE	KDG	LDN	REMOVED VACUUM RELIEF HEATER
2	FR-1673	03-24-03	ADT	KDG	LDN	SERIAL CABLE STK# CORRECT 195422 TO 195442
1	FR-1673	3-06-03	ADT	KDG	LDN	ADD 191751 BOARD, LID SWITCH 360256 & 8628

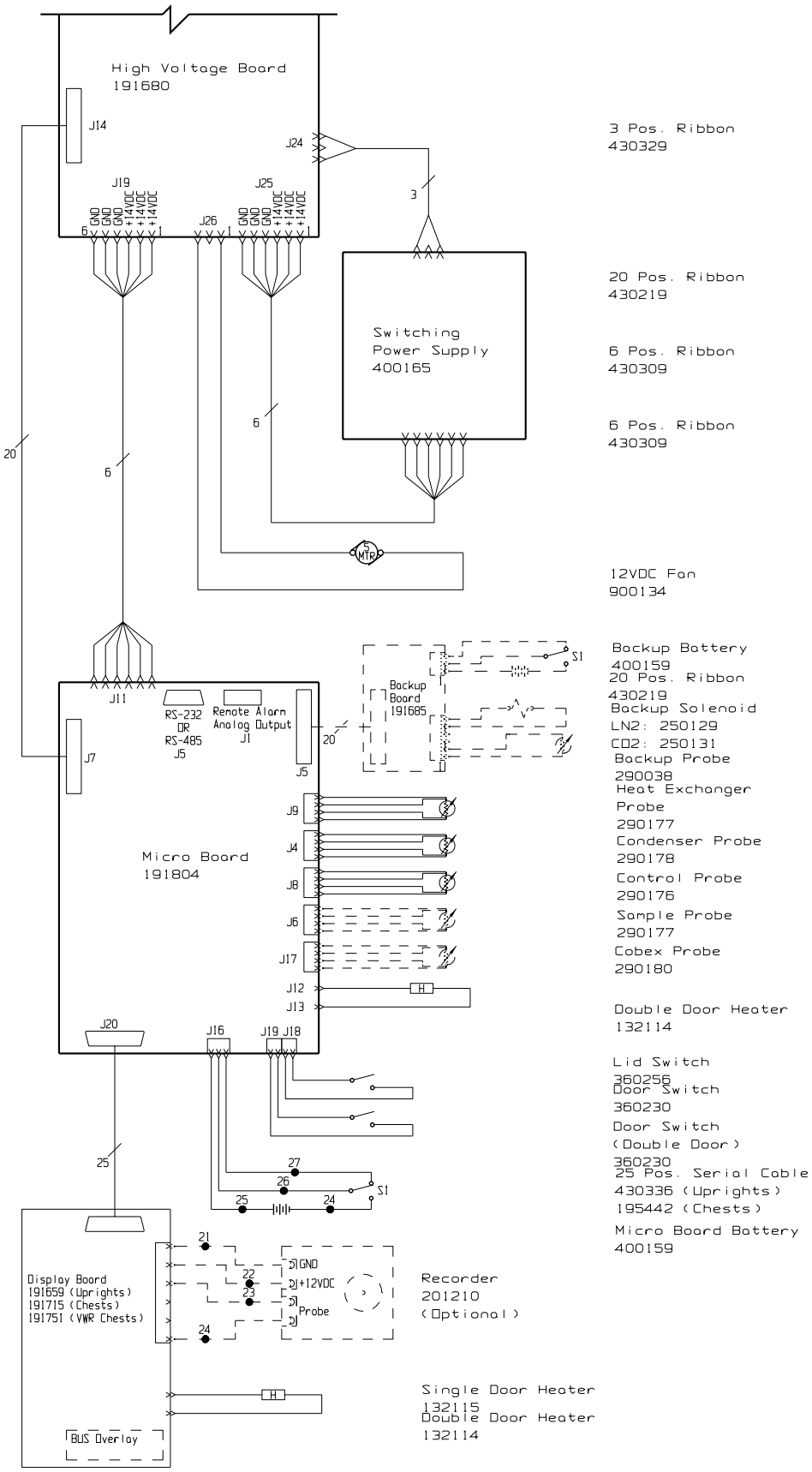
Models:
5602, 5605, 5606, 5612
5619, 5620, 8602, 8605
8606, 8607, 8612, 8619
8620, 8627, 8628, 8691
8694, 8695

MODEL/PART NAME: 8600 SERIES, 230V, ULT FREEZERS
DWG TITLE: UNIT SCHEMATIC
DWN: ADT | CAD: ADT | APPD: MAH | DATE: 3-22-02 | SCALE: NONE
MATERIAL:
PAINT COLOR:
TOLERANCE UNLESS OTHERWISE SPECIFIED ANGLES: DECIMAL: .XX=± .XXX=±
DRAWING NUMBER 8602-70-1
SIZE D

ATTENTION
OBSERVE PRECAUTIONS
ELECTROSTATIC
SENSITIVE DEVICES

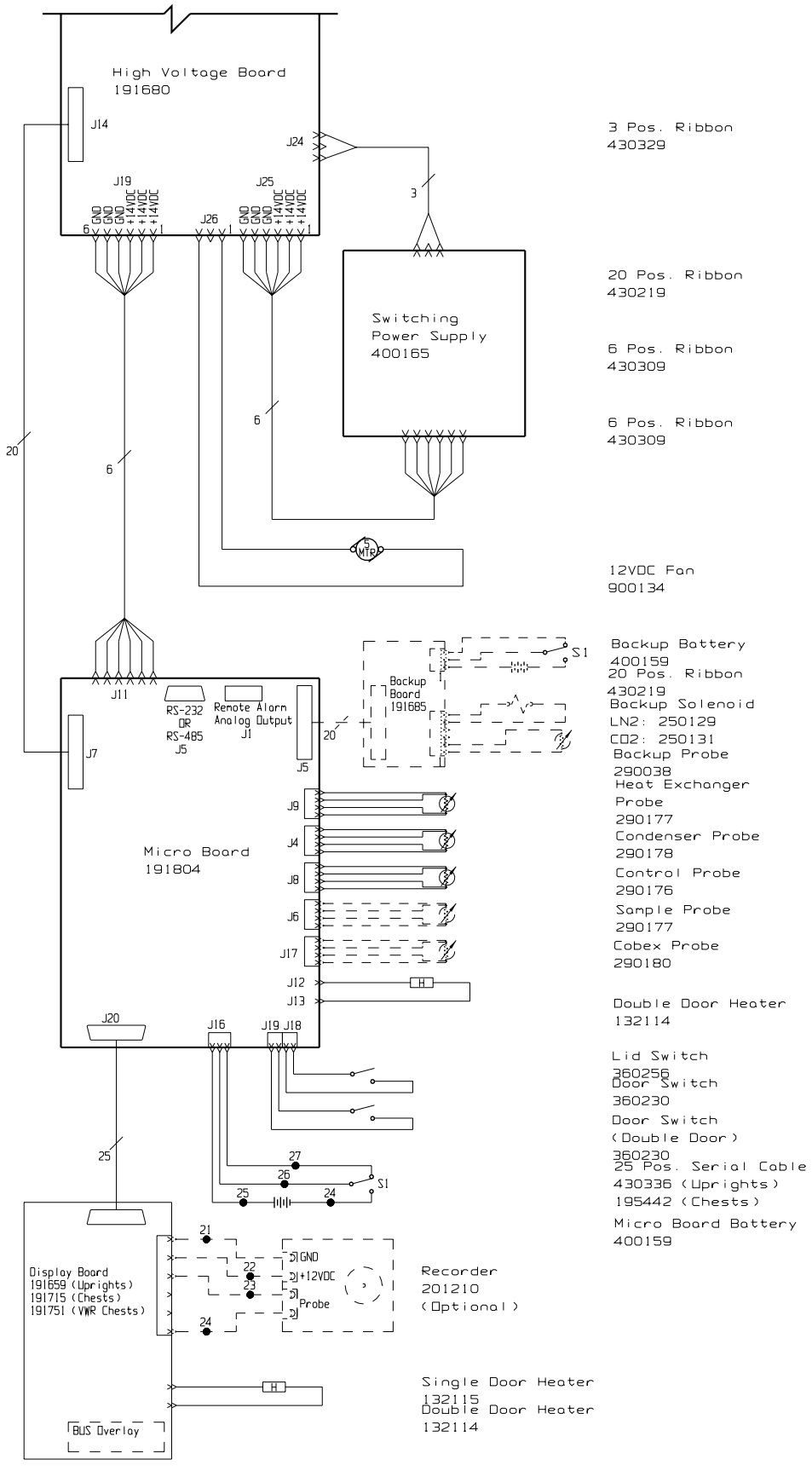
Thermo
ELECTRON CORPORATION
Controlled Environment Equipment
Box 649, Marietta, Oh 45750

8602-70-1-D Rev.5
Page 3 of 3



Models:
5603, 5604, 5615, 5618
5621, 5656, 8603, 8604
8615, 8618, 8621, 8656
8690, 8692, 8693

8603-70-1-D Rev. 5
Page 1 of 3



Models:
5603, 5604, 5615, 5618
5621, 5656, 8603, 8604
8615, 8618, 8621, 8656
8690, 8692, 8693

8603-70-1-D Rev. 5
Page 2 of 3

WIRE #	COLOR	GAUGE	WIRE #	COLOR	GAUGE
1	BLK	14	25	RED	18
2	RED	14	26	BLK	18
3	GRN/YEL	14	27	BLK	18
4	RED	14	28	BLK	18
5	BLK	14	29		
6	BLK	18	30		
7	BLK	18	31	GRN/YEL	14
8	BLK	18	32	BLK	14
9	BLK	18	33	BLU	14
10	BLK	18	34	BLK	14
11	BLK	18	35	BLU	14
12	BLK	18	36	BLK	14
13	BLK	18	37	BLU	14
14	GRN/YEL	18	38	BLK	14
15	GRN/YEL	18	39	BLU	14
16	GRN/YEL	18	40	BLK	14
17	GRN/YEL	14	41	BLU	14
18	GRN/YEL	14	42	BLK	14
19	BLK	14	43	BLU	14
20	BLK	14			
21	BLK	18			
22	RED	18			
23	BLK	18			
24	RED	18			

Uprights

SIZE	THERMO	THERMO	VWR
13	8603	8692	5603
17	8604	8693	5604
23	8656	8690	5656

Chests

SIZE	THERMO	VWR
12.7	8615	5615
17	8618	5618
20	8621	5621

REMOTE CONTACTS/ANALOG OUTPUT
PIN# 1 Analog Output +
PIN# 2 Analog Output -
PIN# 3 Not Connected
PIN# 4 Not Connected
PIN# 5 Normally Closed
PIN# 6 Common.
PIN# 7 Normally Open

CONTACT RATING: 1A @ 30V
CONTACTS IN ALARM STATE

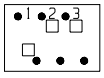
RS-232 SPECIFICATION

BAUD = 1200
PARITY = N
BITS = 8
STOP BITS = 2

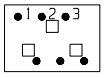
RS-232 PORT
PIN# 2 TXD
PIN# 3 RXD
PIN# 5 GND

SW1 Settings for Analog Output

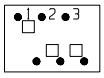
4-20mA Output



0-1V Output

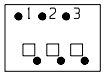


0-5V Output

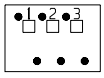


SW2 Settings for Communication Output

RS-485



RS-232



1. Schematic represents single & double door upright models and chest models. All heater are for uprights only. Expansion solenoid on 17 & 23 cuft uprights only.
2. Door switches shown in open position.
3. Battery switch shown in the OFF position.
4. Circuit breaker switch shown in OFF position.
5. Options and acessories shown in dashed lines.

REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
5	FR-1789	08-14-04	ADT	KDG	AKS	CHANGED MICRO BOARD 191656 TO 191804
4	FR-1776	03-09-04	ADT	pdk	LDN	ADDED 23 Cu. FT. 120 VOLT MODELS
3	FR-1698	05-07-03	HCE	KDG	LDN	REMOVED VACUUM RELIEF HEATER
2	FR-1673	03-24-03	ADT	KDG	LDN	SERIAL CABLE STK# CORRECT 195422 TO 195442
1	FR-1673	3-06-03	ADT	KDG	LDN	ADD 191751 DISPLAY BOARD & LID SWITCH 360256

Models:
5603, 5604, 5615, 5618
5621, 5656, 8603, 8604
8615, 8618, 8621, 8656
8690, 8692, 8693

ATTENTION
OBSERVE PRECAUTIONS
ELECTROSTATIC
SENSITIVE DEVICES

Thermo
ELECTRON CORPORATION
Controlled Environment Equipment
Box 649, Marietta, Oh 45750

MODEL/PART NAME: 8600 SERIES, 120V, ULT FREEZERS
DWG TITLE: UNIT SCHEMATIC
DWN: ADT | CAD: ADT | APPD: MAH | DATE: 3-22-02 | SCALE: NONE
MATERIAL:
PAINT COLOR:
TOLERANCE UNLESS OTHERWISE SPECIFIED
ANGLES: DECIMAL: .XX=± .XXX=±
DRAWING NUMBER: 8603-70-1
SIZE: D

8603-70-1-D Rev. 5
Page 3 of 3

THERMO ELECTRON CORPORATION 900 & 8600 SERIES ULT FREEZER WARRANTY

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period.

During the first two years of the warranty period, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. The 900 Series ULT Freezers include an additional two year warranty on the compressors, parts only, F.O.B. factory. The 8600 Series ULT Freezers include an additional three year warranty on the compressors, parts only, F.O.B. factory. Installation and calibration is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs and door gaskets are excluded from this warranty.

In addition to the standard warranty, the foamed-in-place cabinet design carries a unit production lifetime warranty (foamed-in-place cabinet, evaporator and foamed-in-place door; parts only). Please contact your sales representative or Thermo for additional information.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original two year warranty period. The Technical Services Department must give prior approval for the return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation, and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-888-213-1790 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA contact your local distributor for warranty information.

Rev. 2 1/04

ISO 9001 REGISTERED

THERMO ELECTRON CORPORATION 900 & 8600 SERIES ULT FREEZER INTERNATIONAL DEALER WARRANTY

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period. Dealers who stock our equipment are allowed an additional four months for delivery and installation, providing the warranty card is completed and returned to the Technical Services Department.

During the first two years of the warranty period, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. The 900 Series ULT Freezers include an additional two year warranty on the compressors, parts only, F.O.B. factory. The 8600 Series ULT Freezers include an additional three year warranty on the compressors, parts only, F.O.B. factory. Installation and calibration is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs and door gaskets are excluded from this warranty.

In addition to the standard warranty, the foamed-in-place cabinet design carries a unit production lifetime warranty (foamed-in-place cabinet, evaporator and foamed-in-place door; parts only). Please contact your sales representative or Thermo for additional information.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original two year warranty period. The Technical Services Department must give prior approval for the return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation, and preventive maintenance.

If equipment service is required, please contact your local distributor or Thermo (1-888-213-1790 in USA and Canada, or 1-740-373-4763). We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contact your local distributor for warranty information.

Rev. 2 1/04

ISO 9001 REGISTERED

Appendix A

Handling Liquid Nitrogen

Contact of liquid nitrogen or cold gas with the skin or eyes may cause serious freezing (frostbite) injury.

Handle liquid nitrogen carefully.

The extremely low temperature can freeze human flesh very rapidly. When spilled on a surface the liquid tends to cover it completely and intimately, cooling a large area. The gas issuing from the liquid is also extremely cold. Delicate tissue, such as that of the eyes, can be damaged by an exposure to the cold gas which would be too brief to affect the skin of the hands or face.

Never allow any unprotected part of your body to touch objects cooled by liquid nitrogen.

Such objects may stick fast to the skin and tear the flesh when you attempt to free yourself. Use tongs to withdraw objects immersed in the liquid, and handle the object carefully.

Wear protective clothing.

Protect your eyes with a face shield or safety goggles (safety glasses without side shields do not give adequate protection). Always wear gloves when handling anything that is, or may have been, in immediate contact with liquid nitrogen. Insulated gloves are recommended, but heavy leather gloves may also be used. The gloves should fit loosely, so that they can be thrown off quickly if liquid should splash into them. When handling liquid in open containers, it is advisable to wear high-top shoes. Trousers (which should be cuffless if possible) should be worn outside the shoes.

Introduction

The safe handling and use of liquid nitrogen in cryogenic refrigerators and dewar flasks is largely a matter of knowing the potential hazards and using common-sense procedures based on that knowledge. There are two important properties of liquid nitrogen that present potential hazards:

1. It is extremely cold. At atmospheric pressure, liquid nitrogen boils at -320°F (-196°C).
2. Very small amounts of liquid vaporize into large amounts of gas. One liter of liquid nitrogen becomes 24.6cu. ft. (0.7ml) of gas.

The safety precautions in this booklet must be followed to avoid potential injury or damage which could result from these two characteristics. Do not attempt to handle liquid nitrogen until you read and fully understand the potential hazards, their consequences, and the related safety precautions. Keep this booklet handy for ready reference and review.

Note: Because argon is an inert gas whose physical properties are very similar to those of nitrogen, the precautions and safe practices for the handling and use of liquid argon are the same as those for liquid nitrogen.

Use only containers designed for low temperature liquids.

Cryogenic containers are specifically designed and made of materials that can withstand the rapid changes and extreme temperature differences encountered in working with liquid nitrogen. Even these special containers should be filled SLOWLY to minimize the internal stresses that occur when any material is cooled. Excessive internal stresses can damage the container.

Do not cover or plug the entrance opening of any liquid nitrogen refrigerator or dewar. Do not use any stopper or other device that would interfere with venting of gas.

These cryogenic liquid containers are generally designed to operate with little or no internal pressure. Inadequate venting can result in excessive gas pressure which could damage or burst the container. Use only the loose-fitting necktube core supplied or one of the approved accessories for closing the necktube. Check the unit periodically to be sure that venting is not restricted by accumulated ice or frost.

Use proper transfer equipment.

Use a phase separator or special filling funnel to prevent splashing and spilling when transferring liquid nitrogen into or from a dewar or refrigerator. The top of the funnel should be partly covered to reduce splashing. Use only small, easily-handled dewars for pouring liquid. For the larger, heavier containers, use a cryogenic liquid withdrawal device to transfer liquid from one container to another. Be sure to follow instructions supplied with the withdrawal device. When liquid cylinders or other large storage containers are used for filling, follow the instructions supplied with those units and their accessories.

Do not overfill containers.

Filling above the bottom of the necktube (or specified maximum level) can result in overflow and spillage of liquid when the necktube core or cover is placed in the opening.

Never use hollow rods or tubes as dipsticks.

When a warm tube is inserted into liquid nitrogen, liquid will spout from the top of the tube due to gasification and rapid expansion of liquid inside the tube.

Nitrogen Gas Can Cause Suffocation Without Warning!

Store and use liquid nitrogen only in a well-ventilated place.

As the liquid evaporates, the resulting gas tends to displace the normal air from the area. In closed areas, excessive amounts of nitrogen gas reduce the concentration of oxygen and can result in asphyxiation. Because nitrogen gas is colorless, odorless and tasteless, it cannot be detected by the human senses and will be breathed as if it were air. Breathing an atmosphere that contains less than 18% oxygen can cause dizziness and quickly result in unconsciousness and death.

Note: The cloudy vapor that appears when liquid nitrogen is exposed to the air is condensed moisture; not the gas itself. The issuing gas is invisible.

Never dispose of liquid nitrogen in confined areas or places where others may enter.

Disposal of liquid nitrogen should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage. Do not pour the liquid on pavement.

Appendix B

Handling Liquid Co_2

High concentrations of CO_2 gas can cause asphyxiation! OSHA Standards specify that employee exposure to carbon dioxide in any eight-hour shift of a 40-hour work week shall not exceed the eight-hour time weighted average of 5000 PPM (0.5% CO_2). The short term exposure limit for 15 minutes or less is 30,000 PPM (3% CO_2). Carbon dioxide monitors are recommended for confined areas where concentrations of carbon dioxide gas can accumulate.

Store and use liquid CO_2 only in a well-ventilated place.

As the liquid evaporates, the resulting gas tends to displace the normal air from the area. In closed areas, excessive amounts of CO_2 gas reduce the concentration of oxygen and can result in asphyxiation. Because CO_2 gas is colorless, odorless and tasteless, it cannot be detected by the human senses and will be breathed as if it were air. Breathing an atmosphere that contains less than 18% oxygen can cause dizziness and quickly result in unconsciousness and death.

Note: The cloudy vapor that appears when liquid CO_2 is exposed to the air is condensed moisture; not the gas itself. The issuing gas is invisible.

Never dispose of liquid CO_2 in confined areas or places where others may enter.

Disposal of liquid CO_2 should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage. Do not pour the liquid on pavement.

First Aid

If a person seems to become dizzy or loses consciousness while working with liquid nitrogen or carbon dioxide, move to a well-ventilated area immediately. If breathing has stopped, apply artificial respiration. If breathing is difficult, give oxygen. Call a physician. Keep warm and at rest.

If exposed to liquid or cold gas, restore tissue to normal body temperature (98.6° F) as rapidly as possible, followed by protection of the injured tissue from further damage and infection. Remove or loosen clothing that may constrict blood circulation to the frozen area. Call a physician. Rapid warming of the affected part is best achieved by using water at 108° F. Under no circumstance should the water be over 112° F, nor should the frozen part be rubbed either before or after rewarming. The patient should neither smoke nor drink alcohol.

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8602**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	LVD:
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

Thermo
ELECTRON CORPORATION

19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp..

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8603**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	LVD:
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

Thermo
ELECTRON CORPORATION

19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8604**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	LVD:
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8605**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	LVD:
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

Thermo
ELECTRON CORPORATION

19 December 2003

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8606**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8607**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
Regulatory Compliance Manager

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19 December 2003

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Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Blood Bank Freezer

Product Designations: **8627**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
MDD: 93/42/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**MDD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8656**

Year of Initial CE Marking: 2004

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010-1

Richard L. Miller, CQE
Regulatory Compliance Manager

Thermo
ELECTRON CORPORATION

03 March 2004

Rev. 0

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8690**

Year of Initial CE Marking: 2004

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010-1

Richard L. Miller, CQE
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Thermo
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03 March 2004

Rev. 0

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8691**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8692**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8693**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma ® Laboratory Freezer

Product Designations: **8694**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

Richard L. Miller, CQE
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19 December 2003

Rev. 2

Declaration of Conformity

Manufacturer's Name: Thermo Electron Corp.

Manufacturer's Address: 401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

Product Description: Forma® Laboratory Freezer

Product Designations: **8695**

Year of Initial CE Marking: 2002

Affected Serial Numbers: Release 2
(Release level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 89/336/EEC
LVD: 73/23/EEC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:1997	EN 61010-1
EN 50081-1:92	Amendments 1 and 2
EN 50082-1:97	EN 60335-2-24 (applicable sections)
	CSA C22.2 No. 1010.1
	UL 471 (applicable sections)
	UL 61010A-1

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19 December 2003

Rev. 2

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