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Manual No. 8008022

Rev.	ECR/ECN	Date	Description	
3	19213/FR-1395	5/31/00	Updated schematics – switch/circuit breaker 230179 from 230124	ccs
2	18257/SI-7528	6/30/99	Updated schematics and assembly drawings – line cord 430108	ccp
- - -	16915/FR-1017	3/2/98	Changed door liner and gasket, models 8024 and 8025	heg
- - -	16916/FR-1018	3/2/98	Changed door liner and gasket, models 8026 and 8027	heg
1	FR-736	9/94	Revise parts list and change specifications per ECR.	
		8/93	Revised manual to current format.	

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General Safety Notes used in this Manual

	This symbol alerts the user to important operating and/or maintenance instructions. It may be used alone or with other safety symbols. Read the accompanying text carefully.
	This symbol alerts the user to potential electrical hazards. Only qualified persons should perform the instructions and procedures associated with this symbol.
	This symbol represents extreme temperature hazards, hot or cold. Instructions associated with this symbol should only be carried out when using special handing equipment or wearing special, protective clothing.
	This symbol alerts the user of potential biological hazards. Proper protective equipment and procedures must be used when following instructions associated with this symbol.
	This symbol alerts the user of the presence of potentially hazardous energy. Equipment being maintained or serviced must be locked off to prevent possible injury.

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Section 1 - Receiving

1.1 Preliminary Inspection

This product was thoroughly inspected and carefully packed prior to shipment and all necessary precautions were taken to ensure safe arrival of the merchandise at its destination. Immediately upon receipt, before the unit is moved from the receiving area, carefully examine the shipment for loss or damage. Unpack the shipment and inspect both interior and exterior for any in-transit damage.

1.2 Responsibility for Shipping Damage

For products shipped F.O.B. Marietta, Ohio, the responsibility of Forma Scientific, Inc. ends when the merchandise is loaded onto the carrier's vehicle.

On F.O.B. Destination shipments, Forma Scientific's and the carrier's responsibility ends when your Receiving Department personnel sign a free and clear delivery receipt.

Whenever possible, Forma Scientific, Inc. will assist in settling claims for loss or in-transit damage.

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Section 2 - Introduction

2.1 General Description

The Model 8022 Freezing Chamber is a well insulated, top loading unit of stainless steel construction. It is sufficiently compact to be placed on a laboratory table, yet has the capacity to house several stacked freezing racks.

- All freezing chamber space is usable. An electric blower, mounted at the rear of the chamber, circulates nitrogen gas to assure uniform cooling. Thermocouple temperature probes provide the programmable freezing controller with sample and chamber temperature information.

- An 800 watt integral heating element warms the freezing chamber after each freezing run has been completed and specimens are removed.

- Nitrogen gas used in the cooling process escapes from the freezing chamber to the atmosphere through a vent located at the rear of the chamber. A liquid nitrogen transfer hose and pressure relief, set at 60 PSIG, connects to the solenoid valve to supply coolant to the freezing chamber. Electrical connectors for the thermocouple and control lines for the blower, heater, and solenoid valve(s) are supplied.

2.2 Principles of Operation

Liquid nitrogen enters the freezing chamber at the command of the controller. Exposed to atmospheric pressure within the chamber, the liquid nitrogen immediately begins to boil and evaporate. Since the boiling point of liquid nitrogen is approximately -195.8°C at one atmosphere of pressure, the freezing chamber is cooled as latent heat is absorbed by the liquid nitrogen as it boils off and evaporates.

Gaseous nitrogen escapes to the atmosphere from a vent located at the rear of the freezing chamber. Since vaporization is almost instantaneous, controlling the rate at which the liquid nitrogen enters the chamber controls the rate at which heat is absorbed and removed from the freezing chamber.

The temperature control system of the Forma Model 8022 Freezing Chamber consists of a controller, temperature probes and two solenoid valves, Cool and Cool Plus. The Cool solenoid valve is used by the controller for all cooling rates up to 1°C/min. For cooling rates above 1°C/min, the Cool Plus valve is activated.

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Temperature probes, consisting of a sample and permanently mounted chamber thermocouple, provide temperature information, in the form of minute electrical currents to the controller.The shorter thermocouple, mounted behind the fan guard, is the chamber thermocouple. It senses the atmospheric temperature of the freezing chamber. The longer thermocouple is the sample thermocouple. It senses the temperature of the sample fluid, whose freezing characteristics are similar to the those of the specimens to be frozen. The sample probe is immersed in the sample fluid.

The controller monitors the chamber thermocouple outputs and regulates the amount of liquid nitrogen entering the freezing chamber. The controller also displays the chamber and/or the sample temperature on a strip chart recorder.

A fan, located within the freezing chamber, circulates the nitrogen gas within the freezing chamber to assure uniform cooling.

Upon completion of the freezing process, a heater is energized within the chamber, to melt frozen water vapor which has condensed on the internal walls. This process also quickly warms the freezing chamber so that the next freezing cycle can be started.

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Section 3 - Installation and Start-Up

3.1 Unpacking List

All components needed for normal operation of the unit are supplied, and include the following:

- A four foot nitrogen transfer hose with swivel end and fittings.

Note: A six foot hose with swivel is available as an option. However, the use of a transfer hose longer than six feet is not recommended and may degrade system performance. Contact Forma Scientific if a longer transfer hose length is required.

- A pressure relief valve set at 60 PSIG
- A flare input fitting for connecting the liquid nitrogen transfer hose to the freezing chamber solenoid valve.
- Electrical connectors for thermocouple signal, control and electrical power.
- A thermocouple assembly consisting of a sample thermocouple and thermocouple connectors. The chamber thermocouple has been permanently mounted behind the fan guard to assure accurate chamber temperature output to the controller.
- Stabilizing corks for securing the sample thermocouple inside the control ampules.

Items required but not supplied

In addition to the above furnished items the following items are *required*, but *not* furnished. Each complete freezing system requires:

- Controller
- Regulated liquid nitrogen supply **(22 PSI)**
- Temperature recording device

The programmable freezing controller and the recorder must be plug-to-plug compatible with the Model 8022 freezing chamber.

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3.2 Location

The Model 8022 freezing chamber should be located in a well-ventilated area of the laboratory, on a benchtop with adequate work space available. Allow for adequate clearance for door swing and latch.

The chamber should be located adjacent to the liquid nitrogen supply and a suitable electrical outlet. Space must also be allowed for access to the unit's electrical power switch mounted on the electrical box on the back of the freezer.

CAUTION! The freezing chamber must not be positioned above the controller or recorder. Such positioning will result in condensate dripping into the electronic causing serious damage to the internal circuitry.

The nitrogen gas vent, located at the rear of the chamber must not be obstructed. Obstruction of the vent will seriously interfere with normal system operation. The area surrounding the nitrogen vent is subject to low temperatures. Items which will be adversely affected by extreme cold should be kept away from the vent.

Arrangements should be made to collect the condensate which will form on the transfer hose and at the freezing chamber exhaust.

3.3 Connecting the Liquid Nitrogen Transfer Hose

Liquid nitrogen is the only consumable material that is required for operation. Most facilities use portable cryogenic supply tanks filled with liquid nitrogen.

Only tanks meeting the following specifications should be used with the unit's storage system.

Low Pressure Supply:	22 PSIG Maximum
Liquid Outlet Fitting:	1/2", 45° flared tube

Connect the liquid nitrogen transfer hose to the input flare fitting connected to the solenoid valve at the back of the unit. Use an adjustable wrench to tighten the swivel nut on each hose end and a second wrench to steady the tank outlet.

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3.4 Electrical Connections

It will be necessary to connect the thermocouple leads to the controller, and interconnect the controller and the strip chart recorder with the freezing chamber.

CAUTION! Do not force the connectors together. If connectors do not join easily, check the pin and socket orientation of the plug and receptacle. Thermocouple leads are colo-coded to assure proper mating. Failure to follow these cautions may result in permanent connector damage.

Make the following connections:

1. Connect the sample and chamber thermocouple leads to the controller.

2. Connect the control lead to the controller and chamber.

3. Connect the strip chart recorder to the temperature controller and make the appropriate power connections.

4. With the controller power switch turned OFF, connect the controller to an adequate *grounded* power source.

Note: Refer to the electrical schematic or the serial tag on the rear of the controller for specific electrical requirements.

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Section 4 - Operation

4.1 Preliminary Operating Procedures

It is suggested that Forma's freezing racks be used in the freezing chamber. These freezing racks have been specifically designed to maximize dense packing of specimen containers, and to maintain sufficient circulation to assure uniform and efficient cooling.

Cryotube Geometry

The freezing rate of materials within the chamber is directly related to the diameter of the cryotube and determines the *phase change temp drop* control setting requirement of the controller.

- One milliliter and two milliliter cryotubes have the same diameter and will normally require a *phase change temp drop* control setting of –40°C.
- Smaller diameter cryotubes, such as the Beckman microtube, normally requires a *phase change temp drop* control setting of –20°C.
- A 5 ml cryotube will normally require a *phase change temp drop* control setting of –45°C to –50°C.

Sample Thermocouple Positioning

CAUTION! Failure to properly position sample thermocouple probe may result in improper temperature readings, un-repeatable results, inaccurate control and loss of specimen.

Using the stabilizing corks provided, carefully push the sample thermocouple through the cork, positioning the probe so that it is immersed in the freezing media. To ensure accurate and repeatable results, the thermocouple must be positioned in the center of the control ampule, equidistant from the vertical walls.

This central position gives an average temperature of the control ampule. If the thermocouple probe is near or touching the outer surface of the control ampule, the probe may sense the temperature of the circulating nitrogen gas. This may cause wide temperature variations in the control sample, especially during phase change (heat of fusion) where the chamber temperature is 30°C to 40°C lower than the average sample temperature.

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Liquid Nitrogen Service

Before opening the nitrogen service supply valve, verify the following:

- Transfer hose is properly connected to the liquid nitrogen supply and to the freezing chamber.
- Liquid nitrogen supply pressure relief valve is 22 PSIG.
- Gaseous nitrogen vent, located at the rear of the chamber, is not obstructed.
- Sufficient clearance to permit chamber door opening and for loading and unloading specimens.

The Liquid Nitrogen Supply:

Open the liquid nitrogen service supply valve completely, then "back-off" the valve slightly (one turn). This will prevent the supply valve from sticking in the open position. Verify that the liquid nitrogen supply pressure, as measured at the supply tank, is at least 10 PSIG, but not greater than 22 PSIG.

The Transfer Hose:

To conserve liquid nitrogen, it is recommended that the liquid nitrogen service supply valve be shut off when not in use. Disconnecting the transfer hose is not necessary.

The liquid nitrogen transfer hose does not require insulation. However, thermal barrier material is available to reduce the possibility of frostbite from accidental contact, and to reduce the thermal loss of liquid nitrogen.

4.2 Specimen Loading

Establish the desired starting temperature in the freezing chamber. Refer to the appropriate controller manual. Load the chamber as follows:

1. Release the freezing chamber latch and open the door. The Model 8022 is equipped with a limit switch that disables the blower, heater and solenoid valve when the chamber door is opened.

2. Place the control sample ampule in the center of the freezing rack and surround it with specimens to be frozen.

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Note: The control sample must be identical to the other specimens in container size and shape, volume of sample and percent of cryoprotectant contained in the solution.

3. Close the freezing chamber door and secure the latch.

4. Begin the freezing run. See applicable controller manual.

4.3 Specimen Unloading

Once the freezing sequence has been completed, specimen unloading should be done as follows:

WARNING! Danger of frostbite exist! Wear protective clothing.

1. Unlatch the freezing chamber door.

2. Carefully remove the sample ampule from the freezing rack and remove the rack from the chamber.

3. Carefully transfer the frozen specimens to inventory control system storage.

4. Close the freezing chamber door and warm.

5. Open the freezing chamber door and wipe down with a clean dry cloth, to remove condensate.

4.4 System Shut-Down

Normal Shut-Down

Under normal operating conditions, the freezing chamber is remotely operated by the controller. At the end of the day, or if another freezing run will not be done for a considerable amount of time, the liquid nitrogen service supply valve should be shut off. The electrical power switch, located in the lower right corner of the rear electrical box, should also be turned off.

Emergency Shut-Down

To shut down the freezing chamber in an emergency, turn off the controller and either turn the unit's power switch off or disconnect the chamber line cord from the electrical receptacle. This will remove power to the freezing chamber and close the solenoid valve. If nitrogen is still entering the freezing chamber, close the liquid nitrogen service supply valve.

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Section 5 - Maintenance

5.1 Cleaning the Freezing Chamber

1. The freezing chamber is readily disinfected with an appropriate laboratory chemical. Dilute with sterile distilled water (50K to 1M Ohm/cm).

2. Remove and wash the freezing rack and all interior surfaces.

3. Rinse all surfaces at least twice with sterile distilled water, or until all of the disinfectant-detergent has been removed.

4. Thoroughly clean the door gasket.

5. If desired, all surfaces can then be wiped or sprayed with 70% alcohol.

CAUTION! After completing the decontamination procedure, it is recommended that the unit be run and tested before placing any valuable contents inside the freezing chamber.
Alcohol, eveen a 70% solution, is volatile and flammable. Use only in a well-ventilated area, free from open flame. If any component is cleaned with alcohol, do not expose the component to open flame or other possible hazard.
Do not use strong alkaline or caustic agents. Stainless steel is corrosion rsistant, not corrosion proff.
Do not use chlorinated solvents or other halogens on stainless steel, as they can cause pitting and rusting.

5.2 Cleaning the Cabinet Exterior

The cabinet may be cleaned with soap and water, or with any non-abrasive commercial spray cleaner. Use the mildest cleaning procedure that will do the job effectively. To insure maximum effectiveness and avoid marring the surface, always rub in the direction of the finish polish lines. Be sure to rinse the surface thoroughly after every cleaning procedure. To avoid water marks, wipe the surface dry.

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Problem	Probable Cause	Remedy
Nitrogen continually enters the freezing chamber.	• Controller is improperly set or is malfunctioning. • Solenoid valve is stuck in the "open" position. • Liquid nitrogen supply pressure is above 22 PSIG.	• Reset/repair controller • Repair/replace solenoid. • Adjust liquid nitrogen supply pressure from 22 to 10 PSIG.
Liquid nitrogen will not enter freezing chamber.	• LN_2 supply empty. • Liquid nitrogen service supply valve is shut. • Power signal, and/or connectors are not properly, or completely, installed. • Solenoid valve is faulty. • Controller is faulty.	• Open liquid nitrogen service supply valve. • Check for proper connections. • Repair/replace solenoid valve. • Repair faulty controller.
Uneven cooling in freezer chamber.	• Fan has not been energized at the controller.	• Energize fan at controller.
Fan is not operating.	• Fan has not been energized at the controller. • Fan is jammed or motor is defective. • Limit switch is defective.	• Energize fan at the controller. • Mechanically free fan and/or replace fan motor. • Replace limit switch.

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Problem	Probable Cause	Remedy
Inability to sufficiently cool specimens.	• Controller is improperly set. • Insufficient liquid nitrogen pressure at freezing chamber.	• Adjust controller setting. Refer to appropriate controller manual. • Increase liquid nitrogen supply pressure to 22 PSIG as measured at the freezing chamber.
Nitrogen gas is escaping from pressure relief valve at rear of freezing chamber.	• Liquid nitrogen pressure supply is too high. • Pressure relief valve is defective.	• Reduce liquid nitrogen pressure to 22 PSIG. • Replace pressure relief valve.
Heater in freezing chamber does not operate.	• Heater has not been energized at controller. • Element is faulty. • Heater relay is faulty. • Wiring connections are faulty.	• Energize heater; refer to appropriate controller manual. • Replace faulty heating element. • Replace faulty heater relay. • Check wiring harness for proper connector seating at controller.

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Section 6 - Freezing Chamber Specifications

Model	8022 (8023)	8024 (8025)	8026 (8027)
External Dimensions	10.4"W x 16.0"H x 16.1" F-B (26.4cm x 40.6cm x 41.0cm)	18.1"W x 16.8"H x 17.0" F-B* (46.1cm x 42.6cm x 43.2cm)	24.3"W x 17.8"H x 20.8" F-B (61.6cm x 45.1cm x 52.8cm)
Internal Dimensions/ Usable Space	5.9"W x 11.7"H x 3.4" F-B (15.0cm x 29.7cm x 8.6cm)	9.3"W x 12.0"H x 9.9" F-B (23.6cm x 30.5cm x 25.1cm)	13.0"W x 13.0"H x 13.7" F-B (33.0cm x 33.0cm x 34.8cm)
Volume	0.1 cu. ft. (3.8 liters)	0.6 cu. ft. (18.0 liters)	1.3 cu. ft. (37.7 liters)
Weight	30 lbs. (13 kg)	51 lbs. (23 kg)	90 lbs. (41 kg)
Electrical	95-125VAC, 1 PH, 50/60 Hz, 8 FLA (190-250VAC, 1 PH, 50/60 Hz, 4.0 FLA)	95-125VAC, 1 PH, 50/60 Hz, 9.5 FLA (190-250VAC, 1 PH, 50/60 Hz, 4.0 FLA)	95-125VAC, 1 PH, 50/60 Hz, 9.5 FLA (190-250VAC, 1 PH, 50/60 Hz, 4.0 FLA)
Utility Connections	1/2" 45° Flare. Four foot flexible hose supplied with 8022 (8023) and 8024 (8025). Six foot flexible hose supplied with 8026(8027).		

**Includes handle.*

Continuing research and improvements may result in specification changes at any time.

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Section 7 - Parts List

Model 8022

STOCK #	DESCRIPTION
4000400	Transfer Hose, 4 Ft.
100085	Fan Blade, 5", CW
103035	Gasket, Silicone, P-Style, 6x6 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156087	Fan Motor, 1/50 HP, modified
189802	Strike Plate, Teflon
250093	Solenoid, Brass, 1/4 FPT, 120V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230066	Fuse, Ceramic, 10A, 250V
300245	Relay, Quick Connect, SPDT
4000381	Thermocouple Sensor, Sample, 2Ml

Model 8023

STOCK #	DESCRIPTION
4000400	Transfer Hose, 4 Ft.
100085	Fan Blade, 5", CW
103035	Gasket, Silicone, P-Style, 6x6 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156091	Fan Motor, 1/40 HP
189802	Strike Plate, Teflon
250094	Solenoid, Brass, 1/4 FPT, 220V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230093	Fuse, Ceramic, 5A, 250V
300245	Relay, Quick Connect, SPDT
4000381	Thermocouple Sensor, Sample, 2Ml

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Model 8024

STOCK #	DESCRIPTION
4000400	Transfer Hose, 4 Ft.
100080	Fan Blade, 8", CW
181003	Teflon door liner
103096	Gasket, Silicone, P-Style, 12x11 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156067	Fan Motor, 1/50 HP, 1550 RPM
189801	Strike Plate, Teflon
250093	Solenoid, Brass, 1/4 FPT, 120V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230066	Fuse, Ceramic, 10A, 250V
300245	Relay, Quick Connect, SPDT
4000385	Thermocouple Sensor Sample, 2Ml

Model 8025

STOCK #	DESCRIPTION
4000400	Transfer Hose, 4 Ft.
100080	Fan Blade, 8", CW
181003	Teflon door liner
103096	Gasket, Silicone, P-Style, 12x11 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156090	Fan Motor, 1/40 HP, 1500 RPM
189801	Strike Plate, Teflon
250094	Solenoid, Brass, 1/4 FPT, 220V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230093	Fuse, Ceramic, 5A, 250V
300245	Relay, Quick Connect, SPDT
4000385	Thermocouple Sensor Sample, 2Ml

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Model 8026

STOCK#	DESCRIPTION
4000401	Transfer Hose, 6 Ft.
100080	Fan Blade, 8", CW
181004	Teflon Door Liner
103097	Gasket, 16x13 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156067	Fan Motor, 1/50 HP, 1550 RPM
189801	Strike Plate, Teflon
250093	Solenoid, Brass, 1/4 FPT, 120V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230066	Fuse, Ceramic, 10A, 250V
300245	Relay, Quick Connect, SPDT
4000385	Thermocouple Sensor Sample, 2Ml

Model 8027

STOCK#	DESCRIPTION
4000401	Transfer Hose, 6 Ft.
100080	Fan Blade, 8", CW
181004	Teflon Door Liner
103097	Gasket, 16x13 ID
121047	Latch Handle, Freezing Chamber
121048	Cam Latch, Freezing Chamber
156090	Fan Motor, 1/40 HP, 1500 RPM
189801	Strike Plate, Teflon
250094	Solenoid, Brass, 1/4 FPT, 220V, NC
251004	Pressure Relief Valve, 1/4 MPT
360193	Switch, Push-button, SPST, MOM-NO
230093	Fuse, Ceramic, 5A, 250V
300245	Relay, Quick Connect, SPDT
4000385	Thermocouple Sensor Sample, 2Ml

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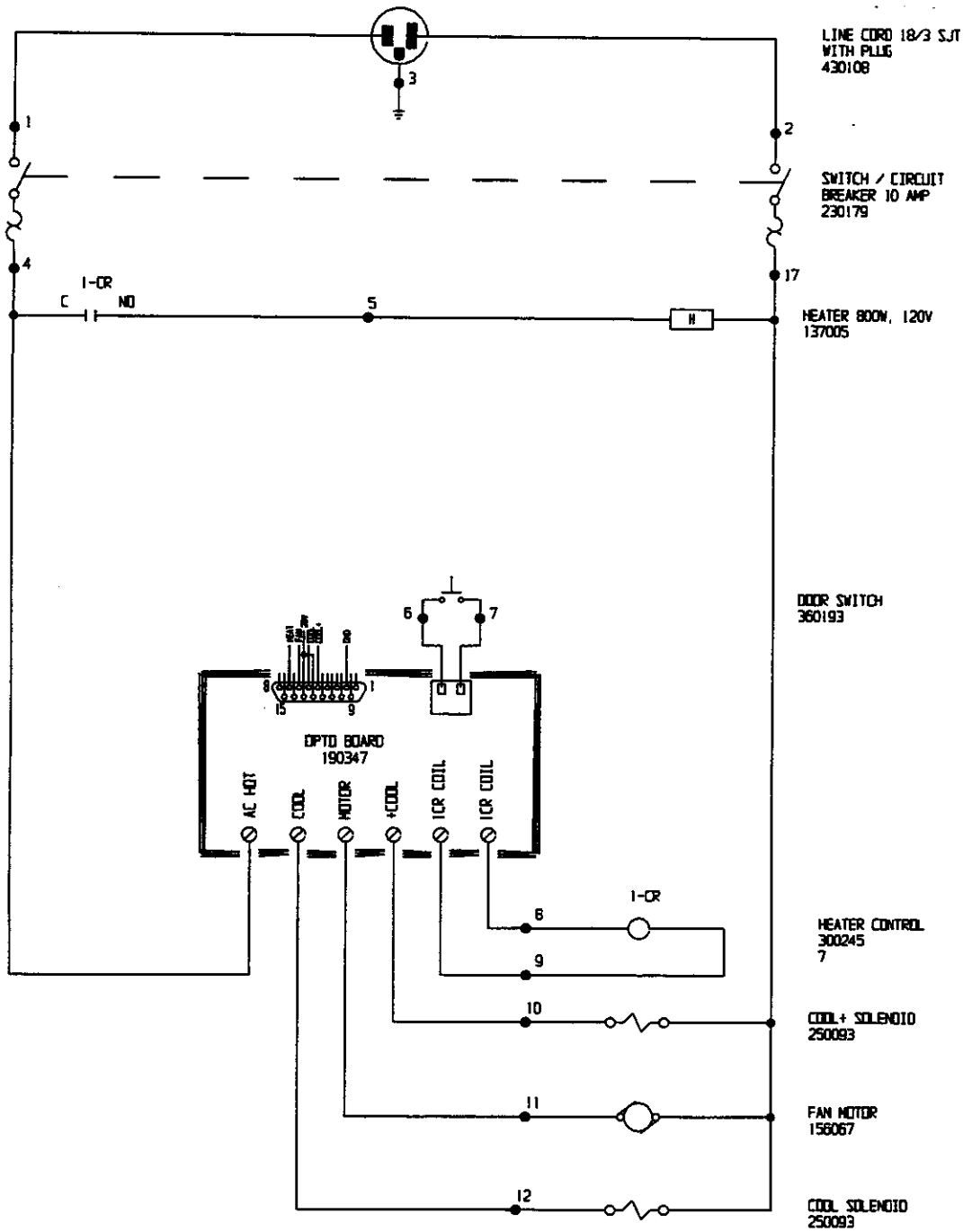
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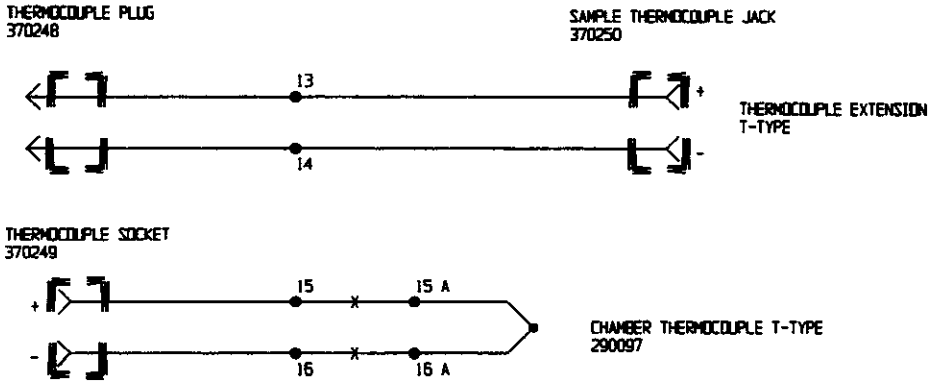
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POWER CONNECTION
115VAC, 1Ø, 50/60 Hz, 8.0 FLA





Electrical Schematic
Forma Model:
8022
Freezing Chamber

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WIRE CHART

WIRE NO.	GAUGE	COLOR
1	18	BROWN
2	18	BLUE
3	18	GRN/YEL
4	18	BLACK
5	18	PURPLE
6	20	BLACK
7	20	BLACK
8	20	RED
9	20	RED
10	20	BLUE
11	20	BLACK
12	20	YELLOW
13	24	BLUE
14	24	RED
15	24	BLUE
15A	24	BLUE
16	24	RED
16A	24	RED
17	18	WHT

NOTES:

● Denotes Terminal Strip Connection — Parts List Reference Number

1-CR Last Relay Number — ○ Assembly

N/A Last Terminal Number — ⌒ Panel

17 Last Wire Number — ○ Refrigeration

□ Wiring

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DATE OF APPROVAL _____

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[illegible]

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
3	FR-1395	05-11-00	DHG	KOG	LDN	CHG'D. 230124 SWITCH TO 230179
2	SI-7528	05-10-99	NAB	FOK	LDN	LINE CORD CHANGE
1	FR-539	3-25-93	RTT	KOG	LDN	ADD SWITCH / BREAKER
0	N/A	9-14-92	JD	JD	LDN	RELEASED FOR PRODUCTION

DATE 3-2-92 | DWN RTT | CAD JD | APPD LDN | SCALE NONE

CUSTOMER

JOB TITLE 8022 FREEZING CHAMBER

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION | JOB NUMBER | DRAWING NUMBER 8022-70-0-D

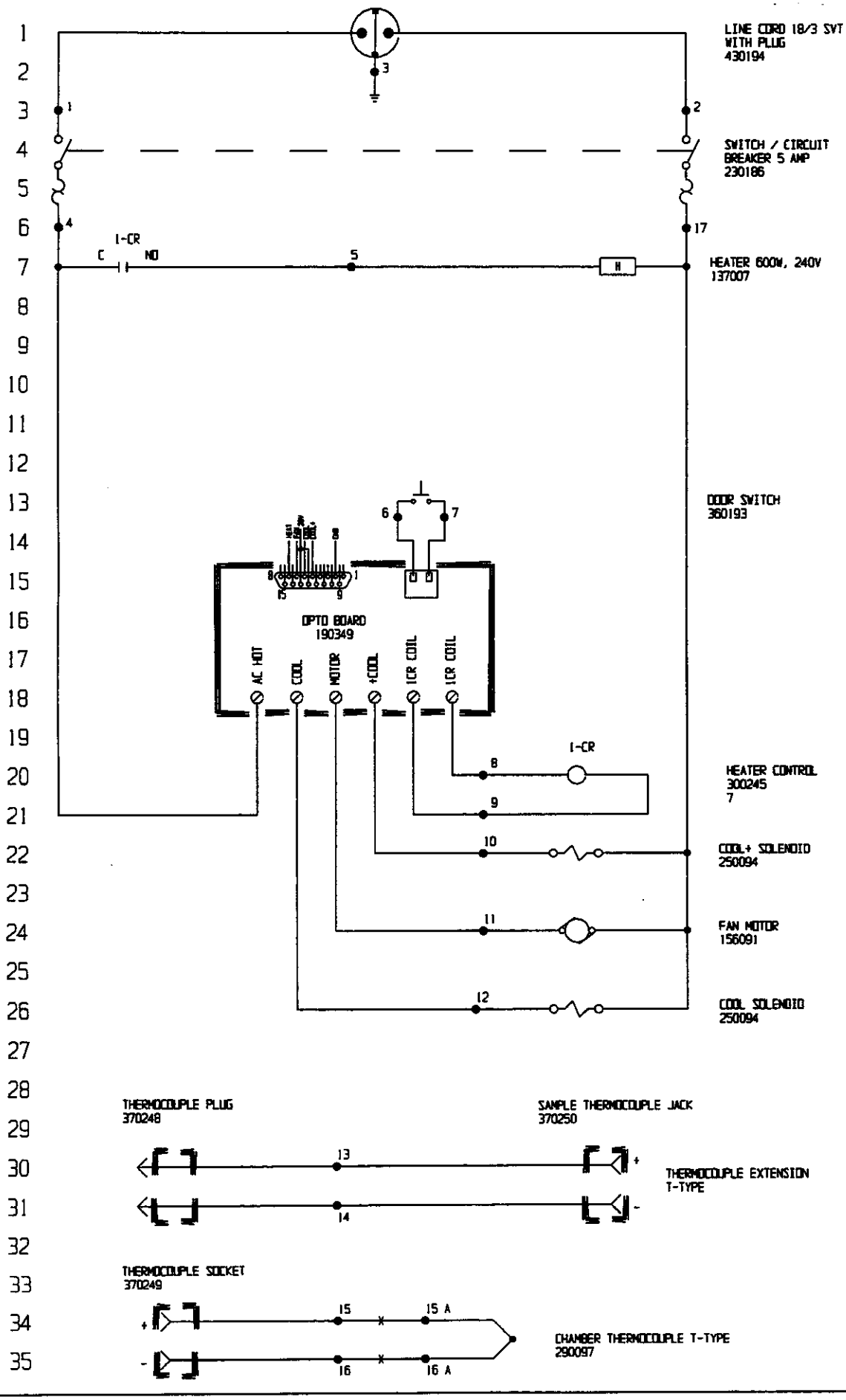
Electrical Schematic
Forma Model:
8022
Freezing Chamber

8022-70-0-D Rev. 3
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POWER CONNECTION
220VAC, 1Ø, 50/60 Hz, 4.0 FLA



Electrical Schematic
Forma Model:
8023
Freezing Chamber

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WIRE CHART

WIRE NO.	GAUGE	COLOR
1	18	BROWN
2	18	BLUE
3	18	GREEN/YELLOW
4	18	BLACK
5	18	PURPLE
6	20	BLACK
7	20	BLACK
8	20	RED
9	20	RED
10	20	BLUE
11	20	BLACK
12	20	YELLOW
13	24	BLUE
14	24	RED
15	24	BLUE
15A	24	BLUE
16	24	RED
16A	24	RED
17	18	WHT

NOTES:

● Denotes Terminal Strip Connection	Parts List Reference Number
1-CR Last Relay Number	○ Assembly
N/A Last Terminal Number	⬠ Panel
17 Last Wire Number	○ Refrigeration
	□ Wiring

CUSTOMER APPROVAL/REFERENCE

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DATE OF APPROVAL _____

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REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
3	FR-1395	05-11-00	DHG	KOG	LDN	CHG'D. 230088 SWITCH TO 230186
2	FR-736	08-17-94	DHG	KOG	LDN	DIG FAN MOTOR & SWITCH/CIRCUIT BREAKER
1	FR-539	3-26-93	RTT	KOG	LDN	ADD SWITCH / BREAKER
0	N/A	9-12-92	AT	AT	LDN	RELEASED FOR PRODUCTION

DATE 8-28-92	DWN AT	CAD AT	APPD LDN	SCALE NONE
CUSTOMER			
JOB TITLE 8023 EXPORT FREEZING CHAMBER			
DWG TITLE ELECTRICAL SCHEMATIC			
LOCATION	JOB NUMBER	DRAWING NUMBER 8023-70-0-D	

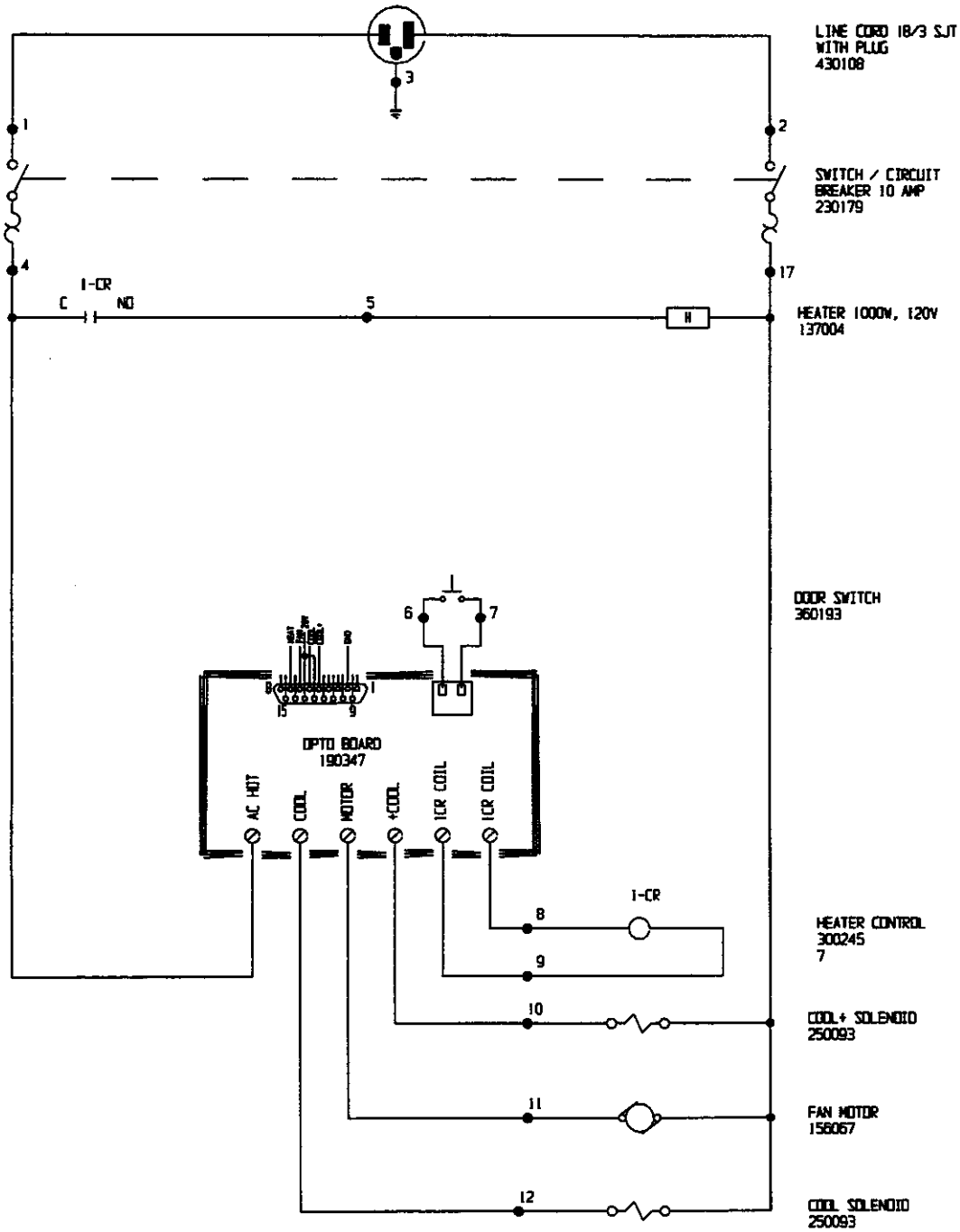
Electrical Schematic
Forma Model: 8023
Freezing Chamber

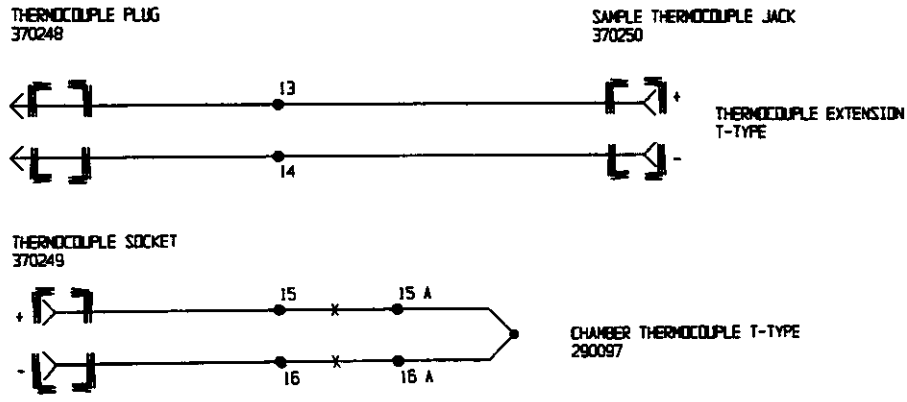
8023-70-0-D Rev. 3
Page 2 of 2

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POWER CONNECTION
115VAC, 1Ø, 50/60 Hz, 9.5 FLA





Electrical Schematic
Forma Model:
8024/8026
Freezing Chamber

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WIRE CHART

WIRE NO.	GAUGE	COLOR
1	18	BROWN
2	18	BLUE
3	18	GRN/YEL
4	18	BLACK
5	18	PURPLE
6	20	BLACK
7	20	BLACK
8	20	RED
9	20	RED
10	20	BLUE
11	20	BLACK
12	20	YELLOW
13	24	BLUE
14	24	RED
15	24	BLUE
15A	24	BLUE
16	24	RED
16A	24	RED
17	18	WHT

NOTES:

● Denotes Terminal Strip Connection	Parts List Reference Number
1-CR Last Relay Number	○ Assembly
N/A Last Terminal Number	∩ Panel
17 Last Wire Number	○ Refrigeration
	□ Wiring

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REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
3	FR-1395	05-11-00	DNG	KDG	LDN	CHG'D. 230124 SWITCH TO 230179
2	SI-7528	05-10-99	NAB	PDK	LDN	LINE CORD CHANGE
1	FR-539	3-25-93	RTT	KDG	LDN	ADD SWITCH / BREAKER
0	N/A	9-14-92	AT	AT	LDN	RELEASED FOR PRODUCTION

DATE 3-2-92	DWN RTT	CAD JD	APPD LDN	SCALE NONE

CUSTOMER

JOB TITLE 8024/8026 FREEZING CHAMBER

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION	JOB NUMBER	DRAWING NUMBER
		8024-70-0-D

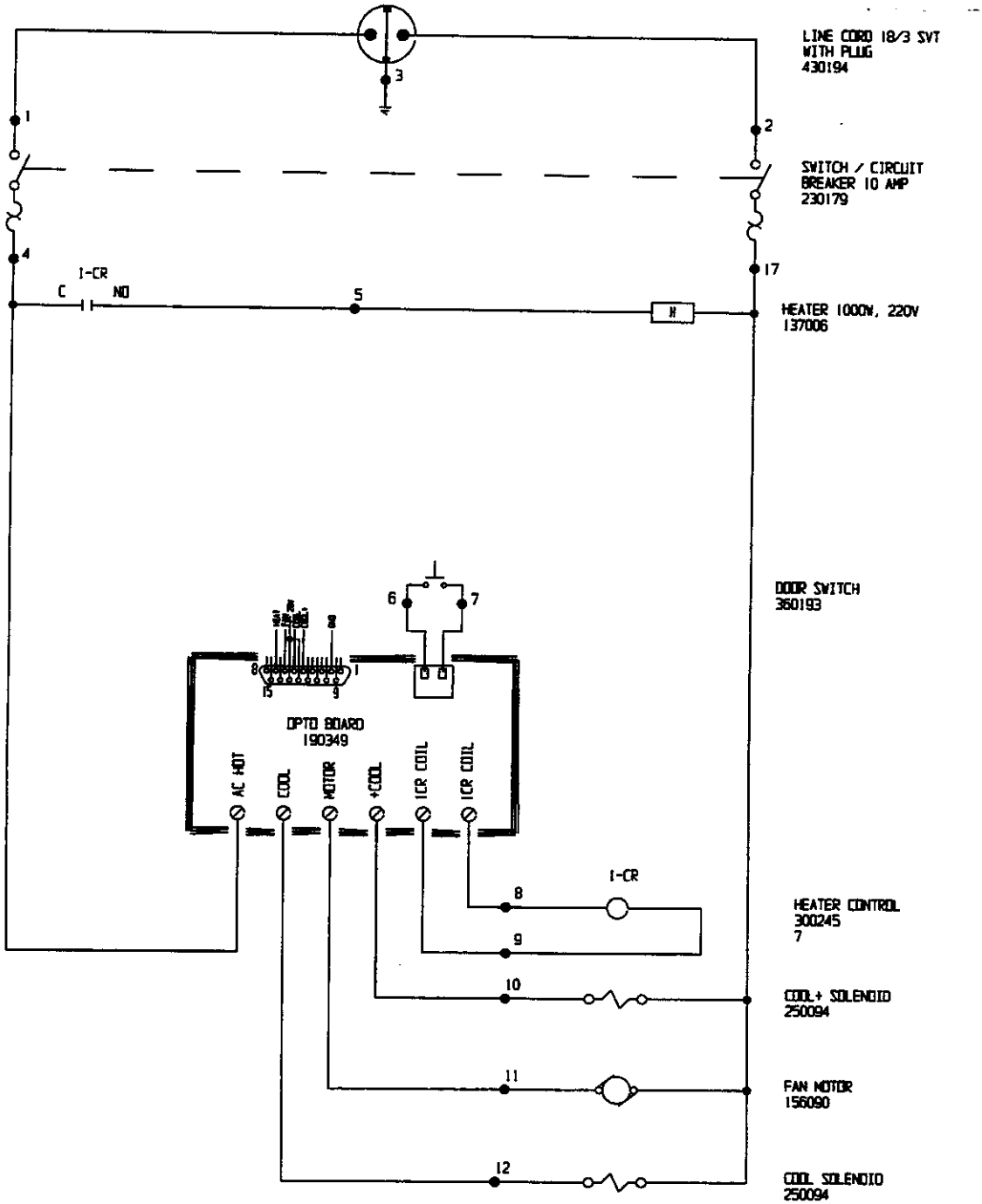
Electrical Schematic
Forma Model:
8024/8026
Freezing Chamber

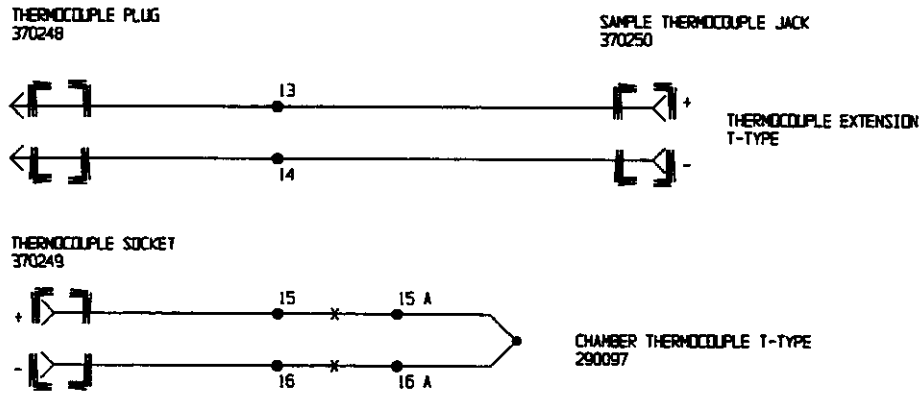
8024-70-0-D Rev. 3

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POWER CONNECTION
220VAC, 1Ø, 50/60 Hz, 4.0 FLA





Electrical Schematic
Forma Model:
8025/8027
Freezing Chamber

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WIRE CHART

WIRE NO.	GAUGE	COLOR
1	18	BROWN
2	18	BLUE
3	18	GREEN/YELLOW
4	18	BLACK
5	18	PURPLE
6	20	BLACK
7	20	BLACK
8	20	RED
9	20	RED
10	20	BLUE
11	20	BLACK
12	20	YELLOW
13	24	BLUE
14	24	RED
15	24	BLUE
15A	24	BLUE
16	24	RED
16A	24	RED
17	18	WHT

NOTES:

●	Denotes Terminal Strip Connection	Parts List Reference Number	
1-CR	Last Relay Number	○	Assembly
N/A	Last Terminal Number	⌂	Panel
17	Last Wire Number	○	Refrigeration
		□	Wiring

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REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
3	FR-1395	05-11-00	DMG	KOG	LDN	CHG'D. 230124 SWITCH TO 230179
2	FR-735	08-17-94	DMG	POK	LDN	REVISED FAN MOTOR
1	FR-539	3-26-93	RTT	KOG	LDN	ADD SWITCH / BREAKER
0	N/A	9-12-92	AT	AT	LDN	RELEASED FOR PRODUCTION

DATE 8-28-92 | DWN AT | CAD AT | APPD LDN | SCALE NONE

CUSTOMER

JOB TITLE 8025/8027 EXPORT FREEZING CHAMBER

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION	JOB NUMBER	DRAWING NUMBER
FREEZERS01		8025-70-0-D

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[illegible]

Electrical Schematic
Forma Model:
8025/8027
Freezing Chamber

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Section 9 - Warranty Information

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FORMA STANDARD PRODUCT WARRANTY

Dear Purchaser:

Good performance is what you expect when you buy products from Forma Scientific, Inc. We, too, are concerned about performance. That's why we offer the following One Year Protective Warranty: **Two (2) years on LN_2 Vacuum Integrity.**

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

During the one year warranty period, component parts proven to be defective in materials or workmanship will be repaired or replaced at our expense, labor included. Installation and calibration is not covered by this warranty agreement. The Forma Scientific, Inc. Service Department must be contacted for warranty determination and direction prior to any work being done.

Expendable items such as glass, filters, pilot lights, light bulbs, and door gaskets are excluded from this warranty coverage. Naturally, our warranty does not cover damage caused by accident, misuse, fire, flood, or acts of God.

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 one year warranty period. The Forma Service 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 MERCHANTIBILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Forma Scientific, Inc. shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

A word on installation and operation. We know you expect a proper installation. Your local Forma 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.

And about equipment service? Let's face it. Even the best products need service. If this occurs, please call your Forma Service Office at 1-800-848-3080 in the USA or 1-614-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance service and special applications.

We encourage you to keep this warranty explanation. You may never need it, but it's nice to know the protection is there.

Sincerely,

FORMA SCIENTIFIC, INC.

ISO 9001

CONDITIONS AND TERMS OF SALE

SPECIFICATIONS AND MATERIAL CHANGES: Forma Scientific, Inc. reserves the right to offer our latest and improved models at time of shipment.

SHIPMENTS: All shipments are FOB Marietta, Ohio, freight prepaid and add. Unless Specific shipment instructions are provided, shipment will be made by the least expensive method.

PRICES: All prices are firm for the delivery period specified based on receipt of a purchase order within 30 days. Purchase Orders received after this time are subject to review and price adjustment. If, after acceptance of a Purchase Order the required delivery date is modified by the purchaser, Forma reserves the right to adjust the price to recover additional expenses incurred, due to increased labor or material cost (including mark-up), inventory expenses, and such like. In addition, Forma Scientific, Inc. will be entitled to invoice and receive payment for 90% of the value of labor and material expended.

TAXES: The prices quoted do not include any state, local or federal taxes.

PAYMENT: All payments are net 30 days from date of shipment. Order acceptance is subject to approval of our Credit Department.

CANCELLATION: Orders shall not be subject to cancellation unless cancellation charges are paid by the purchaser. Custom, non-catalog and modified units are not subject to cancellation under any condition.

DAMAGES OR SHORTAGES: Claims for shortages in shipment must be made within 5 working days of receipt of material. If the outer crate or carton is damaged in any way, purchaser should not sign the bill of lading until the carrier notes such damage on the bill of lading. Without this notation, carriers usually refuse purchaser damage claims. Unauthorized return of goods will be refused at Forma's dock. Authorized returned goods will be allowed at a 20% restocking charge plus whatever expenses are necessary to return material to first class, saleable condition. Custom fabricated or modified equipment is not subject to return under any condition.

DELIVERY: Delivery dates are approximate and based on production at time of quotation. Forma shall not be liable for damages to the purchaser for any default or delay in delivery for any reason. Every effort shall be made to meet the delivery quoted, but failure to meet the estimated delivery will not be considered cause for cancellation and/or claims which may arise from such delay.

LIMITATION OF LIABILITY: In no event, whether as a result of breach of contract, warranty or tort (including negligence and strict liability), shall Forma Scientific, Inc. be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of the equipment or any associated equipment, down-time costs, cost of substitute equipment, costs of labor, costs due to delays or claims of Purchaser's own customers for such damages. Purchaser agrees to indemnify Forma Scientific, Inc. and hold Forma Scientific, Inc. harmless from any and all liability, claims, demands, actions, suits, expenses or costs, including reasonable attorney's fees relating to such consequential or incidental damages.

The responsibility of Forma Scientific, Inc. for damages due to injuries, or death of employees of the Purchaser, or ultimate user of the equipment being serviced, caused by the equipment, shall be limited to that portion of such damages as might be attributed to the negligence or strict liability of Forma Scientific, Inc. The Purchaser and ultimate user agree to indemnify Forma Scientific, Inc. and hold Forma Scientific, Inc. harmless from any further damages, indemnity or contribution. All warranties, limitations of liability and indemnities provided herein will survive the termination of this agreement.

Forma Scientific's liability for any claim of any kind (including negligence and strict liability) for any loss or damage arising out of, or resulting from, this agreement or from the performance or breach thereof, or from the Services, Products or Parts furnished hereunder shall in no case exceed the price of the same giving rise to the claim.

INSTALLATION: Installation of all equipment shall be by, and at the expense of, the purchaser unless quoted herein. When installation is quoted, it is understood that elevator service will be made available to Forma Scientific, Inc. at no charge to move the equipment to specific locations. If elevator service is not available or if access to the specified location is not adequate, Forma Scientific, Inc. reserves the right to bill the purchaser for the additional cost of work required.

ACCEPTANCE: Orders, terms and specifications are subject to approval of Forma Scientific, Inc., Home Office. No variation shall be binding unless in writing signed by a Forma executive officer.

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Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

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Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

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(217) 352-9330 | sales@artisantg.com | artisantg.com

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