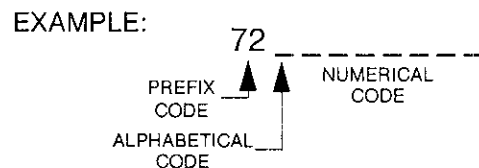


Model SC (Air-Cooled) Compressor Installation, Operation and Maintenance Instructions

8040307
Rev. 100 (7/2002)

*NOTE: This manual applies to all SC (air-cooled) compressors having a serial number **Prefix Code 72** embossed on the rear panel nameplate.*



Helix Technology Corporation no longer manufactures this product. Please contact Technical Support at 1-800-284-2796 (1-508-337-5551 outside the U.S.) for product upgrade options.

June 14, 2005

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- Product Serial Number
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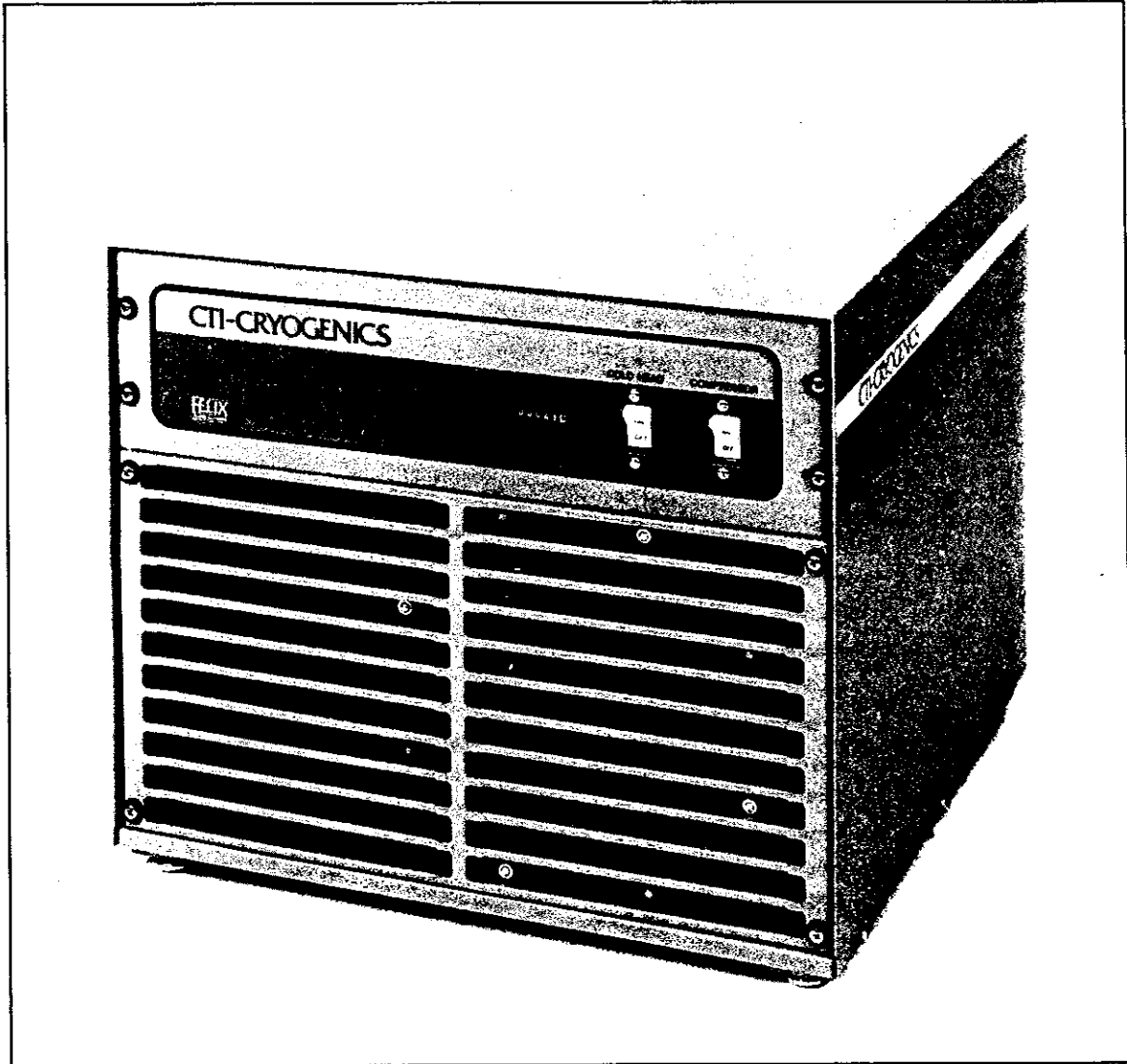


Figure 1.1 Model SC Compressor

Section 1 Introduction

1.1	General	1-1
1.2	Installation, Operation and Servicing Instructions	1-1

1.1 General

This manual provides instructions for installing, operating and servicing the Model SC (Air) Compressor, P/N 8032224. If you are installing or operating a Cryo-Torr® High-Vacuum System you should also have available the Cryo-Torr 100, 7, 8 and 8F High-Vacuum Pumps, Manual No. 8040240.

The manuals for a system cover two basic components: the high-vacuum pump and the compressor. Each manual outlines the details necessary for installation, operation and servicing of that component. A manual is shipped with each system component (high-vacuum pump and compressor).

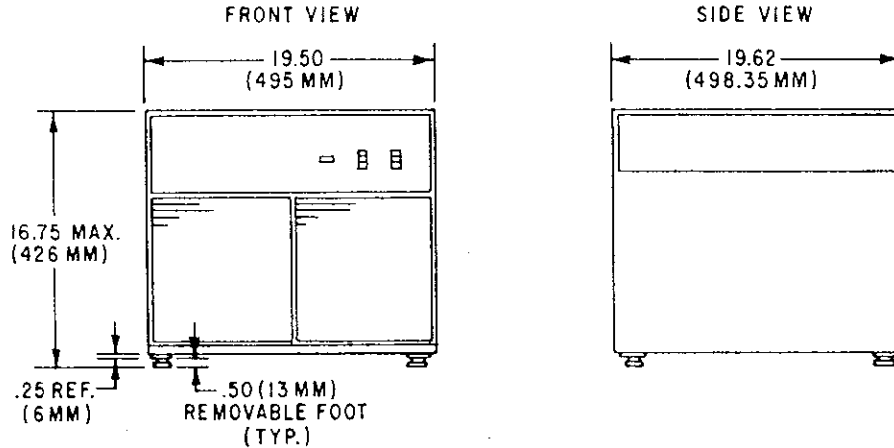
When you purchase a system, you will receive the two manuals necessary for system installation, plus a loose-leaf binder with index tab separators, allowing you to compile a complete indexed notebook.

1.2 Installation, Operation and Servicing Instructions

Installation, Operation and Servicing Instructions for your Model SC Compressor provide easily accessible information. All personnel with installation, operation and servicing responsibilities should become familiar with the contents of these instructions to ensure high quality, safe, reliable performance.

Table 1.1 Model SC Compressor Specifications

Dimensions



Weight

140 lbs (63.5 kg), approximate

Weight (shipping)

155 lbs (70.5 kg), approximate

Power requirements (steady-state conditions)

VOLTS	HZ	PHASE	NOMINAL OPERATING CURRENT (AMPS)	OPERATING VOLTAGE RANGE (VOLTS)	MINIMUM RECOMMENDED ELECTRICAL SERVICE (AMPS)
208/230	60	1	10	198-253	15
200	50	1	10	180-220	15

Power consumption

2.1 kw, nominal operating

Compressor input-power cable (customer-supplied)

Recommended type SO-3 conductor, 600V, neoprene jacket and 14-gauge (2.5 mm²) wire
Install per Figure B.1, page B-3, Electrical Schematic, ensuring compliance with all national, state and local standards.

Helium pressure

Static: 245-250 psig (1690-1725 kPa) at 70 to 80°F (21 to 27°C)
Supply: nominal operation: 270-290 psig (1860-2000 kPa) at operating temperature

Ambient operating temperature range

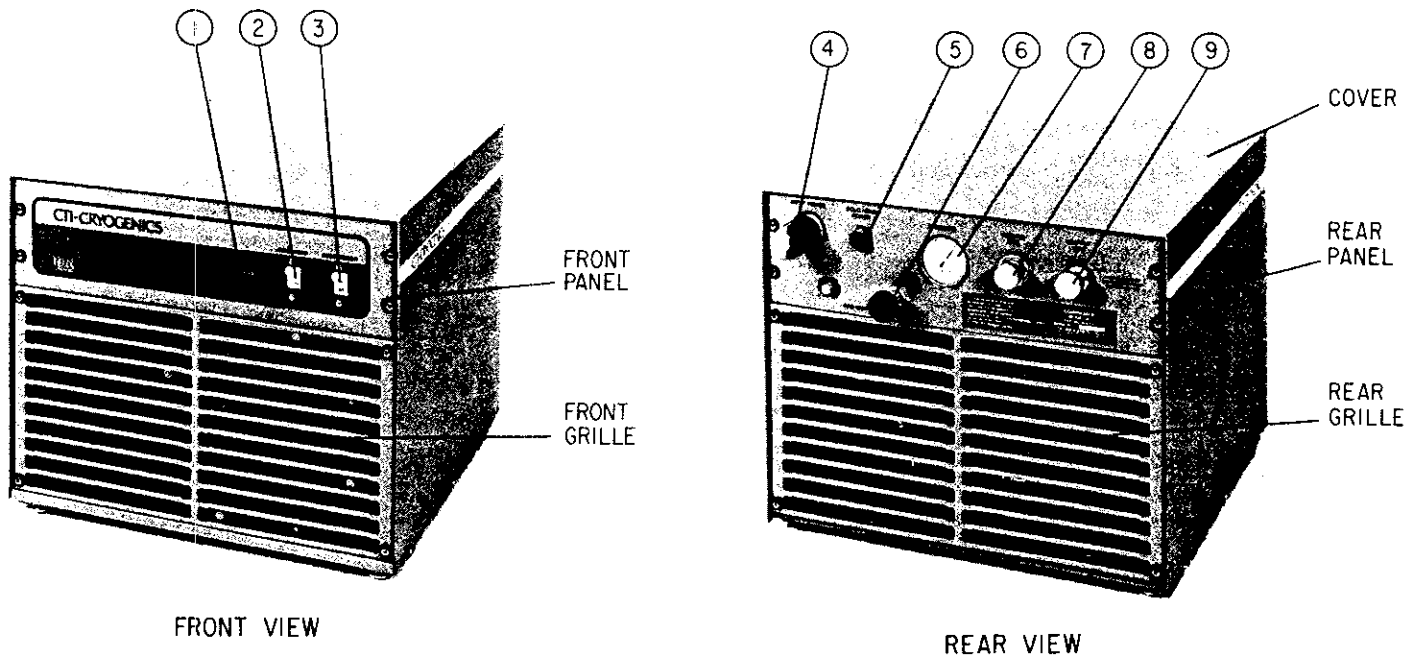
50 to 100°F (10 to 38°C)

Interface

Cold head power receptacle: Mates with plug on cold-head power cable.
Compressor input-power receptacle: Mates with Hubbel twist lock plug No. 4579C, supplied with compressor.
Gas-supply connector: 1/2-inch self-sealing coupling
Gas-return connector: 1/2-inch self-sealing coupling

Adsorber

Replace every 10,000 hours.



Legend

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Elapsed time meter (ETM), in hours.</p> <p>2. Cold head ON/OFF switch (SW3)
Starts and stops the cold head.
SW3 switch is interlocked to SW1, which
must be on to operate.</p> <p>3. Compressor ON/OFF switch (CB1)
Starts and stops the compressor and cooling fan.
Switch contains a circuit breaker.</p> | <p>4. Input power cable plug.</p> <p>5. Cold head power cable receptacle.</p> <p>6. Helium gas charge fitting and valve.</p> <p>7. Helium supply pressure gauge.</p> <p>8. Helium gas-return connector self-sealing coupling.</p> <p>9. Helium gas-supply connector self-sealing coupling.</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Figure 1.2 Model SC Compressor - location of components

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Section 2 Inspection

2.1 Packaging of the System 2-1
2.2 The Compressor 2-1

2.1 Packaging of the System

A Cryo-Torr High-Vacuum Pump System is packaged in three separate cartons. Listed below are the contents of each carton, depending upon which cryopump is included in the system. Note that an Installation, Operation and Servicing Manual is included in the carton for the high-vacuum pump and for the compressor; each manual covers the component packaged in that carton.

When installing a Cryo-Torr High-Vacuum Pump System, CTI recommends that as you unpack a component, you perform an inspection and the necessary tasks for system installation for the component according to the manual included with the component. Final system installation and operation will be performed following procedures in the cryopump manual (8040240).

CRYO-TORR HIGH-VACUUM PUMP SYSTEM		
CARTON LABEL	SYSTEM COMPONENT	MANUAL INCLUDED
Cryo-Torr®	Cryo-Torr 100, 7, 8 and 8F Cryopump	8040240
Compressor	Model SC Compressor	8040307
Accessories	Installation and Scheduled Maintenance Tool Kit and Accessories, P/N 8032040G004	None

2.2 The Compressor

On receipt, remove the Model SC Compressor from its shipping carton and inspect the compressor for evidence of damage as described in this Section.

1. Unpackage and remove the compressor from its shipping carton.
2. Check the carton contents. It should contain:
 - a. Model SC Compressor.
 - b. Compressor Manual, No. 8040307.
3. After unpackaging, inspect the compressor for evidence of damage as follows:
 - a. Inspect the compressor overall exterior for damage and evidence of oil leakage.
 - Report damage to the shipper at once.
 - Retain shipping cartons for storage or return shipment.
 - b. Check the helium pressure gauge. The gauge should indicate 250 psig (1725 kPa) minimum at 70°F. If additional gas pressure is required, follow the instructions in Section 4.2.1, page 4-3, under Adding Helium Gas.

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Section 3 Installation

3.1 Compressor Installation 3-1
3.2 Preparing the Compressor Input-Power Cable 3-2
3.3 Electrical Preparation of Compressor Control Module 3-3
3.4 Connecting the Compressor to the Cryopump 3-4
3.5 Electrical Connection of Compressor 3-4

3.1 Compressor Installation

Figure 3.1, is a block diagram of the major tasks that are detailed in this section required for compressor installation. Installation of your compressor requires no special tools other than those supplied in the Installation and Scheduled Maintenance Tool Kit.

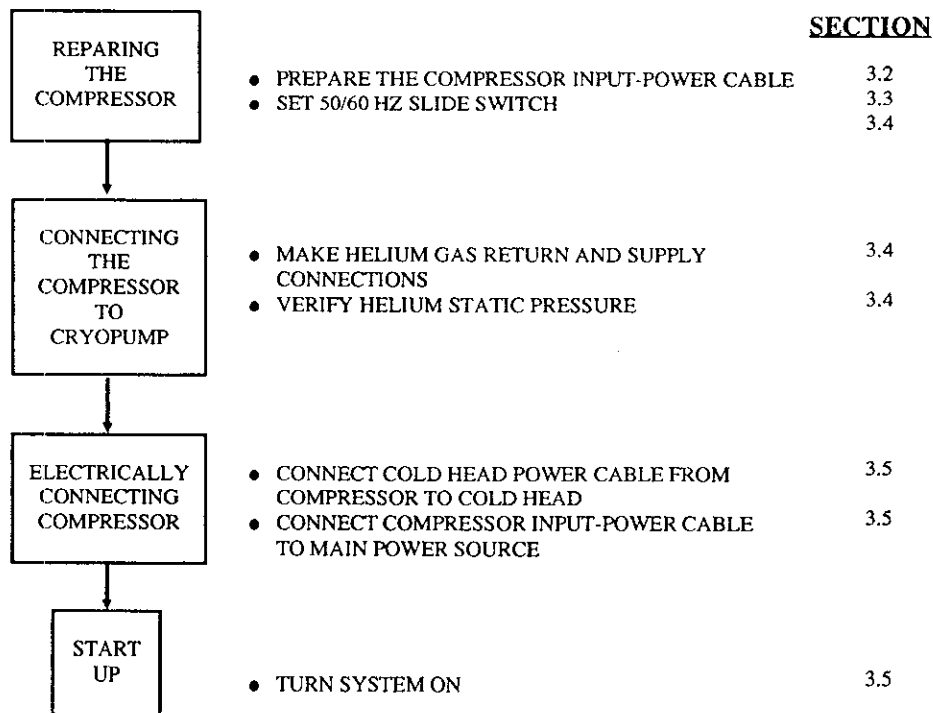


Figure 3.1 Block diagram for Model SC Compressor installation

3.2 Preparing the Compressor Input-Power Cable

CAUTION

Use round cable (diameter 0.595" to 1.50") with the CTI-supplied compressor receptacle plug. Do not tin the conductor leads.

Assemble the compressor input-power cable using the CTI-supplied compressor receptacle plug and a 600-volt power cable that has a SO-3 conductor, 600-volt rating neoprene jacket and 14-gauge (2.5 mm²) wire as follows.

1. Prepare the input power cable by stripping wires and jacket of the cable as shown in Figure 3.2.

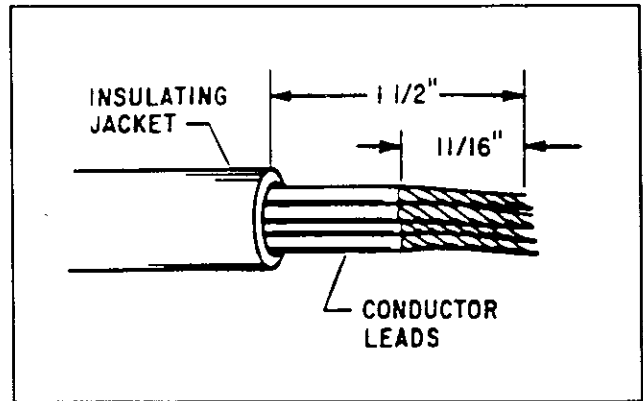
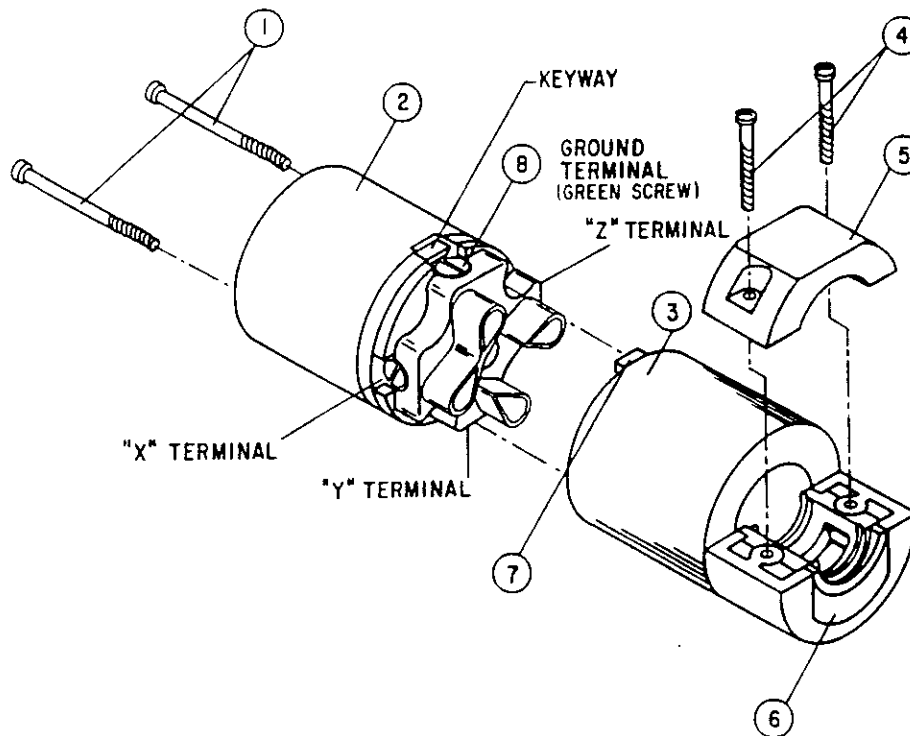


Figure 3.2 Stripping compressor input-power cable insulation



- | | |
|-----------------------|-----------------------|
| 1. Assembly Screw (2) | 5. Cord Clamp |
| 2. Plug Face | 6. Auxiliary Insert |
| 3. Cover | 7. Key |
| 4. Clamp Screw (2) | 8. Terminal Screw (4) |

Figure 3.3 Input power cable receptacle plug

2. Disassemble the receptacle plug. See Figure 3.3.
 - a. Loosen the two assembly screws (1) securing the receptacle plug face (2) to the cover (3) until plug face can be removed from cover.
 - b. Open cord clamp (5) by loosening the two clamp screws (4) securing the clamp to the cover.

Note: If you are using cable with a diameter greater than 0.895 inch, remove the auxiliary insert (6) from the cover.
 - c. Insert the stripped end of the power cable into the cover opening by starting from clamp end (6) until the stripped conductor ends are exposed.
 - d. Loosen and back off all terminal screws on receptacle plug face (2).
 - e. Insert all conductors into their proper wire entrance holes on receptacle plug face. See Figure 3.4. Check that there are no bare conductors exposed. Tighten terminal screws to 9-12 in.-lbs. torque.

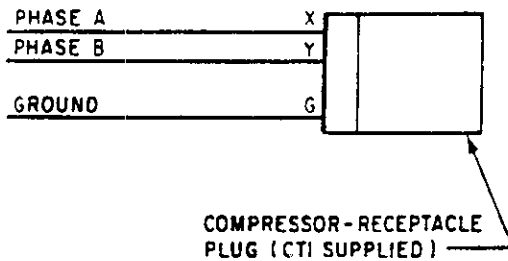



Figure 3.4 Wiring diagram for compressor-receptacle plug

3. Assemble the receptacle plug by sliding the cover over the wire assembly noting key (7). Align the key on the cover to the keyway on the plug face and tighten the two assembly screws (1) to secure the cover and plug face. Alternately tighten the clamp screws (4) to 8-10 in.-lbs. torque.

	⚠ WARNING
<p>Insure that the ground wire is returned to a suitable ground in a non-interrupting manner.</p> <p>Do not connect the compressor to the power source at this time. All of the preparation must be completed and all the panels reinstalled before electrically connecting the compressor.</p>	

3.3 Electrical Preparation of Compressor Control Module

Your compressor is factory pre-set to operate at 60 Hz. If your operation frequency is 60 Hz, no action is required. For 50 Hz operation, reposition the slide switch to the 50 Hz frequency position as follows:

- a. Remove the compressor cover.
- b. Set the 50/60 Hz slide switch (7, Figure C.1, page C-3) to the 50 Hz frequency position.

⚠ CAUTION
<p>Failure to reset the slide switch at 50 Hz position when operating at that frequency may cause improper cold head operation.</p>

- c. Replace the compressor cover.
- d. Install the compressor in its permanent location on a level surface. The Model SC Compressor must have a minimum clearance of 12 inches at the front and back for adequate airflow.

3.4 Connecting the Compressor to the Cryopump

Make the connection between the cryopump and compressor. See Figure 3.5.

1. Remove all dust plugs and caps from the supply fittings and return lines, compressor, and cryopump cold head. Check all fittings.
2. Connect the helium-gas return line from the gas-return connector on the rear of the compressor to the gas-return connector on the cryopump cold head.
3. Connect the helium-gas supply line from the gas-supply connector on the rear of the compressor to the gas-supply connector on the cryopump cold head.
4. Attach the supply and return line identification decals (CTI-supplied) to their respective connecting piping ends.


Verify proper helium supply static pressure by confirming that the helium pressure gauge reads 245-250 psig (1690-1725 kPa), in an ambient temperature range of 60 to 100°F (16 to 38°C).

If the indicated pressure is higher than 250 psig (1725 kPa), reduce the pressure as follows:

1. Remove the flare cap from the gas charge fitting located on the rear of the compressor.
2. Open the gas charge valve very slowly. Allow a slight amount of helium gas to escape until the helium pressure gauge reads 250 psig (1725 kPa).
3. Close the gas charge valve and reinstall the flare cap.

If the indicated pressure is lower than 245 psig (1690 kPa), add helium gas as described in Section 4.2.1, page 4-3.

3.5 Electrical Connection of Compressor

	<h2 style="margin: 0;">⚠ WARNING</h2>
<p>Both switches on the front of the compressor must be in the OFF position before making any and all electrical connections.</p>	

1. Connect the cold head power cable to the rear panel of the compressor and the other end to the electrical power connector on the cryopump cold head.
2. Plug the compressor input power cable into the power source.
3. Turn on compressor and cold head switches.
4. Your Cryo-Torr system is now ready for operation.

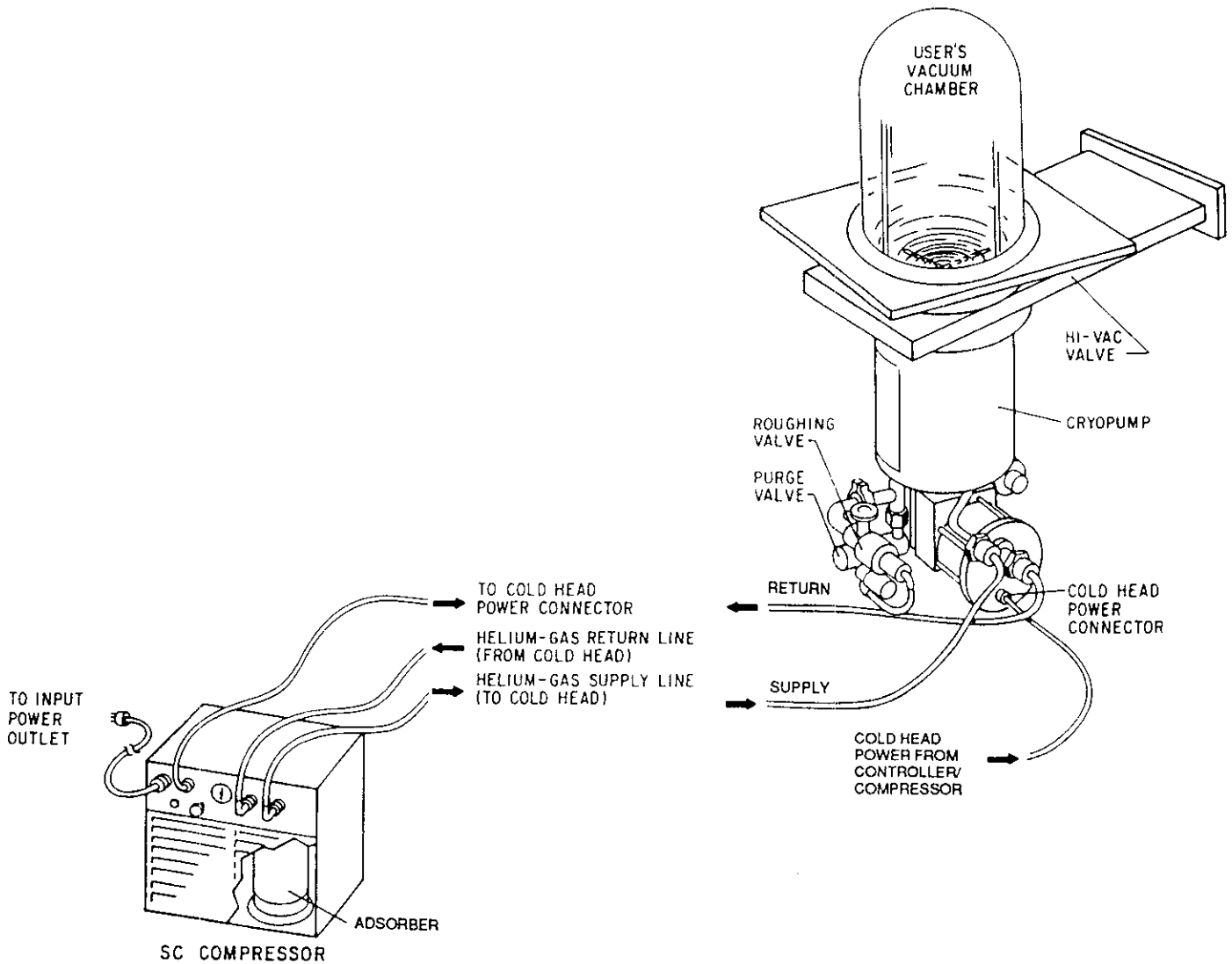




Figure 3.5 Model SC Compressor installation

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Section 4 Maintenance Procedures

4.1	Scheduled Maintenance	4-1
4.2	Unscheduled Maintenance	4-3
4.2.1	Adding Helium Gas	4-3
4.2.2	Helium Circuit Decontamination	4-4
4.2.3	Cryopump Decontamination Procedures	4-5
4.2.4	Compressor Decontamination Procedures	4-6

	⚠ WARNING
Always disconnect the compressor from all sources of electrical power before performing any maintenance procedures.	

	⚠ WARNING
Depressurize the adsorber before disposing of it. Attach the depressurization fitting (included in the Installation Tool Kit) to the coupling half at either end of the cartridge and tighten it slowly.	

4.1 Scheduled Maintenance

The only scheduled maintenance required on the Model SC Compressor is the replacement of the compressor adsorber (P/N 8080255K001) after every 12 months. To remove and replace the compressor adsorber proceed as follows:

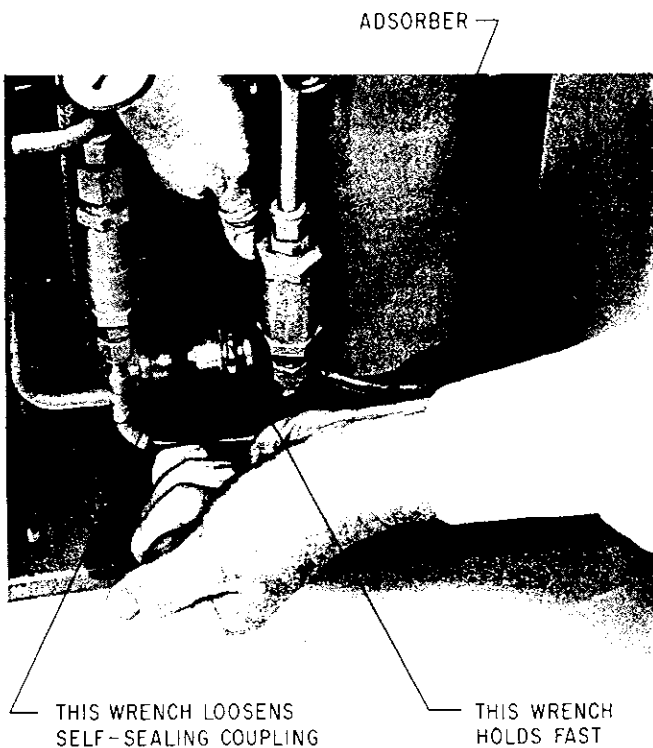
Removing the Compressor Adsorber

1. Shut down the compressor.
2. Disconnect the compressor input power cable from its electrical power source.
3. Disconnect the flex lines from the gas-return and gas-supply connectors at the rear of the compressor.
4. Remove the screws holding the compressor rear grille, front grille, rear panel, front panel and cover (Figure 1.2, page 1-3). Front and rear panels remain in place.
5. Remove the adsorber from the compressor according to Figures 4.1 and 4.2. Save all nuts, bolts, and washers for installing the replacement adsorber.

Installing the Compressor Adsorber

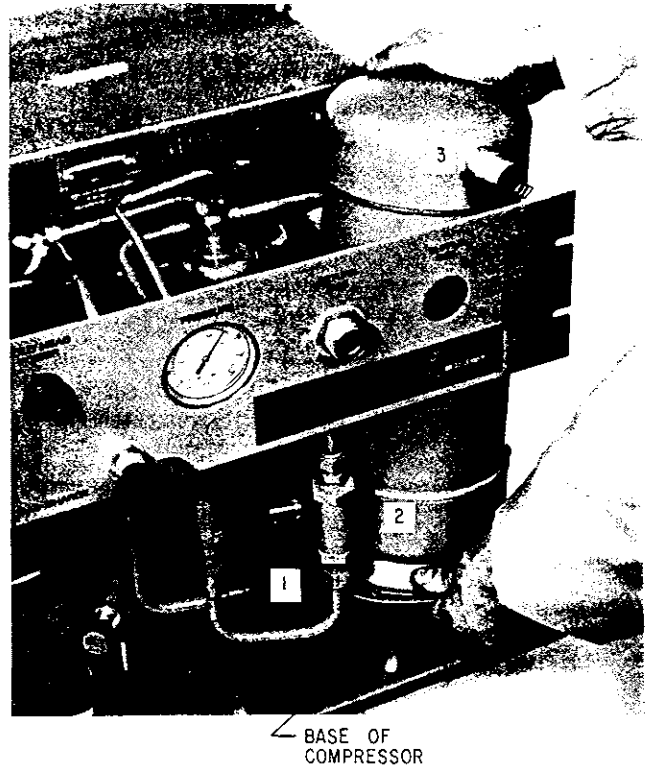
1. Install the replacement adsorber as follows:
 - a. Remove the dust caps from the self-sealing coupling halves at each end of the replacement adsorber.
 - b. Write installation date on the adsorber decal.
 - c. Install the replacement adsorber following the steps for compressor adsorber removal in reverse order. Use the hardware saved in step 5 above.
2. Connect the adsorber to the compressor internal piping. Refer to Figure 4.3.
 - a. Check the self-sealing connector flat rubber gasket to make sure that it is clean and properly positioned.

⚠ CAUTION
Make sure to hold fast on the left coupling nut while tightening the right coupling nut, as shown in Figure 4.3.



1. Use two wrenches (supplied) to avoid loosening the body of the coupling from its adapter.
2. Unscrew the two self-sealing coupling halves quickly to minimize gas leakage.

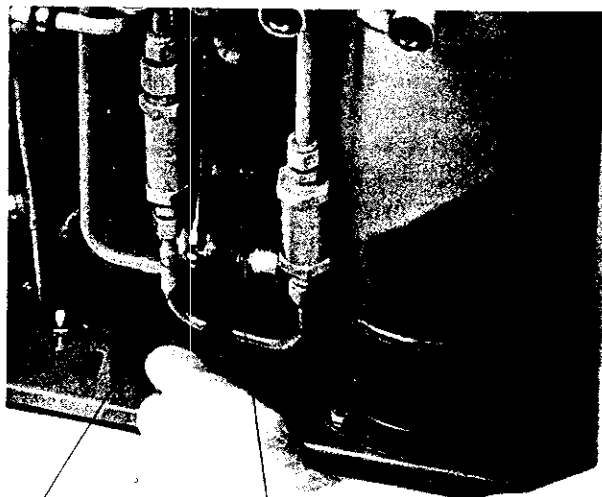
Figure 4.1 Disconnecting the adsorber self-sealing coupling



1. Disconnect the adsorber-inlet self-sealing coupling. See also Figure 4.1.
2. Remove the bolts, nuts, and washers that secure the adsorber to the base of the compressor.
3. Carefully lift the adsorber inward until the outlet self-sealing coupling clears the rear panel and remove the adsorber.

Figure 4.2 Removing the adsorber from the compressor

- b. Make the first turns by hand and then firmly seal the connection using the two wrenches until the fittings "bottom". Refer to Figure 4.3, for proper coupling of the self-sealing connection.
3. Replace the cover and the front and rear grilles and secure them with their screws.
4. Ensure that the supply pressure gauge reads 245-250 psig (1690-1725 kPa). If additional gas pressure is required, follow the instructions in Section 4.2.1, under Adding Helium Gas.
5. Reconnect the return and supply flex lines to the compressor.
6. Connect the compressor input power cable to the electrical power source.



THIS WRENCH
HOLDS FAST

THIS WRENCH TIGHTENS
SELF-SEALING COUPLING

Figure 4.3 Connecting self-sealing couplings

4.2 Unscheduled Maintenance

Suggested Unscheduled Maintenance Equipment

It is advisable to keep on hand the unscheduled maintenance equipment and disposable supplies listed below.

1. Helium, 99.999% pure.
2. Pressure regulator (0-3000/0-400 psig).
3. Maintenance manifold, P/N 8080250K003*.
4. Helium charging line terminating in a 1/4-inch female flare fitting, P/N 7021002P001.
5. Installation and Scheduled Maintenance Tool Kit, P/N 8032040G004.

*Available from stock; consult the factory or your sales representative.

4.2.1 Adding Helium Gas

Use only 99.999% pure helium gas.

CAUTION

If the compressor helium pressure gauge reads 0, decontamination is required. Refer to decontamination procedures on page 4-4, or contact the Product Service Department.

1. A User-supplied helium charging line terminating in a 1/4-inch female flare fitting, and a pressure regulator rated at 0-3000/0-400 psig is required for this operation.
2. If you need to add helium more than once every several months, check for leaks caused by improperly connected self-sealing connections or any mechanical joint within the compressor.

There are two conditions that require the addition of helium gas:

1. Compressor not operating; helium pressure gauge reads 245 psig, or below.
2. Compressor operating; helium pressure reads 270 psig, or below.

To add helium gas:

1. Attach a pressure regulator (0-3000/0-400 psig) and charging line to a helium bottle (99.999% pure). **DO NOT OPEN THE BOTTLE AT THIS TIME.** Purge the regulator and charging lines as instructed in steps a through e below. Do *not* use helium gas that is *less than 99.999% pure*.
 - a. Open the regulator a small amount by turning the adjusting knob clockwise until it contacts the diaphragm; then turn approximately 1/8 to 1/4 turn more, so that the regulator is barely open.
 - b. Slowly open the bottle valve, and purge the regulator for 10 to 15 seconds. Turn the regulator knob counterclockwise until the helium stops flowing.
 - c. Connect the charge line to the helium pressure regulator.
 - d. Remove the flare cap of the gas charge fitting on the rear of the compressor. Loosely connect the charge line to the charge fitting.
 - e. Set the helium pressure regulator to 10 to 25 psig (70-125 kPa). Allow helium gas to flow through the charging line and around the loosened flare fitting for 30 seconds to purge the charging line of air. Then tighten the flare nut at the end of the charge line.

(The procedure is required to ensure that both the regulator and the charging line will be purged of air and that the air trapped in the regulator will not diffuse back into the helium bottle. For best results, CTI suggests a dedicated helium bottle, regulator, and line, which are never separated, for adding helium.)

2. Set the helium pressure regulator to 300 psig (2070 kPa). Depending on the compressor operating state, add helium gas:
 - a. If the compressor is running (approximately 2 hours operating time) under normal operating conditions, slowly open the helium charge valve on the rear of the compressor. When the helium pressure gauge rises to 270-290 psig (1860-2000 kPa), tightly close the charge valve.
 - b. If the compressor is not running, slowly open the helium charge valve. When the helium pressure gauge rises to 245-250 psig (1690-1725 kPa), tightly close the charge valve.

⚠ CAUTION

Add helium gas slowly to prevent relief valve blow-off.

3. Ensure that the helium charge valve on the compressor is tightly closed. Shut off the helium pressure regulator on the helium bottle and remove the charging line from the male flare fitting. Shut off the helium gas bottle valve. Reinstall the flare cap.

4.2.2 Helium Circuit Decontamination

Contamination of the helium-gas circuit is indicated by sluggish or intermittent operation (ratcheting) of the cold head drive mechanism. With severe contamination the cold head drive may seize and fail to operate. One of the major sources of contamination is using helium gas of less than the required purity. When performing the decontamination process, use only 99.999% pure-helium gas, and the regulator and charging line must be properly connected and purged. This decontamination procedure will remove contaminants from the cold-head and/or compressor, thereby restoring system performance. The cold-trapping of contaminants inside the cold head during this procedure will also decontaminate the compressor if the contamination of the system is not severe. Separate decontamination of the compressor is required whenever the compressor has been opened to atmosphere, or the pressure dropped to zero.

4.2.3 Cryopump Decontamination Procedures

1. Cool down the cryopump and operate it for one to three hours. If the system will not cool down, proceed to step 2. Operating the cryopump will isolate the contaminants by "freezing" them in the cold head. The contaminants in the helium-gas circuit of the cryopump tend to become frozen inside the cold head. The longer the cryopump is operated beyond the one-hour period, the greater is the amount of contamination that becomes isolated inside the cold head.
2. Shut down the compressor as follows:
 - a. Close the Hi-Vac valve in your vacuum system.
 - b. Turn off the system.

CAUTION

Exposing the cryopump to atmosphere during warm-up will cause excessive water vapor adsorption by the charcoal of the 15K array.

3. **Immediately** disconnect the helium-gas supply and helium-gas return lines from the gas-supply and gas-return connectors at the rear of the compressor. Leave them attached to the cold head.
4. Attach the maintenance manifold (P/N 8080250K003) to the disconnected ends of the helium-gas return and helium-gas supply lines.
5. Reduce the pressure in the cold head to a level of 45 psig by using the maintenance manifold.
6. Allow the second stage of the cold head to warm up to room temperature. Warm-up time can be reduced by purging the cryopump with warm dry argon or nitrogen gas. Using the gas heater, CTI P/N 8080250K020, will reduce warm-up time about 50 percent, and will maintain the gas temperature below the 150°F (66°C) limit.
7. Once the cryopump has reached room temperature, attach a pressure regulator (0-3000/0-400 psig) and charging line to a helium bottle (99.999% pure). **DO NOT OPEN THE BOTTLE VALVE AT THIS TIME.** Purge the regulator and charging line as instructed in steps a through e in Section 4.2.1, page 4-3. Do *not* use helium gas that is *less than 99.999% pure*.
8. Perform in sequence:
 - a. Backfill the cold head and helium-gas return and supply lines with helium to a static charge pressure of 245-250 psig (1690-1725 kPa) by adjusting the regulator to the required pressure, and opening the valve on the manifold. Close the valve when the pressure is correct.
 - b. Depressurize the cold head by *slowly* opening the ball valve and allowing the helium to bleed out slowly. Do *not* reduce the pressure to *less than 30 psig* or the cold head may be further contaminated.
 - c. Perform flushing steps a and b two more times.
 - d. Pressurize the cold head to the static charge pressure of 245-250 psig (1690-1725 kPa) and run the cold head drive motor for 10 to 30 seconds by actuating the cryopump ON/OFF switch to ON.
 - e. Perform steps b through d two more times for a total of 9 flushes and a total of 2 drive-motor runs.
9. Verify that the cold head is pressurized to the static charge pressure of 245-250 psig (1690-1725 kPa).
10. Disconnect the maintenance manifold from the helium-gas return and helium-gas supply lines.
11. Reconnect the helium-gas return and helium-gas supply lines to the return and supply connectors at the rear of the compressor. The cryopump is now ready for operation.

4.2.4 Compressor Decontamination Procedures

The procedure to decontaminate a compressor is similar to the above procedure with certain exceptions.

- There is no need to operate the cryopump before decontaminating the compressor.
 - The maintenance manifold and helium-gas supply and helium-gas return lines will be connected to the supply and return fittings on the compressor.
1. Open the ball valve slightly on the maintenance manifold and allow the helium to bleed out and depressurize the compressor (if pressurized) to 30 psig.
 2. Charge the compressor slowly to approximately 250 psig (1725 kPa) by opening the 1/8-inch valve on the maintenance manifold.
 3. Run the compressor for about 30 seconds.
 4. Repeat steps 1 and 2, one more time.
 5. Disconnect the maintenance manifold from the helium-gas return and helium-gas supply lines.
 6. Reconnect the helium-gas return and helium-gas supply lines to the return and supply connectors on the cold head. The compressor is now ready for operation.

For Your Information —

After connecting the compressor to the cryopump, and operating the system for a period of time, it may be necessary to decontaminate the cryopump, as some residual contamination from the compressor may become trapped in the cold head. If the entire system were reduced to zero psig (a broken flex line, for example), then the cryopump and compressor would have to be decontaminated according to the cryopump decontamination section, beginning on page 4-4.

Appendix A

Troubleshooting Procedures

A.1 Troubleshooting the Compressor A-1
A.2 Technical Inquiries A-1


A.1 Troubleshooting the Compressor

The compressor troubleshooting procedures are summarized in Table A.1.

A.2 Technical Inquiries

Please refer to page ii of this manual for a complete list of the CTI-CRYOGENICS' world wide customer support centers.

Table A.1 Compressor Troubleshooting Procedures

	<h2 style="margin: 0;">⚠ WARNING</h2>
<ol style="list-style-type: none"> 1. Disconnect the compressor from its power source before performing any troubleshooting procedures. 2. The compressor pump is hot after operating. Wait for the pump to cool down before working on the inside of the compressor. 	

Problem	Possible Cause	Corrective Action
1) Compressor ON/OFF switch (SW1) will not remain in the ON position. Refer to Figure B.1, page B-3, for identification of all electrical components.	<ol style="list-style-type: none"> 1) The thermal protective switch (TS1) is closed, activating the relay-trip coil in the ON/OFF switch (SW1). 2) Excessive current drain has activated the series trip in the compressor ON/OFF switch. 	<ol style="list-style-type: none"> 1) Test switch (TS1). If continuity is found, contact the Product Service Department. 2) Measure and record the current and contact the Product Service Department.
2) Compressor ON/OFF switch (SW1) remains in the ON position when switched to ON, but the compressor will not run.	<ol style="list-style-type: none"> 1) No power coming from the power source. 2) Incorrect or disconnected wiring within the compressor. 	<ol style="list-style-type: none"> 1) Check service fuses, circuit breakers, and wiring associated with power source, and repair as needed. 2) Check the compressor against its electrical schematic, Figure B.1, page B-3.

Table A.1 Compressor Troubleshooting Procedures (Cont.)

Problem	Possible Cause	Corrective Action
3) Compressor stops after several minutes of operation and remains off.	1) Ambient temperature is unusually high resulting in the opening of the thermal protective switch (TS1).	1) Provide a free flow of air to the compressor. Confirm a 12 inch (30 cm) clearance at the front and back of the compressor.
	2) Insufficient helium supply pressure as indicated by the supply pressure gauge.	2) Add helium per Section 4.2.1, page 4-3, Unscheduled Maintenance.
	3) Mechanical seizure.	3) Contact the Product Service Department.
4) Compressor pump stops after several minutes of operation and then recycles ON and OFF at short intervals.	1) Low power source voltage.	1) Confirm power source voltage between 180 and 253 volts and restore if necessary.

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Appendix B

Electrical Schematic and Location Information

LEGEND FOR FIGURE B.1

- C1 - Compressor-Run Phase-Shifting Capacitor, 35 μ f, 370 VAC
- C2 - Compressor Start Capacitor, 108-130 μ f, 330 VAC
- C3 - Cold-Head-Drive-Motor Phase-Shifting Capacitor, 6 μ f, 330 VAC
- C4 - Cold-Head-Drive-Motor Phase-Shifting Capacitor, 2 μ f, 330 VAC
- CB1 - Compressor "ON/OFF" Switch
- ETM - Elapsed-Time Meter
 - F1 - Cold-Head Circuit Fuse, 1A
 - F2 - ETM Circuit Fuse, 1A
- FAN - Cooling Fan
 - K1 - Compressor Starting Relay
 - M1 - Compressor Pump Motor
 - M2 - Cold-Head Drive Motor
 - P1 - Input Power Connector
 - P2 - Chassis Connector, 15 Pin
 - P3 - Cold-Head Power Connector, 6 Pin
 - P4 - Fan Power Connector, 3 Pin
 - P5 - Cold-Head Cable Connector, 6 Pin
 - P6 - Solenoid Power Connector, 3 Pin
 - R1 - Cold-Head-Drive-Motor Phase-Shifting Resistor, 150 Ω
 - R2 - Compressor Start Capacitor "Bleed" Resistor, 15 K Ω
 - R3 - Ballast Resistor for Elapsed Time Meter, 13 K Ω
 - R4 - Voltage Dropping Resistor for Pullout Coil, 330 Ω
 - S3 - Cold-Head "ON/OFF" Switch
 - S4 - 50-60 Selector Slide Switch
- SOL1 - Solenoid Valve, Pressure "Dump"
 - T1 - Cold-Head Isolation Transformer, 140-168 VAC Output
- TS1 - Thermal Protective Switch - Air Flow

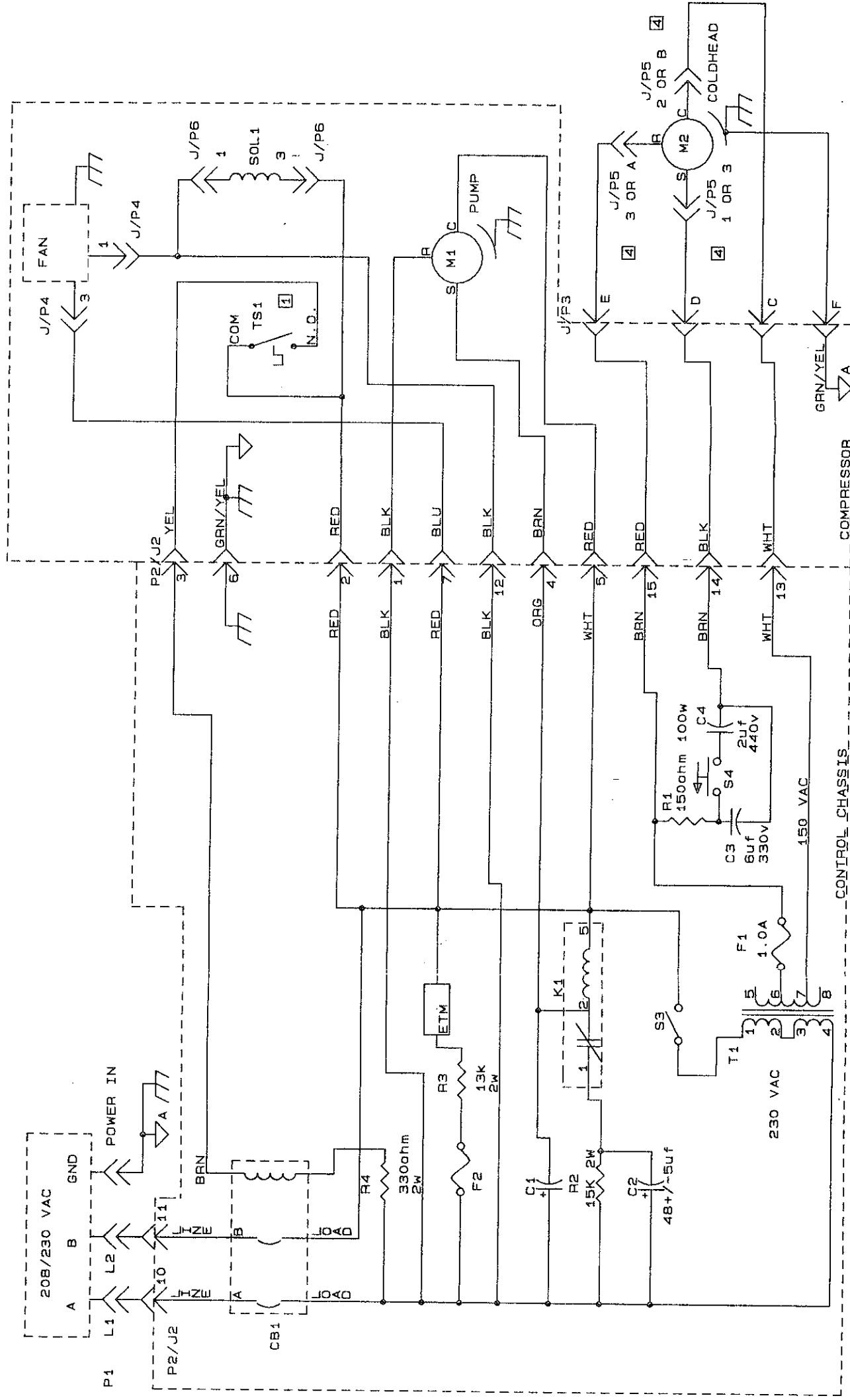
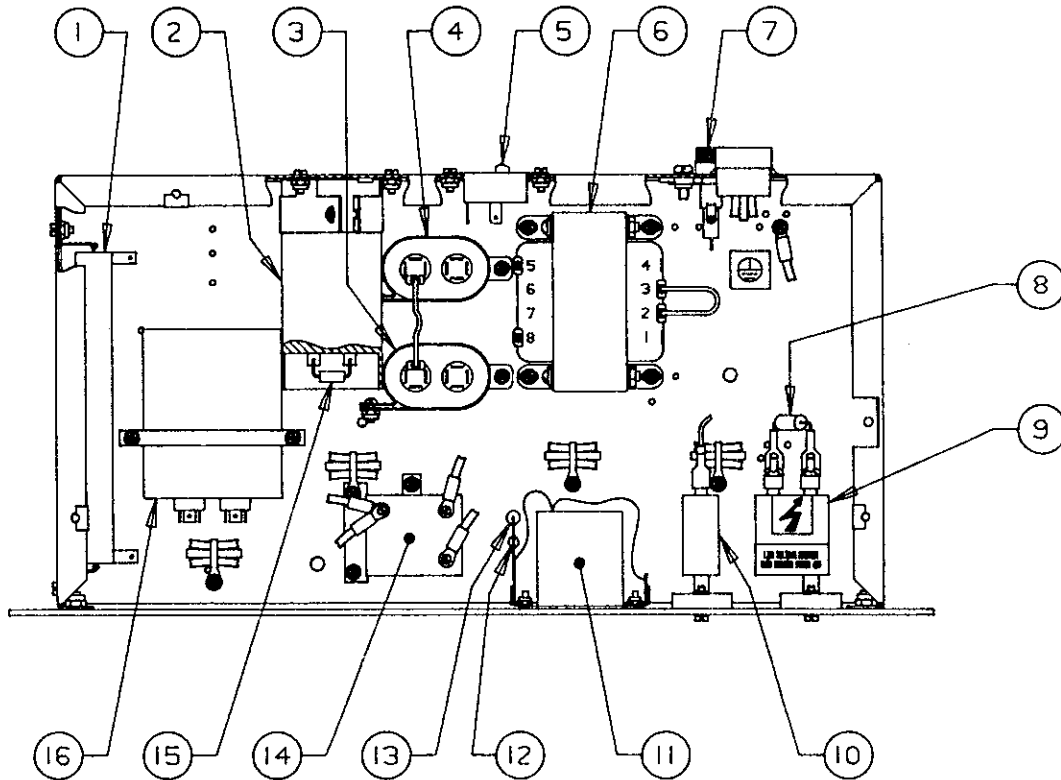


Figure B.1 Electrical schematic for Model SC Compressor, Drawing No. 8032539 Rev. A

Appendix C

Components in the Electrical Control Module of Model SC Compressor



ITEM NUMBER	DESCRIPTION	SYMBOL DESIGNATION
1	Cold-Head Drive-Motor Phase-Shifting Resistor, 150 Ω	R1
2	Compressor-Start Capacitor, 108-130 μ f, 330 VAC	C2
3	Cold-Head Drive-Motor Phase-Shifting Capacitor, 6 μ f, 330 VAC	C3
4	Cold-Head Drive-Motor Phase-Shifting Capacitor, 2 μ f, 330 VAC	C4
5	50-60 Hz Selector Slide Switch	S4
6	Cold-Head Isolation Transfer, 140-168 VAC	T1
7	Cold-Head Circuit Fuse, 1A	F1
8	Voltage Dropping Resistor for Pullout Coil, 330 Ω	R4
9	Compressor "ON/OFF" Switch	CB1
10	Cold-Head "ON/OFF" Switch	S3
11	Elapsed Time Meter	ETM
12	Ballast Resistor for Elapsed Time Meter, 13 K Ω	R3
13	ETM Circuit Fuse, 1A	F2
14	Compressor Starting Relay	K1
15	Compressor Start Capacitor "Bleed" Resistor, 15 K Ω	R2
16	Compressor-Run Phase-Shifting Capacitor, 35 μ f, 370 VAC	C1

Figure C.1 Components in the electrical control chassis of Model SC Compressor

Appendix D

Flow Diagram for Model SC Compressor

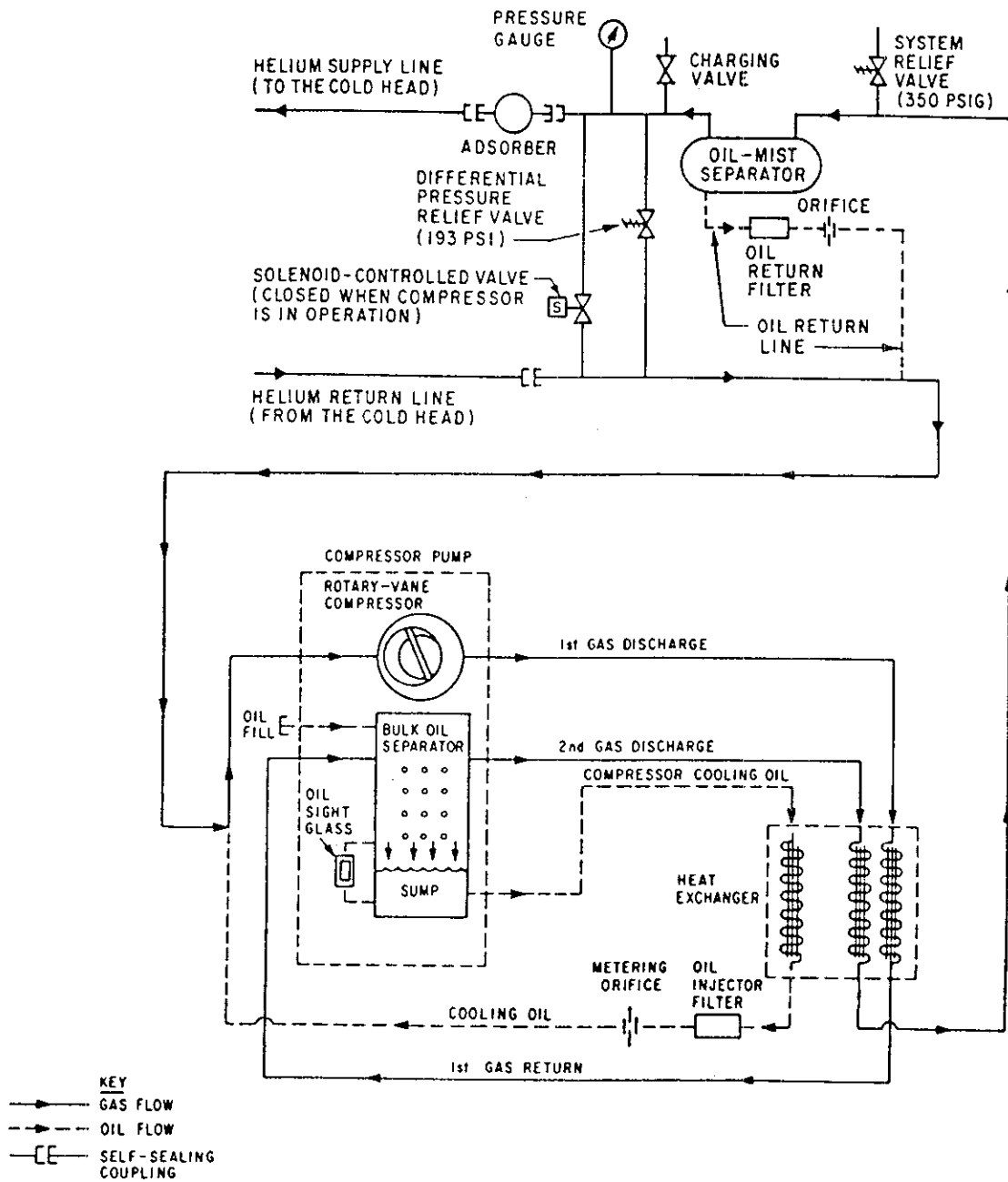


Figure D.1 Flow Diagram of Model SC (Air) Compressor