Sumitomo
(SHI) CRYOGENICS OF AMERICA, INC.

FA-20L Helium Compressor

Operating Manual

Sumitomo (SHI) Cryogenics of America, Inc.
1833 Vultee Street
Allentown, PA 18103-4783
U.S.A.

Revision C: March 2023 **280682A**

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SAFETY

GENERAL

SCAI equipment is designed to operate safely when the installation, operation and servicing are performed in accordance with the instructions in this technical manual. For Service Center locations, see the Service section of this manual.

SPECIAL NOTICES

Three types of special notices -- **WARNINGS, CAUTIONS** and **NOTES** are used in this technical manual.

WARNINGS call attention to actions or conditions that can result in serious injury or death.

CAUTIONS call attention to actions or conditions that can result in damage to the equipment or in abnormal performance.

NOTE

NOTES give important, additional information, explanations or recommendations related to the appropriate topic or procedure.

WARNINGS and **CAUTIONS**, like other safety instructions, appear within rectangles in the text where they are applicable. Because of their importance, they are summarized in this Safety section and in the General Technical Manual, and should be read first.

NOTE

Changes to this manual since the previous issue are identified by parallel lines (||) in the right margins.

WARNINGS

AVOID ELECTRIC SHOCK. This equipment must only be connected to a supply mains switch with protective earth. All electrical supply equipment must meet applicable codes and be installed by qualified personnel.

If this equipment is modified, appropriate inspection and testing must be conducted to ensure safe use of equipment.

Disconnect the power to the compressor before troubleshooting the electrical components.

All electrical supply equipment must meet applicable codes and be installed by qualified personnel. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

AVOID INJURY. Never use compressed helium gas from a cylinder without a proper regulator. Overpressure can cause serious injury if the system equipment ruptures.

During operation, some surfaces under the compressor's cover become hot. Allow the compressor to cool for 1/2 hour after shutdown before removing the cover for maintenance.

Always wear eye protection when handling pressurized gas lines and other pressurized equipment. Never apply heat to a pressurized gas line or other pressurized components.

Disconnect gas lines only when the compressor is stopped. Disconnecting the cold head while it is cold can create excessively high internal pressure as the gas warms. Material failure and uncontrolled pressure release can cause serious injury.

Use two wrenches when disconnecting a gas line coupling to avoid loosening the cold head or compressor coupling. Gas pressure can project the coupling with enough force to cause serious injury.

The compressor is charged with helium gas. Except when disconnecting the adsorber or the gas lines, vent both supply and return Aeroquip couplings to atmospheric pressure before disassembly. Uncontrolled pressure release can cause serious injury.

Always vent a gas-charged component before beginning to disassemble its couplings. Gas pressure can launch a loose coupling with enough force to cause serious injury.

The adsorber is charged with helium gas. Follow the used adsorber venting procedure for safe disposal of the used adsorber.

The compressor's elapsed time meter contains a lithium battery. Do not remove the battery. Do not recharge, disassemble, mutilate, wet or dispose of the meter in fire. Contact local environmental authorities for proper disposal of the lithium battery.

CAUTIONS

PRESERVE YOUR WARRANTY. Modification to equipment without the consent of the manufacturer will void the warranty.

Specifications require the use of 99.999% pure helium gas. Using a lesser quality of helium can damage the system and void the warranty.

AVOID GAS LEAKS. Check the condition of the gasket face seal on the male half of each Aeroquip coupling. Be sure the gasket face seal is in place and the sealing surfaces on both the male and female halves are clean before connecting. Replace the gasket face seal if it is damaged or missing.

Keep the gas line couplings aligned when making or breaking a coupling connection. Leaks can occur due to the weight of the gas line or due to a sharp bend near the connection.

AVOID CONTAMINATION. When checking the compressor for shipping damage, do not connect the gas lines and the cold head. The components may become contaminated with compressor oil.

Follow the charging or venting procedures to prevent reversed flow of system gas. Do not charge through the supply coupling. Do not vent through the return coupling. Reversed flow can contaminate the system with compressor oil.

Do not attempt to repair a leaking coupling on an adsorber in the field. Consult a Service Center. Venting the adsorber will introduce contaminants to the system, which cannot be removed in the field.

PREVENT EQUIPMENT DAMAGE. Damage to gas lines can result from crimping by repeated bending and repositioning.

Use properly rated commercial equipment for lifting or moving the compressor. Make sure compressor is held in a balanced and stable position. Follow all applicable safety procedures for overhead material transport.

Never pull a vacuum on the compressor or cold head. The motors will short circuit if started.

AVOID A MALFUNCTION. Repeatedly charging the system with helium gas rather than locating and repairing gas leaks can cause a malfunction. Impurities are introduced at an abnormal rate and can freeze in the cold head.

Do not allow air to get into the helium gas refrigerant of the system. Moisture from the atmosphere can seriously degrade cold head performance

AVOID EQUIPMENT FAILURE, CONTAMINATION OR A NUISANCE SHUTDOWN. Do not tip the compressor greater than 5 degrees from horizontal, to avoid flowing oil into unwanted places.

Use SHIG adsorber P/N F300138A only. Use of non-SHIG spare parts will void the warranty.

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SERVICE

U.S.A. HEADQUARTERS

Sumitomo (SHI) Cryogenics of America, Inc.
1833 Vultee Street
Allentown, PA 18103-4783

Sales and Parts
TEL: (800) 525-3072
or
(610) 791-6700
FAX: (610) 791-0440

Service
TEL: (800) 525-3071
or
TEL: (610) 791-6750

SERVICE CENTERS

Central U.S.A

Sumitomo (SHI) Cryogenics of America, Inc.
150 Innovation Dr., Suite #C
Elk Grove Village, IL 60007

TEL: (847) 290-5801
FAX: (847) 290-1984

Europe

Sumitomo (SHI) Cryogenics of Europe, Ltd.
3 Hamilton Close
Houndmills Industrial Estate
Basingstoke
Hampshire RG21 6YT
United Kingdom

TEL: +44 1256 853333
FAX: +44 1256 471507

Sumitomo (SHI) Cryogenics of Europe, GmbH
Daimlerweg 5a
D-64293 Darmstadt
Germany

TEL: +49 6151 860 610
FAX: +49 6151 800 252

Asia

Sumitomo Heavy Industries, Ltd.
Service Section
Cryogenics Division
2-1-1 Yato-Cho Nishitokyo-City
Tokyo 188-8585
Japan

TEL: +81 424 68 4264
FAX: +81 424 68 4462

Sumitomo (SHI) Cryogenics Korea, Co., Ltd.
3F, 280-3, Saneop-ro
155beon-gil, Gweonseon-Gu
Suwon-Si, Gyeonggi-Do
South Korea

TEL: +82 31 278 3050
FAX: +82 31 278 3053

Sumitomo (SHI) Cryogenics Shanghai, Ltd.
Building 15, Lane 333
Zhujian Road, Minhang District
Shanghai 201107
People's Republic of China

TEL: +86 21-5486-6318
FAX: +86 21-5486-0065

Sumitomo (SHI) Cryogenics Taiwan Co., Ltd.
4th Floor, No.3
Lane 216, Gongyuan Rd.
Hsinchu City 300
Taiwan ROC

Phone: +886 3 561 2557/2101
Fax: +886 3 562 3400

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INTRODUCTION

Helium Compressor, Model FA-20L

The compressor is designed to deliver high-pressure, oil-free, helium gas to cryogenic refrigerators. Cold head cables are used with the compressor to supply electrical power to cold heads. Self-sealing gas couplings allow for easy connection to and disconnection from the rest of the closed-cycle cryogenic refrigeration system.

The information in this manual pertains only to the FA-20L (low voltage model) Compressor. Other components used to form an operating system are described in separate technical manuals.

Pressures are stated as gauge, not absolute. Pressure units are bar and pounds per square inch (psig). For reference:

1 bar = 14.5 psig.
1 MPa = 10 bar

Definition of Symbols used in this manual and on equipment:

I	Mains Disconnect On		Protective Earth (Ground)
O	Mains Disconnect Off		Warning Dangerous Voltage
	Refer to Manual	V3~	Volts, AC, 3 phase
			Class I equipment is grounded equipment.

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PRINCIPLES of OPERATION

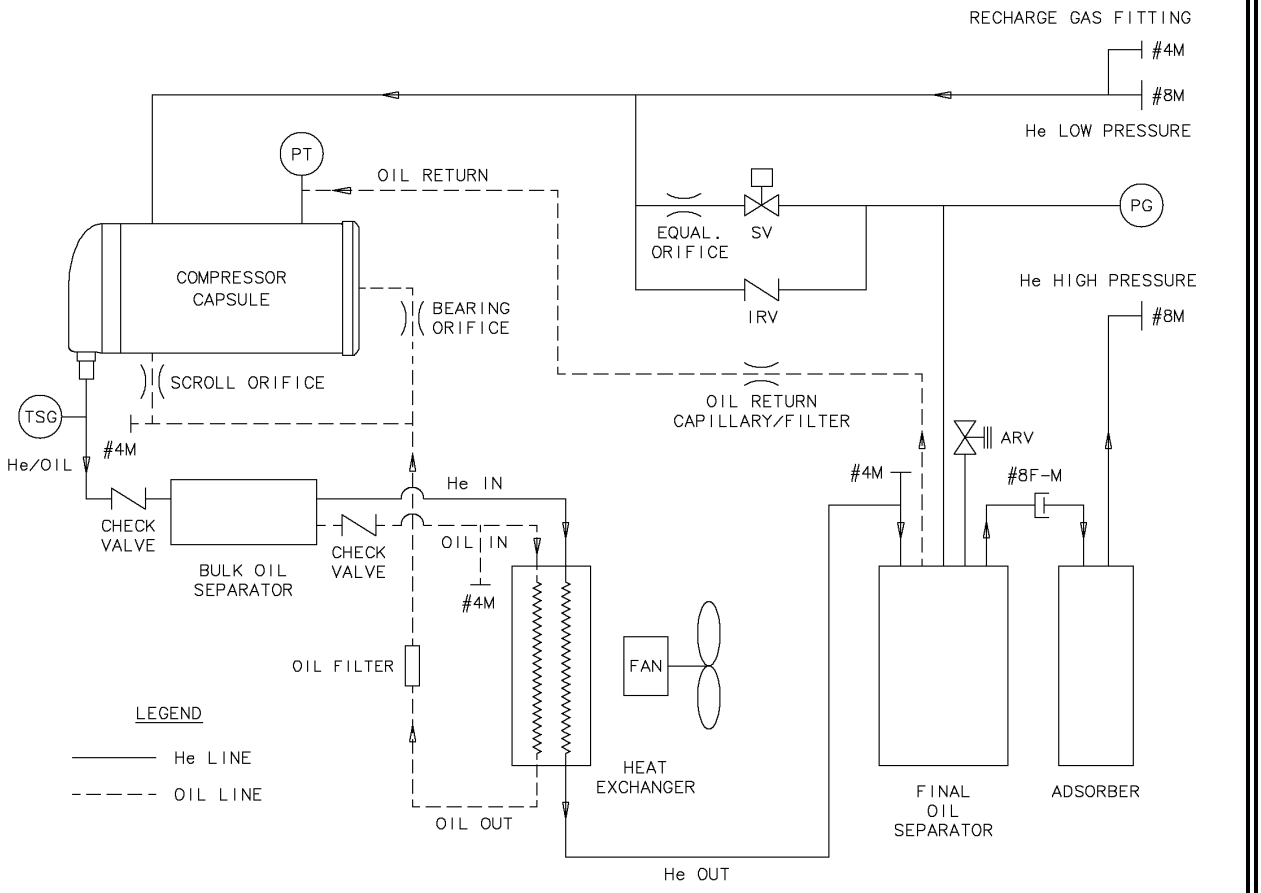

Figure 1 Compressor Flow Diagram

Key	
TSG	Helium discharge temperature switch
ARV	Atmospheric relief valve
IRV	Internal relief valve
SV	Solenoid valve
PG	Pressure gauge

The compressor continuously draws low-pressure helium from the system return line. It compresses, cools and cleans the gas, then delivers it through the system gas supply line to the cold head. See Figure 1.

When helium gas leaves the compressor capsule, the gas contains heat and compressor lubricant. Both must be removed. From the compressor capsule, the hot gas with its entrained oil flows out of the shell and through the bulk oil separator. The gas next flows through one circuit of a two-circuit, air-cooled, heat exchanger, where it is cooled. Next, the gas passes through the final oil separator and the adsorber for oil and moisture removal. From the adsorber, the high-pressure helium gas flows to the cold head through the gas lines.

Through the system gas return line, low-pressure gas from the cold head flows into the compressor.

A gas line containing an internal relief valve (IRV) connects the high-pressure line to the low-pressure line. The relief valve will open to prevent overloading the motor when the system gas lines are not connected to the compressor.

Oil is separated from the gas in three stages. The first stage is by gravity when the gas passes through the bulk oil separator. The second stage is in the final oil separator whose element collects oil mist from the gas; oil is agglomerated and returned to the compressor. The third stage is the adsorber that removes any remaining oil the gas is carrying.

Oil collected in the oil separators flows back to the compressor capsule through capillary tubes and orifices. The differential gas pressure across the system is the moving force, and the restriction size limits the amount of gas bypassed. The small amount of oil collected in the adsorber remains there and is removed only by replacing the adsorber.

Before being returned to the compressor capsule, the oil separated in the bulk oil separator flows through the heat exchanger where it is cooled. It is then injected into the low pressure side of the compressor capsule to adsorb heat and lubricate the compressor capsule.

Description

Components

50/60 Hz Toggle Switch - This switch on the front electrical panel is used to select different phasing circuits for RDK-101D cold head operations at 50 or 60 Hz.

Accessory Receptacle and optional Remote ON/OFF cable - The accessory receptacle on the front electrical panel is a 4-socket connector for supplying remote ON/OFF capability. The remote ON/OFF cable is available as an option.

Adsorber - The adsorber removes any oil and moisture the gas is carrying which did not drop out in the separator. The adsorber has a finite life and must be replaced at regular intervals.

Atmosphere Relief Valve [ARV] – The pressure relief valve prevents the compressor from operating at an unsafe pressure by venting to the atmosphere.

Bulk Oil Separator - Removes much of the entrained oil from the gas stream. This unit needs no servicing or replacement.

Circuit Breaker – A 20 A circuit breaker is mounted on the front electrical panel. This device provides a means to disconnect the mains power supply and protects the compressor from electrical overload.

Cold Head Receptacle - A 28-socket receptacle on the front electrical panel and a cold cable supplies electrical power from the compressor to the cold head. The compressor can be supplied with cables for operating CH Series or RDK-101D cold heads.

Compressor Capsule - Helium, scroll compressor with a hermetically sealed motor.

Compressor High Temperature Motor Protector Switch - Located inside the compressor motor, the switch senses compressor motor temperature and stops the motor if the temperature is too high. The switch resets after cool down.

Elapsed Time Meter - Located on the front electrical panel, the ETM has a battery-operated LCD digital display that shows the compressor's cumulative running time in hours.

⚠ WARNING

AVOID INJURY. The compressor's elapsed time meter contains a lithium battery. Do not remove the battery. Do not recharge, disassemble, mutilate, wet or dispose of the meter in fire. Contact local environmental authorities for proper disposal of the lithium battery.

Electrical Chassis - The electrical box contains electrical components and connections and distributes power to all system circuits.

Fan – Moves air through the heat exchanger to helium and oil.

Final Oil Separator - Removes most of the remaining entrained oil from the gas stream. This unit needs no servicing or replacement.

Fuses – Four (4) time delay, 5 x 20 mm fuses, located on the compressor front electrical panel, protect the control circuit and the cold head supply circuit.

Gas Equalization Solenoid Valve – This solenoid valve opens when the compressor shuts down, allowing helium gas pressure to equalize and prevent oil from moving into low pressure side of compressor.

Gas Supply and Return Couplings - Located on the compressor front electrical panel, both are self-sealing, size #8, male bulkhead couplings and are the points of connection for system gas lines.

Heat Exchanger - Uses an air-cooled HX to cool the high-pressure helium refrigerant and the compressor's lubricating oil.

Helium Charge Coupling - A size 4, male (4M) coupling located on the front of the compressor is used for charging or venting helium gas refrigerant.

Helium Discharge High Temperature Switch [TSG] – Senses helium discharge gas temperature and shuts the compressor off if the temperature of the high-pressure helium from the compressor is too high.

Internal Relief Valve [IRV] - The internal relief valve opens to allow the compressor to be operated in the stand-alone mode or when the system gas lines are disconnected, to avoid overloading the motor.

Mains Power Receptacle - A screw-mounted rectangular connector located on the front electrical panel and optional mains power supply cables, provide mains power supply to the compressor.

Oil Capillary - The capillary returns oil collected in the oil separator sump to the compressor for recycling.

Oil Filter - Filters in the oil lines protect the oil return capillary and the orifices.

Oil Injection Orifices - These orifices are installed in the oil return lines and control the flow rate of oil returned to the compressor.

ON/OFF Switch – Located on front electrical panel, switch is local control for starting and stopping compressor.

Pressure Gauge - Indicates gas pressure in the supply line. When the compressor is not running, the gauge located on the compressor's front panel shows the equalization pressure.

SPECIFICATIONS

FA-20L Compressor

There are two electrical voltage variations:

Compressor P/N	Mains Voltage
280504D18N	208-230 VAC +/- 10%, V~ 60 Hz and 200 VAC +/- 10%, V~ 50 Hz
280504D27N	220 - 240 VAC +/- 10%, V~ 50 Hz 265 VAC +/- 10%, V ~ 60 Hz

Electrical Characteristics

Service required: 2 poles, 3 wires (single phase plus protective ground.)

Mains Power Receptacle: Heavy Duty Power Connector, HAN I0E, Harting 09330102602

Power Consumption

Variation	Frequency [Hz]	Voltage	Operation [kW]	Compressor RLA [A]	Compressor LRA [A]	MCA [A]	MOP [A]
18N	60	220	2.6	12.0	56	15.0	30.0
	50	200	2.4	12.0		15.0	30.0
27N	50	230	2.25	10.0	43-47	13.0	25.0
	60	265	2.4	10.0		13.0	25.0

RLA = rated load current
LRA = locked rotor amps
MCA = minimum circuit ampacity
MOP = maximum overcurrent protection

Mains Power Supply Cable: 12 AWG, 3 conductor, 300V cordage with Phoenix connector and NEMA L6-20P (2 pole, 3 wire, 20A, 250 V~) locking plug, P/N 280112C10

Circuit Protection:

Input: 20A, 250V circuit breaker
Control Circuit: (2) FU1 & FU2, 1.0A Slo Blo, 5 x 20 m fuses
Cold Head Valve Motor Circuit: (2) FU3 & FU4, 1.0A Slo Blo, 5 x 20 mm fuses
All fuses are located on front control panel

Class 1: Grounded equipment
Ingress Protection: IP2X

See Compressor wiring diagrams, Figures 20 and 21

Compressor Control

- ON and OFF switch with run light for local operation of compressor and cold head.
- Remote Start/Stop capability (using optional accessory cable, P/N 280368B20).
- Automatic restart upon restoration of power after power interruption.
- Automatic shutoff for the following system faults. Operator correction is required before restart.
  - High helium gas discharge temperature [TSG] when > 93° C (200° F)
  - High compressor motor windings temperature.

FA-20L P/N	Switch Opens	Switch Resets
280504D18N	145° C (293° F)	69-87° C (156-189° F)
280504D27N	120° C (248° F)	52-70° C (126-158° F)

  - Open control circuit/valve motor fuse(s)

Front Panel Connections (See Figure 2.)

- Helium gas connections: size 8, male (8M) couplings, high-pressure supply (red) and low-pressure return (green).
- Helium fill port: size 4, male (4M) coupling.
- Cold head receptacle: Amp CPC 17-28 socket
- Mains power receptacle: Heavy Duty Power Connector, HAN E 10, Harting 09330102602
- Accessory receptacle: Amp CPC 11-4 socket

Front Panel Mounted Items (See Figure 2.)

- Supply pressure gauge (0-600 psig, 0-40 bar, 0-4000 kPa)
- Main power circuit breaker (set at 20 A)
- ON/OFF rocker switch with run light
- Fuses
- Elapsed time meter (ETM)
- 50/60 Hz Toggle switch (for operation with RDK-101D cold head only)

Environmental Requirements

	Operating	Storage
Ambient Temperature	4° C to 40° C (40° F to 104° F)	-20° C to 65° C (-4° F to 150° F)
Relative Humidity	20% to 80% (non-condensing)	10% to 90% (non-condensing)
Atmospheric Pressure	70 kPa to 106 kPa	20 kPa to 106 kPa
Magnetic Field Limits	≤ 150 Gauss	

NOTE

Operating the equipment out of specifications may void the warranty.

Mounting Position

Compressor must be mounted base down and level within 5 degrees of horizontal.

Heat Rejection to Room

60 Hz	2.75 kW
50 Hz	2.35 kW

Helium Gas Pressures

Application	Flex Gas Line	Equalization Pressure at 20° C (68° F)
RDK-101D Cold Head, 50/60 Hz	Ø½ " x 3m-20m (10ft – 65ft) ①	210 psig
CH-104 Cold Head, 50/60 Hz	Ø½ " x 3m-20m (10ft – 65ft) ②	240 psig
CH-202 Cold Head, 50/60 Hz	Ø½ " x 3m-20m (10ft – 65ft) ②	230 psig
CH-204 Cold Head, 50/60 Hz	Ø½ " x 3m-20m (10ft – 65ft) ②	240 psig
CH-204-N Cold Head, 50/60 Hz	Ø½ " x 3m-20m (10ft – 65ft) ②	240 psig

① Recommended flex gas line is P/N 268112Bxxx (has #4F couplings at one end)
② Recommended flex gas line is P/N 263058Bxxx
Mass of helium refrigerant in compressor at 1.65 MPa (240 psig): 34g (0.07 lbs.)

Refrigerant Quality

Required refrigerant for charging is 99.999% pure helium gas with a dew point temperature less than -60° C (-76° F) at 20.7 bar (300 psig).

CAUTION

PRESERVE YOUR WARRANTY. Specifications require the use of 99.999% pure helium gas. Using a lesser quality of helium can damage the system and void the warranty.

Color Codes

The compressor helium connections are color-coded to match color labels provided with the gas lines.

SUPPLY (red) - Helium high-pressure gas supply from the compressor to the cold head.
RETURN (green) - Helium low-pressure gas return to the compressor from the cold head.

Required Spacing for Airflow

See Figure 4

Optional Spacing

Allow 600 mm (24") space in front of the compressor for access to electrical and gas connections. Allow 600 mm (24") space on the left side (when facing the front) of the compressor for maintenance of the adsorber.

Maintenance Intervals

Compressor adsorber: 30,000 operating hours

Noise Level

< 70 dB(A) at 1m

Dimensions

See Figure 3.

Weight (approximate)

Compressor: 101 kg (222 pounds)

General Operating Conditions

Normal pressure and temperature data are listed above. User should record monthly the operating conditions in a logbook. Keep this record of data for reference and later comparisons.

Supplier Name and Address

Sumitomo (SHI) Cryogenics of America, Inc.
1833 Vultee Street
Allentown, PA 18103-4783
U.S.A.
(610) 791-6700

NOTE

SHIG will provide circuit diagrams, component part lists, descriptions and calibration instructions to assist qualified service personnel in parts repair.

Product End of Life Instructions

1. Depressurize helium refrigerant gas to atmospheric pressure.

2. Drain oil.

3. Dispose used equipment in accordance with local laws and requirements.

Regulatory Compliance

Cryogenics Group

EU Declaration of Conformity

Manufacturer's Name	Sumitomo (SCAI) Cryogenics of America
Manufacturer's Address	1833 Vultee Street Allentown, PA 18103 U.S.A.
Authorized Representative's Name	Sumitomo (SHI) Cryogenics of Europe GmbH
Authorized Representative's Address	Daimlerweg 5a D-64293 Darmstadt Germany
Authorized Representative's Contact Information	Tel: +49 (0) 6151-860-610 Fax: +49 (0) 6151-800-252 E-mail: contact@sumitomocryo.de
Type of Equipment	Cryogenic Refrigeration Systems

We declare under our sole responsibility that the following product(s)

FA-20L Series Compressor

are in conformity with the relevant Union harmonization legislation

CE

Application of Council Directives:

- **Machinery Directive 2006/42/EC**
- **EMC Directive 2014/30/EU**
- **RoHS Directive 2011/65/EU and as amended 2015/863/EU**
  - o **Exemptions used: 6a, 6c, 8b-1**

I, the undersigned, hereby declare that the products specified above conform to the above Directives.

By: Mark O. Derakhshan

Mark O. Derakhshan
Chief Executive Officer, SCAI
November 2022

UKCA Declaration of Conformity

Manufacturer's Name	Sumitomo (SCAI) Cryogenics of America
Manufacturer's Address	1833 Vultee Street Allentown, PA 18103 U.S.A.
Authorized Representative's Address	3 Hamilton Close Houndmills Industrial Estate Basingstoke Hampshire RG21 6YT United Kingdom
Authorized Representative's Contact Information	Tel: +44 (0) 1256 853333 Fax: +44 (0) 1256 471507 E-mail: uksales@shicryogenics.com ukservice@shicryogenics.com
Type of Equipment	Cryogenic Refrigeration Systems

We declare under our sole responsibility that the following product(s)

FA-20L Series Compressor

are fully compliant with the essential requirements and relevant requirements of the following UK regulations:

- **Supply of Machinery (Safety) Regulations 2008**
- **Electromagnetic Compatibility Regulations 2016**
- **The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended January 2021)**
  - **Exemptions used: 6a, 6c, 8b-1**

I, the undersigned, hereby declare that the products specified above conform to the above Directives.

By: _____

Mark O. Derakhshan
Chief Executive Officer, SCAI
November 2022

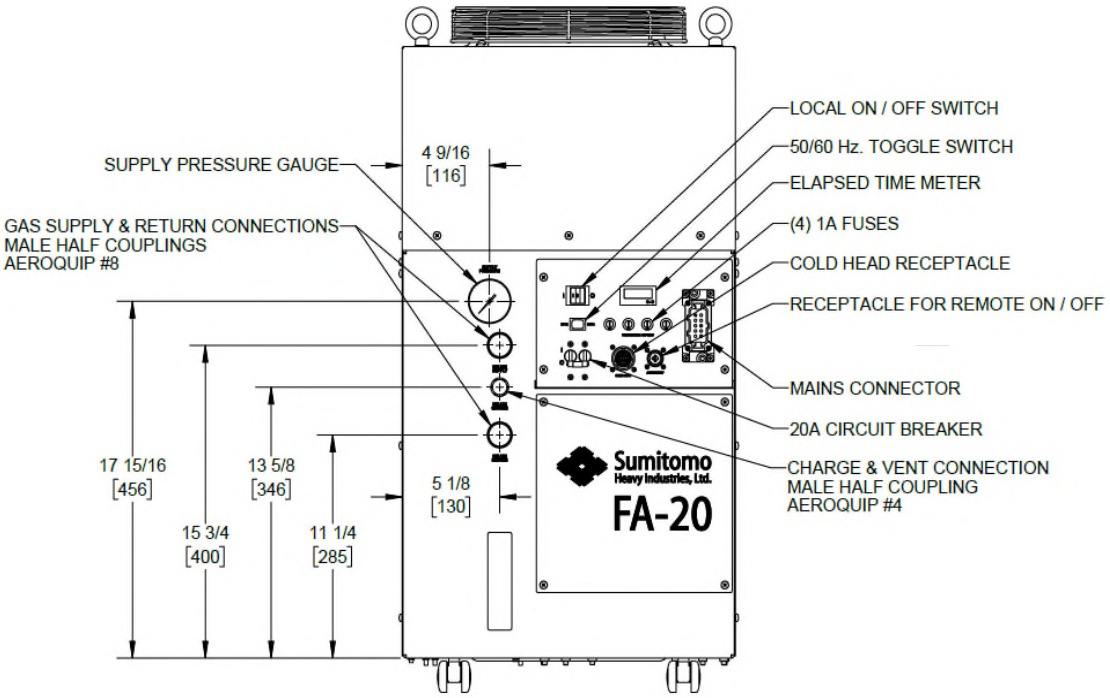

Figure 2 FA-20L Compressor, Front View

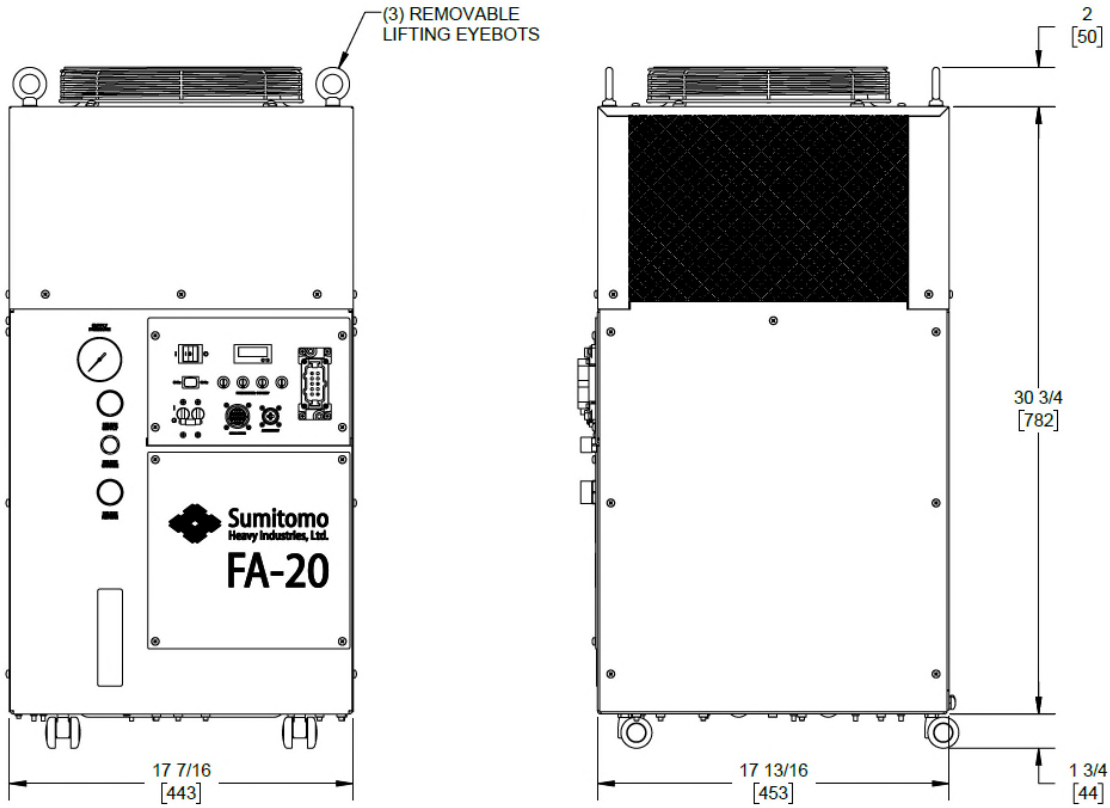

Figure 3 FA-20L Compressor, Dimensions
Dimensions are in inches and [mm].

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Installation

Introduction

Install the FA-20L Compressor, Mains Power Cable and the Gas Lines according to the following procedures.

The following installation procedures are based on standard arrangements of equipment, using SCAI standard components.

To prevent contaminating the components or the system, it is important to follow the procedures in this manual step by step.

NOTE

Be sure to have 99.999% pure helium gas available for installation of the system. See Refrigerant Quality in Specifications.

Receipt Inspection Instructions

CAUTION

AVOID EQUIPMENT FAILURE, CONTAMINATION OR A NUISANCE SHUTDOWN. Do not tip the compressor more than 5 degrees from horizontal to avoid flowing oil into unwanted places.

CAUTION

AVOID CONTAMINATION. When checking the compressor for shipping damage, do not connect gas lines and cold head. The components may become contaminated with compressor oil.

1. Upon receipt, inspect the shipping container and the compressor for damage.

1.1. If there is any evidence of external damage to the container, be sure the carrier's driver sees the damage. Note it on the shipping documents and have the driver acknowledge it by his initials on the delivery receipt.

1.2. Remove the compressor from its shipping container and inspect for damage. If there was external damage to the compressor, remove its covers and check for internal damage. Notify the carrier immediately and take photographs of the damage to document your claim to the carrier. Keep the damaged shipping container.

NOTE

Retain the shipping containers, if reusable, for returning the components to the factory if reconditioning is required. If internal damage is suspected, retain the shipping container for proof to the carrier.

2. Inspect for Proper Charge Pressure

2.1 The Charge Pressure of the Compressor Unit can be checked from the outside of the shipping container without removing the packaging.

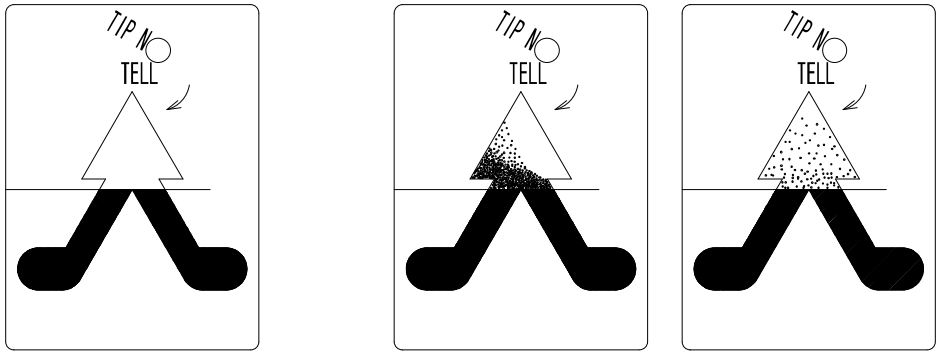
2.2 Look through the "peep hole" on the container. View the pressure gauge on the Compressor Unit front panel. The pressure gauge should indicate equalization pressure shown in specification section.

2.3 If the gauge indicates 0 PSIG (0 MPa), the Compressor Unit cannot be used. Contact the nearest SHIG Service Center.

3. Upon receipt, inspect Tip-N-Tell Sensor on Package for Activation

3.1 The Tip-N-Tell sensor mounted on the shipping container package surface should be checked upon receipt and before unpackaging to verify the "Compressor Unit shipping container" was NOT tipped or mishandled during transport.

3.2 If activated, Tip-N-Tell sensor turns blue in the arrow as shown below. Proceed with internal inspection.



Non-Activated (Good) Activated (Not Good)

Unpackaging and Product Inspection Instructions

1. Unpackaging Instructions

1.1 Remove the straps around the package.

1.2 Remove the Packaging Cover Shell and Top Inside Cushions.

1.3 Insert and tighten the three (3) furnished eyebolts into the top of the compressor. See Figure 3.

CAUTION

PREVENT EQUIPMENT DAMAGE. Use properly rated commercial equipment for lifting or moving the compressor. Make sure compressor is held in a balanced and stable position. Follow all applicable safety procedures for overhead material transport.

1.4 Carefully lift the compressor off the wooden base.

1.5 Retain the reusable shipping container parts for possible reuse. This includes the wooden base with Ethafoam cushion blocks, the packaging cover shell and the top inside cushions.

2. Inspect the Tip-N-Tell Sensor on Compressor Unit for Activation.

2.1 Check the Tip-N-Tell sensor mounted on the compressor rear panel. If the Tip-N-Tell sensor shows no mishandling and there is no apparent physical damage, skip Steps **2.2** and **2.3** and proceed to the section Compressor Location.

If the Tip-N-Tell sensor indicates mishandling (arrow dot is red), proceed to either Step **2.2** or **2.3**:

2.2 The equalization pressure is within specifications:

If the compressor has been momentarily tipped (less than one hour) and the equalization pressure is within specifications, allow it to stand upright for two hours before performing this step

⚠ WARNING

AVOID ELECTRIC SHOCK. This equipment must only be connected to a supply mains with protective earth. All electrical supply equipment must meet applicable codes and be installed by qualified personnel.

⚠ WARNING

AVOID ELECTRIC SHOCK. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death

Connect power to the compressor. See the next sections Compressor Location, Electrical Supply Connection, Coolant Connections and Compressor Checkout. Test run the compressor for two (2) hours minimum. If there are no problems during this time, stop the compressor and proceed to assemble the system.

If the compressor shuts down during the two- (2) hour test, contact the nearest SCAI Service Center.

2.3 If the equalization pressure is outside the specified range or there is physical damage to the compressor enclosure or the compressor has been on its side or upside down for an extended period of time (more than one hour), contact the nearest SCAI Service Center and notify the delivering carrier of the damage.

NOTE

When checking the compressor for shipping damage, do not connect gas lines and cold head. The components may become contaminated with compressor oil.

3. Inspect for Visible Damage of Compressor Unit.

3.1 Inspect the exterior panels of the Compressor Unit for evidence of damage.

3.2 If there was external damage to the compressor, remove the compressor unit panels and check for internal damage. Notify the carrier immediately and take photographs of the damage to document your claim to the carrier.

3.3 If any irrecoverable damage is found (e.g. oil Leakage, panel deformation), contact the nearest SCAI Service Center.

Compressor Location

Place the compressor in a location that is protected from the elements and where the ambient temperature will always be within the range of 4° C to 40° C (40° F to 104° F).

The compressor must be installed base down, within 5 degrees of horizontal.

The compressor must be installed in a location allowing proper airflow. Proper airflow prevents warm discharge air from entering the heat exchanger. Minimum spacing requirements are shown in Figure 4.

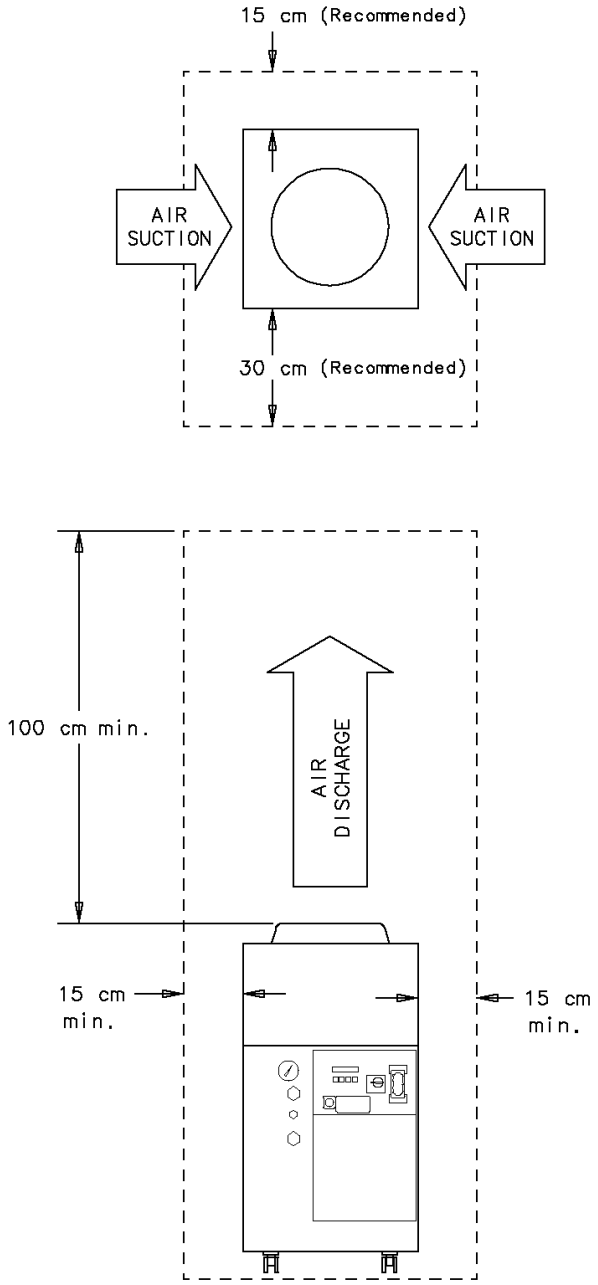


Figure 4 Required Space for Compressor Unit

Electrical Supply Connection - Field Wiring Instructions

Tool required: #3 Phillips screwdriver
5 mm Hex driver

The FA-20L compressor must be installed in a circuit capable of supplying the specified voltage and power. The wiring method used for connection to the front panel power connector must meet applicable codes.

> **⚠ WARNING**
>
> **AVOID ELECTRIC SHOCK.** All electrical supply equipment must meet applicable codes and be installed by qualified personnel. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

Connect mains power supply cable into the mains power receptacle on the front panel and fasten cover with attached screws. See Figure 4 below.

Figure 5 Connect Mains Power Supply Cable to Mains Power Receptacle

Compressor Checkout

The compressor should be operated before being connected to the other system components.

1. Ensure that the circuit breaker on the compressor is open (handle is down).
2. Supply power to the compressor.
3. Close the circuit breaker (handle up).
4. Press the ON/OFF rocker switch to ON position. The ON/OFF switch will light and the compressor will start.
5. Run the compressor for ten (10) minutes and then stop.

If the compressor starts but does not build pressure, turn it off immediately. It could be running in reverse.

This completes the checkout of the compressor.

Install the Gas Lines

Tool required: Open-end wrenches, 1", 1 1/8", 1 3/16"

Gas lines are shipped with protective dust plugs. Do not remove the plugs until the gas lines are ready to be attached. All bending and routing of gas lines should take place with plugs in place.

⚠ WARNING

AVOID INJURY. Always wear eye protection when handling pressurized gas lines and other pressurized equipment. Never apply heat to a pressurized gas line or other pressurized components.

CAUTION

PREVENT EQUIPMENT DAMAGE. Damage to gas lines can result from crimping by repeated bending and repositioning.

NOTE

Be sure to have 99.999% pure helium gas available at the installation site in case gas needs to be added to the system. See Refrigerant Quality in Specifications in this manual.

1. Identification labels are furnished with the gas lines. Before installing the gas lines, identify each with an appropriate label, SUPPLY (high pressure, color-coded red) or RETURN (low pressure, color-coded green) by applying the label adjacent to each Aeroquip coupling. See Figure 6.

NOTE

Supply and return gas lines are identical. Labels are used to prevent making a wrong connection at installation or at reassembly following maintenance.

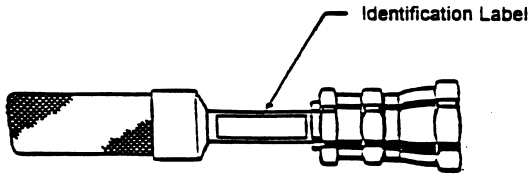


Figure 6 Attach Identification Label

2. Arrange the system components so that the gas lines will be protected from stress and traffic. Observe the minimum bend radius of 180 mm (7") when routing gas lines. Provide supports where needed.

3. Remove the dust caps from the compressor's supply and return gas couplings.

4. Connect the gas lines to the compressor's high-pressure (supply) and low-pressure (return) couplings. Use two wrenches to tighten the coupling. Torque all couplings to 47 ± 7 Nm (35 ± 5 ft. lbs.) See Figure 7. Tighten each coupling before proceeding to the next one.

CAUTION

AVOID GAS LEAKS. Check the condition of the gasket seal on the male half of each Aeroquip coupling. Be sure the gasket seal is in place and the sealing surfaces on both the male and female halves are clean before connecting. Replace the gasket seal if it is damaged or missing.

Keep the gas line couplings aligned when making or breaking a coupling connection. Leaks can occur due to the weight of the gas line or due to a sharp bend near the connection.

NOTE

Retain the dust caps and plugs to re-cover the couplings when they are not in use. They protect the couplings from damage and prevent the entry of contaminants.

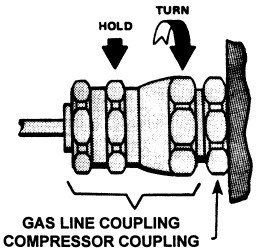


Figure 7 Connect Gas Line to Compressor or Cold Head

5. Using two wrenches, connect the RETURN gas line to the RETURN coupling on the cold head. Tighten the coupling to 47 ± 7 Nm (35 ± 5 ft. lbs.).

6. Using two wrenches, connect the SUPPLY gas line to the SUPPLY coupling on the cold head. Tighten the coupling to 47 ± 7 Nm (35 ± 5 ft. lbs.).

The system equalization pressure, shown by the compressor gauge after all components have been connected, will determine if charging or venting is required. System equalization pressure should equal the value provided in the system level manual or the Specification section of this manual.

Install the Cold Head Cable(s)

1. Ensure the compressor's circuit breaker is in the OFF position (handle down).

2. Connect the applicable cold head cable to the cold head receptacle on a compressor front panel.

3. Connect the other end of the cold head cable to the electrical receptacle on the cold head.

Remote On/Off Cable (Optional Accessory)

A remote on/off cable can be furnished as an accessory. See the Parts section for part number and ordering.

1. Disconnect the power to the compressor.

2. Remove the heat shrink cap from one end of the remote on/off cable. Connect the cable to customer's remote switch. Use the green conductor to ground the switch box. Switch voltage will be the same as the customer's power source, single phase. See Figure 9, Electrical Schematic Diagram.

3. Connect the other end of the cable to the accessory receptacle on the compressor.

4. Reconnect the compressor to its power source.

The system can now be operated from the compressor or from customer's remote switch. When using the customer's remote on/off switch, the power switch on the compressor must be in the stop (off) position.

5. To verify that the cable installation is correct, close customer's remote switch. Run the system for one minute, then stop.

NOTE

When customer's remote switch starts the compressor, it cannot be stopped by the compressor's power switch. Open the compressor's circuit breaker to stop it locally. When the compressor is started at the compressor power switch, it cannot be stopped at the remote on/off switch.

Prestart Check

1. Check that all electric connections are made:
   - **a.** Power to the compressor
   - **b.** Cold head cable
2. Check that the mains circuit breaker switch is open (handle is down) and the electrical power supply is switched ON.
3. Check that the equalization pressure is as specified when the compressor is at room temperature, 20° C (68° F). A change in temperature, higher or lower, will cause a small change, higher or lower, in the equalization pressure. If the pressure is far from the specified equalization pressure, the gas charge is incorrect and may indicate a leak or incorrect filling.

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OPERATION

Starting

Close the circuit breaker by pushing up the handle.

Press the power switch.

The indicator in the switch will light. The compressor will start. Any items drawing power from the compressor will start. Verify cooling fan is running and there is airflow out of the top of the compressor.

Stopping

At the compressor, press the power switch.

The indicator light in the switch will go off. The compressor will stop. Any items drawing power from the compressor will stop.

Restarting After a Power Failure

If the compressor stops due to a power interruption, it is designed to restart immediately after the power has been restored. If the compressor stops for other reasons, compressor troubleshooting is required.

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Adsorber Replacement

Part required: Adsorber, P/N F300138A

Tools required: #2 Phillips screwdriver
Open-end wrenches, 1", 1 1/8", 1 3/16"
Snoop®

CAUTION

AVOID EQUIPMENT FAILURE OR CONTAMINATION. Use SHIG adsorber P/N F300138A only. Use of non-SHIG spare parts will void the warranty.

The compressor's adsorber should be replaced every 30,000 operating hours (40 months). The used adsorber has no salvage or repair value. Venting the compressor is not required when replacing the adsorber because the gas couplings are self-sealing

Adsorber Removal

1. Stop the compressor and disconnect the power to the compressor.
2. Using two wrenches, disconnect the high pressure (supply) gas line from the helium high pressure coupling on the compressor. Screw a dust plug into the disconnected gas line.

NOTE

Always hold the stationary nut on the gas line coupling with one wrench while turning the moveable coupling with the other wrench.

3. Remove the compressor's left side cover panel. See Figure 8.

Figure 8 Compressor Cover Panel Removed

4. Using two wrenches to disconnect the self-sealing coupling on the inlet side of the adsorber. See Figure 9.

Figure 9 Disconnect Self-Sealing Coupling

5. Use a Phillips screwdriver to remove the two screws holding the adsorber to the base. See Figure 10.

Figure 10 Disconnect Adsorber from Base

6. Remove the locknut on the Aeroquip supply coupling on the front panel. See Figure 11.

Figure 11 Remove Supply Coupling Locknut

7. Pull the adsorber back until the supply coupling clears the front panel. Remove the adsorber. Remove the lock washer from the Aeroquip supply coupling. Retain all hardware to reuse with the new adsorber. See Figure 12.

Figure 12 Remove Adsorber

⚠ WARNING

AVOID INJURY. The adsorber is charged with helium gas. Follow the used adsorber venting procedure for safe disposal of the used adsorber.

Adsorber Installation

1. Remove the dust caps from the gas couplings of the new adsorber. **Do not vent the new adsorber.**

2. Install the lock washer on to the supply coupling of the new adsorber. Insert the supply coupling through the front panel and position the adsorber. See Figure 13.

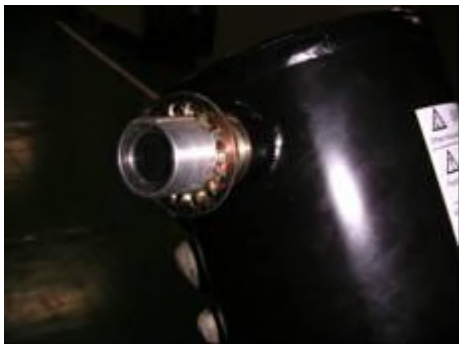

Figure 13 Install Lock Washer on Adsorber

3. Insert and tighten the screws to secure the new adsorber to the base. See Figure 14.

Figure 14 Install Adsorber

4. Install the red nylon washer and the locknut on the supply coupling. Torque the locknut to 54 Nm (40-ft. lbs.). See Figure 15.

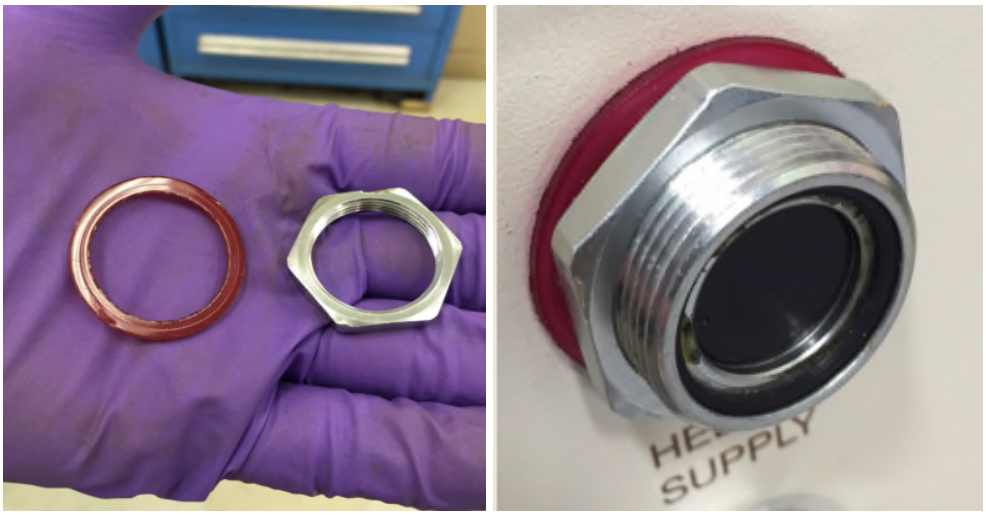

Figure 15 Install Supply Coupling Washer and Locknut

5. Connect the adsorber's self-sealing coupling on its inlet side to the oil separator's outlet coupling. With two wrenches, torque the Aeroquip coupling to 47 ± 7 Nm (35 ± 5 ft. lbs.). See Figure 16.

Figure 16 Connect Self-Sealing Coupling

6. Reconnect the supply (red) gas line to the supply coupling on the compressor. Torque the coupling to 47 ± 7 Nm (35 ± 5-ft. lbs.).

7. Using Snoop®, leak check all Aeroquip couplings just completed. Wipe off the Snoop® to prevent rusting. See the Leak Check procedure in Maintenance in this manual. See Figure 17.

Figure 17 Leak Check Aeroquip Couplings

8. Check the equalization pressure. See Specifications in the Operating Manual.

9. Reinstall the compressor's cover panel.

This completes the procedure for replacing an adsorber.

Used Adsorber Venting and Disposal

For safe disposal of the used adsorber:

1. A venting adapter fitting is included with the new adsorber. Attach it to one of the self-sealing couplings on the **used** adsorber. Vent the **used** adsorber to atmospheric pressure.

2. Discard the used adsorber with the venting adapter fitting connected.

Charging or Venting

Tools required: Charge and vent tool with valve, #4Fx¼" Swagelok, P/N 267191A.
Bleed adapter, P/N 267192A
Open-end wrenches, 5/8", 3/4"
Helium gas cylinder with pressure regulator and charge line

Charging or venting is required whenever the equalization pressure of the system is outside the range as stated in the Specifications. See the Specifications section of this manual. Venting a component to atmospheric pressure is required if the component needs to be disassembled for repairs or maintenance, including repairs to its self-sealing couplings.

⚠ WARNING

AVOID INJURY. Never use compressed helium gas from a cylinder without a proper regulator. Overpressure can cause serious injury if the system equipment ruptures.

CAUTION

AVOID CONTAMINATION. Follow the charging and venting procedure to prevent reversed flow of system gas. Do not charge through the supply coupling. Do not vent through the return coupling. Reversed flow can contaminate the system with compressor oil.

NOTE

Adapter fittings for charging and venting are available as optional service tools. See the Parts section of this manual.

Charging Procedure

CAUTION

PRESERVE YOUR WARRANTY. Specifications require the use of 99.999% pure helium gas. Using a lesser quality of helium can damage the system and void the warranty.

CAUTION

AVOID A MALFUNCTION. Repeatedly charging the system with helium gas rather than locating and repairing gas leaks can cause a malfunction. Impurities are introduced at an abnormal rate and can freeze in the cold head.

To charge helium gas to the system:

1. Stop the compressor.
2. Locate charge and vent tool, P/N 267191A, and bleed adapter, P/N 267192A. Screw bleed adapter into charge and vent tool.
3. Connect the charge line from the pressure regulator of a helium gas cylinder containing 99.999% pure helium with a dew point less than -62° C (-80° F) at 20.7 bar (300 psig) to Swagelok connector on charge and vent tool, P/N 267191A.
4. Slightly open charge and vent tool's valve and thoroughly purge the charge line from the regulator. It is important to remove all air contaminants to prevent them from entering the system.
5. Unscrew the self-sealing coupling on the bleed adapter, P/N 267192A, from the charge and vent tool, P/N 267191A. Close the valve.
6. Use two wrenches to attach the charge and vent tool to the 4M Aeroquip helium charge port on the front of the compressor.

7. Adjust the regulator to the required equalization pressure. See the Specifications section. **Slowly** open the valve on the charge and vent tool. Charge the system with helium gas to the equalization pressure.
8. Close the valves on the charge and vent tool and on the gas cylinder.
9. Disconnect the charge line from the charge and vent tool. Using two wrenches, remove the charge and vent tool. Store the charge line to keep it clean.
10. Leak check the Aeroquip couplings using the Leak Check procedure in this manual

This completes the charging procedure.

Venting Procedure to Adjust the Equalization Pressure

NOTE
This venting procedure is not to be used for gas cleanup of the compressor.

To vent helium gas from the system:

1. Stop the compressor.
2. Be sure the valve on the charge and vent tool, P/N 267191A, is closed. Using two wrenches, install this tool on the 4M Aeroquip helium charge port.
3. **Slowly** open the valve on the charge and vent tool. Vent the system until the required equalization pressure is attained. See the Specifications section. Close the valve on the tool.
4. Using two wrenches, remove the charge and vent tool from the compressor.

This completes the venting procedure to adjust the equalization pressure.

Gas Cleanup

Tools required: 2 adapter fittings with valve, 8F Aeroquip, 255919B2.
Open-end wrenches, 1", 1 1/8" and 1 3/16".
Helium gas cylinder with pressure regulator and charge line.

If the equalization pressure shown by the compressor's pressure gauge is less than 1.4 bar (20 psig), gas cleanup of the compressor is required. Look for and repair helium leaks. Perform gas cleanup.

If system components are connected and the equalization pressure of the system is less than 1.4 bar (20 psig), check for leaks. Repair leaks. Perform gas cleanup of the system.

CAUTION

PREVENT EQUIPMENT DAMAGE. Never pull a vacuum on the compressor or on the cold head. The motors will short circuit if started.

⚠ WARNING

AVOID INJURY. Disconnect gas lines only when the compressor is stopped. Disconnecting the cold head while it is cold can create excessively high internal pressure as the gas warms. Material failure and uncontrolled pressure release can cause serious injury.

Gas cleanup is required if the compressor's interior has been opened to the atmosphere or the equalization pressure is 1.4 bar (20 psig) or lower. Gas cleanup is performed with the compressor disconnected from the other system components.

NOTE

If the compressor's interior has been exposed to the atmosphere for an extended period, gas cleanup may not suffice to guarantee system gas purity. Contact a Service Center.

1. Disconnect the gas lines from the compressor. Plug the disconnected gas line couplings.

2. Locate two adapter fittings P/N 255919B2. Be sure their valves are closed. Attach them to the supply and return Aeroquip couplings on the compressor.

3. Connect a charge line to the pressure regulator of a helium gas cylinder containing 99.999% pure helium gas with a dew point less than -62° C (-80° F) at 20.7 bar (300 psig). Adjust the gas cylinder pressure regulator to 0.35 bar (5 psig).

4. While connecting the charge line to the adapter fitting on the compressor's return coupling, thoroughly purge the charge line from the regulator. It is important to remove all air contaminants to prevent them from entering the system.

5. Adjust the pressure regulator to 15.2 bar (220 psig). Open the valve on the adapter fitting and charge the compressor to 15.2 bar (220 psig).

6. Close the valve on the adapter fitting used for charging.

7. Run the compressor for at least 30 minutes to heat the oil to operating temperature. Stop the compressor.

8. Open the vent valve on the supply coupling of the compressor. Watch the compressor's pressure gauge. When the pressure falls to 0.35 to 0.7 bar (5 to 10 psig), close the vent valve. Open the charge valve to increase the pressure to 15.2 bar (220 psig). Close the charge valve.

9. Start the compressor

10. After running 30 to 45 seconds, stop the compressor. Open the vent valve and vent the compressor to 0.35 to 0.70 bar (5 to 10 psig). Close the vent valve.

11. Repeat steps 8, 9 and 10 ten (10) times, and then go to Step 12.

12. Open the charge valve on the adapter fitting. Charge the compressor to the equalization pressure. Close the charge valve.

13. Allow the compressor to cool. Read the pressure gauge with the compressor at 20° C (68° F). Adjust the equalization pressure by charging or venting to conform to the Specifications.

14. Close the gas cylinder valve and adjust the pressure regulator to zero psig.

15. Disconnect the charge line from the adapter fitting. Store the charge line to keep it clean.

16. Remove both adapter fittings.

17. If other components need cleaning, perform the appropriate procedures in their manuals. Otherwise, reconnect the supply and return gas lines. Torque the gas line couplings to 47 ± 7 Nm (35 ± 5 ft. lbs.).

18. Leak check the Aeroquip couplings. See the Leak Check section.

This completes the gas cleanup procedure for the compressor.

Fuse Replacement

Tool required: Flat screwdriver

Fuses for the FA-20L are located in the front panel of the electrical chassis of the compressor Control circuit (FU-1, FU-2, FU-3 and FU-4) as shown in Figure 18:

a. Four (3) 1AT , 250V

For FU-1, FU-2, FU-3 and FU-4

1. Disconnect the mains power supply to the compressor (if connected).

⚠ WARNING

AVOID ELECTRIC SHOCK. Disconnect the power to the compressor before troubleshooting the electrical components.

⚠ WARNING

AVOID ELECTRIC SHOCK. All electrical supply equipment must meet applicable codes and be installed by qualified personnel.

2. Open fuse holder with flat screwdriver and Remove open fuse from fuse holder and replace with new fuse of same ampere rating.

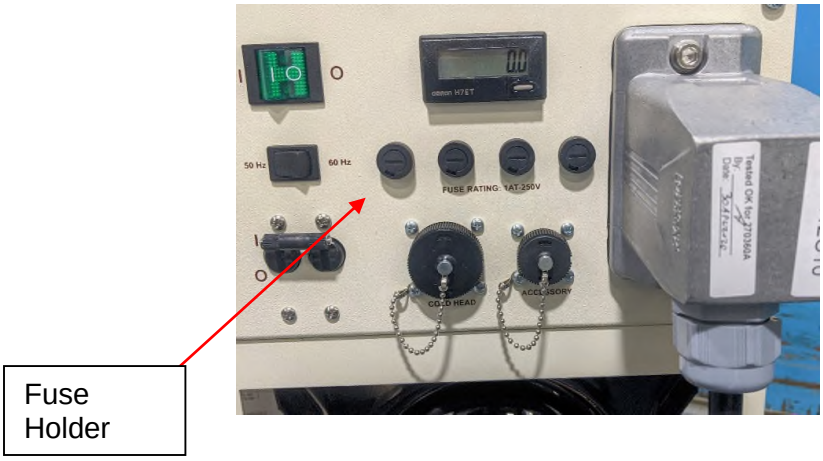

Figure 18 Fuse Holders on FA-20L Front Panel

Heat Exchanger Cleaning

Heat exchanger cleaning to remove collected dust and debris is required regularly to maintain proper compressor operation. Cleaning is recommended twice a year, but it may be necessary more often, depending on the operating environment.

In order to clean the heat exchanger:

1. Stop the compressor and confirm the fan has stopped.

2. Using a portable vacuum cleaner, remove dust and debris for the outside (suction side) of the heat exchanger. See Figure 19. Cleaning the inside surface is not necessary. Do not remove the fan guard to clean the inside surface.

   A soft brush or soft brush attachment may be used to help remove dust.

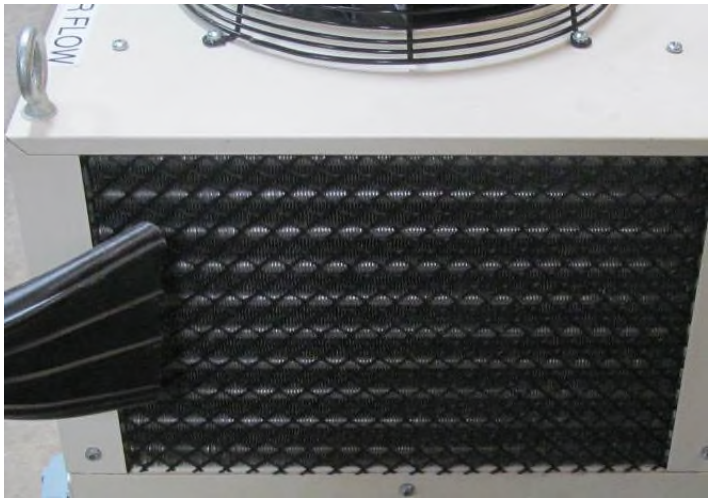

Figure 19 Clean Heat Exchanger

⚠ WARNING

AVOID INJURY. Do not touch heat exchanger fins. Fins are sharp and may cause injury.

CAUTION

PREVENT EQUIPMENT DAMAGE. Do not insert object or admit fluids through fan guard under any circumstances. Injury or malfunction may occur.

TROUBLESHOOTING

Automatic Shutdown

The compressor will not start or will shut down automatically if any of the following are open:

- the compressor motor protector switch;
- the gas high-temperature switch;
- the motor over-current relay;
- the circuit breaker.

If the compressor has been shut down by one of these interlocks, do not restart until the problem has been found and corrected. Refer to the Troubleshooting Guide to identify the problem.

If the unit shuts down again, refer to the Troubleshooting section to determine the cause and corrective action.

When the shutdown is caused by one of the high-temperature switches, the compressor will restart only after it has cooled enough for the switch to close. After waiting for the compressor to cool, press the power switch to restart. Should the compressor fail to start, turn it off and allow more cooling time. Repeat the start procedure.

The motor over-current relay automatically resets after the compressor shuts down and the relay cools. To restart the compressor, press the power switch to the “ON” position. If the compressor fails to start, turn it “OFF” and allow more cooling time. Repeat the start procedure.

If the circuit breaker opens, reset the breaker by pushing its lever to the “UP” position.

If a fuse is open, disconnect the power from the compressor, replace the fuse, and then restart the compressor. The four (4) fuses located in the front electrical panel protect the control circuit cold head supply circuit.

Refer to the Troubleshooting Guide and the following procedures for checking the compressor’s electrical components. The Troubleshooting Guide lists problems that can occur in the compressor and suggests possible causes sand corrective actions.

⚠ WARNING

AVOID ELECTRIC SHOCK. Disconnect the power to the compressor before troubleshooting the electrical components.

⚠ WARNING

AVOID ELECTRIC SHOCK. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

CAUTION

PRESERVE YOUR WARRANTY. Modification of equipment without the consent of the manufacturer will void the warranty.

Troubleshooting Guide

The Troubleshooting Guide that follows lists problems that can occur in the system and suggests causes and corrective actions.

Problem	Possible Cause	Corrective Action
Compressor and items powered by it do not start when the start switch on the compressor is closed. Run light is not on.	No electrical power.	Check that the power source is “ON” and the power cord is connected.
	Tripped circuit breaker in the compressor.	Check the voltage. Reset the circuit breaker. Consult a SCAI Service Center if the problem persists.
	Open fuse in the control circuit.	Check for a short circuit. Replace the fuse. Consult a SCAI Service Center if the problem persists.
Compressor starts but shuts down after a few minutes of operation.	Wrong equalization or operating pressure.	Refer to Specifications and the section on Charging and Venting. Leak check the system if the pressure is low.
	Gas equalization solenoid valve has failed.	Replace the solenoid valve.
	Low oil flow.	Look for oil leaks in the compressor capsule. Consult a SCAI Service Center.
	Orifice or the oil cooling line filter is blocked.	Replace the orifice and filter.

Problem	Possible Cause	Corrective Action
Compressor starts but shuts down sometime later.		
	Circuit breaker or fuse is open.	Reset the Circuit breaker or replace a fuse. Compare the electric service with system specifications. Consult a SCAI Service Center if the problem persists.
	Component failure in the power circuit.	Check for an open circuit breaker or fuse. Reset or replace if necessary. Check for a faulty component.
	Incorrect current draw.	Measure the current. Check motor winding resistances. If checks reveal a failed motor windings or locked rotor, consult SCAI Service Center.
	Compressor overload relay opens.	If power checks indicate the utilities are within specifications, interlocks may be faulty. Consult a SCAI Service Center.
System starts but gas pressures are abnormally high or low.	Wrong equalization pressure.	Refer to Specifications and the section on Charging and Venting. Leak check the system if the pressure is low.
	Gas line couplings are not fully engaged.	Ensure all Aeroquip couplings are fully engaged and torqued.
	Gas lines are connected wrong.	Reconnect lines. See the Installation section.

Problem	Possible Cause	Corrective Action
Compressor runs, but cold head valve motor operation is abnormal.	Wrong cold head cable.	Ensure correct cold head cable is connected per “Install the Cold Head Cable(s)” procedure and visual inspection.
	Cold head problem.	Consult cold head manual.
Gradual loss of helium gas pressure.	Gas is leaking from the compressor.	Leak check the compressor and repair.
Compressor runs but the elapsed time meter does not run.	Defective elapsed time meter or motor contactor.	Consult a SCAI Service Center.

⚠ WARNING

AVOID INJURY. The compressor’s elapsed time meter contains a lithium battery. Do not remove the battery. Do not recharge, disassemble, mutilate, wet or dispose of the meter in fire. Contact local environmental authorities for proper disposal of the lithium battery.

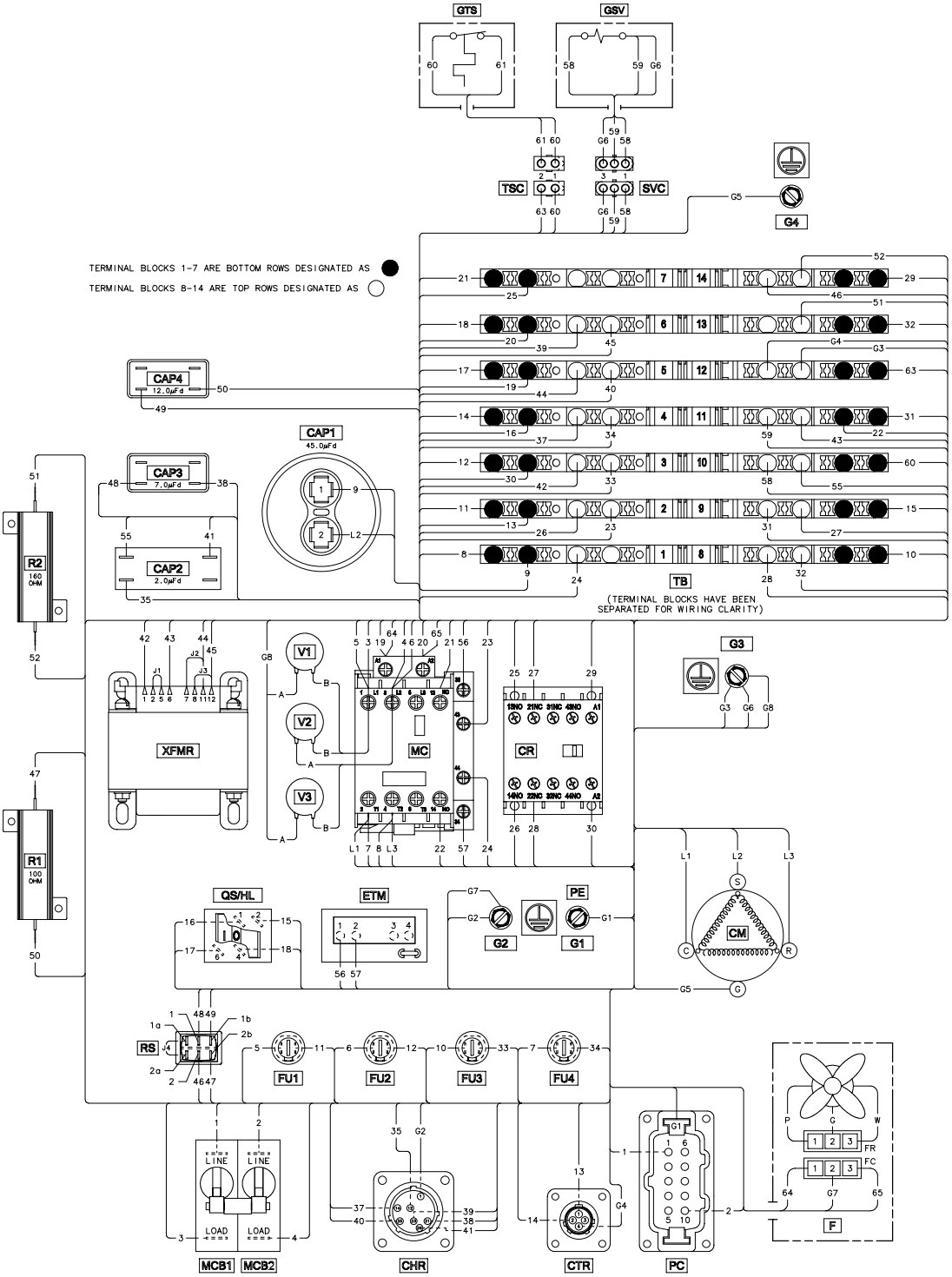

Figure 20 FA-20L Compressor Wiring Diagram

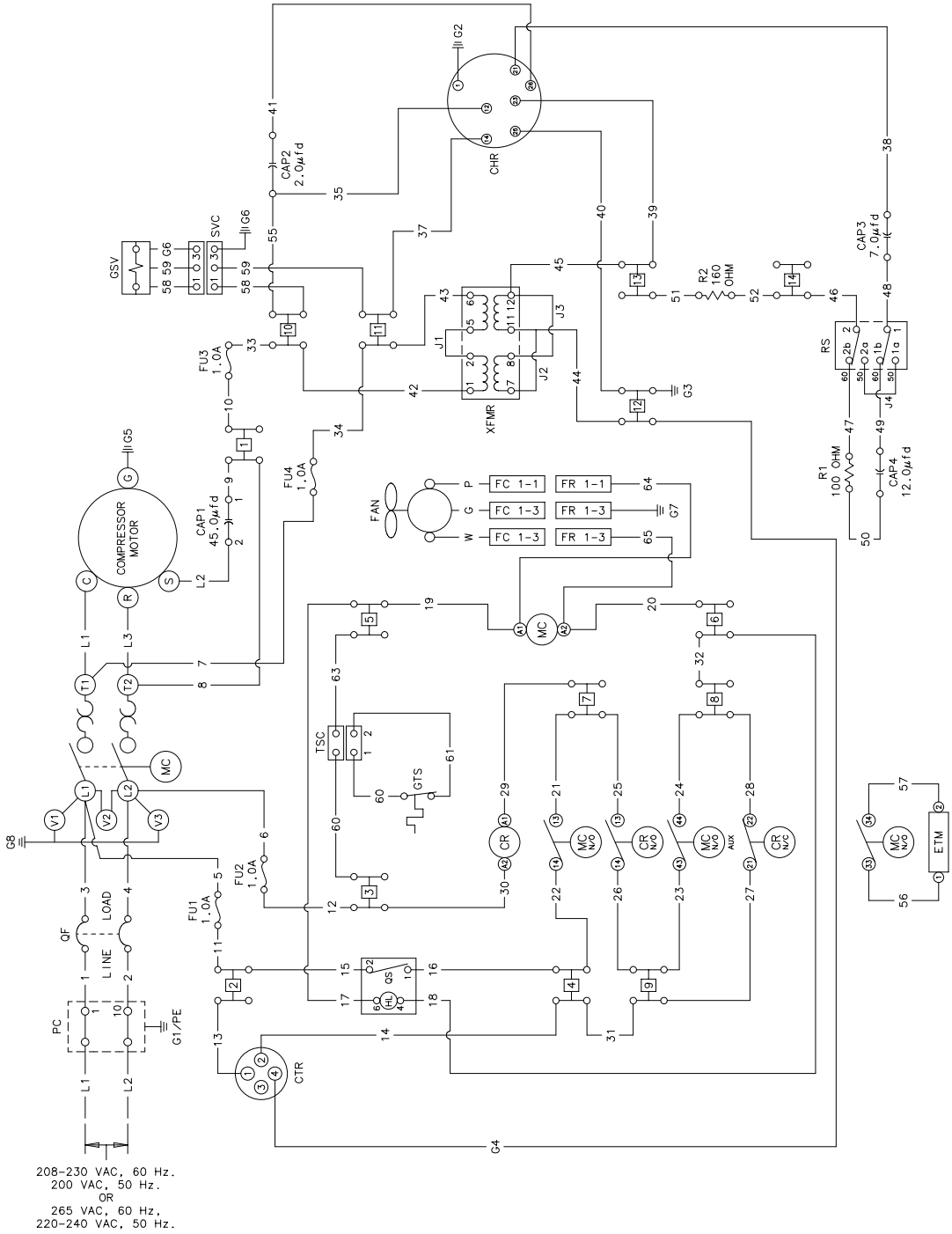

Figure 21 FA-20L Compressor Wiring Schematic

PARTS

Ordering

The nameplate fastened to the front panel of the compressor housing identifies the compressor as follows:

Model Number
Part Number
Serial Number
Date of Manufacture

Furnish this complete information when ordering parts. Also, order parts by part number and name. Refer to the next section for Parts Identification and Numbers.

Installation Tool Kit

The following installation tool kit is used for installing or servicing the FA-20L compressor and is available as an accessory from SCAI Installation tool kit P/N 267990A consists of:

Item	Quantity	Part Name	Part Number
1	1	Wrench installation kit for ½" gas lines	255438A
2	2	Charge and vent tool kit	267190A

Adapter Fittings

The following adapter fittings, required for servicing the FA-20L Compressor, are available as accessories from SCAI.

Item	Quantity	Description	Part Number	Figure
1	2	Adapter fitting, 8Fwith valve	255919B2	21

(1)Denotes size 8, female, Aeroquip coupling.
(2)Denotes size 8, male, Aeroquip coupling.

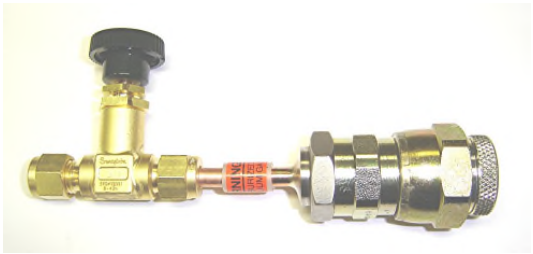

Figure 22 Adapter Fitting, 8F with Valve

Cables

The following cables are available for use with the FA-20L Series Compressors as accessories from SCAI.

Item	Quantity	Description	Part Number
1	1	Mains Power Supply Cable, FA-20L, 3 m (10 ft.) long.	280112C10*****
2	1	Remote On/Off Cable, 6 m (20 ft.) long.	280368B20*****
3	1	Cold head cable, CH Cold head, 3 m (10 ft.) long.	267285C11*****
4	1	Cold head cable, RDK-101, 3.3 m (11 ft.) long.	268094C11*****

***Note:** Other cable lengths are available.

Spare Compressor Parts

Item	Quantity	Description	Part Number
1	1	Adsorber	F300138A
2	1	Fuse kit, 4x 1.0A, 5 x 20mm	F280510A