BALZERS

Cryogenic Equipment

Operating Manual

BALZERS

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Operating Instructions

Helium Compressor
UCC 110S and UCC 064S

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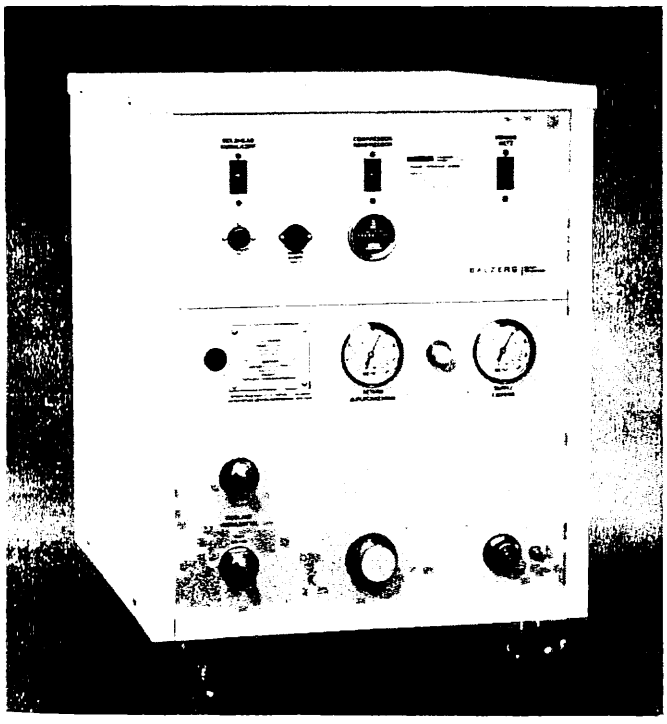

Helium Compressor Model UCC 110S and UCC 064S

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SAFETY

Balzers helium refrigerator systems are high pressure, high voltage devices. They must be installed, operated and maintained with appropriate caution. Accepted safety measures and techniques should be observed.

Although great care and attention to safety has been taken in the design of these components, the possibility of injury, death or equipment damage exists if proper techniques are not carefully followed.

These precautions must be observed when working with this equipment.

- **Carefully read the operating instructions** before unpacking, connecting or operating the compressor unit.
- **Read the instructions for unpacking the unit and follow the prescribed procedures carefully.** There is important information in these instructions that can prevent accidental damage to the unit.
- **Do not tilt the compressor in any direction during any operation,** under any circumstances. Oil may contaminate the system resulting in malfunction or damage to the system.
- **Only operate the compressor** after assuring that all water and electrical connections have been properly made. Check that all utilities are verified to be within the specified requirement and the compressor is properly phased.
- **Always use two wrenches** when connecting and disconnecting self-sealing couplings to prevent loosening of the fixed fitting.
- **Turn off and lock out the power source** whenever any maintenance is to be carried out on the compressor unit.
- **Electrical work must be performed by properly trained personnel.**
- **Do not disassemble any part of any system or component without releasing the gas** from all portions of the system or components unless specifically recommended by the operating instructions. For example, the compressor may remain charged during the replacement of the adsorber.
- **Never disable or otherwise alter any gas relief valve on any component.** If it is suspected that any relief or bypass valve is malfunctioning, its proper operation should be verified before continuing to operate the component or system.
- **Do not exceed the maximum static charge** pressure of 275 psig (1900 kPa) of any component.

  The pressure values are always given in "gauge" readings, not in "absolute" pressure (Thus "PSIG" means Pounds per Square Inch, Gauge and "kPa" means Kilo Pascals, gauge).
- **Always use helium with guaranteed purity of 99.995%** and water dew point of less than - 80 degrees F (-62 degrees C).
- **Never attempt to add high pressure helium to any component of the refrigeration system without the use of *an* appropriate pressure regulator and an appropriate gas transfer line.**
- **Adequate ventilation** must always be provided when venting, purging or charging any component with helium.
- **Never use an adsorber assembly beyond its rated life.**
- **Always remove the water from the heat exchanger when shipping or storing the compressor.**
- **Ensure the shipping constraints are in place prior to shipping the compressor.**
- Units returned for maintenance or repair must **not contain any poisonous or radioactive substances.**

INTRODUCTION

This manual covers the installation and operating instructions for Balzers standard line of helium scroll compressors, Models UCC 064S and UCC 110S. The two models are very similar in appearance and operation. The major differences are in compressor power and throughput, variations in electrical and water requirements, and cold head motor power supplies. Differences in installation and operating procedures are noted throughout this manual. Specifications for the standard products are listed at the end of the manual. Additional information on special or custom products will be covered by an addendum to this manual, as required.

UNPACKING AND INITIAL SET UP

Before unpacking the compressor inspect the shipping carton. Upon receipt, the compressor should be in an upright position, and the shipping container undamaged.

If this is not the case, take a photograph of the condition in which it was received, noting any discrepancies or damage, in the event a claim has to be filed with the carrier.

1.1 UNPACKING

Tools necessary:

- Strap Cutter
- Phillips Screwdriver

CAUTION: DO NOT TILT THE COMPRESSOR IN ANY PHASE OF THE UNPACKING PROCEDURE.

Procedure:

1. Cut the two straps securing the carton to the skid.
2. Lift the carton up, off the compressor.
3. Remove the accessory carton from the top of the compressor.
4. Cut the straps that secure the compressor to the skid.
5. Remove the four upper screws that secure the compressor top cover and remove the cover.
6. Using the top of the interior frame as a grip, lift the compressor **straight up — DO NOT TILT** — and off the skid. Proceed with caution. The compressors weigh:
   UCC 064S - 220 lbs (100 kg)
   UCC 110S - 230 lbs (105 kg).

1.2 REMOVING THE SHIPPING RESTRAINTS

To prevent any damage to the compressor unit during transit, the compressor assembly is rigidly secured to the deck of the main compressor frame by means of restraining shims. These shims must be removed prior to operating the compressor.

When shipping the unit, it will be necessary to replace the shipping restraints. After they have been removed, store them in a safe place. To reinstall the shipping restraints, refer to the procedure in section 6.7 of this manual.

FIGURE 1.1 SHIM SHIPPING RESTRAINTS

Tools necessary:

— Phillips Screwdriver

— 10mm Wrench

— 13mm Wrench

Procedure:

1. Remove the four lower screws that secure the outer skin to the compressor frame.
2. Remove the outer skin by spreading the two sides away from the compressor and pushing back off the rear of the frame.
3. Loosen the four 10mm mounting nuts that secure the compressor to the base, while holding the 13mm nuts on the underside of the base from turning.
4. Remove the restraining shims from under the compressor.
5. Retighten the mounting nuts.

   Save these shims for repacking the compressor.

   For procedures on reinstalling the shims when shipping or storing the compressor, see section 6.7 of this manual.
6. Inspect the compressor components for any obvious damage.
7. Ensure that the compressor is properly charged (250, ± 5 psig; 1725 kPa).

NOTE: IF THE UNIT, UPON INSPECTION, IS CHARGED ≤ (LESS THAN OR EQUAL TO) 5 PSI (35 kPa) BELOW THE SPECIFIED PRESSURE, CHECK THE UNIT FOR LEAKS WITH A HELIUM LEAK DETECTOR.

THIS PRESSURE READING IS RATED AT 70 DEGREES F. ALLOW FOR VARIATION IN THIS READING DUE TO CHANGES IN AMBIENT TEMPERATURE AND/OR ATMOSPHERIC PRESSURE.

1.3 PARTS LIST:

In general, the following items will be found in the shipping carton. The actual contents will vary under special circumstances. Check the enclosed packing slip against your record of the order.

— Operating Instructions

— 10 ft. Supply Flexline
— 10 ft. Return Flexline
} May vary, depending on order.

— Electrical Power Cable to Cold Head

— Aeroquip Bleed Fitting.

— Remote Control Cable, 25 ft. — depending on order.

— Wrench Kit (one each)

- 1-3/16"
- 1"
- 1-5/8"
- 1-3/8"

— Helium Compressor

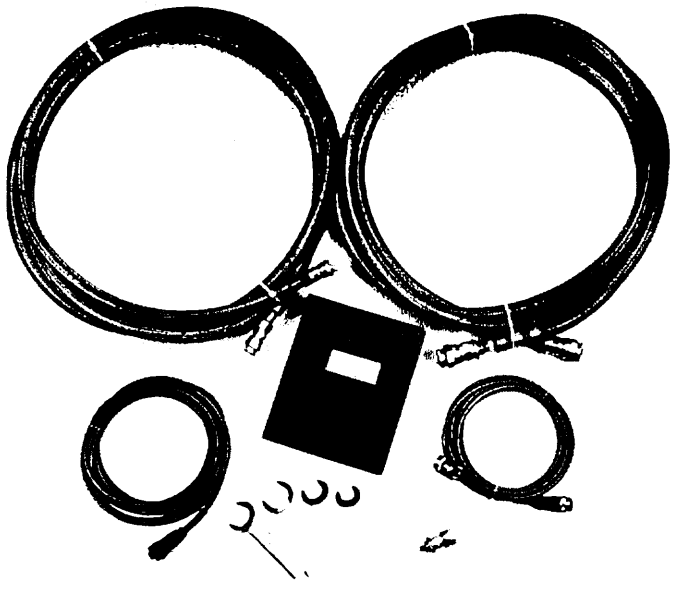


FIGURE 1.2 ITEMS GENERALLY SHIPPED WITH COMPRESSOR

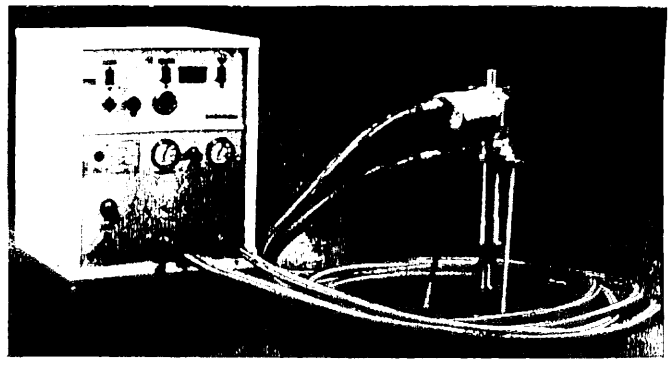


FIGURE 2.1 TYPICAL CRYOGENIC REFRIGERATION SYSTEM

2.0 SYSTEM DESCRIPTION

Balzers Cryogenic Refrigerators use a principle similar to a typical household refrigerator, except that helium is employed as a refrigerant. The system consists of three components:

— Compressor

— Cold head

— Interconnecting lines for gas (supply and return), power and remote control.

The compressor delivers compressed gas at room temperature to the cold head. The compressor unit also contains the electrical supply and control unit for the entire system. The operation of the compressor is explained in detail in the following section.

The expansion of the helium gas in the cold head creates the refrigeration. Inside the cold head is a piston-like mechanism, called a "displacer" that moves up and down in the cold head cylinder and a valve mechanism which controls the gas flow to and from the displacer. Acting in concert, the displacer and valves produce the cooling effect. This process is explained in detail in the Cold Head Manual.

The gas lines are the conduits by which the helium flows between the compressor and the cold head. The electrical cables are for system power, the cold head motor and remote control.

3.0 COMPRESSOR DESCRIPTION

The Balzers UCC 064S and UCC 110S helium compressors are single-stage scroll-type compressors that deliver clean oil-free high pressure helium gas to the cold head.

The system contains the following major components:

— A single-stage scroll compressor.

— Gas and oil to water heat exchanger.

— Oil management system: including an oil separator and adsorber.

— Low pressure surge volume tank.

— Electrical control box.

3.1 COMPONENT IDENTIFICATION

Figure 3.1 identifies the compressor's major components, connections, instrumentation and controls.

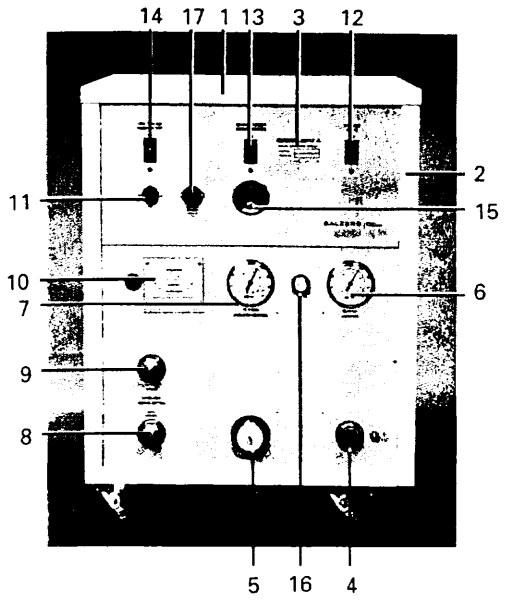


FIGURE 3.1a COMPRESSOR FRONT VIEW

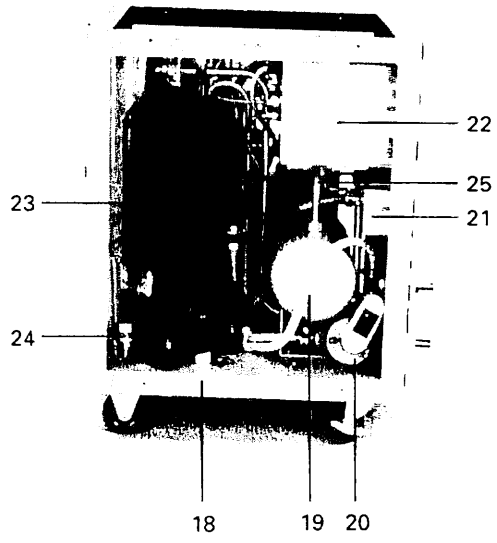


FIGURE 3.1b COMPRESSOR LEFT SIDE VIEW

1 Cover
2 Outer Skin
3 Compressor Identification Plate
4 Aeroquip Coupling, High Pressure (Supply)
5 Aeroquip Coupling, Low Pressure (Return)
6 Gauge, High Pressure (Supply)
7 Gauge, Low Pressure (Return)
8 Cooling Water Inlet
9 Cooling Water Outlet
10 Main Power Connection Access Cover
11 Cold Head Cable Connection
12 Main Switch
13 Switch, Compressor Unit
14 Switch, Cold Head
15 Elapsed Time Meter
16 He Charging Connection
17 Remote Control Connection

18 Shipping Restraints
19 Oil Separator
20 Water Flow Switch
21 Main Power Connection Box
22 Electrical Control Module
23 Compressor Module
24 Oil Fill Connection
25 Temperature Monitor

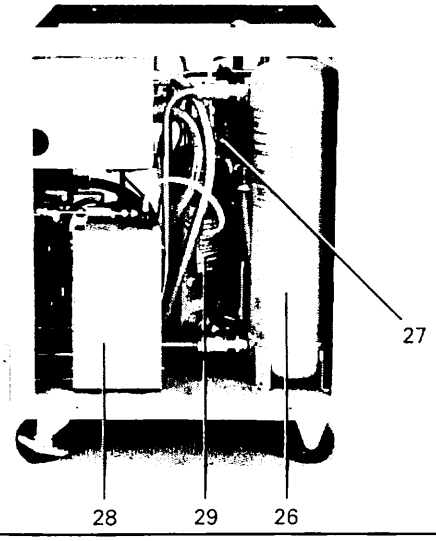


FIGURE 3.1c COMPRESSOR RIGHT SIDE VIEW

26 Adsorber
27 Solenoid Valve, Oil Circuit
28 Cold Head Motor Control Module
29 Heat Exchanger
30 Surge Volume

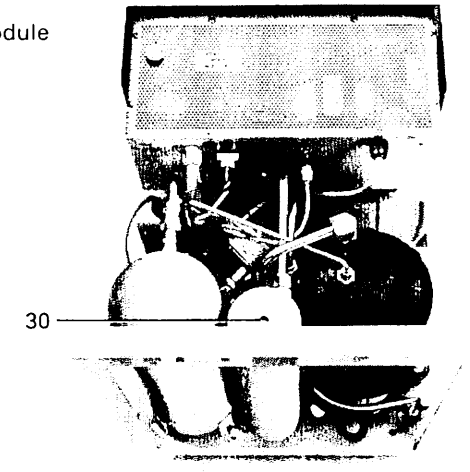


FIGURE 3.1d COMPRESSOR TOP VIEW

3.2 FUNCTIONAL DESCRIPTION

3.2.1 SCROLL COMPRESSOR DESCRIPTION AND CONFIGURATION

Balzers Models UCC 110S and UCC 064S are single stage scroll type compressors. A scroll compressor achieves constant compression with little variation of torque, little vibration and noise. Construction is relatively simple, with few moving parts, assuring long term reliability.

3.2.2 COMPRESSION CYCLE

The compressor chamber consists of two scrolls, one fixed and the other orbiting. As the orbiting scroll rotates within the fixed scroll, the "laps" or sides of the scrolls come in contact with one another creating a hermetic chamber. This chamber decreases in size as the rotating scroll moves through its cycle compressing the gas.

Gas enters the system when the chamber is at its largest volume. As it cycles through its rotation, the chamber volume decreases and the gas is compressed.

Suction valves and discharge valves are not required because the suction chamber and the discharge chamber are not directly connected. As a result there are no leaks, noises or valve damage. The compressed gas is cooled by oil that is injected into the chamber during the compression cycle.

The compressed gas moves through a discharge passage to the motor compartment. The gas cools the motor. Some of the oil that was previously injected into the compressor is removed by gravity separation and falls to the oil sump.

3.2.3 GAS COOLING, OIL SEPARATING AND RETURN

The high temperature gas and oil mixture exits the compressor and goes to the heat exchanger where it is cooled. The water-cooled heat exchanger (Fig. 3.1; #29) also cools the oil injected during compression.

A solenoid valve (Fig. 3.1; #27), located at the heat exchanger in the compressor's oil cooling line prohibits oil from slugging into the compressor when the system is shut down.

A temperature monitor (Fig. 3.1; #25) on the gas outlet will shut the compressor down if the temperature exceeds 120 degrees F (49 degrees C).

A water flow switch (Fig 3.1; #20) will shut the compressor down if the water flow is below 3 gpm (11.4 lpm) for the UCC 110S or 1.5 gpm (5.7 lpm) for the UCC 064S compressor.

After being cooled by the heat exchanger, the gas/oil mixture goes to the oil separator (Fig. 3.1; #19) where virtually all the liquid oil that remains in the gas is removed and returned to the compressor. The remaining oil vapor is removed as the gas passes through the adsorber (Fig. 3.1; #26).

NOTE: The adsorber provided with the UCC 110S and UCC 064S have a finite life, and must be replaced after 26,000 hours of operation.

After leaving the adsorber, the high pressure helium is directed to the front panel where it is available to be carried through the supply lines to the cold head (or through the differential bypass valve when a cold head is not installed).

The returning low pressure gas enters the surge volume (Fig. 3.1; #30) which dampens the pressure pulsations caused by the cold head, before re-entering the compressor module.

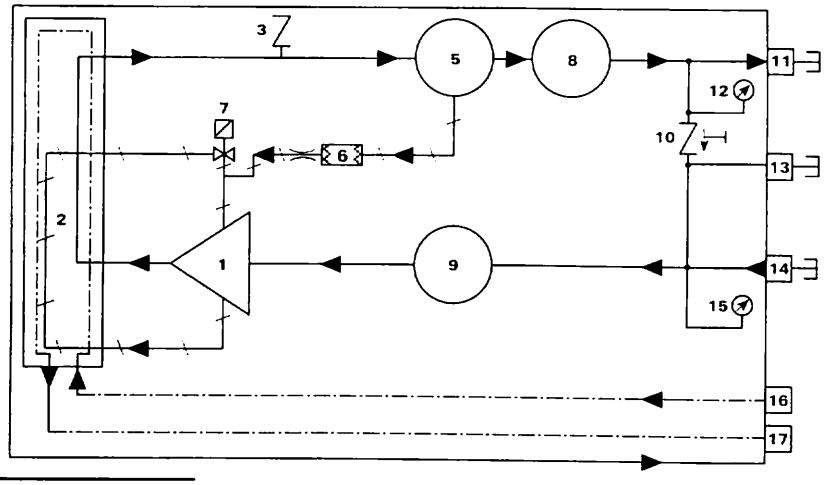


FIGURE 3.2 FUNCTIONAL FLOW DIAGRAM

1 Helium Compressor Module
2 Heat Exchanger
3 Pressure Relief Valve
4 Not Applicable
5 Oil Separator
6 Oil Filter And Orifice
7 Oil Solenoid Valve
8 Vapor Adsorber
9 Helium Reservoir
10 Bypass Valve
11 Gas Supply Connection
12 Gas Supply Pressure Gauge
13 Gas Charge Connection
14 Gas Return Connection
15 Gas Return Pressure Gauge
16 Water Inlet Connection
17 Water Outlet Connection

3.3 POWER SUPPLY AND CONTROL

The compressor supplies power and control for the whole refrigerator system (including the cold head) by means of the electrical control box located in the upper third of the compressor (Fig. 3.1; #22). Manual switches or remote signals power the system. Remote operation is permitted by means of the Remote Control outlet on the front panel of the compressor, (Fig. 3.1; #17).

The electrical control circuit is in series with the temperature monitor (Fig. 3.1; #25), water flow switch (Fig. 3.1; #20), electrical current overloads (Fig. 3.3; #1) and reverse phase relay that will prevent the system from operating under unsafe conditions.

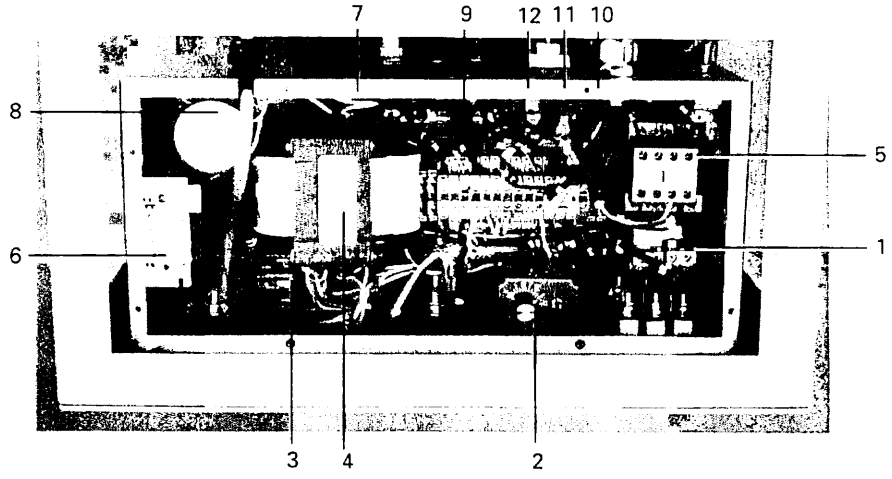


FIGURE 3.3 ELECTRICAL CONTROL MODULE COMPONENTS, 3-PHASE COMPRESSOR MOTOR

1 Current Overload Switch (Thermal Overload)
2 Time Delay Relay
3 Remote Control Relays
4 Transformer
5 Contactor
6 Cold Head Control Module Low Voltage Supply*
7 Cold Head Control Module High Voltage Supply Rectifier*
8 Cold Head Control Module High Voltage Supply Capacitor*
9 F1 — Primary Circuit Fuse
10 F2 — Control Circuit Fuse
11 F3 — Cold Head Circuit Fuse
12 F4 — ETM Circuit Fuse (3-Phase), Primary Circuit Fuse (1-Phase)

** Components for cold head motor will vary with refrigerator model.*

4.0 INSTALLATION AND CONNECTIONS

SAFETY AND PRECAUTIONS

BALZERS HELIUM REFRIGERATOR SYSTEM COMPONENTS ARE UNDER HIGH PRESSURE. SAFETY TECHNIQUES AND PRACTICES MUST BE OBSERVED THAT ARE APPROPRIATE FOR HIGH PRESSURE DEVICES.

ALTHOUGH THESE COMPONENTS HAVE BEEN DESIGNED WITH UTMOST CARE AND ATTENTION TO SAFE OPERATION, IMPROPER USE OR FAILURE TO FOLLOW RECOMMENDED PROCEDURES CAN RESULT IN DAMAGE TO THE EQUIPMENT OR INJURY.

ELECTRICAL WORK MUST BE PERFORMED BY TRAINED AND QUALIFIED PERSONNEL.

DO NOT ATTEMPT TO CONNECT OR OPERATE ANY COMPONENT OF THE CRYOGENIC REFRIGERATOR SYSTEM UNTIL THE APPLICABLE OPERATING INSTRUCTIONS HAVE BEEN READ AND UNDERSTOOD IN THEIR ENTIRETY.

NEVER DISABLE OR OTHERWISE ALTER ANY GAS RELIEF VALVE ON ANY COMPONENT. IF IT IS SUSPECTED THAT ANY RELIEF OR BYPASS VALVE IS MALFUNCTIONING, IT SHOULD BE REPAIRED BEFORE CONTINUING TO OPERATE THE COMPONENT OR SYSTEM.

4.1 COOLING SYSTEM CONNECTIONS

The system is cooled by a water supply that is connected to the coolant inlet and return ports on the front panel (Fig. 4.1; #'s 1 and 2).

The water supply system for the UCC 064S should be able to deliver 1.5 gpm (5.7 lpm) of water at 40 to 70 degrees F (4.5 to 21 degrees C).

A water flow switch is set for that minimum flow rate. This switch will shut down the compressor if proper water flow is not present. THE SWITCH HAS A 0.6 GPM MAXIMUM DEAD BAND. THEREFORE AS MUCH AS 2.1 GPM (7.9 LPM) MAY BE REQUIRED TO INITIALLY SET THE SWITCH.

The water supply system for the UCC 110S should be able to deliver 3.0 gpm (11.3 lpm) of water at 40 to 70 degrees F (4.5 to 21 degrees C).

A water flow switch is set for that minimum flow rate. This switch will shut down the compressor if proper water flow is not present. THE SWITCH HAS A 1 GPM MAXIMUM DEAD BAND. THEREFORE AS MUCH AS 4.0 GPM (15.1 LPM) MAY BE REQUIRED TO INITIALLY SET THE SWITCH.

The compressor unit has been designed to operate with water having a pH value of 6.0 to 8.0, calcium concentration of less than 80.0 ppm, chloride concentration of less than 55.0 ppm, total hardness of less than 100.0 ppm.

We also recommend the use of a 150 micron filter to the water supply line to prevent clogging of the water flow system within the compressor.

Procedure:

1. Connect the water coolant supply and return hoses. Barbed fittings have been provided which will accept a 1/2 inch inside diameter hose.
2. Turn on the water supply and check for leaks.

4.2 ELECTRICAL CONNECTION

WARNING: CORRECT ELECTRICAL CONNECTION IS MANDATORY. HAVE A QUALIFIED TECHNICIAN WHO IS THOROUGHLY FAMILIAR WITH THE ELECTRICAL ENVIRONMENT OF THE FACILITY INSTALL THIS UNIT.

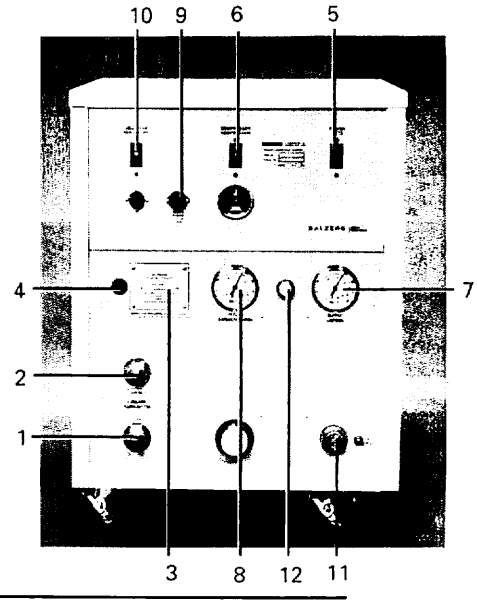


FIGURE 4.1 FRONT PANEL CONNECTION

1 Water Inlet Connection
2 Water Outlet Connection
3 Power Connection Access Cover
4 Power Connection Knock Out Plug
5 Main Power Switch
6 Compressor Switch
7 Supply (High Pressure) Gauge
8 Return (Low Pressure) Gauge
9 Remote Cable Connector
10 Cold Head Power Switch
11 Helium Supply (High Pressure) Self-Sealing Connector
12 Helium Charge Connection

Procedure:

1. Remove the four screws that secure the power connection access cover to the front panel. (Fig. 4.1; #3).
2. Remove the knock-out plug on the front panel. (Fig. 4.1; #4).
3. Feed the power cable through the front panel and into the junction box.
4. Connect the power cable to the terminal strip TB2. (Fig. 4.2.1) for 380/460 volt compressor or Fig. 4.2.2 for 200/230 volt compressor.

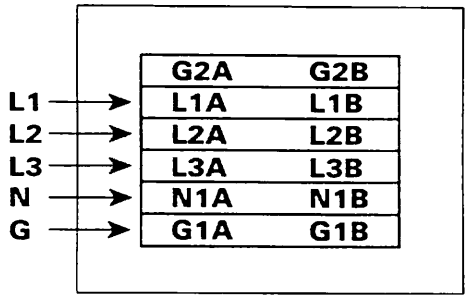


FIGURE 4.2.1 MAIN POWER CONNECTIONS FOR 380/460 VOLT COMPRESSOR

5. Secure the cable with the strain relief provided.
6. Reinstall the access plate to the front panel.
7. Connect or plug the other end of the power cable to a five-wire power source for the 380/460 volt compressor or a four-wire power source for 200/230 volt compressor.

The prime power source must have the following relationship:

L2 must lag L1 120 degrees.

L3 must lag L1 240 degrees.

8. Ensure the oil solenoid, temperature monitor, and water flow switch (optional) are connected to their proper receptacles on the rear of the electrical control box.
9. Ensure that the 50/60 Hz switch is in the proper location. When facing the switch,

   — The 50 Hz position is fully clockwise.

   — The 60 Hz position is fully counter-clockwise.

10. Ensure remote/manual switch located on the rear of the electrical control box is in the manual position.
11. Switch the source power on and turn on (close) the power switch on the compressor. (Fig. 4.1; #5). If the compressor is properly wired the red indicator light on the reverse phase relay will light. The indicator light can be seen through the perforated cover of the electrical box. If the light is not on, disconnect and lock out the source power and interchange any two-phase leads.

WARNING: NEVER ALTER THE COMPRESSOR WIRING INSIDE THE ELECTRICAL BOX. IMPROPER PHASING OF THE POWER LEADS DOWNSTREAM FROM THE PHASE MONITOR WILL ALLOW THE COMPRESSOR TO OPERATE IN REVERSE AND CAUSE COMPRESSOR FAILURE.

12. With the power switch on, turn on (close) the compressor switch. After a timer delay of 30 seconds, the compressor should start. Observe the pressure gauges. The supply pressure will increase immediately, and should stabilize at more than 300 psig (2010 kPa). The return pressure will decrease immediately, and should drop to a level of less than 80 psig (530 Kpa). If the compressor does not start within 60 seconds, it is probably reverse phased. Return to step 11 above. If the power cable is properly phased as discussed in step 11, and the compressor still will not start within 60 seconds of the compressor switch being turned on, check for adequate water flow as per (4.1) above, or contact your Balzers service representative.

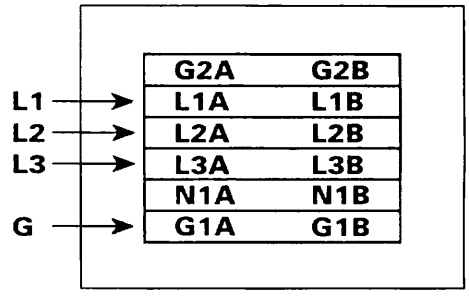


FIGURE 4.2.2 MAIN POWER CONNECTIONS FOR 200/230 VOLT COMPRESSOR

4.3 INSTALLATION CHECKLIST

1. Ensure that the water inlet and outlet hoses are properly connected and that there are no leaks.
2. Ensure that the compressor is properly wired.
3. Ensure remote/manual switch located on the rear of the electrical control box is in the *manual* position for manual control or in the *remote* position for remote control. (See section 4.4 in this manual.)

If all is in order, replace the compressor skin.

4.4 REMOTE CABLE CONNECTION

For remote operation, the manual/remote switch, located on the back of the electrical control box must be in the *remote* position.

The connector end of the remote cable must be installed on the remote control connector on the compressor front panel. (Fig. 4.1; #9)

The free end of the remote cable must be connected to a 24 volt AC or DC power supply.

There is also a set of normally open contacts, accessible via the remote cable. (Fig. 4.3)

In remote mode:

— The manual switches on the front panel for the cold head and compressor are disabled.

— The main power switch on the front panel is *not* disabled and must be in the **ON** position.

— The compressor and cold head are started and stopped by supplying or removing the 24-volt signal.

— The status signal contacts are *closed* when the system is operating and *open* when the system is off.

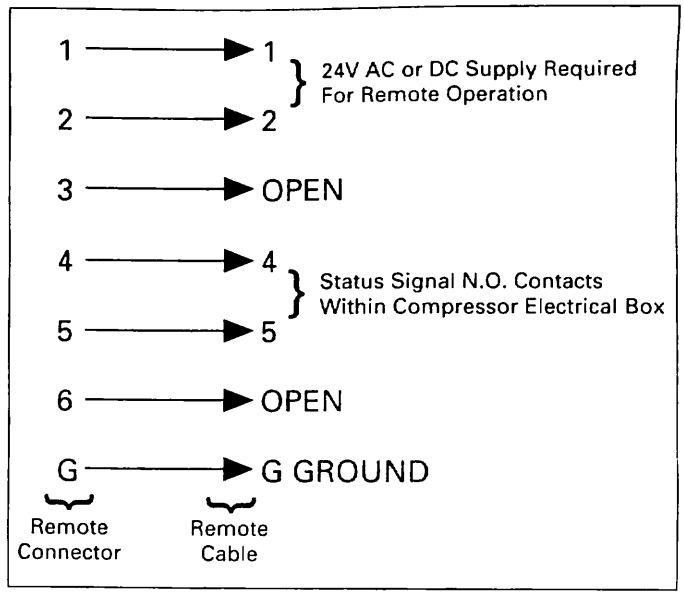


FIGURE 4.3 REMOTE CABLE SCHEMATIC

4.5 GAS LINE CONNECTIONS

Whenever the gas lines and cold head are first connected to the compressor, ensure that the static pressure does not drop. The gas lines and cold head are shipped leak-tight and precharged to the compressor's specified static pressure. A drop in static pressure after a component is connected may be an indication of a leak caused by damage during shipping. Operating the system in this manner may cause contamination.

WARNING: WHEN CONNECTING OR DISCONNECTING THE AEROQUIP COUPLINGS FOR THE GAS FLEX LINES, ALWAYS USE TWO WRENCHES AS SHOWN IN FIGURE 4.4.

WHEN INSTALLING AND ROUTING GAS FLEX LINES DO NOT EXCEED THE MINIMUM BEND RADIUS OF 8 INCHES (20 cm).

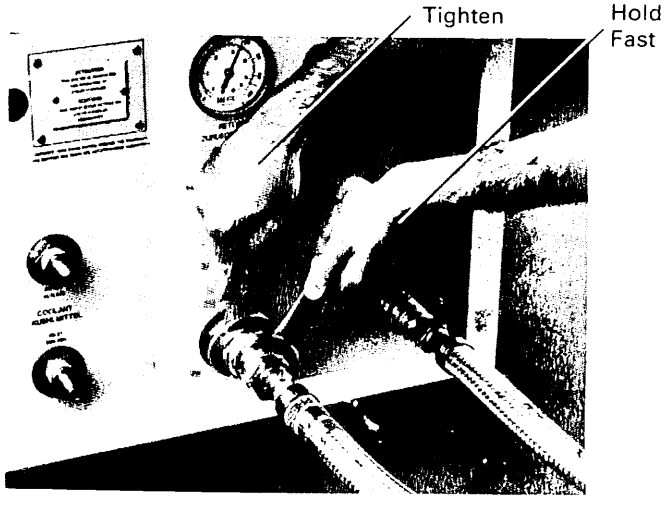


FIGURE 4.4 PROPER CONNECTION OF AEROQUIP COUPLINGS

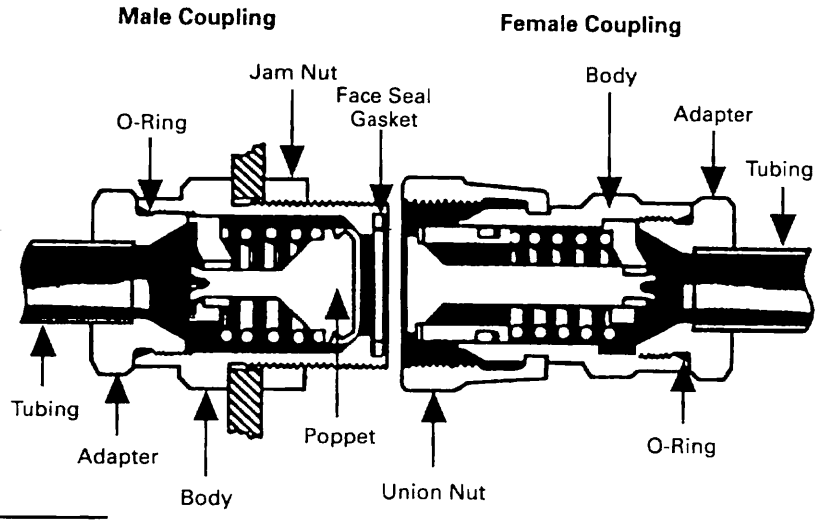


FIGURE 4.5 COUPLINGS, MALE, FEMALE

4.5.1 CONNECTING GAS FLEX LINES

1. The system gas connections are shipped with caps and plugs to keep the fittings clean and free from damage. Remove the caps and plugs and thread them together for storage.
2. Wipe the faces of the couplings with a lint-free cloth to ensure that they are clean and free of any contaminants.
3. Ensure that the face seal is in place on the inside periphery of the male coupling. (Fig. 4.5)
4. Place a light coat of vacuum grease on the poppet (Fig. 4.5) and face seal of the male connector.
5. To make the connection, start by turning the female, hose-side union nut onto the male connector by hand. Then, with the wrenches supplied in the Accessory Kit, hold the stationary part of the female coupling while turning the union nut with the other wrench. See Figure 4.4.

   As the poppet begins to open there may be a slight venting of gas from the fitting. Continue to tighten until the female coupling is firmly seated against the face seal on the male coupling.

   The required torques are:

   35 ft-lbs (47.5 N-m) for the 1/2" connection.

   45 ft-lbs (61.0 N-m) for the 3/4" connection.

4.5.2 DISCONNECTING THE GAS FLEX LINES

4.5.2.1 To disconnect the gas flexline at the cold head:

1. Use one wrench to turn the female coupling union nut (the female coupling is always connected to the gas flex line) about 1/8 turn, while holding the male coupling with the other wrench.

   This will overcome the initial torque required to break the connection without loosening the male connector from its adapter.

   Ensure that the hose is free to rotate, so as to avoid torsional force on the hose.
2. Place the second wrench on the stationary part of the female coupling and continue to unthread the union nut.

   Be sure the male connector does not rotate when disconnecting.

4.5.2.2 To disconnect the gas flex line at the Compressor:

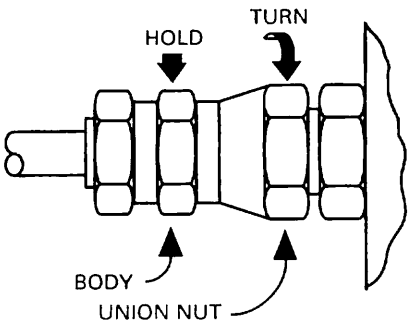
1. Turn the union nut on the female coupling while holding the stationary part of the female coupling with a second wrench.

   Since the male coupling is bulkheaded to the compressor front panel with a lock washer, the male coupling should not rotate from its adapter. However, ensure that the bulkhead jam nut is secure and that the male coupling does not rotate when removing the gas line.
2. When the hoses are disconnected, check each male coupling to ensure the face seal is in place.

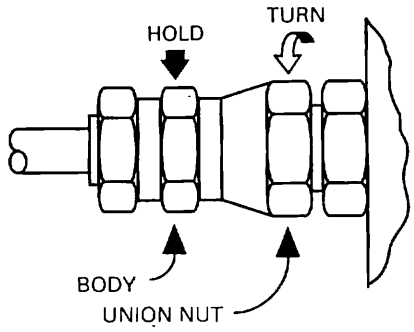
   Many times, while the hose is venting during disconnection, the face seal will be blown out of its gland and into the female coupling. Failure to remove the seal from the female coupling will cause the connection to leak when reconnected, with or without another face seal installed.
3. If all seals are in place, replace the dust caps and plugs to the coupling halves.

Notes:

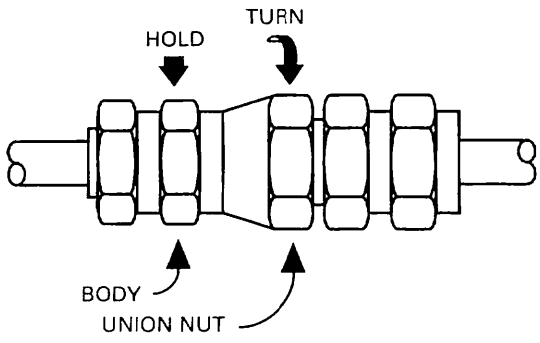
1. Ensure the male couplings at the compressor and cold head do not rotate when disconnecting lines.
2. Avoid torsional forces on the flex sections.



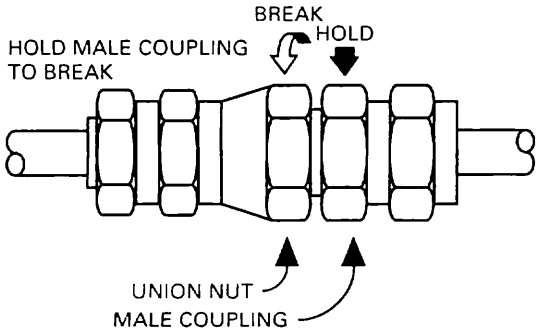
CONNECTING TO COMPRESSOR

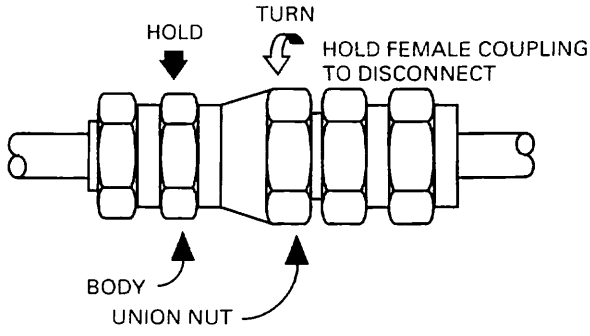


DISCONNECTING FROM COMPRESSOR



CONNECTING TO COLD HEAD





DISCONNECTING FROM COLD HEAD

FIGURE 4.6 CONNECTING AND DISCONNECTING GAS FLEX LINES

5.0 OPERATION

After the compressor has been properly installed, it is ready for operation. When the cold head has been properly installed (refer to the Cold Head Operating Manual) and connected to the compressor, the system is ready for operation.

If required, the compressor may be safely operated without the cold head or flex lines connected. In this condition, the compressor is "dead ended" and runs on its internal differential bypass valve.

5.1 START-UP: MANUAL MODE

APPLY POWER TO THE COMPRESSOR UNIT ONLY AFTER ALL COOLING SYSTEM, ELECTRICAL AND WATER CONNECTIONS HAVE BEEN MADE PROPERLY.

Three (3) switches turn the system on when it is operating in *manual* mode.

Power Switch: The rocker switch on the right (when facing the unit) (Fig. 4.1; #5). Supplies power to the control circuit.

Compressor Switch: Rocker switch in the center (Fig. 4.1; #6). Closes the control circuit and starts the compressor.

Cold Head Switch: Left side (Fig. 4.1; #10). Closes the cold head circuit.

The cold head cannot be operated independently; it can only operate when the compressor is on. However, the cold head can be turned off with the compressor operating. Under this condition, the compressor will operate "dead ended."

5.2 START-UP: REMOTE MODE

The power switch and a 24-volt signal are required to start the system when it is in the remote mode. Refer to section 4.4 for installation procedures.

When in the remote mode, both the cold head and the compressor start when the 24-volt signal is applied and both will shut down when the signal is removed.

5.3 OPERATING CONDITIONS

When operated without a cold head, when initially started, the low pressure gauge will fall to approximately 30 psig (205 kPa) and the high pressure gauge will rise to 335 psig (2275 kPa). These conditions will vary slightly as the compressor warms up to the steady state operating temperature.

When the compressor is operating with a cold head, the low pressure gauge will fall to approximately 50 psig (345 kPa) and the high pressure will rise to 330 psig (2275 kPa). The high and low pressures will fluctuate as the cold head accepts or returns gas to the compressor.

As the cold head cools down, the low pressure gauge will increase and the high pressure will decrease. The cool-down time and steady state operating pressures will vary with the heat load and mass connected to the cold head. In general, with the cold head at minimum temperature, the low pressure gauge will read 100 psig (690 kPa), and the high pressure will be 300 psig (2070 kpa).

6.0 MAINTENANCE

This section covers scheduled periodic maintenance, and unscheduled maintenance that can be performed without breaking into the pressure boundaries. Complete maintenance procedures are available in a separate manual.

The only scheduled maintenance is that of replacing the adsorber, which must be performed every 26,000 hours of operation.

Unscheduled maintenance procedures include adding gas, venting gas and decontaminating the compressor. Having to add gas or decontaminate the system may be a symptom of a larger problem. If the situation persists, contact Balzers service department. Although no procedures are included, electrical maintenance can usually be performed by any qualified electrical technician following standard safety practices and electrical troubleshooting techniques. Any electrical component of the compressor can be replaced without breaking into pressure boundaries, except for the mechanical portion of the oil solenoid valve.

Also included for reference are procedures for removing the compressor enclosure, draining the water from the heat exchanger and installing the shipping restraints.

6.1 REMOVING THE COMPRESSOR ENCLOSURE

WARNING: TURN OFF AND LOCK OUT THE POWER SOURCE WHENEVER ANY MAINTENANCE IS TO BE CARRIED OUT ON THE SYSTEM.

1. Turn off and lock out the power source to the compressor.
2. Remove the four upper screws that secure the cover to the top of the compressor frame.
3. Lift the cover up and off the compressor.
4. Remove the four lower screws that secure the skin to the compressor frame.
5. Spread both sides of the skin away from the front panel and push it back and off the rear of the compressor frame.

WARNINGS:

— **DO NOT DISASSEMBLE ANY PART OF ANY SYSTEM OR COMPONENT WITHOUT RELEASING THE GAS FROM ALL PORTIONS OF THE SYSTEM** OR COMPONENTS UNLESS SPECIFICALLY RECOMMENDED BY THE OPERATING INSTRUCTIONS. FOR EXAMPLE, THE COMPRESSOR MAY REMAIN CHARGED DURING THE REPLACEMENT OF THE ADSORBER.

— **NEVER DISABLE OR OTHERWISE ALTER ANY GAS RELIEF VALVE ON ANY COMPONENT.** IF IT IS SUSPECTED THAT ANY RELIEF OR BYPASS VALVE IS MALFUNCTIONING, ITS PROPER OPERATION SHOULD BE VERIFIED BEFORE CONTINUING TO OPERATE THE COMPONENT OF SYSTEM.

6.2 ADSORBER REPLACEMENT

At each 26,000 hours interval of compressor running, as indicated by the elapsed time meter of the front panel, the activated carbon in the adsorber will have been saturated with oil and other impurities and the adsorber will have to be replaced. The adsorber is installed with self-sealing (Aeroquip) fittings. Therefore the gas charge need not be vented during this replacement procedure.

WARNING: TURN OFF AND LOCK OUT THE POWER SOURCE WHENEVER ANY MAINTENANCE IS TO BE CARRIED OUT ON THE SYSTEM.

Procedure:

1. Remove the cover and the skin from the compressor following the procedure in section 6.1.
2. Loosen and remove the two hex-head screws (Fig. 6.1; #1) which attach the adsorber to the compressor frame. This is done so that the adsorber can be moved when disconnecting it from the Aeroquip fittings.

WARNING: ALWAYS USE TWO WRENCHES WHEN CONNECTING AND DISCONNECTING SELF-SEALING COUPLINGS TO PREVENT LOOSENING OF THE FIXED FITTING.

4. Using two wrenches, as shown in figure 4.5, alternately loosen the top and bottom self sealing fittings of the adsorber (Fig. 6.1; #2 & 3) until both are completely free.
5. Remove the adsorber from the machine. Inspect the fittings on the tubes that lead to and from the absorber to be sure they are clean.
6. Record installation date and compressor elapsed time meter reading on label of new adsorber (Fig. 6.2).

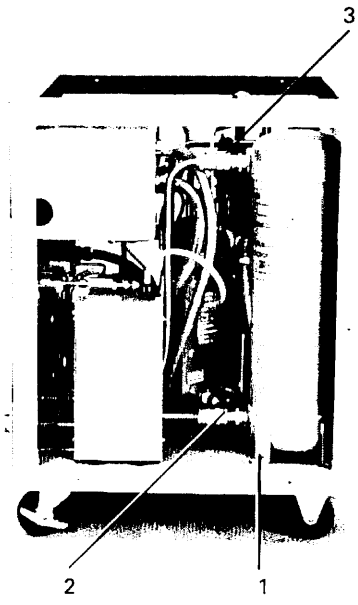


FIGURE 6.1 ADSORBER, COUPLINGS AND HARDWARE

1 Mounting Screw
2 Adsorber Inlet Self-Sealing Connector
3 Adsorber Outlet Self-Sealing Connector

7. Position the new adsorber in place. Using two wrenches, connect the Aeroquip connectors alternately until both are completely tight.
8. Position the new adsorber and bolt it in place using the two hex-head screws.
9. Check the static charge of the compressor. Ensure the system is charged to 250 psig (1725 kpa).

10. **IMPORTANT**. Using Aeroquip bleed fittings, remove the high pressure helium from the used adsorber. Release the compressed gas slowly and point the bleed fitting away from all personnel.

WARNING: ADEQUATE VENTILATION MUST ALWAYS BE PROVIDED WHEN VENTING OR PURGING ANY COMPONENT WITH HELIUM.

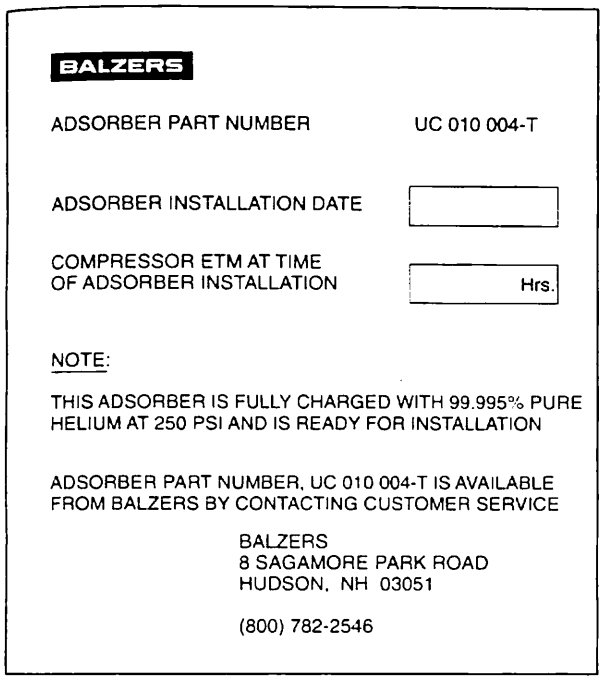


FIGURE 6.2 ADSORBER LABEL

6.3 ADDING GAS

WARNINGS:

- ALWAYS USE HELIUM WITH GUARANTEED PURITY OF 99.995%, AND WATER OF DEW POINT OF LESS THAN -80 DEGREES F (-62 DEGREES C).
- NEVER ATTEMPT TO ADD HIGH PRESSURE HELIUM TO ANY COMPONENT OF THE REFRIGERATION SYSTEM WITHOUT THE USE OF AN APPROPRIATE PRESSURE REGULATOR AND AN APPROPRIATE GAS TRANSFER LINE.
- DO NOT EXCEED THE MAXIMUM STATIC CHARGE PRESSURE OF 250 PSIG (1725 kPa) OF ANY COMPONENT.

Procedure:

If the compressor's static charge is less than 245 psig (1690 kPa), it can be increased by connecting the system to a high pressure helium cylinder through the small Aeroquip fitting on the front panel (Fig. 4.1; #12).

Be sure to use a properly cleaned and purged charge line and a proper pressure regulator.

When the pressure gauges indicate the desired pressure, disconnect the Aeroquip fitting from the compressor.

6.4 VENTING GAS

WARNING: ADEQUATE VENTILATION MUST BE PROVIDED WHEN VENTING OR PURGING ANY COMPONENT WITH HELIUM.

Procedure:

If the compressor is inadvertently overcharged, the helium can be vented by slowly bleeding gas out the helium supply fitting on the front panel (Fig. 4.1; #11) using the Aeroquip bleed fitting supplied with the compressor.

The return pressure gauge reading will lag behind the supply gauge while venting. This is normal. After a short time the system will equalize. At equalization, the pressure should read 250 ± 5 psig (1725 kPa) at room temperature.

6.5 COMPRESSOR DECONTAMINATION

Contamination of the helium can severely impair the operation of the system. In a mild case, it will cause loss of refrigeration capacity and in the extreme case, contamination will cause a mechanical failure.

It is critical that the helium in the system be free from all contamination.

HELIUM CERTIFIED AT 99.995% OR BETTER PURITY MUST BE USED TO PREVENT CONTAMINATION OF THE COLD HEAD.

First indication of contamination is a loss of cooling capacity, resulting in temperatures not decreasing to specified levels or thermal cycling.

Contaminants can also freeze out in the cold head and hinder its mechanical operation. Significant contamination can cause ratcheting or complete seizing of the pump mechanism.

Corrective steps should be taken at the first sign of contamination.

Typically there are three types of contaminants: air, water, oil. Air and water can enter the system by back diffusion of atmospheric air through a leak, by recharging the system with an improperly purged gas line, or by recharging the system with impure helium.

Water and oil vapors can evolve gradually in the system by operating the compressor at abnormally high temperatures. Surface water in equilibrium at normal temperatures will out gas at elevated temperatures. High operating temperatures will not only increase the amount of oil entrained in the compressed gas, but will also reduce the efficiency of the oil separation system, thereby causing the separation system to prematurely fail.

Oil can be introduced into the gas stream by using an adsorber beyond its rated life.

Except for a gas analysis, there is no way to determine the type of contamination.

The following procedure will remove air and water contamination; however, no gas clean-up procedure will eliminate oil contamination — at best any improvement will only be temporary.

READ THESE INSTRUCTIONS COMPLETELY BEFORE BEGINNING THIS PROCEDURE, THEN FOLLOW THE PROCEDURE STEP BY STEP

In mild cases, decontamination can be performed at the cold head alone.

In more severe cases, however, it is best to decontaminate both the cold head and compressor. **If the cold head will not cool down at all, proceed directly to the following procedure**:

Equipment needed for this procedure:

Charge/Purge adapter, Balzers part number UC 014 010-U (Fig 6.3; #1.)

Aeroquip wrench set Balzers part number UC 014 006-T (enclosed with compressor).

Aeroquip bleed fitting, Balzers part number UC 010 014-U (enclosed with compressor.)

High pressure helium cylinder, including proper and purged charging line, Balzers part number UC 014 025-U (Fig 6.3.3) and regulator, Balzers part number U4 265 160 (Fig 6.3.2)

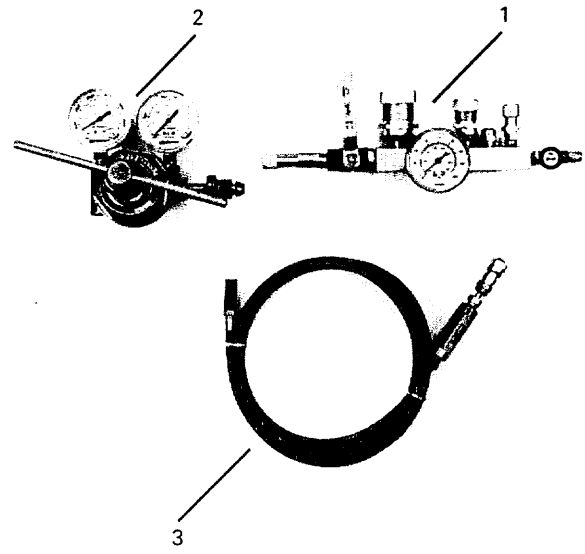


FIGURE 6.3 AVAILABLE MAINTENANCE TOOLS

1 Helium Charge/Purge Adapter Balzers P/N UC 014 010-U
2 Helium Pressure Regulator Balzers P/N U 4265 160
3 Helium Changing Line Balzers P/N UC 014 025-U

PROCEDURE

1. Shut the system off.
2. Disconnect the cold head electrical cable from the cold head.
3. Disconnect the gas lines at the cold head.
4. Connect a charge/purge adapter (Balzers part number P/N UC 014 010-U) to the free ends of the flex lines removed from the cold head. Ensure that both valves on the charge/vent adapter are closed prior to connecting the flex lines to the appropriate connections.
5. Disconnect the high pressure flex line at the compressor.
6. Connect an Aeroquip bleed fitting to the supply fitting on the compressor front panel (Fig 4.1; #11). Engage the bleed fitting slowly until the gas just starts to vent. Allow the gas to slowly vent to 10 psig as indicated by the compressor gauges.

CAUTION: ENSURE THE GAS VENTING IS PERFORMED WITH ADEQUATE VENTILATION. ALTHOUGH HELIUM IS NOT TOXIC, IT CAN CAUSE ASPHYXIATION BY DISPLACING THE AVAILABLE OXYGEN.

7. Attach a high pressure helium cylinder using a proper and purged charging line and regulator to the helium charge fitting on the compressor front panel. (Fig 4.1; #12)

WARNINGS:

— ALWAYS USE HELIUM WITH GUARANTEED PURITY OF 99.995% AND WATER DEW POINT OF LESS THAN -80 DEGREES F (-62 DEGREES C).

— NEVER ATTEMPT TO ADD HIGH PRESSURE HELIUM TO ANY COMPONENT OF THE REFRIGERATION SYSTEM WITHOUT THE USE OF AN APPROPRIATE PRESSURE REGULATOR AND AN APPROPRIATE GAS TRANSFER LINE.

8. Slowly recharge the compressor until both front panel gauges indicate 200 psig (1379 kPa).
9. Turn off the helium cylinder using the main valve.
10. Slowly vent the compressor, as above, to 10 psig (70 kPa).
11. Repeat the above procedure; slowly charge to 200 psig (1380 kPa) and slowly vent to 10 psig (70 kPa). Do this a total of five times.
12. Charge the compressor to 250 psig (1725 kPa) and turn the cylinder off at the main valve.
13. Start the compressor and allow it to run for 15 minutes; then shut it off.
14. Slowly vent the compressor to 10 psig (70 kPa).
15. Recharge the compressor to 250 psig (1725 kPa) and run for one minute before shutting down and slowly venting to 10 psig (70 kPa).
16. Repeat the above; slowly charge to 250 psig (1725 kPa), run one minute, slowly vent to 10 psig (70 kPa). Do this a total of five times.
17. Charge the compressor to 250 psig (1725 kPa).
18. Remove the charging line from the charge fitting on the compressor front panel (Fig. 4.1; #12).
19. Reconnect the supply line to the supply fitting on the compressor front panel.
20. Remove the charge/purge adapter from the cold head end of the flex lines.
21. Refer to Cold Head manual for cold head clean-up procedure.

6.6 REMOVING WATER FROM THE HEAT EXCHANGER

If the compressor is to be shipped or stored, the water should be drained from the heat exchanger using the following procedure:

1. Turn off and lock out the power source to the compressor.
2. Turn off the water supply and return valves as applicable.
3. Place a small receptacle under the water inlet and outlet fittings to catch the water. The total water volume will be less than one quart (one liter), not including the volume that may drain back through the supply and return hoses.
4. Disconnect the supply and return lines.
5. Apply a low gas pressure, less that 5 psig (35 kPa), to the water return fitting and blow the water into the receptacle.

6.7 INSTALLING THE SHIPPING RESTRAINTS

Any time the compressor is to be shipped, the shipping restraints must be installed using the following procedure and referring to Figure 1.1.

1. Turn off and lock out the power source to the compressor.
2. Disconnect the water supply and return and remove the residual water from the heat exchanger, by following the procedure of section 6.6.
3. Remove the compressor enclosure following the procedure of section 6.1.
4. Loosen the four 10mm mounting nuts at the compressor module mounting feet.
5. Equally space the shipping restraints under the compressor module.
6. Tighten the 10mm mounting nuts and ensure that the 13mm nuts on the underside of the compressor base are secure.

7.0 TROUBLESHOOTING

This troubleshooting guide is written to help the user identify faults, their causes and corrective action. It is broken down into a number of sub-section categories by symptom.

Each subsection then lists possible causes in the left hand column and the necessary corrective action direct'y opposite in the right hand column. As with the maintenance section, the corrective actions are restricted from breaking into the pressure boundaries.

All appropriate safety precautions should be observed when using this guide.

Problems Covered in this Section:

7.1 SYSTEM DOES NOT START

7.2 SYSTEM STARTS BUT THEN SHUTS DOWN

7.3 LITTLE OR NO DIFFERENTIAL PRESSURE

7.4 BOTH SUPPLY AND RETURN PRESSURES ARE HIGH

7.5 BOTH SUPPLY AND RETURN PRESSURES ARE LOW

7.6 LOW DIFFERENTIAL PRESSURE

7.7 HIGH DIFFERENTIAL PRESSURE

7.8 COMPRESSOR IS ABNORMALLY NOISY

7.1 SYSTEM DOES NOT START

7.1.1	Main circuit disconnect open.	Close the main circuit disconnect.
7.1.2	Improper input power	Ensure the input voltage and frequency meet the system specifications and are properly connected.
7.1.3	Power and/or compressor switches open.	Close switches on compressor front panel.
7.1.4	Manual/Remote switch is in the wrong position	Put the Manual/Remote switch, located in the rear of the electrical control box, in the correct position.
7.1.5	The 50/60 Hz switch (where applicable) is in the null position.	Put the 50/60 Hz switch in the correct position. This is a key switch located on the rear of the electrical control box.
7.1.6	Power "On" delay relay has not timed out.	Allow 30 seconds after throwing compressor power switch "On" for the system to start.
7.1.7	Improper water flow.	Improper water flow will prevent compressor start-up. See "Cooling System Connections" of this manual for proper water flow specifications.
7.1.8	Water flow switch or jumper, temperature monitor and oil valve not properly connected.	Ensure that the plugs for the water flow switch or jumper, temperature monitor and oil valve are properly connected. These plugs are located on the rear of the electrical control box.
7.1.9	The control circuit is open.	Refer to the appropriate electrical diagram to locate the open circuit or component.
7.1.10	The main power circuit is open.	Referring to the wiring diagrams, perform a continuity check to isolate and repair the open circuit.

7.2 SYSTEM STARTS BUT THEN SHUTS DOWN

Since the compressor started, it is assumed that the controls are properly set.

If the system shuts down due to the opening of a safety device, the operator should seek to find and fix the source of the problem.

7.2.1	Water flow switch is open.	The cooling water flow is not to spec. Ensure water conditions are within specifications.
7.2.2	Temperature monitor is open.	Ensure water temperature is 70F (20C) maximum and/or ambient temperature is less than 105F (40C).
7.2.3	Main circuit protection open.	Replace the fuse or reset the circuit breaker. If this symptom continues, it may be due to an underfused main or a drop in the input voltage.
7.2.4	Compressor overloads are open.	Ensure the input power is correct for the compressor and within specifications. Refer to "Electrical Connections" in this manual. Reset the overloads by pushing the button on the top of the electrical control box.
7.2.5	The compressor windings are shorted or open.	Check the compressor for shorted or open windings.
7.2.6	The rotor may be locked.	Check current draw. Locked rotor current is >50A.

7.3 LITTLE OR NO DIFFERENTIAL PRESSURE

7.3.1	Compressor is running backwards. Three phase compressor only.	Interchange any two phase leads. This should never occur, except when a wiring error is made during initial installation.

7.4 BOTH SUPPLY AND RETURN PRESSURES ARE HIGH

7.4.1	System is overcharged.	Vent the system through helium charging port on the front panel.

7.5 BOTH SUPPLY AND RETURN PRESSURES ARE LOW

7.5.1	System is undercharged.	Shut the system off and follow procedure for charging with helium, described in this manual, Section 6.3.
7.5.2	System leak.	Locate the leak by means of a soap/water solution or a leak detector. Repair leak or replace component. Refer to Maintenance Manual.

7.6 LOW DIFFERENTIAL PRESSURE

7.6.1	Bypass valve hung open.	Replace bypass valve. Refer to Maintenance Manual.
7.6.2	Low compressor oil level.	Add oil to compressor. Refer to Maintenance Manual.

7.7 HIGH DIFFERENTIAL PRESSURE

7.7.1	Gas lines or adsorber self-sealing couplings not fully connected.	Shut system off. Check couplings and tighten as required.
7.7.2	Cold Head not operating.	Refer to cold head manual.

7.8 COMPRESSOR IS ABNORMALLY NOISY

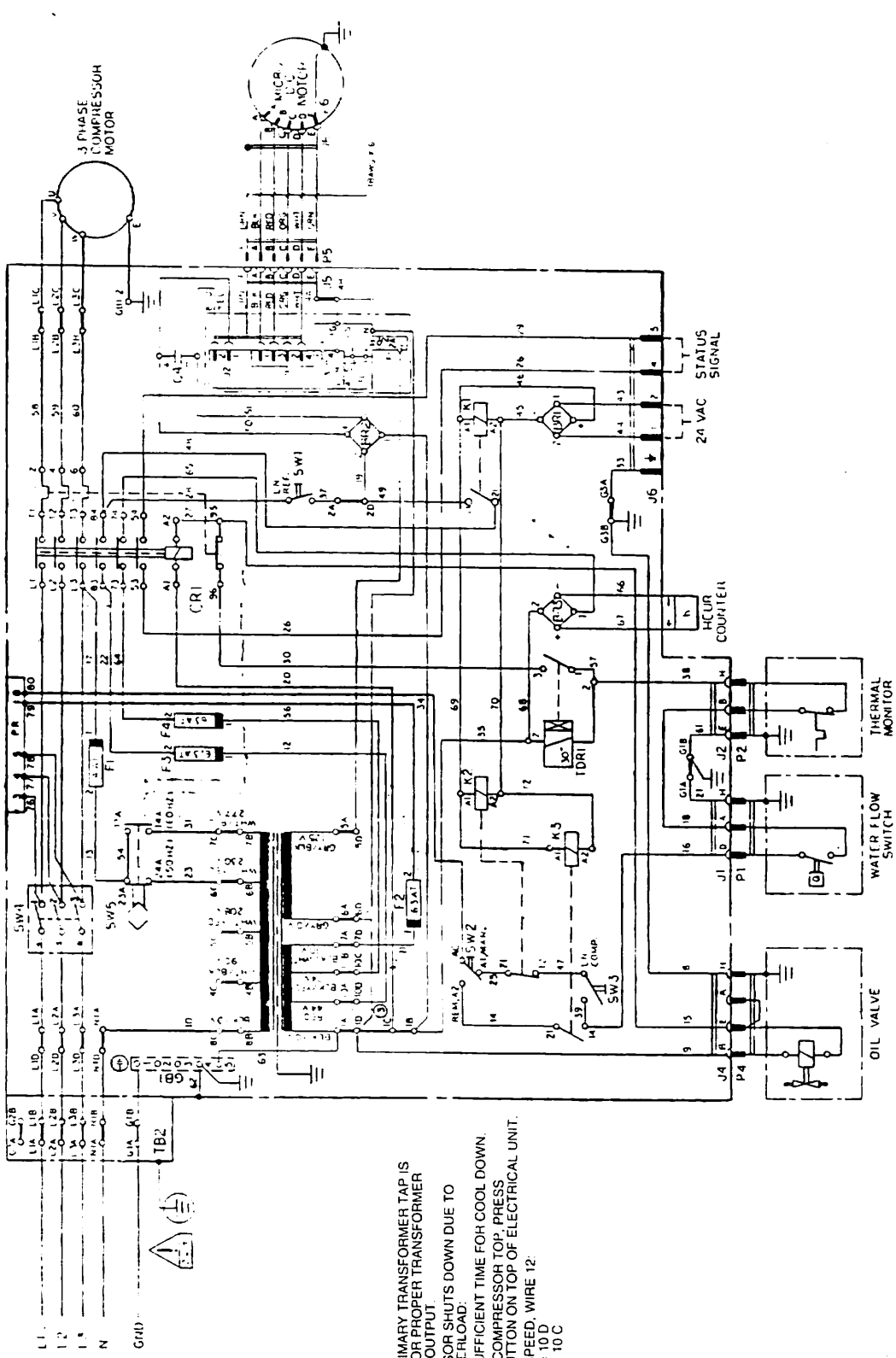
Vibrates and sounds rough:

7.8.1	Shipping restraint shims not removed.	Remove shipping restraint shims below the compressor. See Section 1.0 of this manual.
7.8.2	Component loose.	Tighten or adjust a loose component.

8.0 SPARE PARTS

Check compressor nameplate for part number, and order appropriate spare parts from chart below.

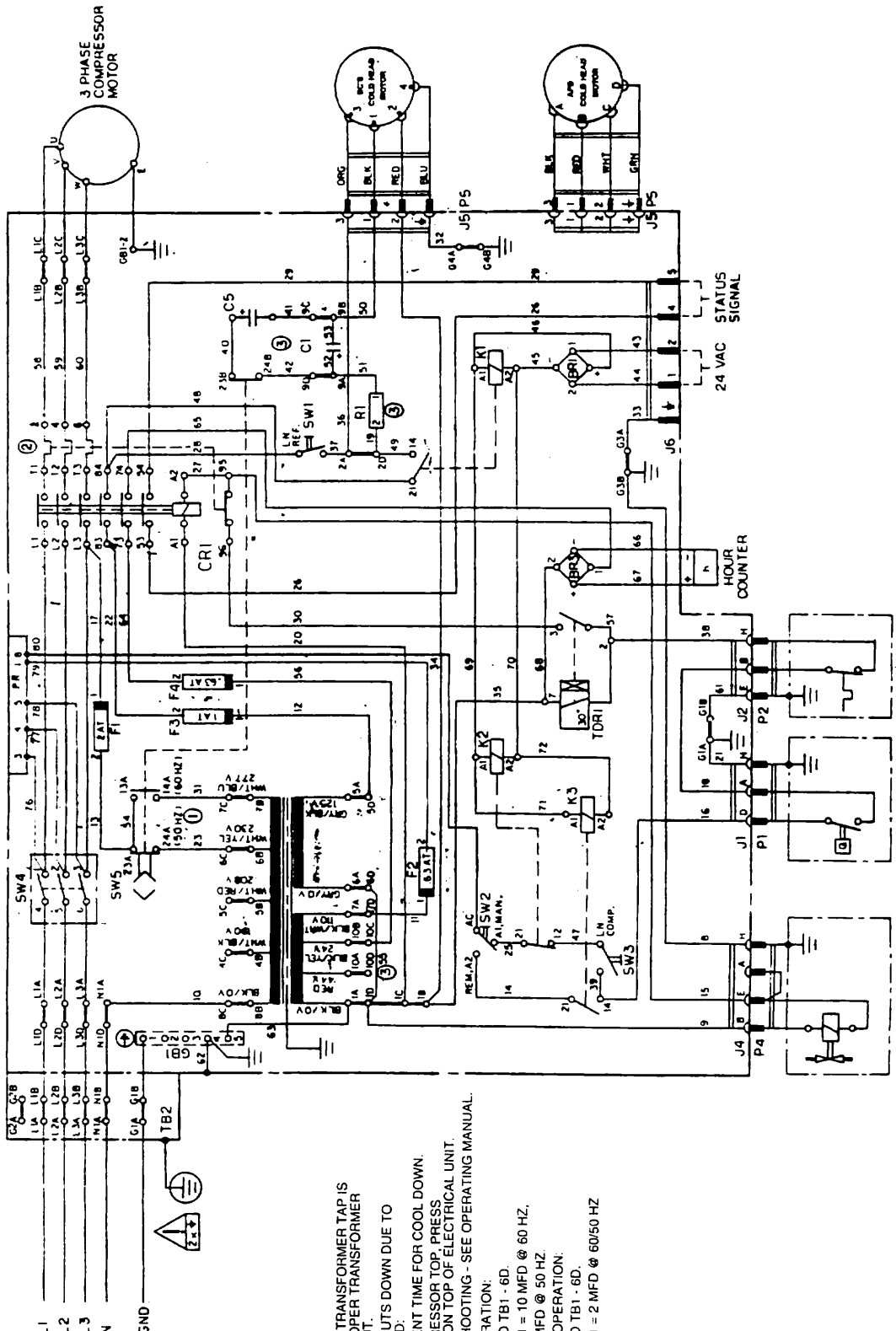
		Fuses				
Compressor Part No.	**Adsorber Assembly**	**F1**	**F2**	**F3**	**F4**	**F5**
UC 010 875-T	UC 010 004-T	U 4666 396	B 4666 432	B 4666 454	B 4666 432	Not Reqd.
UC 010 915-T	UC 010 004-T	U 4666 396	B 4666 432	B 4666 436	B 4666 432	Not Reqd.
UC 010 914-T	UC 010 004-T	U 4666 396	B 4666 432	B 4666 436	B 4666 432	U 4666 390
UC 010 916-T	UC 010 004-T	U 4666 396	B 4666 432	B 4666 454	B 4666 432	U 4666 396



NOTES:

1. CORRECT PRIMARY TRANSFORMER TAP IS ESSENTIAL FOR PROPER TRANSFORMER SECONDARY OUTPUT.
2. IF COMPRESSOR SHUTS DOWN DUE TO THERMAL OVERLOAD:
   A) ALLOW SUFFICIENT TIME FOR COOL DOWN.
   B) REMOVE COMPRESSOR TOP, PRESS RESET BUTTON ON TOP OF ELECTRICAL UNIT.
3. COLD HEAD SPEED, WIRE 12:
   144 RPM = 10 D
   72 RPM = 10 C

WIRING DIAGRAM UCC 110S, 380/460V, 3-PHASE, 50/60Hz, 5 HP COMPRESSOR



NOTES:

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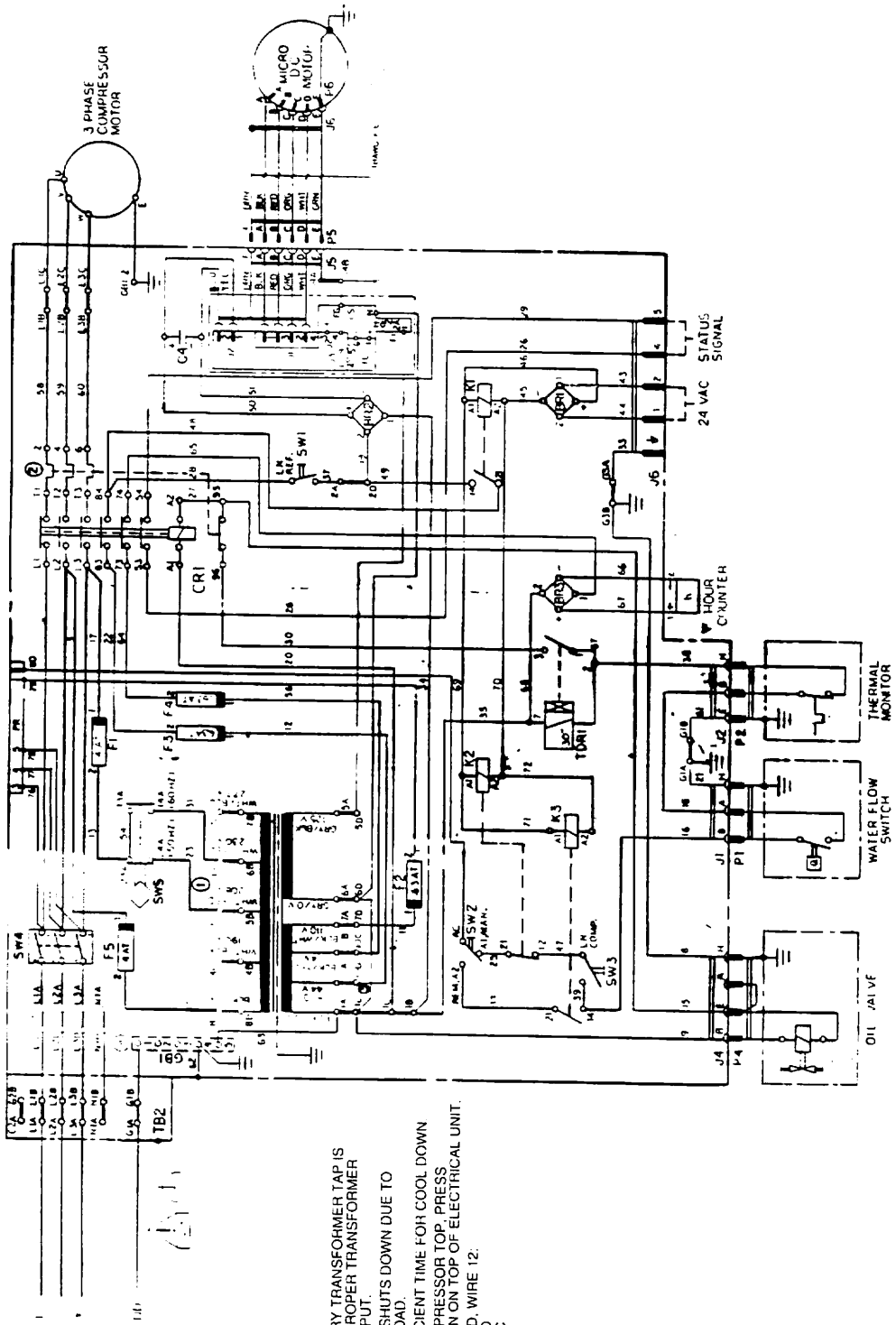
2. IF COMPRESSOR SHUTS DOWN DUE TO THERMAL OVERLOAD:
   A) ALLOW SUFFICIENT TIME FOR COOL DOWN.
   B) REMOVE COMPRESSOR TOP, PRESS RESET BUTTON ON TOP OF ELECTRICAL UNIT.
   C) FOR TROUBLESHOOTING - SEE OPERATING MANUAL.
3. BC COLD HEAD OPERATION:
   JUMP TB1 - 1D TO TB1 - 6D.
   R1 = 100 OHM; C1 = 10 MFD @ 60 HZ.
   (C5 = 5 MFD) 15 MFD @ 50 HZ.
   APDT'S COLD HEAD OPERATION:
   JUMP TB1 - 7D TO TB1 - 6D.
   R1 = 500 OHM; C1 = 2 MFD @ 60/50 HZ

WIRING DIAGRAM UCC 064S, 380/460V, 3-PHASE, 50/60Hz, 3 HP COMPRESSOR



NOTES:

1. CORRECT PRIMARY TRANSFORMER TAP IS ESSENTIAL FOR PROPER TRANSFORMER SECONDARY OUTPUT.
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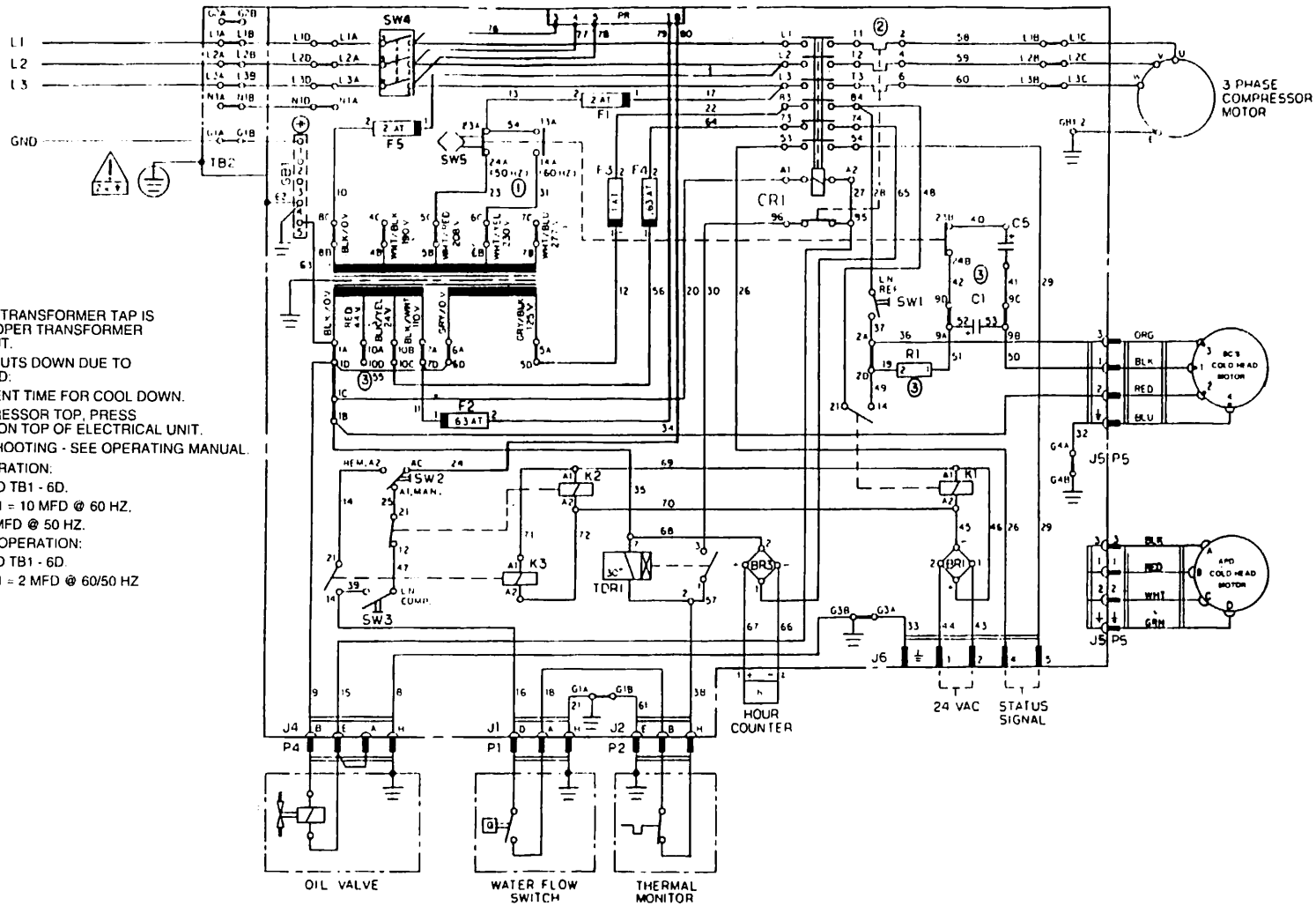
   A) ALLOW SUFFICIENT TIME FOR COOL DOWN
   B) REMOVE COMPRESSOR TOP. PRESS RESET BUTTON ON TOP OF ELECTRICAL UNIT.
3. COLD HEAD SPEED. WIRE 12:
   144 RPM - 10 D
   72 RPM - 10 C

WIRING DIAGRAM, UCC 110S, 200/200-230V, 3-PHASE, 50/60Hz, 5 HP COMPRESSOR

WIRING DIAGRAM, UCC 064S, 200/200-230V, 3-PHASE, 50/60Hz, 3 HP, COMPRESSOR



NOTES:

1. CORRECT PRIMARY TRANSFORMER TAP IS ESSENTIAL FOR PROPER TRANSFORMER SECONDARY OUTPUT.
2. IF COMPRESSOR SHUTS DOWN DUE TO THERMAL OVERLOAD:
   A) ALLOW SUFFICIENT TIME FOR COOL DOWN.
   B) REMOVE COMPRESSOR TOP, PRESS RESET BUTTON ON TOP OF ELECTRICAL UNIT.
   C) FOR TROUBLESHOOTING - SEE OPERATING MANUAL.
3. BC COLD HEAD OPERATION:
   JUMP TB1 - 1D TO TB1 - 6D.
   R1 = 100 OHM; C1 = 10 MFD @ 60 HZ.
   (C5 = 5 MFD) 15 MFD @ 50 HZ.
   APDT'S COLD HEAD OPERATION:
   JUMP TB1 - 7D TO TB1 - 6D.
   R1 = 500 OHM; C1 = 2 MFD @ 60/50 HZ

SPECIFICATIONS: UCC 064S HELIUM SCROLL COMPRESSOR

PART NO.	UC 010 914-T	UC 010 915-T
ELECTRICAL REQUIREMENT	200-230V, 3-phase, 60 Hz or 200V, 3-phase 50 Hz	460V, 3-phase 60Hz or 380V, 3-phase 50 Hz
COLD HEAD MOTOR ELECTRICAL SUPPLY	120V with RC network for Balzers UCH 065	120V with RC network for Balzers UCH 065
CONNECTED LOAD	4.3 kW Nominal	
COOLING	Water, 1.5 gpm (5.7 l/m)*, steady state. 40 to 70 degrees F (5 to 21 degrees C)	
AMBIENT TEMPERATURE RANGE	40 to 100 degrees F (5 to 38 degrees C)	
STATIC CHARGE PRESSURE	250 psi (1725 kPa) at 70 degrees F (21 degrees C)	
REFRIGERATION MEDIUM	Helium, minimum purity 99.995 certified	
DIMENSIONS	20"W x 22"L x 28"H (505 mm x 550 mm x 700 mm)	
WEIGHT	220 lbs (100 kg)	

***NOTE**: 2.1 gpm to initially set the switch. The compressor unit has been designed to operate with water having a pH value of 6.0 to 8.0, calcium concentration of less than 80.0 ppm, chloride concentration of less than 55.0 ppm, total hardness of less than 100.0 ppm.

SPECIFICATIONS: UCC 110S HELIUM SCROLL COMPRESSOR

PART NO.	UC 010 916-T	UC 010 875-T
ELECTRICAL REQUIREMENT	200-230V, 3-phase 60 Hz or 200V, 3-phase 50 Hz	460V, 3-phase 60 Hz or 380V, 3-phase 50 Hz
COLD HEAD MOTOR ELECTRICAL SUPPLY	DC power supply and motor controller for Balzers UCH 130	
CONNECTED LOAD	6.5 kW Nominal	
COOLING	Water, 3 gpm (11.4 l/m)*, steady state. 40 to 70 degrees F (5 to 21 degrees C)	
AMBIENT TEMPERATURE RANGE	40 to 105 degrees F (5 to 40 degrees C)	
STATIC CHARGE PRESSURE	250 psi (1725 kPa) at 70 degrees F (21 degrees C)	
REFRIGERATION MEDIUM	Helium, minimum purity 99.995 certified	
DIMENSIONS	20"W x 22"L x 28"H (505 mm x 550 mm x 700 mm)	
WEIGHT	230 lbs (105 kg)	

***NOTE**: 4.0 gpm to initially set the switch. The compressor unit has been designed to operate with water having a pH value of 6.0 to 8.0, calcium concentration of less than 80.0 ppm, chloride concentration of less than 55.0 ppm, total hardness of less than 100.0 ppm.

PRESSURE CONVERSION TABLE

	kPa	bar	psi
kPa	—	0.01	0.145
bar	100	—	14.504
psi	6.895	0.06895	—

OTHER CONVERSIONS:

1 Gallon = 3.785 Liters

1 Inch = 2.540 centimeters

Temperature:

F ⟶ C: 5/9 (F - 32)

C ⟶ F: 9/5 C + 32

32 degrees F = 0 degrees C

212 degrees F = 100 degrees C