

Refrigerant Recovery Unit, Model RRU999

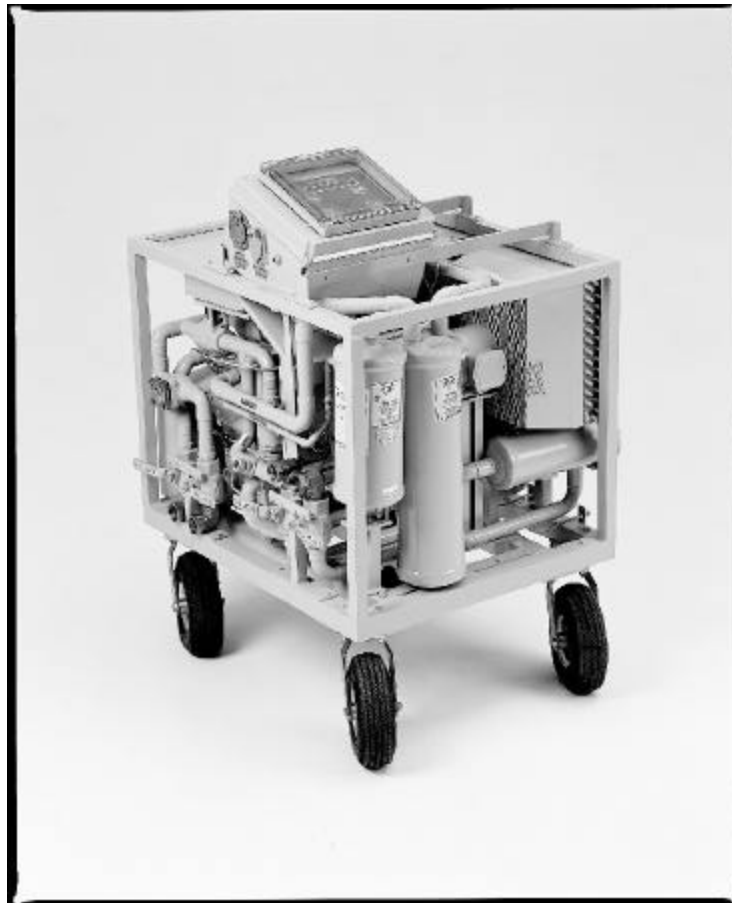


Table of Contents

Specifications	3
Product Description.....	4
Shipping Contents	5
Operating Procedures	6
Calibration Procedure	9
Changing Compressor Oil.....	10
Display Sequence	12
Electrical Parts Breakdown	13
Replacement Parts List	14
Troubleshooting	15

"McQuay" is a registered trademark of McQuay International
©1997 McQuay International

"Illustrations cover the general appearance of McQuay International products at the time of publication and we reserve the right to make changes in design and construction at anytime without notice."

Specifications

Electrical Power Requirements

Recovery Main Components: 460 VAC, 60 Hz, 7.5-Hp, 3-Phase, 20-Amperes
575 VAC, 60 Hz, 7.5-Hp, 3-Phase, 20-Amperes

For Controls: 115 VAC, 50/60 Hz, 1-Phase, 20-Amperes

Dimensions (approximate): 54 in. high x 40 in. wide x 40 in. deep

Weight: 400-lbs. (550-lbs shipping)

NOTICE

McQuay International urges that all HVAC servicers working on McQuay equipment or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC, and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service of this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available. Conservation and emission reduction can be accomplished by following recommended service and safety procedures.

WARNING

To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant and to all labels on refrigerant containers. Certain procedures common to refrigeration system service may expose personnel to liquid or vaporous refrigerant.

Product Description

McQuay's RRU999 recovery system provides automated recovery of most positive-pressure refrigerants and blends.

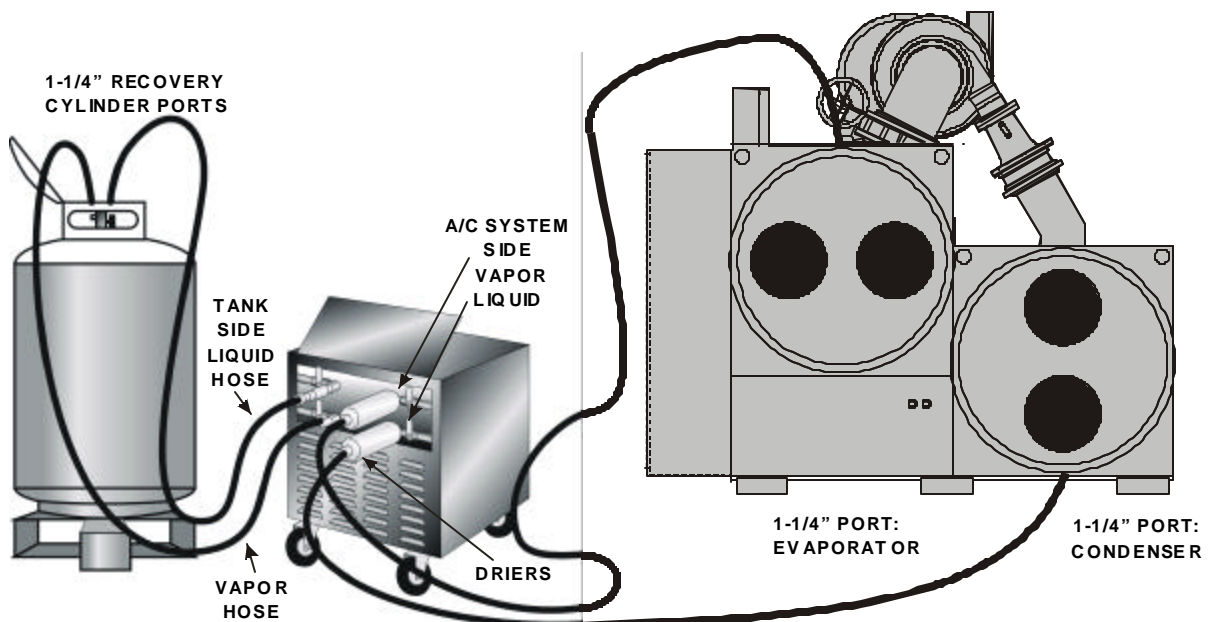
The unit consists of a 7.5-hp compressor with a suction accumulator, oil separator, dual high capacity air-cooled condensers, microprocessor control system, and actuated valving system. Unit connections are 1¼ in. male pipe with isolation valves.

After the hoses are connected and purged or evacuated, the RRU999 starts automated recovery by letting the refrigerant migrate from the A/C system to the recovery tank. It then draws vapor off the recovery tank, heats it via compression, and injects it back into the A/C system high side, thus creating a pressure differential before commencing liquid transfer.

When a pressure transducer determines that pressure differential is below 20 psig and the liquid sensor determines that liquid transfer has been completed, the RRU999 will switch from liquid push/pull mode to vapor recovery. The recovery unit then begins removing vapor from both sides of A/C system. Vapor refrigerant is first cleansed by the 96 cubic inch inlet drier, then travels through coalescent oil separator, then through a suction accumulator, through a crankcase pressure regulator, then finally into the compressor where refrigerant is then compressed. Discharged hot gas from the compressor is then sent through an oil separator where oil is extracted from the hot gas and returned to the compressor. The refrigerant is then condensed by the dual air-cooled condensers and sent to the recovery tank.

The RRU999 can be programmed to stop transfer at 0 psi or 15 in. Hg vacuum. This transfer stops when a pressure transducer indicates the A/C system reaches the programmed pressure. The unit then confirms the vacuum level by monitoring pressure for two minutes. Should pressure in the A/C system rise, the RRU999 energizes again to achieve A/C system vacuum.

Figure 1, RRU999 Connections



Shipping Contents

Furnished with RRU999 are:

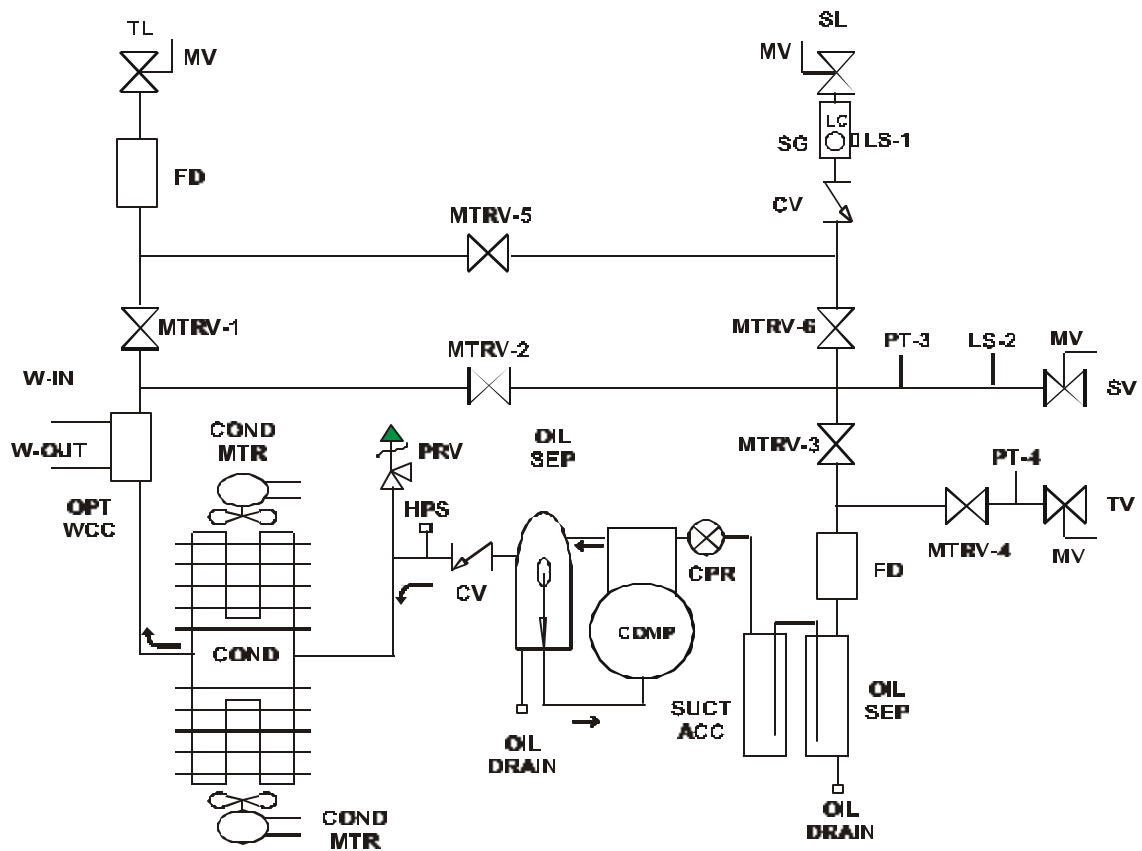
- 100-ft. 3 phase-VAC power cord
- 100-ft. 120-VAC power cord
- Two 96 cubic inch drier shells
- Four filter cores

Note: Please follow the recommended procedures outlined in this manual for regular changing of compressor oil and coalescent oil filter. Before every recovery job install new drier cores.

Peak Performance:

To get the highest performance from your RRU999 unit, we recommend that you connect to 1¼ in. evaporator and condenser ports on the chiller or A/C system and to recovery cylinders with 1¼ in. ports whenever possible.

Figure 2, Process and Identification Schematic



Operating Procedures

CAUTION

:To ensure your safety as well as others, before attempting to recover an A/C, refrigeration or chiller system, proper and thorough preparation must take place.

- Make sure you have a recovery cylinder with a minimum 1¼ in. male flare vapor port and a minimum 1¼ in. male flare liquid port. This tank or series of tanks have to be able to hold the entire charge.
 - **Reminder:** The refrigerant full weight is 80% of water capacity weight determined as follows: Maximum allowable gross weight = 80% of water capacity weight + cylinder tare weight.
 - In addition, a suitable scale should be used to weigh the tanks in case the RRU999 needs to be shut down to prevent overfilling tanks. If a scale is not available, the tanks can be equipped at the time of purchase with a float switch that will work with the RRU999's microprocessor control circuit.
 - Finally, the recovery cylinder or cylinders must be pulled into a 29 in. vacuum before recovery commences. Failure to follow these above stated procedures will decrease the likelihood of the RRU999 performing at its highest possible effectiveness.
1. Turn the chiller, refrigeration or A/C system off and make sure that the system cannot restart.
 2. Connect the 100-ft 3-phase power cord to a proper size breaker or fused disconnect and plug it into the RRU999's control box. Connect the 100-ft 120-VAC 1-phase power cord for controls. Connect at this time, if equipped, with the 80% safety shut off float cable.
 3. At this point, the display lights up indicating the unit has power and prompting you to press "Start".

An additional feature can be accessed at this time, by pressing the "M" key. This display will show you the total compressor run time as well as give you a historical maintenance schedule. In addition, at every 10 hours of cumulative operating run time for the compressor, an automatic message will appear each time you start the RRU999 until maintenance is performed. After changing oil, then press the "Enter" key which records that maintenance has been performed. A message will then not appear until the next 10 hours of compressor run time is accumulated. The system will retain a log of each maintenance event recorded.
 4. The RRU999 then asks you to "Select Refrigerant" being recovered. Scroll to the desired refrigerant using the "M V" keys then press "Enter".
 5. The RRU999 then prompts you to check selection by displaying "Selected Refrigerant R___, Is This Correct? Enter = Yes, Canc = No". The RRU999 then prompts you to select the vapor transfer shutdown pressure with "USE M V to select 0 PSI or 15 Hg Shutdown". Select desired shutdown pressure, then press "ENTER".
 6. The RRU999 then asks you to "Connect all Refrigerant Hoses" then press "Enter". Connect two hoses to the RRU999's recovery side liquid and vapor ports and to liquid and vapor ports on the recovery cylinder. Connect other two hoses and 96 cubic inch drier shells to system side ports on the RRU999 and to the chiller evaporator and condenser or A/C system.
 7. Open vapor and liquid access valves on A/C system being recovered then press "Enter".
 8. "Open system vapor and liquid hand valves on the RRU999 recovery unit" then press "Enter".
 9. "Open recovery vapor and liquid hand valves on the RRU999 recovery unit" then press "Enter".

Note: If the recovery hoses have isolation valves, open them now.

10. The RRU999 then asks you to “Purge Both Refrigerant Lines at the Recovery Tank” then press “Enter”.
11. Next “open vapor and liquid hand valves on recovery tank” then press “Enter”.
12. The RRU999 then displays “Liquid Transfer!” and displays the A/C system and recovery tank pressures.

<p>The RRU999 now begins automated recovery while continuously displaying the A/C system and recovery tank pressures.</p>
--

Note: The RRU999 is equipped with a coalescent oil separator, designed to remove oil from the dirty recovered refrigerant. During the recovery periodically drain the oil from this separator into a suitable container, failure to drain this separator will allow contaminated oil to be passed through the system and will remain in the recovered refrigerant.

13. Once pressure between the cooling system and recovery tank are within 20-psi of each other and a liquid sensor indicates that all liquid from the liquid transfer has been removed, the unit switches to vapor recovery, displaying “Vapor Recovery in Process” and continues to display the A/C system and recovery tank pressures.

If the RRU999 does not switch to vapor recovery and you are absolutely sure that all of the liquid has been removed, it may be because lines to the recovery tank or to the cooling system are restricted. In this case, a bypass feature can be accessed that forces the unit to begin vapor recovery. To perform this task, press the enter key two times in a row during the liquid recovery mode and vapor recovery will commence.

It is absolutely imperative that all liquid has been transferred before using this override feature. Failure to do so may result in liquid slugging to the compressor and causing major damage.

14. When a 15 in. vacuum has been achieved in the A/C system, the unit compressor shuts off and the display reads “Vapor Recovery 2 Minute Wait State” and displays the time remaining.

At this point, the microprocessor continues to monitor A/C system pressure. Should pressure rise, the RRU999 restarts to again achieve a 15 in. vacuum.

15. Then the display will read “Vapor Recovery Finished!” Press “Enter”.

Upon pressing “Enter”, the RRU999 prompts you to perform the following valve manipulations 16-22:

16. “Close access valves on A/C system being recovered” and then press “Enter”.
17. “Close both hand valves on the RRU999 unit A/C System Side” and press “Enter”.
18. The RRU999 compressor then restarts and begins to force remaining liquid in the RRU999 as well as liquid in hose into the recovery tank. Displaying “Liquid Refrigerant Clearing in Process”.
19. “Close both liquid and vapor hand valves on recovery tank” and press “Enter”.
20. The RRU999 then begins evacuating the recovery tank vapor hose, displaying “Hose Evacuation in Process”.
21. When the hose evacuation is complete the unit displays “Close both Liquid and Vapor Tank Hand Valves on RRU999 Unit”, then press “Enter”.
22. Finally, the unit displays “System Recovery Completed! Disconnect all Hoses and Power”.

At this time, close all four refrigerant hose isolation valves located on the ends of the refrigerant hoses connected from the RRU999 to the recovery tank.

There will still be a small residual amount of refrigerant in the RRU999. This amount must be removed if you want to change to a different type of refrigerant. An explanation on how to remove this residual amount of refrigerant is described in the next paragraph.

Removing Remaining Residual Refrigerant

- a. Connect the center tap of a manifold set to a suitable vacuum pump inlet and the discharge side of the pump to a 50 lb. evacuated recovery cylinder. Connect the low and high side of the manifold set to the ¼ in. compressor suction and discharge access ports located on the side of the RRU999 unit.
- b. Open valve on the 50 lb. recovery tank and turn on the vacuum pump. Open the low and high side manifold valves and wait until a 29 in. vacuum has been achieved on your manifold gauge.
- c. Close both manifold valves, shut down the vacuum pump and close the recovery tank valve.

If you intend to use the RRU999 on a different type of refrigerant, make sure to change the compressor oil and disposable driers.

Changing Replaceable Cores

Make sure you replace filter cores after each recovery job. Simply unscrew bolts on the drier shells and replace the cores in the filter assembly.

The driers and compressor lubricant are available from McQuay.

Calibration Procedure

Pressure Transducer Calibration Procedure

The RRU999 unit is equipped with a sensitive pressure transducer which needs to be calibrated prior to running the RRU999. This will take into account the variations in atmospheric pressure at various altitudes and locations.

McQuay recommends that this calibration procedure be performed if any of the following events occur:

- a. Any time a new pressure transducer is installed on the unit.
- b. Any time that the unit is moved to a substantially different altitude or is exposed to significantly different atmospheric pressure.
- c. Any time that the pressure readings appear to be questionable or there is any reason to doubt the accuracy of the transducer readings.

Calibration Procedure Steps:

1. At power up, the RRU999 recovery unit will display:
 “RRU999 Commercial Recovery Unit”
 “Has Power (Press Start)”
2. At this screen you must press “**CANCEL**” twice within 5 seconds to enter the calibration mode. The display will then show the following:
 “Open Pressure Transducers to Atmosphere” (Then press “Enter” key)
3. Now, with no hoses connected, open the liquid and vapor system and recovery tank valves on the RRU999 to the atmosphere and press “Enter”.
4. The screen will then display the following message:
 “System Pressure XX PSI”
 “Press Enter To Calibrate This Transducer”
 The system is displaying the raw, uncalibrated reading from the transducer. If you press “Enter”, it will calculate a calibration value and store it in the computer’s nonvolatile memory. If you press “Cancel”, a new calibration factor will not be calculated.
5. It will then display the following message:
 “Recovery Tank Pressure xx HG”
 “Press Enter to Calibrate this Transducer”
 The system is once again displaying the raw, uncalibrated reading from the transducer. Once you press “Enter”, it will calculate a calibration value for this transducer and store it in memory. If you press “Cancel”, a new calibration factor will not be calculated. It will then display the following message and be ready for operation:
 “RRU999 Commercial Recovery Unit”
 “Has Power (Press Start)”

Changing Compressor Oil

The compressor's charge of Polyol Ester fluid should be regularly replaced with an identical fluid or, at a minimum, after these events:

1. After a maximum of 10 hours of run time.
2. When changing recovery jobs that involve different refrigerants.
3. After recovering a system with a burnt out compressor.

To remove and change the oil in the compressor and the oil separator:

WARNING

When changing oil, it is highly recommended that the same type of oil being used with the refrigerant being recovered be used in the RRU999 compressor. This will help ensure that cross contamination does not occur.

- a. Make sure the RRU999 unit has no refrigerant in its internal parts.
- b. Connect a manifold set to dry nitrogen and to the suction and discharge service ¼ in. access ports located on the side of the RRU999.
- c. Connect another ¼ in. hose to the access fitting on the bottom of the RRU999 oil separator fitting and the other end to a suitable disposable oil container.
- d. Gradually allow dry nitrogen to go into the discharge port on the RRU999 unit until all oil has been forced out of the oil separator. **Note:** 10 to 15 PSI will be more than adequate.
- e. Remove oil plug from rear of compressor located just below heater junction box. Drain into a suitable disposable oil container.
- f. Gradually allow dry nitrogen to go into the suction port on the RRU999 unit until all oil has been forced out of the compressor.
- g. To add new oil to the RRU999 compressor, connect a vacuum pump to the ¼ in. access port on the suction side of the compressor. Pull down into a minimum 29 in. vacuum.
- h. Connect other hose to the ¼ in. access port on the top rear of the compressor and into the new oil container. **Note:** Fill compressor with exactly 50 oz. of oil.
- i. Connect the other hose to the ¼ in. access port on the bottom of the oil separator and into the same new oil container. **Note:** Fill the separator with exactly 16 oz. of oil.
- j. Once this procedure is finished, remove all hoses and pull the entire RRU999 into a 29 in. vacuum. Dispose of old oil properly.

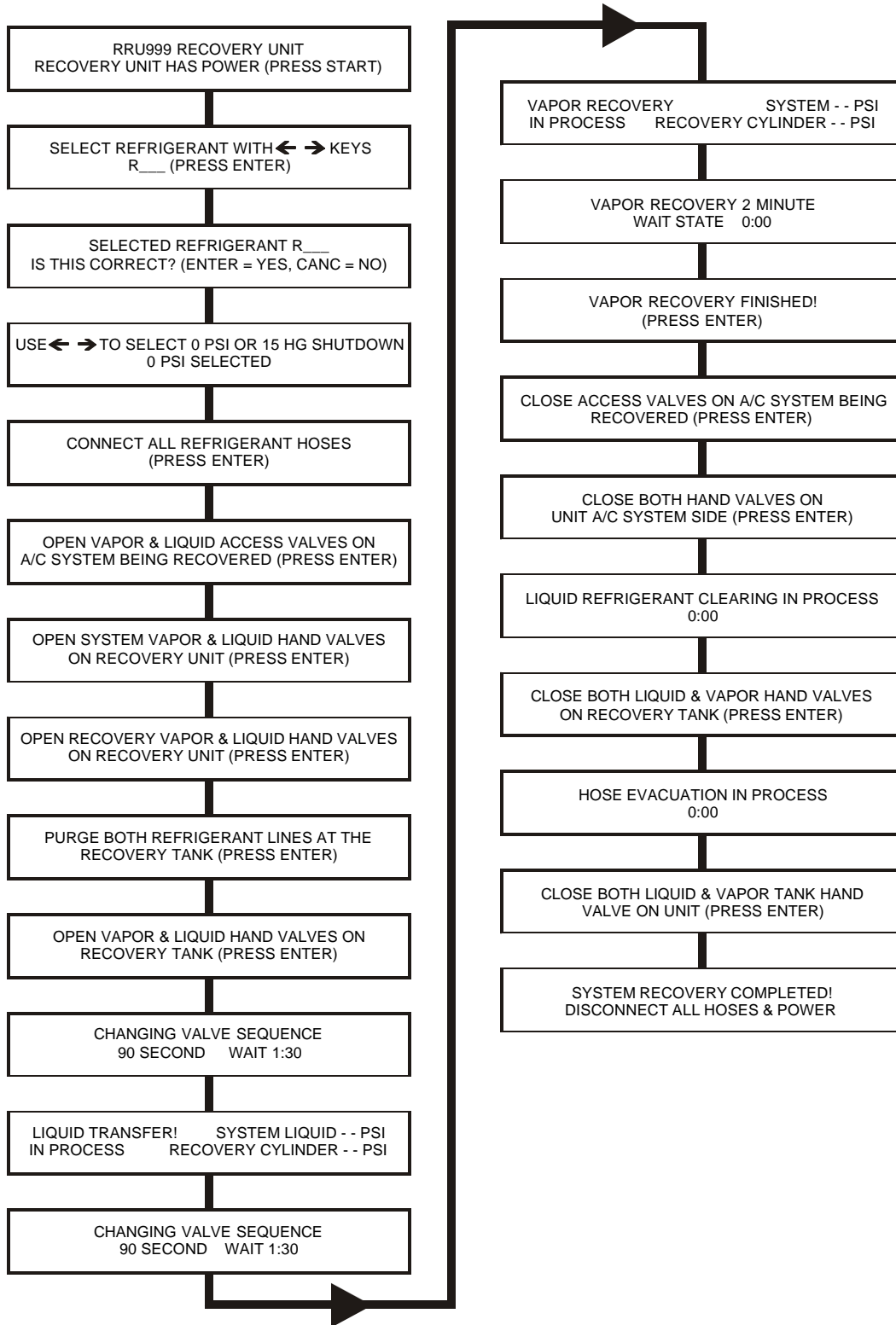
Note: After approximately 20 hours of continuous recovery replace coalescent filter in the oil separator. This procedure can be accomplished by removing the oil separator side panel, unscrewing bolts on the oil separator body and replacing the coalescent filter per instructions given with the filter.

WARNING

Failure to follow above procedures for recharging oil in the compressor with the exact amount of oil may result in major damage to the compressor.

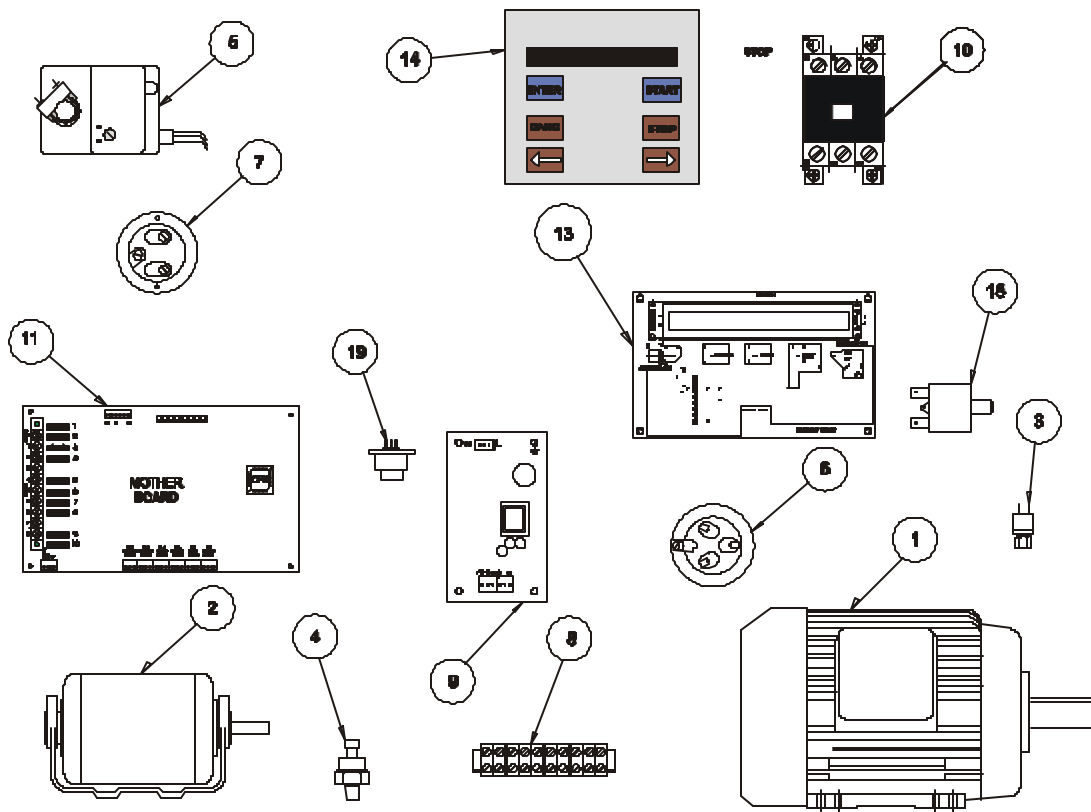
Display Sequence

High Pressure Refrigerant Recovery Only



Electrical Parts Breakdown

1. Compressor Motor:
7.5Hp, 460VAC, 50/60Hz, 3Ph
7.5Hp, 575VAC, 50/60Hz, 3 Ph for 575 Model
2. Condenser Fan Motor - 115/230 VAC 60Hz
3. High Pressure Switch
4. (2) Pressure Transducer
5. (6) Actuator Ball Valve Assembly - 120 VAC 50/60 Hz 133 in-lbs 150s
6. Male Inlet - 50A, 480VAC, 3PH, 4W or 600VAC For 575 Model
7. Male Inlet -15A,125V, 1PH, 3W GRD
8. Terminal Block
9. Power Supply - 20W, 115V, 1A / 230VAC, 0.6A
10. Contactor-120V 50/60Hz 10Hp 600 VAC - MAX 30A open
11. CPU Mother Board Assembly
13. Display Board Assembly
14. Keypad
18. Circuit Breakers- 20 Amp, 250 VAC, 28 VDC
19. Float Connector



Replacement Parts List

Reference Number	Part Number	Description
1	EVA182	Motor Actuator
2	RVA150	Actuated Ball Valve Assembly
3	XPT287	Pressure Transducer
4	RVC055	Check Valve
5	ROS055	Vapor Comp Oil Separator
6	RPR008	Crankcase Pressure Regulator
7	RSA011	Suction Accumulator
8	MFR004	Unit Frame
9	EMO237	Compressor Drive Motor
9	EMO575	Compressor Drive Motor
10	HMB184	Motor Slide Base
11	HPY294	Motor Drive Pulley
12	HBU009	Motor Drive Pulley Bushing
13	HBT261	Motor Drive Belts
14	HPY004	Compressor Pulley
15	RCP755	Vapor Recovery Compressor
16	EMO112	Cond Fan Motor
17	HFB125	Cond Fan Blade
19	RCC014	Condenser Coil
20	RSL004	Liquid Level Sensor
21	RSG001	Liquid Chamber Sight Glass
23	RVC055	Liquid Check Valve
24	XPT287	Pressure Transducer
25	RVA150	Hand Ball Valves Tank and System
26	XKP006	6 Button Keypad
27	XPC210	Display Board A-2 40X2 LCD
28	XCA034	Ribbon Cable 34 Pin Assembly
29	XPC101B	Mother Board B-1 Allvac Stuffing
32	EMI200	Male Inlet 230/480
32	EMI459	Male Inlet 600V
33	EMI115	Male Inlet 115V
34	XPS200	Power Supply (Electronics)
35	XTL210	10 Position Terminal Strip
38	XRY150	Solid State Relay
39	ECP004	Contactator

Troubleshooting

WARNING

To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant and to all labels on refrigerant containers. Certain procedures common to the refrigeration system service may expose personnel to liquid or vaporous refrigerant.

Troubleshooting Procedures

If functional difficulties are experienced and the preceding maintenance checks do not resolve the problem, refer to the following troubleshooting chart for assistance.

Troubleshooting Guide

The following guide is provided to assist in analyzing problems that could occur.

- Symptom: Describes what is happening;
- Cause: Suggests possible sources;
- Solution: Describes what must be done.

Symptom	Cause	Solution
EVAC will not switch from liquid mode to vapor mode when transferring high pressure refrigerant.	Still have liquid in system. Possible malfunction.	When the pressure differential between system and receiving tank is less than 15 psig, and all liquid has been removed, unit will automatically switch from liquid to vapor mode. If unit does not automatically switch to vapor mode, make sure that all liquid has been transferred and that no liquid is in the sight glass. Press ENTER key 2 times in a row. This will manually force EVAC into vapor mode.
Slow liquid transfer.	Restriction in flow.	Replace restrictive fittings and hoses with appropriate size to expedite transfer.
Pressure differential between system and recovery tank becomes too high - greater than 50 psig.	Restrictions in recovery line.	Restriction in liquid recovery lines or tank. Tank needs to have a 1½ in. ID valve. Many tanks do not have 1½ in. valves. McQuay provides tanks fitted with properly sized valves for this purpose.
Unit will not pump down to a 15 in. vacuum on final vapor refrigerant recovery.	Pressure transducer not properly calibrated.	Verify that displayed pressure is equal to gauge pressure. If they are different, please follow the calibration procedures enclosed to calibrate the pressure transducer.
Oil separator float is stuck open and feeding refrigerant back to suction side of compressor.		Drain compressor oil separator.
EVAC running high head pressure back to recovery tank.	Restriction in hoses going to tank.	Replace with appropriately sized hoses and fittings. Run water over tank or add secondary water cooled condenser on liquid return line going to recovery tank. McQuay has available secondary water cooled and air cooled condensers.
	Capacity of recovery tank is too small or tank is overfilled.	Replace with appropriately sized tanks.
	High concentration of noncondensibles.	Remove noncondensibles.
Automatic actuator valves do not function.	Loss of power to valves.	Make sure LED's on A-4 circuit board are working. If LED signal is present at A-4 board, check to verify that 24 VAC is being supplied to actuators. If 24 VAC is not present, replace transformer.



Post Office Box 2510, Staunton, Virginia 24402-2510 • (800) 432-1342 • www.mcquay.com