Mobile Climate Control

OPERATION / SERVICE MANUAL
for
MCC MODEL Y50-13606-XX
Gen IV

T-364

REV. 07/2014

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SAFETY SUMMARY

GENERAL SAFETY NOTICES

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. A listing of the specific warnings and cautions appearing elsewhere in the manual follows the general safety notices.

FIRST AID

An injury, no matter how slight, should never go unattended. Always obtain first aid or medical attention immediately.

OPERATING PRECAUTIONS

Always wear safety glasses.

Keep hands, clothing and tools clear of the evaporator and condenser fans.

No work should be performed on the unit until all start-stop switches are placed in the OFF position, and power supply is disconnected.

Always work in pairs. Never work on the equipment alone.

In case of severe vibration or unusual noise, stop the unit and investigate.

MAINTENANCE PRECAUTIONS

Beware of unannounced starting of the evaporator and condenser fans. Do not open the unit cover before turning power off.

Be sure power is turned off before working on motors, controllers, solenoid valves and electrical controls. Tag circuit breaker and power supply to prevent accidental energizing of circuit.

Do not bypass any electrical safety devices, e.g. bridging an overload, or using any sort of jumper wires. Problems with the system should be diagnosed, and any necessary repairs performed by qualified service personnel.

When performing any arc welding on the unit, disconnect all wire harness connectors from the modules in the control box. Do not remove wire harness from the modules unless you are grounded to the unit frame with a static-safe wrist strap.

In case of electrical fire, open circuit switch and extinguish with CO_2 (never use water).

SPECIFIC WARNINGS AND CAUTIONS

WARNING

Use of an electro-magnetic valve as a means of positive shutoff for service is not recommended for safety, or good service practice.

WARNING

Be sure to observe warnings listed in the safety summary in the front of this manual before performing maintenance on the hvac system

WARNING

Read the entire procedure before beginning work. Park the vehicle on a level surface, with parking brake applied. Turn main electrical disconnect switch to the off position.

WARNING

Do Not Use A Nitrogen Cylinder Without A Pressure Regulator

WARNING

Do Not Use Oxygen In Or Near A Refrigeration System As An Explosion May Occur.

WARNING

The Filter-drier May Contain Liquid Refrigerant. Slowly Loosen The Connecting Nuts And Avoid Contact With Exposed Skin Or Eyes.

CAUTION

The Y50-13606 Rooftop Systems have R134a service port couplings installed on the compressor and on the unit piping.

CAUTION

To prevent trapping liquid refrigerant in the manifold gauge set be sure set is brought to suction pressure before disconnecting.

SECTION 1

DESCRIPTION

1.1 INTRODUCTION

This manual contains Operating Instructions, Service Instructions and Electrical Data for the Model Y50-13606 Air Conditioning and Heating equipment furnished by Mobile Climate Control as shown in Table 1-1.

The system is identified with a Model/Serial number tag located inside the left evaporator (roadside), in the front corner of the assembly. Example is shown in Figure 1-1.

Model Y50-13606 system consists of a Rooftop unit containing the condensing section, the evaporator sections and engine compartment mounted compressor. To complete the system, the air conditioning and heating equipment interfaces with an optional drivers evaporator (dash-air), electrical cabling, refrigerant piping, engine coolant piping (for heating), duct work and other components furnished by Mobile Climate Control and/or the bus manufacturer.

Additional support manuals are shown in Table 1-2.

Operation of the unit is controlled automatically by a Mobile Climate Control Microprocessor based controller. The controls maintain the vehicle's interior temperature at the desired set point.

Table 1-1 Y50-13606 Models

Model	Voltage	Controller	With Heat	Single Loop	W/Covers
Y50-13606-00	24 VDC	MCC Microprocessor	Yes	Yes	Yes

Table 1-2 Additional Support Manuals

MANUAL NUMBER	EQUIPMENT COVERED	TYPE OF MANUAL
T-364PL	Y50-13606-00	Service Parts List

1.2 GENERAL DESCRIPTION

1.2.1 Rooftop Unit

The rooftop unit includes the condenser section and the evaporator sections (See Figure 1-1).

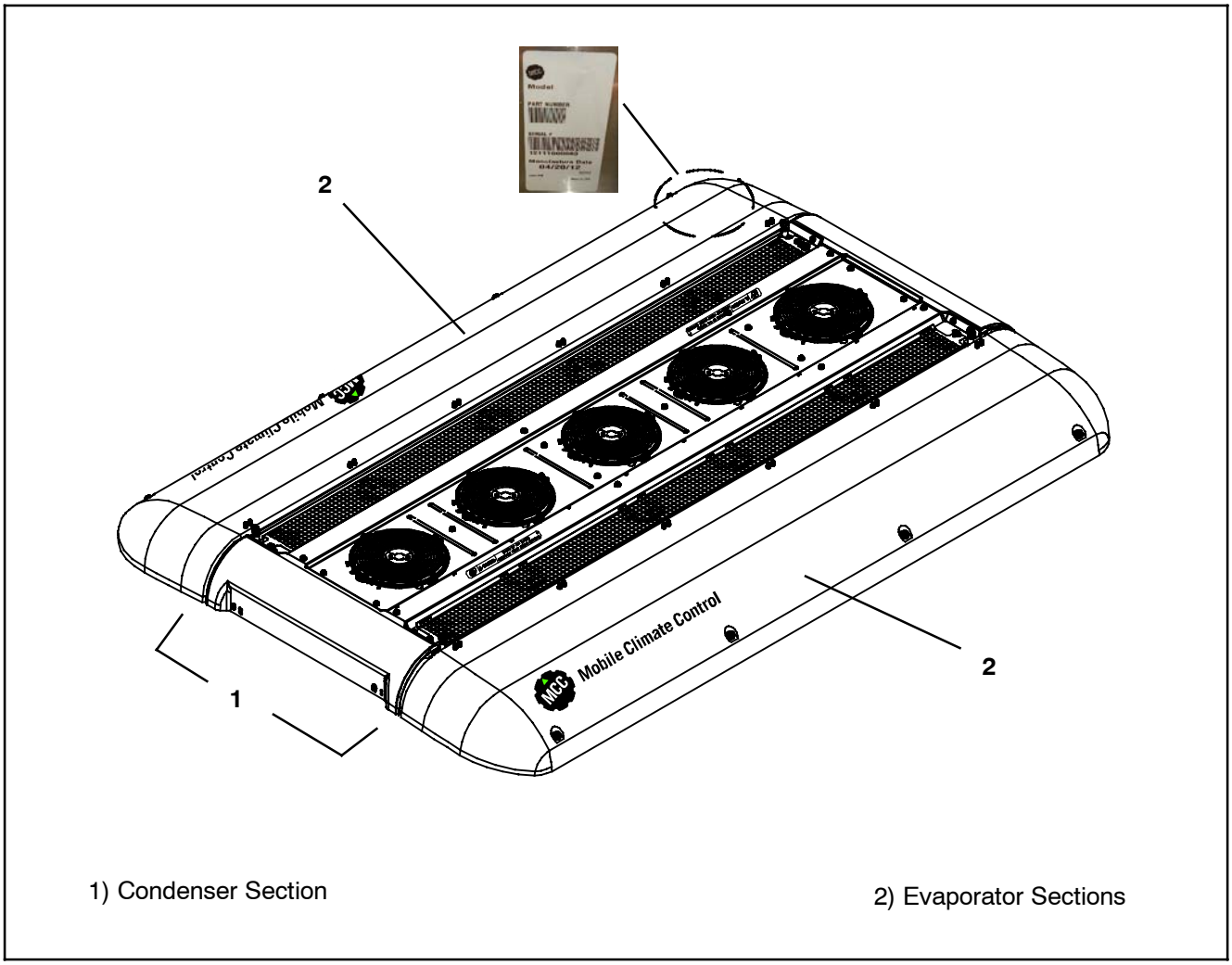


Figure 1-1 Y50-13606-00 Rooftop Unit

1.2.2 Condensing Section

The condensing section includes the condenser coils, five (5) fan and motor assemblies, filter-drier, liquid line solenoid and service valves.

The condenser coils provide heat transfer surface for condensing refrigerant gas at a high temperature and pressure into a liquid at high temperature and pressure. The condenser fans circulate ambient air across the outside of the condenser tubes at a temperature lower than refrigerant circulating inside the tubes; this results in condensation of the refrigerant into a liquid. The coil header is also fitted with a pressure relief valve which protects the system from unsafe high pressure conditions. The filter-drier removes moisture and debris from the liquid refrigerant before it enters the thermostatic expansion valve in the evaporator assembly.

a. Condenser fan operation

Low Speed ON: 150 psig (10.31 bar)
Low Speed OFF: 120 psig (8.27 bar)

High Speed ON: 225 psig (15.51 bar)
High Speed OFF: 165 psig (11.38 bar)

1.2.3 Evaporator Sections

There are two Evaporator sections on each unit. Each evaporator section includes the evaporator coil, three (3) blower motor assemblies, a heater coil assembly, a thermostatic expansion valve and condensate drain connections.

The evaporator coils provide heat transfer surface for transferring heat from air circulating over the outside of the coil to refrigerant circulating inside the tubes; thus providing cooling. The heating coils provide a heat transfer surface for transferring heat from engine coolant water circulating inside the tubes to air circulating over the outside surface of the tubes, thus providing heating. The fans circulate the air over the coils. The air filters remove dirt particles from the air before it passes over the coils. The thermostatic expansion valve meters the flow of refrigerant entering the evaporator coils. The heat valve controls the flow of engine coolant to the heating coils upon receipt of a signal from the controller. The condensate drain connections provide a means for connecting tubing for disposing of condensate collected on the evaporator coils during cooling operation.

1.2.4 MCC Microprocessor

The MCC controller has five (5) modes, Auto, Cool, Heat, Vent and Defrost. Refer to Section 2, for operational sequences.

1.3 REFRIGERATION SYSTEM COMPONENT SPECIFICATIONS

a.System Capacity: **Cooling - 95,600 Btu (28 kW)**
Heating - 130,000 Btu (38 kW)

b. Refrigerant Charge R-134a (Approximate)

NOTE

Refrigerant charge will depend on hose lengths and diameters; or if there is an In-Dash unit (front evaporator). The following should only be used as a guideline.

Y50-13606 with Bock FK40/655 Compressor
14 Pounds and 8 oz. (6.6 kg)

c. Compressors

Compressor	Bock FK40
Weight, (Wet) w/o Clutch	75 Lbs. (34 kg)
Oil Charge	4.23 (±0.5) pints 2.0 (±0.25) liters

d. Thermostatic Expansion Valve:

Superheat Setting Factory Set at 9°F (5°F)

e. High Pressure Switch (HPS) *Normally Closed*

Opens at: 360 ±10 psig (20.41 ±0.68bar)
Closes at: 280 ±10 psig (13.61 ±0.68bar)

f. Low Pressure Switch (LPS) *Normally Open*

Opens at: 6 ±3psig (0.41 ±0.20 bar)
Closes at: 25 ±3 psig (1.7 ±0.20 bar)

g. Water Temperature Switch (WTS) (If Equipped)

[Bus Manufacturer Supplied - Suggested close on temperature rise at 105°F (41°C)]

1.4 ELECTRICAL SPECIFICATIONS - MOTORS

a. Evaporator Blower/Motor

Evaporator Motor	Brushless
	24 VDC
Horsepower (kW)	0.5 (.37)
Full Load Amps (FLA)	15.2
Operating Speed High/	3830
Bearing Lubrication	Factory Lubricated (additional grease not required)

b. Condenser Fan Motor

Condenser Motor	Brushless
	24 VDC
Horsepower (kW)	0.24 (.18)
Full Load Amps (FLA)	7
Operating Speed (RPM)	2840
Bearing Lubrication	Factory Lubricated (additional grease not required)

c. Temperature Sensors (All)

Input Range: -40 to 167° F (-40 to 75°C)
Output: NTC 10K ohms at 77° F (25°C)

d. Ambient Sensor (Controls Compressor Outputs)

Opens at: 43° F (6.1°C)
Closes at: 47° F (8.3°C)

1.5 SAFETY DEVICES

System components are protected from damage caused by unsafe operating conditions with safety devices. Safety devices with Mobile Climate Control supplied equipment include high pressure switch (HPS), low pressure switch (LPS), circuit breakers and fuses.

a. Pressure Switches

High Pressure Switch (HPS)

During the air conditioning cycle, compressor clutch operation will automatically stop if the HPS switch contacts open due to an unsafe operating condition. Opening HPS contacts de-energizes the compressor clutch shutting down the compressor. The high pressure switch (HPS) is installed at the compressor assembly. See paragraph 1.3 for specifications.

Low Pressure Switch (LPS)

The low pressure switch is installed on the compressor assembly and opens on a pressure drop to shut down the system when a low pressure condition occurs. See paragraph 1.3 for specifications.

b. Fuses and Circuit Breakers

The Relay Board is protected against high current by an OEM supplied circuit breaker or fuse located in the bus battery compartment (150 Amp for 24 VDC systems is recommended). Independent 10 and 20 Amp, 24 VDC circuit breakers protect each motor while the output circuits are protected by an additional 5 Amp fuse. During a high current condition, the circuit protection may open.

c. Ambient Lockout

Auto Mode

Opens Compressor Output at: 43° F (6.1°C)
Closes Compressor Output at: 47° F (8.3°C)

Defrost Mode

Opens Compressor Output at: 28° F (-2.2°C)
Closes Compressor Output at: 32° F (0°C)

The ambient temperature sensor measures the condenser inlet air temperature. These settings protect the compressor from damage caused by operation at low pressures.

d. Unloader Operation

The compressor is equipped with one unloader to allow compressor operation at 50% or 100% capacity.

Low Pressure Control

Energizes Unloader Output (Unloads) at: 25 psig (1.7 bars)
De-energizes Unloader Output (Loads) at: 32 psig (2.2 bars)

High Pressure Control (below 87.5 F (30.8C)

Energizes Unloader Output (Unloads) at: 300 psig (20.7 bars)

High Pressure Control (above 92.5 F (33.6C)

Energizes Unloader Output (Unloads) at: 340 psig (23.4 bars)

In response to the high pressure conditions above, the unloader remains energized for 2 minutes. Once the pressures return below the parameters listed, the unloader circuit will de-energize.

1.6 Outside Air Damper/Flapper

The System is equipped to provide 20% outside air to the interior of coach. The conditions to Open or Close the Outside Air Dampers are:

Open:

If the outside air temperature is more than 3.6° F (2°C) above set point, and the inside air temperature is more than 5.4° F (3°C) above set point, the Fresh Air Damper is open.

Closed:

If the outside air temperature is less than 3.6° F (2°C) below set point, and the inside air temperature is more than 5.4° F (3°C) below set point, the Fresh Air Damper is Closed.

1.7 AIR CONDITIONING REFRIGERATION CYCLE

When air conditioning (cooling) is selected by the controller, the unit operates as a vapor compression system using R-134a as a refrigerant (See Figure 1-2 refrigerant flow diagram). The main components of the system are the A/C compressor, air-cooled condenser coils, filter-drier, thermostatic expansion valve, liquid line solenoid valve and evaporator coils.

The compressor raises the pressure and the temperature of the refrigerant and forces it into the condenser tubes. The condenser fan circulates surrounding air (which is at a temperature lower than the refrigerant) over the outside of the condenser tubes. Heat transfer is established from the refrigerant (inside the tubes) to the condenser air (flowing over the tubes). The condenser tubes have fins designed to improve the transfer of heat from the refrigerant gas to the air; this removal of heat

causes the refrigerant to liquefy, thus liquid refrigerant leaves the condenser and flows to the filter-drier.

The refrigerant passes through a filter-drier where a desiccant keeps the refrigerant clean and dry.

From the filter-drier, the liquid refrigerant then flows through the liquid line to the sight-glass and then to the thermostatic expansion valve. The thermal expansion valve reduces pressure and temperature of the liquid and meters the flow of liquid refrigerant to the evaporator to obtain maximum use of the evaporator heat transfer surface.

The low pressure, low temperature liquid that flows into the evaporator tubes is colder than the air that is circulated over the evaporator tubes by the evaporator fans. Heat transfer is established from the evaporator air (flowing over the tubes) to the refrigerant (flowing inside the tubes). The evaporator tubes have aluminum fins to increase heat transfer from the air to the refrigerant; therefore the cooler air is circulated to the interior of the bus.

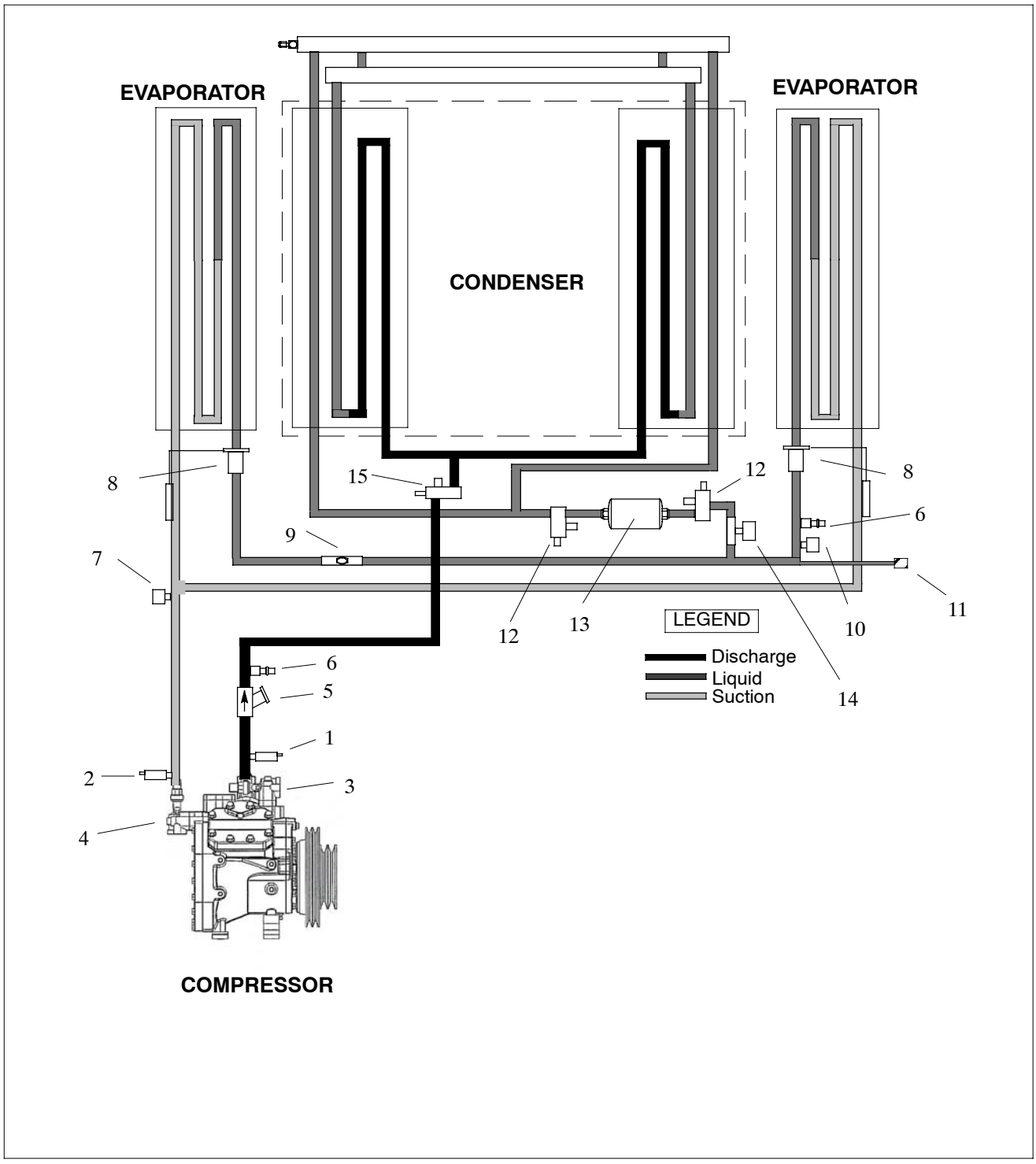
The transfer of heat from the air to the low temperature liquid refrigerant in the evaporator causes the liquid to vaporize. This low temperature, low pressure vapor passes through the suction line and returns to the compressor where the cycle repeats.

1.8 HEATING CYCLE

Heating circuit (See Figure 1-3) components furnished by Mobile Climate Control include the heater cores and solenoid operated heat valve. Components furnished by the bus manufacturer may include a water temperature switch (WTS) , boost water pump and floor blower convectors.

The controller automatically controls the heat valves during the heating mode to maintain required temperatures inside the bus. Engine coolant (glycol solution) is circulated through the heating circuit by the engine and an auxiliary boost water pump. When the heat valve solenoids are energized, the valves will open to allow engine coolant to flow through the heater coils. The valves are normally closed.

NOTE: In order to ensure water is entering the heater coils sufficiently heated, it is suggested that the OEM supplied Water Temperature Switch (WTS), (If equipped) close on temperature rise at 105°F (40.5°C).



1. High Pressure Switch
2. Low Pressure Switch
3. Discharge Service Valve
4. Suction Service Valve
5. Discharge Check Valve
6. Service Port, High Side)
7. Pressure Transducer (SPT)
8. Thermal Expansion Valve (TXV)
9. Liquid Line Sight Glass
10. Pressure Transducer (DPT)
11. Auxiliary Liquid Line
12. Filter Drier Service Valve
13. Filter Drier
14. Liquid Line Solenoid Valve
15. Charge Isolation Valve

Figure 1-2 Refrigerant Flow Diagram

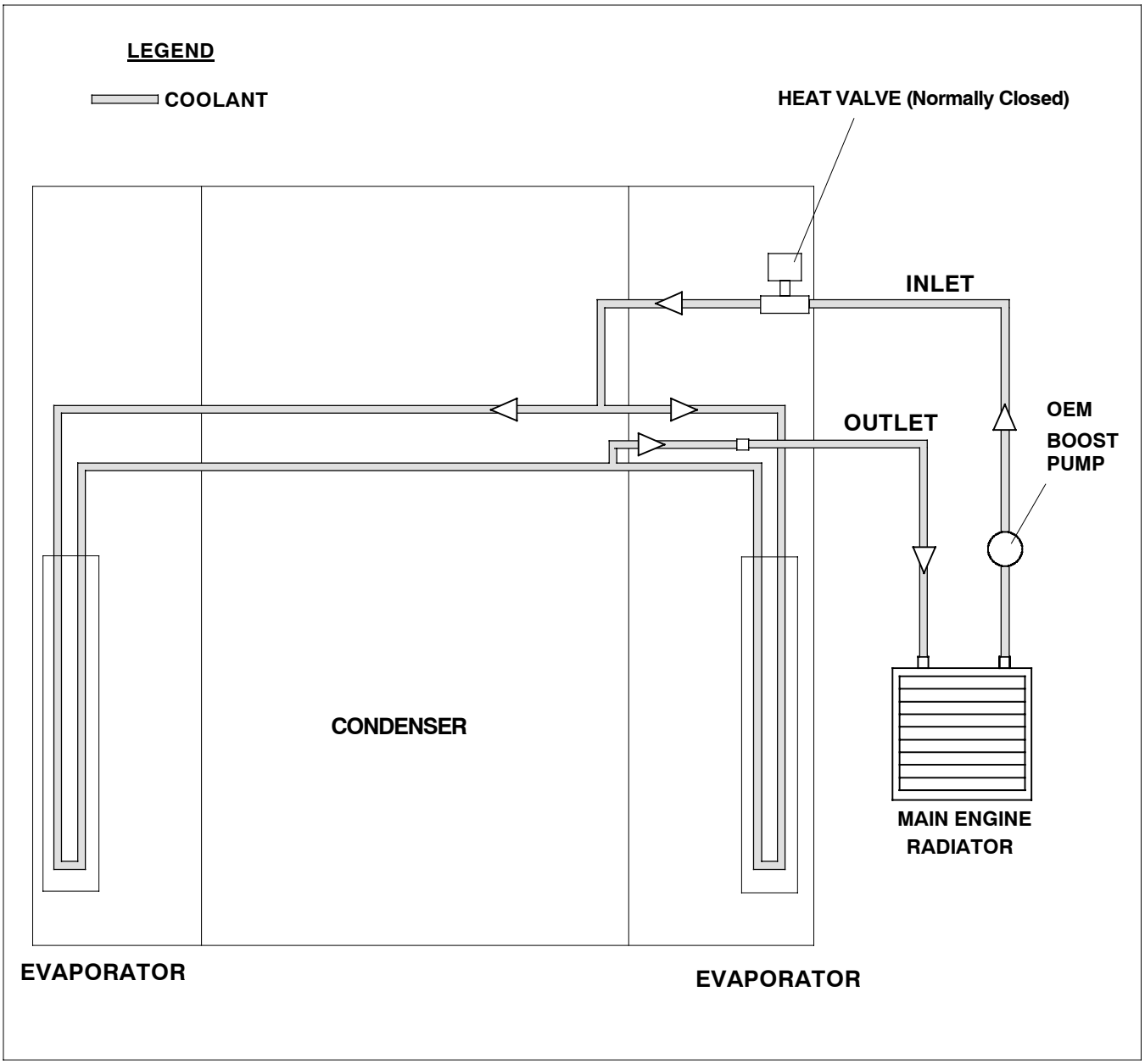


Figure 1-3 Heat Flow Diagram

SECTION 2

OPERATION of MCC CONTROLLER

2.1 General Description

Control of the MCC unit Y50-13606 is versatile, and can be configured with operational control through the MCC Driver's display only, or in conjunction with manual control switches provided through the OEM supplier.

When the MCC Display is used to control operation, the Mode selection is selected using the "Mode" button (item 4) on display, shown in Figure 2-1.

If manual selector switch is supplied, the Mode selection will dependant on the switch position. The display will then function as a means of changing temperature set point, as well as viewing any alarms generated related to system operation.

Ability to view system pressures, sensor temperatures, component status, etc. is available whether system control is controlled by either the MCC Display Module, or OEM selector switches.

2.2 STARTING, STOPPING AND OPERATING INSTRUCTIONS

The MCC Drivers Display Module is marked with international symbols (See Figure 2-1).

OEM selector switches will be selected and identified by designations chosen by OEM

Before starting, electrical power must be available from the bus power supply.

A 150 Amp @24 VDC circuit breaker/fuse in the battery compartment passes power for the clutch, evaporator and condenser assemblies.

2.2.1 Starting

a. If the engine is not running, start the engine.

b. When the 24VDC power is applied, the driver display will be ready to except request for system operation. Press the On/Off key (Item 1 Figure 2-1) on the display to trigger the start up sequence, if system is being controlled by the MCC Drivers display module.

If system control is with OEM selector switch, turn switch to desired mode.

2.2.2 Stopping

Toggling the On/Off key (Item 1 Figure 2-1) on the display again will stop the system operation if system is being controlled by the MCC Drivers display module.

If system control is with OEM selector switch, turn switch to OFF position.

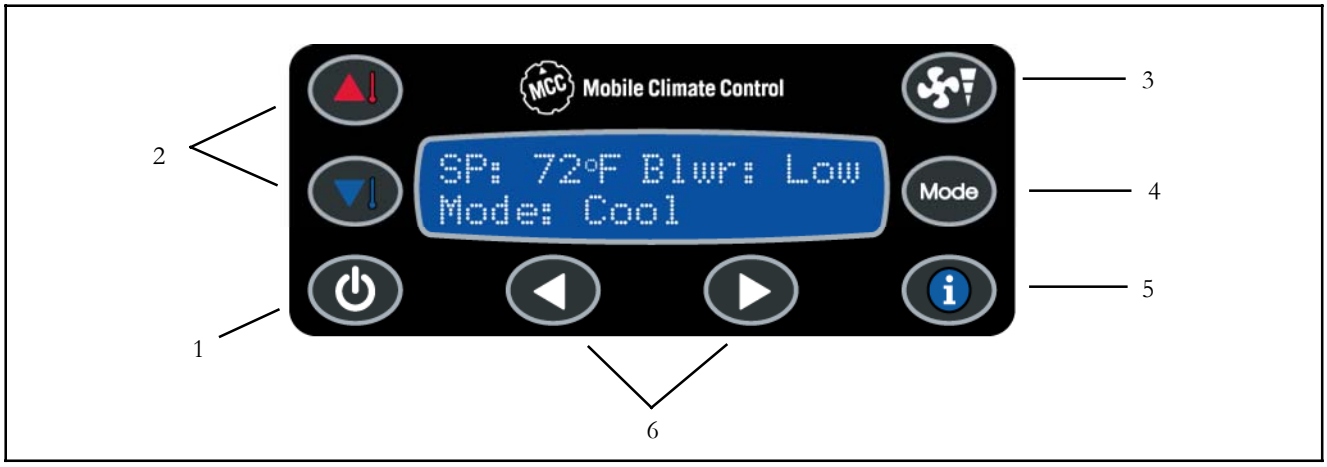


Figure 2-1 MCC Driver Display Module

1. On/Off
2. Temperature Set Point Control
3. Fan Speed Control
4. Mode Selection
5. Information/Display Settings
6. Cursors

2.3 SEQUENCE OF OPERATION

2.3.1 Function of Keys when "Engine On" and controller active:

a. **On/Off Key** - Turns HVAC unit On or Off, unless OEM supplied switches are installed. It also is used to exit diagnostic menu.

b. **Temperature Set Point Control Key** - These buttons increase or decrease the temperature set point for the HVAC unit. The control range is 62° F (16° C) to 82° F (28° C). When in diagnostic mode, it can be used to scroll through menu.

c. **Fan Speed Control Key** - Fan speed can be cycled between Low speed and High speed.

d. **Mode Selection Key**- Set the operating mode to Auto, Heat, Vent, Cool, and Defrost.

e. **Information/Display Settings Key** - Allows access to display settings and system diagnostics.

f. **Cursors Key** - Use to adjust parameter settings (Temperature units, display and contrast).

2.3.2 Illuminating Indications (Display)

With "Engine-On" and Controller active by the On/Off button or OEM mode selection switch being set.

2.4 BASIC OPERATING INSTRUCTIONS

When the engine is running, press the On/Off button on display, or toggle the OEM Switch (if supplied) to desired mode to activate the Air Conditioning Unit.

2.4.1 Display

When the unit is ON, the display shows the interior set point temperature, current blower speed setting and mode selection.

2.4.2 Interior Set Point Temperature Control

Press the UP (Red) or Down (Blue) keys to set the desired interior temperature.

The temperature can be adjusted between 62° F (16° C) and 82° F (28° C).

2.4.3 Blower Speed Setting

Blower speed operation can be set for high or low speed operation by pressing the fan speed Key (Key 3 shown in Figure 2-1, if equipped).

If no display is present, fan speeds can be selected with OEM supplied switch (if equipped).

2.4.4 Mode Selection Descriptions

a. **Auto** - In the auto mode, the ECC node will adjust the individual components to maintain the desired set point temperature.

   In the auto mode, the A/C system will continue to operate when set point is reached, and will energize the boost pump and the heat solenoid valve to maintain temperature. This is referred to as Reheat mode, to provide additional dehumidification of interior space.

   The reheat mode will be disabled if the outside ambient air temperature is below 43° F (6.1° C).

b. **Cooling** - In the cooling mode, the Compressor, condenser fans and evaporator fans will be energized. The heater solenoid valve will be energized (closed), to provide full cooling.

   The compressor and condenser fans will be de-energized 2 degrees F below set point. The evaporator fans will continue to operate to circulate interior air.

c. **Heating** - In the heating mode, the compressor and condenser fans will remain de-energized. Evaporator fans will be energized. The boost pump will be energized,and the heat solenoid valve will be energized (opened), to allow engine coolant to flow through the heater coils. If the interior temperature is more than 5° F (3° C) below set point, the floor blowers (if equipped) will also be energized.

d. **Defrost** - In the defrost mode, the boost pump will be energized to provide engine coolant flow to the drivers unit to allow defogging of the windshield.

   Defrost Override - In the event the main HVAC system is "OFF", the ability of the OEM to provide a signal to the controller to energize the Boost Pump to provide engine coolant flow for the Drivers Defroster is provided.

e. **Vent**- In the vent mode, the evaporator blowers are operated to circulate air in the bus. The fresh air damper will be controlled according to interior temperature.

2.4.5 Capacity Control "Ladder" Diagrams

Ladder diagrams showing system operational control logic for Auto/ Cool (Reheat system), and Heat, can be seen in Figure 2-2.

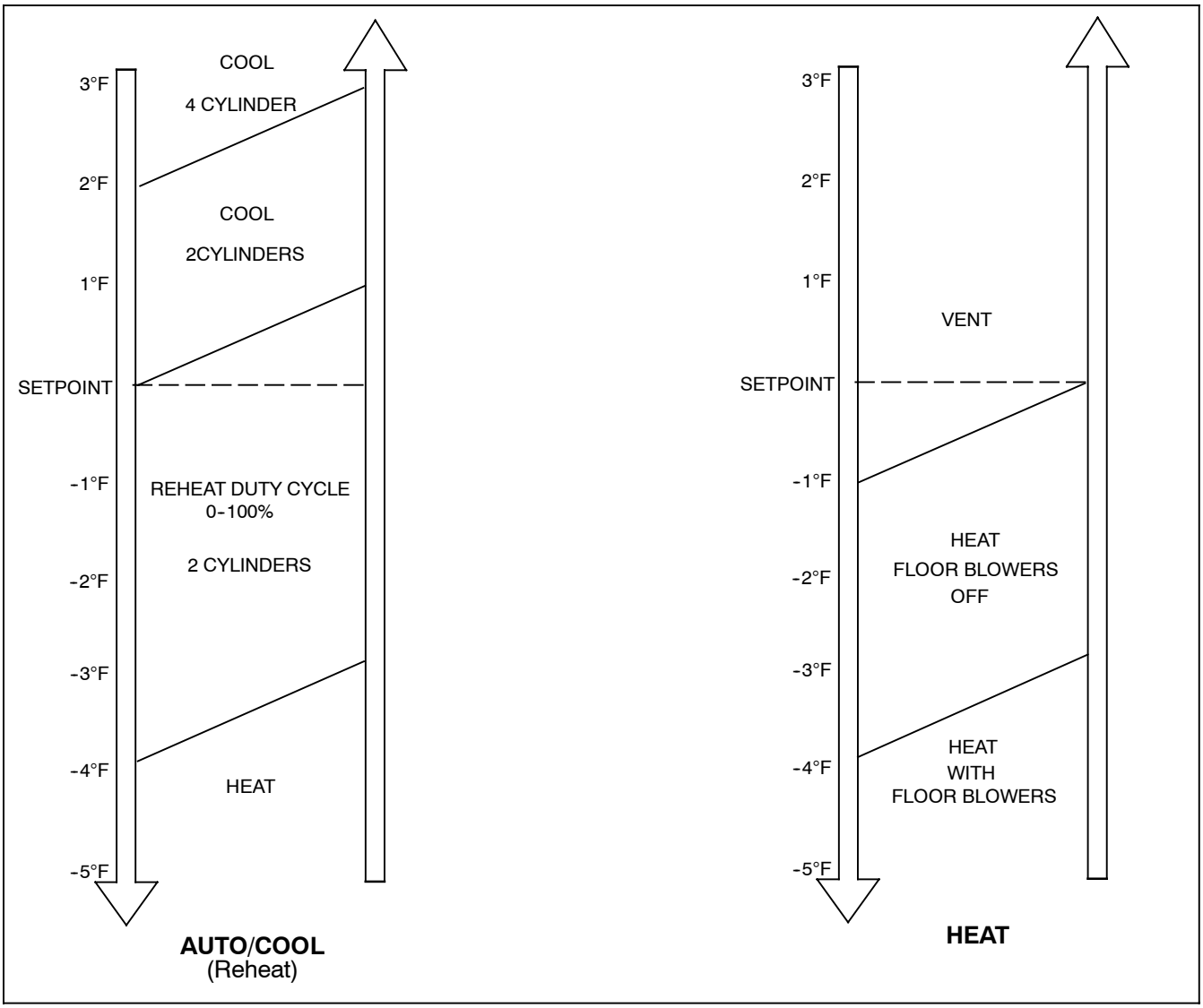


Figure 2-2 Capacity Control Ladder Diagrams

2.4.6 Display Settings

To adjust display settings, from the main menu:

a. Press and hold the "Settings" button, then press the Left or Right cursor (Items 1 and 2 in Figure 2-3).

b Use Temperature Control buttons (Items 3 in Figure 2-3) to select parameter.

c To adjust settings, press the cursor keys (Item 2 in Figure 2-3).

d After adjustment, press ON/Off button (Item 4 in Figure 2-3) to exit.

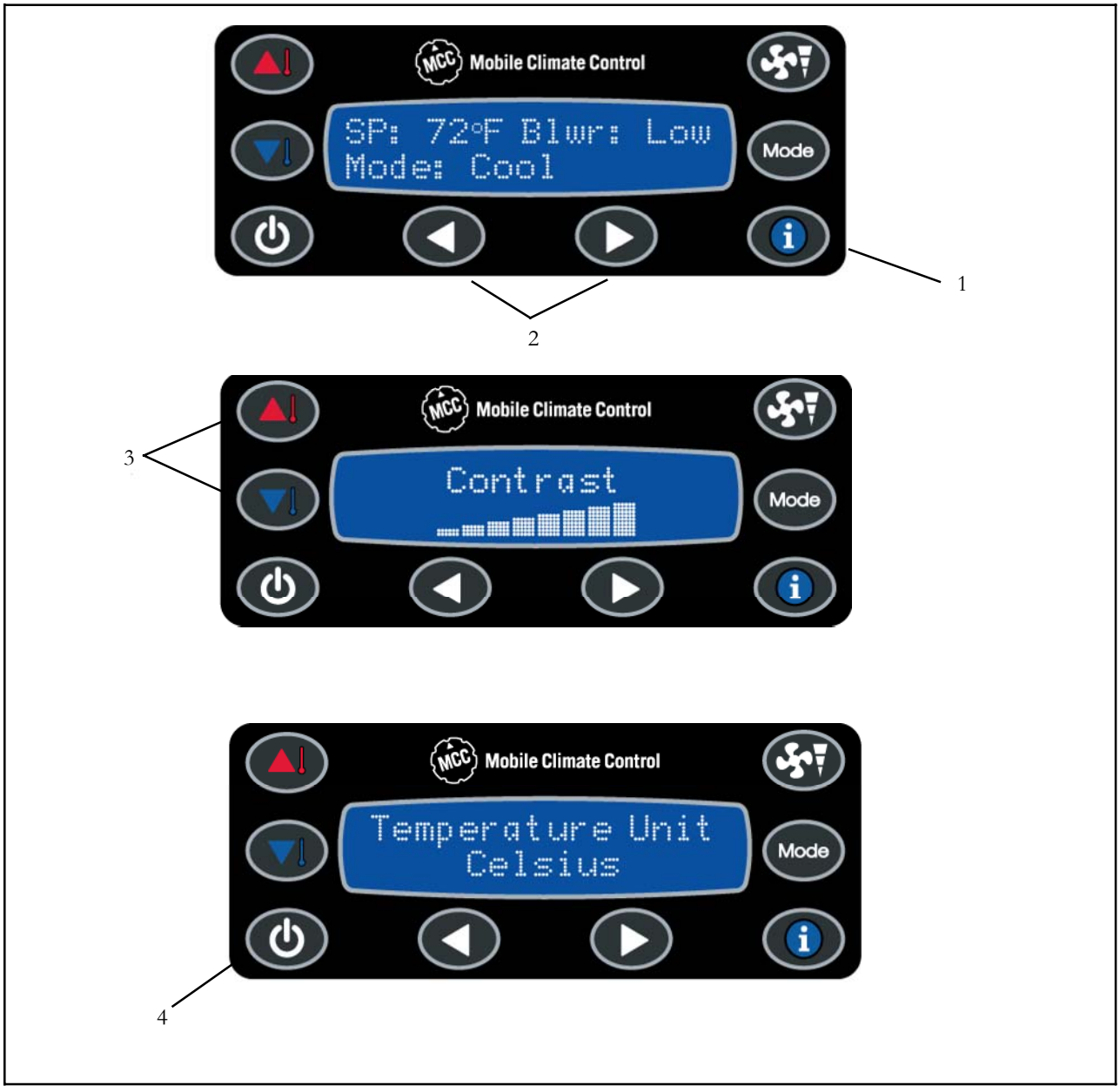


Figure 2-3 HVAC DISPLAY SETTINGS

1 Information/Display Settings
2. Cursors
3. Temperature Control Settings
4 On/Off

2.4.7 HVAC Diagnostic Menu

The diagnostic menu will allow user to view the system parameters of temperature sensors, pressure transducers and HVAC component status. To enter the diagnostic menu:

For Component status: 0=OFF and 1=ON

a. Press the "Settings" button (Item 5 in Figure 2-1).

b To scroll through the diagnostic screens, use the "Temperature set point" buttons (Items 2 in Figure 2-1).

c To exit the Diagnostic Menu, press the "Power" button (Item 1 in Figure 2-1).

Examples of the available screens can be seen in Figure 2-5

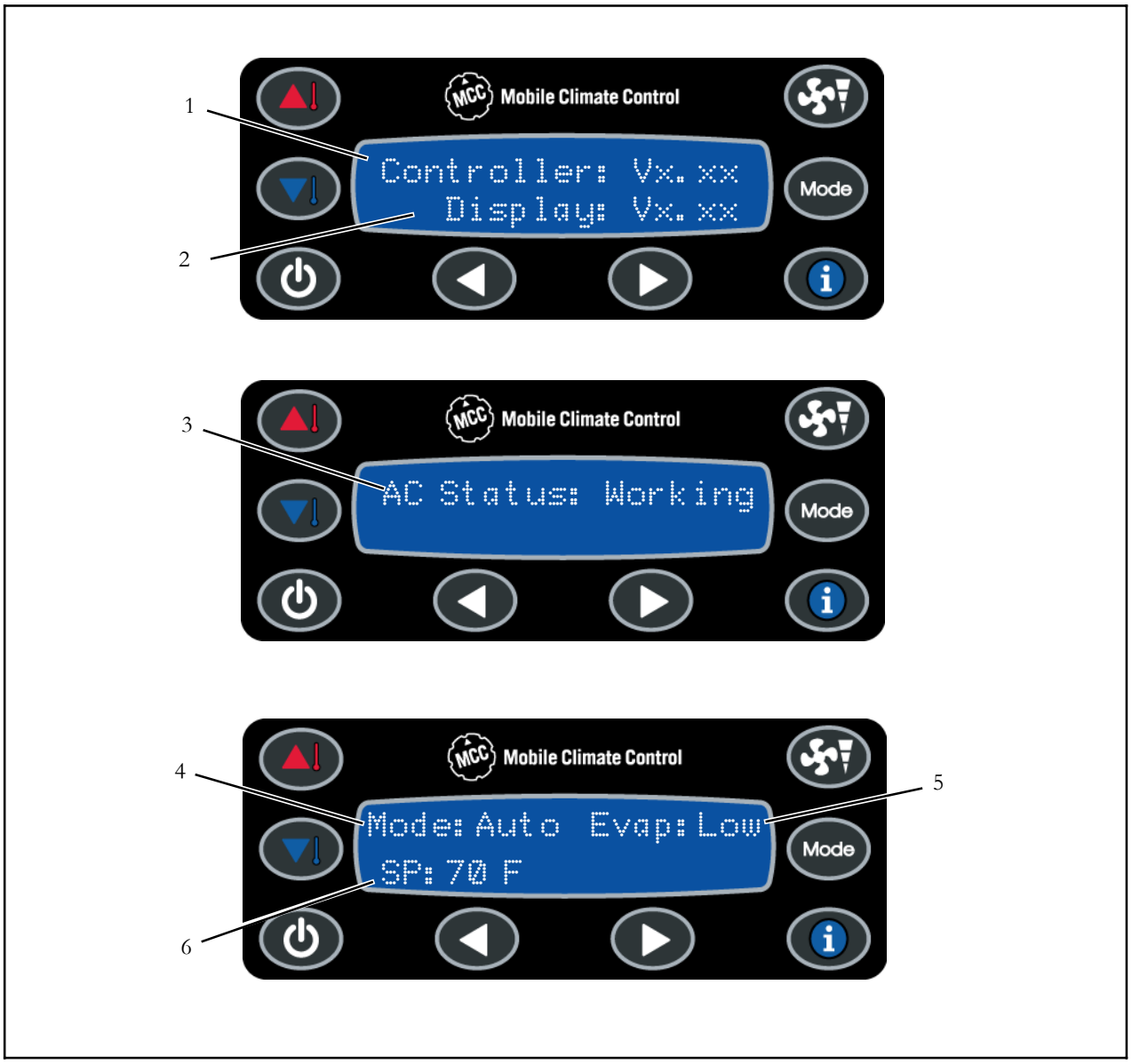


Figure 2-4 HVAC DIAGNOSTIC MENU

1. Controller Software Version
2. Display Software Version
3 AC Status (On/Off)
4. AC Mode Selection
5. Evaporator Blower Speed Status
6. Setpoint Temperature

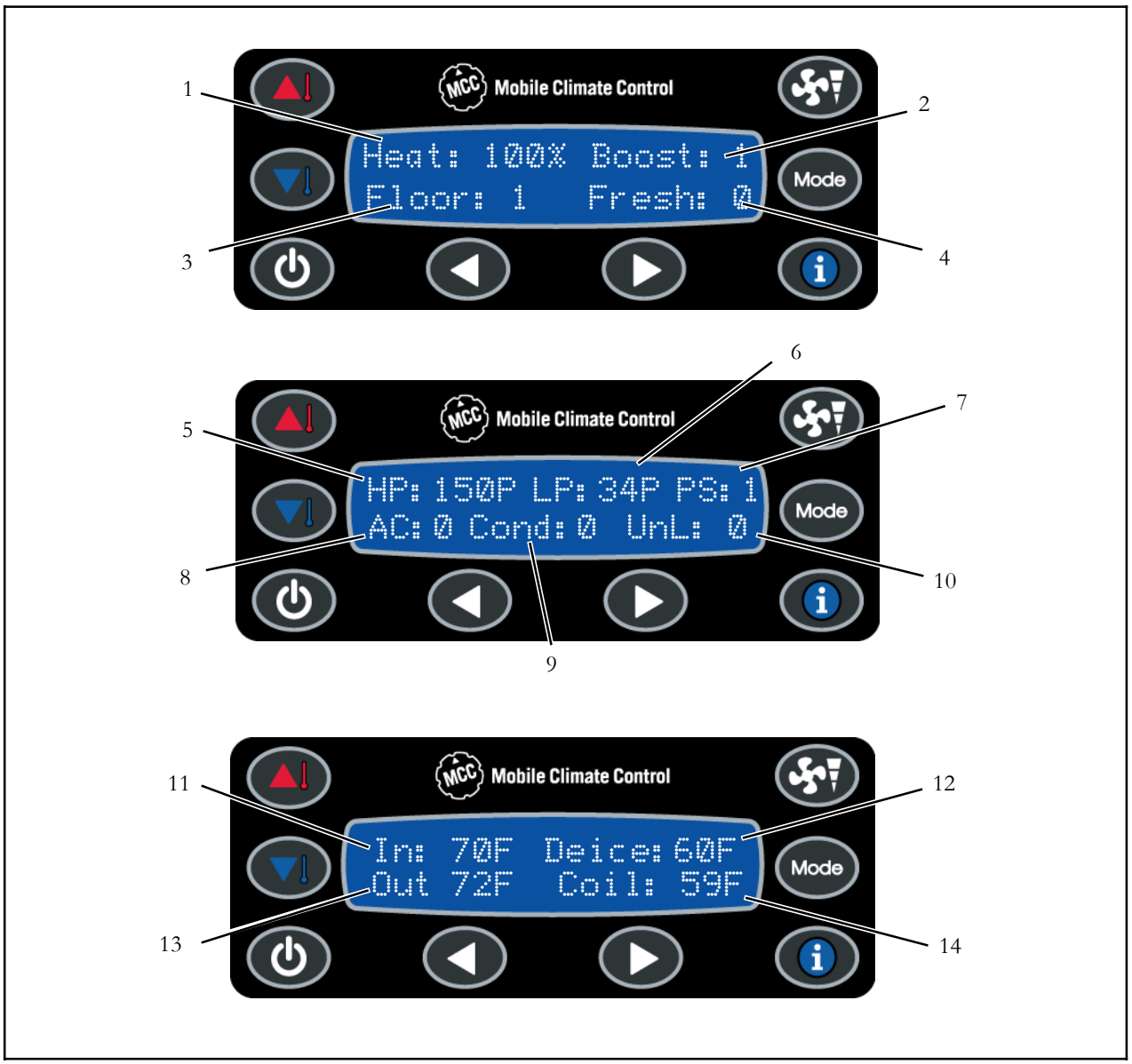


Figure 2-5 HVAC DIAGNOSTIC MENU

1. Heat Valve Percentage
2. Boost Pump Status
3 Floor Blower Status
4. Fresh Air Intake Status
5 High Pressure Transducer
6. Low Pressure Transducer
7. Pressure Switch Status
8. Compressor Status
9 Condenser Status
10 Unloader Status
11 Inside Air Sensor Status
12 De-ice Sensor
13 Outside Air Sensor
14 After Coil Sensor

2.4.8 HVAC Alarm Description

The HVAC Controller will notify user in the event there is a problem or interruption in system control. The broadcasted alarms are reported to the driver display and A/C Fail Light (if equipped). A description of alarms and controller response are as follows.

a. High or Low pressure Condition

In the event a high pressure or low pressure condition occurs, the compressor and liquid line solenoid will be disabled for a minimum of one minute. High or Low pressure can be triggered by either a pressure transducer or physical pressure switch.

1) For high pressure condition, the condenser and evaporator fan circuits remain energized to bring the system pressure down. After the one minute compressor "Off" cycle, if pressures return to operational limits, the compressor circuit will re-energize.

If the high pressure condition occurs more than four (4) times within a 20 minute period, the compressor, LLS and condenser circuits will be locked out and an alarm will be broadcast to the Driver display and A/C Fail light. Driver's display examples are shown in Figure 2-6.

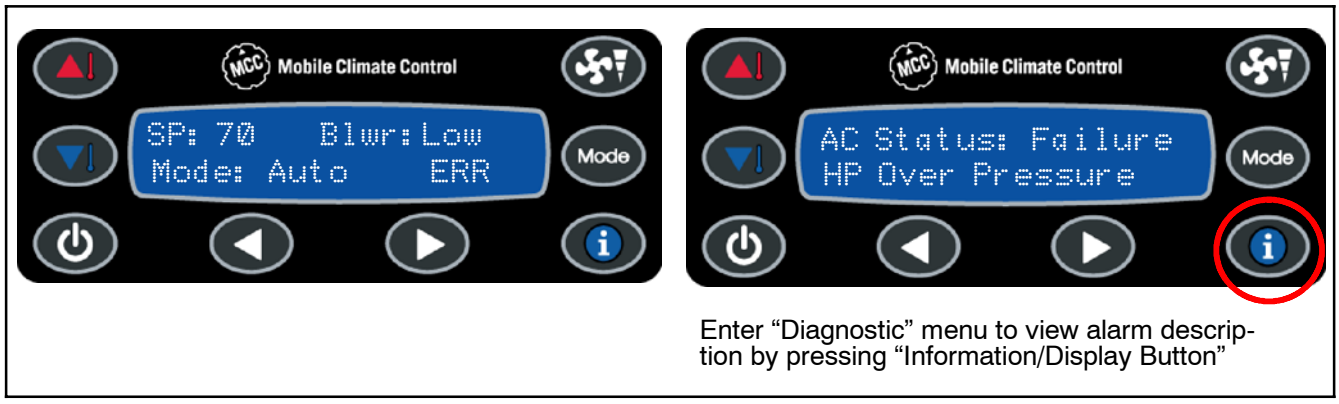


Figure 2-6 High Pressure Alarm

2) For low pressure condition, the condenser and evaporator fan circuits remain energized. After the one minute compressor "Off" cycle, if pressures return to operational limits, the compressor circuit will re-energize.

If the low pressure condition occurs more than four (4) times within a 20 minute period, the compressor, LLS and condenser circuit will be locked out and an alarm will be broadcast to the Driver display and A/C Fail light. Driver's display examples are shown in Figure 2-7.

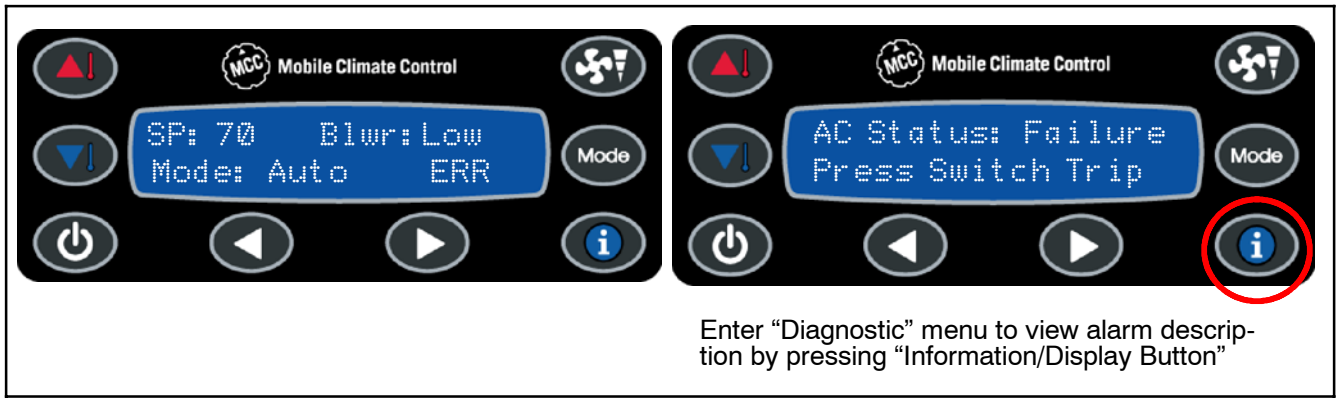


Figure 2-7 Low Pressure Alarm

b. High or Low Transducer Failure

In the event a high pressure or low pressure transducer fails, the compressor, liquid line solenoid and condenser fans will remain energized, and the compressor will unload to two (2) cylinder operation to allow the system to provide 50% capacity until condition can be corrected. The A/C Fail light will alert Driver of the problem. High and low pressure switches will disable the cooling circuit in the event system pressures reach an unsafe condition.

Error code and A/C Fail light will remain on until system power is cycled, even if pressure transducer signal is re-established. Examples of "Drivers Display" screens associated with transducer problems/failures can be seen in Figure 2-8.

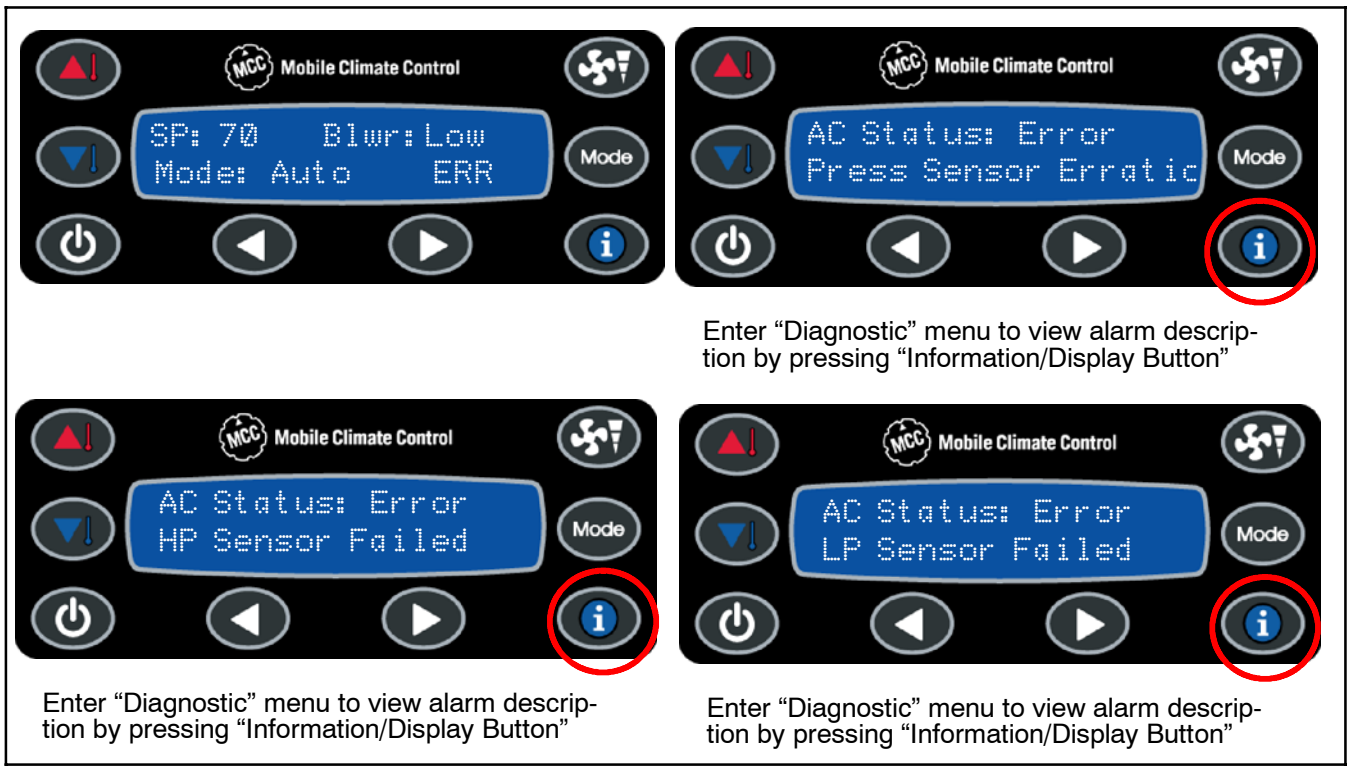
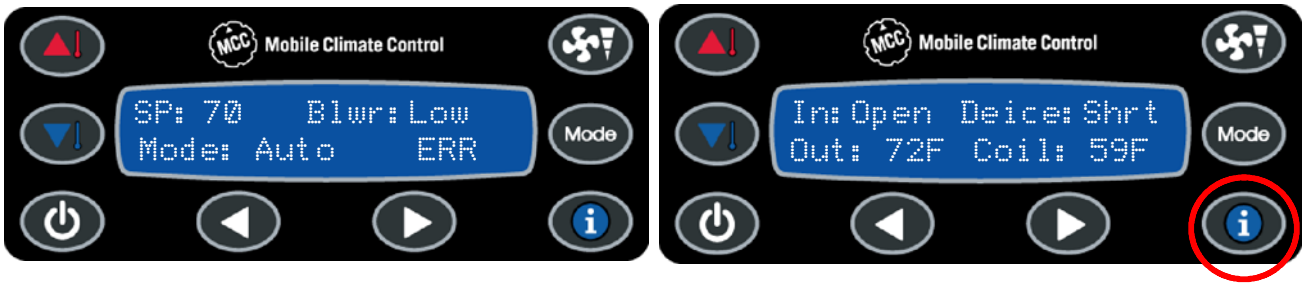


Figure 2-8 Transducer Alarms

c. Return Air or Ambient Air sensor failure

In the event an out of range (Open/Short) condition occurs with the Return Air, Outside Air, Deice, or Coil sensors, the system will be unable to recognize these parameters for proper operation of A/C system. If one of these conditions occurs, the Controller will trigger an ERRor code on the display to alert Driver of this condition.



Enter “Diagnostic” menu to view alarm description by pressing “Information/Display Button”

Figure 2-9 Sensor Alarms

2.5 MCC Coolview

MCC Coolview is designed to assist in monitoring, diagnosing and troubleshooting of the vehicle HVAC system via a communication cable between the controller and laptop/remote computer.

2.5.1 Starting the MCC Coolview Application

a. Connect USB end of USB to RS-485 converter (MCC P/N 35-0735) to USB port of computer.

b. Connect RS-485 end of USB to RS-485 converter to controller's RS-485 communication cable.

c. Connect RS-485 end of USB to RS-485 converter to controller's RS-485 communication cable.

d. Open Coolview software on computer.

e. Choose communication port associated with communication cable by selecting the drop down list under "Available Port" section in Coolview screen (Item 1 in Figure 2-10).

f. Click "Start" button (Item 2 in Figure 2-10) to begin communication between controller and Coolview. If a communication error is displayed in the "Error List" screen of Coolview, verify the correct USB Port has been chosen.

g. Once communication has been established, the communication indicator lights on both Coolview screen, as well as the RS-485 coverter should flash. Software version of controller and display will be shown on Coolview screen (Item 3 in Figure 2-10).

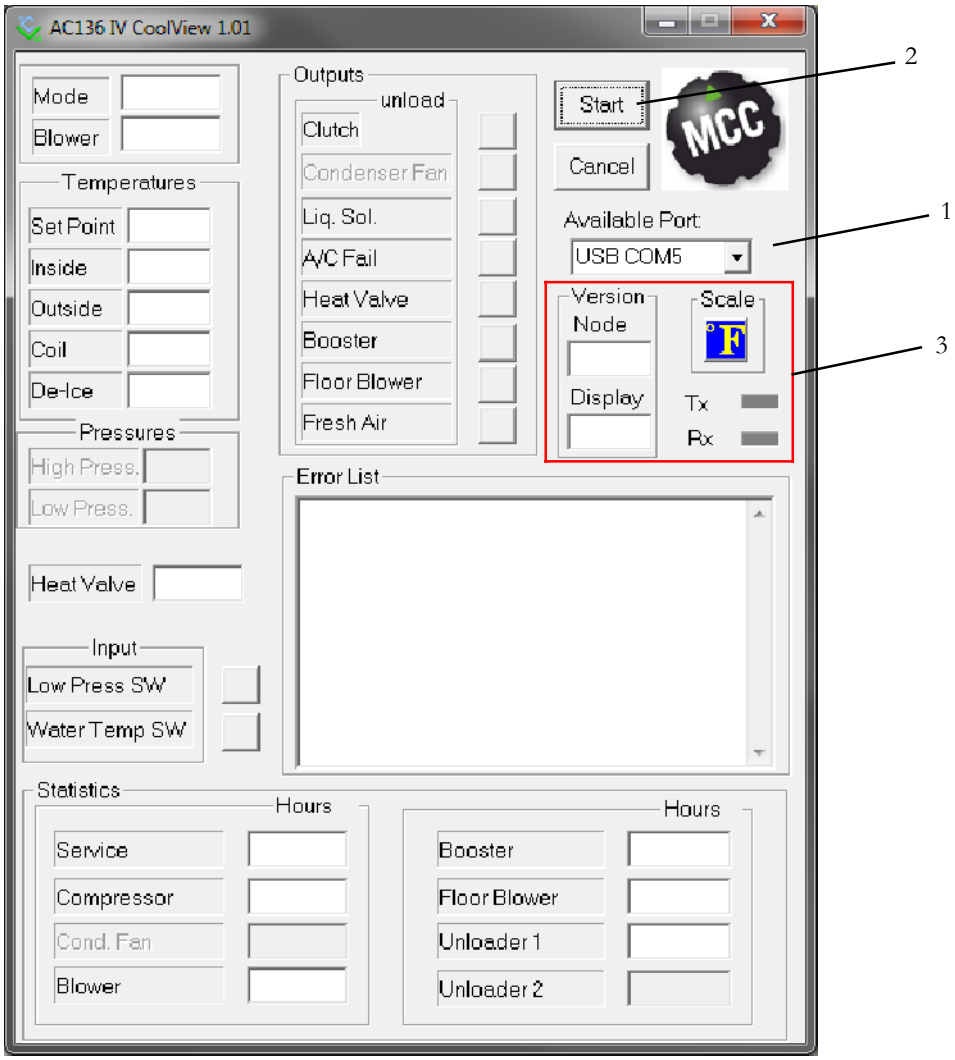


Figure 2-10 MCC Coolview

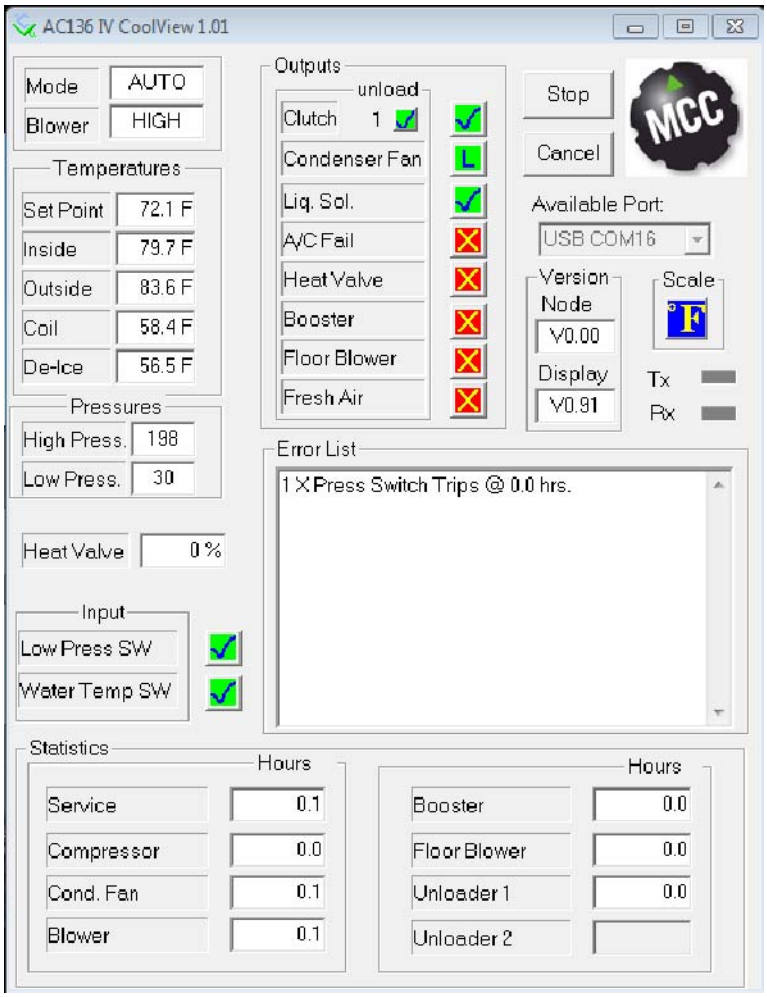


Figure 2-11 MCC Coolview (Example Screenshot)

2.5.2 Coolview Screen Layout

a. **Inputs and Mode Indicator**- Coolview displays "real time" status of the items shown in Figure 2-12.

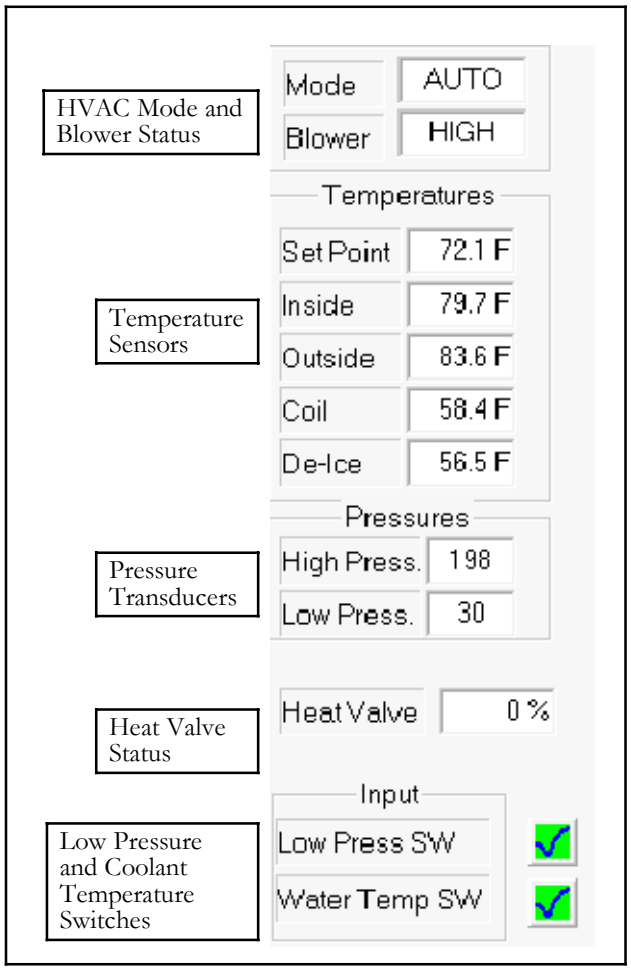


Figure 2-12 MCC Coolview Inputs and Mode

b. **Outputs**- Coolview displays "real time" status of the items shown in Figure 2-13. Indicator boxes will turn green when outputs are switched on, and red when switched off.

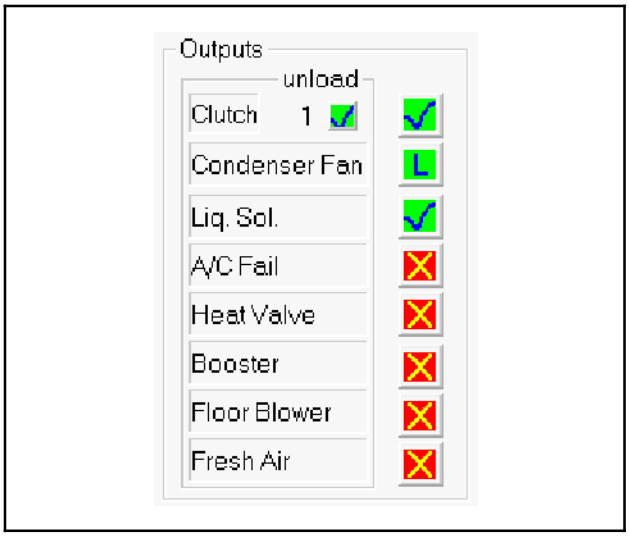


Figure 2-13 MCC Coolview Inputs and Mode

c. **Error List**- Coolview displays input/output, communication and compressor errors that are stored in controller's memory

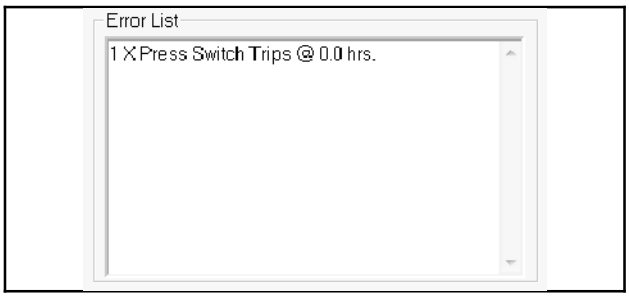


Figure 2-14 MCC Coolview Error List

d. **Statistics**- Coolview displays the run hours of the following items shown in Figure 2-14.

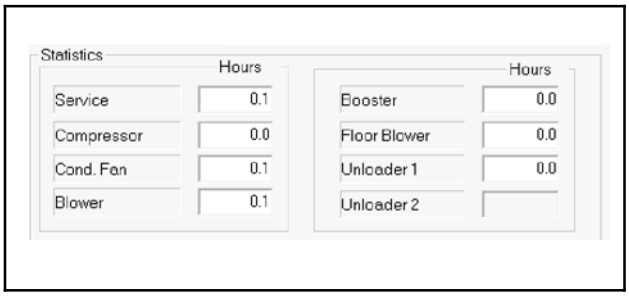


Figure 2-15 MCC Coolview Statistics

SECTION 3

TROUBLESHOOTING

Table 3-1 General System Troubleshooting Procedures

INDICATION - TROUBLE	POSSIBLE CAUSES
3.1 System Will Not Cool	
Compressor will not run	Drive-Belt loose or defective Clutch coil defective Clutch malfunction Compressor malfunction
Electrical malfunction	Coach power source defective Circuit Breaker/safety device open
3.2 System Runs But Has Insufficient Cooling	
Compressor	Drive-Belt loose or defective Compressor valves defective
Refrigeration system	Abnormal pressures No or restricted evaporator air flow Expansion valve malfunction Restricted refrigerant flow Low refrigerant charge Service valves partially closed Safety device open
Restricted air flow	No evaporator air flow or restriction
Heating system	Heat valve stuck open
3.3 Abnormal Pressures	
High discharge pressure	Refrigerant overcharge Noncondensable in system Condenser motor failure Condenser coil dirty
Low discharge pressure	Compressor valve(s) worn or broken Low refrigerant charge
High suction pressure	Compressor valve(s) worn or broken
Low suction pressure	Suction service valve partially closed Filter-drier inlet valve partially closed Filter-drier partially plugged Low refrigerant charge Expansion valve malfunction Restricted air flow
Suction and discharge pressures tend to equalize when system is operating	Compressor valve defective
3.4 Abnormal Noise Or Vibrations	
Compressor	Loose mounting hardware Worn bearings Worn or broken valves Liquid slugging Insufficient oil Clutch loose, rubbing or is defective Drive-Belt cracked, worn or loose Dirt or debris on fan blades

Table 3-1 General System Troubleshooting Procedures - Continued

INDICATION - TROUBLE	POSSIBLE CAUSES
3.4 Abnormal Noise Or Vibrations - Continued	
Condenser or evaporator fans	Loose mounting hardware Defective bearings Blade interference Blade missing or broken
3.5 No Evaporator Air Flow Or Restricted Air Flow	
Air flow through coil blocked	Coil frosted over Dirty coil Dirty filter
No or partial evaporator air flow	Motor(s) defective Motor brushes defective Evaporator fan loose or defective Fan damaged Return air filter dirty Icing of coil Fan relay(s) defective Safety device open Fan rotation incorrect
3.6 Expansion Valve Malfunction	
Low suction pressure with high superheat	Low refrigerant charge Wax, oil or dirt plugging valve orifice Ice formation at valve seat Power assembly failure Loss of bulb charge Broken capillary tube
Low superheat and liquid slugging in the compressor	Bulb is loose or not installed. Superheat setting too low Ice or other foreign material holding valve open
Side to side temperature difference (Warm Coil)	Wax, oil or dirt plugging valve orifice Ice formation at valve seat Power assembly failure Loss of bulb charge Broken capillary
3.7 Heating Malfunction	
Insufficient heating	Dirty or plugged heater core Coolant solenoid valve(s) malfunctioning or plugged Low coolant level Strainer(s) plugged Hand valve(s) closed Water pumps defective Auxiliary Heater malfunctioning.
No Heating	Coolant solenoid valve(s) malfunctioning or plugged Controller malfunction Pump(s) malfunctioning Safety device open
Continuous Heating	Coolant solenoid valve stuck open

SECTION 4

SERVICE

WARNING

Be sure to observe warnings listed in the safety summary in the front of this manual before performing maintenance on the hvac system.

WARNING

Read the entire procedure before beginning work. Park the coach on a level surface, with parking brake applied. Turn main electrical disconnect switch to the off position.

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws.

4.1 MAINTENANCE SCHEDULE

SYSTEM		SYSTEM
ON	OFF	
a. Daily Maintenance		
X		Pre-trip Inspection - after starting
	X	Check tension and condition of V-belt
b. Weekly Inspection		
	X	Perform daily inspection
	X	Check condenser, evaporator coils and air filters for cleanliness
	X	Check refrigerant hoses and compressor shaft seal for leaks
X		Feel filter-drier for excessive temperature drop across drier
c. Monthly Inspection and Maintenance		
	X	Perform weekly inspection and maintenance
	X	Clean evaporator drain pans and hoses
	X	Check wire harnesses for chafing and loose terminals
	X	Check fan motor bearings
	X	Check compressor mounting bolts for tightness
	X	Check fan motor brushes

4.2 OPENING TOP COVER (EVAPORATORS)

To open either side of the evaporator assembly cover do the following: (See Figure 4-1.)

a. Twist all 4 of the 1/4 Turn cam locks counter-clockwise.

b. Grasp the cover section under the bottom edge and lift up.

c. Locate metal rod (prop) secured behind the evaporator motor assemblies.

d. Lift end of metal rod (prop) and place in plate on cover assembly.

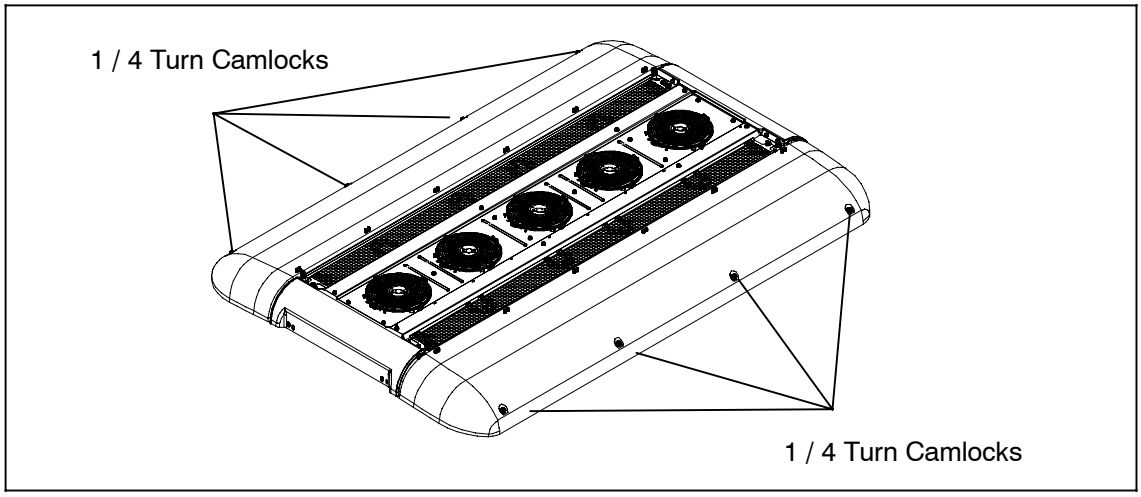


Figure 4-1 Opening Top Cover (Evaporator)

4.3 REMOVING TOP COVER (CONDENSER)

The condenser cover consist of the condenser fan deck. To remove the fan deck from the condenser assembly do the following: (See Figure 4-2.)

a. Remove the air intake grills to provide easier access (Item 1 in Figure 4-2)

b. Remove the (20) 6MM hex head screws (Item 2 in Figure 4-2) securing fan deck. With two technicians, slowly raise the condenser fan deck and disconnect the fans from the electrical harness.

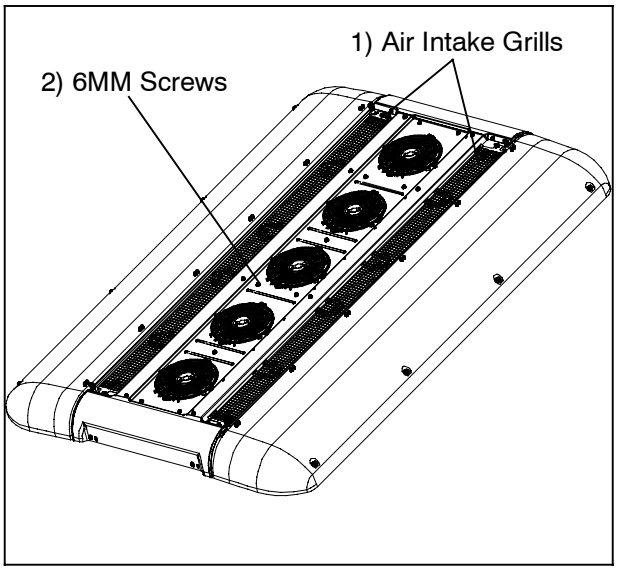


Figure 4-2 Condenser Cover Removal

4.4 SUCTION AND DISCHARGE SERVICE VALVES

The suction and discharge service valves (Figure 4-3) are provided with a double seat and a gauge port, which allows servicing of the compressor and refrigerant lines.

Turning the valve stem counterclockwise (all the way out) will *backseat* the valve to open the line to the compressor and close off the gauge port. In normal operation, the valve is backseated to allow full flow through the valve. The valve should always be backseated before removing the gauge port cap.

Turning the valve stem clockwise (all the way forward) will *frontseat* the valve to isolate the compressor line and open the gauge port.

To measure suction or discharge pressure, midseat the valve by opening the valve clockwise 1/4 to 1/2 turn. With the valve stem midway between frontseated and backseated positions, the suction or discharge gauge port is open to both the compressor and the line.

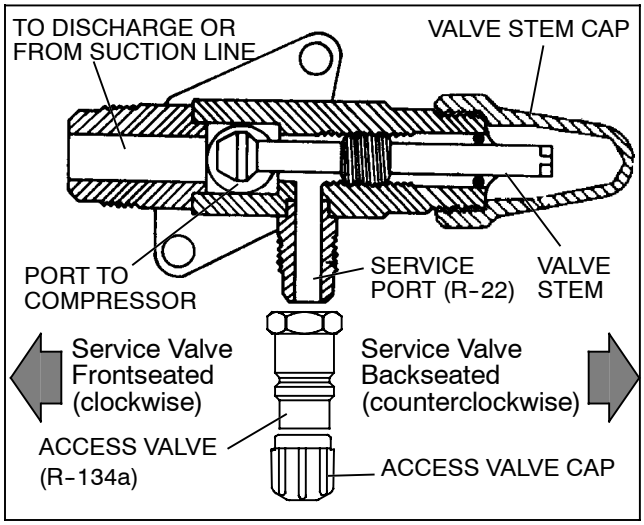


Figure 4-3 Suction or Discharge Service Valve

4.4.1 Installing R-134a Manifold Guage Set

A R-134a manifold gauge/hose set with self-sealing hoses is required for service of models covered within this manual. To perform service using the manifold gauge/hose set, do the following:

a. Preparing Manifold Gauge/Hose Set For Use

1. If the manifold gauge/hose set is new or was exposed to the atmosphere it will need to be evacuated to remove contaminants and air as follows:
2. Back seat (turn counterclockwise) both field service couplers (see Figure 4-4) and midseat both hand valves.
3. Connect the yellow hose to a vacuum pump and an R-134a cylinder.
4. Evacuate to 10 inches of vacuum and then charge with R-134a to a slightly positive pressure of 1.0 psig.
5. Front seat both manifold gauge set hand valves and disconnect from cylinder. The gauge set is now ready for use.

b. Connecting Manifold Gauge/Hose Set

To connect the manifold gauge/hose set for reading pressures, do the following:

1. Remove service valve stem cap and check to make sure it is backseated. Remove access valve cap.
2. Connect the field service coupler (see Figure 4-4) to the access valve.
3. Turn the field service coupling knob clockwise, which will open the system to the gauge set.
4. Read system pressures.
5. Repeat the procedure to connect the other side of the gauge set.

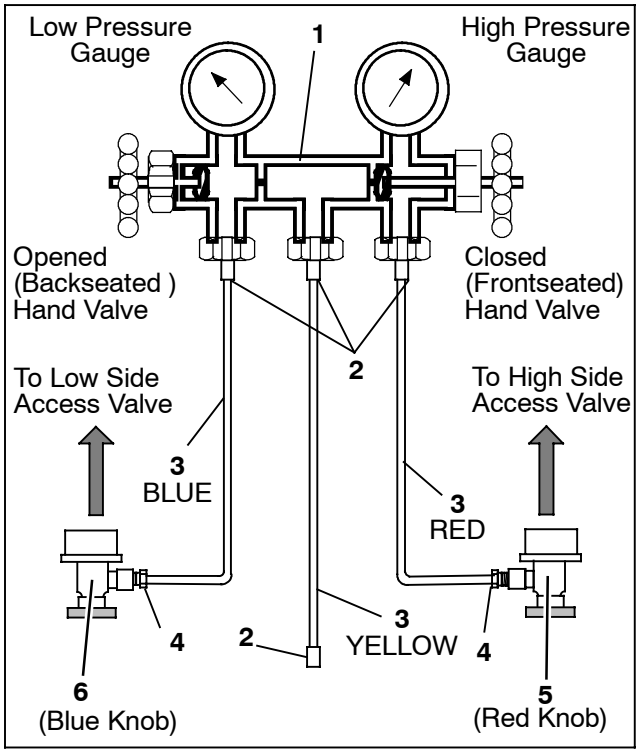
c. Removing the Manifold Gauge Set

1. While the compressor is still ON, backseat the high side service valve.
2. Midseat both hand valves on the manifold gauge set and allow the pressure in the manifold gauge set to be drawn down to low side pressure. This returns any liquid that may be in the high side hose to the system.

⚠ CAUTION

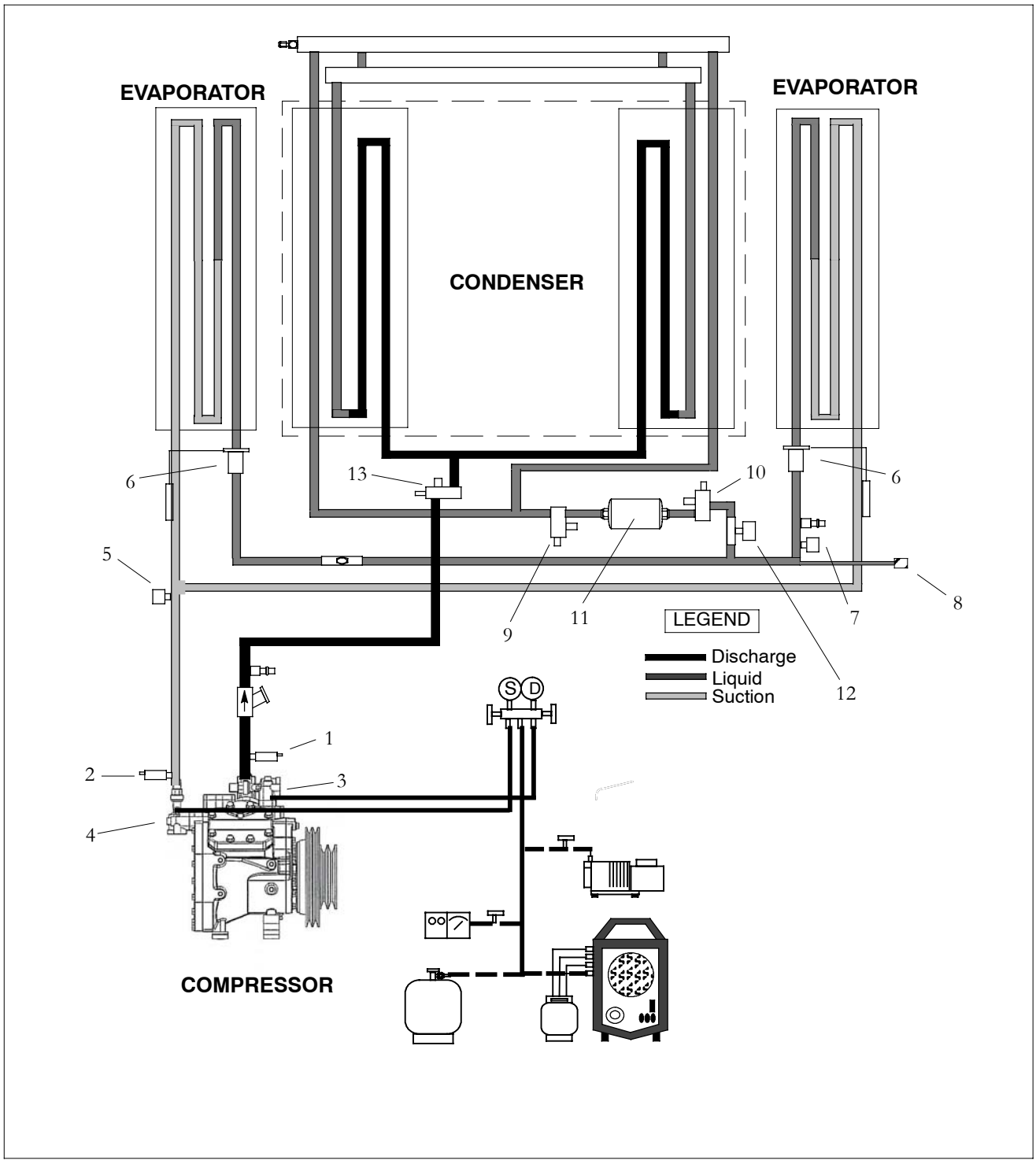
To prevent trapping liquid refrigerant in the manifold gauge set be sure set is brought to suction pressure before disconnecting.

3. Backseat the low side service valve. Backseat both field service couplers and frontseat both manifold set hand valves. Remove the couplers from the access valves.
4. Install both service valve stem caps and access valve caps (finger-tight only).



1. Manifold Gauge Set
2. Hose Fitting (0.5-16 Acme)
3. Refrigeration and/or Evacuation Hose . (SAE J2196/R-134a)
4. Hose Fitting w/O-ring (M14 x 1.5)
5. High Side Field Service Coupler
6. Low Side Field Service Coupler

Figure 4-4 Manifold Gauge Set (R-134a)



1. High Pressure Switch
2. Low Pressure Switch
3. Discharge Service Valve
4. Suction Service Valve
5. Pressure Transducer (SPT)
6. Thermal Expansion Valve (TXV)
7. Pressure Transducer (DPT)
8. Auxiliary Liquid Line
9. Filter Drier Service Valve (Inlet)
10. Filter Drier Service Valve (Outlet)
11. Filter Drier
12. Liquid Line Solenoid Valve
13. Charge Isolation Valve

Figure 4-5 Low Side Pump Down Connections

4.4.2 SYSTEM PUMP DOWN FOR LOW SIDE REPAIR

To service or replace the thermostatic expansion valves, filter drier, suction line or liquid line solenoid valve. pump the refrigerant to the condenser and receiver as follows:

a. Install manifold gauge set to compressor suction & discharge valve service ports (items 3 & 4). Refer to Figure 4-5.

b. Frontseat the filter-drier inlet service valve (9) by turning clockwise. Disconnect suction pressure transducer (6) electrical connector, install a jumper on the compressor mounted low pressure switch (2) (electrical connector on harness).

c. Start the system and run in cooling. Stop the unit when suction reaches 0 psig (0 Bar).

d. **Disconnect the compressor clutch wire to disable clutch operation.** Frontseat the compressor discharge service valve (3) to trap refrigerant in the high side of the system between the compressor discharge service valve and the filter-drier inlet valve. Wait 5 minutes to verify that system remains at approximately 0 psig (0 Bar). If system pressure rises above 0 psig (0 Bar), open the compressor discharge service valve, re-connect the compressor clutch wiring and repeat steps c and d until the system remains at 0 psig (0 Bar).

e. Service or replace necessary components.

f. Leak check connections and replace filter-drier (11). Refer to paragraph 4.5.

g. Energize the Liquid Line Solenoid Valve (LSV) (12) using an external power source (24 VDC).

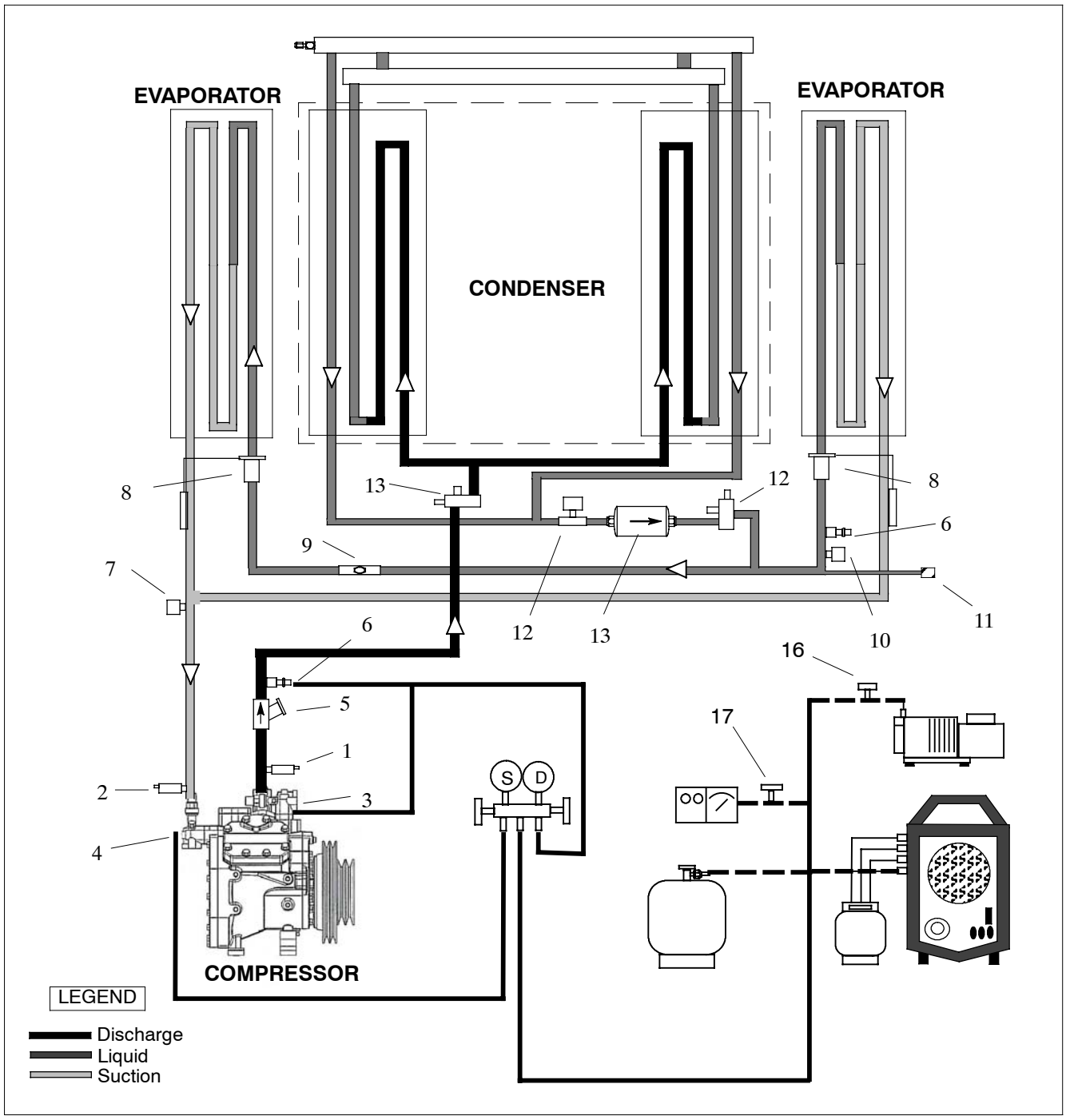
h. Using refrigerant hoses designed for vacuum service, evacuate and dehydrate the low side of the system by connecting a vacuum pump to the center hose connection of manifold gauge set. Verify the compressor suction service valve is mid-seated. Open (backseat) the manifold suction and discharge service valves. Evacuate system to 500 microns. Close off vacuum pump valve and stop pump. Wait 5 minutes to verify that vacuum holds. If vacuum holds below 1000 microns, isolate the micron gauge from system to prevent exposure to pressure.

i. Open compressor suction and discharge service valves and inlet service valve of filter drier.

j. Disconnect external 24 VDC to liquid solenoid valve (12).

k. Re-connect compressor clutch, low pressure switch and low pressure transducer electrical connectors.

l. Run and check refrigerant level. Refer to paragraph 4.7.



1. High Pressure Switch
2. Low Pressure Switch
3. Discharge Service Valve
4. Suction Service Valve
5. Discharge Check Valve
6. Service Port, High Side)
7. Pressure Transducer (SPT)
8. Thermal Expansion Valve (TXV)
9. Liquid Line Sight Glass
10. Pressure Transducer (DPT)
11. Auxiliary Liquid Line
12. Filter Drier Outlet Service Valve
13. Filter Drier
14. Liquid Line Solenoid Valve
15. Charge Isolation Valve
16 Vacuum Pump Isolation Valve
17 Micron Gauge Isolation Valve

Figure 4-6 Service Connections

4.4.3. Removing Entire System Charge

NOTES

It is recommended that the Filter/Drier be replaced after opening the refrigeration system for any repair.

⚠ WARNING

Use of an electro-magnetic valve as a means of positive shutoff for service is not recommended or good service practice.

⚠ CAUTION

For Safety, the bus and A/C system should be OFF, and lockout/tag out procedures should be implemented.

To remove the entire refrigerant charge for system component repair, do the following:

a. Connect a manifold gauge set to the system as shown in Figure 4-6.

b. Connect a reclaimer to the center manifold gauge set connection.

c. Recover refrigerant in accordance with reclaimer manufacturers instructions.

d. After repair is completed, a leak check should be performed prior to system evacuation/dehydration and charging. Refer to paragraph 4.5.

4.5 REFRIGERANT LEAK CHECK

A refrigerant leak check should always be performed after the system has been opened to replace or repair a component. To check for leaks in the refrigeration system, perform the following procedure:

NOTE

It is emphasized that only the correct refrigerant should be used to pressurize the system. Use of any other refrigerant will contaminate the system, and require additional evacuation.

a. Ensure the service valves are open.

b. If system is without refrigerant, charge system with refrigerant vapor to build up pressure to approximately 30 PSIG (R-134a).

c. Add sufficient nitrogen to raise system pressure to 150 to 200 psig (10.21 to 13.61 bar).

d. Check for leaks. The recommended procedure for finding leaks in a system is with an electronic leak detector. Testing joints with soap suds is satisfactory and may be necessary under conditions when an electronic leak detector will not function correctly.

e. Remove test gas and replace filter-drier.

f. Evacuate and dehydrate the system. Refer to paragraph 4.6.

g. Charge the unit. Refer to Section 4.7.

4.6 EVACUATION AND DEHYDRATION

4.6.1 General

The presence of moisture in a refrigeration system can have many undesirable effects. The most common are copper plating, acid sludge formation, "freezing-up" of metering devices by free water, and formation of acids, resulting in metal corrosion. A triple evacuation (Refer to paragraph 4.6.4) should be performed after a major system repair (compressor, evaporator, or condenser replacement). A one time evacuation (Refer to paragraph 4.6.3) should take place after a minor system repair (replacement of a solenoid valve or a filter drier).

4.6.2 Preparation

NOTE

Using a compound gauge for determination of vacuum level is not recommended because of its inherent inaccuracy.

a. Evacuate and dehydrate only after pressure leak test. Refer to paragraph 4.5.

b. Essential tools to properly evacuate and dehydrate any system include a good two stage vacuum pump with a minimum of 6 cfm (10.2 m^3/hr) volume displacement.

c. Keep the ambient temperature above 60°F (15.6°C) to speed evaporation of moisture. If ambient temperature is lower than 60°F (15.6°C), ice may form before moisture removal is complete.

4.6.3 Procedure for Evacuation and Dehydrating System (One Time Evacuation)

a. Remove refrigerant using a refrigerant recovery system. Refer to paragraph 4.4.3.

b. The recommended method is connecting lines (refrigerant hoses designed for vacuum service) as shown in Figure 4-6.

c. Start vacuum pump. Slowly open valves halfway and then open vacuum gauge valve. (Items 16 & 17).

d. Evacuate unit until vacuum gauge indicates 500 microns Hg vacuum.

e. Close off pump valve (Item16), and stop pump. Wait five minutes to see if vacuum holds below 1000 microns.

f. Close vacuum gauge valve (Item17) to prevent damage to vacuum gauge. Vacuum gauges should never be exposed to positive pressure to avoid damage or affect the vacuum gauge calibration.

g. Charge system. Refer to paragraph 4.7.3.

4.6.4 Procedure for Evacuation and Dehydrating System (Triple Evacuation)

a. Remove refrigerant using a refrigerant recovery system. Refer to paragraph 4.4.3.

b. The recommended method is connecting lines (refrigerant hoses designed for vacuum service) as shown in Figure 4-6.

c. Start vacuum pump. Slowly open valves halfway and then open vacuum gauge valve.

d. Evacuate unit until vacuum gauge indicates 2000 microns Hg vacuum. Close gauge valve, vacuum pump valve, and stop vacuum pump.

e. Break the vacuum with nitrogen. Raise system pressure to approximately 2 psig.

f. Purge the nitrogen from the system.

g. Repeat steps c. thru f. one time.

h. Start vacuum pump and open all valves. Dehydrate unit to 500 microns Hg vacuum.

i. Close off pump valve (Item 16 in Figure 4-6), and stop pump. Wait five minutes to see if vacuum holds.

j. Close vacuum gauge valve (Item17) to prevent damage to vacuum gauge. Vacuum gauges should never be exposed to positive pressure to avoid damage or affect the vacuum gauge calibration.

k. Charge system. Refer to paragraph 4.7.3.

4.7 CHECKING AND ADDING REFRIGERANT TO SYSTEM

4.7.1 Checking Refrigerant Charge By Pressures

For the purpose of checking refrigerant pressures to determine if the approximate charge level is correct, the following conditions and method can be used:

a. Install Manifold Gauge set as described in Paragraph 4.4.1

b. Coach engine operating at high idle.

c. Unit operating fully loaded in cool mode for 15 minutes.

d. Compressor discharge (head) pressure to 150 PSIG (R-134a). (It may be necessary to heat the coach to provide sufficient heat load).

e. Under the above conditions, the "Rule of Thumb" method can be used as a reference for proper charge level. See Figure 4-7.

"Rule of Thumb"
Air Conditioning System Pressures

For Discharge Pressure

Condenser Inlet Temperature	_____	_ F
Plus (Constant)	40	_ F
Equals	_____	_ F
P/T Chart Temperature	_____	PSIG

For Suction Pressure

Evap. Return Air Temperature	_____	_ F
Minus (Constant)	30	_ F
Equals	_____	_ F
P/T Chart Temperature	_____	PSIG

Figure 4-7 Rule of Thumb

4.7.2 Checking Refrigerant Charge By Manifold Sight Glasses

For the purpose of checking refrigerant using sight glasses (provided in the condenser integrated receiver), to determine if the approximate charge level is correct, the following conditions and method can be used:

a. Unit operating fully loaded in cool mode for 15 minutes.

b. Compressor discharge (head) pressure to 150 PSIG (R-134a). (It may be necessary to heat the coach to provide sufficient heat load).

c. Under the above conditions, the system is charged properly when liquid refrigerant is visible in the

lower sight glass located on condenser header tube, with no refrigerant visible in the upper sight glass.

4.7.3 Adding Full Charge

a. Install manifold gauge set at the compressor suction service valve and discharge service port. See figure Figure 4-6.

b. Leak check the system. Refer to paragraph 4.5.

c. Evacuate and dehydrate system. Refer to paragraph 4.6.

NOTE

Liquid charging can be done at the discharge service port (See Figure 4-6, Item 6).

d. Place appropriate refrigerant cylinder on scales. Prepare to charge liquid refrigerant into the system by connecting the charging hose from refrigerant cylinder to the discharge service port (Item 6).

e. Note weight of refrigerant and cylinder.

f. Open cylinder valve and charge system.

g. When correct charge has been added (refer to paragraph 1.3), close cylinder valve.

h. Check charge level in accordance with the procedures of paragraph 4.7.1.

4.7.4 Adding Partial Charge

NOTES

The Y50-13606 Rooftop A/C unit is not equipped with a receiver tank, however the condenser coil assembly is designed with oversized headers that provide a receiver like function for refrigerant storage. The oversized headers are also equipped with two sight glasses, i.e., upper and lower, to gauge the amount of refrigerant charge in the system, as well as provide moisture indication. These sight glasses can be used to insure the system is properly charged in accordance with the charge procedure noted elsewhere in this publication.

a. Check charge level in accordance with the procedures of paragraph 4.7.2.

4.8 CHECKING SYSTEM FOR NON-CONDENSIBLES

To check for noncondensibles, proceed as follows:

a. Stabilize system to equalize pressure between the suction and discharge side of the system.

b. Check temperature at the condenser and receiver.

c. Check pressure at the filter-drier inlet service valve.

d. Check saturation pressure as it corresponds to the condenser/receiver temperature using the Temperature-Pressure Chart, Table 4-3.

e. If gauge reading is 3 psig (0.20 bar) or more than the saturation pressure in step d, noncondensibles are present.

f. Remove refrigerant using a refrigerant recovery system.

g. Evacuate and dehydrate the system. Refer to paragraph 4.6.4.

h. Charge the unit. Refer to paragraph 4.7.3.

4.9 CHECKING AND REPLACING HIGH OR LOW PRESSURE SWITCH

⚠ WARNING

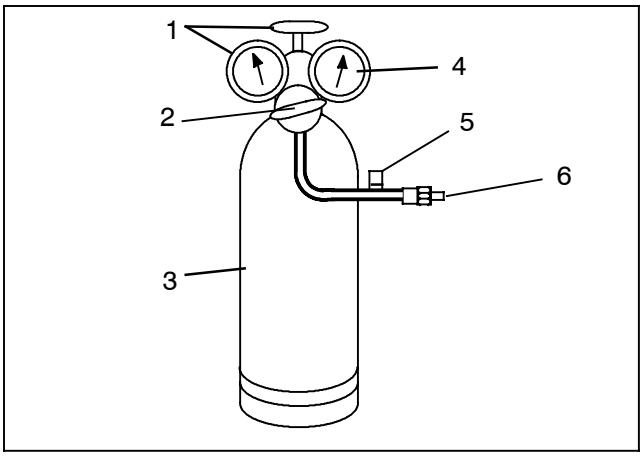
Do not use a nitrogen cylinder without a pressure regulator

⚠ WARNING

Do not use oxygen in or near a refrigeration system as an explosion may occur.

a. Disconnect wiring and remove switch from unit. All units are equipped with a schrader valve at the pressure switch connections.

b. Connect switch to a cylinder of dry nitrogen. See Figure 4-8.



1. Cylinder Valve and Gauge
2. Pressure Regulator
3. Nitrogen Cylinder
4. Pressure Gauge (0 to 400 psig = 0 to 27.22 bar)
5. Bleed-Off Valve
6. 1/4 inch Connection

Figure 4-8 Checking High Pressure Switch

c. Connect an ohmmeter across switch terminals.

d. Set nitrogen pressure regulator higher than the upper switch setting. (refer to paragraph 1.3.)

e. For a high pressure switch, close cylinder valve and open bleed-off valve. Open cylinder valve and slowly close bleed-off valve. The switch should open, (no continuity) within required cut out tolerance. Close cylinder valve and release pressure through the bleed-off valve. As pressure drops, switch should close, (continuity) within required cut in tolerance.

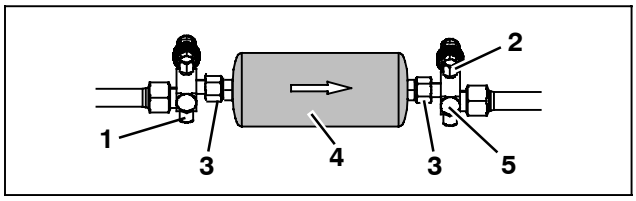
f. For a low pressure switch, close cylinder valve and bleed-off valve. Open cylinder valve to bring pressure above the cutout setting. Close the cylinder valve and slowly open bleed-off valve. The switch should open, (no continuity) within required cut out tolerance. Open cylinder valve and increase pressure by closing the bleed-off valve. As pressure increases, switch should close, (continuity) within required cut in tolerance.

g. Replace or re-install switch (as required) and reconnect wiring.

4.10 FILTER-DRIER

4.10.1 To Check Filter-Drier

The filter-drier (see Figure 4-9) must be changed if the drier is partially restricted or service has been performed on the refrigerant system. Check for a restriction by feeling the inlet and outlet lines of the filter-drier. If the outlet side feels cooler than the inlet side, then the filter-drier should be changed.



1. Filter-Drier Inlet Service Valve
2. Valve Service Port
3. Hex Nut (ORS)
4. Filter-Drier
5. Filter-Drier Outlet Service Valve

Figure 4-9 Filter-Drier Removal

4.10.2 To Replace Filter-Drier

⚠ WARNING

Use of an electro-magnetic valve as a means of positive shutoff for service is not recommended for safety, or good service practice.

a. Perform a system low side pump down. Refer to paragraph 4.4.2.

b. Front seat the filter drier outlet valve to isolate filter drier.

c. Lock out/Tag out the bus electrical system to prevent unit operation.

d. Using wrenches to back up the service valves, slowly loosen hex nuts retaining the filter drier.

⚠ WARNING

The filter-drier may contain liquid refrigerant. Slowly loosen the ORS hex nuts to avoid refrigerant contact with exposed skin or eyes.

e. Place a new filter-drier near the unit for immediate installation.

f. Loosen or remove clamps securing the filter-drier.

g. Remove the filter-drier.

h. Remove seal caps from the new filter-drier. Apply a light coat of mineral oil to the O-Rings and seat in the grooves of the filter-drier.

i. Assemble the new filter-drier to lines ensuring that the arrow on the body of the filter-drier points in

the direction of the refrigerant flow (refrigerant flows from the condenser to the evaporator), and that the O-Rings have remained in place. Finger tighten ORS hex nuts.

j. Tighten the filter-drier ORS hex nuts using two open end wrenches.

k. Leak check filter drier connections with nitrogen by adding through filter drier service valve ports.

l. Remove nitrogen and evacuate filter drier using filter drier service ports.

m. Open filter drier service ports and restore electrical power to unit.

4.11 SERVICING THE LIQUID LINE SERVICE VALVE

The Liquid line solenoid valve (Figure 4-10) requires no maintenance unless a malfunction to the internal parts or coil occurs. This may be caused by foreign material such as: dirt, scale, or sludge in the refrigeration system, or improper voltage to the coil.

There are only three possible valve malfunctions: coil burnout, failure to open, or failure to close.

Coil burnout may be caused by the following:

1 Improper voltage.

2 Continuous over-voltage, more than 10% or under-voltage of more than 15%.

3 Incomplete magnet circuit due to the omission of the coil housing or plunger.

4 Mechanical interface with movement of plunger which may be caused by a deformed enclosing tube.

Failure to open may be caused by the following:

1 Coil burned out or an open circuit to coil connections.

2 Improper voltage.

3 Defective plunger or deformed valve body assembly.

Failure to close may be caused by the following:

1 Defective plunger or deformed valve body assembly.

2 Foreign material in the valve.

4.11.1 Coil Replacement

a. It is not necessary to remove the refrigerant charge from the system.

b. Place main battery disconnect switch in OFF position and lock.

c. Disconnect wire leads to coil.

d. Remove coil retaining screw.

e. Lift coil from enclosing tube and replace.

f. With the coil installed replace the retaining screw.

g. Connect wire leads and test operation

4.11.2 Internal Part Replacement

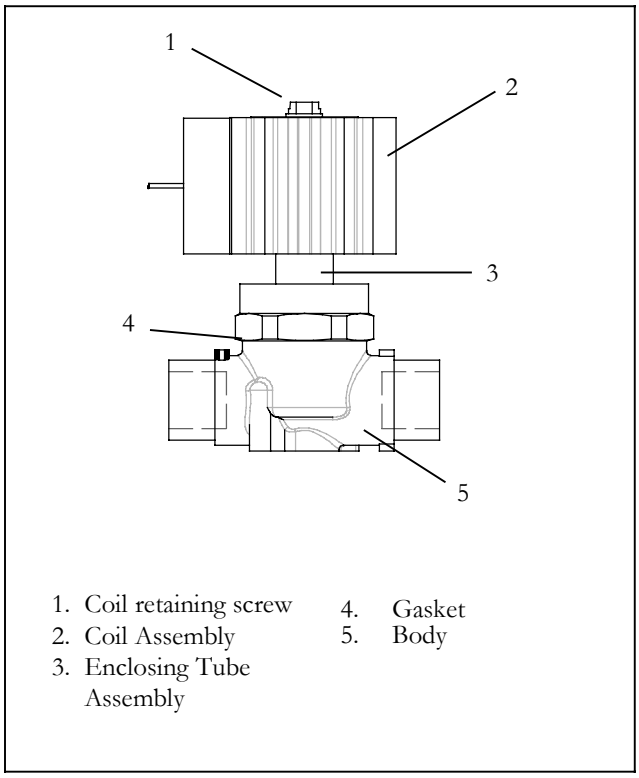
a. Perform a low side pump down on system. Refer to paragraph 4.4.2.

b. Carefully loosen enclosing tube assembly and ensure no pressure remains within the valve. Disassemble valve and replace defective parts.

c. Assemble valve and leak check. Refer to paragraph 4.5

d. Evacuate/Dehydrate low side of system. Refer to paragraph .

e. Open valves and test operation..



1. Coil retaining screw
2. Coil Assembly
3. Enclosing Tube Assembly
4. Gasket
5. Body

Figure 4-10 Liquid Line Solenoid Valve

4.11.3 Replace Entire LLS Valve

a. Perform a low side pump down on system. Refer to paragraph 4.4.2.

b. Remove coil assembly and enclosing tube assembly. Refer to paragraph 4.11.1.

c. Un-braze valve body from piping, while using an inert gas purge to avoid system contamination from carbon due to heat and oxidation.

d. Clean tubing to accept new valve body.

e. Disassemble enclosing tube assembly and components from new valve. Install new valve body by brazing body to piping while using inert gas purge to protect system contamination.

f. Install new filter-drier.

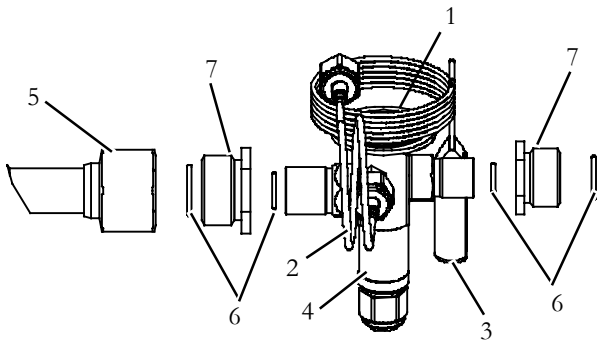
g. Leak check connections. Refer to paragraph 4.5, excluding the replacement of filter drier referenced in step (e).

h. Evacuate/Dehydrate low side of system. Refer to paragraph 4.6.

i. Replace coil assembly and test operation.

4.12 THERMOSTATIC EXPANSION VALVE

The thermostatic expansion valve (Figure 4-10) is an automatic device which maintains constant superheat of the refrigerant gas leaving the evaporator regardless of suction pressure. The valve functions are: (a) automatic control of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant entering the compressor. Unless the valve is defective, it seldom requires any maintenance.



1. Power Head Assembly
2. Equalizer Connection
3. Bulb
4. Body
5. ORS Fitting
6. O-Ring
7. ORS Adapter Fitting

Figure 4-11 Thermostatic Expansion Valve

4.12.1 Valve Replacement

a. Remove entire refrigerant charge from unit. Refer to paragraph 4.4.3.

b. Remove insulation from expansion valve and bulb. See Figure 4-11 and Figure 4-12.

c. Loosen retaining straps holding bulb to suction line and detach bulb from the suction line.

d. Loosen flare nuts on equalizer line and disconnect equalizer line from the expansion valve.

e. Using two open end wrenches, slowly crack open the ORS hex nuts on each side of the valve assembly. Remove the valve assembly from the unit.

f. Lubricate and insert the new O-rings using mineral oil.

g. Reinstall the valve assembly into the unit, again taking care to oil and install new O-Rings.

h. Fasten equalizer line to the expansion valve.

i. Assemble valve and leak check. Refer to paragraph 4.5

j. The thermal bulb is installed below the center of the suction line (four or eight o'clock position). This area must be clean to ensure positive bulb contact. Strap thermal bulb to suction line. Ensure that retaining straps are tight and renew insulation.

k. Evacuate/Dehydrate system. Refer to paragraph 4.6.

l. Recharge system. Refer to paragraph 4.7.3.

m. Run the coach for approximately 30 minutes on fast idle.

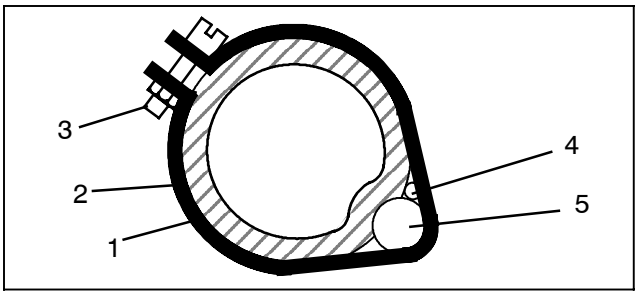
n. Check refrigerant level. Refer to paragraph 4.7.1.

o. Check superheat. Refer to paragraph 4.12.2.

4.12.2 Superheat Measurement

NOTE

All readings must be taken from the TXV bulb location and out of the direct air stream.



1. Suction Line (section view)
2. TXV Bulb Clamp
3. Nut & Bolt (clamp)
4. Thermocouple
5. TXV Bulb (Shown in the 4'clock position)

Figure 4-12 Thermostatic Expansion Valve Bulb and Thermocouple

a. Remove Presstite insulation from expansion valve bulb and suction line.

b. Loosen one TXV bulb clamp and make sure area under clamp is clean.

c. Place temperature thermocouple in contact with the suction tube and parallel to the TXV bulb, and then secure loosened clamp making sure both bulb and thermocouple are firmly secured to suction line. See Figure 4-12. Reinstall insulation around the bulb.

d. Connect an accurate low pressure gauge to the low pressure port (Figure 1-2).

e. Start bus and run on fast idle until unit has stabilized, about 20 to 30 minutes.

NOTE

When conducting this test, the suction pressure must be at least 6 psig (0.41 bar) below the expansion valve maximum operating pressure (MOP). Refer to paragraph 1.3 for MOP.

f. From the temperature/pressure chart (Table 4-3), determine the saturation temperature corresponding to the evaporator outlet pressure.

g. Note the temperature of the suction gas at the expansion valve bulb. Subtract the saturation temperature from this temperature. The difference is the superheat of the suction gas.

h. The superheat may cycle from a low to high reading. Monitor the superheat taking readings every 3-5 minutes for a total of 5-6 readings. Calculate the superheats, add the readings and divide by the number of readings taken to determine average superheat. Refer to paragraph 1.3 for superheat setting.

i. If superheat is not within tolerance, replace the valve.

4.13 REPLACING EVAPORATOR RETURN AIR FILTERS

The evaporator return air filters are located in the evaporator section next to the evaporator coils. Access to the filters is accomplished by opening the evaporator covers.

The filters should be checked for cleanliness periodically depending on operating conditions. A dirty filter will restrict air flow over the evaporator coil which may cause insufficient cooling or heating and possible frost buildup on the coil. To remove the filters, do the following.

a. Place main battery disconnect switch in OFF position and lock.

b. Open the evaporator top covers. Refer to paragraph 4.2.

c. Grasp and lift the filter elements out using care not to damage the evaporator coil.

d. Reverse procedure to install new filters and close the covers.

4.14 COMPRESSOR MAINTENANCE

General maintenance and procedures regarding the Bock FK40/655 Compressor are addressed in this section. For more detailed information regarding the compressor and repair procedures, please refer to the manufactures manual, by downloading from the following website.

www.bock.de

4.14.1 Removing the Compressor

If compressor requires replacement, remove the refrigerant from the compressor by installing manifold gauge set on compressor service valves. Perform a low side pump down, or front seat the compressor suction and discharge service valves and reclaiming the refrigerant in the compressor.

a. Place main battery disconnect switch in OFF position and lock.

b. Tag and disconnect wiring to the high pressure and low pressure switch, unloaders and clutch.

c. Remove tension on drive belts, remove drive belts.

d. Loosen bolts at suction and discharge service valve flanges and break seal to be sure pressure is released. Remove bolts.

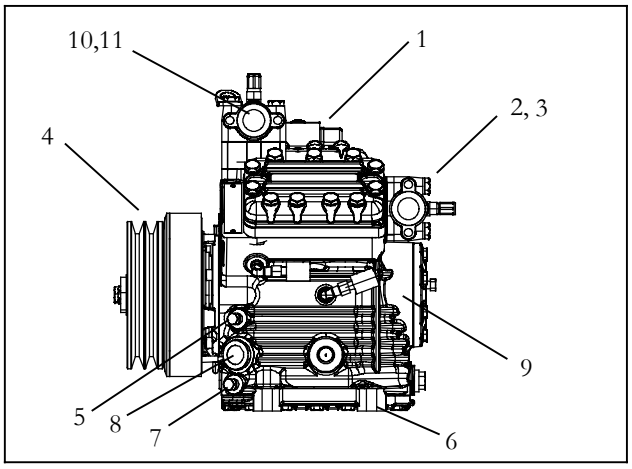
e. Remove bolts holding compressor to base.

f. Attach sling or other device to the compressor and remove compressor from the coach through the rear access door.

NOTES

1 Service replacement compressors are sold without service valves. Valve pads are installed in their place. The optional unloaders are not supplied. Customer should retain the original unloader valves for use on the replacement compressor.

2 Check oil level in service replacement compressor. Refer to paragraphs 1.3 and 4.14.3.



1. Electric Unloader Valve
2. Suction Service Valve Charging Port
3. Suction Service Valve
4. Clutch
5. Oil Fill Plug
6. Bottom Plate
7. Oil Drain Plug
8. Oil Level Sight Glass
9. Oil Pump
10. Discharge Service Valve
11. Discharge Service Port

Figure 4-13 Compressor

g. Remove the pressure switches and install on replacement compressor after checking switch operation. Refer to paragraph 4.9.

h. Remove clutch assemble and retain original clutch key. Install on replacement compressor.

i. Install compressor in unit by performing the removal steps in reverse. It is recommended that new locknuts be used when replacing compressor. Install new gaskets on service valves and tighten bolts uniformly. Refer to Bock Service manual for torque values.

j. Leak check compressor with 150 psi (10.3 Bars) of dry nitrogen.

k. Evacuate/Dehydrate compressor to 500 microns.

l. Back seat/mid-seat compressor suction and discharge service valves.

m. Start unit and check refrigerant level. Refer to paragraph 4.7.1.

n. Check compressor oil level. Refer to paragraph 4.14.3.

o. Check compressor unloader operation. Refer to paragraph 4.14.4

p. Backseat compressor service valves.

q. Remove manifold gauge set. Refer to paragraph 4.4.1.

4.14.2 Transferring Compressor Clutch

Clutch	Lang KK73 (24 vdc)
Current	5.17 A @ (68 °F or 20°C)
Resistance	9.2 ohms @ (68 °F or 20°C)

To remove a clutch (see Figure 4-16) from a compressor and install on a replacement compressor, do the following:

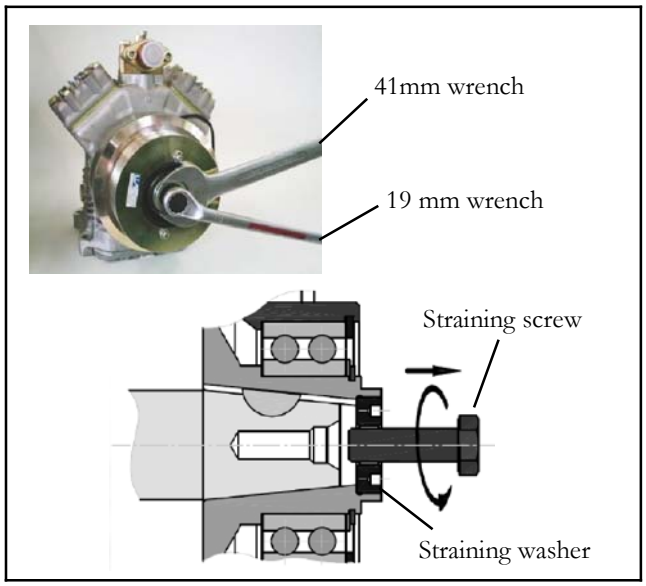


Figure 4-14 Compressor Clutch

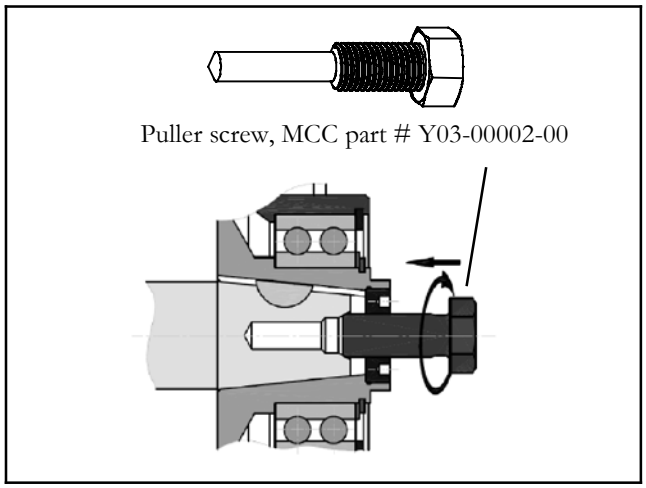


Figure 4-15 Compressor Clutch

a. Place main battery disconnect switch in OFF position and lock.

b. Tag and disconnect wiring to the clutch.

c. Remove tension on drive belts, remove drive belts.

d. Using a 41 mm wrench to secure the clutch rotor (See Figure 4-14), removes the 12 mm straining screw and washer from the compressor crankshaft by turning counter clockwise.

e. Insert the 16mm Puller Screw, MCC part# Y03-00002-00, and turn clockwise to jack the clutch pulley of of the compressor crankshaft (see Figure 4-15).

f. Remove the clutch pulley.

g. Remove the 4- 8mm screws securing the clutch electromagnetic coil(see Figure 4-16) and remove.

Figure 4-16 Clutch Coil

h. Re-install in reverse order.

i. Install the electromagnetic coil. Install the 4- 8mm screws retaining the coil in crosshatch pattern, and torque to 25 ft/lb (34 Nm).

j. Mount Woodruff Key and slide clutch assembly onto shaft and position over coil. Pay close attention to ensure the pulley is properly positioned. Secure the clutch pulley to the compressor shaft using the straining washer and 12mm screw. While using a 41mm wrench to hold the pulley, torque the straining screw into shaft end to 44-59 ft/lb (60-80 Nm).

k. Re-connect wiring to the magnet/coil. Route and secure wiring from sources of heat and chafing.

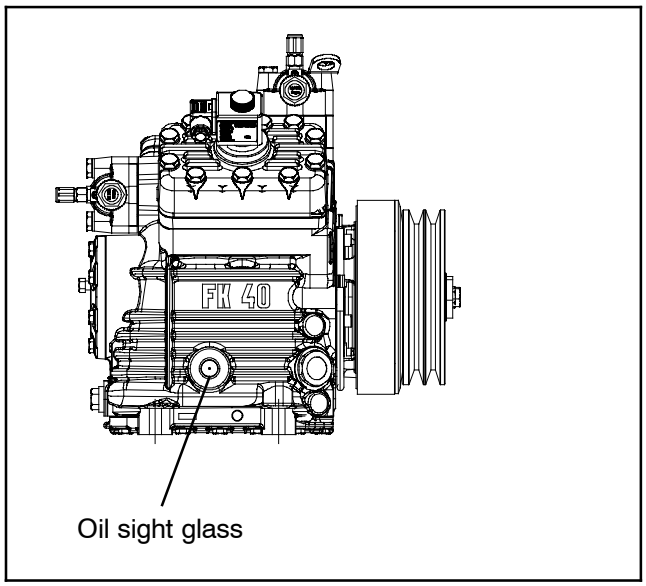


Figure 4-17 Compressor Sight Glass

4.14.3 Compressor Oil Level

To check the compressor oil level do the following:

a. Operate the coach for at least one-half hour at fast idle speed, with the temperature controls at the coolest setting, and the compressor fully loaded. It may be necessary to pre-heat the coach and/or operate the system in the reheat mode to keep the compressor fully loaded throughout this procedure

b. Ensure the system is fully charged (refer to paragraph 4.7.1) and the compressor crankcase is warm to the touch after fifteen minutes of operation.

c. Shut off the system and immediately record the oil level in the compressor sight glass. See Figure 4-17. If the compressor is not level, an average between the sight glass levels will have to be made to determine level.

d. The correct oil level for this application should be between the 1/4 and 3/4 of the oil level sightglass.

4.14.4 Checking Unloader Operation

To check unloader operation do the following:

a. Install a manifold gauge set onto suction and discharge service valves at compressor. Ensure both manifold valves are frontseated and center connection is tight on blank fitting.

b. Midseat compressor suction and discharge valves slightly to monitor pressures.

c. Start the bus and run in cooling, lower set point if required to ensure system remains in full cooling (fully loaded).

d. Slowly frontseat (turn clockwise) the compressor suction service valve until gauge pressure reaches 23 psig (1.58 Bars). This should force the unloader to be energized.

e. Verify unloader solenoid is energized by checking for 24 VDC at solenoid coil.

f. Monitor the suction and discharge pressures on the manifold gauge set. If the internal operation of unloader is functional, the suction pressure should rise, and the discharge pressure should drop.

g. Slowly open the suction service valve (turn counterclockwise) and allow suction pressure to rise above 32 psig (2.2 Bars). Unloader solenoid should de-energize.

h. Monitor the suction and discharge pressures on the manifold gauge set. The suction pressure should drop, and the discharge pressure should rise.

i. Backseat (turn counter clockwise) the compressor suction and discharge service valves and remove manifold gauge set. Replace all service valve caps.

4.15 TEMPERATURE SENSOR CHECKOUT

a. An accurate ohmmeter must be used to check resistance values shown in Table 4-1.

b. Due to variations and inaccuracies in ohmmeters, thermometers or other test equipment, a reading within two percent of the chart value would be considered acceptable. If a sensor is bad, the resistance value would usually be much higher or lower than the value given in Table 4-1.

c. At least one sensor lead must be disconnected from the controller before any reading can be taken. Not doing so will result in a false reading. Two preferred methods of determining the actual test temperature at the sensor are an ice bath at 32°F (0°C) and/or a calibrated digital temperature meter.

Table 4-1 Temperature Sensor Resistance

Temperature		Resistance In Ohms
°F	°C	
-20	-28.9	165,300
-10	-23.3	117,800
0	-17.8	85,500
10	-12.2	62,400
20	- 6.7	46,300
30	- 1.1	34,500
32	0	32,700
40	4.4	26,200
50	10.0	19,900
60	15.6	15,300
70	21.1	11,900
77	25	10,000
80	26.7	9,300
90	32.2	7,300
100	37.8	5,800
110	43.3	4,700
120	48.9	3,800

4.16 PRESSURE TRANSDUCER CHECKOUT

NOTE

System must be operating to check transducers.

a. With the system running use the driver display and manifold gauges to check suction and/or discharge pressure(s) simultaneously.

b. Determine with the gauges whether one or both pressure readouts are correct. If one is correct, exchange the pressure transducer locations. If the problem moves with the transducer, replace the faulty transducer.

c. If the driver display read out disagrees with both values shown on the manifold gauges proceed to step d.

d. Verify that the wiring to the transducer(s) is in good condition.

e. Use a digital volt-ohmmeter to measure voltage across the transducer connector corresponding to terminals A & B. See Figure 4-18. The reading should be 5.0 VDC.

f. Use a digital volt-ohmmeter to measure voltage across the transducer at terminals A & C. See Figure 4-18. Compare to values in Table 4-2. A reading within two percent of the values in the table would be considered good.

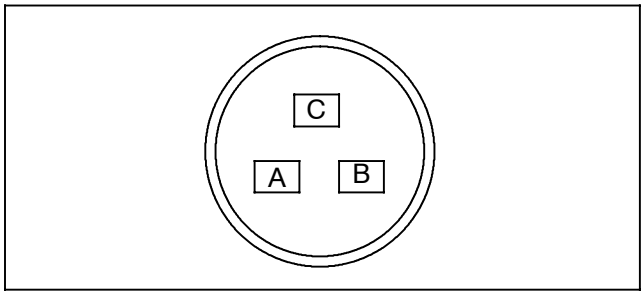


Figure 4-18 Transducer Terminal Location

4.17 REPLACING SENSORS AND TRANSDUCERS

a. Place main battery disconnect switch in OFF position and lock.

b. Tag and disconnect wiring from defective sensor or transducer.

c. Remove and replace defective sensor or transducer. Sensor/transducer connections are fitted with Schreader valves to facilitate replacement.

d. Connect wiring to replacement sensor or transducer.

e. Checkout replacement sensor or transducer. Refer to section 4.15 or 4.16 as applicable.

f. Repair or replace any defective component(s), as required.

Table 4-2 Pressure Transducer Voltage

"/hg	Voltage	Psig	Voltage	Psig	Voltage	Psig	Voltage	Psig	Voltage	Psig	Voltage
20"	0.369	40	0.858	95	1.397	150	1.936	205	2.475	260	3.014
10"	0.417	45	0.907	100	1.446	155	1.985	210	2.524	265	3.063
Psig	**Voltage**	50	0.956	105	1.495	160	2.034	215	2.573	270	3.112
0	0.466	55	1.007	110	1.544	165	2.083	220	2.622	275	3.161
5	0.515	60	1.054	115	1.593	170	2.132	225	2.671	280	3.210
10	0.564	65	1.103	120	1.642	175	2.181	230	2.720	285	3.259
15	0.614	70	1.152	125	1.691	180	2.230	235	2.769	290	3.308
20	0.663	75	1.204	130	1.740	185	2.279	240	2.818	295	3.357
25	0.712	80	1.250	135	1.789	190	2.328	245	2.867	300	2.406
30	0.761	85	1.299	140	1.838	195	2.377	250	2.916	305	3.455
35	0.810	90	1.348	145	1.887	200	2.426	255	2.965	310	3.504

Table 4-3 R-134a Temperature - Pressure Chart

Temperature		Vacuum		
°F	°C	"/hg	Kg/cm2	Bar
-40	-40	14.6	37.08	0.49
.35	.37	12.3	31.25	0.42
-30	-34	9.7	24.64	0.33
-25	-32	6.7	17.00	0.23
-20	-29	3.5	8.89	0.12
-18	-28	2.1	5.33	0.07
-16	-27	0.6	1.52	0.02

Temperature		Pressure		
°F	°C	Psig	Kg/cm2	Bar
-14	-26	0.4	0.03	0.03
-12	-24	1.2	0.08	0.08
-10	-23	2.0	0.14	0.14
-8	-22	2.9	0.20	0.20
-6	-21	3.7	0.26	0.26
-4	-20	4.6	0.32	0.32
-2	-19	5.6	0.39	0.39
0	-18	6.5	0.46	0.45
2	-17	7.6	0.53	0.52
4	-16	8.6	0.60	0.59
6	-14	9.7	0.68	0.67
8	-13	10.8	0.76	0.74
10	-12	12.0	0.84	0.83
12	-11	13.2	0.93	0.91
14	-10	14.5	1.02	1.00
16	-9	15.8	1.11	1.09
18	-8	17.1	1.20	1.18
20	-7	18.5	1.30	1.28
22	-6	19.9	1.40	1.37
24	-4	21.4	1.50	1.48
26	-3	22.9	1.61	1.58

Temperature		Pressure		
°F	°C	Psig	Kg/cm2	Bar
28	-2	24.5	1.72	1.69
30	-1	26.1	1.84	1.80
32	0	27.8	1.95	1.92
34	1	29.6	2.08	2.04
36	2	31.3	2.20	2.16
38	3	33.2	2.33	2.29
40	4	35.1	2.47	2.42
45	7	40.1	2.82	2.76
50	10	45.5	3.20	3.14
55	13	51.2	3.60	3.53
60	16	57.4	4.04	3.96
65	18	64.1	4.51	4.42
70	21	71.1	5.00	4.90
75	24	78.7	5.53	5.43
80	27	86.7	6.10	5.98
85	29	95.3	6.70	6.57
90	32	104.3	7.33	7.19
95	35	114.0	8.01	7.86
100	38	124.2	8.73	8.56
105	41	135.0	9.49	9.31
110	43	146.4	10.29	10.09
115	46	158.4	11.14	10.92
120	49	171.2	12.04	11.80
125	52	184.6	12.98	12.73
130	54	198.7	13.97	13.70
135	57	213.6	15.02	14.73
140	60	229.2	16.11	15.80
145	63	245.6	17.27	16.93
150	66	262.9	18.48	18.13
155	68	281.1	19.76	19.37

SECTION 5

ELECTRICAL

5.1 INTRODUCTION

This section includes electrical wiring schematics. The schematics shown in this section provides information for the Y50-13606 model rooftop air conditioning units which are fitted with three evaporator blower/motor assemblies in each evaporator section, and five (5) condenser fan motor assemblies. Figure 5-1 shows the MCC schematic used with the Y50-13606 system.

Additional technical data regarding wiring, electrical connectors and relay assignment are listed below .

UNIT	CONTROLLER	FIGURE NUMBERS
Y50-13606-00	MCC	Figure 5-1

ELECTRICAL WIRING SPEC.:

* MAIN POWER CABLES:
- WIRE #A: 1GA RED SGX WIRE
- WIRE #B: 1GA BLACK SGX WIRE
- WIRE #C: 4GA RED SGX WIRE
- WIRE #D: 4GA BLACK SGX WIRE

* UNIT WIRE HARNESS:
- WIRE #BPX,#FPX: 14GA WHITE GXL WIRE
- WIRE #BGX,#FGX: 14GA WHITE GXL WIRE
- WIRE #1 -#10: 16GA WHITE GXL WIRE
- WIRE #21-#80: 18GA WHITE GXL WIRE
- WIRE #BX: 18GA BLACK GXL WIRE

ELECTRICAL CONNECTION:

A - 22 WAY WEATHER PACK CONNECTOR
MCC SIDE: 12020991 (W/ FM TERMINAL)
NABI SIDE: 12020005 (W/ M TERMINAL)
B - 4 WAY DEUTSCH CONNECTOR (DT)
NABI SIDE: DT04-4P (W/ M TERMINAL)
DOWNLOADING CABLE SIDE: DT06-4S

J1, J4 - DEUTSCH 12-W CONN, DT04-12P
J2, J3 - DEUTSCH 12-W CONN, DT06-12S
J5 - DEUTSCH 6-W CONN, DT04-6P
J6 - DEUTSCH 6-W CONN, DT06-6S

I/O BOARD RELAY ASSIGNMENT:

RELAY	RLY1	RLY2	RLY3	RLY4	RLY5	RLY6
INPUT	CON3:05	CON3:01	CON3:13	CON3:09	CON3:14	CON3:02
OUTPUT	CON5:03	CON5:03	CON3:16	CON3:10	CON3:08	CON3:11

NOTES:

— — — WIRING HARNESS SUPPLIED BY NABI
<⌐¬> SHIELDED TWISTED CABLES

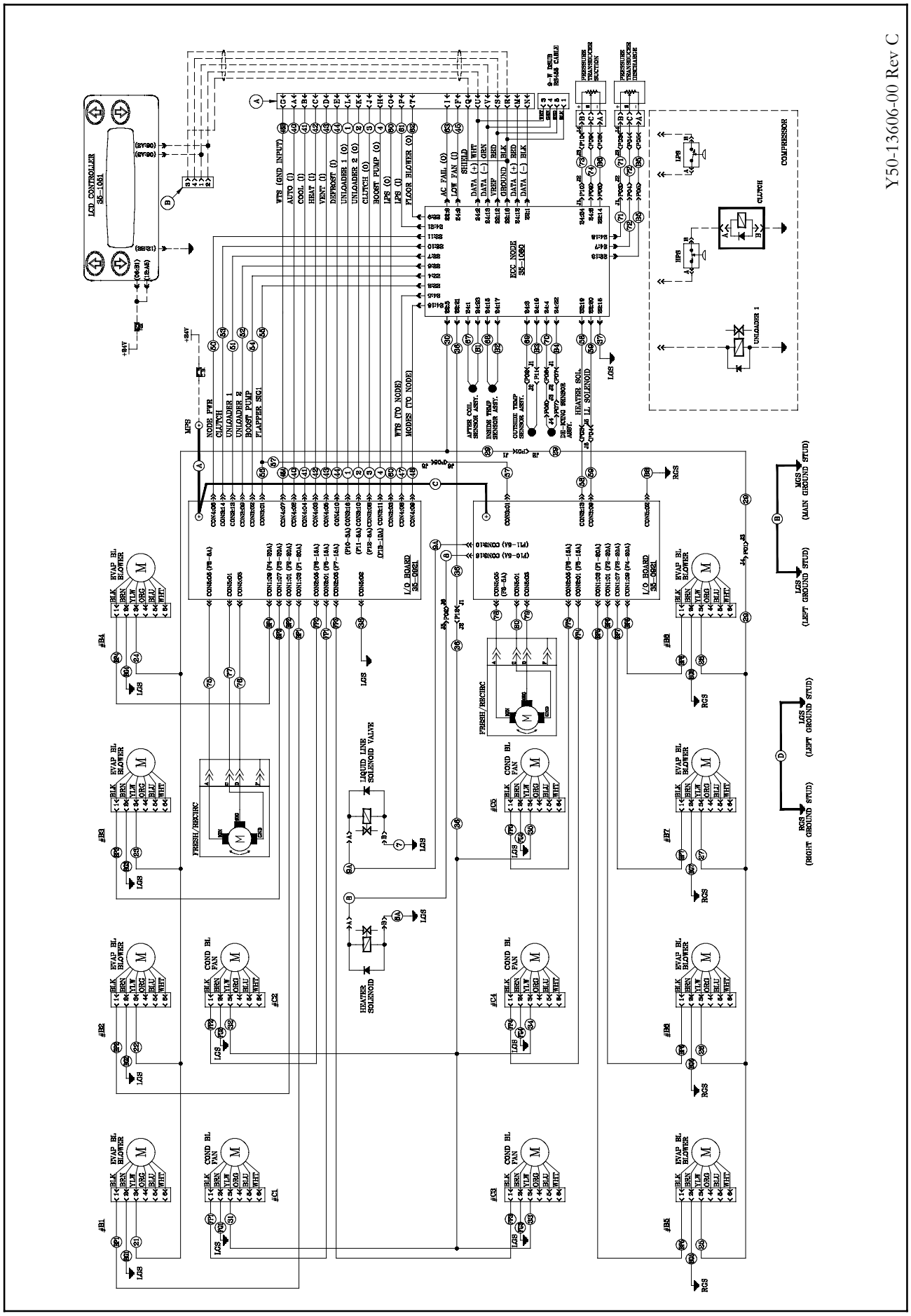


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Figure 5-1 SCHEMATIC

Mobile Climate Control

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Mobile Climate Control

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