Mobile Climate Control

T-369 Manual

OPERATION/SERVICE PARTS and INSTALLATION

For Aftermarket

Rail Mounted EcoLine 8 & 10 Products on Sprinter Applications

T-369

REV. 05/2015

Mobile Climate Control

TABLE OF CONTENTS

SAFETY SUMMARY **Safety-1**

DESCRIPTION **1-1**

1.1 INTRODUCTION 1-1

1.2 GENERAL DESCRIPTION 1-2

1.2.1 Description EcoLine 8/10 1-2

1.2.2 Condensing Section 1-2

1.2.3 Evaporator Section 1-2

1.3 REFRIGERATION SYSTEM COMPONENT SPECIFICATIONS 1-3

1.4 ELECTRICAL SPECIFICATIONS - Sensors 1-3

1.5 SAFETY DEVICES 1-3

1.6 AIR CONDITIONING REFRIGERATION CYCLE 1-4

1.7 HEATING CYCLE 1-4

Installation **2-1**

2.1 TORQUE SPECIFICATIONS - REFRIGERANT FITTINGS 2-1

2.2 TORQUE SPECIFICATIONS - BOLTS 2-2

2.3 Hose installation Guidelines 2-3

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued: 2-3

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued: 2-4

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued: 2-5

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued: 2-6

2.4 EcoLine 8 & 10 Rail Mounting Method (Sprinter application shown) 2-7

2.4.1 Roof Cut Out and Transition Duct Mounting 2-8

2.4.2 Air Distribution and Interior Roof Support 2-14

2.4.3 Roof Unit Installation 2-16

2.4.4 Refrigerant Hose Routing 2-17

2.4.5 Electrical Harness Routing 2-22

2.4.6 Heater Hose Routing (Eco 8 Only) 2-28

2.4.7 Condensate Line Routing 2-33

OPERATION of the MVC DIGITAL Controller **3-1**

3.1 STARTING, STOPPING AND OPERATING INSTRUCTIONS 3-1

3.1.1 Starting 3-1

3.1.2 Stopping 3-1

3.2 OPERATING INSTRUCTIONS 3-2

3.2.1 Display 3-2

3.2.2 Interior Temperature Control 3-2

3.2.3 Blower Speeds 3-2

3.2.4 Modes of Operation 3-2

3.3 CHANGING BETWEEN °F (FAHRENHEIT) AND °C (CELCIUS) 3-3

3.4 MVC DIAGNOSTICS MENU 3-3

3.4.1 Setup Menu 3-3

3.4.2 View Menus 3-3

OPERATION of the MVC DIGITAL Controller (Continued) **3-1**
3.4.3 Statistics Menus 3-4
3.4.4 Error List Menu 3-4
3.4.5 Exiting Diagnostic Menu 3-4
TROUBLESHOOTING **4-1**
4.1 SYSTEM WILL NOT COOL 4-1
4.2 SYSTEM RUNS BUT HAS INSUFFICIENT COOLING 4-1
SERVICE **5-1**
5.1 MAINTENANCE SCHEDULE 5-1
5.2 MANIFOLD GAUGE SET 5-1
5.2.1 Installing R-134a Manifold Gauge/Hose Set 5-2
5.3 REMOVING THE REFRIGERANT CHARGE 5-3
5.3.1 Removing Entire System Charge 5-3
5.4 REFRIGERANT LEAK CHECK 5-3
5.5 EVACUATION AND DEHYDRATION 5-3
5.5.1 General 5-3
5.5.2 Preparation 5-3
5.5.3 Procedure for Evacuation and Dehydrating System 5-4
5.6 ADDING REFRIGERANT TO SYSTEM 5-4
5.6.1 Checking Refrigerant Charge 5-4
5.6.2 Adding Full Charge 5-6
5.7 CHECKING FOR NONCONDENSIBLES 5-6
5.8 FILTER-DRIER 5-6
5.8.1 To Check Filter-Drier 5-6
5.8.2 To Replace Filter-Drier Assembly 5-6
5.9 SERVICING THE HEAT VALVE 5-7
5.9.1 Replace Entire Valve 5-7
5.10 REPLACING RETURN AIR FILTERS 5-7
5.11 THERMOSTATIC EXPANSION VALVE 5-7
5.11.1 Valve Replacement 5-8
ELECTRICAL **6-1**
6.1 INTRODUCTION 6-1
SERVICE PARTS **7-1**
INTRODUCTION 7-1
CONFIGURATION IDENTIFICATION 7-1
GENERAL NOTES 7-1
7.1 MCC EcoLine 8, 12 VDC, Models 50-1509 7-2
7.2 MCC EcoLine 10, 12 VDC, Models 50-1859 7-4
7.3 MCC EcoLine Electrical Panel, Y25-00090-00 7-6
7.4 MCC EcoLine Heater Components 7-7

LIST OF TABLES

Table 1-1 EcoFlex and EcoLine Models 1-1
Table 1-2 EcoLine Model Specifications 1-3
Table 2-1 STANDARD TORQUE REQUIREMENTS 2-1
Table 2-2 Metric Torque Specs 2-2
Table 2-3 U.S. Torque Specs 2-2
Table 4-1 General System Troubleshooting Procedures 4-1
Table 5-1. Mobile Climate Control SYSTEM PERFORMANCE CHART 5-5
Table 4-4 R-134a Temperature - Pressure Chart 5-9

LIST OF FIGURES

Figure 1-1 EcoLine 8/10 Rooftop Unit 1-2
Figure 1-2 Basic Refrigerant/Heat Flow Diagram 1-5
Figure 2-1 Metric Bolt Markings 2-2
Figure 2-2 U.S. Bolt Markings 2-2
Figure 2-3 Overall Layout and Parts Identification 2-7
Figure 2-4 Determining Roof Support Bow Location 2-8
Figure 2-5 Marking of Roof Support Bows 2-8
Figure 2-6 Template Orientation 2-9
Figure 2-7 Determining Location for Unit 2-9
Figure 2-8 Marking Roof Cut-Outs 2-9
Figure 2-9 Supply and Return Cut Outs 2-9
Figure 2-10 EcoLine 8 and 10 Mounting Template 2-10
Figure 2-11 De-Burr cut edges 2-11
Figure 2-12 General Assembly Layout of Rail Mounted Unit 2-11
Figure 2-13 Transition Ducts (Interior) 2-12
Figure 2-14 Clamp Transition and Roof Metal 2-12
Figure 2-15 Drill Holes for Transition Ducts (Interior) 2-12
Figure 2-16 Riveting Transition Ducts (Exterior) 2-12
Figure 2-17 Transition Ducts Riveted 2-12
Figure 2-18 Preparation of Sikaflex application 2-13
Figure 2-19 Transition and Rivets Sealed 2-13
Figure 2-20 Air Distribution Bracket 2-14
Figure 2-21 Orientation of Slotted Holes 2-14
Figure 2-22 Nut Inserts 2-14
Figure 2-23 Vertical Bracket Installation 2-15
Figure 2-24 Horizontal Bracket Installation 2-15
Figure 2-25 A/C Hose Routing Curbside 2-15
Figure 2-26 Electrical Harness Routing Roadside 2-15

LIST OF FIGURES (Continued)

Figure 2-27 Mounting Rail Hardware 2-16
Figure 2-28 Hoist for Unit 2-16
Figure 2-29 Setting unit 2-16
Figure 2-30 Lowering onto Transition Ducts 2-16
Figure 2-31 Unit Set and Secured 2-16
Figure 2-32 A/C Hose Routing Curbside 2-17
Figure 2-33 Passenger column “B” cover 2-17
Figure 2-34 Styrofoam Access Cover 2-17
Figure 2-35 Column Block Off Plate 2-18
Figure 2-36 Hole Saw with Extension 2-18
Figure 2-37 Passenger column “B” Top Access 2-18
Figure 2-38 Passenger column “B” Seat belt Access 2-18
Figure 2-39 Upper Passenger Column Hose Routing 2-19
Figure 2-40 Passenger side Hose Routing to Unit 2-19
Figure 2-41 Refrigerant Hose Routing at Unit 2-19
Figure 2-42 Refrigerant Hose Under Vehicle 2-19
Figure 2-43 Service Port Fittings 2-20
Figure 2-44 Wheel Well Routing 2-20
Figure 2-45 Wheel Well Routing 2-20
Figure 2-46 Hose Protection (Brake Line Bracket) 2-20
Figure 2-47 Hose Protection (Vehicle Frame) 2-21
Figure 2-48 Hose Routing to Compressor 2-21
Figure 2-49 Hose Routing to Compressor with “Sleeve” 2-21
Figure 2-50 Fittings at Compressor 2-21
Figure 2-51 Electrical Harness Routing Roadside 2-22
Figure 2-52 Electrical Harness Positioning 2-22
Figure 2-53 Electrical Routing from Column Base to Pedestal 2-23
Figure 2-54 Electrical Routing from Column to Driver Display 2-23
Figure 2-55 Driver Display Mounted 2-23
Figure 2-56 Electrical Routing from Column to A/C Unit 2-24
Figure 2-57 Electrical Routing Inside A/C Unit 2-24
Figure 2-58 Electrical Routing into A/C Unit 2-24
Figure 2-59 Electrical Routing From Vehicle Battery 2-24
Figure 2-60 Eco 10 Panel Installed 2-25
Figure 2-61 Eco 8 Panel Components 2-25
Figure 2-62 Eco 8 Panel Installed 2-25
Figure 2-63 OEM Interface 2-25
Figure 2-64 Electrical Boot from Driver Pedestal 2-26
Figure 2-65 Electrical Boot Under Driver Pedestal 2-26

LIST OF FIGURES (Continued)

Figure 2-66 Clutch Signal Wire Routing Under Vehicle 2-26
Figure 2-67 Clutch Signal Wire at Wheel Well 2-26
Figure 2-68 Clutch Signal Wire Compressor 2-27
Figure 2-69 General Overview of Heater Hose Routing 2-28
Figure 2-70 Optional Heater Hose Routing Roadside (Interior) 2-28
Figure 2-71 Protective Metal Fuel Fill Cover 2-29
Figure 2-72 Plug Holes at Driver Column Underneath Vehicle 2-29
Figure 2-73 Fuel Fill Access Door 2-29
Figure 2-74 Heater Hose Protection 2-30
Figure 2-75 Heater Hose Exiting Column 2-30
Figure 2-76 Heater Hose Routing Along Roadside 2-30
Figure 2-77 Auxiliary Boost Pump 2-30
Figure 2-78 Heater Hose Routing at Boost Pump 2-31
Figure 2-79 Heater Hoses Installed at Boost Pump 2-31
Figure 2-80 Heater Hoses Under Vehicle 2-31
Figure 2-81 Heater Hoses Entering Engine Compartment 2-31
Figure 2-82 Heater Hose Routing in Engine Compartment 2-32
Figure 2-83 Heater Hose Routing at Air Cleaner Bracket 2-32
Figure 2-84 Heater Hose Interface 2-32
Figure 2-85 Heater Hose Interface 2-32
Figure 2-86 General Routing of Condensate Lines 2-33
Figure 2-87 Route Condensate Lines for Proper Slope 2-33
Figure 2-88 Drain Pan Connections 2-33
Figure 2-89 Sidewall Routing of Condensate Lines 2-34
Figure 2-90 Exit Hole Location for Condensate Lines 2-34
Figure 2-91 Kazoo Valve Installation 2-34
Figure 3-1 MVC Controller 3-1
Figure 3-2 MVC Main Screen 3-2
Figure 3-3 MVC Blower Speeds 3-2
Figure 3-4 MVC Modes 3-2
Figure 3-5 °F to °C 3-3
Figure 3-6 Setup Menu 3-3
Figure 3-7 View Menus 3-3
Figure 3-8 Statistic Menus 3-4
Figure 3-9 View Menus 3-4
Figure 5-1 Manifold Gauge Set (R-134a) 5-2
Figure 5-2 In-Line Service Connections 5-3
Figure 5-3 Filter-Drier 5-6

LIST OF FIGURES (Continued)

Figure 5-4 Heat Valve 5-7
Figure 5-5 Air Filter 5-7
Figure 5-6 Thermostatic Expansion Valve (Block Valve) 5-8
Figure 6-1 EcoLine 8 w/ Electronic Controller (Sprinter) 6-2
Figure 6-2 EcoLine 10 w/ Electronic Controller (Sprinter) 6-3

SAFETY SUMMARY

⚠ WARNING

It is the responsibility of Installer to obtain specific approval from the vehicle manufacturer with regard to placement and modification to vehicle roof and body structure. It may be necessary to provide adequate roof structure support to accept the A/C unit to be installed once OEM approval is obtained. MCC is not responsible for damage related to Installation Issues.

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

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 EcoFlex/EcoLine 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, Electrical Data and general Installation Instructions for aftermarket EcoLine Air Conditioning and Heating equipment furnished by Mobile Climate Control as shown in Table 1-1.

Models consist of a Rooftop unit containing the condenser, evaporator, heating coil (if equipped) and engine compartment mounted compressor(s). To complete the system, the air conditioning and heating equipment interfaces with electrical cabling, refrigerant piping, engine coolant piping (for heating), duct work and other components furnished by Mobile Climate Control and/or the vehicle manufacturer.

Operation of the unit is controlled automatically by manual switches or an electronic thermostat. The controls maintain the vehicle's interior temperature at the desired set point.

Table 1-1 EcoFlex and EcoLine Models

Model	Part Number	Voltage	Controller	With Heat	Compressor Drive
EcoLine 8	50-1509	12 VDC	Digital	Yes	Engine Mount
EcoLine 10	50-1859	12 VDC	Digital	No	Engine Mount

1.2 GENERAL DESCRIPTION

General components related to each Model can be seen in Figure 1-1 below:

Figure 1-1 EcoLine 8/10 Rooftop Unit

1.2.1 Description EcoLine 8/10

The EcoLine 8/10 includes the condenser coil, condenser fan and motor assembly, evaporator coil, blower assembly, heater coil (EcoLine 8 only), receiver/filter-drier. Unit utilizes an auxiliary engine mounted compressor. EcoLine 10 units offer higher cooling capacity, without heat option.

1.2.2 Condensing Section

The condensing section includes the condenser coils, fan and motor assemblies and receiver/filter-drier.

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 receiver/filter drier collects and stores liquid refrigerant and removes moisture and debris from the liquid refrigerant before it enters the thermostatic expansion valve in the evaporator assembly. The receiver/filter drier is also fitted with a binary pressure switch which protects the system from unsafe high/low pressure conditions.

1.2.3 Evaporator Section

The evaporator section includes the evaporator coils, blower/motor assemblies, heater coil assemblies (if equipped), 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 (if equipped) 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.

Table 1-2 EcoLine Model Specifications

	EcoLine 8	EcoLine 10
Application	Conventional	Conventional
Compressor Type	Engine Driven	Engine Driven
Cooling Capacity (ARI)	29,000 Btu (8.5 kW)	34,000 Btu (10 kW)
Voltage	12 VDC	12 VDC
Heating Capacity @ Q100 (Air -20°C Water 80°C @ 16L/min	34,000 Btu (10 kW)	N/A
Fresh Air	No	No
Width	43.62" (1108mm)	43.62" (1108mm)
Length	43.74" (1111mm)	43.74" (1111mm)
Height (w/o rails)	7.68" (195mm)	7.68" (195mm)
Air flow (free)	700 CFM (1200 m3/h)	700 CFM (1200 m3/h)
Current (max)	49A (12 VDC) 25A (24 VDC)	60A (12 VDC)
Refrigerant Charge	Dependant on application	Dependant on application
Weight (total)	100 lbs (45.4 kg)	100 lbs (45.4 kg)

1.3 REFRIGERATION SYSTEM COMPONENT SPECIFICATIONS

a. Refrigerant Charge R-134a

NOTE

Refrigerant charge will depend on hose lengths, diameters and compressor application. Initial charge is 1.5 - 2 lbs. (0.68 -0.91 kg). Exact charge adjustment can then be determined by referring to Section 5.6.

b. Thermostatic Expansion Valves:

Superheat Setting Factory Set at 8°F (±1.5°F)

4.57°C (±1°C)

Nominal Capacity 2 Ton

c. Binary Pressure Switch (High/Low)

Opens at: 384 ±10 psig (26.5 ±0.69bar)
Closes at: 28 ±10 psig (1.9 ±0.69bar)

1.4 ELECTRICAL SPECIFICATIONS - Sensors

Output: 10K ± 2% ohms at 77° F (25°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 binary pressure switch (HPS & LPS), circuit breakers and fuses.

a. Pressure Switches

High Pressure Condition

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 is installed in the receiver/filter drier.

Low Pressure Condition

The low pressure switch is installed in the receiver/filter drier and opens on a pressure drop to shut down the system when a low pressure condition occurs.

b. Fuses and Circuit Breakers

The Relay Board is protected against high current by an OEM or MCC supplied circuit breaker or fuse located in the power supply circuit to the unit. Independent fuses protect each condenser and evaporator motor. Output circuits are protected by

additional fuses according to circuit loads. During a high current condition, the fuse may open.

1.6 AIR CONDITIONING REFRIGERATION CYCLE

When air conditioning (cooling) is selected , 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, receiver, filter-drier, thermostatic expansion 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 receiver/filter drier.

The refrigerant leaves the receiver/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 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 (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 vehicle.

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.

1.7 HEATING CYCLE

Heating circuit (See Figure 1-2) components furnished by Mobile Climate Control include the heater cores and electrically operated heat valves and optional boost water pump.

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

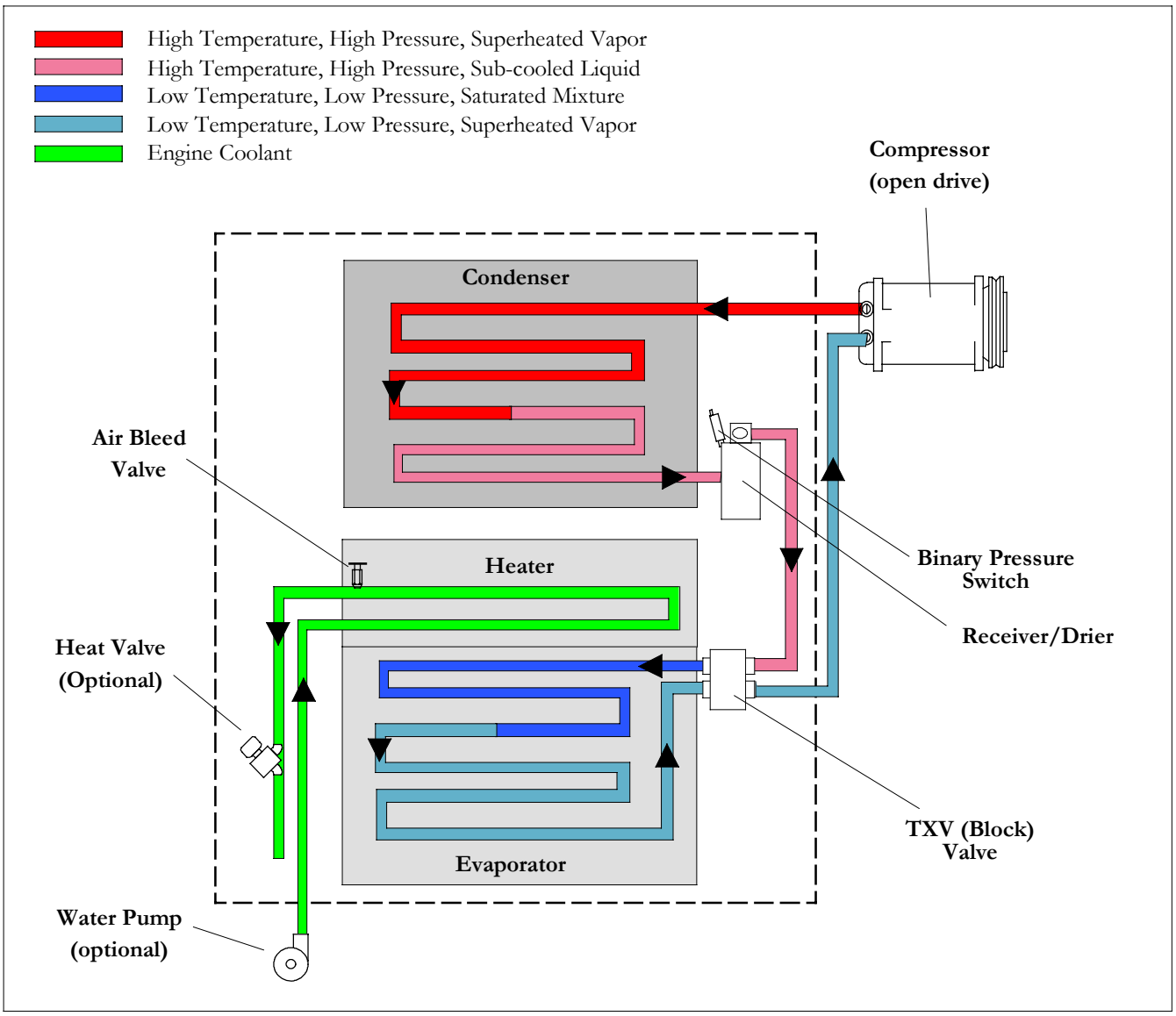


Figure 1-2 Basic Refrigerant/Heat Flow Diagram

SECTION 2

Installation

WARNING

It is the responsibility of Installer to obtain specific approval from the vehicle manufacturer with regard to placement and modification to vehicle roof and body structure. It may be necessary to provide adequate roof structure support to accept the A/C unit to be installed once OEM approval is obtained. MCC is not responsible for damage related to Installation Issues.

WARNING

Be sure to observe warnings listed in the safety summary in the front of this manual before performing installation 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.

Table 2-1 STANDARD TORQUE REQUIREMENTS

SIZE	TUBE O.D. *	FLARE	O-RING		THREAD **
			STEEL TUBING	ALUM. TUBING	
4	1/4 inch (.250)	11-13 ft./lbs.	30-35 ft./lbs.	5-7 ft./lbs.	7/16
5	3/8 inch (.375)	15-17 ft./lbs.	30-35 ft./lbs.	8-10 ft./lbs	9/16
6	3/8 inch (.375)	18-20 ft./lbs.	30-35 ft./lbs.	11-13 ft./lbs	5/8
8	1/2 inch (.500)	36-39 ft./lbs.	30-35 ft./lbs.	15-20 ft./lbs	3/4
10	5/8 inch (.625)	52-57 ft./lbs.	30-35 ft./lbs.	21-27 ft./lbs	7/8
12	3/4 inch (.750)	71-79 ft./lbs.	30-35 ft./lbs.	28-33 ft./lbs	1-1/16

* The tube O.D. is measured at the point it passes through the nut. ** Thread pitch may vary.

2.1 TORQUE SPECIFICATIONS - REFRIGERANT FITTINGS

All refrigerant hose fitting connections must be torqued to the specifications listed in Table 2-1.

NOTE

No matter what type of lubricant (oil) used in the system, always use mineral oil to lubricate the O-Rings and fittings. PAG oils will absorb moisture and become very acidic and corrosive. Mineral oil absorbs moisture at a much lower rate than PAG oils.

2.2 TORQUE SPECIFICATIONS - BOLTS

The torque values listed in Table 2-2 and Table 2-3 are are based on the use of lubricated threads.

Table 2-2 Metric Torque Specs

Bolt Size Dia. mm	Torque (Ft-Lb Cast Iron Grade 8.8	Torque (Ft-Lb Cast Iron Grade 10.9	Torque (Ft-Lb Cast Iron Grade 12.9
6	7	9	9
7	10	13	18
8	18	23	27
10	30	45	50
12	55	75	95
14	85	120	145
16	130	175	210

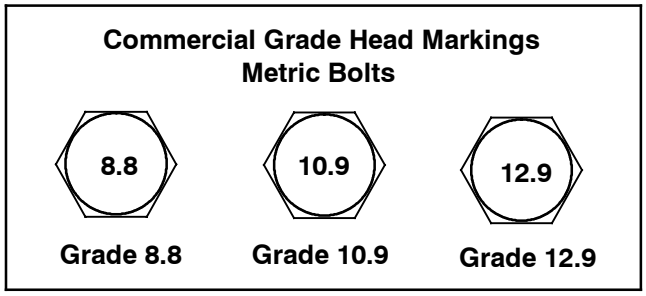


Figure 2-1 Metric Bolt Markings

Table 2-3 U.S. Torque Specs

Bolt Size Dia. mm	Torque (Ft-Lb) Cast Iron Grade 2	Torque (Ft-Lb Cast Iron Grade 5	Torque (Ft-Lb Cast Iron Grade 8
1/4-20	5	7	11
5/16-18	10	15	22
3/8-16	18	30	40
7/16-14	30	45	65
7/16-20	32	50	70
1/2-13	45	70	95
1/2-20	50	75	110
5/8-11	82	135	190
5/8-18	93	155	215

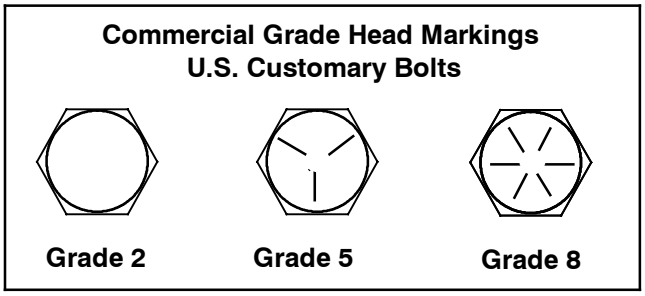


Figure 2-2 U.S. Bolt Markings

2.3 Hose installation Guidelines

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued:

Step 1: Cut the Hose

Cut the hose to proper length with an appropriate cutting tool.

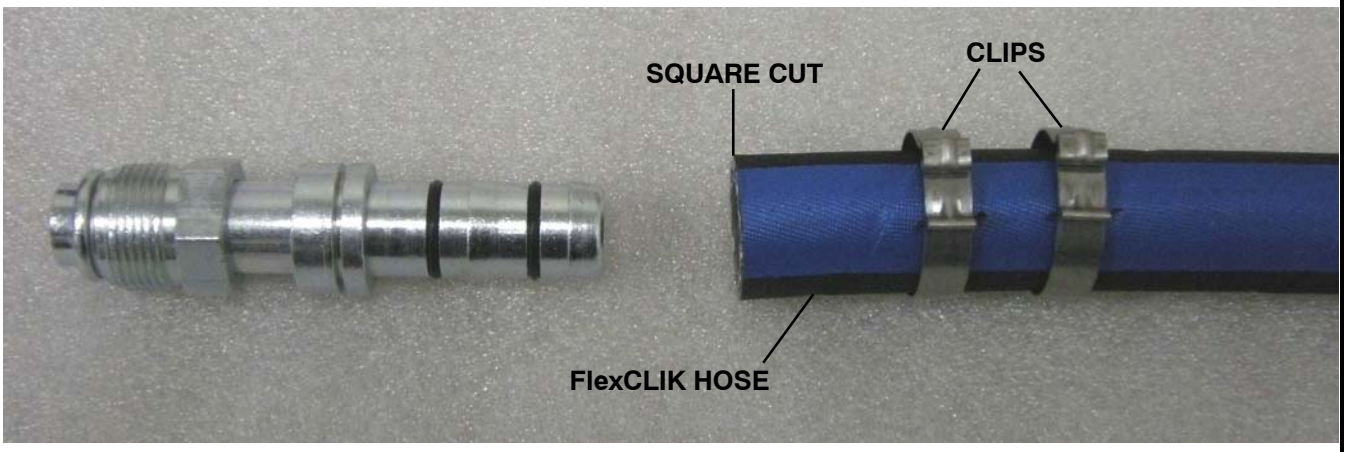
Be sure the cut is made square to the hose length.

Step 2: Slide on Two Clips

Install two proper-sized clips onto the cut end of the hose.

Orientation of the clips does not affect the performance of the connection. However, for ease of assembly, both clips should have the same orientation.

Note: Failure to slide the clips over the hose at this time will require the clips to be stretched over the hose or fitting later, which may permanently damage the clip.



Step 3: Oil the Nipple

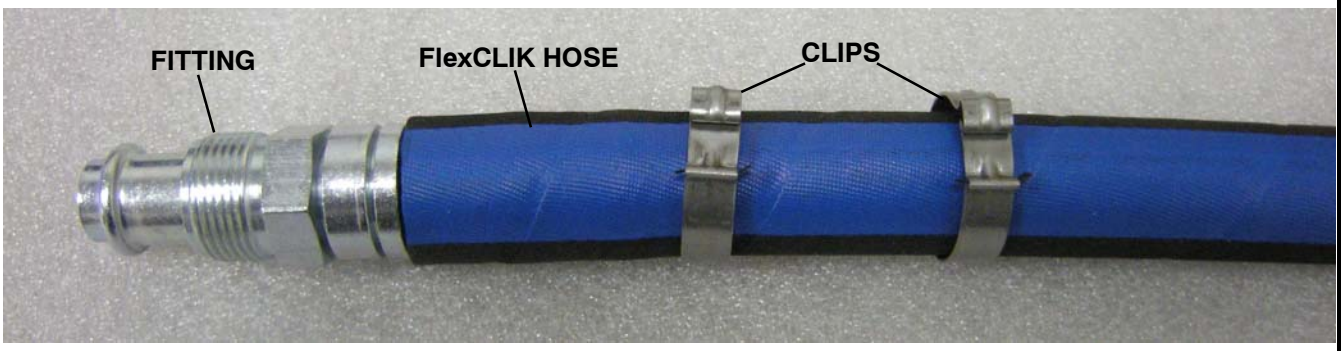
Lubricate the nipple with a generous amount of **mineral oil**. This MUST be done to lower the force of nipple insertion.

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued:

Step 4: Insert the Nipple into the Hose

To ensure that the nipple is fully inserted, check the gap between the cut end of the hose and the shoulder of the nipple. Care should be taken to avoid kinking or other damage to the hose during nipple insertion.

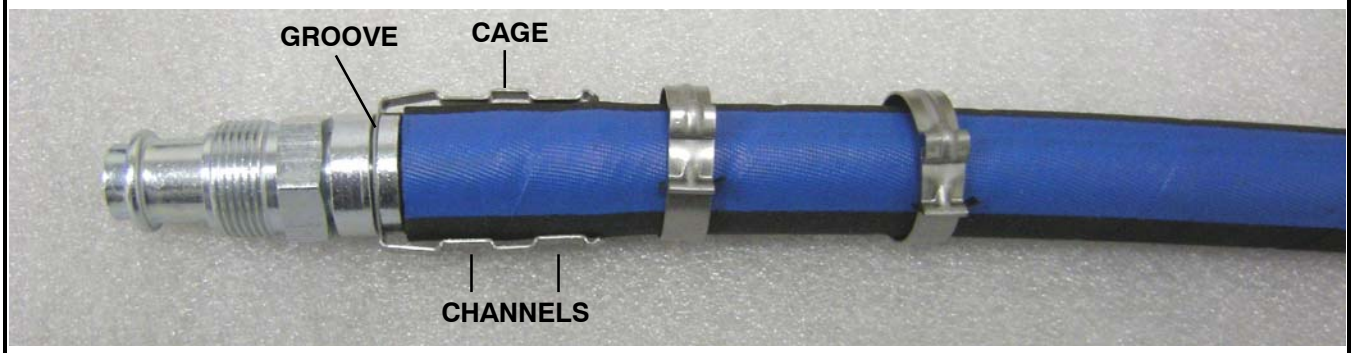
NOTE: Be sure to wipe excess oil from the nipple and hose



Step 5: Snap on the Cage

Snap the cage into the groove on the nipple. The arms should extend over the hose length. When the cage has been correctly installed in the cage groove, the cage will be able to rotate in the groove. This step MUST be performed to ensure:

1. The clips will be located over the O-Rings on the nipple.
2. The connection will be compatible with the connection's pressure ratting



Step 6: Slide the Clips

Slide the clips over the cage arms and into the channels on each arm. **SEE BELOW**

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued:

Step 7: Close the Clips

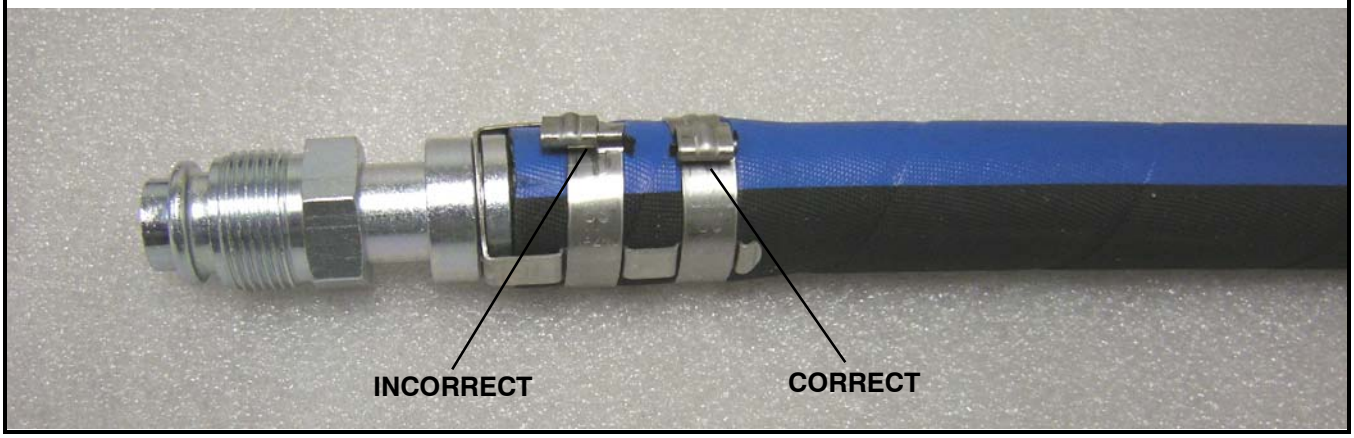
Use the FlexCLIK pliers to close the clips. The pliers should be positioned squarely on the clip connection points and should remain square during the closing of the clip. **SEE BELOW**

Nose of the pliers should be firmly seated under the assembly bump and lock latch.

If the pliers are not kept square during closing of the clip, the clasp may have an off-set. Use the pliers to correct the clasp alignment.

Notice: FlexCLIK components should not be reused. For recommendations on cleaning and routing hose assemblies, please consult "Mobile Climate Control Installation Procedures Manual T-311.

FlexCLIK - ASSEMBLY INSTRUCTIONS - Continued:



⚠ WARNING

FAILURE TO FOLLOW THESE ASSEMBLY INSTRUCTIONS AND/OR THE USE OF MOBILE CLIMATE CONTROL FlexCLIK HOSE WITH FITTINGS SUPPLIED BY OTHER MANUFACTURERS MAY RESULT IN UNRELIABLE AND UNSAFE HOSE ASSEMBLIES, WHICH MAY RESULT IN SUDDEN OR UNINTENDED ESCAPE OF REFRIGERANT GASES. PERSONAL INJURY AND/OR VIOLATIONS OF EPA REGULATIONS MAY OCCUR AS A CONSEQUENCE.

2.4 EcoLine 8 & 10 Rail Mounting Method (Sprinter application shown)

MCC PART NO: Y66-14086 BOM				
ITM NO.	PART NO.	PART NAME	PART QUALIFIER	QTY
1	23-0443	AIR DISTRIBUTOR ASSY	ECO 8/10	1
2	24-12086	TRANSITION DUCT ASSY	INLET	1
3	24-12088	TRANSITION DUCT ASSY	OUTLET	1
4	34-00662-12	WASHER, PLAIN	5/16"	8
5	34-00667-12	NUT, SELF-LOCKING	U.N.C. (S.S.) 5/16-18	8
6	34-00774-00	RIVET, BLIND	.189 DIA	54
7	34-01267-16	SCREW	FLAT HD SOCKET, M6	6
8	34-06051-104	RIV NUT	M6 X 1.0	6
9	34-62046-00	SCREW, TF PANHEAD	#10-16 X 5/8" LG TYPE 'AB'	20
10	58-62064-01	TRIM, FLEXIBLE	1/8" GRIP	9'
11	701-123	CLIP, RETAINING	HI TORQUE, 10AB TINN	20
12	801-403	GASKET	1 1/4 SQ. FOAM	8'
13	Y24-00367-00	BRACKET	MOUNTING RAIL	1
14	Y24-00367-01	BRACKET	MOUNTING RAIL	1
15	Y24-00367-02	BRACKET	MOUNTING RAIL	1
16	Y24-00367-03	BRACKET	MOUNTING RAIL	1
17	Y24-00369-00	BRACKET	CROSS RAIL	3
18	Y29-00045-00	ELEVATOR BOLT	5/16-18x1.00	8

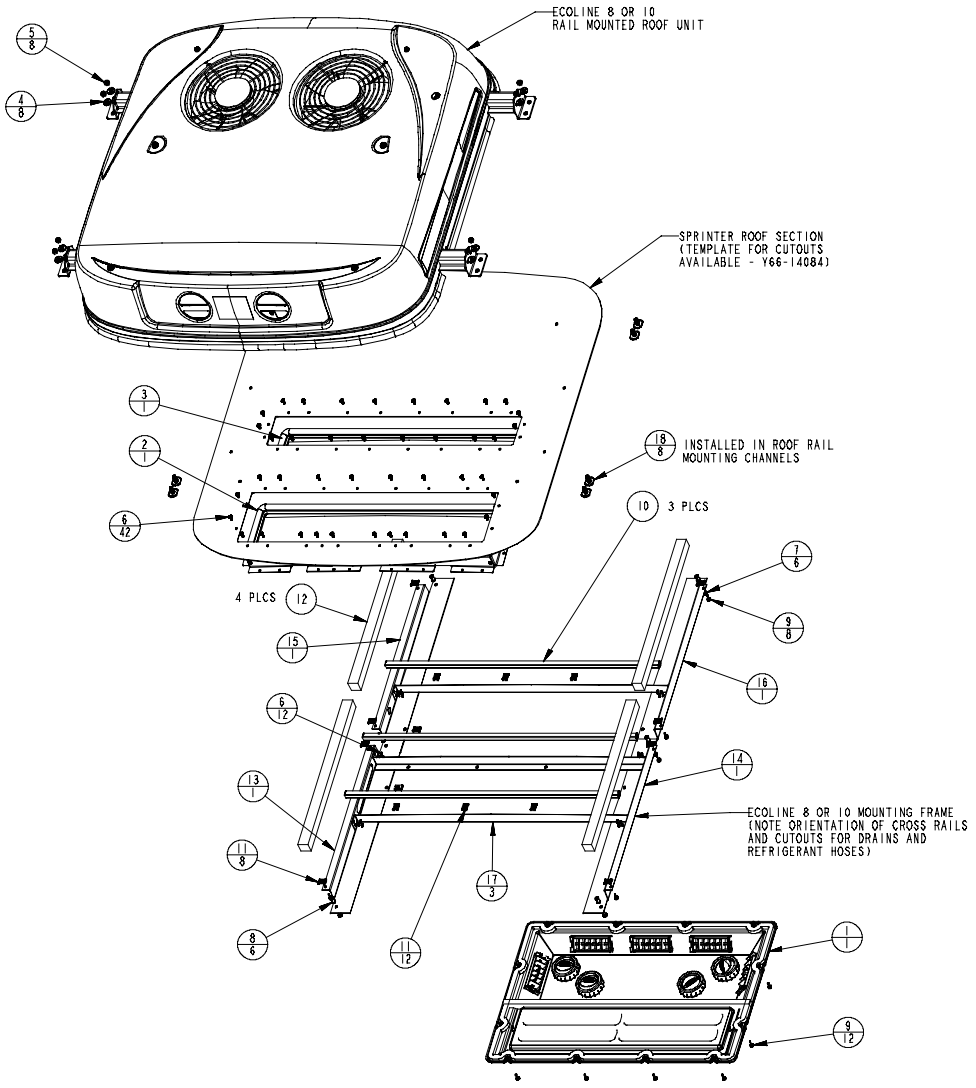


Figure 2-3 Overall Layout and Parts Identification

NOTE

The following procedure is based on an installation on a Mercedes Sprinter with a Freightliner chassis. General routing of hoses and electrical interface will differ on other vehicles, however general guidelines should be followed.

NOTE

The EcoLine rail mounted roof units are designed to utilize OEM/Installer provided roof rails to secure the unit to vehicle.

NOTE

Placement of the EcoLine rail mounted roof units should straddle the supply and return roof openings on either side of a roof bow support without altering the roof bow support.

NOTE

Before beginning the instructions listed below, it will be necessary to remove the interior headliner in the areas surrounding hose/electrical routing and area the unit is to be installed.

2.4.1 Roof Cut Out and Transition Duct Mounting

1. Based on the intended use of vehicle, determine the best location for placement of A/C unit.
2. It is beneficial to identify roof support bow locations. One method is to used the bolts securing the OEM rails as a reference dimension for roof bow (see figure Figure 2-4 and Figure 2-5).

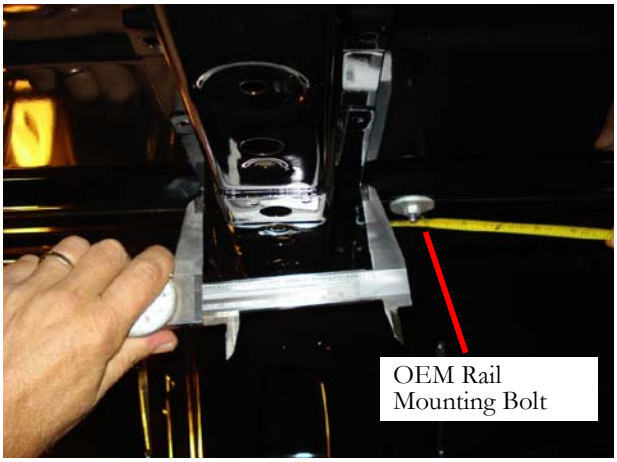


Figure 2-4 Determining Roof Support Bow Location

Figure 2-5 Marking of Roof Support Bows

3. Temporarily mark lines referencing the roof support bow to assist in template orientation. One method is using a chalk line that can be easily removed (see figure Figure 2-6).

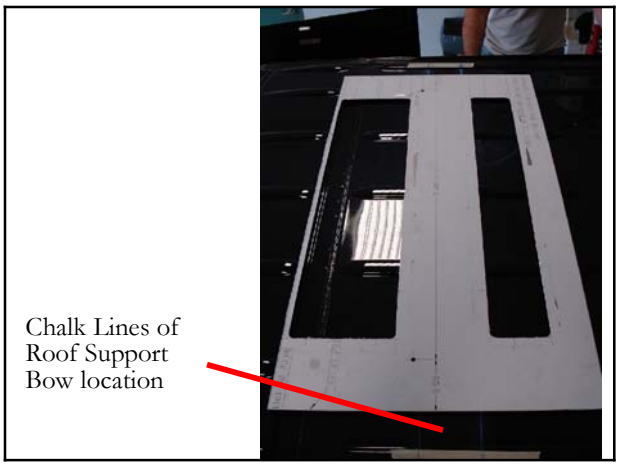


Figure 2-6 Template Orientation

4. Using dimensions in Figure 2-10, construct a template using a rigid material to assist in layout of supply and return location cut outs.

NOTE:

To assist with install a metal template is available for purchase if desired, part # Y24-00370.

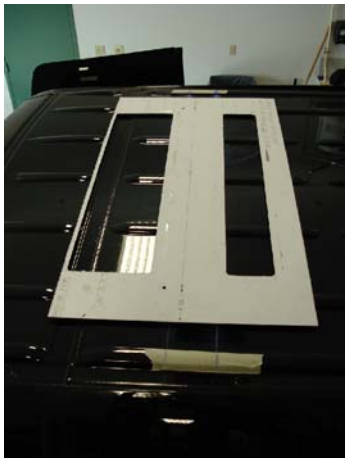


Figure 2-7 Determining Location for Unit

5. Mark off roof cut outs for the supply and return openings straddling each side of roof support bow (see Figure 2-8).

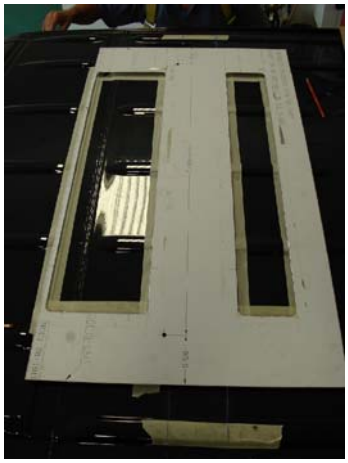


Figure 2-8 Marking Roof Cut-Outs

NOTE

Once location for cut-outs are determined, it may be beneficial to apply masking tape at opening locations to mark the cut-outs and help protect roof surface while cutting.

6. Drill ¼" pilot holes in the 4 corners of both openings for supply and return air distribution. **Remember to drill pilot holes ½" in from each side because holes will be enlarged with a 1" hole saw.** Refer to Figure 2-9.
7. Once pilot holes have been drilled, check for proper clearance on interior of vehicle before proceeding.
8. Using a 1" hole saw, drill out the corners of each supply and return opening.
9. Use a jig/scroll saw to complete the cut out of roof openings for supply and return access. See Figure 2-9.

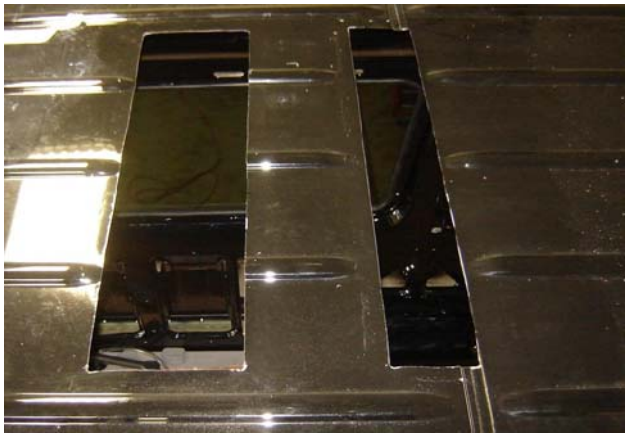


Figure 2-9 Supply and Return Cut Outs

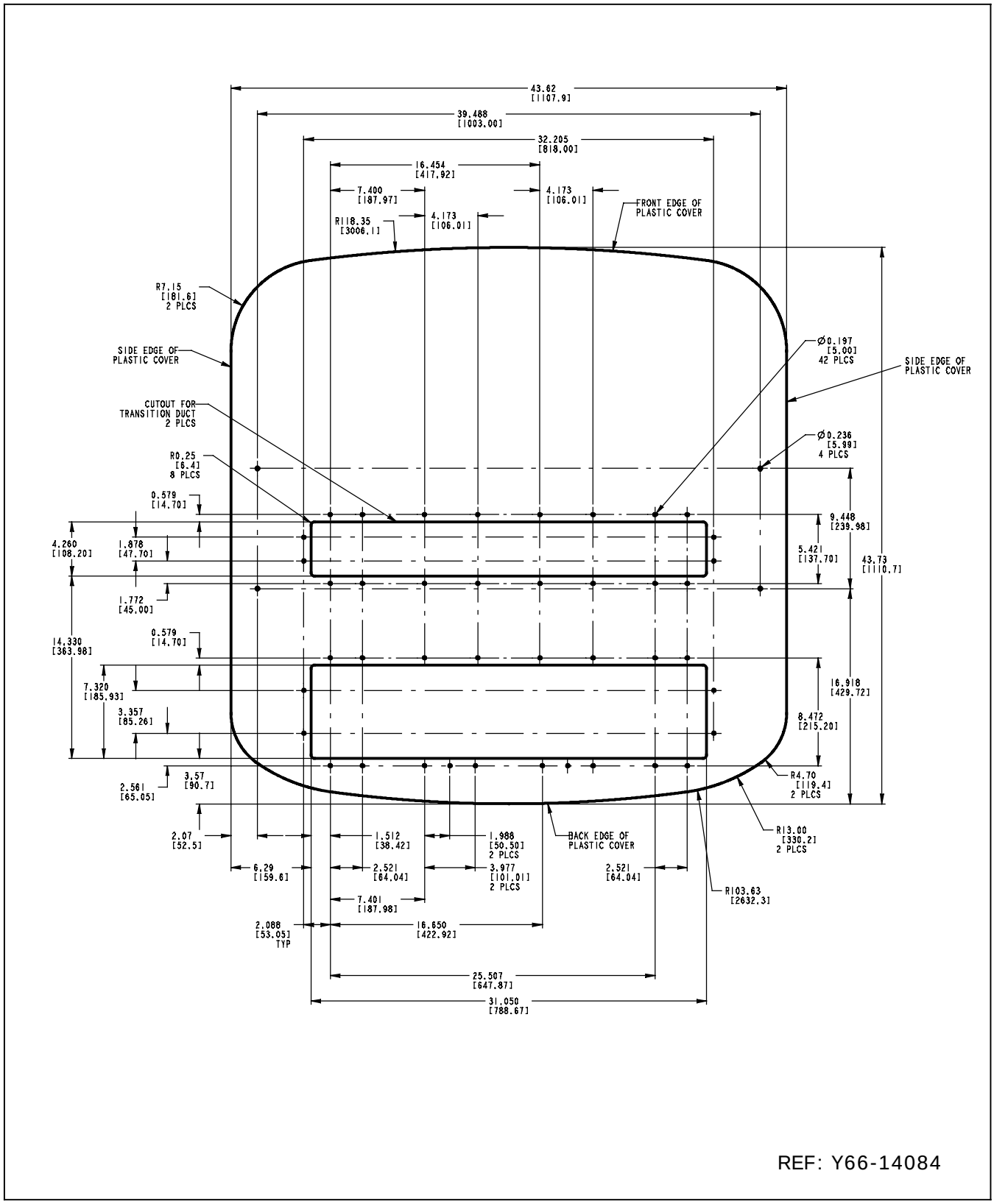


Figure 2-10 EcoLine 8 and 10 Mounting Template

10. Once cut outs have been made, de-burr the exposed metal surfaces that were cut (See Figure 2-11).

Figure 2-11 De-Burr cut edges

11. Thoroughly clean the roof of all metal shavings and dirt. Paint all exposed/bare metal with primer paint, both inside and outside of areas cut.

NOTE

Be sure to tape off all areas of roof to avoid any over spray onto existing painted surfaces.

NOTE

Figure 2-12 Shows a basic layout of how transition ducts 24-12088 (outlet/supply air) and 24-12086 (inlet/return air) will interface into the openings provided in the base of unit.

NOTE

The return air transition duct is taller on one side. The taller side should be positioned to the rear of vehicle. See Figure 2-12.

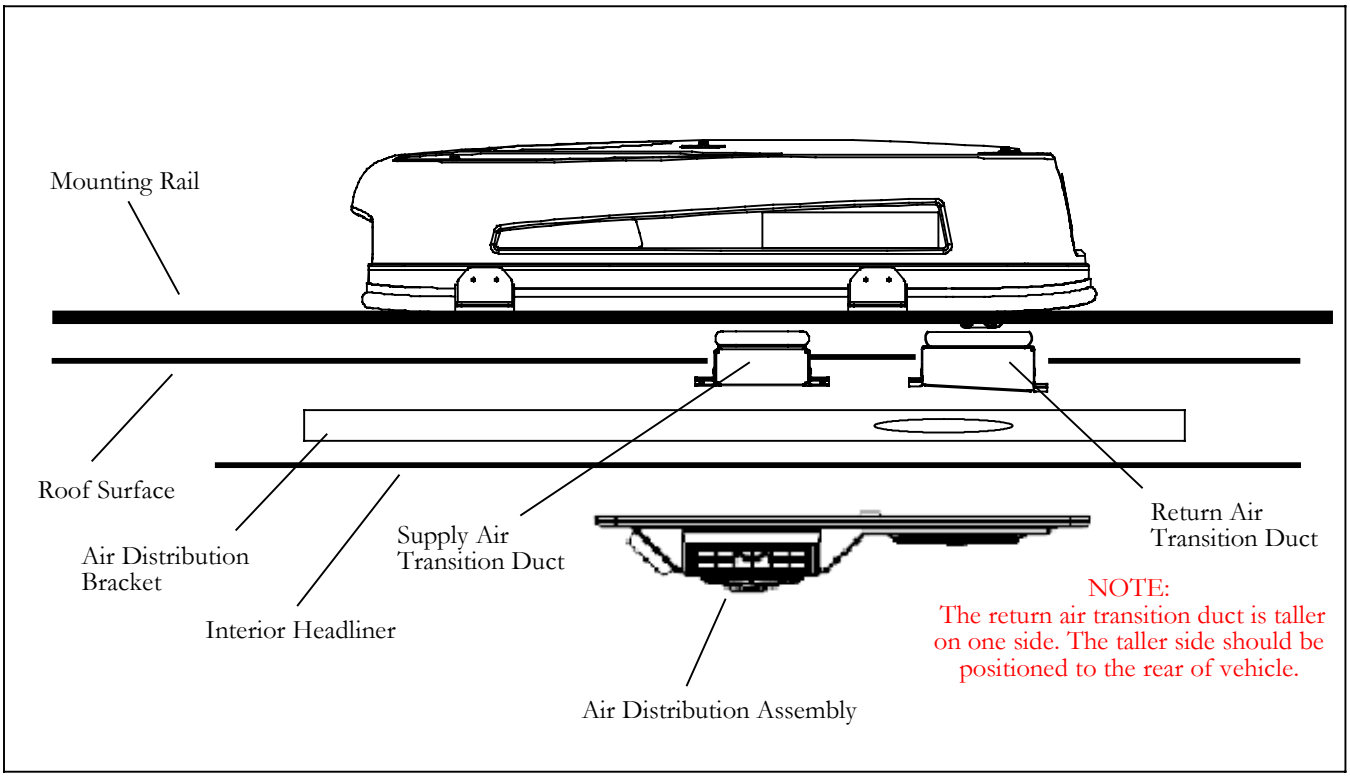


Figure 2-12 General Assembly Layout of Rail Mounted Unit

12. Insert supply and return transition ducts up through roof cut outs from interior of vehicle. Center ducts in opening and temporarily secure with set screw at each end of transition duct (Refer to Figure 2-13).

Figure 2-13 Transition Ducts (Interior)

13. Use clamps to secure transition ducts to vehicle roof (Refer to Figure 2-14).

Figure 2-14 Clamp Transition and Roof Metal

14. Drill 3/16" holes for rivets through the vehicle roof from inside vehicle. Move the supporting clamps as needed to stabilize transition duct and roof metal (See Figure 2-15) .

NOTE

It may be necessary to clean and de-burr the holes drilled to provide a clean mating surface for pop rivets.

Figure 2-15 Drill Holes for Transition Ducts (Interior)

15. While using clamps to secure transition ducts to roof (See Figure 2-14), insert pop rivets from roof and secure ducts to roof (See Figure 2-16 and Figure 2-17).

Figure 2-16 Riveting Transition Ducts (Exterior)

Figure 2-17 Transition Ducts Riveted

16. In preparation for sealing around transition ducts, it may be beneficial to apply masking tape or similar product to prevent sealant from entering the interior of vehicle (Refer to Figure 2-18).

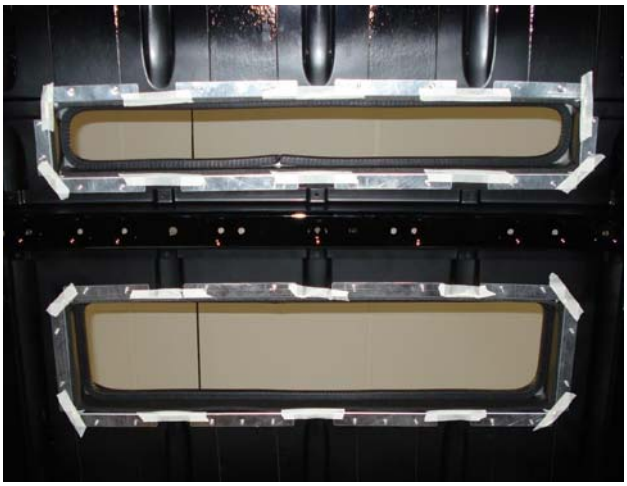


Figure 2-18 Preparation of Sikaflex application

17. Clean roof surface around transition ducts and adequately seal roof cut out seams and rivets at transition ducts to prevent external water leaks. (Refer to Figure 2-27).

Figure 2-19 Transition and Rivets Sealed

2.4.2 Air Distribution and Interior Roof Support

1. Mount supplied Air Distribution Brackets as seen in Figure 2-20.

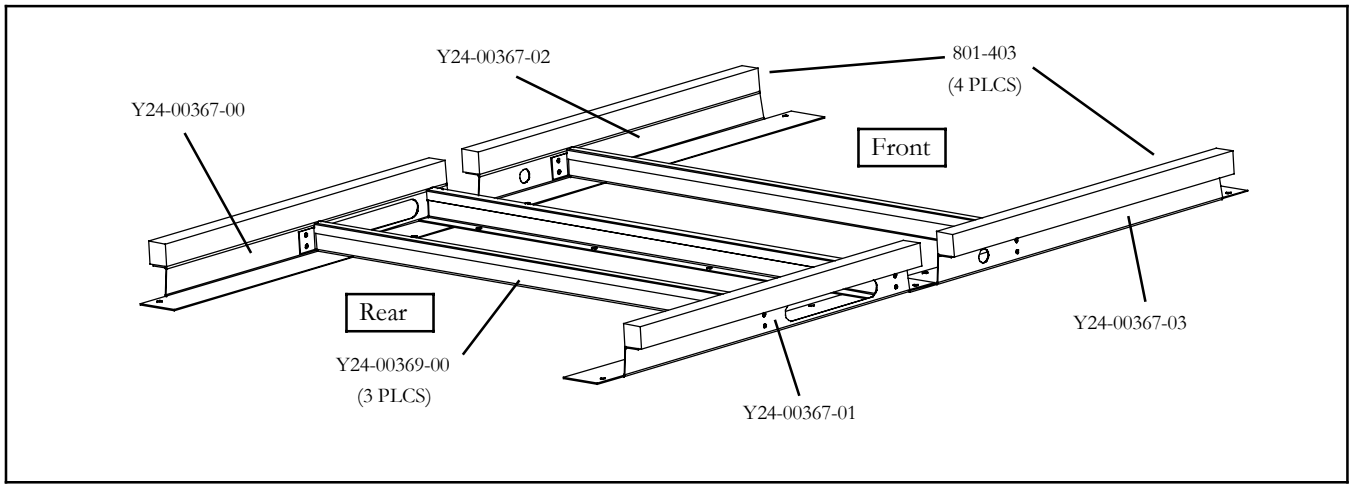


Figure 2-20 Air Distribution Bracket

2. The vertically mounted brackets provided will utilize existing holes in roof support bows by inserting 8 Tinnerman clips (part# 701-123) and 6 Riv Nuts (part number 34-06051-104). See Figure 2-3 for locations.

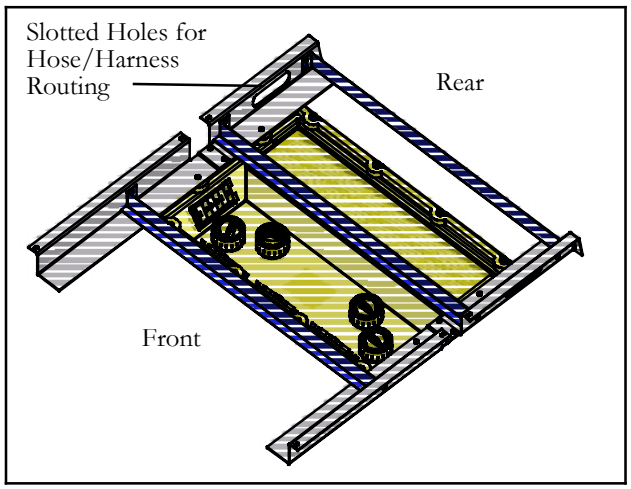


Figure 2-21 Orientation of Slotted Holes

Figure 2-22 Nut Inserts

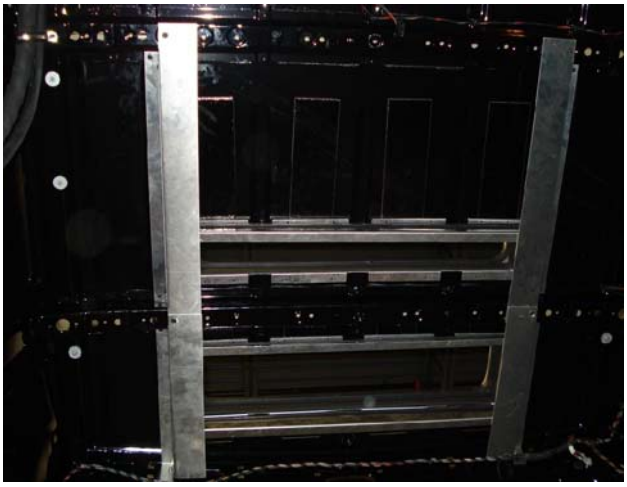


Figure 2-23 Vertical Bracket Installation

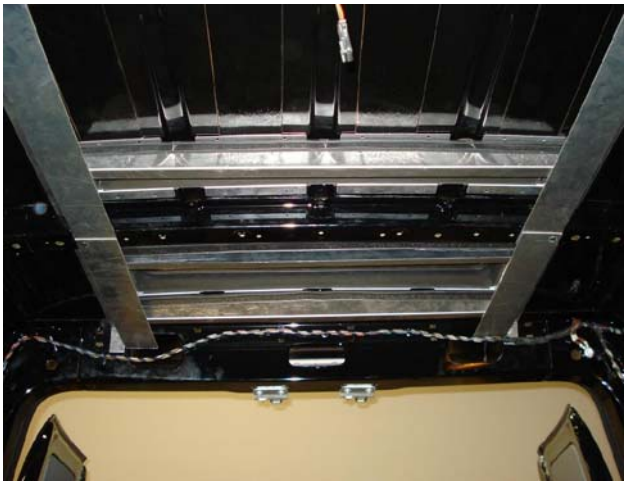


Figure 2-24 Horizontal Bracket Installation

NOTE

The slotted cut outs in vertical run channels will be used for routing refrigerant lines on the curbside, and the electrical and heater lines on the roadside (See Figure 2-25 and Figure 2-26).

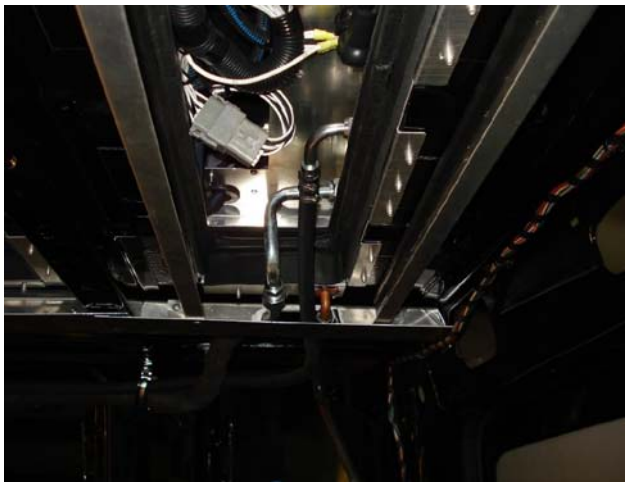


Figure 2-25 A/C Hose Routing Curbside

Figure 2-26 Electrical Harness Routing Roadside

2.4.3 Roof Unit Installation

Once the Sikaflex sealant has set, the placement of the Eco 8 or 10 roof unit can be performed.

1. Position the 8 rail mounting bolts supplied in Kit, part # Y29-00045-00 for securing unit to the roof rails. See Figure 2-27.

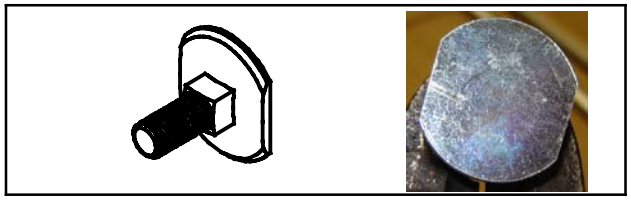


Figure 2-27 Mounting Rail Hardware

2. Using a lift or hoist, carefully position the roof unit over the transition ducts and rail mounting bolts. (See Figure 2-28 thru Figure 2-29).

Figure 2-28 Hoist for Unit

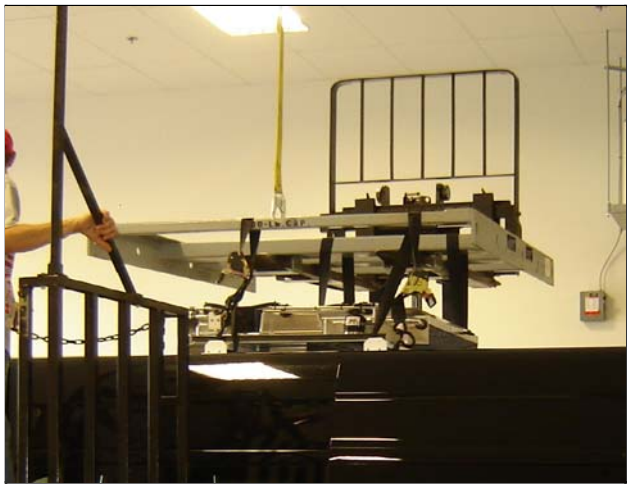


Figure 2-29 Setting unit

3. Lower unit slowly, taking care that drain lines or other items clear the transition ducts and bulb gaskets are not damaged. (See Figure 2-30).

Figure 2-30 Lowering onto Transition Ducts

4. Once unit has been properly positioned and set, secured unit mounting rails to the OEM roof rails with washers and nuts provided (See Figure 2-31).

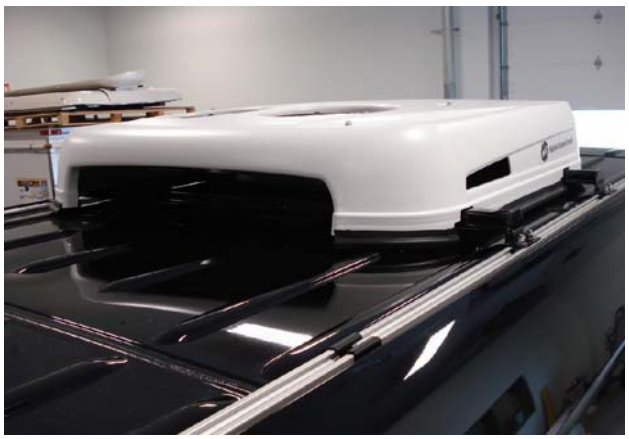


Figure 2-31 Unit Set and Secured

2.4.4 Refrigerant Hose Routing

Refrigerant hose routing on the Mercedes Sprinter application will be done on the passenger side of vehicle as shown in Figure 2-32.

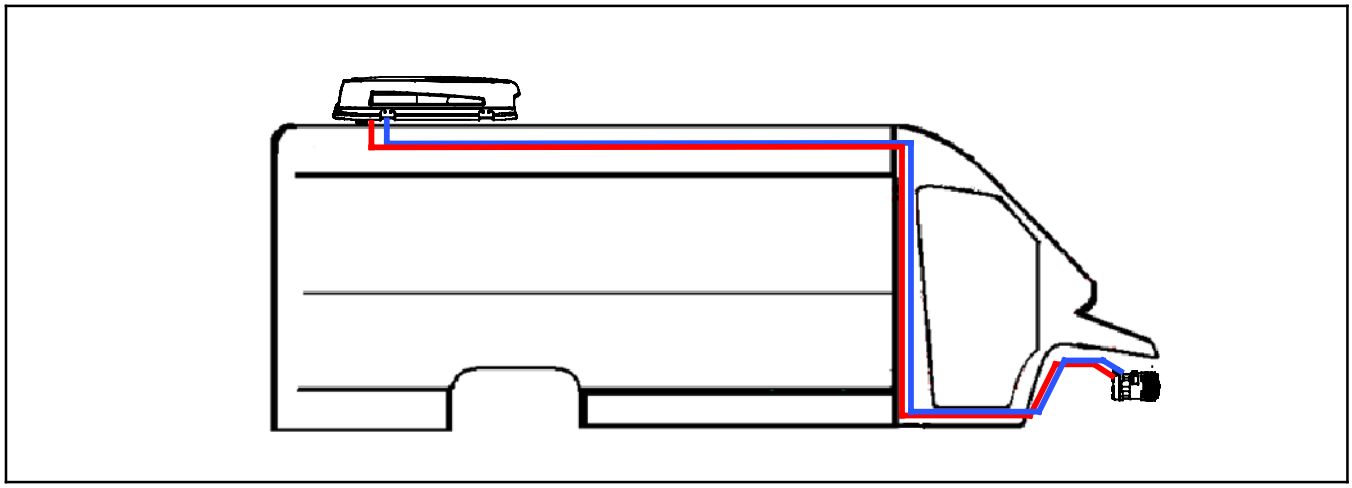


Figure 2-32 A/C Hose Routing Curbside

1. If installation is being performed on a finished interior vehicle, it will first be necessary to remove the interior panels and headliners.
2. Remove cover from "B" column behind the front passenger seat as seen in Figure 2-33.

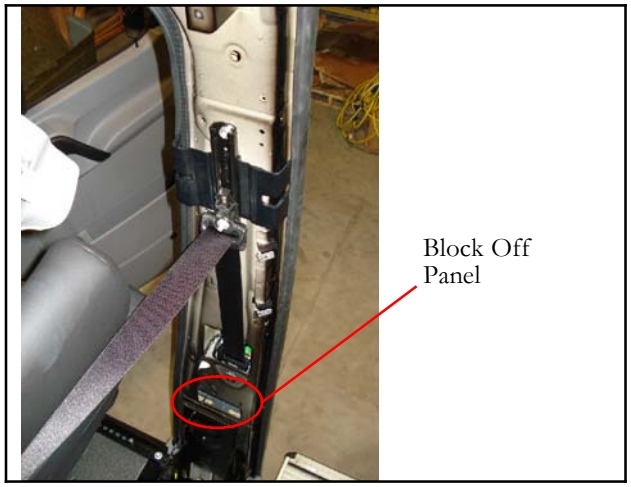


Figure 2-33 Passenger column "B" cover

3. There is a plastic block off plate in the column that will need access holes be drilled in order to route hoses (See Figure 2-33).
4. To gain access into the column, remove the Styrofoam plug located under vehicle directly under the column (See Figure 2-34).

Figure 2-34 Styrofoam Access Cover

5. The column block off plate can be seen in Figure 2-35. Holes will need to be drilled for hose routing. A hole saw with extension as seen in Figure 2-36 can be used.

Figure 2-35 Column Block Off Plate

Figure 2-36 Hole Saw with Extension

6. Once access holes have been cut, the refrigerant hoses can be routed up from underneath the vehicle, through the block off plate. Depending on chassis, either feed hoses to the access hole at the top of column (See Figure 2-37), or exit at the hole by seat belt (See Figure 2-38).

NOTE

If chassis requires the hoses to exit column at the seat belt access hole, care needs to be taken to eliminate the possibility of obstructing seat belt operation or chafing of the refrigerant lines.

NOTE

The suction hose should be insulated to prevent possibility of line "sweating" during periods of high humidity and high interior temperatures.

Figure 2-37 Passenger column "B" Top Access

Figure 2-38 Passenger column "B" Seat belt Access

7. Route refrigerant lines up to top of column as shown in Figure 2-39. Continue pulling enough hose to reach the unit connections before securing.

NOTE

All areas where hoses could come in contact or rub on sharp edges should be protected using trimlok or other protective material.

NOTE

Be certain to leave enough hose beneath vehicle to route refrigerant hoses to the engine mounted compressor.

Figure 2-39 Upper Passenger Column Hose Routing

8. Route refrigerant lines up to top of column as shown in Figure 2-39. Continue pulling enough hose to reach the unit connections before securing.

NOTE

Protective rubber P-clamps should be used to secure hoses to roof support bows, utilizing existing holes at corners. Screws and proper Tinnerman clips will work nicely.

9. Secure refrigerant lines in place (See Figure 2-40) .

Figure 2-40 Passenger side Hose Routing to Unit

10. Install refrigerant fittings and interface refrigerant lines to the unit (See Figure 2-41). Section 2.3 provides instructions for proper fitting/hose installation procedures. Torque fittings according to values in Table 2-1.

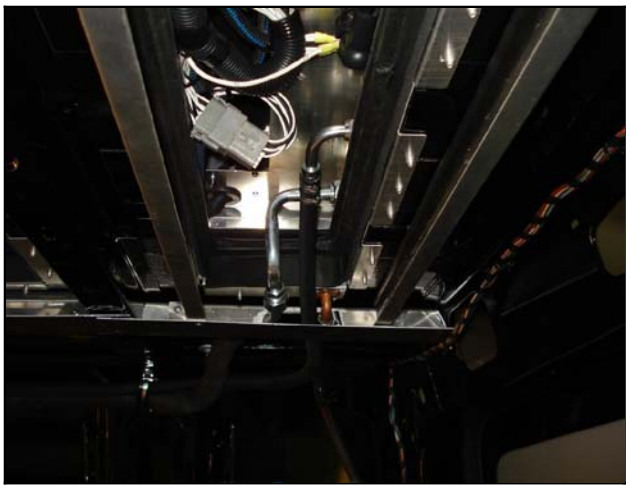


Figure 2-41 Refrigerant Hose Routing at Unit

11. Route lines from base of passenger column to engine compartment.

NOTE

Wheel well covers at front passenger side tire will need to be removed in order to properly secure and protect refrigerant hose routing in this area.

12. Route lines from base of passenger column to engine compartment.

Figure 2-42 Refrigerant Hose Under Vehicle

13. Service access ports could be cut in between column access plug under vehicle and where the hoses go behind wheel well covers. This provides easy access for servicing (See Figure 2-43).

Figure 2-43 Service Port Fittings

14. Route refrigerant hoses through front passenger side wheel well (See Figure 2-45 and Figure 2-44).

NOTE

Protective sleeve should be added over hoses leaving compressor and into wheel well area.

Figure 2-44 Wheel Well Routing

Figure 2-45 Wheel Well Routing

15. There will be areas where trimlok or protective material will be required to avoid hose chafing (See Figure 2-46 and Figure 2-47).

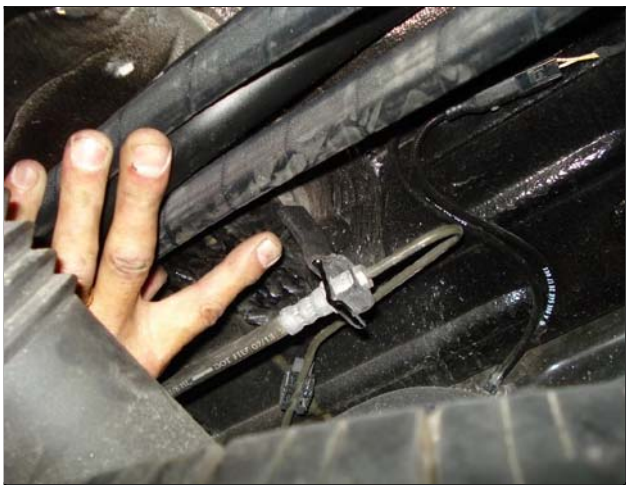


Figure 2-46 Hose Protection (Brake Line Bracket)

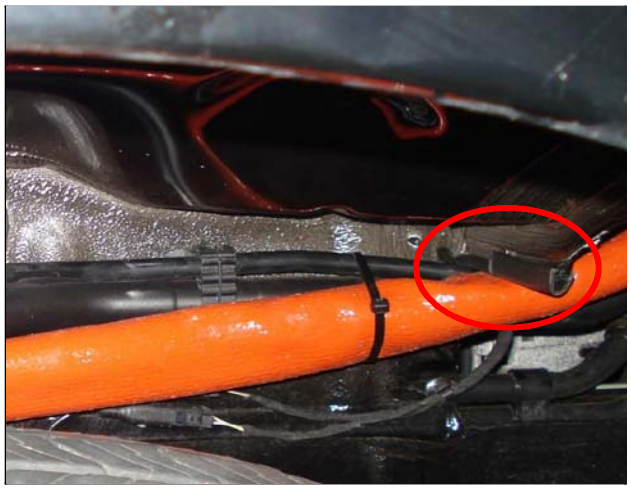


Figure 2-47 Hose Protection (Vehicle Frame)

16. Route refrigerant lines from wheel well to compressor. Be sure to leave extra hose to provide a service loop and slack for engine movement under throttle conditions

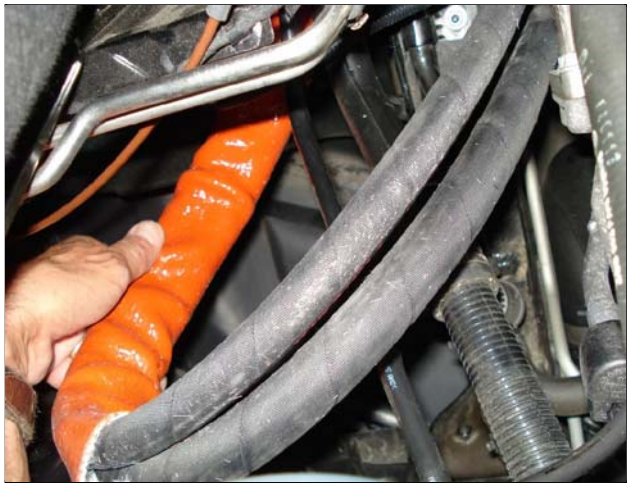


Figure 2-48 Hose Routing to Compressor

17. Add additional sleeve material to hose if necessary and install compressor fittings.

Figure 2-49 Hose Routing to Compressor with "Sleeve"

18. Secure fittings onto compressor. Torque fittings according to values in Table 2-1.

Figure 2-50 Fittings at Compressor

19. Verify hoses are properly secured and protected at all routing points.

NOTE

DO NOT re-install the wheel well covers until the wiring for compressor clutch has been installed.

2.4.5 Electrical Harness Routing

Electrical harness routing on the Mercedes Sprinter application will be done on the driver side of vehicle, from driver seat pedestal to A/C unit as shown in Figure 2-51.

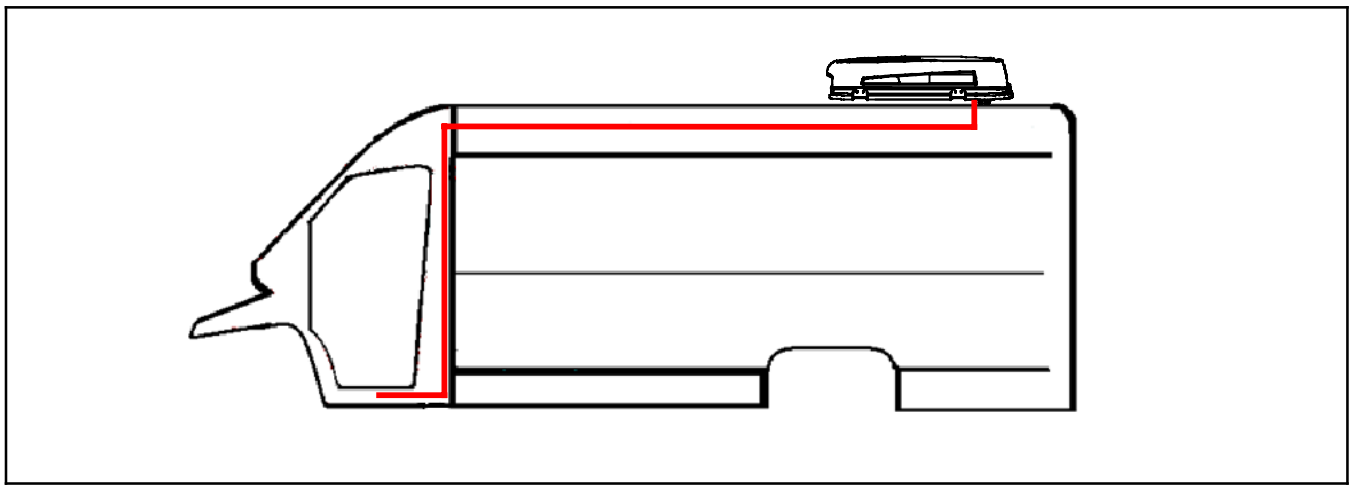


Figure 2-51 Electrical Harness Routing Roadside

1. A good starting point may be to begin by laying out main control harness which goes from A/C unit to driver pedestal and driver display.

2. Position the control harness where it splits to go to the driver display and drop down to the driver pedestal at the top of column "A" behind driver seat (See Figure 2-52).

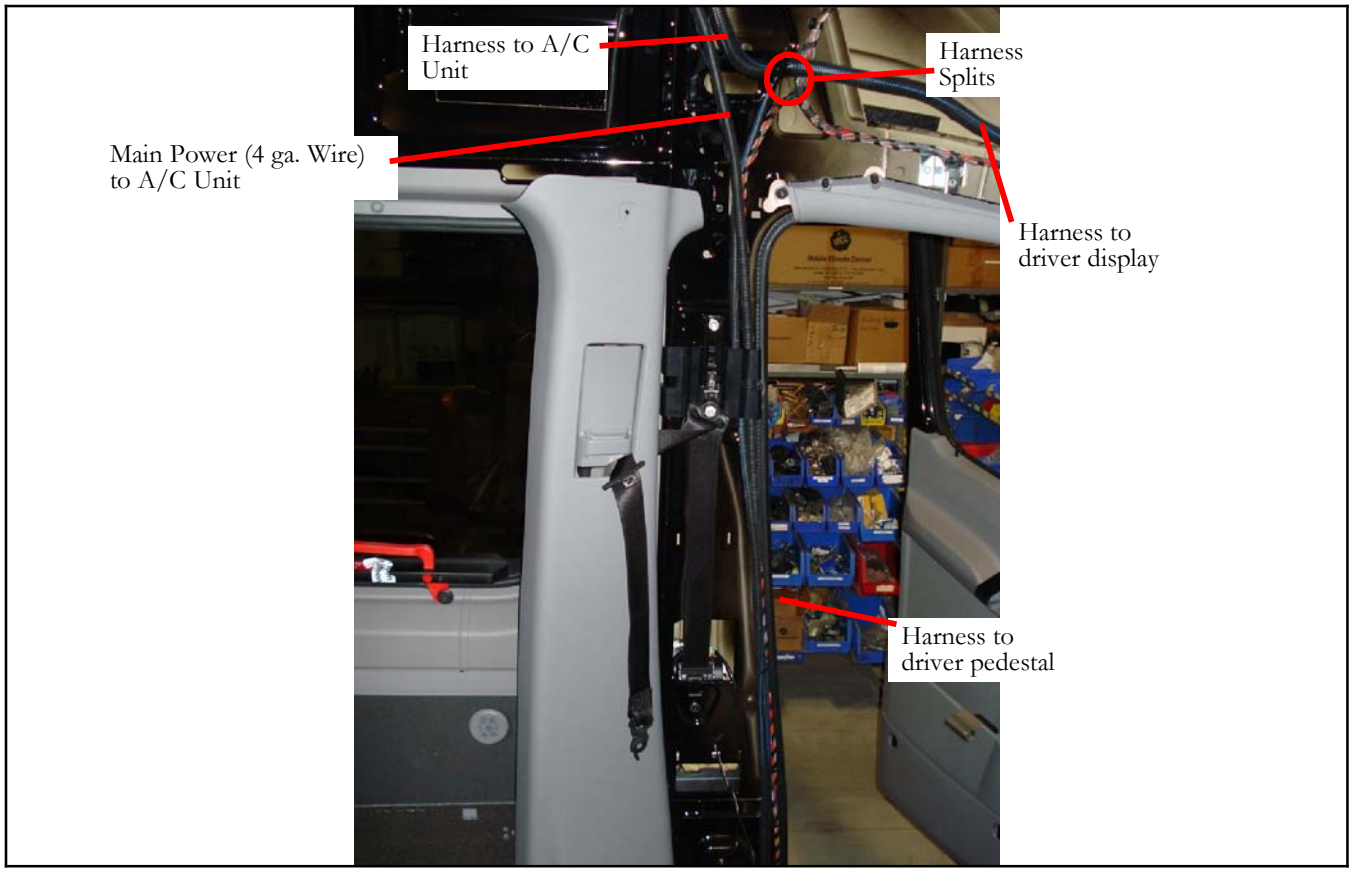


Figure 2-52 Electrical Harness Positioning

3. Secure the harness at top of column.
4. Route the main power wire (4 Ga.) down the column along with the control harness. Leave adequate length to continue routing into driver pedestal and connect to the load side of electrical contactor.
5. Depending on chassis, route the main power wire (4 Ga.) and control harness into the drivers pedestal. A possible option is an opening of pedestal on side facing driver's door (See Figure 2-53).

NOTE

It may be necessary to loosen bolts of driver pedestal to route wires. Be sure that wires do not get crushed or pinched. If the routing cannot be completed safely, consider alternative path.

Figure 2-53 Electrical Routing from Column Base to Pedestal

6. Route the control harness from top of driver column, above driver door and across front windshield to center of vehicle where display will be mounted in front headliner (See).

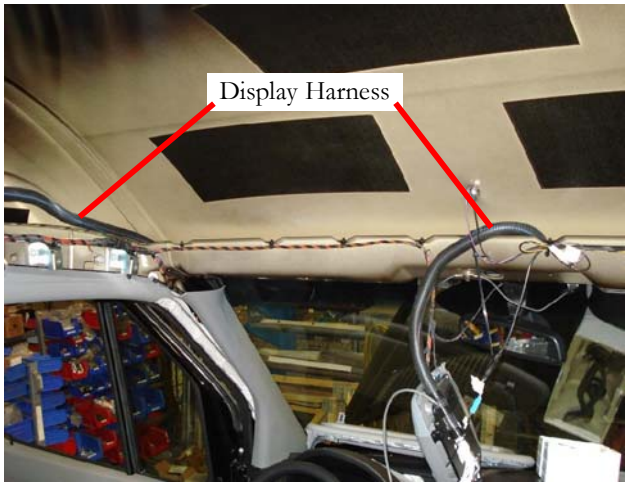


Figure 2-54 Electrical Routing from Column to Driver Display

Figure 2-55 Driver Display Mounted

7. Continue routing the control harness from top of driver column along the driver's side ceiling to the A/C unit. Use rubber protective P-clamps or wire tie to existing electrical harness fasteners to secure. Harness wires may need to be routed behind a Styrofoam brace for headliner (see Figure 2-56).

Figure 2-56 Electrical Routing from Column to A/C Unit

8. Route power harness and control harness through slotted hole in air distribution framing and connect to appropriate power stud and connectors (See Figure 2-57 and Figure 2-58).

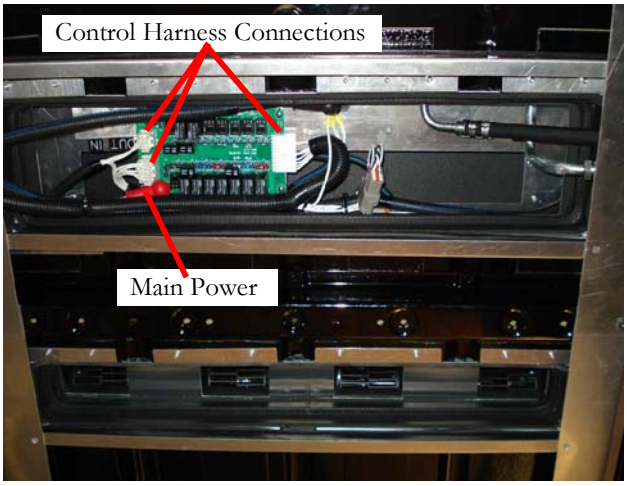


Figure 2-57 Electrical Routing Inside A/C Unit

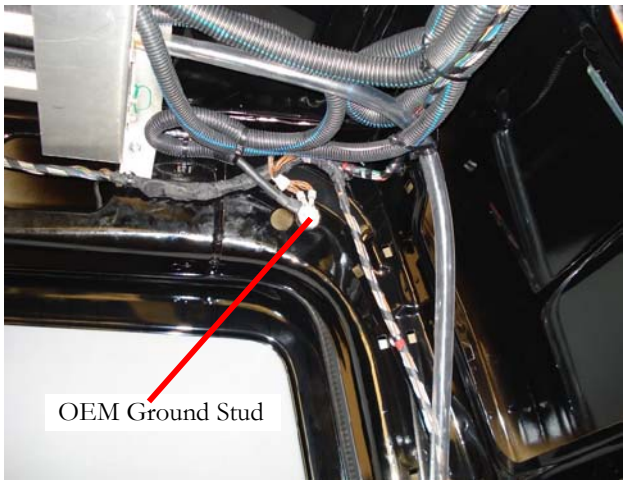


Figure 2-58 Electrical Routing into A/C Unit

9. Route the main ground harness supplied in kit from ground stud in unit return air section to the OEM stud at rear driver's side corner of vehicle (See Figure 2-58).
10. Neatly route and secure the electrical harnesses at A/C unit.
11. Using harness supplied in the install kit (Part# Y25-00090-54), route 4 Ga. wire from battery post manifold to the inside of driver's pedestal (See Figure 2-59). It may be necessary to un-bolt pedestal to feed wiring into pedestal.

NOTE

It may be necessary to loosen bolts of driver pedestal to route wires. Be sure that wires do not get crushed or pinched. If the routing cannot be completed safely, consider alternative path.

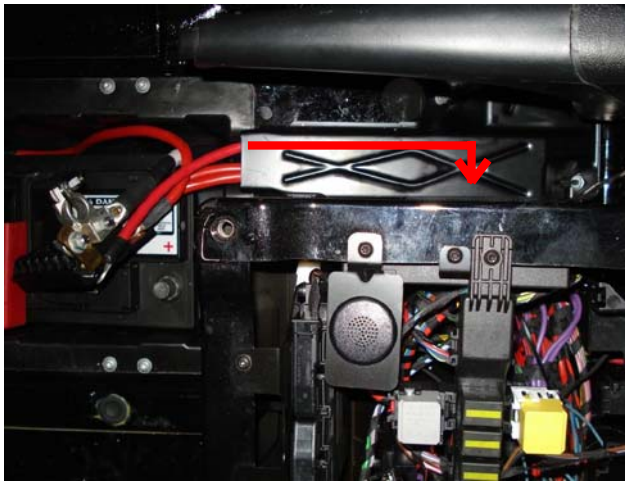


Figure 2-59 Electrical Routing From Vehicle Battery

12. Mount electrical panel (Part# Y25-00090-00) inside of driver pedestal. Panel may be different for the Eco 8 (with heat) which utilizes and extra relay for boost pump option, as opposed to the Eco 10 unit without heat option (See Figure 2-60 thru Figure 2-62) . The panel may require holes to be drilled (Figure 2-62), or mounted to exist studs depending on vehicle chassis (Figure 2-60).

NOTE

Be sure to properly route and protect all wiring from chafing against sharp surfaces.

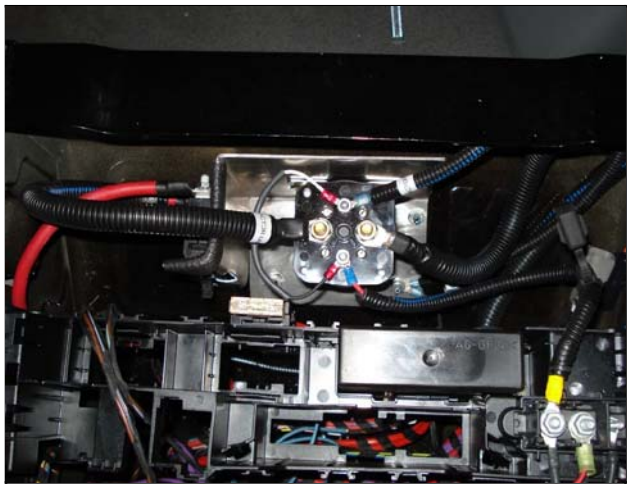


Figure 2-60 Eco 10 Panel Installed

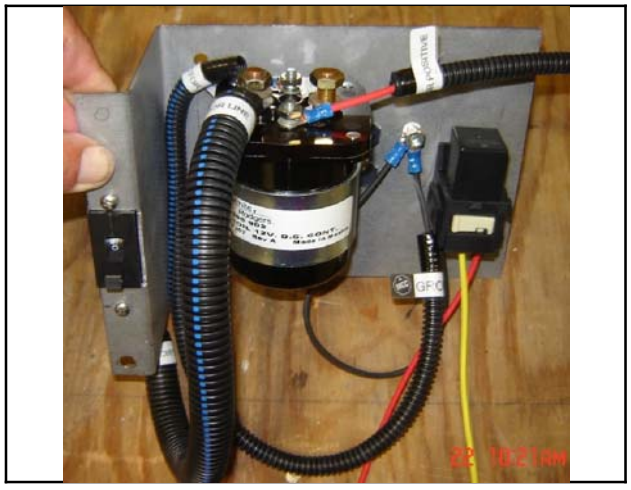


Figure 2-61 Eco 8 Panel Components

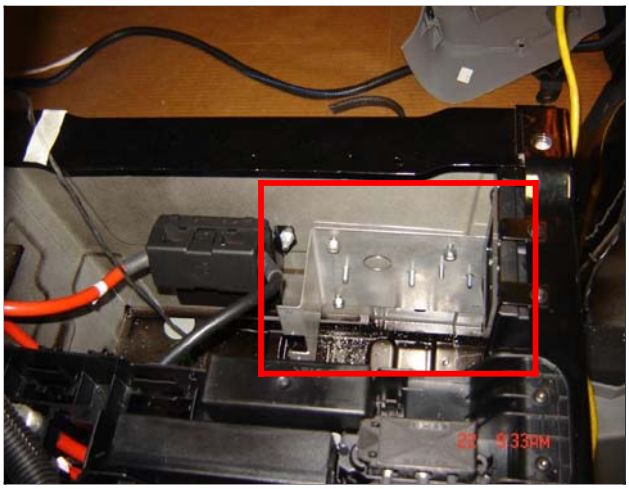


Figure 2-62 Eco 8 Panel Installed

13. Following the electrical schematic for Section of manual, connect electrical harnesses to contactors and relay (If applicable). Supplied harnesses are labeled with point A to point B labels. OEM ignition interface should be done at EK1 terminal as per OEM instructions (See Figure 2-63).

NOTE

Be sure to identify the correct terminal/stud designated EK1, as orientation of stud may vary depending on chassis.

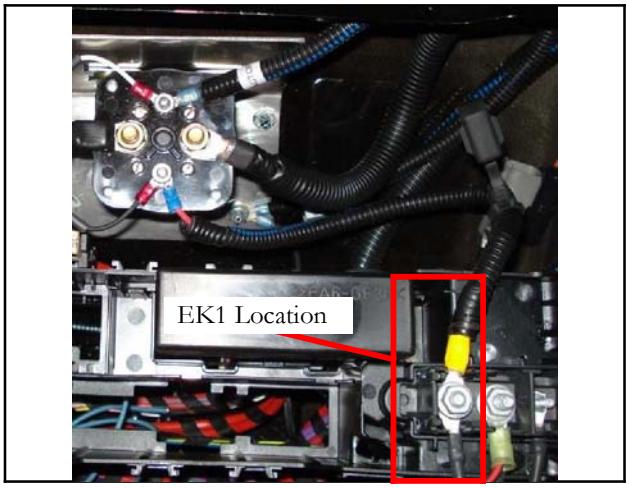


Figure 2-63 OEM Interface

14. A wire included in the electrical harness inside driver pedestal will need to be routed to the compressor clutch . There is a "boot" located through flooring at pedestal that can be used to route the compressor signal wire supplied in harness (see Figure 2-64 and Figure 2-65).

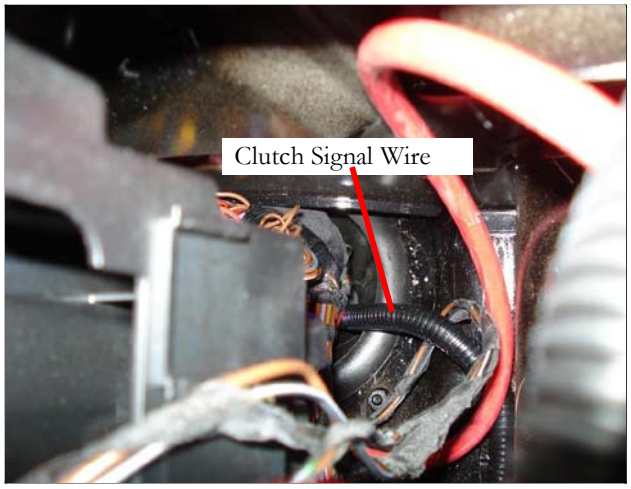


Figure 2-64 Electrical Boot from Driver Pedestal

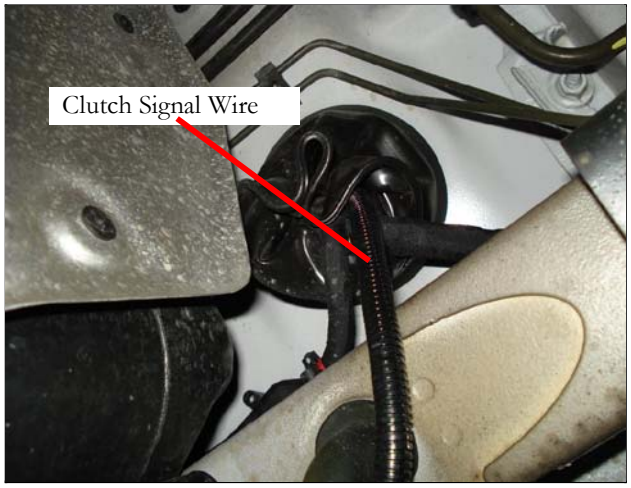


Figure 2-65 Electrical Boot Under Driver Pedestal

15. The clutch signal wire will need routed from drivers side of vehicle, to the passenger side. An example of routing is shown in.

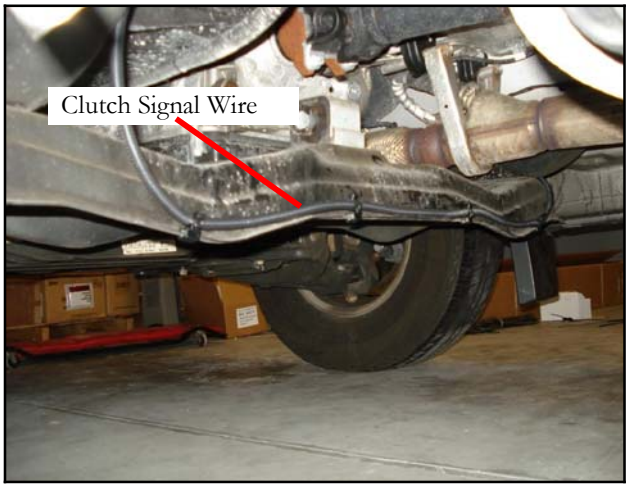


Figure 2-66 Clutch Signal Wire Routing Under Vehicle

16. Continue routing the clutch signal wire up through the front passenger wheel well along the same path as refrigerant hoses in Section 2.4.4.

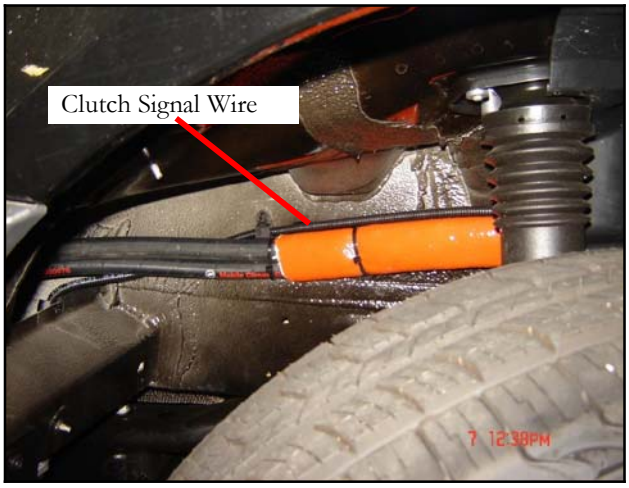


Figure 2-67 Clutch Signal Wire at Wheel Well

17. Adapt clutch coil wire with proper electrical connector for interface with clutch signal wire harness (See Figure 2-68).

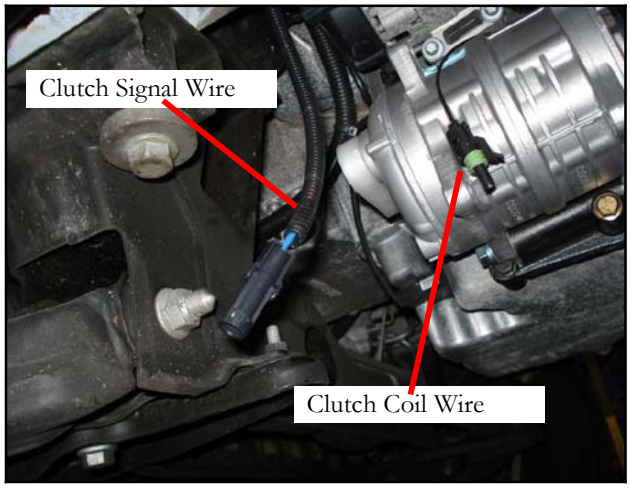


Figure 2-68 Clutch Signal Wire Compressor

2.4.6 Heater Hose Routing (Eco 8 Only)

Heater hose routing on the Mercedes Sprinter application will need to be determined. If decided to be done on the interior of driver side of vehicle, from column "A" behind driver seat to A/C unit, refer to Figure 2-70. If it is determined to run heater hoses on the exterior of vehicle, the hoses will require insulation to be added.

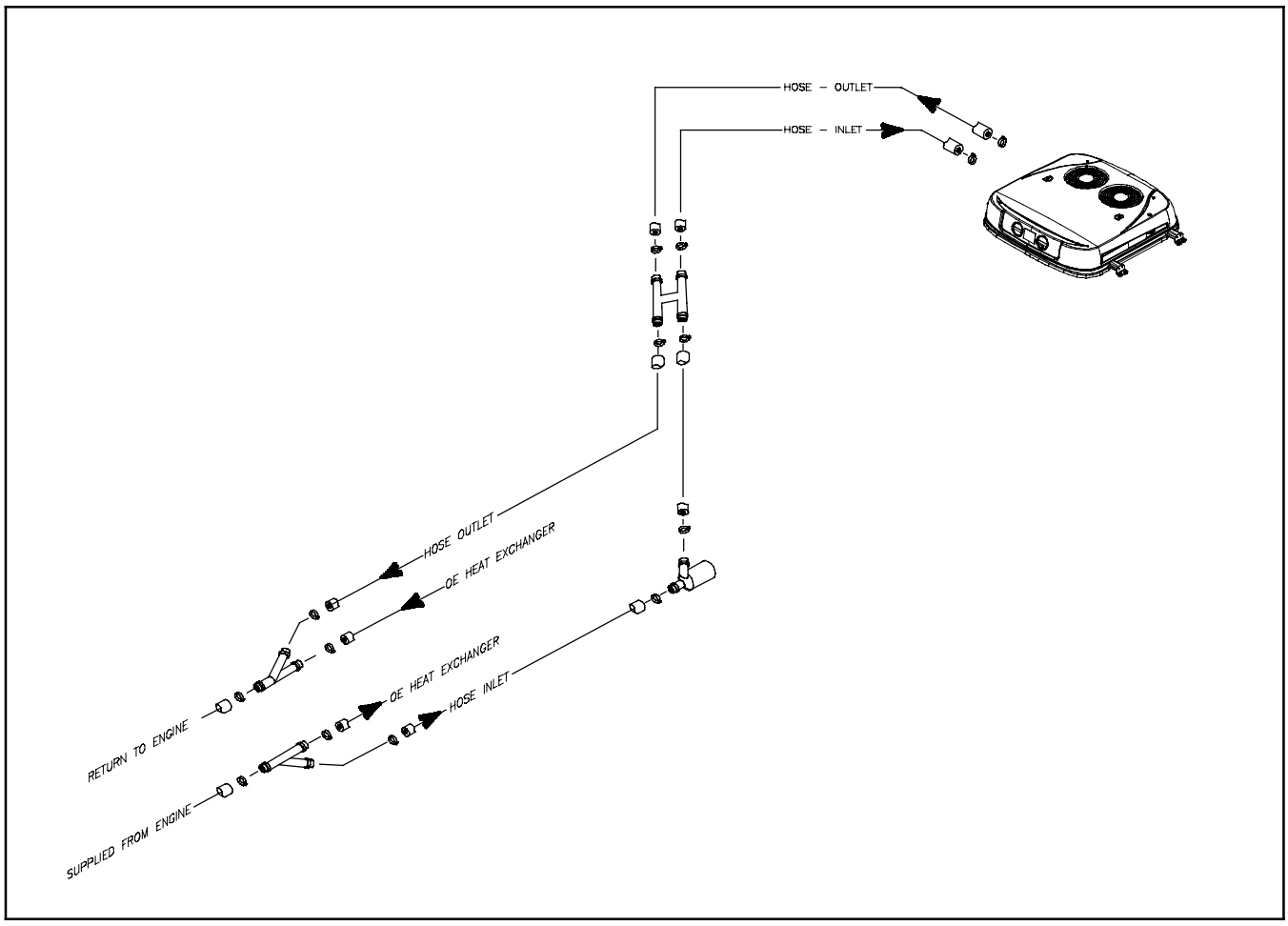


Figure 2-69 General Overview of Heater Hose Routing

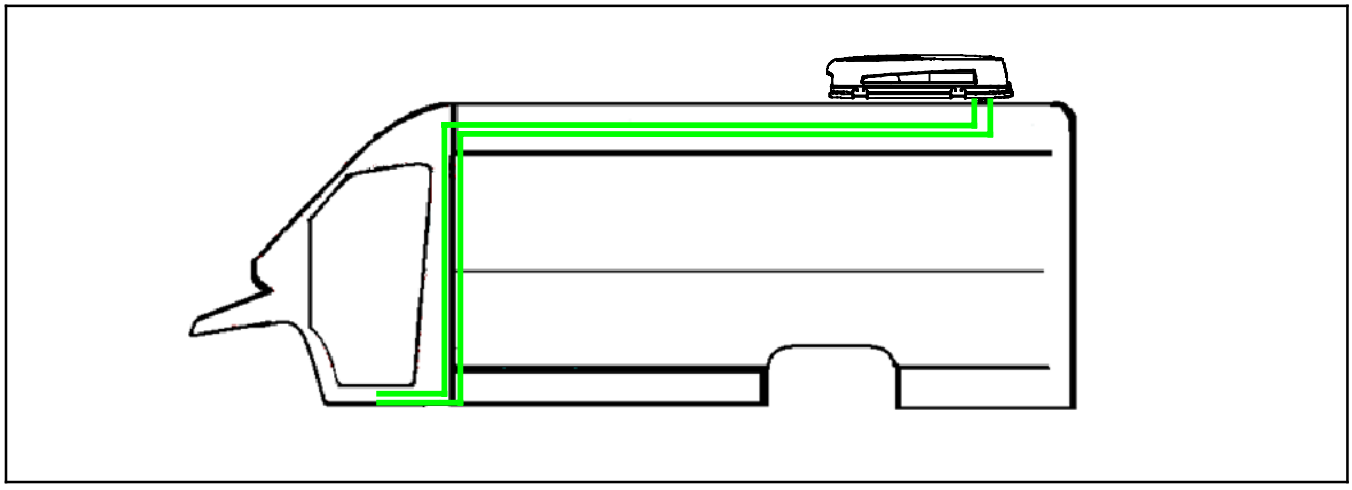


Figure 2-70 Optional Heater Hose Routing Roadside (Interior)

1. Begin by removing protective metal cover underneath the vehicle, over fuel fill tube. Cover is located directly underneath driver column "A" (See Figure 2-71).

Figure 2-71 Protective Metal Fuel Fill Cover

2. Once cover is removed, drill 2 holes large enough to accept the heater hoses through the Styrofoam plug that is covering the column opening (See Figure 2-72).

⚠ CAUTION

There may be sensor wiring above the Styrofoam plug. Be careful not to damage this wiring.

Figure 2-72 Plug Holes at Driver Column Underneath Vehicle

3. In order to provide easier access in routing the lines from under vehicle to top of driver column, remove the Fuel fill door and cap shown in Figure 2-73.

Figure 2-73 Fuel Fill Access Door

4. To prevent chafing, install protective sleeve at areas where heater lines come in contact with sharp edges. Example can be seen in Figure 2-74.

Figure 2-74 Heater Hose Protection

5. Heater lines will exit driver column as seen in Figure 2-75. Trimlok or protective material should also be used at opening to protect heater lines.

Figure 2-75 Heater Hose Exiting Column

6. Heater lines will be run along top corner of drive side, along with electric harnesses. If there is any Styrofoam "stand-offs", they will require modifications to route lines behind them, to avoid interference with headliners when re-installed.

NOTE

Figure 2-76 Does not show the air distribution bracket. The lines will be run through slotted opening in air distribution bracket, along with electrical harnesses, similar to refrigerant lines seen in Figure 2-41.

Figure 2-76 Heater Hose Routing Along Roadside

7. Rubberized protective P-clamps should be used to secure heater hoses using existing holes in roof bows. Proper size Tinnerman clips and screws will accomplish this.
8. If an auxiliary boost pump is to be used in the application, it can be installed under vehicle where heater lines exit the driver column.

Figure 2-77 Auxiliary Boost Pump

9. Hook up locations for Boost assembly can be seen in Figure 2-78. For further clarity refer to installation drawing supplied (Y66-14088)

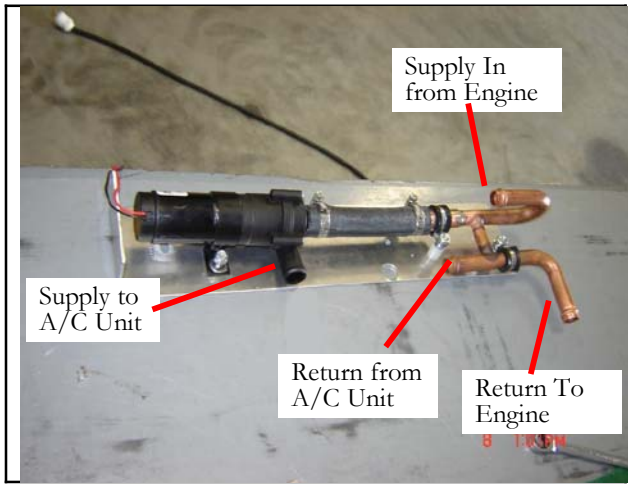


Figure 2-78 Heater Hose Routing at Boost Pump

Figure 2-79 Heater Hoses Installed at Boost Pump

10. Hoses should be routed to engine compartment and secured in a manner that will isolate lines from damage due to chafing or engine heat. Images of a routing example can be seen in Figure 2-80 thru Figure 2-82. Stand off brackets, etc. may need to be fabricated.

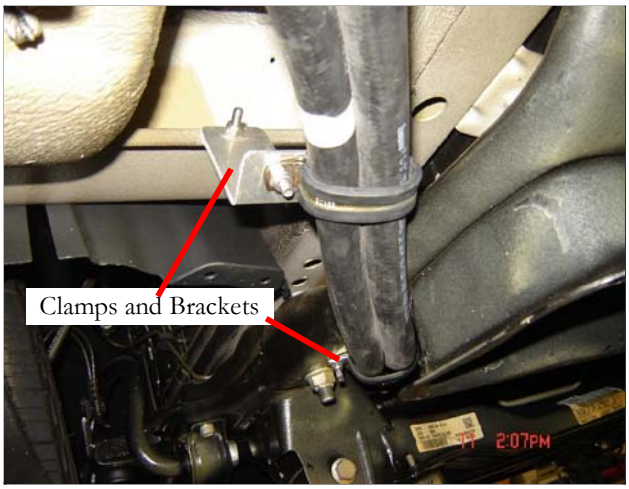


Figure 2-80 Heater Hoses Under Vehicle

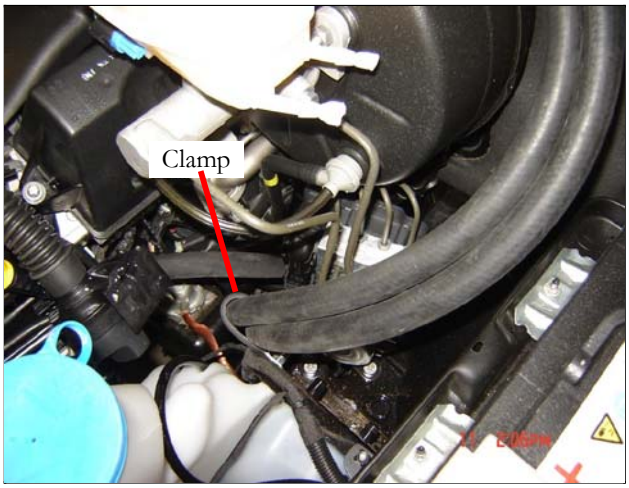


Figure 2-81 Heater Hoses Entering Engine Compartment

Figure 2-82 Heater Hose Routing in Engine Compartment

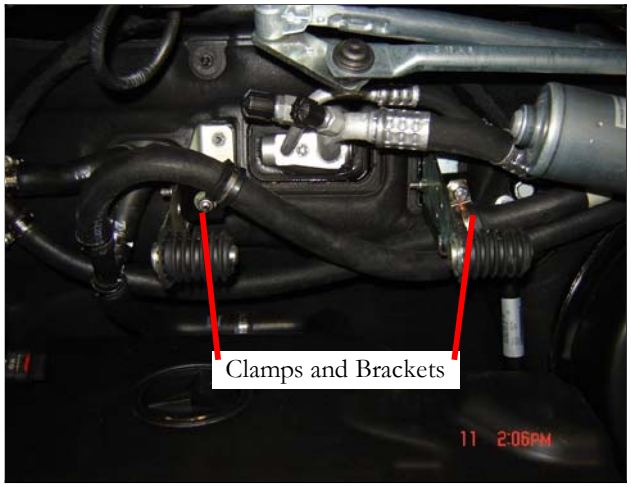


Figure 2-83 Heater Hose Routing at Air Cleaner Bracket

11. Once hoses have been routed into engine compartment, interfacing with the OEM system at In-dash heater coil can be done with the "Y" fittings provided. Detail of supply and return interface can be seen in Figure 2-84.

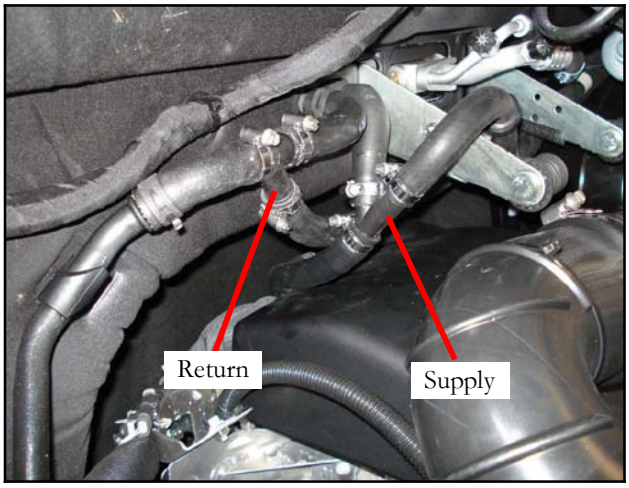


Figure 2-84 Heater Hose Interface

12. To aide with bleeding air from heater system, a bleed valve has been provided on the heater coil as seen in.

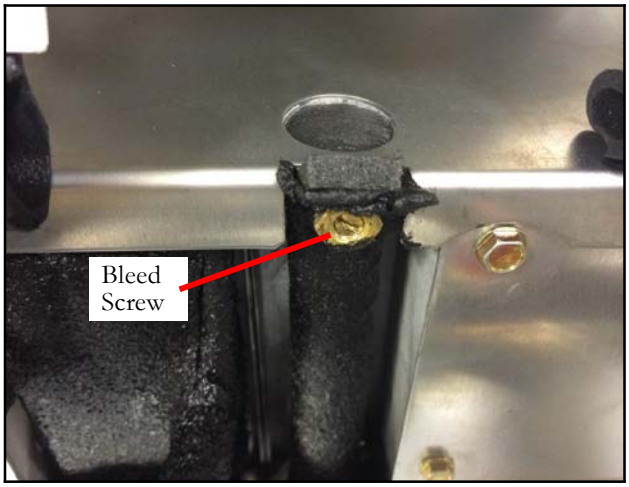


Figure 2-85 Heater Hose Interface

2.4.7 Condensate Line Routing

A general layout of condensate drain line routing can be seen in Figure 2-86.

NOTE

It is **mandatory** that the front and rear drain lines remain separated. Differences in air pressures across coil will hinder the ability of the condensate to drain properly if the front and rear drain lines are tied together. Condensate hoses should be carefully routed to provide a downhill slope through entire routing process. The side to side routing of hoses is ultimately decided according to application, so long as the front of pan is routed to one side, and the rear is routed to the opposite side to provide proper drainage.

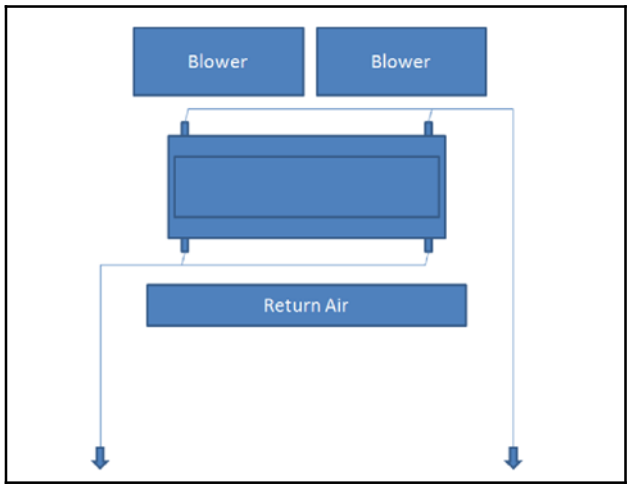


Figure 2-86 General Routing of Condensate Lines

1. Elbows, T-fittings, clamps and hose are provided in the installation kit to perform the following outlined procedures.

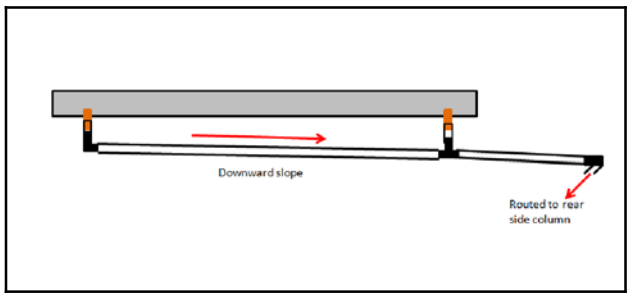


Figure 2-87 Route Condensate Lines for Proper Slope

2. It is important when routing drain lines to provide a consistent downward slope between drain line fittings. Example can be seen in Figure 2-87.

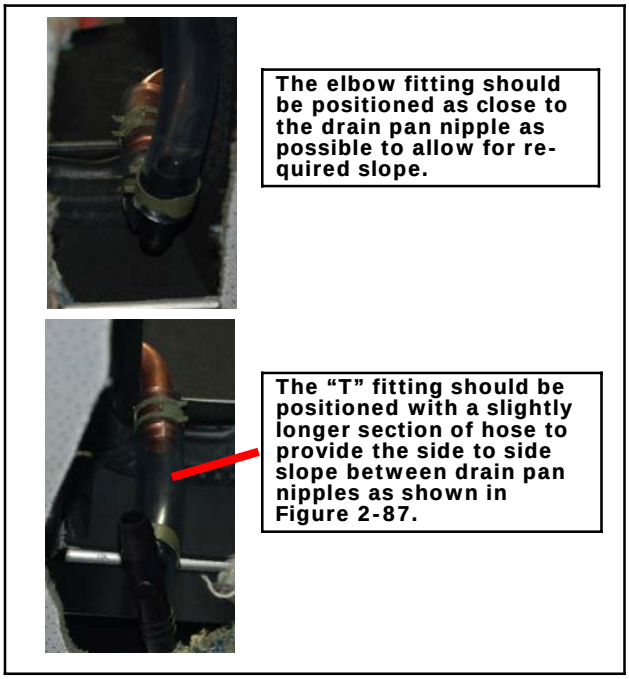


Figure 2-88 Drain Pan Connections

3. Once condensate hose is routed from drain pan connections to exterior sidewalls, a consistent down ward slope should be continued to the point of entry into the rear column of vehicle as shown in Figure 2-89.

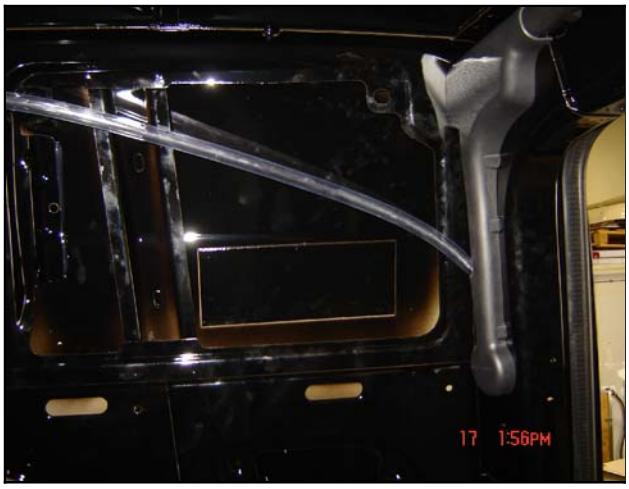


Figure 2-89 Sidewall Routing of Condensate Lines

4. Holes will need to be drilled in body underneath the vehicle for the condensate drain lines to exit the rear columns on both the road side and curb side of vehicle. The location for these holes is shown in Figure 2-90.

NOTE

Always be sure to prime any exposed metal when cutting or drilling into vehicle body

Figure 2-90 Exit Hole Location for Condensate Lines

5. Once the condensate hose has been "fished" down through the exit hole, the hose should be trimmed to length and the kazoo valve should be connected as shown in

Figure 2-91 Kazoo Valve Installation

SECTION 3

OPERATION of the MVC DIGITAL CONTROLLER

3.1 STARTING, STOPPING AND OPERATING INSTRUCTIONS

The MVC Digital Display is marked with international symbols (See Figure 3-1).

3.1.1 Starting

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

b. When the 12VDC power is applied, the driver display will illuminate and show return air set point. If display does not illuminate, press the On/Off key (Item 1 in Figure 3-1).

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

3.1.2 Stopping

Toggling the On/Off button (Item 1 Figure 3-1) on the display again will stop the system operation.

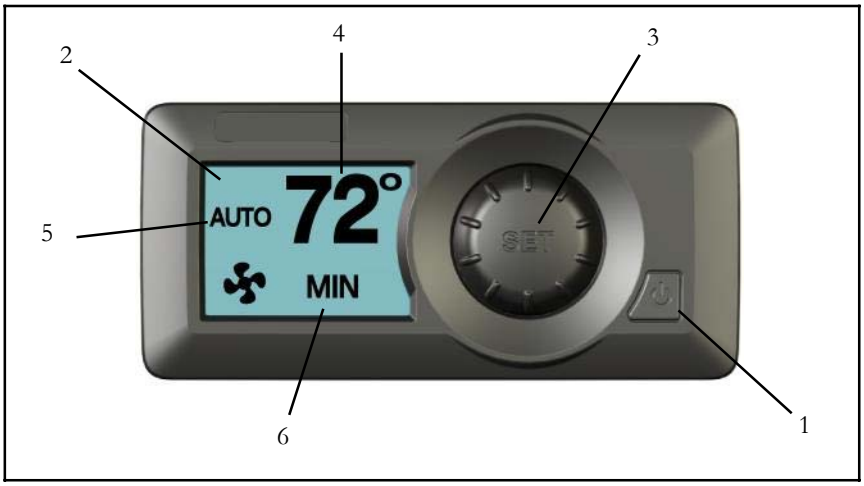


Figure 3-1 MVC Controller

1. On/Off Button
2. LCD Display
3. Set/Select Knob
4. Temperature Set Point
5. Mode of Operation
6. Blower Speed

NOTE:

The following procedures are general in nature and are dependant on the software version installed in the MVC Controller module and system related components and sensors.

3.2 OPERATING INSTRUCTIONS

When the engine is running, toggle the A/C Switch to "ON" to activate the Air Conditioning Unit.

Figure 3-2 MVC Main Screen

3.2.1 Display

When the unit is initially turned ON, the display shows the interior set point temperature, control mode and blower speed. After a few seconds, the display will show the interior air temperature. When selecting individual functions, the display shows the corresponding information. The display is dark when the engine and control unit are OFF.

3.2.2 Interior Temperature Control

To adjust the desired interior set point, turn the "Set" knob one click in either direction and the display will show screen as seen in Figure 3-2. Simply turn the "Set" knob counter clockwise to lower temperature or clockwise to increase temperature set point

The temperature can be adjusted between 62° F (17° C) and 82° F (28° C).

NOTE:

When the outside temperatures are below 45° F (7° C) (adjustable parameter), the A/C compressor remains disabled until temperature rises above 50°F (10°C).

3.2.3 Blower Speeds

Figure 3-3 MVC Blower Speeds

When the unit is operating in Automatic Climate Control mode, the blower speed is controlled based on the interior temperature.

To manually select the blower speed operation, press the "Set" knob while the main screen (Figure 3-2) is showing, until display shows the "Fan" symbol as seen in Figure 3-3. Rotate the "Set" knob to desired fan speed.

NOTE:

If the blowers are switched to OFF when in the "AUTO" mode, the A/C compressor will de-energize.

If the blowers are switched to OFF when in the "HEAT" mode, the heater control valve will de-energize.

3.2.4 Modes of Operation

To manually select the operation mode, press the "Set" knob while the main screen (Figure 3-2) is showing, until display shows the "MODE" symbol as seen in Figure 3-3. Rotate the "Set" knob to desired mode. Decscription of mode operations is listed below.

Figure 3-4 MVC Modes

The AUTO mode controls interior temperature based on selected set point. The controller constantly monitors the system electronic sensors and controls A/C and heat functions (if equipped) accordingly.

The HEAT mode operates electronic heater valve (if equipped) based on selected set point. The A/C compressor circuit is de-energized while in heat mode. When set point temperature is reached, evaporator fans continue to circulate interior air.

The COOL mode cycles the A/C compressor based on selected set point. The A/C compressor circuit is de-energized when set point temperature is reached, evaporator fans continue to circulate interior air.

NOTE:

When the outside temperatures are below 45° F (7° C) (adjustable parameter), the A/C compressor remains disabled until temperature rises above 50°F (10°C).

3.3 CHANGING BETWEEN °F (FAHRENHEIT) AND °C (CELCIUS)

Procedures for changing the MVC Controller between Fahrenheit and Celsius is as follows:

To toggle between Fahrenheit and Celsius, press the "Set" knob while the main screen (Figure 3-2) is showing, until display shows the "MODE" symbol as seen in Figure 3-3.

Press and hold the On/Off button (Item 1 in Figure 3-1) while rotating the "Set" knob 3 clicks counterclockwise.

Press the "Set" knob to highlight temperature designation (see Figure 3-5) and turn the "Set" knob to change.

Press "Set" knob to exit

Figure 3-5 °F to °C

3.4 MVC DIAGNOSTICS MENU

To enter the diagnostics menus, press the "Set" knob while the main screen (Figure 3-2) is showing, until display shows the "MODE" symbol as seen in Figure 3-3.

Press and hold the On/Off button (Item 1 in Figure 3-1) while rotating the "Set" knob 3 clicks clockwise.

By turning the "Set" knob, user can toggle between the Setup, View, Statistics and Error List menus.

3.4.1 Setup Menu

Figure 3-6 Setup Menu

In the "Set Up" menu, the only parameter that can be modified is the date. The parameter for installed software is dependant on current software installed. To modify date, press the "Set" knob once, and the month can be modified by turning the "Set" knob in either direction. When finished, press the "Set" knob again once, and the day can be modified by turning the "Set" knob. Press the "Set" knob again one time and the Year can be modified by turning the "Set" knob.

When complete, press the "Set" knob to complete.

3.4.2 View Menus

In the "VIEW" menus, the controller's input and output parameters will be shown. This may include all temperature sensors, system status settings and display settings. Any errors from sensors, pressure switches, heater valve or A/C system fail can be observed.

Figure 3-7 View Menus

3.4.3 Statistics Menus

In the "STATISTICS" menus, the display will show hours of operation for blowers and A/C compressor, as well as A/C compressor cycle count.

If necessary, the component operating hour data can be re-set. While in the "STATISTICS" menu, turn the "Set" knob one click counter clockwise. A re-set dialogue box will be displayed. (See Figure 3-8). Press the "Set" knob once to re-set all component operating hours.

Figure 3-8 Statistic Menus

3.4.4 Error List Menu

In the "ERROR LIST" menus, the display will show a count of errors occurring on sensors, A/C compressor and heater valve functions.

Errors can be cleared by turning the "Set" knob one click counter clockwise while in the menu 1 screen. A re-set dialogue box will be displayed. (See Figure 3-9 top screen). Press the "Set" knob once to re-set all component errors.

Figure 3-9 View Menus

3.4.5 Exiting Diagnostic Menu

To exit the Diagnostic menus, turn "Set" knob until "EXIT" appears at the top of display. Press the "Set" knob once, and the display will revert to the "Main Menu" screen.

SECTION 4

TROUBLESHOOTING

Table 4-1 General System Troubleshooting Procedures

INDICATION/ TROUBLE	POSSIBLE CAUSES
4.1 SYSTEM WILL NOT COOL	
Compressor will not run	Drive–Belt loose or defective Clutch coil defective Clutch malfunction Low refrigerant charge Compressor malfunction
Electrical Malfunction	Circuit Breaker Open Relay Defective
4.2 SYSTEM RUNS BUT HAS INSUFFICIENT COOLING	
Compressor	Drive–Belt loose or defective Compressor defective
Refrigeration system	Abnormal pressures No or restricted evaporator air flow Expansion valve malfunction Restricted refrigerant flow Low refrigerant charge
4.3 ABNORMAL PRESSURES	
High discharge pressure	Refrigerant overcharge Non–condensables in system Condenser motor(s) failure Dirty Condenser coil
Low discharge pressure	Compressor defective Low refrigerant charge
High suction pressure	Compressor defective
Low suction pressure	Filter–drier or Receiver–Drier partially plugged Low refrigerant charge Expansion valve malfunction Restricted air flow
Suction and discharge pressures equal or near equal	Compressor valves defective

4.4 ABNORMAL NOISES, VIBRATIONS OR CONDITIONS	
Compressor – Engine area	Compressor or compressor mounting loose Liquid slugging Insufficient oil Excessive oil Clutch loose, rubbing or defective Dirt or debris on vehicle fan blades Drive belt cracked, worn or loose
Evaporator area	Evaporator blower assembly broken or loose Blower wheel loose or out of alignment Blade interference
Condenser area	Broken or missing fan blade Condenser assembly loose Fan assembly loose

4.5 NO EVAPORATOR AIR FLOW OR RESTRICTED AIR FLOW	
Air flow through coil blocked	Coil frosted over Dirty coil Dirty filter assembly
No or partial evaporator air flow	Motor running in reverse Motor(s) defective Evaporator fan loose or defective Fan damaged Dirty filter Icing of coil Fan speed control defective Fan rotation incorrect
4.6 EXPANSION VALVE MALFUNCTION	
Low suction pressure	Low refrigerant charge Ice formation or dirt at block valve orifice
4.7 CONTROL SYSTEM MALFUNCTION	
Will not operate/control	Circuit breaker or relay defective Fan speed switch defective Thermostat defective Microprocessor controller malfunction
4.8 NO OR INSUFFICIENT HEATING	
Insufficient heating	Dirty or plugged heater core Coolant heat valve(s) malfunctioning or plugged Low coolant level Hand valve(s) partially closed Water pump defective
No Heating	Hand valve(s) closed Coolant heat valve(s) malfunctioning or plugged Pump(s) malfunctioning
Continuous Heating	Hand valve(s) defective Coolant heat valve(s) malfunctioning

SECTION 5

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 vehicle 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.

5.1 MAINTENANCE SCHEDULE

SYSTEM ON	SYSTEM OFF	SYSTEM
a. Daily Maintenance		
X		Pre-trip Inspection - after starting
	X	Check tension and condition of drive belts (if applicable).
b. Weekly Inspection		
	X	Perform daily inspection
	X	Check condenser, evaporator coils and air filters for cleanliness
	X	Check refrigerant hoses, fittings and component connections 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

5.2 MANIFOLD GAUGE SET

A manifold gauge set can be used to determine system operating pressures, add charge, equalize or evacuate system.

When the suction pressure hand valve is front seated (turned all the way in), the suction (low) pressure can be read. When the discharge pressure hand valve is front seated, discharge (high) pressure can be read. When both valves are open (turned counterclockwise), high pressure vapor will flow into the low side. When only the low pressure valve is open, the system can be charged or evacuated.

⚠ CAUTION

The EcoFlex and EcoLine Rooftop Systems have R134a service port couplings installed for system servicing.

5.2.1 Installing R-134a Manifold Gauge/Hose Set

An R-134a manifold gauge/hose set with self-sealing hoses is pictured in Figure 5-1. The manifold gauge/hose set is available from Mobile Climate Control. (Mobile Climate Control P/N 07-00294-00, which includes items 1 through 6, Figure 5-1). 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 5-1) and mid-seat 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 R134a to 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 the Manifold Gauge Gauge/Hose Set.

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

1. Connect the field service couplers (see Figure 5-1) to the high and low in-line service ports.

2. Turn the field service coupling knobs clockwise, which will open the system to the gauge set.

3. Read the system pressures.

c. Removing the Manifold Gauge Set.

1. While the compressor is still ON, backseat (counterclockwise) the high side field service coupler on the manifold gauge set. Mid-seat 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.

2. Back-seat the low side field service coupler and front-seat both manifold set hand valves. Backseat the in-line system access valves (if applicable). Remove the couplers from the in-line access valves.
3. Install both in-line access valve caps.

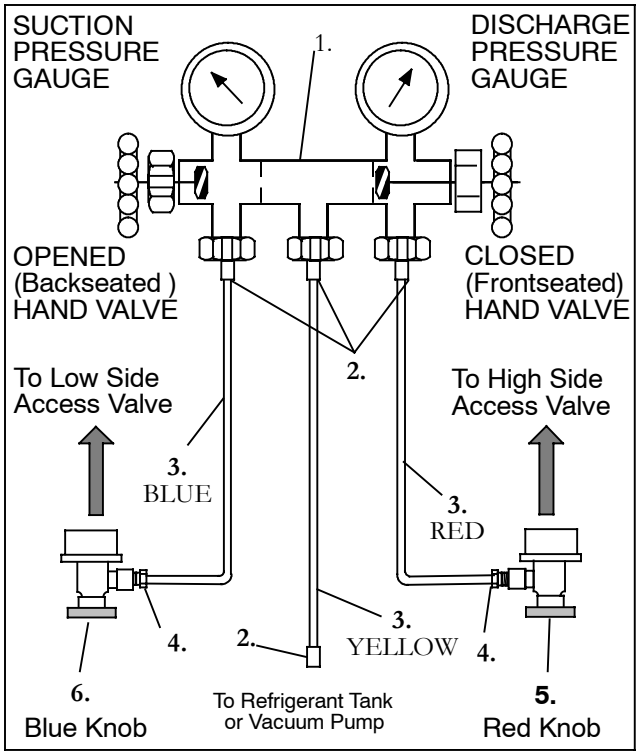


Figure 5-1 Manifold Gauge Set (R-134a)

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 Coupling
6.. Low Side Field Service Coupling

5.3 REMOVING THE REFRIGERANT CHARGE

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant.

5.3.1 Removing Entire System Charge

To remove the entire refrigerant charge, do the following:

a. Connect a manifold gauge set to the system as shown in Figure 5-2 .

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

c. Recover refrigerant in accordance with reclaimer manufacturers instructions.

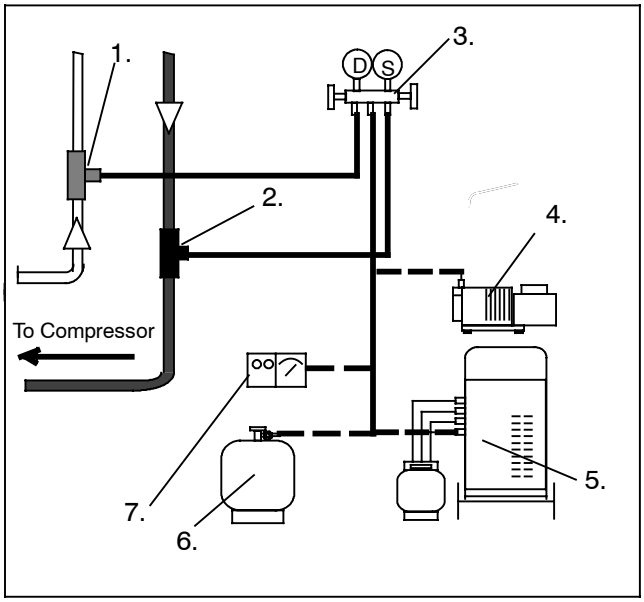


Figure 5-2 In-Line Service Connections

1. Discharge Service Port
2. Suction Service Port
3. Manifold Gauge Set
4. Vacuum Pump
5. Reclaimer
6. Refrigerant Cylinder
7. Thermistor Vacuum Gauge

5.4 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 must be 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.

d. If system is without refrigerant, charge system with refrigerant vapor to build up pressure between 20 to 30 psig (1.36 to 2.04 bar).

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

f. Check for leaks. The recommended procedure for finding leaks in a system is with an electronic leak detector. Testing joints with soapsuds is satisfactory only for locating large leaks.

g. Remove test gas and replace filter-drier.

h. Evacuate and dehydrate the system. (Refer to paragraph 5.5.)

i. Charge the unit. (Refer to paragraph 5.6.)

5.5 EVACUATION AND DEHYDRATION

5.5.1 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. An evacuation should take place after a system repair (replacement of filter drier. expansion valve, solenoid valve, etc).

5.5.2 Preparation

NOTE

Using a compound gauge (manifold 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 5.4)

b. Essential tools to properly evacuate and dehydrate any system include a good vacuum pump with a minimum of 5 cfm *(8.5 m^3/hr)* volume displacement, and a good micron gauge.

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.

5.5.3 Procedure for Evacuation and Dehydrating System

a. Remove refrigerant using a refrigerant recovery system. Refer to paragraph 5.3.1

b. The recommended method is connecting 3/8" OD refrigerant hoses designed for vacuum service as shown in Figure 5-1.

c. Make sure vacuum pump valve is open.

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

e. Evacuate unit until vacuum gauge indicates 500 microns Hg vacuum. Close gauge valve, vacuum pump valve, and stop vacuum pump.

f. Wait five minutes to see if vacuum holds.

g. Charge system. Refer to paragraph 5.6.2

5.6 ADDING REFRIGERANT TO SYSTEM

5.6.1 Checking Refrigerant Charge

The following conditions must be met to accurately check the refrigerant charge.

a. Bus engine operating at high idle.

b. Unit operating in cool mode for 15 minutes.

c. Compressor discharge pressure at least 150 psig (10.21 bar). (It may be necessary to block condenser air flow to raise discharge pressure.)

d. Using Table 5-1., determine if system pressures are correct.

Table 5-1. Mobile Climate Control SYSTEM PERFORMANCE CHART

Use the following table to determine if the correct charge has been obtained.

Table			Procedure	Your Entry	Example
Pressure	**Refrigerant Temp.**		**1.** Connect Manifold Gauge Set To Air Conditioning System	NONE	NONE
PSIG	R-12	R134a			
(A)	(B)	(C)			
95	87	85	**2.** Measure outside (ambient) air temperature. Enter here ---------->	_____Degrees F	100 Degrees F
100	90	88			
105	93	90			
110	96	93			
115	99	96			
120	102	98	**3.** Add 40 degrees F to the outside (ambient) air temperature ---> **Note:** If using a Micro-channel style condenser, use 37 degrees F instead of 40. This is due to the reduced discharge pressure associated with this type of application.	40 Degrees F _____Degrees F	40 Degrees F = 140 Degrees F
125	104	100			
130	107	103			
135	109	105			
140	112	107			
145	114	109	**4.** Find closest refrigerant temperature in Table (B or C) and enter here ---->	_____Degrees F	139 Degrees F
150	117	112			
155	119	114			
160	121	116			
165	123	118			
170	126	120	**5**. Going across the Table, find the corresponding pressure (A) -->	(D)=_____ PSI	225 PSI
175	128	122			
180	130	123			
185	132	125			
190	134	127			
195	136	129	**6.** If the Discharge Pressure (High Side) on gaugers (With compressor engaged, engine speed 1200 RPM, and system operating) is : Greater than (D) - Reduce refrigerant by 4 ounce increments. Less than (D) - Add refrigerant Wait 10 minutes for system to stabilize before taking new readings	***	***
200	138	131			
205	140	132			
210	142	134			
215	143	136			
220	145	137			
225	147	139			
235	150	142			
245	154	145			
255	157	148			
265	160	151			
275	163	153			

5.6.2 Adding Full Charge

a. Install manifold gauge set at the in-line suction and discharge service ports.

b. Evacuate and dehydrate system. (Refer to paragraph 5.5)

c. Place appropriate refrigerant cylinder on scales. Prepare to charge liquid refrigerant by connecting charging hose from container to center connection on gage manifold. Purge air from hoses.

d. Note weight of refrigerant and cylinder.

e. Open cylinder valve, backseat discharge valve on gauge manifold and allow liquid refrigerant to flow into the high side of the system

f. When correct charge has been added , close cylinder valve and front seat manifold discharge valve.

g. Prepare the cylinder as required to allow vapor charging. Backseat the manifold suction valve and charge vapor until the correct charge has been added. Close cylinder valve and front seat suction manifold set.

h. Check charge level in accordance with the procedures of paragraph 5.6.1.

5.7 CHECKING FOR NONCONDENSIBLES

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 discharge (in-line) service port.

d. Check saturation pressure as it corresponds to the condenser/receiver temperature. See temperature-Pressure chart Table Table 4-4 for R134a.

e. If gauge reading is 3 psig or more than the calculated P/T pressure in step d., non-condensables are present.

f. Remove refrigerant using a refrigerant recovery system.

g. Evacuate and dehydrate the system. (Refer to paragraph 5.5.)

h. Charge the unit. (Refer to paragraph 5.6.2.)

5.8 FILTER-DRIER

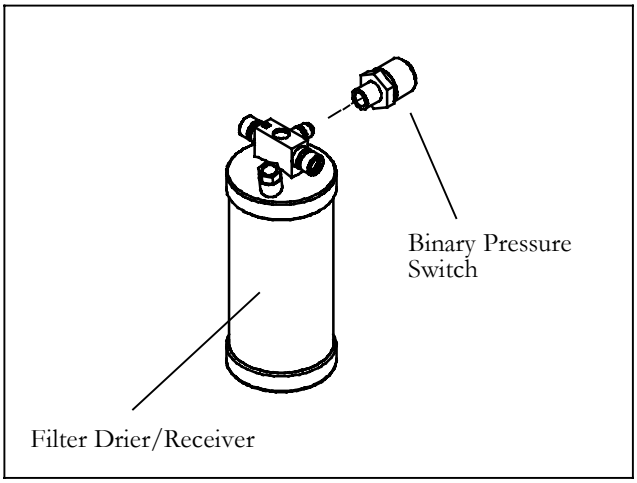


Figure 5-3 Filter-Drier

5.8.1 To Check Filter-Drier

The filter-drier (See Figure 5-3) must be changed if the system has been opened, (for any reason), or the filter drier is partially restricted. Restriction can be identified by either the outlet frosting or a temperature difference between the inlet and outlet.

5.8.2 To Replace Filter-Drier Assembly

Filter Drier replacement can be accomplished by performing the following procedure.

a. Remove refrigerant charge. Refer to Section 5.3.1

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

⚠ WARNING

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

c. Using two open end wrenches, slowly crack open the connecting nuts on each side of the filter-drier assembly. Loosen clamps retaining drier. Remove the filter-drier assembly.

d. Remove seal caps from the new filter-drier. Apply a light coat of mineral oil to the filter-drier connections and O-rings.

e. Assemble the new filter-drier to lines ensuring the direction of the refrigerant flow (refrigerant flows from the receiver to the evaporator). Finger tighten the connecting nuts. Reinstall retaining clamps.

f. Tighten filter-drier connecting nuts using two open end wrenches.

g. Perform system evacuation (refer to paragraph 5.5.3)

h. Recharge system with refrigerant (refer to paragraph 5.6.2)

i. Remove Gauges.

5.9 SERVICING THE HEAT VALVE

The heat valve requires no maintenance unless a malfunction to the internal parts occurs. This may be caused by foreign material such as: dirt, scale, or sludge in the coolant system, or improper voltage to the coil.

j. Open the vent fitting at the top of the outlet header of the heater coil.

k. Drain coil by opening the drain-cock on the inlet tube.

l. Disassemble valve and replace defective parts.

m. Assemble valve, refill and bleed coolant lines.

5.9.1 Replace Entire Valve

a. Disconnect system from bus battery.

b. Drain coolant from lines as previously described and disconnect hoses to valve .

c. Disconnect wire leads to valve actuator.

d. Remove valve assembly from bracket.

e. Install new valve and re-connect hoses. It is not necessary to disassemble the valve when installing.

f. Refill and bleed coolant lines.

g. Connect wire leads and test operation.

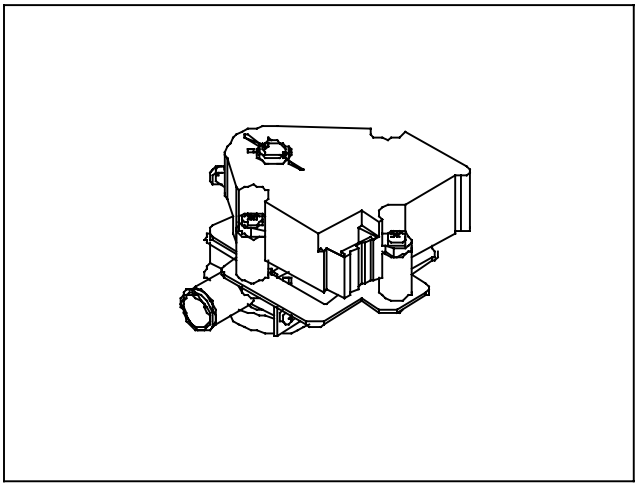


Figure 5-4 Heat Valve

5.10 REPLACING RETURN AIR FILTERS

The return air filters are located behind the return air grill, inside the vehicle.

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. Insure air conditioning system is in the off position.

b. Remove the 2 screws retaining the return air grille.

c. Remove the air filter and clean or replace..

d. Place filter into composite frame, with filter element down (See Figure 5-5).

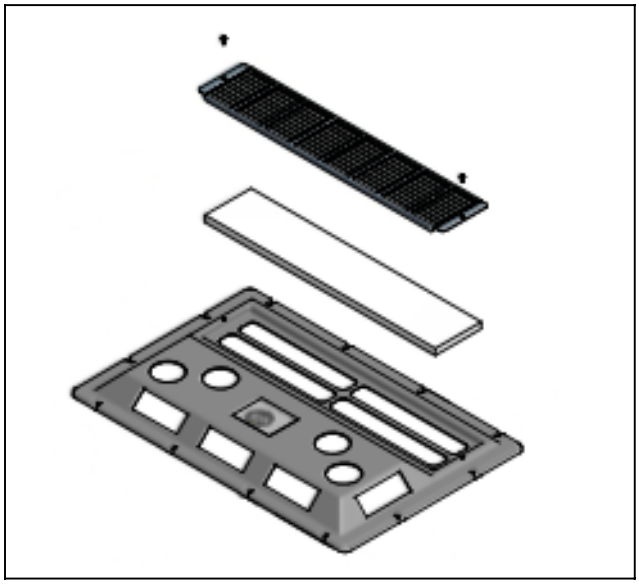


Figure 5-5 Air Filter

5.11 THERMOSTATIC EXPANSION VALVE

The thermostat expansion valve (Figure 5-6) 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.

NOTE

R-134a valves are non-adjustable. Valves are preset at the factory.

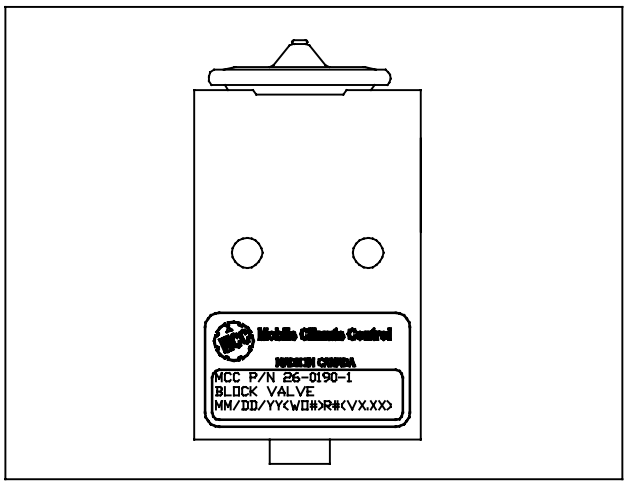


Figure 5-6 Thermostatic Expansion Valve (Block Valve)

5.11.1 Valve Replacement

a. Recover and recycle refrigerant from the system.(refer to 5.3.1)
b. Remove prestite insulation from valve body.
c. Loosen refrigerant fittings from valve body.
d. Remove mounting screws from retaining bracket.
e. Replace valve and install new o-rings to refrigerant fittings. Coat new o-rings with mineral oil before installing.
f. Reinstall mounting screws to retaining bracket and tighten.
g. Tighten fittings to proper torque (refer to Table 2-1).
h. Leak check connections (refer to paragraph5.4)
i. Reinstall prestite insulation on valve body.
j. Evacuate/dehydrate system (refer to paragraph 5.5.3)
k. Recharge system with refrigerant and check performance. (refer to paragraph 5.6.2)

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

Temperature		Vacuum			
°F	°C	"/hg	cm/hg	kg/cm2	bar
-40	-40	14.6	49.4	37.08	0.49
.35	.37	12.3	41.6	31.25	0.42
-30	-34	9.7	32.8	24.64	0.33
-25	-32	6.7	22.7	17.00	0.23
-20	-29	3.5	11.9	8.89	0.12
-18	-28	2.1	7.1	5.33	0.07
-16	-27	0.6	2.0	1.52	0.02

Temperature		Pressure			
°F	°C	psig	kPa	kg/cm2	bar
-14	-26	0.4	1.1	0.03	0.03
-12	-24	1.2	8.3	0.08	0.08
-10	-23	2.0	13.8	0.14	0.14
-8	-22	2.9	20.0	0.20	0.20
-6	-21	3.7	25.5	0.26	0.26
-4	-20	4.6	31.7	0.32	0.32
-2	-19	5.6	36.6	0.39	0.39
0	-18	6.5	44.8	0.46	0.45
2	-17	7.6	52.4	0.53	0.52
4	-16	8.6	59.3	0.60	0.59
6	-14	9.7	66.9	0.68	0.67
8	-13	10.8	74.5	0.76	0.74
10	-12	12.0	82.7	0.84	0.83
12	-11	13.2	91.0	0.93	0.91
14	-10	14.5	100.0	1.02	1.00
16	-9	15.8	108.9	1.11	1.09
18	-8	17.1	117.9	1.20	1.18
20	-7	18.5	127.6	1.30	1.28
22	-6	19.9	137.2	1.40	1.37
24	-4	21.4	147.6	1.50	1.48
26	-3	22.9	157.9	1.61	1.58

Temperature		Pressure			
°F	°C	psig	kPa	kg/cm2	bar
28	-2	24.5	168.9	1.72	1.69
30	-1	26.1	180.0	1.84	1.80
32	0	27.8	191.7	1.95	1.92
34	1	29.6	204.1	2.08	2.04
36	2	31.3	215.8	2.20	2.16
38	3	33.2	228.9	2.33	2.29
40	4	35.1	242.0	2.47	2.42
45	7	40.1	276.5	2.82	2.76
50	10	45.5	313.7	3.20	3.14
55	13	51.2	353.0	3.60	3.53
60	16	57.4	395.8	4.04	3.96
65	18	64.1	441.0	4.51	4.42
70	21	71.1	490.2	5.00	4.90
75	24	78.7	542.6	5.53	5.43
80	27	86.7	597.8	6.10	5.98
85	29	95.3	657.1	6.70	6.57
90	32	104.3	719.1	7.33	7.19
95	35	114.0	786.0	8.01	7.86
100	38	124.2	856.4	8.73	8.56
105	41	135.0	930.8	9.49	9.31
110	43	146.4	1009	10.29	10.09
115	46	158.4	1092	11.14	10.92
120	49	171.2	1180	12.04	11.80
125	52	184.6	1273	12.98	12.73
130	54	198.7	1370	13.97	13.70
135	57	213.6	1473	15.02	14.73
140	60	229.2	1580	16.11	15.80
145	63	245.6	1693	17.27	16.93
150	66	262.9	1813	18.48	18.13
155	68	281.1	1938	19.76	19.37

SECTION 6

ELECTRICAL

6.1 INTRODUCTION

This section includes electrical wiring schematics. The schematics shown in this section provides information for the EcoLine 8 & 10 model rooftop air conditioning units which are fitted with electronic controllers.

UNIT	CONTROLLER	FIGURE NUMBERS
50-1509	Electronic	Figure 6-1
50-1859	Electronic	Figure 6-2

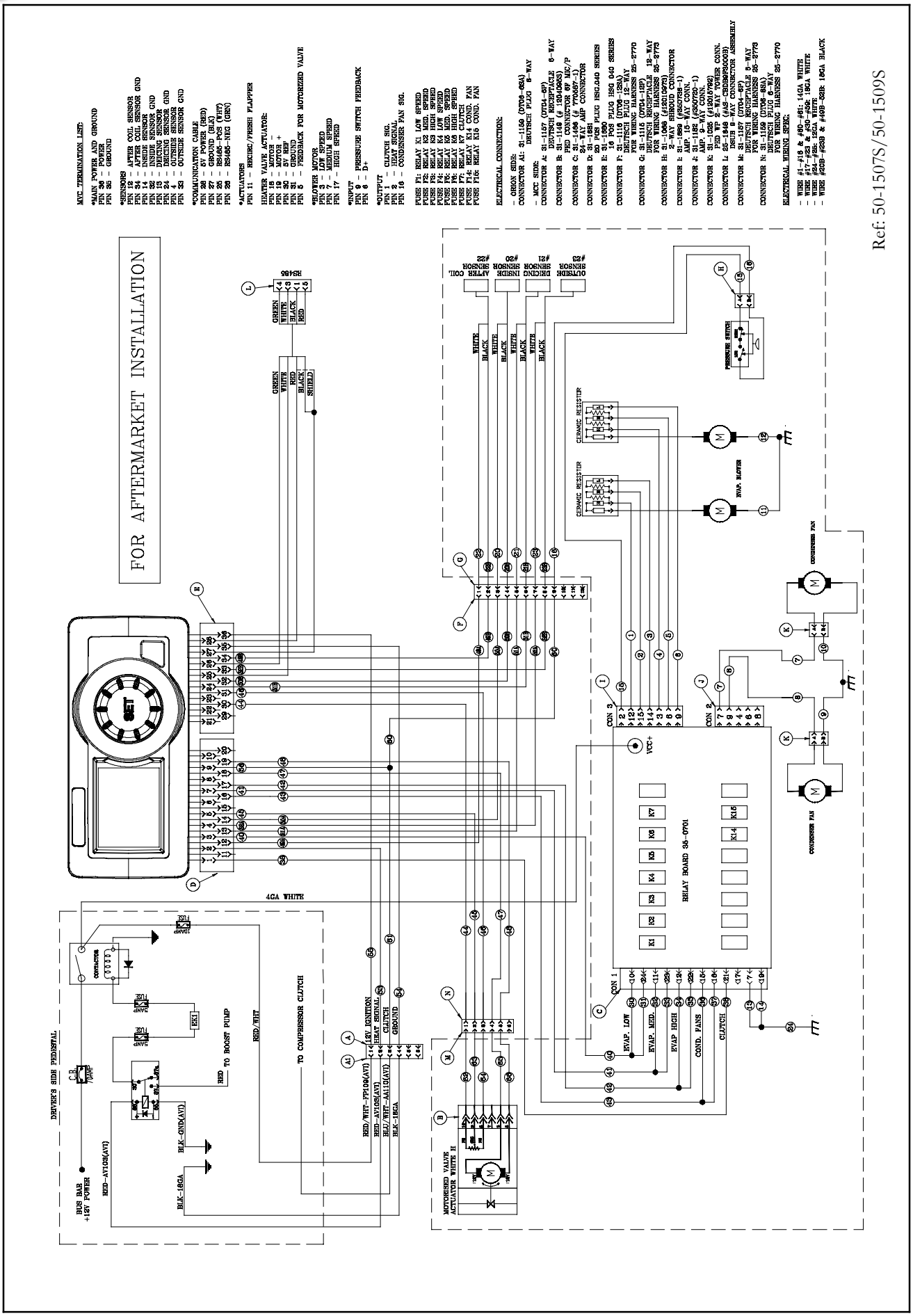


Figure 6-1 EcoLine 8 w/ Electronic Controller (Sprinter)

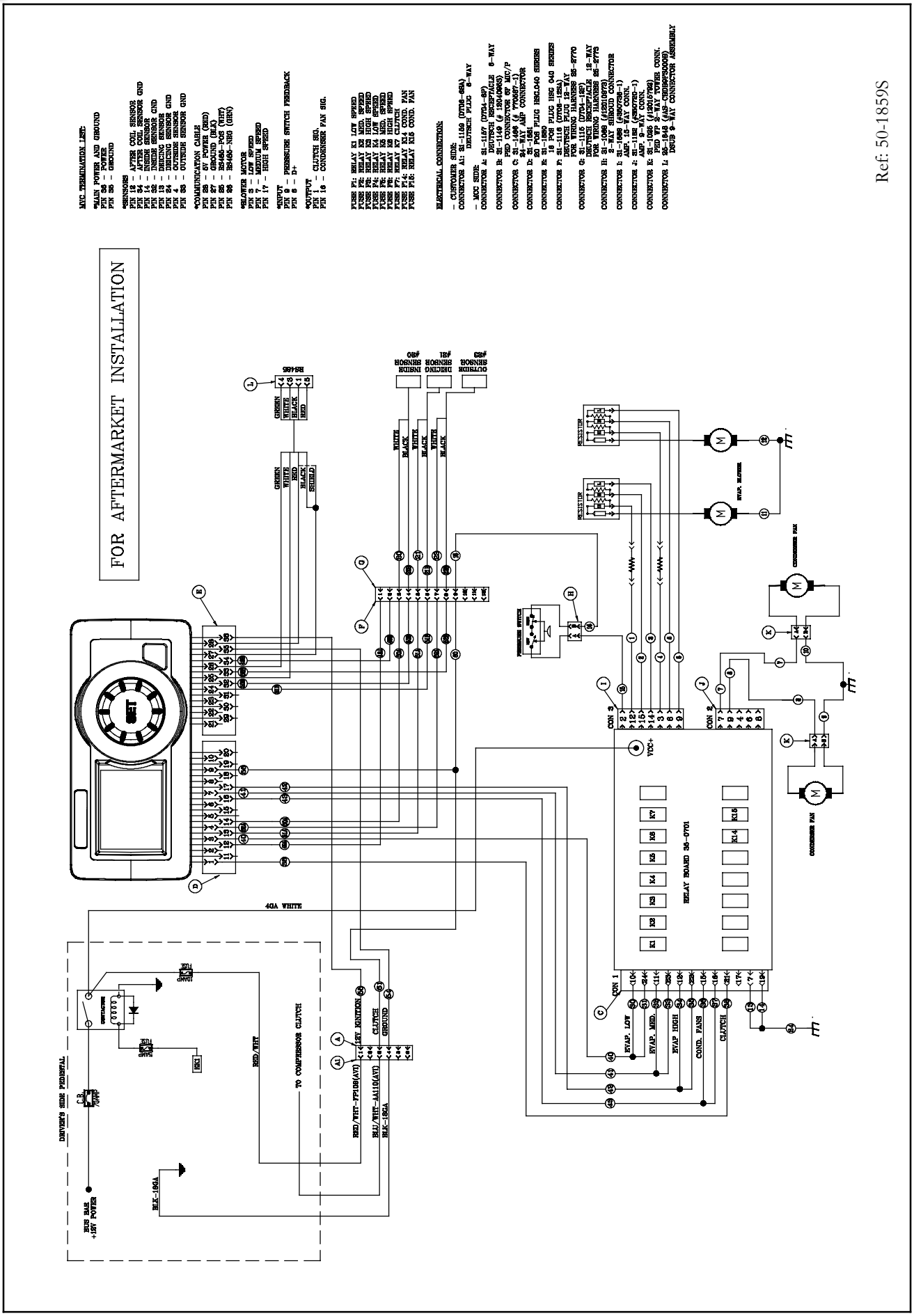


Figure 6-2 EcoLine 10 w/ Electronic Controller (Sprinter)

SECTION 7

SERVICE PARTS

INTRODUCTION

This section provides identification of service replacement parts for the Mobile Climate Control EcoFlex and EcoLine products.

CONFIGURATION IDENTIFICATION

Unit identification information is provided on a plate (decal) located on the unit assembly. This plate provides the unit model number and the unit serial number. The model number identifies the unit configuration and differences in detailed parts.

GENERAL NOTES

To find replacement parts, determine major group in which replacement parts are located and turn to the appropriate page for the illustrated breakdown of the replacement parts. The following letter designations are used to classify parts throughout this list. Parts can be obtained by ordering from the following website:

www.mcc-hvac.com

A/R As Required

N.S. Not Shown on Illustration

NSI Non-Stock Item (Items **may not be available** for purchase, or **may require extended lead times**)

NSS Not Sold Separately - Order next higher assembly or kit.

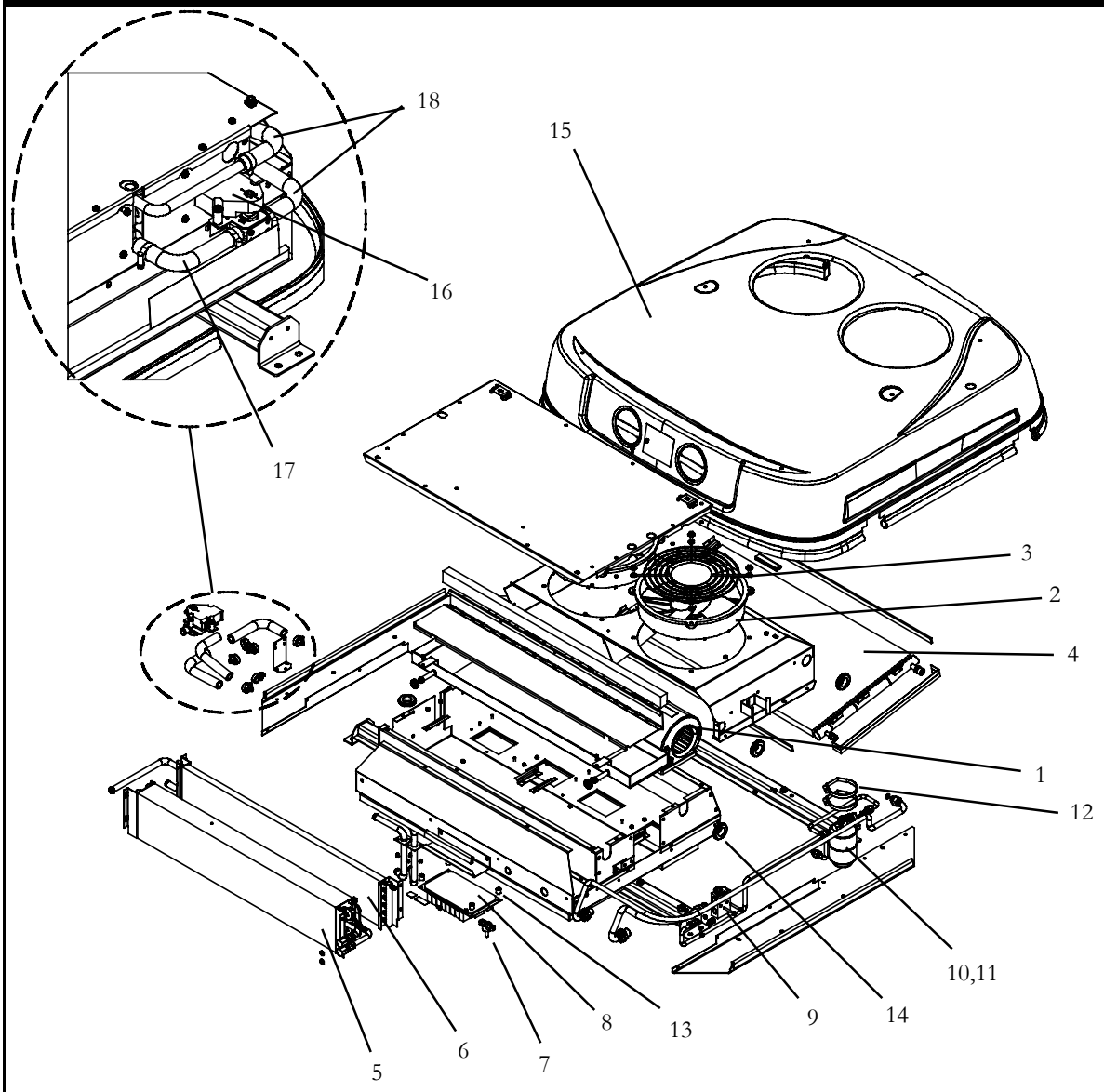
P-- Suffix P-- added to part number means part is available in packaged quantity only.

PL Purchase Locally

SS Stainless Steel

SV Suffix SV added to part number designates service replacement part.

7.1 MCC EcoLine 8, 12 VDC, Models 50-1509

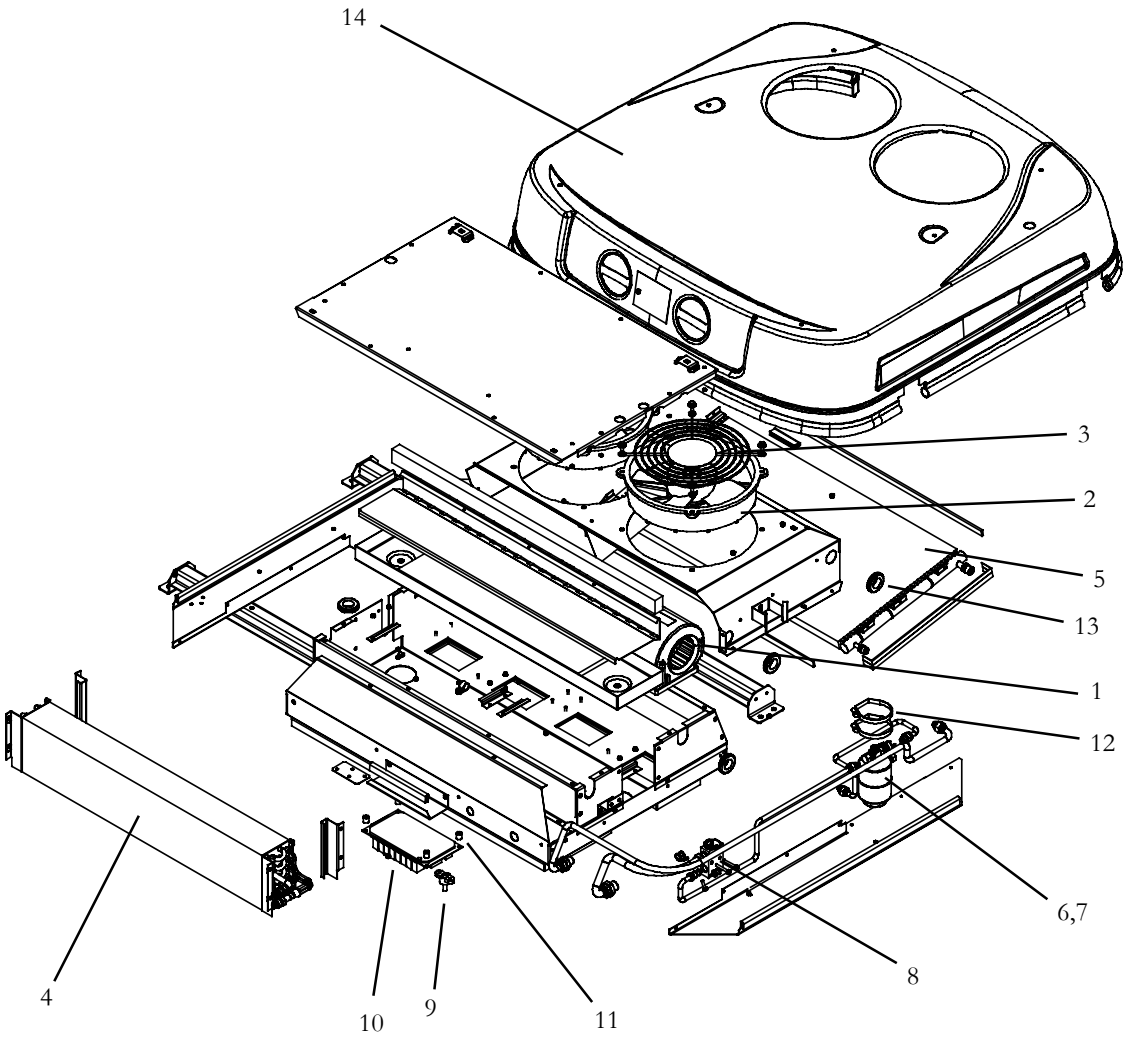


Item	Part Number	Description	Qty
1	15-1505	Blower Assembly, 12 VDC	2
2	15-7503	Fan Assembly, 12 VDC	2
3	23-0148	Finger Guard	2
4	21-9023	Coil, Condenser	1
5	21-9035	Coil, Evaporator	1
6	22-1122	Coil, Heater	1
7	25-0781	Terminal Stud, ⅜”	1
8	35-0763	Relay Board	1
9	26-0190	Block Valve (TXV)	1
10	26-8251	Receiver/Drier	1

7.1 MCC EcoLine 8, 12 VDC, Models 50-1509, (Continued):

Item	Part Number	Description	Qty
11	25-0308	Pressure Switch, Binary	1
12	27-0183	Clamp, Gear, 3.4" - 4" (86.4 MM - 101.6 MM)	2
13	29-0124	Nylon Spacer, ½"	4
14	28-0005	Grommet, ⅝"	6
15	28-1905	Cover Assembly	1
16	26-0652	Motorized Valve Assembly	1
17	27-3374	Elbow, ⅝"	1
18	27-3394	Elbow, ⅝"	2
NS	27-0601	O-Ring, #6	4
NS	27-0602	O-Ring, #8	3
NS	27-0603	O-Ring, #10	1

7.2 MCC EcoLine 10, 12 VDC, Models 50-1859

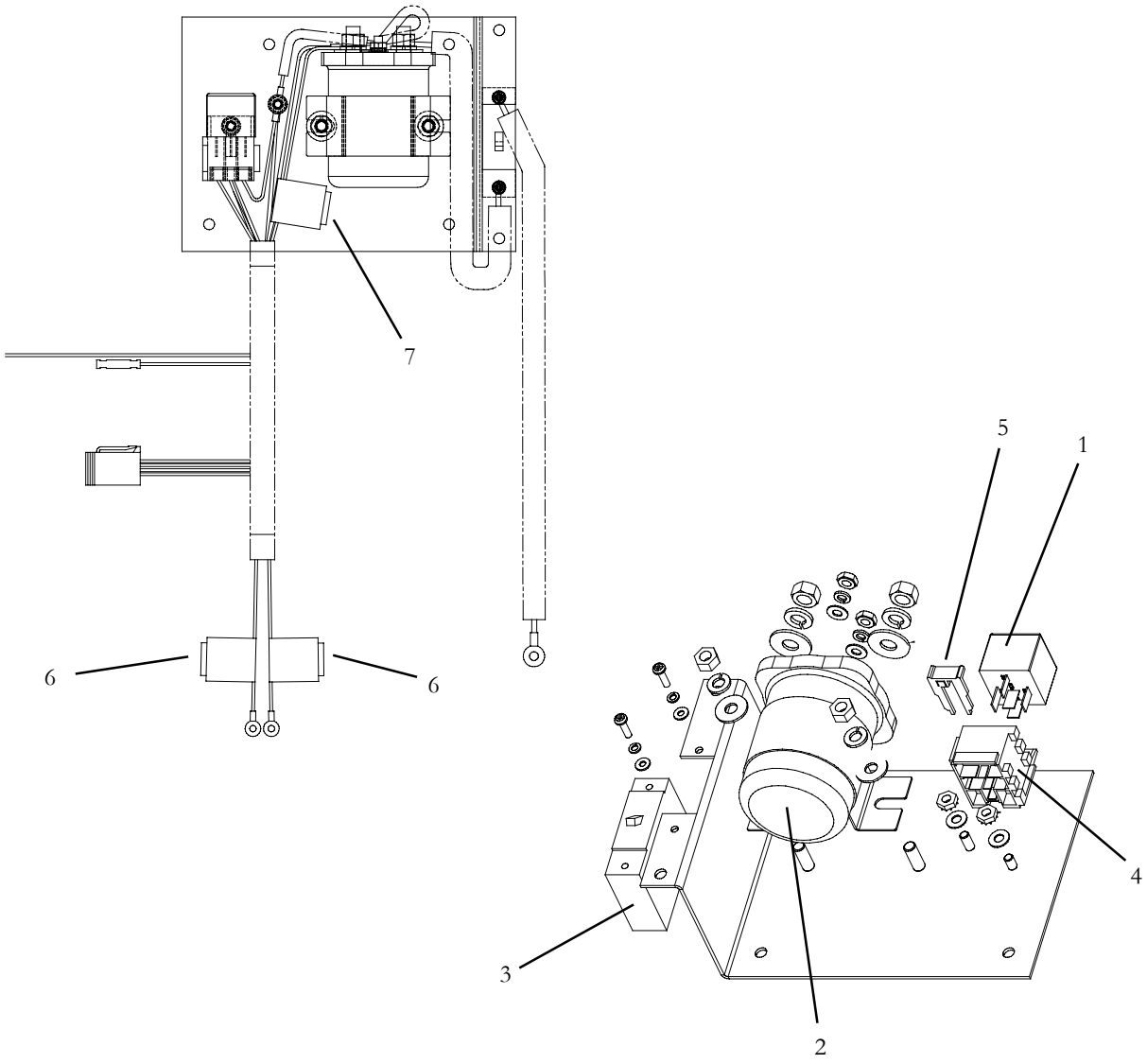


Item	Part Number	Description	Qty
1	15-1505	Blower Assembly, 12 VDC	2
2	15-7503	Fan Assembly, 12 VDC	2
3	23-0148	Finger Guard (Grille)	2
4	21-1760	Evaporator Coil	1
5	21-9023	Condenser Coil	1
6	25-0308	Pressure Switch, Binary	1
7	26-8251	Receiver Drier	1
8	26-1463	Block Valve (TXV)	1
9	25-0781	Terminal Stud, ⅜”	1
10	35-0763	Relay Board	1

7.2 MCC EcoLine 10, 12 VDC, Model 50-1859, (Continued):

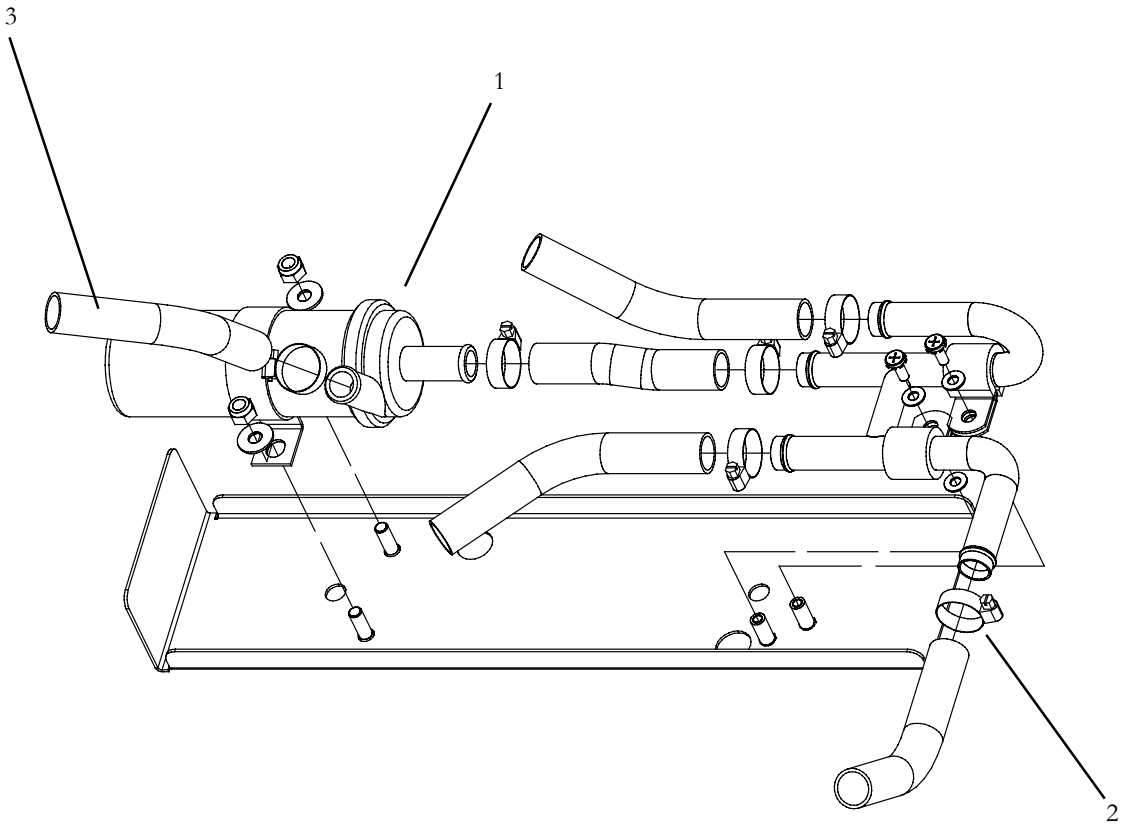
Item	Part Number	Description	Qty
11	29-0124	Nylon Spacer, ½"	4
12	27-0183	Clamp, Gear, 3.4" - 4" (86.4 MM - 101.6 MM)	2
13	28-0005	Grommet, ⅝" (15.9 MM)	6
14	28-1905	Cover Assembly	1
NS	27-0601	O-Ring, #6	4
NS	27-0602	O-Ring, #8	3
NS	27-0603	O-Ring, #10	1

7.3 MCC EcoLine Electrical Panel, Y25-00090-00



Item	Part Number	Description	Qty
1	Y25-00001-05	Relay, 24 VDC	1
2	Y35-00021-00	Contactor	1
3	25-2553	Circuit Breaker	1
4	201-901	Connector, Relay Socket	1
5	201-931	Lock, Relay	1
6	22-02336-02	Fuse, 5A	2
7	22-02336-04	Fuse, 10A	1

7.4 MCC EcoLine Heater Components



Item	Part Number	Description	Qty
1	Y46-00005-00	Pump, ⅝" Inlet and Outlet	1
2	701-205	Clamp, Hose	6
3	301-218	Hose, Heater, ⅝" ID	A/R

PARTS INDEX

1

15-1505	7-2, 7-4
15-7503	7-2, 7-4

2

201-901	7-6
201-931	7-6
21-1760	7-4
21-9023	7-2, 7-4
21-9035	7-2
22-02336-02	7-6
22-02336-04	7-6
22-1122	7-2
23-0148	7-2, 7-4
25-0308	7-3, 7-4
25-0781	7-2, 7-4
25-2553	7-6
26-0190	7-2
26-0652	7-3
26-1463	7-4
26-8251	7-2, 7-4
27-0183	7-3, 7-5
27-0601	7-3, 7-5
27-0602	7-3, 7-5
27-0603	7-3, 7-5
27-3374	7-3
27-3394	7-3
28-0005	7-3, 7-5
28-1905	7-3, 7-5
29-0124	7-3, 7-5

3

301-218	7-7
35-0763	7-2, 7-4

7

701-205	7-7

Y

Y25-00001-05	7-6
Y35-00021-00	7-6
Y46-00005-00	7-7

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T-369 Rev. 05/2015