LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

P2550

RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01
PART I
THEORY OF OPERATION
SECTION 05 - HVAC

SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

PART I

THEORY OF OPERATION

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SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

05-I-01 INTRODUCTION

This Section of the Running Maintenance and Service Manual is divided into three Parts:

- Part I: Theory of Operation
- Part II: Troubleshooting
- Part III: Maintenance

Each Paragraph is numbered accordingly, to avoid that paragraphs of the same Section, pertaining to a different Part, have the same number.

Part I - Theory of Operation

Part I gives a thorough overlook of the System structure and operation, by means of descriptions, figures, photos, schematics, block diagrams and flow charts, together with references to other documents or Sections when needed.

Part II - Troubleshooting

It gives the Maintenance Technicians a path to troubleshoot the System in every condition by means of the available tools:

- The PTU, equipped with the specific SW program
- The IDU
- The Fault Isolation Table

The Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment , Tools & Special Tools

05-I-01.a LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

The Abbreviations, Acronyms and Symbols commonly used throughout this manual are given below with their related meaning.

Abbreviation	Meaning
AB	AnsaldoBreda
APS	Auxiliary Power Supply
BHP	Pressure Switch, High Pressure
BLP	Pressure Switch, Low Pressure
BMP	Pressure Switch, Modulation Pressure
BRAS	Return Air Sensor
C/L	Centerline
CB	Circuit Breaker
CCH	Communication Control Head
CCU	Climate Control Unit
CM	Coast Motoring
DVE	Discharge Vibration Eliminator
EXP	Expansion Valve
FD	Filter Drier
GTW	Gateway
HV	High Voltage
HVAC	Heating, Ventilation & Air Conditioning
HW	Hardware
IDU	Integrated Diagnostic Unit
IP	Ingress Protection Rating
KO	Out of Service
LED	Light Emitting Diode
LH	Left Hand Side
LRV	Light Rail Vehicle
LV	Low Voltage
LVDS	Low Voltage Distribution System
LVPS	Low Voltage Power Supply
MV	Medium Voltage
MVB	Multifunction Vehicle Bus
OK	Working
PTU	Portable Test Unit
RH	Right Hand Side
SB	Service Brake
SCEB	Slide Controlled Emergency Brake

Abbreviation	Meaning
SRV	Safety Relief Valve
SVE	Suction Vibration Eliminator
SW	Software
SWT	Switch, A/C Unit AUTO-OFF-TEST
TBS	To Be Supplied
TCMS	Train Communication System
TCN	Train Communication Network
TWC	Train-to-Wayside Communication
WTB	Wired Train Bus
YLL	Solenoid Valve, Liquid Line

05-I-01.b LIST OF DEFINITIONS

The Definitions commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
//	Parallel
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0	Empty car operating weight
AW1	Full seated load plus AW0
AW2	Standees at 4 persons per square meter plus AW1
AW3	Standees at 6 persons per square meter plus AW1
AW4	Standees at 8 persons per square meter plus AW1
Front door	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section

05-I-01.c LIST OF MEASUREMENT UNITS AND SYMBOLS

The Measurement Units commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
Ω	Ohm
°C	Celsius degree
°F	Fahrenheit degree
A	Ampere
ac	Alternate Current
dB	Decibel
dc	Direct Current
ft	Foot
gal	Gallon
Hz	Hertz
in	Inch
kg	Kilogram - approx 2.205 pounds
km	Kilometer - approx 0.621 miles
kN	Kilo-Newton - approx 224.809 pounds force
kVA	Kilo Volt Ampere
lb	Pound
lb-ft	Pound force
lps	Liters per Second
m	Meter - approx 3.28 feet
mH	Milli Henry
mm	Millimeter - approx 0.0394 inches
ms	Milli second
Pa	Pascal
psig	Pounds per square inch
rms	Root Mean Square Voltage
rpm	Revolution per Minute
V	Voltage
Vin	Input Voltage
W	Watt

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05-I-02 THEORY OF OPERATION

05-I-02.01 General Description of the System

The HVAC consists of two independent and identical systems, one per Vehicle Body Section.

Each HVAC System is made up of a Climate Control Unit (CCU) connected to the Air Distribution System which delivers the treated air in the Passenger compartment and in the Operator Cab.

The Climate Control Unit (CCU), supplied by Thermo King Corporation for the P2550 Light Rail Vehicle, is an automatically controlled, self-contained, hermetically sealed roof-mount unit.

Each CCU contains two compliant scroll compressors operating in two independent refrigerant circuits.

The cooling is accomplished by pulling return air from the car interior into a chamber where it mixes with fresh air ducted in from the end of the unit.

The mixed air then passes through the evaporator coil, where it is cooled, dehumidified, then warmed in the heaters (if needed) before it enters the fans.

The fans pressurize the cooled air and discharge it out the bottom of the unit into the vehicle air distribution ducts (refer to paragraph 05-I-02.03).

The refrigerant system is hermetically sealed.

Major components such as the evaporator blower assembly, return air filters and the condenser fan assemblies are arranged for easy access and service from the rooftop level.

Both hinged and removable access covers and grilles are used to provide complete service access to all unit components requiring service or maintenance.

The microprocessor controller and electrical control system components are located in the control box that is accessible from the return air plenum. The controller is removable through the return air plenum.

Figure 05-I-02.1 HVAC Location

i. System-Vehicle Relationship

The interconnections of the HVAC System with the other vehicle systems are very limited.

The HVAC system is interconnected with:

- The LVDS (through the Relay Logic, refer to Section 10). The LV Signals are listed in Table 05-I-02.5
- The IDUs through the MVB bus (refer to Section 18). The MVB Signals are listed in Table 05-I-02.6 through Table 05-I-02.13)
- The TCU, through the MVB bus, to acquire the Propulsion System Status

Figure 05-I-02.2 describes the HVAC System - Vehicle Relationship.

Figure 05-I-02.2 System - Vehicle Relationship

The Operator can manage the HVAC System directly from the Active Cab through:

— The HVAC ON/OFF Switch (12S01) Relay Logic (LVDS)
(refer to Figure 05 -I-02.3)
— The HVAC Dampers Open/Close Switch (12S02) Relay Logic (LVDS) (refer to Figure 05-I-02.4)
— The IDU - HVAC System Status Screen: (Refer to Section 18)

Figure 05-I-02.3 12S01: HVAC ON/OFF Switch

Figure 05-I-02.4 12S02: HVAC Dampers Open/Close Switch

Independently from the Operator request, the Relay Logic shuts down the HVAC System if the APS is out of service (the 3K18 Relay is de-energized) and if the vehicle is in Car Wash Mode.

[redacted]

Figure 05-I-02.5 HVAC_A LV Connections

[redacted]

Figure 05-I-02.6 HVAC_B LV Connections

ii. System-Equipment Relationship

Figure 05-I-02.7 System-Equipment Relationship

iii. CCU Performances and Characteristics

A/C System Specifications:

Compressor Model No.:	ZR61KCE-TF5, Hermetic Scroll
Refrigerant:	R-407C
Refrigerant Charge:	26.5 lb
System Compressor Oil Capacity:	
Replacement Compressor Charge (each):	1.69 liter (57 oz.)
Additional Refrigeration System Charge:	1.2 liter (41 oz..)
Total Charge:	4.6 liter (175 oz.)
Compressor Oil Type:	Polyol Ester Based Type (required) TK Part No. 203-433
High Pressure Cutout Switch:	Open 450 +/- 10 psig Close 315 +/- 15 psig
Modulation Pressure Switch:	Open 390 +/- 12 psig Close 315 +/- 12 psig
Low Pressure Cutout Switch:	Open 5 to 17 in. Hg vacuum Close 1 to 7 psig
High Pressure Relief Valve:	Relief Pressure 550 to 700 psig
Liquid Line Solenoid Valve:	Type TK P/N 306-1807 Voltage 24 Vdc
Compressor Overload Set point:	24 A
Condenser Overload Set point:	4 A
Evaporator Overload Set point:	13 A
Interface Control Voltage:	37.5 Vdc, 6A
Power Supply:	208 Vac, 60 Hz, 3 phases

WARNING: **WHEN THE COMPRESSOR IS REMOVED FROM THE UNIT, OIL LEVEL SHOULD BE NOTED OR THE OIL REMOVED FROM THE COMPRESSOR SHOULD BE MEASURED SO THAT THE SAME AMOUNT OF OIL CAN BE MAINTAINED IN THE REPLACEMENT COMPRESSOR.**

WARNING: **DO NOT USE OR ADD STANDARD SYNTHETIC OR MINERAL OIL TO THE REFRIGERATION SYSTEM. IF ESTER BASED OIL IS CONTAMINATED WITH MOISTURE OR WITH STANDARD OILS, DISPOSE OF IT PROPERLY - DO NOT USE IT!**

Electrical System

Circuit Breakers:

Controller Circuit (QSUP):	6 A
Compressor #1 (QCOM1):	24 (20 -25) A
Compressor #2 (QCOM2):	24 (20 -25) A
Condenser Fan Motor #1 (QCFM):	4 (2.2 - 5) A
Condenser Fan Motor #2 (QCFM):	4 (2.2 - 5) A
Evaporator Fan Motor #1(QEFM):	13 (11 - 16) A
Heater #1 (QHTR1):	25 A
Heater #2 (QHTR2):	25 A

Thermal Overload Current Setting:

Compressor#1:	Overload Set point 24 A
Compressor#2:	Overload Set point 24 A
Condenser Fan Motor #1:	Overload Set point 4 A
Condenser Fan Motor #2:	Overload Set point 4 A
Evaporator Fan Motor #2:	Overload Set point 13 A
Heater #1:	Overload Set point 25 A
Heater #2:	Overload Set point 25 A

Compressor Motor:

Type:	208V, 60 Hz, 3 Phases
Number:	2
Kilowatts (60 Hz):	6.3 kW
Horsepower (60 Hz):	8.5 hp
RPM (60 Hz):	3,450 rpm
Full. Load Amps (60 Hz):	20.7 A
Locked Rotor Amps (50 Hz):	128 A

Condenser Fan Motors:

Type:	208V, 60 Hz, 3 Phases
Number:	2
Kilowatts (60 Hz):	0.75 kW each
Horsepower (60 Hz):	1 hp each
RPM (60 Hz):	1,725 rpm
Full Load Amps (60 Hz):	4 A
Locked Rotor Amps (60 Hz) :	26 A

Evaporator Blower Motor:

Type:	208V, 60 Hz, 3 Phases
Number:	1
Kilowatts (60 Hz):	2.98 kW
Horsepower (60 Hz):	4.0 hp
RPM (60 Hz):	1,725 rpm
Full Load Amps (60 Hz)	12.8 A
Locked Rotor Amps (60 Hz):	103.5 A
Heaters (Low Heat) Stage1:	9 kW
Heaters (Full Heat) Stage2:	18 kW
Thermal Overheat Protection Thermostat:	1-stage Open 194°F 2-stage Open 284°F

Physical Specifications

LRV 8T Base Unit (net weight):	1,270 lb
Component Weight:	
Compressor:	90 lb
Condenser Fan Motor:	37 lb
Evaporator Blower Motor:	66 lb

Figure 05-I-02.8 CCU Dimensions

05-I-02.02 Climate Control Unit (CCU)

The Climate Control Unit manages the air temperature automatically (through the HVAC electronic equipment).

Nevertheless, the operator can choose to turn the system ON or OFF or to force the "Ventilation Only" Mode.

The main HVAC components are (Refer to Figure 05-I-02.9):

1. Scroll Compressors (2)
2. Condenser Coils (2)
3. Condenser Fans and Motors (2)
4. Dehydrator
5. Liquid Receiver Tank
6. Vibration Eliminators (2)
7. Evaporator Coil Assembly and Solenoid Valves
8. Evaporator Blower Assembly
9. Air Filters
10. Control Box
11. Microprocessor Controller
12. Structural Frame
13. Covers and Grilles
14. Heater Assembly
15. Water Eliminator with Fresh Air Damper

01. SCROLL COMPRESSOR (2)
02. CONDENSER COILS (2)
03. CONDENSER FAN MOTORS (2)
04. DEHYDRATOR
05. LIQUID RECEIVER TANK
06. VIBRATION ELIMINATOR (2)
07. EVAPORATOR COIL
08. EVAPORATOR BLOWER
09. AIR FILTERS
10. CONTROL BOX
11. MICROPROCESSOR CONTROLLER
12. STRUCTURAL FRAME
13. COVERS AND GRILLES
14. HEATHER ASSEMBLY
15. WATER ELIMINATOR

Figure 05-I-02.9 HVAC Components

05-I-02.02.01 CCU Components

05-I-02.02.01.01 Scroll Compressors

Figure 05-I-02.10 Scroll Compressors

Each HVAC unit is equipped with two fully hermetic Copeland Scroll compressors.

The compressors are mounted in the condenser end of the unit adjacent to the condenser coil.

Resilient mounts and a one-piece mounting base provide easy removal of both compressor assemblies.

Each compressor includes an electrical junction box and an internal motor. The external check valves are located in the discharge lines of both compressors.

05-I-02.02.01.02 Condenser Coils

Figure 05-I-02.11 Condenser Coils

Each HVAC unit contains two aluminum wavy fin, copper tube condenser coil assemblies that mount adjacent to the condenser fans and motors.

Pressurized refrigerant gas (R-407C) is discharged by the compressors into the condenser coils for the condensing phase of the refrigeration cycle.

Air is drawn through the coils by two propeller type fans.

Refrigerant gas condenses in the condenser coils, returning the refrigerant to the liquid state.

Condenser coils also include a sub cooler circuit that lowers the temperature of the liquid refrigerant before it enters the expansion valves of the evaporator coil.

05-I-02.02.01.03 Condenser Fans and Motors

Figure 05-I-02.12 Condenser Fans and Motors

Each HVAC unit contains two condenser fan and motor assemblies.

Located between the condenser coils, the fans are designed to pull fresh air through the condenser coils.

Two grilles mounted on the side condenser covers prevent debris from being drawn into the condenser coils.

A stainless steel split-lock bushing mounts the fan blade onto the motor shaft.

Each fan blade is centered in an inlet ring that mounts onto the fan cover assembly. Two condenser fan outlet grilles mounted on the center condenser cover prevent objects from contacting the fan blades.

The condenser fan motors feature permanently sealed ball bearings, over temperature protection, protection against tropical conditions (fungus and humidity), and an individual junction box.

01. FAN
02. ELECTRICAL CONNECTORS
03. MOTOR
04. SCREW, WASHER AND NUT
05. ALLEN SCREW
06. GRID

Figure 05-I-02.13 Condenser Fan Motor Components

05-I-02.02.01.04 Dehydrator (filter-drier)

Two dehydrators (filter-driers) are a cartridge type unit located next to the evaporator coil.

The dehydrators remove any particles or debris in the refrigerant and retain any moisture present in the refrigeration system.

05-I-02.02.01.05 Liquid Receiver Tank

The liquid receiver tank mounts in the compressor compartment. The receiver tank is connected between the condenser coil outlet lines and the condenser coil sub cooler circuit inlet lines. The receiver tank stores reserve refrigerant that is needed to support variable system demands.

01. CONDENSER COIL
02. OUTLET SUBCOOLER
03. INLET SUBCOOLER
04. LIQUID RECEIVER TANK
05. SERVICE REFILL PIPE (CLOSED)
06. OUTLET CONDENSER

Figure 05-I-02.14 Liquid Receiver Tank Components

05-I-02.02.01.06 Vibration Eliminators

The suction line and discharge line contain in-line vibration eliminators.

Constructed of stainless steel reinforced flexible hose, the vibration eliminators remove the vibration and noise that are normally produced by the major mechanical devices and transmitted along refrigerant lines to more sensitive components.

05-I-02.02.01.07 Evaporator Coil Assembly and Solenoid Valve

Figure 05-I-02.15 Evaporator Coil Assembly

The HVAC unit contains an aluminum, wavy fin, copper tube evaporator coil assembly that mounts above the return air opening in the evaporator section.

The liquid solenoid valve closes to isolate the refrigerant charge in the receiver tank and condenser coils during system shutdown and reopens prior to system startup.

Liquid refrigerant flows from the sub cooler circuits to the evaporator coil expansion valves. Airflow going to the evaporator blowers passes through the evaporator coils creating an evaporation process (liquid returns to a vapor state), thereby the cooling and dehumidifying the vehicle air.

Then, if needed, the dehumidified air is warmed by passing through the heater coils.

This airflow is then discharged back into the vehicle supply air ducts. An insulated drain pan mounts underneath the evaporator coils to catch any water condensation from the evaporator coils.

Drain lines allow the water to flow from the unit.

01. PRESSURE SWITCH (BLP)
02. PRESSURE SWITCH (BHP)
03. PRESSURE SWITCH (BMP)
04. FILTER DRIER
05. SOLENOID VALVE
06. EXPANSION VALVE
07. EVAPORATION COIL

Figure 05-I-02.16 Evaporator Coil Components

05-I-02.02.01.08 Evaporator Blower Assembly

Figure 05-I-02.17 Evaporator Blower Assembly

The evaporator blower assembly consists of two blowers with an integrated electric motor that discharges air into the vehicle supply air ducts.

The blower assembly is located in the evaporator section.

The evaporator blower motor has permanently sealed ball bearings, over temperature protection, protection against tropical conditions (fungus and humidity) and a junction box.

Rotation arrows designating fan rotation are located on the blower housings.

01. MOTOR
02. BLOWER
03. TEMPERATURE SENSOR
04. EVAP. BLOWER CONN. NUT
05. ROTATION DIRECTION SIGN
06. MOTOR CONNECTION NUT

Figure 05-I-02.18 Evaporator Blower Components

05-I-02.02.01.09 Air Filters

Each HVAC unit is equipped with disposable air filters that remove dust and dirt:

- Fresh Air Filter
- Return Air Filter

The Fresh Air Filter element is located inside the Intake grid (faces the Articulation section) and can be accessed from the rooftop only.

The Return Air Filter element is located inside the Return Air grid and can be accessed from the vehicle interior, from the Return Air Plenum, through the HVAC access panel in the Passenger Compartment.

05-I-02.02.01.10 Control Box

Figure 05-I-02.19 Control Box

The LRV Control Box is located in the return air plenum and contains all electrical controls including the current transformer, relays, contactors and circuit breakers, as well as the controller.

The unit switch, a 3-position switch (OFF, AUTO, TEST) that controls the overall operation of the LRV unit is also contained in the control box.

When maintenance tasks are being performed, place the switch in the OFF position. During normal system operation, the test switch remains in the AUTO position.

When the unit switch is placed in the TEST position (unit switch moved from AUTO or OFF to TEST position), the controller performs an automatic check of system control.

The RESET button resets the controller. See the Service software User Manual for more information.

A green light indicates that the control voltage is functioning correctly and that the unit switch SWT is in the AUTO position.

A red light indicates a fault. Flashing red means warning. Continuous red means alarm. Use the Service software for fault identification. See also the Microprocessor Controller paragraph in this manual for more information (page 32).

a) High Voltage Components

- Contactor, Condenser Fan Motor #1 (KCFM1)
- Contactor, Condenser Fan Motor #2 (KCFM2)
- Contactor, Compressor Motor #1 (KCOM1)
- Contactor, Compressor Motor #2 (KCOM2)
- Contactor, Evaporator Fan Motor (KEFM)
- Contactor, Heater # 1 (KHTR1)
- Contactor, Heater #2 (KHTR2)
- Circuit Breaker, Condenser Fan Motor #1 (QCFM1)
- Circuit Breaker, Condenser Fan Motor #2 (QCFM2)
- Circuit Breaker, Compressor Motor #1 (QCOM1)
- Circuit Breaker, Compressor Motor #2 (QCOM2)
- Circuit Breaker, Evaporator Fan Motor (QEFM)
- Circuit Breaker, Heater #1 (QHTR1)
- Circuit Breaker, Heater #2 (QHTR2)
- Power Line Connector (X12)

b) Low voltage components include:

- Microprocessor Controller (D1)
- Circuit Breaker, Controller Circuit (QSUP)
- Switch, A/C Unit AUTO-OFF-TEST (SWT)
- Current Transformer, Condenser Fan Motor (TCFM)
- Current Transformer, Compressor Motors (TCOM)
- Current Transformer, Evaporator Fan Motor (TEFM)
- Control Circuit Connector (X11)
- Liquid Line Solenoid Valve (YLL)

Refer to paragraph 05-I-01.01.01 for Control Box Functional Schematic.

01. POWER AC CONNECTOR
02. SIGNAL LED (GREEN)
03. COMMUNICATION CONNECTOR
04. SWITCH - AUTO/OFF/TEST
05. SIGNAL LED (RED)
06. SIGNAL LED (YELLOW)
07. MULFUNCTION CONNECTOR

Figure 05-I-02.20 Control Box Front View

01. RETURN AIR TEMP. SENSOR
02. DISCHARGE AIR TEMP. SENSOR
03. FRESH AIR TEMP. SENSOR
04. COMMUNICATION CONNECTOR
05. LOW VOLT. CONTROL OUTLET
06. POWER AC CONNECTOR
07. GROUND
08. LIMIT SWITCH
09. MULTIFUNTION CONNECTOR
10. FANS VOLTAGE
11. COMPRESSOR VOLTAGE
12. HEATERS VOLTAGE

Figure 05-I-02.21 Control Box Side View

01. COMMUNICATION CONNECTOR
02. CONTROL PANEL
03. CONTROLLER
04. TERMINAL BLOCK
05. CONVERTER

Figure 05-I-02.22 Control Box Internal View

Figure 05-I-02.23 Control Panel

Table 05-I-02.1 Control Panel Components

Acronym	Description	Voltage
KCFM1	Contactor, Condenser Fan Motor 1	208 V High
KCFM2	Contactor, Condenser Fan Motor #2	208 V High
KCOM1	Contactor, Compressor Motor #1	208 V High
KCOM2	Contactor, Compressor Motor #2	208 V High
KEFM	Contactor, Evaporator Fan Motor	208 V High
KHTR1	Contactor, Heater # 1	208 V High
KHTR2	Contactor, Heater #2	208 V High
QCFM1	It is a 5 amp circuit breaker which protects the Power Supply Circuit. Of Condenser Fan motor #1	208 V High
QCFM2	It is a 5 amp circuit breaker which protects the Power Supply Circuit. Of Condenser Fan motor #2	208 V High
QCOM1	25 amp circuit breaker Protects compressor #1	208 V High
QCOM2	25 amp circuit breaker Protects compressor #2	208 V High
QEFM	16 amp circuit breakers Protects the Evaporator Fan Motor	208 V High
QHTR1	25 amp circuit breaker Protects the Power Supply Circuit of Heater #1	208 V High
QHTR2	25 amp circuit breaker Protects the Power Supply Circuit of Heater #2	208 V High
QSUP	6 amp circuit breaker Protects the Control Power Supply Circuit	Low
TCFM	Current Transformer, Compressor Motors	Low
TCOM	Current Transformer, Condenser Fan Motor	Low
TEFM	Current Transformer, Evaporator Fan Motor	Low
QHSR1	Relay Shunt Release	Low
QHSR2	Relay Shunt Release	Low
PR2	Over-voltage Arrester	High
SKEFM	Auxiliary Contact Block	

c) Microprocessor Controller

Each unit is controlled by a Microprocessor located in an enclosure mounted in the return air plenum of the unit.

The microprocessor provides system component control, fault indication and system diagnostics to simplify system service and maintenance.

A portable microcomputer operating Service software (refer to Section 5 - Part II) allows technicians to download diagnostic information from the LRV unit controller via a RS232 serial port both in the evaporator return air section of the unit and in the car. Service software allows the technician to observe unit operating status, observe faults, manually initiate any unit operating mode, observe sensor temperatures, initiate an LRV system cooling check and initiate a controller self-diagnostic check. You can also modify system temperature control algorithms and temperature set-points through a password protected menu using Service software.

The microprocessor operates the unit to maintain interior conditions. The microprocessor controller operates the LRV unit in the following modes of operation:

- Full Cool
- Partial Cool
- Reheat Mode
- Ventilation
- Heating 1
- Heating 2

Microprocessor Inputs:

- Return Air Sensor (BRAS)
- Duct Air Sensor (BDAS)
- Fresh Air Sensor (BFAS)
- Pressure Switch, Modulation Pressure (BMP)
- Fault Signal, Evaporator Fan Motor Overload (FS1)
- Fault Signal, Compressor Motor #1 Overload (FS2)
- Fault Signal, High Pressure (FS3)
- Fault Signal, Low Pressure (FS4)
- Fault Signal, Compressor Motor #2 Overload (FS5)
- Fault Signal, Condenser Fan Motor #1 Overload (FS6)
- Fault Signal, Condenser Fan Motor #2 Overload (FS7)
- Fault Signal, Evaporator Contactor is switched off (FS8)
- Fault Signal, Heater #1 (FS9)
- Fault Signal, Heater #2 (FS10)
- Fault Signal, Back Up Protection Heater #1&#2 (FS11)
- Fault Signal, Condenser Fan Motor #1 Thermal Overload (FS12)
- Fault Signal, Condenser Fan Motor #2 Thermal Overload (FS13)
- Fault Signal, Evaporator Fan Motor Thermal Overload (FS14)
- Inverter AC okay Signal (ACOK)

Microprocessor Output:

- Solenoid Valve, Liquid Line (YLL)

05-I-02.02.01.11 Structural Frame, Covers and Grilles

Figure 05-I-02.24 Frame and Cover

The CCU structural frame is manufactured from stainless steel. Outer covers and panels are formed from aluminum.

Two hinged evaporator side covers provide primary access to the evaporator coil, expansion valves, evaporator blower assembly, refrigerant piping and solenoid valve, dehydrator, receiver tank and compressor assembly.

A compressor cover provides top access to the compressor assembly.

Two removable side condenser covers provide access to the condenser coils. Removable condenser fan grilles and a removable center condenser cover provide access to the condenser fan motor and fan blade assemblies.

The return air grille, accessed from the car interior, provides access to the air filters. Access to the control box that contains the circuit breaker and contactor panel as well as the microprocessor controller is also provided through the return air grille. A RS232 communications port is accessible through the return air plenum.

05-I-02.02.01.12 Heaters

Figure 05-I-02.25 Heater

The CCU contains one (1) 2 stage 18 kW heater. The heater is wire wound with two (2) temperature limit switches.

The Heater is provided with water barrier

05-I-02.02.01.13 Water Eliminator with Fresh Air Damper

The fresh air damper is directly controlled via HW signals.

The purpose of the Air Dampers is to close off outside air from being sucked into the passenger compartment during a fire in a tunnel.

The default position of damper is open. Water Eliminator secures fresh air input against the water drops in case of rain.

05-I-02.02.01.14 Unit Decals

Serial number decals, refrigerant type decals and warning decals appear on all Thermo King equipment. These decals provide information that may be needed to service or repair the unit. Service technicians should especially read and follow the instructions on all warning decals.

Serial Number Locations:

- Electric Motors: Nameplate attached to the motor housing
- Compressor: Nameplate attached to the compressor housing
- CCU: the First nameplate is on the unit frame outside under the right evaporator cover (near by fresh air openings). The Second nameplate is on the unit frame outside on the evaporator wall - right bottom corner

05-I-02.02.02 CCU Functional Description

05-I-02.02.02.01 Basic A/C System Theory of Operation

The components of the A/C unit are all connected in a closed, hermetically sealed system to form a refrigerant loop that responds to the commands of the microprocessor controller.

The refrigerant system circulates R-407C refrigerant (refer to NOTE in the next page) between the evaporator and the condenser coil to provide the necessary pressures. (Refer to Figure 05-I-02.26)

The evaporator blower circulates heat-laden air across the evaporator coil. The heat is absorbed by the refrigerant (a low pressure, low temperature liquid) in the coil as it evaporates.

As the refrigerant evaporates, a low pressure, high temperature, heat-laden vapor is formed. In this manner, heat is transferred from the air to the refrigerant. The conditioned air is forced into the ductwork for distribution throughout the rail car. Although the air is now conditioned and cools, the refrigerant needs to release the heat it gained from the evaporator.

Compressor suctions continuously draw the heat-laden vapor from the evaporator. As the refrigerant vapor is compressed, it increases its pressure and temperature, changing it to high-pressure, high temperature vapor.

This elevates the vapor temperature and pressure to facilitate heat transfer to the ambient air and establish a higher condensing temperature.

As the high-temperature vapor travels through the condenser coil, the heat from the refrigerant is dispersed into the cooling fins, and is removed by the ambient air circulated by the condenser fan.

As the heat is removed, the vapor condenses back into a liquid.

Thus, the heat absorbed by the refrigerant from the evaporator, is transferred to the condenser and given off to ambient air.

The high temperature liquid is maintained under high pressure in the receiver, where it is stored until needed.

The receiver serves as a reservoir for the variable demands of liquid refrigerant from the system.

Liquid refrigerant then flows from the receiver tank through the sub cooler circuit in the bottom of the condenser coil.

The refrigerant continues to give off heat to the cooler ambient air circulating across the fins of the sub cooling circuit, lowering, the liquid temperature below saturation/condensing temperature.

This additional cooling ensures that the high pressure liquid remains in its liquid state until it reaches the thermal expansion valve(s).

From the sub cooler circuit of the condenser coil, liquid refrigerant flows through the filter-drier (dehydrator), where impurities, solids, and moisture are removed.

The filter-drier consists of a filter and a desiccant (molecular sieve) that traps and holds water molecules.

From the filter-drier, the high temperature, high, pressure liquid flows through the liquid line solenoid valve to the expansion valves.

The expansion valves control the flow of the liquid refrigerant entering the evaporator coil, where it again absorbs heat from the car interior air circulated over the evaporator coil by the evaporator blower.

The low pressure, low temperature liquid refrigerant absorbs heat, causing a change of state from liquid to vapor (evaporates).

A heat laden, low pressure, low temperature gas then repeats the cycle as it is drawn back to the compressors.

When Partial Cool is required, the controller energizes the liquid line solenoid valve, one compressor and one condenser fan motor, circulating refrigerant through the evaporator coil.

The evaporator blower starts first and runs at all modes.

When Full Cool is required, the controller also energizes the second compressor and the second condenser fan motor.

NOTE: The R-407C is a mixture of HFC-32, HFC-125 and HFC-134a, not harmful for the ozone layer. The R-407C mixture is fit for applications in air conditioning systems and is a good alternative to R-22 in small air conditioning systems. Since it is similar to R-22, it can be used as conversion fluid in air conditioning systems which make use of R-22.

Table 05-I-02.2 Temperature/Pressure Table

Temperature (°C)	Pressure (liquid) (kPa)	Pressure (vapor) (kPa)
-20	281	215
-15	339	264
-10	405	320
-5	481	386
0	568	461
5	666	547
10	776	645
15	899	755
20	1,036	880
25	1,188	1019
30	1,256	1175
35	1,541	1348
40	1,745	1539
45	1,967	1751

DVE: VIBRATION ELIMINATOR
EXP: EXPANSION VALVE
BHP: HIGH PRESSURE SWITCH
FD: FILTER DRIER
SVE: VIBRATION ELIMINATOR
BMP: MODULATION SWITCH
YLL: SOLENOID VALVE
BLP: LOW PRESSURE SWITCH
SRV: SAFETY RELIEF VALVE

Figure 05-I-02.26 CCU Diagram

05-I-02.02.02.02 CCU Controls

a) A/C Unit Auto-OFF-Test Switch

- AUTO position. Unit will operate in one mode depending on the controller set-point temperature and the rail car air temperature (Full Cool, Partial Cool, Reheat, Ventilation, Heating 1, and Heating 2)
- OFF position. The unit will not operate
- TEST position. When the unit switch is placed in the TEST position (unit switch moved from AUTO or OFF position to TEST position), the controller performs an automatic check of the system controls

b) Microprocessor Controller

A microprocessor controls all unit functions to maintain the rail car at the proper temperature.

The controller also monitors and records system faults.

Service software operates on a Laptop Computer which is used to download information, program unit functions and perform diagnostic tests of the A/C system.

c) Modulation Pressure (BMP) Switch

When the condenser head pressure rises above 2691±83 kPa, 26.91±0.83 bar, 390±12 psig, the modulation pressure switch opens, signaling the controller to stop one compressor. Both condenser fans continue to run.

Stopping one compressor and reducing the discharge pressure on the running compressor reduces the compressor current draw to protect against unit shut down due to high current draw in high ambient.

The unit continues cooling Modulation Cool until the modulation pressure switch closes.

The modulation pressure switch closes when the condenser head pressure decreases to 2174 ± 83 kPa, 21.74 ± 0.83 bar, 315 ± 12 psig. If the return air temperature requires Full Cool operation, the controller starts compressor 2, placing the unit in Full Cool mode.

05-I-02.02.02.03 CCU Protection Devices

a) Circuit Breakers

A number of circuit breakers located in the control box protect unit circuits and components.

- A 25 amp circuit breaker (QCOM1) protects the compressor #1 208 V power supply circuit.
- A 25 amp circuit breaker (QCOM2) protects the compressor #2 208 V power supply circuit.

- A 5 amp circuit breaker (QCFM1) protects the condenser fan motor #1 208 V power supply circuit
- A 5 amp circuit breaker (QCFM2) protects the condenser fan motor #2 208 V power supply circuit
- A 25 amp circuit breaker (QHTR1) protects the heater #1 power supply circuit
- A 25 amp circuit breaker (QHTR2) protects the heater #2 power supply
- A 6 amp circuit breaker (QSUP) protects the control power supply circuit
- A 16 amp circuit breakers (QEFM) protects the evaporator fan motor 208 V power supply circuits

b) High Pressure (SWHP) Switch

The refrigerant high pressure opens and sends a fault signal to the controller if the compressor discharge pressure rises above 3105 ± 69 kPa, 31.05 ± 0.69 bar, 450 ± 10 psig.

The controller immediately stops the compressors and condenser fans. However, after 2 minutes, the controller attempts a cooling system restart.

If high pressure recurs 3 times in 30 minutes, the controller locks out cooling operation and operates the unit on ventilation only.

The high pressure switch resets (closes) when the pressure drops back to 2174 ± 104 kPa, 21.74 ± 1.04 bar, 315 ± 15 psig.

After the high pressure switch closes, the controller restarts the cooling system.

The cooling system operates until high discharge pressure recurs.

If high pressure cutout recurs 3 times in 30 minutes, the controller locks out cooling operation (unit operates on ventilation only).

The controller must be reset before cooling system will restart.

c) Low Pressure (BLP) Switch

The refrigerant low pressure opens and sends a fault signal to the controller if the compressor suction pressure drops below - 17 to -57 kPa, -0. 17 to -0.57 bar, 5 to 17 in. Hg vacuum.

The controller immediately stops the compressors and condenser fans. However, after 2 minutes, the controller attempts a cooling system restart.

If low pressure cutout recurs 3 times in 30 minutes, the controller locks out cooling operation and operates the unit on ventilation only.

The low pressure switch resets (closes) when the pressure drops back to 7 to 48 kPa, 0.07 to 0.48 bar, I to 7 psig.

After the low pressure switch closes, the controller restarts the cooling system.

The cooling system operates until low refrigerant pressure recurs.

If low pressure cutout recurs 3 times in 30 minutes, the controller locks out cooling operation. The controller must be reset before cooling system will restart.

d) Safety Relief Valve (SRV)

A safety (high pressure) relief valve is installed in the compressor discharge line to avoid excessive pressure build-up within the refrigeration system from extraordinary and unforeseen circumstances.

The valve is a spring- loaded piston that lifts when refrigerant pressure exceeds 3795 to 4830 kPa, 37.95 to 48.30 bar, 550 to 700 psig.

e) Thermal Overload Relay Protection

The compressors, condenser fan motors and evaporator fan motor are protected by external thermal overload relays, which are combined with circuit breakers.

f) Current Transformers

Three current transformers measure component current draw of the compressor motors, condenser fan motors and the evaporator fan motor.

Component current draw is then monitored by the controller so component operation can be interrupted (via control circuits) in the event of low airflow or current overload conditions.

g) Heat Limiter

The heaters are protected by heat limiter against the overheating.

h) Overvoltage Arrester

The overvoltage arrester protects the control circuit against overvoltage.

05-I-02.02.02.04 Starting the A/C System

A/C system operation is fully automatic.

The A/C systems starts when the ON/OFF switch located in the active cab is turned on.

The controller operates the system on Full Cool, Partial Cool, Reheat or Heating based on the set-point temperature, return air temperature and fresh (outside) air temperature.

The set-point temperature is given automatically by controller in relation with outside temperature.

1. Turn rail car power supply ON. Turn the ON/OFF switch on.
2. When the ON/OFF switch is in the ON position, the controller checks if the inverter generated the ACOK (24 Vdc) signal.
3. When the unit switch is in the TEST position, the controller initiates the Unit Self Test mode. In the Unit Self Test mode, the controller operates the unit in Full Cool for 5 minutes and then in Full Heat for 5 minutes. Position of the ON/OFF switch is not significant in this case.
4. To start the unit, turn the unit switch to the AUTO position. The controller initiates the unit startup in the required operating mode.
5. In both cases, the unit starts sequentially as follows:

Depending on the control voltage (24 Vdc) and ACOK input, the controller energizes the evaporator blower contactor after a delay of0. 1 to 4.0 seconds.

- The controller energizes condenser fan motor I contactor (KCFM1)
- The controller then energizes compressor motor 1 contactor (KCOM1) after another delay of 1 second
- The controller energizes the liquid line solenoid valve (YLL) after another delay of 4 seconds

On each successive switch between cooling modes, the controller alternates the initial startup of the condenser fan motor between condenser fan motor 1 and Condenser fan motor 2.

NOTE: The controller also alternates the startup of the compressor between compressor 1 and compressor 2. This is done to balance the service duty (hours of operation) equally between both condenser fan motors and both compressors.

- The controller energizes condenser fan motor 2 (KCFM2) contactor after a delay of 1 second. The controller then energizes compressor motor 2 contactor (KCOM2) after another delay of 1 second.

If an alarm condition prevents unit startup, the remote Fault Light will flash.

See "Alarm Codes, Descriptions and Correct Actions” in this manual. Correct the problem before trying to restart the A/C system.

WARNING: **SOME UNIT MALFUNCTIONS WILL CAUSE AN ALARM AND UNIT SHUTDOWN CONDITION. WHEN THE CONTROLLER IS RESET, THE UNIT WILL START AUTOMATICALLY.**

NOTE: A permanent record of the alarm codes remains stored in the controller memory for retrieval via Service software.

a) Normal Operating Modes

With the A/C system energized and operating with the unit switch in the AUTO position, the return air sensor, fresh air sensor and set-point temperature determine the unit mode of operation. (refer to Figure 05-I-02.27).

Figure 05-I-02.27 A/C Regular Temperature Control

b) Full Cool

During the Full Cool Mode the controller energizes the following:

- Evaporator Fan Motors Contactor (KEFM)
- Condenser Fan Motor Contactors (KCFM1&2)
- Liquid Line Solenoid Valve (YLL)
- Compressor Motor Contactors (KCOM1&2)

On increasing rail car temperature, the unit shifts from Partial Cool to Full Cool when the return air temperature increases to 4 K (7.2°F)[1] above the set-point temperature.

On decreasing rail car temperature, the unit shifts from Full Cool to Partial Cool when the return air temperature decreases to 2 K (3.6°F)[2] above the set-point temperature.

c) Partial Cool

During the Partial Cool mode the controller will energize the following:

- Evaporator Fan Motor Contactor (KEFM)
- Condenser Fan Motor Contactors (KCFM1)
- Liquid Line Solenoid Valve (YLL)
- Compressor Motor Contactors (KCOM1)

The unit shifts from Reheat to the Partial Cool mode when the return air temperature increases to 2 K (3.6°F) above the set-point temperature.

The unit then remains in Partial Cool as long as the return air temperature remains between 1 K (1.8°F)[3] above set-point and 4 K (7.2°F) above the set-point temperature.

On each successive switch from Full Cool to Partial Cool, the controller alternates the initial startup of the condenser fan motor between condenser fan motor 1 and condenser fan motor 2.

NOTE: The controller also alternates the startup of the compressor between compressor 1 and compressor 2. This is done to balance the service duty (hours of operation) equally between both condenser fan motors and both compressors.

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[1] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[2] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[3] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

The controller also places the unit in Modulation Cool whenever the unit is operating in Full Cool and the modulation pressure switch opens (refrigerant discharge pressure rises to 2691 ± 83 kPa, 26.91 ± 0.83 bar, 390 ± 12 psig).

NOTE: The modulation pressure switch protects against unit shutdown due to current overload in high ambient operating conditions. (Modulation Cool Mode is not normal operating mode.

During this mode, in addition to the components, which are energized in the Partial Cool Mode, the second condenser fan motor is energized too).

d) Reheat

The purpose of reheating is to dehumidify. During the reheat mode the controller will energize the following:

- Evaporator Fan Motor Contactor (KEFM)
- Condenser Fan Motor Contactor (KCFM1)
- Liquid Line Solenoid Valve (YLL)
- Compressor Motor Contactor (KCOM1)
- Stage 1 Heat Contactor (KHTR1)

The unit switches from Ventilation Mode to the Reheat Mode when the return air temperature increases by 1 K (1.8°F)[4] above set-point temperature.

The unit remains in the Reheat Mode as long as the return air temp remains between 1.5 K (2.7°F)[5] below set-point and 2 K (3.6°F)[6] above set-point temperature.

The units shifts from Reheat Mode to Ventilation Mode, when return air temp decreases to 1.5 K (2.7°F)[7] below its set-point temperature.

[4] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[5] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[6] This default value is a parameter that, can be modified using communication software. Refer to Section 05 - Part II.

[7] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

e) Ventilation

During ventilation the controller will energize the following:

- Evaporator Fan Motor Contactor (KEFM)

The unit switches from Ventilation Mode to the Reheat Mode when the return air temperature increases by 1 K (1.8°F)[8] above set-point temperature.

The unit remains in the Ventilation mode as long as the return air temp remains between 2.5 K (4.5°F)[9] below set-point and 1 K (1.8°F)[10] above set-point.

The units shifts from Ventilation Mode to Heat Stage 1 Mode, when return air temp decreases to 2.5 K (4.5°F)[11] below its set-point temperature.

f) Heat, Stage 1

During Heat Stage 1, one heater (in the LRV unit) is energized in addition to the blower motor.

The unit shifts from Ventilation Mode to Heat Stage 1 when return air temperature decreases by 2.5 K (4.5°F)[12] below set-point.

The unit remains in Heat Stage 1 as long as the return air temp remains between 2.5 K (4.5°F) [13] below set-point and 0.5 K (0.9°F)[14] below set-point.

The unit shifts from Heat Stage 1 to Heat Stage 2 when return air temperature decreases by 5 K (7.5°F)[15] below set-point.

During Heat Stage 1 the controller energizes the following:

- Evaporator Fan Motor Contactor (KEFM)
- Stage 1 Heat Contactor (KHTR1)

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[8] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[9] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[10] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[11] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[12] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[13] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[14] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[15] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

g) Heat, Stage 2

During Heat Stage 2, both heaters in LRV unit are energized in addition to Evaporator blower motor.

The unit shifts from Heat Stage 2 to Heat Stage 1, when return air temperature increases by 2 K (3.6°F)[16] below set-point.

The unit shifts from Heat Stage 1 to Heat Stage 2, when return air temperature decreases by 5 K (7.5°F)[17] below set-point.

The unit remains in Heat Stage 2 as long as the return air temperature remains 2 K (3.6°F)[18] below set-point.

During heat stage 2 the controller will energize the following:

- Evaporator Fan Motor Contactor (KEFM)
- Stage 1 Heat Contactor (KHTR1)
- Stage 2 Heat Contactor (KHTR2)

h) Fresh Air Dampers

The fresh air dampers are directly controlled via hard-wired signals
(refer to Table 05-I-02.5). The default position of the dampers is OPEN.

The Fresh Air Dampers are to be closed by the train operator should there be fire or smoke in the vicinity.

[16] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[17] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

[18] This default value is a parameter that can be modified using communication software. Refer to Section 05 - Part II.

05-I-02.02.02.05 Microprocessor Controller

The controller is a programmable Microprocessor that regulates all unit functions to maintain the rail car at the proper temperature and humidity.

The Microprocessor Controller is equipped with an MVB module for exchanging data with the Vehicle Logic.

TCU MoV (Master of Vehicle) / Slave detection:

At a certain time only one of the two TCUs can be the Master Of Vehicle (refer to Section 07). The TCU that is currently Master Of Vehicle must be detected by reading the datasets number (105 for TCU_A and 106 for TCU_B) and considering the status of the MoV bit (position 2.0 of dataset TRAINCMD_A (0) or TRAINCMD_B (0); refer to Table 05-I-02.3, Table 05-I-02.4 and Section 18).

If TCU_A is detected to be MoV, the slave units (TCUs, ECUs and HVACs) must read and use the information from the MoV listed in the following dataset:

Table 05-I-02.3 Input Dataset (from MoV TCU_A)

Port Number	Group Name	Source	Description
510	TCU_A_INFO	TCU_A	Time reference, vehicle ID etc.
105	TRAINCMD_A (0)	TCU_A	Commands from Local TCU_A

If TCU_B is detected to be Master Of Vehicle, the slave units (TCUs, ECUs and HVACs) must read and use the information from the MoV in the following dataset:

Table 05-I-02.4 Input Dataset (from MoV TCU_B)

Port Number	Group Name	Source	Description
610	TCU_A_INFO	TCU_B	Time reference, vehicle ID etc.
106	TRAINCMD_B (0)	TCU_B	Commands from Local TCU_B

The Microprocessor Controller generates Warning Signals and Alarm Signals for remote monitoring.

The Fault light flashes ON and OFF continuously when a Warning signal occurs. Warning signals indicate that a corrective action should be taken before the problem becomes severe.

In this condition the unit continues to operate, however, some unit functions may be inhibited.

The Fault light stays ON when an Alarm Signal occurs. Alarm signals indicate that a problem exists that affects the cooling system performance.

On some alarms, the compressors and condenser fans are stopped to prevent damage to unit components while the unit continues to operate in ventilation mode.

Usually alarms must be corrected and the Microprocessor Controller reset before the A/C system can be set back to normal operation. See Section 5 - Part II on “Alarm Codes, Descriptions and Corrective Actions” for information about the specific actions the Microprocessor Controller takes in response to each alarm code.

Fault codes are recorded in the Microprocessor Controller memory to ease unit diagnosis and troubleshooting procedures.

Fault codes are available both via MVB and RS232 port.

Two HVAC units are supplied by one Inverter. Due to inrush current, the units cannot start at the same time.

The units communicate via MVB. When one unit starts, it generates a DOUSI signal. Based on the DOUSI signal, a DISE signal (Digital Input Second Unit) is generated for the second unit. In this way, the second unit can start when DISE signal is in logical 1 only.

A serial communication port is provided for downloading system performance data, monitoring system operation and performing system test and diagnostic routines using a Laptop (PTU) with Service software (Refer to Section 05 - Part II.)

Return air, duct air and fresh (outside) air sensors are field replaceable.

- Internal diagnostic capability: The unit has an internal self-checking and diagnostic capability upon initial startup and in the background.
- Data recording capability: The microprocessor controller records all sensor temperatures, system faults and six hourmeter counters. Recorded data can be downloaded (or erased) from the controller memory using Service software.
- Sequential component start-up control: A sequence start of the required loads occurs during initial start-up of the controller and when a control mode shift requires the compressor to start.
- Hourmeters: The Microprocessor Controller is equipped with six built-in hourmeters, accessible by means of the Service software. Separate hourmeter counters record the operation hours of the controller, the condenser fan motor #1, the condenser fan motor #2, compressor #1, compressor #2 and the evaporator blower motor.
- Flash memory: A flash program memory in the controller allows the application software to be updated without replacing the controller. Application software can be updated in the field using a Laptop (PTU) with Service software.

a) Communications between HVAC and Vehicle Logic

Each CCU is connected with the Vehicle Logic through:

- HVAC Low Voltage Wired Lines: High/Low signals transferred through dedicated wired lines. The vehicle Relay Logic and the LVDS in general (Refer to Section 10) manage these signals.

- MVB Bus: through this bus the HVAC System communicates its status to the other Vehicle Systems and receives commands. (Refer to Section 18).

The Microprocessor Controller receives the HVAC LV signals.

With the MVB communication working properly, the unit remains in OFF mode (switched off), until it receives the start command via MVB. If the MVB communication is not working properly and HVAC ON/OFF and HVAC SHUT DOWN signals are in logical 1, then the unit starts with a 3 seconds delay HVAC_SD..

If MVB is not working, the unit controllers make sure that the motors (Compressor motors, evaporator and condenser fan motors) of the two car units (supplied by one inverter) do not start simultaneously.

In this case, the motors of unit A can start only if the number of seconds in the real time clock is between 0 and 15. While the motors of unit B can start only if the number of seconds in the real time clock is between 30 and 45.

Heaters can start without any time delay.

The CCU (and the Microprocessor Controller as a consequence) is equipped with one connector for interfacing the Vehicle Logic: Connector X11, used for both HVAC LV Wired Lines and MVB signals (refer to the figures in paragraph 05-I-01.01.01).

- HVAC LV Wired Lines

Table 05-I-02.5 lists the hard-wired signals carried via connector X11:

Table 05-I-02.5 List of HVAC LV Wired Signals

Signal	TK Designation	Remark
+ 24 Vdc	-	Control Voltage Supply
HVAC SHUT DOWN	DIACOK1	Hard-wired shut down: if this signals drops to logical 0, unit stops
0 V	-	Control Voltage Supply (Return)
HVAC ON/OFF	DICF0	Hard-wired signal ON/OFF
A-UNIT	DIAOM	Signal for Unit A designation: if in logical 1 Unit A is designed
FAD_IN FAD_OUT	FAD_IN FAD_OUT	Control of Fresh air dampers: FAD_IN put through FAD_OUT damper close. FAD_IN open FAD_OUT damper open
Digital input HSP	DIHSP	Signals reserved for TK use
Digital input MSP	SIMSP	
Digital input LSP	SILSP	
External Switch Common	ESC	
Digital Output for TK use	DOLFLS1	

- MVB Bus

The Tables of this paragraph list all relevant parameters available in the HVAC controller that can be transmitted via MVB. Not all of the following signals are actually used by other vehicle systems. For the signal actually used refer to Section 18.

Table 05-I-02.6 Digital Inputs of the HVAC Controller

Bit Number	Symbol	Description	Remarks
0	DIMPS	Modulation Pressure Switch	DIMPS = 1 → O.K.
1	DIEFOL	Evaporator Fan Overload Relay	DIEFOL = 1 → OK
2	DIC1OL	Compressor #1 Overload Relay	DIC1OL = 1 → OK
3	DIHPCO	High Pressure Cut Out Switch	DIHPCO = 1 → OK
4	DILPCO	Low Pressure Cut Out Switch	DILPCO = 1 → OK
5	DIC2OL	Compressor #2 Overload Relay	DIC2OL = 1 → OK
6	DICF1OL	Condenser Fan #1 Overload Relay	DICF1OL = 1 → OK
7	DICF2OL	Condenser Fan #2 Overload Relay	DICF2OL = 1 → OK
8	DICF0	L_HVAC Shut down	DICF0 = 1 → unit runs DICF0 = 0 → unit stops
9	DIH1TS	Heater #1 Temperature Switch or Heater #1 Circuit breaker trip	DIH1TS = 1 → OK
10	DIAUTO	SWT “AUTO” Position	DIAUTO = 1 → automatic mode
11	DICV	Control Voltage Supply and Dead Man Switch	DICV = 1 → control voltage OK and dead man switch closed
12	DITEST	SWT “TEST” Position	DITEST = 1 ® testing mode
13	DIACOK1	HVAC ON/OFF	DIACOK1 = 1 → Supply Voltage is OK
14	DIH2TS	Heater #2 Temperature Switch or Heater #2 Circuit breaker trip	DIH2TS = 1 → OK
15	DIACOK2		N/A
16	DISE	Motor Start Enable	DISE = 1
17	DILSP	Reserved TK Use	N/A
18	DIMSP	Reserved TK Use	N/A
19	DIHSP	Reserved TK Use	N/A
20	DIHSR	Heaters Circuit Breaker Shunt Release	DIHSR = 0 → OK DIHSR = 1 → shunt release
21	DIHC	Evaporator Contactor Interlocking Signal	DIHC = 1 → if contactor is turned on DIHC = 0 ⇒ if contactor is opened

Table 05-I-02.6 Digital Inputs of the HVAC Controller

Bit Number	Symbol	Description	Remarks
22	DIAOM	Priority Status Bit	DIAOM = 0 → B unit - lower priority DIAOM = 1 → A unit higher priority
23	DICF1TS	Condenser Fan Motor #1 Temperature Switch	DICF1TS = 1 → OK
24	DICF2TS	Condenser Fan Motor #2 Temperature Switch	DICF2TS = 1 → OK
25	DIEFTS	Evaporator Fan Motor Temperature Switch	DIEFTS = 1 → OK

Table 05-I-02.7 Digital Outputs of the HVAC Controller

Bit Number	Symbol	Description	Remarks
0	DOCF1	Condenser Fan Motor #1 ON/OFF Switch	DO1
1	DOCF2	Condenser Fan Motor #2 ON/OFF Switch	DO2
2	DOEF	Evaporator Fan Motor ON/OFF Switch	DO3
3	DOFLS1	Unit Fault - ERROR	DO4
4	DOFLS2	Unit Fault - WARNING	DO5
5	DOC1	Compressor #1 ON/OFF Switch	DO6
6	DOC2	Compressor #2 ON/OFF Switch	DO7
7	DOEH1	External Heater #1 ON/OFF Switch	DO8
8	DOEH2	External Heater #2 ON/OFF Switch	DO9
9	DOYML	Digital Output	DO10 (Not Used)
10	DOYLL	Liquid Line Solenoid ON/OFF Switch	DO11
11	DO12	Digital Output	DO12 (Not Used)
12	DO12	Digital Output	DO13 (Not Used)
13	DOH1	Internal Heater #1 ON/OFF Switch	DO14
14	DOH2	Internal Heater #2 ON/OFF Switch	DO15
15	DOUSI	Unit Start Inhibition	DO16
16	DO17	Digital Output	DO17 (Not Used)
17	DO18	Digital Output	DO18 (Not Used)

Table 05-I-02.8 Analog Inputs of the HVAC Controller

Symbol	Description	Remarks	Sing. Name + Type
AIEFC	Evaporator Fan Motor Current	Analog input	EFC (Integer16)
AICFC	Condenser Fan Motors Current	Analog input	CFC (Integer16)
AICC	Compressor Motors Current	Analog input	CC (Integer16)
AIRAT	Return Air Temperature	Analog input	ReturnAirTemp (Integer16)
	Return Air Temperature Valid	N/A	ReturnAirTempValid (Bit)
AIDAT	Duct Air Temperature	Analog input	DuctAirTemp (Integer16)
	Duct Air Temperature Valid	N/A	DuctAirTempValid(Bit)
AIFAT	Fresh Air Temperature	Analog input	FreshAirTemp (Integer16)
	Fresh Air Temperature Valid	N/A	FreshAirTempValid(Bit)
AISP	Set Point	Analog input	Set-point(Integer16)
	Set-pointValid	N/A	Set-pointValid(Bit)
AITS	Spare Temperature Sensor	Analog input	SPI(Integer16)
AIRH	Relative Humidity	Analog input	RelHum(Integer16)
	Rel Hum Valid	N/A	RelHumValid(Bit)
AIDC2	Spare DC Current Input	Analog input	CI2(Integer16)

Table 05-I-02.9 Internal Parameters of the HVAC Controller

Symbol	Description	Remarks	Sing. Name + Type
WHU	Working hours of the A/C unit	Time resolution 1 minute	WHU(Integer16)
WHEF	Working hours of the evaporator fan (#1 and #2)	Time resolution 1 minute	WHEF(Integer16)
WHCF1	Working hours of the condenser fan #1	Time resolution 1 minute	WHCF1(Integer16)
WHCF2	Working hours of the condenser fan #2	Time resolution 1 minute	WHCF2(Integer16)
WHC1	Working hours of the Compressor #1	Time resolution 1 minute	WHC1(Integer16)
WHC2	Working hours of the Compressor #2	Time resolution 1 minute	WHC2(Integer16)
WHIEH1	Working hours of the Internal Electric Heater #1	Time resolution 1 Minute	WHIEH(Integer16)
WHIEH2	Working hours of the Internal Electric Heater #2	Time resolution 1 minute	WHIEH(Integer16)

Table 05-I-02.9 Internal Parameters of the HVAC Controller

Symbol	Description	Remarks	Sing. Name + Type
WHEEH1	Working hours of the External Electric Heater #1	Time resolution 1 minute	WHEEH1(Integer16)
WHEEH2	Working hours of the External Electric Heater #2	Time resolution 1 minute	WHEEH2(Integer16)
AWM	Actual working mode	Actual Mode	AworkMode(ENUM4)
RWM	Required working mode	Required Mode	RworkMode(ENUM4)
UnitId	Unit Identification	Identification Number	UnitId(ENUM4)
AS	Actual Status	Actual Unit Status	ActualStatus(Integer16)
DICFO	Control voltage	DICFO = 1 = OK	ActualStatus Bit0
DIACOK1	Power 1 OK	DIAOK1 = 1 = OK	ActualStatus Bit1
DIACOK2	Power 2 OK	DIAOK2 = 1 = OK	ActualStatus Bit2
DIAOM	Priority status bit	DIAOM = 1 = Unit A (master), DIAOM = 0 = Unit B	ActualStatus Bit3
DOUSI	Unit start inhibition	DOUSI = 1 = Unit star	ActualStatus Bit4
Modulation	Modulation pressure Switch	Modulation = 1 = Activ	ActualStatus Bit7
HumidCtrl	Humidity control	HumcontrolExist = 1 = Activ	ActualStatus Bit8
AlarmExist	Alarm state	AlarmExist = 1 = Activ	ActualStatus Bit9
WarnExist	Warning state	WarnExist = 1 = Activ	ActualStatus Bit10
Emergency	Emergency state	Emergency = 1 =Activ	ActualStatus Bit11

Table 05-I-02.10 SW and NSDB versions sent to TCU

Description	Remarks	Sing. Name + Type
NSDB Release Number	NSDB Release Number	NSDBVersion Rel (Integer16)
NSDB Patch Number	NSDB Patch Number	NSDBVersion Pat (Integer16)
NSDB Release Number	NSDB Release Number	NSDBVersion Rel (Integer16)
NSDB Patch Number	NSDB Patch Number	NSDBVersion Pat (Integer16)

Table 05-I-02.11 Error Signals sent to HVAC and TCU

Description	Remarks	Sing. Name + Type
Critical Faults	CriticalFault = 1 = some critical faults CriticalFault = 0 = without critical faults	CriticalFault(Bit)
Minor Faults	MinorFault = 1 = some minor faults MinorFault = 0 = without minor faults	MinorFault(Bit)
Maintanance Request	MaintananceRequest = 1 = some maintanance request MaintananceRequest = 0 = without maintanance requests	MaintananceReq(Bit)

Table 05-I-02.12 Error Signals sent to TCU via MVB

Description	Remarks	Sing. Name + Type
Critical Error Bits		CritErrBits(Bitset32)
Alarm Code 10	1 = Activ,0 = NonActiv	LowPressCO Bit0 (Bit)
Alarm Code 11	1 = Activ,0 = NonActiv	HighPressCO Bit1 (Bit)
Alarm Code 140	1 = Activ,0 = NonActiv	TempReadFault Bit2 (Bit)
Alarm Code 350	1 = Activ,0 = NonActiv	BothWyeTrip Bit3 (Bit)
Alarm Code 405	1 = Activ,0 = NonActiv	EFOLR Bit4 (Bit)
Alarm Code 406	1 = Activ,0 = NonActiv	EFTherm Bit5 (Bit)
Alarm Code 415	1 = Activ,0 = NonActiv	HeatShunt Bit6 (Bit)
Alarm Code 420	1 = Activ,0 = NonActiv	ContainerOpen Bit7 (Bit)
Alarm Code 416	1 = Activ,0 = NonActiv	EFContactOpen Bit8 (Bit)
Minor Error Bits		MinorErrBits(Bitset32)
Alarm Code 5	1 = Activ,0 = NonActiv	CalConstErr Bit0 (Bit)
Alarm Code 6	1 = Activ,0 = NonActiv	GlgDataErr Bit1 (Bit)
Alarm Code 7	1 = Activ,0 = NonActiv	DataArchErr Bit2 (Bit)
Alarm Code 101	1 = Activ,0 = NonActiv	RASensFail Bit3 (Bit)
Alarm Code 102	1 = Activ,0 = NonActiv	FASensFail Bit4 (Bit)
Alarm Code 103	1 = Activ,0 = NonActiv	DASensFail Bit5 (Bit)
Alarm Code 105	1 = Activ,0 = NonActiv	HumidSensFail Bit6 (Bit)
Alarm Code 403	1 = Activ,0 = NonActiv	C1WyeTrip Bit7 (Bit)
Alarm Code 404	1 = Activ,0 = NonActiv	C2WyeTrip Bit8 (Bit)
Alarm Code 408	1 = Activ,0 = NonActiv	CF1Therm Bit9 (Bit)
Alarm Code 410	1 = Activ,0 = NonActiv	CF2Therm Bit10 (Bit)

Table 05-I-02.12 Error Signals sent to TCU via MVB

Description	Remarks	Sing. Name + Type
Alarm Code 401	1 = Activ,0 = NonActiv	C1OLR Bit 11 (Bit)
Alarm Code 402	1 = Activ,0 = NonActiv	C2OLR Bit 12 (Bit)
Alarm Code 407	1 = Activ,0 = NonActiv	CF1OLR Bit13 (Bit)
Alarm Code 409	1 = Activ,0 = NonActiv	CF2OLR Bit14 (Bit)
Alarm Code 411	1 = Activ,0 = NonActiv	Heat1Fault Bit15(Bit)
Alarm Code 413	1 = Activ,0 = NonActiv	Heat2Fault Bit16(Bit)
Alarm Code 30	1 = Activ,0 = NonActiv	HighDucTemp Bit17(Bit)
Alarm Code 24	1 = Activ,0 = NonActiv	LowFATemp Bit18(Bit)
Alarm Code 25	1 = Activ,0 = NonActiv	HighRelHumid Bit19(Bit)
Alarm Code 150	1 = Activ,0 = NonActiv	HighHumidSensBit20 (Bit)
Alarm Code 151	1 = Activ,0 = NonActiv	LowHumidSensBit 21(Bit)
Alarm Code 20	1 = Activ,0 = NonActiv	GenCoolFault Bit22 (Bit)
Alarm Code 21	1 = Activ,0 = NonActiv	HotVehFault Bit23 (Bit)
Alarm Code 22	1 = Activ,0 = NonActiv	InvalidDigSP Bit24 (Bit)
Alarm Code 23	1 = Activ,0 = NonActiv	InvalidAnSP Bit25(Bit)
Maintenance Error Bits		MaintenErrBits(Bitset32)
Alarm Code 1	1 = Activ,0 = NonActiv	InitRS232ErrBit0 (Bit)
Alarm Code 2	1 = Activ,0 = NonActiv	BatLow Bit1(Bit)
Alarm Code 110	1 = Activ,0 = NonActiv	RASensShort Bit2(Bit)
Alarm Code 111	1 = Activ,0 = NonActiv	RASensOpen Bit3(Bit)
Alarm Code 120	1 = Activ,0 = NonActiv	FASensShort Bit4(Bit)
Alarm Code 121	1 = Activ,0 = NonActiv	FASensOpen Bit5(Bit)
Alarm Code 130	1 = Activ,0 = NonActiv	DASensShort Bit6(Bit)
Alarm Code 131	1 = Activ,0 = NonActiv	DASensOpen Bit7(Bit)
Alarm Code 300	1 = Activ,0 = NonActiv	BothCOverC Bit8(Bit)
Alarm Code 301	1 = Activ,0 = NonActiv	C1OverC Bit9(Bit)
Alarm Code 302	1 = Activ,0 = NonActiv	C2OverC Bit10(Bit)
Alarm Code 303	1 = Activ,0 = NonActiv	BothCFOverC Bit11(Bit)
Alarm Code 3	1 = Activ,0 = NonActiv	CF1UnderC Bit12(Bit)
Alarm Code 3	1 = Activ,0 = NonActiv	CF2UnderC Bit13(Bit)
Alarm Code 306	1 = Activ,0 = NonActiv	EFOverC Bit14(Bit)
Alarm Code 307	1 = Activ,0 = NonActiv	EFUnderCBit15(Bit)
Alarm Code 308	1 = Activ,0 = NonActiv	FilterFault Bit16 (Bit)
Alarm Code 309	1 = Activ,0 = NonActiv	BothCFUnderC Bit17(Bit)
Alarm Code 310	1 = Activ,0 = NonActiv	CF1OverC Bit18 (Bit)
Alarm Code 311	1 = Activ,0 = NonActiv	CF2OverC Bit 19(Bit)

Table 05-I-02.13 Digital Commands sent via MVB

Description	Remarks	Sing. Name + Type
Bit0	VentilationOn = 1 . → Ventilation mode VentilationOn = 0 and HVACOn = 0 →. HVAC OFF	VentilationOn(Bit)
Bit1	HVACOn = 1 . HVAC control VentilationOn = 0 and HVACOn = 0 →. HVAC OFF	HVACOn(Bit)
LoadShed	LoadShed = 1 LoadShedModeActiv LoadShed = 0 LoadShed ModeDeactiv	LoadShed(Bit)

b) HVAC Sensors - Microprocessor Controller Inputs

System inputs are used to monitor system performance and determine operating modes.

Analog Inputs

- Return Air Sensor (BRAS)
- Duct Air Sensor (BDAS)
- Fresh (Outside) Air Sensor (BFAS)
- Current Signal, Compressor Motors (TCOM)
- Current Signal, Evaporator Fan Motor (TEFM)
- Current Signal, Condenser Fan Motors (TCFM)

Digital Inputs

- Pressure Switch, Modulation (BMP)
- Fault Signal, Evaporator Fan Motor Overload (FS1)
- Fault Signal, Compressor Motor #1 Overload (FS2)
- Fault Signal, High Pressure (FS3)
- Fault Signal, Low Pressure (FS4)
- Fault Signal, Compressor Motor #2 Overload (FS5)
- Fault Signal, Condenser Fan Motor #1 Overload (FS6)
- Fault Signal, Condenser Fan Motor #2 Overload (FS7)
- Fault Signal, Evaporator Contactor Switched Off (FS8)
- Fault Signal, Heater #1 (FS9)
- Fault Signal, Heater #2 (FS10)
- Fault Signal, Back up Protection Heater #1 and #2 (FS11)
- Fault Signal, Condenser Fan Motor #1 Thermal Overload (FS12)
- Fault Signal, Condenser Fan Motor #2 Thermal Overload (FS13)
- Fault Signal, Evaporator Blower Motor Thermal Overload (FS14)

c) Microprocessor Controller Outputs

System outputs are used to control system component operation.

- Fault Light Signal (FLS1)
- Solenoid Valve, Liquid Line (YLL)
- Contactor, Condenser Fan Motor #1 (KCFM1)
- Contactor, Condenser Fan Motor #2 (KCFM2)
- Contactor, Compressor Motor #I (KCOM1)
- Contactor, Compressor Motor #2 (KCOM2)
- Contactor, Evaporator Fan Motor (KEFM)
- Contactor, Heater #1 (KHTR1)
- Contactor, Heater #2 (KHTR2)

d) General Theory Of Operation

The microprocessor controller uses advanced solid-state integrated circuits to monitor and control all unit functions.

The controller monitors inputs from:

- Return air sensor
- Duct air sensor
- Fresh (outside) air sensor
- Current transformer circuits(3) for compressor motors, condenser fan motors and evaporator blower motor

Output signals from the controller automatically regulate all unit functions including:

- Compressor operation
- Condenser fan operation
- Evaporator blower motor operation
- Liquid line solenoid valve
- Fault light
- Two Stage Heater

e) Unit Start-up

A sequence start of the required loads occurs during initial start-up of the controller.

If cooling is required, the unit operates in the Full Cool or Partial Cool as required by the return air sensor, set-point temperature and control algorithm.

- When the unit AUTO-OFF-TEST switch is turned to AUTO, the controller polls the control voltage (24 Vdc) and ACOK inputs. If either input is ON (High), the controller energizes the evaporator fans' contactors after a delay of 0.1 to 4.0 seconds.

- If the controller calls for cooling, the controller energizes the condenser fan motor 1 contactor and the liquid line solenoid valve after a 1 second delay.
- The controller then energizes compressor motor 1 contactor after another 1 second delay, placing the unit in Partial Cool.

NOTE: On each successive switch from low heat mode to a reheat mode, the controller alternates the initial startup of the condenser fan motor between condenser fan motor 1 and condenser fan motor 2. The controller also alternates the startup of the compressor between compressor 1 and compressor 2.

This is done to balance the service duty (hours of operation) equally between both condenser fan motors and both compressors.

- If the return air temperature requires Full Cool operation, the controller energizes the condenser fan motor 2 contactor, Compressor 2 combination after a 1 second delay, setting the unit in Full Cool.

f) Continuous Temperature Control Operation

After initial unit start-up, the controller regulates the compressors, condenser fan motors, and liquid line solenoid valve based on the set point temperature and the return air sensor temperature. The controller operates the unit on (see Figure 05-I-02.27):

- Full Cool mode
- Partial Cool mode
- Reheat mode
- Ventilation mode
- Heat Stage 1 mode
- Heat Stage 2 mode

NOTE: The controller also places the unit in Modulation Cool mode whenever the unit is operating in Full Cool and the modulation pressure switch opens (refrigerant discharge pressure rises to 390 ± 12 psig).

The modulation pressure switch protects against unit shutdown due to current overload in high ambient operating conditions.

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05-I-02.02.02.06 CCU Diagrams and Functional Schematics

Figure 05-I-02.28 LV Control Box Diagram

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Figure 05-I-02.29 MV Control Box Diagram

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Designation	Description
-A_UNIT	SIGNAL FROM EXTERNAL SYSTEM
-BDAS	DISCHARGE AIR TEMPRATURE SENSOR
-BFAS	FRESH AIR TEMPRATURE SENSOR
-BHP	PRESSURE SWITCH, HIGH PRESSURE NC (OPEN ON RISE)
-BLP	PRESSURE SWITCH, LOW PRESSURE NC (OPEN ON DROP)
-BMP	PRESSURE SWITCH, MODULATION PRESSURE NC (OPEN ON RISE)
-BRAS	RETURN AIR TEMPRATURE SENSOR
-EHTR1	ELECTRIC HEATER 1
-EHTR2	ELECTRIC HEATER 2
-F2HTR	BACK UP THERMAL SWITCH HEATER #1 AND HEATER #2
-FCFM1	THERMAL OVERLOAD, CONDENSER FAN MOTOR #1
-FCFM2	THERMAL OVERLOAD, CONDENSER FAN MOTOR #2
-FEFM	THERMAL OVERLOAD EVAPORATOR FAN MOTOR
-FHTR1	THERMAL SWITCH, HEATER #1
-FHTR2	THERMAL SWITCH, HEATER #2
-FLS1	FAULT SIGNAL #1 OUTPUT (ALARM)
-FS1	FAULT SIGNAL, EVAPORATOR FAN MOTOR OVERLOAD
-FS10	FAULT SIGNAL, HEATER#2
-FS11	BACK UP PROTECTION FAULT, HEATER #1 AND HEATER #2
-FS12	FAULT SIGNAL, CONDENSER FAN MOTOR #1 THERMAL OVERLOAD
-FS13	FAULT SIGNAL, CONDENSER FAN MOTOR #2 THERMAL OVERLOAD
-FS14	FAULT SIGNAL, EVAPORATOR FAN MOTOR THERMAL OVERLOAD
-FS2	FAULT SIGNAL, COMPRESSOR #1 MOTOR OVERLOAD
-FS3	FAULT SIGNAL, HIGH PRESSURE
-FS4	FAULT SIGNAL, LOW PRESSURE
-FS5	FAULT SIGNAL, COMPRESOR #2 MOTOR OVERLOAD
-FS6	FAULT SIGNAL, CONDENSER MOTOR #1 OVERLOAD
-FS7	FAULT SIGNAL, CONDENSER MOTOR #2 OVERLOAD
-FS8	FAULT SIGNAL, EVAPORATOR CONTACTOR IS SWITCHED OFF
-FS9	FAULT SIGNAL, HEATER#1
-H1	SIGNAL LED (GREEN) - AUTO MODE
-H2	SIGNAL LED (RED) - FAULT
-H3	SIGNAL LED (YELLOW) - WARNING
-HVAC ON/OFF	START SIGNAL
-K1CFM1	CONTACTOR, CONDENSER FAN MOTOR #1
-K1CFM1	CONTACTOR, CONDENSER FAN MOTOR #2
-K1COM1	CONTACTOR, COMPRESSOR MOTOR #1
-K1COM21	CONTACTOR, COMPRESSOR MOTOR #2
-K1EFM	CONTACTOR, EVAPORATOR FAN MOTOR
-K1HTR1	CONTACTOR, HEATER #1
-K1HTR2	CONTACTOR, HEATER #2
-L_SHUTDOWN	SIGNAL FROM EXTERNAL SYSTEM
-MCFM1	CONDENSER FAN MOTOR #1
-MCFM2	CONDENSER FAN MOTOR #2
-MCOM1	COMPRESSOR MOTOR #1
-MCOM2	COMPRESSOR MOTOR #2
-MEFM	EVAPORATOR FAN MOTOR
-MVB (A)	Multifunction vehicle bus MVB (A)
-MVB (B)	Multifunction vehicle bus MVB (B)
-QCFM1	CIRCUIT BREAKER, CONDENSER FAN MOTOR #1
-QCFM2	CIRCUIT BREAKER, CONDENSER FAN MOTOR #2
-QCOM1	CIRCUIT BREAKER, COMPRESSOR MOTOR #1
-QCOM2	CIRCUIT BREAKER, COMPRESSOR MOTOR #2
-QEFM	CIRCUIT BREAKER, EVAPORATOR FAN MOTOR
-QHSR1	SHUNT RELEASE - QHTR1
-QHSR2	SHUNT RELEASE - QHTR2
-QHTR1	CIRCUIT BREAKER, HEATER #1
-QHTR2	CIRCUIT BREAKER, HEATER #2
-R1,2,3	LIMIT RESISTORS
-SWDM1	DEAD MAN SWITCH #1
-SWDM2	DEAD MAN SWITCH #2
-SWT	SWITCH, A/C UNIT AUTO-OFF-TEST
-TCFM	CURRENT TRANSFORMER, CONDENSER FAN MOTOR
-TCOM	CURRENT TRANSFORMER, COMPRESSOR MOTORS
-TEFM	CURRENT TRANSFORMER, EVAPORATOR FAN MOTOR
-W1	HEATERS COMB BUS BAR
-W2	HEATERS AND COMPS BUS BAR
-W3	COMPRESSOR COMB BUS BAR
-W4	COMPS AND FANS BUS BAR
-W5	FANS COMB BUS BAR
-WIN1	POWER SUPPLZ INPUT MODULE
-X11	LOW VOLTAGE CONNECTOR
-X12	POWER LINE CONNECTOR
-XBLP	LOW PRESSURE SWITCH CONNECTOR
-XBMHP	HIGH AND MODULATION PRESSURE SWITCH CONNECTOR
-XDAS	DUCT AIR SENSOR CONNECTOR
-XDB9	RS232 COMMUNICATION LINE CONNECTOR
-XFAS	FRESH AIR SENSOR CONNECTOR
-PR1	OVERVOLTAGE ARRESTER
-XRAS	RETURN AIR SENSOR CONNECTOR
-XSK1	Connector for MVB (B) side controller
-XSK2	Connector for MVB (A) side controller
-YLL	SOLENOID VALVE, LIQUID LINE
-GS1	INVERTER DC/DC
-XFAD	-Fresh Air Damper Connector
-FAD	-Fresh Air Damper

Figure 05-I-02.30 List of Signals

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Figure 05-I-02.31 Control Box Connectors

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Figure 05-I-02.32 HVAC Electrical Interface

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MBV(A)	Multifuncion vehicle bus MVB(A)
MBV(B)	Multifuncion vehicle bus MVB(B)
RS/232	Service Connector
CFAD	Control Fresh Air Damp. Open = Damper Open
X11	Low voltage connector
X12	High voltage connector
+37.5VDC	Control voltage 37.5V DC Power Supply
HVAC OFF/ON	37.5V = unit operate, 0V = unit stop.
0V DC	Control voltage 0V DC Power Supply
HVAC ENABLE	37.5V = unit operate, 0V = unit stop.
A-UNIT	24V = Master unit, 0V = Slave unit.
FAD_IN	Fresh Air Damper Control. Signal input.
FAD_OUT	Fresh Air Damper Control. Signal output.

Figure 05-I-02.33 Electrical Interface Signals

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05-I-02.03 Air Distribution System

Figure 05-I-02.34 shows the Air Flow Distribution system.

The Fresh Air coming from the outside is mixed with the Return Air flowing from the passenger compartment (01) before going to the CCU to be conditioned (dehumidified, cooled and/or heated).

Air filters (Return Air Filter and Fresh Air Filter) are provided to prevent dust from entering the CCU.

Water barriers are provided inside the return air opening to prevent drain water from jumping into return air opening when the train is in motion or on a sloped track.

The Evaporator Blower pushes the conditioned air towards the adjustable central flange (02).

Through the central flange the conditioned air is conveyed towards the front and the rear of the vehicle, the amount of air depending on the position of the flange itself, adjustable by means of the adjustment slots (Figure 05-I-02.35, #04).

The central flange conveys the air from the vertical to the horizontal direction, allowing air distribution by the air diffusers located along the air ducts.

It is made of two steel sheets welded together and is installed on the roof structure by rivets.

The flow directed towards the rear passenger's area passes through the extended channels called right and left pockets (03).

The laterally extended shape of this pattern is motivated by the presence of the inlet channel (01) which strongly reduces the air flow passage section.

With the pockets the passage section of the air flow can be maintained approximately constant.

As a consequence, the speed of air flow is quite regular and losses are somewhat reduced.

The air flow directed towards the front passenger area is driven through ducts (05) and (06).

The operator's cab is reached by the flange (07) positioned at the end of the duct (06).

The conditioned air is then distributed in the passenger's area through the air/light fixtures (refer to Section 6) fitted on the ceiling of the passengers' compartment and in the operator's cab through the relevant air diffusers (Figure 05-I-02.40).

01. AIR ENTERING THE CCU
02. ADJUST. CENTRAL FLANGE
03. POCKETS
04. DUCT FOR REAR PASS. AIR
05. DUCT FOR FRONT PASS. AIR
06. DUCT FOR FRONT PASS. AIR
07. FLANGE TO THE CAB

Figure 05-I-02.34 Air flow Distribution System

01. CLIMATE CONTROL UNIT 02. RETURN AIR DUCT 03. CENTRAL FLANGE
04. ADJUSTMENT SLOT

Figure 05-I-02.35 Central Flange

05-I-02.03.01 Air Grids and Filters

The Return Air Duct allows air flowing from inside the vehicle (Passenger Compartment) to the Climate Control Unit.
The filter elements are made of fiberglass and are installed in a stainless steel frame .
Access to the Filter elements is given:

- For the Fresh Air Filter: from the rooftop, by opening the Fresh Air Intake grid (from the side of the Articulation Section only for both car sections)
- For the Return Air Filter: from the Passenger Compartment, by opening the grid hinged to the LH side. A safety steel wire is provided between duct structure and air grid (RH side) to prevent the frame from completely opening

The filter elements are characterized by a maximum pressure drop of 30 Pa (0.12 inches of water when the filters are clean). The average efficiency is 70% minimum, with a maximum pressure drop of 125 Pa (0.5 inches of water) at constant velocity of 1.5m/s (300 fpm).

Filters and filter holders are sealed at their edges to prevent filter bypass. Support of the filter elements is provided to prevent blow-out of the filter elements under clogged filter conditions.

In case of intense smoke Fresh Air Intake can be blocked by means of two dampers powered from the Indicator & Switch Panel (Refer to Figure 05-I-02.36)

Figure 05-I-02.36 Fresh Air Filter

05-I-02.03.02 Passenger Compartment Air Distribution

The Air Distribution for the passenger compartment (refer to Figure 05-I-02.37 consists of ducts that allow the air conditioning distribution in the passenger compartment and in the operator cab.

The connections between the HVAC unit and the supply air plenum are made by means of a neoprene compression gasket.

The top and sides of the main air distribution ducts are made of stainless steel. A separate, but identical, main air distribution duct arrangement is provided for each half of the car.

The ducts are supplied with conditioned air from each evaporator-blower unit, and discharge the air by means of two rows of continuous, double-slot type air diffusers into the passenger compartment (03).

The supply air distribution ducts are located over the car ceiling and insulated in order to minimize both heat and cold transfer through the roof by direct conduction, and the formation of condensed water.

Duct insulation materials are fastened to the outside of the duct with waterproof adhesive and strapping.

All air ducts are designed so that average air velocity does not exceed 6 m/s (1200 fpm).

Diffusers are part of the light-fixtures and flush-mounted (refer to Figure 05-I-02.37) The diffusers permit the uniform distribution of air.

Two types of Air Diffusers are installed on board: Type “E” and Type “2”.

Refer to Figure 05-I-02.38 for the specific installation location of each Air Diffuser Type

The maximum speed of discharged air from the double slot diffusers in the passenger compartment is less than 0.5 m/s (100 fpm) at a distance of 15 cm (6 inches) from the face of the diffusers.

Maximum speed throughout the car 120 cm (48 inches) above the floor is 0.25 m/s (50 fpm).

Figure 05-I-02.37 Passenger Compartment Air Distribution

Figure 05-I-02.38 Passenger Compartment Air Diffusers Location

05-I-02.03.03 Operator's Cab Air Distribution

Air conditioning and heating of the operator's cab is realized by means of the HVAC system and air distribution (01) and, as an additional source of heating, by means of the Heater/Demister (see Figure 05-I-02.41).

Refer to Figure 05-I-02.39, the conditioned air is distributed through the cabin Plenum (02). The plenum is installed over the cab dividing wall, at roof level.

The Cabin Plenum is connected with four Aluminum Hoses (03).

All components of the pipes are made with aluminum alloy and are fixed on the plenum and on the cab with hose clamps.

The air enters the operator cab through Air Diffusers (Refer to Figure 05-I-02.40) located at the end of the hoses.

The diffusers are mounted symmetrically on the ceiling of the operator cab. The air flow can be adjusted in direction and amount.

The cab heater is mainly used as defroster but can be also used as additional thermal source or in the case of CCU fault.

Figure 05-I-02.39 Operator's Cab Air Distribution

01. RING
02. SCREWS
03. AIR DIFFUSER - PART 3
04. AIR DIFFUSER - PART 2
05. SCREWS
06. AIR DIFFUSER GRID

Figure 05-I-02.40 Operator's cab Air Diffusers

01. AIR DIFFUSER 02. AIR CHANNEL 03. CONSOLE

Figure 05-I-02.41 Heater/Demister Air Distribution

LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

P2550

RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01
PART II
TROUBLESHOOTING
SECTION 05 - HVAC

SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

PART II

TROUBLESHOOTING

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SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

05-II-01 INTRODUCTION

This Section of the Running Maintenance and Service Manual is divided into three Parts:

- Part I: Theory of Operation
- Part II: Troubleshooting
- Part III: Maintenance

Each Paragraph is numbered accordingly, to avoid that paragraphs of the same Section, pertaining to a different Part, have the same number.

Part I - Theory of Operation

Part I gives a thorough overview of the System structure and operation, by means of descriptions, figures, photos, schematics, block diagrams and flow charts, together with references to other documents or Sections when needed.

Part II - Troubleshooting

It gives the Maintenance Technicians a path to troubleshoot the System in every condition by means of the available tools:

- The PTU, equipped with the specific SW program
- The IDU
- The Fault Isolation Table

The Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment , Tools & Special Tools

05-II-01.a LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

The Abbreviations, Acronyms and Symbols commonly used throughout this manual are given below with their related meaning.

Abbreviation	Meaning
AB	AnsaldoBreda
APS	Auxiliary Power Supply
BHP	Pressure Switch, High Pressure
BLP	Pressure Switch, Low Pressure
BMP	Pressure Switch, Modulation Pressure
BRAS	Return Air Sensor
C/L	Centerline
CB	Circuit Breaker
CCH	Communication Control Head
CCU	Climate Control Unit
CM	Coast Motoring
DVE	Discharge Vibration Eliminator
EXP	Expansion Valve
FD	Filter Drier
GTW	Gateway
HV	High Voltage
HVAC	Heating, Ventilation & Air Conditioning
HW	Hardware
IDU	Integrated Diagnostic Unit
IP	Ingress Protection Rating
KO	Out of Service
LED	Light Emitting Diode
LH	Left Hand Side
LRV	Light Rail Vehicle
LV	Low Voltage
LVDS	Low Voltage Distribution System
LVPS	Low Voltage Power Supply
MV	Medium Voltage
MVB	Multifunction Vehicle Bus
OK	Working
PTU	Portable Test Unit
RH	Right Hand Side
SB	Service Brake
SCEB	Slide Controlled Emergency Brake

Abbreviation	Meaning
SRV	Safety Relief Valve
SVE	Suction Vibration Eliminator
SW	Software
SWT	Switch, A/C Unit AUTO-OFF-TEST
TBS	To Be Supplied
TCMS	Train Communication System
TCN	Train Communication Network
TWC	Train-to-Wayside Communication
WTB	Wired Train Bus
YLL	Solenoid Valve, Liquid Line

05-II-01.b LIST OF DEFINITIONS

The Definitions commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
//	Parallel
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0	Empty car operating weight
AW1	Full seated load plus AW0
AW2	Standees at 4 persons per square meter plus AW1
AW3	Standees at 6 persons per square meter plus AW1
AW4	Standees at 8 persons per square meter plus AW1
Front door	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section

05-II-01.c LIST OF MEASUREMENT UNITS AND SYMBOLS

The Measurement Units commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
Ω	Ohm
°C	Celsius degree
°F	Fahrenheit degree
A	Ampere
ac	Alternate Current
dB	Decibel
dc	Direct Current
ft	Foot
gal	Gallon
Hz	Hertz
in	Inch
kg	Kilogram - approx 2.205 pounds
km	Kilometer - approx 0.621 miles
kN	Kilo-Newton - approx 224.809 pounds force
kVA	Kilo Volt Ampere
lb	Pound
lb-ft	Pound force
lps	Liters per Second
m	Meter - approx 3.28 feet
mH	Milli Henry
mm	Millimeter - approx 0.0394 inches
ms	Milli second
Pa	Pascal
psig	Pounds per square inch
rms	Root Mean Square Voltage
rpm	Revolution per Minute
V	Voltage
Vin	Input Voltage
W	Watt

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05-II-02 TROUBLESHOOTING

The tools available for troubleshooting the HVAC System are:

- The IDU (Integrated Diagnostic Unit)
- The PTU (Portable Test Unit)
- The Fault Isolation / Repair Tables
- The Alarms Codes displayed by the Climate Control Unit

The IDU interface is made up of a display located in each vehicle cab.
The IDU can be accessed in two Modes:

- Operating Mode, for the operators;
- Maintenance Mode, for maintenance personnel, accessible by means of a numeric password

The Operating Mode provides an overview with, essential information to help the operator start the troubleshooting or to pass the information on to the ROC (Rail Operations Control) (refer to paragraph05-II-03.01.01).

In Maintenance Mode the IDU can display more detailed information, thus giving the Maintenance personnel the possibility to troubleshoot more in depth and more accurately (refer to paragraph 05-II-03.01.02).

The HVAC System is connected to the MVB (Multifunction Vehicle Bus) (for a more detailed description of the MVB and the IDU refer to Section 18).

The PTU for the HVAC System is a Laptop equipped with a RS232 Connector (Serial Port) and with the “Thermo King Service Software” installed (refer to paragraph 05-II-02.02).

The Fault Insulation / Repair Tables list possible faults with the suggested corrective actions (refer to paragraph 05-II-02.03).

The Alarms Codes displayed by the Climate Control Unit have specific meanings that can help troubleshoot the System when the IDU and/or the PTU are not available (refer to paragraph 05-II-02.04).

05-II-02.01 Troubleshooting with the IDU

The HVAC status signals go from the CCU to the IDU through the MVB.

These signals are collected in five datasets for each CCU unit.

The datasets are (refer to Section 18 for more details):

1. HVAC_A_INFO and HVAC_B_INFO;
2. HVAC_A_STATUS1 and HVAC_B_STATUS1;
3. HVAC_A_STATUS2 and HVAC_B_STATUS2;
4. HVAC_A_STATUS3 and HVAC_B_STATUS3;
5. HVAC_A_STATUS4 and HVAC_B_STATUS4.

The IDU screen shows the APS/LVPS status on the following screens:

- HVAC System Status Screen
- HVAC Equipment Status Screen
- Monitor - MVB Screen

05-II-02.01.01 IDU - HVAC System Status Screen

In Operating Mode (refer to Figure 05-II-02.2) faults are referred to the HVAC System of the vehicle and no analog value is shown. The fault information refers to the HVAC System of the whole vehicle (A and B HVAC units).

In Maintenance Mode (refer to Figure 05-II-02.3) the display shows one panel for each vehicle of the train consist, each one of which is divided into two parts, for the A and B car sections.

The information for each car section is divided into three rows:
The first row displays the following information:

Return Air Temperature (IN TEMP)	Unit	°C or °F
Fresh Air Temperature (OUT TEMP)	Unit	°C or °F
Duct Air Temperature (OUT TEMP)	Unit	°C or °F

The center row shows the HVAC actual working mode:

- Full Cooling
- Partial Cooling
- Heating
- Ventilation Only
- OFF

Faults are displayed in the third row:

- Critical
- Minor
- Maintenance Requested

When a fault is in progress the relevant label turns red as shown in the following figure:

Figure 05-II-02.1 HVAC Fault Label

Both in Maintenance and Operating Mode, two command buttons are placed at the left of the screen body.
They are used to change the local vehicle HVAC configuration:

- Force OFF
- Force Ventilation only

These buttons are available on both IDUs.
In this way, it is possible to force both HVACs (A and B) either from Cab A or Cab B.
The active cab has the exclusive use of the commands.

Figure 05-II-02.2 HVAC System Status Screen - Operating Mode

Figure 05-II-02.3 HVAC System Status Screen - Maintenance Mode

05-II-02.01.02 HVAC Equipment Status Screen

The IDU can show the HVAC Equipment Status Screen, where the HVAC analog values are listed, in Maintenance Screen Mode only (refer to Table 05-II-02.1).

Table 05-II-02.1 HVAC Equipment Status Screen

Name	Unit	Description
FATemp	°C or °F	Fresh Air Temperature
RATemp	°C or °F	Return Air Temperature
DATemp	°C or °F	Duct Air Temperature
SP	°C or °F	Set Point

05-II-02.01.03 Monitor - MVB Screen

By entering Maintenance Mode and touching the MONITOR button, the IDU monitor shows information related to both the local vehicle and the train.

By touching the “MVB BUS” button the Screen shows the MVB communication status of all vehicle systems connected with the MVB.

Referring to the HVAC_A and HVAC_B the relative white bars must be changing. If they don’t, or if the bar movement is too slow, it means that the system is not well connected with the bus or, for the same reason, the bus communication is not working properly.

Figure 05-II-02.4 MVB Bus Screen

05-II-02.01.04 IDU Fault List

By touching the “Faults” button at the bottom of the IDU screen, the “Faults” Screen pops up with the list of the faults present in all train Systems, with date and time of the occurrence. In this way the Maintenance personnel can detect a fault as soon as it occurs.

As soon as a fault occurs (fault “activated” - red characters), the Train Control and Monitoring System (TCMS - refer to Section 18 for a more detailed description) saves the “image” of the fault in a file of the “A” IDU memory (the B IDU has no memory) named “LogFile.dat”. The system saves an image of the activated fault every 100 ms for a period from 1 s before and 5 s after the activation.

The system also saves a sample of the deactivated faults (green characters) once, with the information present at the time of the memorization.

Figure 05-II-02.5 IDU Faults Screen (Fault History)

The Complete HVAC IDU Fault List is reported in Appendix05-II-03.01.

The Appendix describes, for each fault type, how to troubleshoot the HVAC System by means of the IDU, both in Normal and in Maintenance Mode.

The suggested Maintenance Actions (Operator Guide) are shown by pressing the “Details” Screen Button and are referred to the selected Fault shown on the IDU “Faults” Screen.

The Fault List can also be filtered by means of the system button (in this case the HVAC button - refer to Figure 05-II-02.5).

05-II-02.02 Portable Test Unit (PTU)

The HVAC PTU (a laptop with a serial port and the Thermo King Service Software installed) is used both for system Settings and for system Troubleshooting.

The PTU can be connected to the CCU through:

- The RS232 port, on the relevant CCU Control Box
- The RS232 (Label: 12X01), on the Data Download Panel of the relevant Electronic Locker (refer to Figure 05-II-02.6)

01. LINE SELECTOR

02. (3X27) PCADAC CONNECTOR (PROPULSION)

03. ((3X26) FBKDIA CONNECTOR (PROPULSION)

04. (3X28) PCA232 CONNECTOR (PROPULSION)

05. (3X29) STB232 CONNECTOR (PROPULSION)

06. LONWORKS BUS CONNECTOR

07. (12X01) HVAC CONNECTOR

08. ODOMETER DISPLAY

09. (3X30) JP1P (PSC) CONNECTOR (APS/LVPS)

10. (3X31) JP1C (CIA) CONNECTOR (APS/LVPS)

11. APS/LVPS SELECTOR

Figure 05-II-02.6 Data Download Panels

05-II-02.02.01 Software Installation

Insert the supplied CD-ROM in the Laptop drive. Double click the TK icon on the window that opens in the middle of your laptop screen.

Figure 05-II-02.7 Software Setup First Window

A new window will open announcing that files are being decompressed and extracted.

Figure 05-II-02.8 Self Extracting ZIP File Window

A progress window will open showing the installation process.

Figure 05-II-02.9 Installation Process Window

05-II-02.02.02 Main Menu Page

Figure 05-II-02.10 Main Menu Page

At start up this page allows the technician to choose the sub menu page he wishes to work with. Thermo King has designed a friendly user interface to facilitate this task. Some of the main sub-menus available in the tabs are:

- OVERVIEW TAB: By double clicking the button PROJECT INFO tab, a sub menu will open allowing you to monitor basic functions without being able to alter the operation such as checking running temperatures, faults, etc. More details will be displayed in the next pages.
- RUNTIME: by double clicking this menu tab, the runtime of various components are recorded.
- ALL PARAMETERS: another useful menu page showing all units parameters. It is password protected but is also a READ ONLY file accessed for valuable info.
- CAR CODE and TRAIN CODE: This page can show the unit number vs. the numbers of vehicle in train, location of this unit Vs all other units communicating with each other.
- NEXT UNIT DATA: a very useful menu to access OTHER units remotely from one location on the car assuming the communications between units and cars are set up.
- OPERATIONS MODE: Two sub menus exist under this tab, depending on your password execution level, the technician will be able to access either FORCED MODE or INDEPENDENT OUTPUT tabs. Further details will be highlighted in the appropriate section.
- FAULTS: Double clicking this tab will allow the authorized technician to clear the faults already recorded on the project info page.
- LADDER DIAGRAMS: This is an important page where multiple level diagrams allow a complete understanding of various scenarios taking place.

- SETTINGS: the most important page of the software allowing the proper authorized person to access critical features such as: Set-point set-up; Technological parameters needed to run the unit, Self-test setting, Temperature sensors set up when replacing them, Car codes in case of can bus usage and Motors parameters
- DIAGNOSTICS: This is a critical page found to be very useful during troubleshooting. Accessing these sub menus (digital input/output and analog input/output) will help the troubleshooter monitor the state of the unit interactively. This will allow the technicians to determine the course of corrective actions

05-II-02.02.03 Project Information Page

01. SOFTWARE VERSION DETAILS
02. CURRENT DRAWN FROM MOTORS
03. YOUR ACTUAL RUNNING MODE, UNIT CALLING M0DE, EXTRA PARAMETERS STATUS SUCH AS LOAD SHED MODE, ANTI FREEZE MODE OR SIMILARLY PARTICULAR MODES TO EACH PROJECT
04. SELECTED SET-POINT (MANUAL OR IC)
05. WARNINGS AND FAULTS WINDOW
06. TEMPERATURE READINGS RECORDED FROM ALL OPERATING SENSORS

Figure 05-II-02.11 Project Information Page

One of the most important features of this menu page is the ability to interactively read recorded faults via the alarm windows.

An alarm counter will shown how many times this warning or alarm occurred.

Double clicking on the code window will open a sub window with the suggested common cause of the warning or fault.

While the explanation of a determined fault might be one of many important reasons it might have occurred, it is recommended to be knowledgeable in HVAC to be able to determine the cause of some failures.

05-II-02.02.04 Operation Modes

05-II-02.02.04.01 Forced Mode

01. PARTIAL COOLING COMMAND 02. SELECTED MODE START BUTTON 03. PARTIAL COOLING EDITING
04. "STOP & LEAVE FORCED MODES" BUTTON

This feature is useful to force a particular stage by-passing the sensors. A password is needed to access this page.

- Open forced mode window
- Align the mouse of the laptop over the command window (#1). A pull down menu will appear
- Select the stage you want the unit to be locked at and press OK (#2)
- Click START (# 3). The unit will operate under this mode until the selected time is elapsed or you click STOP AND LEAVE FORCED MODE (#4)

To switch between selected forced modes, the technician needs to exit the running forced mode by selecting STOP then repeat the process of selecting another forced mode as described above.

05-II-02.02.04.02 Independent Output

01. MAX TIME FOR OUTPUT HIGH SETTING
02. "LEAVE INDIPENDENT OUTPUTS MODE" BUTTON
03. "ALL DIGITAL OUTPUTS LOW" BUTTON
04. EQUINPMENT BUTTON (WHITE=OFF, GREEN=ON)

Figure 05-II-02.13 Independent Output

The independent output is also accessible by mean of a higher level password. This feature allows the qualified technician to power individual components by determining a specific run time.

Interactively, the selected component will run and then stop until the technician decides to repeat his test or to exit this menu all together to perform this task:

- Access this window.
- Select the run time needed. Thermo king recommends selecting the default time in the software. To do so, click into the window showing time. Highlight it and type the new time needed if the default time is too short.(#1)
- Click on the green button of the component to be tested. That particular button will change color interactively showing that it has been pushed. The component will start running. (#2)
- The elapsed time until the countdown takes place is shown in the right window to the button

In case an emergency stop is needed immediately during troubleshooting, the technician can double click on the same button to stop the operation immediately OR double click on the bottom bar “All digital outputs low” (#3).

To exit this page, double click the bar called LEAVE INDEPENDENT OUTPUTS MODE. (#4).

CAUTION: PLEASE EXIT ANY FORCED INDEPENDENT OUTPUT MODE BEFORE EXITING THIS PAGE.

05-II-02.02.05 Clear Faults

On the main project info page (refer to Figure 05-II-02.11), the recorded faults and/or warnings can be accessed and read.

A counter will record the number of times the fault occurred.

Double click on the code and the counter window and a new window will pop up (refer to Figure 05-II-02.14).

This window shows when the fault took place, the first time it occurred, the last time it disappeared, the actual status of the fault.

Line	AlarmCode	ActStatus	Counter	FirstOccurrence	LastDisappear
0	306		1	06/08/2002 11:57:02	06/08/2002 11:57:02
1	411	Active	2	06/08/2002 11:56:50	06/08/2002 11:57:02
2	413	Active	2	06/08/2002 11:56:50	06/08/2002 11:57:02

Figure 05-II-02.14 Clear Faults

Each line represents ONE fault or warning, its code, the time and date of its first occurrence, the last disappearance.

A set of faults can be exported (saved) to a laptop folder or a diskette to be analyzed further by other parties.

To erase the fault, double click on the CLEAR fault button (password level protected). A small window will appear asking you to validate the request. Click YES.

Faults will be erased.

Figure 05-II-02.15 Request Validation Window

05-II-02.02.06 Run Time

Figure 05-II-02.16 Run Time

This is a useful feature enabling the technicians to monitoring the unit and sub-component usage. It is also useful when performing a reliability and maintainability study on the performance of the unit.

Resetting the clock on individual component is password protected. Only designated managers are allowed to do so.

Please note that data WILL BE LOST in case the controller is damaged or destroyed. It is always recommended to keep a record of this page in the monthly record for service purposes.

05-II-02.02.07 Ladder Diagrams

This is a great feature to explain the unit's operations and the various stages taking place as part of the software design.

It clearly shows the temperature at which each stage will be energized and de-energized. Highest level password protected access personnel CAN change the set points on this page.

Other ladder diagrams also show what would take place in case of high humidity, control of units without heaters, with heaters and in case the unit is in the emergency mode.

Figure 05-II-02.17 Ladder Diagrams

05-II-02.02.08 Settings

05-II-02.02.08.01 Setpoint Setup

This is a password protected feature. If you have access to this page, the three levels set points can be changed by double clicking inside the box for HIGH, MEDIUM and LOW set points.

Changes will take place in the RED CURVE showing the effect of the change selected. This is a useful feature for some clients operating on different levels set points.

Figure 05-II-02.18 Setpoint Setup

UNIQUE FEATURE: Changes for test purposes can take place in the field (under TK supervision).

05-II-02.02.08.02 Heathing Mode Setup Table

This feature is used when car builders also control External heaters other than what Thermo King supplied inside the HVAC unit (such as floor baseboard heaters).

To change the specific setting of a particular program, double click inside the window (enable/disable).

The selection can be then chosen to accommodate the need of the technician or the car builder.

Figure 05-II-02.19 Heating Mode Setup Table

05-II-02.02.08.03 Technological Parameters

This is one of the most important pages helping the user understand all the parameters affecting the operation of the unit.

All items are self-explanatory. Users cannot change items on this page if not authorized to do so.

Figure 05-II-02.20 Technological Parameters

05-II-02.02.08.04 Self Test Settings

Accessing SELF TEST mode is helpful during normal periodic maintenance. The unit will conduct a full self test showing the technician what stages are being tested. With the initial proper password the manager can adjust the total self test period. In addition if there is any recorded fault or warning, it will be LOGGED into the faults page.

Figure 05-II-02.21 Self Test Settings

05-II-02.02.08.05 Temperature Sensor Setup

Accessing this page will allow the authorized personnel to compensate for the sensor grade when replacing a defective sensor with a new one.

Adjusting the grade ensures the accuracy of readings resulting in a better temperature control accuracy and sensor cost reduction.

To change grade, double click inside the window of the appropriate sensor. A window will pull down.

Match the grade printed on the body of the sensor with the one on the list. Double click again.

The number selected by the technician is the one that will be now appearing on the small window.

Figure 05-II-02.22 Temperature Sensor Setup

05-II-02.02.09 Diagnostics

This is a critical page very useful to the technicians performing repairs and diagnostics.

It is an interactive page.

When the LED is turned green, the component is energized.

When it is black, the component is OFF.

When the service technician accesses the FORCED MODE page and select a particular mode, he or she can open this window and observe the actions taking place. It can also be used during AUTO MODE.

NOTE: NO CHANGES can take effect in THIS page. This is for information purpose ONLY.

During the normal AUTO mode of the unit this page is also useful to monitor the behavior of various stages, components, etc.

Figure 05-II-02.23 Digital Input Output

05-II-02.02.10 Other Useful Functions

05-II-02.02.10.01 Post Mortem Archiving

This feature details the chain of events that caused a particular failure. The controller has a deep memory that records up to 17,000 set of events and will overwrite it in a closed loop.

To access this feature perform the following (refer to Figure 05-II-02.24):

1. Double click the third filing cabinet icon (#1)
2. Highlight any chosen POST MORTEM bank (#2).
3. Select which ITEM you wish to monitor that you think might have caused the failure (#3).
4. A new window will open showing the readings of the events recorded (#4).

01. CABINET ICON
02. POST MORTEM BANK
03. ITEM TO MONITOR
04. ECORDED EVENTS

Figure 05-II-02.24 Post Mortem Archiving

05-II-02.02.10.02 Recording

This feature is also for technicians with password access.

It is an enhancement over the basic INPUT/OUTPUT page mentioned previously.

To access this feature perform the following tasks:

1. Double click the file cabinet located on the upper menu bar (#1)
2. A new window will open. Select RECORDING and double click (#2)
3. A third window will pop up. Within this window, the technician can observe interactively all operations taking place that have recording data being captured. All data is numerical.

NOTE: In order to switch to the graph mode (recommended), Double-click the INPUT or OUTPUT buttons (#3).

This step will turn the numerical data into graph.
When the line is FLAT, the shown component is OFF.
When the line is a square shape, the component is ON; High = ON, Low = OFF.

01. CABINET ICON

02. RECORDING BANK

03. GRAPH MODE SWITCH

Figure 05-II-02.25 Recording

05-II-02.02.11 User Log In and Log Out

This software allows multiple users to operate the software.
Each level will require a different user's password.
To enter:

1. Double click on USERS menu;
2. A new window will pop up;
3. Enter the allocated USER NAME and password level.

To exit:

1. Double click on USERS menu and select USERS LOGOUT.

Failure to do so (for upper level password), can leave the software at the selected window open for anyone else afterward to change data thus affecting the operation of the unit.
Shutting off the program will also reset the password level to its lowest setting.

Figure 05-II-02.26 User Log In and Log Out

05-II-02.02.12 File Transfer

Figure 05-II-02.27 File Transfer

In rare instances Thermo King will need to modify the software and pass along the new version for its personnel or end users' to update the operating version.

We had put in mind that issue during the design of this page to make it as user friendly as possible.

Once started the process is fully automated making updating the software an enjoyable experience.

To perform this task, do the following:

1. Double click on the icon in the sub menu bar (refer to Figure 05-II-02.27);
2. A new window will pop up. This is the upgrade window. Select AUTOMATIC PROGRAM DOWNLOAD (#1);
3. A new window will appear. The folder file is called "REPOSITORY" where the Thermo King files reside. Highlight the *.MEM (#2). The full process will take place automatically.
4. A status bar (#3) appears showing the progress of the download and files being copied into the controllers.

Thermo King designed the flash loading feature to make it "user friendly" to the operators and troubleshooters.

During the design phase we have put a lot of effort to automate this process as much as possible to avoid flashing error. Inserting the delivered software change on a CDROM or diskette and following the minimal steps which will initiate the automatic flashing of the new version software.

On the other hand, MORE FEATURES are available for certified personnel to modify or test variants of the initial software.

In addition to what was previously mentioned, the following CAN BE DONE:

- Save these changes from the controller to the laptop and vice-versa. This allows ease of field testing and monitoring of test versions software BEFORE implementing the changes.
- Saved changes on the laptop can be re-flashed to other controllers.

NOTE: Altering Software Parameters cannot be performed without the full consent of Thermo King.

01. "AUTOMATIC PROGRAM DOWLOAD" BUTTON 02. *.MEM FILE 03. STATUS BAR

Figure 05-II-02.28 File Transfer

05-II-02.02.13 Next Unit Monitoring

This software allows the technicians to follow up on working status of other units connected on the network via LAN or MVB communication, assuming the program is turned on Initially and the car design allows for this feature.

Basic conditions such as temperatures, actual mode, recorded warnings or faults are logged.

Figure 05-II-02.29 Next Unit Monitoring

05-II-02.03 Fault Insulation / Repair Tables

Table 05-II-02.2 Fault Insulation / Repair Table

Condition	Possible Cause	Corrective Action
1. Compressor does not operate - no amperage draw.	1. No power to unit (condenser and evaporator fans do not operate)	Locate fault and repair; power source, inverter ACOK signal, power plug, compressor circuit breakers, motor contactor, motor terminals, motor
	2. Open in 24 VDC control circuit	Check control circuit and controller circuit breakers. Repair as required
	3. Rail car temperature does not demand cooling	No remedy. Turn unit switch OFF and then to TEST. Automatic Unit Self Test should verify compressor operation
	4. Defective compressor	Replace compressor
	5. No output signal from controller	Diagnose and repair/replace wiring or controller
	6. Fault code condition: - (-) Internal System Fault - (1) Analog to Digital Conversion Failure - (10) Low Pressure Fault - (11) High Pressure Fault - (30) Compressor Failure (both) or Condenser Fan Failure (both) - (104) Sensor Failure (Two or More) - (300) Compressor Motors (1 and 2) Overload Fault - (305) Evaporator Blower Motor Overload Fault - (405) Evaporator Blower Motor Thermal Relay Fault [redacted]900) Test Mode Fault	Refer to Table 05-II-02.3
2. Compressor does not	1. Rotation scroll stuck	Replace compressor

Table 05-II-02.2 Fault Insulation / Repair Table

Condition	Possible Cause	Corrective Action
operate; excessive amperage draw or intermittent cycling on overload	2. Seized or frozen compressor bearings	Replace compressor
	3. Improperly wired	Check/correct wiring against wiring diagram
	4. Low line voltage	Check line voltage - determine location of voltage drop
	5. Open circuit in compressor motor winding	Check motor stator connections. Check stator winding for continuity. If open, replace compressor
	6. Fault code condition: - (11) High Pressure Fault - (30) Compressor Failure (both) or Condenser Fan Failure (both) - (300) Compressor Motors (1 and 2) Overload Fault - (301) Compressor Motor 1 Overload Fault - (302) Compressor Motor 2 Overload Fault - (401) Compressor Motor 1 Thermal Relay Fault - (402) Compressor Motor 2 Thermal Relay Fault	Refer to Table 05-II-02.3
3. Compressor contactor burned out	1. Low line voltage	Increase line voltage at least 90% of compressor motor rating
3. Compressor contactor burned out (cont'd)	2. Excessive line voltage	Reduce line voltage to at least 110% Of compressor motor rating
	3. Short cycling	Eliminate cause of short cycling

Table 05-II-02.2 Fault Insulation / Repair Table

Condition	Possible Cause	Corrective Action
4. Compressor (Unit) short cycles	1. Low refrigerant charge	Locate and repair refrigerant leak. Recharge with refrigerant
5. Compressor (Unit) short cycles	1. Restricted solenoid valve or expansion valve	Clean/replace faulty solenoid valve or expansion valve.
	2. Fault code condition: - (10) Low Pressure Fault - (11) High Pressure Fault - (306) Filter Fault (Evaporator Blower)	Refer to Table 05-II-02.3
6. Noisy Compressor	1. Loose mounting bolts	Tighten mounting bolts
	2. Refrigerant flooding back	Check expansion valve adjustment
	3. Scroll rotating backwards	Check phase of 480 VAC power and check unit wiring
	4. Faulty compressor	Repair or replace compressor
7. Condenser fan motor does not operate	1. Loose line connection	Tighten connections
	2. No condenser fan output signal from controller	Diagnose and repair/replace wiring or controller
	3. Defective motor	Replace motor

Table 05-II-02.2 Fault Insulation / Repair Table		
Condition	**Possible Cause**	**Corrective Action**
7. Condenser fan motor does not operate (cont'd)	1. Fault code condition: - (10) Low Pressure Fault - (11) High Pressure Fault Failure - (30) Compressor Failure (both) or Condenser Fan Failure (both) - (104) Sensor Failure (Two or More) - (303) Condenser Fan Motor 1 Overload Fault - (304) Condenser Fan Motor 2 Overload Fault - (403) Condenser Fan Motor 1 Thermal Relay Fault - (404) Condenser Fan Motor 2 Thermal Relay Fault	Refer to Table 05-II-02.3
8. Evaporator blower motor does not operate	1. Loose line connection	Tighten connections
	2. No evaporator blower output signal from controller	Diagnose and repair/replace wiring or controller
	Defective motor	Replace motor
	3. Fault code condition: - (10) Low Pressure Fault - (11) High Pressure Fault Failure - (305) Evaporator Blower Motor Overload Fault - (405) Evaporator Blower Motor Thermal Relay Fault	Refer to Table 05-II-02.3
9. Rail Car temperature too high (unit not cooling)	1. Compressor does not operate	Refer to Condition 1 and/or 2

Table 05-II-02.2 Fault Insulation / Repair Table

Condition	Possible Cause	Corrective Action
9. Rail Car temperature too high (unit not cooling) (cont'd)	2. Fault code condition: - General Cool Fault - (21) Hot Vehicle Fault - (306) Filter Fault (Evaporator Blower)	Refer to Table 05-II-02.3
	3. Shortage of refrigerant	Repair leak and recharge refrigerant
	4. Air in refrigeration system	Evacuate and recharge
	5. Iced or dirty evaporator coil	Defrost or clean evaporator coil
	6. Restricted lines on high side	Check for clogged or restricted solenoid valve. Clear/repair restriction
	7. Plugged filter-drier	Change filter-drier
	8. Condenser coil dirty or airflow restricted	Clean condenser coil, clear restriction, or repair or replace fan motor or fan blade
	9. Expansion valve open too much	Adjust or replace valve
10. Rail Car temperature too high (unit not cooling)	1. Expansion valve power element lost its charge	Replace power element
	2. Expansion valve feeler bulb improperly mounted, poorly insulated or making poor contact	Correct feeler bulb installation
11.Frosted liquid line	1. Restricted filter-drier	Replace filter-drier
12. Frosted or sweating suction line	1. Expansion valve admitting excess refrigerant	Check feeler bulb and adjust expansion valve
	2. Iced or dirty evaporator coil	Defrost or clean evaporator coil
12. Frosted or sweating suction line (cont'd)	3. Evaporator blower does not operate	Refer to Condition 8

Table 05-II-02.2 Fault Insulation / Repair Table		
Condition	**Possible Cause**	**Corrective Action**
13. Unit in vacuum. Frost on expansion valve only	1. Ice plugging expansion valve orifice	Apply hot wet cloth to expansion valve. Moisture indicated by increase in suction pressure. Replace dehydrator
14. Compressor loses oil	1. Refrigerant leak	Repair leak and recharge with refrigerant
15. Compressor oil migrates to system	1. Short cycling	See "Unit short cycles"
16. Rail car temperature too low	1. Heater does not operate Dirty evaporator coil Dirty return air filter	Limit switch open Limit switch open Limit switch open

05-II-02.04 Alarm Codes

Table 05-II-02.3 Alarm Codes

Code	Description	Corrective Action
0-9	Hardware fault	Change of Controller
10	Low pressure fault (Alarm) Indicates the low pressure switch has opened for more than 30 seconds and controller has attempted 3 restarts in 30 minutes. Compressor(s) and condenser fans stop then low pressure switch opens for 30 seconds. After 2 minutes, controller attempts cooling system restart. If low pressure cutout recurs 3 times in 30 minutes, unit operates on ventilation only until controller is reset.	Check for restricted dehydrator or low side (expansion valve partially closed by ice, dirt, etc.). Check for low refrigerant charge. Check for defective low pressure switch.
11	High pressure fault (Alarm) Indicates the high pressure switch has opened for more than 5 second and controller has attempted 3 restarts in 30 minutes. Compressor(s) and condenser fans stop when high pressure switch opens for 5 seconds. After 2 minutes, controller attempts cooling system restart. If high pressure cutout recurs 3 times in 30 minutes, unit operates on ventilation only until controller is reset.	Check for dirty or restricted condenser coil. Check for proper condenser fan operation. Check for defective high pressure switch.

Table 05-II-02.3 Alarm Codes

Code	Description	Corrective Action
20	General cooling fault (Alarm) Indicates cooling system performance failure when unit switch is in TEST position and a Full Cool test is activated. Alarm is recorded but unit continues to operate as controller continues to perform automatic check of system performance.	Check for other alarm codes. Check compressors and compressor contactors. Check evaporator blower motor and motor contactor. Check condenser fan motors and motor contactors. Check the refrigeration system.
21	Hot vehicle fault (Alarm) Indicates return air temperature has remained above 95°F for more than 20 minutes (and return air sensor is OK). Alarm is recorded but unit continues to operate. Controller resets alarm when car air temperature is OK.	Check for other alarm codes. Check compressors and compressor contactors. Check evaporator blower motor and motor contactor. Check condenser fan motors and motor contactors. Check the refrigeration system.
22	No digital setpoint (Warning) Circuit of the digital setpoint is open. The unit is running with highest setpoint.	Inspect wires and connection.
23	No analog setpoint (Warning) Analog setpoint is beyond the limits. Setpoint is selected according UIC curve.	Inspect wires and connection.
24	Low ambient temperature (Warning) Ambient temperature < 40.1°F	No Action.
30	High duct air temperature (Warning) Duct air temperature > 140°F.	Check evaporator blower and heaters.

Table 05-II-02.3 Alarm Codes(cont'd)

101	Return air sensor failure (Warning) Indicates a problem exists with this sensor or its wiring (open or short). If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating.	Check the sensor by selecting it using the Service software. If software shows incorrect temperature, the sensor is defective (or circuit is open or shorted). Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
102	Fresh (outside) air sensor failure (Warning) Indicates a problem exists with this sensor or its wiring (open or short). If the Fresh Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by selecting it using the Service software. If software shows incorrect temperature, the sensor is defective (or circuit is open or shorted). Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
103	Duct air sensor failure (Warning) Indicates a problem exists with this sensor or its wiring (open or short). If the Duct Air Sensor fails, the controller continues unit operation using the Return Air Sensor and Fresh Air Sensor temperatures plus an offset to determine system operating mode.	Check the sensor by selecting it using the Service software. If software shows incorrect temperature, the sensor is defective (or circuit is open or shorted). Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.

Table 05-II-02.3 Alarm Codes(cont'd)

110	Return air sensor short circuit (Warning) Indicates a short circuit in this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
111	Return air sensor open (Warning) Indicates an open loop of this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
120	Fresh (outside) air sensor short circuit (Warning) Indicates a short circuit in this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
121	Fresh (outside) air sensor open (Warning) Indicates an open loop of this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.

Table 05-II-02.3 Alarm Codes(cont'd)

130	Duct air sensor short circuit (Warning) Indicates a short circuit in this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
131	Duct air sensor open (Warning) Indicates an open loop of this sensor or its wiring. If the Return Air Sensor fails, the controller continues unit operation using the Duct Air Sensor temperature plus an offset to determine system operating mode.	Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
140	Temperature reading fault (Alarm) More than one temperature sensor is faulty.	Check the sensors by substitution. Be sure sensors polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. Do NOT use a test light or other instrument; or controller damage may result.
300	Compressor motors (1and2) overload fault (Alarm) Indicates a compressor motor overload (both compressor operating). Compressor motors 1and 2 exceeded nominal draw. Compressors and condenser fan motors stop, unit operates on ventilation only until controller is reset.	Use check routine in Service software to determine which compressor has failed. Check compressors 1 and 2; and compressor contactors.

Table 05-II-02.3 Alarm Codes(cont'd)

301	Compressor motor 1 overload fault (Alarm) Indicates a compressor motor 1 overload. Compressor motor 1 exceeded nominal current draw. Controller continues unit operation on compressor 2 until controller is reset.	Check compressor 1 and compressor 1 contactor.
302	Compressor motor 2 overload fault (Alarm) Indicates a compressor motor 2 overload. Compressor motor 2 exceeded nominal current draw. Controller continues unit operation on compressor 1 until controller is reset.	Check compressor 2 and compressor 2 contactor.
303	Condenser fan motors (1 and/or 2) overload fault (Alarm) Indicates one or both condenser fan motors overload for more than 10 seconds. Controller continues unit operation on good condenser fan or stops the unit. Controller attempts to restart condenser fans 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check condenser fan motors and fan motor contactors.

Table 05-II-02.3 Alarm Codes(cont'd)

304	Condenser fan motor 1 underload fault (Alarm) Indicates condenser fan motor 1 underload for more than 10 seconds. Controller continues unit operation on condenser fan 2. Controller attempts to restart condenser fan 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault signal 408 appears, it is necessary to wait until the motor is cold.
305	Condenser fan motor 2 underload fault (Alarm) Indicates condenser fan motor 2 Underload for more than 10 seconds. Controller continues unit operation on condenser fan 2. Controller attempts to restart condenser fan 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault signal 410 appears, it is necessary to wait until the motor is cold.
306	Evaporator blower motor overload fault (Alarm) Indicates blower motor overload for more than 10 seconds. Controller stops compressor and condenser fan operation. After 5 minutes, controller attempts cooling system restart. Controller attempts to restart system 2 times in 30 minutes. After 2 restart attempts, controller shuts down system operation until controller is reset.	Check evaporator blower motor and blower motor contactor.

Table 05-II-02.3 Alarm Codes(cont'd)

307	Evaporator blower motor underload fault (Alarm) Indicates blower motor underload for more than 10 seconds. Controller stops compressor and condenser fan operation. After 5 minutes, controller attempts cooling system restart. Controller attempts to restart system 2 times in 30 minutes. After 2 restart attempts, controller shuts down system operation until controller is reset.	Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault signal 406 appears, it is necessary to wait until the motor is cold.
308	Filter fault (Evaporator blower) (Warning) Evaporator blower motor current draw indicates restricted evaporator airflow for more than 5 hours.	Check / replace return air filters
309	Condenser fan motors (1 and/or 2) underload fault (Alarm) Indicates one or both condenser fan motors underload for more than 10 seconds. Controller continues unit operation on good condenser fan or stops the unit. Controller attempts to restart condenser fans 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault signal 408 or 410 appears, it is necessary to wait until the motor is cold.

Table 05-II-02.3 Alarm Codes(cont'd)

310	Condenser fan motor 1 overload fault (Alarm) Indicates condenser fan motor 1 overload for more than 10 seconds. Controller continues unit operation on condenser fan 2. Controller attempts to restart condenser fan 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check condenser fan motor 1 and fan motor 1 contactor.
311	Condenser fan motor 2 overload fault (Alarm) Indicates condenser fan motor 2 overloads for more than 10 seconds. Controller continues unit operation on condenser fan 1. Controller attempts to restart condenser fan 2 times in 30 minutes. After 2 restart attempts, controller reset is necessary.	Check condenser fan motor 2 and fan motor 2 contactor.
350	Compressor (1 and/or 2) Wye protector trip (Alarm)	Check compressor motors. Compressors have to cold for checking.
401	Compressor motor 1 thermal relay fault (Alarm) Indicates a compressor motor 1 thermal overload relay is open (or fails to provide diagnosis response to controller.) Controller continues unit operation on compressor 2 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check compressor motor 1 thermal overload relay.

Table 05-II-02.3 Alarm Codes(cont'd)

402	Compressor motor 2 thermal relay fault (Alarm) Indicates a compressor motor 2 thermal overload relay is open (or fails to provide diagnosis response to controller). Controller continues unit operation on compressor 1 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check compressor motor 2 thermal overload relay.
403	Compressor 1 Wye protector trip (Warning) Indicates compressor motor 1 is not running. System continues operation on compressor 2.	Check compressor motor 1. Compressor has to cold for checking.
404	Compressor 2 Wye protector trip (Warning) Indicates compressor motor 2 is not running. System continues operation on compressor 1.	Check compressor motor 2. Compressor has to be cold for checking.
405	Evaporator blower motor thermal relay fault (Alarm) Indicates evaporator blower motor thermal overload relay is open (or fails to provide diagnosis response to controller. Controller stops compressor and condenser fan motor operation until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check evaporator blower motor thermal overload relay.
406	Evaporator blower motor thermal switch fault (Alarm) Controller stops the unit.	Check blower motor. Motor has to be cold for checking.

Table 05-II-02.3 Alarm Codes(cont'd)

407	Condenser fan motor 1 overload relay fault (Alarm) Indicates a condenser fan motor 1 thermal overload relay is open (or fails to provide diagnosis response to controller). Controller continues unit operation on condenser fan 2 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check condenser fan motor 1 thermal overload relay
408	Condenser fan motor 1 thermal switch fault (Alarm) Indicates a condenser fan motor 1 thermal switch is open (or fails to provide diagnosis response to controller). Controller continues unit operation on condenser fan 2 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check condenser fan motor 1. Motor has to be cold for checking.
409	Condenser fan motor 2 overload relay fault (Alarm) Indicates a condenser fan motor 2 thermal overload relay is open (or fails to provide diagnosis response to controller). Controller continues unit operation on condenser fan 1 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check condenser fan motor 2 thermal overload relay

Table 05-II-02.3 Alarm Codes(cont'd)

410	Condenser fan motor 2 thermal switch fault (Alarm) Indicates a condenser fan motor 2 thermal switch is open (or fails to provide diagnosis response to controller). Controller continues unit operation on condenser fan 2 until controller is reset. Controller automatically resets alarm when thermal relay fault is corrected.	Check condenser fan motor 2. Motor has to be cold for checking.
411	Heater 1 thermal switch fault or overcurrent fault (Alarm) Heater 1 does not run. The unit operates with Heater 2.	Revise, repair or replace the switch. Check airflow and check air filter.
413	Heater 2 thermal switch fault or overcurrent fault (Alarm) Heater 2 does not run. The unit operates with Heater 1.	Revise, repair or replace the switch. Check airflow and check air filter.
415	Heaters thermal switch fault (Alarm)	Revise, repair or replace the switch. Check airflow and check air filter.
416	Evaporator blower contactor fault (Alarm) Controller stops the unit.	Check the contactor.
420	Dead-man switch open (Alarm) The unit is switched off.	Check, if the covers are closed properly. Check the dead-man switch.
421	Internal inverter voltage fault (Alarm)	Check inverter. Reset controller.

05-II-03 APPENDIX

05-II-03.01 IDU Fault List

05-II-03.01.01 Operating Mode

All faults related to the HVAC System and monitored by the IDU, are listed in the IDU screen and described in the relevant Fault Charts.

The Operating Mode Fault Charts listed below, include the relevant Operator Guide for each fault, which gives the Operator suggestions on how to overcome the fault. The Operator Guide can be shown by touching the “Detail” button on the screen and is referred to the fault highlighted on the list.

Refer to Table 05-II-03.1 for Operating Mode Fault List

Refer to Table 05-II-03.2 for Operating Mode Fault Details

Refer to Table 05-II-03.4 for Operating Mode and Maintenance Mode Fault Relationship

Table 05-II-03.1 Operating Mode Fault List

Code	Affected Subsystem	Description
3058	HVAC	Critical Fault
3059	HVAC	Minor Fault
3060	HVAC	Maintenance Fault
3156	HVAC_A	MVPD Circuit Breaker Open
3157	HVAC_A	LVPD Circuit Breaker Open
3256	HVAC_B	MVPD Circuit Breaker Open
3257	HVAC_B	LVPD Circuit Breaker Open

Table 05-II-03.2 Operating Mode Fault Details

Fault#	Date	Time	Vehicle#	System	Description
3058	mm/dd/yy	hh:mm:ss	xxx	HVAC	Critical Fault
Operator Guide NO VENTILATION / NO COOLING / NO HEATING.					

Fault#	Date	Time	Vehicle#	System	Description
3059	mm/dd/yy	hh:mm:ss	xxx	HVAC	Minor Fault
Operator Guide It is required a maintenance check					

Fault#	Date	Time	Vehicle#	System	Description
3060	mm/dd/yy	hh:mm:ss	xxx	HVAC	Maintenance Fault
Operator Guide Contact Maintenance People					

Fault#	Date	Time	Vehicle#	System	Description
3156	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	MVPD Circuit Breaker Open
3256	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	MVPD Circuit Breaker Open
Operator Guide Check the 2F04 circuit breaker (Cab. Panel Car B)					

Fault#	Date	Time	Vehicle#	System	Description
3157	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	LVPD Circuit Breaker Open
3257	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	LVPD Circuit Breaker Open
Operator Guide Check the Power Supply circuit breaker 12F01 (LV Cabinet Car A for HVAC A and LV Cabinet Car B for HVAC B) and/or the Command circuit breaker 12F02 (Cab. Panel Car A for HVAC A and Cab. Panel Car B for HVAC B).					

05-II-03.01.02 “Maintenance” Mode IDU Fault Charts

All faults related to the HVAC System and monitored by the IDU in Maintenance Mode are listed in the following Fault Charts.

The Operator Guide pops up by touching the “Detail” button on the screen and is referred to the fault highlighted on the list.

Refer to Table 05-II-03.3 for Maintenance Mode Fault List

Refer to Table 05-II-03.4 for Operating Mode and Maintenance Mode Fault Relationship

Refer to Table 05-II-03.5 for Maintenance Mode Fault Details

Table 05-II-03.3 Maintenance Mode Fault List

Code	Affected Subsystem	Description
3101	HVAC_A	Low Pressure Cut Out
3102	HVAC_A	High Pressure Cut Out
3103	HVAC_A	Temperature Reading Fault
3104	HVAC_A	Both Wye protector tripped
3105	HVAC_A	Evaporator Fan Overload Relay Fault
3106	HVAC_A	Evaporator Fan Thermal Switch
3107	HVAC_A	Internal Heater Shunt Released
3108	HVAC_A	Container Open (Dead Man Switch Open)
3109	HVAC_A	Invalid Digital Set Point
3110	HVAC_A	Error in serial communication initialization
3111	HVAC_A	Backup Battery Low Voltage
3112	HVAC_A	Return Air Sensor Short Circuit
3113	HVAC_A	Return Air Sensor Open Loop
3114	HVAC_A	Fresh Air Sensor Short Circuit
3115	HVAC_A	Fresh Air Sensor Open Loop
3116	HVAC_A	Duct Air Sensor Short Circuit
3117	HVAC_A	Duct Air Sensor Open Loop
3118	HVAC_A	Compressor Motors #1 and #2 Overcurrent
3119	HVAC_A	Compressor Motor #1 Overcurrent
3120	HVAC_A	Compressor Motor #2 Overcurrent
3121	HVAC_A	Condenser Fan Motors #1 and #2
3122	HVAC_A	Condenser Fan Motors #1 Undercurrent
3123	HVAC_A	Condenser Fan Motors #2 Undercurrent
3124	HVAC_A	Evaporator Fan Motor Overcurrent

Table 05-II-03.3 Maintenance Mode Fault List (cont'd)

Code	Affected Subsystem	Description
3126	HVAC_A	Filter Fault (dirty)
3127	HVAC_A	Condenser Fan Motor #1 and #2 Undercurr.
3128	HVAC_A	Condenser Fan Motor #1 Overcurrent
3129	HVAC_A	Condenser Fan Motor #2 Overcurrent
3131	HVAC_A	Heater #2 Thermal Switch or Overcurrent
3132	HVAC_A	High Duct Air Temp. in Heating Mode
3133	HVAC_A	Low Fresh Air Temperature
3136	HVAC_A	General Cool Fault
3137	HVAC_A	Hot Vehicle Fault
3138	HVAC_A	Compressor #2 Wye Protector Trip
3139	HVAC_A	Condenser Fan #1 Thermal Switch
3140	HVAC_A	Condenser Fan #2 Thermal Switch
3141	HVAC_A	Compressor #1 Overload Relay Fault
3142	HVAC_A	Compressor #2 Overload Relay Fault
3143	HVAC_A	Condenser Fan #1 Overload Relay Fault
3144	HVAC_A	Condenser Fan #2 Overload Relay Fault
3145	HVAC_A	Heater #1 Thermal Switch or Overcurrent
3146	HVAC_A	Calibrating Constant Error
3147	HVAC_A	Global Data Structure Error
3148	HVAC_A	Some Data Archive Error
3149	HVAC_A	Return Air Sensor Failure
3150	HVAC_A	Fresh Air Sensor Failure
3151	HVAC_A	Duct Air Sensor Failure
3153	HVAC_A	Compressor #1 Wye Protector Trip
3155	HVAC_A	Evaporator Fan Contactor Open
3156	HVAC_A	MVPD Circuit Breaker Open
3157	HVAC_A	LVPD Circuit Breaker Open
3201	HVAC_B	Low Pressure Cut Out
3202	HVAC_B	High Pressure Cut Out
3203	HVAC_B	Temperature Reading Fault
3204	HVAC_B	Both Wye protector tripped
3205	HVAC_B	Evaporator Fan Overload Relay Fault
3206	HVAC_B	Evaporator Fan Thermal Switch
3207	HVAC_B	Internal Heater Shunt Released

Table 05-II-03.3 Maintenance Mode Fault List (cont'd)

Code	Affected Subsystem	Description
3208	HVAC_B	Container Open (Dead Man Switch Open)
3209	HVAC_B	Invalid Digital Set Point
3210	HVAC_B	Error in serial communication initialization
3211	HVAC_B	Backup Battery Low Voltage
3212	HVAC_B	Return Air Sensor Short Circuit
3213	HVAC_B	Return Air Sensor Open Loop
3214	HVAC_B	Fresh Air Sensor Short Circuit
3215	HVAC_B	Fresh Air Sensor Open Loop
3216	HVAC_B	Duct Air Sensor Short Circuit
3217	HVAC_B	Duct Air Sensor Open Loop
3218	HVAC_B	Compressor Motors #1 and #2 Overcurrent
3219	HVAC_B	Compressor Motor #1 Overcurrent
3220	HVAC_B	Compressor Motor #2 Overcurrent
3221	HVAC_B	Condenser Fan Motors #1 and #2
3222	HVAC_B	Condenser Fan Motors #1 Undercurrent
3223	HVAC_B	Condenser Fan Motors #2 Undercurrent
3224	HVAC_B	Evaporator Fan Motor Overcurrent
3225	HVAC_B	Evaporator Fan Motor Undercurrent
3226	HVAC_B	Filter Fault (dirty)
3227	HVAC_B	Condenser Fan Motor #1 and #2 Undercurr.
3228	HVAC_B	Condenser Fan Motor #1 Overcurrent
3229	HVAC_B	Condenser Fan Motor #2 Overcurrent
3231	HVAC_B	Heater #2 Thermal Switch or Overcurrent
3232	HVAC_B	High Duct Air Temp. in Heating Mode
3233	HVAC_B	Low Fresh Air Temperature
3236	HVAC_B	General Cool Fault
3237	HVAC_B	Hot Vehicle Fault
3238	HVAC_B	Compressor #2 Wye Protector Trip
3239	HVAC_B	Condenser Fan #1 Thermal Switch
3227	HVAC_B	Condenser Fan Motor #1 and #2 Undercurr.
3240	HVAC_B	Condenser Fan #2 Thermal Switch
3241	HVAC_B	Compressor #1 Overload Relay Fault
3242	HVAC_B	Compressor #2 Overload Relay Fault
3243	HVAC_B	Condenser Fan #1 Overload Relay Fault

Table 05-II-03.3 Maintenance Mode Fault List (cont'd)

Code	Affected Subsystem	Description
3244	HVAC_B	Condenser Fan #2 Overload Relay Fault
3245	HVAC_B	Heater #1 Thermal Switch or Overcurrent
3246	HVAC_B	Calibrating Constant Error
3247	HVAC_B	Global Data Structure Error
3248	HVAC_B	Some Data Archive Error
3249	HVAC_B	Return Air Sensor Failure
3250	HVAC_B	Fresh Air Sensor Failure
3251	HVAC_B	Duct Air Sensor Failure
3253	HVAC_B	Compressor #1 Wye Protector Trip
3255	HVAC_B	Evaporator Fan Contactor Open
3256	HVAC_B	MVPD Circuit Breaker Open
3257	HVAC_B	LVPD Circuit Breaker Open

Table 05-II-03.4 Operating Mode and Maintenance Mode Fault Relationship

Operating Mode Fault Codes	Maintenance Mode Fault Codes							
3058	3101	3102	3103	3104	3105	3106	3107	3108
	3201	3202	3203	3204	3205	3206	3207	3208
3059	3109	3127	3131	3132	3133	3136	3137	3138
	3139	3140	3141	3142	3143	3144	3145	3146
	3147	3148	3149	3150	3151	3153	3155	3209
	3227	3231	3232	3233	3236	3237	3238	3239
	3240	3241	3242	3243	3244	3245	3246	3247
	3248	3249	3250	3251	3253	3255		
3060	3110	3111	3112	3113	3114	3115	3116	3117
	3118	3119	3120	3121	3122	3123	3124	3125
	3126	3128	3129	3210	3211	3212	3213	3214
	3215	3216	3217	3218	3219	3220	3221	3222
	3223	3224	3225	3226	3228	3229		
3156	3156							
3157	3157							
3256	3256							
3257	3257							

Table 05-II-03.5 Maintenance Mode Fault Details

Fault#	Date	Time	Vehicle#	System	Description
3101	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Low Pressure Cut Out
3201	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Low Pressure Cut Out
Operator Guide					
NO COOLING. Check for restricted dehydrator or low side (expansion valve partially closed by ice, dirt, etc.). Check for low refrigerant charge. Check for defective low pressure switch.					

Fault#	Date	Time	Vehicle#	System	Description
3103	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Temperature Reading Fault
3203	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Temperature Reading Fault
Operator Guide					
No Cooling/Heating. Check the sensors by substitution. Be sure sensors polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3104	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Both Wye protector tripped
3204	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Both Wye protector tripped
Operator Guide					
NO COOLING. Check compressor motors. Compressors have to cold for checking.					

Fault#	Date	Time	Vehicle#	System	Description
3105	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Evaporator Fan Overload Relay Fault
3205	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Evaporator Fan Overload Relay Fault
Operator Guide					
NO VENTILATION. Check evaporator blower motor thermal overload relay.					

Fault#	Date	Time	Vehicle#	System	Description
3106	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Evaporator Fan Thermal Switch
3206	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Evaporator Fan Thermal Switch
Operator Guide					
NO VENTILATION. Check blower motor. Motor has to be cold for checking.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3107	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Internal Heater Shunt Released
3207	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Internal Heater Shunt Released
Operator Guide NO HEATING.					

Fault#	Date	Time	Vehicle#	System	Description
3108	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Container Open (Dead Man Switch Open)
3208	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Container Open (Dead Man Switch Open)
Operator Guide NO VENTILATION / DANGER!!! Check, if the covers are closed properly. Check the dead-man switch.					

Fault#	Date	Time	Vehicle#	System	Description
3109	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Invalid Digital Set Point
3209	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Invalid Digital Set Point
Operator Guide Inspect, repair.					

Fault#	Date	Time	Vehicle#	System	Description
3110	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Error in serial communication initialization
3210	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Error in serial communication initialization
Operator Guide No action					

Fault#	Date	Time	Vehicle#	System	Description
3111	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Backup Battery Low Voltage
3211	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Backup Battery Low Voltage
Operator Guide Replace the backup battery of the controller					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3112	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Return Air Sensor Short Circuit
3212	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Return Air Sensor Short Circuit
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3113	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Return Air Sensor Open Loop
3213	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Return Air Sensor Open Loop
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3114	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Fresh Air Sensor Short Circuit
3214	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Fresh Air Sensor Short Circuit
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3115	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Fresh Air Sensor Open Loop
3215	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Fresh Air Sensor Open Loop
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3116	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Duct Air Sensor Short Circuit
3216	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Duct Air Sensor Short Circuit
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3117	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Duct Air Sensor Open Loop
3217	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Duct Air Sensor Open Loop
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3118	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor Motors #1 and #2 Overcurrent
3218	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor Motors #1 and #2 Overcurrent
Operator Guide					
Check compressors 1 and 2, and compressor contactors.					

Fault#	Date	Time	Vehicle#	System	Description
3119	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor Motor #1 Overcurrent
3219	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor Motor #1 Overcurrent
Operator Guide					
Check compressor 1 and compressor 1 contactor.					

Fault#	Date	Time	Vehicle#	System	Description
3120	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor Motor #2 Overcurrent
3220	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor Motor #2 Overcurrent
Operator Guide					
Check compressor 2 and compressor 2 contactor.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3121	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motors #1 and #2 Overcurrent
3221	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motors #1 and #2 Overcurrent
Operator Guide Check condenser fan motors and fan motor contactors.					

Fault#	Date	Time	Vehicle#	System	Description
3122	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motors #1 Undercurrent
3222	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motors #1 Undercurrent
Operator Guide Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault Condenser Fan #1 Thermal Switch appears, it is necessary to wait until the motor is cold.					

Fault#	Date	Time	Vehicle#	System	Description
3123	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motors #2 Undercurrent
3223	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motors #2 Undercurrent
Operator Guide Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault Condenser Fan #2 Thermal Switch appears, it is necessary to wait until the motor is cold.					

Fault#	Date	Time	Vehicle#	System	Description
3124	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Evaporator Fan Motor Overcurrent
3224	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Evaporator Fan Motor Overcurrent
Operator Guide Check evaporator blower motor and blower motor contactor.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3125	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Evaporator Fan Motor Undercurrent
3225	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Evaporator Fan Motor Undercurrent
Operator Guide Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault Evaporator Fan Thermal Switch appears, it is necessary to wait until the motor is cold.					

Fault#	Date	Time	Vehicle#	System	Description
3126	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Filter Fault (dirty)
3226	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Filter Fault (dirty)
Operator Guide Check / replace return air filters					

Fault#	Date	Time	Vehicle#	System	Description
3127	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motor #1 and #2 Undercurrent
3227	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motor #1 and #2 Undercurrent
Operator Guide Check all electric circuit (circuit breaker, contactor, thermal relay, motor). If the fault Condenser Fan #1 Thermal Switcht or Condenser Fan #2 Thermal Switch appears, it is necessary to wait until the motor is cold.					

Fault#	Date	Time	Vehicle#	System	Description
3128	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motor #1 Overcurrent
3228	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motor #1 Overcurrent
Operator Guide Check condenser fan motor 1 and fan motor 1 contactor					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3129	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan Motor #2 Overcurrent
3229	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan Motor #2 Overcurrent
Operator Guide Check condenser fan motor 2 and fan motor 2 contactor					

Fault#	Date	Time	Vehicle#	System	Description
3130	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Invalid Analogue Set Point
3230	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Invalid Analogue Set Point
Operator Guide Inspect, repair.					

Fault#	Date	Time	Vehicle#	System	Description
3131	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Heater #2 Thermal Switch or Overcurrent
3231	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Heater #2 Thermal Switch or Overcurrent
Operator Guide Heater 2 does not run. The unit operates with Heater 1. Revise, repair or replace the switch. Check air flow and check air filter.					

Fault#	Date	Time	Vehicle#	System	Description
3132	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	High Duct Air Temperature in Heating Mode
3232	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	High Duct Air Temperature in Heating Mode
Operator Guide Duct air temperature > 60 °C. Check evaporator blower and heaters.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3133	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Low Fresh Air Temperature
3233	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Low Fresh Air Temperature
Operator Guide					
Ambient temperature < 4.5 °C. No action.					

Fault#	Date	Time	Vehicle#	System	Description
3136	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	General Cool Fault
3236	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	General Cool Fault
Operator Guide					
Check for other alarm codes. Check compressors and compressor contactors. Check evaporator blower motor and motor. Check condenser fan motors and motor contactors. Check the refrigeration system.					

Fault#	Date	Time	Vehicle#	System	Description
3137	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Hot Vehicle Fault
3237	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Hot Vehicle Fault
Operator Guide					
Check for other alarm codes. Check compressors and compressor contactors. Check evaporator blower motor and motor contactor. Check condenser fan motors and motor contactors. Check the refrigeration system.					

Fault#	Date	Time	Vehicle#	System	Description
3138	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor #2 Wye Protector Trip
3238	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor #2 Wye Protector Trip
Operator Guide					
Check compressors motor 2. Compressor has to cold for checking.					

Fault#	Date	Time	Vehicle#	System	Description
3139	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan #1 Thermal Switch
3239	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan #1 Thermal Switch
Operator Guide					
Check condenser fan motor 1. Motor has to be cold for checking.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3140	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan #2 Thermal Switch
3240	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan #2 Thermal Switch
Operator Guide Check condenser fan motor 2. Motor has to be cold for checking.					

Fault#	Date	Time	Vehicle#	System	Description
3141	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor #1 Overload Relay Fault
3241	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor #1 Overload Relay Fault
Operator Guide Compressor motor 1 exceeded nominal current draw. Controller continues unit operation on compressor 2 until controller is reset. Check compressor 1 and compressor 1 contactor.					

Fault#	Date	Time	Vehicle#	System	Description
3142	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor #2 Overload Relay Fault
3242	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor #2 Overload Relay Fault
Operator Guide Compressor motor 2 exceeded nominal current draw. Controller continues unit operation on compressor 1 until controller is reset. Check compressor 2 and compressor 2 contactor.					

Fault#	Date	Time	Vehicle#	System	Description
3143	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan #1 Overload Relay Fault
3243	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan #1 Overload Relay Fault
Operator Guide Indicates condenser fan motor 1 overload for more than 10 seconds. Check condenser fan motor 1 and fan motor 1 contactor.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3144	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Condenser Fan #2 Overload Relay Fault
3244	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Condenser Fan #2 Overload Relay Fault
Operator Guide Indicates condenser fan motor 2 overload for more than 10 seconds. Check condenser fan motor 2 and fan motor 2 contactor.					

Fault#	Date	Time	Vehicle#	System	Description
3145	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Heater #1 Thermal Switch or Overcurrent
3245	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Heater #1 Thermal Switch or Overcurrent
Operator Guide Heater 1 does not run. The unit operates with Heater 2. Revise, repair or replace the switch. Check air flow and check air filter.					

Fault#	Date	Time	Vehicle#	System	Description
3146	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Calibrating Constant Error
3246	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Calibrating Constant Error
Operator Guide No action					

Fault#	Date	Time	Vehicle#	System	Description
3147	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Global Data Structure Error
3247	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Global Data Structure Error
Operator Guide No action					

Fault#	Date	Time	Vehicle#	System	Description
3148	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Some Data Archive Error
3248	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Some Data Archive Error
Operator Guide No action					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3149	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Return Air Sensor Failure
3249	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Return Air Sensor Failure
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3150	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Fresh Air Sensor Failure
3250	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Fresh Air Sensor Failure
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3151	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Duct Air Sensor Failure
3251	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Duct Air Sensor Failure
Operator Guide					
Check the sensor by substitution. Be sure sensor polarity is correct. Check circuit wiring using a high quality ohmmeter. Be sure to maintain the correct polarity. NOTE: Do NOT use a test light or other instrument; or controller damage may result.					

Fault#	Date	Time	Vehicle#	System	Description
3153	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Compressor #1 Wye Protector Trip
3253	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Compressor #1 Wye Protector Trip
Operator Guide					
Check compressor motor 1. Compressor has to cold for checking.					

Fault#	Date	Time	Vehicle#	System	Description
3155	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	Evaporator Fan Contactor Open
3255	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	Evaporator Fan Contactor Open
Operator Guide					
NO VENTILATION. Check the contactor.					

Table 05-II-03.5 Maintenance Mode Fault Details (cont'd)

Fault#	Date	Time	Vehicle#	System	Description
3156	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	MVPD Circuit Breaker Open
3256	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	MVPD Circuit Breaker Open
Operator Guide Check the 2F04 circuit breaker (Cab. Panel Car B)					

Fault#	Date	Time	Vehicle#	System	Description
3157	mm/dd/yy	hh:mm:ss	xxx	HVAC_A	LVPD Circuit Breaker Open
3257	mm/dd/yy	hh:mm:ss	xxx	HVAC_B	LVPD Circuit Breaker Open
Operator Guide Check the Power Supply circuit breaker 12F01 (LV Cabinet Car A for HVAC A and LV Cabinet Car B for HVAC B) and/or the Command circuit breaker 12F02 (Cab. Panel Car A for HVAC A and Cab. Panel Car B for HVAC B).					

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LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE
P2550

RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01-A
PART III
MAINTENANCE
SECT 02 HVAC

SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

PART III

MAINTENANCE

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SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

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SECTION 05

HEATING, VENTILATION & AIR CONDITIONING

05-III-01 INTRODUCTION

The HVAC Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment & Special Tools

05-III-01.a List of Abbreviations, Acronyms & Symbols

The Abbreviations, Acronyms and Symbols commonly used throughout this Section are given below with their relevant meaning.

Abbreviation	Meaning
AB	AnsaldoBreda
APS	Auxiliary Power Supply
ASSY	Assembly
BHP	Pressure Switch, High Pressure
BLP	Pressure Switch, Low Pressure
BMP	Pressure Switch, Modulation Pressure
BRAS	Return Air Sensor
C/L	Centerline
CB	Circuit Breaker
CCH	Communication Control Head
CCU	Communication Control Unit
CM	Coast Motoring
DVE	Discharge Vibration Eliminator
ELE	Electronic
EXP	Expansion Valve
FD	Filter Drier
GTW	Gateway
H-CML	Heavy Consumable Material List
H-CMS	Heavy Corrective Maintenance Sheet
HV	High Voltage
HVAC	Heating, Ventilation & Air Conditioning
HW	Hardware
IDU	Integrated Diagnostic Unit
IP	Ingress Protection Rating
IPC	Illustrated Parts Catalog
KO	Out of Service
LED	Light Emitting Diode
LH	Left Hand Side
LRV	Light Railway Vehicle
LV	Low Voltage
LVDS	Low Voltage Distribution System
LVPS	Low Voltage Power Supply
MV	Medium Voltage
MVB	Multifunction Vehicle Bus
OK	Working
PTU	Portable Test Unit

(cont'd)

(cont'd)

Abbreviation	Meaning
R-CML	Running Consumable Material List
R-CMS	Running Corrective Maintenance Sheet
RH	Right Hand Side
RMSM	Running Maintenance & Service Manual
R-PMM	Running Preventive Maintenance Matrix
R-PMR	Running Preventive Maintenance Report
R-PMS	Running Preventive Maintenance Sheet
R-TESTL	Running Test Equipment & Special Tools List
SB	Service Brake
SCEB	Slide Controlled Emergency Brake
SCPM	Safety Critical Preventive Maintenance
SYS	System
SRV	Safety Relief Valve
SVE	Suction Vibration Eliminator
SW	Software
SWT	Switch, A/C Unit AUTO-OFF-TEST
TBD	To Be Defined
TBS	To Be Supplied
TCMS	Train Communication System
TCN	Train Communication Network
TOC	Table Of Content
TTEM	Tools & Test Equipment Manual
TWC	Train-to-Wayside Communication
WTB	Wired Train Bus
W/	With
W/O	Without
YLL	Solenoid Valve, Liquid Line

05-III-01.b List of Definitions

The Definitions commonly used throughout this Section are given below with their relevant meaning.

Definition	Meaning
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0	Empty car operating weight
AW1	Full seated load plus AW0
AW2	Standees at 4 persons per square meter plus AW1
AW3	Standees at 6 persons per square meter plus AW1
AW4	Standees at 8 persons per square meter plus AW1
Front door	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section
MC Handle	Master Controller Handle
"A" Cab (or Cab A)	Operator Cab in the A body section
"B" Cab (or Cab B)	Operator Cab in the B body section

05-III-01.c List of Measurement Units

The Measurement Units commonly used throughout this Section are given below with their relevant meaning.

Definition		Meaning
ft	Foot	(Length)
gal	Gallon	(Volume)
in	Inch	(Length)
kg	Kilogram - approx 2.205 pounds	(Weight)
km	Kilometer - approx 0.621 miles	(Length)
lb	Pound	(Weight)
lb-ft	Pound force	(Force)
m	Meter - approx 3.28 feet	(Length)
mm	Millimeter - approx 0.0394 inches	(Length)
mph	Miles per hour	(Velocity)
Km/h	Kilometers per hour	(Velocity)
s	Seconds	(Time)
V	Volt	(Tension)
Vdc	Direct Voltage	(Tension)
Vac	Alternate Voltage	(Tension)
kVA	Kilo-Volt-Ampere	(Power)
kW	Kilo-Watt	(Power)
W	Watt	(Power)
F	Farad	(Capacity)
H	Henry	(Inductance)
Ω	Ohm	(Resistance)
°F	Fahrenheit	(Temperature)
°C	Celsius	(Temperature)
A	Ampere	(Current)
Hz	Hertz	(Frequency)
rpm	Revolution per Minute	(Frequency)
N	Newton	(Force)
Nm	Newton-Meter	(Torque)
mphps	Mile Per Hour Per Second	(Acceleration)

05-III-01.d References

Refer to Section 00 of this RMSM for details relevant to the following Topics :

Topic	Paragraph
MANUAL PURPOSE	*00-02*
MANUAL ARRANGEMENT	*00-03*
MANUAL APPLICABILITY	*00-04*
ACQUISITION OF COPIES, REVISIONS AND CHANGES	*00-05*
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05-III-02 P2550 ANSALDOBREDA MAINTENANCE PLAN

The AB Preventive Maintenance Plan (PMP) has been designed in order to permit a 30-year Structural and Service Vehicle Life with the following basic assumptions :

- Yearly mileage: 120,000 Miles
- Motor and Trailer Truck removal: every 5 years. (600,000 Miles)

The AB Preventive Maintenance Plan (PMP) provides the Preventive Maintenance Tasks to be performed according the following Mileage Intervals:

Running Maintenance		Heavy Maintenance	
Daily			
10,000	Miles		
30,000	Miles	600,000	Miles
60,000	Miles	1,200,000	Miles
120,000	Miles	1,800,000	Miles

In accordance with the Preliminary Version of the AB Preventive Maintenance Plan, the Scheduled Maintenance Tasks for the entire Vehicle Life have been grouped into:

- Running Preventive Maintenance
- Heavy Preventive Maintenance

In accordance with the AB Corrective Maintenance Analysis, the Corrective Maintenance Tasks for the entire Vehicle Life have been grouped into:

- Running Corrective Maintenance
- Heavy Corrective Maintenance

05-III-03 RUNNING -PREVENTIVE MAINTENANCE

05-III-03.01 Running -Preventive Maintenance Matrixes (R-PMM)

The HVAC Running -Preventive Maintenance Matrix (R-PMM)
provides the Preventive Maintenance Plan of the HVAC up to 120,000 Miles.

The HVAC (R-PMM) is provided in two different arrangements as follows:

- **R-PMM Component Based**

It lists the HVAC Running - Preventive Maintenance Tasks ordered by Subsystem /Assemblies / Component break down, followed by the PM Task Description and Scheduled Task Interval and linked to the relevant R-PM Sheet Code.

The R-PMM Component Based provides the Maintainer with the following data:

- SUBSYSTEM /ASSEMBLY/UNIT/COMPONENT
- TASK
- SCPM
- INSPECTION INTERVAL
- SHEET CODE

- **R-PMM Mileage Based**

It lists the HVAC Running - Preventive Maintenance Tasks ordered by Scheduled Maintenance Interval and broken down into the related Subsystem /Assemblies/Component followed by the PM Task Description and Person Hours and linked to the relevant R-PM Sheet Code.

The R-PMM Mileage Based provides the Maintainer with the following data:

- INSPECTION INTERVAL
- SYSTEM/SUBSYSTEM /ASSEMBLY/UNIT/COMPONENT
- TASK
- SCPM
- PERSON HOURS
- SHEET CODE

The data listed in this Matrix are the same of those listed in the R-PMM Component Based with the exception of the PERSON HOURS.

05-III-03.01.01 Definitions

The following definitions are applicable to both types of R-PMM

Tasks

Cleaning: Methods and processes required (Step-By-Step Procedural Instructions) for cleaning specific parts or areas of the Vehicle.

Inspection: Preventive Maintenance procedures such as those required to ascertain the serviceability of a Part, Assembly, System or the specific interrelationship of Parts that perform a functional operation.

Lubrication: Provides component lubrication Instructions.

Replacement Provides the Components / Assemblies and Subassemblies removal & installation in a logical sequential order.
Maintenance procedures identified in this topic include Components that are replaced within a 4 hours window.

Service: Operation performed to replenish Sand, Windshield Wiper Washer Fluid, HVAC Coolant, Gear and Compressor Oil, and Vehicle Lubrication.

Test: Procedures and Parameters to evaluate the operational efficiency and integrity of a System /Subsystem/Component and the interrelationship of Parts performing functional operations.

NOTE : The Safety Precautions to be followed to safely accomplish the Maintenance of the HVAC System are provided (in sheet format) at the beginning of the section containing the relevant R-PMS.

05-III-03.01.02 Inspection Intervals

The Running - Preventive Maintenance Intervals for the P2550 LRV Fleet are scheduled as follows:

Daily	10,000 Miles	30,000 Miles	60,000 Miles	120,000 Miles

The marker "●" in the INSPECTIONS INTERVAL column, indicates the periodicity of the corresponding Task.

05-III-03.01.03 Safety Critical Preventive Maintenance (SCPM) Tasks

The marker "☑" in the SCPM column, indicates that the corresponding Task is a Safety Critical Preventive Maintenance (SCPM) Task, as per the results of the Safety Analyses performed, on Vehicle Subsystems, according to Vehicle Specification.

05-III-03.01.04 Sheet Code

The Sheet Code column, indicates the reference to Running -Preventive Maintenance Sheet where the Procedure to be performed is described and illustrated.

THE SHEET CODE IS THE EXPLICIT LINK BETWEEN R-PM MATRIXES, R-PMR /JOB CARDS AND R-PM SHEETS

Refer to Paragraph 05-III-03.03.01 for Running- Preventive Maintenance Sheet (R-PMS) Form for detailed explanation.

05-III-03.01.05 Person Hours

It indicates the time required to perform the corresponding Task with the basic assumption that the Vehicle is on an Inspection Pit or Stand Up Rail and the Consumables, Tools and Spare Parts needed to accomplish the Task are available at the Location of the Equipment to be maintained.

Refer to :

- Table 05-III-03.1 for Running - Preventive Maintenance Matrix (R-PMM) (Component Based)
- Table 05-III-03.2 for Running - Preventive Maintenance Matrix (R-PMM) (Mileage Based)

05-III-03.01.06 Running Preventive Maintenance Matrix (Component Based)

Table 05-III-03.1 Running Preventive Maintenance Matrix (Component Based)

SYSTEM 05 HEATING VENTILATION & AIR CONDITIONING								
SUBSYSTEM ASSY/UNIT/COMPONENT	TASK	SCPM	INSPECTION INTERVAL MILES					SHEET CODE
			Daily	10K	30K	60K	120K	
-CLIMATE CONTROL UNIT	SAFETY PRECAUTIONS							R-P-05-00-00-00/SP-00
-CLIMATE CONTROL UNIT	TEST					●		R-P-05-01-00-00/T-00
-CLIMATE CONTROL UNIT	INSPECTION	☑				●		R-P-05-01-00-00/I-00
--AIR FILTER	REPLACEMENT				●			R-P-05-01-12-00/R-00
--HEATERS ASSEMBLY	INSPECTION	☑					●	R-P-05-01-14-00/I-00
--CONDENSER COIL	CLEANING					●		R-P-05-01-15-00/C-00
--EVAPORATOR COIL	CLEANING					●		R-P-05-01-16-00/C-00
--AIR DAMPER	INSPECTION						●	R-P-05-01-17-00/I-00
--FRESH AIR INTAKE	INSPECTION					●		R-P-05-01-23-00/I-00
--REFRIGERANT LINES	INSPECTION						●	R-P-05-01-24-00/I-00
--DRAIN PAN / LINES	CLEANING						●	R-P-05-01-25-00/C-00
-ELECTRICAL PLANT EQUIPMENT	INSPECTION	☑					●	R-P-05-02-00-00/I-00
-- CONTROL BOX	INSPECTION	☑					●	R-P-05-02-26-00/I-00

05-III-03.01.07 Running Preventive Maintenance Matrix (Mileage Based)

Table 05-III-03.2 Running Preventive Maintenance Matrix (Mileage Based)

SYSTEM 05 HEATING VENTILATION & AIR CONDITIONING

SUBSYSTEM	TASK	SCPM	PERSON HOURS	SHEET CODE
-CLIMATE CONTROL UNIT	SAFETY PRECAUTIONS			R-P-05-00-00-00/SP-00
30,000 MILES				
-CLIMATE CONTROL UNIT				
--AIR FILTER	REPLACEMENT		1	R-P-05-01-12-00/R-00
60,000 MILES				
-CLIMATE CONTROL UNIT	TEST		1	R-P-05-01-00-00/T-00
-CLIMATE CONTROL UNIT	INSPECTION	☑	2	R-P-05-01-00-00/I-00
--CONDENSER COIL	CLEANING		0.5	R-P-05-01-15-00/C-00
--EVAPORATOR COIL	CLEANING		0.5	R-P-05-01-16-00/C-00
--FRESH AIR INTAKE	INSPECTION		0.3	R-P-05-01-23-00/I-00
120,000 MILES				
-CLIMATE CONTROL UNIT				
--HEATERS ASSEMBLY	INSPECTION	☑	0.2	R-P-05-01-14-00/I-00
--AIR DAMPER	INSPECTION		0.2	R-P-05-01-17-00/I-00
--REFRIGERANT LINES	INSPECTION		0.5	R-P-05-01-24-00/I-00
--DRAIN PAN / LINES	CLEANING		0.3	R-P-05-01-25-00/C-00
-HVAC CONTROL	INSPECTION	☑	1	R-P-05-02-00-00/I-00
--UNIT CONTROL BOX	INSPECTION	☑	1	R-P-05-02-26-00/I-00

05-III-03.02 Running -Preventive Maintenance Reports (R-PMR/Job Cards)

This paragraph describes the contents of the HVAC Running -Preventive Maintenance Reports (R-PMR/Job Cards) for the Running - Preventive Maintenance Tasks.

05-III-03.02.01 R-PMR/Job Card Form Content

The R-PMR/JOB CARDS are broken down into two main topics:

Specific Data and R-PM Data

Refer to Figure 05-III-03.1 for R-PMR/JOB CARD Form example

RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM		
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER		
ITEM #	**TITLE**	**EXPLANATORY NOTE**
1	**VEHICLE #**	This field indicates the Vehicle Identification Number
2	**DATE**	This field indicates the Date on which the Vehicle entered the Maintenance Shop
3	**RUNNING HOURS**	This field indicates the Vehicle Running Hours at the above Date
4	**MILES**	This field indicates the Vehicle Running Miles at the above Date.
5	**EMPLOYEE # & SIGNATURE**	This Field indicates the Employee # & Signature of the Maintainer(s) that perform the referred Task(s)
6	**STARTING DATE**	This field indicates the Starting Date of the referred Task(s).
7	**WORK HOURS**	This field indicates the Work duration to perform the referred Task(s).
8	**COMPLETION DATE**	This field indicates the Completion Date of the referred Task(s).
9	**DEFECT FOUND/COMMENTS**	This field indicates the result of the Task(s) execution and/ or note related to any items of the maintained Equipment requiring Corrective Maintenance
A	**P2550 RUNNING PREVENTIVE MAINTENANCE REPORT SYSTEM (Maintenance Interval) JOB CARD**	This field provides R-PMR Title. The R-PM Maintenance Intervals are the following: Daily; 10,000 Miles; 30,000 Miles,60,000 Miles.120,000 Miles
B	**WORK AREA**	This column lists the On Vehicle Areas where the Equipment to be maintained is located The Work Areas are provided to optimize the jobs organization of the Preventive Maintenance tasks in order to: 1- respect the Safety Precautions to be followed 2- complete the preparation and the availability of the Consumables, Tools and Spare Parts, needed to perform the referred Task. 3- respect the time (PERSON HOURS) established to perform the referred Task (with the basic assumption that the Vehicle is on an Inspection Pit or Stand Up Rail and the Consumables, Tools and Spare Parts are available at the location of the Equipment to be maintained.) The On Vehicle Work Areas are the following: Exterior - Interior - Roof - Truck - Undercar - Vehicle (Vehicle as a whole)

RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM		
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER		
ITEM #	**TITLE**	**EXPLANATORY NOTE**
C	**ITEM**	This column lists the Subsystem/Assembly, Unit, Component to be maintained
D	**TASK**	This column lists the R-PM tasks to be performed for each Assembly/Unit/Component (i.e., Cleaning, Inspection, Test) The R-PM Tasks are the following: Cleaning - Inspection -Lubrication - Replacement - Service- Test
E	**LOCATION**	This column lists the On Board Vehicle Location of all Equipment to be maintained according to the following Location identification Codes

RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM	
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER	
ITEM #	**TITLE**
E (cont'd)	**LOCATION (cont'd)**
EXPLANATORY NOTE	

Door Numbering

ITEM #	TITLE	EXPLANATORY NOTE
F	**PM SHEET CODE**	This column lists the reference to Running-Preventive Maintenance Sheet where the Procedure to be performed is described and illustrated. Refer to Running-Preventive Maintenance Sheet (R-PMS) Form for detailed explanation.
G	**SHEET ….OF……**	This field indicates the progressive sheet page number of each. R-PMR/JOB CARD

Figure 05-III-03.1 R-PMR/Job Card Form -Example

05-III-03.02.02 R-PMR/Job Card Sequence

The R-PMR/JOB CARDS provided in this Section are grouped according to the following sequence:

Daily 10,000 Miles 30,000 Miles 60,000 Miles 120,000 Miles

05-III-03.02.03 Running -Preventive Maintenance Cycle & R-PMR/Job Card Content

The Running -Preventive Maintenance Cycle and the relevant R-PMR/JOB CARD content are as follows :

MAINTENANCE INTERVAL	PMR /JOB CARD TITLE	PMR /Job Card CONTENT
DAILY	DAILY JOB CARD	List of Assemblies/Components and related Tasks to be performed **DAILY**
10,000 Miles	10,000 MILES JOB CARD	• DAILY Job Card content + List of Assemblies/Components and related Tasks to be performed at **10,000** Miles
30,000 Miles	30,000 MILES JOB CARD	• DAILY Job Card content + 10,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at **30,000** Miles
60,000 Miles	60,000 MILES JOB CARD	• DAILY Job Card content + 10,000 Job Card content + 30,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at **60,000** Miles
120,000 MILES	120,000 MILES JOB CARD	• DAILY Job Card content + 10,000 Job Card content + 30,000 Job Card content + 60,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at **120,000** Miles

05-III-03.02.04 R-PMR/Job Card Data Presentation Sequence

The Subsystems / Assemblies / Units / Components listed in the ITEMS column of each R-PMR/JOB CARD are grouped by Work Area and Vehicle Systems' and sequenced, in alphabetical order, in conjunction with their On Vehicle Locations and Tasks to be performed.

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HEATING, VENTILATION & AIR CONDITIONING

Running - Preventive Maintenance Reports

R-PMR/JOB CARDS

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HVAC
RUNNING PREVENTIVE MAINTENANCE REPORT
30,000 MILES JOB CARD

VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 1 OF 1

WORK AREA	SYSTEM	ITEM	TASK	LOCATION				PM SHEET CODE
				BODY SECT	TRUCK	AXLE	SIDE	
ROOF	HEATING VENTILATION & AIR CONDITIONING	AIR FILTERS	REPLACEMENT	A				R-P-05-01-12-00/R-00
		AIR FILTERS	REPLACEMENT	B				R-P-05-01-12-00/R-00

DEFECT FOUND / COMMENTS

EMPLOYEE # & SIGNATURE	STARTING DATE	WORK HOURS	COMPLETION DATE

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HVAC
RUNNING PREVENTIVE MAINTENANCE REPORT
60,000 MILES JOB CARD

VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 1 OF 2

WORK AREA	SYSTEM	ITEM	TASK	LOCATION				PM SHEET CODE
				BODY SECT	TRUCK	AXLE	SIDE	
ROOF	HEATING VENTILATION AIR CONDITIONING	AIR FILTERS	REPLACEMENT	A				R-P-05-01-12-00/R-00
		CLIMATE CONTROL UNIT	INSPECTION	A				R-P-05-01-00-00/I-00
		CLIMATE CONTROL UNIT	TEST	A				R-P-05-01-00-00/T-00
		CONDENSER COIL	CLEANING	A				R-P-05-01-15-00/C-00
		EVAPORATOR COIL	CLEANING	A				R-P-05-01-16-00/C-00
		FRESH AIR INTAKE	INSPECTION	A				R-P-05-01-23-00/I-00
		AIR FILTERS	REPLACEMENT	B				R-P-05-01-12-00/R-00
		CLIMATE CONTROL UNIT	INSPECTION	B				R-P-05-01-00-00/I-00
		CLIMATE CONTROL UNIT	TEST	B				R-P-05-01-00-00/T-00
		CONDENSER COIL	CLEANING	B				R-P-05-01-15-00/C-00
		EVAPORATOR COIL	CLEANING	B				R-P-05-01-16-00/C-00
		FRESH AIR INTAKE	INSPECTION	B				R-P-05-01-23-00/I-00

DEFECT FOUND / COMMENTS

(cont'd)

HVAC - RUNNING PREVENTIVE MAINTENANCE REPORT - 60,000 MILES JOB CARD								
VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 2 OF 2

DEFECT FOUND / COMMENTS

EMPLOYEE # & SIGNATURE	STARTING DATE	WORK HOURS	COMPLETION DATE

HVAC
RUNNING PREVENTIVE MAINTENANCE REPORT
120,000 MILES JOB CARD

VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 1 OF 2

WORK AREA	SYSTEM	ITEM	TASK	LOCATION				PM SHEET CODE
				BODY SECT	TRUCK	AXLE	SIDE	
ROOF	HEATING VENTILATION AIR CONDITIONING	AIR FILTERS	REPLACEMENT	A				R-P-05-01-12-00/R-00
		CLIMATE CONTROL UNIT	INSPECTION	A				R-P-05-01-00-00/I-00
		CLIMATE CONTROL UNIT	TEST	A				R-P-05-01-00-00/T-00
		CONDENSER COIL	CLEANING	A				R-P-05-01-15-00/C-00
		AIR DAMPER	INSPECTION	A				R-P-05-01-17-00/I-00
		DRAIN PAN / LINES	CLEANING	A				R-P-05-01-25-00/C-00
		EVAPORATOR COIL	CLEANING	A				R-P-05-01-16-00/C-00
		FRESH AIR INTAKE	INSPECTION	A				R-P-05-01-23-00/I-00
		HEATER	INSPECTION	A				R-P-05-01-14-00/I-00
		ELECTRICAL PLANT EQUIPMENT	INSPECTION	A				R-P-05-02-00-00/I-00
		REFRIGERANT LINES	INSPECTION	A				R-P-05-01-24-00/I-00
		CONTROL BOX	INSPECTION	A				R-P-05-02-26-00/I-00
		AIR FILTERS	REPLACEMENT	B				R-P-05-01-12-00/R-00
		CLIMATE CONTROL UNIT	INSPECTION	B				R-P-05-01-00-00/I-00
		CLIMATE CONTROL UNIT	TEST	B				R-P-05-01-00-00/T-00
		CONDENSER COIL	CLEANING	B				R-P-05-01-15-00/C-00
		AIR DAMPER	INSPECTION	B				R-P-05-01-17-00/I-00
		DRAIN PAN / LINES	CLEANING	B				R-P-05-01-25-00/C-00
		EVAPORATOR COIL	CLEANING	B				R-P-05-01-16-00/C-00
		FRESH AIR INTAKE	INSPECTION	B				R-P-05-01-23-00/I-00
		HEATER	INSPECTION	B				R-P-05-01-14-00/I-00
		ELECTRICAL PLANT EQUIPMENT	INSPECTION	B				R-P-05-02-00-00/I-00
		REFRIGERANT LINES	INSPECTION	B				R-P-05-01-24-00/I-00
		CONTROL BOX	INSPECTION	B				R-P-05-02-26-00/I-00

DEFECT FOUND / COMMENTS

HVAC - RUNNING PREVENTIVE MAINTENANCE REPORT - 120,000 MILES JOB CARD								
VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 2 OF 2

DEFECT FOUND / COMMENTS

EMPLOYEE # & SIGNATURE	STARTING DATE	WORK HOURS	COMPLETION DATE

05-III-03.03 Running -Preventive Maintenance Sheets (R-PMS)

Each R-PMS provides the following data consistent with Preventive Maintenance Plan (PMP), AB Design Documentation and Vehicle Systems Functional Tree:

- **R-PM Sheet Code**
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT**, **Component** (Names)
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT**, **Component** (Location)
- **Maintenance Interval** (Miles)
- **Maintenance Task**,
- **Man Hours**, needed to perform the Task
- **SPARE PARTS**, needed to perform the Task

Each R-PMS also provides:

- **SAFETY PRECAUTIONS**, to be followed to safely accomplish the Task
- **TOOLS**, including Special Tools and Test Equipment needed to accomplish the Task **CONSUMABLES**, required to accomplish the Task and consistent with those used by MTA
- **PROCEDURE**, consisting of **Preliminary Operations** and **Procedural Steps**,to be followed while performing Maintenance Tasks
- **Illustrations** and **Pictures** are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure

05-III-03.03.01 Running- Preventive Maintenance Sheet (R-PMS) Form

The R-PMS Form (refer to Figure 05-III-03.2) consists of several fields containing the following data/ information:

RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form			
ITEM #	**TITLE**	**CONTENT**	**EXPLANATORY NOTES**
1	**Card code**	**Sheet code**	The Sheet Code is an alphanumerical code that identifies each R-PM Sheet. **THE SHEET CODE IS THE EXPLICIT LINK BETWEEN R-PM MATRIXES, R-PMR /JOB CARDS AND R-PM SHEETS** The Sheet Code consists of letters R-P followed by an 11 digit code number as follows: **R-P-nn-mm-zz-ww/Y-kk** **R = R**unning **P= P**reventive **nn** may vary from 02 to 19, identifying the System/ Manual Section number. **mm-zz-ww** each one may vary from 00 to 99, according to AB System Functional Tree, allowing the identification of the Assembly/Unit/Component **Y** Maintenance Task Code. It may be one of the following: **C=C**leaning **I =I**nspection **L = L**ubrication **R=R**eplacement **S=S**ervice **T=T**est **kk** It may vary from 00 to 99. It is a progressive number allowing the explicit identification of RPMS when one of the following cases occur: 1- same Maintenance Task pertaining to vehicle as a whole or to the same System/Subsystem/Assembly to be performed at same Maintenance Interval in different Vehicle Area (i.e Vehicle as a Whole DAILY Exterior /Interior INSPECTION) 2- same Maintenance Task pertaining to the same Assembly/Unit/Component to be performed at different Maintenance Intervals and for this reason consisting of different Maintenance Procedure
2	**System**	**System name**	This field indicates the System to which the Assembly/Unit/Component belongs.
3	**Subsystem/ Assembly**	**Subsystem/ Assembly name**	This field indicates the Subsystem/Assembly to which the Unit/Component belongs.
4	**Unit**	**Unit name**	This field indicates the Unit to which the Component belongs.
5	**Component**	**Component name**	This field indicates the Component the Maintenance Task is referring to
6	**Maintenance Task**	**Maintenance Task name**	This field indicates the Maintenance Task to be performed.
7	**Interval Miles**	**Number**	This field indicates the maintenance Interval Miles. It may be DAILY, 10,000 Miles, 30,000 Miles, 60,000 Miles, 120,000 Miles

RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form (cont'd)			
ITEM #	**TITLE**	**CONTENT**	**EXPLANATORY NOTES**
8	**Man Hours**	**Number**	The Man Hour field indicates the time needed to perform the corresponding Maintenance Task, with the basic assumption that the Vehicle is staged on an Inspection Pit/Jacking tracks with the required Consumables, Tools And Materials Available.
9	**Sheet**	**Pages numbering**	This field indicates the progressive R-PMS sheet page number.
10	**LOCATION**	**Illustration**	This field indicates the On Board Location of the Equipment to be maintained The following Graphic Symbols are used for: Assembly/Unit/Component for System/Subsystem/Vehicle as a Whole
11	**R**	**Letter**	This field indicates that the Sheet pertains to Running Maintenance
12	**P**	**Letter**	This field indicates that the Sheet pertains to Preventive Maintenance
13	**nn**	**Number**	This field indicates the System/Manual Section number to which the Sheet pertains. It may vary from 01 to 19
14	**rr**	**Number**	This field indicates the Sheet Revision number
15	**Page ##**	**Page ##**	This field indicates the RMSM Section Page number
16	**-#**	**Number**	This field indicates the RMSM Section Revision number
17	**SAFETY PRECAUTIONS**	**Text**	This field presents the General and/or specific Safety Precautions to be followed to accomplish safely the relevant Maintenance Tasks.
18	**TOOLS**	**Text**	This field lists the description and the P/N of the Standard tools, Special Tools and Test Equipment needed to accomplish the Maintenance Task. Refer to the TTE Manual for the TE and Special Tools detailed descriptions and tools maintenance.
19	**CONSUMABLES**	**Text**	This field lists the Consumables Materials (consistent with those used by MTA with the related P/N.) needed to accomplish the Maintenance Task. Cleaning agents are included
20	**SPARE PARTS**	**Text**	This field lists the Description and PN of Spare Parts (consistent with Illustrated Parts Catalog) needed to accomplish the Maintenance Task.
21	**PROCEDURE**	**Text**	The Procedure field provides Preliminary Operations and Procedural step by step Instructions to be followed while performing the Maintenance Task. Illustrations and Pictures are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step

Figure 05-III-03.2 R-PMS Form (Sheet 1 of 2)

LACMTA P2550 LRV
Running Maintenance and Servicing Manual - Section 01

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-nn-mm-zz-ww/Y-kk

System:
Sheet: x/z
Subsystem/Assy:
Unit:
Component:
Man Hours:
Maintenance Task:
Interval/Miles:

SAFETY PRECAUTIONS:

TOOLS:

CONSUMABLES:

SPARE PARTS:

PROCEDURE:

PRELIMINARY OPERATIONS

Page 01-2
Draft

Metro

R	P	nn	rr

Figure 05-III-03.2 R-PMS Form (Sheet 2 of 2)

05-III-03.03.02 How to Use the R-PM Sheets and R-PMR /Job Cards

To optimize the job organization, proceed as follows:

1. **At Scheduled Preventive Maintenance Interval Expiration Date**
   a) Use the relevant (Maintenance Interval) R-PMR/JOB CARD where the Subsystems/Assemblies/Units/Components, listed in the ITEMS column, are grouped by Work Area and Vehicle System and sequenced, in alphabetical order, in conjunction with their On Vehicle Location and Task to be performed.
   b) Select the Work Area and the System
   c) Select the first Equipment listed in the ITEMS column and the Sheet Code listed in conjunction with the Task to be performed and gather the relevant Sheet
   d) Read carefully the Sheet to fully understand the provided Data/Instructions.
   e) Carefully read:
      - The Safety Precautions to perform the Task safely
      - The Preliminary Operations to set the Vehicle in safety conditions according to MTA Maintenance Shop Regulations
      - The Tools, Consumables and Spare Parts listed in each Sheet which are needed to accomplish the Task, in order to have all of them available next to the location of the Equipment to be maintained before starting the activities
   f) Fill the R-PMR/JOB CARD with the data required by the Maintainer at the start of the Maintenance Activities

2. **Task Execution**
   a) Follow carefully the prescribed Safety Precautions and Maintenance Procedural Steps provided in the R-PM Sheet.
   b) Perform the Maintenance Task Procedure on the first Equipment (listed in the ITEMS column of the relevant R-PMR /JOB CARD) at its On Vehicle LOCATION. as indicated in the LOCATION column of the R-PMR /JOB CARD.
   c) Upon completing the Maintenance Task on the first Equipment highlight (with a flag) its LOCATION field on the R-PMR / JOB CARD.
   d) Note Equipment Defect Found and / or your Comments on the End Page of the R-PMR / JOB CARD
   e) Proceed to perform the same Task on the second (same) Equipment listed in the R-PMR / JOB CARD at its On Vehicle LOCATION, (different from the previous one) as indicated in the LOCATION column of the R-PMR /JOB CARD.
   f) Proceed as above to perform the same Task on every Equipment (to which the same Sheet Code refers) listed in the ITEMS column of the relevant (Maintenance Interval) R-PMR /JOB CARD.
   g) During Task execution, note any Areas / Items of the Assembly / Unit/ Component under Preventive Maintenance Process requiring Corrective Maintenance.
   h) Gather as much information about the Equipment as is practical to increase your Equipment knowledge (i.e.; knowledge about the malfunction in terms of correctly operating and incorrectly operating equipment processes).

3. At every Task Completion

a) Follow carefully the prescribed Safety Precautions before restoring Electrical Power to Vehicle.

b) Check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.

c) Perform this check on the IDU “A “as follows:

NOTE: Through the IDU you can check if all Systems are exchanging data through the MVB or LonWorks Bus and the Trainlines Status.
The IDU Display also shows in real time the Status of all Vehicle Systems.
Reading the IDU Fault List it is possible to immediately detect a fault
Using the IDU in the Operating Mode the Fault Indications are generic,
Using the IDU in Maintenance Mode the same Fault has a detailed description.

For more in depth troubleshooting use the PTU connected to the relevant system that requires further troubleshooting.

1. On IDU “A” access to the Maintenance Menu first and then to the “Faults” Screen by selecting, in sequence, the relevant icons.
2. Check, On IDU “A” through the list of the Current Active Faults shown in the “Faults” Screen, for “Fault” Codes related to the Subsystem to which the maintained Equipment pertains.

   Refer to Section 18 of RMSM for Fault Signals Details.
3. As per “Fault” Codes check results proceed as follows:

- **No Faults are listed in the “Faults” Screen**

  a) Key OFF the Vehicle.

  b) Record Service and Test results on the Defect Report Card for administrative and maintenance planning.

  c) Fill the R-PMR /JOB CARD with the data required to the Maintainer at the completion of the Maintenance Activities and include your comments

- **Fault Codes are listed in the "Faults" Screen**

a) Investigate/troubleshoot the Equipment previously maintained first and then the System/Subsystem/Assembly/Unit for Fault Probable Causes

b) Gather as much information about the failure symptoms as is practical.

c) Refer to Section 18 of RMSM for Fault Signals Details

d) Try to identify the malfunction in terms of correctly operating and incorrectly operating equipment processes.

e) Identify which equipment signals or parameters will best help you to localize the failure.

f) Identify the source of the problem.

g) Repair or replace the defective component.

h) Verify that the repair is effective in eliminating all of the failure symptoms.

i) Evaluate whether or not the defective component was the root cause of the failure.

j) Once the Fault Codes are not found in the "Faults" Screen perform steps from 3-a through 3-c (previous subparagraph **"No Faults are listed in the "Faults" Screen)**

05-III-03.03.03 Running- Preventive Maintenance Sheet (R-PMS) List

The HVAC Running- Preventive Maintenance Sheets (R-PMS) List is provided in the following pages

The R-PM Sheets are listed by Subsystem / Assembly / Unit / Component and sequenced by Maintenance Interval in conjunction with their Sheet Codes and Tasks (including SCPM flag) to be performed

Table 05-III-03.3 Running Preventive Maintenance Sheets List

SYSTEM 05 HEATING, VENTILATION & AIR CONDITIONING					
SUBSYSTEM/ ASSY	ASSY /UNIT/ COMPONENT	SCPM	TASK	MAINTEN. INTERVAL (MILES)	SHEET CODE
CLIMATE CONTROL UNIT	SAFETY PRECAUTIONS				R-P-05-00-00-00/SP-00
CLIMATE CONTROL UNIT	AIR FILTER		REPLACEMENT	30,000	R-P-05-01-12-00/R-00
CLIMATE CONTROL UNIT	CLIMATE CONTROL UNIT	☑	INSPECTION	60,000	R-P-05-01-00-00/I-00
CLIMATE CONTROL UNIT	CLIMATE CONTROL UNIT		TEST	60,000	R-P-05-01-00-00/T-00
CLIMATE CONTROL UNIT	CONDENSER COIL		CLEANING	60,000	R-P-05-01-15-00/C-00
CLIMATE CONTROL UNIT	EVAPORATOR COIL		CLEANING	60,000	R-P-05-01-16-00/C-00
CLIMATE CONTROL UNIT	FRESH AIR INTAKE		INSPECTION	60,000	R-P-05-01-23-00/I-00
CLIMATE CONTROL UNIT	HEATERS ASSEMBLY	☑	INSPECTION	120,000	R-P-05-01-14-00/I-00
CLIMATE CONTROL UNIT	AIR DAMPER		INSPECTION	120,000	R-P-05-01-17-00/I-00
CLIMATE CONTROL UNIT	REFRIGERANT LINES		INSPECTION	120,000	R-P-05-01-24-00/I-00
CLIMATE CONTROL UNIT	DRAIN PAN / LINES		CLEANING	120,000	R-P-05-01-25-00/C-00
CLIMATE CONTROL UNIT	ELECTRICAL PLANT EQIPMENT	☑	INSPECTION	120,000	R-P-05-02-00-00/I-00
CLIMATE CONTROL UNIT	CONTROL BOX	☑	INSPECTION	120,000	R-P-05-02-26-00/I-00

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HEATING, VENTILATION & AIR CONDITIONING

Running - Preventive Maintenance Sheets

R-PMS

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P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-00-00-00/SP-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy:	Unit:
Component:	Man Hours:
Maintenance Task: **SAFETY PRECAUTIONS**	Interval/Miles:

PROCEDURE:

WARNING: BLUE FLAG THE VEHICLE IN ACCORDANCE WITH ALL LACMTA BLUE FLAG POLICIES, RULES, & PROCEDURES IN ORDER TO WARN THAT MAINTENANCE PERSONNEL ARE WORKING ON, UNDER, OR NEAR ROLLING EQUIPMENT.

WARNING: DANGER OF PERSONAL INJURY EXISTS DUE TO ELECTRICAL POWER. (750 V) ENSURE CATENARY POWER IS REMOVED AND ISOLATED PER LACMTA SAFETY RULES AND PROCEDURES. IF POSSIBLE, WORK SHOULD BE DONE IN AN AREA WITHOUT OVERHEAD CATENARY. DANGER OF PERSONAL INJURY EXISTS DUE TO THE WORKING ON ROOF. FOLLOW SAFETY PROCEDURES FOR ACCESSING ROOF. ALWAYS WEAR A SAFETY HARNESS WHEN ACCESSING THE ROOF.

WARNING: WHEN SERVICING OR REPAIRING AN AIR CONDITIONING UNIT, THE POSSIBILITY OF SERIOUS OR EVEN FATAL INJURY FROM ELECTRICAL SHOCK EXISTS. EXTREME CARE MUST BE USED WHEN WORKING WITH A AIR CONDITIONING UNIT THAT IS CONNECTED TO A SOURCE OF OPERATING POWER, EVEN IF THE UNIT IS NOT RUNNING. LETHAL VOLTAGE POTENTIALS CAN EXIST AT THE UNIT POWER CORD, INSIDE THE CONTROL BOX, AT THE MOTORS, AT ANY JUNCTION BOX AND WITHIN THE WIRING HARNESSES.

WARNING: CONTROL CIRCUITS ARE LOW VOLTAGE. THIS VOLTAGE POTENTIAL IS NOT CONSIDERED DANGEROUS, BUT THE LARGE AMOUNT OF CURRENT AVAILABLE (OVER 30 AMPERES) CAN CAUSE SEVERE BURNS IF SHORTED TO GROUND. DO NOT WEAR JEWELRY, WATCH OR RINGS. THESE ITEMS CAN SHORT OUT ELECTRICAL CIRCUITS AND CAUSE SEVERE BURNS TO THE WEARER.

WARNING: ALWAYS WEAR GOGGLES OR SAFETY GLASSES. REFRIGERANT LIQUID AND BATTERY ACID CAN PERMANENTLY DAMAGE THE EYES

WARNING: NEVER CLOSE THE COMPRESSOR DISCHARGE VALVE WITH THE UNIT IN OPERATION. NEVER OPERATE THE UNIT WITH THE DISCHARGE VALVE CLOSED.

WARNING: KEEP YOUR HANDS, CLOTHING AND TOOLS CLEAR OF THE FANS WHEN THE AIR CONDITIONING UNIT IS RUNNING. IF IT IS NECESSARY TO RUN THE AIR CONDITIONING UNIT WITH COVERS REMOVED, BE VERY CAREFUL WITH TOOLS OR METERS BEING USED IN THE AREA.

WARNING: BE SURE THE GAUGE MANIFOLD HOSES ARE IN GOOD CONDITION. NEVER LET THEM COME IN CONTACT WITH A FAN MOTOR BLADE OR ANY HOT SURFACE.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE (CONT'D):

WARNING: THE FLUOROCARBON REFRIGERANTS, IN PRESENCE OF AN OPEN FLAME OR ELECTRICAL ARC, PRODUCE TOXIC GASES THAT ARE SEVERE RESPIRATORY IRRITANTS CAPABLE OF CAUSING DEATH. NEVER APPLY HEAT TO A SEALED AIR CONDITIONING SYSTEM OR CONTAINER.

WARNING: USE EXTREME CAUTION WHEN DRILLING HOLES IN THE UNIT. THE HOLES MAY WEAKEN STRUCTURAL COMPONENTS. HOLES DRILLED INTO ELECTRICAL WIRING CAN CAUSE FIRE OR EXPLOSION. HOLES DRILLED INTO THE AIR CONDITIONING SYSTEM MAY RELEASE REFRIGERANT.

WARNING: USE CAUTION WHEN WORKING, AROUND EXPOSED COIL FINS. THE FINS CAN CAUSE PAINFUL LACERATIONS. USE CAUTION WHEN WORKING WITH A REFRIGERANT OR AIR CONDITIONING SYSTEM IN ANY CLOSED OR CONFINED AREA WITH A LIMITED AIR SUPPLY. REFRIGERANT TENDS TO DISPLACE AIR AND CAN CAUSE OXYGEN DEPLETION, RESULTING IN SUFFOCATION AND POSSIBLE DEATH.

WARNING: USE TOOLS WITH INSULATED HANDLES THAT ARE IN GOOD CONDITION. NEVER HOLD METAL TOOLS IN YOUR HAND IF EXPOSED, ENERGIZED CONDUCTORS ARE WITHIN REACH.

WARNING: DO NOT MAKE ANY RAPID MOVES WHEN WORKING ON HIGH VOLTAGE CIRCUITS. IF A TOOL OR OTHER OBJECT FALLS, DO NOT ATTEMPT TO GRAB IT. PEOPLE DO NOT CONTACT HIGH VOLTAGE WIRES ON PURPOSE. IT OCCURS FROM AN UNPLANNED MOVEMENT.

WARNING: TREAT ALL WIRES AND CONNECTIONS AS HIGH VOLTAGE UNTIL A METER AND WIRING, DIAGRAM SHOW OTHERWISE.

WARNING: NEVER WORK ALONE ON HIGH VOLTAGE CIRCUITS ON THE AIR CONDITIONING UNIT. ANOTHER PERSON SHOULD ALWAYS BE STANDING BY IN THE EVENT OF AN ACCIDENT TO SHUT OFF THE AIR CONDITIONING UNIT AND TO AID A VICTIM.

WARNING: HAVE ELECTRICALLY INSULATED GLOVES, CABLE CUTTERS AND SAFETY GLASSES AVAILABLE IN THE IMMEDIATE VICINITY IN THE EVENT OF AN ACCIDENT.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**4/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE (CONT'D):

CAUTION :SERVICING OF UNITS WITH A MICROPROCESSOR CONTROLLER

PRECAUTIONS MUST BE TAKEN TO PREVENT ELECTROSTATIC DISCHARGE WHEN SERVICING THE MICROPROCESSOR CONTROLLER AND RELATED COMPONENTS.

IF THESE PRECAUTIONARY MEASURES ARE NOT FOLLOWED, THE RISK OF SIGNIFICANT DAMAGE TO THE ELECTRONIC COMPONENTS OF THE UNIT IS POSSIBLE.

- THE PRIMARY RISK POTENTIAL RESULTS FROM THE FAILURE TO WEAR ADEQUATE ELECTROSTATIC DISCHARGE PREVENTIVE EQUIPMENT WHEN HANDLING AND SERVICING THE MICROPROCESSOR
- THE SECOND CAUSE RESULTS FROM ELECTRIC WELDING ON THE UNIT AND CONTAINER CHASSIS WITHOUT TAKING PRECAUTIONARY STEPS

CAUTION :CONTROLLER REPAIR

WHEN SERVICING THE MICROPROCESSOR CONTROLLER, IT IS NECESSARY TO ENSURE THAT ELECTROSTATIC DISCHARGES ARE AVOIDED.

POTENTIAL DIFFERENCES CONSIDERABLY LOWER THAN THOSE WHICH PRODUCE A SMALL SPARK FROM A FINGER TO A DOOR KNOB CAN SEVERELY DAMAGE OR DESTROY SOLID-STATE INTEGRATED CIRCUIT COMPONENTS.

THE FOLLOWING PROCEDURES MUST BE RIGIDLY ADHERED TO WHEN SERVICING THESE UNITS TO AVOID MICROPROCESSOR DAMAGE OR DESTRUCTION.

1. DISCONNECT ALL POWER TO THE UNIT.
2. AVOID WEARING CLOTHING THAT GENERATES STATIC ELECTRICITY (WOOL, NYLON, POLYESTER, ETC.).
3. DO WEAR A STATIC DISCHARGE WRIST STRAP WITH THE LEAD END CONNECTED TO THE MICROPROCESSOR'S GROUND TERMINAL. THESE STRAPS ARE AVAILABLE AT MOST ELECTRONIC EQUIPMENT DISTRIBUTORS. DO NOT WEAR THESE STRAPS WITH POWER APPLIED TO THE UNIT.
4. AVOID CONTACTING THE ELECTRONIC COMPONENTS ON THE CIRCUIT BOARDS OF THE UNIT BEING SERVICED.
5. LEAVE THE CIRCUIT BOARDS IN THEIR STATIC PROOF PACKING MATERIALS UNTIL READY FOR INSTALLATION.
6. IF A DEFECTIVE MICROPROCESSOR IS TO BE RETURNED FOR REPAIR, IT SHOULD BE RETURNED IN THE SAME STATIC PROTECTIVE PACKING MATERIALS FROM WHICH THE REPLACEMENT COMPONENT WAS REMOVED.
7. AFTER SERVICING THE CIRCUIT BOARD AND ANY OTHER CIRCUITS, THE WIRING SHOULD BE CHECKED FOR POSSIBLE ERRORS BEFORE RESTORING POWER.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE (CONT'D):

CAUTION :WELDING OF UNITS OR RAIL CAR

WHENEVER ELECTRIC WELDING IS TO BE PERFORMED ON ANY PORTION OF THE AIR CONDITIONING UNIT, UNIT CHASSIS OR RAIL CAR WITH THE AIR CONDITIONING UNIT ATTACHED, IT IS NECESSARY TO ENSURE THAT WELDING CURRENTS ARE NOT ALLOWED TO FLOW THROUGH THE ELECTRONIC CIRCUITS OF THE UNIT.

THESE PROCEDURES MUST BE RIGIDLY ADHERED TO WHEN SERVICING THESE UNITS TO AVOID DAMAGE OR DESTRUCTION.

1. DISCONNECT ALL POWER TO THE AIR CONDITIONING UNIT.

2. DISCONNECT THE CHASSIS GROUND LEADS CONNECTED TO THE MICROPROCESSOR'S "GRND" TERMINALS (WIRES LABELED "CH"). SECURE THESE LEADS TO PREVENT THEM FROM CONTACTING THE MICROPROCESSOR.

3. SWITCH ALL OF THE ELECTRICAL CIRCUIT BREAKERS IN THE CONTROL BOX TO THE OFF POSITION.

4. WELD UNIT AND/OR CONTAINER PER NORMAL WELDING PROCEDURES. KEEP AROUND RETURN ELECTRODE AS CLOSE TO THE AREA TO BE WELDED AS PRACTICAL. THIS WILL REDUCE THE LIKELIHOOD OF STRAY WELDING CURRENTS PASSING THROUGH ANY ELECTRICAL OR ELECTRONIC CIRCUITS.

5. WHEN THE WELDING OPERATION IS COMPLETED, THE UNIT POWER CABLES, WIRING AND CIRCUIT BREAKERS MUST BE RESTORED TO THEIR NORMAL CONDITION.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-00-00-00/SP-00

System:
HEATING VENTILATION & AIR CONDITIONING

Sheet: **6/6**

Subsystem/Assy:

Unit:

Component:

Man Hours:

Maintenance Task:
SAFETY PRECAUTIONS

Interval/Miles:

1 PRELIMINARY OPERATIONS

a. Set the Vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations
b. Lock-out and tag-out the Overhead Catenary, 750Vdc Power, per LACMTA Safety Rules and Procedures

NOTE The tag must indicate the name of the person who removed Power.
That person knows why the Power was removed and when it safe to restore it.
Only the individual whose name appears on the tag or a person with his approval should remove the tag and restore Power.

c. Before attempting any operation (with the exception of the CCU Test), switch to OFF position the Circuit Breakers indicated in the following Table 1:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

d. Access Vehicle Roof according to MTA Procedures.
e. Follow the Safety Precautions previously listed
f. Remove the CCU Cover(s) to gain access to the CCU Control Panel and / or Components

2 MAINTENANCE OPERATIONS

a. Perform the Task and follow the Specific Safety Precautions as indicated in each relevant Maintenance Sheet

3 FINAL OPERATIONS

a. Record Task Results on the Defect Report Card for administrative and maintenance planning
b. Make sure that the CCU SWT Switch is to AUTO position
c. Install the CCU Cover(s)
d. Remove Tools, Cleaners and Rags (used during Maintenance Operations) from the Vehicle Roof
e. Leave the Vehicle Roof according to MTA Procedures
f. Restore Power to Catenary or relocate Vehicle to an area where there is Overhead Catenary. power supplied
g. Restore Power to CCU by switching to ON position the Circuit Breakers indicated in the Table 1
h. Leave the Vehicle in safety condition as prescribed by LACMTA Maintenance Shop Regulations

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.

Refer to **HOW TO USE THE R-PM SHEETS** (para 05-III-03-03-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion".**

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-12-00/R-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR FILTERS**
Component:	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles: **30,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-12-00/R-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR FILTERS**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
REPLACEMENT	**30,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

FRESH AIR FILTER (MASTER)	P/N	92-2819	
RETURN AIR FILTER	P/N	096290	AA04BA2

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-12-00/R-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR FILTERS**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
REPLACEMENT	**30,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET	
Card Code: **R-P-05-01-12-00/R-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR FILTERS**
Component:	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles: **30,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00.

2 REPLACEMENT (REFER TO FIG 2)

2.1 FRESH AIR FILTERS

a. Remove the Water Eliminator Cover (5).
b. Remove the Filter Element from its Holder.
c. Note any item requiring Corrective Maintenance.
d. Check that Drainage Piping Holes of Water Eliminator are free of dirt and check that water can flow correctly through the Holes.
e. Using a Flashlight , check for no water inside.
f. Install new Filter Element.

NOTE: Make sure that the Filter fits properly in its Seat to avoid that Air Flow bypass around Filter.

g. Install the Water Eliminator Cover.

2.2 RETURN AIR FILTER (REFER TO FIG 3)

a. Remove the Air Return Filter from Mounting Channel.

NOTE: Use care when removing dirty filters from the mounting channels.

b. Note any Item requiring Corrective Maintenance.
c. Install new Air Return Filter.
d. Secure the Filter by installing new Spring Loaded Retainers.
e. Install the Return Grille and secure it by its relevant Latches.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-12-00/R-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR FILTERS**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
REPLACEMENT	**30,000**

PROCEDURE (CONT'D):

1.	Frame - Filter Unit	2.	Eliminator - Water	3.	Filter - Air (Master)
4.	Filter - Air (Aux)(Not Installed)	5.	Roof - Filter Unit	6.	Screw - Roof
7.	Washer - Special	8.	Nut - Speed	9.	Cover - Side
10.	Insulation	11.	Strip - Neoprene	12.	Strip - Neoprene
13.	Strip - Neoprene	14.	Extrusion - Rubber	15.	Nameplate - No Step

FIGURE 2 - AIR FILTERS REPLACEMENT

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-12-00/R-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR FILTERS**
Component:	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles: **30,000**

PROCEDURE (CONT'D):

FIGURE 3 RETURN AIR GRILLE -RETURN AIR FILTER REPLACEMENT

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **2**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-00-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **2**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: HIGH PRESSURE AIR OR WATER SPRAY CAN DAMAGE CONDENSER AND EVAPORATOR COILS. USE CARE WHEN SPRAYING COILS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

VACUUM CLEANER
ELECTRONIC LEAK DETECTOR
PTU AND SERVICE SOFTWARE

CONSUMABLES:

Detergent / Water Solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	2

Maintenance Task:	Interval/Miles:
INSPECTION	**60,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/I-00

System:
HEATING VENTILATION & AIR CONDITIONING

Sheet:
4/6

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:

Component:

Man Hours:
2

Maintenance Task:
INSPECTION

Interval/Miles:
60,000

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 INSPECTION

a. Perform the followings Tasks:

COMPONENT	TASK
All	**1.** Note any Item requiring Corrective Maintenance **2.** Replace damaged / worn Parts and/or Hardware as necessary. **3.** Replace any Parts that are cracked or show sign of overheating. **4.** Check loose or missing and mounting Hardware. Tighten or replace as necessary
Controller	**1.** Download CCU Operating Data from the Data Download Panel using a PTU and Service Software according to Sheet R-P-05-01-00-00/T-00 Step 2.2 and detailed in Paragraph 05-II-02.02 of this Section
CCU	**1.** Perform a Functional Check of the HVAC System using a PTU and Service software according to Sheet R-P-05-01-00-00/T-00 Step 2.1and detailed in Paragraph 05-II-02.02 of this Section A complete functional Test includes: · Testing the Connection between Hardware and Software · Testing the Connection between the Microprocessor Controller and the Air Conditioning Unit (examination of carriage wiring) · Testing the Individual Functions of the A/C system
CCU Weldment	**1.** Visually inspect CCU Enclosure. **2.** Check for secure mounting on Vehicle Roof. **3.** Check condition of all Covers and Attaching Hardware. **4.** Clean debris accumulated on all Grilles.
Fresh Air Intake	**1.** Visually inspect to make sure the Fresh Air Intake is clean and free of debris (such as leaves, paper, etc.)
All Major Components	**1.** Visually inspect all major Components for loose, damaged or broken parts.
Condenser Coils	**1.** Inspect Coil and Coil Fin Surfaces for cleanliness. **2.** Vacuum clean any dirt or debris from the Coil. If necessary, clean with Low Pressure Compressed Air or recommended Detergent in water solution. **CAUTION:** HIGH PRESSURE AIR OR WATER SPRAY CAN DAMAGE CONDENSER AND EVAPORATOR COILS. USE CARE WHEN SPRAYING COILS.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	2

Maintenance Task:	Interval/Miles:
INSPECTION	**60,000**

PROCEDURE (CONT'D):

2 INSPECTION (CONT'D)

COMPONENT	TASK
Air Filters	**1.** Remove and replace Filters according to Sheet R-P-05-01-12-00/R-00
Wiring	**1.** Check integrity of all A/C Wiring to Car Electrical System. **2.** Repair or replace any worn or damaged Connections. **3.** Check Wiring Connectors on all three Pressure Switches.
CCU Control Panel	**1.** Vacuum any dust and debris from Box Interior. **2.** Inspect Electrical Connections for fraying or burned condition. **3.** Inspect Controller. Make sure it is securely mounted. **4.** Inspect Contactors and Relays. Make sure they are securely mounted. **5.** Check Contactor(s) for Voltage Drop/Imbalance across Contacts. Where voltage Drop/Imbalance is found (indicating High Resistance due to Contact Wear), replace the Contactor.
Refrigerant Lines	**1.** Check all Refrigerant Lines, Soldered Joints, and Pressure Switch Connections for Refrigerant Leaks using an Electronic Leak Detector.
All Major Components	**1.** Check Mounting Hardware on all major Components including Condenser and Evaporator Coils, Compressors, and Receiver Tank..
Condenser Fans	**1.** Clean any dirt and/or Oil accumulations from Fan Blades. **2.** Inspect for bent or broken Blades. **3.** Check for loose fit on Hub. **4.** Replace damaged Fan, or Hub. Make sure Hub fit is tight on Motor Shaft.
Condenser Fan Motors	**1.** Clean excessive dirt and /or Oil accumulation from Condenser Fan Motors. **2.** Check Motor Mounting for loose or missing Hardware. **3.** Tighten or replace Hardware as necessary. **4.** Rotate Motor Shaft by hand. Check for Bearing Noise, roughness or looseness. Replace damaged Motor. **5.** Check that the Cable Bushing and Cover Gasket of the Motor Power Supply Junction Box are watertight

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/I-00

System:
HEATING VENTILATION & AIR CONDITIONING

Sheet:
6/6

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:

Component:

Man Hours:
2

Maintenance Task:
INSPECTION

Interval/Miles:
60,000

PROCEDURE (CONT'D):

2 INSPECTION (CONT'D)

COMPONENT	TASK
Heater	**1.** Inspect the Heater. **2.** Inspect the Wiring Connections. **3.** Inspect the Thermal Switch.
Evaporator Blower Motor	**1.** Vacuum clean accumulations of dust and/or debris from Blower Motor. **2.** Check Motor Mounting Hardware. **3.** Rotate Motor Shaft by Hand. **4.** Check for Bearing Noise, roughness or looseness. **5.** Replace damaged Motor. **6.** Check that the Cable Bushing and Cover Gasket of the Motor Power Supply Junction Box are watertight
Evaporator Blowers	**1.** Carefully vacuum clean accumulations of dust and/or debris from Blower Wheels. Check Mounting Hardware. **2.** Check Fan Wheel Hubs for loose or missing Hardware. **3.** Rotate Blowers by hand. **4.** Determine if Blower Wheels are rubbing/chafing on housing. Adjust if necessary.
Evaporator Coil	**1.** Inspect Coil and Coil Fins Surface for cleanliness. **2.** Vacuum clean any dirty or debris from the Coil. **3.** If necessary, clean with Low Pressure Compressed Air or Detergent/water solution. **4.** Check for proper Drainage from Drain Pan **CAUTION:** HIGH PRESSURE AIR OR WATER SPRAY CAN DAMAGE COILS. USE CARE WHEN SPRAYING COILS
Drain Pan	**1.** Inspect Condenser and Evaporator Drain Pan Insulation for damage or signs of leaking. **2.** Replace Insulation as necessary.
Drain pipes	**1.** Ensure that the HVAC unit sides external Kazoos are trimmed properly and are not blocked and free of dirt and debris. This will prevent any clogging, thus the water retention inside the HVAC unit.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/T-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1**
Maintenance Task: **TEST**	Interval/Miles: **60,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-00-00/T-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1**
Maintenance Task: **TEST**	Interval/Miles: **60,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

WARNING: BEFORE PERFORMING MAINTENANCE PROCEDURES AND TOUCHING ANY COMPONENT, USE A RELIABLE HIGH VOLTAGE TEST PROBE TO VERIFY THAT NO VOLTAGE IS PRESENT.

CAUTION: THE INTERNAL PART OF THE KNIFE SWITCH COVER IS SHAPED IN SUCH A WAY THAT IT IS NOT POSSIBLE TO CLOSE IT IF THE SWITCH IS NOT IN "NORMAL" POSITION. FORCING IT TO CLOSE COULD RESULT SWITCH / COVER DAMAGE.

TOOLS:

PTU WITH TK SERVICE SW.

CONSUMABLES:

N/A

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/T-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
TEST	**60,000**

PROCEDURE:

To perform the Task, proceed as follows :

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-00-00/T-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1**
Maintenance Task: **TEST**	Interval/Miles: **60,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Set the Vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations
b. Access the CCU via the Ceiling Panel and Return Air Duct.

2 TEST

2.1 CCU TEST

NOTE: A Green Light indicates that the Control Voltage is functioning correctly and that the unit switch SWT is in the AUTO position.
A Red Light indicates a Fault. :
- Flashing Red means WARNING.
- Continuous Red means ALARM.

Use the PTU and Service Software for Fault Identification.
Refer to paragraph 05-II-02-02 of this Section

a. Place the SWT Switch to TEST position

NOTE : The Controller automatically performs an Automatic Check of the System Controls when the SWT Switch is placed in the TEST position
Any System Faults that occur are recorded in the Controller's Memory.

b. With the SWT Switch in the TEST position the Sequence of the Controller Operations is as follows:
- The Controller polls the control voltage input.
- If the control voltage input is **OK (37.5 VDC)**, the Controller proceeds to poll the Return Air
- Sensor Temperature.
- If the Return Air Temperature is above **13°C (55.4 °F)**, the Controller polls the Fresh (Outside) Air Sensor Temperature.
- If the Outside Air Temperature has been above **4.5 °C (40.1 °F)** for the last **30** minutes, the Controller initiates a sequence start of the A/C System on Full Cool after a delay of **5** seconds.
- The Controller will operate the Unit on Full Cool for **5** minutes.
- If the Outside Air Temperature has been below **4.5 °C (40.1 °F)** during the last **30** minutes, the Controller initiates a sequence start of the A/C system on the Ventilation (Evaporator Blower operation only) after a delay of **5** seconds.
- After 5 minutes, the Controller operates the Unit on Full Heat.
- When a Unit Self Test is complete, the Unit stops.

c. Place the SWT Switch to AUTO position

NOTE If the Unit appears to be operating incorrectly, use Service Software to download and view any Fault Codes that may be stored in the Controller Memory.
Diagnose and correct the problem associated with each Alarm Code
If you have viewed and corrected these problems and the Unit still appears to be operating incorrectly, eliminate any possibility that the problem is caused by failure of components other than the Controller.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-00-00/T-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
TEST	**60,000**

PROCEDURE (CONT'D):

2.2 CCU OPERATING DATA DOWNLOAD

a. Locate the Data Download Panel (ELE Locker A/B Sections)
b. Plug in the PTU RS-232 Plug to the Data Download Panel RS-232 Port Connector (12X01) as indicated below and start the PTU and the Application

A BODY SECTION DATA DOWLOAD PANEL

B BODY SECTION DATA DOWLOAD PANEL

c. Exit the Application, Shut down the PTU and then plug out the PTU from the Data Download Panel RS-232 Port Connector (12X01)

3 FINAL OPERATIONS

a. Record Task Results on the Defect Report Card for administrative and maintenance planning

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.
Refer to **HOW TO USE THE R-PM SHEETS** (para 05-III-03-03-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion".**

P2550 PREVENTIVE MAINTENANCE SHEET	
Card Code: **R-P-05-01-00-00/T-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1**
Maintenance Task: **TEST**	Interval/Miles: **60,000**

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P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-15-00/C-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER COIL**
Component:	Man Hours: **0.5**
Maintenance Task: **CLEANING**	Interval/Miles: **60,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-15-00/C-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER COIL**

Component:	Man Hours:
	0.5

Maintenance Task:	Interval/Miles:
CLEANING	**60,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: USE EXTRA CARE TO AVOID DAMAGE TO THE CONDENSER FINS WHILE CLEANING AROUND THE COILS USING A VACUUM OR HIGH PRESSURE STEAM CLEANER.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit
VACUUM CLEANER
STEAM CLEANER

CONSUMABLES:

Detergent / Water Solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-15-00/C-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER COIL**

Component:	Man Hours:
	0.5

Maintenance Task:	Interval/Miles:
CLEANING	**60,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-15-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER COIL**
Component:	Man Hours: **0.5**
Maintenance Task: **CLEANING**	Interval/Miles: **60,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 CLEANING

a. Vacuum clean upstream and downstream face of each Coil.

b. Blown out and clean with High Pressure Steam Cleaner. Spray from the inside of the coil outward (opposite direction of normal airflow).

CAUTION: USE EXTRA CARE TO AVOID DAMAGE TO THE CONDENSER FINS WHILE CLEANING AROUND THE COILS USING A VACUUM OR HIGH PRESSURE STEAM CLEANER.

FIGURE 2 - CONDENSER COIL CLEANING

c. Check for obvious defects such as dents or bent Coil Fins.

d. Straighten minor Fin damage

e. Clean Condenser Coils and Fins thoroughly using a mild detergent cleaning mixture (liquid cleaner and hot water).

NOTE: The entire surface of each Coil should be washed, paying special attention to the areas between the Coil Fins. Care must be taken to confine the spray to the Condenser only.

f. Hold the Nozzle End of Pressure Cleaner Gun at an angle (30 to 90 degrees) to surface to be cleaned to obtain maximum scouring action while washing.

g. After washing, rinse Condenser Coil thoroughly with clean water.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-16-00/C-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR COIL**
Component:	Man Hours: **0.5**
Maintenance Task: **CLEANING**	Interval/Miles: **60,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-16-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR COIL**
Component:	Man Hours: **0.5**
Maintenance Task: **CLEANING**	Interval/Miles: **60,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: USE EXTRA CARE TO AVOID DAMAGE TO THE EVAPORATOR COIL FINS WHILE CLEANING AROUND THE COILS USING A VACUUM OR HIGH PRESSURE STEAM CLEANER.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Steam Cleaner
Vacuum Cleaner

CONSUMABLES:

Detergent / Water Solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-16-00/C-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR COIL**

Component:	Man Hours:
	0.5

Maintenance Task:	Interval/Miles:
CLEANING	**60,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-16-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR COIL**
Component:	Man Hours: **0.5**
Maintenance Task: **CLEANING**	Interval/Miles: **60,000**

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 CLEANING

a. Remove excessive dirt around Evaporator Coils using a Steam Cleaner

CAUTION: USE EXTRA CARE TO AVOID DAMAGE TO THE EVAPORATOR COIL FINS WHILE CLEANING AROUND THE COILS USING A VACUUM OR HIGH PRESSURE STEAM CLEANER.

FIGURE 2 - EVAPORATOR COIL CLEANING

b. Check for obvious defects such as dents or bent Coil Fins.

c. Straighten minor Fin damage

d. Clean thoroughly Evaporator Coils and Fins using the Pressure Hose and a cleaning mixture (cleaner and hot water). If accumulation of caked dirt, leaves etc. exists, use a long Bristled Brush, and water to wash off any accumulation.

NOTE: The entire surface of each Coil should be washed, paying special attention to the areas between the Coil Fins.
Care must be taken to confine the spray to the Evaporator only.

e. Hold the Nozzle End of Pressure Cleaner Gun at an angle (30 to 90 degrees) to surface to be cleaned to obtain maximum scouring action while washing. Spray from the inside of the coil outward (opposite direction of normal airflow)

f. After washing, rinse Evaporator Coil thoroughly with clean water and dry with soft, fluff proof cleaning rags

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-23-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FRESH AIR INTAKE**
Component:	Man Hours: **0.3**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-23-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FRESH AIR INTAKE**
Component:	Man Hours: **0.3**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

Detergent / Water Solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-23-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**FRESH AIR INTAKE**

Component:	Man Hours:
	0.3

Maintenance Task:	Interval/Miles:
INSPECTION	**60,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-23-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FRESH AIR INTAKE**
Component:	Man Hours: **0.3**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 INSPECTION

a. Check condition of the Top and Side Covers of the Water Eliminator and Air Fresh Filters Housing.
b. Check Name Plates on Covers for damage / loosening / missing. Repair / replace as per check result.
c. Check Top and Side Water Eliminator and Air Fresh Filters Housing Covers attaching Hardware for damage / loosening / missing. Repair / replace as per check result.
d. Check Water Eliminator Grille and Gasket for damage / loosening missing Hardware
e. Clean debris accumulated on Water Eliminator Grille using recommended detergent / water solution.
f. Remove the Water Eliminator and Air Fresh Filters Housing Covers.
g. Check Top Water Eliminator and Air Fresh Filter Housing Cover Insulation for damage / missing. Repair / replace as per check result.
h. Check that both types of the Filter Elements are free of dirt. As per check result clean Filter(s) or replace according to Sheet R-P-05-01-12-00/R-0.
i. Check that each Filter fits properly in its Seat to avoid that Air Flow bypass around Filter.
j. Note any item requiring Corrective Maintenance.
k. Replace any bent or otherwise damaged Support/Hold Down Retainers
l. Check that Drainage Piping Holes of Water Eliminator are free of dirt and check that water can flow correctly through the Holes.

NOTE: If necessary remove debris first using Vacuum Cleaner or a Pig (a Brush to be pulled and pushed through the Pipe).
Then blow out Piping with High Pressure Steam Cleaner and use applicable detergent Product.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-23-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**FRESH AIR INTAKE**

Component:	Man Hours:
	0.3

Maintenance Task:	Interval/Miles:
INSPECTION	**60,000**

PROCEDURE (CONT'D):

1.	Frame - Filter Unit	2.	Eliminator - Water	3.	Filter - Air (Master)
4.	Air Filter (Aux) (Not Installed))	5.	Roof - Filter Unit	6.	Screw - Roof
7.	Washer - Special	8.	Nut - Speed	9.	Cover - Side
10.	Insulation	11.	Strip - Neoprene	12.	Strip - Neoprene
13.	Strip - Neoprene	14.	Extrusion - Rubber	15.	Nameplate - No Step

FIGURE 2 - FRESH AIR INTAKE INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-23-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FRESH AIR INTAKE**
Component:	Man Hours: **0.3**
Maintenance Task: **INSPECTION**	Interval/Miles: **60,000**

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P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-14-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATERS ASSEMBLY**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-14-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATERS ASSEMBLY**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: LOOSE CONNECTIONS WILL CAUSE TERMINAL TO OVERHEAT AND CAUSE DAMAGE AND OR FIRE.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

MULTIMETER

CONSUMABLES:

N/A

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-14-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HEATERS ASSEMBLY**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET	
Card Code: **R-P-05-01-14-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATERS ASSEMBLY**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 INSPECTION

a. Using a Multimeter, double check that Heater Coil is really opened.
b. Check overall Heater installation. Replace damaged parts as per check result
c. Check the Water Barrier for proper hardware installation and sealant integrity.(refer to Fig 3)
d. Inspect cable/connection integrity.
e. Note any Item requiring Corrective Maintenance
f. Using a Multimeter, check Heater Resistance for proper design value of **35-36 Ohms**

NOTE : If Heater Resistance reads 35-36 Ohms, the Heater is OK.

g. Check the Overhead Heat Protection Thermostat for damage /sign of overheating. Replace as per check result.
h. Check Wiring Connections to Heater Terminals for damage /sign of overheating / tightness.

CAUTION: LOOSE CONNECTIONS WILL CAUSE TERMINAL TO OVERHEAT AND CAUSE DAMAGE AND OR FIRE.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-14-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HEATER ASSEMBLY**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE (CONT'D):

1. Heater
2. Thermostat (90 ° C)
3. Thermostat (120 °C)
4. Insulation
5. Terminal Board -
6. Harness - Heater Power Outlet
7. Harness - LV Control
8. Harness - Heater Connection
9. - Cable Bushing

FIGURE 2 - HEATER INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-14-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSEMBLY**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

FIGURE 3 - HEATER WATER BARRIER INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-17-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-17-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Vacuum Cleaner

CONSUMABLES:

Detergent/Water Solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-17-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/10**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR DAMPER**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-17-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Set the Vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations
b. Remove Power from Overhead Catenary or relocate Vehicle to an area where there is no Overhead Catenary.
c. Supply Power to Vehicle as follows:

1. Gain access to the Knife Switch Box by opening the relevant Skirt using a Maintenance Key.

2. Open the Knife Switch Box by unlocking the relevant Safety Locks using a Maintenance Key.

3. Lift the Cover from its Upper Hinges and remove it..

4. Place the Knife Switch Handle to SHOP position.

5. Connect the Workshop Power Plug to the Vehicle Shop Power Socket.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-17-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/10**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR DAMPER**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

2 INSPECTION

NOTE : The Task should be performed by Two Technicians :

Tech #1 on the Roof, CCU Location

Tech#2 in the Cab

The Technicians should be equipped with Shop Portable Radio Transceivers as walkie-talkie

Tech #1(CCU)

a. Access Vehicle Roof according to MTA Procedures.
b. Follow the Safety Precautions according to Sheet R-P-05-00-00-00/SP-00
c. Establish communication with Tech # 2

Tech#2 (Cab)

a. Enter the “A” Cab
b. Key on the Vehicle
c. Confirm communication with Tech # 1

Tech #1(CCU)

a. Remove the “ A “ CCU Water Eliminator & Air Dampers Housing Covers to gain access to the Damper assembly.
b. Check that the default position of the Damper is open.
c. Check the Damper overall installation. Adjust / replace Items as per checks result.
d. Check Damper Actuator Seat and Blades for presence of dirt / debris. Clean as per check result using Vacuum Cleaner and / or recommended Detergent and cleaning rags.
e. Note any Item requiring Corrective Maintenance. Replace as per check result.
f. Check Damper Rods for damage, deformation, loose /missing hardware.
g. Check Wiring Leads for secure connection to Actuator Terminals.
h. Check Actuator Limit Switch for proper installation, damage or loose / missing hardware.
i. Communicate to the Tech # 2 to close the Damper.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-17-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

2 INSPECTION (CONT'D)

Tech#2 (Cab)

a. Position the 12S02 HVAC DAMPERS Switch to CLOSED position
b. Verify that the FRESH AIR DAMPERS CLOSED Indicator (Yellow - Indicator Panel B) lit accordingly.

FIG 1 12S02 HVAC DAMPERS Switch

FIG 2 FRESH AIR DAMPERS CLOSED Indicator

c. Note any Item requiring Corrective Maintenance. Replace as per check result.
d. Communicate to Tech # 1 that the required Operation has been done in order to proceed the Inspection.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-17-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**7/10**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR DAMPER**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE (CONT'D):

1. Blade - damper
2. Blade - damper
3. Washer - shoulder
4. Stopper - damper
5. Stopper - damper
6. Motor
7. Clip - louver
8. Actuator - assembly
9. Shaft - centering
10. Washer - shoulder
11. Rod
12. Rod
13. Grommet
14. Extrusion - rubber
15. Strip - neoprene
16. Mount - Band wrap

FIGURE 3 - AIR DAMPER INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-17-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **8/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**
Component:	Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

2 INSPECTION (CONT'D)

Tech #1(CCU

a. Observe the Damper Actuator and Blades rotation to closing.
b. Check the Actuator rotation for noise, roughness or looseness.
c. Check the Damper Blades for complete closing without clearance between the relevant Rubber Extrusions and the Air Ducts.
d. Adjust / replace Items as per checks result.
e. Communicate to the Tech # 2 to open the Damper.

Tech#2 (Cab)

a. Position the 12S02 HVAC DAMPERS Switch to OPEN position.
b. Verify that the FRESH AIR DAMPERS CLOSED Indicator Light (Yellow - Indicator Panel B) switch -off accordingly.
c. Communicate to Tech # 1 that the Operation has been done in order to proceed the Inspection.

Tech #1(CCU

a. Observe the Damper Actuator and Blades rotation to opening.
b. Check the Actuator rotation for noise, roughness or looseness.
c. Check the Damper Blades for complete opening against the relevant Stoppers.
d. Adjust / replace Items as per checks result.
e. Install the Water Eliminator & Air Damper Housing Covers.
f. Communicate to the Tech # 2 the completion of the " A" CCU -Dumper Inspection.

Tech#2 (Cab)

a. Key off the " A" Cab.

Tech #1(CCU) and Tech#2 (Cab)

a. Repeat the Procedure on "B" CCU. Once completed proceed as follows:

Tech #1(CCU)

a. Make free the Vehicle Roof from Tools /Cleaners /Rags used during Maintenance Operations.
b. Leave the Vehicle Roof according to MTA Procedures.
c. Close communication with Tech # 2.

Tech#2 (Cab)

a. Key off the "and leave the B" Cab.
b. Close communication with Tech # 1.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-17-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**9/10**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**AIR DAMPER**

Component:	Man Hours:
	0.2

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE (CONT'D):

3 FINAL OPERATIONS

a. Record Task Results on the Defect Report Card for administrative and maintenance planning.
b. Disconnect the Workshop Power Plug from Vehicle Shop Power Socket and place the Knife. Switch Handle in "NORMAL" position.
c. Position the Knife Switch Cover on the its Upper Hinges and close it using the Maintenance Key.

CAUTION: THE INTERNAL PART OF THE KNIFE SWITCH COVER IS SHAPED IN SUCH A WAY THAT IT IS NOT POSSIBLE TO CLOSE IT IF THE SWITCH IS NOT IN "NORMAL" POSITION. FORCING IT TO CLOSE COULD RESULT SWITCH / COVER DAMAGE.

d. Close the relevant Skirt using the Maintenance Key.
e. Restore Power to Catenary or relocate Vehicle to an area where there is Overhead Catenary. power supplied.
f. Leave the Vehicle in safety condition as prescribed by LACMTA Regulations.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.

Refer to **HOW TO USE THE R-PM SHEETS** (para 05-III-03-03-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion".**

P2550 PREVENTIVE MAINTENANCE SHEET		
Card Code: **R-P-05-01-17-00/I-00**		
System: **HEATING VENTILATION & AIR CONDITIONING**		Sheet: **10/10**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **AIR DAMPER**	
Component:		Man Hours: **0.2**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**	

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P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-24-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **REFRIGERANT LINES**
Component:	Man Hours: **0.5**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-24-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **REFRIGERANT LINES**
Component:	Man Hours: **0.5**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

ELECTRONIC LEAK DETECTOR

CONSUMABLES:

Detergent / water solution

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-24-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**REFRIGERANT LINES**

Component:	Man Hours:
	0.5

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

To perform the Task, proceed as follows :

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-24-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **REFRIGERANT LINES**
Component:	Man Hours: **0.5**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 INSPECTION

a. Clean the Lines using recommended detergent and cleaning rags.

b. Check Refrigerant Lines including Solenoid Valves, Expansion Valves, Sub-cooler Circuits, Soldered Joints, and Pressure Switch Connections for Refrigerant Leaks using an Electronic Leak Detector. Repair /replace as per check result.

CAUTION : INSPECT THE TIP OF THE LEAK DETECTOR BEFORE START THE INSPECTION. PERIODICALLY IT MAY BECOME CLOGGED WITH DIRT, GREASE, AND OIL. IF THE TIP LOOKS DIRTY, AND YOU HAVE DIFFICULTY PINPOINTING A LEAK OR EXPERIENCE CONSTANT FALSE ALARMS, THE TIP PROBABLY NEEDS TO BE CLEANED OR REPLACED.

c. Check for lost Insulation on the Suction Line. Repair /replace as per check result.

d. Check for absence of any bend or slack in the Refrigerant Lines.

e. Check Vibration Eliminators for damage / loose / missing hardware. Replace as per check result.

FIG 1 REFRIGERANT LINES INSPECTION

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-24-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **5/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **REFRIGERANT LINES**
Component:	Man Hours: **0.5**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

FIG 2 REFRIGERANT LINES INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET		
Card Code: **R-P-05-01-24-00/I-00**		
System: **HEATING VENTILATION & AIR CONDITIONING**		Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **REFRIGERANT LINES**	
Component:		Man Hours: **0.5**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**	

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P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-25-00/C-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DRAIN PAN / LINES**
Component:	Man Hours: **0.3**
Maintenance Task: **CLEANING**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-25-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DRAIN PAN / LINES**
Component:	Man Hours: **0.3**
Maintenance Task: **CLEANING**	Interval/Miles: **120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Steam Cleaner

CONSUMABLES:

“KON -TROLE CONDENSATE DRAIN PAN CLEAR”.

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-25-00/C-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**DRAIN PAN / LINES**

Component:	Man Hours:
	0.3

Maintenance Task:	Interval/Miles:
CLEANING	**120,000**

PROCEDURE:

To perform the Task proceed as follows

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-25-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DRAIN PAN / LINES**
Component:	Man Hours: **0.3**
Maintenance Task: **CLEANING**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 CLEANING

a. Check Evaporator Insulated Drain Pan, Condenser Insulated Drain Pan and the and relevant Drain Lines for damage / missing.
b. Check that the condensed water flows correctly through the holes.
c. Replace Insulation as per check result
d. Check the Drain Valve (Kazoo) for proper installation and trimming (Drain Cut Vertical +/- 2-3 mm) (Refer to Figure 2)
e. Check the Clamp of the Drain Pipe for proper tightening to avoid that the clamp will compress excessively the Drain Pipe. Hand tightening is recommended.
f. Pour a cup of water into drain pan to ensure water flows freely through drain piping. If not, clean out drain lines using a Pig (a brush to be pulled and pushed through the pipe) to remove debris. Then blow out with High Pressure Steam Cleaner and use applicable disinfectant product as "KON - TROLE CONDENSATE DRAIN PAN CLEAR".

FIG 1 INSULATED DRAIN PANS & DRAIN PIPE LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-01-25-00/C-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **5/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DRAIN PAN / LINES**
Component:	Man Hours: **0.3**
Maintenance Task: **CLEANING**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

FIG 2 DRAIN VALVE CUT - INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-01-25-00/C-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DRAIN PAN / LINES**
Component:	Man Hours: **0.3**
Maintenance Task: **CLEANING**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-00-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **ELECTRICAL PLANT EQUIPMENT**	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-00-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
ELECTRICAL PLANT EQUIPMENT	**1**

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

DIGITAL MULTIMETER

CONSUMABLES:

CRC 2000 Contact Cleaner or Equivalent

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-00-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **ELECTRICAL PLANT EQUIPMENT**	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE:

To perform the Task proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-02-00-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **ELECTRICAL PLANT EQUIPMENT**	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1.

2 INSPECTION

a. Inspect HVAC Wirings outside the CCU for signs of damage such as broken or missing parts, overheating. Replace as per check result.
b. Check each Terminal & Connection for loose / missing items. Tighten as needed.
c. Note any Areas / Items requiring Corrective Maintenance.
d. Repair or replace as per check result.
e. Inspect Wiring Connectors for signs of overheating.
f. Check Compressor and Fan Motor Amperage Draw with PTU.
g. Spray Contacts and Terminals with an electrical cleaner. A good grade of cleaner will also provide waterproofing that can help prevent voltage leaks.
h. Check Labels for damage or missing.
i. Check integrity of CCU Wiring Interface to Vehicle MV and LV Electrical Plant.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-00-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **5/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **ELECTRICAL PLANT EQUIPMENT**	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

FIG 2.1 CCU ELECTRICAL PLANT EQUIPMENT INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-02-00-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **ELECTRICAL PLANT EQUIPMENT**	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

1.LIMIT SWITCH CABLE (LH)

2.LIMIT SWITCH CABLE (RH)

3. TEMP. SENSOR CABLE (RETURN AIR)

4. TEMP. SENSOR CABLE (FRESH AIR)

5. TEMP. SENSOR CABLE (DUCT AIR)

6. HARNESS HEATER POWER

7. HARNESS COMPRESSOR POWER

8. HARNESS FANS & BLOWERS

9. GROUNDING WIRE (OUTLET)

10. HARNESS LV CONTROL (OUTLET)

11. HARNESS HEATER CONNECTION

12. TEMPERATURE SENSOR

13. SENSOR BUSHING

14. LIMIT SWITCH

15. CABLE BUSHING -

16. TERMINAL BOARD -

17. FRESH AIR DAMPER CABLE

FIG 2.2 CCU ELECTRICAL PLANT EQUIPMENT INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-26-00/I-00

System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component:	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-26-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

SAFETY PRECAUTIONS:

WARNING: SHEET R-P-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

VACUUM CLEANER

CONSUMABLES:

CRC 2000 Contact Cleaner or Equivalent

SPARE PARTS:

N/A

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-26-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

To perform the Task, proceed as follows:

1- Scroll Compressors
2- Condenser Coils
3- Condenser Fans & Motors
4- Dehydrator
5-Liquid Receiver Tank
6- Vibration Eliminators
7- Evaporator Coil Assembly & Solenoid Valves
8- Evaporator Blower Assy
9- Air Filters
10- Control Box
11- Microprocessor Controller
12- Structural Frame
13- Covers and Grilles
14- Heater Assembly
15- Water Eliminator with Fresh Air Damper

FIGURE 1 - CCU LAYOUT & COMPONENTS LOCATION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-02-26-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component:	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 1

2 INSPECTION

a. Gain access to the Control Box via Ceiling Panel and Air Return Duct .
b. Remove the Covers of the Control Box Enclosure.
c. Vacuum clean any dust and debris from Box Interior.
d. Inspect Wirings and Electrical Connections for fraying or burned condition.
e. Replace Wiring / Connectors as per check result.
f. Inspect the Controller. Make sure it is securely mounted.
g. Check Controller Board for secure fitting on its seat.
h. Inspect Circuit Breakers, Contactors and Relays. Make sure they are securely Mounted.
i. Replace Circuit Breakers, Contactors Relays and any Parts that are cracked or showing sign of overheating.
j. Check Contactor(s) for Voltage Drop/Imbalance across Contacts. Where Voltage Drop / Imbalance is found (indicating High Resistance due to Contact wear), replace the Contactor according to Sheet R-C-05-02-04-00/R-00.
k. Clean and protect any part using CRC 2000 Contact Cleaner or Equivalent.

FIG 1 CCU CONTROL BOX

3 FINAL OPERATIONS

Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3.

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:
R-P-05-02-26-00/I-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
INSPECTION	**120,000**

PROCEDURE:

FIGURE 3.1 - CCU CONTROL BOX COMPONENT INSPECTION

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code: **R-P-05-02-26-00/I-00**	
System: **HEATING VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component:	Man Hours: **1**
Maintenance Task: **INSPECTION**	Interval/Miles: **120,000**

1. NSS PANEL - CONTROL BOX
2. CONTROLLER
3. NSS PANEL - CONTACTORS
4. NSS BLOCK - TERMINAL
5. CONVERTER - DC/DC
6. CONNECTOR - ASSEMBLY
7. CONNECTOR - ASSEMBLY
8. CONNECTOR - ASSEMBLY
9. CONNECTOR - ASSEMBLY
10. CONNECTOR - ASSEMBLY
11. LIGHT - SIGNAL (RED)
12. LIGHT - SIGNAL (GREEN)
13. LIGHT - SIGNAL (YELLOW
14. HEAD - CONTROL
15. SWITCH - ASSEMBLY
16. BUSHING - CABLE
17. BUSHING - CABLE
18. BUSHING - CABLE
19. BUSHING - CABLE
20. TRANSFORMER - CURRENT
21. TRANSFORMER - CURRENT
22 MOUNT BANDWRAP
23. SCREW - GROUND
24. SCREW - GROUND
25. LABEL - GROUND
26. CONNECTOR
27. CONNECTOR (2 PIN)
28. CONNECTOR (4 PIN)
29. CONNECTOR (6 PIN
30. CONNECTOR (10 PIN)
31. CONNECTOR (11 PIN)
32. CONNECTOR (12 PIN)
33. CONNECTOR (3 PIN)
34. CONNECTOR (10 PIN)
35. CONNECTOR (4 PIN)
36. CLAMP - GROUNDING
37. CABLE (RS232, 02)
38. CABLE (RS232, 03
39. CABLE (RS232, 01)
40. CABLE - TEMP. SENSOR (RETURN AIR)
41. CABLE - TEMP. SENSOR (FRESH AIR)
42. CABLE - TEMPERATURE SENSOR (DUCT AIR
43. WIRE - GROUNDING
44. WIRES - POWER
45. CABLE - COMMUNICATION MVB (A)
46. CABLE - COMMUNICATION MVB (A)

FIGURE 3.2 - CCU CONTROL BOX COMPONENT INSPECTION

05-III-04 RUNNING -CORRECTIVE MAINTENANCE

05-III-04.01 Running -Corrective Maintenance Sheets (R-CMS)

Each R-CMS provides the following data consistent with Corrective Maintenance Analysis (CMA), AB Design Documentation and Vehicle Systems Functional Tree:

- **R-CM Sheet Code**
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component** (Names) ·

SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component (Location) ·

Maintenance Task,

The following definitions are applicable to the R-CM Tasks

Inspection:	Maintenance procedures such as those required to ascertain the serviceability of a Part, Assembly, System or the specific interrelationship of Parts that perform a functional operation.
Leveling:	Procedure to adjust the distance between the Vehicle Floor to the Top Of Rail and the designated Vehicle Height.
Replacement:	Provides the Components / Assemblies and Subassemblies removal & installation in a logical sequential order.
Re-Profiling:	Provides the procedure to maintain the safe and proper "wheel profile."
Repair:	Provides detailed procedures for the repair of a specific Equipment / Component
Service:	Operation performed to replenish Sand, Windshield Wiper Washer Fluid, HVAC Coolant, Gear and Compressor Oil, and Vehicle Lubrication.

- **Man Hours,** needed to perform the Task
- **SPARE PARTS,** needed to perform the Task

Each R-CMS also provides:

- **SAFETY PRECAUTIONS,** to be followed to safely accomplish the Task.
- **TOOLS,** including Special Tools and Test Equipment, needed to accomplish the Task
- **CONSUMABLES,** required to accomplish the Task and consistent with those used by MTA .
- **PROCEDURE,** consisting of Preliminary Operations and Procedural Steps, to be followed while performing Maintenance Tasks.
- **Illustrations and Pictures** are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure**.**

Each R-CM Sheet refers to one Task and consists of several pages where Safety Precautions and Maintenance Instructions to perform safely the Task are provided by Procedural Steps in conjunction with Illustrations and Pictures.

NOTE : The Safety Precautions to be followed to safely accomplish the Maintenance of the HVAC System are provided (in sheet format) at the beginning of the section containing the relevant R-CMS.

05-III-04.01.01 Running- Corrective Maintenance Sheet (R-CMS) Form

The R-CMS Form (refer to Figure 05-III-04.1) consists of several fields containing the following data/ information:

RUNNING -CORRECTIVE MAINTENANCE SHEET (R-CMS) Form			
ITEM #	**TITLE**	**CONTENT**	**EXPLANATORY NOTES**
1	**Card code**	**Sheet code**	The Sheet Code is an alphanumerical code that identifies each R-CM Sheet. **THE SHEET CODE IS EXPLICIT** The Sheet Code consists of letters **R-C** followed by an 11 digit code number as follows: **R-C**-nn-mm-zz-ww/Y-kk **R = Running** **C= Corrective** **nn** may vary from 02 to 19, identifying the System/ Manual Section number. **mm-zz-ww** each one may vary from 00 to 99, according to AB System Functional Tree, allowing the identification of the Assembly/Unit/Component **Y** Maintenance Task Code. It may be one of the following: **I =** **I**nspection **LL =L**eveling **R =** **R**eplacement **RP=** **R**e-**P**rofiling **RR = R**epair **S = S**ervice **SP = S**afety **P**recautions **kk** It may vary from 00 to 99. It is a progressive number allowing the explicit identification of R-CMS **NOTE :** The code R-C-nn-00-00-00-R-kk identifies a Typical Replacement Procedure The TypicalReplacement Procedure is provided for the following items : Board, Circuit Breaker, Diode, Indicator Lamp, Main Contactor,Switch & Relays.
2	**System**	**System name**	This field indicates the System to which the Assembly/Unit/Component belongs.
3	**Subsystem/ Assembly**	**Subsystem/ Assembly name**	This field indicates the Subsystem/Assembly to which the Unit/Component belongs.
4	**Unit**	**Unit name**	This field indicates the Unit to which the Component belongs.
5	**Component**	**Component name**	This field indicates the Component the Maintenance Task is referring to
6	**Maintenance Task**	**Maintenance Task name**	This field indicates the Maintenance Task to be performed.
7	**Man Hours**	**Number**	The Man Hour field indicates the time needed to perform the corresponding Maintenance Task. with the basic assumption that the Vehicle is staged on an Inspection Pit/Jacking tracks with the required Consumables, Tools and Materials available.

RUNNING -CORRECTIVE MAINTENANCE SHEET (R-CMS) Form (cont'd)			
ITEM #	**TITLE**	**CONTENT**	**EXPLANATORY NOTES**
8	**Sheet**	**Pages numbering**	This field indicates the progressive R-CMS sheet page number.
9	**LOCATION**	**Illustration**	This field indicates the On Board Location of the Equipment to be maintained The following Graphic Symbols are used for: Assembly/Unit/Component for System/Subsystem/Vehicle as a Whole
10	**R**	**Letter**	This field indicates that the Sheet pertains to Running Maintenance
11	**C**	**Letter**	This field indicates that the Sheet pertains to Corrective Maintenance
12	**nn**	**Number**	This field indicates the System/Manual Section number to which the Sheet pertains. It may vary from 01 to 19
13	**rr**	**Number**	This field indicates the Sheet Revision number
14	**Page ##**	**Page ##**	This field indicates the RMSM Section Page number
15	**-#**	**Number**	This field indicates the RMSM Section Revision number
16	**SAFETY PRECAUTIONS**	**Text**	This field presents the General and/or specific Safety Precautions to be followed to accomplish safely the relevant Maintenance Tasks.
17	**TOOLS**	**Text**	This field lists the description and the P/N of the Standard tools, Special Tools and Test Equipment needed to accomplish the Maintenance Task. Refer to the TTE Manual for the TE and Special Tools detailed descriptions and tools maintenance.
18	**CONSUMABLES**	**Text**	This field lists the Consumables Materials (consistent with those used by MTA with the related P/N.) needed to accomplish the Maintenance Task. Cleaning agents are included
19	**SPARE PARTS**	**Text**	This field lists the Description and PN of Spare Parts (consistent with Illustrated Parts Catalog) needed to accomplish the Maintenance Task.
20	**PROCEDURE**	**Text**	The Procedure field provides Preliminary Operations and Procedural step by step Instructions to be followed while performing the Maintenance Task. Illustrations and Pictures are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure.

Figure 05-III-04.1 R-CMS Form (Sheet 1 of 2)

Figure 05-III-04.1 R-CMS Form (Sheet 2 of 2)

05-III-04.01.02 How to Use the R-CM Sheets

To optimize the job organization it is suggested to proceed as follows:

1. Before Task Execution

a) Carefully read the sheets to ensure that you fully understand all safety precautions, preliminary conditions required, warnings, notes & procedures that will be followed.

b) Particularly read

- The Safety Precautions to perform safely the Task
- The Preliminary Operations to set the Vehicle in safety conditions according to MTA Maintenance Shop Regulations
- The Tools, Consumables and Spare Parts listed in each Sheet that are needed to accomplish the Task and to have all of them available next the location of the Equipment to be maintained before starting the activities

2. During Task Execution

a) Follow accurately the prescribed Safety Precautions and Maintenance Procedural Steps.

b) Note any Areas/Items of the Assembly/Unit/Component under Corrective Maintenance Process requiring further Corrective Maintenance.

c) Gather as much information about the Equipment as is practical.

(i e knowledge about the malfunction in terms of correctly operating and incorrectly operating equipment processes) to increase your equipment knowledge.

3. At every Task Completion

a) Carefully follow the prescribed Safety Precautions before restoring the Electrical Power to Vehicle.

b) Check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.

c) It is suggested to perform this check on the IDU “A “as follows:

NOTE: Through the IDU you can check if all Systems are exchanging data by MVB or LonWorks Bus and the Trainlines Status.
The IDU Display also shows in real time the Status of all Vehicle Systems.
Reading the IDU Fault List it is possible to immediately detect a fault
Using the IDU in the Operating Mode the Fault Indications are generic
Using the IDU in Maintenance Mode the same Fault has a detailed description.

For more in depth troubleshooting use the PTU connected to the relevant system that requires further troubleshooting.

1. On IDU “A” access to the Maintenance Menu first and then to the “Faults” Screen by selecting, in sequence, the relevant icons.
2. Check, On IDU “A” through the list of the Current Active Faults shown in the “Faults” Screen, for Fault Codes related to the Subsystem to which the maintained Equipment pertains.

   Refer to Section 18 of RMSM for Fault Signals Details.
3. As per “Fault” Codes check results proceed as follows:

- **No Faults are listed in the “Faults” Screen**

a) Key OFF the Vehicle.
b) Record Service and Test results on the Defect Report Card for administrative and maintenance planning.

- **Fault Codes are listed in the “Faults” Screen**

a) Investigate/troubleshoot the Equipment previously maintained first and then the System/Subsystem/Assembly/Unit for Fault Probable Causes.
b) Gather as much information about the failure symptoms as is practical.
   Refer to Section 18 of RMSM for Fault Signals Details.
c) Try to identify the malfunction in terms of correctly operating and incorrectly operating equipment processes.
d) Identify which equipment signals or parameters will best help you to localize the failure.
e) Identify the source of the problem.
f) Repair or replace the defective component.
g) Verify that the repair is effective in eliminating all of the failure symptoms.
h) Evaluate whether or not the defective component was the root cause of the failure.
i) Once the Fault Codes are not found in the “Faults” Screen perform steps from 3-a through 3-b (previous subparagraph **“No Faults are listed in the “Faults” Screen).**

05-III-04.01.03 Running- Corrective Maintenance Sheet (R-CMS) List

The HVAC Running- Corrective Maintenance Sheets (R-CMS) List is provided in the following Table 05-III-04.1.

The R-CM Sheets are listed by Subsystem / Assembly / Unit / Component and sequenced by Sheet Codes and Tasks to be performed.

Table 05-III-04.1 Running Corrective Maintenance Sheets List

SYSTEM 05 HEATING, VENTILATION & AIR CONDITIONING				
SUBSYSTEM / ASSY	**UNIT**	**COMPONENT**	**TASK**	**SHEET CODE**
CLIMATE CONTROL UNIT	SAFETY PRECAUTIONS			R-C-05-00-00-00/SP-00
HVAC CONTROL		CIRCUIT BREAKER TYPE S280	REPLACEMENT (TYPICAL)	R-C-05-00-00-00/R-00
HVAC CONTROL		RELAY	REPLACEMENT (TYPICAL)	R-C-05-00-00-00/R-01
HVAC CONTROL		SWITCH	REPLACEMENT (TYPICAL)	R-C-05-00-00-00/R-02
HVAC CONTROL		DIODE	REPLACEMENT (TYPICAL)	R-C-05-00-00-00/R-03
CLIMATE CONTROL UNIT	CLIMATE CONTROL UNIT		REPLACEMENT	R-C-05-01-00-00/R-00
CLIMATE CONTROL UNIT	CLIMATE CONTROL UNIT		SERVICE	R-C-05-01-00-00/S-00
CLIMATE CONTROL UNIT	CONDENSER FAN MOTOR		REPLACEMENT	R-C-05-01-01-00/R-00
CLIMATE CONTROL UNIT	CONDENSER FAN		REPLACEMENT	R-C-05-01-02-00/R-00
CLIMATE CONTROL UNIT	EVAPORATOR BLOWER MOTOR		REPLACEMENT	R-C-05-01-03-00/R-00
CLIMATE CONTROL UNIT	EVAPORATOR BLOWER		REPLACEMENT	R-C-05-01-04-00/R-00
CLIMATE CONTROL UNIT	COMPRESSOR		REPLACEMENT	R-C-05-01-06-00/R-00
CLIMATE CONTROL UNIT	COMPRESSOR	VIBRASORBER SUCTION	REPLACEMENT	R-C-05-01-07-00/R-00
CLIMATE CONTROL UNIT	COMPRESSOR	VIBRASORBER DISCHARGE	REPLACEMENT	R-C-05-01-08-00/R-00
CLIMATE CONTROL UNIT	SOLENOID VALVE		REPLACEMENT	R-C-05-01-09-00/R-00
CLIMATE CONTROL UNIT	SOLENOID VALVE	COIL	REPLACEMENT	R-C-05-01-10-00/R-00
CLIMATE CONTROL UNIT	EXPANSION VALVE		REPLACEMENT	R-C-05-01-11-00/R-00
CLIMATE CONTROL UNIT	FILTER DRIER		REPLACEMENT	R-C-05-01-12-00/R-00
CLIMATE CONTROL UNIT	RELIEF VALVE		REPLACEMENT	R-C-05-01-13-00/R-00
CLIMATE CONTROL UNIT	HEATER ASSY		REPLACEMENT	R-C-05-01-14-00/R-00
CLIMATE CONTROL UNIT	CONDENSER COIL		REPAIR	R-C-05-01-15-00/RR-00
CLIMATE CONTROL UNIT	EVAPORATOR COIL		REPAIR	R-C-05-01-16-00/RR-00
CLIMATE CONTROL UNIT	DAMPER ACTUATOR		REPLACEMENT	R-C-05-01-17-00/R-00

(cont'd)

Table 05-III-04.1 Running Corrective Maintenance Sheets List (cont'd)

SYSTEM 05 HEATING, VENTILATION & AIR CONDITIONING (cont'd)				
SUBSYSTEM / ASSY	**UNIT**	**COMPONENT**	**TASK**	**SHEET CODE**
CLIMATE CONTROL UNIT	CONTROL BOX	TERMINAL BLOCK	REPLACEMENT	R-C-05-01-19-00/R-00
CLIMATE CONTROL UNIT	COMPRESSOR	RESILIENT MOUNTING	REPLACEMENT	R-C-05-01-20-00/R-00
CLIMATE CONTROL UNIT	CLIMATE CONTROL UNIT	RESILIENT MOUNTING	REPLACEMENT	R-C-05-01-21-00/R-00
CLIMATE CONTROL UNIT		REFRIGERANT INDICATOR	REPLACEMENT	R-C-05-01-22-00/R-00
CLIMATE CONTROL UNIT	EVAPORATOR	PRESSURE SWITCHES	REPLACEMENT	R-C-05-02-01-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	CONTACTOR	REPLACEMENT	R-C-05-02-04-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	CIRCUIT BREAKERS	REPLACEMENT	R-C-05-02-08-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	MICROPROCESSOR CONTROLLER	REPLACEMENT	R-C-05-02-12-00/R-00
CLIMATE CONTROL UNIT	HVAC CONTROL	TEMPERATURE SENSORS	REPLACEMENT	R-C-05-02-13-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	CURRENT TRANSFORMERS	REPLACEMENT	R-C-05-02-14-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	DC / DC CONVERTER	REPLACEMENT	R-C-05-02-17-00/R-00
CLIMATE CONTROL UNIT	HEATERS	TEMPERATURE SWITCHES	REPLACEMENT	R-C-05-02-18-00/R-00
CLIMATE CONTROL UNIT		LIMIT SWITCHES	REPLACEMENT	R-C-05-02-19-00/R-00
CLIMATE CONTROL UNIT	CONTROL BOX	BUS BAR	REPLACEMENT	R-C-05-02-20-00/R-00

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05-III-04.01.04 Running- Corrective Maintenance Sheets (R-CMS)

HEATING, VENTILATION & AIR CONDITIONING

Running - Corrective Maintenance Sheets

R-CMS

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE:

WARNING: BLUE FLAG THE VEHICLE IN ACCORDANCE WITH ALL LACMTA BLUE FLAG POLICIES,
RULES, & PROCEDURES IN ORDER TO WARN THAT MAINTENANCE PERSONNEL ARE WORKING ON, UNDER, OR NEAR ROLLING EQUIPMENT.

WARNING: DANGER OF PERSONAL INJURY EXISTS DUE TO ELECTRICAL POWER. (750 V) ENSURE CATENARY POWER IS REMOVED AND ISOLATED PER LACMTA SAFETY RULES AND PROCEDURES. IF POSSIBLE, WORK SHOULD BE DONE IN AN AREA WITHOUT OVERHEAD CATENARY.DANGER OF PERSONAL INJURY EXISTS DUE TO THE WORKING ON ROOF. FOLLOW SAFETY PROCEDURES FOR ACCESSING ROOF. ALWAYS WEAR A SAFETY HARNESS WHEN ACCESSING THE ROOF.

WARNING: CONTROL CIRCUITS ARE LOW VOLTAGE. THIS VOLTAGE POTENTIAL IS NOT CONSIDERED DANGEROUS, BUT THE LARGE AMOUNT OF CURRENT AVAILABLE (OVER 30 AMPERES) CAN CAUSE SEVERE BURNS IF SHORTED TO GROUND. DO NOT WEAR JEWELRY, WATCH OR RINGS. THESE ITEMS CAN SHORT OUT ELECTRICAL CIRCUITS AND CAUSE SEVERE BURNS TO THE WEARER.

WARNING: ALWAYS WEAR GOGGLES OR SAFETY GLASSES. REFRIGERANT LIQUID AND BATTERY ACID CAN PERMANENTLY DAMAGE THE EYES

WARNING: NEVER CLOSE THE COMPRESSOR DISCHARGE VALVE WITH THE UNIT IN OPERATION. NEVER OPERATE THE UNIT WITH THE DISCHARGE VALVE CLOSED.

WARNING: KEEP YOUR HANDS, CLOTHING AND TOOLS CLEAR OF THE FANS WHEN THE AIR CONDITIONING UNIT IS RUNNING. IF IT IS NECESSARY TO RUN THE AIR CONDITIONING UNIT WITH COVERS REMOVED, BE VERY CAREFUL WITH TOOLS OR METERS BEING USED IN THE AREA.

WARNING: BE SURE THE GAUGE MANIFOLD HOSES ARE IN GOOD CONDITION. NEVER LET THEM COME IN CONTACT WITH A FAN MOTOR BLADE OR ANY HOT SURFACE.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE (CONT'D):

WARNING: THE FLUOROCARBON REFRIGERANTS, IN PRESENCE OF AN OPEN FLAME OR ELECTRICAL ARC, PRODUCE TOXIC GASES THAT ARE SEVERE RESPIRATORY IRRITANTS CAPABLE OF CAUSING DEATH. NEVER APPLY HEAT TO A SEALED AIR CONDITIONING SYSTEM OR CONTAINER.

WARNING: USE EXTREME CAUTION WHEN DRILLING HOLES IN THE UNIT. THE HOLES MAY WEAKEN STRUCTURAL COMPONENTS. HOLES DRILLED INTO ELECTRICAL WIRING CAN CAUSE FIRE OR EXPLOSION. HOLES DRILLED INTO THE AIR CONDITIONING SYSTEM MAY RELEASE REFRIGERANT.

WARNING: USE CAUTION WHEN WORKING, AROUND EXPOSED COIL FINS. THE FINS CAN CAUSE PAINFUL LACERATIONS. USE CAUTION WHEN WORKING WITH A REFRIGERANT OR AIR CONDITIONING SYSTEM IN ANY CLOSED OR CONFINED AREA WITH A LIMITED AIR SUPPLY. REFRIGERANT TENDS TO DISPLACE AIR AND CAN CAUSE OXYGEN DEPLETION, RESULTING IN SUFFOCATION AND POSSIBLE DEATH.

WARNING: USE TOOLS WITH INSULATED HANDLES THAT ARE IN GOOD CONDITION. NEVER HOLD METAL TOOLS IN YOUR HAND IF EXPOSED, ENERGIZED CONDUCTORS ARE WITHIN REACH.

WARNING: DO NOT MAKE ANY RAPID MOVES WHEN WORKING ON HIGH VOLTAGE CIRCUITS. IF A TOOL OR OTHER OBJECT FALLS, DO NOT ATTEMPT TO GRAB IT. PEOPLE DO NOT CONTACT HIGH VOLTAGE WIRES ON PURPOSE. IT OCCURS FROM AN UNPLANNED MOVEMENT.

WARNING: TREAT ALL WIRES AND CONNECTIONS AS HIGH VOLTAGE UNTIL A METER AND WIRING, DIAGRAM SHOW OTHERWISE.

WARNING: NEVER WORK ALONE ON HIGH VOLTAGE CIRCUITS ON THE AIR CONDITIONING UNIT. ANOTHER PERSON SHOULD ALWAYS BE STANDING BY IN THE EVENT OF AN ACCIDENT TO SHUT OFF THE AIR CONDITIONING UNIT AND TO AID A VICTIM.

WARNING: HAVE ELECTRICALLY INSULATED GLOVES, CABLE CUTTERS AND SAFETY GLASSES AVAILABLE IN THE IMMEDIATE VICINITY IN THE EVENT OF AN ACCIDENT.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:
HEATING VENTILATION & AIR CONDITIONING

Sheet:
4/6

Subsystem/Assy:

Unit:

Component:

Man Hours:

Maintenance Task:
SAFETY PRECAUTIONS

Interval/Miles:

PROCEDURE (CONT'D):

CAUTION :SERVICING OF UNITS WITH A MICROPROCESSOR CONTROLLER

PRECAUTIONS MUST BE TAKEN TO PREVENT ELECTROSTATIC DISCHARGE WHEN SERVICING THE MICROPROCESSOR CONTROLLER AND RELATED COMPONENTS.

IF THESE PRECAUTIONARY MEASURES ARE NOT FOLLOWED, THE RISK OF SIGNIFICANT DAMAGE TO THE ELECTRONIC COMPONENTS OF THE UNIT IS POSSIBLE.

- THE PRIMARY RISK POTENTIAL RESULTS FROM THE FAILURE TO WEAR ADEQUATE ELECTROSTATIC DISCHARGE PREVENTIVE EQUIPMENT WHEN HANDLING AND SERVICING THE MICROPROCESSOR.
- THE SECOND CAUSE RESULTS FROM ELECTRIC WELDING ON THE UNIT AND CONTAINER CHASSIS WITHOUT TAKING PRECAUTIONARY STEPS.

CAUTION: CONTROLLER REPAIR

WHEN SERVICING THE MICROPROCESSOR CONTROLLER, IT IS NECESSARY TO ENSURE THAT ELECTROSTATIC DISCHARGES ARE AVOIDED.

POTENTIAL DIFFERENCES CONSIDERABLY LOWER THAN THOSE WHICH PRODUCE A SMALL SPARK FROM A FINGER TO A DOOR KNOB CAN SEVERELY DAMAGE OR DESTROY SOLID-STATE INTEGRATED CIRCUIT COMPONENTS.

THE FOLLOWING PROCEDURES MUST BE RIGIDLY ADHERED TO WHEN SERVICING THESE UNITS TO AVOID MICROPROCESSOR DAMAGE OR DESTRUCTION.

1. DISCONNECT ALL POWER TO THE UNIT.

2. AVOID WEARING CLOTHING THAT GENERATES STATIC ELECTRICITY (WOOL, NYLON, POLYESTER, ETC.).

3. DO WEAR A STATIC DISCHARGE WRIST STRAP WITH THE LEAD END CONNECTED TO THE MICROPROCESSOR'S GROUND TERMINAL. THESE STRAPS ARE AVAILABLE AT MOST ELECTRONIC EQUIPMENT DISTRIBUTORS. DO NOT WEAR THESE STRAPS WITH POWER APPLIED TO THE UNIT.

4. AVOID CONTACTING THE ELECTRONIC COMPONENTS ON THE CIRCUIT BOARDS OF THE UNIT BEING SERVICED.

5. LEAVE THE CIRCUIT BOARDS IN THEIR STATIC PROOF PACKING MATERIALS UNTIL READY FOR INSTALLATION.

6. IF A DEFECTIVE MICROPROCESSOR IS TO BE RETURNED FOR REPAIR, IT SHOULD BE RETURNED IN THE SAME STATIC PROTECTIVE PACKING MATERIALS FROM WHICH THE REPLACEMENT COMPONENT WAS REMOVED.

7. AFTER SERVICING THE CIRCUIT BOARD AND ANY OTHER CIRCUITS, THE WIRING SHOULD BE CHECKED FOR POSSIBLE ERRORS BEFORE RESTORING POWER.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:	Sheet:
HEATING VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:

Component:	Man Hours:

Maintenance Task:	Interval/Miles:
SAFETY PRECAUTIONS	

PROCEDURE (CONT'D):

CAUTION :WELDING OF UNITS OR RAIL CAR

WHENEVER ELECTRIC WELDING IS TO BE PERFORMED ON ANY PORTION OF THE AIR CONDITIONING UNIT, UNIT CHASSIS OR RAIL CAR WITH THE AIR CONDITIONING UNIT ATTACHED, IT IS NECESSARY TO ENSURE THAT WELDING CURRENTS ARE NOT ALLOWED TO FLOW THROUGH THE ELECTRONIC CIRCUITS OF THE UNIT.

THESE PROCEDURES MUST BE RIGIDLY ADHERED TO WHEN SERVICING THESE UNITS TO AVOID DAMAGE OR DESTRUCTION.

1. DISCONNECT ALL POWER TO THE AIR CONDITIONING UNIT.

2. DISCONNECT THE CHASSIS GROUND LEADS CONNECTED TO THE MICROPROCESSOR'S "GRND" TERMINALS (WIRES LABELED "CH"). SECURE THESE LEADS TO PREVENT THEM FROM CONTACTING THE MICROPROCESSOR.

3. SWITCH ALL OF THE ELECTRICAL CIRCUIT BREAKERS IN THE CONTROL BOX TO THE OFF POSITION.

4. WELD UNIT AND/OR CONTAINER PER NORMAL WELDING PROCEDURES. KEEP AROUND RETURN ELECTRODE AS CLOSE TO THE AREA TO BE WELDED AS PRACTICAL. THIS WILL REDUCE THE LIKELIHOOD OF STRAY WELDING CURRENTS PASSING THROUGH ANY ELECTRICAL OR ELECTRONIC CIRCUITS.

5. WHEN THE WELDING OPERATION IS COMPLETED, THE UNIT POWER CABLES, WIRING AND CIRCUIT BREAKERS MUST BE RESTORED TO THEIR NORMAL CONDITION.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/SP-00

System:
HEATING VENTILATION & AIR CONDITIONING

Sheet:
6/6

Subsystem/Assy:

Unit:

Component:

Man Hours:

Maintenance Task:
SAFETY PRECAUTIONS

Interval/Miles:

1 PRELIMINARY OPERATIONS

a. Set the Vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
b. Lock-out and tag-out the Overhead Catenary, 750Vdc Power, per LACMTA Safety Rules and Procedures.

NOTE The tag must indicate the name of the person who removed Power.
That person knows why the Power was removed and when it safe to restore it.
Only the individual whose name appears on the tag or a person with his approval should remove the tag and restore Power.

c. Before attempting any operation (with the exception of the CCU Test), switch to OFF position the Circuit Breakers indicated in the following Table 1:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

d. Access Vehicle Roof according to MTA Procedures.
e. Follow the Safety Precautions according to Sheet R-C-05-00-00-00/SP-00.
f. Remove the CCU Cover(s) to gain access to the CCU Control Panel and / or Components.

2 MAINTENANCE OPERATIONS

a. Perform the Task and follow the Specific Safety Precautions as indicated in each relevant Maintenance Sheet.

3 FINAL OPERATIONS

a. Record Task Results on the Defect Report Card for administrative and maintenance planning.
b. Make sure that the SWT Switch of CCU is to AUTO position.
c. Install the CCU Cover(s).
d. Make free the Vehicle Roof from Tools /Cleaners /Rags used during Maintenance Operations.
e. Leave the Vehicle Roof according to MTA Procedures.
f. Restore Power to Catenary or relocate Vehicle to an area where there is Overhead Catenary power supplied.
g. Restore Power to CCU by switching to ON position the Circuit Breakers indicated in the Table 1.
h. Leave the Vehicle in safety condition as prescribed by LACMTA Maintenance Shop Regulations.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS** (para 05-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion."**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
1/8

Subsystem/Assy:
HVAC CONTROL

Unit:

Component:
CIRCUIT BREAKER TYPE S280

Man Hours:
0.5

Maintenance Task:
REPLACEMENT (TYPICAL)

LOCATION:

APPLICABILITY:

This Replacement procedure is applicable to the following Equipment :

TABLE 1 CIRCUIT BREAKERS IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
12F01	HVAC PROTECTION	S281 C 10A	211EK22984B03	A - B	LV LOCKER	LV	115
12F02	HVAC PROTECTION	S281 K 3A	211EK22984B14	A - B	CAB -LV CB PANEL	LV	115

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/8**

Subsystem/Assy:	Unit:
HVAC CONTROL	

Component:	Man Hours:
CIRCUIT BREAKER TYPE S280	**0.5**

Maintenance Task:
REPLACEMENT (TYPICAL)

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION :SWITCH OFF THE 3F07 CB (LV LOCKER -“A” / “B” SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

MULTIMETER (FLUKE 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Circuit Breakers Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **3/8**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **CIRCUIT BREAKER TYPE S280**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE (CONT'D):

PRELIMINARY OPERATIONS

1. Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -"A" / "B" SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1.

REMOVAL

To perform the Task proceed as follows:

1. Locate the Circuit Breaker to be replaced according to the Label identification and the Location provided in the previous Table 1.

FIG 1 CAB LV CB PANEL

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-00-00-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/8**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **CIRCUIT BREAKER TYPE S280**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE (CONT'D):

REMOVAL

FIGURE 2 - LV LOCKER -CIRCUIT BREAKERS RACK

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/8**

Subsystem/Assy:	Unit:
HVAC CONTROL	

Component:	Man Hours:
CIRCUIT BREAKER TYPE S280	**0.5**

Maintenance Task:
REPLACEMENT (TYPICAL)

PROCEDURE:

2 Remove the Circuit Breakers Front Panel by loosening relevant Fixing Screws.
Retain hardware for later use

FIGURE 3 -CIRCUIT BREAKERS FRONT PANEL REMOVED

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**6/8**

Subsystem/Assy:	Unit:
HVAC CONTROL	

Component:	Man Hours:
CIRCUIT BREAKER TYPE S280	**0.5**

Maintenance Task:
REPLACEMENT (TYPICAL)

PROCEDURE (CONT'D):

3 Locate the Circuit Breaker to be replaced

FIGURE 4 -CB INSTALLATION (TYPICAL)

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**7/8**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **CIRCUIT BREAKER TYPE S280**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE:

4 Remove and discard the Circuit Breaker according to the Instructions provided in the following figure 5

FIGURE 5 -CB REMOVAL

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**8/8**

Subsystem/Assy:	Unit:
HVAC CONTROL	

Component:	Man Hours:
CIRCUIT BREAKER TYPE S280	**0.5**

Maintenance Task:
REPLACEMENT (TYPICAL)

PROCEDURE (CONT'D):

5 Install the Circuit Breaker according to the instructions provided in the following figure 6

FIGURE 6 -CB INSTALLATION

6 Install the Circuit Breakers Front Panel and secure it by installing and tightening the relevant Fixing Screws.

7 Close and secure the LV Locker Door using Maintenance Key.

8 Restore Electrical Power.

9 Record Task Result on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS** (para 05-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion."**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-01

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **RELAY**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-01

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
2/4

Subsystem/Assy:
HVAC CONTROL

Unit:

Component:
RELAY

Man Hours:
0.5

Maintenance Task:
REPLACEMENT (TYPICAL)

APPLICABILITY:

This Replacement procedure is applicable to the following Items :

TABLE 1 RELAY IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
12K01	AIR GRATING CLOSING RELAY	2 CONTACTS	211VK01374B0801	B	LV LOCKER	LV	116

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -“A” / “B” SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Standard Tools Kit

MULTIMETER (FLUKE 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Relay Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-01

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **RELAY**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE (CONT'D):

To perform the Task proceed as follows:

PRELIMINARY OPERATIONS

1. Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -"A" / "B" SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1.

REMOVAL

1. Gain access to the Relays Rack installed in the " B " LV Lockers, by opening the relevant LV Locker Door using Maintenance Key.

2. Locate the Relay to be replaced.

FIGURE 1 - " B " LV LOCKER -RELAY REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-00-00-00/R-01**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **RELAY**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE:

REMOVAL (cont'd)

3. Loose and remove the Self Locking Nuts & Washers fixing the Relay to the Rack.
Retain them for later use.

4. Slide out the Relay in order to gain access to the relevant Wiring and Terminals connections.

5. Take note of Wiring Color Codes and relevant positions on Relay Terminals.

6. Disconnect the Wiring Cable from Relay Terminals.

7. Remove and discard the Relay.

INSTALLATION

1. Clean the Relay Seat using recommended Cleaner / Agent and lint-free rags.

2. Check Relay Plate for installation / missing / loosen Hardware.

3. Torque, as per check result, to **15.2 ft-lb.**

4. Check Wires and Wire Terminals for signs of overheating.

5. Connect the Wiring to the Relay Terminals according to their position and Color Codes previously Noted.
Refer to the Functional Schematic Sheet listed in the previous Table 1 for complete Wiring Details.

6. Torque, the Wires Screw Terminals to **4 ft-*lb**

7. Install the Relay in its position.

8. Install the Relay attaching Washers and Self Locking Nuts. Torque, to **4 ft-*lb.**

9. Leave the LV Locker.

10. Close and the LV locker Door using the Maintenance Key.

11. Restore Electrical Power.

12. Record Task results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains..

Refer to **HOW TO USE THE R-CM SHEETS** (para 05-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion."**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-02

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
1/4

Subsystem/Assy:
HVAC CONTROL

Unit:

Component:
SWITCH

Man Hours:
0.5

Maintenance Task:
REPLACEMENT (TYPICAL)

LOCATION:

APPLICABILITY:

This Replacement procedure is applicable to the following Items :

TABLE 1 SWITCHES IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
12S01	HVAC	2 Stable Positions Rotary Switch		A - B	CAB -INDICATOR & SWITCH LH PANEL	LV	115
12S02	HVAC DAMPERS	2 Stable Positions Rotary Switch		A - B	CAB -INDICATOR & SWITCH LH PANEL E	LV	115

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-06-00-00-00/R-02**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **SWITCH**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -“A” / “B” SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

MULTIMETER (FLUKE 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Switches Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-06-00-00-00/R-02

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **SWITCH**	Man Hours: **0.5**

Maintenance Task:
REPLACEMENT (TYPICAL)

PROCEDURE:

FIG 1 CAB -INDICATOR & SWITCH LH PANEL LOCATION

FIG 2 CAB -INDICATOR & SWITCH LH PANEL

FIG 3 12S01

FIG 4 12S02

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-06-00-00-00/R-02**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **SWITCH**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT (TYPICAL)**	

PROCEDURE (CONT'D):

PRELIMINARY OPERATIONS

1. Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -"A" / "B" SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1.

REPLACEMENT

To perform the Switch Replacement proceed as follows:

Removal

1. Gain access to the Indicator inside by loosening the relevant Indicator ("A " / " B ") Panel Front Plate Fixing Screws.

NOTE: It is advised to retain the attaching Hardware for later use.

a) Locate the Switch Body to be replaced and its Electrical Connections.
b) Note the Switch Body Wiring Identification Codes.
c) Disconnect the Switch Body electrical Connections.
d) Disengage the Switch Assy from its seat.
e) Remove the Switch Assy.

Installation

a) Install and engage on its seat the Switch Assy to be installed.
b) Connect the Switch Body Electrical Connections according to the previously noted Wiring Identification Codes (Refer to LV Functional Schematic, Sheet 115 for complete Wiring Scheme).
c) Position the Indicator Panel Front Plate.
d) Install and tighten the relevant attaching Hardware.
e) Key on the Vehicle and check that the "new" Switch work properly.
f) Record Task results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS** (para 05-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion."**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-03

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
1/4

Subsystem/Assy:
HVAC CONTROL

Unit:

Component:
DIODE

Man Hours:
1

Maintenance Task:
REPLACEMENT(TYPICAL)

LOCATION:

APPLICABILITY:

This Replacement procedure is applicable to the following Items :

TABLE 1 DIODES IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET
12V01	PROTECTIVE DIODE	ABB DACOM	211VV01044B	A-B	LV LOCKER	LV	115-116
12V02	PROTECTIVE DIODE	ABB DACOM	211VV01044B	A-B	LV LOCKER	LV	115-116
12V03	PROTECTIVE DIODE	ABB DACOM	211VV01044B	A-B	LV LOCKER	LV	115-116

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-03

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
HVAC CONTROL	

Component:	Man Hours:
DIODE	**0.5**

Maintenance Task:
REPLACEMENT(TYPICAL)

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -“A” / “B” SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

MULTIMETER (FLUKE 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Diodes Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-00-00-00/R-03

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **DIODE**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT(TYPICAL)**	

PROCEDURE (CONT'D):
To perform the Task proceed as follows:

PRELIMINARY OPERATIONS

1 Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:
CAUTION:SWITCH OFF THE 3F07 CB (LV LOCKER -"A" / "B" SECTIONS) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY ITEM LISTED IN THE PREVIOUS TABLE 1

REMOVAL (refer to figures 1 & 2)

1. Gain access to the Diodes Section on the side of the Rack installed in the "A " & " B " LV Lockers, by opening the relevant LV Locker Door using the Maintenance Key.

2. Locate the Diode to be Replaced.

FIGURE 1 DIODE LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-00-00-00/R-03**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **HVAC CONTROL**	Unit:
Component: **DIODE**	Man Hours: **0.5**
Maintenance Task: **REPLACEMENT(TYPICAL)**	

PROCEDURE:

3. Take note of Wiring Color Codes and relevant positions on Diode Terminals.
4. Disconnect the Wiring from Diode Terminals by loosening and removing the relevant Screws on 4 Diode Terminals. Retain them for later use.
5. Loose and remove the Diode Locking Screws & Washers. Retain them for later use.
6. Remove the Diode and discard it.

INSTALLATION

1. Install the Diode in position.
2. Install Diode Locking Screws & Washers. Tighten as required.
3. Connect the Wiring to the Diode Terminals according to their position and Color Codes previously noted. Tighten as required.
4. Leave the LV Locker and close the LV locker Door using Maintenance Key.
5. Restore Electrical Power.
6. Record Task results on the Defect Report Card for administrative and maintenance planning.

FIGURE 2 DIODE REPLACEMENT

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS** (para 05-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 **"At every Task Completion."**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

WARNING: BE SURE THAT THE CCU LIFTER MIN CAPACITY IS 1500 LB.

CAUTION: THE CLIMATE CONTROL UNIT WEIGHS APPROXIMATELY 600 KG (1.300 LB). USE EXTREME CARE TO PREVENT PERSONAL INJURY DURING REPLACEMENT.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit
Lifter PN 98-6371

CONSUMABLES:

SPARE PARTS:

Gasket - Unit Mounting (Return Air) PN 2 33-3422
Gasket - Unit Mounting (Duct Air) PN 3 33-3598

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

NOTE: Retain the removed hardware/ attaching parts for later use.

NOTE: it is advised to secure and protect the Cables, Connectors and relevant receptacles on Control Box with suitable Clamps and Protection Caps to avoid damage during CCU Replacement.

2-1 REMOVAL

a. Gain access to the Control Box of the CCU to be removed via Ceiling Panel and Air Plenum Duct.

2-1-1 ELECTRICAL CONNECTIONS (Refer to Figure 1)

a. Set the Switch (13) to OFF position.
b. Disconnect the LV and MV Connectors and Cables located as shown in Fig 1:

2-1-2 MECHANICAL CONNECTIONS (Refer to Figure 2)

a. Remove the valves (4) from relevant draining pipes by removing first the relevant valve clamps.
b. For each CCU Support (10) proceed as follows:
   1. Remove Nut (60), Flat washer (50), Lock Washer (40),
   2. Remove Upper Silent Block (20).
   3. Leave in place the Fixing plate (30).

2-1-3 CLIMATE CONTROL UNIT (Refer to Figure 2)

WARNING: BE SURE THAT THE CCU LIFTER MIN CAPACITY IS 1500 LB

a. Using overhead crane properly position the Lifter (1) over the CCU.
b. Connect the Lifter Hoisting Eyes to the CCU Supports as shown in Figure 2.
c. Slowly hoist the Climate Control Unit and rest it on a suitable CCU Support Stand.
d. Remove the Lower Silent Block (20).
e. Remove and discard the Gaskets (2) and (3).

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 RETURN AIR TEMPERATURE SENSOR
2 DISCHARGE AIR TEMPERATURE SENSOR
3 FRESH AIR TEMPERATURE SENSOR
4 COMMUNICATION CONNECTOR
5 LV CONTROL OUTLET
6 AC POWER CONNECTOR
7 GROUND
8 LIMIT SWITCH
9 MULTIFUNCTION CONNECTOR
10 FANS VOLTAGE
11 COMPRESSOR VOLTAGE
12 HEATERS VOLTAGE
13 SWITCH (AUTO/OFF/TEST)

FIG 1 - CCU - CONTROL BOX - ELECTRICAL CONNECTIONS

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:
REPLACEMENT

PROCEDURE:

FIG 2 – CLIMATE CONTROL UNIT - REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-00-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/8**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.00**
Maintenance Task: **REPLACEMENT**	

PROCEDURE:

2-2 INSTALLATION

2-2-1 CLIMATE CONTROL UNIT (Refer to Figure 2)

a. Clean the Climate Control Unit installation area.

b. Install the “new” Gaskets (2) and (3)

WARNING: BE SURE THAT THE CCU LIFTER MIN CAPACITY IS 1500 LB.

c. Install the Lower Silent Block (20).

d. Using an Overhead Crane properly position the Lifter (1) over the CCU to be installed.

e. Connect the Lifter Hoisting Eyes to the CCU Supports as shown in Figure 2.

f. Slowly hoist the Climate Control Unit from the CCU Support Stand.

g. Carefully lower the Lifter in order to place in position the CCU.

CAUTION: PAY ATTENTION TO NOT DAMAGE THE GASKETS (2) AND (3) DURING CCU INSTALLATION.

h. Upon properly positioning the CCU, disconnect the Lifter Hoisting Eyes from CCU Supports (10.)

2-2-2 MECHANICAL CONNECTIONS (Refer to Figure 2)

a. For each CCU Support (10) proceed as follows:

1. Install the Upper Silent Block (20).
2. Install Lock Washer (40) Flat washer (50) and Nut (60).
3. Torque the Nut (60) to **150 ft lb (204 Nm).**

b. Install the draining pipes and secure them by the relevant clamps, paying attention to avoid that the clamps will compress excessively the pipe .Hand tightening is recommended.

c. Install the Drain Valves (4) on the Drain Pipes.

d. Upon completing the Valve installation verify / adjust the Drain Valve Cut to meet the proper position as shown in Figure 3 (Valve Cut vertical +/- 2-3 mm).

2-2-3 ELECTRICAL CONNECTIONS (Refer to Figure 1)

a. Remove Clamps and Protection Caps (previously installed) from Cables and Connectors.

b. Re-connect the LV and MV Connectors and Cables in its relevant positions as shown in Fig 1:

c. Set the Switch (13) to ON position.

d. Reinstall the Ceiling Panel.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**7/8**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.00

Maintenance Task:
REPLACEMENT

PROCEDURE:

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

b. Test the CCU according to Sheet R-P-05-01-00-00/T-00.

FIG 3 DRAIN VALVE CUT - INSTALLATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-00-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **8/8**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.00**
Maintenance Task: **REPLACEMENT**	

PROCEDURE:

3 FINAL OPERATIONS

c. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

d. Test the CCU according to Sheet R-P-05-01-00-00/T-00.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS GENERALLY GOOD PRACTICE TO REPLACE THE FILTER DRIER WHENEVER THE HIGH SIDE IS OPENED OR WHEN THE LOW SIDE IS OPENED FOR AN EXTENDED PERIOD OF TIME.

REFRIGERATION MAINTENANCE AND SERVICE OPERATION

NOTE: THE FOLLOWING PROCEDURES INVOLVE SERVICING THE REFRIGERATION SYSTEM. SOME THESE SERVICE PROCEDURES ARE REGULATED BY FEDERAL, AND IN SOME CASES, BY STATE AND LOCAL LAWS.

NOTE: ALL REGULATED REFRIGERATION SERVICE PROCEDURES MUST BE PERFORMED BY AN EPA CERTIFIED TECHNICIAN, USING APPROVED EQUIPMENT AND COMPLYING WITH ALL FEDERAL, STATE AND LOCAL LAWS.

SERVICE TOOLS

CAUTION: WHEN SERVICING THERMO KING R-407C REFRIGERATION SYSTEMS, USE ONLY THOSE SERVICE TOOLS (I.E., VACUUM PUMP, REFRIGERANT RECOVERY EQUIPMENT, GAUGE HOSES, AND GAUGE MANIFOLD SET) CERTIFIED FOR AND DEDICATED TO R-407C REFRIGERANT AND POLYOL ESTER BASED COMPRESSOR OILS. RESIDUAL NON-HFC REFRIGERANTS OR NON- ESTER BASED OILS WILL CONTAMINATE HFC SYSTEMS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit
VACUUM PUMP WITH MICRON GAUGE ELECTRONIC LEAK DETECTOR
DIGITAL MULTIMETER AMPROBE
PTU FOR CONTROLLER DIAGNOSTICS A/C GAUGE MANIFOLD SET

CONSUMABLES:

R-407C Refrigerant
Oil Test Kit P/N 203-457

SPARE PARTS:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE:

SERVICE TOOLS

UNIT SERVICE FITTINGS
The LRV uses a Hermetically Sealed Refrigeration System.
In the event that the Refrigerant Charge must be recovered, the Fittings for LPCO and HPCO have to be used. Install the Service Fittings on the Suction Line and Discharge Line Process Tubes located in the Compressor Compartment.

LEAK DETECTION
Leaks can be detected with the use of soap bubbles and with Halogen Leak Detectors such as model H10G, P/N 204-712 or model H10N, P/N 204-756 (portable).

GAUGE MANIFOLD SET
A new Gauge Manifold Set (P/N 204-758) should be dedicated for use with R-407C only.
Gauge hoses should also be dedicated to R-407C.

VACUUM PUMP
A Two-Stage (P/N 204-725), Three-Stage or Five-Stage Pump is recommended for Evacuation.
Purging the System with Dry Nitrogen is recommended before Evacuation.
Because residual Refrigerant may be present in used Vacuum Pumps, a new Vacuum Pump should be used and dedicated strictly as an R-407C Refrigerant Pump.
Use only recommended Vacuum Pump Oils and change Oil after every major Evacuation.
Because Vacuum Pump Oils are Highly Refined to obtain Low Vacuums, failure to follow these recommendations may result in Acidic Conditions that will destroy the Pump.

SYSTEM CLEANUP
Cleanup Devices such as Suction Line Filters and Compressor Oil Filters may be used if they are properly cleaned and new Filters and Cartridges are used.
All standard Petroleum and Synthetic Compressor Oils must be removed to prevent the contamination of R-407C systems.

REFRIGERANT RECOVERY
Use only Refrigerant Recovery Equipment approved for and dedicated to R-407C Recovery.

COMPRESSOR OIL ACID TEST
Perform an Oil Acid Test (Oil Test Kit P/N 203-457) whenever a System has a substantial Refrigerant Loss, a Noisy Compressor or Dark/Dirty Oil.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE:

1 REFRIGERANT LEAK TEST PROCEDURE

a. Use a reliable Halogen Leak Detector such as model H10G, P/N 204 -712 or 204-756 (portable), to Leak Test the Refrigeration System.
b. Inspect carefully for signs of Compressor Oil Leakage which is the first sign of a Leak in the Refrigeration System.

CAUTION: DUE TO ENVIRONMENTAL CONCERNS AND PERSONAL SAFETY, THE USE OF A HALIDE TORCH IS NO LONGER RECOMMENDED.

- **IF REFRIGERANT HAS LEAKED OR BEEN REMOVED FROM THE SYSTEM:**

1. Check entire System for possible Component damage and Refrigerant Oil loss.
2. Attach Gauge Manifold Set using the Low Pressure Cutout Switch and High Pressure Cutout Switch Schrader Valves. (Refer to Sheet R-C-05-02-01-00/R-00 for locations)
   Remove Low Pressure Cutout Switch and High Pressure Cutout Switch from Schrader Valve Fittings according to Sheet R-C-05-02-01-00/R-00
   Then :
   - attach Gauge Manifold Compound Gauge Line to Low Pressure Switch Schrader Valve.
   - attach High Pressure Gauge Line to High Pressure Switch Schrader Valve.
   - attach Refrigerant Bottle Charging Hose to Center of Gauge Manifold and purge Charging Hose of Air.
4. Pressurize the System with Refrigerant (GAS ONLY) until **50 psig (345 kPa, 3.45 bar)** Vapor Pressure is achieved.
5. Leak check the System with an Electronic Leak Detector to inspect all Joints and Connections.

- **IF NO LEAKS ARE FOUND BUT THE SYSTEM HAS LOST ITS REFRIGERANT CHARGE**

1. Close both Hand Valves on Gauge Manifold (Front Seated).
2. Disconnect the Refrigerant Charging Hose.
3. Connect the Charging Hose to a Source of Nitrogen.
   Adjust the Pressure Regulator to **200 psig (1380 kPa, 13.80 bar).**
   See Step 2-14"Using Pressurized Nitrogen."

CAUTION: NITROGEN (N2) IS UNDER 2,200 PSIG (15,170 KPA, 151.70 BAR) PRESSURE IN A FULL CYLINDER AT 70 °F (21 °C). DO NOT USE OXYGEN, ACETYLENE OR ANY OTHER TYPE OF PRESSURIZED GAS IN THE SYSTEM.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

- **IF NO LEAKS ARE FOUND BUT THE SYSTEM HAS LOST ITS REFRIGERANT CHARGE (CONT'D)**

4. Pressurize the System with Nitrogen to **200 psig (1380 kPa, 13.80 bars)**.
5. Close the Supply Valve on the Nitrogen Bottle.
6. Use an Electronic Leak Tester to inspect all Joints and Connections.

NOTE: If System Leakage is indicated, loosen Supply Line Hose Fittings to release Pressure. Repair leakage condition.
If System repair is necessary, recheck system after repairs are completed.

FIG. 1 TESTING FOR REFRIGERANT LEAK

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE (CONT'D):

2 EVACUATION AND CLEANUP OF THE REFRIGERATION SYSTEM

2-1 Contamination

a. Whenever Contaminants have entered the System, a thorough Clean Up is required to prevent damage or loss of Compressor.
b. It is well known by the Refrigeration Service Industry that the Purpose of Evacuation is to remove moisture and air from the Refrigeration System before charging, with new Refrigerant after a System has been opened.
c. The importance of thorough Evacuation and System Preparation cannot be over emphasized. Even infinitesimal quantities of air or moisture in a System can cause severe problems.
d. We know that the presence of moisture, oxygen, and heat under certain conditions can result in many forms of drainage. Corrosion, sludge, copper plating, oil breakdown, carbon formation, and eventual compressor failure can be caused by these contaminants.

Things that will contaminate a system are (in order of importance):

- **AIR** - with oxygen as a contaminant.
  Oxygen in the air reacts with the oil. The oil begins to break down and can eventually lead to carbonization in the Compressor and acid buildup. The longer this breakdown process goes on, the darker the compressor oil becomes until finally the color is BLACK indicating major system contamination.
- **MOISTURE.**
  Moisture in a System will cause metal corrosion and metal plating.
  It can freeze in the Expansion Valve and cause intermittent operational problems.
  It reacts in the oil to begin acid buildup.
- **DIRT, DUST, METAL PARTICLES, OTHER FOREIGN MATERIALS.**
  Particles of any kind left to float through the System will cause severe damage to all close tolerance items.
  DO NOT leave a System open to the infiltration of dirt. If you must open a system for any reason, seal off the open areas as soon as possible and DO NOT work in a dirty environment.
- **ACID.**
  Air and moisture cause a chemical breakdown of the oil and/or the refrigerant itself.
  The acid will accelerate the deterioration of the softer metals (i.e., copper) and cause metal plating as the softer material begins to cover the inside of the system.
  If this condition is not stopped, it can result in the total destruction of your Equipment.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**7/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

2-2 Compressor Oil Color Code

BLACK OIL - indicates Carbonization caused by air in the System.
BROWN OIL - indicates Copper Plating caused by moisture in the System
GRAY OR METALLIC OIL - indicates Bearing Wear or Piston Scoring.

NOTE: If the Compressor Oil is discolored, perform a Compressor Oil Acid Test
If the Compressor Oil shows an Acid Condition, change :

- The Oil
- The In-Line Oil Filter
- The Filter Drier
- And perform a Refrigeration System Cleanup

2-3 System Preparation and Hookup

CAUTION:DO NOT ATTEMPT TO EVACUATE A SYSTEM UNTIL IT IS CERTAIN THAT THE SYSTEM IS LEAK FREE. A SYSTEM WITH LESS THAN A FULL CHARGE OF REFRIGERANT SHOULD BE THOROUGHLY LEAK TESTED. ANY LEAKS FOUND MUST BE REPAIRED.

a. Proceed as follows:

1. Recover all Refrigerants from the System and reduce the System Pressure to the proper level (US Federal Law requires a **5 to 10 in. (-17 to -34 kPa, -0.17 to -0.34 bar)** Vacuum that is dependent upon the Recovery Equipment used).
2. Break vacuum with Refrigerant and equalize System Pressure to **0 psig (0 kPa, 0 bar)** and Replace the Liquid Line Filter Drier.
3. Confirm that the Evacuation Station functions properly and determine "Blank Off' Pressure. The Blank Off Pressure of the Vacuum Pump is the deepest vacuum that the Vacuum Pump can attain when isolated from the rest of the System.
   If a Vacuum Pump (isolated from a System) is started and the Micron Meter responds quickly by going to a Deep Vacuum, the Operator can be confident that the Pump and Oil are in good condition.
   If the Vacuum Pump fails to reach a deep vacuum within **5** minutes, the Operator should suspect the condition of the Oil or the Pump.
   It is recommended that the Pump Oil be changed first to see if the rate of reaching a deep vacuum is improved.
   Connect the Evacuation Station and Refrigerant Tank with Gauge Manifold (optional) to the System as indicated in Figure 2.
5. Connect Evacuation Hoses to the Fittings installed on the Suction Line and Liquid Line.
6. Open Evacuation Station Valves (V1, V3, and V4).
   It is only necessary to open Valve V2 when a reading on the Micron Meter is desired.
   This is especially true when starting to evacuate a System and large amounts of moisture and oil will be passing by the Sensor.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**8/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

2-3 System Preparation and Hookup (cont'd)

7. Open the Vacuum Pump ISO-Valve built into the Pump Housing below the Handle. It is recommended that the Valve be kept open at all times.
8. If connecting a Refrigerant Tank and Gauge Manifold to the Evacuation Station, close the Gauge Manifold and Refrigerant Tank Valves to prevent Refrigerant from being drawn from the Tank.

1. Special Quick Disconnect Couplers
2. Gas Ballast Valve
3. ISO Valve
4. Two stage Vacuum Pump
5. To AC Power
6. Calibration Standard
7. Micron Meter
8. Sensor

FIG.2 EVACUATION STATION AND UNIT HOOKUP

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**9/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

2-4 System Evacuation

a. Proceed as follows:

1. Turn on the Vacuum Pump.
   Open the Gas Ballast Valve located on top of the Pump Housing behind the Handle (the Valve is fully open at two turns counter- clockwise).
   Evacuate the System to **500 microns** to achieve a Final Equilibrium Pressure of **2000 microns or less**.

NOTE: The presence of Refrigerant in the Compressor Oil may prevent a Low Vacuum Reading from being achieved. Compressor Oil can continue to outages for long periods of time.

2. If the vacuum level appears to stall above **500 microns**, back seat the Discharge Service Valve and observe the Micron Meter.
   - A drop in pressure indicates that the compressor oil is out-gassing and further evacuation is necessary.
   - An increase in pressure indicates that a leak exists or there is moisture in the system. Perform a "Pressure Rise Test" and evaluate.

3. Close valve VI when the desired vacuum level has been reached.

4. Wait five minutes and read the Micron Meter.
   - A system that is leak free and dry will remain below **2000 microns** for **five** minutes.
   - A system that rises above **2000 microns** but stabilizes below atmospheric pressure is probably contaminated with moisture or has refrigerant out gassing from the compressor oil. Additional evacuation is required.
   - A system that continues to rise without stabilizing has a leak and must be repaired.

5. If the vacuum level remained below **2000 microns** for **five** minutes, the System is ready to.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **10/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE (CONT'D):

2-5 Pressure Rise Test

a. Evacuate the system and close valve V. With valves V3 and V4 open, the pump is isolated and the system is held under a vacuum.

b. If the Micron Meter rises, one of the following conditions exist.

- Leak: Watch the movement of the Micron Meter needle. If the needle continues to rise until it reaches atmospheric pressure, it is an indication that a leak exists somewhere in the system. When a leak is in a system, the vacuum will eventually stabilize at atmospheric pressure

  NOTE: Close the vacuum valve and watch the movement of vacuum gauge needle. If needle continues to rise, this is indication that a leak exists in the unit or connection line. The leak must be then located and eliminated.

- Moisture: When the needle indicates a rise and then stabilizes at a level below atmospheric pressure, it is an indication that the system is vacuum tight, but is still wet and requires additional dehydration and pumping time (see Figure 3.)

  NOTE: Close the vacuum valve and watch the movement of vacuum gauge needle. If needle shows a pressure rise but finally levels of to constant pressure, the system still contains too much moisture. Dehydration and additional evacuation time are required.

2-6 Factors Affecting the Speed of System Evacuation

a. It is almost impossible to state the exact amount of time required to evacuate any system.
b. Some factors that can influence Evacuation Time are listed below.
c. System size.
d. Amount of moisture contained in the system.
e. Ambient temperature.
f. Internal restrictions within the system.
g. External restrictions between the system and the vacuum pump.
h. Hose size, both diameter and length, affect evacuation times.
i. Laboratory tests show that the Evacuation Time can be significantly reduced by larger diameter hoses and shorter hoses.
j. To obtain optimum pumping speed, keep hoses as short as possible and as large in diameter as possible. For example, it takes eight times as long to pull a given vacuum through a 1/4 inch diameter hose as it does through a 1/2 inch diameter hose.
k. It takes twice as long to pull a vacuum through a 6 foot long hose as it does through a 3 foot long hose.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**11/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

1. Constant Pressure Rise Indicates Leak.
2. Time Axis.
3. Pressure (Vacuum).
4. Atmospheric Pressure.

FIG. -3 CONSTANT PRESSURE RISE AFTER EVACUATION INDICATES SYSTEM LEAK

1. Pressure Rise that Levels Off Indicates Leak.
2. Time Axis.
3. Pressure (Vacuum).
4. Atmospheric Pressure.

FIG 4 PRESSURE RISE THAT LEVELS OFF AFTER EVACUATION INDICATES MOISTURE IN SYSTEM

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **12/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE (CONT'D):

2-7 Heat Saves Time

a. A useful and practical time saver is the application of heat to the system.
b. Increasing the temperature of the compressor oil and refrigerant will speed up the vaporization of any water present in the system.

WARNING: NEVER USE A TORCH OR OTHER CONCENTRATED HEAT SOURCE TO HEAT THE COMPRESSOR OR OTHER REFRIGERATION SYSTEM COMPONENT.

c. Heat lamps, electric heaters, or fans can be applied to the compressor crankcase and other parts of the system to increase the temperature of the refrigerant and compressor oil.

2-8 System Charging (from an Evacuated Condition)

a. Proceed as follows:

1. Close valve V4.
2. Open the Gas Ballast valve (located on top of the pump housing behind the handle).
3. Stop the vacuum pump.
4. Connect the Refrigerant Tank with Gauge Manifold to the Evacuation Station (see previous Step 2-3 System Preparation and Hookup").
5. Weigh the Tank of Refrigerant.
6. Check the LRV System holds **26.5 lb (11.8 kg)** of R-407C refrigerant.
   Subtract this amount of the Charge to be input to your system from the Total Weight of the Tank of Refrigerant. This provides Final Tank Weight after the System receives a full System Refrigerant Charge.
7. Set the Refrigerant Tank for Liquid Removal. Open the Hand Valve on the Tank.
8. With the system OFF, open the Gauge Manifold Hand Valve and charge Liquid Refrigerant into the System.

   NOTE: Use only the Liquid for charging!
9. Close the refrigerant Tank Hand Valve when the correct amount (by weight) of Refrigerant has been added or if the System will take no more liquid.
   The System is now ready to have the Evacuation Station removed
   See following Steps, 2-9 and 2-10, to complete Charging Procedure.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**13/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

2-9 Evacuation Station Removal

a. Proceed as follows:

1. Close the Refrigerant Tank Hand Valve.
2. Operate the System in Cool Mode.
3. Open the Hand Valve at the Gauge Manifold and read Suction Pressure.
4. Front seat the Suction Service Valve and pump down the System to **21 to 35 kPa, 0.21 to 0.35 bar,**
5. Remove the hose from the Discharge Line Process Tube Service Fitting.
6. Install a Gauge Manifold Set.
   - If the System is fully charged, perform a Functional Check Out.
   - If the System has a partial charge, complete the Charging Process as described below.

2-10 Final Charging Procedure for Partially Charged Systems

a. Proceed as follows:

1. Connect the Gauge Manifold to the Suction Line and Discharge Line Process Tube Service Fittings. Be sure to purge the air from the Lines
2. Connect a Refrigerant Tank to the Gauge Manifold Service Line.
3. Set the Refrigerant Tank for Liquid Charging. Open the Refrigerant Tank Hand Valve.

   NOTE: Use only the Liquid for charging!

4. Start and operate the system in the COOL mode.
5. Read the Suction Pressure and slowly open the Gauge Manifold Low Pressure Hand Valve to permit Suction Pressure to increase approximately **25 psig (172 kPa, 1.72 bar).** This will meter liquid refrigerant slowly into the Low Side.
6. Add Refrigerant until the rest of the scale indicates that **26.5 lb (11.8 kg)** of R-407C have been charged (added) into the System.
7. Close the Hand Valve On The Refrigerant Tank.
8. Remove the Gauge Manifold Set.
9. Cap all Service Ports and Valve Stems.

CAUTION: IF THE UNIT SWITCH WAS PLACED ON TEST TO FORCE COOL OPERATION, BE SURE TO RETURN THE SWITCH TO THE AUTO POSITION BEFORE PLACING THE SYSTEM BACK IN SERVICE.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **14/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE (CONT'D):

2-11 Refrigerant Recovery

CAUTION: USE ONLY REFRIGERANT RECOVERY EQUIPMENT APPROVED FOR AND DEDICATED TO R-407C RECOVERY.

a. When removing any refrigerant from a Thermo King refrigeration system, use a recovery process that prevents or absolutely minimizes the refrigerant that can escape to the atmosphere.

b. Typical service procedures that require removal of refrigerant from the system include:
- To reduce the refrigerant pressure to a safe working level when maintenance must be performed on high- pressure side components.
- To empty the system of refrigerant when an unknown amount of charge is in the system and a proper charge is required.
- To empty the system of contaminated refrigerant when the system has become contaminated.

2-12 Vapor Recovery

a. Proceed as follows:

1. Install a gauge manifold set on the system. Attach the service line to the recovery machine and properly purge the lines. Set the recovery machine for vapor recovery.
2. Keep the system OFF and mid-seat the discharge line service valve.
3. Turn ON the recovery machine and open (back seat) both gauge manifold and hand valves.
4. Continue to operate the recovery machine until system pressures drop to **0 psig (0 kPa, 0 bar) pressure.**

2-13 Liquid Recovery

a. Proceed as follows:

1. Install a Gauge Manifold's Low Pressure Line to the Suction Line Service Valve in the Suction Line. Attach the Manifold's High Pressure Line to the Discharge Line Service Valve. Attach the Service Line to the Recovery Station and properly purge the Lines.
2. Operate the system and build discharge pressure to approximately **200 psig (1380 kPa, 13.80 bar).**
3. Stop the system.
4. Set the recovery machine for liquid recovery and turn it ON.
5. Open (back seat) the gauge manifold's high-pressure hand valve.
6. Operate the recovery machine until the system pressures reach approximately **0 psig (0 kPa, 0 bar).**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-00-00/S-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**15/16**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
	1.5

Maintenance Task:
SERVICE

PROCEDURE (CONT'D):

2-14 Using Pressurized Nitrogen

a. The improper use of high pressure cylinders can cause physical damage to components, or personal injury, or cause stress that would lead to failure of components.

Safety Precautions

a. Observe the proper handling of cylinders:

1. Always keep protective cap on cylinder when not in use.
2. Secure cylinder in proper storage area or fastened to cart.
3. DO NOT expose to excessive heat or direct sun light.
4. DO NOT drop, dent, or damage cylinder.
5. Use a pressure regulator and a safety pressure relief valve as part of the pressure testing equipment. The safety pressure relief valve should be of the non-adjustable, non-tempering type. The valve should bypass any time the pressure exceeds its setting.
6. Open valve slowly; use regulators and safety valves that are in good working order.
7. The regulator should have two gauges; one to read tank pressure, the other to read line pressure. Properly maintained equipment will allow leak testing, purging, or dehydration to be done safely.

1. Line Pressure
2. Tank Pressure
3. Tank
4. Pressure Test Line To System
5. Safety Valve
6. Pressure Regulator

FIG. -5
TYPICAL PRESSURIZED GAS BOTTLE WITH PRESSURE REGULATOR & GAUGES

CAUTION: NITROGEN (N2) IS UNDER 2,200 PSIG (15,170 KPA, 151.70 BAR), OR GREATER. PRESSURE IS FOR FULL CYLINDER AT 70 °F (21 °C). DO NOT USE OXYGEN (02), ACETYLENE OR ANY OTHER TYPES OF PRESSURIZED GAS ON REFRIGERATION SYSTEMS OR ANY COMPONENT OF A SYSTEM.

b. Dehydration, pressure testing, purging and soldering can be accomplished with the use of Dry Nitrogen (N2). The proper equipment and application of equipment is of greatest importance.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-00-00/S-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **16/16**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component:	Man Hours: **1.5**
Maintenance Task: **SERVICE**	

PROCEDURE (CONT'D):

2-14 Using Pressurized Nitrogen(cont'd):

Procedure

a. Proceed as follows:

1. Attach gauge manifold set. Close both hand valves on the gauge manifold (front seated).
2. Connect charging hose to a source of nitrogen. Adjust pressure regulator to the proper pressure for the required procedure.
3. Purge system high side to low side.

b. The following procedures should utilize the following MAXIMUM gas pressure:

- Leak Testing: **150 to 174 psig (1034 to 1200 kPa, 10.34 to 12.00 bar)**
- Purging/Dehydration: **10 to 20 psig (69 to 138 kPa, 0.69 to 1.38 bar)**
- Soldering: **5 psig (35 kPa, 0.35 bar)**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-01-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER FAN MOTOR**

Component:	Man Hours:
	1.5

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-01-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER FAN MOTOR**
Component:	Man Hours: **1.5**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: THE CONDENSER FAN MOTOR WEIGHS APPROXIMATELY 17 KG (37 LB). USE CARE WHEN REMOVING THE CONDENSER FAN MOTOR TO PREVENT PERSONAL INJURY DURING REMOVAL.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

CONDENSER FAN MOTOR P/N: 104-686 (LEESON OL121472)

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-01-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER FAN MOTOR**

Component:	Man Hours:
	1.5

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Loosen the setscrew securing the Fan Hub Bushing to the Condenser Motor Shaft Key.
b. Remove three Cap Screws securing the Fan Hub Bushing and the Condenser Fan to the Condenser Motor Shaft.
c. Install all three of the Cap Screws removed during previous step into the Special Threaded Jack Holes of Bushing.
d. Tighten Cap Screws alternately until Fan Hub and Bushing separate.
e. Remove Cap Screws.
f. Carefully remove Condenser Fan Assembly and Hub Bushing from Motor Shaft.

CAUTION: USE CARE NOT TO LOSE KEY FROM MOTOR SHAFT.

g. Remove 4 Screws securing the Motor Junction Box Cover.
h. Remove Cover.
i. Tag and disconnect Wiring from Condenser Motor.
j. Loosen Strain Relief and carefully guide Conduit out of Motor Junction Box.
k. Remove Bolts, Washers, and Nuts securing the Motor to the Mounting Bracket.

CAUTION: THE CONDENSER FAN MOTOR WEIGHS APPROXIMATELY 17 KG (37 LB). USE CARE WHEN REMOVING THE CONDENSER FAN MOTOR TO PREVENT PERSONAL INJURY DURING REMOVAL.

l. Carefully lift the Motor out through orifice.
m. Get a new Condenser Fan Motor.
n. Carefully lower the Condenser Fan Motor through Fan orifice and align with the Frame.
o. Secure the Motor Mounting Base to the Frame with Bolts, Washers, And Nuts. Torque the Nuts securely.
p. Carefully guide the Conduit into the Motor Junction Box and tighten Strain Relieves.
q. Check the Tags and connect Wiring to Junction Box Terminals.
r. Install the Junction Box Cover and secure it with four Screws.
s. Align the Fan Bushing with the Hub of Fan.
t. Install the three Cap Screws into the Fan Bushing and engage a few threads.
u. Place the Fan/Bushing Assembly on the Motor Shaft.

NOTE: Make sure that the Keyway of Motor Shaft and the Keyway of Bushing are properly aligned.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-01-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER FAN MOTOR**
Component:	Man Hours: **1.5**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

2 REPLACEMENT(CONT'D)

v. Tighten Cap Screws just enough to hold the Fan/Bushing Assembly in place on the Motor Shaft.
w. Insert the Key into the Bushing Keyway and carefully tap it in place until it reaches end of Keyway on the Motor Shaft.
x. Lightly tap Fan/Bushing Assembly upward until one- third (1/3) of the Fan Blade protrude above the Top Edge of Fan Orifice.
y. Torque the three Cap Screws to **41 to 45 N-m (30 to 33 ft-lb)**.

FIGURE 1 - CONDENSER FAN MOTOR REPLACEMENT

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-02-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER FAN**

Component:	Man Hours:
	1.5

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-02-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER FAN**
Component:	Man Hours: **1.5**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: USE NOT TO LOSE KEY FROM MOTOR SHAFT.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

CONDENSER FAN P/N: 78-1215

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-02-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER FAN**

Component:	Man Hours:
	1.5

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1

2 REPLACEMENT

a. Loosen the setscrew securing the Fan Hub Bushing to the Condenser Motor Shaft Key.
b. Remove the three Cap Screws securing the Fan Hub Bushing and the Condenser Fan to the Condenser Motor Shaft.
c. Install all three of the Cap Screws removed during previous step into the Special Threaded Jack Holes of Bushing.
d. Tighten the Cap Screws alternately until the Fan Hub and the Bushing separate.
e. Remove the Cap Screws.
f. Carefully remove the Condenser Fan Assembly and the Hub Bushing from the Motor Shaft.

CAUTION: USE CARE NOT TO LOSE KEY FROM MOTOR SHAFT.

g. Get a new Condenser Fan.
h. Align the Fan Bushing with the Hub of Fan.
i. Install the three Cap Screws into the Fan Bushing and engage a few threads.
j. Place the Fan/Bushing Assembly on the Motor Shaft.

NOTE: Make sure that the Keyway of the Motor Shaft and the Keyway of the Bushing are properly aligned.

k. Tighten the Cap Screws just enough to hold the Fan/Bushing Assembly in place on the Motor Shaft.
l. Insert the Key into Bushing Keyway and carefully tap it in place until it reaches end of the Keyway on the Motor Shaft.
m. Lightly tap the Fan/Bushing Assembly upward until one- third (1/3) of the Fan Blade protrudes above the Top Edge of Fan Orifice.
n. Torque the three Cap Screws to **41 to 45 N-m (30 to 33 ft-lb)**.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-02-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER FAN**
Component:	Man Hours: **1.5**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - CONDENSER FAN REPLACEMENT

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-03-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER MOTOR**

Component:	Man Hours:
	6

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-03-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR BLOWER MOTOR**
Component:	Man Hours: **6**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION: THE EVAPORATOR BLOWER MOTOR ALONE WEIGHS APPROXIMATELY 30 KG (66 LB). USE CARE TO PREVENT PERSONAL INJURY WHEN REMOVING THE BLOWER ASSEMBLY FROM THE UNIT

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

EVAPORATOR BLOWER MOTOR P/N: 104-710

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-03-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER MOTOR**

Component:	Man Hours:
	6

Maintenance Task:
REPLACEMENT

PROCEDURE:

FIGURE 1 - EVAPORATOR BLOWER ASSEMBLY LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-03-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**
Sheet: **4/6**

Subsystem/Assy: **CLIMATE CONTROL UNIT**
Unit: **EVAPORATOR BLOWER MOTOR**

Component:
Man Hours: **6**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Remove the Left and Right Upper Beams.
b. Remove the Cover from the Evaporator Motor Junction Box.
c. Tag and disconnect Wiring from Junction Box Terminals.
d. Loosen Strain Relief and carefully guide Wiring from Junction Box.
e. Remove all Blower Motor Assembly Mounting Bolts.
f. Lift the entire Evaporator Blower Assembly from the Unit and place on Service Bench.

CAUTION: THE EVAPORATOR BLOWER MOTOR ALONE WEIGHS APPROXIMATELY 30 KG (66 LB). USE CARE TO PREVENT PERSONAL INJURY WHEN REMOVING THE BLOWER ASSEMBLY FROM THE UNIT.

g. Remove the Motor from the Blowers and from the Base.
h. Get a new Motor.
i. Connect the Motor to the Blowers and install them on the Base.
j. Lift the Blower Assembly and move it to the Vehicle Roof near the CCU location
k. Carefully lower Blower Assembly into the Unit.
l. Install and secure all Mounting Bolts, Flat Washers and Locknuts.
m. Check Wiring Tags and guide Wiring through Strain Relief into Motor Junction Box.
n. Tighten Strain Relief.
o. Connect Wiring per Tags.
p. Install the Cover on the Motor Junction Box.
q. Supply 208 VAC and 37.5 VDC Power to the HVAC System as follows :
   - Place the Knife Switch Handle in SHOP position
   - Connect the Workshop Power Supply Plug to the Vehicle Shop Power Socket
r. Switch to ON the following Circuit Breakers:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

s. Make sure that the SWT Switch on CCU Control Panel is to AUTO position.
t. Operate Evaporator Blowers to confirm correct direction of rotation. Adjust as per check result.
u. Place SWT Switch to OFF position.
v. Install the Left and Upper Beams.
w. Place SWT Switch to AUTO position.
x. Disconnect the Workshop Power Plug from Vehicle Shop Power Socket and place the Knife Switch.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-03-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER MOTOR**

Component:	Man Hours:
	6

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

FIGURE 2 - EVAPORATOR BLOWER ASSY MOTOR REPLACEMENT

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-03-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR BLOWER MOTOR**
Component:	Man Hours: **6**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER**

Component:	Man Hours:
	1

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

BLOWER, CCW P/N: 78-1329
BLOWER, CW P/N: 78-1333

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

PROCEDURE:

FIGURE 1 - EVAPORATOR BLOWER ASSEMBLY LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-04-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
4/6

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:
EVAPORATOR BLOWER

Component:

Man Hours:
1

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Remove the Left and Right Upper Beams.
b. Remove the Cover from the Evaporator Motor Junction Box.
c. Remove the Drum Temperature Sensor according to Sheet R-C-05-02-13-00/R-00.
d. Tag and disconnect Wiring from Junction Box Terminals.
e. Loosen Strain Relief and carefully guide Wiring from Junction Box.
f. Remove all Blower Motor Assembly Mounting Bolts.
g. Lift the entire Evaporator Blower Assembly from the Unit and place on Service Bench.
h. Remove the Blower(s) from the Motor and from the Base.
i. Get new Blower(s).
j. Connect the Blower(s) to the Motor and install them on the Base.
k. Lift the Blower Assembly and move it to the Vehicle Roof near the CCU location.
l. Carefully lower Blower Assembly into the Unit.
m. Install and secure all Mounting Bolts, Flat Washers and Locknuts.
n. Check Wiring Tags and guide Wiring through Strain Relief into Motor Junction Box.
o. Tighten Strain Relief.
p. Install the Drum Temperature Sensor according to Sheet R-C-05-02-13-00/R-00.
q. Connect Wiring per Tags.
r. Install Cover on Motor Junction Box.
s. Supply 208 VAC and 37.5 VDC Power to the HVAC System as follows :
   - Place the Knife Switch Handle in SHOP position
   - Connect the Workshop Power Supply Plug to the Vehicle Shop Power Socket
t. Switch to ON the following Circuit Breakers:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

u. Make sure that the SWT Switch on CCU Control Panel is to AUTO position.
v. Operate Evaporator Blowers to confirm correct direction of rotation. Adjust as per check result.
w. Place SWT Switch to OFF position.
x. Install the Left and Upper Beams.
y. Place SWT Switch to AUTO position.
z. Disconnect the Workshop Power Plug from Vehicle Shop Power Socket and place the Knife Switch.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR BLOWER**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

FIGURE 2 - EVAPORATOR BLOWER ASSY BLOWER REPLACEMENT

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-P-05-00-00-00/SP-00 Step 3

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-04-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR BLOWER**
Component:	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-06-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**COMPRESSOR**

Component:	Man Hours:
	12

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-06-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **COMPRESSOR**
Component:	Man Hours: **12**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: CHANGE BOTH COMPRESSORS AT ONE TIME. NEVER CHANGE ONLY ONE.

CAUTION: THE COMPRESSOR ASSEMBLY WEIGHS APPROXIMATELY 41 KG (90 LB). USE EXTREME CARE TO PREVENT PERSONAL INJURY DURING REMOVAL.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

COMPRESSOR ASSY	P/N: 206B7
COMPRESSOR, SCROLL	P/N: 102-740

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-06-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**COMPRESSOR**

Component:	Man Hours:
	12

Maintenance Task:
REPLACEMENT

PROCEDURE:

FIGURE 1 - COMPRESSOR ASSY LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-06-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **COMPRESSOR**
Component:	Man Hours: **12**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

b. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

2-1 REMOVAL

CAUTION: CHANGE BOTH COMPRESSORS AT ONE TIME. NEVER CHANGE ONLY ONE.

a. Remove the Left and Right Upper Beams.
b. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
c. Unsolder the Liquid and Suction Line Connections to the Compressor Assembly.
d. Remove Covers from both Compressor Motor Junction Boxes.
e. Tag and disconnect System Wiring from each Compressor Terminal Block.
f. Remove Bolts, Lock Washers and Flat Washers securing the Compressor Base (Saddle) Assembly to the Unit Mounts.

CAUTION: THE COMPRESSOR ASSEMBLY WEIGHS APPROXIMATELY 41 KG (90 LB). USE EXTREME CARE TO PREVENT PERSONAL INJURY DURING REMOVAL.

a. Connect on Overhead Lifting Device and sting to lift Compressor Assembly from Unit.
b. Remove Base (Saddle) Assembly from Compressors.
c. Remove Upper Brackets from Scroll Compressors.
d. Unsolder Liquid and Suction Line Connections joining Scroll Compressors together.
e. Remove the Scroll Compressors.

2-2 INSTALLATION

a. Get new Scroll Compressors.
b. Clean Tubes for soldering.
c. Place Scroll Compressors on Level Work Bench.
d. Install Scroll Compressors on Base (Saddle) Assembly.
e. Install Upper Brackets on the Scroll Compressors.
f. Solder Discharge and Suction Lines on Compressor Assembly with High Temperature Silver Solder (30% Silver).

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS

g. Connect an Overhead Lifting Device to Compressor Base Assembly.
h. Carefully guide the Compressor and Base Assembly into the Unit.
i. Secure Compressors to Base with Bolts, Lock Washers and Flat Washers.
j. Torque Bolts securely.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-06-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **5/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **COMPRESSOR**
Component:	Man Hours: **12**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

2 REPLACEMENT(CONT'D):

2-2 INSTALLATION(CONT'D)

k. Solder Discharge and Suction Line Connections to Refrigeration System with High Temperature Silver Solder (30% Silver).
l. Check Tags on Wiring.
m. Guide Wiring into Compressor Junction Boxes.
n. Connect Wiring to Terminal Block of each Compressor.
o. Install Covers on the Motor Junction Boxes.
p. Replace Filter-Drier Cartridge according to Sheet R-C-05-01-12-00/R-00).
q. Pressurize the Refrigeration System according to Sheet R-C-05-01-00-00/S-00.
r. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
s. Evacuate the System according to Sheet R-C-05-01-00-00/S-00.
t. Recharge the Syste. according to Sheet R-C-05-01-00-00/S-00.
u. Install Left and Right Beams. I

3 FINAL OPERATIONS

e. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-06-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **COMPRESSOR**
Component:	Man Hours: **12**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIG 2 COMPRESSOR ASSY REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-07-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **VIBRASORBER SUCTION**	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-07-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **VIBRASORBER SUCTION**	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

VIBRASORBER SUCTION P/N: 306-1395

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-07-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
VIBRASORBER SUCTION	**4**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Remove the Compressor Assembly according to Sheet R-C-05-01-06-00/R-00.Step 2-1

NOTE: The Compressor Removal includes the to Refrigerant Charge Recovering from A/C System according to Sheet R-C-05-01-00-00/S-00.

b. Unsolder the Suction Pipes.
c. Disengage both the Clamps securing the Suction Pipes.
d. Remove the Vibrasorber Suction.
e. Get a new Vibrasorber Suction
f. Clean Tubes for soldering.
g. Position the Vibrasorber Suction between the Suction Pipes.
h. Engage both the Clamps.
i. Solder the Suction Pipes with High Temperature Silver Solder (30% Silver).

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

j. Install the Compressor Assembly according to Sheet R-C-05-01-06-00/R-00. Step 2-2

NOTE The Compressor Installation includes:

- The Filter-Drier Cartridge Replacement according to Sheet R-C-05-01-12-00/R-00
- The Refrigeration System Pressurization according to Sheet R-C-05-01-00-00/S-00
- The Leaks Checking according to Sheet R-C-05-01-00-00/S-00
- The Evacuation according to Sheet R-C-05-01-00-00/S-00
- The Recharging according to Sheet R-C-05-01-00-00/S-00

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-07-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **VIBRASORBER SUCTION**	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - VIBRASORBER SUCTION REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-08-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
VIBRASORBER DISCHARGE	**4**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-08-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
VIBRASORBER DISCHARGE	**4**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

VIBRASORBER DISCHARGE	P/N: 306-1397
O-RING, Relief Valve	P/N: 33-1015

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-08-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
VIBRASORBER DISCHARGE	**4**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Remove the Compressor Assembly according to Sheet R-C-05-01-06-00/R-00.Step 2-1.

NOTE: The Compressor Removal includes the to Refrigerant Charge Recovering from A/C System according to Sheet R-C-05-01-00-00/S-00.

b. Remove the Relief Valve according to Sheet R-C-05-01-13-00/R-00,(as Precautionary Measure to not damage the Valve installed on during Discharge Pipes unsoldering).
c. Unsolder the Discharge Pipes.
d. Disengage both the Clamps securing the Discharge Pipes.
e. Remove the Vibrasorber Discharge.
f. Get a new Vibrasorber Discharge.
g. Clean Tubes for soldering.
h. Position the Vibrasorber Discharge between the Discharge Pipes.
i. Engage both the Clamps.
j. Solder the Discharge Pipes with High Temperature Silver Solder (30% Silver).

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

k. Install the Relief Valve with new O-ring according to Sheet R-C-05-01-13-00/R-00
l. Install the Compressor Assembly according to Sheet R-C-05-01-06-00/R-00. Step 2-2

NOTE The Compressor Installation includes:

- The Filter-Drier Cartridge Replacement according to Sheet R-C-05-01-12-00/R-00.
- The Refrigeration System Pressurization according to Sheet R-C-05-01-00-00/S-00
- The Leaks Checking according to Sheet R-C-05-01-00-00/S-00
- The Evacuation according to Sheet R-C-05-01-00-00/S-00
- The Recharging according to Sheet R-C-05-01-00-00/S-00

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-08-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **VIBRASORBER DISCHARGE**	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - VIBRASORBER DISCHARGE REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-09-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**SOLENOID VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-09-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**SOLENOID VALVE**

Component:	Man Hours:
	4

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

CAUTION: THE FEELER BULB MUST MAKE GOOD CONTACT WITH THE SUCTION LINE OR OPERATION WILL BE FAULTY.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

SOLENOID VALVE	P/N: 61-877	QTY: 1

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-09-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**SOLENOID VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
b. Locate the Solenoid Valve and the Feeler Bulb.
c. Remove Insulating Tape of the Feeler Bulb.
d. Mark the position of the Feeler Bulb on the side of the Suction Line.
e. Unclamp and remove the Feeler Bulb from the Suction Line.
f. Remove Insulating Tape from Solenoid Valve Outlet Line.
g. Disconnect Wiring from Solenoid Valve Coil Enclosure.
h. Heat and unsolder the Equalizer Line from Solenoid Valve.
i. Heat and unsolder the Line Inlet and Outlet Connections to Solenoid Valve in Evaporator Section.
j. Remove Solenoid Valve from Bracket. Retain the securing Hardware for later use.
k. Get a new Solenoid Valve.
l. Clean all the Lines for soldering.
m. Place new Solenoid Valve in its position on Bracket and secure it by means of relevant Securing Hardware.
n. Solder Line Connections to Valve.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

o. Reconnect Wiring to Solenoid Valve Coil Enclosure and protect with a light spray coat of recommended Contact Cleaner.
p. Clean the Suction Line to a bright polished condition.
q. Install a new Feeler Bulb in the Clamp on the Suction Line.
r. Locate Bulb on the Suction Line in the position previously marked.

CAUTION: THE FEELER BULB MUST MAKE GOOD CONTACT WITH THE SUCTION LINE OR OPERATION WILL BE FAULTY.

s. Cover the Feeler Bulb with Insulating Tape.
t. Replace Filter-Drier according to Sheet R-C-05-01-12-00/R-00.
u. Pressurize the Low Side and check for Leaks according to Sheet R-C-05-01-00-00/S-00.
v. Evacuate the Low Side according to Sheet R-C-05-01-00-00/S-00.
w. Cover the Solenoid Valve Outlet Line with Insulating Tape.
x. Recharge the System according to Sheet R-C-05-01-00-00/S-00.
y. Supply 208 VAC and 37.5 VDC Power to the HVAC System as follows:
   - Place the Knife Switch Handle in SHOP position
   - Connect the Workshop Power Supply Plug to the Vehicle Shop Power Socket

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-09-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
4/6

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:
SOLENOID VALVE

Component:

Man Hours:
4

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

2 REPLACEMENT (CONT'D)

z. Switch to ON the following Circuit Breakers:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

aa. Make sure that the SWT Switch on CCU Control Panel is to AUTO position.
bb. Operate the System.
cc. Note the Suction Pressure and Container Temperature to make sure that the Solenoid Valve is properly installed and that the Feeler Bulb is properly located. Adjust as per check result.
dd. Disconnect the Workshop Power Plug from Vehicle Shop Power Socket and place the Knife Switch Handle in "NORMAL" position.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-09-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**SOLENOID VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

FIGURE 2 - SOLENOID VALVE REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-09-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **SOLENOID VALVE**
Component:	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-10-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **SOLENOID VALVE**
Component: **COIL**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-10-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **SOLENOID VALVE**
Component: **COIL**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

COIL PN TBD

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-10-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**SOLENOID VALVE**

Component:	Man Hours:
COIL	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Disconnect the Wiring from Solenoid Valve Coil Enclosure.
b. Remove the Screw securing the Coil to Valve.
c. Remove the coil.
d. Clean the Coil seat.
e. Position Valve Coil.
f. Install and tighten the Screw to secure the Coil on the Valve.
g. Reconnect the Wiring from the Solenoid Valve Coil Enclosure.
h. Protect with a light spray coat of recommended Contact Cleaner.

FIG 1 SOLENOID VALVE **COIL REPLACEMENT**

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-10-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **SOLENOID VALVE**
Component: **COIL**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-11-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EXPANSION VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-11-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EXPANSION VALVE**
Component:	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

CAUTION: THE FEELER BULB MUST MAKE GOOD CONTACT WITH THE SUCTION LINE OR OPERATION WILL BE FAULTY.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

EXPANSION VALVE PN 61-2566

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-11-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EXPANSION VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
b. Locate the Expansion Valve and the Feeler Bulb to be replaced.
c. Remove Insulating Tape of the Feeler Bulb.
d. Mark the position of the Feeler Bulb on the side of the Suction Line.
e. Unclamp and remove the Feeler Bulb from the Suction Line.
f. Remove Insulating Tape from Expansion Valve Outlet Line.
g. Heat and unsolder the Equalizer Line from Expansion Valve.
h. Heat and unsolder the Line Inlet and Outlet Connections to Expansion Valve in Evaporator Section.
i. Remove Expansion Valve from Bracket. Retain the securing Hardware for later use.
j. Get a new Expansion Valve.
k. Clean all the Lines for soldering.
l. Place new Expansion Valve in its position on Bracket and secure it by means of relevant Fixing Hardware.
m. Solder Line Connections to Valve.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

n. Clean the Suction Line to a bright polished condition.
o. Install a new Feeler Bulb in the Clamp on the Suction Line.
p. Locate Bulb on the Suction Line in the position previously marked.

CAUTION: THE FEELER BULB MUST MAKE GOOD CONTACT WITH THE SUCTION LINE OR OPERATION WILL BE FAULTY.

q. Cover the Feeler Bulb with Insulating Tape.
r. Replace Filter-Drier according to Sheet R-C-05-01-12-00/R-00.
s. Pressurize the Low Side and check for Leaks according to Sheet R-C-05-01-00-00/S-00.
t. Evacuate the Low Side according to Sheet R-C-05-01-00-00/S-00.
u. Cover Expansion Valve Outlet Line with Insulating Tape.
v. Recharge the System, according to Sheet R-C-05-01-00-00/S-00.
w. Supply 208 VAC and 37.5 VDC Power to the HVAC System as follows:
   - Place the Knife Switch Handle in SHOP position
   - Connect the Workshop Power Supply Plug to the Vehicle Shop Power Socket

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-11-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
4/6

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:
EXPANSION VALVE

Component:

Man Hours:
4

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

x. Switch to ON the following Circuit Breakers:

CB IDENTIFICATION	LABEL NAME	LOCATION	
2F04	HVAC SUPPLY	LV LOCKER-MV RACK	A-B SECTIONS
12F01	HVAC PROTECTION	LV LOCKER-	A-B SECTIONS
12F02	HVAC PROTECTION	CB PANEL	A-B CABS

y. Make sure that the SWT Switch on CCU Control Panel is to AUTO position
z. Operate the System
aa. Note the Suction Pressure and Container Temperature to make sure that the Expansion Valve is properly installed and that the Feeler Bulb is properly located. Adjust as per check result
bb. Disconnect the Workshop Power Plug from Vehicle Shop Power Socket and place the Knife Switch Handle in "NORMAL" position.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-11-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EXPANSION VALVE**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

Figure 1 - Expansion valve replacement

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-11-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EXPANSION VALVE**
Component:	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-12-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**FILTER DRIER**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-12-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FILTER DRIER**
Component:	Man Hours: **4**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

FILTER DRIER PN 306-1806

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-12-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**FILTER DRIER**

Component:	Man Hours:
	4

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Recover Refrigerant Charge from A/C system. according to Sheet R-C-05-01-00-00/S-00.

WARNING: WEAR PROTECTIVE EYE SHIELD AND GLOVES DURING THE FOLLOWING STEPS. PROTECT EYES AND HANDS FROM LIQUID REFRIGERANT.

b. Unsolder the Liquid Line in Compressor Compartment.
c. Remove Filter-Drier Cartridge.
d. Get a new Filter-Drier Cartridge.
e. Carefully align new filter-Drier Cartridge in its position in Liquid Line.

CAUTION: PAY ATTENTION TO THE ARROW ON THE CARTRIDGE INDICATING THE RIGHT FLUID DIRECTION.

f. Solder Inlet and Outlet Connections to new Filter-Drier Cartridge.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

g. Pressurize the Refrigeration System according to Sheet R-C-05-01-00-00/S-00.
h. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
i. Evacuate the System according to Sheet R-C-05-01-00-00/S-00.
j. Recharge the System according to Sheet R-C-05-01-00-00/S-00.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET		
Card Code: **R-C-05-01-12-00/R-00**		
System: **HEATING, VENTILATION & AIR CONDITIONING**		Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **FILTER DRIER**	
Component:		Man Hours: **4**
Maintenance Task: **REPLACEMENT**		

PROCEDURE (CONT'D):

FIGURE 1 - FILTER-DRIER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**RELIEF VALVE**

Component:	Man Hours:
	2

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**RELIEF VALVE**

Component:	Man Hours:
	2

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

RELIEF VALVE	P/N: 66-7392
O-RING, Relief Valve	P/N: 33-1015

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**RELIEF VALVE**

Component:	Man Hours:
	2

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. **R**emove the Left and Right Upper Beams.
b. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
c. Remove the Relief Valve and related O-Ring.
d. Discard O-ring and make the Valve available for Maintenance.
e. Get a new Relief Valve and a new O-ring.
f. Install the O-ring on the Valve.
g. Install the Relief Valve on its Seat.
h. Pressurize the Refrigeration System according to Sheet R-C-05-01-00-00/S-00.
i. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
j. Evacuate the System, according to Sheet R-C-05-01-00-00/S-00.
k. Recharge the System, according to Sheet R-C-05-01-00-00/S-00.
l. Install Left and Right Upper Beams. I

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-05-01-13-00/R-00	
System: HEATING, VENTILATION & AIR CONDITIONING	Sheet: 4/4
Subsystem/Assy: CLIMATE CONTROL UNIT	Unit: RELIEF VALVE
Component:	Man Hours: 2
Maintenance Task: REPLACEMENT	

PROCEDURE (CONT'D):

FIGURE 1 - RELIEF VALVE REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-14-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSY**
Component:	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-14-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSY**
Component:	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

WARNING: BEFORE ACCESSING HEATER ENSURE THAT ALL POWER ARE SHUT OFF.

CAUTION: LOOSE CONNECTIONS WILL CAUSE TERMINAL TO OVERHEAT AND CAUSE DAMAGE AND OR FIRE.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

SILICONE GE “Drain & Gutter

SPARE PARTS:

HEATER ASSY PN 67-2007

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-14-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HEATER ASSY**

Component:	Man Hours:
	2

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT (refer to Figure 1)

WARNING: BEFORE ACCESSING HEATER ENSURE THAT ALL POWER ARE SHUT OFF.

a. Remove Connecting Wires from Heater Terminals.

b. Remove Protection Thermostat Wires.

c. Remove the Water Barrier and pull out the Heater Assembly.

d. Insert new Heater Assembly in its Seat.

e. With standard rubbing alcohol, clean the surface from any residual dust or dirt where silicone will be applied under the Water Barrier.

f. Apply silicone and the Water Barrier against the Heater Assembly and fasten it by using the Screws holding the Heater Assembly (Refer to Figure 2).

g. Remove excess silicone.

h. •Seal the sides of the Water Barrier.

i. Reconnect all Wires. (Refer to the Schematic Diagrams in Figure 3)).

j. Check all Connections for tightness.

CAUTION: LOOSE CONNECTIONS WILL CAUSE TERMINAL TO OVERHEAT AND CAUSE DAMAGE AND OR FIRE.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-14-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSY**
Component:	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - HEATER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-14-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **5/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSY**
Component:	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 2 - HEATER WATER BARRIER INSTALLATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-14-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER ASSY**
Component:	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

[redacted]

FIG 3 HEATER SCHEMATIC DIAGRAM

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-15-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER COIL**

Component:	Man Hours:
	2

Maintenance Task:
REPAIR

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-15-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONDENSER COIL**

Component:	Man Hours:
	2

Maintenance Task:	Interval/Miles:
REPAIR	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

LEFT CONDENSER COIL	P/N: 67-1836	QTY: 1
RIGHT CONDENSER COIL	P/N: 67-1835	QTY: 1

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-15-00/RR-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **3/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER COIL**
Component:	Man Hours: **2**
Maintenance Task: **REPAIR**	

PROCEDURE:

FIGURE 1 - CONDENSER COIL REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-15-00/RR-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONDENSER COIL**
Component:	Man Hours: **2**
Maintenance Task: **REPAIR**	

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2.1 REMOVAL

a. Locate the Condenser Coil to be replaced.
b. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
c. Using a Ratchet and Extension, loosen all Condenser Coil Mounting Bolts.
d. Unsolder Coil Inlet and Outlet Line Connections.
e. Remove Mounting Bolts, Lock Washers and Flat Washers.
f. Lift the Coil from the Unit and place on Service Bench.

2.2 REPAIR

a. Damaged Condenser Coil must be replaced. Repair is not recommended.

2.3 INSTALLATION

a. Get a new Condenser Coil.
b. Clean the Tubes for soldering.
c. Slide the Coil into the Unit and align the Slots with the existing Mounting Bolts.
d. Install several Bolts, Lock Washers and Flat Washers to align the Coil, but do not tighten.
e. Position and solder the Inlet and Outlet Line Connections.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

f. Install the rest of the Mounting, Bolts, Lock Washers and Flat Washers.
g. Torque all Mounting Bolts securely.
h. Replace Filter-Drier according to Sheet R-C-05-01-12-00/R-00).
i. Pressurize the Low Side according to Sheet R-C-05-01-00-00/S-00.
j. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
k. Evacuate the Low Side, according to Sheet R-C-05-01-00-00/S-00.
l. Recharge the System, according to Sheet R-C-05-01-00-00/S-00.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-16-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR COIL**

Component:	Man Hours:
	2

Maintenance Task:
REPAIR

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-16-00/RR-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR COIL**
Component:	Man Hours: **2**
Maintenance Task: **REPAIR**	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

WARNING: THE EVAPORATOR COIL WEIGHS 45 POUNDS. USE EXTREME CARE TO PREVENT PERSONAL INJURY.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

EVAPORATOR COIL P/N: 67-1891

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-16-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR COIL**

Component:	Man Hours:
	2

Maintenance Task:
REPAIR

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

FIGURE 1 - EVAPORATOR COIL REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-01-16-00/RR-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR COIL**
Component:	Man Hours: **2**
Maintenance Task: **REPAIR**	

PROCEDURE (CONT'D):

2.1 REMOVAL

a. Remove the Left and Right Upper Beams.
b. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00.
c. Gain access to Evaporator Coil.
d. Cut Tie Wraps and remove Insulation from Evaporator Suction Line and Expansion Valve Feeler Bulbs.
e. Disconnect Equalizer Lines from Expansion Valves.
f. Cap or plug Fittings and Equalizer Lines.
g. Unsolder Expansion Valve Lines from the Evaporator Coil.
h. Remove Refrigerant Line Retaining Clamps.
i. Loosen the Bolt Fixing Clamp to enable movement of the Refrigerant Line.
j. Unsolder Evaporator Suction Line Connection.
k. Remove Mounting Bolts, Lock Washers and Flat Washers securing the Evaporator Coil / Unit Frame Members.

WARNING: THE EVAPORATOR COIL WEIGHS 45 POUNDS. USE EXTREME CARE TO PREVENT PERSONAL INJURY.

l. Using a Padded Sling and Overhead Lifting Device, carefully lift Evaporator Coil from Unit and place on Service Bench.

2.2 REPAIR

a. Damaged Evaporator Coil must be replaced. Repair is not recommended.

2.3 INSTALLATION

a. Get a new Evaporator Coil.
b. Using a Padded Sling and Overhead Lifting Device, carefully lift Evaporator Coil into Unit.
c. Secure Evaporator Coil to Unit Frame Members with Mounting Bolts, Lock Washers and Flat Washers.
d. Torque Mounting Bolts securely.
e. Remove Caps or Plugs installed in Evaporator Coil Suction Line and Refrigerant Line.
f. Solder Evaporator Suction Line Connection.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

g. Locate Refrigerant Line Retaining Clamp.
h. Torque the Bolt securing the Clamp to Unit Frame.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-16-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR COIL**

Component:	Man Hours:
	2

Maintenance Task:
REPAIR

PROCEDURE (CONT'D):

2.3 INSTALLATION (CONT'D):

i. Remove Caps or Plugs installed in Expansion Valve Fittings.
j. Align the Expansion Valve with the Evaporator Coil Inlet Lines.
k. Solder the Inlet Line Connections.
l. Install Equalizer Line to Expansion Valve and Suction Line Fitting.
m. Solder the Equalizer Line Connections securely.
n. Align the Feeler Bulbs with the Suction Line and secure with Insulation and Tie Wraps.
m. Replace the Filter-Drier according to Sheet R-C-05-01-12-00/R-00).
n. Pressurize the refrigeration System according to Sheet R-C-05-01-00-00/S-00.
o. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
p. Evacuate the System, according to Sheet R-C-05-01-00-00/S-00.
q. Recharge the System, according to Sheet R-C-05-01-00-00/S-00.
r. Install Insulation on the Suction Line and secure with Tie Wraps.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-16-00/RR-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**6/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR COIL**

Component:	Man Hours:
	2

Maintenance Task:
REPAIR

INTENTIONALLY
LEFT BLANK

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**DAMPER ACTUATOR**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-17-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **DAMPER ACTUATOR**
Component:	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**DAMPER ACTUATOR**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

PROCEDURE

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Disconnect both the Actuator Rods from the relevant Blades.
b. Disconnect Wiring from Actuator Junction Box. Take note of Wiring Codes.
c. Release the Mounting Band-wraps securing the Actuator Assy.
d. Remove the Actuator Assy and make it available for repair. Discard the Band-wraps.
e. Get a new Actuator Assy.
f. Clean the Actuator Seat.
g. Position the Actuator onto its Seat and secure it by means of new Band-wraps.
h. Connect the Wiring to Actuator Junction Box.
i. Connect both the Actuator Rods to the relevant Blades.
j. Perform the Damper Functional Inspection according to Sheet R-P-05-01-17-00/I-00.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**DAMPER ACTUATOR**

Component:	Man Hours:
	1

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1. Blade - damper
2. Blade - damper
3. Washer - shoulder
4. Stopper - damper
5. Stopper - damper
6. Motor
7. Clip - louver
8. Actuator - assembly
9. Shaft - centering
10. Washer - shoulder
11. Rod
12. Rod
13. Grommet
14. Extrusion - rubber
15. Strip - neoprene
16. Mount - Band-wrap

FIGURE 1 -DUMPER ACTUATOR REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-19-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
TERMINAL BLOCK	**2**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-19-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
TERMINAL BLOCK	**2**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

#	DESCRIPTION	PN	Q.TY
1	DIN Rail	92-1419	2
	RIVET - Rail	55-5130	6
2	ELEMENT - End Fixative	41-3895	4
3	TERMINAL - Single	41-3892	13
4	TERMINAL - Double	41-3893	37
5	TERMINAL - End	41-3894	2

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-19-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
TERMINAL BLOCK	**2**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Remove the Covers of the Control Box Enclosure.
b. Locate the Terminal Block to be replaced.
c. Tag and disconnect Wiring from the Terminal Block.
d. Disengage the Terminal Block from the relevant DIN Rail.
e. Get a new Terminal Block.
f. Engage the new Terminal Block on the DIN Rail.
g. Reconnect the Wiring as per previous Tags.
h. Protect Terminal Block with a light spray coat of recommended Contact Cleaner.
i. Install and secure the Covers of the Control Box Enclosure.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

FIG 1 CONTROL BOX TERMINAL BLOCK LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-19-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
TERMINAL BLOCK	**2**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

#	DESCRIPTION	PN	Q.TY
1	DIN Rail	92-1419	2
	RIVET - Rail	55-5130	6
2	ELEMENT - End Fixative	41-3895	4
3	TERMINAL - Single	41-3892	13
4	TERMINAL - Double	41-3893	37
5	TERMINAL - End	41-3894	2

FIG 1 CONTROL BOX TERMINAL BLOCK REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-20-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **COMPRESSOR**
Component: **RESILIENT MOUNTING**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-20-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**COMPRESSOR**

Component:	Man Hours:
RESILIENT MOUNTING	**1**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: CHANGE THE FOUR RESILENT MOUNTING AT ONE TIME. NEVER CHANGE ONLY ONE.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

Shell Alvania # 2

SPARE PARTS:

#	DESCRIPTION	PN	QTY
4	SCREW - Base To Frame	51-111	4
	Flat Washer	55-7347	4
	Lock Washer	55-8536	4
5	ISOLATOR - Compressor	11-9626	4
	SCREW - Isolator	55-7341	8
	Flat Washer	55-6988	8
	Lock Washer	55-7066	8
	Nut	55-7825	8
6	Spacer -	92-1844	4
7	Spacer -	92-1954	4

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-20-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**COMPRESSOR**

Component:	Man Hours:
RESILIENT MOUNTING	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION: CHANGE THE FOUR RESILENT MOUNTING AT ONE TIME.
NEVER CHANGE ONLY ONE OR A PAIR

a. Remove the Compressor Assy according to Sheet R-c-05-01-06-00/R-00 Step 2-1.
b. Loose and remove the Bolt (4) fixing the Resilient Mounting 5) to the Compressor Cradle.
c. Remove the Lock Washer, Flat Washer and Nut.
d. Remove and discard the Resilient Mounting (5) with relevant Lock Washer and Flat Washer.
e. Remove the Spacers (6,7).
f. Check Securing Hardware and Spacers for damage or deformation. Replace as per check result.
g. Get a new Resilient Mounting Kit.
h. Install the Spacers.
i. Install New Resilient Mounting.
j. Lightly coat the Bolt (4) with recommended product.
k. Install Fixing Hardware and Bolt.
l. Torque the Bolts to **12.5 ft lb.**
m. Install the Compressor assy according to Sheet R-c-05-01-06-00/R-00 Step 2-2.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-20-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**COMPRESSOR**

Component:	Man Hours:
RESILIENT MOUNTING	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

FIG 1 COMPRESSOR RESILIENTS MOUNTING REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-21-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CLIMATE CONTROL UNIT**
Component: **RESILIENT MOUNTING**	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-21-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CLIMATE CONTROL UNIT**

Component:	Man Hours:
RESILIENT MOUNTING	**2**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: CHANGE THE RESILENT MOUNTING AT ONE TIME.
NEVER CHANGE ONLY ONE OR A PAIR.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CCU LIFTER

CONSUMABLES:

Shell Alvania # 2

SPARE PARTS:

ISOLATOR 508-5-N-S	PN	1B148187H02	REV E	QTY=8
NUT-HEX M8x1.25 SS	PN	1096A95H05	REV E	QTY =16
WASHER, LOCK M8 SS	PN	3A86187H10	REV G	QTY =16
WASHER, FLAT M8 SS	PN	3A86186H7	REV I	QTY =16
SCREW, HH M8x1.0x20 SS	PN	3A86192H07	REV I	QTY =16

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-21-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CLIMATE CONTROL UNIT**

Component:	Man Hours:
RESILIENT MOUNTING	**2**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION: CHANGE THE RESILENTS MOUNTING AT ONE TIME.
NEVER CHANGE ONLY ONE OR A PAIR.

a. Loose and remove the Nut (60).
b. Remove and discard Flat and Lock Washers (50, 60).
c. Remove and discard the Upper Resilient Mounting (20)
d. Lift the CCU (10) using Overhead Lifting Device and CCU Lifter just to have suitable clearance to remove the Lower Resilient Mounting.
e. Slide out and discard the Lower Resilient Mounting from the Threaded Stud of the Flange Plate.
f. Get a new Resilient Mounting Kit.
g. Lightly coat the Stud of the Flange Plate with recommended product.
h. Install the Lower Resilient Mounting into the Threaded Stud of the Flange Plate
i. Carefully lower the CCU.
j. Install the Upper Resilient Mounting
k. Install new Flat and Lock Washers (50, 60) and the Nut (60).
l. Torque securely the Nut to **150 ft lb (204 Nm).**

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-21-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CLIMATE CONTROL UNIT**
Component: **RESILIENT MOUNTING**	Man Hours: **2**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIG 1 CCU RESILIENTS MOUNTING REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-22-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **REFRIGERANT INDICATOR**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-01-22-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit:
Component: **REFRIGERANT INDICATOR**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

REFRIGERANT INDICATOR PN 66-1296

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-22-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
REFRIGERANT INDICATOR	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Recover Refrigerant Charge from A/C System according to Sheet R-C-05-01-00-00/S-00

WARNING: WEAR PROTECTIVE EYE SHIELD AND GLOVES DURING THE FOLLOWING STEPS. PROTECT EYES AND HANDS FROM LIQUID REFRIGERANT.

b. Unsolder the Liquid Line in Compressor Compartment.
c. Remove the Refrigerant Indicator.
d. Get a new Refrigerant Indicator.
e. Carefully align the new Refrigerant Indicator in position in Liquid Line.
f. Solder the Inlet and Outlet Connections to new Refrigerant Indicator.

CAUTION: IT IS STRONGLY RECOMMENDED THAT DRY NITROGEN BE USED TO PURGE THE SYSTEM DURING ANY SOLDER OPERATIONS.

g. Pressurize the Refrigeration System according to Sheet R-C-05-01-00-00/S-00.
h. Check for Leaks according to Sheet R-C-05-01-00-00/S-00.
i. Evacuate the System according to Sheet R-C-05-01-00-00/S-00.
j. Recharge the System according to Sheet R-C-05-01-00-00/S-00.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-01-22-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	

Component:	Man Hours:
REFRIGERANT INDICATOR	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

FIGURE 1 - REFRIGERANT INDICATOR REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-01-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR**

Component:	Man Hours:
PRESSURE SWITCHES	**1**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-01-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR**

Component:	Man Hours:
PRESSURE SWITCHES	**1**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

WARNING: THERE IS HIGH REFRIGERANT PRESSURE IN THE LIQUID LINE WHEN REPLACING THE HIGH OR THE MODULATION PRESSURE SWITCH.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

LOCTITE

SPARE PARTS:

HIGH PRESSURE SWITCH	P/N: 304-1921	QTY: 1
LOW PRESSURE SWITCH	P/N: 44-4263	QTY: 1
MODULATION PRESSURE SWITCH	P/N: 41-2588	QTY: 1

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-01-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**EVAPORATOR**

Component:	Man Hours:
PRESSURE SWITCHES	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 APPLICABILTY

a. This procedure is applicable to the following Pressure Switches :
- HIGH PRESSURE SWITCH
- LOW PRESSURE SWITCH
- MODULATION PRESSURE SWITCH

2 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1

3 REPLACEMENT

a. Gain access to the Evaporator Coil Section.
b. Locate the Pressure Switch to be replaced
c. Tag Wires and disconnect the Wire Leads from the Switch.
d. Unscrew High Pressure Switch from Schrader Fitting.

WARNING: THERE IS HIGH REFRIGERANT PRESSURE IN THE LIQUID LINE WHEN REPLACING THE HIGH OR THE MODULATION PRESSURE SWITCH.

e. Have a new Pressure Switch ready to install.
f. Apply a refrigeration "Loctite" to the Threads of the new Pressure Switch.
g. Quickly screw the new Switch into Schrader Fitting.
h. Reconnect the wire leads according to previously Tags.
i. Check Pressure Switch and Schrader Fitting for Leaks according to Sheet R-C-05-01-00-00/S-00.

4 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-01-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **EVAPORATOR**
Component: **PRESSURE SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

EVAPORATOR COIL SECTION

HIGH PRESSURE SWITCH LOW PRESSURE SWITCH MODULATION PRESSURE SWITCH

FIG 1 PRESSURE SWITCH REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
CONTACTOR	**1**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-04-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
2/4

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:
CONTROL BOX

Component:
CONTACTOR

Man Hours:
1

Maintenance Task:
REPLACEMENT

Interval/Miles:

APPLICABILITY

This Replacement procedure is applicable to the following Equipment :

TABLE 1 HVAC CONTACTORS IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAM	
					SCHEMATIC	SHEET
KCOM1	COMPRESSOR MOTOR 1	IE21792	A - B	CCU CONTROL BOX	LV	117
KCOM2	COMPRESSOR MOTOR 2	IE21792	A - B	CCU CONTROL BOX	LV	117
KCFM1	CONDENSER FAN MOTOR 1	IE21792	A - B	CCU CONTROL BOX	LV	117
KCFM2	CONDENSER FAN MOTOR 2	IE21792	A - B	CCU CONTROL BOX	LV	117
KEFM	EVAPORATOR FAN MOTOR	IE21792	A - B	CCU CONTROL BOX	LV	117
KHTR1	HEATER 1	IE21792	A - B	CCU CONTROL BOX	LV	117
KHTR2	HEATER 2	IE21792	A - B	CCU CONTROL BOX	LV	117

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE
USE NON-CONDUCTIVE TOOLS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 for Contactors Identification

#	DESCRIPTION	PN	Q,TY
24	SUPPRESSOR	41-3812	2
25	SUPPRESSOR	41-2942	5

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-04-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
CONTACTOR	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION: TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

a. Remove the Covers of the Control Box Enclosure.
b. Locate the Contactor to be replaced.
c. Tag and disconnect Wiring from the Contactor.
d. Remove the Hardware securing the Contactor to DIN Rail.
e. Disengage the Contactor from the relevant DIN Rail.
f. Discard the Contactor with the relevant Suppressor.
g. Have a new Contactor ready to install (equipped with relevant new Suppressor).
h. Engage the new Contactor on the DIN Rail.
i. Secure the Contactor by means of the relevant Fixing Hardware.
j. Reconnect the Wiring as per previous Tags.
k. Protect Circuit Breaker with a light spray coat of recommended Contact Cleaner.
l. Install and secure the Covers of the Control Box Enclosure.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-04-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **CONTACTOR**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - CONTACTOR REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-08-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **CIRCUIT BREAKER**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-08-00/R-00

System:
HEATING, VENTILATION & AIR CONDITIONING

Sheet:
2/4

Subsystem/Assy:
CLIMATE CONTROL UNIT

Unit:
CONTROL BOX

Component:
CIRCUIT BREAKER

Man Hours:
1

Maintenance Task:
REPLACEMENT

Interval/Miles:

APPLICABILITY

This Replacement procedure is applicable to the following Equipment :

TABLE 1 HVAC CONTACTORS IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAM	
					SCHEMATIC	SHEET
QCOM1	COMPRESSOR MOTOR 1	IE21792	A - B	CCU CONTROL BOX	LV	117
QCOM2	COMPRESSOR MOTOR 2	IE21792	A - B	CCU CONTROL BOX	LV	117
QCFM1	CONDENSER FAN MOTOR 1	IE21792	A - B	CCU CONTROL BOX	LV	117
QCFM2	CONDENSER FAN MOTOR 2	IE21792	A - B	CCU CONTROL BOX	LV	117
QEFM	EVAPORATOR FAN MOTOR	IE21792	A - B	CCU CONTROL BOX	LV	117
QHTR1	HEATER 1	IE21792	A - B	CCU CONTROL BOX	LV	117
QHTR2	HEATER 2	IE21792	A - B	CCU CONTROL BOX	LV	117

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 for Contactors Identification

#	DESCRIPTION	PN	Q,TY
12	BLOCK - Contact (Auxiliary)	41-2931	5
13	BLOCK - Contact (Auxiliary)	41-5266	2

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-08-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
CIRCUIT BREAKER	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

a. Remove the Covers of the Control Box Enclosure.
b. Locate the Circuit Breaker to be replaced.
c. Tag and disconnect Wiring from the Circuit Breaker Main & Aux Contacts.
d. Remove the Hardware securing the Circuit Breaker to DIN Rail.
e. Disengage the Circuit Breaker from the relevant DIN Rail.
f. Discard the Circuit Breaker with the Aux Contacts.
g. Have a new Circuit Breaker ready to install (equipped with relevant new Aux Contacts).
h. Engage the new Circuit Breaker on the DIN Rail.
i. Secure the Circuit Breaker by means of the relevant Fixing Hardware.
j. Reconnect the Wiring as per previous Tags.
k. Protect Circuit Breaker with a light spray coat of recommended Contact Cleaner.
l. Install and secure the Covers of the Control Box Enclosure.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-08-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **CIRCUIT BREAKER**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

QCOM1 (4), QCOM2 (4), QHTR1 (5), QHTR2 (5), QEFM (3), QCFM1 (6), QCFM2 (6)

FIGURE 2 - CIRCUIT BREAKER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-12-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
MICROPROCESSOR CONTROLLER	**1**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-12-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **MICROPROCESSOR CONTROLLER**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS.

CAUTION: USE EXTREME CARE WHEN HANDLING ELETROSTATICALLY SENSITIVE EQUIPMENT.
HANDLE THE CONTROLLER WITH GREAT CARE AND STORE IT IN AN APPROVED, ANTISTATIC WRAPPING UNTIL RE-INSTALLATION OR REPAIR.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

MICROPROCESSOR CONTROLLER PN 41-5258

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-12-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
MICROPROCESSOR CONTROLLER	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

a. Place the CCU SWT Switch to OFF position.
b. Remove the Covers of the Control Box Enclosure.
c. Locate the Microprocessor Controller.
d. Disconnect Connectors from the Microprocessor Controller.

CAUTION.: USE EXTREME CARE WHEN HANDLING ELETROSTATICALLY SENSITIVE EQUIPMENT. HANDLE THE CONTROLLER WITH GREAT CARE AND STORE IT IN AN APPROVED, ANTISTATIC WRAPPING UNTIL RE-INSTALLATION OR REPAIR.

e. Support the Controller and, using approved, non-conductive Tools, remove Hardware securing the Controller to the Control Box Mounting Plate.
f. Remove the Controller and make it available for repair.
g. Have a new Controller ready to install.
h. Support the Controller and position it on its Seat on the Control Box Mounting Plate.
i. Secure the Controller by means of the relevant Fixing Hardware.
j. Reconnect the Connectors.
k. Protect Connectors and Controller with a light spray coat of recommended Contact Cleaner.
l. Install and secure the Covers of the Control Box Enclosure.
m. Place the CCU SWT Switch to AUTO position.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-12-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **MICROPROCESSOR CONTROLLER**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - MICROPROCESSOR CONTROLLER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HVAC CONTROL**

Component:	Man Hours:
TEMPERATURE SENSORS	**1**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HVAC CONTROL**

Component:	Man Hours:
TEMPERATURE SENSORS	**1**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

PLASTIC CLAMP

SPARE PARTS:

TEMPERATURE SENSOR	P/N: 41-4022	QTY: 3

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HVAC CONTROL**

Component:	Man Hours:
TEMPERATURE SENSORS	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 APPLICABILITY

a. This Replacement procedure is applicable to FRESCH AIR, RETURN AIR and DUCT AIR.

2 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

3 REPLACEMENT

a. Locate the Temperature Sensor to be replaced (Refer to Fig 1).
b. Gain access to the Sensor from inside or from the roof according to its location.

FIG 1 TEMPERATURE SENSORS LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-13-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HVAC CONTROL**
Component: **TEMPERATURE SENSORS**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

3 REPLACEMENT(CONT'D):

(Refer to Fig 2)

c. Cut the Plastic Clamp to make free the Sensor Cable.

d. Disconnect the Sensor Connector.

e. Disconnect and tag the Cable Wiring Leads from the Connector.

f. Unscrew the Nut to remove the Sensor with Cable from the Bracket.

g. Remove the Sensor (with the Cable) from the Bracket.

CAUTION: TAKE CARE DO NOT DAMAGE THE RUBBER RING WHEN REMOVING THE SENSOR**.**

h. Discard the Sensor with relevant Cable.

i. Have a new Sensor with relevant Cable to install.

j. Position the Sensor onto its seat on the Bracket.

CAUTION: TAKE CARE DO NOT DAMAGE THE RUBBER RING WHEN INSTALLING THE SENSOR.

k. Secure the Sensor by tightening the Nut.

l. Connect the Cable Wiring Leads to the Connector.

m. Re-connect the Sensor Connector.

n. Fix the Sensor Cable by Plastic Clamp.

4 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-13-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	5/6

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	HVAC CONTROL

Component:	Man Hours:
TEMPERATURE SENSORS	1

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

3 REPLACEMENT(CONT'D):

FIG 2 - TEMPERATURE SENSOR REPLACEMENT (TYPICAL)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-02-13-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **6/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HVAC CONTROL**
Component: **TEMPERATURE SENSORS**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-14-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **CURRENT TRANSFORMERS**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-14-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
CURRENT TRANSFORMERS	**1**

Maintenance Task:	
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

CURRENT TRANSFORMER TEFM	P/N: 304-2593
CURRENT TRANSFORMER TCFM	P/N: 304-2593
CURRENT TRANSFORMER TOCM	P/N: 304-2594

#	DESCRIPTION	PN
22	MOUNT - bandwrap	99-3281
	RIVET - mount	55-5130
	BANDWRAP	55-2330

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-14-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**
Sheet: **3/4**

Subsystem/Assy: **CLIMATE CONTROL UNIT**
Unit: **CONTROL BOX**

Component: **CURRENT TRANSFORMERS**
Man Hours: **1**

Maintenance Task: **REPLACEMENT**

PROCEDURE (CONT'D):

1 APPLICABILITY

his Replacement procedure is applicable to the following Equipment :

TABLE 1 HVAC CONTACTORS IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAM	
					SCHEMATIC	SHEET
TCOM	COMPRESSOR MOTOR	IE21792	A - B	CCU CONTROL BOX	LV	117
TCFM	CONDENSER FAN MOTOR	IE21792	A - B	CCU CONTROL BOX	LV	117
TEFM	EVAPORATOR FAN MOTOR	IE21792	A - B	CCU CONTROL BOX	LV	117

2 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

3 REPLACEMENT

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS.

a. Remove the Covers of the Control Box Enclosure.
b. Locate the Current Transformer to be replaced.
c. Tag and disconnect Wiring from the Current Transformer.
d. Remove the Band-wrap securing the Current Transformer and discard it.
e. Remove the Current Transformer and discard it.
f. Have a new Current Transformer ready to install (with relevant new Band-wrap).
g. Install the new Current Transformer on its Seat.
h. Secure the Current Transformer by means of the relevant new Band-wrap.
i. Reconnect the Wiring as per previous Tags.
j. Protect Current Transformer with a light spray coat of recommended Contact Cleaner.
k. Install and secure the Covers of the Control Box Enclosure.

4 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: **R-C-05-02-14-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **CURRENT TRANSFORMERS**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

TCOM (21), TEFM (20), TCFM (20),

FIGURE 1 - CCU CONTROL BOX CURRENT TRANSFORMER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**1/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
DC / DC CONVERTER	**1**

Maintenance Task:
REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-17-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **DC / DC CONVERTER**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

CAUTION: TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

DC / DC CONVERTER P/N: 45-2005

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
DC / DC CONVERTER	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

a. Remove the Covers of the Control Box Enclosure.
b. Locate the DC/DC Converter to be replaced.
c. Tag and disconnect Wiring from the DC/DC Converter.
d. Remove the Fixing Hardware securing the DC/DC Converter to the Mounting Plate.
e. Retain Fixing Hardware for later use.
f. Remove the DC/DC Converter and discard it.
g. Have a new DC/DC Converter ready to install.
h. Install the new DC/DC Converter on its Seat.
i. Secure the DC/DC Converter by means of the relevant Fixing Hardware.
j. Reconnect the Wiring as per previous Tags.
k. Protect DC/DC Converter and Terminals with a light spray coat of recommended Contact Cleaner.
l. Install and secure the Covers of the Control Box Enclosure.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-17-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**4/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
DC / DC CONVERTER	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

DC / DC Converter (5)

FIGURE 1 - DC/DC CONVERTER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-18-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER**
Component: **TEMPERATURE SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-18-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER**
Component: **TEMPERATURE SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

SWITCH, Temperature (90 ° C)	P/N: 41-3791	Qty 2
SWITCH, Temperature (120 ° C)	P/N: 41-3939	Qty 1

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-18-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **3/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER**
Component: **TEMPERATURE SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - CCU HEATER TEMPERATURE SWITCH LOCATION

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-18-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/6**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HEATER**
Component: **TEMPERATURE SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

1 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

2 REPLACEMENT

a. Locate the Temperature Switch to be replaced.
b. Tag and disconnect Wiring Leads from the relevant Temperature Switch Terminals.
c. Remove the Fixing Hardware securing the Temperature Switch to the Heater Frame through the Insulation Panel.
d. Retain Fixing Hardware for later use.
e. Remove the Temperature Switch and discard it.
f. Have a new Temperature Switch ready to install.
g. Install the new Temperature Switch on its Seat.
h. Secure the Temperature Switch by means of the relevant Fixing Hardware.
i. Reconnect the Wiring Leads as per previous Tags.
j. Protect Temperature Switch and Terminals with a light spray coat of recommended Contact Cleaner.
k. Install and secure the Covers of the Control Box Enclosure.

3 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-18-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**5/6**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HEATER**

Component:	Man Hours:
TEMPERATURE SWITCHES	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

Temperature Switch (90 °C) (2) and (120 ° C) (3)

FIGURE 2 - HEATER TEMPERATURE SWITCH REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-05-02-18-00/R-00	
System: HEATING, VENTILATION & AIR CONDITIONING	Sheet: 6/6
Subsystem/Assy: CLIMATE CONTROL UNIT	Unit: HEATER
Component: TEMPERATURE SWITCHES	Man Hours: 1
Maintenance Task: REPLACEMENT	

INTENTIONALLY
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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-19-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HVAC CONTROL**
Component: **LIMIT SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-19-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **2/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HVAC CONTROL**
Component: **LIMIT SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	Interval/Miles:

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

LIMIT SWITCH P/N: 41-3917

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-19-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**HVAC CONTROL**

Component:	Man Hours:
LIMIT SWITCHES	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE:

1 APPLICABILITY

a. This Replacement procedure is applicable to LEFT & RIGHT Limit Switches.

2 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

3 REPLACEMENT

a. Locate the Limit Switch to be replaced.
b. Disconnect Wiring Connector from the relevant Limit Switch.
c. Remove the Fixing Hardware securing the Limit Switch to its Bracket.
d. Retain Fixing Hardware for later use.
e. Remove the Limit Switch and discard it.
f. Have a new Limit Switch ready to install.
g. Install the new Limit Switch on its Bracket.
h. Secure the Limit Switch by means of the relevant Fixing Hardware.
i. Reconnect the Wiring Connector.
j. Protect Limit Switch and Terminals with a light spray coat of recommended Contact Cleaner.
k. Install and secure the Covers of the Control Box Enclosure.

4 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-19-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **HVAC CONTROL**
Component: **LIMIT SWITCHES**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

FIGURE 1 - LIMIT SWITCH REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-20-00/R-00

System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **1/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **BUS BAR**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-20-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**2/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
BUS BAR	**1**

Maintenance Task:	Interval/Miles:
REPLACEMENT	

SAFETY PRECAUTIONS:

WARNING: SHEET R-C-05-00-00-00/SP-00 PROVIDES SAFETY PRECAUTIONS AND STANDARD INSTRUCTIONS THAT MUST BE FOLLOWED EACH TIME MAINTENANCE IS DONE ON THE HVAC SYSTEM

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

#	DESCRIPTION	PN	Q.TY
14	BUSBAR (3 phase, 6 pin)	41-4726	1
15	BUSBAR (3 phase, 9 pin)	41-3889	1
16	BUSBAR (3 phase, 6 pin)	41-4685	1
17	BUSBAR (3 phase, 6 pin)	41-4684	2

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:
R-C-05-02-20-00/R-00

System:	Sheet:
HEATING, VENTILATION & AIR CONDITIONING	**3/4**

Subsystem/Assy:	Unit:
CLIMATE CONTROL UNIT	**CONTROL BOX**

Component:	Man Hours:
BUS BAR	**1**

Maintenance Task:
REPLACEMENT

PROCEDURE (CONT'D):

1 APPLICABILITY

a. This Replacement procedure is applicable to the following Equipment :

#	DESCRIPTION
14	BUSBAR (3 phase, 6 pin)
15	BUSBAR (3 phase, 9 pin)
16	BUSBAR (3 phase, 6 pin)
17	BUSBAR (3 phase, 6 pin)

2 PRELIMINARY OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 1.

3 REPLACEMENT

CAUTION : TO PERFORM CONTROL BOX MAINTENANCE USE NON-CONDUCTIVE TOOLS

a. Remove the Covers of the Control Box Enclosure.
b. Locate the Bus Bar to be replaced.
c. Remove the Bus installed on.
d. Remove the Hardware securing the Bus Bar to DIN Rail.
e. Disengage the Bus Bar from the relevant DIN Rail.
f. Discard the Bus Bar.
g. Have a new Bus Bar ready to install.
h. Engage the new Bus Bar on the DIN Rail.
i. Secure the Bus Bar by means of the relevant Fixing Hardware.
j. Install the Bus previously removed.
k. Protect Bus Bar and Bus with a light spray coat of recommended Contact Cleaner.
l. Install and secure the Covers of the Control Box Enclosure.

4 FINAL OPERATIONS

a. Follow the Safety Precautions and the Instructions provided at Sheet R-C-05-00-00-00/SP-00 Step 3.

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-05-02-20-00/R-00**	
System: **HEATING, VENTILATION & AIR CONDITIONING**	Sheet: **4/4**
Subsystem/Assy: **CLIMATE CONTROL UNIT**	Unit: **CONTROL BOX**
Component: **BUS BAR**	Man Hours: **1**
Maintenance Task: **REPLACEMENT**	

PROCEDURE (CONT'D):

Bus Bar W3 (15), W2 (17), W1 (17), W4 (16), W5 (14),

FIGURE 1 - CCU CONTROL BOX BUS BAR REPLACEMENT

05-III-05 CONSUMABLE MATERIALS LIST (R-CML)

The Consumable Materials needed to accomplish the HVAC Running Maintenance are listed, sequenced in alphabetical order, by SUBSYSTEM /ASSY -UNIT / COMPONENT in the following Table 05-III-05.1

Table 05-III-05.1 Running Maintenance Consumable Materials List (R-CML)

SYSTEM 05 HEATING, VENTILATION & AIR CONDITIONING			
SUBSYSTEM /ASSY - UNIT / COMPONENT	**AGENT**	**PN**	**MTA PN**
CLIMATE CONTROL UNIT	R-407C Refrigerant	(commercial)	
	Detergent/Water Solution		
	CRC 2000 Contact Cleaner		
	Silicone (GE “Drain & Gutter)		
	Plastic Clamp		
HVAC CONTROL	Detergent/Water Solution		
	CRC 2000 Contact Cleaner		

05-III-06 TEST EQUIPMENT & SPECIAL TOOLS LIST (R-TESTL)

The Tools and Test Equipment needed to accomplish the HVAC Running Maintenance are listed, sequenced in alphabetical order, by SUBSYSTEM /ASSY -UNIT / COMPONENT, in the following Table 05-III-06.1.

Refer to “Tools and Test Equipment Manual” for Special Tools / Test Equipment Description and Maintenance.

Table 05-III-06.1 Running -Test Equipment & Special Tools List (R-TESTL)

SYSTEM 05 HEATING, VENTILATION & AIR CONDITIONING				
SUBSYSTEM /ASSY - UNIT / COMPONENT	**LACMTA STANDARD TOOLS KIT**	**LACMTA WORKSHOP DEVICES**	**SPECIAL TOOL / TEST EQUIPMENT**	**PN**
CLIMATE CONTROL UNIT	X	Vacuum Cleaner	Electronic Halogen Leak Detector	204-56
			Portable Test Unit (PTU) (Dell) Laptop with specific SW installed. Refer to Table 00-22.1 for SW List	
			Oil Test Kit	203-457
			Vacuum Pump With Micron Gauge	204-725
			A/C Manifold Gauge Set	204-758
			CCU Lifting Kit	52429_2.0
			Recovery And Recycling Unit	
			Multimeter Amprobe	
			Air Flow Meter	5ZT15
HVAC CONTROL	X	Vacuum Cleaner		
			Pin Extractor Tool Kit	
PIPING	X		10’ Coil Air Lines	2Z252
			Electronic Halogen Leak Detector	204-56