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INSTRUCTIONS FOR CONTINUED AIRWORTHINESS
AIRBUS EC135
AIR CONDITIONING SYSTEM

THIS HANDBOOK INCLUDES THE MAINTENANCE INFORMATION REQUIRED TO BE AVAILABLE BY FAR PART 27

RECORD OF REVISIONS

Rev	Date	Description of Change	Approval
1	10/17/2005	Minor view changes & addition of single fwd evap. information, chg. To periodic inspection chart.	N/A Prepared by GP
2	10/12/2006	Compressor view changes, Belt tension info.	N/A Prepared by GP
3	4/30/2007	Added ES61064-2 motor to suggested spares	N/A Prepared by GP
4	6/11/2007	ES57178-1 Switch was ES57010-1	N/A Prepared by NS
5	7/12/2007	Added EC135 P2+ & EC135 T2+ to applicability	N/A Prepared by GP
6	3/4/2008	Added compressor pulley removal & Installation	N/A Prepared by GP
7	8/23/2013	Minor ICA change to clarify refrigerant oil requirements, allow for use, add replace instructions where previously said "reverse of removal," and updated formatting and typographical errors (revision bars were omitted for formatting and typographical or spelling and grammar updates).	Prepared By: Karen G. Blecha (KGB) 8/23/2013 Date ACC Approval: MJK 11/25/13 Signature Date FAA Acceptance (Major Change): N/A – Meets Minor Change Agreement MR-100-134 7/24/2013 Signature Date
8	2/23/2015	Minor ICA change to clarify refrigerant oil requirements, add Molex connector inspection reqmts. & install instruct., allow for use of PAG oil, add replace instructions where previously said "reverse of removal," and updated formatting and typographical errors (revision bars were omitted for formatting and typographical or spelling and grammar updates).	Prepared By: Karen G. Blecha (KGB) 2/23/2015 Date ACC Approval: MDAME 3/10/2015 Signature Date FAA Acceptance (Major Change): N/A – Meets Minor Change Agreement MR-100-134 7/24/2013 Signature Date

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CHAPTER 1
INTRODUCTION

1. Scope

The scope of this manual encompasses scheduled and unscheduled maintenance procedures for continued airworthiness of Air Comm Corporation air conditioning system installed in the Airbus EC135 series helicopter.

2. Purpose

The purpose of this manual is to provide aircraft field mechanic necessary information to maintain the air conditioning system.

3. Arrangement

This manual is arranged by chapters which are broken down into paragraphs and sub-paragraphs. All chapters and paragraphs are listed in the front of this manual in the Table of Contents, and are further identified by their individual page number.

4. Applicability

This manual is applicable to Bell Helicopter models EC135, P2, T2, P2+, and T2+ equipped with Air Comm Corporation kit number EC135-200 & EC135-202 air conditioner systems.

5. Definitions

The following terms are provided to give a ready reference to the meaning of some words contained within this manual. These definitions may differ from those given by a standard dictionary.

Ambient air temperature: Temperature of the air surrounding a person or object.

Charging station: An air conditioning system service unit which is capable of evacuating and charging an air conditioner.

Condensation: The process of changing a gaseous phase into a liquid.

Desiccant: Material used in a receiver/drier bottle, designed to absorb moisture from refrigerant.

Heat load: The amount of heat which the air conditioner is required to remove from the aircraft cabin.

Inches of mercury: A measurement of pressure, normally used for pressures below atmospheric, one inch of mercury is equal to approximately one half pound per square inch.

Pressure, ambient: The pressure of the air surrounding a body, normally measured in pounds per square inch, or PSIG.

Refrigerant: A fluid which is used in an air conditioning system to absorb heat from the cabin and carry it outside the helicopter where it can be transferred to the outside air.

Relative humidity: The ratio of the amount of water vapor in the air to the amount of water vapor required to saturate the air at the existing temperature.

Thermostat: An air conditioning control which senses the temperature of the evaporator coil and causes the system to cycle or by-pass to maintain the proper temperature of cooling air.

Vacuum: A negative pressure, or pressure below atmospheric; it is usually expressed in inches of mercury.

Vapor: The gas formed by boiling or evaporating a liquid. A gas at a temperature below its critical temperature.

6. Abbreviations

InHg:	Inches of Mercury
Lbs:	Pounds
oz:	Ounces
Psig:	Pounds Per Square Inch (gauge)
gr:	Grams
kg:	Kilograms
Kg/cm:	Kilograms per Centimeter
ml:	Milliliters
mm:	Millimeters
Nm:	Newton-meters

7. Precautions

The following precautions are found throughout this manual, and will vary depending on the seriousness of the Hazard or Condition:

WARNING: May be a maintenance procedure, practice, condition, etc., which could result in personal injury or loss of life.

CAUTION: May be a maintenance procedure, practice, condition, etc., which could result in damage or destruction of equipment.

NOTE: May be a maintenance procedure, practice, condition, etc., or a statement which needs to be highlighted.

8. Units of Measure

All measurements contained within this manual are generally given in the United States standard measurement, with metric conversions in parentheses as needed.

9. Information Essential to Continued Airworthiness

This manual provides information which is required for operation and maintenance of the Air Comm air conditioning system installed in the Airbus model EC135 series helicopter. After completion of the air conditioner installation this document must be placed with the appropriate existing aircraft documents.

10. Reference Documents

The approval basis of the system covered by this ICA is Supplemental Type Certificate SR00565DE.

11. Distribution

This document is to be placed with the aircraft maintenance records at the time of system installation.

Changes will be made to this document in response to safety-of-flight or non-safety-of-flight issues. Any changes will result in a revision to this document. Revisions shall be noted in the Record of Revisions and on the List of Revisions of this manual.

In addition to the revision of the manual, those changes categorized as safety-of-flight shall have a Service Bulletin issued to the operator providing the necessary information to comply with or to correct the safety-of-flight issue.

Replacement or revised copies of this manual can be obtained by contacting:

Air Comm Corporation Service Department
1575 West 124th Ave.
Westminster, Colorado 80234
Phone No. 303-440-4075 Fax No. 303-440-6355
INFO@aircommcorp.com

12. Changes to Instructions for Continued Airworthiness

Changes made to a line or paragraph of this document will be indicated by a vertical bar in the right hand margin. A complete page change will be indicated by a vertical bar next to the page number.

(Example: Any change will appear with a vertical bar next to that change).

13. Air Conditioner Features

The vapor cycle air conditioner features two forward (optional single forward evaporator) mounted evaporator (cockpit), one aft mounted evaporator assembly (below main cabin), one condenser, and a compressor driven by the accessory drive pad just aft of the aft main transmission. These components combine to provide “conditioned air” through sections of the existing air distribution system when the engines are operating during both ground and flight operations.

This system can be operated in either the Air Condition (A/C), or Fan mode. In the A/C mode, conditioned air is provided by the forward and aft evaporators to the cockpit and main cabin areas respectively. In the Fan mode, the evaporator blowers are used to circulate cabin air, while the compressor clutch remains disengaged. When using the

cabin heater it is acceptable to operate the air conditioner if desired, to assist in defogging the cabin windows.

The air conditioning system is connected electrically to the aircraft's DC Power Panel 28 VDC Bus.

The control panel for the air conditioner system is located on the existing center console between the pilot's and co-pilot's seats. This panel consists of the A/C & Fan switch, two switches, for the control of the Cockpit & Cabin evaporator blower fan speeds, a "FRESH" / "RECIRC" switch which opens and closes an air inlet box located above the main cabin overhead air outlets, a Temperature control rheostat knob, and compressor on annunciator.

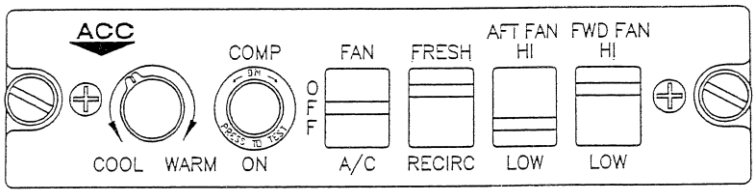


Figure 1: Cockpit A/C Control Panel

The Fan motors feature dual speed operation (Hi or Lo), and this feature can be used in both the air conditioner or fan modes.

The compressor is mounted to the surface of the Main Gear Box Drive Pad, in the aft aircraft center portion of the transmission compartment. It is driven by a Ploy V-belt and a pulley which is mounted to a splined drive shaft. Access to the compressor is provided by transmission compartment access doors. Airflow through the condenser heat exchanger is provided by two 28 volt DC high performance blowers.

The aft evaporator is equipped with a Freeze Switch. The Freeze Switch probe is located in the core of the evaporator heat exchanger. This unit performs two functions; 1. It acts to prevent coil freeze-up by limiting the minimum coil temperature to 32º F (0º C), and 2. It acts in conjunction with the cabin air temperature control system, by controlling the bypass of refrigerant through the evaporator coil in response to adjustment of the thermostat switch located on the control panel assy. between the pilot and co-pilots seats.

The refrigerant plumbing for this system installation incorporates insert O-Ring and TORQ LOK® fittings:

A. INSERT O-RING FITTINGS: These fittings have formed ends that along with an O-Ring create a seal. Caution when assembling these fittings; care should be taken not to damage the O-Ring (i.e. nicking, splitting, or crushing, etc.). These fittings are signified by a green band placed around the outside diameter of the hose or tube they are utilized on. **Black O-Rings must not be used on these fittings**. (See CHAPTER 7 for torqueing procedures).

B. TORQ LOK® FITTINGS: These fittings have two flat mating surfaces that along with an O-Ring create a seal. Caution when assembling these fittings; care should be taken not to damage the O-Ring (i.e. nicking, splitting, or crushing etc.). **Green O-Rings must not be used on these fittings.** (See CHAPTER 7 for torqueing procedures).

The system is also equipped with a Binary switch. This switch is designed to protect the system against over-pressure situations, or under-pressure in the event of refrigerant loss from the system. The switch also prevents the system from operating in low ambient temperatures below 50º F (10º C).

The switch operating pressures are:

Low Pressure Function:

Cut-out at 28 ± 2.8psi (2.0 ± .2 Kg/cm²)

Cut-in at 29 ± 4.3 psi (2.1 ± .3 Kg/cm²)

High Pressure Function:

Cut-out at 384 ± 30psig (28.0 ± 2.0 Kg/cm²)

Cut-in at 298 ± 43psig (20.9 ± 2.0 Kg/cm²)

14. Description of Vapor Cycle Air Conditioner and Installation

This section contains a general overview of a vapor-cycle air conditioning system and how it functions. This type of system operates in a closed loop, in which the refrigerant absorbs heat from the cabin and ejects it into the outside air. The refrigerant then returns to the cabin to repeat the cycle. The operation of the system is described below (See Figure 2).

Liquid refrigerant is contained in the receiver-drier under pressure from the compressor. The receiver-drier also filters the refrigerant through a material know as desiccant. The desiccant insures that the liquid refrigerant leaving this component is free of any water or other contaminants.

The low pressure (suction) line from the compressor is attached to the evaporator lines, and causes the refrigerant to be pulled out of the receiver-drier and through the expansion valves. The expansion valves serve as a controlled spray orifice, to spray the correct amount of refrigerant into the evaporator. This regulation of refrigerant allows the liquid to absorb the heat from the cabin air, and transform it to a vapor state just prior to its exiting the evaporator assembly.

The low pressure vapor is then drawn into the compressor where its pressure is raised to approximately 200 psig (14.06 kg/cm) and its temperature to around 200º F (93.3º C). This high pressure/high temperature vapor then travels to the condenser (a heat exchanger cooled by a flow of outside air). Heat is extracted from the refrigerant, and as it cools it condenses back into a liquid and flows into the receiver-dryer, ready to repeat the cycle.

15. Refrigeration Cycle Illustration

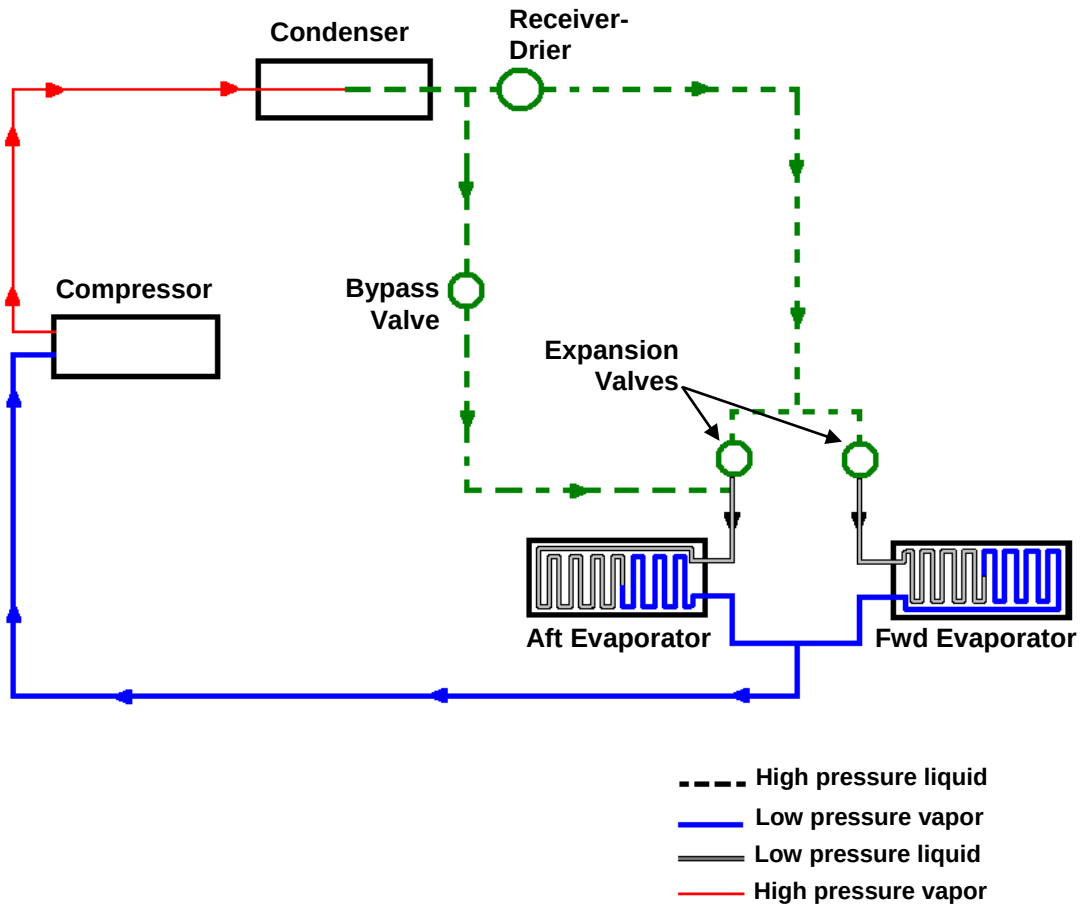


Figure 2: Refrigeration Cycle Illustration
(NOTE: This illustration is provided as a reference only and may not match actual installation)

CHAPTER 2
AIRWORTHINESS LIMITATION SECTION

1. Airworthiness Limitations

The Airworthiness limitations section is FAA approved and specifies inspections and other maintenance required under Sections 43.16 and 91.403 of Federal Aviation Regulations unless an alternative program has been FAA approved.

“No airworthiness limitations associated with this type design change.”

CHAPTER 3
INSPECTIONS AND OVERHAUL

1. Inspection Requirements

PERIODIC INSPECTIONS
(Hours are aircraft time)

Item	Annual	Every 100 Hours of Operation	Special Inspection Information
Fwd Evaporator Blower(s)	X	X	Check for operation in High and Low settings.
Aft Evaporator Blower	X	X	Check for operation in High and Low settings.
Condenser Blower Motor(s) & Fan blade assembly	X	X	Check for operation.
Compressor Drive Belt	X	X	Check belt tension and for signs of excessive wear (example: glazing, cracks, and exposed fibers).
Placards & Markings	X	X	Check for security and legibility.
Compressor Assembly	X	X	Check for operation, security of attaching hardware, and signs of oil or refrigerant leaks.
Compressor Mount	X	X	Check mount for cracks and security of the attaching hardware.
Plumbing and Fittings	X	X	Check for security and signs of oil or refrigerant leaks.
Compressor drive pulley	X	X	Check for security of attaching hardware.
Blower Electrical Connectors	X		Visually inspect the condenser and evaporator blower motors for signs of overheating

2. Inspection Of Blower Electrical Connectors (annual requirement)

a) Locate the Molex electrical connectors that power the aft evaporator and condenser blowers. The connectors are at the interface between the blower harness and the aircraft harness and identified by their white plastic housing. Note that the evaporator blower has an additional connector to inspect located several inches away from the harness connector.

b) De-mate each connector and inspect both mates for signs of overheating (discoloration or plastic deformation). If any signs of overheating of the housing are present the system must be rendered inoperative and the connector housing and contacts replaced before further operation. Contact ACC service dept. for replacement parts if necessary.

c) Installation & replacement of the wire harness electrical connectors for the evaporator and condenser blowers.

To avoid potentially serious overheating issues the Molex style connectors (identified by their white plastic housing) installed on the aircraft harness for connecting to the evaporator and condenser blowers must be installed per ACC procedure PPP23 and only using the appropriate terminal crimp tool. This document is available on the ACC website www.aircommcorp.com/customer-support/service-manuals/.

3. Component Overhaul / Replacement Schedule

Description	Part Number	Overhaul / Replacement Hours
Condenser & Forward / Aft Evaporator Blower Motor & Fan replacement	ES73186-9 (Condenser Blower Assembly) ES61064-1(Fwd Evaporator Motor) ES61142-3 (Aft Evaporator Motor)	The blower manufacturer recommended TBO is 1000 hrs. At the discretion of the operator it is acceptable to operate the blower until failure. A blower failure will result in a reduction in cooling, but no safety-of-flight issues are involved.

CHAPTER 4
LOCATION AND ACCESS

1. Location of Air Conditioner Components

Nomenclature	Description of Location
Control Panel	Located in the existing center console panel between the pilot & co-pilot seats
Forward (Flight Deck) Evaporators	Mounted to the center pedestal forward of the instrument panel in the chin bubble area
Aft (Main Cabin) Evaporator	Located on aircraft right, below the cabin floor
Condenser Assembly	Located on the left hand side of the aircraft, just aft of the engine compartment
Compressor Assembly	Mounted to the main gearbox accessory drive case
Receiver Drier/Pressure Switch	Mounted aft of the condenser assembly
Bypass Valve	Mounted adjacent to the aft evaporator
Refrigerant Plumbing	Routed from the compressor, to the area below the passenger compartment, and forward to the nose area (As the refrigerant plumbing connects the compressor, condenser and evaporators, it may be necessary to remove several panels to gain access to its components).
Servicing Ports	Located in the left hand engine compartment adjacent to the condenser assembly

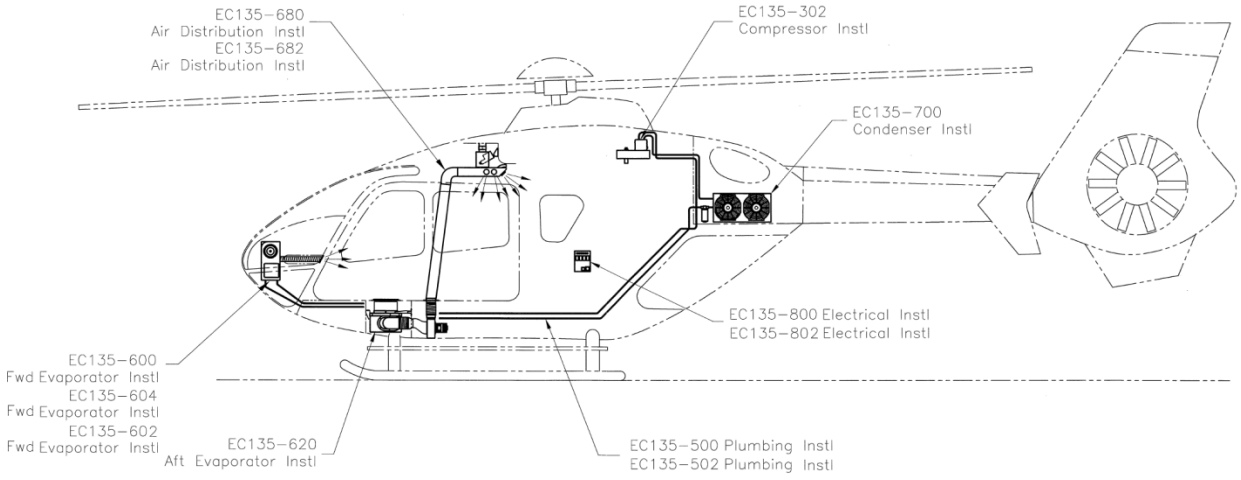


Figure 3: Layout of Air Conditioner Dual/Single Evaporators (Side View)

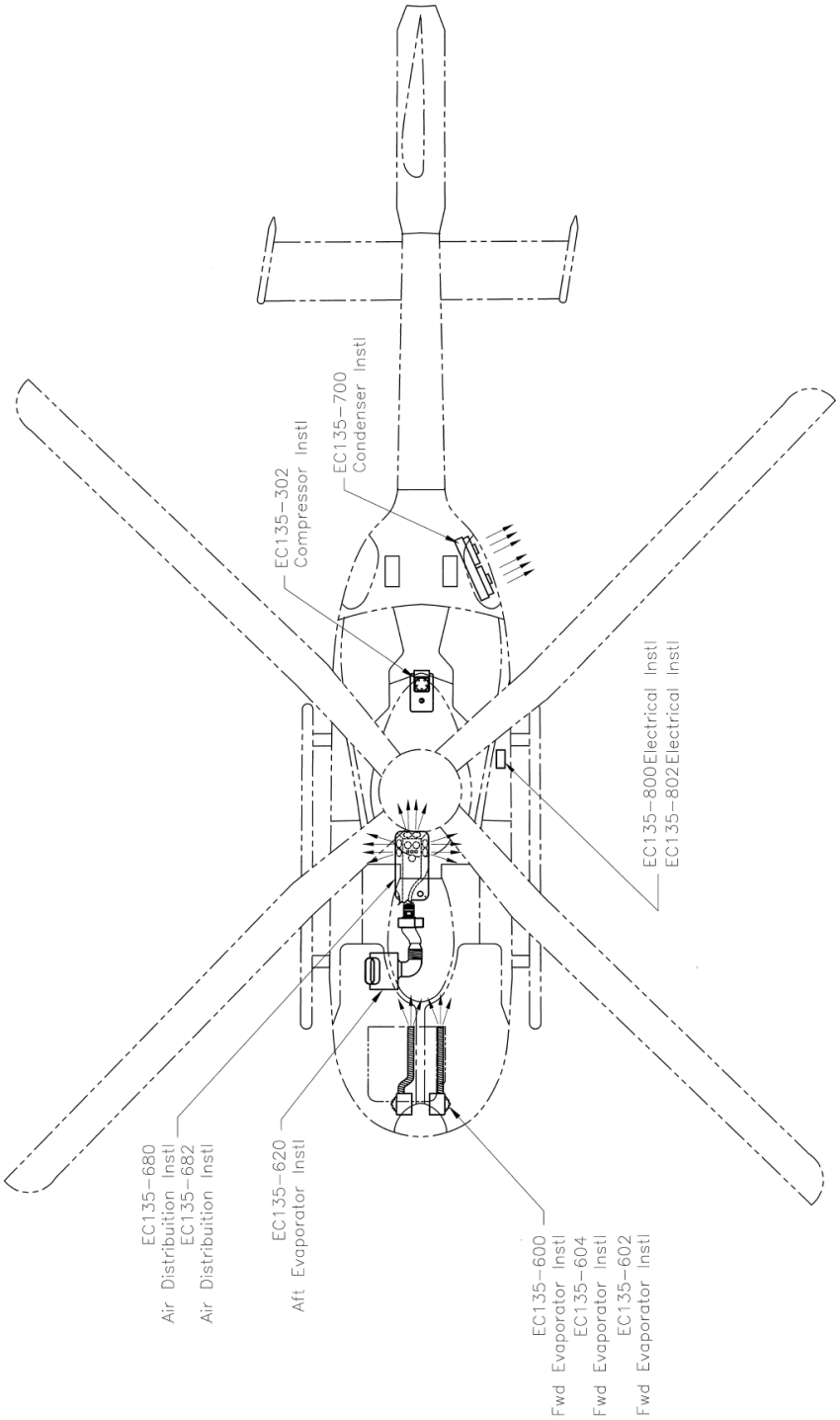


Figure 4: Layout of Air Conditioner Dual/Single Evaporators (Top View)

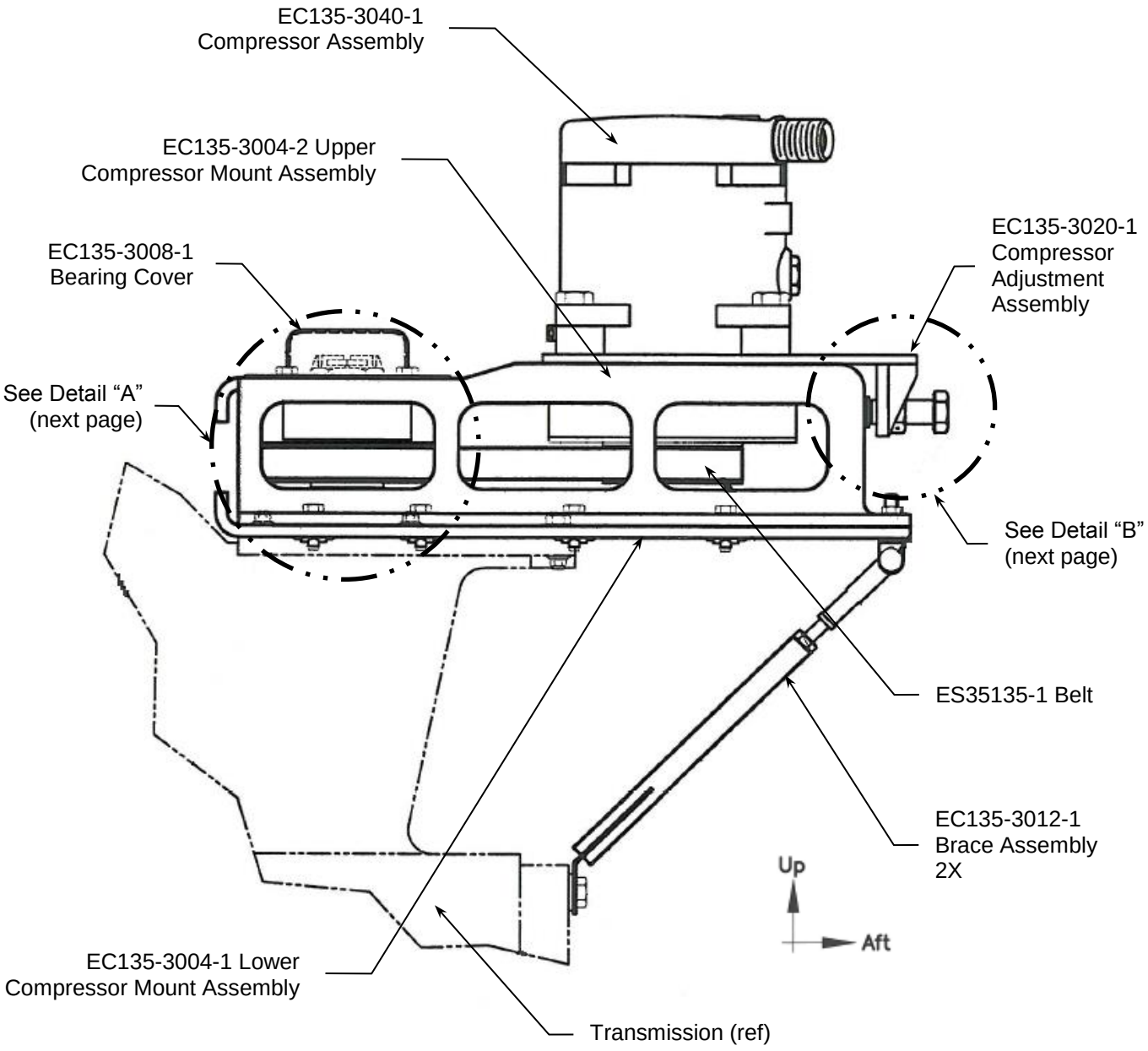


Figure 5: Compressor Installation
(View Looking Inboard, LH Side)

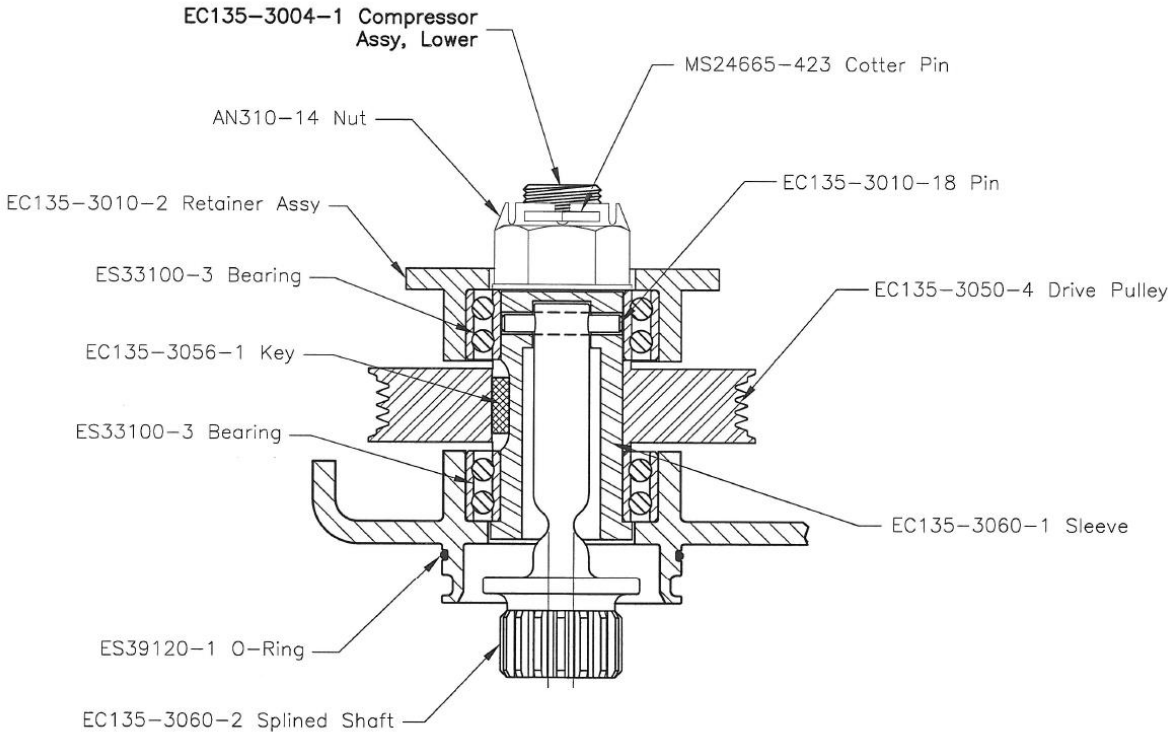


Figure 6: Detail "A" Compressor Lower Mount Drive Pulley Assembly

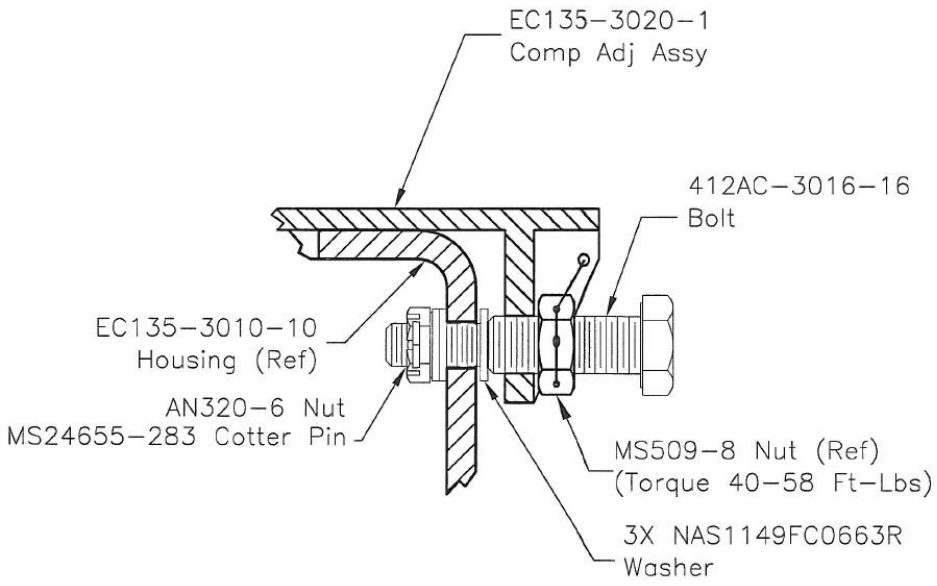


Figure 7: Detail "B" Compressor Adjustment Assembly

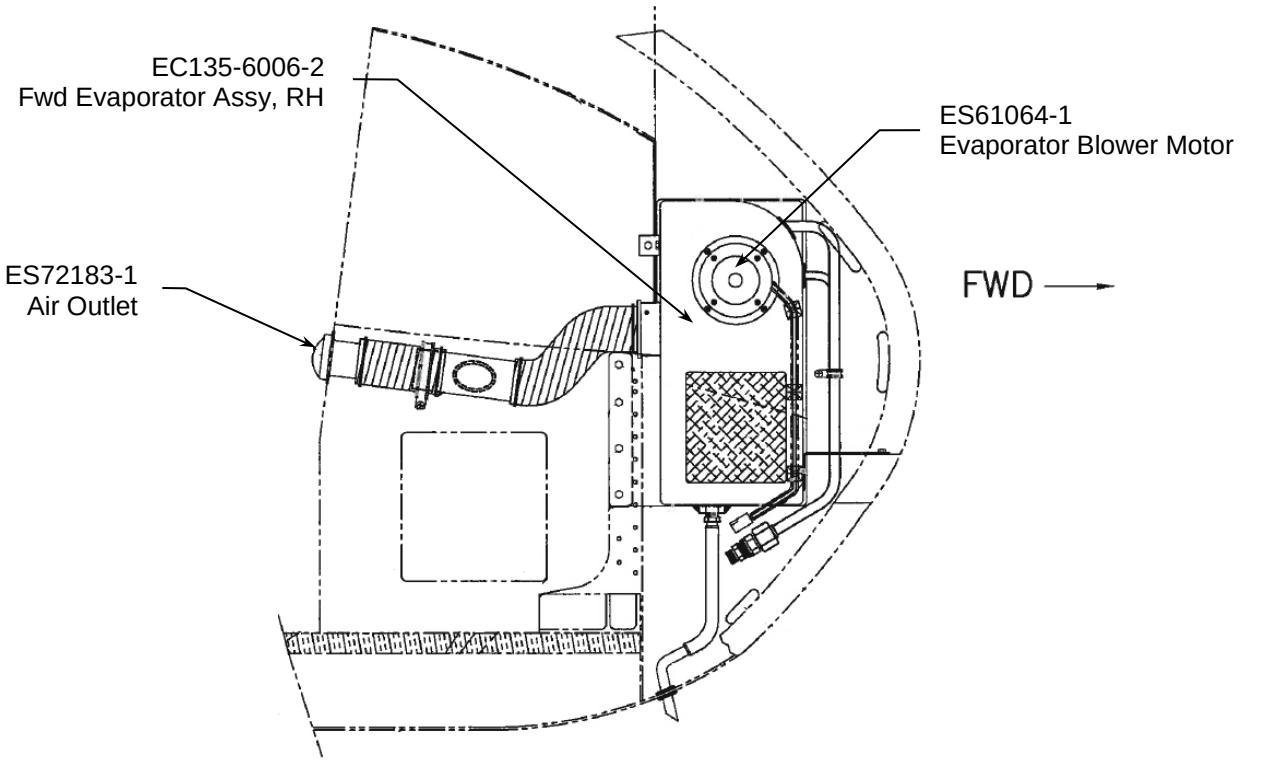


Figure 8: Fwd Evaporator Installation, RH (View Looking Inboard)

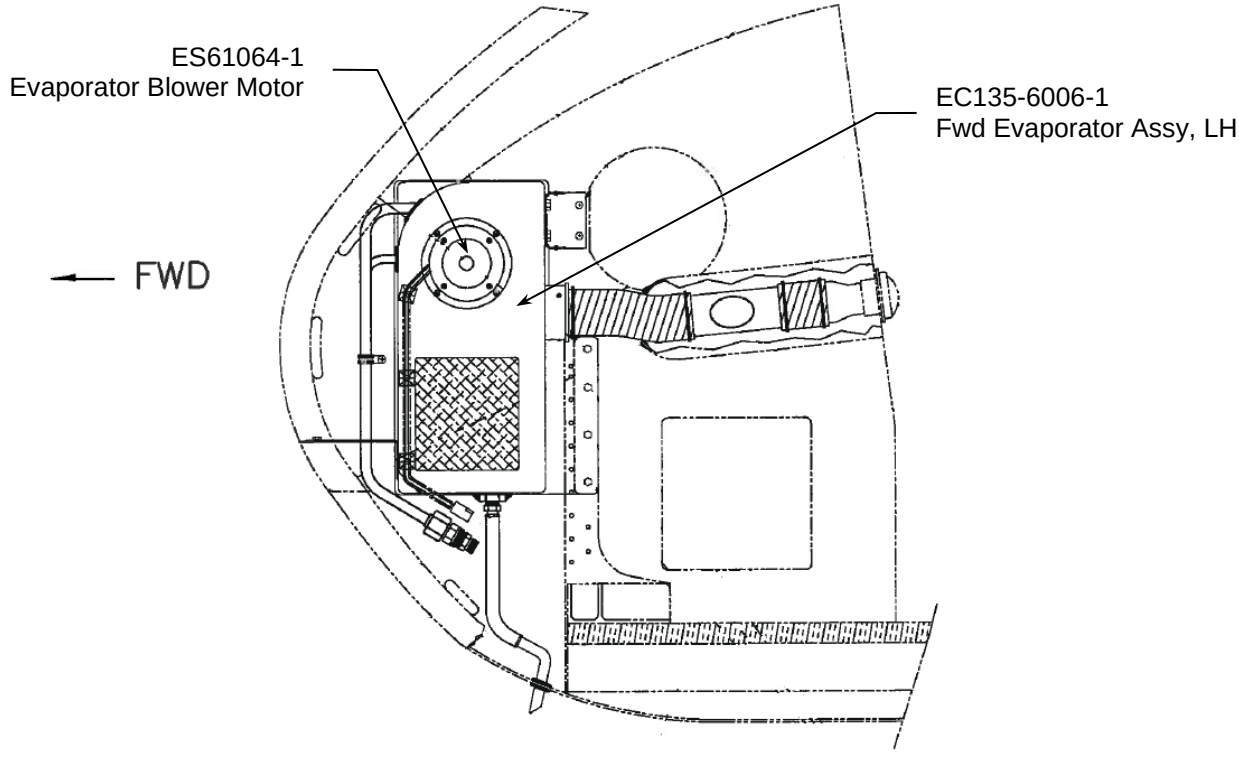


Figure 9: Fwd Evaporator Installation, LH (View Looking Inboard)

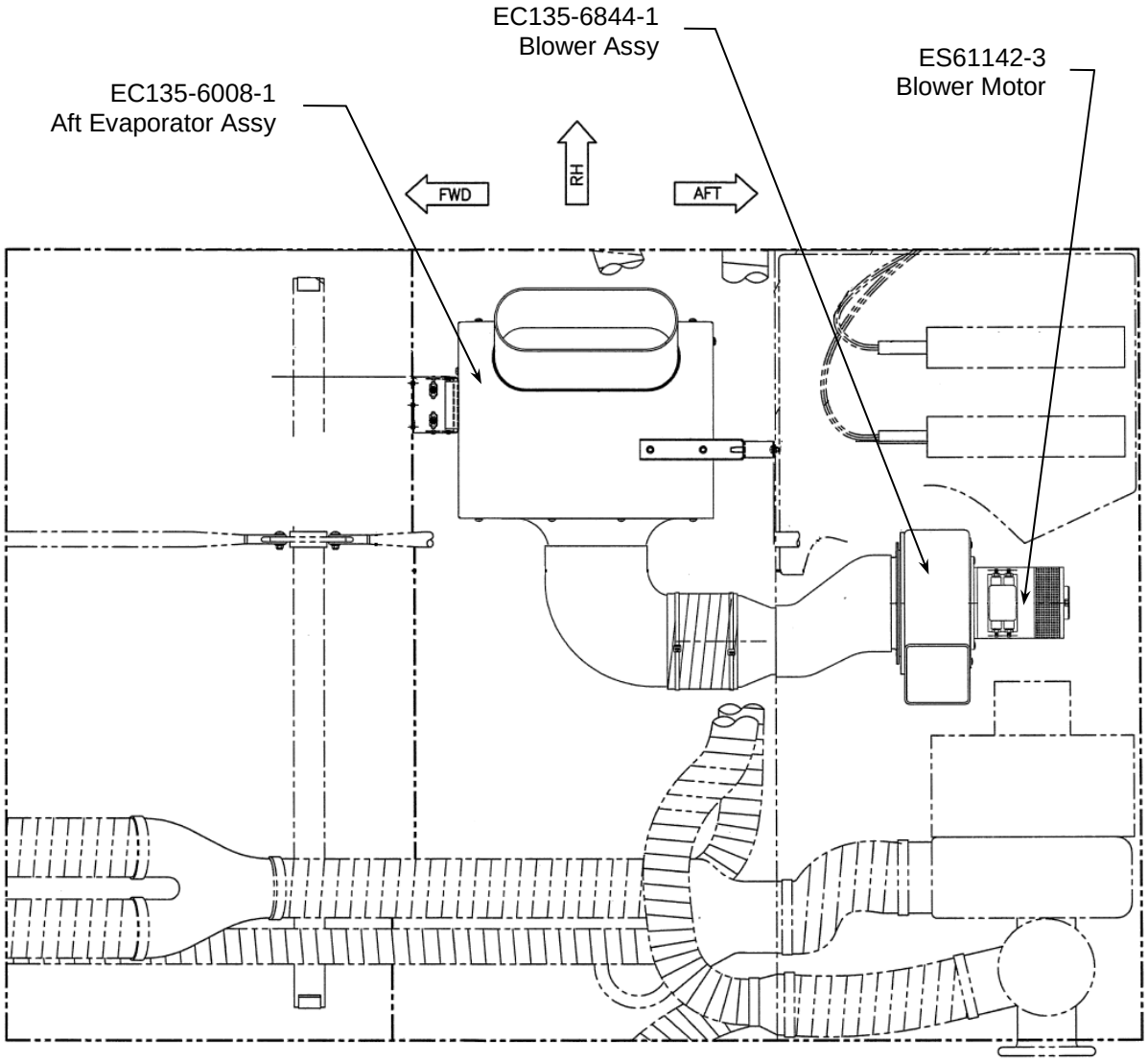


Figure 10: Aft Evaporator Installation Beneath Cabin Floor (View Looking Down)

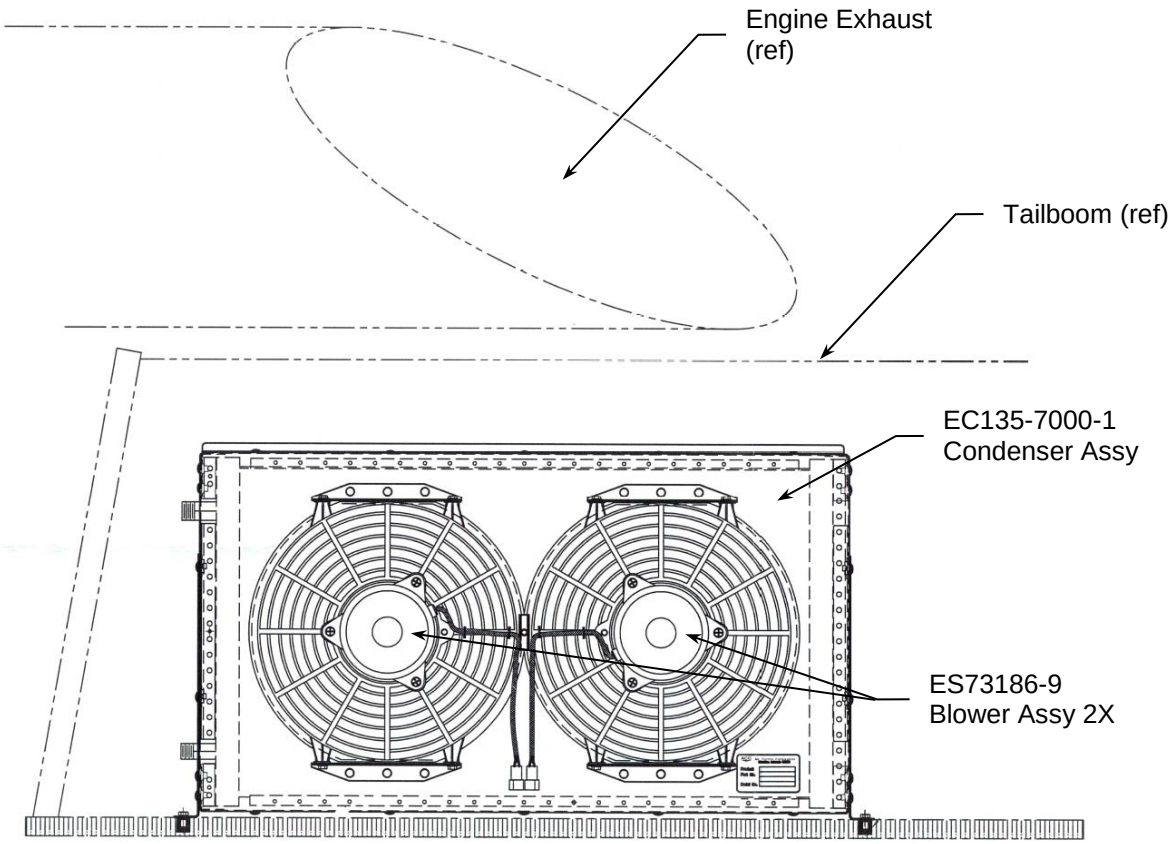


Figure 11: Condenser Installation
(View Looking Inboard, LH Side)

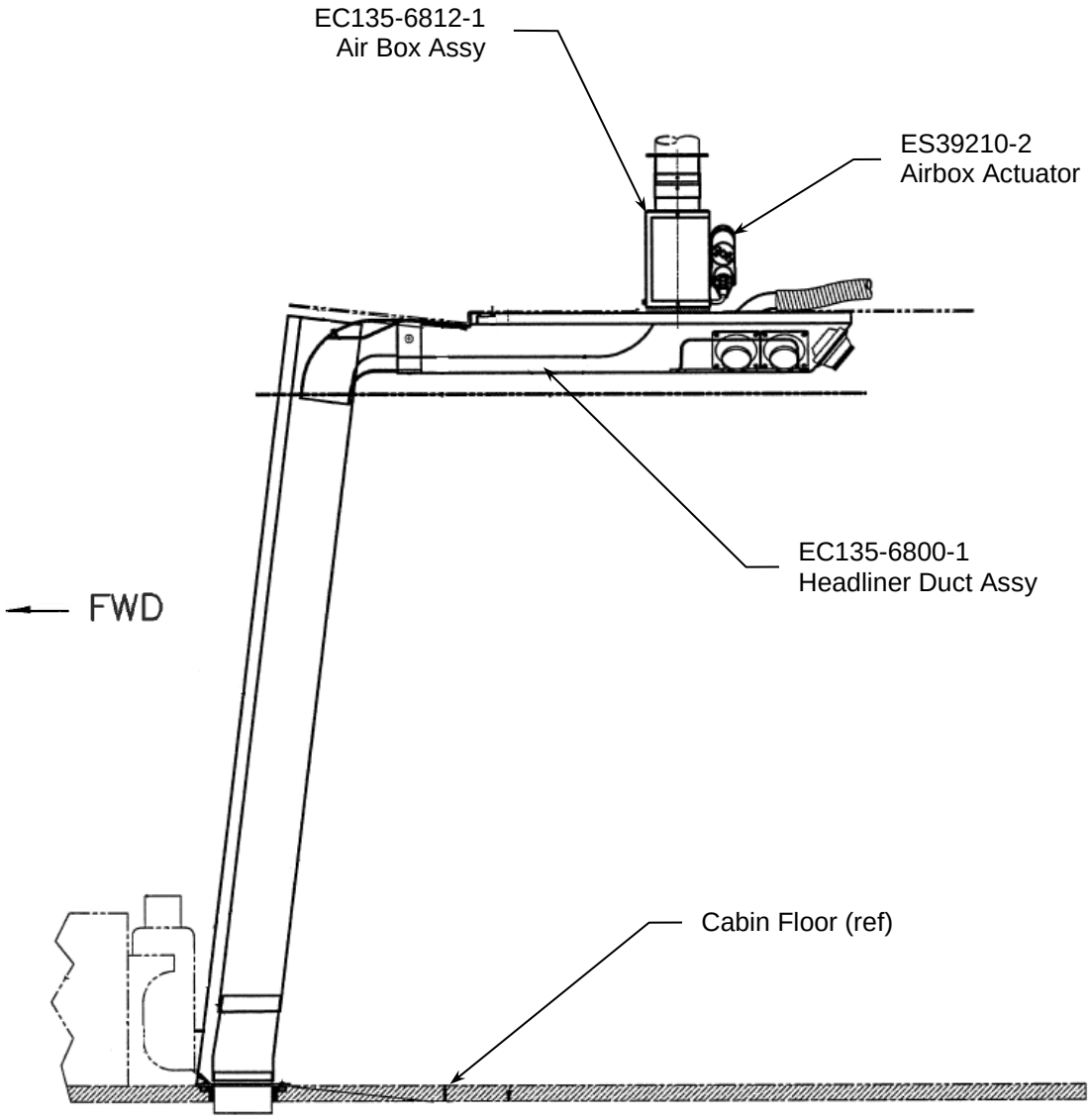


Figure 12: Air Distribution Installation
(View Looking Inboard, LH Side)

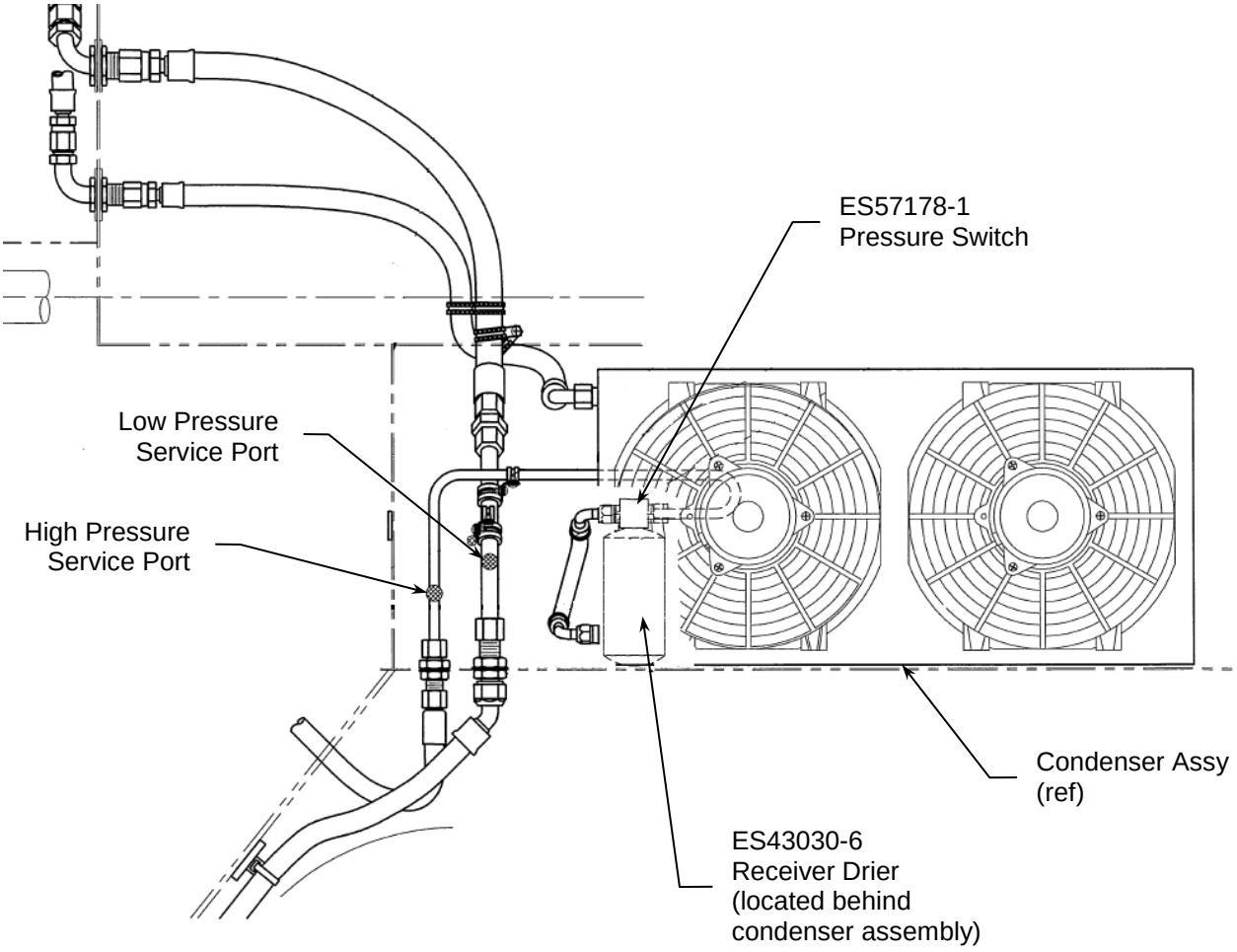


Figure 13: Receiver Drier, Service Ports, and Pressure Switch Installation (View Looking Inboard, LH Side)

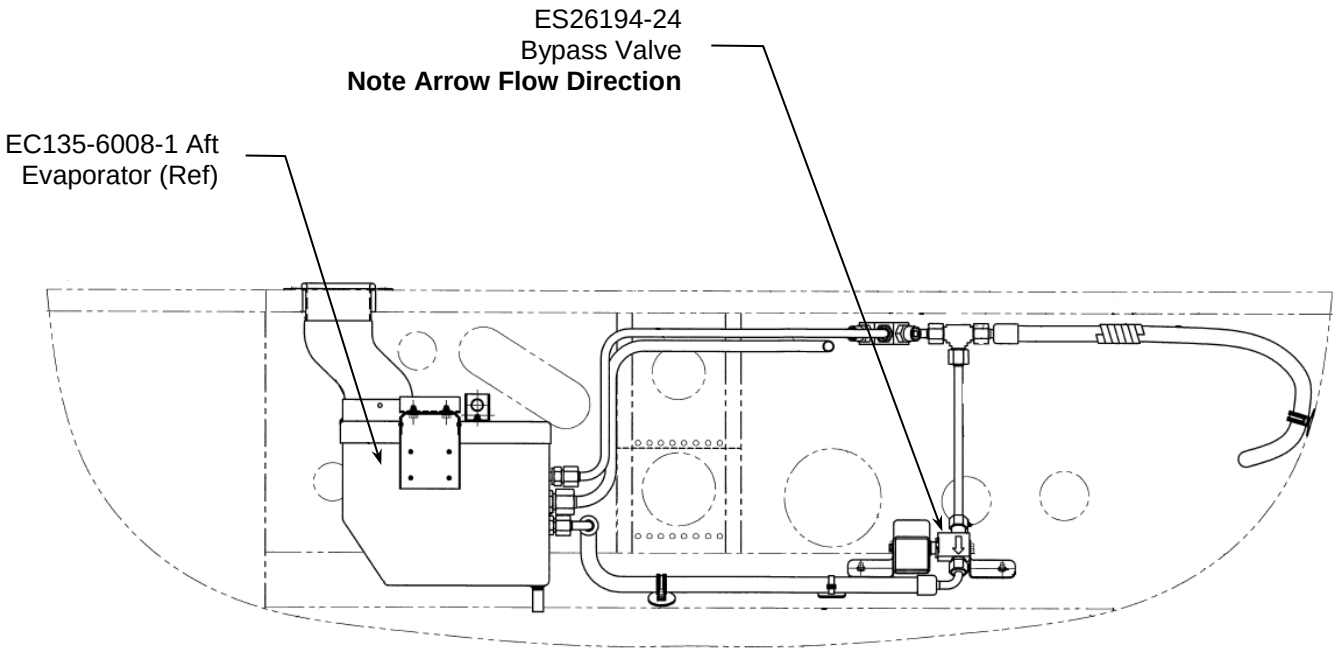


Figure 14: Bypass Valve Installation
(View Looking Inboard, LH Side)

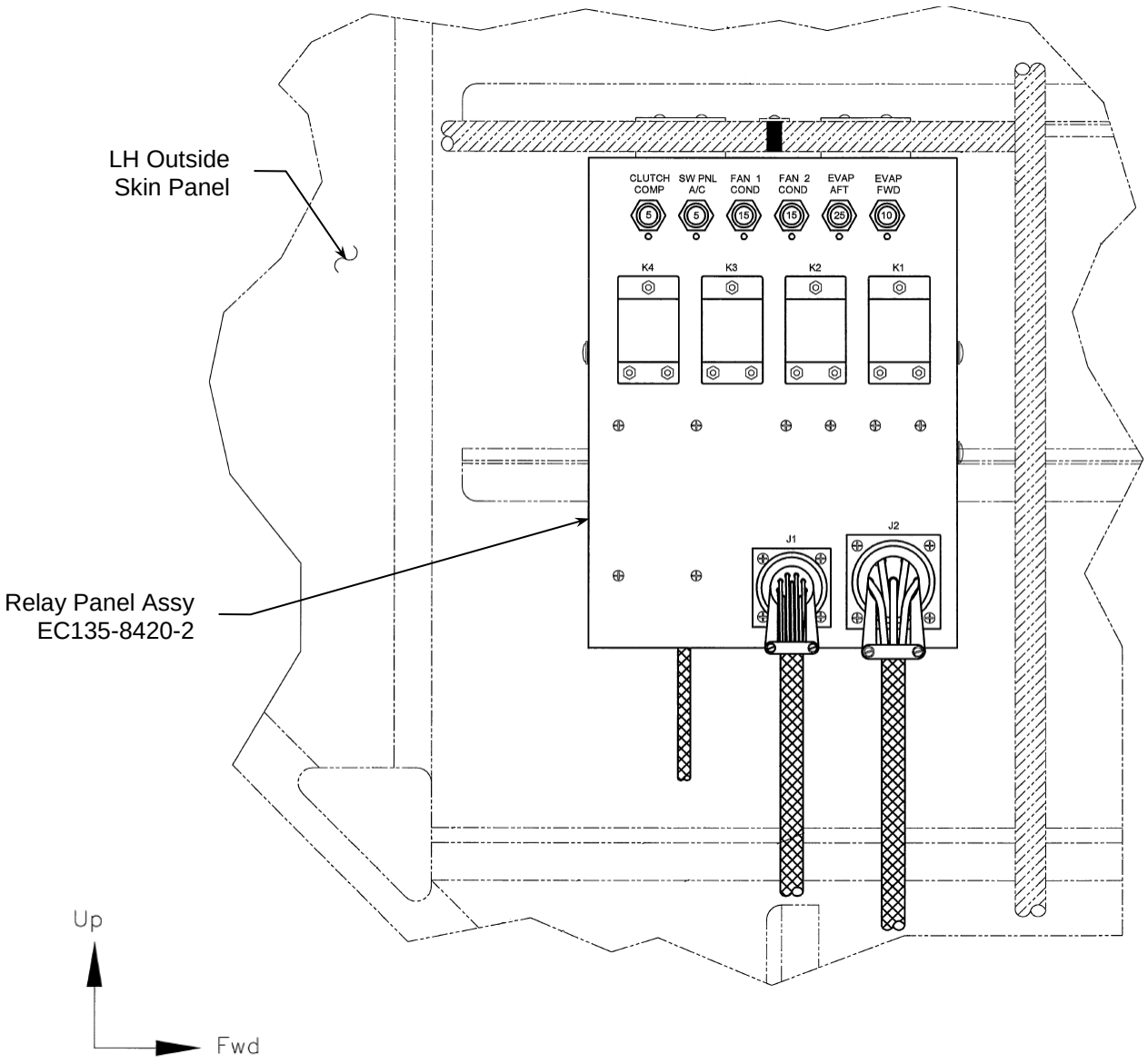


Figure 15: Relay Panel Installation
(View Looking Outboard)

CHAPTER 5
PLACARDS AND MARKINGS

1. Placard and Marking Information

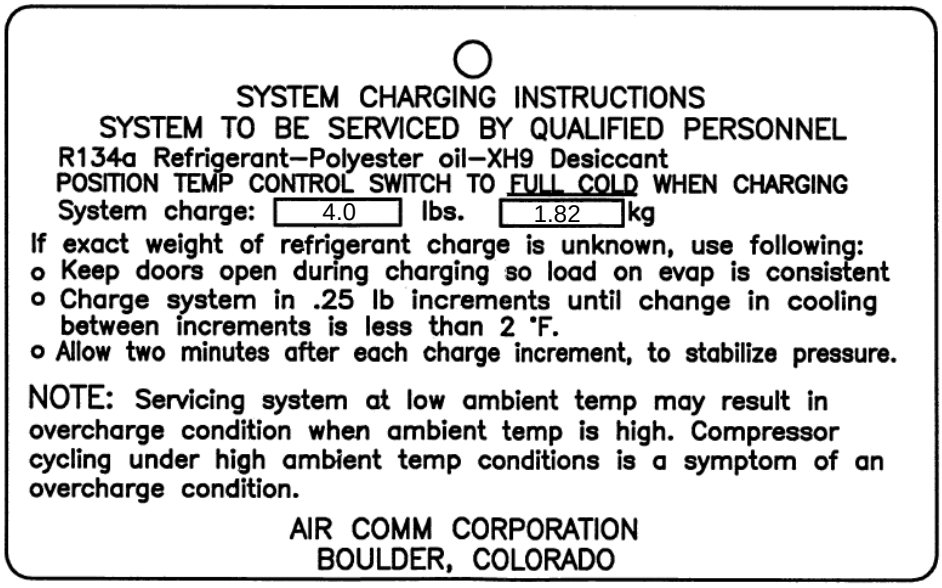


Figure 16: System Charging Instruction Placard
(Refrigerant charge shown for dual evap installation)

NOTE

Newer systems do not include the “BOULDER, COLORADO” annotation on the System Charging Instructions Placard.

NOTE

Systems shipped in 2015 or later include both “Polyester oil” and “Ultra PAG oil” in the annotation on the System Charging Instructions Placard.

CHAPTER 6
SERVICING

1. Safety Precautions

CAUTION

Refrigeration servicing should be performed by qualified personnel only. Check all local and federal regulations before servicing any refrigerant system or storage device.

The refrigerant used in the air conditioning system is the environmentally safe HFC R134a. This refrigerant is non-explosive, non-flammable, and non-corrosive, has practically no odor, and is heavier than air. However, certain precautions must be observed to ensure the safety of the equipment and any personnel servicing this system.

HFC R134A is stored in a liquid state. It will rapidly evaporate or sublimate when exposed to normal temperature and atmospheric pressure. This rapid evaporation can causes a severe drop in temperature. If liquid refrigerant comes in contact with the skin or eyes it may cause severe frostbite or blindness. Care must be taken to prevent liquid refrigerant from contacting the skin or the eyes.

WARNING

Safety glasses must be worn at all times when servicing the air conditioning system. Should any liquid refrigerant come in contact with the skin or eyes seek medical attention immediately even if the irritation ceases.

WARNING

To avoid a potential explosion NEVER weld, solder, steam clean, use a flame type leak detector, blow torch, bake on aircraft finish, or use excessive heat on, or in the immediate area of refrigerant lines or supply tanks while they are closed to the atmosphere.

WARNING

Refrigerant servicing must be performed in a well-ventilated area to minimize inhalation of the refrigeration gas.

2. Servicing Information

CAUTION

Refrigeration servicing should be performed by qualified personnel only.

NOTE

A list of suggested servicing equipment is provided later in this chapter.

Servicing Procedure

A. Connect the servicing manifold to the servicing ports located adjacent to the condenser assembly (Figure 13). BLUE for low pressure or “Suction” and RED for high pressure or “Discharge.”

B. After the quick disconnect fittings have been attached to the servicing ports, tighten the knobs on the back of the fittings to engage the Schrader valves located inside the charging ports.

NOTE

The Schrader valves inside the charging ports must be engaged to allow servicing of the air conditioner system.

C. Connect the YELLOW line in the center of the manifold to the vacuum pump. Turn the vacuum pump on and open both valves on the charging manifold. Decreasing the pressure in the closed system to -29.40 InHg causes the moisture in the system to vaporize allowing it to be drawn out by the vacuum pump. Removal of all moisture is crucial to the operation of the A/C system. Any moisture left in the system will be turned into ice causing undesired operation or blockage of one or more expansion valve. Allow the vacuum pump to draw against the system for a minimum of ONE HOUR.

NOTE

Due to a drop in atmospheric pressure with an increase in altitude, the normal vacuum reading will drop 1” (1 kg/cm) for each 1000 ft of altitude gained e.g., Sea Level Reading = 10 InHg, reading at 1000 feet above sea level = 9 InHg.

D. After the system has been evacuated, turn both valves on the manifold assembly to the “OFF” position and switch the vacuum pump off. Allow the system to hold the vacuum for a minimum or ONE hour to check for vacuum leaks. If the system will not hold the vacuum, the system may have a fitting leak. It may be necessary to charge the system with one to two pounds of refrigerant and conduct a leak check using an electronic leak detector.

CAUTION

To ensure trouble free operation the system must be leak free.

E. After the leak check has been performed evacuate the system for a minimum of ½ hour before charging with the required amount of HFCR134A as called out later in this chapter.

NOTE

Static charging is the most accurate and safest way to charge an air conditioning system. To accomplish this, all refrigerant must be charged into the system without the compressor engaged or the system operating.

CAUTION

Operating the air conditioning system with a low refrigerant charge may cause severe damage to the compressor assembly.

F. If a charging station is not available, charge the A/C system as follows:

1) After vacuum and leak check have been performed (Steps A through E) and the system has been proven to be "Leak Free," charge the system with an initial charge of 3.0 Lbs (1.82 Kg.). Open doors to the helicopter so that the evaporator inlet air remains stable during charging.

2) Engage the compressor and add the remainder of the required charge in .2 lb. increments allowing two minutes to elapse between each addition of refrigerant.

WARNING

If charging is to be accomplished with the compressor engaged it must be accomplished through the LO (BLUE) side only. **Never Charge through the Discharge or "HIGH" (RED) side of the system while the compressor is running. This may cause severe damage to the servicing equipment and may cause personal injury or death**. Care should be taken to ensure the HIGH (RED) side valve stays closed during this procedure and any time the system is operating.

G. After charging, perform a test run to ensure proper function of the Air Conditioning System.

CAUTION

When reclaiming refrigerant, be sure to note any oil that is removed from the system, and replace the lost oil before or during re-servicing. Maintaining a proper oil and refrigerant charge is critical to the life of the compressor assembly.

SYSTEM DESCRIPTION	REFRIGERANT CHARGE		OIL CHARGE	
EC135 Air Conditioner system **Single** Fwd Evaporator	3.8 lbs	1.73 Kg	8.0 oz.	238 ml
EC135 Air Conditioner system **Dual** Fwd Evaporator	4.0 lbs	1.82 Kg	8.0 oz.	238 ml

3. Lubrication Information

CAUTION

This system is serviced with either Polyester Based Refrigerant Oil (POE) or Double end capped Polyalkylene oil (DEC PAG, aka Ultra PAG). The use of Mineral Oil or Polyalkylene (PAG) in this system will cause damage to the air conditioner compressor and expansion valves.

A. The total system oil charge is 8.0 fl oz. (238 ml.) of Double End Capped Polyalkylene Glycol (DEC PAG). The oil is initially contained within the compressor as shipped from the factory so no additional oil is required when installing a new system.

B. If oil is spilled during installation/maintenance, or is lost due to a leak in the system, it is necessary to approximate the amount of lost oil and add this amount to the system.

C. The oil charge is continuously circulated by the refrigerant during the operation of the system. A quantity of oil is trapped by the compressor.

NOTE

Maintaining the correct amount of refrigerant and refrigerant oil in the system is critical for ensuring the long life of the compressor.

D. The Service Ports for this system are located in the upper aft right-hand corner of the baggage compartment adjacent to the condenser assembly (Figure 13).

E. This system may be serviced with either Polyolester (POE) or Double End Capped Polyalkylene Glycol (DEC PAG). Polyalkylene Glycol is preferred due to its superior lubricating properties and improved compressor service life. There are several types of PAG available. Only the “Double End Capped” type is permissible in Air Comm Corporation air conditioning systems. Double End Capped PAG oil is available from Air Comm Corporation in 8 ounce bottles (P/N ES94006-13). Mixing of POE and PAG is acceptable. Disregard previous statements to the contrary. They referenced PAG oil that was not “Double End Capped”. Current versions of compressors are designed to be operated using PAG oil. Testing by Air Comm Corporation has shown that “Double End

Capped" PAG is compatible with POE and can therefore be mixed. "Double End Capped" is a reference to the chemical structure of the molecule and not to the container.

Do not use Mineral oil in this system with R134a refrigerant. Do not use any refrigerant oil other than Double End Capped Polyalkylene Glycol (also known as "ULTRA PAG") or Polyolester (also POE).

Containers of DEC PAG or POE will absorb moisture if left open (hygroscopic). Keep containers tightly capped when not in use and keep all system components capped while servicing system.

The quantity of lubrication in the system is critical. If too little lubrication is in the system the compressor life may be reduced. No other component in the A/C system requires lubrication. Too much lubricant in the system will retard heat transfer in the evaporator and condenser coils and reduce the cooling capacity of the system.

F. The following chart may be used to calculate the amount of oil to be added in case a component is being replaced with a new part.

Component	Oil Amount
Compressor	See Instructions
Evaporator	1.0 oz. per evaporator
Condenser	1.5 oz.
Receiver Drier	1.5 oz.
Hose - Vapor	1.0 oz. per 10 foot
Hose – Liquid	1.0 oz. per 20 foot

4. System Leak Check

A. It is important to identify and eliminate refrigerant leaks at system connections to ensure trouble free operation of the air conditioning system.

A new or empty system can be pressurized with R134a at 50 psi (3.5 kgcm) to conduct a leak survey. Do not pressurize the system with compressed air. Compressed air will introduce moisture into the system, which will degrade the operation of the system.

The preferred method is to use an electronic leak detector in conjunction with a small charge of R134a refrigerant. All checks done in this manner should be conducted with the air conditioner off. Since the refrigerant is heavier than air, leaks are most likely to be detected on the underside of hoses and fittings. In

some cases, leaking refrigerant gas may collect in low areas of the aircraft and provide erroneous leak detection. A stream of compressed air from a nozzle may be useful in clearing the area just prior to conducting a leak test.

B. If a leak is detected at an O-Ring fitting, check to insure proper torque has been applied to the fitting. If the system continues to leak, reclaim the refrigerant and install a new O-Ring.

NOTE

Be sure that the O-Ring is lubricated with refrigerant oil prior to its installation.

A small amount of leakage (approximately one ounce per year) past the compressor shaft seal is normal. Most leak detectors are sensitive enough to show a leak of this magnitude.

5. Suggested Equipment for Servicing

Recovery / Recycling / Recharging Station
(Example: Snap-on Model ACT 3340, Robinair Model 34700, or equivalent)

Electronic Leak Detector (R134a compatible)
(Example: Micro-Tech III, Robinair, Snap-on, or equivalent)

Manifold and gauge set (R134a compatible)
(Example: Robinair, Snap-on, or equivalent)

6. Consumable Materials

A. O-Rings: This system utilizes the refrigerant HFC R134a. Consequently, the system must also utilize Highly Saturated Nitrile (HSN O-Rings) the insert O-Ring fittings (as previously described in this manual) require the use of Green HSN O-Rings while the TORQ LOK® Fittings (As previously described in this manual) require the use of the Black HSN O-Rings.

B. Loctite thread sealer 554 (or equivalent).

C. Torque-Seal Anti Sabotage Lacquer.

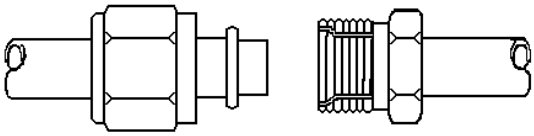
7. Suggested Spares List

ITEM	PART NUMBER
Blower Motor – Aft Evaporator	ES61142-3
Blower Motor – Forward Evaporator	ES61064-1
Compressor Assembly	EC135-3040-1
Compressor Drive Belt	ES35135-1
Receiver / Drier Bottle	ES43030-6
Binary Switch	ES57178-1
By-pass Valve	ES26194-24
Condenser Blower	ES73186-9
Compressor Drive Bearings	ES33100-3
HSN O-Rings; Insert Type (Green)	
# 6 O-Ring	ES44010-2
# 8 O-Ring	ES44010-3
# 10 O-Ring	ES44010-4
HSN O-Rings; TORQ LOK® Type (Black)	
#6 O-Ring	ES44012-2
#8 O-Ring	ES44012-3
#10 O-Ring	ES44012-4

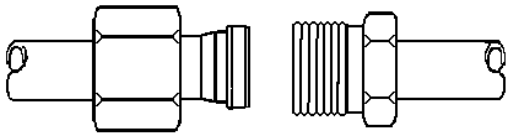
CHAPTER 7
STANDARD PRACTICES AND INFORMATION

1. Fitting Torque Procedures and Values

INSERT O-RING FITTINGS



TORQ-LOK® FITTINGS



Apply a thin coating of refrigerant oil to O-Ring and Female side of fitting.
Confirm there is no damage (nicks, dirt, etc.) on fittings.
Slide B-nut back away from the end of the tube so you can see the O-Ring as you slide the fitting together.

Be careful not to pinch O-Ring during assembly.

Engage the male end into the female fitting being careful to maintain alignment.

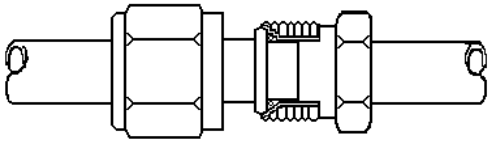
The male flange should seat fully against the female fitting without the O-Ring being pinched.

It is important to hold the fitting together while sliding the B-nut forward and engaging the threads. Tighten the B-nut by hand and then torque as follows:

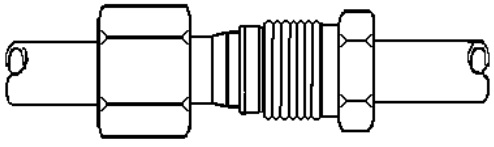
a. TORQ LOK® Fittings: Must be hand snug (metal to metal) and then add an additional 30 degrees (one half flat).
b. Insert O-Ring Fittings: Must be hand snug against O-ring, and then an additional 60 degrees (one flat).

CAUTION:
Excessive torque will damage fitting.
DO NOT OVER TORQUE
ALWAYS USE BACK UP WRENCH

INSERT O-RING FITTINGS



TORQ-LOK® FITTINGS



2. Torque Seal.

Once system is charged, check each fitting with an electronic leak detector. Once fittings have been checked and are leak free, torque Seal as appropriate.

3. General Information

A. Refer to Airbus Model EC135 Maintenance Manual for general removal and installation procedures associated with basic aircraft equipment and components.
B. Prepare helicopter for maintenance. Disconnect battery and/or electrical power supply.
C. It may be necessary to evacuate (discharge) refrigerant from the system to remove or replace certain components. Instructions for servicing are found in CHAPTER 7.
D. All openings and ports in components, hoses, and tubes disconnected or removed to facilitate removal and replacement procedures must be capped or plugged to prevent contamination.
E. Retain all parts and attaching hardware for reassembly, unless otherwise noted.
F. Always use a back-up wrench on lines and fittings when removing and installing refrigerant plumbing.
G. Perform functional checks and/or ground runs to verify component/system operation.

4. Removal and Replacement of Forward Evaporator Assembly (LH or RH) (Figure 8 and Figure 9)

Removal

A. Discharge refrigerant. See Chapter 6 Servicing for instructions.
B. Disconnect refrigerant plumbing from evaporator tube and fittings once refrigerant is evacuated.
C. Remove outlet flex duct from the outlet adapter on evaporator by removing cable ties.
D. Disconnect drain line from bottom of evaporator by removing cable tie.
E. Disconnect blower motor electrical connector.
F. Remove attaching hardware securing evaporator assembly to mounting brackets and supports.
G. Remove forward evaporator assembly.

Installation/Replacement

A. Install forward evaporator assembly and secure with retained attaching hardware to mounting brackets and supports.

B. Connect blower motor electrical connector and secure as needed.
C. Connect drain line at bottom of evaporator and secure with cable tie.
D. Replace all O-Rings before connecting refrigerant plumbing to evaporator tube and fittings. Torque refrigerant line connections per tightening instructions pg.29.
E. Connect outlet flex ducts to the outlet adapter on the evaporator and secure with cable ties.
F. Service air conditioning system with refrigerant.

5. Removal and Replacement of Forward Evaporator Blower Motor Assembly (LH or RH, Figure 8 and Figure 9)

Removal

A. Disconnect blower motor electrical connector and cut cable ties to free motor wiring from cable tie mounts on evaporator.
B. Remove attaching hardware securing blower motor assembly to evaporator enclosure. Remove blower motor and wheel assembly.
C. Cut wire leads at splices and retain wire and connector lead for reuse on new motor. Record correct polarity of connections.
D. Loosen retaining set screw and remove blower wheel from blower motor shaft. Retain blower wheel.

NOTE

It may be necessary to apply heat to the set screw of the blower wheel in order to separate the two parts.

Installation/Replacement

A. Install retained blower wheel on new motor. Press the blower wheel onto the motor shaft until it stops against motor. Back blower wheel away to achieve a .030” – .040” clearance between blower wheel and new motor. Apply one drop of low strength Loctite to set screw and tighten against flat portion of motor shaft to lock wheel in place (Figure 17).

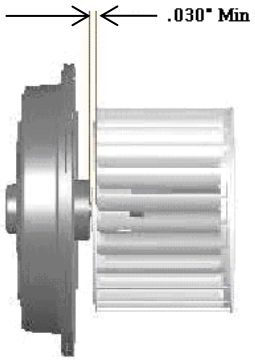


Figure 17: Fwd Evap Blower Motor and Wheel Assembly

B. Install blower motor and wheel assembly in evaporator enclosure and secure with attaching hardware.
C. Install M81824/1-3 or equivalent splices to motor wires and retained connector leads. Observe correct polarity of connections.
D. Connect blower motor electrical connector and secure to cable tie mounts as required.

6. Removal and Replacement of Aft Evaporator Assembly (Figure 10)

Removal

A. Discharge the refrigerant. See chapter 6 Servicing for instructions.
B. Remove belly panel below RH seat to gain access to the aft evaporator assembly.
C. Disconnect electrical connector to evaporator freeze switch.
D. Disconnect return air transition duct from adapter ring on the aft evaporator.
E. Disconnect refrigerant plumbing from evaporator fittings once refrigerant is evacuated.
F. Remove attaching hardware securing evaporator assembly to mounting brackets and supports.
G. Remove aft evaporator assembly.

Installation/Replacement

A. Install aft evaporator assembly and secure with retained attaching hardware to mounting brackets and supports.
B. Connect electrical connector to evaporator freeze switch.
C. Connect return air transition duct to adapter ring on the aft evaporator.
G. Replace all O-Rings before connecting refrigerant plumbing to evaporator tube and fittings. Torque refrigerant line connections per tightening instructions pg.29.
D. Service air conditioning system with refrigerant.

7. Removal and Replacement of Aft Evaporator Blower Motor Assembly (Figure 10)

Removal

A. Remove belly panel to gain access to the aft evaporator blower assembly.
B. Disconnect blower motor electrical connector.
C. Remove attaching hardware securing blower motor assembly and mounting brackets. Remove blower motor and wheel assembly from blower housing.
D. De-pin wire leads and retain connector for reuse on new motor. Record correct polarity of connections.

E. Note the clearance between blower wheel and forward mount assembly on motor. Record clearance for reference (Figure 18).
F. Loosen retaining set screw and remove blower wheel from blower motor shaft. Retain blower wheel.

NOTE

It may be necessary to apply heat to the set screw of the blower wheel in order to separate the two parts.

G. Remove forward and aft mount assemblies and cooling tube from motor.

Installation/Replacement

A. Install forward and aft mount assemblies and cooling tube on new motor.
B. Install retained blower wheel on new motor. Press the blower wheel onto the motor shaft until it stops against motor. Back blower wheel away to achieve the noted clearance between blower wheel and forward mount assembly on motor. Apply one drop of low strength Loctite to set screw and tighten against flat portion of motor shaft to lock wheel in place (Figure 18).

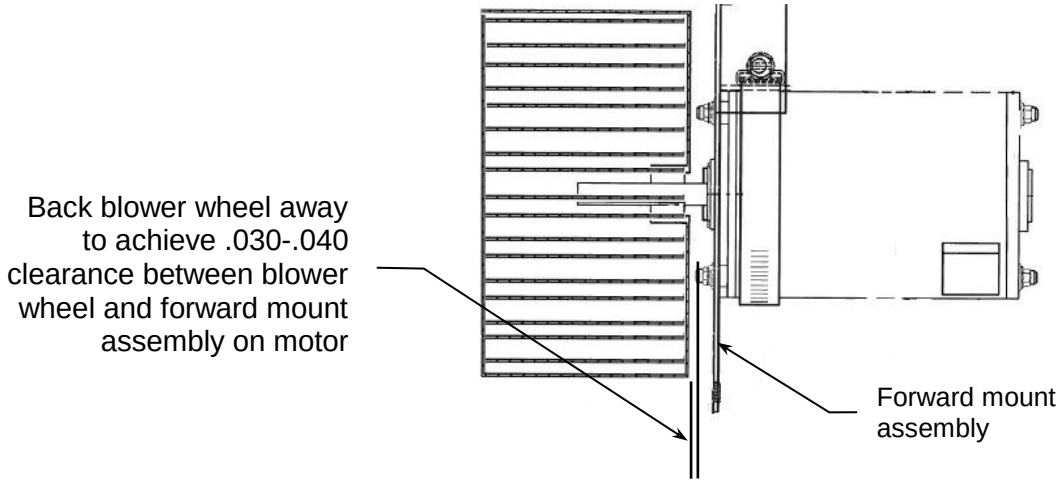


Figure 18: Aft Evap Blower Motor and Wheel Assembly

C. Install blower motor and wheel assembly in blower enclosure and secure with attaching hardware.
D. Install retained connector to motor wires. Observe correct polarity of connections.
E. Connect blower motor electrical connector to aircraft wiring and secure as required.

F.

8. Removal and Replacement of Condenser Assembly (Figure 11)

Removal

A. Discharge the refrigerant. See Chapter 6 Servicing for instructions.
B. Remove LH aft engine fairing from aircraft to gain access to the condenser assembly.
C. Disconnect both condenser blower assembly electrical connectors.
D. Disconnect refrigerant plumbing from condenser and receiver drier fittings once refrigerant is evacuated.
E. Remove attaching hardware securing condenser assembly to engine deck.
F. Remove the condenser assembly.

Installation/Replacement

A. Install condenser assembly and secure with retained attaching hardware to engine deck.
B. Connect electrical connectors to condenser blower assemblies.
C. Replace all O-Rings before connecting refrigerant plumbing to condenser and receiver drier tube and fittings. Torque refrigerant line connections per fitting tightening instructions pg.29.
D. Service air conditioning system with refrigerant.

9. Removal and Replacement of Condenser Blower Assembly (Figure 11)

Removal

A. Remove LH aft engine fairing from aircraft to gain access to the condenser assembly.
B. Disconnect the appropriate condenser blower assembly electrical connector.
C. Remove safety wire and attaching hardware securing blower assembly to the condenser assembly.
D. Remove the blower assembly.

Installation/Replacement

A. Install blower assembly and secure with retained attaching hardware to condenser assembly and apply safety wire per MIL-P-8564, using MS20995C-32 safety wire.
B. Connect electrical connector to the condenser blower.

10. Removal, Replacement and Adjustment of Compressor Drive Belt (Figure 5 and Figure 7)

Removal

A. Remove upper engine cowlings and aft engine baffle plate to gain access to the compressor and mount assembly.
B. Cut the safety wire that secures MS509-8 jam nut to EC135-3020-1 compressor adjustment assembly and loosen nut (Figure 7).
C. Loosen attaching hardware that secures the base of the compressor assembly to the upper compressor mount.
D. Turn the 412AC-3016-16 Belt Tensioning Bolt counterclockwise to loosen the belt tension. Remove belt from compressor pulley.
E. Remove attaching hardware that secures the EC135-3008-1 bearing cover to the upper compressor mount assembly.
F. Remove attaching hardware that secures the upper compressor mount assembly to the lower mount assembly.
G. Remove attaching hardware from the two aft outboard EC135-3012-1 brace assemblies and the upper compressor mount.
H. Carefully lift the upper compressor mount assembly and provide support to prevent damage.
I. Remove belt from drive pulley.

Installation/Replacement

A. Install the drive belt on the drive pulley.

CAUTION

Care should be taken to ensure that the new belt is not damaged (nicked or cut) during installation.

B. Carefully lift the upper compressor mount assembly and place onto the lower mount assembly.
C. Install belt on to compressor pulley.
D. Install attaching hardware that secures the upper compressor mount assembly to the lower mount assembly. Torque bolts to 20-25 In-Lbs.
E. Install attaching hardware to the two aft outboard EC135-3012-1 brace assemblies and the upper compressor mount. Torque nuts to 30-40 In-Lbs.
F. Install attaching hardware that secures the EC135-3008-1 bearing cover to the upper compressor mount assembly. Torque bolts to 20-25 In-Lbs.
G. Tighten attaching hardware that secures the base of the compressor assembly to the upper compressor mount. Torque bolts to 160-190 In-Lbs.
H. Adjust belt tension using the 412AC-3016-16 Belt Tensioning Bolt (See adjustment procedure below).

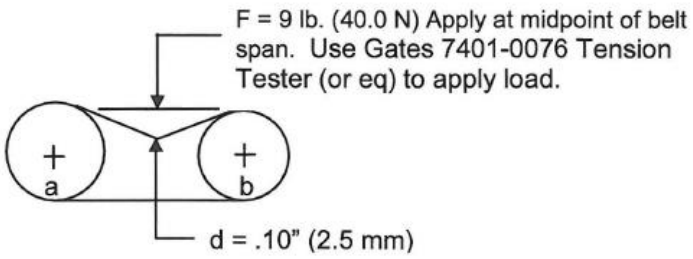
I. Tighten MS509-8 jam nut to EC135-3020-1 compressor adjustment assembly. Torque nut to 40-58 Ft-Lbs and apply safety wire per MIL-P-8564, using MS20995C-32 safety wire.

Adjustment

NOTE

Proper static belt tension is necessary to insure a proper belt service life and to avoid excessive loads on the compressor, and bearing assemblies.

A. The proper belt tension is achieved when the belt deflects .10” (2.5 mm) with a 9lb. (40.0 N) load applied as shown below. This can be achieved with the aid of a belt tensioning tool (Gates 7401-0076 Belt Tension Gauge or equivalent). This is the preferred method of obtaining proper belt tensioning.



NOTE

The belt tension should be checked, and adjusted, if necessary after the first two hours of operation for a newly installed belt.

11. Removal and Replacement of Compressor Assembly (Figure 5 and Figure 7)

Removal

A. Remove upper engine cowlings and aft engine baffle plate to gain access to the compressor and mount assembly.
B. Discharge the refrigerant. Refer to Chapter 6 Servicing for instructions.
C. Disconnect refrigerant hoses from compressor fittings once refrigerant is evacuated.
D. Disconnect clutch coil wire at the TSE-16-01 connector.
E. Cut the safety wire that secures MS509-8 jam nut to EC135-3020-1 compressor adjustment assembly and loosen nut (Figure 7).
F. Loosen attaching 4X bolts that secures the base of the compressor assembly to the upper compressor mount.
G. Turn the 412AC-3016-16 Belt Tensioning Bolt counterclockwise to loosen the belt tension. Remove belt from compressor pulley.

H. Remove attaching hardware that secures the EC135-3008-1 bearing cover to the upper compressor mount assembly.
I. Remove attaching hardware that secures the upper compressor mount assembly to the lower mount assembly.
J. Remove attaching hardware from the two aft outboard EC135-3012-1 brace assemblies and the upper compressor mount.
K. Carefully lift the upper compressor mount assembly and provide support to prevent damage.
L. Remove and retain belt from drive pulley.
M. Remove safety wire on 8X compressor pulley bolts and remove bolts (Figure 19).

NOTE

Note the index marks on the compressor pulley and sleeve assembly prior to removal.

NOTE

The clutch plate must be secured to prevent the compressor shaft from turning to break the torque on the retaining nut. The clutch plate can then be removed with the use of a clutch plate removal tool, or pulley puller.

N. Remove and retain the compressor clutch retaining nut, and remove the clutch plate from the compressor shaft.
O. Remove the snap-ring from the top of the compressor clutch coil, and remove the coil from the compressor shaft housing.
P. Remove the compressor pulley retaining snap-ring from the top of the compressor pulley sleeve.
Q. Remove the sleeve from the compressor shaft housing using the EC135-3054-1 compressor pulley / clutch removal tool.
R. Remove attaching hardware that secures the compressor assembly to the upper compressor mount.
S. Remove compressor assembly.

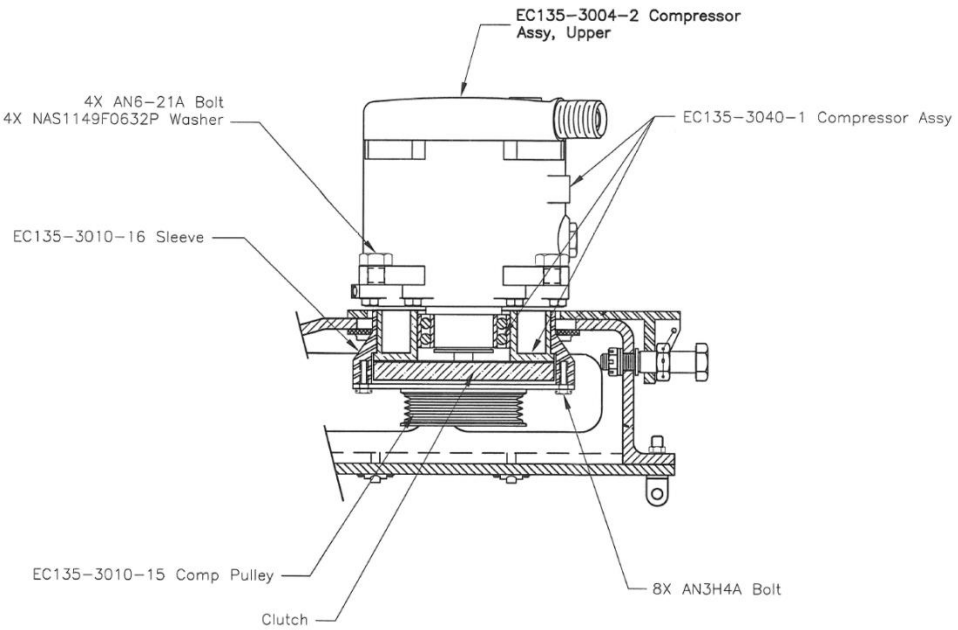


Figure 19: Compressor and Pulley Assembly

Installation/Replacement

A. The replacement compressor will come shipped with 8 oz. of refrigerant oil, however that level will need to be reduced to account for oil existing in the system. To properly calculate the amount of oil required in the replacement compressor, it is necessary to pour the oil out of the old compressor into a clean container. Drain the oil out of the fill plug hole and then pour oil out of the suction and discharge ports while rotating the center shaft clockwise. Measure the total amount of oil removed from the old compressor. Add ½ oz. to the total measured to account for unrecoverable oil in the old compressor. This total is what is needed in the new compressor. New compressors come from Air Comm charged with 8 oz. (240 cc) of oil. This should be adjusted according to the amount of oil recovered from the old compressor and any other components being replaced. The receiver drier should always be replaced when the compressor is replaced or when the system has been open for an appreciable time, which accounts for another 1.5 oz. of oil that should be added.

   Below is an example of a compressor (and receiver drier) replacement for illustration:

   Example: Evacuating the system recovers 1.5 oz. of oil. Draining the old compressor recovered 2.0 oz. of oil. Adding 0.5 oz. of residual unrecoverable oil in the compressor gives 2.5 oz. The new receiver/drier requires an additional 1.5 oz., plus 1.5 oz. lost when the refrigerant was evacuated from the system. So the total oil needed in the replacement compressor for this

case is 5.5 oz. Since the new compressor comes with 8 oz. of oil, remove the oil fill plug and pour out 2.5 oz. of oil. Torque compressor oil fill cap to 132-216 in-lb.

A. Install the compressor assembly in the upper mount and install 4X compressor bolts. Do not tighten bolts.
B. Install and torque the compressor clutch plate retaining nut 170 to 180 In-Lbs.
C. Align the pulley and sleeve assembly index marks and install attaching hardware. Torque 8X pulley bolts to 70-75 In-Lbs and apply safety wire per MIL-P-8564, using MS20995C-32 safety wire.

CAUTION

Do not allow safety wire pigtails to protrude above the height of the 8X pulley bolt heads or damage to the drive belt may occur.

D. Install the drive belt on the drive pulley.

CAUTION

Care should be taken to ensure that the new belt is not damaged (nicked or cut) during installation.

E. Carefully lift the upper compressor mount assembly and place onto the lower mount assembly.
F. Install belt on to compressor pulley.
G. Install attaching hardware that secures the upper compressor mount assembly to the lower mount assembly. Torque bolts to 20-25 In-Lbs.
H. Install attaching hardware to the two aft outboard EC135-3012-1 brace assemblies and the upper compressor mount. Torque nuts to 30-40 In-Lbs.
I. Install attaching hardware that secures the EC135-3008-1 bearing cover to the upper compressor mount assembly. Torque bolts to 20-25 In-Lbs.
J. Adjust belt tension using the 412AC-3016-16 Belt Tensioning Bolt (See adjustment procedure above).
K. Tighten MS509-8 jam nut to EC135-3020-1 compressor adjustment assembly. Torque nut to 40-58 Ft-Lbs and apply safety wire per MIL-P-8564, using MS20995C-32 safety wire.
L. Tighten attaching hardware that secures the base of the compressor assembly to the upper compressor mount. Torque 4X bolts to 160-190 In-Lbs.
M. Reconnect clutch coil wire at the TSE-16-01 connector.

12. Removal and Replacement of Receiver Drier (Figure 13)

Removal

A. Remove LH aft engine fairing from aircraft to gain access to the condenser assembly.

B. Disconnect refrigerant plumbing from receiver drier fittings once refrigerant is evacuated.
C. Remove attaching hardware securing receiver drier clamps to condenser frame.
D. Remove the receiver drier.

Installation/Replacement

CAUTION

Receiver drier is capped to prevent moisture contamination. Keep caps on receiver drier fittings until just prior to installation.

A. Install receiver drier and secure clamps with retained attaching hardware to condenser frame.
B. Replace all O-Rings before connecting refrigerant plumbing to receiver drier fittings. Torque refrigerant line connections per fitting tightening instructions pg.29.
C. Service air conditioning system with refrigerant.

13. Removal and Replacement of Bypass Valve (Figure 14)

Removal

A. Remove belly panel below RH seat to gain access to the bypass valve assembly.
B. Disconnect wiring from two each TSE-16-01 connectors.
C. Disconnect refrigerant plumbing from bypass valve fittings once refrigerant is evacuated.
D. Remove safety wire and attaching hardware securing bypass valve to the mounting bracket.
E. Remove the bypass valve.

Installation/Replacement

CAUTION

Flow direction arrow on bypass valve body must point toward the Aft Evaporator. Air Conditioner system will not function properly if this valve is installed in reverse.

A. Install bypass valve with retained attaching hardware to mounting bracket and apply safety wire per MIL-P-8564, using MS20995C-32 safety wire.
E. Replace all O-Rings before connecting refrigerant plumbing to bypass valve fittings. Torque refrigerant line connections per fitting tightening instructions pg.29.
B. Connect wiring using two each TSE-16-01 connectors.
C. Service air conditioning system with refrigerant.

14. Removal and Replacement of Binary Switch (Figure 13)

Removal

A. Remove LH aft engine fairing from aircraft to gain access to the condenser assembly and binary switch located on the receiver drier.
B. Disconnect electrical connectors from top of binary switch.

NOTE

Use the flats provided on the top of the switch body to remove the switch; do not attempt to tighten or loosen the pressure switch by hand.

C. Loosen switch from Schrader valve located on the receiver drier.
D. Remove binary switch.

Installation/Replacement

A. Install the binary switch.

NOTE

Use the flats provided on the top of the switch body to install the switch, do not attempt to tighten or loosen the pressure switch by hand.

B. Tighten the binary switch onto the Schrader valve located on the receiver drier.
C. Reconnect the electrical connectors on the top of the binary switch.

CHAPTER 8
TROUBLESHOOTING

1. System Troubleshooting

Prior to troubleshooting a defective system, it is advisable to conduct a visual inspection for general condition and obvious signs of damage or failure.

The following matrix lists the easiest checks and the most likely problems.

Problem	Probable Cause	Corrective Action
System not Cooling (Evaporator blowers still operating)	System is low or empty of refrigerant	Evacuate the system, determine the origin of the refrigerant leak if applicable, and re-charge the system.
	Moisture or air in the system	Evacuate the system, replace the receiver drier, and place the system under a vacuum for a minimum of 30 minutes before recharging the system.
	Compressor	If the compressor has failed, it must be replaced.
	Compressor drive belt	If the compressor drive belt has failed it will need to be replaced and adjusted.
	By-pass valve	Check to insure the temperature control knob on the A/C control panel in the cockpit is in the full cold position and that there is no voltage at either wire connection on the bypass valve. If the valve remains open (by-passing refrigerant) the valve will need replacement.
	Condenser blower motor / fan assembly	Check to insure the condenser blower motor/fan assembly are receiving power, and the circuit breaker has not tripped; if the blowers still do not function, they may have failed internally and must be replaced.
	Condenser Blockage	Check to insure the condenser fins are clear and free of any blockage. This will cause higher than normal discharge pressure in the system.
System not cooling (Evaporator blowers not operating)	Air conditioner control circuit breaker tripped	Reset circuit breaker; if breaker will not reset, check for short in circuit.
	Forward or Aft evaporator blower circuit breaker tripped	Reset circuit breaker; if breaker will not reset, check for short in circuit.

Problem	Probable Cause	Corrective Action
System not cooling (Evaporator blowers not operating)	Forward and aft evaporator blower motor(s)	Check for power to the motor(s), and for the free movement of the blower wheel; if the motor shaft does not turn smoothly the motor must be replaced.
Loss of cooling limited to one evaporator	Expansion valve malfunction	If cooling is lost in only one of the evaporators, and the blowers continue to function, it is most likely a blockage at the expansion valve orifice, this is most often caused by contamination in the system forming a blockage as the refrigerant passes through the valve. Evacuating the system and changing the receiver drier should cure this problem. If the above actions do not resolve the problem, the evaporator assembly must be replaced.
External moisture (Condensate) in the area of forward / aft evaporator	Leak in evaporator, or evaporator drainage system	Water noted in the area near the evaporator is normally caused by a loose, cracked, plugged, or disconnected drain line. To test, pour water into the face of the evaporator checking for proper drainage and note any leaks. **NOTE** The drain line consists of a tube which extends from the lower surface of the evaporators through the outer contour of the helicopter.
	The suction or low side of the evaporator refrigerant plumbing may be cold and will condense moisture.	Cover line with a layer of insulating cork tape.

Contact Air Comm Corporation Service Department for current pricing and availability of replacement components and parts: service@aircommcorp.com

2. System Schematics

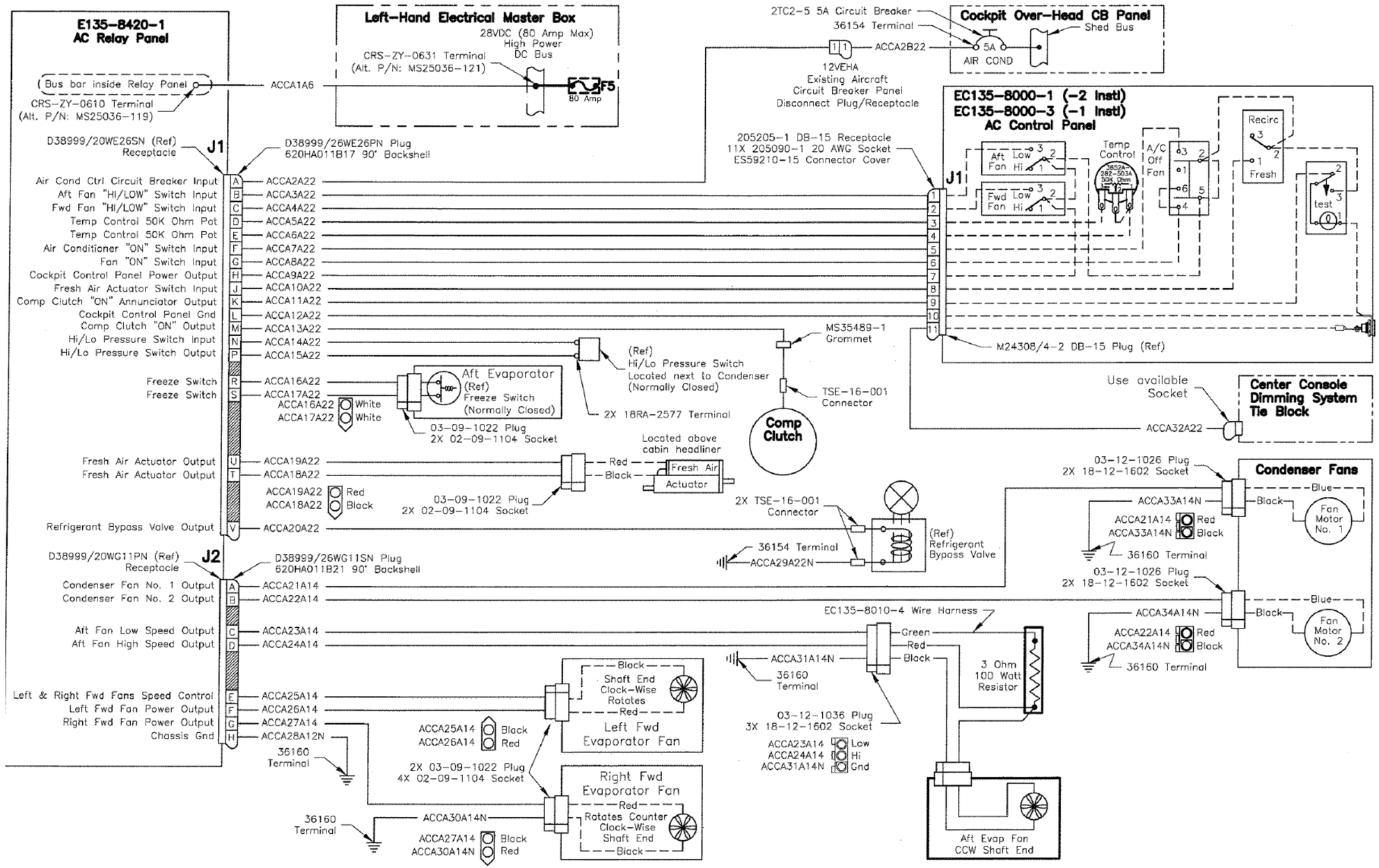


Figure 20 – Electrical Schematic

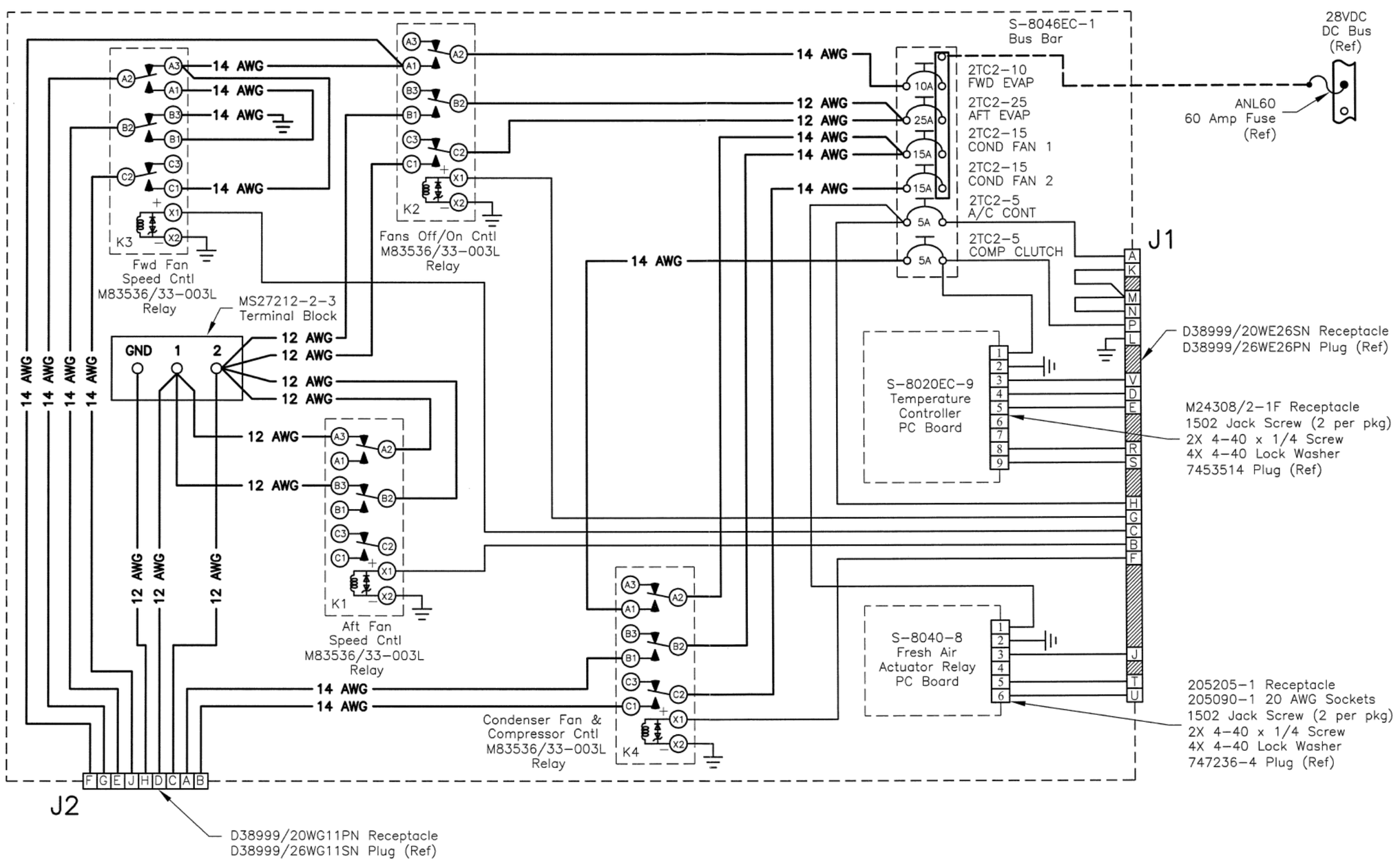


Figure 20: Relay Panel Schematic

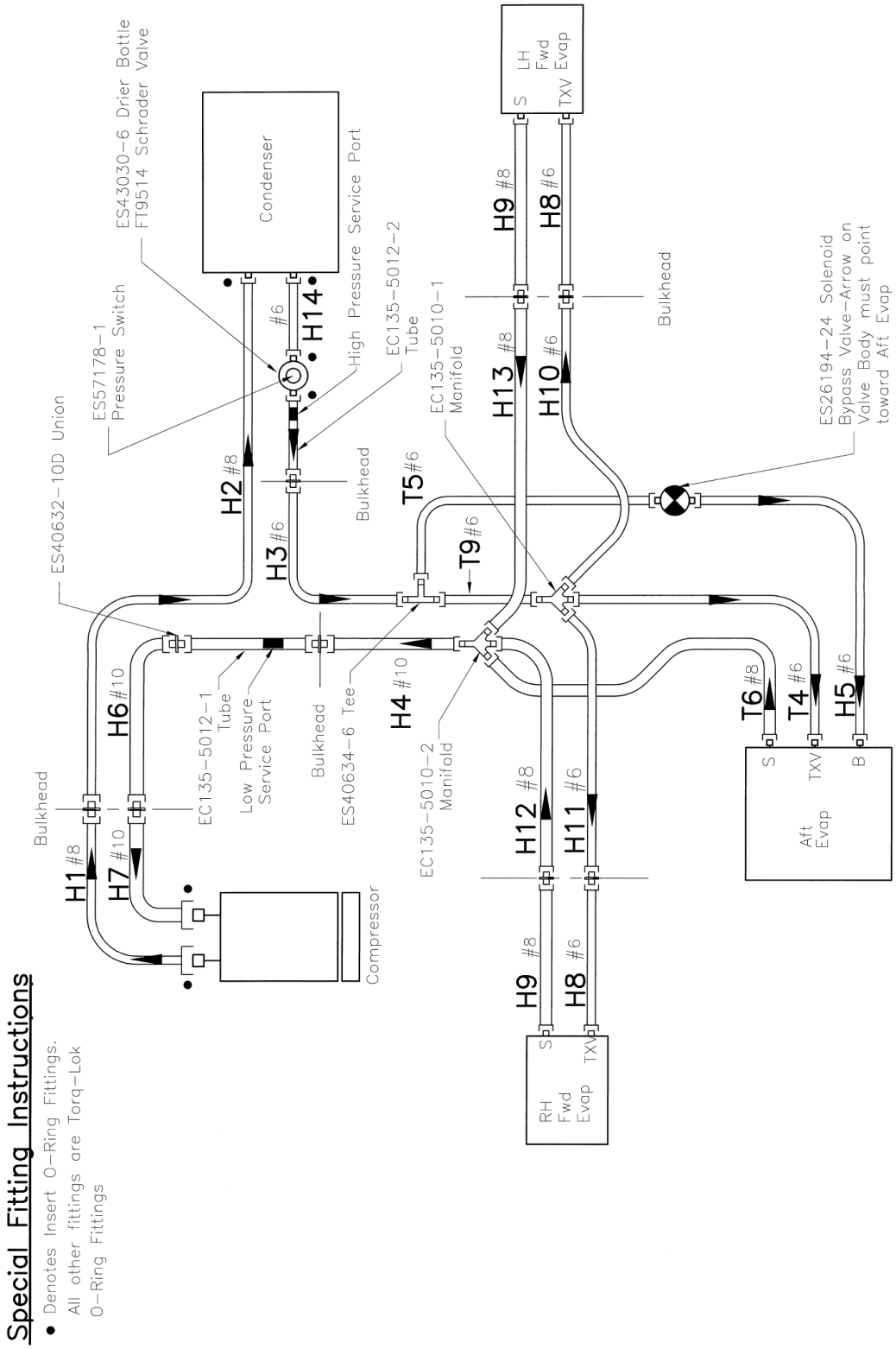


Figure 21: Refrigerant Plumbing Schematic – Dual Evaporator Installation

APPENDIX A
WEIGHT AND BALANCE INFORMATION

Weight breakdown – Airbus EC135 Air Conditioner System:
Reference Drawing EC135-200 & EC135-202

Item	Wt. (lbs)	X-Arm (in)	X-M (lb-in)	Y-Arm (in)	Y-M (lb-in)
Total EC135 with Dual Forward & Single Aft Evaporator (EC135-200)	126.13	154.3	19,459	-3.4	-427
Total EC135 with Single Forward & Single Aft Evaporator (EC135-202)	113.68	163.7	18,611	-3.8	-427

airb