Air Comm Corporation

SYSTEM SERVICE MANUAL

TR-134

REVISION L

VAPOR CYCLE AIR CONDITIONING SYSTEM

USING REFRIGERANT R-134A

RECORD OF REVISIONS

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
J. L. PHIPPS	N/A	MJR		**NC**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
MJR	N/A	9/1/1993	9/01/1993	

DESCRIPTION OF CHANGES
Original Release – No Changes
Reason:

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
UNKNOWN	N/A	UNKNOWN		**A**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	9/15/1995	9/15/1995	

DESCRIPTION OF CHANGES
Unknown
Reason:

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
UNKNOWN	N/A	UNKNOWN		**B**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	2/24/1998	2/24/1998	

DESCRIPTION OF CHANGES
Unknown
Reason:

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
MML	N/A	HOA		**C**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	6/6/2000	6/6/2000	

DESCRIPTION OF CHANGES
Pg 12-13. Added photos with description of installation of expansion valve.
Pg ii. Replaced revision sheet.
Pg iii. Updated effectivity list.
Pg 19. Added replacement of expansion valve to item 1.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
JMS	N/A	HOA		**D**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	10/23/2000	10/23/2000	

DESCRIPTION OF CHANGES
Pg 20 Deleted sect. 2 letter E
Modified sect.2 letter F now reads “check sight glass for presence….”

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
BCS	N/A	MAK		**E**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	3/6/2002	3/6/2002	

DESCRIPTION OF CHANGES

Revised doc., was Inc., now L.P., Revised doc., was Polyol Ester, now Polyolester, Revised pg. 10, was ES49000-3, now ES49000-1, Gave more detail steps to checking oil level after discharging system pg. 7 sec. 2 letter C step 3, Gave more detail steps to charging system pg. 8 sect 4 letter C step 3, Revised doc. page 2, was 28 vDC, now electrical Revised doc. on pg. 4, deleted first 28 vDC, second was vDC, now voltage, Deleted step 2C discharge procedure & renumber other steps, was Discharge the air conditioning system in accordance with the recovery unit's instructions. Added "per recovery unit's instructions" to step 2 pg. 7 Revised step 2 page 7, was amount of oil, now is the, Added **NOTE** to step 3 of charging procedure pg 8, Revised pg 9, was peek, now peak; Revised pg 18, was below, now above, revised table on pg 19, was 28 VDC, now dc power supply, Updated all charging / discharging instructions to refer to Pg 7/ Pg 8.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
DRC	N/A	MAK		**F**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	7/29/2002	7/29/2002	

DESCRIPTION OF CHANGES

Inserted section F to Pg. 11, changed letters to section headings thereafter. Matched titles to corresponding figures on Pg. 22. Added pg.iii to Record of Revisions. Changed pg. numbers to make up for new page.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
TLW	N/A	MAK		**G**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	8/21/2006	8/21/2006	

DESCRIPTION OF CHANGES

Updated record of revisions tables to fit on one page. Revised inspection intervals and added instructions to inspect around existing regularly scheduled maintenance checks per ER2805. Added Flushing System to Refrigerant Servicing section. Added Compressor Maintenance Procedures to General Servicing section. Added Figure 2 and updated subsequest figure numbers.
Deleted specific page number references. Updated page numbers.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
LEO	N/A			**H**
CHECKED ENGR	**CHECKED OTHER**	**APPROVED DATE**	**RELEASED DATE**	
N/A	N/A	1/8/2010	1/28/2010	

DESCRIPTION OF CHANGES

Rewrote Flushing Procedures. See revision G for previous procedure configuration.
Edited step 12 WAS Discharge the system thru… NOW Recover the system thru… on pg. 11.
Added O-ring and flare recommended torque values to chart on page 15.
Continued on next page.
Continued from previous page.
Edited step 1 WAS greater than one (1) hour NOW greater than 10 minutes. On part H pg. 15.
Compressor Oil Level Page 27; Deleted Steps 2 thru 8 and Step 2. for Previous steps see Rev. G
Updated Table of Contents page numbers.
Reason: Improve Flushing Procedures per ER3949.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
T. HARDY	C. WOYCHESIN	M. DAME		J
CHECKED ENGR	CHECKED OTHER	APPROVED DATE	RELEASED DATE	
MDP	N/A	9/24/2013	SEP 24, 2013	

1) Updated servicing and troubleshooting procedures to add pressures in addition to sight glass for system diagnosis. 2) Added Appendix A for acceptable pressure ranges. 3) Updated document formatting to reflect new company name
Reason: Receiver Drier bottles no longer available with sight glass, ER4717

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
R. LONGCRIER	P. GUERRIE	JEB		K
CHECKED ENGR	CHECKED OTHER	APPROVED DATE	RELEASED DATE	
N/A	N/A	9/12/2016	9/12/2016	

Added Page 28 with Figures 5 & 6. Information was previously included in Rev G but was inadvertently omitted in Rev H. Reference ECR 16-030.

PREPARED ENGR	CHECKED OTHER	APPROVED ENGR	REVISION RECORD	REV
C. POSVIC	B. Dow	A Awgm		L
CHECKED ENGR	CHECKED OTHER	APPROVED DATE	RELEASED DATE	
T. Nitchman		8/28/19	8/28/2019	

Pg. 2: Revised 2.1.
Pg. 5: Revised 2.3.
Pg. 8: Revised 3.3 C.2 and added 3.3 C.3.
Pg. 9: Removed existing 3.4 C.3.a-b and added 3.4 C.3.a-f and associated notes.
Pg. 13: Revised 3.5 B.22.
Pg. 21: Revised 5.1.
Pg. 28/29: Added 6.4.B, 6.4.C, and two notes following 6.4.C.
Revised the title of Appendix A-1.0
Updated Table A.1 in Appendix A-1.1.
See ECO 19-342 for description of change.

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LIST OF EFFECTIVE PAGES

SECTION	PAGE	DATE
Title	i	August 20, 2019
Record of Revisions	ii	August 20, 2019
	iii	August 20, 2019
	iv	August 20, 2019
Proprietary Notice	v	August 20, 2019
List of Effective Pages	vi	August 20, 2019
Table of Contents	vii	August 20, 2019
Introduction	1	August 20, 2019
Air Conditioning System Description	2	August 20, 2019
	3	August 20, 2019
	4	August 20, 2019
	5	August 20, 2019
Refrigerant Servicing	6	August 20, 2019
	7	August 20, 2019
	8	August 20, 2019
	9	August 20, 2019
	10	August 20, 2019
	11	August 20, 2019
	12	August 20, 2019
	13	August 20, 2019
General Servicing	14	August 20, 2019
	15	August 20, 2019
	16	August 20, 2019
	17	August 20, 2019
	18	August 20, 2019
	19	August 20, 2019
	20	August 20, 2019
Troubleshooting	21	August 20, 2019
	22	August 20, 2019
	23	August 20, 2019
	24	August 20, 2019
	25	August 20, 2019
	26	August 20, 2019
Checks	27	August 20, 2019
	28	August 20, 2019
	29	August 20, 2019
Appendix A-Title	A-1	August 20, 2019
Charge Pressures	A-2	August 20, 2019

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

The purpose of this System Service Manual is to provide detailed instructions for the servicing, troubleshooting, checking and maintaining of the Air Comm Corporation, Inc. air conditioning systems using R134a refrigerant. It is intended to be used for all Air Comm Corporation air conditioning systems using R134a refrigerant that do not contain separate maintenance instructions. The System Service Manual supplements the Maintenance Manual supplied by Air Comm Corporation for your particular aircraft type. For the latest revision of this document, please visit www.aircommcorp.com.

1.2 Scope

The scope of the System Service Manual provides the maintenance technician with detailed information covering:

- Overall system level description and theory of operation.
- Component level description and theory of operation.
- System level checking and troubleshooting procedures.
- Procedures for servicing the air conditioning system refrigerant.
- The identification of special equipment to accomplish the specific tasks.

1.3 Arrangement

This System Service Manual is arranged similar to Air Transport Association (ATA) Specification 100 and provides general servicing and maintenance instructions.

1.4 Glossary

Nonstandard abbreviations and symbols used in the Maintenance Manual are described below.

Abbreviations:

A/C		Air Conditioning
A/R		As Required
Assy	-	Assembly
Comm. Avail.	-	Commercially Available
Evap	-	Evaporator
Gnd	-	Ground
GPU	-	Ground Power Unit

SW		Switch
VDC	-	Volts Direct Current

2.0 AIR CONDITIONING SYSTEM – SYSTEM DESCRIPTION

2.1 Vapor Cycle System Description

The Air Comm Corporation, (ACC), vapor cycle air conditioning system uses liquid refrigerant R134a to cool the aircraft cabin. The major components for the R134a air conditioning system consist of a receiver/dryer, expansion valve, evaporator, compressor and condenser to cool the aircraft cabin. Figure 1 shows an operational schematic of the air conditioning system.

The receiver/drier stores liquid R134a refrigerant under pressure. The drier portion of the assembly removes any traces of moisture that may have accumulated in the system. Liquid refrigerant flows from the receiver drier through the expansion valve where the refrigerant pressure is reduced, allowing it to spray into the evaporator. At the same time, a blower driven by an electric motor passes air over the evaporator. This air is cooled since heat is removed from the air by the evaporation of the refrigerant in the evaporator. The evaporator produces water due to condensation. This water drains overboard through a line attached to the evaporator cover.

The refrigerant leaves the evaporator as a gas. This gas is pumped by the compressor, raising its pressure and temperature. This high temperature gas then flows to the condenser. Cooling air, driven by another electric blower motor, passes over the condenser, cooling and therefore condensing the refrigerant to a liquid. The liquid refrigerant then enters the receiver/drier, repeating the process.

The plumbing which connects the compressor, condenser and the evaporators, consists of rubber based hoses with a nylon barrier. The fittings are permanently swaged onto the hoses. Some systems that have been converted from R12 to R134a refrigerant use Barb Lok hose fittings. Fittings are either "o-ring" type or use flared connections. Sealant is used on the fitting mating surfaces to prevent refrigerant leaks. Two R134a service valves are sized differently to avoid incorrect cross-connecting when gaining access to the plumbing for system recharging.

The compressor on ACC air conditioning systems is driven either by an electrical motor, or by the engine or an accessory drive on the engine or gearbox. Listed below is a more detailed description of electric and engine driven compressor systems.

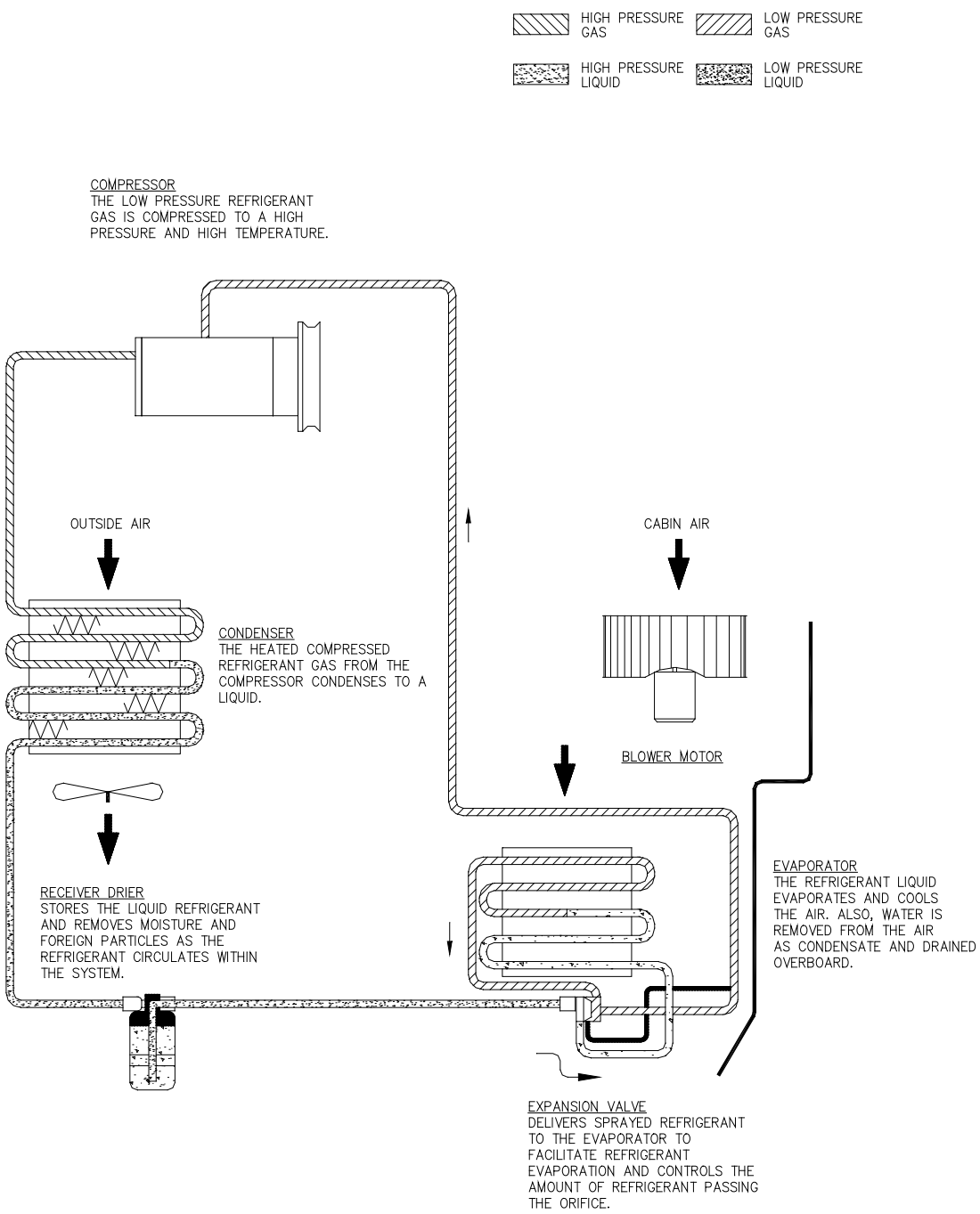

Figure 1. Air Conditioning Vapor Cycle System

2.2 Electrical Driven Compressor Systems

Electrically operated systems use the aircraft electrical system and are operable in most normal flight modes. Air conditioning may be operated with ground external power or the aircraft electrical system providing voltage to the proper bus.

The compressor and condenser are manufactured on an assembly pallet. In most cases, the compressor drive and condenser fan drive are both driven by a common, double shafted motor. The compressor is belt driven from the shortest shaft while the condenser fan is attached directly to the longer motor shaft. Condenser cooling air (ambient air) is drawn over the compressor and drive motor to provide cooling airflow for those components prior to passing through the condenser coil to remove heat from the system. Some electrically driven systems have separate compressor drive and condenser fan motors. After passing through the condenser coil, the air is exhausted to the outside. The compressor takes low pressure refrigerant gas and compresses it to a higher pressure and temperature.

On the ground, the electrical system allows operation of the air conditioning system from either aircraft generator or from an active GPU prior to engine start. Some system safety features include electrical interlocking and load shedding. In flight, the air conditioning system can be operated from the aircraft electrical system only with aircraft generators on line. Loss of aircraft generator power will automatically shed the air conditioning system electrical loads except for the minimal loads of the evaporator fans.

The entire air conditioning refrigerant loop is protected against over pressure and over temperature conditions by two separate safety devices. The first device is a binary high/low pressure switch that activates in the event of an overpressure and is on the compressor discharge port. This switch will open at approximately 350 PSIG and will interrupt power to the compressor control circuit. This in turn will de-energize the compressor motor relay and remove power to the compressor motor. The refrigerant system pressures will then drop. The switch will also interrupt power to the compressor control circuit under low pressure conditions. The second safety overpressure device is a fuse plug which will vent the system refrigerant safely overboard in the event of a system pressure in excess of 425 psig. It is located on the receiver/drier.

2.3 Engine Driven Compressor Systems

Engine driven systems use compressors that are engine mounted; or on some rotorcraft, driven off the tail rotor drive shaft or an accessory drive on the engine or gearbox. A pulley via a "V" type belt turns the compressor. A clutch mounted on the compressor engages the compressor when the air conditioning system is selected ON.

The condenser uses a separate fan with electrical motor to supply cooling air. The condenser cooling air (ambient air) is drawn in through a cutout in the fuselage skin of the aircraft and passes through the condenser coil to remove heat from the system. After passing through the condenser coil and blower, the air is exhausted to the outside of the aircraft.

The entire air conditioning refrigerant loop is protected against over pressure conditions by two separate safety devices. The first device is a binary high/low pressure switch. This switch will open at approximately 350 PSIG and will interrupt power to the compressor clutch at which point the system pressures will drop. The switch will also interrupt power to the compressor clutch under low pressure conditions. The second overpressure safety device is a fuse plug which will vent the system refrigerant in the event of a system pressure in excess of 425 PSIG. It is located on the receiver/drier.

3.0 REFRIGERANT SERVICING

3.1 General

The air conditioning system uses refrigerant R134a and the compressor lubricating oil used is Polyolester Oil viscosity grade (ISO) 68. No other refrigerant or compressor oil should be used.

Refrigerant R134a is non explosive, non-flammable, non -corrosive, has practically no odor, and is heavier than air. Although R134a is classified as a safe refrigerant, certain precautions must be observed to personnel and property when working with R134a refrigerant.

WARNING:

A. Liquid R134a, at normal atmospheric pressure and temperature, evaporates so quickly that it tends to freeze anything that it contacts. Care must be taken to prevent any liquid refrigerant from coming into contact with skin.

B. Always wear safety goggles when servicing any part of the refrigerant system to prevent refrigerant from coming into contact with the eyes.

C. To avoid explosion, never weld, use a blow torch, solder, steam clean, or use excessive amounts of heat on, or in, the immediate area of the air conditioning system, or refrigerant supply tank, full or empty, while they are closed to atmosphere.

D. The refrigerant service cart/container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instruction on the label. In particular, never store it in a hot location (above 126°F, 52°C) or drop it.

CAUTION: Do not operate air conditioning system with condenser air outlet blocked.

3.2 Discharging System

A. General

The air conditioning system refrigerant must be discharged prior to disconnecting or removing components in the refrigerant loop. Federal law prohibits discharging refrigerant into the atmosphere. Use only an R134a compatible recycling/recovery unit when discharging the air conditioning system.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Service Pressure Gauge	Comm. Avail.	1	None
R134a Compatible Recycling/Recovery Unit	Comm. Avail.	1	None

C. Discharging Procedure

1) Connect R134a compatible recycling/recovery unit to the R134a service valves on the aircraft's air conditioning system. If recovery unit does not have pressure gauges, connect service pressure to air conditioning system.

2) After cart oil level has been verified, evacuate the system, per recovery unit’s instructions. Let the system sit for approximately 5-10 minutes to let any residual refrigerant boil from the system oil. Note the amount of post recovery oil in cart. The amount of oil in the cart prior to recovery should be subtracted from the amount of oil after recovery. This is the amount of oil that needs to be added to the system before charging.

3) Remove recovery unit when discharging is complete.

3.3 Evacuating System

A. General

The air conditioning system must be evacuated prior to charging the system with refrigerant. Evacuating the system removes any moisture that may be in the system. Use only an R134a compatible recycling/recovery unit when evacuating the air conditioning system.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Service Pressure Gauge	Comm. Avail.	1	None
R134a Compatible Recycling/Recovery Unit	Comm. Avail.	1	None

C. Evacuating Procedure

1) Connect R134a compatible recycling/recovery unit to the R134a service valves on the aircraft's air conditioning system. If recovery unit does not have pressure gauges, connect service pressure to air conditioning system.

2) Evacuate the air conditioning system in accordance with the recovery unit's instructions.

3) Pull the system down on a continuous vacuum for a minimum of 45 minutes to ensure any moisture that may have been present is removed.

4) Once the air conditioning system has been evacuated, it is then ready for charging with new/recycled R134a refrigerant.

3.4 Charging System

A. General

Use only R134a refrigerant when charging air conditioning system. Federal law prohibits discharging refrigerant into the atmosphere. Use only R134a compatible recycling/recovery unit when charging the air conditioning system.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Service Pressure Gauge	Comm. Avail.	1	None
R134a Compatible Recycling/Recovery Unit	Comm. Avail.	1	None
Polyolester Oil	Comm. Avail	A/R	Viscosity ISO 68

C. Charging Procedure

1) Connect R134a compatible recycling/recovery unit to the R134a service valves on the aircraft's air conditioning system. If recovery unit does not have pressure gauges, connect service pressure to air conditioning system.

2) Add the amount of compressor oil recovered during discharging. Add new polyolester oil, viscosity ISO 68 to the compressor oil fill port.

3) Charge the air conditioning system in accordance with recovery unit's instructions, until:

a. Record outside ambient temperature and humidity (OAT).

NOTE: Results, system pressures, and total refrigerant serviced will vary based on atmospheric conditions, heat load, aircraft configuration, etc.

b. With system running, service system to approximately 2 lbs. and then slowly introduce .25 lb. increments of refrigerant.
c. Allow 2-3 minutes between each servicing increment to allow system to settle and distribute evenly throughout system.
d. Monitor low pressure when servicing to ensure that psi rating increases with each increment.
e. Using meat thermometer, measure cabin and cockpit outlet temperatures. Note outlet temperature after each additional

increment vs OAT. This is what is referred to as Delta Temperature Rating.

NOTE: Outlet temperature will begin to increase once system has exceeded peak refrigerant charge.

f. System charge is optimized when outlet temperature has reached maximum value vs OAT.

NOTE: Keep the low side closed and the high side open during charging so that liquid R134a passes through the evaporator and evaporates into a gas before entering the compressor. Liquid R134a entering the compressor can cause permanent damage!

3.5 Flushing System

A. General

The following procedure is used to whenever the compressor is replaced and when system contamination is suspected.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
ACC Hose Coupler Tool	See Procedures	A/R	None
Service Pressure Gauge	Comm. Avail.	1	None
R134a Compatible Recycling/Recovery Unit	Comm. Avail.	1	None
Polyolester Oil	Comm. Avail.	A/R	Viscosity ISO 68

System Flushing Procedure

1. Connect the refrigerant recovery cart to the normal service ports.

2. Empty the refrigerant recovery cart's oil collection tube so that it begins with zero oil collected.

3. Discharge the air-conditioning system and recover the refrigerant per the refrigerant cart's instructions. Do not empty the oil collection tube.

4. Disconnect the refrigerant recovery cart from the normal service ports.

5. Remove the compressor and connect the service valve couplers to the suction and discharge plumbing hoses.

    - O-ring Style Coupler P/N's JBS6020-7 and JBS6020-8.
    - Flare Style Coupler P/N's JBS6020-9 and JBS6020-10.

6. Bypass the binary pressure switch. If located on the condenser assembly, attach the plumbing hose directly to the condenser. If located on the compressor then bypass per previous step.

7. Remove the receiver/drier bottle from the aircraft and properly dispose. Attach the hose coupler tool in place of the receiver/drier bottle.

    - O-ring Style Coupler P/N JBS6009-1.
    - Flare Style Coupler P/N JBS6020-6.

8. Disconnect all of the expansion valves from the evaporator assemblies. Attach the hose coupler tool in place of the expansion valves on all evaporator assemblies. Use caution in handling the expansion valves. Do not support the expansion valve by its remote bulb tubing. Do not disconnect the external equalization port fitting if the expansion valve is an externally equalized style (ES26105-1 and ES26106-1).

    - O-ring Style Coupler P/N JBS6020-3
    - Flare Style Coupler P/N JBS6020-4

9. Connect the refrigerant recovery cart to the service port couplers located where the compressor was removed to create a refrigerant loop with the refrigerant cart.

10. Evacuate the system thru the HIGH side port only per the refrigerant recovery cart's instructions for a minimum 10 minutes.

11. Charge the system thru the LOW side port only with 1.5 to 2 times a normal refrigerant charge of refrigerant. Do not add any oil to system.

12. Recover the system thru the HIGH side port only per the refrigerant recovery cart's instructions.

13. Repeat previous three steps two additional times.

14. Disconnect the refrigerant recovery cart from the service ports.

15. Remove the compressor and drain all of the oil from the compressor into an empty graduated cylinder. It will be necessary to rotate the clutch plate several times to get as much oil as possible from the compressor.

16. Empty the refrigerant recovery cart's oil collection tube into the graduated cylinder with the drained compressor oil. Inspect the oil for debris contamination and replace compressor if necessary.

17. New compressors come serviced with 5 ounces of oil and do not require oil adjustment. If the existing removed compressor is reused or other replacement compressor for which the oil level is unknown, then completely drain the compressor and then add 5 ounces of new polyolester oil ISO grade 68 to the compressor. Torque the oil plug to 6 to 9 ft-lbs.

18. Install the compressor. Use new o-rings.

19. Inspect the expansion valves for damage and debris. Replace if any contamination is found. Use new o-rings.

20. Inspect the binary pressure switch for damage and debris. Flush with dry nitrogen or clean dry compressed air before re-installing. Use new o-rings.

21. Install a new receiver/drier bottle. Do not reuse the old bottle under any circumstance. Use new o-rings.

Caution: Receiver/drier bottles left open to the atmosphere for more than 10 minutes must be discarded and replaced with new.

22. Evacuate the system per the refrigerant recovery cart's instructions for a minimum 45 minutes or until there is no residual solvent remaining in the system.

23. Add 1 ounces of new polyolester oil ISO grade 68 for each 7 feet of plumbing over 15 feet total length to the system thru the HIGH side port only.

24. Charge the system per Charging Procedure.

4.0 GENERAL SERVICING

4.1 General

General service procedures are provided to keep the air conditioning system operating at peak efficiency. Procedures are provided for general maintenance tips, inspection intervals, maintenance of the plumbing system, to repair hoses, and to clean coils. Procedures are also provided for removal and installation of the expansion valve.

CAUTION: Do not operate air conditioning system with condenser air outlet blocked.

4.2 Inspection Intervals

A. General

Periodic inspections of the air conditioning system will keep the system operating at peak efficiency. The inspections are simple visual inspections requiring a minimal amount of time.

B. Inspection Intervals

ITEM	INSPECT FOR	INTERVAL	ACTION
Air Conditioning System Components	Dirt , Damage	*Every 500 hours and annually	Clean or replace component as necessary
Compressor Belt	Tension, Wear	Within 5 hours of installing new belt *Every 500 hours and annually	Tension or replace as necessary
Sight Glass (if so equipped)	Proper refrigerant level	When problem is suspected	Discharge/charge as necessary per Refrigerant Servicing section
Evaporator and condenser coils	Dirt	*Every 500 hours and annually	Clean as necessary

*Recommended inspection interval maximums. Actual inspection times should be conducted around the aircrafts existing regularly scheduled maintenance checks.

4.3 Plumbing System Maintenance Procedures

A. General

The following procedures are used to perform typical maintenance on the air conditioning system plumbing. Procedures are provided for hose or fitting replacement. New ACC air conditioning systems use swaged hose fittings. Some systems that have been converted from R12 to R134a refrigerant use Barb Lok hose fittings. Fittings are either "o-ring" type or use flared connections.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
R134a Compatible Hose Swaging Kit	Available from ACC	1	None
Sharp Knife	Comm. Avail.	1	None
Impact Wrench	Comm. Avail.	1	None
Light Machine Oil	Comm. Avail.	A/R	None
Polyolester Oil	Comm. Avail.	A/R	Viscosity ISO 68
Sealant	ES49000-1	A/R	None

C. Hose or Fitting Replacement (Swaged Hose Fittings)

NOTE: If it is found that a hose or fitting has a leak, it will be necessary to replace the entire hose assembly. Follow the Hose Swaging Instruction below:

1. Hose should only be cut with a sharp knife. (**Note:** Use of serrated blades or saws to cut hose will leave particles that can contaminate system.)
2. Insert the proper size die in the swaging tool.
3. Insert fitting in swaging tool so that it is centered in the die and hand tighten.
4. Insert hose in fitting until it bottoms (**Note:** Indicating hole is in base of fitting).
5. Using impact wrench, tighten nut until die housings contact. (**Note:** It is important to keep hose pushed into fitting while swaging).
6. Reverse impact and back off nut until housing contacts rubber stops.

D. Hose or Fitting Replacement (Barb-Lok Hose Fittings)

NOTE: If it is found that a hose or fitting has a leak, it will be necessary to replace the entire hose assembly. Follow the Hose Barb-Lok Instruction below:

1. Hose should only be cut with a sharp knife. (**Note:** Use of serrated blades or saws to cut hose will leave particles that can contaminate system.)
2. Slide the Barb-Lok socket onto the hose fitting with the round end towards the stop. Apply a few drops of machine oil to nut to ease installation. (**Note:** Do not lubricate fitting barbs.)
3. Push hose on barbed end of fitting until all barbs are covered. Hose end shall be about 1/8 inch past last barb.
4. Hold hose in place. Pull socket towards hose and thread onto hose counter-clockwise. Use wrench to turn socket onto hose. The round end of the socket should be 0.82 inch (or one socket length) from the push-on hose stop.
5. About 1/8 inch of hose should protrude past the socket. This may be trimmed to improve the appearance of the hose assembly.

E. Connection to Components - O-Ring Replacement
   1. Place the appropriate o-ring over the tube "O" end of the fitting.
   2. Lubricate o-ring with polyolester oil or sealant prior to assembly.
   3. Apply sealant to all fitting mating surfaces prior to assembly.

F. Recommended standard dry torque specifications.

Thread Size	O-Ring		Flare	
	FT-Lb	N-M	FT-Lb	N-M
5/8”	11-13	15-18	20-25	27-34
3/4"	15-20	20-27	35-40	47-54
7/8”	21-27	29-37	50-60	68-81
1 1/16”	28-33	38-45	70-80	95-108

G. Connection to Components - Flared Fittings
   1. Apply sealant to all fitting mating surfaces prior to assembly.

H. Receiver/Drier Replacement
   1. Replace receiver/drier whenever the compressor is replaced or when the air conditioning system plumbing is left open to the atmosphere for a period of time greater than 10 minutes.

4.4 Coil Cleaning Maintenance Procedures

A. General

The following procedure is used for cleaning either evaporator or condenser coil.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Vacuum Cleaner	Comm. Avail.	1	None
Coil Cleaner	Comm. Avail.	A/R	Non-acid based

C. Coil Cleaning Procedure

1. Use vacuum cleaner to remove large debris from upstream and downstream coil faces.
2. Spray coil cleaner on both coil faces. Wash off with water.
3. Allow coil to dry thoroughly prior to additional maintenance.

4.5 Expansion Valve Removal and Installation

A. General

The following procedure is used to remove or install the air conditioning system expansion valve.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Sealant	ES49000-1	A/R	None
Polyolester Oil	Comm. Avail.	A/R	Viscosity ISO 68

C. Expansion Valve Replacement

1. Discharge system in accordance with Refrigerant Servicing section.
2. Disconnect liquid line from inlet of expansion valve, and cap. Remove the thermal sense bulb from its clamp located on the suction tube of the evaporator and carefully remove insulation covering bulb.
3. Disconnect the fitting that connects the valve to the coil and plug coil fitting.
4. Install new expansion valve and o-ring (for o-ring fitting systems) in the reverse order.
5. Lubricate o-ring with polyolester oil or apply sealant to fitting mating surfaces prior to assembly.
6. Install the thermal sense bulb such that it makes contact with the suction tube along its entire length. When viewing the suction tube extruding out of the evaporator, the sense bulb should be in the three or nine o'clock position (Figure 4-1 and 4-2). Attach the sensor bulb using two zip ties. Insulate the bulb and expansion valve thoroughly with insulation (Figure 4-3).

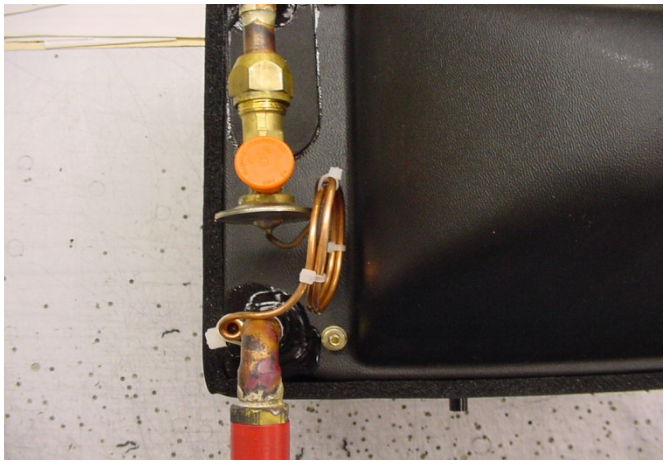

Figure 4-1

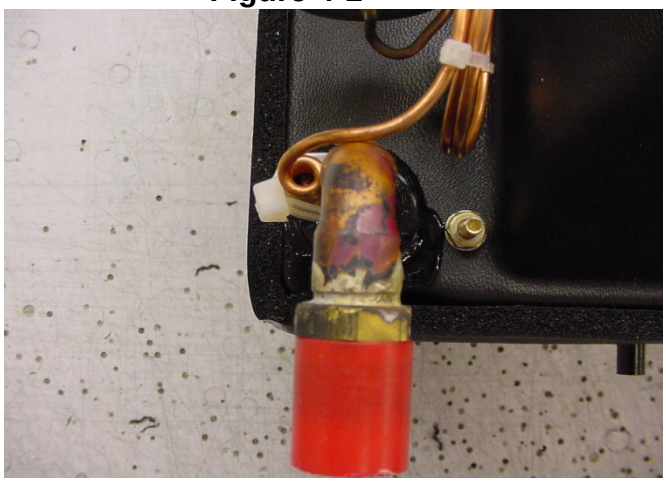

Figure 4-2

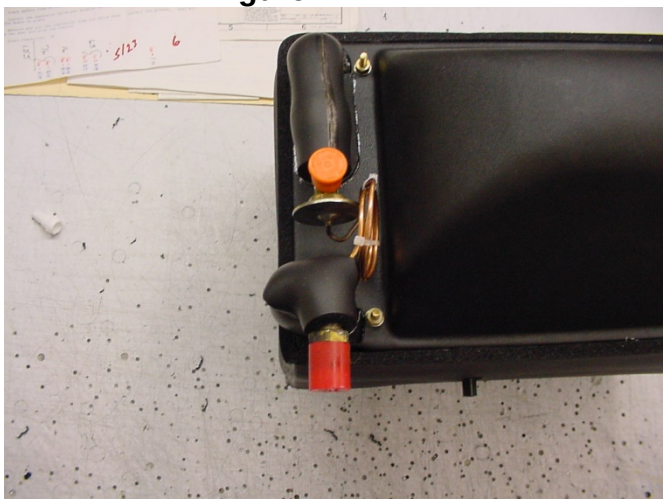

Figure 4-3

4.6 Compressor Maintenance Procedures

A. General

The following procedure is used whenever the compressor is replaced or contamination is suspected.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
None	-	-	None

C. Compressor Replacement

Flush system and replace compressor per the Refrigerant Servicing section.

5.0 TROUBLESHOOTING

5.1 General

The procedures below present troubleshooting charts for the air conditioning system and the compressor. A diagnoses chart is presented for insufficient air conditioning system cooling. The performance characteristics of an aircraft's particular system are dependent upon the design parameters of the systems components. The performance of any one particular system varies with ambient temperature, altitude, and humidity. The information below presents possible air conditioning system problems and solutions.

CAUTION: Do not operate air conditioning system with condenser air outlet blocked.

5.2 Air Conditioning System Diagnosis Chart

Figure 3 shows a procedure for diagnosing air conditioning system problems. Following this procedure will expedite the troubleshooting process.

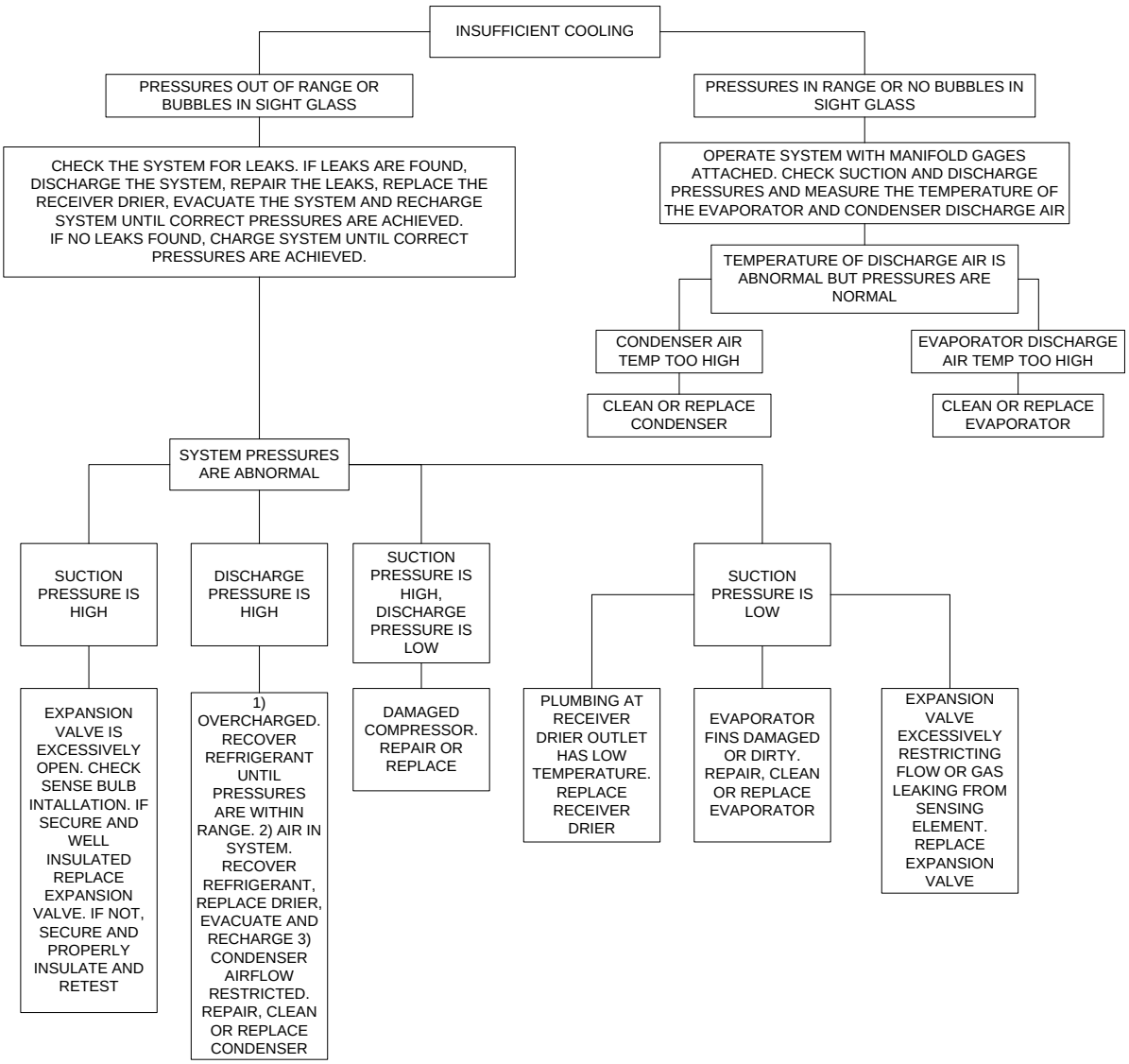

Figure 3. Air Conditioning System Diagnosis Chart

5.3 Air Conditioning System Troubleshooting

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
INSUFFICIENT REFRIGERANT CHARGE Insufficient cooling. Bubbles appear in sight glass (if so equipped).	SUCTION PRESSURE: below normal DISCHARGE PRESSURE: below normal	Refrigerant is low, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. Evacuate as necessary and recharge system.
ALMOST NO REFRIGERANT No cooling action. A lot of bubbles or something like mist appears in sight glass (if so equipped).	SUCTION PRESSURE: much below normal DISCHARGE PRESSURE: much below normal	Serious refrigerant leak.	Stop compressor immediately. 1. Leak test. 2. Discharge system. 3. Repair Leak(s). 4. Replace receiver drier, if necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE a) Slight cooling. Sweating or frosted expansion valve outlet. b) Insufficient cooling. Sweated suction line. c) No cooling. Sweating or frosted suction line.	a) SUCTION PRESSURE: below normal DISCHARGE PRESSURE: below normal b) SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal c) SUCTION PRESSURE: above normal DISCHARGE PRESSURE: below normal	a) Expansion valve restricts refrigerant. Or, expansion valve is clogged. Or, expansion valve is inoperative. Or, valve stuck closed. Thermal bulb has lost charge. b) Expansion valve allows too much refrigerant through evaporator. Sensing bulb on suction line not well insulated or properly attached to line. c) Faulty expansion valve.	a) 1. Discharge system. 2. Replace valve. 3. Evacuate and recharge system. b) 1. Check valve for operation. If suction side does not show a pressure decrease, replace valve. 2. Check security and insulation on sensing bulb. c) 1. Discharge system. 2. Replace valve. 3. Evacuate and recharge system.

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
AIR IN SYSTEM Insufficient cooling. Sight glass (if so equipped) shows occasional bubbles.	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows approx 6 psi oscillation.	SUCTION PRESSURE: below normal DISCHARGE PRESSURE: above normal	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30 minute evacuating three times.) 4. Recharge system.
FAULTY CONDENSER Insufficient cooling. Bubbles appear in sight glass of drier. Suction line is very hot.	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Condenser air or refrigerant flow is restricted.	Check condenser for dirt accumulation. Check for refrigerant overcharge. If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.
HIGH PRESSURE LINE BLOCKED Insufficient cooling. Frosted high pressure liquid line.	SUCTION PRESSURE: much below normal DISCHARGE PRESSURE: much above normal	Drier clogged, or restriction in high pressure line.	1. Discharge system. 2. Remove receiver drier and replace it. 3. Evacuate and charge system.

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
FAULTY COMPRESSOR Insufficient cooling.	SUCTION PRESSURE: much above normal DISCHARGE PRESSURE: much below normal	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.
TOO MUCH OIL IN SYSTEM (Excessive) Insufficient cooling.	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to Oil Level Check for correcting oil level.

5.4 Compressor Troubleshooting

A. General

The following procedures are used for troubleshooting the compressor.

B. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Service Pressure Gauge	Comm. Avail.	1	None
DC Power Supply		A/R	None

C. Compressor Troubleshooting Procedures

With the air conditioning system operating, do any of the following conditions occur:

NOTE: Always attach a service gauge set to the system prior to trouble shooting, to insure proper refrigerant charge is present.

Trouble	Probable Cause	Correction
1. Unusually high suction pressure with low discharge pressure.	(a) Internal problem with compressor body. (b) Faulty Expansion valve	(a) Replace compressor. (b) Replace expansion valve
2. Unusually low suction and discharge pressure.	System or compressor leak.	Repair leak or replace compressor
3. High compressor discharge pressure.	(a) Air exhaust duct collapsed or restricted. (b) Refrigerant overcharge.	(a) Inspect/replace exhaust duct. (b) Discharge refrigerant until only occasional bubble are present in sight glass (if so equipped) or until pressures are with range (ref Table A.1).
4. Rough running.	Internal compressor problem.	Replace compressor.

6.0 CHECKS

6.1 General

The following procedures are used to perform typical maintenance checks for air conditioning system refrigerant leaks, refrigerant charge and compressor oil level.

CAUTION: Do not operate air conditioning system with condenser air outlet blocked.

A. Tools and Equipment

Designation	Ref. No.	Qty	Remarks
Service Pressure Gage	Comm. Avail.	1	None
Oil Dipstick	Make from metal wire.	1	See Fig. 3.
Electronic Leak Detector	Comm. Avail.	A/R	Type H-10G
Polyolester Oil	Comm. Avail.	A/R	Viscosity ISO 68

6.2 Refrigerant Level Check

A. Connect service cart with gages to the system
B. Select air conditioning system to ON.
C. Set the temperature selector (if so equipped) to the full cold position.
D. Set the blower speed to the maximum position.
E. Run system for five (5) minutes minimum.
F. Check that pressures are within range per Table A.1. Add or recover refrigerant as required until pressures are within range. If so equipped, a less accurate method is to check the sight glass for presence of bubbles. Add refrigerant until bubbles disappear.

NOTE: Accurate readings are difficult to obtain when ambient temperatures are below 65°F. Always re-check refrigerant level when ambient temperature is above 65°F for proper level.

6.3 Refrigerant System Leakage Check

A. The system leakage check is to be performed in an area with an ambient temperature of 65°F or above.
B. Install service pressure gage to low and high pressure R-134a service valves.
C. Check for system pressure of approximately 64 psig or above. The low pressure gage may be used to check system pressure. If system pressure is below 64 psig, a small amount of refrigerant R-134a may be added to obtain the required pressure.
D. On systems that have not been operated for 2 weeks or longer, operate the system for a minimum of 15 minutes. This will lubricate the compressor shaft seal and ensure a more accurate leakage check of the shaft seal.
E. With the system off, and using a type H-10G electronic leak detector or equivalent, check all connections, compressor shaft seal, and fabricated components for leakage. No leakage is acceptable

6.4 Compressor Oil Level Check

NOTE: It is not necessary to check the compressor oil level during routine maintenance. It only needs to be checked when a system component is replaced or when incorrect oil level is suspected. Only polyolester oil viscosity grade ISO 68 should be used.

A. Operate air conditioning system for 10 minutes. This will collect as much oil as possible in the compressor.
B. On certain models, a dipstick method can be used for checking the oil on aircraft. See Figure 5 and the table below for information.
C. **If the dipstick method cannot be used:** To properly calculate the amount of oil required in a replacement compressor, or check the oil level in the existing compressor, it is necessary to pour the oil out of the installed compressor into a clean container. Drain the oil and then drain the oil out of the suction and discharge ports while rotating the center shaft clockwise. Measure the total amount of oil removed from the compressor. Add ½ oz to the total measured to account for unrecoverable oil in the removed compressor. This total is what is needed in a new compressor or is the oil level of the existing compressor. New compressors come from Air Comm charged with 5 oz. 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.

NOTE: Maintaining the correct amount of refrigerant and refrigerant oil in the system is critical for ensuring the longevity of the compressor.

NOTE: If too little lubrication is in the system, the life of the compressor may be significantly 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.

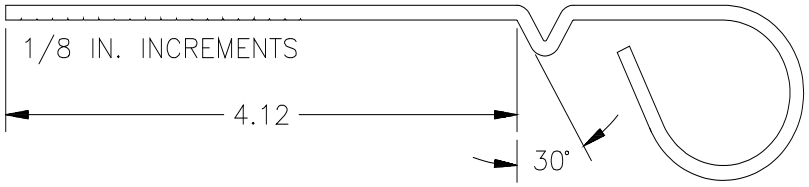

Figure 5. Make Dipstick as Shown Above.

Mounting Angle (Degrees)	Compressor P/N: ES10505 JBS201 JBS215 JBS14026	Compressor P/N: ES10507 JBS220 JBS221 JBS14116	Compressor P/N: ES10508
0	4-6	3-5	4-6
10	6-8	5-7	6-8
20	8-10	6-8	7-9
30	10-11	7-9	8-10
40	11-12	8-10	9-11
50	12-13	8-10	9-11
60	12-13	9-11	9-11

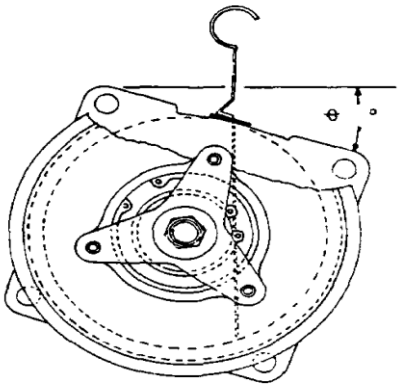

Figure 6. Acceptable Oil Level in Increments for Keith Products Compressor P/N's

APPENDIX A

A-1.0 GENERAL PRESSURES

A-1.1 Normal Range (for reference only)

OAT	Suction (psig)		Discharge (psig)	
65	25	45	135	230
70	25	45	140	240
75	30	45	150	250
80	30	50	165	265
85	35	55	180	280
90	35	55	200	300
95	40	55	225	320
100	45	55	250	340
105	50	60	275	365
110	50	60	300	390

Table A.1

A-1.2 Interpreting Readings

Interpreting Pressure Readings		
Suction	Discharge	Action Required
Low	Low	Add refrigerant until pressures are in range.
Low	High	Need service. Possible expansion valve blockage
High	Low	Needs service. Possible faulty compressor.
High	High	Overcharged. Recover refrigerant until pressures are in range.

Table A.2