

Integrated Flight Systems  
Air Conditioning System  
Instructions for  
Continued Airworthiness  
For  
Agusta S.p.A.

A109A

A109A II

A109C

A109K2

A109E

**RECORD OF REVISIONS**

Revision	Description	Date	Approval
IR	Initial Release	11/01/08	L. Aday
A	Added A109A model. Clarified oil charging instructions.	02/08/10	L. Hufford

**LIST OF EFFECTIVE PAGES**

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**INSTRUCTIONS FOR CONTINUED AIRWORTHINESS  
FOR INTEGRATED FLIGHT SYSTEMS  
AGUSTA S.p.A. A109, A109A, A109A II, A109C, A109K2, AND A109E  
AIR CONDITIONING SYSTEM**

Aircraft Make: Agusta S.p.A

Aircraft Model: A109A, A109A II, A109C, A109K2, A109E

- 1. Introduction:** Kit #109-00-011 is applicable to the specified models of the Agusta A109 series helicopter. It is a system utilizing R-134a (non-CFC type) refrigerant. This kit is compatible with utility, corporate, and EMS configurations. An Integrated Flight Systems unit is designated to be as maintenance free as possible. It incorporates in the design components that have proven themselves to be highly reliable.
- 2. Description:** The Integrated Flight Systems (IFS) Air Conditioning System is a vapor cycle system using R134a as the refrigerant. The compressor uses an IFS bracket attached to mounting points on the transmission case. A single evaporator is used for this system, mounted on the cabin roof in the “doghouse”. Dual 24-volt fan motors are used to circulate the cabin and cockpit air through the evaporator. Air distribution is accomplished through the ducts in the cabin. The ducts are equipped with directional valves. The condenser is also mounted on the cabin roof in the “doghouse”. Dual 24-volt fan motors also circulate air through the condenser. The air enters through the intake screen in a scoop on the aircraft.

The system is activated by an On/Off switch in the pilot’s compartment and a selector switch to provide high or low air velocity distribution options.
- 3. Operation:** The air conditioning installation consists of a belt driven vapor cycle air-conditioning system using R-134a as the refrigerant. The air conditioning system provides for cabin and cockpit comfort during all operations, both on the ground and in flight. During ground operations when the engines are running, cooling may be provided. Controls for the air conditioning system are located on the switch panel in the cabin overhead. Three switches are provided. The Master Control Selector consists of a toggle type switch, with a Placard labeled “A/C”, “OFF”, and “FAN”. Selecting the “A/C” position turns on the system’s evaporator fan, condenser blower, and belt driven compressor. The second toggle switch is “HIGH”, “LOW” evaporator fan speed selection for the forward cockpit. An Aft Rocker type switch is provided for Cabin Fan Speed Control and is labeled “HI”, “LOW”.

- 4. Servicing Information:** All components are readily accessible for inspection or servicing. Major components are accessed as follows:
- A. Compressor: Remove transmission cowling in accordance with the Agusta Maintenance Manual.
  - B. Condenser/Condenser Blower: Remove “doghouse” in accordance with Agusta Maintenance Manual.
  - C. Evaporator/Evaporator Blower: Remove “doghouse” in accordance with Agusta Maintenance Manual.
  - D. Service Ports/Sight Glass: Open “doghouse” right side service door..

Charging Refrigerant (R-134a) Into System:

- A. The refrigerant used in this system is R-134a and no other refrigerant is to be considered.** Normal safety practices, such as wearing of gloves and the use of goggles should be utilized.
- B.** Charging of the system is a simple procedure whether on initial or recharging after leakage repair. A set of refrigerant gauges with a minimum of three hoses should be connected to the high side and low side service ports provided.
- C.** The sight glass is located in the #6 line in the “doghouse” on the cabin roof.
- D.** Charge the system in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

Oil Charging: R-134a Refrigerant

- A.** Prior to the use of R-134a refrigerant, R-12 refrigerant was used in all IFS systems. **The PROPERTIES OF R-134a REFRIGERANT AND THE VARIOUS TYPES OF OIL USED WITH THIS REFRIGERANT ARE COMPLETELY DIFFERENT.**
- B. The Sanden compressor uses 4 oz. of 500 viscosity “ESTER” type oil (yellow label). No other type oil can be utilized. Do not add additional oil if replacing a compressor in an existing system.**
- C.** Charge the system in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

Initial Charging:

- A.** Charge the system in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

#### Adding R-134a Refrigerant to System:

- A. If the system is found to be completely empty of R-134a, a set of charging gauges should be connected to both high and low side service ports and to a cylinder of R-134a. Purge the charging hoses from the cylinder to the service ports with R-134a vapor. Open both the low and high side charging valves and allow pressure from the cylinder to equalize through the system until at least 50 PSI is noted. Utilizing an electronic leak detector, check all fittings on the system to determine the point of leakage. Any fitting indicating an oily or dirty condition is a prime suspect.
- B. Service the system in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

- 5. Maintenance Instructions:** An Integrated Flight Systems unit is designed to be as maintenance free as possible. It incorporates design components that have proven themselves to be highly reliable. It is suggested that at each periodic inspection, whether at 50 or 100 hour intervals, at least a visual inspection be accomplished to the following items; to fulfill with inspection criteria per Appendix D, Far-43: Para A, Para B, 2, Para C, 1, 7, Para D, 2, 7, 9, and Para F, G, I, 2, 3, J.

- A. Compressor
- B. Compressor Clutch Bearing
- C. Compressor Mount
- D. Refrigerant Hose and Fittings
- E. Evaporator Fan and Mounting
- F. Condenser Blower and Mounting
- G. Condense/Evaporator Coils
- H. Wiring

#### Compressor:

- i) In addition to the above inspection, the compressor should be inspected for a true turning and free clutch. One mechanic should turn the main rotor blade while another observes the belt and clutch faceplate. Turn system to A/C and check magnetic operation of clutch plate. An independent #14 wire may be necessary from the compressor to an airframe ground in order to ensure that the clutch engages in a positive manner.
- ii) If clutch plate and pulley show signs of excessive heat, replace clutch pulley assembly, bearing, and coil.
- iii) The compressor mounts should be inspected for possible cracks, deterioration and that all bolts are firmly attached.
- iv) Check condition of belt. Inspect for cracks, deterioration, separation, worn or flat spots. Change belt whenever any of these conditions exist or one thousand hours, whichever comes first.

**Hoses:**

- i) Inspect hoses for general condition, cuts or swelling. Replace as required. Check security of clamps and anti-chaff material.

**Evaporator:**

- i) The evaporator blower motors are a permanent magnetic type. No repair is recommended other than replacement of the brushes. Unit should be returned to IFS for overhaul. If brush height is 5/16" or less, replace. Inspect every 400 hours.
- ii) NOTE: TAKE CARE WHEN INSTALLING BRUSHES THAT BRAIDED POSITIVE LEAD DOES NOT CONTACT HOUSING, CAUSING SHORT.
- iii) Run the evaporator blowers in the "FAN" position and perform visual inspection of the assembly to see that foreign materials have not been ingested into the blowers, which might cause blade damage. The blowers should also be run at the various speeds available to check motor operation.

**Condenser:**

- i) Either four (4) or two (2) brushes are located under caps on each side of the motor. Inspect brushes every 400 hours for wear. If brush length is 5/16" or less, replace brush.
- ii) NOTE: TAKE CARE WHEN INSTALLING BRUSHES THAT BRAIDED POSITIVE LEAD DOES NOT CONTACT HOUSING, CAUSING SHORT.
- iii) The fins of the condenser coil as well as the evaporator coil should be checked for cleanliness and that they are straight. If damage has occurred to the fins, a fin comb should be utilized to put them in like new condition.

**6. Troubleshooting Information:****General:**

- A. Should the system not perform as expected, either because of unreasonably erratic pressure readings, total lack of cooling or reduced cooling, it will be necessary to use the trouble shooting procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.
- B. The high and low-pressure switches should be checked if electrical power is lost to the compressor clutch. The Low Pressure Switch is in series, and should be checked from its electrical source, which is the 50-amp condenser blower circuit breaker.
- C. Always check system R-134a pressure first, as leaking unit may have caused the low-pressure switch to open. This switch is set to open at 8 PSI and close at 22 PSI.

- D. The High Pressure Switch is connected to a one amp circuit breaker that controls the compressor and condenser fans. If the High Pressure Switch is activated, it will open the 1 amp circuit breaker, interrupting power to both the compressor clutch and the condenser blowers. The system will not come on until the one amp circuit breaker is reset.
- E. Failure of the condenser blower or coil blockage could result in high side pressure switch opening. Both switches are designed to reset automatically.
- F. **NOTE:** Internal blockage of the high-pressure side of the refrigerant system can cause a very low-pressure reading at the “low side” service gage and may also cause a low-pressure reading at the “high side” service gage. This can occur when either (or both) of the two (2) expansion valves in the system closes or when the receiver/drier becomes clogged.

#### Compressor:

- A. The compressor installed is manufactured by Sanden International.
- B. A copy of Sanden Service Manual can be found on the Sanden website at [www.sanden.com](http://www.sanden.com).
- C. No maintenance, other than “clutch bearing” or “coil replacement” should be attempted in the field.

#### Evaporator:

- A. If the evaporator blower fails to run, confirm that the Aircraft Master Switch is in the “ON” position and the Air Conditioning control Switch is placed in the “FAN” position. If the fan/blower still does not run, determine that electrical power is available to the aircraft from an outside power source, such as a GPU or the aircraft power source. If power is available, it will be necessary to test with a voltmeter that electrical power is being supplied directly to the motor by the appropriate wire. If power is being supplied, and the motor is properly grounded, then it can be assumed that the motor has failed.
- B. On the blower, P/N 490029, the blower may be disassembled to allow removal of the motor, P/N 050052-1. The motor may be obtained from Integrated Flight Systems and installed in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

#### Condenser:

- A. The condenser blowers may be checked by placing the Aircraft Master Switch “ON” and then placing the Air Conditioning Control Switch to the “A/C” position and the override switch “ON”. If the 50-amp circuit breaker is not open, then power should be supplied directly to the condenser blowers, which are mounted on the condenser assembly.
- B. If air is not being exhausted, a voltmeter should be utilized to determine if the power is being supplied through the switch and relay to the appropriate wire. Check that all electrical terminals are secure and that power is

directed to the motor's terminals. Inspect ground. If it is determined that the motor has failed, the screws holding the blower assembly in place should be removed. The blower assembly must be removed as an entire assembly and replaced in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011.

Receiver/Drier:

- A. The receiver/drier may be replaced, if required, by discharging the R-134a from the system through a refrigerant hose or set of charging gauges. Again, all R-134a refrigerants **MUST BE CAPTURED**. Normally, the receiver/drier will not need replacement unless one of two factors is present:
- i) The system has been left open for sometime and may be contaminated by air and/or moisture.
  - ii) The receiver/drier has become plugged which is evident by a large temperature differential on either side of the receiver/drier. Normally, the liquid line to and from it would be of approximately equal temperature and will be quite warm. IF one side is relatively warm and the other side is very cool or attempts to frost, then blockage of the receiver/drier has been determined. The receiver/drier should be removed and a new one installed in its place. The P/N is 090016-5 ("O" ring type). The charging instructions should be followed in recharging the system.

Expansion Valve:

- A. The Expansion Valve is of "O" ring type, P/N 090002-"O".
- B. NOTE: THE EXPANSION VALVE OF THE ABOVE PART NUMBER CONTAINS A "CHARGE" IN THE HEAD OF THE VALVE, CONTAINING R-134A.
- C. It is EXTREMELY IMPORTANT that the sensing bulb be clamped tightly to the suction return line in the same manner as removed. Also, the line is to be clean, so good contact takes place between the sensing bulb and the line. This area must be re-insulated as in the original manner. Leak test and recharge in accordance with the procedures outlined in the IFS Maintenance Manual Document Number MM-109-00-011 and applicable sections of this Document.

Hoses:

- A. Nylon "barrier type" hoses with "Bubble" crimped ferrules are utilized with "O" ring fittings. They are found at all fitting locations and should be inspected for security, crimped fitting for leakage, and obvious defects.



Low Pressure Switch:

- A. This switch is a non-adjustable type (normally open) and is located in the transmission compartment near the evaporator. P/N 050107 (set at 7 PSI out, 22 PSI in) is utilized. The switch will automatically reset to the closed position as soon as pressure is applied in PSI, greater than the cut-in point.

High Pressure Switch:

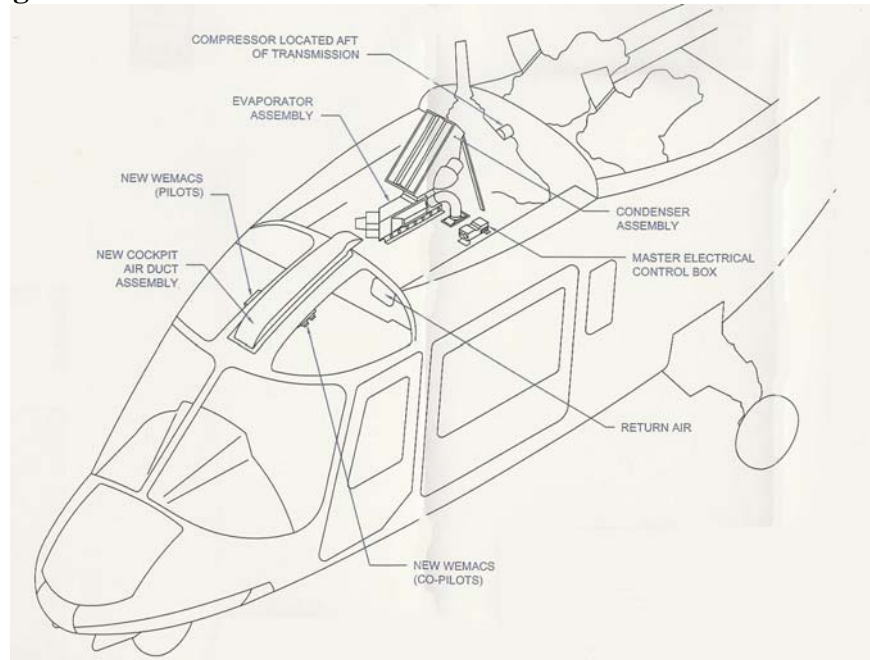
- A. High-pressure switch is identified under P/N 090004. It is also located in the transmission compartment near the evaporator. It is a “normally closed” switch, which “opens” on a rise in pressure that exceeds the switches upper limit. Once the pressure has been reduced below the switches upper design point, it will again close, automatically.

System Operation Limitations:

- A. Below 60 degrees Fahrenheit, it may be found that the air conditioning compressor will not come on line and remain in operation. This is due to that fact that coolness of the air available across the condenser does not allow the refrigerant system to maintain sufficient low side pressure to keep the safety low-pressure switch from tripping the compressor “off line”. The system should not be operated in temperatures below 66°F, except for re-circulation of air only.

- 7. Removal and Replacement Information:** The Integrated Flight Systems Air Conditioning Kit Part Number A109-00-011 is installed and removed in accordance with Installation Instructions Document Number IM-A109-00-011. If an older IFS system is installed (prior to 2008), conversion kit P/N A109-00-505 is required to bring system up to date to current approved configuration. The installation and removal of this conversion is accomplished in accordance with Installation Instructions Document Number IM-A109-00-505.

**8. Diagram:**



- 9. Special Inspection Requirements:** No special inspections are required for this system.
- 10. Application of Protective Treatments:** No special treatments are required after inspection and/or maintenance.
- 11. Data:** Torque values for all attachment hardware are listed in the Integrated Flight Systems Installation Instructions Document Number IM-A109-00-011.
- 12. List of Special Tools:** No special tools are required for inspection or maintenance of this system.
- 13. Recommended Overhaul Periods:** No additional overhaul time limitations are required for this system.
- 14. Airworthiness Limitation:** No additional Airworthiness Limitations are required for this system.

**NOTE:**  
The Airworthiness Limitations section is FAA Approved and specifies maintenance required under § 43.16 and § 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA Approved.

- 15. ICA Revision:** Any revisions to these instructions will be made available at the Production Approval Holders website: [www.integratedflightsys.com](http://www.integratedflightsys.com).