



KELLY AEROSPACE

Thermal Systems

Document Number: NC-12-013
Title: Cessna 172N, 172P, 172R & 172S Air
Conditioning System ICA
Revision: C
Date: 11/22/17

	Name	Signature	Date
Author	Jeremy Heidinger		5/23/2012
Approved	Jeff Barlett		5/23/2012

Revisions

Rev.	Description	Author	Date	Approved
A	Initial Release	JLH	5/23/2012	JB
B	Added model 172N, 172P & 172R and CB-2	PG	1/25/2017	JB
C	Revised Section 17, contact KATS not FAA (ECN 17-043)	EF	11/22/2017	JB

The latest revision of the maintenance manual can be obtained from the Kelly Aerospace website at www.kellyaerospace.com.

IN THE EVENT INTERNET ACCESS IS NOT AVAILABLE, PLEASE CONTACT THE CUSTOMER SERVICE OFFICE FOR INQUIRY OR A COPY OF THE LATEST REVISION:

Kelly Aerospace Thermal Systems
 1625 Lost Nation Road
 Lost Nation Airport
 Willoughby, Ohio 44094
 440-951-4744

TABLE OF CONTENTS

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	2 of 12

SECTION 1: INTRODUCTION 4

SECTION 2: DESCRIPTION OF THE ALTERATION 4

SECTION 3: CONTROL / OPERATION INFORMATION..... 4

SECTION 4: MAINTENANCE / SERVICING INSTRUCTIONS 5

SECTION 5 MAINTENANCE INSTRUCTIONS 8

SECTION 6: TROUBLESHOOTING..... 9

SECTION 7: REMOVAL AND REPLACEMENT INFORMATION 9

SECTION 8: DIAGRAMS 10

SECTION 9: SPECIAL INSPECTION REQUIREMENTS 10

SECTION 10: APPLICATION OF PROTECTIVE TREATMENTS 10

SECTION 11: DATA RELATED TO STRUCTURAL FASTNERS..... 11

SECTION 12: LIST OF SPECIAL TOOLS 11

SECTION 13: FOR COMMUTER CATEGORY AIRCRAFT 12

SECTION 14: OVERHAUL PERIOD 12

SECTION 15: AIRWORTHINESS LIMITATIONS 12

SECTION 16: REVISION 12

SECTION 17 ASSISTANCE 12

SECTION 18 IMPLEMENTATION AND RECORD KEEPING 12

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	3 of 12

SECTION 1: INTRODUCTION

This document identifies the instructions for continued airworthiness (ICA) for the modification of the above aircraft by installation of the Kelly Aerospace Air Conditioning System.

Applicability: Applies to aircraft altered by installation of Kelly Aerospace Air Conditioning System

Distribution: This document should be a permanent aircraft record.

SECTION 2: DESCRIPTION OF THE ALTERATION

The Kelly Aerospace Thermacool Air Conditioning System is installed in the aircraft as a remote-mount unit in the baggage area of the aircraft. Conditioned air is directed through vents located above the hat rack shelf.

Pilot control of the air conditioning is through controls located on the copilot's instrument panel.

SECTION 3: CONTROL / OPERATION INFORMATION

Basic control is through use of two toggle switches, ON/OFF and HI/LOW. Optional Digital Climate Control panel may be installed and will adjust air conditioning to selected cabin temperature. The Digital Controller has both a fan mode only and a cooling mode.

Before testing the air-conditioning system, assure that all electrical connections are tight and all loose items are secured.

Note: The Air Conditioner compressor controller located inside the pallet **MUST NOT BE POWERED WITHOUT A PROPER GROUND AND AIRCRAFT BATTERY INSTALLED AND FUNCTIONAL.**

Failure to have a proper ground or Battery installed will result in failure of the compressor controller and is not covered under warranty.

With an external source of power connected to the aircraft, control the operation of the air conditioning system using the Climate Controls located on the instrument panel.

Monitor the system voltage, amperage and refrigerant flow. In a properly charged and properly installed system, the voltage should be approximately 28 VDC. The condenser fan should draw approximately 4.8 amps,

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	4 of 12

the evaporator fan should draw approximately 4.0 amps, the compressor should draw approximately 33 amps and the entire system should draw approximately 44 Amps at maximum output. The current draw will vary with temperature.

With the Digital Climate controller the operator may select the operation mode of the air conditioning by adjusting the Digital Climate Controller located in co-pilot's side of the instrument panel. The TEMP switch varies the temperature set point for the air-conditioning system. The FAN switch adjusts the air movement rate of the evaporator fan and the air circulation in the cabin.

The AC Annunciator will illuminate when the system is operating. The FAN Annunciator will illuminate when the circulating fan is operating. The FAIL Annunciator will illuminate if the compressor controller senses a fault condition. The system may be operated during level flight, take off and landing or on the ground during taxi.

The air conditioning system may be operated on the ground and without the engine running by connecting an APU or GPU to the ground power receptacle on the aircraft. The GPU or APU must be of sufficient capacity to run the A/C system with a minimum capacity of 45 amps at 28 volts.

SECTION 4: MAINTENANCE / SERVICING INSTRUCTIONS

There are no maintenance requirements for the Air-conditioning System outside of normal 100hr/Annual inspection intervals or during routine maintenance.

Perform a system functional test after any maintenance is performed on the air conditioning system. Functional check should be performed following NC-12-014, AFMS Section 4.0.

Note: The Air Conditioner compressor controller located inside the pallet **MUST NOT BE POWERED WITHOUT A PROPER GROUND AND AIRCRAFT BATTERY INSTALLED AND FUNCTIONAL.** Failure to have a proper ground or Battery installed will result in failure of the compressor controller and is not covered under warranty.

Charging - Summary

The Air Conditioning System should contain 20oz of R-134A Refrigerant. There are no substitutions permitted.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	5 of 12

The service ports are located inside the air conditioning system plenum located on the hat rack of the aircraft. The front wall of the plenum can be removed to access these components. The small service port is the high pressure side and the large service port is the low pressure side.

Caution: It is vital that the compressor is NOT operated while the system is under vacuum. Doing so will instantly damage the compressor.

Reduce system to atmospheric pressure (Bleed off nitrogen charge slowly to prevent condensation if the system has been pressure checked). Evacuate system with a vacuum pump to 29-inches Hg or better for at least two hours. Weigh in the required amount of R-134A refrigerant.

Charging Procedure and Tools & Equipment

System Evacuation Procedure

CAUTION: Do NOT over tighten plumbing connections. Stripped threads or cracked flanges may result. If the air conditioning system has been open to the atmosphere, it must be evacuated before the system can be charged; Moisture and air mixed with refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the air conditioning system and damage the compressor. Moisture will also boil at near room temperature when exposed to vacuum. An approved Recovery/Recycling Station must be used to evacuate the refrigerant system. Refer to the operating instructions provided with the equipment for proper operation.

Connect the charging manifold to the service ports.

Connect the manifold charging hose to the vacuum pump and turn on the pump.

Open both valves of the charging manifold gauge set.

Open both valves of the charging hose.

Observe the charging manifold gauges to verify vacuum.

Evacuate the system until at least 29 inches Hg is obtained.

Close all valves and turn off the vacuum pump.

If the system maintains the specified vacuum for 2-hours, start the vacuum pump, open the suction and discharge valves, and evacuate the system for an additional 40 minutes.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	6 of 12

If the specified vacuum is not maintained, locate and repair the refrigeration system leak before continuing.

Close all valves and turn off the vacuum pump.

Disconnect the manifold service hose from the vacuum pump. The system is now ready for refrigerant charging.

CAUTION: Any change in vacuum pressure, or failure to achieve a system pressure of 29 inches Hg vacuum indicates the presence of a plumbing leak. Locate and fix all leaks.

System Charging

NOTE: There are numerous procedures for charging the system including those included in Refrigerant recovery/recycle units. This procedure uses the manifold pressure gauge and weight method. Only R-134A refrigerant is to be used. Other refrigerants will damage the system. Overcharging of the system will result in reduced performance, reduced service life, and potential damage to the system components.

Evacuate the system as described earlier in the system evacuation procedure.

Connect the manifold charging hose to the R-134A cylinder and open the valve.

Crack open the charge hose fitting at the manifold gauge set, and vent air from the hose until refrigerant is evidently escaping.

Place the refrigerant bottle on a 0-50 lb (0-25 kg) scale and record the weight.

Open both manifold gauge set valves. Add refrigerant to the system until pressure stabilizes.

Close the manifold valves and verify that system pressure is 50 psi (3.4 bar) or greater.

Attach a GPU plug to the aircraft and turn on the air conditioning system.

Set cabin temperature controller to 55 Degrees F (13 Degrees C) or select On and HI.

CAUTION: Do NOT open the high pressure valve on the manifold gauge set.

With the system operating, observe the system discharge and suction pressures.

With the R-134A cylinder connected to the charging hose, charging container shutoff valve open and hose purged of air, then slowly open the suction manifold valve. The suction pressure will increase.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	7 of 12

Continue to add refrigerant until 20 oz of refrigerant has been added.

Close the suction manifold valve and let the system operate for 5 to 10 minutes to evaluate performance.

NOTE: The system must run to allow the expansion valve to stabilize system pressure.

Run the system for another 5 minutes after system pressure is stable.

Turn off the air conditioning system. Suction and discharge pressures will then equalize.

Close the refrigerant container shutoff valve. Record the refrigerant container final weight and compare beginning weight with final weight to determine refrigerant charge.

Turn the suction and discharge charging hose valves to closed and disconnect the hoses from the service ports.

Remove the charging hose from the refrigerant container and store the manifold gauge set.

Install service port caps.

SECTION 5 MAINTENANCE INSTRUCTIONS

Inspect the system during 100 Hr and/or Annual inspections. There are no special servicing requirements for the Air-conditioning System outside of normal 100hr/Annual inspection intervals or during routine maintenance.

During the annual or 100 hr inspections check for the following items:

- a) Security of attachment of all components.
- b) Evidence of any leaks.
- c) Fretting or cracking of any sheet metal structures.
- d) Insect or animal nests in condenser or evaporator sections.
- e) Bent or obstructed fins on the condenser and evaporator coils.
- f) Loose or missing hardware.
- g) Loose or chaffing tubing.
- h) Loose or chaffing wires.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	8 of 12

SECTION 6: TROUBLESHOOTING

Reference current revision Wiring Schematic for troubleshooting. For systems with digital controls use drawing # AC-00943 for CB-1 or AC-01478 for CB-2. For systems with Toggle Switches use drawing # AC-00633. Failures of the Kelly Aerospace Thermacool Air Conditioning System can include but may not be limited to the following items:

Fan motor failure, characterized by no or little airflow.

Corrective action: Troubleshoot the fan motor wiring, relay and fan for proper operation, repair or replace as necessary.

Compressor failure, characterized by low amp draw, or little cold air output.

Corrective action: Troubleshoot compressor and compressor controller and wiring, repair or replace as necessary.

Switch failure, characterized by inability to operate any or all components of the system.

Corrective Action: Trouble shoot switch and switch wiring, repair or replace as necessary.

Low or no refrigerant, characterized by little or no cold air.

Corrective Action: Inspect system for leaks, repair as necessary, and service system appropriately with R-134A refrigerant.

Any or all of these probable failures require inspection as necessary, or system must be secured and placarded until repaired

SECTION 7: REMOVAL AND REPLACEMENT INFORMATION

Refer to the Kelly Aerospace Thermacool Air Conditioning System Installation Manual for complete installation details.

Air conditioning Plenum AC-00617

1. Remove trim panels and Plenum front cover.
2. Disconnect both 3 inch hose clamps from cabin vent outlets
3. Remove all AN3-4A that hold the Plenum to hat rack shelf.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	9 of 12

4. Disconnect all electrical connections
5. Disconnect tail condenser exhaust hose
6. Disconnect Plenum drain tube
7. Remove AC-00617 from hat rack baggage area.
8. Removal reverse of installation

Condenser exhaust duct outlet assembly AC-00525

1. Remove exterior screened panel by removing screws
2. Remove four AN3 bolts that attach the duct to the hose adapter
3. Remove hose clamp from ceet tube.
4. Removal reverse of installation

Climate Control panel CB-1 or CB-2 (optional equipment)

1. Panel is held in by pressure tabs on the left and right sides
2. Disconnect electrical connector
3. Removal reverse of installation

ES10024FB-2 alternator

1. Follow Cessna OEM alternator instructions for removal, replacement and belt adjustment.

SECTION 8: DIAGRAMS

Not applicable

SECTION 9: SPECIAL INSPECTION REQUIREMENTS

Not applicable

SECTION 10: APPLICATION OF PROTECTIVE TREATMENTS

Not applicable

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	10 of 12

SECTION 11: DATA RELATED TO STRUCTURAL FASTNERS

Unless otherwise specified, use the following torque values.	
6-32 UNC	7-9 inch-lbs
8-32 UNC	17-19 inch-lbs
10-24 UNC	20-22 inch-lbs
10-32 UNF	28-31 inch-lbs
1/4-20 UNC	70-75 inch-lbs
1/4-28 UNF	90-94 inch-lbs
5/16-24 UNF	220-230 inch-lbs
3/8-24 UNF	445-455 inch-lbs
7/16-20 UNF	760-780 inch-lbs
Table 1 – Torque Specifications	

SECTION 12: LIST OF SPECIAL TOOLS

The following tools and equipment are required for charging the refrigerant system:

Gaseous dry nitrogen, regulated source (0-500 psig or 35 bar).

R-134A refrigerant

Refrigerant oil, Ester RL-500s or equivalent.

R-134a refrigerant charging manifold with gauges and hoses with quick disconnect couplers. The coupler has a knob on top which is used to engage and disengage the aircraft service ports.

R-134A charging station and recovery/recycling station (SAE standard J2210).

Air conditioning vacuum pump.

Nitrogen bottle hose adapter to connect to system.

Vacuum pump hose adapter to connect to system.

Electronic leak detector.

Hose adapter, for nitrogen bottle.

Torque wrench capable of reading inch – pounds or Newton meter.

Small hand tools and socket set.

Thermometer, 0-150 deg F

Adjustable inspection mirror

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	11 of 12

Service Light or flashlight.

Shop hand towels

Weight scale, 0-50 lbs (0-25 kg) capable of .1 pound (5-gram) precision.

SECTION 13: FOR COMMUTER CATEGORY AIRCRAFT

Not applicable

SECTION 14: OVERHAUL PERIOD

No additional overhaul time limitations.

SECTION 15: AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations Section is FAA APPROVED and Specifies maintenance required under FARs parts 43.16 and 91.403 unless an alternate program has been FAA APPROVED. There are no additional Airworthiness Limitations as a result of this alteration.

SECTION 16: REVISION

To revise this ICA, a letter must be submitted to the local FSDO with a copy of the revised FAA form 337 and revised ICA. The FAA inspector accepts the change by signing block 3 and including the following statement: “The attached revised/new instructions for Continued Airworthiness (date ____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the instructions for Continued Airworthiness(date ____)”

SECTION 17 ASSISTANCE

Address customer service office of Kelly Aerospace Thermal Systems for questions regarding the ICA.

SECTION 18 IMPLEMENTATION AND RECORD KEEPING

For major alterations performed in accordance with FAA field approval policy, the owner/operator operating under Part 91 is responsible for ensuring that the ICA is made part of the applicable section 91.409 inspection program for their aircraft. This is accomplished when a maintenance entry is made in the aircraft’s maintenance record in accordance with section 43.9. This entry records the major alteration and identifies the original ICA location (e.g. Block 8 of FAA Form 337, dated ____). Along with a statement that the ICA is now part of the aircraft’s inspection/maintenance requirements.

Kelly Aerospace, Thermal Systems Division 1625 Lost Nation Rd Willoughby, Ohio 44094 PH: 440-951-4744

Project	Document Title	Document No	Rev	Page
	Cessna 172N, P, R & S Air Conditioning System ICA	NC-12-013	C	12 of 12