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Installation Manual

KT 74 Mode S/ADS-B Out Transponder

Part Number	CAGE
89000007-000001	6PC31

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TRANSMITTAL INFORMATION

THIS IS AN INITIAL RELEASE OF KT 74 MODE S*I*ADS-B OUT TRANSPONDER IM PUB. NO. D201308000037 AND IS ISSUED FOR USE IN SUPPORT OF THE FOLLOWING:

Table TI-1 shows the applicable components.

Table TI-1. Applicable Components

Component Part Number	Nomenclature
89000007-000001	KT 74 Mode S*I*ADS-B Out Transponder

Revision History

Table TI-2 shows the revision history of this IM.

Table TI-2. Revision History

Revision Number	Revision Date
0	15 Nov 2013

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RECORD OF REVISIONS

For each revision, write the revision number, revision date, date put in the manual, and your initials in the applicable column.

NOTE: Refer to the Revision History in the TRANSMITTAL INFORMATION section for revision data.

Revision Number	Revision Date	Date Put in Manual	By		Revision Number	Revision Date	Date Put in Manual	By

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RECORD OF TEMPORARY REVISIONS

Instructions on each page of a temporary revision tell you where to put the pages in your manual. Remove the temporary revision pages only when discard instructions are given. For each temporary revision, put the applicable data in the record columns on this page.

Definition of Status column: A TR may be active, incorporated, or deleted. “Active” is entered by the holder of the manual. “Incorporated” means a TR has been incorporated into the manual and includes the revision number of the manual when the TR was incorporated. “Deleted” means a TR has been replaced by another TR, a TR number will not be issued, or a TR has been deleted.

Temporary Revision Number	Status	Page Number	Issue Date	Date Put in Manual	By	Date Removed from Manual	By

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LIST OF EFFECTIVE PAGES

Subject	Page	Date	Subject	Page	Date
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	T-2	15 Nov 2013		INTRO-5	15 Nov 2013
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	TI-1	15 Nov 2013		1-2	15 Nov 2013
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	2-13	15 Nov 2013		4-4	15 Nov 2013
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Section 3 System Interconnect				5-1	15 Nov 2013
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	3-1	15 Nov 2013	Appendix A Enviromental Qualification		
	3-2	15 Nov 2013			
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LIST OF TABLES

INTRODUCTION

1. How To Use This Manual

A. General

(1) This publication gives maintenance instructions for the equipment shown on the title page.

(2) Standard maintenance procedures that technicians must know are not given in this manual.

(3) This publication is written in agreement with the ATA Specification.

(4) Warnings, cautions, and notes in this manual give the data that follows:

- A WARNING gives a condition or tells personnel what part of an operation or maintenance procedure, which if not obeyed, can cause injury or death
- A CAUTION gives a condition or tells personnel what part of an operation or maintenance procedure, which if not obeyed, can cause damage to the equipment
- Warnings and cautions go before the applicable paragraph or step. Notes follow the applicable paragraph or step.

B. Observance of Manual Instructions

(1) Make sure that you carefully obey all safety, quality, operation, and shop procedures for the unit.

(2) All personnel who operate equipment and do maintenance specified in this manual must know and obey the safety precautions.

C. Symbols

(1) The symbols and special characters are in agreement with IEEE Publication 260 and IEC Publication 27. Special characters in text are spelled out.

(2) The signal mnemonics, unit control designators, and test designators are shown in capital letters.

(3) The signal names followed by an "*" show an active low signal.

(4) The symbols in Figure INTRO 1 show ESDS and moisture sensitive devices.

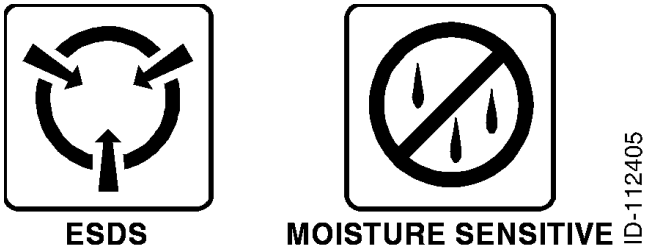

Figure INTRO 1. Symbols

D. Units of Measure

(1) Measurements, weights, temperatures, dimensions, and other values are expressed in the USMS followed by the appropriate SI metric units in parentheses. Some standard tools or parts such as drills, taps, bolts, nuts, etc. do not have an equivalent.

E. Standard Practices Manual

(1) **Standard** cleaning, check, repair, and assembly procedures applicable to multiple models can be found in a standard practices manual. Refer to Paragraph 2.

F. Electrostatic Discharge

(1) **Touch** the items susceptible to electrostatic discharge in accordance with MIL-HDBK-263. Refer to MIL-STD-1686 for definition of the standards and conditions.

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- Email: techsupport@bendixking.com.

3. References

A. Honeywell/Vendor Publications

(1) Related Honeywell publications in this manual are shown in the list that follows:

- Pub. No. D201308000036, KT 74 Mode S Transponder Pilot's Guide
- ATA No. 20-00-03 (Pub. No. A09-1100-004), Standard Repair Procedures for Honeywell Avionics Equipment Instruction Manual.

B. Other Publications

(1) These publications are standard references. Check for latest version of publication.

- The United States GPO Style Manual 2000 (available at http://www.gpoaccess.gov/stylemanual/browse.html)
- IEEE Std 260, Standard Letter Symbols for Units of Measurement (available from the American National Standards Institute, New York, NY)
- ASME Y14.38, Abbreviations for Use on Drawings and in Text (available from the American National Standards Institute, New York, NY)
- ANSI/IEEE Std 91, Graphic Symbols for Logic Functions (available from the American National Standards Institute, New York, NY)
- H4/H8 CAGE Codes (available at http://www.logisticsinformationservice.dla.mil)
- IEEE 315/ANSI Y32.2, Graphic Symbols for Electrical and Electronics Diagrams (available from the American National Standards Institute, New York, NY)
- MIL-HDBK-263, Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) (Metric) (available from any military standards database)
- MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) (Metric) (available from any military standards database)
- EUROCAE ED-73E, MOPS for Secondary Surveillance Radar Mode S Transponders (available at http://www.eurocae.net/)
- RTCA DO 160G, Environmental Conditions and Test Procedures for Airborne Equipment (available at http://www.rtca.org/)
- RTCA DO 178B, Software Considerations in Airborne Systems and Equipment Certification (available at http://www.rtca.org/)
- RTCA DO 181E, Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment (available at http://www.rtca.org/)
- RTCA DO 254, Design Assurance Guidance for Airborne Electronic Hardware (available at http://www.rtca.org/)
- RTCA DO 260B, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B) (available at http://www.rtca.org/).

4. Acronyms and Abreviations

A. General

(1) The abbreviations are used in agreement with ASME Y14.38.

(2) Acronyms and non-standard abbreviations used in this publication are as follows.

List of Acronyms and Abbreviations

Term	Full Term
A/C	aircraft
ADC	air data computer
ADF	automatic direction finding
ADS-B	automatic dependent surveillance-broadcast
ALT	altitude
AMC	acceptable means of compliance
AMP	ampere
ANSI	American National Standards Institute
ARINC	Aeronautical Radio, Incorporated
ASME	American Society of Mechanical Engineers
ATA	Air Transport Association
ATC	air traffic control
AWG	american wire gauge
BDS	COMM-B data selector
BNC	British naval connector
bps	bits per second
C	Celsius
CAGE	commercial and government entity
cm	centimeter
CFR	Code of Federal Regulations
COMM	communication
dB	decibel
dBM	decibel milliwatt
DC	direct current
DIA	diameter
DIM.	dimension
DME	distance measuring equipment
ENT	enter
ESDS	electrostatic discharge sensitive

List of Acronyms and Abbreviations (Cont)

Term	Full Term
ETSO	European technical standard order
EUROCAE	European Organization for Civil Aviation Equipment
F	Fahrenheit
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FPGA	field-programmable gate array
FUNC	function
GPO	Government Printing Office
GPS	global positioning system
GND	ground
GVA	geometric vertical accuracy
Hz	hertz
I/O	input/output
ICAO	International Civil Aviation Organization
ID	identifier
IDENT	identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
Kg	kilogram
Km	kilometer
KSN	King Safety Navigator
KT	King Transponder
LCD	liquid crystal display
m	meter
MAX	maximum
MHz	megahertz
mm	millimeter
MOPS	minimum operational performance standards
MTL	minimum triggering level
NACp	navigational accuracy category for position
NACv	navigational accuracy category for velocity
NIC	navigation integrity category
NMEA	National Marine Electronics Association
No.	number

List of Acronyms and Abbreviations (Cont)

Term	Full Term
PLD	programmable logic device
PN	part number
Pub.	publication
RMS	root mean square
ROM	read-only memory
RTCA	Radio Technical Commission for Aeronautics
SBY	standby
SDA	system design assurance
SI	International System of Units
SIL	source integrity level
SPI	special position identifier
TCAS	traffic collision avoidance system
TIS-A	traffic information service
TR	temporary revision
TSO	technical standard order
U.S.A.	United States of America
UAT	universal access transceiver
USMS	United States Measurement System
VDC	volts direct current
VFR	visual flight rule
VSWR	voltage standing wave ratio
WAAS	wide area augmentation system

5. Software History

A. Software Data

(1) At the publication date of this manual the software version identifier for the KT 74 is 3.9 and the FPGA version identifier is 110613a. The software and FPGA versions are subject to change without notice.

SECTION 1
GENERAL INFORMATION

1.1 KT 74 Description

The KT 74 Mode S panel mount transponder is an ED-73E and DO-181E Class 1 compliant Mode S level 2es datalink transponder, with support for extended squitter, elementary surveillance and surveillance identifier codes. The KT 74 is also a DO-260B Class B1S compliant ADS-B out participant. The KT 74 meets the relevant environmental requirements of DO-160G/ED-14G, and is certified to ETSO C112d, ETSO C166b, TSO C112d and TSO C166b.

The KT 74 transmitter power output is nominally 240 watts, and the transponder runs from either 14 volt nominal or 28 volt nominal DC power supply with no configuration changes required.

The KT 74 transponder responds to both legacy Mode A/C interrogations and to Mode S interrogations from both ground radar and airborne collision avoidance systems. In all cases, the interrogations are received by the transponder on 1,030 MHz, and replies are transmitted on 1,090 MHz.

In the Mode S environment, S stands for Select, and a Mode S interrogator can selectively address a single transponder. This allows accurate position plotting with lower reply rates, which in turn reduces frequency congestion and interference. In addition, power consumption by the transponder may be reduced, and simple datalink services can be supported, such as ADS-B out. It is however crucial to the reliable operation of the system that each aircraft has a distinct Mode S address. The Mode S address is allocated by the registration authority for the aircraft, and must be set when the KT 74 is installed.

1.2 Interfaces

At the rear, the transponder has two Molex style connectors and a single antenna connector for blind mating with the corresponding connectors in the mounting tray.

The interfaces provide the following services shown in Table 1-1.

Table 1-1. Interface Services

Interface	Description of Service
Parallel altitude input	Connection to an external altitude encoder using Gillham code.
Serial altitude input	Connection to an external RS232 altitude encoder. Using serial altitude data allows the transponder to report altitude with 25 foot (7.62 m) resolution.

Table 1-1. Interface Services (Cont)

Interface	Description of Service
Serial altitude output	Connection to a GPS or other device needing serial altitude data – this allows the transponder to act as a repeater instead of requiring a second altitude encoder.
Ident input	External IDENT switch input.
Standby input	External standby input for dual transponder installations.
“On ground” input	Allows automatic flight/ground mode switching for aircraft with a squat switch.
Lighting bus input	Used to adjust the backlight and switch lighting intensity.
DME Suppression Input	Input to limit interference between DME interrogations and transponder replies – suppresses transponder when active.
Suppression bus I/O	ARINC compatible suppression bus signal used in aircraft with more sophisticated suppression needs, both an input to and output from the transponder.
Audio output	Optionally used by the altitude monitor function.
Audio mute input	Toggle function to mute the audio output.
Altitude alert output	Output used to signal altitude deviations when altitude monitor function is used.
GPS Input	Connection to a GPS supplying position input for ADS-B position reporting.
Serial TIS-A Output	RS232 output for connection to traffic display.
ARINC TIS-A Output	ARINC429 output for connection to traffic display.

1.3 Regulatory

Refer to Table 1-2 for regulatory data for the KT 74 Mode S Transponder.

Table 1-2. Regulatory Data

Specification	Characteristics
Compliance	ETSO C112d, TSO C112d; Class 1 Level 2es ETSO C166b, TSO C166b; Class B1S
FCC identification	VZI01157
Applicable documents	EUROCAE ED-73E, EUROCAE ED-14G (RTCA DO-160G), RTCA DO-181E, RTCA DO-260B Corrigenda 1
Software	ED-12B (RTCA DO-178B) Level B
PLD	DO-254B Class C

Table 1-2. Regulatory Data (Cont)

Specification	Characteristics
Power requirements	11 to 33 VDC, typical 6.3 watts at 14 volts
Altitude	55,000 feet (16.76 Km)
Humidity	95% at +122°F (+50°C) for 6 hours 85% at +100°F (+38°C) for 16 hours Tested to Category A in DO-160G
Operating temperature	-13 to 158°F (-25 to +70°C)
Transmitter frequency	1,090 MHz ± 1 MHz
Transmitter power	240 Watts nominal; 125 Watts minimum at antenna after allowing for 0.5 dB connector losses and 1.5 dB cable losses.
Transmitter modulation	6M75 V1D
Receiver frequency	1,030 MHz
Receiver sensitivity	-74 dBm ± 3 dB

1.3.1 Approved Deviations

The KT 74 ADS-B function is certified to ETSO C166b which references DO-260B as the applicable standard. Since publication of DO-260B a corrigendum has been published; the KT 74 complies with the corrected DO-260B which technically is a deviation from the ETSO. This deviation has been approved by EASA.

1.4 Physical Specifications (in Tray)

Refer to Table 1-3 for the physical specifications.

Table 1-3. Physical Specifications

Specification	Characteristics Inches (mm)
Height	1.7 (42)
Width	6.30 (160)
Length	10.7 (272)
Weight	2.8 pounds (1.35 Kg)

1.5 Installation Approval

The conditions and tests required for TSO approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must determine that the aircraft installation conditions are within the TSO standards which include any accepted integrated non-TSO functions standards. TSO articles and any accepted integrated non-TSO function(s) must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements.

1.6 TSO Failure Condition Classification

The KT 74 Mode S Transponder has been designed to the major failure condition classification as described by TSO C112d and C166b. Malfunction of the functions defined in Paragraph 3.a of these TSOs are a major failure condition.

1.7 Non–TSO Functions

The KT 74 Mode S Transponder contains the following non-TSO functions:

- Stopwatch and Flight Timer: The transponder provides a simple stopwatch and flight timer function, displayed on the front panel.
- Altitude Monitor: The Altitude Monitor activates an audio annunciator or annunciator light (depending on installation) when the aircraft pressure altitude differs from the previously selected altitude by more than 200 feet.
- Altitude Repeater: This is a serial altitude output that can connect to a GPS or other device needing serial altitude data – this allows the transponder to act as a repeater for the altitude input instead of requiring a second altitude encoder.

The operation of each of these functions is described later in this manual.

The non-TSO functions defined in this section are not part of the TSO approval. The non-TSO function data included in this section is approved under 14 CFR 21.305(d).

1.8 KT 74 Mode S Transponder Items

Your KT 74 Mode S transponder includes the following items. Refer to Table 1-4.

Table 1-4. Included Transponder Items

Unit Description	Qty	BendixKing PN
KT 74 Mode S transponder	1	89000007-000001
Mounting tray	1	89000007-041001

Table 1-4. Included Transponder Items (Cont)

Unit Description	Qty	BendixKing PN
Installation kit	1	89000007-001001
KT 74 documentation kit	1	89000007-040001

1.9 Installation Kit

Your KT 74 installation kit includes the following items. Refer to Table 1-5.

Table 1-5. Installation Kit

Unit Description	Quantity
12-way double sided crimp housing connector	1
24-way double sided crimp housing connector	1
Crimp terminal, female, AWG 18 to 24	30
Screw, Pozidrive, pan head, M3x12 mm long	4
Connector, coaxial panel mount right angle blind mate	1
Circlip, 7/16-inch external	1
Washer, 7/16-inch plain, stainless steel	1
Washer, 7/16- inch crinkle, beryllium copper	1

1.10 Documentation Kit

Your KT 74 documentation kit includes the following items. Refer to Table 1-6.

Table 1-6. Documentation Kit

Unit Description	Qty	BendixKing PN
KT 74 Pilots Operating Manual	1	D201308000036

1.11 Required Items

Additional items you will require, but which are not in the KT 74 package, include:

- Antenna and mounting hardware. The KT 74 is compatible with any transponder antenna approved to TSO-C66( )/ETSO-2C66( ) or TSO-C74( )/ETSO-2C74( ) or TSO-C112 ( )/ETSO-2C112( ), that meets the installation requirements of this manual.
- Altitude encoder. You require an encoding altimeter or a blind encoder with either Gillham code or RS232 serial output. For best results, and simpler installation, an encoder with a serial output is recommended.

- Cables. You need to supply and fabricate all required cables. Guidance on cable types is given in Paragraph 2.8.1 below.
- Mounting. To secure the transponder tray to the airframe you will need at least 6 flat head screws and six self-locking nuts. If the aircraft does not have existing mounting provisions you may need to fabricate additional brackets to support the transponder tray.

To support the optional ADS-B features a GPS receiver with an appropriate serial output is required. To support the optional TIS-A features a display with an appropriate serial input is required.

1.12 Normal Operations Overview

On the front panel is a blue tinted white backlit LCD display adjacent to a rotary mode selector knob (OFF, SBY, ON, and ALT) and buttons for IDENT and VFR squawk code. A row of numeric buttons along with the enter (ENT) and function (FUNC) buttons lie below the display. Refer to Figure 1-1.

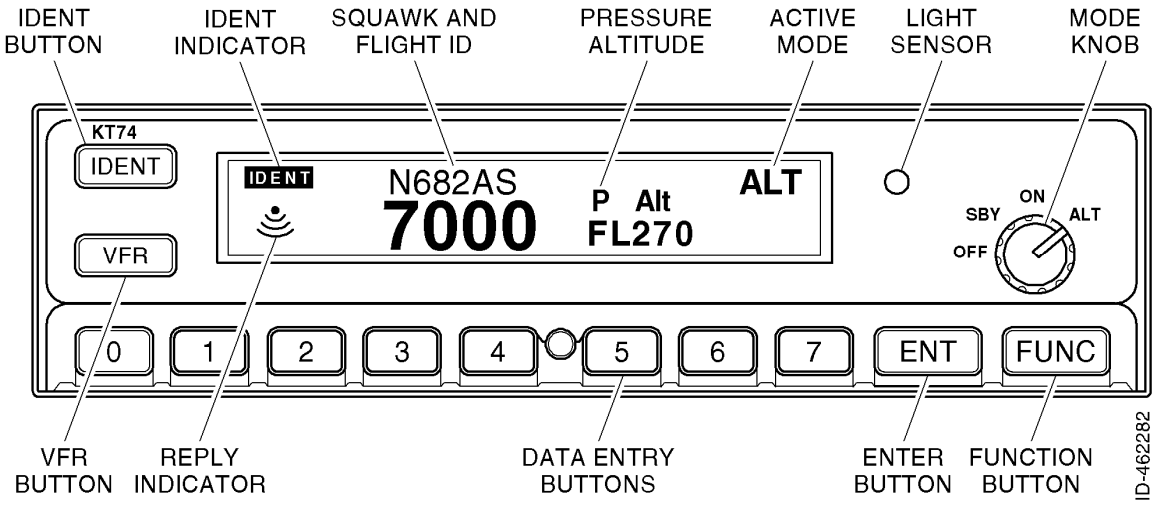

Figure 1-1. KT 74 Display

1.13 Display

The display shows the operating mode of the transponder, the reported pressure altitude, and the current squawk code and Flight ID. The reply indicator is active when the transponder replies to interrogations.

The pressure altitude is displayed as a Flight Level, which is the pressure altitude in hundreds of feet. When non-standard atmospheric conditions apply, this may not match the altimeter indicated altitude.

1.14 Mode Selector Knob

The right hand knob controls the power to the transponder and the operating mode.

OFF Power is removed from the transponder.

SBY The transponder is on, but will not reply to any interrogations.

ON The transponder will respond to all interrogations, but altitude reporting is suppressed.

ALT The transponder will respond to all interrogations.

When airborne, the transponder should always be set to ALT unless otherwise directed by Air Traffic Control. Aircraft installations that include a gear squat switch or other method of air/ground determination will automatically select surface reporting mode on landing or when taxiing. The mode indicator will read GND.

1.15 Push Buttons

Refer to Table 1-7 for the push buttons and their functions.

Table 1-7. Push Button Functions

Button	Function
IDENT	Press the IDENT button when ATC instructs you to “Ident” or “Squawk Ident”. This activates the SPI pulse in the transponder replies for 18 seconds. IDENT will appear in the display.
VFR	Pressing the VFR button sets the transponder to the pre-programmed VFR squawk code. Pressing the button again restores the previous squawk code. Pressing the VFR button when in Flight ID Edit changes the Flight ID to the pre-programmed ID set up during configuration of the transponder.
FUNC	Pressing the FUNC button provides access to the flight timer, stopwatch, Flight ID editing, ADS-B monitor (depending on installation) and altitude monitor function.
ENT	The ENT button confirms entry data or presented options.

1.16 Squawk Code Entry

Press any of the numeric buttons (0 through 7) to start modifying the squawk code. A new squawk code is set when the fourth digit is entered. If the code entry is not completed within 7 seconds, the changes are ignored and the previous code restored.

Some standard squawk codes are listed below:

1200 VFR code in the USA

7000 VFR code commonly used in Europe

7500 Hijack code

7600 Loss of communications

7700 Emergency code

1.17 Flight Timer

The Flight Timer records the time for which the transponder has been powered on and operating in flight mode – either ON or ALT. Press the FUNC button to display the Flight Timer.

1.18 Stopwatch

The stopwatch can be used as a convenient timer. Press the FUNC button to display the stopwatch. Pressing ENT will reset and start the timer. Pressing ENT again will stop the timer.

1.19 Flight ID Entry

Select the Flight ID screen using the FUNC button and then edit the Flight ID using the numeric buttons. The lower portion of the display shows the alpha numeric characters selectable through multiple presses of the numeric buttons. When the correct character is shown in the flight ID section of the screen, press the ENT button to accept and advance to the next digit. When ENT is pressed on the last digit, the new Flight ID will replace the previous value. If a button is not pressed for 30 seconds, the changes are ignored and the previous code restored.

The Flight ID should correspond to the aircraft call sign entered on your flight plan. If no flight plan is active, the aircraft registration should be used as your Flight ID. Use only letters and digits. If the Flight ID is less than 8 characters long, entering a blank character will end it.

1.20 Altitude Monitor

The Altitude Monitor activates an audio annunciator or annunciator light (depending on installation) when the aircraft pressure altitude differs from the selected altitude by more than 200 feet. Press the FUNC button to display the altitude monitor enable screen. Pressing ENT toggles the altitude monitor at the current altitude.

When altitude monitoring is in use, a small deviation pointer appears adjacent to the altitude display on the transponder.

1.21 ADS-B Monitor

The ADS-B Monitor is only available on installations that include an ADS-B position source. The ADS-B Monitor provides a display of the position information that is being transmitted in ADS-B position reports. This can provide confirmation that the correct information is being transmitted, particularly where the GPS source is remote from the transponder.

In the event that valid position information is NOT available from the GPS, the latitude and longitude display will be replaced by dashes; if no valid latitude and longitude is shown then ADS-B position information is NOT being transmitted.

Loss of ADS-B position information will also result in a WARNING message being displayed.

1.22 Warning Messages

If the transponder detects a problem, the screen will indicate WARNING and a brief statement of the problem. Depending on the nature of the problem, your transponder may not be replying to interrogations. The WARNING message should clear when the event has cleared. Press ENT to clear the message at any time; if the fault is still present the message may reappear. Refer to Section 4.5 for lists of warning messages.

1.23 Fault Annunciation

If the transponder detects an internal failure, the screen will indicate FAULT and a brief statement of the problem. No replies will be made to interrogations when a fault is detected.

Some FAULT indications can be recovered by switching the transponder off and back on again, although in all cases a FAULT code implies that there is a fault with the transponder or the installation. Refer to Section 4.5 for list of fault annunciation.

1.24 Low Temperature Operation

The KT 74 is certified to operate down to −13°F (−25°C). A heating element is built into the front panel to automatically raise the temperature around the display during cold operating conditions. The heating element will take several minutes to raise the temperature around the display after initial power on.

1.25 Limited Warranty

BENDIXKING KT 74 WARRANTY STATEMENT

"Nonconformance" means failure to comply with, or failure to operate due to noncompliance with, applicable Seller drawings or having defects in workmanship or material. Normal wear and tear and the need for regular overhaul and periodic maintenance do not constitute a Nonconformance.

"Product" includes end items, line replaceable units and components thereof, including those returned for exchange.

Seller warrants that its Products will comply with applicable Seller drawings and will be free from defects in workmanship and material at time of shipment to Buyer. These warranties are extended to the Buyer, its successors, assigns, and customers, and is valid as follows:

•KT 74 Transponder – Two (2) years from date of delivery to retail customers, provided that this delivery occurs within eighteen (18) months of shipment from Seller.

REPAIRED EQUIPMENT:

•KT 74 Transponder – Three (3) month Limited Warranty from date of shipment from the Seller. Limited warranty covers the parts and the labor of the specific repair. It does not cover the repair of the entire unit.

Buyer must notify Seller in writing during the warranty period of a Nonconformance and, within 30 calendar days of discovery of the Nonconformance, return the Product to Seller's designated facility.

Seller's obligation and Buyer's sole remedy under this warranty is repair or replacement, at Seller's election, of any Product Nonconformance. All Products repaired or replaced are warranted only for the unexpired portion of the original warranty period.

Seller assumes round trip shipping costs for Nonconforming Products in an amount not to exceed normal surface shipping charges to and from Seller's nearest warranty repair facility for such Products. The party initiating transportation bears the risk of loss or damage to Products in transit. If Seller reasonably determines, after analysis of the returned Product, that a Nonconformance does not exist, then Buyer will pay all expenses related to the improper return including, but not limited to, analysis and shipping charges.

Seller will not be liable under this warranty for: (1) maintenance, repair, installation, handling, packaging, transportation, storage, operation or use of Products which is improper or otherwise not in compliance with Seller's instruction; (2) Product alteration, modification or repair by anyone other than Seller or those specifically authorized by Seller; (3) accident, contamination, foreign object damage, abuse, neglect or negligence after Product shipment to

BENDIXKING KT 74 WARRANTY STATEMENT (Cont)

Buyer; (4) damage caused by failure of a Seller-supplied Product not under warranty or by any hardware or software not supplied by Seller; (5) use of counterfeit or replacement parts that are neither manufactured nor approved by Seller for use in Seller-manufactured Products; (6) products not manufactured by Honeywell (but manufacturer's warranty is passed through to Buyer to the extent permitted); or (7) Products normally consumed in operation or which have a normal life inherently shorter than the foregoing warranty period including, but not limited to, consumables (e.g. flashtubes, lamps, batteries, storage capacitors).

Seller has no obligation under this warranty unless Buyer maintains records that accurately document operating time, maintenance performed and the nature of the unsatisfactory condition of Seller's Product. Upon Seller's request, Buyer will give Seller access to these records for substantiating warranty claims.

THESE WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE. IN NO EVENT WILL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES, EVEN IF INFORMED OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF THE ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. NO EXTENSION OF THIS WARRANTY WILL BE BINDING UPON SELLER UNLESS SET FORTH IN WRITING AND SIGNED BY SELLER'S AUTHORIZED REPRESENTATIVE.

1.26 ADS-B Compliance

KT 74 transponders with software Version 3.9 and above include support for extended squitter ADS-B out which is compliant with DO-260B, with Corrigendum 1. The KT 74 is a B1S ADS-B transmitter.

1.27 ADS-B Parameters Supported

Table 1-8 lists the ADS-B parameters that are transmitted by the KT 74 transponder when connected to an appropriate GPS receiver.

Table 1-8. ADS-B Parameters

Parameter	BDS Register
SPI	0.5
Emergency indicator	0.5
Barometric altitude	0.5

Table 1-8. ADS-B Parameters (Cont)

Parameter	BDS Register
Quality indicator (NIC)	0.5
Airborne Position: • Latitude • Longitude	 0.5 0.5
Quality indicator (NIC)	0.6
Surface Position: • Latitude • Longitude	 0.6 0.6
Surface ground speed	0.6
Surface ground track	0.6
Aircraft identification	0.8
Airborne ground velocity	0.9
Geometric to barometric altitude difference	0.9
Geometric vertical speed	0.9
Squawk code	6.1
Emergency status	6.1
Quality indicator (NACp, NACv and GVA)	6.5
Quality indicator (SIL and SDA)	6.5
Version indicator	6.5
Surface length/width	6.5
Surface antenna offset	6.5

In all cases, uncompensated latency due to the transponder is less than 10 milliseconds. Analysis of the system latency should add this to the latency of the GPS system and the transmission time of the position data from the GPS to the transponder to determine the overall latency.

1.28 FAA 91.227 Compliance

The KT 74 transponder can be connected to the following GPS units to form the basis of a 14 CFR 91.227 compliant ADS-B installation:

Freeflight 1201 WAAS/GPS sensors

NexNav MINI WAAS/GPS sensors

For installations seeking certification to 91.227 or other applicable standards, additional compliance information is available on request.

1.29 AMC 20-24 Compliance

The KT 74 transponder can be connected to the following GPS units to form the basis of an AMC 20-24 compliant ADS-B installation:

Freeflight 1201 WAAS/GPS sensors

NexNav MINI WAAS/GPS sensors

Garmin GNS400W and GNS500W series.

For installations seeking certification to AMC 20-24 or other applicable standards, additional compliance information is available on request.

1.30 Automatic Air/Ground Determination

The KT 74 can report ADS-B surface and airborne messages. The ADC, airspeed, or squat switch inputs can be utilized to determine air/ground status as explained in Section 2.

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SECTION 2
INSTALLATION

2.1 Unpacking and Inspecting Equipment

Carefully unpack the transponder and make a visual inspection of the unit for evidence of any damage incurred during shipment. If the unit is damaged, notify the shipping company to file a claim for the damage. To justify your claim, save the original shipping container and all packaging materials.

2.2 Mounting

The KT 74 Mode S transponder must be mounted rigidly in the aircraft panel. The following installation procedure should be followed, remembering to allow adequate space for installation of cables and connectors.

- Select a position in the panel that is not too close to any high external heat source. (The KT 74 is not a significant heat source itself and does not need to be kept away from other devices for this reason).
- Avoid sharp bends and placing the cables too near to the aircraft control cables.
- Secure the mounting tray, PN 89000007-041001, to the instrument panel via the six mounting holes in the tray. It is important that the tray is supported at the rear two mounting holes as well as the front four.
- Check that the locking mechanism is correctly oriented by unscrewing the locking screw if required.
- Slide the KT 74 transponder into the secured mounting tray.
- Lock the KT 74 transponder into the mounting tray using a 3/32 inch allen key, taking care not to over tighten the locking screw.

2.3 Installation Drawings

Refer to Figure 2-1 for the Installation Drawing.

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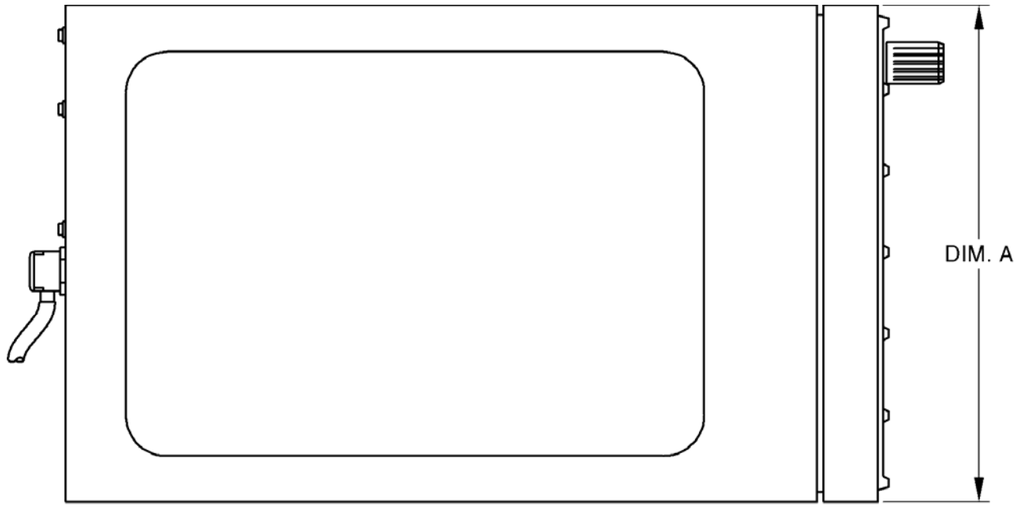
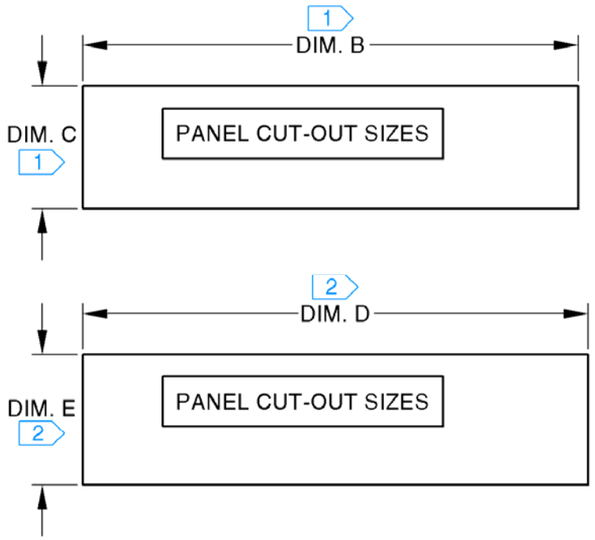
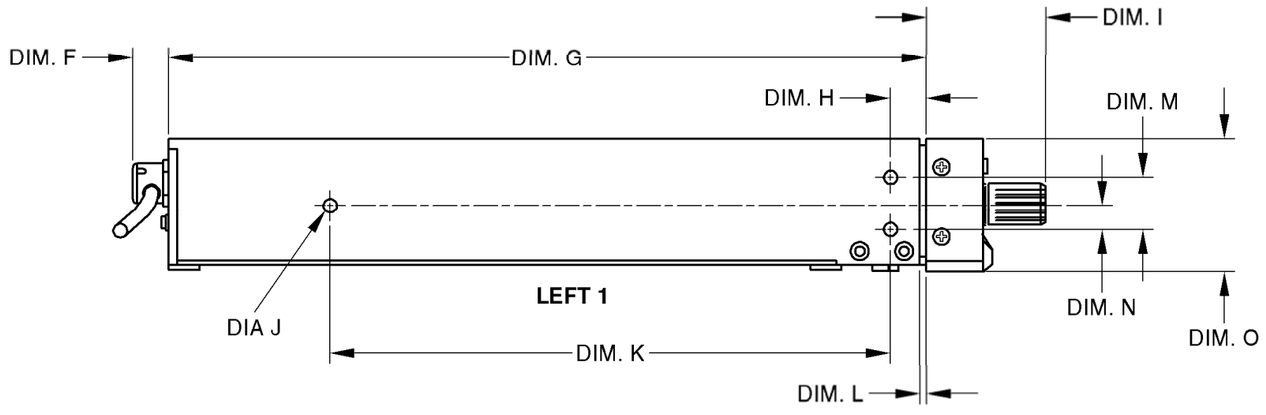
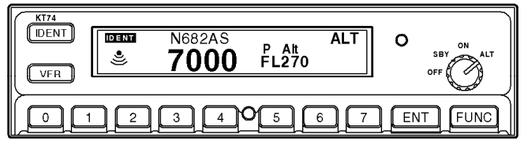


TOP 1





LEFT 1



FRONT 1

NOTES:
1. Cut-out dimensions for behind aircraft panel mount.
2. Cut-out dimensions for front aircraft panel mount

ID-462285

Figure 2-1. KT 74 Installation Drawing

Dimensional Limits for Figure 2-1

Reference	Limits Inches (mm)	Reference	Limits Inches (mm)
DIM. A	6.30 (160.0)	DIM. I	1.254 (31.86)
DIM. B	6.185 (157.10)	DIA J	0.158 (4.015)
DIM. C	1.56 (39.6)	DIM. K	7.00 (177.8)
DIM. D	6.31 (160.3)	DIM. L	0.079 to 0.095 (2.0 to 2.4)
DIM. E	1.622 (41.20)	DIM. M	0.658 (16.70)
DIM. F	0.423 (10.70)	DIM. N	0.298 (7.57)
DIM. G	9.478 (240.75)	DIM. O	1.665 (42.30)
DIM. H	0.441 (11.20)		

2.4 Cooling Requirements

The KT 74 Mode S transponder meets all applicable ETSO and TSO requirements without forced air-cooling.

Attention should however be given to the incorporation of cooling provisions to limit the maximum operating temperature of each unit when the KT 74 is installed in a typical panel or rack. The reliability of equipment operating in close proximity in a rack can be degraded if adequate cooling is not provided.

2.5 Electrical Connections

The KT 74 has two Molex edge connectors, one with 24 contacts, which is the primary interface, and a second connector with 12 contacts which carries signals to support ADS-B and uplinked TIS-A traffic. A single coaxial connector attaches to the antenna. In simple installations it is possible to omit wiring for the second connector altogether.

The Molex edge connector used in the KT 74 is similar to the connector used on the KT 76A and KT 78A transponders, and the common signals on the primary connector use the same contact positions and are electrically compatible. The antenna connector is also compatible. Providing that the wiring is appropriately installed, it is intended that you can upgrade a KT 76A or KT 78A installation to the KT 74 without any connector rewiring. Before doing that however, you must check that the wiring for the existing transponder is in good condition.

2.5.1 Primary Interface – Pinout

Refer to Table 2-1 and Figure 2-2 for the primary interface pinout locations.

Table 2-1. Primary Interface Pinout Locations

Pin	Signal	Directions
1	Ground	-
2	Lighting 14 V	Input
3	Lighting 28 V	Input
4	Suppress I/O [1]	Bi-directional
5	Squat switch in [1]	Input
6	TIS-A traffic out [1]	Output
7	GPS position in [1]	Input
8	Altitude D4	Input
9	Suppress in	Input
10	Standby switch	Input
11	11 to 33 VDC	-
12	11 to 33 VDC	-
A	Ground	-
B	Altitude B4	Input
C	Altitude B2	Input
D	Altitude C1	Input
E	Altitude B1	Input
F	Ident switch in	Input
H	Altitude C4	Input
J	Altitude A4	Input
K	Altitude A2	Input
L	Altitude C2	Input
M	Altitude A1	Input
N	Do not connect [1]	-

NOTE: **1**. These signals are different to the KT76A/KT78A pinout; on the KT76A and KT78A these signals are not usually connected in the aircraft.

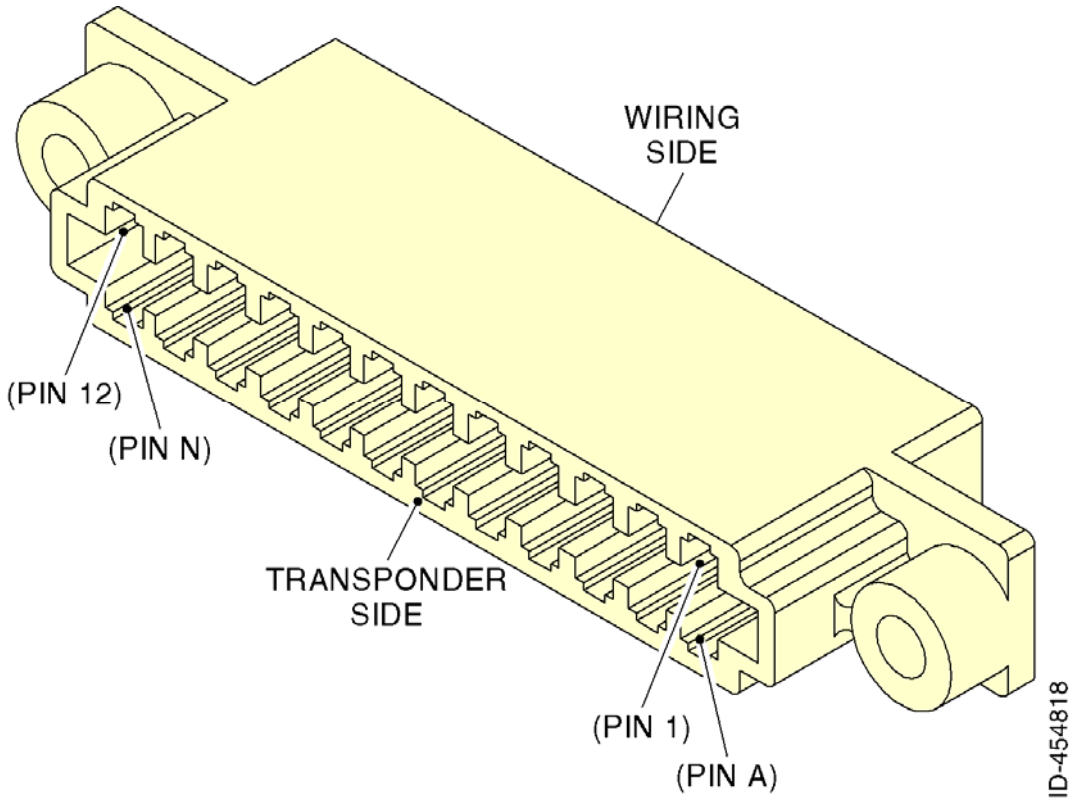


Figure 2-2. Primary Interface Pinout Locations

2.5.2 Secondary Interface – Pinout

Refer to Table 2-2 and Figure 2-3 for the primary interface pinout locations.

Table 2-2. Secondary Interface Pinout Locations

Pin	Signal	Direction
1	Ground	-
2	Serial Alt out	Output
3	Serial Alt in	Input
4	Reserved	Input
5	Audio mute in	Input
6	Altitude alert	Output
A	Ground	-
B	Audio +	Output
C	Audio -	Output
D	Reserved	-

Table 2-2. Secondary Interface Pinout Locations (Cont)

Pin	Signal	Direction
E	ARINC Traffic B	Output
F	ARINC Traffic A	Output

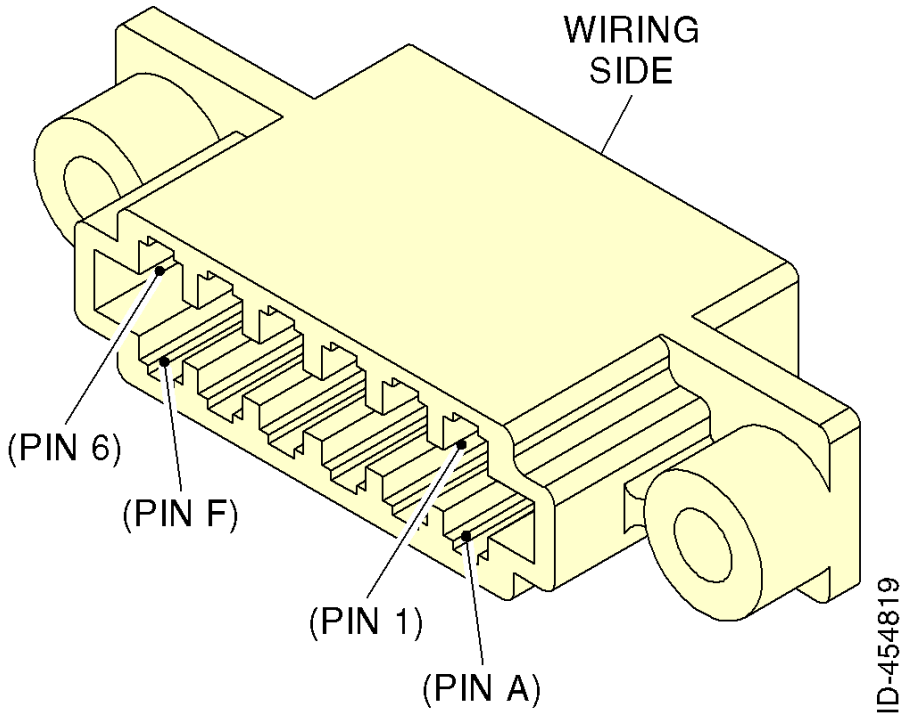


Figure 2-3. Secondary Interface Pinout Locations

2.5.3 Orientation Diagram

To assist in connector orientation, the following example shows a typical set of connections. Figure 2-4 shows the expected connector positions when viewed from the transponder side of the tray, looking into the tray from the front. In the example shown the aircraft uses a 14-volt lighting bus, a parallel altitude encoder, a DME with simple suppression output, a GPS with serial position output, and a simple lamp for the altitude alerter. This example is representative of a simple fixed gear 14-volt aircraft.

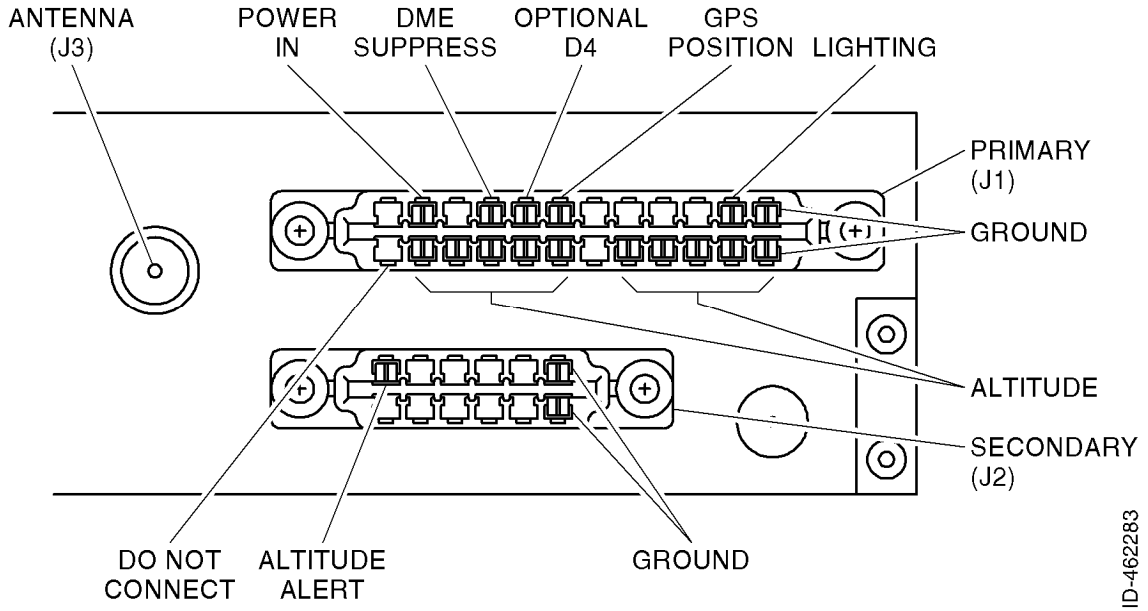


Figure 2-4. KT 74 Connector Positions

2.6 Interface Details

2.6.1 Power Input

The power supply can be 11 to 33 VDC; no voltage adjustment is required. Contacts 11 and 12 on the 24-way connector are both available as power inputs. This is for compatibility reasons only – internally the two are connected together, and in most installations only one need be connected to the power supply.

Use a 3 AMP circuit breaker for power supply protection to the KT 74.

2.6.2 Lighting Bus Input

The KT 74 will adjust the brightness of the front panel switch lighting according to the voltage on the lighting bus input. Two lighting bus inputs are provided on the 24-way connector to accommodate aircraft with 14- or 28-volt lighting systems. When the lighting bus operates at 28 volts, connect the bus input to Contact 3, and leave Contact 2 unconnected. When the lighting bus operates at 14-volts, connect the bus input to Contact 2. In this case Contact 3 can be left unconnected, but for backwards compatibility may also be grounded instead with no effect.

If no lighting bus input is detected, the KT 74 will automatically control the front panel lighting based on the ambient light sensor.

2.6.3 Mutual Suppression

Mutual suppression allows two or more transmitters on adjacent frequencies to inhibit the other transmitters when one is active to limit the interference effects. It is commonly used between transponders and DME systems, and between transponders and collision avoidance systems.

The KT 74 provides two styles of mutual suppression interface on the 24-way connector. The suppress input on contact 9 is typically used in aircraft with simple DME systems and no other suppression requirements. It is an input only, and is active whenever the input is greater than approximately 5 volts.

The suppress I/O on contact 4 is an ARINC compatible suppression bus interface, which acts as both an input and an output. The KT 74 will assert this signal when it is transmitting, and can be suppressed by other equipment that asserts the signal. The KT 74 will drive approximately 24 volts on the output (independently of supply voltage), and will treat the input as active whenever the bus has greater than 10 volts.

2.6.4 Altitude Inputs and Output

The KT 74 can use either a Gillham code altitude input, or serial RS232 altitude input. The parallel input is on the 24-way primary connector, the serial input is on the 12-way secondary connector. If the altitude encoder you are using offers both, we recommend using the RS232 serial input. Serial formats allow a higher resolution altitude representation that can be used by Mode S interrogations, whereas Gillham code format can only represent altitude to the nearest 100 feet (30.5 m). You must choose between serial or parallel formats – you should not connect both. If a parallel encoder is connected the KT 74 will always use that as the altitude source even if a serial encoder is also connected.

The parallel encoder inputs are active when the voltage to ground is pulled below approximately 4 volts. The KT 74 includes internal isolation diodes which prevent the unit from pulling the encoder lines to ground when the transponder is switched off. The KT 74 can therefore share the altitude inputs with other devices without needing external isolation.

Parallel output altitude encoders intended for operation below 30,000 feet (9.144 Km) may not have a signal connection for D4. In an aircraft with a service ceiling below 30,000 feet (9.144 Km) input D4 will never be active, and can safely be left unconnected.

The serial encoder input uses RS232 input levels. The communication should be 9,600 bps, no parity. The KT 74 will correctly recognize either “Icarus/Trimble/Garmin” format altitude data, or “RMS” format altitude data. Refer to the encoder documentation to determine jumper settings as appropriate.

The KT 74 can also accept Shadin family Format G, Format S, and Format Z air data protocols which supply both altitude and airspeed information. The airspeed information can be used to provide an automatic air/ground determination for an ADS-B installation.

The KT 74 includes a serial altitude output which repeats the altitude received on the encoded input (either parallel or serial) for connection to a GPS or other equipment. The serial output supplies RS232 output levels, and runs at 9,600 bps, no parity. The output format is always "Icarus/Trimble/Garmin" format. If the altitude source is a parallel encoder, the serial output is reported every 0.5 seconds; if the source is a serial encoder, the output simply repeats the input reports, each report delayed by up to 10 milliseconds from the corresponding input report.

2.6.5 Squat Switch Input

The Squat switch input allows the transponder to automatically switch between Airborne and Ground modes of operation. The squat switch will also automatically start and stop the flight timer. The input will be asserted when the voltage to ground is pulled below approximately 4 volts. The operating mode of the squat switch can be programmed during setup to allow for active low or active high logical behavior. For aircraft with no squat switch this input should be left open circuit, and the setup mode programmed for "Not Connected".

2.6.6 Ident Switch Input

The Ident switch input, on the 24-way connector, allows the IDENT function to be selected using a remote switch. The input is active low, and will be asserted when the voltage to ground is pulled below approximately 4 volts.

2.6.7 External Standby Input

This input, when held low, places the transponder in Standby mode. It should be used to switch between transponders in an installation with two transponders. The input is active low, and will be asserted when the voltage to ground is pulled below approximately 4 volts.

2.6.8 Audio Output

The audio output is on the 12-way secondary connector. The audio output is a balanced (two wire) audio output that can be connected to an unswitched input on the aircraft audio panel. Audio output is up to 10 volts peak-to-peak across the pair when driving a 600-ohm load. Actual level can be adjusted at installation. Refer to Section 2.

NOTE: The audio pair is not a true transformer balanced output – both pins are actively driven. If the audio panel input is single-ended, then only one of the output pins should be used, together with a local ground pin – the other audio output should be left floating.

The audio output carries the traffic alert messages for TIS-A, and the altitude audio annunciator used by the altitude monitor function.

2.6.9 Altitude Alerter Output

The KT 74 includes an altitude monitor function that can alert the pilot to altitude deviations in cruise flight. The altitude alerter output, on the 12-way secondary connector, is switched to ground when the altitude deviation is detected and can be connected to a visual or aural warning device to alert the pilot. The output is an open collector transistor, and can sink up to 1 AMP DC. The switched voltage should not exceed 60 volts.

2.6.10 GPS Position Input

The GPS position input is required to support ADS-B functionality. The GPS position input is an RS232 input to the transponder. The ADS-B features are optional – no GPS is required for normal Mode S elementary surveillance. The GPS input is on the 24 way primary connector.

The KT 74 GPS input can recognize the following protocols:

- Aviation Format
- NMEA 0183
- NexNav/FreeFlt
- Garmin ADS-B
- Trig ADS-B
- BK GPS Xpress.

The interface speed can be selected between 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600 and 115,200 bps.

Some of the protocols listed above may not contain all the required data for a compliant ADS-B message, depending on the intended airspace regulations. For further information refer to Section 1.26 (ADS-B Compliance) of this manual.

2.6.11 TIS-A Traffic Output

The TIS-A traffic output supports the display of uplinked TIS-A messages. It is provided on both an RS232 output on the 24-way primary connector and an ARINC 429 output on the 12-way secondary connector. The KT 74 RS232 TIS-A output can drive the Trig proprietary traffic protocol, and can also support the format used by certain Garmin handheld displays including the 495, 496, 695 and 696.

The KT 74 ARINC TIS-A output can drive a number of common traffic displays, including Garmin and BendixKing multifunction displays.

NOTE: TIS-A is a Mode S uplink service that is provided by some US approach radars. TIS-A coverage is limited to the coverage areas of those radars. There is no TIS-A provision outside the U.S.A.

2.7 Molex Crimp Terminals

The Molex connector contacts should be wired with wire of AWG 18 to AWG 24. The contacts are compatible with a wide range of crimp tools. Ensure that the contact has been crimped using both the conductor crimp and the insulator crimp. Refer to Figure 2-5.

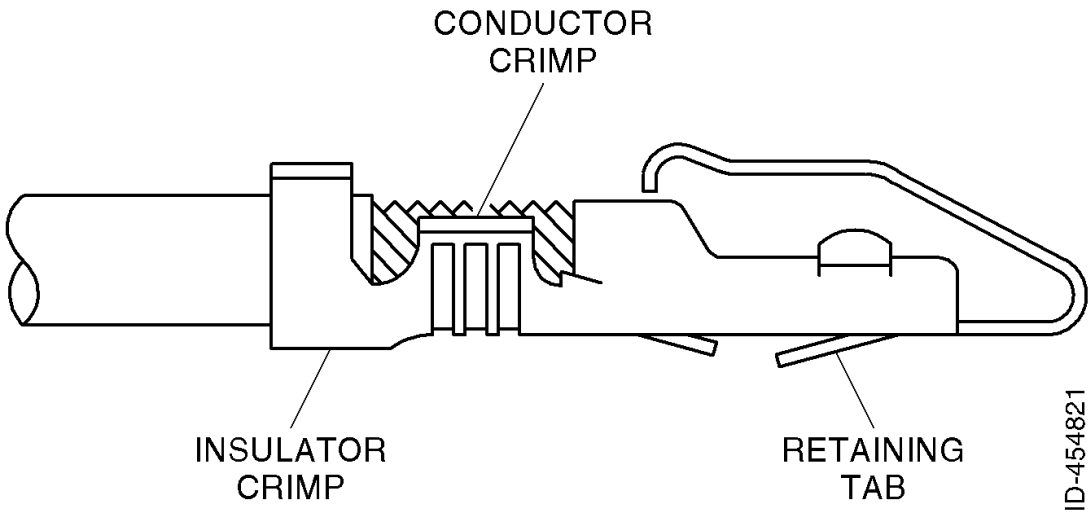


Figure 2-5. Molex Crimp Terminals

Once crimped, the contacts should be inserted into the rear of the connector shell. Push the contact in until the retaining tab clicks into place. Tug gently to confirm the contact is locked in place.

The contacts can be easily removed using the Molex removal tool, or equivalent. This is pushed gently into the connector shell from the side opposite from the wire entry, and lifts the retaining tab from the stop, allowing the contact to be eased out by pulling on the wire.

2.8 Antenna Installation

The antenna should be installed according to the manufacturer's instructions.

The following considerations should be taken into account when locating the antenna.

- The antenna should be well removed from any projections, the engine(s) and propeller(s). It should also be well removed from landing gear doors, access doors or others openings which will break the ground plane for the antenna.
- The antenna should be mounted on the bottom surface of the aircraft and in a vertical position when the aircraft is in level flight.
- Avoid mounting the antenna within 3 feet (91.4 cm) of the ADF sense antenna or any COMM antenna and 6 feet (182.9 cm) from the transponder to the DME antenna.

- Where practical, plan the antenna location to keep the cable lengths as short as possible and avoid sharp bends in the cable to minimize the VSWR.
- To prevent RF interference, the antenna must be physically mounted a minimum distance of 3 feet (91.4 cm) from the KT 74 Mode S transponder.

Electrical connection to the antenna should be protected to avoid loss of efficiency as a result of the presence of liquids or moisture. All antenna feeders shall be installed in such a way that a minimum of RF energy is radiated inside the aircraft.

2.8.1 Antenna Cable

The KT 74 is designed to meet Class 1 requirements with an allowance of 2 dB for loss in the connectors and cable used to connect it to the antenna. Excessive loss will degrade both transmitter output power and receiver sensitivity.

Allowing 0.25 dB loss for the connector at each end of the antenna cable assembly leaves an allowance of 1.5 dB maximum loss for the cable itself.

An acceptable cable:

- Has less than 1.5 dB loss for the run length needed
- Has a characteristic impedance of 50 ohms
- Has double braid screens or has a foil and braid screen.

Once the cable run length is known, a cable type with low enough loss per meter that meets the above requirements can be chosen. Longer runs require lower loss cable.

NOTE: Low loss cable typically uses foamed or cellular dielectrics and foil screens. These make such cables especially prone to damage from too-tight bends or from momentary kinking during installation. Once kinked, these cables do not return to full performance when straightened.

Table 2-3 is a guide to the maximum usable lengths of some common cable types. Actual cable loss varies between manufacturers, there are many variants, and the table is therefore based on typical data. Use it as a guide only and refer to the manufacturer's data sheet for your specific chosen cable for accurate values.

Table 2-3. Maximum Usable Cable Lengths

MAX Length in Feet-Inches	MAX Length in Meters	Insertion Loss dB/meter at 1,090 MHz	MIL-C-17 Cables	Electronic Cable Specialists Type
8-4	2.54	0.59	M17/128 (RG400)	-
10-4	3.16	0.47		3C142B

Table 2-3. Maximum Usable Cable Lengths (Cont)

MAX Length in Feet-Inches	MAX Length in Meters	Insertion Loss dB/meter at 1,090 MHz	MIL-C-17 Cables	Electronic Cable Specialists Type
12-6	3.81	0.39	M17/112 (RG304)	-
17-3	5.25	0.29	M17/127 (RG393)	311601
21-1	6.42	0.23	-	311501
26-11	8.22	0.18	-	311201
41-3	12.59	0.12	-	310801

When routing the cable, make sure that you:

- Route the cable away from sources of heat.
- Route the cable away from potential interference sources such as ignition wiring, 400 Hz generators, fluorescent lighting and electric motors.
- Allow a minimum separation of 12 inches (300 mm) from an ADF antenna cable.
- Keep the cable run as short as possible.
- Avoid routing the cable around tight bends.
- Avoid kinking the cable even temporarily during installation.
- Secure the cable so that it cannot interfere with other systems.

2.8.2 BNC Connector

This section describes the technique for attaching the antenna cable to the supplied blind-mate BNC connector.

If a low-loss cable is needed that has too large a dielectric diameter to fit the supplied blind-mate BNC connector, a short length (up to 6 inches (150mm)) of smaller cable may be used with suitable mating connectors to adapt to the transponder connector.

1. Strip back the coax cable to the dimensions in table, and as shown in the figure below. Slide 1 inch (25.4 mm) of heat shrink tubing over the cable. Refer to Figure 2-6.

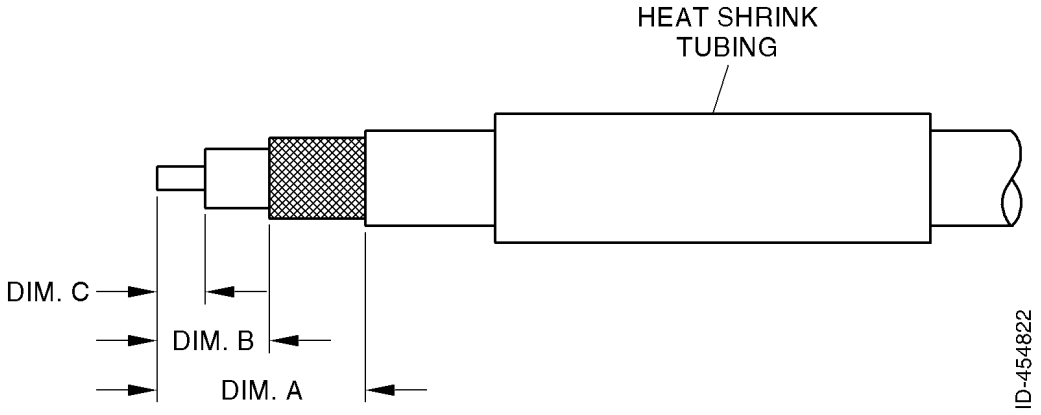


Figure 2-6. Coax Cable Stripping Dimensions

Dimensional Limits for Figure 2-6.

Reference	Limits Inches (mm)	Reference	Limits Inches (mm)
DIM. A	0.5 (12.7)	DIM. C	0.125 (3.2)
DIM. B	0.25 (6.4)		

2. Insert the cable into the connector – the inner conductor should align with the center contact, the inner shield should be inside the body of the connector and the outer shield should be outside the body. Refer to Figure 2-7.

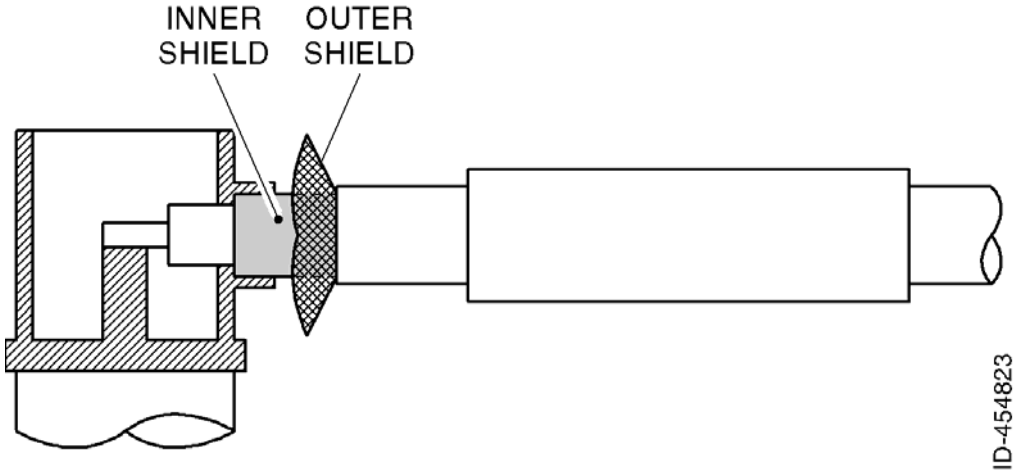


Figure 2-7. Coax Cable Inner and Outer Shield Orientation

3. Solder the center conductor to the center contact, aligning the conductor with the slot in the contact. Avoid excess solder heat on the center BNC conductor pin.
4. Solder the inner shield to the inside of the connector body by applying a soldering iron to the body and running solder into the gap. Try to avoid excess solder heat on the connector body.
5. Solder the outer shield to the outside of the connector body. Avoid excess solder heat on the connector body. Refer to Figure 2-8.

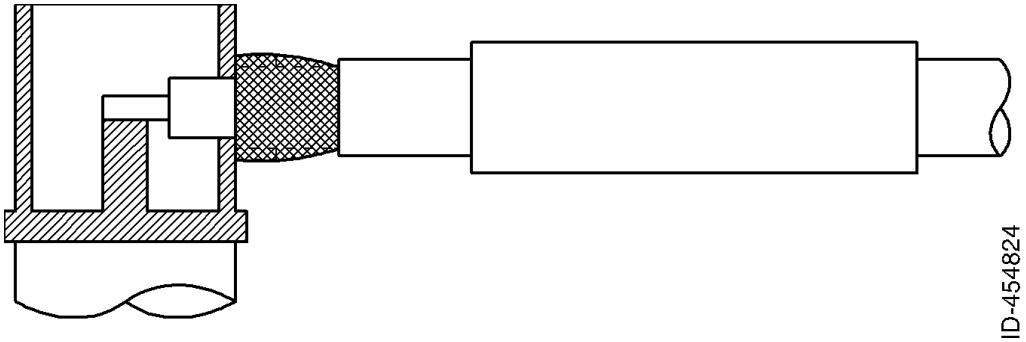


Figure 2-8. Coax Cable Outer Shield to BNC Solder Location

6. Slide heat shrink tubing forward (flush to connector) and heat to shrink the tubing. Refer to Figure 2-9.

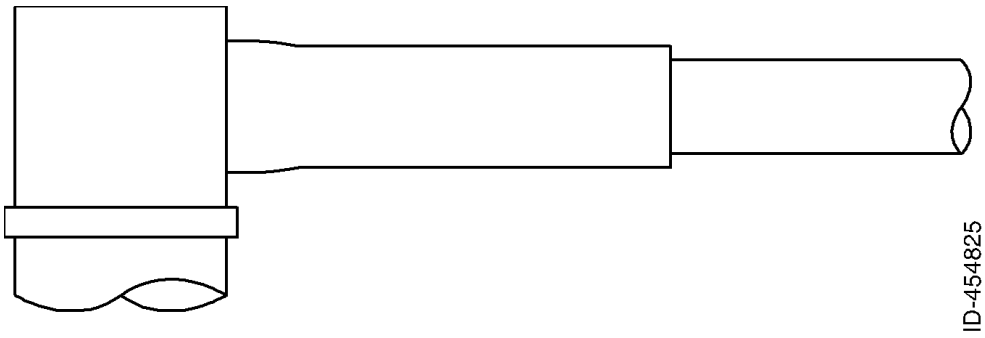


Figure 2-9. Coax Cable and BNC Heat Shrink Location

7. Complete the assembly by installing the bushing over the center contact, and fitting the cap. Solder the cap in place in at least two places. Refer to Figure 2-10.

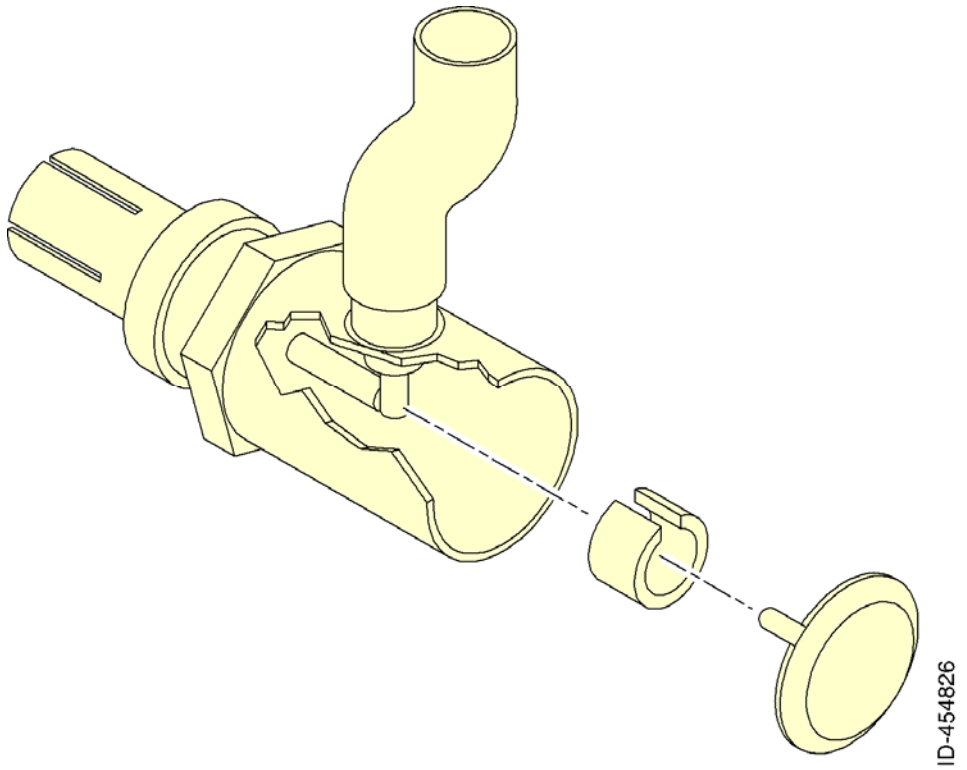


Figure 2-10. BNC Completed Assembly

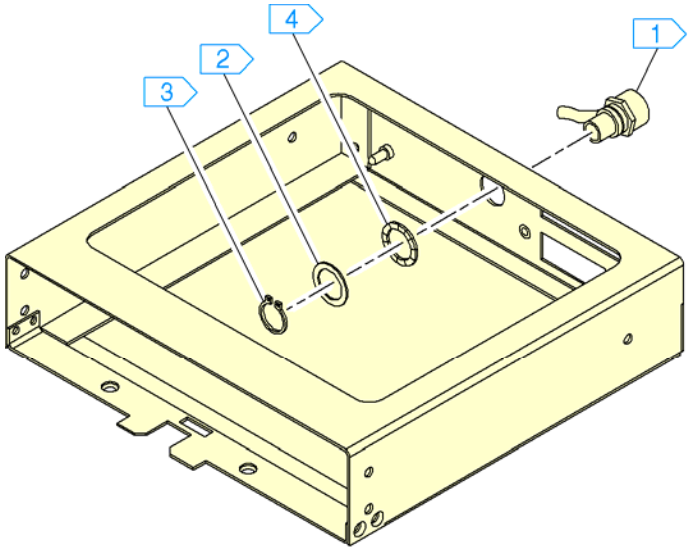
2.9 Tray/BNC Connector Assembly

When the BNC is prepared, feed it through the KT 74 mounting tray and attach the washer combination in the following order:

- Wave washer
- Plain washer
- Circlip washer.

The Circlip washer should be fitted with a set of Circlip pliers.

The two Molex connectors should be passed through the openings in the rear of the tray, and then mounted firmly to the tray from the inside using the four M3 screws supplied. Refer to Figure 2-11.



NOTES:

1. PN 00239-00.
2. PN 00241-00.
3. PN 00242-00.
4. PN 00317-00.

Figure 2-11. Tray / BNC Connector Assembly

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SECTION 3
SYSTEM INTERCONNECT

3.1 Basic Interconnect Diagram

Refer to Figure 3-1 for the basic interconnect diagram.

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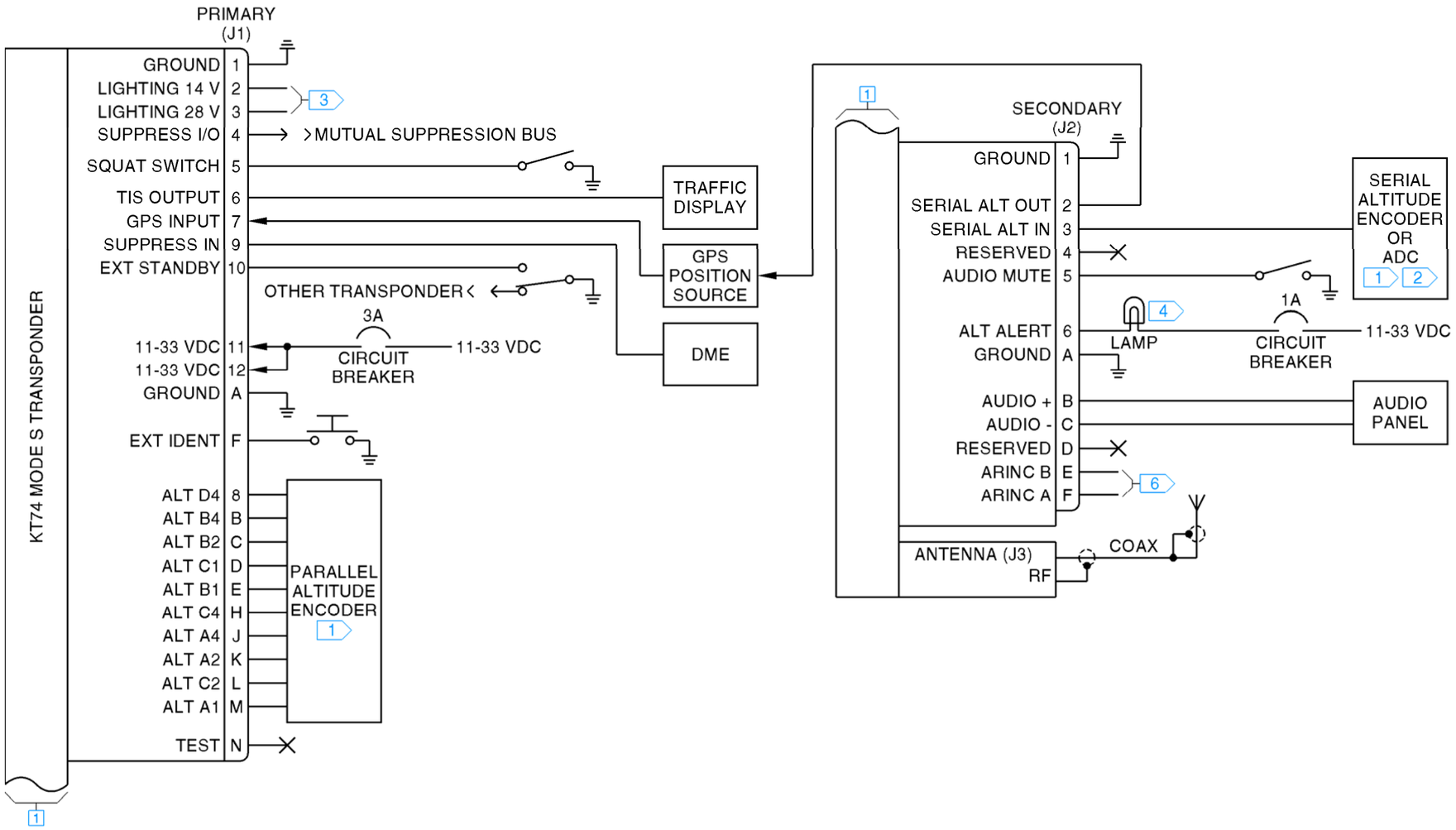

NOTES:

1. Only connect one altitude data source, either a serial encoder, parallel encoder or ADC.
2. When using data from an ADC, it should be connected to the "SERIAL ALT IN", as shown.
3. Connect only one input to the lighting bus, depending on line voltage.
4. Lamp shown as example of possible alerter installation. Other options are possible.
5. All wires should be 18-24 AWG.
6. If KSN 765/770 is utilized as a traffic display then connect to Pins E and F on the Secondary (J2) connector for TIS output.

ID-462286

Figure 3-1. KT 74 Basic Interconnect Diagram

SECTION 4
POST-INSTALLATION CONFIGURATION, CALIBRATION, AND CHECKOUT

4.1 Post Installation Checks

Post installation checks should be carried out in accordance with your certification requirements. These checks should include:

- Mode S interrogations to verify correct address programming.
- Verification of the reported altitude using a static tester. For aircraft using Gillham code encoders, the test should include a range of altitudes up to 6,800 feet (2.07 km), 14,800 feet (4.5 km) or 30,800 feet (9.39 km), depending on the service ceiling of the aircraft – these altitudes correspond to code changes which are not otherwise tested at lower altitudes.
- Where installed, verification of correct squat switch ground/airborne indications. In an aircraft with a squat switch, setting the Mode switch to ALT when the aircraft is on the ground should leave the transponder in GND mode; when the aircraft becomes airborne, the mode should switch automatically to ALT.
- Interrogations to verify the receiver sensitivity. A Mode S transponder should have a MTL of between -77 dBm and -71 dBm. Failure to meet this requirement usually indicates antenna or coaxial cable problems.
- Interrogations to verify the transmitted power. A Class 1 installation should have no less than 125 Watts at the antenna (and no more than 500 Watts). Failure to meet this requirement is also generally due to antenna or wiring issues.
- Where installed, verification of the GPS position source and ADS-B outputs. In an aircraft with a configured GPS, pressing the FUNC button on the transponder front panel in normal operation will display the ADS position monitor. With the aircraft outside the hangar (for good GPS reception) the aircraft position should be displayed on the transponder. If the position indications are all dashes then either the GPS position is not valid or the GPS interface is not correctly configured. Whenever a valid position is received by the transponder and the transponder is in any mode other than Standby, ADS-B Extended Squitters should be observed on the transponder test set.
- Where installed, verification of the TIS-A output. A Mode S test set with TIS-A capability should be used; with the transponder in ALT mode traffic should be shown on the attached display.

4.2 Installation Setup and Test

The KT 74 uses a simple setup system to program important system parameters, including the Mode S address. In the original factory configuration, the setup screen is the first thing that runs when you switch on the transponder. If the transponder has already been configured, and you want to access the setup screen again, simply hold down the FUNC button while switching on the transponder and the setup system will run.

The script will prompt for the following configuration items:

- Aircraft registration
- Mode S address
- VFR squawk code
- Aircraft maximum airspeed
- Aircraft category
- Squat switch source, if fitted
- ARINC TIS-A output format, if used
- RS232 TIS-A output format, if used
- GPS position source, if fitted, and ADS-B parameters
- Measurement units
- Aircraft length and width
- GPS reference offset
- Audio output volume
- LCD dimming settings.

It will then run some simple installation diagnostics, including an external interface check, a check of the altitude encoder interface, and a check of the lighting bus input.

All the programming is accomplished using the numeric buttons 2 (back), 6 (down), 7 (up), and the ENT and FUNC buttons. Pressing the ENT button accepts the current input. Pressing the 2 (back) button goes back to the previous page. Pressing 6 or 7 buttons allows the user to move up and down the menu options. Pressing the FUNC button also accepts the selection and moves directly to the next screen. Refer to Figure 4-1.

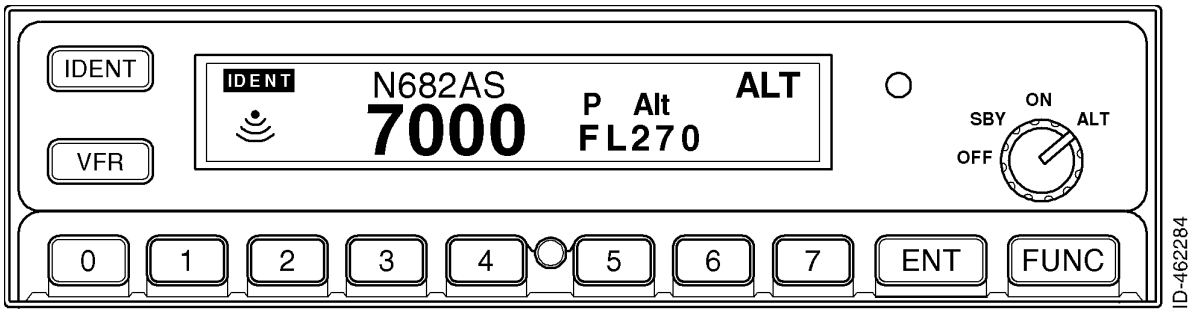

Figure 4-1. KT 74 Transponder

4.3 Configuration Items

4.3.1 Aircraft Registration/VFR Flight ID

The default flight ID for an aircraft not on an IFR flight plan should be the aircraft registration. Enter the aircraft registration using the numeric buttons and the ENT button. To aid character entry, the lower portion of the display shows the alpha numeric characters selected through multiple presses of the numeric buttons. When the correct character is shown in the flight ID section of the screen, press the ENT button to accept and advance to the next digit.

Note that the aircraft registration is loaded as letters and numbers only. There are no dashes or other punctuation marks, and no spaces can be inserted. When you enter a terminator character it finishes the data entry and moves to the next item.

4.3.2 Aircraft Address Programming

The Mode S address is a 24-bit number issued to the aircraft by the registration authority for the aircraft. These addresses are usually written as a six-digit hexadecimal number, although you may also encounter one written as an eight-digit octal number. The KT 74 only understands the hexadecimal format, so you must first convert an octal number to hexadecimal.

Enter the six-digit aircraft address using the numeric buttons and the ENT button.

Press FUNC to move to the next menu item.

In the case of an N registration aircraft, this Mode S address will normally be filled in automatically based on the tail number.

4.3.3 VFR Squawk Code

When the pilot presses the VFR button, a pre-programmed code will replace the current squawk code. The code is set up next; the choice of code will depend on the normal location of the aircraft. In the U.S.A., the VFR squawk code is 1,200. In most parts of Europe, the VFR squawk code should be set to 7000.

Enter the four-digit squawk code using the numeric buttons.

Press FUNC to move to the next menu item.

4.3.4 Airspeed Category

Mode S transponders can transmit their maximum airspeed characteristics to aircraft equipped with TCAS. This information is used to help identify threats and to plan avoidance actions by the TCAS equipped aircraft. The airspeeds are grouped in ranges; using the numeric buttons (6 and 7), select the range that corresponds to the aircraft. Press FUNC to accept and move to the next menu item.

4.3.5 Aircraft Category

To assist ATC tracking of aircraft, an aircraft category can be transmitted by Mode S transponders. Using the numeric buttons (6 and 7), select the aircraft category that most closely matches the aircraft the transponder is installed in. Press FUNC to accept and move to the next menu item.

4.3.6 Squat Switch Source

The squat switch input allows the transponder to automatically switch between airborne and ground modes, and to automatically start and stop the flight timer. The sense of the squat switch input can be selected using the numeric buttons (6 and 7). Press FUNC to accept and move to the next menu item.

If the squat switch input is not connected the “not connected” option must be selected.

4.3.7 ARINC TIS-A Output

If the aircraft has a compatible display connected to the transponder, enable the appropriate ARINC output using the numeric buttons (6 and 7).

4.3.8 Serial TIS-A Output

If the aircraft has a TIS-A compatible display connected to the transponder, select the appropriate interface protocol using the numeric buttons (6 and 7). On this menu you can select None, TIS-A Traffic 1, and TIS-A Traffic 2. When connecting to the Bendixking KSN 765/770 or Garmin display, select TIS-A Traffic 1

NOTE: TIS-A is a Mode S uplink service that is provided by some US approach radars. TIS-A coverage is limited to the coverage areas of those radars; there is no TIS-A provision outside the U.S.A.

4.3.9 GPS Input

If a GPS is connected for ADS-B position reporting, select the appropriate interface protocol using the numeric buttons (6 and 7). Press FUNC to accept and move to the next menu item.

4.3.10 GPS/TIS-A Line Speed

If a GPS input or TIS-A serial output has been configured, you should select the appropriate line speed using the numeric buttons (6 and 7). Press FUNC to accept and move to the next menu item.

Traffic displays using the Garmin protocol run at 9,600 bps. Panel mount GPS units with Aviation format outputs generally also run at 9,600 bps, as do Garmin and Trig ADS-B outputs. NMEA GPS units generally run at 4,800 or 9,600 bps. Freeflight 1201 and NexNav 3101 GPS receivers generally run at 19,200 bps. BendixKing GPS receivers run at 9,600 bps for legacy systems, such as the KLN94, and 115200 for the high performance receiver in the KSN 765/770.

NOTE: The TIS-A output and GPS input speeds are not separately controlled on the KT 74. Not all combinations of GPS input and TIS-A output will be usable if the external devices operate on fixed bit rates and are different to each other.

4.3.11 GPS System Certification Level

An important metric for ADS-B ground system behavior is the SDA level. It is intended to reflect the probability that the GPS position source is providing erroneous information, and is based on the certification standard that was used by the GPS vendor. This will be indicated in the form of a letter code (A to D) on the data plate or installation documentation for the GPS in accordance with the standards DO-178B and DO-254, for example “DO-178B level C”. If both standards are reported but at different levels, use the lower standard (higher letter).

4.3.12 GPS NACv

Another metric that the ADS-B ground system uses to help it track the aircraft is NACv. NACv is a design feature of the GPS receiver. It represents the error bound for velocity that the GPS may report in acceleration/deceleration or turning maneuvers. You can find this information from your GPS installation manual.

4.3.13 Measurement Unit

Entry of the following configuration items may be in meters or feet. Select the required measurement unit from the choice on the display.

4.3.14 Aircraft Length and Width

On the ground, ADS-B transmits encoded aircraft size information which is used by ATC to identify taxiing routes and potential conflicts. When configured for ADS-B, the KT 74 will ask for the aircraft length and width (wingspan), in meters, and will calculate the appropriate size code for transmission.

4.3.15 GPS Antenna Offset

The GPS antenna offset is used together with the aircraft length and width to manage taxiway conflicts. A typical GPS installation does not report the geographic position of the center of the aircraft, or even the tip of the nose of the aircraft; instead it usually reports the location of the actual GPS antenna (not the GPS receiver). In normal flight operations this distinction is of no practical importance at all, but if ADS-B is used to manage taxiway conflicts, a significant offset in antenna position could mean that the aircraft is not in the same place as the ADS-B reported position. Although primarily intended for position correction on large transport aircraft, General Aviation aircraft can also have a significant offset. For example, if the aircraft has a long tail boom and the GPS antenna is on the top of the tail, the GPS position could be 15 feet (4.6 m) or more from the nose of the aircraft.

Enter the position of the GPS antenna relative to the nose of the aircraft. The position is stored and transmitted to the nearest 6.6 feet (2 m); great accuracy in measurement is not required.

4.3.16 ADS-B Receiver Options

In the U.S.A. there are two ADS-B channels, 1090ES and UAT. There is also an ADS-B based traffic information service called TIS-B. ADS-B ground stations relay this information between the two channels so that equipped aircraft can receive traffic information. To limit channel congestion these services are only provided to aircraft equipped to receive them. When an aircraft is equipped with an ADS-B receiver the KT 74, if configured, will periodically report what receivers are on-board so that ground station data will be transmitted to the aircraft.

4.3.17 Audio Volume

The altitude alert function includes an audio alert, as does the TIS-A traffic service. This configuration item lets you adjust the audio volume output from the transponder using the numeric buttons (6 and 7). While you are adjusting the volume control, the transponder will periodically output a test signal to verify the settings.

Press FUNC to accept and move to the next menu item.

4.3.18 LCD Dim Point

The LCD backlight illumination is controlled automatically by the ambient light sensor. Depending on the amount of light spill in the cockpit, and the brightness of other adjacent avionics displays, it may be necessary to adjust the darkest setting of the backlight to best match other equipment and to improve the cockpit appearance.

NOTE: It is only practical to do this in pitch darkness, since that is the in-flight environment that you are trying to reproduce. If you are working in a hangar with any other lighting it may be better to leave the setting in the mid-range.

4.3.19 LCD Brightness Curve

The actual maximum brightness of the LCD cannot be increased with this control. What it controls is the rate at which the lighting increases in brightness as the ambient light increases. This allows the brightness to be matched to other avionics displays during light level changes as far as possible.

4.4 Test items

4.4.1 Interface Check

The interface check screen displays the current state of the external IDENT, external STANDBY and external GROUND inputs. Exercise these inputs to confirm the correct behavior.

4.4.2 Altitude Check

The altitude check displays the current state of the altitude inputs. Individual Gillham code lines are shown to assist in fault tracing.

4.4.3 Lighting Bus

The lighting bus check displays the voltage on the lighting bus to assist in verifying the correct operation of the lighting bus.

4.4.4 Temperature

The internal temperature of the transponder can be displayed. The display is in degrees Celsius.

4.4.5 GPS Interface

The GPS interface check provides a simple confidence check that the transponder is receiving data on the RS232 input. Note that this check does not attempt to decode the received data; it is intended only to provide a quick wiring check in the hangar. To assure that the interface is fully operable the aircraft should be tested with the transponder in normal operating mode, with the GPS receiver operating correctly, and a ramp test of the transmitted parameters completed.

4.5 Warnings and Faults

The messages shown in Table 4-1 and Table 4-2 may appear on the screen of the KT 74 transponder. These tables provide further information on the possible cause and actions to take in the event these occur.

Table 4-1. Warning Messages

Message	Issue Description	Initial Action
Antenna fault	The transponder has detected that there is a fault in the antenna cabling or antenna connection.	Check transmitter cabling and connection to antenna.
Output power low	The transponder has detected that it transmitted at a lower power level than expected. This may be caused by: • Poor antenna connection in the transponder tray • Poor antenna cable connections • A transponder hardware fault.	Check cabling. connection at the transponder tray and transmitter
No ADS-B position	Valid ADS-B position data has not been received for either: • 180 seconds from system start-up • 2 seconds once a GPS position data has been received by the transponder.	Check cabling to GPS and GPS antenna position and connection.

Table 4-2. Fault Messages

Message	Initial Action
FPGA fault	Call BendixKing Customer Support
ROM checksum failed XXXX	Call BendixKing Customer Support
Receiver fault or no signal	Call BendixKing Customer Support
Transmitter failed	Call BendixKing Customer Support
Squitter failure	Call BendixKing Customer Support
I2C write data	Call BendixKing Customer Support

BendixKing Customer Support:

- Telephone: 855-250-7027 (Toll Free U.S.A./Canada)
- Telephone: 602-365-7027 (International)
- Website: www.bendixking.com/support
- Email: techsupport@bendixking.com.

SECTION 5
INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

5.1 Continued Airworthiness

Other than for periodic functional checks required by the regulations, the KT 74 Mode S/ADS-B Out Transponder has been designed and manufactured to allow “on condition maintenance”. This means that there are no periodic service requirements necessary to maintain continued airworthiness, and no maintenance is required until the equipment does not properly perform its intended function. When service is required, a complete performance test should be accomplished following any repair action. Repairs should only be carried out in accordance with BendixKing service agreements.

5.2 Cleaning the KT 74 Transponder

The front panel, buttons and selector knob should be cleaned with a soft cotton cloth moistened with clean water. The glass fascia covering the LCD screen should be lightly cleaned with a lint free cloth taking care not to scratch the surface.

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APPENDIX A
ENVIROMENTAL QUALIFICATION

A-1 Environmental Qualification Form

Refer to Table A-1 for the environmental qualification form.

Table A-1. Environmental Qualification Form

Nomenclature	KT 74 Mode S Transponder	
TSO	TSO C112d; Class 1 Level 2es, TSO C166b; Class B1S	
ETSO	ETSO C112d, ETSO C166b	
Conditions	**DO-160G Section**	**Description of Conducted Tests**
Temperature and altitude	4.0	Equipment tested to Categories A4 and C4
Low temperature ground survival	4.5.1	-67°F (-55°C)
Low temperature operating	4.5.1	-13°F (-25°C)
High temperature operating	4.5.3	+158°F (+70°C)
High temperature short-time operating	4.5.2	+158°F (+70°C)
High temperature ground survival	4.5.2	+185°F (+85°C)
Loss of cooling	4.5.4	Cooling air not required +158°F (+70°C) operating without cooling air
Altitude	4.6.1	55,000 feet (16.76 Km)
Decompression	4.6.2	8,000 to 55,000 feet (2.44 to 16.76 Km) in 15 seconds
Overpressure	4.6.3	-15000 feet (-4.57 Km)
Temperature variation	5.0	Equipment tested to Category C

Table A-1. Environmental Qualification Form (Cont)

Conditions	DO-160G Section	Description of Conducted Tests
Humidity	6.0	Equipment tested to Category A
Operational shocks	7.2	Equipment tested to Category B
Crash safety	7.3	Equipment tested to Category B
Vibration	8.0	Aircraft Zone 2; Type 3, 4, 5 to Category S, Level M Aircraft Zone 2; Type 1 (helicopters) to Category U, Level G
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids susceptibility	11.0	Equipment identified as Category X, no test required
Sand and dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt spray	14.0	Equipment identified as Category X, no test required
Magnetic effect	15.0	Equipment tested to Category Z
Power input	16.0	Equipment tested to Category BX
Voltage spike	17.0	Equipment tested to Category B
Audio frequency conducted susceptibility	18.0	Equipment tested to Category B
Induced signal susceptibility	19.0	Equipment tested to Category AC

Table A-1. Environmental Qualification Form (Cont)

Conditions	DO-160G Section	Description of Conducted Tests
Radio frequency susceptibility	20.0	Equipment tested to Category TT
Radio frequency emission	21.0	Equipment tested to Category B
Lightning induced transient susceptibility	22.0	Equipment tested to Category B2H2L2
Lightning direct effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required
Electrostatic discharge	25.0	Equipment tested to Category A
Flammability	26.0	Manufacturer’s data sheets used to ensure Category C

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