



KLR 10

Lift Reserve Indicator



Installation
Manual

BendixKing

by Honeywell

BendixKing.com

Bendix/King by Honeywell

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Product Registration

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KLR 10™
LIFT RESERVE
INDICATOR
INSTALLATION MANUAL

***The KLR 10 is approved for installation in experimental category aircraft ONLY.
It is not approved for installation in certified aircraft***

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Revision History and Instructions

Manual	KLR 10 Life Reserve Indicator Installation Manual
Revision	1
Summary	Revised footers.

Manual	KLR 10 Life Reserve Indicator Installation Manual
Revision	0
Summary	This is a new release.

Record of Revisions

REVISION NUMBER	REVISION DATE
0	JULY, 2013
1	JULY, 2013

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1. GENERAL

1.1 OBJECTIVE:

This manual contains a lot of information that is repeated and shown in different ways to help explain all steps of installation through calibration and help with the FAA required paperwork. Think of this manual as a written journey, to give you as much detail as you want.

This manual is designed to take you step by step through the planning, installation, documentation and calibration for your KLR 10. If you follow the instructions through the entire process, the installation can be completed correctly the first time.

1.2 REFERENCES:

For those of you that desire more information we have included references with the instructions. These references may be used as acceptable data when documenting the installation.

1.3 PAGE AND SUBJECT NUMBERS:

Pages in this manual are assigned a two part page number. The first number always specifies the chapter number. The last number always indicates the page number. Subjects within a chapter are numbered with the chapter number first then the subject number second.

1.4 REVISIONS:

When a revision is required of this manual, the manual will be revised in its entirety.

1.5 TECHNICAL SUPPORT:

Contact Bendix/King's customer support lines at 1-855-250-7027 / 602-365-7027 or techsupport@bendixking.com.

1.6 WARRANTY INFORMATION:

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.

Bendix/King offers a **two year warranty from date of purchase** against manufacturer defect for material and labor. After expiration of standard warranty repair coverage will be available for a **fixed fee of \$200 per occurrence until five years from date of purchase**. After that repairs are subject to parts and labor cost.

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 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.

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1.7 STANDARD COMPONENTS

The table below shows the list of standard components for the KLR 10 kit:

Table 1-1: Standard Kit

PART NUMBER	DESCRIPTION	QTY
89000008-001001	Standard Kit	1

Table 1-2: KLR 10 Standard Kit Components

DESCRIPTION	QTY
KLR 10 Indicator	1
6 ft Display Cable	1
KLR 10 Flush Mount Panel Kit	1
KLR 10 Interface Module	1
Interface Module Power Cable	1
Auxiliary Cable	1
KLR 10 Standard AOA Probe with Swivel Connectors	1
25 ft Blue and White Hose Kit	1
9 in. X 9 in. Standard Mounting Plate with Hardware and Probe Lock Plate	1
Small flat-head screwdriver for calibration	1
Protractor	1
AOA Probe Cover with Flag	1
Installation Manual	1
Pilot's Guide	1
Certificate of Conformity	1
Note: <i>If a 12 V or 24 V heated probe or glare shield swivel mount is ordered with the kit, it will replace the standard probe or flush mount included with the kit respectively.</i>	

1.8 OPTIONAL COMPONENTS

The table below shows the list of optional components for the KLR 10 system:

Table 1-3: KLR 10 Optional Components

PART NUMBER	DESCRIPTION	QTY
89000008-543001	12 VDC Heated AOA Probe	1
89000008-544001	24 VDC Heated AOA Probe	1
89000008-685001	KLR 10 Flush panel mount	1
89000008-686001	KLR 10 Glare shield Swivel Mount	1
89000008-684001	KLR 10 AOA Probe Cover with Flag	1

1.9 KLR 10 MAIN COMPONENT DETAILS:

KLR 10 indicator

The KLR 10 indicator is 2.35 in. tall X 1.55 in. wide X 1.26 in. deep and can be mounted anywhere in the cockpit



Figure 1-1: KLR 10 Indicator

Panel Mounting Kit

Mounting ears are included in the Panel Mounting Kit that attach to either side of the KLR 10 Indicator as shown in the figure below. This lets you mount the KLR 10 indicator anywhere on the panel.

Note: *If the KLR 10 is ordered with the optional swivel mount, the mounting ears are not included in the kit, but can be ordered as an optional accessory.*

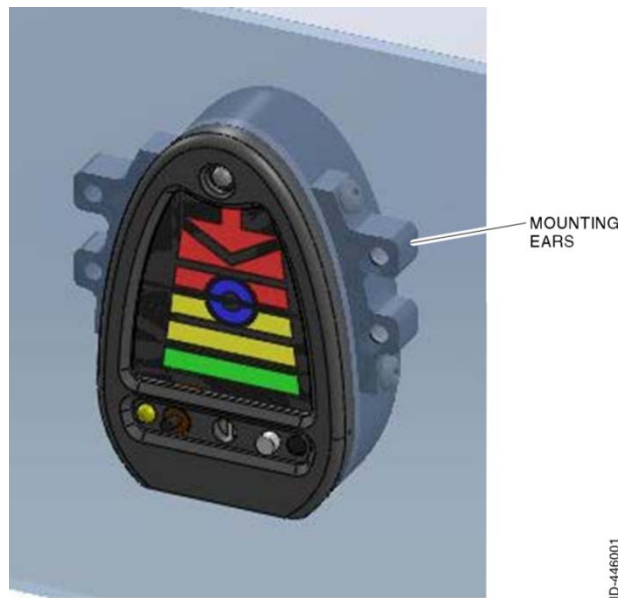


Figure 1-2: Panel Mounting Kit

KLR 10 Swivel Mount Kit

An optional mounting kit is available for vertical swivel flush mount for those aircraft that have a sloping glare shield, see Figure 1-3 below.



Figure 1-3: KLR 10 Swivel Mount

KLR 10 Interface Module (IF Module)

The IF module is 1.63 in. tall X 5.81 in. wide X 2.58 in. deep and weighs 0.8 LBS.



Figure 1-4: KLR 10 Interface

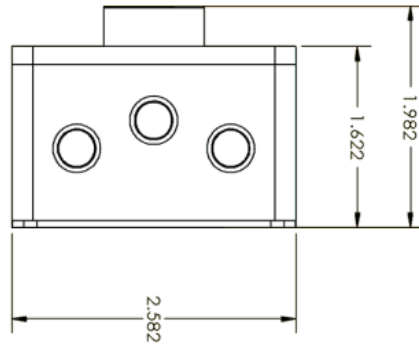
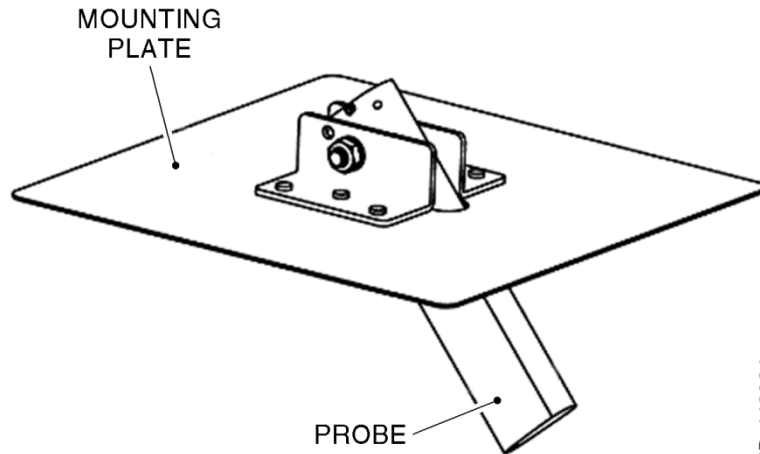


Figure 1-5: AOA Probe Sensor Fittings

KLR 10 AOA probe

The AOA Probe is mounted on a 9 in. x 9 in. mounting plate. The mounting plate is cut to fit the existing opening.



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Figure 1-6: Mounting Plate

AOA Probe and 2 fittings = .23 lbs.

9"X9" plate + hardware = .40 lbs (Less when cut to fit existing opening)

Add .25 lbs with optional heated probe.

Two sense lines are connected to the AOA probe. The weight of sense line is .02 lbs/ft.

2. PLANNING

2.1 PREPARATION:

This chapter will guide you through the planning phase of the installation process. To prepare for the installation it is recommended that you read this manual in its entirety and complete this chapter prior to performing any work.

2.2 ESTABLISH THE LOCATION FOR THE KLR 10 INDICATOR:

The KLR 10 is intended to provide supplemental information therefore it **cannot** be used as a replacement for any required instruments. There is some good guidance in **AC43.13-2B** Chapter 11 and **FAR §23.1321** that refer to the location and installation of the instruments. Basically the instruments should be arranged in the standard "T" configuration with the KLR 10 indicator **preferably** as high and left of the attitude indicator as possible. The location should also allow routing of the electrical wiring so it will not interfere with any moving controls, cables or come in contact with any line containing flammable fluids or gases.

Since the KLR 10 indicator is electronic there are a number of other considerations that should be looked at, for example the intent of **FAR 23.1311** is to cover installation of "CRT" or "LCD" displays that replace conventional analog instruments. Since the KLR 10 system does not replace any required instruments and does not involve a "CRT" or "LCD" display the regulation may not apply. Taking a conservative approach and showing compliance with this FAR can be done as follows:

23.1311 Electronic display instrument system

(a)(1) Arrangement and visibility; this requirement will have been met by complying with **FAR 21.1321**.

(a)(2) Be easily legible under all lighting conditions; this requirement has been met by design. The display is designed to be seen in direct sunlight and has a built in dimming device for lower levels of light.

(a)(3-7),(b)&(c) Does not apply since the system is a stand-alone system and does not interface or replace any existing instruments or displays and is not considered essential for flight.

Listed below are four different scenarios, find and complete the one that pertains to your installation and use the following formula when calculating the additional load:

(Indicator Weight) X (Aircraft "G" Limit) X 1.5 (Safety Margin) = Additional Load

Example:

.5lbs X 6.6 X 1.5 = 4.95lbs.

IF you plan to install the KLR 10 indicator in an **existing hole** on the instrument panel then a determination is needed to insure that the fasteners/shock mounts will accept the additional load of the indicator. This is an easy one, the KLR 10 indicator only weighs .5 lbs so the addition of the KLR 10 indicator should not normally exceed the limits of the mounting hardware. This is a preferred method of installing the KLR 10 indicator and in most cases will require no additional alterations. Please refer to AC43.13-2B Chapter 1 and Chapter 2 paragraph 203(a-e) for guidance.

IF you plan to install the KLR 10 indicator in a **panel that is shock mounted and has no existing mounting hole present** you will need to make two determinations. First, will the shock mounts accept the additional load of the KLR 10 indicator and secondly, will the panel be strong enough with an additional instrument hole in it. The KLR 10 indicator only weighs .5lbs so the addition of the KLR 10 indicator should not normally exceed the limits of the shock mounts. The panel strength should not be an issue if you keep the hole spacing the same as the original panel layout. This is also a preferred method of installing the KLR 10 indicator and in most cases will require no additional support structure. Please refer to AC43.13-2B Chapter 1 and Chapter 2 paragraph 203(a-e) for guidance

IF you plan to install the KLR 10 indicator on a **glare shield** you will need to make a determination that the structure is strong enough to support the weight of the indicator. This is also a preferred method of installing the KLR 10 indicator and in most cases will require no additional support structure. Please refer to AC43.13-2B Chapter 1 and Chapter 2 paragraph 205(a-c) for guidance.

IF you plan to install the KLR 10 indicator in a panel **where no mounting hole is present and the panel is not shock mounted** several determinations will be required. First is the panel **non-structural**? If so, you will need to determine that the mounting hardware will accept the additional load of the KLR 10 indicator and will the panel be strong enough with an additional instrument hole in it. The KLR 10 indicator only weighs .5lbs so the additional load of the KLR 10 indicator should not normally exceed the limits of the mounting hardware. The panel strength should not be an issue if you keep the hole spacing the same as the original panel layout. This method of installing the KLR 10 indicator will, in most cases, not require additional support structure. If the panel you intend to install the KLR 10 indicator in is a **structural** panel, refer to **AC43.13-2B** Chapter 1 and Chapter 2 paragraph 203(a-e) for guidance.

2.3 ESTABLISH THE LOCATION FOR THE IF MODULE:

The IF module is used to convert pressures, measured at two points on the AOA probe, to an electronic signal that is then delivered to the KLR 10 indicator which displays KLR 10 information to the pilot. The IF module may be physically installed just about anywhere observing the following limitations:

- On a structure that will support the additional load of the IF module.
- The sense lines are routed so that they do not interfere with any moving controls or cables.
- The electrical wiring does not interfere with any moving controls or cables and does not come in contact with any line containing flammable fluids or gases.
- The IF module must be bonded to the airframe (grounded for shielding).
- The IF module must be mounted within six ft of the AOA Display.
- The IF module must be mounted within six ft of the power source or the optional on/off switch. *

NOTE: *If a longer cable is required it may be possible to have a longer custom cable assembly fabricated, contact Bendix/King for more information.*

Use the following formula when calculating the additional load:

$$(\text{Module Weight}) \times (\text{Aircraft "G" Limit}) \times 1.5 (\text{Safety Margin}) = \text{Additional Load}$$

Example:

$$.8\text{lbs} \times 6.6 \times 1.5 = 7.92\text{lbs.}$$

Please refer to AC43.13-2B Chapter 1 and Chapter 2 paragraphs 201, 202, 204-206 for guidance.

2.4 ESTABLISH THE LOCATION FOR THE AOA PROBE

The AOA probe is mounted on the wing with the following limitations:

- The AOA probe is mounted a minimum of **24 in.** outboard of the propeller arc.
- The AOA probe is mounted a minimum of **12 in.** inboard of the wing tip.
- The AOA probe is mounted at least **6 in.** outboard of any struts or landing gear.
- The AOA probe is mounted between **10% to 90%** of the Mean Aerodynamic Cord (**MAC**).
- The AOA probe must **not** be mounted on a wing that contains a remote compass system if heated probe is to be installed for the AOA probe.

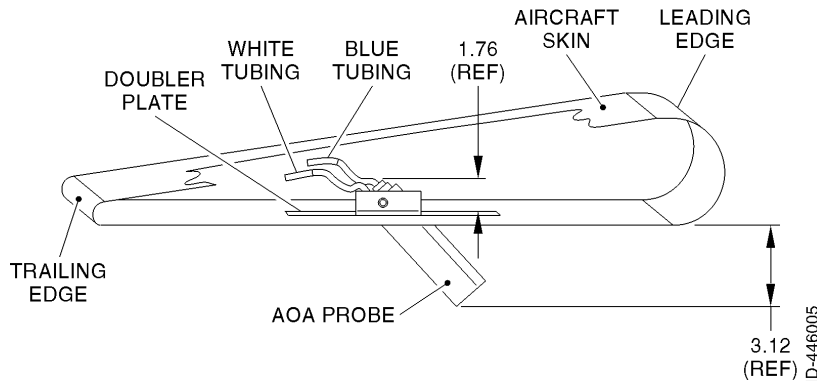


Figure 2-1: AOA Probe in Wing

Due to the number of aircraft, wing designs, inspection locations, braces, struts and so on, the object of the best location is “**clean air flow / undisturbed air**” at the location of the AOA probe for all angles, slips or attitudes, would not affect the measurement of air present at the AOA probe.

Listed below are three different scenarios, find and complete the one that pertains to your installation and use the following formulas when calculating the additional load and drag:

$$(\text{AOA Probe} + \text{Hardware Weight}) \times (\text{Aircraft "G" Limit}) \times 1.5 (\text{Safety Margin}) = \text{Additional Load}$$

Examples:

$$.6\text{lbs} \times 6.6 \times 1.5 = 5.94\text{lbs.}$$

$$(\text{Drag Coefficient}) \times (\text{Frontal Area of the AOA Probe}) \times V_{NE}^2 = \text{Drag in LBS at } V_{NE}$$

$$.000327 \times .064 \times 200^2 = .83712$$

IF a non-structural inspection panel is available, determine that the existing structure will support the additional load and drag of the AOA probe and mounting hardware. Please refer to AC43.13-2B Chapter 1 & Chapter 3 for guidance. This is the preferred method of installing the AOA probe and in most cases will require no additional support structure. However, if you have a very fast and/or a thin skinned aircraft the addition of supporting structure may be required. Please refer to AC43-13-1B Chapter 4, AC43.13-2B Chapter 1 & Chapter 3 for guidance.

IF no inspection panel is available to support the AOA probe, an inspection hole along with a doubler and/or supporting structure may be installed in the wings skin. Please refer to AC43.13-1B Chapter 4, AC43.13-2B Chapter 1 & Chapter 3 for guidance.

2.5 ESTABLISH A PLAN TO ROUTE THE SENSE LINES

The sense lines must be installed through the aircraft structure with the following limitations:

- Do not remove hose end caps until final connector installation. This keeps contamination from entering the sense lines during installation.
- A minimum bend radius of 4" for the lines must be observed.
- Attach the sense lines at regular intervals by means of suitable clamps.
- Do not clamp sense lines at the end fittings.
- Use AN931 Grommets (preferred) or bulkhead fittings where the sense lines pass thru bulkheads.
- Engineering data may be required if installing on a pressurized aircraft.
- Keep the sense lines well clear of any moving controls or cables.

Refer to AC43.13-1B chapter 12 section 4 for instructions on replacing/installing new pitot static lines.

2.6 ESTABLISH A PLAN FOR THE ELECTRICAL POWER:

The KLR 10 requires less than ¼ amp (250 mA) of electrical power within its acceptable voltage range of 10-28 VDC. Our recommendations would be to have the KLR 10 get power from the avionics bus through an on/off switch in series with the positive lead for the control module (this would offer some protection from surges during starts and the on/off switch would enhance operational flexibility).

For additional information please refer to AC43.13-1B Chapter 11, which has a wealth of information on wire, switches, loads, etc., also AC43.13-2B Chapter 2 paragraph 207 is useful.

2.7 OPTIONAL PROBE HEAT INSTALLATION:

The optional heated probe requires 7.8 amps of electrical power at 12 or 24VDC.

Determine the size of wire required from AC43.13-1B Chapter 11 Section 5, (12VDC in free air #14 wire will be adequate for runs up to 20' & for 24VDC in free air #16 wire will be adequate for runs up to 25'). As an added precaution to prevent interference with other aircraft systems use MIL Spec. shielded wire.

Electrical cable/wire must be installed such that the risk of mechanical damage and/or damage caused by fluids, vapors, or sources of heat, is minimized. Route as far away as possible from any instrument, system or wiring that may be effected (i.e. compass/flux gate, antenna or antenna coax).

We recommend that you use a Mil. Spec. DC switch with silver contacts rated for twice the required amperage (i.e. Eaton 8500K9, MS24523-22 SPST switch).

AC43.13-1B Chapter 11 has a wealth of information on wire, switches, loads, etc. also AC43.13-2B Chapter 2 paragraph 207 is useful.

2.8 REVIEW YOUR PLANS

Make sure that your plans meet the requirements of the following regulations:

§23.1301:

(a) Is it of a kind and design appropriate to its intended function?

If you intended to add a KLR 10 and can do it as described above then the answer is yes.

(b) Can it be labeled as to its identification, function?

The indicator meets this identification requirement for the indicator.

However, if you install the optional on/off switch or heated probe then you are required to label the switch(s) and circuit breaker(s) as to their function.

(c) Can it be installed according to limitations specified?

You must meet **all** specified requirements to answer this yes.

If you answered any of the above questions with a “**NO**” then revise your plan until you can answer all the questions with a “**YES**”.

§23.1309: (a)(1) When performing its intended function, will it adversely affect the response, operation or accuracy of any:

- Equipment essential to safe operations?

If the KLR 10 is installed correctly it should not affect any other equipment as it is a standalone system which does not interface with any other equipment, one exception is the optional heated probe which must be looked at very closely.

Other equipment unless there is a means to inform the pilot of the affect?

Same as above, additionally do not utilize a circuit breaker shared with any other piece of equipment for the KLR 10 or the heated probe in an effort to avoid this situation.

Refer to **AC23.1309-1D** section 9, it will help you answer the questions and the flow chart makes it easy to determine if the installation will meet the requirements of §23.1309(a).

If you answered either of these two questions with a “**YES**” then revise your plan until you can answer them both with a “**NO**”.

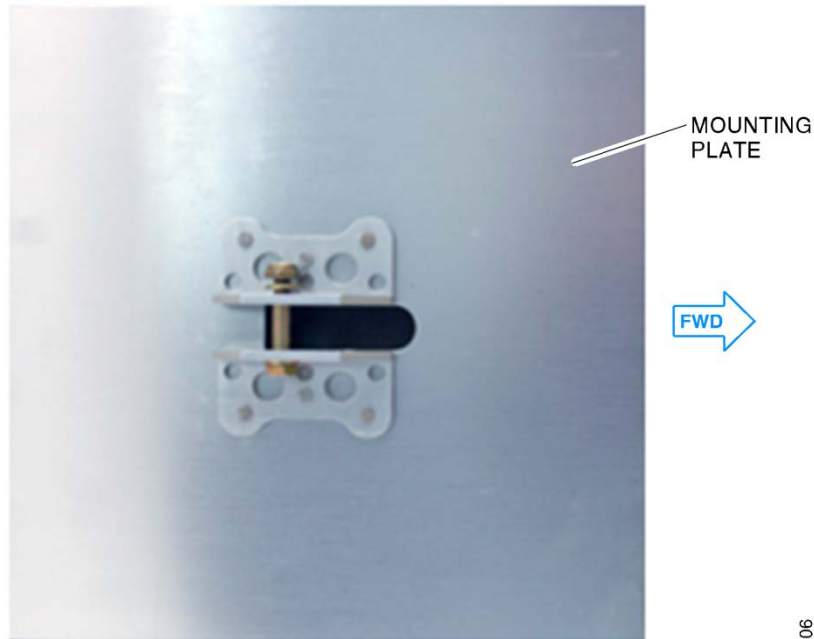
If you made it through all this successfully, you are doing great, and are now ready to install the KLR 10 in your aircraft.

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3. INSTALLATION

3.1 INSTALLATION OF THE PROBE MOUNTING PLATE

- In chapter two the location for the AOA probe was established. If it was determined that additional structure or modification to the wing will be required, perform that work now in accordance with the established plan and or any required engineering data.
- If not already done, remove the inspection panel at the location where the AOA probe will be mounted.
- Modify the AOA probe mounting plate to fit the hole (the panel removed may be used as a template).
- Ensure that the slot in the mounting plate is aligned so that the rounded end of the slot faces forward.



NOTE:
Rounded end of the slot faces forward.

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Figure 3-1: Mounting Plate Alignment

- On a non-structural panel the screw spacing should be no less than 1 screw every 2 to 3 inches along the outside circumference of the mounting plate. If the existing layout is greater add nut plates as required to accomplish the proper screw spacing (on a structural panel the screw spacing would be much closer).
- Drill holes in the mounting plate to match the layout in the wing (Use the inspection panel as a template).
- Install the mounting plate on the wing and check for proper fit. When satisfied remove the mounting plate and prepare the mounting plate for paint.
- Finish mounting plate as desired and set aside to cure.

3.2 INSTALLATION OF THE SENSE LINES

- Gain access to the aircraft so that the sense lines can be installed and routed through the aircraft from the AOA probe location to the IF module location in accordance with the plan established in chapter two.
- Route the sense lines and observe the following requirements:
 - The sense lines have a minimum bend radius of 4 in.
 - Attach sense lines at regular intervals by means of suitable clamps.

- Do not clamp sense lines at the end fittings.
- Use AN931 grommets (preferred) or bulkhead fittings where the sense lines pass thru bulkheads.
- Do not remove the caps installed on either ends of the sense lines and leave sufficient length so they may be cut to length later in the installation process.

CAUTION:

Keep the sense lines well clear of any moving controls or cables.

3.3 INSTALL WIRING, SWITCH & CIRCUIT BREAKER FOR KLR 10

NOTE: *It may be advantageous to perform the steps found in **Section 4.4** at the same time the following work is performed if the optional heated probe is to be installed.*

In chapter three a plan was established so that the requirements for supplying power to the KLR 10 were satisfied, in accordance with that plan:

- Ensure that the aircraft electrical system is **NOT** powered and the aircraft battery is disconnected.
- Install the circuit breaker. Mount in a manner accessible to a crewmember during flight for circuit breaker resetting.
- Identify and label the circuit breaker.
- Optional, install the “**on/off**” switch so it is accessible to appropriate crewmembers.
- If installed, label the switch as to its operation.
- When running the wiring, observe the following:
 - Keep wires well clear of any moving controls or cables.
 - Physically separate electrical wire from lines or equipment containing oil, fuel, hydraulic fluid, alcohol or oxygen.
 - Route wires above flammable fluid lines and securely clamp to structure, ***in no case may a wire be clamped to line containing flammable fluids.***
- Route the appropriately sized wire from the source of power identified in chapter 3 to the input side of the circuit breaker.
- Route a wire from the output side of the circuit breaker to the “on/off” switch, if installed.
- Route the power (+) wire (White with no Stripe) on the unterminated end of the Power Cable from the IF module location to the power switch, if installed. Otherwise route the White wire to the output side of the circuit breaker.
- Route the ground (-) wire (White wire with Blue Stripe) on the unterminated end of the Power Cable from the IF module location to an adequate ground connection.

NOTE: *Make sure enough slack is left in the Power Cable for the Power Cable Connector to be installed on the IF module later in the installation procedure.*

- If additional wire was used ensure the wire is identified / labeled.
- Attach the shielding together at a break in the wire (i.e. at the switch) and ensure it is insulated so as to prevent contact with any other conductor.
- Do not connect the shield to ground as it is grounded at the connector, doing so would cause a ground loop.
- Recheck the wiring from the Power Connector from the IF module for proper polarity, **(+)** White wire, **(-)** White with **Blue Stripe** (Ground).
- Route the wiring from the Auxiliary I/O Connector to the audio panel/intercom/radio in the aircraft. Refer to the Audio Manufacturer Install guide. Table 5-2: Auxiliary I/O Connector on page 5-2 shows the pin-outs for the Auxiliary I/O Connector.

3.4 INSTALL WIRING, SWITCH & CIRCUIT BREAKER FOR PROBE HEAT

NOTE: *This section may be skipped if the optional AOA heated probe is not to be installed.*

In chapter two a plan was established so that the requirements for installing the heated probe were satisfied, in accordance with that plan:

- If not already done, ensure that the aircraft electrical system is **NOT** powered and the aircraft battery is disconnected.
- Install the circuit breaker. Mount in a manner accessible to a crewmember during flight for circuit breaker resetting.
- Identify and label the circuit breaker.
- Install the switch so it is accessible to appropriate crewmembers.
- Label the switch as to its operation.
- Label the wire so it may be identified once installed.
- Install the wire from the circuit breaker through the switch to the AOA probe location and to a suitable ground observing the following:
 - Physically separate electrical wire from any lines or equipment containing oil, fuel, hydraulic fluid, alcohol or oxygen.
 - Route wires above any flammable fluid lines and securely clamp to structure, ***in no case may a wire be clamped to line containing flammable fluids.***
 - Route as far away as possible from any instrument, system or wiring that may be effected (i.e. compass/flux gate, antenna or antenna coax).
 - Leave sufficient wire at the AOA probe location so it may be cut to length and connected to the AOA probe later in the installation process.

Attach the shielding to a suitable ground on one end of the wire only. This will prevent a ground loop. Attach the shielding together at a break in the main conductor (i.e. at the switch connections) and ensure it is insulated so as to prevent contact with any other conductor.

3.5 INSTALL THE KLR 10 SWIVEL MOUNT (OPTIONAL)

The “KLR 10” Indicator can be mounted in the pilot’s peripheral vision, vertically by purchasing the optional mounting kit. This mounting kit allows for accurate positioning in a vertical orientation, on or above the aircrafts glare shield and mounts simply with 4 screws. The surface mount swivel can also be mounted on a windshield frame.

Glareshield Mounting Instructions

The swivel mount requires 1-¼” clearance below glare shield.

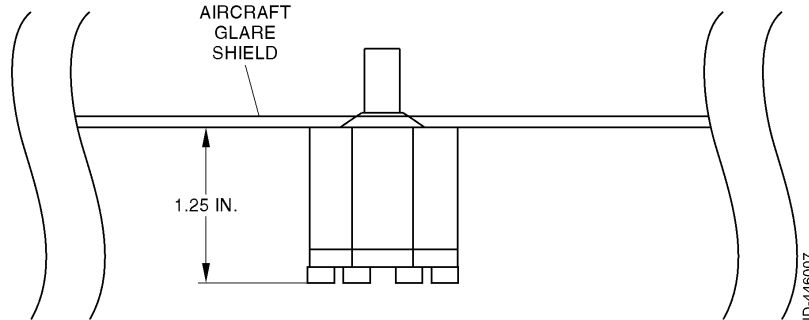


Figure 3-2: Swivel Mount on Glareshield

A drill guide disk with 5 holes is included with the swivel mount kit.

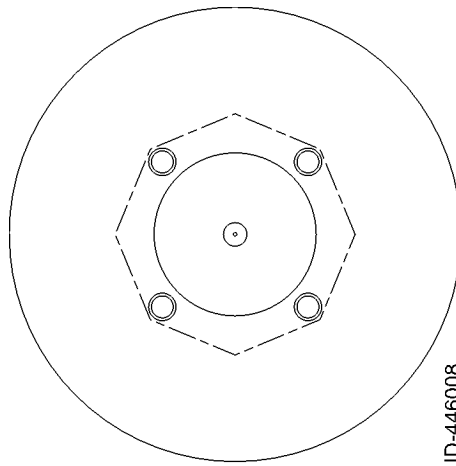


Figure 3-3: Swivel Mount Template

Step 1 - Orient drill guide in location where swivel will mount. Using a #40 drill:

- Drill a hole thru the existing hole in the drill guide disk and thru the glareshield,
- Cleco through the hole.
- Spin the drill guide disk to the final location.

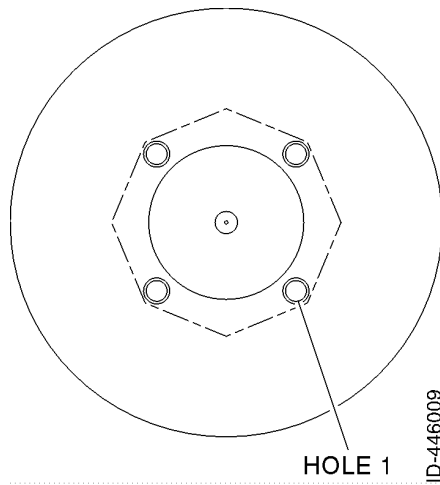


Figure 3-4: Swivel Mount Instructions - Step 1

Step 2 - When disk is in the final position, use a #40 drill to:

- Drill hole 2 and cleco thru hole 2.
- Drill hole 3 and cleco thru hole 3.
- Drill holes 4 and 5.

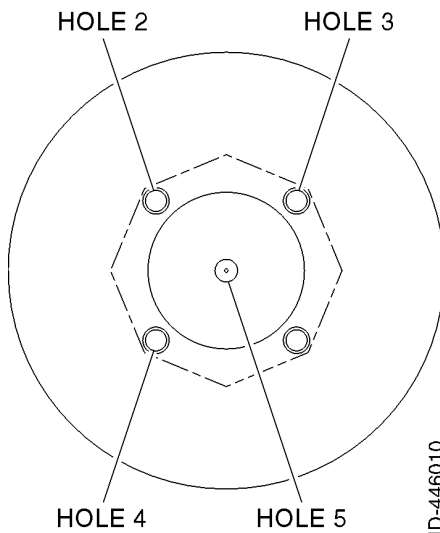


Figure 3-5: Swivel Mount Instructions - Step 2

Step 3 - Drill hole 5 to a diameter of .720: for clearance of the swivel base.

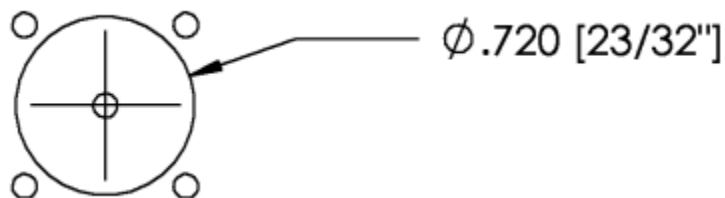


Figure 3-6: Swivel Mount Instructions - Step 3

Step 4 - Re-drill 4 outer holes with a # 32 drill bit (.116") to provide clearance for the 4-40 mounting screws.

Step 5 - Mount the swivel base to the glareshield using the provided 4-40 mounting screws and nuts.

3.6 INSTALLATION OF THE KLR 10 INDICATOR

- In chapter two the location for the KLR 10 indicator was established. If it was determined that additional structure or modification to the instrument panel will be required, perform that work now in accordance with the established plan and or any required engineering data.
- Install the KLR 10 indicator and check for fit and clearances.
 - The KLR 10 indicator may be mounted using any two of the six threaded (6x32) mounting holes. If utilizing side holes the screw cannot be any longer than ¼ in. plus the mounting panel thickness. If utilizing the rear holes the screws can be no longer than ¼ in. plus the mounting panel thickness. The angles provided with the mounting kit are provided to aid in mounting the KLR 10 indicator in the instrument panel and their use is not mandatory.
 - The KLR 10 indicator was designed to be mounted in a Vertical orientation.
 - The KLR 10 indicator can be mounted above the glare shield with the vertical flush mount swivel kit. This kit allows the KLR 10 indicator to be mounted and positioned so that the KLR 10 indicator is up as high in the cockpit as possible, allowing viewing of the KLR 10 without looking down to the instrument panel.
- Route the cable from the KLR 10 indicator to the IF module location, observing the following:
 - Keep wires well clear of any moving controls or cables.
 - Physically separate electrical wire from lines or equipment containing oil, fuel, hydraulic fluid, alcohol or oxygen.
 - Mount electrical wire bundles above flammable fluid lines and securely clamp to structure, ***in no case may a wire be clamped to line containing flammable fluids.***

3.7 INSTALLATION OF THE IF MODULE

- In chapter two, the location for the IF module was established. If it was determined that additional structure or modification will be required, perform that work now in accordance with the established plan and or any required engineering data.
- Attach the IF module to the airframe utilizing the four slots on the attached mounting base plate. The IF module must be grounded for shielding. If the module is not grounded by the mounting hardware install a grounding strap from one of the mounting screws to a suitable ground.
- Cut the KLR 10 sense lines (at a 90° angle, **NO burrs**) to length and insert the sense lines firmly in the connectors, observe the color coding, **BLUE / FRONT connector TO blue sense line AND WHITE / BOTTOM connector TO white sense line**. When correctly installed, the sense lines will be inserted approximately 3/8 in. into the connectors. **Push the sense line into connector until it stops.**
- Ensure the sense line is installed correctly by giving the tubing a light pull, if the tubing does not back out, it is a good connection.
- If you ever need to disconnect the sense lines; **depress the black collar** (the furthest outboard portion of the connector) on the fitting and pull the sense line out. **See help sheet included with manual.**

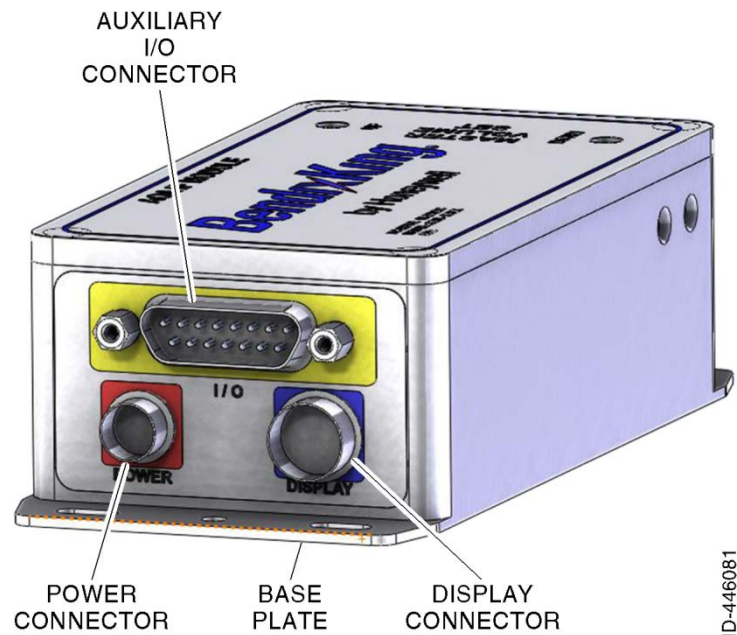


Figure 3-7: KLR 10 Interface Module Electrical Connectors

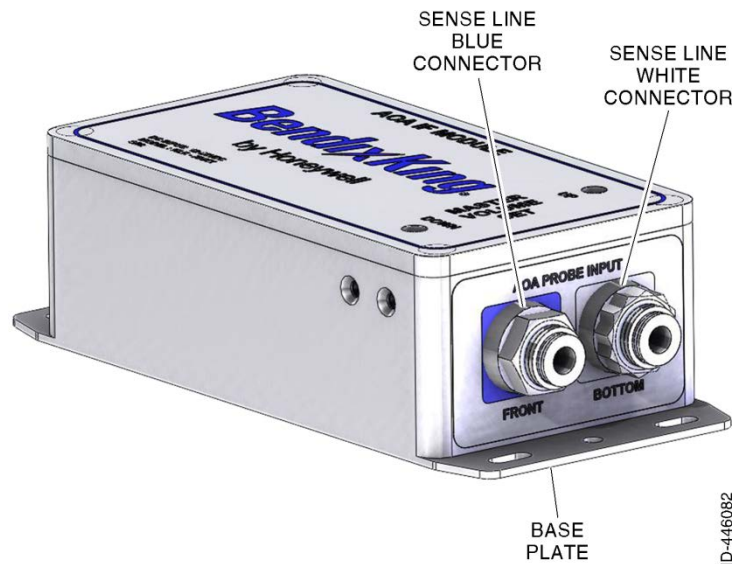


Figure 3-8: KLR 10 Interface Module Sense Line Connectors

- Connect the display cable connector (10 Pin) to the IF module connector, they are both color coded **BLUE**. This may be accomplished by holding the cable connector by its black strain relief and rotate it on the display connector until the alignment keyways mate up then push towards the control module and the retaining collar will snap into place tightly against the IF module. **Verify connector is seated completely by pulling lightly on wire and connector stays on IF module.**
- Connect the power cable connector (4 pin) to the IF module connector; the connector label and the power cable are both color coded **RED**. This may be accomplished by holding the cable connector by its black strain relief and rotate it on the case power connector until the alignment keyways mate up, then push towards the IF module and the retaining collar will snap into place tightly against the IF module. **Verify connector is seated completely by pulling lightly on wire and connector stays on IF module.**
- To remove either of the electrical connectors grip the collar and pull away from the IF module, slide the connector off.

3.8 INSTALLATION OF AOA PROBE

(Optional), if installing a heated probe, it will come from the factory installed with high temperature fittings and colored (Blue / White) high temperature hoses with the heater in AOA probe.

Install the AOA probe in the mounting plate and secure it as follows:

- Locate the 50° index hole on the AOA probe using the following figure.

NOTE: Refer to Appendix section 5.3 AOA Probe Angles on page 5-3 for more information on the probe lock plate.

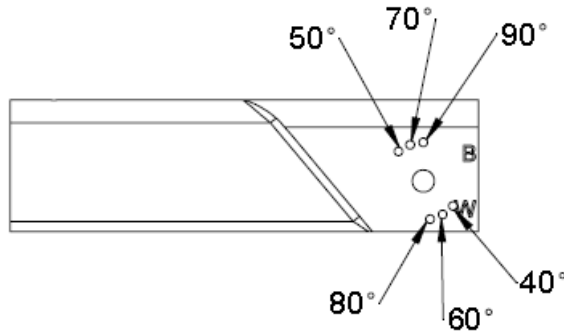


Figure 3-9: AOA Probe Pin Positions- Left Side

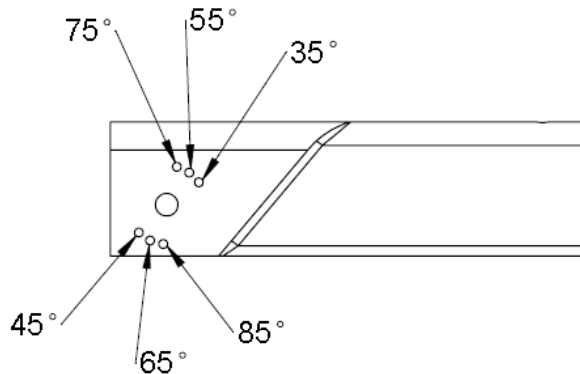


Figure 3-10: AOA Probe Pin Positions- Right Side

- Insert the AN4 bolt through the probe lock plate. Make sure that the two pins on the probe lock plate face the thread side of the bolt.
- Insert the AOA probe through the mounting bracket and line up the bolt hole in the AOA probe with the bolt hole in the mounting bracket.
- Insert the AN 4 bolt and probe lock plate loosely through the AOA mounting bracket and AOA probe from the left side (looking at AOA probe from rear).
- Line up the 50° index hole on the AOA probe with the front hole in the mounting bracket and insert the longer pin on the probe lock plate through the front hole on the mounting bracket and into the 50° hole on the AOA probe. The probe lock plate location should match the following figure.

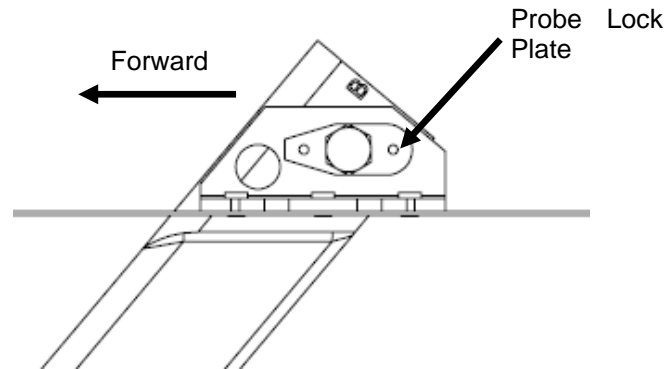


Figure 3-11: Correct position of Probe lock plate

NOTE: The probe lock plate can face forwards or backwards and can be placed on either the left or right side of the AOA probe depending on which pin hole is selected on the AOA probe.

- It may be necessary to remove material from the mounting plate that would prevent the AOA probe from being installed at the proper angle. If the 50° (or less) angle of the AOA probe interferes with the plate or in the final calibration steps, the AOA probe needs to be at a tighter angle, remove material from the mounting plate only as required to allow enough range of motion for accurate calibration.

CAUTION:

Drilling out the probe is not needed and will nullify the warranty.

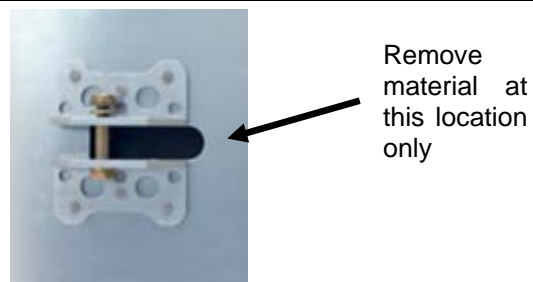


Figure 3-12: Enlarging Mounting Plate Hole

- Install the washer and nut onto the AN4 bolt and tighten it so the AOA probe will not move in flight.
- Use the included protractor to confirm that the AOA probe is at an initial 50° angle. If not, loosen the nut enough that the probe lock plate can be backed out of the mounting bracket enough to rotate the AOA probe until the correct hole is lined up, then reinsert probe lock plate and retighten bolt and nut.
- **Optional**, cut the electrical wires for the AOA heated probe to length and connect them to the heater, **polarity is not an issue**, connect power to one lead and ground the other. Attach the shielding to a suitable ground on one end of the wire only; this will prevent a ground loop.
- Cut the sense lines (at a 90° angle, **verify NO burrs**) to length so they may be easily attached to the AOA probe but short enough so they will not kink when the mounting plate is secured to the wing. Allow enough hose to re-position the AOA probe angle for final adjustments.
- Insert the lines firmly in the connectors, observe the 2 letters (**B & W**) on the side of the AOA probe, **“B” (for Blue, Front Hole) TO BLUE LINE** and **“W” (for White, Bottom Hole) TO WHITE LINE**. When correctly installed, the line is inserted approximately 3/8 in. into the connector. Push hose in firmly until a positive stop is felt.

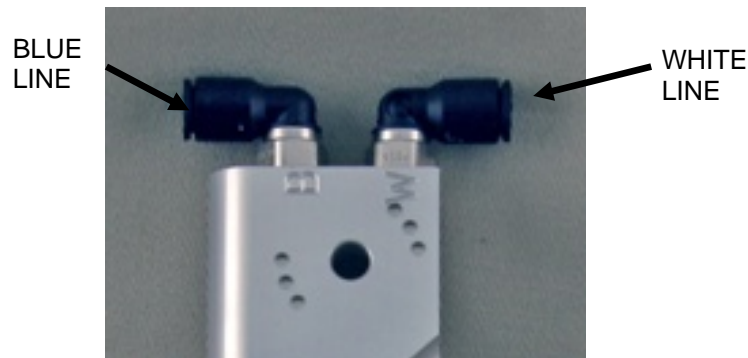


Figure 3-13: AOA Probe Connectors

- Ensure the lines are installed correctly by giving the line a light pull and if the line does not back out it is a good connection. If you ever need to disconnect the lines depress the black collar (the furthest outboard portion of the connector) on the fitting and pull the line out.

Slowly slide the AOA probe and mounting plate into position ensuring that everything will fit properly and not kink or bind. When satisfied, secure the mounting plate to the wing and tighten all screws.

3.9 INSPECT THE KLR 10 INSTALLATION

- Inspect in the areas that were opened to install the KLR 10 sufficiently so you can determine that the installation was done correctly and no discrepancies are left unresolved.
- Connect the aircraft battery.
- Close any open circuit breakers for the KLR 10 and the heated probe (if installed).
- Power up the aircraft electrical system.
- If a separate power switch for the KLR 10 is installed, power up the KLR 10.
- Disregard any KLR 10 indications at this time.
- All segments on the KLR 10 indicator will be flashing; this indicates all calibrations need to be made **BEFORE** the KLR 10 is functional.
- Re-inspect the areas that were opened to install the KLR 10, paying particular attention to the electrical part of the installation, determine that there are no unresolved issues with the electrical part of the installation.
- If heated probe is installed, check the operation of the heated probe with the probe heat switch in the “ON” and “OFF” position. Ensure that the compass or other systems are **NOT** affected by the heated probe. When finished, place the probe heat switch in the “OFF” position.

CAUTION - BURN HAZARD:

When checking the AOA heated probe, DO NOT TOUCH THE AOA PROBE! Use a thermometer or place your hand above the probe to feel the radiated heat. Leaving the heated probe on for extended periods, while on the ground, will shorten its service life.

- If a separate power switch for the KLR 10 is installed, remove power from the KLR 10.
- Power off the aircraft electrical system.
- Close the aircraft up by installing any access panels or equipment that was removed to install the KLR 10.

4. SETUP AND CALIBRATION

The initial setup and calibration of the KLR 10 has 7 simple steps:

1. On ground **Zero Pressure** calibration, see page 4-1.
2. Set initial **Brightness** calibration of the KLR 10 Indicator, see page 4-2.
3. On ground Setup and In-Flight Calibration Overview, see page 4-3.
4. In-flight Optimum Alpha Angle (**OAA**) set point calibration, see page 4-5.
5. In-flight **Cruise** set point calibration, see page 4-6.
6. In-flight Exiting the Calibration Mode, see page 4-7.
7. On ground Completion of the Calibration, see page 4-8.

Included in this manual are detailed definitions for each step to assist the pilot for easy step by step calibration.

It is highly recommended, to make calibration easier and safer, that the pilot flies the aircraft while a second person follows the calibration procedure and enters the appropriate set points for the instrument. **At ALL times**, the Pilot-in-Command must fly the aircraft in a safe manner at altitude while maneuvering the aircraft in slow flight.

4.1 ON THE GROUND ZERO PRESSURE CALIBRATION:

Ground **Zero Pressure** calibration must be done in a “zero pressure condition”, preferably in a calm environment such as a hanger or no wind environment.

To set the Ground **Zero Pressure** calibration point, do the steps that follow:

Ensure that power is not applied to the KLR 10.

Hold down the calibration set push button using a pencil or other small blunt pointer.



Apply power to the KLR 10 while continuing to hold down the calibration set push button.

If the **Zero Pressure** calibration point is accepted, the unit announces “**Initial Zero Calibration Set**”.

If the **Zero Pressure** calibration point is not accepted, the KLR 10 indicator flashes on and off continuously, and the unit announces “**Invalid Set-Point**”. Remove power and do steps 1-5 again until the **Zero Pressure** calibration point is accepted.

CAUTION

The KLR 10 is not functional at this time as the two in-flight calibration points must still be set.

Failure to Complete Zero Pressure Ground Calibration

If the KLR 10 continues to annunciate “Invalid Set-Point”, the **Zero Pressure** value from the sensor is too high. This indicates something is wrong electrically or mechanically with the system, or something in the environment affects the system. The system will flag the bad zero offset and continue to repeat the “Invalid Set Point” annunciation, even if the system is powered off and on, until an acceptable **Zero Pressure** set point has been detected by repeating the above procedure.

To isolate the failure between mechanical or electrical problems, the air hoses should be disconnected from the IF module and the above operation repeated.

If the condition persists, then the failure is electrical and the IF module should be returned for an authorized repair.

If the setting is successful, then the failure is mechanical such as a blockage in the air hoses, etc. Once the mechanical failure is fixed, the above operation should be repeated.

NOTE: *This is a Power-On Procedure.*

For calibration, the system samples power and outputs to gain accuracy. Blue segments on the KLR 10 indicator may flash several times before the electronics stabilize and stop flashing for an acceptable / valid zero pressure point. This is normal.

Before the unit becomes functional, the operator must calibrate the 2 in-flight set points, (OAA, Cruise) of the system.

NOTE 1: *It is not necessary to do the ground calibration once a successful value was entered.*

NOTE 2: *If the KLR 10 unit is put into Calibration Mode, the operator must complete the **ENTIRE** calibration process, as the system deletes the previous values: both valid **OAA** and **Cruise** set points, (aircraft must be flown, set points entered), then exiting calibration mode, storing the new values and putting the unit in operational mode.*

4.2 SET BRIGHTNESS OF THE KLR 10 INDICATOR (OPTIONAL)

Since the colored segments will only be active when differential pressure is present, (in-flight), Bendix/King has created a way to force ALL colored segments **ON** for calibration purposes allowing the installer to preset both the daytime and nighttime display brightness levels while on the ground.

Enter the Brightness calibration mode as follows:

Ensure that power is not applied to the KLR 10.

Depress and hold the **Brightness button** on the KLR 10 indicator then apply power to the KLR 10.

Continue to depress the **Brightness button** for about 6 seconds after power has been applied.

Release the Brightness button.

The system enters its self test causing the colored segment illumination routine. All segments are illuminated one by one upwards and then one by one downwards ending with all the segments being illuminated.

The system is now in Brightness calibration mode.

With a light applied directly to the photo diode on the KLR 10 indicator for at least 5 seconds, press and release the **Brightness button** until the display is at its maximum brightness.

You'll know when it's max because going past it will cause the brightness of the colored segments to return to the minimum level. There are 16 brightness steps that are sequenced through, increasing brightness at each step.

Wait 5 seconds for the unit to store the setting then remove the light from the KLR 10 indicator.

The display's brightness will change to the lower brightness level unless the low light setting was set to maximum brightness or the cockpit is in daylight.

Next, cover the photo diode on the display for at least 5 seconds with your thumb or a piece of black electrical tape, quickly press and release the **Brightness button** on the KLR 10 indicator until it's at a minimum or lowest level.

Wait 5 seconds for the unit to store the setting than remove your thumb or tape.

Observe that the display's brightness level changes from dim to bright when light is applied and removed from the photo diode.

Remove power, wait a few seconds and re-apply power.

The system will enter its self test, display illumination routine in which all colored segments are illuminated one by one upwards and then one by one downwards. The system enters the active mode if calibration has been completed or the in-active display mode, needing **OAA** and **Cruise** calibration.

4.3 MASTER VOLUME SET

The master volume for the KLR 10 is controlled from the IF Module.

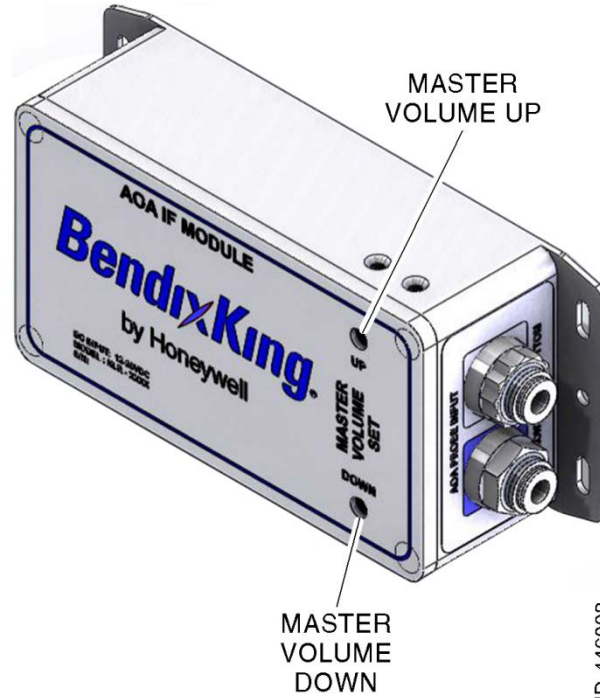


Figure 4-1: Master Volume Controls

Push the UP recessed button on the IF Module to increase the master volume to your audio panel/intercom/radio.

Push the DOWN recessed button on the IF Module to decrease the master volume to your audio/intercom/radio.

Use the master volume set controls in combination with your audio panel/intercom/radio system to give an audible and clear annunciation in your headphones from the AOA system during normal flight.

4.4 IN-FLIGHT CALIBRATION OVERVIEW

The calibration flight(s) may be conducted under §91.407 by at least a private pilot that is rated to fly the aircraft. The adjustment and tightening of the AOA probe may be accomplished by a mechanic, a person that holds a repairman's certificate for that specific aircraft or the aircraft owner if he/she holds at least a private pilot certificate under part §43.3(g) and Appendix "A" to Part §43 item (c)(26).

This procedure may be done as a single pilot operation; however, it does require your attention to be diverted away from flying the airplane. In the interest of safety we strongly recommend that you solicit the aid of someone that can perform the calibration procedure while you fly the airplane or vice versa.

- Use the following outline as a guide to complete the in flight calibration:
- Review the aircraft records; ensure that the return to service entry has been made.
- Plan a flight to an area where slow flight can be performed without any undue hazards (reference § 91.303 & § 91.305).
- Review the stall recovery and minimum controllable flight procedures for your aircraft. If an inadvertent stall occurs, immediately recover from the stall using per your training and the aircraft manufacturers instructions. At no time is a stall required to correctly calibrate or operate the KLR 10.
- Acquaint yourself with the KLR 10 indicator and its controls.

NOTE: The OOA set point calibration and the Cruise set point calibration can be practiced on the ground.

NOTE: While KLR 10 in-flight calibration can be accomplished by a solo pilot, it is advisable that the pilot flying focuses on safely and correctly achieving the calibration set points while a second person assists in performing the indicator calibration.

- Preflight and operate the aircraft as you would normally.
- When in an area where slow flight can be performed, perform clearing turns to ensure the area is clear.

NOTE: *Make sure the winds are calm with little or no turbulence to allow an accurate calibration.*

- Follow the aircraft procedures and slow the aircraft, in the clean configuration, to minimum controllable flight.
- Maintain coordination.
- Maintain altitude with the pitch (use pitch trim to relieve back pressure).
- Use power as needed to maintain flight just above a stall (stall warning not continuously activated and not feeling stall buffets).
- Perform step 4.5 In-Flight Optimum Alpha Angle (OAA) calibration on page 4-5.
- Perform step 4.6 In-Flight Cruise Set Point Calibration on page 4-6.
- Recover from slow flight.
- Accelerate to normal cruise in level flight, we recommend a power setting for long range cruise.
- Return to the airport and shut down the aircraft.
- Perform the step 4.7 Exiting the Calibration Mode on page 4-7.

NOTE: *If the KLR 10 indicator indicates a "Bad Set Point", return to the airport and have the necessary angle adjustments made to the AOA probe. When the AOA probe angle adjustments have been made, perform the **entire in-flight calibration procedure** outlined in this section until you are successful.*

CAUTION

DO NOT ALLOW ANY AOA PROBE ANGLE ADJUSTMENTS TO BE MADE WITH THE ENGINE RUNNING.

4.5 IN-FLIGHT OPTIMUM ALPHA ANGLE (OAA) CALIBRATION




- Enter the OAA Calibration Mode as follows:

Turn the Calibration Mode Switch so that the slot is vertical.



- Press the Brightness button.





- The  segment on the KLR 10 indicator flashes three times, and the unit announces “**Calibration Mode On**”.
 - The KLR 10 is now in the **OAA** set-point calibration mode.
- While in calibration mode, the  segment on the KLR 10 indicator flashes twice every five to six seconds.
 - The pilot flies the aircraft to the AOA Configuration of Optimum Alpha Angle (OAA) as follows:
 - Aircraft is at a safe altitude for slow flight maneuvers.
 - Minimum safe airspeed (approximately 1.3 V_{so}), lower power setting, (such as a down wind or landing pattern power setting).
 - Able to hold altitude, as close to 0 vertical speed as possible (small climb OK), **not descending / 0 sink**.
 - Full aileron, elevator and rudder control,
 - Identify the **OAA** set point by pitching back slowly until no longer able to climb, but holding altitude with full control of the airplane, **not exhibiting any buffet or loss of control surface stability**. The pilot is to fly the aircraft at **OAA**, calibrating the KLR 10 indicator to correlate the  segment to indicate the aircraft’s Angle of Attack (AOA) for minimum maneuvering (**OAA**).
 - To enter an OAA Set Point, press and release the calibration set push button, using a pencil or other small blunt pointer, on the KLR 10 indicator when the aircraft is flown at **OAA**.



NOTE: This operation can be repeated as many times as desired at this point to continuously attempt a new Optimum Alpha Angle Set Point, as long as the system is in the Optimum Alpha Angle (OAA) Calibration Mode. If the set point is valid, the KLR 10 indicator remains operational.



- If the Set Point is successfully entered:
 - The KLR 10 indicator saves the new set point and the display remains operational and announces “**Optimum Alpha Calibration Set**”.
 - This set point must be verified by the pilot to identify correlation for the Optimum Alpha Angle (**OAA**) of his or her airplane to the display at the **OAA** flight dynamic of the aircraft.
 - The set point is lost if power is turned off before completing the **ENTIRE** calibration procedure.
 - Skip to section 4.6 In-Flight Cruise Set Point Calibration.

- If the Set Point is NOT Successfully entered:
 - The KLR 10 indicator returns to an inactive state, discards the attempted set point (Values out of range).
 - AND

- If the AOA probe angle is too low, the KLR 10 indicator's  flashes three times and announces "**Invalid Set Point**". If a valid Set Point cannot be set, terminate the calibration procedure and after landing, increase the AOA probe angle by 5 degrees (next higher increment) and redo the in-flight calibration procedure (refer to section 5.3AOA Probe Angles on page 5-3 for more information on how to set the probe angle). Repeat the In-Flight OAA Set Point procedure until a valid Set Point is entered.
- If the AOA probe angle is too high, the KLR 10 indicator's  flashes three times and announces "**Invalid Set Point**". Repeat the In-Flight OAA Set Point procedure until a valid Set Point is entered. If a valid Set Point cannot be set, terminate the calibration procedure and after landing, reduce the AOA probe angle by 5 degrees (next lower increment) and redo the in-flight calibration procedure (refer to section 5.3AOA Probe Angles on page 5-3 for more information on how to set the probe angle).


4.6 IN-FLIGHT CRUISE SET POINT CALIBRATION

The **OAA** set point must be entered successfully before calibration of the Cruise Set Point.

- After the OAA set point is set successfully, do not adjust the Calibration Mode Switch.
- Press the brightness button to enter the Cruise Set Point calibration mode. The KLR 10 indicator flashes the "" segment three times. There is no audio announcement.
- The system is now in the **Cruise Set Point (Cruise)** calibration mode. As long as the unit is at this point in the calibration routine, the KLR 10 flashes the "" segment on the display twice every five to six seconds.
 - Fly the aircraft at a safe altitude.
 - Increase power to a cruise power setting.
 - Allow aircraft to level off, Cruise attitude, holding altitude.
 - Press and release the calibration set push button, using a pencil or other small blunt pointer, on the KLR 10 indicator when the aircraft is flown at **Cruise**.



NOTE: This operation can be repeated as many times as desired at this point to continuously attempt a new Cruise Set Point, as long as the system is in the Cruise Set Point (Cruise) Calibration Mode. The display remains operational for both invalid and valid set points at this point.

- If the Setting is Successful:
 - The KLR 10 indicator saves the new **Cruise** set point in the system, illuminating the  segment and announces "**Cruise Alpha Calibration Set**".
 - Skip to 4.7Exiting the Calibration Mode on page 4-7.
- If the Setting is **NOT** Successful:
 - The KLR 10 indicator returns to an operational state, discards the attempted set point.
 - (Values out of range).

AND

- The KLR 10 indicator's " " segment flashes three times and announces "**Invalid Set Point**". Repeat the In-Flight Cruise Set Point procedure until a valid Set Point is entered.

!NEXT STEP MUST BE COMPLETED!

4.7 EXITING THE CALIBRATION MODE

NOTE 1: Both **OAA** and **Cruise** set points **must** be entered and **must** be **valid values** before exiting from the calibration mode. The values must be stored before the system can be used.

NOTE 2: If power is removed before completing the **ENTIRE** calibration process, all previous in-flight values are lost and the in-flight calibration procedures must be re-done.

- To exit and store the set points (OAA and Cruise) to memory, turn the calibration mode switch so that the slot is horizontal.



- Press the brightness mode push button.



- If the saved set points (OAA and Cruise) are valid, the KLR 10 indicator announces "**Calibration Mode Off**". The calibration of the set points is complete.

If the saved set points (OAA and Cruise) are invalid, or the calibration procedure is not completed, the KLR 10 indicator announces "Calibration Fail" and the calibration must be repeated.

- If the saved set points (OAA and Cruise) are valid, the calibration of the set points is complete. The linear range of AOA / Lift for your aircraft is represented by the colored segments illuminated on the KLR 10 indicator. The colored segments instantaneously and repeatedly display the amount of AOA / available lift.
- Return to the airport and shut down the aircraft.







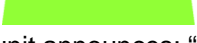

4.8 COMPLETING THE CALIBRATION:

- Confirm the angle of the AOA probe and write it down.
- Remove the probe assembly from the aircraft.
- Tighten the AOA probe mounting bolt to 60 ± 10 inch pounds.
- Add a set screw to probe mounting plate and tighten to 30 inch pounds.
- Reinstall probe assembly.
- Ensure the AOA probe has not moved and will not move.

CAUTION:
DO NOT OVERSTRESS THE STRUCTURE.

- Re-check the probe angle to ensure it has not moved.
- Refer to chapter two and make the necessary logbook entry(s).
- Verify in-flight set points **OAA** and **Cruise** compare to previous segment indications.

Table 4-1: Indications and Annunciations During Calibration

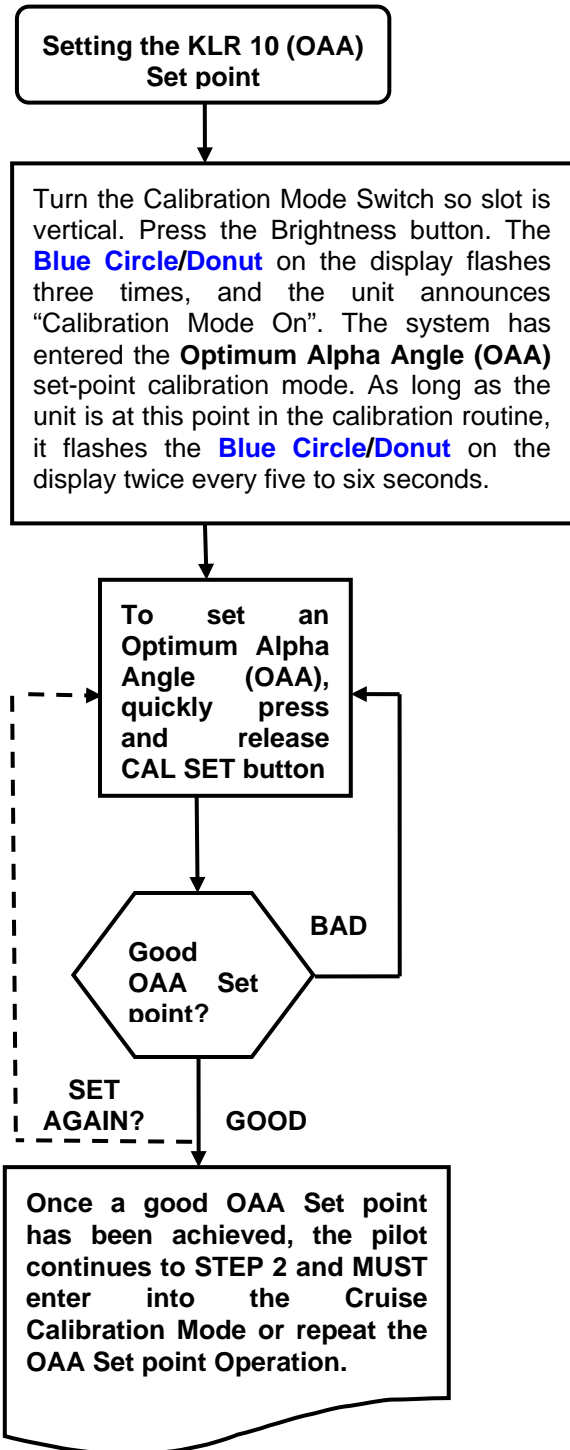
INDICATION/ANNOUNCEMENT	MEANING
All Segments flash continuously and unit announces: "Invalid Set Point" .	The system's Zero Offset set point is <u>NOT</u> accepted.
The unit announces: "Initial Zero Calibration Set" .	The system's Zero Offset set point is accepted.
The  segment flashes 3 times and unit announces: "Calibration Mode On" .	The (OAA) Optimum Alpha Angle must be calibrated.
The  segment flashes 2 times every five to six seconds.	The unit is in (OAA) Optimum Alpha Angle calibration mode.
The  segment flash simultaneously 3 times and unit announces: "Invalid Set Point" .	The attempted (OAA) Optimum Alpha Angle input was NOT valid. The AOA probe angle is too low.
The  segment flashes simultaneously 3 times and unit announces: "Invalid Set Point" .	The attempted (OAA) Optimum Alpha Angle input was NOT valid. The AOA probe angle is too high.
Display becomes operational and unit announces: "Optimum Alpha Calibration Set" .	The attempted (OAA) Optimum Alpha Angle input was valid.
The  segment flashes 3 times and unit makes no announcement.	The Cruise Set Point must be calibrated.
The  segment flashes 2 times every five to six seconds.	The unit is in Cruise Set Point calibration mode.
The  segment flashes 3 times and unit announces: "Invalid Set Point" .	The attempted Cruise Set Point input was NOT valid.
The  segment is displayed and unit announces: "Cruise Alpha Calibration Set" .	The attempted Cruise Set Point input was valid.
The unit announces: "Calibration Fail".	One of the set-points (OAA or CRUISE) was invalid, or the calibration procedure was not complete.
The unit announces: "Calibration Mode Off" .	The set-points (OAA and CRUISE) were calibrated successfully.

NOTE 1: If the power is turned **OFF** during the **OAA** or **Cruise** Set Point procedures, the pilot must enter the **Calibration mode** again and start over with **OAA** calibration then re-enter **Cruise set point** calibration value.

NOTE 2: It is not necessary repeat the (on the ground) **Zero offset** calibration once a successful value was accepted.

The next two pages show an abbreviated flow chart of the calibration procedure.

STEP 1
OPTIMUM ALPHA ANGLE
(IN- FLIGHT CALIBRATION)



Note 1 The **BLUE DONUT** flashes 2 times every five to six seconds to indicate the unit is in (OAA) Optimum Alpha Angle calibration mode. The system will remain at (OAA) Set Point Mode until a valid value has been entered.

- In-Flight calibration requires the pilot to climb to a safe altitude for slow flight maneuvers. The pilot will fly the aircraft to the condition of Optimum Alpha Angle (OAA): Aircraft is at the **Optimum Alpha Angle (OAA)**, when:
1. Aircraft is at a safe altitude for slow flight maneuvers.
 2. Minimum controllable flight, lower power setting, (such as a down wind or landing pattern power setting).
 3. Able to hold altitude, 0 Vertical Speed, **not descending, zero sink (5 to 10 fpm climb OK if your aircraft loses flight control stability at 0 VS)**.
 4. Full aileron, elevator and rudder control, **not in a buffet**, pilot to identify the set point by pitching back slowly to a pitch no longer able to climb but able to hold altitude with full control of the airplane.

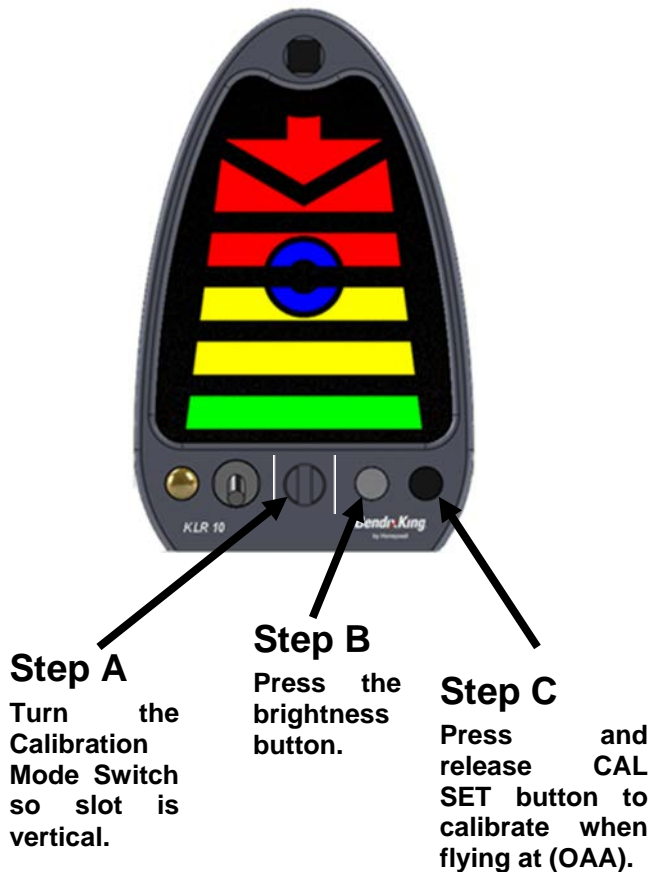
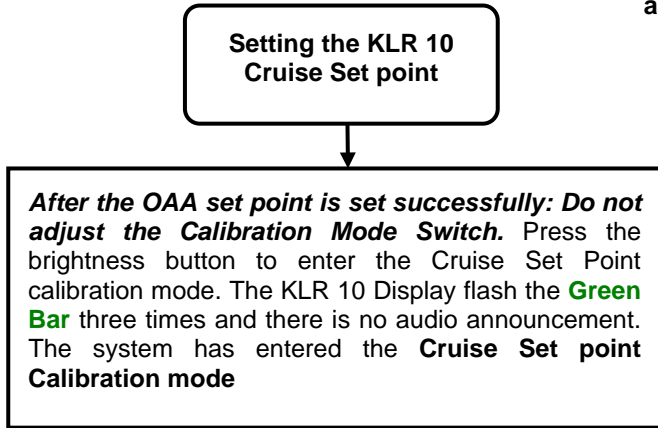


Figure 4-2: OAA Setpoint Flowchart

Step 2
CRUISE SETPOINT
(IN- FLIGHT CALIBRATION)

The pilot must fly the aircraft at a “Cruise” In-flight condition, straight and level, holding altitude at Cruise power. This procedure sets the display to indicate “Cruise” AOA for the aircraft.



STEP A

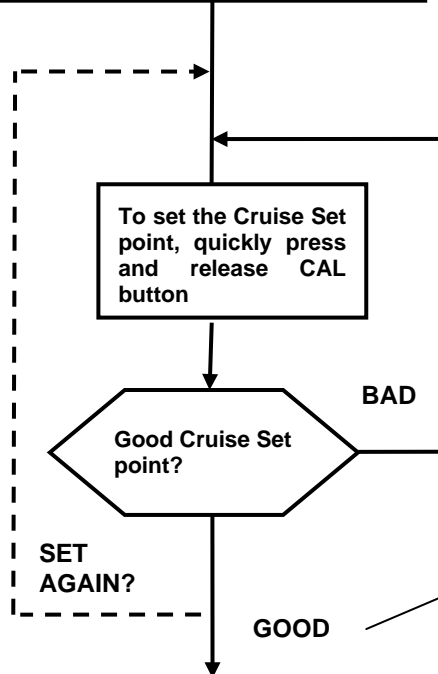
Press the brightness Button. The Green Bar flashes three times, there is no audio announcement.

STEP B

Quickly press and release CAL SET button when flying at “Cruise”

NOTE:

The **GREEN BAR** flashes 2 times every five to six seconds indicating that the unit is in Cruise Set Point calibration mode. Unit will stay in this mode until a valid cruise setting is entered and OAA and Cruise calibration mode is exited.



Bad Set point:

The **GREEN BAR** flashes 3 times and unit announces: “Invalid Set Point”.

Good Set point:

The **GREEN BAR** is displayed and unit announces: “Cruise Alpha Calibration Set”. The operator can set it again or exit calibration Mode, storing the values, putting the system in functional mode.

Note:

If the Setting is NOT Successful:

The KLR 10 display returns to an operational state and discards the attempted set point (Values out of range).

AND

The KLR 10 instrument display’s **Green Bar** flashes three times and announces “Invalid Set Point”.

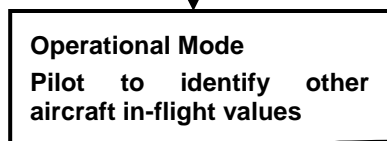
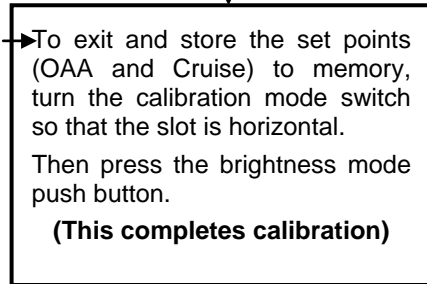


Figure 4-3: Cruise Setpoint Flowchart

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5. APPENDIX

5.1 ACRONYMS AND ABBREVIATIONS

Acronyms and abbreviations used in this manual are defined as follows:

TERMS	DEFINITION
AC	Advisory Circular
AOA	Angle of Attack
CL	Coefficient of Lift
CFR	Code of Federal Regulations
CLmax	Coefficient of Lift Maximum
Cd	Coefficient of Drag
CL/Cd	Coefficient of Lift over Coefficient of Drag
FAA	Federal Aviation Administration
FAR	Federal Air Regulations
FSDO	Flight Standards District Offices
IF module	Interface Module
IA	Inspection Authorization
MAC	Mean Aerodynamic Cord ()
OAA	Optimum Alpha Angle
Vx	Speed that allows for best angle of climb
Vy	Speed that allows for the best rate of climb

5.2 IF MODULE CONNECTORS PIN DEFINITIONS

Table 5-1: Power Connector

PIN	DEFINITION
1	+12 VDC to +28 VDC Input
2	Power Ground
3	Metal Ground
4	Not Connected

Table 5-2: Auxiliary I/O Connector

PIN	DEFINITION
1	AP Ground
2	AP Audio (mono)
3	Reserved
4	Shield
5-15	Not Connected

Table 5-3: Display Connector

PIN	DEFINITION
1	Display +5VDC Power
2	Photo Diode
3	12C Clk (SCL)
4	Ground
5	12C Data (SDA)
6	Spare I/O
7	No connection
8	LED Drvr En
9	No connection
10	No connection

5.3 AOA PROBE ANGLES

Positive Probe Lock System

The design of the AOA probe and the mounting plate allows for the probe lock plate to positively pin the AOA probe from any possible movement after final assembly. Due to differences in wing designs and the number of wing mounting locations, it may become necessary to change the AOA probe angle to allow for full scale and accurate electronic calibration. Depending on the probe lock plate pin and which side of the AOA probe and hole is used, a range of probe angles can be locked from 35 to 90 degrees in 5 degree increments, (see figures below). Start with a 50 degree angle, if a higher or lower angle is required, material from the probe plate must be removed for clearance of the probe to swing in the desired direction. Once the probe lock plate and the ¼ bolt are tightened to 60 inch lbs., the AOA probe is pinned in place.

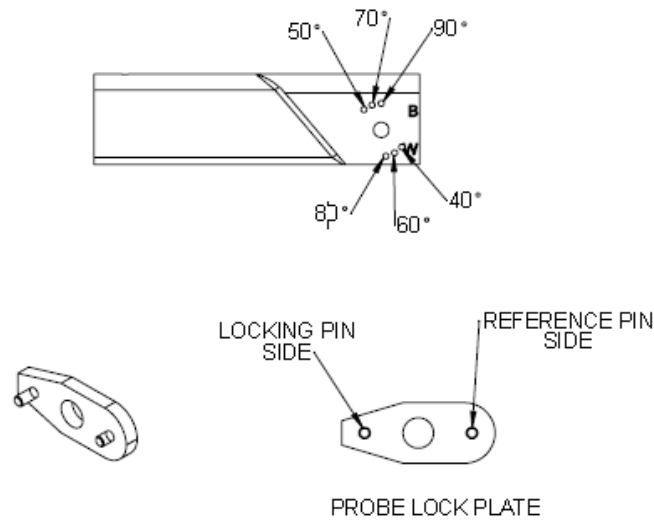


Figure 5-1: Right Side Angles

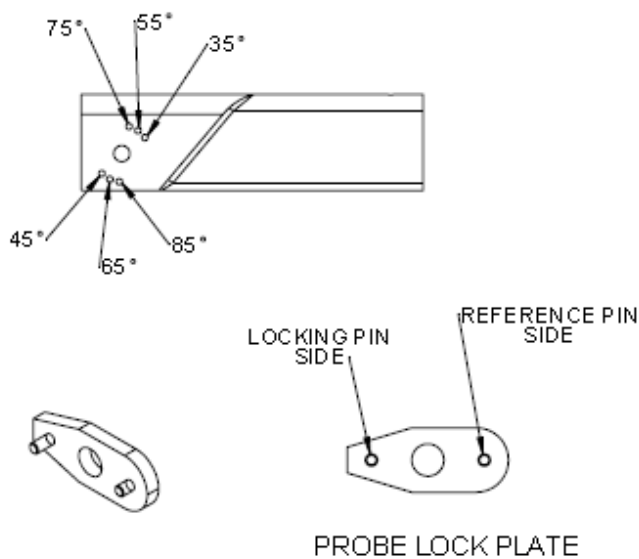


Figure 5-2: Left Side Angles

5.4 LIMITATIONS

Operating Airspeed Range:	Minimum 35 knots TAS Maximum 500 knots TAS
Operating Altitude Range:	Minimum 0 Ft MSL Maximum 30,000 Ft MSL
Operating Humidity:	Maximum 96% Relative Humidity
Operating Temperature Range:	Minimum -20°C (-4°F) Maximum 66°C (151°F)
Storage Temperature Range:	Minimum -30°C (-22°F) Maximum 85°C (185°F)
Voltage operating range:	Minimum 12 Volts Maximum 28 Volts
Electrical load:	Maximum 0.25 Amps
Surge Voltage:	Maximum 56 Volts
The RF emissions meet DO-160G environmental conditions and test procedures for airborne equipment.	
Angular Operation:	The angle of attack limitations of this AOA indicator vary with aircraft configuration and calibration.
Precipitation:	The KLR 10 probe is designed to function properly when flown through precipitation.
Icing:	The KLR 10 has optional heated probes to prevent icing from occurring but is designed not to be damaged if icing occurs.
De-icing Fluid:	No de-icing fluid restrictions on probe but continuous spray into probe orifices could contaminate hoses.

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