

Honeywell

INSTALLATION MANUAL

BENDIX/KING[®]

KLN 90B

GPS RNAV

MANUAL NUMBER 006-10521-0005

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RS-232 FORMAT DEFINITIONS

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SECTION I GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical, and electrical characteristics of the BENDIX/KING KLN 90B Global Positioning System (GPS) Receiver. General installation procedures are also included.

1.2 EQUIPMENT DESCRIPTION

The KLN 90B is a panel mounted, long range, GPS based airborne navigation system with a data base. The primary purpose of the equipment is to provide the pilot with present position information and to display guidance information with respect to a flight plan defined by the pilot. Flight plan information is entered by the pilot via various knobs and buttons on the front panel. The display consists of a right and left page and a status line at the bottom of the display. The information on the left page is controlled by the concentric knobs on the left side of the unit and the information on the right page is controlled by the concentric knobs on the right side of the unit. Present position information will be displayed on the unit CRT or can also be displayed on an EFIS or Radar Graphics unit.

The unit can use its present position information to determine crosstrack error, distance-to-waypoint, ground speed, track angle, time to waypoint, bearing to waypoint and advisory VNAV guidance. The internal data base of the KLN 90B contains information concerning airports, VORs, NDBs, intersections, and outer markers throughout the world. Waypoints are stored in the data base by their ICAO identifiers. The ICAO identifiers are in most cases taken directly from Jeppesen Sanderson or government aeronautical charts.

The information stored in the data base eventually becomes out of date; therefore, to provide a means of updating the information, the database is housed in a cartridge which plugs into the back of the KLN 90B. It is designed so that the user may easily remove the old database cartridge and install a current database cartridge. A secondary method of updating the database is by loading the information via an IBM compatible laptop computer. For more information on availability and cost of updating the database of the KLN 90B refer to the KLN 90B Pilots Guide P/N 006-08773-0000.

1.3 TECHNICAL CHARACTERISTICS

1.3.1 ARINC 429 GAMA FORMAT INFORMATION

ARINC 429 is a serial bus interface that provides information to and from the KLN 90B to external equipment. The serial bus conforms to ARINC 429 specifications for electrical characteristics, receiving, and transmission interval. The format of the labels are GAMA 429 format.

The following labels are received on the EFIS 429 receiver inputs (Pins 4 and 5 of P901):

TABLE 3-1 EFIS 429 Receiver Inputs

LABEL(OCTAL)	DESCRIPTION
100	SELECTED COURSE
306	NAV/WPT/APT LATITUDE
307	NAV/WPT/APT LONGITUDE
314 OR 320	TRUE HEADING MAGNETIC HEADING

The following labels are received on the Radar Graphics 429 receiver inputs (Pins 6 and 7 of P901):

TABLE 3-2 Radar Graphics 429 Receiver Inputs

LABEL(OCTAL)	DESCRIPTION
306	NAV/WPT/APT LATITUDE
307	NAV/WPT/APT LONGITUDE

The following labels are received by the KLN 90B on the Air Data 429 receiver inputs (Pins 8 and 9 of P901):

TABLE 3-3 Air Data 429 Receiver Inputs

LABEL(OCTAL)	DESCRIPTION
203	ALTITUDE (1013.25 MB)
204	BARO CORRECTED ALTITUDE
205	MACH
210	TRUE AIRSPEED
211	TOTAL AIR TEMPERATURE
213	STATIC AIR TEMPERATURE

The following labels are transmitted by the KLN 90B on the ARINC 429 transmitter output (Pins 23 and 24 of P901):

TABLE 3-4 Arinc 429 Gama Transmitter Output)

LABEL(OCTAL)	DESCRIPTION
001	DISTANCE TO GO (BCD)
002	TIME TO GO (BCD)
012	GROUND SPEED (BCD)
074	DATA RECORD HEADER
075	ACTIVE WAYPOINT FROM/TO DATA
100	SELECTED COURSE #1
113	MESSAGE CHECKSUM
114	DESIRED TRACK (TRUE)
115	WAYPOINT BEARING (TRUE)
116	CROSS TRACK DISTANCE
121	HORIZONTAL COMMAND
147	MAGNETIC VARIATION
150	GREENWICH MEAN TIME
251	DISTANCE TO GO
252	TIME TO GO
261	GPS DISCRETE WORD
275	LONG RANGE NAV STATUS
300	STATION MAGNETIC VARIATION, TYPE, AND CLASS
303	MESSAGE LENGTH/TYPE/NUMBER
304	MESSAGE CHARACTERS 1-3
305	MESSAGE CHARACTERS 4-6
306	NAV/WPT/APT LATITUDE
307	NAV/WPT/APT LONGITUDE

310	PRESENT POSITION LATITUDE
311	PRESENT POSITION LONGITUDE
312	GROUND SPEED
313	TRACK ANGLE (TRUE)
314	TRUE HEADING
315	WIND SPEED
316	WIND ANGLE (TRUE)
321	DRIFT ANGLE
326	LATERAL DEVIATION SCALE FACTOR
351	DISTANCE TO DESTINATION (VIA FLIGHT PLAN)
352	TIME TO DESTINATION (VIA FLIGHT PLAN)
371	SPECIFIC EQUIPMENT IDENT
377	EQUIPMENT HEX ID CODE

For RS 232 I/O formats, refer to [Appendix A](#).

1.3.3 UNIT TECHNICAL CHARACTERISTICS

Table 3-6 KLN 90b

TSO Compliance	SEE TSO APPENDIX
Physical Dimensions:	
Width:	6.312 in. (16.03 cm.)
Height:	2.00 in. (5.08 cm.)
Length:	12.55 in. (31.87 cm.)
Weight:	6.30 lbs. (2.86 Kg.)
Mounting:	Panel mounted with Honeywell supplied mounting rack
Cooling Requirements:	4 CFM (cubic feet per minute) provided by blower motor such as KA 33 or equivalent
OPERATIONAL CHARACTERISTICS:	
Temperature Range:	-40° C to +70° C
Altitude Range:	Up to 50,000 FT
Power Inputs:	11 to 33 VDC at 2.5 A MAX (-40°C to +70°C)
Panel Lighting Current Requirements:	
28 VDC Lighting:	286 mA max
14 VDC Lighting:	572 mA max
5 VDC Lighting:	1.0 A max
5 VAC Lighting	1.0 A max (400 Hz rms)

Table 3-7 KLN 90B Signal Inputs

GPS DISPLAYED:	OPEN = GPS displayed (when an indicator resolver is connected to the OBS resolver inputs) GND = GPS not displayed (when an indicator resolver is not connected)
$\overline{\text{TAKE HOME}}$:	OPEN = Normal Operation GND = Take Home Mode
SDI 1/2:	OPEN = Primary Long-range Navigation System GND = Secondary Long-range Navigation System
EFIS 429 RCVR inputs:	See Section 1.3.1
RDRG (Radar Graphics) 429 inputs:	See Section 1.3.1
AIR DATA 429 Inputs:	See Section 1.3.1
$\overline{\text{ARM SELECT}}$:	This pin is used as a mode programming pin on power-up and later as a select input.
$\overline{\text{LEG/OBS CONTROL}}$:	This pin is used as a mode programming pin on power-up and later as a control input.
DATA LOADER IN:	The Data Loader RS 232 input is designed to communicate with the dataloader
RS 232 IN:	The RS 232 input is designed to communicate with devices, i.e. air data and fuel flow sensors via RS 232 format (refer to Appendix A)
$\overline{\text{ALT ALERT}}$:	ENABLED = Open (or tied to A/C Power thru a passive load) DISABLED = GND (This pin also functions as an output, refer to section 2.3.6.2.X for details)

Table 3-8 KLN 90B Gray Code Inputs

(A1,A2,A4,B1,B2,B4,C1,C2,C4,D4)	Gray Code Altitude Signals (0 V. to 28 V.) These inputs are diode isolated inside the KLN 90B on all units above S/N 1542
OBS RES SIN:	OBS resolver sine, nominal input impedance = 36.5 K ohms (ac) and 100 K ohms (dc)
OBS RES COS:	OBS resolver cosine, nominal input impedance = 36.5 K ohms (ac) and 100 K ohms (dc)

Table 3-9 KLN 90B Signal Outputs

OBI SYNC, CLOCK, & DA- TA:	Honeywell Serial Data containing bearing to the active waypoint
RS 232 OUT:	The RS232 output is designed to interface with certain ARNAV ELTs and certain moving map displays, storm scopes, and Shadin fuel flow systems (refer to Appendix A)
WPT ALERT: (Waypoint Alert)	OPEN = Inactive LOW = Active (Output can sink up to 250 mA)
MSG: (Message)	OPEN = Inactive LOW = Active (Output can sink up to 250 mA)
APPROACH ACTIVE:	OPEN = Inactive LOW = Active (Output can sink up to 250 mA)
APPROACH ARM:	OPEN = Inactive LOW = Active (Output can sink up to 250 mA)
CDI Output:	Output is capable of driving up to five 1 KW parallel loads, Output drive range: \$300 mV (\$ 150 mV full scale) 30 mV per nautical mile (Full scale = 5 nautical mile) 150 mV per nautical mile (Full scale = 1 nautical mile) 500 mV per nautical mile (Full scale = .3 nautical mile)(Voltage at pin 22 is relative to voltage at pin 25) The CDI output can manually be selected to the sensitivity of one of the three sensitive modes listed below.
Enroute:	5, 1 or .3 nautical mile scale factor selectable
Approach Arm:	1 or .3 nautical mile scale factor selectable
Approach:	.3 nautical mile scale factor only

Table 3-10 KLN 90B NAV Flag Output

Flag Pulled out of view:	350 to 900 mV
Flag in view:	< 50mV Output capable of driving up to five 1 KW parallel loads
Nav Super Flag Output:	Valid = >18 V in 28 VDC aircraft installations; >10 V in 14 VDC aircraft installations Invalid = <3.5 V in all installations while sinking 1 mA max. Output can source up to 250mA
OBS Resolver Out:	Nominal output frequency = 450 Hz Nominal unloaded peak amplitude = 6 V Output drive capability = 40mA

Table 3-11 KLN 90B To/From Flag Output

To Indication:	+40 to +160 mV on Pin 21 with respect to Pin 20
From Indication:	-40 to -160 mV on Pin 21 with respect to Pin 20 Output capable of driving up to five 200 W parallel loads
Arinc 429 Xmitter:	See Section 1.3.1
DATA LOADER OUT:	The Data Loader RS 232 output is designed to communicate with an IBM compatible personal computer
ALT ALERT:	HIGH = Inactive LOW = Active (can sink up to 250 mA). This pin also functions as an input, refer to section 2.3.6.2.X for details)
ALT ALERT AUDIO:	This output is active whenever ALT ALERT is active, Signal is 1 KHz., 3.5 V rms max into 500 W

KA 91 ANTENNA

Table 3-12 KA 91

TSO Compliance:	SEE TSO APPENDIX
Physical Dimensions:	
Width:	2.90 in. (7.37 cm.)
Height:	0.75 in. (1.91 cm.)
Length:	4.70 in. (11.94 cm.)
Weight:	0.5 lbs. (0.227 Kg.)
Airspeed Rating:	600 Kts. TAS
Output Impedance:	50 Ohms (nominal)
DC Voltage:	5 Volts \pm 0.5 Volt
DC Current:	50 mA maximum

Table 3-13 KA 92**KA 92 ANTENNA**

TSO Compliance:	SEE TSO APPENDIX
Physical Dimensions:	
Width:	2.70 in. (6.86 cm.)
Height:	0.70 in. (1.78 cm.)
Length:	4.30 in. (10.92 cm.)
Weight:	0.27 lbs. (0.12 Kg.)
Airspeed Rating:	600 Kts. TAS
Output Impedance:	50 Ohms (nominal)
DC Voltage:	5 Volts \pm 0.5 Volt
DC Current:	50 mA maximum

**Table 3-14 KA 198 Comm Filter
P/N 071-01565-0000**

Center Notch Frequency:	1575.42 MHz.
Attenuation at 1575.42 ;1.5 MHz:	35 dB min.
Insertion loss from 118.00 to137.00 MHz:	.3dB Max.
Impedance from 118.00 to137.00 MHz:	50 ohms
VSWR from 118.00 to 137.00 MHz:	1.5:1

NOTE

The conditions and tests performed on this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within these performance standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

1.4 UNITS AND ACCESSORIES SUPPLIED

1.4.1 KLN 90B GPS RECEIVER

The KLN 90B is available in the following versions. New manufactured KLN 90B units are P/N 066-04031-1X21/1X22/1X24 and KLN 90/A units that have been converted to KLN 90B are P/N 066-04031-2X21/2X22/2X24.

Table 3-15 KLN 90B Versions

PART NUMBER	14/ 28V LAMP	5V LAMP	NIGHT VISION GOGGLE	BLACK BEZEL	GREY BEZEL	BRNAV CAPABLE (1)	UPGRADED KLN 90B's	ARINC 734A CAPABLE (2)
066-04031-1121	X	-	-	X	-	-	-	-
066-04031-1221	-	X	-	X	-	-	-	-
066-04031-1321	X	-	-	-	X	-	-	-
066-04031-1421	-	X	-	-	X	-	-	-
066-04031-1521	X	-	X	X	-	-	-	-
066-04031-1621	-	X	X	X	-	-	-	-
066-04031-2121	X	-	-	X	-	-	X	-
066-04031-2221	-	X	-	X	-	-	X	-
066-04031-2321	X	-	-	-	X	-	X	-
066-04031-2421	-	X	-	-	X	-	X	-
066-04031-1122	X	-	-	X	-	X	-	-
066-04031-1222	-	X	-	X	-	X	-	-
066-04031-1322	X	-	-	-	X	X	-	-
066-04031-1422	-	X	-	-	X	X	-	-
066-04031-1522	X	-	X	X	-	X	-	-
066-04031-1622	-	X	X	X	-	X	-	-
066-04031-2122	X	-	-	X	-	X	X	-
066-04031-2222	-	X	-	X	-	X	X	-
066-04031-2322	X	-	-	-	X	X	X	-
066-04031-2422	-	X	-	-	X	X	X	-

(1) BRNAV Capable - Is capable of meeting the JAA AMJ 20X2 requirements.

1.4.2 GPS ANTENNA

The KA 91 antenna is available by ordering P/N 071-01545-0200. The KA 92 antenna is available by ordering P/N 071-01553-0200.

1.4.3 KLN 90/90B INSTALLATION KITS

The KLN 90/90B Installation Kit (P/N 050-03096-0000) is available with crimp connectors only. A list of the required crimp tools and insertion/ extraction tools can be found in Section 2 of this manual. The kit and a complete list of the items contained in the kit is given below.

Table 3-16 KLN 90B Installation Kits

P/N	DESCRIPTION	UM	0000	VENDOR NAME P/N
050-03096-0000	KLN90 INSTALL-CRIMP	X		
030-00101-0002	PANEL MOUNT PLUG (J902)	EA	1	TED Mfg. 9-30-10
030-01157-0011	SOCKET CRMP 20G	EA	50	Positronics FC6020D-14
030-01176-0000	CONN SUB-D HSG 50S (J901)	EA	1	Positronics RD50F00000- 782.0
030-01428-0006	HOOD W/SPCL LCK 50P	EA	1	Positronics D50000 GVLD
033-00230-0000	DATA LOADER JACK	EA	1	
057-05621-0000	DECAL DATA LOADER	EA	1	
057-05628-0000	GPS DISCLAIMER	EA	1	
071-01541-0000	MOUNTING RACK ASSY	RF	X	
071-06121-0000	ALLEN WRENCH .094	EA	2	
089-02353-0001	NUT CLIP 6-32	EA	4	
089-06012-0008	SCR FHP 6-32X1/2	EA	4	
089-08252-0030	WASHER	EA	1	
090-00019-0007	RING RTNR .438	EA	1	
187-01722-0000	GASKET	EA	1	

1.4.4 KA 91/92 INSTALLATION KIT

The KA 91 Installation Kit (P/N 050-03195-0000), including its contents, is shown below.

Table 3-17 KA 91 Installation Kits

P/N	DESCRIPTION	UM	- 0000	VENDOR NAME & P/N
050-03195-0000	KA91 INSTALL		X	
030-00134-0001	RIGHT ANGLE CONN COAX	EA	1	TED MFG 5-30-102
047-10130-0002	BACKPLATE, ANTENNA	EA	1	
089-06908-0012	SCREW, AIRCRAFT	EA	4	
187-01807-0000	KA 91 GASKET	EA	1	

Earlier installation kits included a straight TNC coax connector, P/N 030-00134-0000.

The KA 92 Installation Kit (P/N 050-03318-0000), including its contents, is shown below.

Table 3-18 KA 92 Installation Kits

P/N	DESCRIPTION	UM	-0000	VENDOR NAME & P/N
050-03318-0000	KA92 INSTALL		X	
030-00134-0001	RIGHT ANGLE CONN COAX	EA	1	TED MFG 5-30-102
047-10735-0002	BACKPLATE, ANTENNA	EA	1	
089-05909-0012	SCREW, PHP 8-32x3/4	EA	4	
187-01831-0000	KA 92 GASKET	EA	1	

1.4.5 DATABASE

The KLN 90/90B database cartridge is available for three separate geographic areas.

North American Database	071-01523-0302
Atlantic International Database	071-01523-0304
Pacific International Database	071-01523-0305

1.5 ACCESSORIES REQUIRED, BUT NOT SUPPLIED

A. Forced Air Cooling

A KA 33 Cooling Kit or equivalent is required for the KLN 90B installation.

1. KA 33 Blower for 14 VDC installations is available under P/N 071-4037-00.
2. KA 33 Blower for 28 VDC installations is available under P/N 071-4037-01.
3. The installation kit for the KA 33 Blower is available under P/N 050-02204-0000.

B. Indicators and HSIs

An indicator, CDI or HSI, is required for IFR. Listed below are common Honeywell models that are available.

1. KI 202 (P/N 066-3034-XX) Navigation Indicator and installation kit (P/N 050-01524-0000).
2. KI 206 (P/N 066-3034-XX) Navigation Indicator and installation kit (P/N 050-01524-0000).
3. KPI 553A (P/N 066-3045-XX) Horizontal Situation Indicator and installation kit (P/N 050-01791-XXXX).

NOTE

The DME distance display is not compatible with the KLN 90B. KPI 553A used with the KNR 665 Digital Gold Crown is not compatible.

4. KPI 553B (P/N 066-3069-XX) Horizontal Situation Indicator and installation kit (P/N 050-02167-XXXX).
5. KI 525A (P/N 066-3046-XX) Horizontal Situation Indicator and installation kit (P/N 050-01344-XXXX). Refer to [section 2.4.1](#), KLN 90B OBS Resolver Calibration Procedure for 30 Hz indicator calibration.

C. CDI Indicator with "MSG" and "WPT" Annunciators.

Some standalone CDI indicators are available with WPT/MSG annunciators built in. One commonly used is the Model MD40-39, manufactured by Midcontinent Instrument, telephone (316) 683-5619.

1.6 OPTIONAL ACCESSORIES

A. KA 90 Interface Adapter

Order P/N 071-01508-0101 or 071-01508-0202 for a KA 90 Interface Adapter. The KA 90 interfaces the KLN 90B with various other avionics in an aircraft. It converts GAMA 429 output to analog in order to drive mechanical HSI/CDI devices. It also converts analog heading and HSI/CDI outputs into 429 data.

Functions of the -0101 include converting 3-wire heading sources to ARINC 429, converting the resolver output of a non-driven HSI to ARINC 429 so that the KLN 90B can read the selected course from the HSI, converting binary ARINC 429 data to BCD ARINC 429, and converting low speed ARINC 429 to high speed ARINC 429. Functions of the 0201/0202 include all of the functions of the -0101 plus converting ARINC 429 bearing outputs from the KLN 90B to 3-wire XYZ RMI and 4-wire sin/cos OBI formats, converting ARINC 429 distance information to ARINC 561/568 6-wire format, providing interface with Collins EHSI 74 and EFIS 85/85A/86A/86B/86C, and converting ARINC 429 roll steering data to an analog format.

B. PC Interface Kit

To load the database from a personal computer via diskettes, order interface kit P/N 050-03213-0000. The kit contains a ready to use cable which connects between the aircraft connector and the computer's 9 pin or 25 pin serial connector.

The database may be loaded directly from the PC to the KLN 90B installed in an aircraft, or the PC may be used to update the KLN 90B while it is installed in a KCC 90 (refer to [section 2.4.4.11](#) and [Figure 2-18](#) for details) or Commander 2000K from Lone Star Avionics phone (817)548-7768.

Laptop computers used to load the data base require the following:

1. IBM compatibility
2. An available Com 1 or Com 2 serial port
3. A 3.5" high density diskette drive

NOTE

Not all laptops conform to the above requirements. If there is uncertainty relating to this, contact Honeywell Product Services by telephoning (913) 782-0600.

C. Annunciators and Switch/Annunciators

(Refer to I.B. 363 for additional information pertaining to switch/annunciators for GPS systems)

The devices shown below are Eaton 582/584 series switch/annunciators and are representative of those used in our original certification. They were chosen because of their excellent sunlight readable characteristics and meet or exceed the requirements of Advisory Circular 20-138. These are high quality devices and we encourage their use, However, there are other comparable devices on the market that may be substituted at the installer/customers choice, such as the Mid-Continent Instrument, MD41.

These switch/annunciators are available through Honeywell Service Stock or direct from our supplier, LCOMP Aerospace Controls. It is advantageous to order direct from LCOMP, if possible, in order to avoid additional price mark-ups. LCOMP's address and telephone number are listed as follows:

LCOMP Aerospace Controls
c/o Carlton-Bates Co. (800) 786-0617
9214 Bond St. (913) 438-4848
Overland Park, KS 664214 (913) 438-4839 Fax

NOTE

The part numbers shown in parenthesis are annunciators previously called out and may be used until supply is depleted.

Replacement bulbs for 031-00785-xxxx

5V	037-00009-0007
14V	037-00009-0008
28V	037-00009-0006

KLN 90B Enroute/Terminal Set for CDI or Elect. Mech. HSI Installations

The following switch/annunciators are being offered for CDI or HSI switching and annunciation in the KLN 90B IFR enroute/terminal installations. They are optional for KLN 90B/KLX 135 VFR installations.

KLN 90/B or KLX 135 Ann. Set (28 V. Itg.)

NAV/GPS Sw. Ann. 031-00785-0711 or (031-00763-0711)

WPT/MSG Ann. 031-00785-0505 or (031-00763-0505/-0718)

KLN 90/B or KLX 135 Ann. Set (14 V. Itg.)

NAV/GPS Sw. Ann. 031-00785-0712 or (031-00763-0712)

WPT/MSG Ann. 031-00785-0762 or (031-00763-0762/-0719)

KLN 90/B or KLX 135 Ann. Set (5 V. Itg.)

NAV/GPS Sw. Ann. 031-00785-0713 or (031-00763-0713)

WPT/MSG Ann. 031-00785-0506 or (031-00763-00506/-0720)

KLN 90B Approach Set for CDI or Elect. Mech. HSI Installations

The following switch/annunciators are being offered for CDI or HSI switching, GPS CRS and APR switching, and annunciation in KLN 90B non-precision approach installations.

NOTE

The GPS CRS OBS/LEG switch annunciators were available in two different color configurations. Both versions were approved for use with the GPS's. The white OBS was the preferred version.

The 031-00785-0763/0764/0765 versions were visible white for the GPS CRS field, yellow for the OBS field and green for the LEG field.

The 031-00785-0778/0779/0780 versions were visible white for the GPS CRS field, white for the OBS field and green for the LEG field.

KLN 90B Ann. Set	(28 V. Ltg.)
NAV/GPS Sw. Ann.	031-00785-0711 or (031-00763- 0711)
WPT/MSG Ann.	031-00785-0505 or (031-00763- 0505/-0718)
GPS CRS OBS/LEG	
Sw. Ann.	031-00785-0778 or (031-00785-0763)
GPS APR ARM/ACT	
Sw. Ann.	031-00785-0766

KLN 90B Ann. Set (14 V. Ltg.)	
NAV/GPS Sw. Ann.	031-00785-0712 or (031-00763- 0712)
WPT/MSG Ann.	031-00785-0762 or (031-00763- 0762/-0719)
GPS CRS OBS/LEG	
Sw. Ann.	031-00785-0779 or (031-00785-0764)
GPS APR ARM/ACT	
Sw. Ann.	031-00785-0767

KLN 90B Ann. Set (5 V. Ltg.)	
NAV/GPS Sw. Ann.	031-00785-0713 or (031-00763- 0713)
WPT/MSG Ann.	031-00785-0506 or (031-00763- 0506/-0720)
GPS CRS OBS/LEG	
Sw. Ann.	031-00785-0780 or (031-00785-0765)
GPS APR ARM/ACT	
Sw. Ann.	031-00785-0768

KLN 90A Upgrade to KLN90B Approach Set

If a KLN 90A is upgraded to a KLN 90B, the additional GPS CRS and GPS APR switch/annunciators are needed.

or

KLN 90B with EFIS Approach Set

Most EFIS systems will provide NAV/GPS switching and WPT/MSG annunciation but still require external GPS CRS and GPS APR switch/annunciators.

NOTE

The GPS CRS OBS/LEG switch annunciators were available in two different color configurations. Both versions were approved for use with the GPS's. The white OBS was the preferred version.

The 031-00785-0763/0764/0765 versions were visible white for the GPS CRS field, yellow for the OBS field and green for the LEG field.

The 031-00785-0778/0779/0780 versions were visible white for the GPS CRS field, white for the OBS field and green for the LEG field.

EFIS or KLN90A to 90B Upgrade Ann. Set (28 V. Itg.)

GPS CRS OBS/LEG

Sw. Ann. 031-00785-0778 or (031-00785-0763)

GPS APR ARM/ACT

Sw. Ann. 031-00785-0766

EFIS or KLN90A to 90B Upgrade Ann. Set (14 V. Itg.)

GPS CRS OBS/LEG

Sw. Ann. 031-00785-0779 or (031-00785-0764)

GPS APR ARM/ACT

Sw. Ann. 031-00785-0767

EFIS or KLN90A to 90B Upgrade Ann. Set (5 V. Itg.)

GPS CRS OBS/LEG

Sw. Ann. 031-00785-0780 or (031-00785-0765)

GPS APR ARM/ACT

Sw. Ann. 031-00785-0768

NAV/GPS Switch/Annunciator

Installations where the outputs from KLN 90B and an existing navigation system are switched between a common indicator or HSI may require some type of annunciation. A NAV/GPS switch/annunciator is available that provides both the annunciation and a switch contact to energize the switching relay(s) required for the switching of the outputs. This Switch/Annunciator is available in 5 V, 14 V, or 28 V versions as shown below.

LIGHTING	Honeywell P/N	Honeywell P/N
28 V	031-00763-0711	031-00785-0711
5 V	031-00763-0713	031-00785-0713
14 V	031-00763-0712	031-00785-0712
	(Eaton Series 584)	(Eaton Series 582)

WPT/MSG Remote Annunciators

The KLN 90B contains two outputs: 1) Waypoint Alert (WPT) and 2) Message (MSG). Annunciation of these outputs is required for certification purposes. A remote annunciator unit is available to annunciate these outputs and is offered in either 5 V, 14 V, or 28 V versions as shown below. The original design of this unit contained the required (WPT) and (MSG) plus two additional fields (-/-) as it was expected that additional annunciation would be required in the future. It has now been determined, however, that additional annunciation will not be required. Therefore, a new design is being offered that contains only the (WPT) and (MSG) fields which allows improved readability. Both options are listed in the following.

FOUR FIELD ANNUNCIATORS (WPT/MSG/---/---)

LIGHTING	Honeywell P/N
28 V	031-00763-0718
14 V	031-00763-0719
5 V	031-00763-0720

NOTE: (WPT) AND (MSG) will be in amber color and the dashes in green. These annunciators will be deadface and readable only when lit. Dashes will only be lit during an annunciator test as a function of the aircraft installation.

TWO FIELD ANNUNCIATORS (WPT/MSG)

LIGHTING	Honeywell P/N	Honeywell P/N
28 V	031-00763-0505	031-00785-0505
14 V	031-00763-0506	031-00785-0506
5 V	031-00763-0762	031-00785-0762
	(Eaton Series 584)	(Eaton Series 582)

NOTE: (WPT) AND (MSG) will be in amber color. These annunciators will be deadface and readable only when lit.

GPS CRS, OBS/LEG Switch/Annunciator

The KLN 90B may operated in either of two modes, LEG or OBS. In LEG mode, the flightplan legs will automatically sequence as determined by present position. In OBS mode, the active waypoint and inbound or outbound course will be manually selected. The Remote OBS/LEG Switch/Annunciator is recommended for non-precision approaches to reduce pilot workload.

The selection of OBS or LEG may be accomplished in either of two methods.

Method 1:

- Select the Mode Page by rotating the left outer knob
- Turn the left inner knob to select OBS or LEG
- Press ENTER to activate the mode

Method 2:

- Press the Remote OBS/LEG switch/annunciator to change modes

If the Remote OBS/LEG Switch/Annunciator is installed, the KLN 90B will sense its presence, on turn-on, and disallow selection of OBS/LEG modes by the KLN90B front panel controls. If the remote switch is not installed, the front panel controls will function as before.

LIGHTING	Honeywell P/N	or	Honeywell P/N
28 V	031-00785-0778	or	031-00785-0763
14 V	031-00785-0779	or	031-00785-0764
5 V	031-00785-0780	or	031-00785-0765
	(Eaton Series 582)		

GPS APR, ARM/ACTV Switch/Annunciator

The KLN 90B requires a switch/annunciator for arming, disarming, or deactivating the approach mode. It will provide remote annunciation of ARM and ACTV and provide a momentary switch function to arm, disarm, or deactivate the Approach Mode and change the CDI scale factors.

LIGHTING	Honeywell P/N
28V	031-00785-0766
14V	031-00785-0767
5V	031-00785-0768
	(Eaton Series 582)

D. NAV/GPS Switching

Installations in which the outputs from a KLN 90B and an existing navigation system are being switched onto a common indicator will require some remote relay switching that is controlled by the NAV/GPS switch/annunciator.

E. Straight TNC antenna Connector

The part number for a straight connector for the KA 91 or KA 92 antenna connection is 030-00134-0000.

1.7 LICENSE REQUIREMENTS

None.

1.8 RECOMMENDATIONS FOR IFR APPROVAL

1. Aircraft Logbook Entry
2. Aircraft Installation Requirements

The following interface functions were not required for a VFR KLN 90 but are required for an IFR'd KLN 90B installation.

TSO'd Antenna

The antenna must be a TSO'd KA 91, P/N 071-01545-0200 or KA 92 P/N 071-01553-0200. If the P/N of the KA 91 is not available, it may be identified by the serial number as the TSO'd antennas have a five digit serial number. If the antenna is a non-TSO'd KA 91, P/N 071-01545-0100, and the KLN 90B is a modified KLN 90, the antenna is eligible for exchange as part of the upgrade program.

·Nav Instrumentation

The navigation information (D-Bar, Nav Flag, and To-From) must be displayed on an instrument in the pilot's panel.

Electromechanical indicators are capable of displaying the variable scale factors of enroute, terminal, and approach modes. If the NAV information is displayed on an EFIS system, it must be capable of displaying variable D- Bar scaling required for GPS approaches. This may require a modification to the EFIS system. (Refer to [section 1.5](#) for a list of typical Nav indicators).

NOTE

The KPI 552/553/553A's interfaced to the KNR 665 digital Gold Crown are not compatible with the KLN 90B.

·OBS Interface

For approach approval, the OBS resolver must be interfaced so that selected course through the HSI/CDI indicator will be sent to the KLN 90B for D-Bar resolution. In mechanical indicators, it will be accomplished by switching the OBS resolver lines; and in EFIS installations, it will be usually through the serial busses. Some EFIS applications may require an adapter. (Refer to [section 2.3.6.2.P](#) for OBS resolver interface characteristics).

·Switch/Annunciators:**NAV/GPS (Switch/Annunciator)**

If the navigation information is displayed on a shared primary indicator a switch/annunciator will be required to select and annunciate the source unless the indicator is part of an EFIS system that provides that function.

WPT/MSG (Annunciator)

The required annunciators are "WPT" and "MSG" only. Even though the information is available on the KLN 90B display, a remote annunciator is also required in the pilots panel unless it is accomplished in an HSI/CDI or EFIS display.

GPS CRS, OBS/LEG (Switch/Annunciator)

The KLN 90B may operate in either of two modes, LEG or OBS. In LEG mode, the flightplan legs will automatically sequence as determined by present position. In OBS mode, the active waypoint and inbound or outbound course will be manually selected. The Remote OBS/LEG Switch/Annunciator is recommended for non-precision approaches to reduce pilot workload.

GPS APR, ARM/ACTV (Switch/Annunciator)

The KLN 90B requires a switch/annunciator for arming, disarming, or deactivating the approach mode. It will provide remote annunciation of ARM and ACTV and provide a momentary switch function to arm, disarm, or deactivate the Approach Mode and change the D-Bar scale factors. (Refer to [section 1.6.C](#) for typical switch/annunciators).

·Altitude Source

An altitude source is required for IFR certification. The altitude may be derived from a compatible encoding altimeter, some RS 232 air data systems, and most ARINC 429 air data systems. (Refer to [figure 2-17](#) for typical altitude sources).

·Isolation Diodes

KLN 90's below S/N 1542 did not have isolation diodes on the encoding altimeter inputs.

The KLN 90/90A's upgraded to KLN 90B's that are below S/N 1542 still will not have isolation diodes and may need to have them added to the installation. If the KLN 90B is without diode isolation and is paralleled with another unit such as a transponder, the combination can cause a loading effect which may result in one or all of the units in parallel being disabled. If the KLN 90B is connected to a dedicated encoding altimeter, the diodes are not necessary.

3. Approved Airplane Flight Manual Supplement

A flight manual supplement will need to be prepared and approved. The supplement may be prepared based on the sample, P/N 006-00835-0000. Refer to [Appendix B](#) for information on preparing a flight manual supplement and a copy of the STC approval.

4. Pilot's Guide

The KLN 90B pilots' guide must be placed in the aircraft in a location that is accessible to the pilot. The pilot's guide is P/N 006-08773-0000 and the abbreviated pilot's guide is P/N 006-08774-0000.

1.9 INSTRUCTIONS FOR CONTINUED AIR WORTHINESS

The instructions for continued air worthiness given in the TC or STC approvals for this product supplements or supercedes the instructions for continued air worthiness in this manual.

Most Honeywell products are designed and manufactured to allow "on condition maintenance". On condition maintenance is described as follows; There are no periodic service requirements necessary to maintain continued air worthiness. No maintenance is required until the equipment does not properly perform the intended function. When service is required, a complete performance test should be accomplished following any repair action. Consult the appropriate Unit Maintenance/Overhaul Manual for complete performance test information.

SECTION II INSTALLATION

2.1 GENERAL INFORMATION

This section contains general suggestions and information to consider before installation of the KLN 90B GPS RNAV. Close adherence to these suggestions will assure optimum performance from the equipment.

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Exercise extreme care when unpacking the equipment. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. The claim should be promptly filed with the transportation company. It would be advisable to retain the container and packaging material after all equipment has been removed in the event that equipment storage or reshipment should become necessary.

2.3 EQUIPMENT INSTALLATION

2.3.1 AVIONICS COOLING REQUIREMENTS FOR PANEL MOUNTED EQUIPMENT

The greatest single contributor to increased reliability of all modern day avionics is to limit the maximum operating temperature of the individual units whether panel mounted or remote mounted. While modern day individual circuit designs consume much less electrical energy, watts per cubic inch dissipated within the avionics unit remains much the same due to the high density packaging techniques utilized. Consequently, the importance of providing cooling to the avionics stack is still with us today.

While each individual unit may or may not require forced air cooling, the combined heat load of several units operating in a typical avionics location will significantly degrade the reliability of the avionics if provisions for cooling are not incorporated in the initial installation. Failure to provide cooling to the equipment will lead to increased avionics maintenance costs and may also void the Honeywell warranty.

In the case of the KLN 90B, installation of a KA 33, (P/N 071-4037-XX), or equivalent cooling system is required. Ram air cooling is not acceptable. For installation information on the KA 33 refer to the KA 33 installation manual, P/N 006-01069-XXXX or Installation Bulletin 258.

2.3.2 KLN 90B MECHANICAL INSTALLATION

The KLN 90B installation will conform to standards designated by the customer, installing agency, and existing conditions as to the unit location and type of installation. However, the following suggestions will assure a more satisfactory performance from the equipment.

- A. Plan a location on the aircraft panel so that the KLN 90B is plainly visible to the pilot and so that he has complete access to all front panel controls. Check to be sure that there is adequate depth behind the panel for the mounting rack and all the connectors and cabling. Be sure that the mounting location is not close to heater vents or other sources of high heat.
- B. Refer to [figure 2-3](#) for the panel cutout dimensions. Mark and cut the panel opening.

2.3.3 ANTENNA SELECTION

The KA 91 and KA 92 GPS active antennas, P/N 071-01545-0200 and 071-01553-0200 respectively, are the designated antennas for the KLN 90B.

2.3.4 ANTENNA INSTALLATION CONSIDERATIONS

The antenna should be mounted on top of the fuselage near the cockpit. Avoid mounting the antenna near any projections, the propeller, and the T-tail of the aircraft, where shadows could occur. It is recommended that there be a separation of at least 3 ft. between the KLN 90B GPS antenna and any VHF Comm antenna on the aircraft. Antenna baseplate must be level within 5° in both axes when the aircraft is in level flight. If the antenna is tilted more than 5° or is mounted close to other objects that shadow it, loss of some of the satellites will occur and system performance may be degraded. Antenna cable and connector information, including vendor information, is listed below. Refer to [figure 2-10](#) (TNC) and [figure 2-11](#) (BMA) for cable/connector assembly instructions for the 0 to 40 feet category using RG 400/U or RG 142B/U. Refer to [figure 2-12](#) (for both TNC and BMA) for the 0 to 80 feet and 0 to 100 feet categories.

NOTE

KA 91/92 nominal gain and noise figures are 26.5 dB and 2.3 dB respectively. With 0.050 ice on radome, gain will not decrease by more than 2.0 dB when viewing a satellite from 30° above the horizon to zenith, as compared to a no ice condition.

CABLE Length	CABLE PART NUMBER	BMA CONNECTOR	TNC CONNECTOR	MAX. Allowable Loss (dB)
0 to 40 ft.	024-00002-0000 RG142B/U	030-00101-0002 TED Mfg. 9-30-10	030-00134-0000 TED Mfg. 5-10-30	8.0
0 to 40 ft.	024-00051-0060 RG400/U	030-00101-0002 TED Mfg. 9-30-10	030-00134-0000 TED Mfg. 5-10-30	8.0
0 to 80 ft.	024-00072-0000 ECS 311601	030-00452-0000 TED Mfg. 9-30-26	030-00108-0002 TED Mfg. 5-10-307	8.0
0 to 100 ft.	024-00071-0000 ECS 311201	030-00452-0001 TED Mfg. 9-30-25	030-00108-0003 TED Mfg. 5-10-306	8.0

100 to 165 ft. Contact TED, ECS or PIC for complete cable/connector assembly.

NOTE

A right angle antenna connector is available from Honeywell (P/N 030-00134-0001) or from TED.

TED Manufacturing Corp. 11415 Johnson Drive Shawnee, Kansas 66203 Tel: (913) 631-6211	Electronic Cable Specialists (ECS) 11227 W. Forest Home Avenue Franklin, Wisconsin 53132 Tel: (800) ECS-WIRE or (414) 421-5300	PIC Wire and Cable N63 W 22619 Main Street P.O. Box 330 Sussex, Wisconsin 53089 Tel: (800) 742-3191 or (414) 246-0500
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2.3.5 ANTENNA MECHANICAL INSTALLATION**2.3.5.1 General**

To maintain good performance from the antenna system, do not wax or paint the antenna.

2.3.5.2 Installation Procedure

- A. Using the correct template for the antenna chosen, mark the mounting holes on the aircraft fuselage.
- B. Drill and/or punch the required holes.
- C. Use a piece of fine sandpaper or emery cloth to sand the area on the fuselage skin on which the doubler plate for the antenna is to be mounted and on the aircraft skin under where the antenna will be mounted.
- D. Apply Alumiprep No. 33, P/N 016-01127-0000, to both the inside and outside areas of the fuselage and to the back of the doubler plate. Follow the directions on the container to cleanse the metal of any left over residue.
- E. Apply Alodine, P/N 016-01128-0000, to both locations following the directions on the container. This is used to ensure good bonding of the antenna and to prevent oxidation.
- F. Refer to [figure 2-5](#) for the KA 91 installation drawing or [figure 2-8](#) for the KA 92 installation drawing and mount the antenna as shown. First rivet the doubler plate in place. It is imperative that the doubler plate make a good electrical bond with the inside of the aircraft skin and that the antenna itself be well bonded to the aircraft.
- G. When installing the KLN 90B antenna do not exceed 25 inch/lbs of torque on the antenna mounting screws.
- H. Apply white RTV sealant around base of installed antenna. Fill mounting screw holes with RTV sealant (P/N 016-01129-0000 or equivalent).

2.3.6 ELECTRICAL INSTALLATION**2.3.6.1 General Information**

The KLN 90B will operate with an input voltage from 11 to 33 VDC, but the front panel lighting circuit must be wired for either +14 VDC, +28 VDC, +5 VDC, or 5 VAC depending upon the version of unit installed. Refer to the KLN 90B interconnect diagram for wiring details.

- A. The installing facility will supply and fabricate all external cables. The required connectors are supplied as part of the installation kit.
- B. The length and routing of the external cables must be carefully planned before attempting the actual installation. Avoid sharp bends or locating the cable near aircraft control cables.
- C. The KLN 90B and associated wiring must be kept at least a minimum of 3 ft. from high noise sources and not routed with cables from high power sources to insure optimum performance from the system.
- D. Do not route the antenna cable near any cable used for a transmitting antenna.

Prior to installing the KLN 90B itself, a point to point continuity check of the wiring harness should be done to verify proper wiring. The aircraft power input to the unit should be made to insure that power is applied to only the specified power pin(s).

2.3.6.2 Functional Pinout Descriptions

This section gives a brief description of some of the inputs and outputs of the KLN 90B. It is provided so the installer can determine what specific wiring needs to be done to the aircraft in which the unit is to be installed. Unless otherwise specified, pins not used are to be left open.

A. Pin 1; GPS DISPLAYED

This pin is used as an input to tell the unit whether an external indicator is connected to the analog OBS resolver inputs, in which case it will be high. This pin will be grounded if an indicator is not connected or coupled to the unit.

B. Pin 2; $\overline{\text{TAKE HOME}}$

Pin 2, when grounded, places the KLN 90B in Take-Home mode which is used for trip planning only. It performs as if it is receiving adequate GPS signals to determine its position. It displays the latitude and longitude of its last known position or of whatever position it is initialized to on the Setup Page. Pin 2 should always be left open in the aircraft installation.

C. Pin 3; $\overline{\text{SDI 1/2}}$

Pin 3 sets the Long-range Navigation System as primary or secondary. If the pin is open, the ARINC 429 setup is for primary. If the pin is grounded, the ARINC 429 setup is for secondary. This pin is read each time the KLN 90B is turned on. This pin is used only for dual long range navigation installations when a KLN 90B is interfaced, through ARINC 429, as system #2.

D. Pins 4 and 5; EFIS 429 Receiver Inputs

The KLN 90B receives information from the Electronic Flight Instrument System (EFIS) or KA 90 display adapter in GAMA 429 format on this input bus. This bus should be left open if no EFIS or adapter is connected to the KLN 90B. For specific label information refer to [Paragraph 1.3.1](#) in Section 1 of this manual.

E. Pins 6 and 7; Radar Graphics 429 Receiver Inputs

The KLN 90B receives information from the Radar Graphics unit in GAMA 429 format on this input bus. This bus should be left open if no Radar Graphics unit is connected to the KLN 90B. For specific label information refer to [Paragraph 1.3.1](#) in Section 1 of this manual.

F. Pins 8 and 9; Air Data 429 Receiver Inputs

The KLN 90B can receive information from the Air Data unit in GAMA 429 format on this input bus. For specific label information refer to [Paragraph 1.3.1](#) in Section 1 of this manual. If not used, these inputs must be connected to pins 23 and 24 respectively to eliminate unnecessary "air data fail" messages.

G. Pins 10, 11, and 12; OBI Data, Clock, and Sync

This is a three wire data bus that provides bearing to the active waypoint. The data is in Honeywell format and can be used to drive certain Honeywell RMI units. The output can also be converted by a Honeywell KDA 692 which provides standard 4-wire SINE/COSINE OBI information.

H. Pin 13; RS 232 Out

The KLN 90B outputs data in RS 232 format on this pin. It can be used to interface with certain types of ELT's, fuel sensors, and moving map displays, and fuel management systems. For specific label information, refer to [Appendix A](#).

I. Pin 14; $\overline{\text{WPT ALERT}}$

Pin 14 is the Waypoint Alert annunciator output. This output is tied to a remote annunciator lamp. When the line is pulled low the annunciator lamp will illuminate. The annunciator will be on whenever waypoint alerting is occurring. For more complete information refer the KLN 90B Pilots Guide, P/N 006-08773-0000.

J. Pin 15; $\overline{\text{MSG}}$

Pin 15 is the Message annunciator output. This output is tied to a remote annunciator lamp. When the line is pulled low the annunciator lamp will illuminate. The annunciator will be on whenever the message prompt on the KLN 90B is on. For more complete information refer to the KLN 90B Pilots Guide, P/N 006-08773-0000.

K. Pin 16; $\overline{\text{APPROACH ACTIVE}}$

Pin 16 is the Approach Active annunciator output. This output is tied to a remote annunciator lamp. When the line is pulled low the annunciator lamp will illuminate. The annunciator will be on whenever the unit is in the approach mode. For more complete information refer the KLN 90B Pilots Guide, P/N 006-08773-0000.

L. Pin 17; $\overline{\text{APPROACH ARM}}$

Pin 17 is the Approach Arm annunciator output. This output is tied to a remote annunciator lamp. When the line is pulled low the annunciator lamp will illuminate. The annunciator will be on whenever the unit is in the approach arm mode. For more complete information refer the KLN 90B Pilots Guide, P/N 006-08773-0000.

M. Pin 18; Nav Super Flag

Pin 18 is the GPS NAV Super Flag output. A logic high shall be > 18 VDC when the voltage at pin 40 is > 24.8 VDC. A logic high shall be > 10 VDC when the voltage at pin 40 is > 12.4 VDC. A logic high shall be > 20 VDC when the voltage at pin 40 is + 27.5 VDC. A logic low shall be < 3.5 VDC.

N. Pins 19, 20, 21, 22, and 25; NAV Flag +, +From, +To, + RIGHT, and +LEFT/
NAV Flag -

These outputs function like the outputs from standard navigation converters. For the specifications on these outputs refer to Paragraph 1.3.2 in Section 1 of this manual.

O. Pins 23 and 24; GPS 429 Transmitter outputs

Pins 23 and 24 are the GPS ARINC 429 transmitter output port of the KLN 90B. For specific label information transmitted on this bus refer to [Paragraph 1.3.1](#) in Section 1 of this manual.

P. OBS Resolver Interface

Pin 26; OBS Resolver Sine

Pin 31; OBS Resolver Out

Pin 37; OBS Resolver Cosine

This interface is compatible with indicators that are electrically zeroed (EZ) at 300 degrees and indicators that are omni-ranged zero at 300 degrees. This interface will operate properly with either "0.85 gain" resolvers or "0.41 gain" resolvers with no special programming requirements.

OBS Resolver Out is a 450 Hz output used to excite the resolver. The resolver output voltage is then received by the OBS Resolver sine and cosine inputs.

Refer to [section 2.4.1](#), KLN 90B OBS Resolver Calibration Procedure for 30 Hz indicator calibration.

Q. Pin 27; A/C GROUND

Pin 27 is tied to aircraft ground. Wiring harness shields are not to be terminated on this pin. Refer to [figure 2-17](#).

R. Pins 28, 29, and 32; 28 V Light/Light Lo, 14 V/5 V Light, and Light Lo

Pins 28, 29, and 32 are the pins used for the panel lighting. Refer to the interconnect drawing for the correct method of connecting these pins and connecting to the aircraft dimmer bus.

S. Pin 30; Approach Arm Select

Pin 30 is used as a mode programming pin on power-up and later as a select input. If the installation is not certified for approach, the external switch/annunciator is not required. This function can be eliminated by connecting the APPROACH ARM SELECT, pin 30, to the APPROACH ARM ANNUNCIATOR, pin 17. On power-up, it will be monitored to determine whether external switches are installed. If the installation is approved for approach and the external switch/annunciator is installed, then a momentary ground on pin 30 will alternately arm or disarm the approach mode.

T. Pin 33; LEG/ $\overline{\text{OBS}}$ CONTROL

Pin 33 is used as a mode programming pin on power-up and later as a select input. If the installation does not require an external switch/annunciator to select the OBS mode, then connect the LEG/OBS CONTROL, pin 33, to the + TO, pin 21. On power-up, it will be monitored to determine whether external switches are installed. If the external switch/annunciator is not installed, the selection of OBS and LEG will be performed by means of the left inner and outer knobs on the MODE page. If the installation is approved for approach and the external switch/annunciator is installed, then a ground on pin 33 will switch the unit between LEG and OBS modes. The MODE page on the left inner and outer knob will be disabled.

U. Pin 34; Data Loader Out

Pin 34 outputs Data Loader information in RS 232 format. It can be used to interface with a laptop IBM compatible PC to load the database.

V. Pin 35; Data Loader In

Pin 35 inputs Data Loader information in RS 232 format. It can be used to interface with a laptop IBM compatible PC to load the database.

W. Pin 36; RS 232 In

Pin 36 is the RS 232 input. If there is not an RS 232 input, i.e. a Fuel Management or Air Data sensor connected to the KLN 90B, Pin 36 (RS 232 In) should be connected to Pin 13 (RS 232 Out) to eliminate unnecessary "NO RS-232 DATA" messages. For more information refer to KLN 90B Pilots Guide, P/N 006-08773-0000. Pin 36 may be connected to pin 13 even though Pin 13 is also used to drive another load. For specific label information, refer to [Appendix A](#).

X. Pin 38; $\overline{\text{ALT ALERT}}$

Pin 38 is the Altitude Alert input/output pin. Configuration is determined by a sampling at powerup. If pin 38 is grounded, it is configured as an input. All pilot selectable altitude alert functions of the KLN 90B will be disabled. This option should be considered if another altitude preselector is already installed in the aircraft. If pin 38 is open or connected to drive an alerting device, it is configured as an output. Altitude alert functions will be selectable through the KLN 90B front panel controls.

Y. Pin 39; ALT ALERT AUDIO

Pin 39 is the Altitude Alert Audio output which is active whenever ALT ALERT is active.

Z. Pin 40; A/C Power

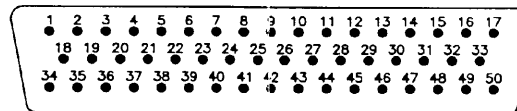
Pin 40 is the DC aircraft power input. The KLN 90B will accept from 11 VDC to 33 VDC input power.

AA. Pins 41 thru 50; Gray Code Inputs

Pins 41 through 50 are gray code altitude inputs from an encoding altimeter. If the KLN 90B is paralleled with another unit such as a transponder, it may be necessary to install isolation diodes between one or both units and the encoder.

KLN 90/90B with serial numbers 1542 and above have diodes already installed internally. Units with serial numbers below 1542 will only need the diodes in the aircraft harness if it is interfaced to an encoder and another unit.

J901		
1	←-----	GPS DISPLAYED
2	←-----	TAKE HOME (SEE NOTE 1)
3	←-----	SDI 1/2'
4	←-----	EFIS 429 RECEIVER B
5	←-----	EFIS 429 RECEIVER A
6	←-----	RADAR GRAPHICS 429 RECEIVER B
7	←-----	RADAR GRAPHICS 429 RECEIVER A
8	←-----	AIR DATA 429 RECEIVER B (SEE NOTE 5)
9	←-----	AIR DATA 429 RECEIVER A (SEE NOTE 5)
10	-----→	OBI DATA OUT
11	-----→	OBI CLOCK OUT
12	-----→	OBI SYNC OUT
13	-----→	RS 232 OUT
14	-----→	WPT ALERT
15	-----→	MSG
16	-----→	APPROACH ACTIVE
17	-----→	APPROACH ARM
18	-----→	NAV SUPER FLAG
19	-----→	NAV FLAG +
20	-----→	+FROM
21	-----→	+TO
22	-----→	+RIGHT
23	-----→	429 TRANSMITTER B
24	-----→	429 TRANSMITTER A
25	-----→	+LEFT/NAV FLAG -
26	←-----	OBS RESOLVER SINE
27	←-----	A/C GROUND
28	←-----	28V LIGHT/LIGHT LO (SEE NOTE 2)
29	←-----	14 V/5 V LIGHT (SEE NOTE 2)
30	←-----	APPROACH ARM SELECT
31	-----→	OBS RESOLVER OUT
32	←-----	LIGHT LO (SEE NOTE 2)
33	←-----	LEG/OBS CONTROL
34	-----→	DATA LOADER OUT
35	←-----	DATA LOADER IN
36	←-----	RS 232 IN (SEE NOTE 3)
37	←-----	OBS RESOLVER COSINE
38	←-----	ALT ALERT
39	-----→	ALT ALERT AUDIO
40	←-----	11-33 V DC A/C POWER
41	←-----	D4
42	←-----	A1
43	←-----	A2
44	←-----	A4
45	←-----	B1
46	←-----	B2
47	←-----	B4
48	←-----	C1
49	←-----	C2
50	←-----	C4
	← INPUTS OUTPUTS →	

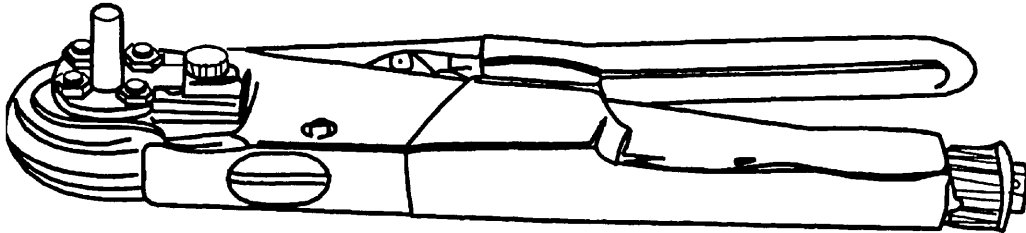


NOTES:

1. THIS PIN SHALL BE LEFT OPEN IN AIRCRAFT INSTALLATIONS.
2. LIGHTING BUS CONNECTIONS ARE AS FOLLOWS:

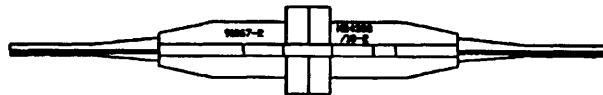
LIGHTING VOLTAGE	PIN 28	PIN 29	PIN 32
28 V LIGHTING	HI	N.C.	LO
14 V LIGHTING	LO	HI	LO
5 V LIGHTING	LO	HI	LO
3. IF THE INSTALLATION DOES NOT PROVIDE AN INPUT FOR J901-36 IN THE RS 232 FORMAT, 3 OF J901-13 (RS 232 OUT) MUST BE CONNECTED TO J901-36 (RS 232 IN).
4. FORCED AIR COOLING IS REQUIRED.
5. IF THE INSTALLATION DOES NOT PROVIDE AN INPUT FOR ARINC 429 AIR DATA (J901 PINS 8,9), THEN PINS 23 AND 24 OF P901 MUST BE CONNECTED TO PINS 8 AND 9 OF P901 RESPECTIVELY.

FIGURE 2-1 KLN 90B CONNECTOR PIN FUNCTIONS



CRIMPING TOOL P/N: 005-02012-0021
BUCHANAN P/N: 612118
POSITRONICS P/N: 9507-0-0-0

POSITIONER P/N: 005-02012-0023
BUCHANAN P/N: 612513
POSITRONICS P/N: 9502-5-0-0 (20-30 AWG)
POSITRONICS P/N: 9502-11-0-0 (18 AWG)



INSERTION/EXTRACTION TOOL P/N: 005-02012-0025
AMP P/N: 91067-2
MIL SPEC P/N: M24308/18-12
POSITRONICS P/N: M81969/1-02

FIGURE 2-2 KLN 90B CRIMPING AND INSERTION/EXTRACTION TOOLS

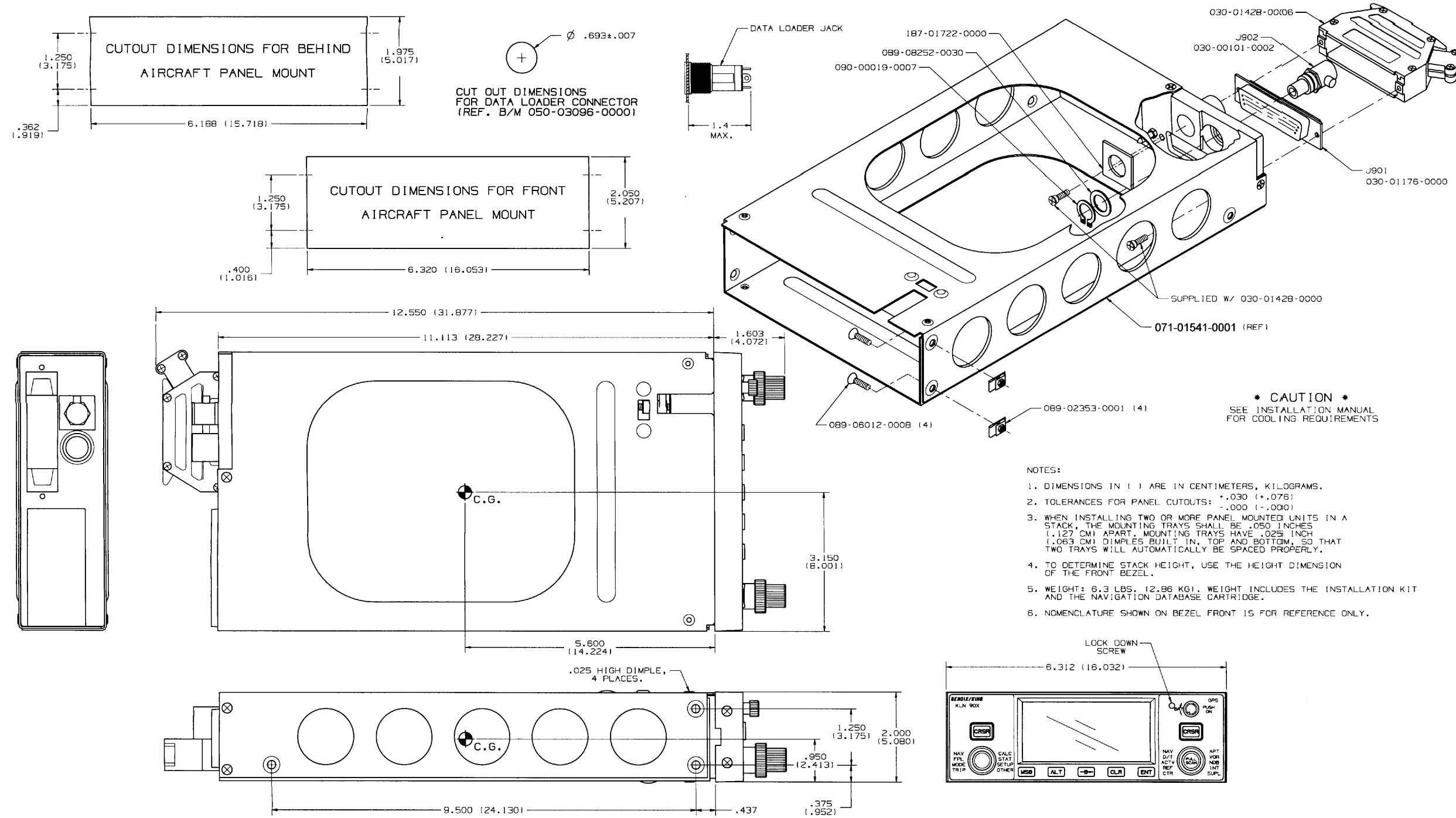


FIGURE 2-3 KLN 90B INSTALLATION DRAWING
(DWG. NO. 155-05818-0000 R-AB)

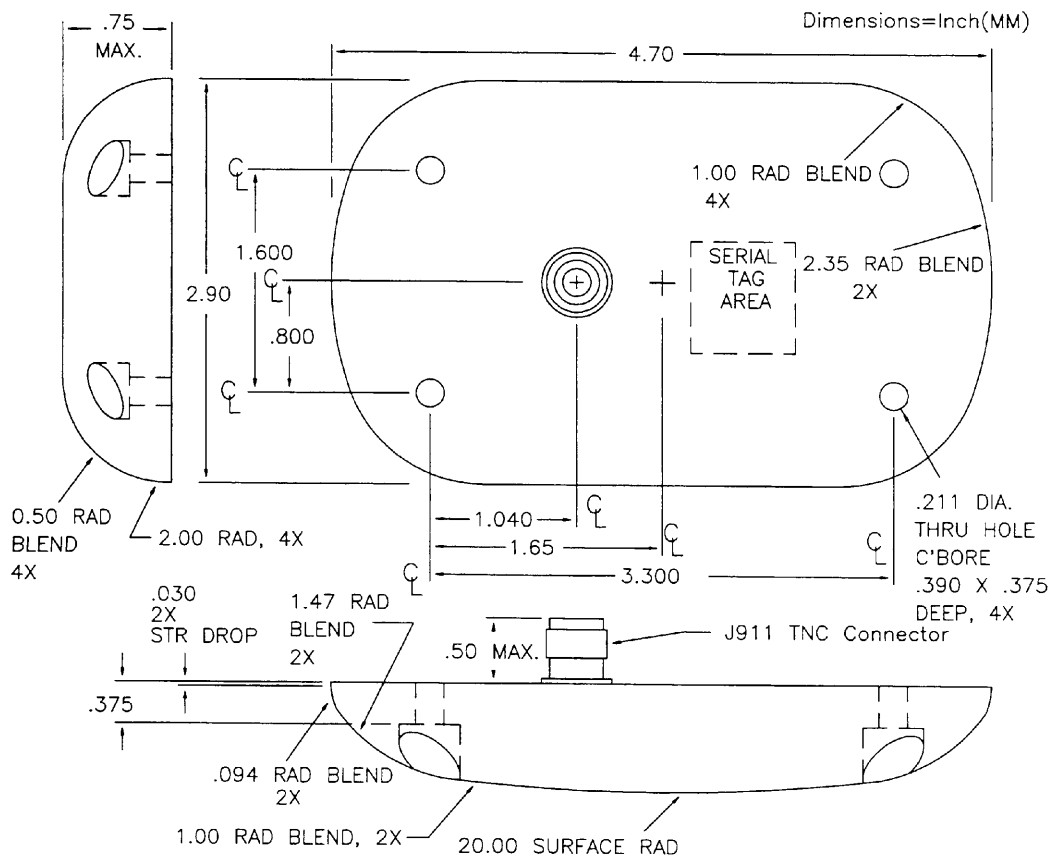
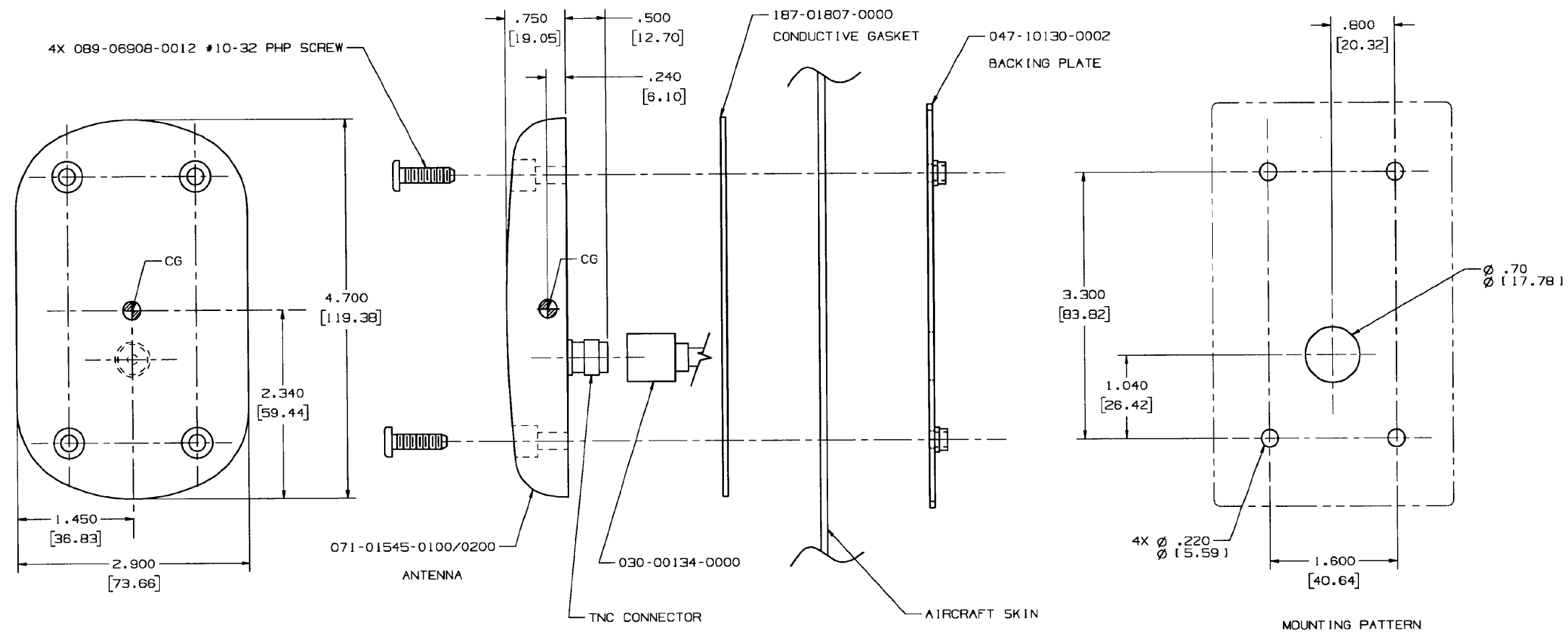


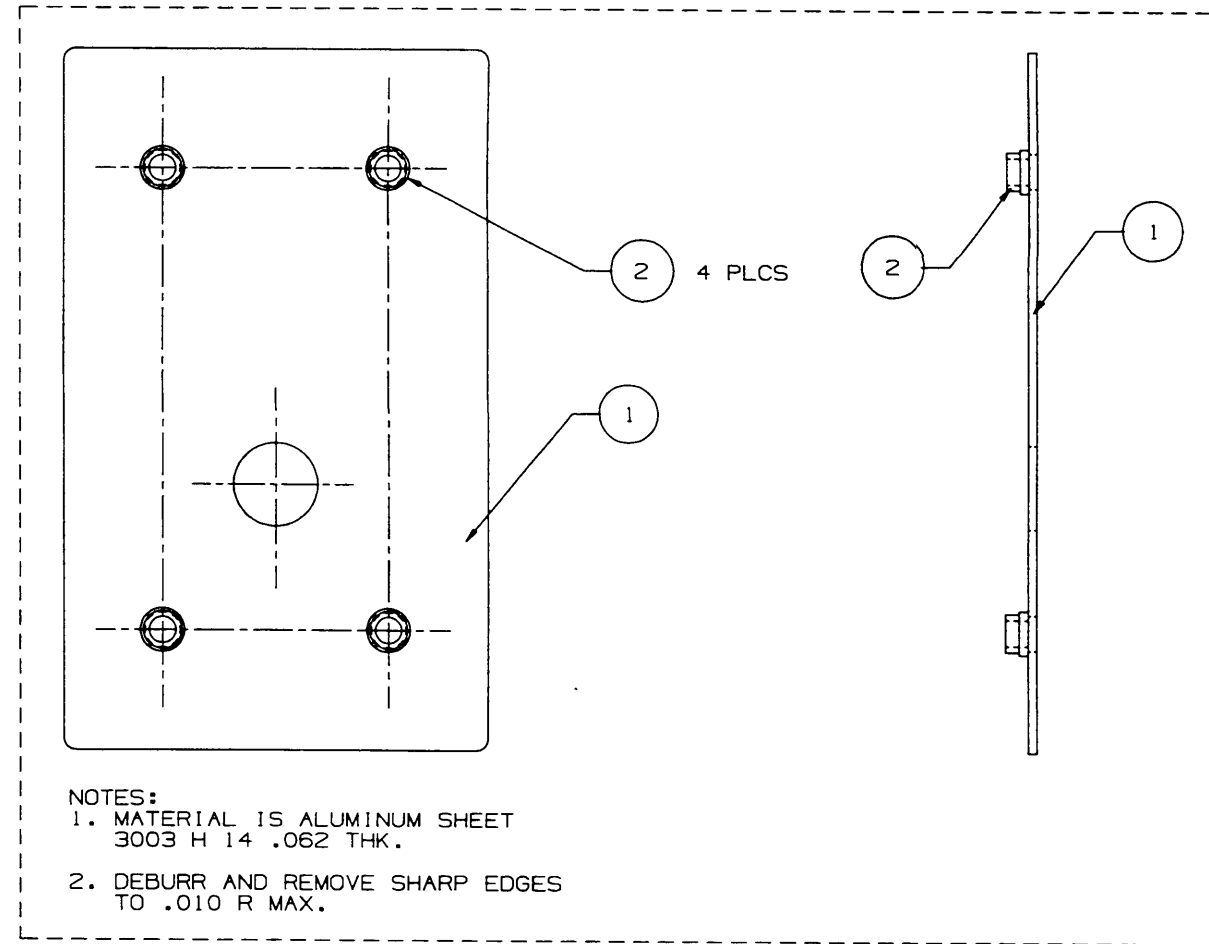
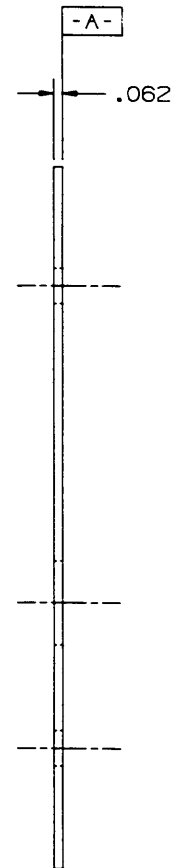
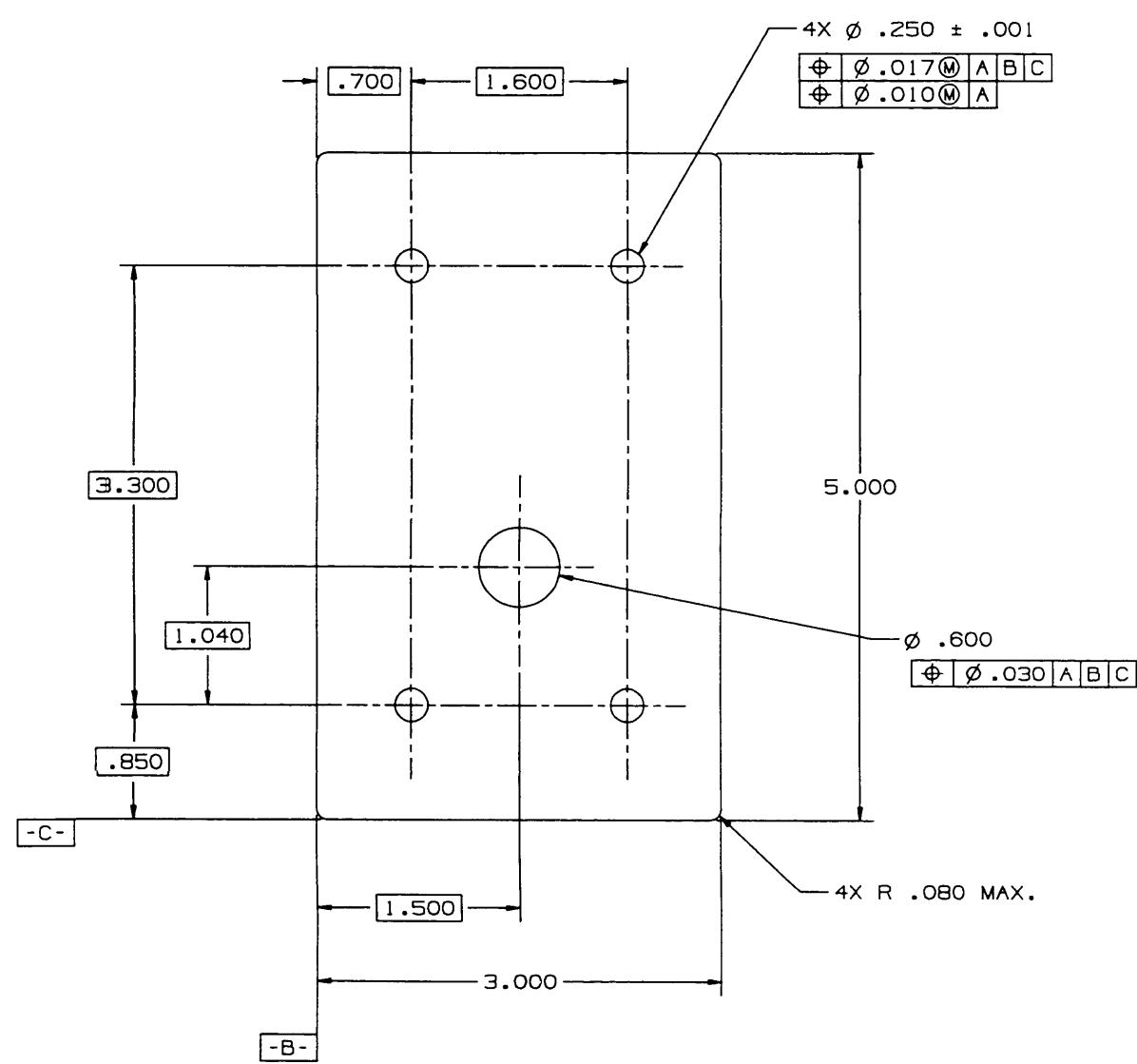
FIGURE 2-4 KA 91 OUTLINE
(DWG. NO. 071-01545-0200 R-4)



NOTES:

1. REMOVE PAINT IN AREA OF ANTENNA INSTALLATION.
2. DIMENSIONS IN INCHES [MILLIMETERS]
3. FOR BEST PERFORMANCE, BOND BETWEEN AIRCRAFT AND ANTENNA TO BE 10 MILLIOHMS RESISTANCE OR LESS.
4. UNIT WEIGHT .5 LBS [.227 KG.]
5. FILL MOUNTING SCREW HOLES WITH RTV SEALANT. APPLY WHITE RTV SEALANT AROUND BASE OF INSTALLED ANTENNA. KPN 016-01129-0000 OR EQUIVALENT.
6. ANTENNA SHOULD BE MOUNTED $\pm 5^\circ$ WITH AIRCRAFT AT LEVEL FLIGHT ATTITUDE.
7. DO NOT PAINT ANTENNA
8. AIRSPEED RATING 600 KTS MAX TAS.

FIGURE 2-5 KA 91 INSTALLATION DRAWING
(DWG. NO. 155-05999-0000 R-5)



NOTES:
 1. MATERIAL IS ALUMINUM SHEET
 3003 H 14 .062 THK.
 2. DEBURR AND REMOVE SHARP EDGES
 TO .010 R MAX.

ALTERNATE VIEW

FIGURE 2-6 KA 91 BACKPLATE OUTLINE
 (DWG. NO. 047-10130-0000/0002 R-2)

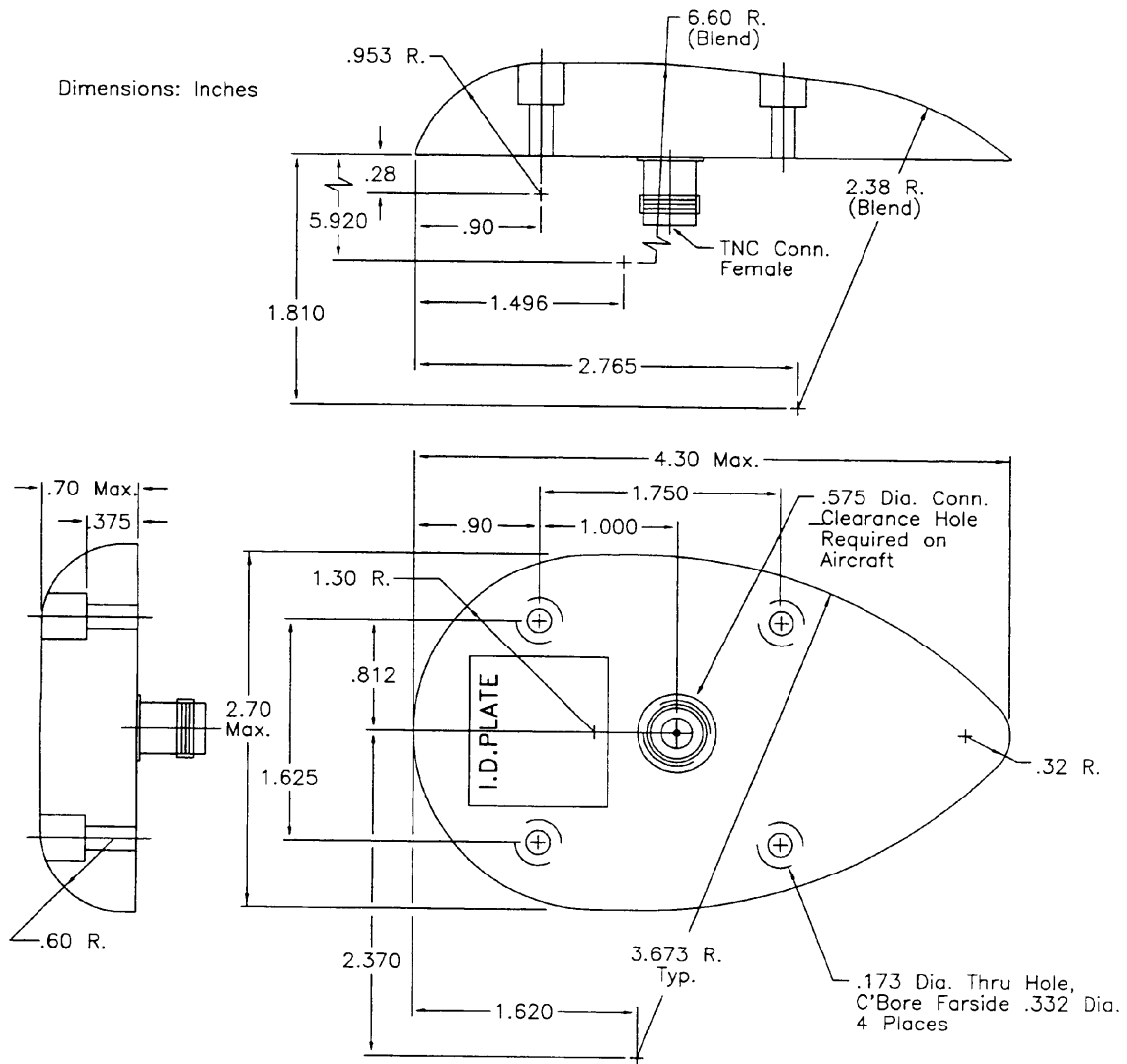
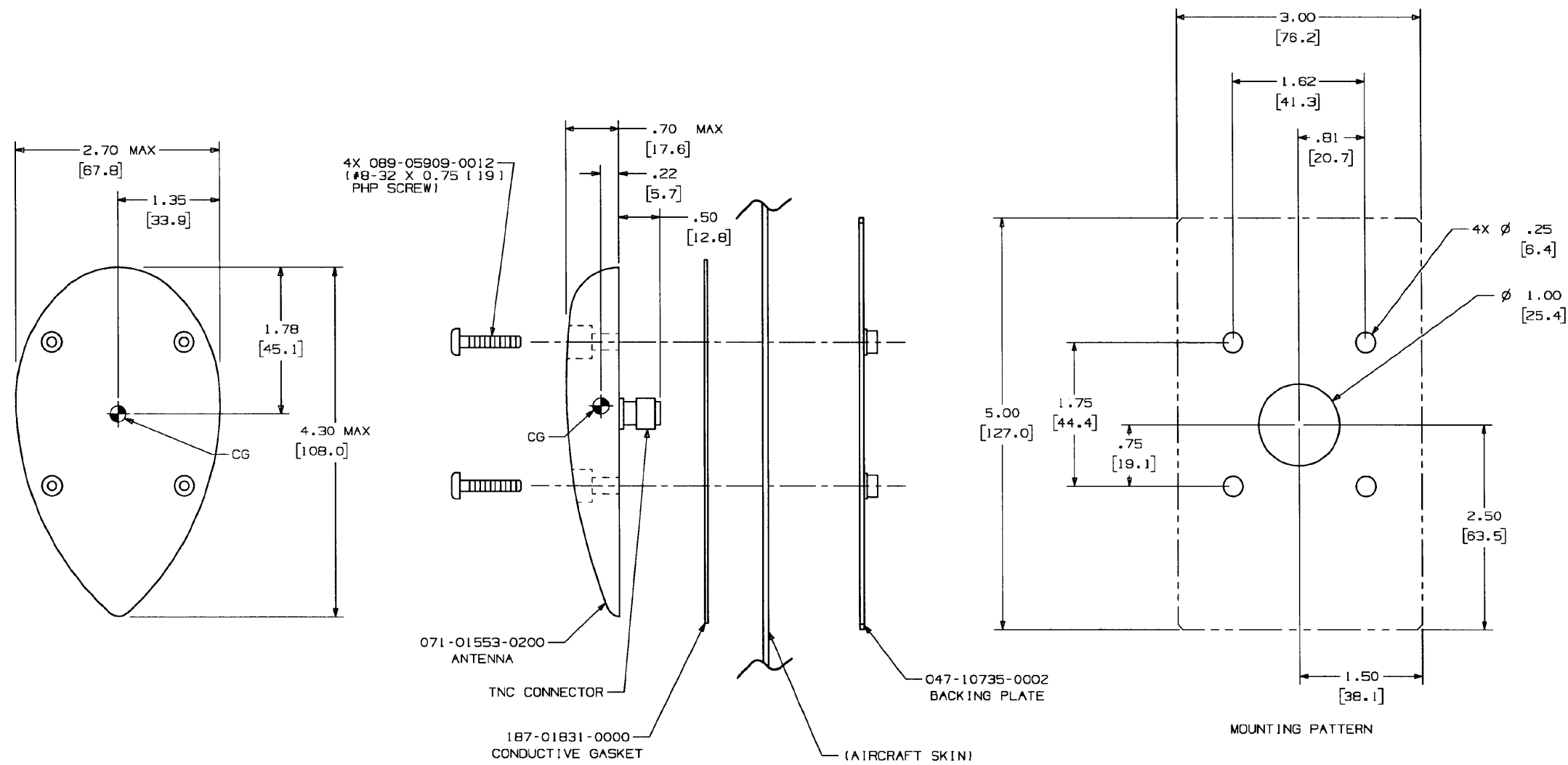


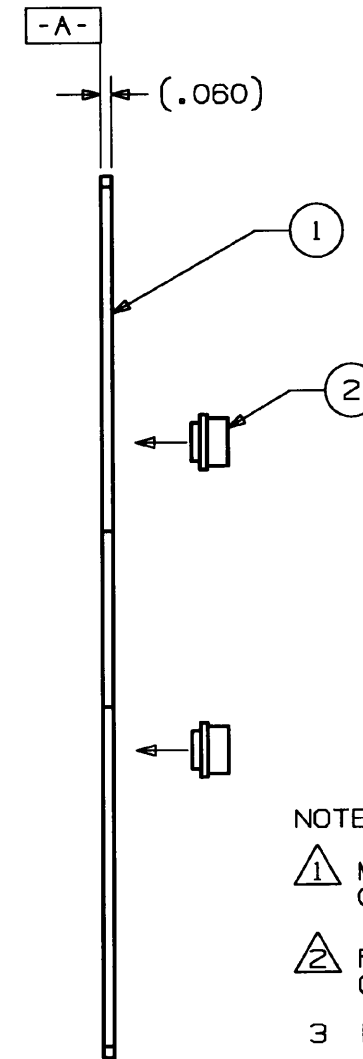
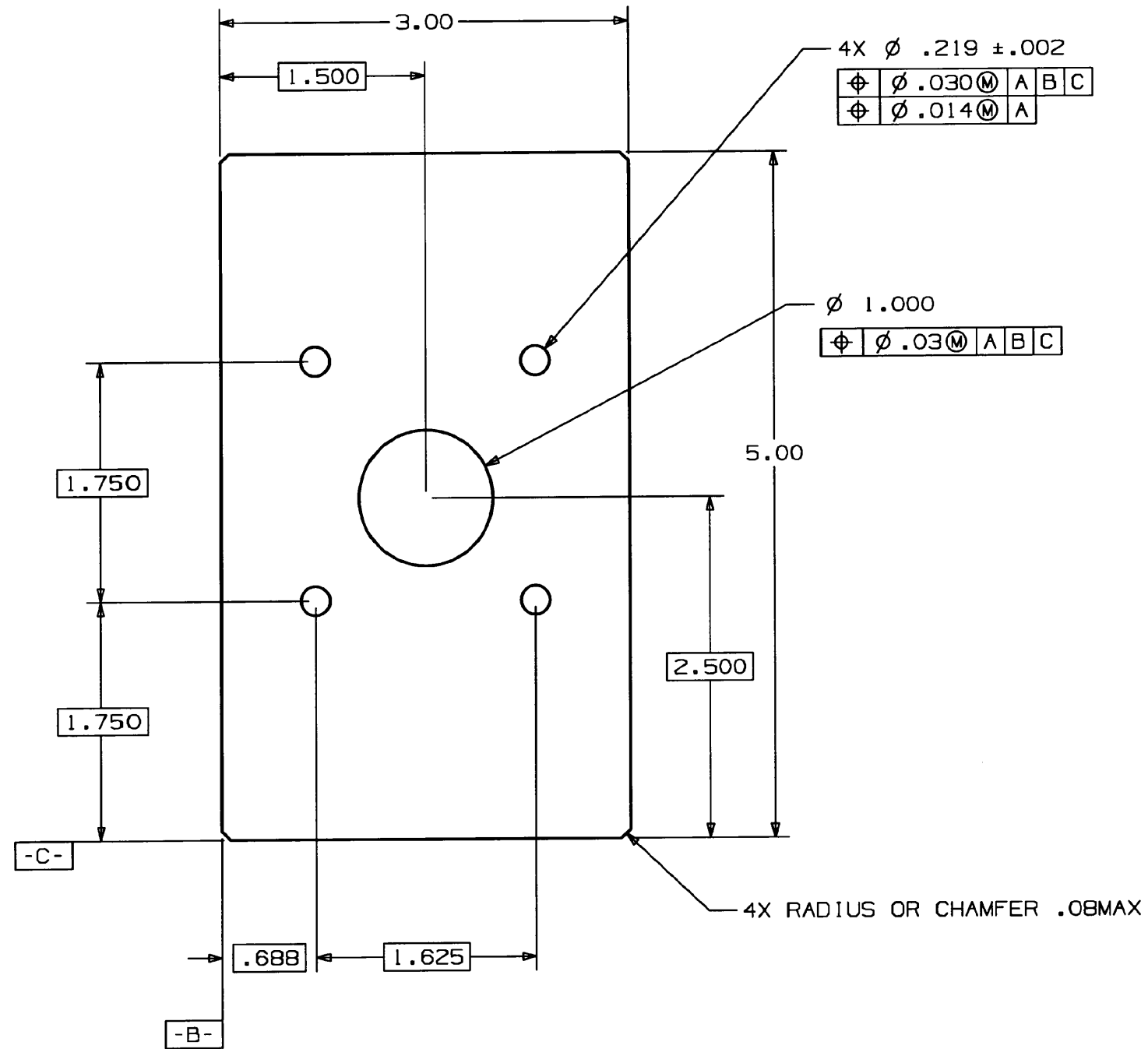
FIGURE 2-7 KA 92 OUTLINE DRAWING
(DWG. NO. 071-01553-0200 R-AB)



NOTES UNLESS OTHERWISE SPECIFIED:

1. REMOVE PAINT IN AREA OF ANTENNA INSTALLATION.
2. DIMENSION IN INCHES (MILLIMETERS)
3. FOR BEST PERFORMANCE, BOND BETWEEN AIRCRAFT AND ANTENNA TO BE 10 MILLIOHMS RESISTANCE OR LESS.
4. UNIT WEIGHT IS .27 LBS (.12 KG)
5. APPLY WHITE RTV SEALANT AROUND BASE OF INSTALLED ANTENNA. FILL MOUNTING SCREW HOLES WITH RTV SEALANT. (KPN 016-01129-0000 OR EQUIVALENT)
6. ANTENNA SHOULD BE MOUNTED LEVEL $\pm 5^\circ$ WITH AIRCRAFT AT LEVEL FLIGHT ATTITUDE.
7. DO NOT PAINT ANTENNA.
8. AIRSPEED RATING 600KTS MAX TAS.

FIGURE 2-8 KA 92 INSTALLATION DRAWING
(DWG. NO. 155-06019-0000 R-2)



NOTES UNLESS OTHERWISE SPECIFIED:

1 MATERIAL IS ALUMINUM 2024-T3
QQ-A-250/4, .063 STOCK THICK

2 FINISH IS GOLD IRIDITE MIL-C-5541
CLASS 1A

3 DEBURR AND REMOVE SHARP EDGES
.01R MAX

FIGURE 2-9 KA 92 BACKPLATE OUTLINE
(DWG. NO. 047-10735-0000/0002 R-1)

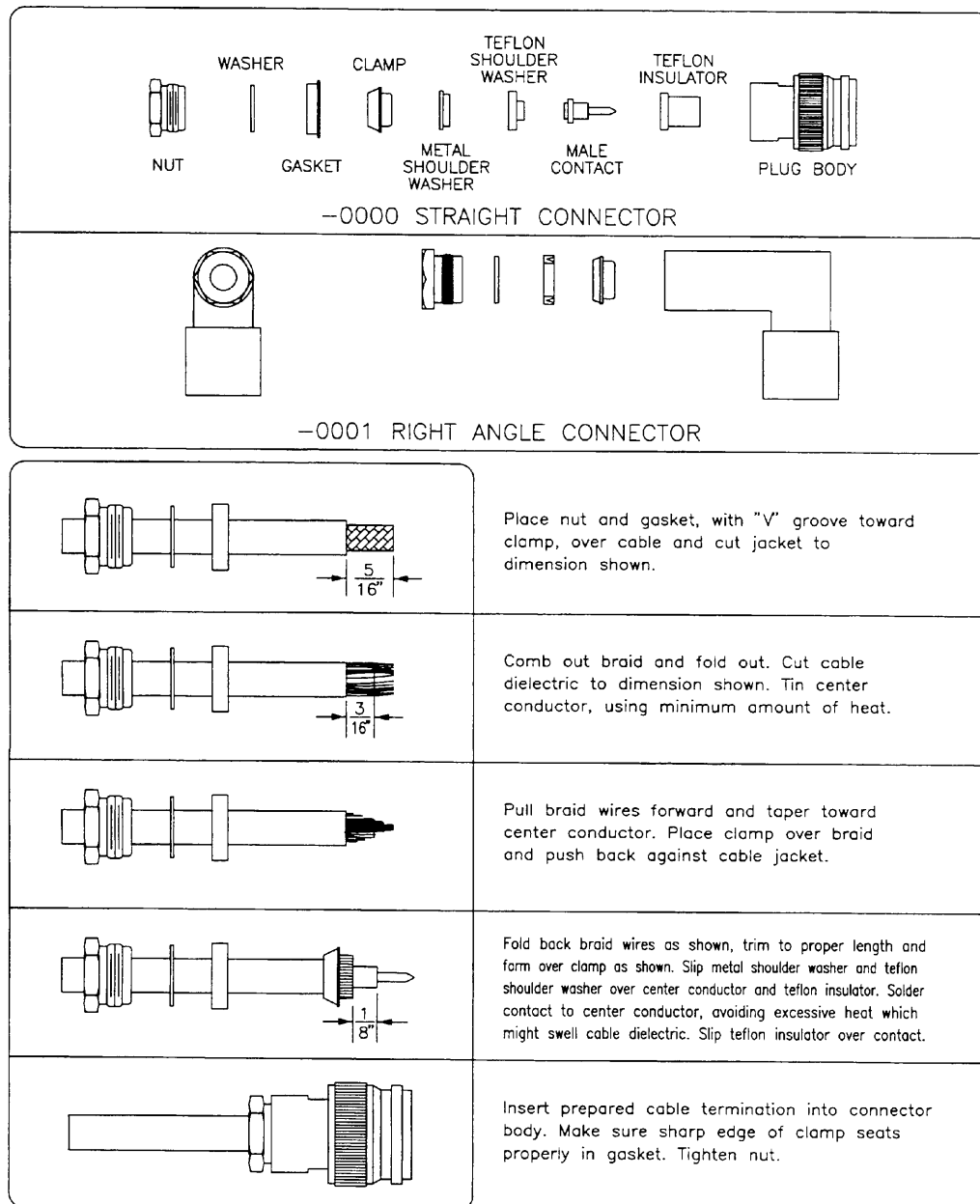
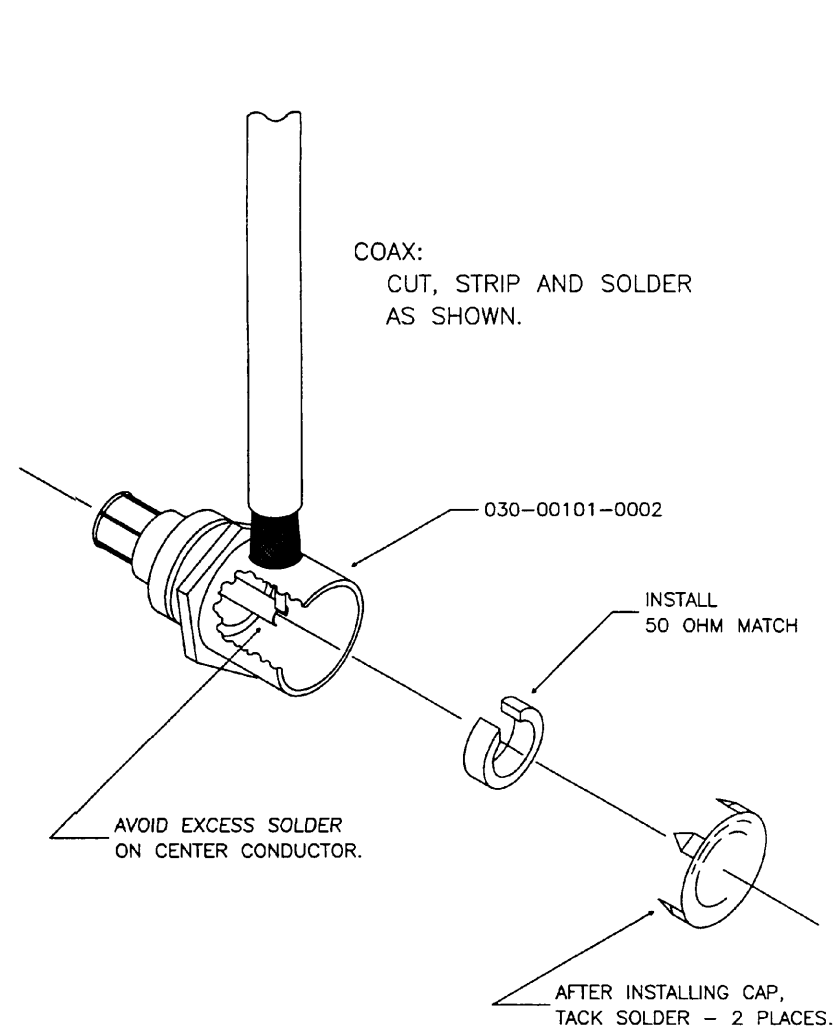
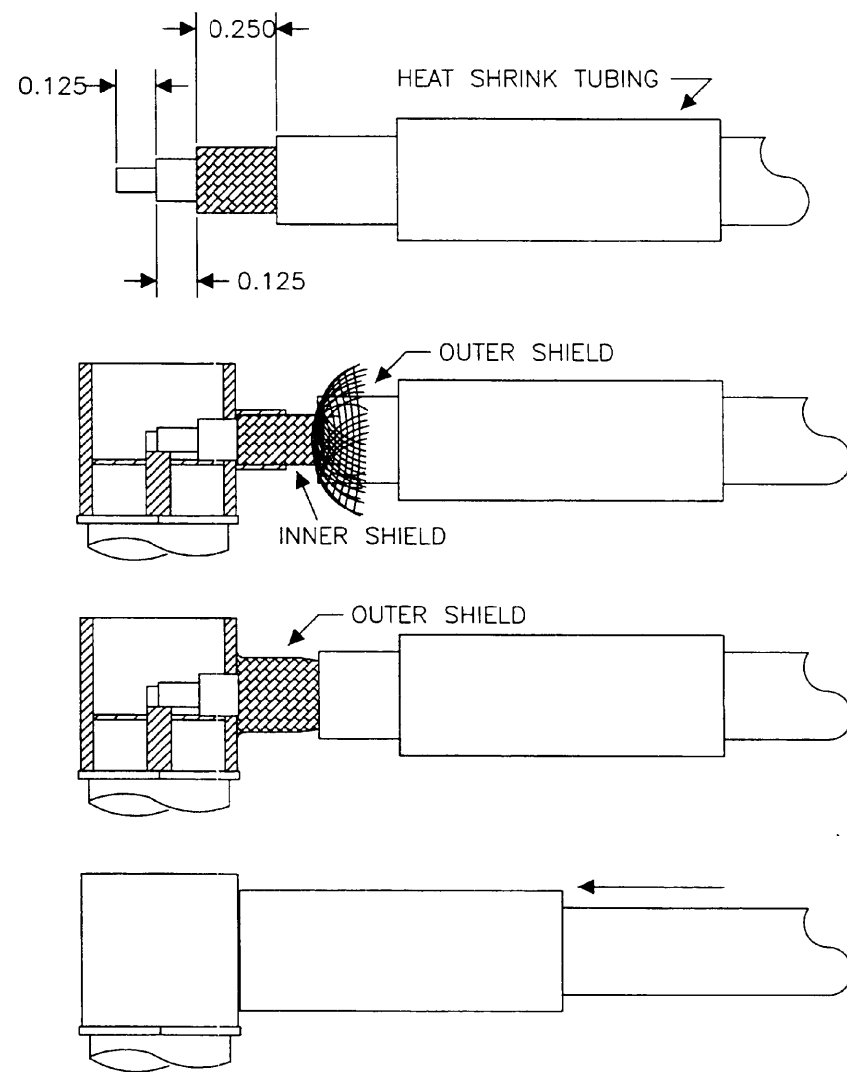


FIGURE 2-10 KA 91/92 TNC ANTENNA COAX/CONNECTOR ASSEMBLY
 RG142B/U OR RG400 0 TO 40 FT.
 (P/N 030-00134-0000, R-3 / 030-00134-0001, R-0)



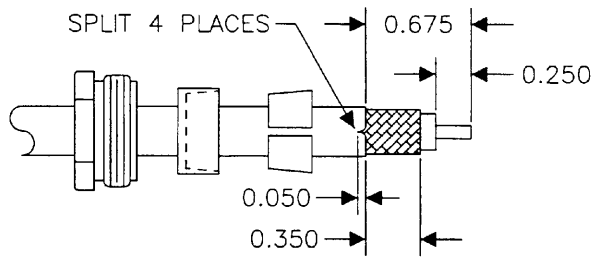
NOTES:

1. WHEN SOLDERING, AVOID APPLYING EXCESS HEAT TO CONNECTOR BODY, HEAT SINK SPRING CONTACTS, AND CENTER CONDUCTOR INSULATOR.

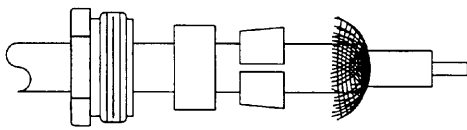


1. STRIP RG-142B/U (P/N 024-00002-0000) AND PLACE 1" HEAT SHRINK TUBING (P/N 150-00025-0010) OVER COAX.
2. SOLDER CENTER CONTACT AND SOLDER INNER SHIELD INSIDE. SEE NOTE 1.
3. SOLDER OUTER SHIELD OUTSIDE. SEE NOTE 1.
4. SLIDE HEAT SHRINK TUBING FORWARD (FLUSH WITH CONNECTOR) AND ADD HEAT TO SHRINK THE TUBING.

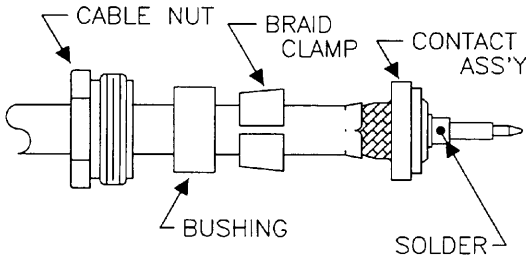
FIGURE 2-11 KA 91/92 BMA ANTENNA COAX/CONNECTOR ASSEMBLY
(RG142 B/U OR RG400 0 TO 40 FT.)
(DWG. NO. 030-00101-0002 R-9)



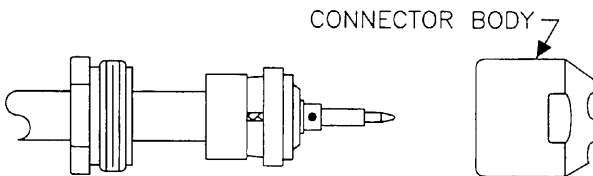
1. Place cable nut, bushing and braid clamp over outer jacket. Trim cable jacket, braid and dielectric to dimensions shown. Split outer jacket in 4 places (approx. 90° apart) to dimension. Lightly tin center conductor.



2. Fold back braid, foil and inner shield to expose dielectric.



3. Slide contact assembly (pin or socket) between inner dielectric and foil shield. Make certain contact assembly is pushed on cable to flare outer jacket and center conductor is visible through inspection hole. Smooth shields back over contact assembly and solder center contact as shown.



4. Push braid clamp and bushing forward over shield as far as possible. Slide cable nut over bushing and insert finished assembly into connector body. Tighten cable nut completely to seal cable assembly.

FIGURE 2-12 KA 91/92 TNC ANTENNA COAX/CONNECTOR ASSEMBLY
 0 TO 80 FT. / 0 TO 100 FT.
 (FOR CABLE P/N'S 024-00071-0000, R-0 / 024-00072-0000, R-0)

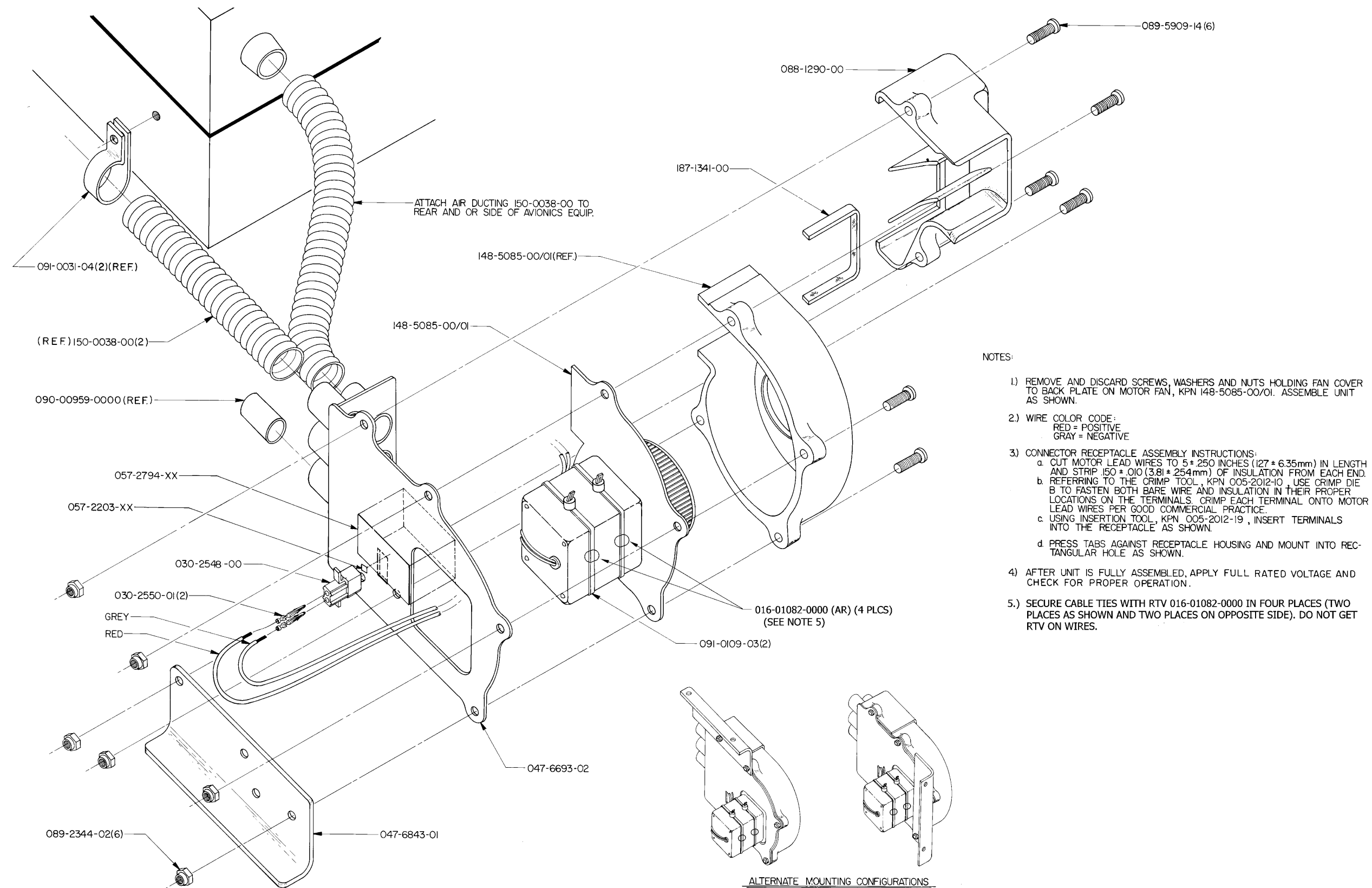
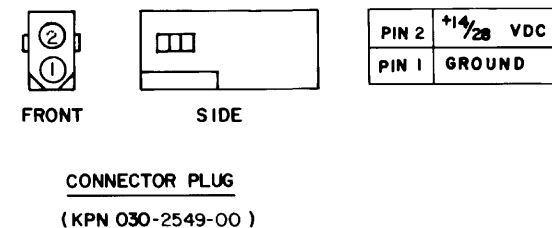
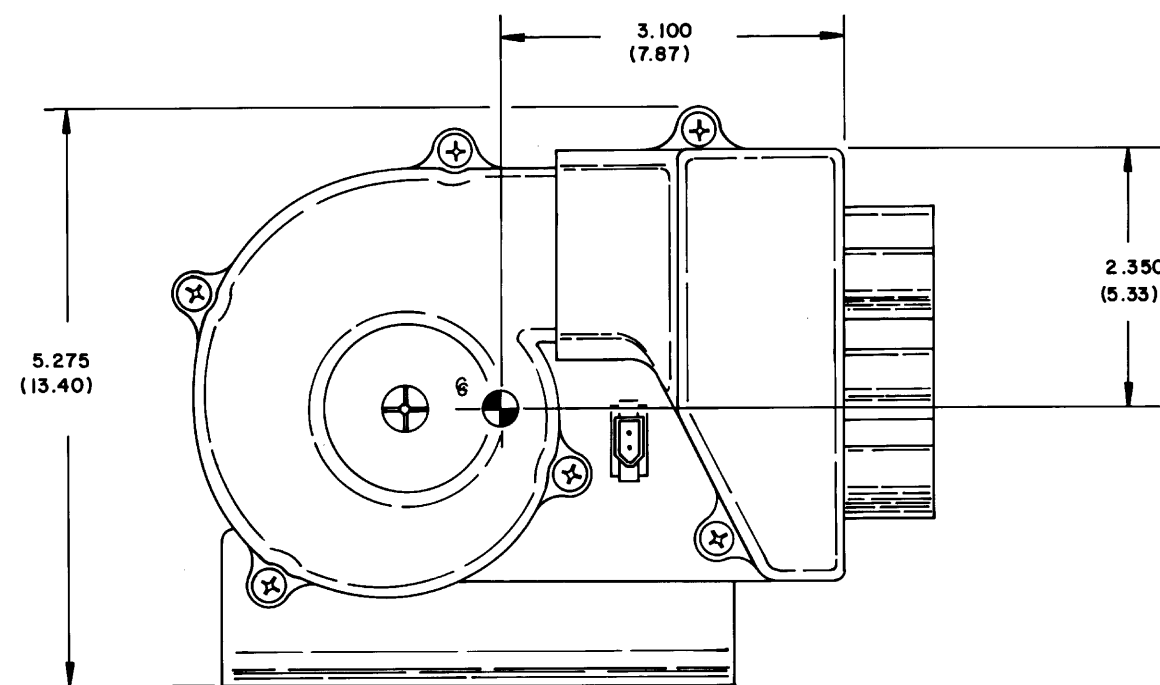
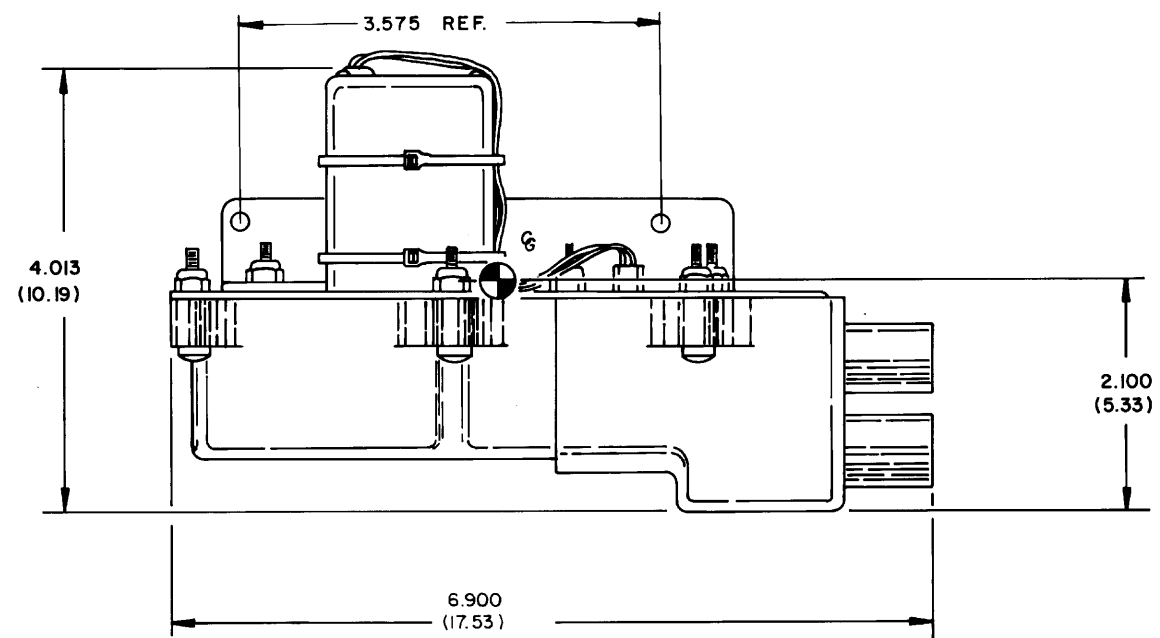


FIGURE 2-13 KA 33 P/N 071-4037-00/01 FINAL ASSEMBLY
(DWG. NO. 300-03256-0000, R-AA)

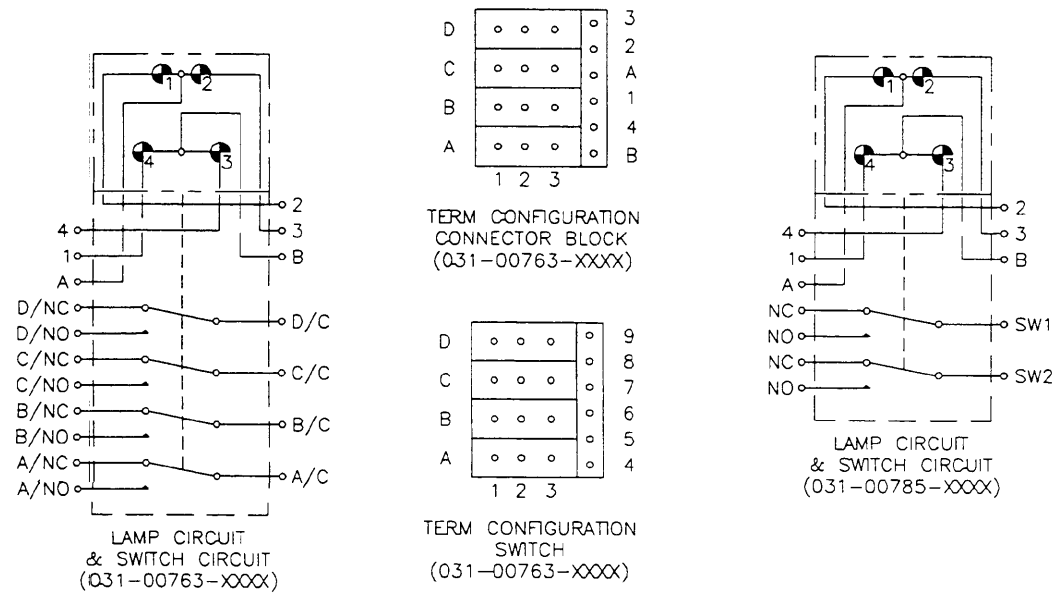
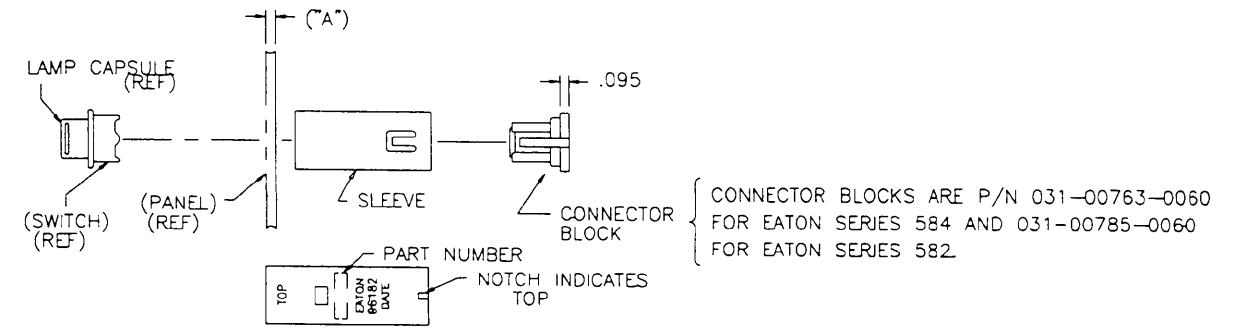


- NOTES: 1. DIMENSIONS IN () ARE IN CENTIMETERS.
 2. USE KA33 BLOWER KIT, KPN 071-4037-00 FOR 14V AIRCRAFT AND KPN 071-4037-01 FOR 28V AIRCRAFT.
 3. WEIGHT: 1.25 LBS. (0.57 KG.)

FIGURE 2-14 KA 33 P/N 071-4037-00/01 OUTLINE AND MOUNTING
(DWG. NO. 155-05574-0000, R-5)

INSTALLATION AND REMOVAL TOOLS (AVAILABLE FROM LCOMP)

TYPE	EATON PART NUMBER
CONNECTOR PIN CRIMP TOOL	58T-103
CONNECTOR PIN REMOVAL TOOL	58T-104
CONNECTOR PIN REMOVAL TOOL TIP	58T-105-2



MOUNTING SLEEVES		
PANEL THICKNESS DIMENSION "A"	ALLIEDSIGNAL PART NUMBER	VENDOR PART NUMBER
.052" TO .072"	031-00763-0029	4686-29
.083" TO .103"	031-00763-0030	4686-30
.115" TO .135"	031-00763-0031	4686-31
USE THE ABOVE WITH EATON SERIES 584		
.052" TO .072"	031-00785-0029	4686-29
.083" TO .103"	031-00785-0030	4686-30
.115" TO .135"	031-00785-0031	4686-31
USE THE ABOVE WITH EATON SERIES 582		

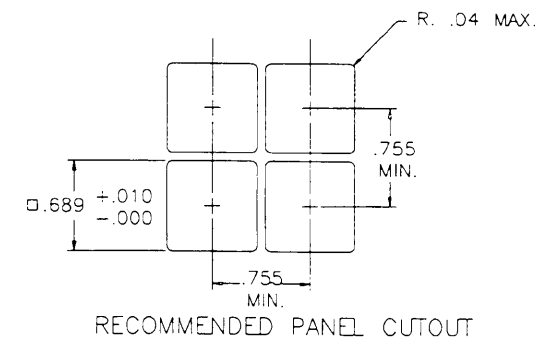
THREE SLEEVES AND A CONNECTOR BLOCK ARE PROVIDED WITH EACH ANNUNCIATOR/SWITCH ASSEMBLY TO ACCOMMODATE A FULL RANGE OF PANEL THICKNESSES.

NOTES:

- MOMENTARY SWITCH TRAVEL IS SUCH THAT THE CAPSULE IS FLUSH WITH, OR RECESSED INTO, THE BEZEL OF THE SWITCH BODY WHEN FULLY ACTUATED.
- ALTERNATE ACTION SWITCH TRAVEL AND RETAINED POSITION ARE SUCH THAT THE CAPSULE IS FLUSH WITH, OR RECESSED INTO, THE BEZEL OF THE SWITCH BODY WHEN ACTUATED.
- COMPLETE ANNUNCIATORS/SWITCHES ARE AVAILABLE FROM LCOMP. PARTS FOR CONVERSION OR REPAIR ARE ALSO AVAILABLE.

LCOMP Aerospace Controls
9214 Bond
Overland Park, KS 66214

TELEPHONE:
(913) 438-4848
(800) 821-2915
(913) 438-4839 (FAX)



RECOMMENDED PANEL CUTOUT

FIGURE 2-15 CUTLER-HAMMER SWITCH/ANNUNCIATOR MOUNTING

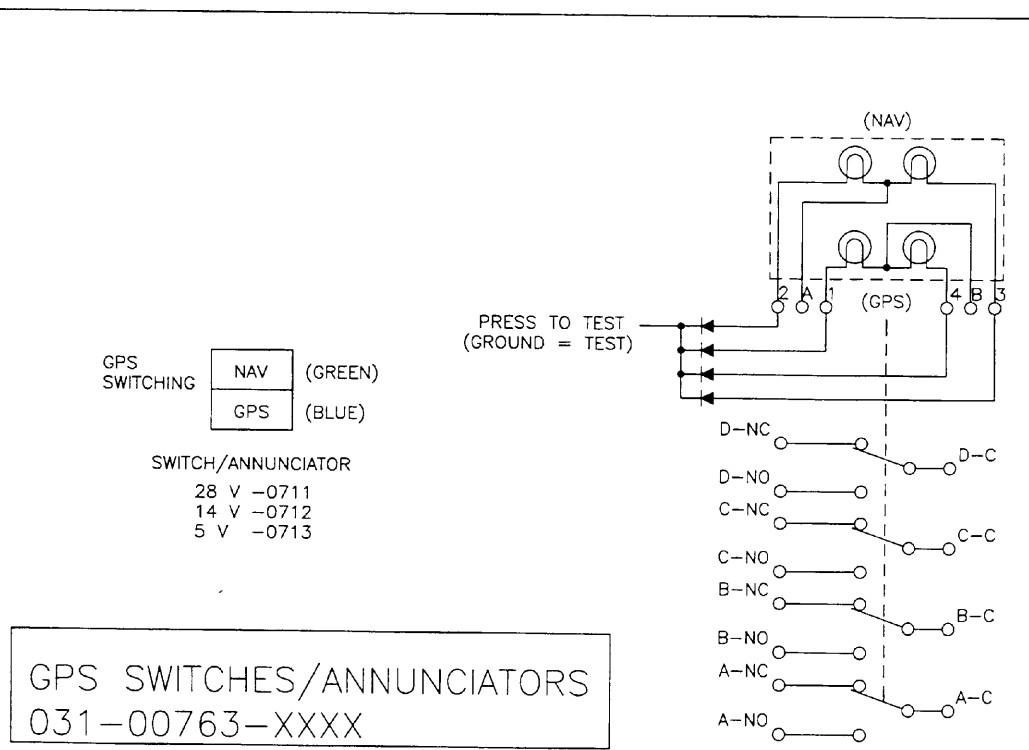
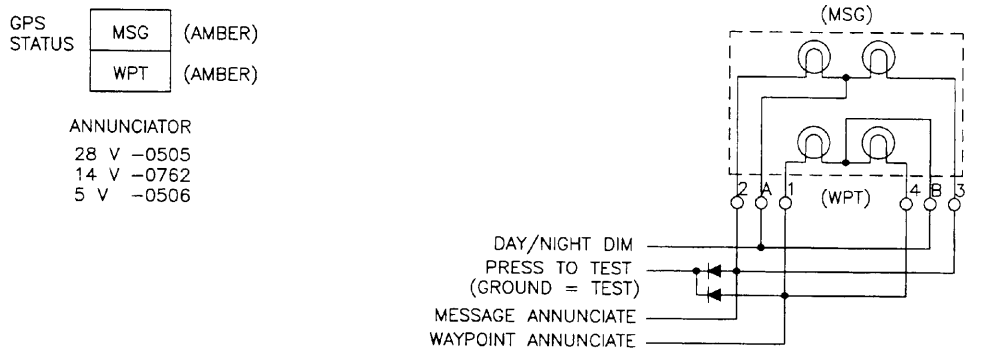


FIGURE 2-16 CUTLER-HAMMER SWITCH/ANNUNCIATOR INTERNAL SCHEMATIC (SHEET 1 OF 2)

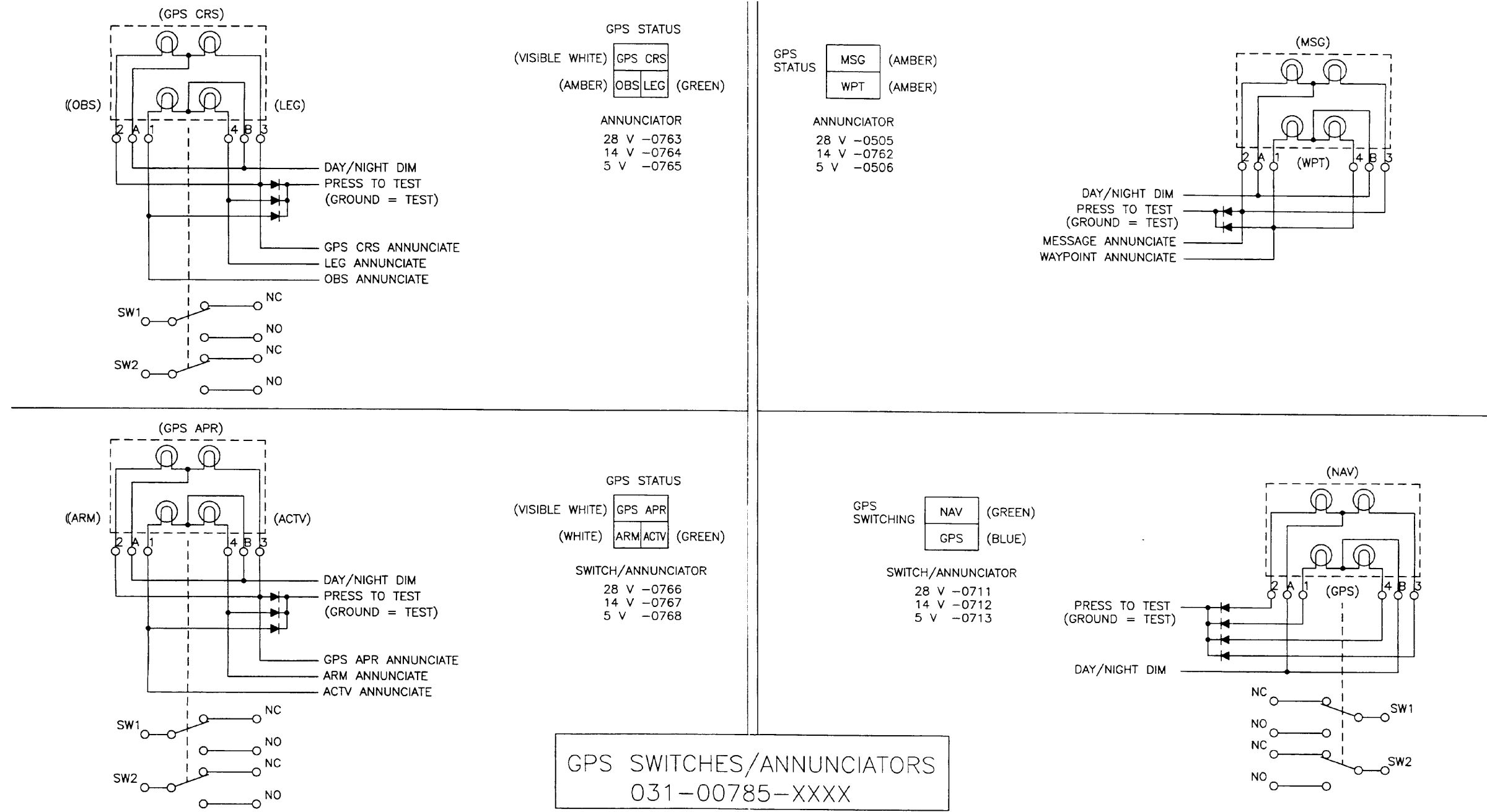


FIGURE 2-16 CUTLER-HAMMER SWITCH/ANNUNCIATOR INTERNAL SCHEMATIC
(SHEET 2 OF 2)

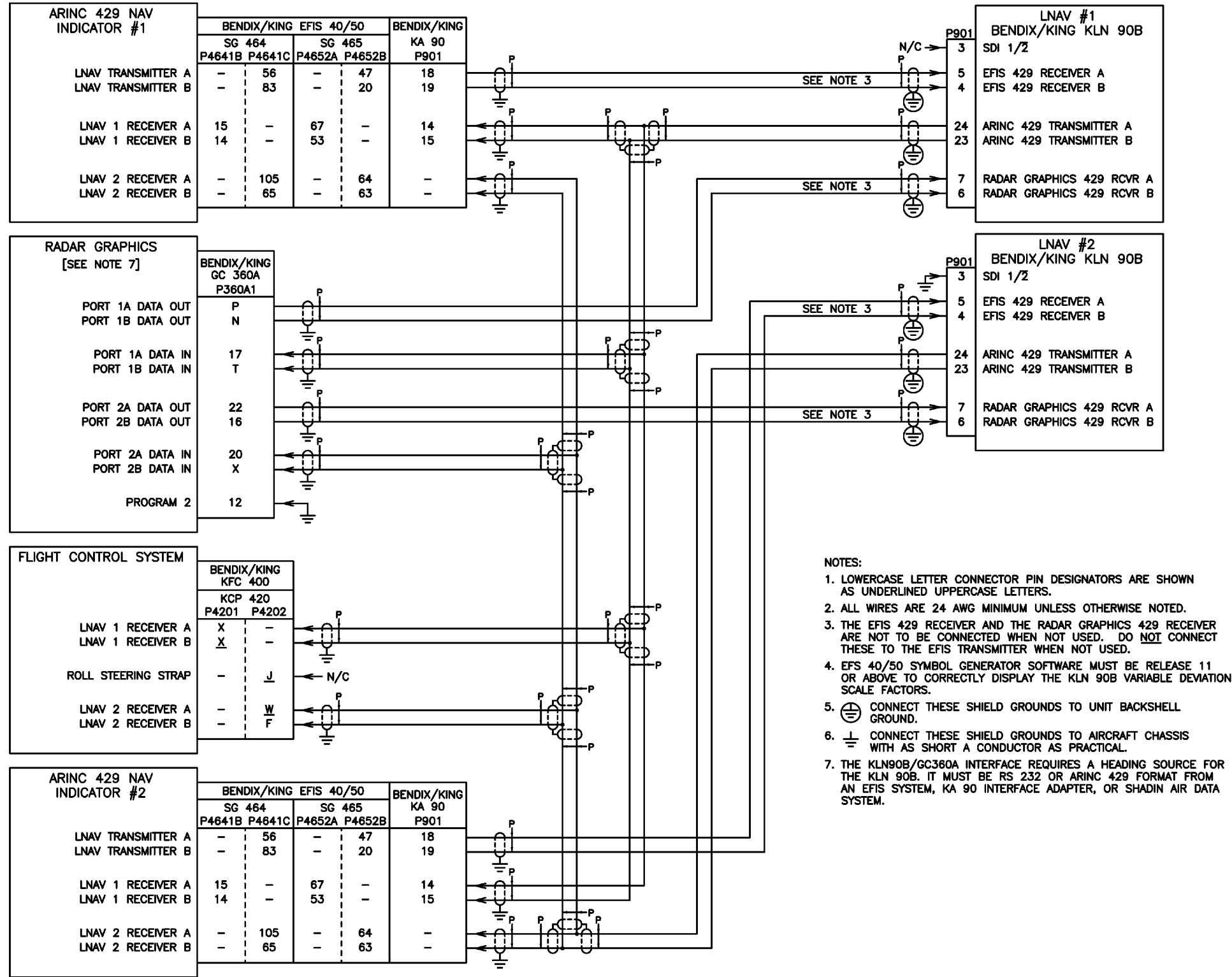
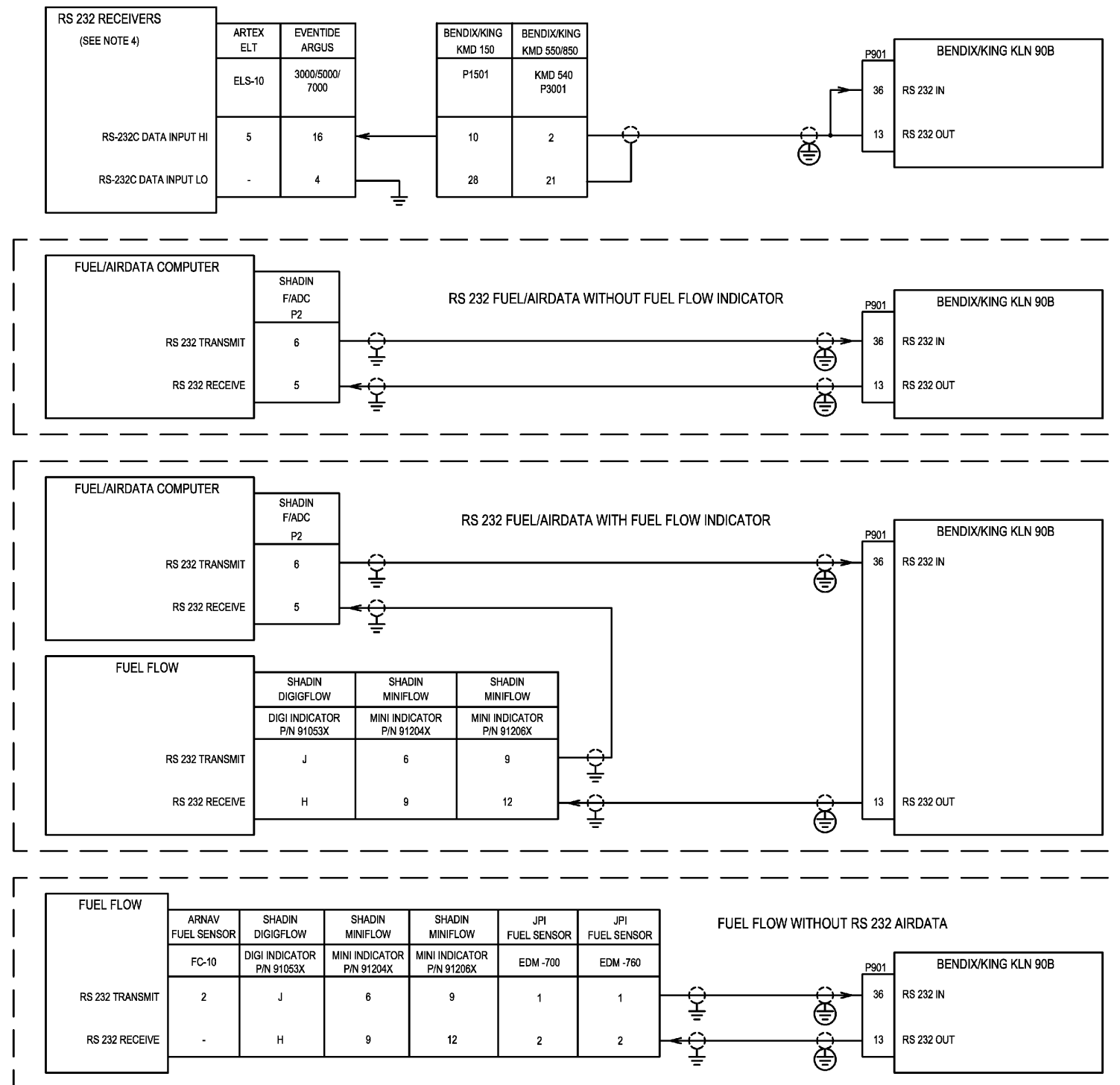
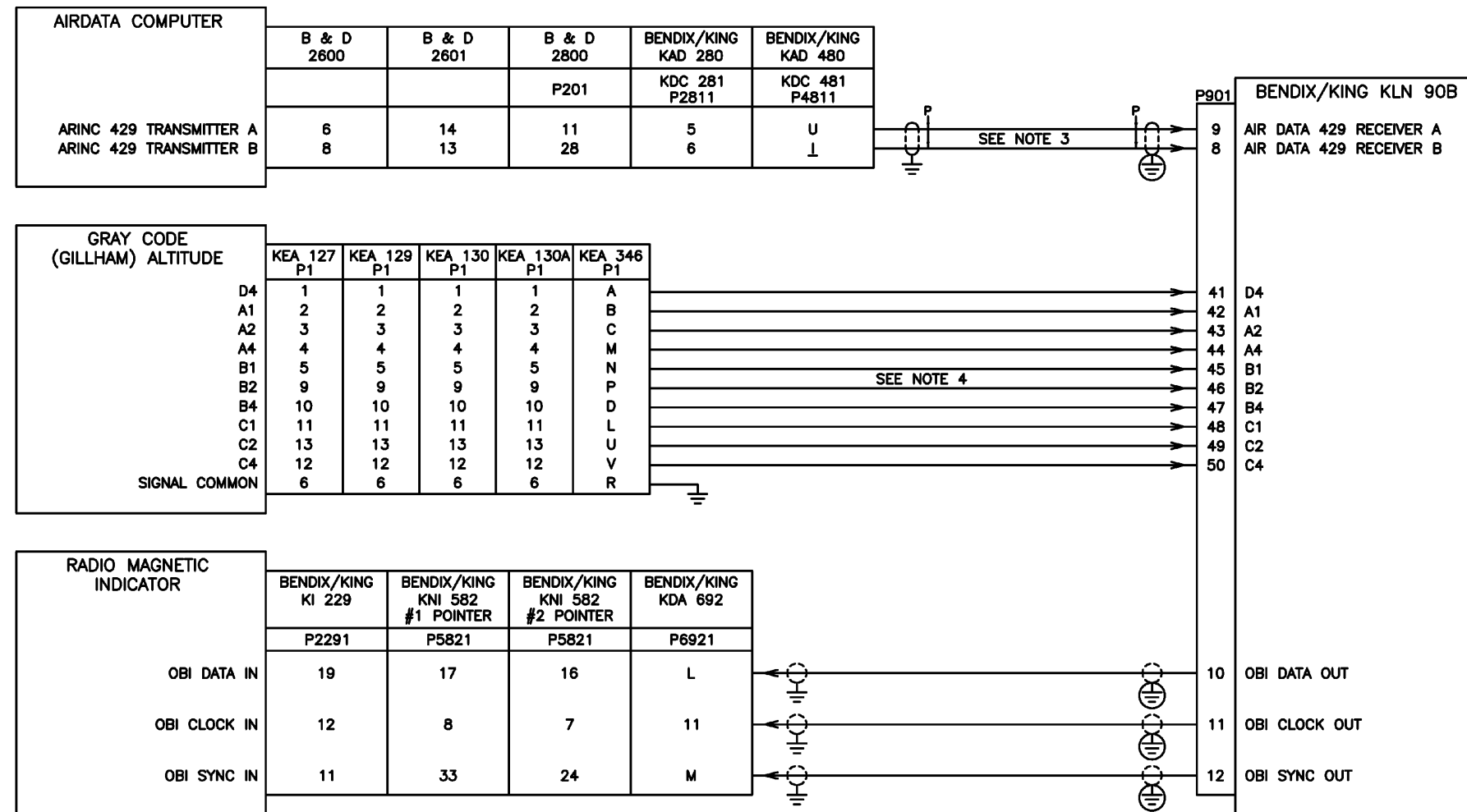


FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 1 OF 10)



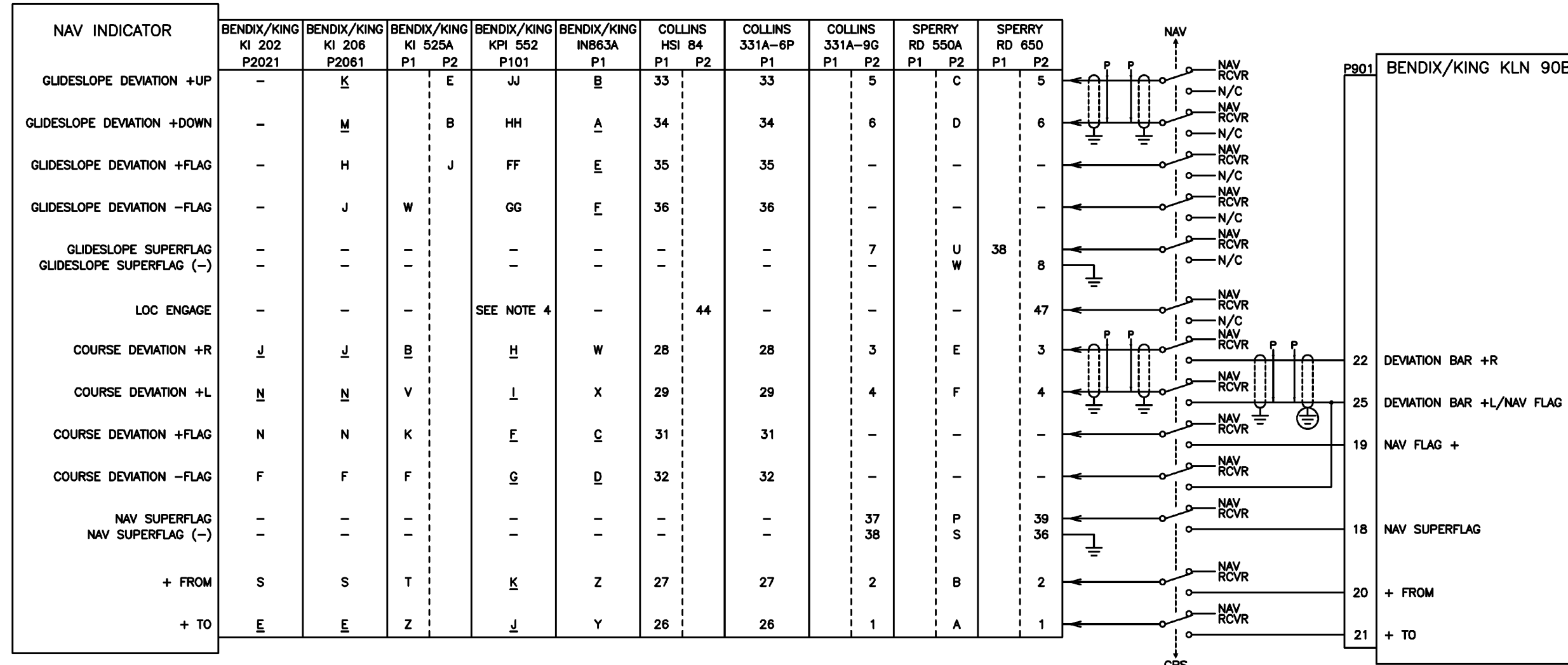
- NOTES:
1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
 2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
 3. RS 232 OUT CAN DRIVE SEVERAL INPUTS. ONLY ONE TRANSMITTER CAN BE CONNECTED TO RS 232 IN AT A TIME. WHEN RS 232 IN IS NOT USED IN THE INSTALLATION, IT MUST BE CONNECTED TO RS 232 OUT TO PREVENT THE "RS-232 DATA ERROR" MESSAGE FROM APPEARING ON THE MESSAGE PAGE.
 4. RS 232 RECEIVERS MAY NOT BE USED AS THE PRIMARY FLIGHT DISPLAY FOR THE KLN 90B.
 5. CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.
 6. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 2 OF 10)



- NOTES:
1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
 2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
 3. WHEN THE AIRDATA 429 RECEIVER IS NOT USED IN THE INSTALLATION, IT MUST BE CONNECTED TO THE TRANSMITTER TO PREVENT THE "AIR DATA FAIL" MESSAGE FROM APPEARING ON THE MESSAGE PAGE.
 4. SOME RECEIVERS OF THE ALTITUDE ENCODER DO NOT HAVE INTERNAL ISOLATION DIODES TO PREVENT THE UNIT FROM PULLING THE ENCODER LINES TO GROUND WHEN THE UNIT IS OFF. KLN 90'S BEFORE SERIAL NUMBER 1542, SOME TRANSPONDERS AND OTHER DEVICES DO NOT HAVE THE INTERNAL DIODES. THESE UNITS REQUIRE A DIODE TO BE ADDED TO THE INSTALLATION HARNESS FOR EVERY ENCODER LINE. THE DIODES ARE INSERTED AT THE CONNECTION TO THE UNIT THAT DOES NOT HAVE INTERNAL DIODES. THE ANODE IS ON THE RECEIVING UNITS SIDE AND THE CATHODE IS ON THE ENCODER SIDE. A 1N4007, OUR PART NUMBER 007-06048-0000, MEETS HIRF AND LIGHTNING REQUIREMENTS. A SET OF DIODES IS REQUIRED FOR EACH UNIT WITHOUT INTERNAL DIODES.
 5. CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.
 6. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

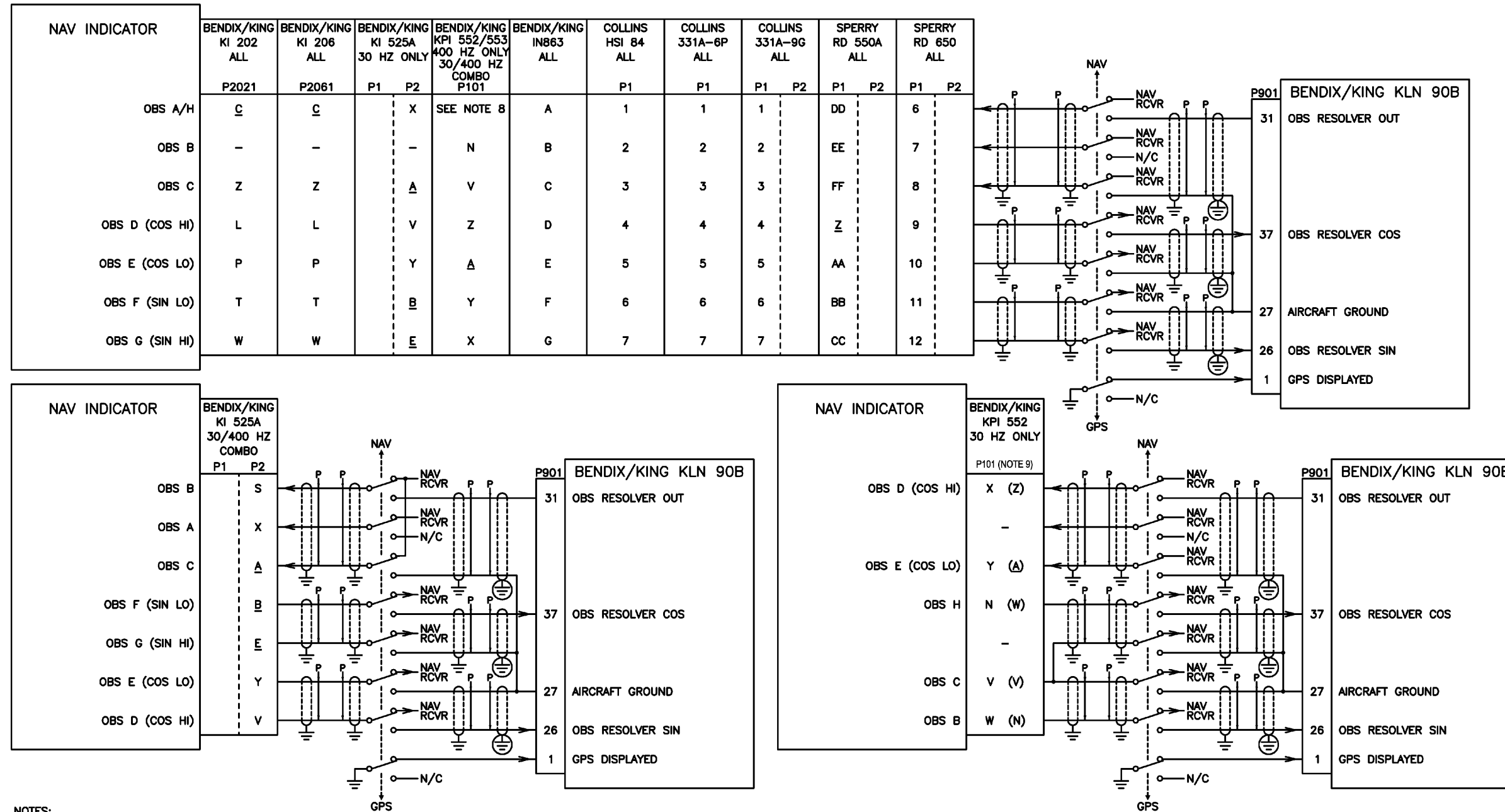
FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 3 OF 10)



NOTES:

1. LOWERCASE LETTER CONNECTORS PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
3. NOT ALL RELAYS ARE NEEDED FOR ALL INSTALLATIONS. A RELAY IS NOT REQUIRED IF AN INDICATOR PIN IS NOT SHOWN FOR THAT RELAY.
4. A RELAY IS NOT REQUIRED FOR THE LOC ENGAGE CONNECTION TO THIS INDICATOR AS THIS PIN DOES NOT HAVE A COURSE DEVIATION FUNCTION; IT IS USED TO PARK THE RMI NEEDLE.
5. CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.
6. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

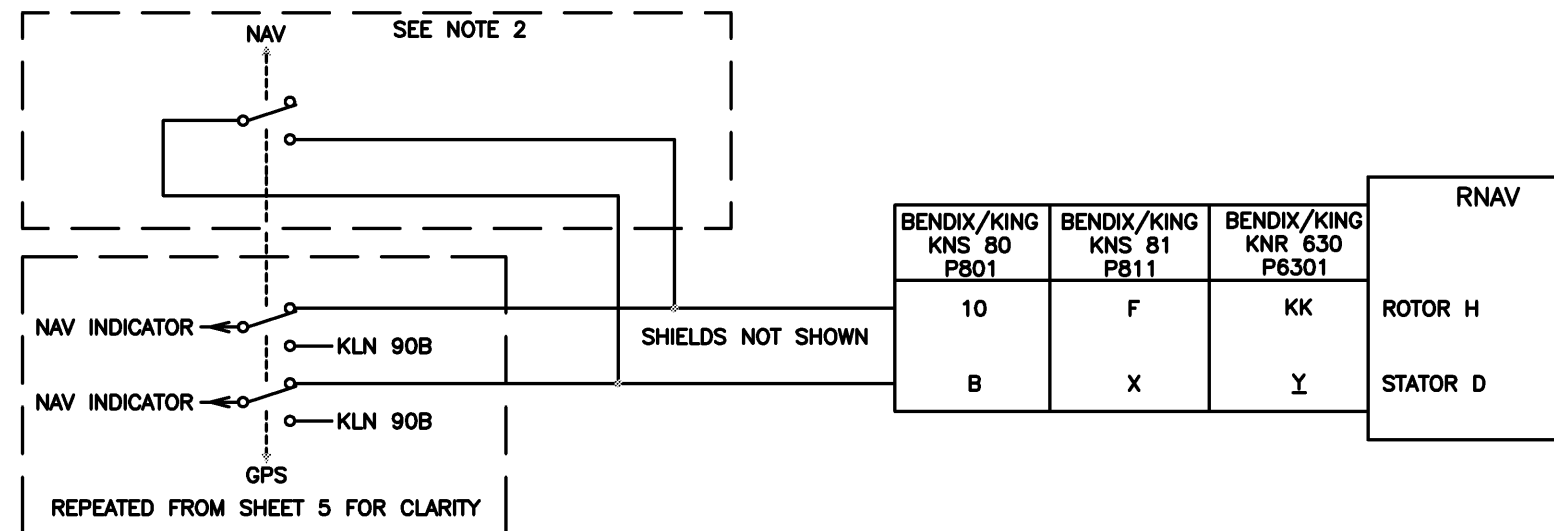
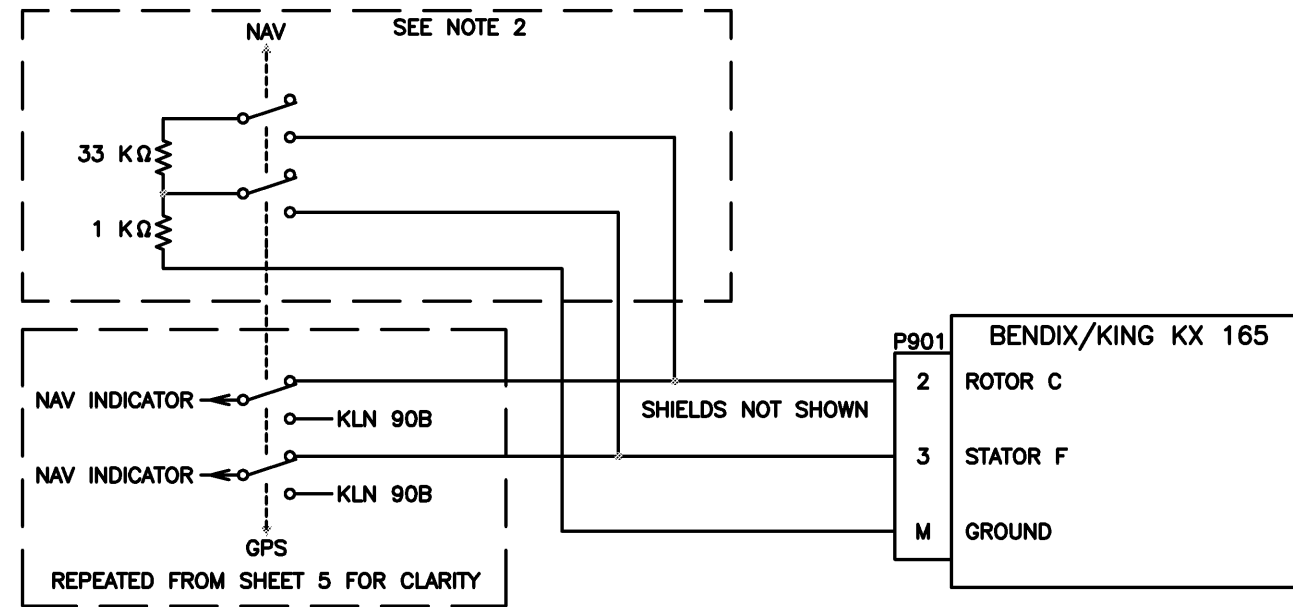
FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
 (DWG. NO. 155-06021-0000, R-AC)
 (SHEET 4 OF 10)



- NOTES:
1. LOWERCASE LETTER CONNECTORS PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
 2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
 3. NOT ALL RELAYS ARE NEEDED FOR ALL INSTALLATIONS. A RELAY IS NOT REQUIRED IF AN INDICATOR PIN IS NOT SHOWN FOR THAT RELAY.
 4. WHEN THE KLN 90B IS USED WITH A KA 90 HSI ADAPTER, THE KA 90 OBS CONNECTIONS ARE USED AND THE KLN 90B OBS CONNECTIONS BECOME NO CONNECTION. WHEN A KA 90 IS USED, THE FOLLOWING KLN 90B PINS BECOME NO CONNECTION: OBS RESOLVER OUT, P901-31; OBS RESOLVER COS, P901-37; OBS RESOLVER SIN, P901-26; GPS DISPLAYED, P901-1.
 5. THE KX 185 NAV/COM AND THE KNS 80 AND KNS 81 RNAV'S WILL FLAG SOME OF THEIR OUTPUTS WHEN THEY ARE NOT CONNECTED TO AN OBS RESOLVER. IF THE KLN 90B SHARES THE NAV INDICATOR WITH ONE OF THESE UNITS THROUGH THE NAV/GPS RELAY, REFER TO SHEET 6 FOR INFORMATION ON HOW TO LOAD THE NAV RECEIVER'S OBS LINES FOR PROPER OPERATION OF THESE NAV RECEIVERS.
 6. CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.

7. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.
8. FOR 400 HZ. CONNECT TO PIN "A". FOR 30/400 HZ. CONNECT TO PIN "W". THIS APPLIES TO ALL KPI 552/552B AND KPI 553/A/B WITH 30/400 RESOLVERS.
9. IF OBS POINTER ON A KPI 552 IS 90° OUT, USE THE PINS INDICATED IN PARENTHESIS.

FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 5 OF 10)



NOTES:

1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
2. THE KX 165 NAV/COM AND THE KNS 80 AND KNS 81 RNAV'S WILL FLAG SOME OF THEIR OUTPUTS WHEN THEY ARE NOT CONNECTED TO AN OBS RESOLVER. IF THE KLN 90B SHARES THE NAV INDICATOR WITH ONE OF THESE UNITS THROUGH THE NAV/GPS RELAY, THE NAV RECEIVER'S OBS RESOLVERS MUST BE LOADED AS SHOWN. RESISTORS ARE 1/4 W, 5%.

FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 6 OF 10)

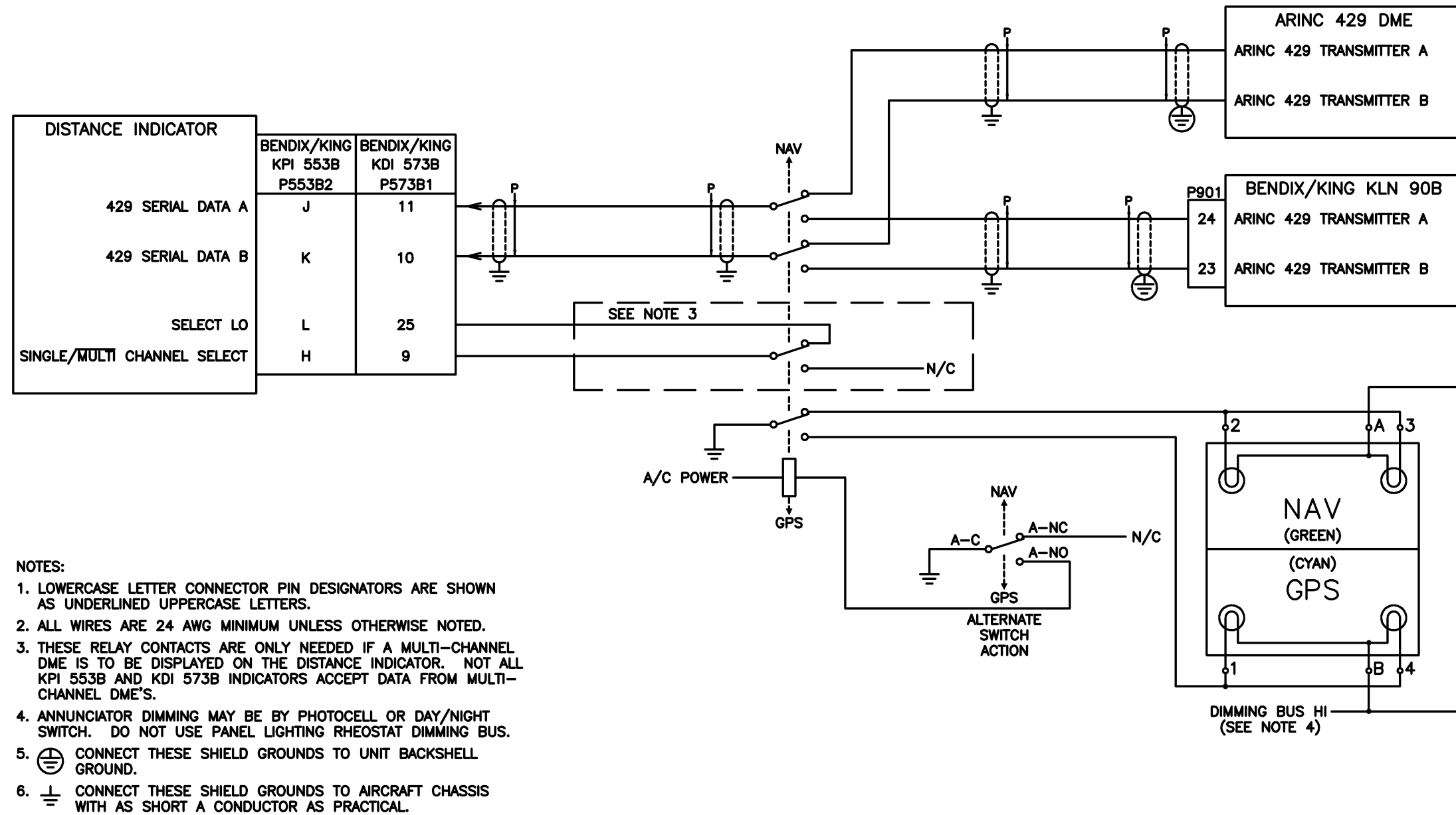


FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 7 OF 10)

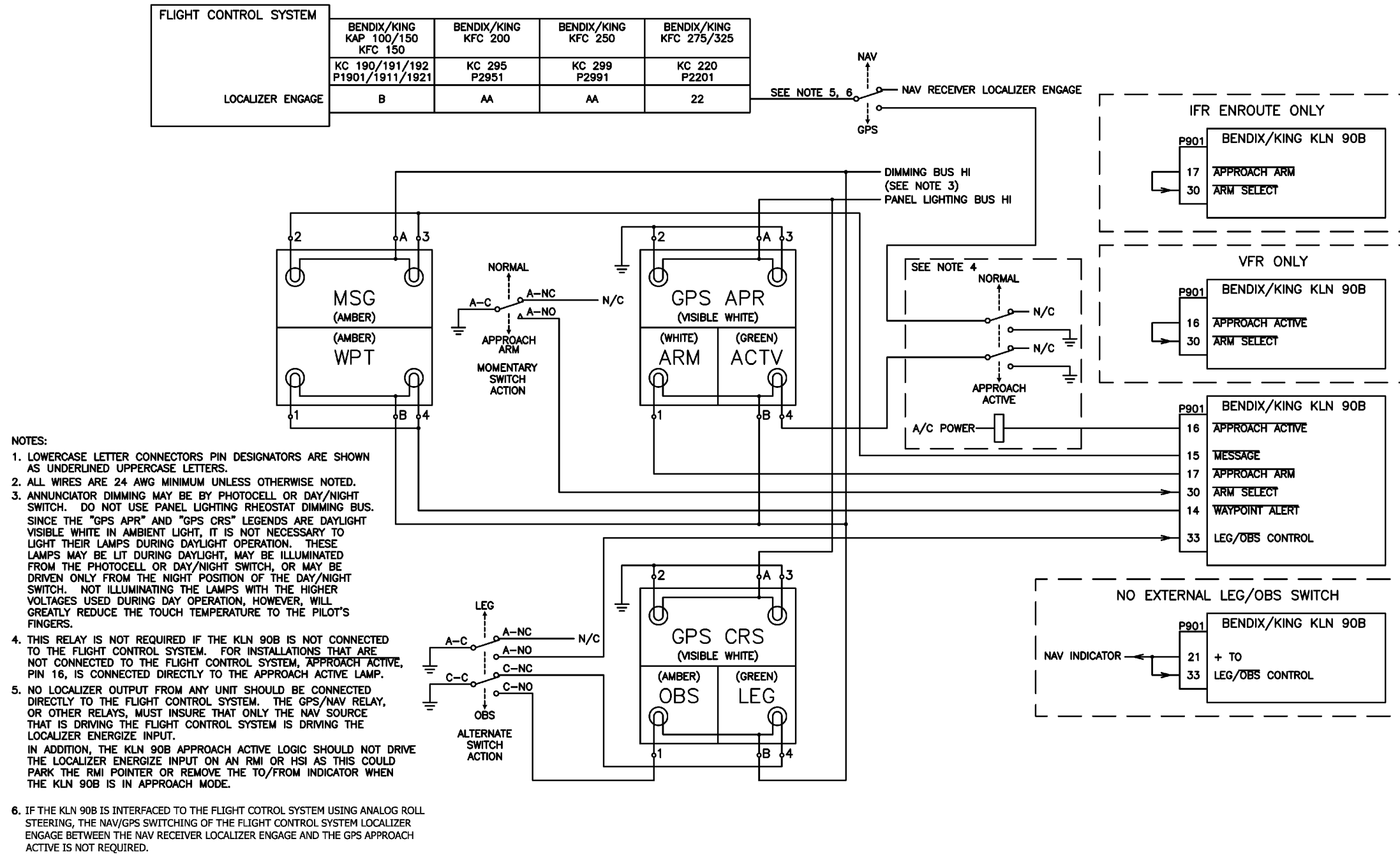
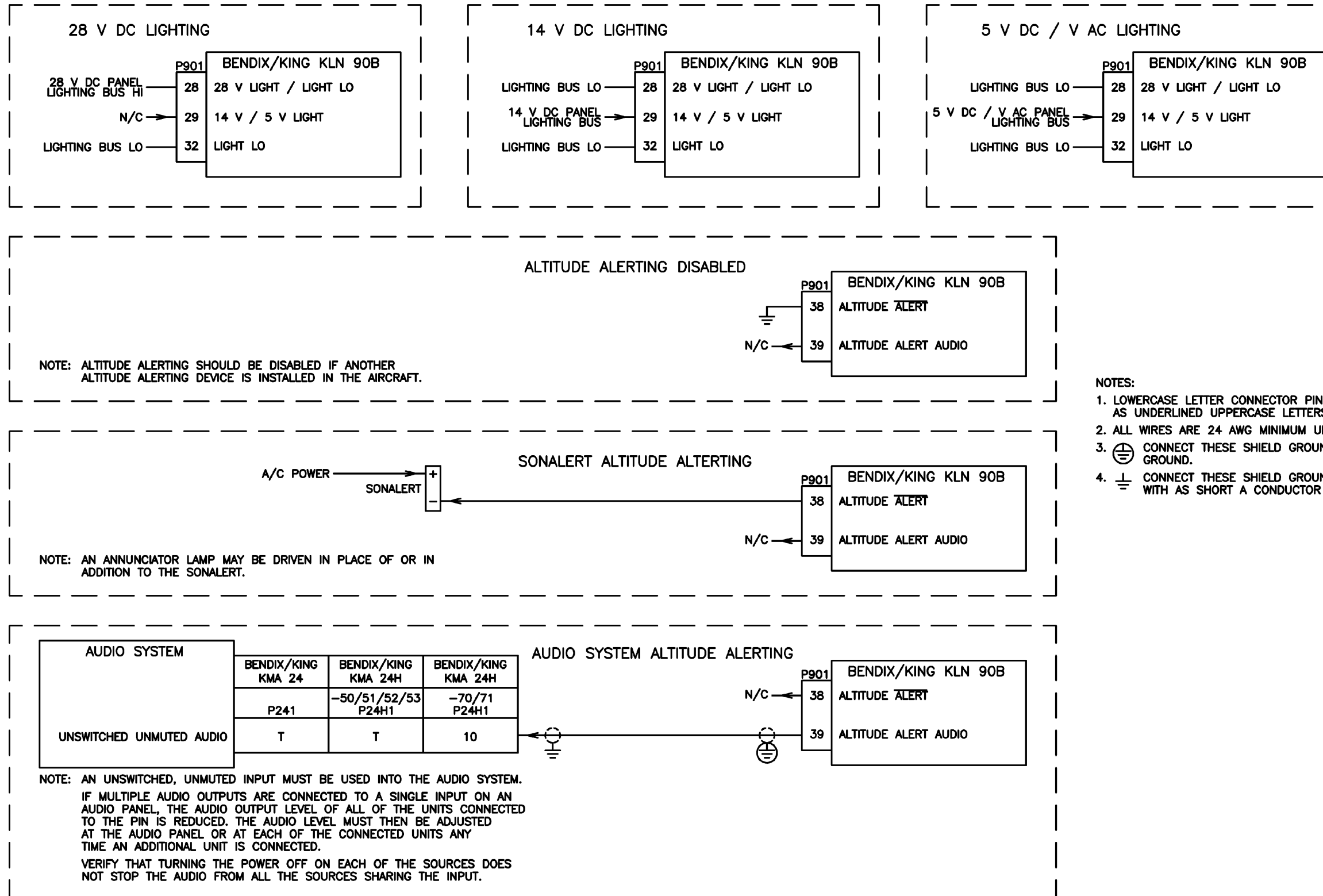
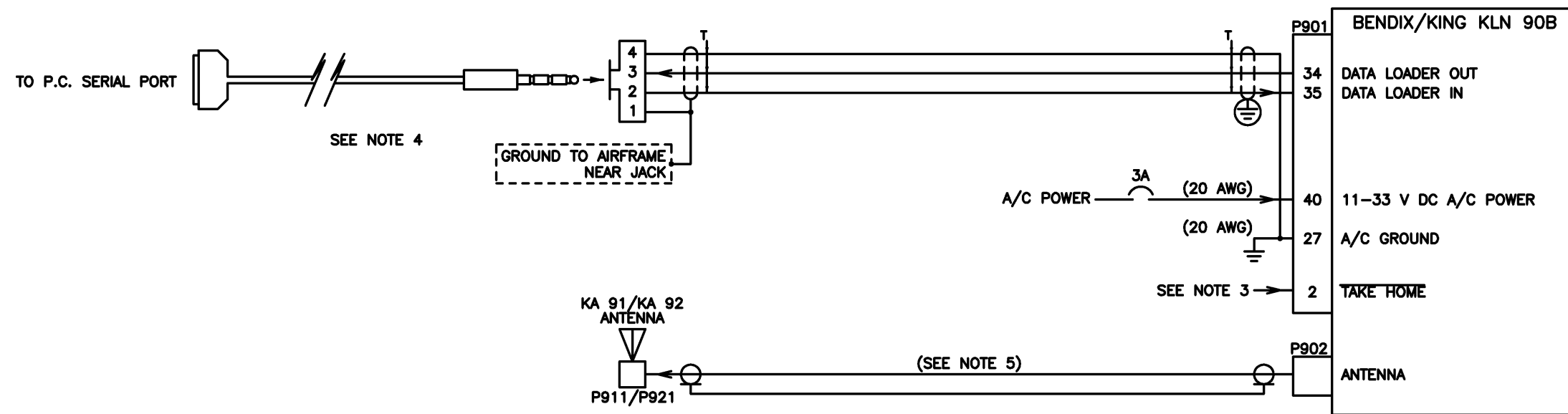


FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
(DWG. NO. 155-06021-0000, R-AC)
(SHEET 8 OF 10)



- NOTES:
1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
 2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
 3. CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.
 4. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
 (DWG. NO. 155-06021-0000, R-AC)
 (SHEET 9 OF 10)



NOTES:



1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
3. THIS PIN MUST ALWAYS BE OPEN WHEN THE UNIT IS USED FOR NAVIGATION. THIS PIN IS CONNECTED TO GROUND TO PLACE THE UNIT IN THE TAKE HOME FLIGHT SIMULATION MODE.
4. PART OF 050-03213-0000 INTERFACE KIT.
5. WIRE TYPE VARIES WITH WIRE LENGTH. REFER TO ANTENNA INSTALLATION CONSIDERATIONS SECTION OF INSTALLATION MANUAL FOR DETAILS.
6.  CONNECT THESE SHIELD GROUNDS TO UNIT BACKSHELL GROUND.
7.  CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-17 KLN 90B INTERCONNECT DRAWING
 (DWG. NO. 155-06021-0000, R-AC)
 (SHEET 10 OF 10)

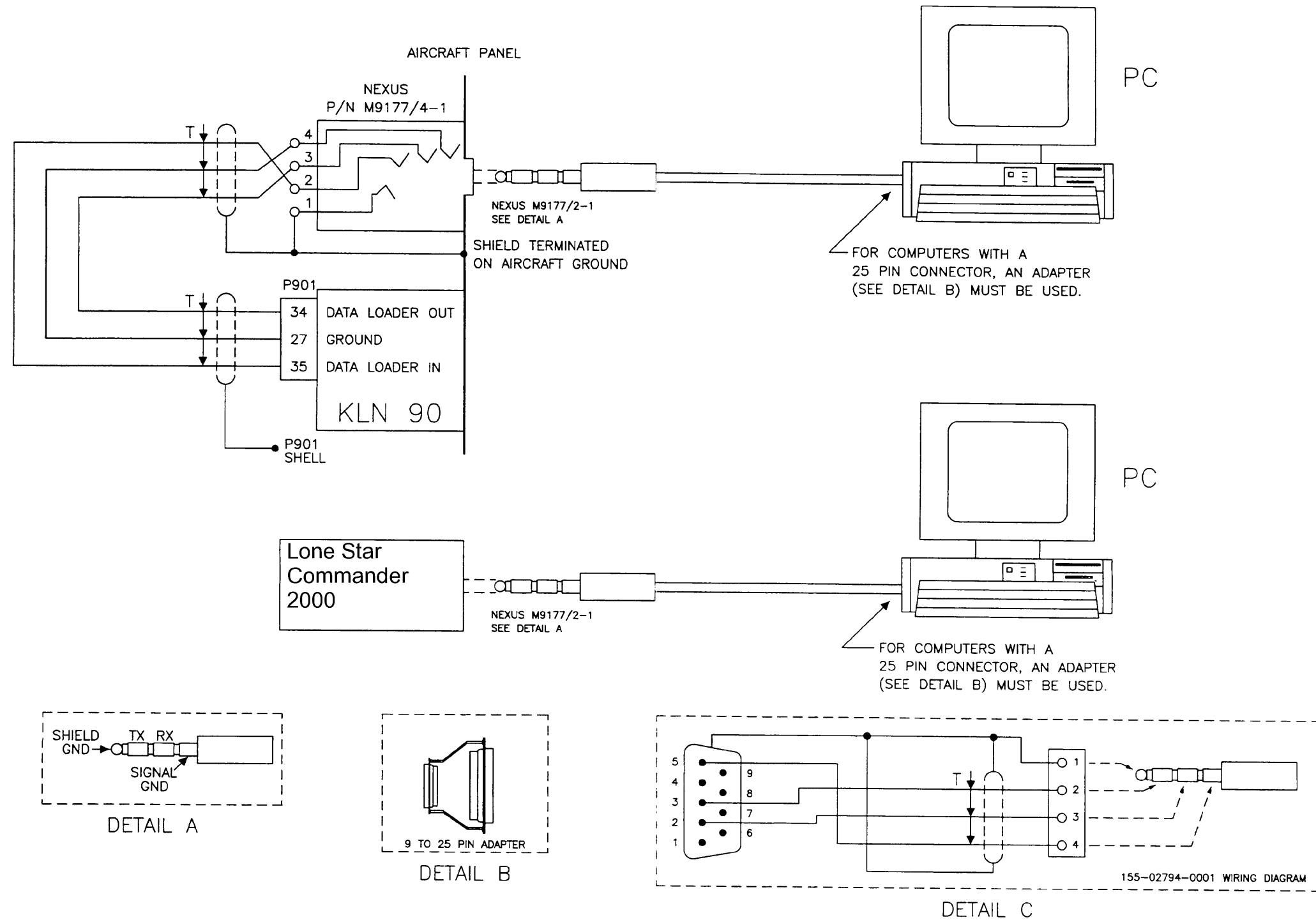


FIGURE 2-18 KLN 90B DATALOADER/PC INTERFACE DRAWING

2.4 POST INSTALLATION CHECK OUT INFORMATION

2.4.1 KLN 90B RESOLVER CALIBRATION METHOD

The KLN 90B supports both 400 Hz and 30 Hz resolvers. However, to assure maximum accuracy, the KLN 90B will need to be calibrated so that it will work with either type. The following is a procedure for calibrating the resolver in the KLN 90B.

1. With the unit off, press and hold the left cursor button.
2. Turn the unit on, continuing to hold the left cursor button for at least 8 seconds.
3. Allow the unit to start up normally.
4. Make sure that the unit has an active waypoint and the aircraft is located where it can acquire a valid satellite position.
5. Put the unit into the OBS mode by pressing the external switch (if installed) or by using the MOD 2 page.
6. Turn to the STA 3 page using the left inner and outer knobs.
7. Make sure that the KLN 90B is the displayed NAV source on the desired indicator.
8. Using the course pointer (for HSI) or the OBS knob (on CDIs), adjust the selected course to 0°.
9. Note what the KLN 90B is using for the OBS angle (shown on the bottom line near the center of the screen). If the OBS angle on the KLN 90B agrees with the selected course on the external indicator, then no calibration is necessary.
10. If the two values do not agree, then the KLN 90B will need to be calibrated. This is done by pressing the left cursor button and adjusting the value next to OBS CAL. A value of 100 is the default setting and represents no correction. It is possible to make adjustments of up to $\pm 10^\circ$. An OBS CAL value of 0 represents -10° and an OBS CAL value of 200 represents a calibration of $+ 10^\circ$.
11. Once the KLN 90B agrees with the external indicator, then the calibration is complete. Turn off the left cursor button.
12. Reset power to restore normal operation.

2.4.2 POST INSTALLATION CHECKOUT PROCEDURE

This procedure is divided into two major sections. The first section deals with "Stand Alone" installations in which none of the signal Input/Output capability of the unit is utilized, (except for the RF input signal from the antenna). In this type of installation the only connections to the KLN 90B are the cable from the GPS antenna, the aircraft power and ground leads, and the lighting bus wires. Connect the unused ARINC 429 Airdata Receiver to the 429 Transmitter and connect the unused RS 232 IN to the RS 232 OUT. All output data is read from the unit front panel display and all input to the unit is via the front panel controls.

The second part of this procedure deals with an installation in which some or all of the electrical signal I/O have been utilized. This second section is divided in such a way that each input or output signal is treated separately, and hence only those subsections that apply to a given installation will be conducted.

It is assumed that the operator's manual for the various units connected to the KLN 90B (as well as the manual for the KLN 90B itself), are available or that the installer is familiar with operating the units.

2.4.3 INSTALLATION CHECK OUT

Before inserting the unit into the mounting rack, verify that at the rear connector of the mounting rack, aircraft power is present on Pin 40, and that there is a ground on Pin 27. In installations using 28 V lighting, lighting bus voltage should be present between Pins 28 (Hi) and 32 (Lo). In Installations using 5 V or 14 V lighting, lighting bus voltage should be present between Pins 29 (Hi) and 28/32 (Lo), that is both Pins 28 and 32 must be low. Verify that there are no voltages or grounds present on any other pins.

- A. Verify that the blower is operating properly.
- B. Making sure that the power On/Off switch, located on the front panel of the KLN 90B, is in the "out" position (power off), plug the unit into the mounting rack and verify that the panel lighting works properly.
- C. Energize the unit by pushing in the power control switch.
- D. Manipulate the controls as necessary to display Nav 2 Page on the right half of the screen and Set 1 Page on the left half of the screen.

On the Set 1 Page, enter the present position for the installation location accurate to within 60 nautical miles.

Display the Set 2 Page. Verify that the date and time are correct to within 10 minutes and update if necessary. If the date is off by a large amount and the date cannot be set back to the correct year, make the receiver blind to the satellites by disconnecting the coax, setting the date while on the bench with no antenna, covering the antenna with aluminum foil or pull the aircraft in where the satellites are not available, such as in the hanger.

- E. At this point the aircraft will have to be moved to a location known to have reasonable GPS signal coverage. This implies an outside location away from tall structures that could mask low elevation satellites.
- F. Display the Status 1 Page. The State shown on the page should change to Acquire (ACQ) and after a period of not more than 5 minutes, (typically two minutes depending on the satellite coverage), the unit should display Latitude and Longitude values on the Nav 2 Page that are correct for the installation location. If the State shown is Search the Sky (STS), the unit will take up to 15 minutes to calculate a position.
- G. Display the Status 1 Page and verify that no asterisks appear next to any satellite with an elevation greater than 25°. Select 121.15 MHz on COMM 1. Transmit on COMM 1 for a period of 20 seconds and verify that no asterisks appear on the Status 1 Page for satellites with an elevation of greater than 25°. Repeat for the following frequencies 121.175, 121.20, 131.250, 131.275 and 131.30 MHz. Repeat the above procedure for all VHF COMM's on board the aircraft.

If any of the above tests do not pass (any asterisks appear on satellites with greater than 25° during the above tests), it will be necessary to identify the source of the interference. There are two common sources of interference:

1. The 12th and 13th harmonics of the above mentioned frequencies can be radiated from the VHF COMM at a level strong enough to be a problem to the GPS but still be well low enough to meet TSO requirements for the VHF COMM. If the interference is from the radiating VHF COMM, an optional notch filter (i.e. the KA 198 P/N 071-01565-0000 or TED Mfg 4-70-54) will need to be installed. The recommended location for the inline filter should be as close to the VHF RT as practical.

NOTE

The conditions and tests performed on this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within these performance standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator

2. The other possibility is re-radiation from an ELT. The radiated RF from the VHF COMM can excite the output tank circuit of the ELT and cause it to oscillate and radiate RF strong enough to interfere with the GPS. If disconnecting the ELT antenna eliminates the GPS interference, the manufacturer of the ELT should be contacted for a recommended solution.

2.4.4 INTEGRATED INSTALLATION CHECK OUT

The following paragraphs define checkout procedures for all possible Input/Output signals that can be connected to the KLN 90B. It should be clearly determined which of the signals are intended to be used in any given installation and then only the paragraphs pertaining to those signals should be performed.

2.4.4.1 All Installations

Perform all steps defined in [Paragraph 2.4.3](#) and leave the system energized with a valid GPS signal being received.

2.4.4.2 EFIS or CDI/HSI Interface

Cycle the power on the KLN 90B which will cause the self test page to be displayed. Verify that the CDI needle, after it has settled, is indicating half scale right deflection. Verify that the TO/FROM flag is indicating FROM. Verify that the nav flag is pulled from view.

Verify the selected course from the EFIS or CDI/HSI is interfaced properly to the KLN 90B in the OBS Mode. The OBS Mode can be selected by two methods:

1. In IFR Non-Precision Approach configurations, the OBS/LEG selection will usually be controlled by means of a GPS CRS external switch/annunciator. Each press of the switch/annunciator will cause the mode to change between OBS and LEG.
2. In VFR or IFR Enroute/Terminal configurations, the OBS/LEG selection will usually be controlled through the front panel controls of the KLN 90B. Select the Mode Page 2 on the left. If the OBS mode is not active, press the enter button.

Verify that the selected course value on the Mode Page 2 agrees with the value displayed on the EFIS Course Pointer or the HSI Course Pointer, if it is a remotely driven type. Press the left cursor button and modify the selected course value. Again, verify the course pointer tracks the new value. Change the selected course value on the EFIS, HSI or CDI using the

OBS knob. Verify that the selected course value displayed on the Mode Page 2 tracks the new value selected.

In the OBS mode with the GPS displayed on the CDI/HSI, the resolver is disconnected from the NAV converter. Verify that the KNS 80 or 81 groundspeed is still functional and the Radial display for the KX 165 or KNS 81 is still functional. These units must have jumpers or resistors across them when the resolver is removed.

In the OBS mode with the GPS not displayed on the CDI/HSI, the resolver is reconnected to the NAV converter. Verify that change in the OBS resolver will not affect the selected OBS on the KLN 90B.

2.4.4.3 Radar Graphics Interface

Activate a flight plan. Verify that the flight plan can be observed on the Radar Graphics display. Select a "Joystick" waypoint on the Radar Graphics Unit. Verify that the selected waypoint appears on the SUP Page of the KLN 90B display.

2.4.4.4 Air Data Interface

With altitude being supplied by a compatible Air Data Computer, verify that the proper altitude is indicated on the ALT page (provided the proper baro setting has been entered and if the Air Data Computer does not provide baro-corrected altitude).

2.4.4.5 Gray Code Altitude Inputs

With gray code altitude being supplied by a compatible encoding altimeter, verify that the proper altitude is indicated on the ALT page (provided no other altitude sources are active and that proper baro has been entered).

Verify that there is no interference between the KLN 90B, transponder, and any other loads on the encoding altimeter output. Remove power from each of the loads on the encoder to verify that the remaining equipment still performs properly. If interference exists, one or more of the units are not diode isolated and isolation diodes will need to be added to the aircraft wiring.

2.4.4.6 RMI Interface

Cycle power on the KLN 90B which will cause the self test page to be displayed. Verify that the RMI indicates 130°.

2.4.4.7 ELT Interface

The following test must be conducted within five minutes after the hour with ELT transmissions limited to 3 (Three) sweeps. A sweep occurs each time there is a voice transmission. Verify that the present position is displayed on the KLN 90B Nav Page 2. Activate the Comm Receiver and tune it to 121.5 MHz. Switch The ELT cockpit toggle switch to TEST. The ELT light should flash and the "sweeping" sound of the ELT should be heard on the Comm Receiver. Within 1 (one) minute, a voice transmission should be heard which contains the present position displayed on the KLN 90B Nav Page 2. Switch the toggle switch to AUTO and push the reset button until it stops flashing.

2.4.4.8 Moving Map Interface

If the KLN 90B is interfaced to a moving map display, verify operation by moving the aircraft out to an open location to acquire a satellite position. Enter some active flightplan or waypoint to develop a presentation on the map. Some moving maps require 30 kts of speed to display as the sense track angle is used instead of the heading. Output track angles below 30 kts. are not output.

2.4.4.9 External Annunciators

Recycle the power on the KLN 90B which will cause the Self Test Page to be displayed. Verify that all external annunciators are energized. Cycle the KLN 90B display past all initialization pages. Verify all external annunciators are extinguished. If the message light comes on, view the Message Page to verify that there is a message. If any other annunciator remains lighted, review the status of the KLN 90B to determine if the lighted annunciator is justified. OBS and LEG annunciators are controlled directly by the annunciator switch contacts and are not driven by the KLN 90B. Toggle the GPS CRS switch to verify that the annunciator switch matches the KLN 90B mode.

NOTE

Annunciators should be checked one at a time in order to verify that the correct one lights.

2.4.4.10 Distance Indicator

Verify that during self test, the distance indicator displays 34.5 NM, 0 KTS, 0 MIN.

2.4.4.11 Dataloader

The data base cartridge may be updated using a 3.5" disk and a laptop computer. The laptop computer must be IBM compatible, have an open COM 1 or COM 2 serial port, and have a 3.5" high density diskette drive.

Connect an IBM compatible laptop via PC loader kit P/N 050-03213-0000 (ref. [figure 2-18](#)). Set the KLN 90B to the Set 0 page. Put the #1 diskette into the PC. Cycle the power of the PC and follow the menu driven instructions.

NOTE

The KLN 90B database may be updated using a PC with the KLN 90B mounted in an aircraft, or via a KCC 90 (ref. [figure 2-18](#)).

2.4.4.12 ALT ALERT, ALT ALERT AUDIO

Upon approval of the self test page, five (5) beeps will be issued on the audio output and five (5) sonalert bursts will be produced by the ALT ALERT output, if ALT ALERT is not strapped low.

2.4.4.13 Heading Interface

Heading information may be interfaced to the KLN 90B by ARINC 429 or RS 232 to aid in the calculation of wind vectors and for heading orientation of the NAV 5 or moving map, and to enable the ARINC 429 roll steering output. ARINC 429 heading information is provided from an EFIS 40/50 system or a KA 90 interface adapter through the EFIS 429 receiver. RS 232 heading information may be provided from an analog to RS 232 converter, such as the Shadin fuel/air data device, through the RS 232 input.

Display the NAV 5 page and select the HDG orientation to test the heading function. If a valid heading source is available, HDG orientation will be selectable. If the heading is from an RS 232 source and the KLN 90B has not been upgraded to software 1102 or later, it will be necessary to have a valid GPS position before the heading input will be recognized. ARINC 429 heading information is recognized with or without a valid position and may be tested in the hanger.

2.4.4.14 Roll Steering Interface

Roll Steering is dependent on ground speed to calculate and cannot be displayed on the ground in the Nav mode. However the KLN 90B will test the roll steering while on the system test page and activate all the outputs. The Roll Steering will be valid and active until you approve the page. While on this page you can engage the flight director and observe the command bars change from 0 degrees to 5 degrees right and back to 0 degrees. This will validate the drivers and wiring so you will feel confident.

**SECTION III
OPERATION**

3.1 GENERAL INFORMATION

For an explanation of the operating controls of the KLN 90B GPS RNAV refer to the KLN 90B pilots guide (P/N 006-08773-0000) or the aircraft's flight manual supplement.

APPENDIX A
RS-232 FORMAT DEFINITIONS

THIS PAGE RESERVED

1.0 RS-232

The RS-232 interface will have the following characteristics:

Electrical per EIA RS232C

9600 baudrate, 8 bits, 1 start bit, 1 stop bit, no parity

MARK is a logical 1 (one) and SPACE is a logical 0 (zero)

START bit begins as MARK, goes to SPACE

The order of transmission within each data byte shall be :

START bit

Data bit 0 (lsb)

Data bit 1

Data bit 2

Data bit 3

Data bit 4

Data bit 5

Data bit 6

Data bit 7 (msb)

STOP bit

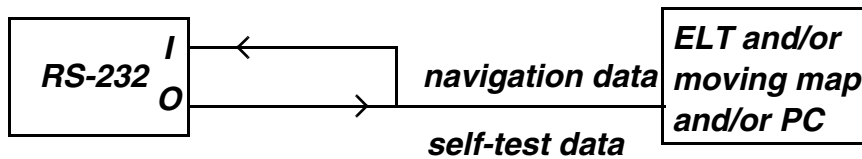
1.1 HOOK-UP CONFIGURATIONS

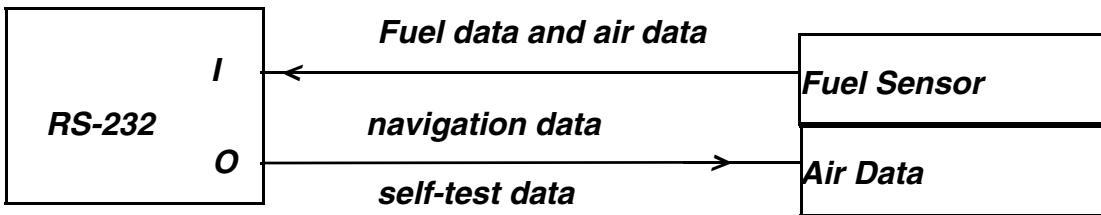
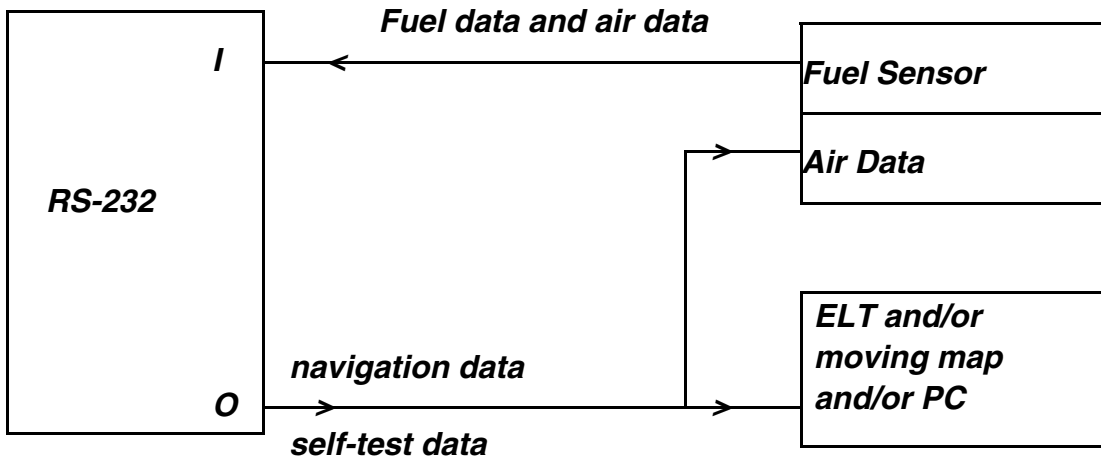
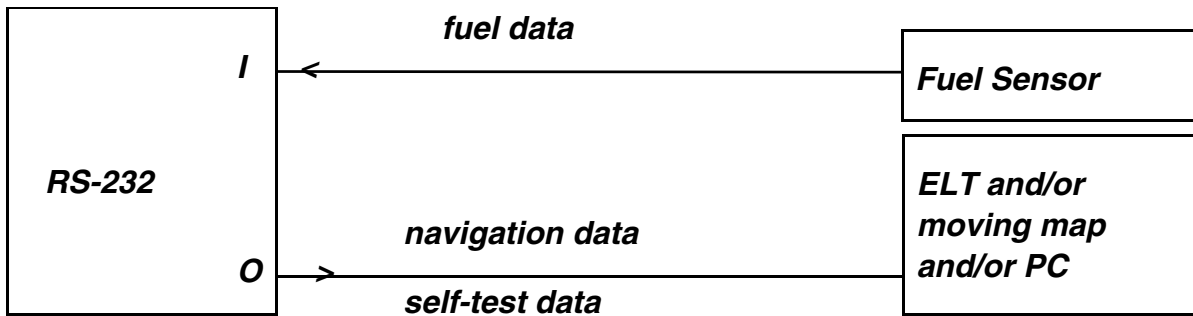
The RS-232 input and output can be hooked up in different configurations.

For normal operations, the RS-232 input will be connected to a fuel sensor and/or air data. In installations where the RS-232 input is not connected to a fuel sensor and air data, it will be looped back to RS-232 output. However, in test mode, the RS-232 input and output can be connected to a PC to read or write from or to a memory location or port.

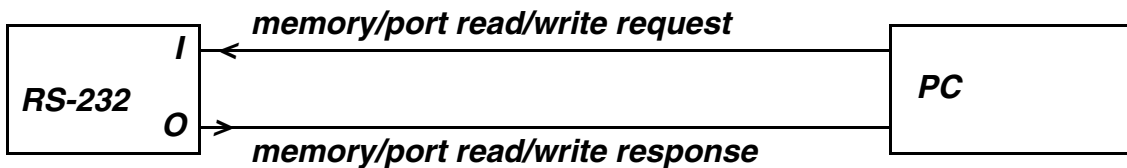
The RS-232 output provides navigation and self-test data in normal and test modes. In test mode, if a memory or port read or write request is received, the system will send the corresponding response packet(s) and stops sending navigation and self-test data. The only way to resume navigation and self-test data output is by recycling the power.

1.1.1 NORMAL AND TEST MODES:





1.1.2 TEST MODE ONLY :



1.2 RS-232 OUTPUTS

1.2.1 NAVIGATION AND SELF-TEST DATA

RS-232 data will be output with the following format:

<STX><id><dddd><it><id><dddd><it>...<id><dddd><it><ETX>

<STX> ASCII start of text character

<id> item designator

<dddd> item data

<it> item terminator: <CR>

<ETX> ASCII end of text character

item desg	item format	field width	item description
----	-----	----	-----
A	1234567890 s dd mmhh	9	present latitude s=sign: N for north, S for south dd=degrees mm=minutes hh=hundredths of minutes
B	s ddd mmhh10	10	present longitude s=sign: E for east, W for west ddd=degrees mm=minutes hh=hundredths of minutes
C	ddd	3	track (magnetic) -- dashed if groundspeed < 2KT ddd=degrees
D	ddd	3	ground speed ddd=knots
E	dddd	5	distance to active waypoint dddd=nm * 10
G	sdddd	5	cross track error s=sign: R for aircraft position right of course, L for aircraft position left of course dddd=nm * 100
I	ddd	4	desired track (magnetic) * 10 ddd=degrees * 10
K	dddd	5	active waypoint identifier dddd=ASCII active waypoint identifier
L	ddd	4	bearing to active waypoint (magnetic) ddd=degrees * 10
Q	sddd	4	magnetic variation s=sign: E for east, W for west ddd=degrees * 10
T	-----	9	this field will always be dashed

l	dddddd	6	distance to destination dddddd=nm * 10
t	abcdefghij	10	GPS discrettes a=W for waypoint alert, T for in turn, dashed otherwise b=N for new message, P for persistent message, dash if not c=E for en route, T for terminal, R for approach arm, A for approach active D=L for leg mode, D for direct to, O for OBS mode, or T for OBS to leg transition e=T for TO, F for FROM, dashed if NAV flagged f, g, h, i, and j=all dashed, reserved for future use
u	(described later in this section) self-test data		
w	(described later in this section) flight plan data		

If data is invalid, transmit the item designator and fill the rest of the field with dashes.

Blank or space character occurs in the item format field will be sent as ASCII character 20H.

The following table defines the output data for track, desired track, bearing to active waypoint, and magnetic variation in leg and OBS modes. The following definitions are used.

- TK angle of the course that the aircraft is flying relative to true north
- DTK angle of the course line at the point nearest the present position relative to true north
- RAD true radial from the active waypoint to the present position (angle is measured at the waypoint)
- MSC angle of the course line at the active waypoint relative to magnetic north; if the waypoint is a VOR or an approach waypoint, magnetic north is based on the published magnetic variation for that VOR.
- LMV magnetic variation at present position
- WMV magnetic variation at the active waypoint; if the waypoint is a VOR or an approach waypoint, its published magnetic variation is used, otherwise the computed magnetic variation at that point.
- BRG true bearing from the present position to the active waypoint

<u>description</u>	<u>leg mode</u>	<u>OBS mode</u>
track	TK - LMV	TK - WMV
desired track	DTK - LMV	MSC
bearing to active waypoint	BRG - LMV	RAD - WMV ?180°
magnetic variation	LMV	WMV

Self-test Data

The following ASCII format is used for self-test data:

abcdeeeeffffgggghhhhhiiiijjj : 28 bytes

where

<u>Bit</u>	<u>Message Description</u>
a0	DB missing or DB Checksum Error
a1	Battery Low : Service required to prevent loss of user data
a2	User data lost
a3	No RCVR data
a4	No RS-232 Data
a5	RS-232 Data Error
a6	RS-232 Output Error
a7	1
b0	Data Loader Error
b1	ARINC 429 Output Fail
b2	EFIS RCVR Failure
b3	RDRG RCVR Failure
b4	Air Data Fail
b5	WPT Annunciator OCD/FAIL
b6	MSG Annunciator OCD/FAIL
b7	1
c0	Approach ACTV OCD/FAIL
c1	Approach ARM OCD/FAIL
c2	NAV SUPER Flag Failure
c3	unused
c4	unused
c5	unused
c6	unused
c7	1
d0	unused
d1	unused
d2	unused
d3	unused
d4	unused
d5	unused
d6	unused
d7	1
eeee	Receiver Error Status Word
ffff	IC designator in case of EEPROM failure
gggg	IC designator in case of CPU failure

hhhh IC designator in case of RAM failure
 iiii IC designator in case of EPROM failure
 jjjj IC designator in case of NV RAM failure

Flight Plan Data

Item designator, sequence number, waypoint identifier, latitude/ longitude, and magnetic variation of each waypoint defined in the active flight plan are transmitted with the following format: No information shall be transmitted for waypoints beyond a fence in a flight plan when the active waypoint is before the fence. Likewise, no information shall be transmitted for waypoints after the beginning of a DME arc that is part of a procedure if the active waypoint is before the last waypoint on the arc. No information shall be transmitted for waypoints prior to the last waypoint on the DME arc if the active waypoint is after the arc.

Item Designator

wdd w = 'w'
 dd = 01 to 99

NOTE

A maximum of 32 waypoints will be transmitted.

Sequence Number

Byte 1
 Bit 76543210
 xlannnnn
 x = undefined
 nnnnn = Sequential waypoint number, Unsigned binary
 a = 1 if waypoint is active
 l = 1 if last waypoint of flight plan

Waypoint Identifier

Byte	2	3	4	5	6
Bit	76543210	76543210	76543210	76543210	76543210
	aaaaaaaa	aaaaaaaa	aaaaaaaa	aaaaaaaa	aaaaaaaa

aaaaaaaa = ASCII characters of five-character identifier

NOTE

A value of 7FH in byte 2 indicates that the waypoint identifier is unknown and bytes 2 through 6 should be ignored.

Latitude/Longitude

Latitude and longitude of waypoint. Packed, unsigned binary values for degrees, minutes, and hundredths of minutes.

Byte	7	8	9
Bit	76543210	76543210	76543210
	sddddddd	xxmmmmm	xhhhhhhh

s = 0 North latitude
 s = 1 South latitude
 x = Undefined
 ddddddd = Latitude degrees
 mmmmmm = Latitude minutes
 hhhhhh = Latitude hundredths of minutes

NOTE

A value of 7FH in byte 7 indicates that latitude and longitude are not presently available and bytes 7 through 13 should be ignored.

Byte	10	11	12	13
Bit	76543210	76543210	76543210	76543210
	sxxxxxx	ddddddd	xxmmmmm	xhhhhh
	s = 0 East longitude			
	s = 1 West longitude			
	x = Undefined			
	ddddddd = Longitude degrees			
	mmmmm = Longitude minutes			
	hhhhh = Longitude hundredths of minutes			

Magnetic Variation

Byte	14	15
Bit	76543210	76543210
	nnnnnnnn	nnnnnnnn

nnnnnnnnnnnnnnnnnn = Magnetic variation at waypoint. Two's complement binary in sixteenths of degrees. Easterly variation is positive.

NOTE

A value of 7FH in byte 14 indicates that magnetic variation is not presently available and bytes 14 and 15 should be ignored.

If the flight plan is invalid no flight plan data will be transmitted.

The data, including all of the waypoints in the active flight plan, shall be output every 2 sec \$ 0.5 sec.

1.3 RS-232 INPUTS

1.3.1 FUEL/AIR DATA INPUT

One of the following 4 ASCII formats shall be transmitted. Any data which is not valid shall be indicated by dashes (ASCII 2DH).

Format A

A 13 byte ASCII string shall be transmitted per the following format:

Byte Data

- | | |
|------|---|
| 1 | STX (ASCII code 02H) |
| 2 | Unit of measure
G = .1 gallon
I = .1 imperial gallon
L = 1 liter
K = 1 kilogram
B = 1 pound |
| 3-6 | Fuel Remaining
ASCII-coded decimal format, LSB first. Example: A fuel remaining value of 432 would be sent as "2340" (32H, 33H, 34H, 30H). |
| 7 | Fuel Remaining Checksum
Break each decimal value into its BCD representation. Using BCD arithmetic, sum the 4 BCD values and convert the low-order BCD digit to an ASCII coded numeric digit. Example: The checksum for a value of 432 would be "9" (39H). |
| 8-11 | Fuel Flow Rate (units/hour)
ASCII-coded decimal format as for Fuel Remaining. |
| 12 | Fuel Flow Rate Checksum
Sum of fuel flow bytes computed as for Fuel Remaining. |
| 13 | ETX (ASCII code 03H) |

This 13 byte record shall be transmitted every 1.6 sec \$.16 sec.

Fuel remaining and fuel flow rate information shall be for the complete aircraft.

Format B

A 52 byte ASCII string shall be transmitted per the following format:

Byte Data

- | | |
|-----|--|
| 1 | STX (ASCII code 02 hex) |
| 2 | Units of Measure
G = gallons
I = Imperial gallons
L = liters
K = kilograms
B = pounds |
| 3-8 | Total Fuel Remaining |

ASCII-coded decimal format (least significant digit is tenths), LSB first. Example: A fuel remaining value of 543.2 would be sent as "2.3450" (32H, 2EH, 33H, 34H, 35H, 30H).

9 Total Fuel Remaining Checksum

Break each decimal value into its BCD representation. Using BCD arithmetic, sum the 4 BCD values and convert the low-order BCD digit to an ASCII coded numeric digit. Example: The checksum for a value of 543.2 would be "4" (34H).

10-15 Total Fuel Flow Rate

ASCII-coded decimal format as for Total Fuel Remaining.

16 Total Fuel Flow Rate Checksum

Sum of fuel flow bytes computed as for Total Fuel Remaining.

17-22 Engine One Fuel Flow Rate

ASCII-coded decimal format as for Total Fuel Remaining.

23 Engine One Fuel Flow Rate Checksum

Sum of Left Engine Fuel Flow Rate bytes computed as for Total Fuel Remaining.

24-29 Engine Two Fuel Flow Rate

ASCII-coded decimal format as for Total Fuel Remaining.

30 Engine Two Fuel Flow Rate Checksum

Sum of Right Engine Fuel Flow Rate bytes computed as for Total Fuel Remaining.

31-36 Total Fuel Used

ASCII-coded decimal format as for Total Fuel Remaining.

37 Total Fuel Used Checksum

Sum of Total Fuel Used bytes computed as for Total Fuel Remaining.

38-43 Engine One Fuel Used

ASCII-coded decimal format as for Total Fuel Remaining.

44 Engine One Fuel Used Checksum

Sum of Left Engine Fuel Used bytes computed as for Total Fuel Remaining.

45-50 Engine Two Fuel Used

ASCII-coded decimal format as for Total Fuel Remaining.

51 Engine Two Fuel Used Checksum

Sum of Right Engine Fuel Used bytes computed as for Total Fuel Remaining.

52 ETX (ASCII code 03 hex)

This 52 byte record shall be transmitted every 1.6 sec \$.16 sec.

In the case of single engine aircraft, all Engine One and Engine Two data (including checksums) shall be asterisks (ASCII code 2A hex).

Format C

A 108 byte ASCII string shall be transmitted. Bytes 1 through 51 shall be the same as format B, described above except that in the Units of Measure field, "I = Imperial Gallons" is undefined. The remaining bytes shall be defined as follows. (If valid data for a particular data item is received both on this bus and on an ARINC 429 input, the ARINC 429 data shall be used, and the RS-232 data shall be ignored.)

Byte Data

52-54 indicated airspeed (IAS, knots)

ASCII-coded decimal format (least significant digit is units), LSB first. Example: An IAS of 298 knots would be sent as "892" (38H, 39H, 32H).

55 indicated airspeed checksum

Break each decimal value into its BCD representation. Using BCD arithmetic, add the three BCD values and convert the low-order BCD digit to an ASCII-coded numeric digit. Example: Checksum for "892" would be "9" (39H).

56-58 true airspeed (TAS, knots)

ASCII-coded decimal format as for IAS.

59 true airspeed checksum

Sum for TAS bytes computed as for IAS.

60-62 MACH (airspeed/speed of sound)

ASCII-coded decimal format with an implicit leading decimal point (least significant digit is thousandths). Example: A MACH value of .492 would be sent as "294" (32H, 39H, 34H).

63 MACH checksum

Sum for MACH bytes computed as for IAS.

64-69 pressure altitude (PALT, feet)

ASCII-coded decimal format with a sign character. Example 1: A PALT of 34500 feet would be sent as "00543+" (30H, 30H, 35H, 34, 33H, 2BH).

70 pressure altitude checksum

Sum for PALT bytes, excluding the sign character. Example: The sum for -850 feet would be "3" (33H).

71-76 density altitude (DALT, feet)

ASCII-coded decimal format with a sign character, as for PALT.

77 density altitude checksum

Sum for DALT bytes, excluding the sign character, as for PALT.

78-80 total air temperature (°C)

ASCII-coded decimal format with a sign character. Example: An OAT of 25°C would be sent as "52+".

81 total air temperature checksum

Sum for total air temperature bytes, excluding the sign character, as for PALT.

82-84 wind direction (degrees from true north)

ASCII-coded decimal format. Example: 122° would be sent as "221" (32H, 32H, 31H).

85 wind direction checksum

Sum for wind direction bytes, as for IAS.

86-88 wind speed (knots)

ASCII-coded decimal format, as for IAS.

89 wind speed checksum

sum for wind speed bytes, as for IAS.

90-92 drift (degrees)

ASCII-coded decimal format with a direction character. Example 1: 7° right would be "70R".

Example 2: 14° left would be "41L".

- 93 drift checksum
sum for drift bytes, excluding the direction character. Example: The sum for "41L" would be "5" (35H).
- 94-98 rate of change of PALT (feet/minute)
ASCII-coded decimal format with a sign character. Example: A PALT rate of change of -210 ft/min (descent), would be "0120-" (30H, 31H, 32H, 30H, 2DH).
- 99 rate of change of PALT checksum
Sum for PALT rate of change bytes, excluding the sign character, as for PALT.
- 100-102 magnetic heading (degrees from magnetic north)
ASCII-coded decimal format, as for wind direction.
- 103 magnetic heading checksum
sum for magnetic heading bytes, as for IAS.
- 104-106 static air temperature (°C)
ASCII-coded decimal format with a sign character. Example: A static air temperature of -2°C would be sent as "20-".
- 107 static air temperature checksum
Sum for static air temperature bytes, excluding the sign character, as for PALT.
- 108 ETX (ASCII code 03H)
This 108 byte record shall be transmitted every 1.6 sec ;.16 sec. If data is invalid or unavailable, the field will be filled with dashes.

Format D

A 121 byte ASCII string shall be transmitted. Bytes 1 through 107 shall be the same as Format C, except that bytes 3 through 9 shall be filled with asterisks if total fuel remaining is not available and consequently must be entered through the KLN 90B. The remaining bytes shall be defined as follows. (If valid data for a particular data item is received both on this bus and on an ARINC 429 input, the ARINC 429 data shall be used, and the RS-232 data shall be ignored.)

Byte Data

- 108-112 barometric setting (Inches HG)
ASCII-coded decimal format (least significant digit is hundredth of inches), LSB first.
Example: A barometric setting of 29.83 inches hg would be sent as "38.92"(33H, 38H, 2EH, 39H, 32H).
- 113 barometric setting checksum
Break each decimal value into its BCD representation. Using BCD arithmetic, sum the 4 BCD values and convert the low-order BCD digit to an ASCII coded numeric digit.
Example: The checksum for a value of 29.83 would be "2" (32H).
- 114-119 baro-corrected altitude (feet)
ASCII-coded decimal format with a sign character.
Example: A baro-corrected altitude of +11000 ft, would be "00011+" (30H, 30H, 30H, 31H, 31H, 2BH).
- 120 baro-corrected altitude checksum
Sum for baro-corrected altitude, excluding sign character, as for pressure altitude.
- 121 ETX (ASCII code 03H)

APPENDIX B

Includes the following:

KLN 90B SUPPLEMENTAL PROCEDURES MANUAL

KLN 90B AIRPLANE FLIGHT MANUAL SUPPLEMENT

KLN 90B SUPPLEMENTAL TYPE CERTIFICATE

THIS PAGE RESERVED

AlliedSignal General Aviation Avionics
BENDIX/KING KLN 90B
GPS RNAV

FLIGHT MANUAL SUPPLEMENT PROCEDURE

For the installation of the KLN 90B GPS to be FAA approved for enroute and approach IFR operation, it is necessary for the installer to create a flight manual supplement that is unique for the installation and to submit that supplement to the FAA for approval.

Following, you will find a copy of the flight manual supplement created by AlliedSignal Avionics Inc. for the initial STC installation of the KLN 90B in Mooney models M20J, K, L, M and R. Use this supplement as a guide in creating the supplement for your installation (do not copy the 006- part number in the footer). If your installation is interfaced to the same equipment (i.e. switches, annunciators, RMI, autopilot, etc.) as the initial installation, copy the guide supplement in its entirety, changing only the installer's name and address, aircraft make and model, approval authorization and section titles/numbers to suit your circumstances as detailed below. More likely, if your installation is not identical to the initial installation, it will be necessary for you to determine the differences and alter your supplement accordingly. Elements of the supplement which may need to be altered for your installation are as follows:

1. FORMAT

The format of the finished supplement should match, as closely as possible, the format of the aircraft's flight manual and/or pilot's operating handbook. Sizing of your manual to match the aircraft's flight manual is most easily accomplished by creating it first as an 8 1/2" X 11" (standard typewriter size paper) document and then reducing that on a reducing copier to the size required before submitting it to the FAA for approval. (Most small aircraft have flight manuals of 5 1/2" X 8 1/2" size. This size has a different height/width ratio than the 8 1/2" X 11" size; the width is narrower. The guide supplement is proportioned correctly for reduction to 5 1/2" X 8 1/2" size; copy its proportions if you are planning to reduce your supplement.)

The headers and footers of the guide supplement may be rearranged to match the format of your aircraft's flight manual; however, most of the information shown is required on every page. The AlliedSignal part number, 006-00835-0000, should not appear in your supplement, but the footer should include the page number, in the format "PAGE _OF _", and the words "FAA APPROVED" and a blank space for the date of the approval in place of the "ORIGINAL ISSUE" of the guide supplement. The aircraft for which the supplement applies should also be identified by manufacturer and model number as shown on the aircraft's serial data plate, i.e. Beech A36 or Piper PA-46-310P (not marketing name like Bonanza, Malibu, etc.).

Headers must identify the section of the supplement for that page. Additionally, we have found it useful to include identification of the system in the header for ease of pilot reference.

The section numbers and names in the guide supplement are typical of many aircraft; however, you should check the aircraft's flight manual and match those section numbers and names when organizing your supplement.

2. COVER

The cover page for your supplement should essentially be identical to the guide supplement with the following exceptions:

- A. In the header, substitute the installer's name and address (whoever is writing the flight manual supplement) in place of the name and address of AlliedSignal Avionics Inc..
- B. Substitute the manufacturer's name and model number (as shown on the serial data plate) for your aircraft in place of the Mooney models listed.

AlliedSignal General Aviation Avionics
BENDIX/KING KLN 90B
GPS RNAV

- C. In the second line of text, where the sample supplement states "is installed in accordance with STC SA00241WI-D.", substitute "is installed in accordance with unit Installation Manual 006-____, Rev. __, and FAA Form 337 dated ____." (Insert the part number and revision of the manual you have used.)
- D. Remove "CHRIS DURKIN, DAS Coordinator, AlliedSignal Avionics Inc." and "DAS4CE" from below the FAA APPROVED line. (Your supplement will be approved by an FAA representative.)
- E. Remove the footer on the cover page. (The footer on the guide supplement cover page is for AlliedSignal internal reference only.)

3. TABLE OF CONTENTS

If the section names and numbers of your aircraft's flight manual do not match those of the sample flight manual supplement, you should arrange your Table of Contents and your supplement in accordance with the format of your aircraft's flight manual.

4. BODY OF TEXT

The body of text for all sections other than NORMAL PROCEDURES should be copied in its entirety. The text for the NORMAL PROCEDURES section may vary depending on the equipment interfaced with the KLN 90B. Some of the annunciators, switches and/or controls described in paragraph B may differ slightly or may not be included as part of your installation. Should this be the case, you will need to alter the text of this paragraph and its subparagraphs to accurately describe the operation of the KLN 90B as it exists in your installation. Do not include descriptions of annunciators, switches or controls not present in your installation. Make sure that the nomenclature on the items you do use matches the description in your flight manual supplement.

This concludes the procedure for writing a KLN 90B GPS Aircraft Flight Manual Supplement. Reduce the pages as required to match the format of your aircraft's flight manual, and you are ready to submit the new document to your local FAA representative for approval.

BENDIX/KING® KLN 90B SUPPLEMENT

AlliedSignal Inc.
Olathe, Kansas 66062

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

BEECH MODELS F33A, A36, A36TC AND B36TC

WITH

KLN 90B GPS NAVIGATION SYSTEM

Reg. No. _____
Ser. No. _____

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix/King KLN 90B GPS is installed in accordance with STC SA00242WI-D. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement; consult the basic Airplane Flight Manual.

FAA APPROVED: Chris Durkin

CHRIS DURKIN
DAS Coordinator
AlliedSignal Inc.
DAS4CE

DATE: 8-21-98

FAA APPROVED: REVISION A

006-00838-0000

BENDIX/KING® KLN 90B SUPPLEMENT

LOG OF REVISIONS

REV	PAGE(S)	DESCRIPTION	APPROVED/DATE
-	All	Original Issue	Chris Durkin DAS Coordinator AlliedSignal Inc. DAS4CE
A	1 3 9 4, 5, 6 6, 8	Added BRNAV note. Added BRNAV limitation. Deleted a note from the list of General Notes. Deleted annunciator color descriptions. Modified note on coupled DME arc intercepts.	See Cover

**BEECH MODELS F33A, A36, A36TC, B36TC
FAA APPROVED: REVISION A**

**006-00838-0000
PAGE I**

BENDIX/KING KLN 90B SUPPLEMENT

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**BEECH MODELS F33A, A36, A36TC, B36TC
FAA APPROVED: REVISION A**

**006-00838-0000
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BENDIX/KING® KLN 90B SUPPLEMENT

SECTION I - GENERAL

The KLN 90B GPS panel mounted unit contains the GPS sensor, the navigation computer, a CRT display, and all controls required to operate the unit. It also houses the data base cartridge which plugs directly into the back of the unit.

The data base cartridge is an electronic memory containing information on airports, nav aids, intersections, SID's, STAR's, instrument approaches, special use airspace, and other items of value to the pilot.

Every 28 days, Bendix/King receives new data base information from Jeppesen Sanderson for the North American data base region. This information is processed and downloaded onto the data base cartridges. Bendix/King makes these data base cartridge updates available to KLN 90B GPS users.

Provided the KLN 90B GPS navigation system is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

VFR/IFR en route oceanic and remote, en route domestic, terminal, and instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System, North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace and latitudes bounded by 74° North and 60° South using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33. Navigation data is based upon use of only the global positioning system (GPS) operated by the United States.

NOTE

Aircraft using GPS for oceanic IFR operations may use the KLN 90B to replace one of the other approved means of long-range navigation. A single KLN 90B GPS installation may also be used on short oceanic routes which require only one means of long-range navigation.

NOTE

FAA approval of the KLN 90B does not necessarily constitute approval for use in foreign airspace.

NOTE

When the KLN 90B contains receiver software RCVR 01621-0001 (or higher dash number), as verified on the **STA 3** page, the unit is qualified for BRNAV operation in the European region in accordance with the criteria of AC 90-96.

**BEECH MODELS F33A, A36, A36TC, B36TC
FAA APPROVED: REVISION A**

**006-00838-0000
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BENDIX/KING® KLN 90B SUPPLEMENT

SECTION II - LIMITATIONS

- A. The KLN 90B GPS Pilot's Guide, P/N 006-08773-0000, dated December, 1994 (or later applicable revision) must be immediately available to the flight crew whenever navigation is predicated on the use of the system. The Operational Revision Status (ORS) of the Pilot's Guide must match the ORS level annunciated on the Self Test page.
- B. IFR Navigation is restricted as follows:
1. The system must utilize ORS level 20 or later FAA approved revision.
 2. The data on the self test page must be verified prior to use. Verify valid altitude data is available to the KLN 90B prior to flight.
 3. IFR en route and terminal navigation is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.
 4. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the KLN 90B data base. The KLN 90B data base must incorporate the current update cycle.
 - (a) The KLN 90B Memory Jogger, P/N 006-08785-0000, dated 12/94 (or later applicable revision) must be immediately available to the flight crew during instrument approach operations.
 - (b) Instrument approaches must be conducted in the approach mode and RAIM must be available at the Final Approach Fix.
 - (c) APR ACTV mode must be annunciated at the Final Approach Fix.
 - (d) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
 - (e) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation.
 - (f) The KLN 90B can only be used for approach guidance if the reference coordinate datum system for the instrument approach is WGS-84 or NAD-83. (All approaches in the KLN 90B data base use the WGS-84 or the NAD-83 geodetic datums.)
 5. The aircraft must have other approved navigation equipment appropriate to the route of flight installed and operational.

BENDIX/KING* KLN 90B SUPPLEMENT

**SECTION II
LIMITATIONS**

6. For BRNAV operations in the European region:
- a. With 23 (24 if the altitude input to the KLN 90B is not available) or more satellites projected to be operational for the flight, the aircraft can depart without further action.
 - b. With 22 (23 if the altitude input to the KLN 90B is not available) or fewer satellites projected to be operational for the flight, the availability of the GPS integrity (RAIM) should be confirmed for the intended flight (route and time). This should be obtained from a prediction program run outside of the aircraft. The prediction program must comply with the criteria of Appendix 1 of AC90-96. In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, cancelled, or rerouted on a track where RAIM requirements can be met.

NOTE

AlliedSignal's Preflight, Version 2.0 or later computer based prediction program may be used for the RAIM prediction. Alternate prediction methods should be submitted for approval through the appropriate FAA Flight Standards Regional Division to the Flight Standards Service, Technical Programs Division (AFS-400), or through EUROCONTROL.

BENDIX/KING KLN 90B SUPPLEMENT**SECTION III - EMERGENCY PROCEDURES
ABNORMAL PROCEDURES**

- A. If the KLN 90B GPS information is not available or invalid, utilize remaining operational navigation equipment as required.
- B. If a "RAIM NOT AVAILABLE" message is displayed while conducting an instrument approach, terminate the approach. Execute a missed approach if required.
- C. If a "RAIM NOT AVAILABLE" message is displayed in the en route or terminal phase of flight, continue to navigate using the KLN 90B or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using another IFR approved navigation system.
- D. Refer to the KLN 90B Pilot's Guide, Appendices B and C, for appropriate pilot actions to be accomplished in response to annunciated messages.

SECTION IV - NORMAL PROCEDURES**WARNING**

Familiarity with the en route operation of the KLN 90B does not constitute proficiency in approach operations. Do not attempt approach operations in IMC prior to attaining proficiency in the use of the KLN 90B.

A. OPERATION

Normal operating procedures are outlined in the KLN 90B GPS Pilot's Guide, P/N 006-08773-0000, dated December, 1994, (or later applicable revision). A KLN 90B Memory Jogger, P/N 006-08785-0000 dated 12/94 (or later applicable revision) containing an approach sequence, operating tips and approach related messages is intended for cockpit use by the KLN 90B familiar pilot when conducting instrument approaches.

B. SYSTEM ANNUNCIATORS/SWITCHES/CONTROLS

1. HSI NAV presentation (**NAV/GPS**) switch annunciator - May be used to select data for presentation on the pilot's HSI; either NAV data from the number one navigation receiver or GPS data from the KLN 90B GPS. Presentation on the HSI is also required for autopilot coupling.
2. Message (**MSG**) annunciator - Will flash to alert the pilot of a situation that requires attention. Press the MSG button on the KLN 90B GPS to view the message. (Appendix B of the KLN 90B Pilot's Guide contains a list of all of the message page messages and their meanings.)

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

3. Waypoint (WPT) annunciator - Prior to reaching a waypoint in the active flight plan, the KLN 90B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of turn anticipation the WPT annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.


WARNING

Turn anticipation is automatically disabled for FAF waypoints and those used exclusively in SID/STARS where overflight is required. For waypoints shared between SID/STARS and published en route segments (requiring overflight in the SID/STARS), proper selection on the presented waypoint page is necessary to provide adequate route protection on the SID/STARS.

4. GPS omni bearing or leg (GPS CRS OBS/LEG) course switch/annunciator - Used to select the basic modes of KLN 90B operation, either a) single waypoint with omni - bearing course (OBS) selection through that waypoint (like a VOR) or b) automatic leg sequencing (LEG) between waypoints.


NOTE

Either LEG or OBS will illuminate during system self test depending upon switch position.

5. HSI course control  knob - Provides analog course input to the KLN 90B in OBS when the NAV/GPS switch/annunciator is in GPS. When the NAV/GPS switch annunciation is in NAV, GPS course selection in OBS mode is digital through the use of the controls and display at the KLN 90B. The HSI course control knob must also be set to provide proper course datum to the autopilot if coupled to the KLN 90B in LEG or OBS.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**
NOTE

Manual HSI course centering in **OBS** using the control knob can be difficult, especially at long distances. Centering the dbar can best be accomplished by pressing  and then manually setting the HSI pointer to the course value prescribed in the KLN 90B displayed message.

6. GPS approach (**GPS APR ARM/ACTV**) switch/annunciator - Used to a) manually select or deselect approach **ARM** (or deselect approach **ACTV**) and b) announce the stage of approach operation either armed (**ARM**) or activated (**ACTV**). Sequential button pushes if in **ACTV** would first result in approach **ARM** and then approach arm canceled. Subsequent button pushes will cycle between the armed state (if an approach is in the flight plan) and approach arm canceled. Approach **ACTV** cannot be selected manually.

C. PILOT'S DISPLAY

Left/right steering information is presented on the pilot's HSI as a function of the NAV/GPS switch position.

D. AUTOPILOT COUPLED OPERATION

The KLN 90B may be coupled to the autopilot by first selecting **GPS** on the NAV/GPS switch. Manual selection of the desired track on the pilot's HSI course pointer is required to provide course datum to the autopilot. (Frequent manual course pointer changes may be necessary, such as in the case of flying a DME arc.) The autopilot approach mode (**APR**) should be used when conducting a coupled GPS approach.

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES****E. APPROACH MODE SEQUENCING AND RAIM PREDICTION****NOTE**

The special use airspace alert will automatically be disabled prior to flying an instrument approach to reduce the potential for message congestion.

1. Prior to arrival, select a STAR if appropriate from the **APT 7** page. Select an approach and an initial approach fix (IAF) from the **APT 8** page.

NOTES

- Using the right hand outer knob, select the **ACT** (Active Flight Plan Waypoints) pages. Pull the right hand inner knob out and scroll to the destination airport, then push the inner knob in and select the **ACT 7** or **ACT 8** page.
 - To delete or replace a SID, STAR or approach, select **FPL 0** page. Place the cursor over the name of the procedure, press **ENT** to change it, or **CLR** then **ENT** to delete it.
2. En route, check for RAIM availability at the destination airport ETA on the **STA 5** page.

NOTE

RAIM must be available at the FAF in order to fly an instrument approach. Be prepared to terminate the approach upon loss of RAIM.

3. At 30 nm from the airport:
 - a. Verify automatic annunciation of **APR ARM**.
 - b. Note automatic dbar scaling change from ± 5.0 nm to ± 1.0 nm over the next 30 seconds.
 - c. Update the KLN 90B altimeter baro setting as required.
 - d. Internally the KLN 90B will transition from en route to terminal integrity monitoring.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

4. Select Super NAV 5 page to fly the approach procedure.
- a. If receiving radar vectors, or need to fly a procedure turn or holding pattern, fly in OBS until inbound to the FAF.

NOTE

OBS navigation is TO-FROM (like a VOR) without waypoint sequencing.

- b. NoPT routes including DME arc's are flown in LEG. LEG is mandatory from the FAF to the MAP.

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

WARNING

Flying final outbound from an off-airport vortac on an overlay approach; beware of the DME distance increasing on final approach, and the GPS distance-to-waypoint decreasing, and not matching the numbers on the approach plate!

5. At or before 2 nm from the FAF inbound:
- a. Select the FAF as the active waypoint, if not accomplished already.
- b. Select LEG operation.
6. Approaching the FAF inbound (within 2 nm.):
- a. Verify APR ACTV.
- b. Note automatic dbar scaling change from ± 1.0 nm to ± 0.3 nm over the 2 nm inbound to the FAF.
- c. Internally the KLN 90B will transition from terminal to approach integrity monitoring.
7. Crossing the FAF and APR ACTV is not annunciated:
- a. Do not descend.
- b. Execute the missed approach.


BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

8. Missed Approach:
- a. Climb
 - b. Navigate to the MAP (in APR ARM if APR ACTV is not available).

NOTE

There is no automatic LEG sequencing at the MAP.

- c. After climbing in accordance with the published missed approach procedure, press , verify or change the desired holding fix and press ENT.

GENERAL NOTES

- The data base must be up to date for instrument approach operation.
- Only one approach can be in the flight plan at a time.
- Checking RAIM prediction for your approach while en route using the STA 5 page is recommended. A self check occurs automatically within 2nm of the FAF. APR ACTV is inhibited without RAIM.
- Data cannot be altered, added to or deleted from the approach procedures contained in the data base. (DME arc intercepts may be relocated along the arc through the SUPER NAV 5 or the FPL 0 pages).
- Some approach waypoints do not appear on the approach plates (including in some instances the FAF)!

BEECH MODELS F33A, A36, A36TC, B36TC
FAA APPROVED: REVISION A

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BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

- Waypoint suffixes in the flight plan:
 - i - IAF
 - f - FAF
 - m - MAP
 - h - missed approach holding fix.
- The DME arc IAF (arc intercept waypoint) will be a) on your present position radial off the arc VOR when you load the IAF into the flight plan, or b) the beginning of the arc if currently on a radial beyond the arc limit. To adjust the arc intercept to be compatible with a current radar vector, bring up the arc IAF waypoint in the **SUPER NAV 5** page scanning field or under the cursor on the **FPL 0** page, press **CLR**, then **ENT**. Fly the arc in **LEG**. adjust the HSI or CDI course pointer with reference to the desired track value on the **SUPER NAV 5** page (it will flash to remind you). Left/right dbar information is relative to the arc. Displayed distance is not along the arc but direct to the active waypoint. If desired, select **NAV 2** page for digital DME arc distance to and radial from the reference VOR. (The **ARC** radial is also displayed on the **SUPER NAV 5** page.)
- The DME arc IAF identifier may be unfamiliar. Example: D098G where 098 stands for the 098° radial off the referenced VOR, and G is the seventh letter in the alphabet indicating a 7 DME arc.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

- APR ARM to APR ACTV is automatic provided:
 - a. You are in APR ARM (normally automatic).
 - b. You are in LEG mode!
 - c. The FAF is the active waypoint!
 - d. Within 2 n.m. of the FAF.
 - e. Outside of the FAF.
 - f. Inbound to the FAF.
 - g. RAIM is available.
- Direct-To operation between the FAF and MAP cancels APR ACTV. Fly the missed approach in APR ARM.
- Flagged navigation inside the FAF may usually be restored (not guaranteed) by pressing the GPS APR button changing from ACTV to ARM. Fly the missed approach.
- The instrument approach using the KLN 90B may be essentially automatic starting 30 nm out (with a manual baro setting update) or it may require judicious selection of the OBS and LEG modes.
- APR ARM may be canceled at any time by pressing the GPS APR button. (A subsequent press will reselect it.)

SECTION V - PERFORMANCE

No change.

BEECH MODELS F33A, A36, A36TC, B36TC
FAA APPROVED: REVISION A

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BENDIX/KING® KLN 90B SUPPLEMENT

AlliedSignal Inc.
Olathe, Kansas USA

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
MOONEY MODELS M20J, M20K, M20L, M20M, AND M20R
WITH
KLN 90B GPS NAVIGATION SYSTEM

Reg. No. _____
Ser. No. _____

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix/King KLN 90B GPS is installed in accordance with STC SA00241W1-D. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: *Chris Durkin*

CD CHRIS DURKIN
DAS Coordinator
AlliedSignal Inc.
DAS4CE

DATE: 11/11/08

BENDIX/KING® KLN 90B SUPPLEMENT

LOG OF REVISIONS

REV	PAGE(S)	DESCRIPTION	APPROVED/DATE
-	All	Original Issue	Chris Durkin DAS Coordinator AlliedSignal Avionics Inc. DAS4CE DATE: <u>2-1-95</u>
1	4 8 9 All	Added turn anticipation warning to Section IV, paragraph A. Added turn anticipation warning to paragraph 4.a. Removed third GENERAL NOTE, "If the destination airport is the active waypoint...". Repaginated to include additional material.	Chris Durkin DAS Coordinator AlliedSignal Avionics Inc. DAS4CE DATE: <u>2-23-96</u>
AA	2 4 6, 7, 8 9, 10 ALL	Added BRNAV Note. Added Limitation regarding BRNAV operations in Europe. Deleted annunciator color descriptions. Modified Note concerning NAV and APR autopilot coupled DME arc intercepts. Revision AA is in lieu of revision 2 due to revision format change.	See Cover.

***BENDIX/KING*® KLN 90B SUPPLEMENT**

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III	EMERGENCY PROCEDURES.....	5
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MOONEY MODELS M20J, M20K, M20L, M20M, M20R
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BENDIX/KING® KLN 90B SUPPLEMENT**SECTION I - GENERAL**

The KLN 90B GPS panel mounted unit contains the GPS sensor, the navigation computer, a CRT display, and all controls required to operate the unit. It also houses the data base cartridge which plugs directly into the back of the unit.

The data base cartridge is an electronic memory containing information on airports, nav aids, intersections, SID's, STAR's, instrument approaches, special use airspace, and other items of value to the pilot.

Every 28 days, Bendix/King receives new data base information from Jeppesen Sanderson for the North American data base region. This information is processed and downloaded onto the data base cartridges. Bendix/King makes these data base cartridge updates available to KLN 90B GPS users.

Provided the KLN 90B GPS navigation system is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

VFR/IFR en route oceanic and remote, en route domestic, terminal, and instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System, North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace and latitudes bounded by 74° North and 60° South using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33. Navigation data is based upon use of only the global positioning system (GPS) operated by the United States.

NOTE

Aircraft using GPS for oceanic IFR operations may use the KLN 90B to replace one of the other approved means of long-range navigation. A single KLN 90B GPS installation may also be used on short oceanic routes which require only one means of long-range navigation.

NOTE

FAA approval of the KLN 90B does not necessarily constitute approval for use in foreign airspace.

MOONEY MODELS M20J, M20K, M20L, M20M, M20R
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BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION 1
GENERAL**

NOTE

When the KLN 90B contains receiver software RCVR 01621-0001 (or higher dash number), as verified on the **STA 3** page, the unit is qualified for BRNAV operation in the European region in accordance with the criteria of AC 90-96. (Reference ICAO Doc 7030 Regional Supplementary Procedures, JAA Technical Guidance Leaflet AMJ20X2 and Eurocontrol RNAV Standard Doc 003-93 Area Navigation Equipment Operational Requirements and Functional Requirements (RNAV).)

BENDIX/KING® KLN 90B SUPPLEMENT**SECTION II - LIMITATIONS**

- A. The KLN 90B GPS Pilot's Guide, P/N 006-08773-0000, dated December, 1994 (or later applicable revision) must be immediately available to the flight crew whenever navigation is predicated on the use of the system. The Operational Revision Status (ORS) of the Pilot's Guide must match the ORS level annunciated on the Self Test page.
- B. IFR Navigation is restricted as follows:
1. The system must utilize ORS level 20 or later FAA approved revision.
 2. The data on the self test page must be verified prior to use. Verify valid altitude data is available to the KLN 90B prior to flight.
 3. IFR en route and terminal navigation is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.
 4. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the KLN 90B data base. The KLN 90B data base must incorporate the current update cycle.
 - (a) The KLN 90B Memory Jogger, P/N 006-08785-0000, dated 12/94 (or later applicable revision) must be immediately available to the flight crew during instrument approach operations.
 - (b) Instrument approaches must be conducted in the approach mode and RAIM must be available at the Final Approach Fix.
 - (c) APR ACTV mode must be annunciated at the Final Approach Fix.
 - (d) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
 - (e) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation.
 - (f) The KLN 90B can only be used for approach guidance if the reference coordinate datum system for the instrument approach is WGS-84 or NAD-83. (All approaches in the KLN 90B data base use the WGS-84 or the NAD-83 geodetic datums.)
 5. The aircraft must have other approved navigation equipment appropriate to the route of flight installed and operational.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION II
LIMITATIONS**

6. For BRNAV operations in the European region:
 - a. With 23 (24 if the altitude input to the KLN 90B is not available) or more satellites projected to be operational for the flight, the aircraft can depart without further action.
 - b. With 22 (23 if the altitude input to the KLN 90B is not available) or fewer satellites projected to be operational for the flight, the availability of the GPS integrity (RAIM) should be confirmed for the intended flight (route and time). This should be obtained from a prediction program run outside of the aircraft. The prediction program must comply with the criteria of Appendix 1 of AC90-96. In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, cancelled, or rerouted on a track where RAIM requirements can be met.

NOTE

AlliedSignal's Preflight, Version 2.0 or later computer based prediction program may be used for the RAIM prediction. Alternate methods should be submitted for approval in accordance with Advisory Circular AC90-96.

BENDIX/KING® KLN 90B SUPPLEMENT**SECTION III - EMERGENCY PROCEDURES
ABNORMAL PROCEDURES**

- A. If the KLN 90B GPS information is not available or invalid, utilize remaining operational navigation equipment as required.
- B. If a "RAIM NOT AVAILABLE" message is displayed while conducting an instrument approach, terminate the approach. Execute a missed approach if required.
- C. If a "RAIM NOT AVAILABLE" message is displayed in the en route or terminal phase of flight, continue to navigate using the KLN 90B or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using another IFR approved navigation system.
- D. Refer to the KLN 90B Pilot's Guide, Appendices B and C, for appropriate pilot actions to be accomplished in response to annunciated messages.

SECTION IV - NORMAL PROCEDURES**WARNING**

Familiarity with the en route operation of the KLN 90B does not constitute proficiency in approach operations. Do not attempt approach operations in IMC prior to attaining proficiency in the use of the KLN 90B.

A. OPERATION

Normal operating procedures are outlined in the KLN 90B GPS Pilot's Guide, P/N 006-08773-0000, dated December, 1994, (or later applicable revision). A KLN 90B Memory Jogger, P/N 006-08785-0000 dated 12/94 (or later applicable revision) containing an approach sequence, operating tips and approach related messages is intended for cockpit use by the KLN 90B familiar pilot when conducting instrument approaches.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**
WARNING

To prevent the possibility of turn anticipation causing potentially misleading navigation when the aircraft is not on course:

- Verify the HSI course and D-BAR presentation is proper prior to takeoff.
- Do not switch from OBS to LEG with greater than 1 nm cross track error (XTK).

If misleading data is suspected, a Direct-To operation to your desired waypoint will clear any previous OBS course, and cancel turn anticipation.

NOTES

- After the above Direct-To operation, further reorientation to the nearest leg of the active flight plan may be accomplished by pressing , , .
- Refer to the Pilot's Guide section 4.2.2 for an explanation of turn anticipation, and Appendix A - Navigation Terms for the definition of cross track error (XTK).

B. SYSTEM ANNUNCIATORS/SWITCHES/CONTROLS

1. HSI NAV presentation (**NAV/GPS**) switch annunciator - May be used to select data for presentation on the pilot's HSI; either NAV data from the number one navigation receiver or GPS data from the KLN 90B GPS. Presentation on the HSI is also required for autopilot coupling.
2. Message (**MSG**) annunciator - Will flash to alert the pilot of a situation that requires attention. Press the MSG button on the KLN 90B GPS to view the message. (Appendix B of the KLN 90B Pilot's Guide contains a list of all of the message page messages and their meanings.)

BENDIX/KING® KLN 90B SUPPLEMENT**SECTION IV
NORMAL PROCEDURES**

3. Waypoint (**WPT**) annunciator - Prior to reaching a waypoint in the active flight plan, the KLN 90B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of turn anticipation the WPT annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.

WARNING

Turn anticipation is automatically disabled for FAF waypoints and those used exclusively in SID/STARS where overflight is required. For waypoints shared between SID/STARS and published en route segments (requiring overflight in the SID/STARS), proper selection on the presented waypoint page is necessary to provide adequate route protection on the SID/STARS.


4. GPS omni bearing or leg (**GPS CRS OBS/LEG**) course switch/annunciator - Used to select the basic modes of KLN 90B operation, either a) single waypoint with omni - bearing course (**OBS**) selection through that waypoint (like a VOR) or b) automatic leg sequencing (**LEG**) between waypoints.

NOTE


Either **LEG** or **OBS** will illuminate during system self test depending upon switch position.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

5. HSI course control  knob - Provides analog course input to the KLN 90B in **OBS** when the NAV/GPS switch/annunciator is in **GPS**. When the NAV/GPS switch annunciation is in **NAV**, GPS course selection in **OBS** mode is digital through the use of the controls and display at the KLN 90B. The HSI course control knob must also be set to provide proper course datum to the autopilot if coupled to the KLN 90B in **LEG** or **OBS**.

NOTE

Manual HSI course centering in **OBS** using the control knob can be difficult, especially at long distances. Centering the dbar can best be accomplished by pressing  and then manually setting the HSI pointer to the course value prescribed in the KLN 90B displayed message.

6. GPS approach (**GPS APR ARM/ACTV**) switch/annunciator - Used to a) manually select or deselect approach **ARM** (or deselect approach **ACTV**) and b) annunciate the stage of approach operation either armed (**ARM**) or activated (**ACTV**). Sequential button pushes if in **ACTV** would first result in approach **ARM** and then approach arm canceled. Subsequent button pushes will cycle between the armed state (if an approach is in the flight plan) and approach arm canceled. Approach **ACTV** cannot be selected manually.
7. RMI NAV presentation switch - May be used to select data for presentation on the RMI; either NAV 2 data from the number two navigation receiver, or GPS data from the KLN 90B GPS.

C. PILOT'S DISPLAY

Left/right steering information is presented on the pilot's HSI as a function of the NAV/GPS switch position.

D. AUTOPILOT COUPLED OPERATION

The KLN 90B may be coupled to the autopilot by first selecting **GPS** on the NAV/GPS switch. Manual selection of the desired track on the pilot's HSI course pointer is required to provide course datum to the autopilot. (Frequent manual course pointer changes may be necessary, such as in the case of flying a DME arc.) The autopilot approach mode (**APR**) should be used when conducting a coupled GPS approach.

BENDIX/KING® KLN 90B SUPPLEMENT

SECTION IV
NORMAL PROCEDURES

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

E. APPROACH MODE SEQUENCING AND RAIM PREDICTION

NOTE

The special use airspace alert will automatically be disabled prior to flying an instrument approach to reduce the potential for message congestion.

1. Prior to arrival, select a STAR if appropriate from the **APT 7** page. Select an approach and an initial approach fix (IAF) from the **APT 8** page.

NOTES

- Using the right hand outer knob, select the **ACT** (Active Flight Plan Waypoints) pages. Pull the right hand inner knob out and scroll to the destination airport, then push the inner knob in and select the **ACT 7** or **ACT 8** page.
 - To delete or replace a SID, STAR or approach, select **FPL 0** page. Place the cursor over the name of the procedure, press **ENT** to change it, or **CLR** then **ENT** to delete it.
2. En route, check for RAIM availability at the destination airport ETA on the **STA 5** page.

NOTE

RAIM must be available at the FAF in order to fly an instrument approach. Be prepared to terminate the approach upon loss of RAIM.

BENDIX/KING® KLN 90B SUPPLEMENT

**SECTION IV
NORMAL PROCEDURES**

3. At 30 nm from the FAF:
 - a. Verify automatic annunciation of APR **ARM**.
 - b. Note automatic dbar scaling change from ± 5.0 nm to ± 1.0 nm over the next 30 seconds.
 - c. Update the KLN 90B altimeter baro setting as required.
 - d. Internally the KLN 90B will transition from en route to terminal integrity monitoring.

4. Select Super **NAV 5** page to fly the approach procedure.
 - a. If receiving radar vectors, or need to fly a procedure turn or holding pattern, fly in **OBS** until inbound to the FAF.

NOTE

OBS navigation is TO-FROM (like a VOR) without waypoint sequencing.

WARNING

To prevent the possibility of turn anticipation causing potentially misleading navigation when the aircraft is not on course, do not switch from **OBS** to **LEG** with greater than 1 nm cross track error (XTK).

- b. **NoPT** routes including DME arc's are flown in **LEG**. **LEG** is mandatory from the FAF to the MAP.

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

WARNING

Flying final outbound from an off-airport vortac on an overlay approach; beware of the DME distance increasing on final approach, and the GPS distance-to-waypoint decreasing, and not matching the numbers on the approach plate!

**SECTION IV
NORMAL PROCEDURES**

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
MOONEY MODELS M20J, M20K, M20L, M20M, M20R
FAA APPROVED: REVISION AA

BENDIX/KING® KLN 90B SUPPLEMENT

5. At or before 2 nm from the FAF inbound:
 - a. Select the FAF as the active waypoint, if not accomplished already.
 - b. Select LEG operation.
6. Approaching the FAF inbound (within 2 nm.):
 - a. Verify APR **ACTV**.
 - b. Note automatic dbar scaling change from ± 1.0 nm to ± 0.3 nm over the 2 nm inbound to the FAF.
 - c. Internally the KLN 90B will transition from terminal to approach integrity monitoring.
7. Crossing the FAF and APR **ACTV** is not annunciated:
 - a. Do not descend.
 - b. Execute the missed approach.
8. Missed Approach:
 - a. Climb
 - b. Navigate to the MAP (in APR **ARM** if APR **ACTV** is not available).

NOTE

There is no automatic **LEG** sequencing at the MAP.

- c. After climbing in accordance with the published missed approach procedure, press , verify or change the desired holding fix and press **ENT**.

GENERAL NOTES

- The data base must be up to date for instrument approach operation.
- Only one approach can be in the flight plan at a time.
- Checking RAIM prediction for your approach while en route using the **STA 5** page is recommended. A self check occurs automatically within 2nm of the FAF. APR **ACTV** is inhibited without RAIM.

BENDIX/KING® KLN 90B SUPPLEMENT**SECTION IV
NORMAL PROCEDURES**

- Data cannot be altered, added to or deleted from the approach procedures contained in the data base. (DME arc intercepts may be relocated along the arc through the **SUPER NAV 5** or the **FPL 0** pages).
- **Some approach waypoints do not appear on the approach plates (including in some instances the FAF)!**
- Waypoint suffixes in the flight plan:
 - i - IAF
 - f - FAF
 - m - MAP
 - h - missed approach holding fix.
- The DME arc IAF (arc intercept waypoint) will be a) on your present position radial off the arc VOR when you load the IAF into the flight plan, or b) the beginning of the arc if currently on a radial beyond the arc limit. To adjust the arc intercept to be compatible with a current radar vector, bring up the arc IAF waypoint in the **SUPER NAV 5** page scanning field or under the cursor on the **FPL 0** page, press **CLR**, then **ENT**. Fly the arc in LEG. adjust the HSI or CDI course pointer with reference to the desired track value on the **SUPER NAV 5** page (it will flash to remind you). Left/right dbar information is relative to the arc. Displayed distance is not along the arc but direct to the active waypoint. If desired, select **NAV 2** page for digital DME arc distance to and radial from the reference VOR. (The **ARC** radial is also displayed on the **SUPER NAV 5** page.)

BENDIX/KING® KLN 90B SUPPLEMENT**SECTION IV
NORMAL PROCEDURES**

- The DME arc IAF identifier may be unfamiliar. Example: D098G where 098 stands for the 098° radial off the referenced VOR, and G is the seventh letter in the alphabet indicating a 7 DME arc.
- APR **ARM** to APR **ACTV** is automatic provided:
 - a. You are in APR **ARM** (normally automatic).
 - b. You are in **LEG** mode!
 - c. The **FAF** is the active waypoint!
 - d. Within 2 n.m. of the FAF.
 - e. Outside of the FAF.
 - f. Inbound to the FAF.
 - g. RAIM is available.
- Direct-To operation between the FAF and MAP cancels APR **ACTV**. Fly the missed approach in APR **ARM**.
- Flagged navigation inside the FAF may usually be restored (not guaranteed) by pressing the GPS APR button changing from **ACTV** to **ARM**. Fly the missed approach.
- The instrument approach using the KLN 90B may be essentially automatic starting 30 nm out (with a manual baro setting update) or it may require judicious selection of the OBS and LEG modes.
- APR **ARM** may be canceled at any time by pressing the GPS APR button. (A subsequent press will reselect it.)

BENDIX/KING® KLN 90B SUPPLEMENT

SECTION V - PERFORMANCE

No change.

006-00835-0000
PAGE 14 OF 14

MOONEY MODELS M20J, M20K, M20L, M20M, M20R
FAA APPROVED: REVISION AA

United States of America
 Department of Transportation -- Federal Aviation Administration
Supplemental Type Certificate

Number SA00242WI-D

This certificate issued to
 Honeywell International Inc.
 23500 W. 105th Street
 Olathe, KS 66061

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified herein meets the airworthiness requirements of Part 3 of the Civil Air Regulations and additional requirements as specified in TCDS 3A15.

Original Product - Type Certificate Number: 3A15
Name: Beech
Model: F33A, A36, A36TC and B36TC
 (See Limitations for Serial Number Restrictions)

Description of Type Design Changes:
 Installation of the Bendix/King KLN 90B Global Positioning System (GPS) for IFR enroute and approach operation.

REQUIRED DATA: 1. Master Drawing List 159-08143-0001, Rev. 0, dated 4-3-95 and 2. Airplane Flight Manual Supplement 006-00838-0000, Rev. 0, dated 4-25-95. Later FAA approved revisions to the above listed data are incorporated without further revision to this Supplemental Type Certificate.

Limitations and Conditions:

1. This approval should not be extended to other specific airplanes of this model on which other previously approved modifications are incorporated, unless it is determined that the interrelationship between this change and any of those other previously approved modifications will introduce no adverse effect upon the airworthiness of that airplane.

(Continued on Continuation Sheet)

If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: 4-3-95

Date received: 2-28-00

Date of issuance: 4-25-95

Date amended:



By direction of the Administrator

Chris Durkin
 (Signature)

Chris Durkin
 DAS Coordinator, DAS-500863-CE

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68)

PAGE 1 of 3 PAGES

This certificate may be transferred in accordance with FAR 21.47.

INSTRUCTIONS: The transfer endorsement below may be used to notify the appropriate FAA Regional Office of the transfer of this Supplemental Type Certificate.

The FAA will reissue the certificate in the name of the transferee and forward it to him.

TRANSFER ENDORSEMENT

Transfer the ownership of Supplemental Type Certificate Number _____

to *(Name of transferee)* _____

(Address of transferee) _____
(Number and street)

(City, State, and ZIP code)

from *(Name of grantor) (Print or type)* _____

(Address of grantor) _____
(Number and street)

(City, State, and ZIP code)

Extent of Authority (if licensing agreement): _____

Date of Transfer: _____

Signature of grantor *(In ink)*: _____

United States of America
Department of Transportation -- Federal Aviation Administration
Supplemental Type Certificate
(Continuation Sheet)

Number SA00242WI-D

Limitations and Conditions: (continued)

2. The KLN 90B GPS has been evaluated as a navigation input source for the KFC 150 Automatic Flight Control System and found to be compatible; the interface of these systems is approved.
3. Additional equipment required for the specific type of operation must be installed and operational prior to use of the KLN 90B under Instrument Flight Rules (IFR).
4. This Approval is limited to the following Serial Number Airplanes:
 - a. Model F33A: s/n CE-772 and above;
 - b. Model A36: s/n E-1241 and above;
 - c. Models A36TC and B36TC: All serial numbers.

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68) PAGE 3 of 3 PAGES This certificate may be transferred in accordance with FAR 21.47.

United States of America
 Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number SA00241WI-D

This certificate, issued to AlliedSignal Avionics Inc.
400 N. Rogers Road
Olathe, KS 66062

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 3 of the Civil Air Regulations. and additional requirements as specified on TCDS 2A3.

Original Product — Type Certificate Number: 2A3

Make: Mooney

Model: M20J, M20K, M20L, M20M, and M20R
(See Limitations for Serial Number Restrictions)

Description of Type Design Change:

Installation of the Bendix/King KLN 90B Global Positioning System (GPS) for enroute and approach IFR operation.
REQUIRED DATA: 1. Master Drawing List 159-08133-0001, Rev. 4, dated 1-24-95; and
 2. Airplane Flight Manual Supplement 006-00835-0000, Rev. 0, dated 2-1-95.
 Later FAA approved revisions to the above listed data are incorporated without further revision to this Supplemental Type Certificate.

Limitations and Conditions:

1. This approval should not be extended to other specific airplanes of this model on which other previously approved modifications are incorporated, unless it is determined that the interrelationship between this change and any of those other previously approved modifications will introduce no adverse effect upon the airworthiness of that airplane.

(Limitations and Conditions continued on Continuation Sheet)

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: 9-2-94

Date received:

Date of issuance: 2-1-95

Date amended:



By direction of the Administrator

Chris Durkin
(Signature)

Chris Durkin
DAS Coordinator, DAS4CE
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

United States of America
Department of Transportation—Federal Aviation Administration
Supplemental Type Certificate
(Continuation Sheet)

Number SA00241WI-D

Limitations and Conditions (continued):

2. The KLN 90B GPS has been evaluated as a navigation input source for the KFC 150, KFC 325 and KFC 400 Series Automatic Flight Control Systems and found to be compatible; the interface of these systems is approved.
3. Additional equipment required for the specific type of operation must be installed and operational prior to use of the KLN 90B under Instrument Flight Rules (IFR).
4. This Approval is limited to the following Serial Number Airplanes:
 - a. Model M20J: s/n 24-3000 and up;
 - b. Model M20K: s/n 25-1000 and up;
 - c. Models M20L, M20M and M20R: All serial numbers.

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-2-1 (10-69)

2-1-95

This certificate may be transferred in accordance with FAR 21.47.

PAGE 2 OF 2 PAGES

C FAA AC 82-03575

APPENDIX C

GPS FAULT/ERROR CODES AND MESSAGES

THIS PAGE RESERVED

KLN 90B GPS FAULT/ERROR CODES, MESSAGES(FROM INSTALLATION BULLETIN 410)

The following tables contain some helpful information to aid in the troubleshooting of the KLN 90B GPS. When the GPS display or the personal computer monitor indicates a GPS Rec. Error Code, GPS Page Message, or Data Loader Error Message, refer to the tables for an explanation and suggested action.

The column headings are:

Error Code or **Message** - the displayed fault indication seen by the user.

Definition - what the message or fault means.

Action Suggested - the probable cause and some possible solutions.

NOTE

If more than one error occurs, the codes can be combined. For instance, if an error code 0800 and an 0008 are both detected, they will be displayed as an 0808. So, if you see an error code displayed that does not exist in the table, check to see if it is a combination of 2 or more error codes.

GPS Rec. error Codes	Definition	Suggested Action
RCVR Hardware Error: 0002	ROM Failure: The ROM failed self-test.	Bad ROM (Read Only Memory). Return for service.
RCVR Hardware Error: 0004	RAM Failure: The RAM failed self-test.	Bad RAM (Random Access Memory). Return for service.
RCVR Hardware Error: 0008	Nonvolatile Memory Failure: The battery-backed RAM failed sum-check test. Nonvolatile memory will be cleared.	It could be one of the following, in the order of probability: 1. Newly upgraded unit software will display this prior to receiving satellite signals. 2. The battery back-up power to the GPS Receiver was lost. This could be due to either a dead internal battery or a bad connection on the flex cable to the receiver. 3. Bad RAM.

GPS Rec. error Codes	Definition	Suggested Action
RCVR Hardware Error: 0010	RF Failure: This means the receiver is not sensing a proper RF signal from the satellites/antenna.	It could be one of the following, in the order of probability: 1. Coax open or shorted. Confirm the 5 volts at the antenna end. 2. Bad antenna. Substitute the antenna, or inject a signal at the coax. 3. Bad Receiver Module in GPS. Substitute the GPS unit, or inject a signal at the input.
RCVR Hardware Error: 0080	ASIC Failure: The GPS Correlator ASIC failed self-test.	It could be one of the following, in the order of probability: 1. The flex cable between the Receiver Board and Main Board may have come out of the socket in the GPS. 2. Bad ASIC on the Receiver Module in the GPS. Substitute the GPS unit.
RCVR Hardware Error: 0100	BBP Timeout: The 1 mS baseband processing timer failed self-test.	It could be one of the following, in the order of probability: 1. The 5 volt supply to the antenna could be shorted out in the coax. This disables the oscillator in the GPS. 2. The flex cable between the Receiver Board and Main Board may have come out of the socket in the GPS. 3. Bad TCXO or ASIC on the Receiver Module in the GPS. Substitute the GPS unit.
RCVR Hardware Error: 0400	RS-232 Receive Failure: The GPS Receiver did not receive any initialization data from the host computer on the RS-232 port.	It could be one of the following, in the order of probability: 1. The flex cable between the Receiver Board and the Main Board may have come out of the socket in the GPS. 2. Bad 32kHz crystal, UART, or processor on the Receiver Module in the GPS. Substitute the GPS unit.
RCVR Hardware Error: 0800	EEPROM Failure: The EEPROM failed sum-check self-test	Bad EEPROM. Return for service.

GPS Rec. error Codes	Definition	Suggested Action
RCVR Hardware Error: 1000	RS-232 Channel 2 Failure: The second RS-232 UART on the receiver failed the loop-back test. This self-test can only be enabled during test mode on the receiver, and should not be seen in normal operation.	It could be one of the following, in the order of probability: 1. The receiver was put in test mode without looping back the two serial ports. 2. Bad ASIC or Microprocessor on the Receiver Board.
RCVR Hardware Error: 2000	BBP Underflow: The baseband processing loop detected an error in the 1 mS processing loop.	It could be one of the following, in the order of probability: 1. The flex cable between the Receiver Board and Main Board may have come out of the socket in the GPS. 2. Bad TCXO, MMIC, or ASIC on the Receiver Board.
RCVR Hardware Error: 8000	BBP Overflow: The baseband processing loop detected an error in the 1 mS processing loop.	It could be one of the following, in the order of probability: 1. The flex cable between the Receiver Board and Main Board may have come out of the socket in the GPS. 2. Bad TCXO, MMIC, or ASIC on the Receiver Board.

GPS Page/Laptop Messages

GPS Message	Definition	Suggested Action
Altitude Fail	Indicates a missing or erroneous altitude. <ul style="list-style-type: none"> · The altitude input on the gray code input from the encoder is wrong. · The GPS is configured for IFR, and there is no altitude source available. 	The altitude from the encoder may be in error due to a miswire or the absence of isolation diodes between the encoder and the transponder. If the GPS is configured for IFR, it must have a valid altitude. Verify the presence of altitude on the Self-Test or NAV 4 Page.
ARINC 429 Air Data Fail	There is no ARINC 429 data at the Air Data 429 input port.	The Air Data source is not providing 429 data to the GPS. If no source of ARINC 429 data is interfaced, the receiver input should be jumpered back to the Main Transmitter. The software and hardware of the KLN 90B are incompatible. Refer to Service Bulletin KLN 90B-2.
EEPROM Failure: lcxxx	Indicates a detected EEPROM failure in either the GPS unit or the database cartridge.	If the xxxx field is: <ul style="list-style-type: none"> · 1xxx - indicates a failure in the processor in the KLN 90/A/B GPS unit. · 03xx/04xx - indicates a failure in the processor in the KLN 90/A/B database cartridge.
NAV Superflag Failure	Indicates an internal test of the NAV Superflag output failed.	When the flag is supposed to be valid, it should reach a minimum voltage. Usually a failure is due to overloading the output. The output can be tested when the Self-Test Page is displayed.
RAIM position error Cross check position	RAIM is a method of calculating integrity in the GPS position. It calculates the position multiple times using different sets of satellites and compares the answers. If they have excessive difference, the message appears.	It could be one of the following, in the order of probability: <ol style="list-style-type: none"> 1. This probably is a GPS receiver failure. Cross check your position by other means of navigation. Return for service. 2. The GPS detected a problem with one of the satellites, and cannot be assured that the unit itself is within IFR limits.

GPS Page/Laptop Messages

GPS Message	Definition	Suggested Action
<p>RAIM not available Cross check position</p>	<p>This means there are not enough satellites available to compute integrity (RAIM). 1. The satellites are blocked from view by obstructions. 2. They are too low on the horizon for use, or too high for adequate geometry. 3. There is a loss of sensitivity in the antenna, the coax, or the Receiver Module.</p>	<p>The aircraft should be in an open area with good visibility, and the SNR (Signal to Noise Ratio) on the STA 1 or OTH 2 should be as noted below: · KLN 89s will usually have 6-8 satellites shown, and the majority of their SNRs will be 7 to 9. SNRs of 3 and below are unusable, 4 is marginal, and 5 through 9 are considered good. · KLN 90/900s will usually have 6-8 satellites shown, and the majority of their SNRs will be 40s. SNRs of 30 and below are unusable, 30-35 are marginal and 35-48 are considered good. If the SNRs are low, it could be one of the following, in the order of probability: 1. Check the antenna coax and connection for problems. 2. Verify that 5 volts is present at the antenna end of the coax. 3. Substitute the receiver to check for sensitivity. 4. Substitute the antenna to check for sensitivity.</p>
<p>No RS-232 Data</p>	<p>There is no RS-232 data at the RS-232 input port.</p>	<p>The Air Data/Fuel Flow source is not providing RS 232 data to the GPS. If no source of RS-232 is interfaced, the receiver input must be jumpered back to the RS-232 output on KLN 89/89Bs and KLN 90/90A/90Bs. If no source of RS-232 is interfaced to a KLN 900, the configuration may be set up wrong.</p>
<p>RCVR hardware error:___</p>	<p>These are error codes that are detected in the GPS receiver.</p>	<p>Refer to the GPS Fault/Error Code table.</p>
<p>RAIM not available Approach mode inhibited Predict RAIM on OTH 3 or STA 5</p>	<p>This is a calculated prediction of RAIM availability. The message appears when integrity monitoring (RAIM) is predicted to not be available at either the FAF or MAP. The GPS will not allow the unit to go into APR ACTV mode until conditions improve.</p>	<p>This is a feature, not a system failure. Turn to the OTH 3 or STA 5 page to perform a RAIM prediction. It will give you an indication of how long it will be until RAIM is available. This prediction can also be performed prior to departure to insure RAIM at your arrival.</p>

GPS Page/Laptop Messages

GPS Message	Definition	Suggested Action
No RS-232 Data	There is no RS-232 data at the RS-232 input port.	The Air Data/Fuel Flow source is not providing RS 232 data to the GPS. If no source of RS-232 is interfaced, the receiver input must be jumpered back to the RS-232 output on KLN 89/89Bs and KLN 90/90A/90Bs. If no source of RS-232 is interfaced to a KLN 900, the configuration may be set up wrong.
RCVR hardware error:___	These are error codes that are detected in the GPS receiver.	Refer to the GPS Fault/Error Code table.
RAIM not available Approach mode inhibited Predict RAIM on OTH 3 or STA 5	This is a calculated prediction of RAIM availability. The message appears when integrity monitoring (RAIM) is predicted to not be available at either the FAF or MAP. The GPS will not allow the unit to go into APR ACTV mode until conditions improve.	This is a feature, not a system failure. Turn to the OTH 3 or STA 5 page to perform a RAIM prediction. It will give you an indication of how long it will be until RAIM is available. This prediction can also be performed prior to departure to insure RAIM at your arrival.

Data Loader Error Messages

Data Loader Error Messages	Definition	Suggested Action
Loader Not Ready	This indicates that the computer and the GPS are not making a connection with each other.	<ol style="list-style-type: none"> 1. Since the database is not a DOS program, it is not compatible with WINDOWS. It is necessary to boot the computer from the diskettes, and not allow WINDOWS to ever start. 2. Some computers do not have the Com Ports enabled until WINDOWS is running. Through the Configuration Setup of your computer, the Com Port can be enabled. Refer to the owner's manual of your computer. 3. Verify the wiring of the data loader cable and aircraft harness.
Check sum error	Indicates an error on the database diskettes.	Try an old cycle. If the old cycle diskette works, contact AlliedSignal Navigation Services for a replacement diskette.
Disk compatibility problem	This indicates a problem with the diskette.	Verify that Windows is not running and that you booted the computer from the database diskette. Try an old cycle. If the old cycle diskette works, contact AlliedSignal Navigation Services for a replacement diskette.
Available Updates Already Used	The disk has been previously used on another GPS. When a disk writes to a GPS, the disk gets keyed so that it may not be used to update another GPS. The disk may be used as many times as desired on that GPS, but not on more than one.	Obtain a new disk from AlliedSignal Navigation Services.

TSO APPENDIX

RTCA DO-160C

ENVIRONMENTAL QUALIFICATION

FORMS

THIS PAGE RESERVED

RTCA/DO-160C

ENVIRONMENTAL QUALIFICATION FORM

NOMENCLATURE: KLN 90B GPS

PART NUMBER: 066-04031-
1121,1221,1321,1421,2121,2221,2321,2421,1521,1621
1122,1222,1322,1422,2122,2222,2322,2422,1522,1622
1124,1224,1324,1424,2124,2224,2324,2424,1524,1624

TSO NUMBER: C129, Class A1

MANUFACTURER'S SPECIFICATION: MPS 004-02017-4000

MANUFACTURER: Honeywell International Inc.

ADDRESS: 23500 W. 105th ST.
OLATHE, KS 66061
USA

CONDITIONS	PARA	CONDUCTED TESTS
TEMPERATURE AND ALTITUDE	4.0	CATEGORY A2 and D1 (Except low temp -40° C)
IN-FLIGHT LOSS OF COOLING	4.5.4	CATEGORY V
TEMPERATURE VARIATION	5.0	CATEGORY B
HUMIDITY	6.0	CATEGORY A
OPERATIONAL SHOCK	7.0	Operational Shock Test
VIBRATION	8.0	CATEGORIES B,M,N,P and S
EXPLOSION	9.0	CATEGORY X (NOT TESTED)
WATERPROOFNESS	10.0	CATEGORY X (NOT TESTED)
FLUIDS SUSCEPTIBILITY	11.0	CATEGORY X (NOT TESTED)
SAND AND DUST	12.0	CATEGORY X (NOT TESTED)
FUNGUS	13.0	CATEGORY X (NOT TESTED)
SALT SPRAY	14.0	CATEGORY X (NOT TESTED)
MAGNETIC EFFECT	15.0	CLASS A
POWER INPUT	16.0	CATEGORY A and B
VOLTAGE SPIKE CONDUCTED	17.0	CATEGORY A and B
AUDIO FREQUENCY CONDUCTED SUSCEPTIBILITY	18.0	CATEGORY A, B and Z
INDUCED SIGNAL SUSCEPTIBILITY	19.0	CATEGORY A
RADIO FREQUENCY SUSCEPTIBILITY	20.0 Change 3	CATEGORY R
RADIO FREQUENCY EMISSION	21.0 Change 3	CATEGORY A
LIGHTNING INDUCED	22.0 Change 2	CATEGORY A3E3
LIGHTING INDUCED TRANSIENT SUSCEPTIBILITY		
LIGHTING DIRECT EFFECTS	23.0 Change 1	Category 1B
ICING	24.0	Category X (Not Tested)

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DOCUMENT NUMBER 004-09129-4800
PAGE 1 OF 3 REV AC

RTCA DO-160
ENVIRONMENTAL QUALIFICATION FORM
REVISION HISTORY

REVISION	CHANGE ORDER NO.	DATE	
0	ORIGINAL ISSUE	DECEMBER 1994	1
102111		JANUARY 1995	2
130167		AUGUST 1997	
AA	133066	OCTOBER 1997	
AB	168052	FEBRUARY 2000	
AC	169656	MARCH 2000	

WORD 000.doc

DOCUMENT NUMBER 004-09129-4800
PAGE 2 OF 3 REV AC

REMARKS

-VIBRATION

CRITICAL FREQUENCIES: 7 TO 35Hz

20 TO 60Hz

No Changes in critical frequencies were observed

WORD 000.doc

DOCUMENT NUMBER 004-09129-4800
PAGE 3 OF 3 REV AC

RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM

NOMENCLATURE: KA 91 GPS ANTENNA
 PART NUMBER: 071-01545-0100/0200
 TSO NUMBER: NOT AVAILABLE for 0100,
 C129 for 0200
 MANUFACTURER'S SPECIFICATION: See Specification Control Dwg.
 071-01545-0100
 MANUFACTURER: KING RADIO CORPORATION
 ADDRESS: 400 N. ROGERS
 OLATHE, KS 66062
 USA

CONDITIONS	PARA	CONDUCTED TESTS
TEMPERATURE AND ALTITUDE	4.0	CATEGORY A2 and F2
TEMPERATURE VARIATION	5.0	CATEGORY A
HUMIDITY	6.0	CATEGORY C
SHOCK	7.0	PER SHOCK TEST
VIBRATION	8.0	CATEGORIES C,L,M, and Y
EXPLOSION	9.0	CATEGORY X (NOT TESTED)
WATERPROOFNESS	10.0	CATEGORY R
FLUIDS SUSCEPTIBILITY	11.0	CATEGORY F
SAND AND DUST	12.0	CATEGORY X (NOT TESTED)
FUNGUS	13.0	CATEGORY X (NOT TESTED)
SALT SPRAY	14.0	CATEGORY S
MAGNETIC EFFECT	15.0	CLASS A
POWER INPUT	16.0	CATEGORY X (NOT TESTED)
VOLTAGE SPIKE CONDUCTED	17.0	CATEGORY A & B
AUDIO FREQUENCY CONDUCTED SUSCEPTIBILITY	18.0	CATEGORY B & Z
INDUCED SIGNAL SUSCEPTIBILITY	19.0	CATEGORY A
RADIO FREQUENCY SUSCEPTIBILITY	20.0	CATEGORY U *
RADIO FREQUENCY EMISSION	21.0	CATEGORY A
LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	22.0	CATEGORY L
LIGHTNING DIRECT EFFECTS	23.0	CATEGORY 1B
ICING	24.0	CATEGORY C

* Additional HIRF testing conducted, see test report 707-00615-0000

004-09100-0000
Revision 1
Page 1 of 2

RTCA DO-160
ENVIRONMENTAL QUALIFICATION FORM
REVISION HISTORY

REVISION	CHANGE ORDER NO.	DATE
1	ECO 98584	July 1993

004-09100-0000
Revision 1
Page 2 of 2

RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM

NOMENCLATURE: KA 92 ANTENNA
 PART NUMBER: 071-01553-0200
 TSO NUMBER: C129
 MANUFACTURER'S SPECIFICATION: See Specification Control Dwg.
 071-01553-0200
 MANUFACTURER: ALLIEDSIGNAL GENERAL AVIATION AVIONCS
 ADDRESS: 400 N. ROGERS ROAD
 OLATHE, KS 66062
 USA

CONDITIONS	PARA	CONDUCTED TESTS
TEMPERATURE AND ALTITUDE	4.0	Category A2 and F2
TEMPERATURE VARIATION	5.0	Category A
HUMIDITY	6.0	Category C
SHOCK	7.0	Operational Shock Test
VIBRATION	8.0	Categories C, L, M and Y
EXPLOSION	9.0	Category X (NOT TESTED)
WATERPROOFNESS	10.0	Category R
FLUIDS SUSCEPTIBILITY	11.0	Category F
SAND AND DUST	12.0	Category X (Not Tested)
FUNGUS	13.0	Category X (Not Tested)
SALT SPRAY	14.0	Category S
MAGNETIC EFFECT	15.0	Class Z
POWER INPUT	16.0	Category A and B
VOLTAGE SPIKE CONDUCTED	17.0	Category A and B
AUDIO FREQUENCY CONDUCTED SUSCEPTIBILITY	18.0	Category A, B and Z
INDUCED SIGNAL SUSCEPTIBILITY	19.0	Category A
RADIO FREQUENCY SUSCEPTIBILITY	20.0 Change 3	Category R
RADIO FREQUENCY EMISSION	21.0 Change 3	Category A
LIGHTING INDUCED TRANSIENT SUSCEPTIBILITY	22.0 Change 2	Category XXE3
LIGHTING DIRECT EFFECTS	23.0 Change 1	Category 1B
ICING	24.0	Category C

004-09130-4800
 Revision 1
 Page 1 of 3

RTCA/DO-160C
ENVIROMENTAL QUALIFICATION FORM
REVISION HISTORY

REV NUMBER	ECO NUMBER	DATE
0	ORIGINAL ISSUE	DECEMBER 1994
1	102111	JANUARY 1995

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Revision 1
Page 2 of 3

REMARKS

-Fluids Susceptability

Fluids Used:

Ethylene Glycol
Isopropyl Alcohol
Denatured Alcohol
1,1,1 Trichloroethane
Jet A Fuel
Aviation Fuel
Skydrol, Type IV
Dichlorvos (DDVP)
Pyrethrum - Based Insecticide
AEA Type 1
AEA Type 2

Swelling of KA 92 observed when exposed to Dichlorvos (DDVP).

004-09130-4800
Revision 1
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