

Honeywell

INSTALLATION MANUAL

BENDIX/KING[®]

KX 155A/165A

COMM/NAV SYSTEM

MANUAL NUMBER 006-10542-0003

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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 Silver Crown KX155A/165A VHF COMM Transceiver/Navigation/VOR/LOC Glideslope Receiver. Installation and operating procedures are also included.

Information relative to the maintenance, alignment, and procurement of replacement parts may be found in the KX155A Maintenance/Overhaul Manual, P/N 006-15542-XXXX and the KX165A Maintenance/Overhaul Manual P/N 006-15610-XXXX.

1.2 EQUIPMENT DESCRIPTION

The KX155A is a VHF NAV/COMM Transceiver which provides the following functions.

- A. Two-way voice communication within the frequency range of 118.00 MHz to 136.975 MHz (760 Channels) in 25 kHz increments.
- B. Reception of navigation signals within the frequency range of 108.00 MHz to 117.95 MHz in 50 kHz increments (200 channels).
- C. Optional reception of glideslope signals within the frequency range of 329.15 MHz to 335.00 MHz in 150 kHz increments (40 channels).
- D. High level speaker audio output plus limited audio intercom inputs and outputs.
- E. Provides a count down timer.

The KX165A is a VHF NAV/COMM Transceiver which provides the following functions.

- A. Two-way voice communication within the frequency range of 118.00 MHz to 136.975 MHz (760 channels) in 25 kHz increments. A flavor option to the unit gives the additional capability of voice communication in 8.33 kHz channel increments over the 118.000 MHz to 136.9917 MHz (2280 channels) band.
- B. Reception of navigation (VOR/LOC) and glideslope signals within the frequency ranges of 108.00 MHz to 117.95 MHz in 50 kHz increments (200 channels) and 329.15MHz to 335.00MHz in 150 kHz increments (40 channels) respectively.
- C. Provides a countdown timer.
- D. Provides OBI serial data output.

The KX155A/165A is a panel mounted unit. Connections to the unit are made through one 36 and one 50 pin Molex printed circuit board edge connector and three BNC coax connectors at the rear of the unit.

Electrically, the KX155A/165A consists of the following sections:

- COMM Transmitter
- COMM Receiver
- NAV Receiver
- Main Board
- Glideslope Receiver and Converter (Optional in KX155A, standard in KX165A)

- Gas Discharge Display
- 4 Ω Audio Amplifier (only available in KX155A)
- VOR/LOC Converter I/O Board (only available in KX165A)

The KX155A/165A is backward compatible with existing KX155/165 installations. See [Section 2.3](#) Additional Installation Notes for details.

1.3 TECHNICAL CHARACTERISTICS

Table 1-1 KX155A/KX165A Technical Specifications

KX155A/KX165A GENERAL SPECIFICATIONS			
ENVIRONMENTAL TSO COMPLIANCE:	RTCA DO-160C, EUROCAE ED-14C Env Cat (see Appendix E)		
TEMPERATURE RANGE:	-20°C to +55°C with short time operation at +70°C. (Operational to -35°C)		
ALTITUDE:	-15,000 feet to 50,000 feet		
WEIGHT:			
KX 155A	VERSIONS	WEIGHT (nominal)	Mtg Rack w/hardware
	069-01032-0101	4.2 lbs (1.9 kg)	1.1 lbs (0.5 kg)
	069-01032-0201	3.7 lbs (1.7 kg)	1.1 lbs (0.5 kg)
KX 165A	VERSIONS	WEIGHT (nominal)	Mtg Rack w/hardware
	069-01033-0101	4.0 lbs (1.8 kg)	1.1 lbs (0.5 kg)
	069-01033-0201	4.0 lbs (1.8 kg)	1.1 lbs (0.5 kg)
PHYSICAL DIMENSIONS (NOMINAL) :			
Width:	6.25 inches (15.875 cm)		
Height:	2.00 inches (5.08 cm)		
Depth:	10.16 inches (25.81 cm) to end of connector		
MOUNTING:	Panel mounted, no shock mounting required		
POWER CONSUMPTION:			
VERSIONS:	RECEIVE TYP.	RECEIVE PEAK	TRANSMIT
069-01032-0101	0.8 A	2.2 A	6.0 A (MAX)

069-01032-0201	0.8 A	2.2 A	6.0 A (MAX)
069-01033-0101	0.6 A	0.7 A	4.0 A (MAX)
069-01033-0201	0.6 A	0.7 A	4.0 A (MAX)

NOTE: Peak currents occur only when installation is configured for the 4 Ω audio output & both COMM and NAV volumes are adjusted to full.

Specifications are at 25°C unless otherwise specified.

COMM TRANSCEIVER

TSO COMPLIANCE:

Transmit:	C37d (KX 155A/165A), JTSO-2C37e (KX 165A) Class 4: all radio flavors Class 4 & 6: 069-01033-0201 only
Receive:	C38d (KX 155A/165A), JTSO-2C38e (KX 165A) Class C & D: all radio flavors Class C, D, & E: 069-01033-0201 only

APPLICABLE DOCUMENTS: RTCA DO-186A, DO-160C,
*EUROCAE ED-23B, ED-14C

DUTY CYCLE: 10%, 4.5 minutes receive, 0.5 minutes transmit

FREQUENCY RANGE: 118.000 MHz to 136.975 MHz (TX-Class 4, RX-Class C&D)
118.000 MHz to 136.9917 MHz (TX-Class 6, RX-Class E)

COMM TRANSMITTER

POWER OUTPUT: 10 Watts minimum
10 Watts typical (KX 155A pre-Mod 5)

MODULATION: 70% minimum modulation capability with less than 15% distortion. Audio leveling circuit used.

SIDETONE OUTPUT: Adjustable up to 100 mW (5.1 mW Mod 1 w/o Mod 6 - KX155A) into 500 Ω headphones

MICROPHONE: Standard carbon or dynamic mic containing transistorized pre-amp. (Must provide 100 mVrms into 100 Ω load.)

HARMONIC CONTENT: -56 dBc, minimum. Typically greater than -60 dBc

HIGH TEMPERATURE PROTECTION: If the transmitter and modulator circuits become hot enough to potentially damage any components in the transceiver, a protection circuit will automatically reduce the transmitter power consumption and output power.

TRANSMITTER TIME OUT: If MIC key is enabled for greater than 30 (Nominal) seconds, the transmitter will shut down. The transmitter is re-set upon release of MIC key.

COMM RECEIVER

RECEIVER SENSITIVITY: -107 dBm (2 μ V hard) or less for 6 dB S + N/N with 1000 Hz tone modulated 30%

RECEIVER SELECTIVITY:
Class C & D operating modes
6 dB bandwidth \pm 8.0 kHz, minimum
60 dB bandwidth \pm 22.0 kHz, maximum

Class E operation mode	6 dB bandwidth ± 2.778 kHz, minimum 60 dB bandwidth ± 7.37 kHz, maximum
RECEIVER AUDIO OUTPUT:	100 mW into 500 Ω minimum.
AGC CHARACTERISTICS:	From - 93 dBm to -33 dBm audio output will not vary more than 3 dB. Active from no signal to +3 dBm.
SQUELCH:	Automatic squelch (internally adjustable carrier to noise setting) with manual disable and carrier squelch override. Both squelch adjustments are externally accessible. The automatic squelch has a typical factory setting of -106 dBm.
OUT OF BAND SPURIOUS RESPONSE INTERMODULATION AND DESENSITIZATION	At least 60 dB down
NAV RECEIVER	
TSO COMPLIANCE:	
LOCALIZER:	C36e (KX 155A/165A), JTSO-C36e (KX 165A) Class A
VOR:	C40c (KX 155A/165A), JTSO-2C40c (KX 165A)
APPLICABLE DOCUMENTS:	RTCA DO-195, RTCA DO-196, RTCA DO-160C *EUROCAE ED-22B, & ED-46B, ED-14C
FREQUENCY RANGE:	108.00 MHz to 117.95 MHz in 50 kHz increments
OUT OF BAND SPURIOUS RESPONSES, INTERMODULATION AND DESENSITIZATION:	At least 60 dB down Meets ICAO FM Immunity requirements consistent with RTCA DO-195, 196 and *EUROCAE ED-22B, 46B
VOR COURSE ACCURACY:	Two sigma limit 3° as specified in RTCA DO-196 when used with indicators per section 1.7.3 or 1.7.4 of this installation manual. Three sigma limit 2.7° as specified in *EUROCAE ED-22B when used with indicators per section 1.7.3 or 1.7.4 of this Installation manual.
AUDIO OUTPUT:	With a 1 kHz tone 30% modulation at least 100 mW output into 500 Ω loads
IDENT/VOICE:	With 100 mV input, 30% modulation at 1020 Hz, the ident/voice tone ratio shall not be less than 15 dB.

* Pre-Mod 5 units may not meet all applicable EUROCAE requirements.	
LOC CENTERING ERROR:	Two sigma limit $\pm 9.9 \mu\text{A}$ as specified in RTCA DO-195 and *EUROCAE ED-46B when used with indicators per section 1.7.2 or 1.7.5 of this Installation manual.
GLIDESLOPE RECEIVER	
TSO COMPLIANCE:	C34e (KX 155A/165A), JTSO-C34e (KX 165A)
APPLICABLE DOCUMENTS:	RTCA DO-192, DO-165C *EUROCAE ED-47B, ED-14C
CENTERING ACCURACY:	Two sigma limit $\pm 10 \mu\text{A}$ as specified in RTCA DO-192 and *EUROCAE ED-47B when used with indicators per section 1.7.1 of this Installation Manual.
DEFLECTION CHARACTERISTICS:	A difference in depth of modulation of 0.091 ddm, or 2 dB, shall produce a deflection of $78 \pm 3 \mu\text{A}$ (typical). The deviation under opposite polarity shall be $78 \pm 3 \mu\text{A}$ (typical).
FREQUENCY RANGE:	329.15 MHz to 335.00 MHz 40 channels (150 kHz spacing).
SPURIOUS RESPONSE:	All responses in the range from 90 kHz to 1500 MHz at least 60 dB below center frequency response, excluding the range from 328.60 MHz to 335.40 MHz.
VOR/LOC CONVERTER (KX 165A ONLY)	
TSO COMPLIANCE:	C40c, JTSO-2C40c VOR C36e, JTSO-36e (Class A) Localizer
ACCURACY - VOR:	Typical bearing error of less than 0.5° with precision track selector (2° max. error).
- LOC	Typical centering error of less than $3 \mu\text{A}$ ($7 \mu\text{A}$ max error).
COURSE WIDTH:	
- VOR:	$10^\circ \pm 1^\circ$ externally adjustable
- LOC:	$90 \mu\text{A} \pm 5 \mu\text{A}$ for ddm of 0.093 ddm of 4 dB
INPUT IMPEDANCE:	60 k Ω for 0.5 Vrms input (VOR mode)
LOADS:	Five 1000 Ω deviation loads, five 1000 Ω flag loads and three 200 Ω from-to loads

* Pre-Mod 5 units may not meet all applicable EUROCAE requirements.	
AUDIO AMP (KX 155A ONLY)	
4 Ω Output:	8 watts nominal
Inputs:	Three 500Ω Auxiliary inputs
* Pre-Mod 5 units may not meet all applicable EUROCAE requirements.	

1.4 UNITS AND ACCESSORIES SUPPLIED

1.4.1 KX 155A/KX 165A

The Bendix/King KX 155A/KX 165A Transceivers are available in the following configurations. Table 1-2 KX 155A Configurations Available

Table 1-2 KX 155A Configurations Available

Part Number	28V	Glideslope Receiver
069-01032-0101	X	X
069-01032-0201	X	

Table 1-3 KX 165A Configurations Available

Part Number	28V	8.33 kHz
069-01033-0101	X	
069-01033-0201	X	X

1.4.2 INSTALLATION KIT

Bendix/King KX 155A/KX 165A Installation Kit (P/N 050-03378-0000/0001), listed in **Table 1-4** contains the following parts: 0000 for units with glideslope and 0001 for units without glideslope. **Table 1-4** Installation Kit (050-03378-XXXX)

Table 1-4 Installation Kit

Part Number	Description	0000	0001
030-00101-0002	PANEL MOUNT PLUG	3	2
030-01094-0060	CONN 18 POS	1	1
030-01094-0088	CONN HOUSING (2 X 2.50) W POLARIZING KEY	1	1
030-01107-0078	CONNECTOR TERM 78T	1	0
030-01107-0068	CONNECTOR TERM 68T	0	1
047-05959-0002	STRAIN RELIEF W/H	2	2
047-05960-0001	STRAIN RELIEF W/F	2	2
073-00431-0007	CONN MTG PLATE COMPLETE	1	1
089-02051-0024	NUT, SPEED, U, 6-32	4	4
089-02353-0001	NUT, CLIP, 6-32	6	6
089-05878-0005	SCR, PHP, 4-40 X 5/16	2	2
089-05878-0012	SCR, PHP, 4-40 X 3/4	4	4
089-05907-0006	SCR, PHP, 6-32 X 3/8	4	4
089-06012-0008	SCR, FHP, 6-32 X 1/2	6	6
090-00019-0007	RING, RTNR, .438	3	2

1.5 ACCESSORIES REQUIRED BUT NOT SUPPLIED

- A. Broad band 50 Ω vertically polarized Communications antenna with coaxial cable.
- B. Headphones: 500 Ω s nominal impedance.
- C. Microphone: Low impedance carbon or dynamic with transistorized pre-amp.
- D. Broad band 50 Ω horizontally polarized Navigation antenna with coaxial cable.
- E. Broad band 50 Ω horizontally polarized Glideslope antenna with coaxial cable or low loss splitter used with the navigation antenna.
- F. VOR, LOC, Glideslope Indicators. See [section 1.7.6](#) for TSO'd systems.
- G. In some installations it may be desirable to allow the Glideslope Receiver to operate using the aircraft's navigation antenna. In other installations it may be desirable to operate two NAV/LOC Receivers or two GS Receivers using a common antenna. Low-loss couplers are available to allow such operation.

An overall degradation in sensitivity will be realized due to the insertion loss of the coupler. The installer must verify that acceptable sensitivity and proper system performance is realized in a system that utilizes a coupler. A minimum of 20 dB of GS receiver-to-receiver isolation is required in dual installations employing a

KX 155A/KX 165A GS receiver. Examples of some common couplers are listed below. Contact the coupler manufacturer for specifications for the couplers listed.

Table 1-5 Common Couplers

Coupler to allow one antenna to operate:	Dayton-Granger (954) 463-3451	Dorne Margolin (516) 585-4000
One Nav and one GS	GSNC 20-05	H22-1
Two Navs	DRC 20-04 or 14830	H21-1
Two Glideslopes	DGSC 20-02 or 16009	H24-1
Two Navs and two GSs	DOC 20-06 or 16010	H69-1

1.6 LICENSE REQUIREMENTS

The KX 155A/KX 165A NAV/COMM transceiver is to be utilized in an aircraft which already has a station license, no additional radio station license is required.

If the transceiver is to be used as a ground station then a Ground Station Authorization is required. Call the Federal Communications Commission (FCC) at 1-800-322-1117, or use the included FCC Form 207, to order FCC Form 406, "Application for Ground Station Authorization in the Aviation Services".

You may also use the FCC's FAX form service by calling 1-202-418-0177.

This equipment has been accepted by the FCC and entered into their list of Type Accepted Equipment as AlliedSignal Avionics, Inc. Model KX 155A/KX 165A.

For more information call the FCC Hot line at 1-800-322-1117, press "2" for assistance with radio service, then press "1" for ship and aircraft licensing information. To get information from the internet, visit the FCC web page at <http://www.fcc.gov>.

The KX 155A/KX 165A owner/operator accepts all responsibility for obtaining the proper licensing before using the transmitter.

CAUTION

THE VHF TRANSMITTER IN THIS EQUIPMENT IS GUARANTEED TO MEET FEDERAL COMMUNICATIONS COMMISSION ACCEPTANCE OVER THE OPERATING TEMPERATURE RANGE ONLY WHEN A BENDIX/KING CRYSTAL IS USED IN THE STABILIZED MASTER OSCILLATOR.

USE OF OTHER THAN A BENDIX/KING CRYSTAL IS CONSIDERED AN UNAUTHORIZED MODIFICATION, AND WILL VOID THE WARRANTY.

An Aircraft Radio Station License is no longer required for this equipment for domestic operation. For international travel, forms (FCC Form 404, New Aircraft Station License, or FCC Form 405A, Renewal of Aircraft Station License) can be obtained from your nearest FCC Field Office.

1.7 REQUIREMENTS FOR TSO'D VOR/ILS GLIDESLOPE SYSTEMS

The additional units used in conjunction with the KX 155A/KX 165A must meet the specifications listed below to comprise a completely TSO'd navigation system.

1.7.1 KX 155A/KX 165A GLIDESLOPE INDICATOR REQUIREMENTS

- A. The indicator shall meet all applicable requirements of TSO C34e.
- B. Centering current to be $0 \pm 6.6 \mu\text{A}$ with a 95% probability under all environmental conditions listed in RTCA Paper DO-192, Minimum Performance Standards -- Airborne ILS Glideslope Receiving Equipment, Paragraph 2.1, sub-paragraph B, Centering Accuracy.
- C. The course deviation pointer shall visibly deflect at least $\pm 5/8$ inch along its scale when the input current is changed from zero to $\pm 150 \mu\text{A}$.
- D. Deflection linearity over the deflection range from zero to $150 \mu\text{A}$ shall be within 10% of being proportional to the input current. Additionally, as the current is increased beyond that producing full scale deflection to a value of $\pm 685.7 \mu\text{A}$, the indicator deflection shall not decrease.
- E. When the input current is abruptly changed from any value from zero to $\pm 150 \mu\text{A}$, the pointer shall reach 67% of its ultimate deflection within 2 seconds and pointer overshoot shall not exceed 5%.
- F. The input impedance shall be $1 \text{ K}\Omega \pm 5\%$ for both the deviation indicator and warning signal.
- G. A warning signal input current of $150 \mu\text{A}$ or less shall produce a fully visible warning flag. A warning signal input current of $260 \mu\text{A}$ or greater shall produce a fully concealed warning flag.

1.7.2 KX 155A LOCALIZER CONVERTER AND INDICATOR REQUIREMENTS

- A. The indicator shall meet all applicable requirements of C36e (RTCA DO-195 Class A) or C36d (RTCA DO-131 Class D).
- B. Centering current to be $0 \pm 6.0 \mu\text{A}$ with a 95% probability under all environmental conditions listed in RTCA Paper DO-195, Minimum Performance Standards -- Airborne ILS Localizer Receiving Equipment, Paragraph 2.1, sub-paragraph b, Centering Accuracy.
- C. The course deviation pointer shall visibly deflect at least $\pm 3/8$ inch along its scale when the input current is changed from zero to $\pm 90 \mu\text{A}$.
- D. Deflection linearity over the deflection range from zero to $\pm 90 \mu\text{A}$ shall be within 10% of being proportional to the difference in depth of modulation of the 90 and 150 Hz signals, or the deflection shall be within 5% of standard deflection ($\pm 90 \mu\text{A}$) of being proportional to the difference in depth of modulation, whichever is greater. Additionally, as the difference in depth of modulation is increased beyond that producing full scale deflection ($\pm 150 \mu\text{A}$) to a value of 0.4 ddm, the course deviation pointer deflection shall not decrease.
- E. When the input current is abruptly changed from zero to $\pm 150 \mu\text{A}$, the pointer shall reach 67% of its ultimate deflection within 2 seconds and pointer overshoot shall not exceed 5%.
- F. The input impedance of the indicator for both the deviation indicator and warning signal shall be $1 \text{ K}\Omega \pm 5\%$.
- G. A warning signal input current of $125 \mu\text{A}$ or less shall produce a fully visible warning flag. A warning signal input current of $260 \mu\text{A}$ or greater shall produce a fully concealed warning flag.

1.7.3 KX 155A VOR CONVERTER AND INDICATOR REQUIREMENTS

- A. The indicator shall meet all applicable requirements of TSO C40c.
- B. The bearing error shall be less than 2.5° with a 95% probability under all environmental conditions listed in RTCA Paper DO-196, Minimum Performance Standards -- Airborne VOR Receiving Equipment, Paragraph 2.1, sub-paragraph 2.1.2, Bearing Accuracy.

NOTE

For older converters/indicators, the Bearing Error shall be less than 2.7° with a 95% probability under all environmental conditions listed in RTCA Paper DO-114, MINIMUM PERFORMANCE STANDARDS -- AIRBORNE VOR RECEIVING EQUIPMENT, Paragraph 2.1, Sub-paragraph B, BEARING ACCURACY.

- C. The course deviation pointer shall visibly deflect at least $\pm 1/2$ inch (for DO-196) or $3/8$ inch (for DO-114) along its scale when the input current is changed from zero to $\pm 150 \mu\text{A}$.
- D. Deflection Linearity
The deflection shall be proportional to the change in phase between the two components of the standard VOR test signal, within 20% of the deflection produced by a 10° ($\pm 150 \mu\text{A}$) change in phase. This requirement shall be met at all deflections produced when the phase difference is varied from plus 10° to minus 10° of that producing an "on course" indication.

The pointer deflection shall not decrease as the phase difference is increased from producing an "on course" indication to that producing an indication which is equivalent to $\pm 80^\circ$ from "on course".
- E. Deflection Response
When the difference in phase between the two components of an "on course" standard VOR test signal is abruptly changed, the pointer shall reach 70% of its ultimate position within 3 seconds and the pointer overshoot shall not exceed 20%.
- F. The input impedance of the indicator for both the bearing error and warning signal shall be $1 \text{ K}\Omega \pm 5\%$.
- G. A warning signal input current of $125 \mu\text{A}$ or less shall produce a fully visible warning flag. A warning signal input current of $266 \mu\text{A}$ or greater shall produce a fully concealed warning flag.
- H. The input impedance of the TO/FROM indicator shall be $200 \Omega\text{s} \pm 200 \mu\text{A}$ sensitivity.

1.7.4 KX 165A VOR INDICATOR REQUIREMENTS

- A. The indicator shall meet all applicable requirements of TSO C40c.
- B. The bearing error shall be less than 1.9° with 95% probability under all environmental conditions listed in RTCA Paper DO-196, Minimum Performance Standards -- Airborne VOR Receiving Equipment, Paragraph 2.1, sub-paragraph 2.2.1, Bearing Accuracy.

NOTE

For older indicators, the Bearing Error shall be less than 2.7° with a 95% probability under all environmental conditions listed in RTCA Paper DO-114, MINIMUM PERFORMANCE STANDARDS -- AIRBORNE VOR RECEIVING EQUIPMENT, Paragraph 2.1, Sub-paragraph B, BEARING ACCURACY.

- C. The course deviation pointer shall visibly deflect at least $\approx 1/2$ inch (for DO-196) $3/8$ inch (for DO-114) along its scale when the input current is changed from zero to $\pm 150 \mu\text{A}$.
- D. Deflection Linearity
The deflection shall be proportional to the change in phase between the two components of the standard VOR test signal, within 20% of the deflection produced by a 10° ($\pm 150 \mu\text{A}$) change in phase. This requirement shall be met at all deflections produced when the phase difference is varied from plus 10° to minus 10° of that producing an "on course" indication.
The pointer deflection shall not decrease as the phase difference is increased from the producing an "on course" indication to that producing an indication which is equivalent to $\pm 80^\circ$ from "on course".
- E. Deflection Response
When the difference in phase between the two components of an "on course" standard VOR test signal is abruptly changed, the pointer shall reach 70% of its ultimate position within 3 seconds and the pointer overshoot shall not exceed 20%.
- F. The input impedance of the indicator for both the bearing error and warning signal shall be $1 \text{ K}\Omega \pm 5\%$.
- G. A warning signal input current of $50 \mu\text{A}$ or less shall produce a fully visible warning flag. A warning signal input current of $350 \mu\text{A}$ or greater shall produce a fully concealed warning flag.
- H. The input impedance of the TO/FROM indicator shall be $200 \Omega \pm 200 \mu\text{A}$ sensitivity.

1.7.5 KX 165A LOCALIZER INDICATOR REQUIREMENTS

- A. The indicator shall meet all applicable requirements of C36e.
- B. The localizer centering current to be $0 \pm 3.2 \mu\text{A}$ with a 95% probability under all environmental conditions listed in RTCA DO-195, Minimum Performance Standards -- Airborne ILS Localizer Receiving Equipment, Paragraph 2.2.1, sub-paragraph B, Centering Accuracy.
- C. The course deviation pointer shall visibly deflect at least $\pm 3/8$ inch along its scale when the input current is changed from zero to $\pm 90 \mu\text{A}$.
- D. Deflection linearity over the range from zero to $\pm 90 \mu\text{A}$ shall be within 10% of being proportional to the difference in depth of modulation of the 90 and 150 Hz signals, or the deflection shall be within 5% of standard deflection ($\pm 90 \mu\text{A}$) of being proportional to the difference in depth of modulation, whichever is greater.
Additionally, as the difference in depth of modulation is increased beyond that producing full scale deflection ($\pm 150 \mu\text{A}$) to a value of 0.4 ddm, the course deviation pointer deflection shall not decrease.

- E. When the input current is abruptly changed from zero to $\pm 150 \mu\text{A}$, the pointer shall reach 67% of its ultimate deflection within 2 seconds and pointer overshoot shall not exceed 5%.
- F. The input impedance of the indicator for both the deviation indicator and warning signal shall be $1 \text{ K}\Omega \pm 5\%$.
- G. A warning signal input current of $50 \mu\text{A}$ or less shall produce a fully visible warning flag. A warning signal input current of $350 \mu\text{A}$ or greater shall produce a fully concealed warning flag.

1.7.6 FULLY TSO'D SYSTEMS

The following systems will meet all TSO system requirements when used in conjunction with the KX 155A/165A .

1. KI 203
2. KI 204
3. KI 208/A
4. KI 209/A
5. KN 72, KI 206
6. KN 72, KI 525A
7. KN 72, KPI 552
8. KN 72, KPI 553
9. KN 72, KI 202

Additionally, the KX 165A will meet all TSO requirements when used in conjunction with the following display systems.

1. KI 202
2. KI 206
3. KI 525A
4. KPI 552
5. KPI 553
6. KI 229 (using King Serial Type I OBI data)
7. KNI 582 (using King Serial Type I OBI data)
8. KDA 692 (using King Serial Type I OBI data)
9. SG 465 (EFS 40/50) (using King Serial Type II OBI data)

SECTION II

INSTALLATION

2.1 GENERAL

This section contains suggestions and factors to consider before installing the KX 155A/KX 165A. Close adherence to these suggestions will assure a more satisfactory 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 unit. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for a damage is to be made, save the shipping container to substantiate the claim. When all equipment is removed, place all packing materials in the shipping container for use in unit storage or reshipment.

2.3 EQUIPMENT INSTALLATION

The KX 155A/KX 165A 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 should be considered before installing your KX 155A/KX 165A. The installing agency will supply and fabricate all external cables. The connectors required are supplied by Honeywell. Interconnect diagrams are **Figures 2-13** through **2-17**.

NOTE

Use good quality stranded wire with at least 600 volt insulation that will not support a flame. If more than one Glideslope Receiver is to be operated from a single antenna, an antenna coupler such as the DORNE and MARGOLIN INC. (Model DMB H4-1) or equivalent should be used.

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. While modern day individual circuit designs consume much less electrical energy, the watts per cubic inch dissipated within avionics units remains much the same due to high density packaging techniques. Consequently, the importance of providing avionics stack cooling is still with us.

Forced air cooling is required for the KX 155A/KX 165A. Forced air must be provided to the KX 155A/KX 165A through the air inlet port located on the back of the unit. Forced air must be supplied by a source capable of delivering a minimum air flow of 3.5 CFM to the unit under the static pressure conditions that will exist at the unit's air inlet port (typically, not more than .032 psi relative to ambient pressure). In order to maintain frequency stability per TSO specifications, the blower's inlet air temperature must not exceed 55° C. However, in order to provide optimum equipment reliability, it is strongly recommended that inlet air temperature not exceed 35° C.

Recommendations on stack cooling are contained in AlliedSignal Installation Bulletin #55. Failure to provide stack cooling will certainly lead to increased avionics maintenance costs and may void the Honeywell warranty.

2.3.2 MOUNTING RACK INSTALLATION

- A. The KX 155A/KX 165A is mounted rigidly in the aircraft panel. Select a position in the panel that is not too close to any high external heat source. Remember to allow adequate space for installation of cables and connectors. Avoid sharp bends and placing the cables near aircraft control cables.
- B. Refer to **Figure 2-11** for the KX 155A/KX 165A mounting dimensions. Mark and drill the mounting holes.
- C. Secure the mounting rack to the instrument panel per **Figure 2-11**. The rear mounting bosses should be attached to the aircraft by means of support brackets.

2.3.3 ANTENNA INSTALLATION

- A. Conventional 50 ohm horizontally polarized NAV Glideslope and vertically polarized COMM antennas are required with the KX 155A/KX 165A. Vertically bent whip antennas are not recommended. Antennas should be installed per manufacturer's recommendations. Additional recommendations are as follows:
 1. COMM Antenna
 - a. Mount antenna on flat metal surface or install a ground plane at least 18 inches square.
 - b. The antenna should be well removed from any projections and the engine(s) and propeller.
 2. Navigation Antennae (VOR/LOC & Glideslope)
 - a. The location should be well removed from other antennas, projections and engine(s). It should have a clear line of sight area if possible.
 - b. The antenna must be mounted symmetrically with the centerline of the aircraft.
 - c. Avoid running other coaxial cables and wires near the NAV antenna cable.
- B. The antenna connectors on the KX 155A/KX 165A are identified on the rear die casting.

NOTE

With KX 155A/KX 165A viewed from the front, the NAV antenna connector is on the right and the COMM antenna connector is on the left. This means that the NAV Frequency Selector and NAV Antenna are on the same side of the radio. The COMM Frequency Selector and COMM Antenna Connector are also on the same side of the radio. The Glideslope Antenna Connector is right above the NAV Antenna Connector.

2.3.4 CABLE HARNESS AND CONNECTOR ASSEMBLY

The KX 155A/KX 165A uses a special connector that mates directly with the printed circuit board inside the unit. Assembly of the connector is as follows:

- A. Contact Terminal Assembly using Molex Crimper (**Figure 2-1** through **2-6**)
 1. Strip each wire 5/32" for contact terminal (Part Number 030-01107-XXXX). (The last two digits of the contact terminal part number indicates the number of terminals required).
 2. Open the Molex hand crimper HT 1921 with the engraved side toward the operator. Place the conductor tab section of a contact terminal on Anvil B with the contact portion facing away from the operator. Close the crimper slightly until the contact tabs touch the female jaw.
 3. Insert the stripped conductor until the insulation is even with the side of the crimper facing the operator. Crimp the conductor tabs by squeezing the handles together until the jaws are fully closed or a sufficient crimp is obtained.
 4. Move the lead to Anvil A. Place the insulating tab section on Anvil A. Crimp again until the jaws are fully closed or a sufficient crimp is obtained.
- B. Contact Insertion into Molex Connector Housing
 1. After the contact terminals have been installed on the wiring harness, the contact terminals can be inserted into the proper location in the connector housing (P/N 030-01094-00XX). The terminal cannot be inserted upside down. Be sure to push the terminal all the way in, until a click can be felt or heard.
 2. The self locking feature can be tested by gently pulling on the wire.
- C. Location of Polarizing Key in Housing
 1. Prior to insertion of connector into rear of unit, check polarizing key position between contacts 3 and 4 for P155A1/P165A1 & between contacts A & B and T & V of P155A2/P165A2.
 2. Refer to **Figure 2-12** to check correct position of polarizing key.
- D. Extraction of Contact from Molex Connector
 1. Slip the flat narrow blade of a Molex contact ejector tool, HT-1884 (P/N 005-02012-0011), under the contact on the mating side of the connector. By turning the connector upside down one can see the blade slide into the stop.
 2. When the ejector is slid into place, the retaining tab of the contact is raised, allowing the contact to be removed by pulling moderately on the lead.
 3. Neither the contact or position is damaged by removing a contact; however, the contact should be checked visually before reinstalling in connector to be certain that retaining tab "A" extends as shown (see **Figure 2-1**).
- E. Coax Connector

Refer to **Figure 2-10** for the details for mounting the right angle coaxial BNC connector to the coax cable. Install the connector into the mounting rack.

2.3.5 KX 155A/KX 165A INSTALLATION

CAUTION

SEE **PARAGRAPH 2.3.1** FOR COOLING REQUIREMENTS.

- A. Looking at the top of the unit, make sure the front lobe of the holddown device is in a vertical position.
- B. Slide the unit into the mounting rack until the front lobe touches the mounting rack.
- C. Insert a 3/32" Allen wrench through the hole in the front panel to engage the locking screw. Turn clockwise until the rear lobe engages the mounting rack. Continue turning until the unit is secure in the mounting rack. Do not overtighten.
- D. For removal, turn the locking screw counterclockwise using a 3/32" Allen wrench until the unit disengages from the mounting rack. Pull the unit out of the mounting rack by pulling on the metal tabs located behind the front panel on each side of the unit.

2.3.6 ELECTRICAL INSTALLATION NOTES
RETROFIT**CAUTION**

Damage may occur in retrofit applications if the old installation used COMM REMOTE TRANSFER or NAV REMOTE TRANSFER. If a COM REMOTE TRANSFER wire was connected to pin P or R, it must be moved to P155A1/165A1-23. If a NAV REMOTE TRANSFER wire was connected to pin 13 or 14, it must be removed. The KX 155A/KX 165A does not support NAV REMOTE TRANSFER. Failure to remove the wire(s) will result in a direct short to ground through the remote transfer switch to the NAV/COM circuit breaker when the switch is pressed. The circuit breaker and switch will be damaged.

EFIS 40/50

The KX 165A may be interfaced to the Bendix/King EFIS 40/50 by using the KX 165A's OBI CLOCK, OBI DATA, and OBI SYNC outputs for VOR bearing (RMI needle) and deviation, the COURSE DEVIATION +RIGHT and +LEFT for localizer deviation, and the GLIDESLOPE DEVIATION +UP and +DOWN for glideslope deviation. In order to use the KX 165A as a navigation source, the EFIS 40/50 must be configured for KNS 81 as VOR/LOC 1 or 2. Additionally, the KX 165A must be configured for Type II OBI data (see **paragraph 3.1.4**).

TRANSMIT INTERLOCK

The KX 155A/165A includes a TRANSMIT INTERLOCK (P155A1-J/165A1-J) input which should be connected to the MIC KEY input of the other COMM transceiver in the aircraft. When this input is grounded, the KX 155A/165A desensitizes its receiver by approximately 13 dB, reducing the likelihood of its squelch breaking while another COMM in the aircraft is transmitting. It is highly recommended to use this feature on all COMMs in the aircraft which include such an interlock feature. If TRANSMIT INTERLOCK is used in installations that employ a KX155A/165A with a KMA26 (or other audio panel that pulls the MIC KEY line above 11 Volts), isolation diodes will need to be installed between P155A1/165A1, pin J and the MIC KEY line. Refer to Installation Bulletin 407 for details.

AUDIO AMPLIFIER

If the KX 155A is installed as a "slide-in" replacement for a KX 155. The KX 155A's audio amplifier functions will work just as the KX 155 did previously without rewiring any of the audio pins. Additionally, there are many new audio system features within the KX 155A which provide maximum flexibility for use in a variety of audio/intercom configurations. The KX 155A provides audio amplification for its VHF communication transceiver for both headphones and the cockpit speaker. In addition, up to three external sources of audio may be amplified and sent to the headphones and speaker. With proper external switching, the KX 155A can provide the microphone bias voltage and amplification necessary for the implementation of a push-to-talk or a hot mic intercom. The KX 155A provides access to signals not commonly found on communication transceivers to allow full-featured installation with audio switching panels and audio isolation/amplifier panels.

Three auxiliary audio inputs, AUX 1 AUDIO IN (P155A2-H), AUX 2 AUDIO IN (P155A2-F), and AUX 3 AUDIO IN (P155A2-4) are typically used to amplify audio from VOR/LOC, Marker Beacon, ADF, DME, Radio Altimeter Decision Height Alerters and other avionics audio sources. Any signal capable of driving a 500Ω or lower impedance load that is adjustable to less than 7 volts is acceptable. Each input has a low side pin, that is connected to ground inside the KX 155A.

Should you have more than three audio sources, it is sometimes possible to successfully connect more than one source to a single pin. The sources will, in addition to driving the KX 155A input load, be driving the other source outputs as loads. Normally, this does not damage the source units but can cause lower signal levels resulting in less audio from these sources sharing that input pin. After installation, verify that turning the power off on each of the sources does not stop the audio from all the sources sharing the input.

COMM AUDIO IN (P155A2-J) and INTERCOM MIC IN (P155A2-8) are inputs to the same amplifier used for the auxiliary audio inputs. The COMM AUDIO IN is reserved for the COMM AUDIO/SIDETONE/INTERCOM OUT and has the same gain as the auxiliary audio inputs. The INTERCOM MIC IN provides a MIC bias voltage output and should only be connected to aircraft microphones. Connection to other devices may result in damage to both the KX 155A and the other device.

Connecting two microphones to the COMM MIC AUDIO or INTERCOM MIC IN at the same time may result in weak or distorted audio. Variations in microphones, even with identical manufacturers' part numbers, can produce this problem when both are connected at the same time. Microphone isolation relays are recommended so that only one microphone is connected at one time.

All five inputs described above are combined and amplified and output on the 500 OHMS AUDIO OUT (P155A2-D) and SUMMED AUDIO (OLD or NEW) OUT (P155A2-9 or P155A2-7). Both pins have identical signals but are at different voltage levels. The 500 OHMS AUDIO OUT will drive headphones directly. The SUMMED AUDIO (OLD or NEW) OUT are provided so that they may be input to the KX 155A's internal 4Ω speaker amplifier. SUMMED AUDIO OLD OUT is utilized in retrofits of KX 155 installations, and SUMMED AUDIO NEW OUT is utilized for new installations. No signals, other than the five inputs, are output from the amplifier, thus allowing the installer complete flexibility.

SUMMED AUDIO IN (P155A2-10) is the input to the speaker amplifier. Only the signal applied to this input will be output on the 4 OHM AUDIO OUT (P155A2-1) output. The output will drive speakers of greater than 4Ω impedance, but since higher impedance speakers may expect higher voltages, they may not be as loud as 4Ω speakers. The speaker amplifier is muted (output is disabled) when the COMM transmitter is active (COMM MIC KEY input is low), and when the KX 155A intercom is keyed (INTERCOM MIC KEY input is low).

If the 4 OHM AUDIO OUT output is to be used, different wiring configurations are required, depending on the KX 155A's supply voltage, and whether or not the aircraft speaker is grounded on its low side.

When a separate audio panel is used, neither the 500Ω nor 4Ω audio amplifiers in the KX 155A are connected. The KX 155A audio amplifiers do not need external loads applied to either their inputs or outputs when they are not used. NOTE: 500Ω audio output (P155A2 pins D & A) of 155-01647-0002 sheet 2 are not TSO'd at time of publication.

AUDIO ALERT

The AUDIO ALERT output may be connected to a Sonalert or equivalent audio alerter, or to a panel-mounted annunciator lamp. At the time of this publication, the only function of AUDIO ALERT is to activate when the KX 155A/KX 165A countdown timer expires.

2.4 POST INSTALLATION CHECK

Refer to [paragraph 3.1.4](#) for instructions on setting installation specific parameters.

Perform a ground check of the installation prior to the flight test. Using a local frequency, confirm that the COMM function can receive and transmit a modulated signal. Using a ramp tester, confirm that VOR, LOC, and GS needle deflections move in the correct direction, the To/From flag is the proper sense, and that the warning flags are functioning properly. An operation performance flight test is recommended after the installation is completed to insure satisfactory performance of the equipment in its normal environment. Check all aircraft control movements to be sure no electrical cables interfere with their operation.

To check the communications transceiver, maintain an altitude of at least 1500 feet and contact a ground station facility at a range of at least fifty nautical miles. Contact a ground station close in. Pull the volume control knob out to defeat the automatic squelch feature and listen for any unusual electrical noise which would reduce the COMM receiver sensitivity by increasing the squelch threshold. If possible, verify the communications capability on both the high and low end of the VHF COMM band.

CAUTION

AS AN ADDED PRECAUTION BEFORE THE FLIGHT, CHECK THE ANTENNA. VSWR SHOULD BE CHECKED WITH AN IN-LINE TYPE WATTMETER INSERTED IN THE COAXIAL TRANSMISSION LINE BETWEEN THE TRANSCIEVER AND THE ANTENNA. ANY PROBLEM WITH THE ANTENNA INSTALLATION WILL MOST LIKELY BE SEEN AS A HIGH REFLECTED POWER. A VSWR OF 3:1 WILL RESULT IN A 25% LOSS IN POWER.

NOTE

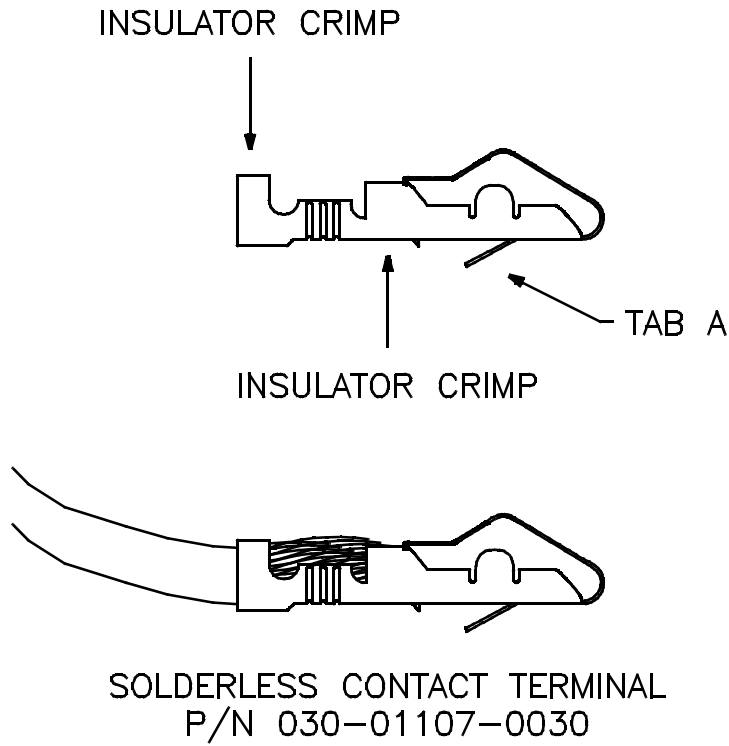
The brightness of the display can be set for the most pleasing intensity during low light level conditions via pilot configuration adjustment, see [paragraph 3.1.3](#).

To check the VOR/ILS system, select a VOR frequency within a forty nautical mile range. Listen to the VOR audio and insure that no electrical interference such as magneto noise is present. Check the tone identifier filter operation. Fly inbound or outbound on a selected VOR radial and check for proper LEFT-RIGHT and TO-FROM indications. Check the VOR accuracy.

NOTE

VOR Ground Station scalloping may be present

To check the localizer and glideslope functions, select an appropriate ILS frequency and fly an approach to the proper runway. Check for proper LEFT-RIGHT and UP-DOWN indications. The glideslope function will not operate for units that do not have the glideslope receiver. Check section 1 for unit part numbers that have glideslope receivers.



HAND EJECTOR
P/N 047-05099-0001
MOLEX P/N HT-1884

FIGURE 2-1 MOLEX TERMINALS AND TOOLS

2.5 MOLEX TERMINAL INSTRUCTIONS

The Molex hand crimpers are available under P/N 071-06041-0000, or from Molex under P/N 6115.

Holding the hand crimpers as shown, release the crimper's ratchet pawl and open by squeezing tightly on the handles, and then releasing pressure.

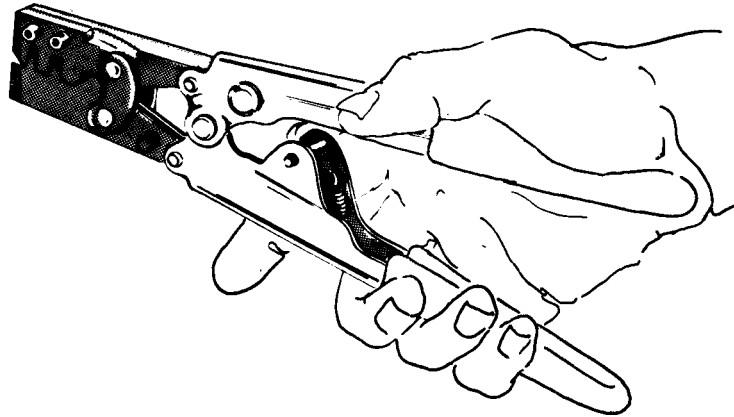


FIGURE 2-2 HAND CRIMPER

Close crimpers until ratchet begins to engage. Then insert the terminal into the jaws from the back side. (See [Figure 2-3](#) and [2-4](#)) For 24 to 30 AWG wire, it will be necessary to start the crimp in jaw A and then complete it in jaw B. The terminal is in the correct position when the insulation tabs are flush with the outside face of the crimp jaws.

JAW	TERMINAL	WIRE SIZE	INSULATION RANGE
A	030-01107-0030	18 TO 24 AWG	.110 TO .055
B	030-01107-0030	24 TO 30AWG	.055 TO .030

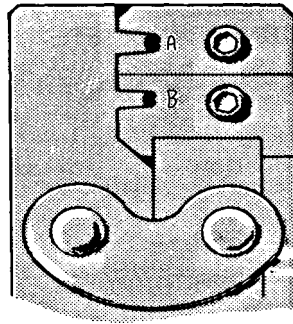


FIGURE 2-3 CRIMP JAWS

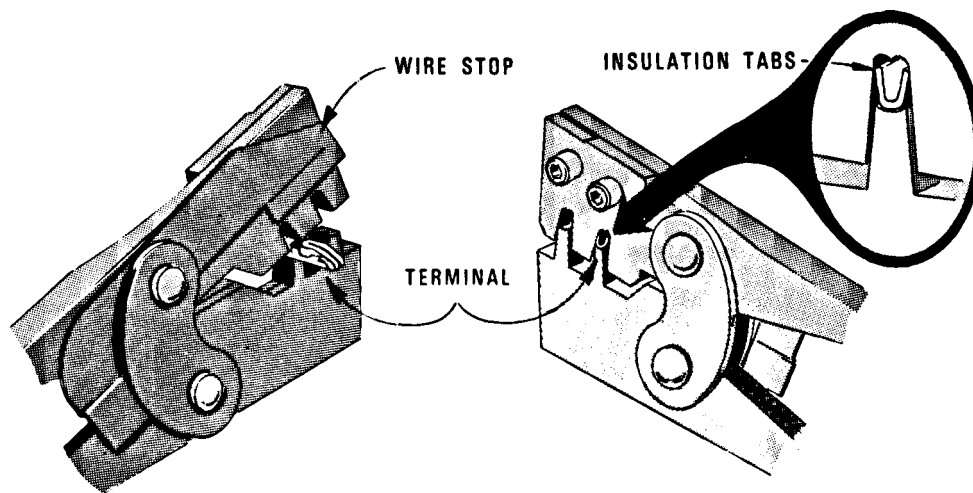


FIGURE 2-4 TERMINAL INSERTION

Once the terminal is in the correct position, close the jaws gently until the terminal is held loosely in place. Push the wire stop down so that it rests snugly behind the contact portion of the terminal. Strip the wire insulation back 1/8 inch and insert the wire through the insulation tabs into the conductor tabs until the insulation hits the conductor jaw face or until the conductor touches the wire stop. Squeeze the handles until the crimp jaws close and the ratchet releases. Straighten the terminal if necessary, then release the plier grips and remove the crimped terminal.

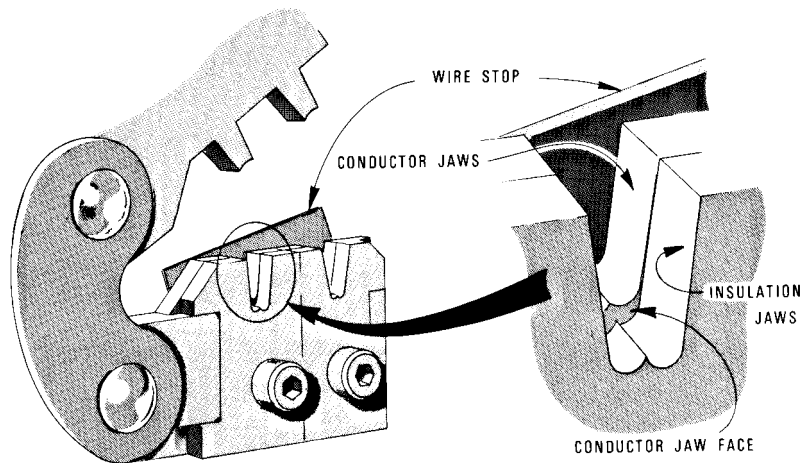


FIGURE 2-5 HAND CRIMPER INSERTION

If too much or too little pressure is needed to release the crimper's ratchet pawl at the end of the crimp stroke, the ratchet can be easily adjusted. A spanner wrench provided with the tool can be used to loosen the lock nut, and rotate the keyed stud clockwise for increased pressure and counter clockwise for decreased pressure. Once the desired pressure has been set, the lock nut must be tightened again. Newer models may have a screwdriver adjustment.

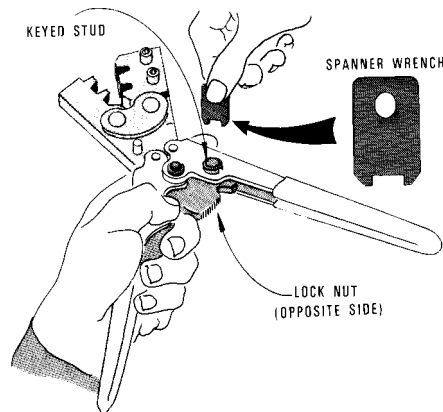


FIGURE 2-6 CRIMPING PRESSURE ADJUSTMENT

1	COM DETECTED AUDIO	A	RNAV MODE
2	COMM MIC AUDIO	B	INTERCOM MIC ⁽¹⁾
3	DME CLOCK	C	OBI DATA *
4	OBI SYNC *	D	DME COMMON
5	DME DATA	E	OBI CLOCK *
6	COMM MIC KEY	F	RNAV/CHAN REQUEST
7	NAV IF AGC	H	VOR/LOC COMPOSITE OUT
8	LOC ENERGIZE	J	COMM IF AGC/ TRANSMIT INTERLOCK
9	COM AUD/SIDETONE/INTERCOM/OUT	K	COM AUDIO/SIDETONE/INTERCOM LO
10	NAV AUD OUT	L	NAV AUD LO
11	SPARE	M	SPARE
12	SWITCHED PWR OUT	N	SWITCHED PWR OUT
13	28 VDC A/C PWR	P	28 VDC A/C PWR
14	RESERVED	R	RESERVED
15	A/C GROUND	S	A/C GROUND
16	SPARE	T	SPARE
17	SPARE	U	SPARE
18	SPARE	V	SPARE
19	RESERVED	W	RESERVED
20	RESERVED	X	RESERVED
21	A/C GROUND	Y	RS 232 OUT
22	AUDIO ALERT	Z	RS 232 IN
23	COM REMOTE TRANSFER	<u>A</u>	CHANNEL REMOTE INCREMENT
24	LIGHTING 14 VDC	<u>B</u>	RESERVED
25	LIGHTING 28 VDC/LO	<u>C</u>	TEST

Figure 2-7 P155A1 & P165A1 CONNECTOR

* Reserved pins in P155A1

NOTE 1: For new (non-KX155 retrofit) installations where the KX155A is intended to provide the intercom function, this connection is superseded by “Intercom Mic In” and “Intercom Mic Key” on connector P155A2. See [Figure 2-15](#).

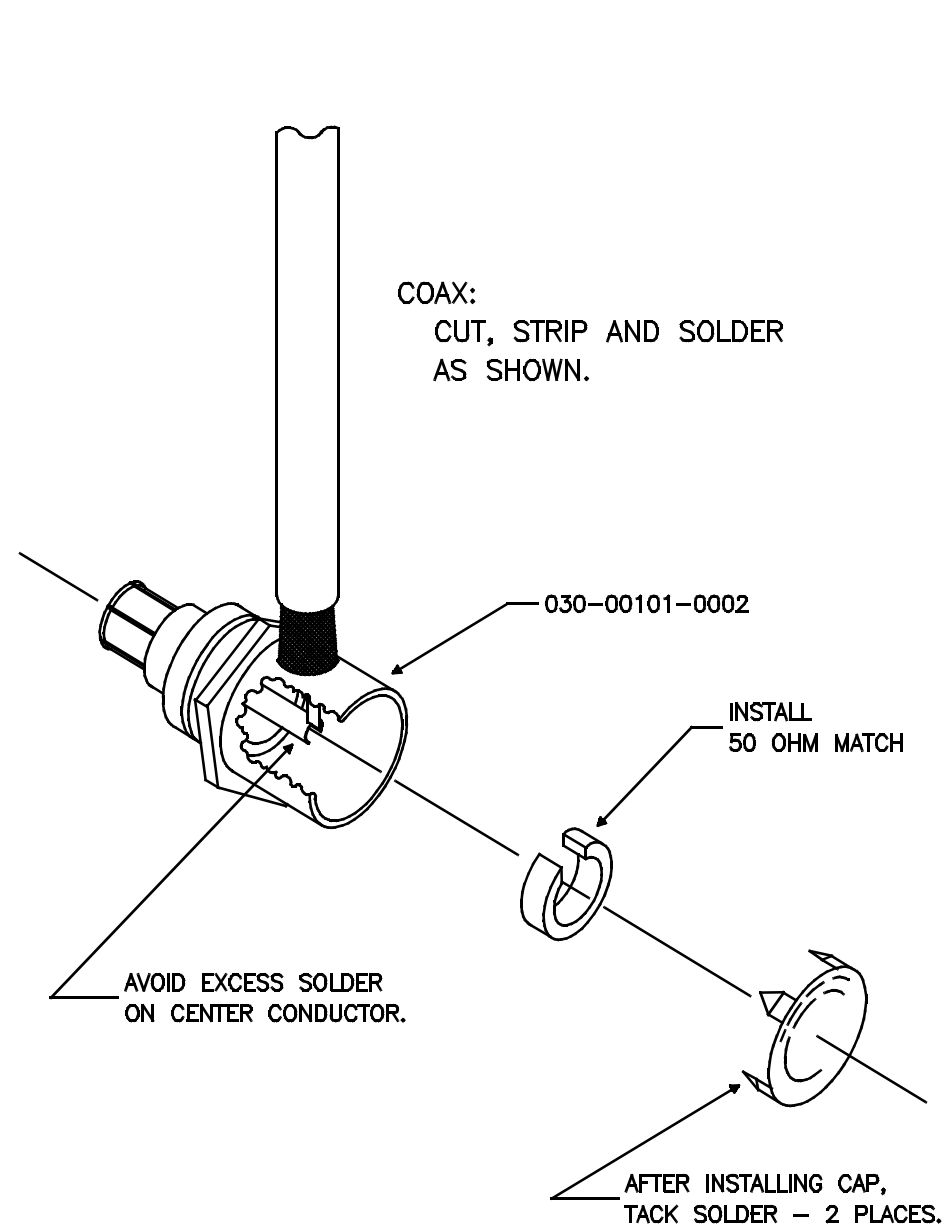
P155A2	
A-----	AUDIO LO
B-----	4 OHM AUDIO OUT 14V LO
C-----	COMM MIC KEY
D-----	500 OHM AUDIO OUT
E-----	RESERVED
F-----	AUX 2 AUDIO IN
H-----	AUX 1 AUDIO IN
J-----	COM AUDIO IN
K-----	INTERCOM MIC KEY
L-----	A/C GROUND
M-----	4 OHM AUDIO BRIDGED
N-----	SPARE
P-----	GS GROUND
R-----	GS -FLAG
S-----	GS +UP
T-----	GS +DN
U-----	GS +FLAG
V-----	GS IF AGC
1-----	4 OHM AUDIO OUT
2-----	COMM AUD OLD IN
3-----	RESERVED
4-----	AUX 3 AUDIO IN
5-----	AUDIO LO
6-----	AUDIO LO
7-----	SUMMED AUDIO NEW OUT
8-----	INTERCOM MIC IN
9-----	SUMMED AUDIO OLD OUT
10-----	SUMMED AUDIO IN
11-----	4 OHM AUDIO OUT 28V LO
12-----	SPARE
13-----	GS GROUND
14-----	GS -FLAG
15-----	GS +UP
16-----	GS +DN
17-----	GS +FLAG
18-----	GS IF AGC

Figure 2-8 P155A2

P165A2

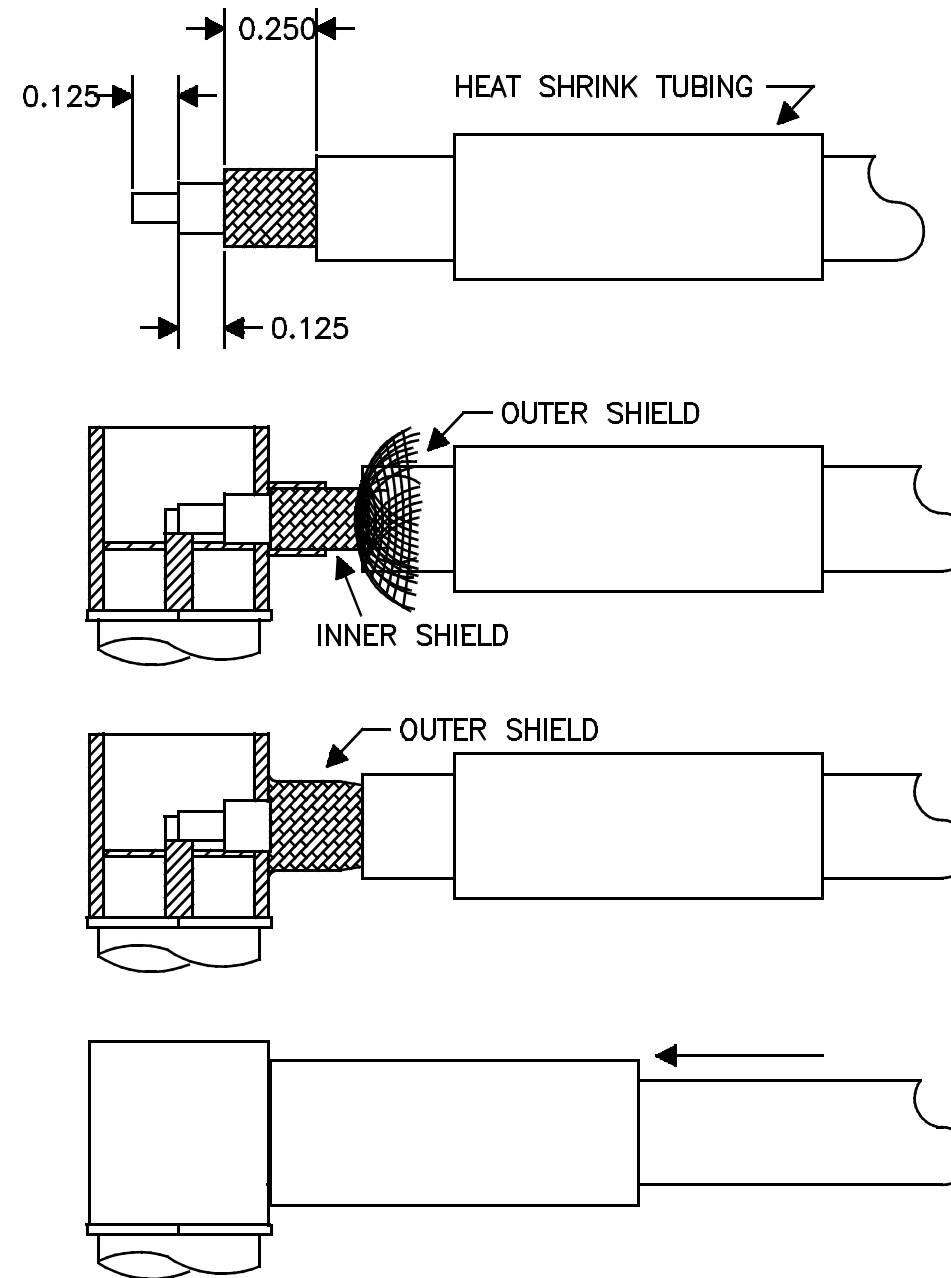
A-----	NAV -FLAG
B-----	NAV +FLAG
C-----	OBS RESOLVER D
D-----	SPARE
E-----	RESERVED
F-----	NAV +TO
H-----	NAV +TO
J-----	COURSE DEVIATION +LEFT
K-----	COURSE DEVIATION +LEFT
L-----	OBS RESOLVER G
M-----	A/C GROUND
N-----	SPARE
P-----	A/C GROUND
R-----	GS -FLAG
S-----	GS +UP
T-----	GS +DN
U-----	GS +FLAG
V-----	GS IF AGC
1-----	NAV -FLAG
2-----	OBS RESOLVER C
3-----	OBS RESOLVER F
4-----	SPARE
5-----	COURSE DEVIATION +RIGHT
6-----	COURSE DEVIATION +RIGHT
7-----	NAV +FLAG
8-----	NAV +FROM
9-----	NAV +FROM
10-----	OBS RESOLVER E
11-----	OBS RESOLVER H
12-----	SPARE
13-----	GS GROUND
14-----	GS -FLAG
15-----	GS +UP
16-----	GS +DN
17-----	GS +FLAG
18-----	GS IF AGC

Figure 2-9 P165A2



NOTES:

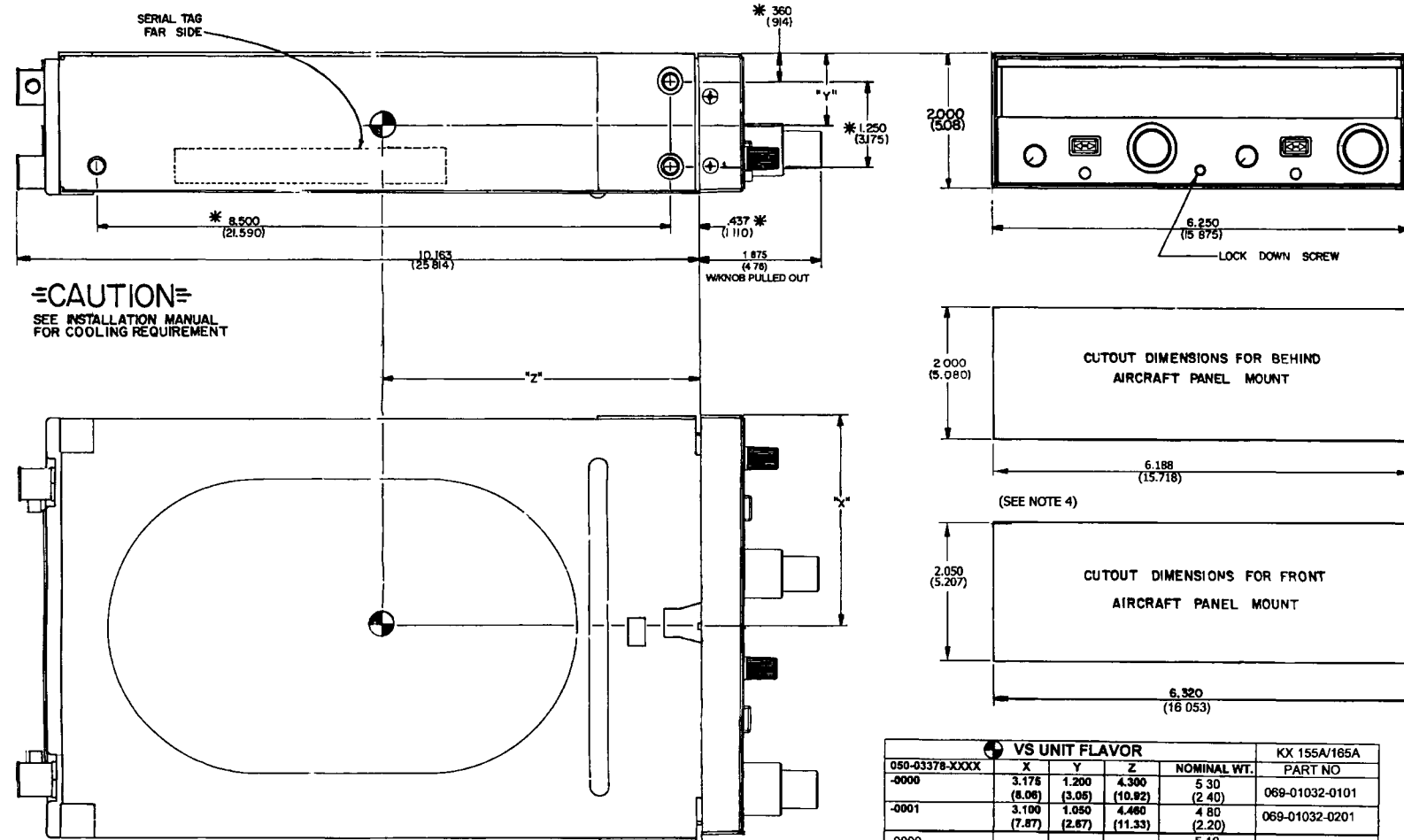
1. WHEN SOLDERING, AVOID APPLYING EXCESS HEAT TO CONNECTOR BODY, HEAT SINK SPRING CONTACTS, AND CENTER CONDUCTOR INSULATOR.



1. STRIP RGU-400 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 2-10 ANTENNA CABLE ASSEMBLY
(P/N 030-00101-0002, R-9)

* MOUNTING USE DIMENSION \triangle 6.



CAUTION
SEE INSTALLATION MANUAL
FOR COOLING REQUIREMENT

CUTOUT DIMENSIONS FOR BEHIND
AIRCRAFT PANEL MOUNT

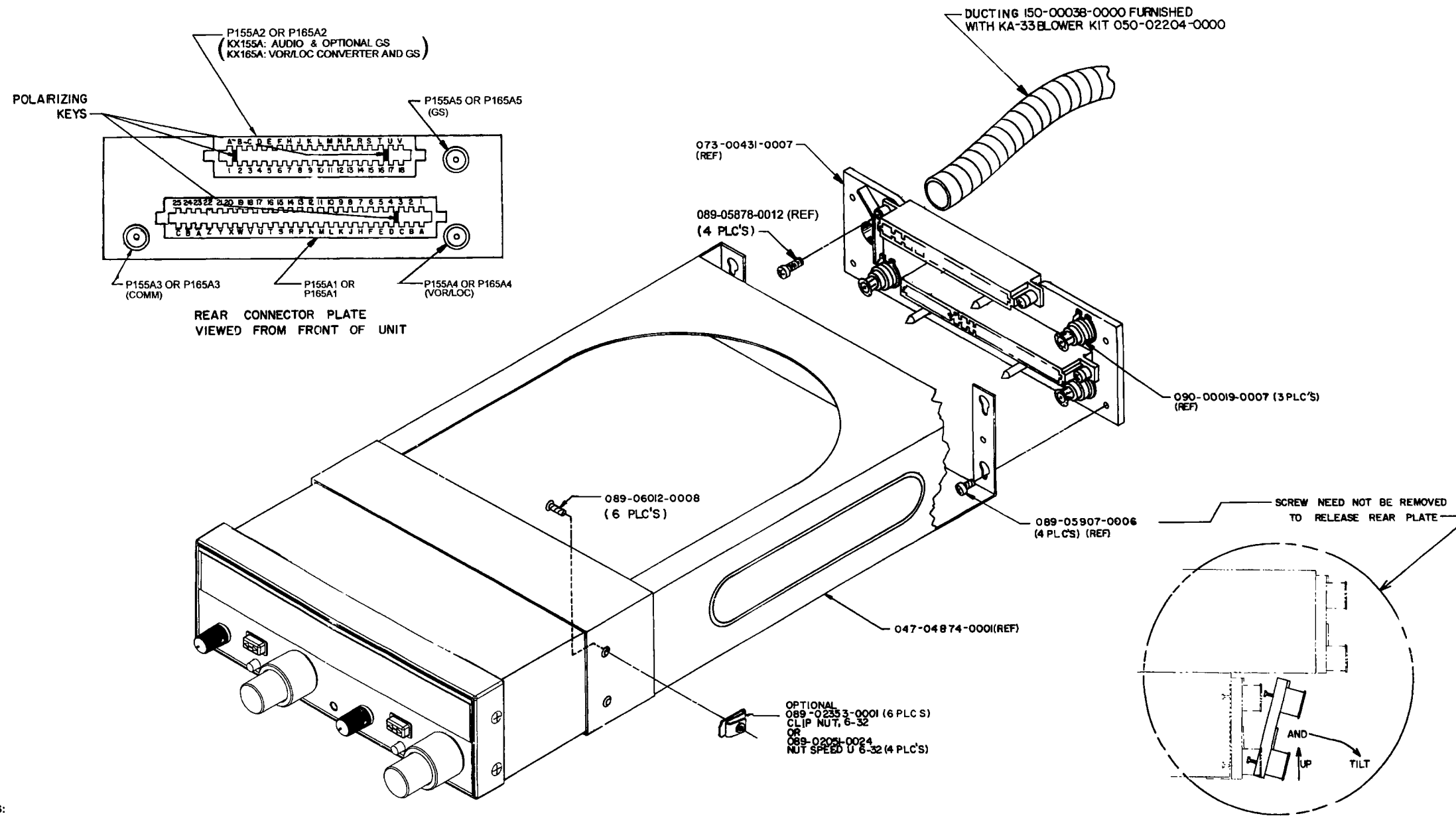
CUTOUT DIMENSIONS FOR FRONT
AIRCRAFT PANEL MOUNT

050-03378-XXXX	VS UNIT FLAVOR			NOMINAL WT.	KX 155A/165A PART NO
	X	Y	Z		
-0000	3.176 (6.06)	1.200 (3.05)	4.300 (10.82)	5.30 (2.40)	069-01032-0101
-0001	3.100 (7.87)	1.050 (2.67)	4.460 (11.33)	4.80 (2.20)	069-01032-0201
-0000	3.060	1.060	4.420	5.10 (2.31)	069-01033-0101/0201

- NOTES:
1. DIMENSIONS IN () ARE IN CENTIMETERS, KILOGRAMS.
 2. TOLERANCES FOR PANEL CUTOUTS: +.000 (+.025) - .000 (-.000)
 3. WHEN INSTALLING TWO OR MORE PANEL MOUNTED UNITS IN A STACK, THE MOUNTING TRAYS SHALL BE .030 INCHES (0.27cm) APART. NEWER STYLE MOUNTING TRAYS HAVE HAD .025 INCH (0.63cm) DIMPLES BUILT IN TOP AND BOTTOM, BOTH SIDES, SO THAT TWO NEW STYLE TRAYS WILL AUTOMATICALLY BE SPACED PROPERLY.
 4. TO DETERMINE STACK HEIGHT, USE THE HEIGHT DIMENSION FOR A FRONT AIRCRAFT PANEL MOUNT.
 5. WEIGHT AND MEASUREMENT WAS TAKEN WITH THE RACK, CONNECTOR BACK PLATE AND THE CORRESPONDING COAX CONNECTORS ONLY.
- \triangle 6. DIMENSION (EXCEPT PANEL CUTOUT OR MOUNTING USE DIMENSIONS) ARE REFERENCE ONLY. REFERENCE DIMENSIONS MAY BE SLIGHTLY OVERSIZE, TO ASSURE FIT OF UNIT.

155-01661-0000RAD

FIGURE 2-11 KX 155A/KX 165A OUTLINE AND MOUNTING DRAWING
(Dwg. No 155-01661-0000, Rev AD)



NOTES:

1. LIQUID STAKE ALL FASTNERS PER SPECIFICATION
001-01080-0000.
2. WRAP WIRE BUNDLÉ WITH ELECTRICAL FRICTION TAPE
TO AVOID WIRE CHAFING.
3. CONNECTOR NAMES ARE DEFINED BASED UPON
WHETHER THE INSTALLATION IS FOR KX155A
OR KX165A.

300092470000RABS01

FIGURE 2-12 KX 155A/165A INSTALLATION ASSEMBLY DRAWING
(Dwg No 300-09247-0000, Rev AB)
(Sheet 1 of 2)

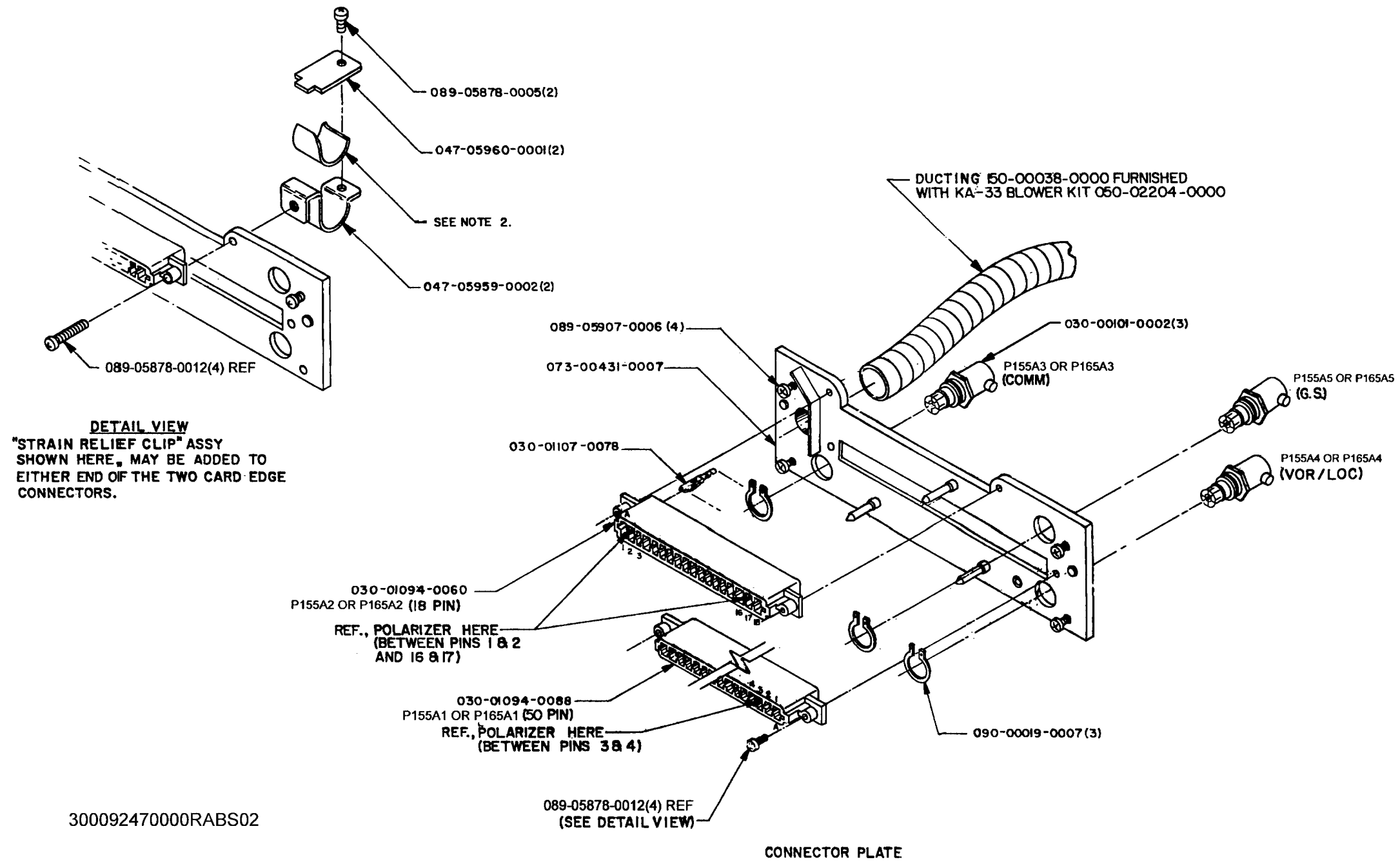
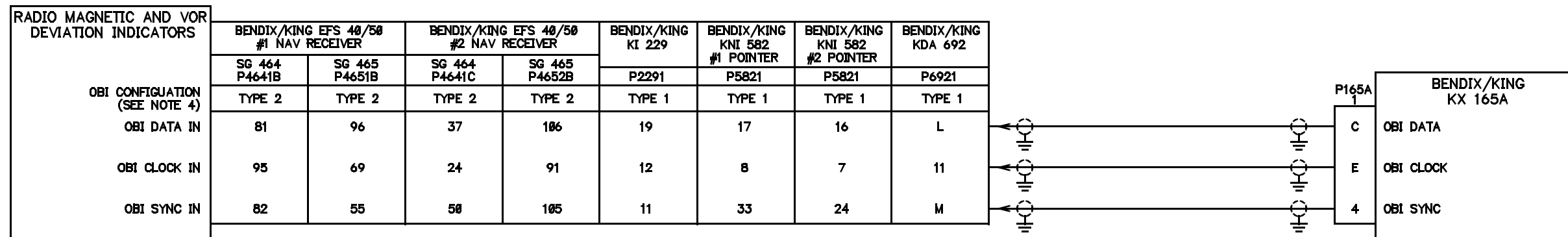
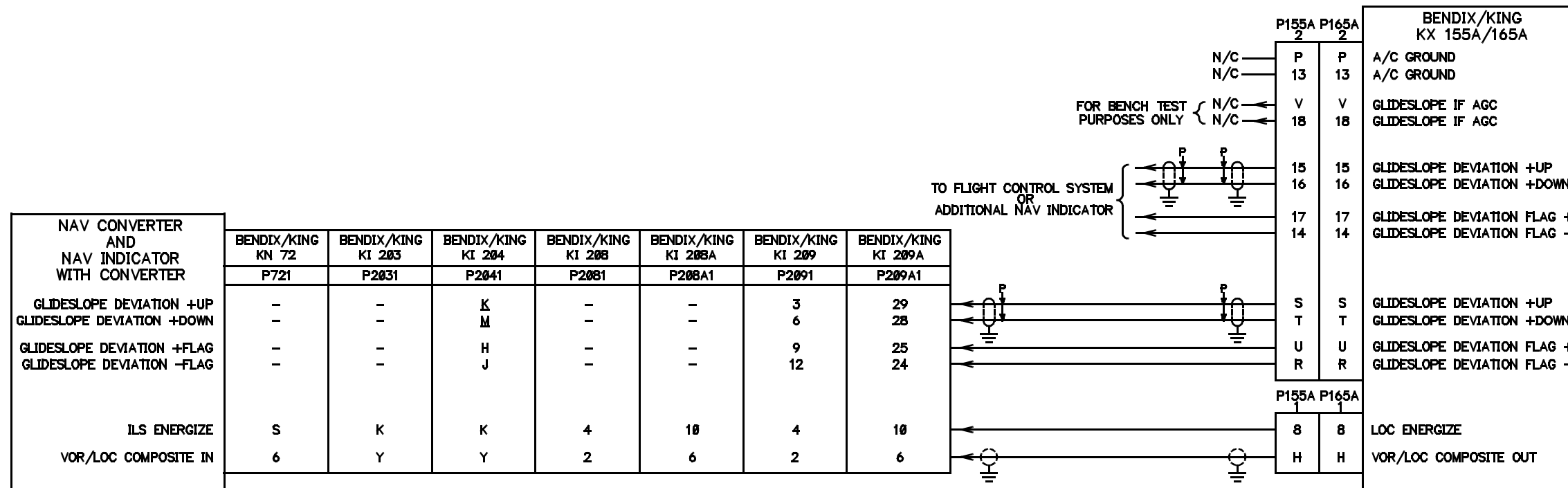


FIGURE 2-12 KX 155A/165A INSTALLATION ASSEMBLY DRAWING
 (Dwg No 300-09247-0000, Rev AB)
 (Sheet 2 of 2)

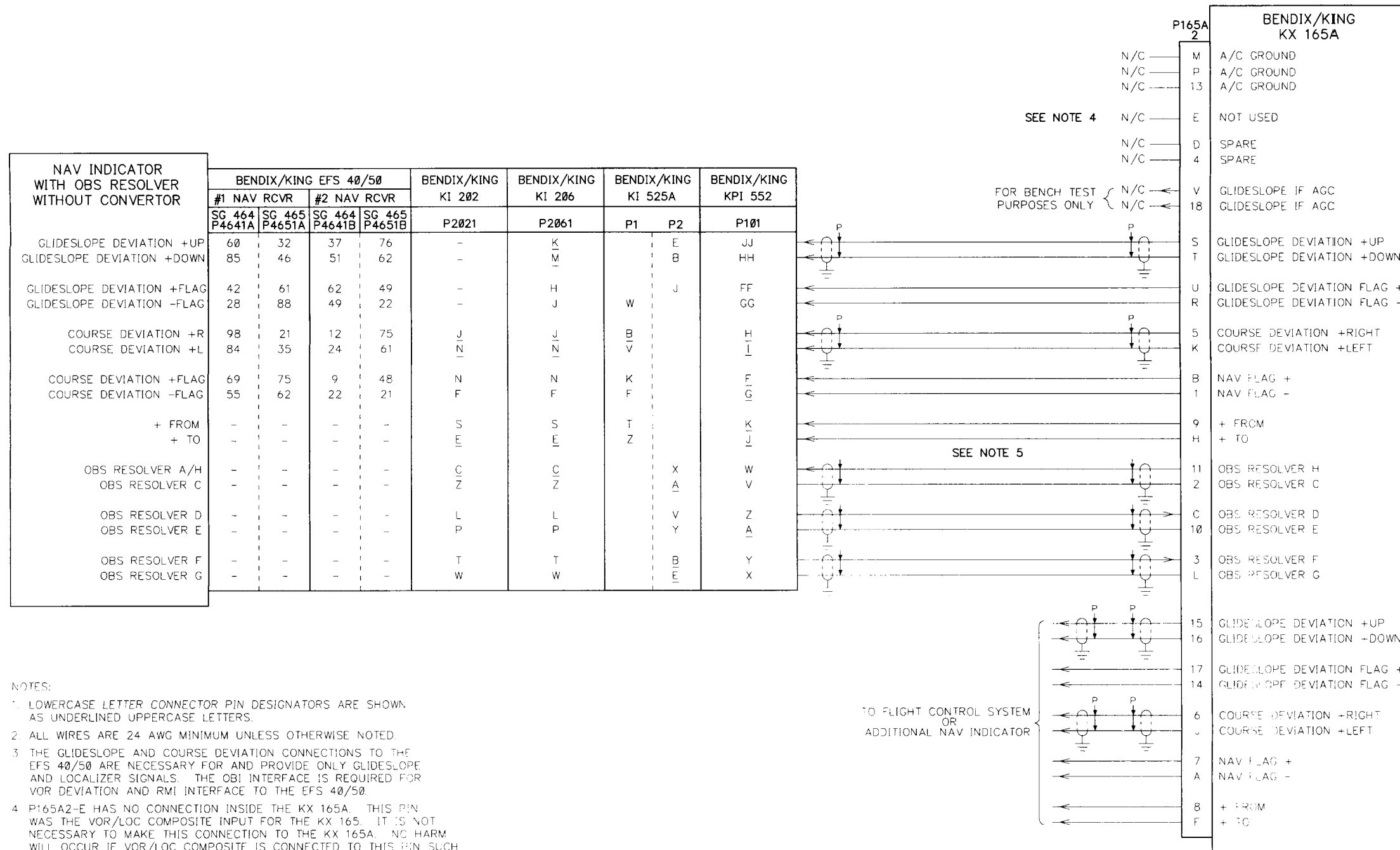


NOTES:

1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
3. THE OBI CONNECTIONS TO THE EFS 40/50 ARE NECESSARY FOR AND PROVIDE ONLY VOR DEVIATION AND RMI DISPLAY. THE GLIDESLOPE AND COURSE DEVIATION CONNECTIONS ARE REQUIRED FOR GLIDESLOPE AND LOCALIZER DISPLAY ON THE EFS 40/50.
4. THE KX 165A MAY REQUIRE CONFIGURATION AT INSTALLATION TO PROVIDE THE CORRECT TYPE OF OBI DATA. REFER TO SECTION 2.4, "POST INSTALLATION CHECKS."
5. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

155016470000-01-AB.DWG

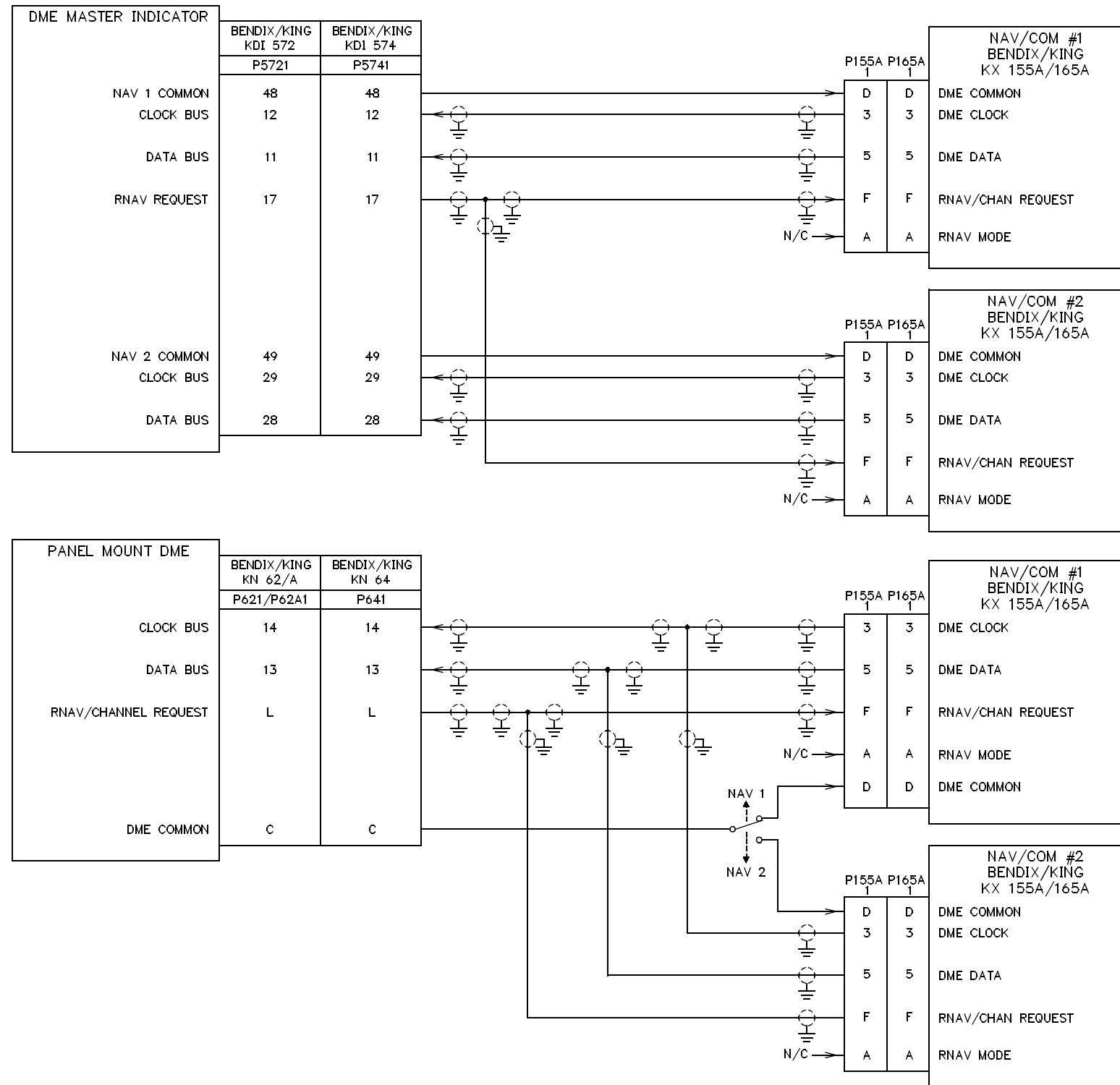
FIGURE 2-13 KX 155A/165A NAV INDICATOR INTERFACE (Sheet 1 of 2) (Dwg No 155-01647-0000, Rev AB)



NOTES:

1. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
2. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
3. THE GLIDESLOPE AND COURSE DEVIATION CONNECTIONS TO THE EFS 40/50 ARE NECESSARY FOR AND PROVIDE ONLY GLIDESLOPE AND LOCALIZER SIGNALS. THE OBS INTERFACE IS REQUIRED FOR VOR DEVIATION AND RMI INTERFACE TO THE EFS 40/50.
4. P165A2-E HAS NO CONNECTION INSIDE THE KX 165A. THIS PIN WAS THE VOR/LOC COMPOSITE INPUT FOR THE KX 165. IT IS NOT NECESSARY TO MAKE THIS CONNECTION TO THE KX 165A. NO HARM WILL OCCUR IF VOR/LOC COMPOSITE IS CONNECTED TO THIS PIN SUCH AS IN A RETROFIT INSTALLATION.
5. IT IS NOT NECESSARY TO CONNECT RESISTIVE LOADS TO THE OBS RESOLVER PINS WHEN A RESOLVER IS NOT CONNECTED. NO HARM WILL OCCUR IF THE RESISTORS ARE CONNECTED SUCH AS IN A RETROFIT INSTALLATION.
6. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-13 KX 155A/165A NAV INDICATOR INTERFACE (Sheet 2 of 2) (Dwg No 155-01647-0000, Rev AB)

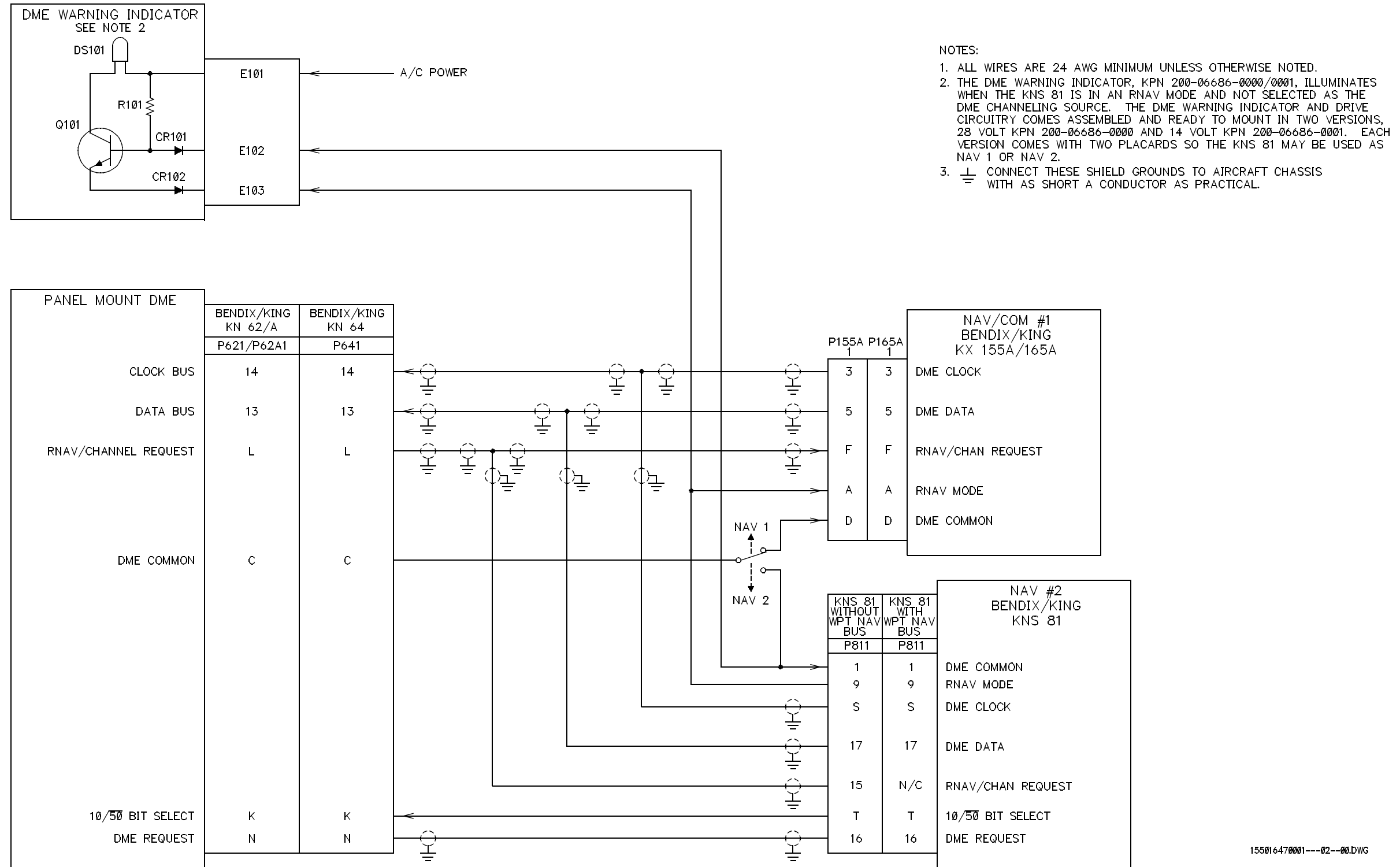


NOTES:

1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
2. CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-14 KX 155A/165A DME/RNAV INTERFACE
 (Dwg No 155-01647-0001, Rev 0)
 (Sheet 1 of 2)

155016470001-01-00.DWG



155016470001---02---00.DWG

FIGURE 2-14 KX 155A/165A DME/RNAV INTERFACE
(Dwg No 155-01647-0001, Rev 0)
(Sheet 2 of 2)

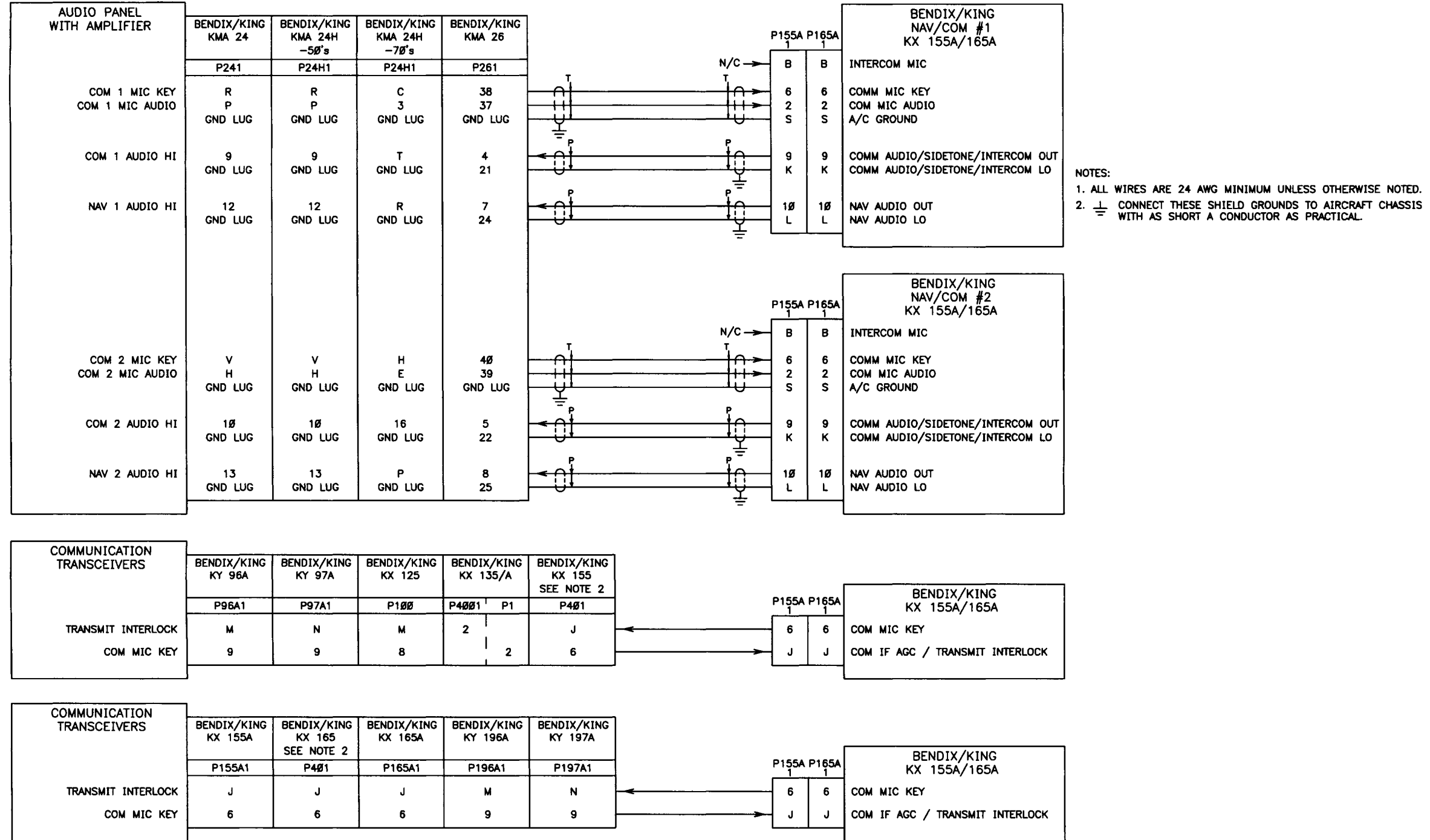
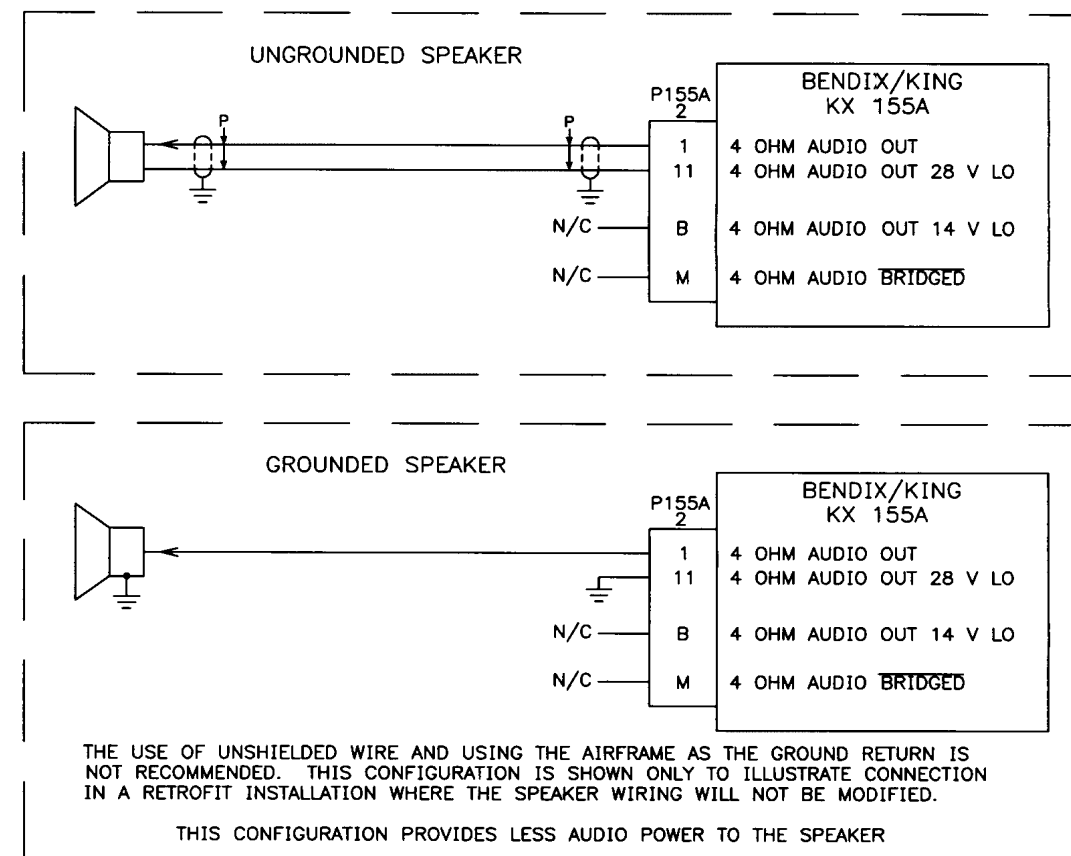
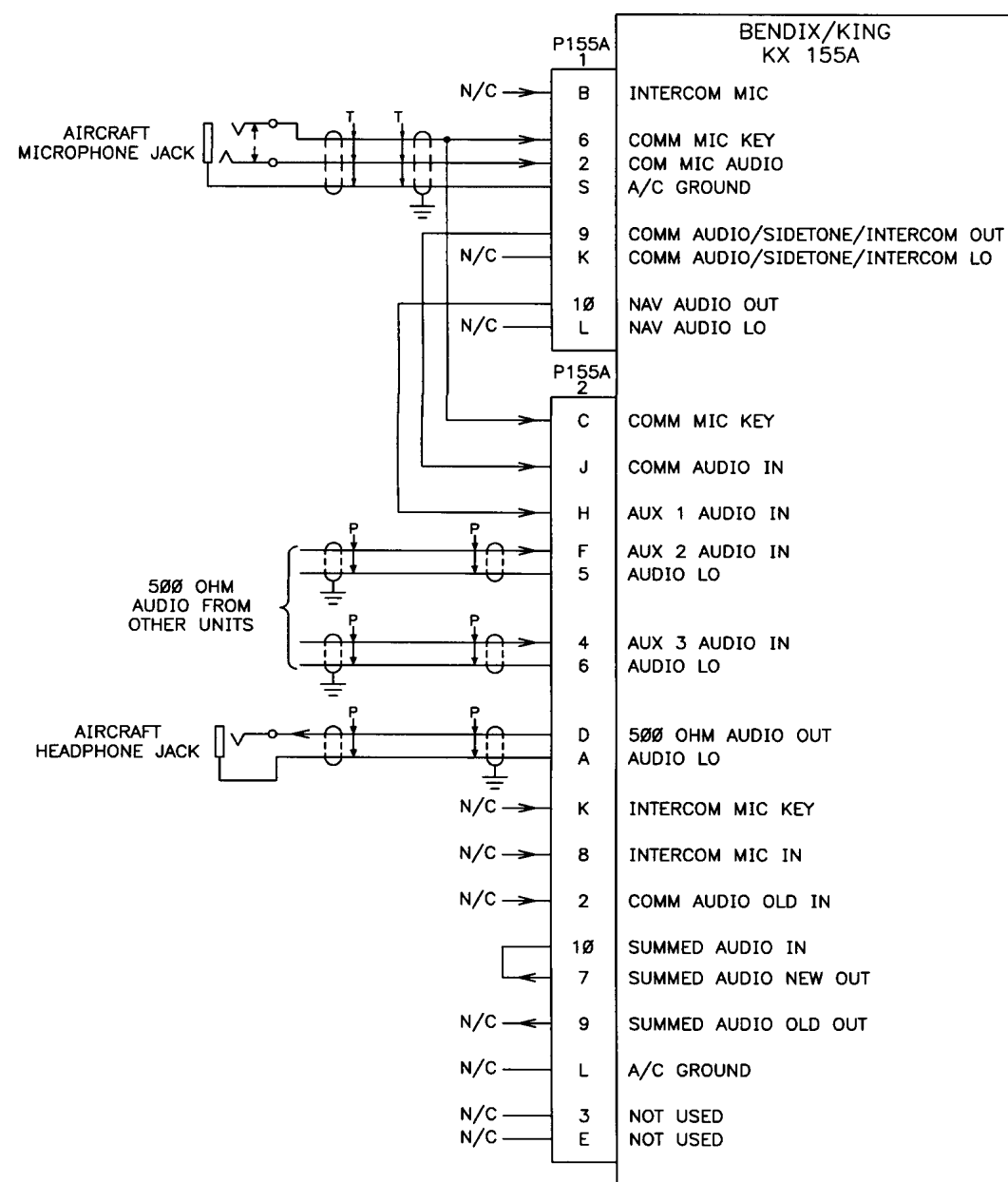


FIGURE 2-15 KX 155A/165A AUDIO INTERFACE
(Dwg No 155-01647-0002, Rev AB)
(Sheet 1 of 4)



KX 155A – NO INTERCOM AND NO AUDIO PANEL

- NOTES:
1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
 2. \perp CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-15 KX155A/165A AUDIO INTERFACE
 (Dwg No 155-01647-0002, Rev AB)
 (Sheet 2 of 4)

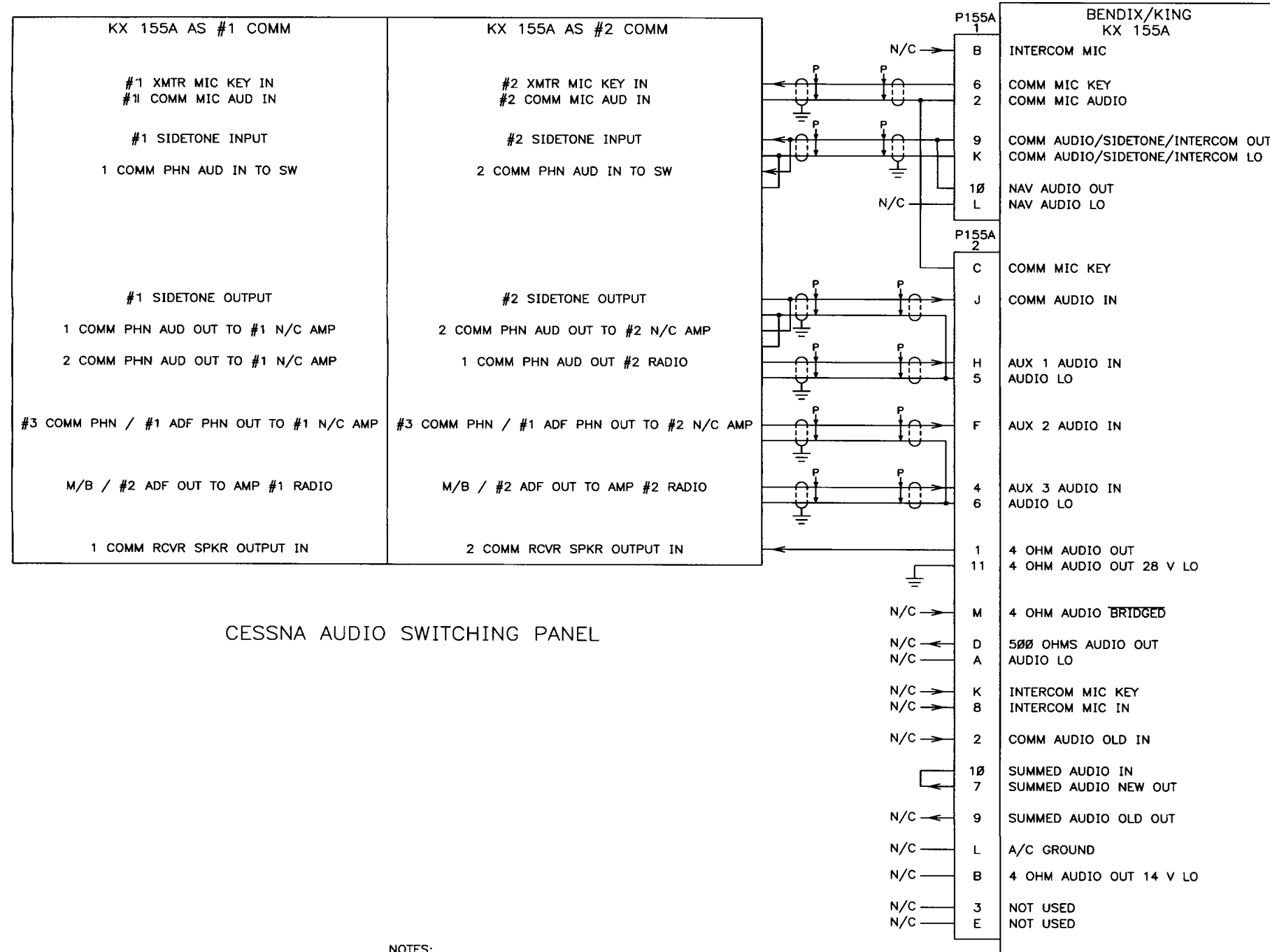
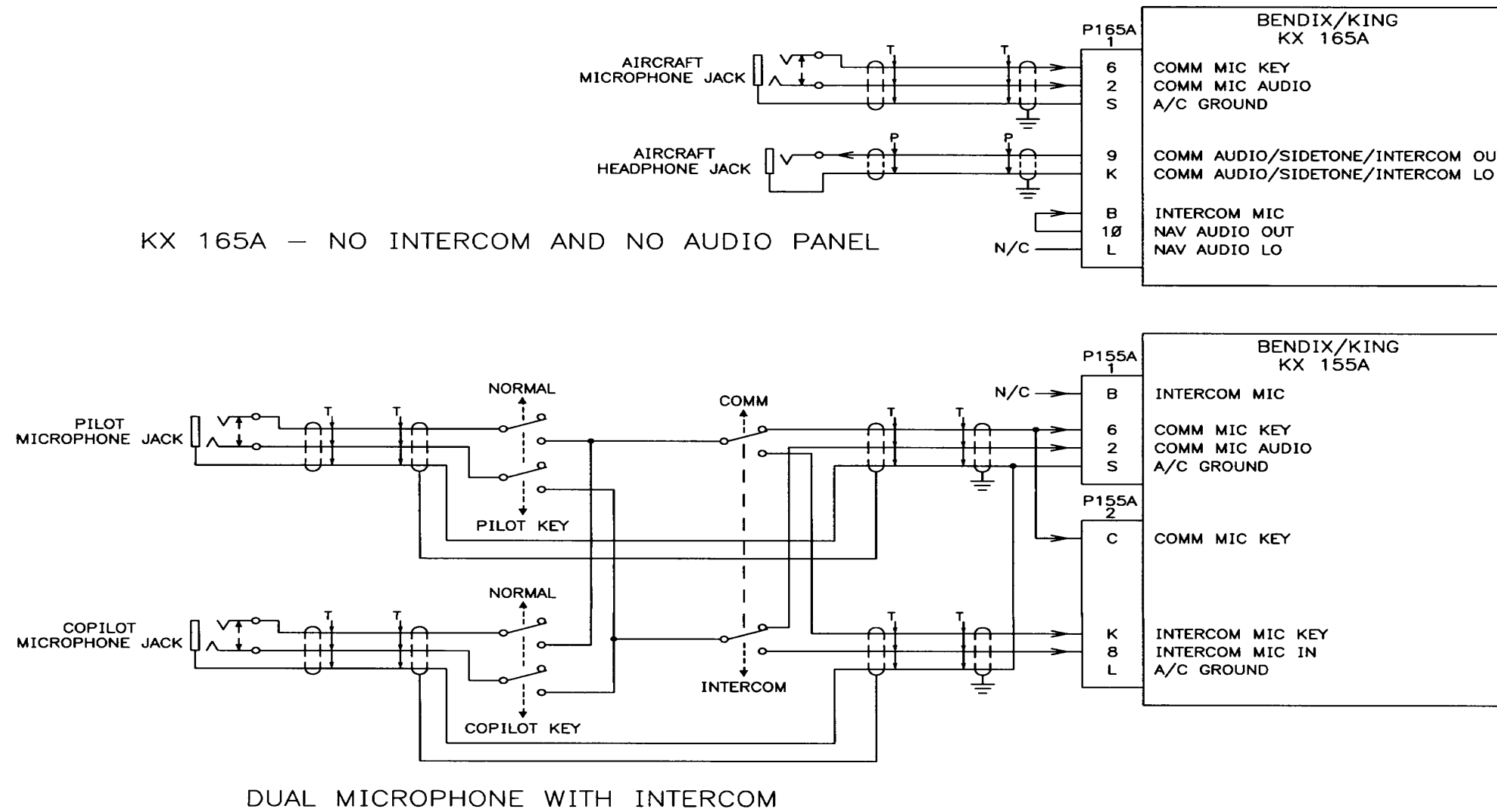


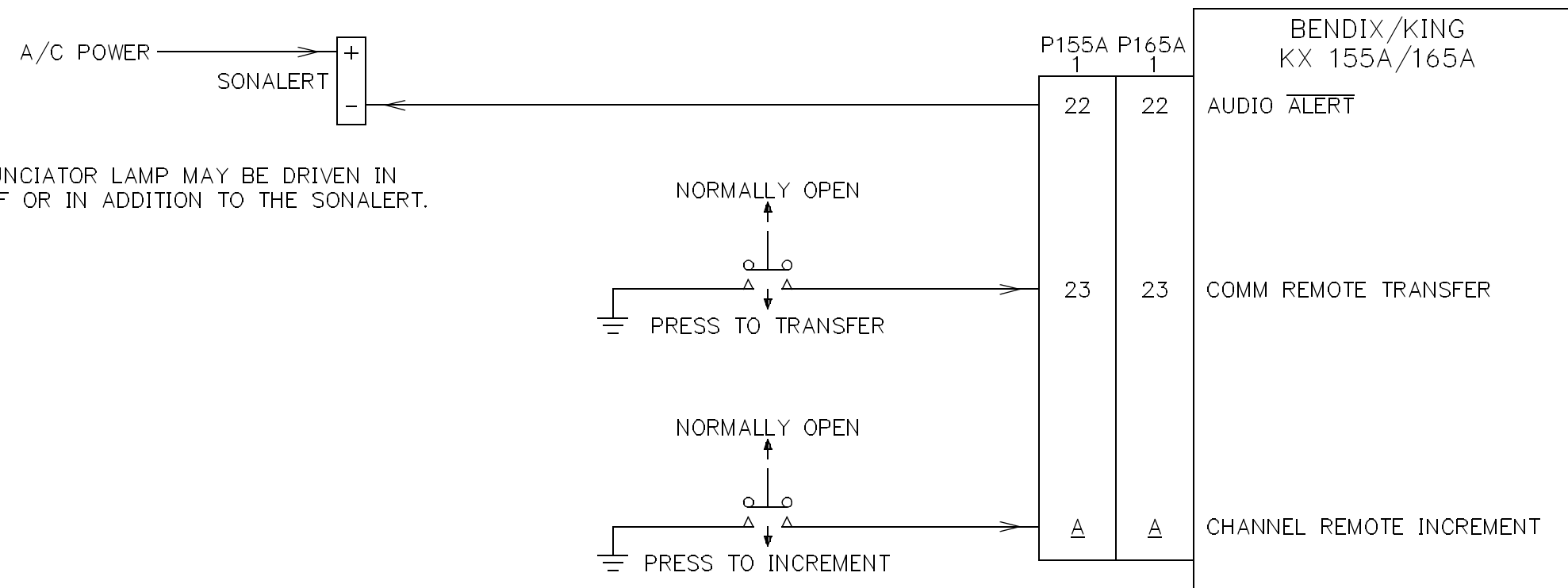
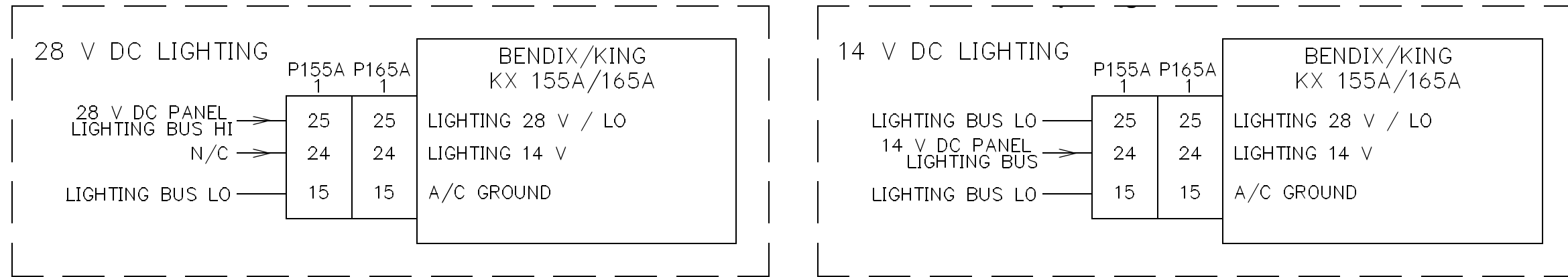
FIGURE 2-15 KX 155A/165A AUDIO INTERFACE
 (Dwg No 155-01647-0002, Rev AB)
 (Sheet 3 of 4)



NOTES:

1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
2. CONNECTING TWO MICROPHONES TO THE COMM MIC IN OR INTERCOM MIC IN AT THE SAME TIME MAY RESULT IN WEAK OR DISTORTED AUDIO. VARIATIONS IN MICROPHONES, EVEN WITH IDENTICAL MANUFACTURERS PART NUMBERS, CAN PRODUCE THIS PROBLEM WHEN BOTH ARE CONNECTED AT THE SAME TIME. MIC ISOLATION RELAYS ARE RECOMMENDED SO THAT ONLY ONE MIC IS HOT AT ONE TIME.
3. \perp = CONNECT THESE SHIELD GROUNDS TO AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

FIGURE 2-15 KX 155A/165A AUDIO INTERFACE
 (Dwg No 155-01647-0002, Rev AB)
 (Sheet 4 of 4)



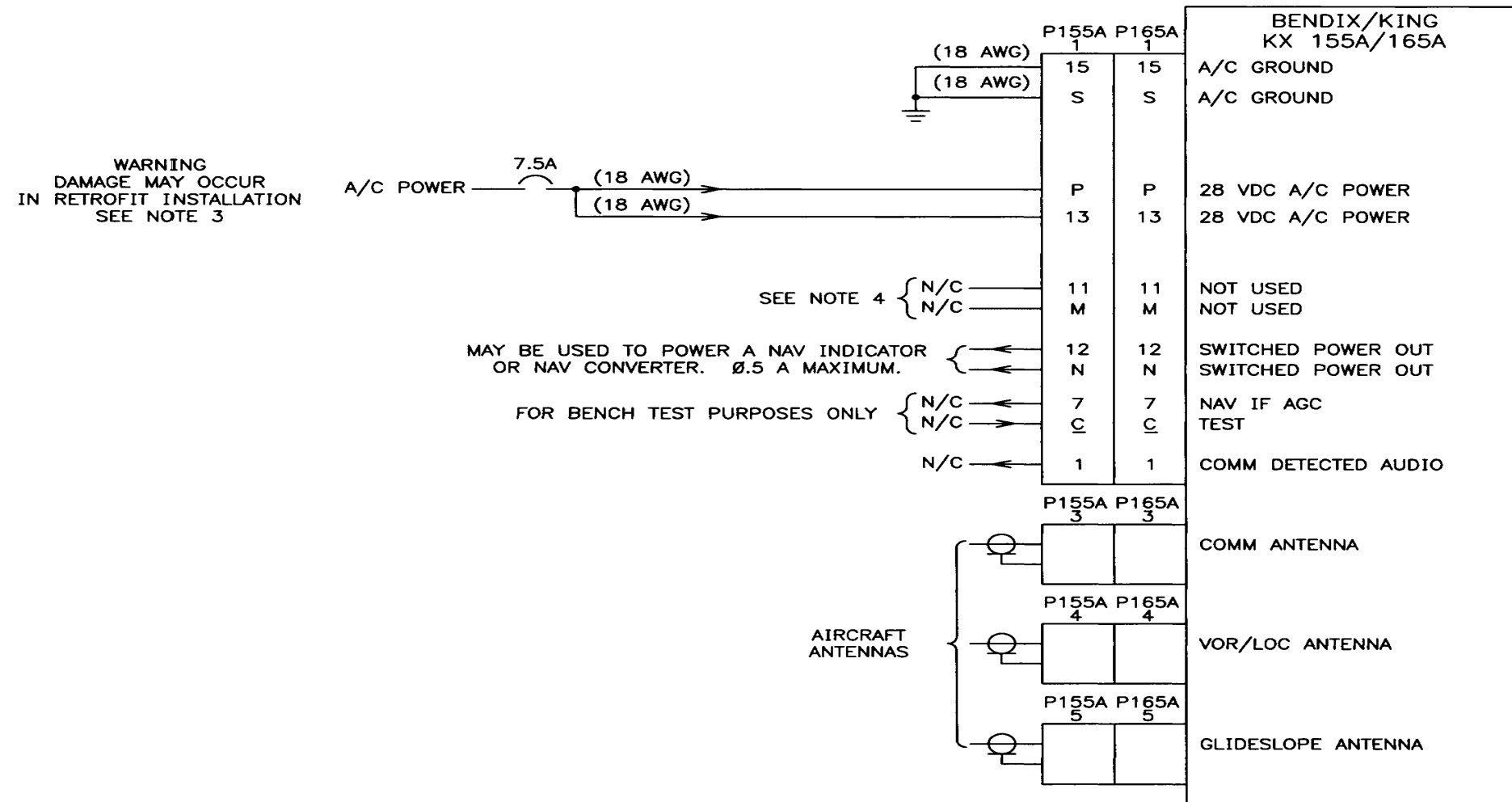
NOTE: AN ANNUNCIATOR LAMP MAY BE DRIVEN IN PLACE OF OR IN ADDITION TO THE SONALERT.

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 AIRCRAFT CHASSIS WITH AS SHORT A CONDUCTOR AS PRACTICAL.

155016470000---01--00.DWG

FIGURE 2-16 LIGHTING, ALERTING AND REMOTE INTERFACE
(Dwg No 155-01647-0003, Rev 0)



NOTES:

1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
2. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.
3. DAMAGE MAY OCCUR IN RETROFIT APPLICATIONS IF THE OLD INSTALLATION USED COMM OR NAV REMOTE TRANSFER. IF A COMM REMOTE TRANSFER WIRE WAS CONNECTED TO PIN P OR R, IT MUST BE MOVED TO P155A/165A1-23. IF A NAV REMOTE TRANSFER WIRE WAS CONNECTED TO PIN 13 OR 14, IT MUST BE REMOVED. THE KX 155A/165A DOES NOT SUPPORT NAV REMOTE TRANSFER.
FAILURE TO REMOVE THE WIRE(S) WILL RESULT IN A DIRECT SHORT TO GROUND THROUGH THE REMOTE TRANSFER SWITCH TO THE NAV/COM CIRCUIT BREAKER WHEN THE SWITCH IS PRESSED. THE CIRCUIT BREAKER AND SWITCH WILL PROBABLY BE DAMAGED.
4. P155A/165A-11 AND M HAVE NO CONNECTION INSIDE THE KX 155A/165A. THESE PINS WERE THE INPUT FOR THE SWITCHED POWER OUT ON THE KX 155/165. THE INPUT FOR THE SWITCHED POWER OUT ON THE KX 155A/165A IS 11-33 VDC A/C POWER. NO HARM WILL OCCUR IF POWER IS CONNECTED TO THESE PINS SUCH AS IN A RETROFIT INSTALLATION.

FIGURE 2-17 MISCELLANEOUS INTERFACE
(Dwg No 155-01647-0005, Rev AA)

SECTION III

OPERATION

3.1 GENERAL

All controls required to operate the KX 155A/165A are located on the unit front panel. (See [Figure 3-1](#))

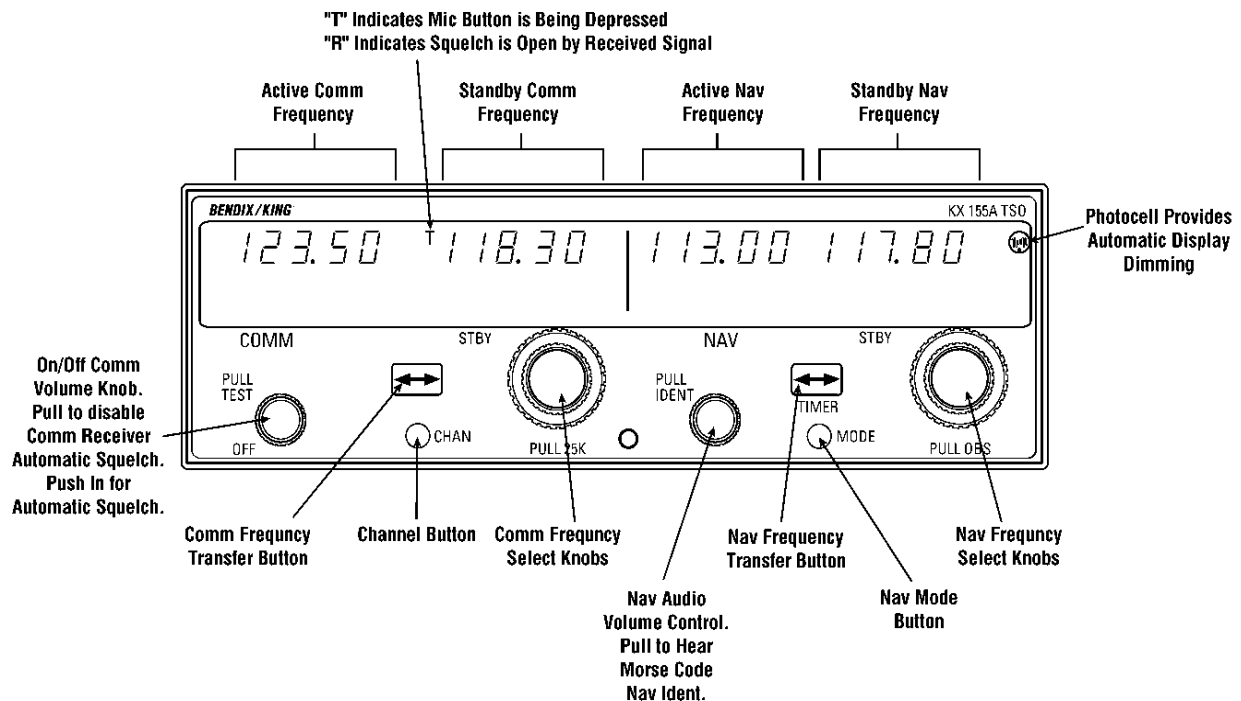


FIGURE 3-1 KX 155A/165A CONTROL FUNCTION

3.1.1 COMM TRANSCEIVER

Rotate the VOL knob clockwise from the OFF position. Pull the VOL knob out and adjust for desired listening level. Push the VOL knob back in to actuate the automatic squelch.

The left portion of the digital display readout is allocated for COMM ACTIVE, and COMM STANDBY frequencies with a "T" between them to indicate TRANSMIT and an "R" to indicate RECEIVE modes of operation.

Select the desired operating frequency in the standby display by rotating the Frequency Select Knobs either clockwise or counter-clockwise. A clockwise rotation will increment the previous frequency while a counterclockwise rotation will decrement the previous frequency.

Frequency Selection for 25 kHz radio versions:

This paragraph applies to KX 155A part numbers 069-01032-0101/0201 and KX 165A part number 069-01033-0101. The outer knob will change the MHz portion of the standby display. At one band-edge (118 or 136 MHz) the following 1 MHz change will wrap around to the other band-edge.

The inner knob will change the kHz portion of the standby display. It will change in steps of 50 kHz when the knob is pushed in, and 25 kHz when the knob is pulled out. The frequency wrap around at the edge of the band is also utilized when incrementing or decrementing the kHz portion of the standby display.

Frequency Selection for 8.33 kHz radio versions:

This paragraph applies to KX 165A part number 069-01033-0201. The outer knob will change the MHz portion of the standby display. At one band-edge (118 or 136 MHz) the following 1 MHz change will wrap around to the other band-edge. The inner knob will change the kHz portion of the standby display. With the inner knob pushed in, the frequency will increment or decrement in 25 kHz steps as the inner knob is rotated clockwise or counterclockwise. The COMM receiver is operating with conventional (25 kHz) selectivity when the inner knob is pushed in. When the inner knob is pulled out the receiver becomes compatible with the new 8.33 kHz airspace. In this case the displayed frequency doesn't always correspond directly to the actual operating frequency. In this case clockwise (counterclockwise) rotation of the inner knob increments (decrements) the digits to the right of the decimal point in the following fashion.

<u>Displayed Frequency</u>	<u>Operating Frequency</u>	<u>Receiver Selectivity</u>
xxx.000	xxx.0000 MHz	25 kHz
xxx.005	xxx.0000 MHz	8.33 kHz
xxx.010	xxx.0083 MHz	8.33 kHz
xxx.015	xxx.0167 MHz	8.33 kHz
xxx.020	xxx.0250 MHz	25 kHz
xxx.030	xxx.0250 MHz	8.33 kHz
xxx.035	xxx.0333 MHz	8.33 kHz
xxx.040	xxx.0417 MHz	8.33 kHz
xxx.050	xxx.0500 MHz	25 kHz
xxx.055	xxx.0500 MHz	8.33 kHz
xxx.060	xxx.0583 MHz	8.33 kHz
xxx.065	xxx.0667 MHz	8.33 kHz
xxx.070	xxx.0750 MHz	25 kHz
xxx.080	xxx.0750 MHz	8.33 kHz
xxx.085	xxx.0833 MHz	8.33 kHz
xxx.090	xxx.0917 MHz	8.33 kHz

This pattern repeats for all the 100 kHz increments. (It should be noted that the pilot does not need to know the operating frequency or selectivity associated with each displayed frequency. Flying charts and/or ATC communications are designed to relate in terms of the displayed frequency only.)

To tune the radio to the desired operating frequency, the desired frequency must be entered into the standby display and then the transfer button must be pushed. This will trade the contents of the active and standby displays. The operating frequency can also be entered by accessing the ACTIVE ENTRY (direct tune) mode which is done by pushing and holding the COMM TRANSFER button for 2 or more seconds. In the direct tune mode, only the active part of the display is visible. The desired frequency can be directly entered into the display. Push the COMM TRANSFER button again to return to the active/standby display.

The transceiver is always tuned to the frequency appearing in the ACTIVE display. It is therefore possible to have two different frequencies stored in the ACTIVE and STANDBY displays and to change back and forth between them at the simple push of the transfer button.

During the transmit mode of operation, a “T” will appear between the ACTIVE and STANDBY displays. An “R” will appear between the ACTIVE and STANDBY displays if a detected signal is strong enough to open the squelch, signifying that the transceiver is in the receive mode of operation.

A non-volatile memory stores the comm ACTIVE and STANDBY frequencies on power down. When the unit is turned on again, the COMM ACTIVE and STANDBY windows will display the same ACTIVE and STANDBY frequencies that were displayed before power down.

The KX 155A/165A also has provision to program 32 channels. Pressing the CHAN button for 2 or more seconds will cause the unit to enter the channel program mode. Upon entering the channel program mode, “PG” is displayed next to the channel number and the channel number will flash indicating that it can be programmed. The desired channel can be selected by turning the comm kHz knob. The channel frequency can be entered by pushing the COMM TRANSFER button which will cause the standby frequency to flash. The comm frequency knobs are then used to enter the desired frequency. If dashes (displayed when rotating the outer knob between 136 MHz and 118 MHz) are entered instead of a frequency, the corresponding channel is skipped in channel selection mode. Additional channels may be programmed by pressing the COMM TRANSFER and using the same procedure. To exit the program mode and save the channel information, momentarily push the CHAN button. This will cause the unit to return to the previous frequency entry mode. The unit will also exit the channel program mode if there is no button or knob activity for 20 seconds.

The channel selection mode can then be entered by momentarily pushing CHAN button. “CH” is displayed next to the last used channel number. The comm frequency knobs can be used to select the desired channel. The unit will automatically default to the previous mode if no channel is selected within 2 seconds after entering the channel selection mode.

The unit is placed in the transmit mode by depressing the MIC KEY button. The unit has a stuck microphone alert feature. If the microphone is keyed continuously for greater than 33 seconds, the transmitter stops transmitting and the active Comm frequency flashes to alert the pilot of the stuck microphone condition.

3.1.2 NAV RECEIVER

The right portion of the display is allocated to NAV receiver information. The frequency channeling is similar to the COMM when operating in the frequency mode ([Figure 3-1](#)). The NAV increment/decrement knobs are located on the right hand side of the front panel. The outer knob operates in 1 MHz steps and increments/decrements the STANDBY frequency display.

The inner knob operates in 50 kHz steps. The NAV receiver’s lower and upper frequency limits are 108.00 MHz and 117.95 MHz. Exceeding the upper limit of frequency band will automatically return to the lower limit and vice versa.

Depressing the NAV frequency transfer button for 2 seconds or more will cause the display to go in to the ACTIVE ENTRY mode. Only the ACTIVE frequency will be displayed and it can be directly changed by using the NAV inc/dec knobs. The display will return to the ACTIVE/STANDBY mode when the NAV frequency transfer button is pushed.

Depressing the mode button will cause the NAV display to go from the ACTIVE/STANDBY format to the ACTIVE/CDI (Course Deviation Indicator) format as shown below in [Figure 3-2](#). In the CDI mode, the increment/decrement knob (pushed in) channels the ACTIVE frequency window and depressing the frequency transfer button will cause the ACTIVE frequency to be placed in blind storage and the STANDBY frequency (in blind storage) to be displayed in the ACTIVE window display. When the ACTIVE window is tuned to a VOR frequency, the standby frequency area is replaced by a three digit OBS (Omni Bearing Selector) display. The desired OBS course can be selected by pulling out the inner NAV frequency knob and turning it. This OBS display is independent of any OBS course selected on an external CDI or HSI. An “OBS” in the middle of the NAV

display will flash while the inner NAV frequency knob is pulled out. The CDI is displayed on the line below the frequency/OBS. When the ACTIVE window is tuned to a localizer frequency, the standby frequency area is replaced by "LOC" **Figure 3-3**. Illustrations of the display are shown below.

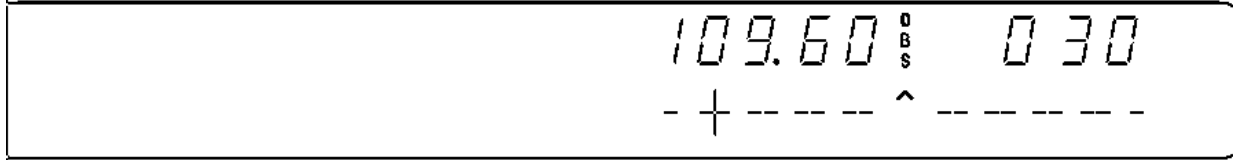


FIGURE 3-2 NAV DISPLAY; ACTIVE VOR FREQUENCY/CDI FORMAT

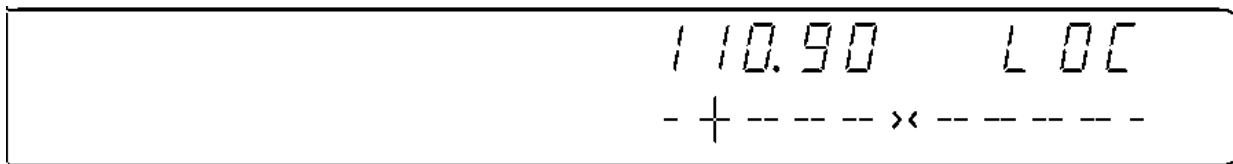


FIGURE 3-3 NAV DISPLAY; ACTIVE LOCALIZER FREQUENCY/CDI FORMAT

When the received signal is too weak to ensure accuracy the display will "flag". See **Figure 3-4**.

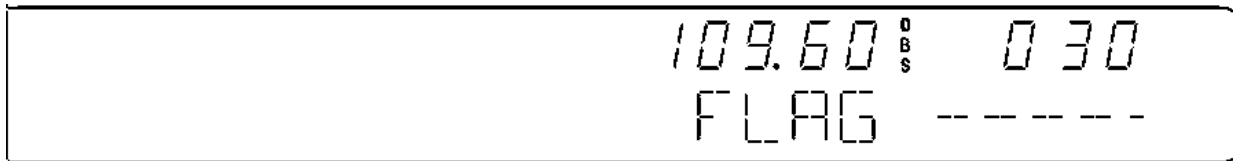


FIGURE 3-4 VOR FLAG DISPLAY

Depressing the mode button will cause the NAV display to go from the ACTIVE/CDI format to the ACTIVE/BEARING format. In the BEARING mode, the increment/decrement knob channels the ACTIVE frequency window and depressing the frequency transfer button will cause the ACTIVE frequency to be placed in blind storage and the STANDBY frequency (in blind storage) to be displayed in the ACTIVE window display. In bearing mode of operation, the right hand window of NAV display shows the bearing TO the station. **Figure 3-5** below illustrates the NAV side of the display in this mode:

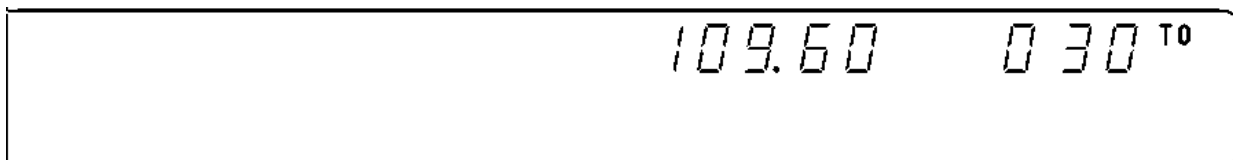


FIGURE 3-5 VOR MODE; BEARING TO FUNCTION

When a too weak or invalid VOR signal is received the display flags as shown in **Figure 3-6**.

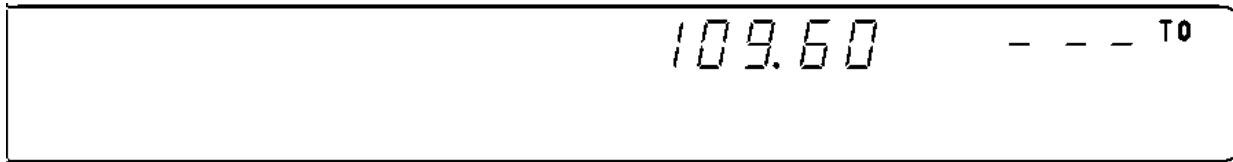


FIGURE 3-6 VOR MODE; ACTIVE/BEARING, FLAG DISPLAY

Another push of the mode button will cause the NAV display to go from the ACTIVE/BEARING format to the ACTIVE/RADIAL format as shown in **Figure 3-7**. In the RADIAL mode, the increment/decrement knob channels the ACTIVE frequency window and depressing the frequency transfer button will cause the ACTIVE frequency to be placed in blind storage and the STANDBY frequency (in blind storage) to be displayed in the ACTIVE window display. In radial mode of operation, the right hand window of NAV display shows the radial FROM the station. The picture below illustrates the NAV side of the display in this mode:

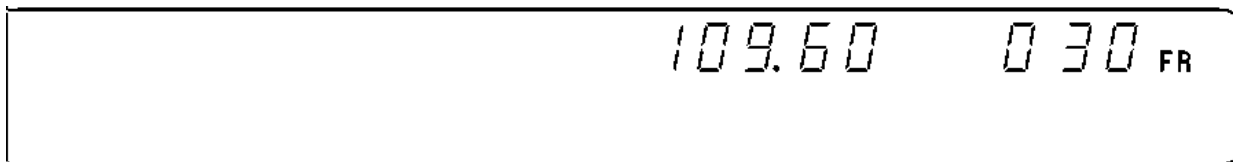


FIGURE 3-7 VOR MODE; RADIAL FROM FUNCTION

When a too weak or invalid VOR signal is received the display flags as shown in **Figure 3-8**.

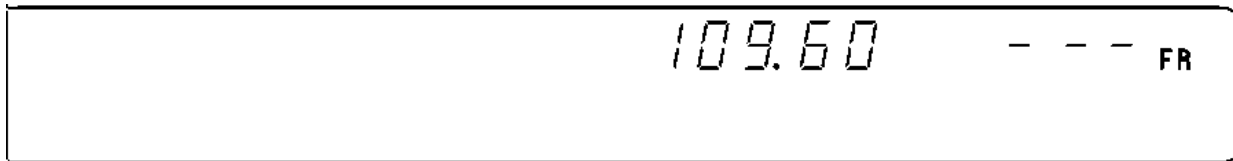


FIGURE 3-8 VOR MODE; ACTIVE/RADIAL, FLAG DISPLAY

Another push of the mode button will cause the unit to go into the TIMER mode. See **Figure 3-9**. When the unit is turned on the elapsed timer begins counting upwards from zero. The timer can be stopped and reset to zero by pushing the NAV frequency transfer button for 2 seconds or more causing the ET on the display to flash. In this state the timer can be set as a countdown timer or the elapsed timer can be restarted. The countdown timer is set by using the NAV inc/dec knobs to set the desired time and then pushing the NAV frequency transfer button to start the timer. The outer knob selects minutes, the inner knob in the "in" position selects ten second intervals, and the inner knob in the "out" position selects individual seconds. After the countdown timer reaches zero, the counter will begin to count upwards indefinitely while flashing for the first 15 seconds. Or the elapsed timer can also be reset to zero and started again after it has been stopped and reset to zero by pushing the NAV frequency transfer button. The Audio Alert pin (pin 22 of P155A1/ P165A1) goes low when the countdown timer goes to zero and drives an external alarm (buyer supplied). The pin is capable of sinking 250 mA at a voltage of not more than 1 VDC.

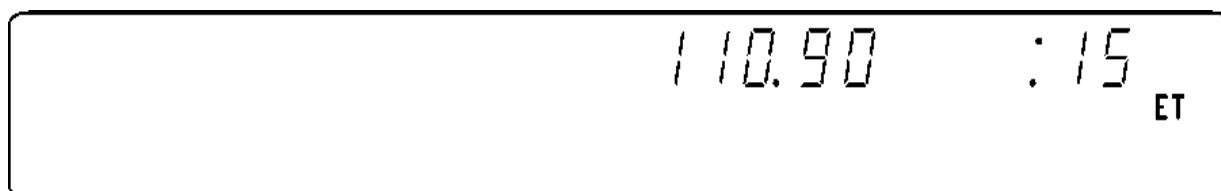


FIGURE 3-9 TIMER MODE

The NAV ACTIVE and STANDBY frequencies are stored in the memory on power down and return on power up.

When the smaller increment/decrement knob is pushed in, depressing the NAV TRANSFER button will interchange the ACTIVE and STANDBY frequencies. The NAV IDENT knob is active in the pulled out position so that both voice and ident can be heard. When this knob is pushed in, the ident tone is attenuated. The volume of voice/ident can be adjusted by turning this knob.

3.1.3 PILOT CONFIGURATION

This mode can be accessed by pressing and holding the Nav Mode Button for more than 2 seconds and then pressing the Nav Frequency Transfer Button for an additional 2 seconds, while continuing to hold the Nav Mode Button. When the Pilot Config Mode is entered the unit will show the "SWRV" mnemonic which is the unit software revision level. Adjustment pages can be accessed by MODE button presses.

The pilot may adjust two parameters in the pilot configuration, the display minimum brightness and sidetone volume level. See **Table 3-1**.

Minimum Brightness (BRIM) will have a range of 0 - 255. The dimmest is 0 and the brightest is 255. The brightness can be increased by rotating the inner and outer NAV Frequency Select knobs clockwise. Rotate the knobs counterclockwise to decrease the brightness and clockwise to increase the brightness. The inner knob will change the brightness in increments of 1 and the outer knob will change it in increments of 10.

Sidetone volume level is adjusted when SIDE is displayed. Values from 0 - 255 may be selected with 0 being least volume, 255 being the greatest.

Table 3-1 Pilot Configuration

Adjustment	Mnemonic	Min Level	Max Level
Software Revision Number	SWRV	--	--
Minimum Display Brightness	BRIM	0	255
Sidetone Level	SIDE	0	255

Subsequent presses of the MODE button sequences through SWRV, BRIM, SIDE, and then back to SWRV.

Momentarily pressing the Nav Transfer Button exits Pilot configuration mode. The Nav returns to its pre-Pilot Config state with the new brightness and sidetone levels stored in non-volatile memory.

3.1.4 INSTALLATION MODE

The installation mode should only be used by a qualified avionics technician. Installation configuration adjusts several unit parameters in order to conform the unit to a given installation. The following adjustments will be accessible from the front panel in order to facilitate unit installation: **Table 3-2** shows the page sequence.

Table 3-2 Installation Mode Pages

Adjustment	Mnemonic	Min Level	Max Level	Comment
Software Revision	SWRV	N/A	N/A	
Intercom	INTC	0	255	
Comm S/N Squelch	SNSQ	0	255	
Comm S/N Squelch (8.33)	SNS8	0	255	KX 165A only
ComQuickTune	CQTN	0	4	
NavQuickTune	NQTN	0	4	
VOR/LOC Composite Level	COMP	0	255	
Photocell Offset	PHOF	-99	99	
VOR D Bar Time Constant	VBAR	1	10	
LOC D Bar Time Constant	LBAR	0.6	3	
VOR/LOC Converter Centering Offset	VLCO	-64	64	KX 165A only
VOR/LOC Converter Course Width	VLCW	0	255	KX 165A only
Resolver Zero Point	Z300	0	1	KX 165A only
External OBS Resolver 300/0 Degree	R300 or R000	Auto		KX 165A only

External OBS Resolver 30/90 Degree	R030 or R090	Auto		KX 165A only
External OBS Resolver 120/180 Degree	R120 or R180	Auto		KX 165A only
External OBS Resolver 210/270 Degree	R210 or R270	Auto		KX 165A only
OBI Type I or II selection	OBI	1	2	KX 165A only
Glide Slope Centering Offset	GSCO	-99	99	
Glide Slope Course Width	GSCW	0	255	
Program Secure	PSEC	n/a	n/a	
Fault 01	FALT	n/a	n/a	
Fault 02	FALT	n/a	n/a	
Fault 03	FALT	n/a	n/a	
Fault 04	FALT	n/a	n/a	
Fault 05	FALT	n/a	n/a	
Fault 06	FALT	n/a	n/a	
Fault 07	FALT	n/a	n/a	
Fault 08	FALT	n/a	n/a	
Fault 09	FALT	n/a	n/a	
Fault 10	FALT	n/a	n/a	

The installation configuration mode will be accessed by the following sequence. The unit is turned on while simultaneously pressing Communication Channel Button for 8 to 12 seconds. The button shall be released within 8 to 12 seconds. Within 0.2 to 2 seconds following its release, the button must be momentarily depressed. Following this sequence, the unit will automatically enter its installation mode. Within 0.5 seconds of reaching installation mode, the display will annunciate "INST" in the 4 character alphanumeric position on the NAV side of the display; all other display segments are off. A page can be accessed once in the installation configuration mode by pushing the Comm Mode Button one or more times. Each button push will cause the display to advance to the next page; the first page shall follow the last page.

3.1.4.1 Intercom Mic Gain adjustment (INTC)

Intercom Mic Gain adjustment (INTC) has a range of 0 to 255. The lowest volume is 0, and the highest volume is 255.

3.1.4.2 Com S/N Squelch (SNSQ)

Com S/N Squelch (SNSQ) adjustment has a range of 0 to 255. In the range of settings from 0 to 63, it changes the Squelch setting approximately 1 dB/step. Lowering the setting causes the squelch to open at higher R.F. power levels. Raising the setting causes the squelch to open at lower R.F. power levels. Adjustments to SNSQ do not take affect until the radio's power is cycled.

3.1.4.3 The SNS8 COMM S/N Squelch

The SNS8 COMM S/N Squelch setting behaves like the SNSQ setting but only applies to the 8.33 channel settings. Lowering the values for SNSQ and SNS8 will require a stronger signal to be present before audio will be heard.

3.1.4.4 Comm Quick Tune (CQTN) and Nav Quick Tune (NQTN)

Comm Quick Tune (CQTN) and Nav Quick Tune (NQTN) are system numbers that will allow an external device to update the standby frequencies for the Comm and Nav. The external device must use the same system number as the number set here.

3.1.4.5 VOR/LOC Composite Level (COMP)

VOR/LOC Composite Level (COMP) has a range of 0 to 255. The Level is factory set, and should not need adjustment. A setting of 0 produces a minimum VOR/LOC level, a setting of 255 produces a maximum level. The VOR/LOC Composite Level may be adjusted to interface with an external converter/indicator. Increasing the Composite Level will increase an indicator's needle deflection. Decreasing the Composite Level will reduce an indicator's needle deflection. Adjustments to COMP do not take affect until the radio's power is cycled. A description of this procedure is included in the Maintenance Manual.

3.1.4.6 Photocell Offset (PHOF)

Photocell Offset (PHOF) has a range of -99 to 99. A setting of -99 increases the brightness of the display, a setting of 99 decreases the brightness of the display.

3.1.4.7 VOR Deviation Bar Response Time (VBAR)

The following, **Table 3-3** describes the correspondence between the front panel display and VOR D bar response times. Response time is defined as time required to reach 67% of the final value.

Note: Any departure from the factory default value of VBAR should only be made after careful consideration of its affect on the aircraft certification, especially where a flight control system is involved.

Table 3-3 VOR Deviation Bar Response Time

Front Panel Value	Time Constant (sec)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

3.1.4.8 Localizer Deviation Bar Time Constant (LBAR)

The following, Table 3-4 and [Figure 3-10](#) describe the correspondence between the front panel display and localizer D bar time constant. In this case, the “dot” shall be used to show the tenths of seconds. Response time is defined as time required to reach 67% of the final value.

Table 3-4 Localizer Deviation Bar Time Constant

Front Panel Value	Time Constant (sec)
0.5	0.6
1.0	1.0
1.5	1.5
2.0	2.0
2.5	2.5
3.0	3.0

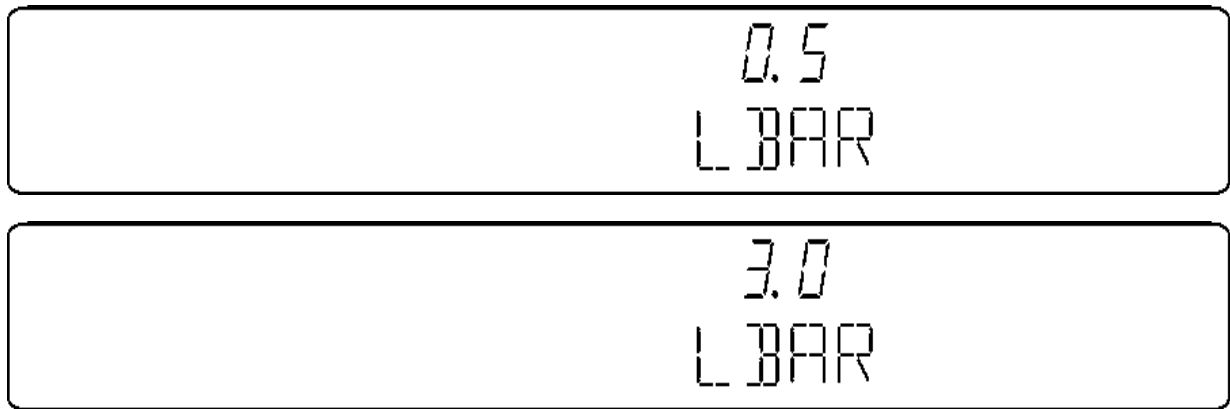


FIGURE 3-10 VOR DEVIATION BAR RESPONSE TIME

NOTE: Any departure from the factory default value of LBAR should only be made after careful consideration of its affect on the aircraft certification, expecially when a flight control system is involved.

3.1.4.9 VOR/LOC Converter Centering Offset (VLCO)

VOR/LOC Converter Centering Offset (VLCO) has a range of -64 to 64. A setting below 0 moves the indicator's needle to the left (increases the voltage?), a setting above 0 moves the indicator's needle to the right (decreases the voltage?). An external RF signal is not required to make this adjustment. The radio automatically outputs a centering converter voltage that can be used when adjusting to interface between the radio's internal converter and an external indicator.

3.1.4.10 VOR/LOC Converter Course Width (VLCW)

VOR/LOC Converter Course Width (VLCW) has a range of 0 to 255. A setting of 0 will result in a minumum amount of needle deflection to the left. A setting of 255 will result in a maximum amount of needle deflection to the left. An external RF signal is not required to make this adjustment. The radio automatically outputs a deflection converter voltage that can be used when adjusting the interface between the radio's internal converter and an external indicator.

3.1.4.11 Resolver Zero Point (Z300)

Resolver Zero Point (Z300) can have the value of 0 or 1. A setting of 1 indicates that the external resolver is aligned at 300 degrees, and the next four pages will be labeled R300, R030, R120 and R210. A setting of 0 indicates that the external resolver is aligned at 0 degrees and the next four pages will be labeled R000, R090, R180 and R270. If this setting is incorrect the next four pages External OBS Resolver Degree Settings will not successfully calibrate.

3.1.4.12 External OBS Resolver Degree Settings (R300, R030, R120, R210; or R000, R090, R180, R270)

Supply a standard VOR signal to the NAV antenna port at 113.5 MHz. Bearing is not important. This is necessary to generate a 30 Hz reference signal output by the internal converter. Adjust the external resolver to the compass point indicated by the last three digits of the mnemonic, for example on the "R030" page set the external resolver to 30 degrees. When adjusting the external

resolver it is best to go slightly past, and then back up to eliminate some of the mechanical backlash.

After External Resolver is set press the NAV Transfer Button. The display will flash while the resolver offset is being calibrated. When the display stops flashing, a number less than 99 should appear. The number represents the alignment error in 0.1-degree units. Repeat for each of the four compass points. The following figure 3-11 shows a 0.4-degree error after calibration at the 300-degree compass point.

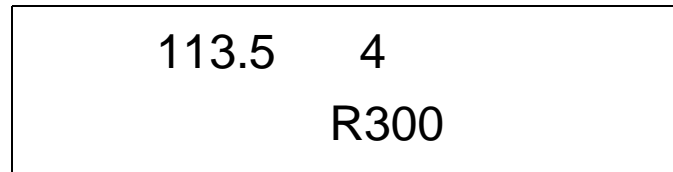


FIGURE 3-11 ALIGNMENT ERROR

If “99” is displayed the calibration was unsuccessful. If any of the four compass pages are unsuccessful, check for presence of a 3 Vp-p 30Hz (nominal) sine wave at Rotor C. If a 3 Vp-p 30 Hz sine wave is present at Rotor C, variable amplitude 30Hz sine waves should be present at Stator D and Stator F. Amplitude of these two signals should vary with resolver compass settings. If all of these conditions are present and alignment shows “99”, the indicator or receiver may require service.

3.1.4.13 OBI Type I or II Selection (OBI)

OBI Type I or II Selection (OBI) should be set for 1 for interfacing to a Type I OBI and set to 2 to interface to a Type II OBI.

OBI Type I is the traditional King serial data bus as defined for providing bearing data from a NAV receiver to RMI or related indicators. Due to a unique interface requirement that surfaced with the introduction of the Honeywell EFS40/EFS50 system, additional data fields, containing no information, had to be added to the OBI word. OBI Type II, which emulates the RNAV data word from a KNS81, was created to meet this interface requirement. Therefore OBI Type II should be used in all installations related to EFS40/EFS50 system interfaces. Otherwise, OBI Type I should be used.

3.1.4.14 GS Converter Centering Offset (GSCO)

GS Converter Centering Offset (GSCO) has a range of -64 to 64. A setting below 0 raises the indicator needle (increases the voltage), a setting above 0 lowers the indicator needle (decreases the voltage). An external RF GS signal is not required to make this adjustment. The radio automatically outputs a centering converter voltage that can be used when adjusting the interface between the radio's internal GS converter and an external indicator. The GS Converter Centering Offset should be adjusted so that the external indicator is set at zero (0 ddm, 0 μ A).

3.1.4.15 GS Converter Course Width (GSCW)

GS Converter Course Width (GSCW) has a range of 0 to 255. A setting of 0 will result in a minimum indicator displayed half deflection. A setting of 255 will result in a maximum indicator displayed half deflection. An external RF GS signal is not required to make this adjustment. The radio automatically outputs a half deflection converter voltage that can be used when adjusting the interface between the radio's internal GS converter and an external indicator. The GS Converter Course Width should be adjusted so that the external indicator is set at half deflection (.091 ddm, 78 μ A).

3.1.4.16 Program Secure

The program secure mode allows the installer to lock or unlock an already defined frequency to a specific channel number, and will prohibit the operator from programming changes to the channel memories from the front of the unit during normal operation. All other functions shall remain unchanged during normal operation. The lock state can be toggled rotating the Nav Inner or Outer Frequency Selection Knobs. The Nav Mode Button is used to scroll the list of channels. If the frequency is locked, the upper left segment of the nav display will display an "L", otherwise a "U" will be displayed as shown in **Figure 3-12**.

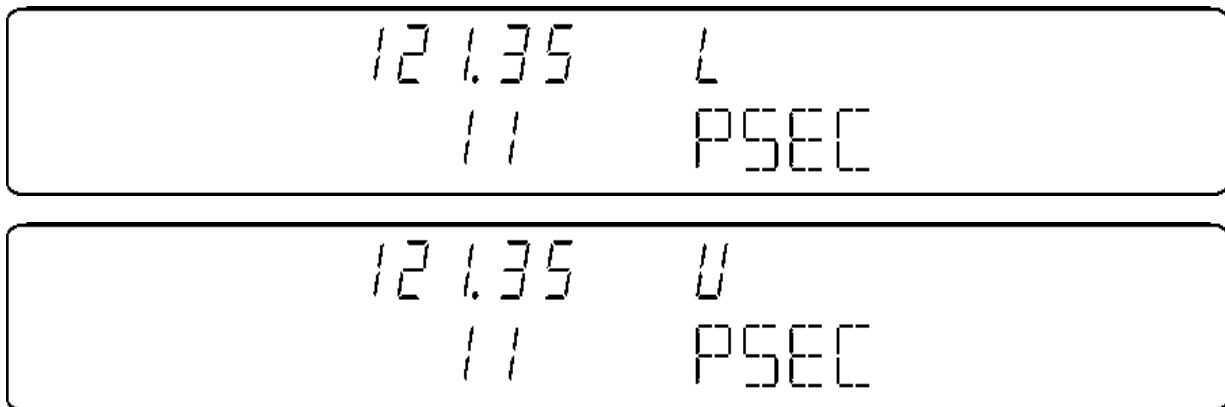


FIGURE 3-12 FREQUENCY LOCK AND UNLOCK STATES

3.1.4.17 Fault Reporting

This section on fault reporting is here for reference only. The KX155A/165A fault codes are primarily for the benefit of Honeywell design engineering personnel. The meaning of each fault code is not published here or in the KX155A or KX165A Maintenance Manual since they contain no user or product service benefit. **However, users need to be aware that if a fault is detected during normal operation, the radio will come up in the fault display mode at the next power-up. Again, as mentioned previously, such a condition does not indicate a radio malfunction. The user should simply rotate one of the frequency selector knobs or press any button, except the NAV MODE button, to return the radio to normal operation.**

Faults that occur in the unit are recorded in non-volatile memory, and are part of the installation mode. Only the last ten faults are recorded, and are shown one fault per page. Page (1) shows the most recent fault. Page (2) shows the next most recent fault and so forth. If less than 10 faults exist, then the fields for the time and fault code are blank. The fault type which is in the active frequency area shows the type of fault that has occurred, and the fault code shows where in the software the fault occurred. **Figure 3-13** and **Table 3-5** show the display while in fault reporting:

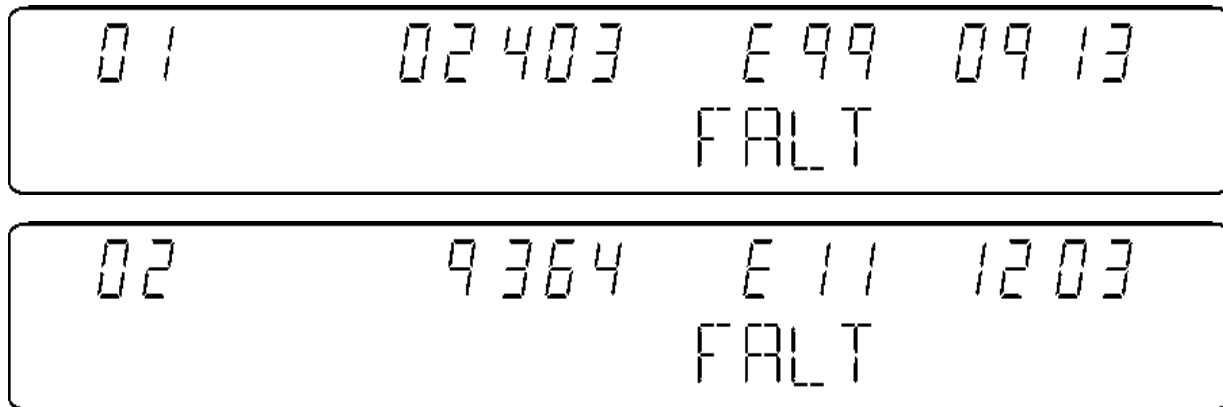


Figure 3-13 TYPICAL FAULT DISPLAY

Table 3-5 Fault Display

Fault Page Number:	Use the 2 most significant digits of the Comm active frequency display.
Fault Time:	Use all digits of the comm standby frequency display with a maximum of 199999 hours
FALT:	Annunciates a fault; alphanumeric portion of the nav display.
Fault Type:	Use 3 least significant digits of the nav active frequency display.
Fault Code	The two most significant digits identify the module in which the error is detected. The two least significant digits identify the error number for the module error.

If no faults exist, the following display is used for empty fault pages as shown in **Figure 3-14**.

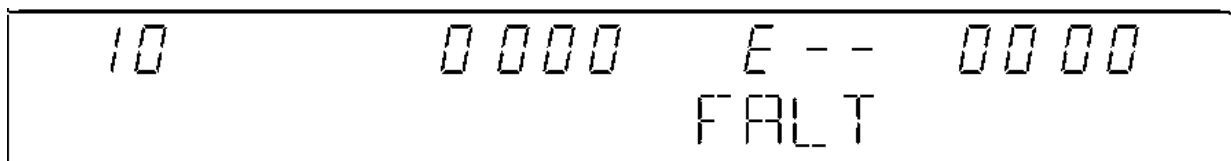


Figure 3-14 FAULT DISPLAY, NO FAULT

The fault codes and times can be reset to zero (blank) by simultaneously depressing the comm transfer and nav transfer buttons for 5 or more seconds.

3.2 KI 202/203/204, KI 206/208/209/208A/209A INDICATOR CONTROLS AND FUNCTIONS

3.2.1 VOR OPERATION

Channel the NAV Receiver to the desired VOR and monitor the audio to positively identify the station. To intercept a selected VOR radial, turn the OBS to set the desired radial under the lubber line. The left-right needle will now deflect in the direction of the desired radial. Flying toward needle deflection will bring the aircraft to the desired radial.

To fly inbound toward the station, turn the OBS to center the left-right needle while the To-From is indicating TO. Read the bearing under the lubber line and fly that magnetic course. When the aircraft passes over the station, the To-From will momentarily disappear and then reappear as FROM. This indicates the aircraft is outbound from the station.

3.2.2 LOC OPERATION

Localizer circuitry is energized when the NAV Receiver is channeled to an ILS frequency. The VOR/LOC flag will be out of view when the signal is usable. Corrections for approach should be made toward the needle, as in VOR, but due to increased sensitivity, corrections are smaller. When flying inbound on a back course, deflection of the needle will be reversed. In KX165A installations where the internal NAV converter circuitry directly drives a convertor-less indicator, the TO/FROM flag will always display a "TO" indicator when a LOC channel is selected.

3.2.3 GLIDESLOPE OPERATION

Glideslope operation is much the same as the Localizer just discussed. An Up deflection of the needle indicates the aircraft is below desired glidepath. The pilot must fly toward the needle for correction. A warning flag is provided to indicate usable signal conditions.

3.2.4 UNIT CONTROL FUNCTIONS

The following figure (**Figure 3-15**) displays the control functions for the KI 204/206/209. The KI 202/203/208 differs in not having a glideslope needle or flag. The KI 207 differs in not having an OBS or Azimuth card.

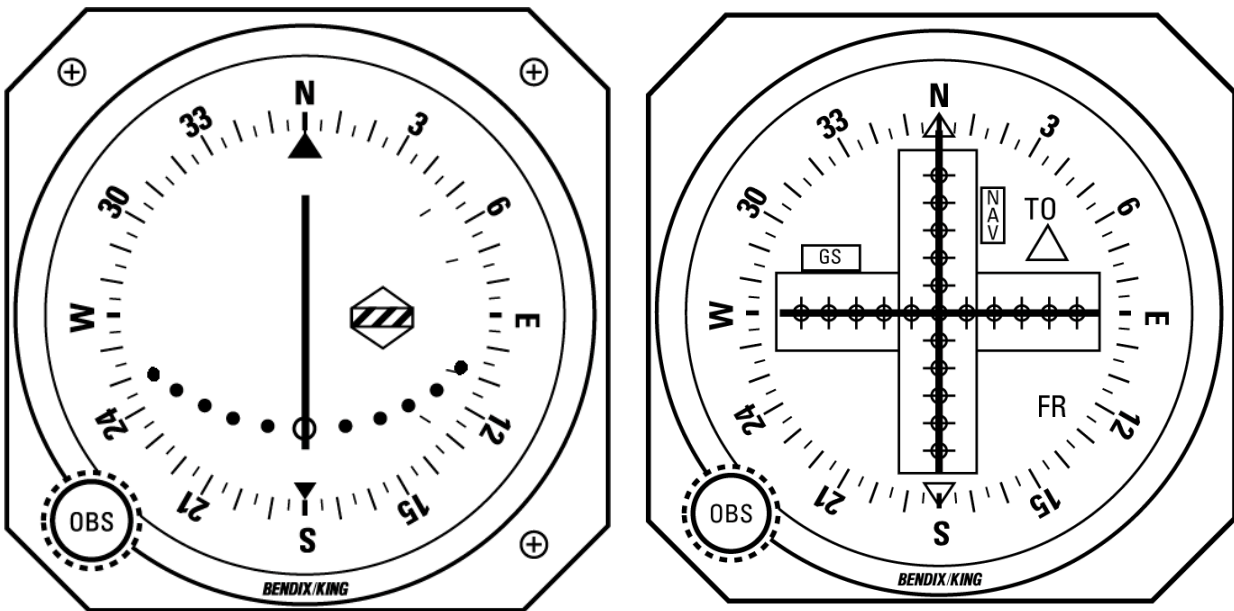


FIGURE 3-15 KI 202/203/204/206/207/208/209/208A/209A TYPICAL INDICATOR MARKINGS

3.3 KI 525A INDICATOR CONTROLS AND FUNCTIONS

3.3.1 VOR/LOC AND GLIDESLOPE OPERATION

Set the navigation receiver to the desired VOR/LOC station and rotate the course select knob to adjust the selected course pointer to the desired course radial. When a usable navigation signal is received by the KI 525A the NAV warning flag will disappear from view.

For an ILS approach, tune the navigation receiver to the desired frequency.

The glideslope pointer will deflect into view after a 2 to 10 second delay if a usable glideslope signal is received. The glideslope pointer indicates the relative position of the glideslope path with respect to the aircraft.

For LOC operation, tune the navigation receiver to the desired frequency and set the pointer to the selected inbound localizer course. The position of the deviation bar with respect to the symbolic aircraft indicates the relative position of the selected course. For backcourse operation, set the course pointer to the inbound localizer front course. The deviation bar position relative to the symbolic aircraft then represents the position of the backcourse with respect to the aircraft. **Figure 3-16** displays the control functions for the KI 525.

NOTE:

The TO/FROM flag will always display a "TO" indication when a LOC channel is selected.

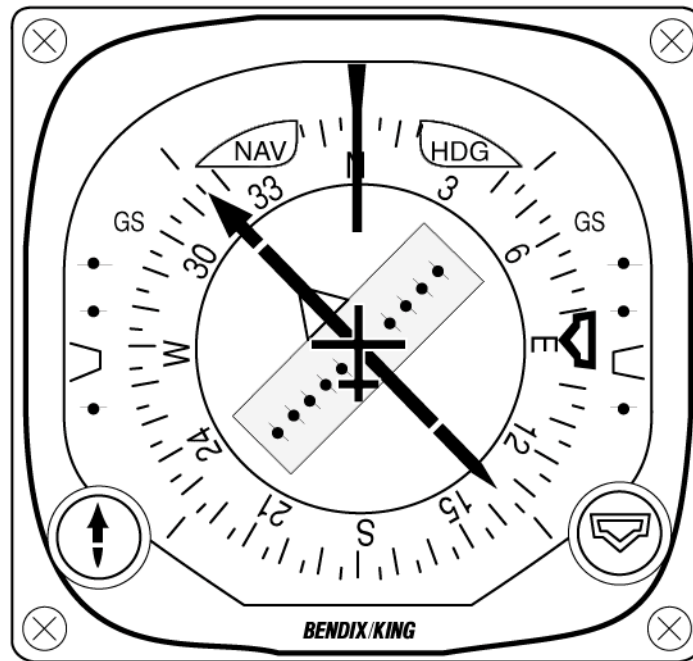


FIGURE 3-16 KI 525A INDICATOR AND CONTROLS

3.4 KI 229 RMI OPERATION

The KNI 229 Radio Magnetic Indicator provides bearing information to both ADF and VOR stations by means of two pointers, each of which is read against the compass card. The servo drive compass card displays heading information derived from ARINC type X, Y, Z, compass headings. The double pointer is dedicated solely to a ADF DC SIN/COS source. The single pointer is assigned to VOR information.

NOTE

The single pointer can be switched between VOR and ADF by means of an external switch as explained in the installation manual of the KNI 229.

3.5 OTHER INDICATORS

Refer to respective installation manuals for operation instructions of other indicators.

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ENVIRONMENTAL QUALIFICATION APPENDIX

**RTCA DO-160C
ENVIRONMENTAL QUALIFICATION
FORMS**

**RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM**

NOMENCLATURE	KX 155A VHF COMMUNICATION TRANSCEIVER/ NAVIGATION RECEIVER
PART NUMBER	069-01032-0101 KX 155A with Glideslope option 069-01032-0201 KX 155A without Glideslope option 050-03378-0000 Installation Kit for -0101 KX 155A 050-03378-0001 Installation Kit for -0201 KX 155A
TSO NUMBER	C34e GLIDESLOPE RECEIVER (-0101 only) C36e (CLASS A) ILS LOCALIZER RECEIVER C37d (Class 4, 100 NM 25 kHz) VHF TRANSMITTER C38d (CLASS C, D) VHF RECEIVER C40c VOR RECEIVER
MANUFACTURER'S SPECIFICATION MANUFACTURER ADDRESS	004-00312-4000 ALLIEDSIGNAL INC ONE TECHNOLOGY CENTER 23500 W 105 th Street OLATHE, KS 66061 USA

CONDITIONS	SECTION	CONDUCTED TESTS
TEMPERATURE AND ALTITUDE	4 0	CATEGORY A1D1 -20°C TO +55°C
IN-FLIGHT LOSS OF COOLING	4 5 4	[-]
TEMPERATURE VARIATION	5 0	CATEGORY B
HUMIDITY	6 0	CATEGORY A
SHOCK OPERATIONAL CRASH SAFETY	7 0	SHOCK / OPERATIONAL CRASH SAFETY
VIBRATION	8 0	CATEGORIES BMNPS
EXPLOSION	9 0	CATEGORY X (NOT TESTED)
WATERPROOFNESS	10 0	CATEGORY X (NOT TESTED)
FLUIDS SUSCEPTIBILITY	11 0	CATEGORY X (NOT TESTED)
SAND 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 Z
POWER INPUT	16 0	CATEGORY B
VOLTAGE SPIKE	17 0	CATEGORIES A AND B
AUDIO FREQUENCY SUSCEPTIBILITY	18 0	CATEGORY B
INDUCED SIGNAL SUSCEPT	19 0	CATEGORY A
RADIO FREQUENCY SUSCEPTIBILITY	20 0	CATEGORY T
RADIO FREQUENCY EMISSION	21 0	CATEGORY A
LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	22 0	CATEGORY X (NOT TESTED)
LIGHTNING DIRECT EFFECTS	23 0	CATEGORY X (NOT TESTED)
ICING	24 0	CATEGORY X (NOT TESTED)

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REVISION B
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RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM

REVISION HISTORY

REV No	PRN/CO NUMBER	DATE	DESCRIPTION OF CHANGE
-	147907	10-7-98	ORIGINAL RELEASE
A	154174	3/99	Add Installation Kit & Update Critical Frequencies
B	155677	5/99	Correction to critical freq Axis reference

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**RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM**

Vibration Critical Frequencies

AXIS	VIBRATION CRITICAL FREQUENCIES
Longitudinal (X axis)	242-296
	624-708
	752-816
Lateral (Y axis)	299-463
Vertical (Z axis)	74-121
	304-333
	344-494
	976-1029
	1232-1436
	1598-1685
	1830-1896

No change in critical frequencies observed during vibration tests
 No change in performance observed during vibration tests

**RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM**

NOMENCLATURE: KX 165A VHF COMMUNICATION TRANSCEIVER/
NAVIGATION RECEIVER

PART NUMBER: 069-01033-0101 KX 165A 25 kHz COMM
069-01033-0201 KX 165A 25/8.33 kHz COMM
050-03378-0000 Installation Kit

TSO NUMBER: GLIDESLOPE RECEIVER: C34e
ILS LOCALIZER RECEIVER: C36e (Class A)
VHF TRANSMITTER: C37d
069-01033-0101: (Class 4, 100 NM 25 kHz)
069-01033-0201: (Class 4, 6, 100 NM 25/8.33 kHz)
VHF RECEIVER: C38d
069-01033-0101: (Class C, D)
069-01033-0201: (Class C,D,E)
VOR RECEIVER: C40c

MANUFACTURER'S SPECIFICATION: 004-00312-4000

MANUFACTURER: HONEYWELL INTERNATIONAL INC.

ADDRESS: ONE TECHNOLOGY CENTER
23500 W. 105th Street
OLATHE, KS 66061
USA

CONDITIONS	SECTION	CONDUCTED TESTS
TEMPERATURE AND ALTITUDE	4.0	CATEGORY A1D1 -20°C TO +55°C
IN-FLIGHT LOSS OF COOLING	4.5.4	[-]
TEMPERATURE VARIATION	5.0	CATEGORY B
HUMIDITY	6.0	CATEGORY A
SHOCK OPERATIONAL CRASH SAFETY	7.0	SHOCK / OPERATIONAL CRASH SAFETY
VIBRATION	8.0	CATEGORIES BMNPS
EXPLOSION	9.0	CATEGORY X (NOT TESTED)
WATERPROOFNESS	10.0	CATEGORY X (NOT TESTED)
FLUIDS SUSCEPTIBILITY	11.0	CATEGORY X (NOT TESTED)
SAND 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 (0.46 m)
POWER INPUT	16.0	CATEGORY B
VOLTAGE SPIKE	17.0	CATEGORIES A AND B
AUDIO FREQUENCY SUSCEPTIBILITY	18.0	CATEGORY B
INDUCED SIGNAL SUSCEPT.	19.0	CATEGORY A
RADIO FREQUENCY SUSCEPTIBILITY	20.0	CATEGORY T with data to 8 GHz.
RADIO FREQUENCY EMISSION	21.0	CATEGORY A
LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	22.0	CATEGORY A3E3 with 60A limit on cable induced testing on power cable
LIGHTNING DIRECT EFFECTS	23.0	CATEGORY X (NOT TESTED)
ICING	24.0	CATEGORY X (NOT TESTED)

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**RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM
KX 165A VHF COMMUNICATION TRANSCEIVER/NAVIGATION RECEIVER**

REVISION HISTORY

REV No.	PRN/CO NUMBER	DATE	DESCRIPTION OF CHANGE
-	PRN 171169	04/17/00	ORIGINAL RELEASE
A	CO 172022	05/08/00	Change Magnetic Effect from Class Z to Class A

**RTCA/DO-160C
ENVIRONMENTAL QUALIFICATION FORM
KX 165A VHF COMMUNICATION TRANSCEIVER/NAVIGATION RECEIVER**

Vibration Critical Frequencies

AXIS	VIBRATION CRITICAL FREQUENCY RANGE (Hz)
Longitudinal (X axis)	226-640
	740-844
	950-977
	1040-1088
Lateral (Y axis)	130-195
Vertical (Z axis)	47-74
	280-427
	443-540
	700-805
	824-853
	883-898
	1047-1106
	1146-1312

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