Honeywell

SYSTEM INSTALLATION MANUAL (Preliminary)

BENDIX/KING®

KTR 2280

MULTI-MODE DIGITAL RADIO (MMDR)

MANUAL NUMBER 006-10654-0000
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REVISION HIGHLIGHTS

KTR 2280 Preliminary H 08/17/06

Part Number	Rev	Date	Description
006-10654-0000	0	Aug/2006	Initial Release

REVISION HIGHLIGHTS

Part Number	Rev	Date	Description

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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical, and electrical characteristics of the Honeywell KTR 2280 Multi-Mode Digital Radio (MMDR). Installation and check out procedures are also included. Information relative to the maintenance, alignment, and procurement of the replacement parts may be found in the KTR 2280 Maintenance/Overhaul Manual, P/N 006-15654-XXXX. The only current KTR 2280 installation option is as a part of the APEX system. For additional information relating to the APEX system, refer to the APEX System Manual 006-10667-XXXX or applicable Engineering Bulletin (EB). This manual, the Apex System Manual, and the applicable EB define the recommended installation for the KTR 2280. Final design of the installation and airworthiness approval is incumbent upon the installer and their respective certification authority.

1.2 EQUIPMENT DESCRIPTION

The KTR 2280 APEX MMDR Transceiver is a blind, panel mount integrated transceiver containing one transmitter and four receivers. The KTR 2280 operates at a nominal voltage of 27.5 VDC. The KTR 2280 is controlled by APEX LRU's which send control information to the KTR 2280 via ARINC 429. Some outputs from the KTR 2280 are in digital formats and sent to other LRU's via ARINC 429. Other outputs are more traditional analog outputs.

The transmitter is a 2280 channel, 16 Watt COM transmitter capable of 8.33 kHz channel spacing operation. The four receivers include one 200 channel NAV receiver, one 40 channel glideslope receiver, one COM receiver, and one ADF receiver. The COM receivers have 2280 channels and are capable of 8.33 kHz channel spacing. The ADF tunes frequencies from 190 kHz to 1799 kHz and 2180 kHz to 2189 kHz. The KTR 2280 has no user interface and is completely controlled by other components of the APEX system via ARINC 429.

The KTR 2280 contains BIT (Built In Test) equipment so that the operational health of the unit is constantly monitored. When a critical fault is detected, the unit notifies the APEX system. The unit stores detected failures in non-volatile memory for later review. The unit also has a temperature sensor and a timer so that faults can be time stamped and temperature data can be collected and stored.

1.3 TECHNICAL CHARACTERISTICS

1.3.1 KTR 2280 TECHNICAL CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
TSO COMPLIANCE COM TRANSMIT: COM RECEIVE: VOR: LOC: GS: ADF: STUCK MICROPHONE:	 TSO C37d, ETSO 2C37e TSO C38d, ETSO 2C38e TSO C40c, ETSO 2C40c TSO C36e, ETSO 2C36f TSO C34e, ETSO 2C34f TSO C41D, ETSO 2C41b TSO C41D, ETSO 2C41b
SOFTWARE CERTIFICATION CATEGORY:	RTCA/DO-178B SOFTWARE LEVEL “C”
ENVIRONMENTAL CATEGORIES:	SEE APPENDIX A
PHYSICAL DIMENSIONS:	SEE FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
WEIGHT:	SEE FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
MOUNTING:	BLIND, RACK MOUNT BEHIND PANEL
TEMPERATURE:	SEE APPENDIX A
ALTITUDE:	SEE APPENDIX A
COOLING:	INTERNAL FAN & EXTERNAL RACK MOUNTED FAN
POWER INPUT:	16-33 VOLTS
POWER REQUIREMENTS RECEIVE (NOMINAL): RECEIVE (MAXIMUM): TRANSMIT (NOMINAL): TRANSMIT (MAXIMUM):	 27.5 V @ 0.76A 27.5 V @ 1.02A 27.5 V @ 4.33A 27.5 V @ 6.11A

TABLE 1-1 KXP 2290 TECHNICAL CHARACTERISTICS

1.3.2 KA 44B ADF ANTENNA TECHNICAL CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
TSO COMPLIANCE:	SEE APPENDIX A
ENVIRONMENTAL SPECIFICATIONS:	SEE APPENDIX A
PHYSICAL DIMENSIONS:	SEE FIGURE 2-5 KA 44B OUTLINE AND MOUNTING DRAWING (-0000)/FIGURE 2-6 KA 44B OUTLINE AND MOUNTING DRAWING (-0010)
WEIGHT:	SEE FIGURE 2-5 KA 44B OUTLINE AND MOUNTING DRAWING (-0000)/FIGURE 2-6 KA 44B OUTLINE AND MOUNTING DRAWING (-0010)
POWER REQUIREMENTS:	8.5 +/-0.5 VDC at 100mA max (supplied by KTR 2280)

1.4 UNITS AND ACCESSORIES SUPPLIED

1.4.1 CONFIGURATIONS AVAILABLE

P/N 069-01037-0101 is the only version of the KTR 2280 that is currently available.

1.4.2 KTR 2280 INSTALLATION KIT

NOTE: The following installation kit information is presented at the revision existing at the time of this publication. Future revisions to these kits may occur. Use the latest revision of the kit as provided by Honeywell.

The KTR 2280 MMDR installation kit P/N 050-03721-0000 contains the following parts:

```
PN            DESCRIPTION                                          REV
-------------------------------------------------------------------------
050-03721-0000 INSTALL KIT KTR 2280                                  B

-------------------------------------------------------------------------------------------------
SYMBOL    PART NUMBER    FIND NO DESCRIPTION                                          UM  -0000
-------------------------------------------------------------------------------------------------
J1        030-03296-0000         HI DENSITY SUBD44P                                  EA   1.00
J101      030-00101-0002         PANEL MOUNT PLUG                                    EA   1.00
J102      030-00101-0002         PANEL MOUNT PLUG                                    EA   1.00
J103      030-00101-0002         PANEL MOUNT PLUG                                    EA   1.00
J104      030-00101-0002         PANEL MOUNT PLUG                                    EA   1.00
J501      148-05199-0003         FAN 25X25X15MM, 4.06CFM, 55MM TEF WIRE, WITH CONN   EA   1.00
          001-01299-0000         INSTRUCTION FOR HARNESS ASSEMBLY PARTS              RF    .00
J1        030-03296-0000         HI DENSITY SUBD44P                                  EA   1.00
```


PN	DESCRIPTION	REV
050-03721-0000	INSTALL KIT KTR 2280	B

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	-0000
	030-01458-0000		CONTACT, SOCKET, SIZE 22	EA	44.00
	047-11179-0002		STRAIN RELIEF CLAMP MED	EA	1.00
	047-11310-0004		RACK, W/FINISH	EA	1.00
	057-05944-0073		KTR 2280 KIT TSO LABEL	EA	1.00
	073-01140-0003		BACKPLATE W/HARDWARE	EA	1.00
	073-01141-0002		CONNECTOR HOOD SUB D 25 90 DEG W/FINISH	EA	1.00
	073-01142-0002		CONN HOOD COVER W/FINISH	EA	1.00
	076-03189-0001		SCREW 100DEG FHP 2-56 X 3/8 SPECIAL	EA	5.00
	088-03559-0001		FAN GUARD	EA	1.00
	089-05874-0014		SCR PHP 2-56X7/8	EA	4.00
	089-05878-0005		SCR PHP 4-40 X 5/16	EA	1.00
	089-05903-0004		SCR PHP 4-40X1/4	EA	3.00
	089-06008-0004		SCR FHP 4-40X1/4	EA	2.00
	089-08252-0030		WASHER	EA	8.00
	090-00019-0007		RING RTNR .438	EA	4.00
	091-00464-0002		CABLE TIE, 5.62 INCH	EA	1.00
	155-03009-0001		CABLE ASSY, POWER, KTR2280 FAN	EA	1.00
	155-06081-0000		INSTALL DRAWING MMDR KTR 2280	RF	.00
	200-10452-0001		BAR CLAMP ASSEMBLY -15	EA	1.00

Shield braids must be clamped to the connector backshell using bar clamp assembly P/N 200-10452-0001 which contains the following parts. See FIGURE 2-3 KTR 2280 INSTALLATION DRAWING and FIGURE 2-4 KTR 2280 BAR CLAMP ASSEMBLY DRAWING for additional information.

PN	DESCRIPTION	REV
200-10452-0001	BAR CLAMP ASSEMBLY -15	-

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	-0001
REF1	300-10452-0000		BAR CLAMP ASSEMBLY KMC 2220	RF	.00
	047-11178-0002		BACKSHELL BAR CLAMP MED	EA	1.00
	076-03190-0001		SCREW PHP 4-40 X 7/16 SPECIAL	EA	2.00
	187-01943-0002		BACKSHELL GASKET MEDIUM	EA	1.00

The KA 44B antenna installation kit P/N 050-01756-0020 contains the following parts:

PN	DESCRIPTION	REV
050-01756-0020	INSTALL KIT 48 FT MMDR KA 44B SO-160D	A

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	-0020
	030-00101-0000		PANEL MNT PLUG	EA	1.00
	057-02259-0000		ANT MTG TEMPLATE	EA	1.00
	057-05944-0074		KA 44B KIT TSO LABEL	EA	1.00
	076-01042-0001		FERRULE W/F	EA	1.00
	090-00019-0007		RING RTNR .438	EA	1.00
	091-00031-0005		NY CA CLAMP .312	EA	1.00
	200-02586-0020		ANT CBL ASSY 48FT KA 44B DO-160D	EA	1.00

The KA 44B antenna cable assembly P/N 200-02586-0020 contains the following parts:

PN	DESCRIPTION	REV
200-02586-0020	ANT CBL ASSY 48FT KA 44B DO-160D	E

SYMBOL	PART NUMBER	FIND NO	DESCRIPTION	UM	-0020
	025-00001-0000		WIRE, HOOKUP, PTFE, 26 (7/34)AWG SPC, BLK	IN	8.20
	025-05120-0000		WIRE, TIN PLTD CU SHLD, 5-24 (19/36)AWG TPC COND	IN	578.00
	026-00029-0000		WIRE, CU, 22AWG, TINNED	IN	3.00
	030-01157-0011		SOCKET CRMP 20G	EA	9.00
	030-01171-0000		CONN SUB-D HSG 9S (FEMALE PINS)	EA	1.00
	030-02351-0000		HOOD/LVR ASSY ST E	EA	1.00
	150-00024-0010		TUBING SHRINK 10G	IN	2.00
	150-00049-0010		SHRINK TUBING WHT	IN	.75
	150-00052-0010		SHRNK TUBING WHT	IN	4.50
	300-02586-0020		ANTENNA CABLE INTERCONNECT KA 44B DO-160D	RF	.00
	53001150-1		50 OHM QUADRAXIAL CABLE	FT	48.17

1.5 ACCESSORIES REQUIRED, BUT NOT SUPPLIED

A. Broadband Communications Antenna (50 ohms)

B. VHF Navigation Antenna (50 ohms)

C. Glideslope Antenna

D. Antenna Splitter(s)

E. ADF Antenna (representative type KA 44B)

The KA 44B, P/N 071-1234-XX, is a low profile ADF Antenna which contains both loop and sense antennas, preamplifiers, and modulators which combine the antenna signals into a single RF signal which is output to the KTR 2280 via a quadaxial cable of non-critical length. The KA 44B is available in four versions. KA 44B antenna P/N 071-1234-00/03 includes a mounting plate. KA 44B P/N 071-1234-01 includes a grounding ring. KA 44B P/N 071-1234-02 has no mounting plate and has the QE adjust accessible vertically.

1.6 LICENSING REQUIREMENTS

The KTR 2280 meets CFR Title 47, Part 15 and Part 2 (FCC Approvals) for all radio equipment. For non-US registered aircraft, follow applicable licensing requirements as required.

The Federal Communications Commission requires that the operator of the transmitter of this equipment hold a restricted radio telephone operators permit (FCC Form 605) or higher class license. A permit may be obtained by a U.S. citizen from the nearest field office of the FCC; no examination is required. An Aircraft Station License is required for this equipment. Forms (FCC Form 605, New Aircraft Station License, or FCC Form 405A, Renewal of Aircraft Station License) can be obtained from the nearest FCC Field Office. This equipment has been type accepted by the FCC and entered on their list of type accepted equipment as Honeywell KTR 2280 and must be identified as Honeywell KTR 2280 on FCC Form 605, Aircraft Radio Station License Application.

CAUTION: THE VHF TRANSMITTER IN THIS EQUIPMENT IS GUARANTEED TO MEET FEDERAL COMMUNICATIONS COMMISSION ACCEPTANCE OVER THE OPERATING TEMPERATURE RANGE ONLY WHEN A HONEYWELL CRYSTAL IS USED IN THE STABILIZED MASTER OSCILLATOR. USE OF OTHER THAN HONEYWELL CRYSTALS IS CONSIDERED AN UNAUTHORIZED MODIFICATION, AND WILL VOID THE WARRANTY.

1.7 CONTINUED AIRWORTHINESS INSTRUCTIONS

1.7.1 EQUIPMENT

The instructions for continued airworthiness given in the TC or STC approvals for this product supplements or supersedes the instructions for continued airworthiness in this manual.

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

14 CFR Part 25.1529 Instructions for Continued Airworthiness is met per the following instructions:

A. The removal of the equipment is on the condition of failure. There is no required maintenance

1.7.2 WIRES/COAX CABLES

During on-condition or regularly scheduled maintenance, inspect the wires and coax cables following the guidelines listed in AC 43.13-1B Chapter 11, 12 as necessary.

1.8 ANTENNA RF EXPOSURE

WARNING: TO MINIMIZE RF EXPOSURE TO PERSONNEL, INSTALL THE ANTENNA GENERALLY AWAY FROM AREAS WHERE PEOPLE ARE LOCATED. IN SITUATIONS WHERE A PERSON WOULD BE DIRECTLY EXPOSED TO ANTENNA RADIATION, SUCH AS IN A COMPOSITE AIRCRAFT, A MINIMUM SEPARATION OF 1.97 FT (60 CM) IS GENERALLY REQUIRED BETWEEN ANY PART OF THE ANTENNA AND ANY LOCATION WHERE A PERSON MAY BE PERMANENTLY SEATED IN THE AIRCRAFT. LESSER SEPARATION IS ACCEPTABLE IN AN AIRCRAFT WHERE METAL SKIN SHIELDS THE OCCUPANTS FROM THE ANTENNA.

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SECTION 2
INSTALLATION

2.1 GENERAL INFORMATION

This section contains general suggestions and information to consider before installation of the KXP 2290. Close adherence to these suggestions will assure optimum performance from the equipment.

NOTE: The conditions and test required for the TSO/ETSO and MOPS approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or with a specified type or class of aircraft to determine that the aircraft installation conditions are within the TSO/ETSO and MOPS standards. These articles must have separate approval for installation in an aircraft. Any features in this equipment outside the requirements of this applicable TSO/ETSO and MOPS must be evaluated and approved as part of the installation approval. The article may be installed only if further evaluation by the applicant confirms that the installation is acceptable and is approved by the Administrator.

2.2 UNPACKING AND INSPECTING EQUIPMENT

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

2.3 EQUIPMENT INSTALLATION

2.3.1 AVIONICS COOLING REQUIREMENTS

The unit is cooled by a fan internal to the unit and one attached to the rear rack assembly plate, the latter being a part of the installation (see FIGURE 2-3 KTR 2280 INSTALLATION DRAWING). During installation, do not block any holes in the unit cover(s) which would restrict air flow.

2.3.2 EQUIPMENT LOCATION

The following paragraphs contain information pertaining to the initial installation of the KTR 2280 MMDR, including instructions concerning the location and mounting of the supporting antenna(s).

The equipment should be installed in the aircraft in a manner consistent with acceptable workmanship and engineering practices and in accordance with the instructions set forth in this publication. To ensure that the system has been properly and safely installed in the aircraft, the installer should make a through visual inspection and conduct an overall operational check of the system on the ground prior to flight.

The installation should be in accordance with standards established by the customer's installing agency and existing conditions as to unit location and type of installation; however, the following should be considered before installing the system in order to assure a more satisfactory performance from the equipment.

NOTE: The TSO identifies the minimum performance standards, tests, and other conditions applicable for issuance of design and production approval of the article. The TSO applicant is responsible for documenting all limitations and conditions suitable for installation of the article. An applicant requesting approval for installation of the article within a specific type or class of product is responsible for determining environmental and functional compatibility.

Care should be exercised to avoid mounting components near equipment operating with high pulse current or high power outputs such as radar and satellite communications equipment. In general, the equipment should be installed in a location convenient for operation, inspection, and maintenance, and in an area consistent with the TSO environmental limits. Determine the mounting location for system components following the guidelines below.

2.3.2.1 MOUNTING TRAY LOCATION(S)

The KTR 2280 MMDR mounting tray is blind-mounted behind the APEX cockpit panel configuration.

2.3.2.2 ANTENNA(S)

The antenna(s) should be well removed from other antenna projections, the engine(s), and propeller(s). It should also be well removed from landing gear doors, access doors, or other openings which will break the ground plane for the antenna(s). On metal skinned aircraft, the antenna(s) should be bonded to the surface of the aircraft in a fore to aft location that provides the flattest ground plane. On composite aircraft, the antenna(s) should be a located at the center of a conductive ground plane, contoured to the shape of the aircraft, having dimensions of at least 2 feet by 2 feet. The antenna penetration should be designed such that the structural integrity of the fuselage is not compromised.

The antenna(s) need to be within 5 degrees of the centerline

Where practical, plan the antenna location(s) to keep cable lengths as short as possible and avoid sharp bends in the cable to minimize the VSWR.

Avoid running other cables or wires near the antenna cable(s).

On pressurized aircraft, the antenna(s) should be sealed using an approved sealant, such as RTV No. 3145 (P/N 016-01082-0000) or equivalent, around the connector and mounting hardware.

The antenna mounting(s) should be sealed from the outside for moisture protection using RTV or equivalent.

Mount the antenna(s) in as clean as environment as possible, away from exhaust gases and oils. The antenna(s) should be kept clean. If left dirty (oil covered), the antenna performance may be affected.

2.3.3 KTR 2280 MECHANICAL INSTALLATION

The mounting tray for the MMDR should be mounted using the dimensions specified in the outline and mounting drawing, FIGURE 2-3 KTR 2280 INSTALLATION DRAWING. Install the unit per the following:

(1) Slide the MMDR into the tray until the locking rod engages the nut on the back of the rack.

(2) Using an Allen wrench, turn the locking rod clockwise until it has drawn the unit into the rack and mating connectors and is tight.

CAUTION: DO NOT OVERTIGHTEN THE LOCKING ROD

To remove the unit, turn the securing rod counter clockwise until it disengages from the mounting tray. Then, pull the unit out of the mounting rack

For additional KXP 2290 installation information, refer to FIGURE 2-3 KTR 2280 INSTALLATION DRAWING as required

2.3.4 ANTENNA MECHANICAL INSTALLATION

2.3.4.1 VHF COM TRANSMITTER/RECEIVER ANTENNA

The VHF COM antenna should be mounted as far away as possible (8 feet, minimum) from other similar antennas and the vertical stabilizer. Mounting the COM antenna as far away as possible from the navigation antenna will help reduce COM to NAV interference. The COM antenna should also be mounted as far away as possible from an ELT antenna to prevent distortion of the radiated pattern and to prevent radiated broadband noise from the ELT when excited by the COM transmissions. Radiated broadband noise from an ELT is a common cause of COM-to-COM and COM-to-NAV interference. Mounting one antenna on top of the fuselage at the highest location to ensure a good radiation pattern and the other on the bottom of the fuselage offers good separation with a minimum of interaction.

It is recommended that a COM be connected to the top antenna for good ground communication and that the other COM be connected to the bottom antenna to provide good airborne communications. If mounting antennas on the same side of the aircraft is unavoidable, maintain the minimum allowable separation (8 feet).

The antenna should be mounted on a section of the aircraft that is horizontal during cruise flight. The base of the antenna should be well bonded to the metal aircraft skin. Remove any paint from around the mounting holes to ensure a good connection between the antenna and the skin. The metal aircraft skin at the base of the antenna should extend a minimum of twenty-four inches in every direction. This provides the ground plane required for the antenna. Any less metallized area will result in reduced communication range at some bearings around the aircraft and may increase interference to and from other systems.

The COM transceiver performance depends heavily on the integrity of the electrical bonding to the airframe and also the electrical integrity of the aircraft structure. If the electrical resistance between an antenna and the aircraft or between adjacent skin panels change intermittently, noisy communications may result.

Connect the antenna to the COM unit with 50 ohm coaxial cable, keeping the cable length to a minimum and avoiding sharp bends in the cable. Keep the COM antenna cable as far away from other antenna cables as possible and do not bundle several cables together.

Use Dow-Corning DC-4, or equivalent, on both inside and outside of the connector and its mate as an effective barrier against moisture and to prevent corrosion.

2.3.4.2 NAVIGATION ANTENNAS

The NAV antenna should be well removed from other antennas, projections, engines or propellers. It should have a clear line of sight area if possible. The antenna must be mounted symmetrically with the center line of the aircraft. Avoid running other coaxial cables and wires near the NAV antenna cable.

The VOR/LOC antenna with Glideslope is a two piece dipole with one part mounted on each side of the vertical stabilizer. It should be installed on the upper section of the vertical stabilizer of single finned aircraft and be at least 28 inches (measured vertically) from the horizontal stabilizer.

On dual VOR/ILS installations, it is recommended that a splitter be used to divide signals from a single VOR/LOC antenna into two or more receivers. Use double shielded cables to reduce interference to the receivers.

2.3.4.3 KA 44B ADF ANTENNA

The antenna installation will determine, to a large extent, whether the ADF will give optimum performance (refer to FIGURE 2-5 KA 44B OUTLINE AND MOUNTING DRAWING (-0000) / FIGURE 2-6 KA 44B OUTLINE AND MOUNTING DRAWING (-0010) as required. The KA 44B antenna contains both the loop and sense antennas. The following considerations should be taken into account before selecting a location for the antenna:

CAUTION: KEEP THE ANTENNA AT LEAST 4 FEET AWAY FROM DME OR TRANSPONDER ANTENNAS TO MINIMIZE L-BAND INTERFERENCE. THE ANTENNA SHOULD BE MOUNTED WELL CLEAR OF THE AIRCRAFT GENERATOR/ALTERNATOR AND WELL CLEAR OF ANY GENERATOR/ALTERNATOR CABLES.

CAUTION: DO NOT ROUTE THE CABLES ALONG WITH HIGH LEVEL TRANSMITTING CABLES. DO NOT ROUTE THE CABLES WITH OR NEAR ALTERNATOR OR 400HZ CABLES. MAKE SURE THAT THE CABLES DO NOT INTERFERE WITH ANY OF THE AIRCRAFT CONTROL CABLES.

- Mount the antenna on the center line of the aircraft fuselage. Failure to do so may result in excessive Q.E. error.
- If the antenna is to be top mounted, select a location where shadowing from the wings, etc., is minimized.
- The antenna should be well removed from any projections such as engines and propellers, as well as landing gear doors, access doors or other openings which will break the ground plane for the antenna.
- Use the template included in the installation kit to mark the mounting holes on the aircraft fuselage.
- Drill and/or punch the required holes.
- Use a piece of fine sandpaper or emery cloth to sand the area on the fuselage skin on which the doubler plate is to be mounted.
- Apply Alumiprep No. 33, P/N 016-01127-0000, to both the inside area of the fuselage and the back of the doubler plate, following the directions on the container to cleanse the metal of any residue.
- Apply Alodine No. 1001, P/N 016-00128-0000, to both locations following the directions on the container. This is used to ensure good bonding and prevent oxidation.
- Refer to the installation manual and mount the antenna as shown. First rivet the doubler plate in place. It is imperative that the doubler plate make a good ground plane contact with the inside of the aircraft skin.

2.3.5 ELECTRICAL INSTALLATION

2.3.5.1 KTR 2280 INTERCONNECTION AND CABLE HARNESS FABRICATION

NOTE: The only current KTR 2280 installation option is as a part of the APEX system. For detailed interconnection information relating to a specific installation, refer to the applicable APEX system installation manual and/or engineering bulletin (EB).

The KTR 2280 MMDR receives primary power from the aircraft power source. Power connections, voltage requirements, and circuit breaker requirements may be found in the APEX system installation manual and/or engineering bulletin (EB) for a specific installation.

The length of the wires to parallel pins should be approximately the same length, so that the best distribution of current can be effected. Honeywell recommends that all wires, including spares, as provided with the interconnect definition information be included in the fabrication of the wiring harness. However; if full wiring is not desired, the installer should ensure that the minimum wiring requirements for the features and functions to be used have been incorporated.

When cables are installed in the aircraft, they must be supported firmly enough to prevent movement and should be carefully protected against chaffing. Additional protection should also be provided in all locations where the cable may be subjected to abuse.

In wire bundles, the cabling should not be tied tightly together as this tends to increase the possibility of noise pickup and similar interference. When routing cables through the aircraft the cables should cross high level rf lines at right angles.

Prior to installing any equipment, make a continuity check of all wires and cables associated with the system. Then apply power and check for proper voltages at system connectors, and then remove power before completing the installation.

The following guidelines are recommended:

(1) The installing facility will supply and fabricate all external cables. The required connectors are supplied as part of the installation kit (P/N 050-03451-0000).

(2) The unit must be kept a minimum of three feet from the antenna. Additionally, the antenna coax cable should not be bundled with the other wiring harnesses to the unit.

(3) The length and routing of the external cables must be carefully planned before attempting the actual installation. Avoid sharp bends or locating the cable near aircraft control cables. The cables should be of a length to allow for a “maintenance loop”. That is, the length should be adequate to access and extend the connectors aft of the panel for future maintenance purposes. Excess cabling should be secured and stowed by tie-wrapping until such maintenance is required.

(4) The cables should be supported firmly enough to prevent movement. They should be carefully protected wherever one may chafe against another or against some other object. Extra protection should be provided in all locations where the cables may be subject to abuse. Shields on shielded wires should be grounded in accordance with the system interconnection information.

(5) Shields should be carried through any obstruction via a thru-bulkhead connector. If shielding cannot be carried through by use of a bulkhead/connector pin, precautions should be taken to ensure each segment of the shielded lead be grounded at only one point. A ground connection of not more than two inches in length should be used. The preceding discussion does not apply to coaxial and quadraxial cable.

(6) Avoid routing cabling near high noise and high power sources.

2.3.5.2 PRIMARY POWER AND CIRCUIT BREAKER REQUIREMENTS

The KTR 2280 MMDR receives primary power from the aircraft power circuit breakers. Power connections, wire sizes, and circuit breaker requirements may be found in the APEX system installation manual and/or engineering bulletin (EB) for a specific installation.

2.3.5.3 CONNECTOR PIN FUNCTIONAL DESCRIPTIONS

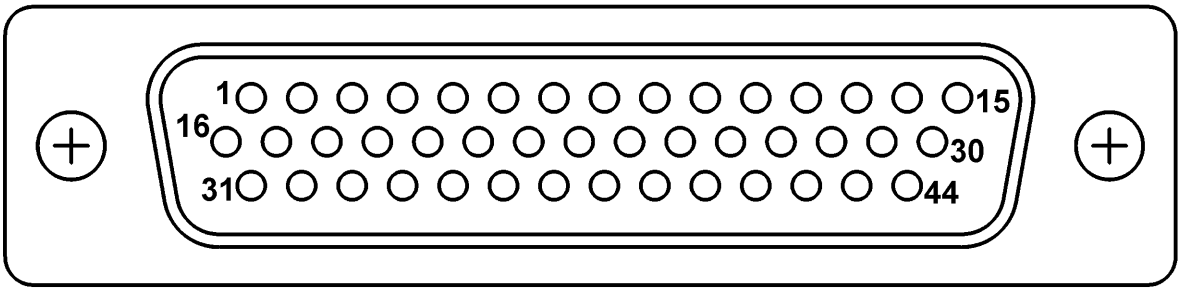

FIGURE 2-1 MAIN CONNECTOR - J1
Front View

Pin #	I/O	Description
1	O	A429 Out1 A
2	O	ADF Loop Enable OUT
3	I	TEST
4	I	Unit Pos PGM 1
5	I	Unit Pos PGM 2
6	I	COM TX Interlock* IN
7	I	COM MIC Key* IN
8	O	RS-422 RX A
9	O	RS-422 RX B
10	I	RS-422 TX A
11	I	RS-422 TX B
12	I	COM MIC GND
13	N.A.	Spare
14	O	ADF Audio LO OUT
15	O	ADF Audio HI OUT
16	O	A429 Out1 B
17	O	ADF MOD/0 OUT
18	O	A429 Out2 A
19	I	Unit Pos Parity
20	I	A429 IN1 A
21	N.A.	Spare
22	I	A429 IN2 A

TABLE 2-1 J1 PIN FUNCTION LIST

Pin #	I/O	Description
23	I	ADF ANT PWR Return
24	I	DC Return 1
25	I	DC Power 2 IN
26	I	Emergency Channel
27	I	COM MIC Audio IN
28	N.A.	Spare
29	O	NAV Audio LO OUT
30	O	NAV Audio HI OUT
31	O	ADF 32 HZ/90 OUT
32	O	A429 Out2 B
33	O	MMDS FAN 5V OUT
34	I	A429 IN1 B
35	N.A.	Spare
36	I	A429 IN2 B
37	I	Pgm Pin Common
38	O	ADF ANT PWR OUT
39	I	DC Power 1 IN
40	I	DC Return 2
41	I	Download
42	I	ON*
43	O	COM Audio/Sidetone LO OUT
44	O	COM Audio/Sidetone LO OUT

TABLE 2-1 J1 PIN FUNCTION LIST

Connector	Pin	I/O	Description
J101	1	I/O	COM RF
J102	1	I	ADF RF IN
J103	1	I	NAV RF IN
J104	1	I	Glideslope RF IN

TABLE 2-2 ANTENNA CONNECTORS AND DESCRIPTIONS

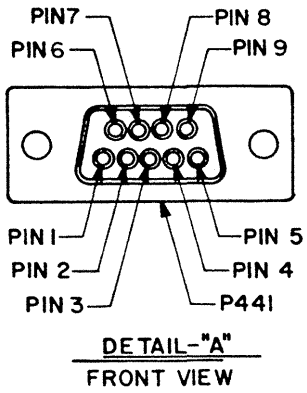

FIGURE 2-2 KA 44/44B PIN LOCATION DIAGRAM

PIN	I/O	SIGNAL NAME
1	I	ANTENNA POWER
2	I	LOOP ENABLE
3	O	RF INPUT
4	I	32Hz +/-90 DEG.
5	I	32Hz 0 DEG.
6		NO CONNECTION
7		GROUND
8		CENTER SHIELD GND
9		OUTER SHIELD GND

TABLE 2-3 KA 44B PIN FUNCTION LIST

2.3.5.4 CRIMP TOOL INFORMATION

The following is a listing of crimp tools and accessories for use with the KTR 2280.

SOURCE *	CRIMP TOOL	POSITIONER 22-30 AWG **	INSERTION/EXTRACTION TOOL
HONEYWELL	005-02012-0034	Not Available	Not Available
MIL-SPEC	M22520/2-01	M22520/2-06	M81969/1-04 ***
DANIELS MFG.	AFM8 (M22520/2-01)	K41 (M22520/2-06)	
POSITRONICS	9507-0-0	9502-3 (K41)	
ASTRO (BUCHANAN)	615717 (M22520/2-01)	615722 (M22520/2-06)	

* All source tools and positioners are to Mil-Spec Standard and are interchangeable.
** Positioner wire gauge (AWG) refers to barrel only.
*** SUPERCEDES MIL SPEC P/N M24308/18-1. ORDER FROM POSITRONICS, DANIELS, OR ASTRO BY MIL SPEC P/N.

NOTE: Selections in parentheses denote optional ordering number from source.

Vendor Ordering Information:

Astro Tool Company
21615 SW TV Hwy, Beaverton, OR 97006
(503) 642-9853 * Fax: 503-591-7766 * Email: sales@astrotool.com

Daniels Manufacturing Company (DMC)
526 Thorpe Road, Orlando, FL 32824-8133 USA
Tel: 407-855-6161 * Fax: 407-855-6884 * Email: dmc@dmctools.com

Positronics Industries, Inc.
423 N. Campbell Ave P.O. Box 8247, Springfield, MO 65801
Tel: 800-641-4054 * Fax: 417-866-4115 * Email: info@connectpositronics.com

TABLE 2-4 SIZE 22 HIGH DENSITY D-SUB CONTACT TOOLS

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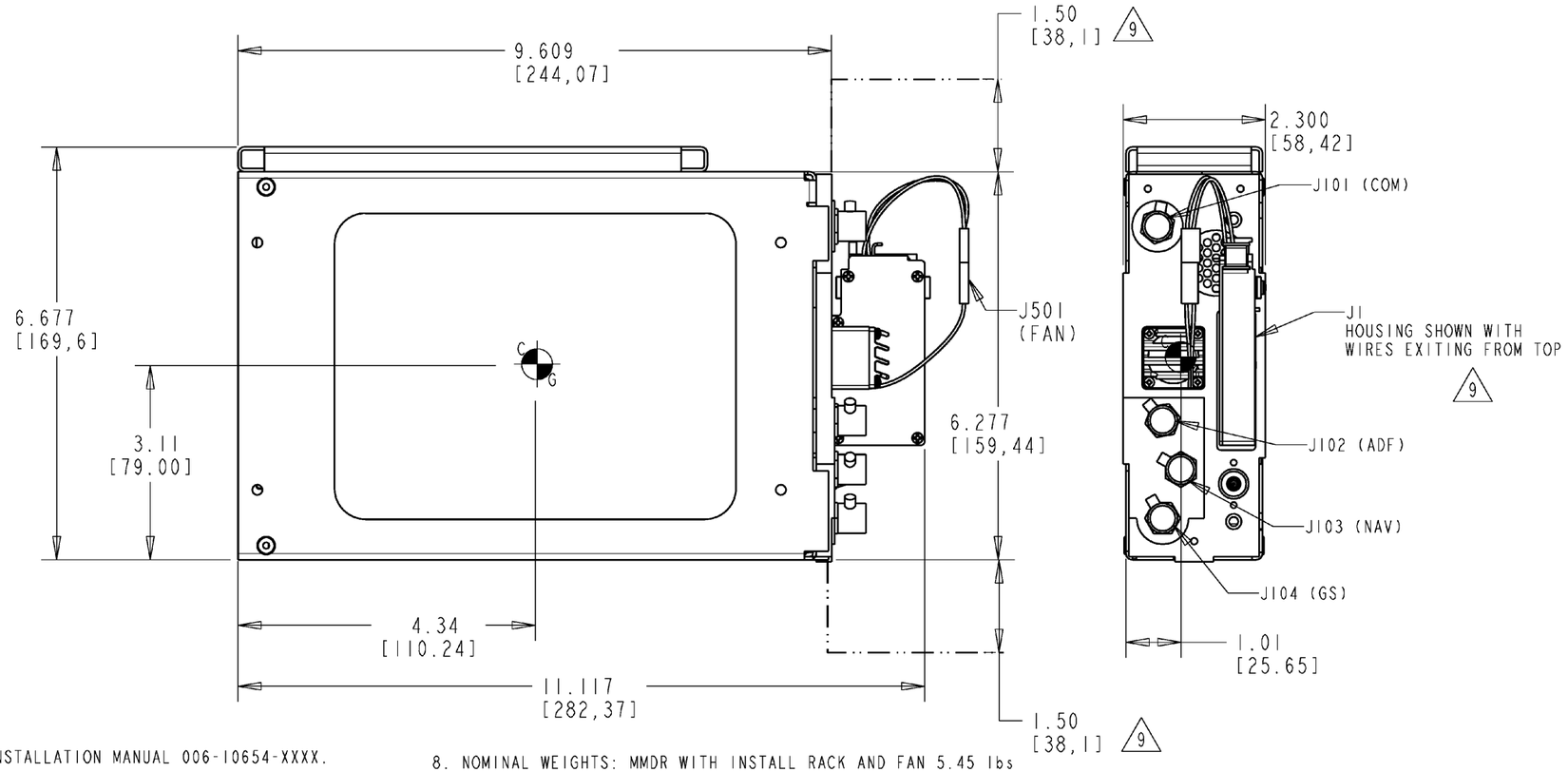

NOTES:

1. REFERENCE INSTALLATION MANUAL 006-10654-XXXX.

2. SHIELD BRAIDS ARE TO BE COMBED/TWISTED AND THREADED THROUGH THE SLOTS IN 073-01141-0002 AND CLAMPED TO BACKSHELLS USING 200-10452-0001 BAR CLAMP ASSEMBLIES.

3. CENTER OF GRAVITY (CG) LOCATIONS ARE APPROXIMATE AND DO NOT INCLUDE MATING CABLES.

4. DIMENSIONS ARE IN INCHES [MILLIMETERS].

5. IF A GROUND BOND OF 2.5 MILLIOHM MAX IMPENDENCE CANNOT BE ACHIEVED THROUGH THE MOUNTING SURFACES THE INSTALLER MAY USE A BOND STRAP FROM THE CONNECTOR HOUSING(S) TO THE AIRFRAME.

6. SECURE RACK WITH SIX STAINLESS STEEL FLATHEAD 100 DEG #6-32 SCREWS, SUCH AS MS24693-CXX (NOT INCLUDED).

7. REMOVE PROTECTIVE COVERS FROM CONNECTORS AND LOCKING ROD PRIOR TO INSTALLATION.

8. NOMINAL WEIGHTS: MMDR WITH INSTALL RACK AND FAN 5.45 lbs
INSTALL KIT .85 lbs

9. CONNECTOR HOUSING MAY BE INSTALLED WITH WIRES EXITING FROM TOP OR BOTTOM. ALLOW 1.50 INCHES OF CLEARANCE FROM TOP OR BOTTOM OF THE UNIT FOR PROPER WIRE BEND RADIUS.

THIS DRAWING IS NOT COMPLETE WITHOUT B/M 050-03721-0000

FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
(Dwg. 155-06081-0000 Rev. B, Sheet 1 of 4)

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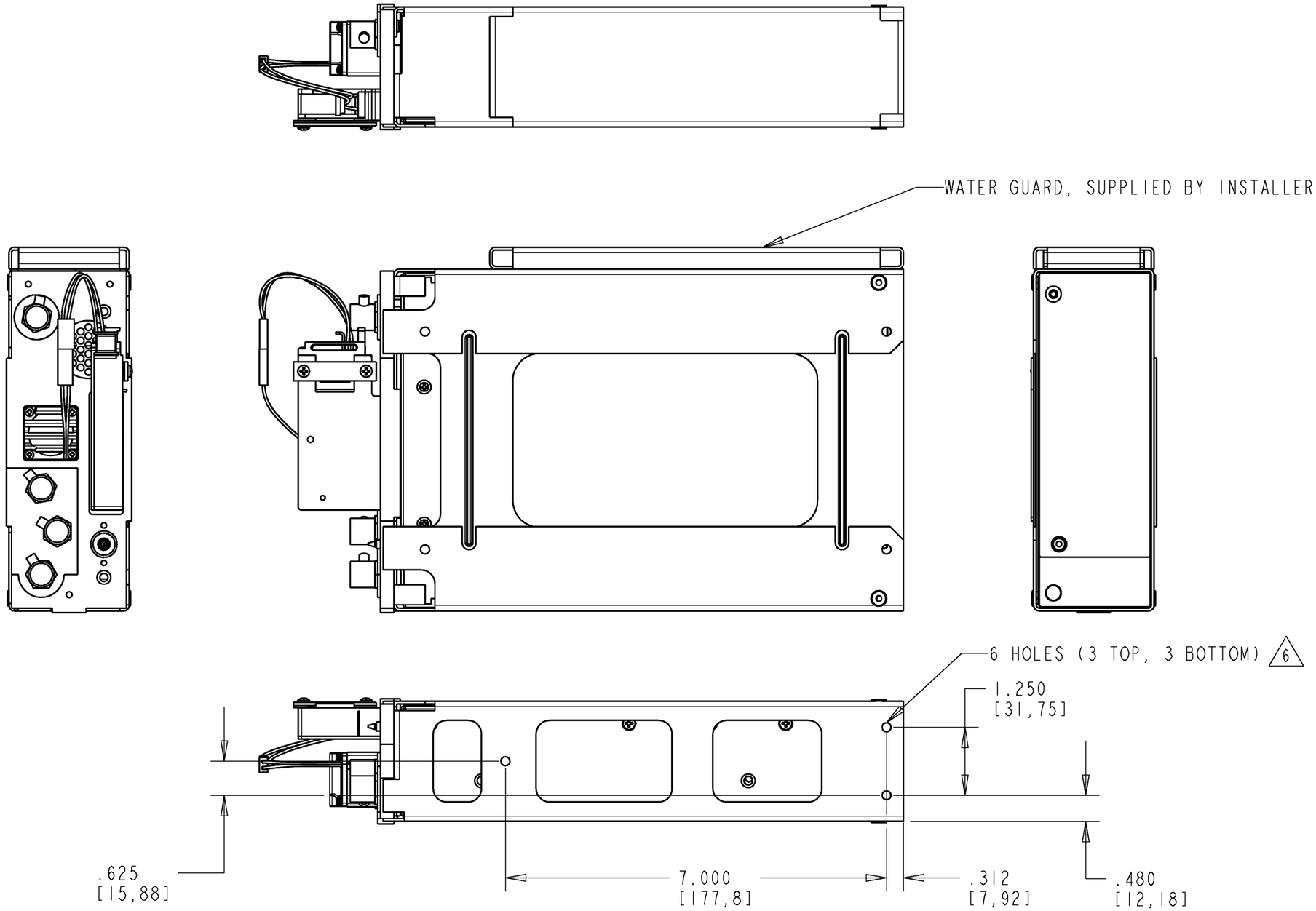

FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
(Dwg. 155-06081-0000 Rev. B, Sheet 2 of 4)

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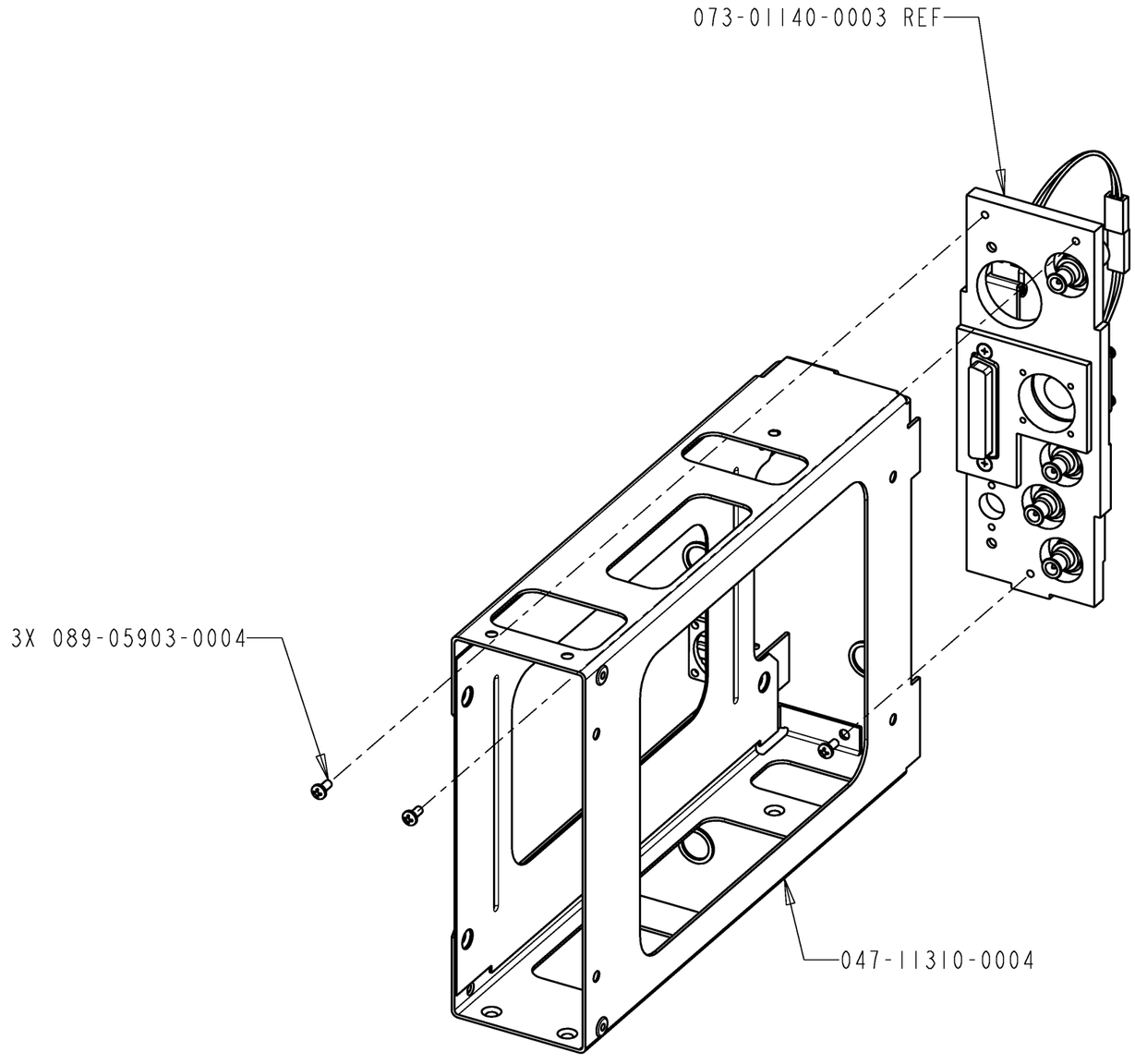

FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
(Dwg. 155-06081-0000 Rev. B, Sheet 3 of 4)

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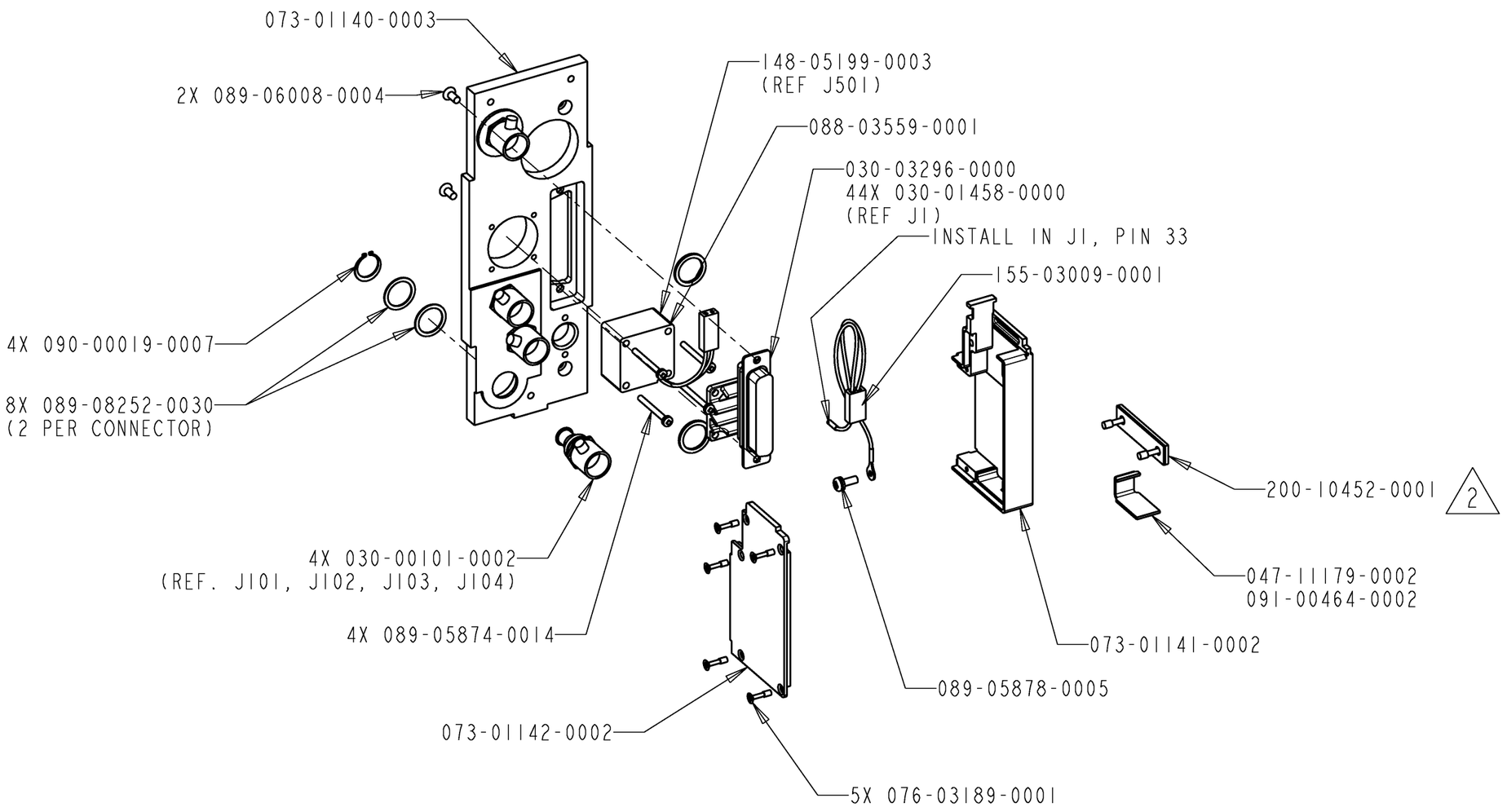

FIGURE 2-3 KTR 2280 INSTALLATION DRAWING
(Dwg. 155-06081-0000 Rev. B, Sheet 4 of 4)

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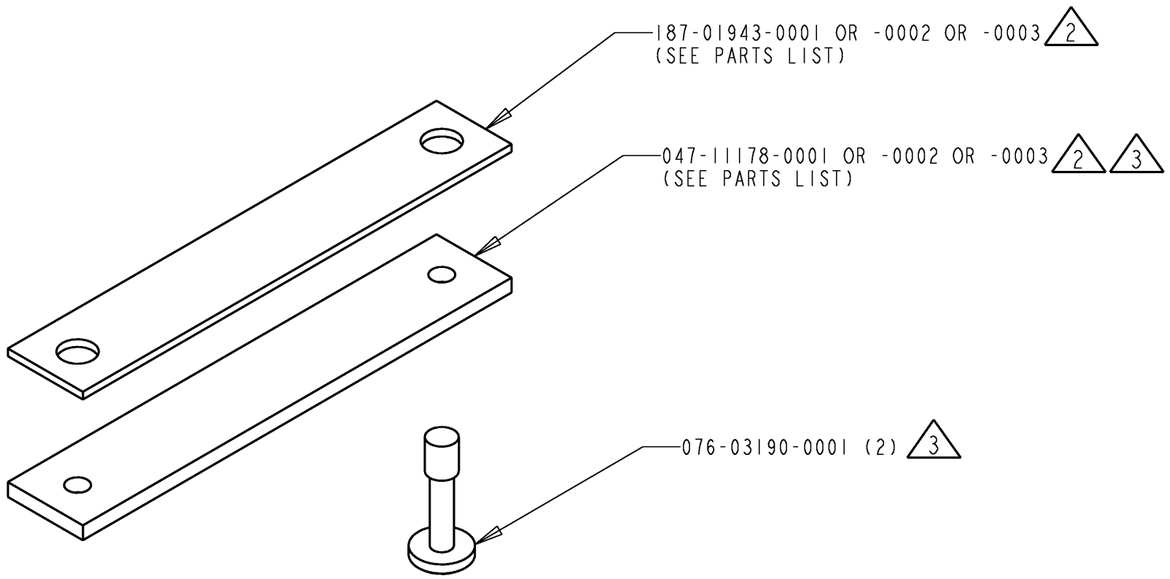

NOTES:

1. THIS DRAWING IS NOT COMPLETE WITHOUT PARTS LIST 200-10452-0000/0002.

2. PEEL LINER AND ADHERE 187-01943-XXXX TO 047-11178-XXXX, APPROXIMATELY ALIGNING THE EDGES.

3. THREAD 076-03190-0001 SCREWS THROUGH TAPPED HOLES IN 047-11178-XXXX.

FIGURE 2-4 KTR 2280 BAR CLAMP ASSEMBLY DRAWING
(300-10452-0000, Rev. -)

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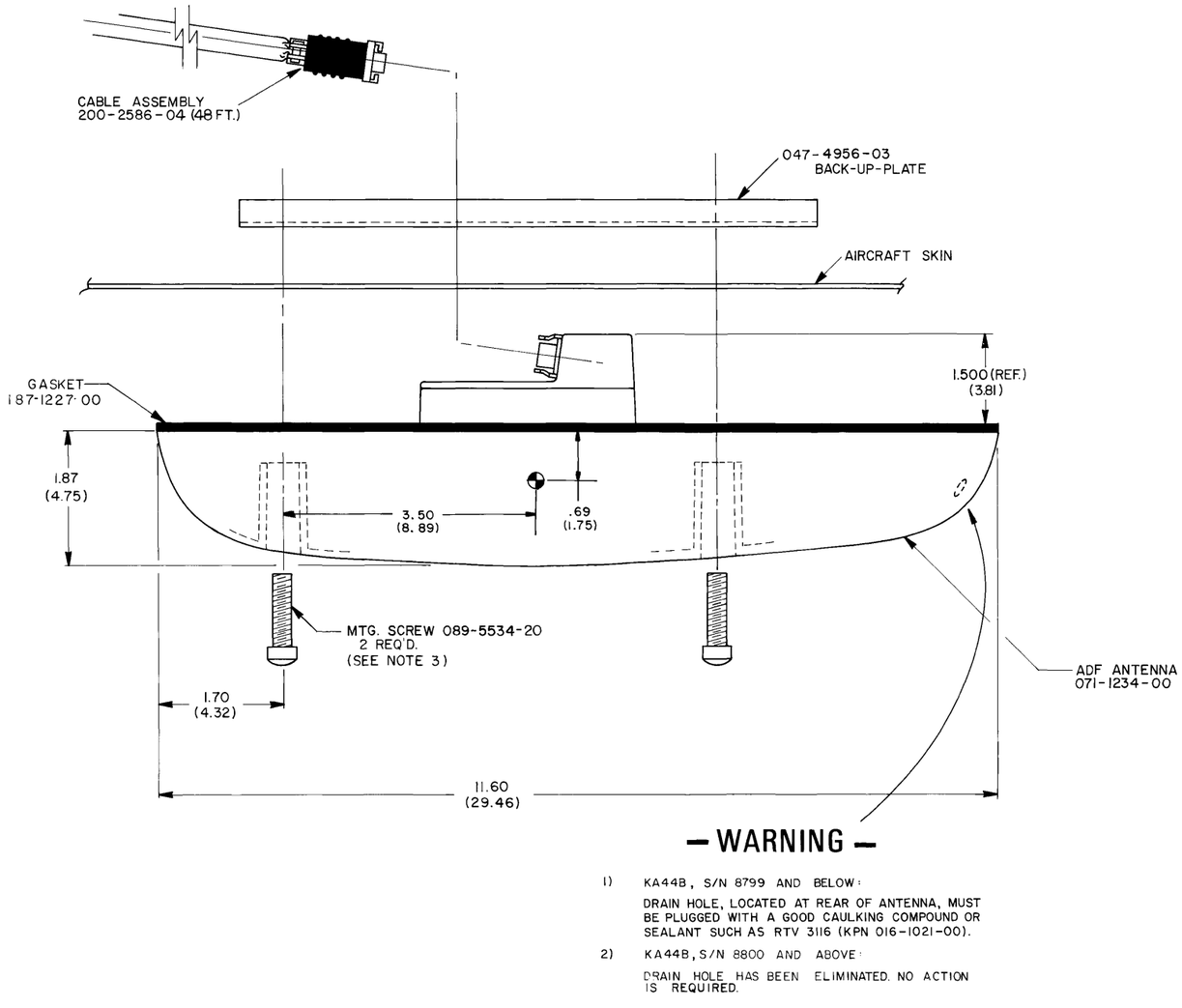

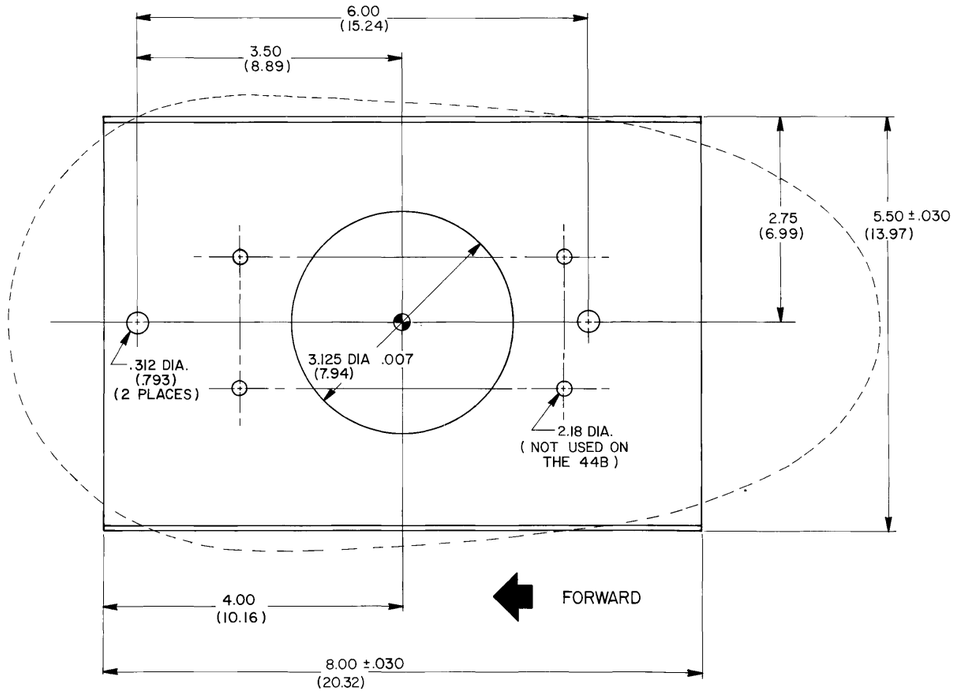

NOTES:

1. DIMENSIONS IN PARENTHESES ARE IN CENTIMETERS.
2. NOMINAL WEIGHT: 4.2 LBS. (1.89 Kg).
3. 2 EA. 089-05534-0036 SCREWS ARE ALSO SUPPLIED WITH ANTENNA FOR INSTALLATIONS THAT REQUIRE LONGER MOUNTING SCREWS.
4. MOUNTING SCREW HOLES MUST BE FILLED WITH SEALANT SUCH AS RTV 3116 (KPN 016-01021-0000) IF ANTENNA IS TOP MOUNTED.

FIGURE 2-5 KA 44B OUTLINE AND MOUNTING DRAWING (-0000)
(Dwg No 155-05334-0000 R-9)

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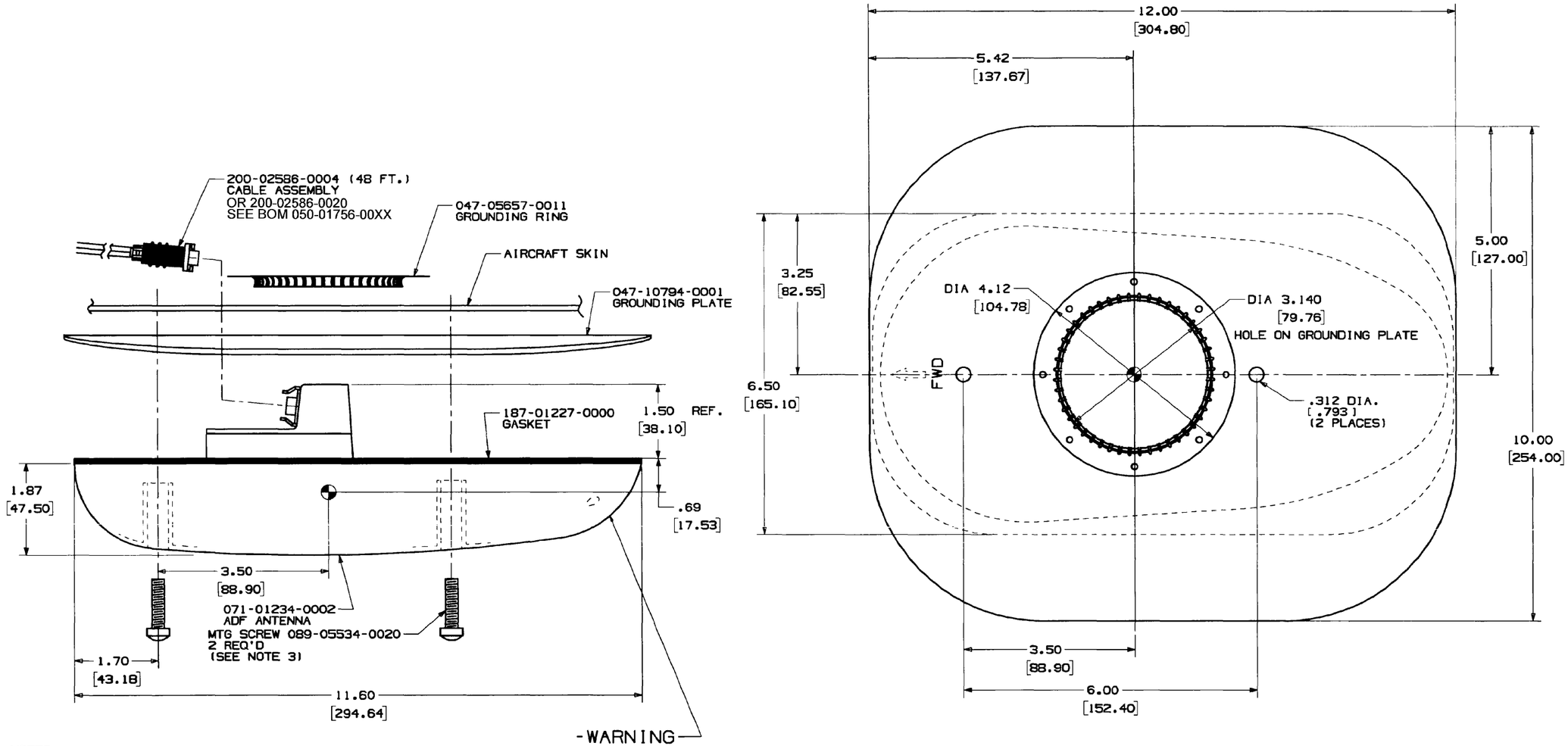

NOTES:

1. DIMENSIONS ARE IN INCHES, [ ] IN MILLIMETERS.
2. NOMINAL WEIGHT: 4.2 LBS. (1.89 Kg).
3. SCREWS 089-05534-0038 (2 EACH) ARE ALSO SUPPLIED WITH ANTENNA FOR INSTALLATIONS THAT REQUIRE LONGER MOUNTING SCREWS.
4. MOUNTING SCREW HOLES MUST BE FILLED WITH SEALANT SUCH AS RTV 3116 (KPN 016-01021-0000) IF ANTENNA IS TOP MOUNTED.
5. GROUNDING RING (047-05657-0011) AND ADAPTER PLATE (047-10794-0001) ARE INSTALLED TO AIRCRAFT SKIN USING RIVETS. SUGGESTED RIVETS MS 2426 AD.

-WARNING

1. KA44B, S/N 8799 AND BELOW:

   DRAIN HOLE, LOCATED AT REAR OF ANTENNA, MUST BE PLUGGED WITH A GOOD CAULKING COMPOUND OR SEALANT SUCH AS RTV 3116 (KPN 016-01021-0000).

2. KA 44B, S/N 8800 AND ABOVE:

   DRAIN HOLE HAS BEEN ELIMINATED. NO ACTION IS REQUIRED.

FIGURE 2-6 KA 44B OUTLINE AND MOUNTING DRAWING (-0010)
(Dwg No 155-05334-0010 R-AA)

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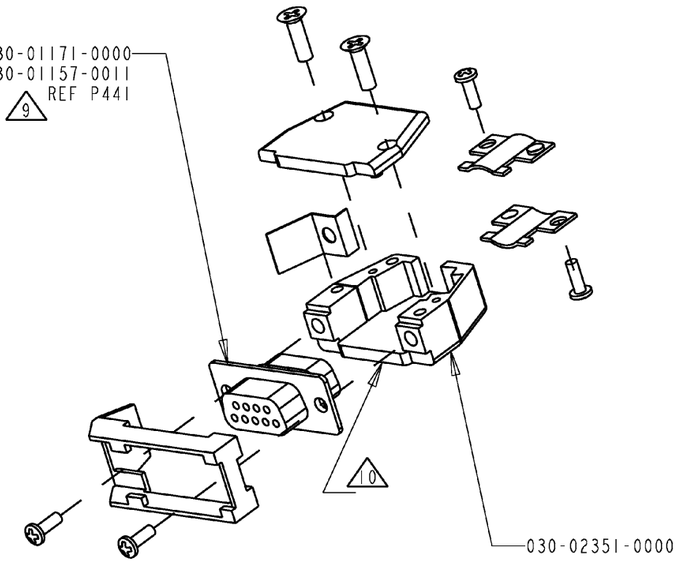
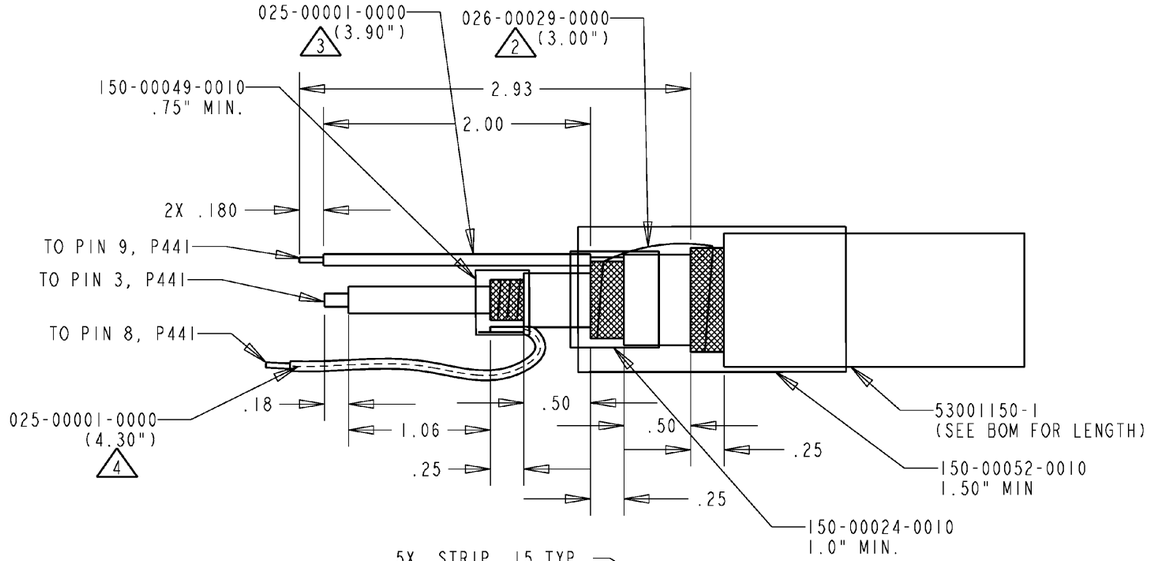
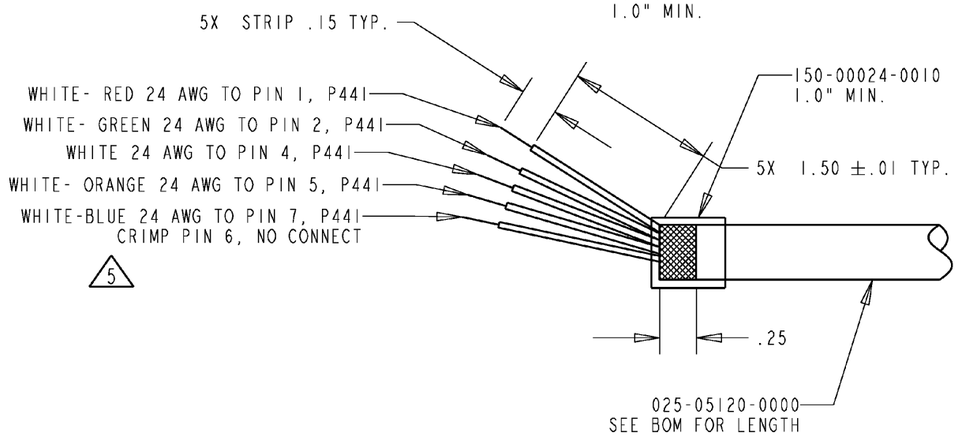
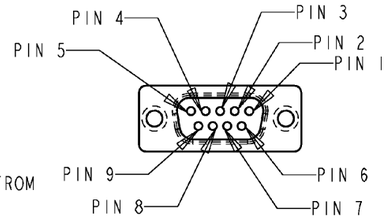


SCALE 1.000





DETAIL C
(NOT TO SCALE) 9



DETAIL "A"
SCALE 1.000

NOTES:

1. TOLERANCE ON OVERALL LENGTH ±2 INCHES PER 12 FOOT LENGTH.
2. CUT (026-00029-0000) TO 3.00". WIND ONE TURN OVER OUTER QUADRAX BRAID, THEN WIND ONE TURN OVER MIDDLE QUADRAX BRAID AND SOLDER TO OUTER AND MIDDLE QUADRAX BRAIDS.
3. CUT (025-00001-0000) TO 3.90". TRIM 1.40" INSULATION FROM ONE END AND .25 FROM THE OTHER END. WIND THREE TURNS FROM THE 1.40" END OVER BRAID, THEN LAY WIRE BACK OVER THESE TURNS AND SOLDER WIRE TO BRAID. COVER OUTER TWO BRAIDS WITH SHRINK SLEEVING (150-00024-0010).
4. CUT (025-00001-0000) TO 4.30". TRIM 1.30" INSULATION FROM ONE END AND .25" FROM THE OTHER END. WIND THREE TURNS FROM THE 1.30" END OVER BRAID, THEN LAY WIRE BACK OVER THESE TURNS AND SOLDER WIRE TO BRAID. COVER WITH SHRINK SLEEVING (150-00049-0010).
5. TRIM .15" OF INSULATION FROM THE END OF 5 WIRES IN CABLE (025-05120-0000).
6. NOTE DELETED
7. THIS DRAWING NOT COMPLETE WITHOUT PARTS LIST 200-02586-0020.
8. SECURE (53001150-1) AND (025-05120-0000) TOGETHER WITH 3" MIN. OF 150-00052-0010 APPROXIMATELY 1" FROM (150-00052-0010).
9. USE SHRINK SLEEVING 150-00052-0010 OVER WIRES ATTACHED TO (030-01157-0011) PINS.

10 IDENTIFICATION ACCORDANCE WITH SPEC. 001-01101-0000

FIGURE 2-7 KA 44B ANTENNA CABLE ASSEMBLY (-0020)
(Dwg No 300-02586-0020 R-E)

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2.4 POST-INSTALLATION CHECKS

2.4.1 KTR 2280 MMDR SYSTEM CHECKOUT

The post-installation test is used to apply power and functionally checkout the system. Successful completion of the post-installation test verifies the proper operation of the KTR 2280 MMDR.

TABLE 2-5 INSPECTION/CHECK PROCEDURE is a visual inspection/check procedure that should be performed after system installation as part of a system checkout. A post-installation test per paragraph 2.4.1.2 POST-INSTALLATION CHECKOUT/ OPERATION should be performed. In addition, the procedure should be used as a periodic maintenance inspection check.

EQUIPMENT	INSPECTION/CHECK PROCEDURE
KTR 2280 MMDR	A. Inspect external surface for damage. B. Check that the unit is securely installed and that retaining mechanism is securely tightened. C. Ensure that all connections in the mounting tray are properly mounted and secure.
Antennas	A. Inspect external surfaces for damage. B. Check that antenna is properly mounted and mounting screws are tight. C. Ensure that antenna coaxial cable connectors are properly mated and secure.

TABLE 2-5 INSPECTION/CHECK PROCEDURE

2.4.1.1 INSPECTION

Perform the following inspection on the overall system:

(1) Check that cables do not interfere with aircraft controls or other equipment.

(2) Check cabling for proper routing and check security of tie-down points. Inspect and adjust cable runs to ensure that cables are not strained, kinked, or severely twisted and are not exposed to rough or sharp surfaces.

2.4.1.2 POST-INSTALLATION CHECKOUT/OPERATION

(1) General

Installation of the MMDR system requires three stages of testing to ensure the proper operation of the MMDR. Initially, prior to the installation of the MMDR and antenna, a system interwiring check should be performed. This check verifies that the aircraft and all MMDR interconnections are correct before power is applied. After the units are installed a visual inspection of the equipment and connections is made. Finally, a ramp test is performed.

(2) System Interwiring Check

To check the aircraft and MMDR system interconnections proceed as follows:

(a) Check that all cables and interwiring are installed in accordance with the Interwiring and Cable Harness Fabrication instructions (paragraph 2.3.5.1 KTR 2280 INTERCONNECTION AND CABLE HARNESS FABRICATION).

(b) Using the applicable interconnection information, check wiring for proper destination, opens, and shorts.

(c) Check rf cables for insertion loss and VSWR.

(3) Visual Inspection

In conjunction with system installation, perform the inspection/check procedure (TABLE 2-5 INSPECTION/CHECK PROCEDURE).

(4) Post-Installation Test (Nav/Com Functionality)

Perform a ground check of the installation prior to the flight test. Using a local frequency, confirm that the COM 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 COM receiver sensitivity by increasing the squelch threshold. If possible, verify the communications capability on both the high and low end of the VHF COM 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 TRANSCEIVER 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.

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.

(5) Post-Installation Test (ADF Functionality)

A quick preliminary check can be made by tuning to a local AM broadcast station or a strong NDB station. Check for satisfactory audio (this should be done where clear reception is possible, preferably outside of the hanger).

(a) Quadrantal Error Adjustments

The system has been factory adjusted to compensate for a typical airframe. Therefore, little or no compensation should be required. Nonetheless, the KTR 2280 provides software adjustment of Quadrantal Error (the average amount of quadrantal error (QE) that exists due to the shape of the airframe). The values for these alignments are stored within the aircraft system maintenance computer and downloaded to the KTR 2280 on power up. If this download does not occur the KTR 2280 uses the last values that were loaded. In event that antenna skew and QE adjustment is required, follow the procedure outlined below.

1. Set the QE adjustment to 0.
2. Tune in a nearby broadcast station, NDB, or compass locator that gives a strong, clear signal free of fading. Position the aircraft on the ramp in an area that is clear of surrounding buildings, such that the indicator points to 0 degrees (i.e., the aircraft is heading directly toward the station). Note the aircraft heading.
3. Using the aircraft directional gyro or compass, turn the aircraft to the left 45 degrees. Note the indicated relative bearing and the amount of error. Continue to turn the aircraft, stopping ar each 45 degree point and noting the relative bearing error.

The errors at the 90 degree, 180 degree, and 270 degree points should be within +/- 5 degrees.

4. Using the following formulas calculate the Quadrantal Error:

Bearing_45 = Bearing from KTR 2280 when aircraft is turned 45 degrees left of the beacon.
Bearing_135 = Bearing from KTR 2280 when aircraft is turned 135 degrees left of the beacon.
Bearing_225 = Bearing from KTR 2280 when aircraft is turned 225 degrees left of the beacon.
Bearing_315 = Bearing from KTR 2280 when aircraft is turned 315 degrees left of the beacon.
QE_45 = Bearing_45 - 45
QE_135 = Bearing_135 - 135
QE_225 = Bearing_225 - 225
QE_3155 = Bearing_3155 - 315
QE = Average of QE_45, QE_135, QE_225, and QE_315.

(b) Operational Checks

The following operational checks are to verify proper operation of the ADF function of the KTR 2280 and can be made with the aircraft in the parking area.

1. Place the ADF in the ANT mode and tune in several known stations. Verify that audio reception is satisfactory and that volume control operation is normal. Verify that the ADF indicator needle is parked at the 90 degree position relative to the noise of the aircraft. Place the unit in the ADF mode and verify that the needle points to the station.

2. Select the BFO function to enter the BFO mode and verify that the BFO tone is present in the receiver audio (if a keyed CW station is used the tone heard will be the coded identifier).

SECTION 3
OPERATION

3.1 GENERAL

The radio tuning philosophy used on the display is based on an association between the tuning controls (knobs and buttons) and a graphical cursor that appears in the PFD tuning window.

Normally, the cursor is a cyan box that surrounds the frequency, code, or mode being controlled. The pilot positions the cursor by pressing the display bezel soft key located adjacent to the desired data field or by pressing a window focus shortcut control key on the MF Controller (MFC). For example, if the soft key adjacent to the NAV 1 tuning field on the pilot's PFD is pressed the cyan box cursor will move to the NAV 1 standby frequency field on that display. When the MF Controller is used the 'window focus' will be on the radio window indicating control is possible through the MF Controller and the joystick is used to move the cursor to the desired field.

The text is shown in the larger font size to enhance visibility while tuning. One second after the controller activity stops, the cursor reverts to the smaller font, but remains on the standby frequency field. Twenty seconds after the controller activity stops, the cursor defaults to the onside VHF COM standby frequency field as a cyan box.

3.2 RADIO TUNING WINDOW

The Radio Tuning window is in the lower right hand corner of the pilot's PFD and the lower left hand corner of the copilot's PFD. The cyan box surrounding the Radio Tuning window shows that the display focus is on the radio tuning, and the MF Controller can be used to control some of the radio functions. The cyan outline on the soft key identifier indicates the radio that any inputs will affect. The Very High Frequency (VHF) Communication (COM) tuning sub-window(s) are the first line(s) of the displayed radios, then the VHF Navigation (NAV) sub-window(s) and the Automatic Direction Finder (ADF) sub-window(s).

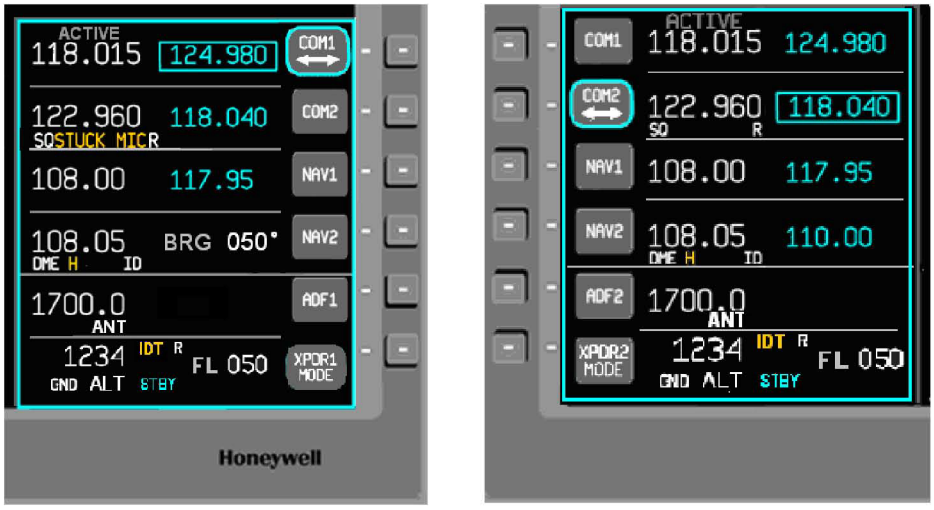

FIGURE 3-1 RADIO TUNING WINDOW

3.2.1 VHF COM TUNING SUB-WINDOW

The Pilot and Copilot VHF COM functions and display locations are as shown in the following examples of the VHF COM tuning sub-window.

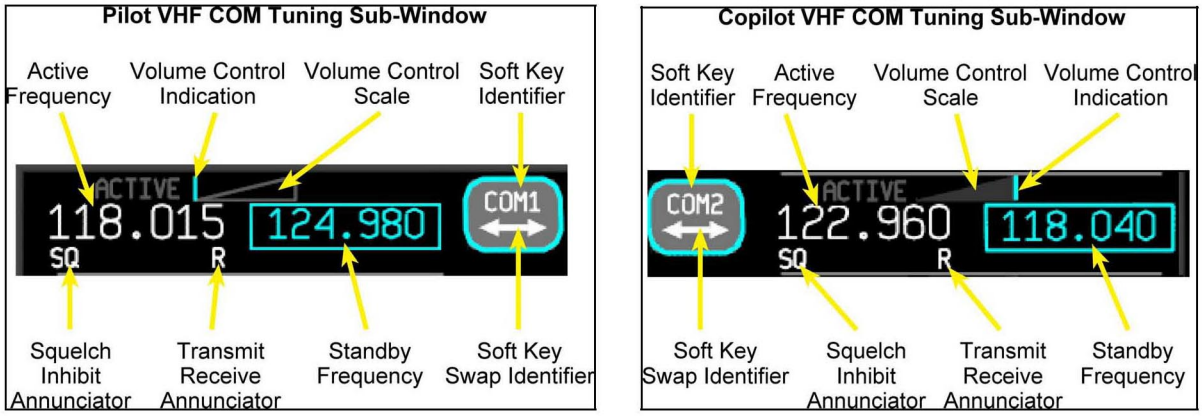

FIGURE 3-2 VHF COM TUNING SUB-WINDOW

3.2.1.1 ACTIVE FREQUENCY

The active COM frequency is displayed on the left side of the VHF COM tuning sub-window.

3.2.1.2 VOLUME CONTROL INDICATION/SCALE

The volume control scale and the indication of the current volume level are located at the top of the VHF COM tuning sub-window, above and between the active and standby frequencies. The volume scale is visible only when the volume knob is being rotated, and is automatically removed from the display one second after volume knob rotation ceases.

3.2.1.3 SOFT KEY IDENTIFIER/SOFT KEY SWAP IDENTIFIER

This shows the function of the soft key on the PFD bezel next to the identifier. The choices are COM, COM1, or COM2. The swap identifier indicates that pressing the soft key will swap the active and standby frequencies, and is only visible when the cursor is in the COM tuning sub-window and the radio is in active/standby tuning mode.

3.2.1.4 SQUELCH INHIBIT ANNUNCIATOR

Indicates that the Squelch Inhibit Mode is active.

3.2.1.5 TRANSMIT/RECEIVE ANNUNCIATOR

This annunciator indicates when the radio is transmitting (T) or receiving (R).

3.2.1.6 STANDBY FREQUENCY

The Standby COM frequency is displayed to the right of the active frequency in the VHF COM tuning sub-window.

3.2.1.7 STUCK MICROPHONE ANNUNCIATION

The STUCK MIC annunciator will be shown in amber in the VHF COM sub-window between the squelch inhibit annunciation and the receive/transmit annunciator when the VHF COM detects a stuck microphone.

FIGURE 3-3 STUCK MICROPHONE ANNUNCIATION

3.2.2 COM DETAIL WINDOW

The COM Detail window will be displayed when the cursor focus is on the COM tuning sub-window and the DETAIL button is pressed on either the PFD or MF Controller.

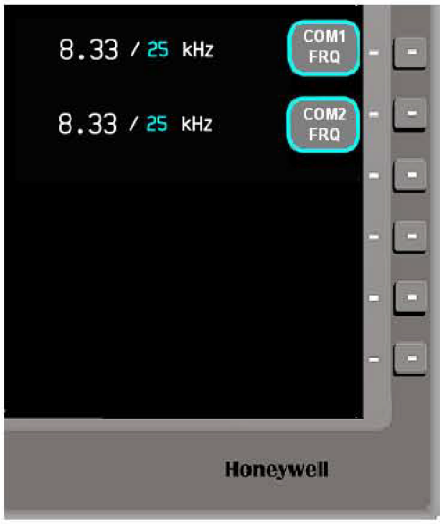

FIGURE 3-4 VHF COM DETAIL WINDOW

The COM frequency spacing selections are shown in the detail window. The active modes are shown with a large font in white, and the inactive modes are shown with a smaller font in cyan.

3.2.3 VHF NAV TUNING SUB-WINDOW

The Pilot and Copilot VHF NAV functions and display locations are as shown in the following examples of the VHF NAV tuning sub-window.

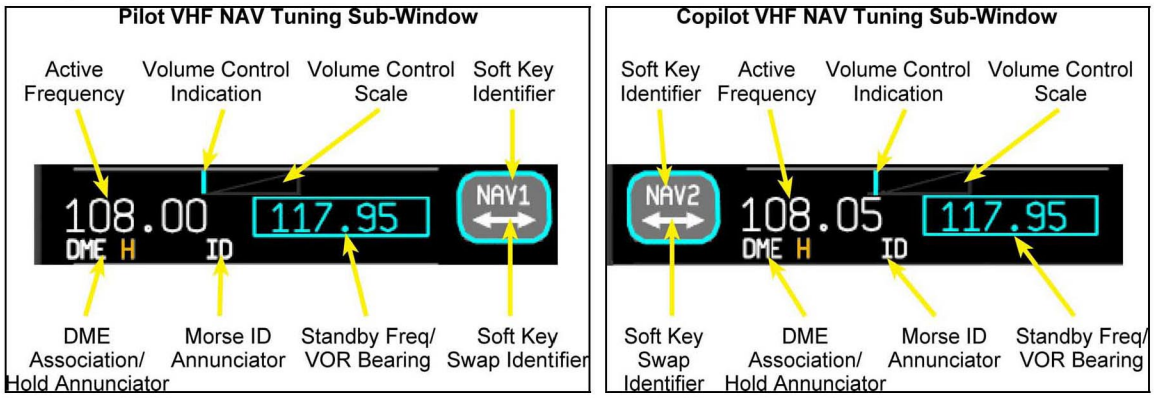

FIGURE 3-5 VHF NAV TUNING SUB-WINDOW

3.2.3.1 ACTIVE FREQUENCY

The active NAV frequency is displayed in white on the left side of the VHF NAV tuning sub-window.

3.2.3.2 VOLUME CONTROL INDICATION/SCALE

The volume control scale and the indication of the current volume level are located at the top of the VHF NAV tuning sub-window, above and between the active and standby frequencies. The volume scale is visible only when the volume knob is being rotated, and is automatically removed from the display one second after volume knob rotation ceases.

3.2.3.3 SOFT KEY IDENTIFIER/SOFT KEY SWAP IDENTIFIER

This shows the function of the soft key on the PFD bezel next to the identifier. The choices are NAV, NAV1, or NAV2. The swap identifier indicates that pressing the soft key will swap the active and standby frequencies, and is only visible when the cursor is in the NAV tuning sub-window and the radio is in active/standby tuning mode.

3.2.3.4 DME ASSOCIATION/HOLD ANNUNCIATOR

The DME association annunciator indicates which DME is associated with the NAV radio. The choices are DME (single DME installation), DME1 or DME2 (for dual DME installations). The Hold annunciator indicates the associated DME is in Hold mode.

3.2.3.5 MORSE CODE ID ANNUNCIATOR

The Morse code ID annunciator indicates that the Morse code filter has been activated, allowing the crew to hear the Morse code through the audio system.

3.2.3.6 STANDBY FREQUENCY/VOR BEARING

Either the standby NAV frequency or the VOR bearing is displayed in cyan to the right of the active frequency in the VHF NAV tuning sub-window. Choice of standby frequency or bearing is made on the VHF NAV detail window. The bearing display will be shown as either BRG XXX° or RAD XXX°, depending on the operator's selection.

FIGURE 3-6 VHF NAV BEARING DISPLAY

3.2.4 NAV DETAIL WINDOW

The NAV detail window will be displayed when the cursor focus is on the NAV tuning sub-window and the DETAIL button is pressed on either the PFD or MF Controller.

FIGURE 3-7 VHF NAV DETAIL WINDOW

The NAV mode selections (BRG, RAD and STBY) and access to the DME detail window are shown in the NAV detail window. The active modes are shown with a large font in white, and the inactive modes are shown with a smaller font in cyan.

3.2.5 DME DETAIL WINDOW

The DME detail window will be displayed when the cursor focus is on the NAV tuning sub-window and the DETAIL button is pressed on either the PFD or MF Controller, when the DME button is pressed on the PFD Controller or by selecting the "Go To DME Detail" soft key on the NAV detail window.

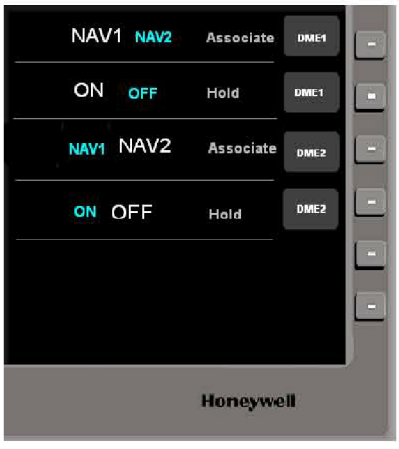

FIGURE 3-8 DME DETAIL WINDOW

The DME association selection (NAV1, NAV2) and DME Hold mode control are shown in the DME detail window. The active modes are shown with a large font in white, and the inactive modes are shown with a smaller font in cyan.

3.2.6 ADF TUNING SUB-WINDOW

The Pilot and Copilot ADF functions and display locations are as shown in the following examples of the ADF tuning sub-window.

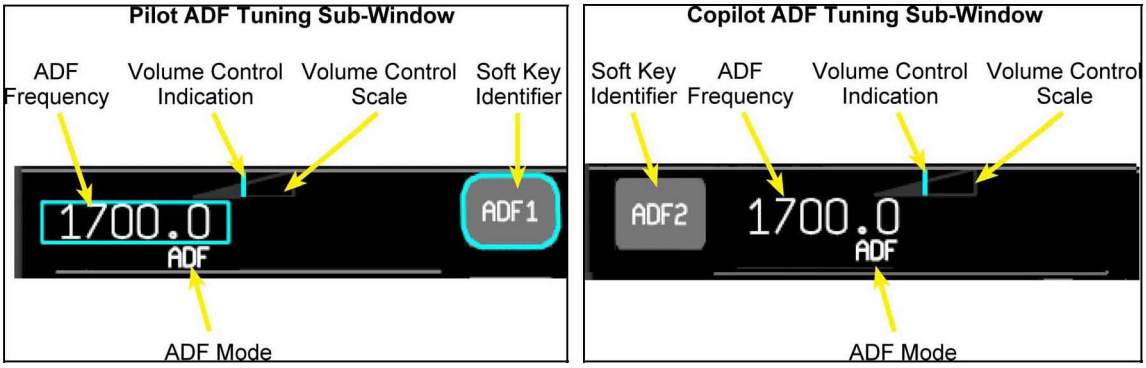

FIGURE 3-9 ADF TUNING SUB-WINDOW

3.2.6.1 ADF FREQUENCY

The ADF frequency is displayed in white on the left side of the ADF tuning sub-window.

3.2.6.2 VOLUME CONTROL INDICATION/SCALE

The volume control scale and the indication of the current volume level are located at the top of the ADF tuning sub-window in the middle. The volume scale is visible only when the volume knob is being rotated, and is automatically removed from the display one second after volume knob rotation ceases.

3.2.6.3 SOFT KEY IDENTIFIER

This shows the function of the soft key on the PFD bezel next to the identifier. The choices are ADF, ADF1, or ADF2.

3.2.6.4 ADF MODE

This shows the function of the soft key on the PFD bezel next to the identifier. The choices are ADF, ANT, or BFO.

3.2.7 ADF DETAIL WINDOW

The ADF detail window will be displayed when the cursor focus is on the ADF tuning sub-window and the DETAIL button is pressed on either the PFD or MF Controller.

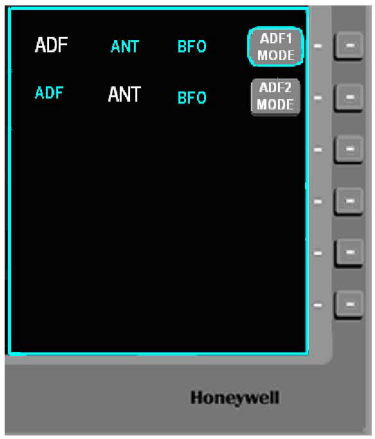

FIGURE 3-10 DUAL ADF DETAIL WINDOW

The ADF mode selection(s) (ADF, ANT or BFO) are shown in the ADF detail window. The active modes are shown with a large font in white, and the inactive modes are shown with a smaller font in cyan.

3.3 KTR 2280 OPERATION

The VHF COM, VHF NAV, and ADF can be operated using the Display Bezel Soft Keys, the PFD Controller, or the MF Controller.

FIGURE 3-11 KMC 2210 PFD CONTROLLER

FIGURE 3-12 KDU 1080 DISPLAY UNIT BEZEL SOFT KEYS

FIGURE 3-13 KMC 2220 MF CONTROLLER

3.3.1 VHF COM CONTROLS

3.3.1.1 DETAIL BUTTON

The DETAIL button on either the PFD or MF Controller activates a secondary window related to the currently active window providing additional details or controls related to the item. A subsequent selection of the DETAIL button removes the secondary window and displays the primary window for the item. Selection of modes from the MFC is accomplished using the SEL outer knob.

3.3.1.2 COM BUTTON

The COM button on either the MF Controller transfers window focus to the pilot's Radio Tuning window and sets the cursor focus to the NAV 1 sub-window, permitting direct keyboard data entry.

3.3.1.3 TUNING SELECT (SEL) CONTROL

The Tuning Select Control consists of two concentric knurled knobs. The outer knob typically controls coarse tuning and the inner knob controls fine tuning. The frequency can also be entered using the MFC numeric keypad, followed by the Enter (ENT) key.

3.3.1.4 FREQUENCY SWAP

The Frequency Swap function exchanges the active and standby frequency. The active frequency becomes the standby frequency, and the standby frequency becomes the active frequency. The swap function can be accomplished using the following:

3.3.1.4.1 SOFT KEY

The function is available when the double-headed arrow is shown in the soft key identifier window. Depressing the soft key initiates the frequency swap.

3.3.1.4.2 SEL/FREQ SWAP KNOB

Depressing the inner knob on the PFD Controller initiates the frequency swap for the radio that has the cursor focus.

3.3.1.4.3 FREQ SWAP BUTTON

Depressing the button on the MF Controller initiates the frequency swap for the radio that has the cursor focus.

Soft keys are also selectable from the MFC using the Joystick control followed by the ENT key.

3.3.2 VHF NAV CONTROLS

3.3.2.1 DETAIL BUTTON

The DETAIL button on either the PFD or MF Controller activates a secondary window related to the currently active window providing additional details or controls related to the item. A subsequent selection of the DETAIL button removes the secondary window and displays the primary window for the item. Selection of modes from the MFC is accomplished using the SEL outer knob.

3.3.2.2 NAV BUTTON

The NAV button on the MF Controller transfers window focus to the pilot's Radio Tuning window and sets the cursor focus to the NAV 1 sub-window, permitting direct keyboard data entry.

3.3.2.3 TUNING SELECT (SEL) CONTROL

The Tuning Select Control consists of two concentric knurled knobs. The outer knob typically controls coarse tuning and the inner knob controls fine tuning.

3.3.2.4 FREQUENCY SWAP

The Frequency Swap function exchanges the active and standby frequency. The active frequency becomes the standby frequency, and the standby frequency becomes the active frequency. The swap function can be accomplished using the following:

3.3.2.4.1 SOFT KEY

The function is available when the double-headed arrow is shown in the soft key identifier window. Depressing the soft key initiates the frequency swap. If the VOR bearing has been selected for display, the swap arrow is not shown, but a blind transfer can be done.

3.3.2.4.2 SEL/FREQ SWAP KNOB

Depressing the inner knob on the PFD Controller initiates the frequency swap for the radio that has the cursor focus.

3.3.2.4.3 FREQ SWAP BUTTON

Depressing the button on the MF Controller initiates the frequency swap for the radio that has the cursor focus.

Soft keys are also selectable from the MFC using the Joystick control followed by the ENT key.

3.3.2.5 VOL/SQ/ID KNOB

Pushing the volume knob on the PFD Controller will toggle selection of the Morse code ID filter.

3.3.2.6 NAV DETAIL WINDOW SOFT KEYS

The soft keys control the NAV mode {BRG (bearing displayed, direct NAV tuning), RAD (radial displayed, direct NAV tuning) or STBY (standby frequency displayed, active/ standby NAV tuning)} and allow access to the DME detail window.

3.3.2.7 DME DETAIL WINDOW SOFT KEYS

The soft keys control the DME association with each NAV and toggle the DME hold mode.

3.3.3 ADF CONTROLS

3.3.3.1 DETAIL BUTTON

The DETAIL button on either the PFD or MF Controller activates a secondary window related to the currently active window providing additional details or controls related to the item. A subsequent selection of the DETAIL button removes the secondary window and displays the primary window for the item. Selection of modes from the MFC is accomplished using the SEL outer knob.

3.3.3.2 ADF DETAIL WINDOW SOFT KEYS

The soft keys control the ADF mode (ADF, ANT, or BFO). Pressing the FREQ SWAP button on the PFD or MF Controller while on the ADF detail page also changes the ADF modes.

APPENDIX A
ENVIRONMENTAL QUALIFICATION FORMS

INCLUDING
SUPPLEMENTAL ENVIRONMENTAL PERFORMANCE INFORMATION

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RTCA/DO-160D (Change 1, 2, 3)

ENVIRONMENTAL QUALIFICATION FORM

NOMENCLATURE:	KTR 2280 Multi-Mode Digital Radio
PART NUMBER:	069-1037-0101
TSO NUMBER:	TSO-C37d, C38d, C128, C40c, C36e, C34e, C41d
MANUFACTURER'S SPECIFICATION:	MPS 004-02257-0000
MANUFACTURER:	Honeywell International inc.
ADDRESS:	One Technology Center 23500 W. 105th Street Olathe KS 66061 USA

DO-160D Section	Condition	Category	Description
4	Temperature and Altitude	A1F1	-40°C to +55°C operating
4.5.4	In-Flight Loss of Cooling	V	30 minutes
4.6.1	Altitude	F1	55,000 ft.
4.6.2	Decompression	A1	8,000 ft to 55,000 ft
4.6.3	Overpressure	A1	170 kPa
5	Temperature Variation	B	5°C/min
6	Humidity	A	Standard Humidity
7	Operational Shocks and Crash Safety	B	Standard Op Shock and Crash Safety
8	Vibration	S	Curve B & M
9	Explosion Proofness	X	
10	Waterproofness	X	
11	Fluids Susceptibility	X	
12	Sand and Dust	X	
13	Fungus Resistance	X	
14	Salt Spray	X	
15	Magnetic Effect	Z	< 0.3 m
16	Power Input	Z	Momentary power interruptions (DC) tested to >50mS with radio reset allowed. Momentary power interruptions (DC) tested to ≤ 50mS with no radio reset allowed. Emergency voltage is 16.0 V.
17	Voltage Spike	A	
18	Audio Frequency Conducted Susceptibility - Power Inputs	BZ	
19	Induced Signal Susceptibility	Z	
20	Radio Frequency Susceptibility (Radiated and Conducted)	TT	
21	Emission of Radio Frequency Energy	M	
22	Lightning Induced Transient Susceptibility	A3J33	

ENVIRONMENTAL QUALIFICATION FORM

DO-160D Section	Condition	Category	Description
23	Lightning Direct Effects	X	
24	Icing	X	
25	Electrostatic Discharge (ESD)	A	

Notes:

1. Vibration Critical Frequencies – The following critical frequencies are mechanical resonances of the unit under test that have peak acceleration amplitudes greater than twice the input acceleration amplitude.

Equipment Under Test (EUT)	EUT Orientation Axis	Frequency Range
<<**Equipment Model No.**>>	Longitudinal (X-axis)	
	Lateral (Y-axis)	
	Vertical (Z-axis)	

2. There were no significant changes in the above resonant frequencies during the test.

RTCA/DO-160D (Change 1, 2, 3)

ENVIRONMENTAL QUALIFICATION FORM

REVISION HISTORY

Rev.	PRN/CO No.	By	Date	Description of Change
draft		G. Triplett	6/16/06	

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KA 44B ENVIRONMENTAL PERFORMANCE

The KA 44B ADF Antenna (071-1234-XX) is certified to TSO C41c with RTCA DO-160A environmentals per B2D2/A/LJY/XXXXXX/ABABA.

Recent "not-for-certification-credit" testing has been performed on this antenna to determine expected performance in selected DO-160D environmental conditions.

DO-160D Section 20 (RF Susceptibility) Tests

A KA 44B production test sample was subjected to Category TT fields as defined in the test environment called out in RTCA DO-160D Section 20 (Change No. 1). This unit was tested in conjunction with the KTR 2280 Multi-Mode Digital Radio. All conducted and radiated susceptibility performance requirements were passed except for radiated susceptibility in the band of interference frequencies between 277 MHz and 339 MHz. Within this band the KA 44B could not tolerate interference levels greater than 0.8 V/m (for acceptable audio signal-to-noise) or greater than 1.1 V/m (for acceptable bearing error).

A KA 44B production test sample was subjected to the 100 V/M (and greater) HIRF levels expected for aircraft system level certification. This test was done in a manner consistent with aircraft system level HIRF certification testing. No permanent damage was noted during the HIRF exposure and the unit returned immediately to normal operation after the HIRF event terminated.

DO-160D Section 22 (Lightning Induced Transient Susceptibility) Tests

A KA 44B production test sample was subjected to Category A3J33 as defined and in the test environment called out in RTCA DO-160D Section 22 (Change No. 3). The KA 44B passed all requirements.

DO-160D Section 23 (Lightning Direct Effects) Tests

A KA 44B production test sample was subjected to Category 2A as defined in the test environment called out in RTCA DO-160D Section 23. The KA 44B passed all requirements.

Other DO-160D based test data has been collected and is available on request from Honeywell.

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