ARNAV Systems, Inc.
16923 Meridian East
P.O. Box 73730
Puyallup, Washington 98375
(253) 848-6060

RCOM-100
Installation GUIDE

PART NUMBER 570-8050B

27 November 2002

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REVISIONS

REV	DESCRIPTION	DATE	APPROVAL
-	Initial Release	August 2002	LAJ
A	Minor Changes	11/15/02	LAJ
B	Added Antenna Doubler	11/27/02	LAJ

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1. INTRODUCTION

The RCOM-100 is a Globalstar satellite telephone for aviation. It is housed in an ARINC 600 2 MCU enclosure. The RCOM-100 is designed to provide voice and data communication in an avionics application.

The voice connection is established through a standard TIP/RING interface. The RCOM-100 can be connected to any standard telephone handset that complies with EIA/TIA-464B and TIA/EIA/IS-470-B.

The data connection is through the RCOM-100 data port. The data port supports two types of data services: asynchronous data, and packet data. Asynchronous data provides the capability of establishing a connection between a device connected to the data port, and any Hayes compatible modem connected to the Public Switch Telephone Network. For packet data the device connected to the data port must be able to support a PPP session over TCP/IP. This is the typical standard used by computers for dial-up services.

The installation to the RCOM-100 consists of:

- Locating and mounting the transmit/receive antenna
- Installation of the mounting tray for the ARINC 600 2MCU box
- Locating and mounting the NAT PTA-12 Dialer
- Locating and mounting the VC28 DC-to-DC converter (14 to 28 volts for PTA-12_
- Wiring the RCOM-100 37 pin circular connector for power, tip/ring, and the data connection port.
- Wiring the PTA-12 to the Audio Panel.

Installation Requirements:

When installing the ARNAV RCOM-100 the installer must have a working knowledge of aircraft electronics installation, and be a holder of a FAA Repairman's Certificate.

All installations should meet the requirements of FAA advisory circular **AC43.13-1B**.

2. OVERVIEW

The main tasks for this installation are listed below:

1. Check the shipped installation kit components against this manual.
2. Determine the approximate location of the RCOM-100, the transmit/receive antenna, the PTA-12, and the VC28. Factors considered for locations are minimum and maximum antenna coax lengths, and minimum GPS and transmit antenna separation.
3. Mount the ARINC 600 2 MCU tray.
4. Mount the transmit/receive antenna.

5. Mount the PTA-12
6. Mount the VC28.
7. Route the coax cables for transmit and receive to the ARINC 600 2 MCU tray.
8. Create the wire harness for the RCOM-100 and PTA12.
9. TIP/RING voice communications check out.

3. INSTALLATION

Installation Kit:

ITEM #	ARNAV P/N	QTY	DESCRIPTION
1	150-1115	4	Connector, TNC
2	150-2168	1	Receptacle, Circular 37 Pin
3	ENG-7069	1	Mounting Frame Assembly, ARINC 600 2 MCU
4	870-1575	1	Antenna, RF Transmit/Receive Satcom
5	NAT PTA-12	1	NAT Phone Dialer Panel Equipment
6	453-0917	1	VC28 14 to 28 volt converter
7	570-8050	1	RCOM-100 Installation Manual

Determining Mounting Locations:

There are two basic restrictions for mounting locations. The first restriction is the distance between the equipment mounting location and the transmit/receive antenna location. The second restrictions is the distance allowed between the transmit antenna and any GPS antenna located on the aircraft. The data below will help identify proper equipment and antenna locations.

Transmit/Receive antenna and equipment location:

The Transmit/Receive antenna and associated coaxial lines have a minimum and maximum signal loss that must be adhered to. Exceeding the min/max signal strength by having an improper coax length may cause poor performance.

The first step is to select the cable and then determine the length of cable that falls in the min/max signal loss window. The coax selection and length will determine the distance between the antenna and the RCOM-100.

The transmitter is at 1.6Ghz.

Transmitter Minimum Loss: 0.66db
Transmitter Maximum Loss: 1.66db

The receiver operates at 2.5Ghz.

Receiver Minimum Loss: 1.14db
Receiver Maximum Loss: 7.14db

The tables below identify different coax cable types that can be used and shows minimum and maximum cable lengths for that coax type. Any other quality coax type can be used as long as the signal loss falls between the minimum and maximum db requirements.

Table 3-1 Transmit Cable Lengths

Part Number	Cable Outside Diameter in Inches	Bend Radius in Inches	Minimum Length in Feet	Maximum Length in Feet	Cable Loss per foot
ECS Cable					
311901	0.195	1	4.4	11	0.1513
311601	0.229	1.15	3.7	9.4	0.1768
311501	0.229	1.15	7.5	18.9	0.0877

Table 3-2 Receive Cable Lengths

Part Number	Cable Outside Diameter in Inches	Bend Radius in Inches	Minimum Length in Feet	Maximum Length in Feet	Cable Loss per foot
ECS Cable					
311901	0.195	1	5.7	35.7	.2
311601	0.229	1.15	8.2	51.5	.13850
311501	0.229	1.15	10.3	64.3	.11100

GPS antenna proximity to transmit/receive antenna:

Due to potential transmit power saturation of a GPS antenna input, there must be a minimum separation between any GPS antenna and the transmit antenna. For a typical active GPS antenna for aviation the minimum separation should be 2 feet. For least interference between the antennas a preferred distance between antennas is 4 feet. The preferred distance may not be practical on aircraft installations so every effort should be made to provide the most separation that circumstances permit.

NOTE: Some GPS antennas provide a filter prior to the pre-amp that helps provide more rejection of non-GPS frequencies. If the GPS antenna can provide additional filtering the separation requirement can be reduced. In any case the GPS performance must be verified during the post-installation ground check.

When routing the coaxial cables make sure to identify the cables so they can be connected to the proper location. There are 2 cables with TNC connectors on both ends and all appear to be the same.

Once the antennas and RCOM-100 locations have been verified to meet the above restrictions the installation can proceed.

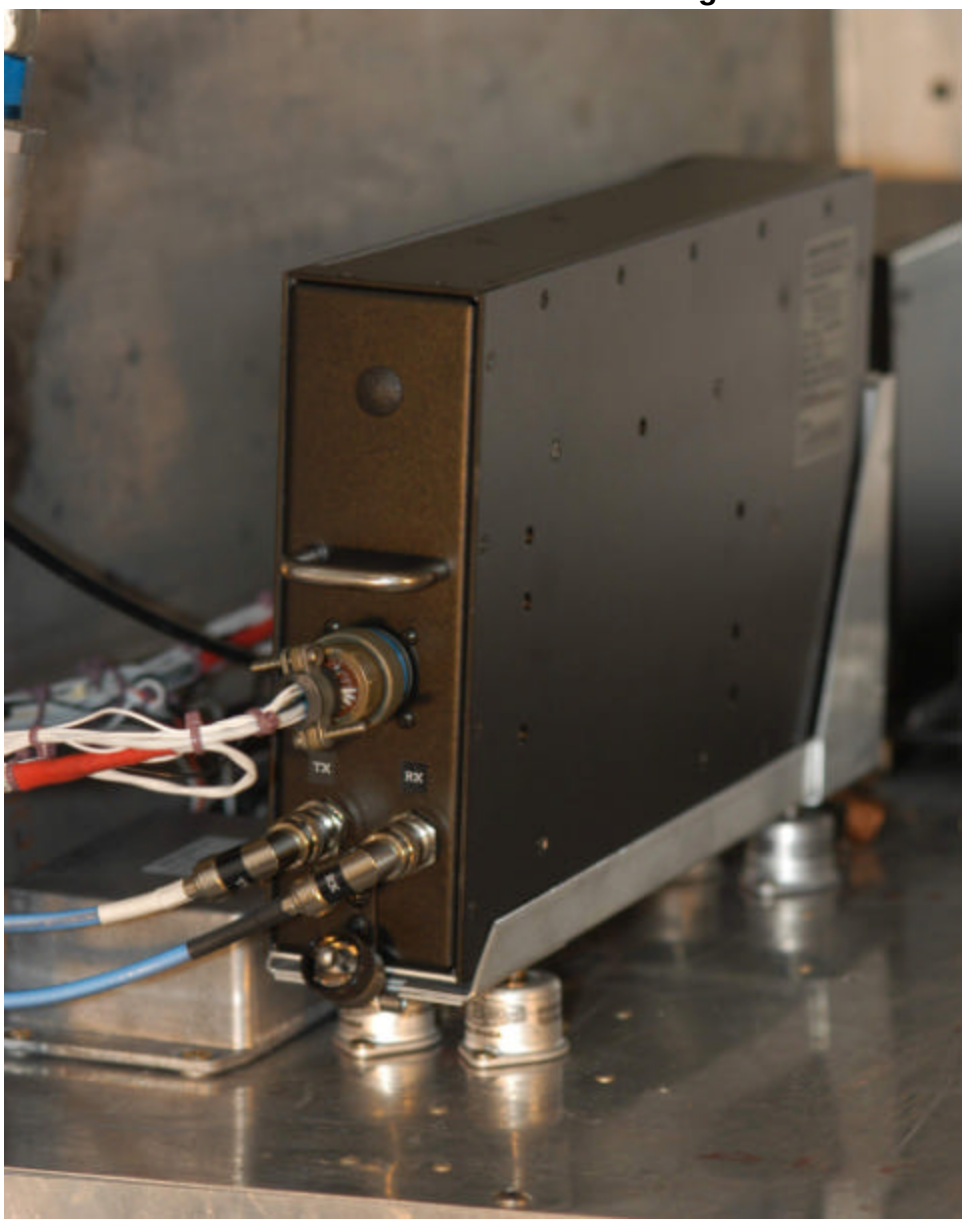
For mounting location in the Cessna 180 series aircraft refer to drawing ENG-5021. The shown locations for Antenna, and RCOM-100 comply with the requirements listed above. If the exact locations on drawing ENG-5021 are used, the drawing also shows information for weight and balance calculation.

Securing The Mounting Tray:

Refer to drawings ENG-4985 and ENG-7069 in appendix A. The ENG-7069 drawing shows the mounting tray assembly with 4 Barry Mount vibrations isolators and the mounting holes and the screws to be used. The ENG-4985 drawing shows the RCOM-100 in the mounting tray with dimensions. Page 2 of ENG-4985 shows the RCOM-100 center of gravity. Prepare the mounting location to provide a good electrical bond between the mounting tray and the airframe. If the removal of paint is required to obtain this electrical bond it should be done.

Prepare the mounting holes and secure the equipment-mounting tray. Place the RCOM-100 into the mounting tray and secure it with the lockdown knob.

RCOM-100 and VC28 Mounting



Transmit/Receive Antenna Installation:

Refer to SENSOR Systems drawing S67-1575-164 in Appendix A. S67-1575-164 shows the dimensions of the antenna and mounting holes. Refer also to drawing ENG-5022. ENG-5022 is the antenna mounting template diagram. It is scaled 1:1 so it can be used to mark hole locations and antenna outline.

The antenna will secured through the aircraft skin at the top center of the fuselage 112.5 inches back from the firewall.

Prepare the mounting location by drilling holes in the aircraft skin or through a mounting plate. Installation of an antenna on the aircraft should be performed only as defined by the aircraft manufacturer.

In addition to the location for the mounting, the aircraft surface should be prepared by removing the paint where the antenna will attach to the skin.

Note: The bond between the airframe and the antenna needs to be 10 milliohms or less. Make sure that this antenna has a spatial separation of 45dB between it and any GPS antennas (as defined above).

You should note and mark on the antenna which terminal is Tx and which is Rx so that the mark can be seen after the antenna is mounted on the airplane.

From the inside of the aircraft secure the antenna using the supplied “O-Ring” and doubler plate (402-1575). Refer to drawing ENG-5026 showing the antenna/O-ring/skin/doubler stackup.

After antenna is secure, seal around the base of the antenna with RTV compound to keep moisture from getting between the antenna and the aircraft skin.

The picture below show the Antenna mount from the outside the aircraft.

Antenna Mount – Outside View

Mounting the NAT PTA-12 Dialer:

Refer to the NAT PTA12-000 Installation and Service Manual (SM55) in Appendix B for dimensions and mounting information.

For locating the PTA-12 refer to the picture below. The PTA-12 is mounted in the panel just above the pilots left knee.

PTA-12 Dialer Install Location

PTA-12 Close-Up

VC28 Mounting:

Refer to drawing ENG-5023 in appendix A. The ENG-5023 drawing shows the mounting template for the VC28 DC-to DC converter. The template is scaled 1:1 so it can be used to mark locations for mounting the VC28 to the airframe. The VC28 is located next to the RCOM-100 (see drawing ENG-5021). Prepare the mounting location to provide a good electrical bond between the VC28 and the airframe. If the removal of paint is required to obtain this electrical bond it should be done.

Prepare the mounting holes and secure the equipment.

Refer to the picture above (RCOM-100 and VC28 Mounting). The VC28 is just to the left of the RCOM-100 and is mounted to the equipment shelf.

Route Coax Cables for Tx and Rx:

Refer to Drawing ENG-5021 to see Coax routing location. The coax pair routes from the Antenna down the right side of the aircraft then back to the RCOM-100. Make sure the correct coax for the Tx and Rx channels is selected and make sure they are attached to the correct antenna terminal and RCOM-100 terminal. Refer to the tables above for coax selection. The cables have a minimum and a maximum db loss and the Tx and Rx are at different frequencies. **The cables are not interchangeable**.

As the cables are routed from the antenna to the RCOM-100, make sure that the do not interfere with any aircraft control cables. Secure the cables to the aircraft framework so that they will not come loose or interfere with moving objects.

Wiring the RCOM-100, VC28, PTA-12:

Table 3-3 is the pin definition for the circular 37-pin connector. The RCOM-100 has been designed to work with either a 28VDC aircraft or a 14VDC aircraft. TIP and RING are for EIA/TIA-464B compatible telephone equipment. The DATA PORT shows how it should be wired up to a DB-9 female connector, which should then plug into a DTE device.

Refer to wire diagram ENG-5024.

Refer to wire routing on drawing ENG-5021. Route wires from the back of the aircraft at the RCOM-100 along the right side of the aircraft and below the doorframe to the area behind the control panel where the wires connect to the audio panel and PTA-12. Assured that the cables are secured and avoid routing near any control cables or moving surfaces.

Connect the aircraft equipment per wire diagram ENG-5024. Add a 5-amp circuit breaker for the RCOM-100 and a 1-amp circuit breaker for the PTA-12.

The telephone audio can come from either the PTA-12 dialer as a headset microphone interface (see NAT PTA-12 Install manual – Appendix B), or it can interface with an existing audio panel. This install drawing shows connection to an audio panel with a Tip/Ring telephone interface. For audio panels without the Tip/Ring telephone input, refer to the NAT PTA-12 install manual for instructions on connecting the PTA-12 audio signals into an audio panel.

Table 3-3 Circular 37 Pin Connector Description

PIN #	Description
1	DATA PORT RXD (OUTPUT) TO DB9 FEMALE PIN 2
2	
3	
4	
5	DATA PORT CTS (OUTPUT) TO DB9 FEMALE PIN 8
6	DATA PORT TXD (INPUT) TO DB9 FEMALE PIN 3
7	DATA PORT RI (OUTPUT) TO DB9 FEMALE PIN 9
8	DATA PORT RFR (INPUT) TO DB9 FEMALE PIN 7
9	POWER RETURN
10	POWER
11	
12	
13	
14	
15	RING
16	TIP
17	
18	
19	DATA PORT SIGNAL RETURN - TO DB9 FEMALE PIN 5
20	
21	
22	
23	
24	
25	DATA PORT RLSD (OUTPUT) TO DB9 FEMALE PIN 1
26	DATA PORT DTR (INPUT) TO DB9 FEMALE PIN 4
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	

4. DATA PORT

The Data Port allows the user to connect a computer to the RCOM-100 to access data services. There are 2 types of data services handled by the Data Port: Asynchronous, and Packet Data. In both of these services the equipment interfacing to the RCOM-100 must be configured for 19200-baud, 8 bits, 1 stop bit, no parity, hardware handshaking, with EIA/TIA RS-232 standard signal levels.

The data port in the RCOM-100 is wired to a DB9 connector and is intended for use by only approved computing devices in the aircraft. If the data port is used by an approved device, the instructions below define the data port capabilities and requirements.

Asynchronous Services:

Asynchronous Services establishes a data connection between a computer or other device connected to the data port, and any Hays compatible modem that is connected to the Public Switched Telephone Network. The connection between the device and the remote modem is accomplished by dialing from the AT command line the number of the remote modem (i.e. ATD18883359533 <ENTER>). Once the connection is established between the 2 modems, binary data, or ASCII data can be transmitted. Sending the "+++" followed by a delay of longer than 1 second then the "ATH" terminates the connection.

Packet Services:

The data connection is established by the computer issuing a dialing command "ATD#777 <enter>". This starts a PPP session using the TCP/IP protocol. Sending the "+++" followed by a delay of longer than 1 second then the "ATH" terminates the connection.

The PPP connection using TCP/IP can be set up as a standard Windows Dial Up networking connection or it can be part of the connecting application. In order to access data through the Packed Services you must have an Internet service provider that allows remote connection through a gateway. Your dial up connection must be set up as follows:

Modem Setup:
Add the RCOM-100 Qualcomm modem INF file to your computer:
Windows 98 example:
Select: Start – Settings – Control Panel – Modems
Select: Add Modem
Check: Do not detect modem; I will select it from a list
Select: Next
Select: Have Disk
Insert the supplied floppy disk into the A: drive
Make sure the A: drive is selected as the file source and select OK
The Modem will be identified as Qualcomm Globalstar Phone Modem
Select: Next
Select: the communications port on your computer that will connect to the RCOM-100
Select: Next
Select: Finish
In the Modem Properties Dialog Box – Select the new Globalstar Modem and click Properties
Change the Baud Rate to 19200 and press OK

Dial Up Connection:
Under “My Computer” – Dial Up Networking --, Make a New Connection
Select: Qualcomm Globalstar Phone Modem
COM port connected to Data Port of RCOM-100
Baud Rate 19200
8 Bit
1 Stop Bit
No Parity
Hardware Handshaking
Phone Number = #777
Type of Dial Up Server = PPP
Allowed Network Protocols = TCP/IP
Enable Software Compression = Yes
TCP/IP Settings
- Server Assigned IP Address
- Specify name server addresses
  - Primary DNS = Provided by your internet service provider
  - Secondary DNS = Provided by your internet service provider
- Use IP Header Compression
- Use Default Gateway on Remote Network

When connecting to the “Dial Up Networking” connection you must enter your User name and Password for your Internet Service Provider.

5. SYSTEM TESTING

Phone Test:

Using the PTA-12 with Phone capable audio panel:

Move the aircraft out of any hanger or enclosed area so the antenna has a clear view of the sky.

The RCOM-100 is taken off hook by selecting “TEL” on the audio panel. After selecting “TEL” there will be a dial tone. Press the “Hook” switch on the PTA-12 then dial the number to place a call.

Dial a phone number and verify that you are able to connect with the number (NOTE: This telephone requires a full area code and number to make connection. **Do not** put a “1” in front of the area code.).

After the call is complete, press “Hook” on the PTA-12 and move the audio panel selector to a position other than “TEL” . Both the audio panel selector and the “Hook” switch on the dialer must be off or the phone is still off hook and will not be ready for another call or an incoming call.

To receive a call a ring is heard in the pilot’s headset from the audio panel. Answer the call by selecting “TEL” on the audio panel. To answer a call there is no interaction with the PTA-12 dialer.

Using an approved telephone handset:

Hook up a standard telephone handset to the TIP and RING signals from the 37-Pin connector.

Move the aircraft out of any hanger or enclosed area so the antenna has a clear view of the sky.

Take the phone off hook and you should get a dial tone.

Dial a phone number and verify that you are able to connect with the number (NOTE: This telephone requires a full area code and number to make connection. **Do not** put a "1" in front of the area code.).

Data Port Test:
With the aircraft out of any enclosed hanger, hook up a laptop computer to the Data Port (Assumes that you have terminated the Data Port with a DB-9 female connector.

Using a terminal emulator program with the serial port set up for (19200,8,n, 1). You should be able to type AT<ENTER> and get an OK back from the RCOM-100. This verifies that the data port is wired correctly and that you can communicate with the internal Modem of the RCOM-100.

Once you have verified connection with the modem you can test the PPP connection using TCP/IP. (Verify that you have configured the modem and dial up networking connection as above, and that you have a working Internet Service Provider)

Appendix A – Drawings

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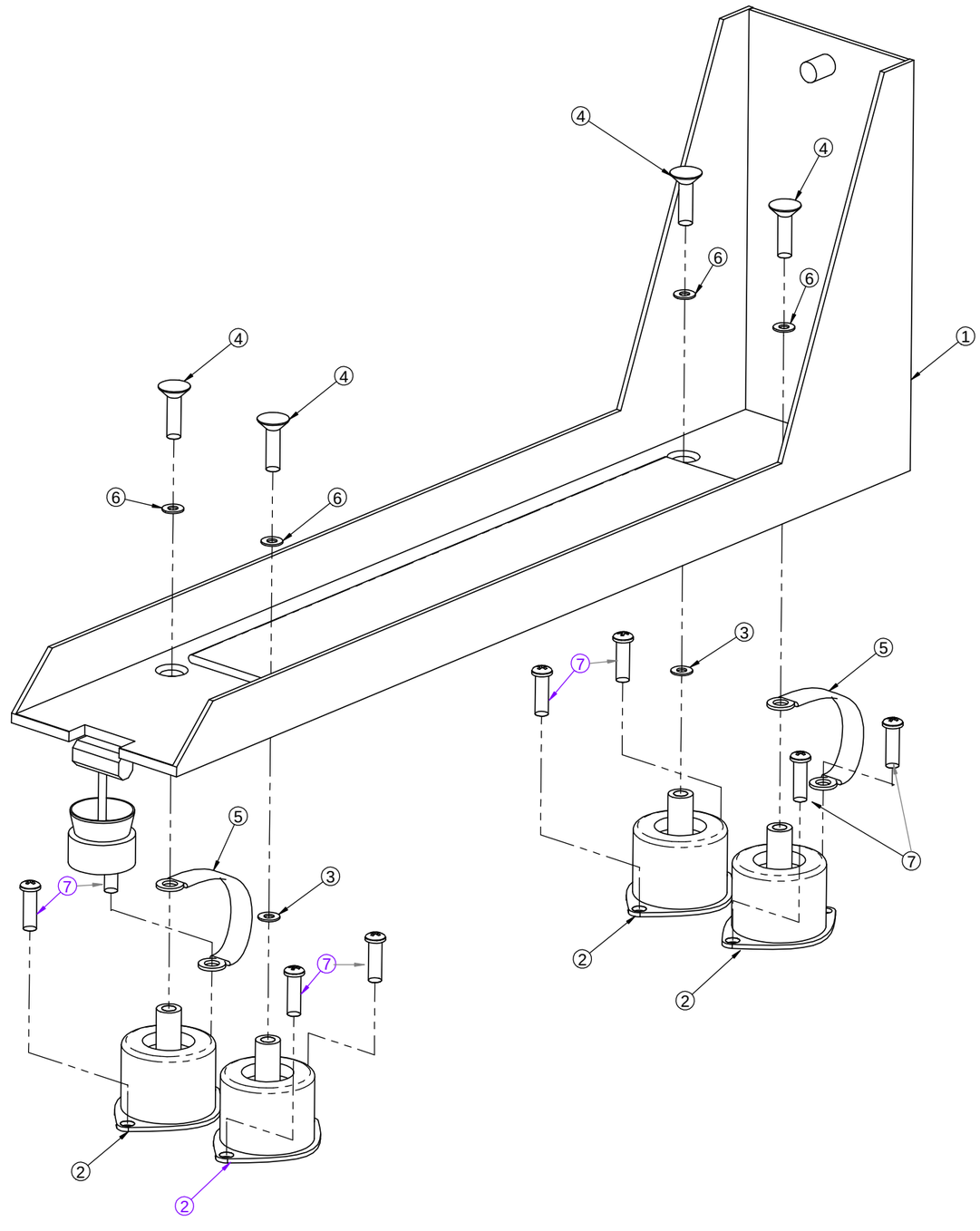
A	ORIGINAL RELEASE	10/08/02	GH
B	ECO-4710	10/09/02	



ITEM NO.	PART OR IDENTIFYING NO.	REVISION	NOMENCLATURE OR DESCRIPTION	QTY REQD
7	201-0805	-	8-32 X 1/2 PHP	8
6	246-0010	-	#8 COUNTERSINK WASHER SS	4
5	136-8002	-	#8 2IN GROUND STRAP	2
4	211-0805	-	8-32 X 1/2 FHP SS	4
3	246-0007	-	#8 WASHER SS	2
2	196-0222	-	VIBRATION ISOLATOR, BARRY T22-AB-2	4
1	452-0161	-	MOUNTING FRAME ASSY, ATR	1

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMAL ANGULAR
.XX ± .010 ± .5°
.XXX ± .005
.XXXX ± .0010

MATERIAL --

FINISH --

DO NOT SCALE DRAWING

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TITLE
RCOM-100 MOUNTING TRAY INSTALL DIAGRAM

SIZE B | DWG. NO. **ENG-7069** | REV. **B**

SCALE | CAD FILE: | SHEET 1 OF 1

REVISIONS						
	REV	DESCRIPTION	DATE	APR	DR	CK
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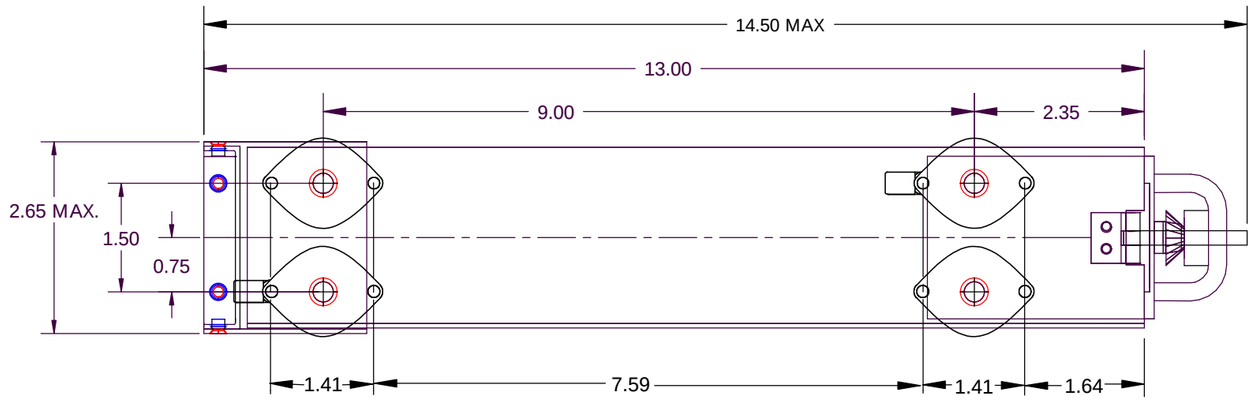
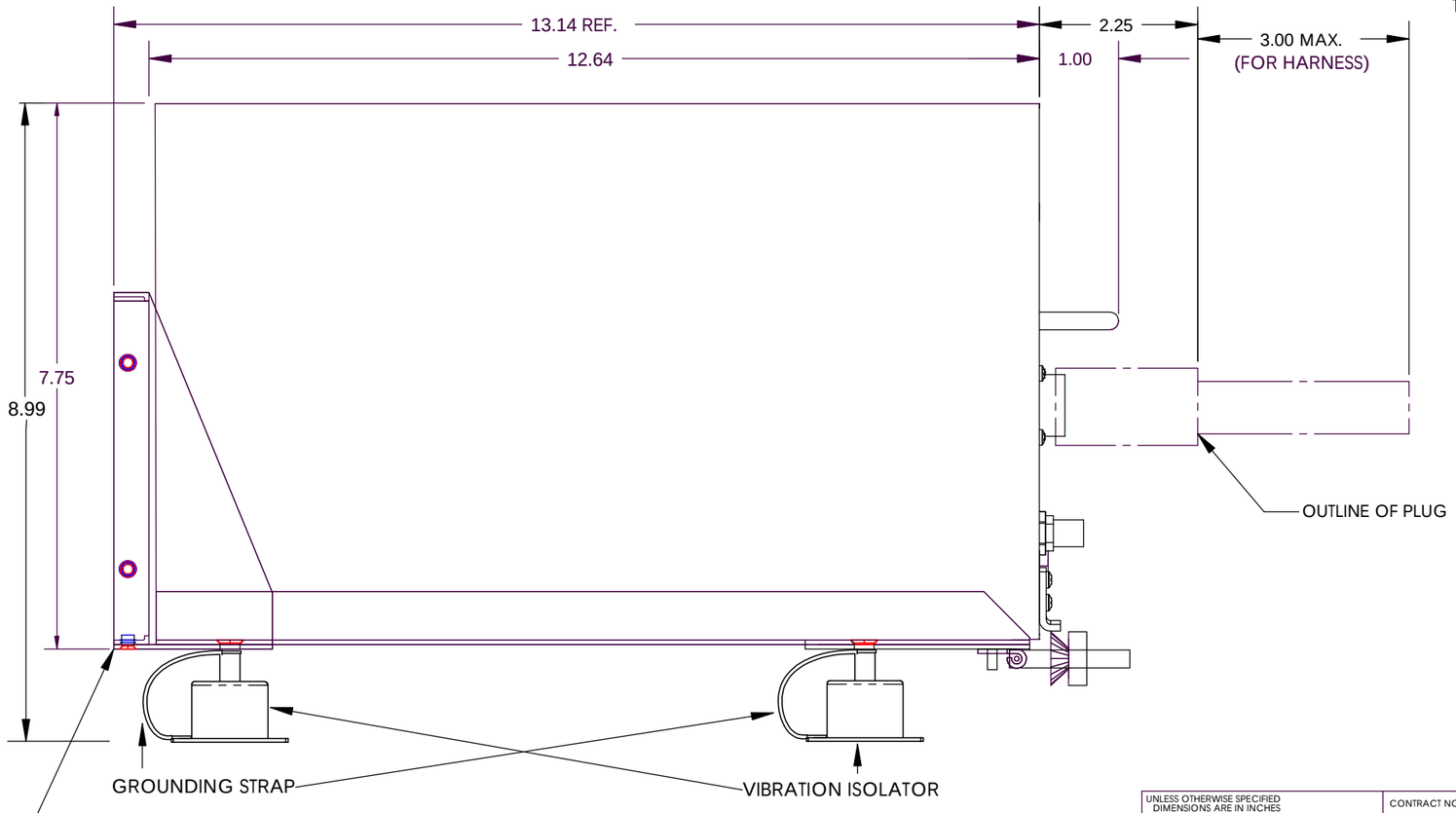
	A	ECO-4710	10/28/02			

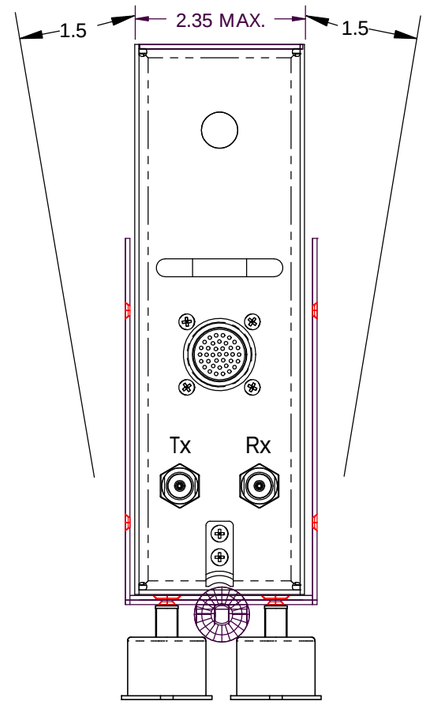




MOUNTING TRAY
ARNAV P/N: 452-0217 OR EQUIVALENT)

FOR MOUNTING USE 8-32X3/8 PAN HEAD PHILLIPS SCREW (8 PLCS) (NOT SUPPLIED)

TOP OF UNIT SHOULD BE LOCATED NO CLOSER THAN 1.5 IN. FROM ADJACENT AVIONICS OR AIRFRAME FOR VIBRATION ISOLATOR FLEX CLEARENCE



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ANGULAR ±0.5°
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TITLE: OUTLINE, MOUNTING TRAY/INSTALL RCOM - 100

SIZE	FSCM NO.	DWG NO.	REV
B		ENG-4985	A

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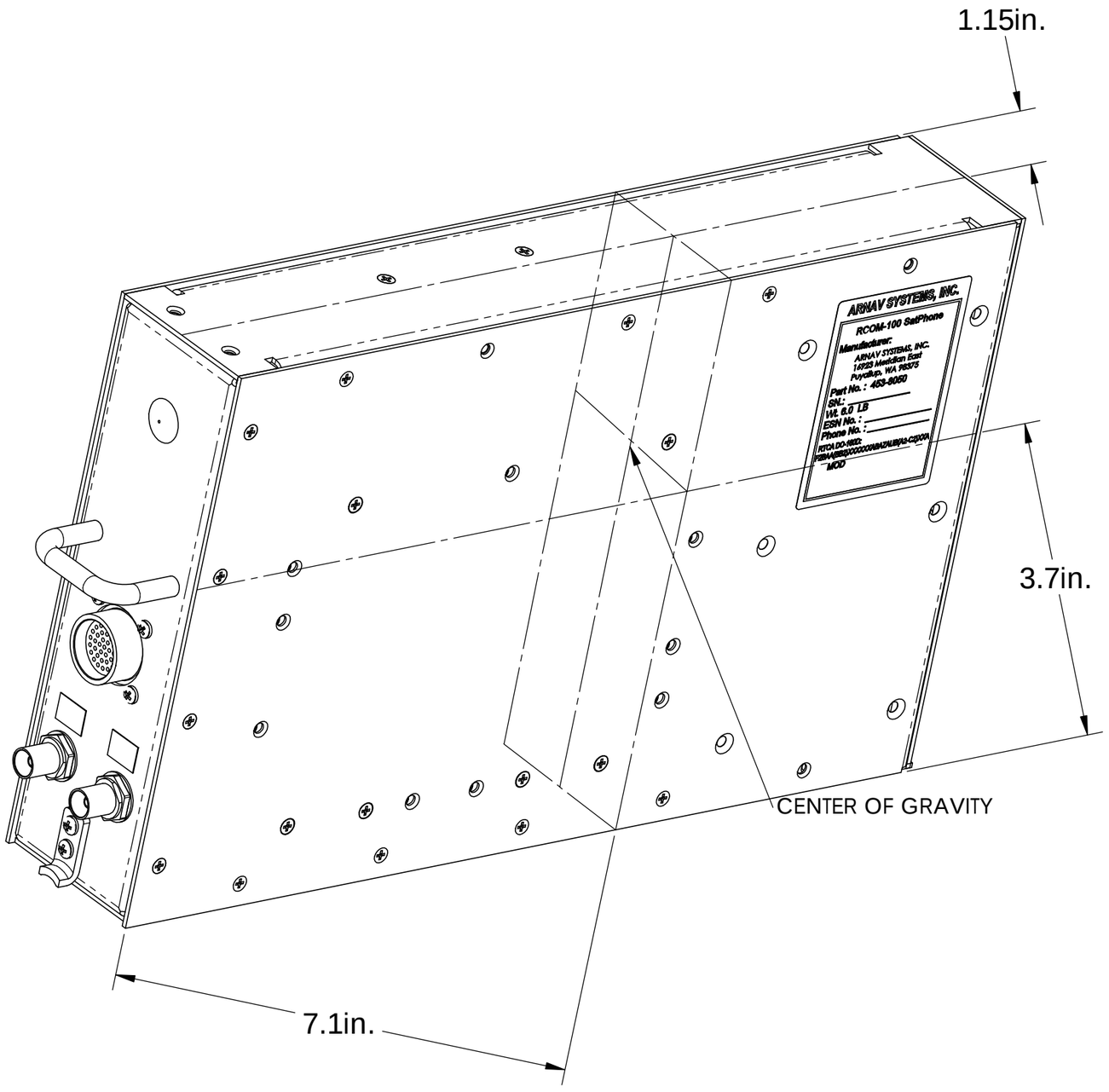
REVISIONS
SEE SHEET 1



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TITLE
OUTLINE, MOUNTING TRAY/INSTALL RCOM - 100

SIZE	DWG. NO.	REV
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SCALE	CAD FILE:	SHEET 2 OF 2

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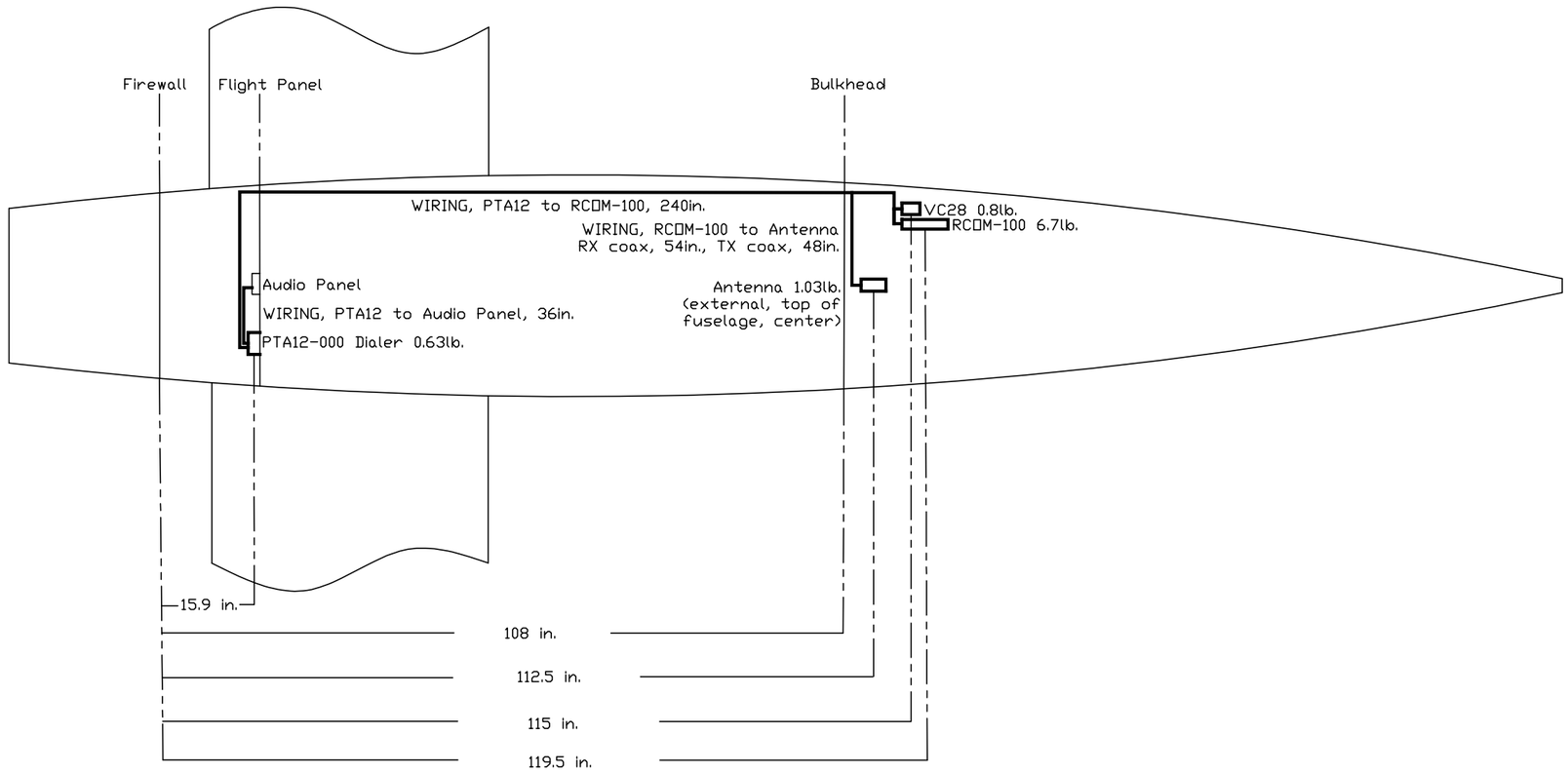

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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ANGULAR: ± .5°

MATERIAL: –

FINISH: –

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TITLE: **RCOM-100 Install Locations**

SIZE: B | DWG. NO.: **ENG-5021** | REV.: -

SCALE 1:1 | CAD FILE: | SHEET 1 OF 1

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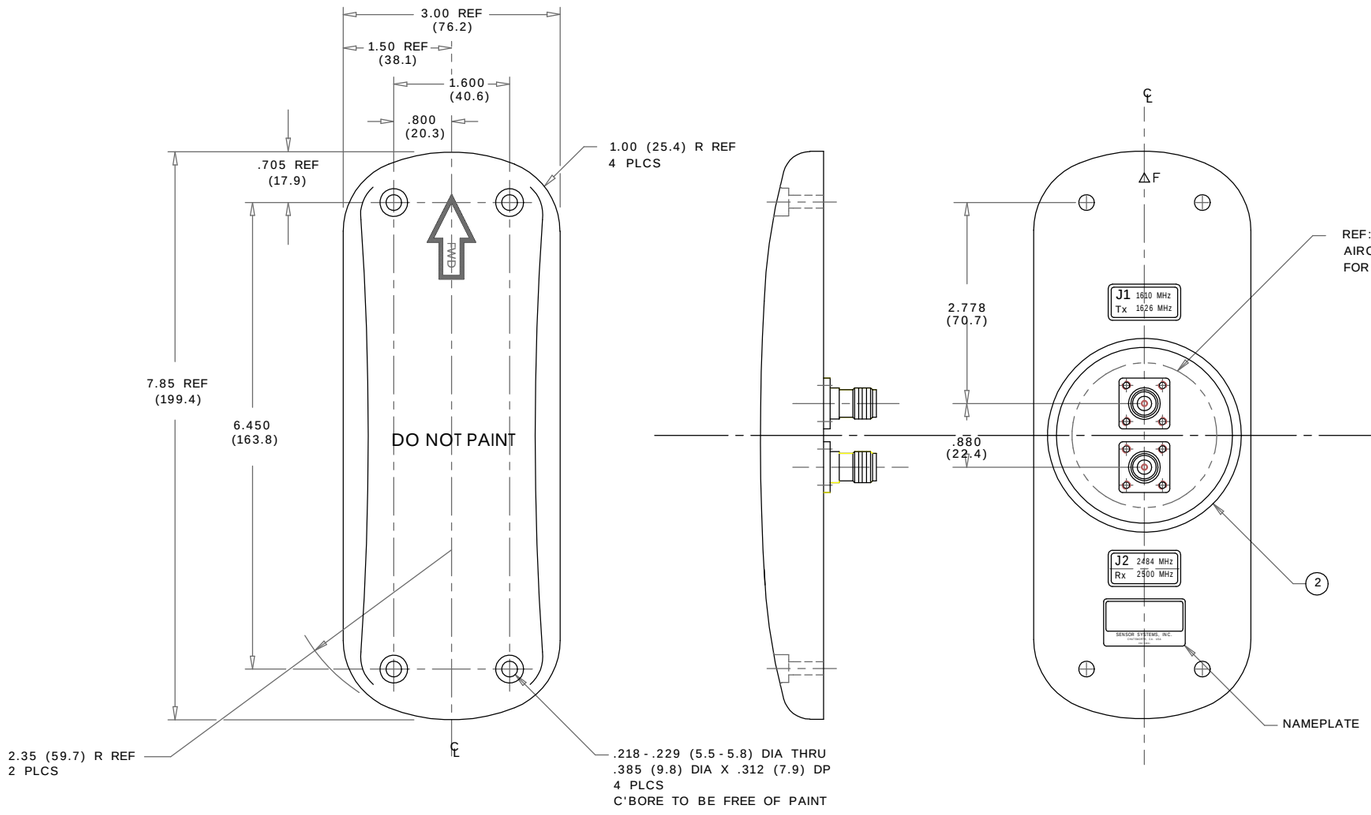
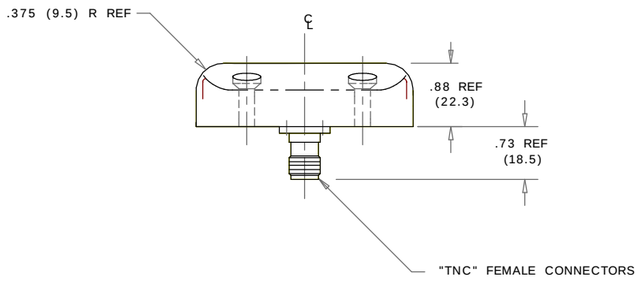
REVISIONS

LTR	DESCRIPTION	EFFECTIVITY	DATE	APPD
A	MOVED CONNECTORS, DELETED ONE O-RING .88 WAS .80	S/N 101 AND SUBSEQUENT ECO 4317		
B	WEIGHT 16.5 OZ(392 GRAMS) WAS 14 OZ(468 GRAMS) J1 Tx & J2 Rx WERE J1 & J2; AMS-C-5541 WAS MIL-C-5541.	ECO #4374	04-10-01 S.A.	
C	UPDATED ELECTRICAL SPECIFICATIONS; ADDED NOTE 4; .312 DP C'BORE WAS 100° C'SINK.	ECO #4411	06-25-01 S.A.	





SPECIFICATIONS

ELECTRICAL

FREQUENCY	J1 Tx 1610 - 1626.5 MHz J1 Rx 1565 - 1585 MHz J2 Rx 2483.5 - 2500 MHz
VSWR	≤ 2.0 : 1
IMPEDANCE	50Ω
POLARIZATION	LHCP
AXIAL RATIO	≤3.0 dB (@ ZENITH)
POWER HANDLING	J1 Tx 60 WATTS J2 Rx 1 WATT
GAIN (ANTENNA)	Gavg > 1 dBic 10° < θ < 90° GAIN AT > -2 dBic θ = 10°
GAIN (PREAMPLIFIER)	J2 Rx 27.5 dB ± 2.5 dB
SUPPLY VOLTAGE	J2 Rx +3.3 TO +28 VDC @ 45 mA MAX
OUT OF BAND REJECTION	J2 Rx > 55 dB @ 824 TO 895 MHz > 53 dB @ 1610 TO 1626.5 MHz > 20 dB @ 3220 TO 4879.5 MHz
ISOLATION Tx TO Rx	> 20 dB
LIGHTNING	DC GROUNDED

MECHANICAL

WEIGHT	16.5 OUNCES (468 GRAMS)
HEIGHT	.88 INCH (22.3 mm)
LENGTH	7.85 INCHES (199.4 mm)
WIDTH	3.0 INCHES (76.2 mm)
FINISH	SKYDROL RESISTANT ENAMEL COLOR: GLOSS WHITE #17925, PER FED-STD-595B BASE: IRIDITE PER AMS-C-5541
MATERIAL	ALUM 6061-T6, THERMOSET PLASTIC
CONNECTOR	TYPE "TNC" FEMALE

ENVIRONMENTAL

TEMPERATURE	-55°C (-67°F) TO +85°C (+185°F)
ALTITUDE	-100 TO 55,000 FT
VIBRATION	10 G's

FEDERAL AND MILITARY

DESIGNED TO:	DO-160C AMS-C-5541 MIL-E-5400 MIL-STD-810 TSO C129a

4. REV. "C" EFFECTIVE WITH S/N 201.
3. RESISTANCE BETWEEN ANTENNA AND MATING SURFACE TO BE LESS THAN 10mΩ FOR GOOD ELECTRICAL CONTACT.
2. MOUNTING SCREWS AND O-RING ARE SUPPLIED BY SENSOR SYSTEMS INC.
1. (XX.X) = mm

NOTES: UNLESS OTHERWISE SPECIFIED

REQD PER ASSY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	MATERIAL OR NOTE	UNIT WT	Z	ITEM NO.
			LIST OF MATERIALS					
1		MS28775-143	O-RING		NITRILE			2
4		MS24693C275	MOUNTING SCREW	10-32 X 7/8 FHD	ALT: AN507C1032R14 STAINLESS STEEL			1

PART DASH NO.	NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
	APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
ANGULAR TOLERANCE ±
LINEAR - HUNDREDTHS ± .030
THOUSANDTHS ± .010
ON SHEET METAL PARTS: ALL BEND RELIEF & INSIDE CORNER RADII .16. OUTSIDE CORNERS .22 RADIUS OPTIONAL. THESE ARE MINIMUM ROUTER REQUIREMENTS. ALL BEND RADII _____
✓ INDICATES SURFACE ROUGHNESS PER MIL-STD-10
FABRICATE PER MANUAL OF STANDARD SHOP PRACTICES No._____

DRAFTSMAN		29 NOV 00
CHECK		
PROJECT ENGR		
MECH		
MECH		
ENGR OFFICE		
Q.C.		
APPROVAL		
APPROVAL		

Sensor Systems inc. Chatsworth, California 91311

TITLE
OUTLINE DRAWING
GLOBALSTAR/GPS ACTIVE ANTENNA
1610-1626.5 MHz, 2483.5-2500 MHz

CODE IDENT NO.	SIZE	NO.	REV
13691	D	S67-1575-164	C

SCALE 1:1 | O575164C #4 SA 06-25-01 | SHEET 1 OF 1

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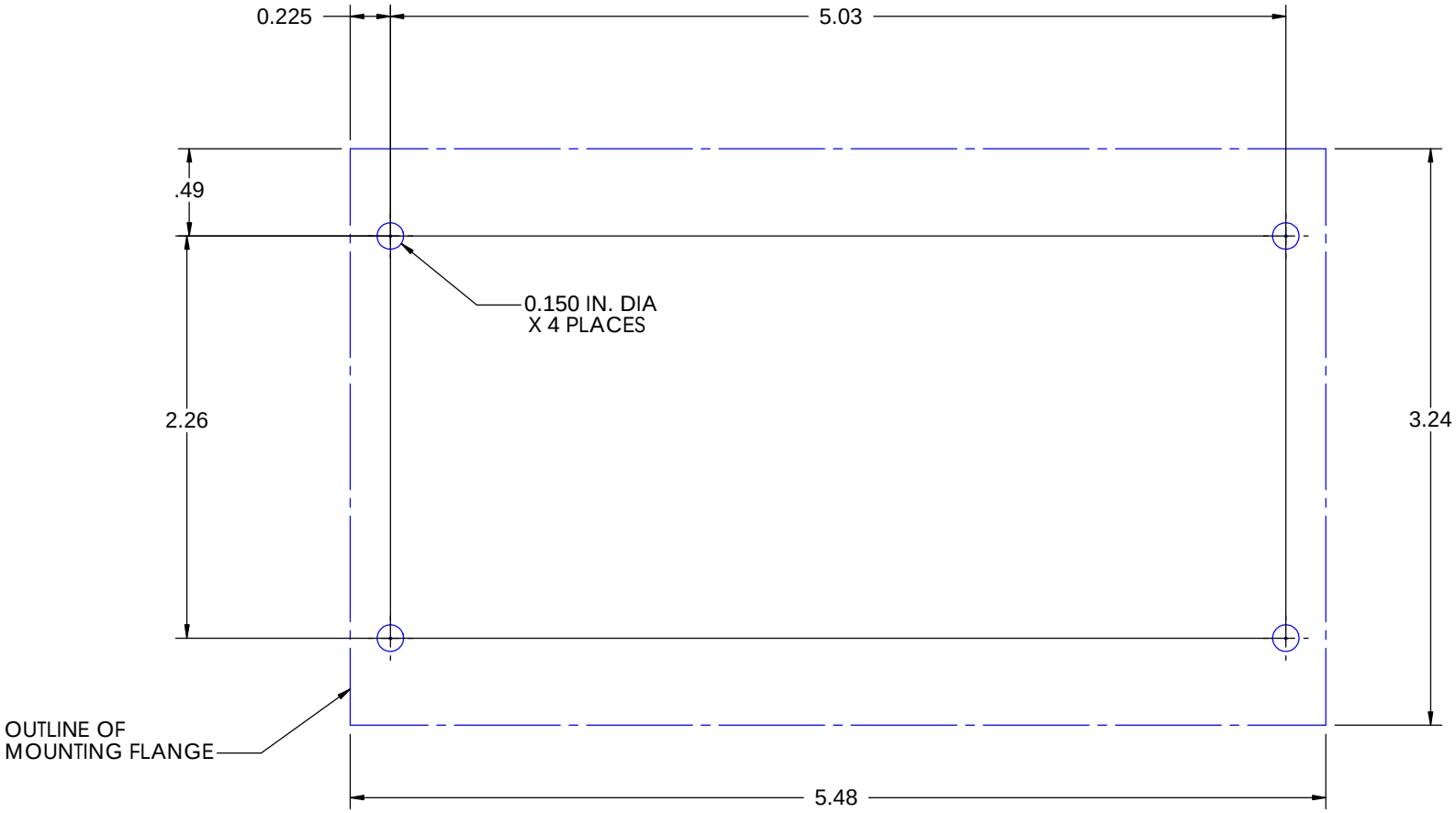
REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	ORIGINAL RELEASE	11/08/02	



NOTES:
1. INSTALL WITH #6 FASTENERS

ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	QTY REQD

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS ..XX±.010 .XXX±.OO5 .XXXX±.0010
ANGULAR ±.5°

MATERIAL ---

FINISH ---

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN JR	11/08/02
CHECKED	
PROJ	
ENGR	
ISSUED	

ARNAV SYSTEMS, INC.
16923 MERIDIAN EAST
PUYALLUP, WA 98373

TITLE

TEMPLATE, VC28

SIZE A | DWG. NO. **ENG-5023** | REV

SCALE | CAD FILE: | SHEET 1 OF 1

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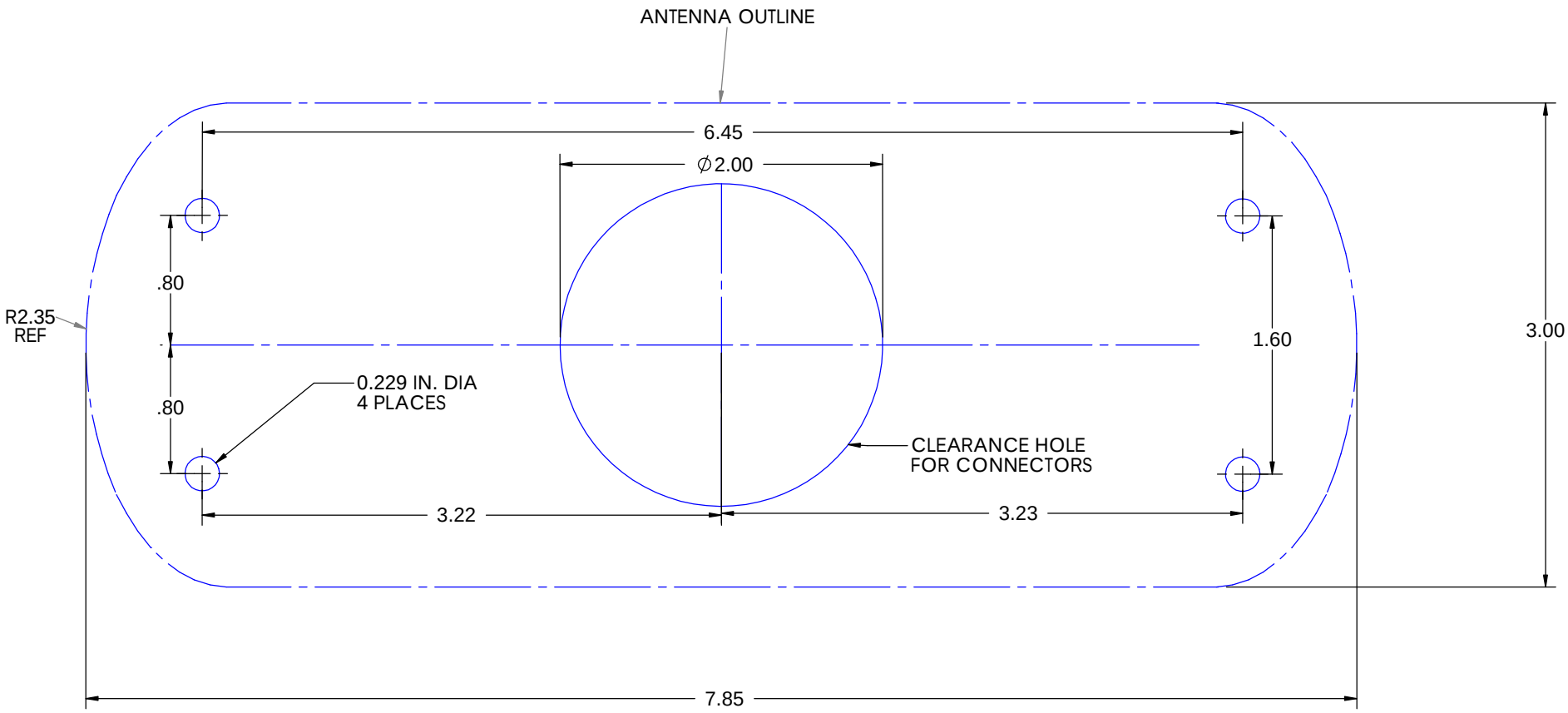
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
-	ORIGINAL RELEASE	10/25/02	



NOTES:
1. REMOVE PAINT FROM UNDER ANTENNA OUTLINE.
2. MASK AND ALLODYNE ANTENNA AREA.
3. INSTALL ANTENNA WITH SUPPLIED O-RING AND #10 FASTENERS.

ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	QTY REQD

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS: ..XX±.010, .XXX±.OO5, .XXXX±.0010
ANGULAR: ±.5°

MATERIAL: ---

FINISH: ---

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN JR	10/25/02
CHECKED	
PROJ	
ENGR	
ISSUED	

ARNAV SYSTEMS, INC.
16923 MERIDIAN EAST
PUYALLUP, WA 98373

TITLE

TEMPLATE, RCOM-100 ANTENNA

SIZE A | DWG. NO. ENG-5022 | REV

SCALE | CAD FILE: | SHEET 1 OF 1

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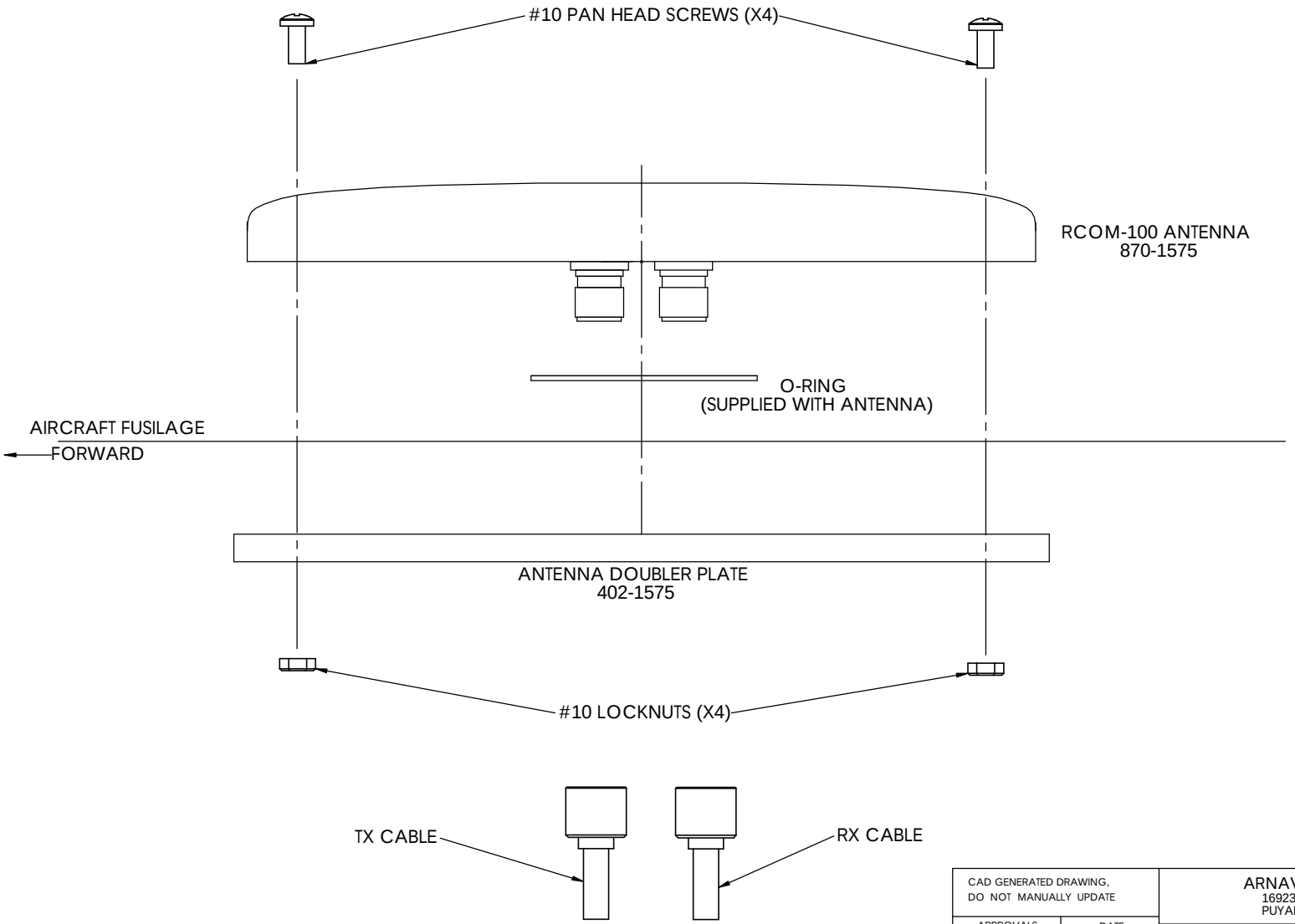
REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	ORIGINAL RELEASE	11/27/02	



CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN JR	11/27/02
CHECKED	
PROJ	
ENGR	
ISSUED	

ARNAV SYSTEMS, INC.
16923 MERIDIAN EAST
PUYALLUP, WA 98373

TITLE

RCOM-100 ANTENNA INSTALLATION

SIZE	DWG. NO.	REV
A	ENG-5026	-

SCALE | CAD FILE: | SHEET 1 OF 1

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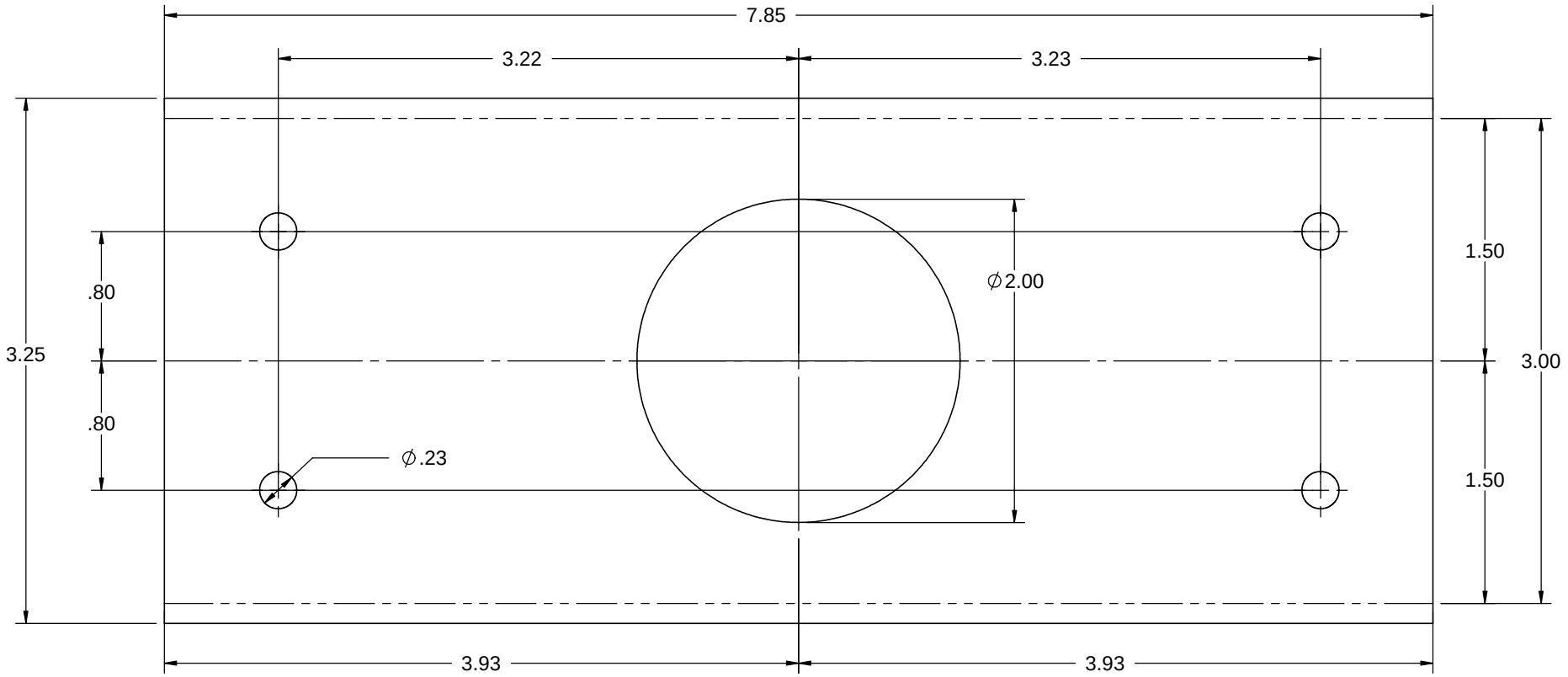
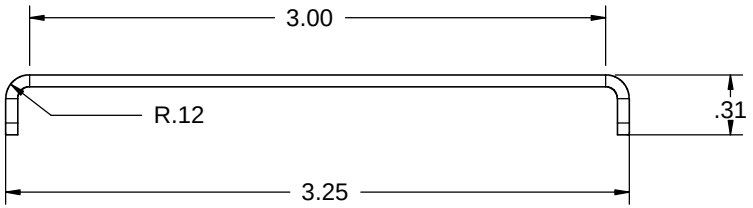
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
-	ORIGINAL RELEASE	10/25/02	





NOTES:
1. BREAK ALL SHARP EDGES AND CORNERS.
2. ALL HOLES TO BE LOCATED WITHIN 0.005" OF TRUE POSITION.
3. MATERIAL: ALUMINUM ALLOY 5052-H32
4. THICKNESS: 0.060" - 0.062"
5. FINISH: CHEMICAL FILM CLASS III PER MIL-C-5541

ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	QTY REQD

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS: ..XX ±.010, .XXX ±.OO5, .XXXX ±.0010
ANGULAR: ±.5°

MATERIAL: ---

FINISH: ---

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN JR	10/25/02
CHECKED	
PROJ	
ENGR	
ISSUED	

ARNAV SYSTEMS, INC.
16923 MERIDIAN EAST
PUYALLUP, WA 98373

TITLE
402-1575 RCOM-100 ANTENNA DOUBLER

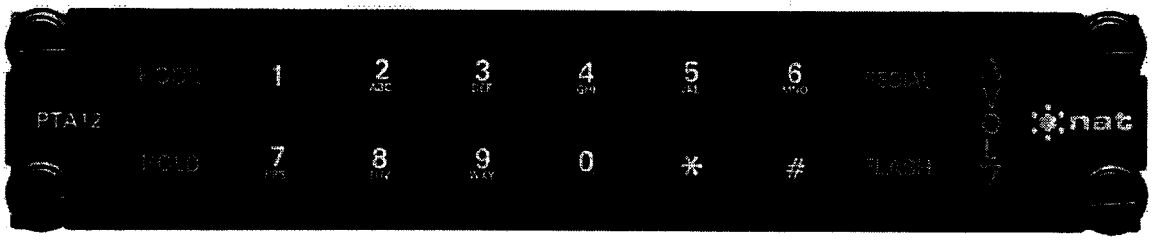
SIZE A | DWG. NO. **402-1575** | REV -

SCALE | CAD FILE: | SHEET 1 OF 1

Appendix B– PTA-12 Install Manual

SM55

PTA12-000
POTS Telephone Adapter
Manual



INSTALLATION AND SERVICE MANUAL

REV 1.00 June 25, 2001

Northern Airborne Technology Ltd.
#14-1925 Kirschner Road
Kelowna, BC, Canada.
V1Y 4N7

Telephone (250) 763-2232
Facsimile (250) 762-3374

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Section 1.0 Description

1.1 Introduction

This manual contains information on the PTA12 POTS Telephone Adapter.

Information in this section consists of purpose of equipment, features and specifications.

1.2 Purpose of Equipment

The PTA12 POTS Telephone Adapter is a keypad control/headset adapter unit for airborne telephone system applications. The PTA12 connects to a telephone system transceiver by a two-wire POTS (Plain Old Telephone Service) interface. The PTA12 can be connected to the aircraft audio controller(s) or directly to an aviation headset/handset.

1.3 Features

The PTA12 POTS Telephone Adapter is compact Dzus mounted POTS telephone interface with a keypad input. The functions of the PTA12 include ring detect, ringer audio generate, DTMF tone generation, speech audio circuits, hook-switch, and flash. The speech circuits include a mic input amplifier and a phones output amplifier with front panel volume control. HOOK-switch control and indication is provided on the front. Ring indication is also provided on the front panel with a flashing green LED. A FLASH key is provided on the front panel for use with call transfer and call waiting. A HOLD key on the front panel mutes all audio to and from the headset. A REDIAL key on the front panel automatically redials the last number entered. The interface to the airborne telephone system transceiver is achieved by a two-wire POTS port. The front panel keypad is illuminated for night operations.

Note: The PTA12 is designed to meet standard North American PSTN requirements, but it is not recommended or approved for land line applications.

1.4 Specifications

1.4.1 Electrical Specifications

Power Supply

Voltage:	Normal	+27.5 Vdc nominal (with reverse & over voltage/current protection)
	Minimum	+22.0 Vdc.
	maximum	+30.3 Vdc.
	emergency	+18.0 Vdc

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Input Current	0.25 Amps max @ +27.5 Vdc.
Backlighting	1.0 mA max @ +27.5 Vdc. 0.1 mA max @ +5.0 Vdc.

Input Signals

Microphone	150 Ohm amplified dynamic. 250 mVrms rated input level. Impedance: 150 Ohm ± 10%.
Circuitry Type	Single Ended.
Mic bias	+13 ± 0.5 Vdc (on/off selectable externally).

Output Signals

Phones	Rated level: 100 mW into 600 or 150 Ohms Circuitry Type: Differential Freq. Resp: ≤ 3 dB roll-off from 350 to 3000 Hz Distortion: ≤ 5% THD @ rated power output Audio Noise (no signal): ≤ -50 dB from rated output Available Audio: RX audio, Sidetone, DTMF sidetone Ringing tone: enabled or disabled externally
Ringer Audio	Ringer audio present based on ringing cadence Level: 2.5 Vrms (typ), 3.6 Vrms (max) into 600 Ohms Circuitry Type: Single Ended
Ringer Drive	Pulled to Power Ground when ringer is active (based on ringing cadence). Open collector, 250 mA max sink current @ +28 Vdc. Over-current and over-voltage protected.

Input / Output Signals

POTS (2 wire)	Reverse polarity protected and current limited.
On-hook Condition	DC voltage: withstands ± 70 Vdc max. Resistance: 10 to 15 MOhms.
Ringing Condition:	Impedance 10 to 15 kOhms @ 25 Hz Active when ringing signal on tip/ring > 30 Vrms @ 25 Hz Inactive when ringing signal on tip/ring < 10 Vrms @ 25 Hz
Ringing Functions	Accepts square, trapezoidal or sinusoidal functions Withstands 120 Vrms (max) 25 Hz sinusoidal function

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Off-hook Condition:

Impedance:	600 Ohms ± 5% @ 1kHz
Circuitry Type:	Balanced
DC loop current:	25 mA (typical) to 120 mA (max)
DC voltage:	≤ 9.0 Vdc @ 25mA loop current
Freq. Response:	≤ 3 dB roll-off from 350 to 3000 Hz
Distortion:	≤ 5% THD
Audio Noise:	≤ -50 dB from rated output (no signal)
Available Audio:	TX Audio, RX Audio.
TX Audio:	Mic Input to tip/ring: 775 mVrms (0 dBm) with < 5% THD
Test condition:	170 mVrms @ 1 kHz into Mic input, Mic level potentiometer set to max
RX Audio:	Typical expected audio level: 77.5 to 775 mVrms (-20 to 0 dBm)
DTMF signaling:	Standard DTMF frequencies used: 0 - 9, *, # Frequency tolerance: ± 1.5 %

DTMF TX on tip/ring (DTMF level potentiometer set to max.):

High group	-2.2 dBm ± 1.0 dB. -2.2 dBm ± 2.5 dB (short time high operating temperature).
Low group	-4.2 dBm ± 1.0 dB. -4.2 dBm ± 2.5 dB (short time high operating temperature).

Miscellaneous

HOLD	TX mic muting: ≤ -60 dB from rated output RX phones muting: ≤ -85 dB from rated output Sidetone muting: ≤ -90 dB from rated output
REDIAL	Typical tone duration: 82 ± 8 ms Typical inter-digit pause time: 82 ± 8 ms
VOL	Dynamic range: 40 ± 3dB

1.4.2 Physical Specifications

Height	1.12" (28.4 mm)
Width	5.75" (146.1 mm) in front of panel 4.80" (121.9 mm) behind panel
Depth	4.17" (105.9 mm) behind panel, including connector
Weight	0.63 lbs. (0.29 kg).

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Front Panel	Aluminum, with Lexan label and Elastomeric keypad. Front panel is not backlit. Silicone rubber, tactile push-buttons backlit by amber LEDs.
Mounting	Dzus rail (4 fasteners).
Material/Finish	Chassis & cover are 5052-H32 brushed aluminum with chromate conversion finish
Connectors	One male filtered 25 pin D-min with Positronics V5 locking tabs

1.4.3 Environmental Specifications

Operating Temperatures	-20° C to +55° C
Survival Temperatures	-55° C to +85° C
Vibration/Shock	DO-160D Cat. [(SBM)(UF)]
Humidity	> 95%
Altitude	50,000 ft.

Compliance:

DO-160D Env. Cat. A1/D1-BAB[(SBM)(UF)]XXXXXXZBABB[UTX]MXXXX.

1.5 Accessories Required But Not Supplied

Installation kit p/n PTA12-IKC (crimp) or PTA12-IKS (solder) is required to complete the installation. They consist of the following:

PTA12-IKC 25-pin D-min Female Crimp Kit (NAT Part No. D25SV-IKC)

Quantity	Description	NAT Part #
1	D-min 25 Socket housing	20-21-025
25	MS Crimp Socket	20-26-901
1	25 Pin JVL Hood/Locklever	20-29-250

PTA12-IKS 25-pin D-min Female Solder Kit (NAT Part No. D25SV-IKS)

Quantity	Description	NAT Part #
1	D-min 25 Socket Solder Cup	20-20-025
1	25 Pin JVL Hood/Locklever	20-29-250

End of section 1.0

ENG-FORM: 800-0106.DOT

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Section 2.0 Installation

2.1 Introduction

Information in this section consists of: unpacking and inspection procedures, installation procedures, post-installation checks, and installation drawings.

2.2 Unpacking and Inspection

Unpack the equipment carefully and locate the warranty card. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Note that each unit should have the following:

- PTA12 POTS Telephone Adapter
- Warranty Card
- Operator's Manual
- Release certification

Verify that all items are present before proceeding and report any shortage immediately to your supplier.

Complete the warranty card information and send it to NAT when the installation is complete. If you fail to complete the warranty card, the warranty will be activated on date of shipment from NAT.

2.3 Installation Procedures

2.3.1 Warnings

Do not bundle any lines from this unit with transmitter coax lines. Do not bundle any audio or DC power lines from this unit with 400 Hz synchro wiring or AC power lines. Do not position this unit or wiring from this unit next to any device with a strong alternating magnetic field such as an inverter, or significant audio interference will result.

2.3.2 Cautions

⇒ In all installations, use shielded cable exactly as shown and ground as indicated. Significant ground loop and noise problems may result from not following these guidelines. **Ensure chassis is grounded to provide proper shield terminations.**

⇒ Use caution when routing microphone wiring, as it is a low level signal prone to coupling from other sources.

⇒ Do not take a ground from the instrument panel or similar location that shares a ground return with a turn and bank, horizon or other motor driven instrument. This may cause the PTA12 unit to pick up the sound of the motor as ground loop interference.

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2.3.3 Cabling and Wiring

All unshielded wire should be MIL-W-22759 or equivalent. For shielded wire applications, use Tefzel MIL-C-27500 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in Section 2.5 as required.

Allow 3 inches from the end of the wire to the shield termination to allow the hood to be easily installed. Note that the hood is a 'clamshell' hood, and is installed after the wiring is complete.

All wiring should be at least 22 AWG, except power and ground lines, which should be at least 20 AWG. Ensure that all ground connections are clean and well secured.

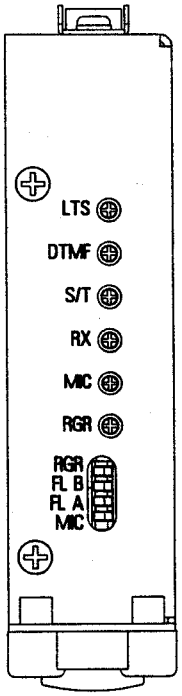
2.3.4 Internal Adjustments

The following adjustments are accessible through holes in the side of the unit.

2.3.4.1 Internal Trimpots

Rotating the trimpots cw will increase the level of the related output, and ccw will decrease it.

LTS	adjusts keypad backlighting level from off to max
DTMF	adjusts DTMF level on POTS interface
S/T	adjusts sidetone level
RX	adjusts receive level on phones output
MIC	adjusts mic level on POTS interface
RGR	adjusts ringer level on both ringer audio and phones output



2.3.4.2 Internal Switches

RGR (ringer select)	on [down]	ringer audio available on both phones and ringer audio outputs
	off [up]	ringer audio only available on ringer audio output
***FL B** (hook flash)	on [down]	flash = 600 ms ± 10%
	off [up]	600ms hook flash disabled
***FL A** (hook flash)	on [down]	flash = 90 ms ± 10%
	off [up]	90ms hook flash disabled
MIC (mic bias)	on [down]	mic bias supplied by PTA12
	off [up]	mic bias not supplied

* One of FL A or FL B must be selected 'on' for proper hook switch operation

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2.3.5 Post-Installation Checks

2.3.5.1 Voltage/resistance checks

Do not attach the PTA12-000 until the following conditions are met.

Check the following:

a) Check P101, pins **<1>** and **<3>** for +28 Vdc relative to ground.

b) Check P101, pins **<14>** and **<16>** for continuity to ground (less than 0.5 Ω).

2.3.9.2 Power On checks

Install the PTA12 and power up the ship's systems. Verify normal operation of all functions. Refer to Section 3 for specific operation details.

Notes: PTA12 functionality is highly dependant on the airborne telephone system interface. Ensure proper operation of the telephone transceiver, and ensure that the transceiver has an activated telephone line.

Where the PTA12 is connected to an existing audio system, ensure that the PTA12 is properly selected when performing audio checks.

a) Initiate a call to a valid telephone number and verify the operation for HOOK, HOLD, DTMF keys (0-9, *, #), and VOL. Re-initiate the call using REDIAL. Test the FLASH function (where applicable) while in the off-hook state (active).

b) Place the PTA12 in the on-hook (inactive) state, and have another party call the line connected to the PTA12. Verify proper RINGER, HOOK and HOLD operation.

Note: To verify proper operation, all functions and levels should be checked in-flight.

Upon satisfactory completion of all performance checks, make the required log entries and complete the necessary Regulatory Agency paperwork before releasing the aircraft for service.

2.4 Continued Airworthiness

Maintenance of the PTA12 is 'on condition' only. Periodic maintenance of this product is not required.

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2.5 Installation Drawings

DRAWING	REV.	DESCRIPTION	TYPE
PTA12\000\403-0	1.00	POTS Telephone Adapter	Interconnect
PTA12\000\405-0	1.00	POTS Telephone Adapter	Connector Map
PTA12\000\905-0	1.00	POTS Telephone Adapter	Faceplate
PTA12\000\922-0	1.00	POTS Telephone Adapter	Mech. Installation

Section 2.0 ends after these Drawings

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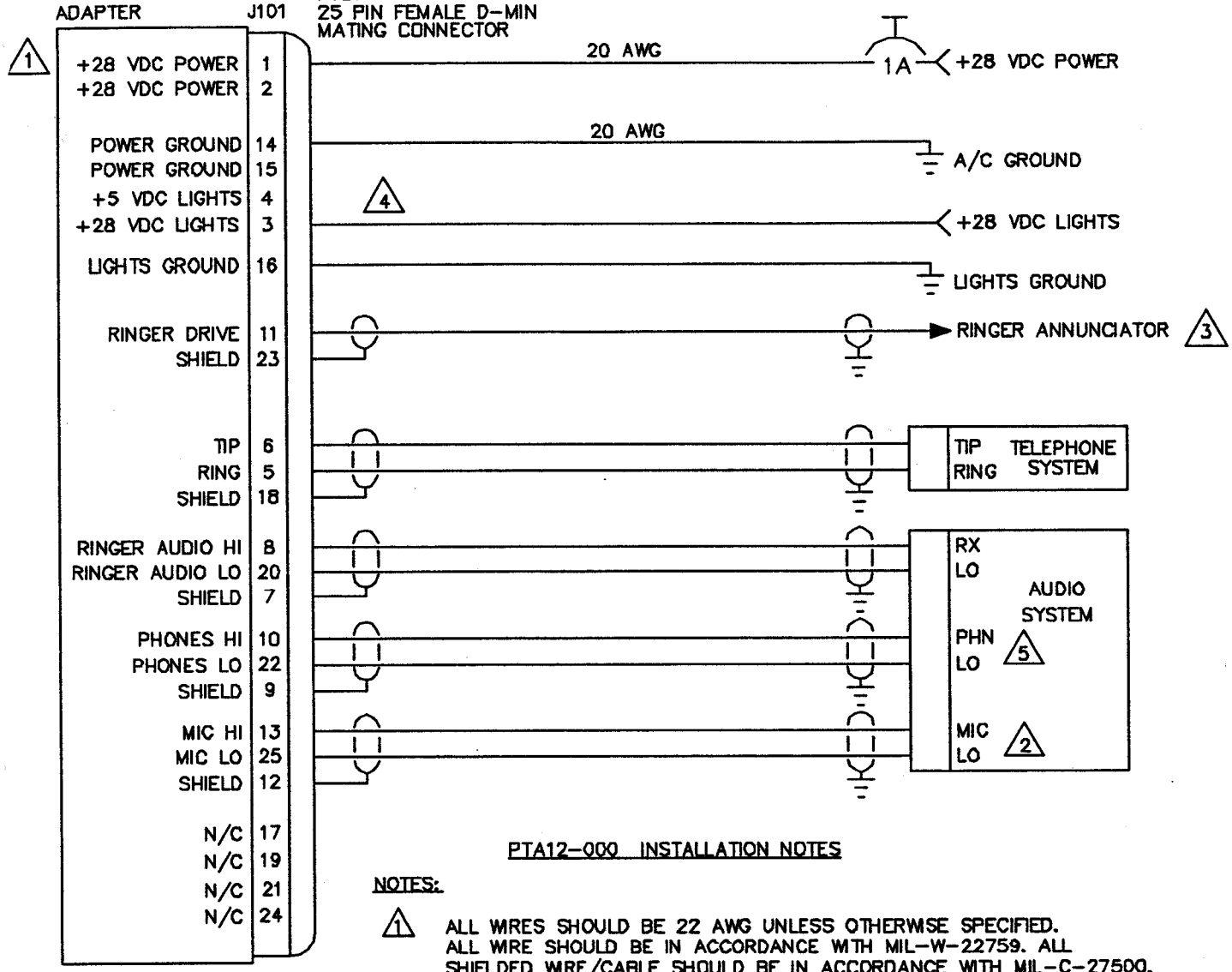
REVISIONS			
REV	DESCRIPTION	DATE	BY
1.01	ECR #2065 – NOTE 6 ADDED.	OCT 12/01	TAT



PTA12-000 INSTALLATION NOTES

NOTES:

1. ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE SPECIFIED. ALL WIRE SHOULD BE IN ACCORDANCE WITH MIL-W-22759. ALL SHIELDED WIRE/CABLE SHOULD BE IN ACCORDANCE WITH MIL-C-27500.
2. MIC LO MUST BE GROUNDED AT AUDIO PANEL.
3. PULLED TO POWER GROUND WHEN ACTIVE. +28 VDC MAX @ 250mA MAX.
4. ONLY +28VDC LIGHTS OR +5VDC LIGHTS MAY BE USED AT ONE TIME.
5. PHONE OUTPUT IS TRANSFORMER COUPLED (BALANCED); 'LO' WIRE REQUIRES TERMINATION.
6. THIS DRAWING APPLIES TO THE FOLLOWING MODELS: PTA12-000, PTA12-004, PTA12-005

DEFINITIONS:

N/C: NO CONNECTION. THE PIN IS NOT CONNECTED TO ANYTHING INTERNALLY, AND THEREFORE SHALL HAVE NO CONNECTION EXTERNALLY.

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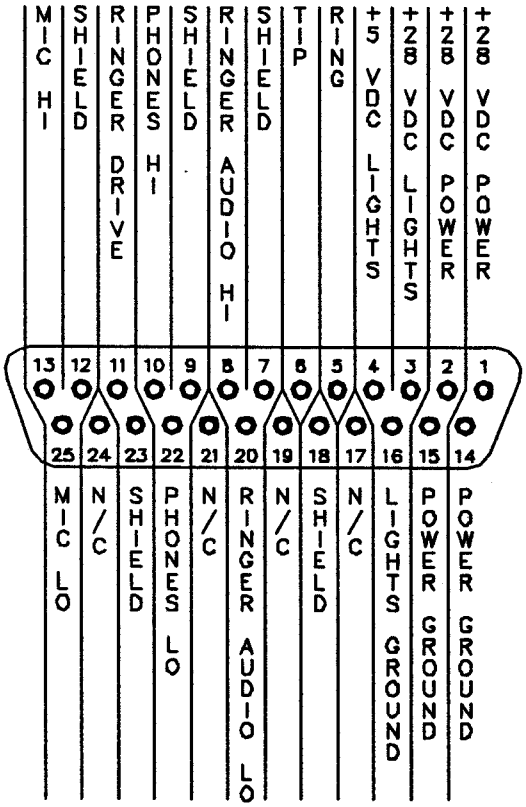
DESIGNED	SRK	NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	MWS					
DATE	APR 09/01	TITLE	POTS TELEPHONE ADAPTER			
CHECKED	NAT 114 / NAT 214					
APPROVED	NAT 113	SIZE A	CAGE CODE 3AB01	PART NO. PTA12-000	REV. 1.01	SHEET 1/1
FILE 403-0101.DWG		DWG. TYPE INTERCONNECT		DWG. NO. PTA12\000\403-0		

REVISIONS			
REV	DESCRIPTION	DATE	BY
1.01	ECR #2065 – NOTE 1 ADDED.	OCT 12/01	TAT

MATING CONNECTOR
25 PIN FEMALE D–MIN

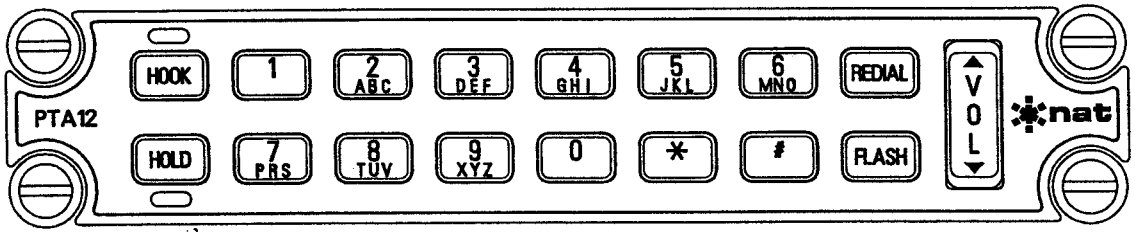
P101



NOTE:
1. THIS DRAWING APPLIES TO THE FOLLOWING MODELS:
PTA21–000, PTA12–004, PTA12–005

CONFIDENTIAL AND PROPRIETARY TO NAT LTD.

DESIGNED	SRK	NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	MWS					
DATE	FEB 23/01	TITLE	POTS TELEPHONE ADAPTER			
CHECKED	NAT 214					
APPROVED	NAT 113	SIZE A	CAGE CODE 3AB01	PART NO. PTA12–000	REV. 1.01	SHEET 1/1
FILE 405–0101.DWG		DWG. TYPE CONNECTOR MAP		DWG. NO. PTA12\000\405–0		



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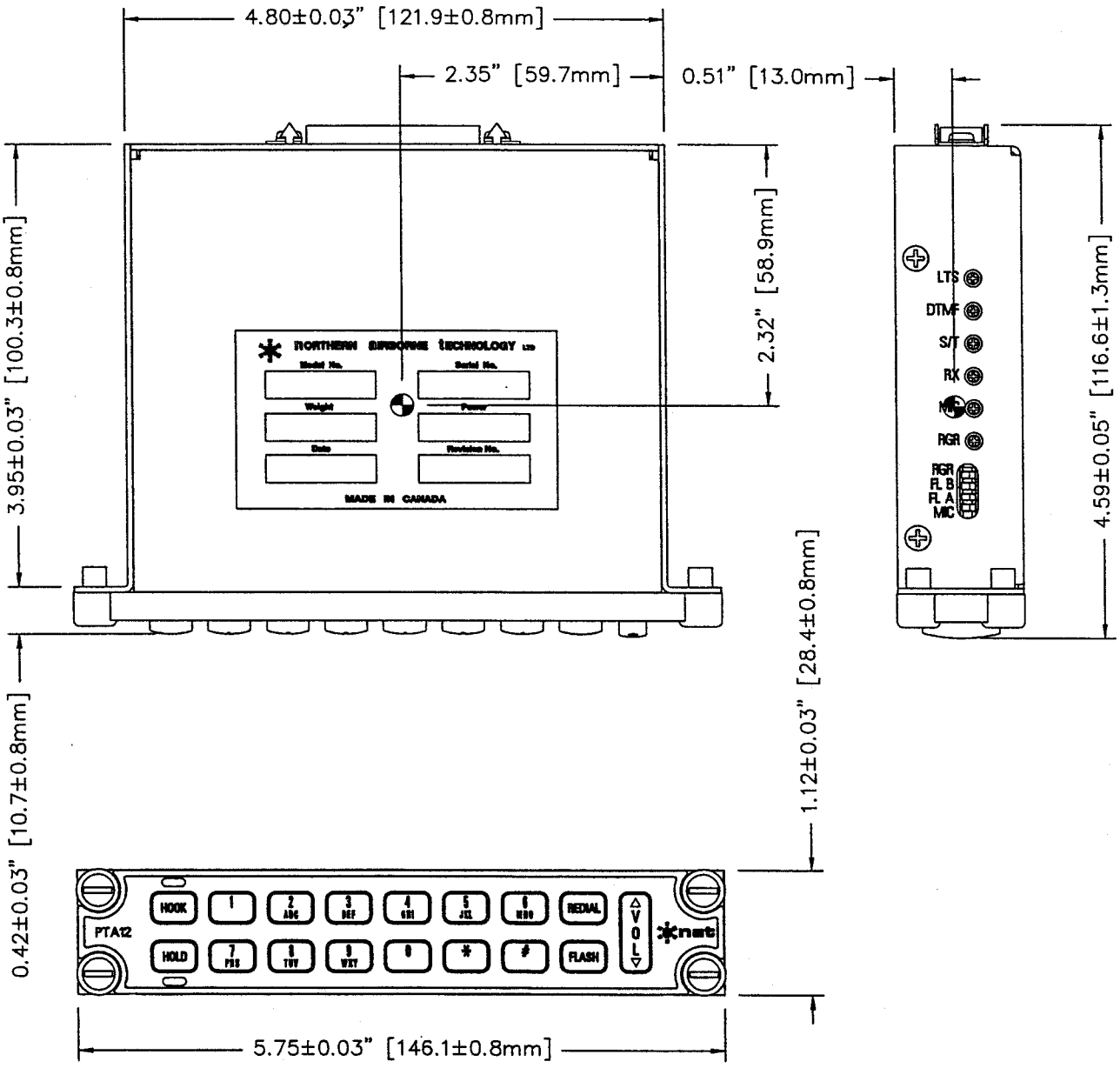
DESIGNED	SRK	nat NORTHERN AIRBORNE TECHNOLOGY LTD.					
DRAWN	MWS						
DATE	APR 18/01	TITLE	POTS TELEPHONE ADAPTER				
CHECKED	NAT 205 / NAT 223						
APPROVED	NAT 107	SIZE A	CAGE CODE 3AB01	PART NO. PTA12-000		REV. 1.00	SHEET 1/1
FILE 905-0100.DWG		DWG. TYPE FACEPLATE		DWG. NO. PTA12\000\905-0			



CENTER OF GRAVITY ±0.10" (±2.54mm)

WEIGHT: 0.63±0.06 lbs. (0.29±0.03 Kg)

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TOLERANCES UNLESS STATED OTHERWISE 0.X=+/−0.030 0.XX=+/−0.010 0.XXX=+/−0.005 0.XXXX=+/−0.002 ANGLE=+/− 0.5 DEG.	DIMENSIONS IN INCHES THIRD ANGLE PROJECTION	DESIGNED: SRK DRAWN: MWS DATE: APR 09/01 CHECKED: NAT NAT 114-223	nat NORTHERN AIRBORNE TECHNOLOGY LTD. TITLE: POTS TELEPHONE ADAPTER
MATERIAL FINISH		APPROVED: NAT 107	SIZE: A; CAGE CODE: 3AB01; PART NO.: PTA12−000; REV.: 1.00; SHEET: 1/1
		FILE: 922−0100.DWG	DWG. TYPE: MECH. INSTALLATION; DWG. NO.: PTA12\000\922−0

Section 3.0 Operation

3.1 Introduction

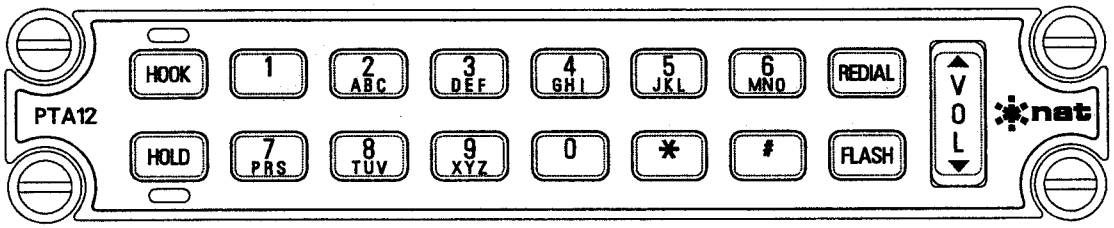
Information in this section consists of the functional and operational procedures for the PTA12 POTS Telephone Adapter.

3.2 General

The PTA12 POTS Telephone Adapter is a keypad control unit for airborne telephone system applications. The PTA12 connects to a telephone system transceiver by a two-wire POTS (Plain Old Telephone Service) interface.

Note: The PTA12 is designed to meet standard North American PSTN requirements, but it is not recommended or approved for landline applications.

3.3 Operation Specifics



3.3.1 Keypad Controls

The keypad controls are silicone rubber, tactile push-buttons, backlit by amber LEDs, and are used to manage all the operator functions of the PTA12.

3.3.1.1 Number and Symbol Keys

The number (0 - 9) and symbol (*, #) buttons on the keypad are used to 'dial' the required telephone number by generating the corresponding DTMF tone on the POTS output. As each key is pressed, audible confirmation is provided on the sidetone of the headset output.

3.3.1.2 HOOK

Press the HOOK button to initiate or receive a call. This corresponds to lifting the handset of a telephone 'off the hook'. Each time the HOOK button is pressed, the hook-switch toggles on / off.

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The 'hook status / ringer active' annunciator is a green LED above the HOOK button. The LED is off when the unit is inactive ('on-hook'), and will illuminate continuously when the unit is active ('off-hook'). If the unit is inactive ('on-hook'), this LED also acts as a 'Ringer Active' annunciator by flashing when an incoming call activates the audible ringing tone in the headset. If the unit is already in use ('off-hook'), the new caller will generally hear a 'busy' signal (depending on the telephone system transceiver used).

Note: The Ringing Detect circuit that activates the headset ringer, the Ringer Audio output and the flashing LED also sends a signal to a further discrete output for a remote indicator (light bulb, etc.) if required.

3.3.1.3 HOLD

The HOLD button allows the operator to put a call 'on hold' by muting the mic and phones audio. This feature is only available when the unit is active ('off-hook').

The hold status annunciator is a green LED below the HOLD button. The LED illuminates to indicate that a call is on hold, and switches off when the call audio is returned to active status.

3.3.1.4 FLASH

The FLASH button is typically used in a system where 'call waiting' and 'call transfer' are supported. When the unit is active ('off-hook'), the FLASH button is used to interrupt a call and allow the user to deal with a second call.

3.3.1.5 REDIAL

The REDIAL button recalls and dials the last number dialed (up to 32 digits). Note that this is volatile storage, i.e.: the last dialed number is 'cleared' when the unit is powered down.

3.3.1.6 VOL

The VOL button is a momentary digital rocker-switch used to increase and decrease the phones output volume within a pre-set range. Press the upper portion of the switch to increase the volume and the lower portion to decrease the volume. There are 32 'steps' from minimum to maximum volume to ensure that a suitable level can be selected. Each 'step' requires a separate action of the push button – holding the button in the 'up' or 'down' position will NOT scroll through the setting range. The volume level setting is stored in non-volatile memory, and will therefore need minimal adjustment on power up.

End of section 3.0

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