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

RCOM-100
Installation GUIDE

PART NUMBER 570-8050

REV –

JANUARY 2002

REVISIONS

REV	DESCRIPTION	DATE	APPROVAL
-	Initial Release	January 2002	LAJ

TABLE OF CONTENTS

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 locating and mounting the transmit/receive antenna, locating and mounting the GPS antenna, installation of the mounting tray for the ARINC 600 2MCU box, and wiring the 37 pin circular connector for power, tip/ring, and the data connection port. For systems used only for data communications the Tip/Ring interface is not required, and for systems using voice communication only, the data port connection is not required.

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, transmit/receive antenna, the GPS antenna, and the mounting tray for the equipment. 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 GPS antenna.
6. Route the coax cables for transmit, receive, and GPS antenna signals to the ARINC 600 2 MCU tray.
7. Create the wire harness for the RCOM-100.
8. TIP/RING voice communication check out.
9. Data port check out.

3. INSTALLATION

Installation Kit:

ITEM #	ARNAV P/N	QTY	DESCRIPTION
1	150-1115	6	Connector, TNC
2	150-2168	1	Receptacle, Circular 37 Pin
3	452-0217	1	Mounting Frame Ass'y, ¼ATR
4	870-1575	1	Antenna, RF Transmit/Receive Satcom
5	870-0028	1	Antenna, GPS
6	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:

The GPS coaxial cable length may use any of the above cable types but must be kept less than 40 feet. There is no minimum length on the GPS cable.

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 6 feet. For least interference between the antennas a preferred distance between antennas is 13 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 help provide more rejection of non-GPS frequencies. If the GPS antenna can provide additional filtering the separation requirement can be reduced. The standard antenna supplied in this kit requires the 6 foot minimum separation.

When routing the coaxial cables make sure to identify the cables so they can be connected to the proper location. There are 3 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.

Securing The Mounting Tray:

Refer to drawing ENG-4985 in appendix A. This drawing shows the dimensions of the mounting holes and the screws to be used. You should 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.

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.

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 manufacture or in accordance with FAA approved engineering data. Special caution must be observed when installing antennas in pressurized aircraft.

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).

GPS Antenna Installation:

Refer to drawing 870-0028 in Appendix A. Drawing 870-0028 shows the dimensions of the antenna and mounting holes for the GPS antenna.

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 manufacture or in accordance with FAA approved engineering data. Special caution must be observed when installing antennas in pressurized aircraft.

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 the transmit/receive antenna (as defined above).

Circular 37 Pin Connector:

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.

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
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.

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:
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 is 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)

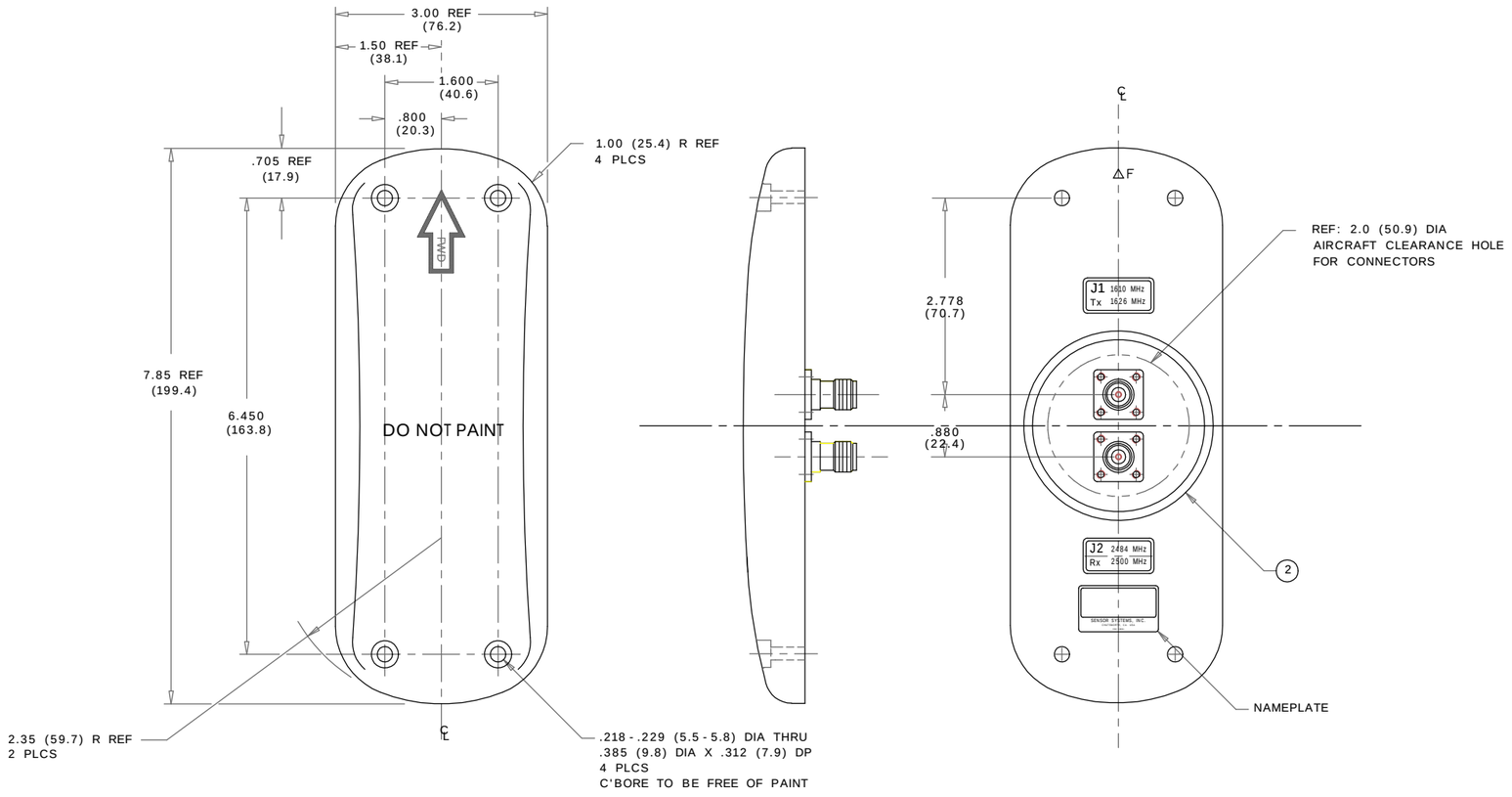
6. TECHNICAL INFORMATION

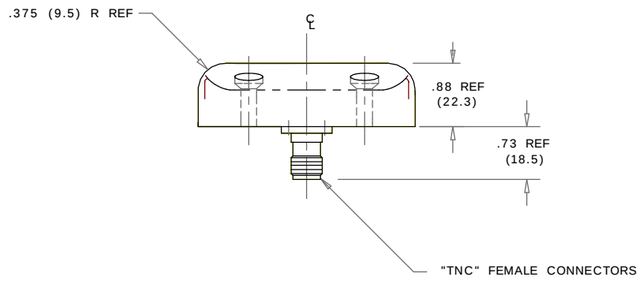
POWER: less than 40W Max. Typical Idle Operation: 5.5W
WEIGHT: ~7.5lB includes antennas, mounting tray, and RCOM-100

7. Appendix A - Drawings

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		

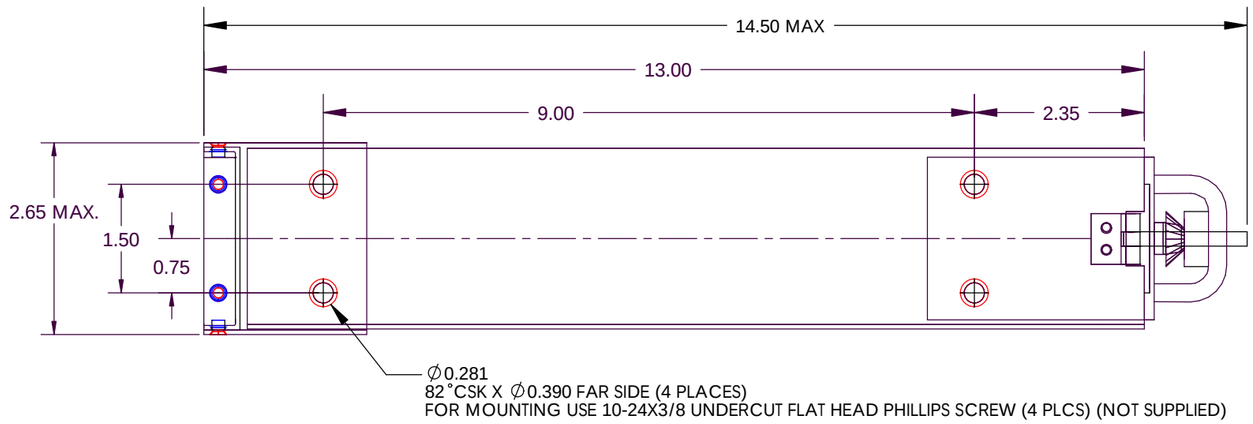
Sensor Systems inc. Chatsworth, California 91311

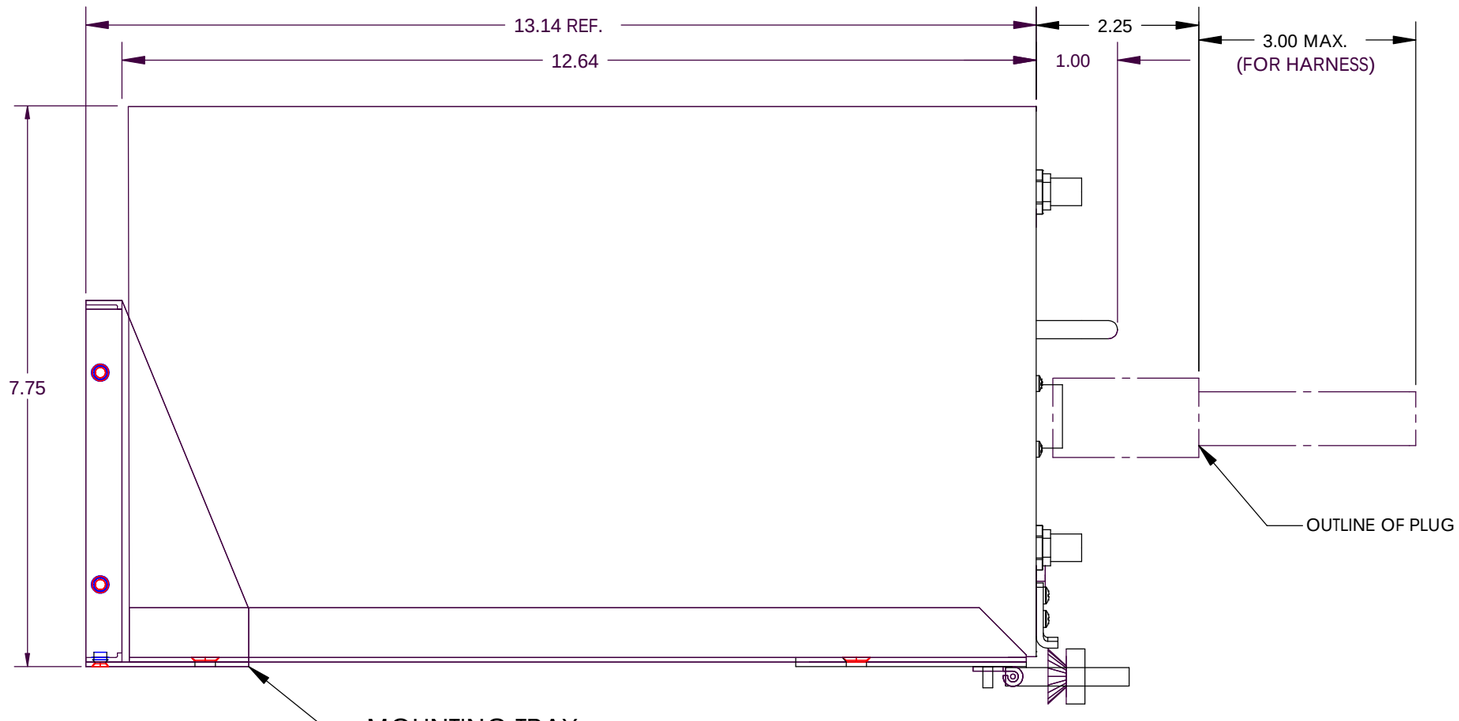
TITLE
OUTLINE DRAWING
GLOBALSTAR/GPS ACTIVE ANTENNA
1610-1626.5 MHz, 2483.5-2500 MHz

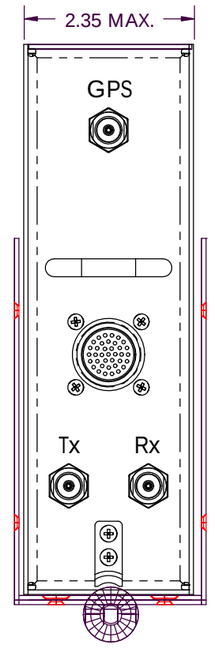
CODE IDENT NO.	SIZE	NO.	REV
13691	D	S67-1575-164	C

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

REVISIONS						
	REV	DESCRIPTION	DATE	APR	DR	CK
	-	ORIGINAL RELEASE	01/15/02	GH	LWR	GH







UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .XX ±0.03 .XXX ±0.010
ANGULAR ±0.5°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN BY: LWR	01/15/02
CHECKED	
PROJ	
ENGR	
ISSUED	

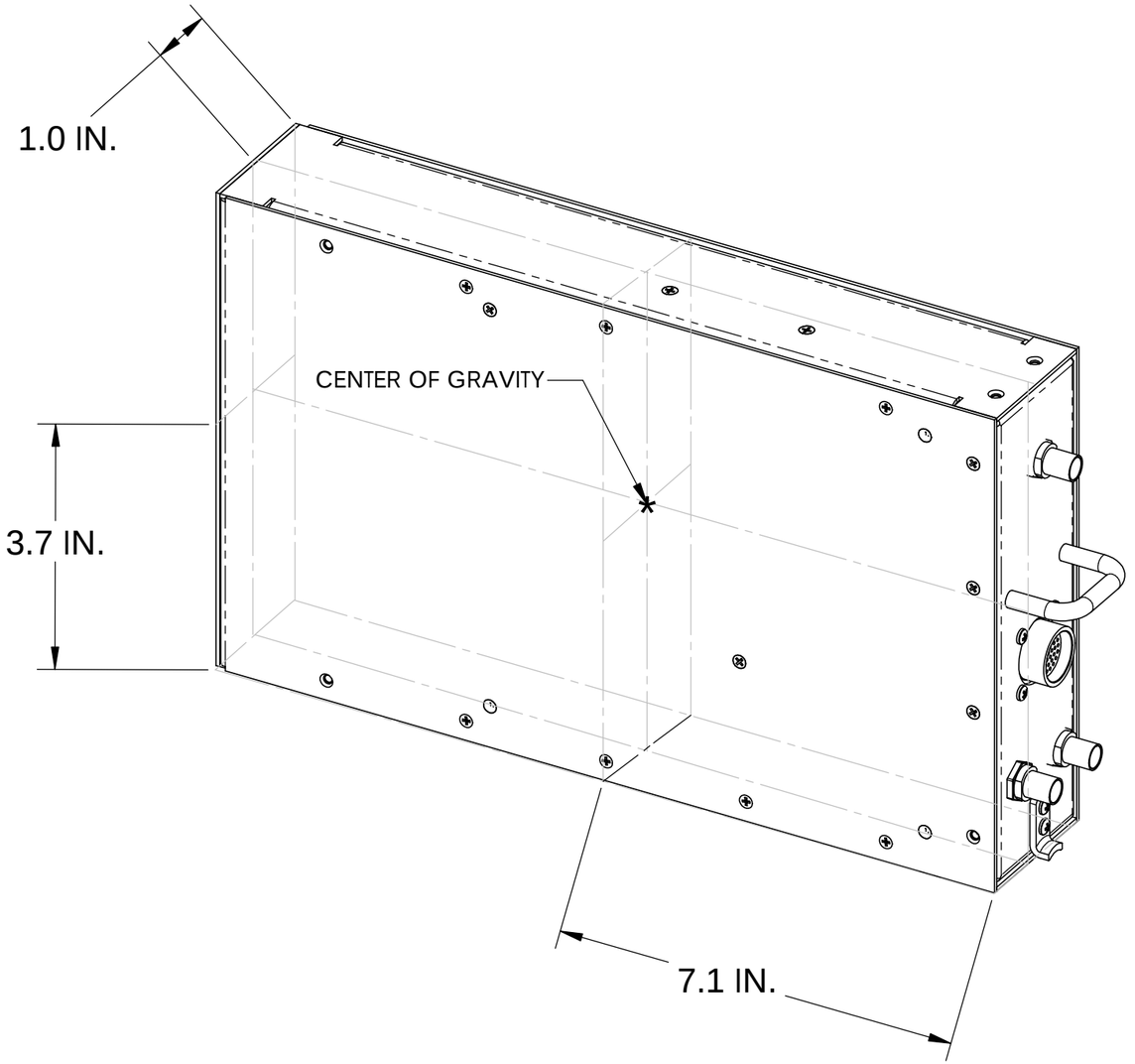
ARNAV SYSTEMS, INC
16923 MERIDIAN EAST, PUYALLUP, WA. 98373

TITLE
OUTLINE, MOUNTING TRAY/INSTALL
RCOM - 100

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

SCALE: 1=1 SHEET: 1 of 2

REVISIONS
SEE SHEET 1



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

TITLE

OUTLINE, MOUNTING TRAY/INSTALL RCOM - 100

SIZE	DWG. NO.	REV
B	**ENG - 4985**	-
SCALE	CAD FILE:	SHEET 2 OF 2

DATE	SYM	REVISION RECORD	AUTH	DR	CK
11-04-91	–	RELEASE	GH	DN	GH
5/19/93			GH	DN	GH

ARNAV SYSTEMS INC.
22007 MERIDIAN E., GRAHAM, WA 98338

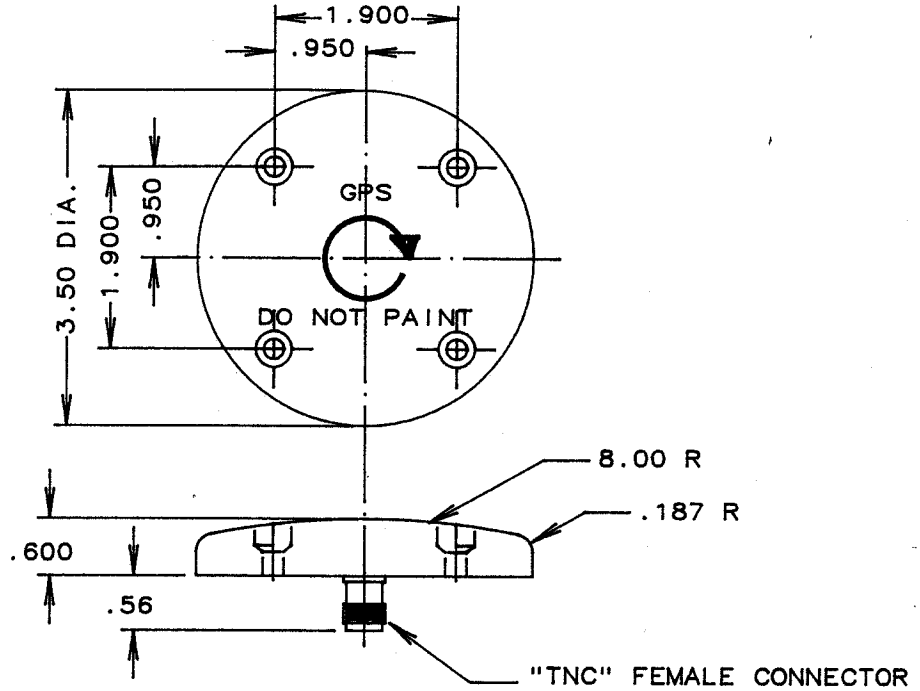
DRAWING NUMBER: 870-0028

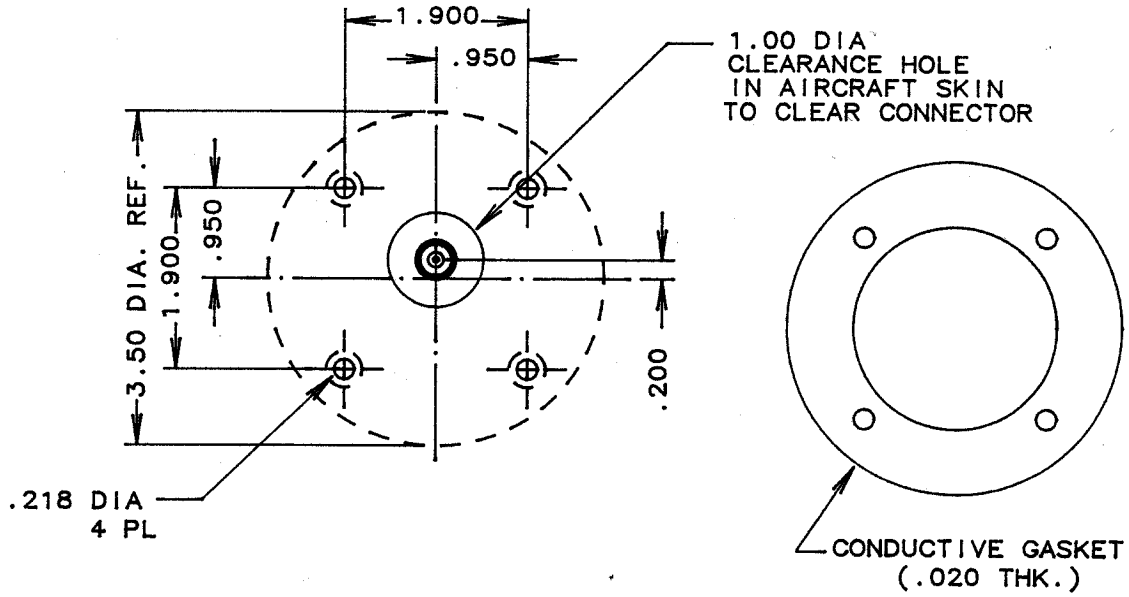
DATE: 10-29-91

APPROVED BY: GARY HAUFT

REVISION:

DESCRIPTION:
ANTENNA, GPS WITH PREAMP





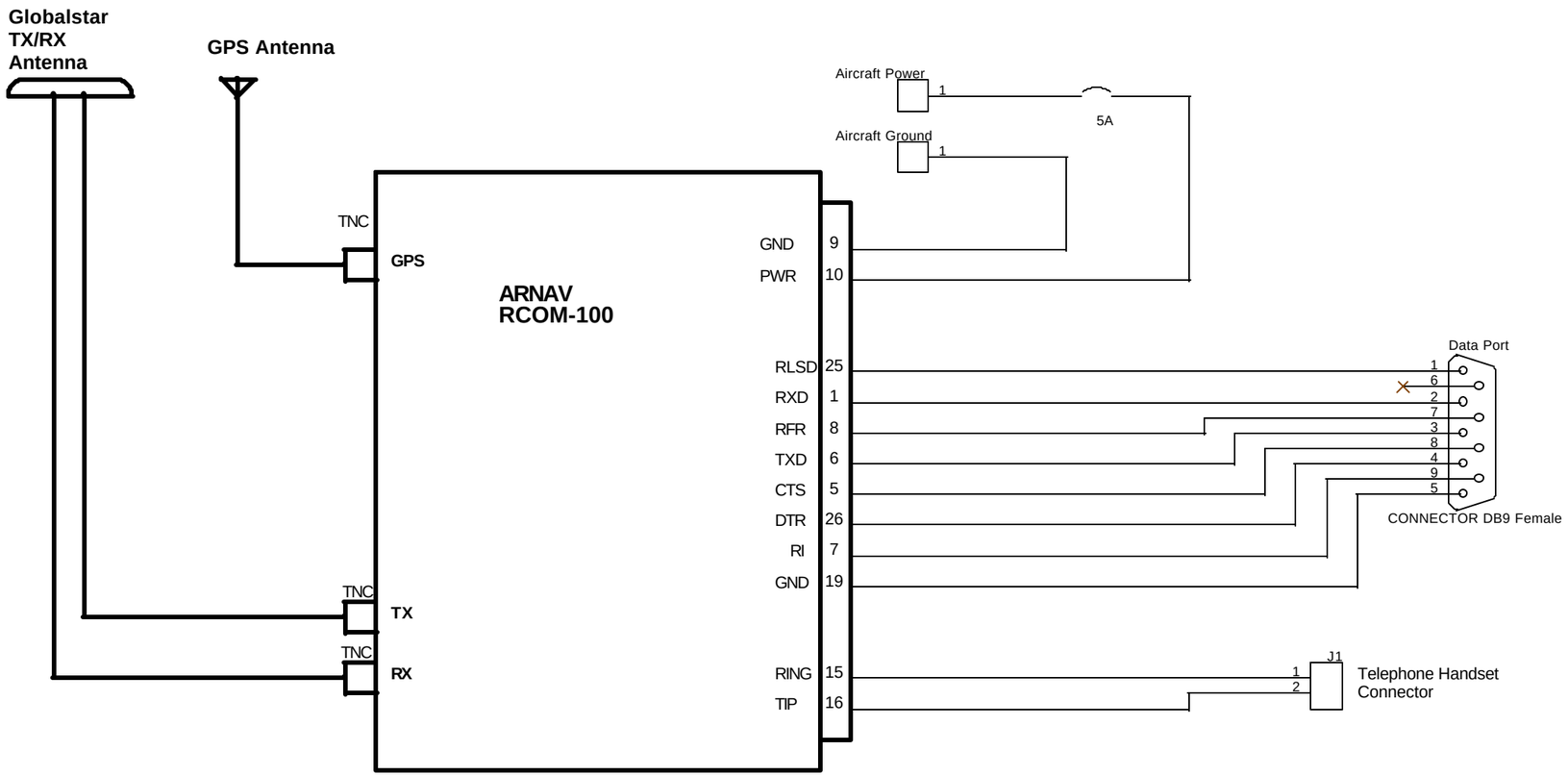
ANTENNA MOUNTING HOLE PATTERN

(BOTTOM SIDE OF ANTENNA SHOWN)

DIMENSIONS IN INCHES.
TOLERANCE: .XX = ±.03
.XXX = ±.010

NOTES:

1. ANTENNA SUPPLIED WITH 1 GASKET AND 4 FHP SCREWS 100 DEG (10-32 x .70).
2. SENSOR SYSTEMS P/N: S67-1575-39
3. GAIN (PREAMP): 26 dB.



APPROVED BY

ARNAV Systems, Inc.

16923 Meridian East
Puyallup, WA 98375

Title

RCOM-100 Installation Diagram

Size	Document Number	Rev
B	**ENG-7010**	

Date: **Thursday, January 17, 2002** Sheet **1** of **1**

Globalstar TX/RX Antenna

Aircraft Power
1
5A
Aircraft Ground
1

TNC
GPS

ARNAV RCOM-100

GND 9
PWR 10

RLSD 25
RXD 1
RFR 8
TXD 6
CTS 5
DTR 26
RI 7
GND 19

Data Port
1 6 2 7 3 8 4 9 5
CONNECTOR DB9 Female

For Computer connection for E-mail and Internet Access

TNC
TX
TNC
RX

RING 15
TIP 16

Telephone Handset Connector
J1
RING 1
TIP 2

Globalstar
RING
TIP
Existing Magnastar

Existing TIP/RING lines to Handset (i.e. Magnastar)
RING
TIP

APPROVED BY

ARNAV Systems, Inc.

16923 Meridian East
Puyallup, WA 98375

Title
RCOM-100 Installation Diagram - Shared Magnastar Handset

Size	Document Number	Rev
B	**ENG-7010-01**	

Date: **Friday, January 18, 2002** Sheet **1** of **1**