



**MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE**

**INSTALLATION MANUAL**

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# MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM

## 1.0 INTRODUCTION

The MagnaStar Digital Airborne Telephone System brings complete telephony service to business and general aviation aircraft. From the GTE Airfone digital air-ground telephone system to SATCOM connections, the MagnaStar C-2000 offers a full-featured communications environment.

### 1.1 Operational Features

The C-2000 system brings the office to the sky. All the communication features required in the office are made available in the airborne environment. The system has been designed to provide these features with high quality of service and ease of operation.

- Direct Dialing**

  - Callers can dial direct through the North American Public Switched Telephone Network (PSTN) or to international destinations. Calls can be charged to the corporate (MagnaStar equipment owner) account (1 + dialing) or to major credit cards (0 + dialing). Of course, operator assisted (0 +) calling is also available.
- Continuous North American Coverage**

  - The MagnaStar Digital Airborne Telephone operates over the GenStar™ digital telephone system from GTE Airfone, which offers continuous North American coverage with automatic cell-to-cell voice-call hand-off without call interruption. Ground system coverage is available throughout the United States, southern Canada, and Mexico.
- SATCOM Connection**

  - The MagnaStar system connects to SATCOM systems, on aircraft so equipped, to provide easy access and choice of communication link to callers from any cabin handset. The C-2000 supports both analog interfaces and the digital CEPT-E1 interface to multi-channel SATCOM systems.
- Cabin Management Connection**

  - MagnaStar air-ground communications can be provided to aircraft using separately supplied cabin management systems. Contact MagnaStar engineering support on the StarLine at (888-246-STAR) for further information and specific interface availability.
- Cellular Connection**

  - The MagnaStar system connects to the Cellular Phone (Cell Phone) System through the use of a Cell Phone Interface (CPI) to provide easy access to the Cellular system whenever the aircraft is on the ground.
- HF Connection**

  - The MagnaStar system connects to HF radios, on aircraft so equipped, to provide easy access to that communication link from any cabin handset. Push-to-talk (PTT) control is voice activated, eliminating the need for a PTT switch on the handset.
- Multiple Calls**

  - The MagnaStar system allows two simultaneous phone calls of any type (voice, data, FAX, TDD) over the GenStar system. Additionally, simultaneous calls can be made through a HF radio and over as many SATCOM channels as supported by the appropriate equipment, if so configured.
- Uplink Calls**

  - Uplink telephone numbers (or SATCOM "Terminal ID" numbers) can be assigned to the aircraft or to each handset. For individuals with an AirCall number from GTE Airfone and signed on to the system, calls will be routed directly to their seats. When a call is received, the calling number is displayed and the called party has the option of accepting the call or not.

MagnaStar is a trademark of the Raytheon Systems Company. GenStar is a trademark of GTE Airfone Incorporated.

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<b>Conference Calls</b>	Conferences can be set up between multiple parties on-board and on the ground, over any of the available links (GenStar, SATCOM, HF).
<b>Call Transfer</b>	Incoming and outgoing calls can be transferred to other handsets on-board the aircraft.
<b>In-Plane Calls</b>	Seat-to-seat (cabin-to-cockpit) calling is a standard feature.
<b>Speed Dialing</b>	With the MagnaStar system, callers can store and quickly call frequently called numbers as well as access services offered by GTE Airfone (hotel, car rental, weather, etc.).
<b>Multiple Phones</b>	The basic C-2000 system allows installation of up to nine independent (non-party-line) telephone handsets. A system configuration allowing up to fifty handsets is currently being developed.
<b>Fax / Data Modem</b>	The MagnaStar system provides RJ-11 jacks for connection of caller's fax or personal computer modem equipment. The RJ-11 jacks are integral to the handset; they may be remoted so that the fax / modem cable does not interfere with use of the handset. The system is designed to support high quality (low error rate) voice band data transmissions at 2400 bps; 4800 bps, and 9600 bps. Higher rate capabilities are in development by Raytheon and GTE Airfone engineering.
<b>TDD</b>	Customer supplied TDD equipment is supported by the MagnaStar system, via the handset itself or the RJ-11 jack.
<b>Call Charging</b>	Service charges for calls made with the MagnaStar system are billed directly to the equipment owner's account (1 + calls) or to credit card accounts (0 + calls). Direct charged (1 +) calls can be blocked, for example during charter use of the aircraft.
<b>Privacy</b>	The MagnaStar system uses an advanced modulation and signaling scheme which offers inherent communications privacy. Your conversation is protected from casual listening by others having 'scanners' or by even similarly equipped aircraft. (This privacy is only limited by the normal private-line telephone service through the PSTN. Additional security can be provided with optional features.)

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## 1.2 Equipment Description

The MagnaStar C-2000 system is designed with the business aircraft in mind. With two air-ground voice channel operations as a standard feature, the C-2000 consists of an Airborne Radio Telecommunications Unit (ARTU), an antenna, a duplexer, a mounting tray for the ARTU, one or more Cabin Data Bus Repeaters (CDBRs), and one to nine telephone handsets. Optional equipment includes one to three Analog Interface Units (AIU), a Call Alerter Switch (CAS), Cell Phone Interface (CPI), Cockpit Headset Interface Panel (CHIP), and other specialized devices.

**ARTU:** The ARTU provides the private automatic base exchange (PABX) features, controls the C-2000 system, and contains the receiver-transmitter functions for radio transmission. This digital radio has been implemented using state-of-the-art multiple digital signal processor techniques to provide accurate waveform control and noise-free, reliable communications in the noisy, fading, high-Doppler signal environment seen in jet aircraft-to-ground communications. Reliability is further enhanced by the automated assembly and test techniques used to manufacture the high density surface-mount-device circuit cards. Should any problem occur, built-in-test identifies the source of the problem for quick circuit card replacement and return of the unit to service.

**Antenna / Duplexer:** The antenna is a low drag, quarter wavelength design suitable for use on high performance jet aircraft. The duplexer is a passive signal filter-combiner that combines the receive and transmit lines to the common antenna.

**CDBR:** The data and control interface to the ARTU is by means of a high speed time division multiplexed digital bus operating as a local area network (LAN). User interface devices such as handsets, fax machines, modems, etc. connect to the system via this LAN. There are two different models of the CDBR. The CDBR-1 (model 1) provides for physical connection of up to two digital handsets (with their RJ-11 jacks for the fax / modem connections) to the LAN bus. The CDBR-2 (model 2) provides two analog interface connections, each of which can support either a four wire analog handset or two wire data for direct connection of a fax machine or modem. Additionally, the CDBR-2 provides a separate interface for connection of a digital handset.

**Digital Handset:** The telephone handsets have been selected for performance and reliability. The handsets contain noise-canceling microphones to overcome the aircraft noise environment; audio is digitized at the handset to further ensure clear communication. Special function keys and a liquid crystal display allow easy use of all options available to the user. The digital handsets are offered with varied mounting provisions to fit any installation requirement. Handsets are offered with a) a standard build-in style mount to hold the handset when not in use, with a ratcheting cord reel, b) that version with a bulkhead mounting adapter, c) the handset and cord reel without a mount, for custom mounting, and d) a "curly-cord" (like standard office phones) with a plug for the ability to relocate the handset to various locations wired with the matching jack. Variations a - c also are available with the RJ-11 jack remoted from the handset, to be located where it best fits in the interior design of the aircraft. All variations come in four colors: white, platinum, pepper dust, and black. Development is on-going for additional telephone handset options.

**AIU:** The AIU can be used to connect an analog SATCOM unit, a Cell Phone Interface (CPI), a HF radio, or a Public Address (PA) amplifier, and/or other communications devices to the MagnaStar system. The AIU has been designed with electrical interfaces to optimize the connection to any analog-interface SATCOM system selected by the customer. Separate connections are provided to account for variations in audio-line impedance and level and in the hook switch and status interfaces between SATCOM equipment. HF radio connections can be made directly or through the aircraft audio control panel. The varying requirements for the SATCOM and HF interfaces led to an AIU design that offers the flexibility to connect a wide variety of equipment and systems to the C-2000. AIUs interface to the ARTU over the LAN, like the CDBRs.

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CAS: The CAS provides ten switches to control call alerting devices (supplied by the installer) such as bells, lights, cabin chime, etc. (Even in the relatively noise-quieted cabins of business jets, the ambient noise can make it difficult to hear the electronic ringer of the standard handset. Increasing the volume of the handset speaker could be annoying should the handset be close to a user's ear when it rang. A separate alerter avoids this problem and allows for installation of the handsets in enclosed compartments.) Single or multiple switches can be assigned to a handset and to multiple handsets; and the cadence of the "ring" pattern can be controlled, giving a great deal of flexibility to customize uplink call notification. One CAS is used per aircraft; it connects to a digital handset port of any of the CDBRs in the system. The CAS may also be used to signal when Air-Ground, SATCOM or HF services are available or when one or more particular handsets are in use.

Miscellaneous: The MagnaStar system can interface to many other communications equipment. The "-802" modification to the ARTU provides a CEPT-E1 interface to connect directly to SATCOM systems or to cabin management equipment. The flexibility is built in to the system to accommodate customer-unique requirements with minimum new development.

### 1.3 Installation Summary

The ARTU is installed in an ARINC style mounting tray using two type A hold downs. It is designed for installation in pressurized or non-pressurized locations. The mounting tray provides an air plenum and fan for cooling. The fan is quiet enough to allow cabin installation. The duplexer can be mounted in any convenient location between the ARTU and the antenna. The antenna comes with a standard six hole mounting flange. As an option, a four hole flange is available for direct replacement of standard 450 MHz radio telephone antennas. The handsets are designed for installation in any convenient area of the cabin. Custom mounting provisions can be readily provided.

Installation information and equipment outline drawings are available in the Interface Control Document (ICD) Appendix B.

**MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM****2.0 TECHNICAL CHARACTERISTICS**

Technical characteristics for the C-2000 system are shown in the following table.

<b>Frequency Range</b>		
Receive		849-851 MHz
Transmit		894-896 MHz
<b>RF Channels</b>		290
<b>Airfone<sup>SM</sup> Service Voice / Data Channels</b>		2 (Independent operation)
<b>Operation</b>		Full Duplex
<b>Transmit Power</b>		10 Watts
<b>Receive Sensitivity</b>		< -110 dBm
<b>Frequency Stability</b>		< 0.2 ppm
<b>Size</b>		See ICD Appendix B for Outline Installation Drawings
<b>Weight</b>		
ARTU	15.4 lbs.	7.0 kg
Mounting Tray	3.1	1.3
Antenna	0.5	0.2
Duplexer	2.0	0.9
Handset (typ.)	0.6 - 1.3	0.3 - 0.6
CDBR-1	0.4	0.2
CDBR-2	2.0	0.9
AIU	0.75	0.34
CAS	0.4	0.2
CHIP	0.7	0.3
CPI	2.8	1.3
<b>Power</b>		
Transmit		
• Nominal (2 phones)		212 Watts (7.7 A. at 27.5 Vdc)
• Maximum		265 Watts (9.6 A. at 27.5 Vdc)
Receive - Nominal		120 Watts (4.4 A. at 27.5 Vdc)
<b>Voltage Range</b>		20.5 to 32.5 Vdc (DO-160C, Category B)
<b>Environmental (Tested per DO-160C)</b>		
Temperature		
• Startup		-30°C to +55°C
• Continuous Operation		-55°C to +55°C
• Intermittent Operation		to + 70°C
Altitude		to 55,000 feet
Vibration		Robust Random (Category B')
Shock		15 g

Specifications furnished are believed to be accurate and reliable. However, all specification data is subject to change without notice.



**MagnaStar® DO-160C Environmental Status**

<u>UNIT</u>	<u>CAT.</u>	<u>TEMP/ALTITUDE</u>			<u>TEMP VARIATION</u>	<u>HUMIDITY</u>	<u>CRASH SAFETY</u>	<u>SHOCK/</u>		<u>EXPLOSION PROOFNESS</u>	<u>MAGNETIC EFFECT</u>	<u>POWER INPUT</u>	<u>VOLTAGE SPIKE</u>	<u>RADIATED EMISSIONS</u>
		<u>LO TEMP</u>	<u>HI TEMP</u>	<u>INTERMIT</u>				<u>VIBRATION</u>						
<b>C-2000 ARTU</b>														
-801	F1	-30 C	+55	+70	CAT B	CAT B	√	CAT B'	CAT E1	CLASS A	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
		(ENG TEST TO -55/+85 C)												
-802	F1	-30 <sup>1</sup>	+55 <sup>1</sup>	+70 <sup>1</sup>	CAT B <sup>1</sup>	CAT B <sup>1</sup>	√ <sup>1</sup>	CAT B'	CAT E1	CLASS A <sup>1</sup>	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>C-750 TMU</b>														
-850	F1	-30 <sup>1</sup>	+55 <sup>1</sup>	+70 <sup>1</sup>	CAT B <sup>1</sup>	CAT B <sup>1</sup>		CAT B'	CAT E1 <sup>1</sup>	CLASS A <sup>1</sup>	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
		(ENG TEST TO -55/+85 C)												
<b>TRAY</b>														
-801	F1	-30 C	+55	+70	CAT B	CAT B		CAT B'	CAT E1	CLASS A	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
		(ENG TEST TO -55/+85 C)												
-802	F1	-30 <sup>1</sup>	+55 <sup>1</sup>	+70 <sup>1</sup>	CAT B <sup>1</sup>	CAT B <sup>1</sup>	√ <sup>1</sup>	CAT B' <sup>1</sup>	CAT E1 <sup>1</sup>	CLASS A <sup>1</sup>	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>DUP-LEXER</b>	F1	-30	+55	+70	CAT B	CAT B	√	CAT B'	CAT E1	CLASS Z	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>CDBR</b>	A2	15	+70	+70	CAT C	CAT A		CAT B'	CAT E1	CLASS Z	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>CDBR2</b>	A2	-15 <sup>2</sup>	+70 <sup>2</sup>	+70 <sup>2</sup>	CAT C	CAT A <sup>1</sup>	√	CAT B'	CAT E1	CLASS Z	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>AIU</b>	F1	-15 <sup>2</sup>	+70 <sup>2</sup>	+70 <sup>2</sup>	CAT C <sup>1</sup>	CAT A <sup>1</sup>	√	CAT B <sup>3</sup>		CLASS Z <sup>1</sup>	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>CAS</b>	A2	-20 <sup>2</sup>	+70 <sup>2</sup>	+70 <sup>2</sup>	CAT C <sup>1</sup>	CAT A <sup>1</sup>	√	CAT B <sup>3</sup>		CLASS Z <sup>1</sup>	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>CHIP</b>	A2	15	+55	+70	CAT C	CAT A	√	CAT B'		CLASS Z	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT Z	
<b>HAND SET</b>	A2	0 <sup>2</sup> .. -20 <sup>2</sup> .	.+50 <sup>2</sup> (operating) +60 <sup>2</sup> (survival)		CAT B	CAT B <sup>4</sup>	√	CAT C		CLASS A	CAT B <sup>5</sup>	CAT A <sup>5</sup>	CAT B(model 2) CAT Z (mach)	

<sup>1</sup> By Similarity, <sup>2</sup> Tested At Sea Level, <sup>3</sup> By Engineering Analysis, <sup>4</sup> Severe Humidity Tested at +60 C, 80% Humidity, <sup>5</sup> Designed To Specified Category, Test Not Required

# **MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM**

## **Flammability**

All materials used in the construction of the MagnaStar system meet the flammability requirements of at least class V1 of UL-94 or has been tested per the requirements of FAR 25.853 appendix F.

## **PMA**

For FAA-PMA applicability see Raytheon Document 481571

**MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM****3.0 UNPACKING AND INSPECTING EQUIPMENT**

Physically compare the presence of each item in the shipment with that shown on the packing list. Exercise care when unpacking each unit. Make a visual inspection of each unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim.

**Antenna:**

The Antenna will be marked with the manufacturer's part number as follows:

MagnaStar Part Number	Dorne & Margolin Inc. Part Number	Description
902131-1	DM N124-19-1	6 Hole Antenna
902131-2	DM N124-18-1	4 Hole Antenna

**Digital Handsets:**

MagnaStar digital handsets, part numbers 724866-805XX, -806XX, -808XX, and -810XX, are shipped with a stronger spring and installation instructions. This spring is recommended for use in installations where the handsets are mounted horizontally. The spring is a stronger spring which will make removing the handset from the bezel easier. The part number for the spring is LC-021AB-10MW

**Connector Kits:**

The ARTU, AIU, CDBR-1, and CDBR-2 are shipped with connector kits. These connector kits are contained within the unit shipping package. The connector kits provide most of the connectors required to interface these units to other devices. Refer to section 3.3 of the Interface Control Document (ICD) in Appendix B of the MagnaStar Installation Manual for a list of connector kit parts.

The connector kits are also accompanied by a connector kit drawing. This document provides assembly instructions describing cable construction steps. Copies of these drawing can be found in section 4 of the MagnaStar Installation Manual.

**ARTU Shipping Items:**

Within the ARTU packaging, several items are shipped with the unit. The items are as follows:

- |  |   |
|--|---|
| - ARTU Connector Kit (P/N 744319-802). | Contains mating connectors for the ARTU.  |
| - C-2000 User Guide.                   | The C-2000 User Guide is to be provided to the customer. For additional copies call the StarLine.                               |
| - GTE Airfone Service Agreement.       | To be completed with the customer. See Dealers Manual for detailed information.   |
| - GTE Airfone Equipment Exchange Form. | Only required for ARTU equipment exchange after customer takes delivery of system. See Dealers Manual for detailed information. |
| AEA Warranty Registration Form.        | To be filled out by the customer and sent to the MagnaStar manufacturer.  |

# MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM

## CABLE CONSTRUCTION TECHNIQUES and CHECK-OUT

This section provides cable construction techniques for LAN (high speed data bus) cabling and gives instructions for the inspection of MagnaStar C-2000 cables before the installation of the MagnaStar C-2000 equipment. Cable fabrication and installation is very important for successful performance of the system. The fabrication of these cables requires the skill and attention required for any modern digital radio system installation. Therefore, **special attention must be given to grounding and shield concerns.**

### 4.1 Cable Construction Techniques

Cable requirements and special fabrication instructions are included in the Interface Control Document (ICD) in APPENDIX B of the MagnaStar Installation Manual. Also, connector kit drawings are included at the end of this section. See paragraph 4.3. These drawings provide detailed cable construction information for the ARTU, CDBR-1, CDBR-2 and AIU.

### 4.2 Cable Check-Out

This section provides some basic instructions for inspecting the cable prior to installation of the MagnaStar equipment.

#### ARTU Data, Inter-CDBR/AIU and Handset Cables

These cables should be verified for correct wiring prior to installation of MagnaStar equipment. Cable check-out should include a visual inspection for bent or damaged connector pins. These cables should then be checked for proper interconnection. The required check list is:

#### SIGNAL CABLE INSTALLATION CHECK LIST

- a) Visually inspect cables for bent or damaged connector pins.
- b) Visually inspect for proper back shell installation.
- c) Continuity check for proper pin-to-pin interconnection between cable connectors.
- d) Check for open circuit condition between each pin and the back shell.
- e) Check for open circuit condition between each pin and all other connector pins.
- f) Continuity check from back shell to back shell for shield connection to connector back shells.

#### Notes:

- 1) An individual ARTU Data cable or Inter-CDBR cable cannot exceed a length of 50 feet.
- 2) The ARTU Data cable plus all Inter-CDBR cables cannot exceed 200 feet in total length.
- 3) The maximum length of the Handset cable cannot exceed 8 feet.
- 4) Reduce potential electrical interference problems by routing these cables away from high current aircraft cables.
- 5) Do not attach an Inter-CDBR cable for "growth". Install such cables as desired but do not connect to the last CDBR/AIU.

#### 4.2.2 Coaxial RF Cables: Antenna, Transmit and Receive cables

RF cables should be visually inspected for proper construction as well as correct interconnection. The required check list is:

#### RF CABLE CHECK LIST

- a) Visual inspection of cables for bent or damaged pins.
- b) Mechanically inspect cables to insure minimal movement between cable connector and coax cable.
- c) Continuity check for center conductor interconnect between coax cable connectors.
- d) Continuity check for shield interconnection between coax cable connectors.
- e) Check for open circuit between center conductor and shield braid.

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- f) Measure cable RF loss at 900 MHz if test equipment is available.

Note: The total RF cable path loss from the ARTU to the ANTENNA should not exceed 3 dB. The two different RF paths include the combination of the Antenna and Receive cables or the Antenna and Transmit cables. The lengths of the RF cables are limited by this requirement.

## Aircraft Power Cable

Prior to installation of the ARTU, verify the power cable installation for proper interconnection and correct voltages. Calculate the voltage drop based on wire gauge and rated system current. Required check list for this cable is:

### POWER CABLE CHECK LIST

- a) Visually inspect cable for bent or damaged pins.
- b) Continuity check for proper pin-to-pin interconnection between cable connectors.
- c) Check for open circuit condition between each pin and the back shell.
- d) Check for open circuit condition between each pin and all other connector pins.
- e) Apply aircraft power to the Power Cable. Check for correct voltage on the proper pins.
- f) Check for ground connection on the proper pins.
- g) Check for the absence of ground or aircraft power on all other connector pins.

## RJ-11 Cables

Prior to installation of a FAX or Modem to a Handset, check the RJ-11 cable for proper interconnection. A required check list for this cable is:

- a) Visually inspect cable for bent or damaged pins.
- b) Continuity check for proper pin-to-pin interconnection between cable connectors.
- c) Check for open circuit condition between each pin and all other connector pins.

## MagnaStar Maintenance Terminal (MMT Cable)

Note: Do not permanently connect the MMT cable to the ARTU. This connector port is for checkout and troubleshooting only. For normal operation, disconnect the MMT cable and replace the dust cover on the ARTU MMT connector.

With the MMT cable connected, after power up, the ARTU will not start running its operational software until instructed to do so by the MMT unit.

## 4.3 Connector Kit Drawings

The connector kit drawings provide detailed instructions for constructing the interface cabling using the parts provided with an individual unit in the connector kit. The connector kit drawings are shipped with each unit and are provided in the installation manual for reference. The connector kit drawings included in the installation manual are as follows:

- 744434 - TMU Connector Kit, use:  
ARTU Connector Kit Drawing - 744319
- 743425 - AIU Connector Kit Drawing
- 744319 - ARTU Connector Kit Drawing
- 744321 - CDBR-1 Connector Kit Drawing
- 744428 - CDBR-2 Connector Kit Drawing

# MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM

## 5.0 EQUIPMENT INSTALLATION

### 5.1 INDIVIDUAL EQUIPMENT INSTALLATION

After cable check-out, the aircraft is ready for the installation of the MagnaStar C-2000 equipment. The following check-out must be followed prior to application of aircraft power.

#### ANTENNA

- a) The Antenna should be mounted to a paint free metal grounded surface. Ensure that the screw contact (countersink) surface of the Antenna is free of paint. The screw threads must make metallic contact to the ground plane. The ground plane must extend at least one foot radially from the Antenna.
- b) After installing the Antenna, measure the DC resistance between the Antenna and the airframe. Bonding resistance must be less than 2.5 milliohms.
- c) Check that the antenna cable to Antenna connection is mechanically secure.
- d) Ensure that the minimum distance between the C-2000 antenna and any antenna for equipment operating in the 800 Mhz to 1200 Mhz frequency band (e.g. DME, Transponder, TCAS) shall be 3 feet, minimum. The minimum distance between the C-2000 and any other antenna shall be two feet.
- e) It should be noted that the MagnaStar system is a line of sight system that operates with equipment located on the ground. The MagnaStar antenna should not be located in position that will be blocked by other mechanical devices in close proximity or easily shadowed when the aircraft maneuvers during flight.

#### 5.1.2 DUPLEXER

- a) After installing the duplexer, measure the DC resistance between the duplexer and the airframe. Bonding resistance must be less than 2.5 milliohms.
- b) Check the antenna cable, transmit cable, and receive cable connections to the duplexer.  
These connections must be mechanically secure so they will not become loose during aircraft vibration. The SMA connectors (transmit and receive connectors) should be tightened to 7 in-lbs of torque if using a 620317-1 duplexer.

#### ARTU MOUNTING TRAY

- a) After ARTU Mounting Tray installation, measure DC resistance between the ARTU Mounting Tray and the airframe. Resistance must be less than 2.5 milliohms.
- b) Check the input and exit airflow paths from the fan in the ARTU Mounting Tray. Airflow paths must be clear of any obstructions that could restrict cooling.

#### ARTU

- a) When installing the ARTU on the ARTU Mounting Tray, insure that the ARTU sits flat on the tray and that the ARTU fully engages the guide pins in the rear of the tray.
- b) Attach and tighten the turn-lock fasteners of the ARTU Mounting Tray to the ARTU.
- c) Connect the ARTU Data, Power, Transmit and Receive cables to the ARTU. Insure that each of these connections is mechanically tight and secure to the ARTU. Connect the ARTU

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Tray cable.

- d) Check that the dust cap is properly secured to the J3 connector (MMT) of the ARTU.
- e) Verify that there are no airflow restrictions at the top of the ARTU.
- f) Verify that the Receive coaxial cable is connected from the Receive port (RCV - J4) of the ARTU to the Receive port (RCV - J3) of the Duplexer.
- g) Verify that the Transmit coaxial cable is connected from the Transmit port (XMT - J5) of the ARTU to the Transmit port (XMT - J1) of the Duplexer.