Rockwell Collins, Inc.

GLU-2100

User’s Manual

This manual is provided for FCC test guidance, it shall not be used for any other reason but this.

1.1 Scope

This document will detail information required to install and use the GLU-2100 unit.

1.1 Overview

The GLU-2100 is packaged in an ARINC 600 size 3 MCU case to receive and process ILS, GLS, VOR, MB, and GNSS signals.
The GLU-2100 is a navigation sensor with internal receivers used for enroute, terminal, and instrument approach and landing operation.
A NAV CCA provides ILS flight path deviation guidance for precision approach and landing as well as VOR/Marker Beacon functions. The VOR function receives, decodes, and processes bearing information from the transmitted VOR signal, while the Marker Beacon function provides visual and aural identification when the aircraft is over a marker beacon transmitter by illuminating one of three indicator lamps and outputting one of three audible tones (400, 1300, or 3000 Hz). A Global Navigation Satellite System (GNSS) CCA provides navigation data for other aircraft systems to support enroute, terminal, precision, and non-precision approach operations.

The NAV CCA section receives very high frequency (VHF) localizer signals in the frequency range of 108.00 to 111.95 MHz, and ultra-high frequency (UHF) glideslope signals in the frequency range of 328.6 to 335.4 MHz. The NAV CCA additionally receives very high frequency data broadcast (VDB) signals in the frequency range of 108.00 to 117.975 MHz in GLS mode. The GNSS CCA section receives signals from the Global Positioning System (GPS) nominal carrier frequency of 1575.42 MHz.

1.2 Input/Output Data Buses

The following Input and Output Data Buses are available on the GLU-2100:

1.2.1 Input:

Air Data / FMS Bus (2 Buses)

Automatic Test Equipment Bus

Data Loader Bus

Inertial Reference System / ADIRU Bus (3 Buses)

OMS/ CFDS Bus

Tune/ Function Select Data Bus (2 Buses)

1.2.2 Output:

Automatic Test Equipment

Data Loader

GNSS (3 Buses)

ILS Look Alike (2 Buses)

MMR Data Broadcast

OMS/ CFDS

1.3 Mechanical Description

The GLU-2100 is packaged in an ARINC 600 size 3 MCU case. A low insertion force size 2 connector on the rear of the unit interfaces with the aircraft wiring. The connector also holds the rear of the unit to the equipment rack. The GLU-2100 is cooled with forced-air supplied to inlet holes on the bottom of the unit and exhausted through outlet holes on the top of the unit.

The GLU-2100 chassis consists of top and bottom plates, front panel, left and right hinged swingout side covers, and a rear connector mounted in an assembly that protects against high intensity radiated fields (HIRF). The top insert of the rear connector is for the GNSS antenna connection, the middle insert is for service connections and VOR/MB antenna connections, and the bottom insert is for power and LOC/GS antenna connections.

Access to the interior of the GLU-2100 is gained by removing the left or right side covers. The side covers are mounted on hinges and held to the chassis with captive screws. When the captive screws are released, the covers can be swung open.

1.4 Power Supply

The GLU-2100 operates on 115 V ac, 400 Hz single phase power supplied by the aircraft. The input power is routed from the rear interconnect to the forward power supply.

2 DESIGN

2.1 GLU-2100 Design Characteristics

This section provides lists of weights, dimensions, and power usage, and applicable drawings and documents for the GLU-2100. This information is presented in Table 1.

Table 1 – GLU-2100 Design Characteristics

CHARACTERISTIC	SPECIFICATION
Connector	
Rear connector	Rear connector RCPN 859-2777-630 ARINC 600 size 2 shell with three inserts and an index pin code of 03 Top plug insert arrangement 11 Middle plug insert arrangement 14 Bottom plug insert arrangement 04
Localizer receiver characteristics	
Frequency range	108.00 - 111.95 MHz
Channel spacing	50 kHz (40 channels), 108.10 MHz to 111.95 MHz
Antennas	50 Ohms Nominal
Receiver sensitivity	Aural sensitivity 6 dB (S+N)/N minimum, over the range –99 to –33 dBm Valid data threshold −110 dBm minimum (+/- 2.0 dBm) Identification tone threshold −93 dBm at percent modulation, 1020 Hz
Glideslope receiver characteristics	
Frequency range	328.6 to 335.4 MHz
Channel spacing	150 kHz (40 channels), from 329.15 to 335.0 MHz
Antenna input	50 Ohms (nominal)
Receiver sensitivity	Valid data threshold −87 dBm minimum
Instrumentation	
Localizer deviation accuracy	
Centering	± 0.004 DDM, 95% probability ± 0.004 DDM, bench
Glideslope deviation accuracy	
Centering	± 0.0093 DDM, 95% probability ± 0.0093 DDM, bench

Localizer audio output level	Adjustable 5 to 40 mW, -87 dBm to -33 dBm, for standard localizer signal, modulated 30 percent at 1000 Hz into 600-ohm load

CHARACTERISTIC	SPECIFICATION
VDB receiver characteristics	
Frequency range	108.000 - 117.975 MHz
Channel spacing	25 KHz
Receiver sensitivity	Message failure rate ≤ 0.15%, with an input power level of −87 dBm
VOR receiver characteristics	
Frequency range	108.00 - 117.95 MHz
Channel spacing	50 kHz
Antenna input	50 Ohms (nominal)
Receiver sensitivity	Aural sensitivity 6 dB (S+N)/N minimum, over the range –109.5 to –27 dBm Valid data threshold −110 dBm minimum (+0.5 / -2.0 dBm) Identification tone threshold −109.5 dBm at percent modulation, 1020 Hz
VOR audio output level	Adjustable 5 to 40 mW, -98 dBm to -33 dBm, for standard VOR signal, modulated 30 percent at 1000 Hz into 600-ohm load
MB receiver characteristics	
Frequency range	75 MHz
Antenna input	50 Ohms (nominal)
Receiver sensitivity	Aural sensitivity 6 dB (S+N)/N minimum, 15 dBm range of threshold (-67 dBm for high, -53 dBm for low) to -13 dBm Valid data threshold –67 dBm (High), –53 dBm (Low)
GNSS receiver characteristics	
Frequency	1575.42 MHz
Channels	14 GPS channels, 4 SBAS channels (Primary/Monitor)
Time to first fix	Worst Case 300 seconds (5 minutes) with or without initialization (95%)
Accuracy (Non SBAS/GBAS)	Horizontal 15 meters 95% (HDOP 1.5) SA OFF Vertical 21 meters 95% (VDOP 3) SA OFF

CHARACTERISTIC	SPECIFICATION
Receiver sensitivity	GPS MOPS Testing performed to a signal level of -120.5 dBm at the input to the receiver

3 Installation

The picture below details the GLU-2100 unit mounted in the ARINC 600 3MCU mount. These type mounts have mechanical mechanisms to allow capture and restraint of the front feet of the unit. This restraint ensures the unit will not come loose from the mount and also that the ARINC defined connector does remains in contact with the rear pins.

The harness that connects the RMP to the GLU-2100 is defined by the aircraft manufacturer. The pinout can be found below.

The equipment setup comes with a complete setup station and wiring going to a standard EMI bulkhead and from the EMI Bulkhead to the test equipment as shown in the pictures below.

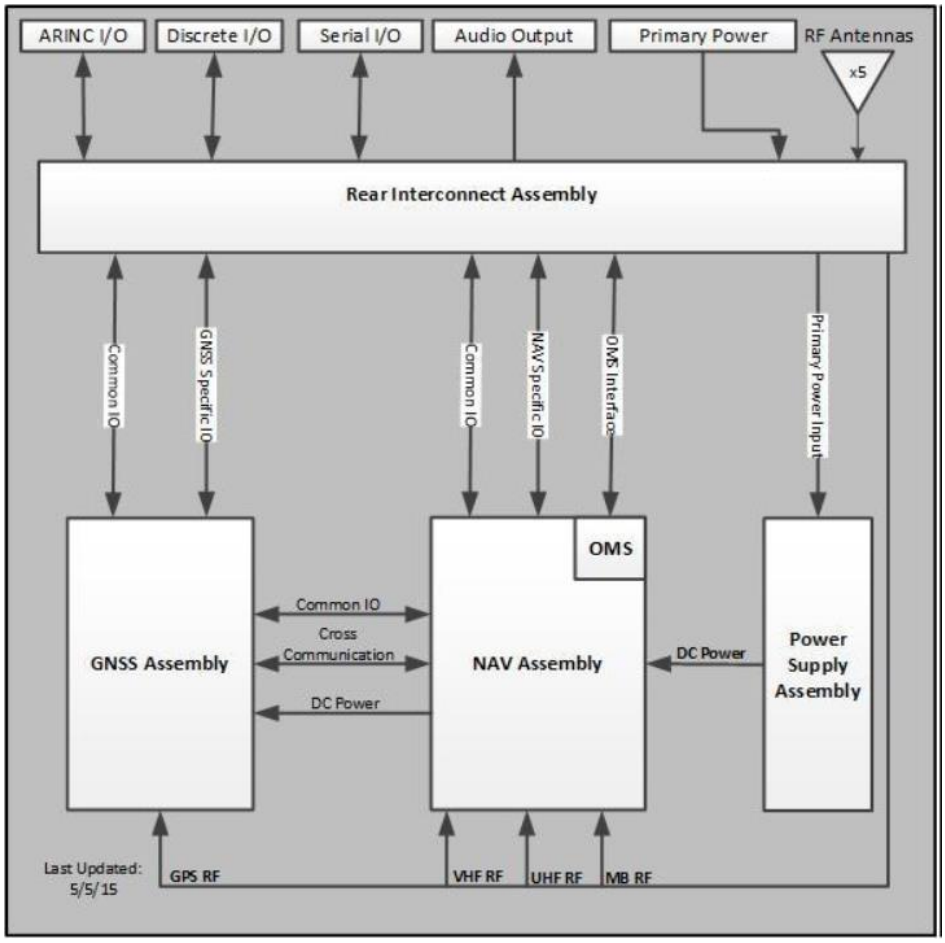

Figure 1 -GLU-2100 Module Interfaces

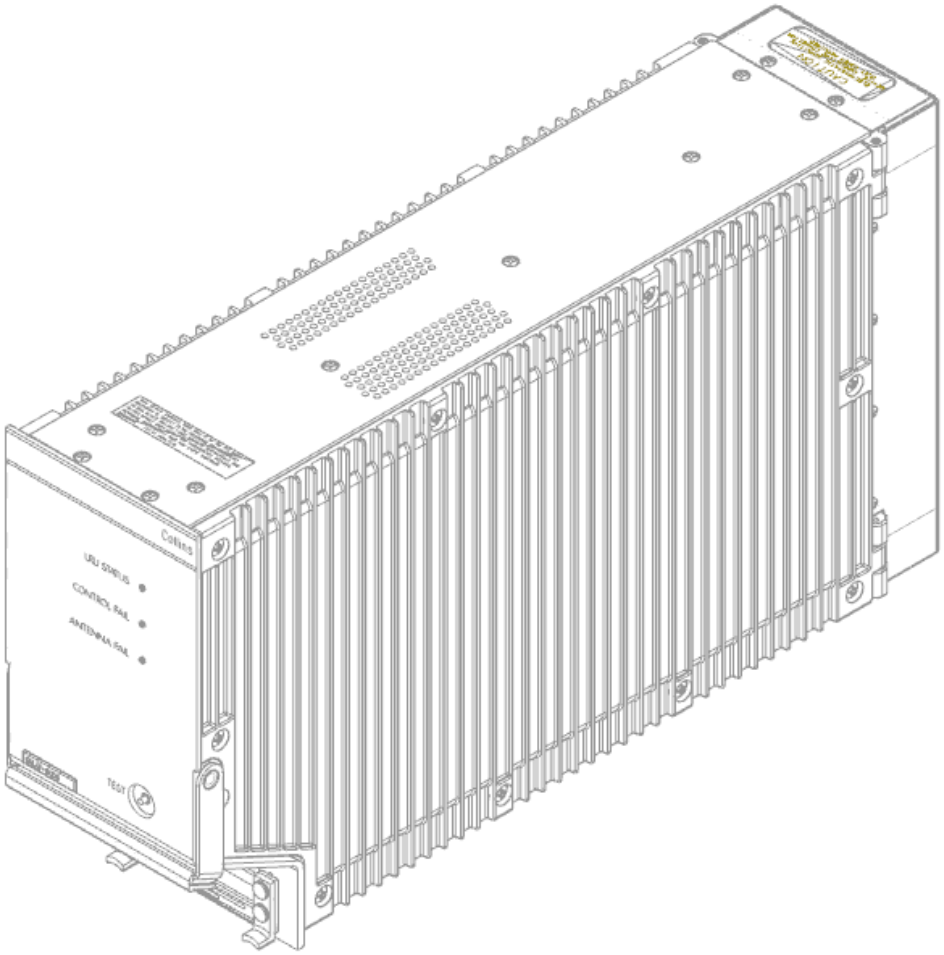

Figure 2 - GLU-2100 Unit overview

Table 2 - Critical Frequency List

#	Frequency (MHz)	Description
1.	178.752	NAV Serial ADC Output
2.	240	GNSS ADC Data Clock
3.	375	NAV Processor Internal Clock
4.	1101	GNSS L5 LO
5.	1500	GNSS L1 LO
6.	1602	GNSS Glonass LO

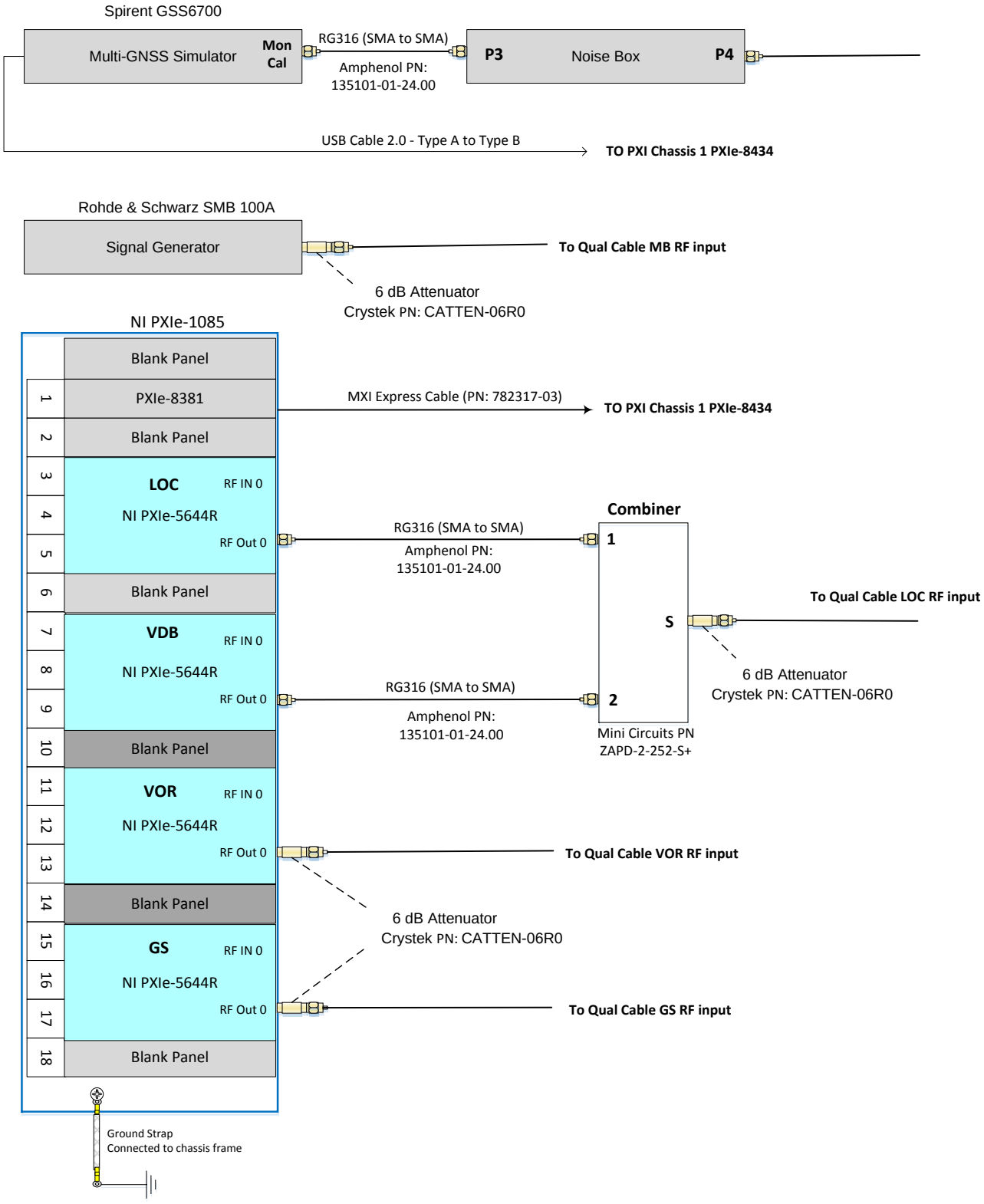

Figure 3 External generators for Flight Test Pallet (provided)

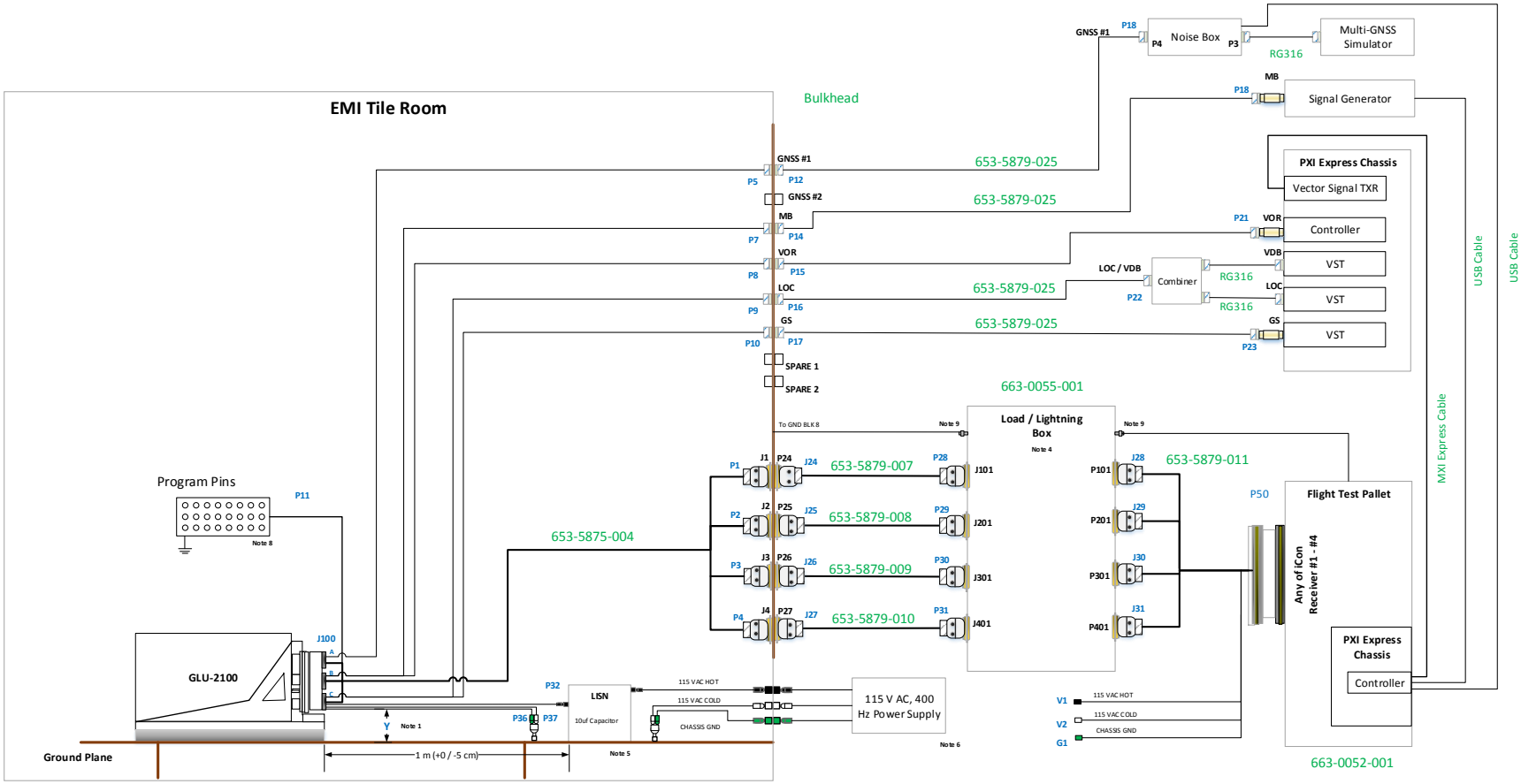

Figure 4 Test Setup with Flight Test Pallet and PXIe Rack

Table 3 EUT Monitoring Test Equipment

Description	Manufacturer	Model	Quantity	Comments
3 MCU Mounting Tray	Rockwell Collins	653-5879-030	1	
LISN	FCC	FCC-LISN-5-50-1-01-DEF-STAN-59-41	1	EMI / EME tests
GLU-2100 Product Line EMI Cable Assembly	Rockwell Collins	653-5875-004	1	
Grounding Block	Rockwell Collins	653-5879-027	1	For program pins
Bulkhead	Rockwell Collins	653-5875-033	1	
Bulkhead Exterior to Front Panel Cable	Rockwell Collins	653-5879-025	5	
Bulkhead Exterior to Load Box Cable	Rockwell Collins	653-5879-007	1	
Bulkhead Exterior to Load Box Cable	Rockwell Collins	653-5879-008	1	
Bulkhead Exterior to Load Box Cable	Rockwell Collins	653-5879-009	1	
Bulkhead Exterior to Load Box Cable	Rockwell Collins	653-5879-010	1	
Load / Lightning Box	Rockwell Collins	663-0055-002	1	
Power Supply	Agilent E3630A	469-0075-009	1	8V Supply for Load / Lightning Box
Load Box to Test Station Front Panel Cable	Rockwell Collins	653-5879-011	1	
GLU-2100 Flight Pallet	Rockwell Collins	983-8406-250	1	
18-Slot 3U PXI Express Chassis	National Instruments	PXIe-1085	1	If using Flight Test Pallet
PXI Express Controller	National Instruments	PXIe-8381	1	Installed in PXIe Chassis when using Flight Test Pallet
6 GHz Vector Signal Transceivers	National Instruments	PXIe-5644R	4	Installed in PXIe Chassis when using Flight Test Pallet

Description	Manufacturer	Model	Quantity	Comments
MXI-Express Cable, 3m	National Instruments	782317-03	1	To connect PXIe controller when using Flight Test Pallet
Signal Generator	Rohde & Schwarz	SMB 100A	1	For MB when using Flight Test Pallet
Multi-GNSS Simulator	Spirent	GSS6700	1	For GNSS when using Flight Test Pallet
Noise Box	Rockwell Collins	983-8406-226	1	Use with Simulator when using Flight Test pallet
USB 2.0 Cable – Type A to Type B, 6 foot	General Purpose	General Purpose	1	To connect Simulator to PXIe when using Flight Test pallet
6 dB Attenuator	Crystek	CATTEN-06R0	4	Use with VSTs and signal generator when set up with Flight Test Pallet
RG-316/U SMA Cable Assembly	Amphenol	135101-01-24.00	3	To connect VSTs to Combiner, and Simulator to Noise Box when using Flight Test Pallet
Coax Power Splitter/Combiner	Mini Circuits	ZAPD-2-252+	1	To couple VDB when using Flight Test Pallet

Figure 5 Flight Test Pallet (Outside EMI Chamber)

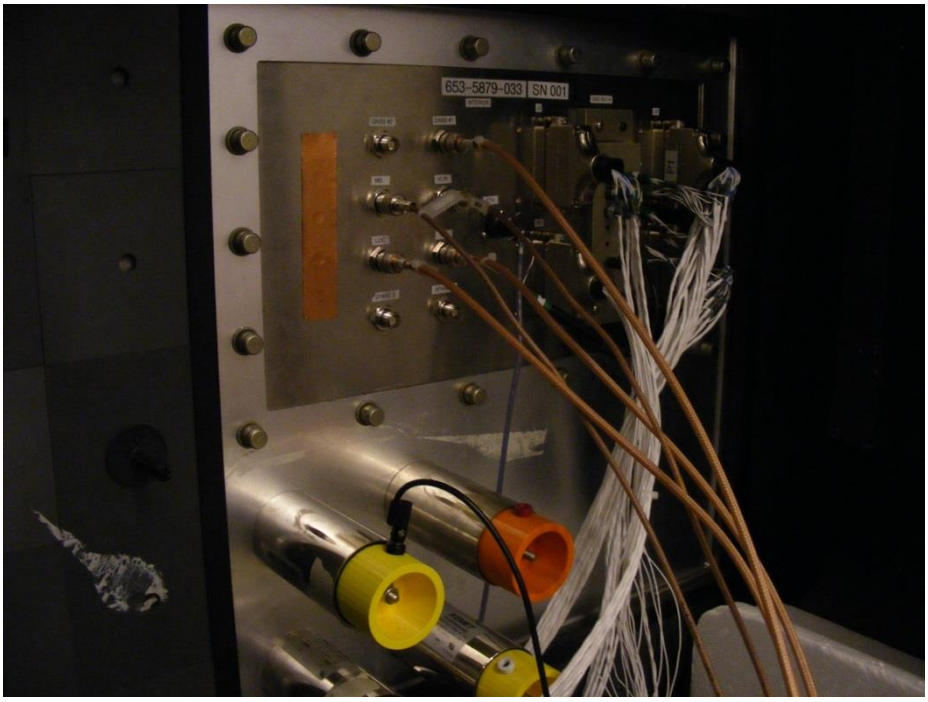

Figure 6 Bulkhead Plate – EUT Side

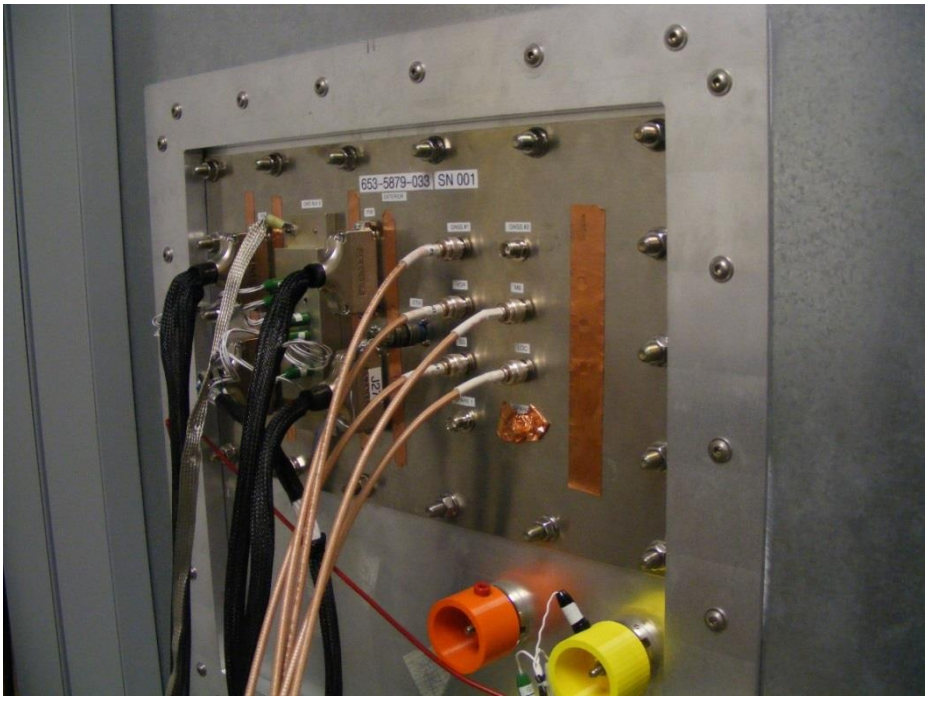

Figure 7 Bulkhead Plate – Test Station Side

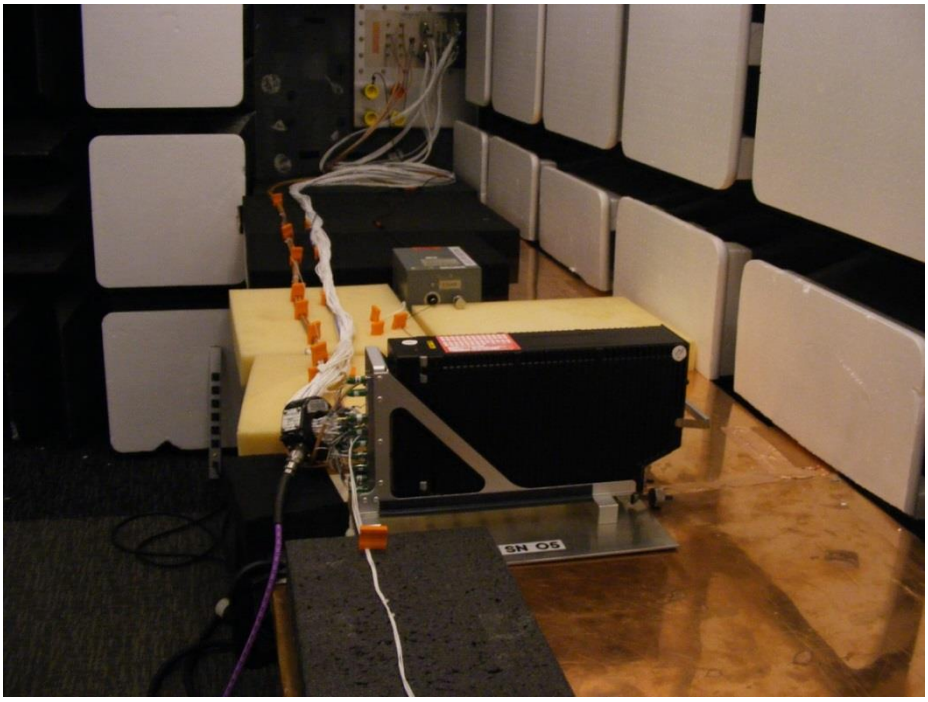

Figure 8 Cable Layout – EUT Perspective

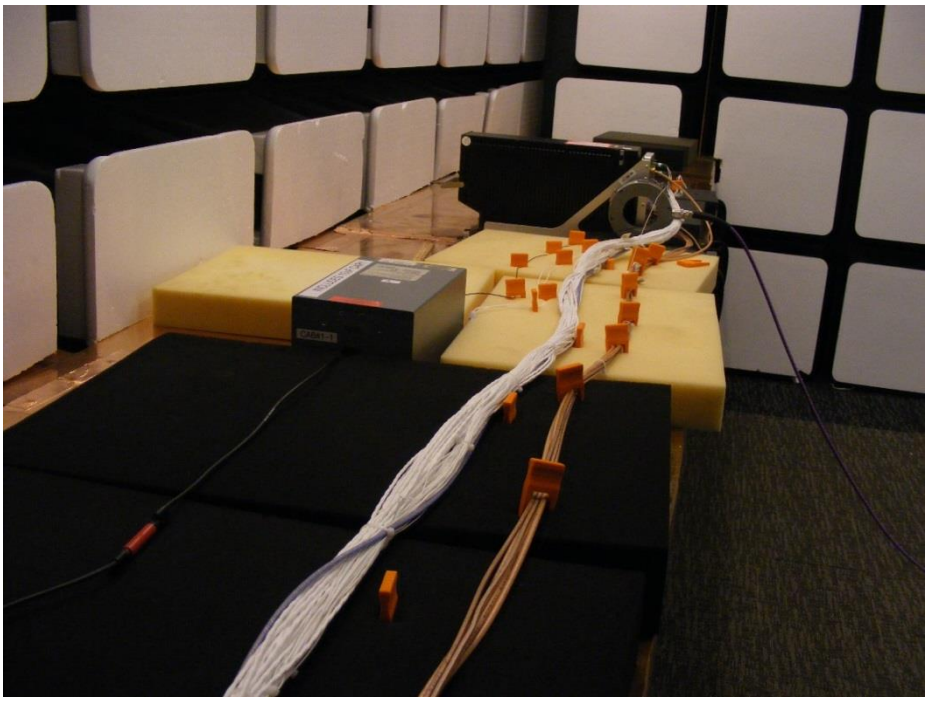

Figure 9 Cable Layout – Bulkhead Perspective

Table 4 Pin Out List

Populated in HW?	Signal Type	Pin Index	Pin Name / Function
Populated	ARINC 429 Output	MP-1A	ILS Look Alike (AFCS) #1 TX A
Populated		MP-1B	ILS Look Alike (AFCS) #1 TX B
Populated	ARINC 429 Input	MP-1C	Tune/Function Select Data Port AA
Populated		MP-1D	Tune/Function Select Data Port AB
Populated	ARINC 429 Input	MP-1E	OMS/CFDS RX A
Populated		MP-1F	OMS/CFDS RX B
Populated	ARINC 429 Output	MP-1G	ILS Look Alike (Inst) #2 TX A
Populated		MP-1H	ILS Look Alike (Inst) #2 TX B
Populated	ARINC 429 Input	MP-1J	Tune/Function Select Data Port BA
Populated		MP-1K	Tune/Function Select Data Port BB
Populated	Clock Output	MP-2A	GNSS Time Mark #1 Out A
Populated	Clock Output	MP-2B	GNSS Time Mark #1 Out B
Populated	ARINC 429 Output	MP-2C	GNSS Data #1 TX A
Populated		MP-2D	GNSS Data #1 TX B
Populated	ARINC 429 Output	MP-2E	OMS/CFDS TX A
Populated		MP-2F	OMS/CFDS TX B
Populated	Clock Output	MP-2G	GNSS Time Mark #2 Out A
Populated	Clock Output	MP-2H	GNSS Time Mark #2 Out B
Populated	ARINC 429 Output	MP-2J	GNSS Data #2 TX A
Populated		MP-2K	GNSS Data #2 TX B
Populated	ARINC 429 Output	MP-3A	Data Broadcast Output Data TX A
Populated		MP-3B	Data Broadcast Output Data TX B
Populated	ARINC 429 Input	MP-3C	Reserved for External Data Broadcast On-Side (#1) RX A
Populated		MP-3D	Reserved for External Data Broadcast On-Side (#1) RX B
Populated	ARINC 429 Input	MP-3E	SDME Input
Populated		MP-3F	SDME Input
Populated	ARINC 429 Output	MP-3G	SDME Output
Populated		MP-3H	SDME Output
Populated	ARINC 429 Input	MP-3J	Reserved for External Data Broadcast Cross-Side (#2) RX A
Populated		MP-3K	Reserved for External Data Broadcast Cross-Side (#2) RX B
Populated	Discrete Input	MP-4A	AIR/GND Discrete
Populated	Discrete Input	MP-4B	Landing Antenna Select
Populated	Discrete Input	MP-4C	Tune/Function Select Data Source A/B
Populated	Discrete Input	MP-4D	Data Loader Enable
Populated	ARINC 429 Input	MP-4E	IRS Cross-Side B (#3) RX A
Populated		MP-4F	IRS Cross-Side B (#3) RX B

Populated	Discrete Input	MP-4G	Functional Test
Populated	Discrete Input	MP-4H	SDI Input #1
Populated	Discrete Input	MP-4J	SDI Input #2
Populated	Discrete Input	MP-4K	Program Common
Populated	Discrete Input	MP-5A	VHF Antenna Select Acknowledge
Populated	Discrete Input	MP-5B	Output Data Not Interrupt
Populated	Discrete Output	MP-5C	VHF Antenna Switch Control
Populated	Discrete Input	MP-5D	Output Data Interrupt
Populated	ARINC 429 Output	MP-5E	Data Loader TX A
Populated		MP-5F	Data Loader TX B
Populated	Discrete Input	MP-5G	Airplane Program Pin #1
Populated	Discrete Input	MP-5H	Airplane Program Pin #2
Populated	Discrete Input	MP-5J	Airplane Program Pin #5
Populated	Discrete Output	MP-5K	Antenna Switch Position Acknowledge
Populated	ARINC 429 Input	MP-6A	FMS Data On-Side (#1) RX A
Populated		MP-6B	FMS Data On-Side (#1) RX B
Populated	Discrete Input	MP-6C	Discrete Input (Spare)
Populated	Discrete Input	MP-6D	Discrete Input (Spare)
Populated	ARINC 429 Input	MP-6E	Data Loader RX A
Populated		MP-6F	Data Loader RX B
Populated	ARINC 429 Input	MP-6G	FMS Data Cross-Side (#2) RX A
Populated		MP-6H	FMS Data Cross-Side (#2) RX B
Populated	Discrete Input	MP-6J	Discrete Input (Spare)
Populated	Discrete Input	MP-6K	Discrete Input (Spare)
Populated	Discrete Input	MP-7A	Marker Beacon Sensitivity Discrete Input
Populated	Discrete Input	MP-7B	Marker Beacon Inhibit Discrete Input
Populated	Discrete Input	MP-7C	Discrete Input (Spare)
Populated	Discrete Input	MP-7D	Airplane Program Pin #3
Populated	Clock Output	MP-7E	GNSS Time Mark #3 Out A
Populated	Clock Output	MP-7F	GNSS Time Mark #3 Out B
Populated	Discrete Input	MP-7G	Airplane Program Pin #4
Populated	Discrete Output	MP-7H	Outer Marker / Program State 1
Populated	Discrete Output	MP-7J	Middle Marker / Program State 2
Populated	Discrete Output	MP-7K	Inner Marker / Program State 3
Populated	ARINC 429 Input	MP-8A	IRS On-Side (#1) RX A
Populated		MP-8B	IRS On-Side (#1) RX B
Populated	ARINC 429 Input	MP-8C	DADS/FMS On-Side (#1) RX A
Populated		MP-8D	DADS/FMS On-Side (#1) RX B

Populated	ARINC 429 Input	MP-8E	LRRA RX A
Populated		MP-8F	LRRA RX B
Populated	ARINC 429 Input	MP-8G	IRS Cross-Side A (#2) RX A
Populated		MP-8H	IRS Cross-Side A (#2) RX B
Populated	ARINC 429 Input	MP-8J	DADS/FMS Cross-Side (#2) RX A
Populated		MP-8K	DADS/FMS Cross-Side (#2) RX B
Populated	Audio Output	MP-9A	VOR Audio High
Populated		MP-9B	VOR Audio Low
Populated	ARINC 429 Output	*MP-9C*	*Future Spare (Contact)*
Populated		*MP-9D*	*Future Spare (Contact)*
Populated	ARINC 429 Output	MP-9E	GNSS Data #3 TX A
Populated		MP-9F	GNSS Data #3 TX B
Populated	Audio Output	MP-9G	Marker Beacon Audio High
Populated		MP-9H	Marker Beacon Audio Low
Populated	ARINC 429 Output	MP-9J	*Future Spare (Contact)*
Populated		MP-9K	*Future Spare (Contact)*
Not Populated	TBD Output	MP-10A	APM Power
Not Populated	TBD Output	MP-10B	APM Clock
Not Populated	TBD Input	MP-10C	APM Data In
Not Populated	TBD Output	MP-10D	APM Data Out
Populated	Discrete Input	MP-10E	Feature Program #1
Populated	Discrete Input	MP-10F	Feature Program #2
Populated	Discrete Input	MP-10G	Feature Program #3
Populated	Discrete Input	MP-10H	Feature Program #4
Populated	Audio Output	MP-10J	xLS Audio Output High
Populated		MP-10K	xLS Audio Output Low
Populated	ARINC 615A Output	MP-11A	ARINC 615A TX High
Populated		MP-11B	ARINC 615A TX Low
Populated	ARINC 615A Input	MP-11C	ARINC 615A RX High
Populated		MP-11D	ARINC 615A RX Low
Not Populated		MP-11E	*Future Spare (Contact)*
Not Populated		MP-11F	*Future Spare (Contact)*
Not Populated		MP-11G	*Future Spare (Contact)*
Not Populated		MP-11H	*Future Spare (Contact)*
Not Populated		MP-11J	*Future Spare (Contact)*
Not Populated		MP-11K	*Future Spare (Contact)*

Populated	RS-422 Output	MP-12E	GNSS ATE TX High
Populated		MP-12F	GNSS ATE TX Low
Populated	RS-422 Input	MP-13E	GNSS ATE RX High
Populated		MP-13F	GNSS ATE RX Low
Populated	GND	MP-14E	Reserved (Isolation Ground)
Populated	GND	MP-14F	Reserved (Isolation Ground)
Not Populated	NOTE SRD DIFF	MP-15E	APM Power Return/Common
Populated	Discrete Input	MP-15F	Tune/Test Inhibit Discrete Input
Populated	RF Coax Input	MP-1T	Marker Beacon Antenna
Populated	RF Coax Input	MP-2T	VOR Antenna

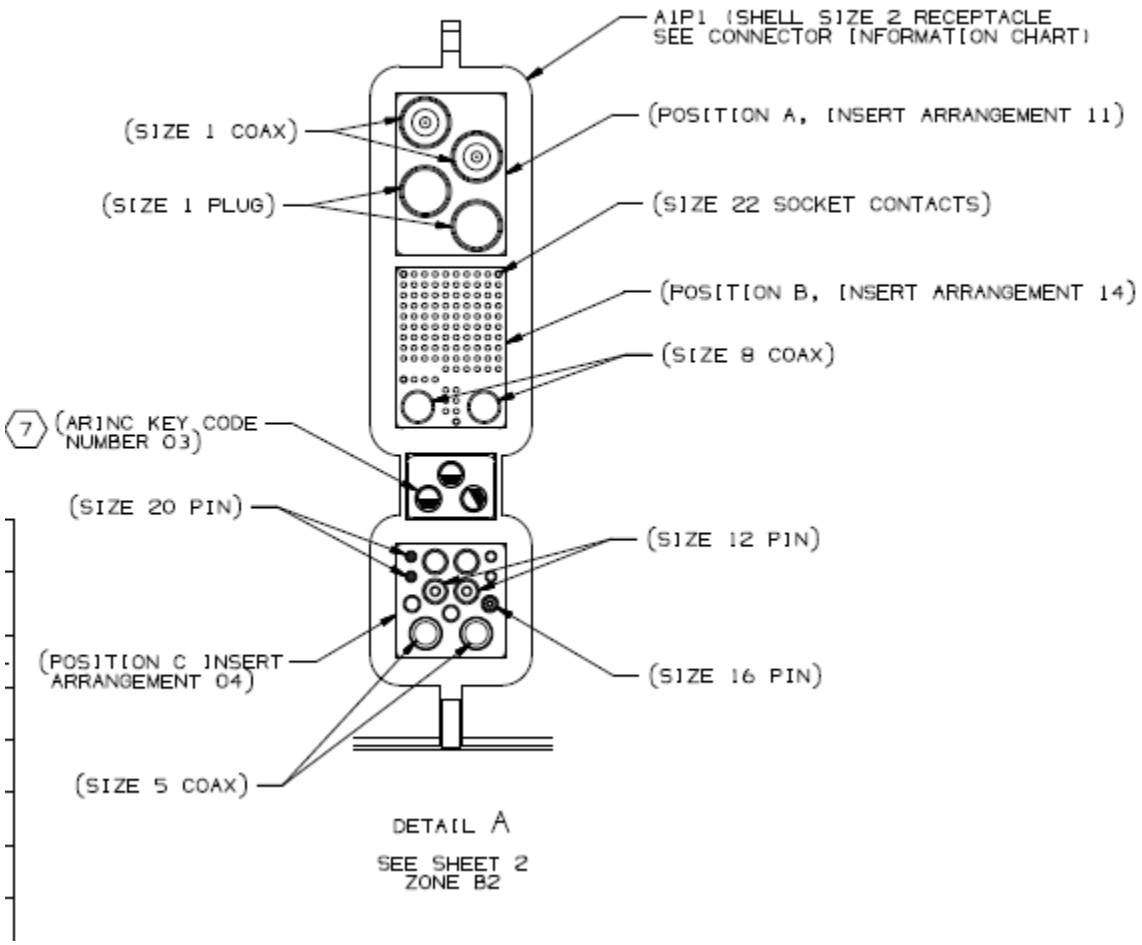

Figure 10 Unit Back Connector

Figure 11 Unit Back Picture

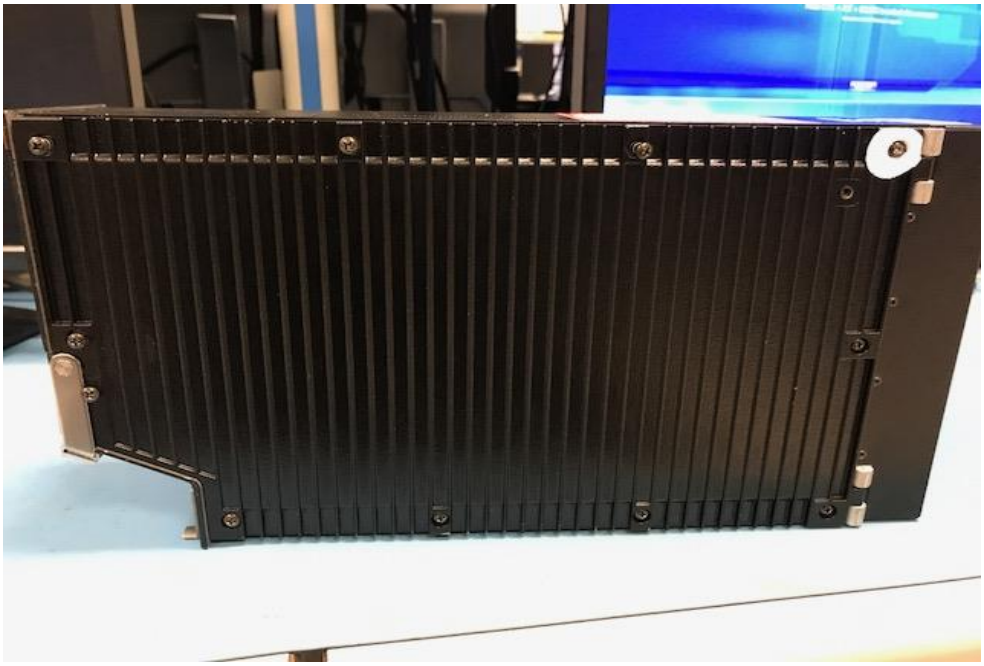

Figure 12 Unit side Picture

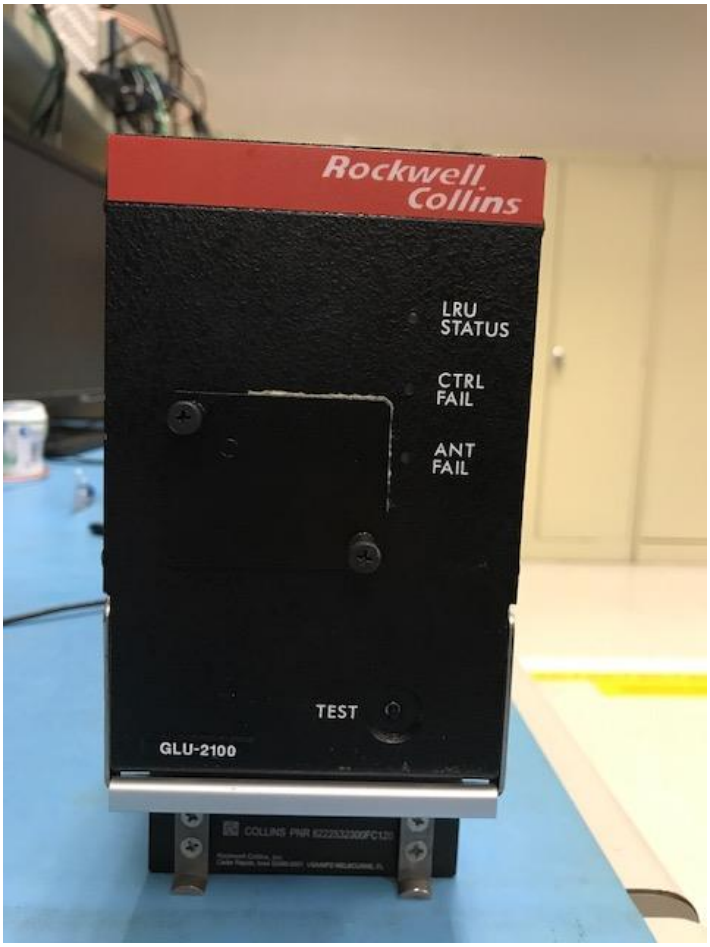

Figure 13 Unit Front Picture

FCC Part 15.19 Warning Statement- (Required for all Part 15 devices)

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE

FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE,

AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING

INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

FCC Part 15.21 Warning Statement-

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT

EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH

MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.