EAR Marking Cover Sheet

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Honeywell

1.0. RTA-50E USER MANUAL

2.0. RTA-50E VDR SYSTEM DESCRIPTION AND THEORY OF OPERATION

2.1. VDR Overview

The RTA-50E VDR is an airborne VHF radio whose function is to provide aircraft with line-of-sight air/ground ATC voice and AOC data communications capability in the 118-136.975 MHz VHF frequency band. The RTA-50E is capable of operating in DSB-AM analog voice mode, VHF ACARS data modes (Mode A and Mode 0) and VDL Mode 2 data mode.

A typical aircraft installation consists of two VDRs dedicated for ATC voice communications and one VDR for data link communications and back-up voice communications. Each VDR interfaces to its own dedicated VHF blade antenna so that simultaneous operation of all three VDRs is possible. Figure 2-1 shows the physical layout of the RTA-50E.

Figure 2-2 shows the interfaces between the RTA-50E and other avionics equipment. This figure also shows the inputs and outputs that are processed in each of the modes of operation. Interfaces that apply to typical go-forward (new aircraft) installations are shown as solid lines. Interfaces that apply to retrofit (legacy) DSB-AM voice-only installations that do not require VDL Mode A or VDL Mode 2 functionality are shown as dashed lines.

Figure 2-1 Photograph of RTA-50E

Voice Communications Installations: Each VHF radio is controlled through one or two Radio Tuning Panels (RTP). The RTA-50E provides ARINC 429 interfaces to two Radio Tuning Panels (RTPs). A discrete input labeled "Frequency Port Select Input" is used to determine which of the two RTP inputs controls the operation of the VDR. The contents of the ARINC 429 Words received from the RTP are used by the VDR to determine the voice channel (frequency) selected as well as the type of voice channel: DSB-AM voice with 25 kHz or 8.33 kHz channel spacing.

An analog audio input and output pair provide the interfaces to the microphone and speakers. A discrete input labeled "PTT" provides the means to switch between transmit and receive operation. When the VDR is operating in transmit mode (PTT is grounded), the transmitted audio is output to the Rx Audio/Sidetone Output port. The Rx Audio/Sidetone Output is muted during transmit operation if an internal VDR failure prevents the radio from transmitting RF.

The RTA-50E provides ARINC 429 interfaces to the On-board Maintenance Systems (OMS). Two different OMS interface protocols are supported: Airbus CMC/CFDS protocol and Boeing CMC protocol. However, only one of the OMS interface protocols is supported at a time depending on the software version loaded (VDR part number).

Data Link Communications Installations: Data link capable installations may support data communications only or they may be wired to support both data and voice communications. When supporting voice and data communications, one or two RTPs provide the means to select the mode of operation (voice or data) and the means to select the voice channel. The mode of operation is determined from the contents of the ARINC 429 Words received from the RTP or from a discrete input labeled "Voice/Data Select Input" depending on the aircraft installation.

The RTA-50E provides ARINC 429 data link interfaces to a Communications Management Unit (CMU) or Air Traffic Services Units (ATSU) or Aircraft Communications Router (ACR) which is the source of the transmitted data messages and the destination of the received data messages. A second CMU or ATSU or ACR may be operated in standby mode if the aircraft installation supports ATC data link communications.

When the selected mode of operation is a Data Only mode (Modes 0, A or 2), the particular Data Only mode is determined from the presence or absence of ARINC 429 data on the ARINC 429 data link interfaces to the two CMUs/ATSUs/ACRs.

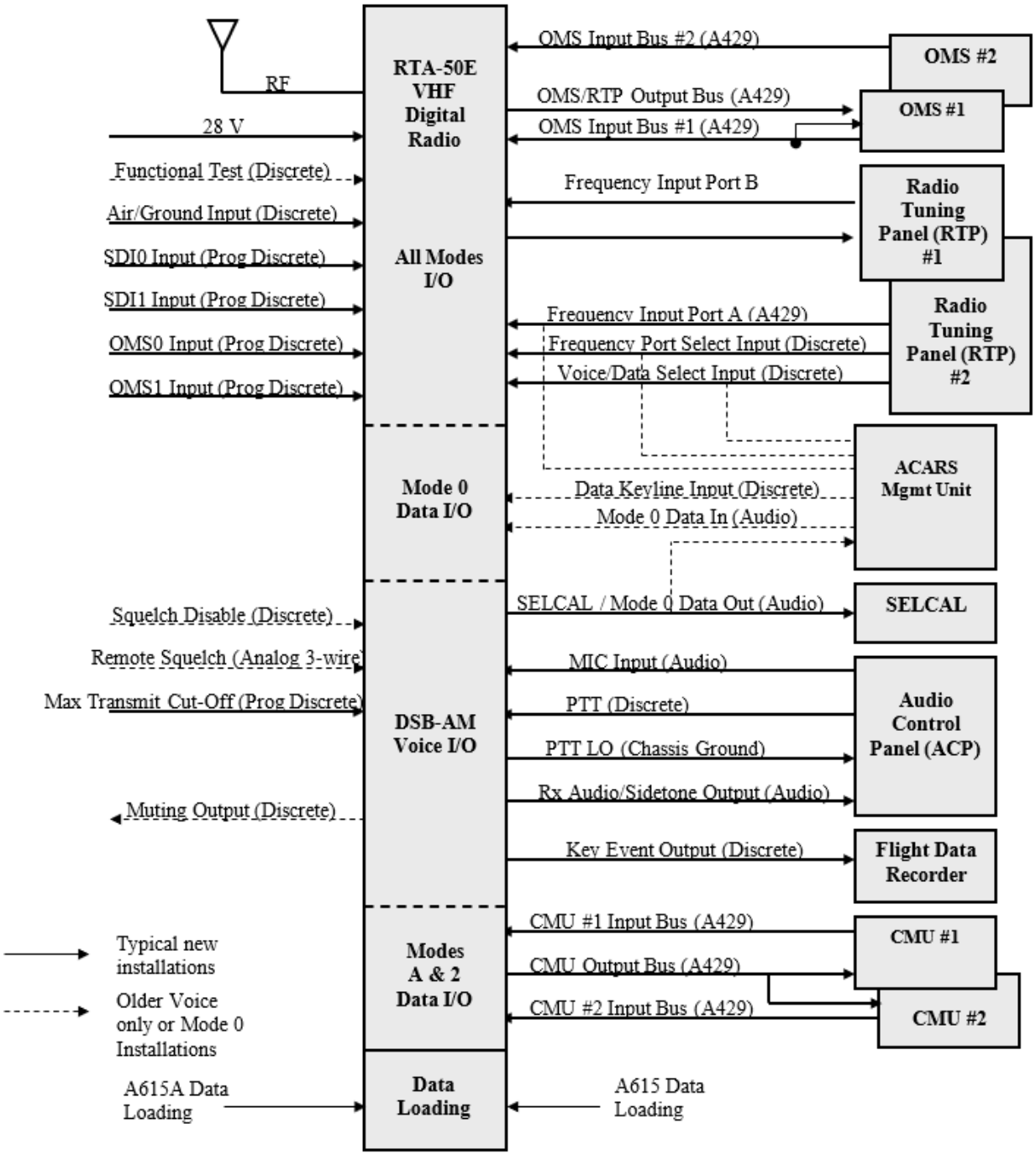


Figure 2-2 RTA-50E VDR Interface Context Diagram

2.2. Purpose of Equipment

The RTA-50E VDR system is an airborne VHF communications transceiver that provides voice and data communication between on-board aircraft systems, other aircraft systems, and ground-based systems. It can operate in analog DSB-AM analog voice mode, VHF ACARS data modes (Mode A and Mode 0), and VDL Mode 2 data mode.
The VDR operates as a voice transceiver that agrees with the voice mode defined in ARINC Characteristic 716 when operated as a 716 voice radio. Microphone audio and PTT audio are inputs and side-tone audio is output. The RF signal is double sideband AM. Frequency and channel bandwidth selection is made through a low-speed ARINC 429 bus input interface to an RTP.

The VDR operates as a transceiver when used as a 716 data radio. In this mode, it agrees with the external data modem interface defined in ARINC Characteristic 716. The data modem audio input, data key-line input, and data modem audio output interface to an ACARS MU. The ACARS data modem audio input and output are 2,400-bps MSK modulated signals. The RF signal is a double sideband AM-MSK signal. Channel frequency selection is made through a second low-speed ARINC 429 bus input interface to the ACARS MU.

The data modem audio output can be wired to a SELCAL decoder when the radio is not wired to support 716 data mode operation. In ARINC 750 Data Mode A, the VDR provides 2,400-bps MSK modem functionality within the radio with ARINC 429 digital data input/output interfaces to a CMU as defined in ARINC Characteristic 750. The command and data transfer protocol between the VDR and CMU uses the ARINC 429 Williamsburg BOP Version 1 or Version 3. The RF signal is a double sideband AM-MSK signal. Channel frequency selection is made through the ARINC 429 interface to the CMU.

When operated in Mode 2, the VDR supplies Mode 2 functionality defined in ARINC Characteristic 750 and a 31,500-bps D8PSK modem functional internal to the radio. The Mode 2 radio uses ARINC 429 digital data input/output interfaces to a CMU as specified in ARINC Characteristic 750. The command and data transfer protocol between the VDR and CMU uses the ARINC 429 Williamsburg BOP Version 3. The RF signal is a D8PSK-modulated RF carrier. Channel frequency selection is made through the ARINC 429 interface to the CMU.

The VDR system requires an antenna for its RF input/output, a control head or radio management panel, an audio input source and output sink for its analog voice functions, and an ACARS MU or a CMU for its digital control and data functions. The VDR system can also be connected to a CMC to transfer maintenance data.

When operated in voice mode, the VDR supplies both 25-kHz and 8.33-kHz channel spacing to meet European airspace requirements. The unit is fully interchangeable with older ARINC 716 communications equipment for backward compatibility. Older equipment includes the former Allied Signal or Bendix RTA-44A, RTA-44D, and RTA-83B VHF radios, Collins VHF 700 and VHF 700A radios, and Honeywell RTA-50D radios.

2.3. Equipment Required but Not Supplied

Equipment required for the RTA-50E VDR system that is not supplied by Honeywell.

Equipment	Description
Power source:	DC power supply of 27.5 volts, 8 AMP
Audio distribution system	Audio system with an input impedance of 200 to 10,000 ohms
Control panel	Provides remote control of frequency selection for 25-kHz or 8.33-kHz channel spacing system operation (serial digital ARINC 429-7 and ARINC 716 Supplement 8), power on/off, volume, and squelch control in accordance with ARINC 716
MU/CMU/ATSU	Provides control and data source/sink when operating in the ARINC 750 data mode
Mount	Provides a means of mounting RTA-50E VDR in the aircraft
VHF antenna	Capable of receiving and transmitting VHF signals over a frequency range of 118.000 to 136.975 MHz. Antenna must meet TSO-C37 and TSO-C38; or TSO-C169.
Microphone	150-ohm impedance microphone (either carbon or transistor) operating from approximately 16-volt power supply
Cables and connectors	Necessary connectors and cables

2.4. Configurations Available

Available configurations of the RTA-50E VDR and features contained in each configuration.

PN	8.33 kHz Channel Spacing	ACARS	Mode A	Mode 2	Airbus CFDS / CMC	Boeing CMC
965-1796-021	X	X	X	X		X
965-1796-051	X	X	X	X	X	

2.5. Environmental Certification

RTA-50E VDR meets the following DO-160G environmental conditions.

Environment	PN 965-1796-021	PN 965-1796-051
Temperature / Decompression /	A2	A2
Altitude	D2	D2
In-flight loss of cooling	Z (18 hours)	Z (18 hours)
Temperature variation	B	B
Humidity	A	A
Operational shocks and crash safety	E	E
Vibration	R(B)(B1)(B3)(B4)	R(B)(B1)(B3)(B4)
Explosion proofness	X	X
Waterproofness	X	X
Fluids and susceptibility	X	X
Sand and dust	X	X
Fungus resistance	X	X

Environment	PN 965-1796-021	PN 965-1796-051
Salt spray	X	X
Magnetic effect	Z	Z
Power input	AXZ	AXZ
Voltage spike	A	A
Audio frequency conducted susceptibility - Power inputs	Z	Z
Induced signal susceptibility	CC	CC
Radio frequency susceptibility (radiated and conducted)	RR	RR
Emission of radio frequency energy	M	M
Lightning induced transient susceptibility	ZZZZZZ	ZZZZZZ
Lightning direct effects	X	X
Icing	X	X
Electrostatic discharge	A	A
Fire, Flammability	C	C

2.6. RTA-50E Leading Particulars

2.6.1. Specification Summary

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.

Changes or modifications not expressly approved by Honeywell could void the user's authority to operate the equipment.

Part 87 of the FCC Rules and Regulations, Section 87.131, defines a maximum power rating of 55 watts for an Aircraft (Communication) Class of station. The RTA-50E does not exceed this limitation.

Power Requirements	+28VDC
Power Consumption 1. During Transmission 2. During Reception	 Transmit 6A (Nominal), 8A (Max) Receive 0.9 A (Nominal), 1.5A (Max)
Weight	9 lbs (4.1 Kg) maximum
Cooling, Forced Air	Forced Air per ARINC Specification 600 (nominal airflow rate of 13.6 Kg/hr at 40ºC)
Frequency Range:	118-136.975 MHz, with 25 kHz and 8.33 kHz channel spacing
Dynamic Range:	-107.0 to -7.0 dBm
Aural Sensitivity:	-107.0 dBm (greater than 6 dB SINAD)
Environmental Certification	Refer Section 2.5
FAA TSO Authorizations	TSO-C169a Classes 3, 5, C & E TSO-C160a Class F and Class 7 & Architecture Class Y TSO-C128a
Frequency Tuning Range	All modes: 118.000 MHz to 136.983 MHz

Modes of Operation	Voice Mode: Per TSO C169a Data Mode 0 : Per ARINC 716-11 (non TSO Approved function) Data Mode A: Per ARINC 618 and ARINC 750 (non TSO Approved function) Data Mode 2 : Per TSO C160 with architecture Class Y
Channel Spacing	Voice Mode: 25 kHz and 8.33 kHz Data Mode 0/A : 25 kHz Data Mode 2 : 25 kHz

2.6.2. Transmitter Performance

Output Power	Voice Mode: 20 Watts min, 30 Watts max (power is not adjustable by operator) Data Mode 0/A: 20 Watts min, 30 Watts max (power is not adjustable by operator) Data Mode 2: 15 Watts min, 25 Watts max (power is not adjustable by operator)
FCC Emission Designators	Voice Mode: 6K00A3E Data Mode 0/A: 13K0A9W Data Mode 2: 14K0G1D
Antenna Port Impedance	All modes:50 Ohms
Carrier Frequency Accuracy	All modes:± 5 ppm
Transmit-to-Receive Switching Time	Voice Mode: < 50 ms Data Mode 0/A: < 50 ms Data Mode 2: < 1.5 ms
Receive-to-Transmit Switching Time	Voice Mode: < 50 ms Data Mode 0/A: < 50 ms Data Mode 2: < 2.75 ms
Adjacent Channel Emissions	Voice Mode: < -45 dBc @ ± 4 kHz offset; < -60 dBc @ ± 12 kHz offset or more Data Mod 0/A: < -60 dBc @ ± 12 kHz or more Data Mode 2: < +2 dBm (1st adjacent 25 kHz channel) < -28 dBm (2nd adjacent 25 kHz channel) < -38 dBm, 4th adjacent 25 kHz channel) < -43 dBm (8th adjacent 25 kHz channel) < -48 dBm (16th adjacent 25 kHz channel) < -53 dBm (32nd adjacent 25 kHz channel or higher)
Harmonic Emissions	All modes: < -16 dBm, harmonics below 1.0 GHz and above 1.7 GHz < -60 dBm, harmonics between 1.0 GHz and 1.7 GHz
Non-harmonic Spurious Emissions	All modes: < -36 dBm, spurious below 1.0 GHz and above 1.7 GHz < -60 dBm, spurious between 1.0 GHz and 1.7 GHz
Modulation	Voice Mode: DSB-AM with modulation between 90% and 98% Data Mode 0/A: 2400 bps MSK over DSB-AM with 90% to 98% modulation Data Mode 2: 31.5 kbps D8PSK (Data Mode 2)
Sidetone Output Level	Voice Mode: 10 mW rms into 600 Ohm load
Microphone Audio Input Level	Voice Mode: 0.25 V rms to 2.5 V rms
Microphone Audio Input Impedance	Voice Mode: 150 Ohms
Data Input Interface	Data Mode 0: -10 dBm from external modem audio into balanced 600 Ohm input Data modes A/2: per ARINC 750-4

2.6.3. Receiver Performance

Sensitivity	Voice Mode: -107 dBm, 6 dB SINAD with Squelch disabled Data Mode 0: -100 dBm, 10 dB SINAD Data Mode A: -100 dBm for 2% message (block) error rate (238 octet message) Data Mode 2: -98 dBm for 15% message (frame) error rate (245 octet message)
Dynamic Range	Voice Mode: -107 dBm to – 7 dBm Data Mode 0: -100 dBm to -7 dBm Data Mode A: -100 dBm to – 2dBm Data Mode 2: -98 dBm to -2 dBm
Selectivity	Voice Mode: 6 dB bandwidth @ ±8 kHz relative to 25 kHz channel center frequency 6 dB bandwidth @ ±2.78 kHz relative to 8.33 kHz channel center frequency Data Mode 0/A: 6 dB bandwidth @ ±8 kHz relative to 25 kHz channel center frequency Data Mode 2: 6 dB bandwidth @ ±8 kHz relative to 25 kHz channel center frequency
Adjacent Channel Rejection	Voice Mode: > 45 dB for < 6 dB SINAD degradation Data Mode 0/A: > 44 dB Data Mode 2: > 43 dB
In-band CW Interference Rejection	Voice Mode: > 54 dB, with CW interference > ± 40 kHz offset from center frequency Data Mode 0/A: > 60 dB with CW interference > ± 100 kHz offset from center frequency Data Mode 2: > 60 dB with CW interference > ± 100 kHz offset from center frequency
FM Interference Rejection[1]	All modes: > 82 dB with FM interference anywhere in 87.5 MHz to 107.9 MHz range
Out-of band CW Interference Rejection[1]	All modes: > 80 dB with CW Interference below 87.5 MHz or above 156 MHz except > 44 dB with CW interference at 21.825 MHz IF
Cross Modulation	Voice Mode: 10 dB below reference audio output level with audio AGC disabled, desired unmodulated carrier level @ -93 dBm, undesired signal modulated 50% @ -33dBm (offset by one channel for 25kHz spacing and two channels for 8.33kHz spacing)
Rx Audio Output Level	Voice Mode: 10 mW rms into 600 Ohm load
Squelch Threshold Settings	Voice Mode: Open @ -104 dBm ± 3 dB Close @ -108 dBm ± 3 dB
Data Output Interface	Data Mode 0: 0.5Vrms uncompressed audio output into 600 Ohm load Data modes A/2: per ARINC 750-4

2.7. Applicable Regulatory Documents

The equipment has been manufactured in compliance with the following FAA regulatory documents:

- ***FAA TSO-C169a****: VHF Radio Communications Transceiver Equipment Operating within the Radio Frequency Range 117.975 to 137.000 MHz*
- ***FAA TSO-C160a****: VDL Mode 2 Communications Equipment.*
- ***FAA TSO-C128a****: Devices that Prevent Blocked Channels Used in Two-Way Radio Communications Due to Unintentional Transmission*

The conditions and tests required for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

The following documents RTCA and EUROCAE documents are also applicable:

- ***RTCA/DO-186B****, Minimum Operational Performance Standards for Airborne Radio Communications Equipment Operating within the Radio Frequency Range 117.975-137.000 MHz.*
- ***RTCA /DO-281C****, Minimum Operational Performance Standards for Aircraft VDL Mode-2 Transceiver Physical, Link and Network Layer.*
- ***RTCA/DO-224D****, Signal-In-Space Minimum Aviation System Performance Standards (MASPS) For Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques.*
- ***RTCA/DO-207****, Minimum Operational Performance Standards for Devices that Prevent Blocked Channels Used in Two-Way Radio Communications Due to Unintentional Transmissions.*
- ***RTCA/DO-160G****, Environmental Conditions and Test Procedures for Airborne Equipment*
- ***RTCA/DO-178C****, Software Considerations in Airborne Systems and Equipment Certification*
- ***RTCA/DO-254****, Design Assurance Guidance for Airborne Electronic Hardware*
- ***EUROCAE ED-23C****, Minimum Performance Specification for Airborne VHF Communications Equipment Operating in the Frequency Range 117.975-137.000 MHz.*
- ***EUROCAE ED-92C****, Minimum Operational Performance Specification for Airborne VDL Mode-2 Transceiver Operating in the Frequency Range 118-136.975 MHz.*
- ***EUROCAE ED-67****, Minimum Operational Performance Specification for Devices that Prevent Unintentional or Continuous Transmissions.*
- ***EUROCAE ED-12C****, Software Considerations in Airborne Systems and Equipment Certification*
- ***EUROCAE ED-14G****, Environmental Conditions and Test Procedures for Airborne Equipment*
- ***EUROCAE ED-80****, Design Assurance Guidance for Airborne Electronic Hardware*

2.8. System Architecture

A high-level block diagram of the internal architecture of the RTA-50E is shown in Figure 2-3. The RTA-50E VDR consists of five sub-assemblies:

- RF Printed Board Assembly (PBA)
- Digital Processor / Power Supply PBA
- Front Panel PBA

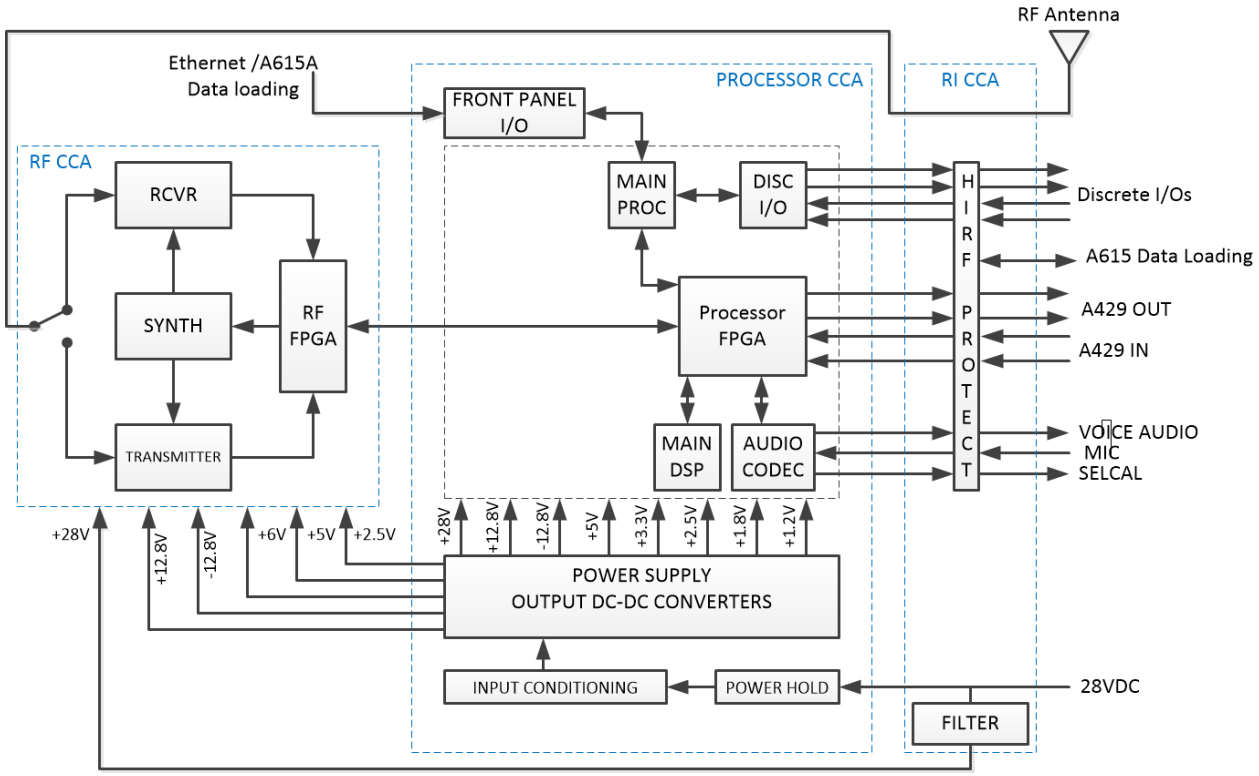


Figure 2-3 RTA-50E VDR Internal Architecture

The RTA-50E VDR is packaged in a 3MCU standard form factor. A low insertion force, size 1 shell ARINC-600 connector with three inserts provides the means to interface to other on-board avionics as well as the antenna and aircraft power. The top-plug (TP) and middle-plug (MP) inserts are used for system interconnects. The bottom-plug (BP) insert is used for input power and coaxial antenna connections.

2.8.1. RF PBA

The RF Card sub-assembly comprises four processing sections:

- Receiver
- Transmitter
- Synthesizer
- RF FPGA

In transmit mode the RF Module accepts baseband I and Q input stream of bits from the processor card, upconverts the signal to RF using PLL frequency synthesizer and Quadrature Modulator, filters and amplifies the signal; and sends the RF signal to the antenna for transmission. In receive mode, it receives RF signals from the base station or other aircraft transmitters through the antenna; down converts to IF using PLL frequency synthesizer, mixer, filters, amplifies the signal; and then converts to a digital I and Q stream of bits which is passed to the processor card. Control signals necessary to perform antenna and mode switching, gain control and frequency selection originate from the processor card and are processed by RF FPGA and directed to appropriate circuits.

2.8.2. Main Processor PBA

The main processor card sub-assembly comprises following sections:

- Digital Signal Processor (DSP)
- Main Processor
- Processor FPGA
- Audio I/O CODEC
- Discrete I/Os
- Clock distribution circuitry
- Power supply circuitry
- Reset circuitry
- Front-Panel LED circuitry
- Memory circuitry
- Ethernet circuitry

The main processor processes all discrete I/O and ARINC 429 I/O to determine the mode of operation and provides the interface with the ATSU or CMU when operating in the mode A data and mode 2 data modes. The main processor also performs the tuning of the transmitter and receiver, controls built-in test, collects fault data and reports status data outputs to the On-board Maintenance System (OMS). When receiving in DSB-AM Voice or Data, the I and Q digital data streams received from the RF card are first envelope-detected by the DSP, and then filtered and sent to the digital-to-analog CODEC. The CODEC provides the interface to the appropriate voice or data audio output port. When transmitting in DSB-AM voice or data, the audio input signal is digitized by an analog-to-digital CODEC and sent to the DSP for filtering. The digitized and filtered audio signal is then “added to a digital carrier” by the DSP and sent to the RF card for mixing with an IF carrier frequency, IF-to-RF translation, amplification and transmission.

When receiving in data mode A, the I and Q digital data streams received from the RF card are enveloped detected and MSK demodulated by the DSP to recover the ARINC 618 ACARS data blocks. The ACARS data blocks are passed to the main data processor for delivery to the ATSU or CMU via the high-speed ARINC 429 interface. When transmitting in data mode A, the main data processor passes downlink data blocks received from the ATSU or CMU to the DSP. The DSP generates the 2400 bps MSK modulator output samples and sends them to the RF module.

When receiving in ARINC 750 data mode 2, the I and Q digital data streams received from the RF card are preamble detected and D8PSK demodulated by the DSP to recover the ARINC 750 data blocks. The 750 data blocks are passed to the main processor for delivery to the ATSU or CMU via the high-speed ARINC 429 interface.

When transmitting in ARINC 750 data mode 2, the main processor passes downlink data blocks received from the ATSU or CMU to the main DSP. The main DSP generates the 31,500 bps D8PSK modulator output samples and sends them to the RF module.

The processor FPGA is primarily responsible for the buffering and conversion of messages to/from ARINC 429 format between the outside interfaces and the main processor.

The main processor card performs the conditioning of the signals that drive three LED lights and a push-button that are visible / accessible from the front panel of the VDR. Also, the main processor card implements following functions.

- UART to DSP and Test Connector
- Watchdog function
- Synchronization of all interfaces
- Audio CODEC interfaces
- LEDs control and Switch Status

The main processor card has high efficiency power supply that converts the 28VDC power into the DC operating voltages required by each sub-assembly. The power supply can hold power up during power input interrupts lasting up to 200 ms during receive mode.

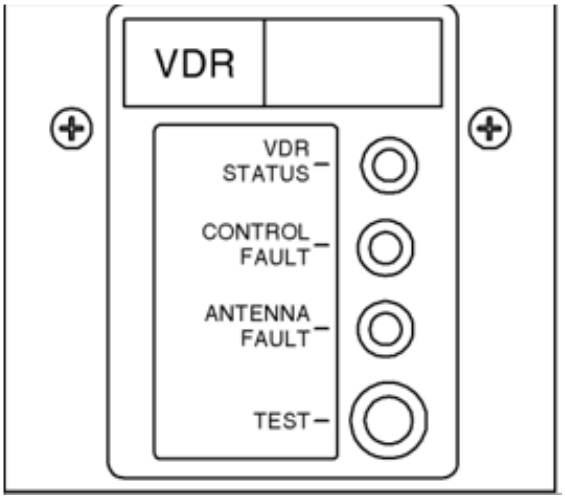
2.8.3. Rear Interconnect PBA

The rear interconnect sub-assembly consists of the ARINC 600 connector and High Intensity Radiated Field (HIRF) protection circuitry. Each of the TP and MP signals is filtered and interfaced to the main processor card via 2, 60-pin ribbon cables.

2.9. RTA-50E Fault Isolation

2.9.1. Functional Self-Test

A functional self-test of the RTA-50E VDR can be initiated by pressing the test key push-button on the front panel. Results of the functional self-test are displayed on the LEDs located on the front panel as indicated on following table.



Mode	RTA-50E Power	VDR Status	Control Fault	Antenna Fault	Reported Condition	Possible Corrective Action	Comment
Power off	Off	Off	Off	Off	LRU powered off	None	LRU power not applied
Normal operation	On	Green	Off	Off	Normal operation	None	LRU operational, no errors detected
General fault	On	Off	Off	Off	1. Breaker malfunction 2. LRU malfunction	1. Check aircraft breaker to LRU 2. Reapply power to LRU, remove if condition repeats	1. Power not reaching LRU due to breaker problem or 2. LRU has internal malfunction
External fault (control)	On	Green	Amber	Off	1. RTP and/or CMC controller not present 2. Internal malfunction of RTP/CMC interface	1. Check aircraft RTP and CMC controllers and/or connections 2. Press functional self-test button, remove if condition repeats	1. RTP and/or CMC controller is not present or 2. LRU has internal malfunction of RTP/CMC interface [1]
External fault (antenna)	On	Green	Off	Amber	1. Antenna is not present. 2. Internal malfunction of antenna interface.	1. Check aircraft antenna, and antenna connection 2. Press functional self-test button, remove if condition repeats	1. Antenna or antenna connection is not present or 2. LRU has internal malfunction of antenna interface [2]
External fault (control /antenna)	On	Green	Amber	Amber	Refer to external (control) fault and external (antenna) fault	Refer to External (control) fault and external (antenna) fault	Refer to external (control) fault and external (antenna) fault
Internal fault (boot)	On	Amber	Amber	Amber	LRU did not complete boot sequence	Reapply power to LRU, remove if condition repeats	Boot sequence did not complete due to internal malfunction

Mode	RTA-50E Power	VDR Status	Control Fault	Antenna Fault	Reported Condition	Possible Corrective Action	Comment
Internal fault	On	Red	Off or Amber	Off or Amber	LRU reports internal malfunction	1. Press functional self-lest button 2. If condition repeats, reapply power to LRU 3. If condition repeats, remove LRU	LRU has detected internal malfunction

2.10. I/O Information

The following table shows the description of the RTA-50E I/O pins.

Pin No.	Type	Signal Name	Function
MPA1	Input	MIC audio input (high)	Microphone audio input. Part of the standard four wire microphone interwiring as described in Attachment 6 of ARINC 716-10. Required for ARINC 716 VHF communication only.
MPB1	Input	MIC audio input (low)	Microphone audio input. Part of the standard four wire microphone interwiring as described in Attachment 6 of ARINC 716-10. Required for ARINC 716 VHF communication only.
MPC1	Input	MIC PTT	Microphone PTT discrete input. Ground/low = transmitter keyed. Open/high = transmitter not keyed. Part of the standard four-wire MIC interwiring as described in Attachment 6 of ARINC 716·10. Required for ARINC 716 VHF communication only.
MPD1	Output	Key event	Discrete input to flight recorder. Follows the state of MIC PTT input. Ground/low = transmitter keyed Open/high = transmitter not keyed Required for ARINC 716 VHF communication only.
MPA2	Input	MAX transmit time cutoff function	Discrete input that enables the MAX transmit cutoff function. Ground/Low = cutoff disabled Open/High = cutoff enabled

Pin No.	Type	Signal Name	Function
MPB2	NA	MIC input ground	Required for ARINC 716 VHF communication only.
MPC2	Input	Data loader input Bus A	A high-speed ARINC 429 input port to allow on-board data loading for software.
MPD2	Input	Data loader input Bus B	A high-speed ARINC 429 input port to allow on-board data loading for software.
MPA3	Input	Optional remote squelch (high)	To accommodate an optional remote squelch adjustment if so required or provided. Required for ARINC 716 VHF communication only.
MPB3	Input	Optional remote squelch (arm)	To accommodate an optional remote squelch adjustment if so required or provided. Required for ARINC 716 VHF communication only.
MPC3	Input	Optional remote squelch (low)	To accommodate an optional remote squelch adjustment if so required or provided. Required for ARINC 716 VHF communication only.
MPD3	NA	DC ground	Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPA4	Input	Functional test	Discrete input that activates LRU functional test function. ground/low = activate functional test. Required for ARINC 716 VHF communication.
MPB4	NA	Audio ground	Required for ARINC 716 VHF communication only.
MPC4	Output	Data loader output Bus A	A high-speed ARINC 429 output port to allow on-board data loading for software.
MPD4	Output	Data loader output Bus B	A high-speed ARINC 429 output port to allow on-board data loading for software.
MPA5	Input	Data link data input (high)	Analog 2,400-bps ACARS data input. Required for ARINC 716 VHF communication only.
MPB5	Input	Data link data input (low)	Analog 2,400-bps ACARS data input. Required for ARINC 716 VHF communication only.
MPC5	NA	Reserved No. 1	Leave open.
MPD5	Output	8.33 kHz programming	Discrete output that indicates to control panel the VDR is capable of 8.33 or 25-kHz operation. This output is internally grounded.
MPA6	Input	Data from OMS/CFDS No. 1 Input Port (A)	One of two low-speed ARINC 429 data input ports provided for dual OMS/CFDSs. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPB6	Input	Data from OMS/CFDS No. 1 Input Port (B)	One of two low-speed ARINC 429 data input ports provided for dual OMS/CFDSs. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.

Pin No.	Type	Signal Name	Function
MPC6	Input	Data from OMS/CFDS No. 2 Input Port (A)	One of two low-speed ARINC 429 data input ports provided for dual OMS/CFDSs. Required for ARINC 750 VDR only.
MPD6	Input	Data from OMS/CFDS No. 2 Input Port (B)	One of two low-speed ARINC 429 data input ports provided for dual OMS/CFDSs. Required for ARINC 750 VDR only.
MPA7	Input	Frequency/function select data I/P Port B (A)	One of two low-speed ARINC 429 input ports to provide frequency tuning data. Required for ARINC 716 VHF communication only.
MPB7	Input	Frequency/function select data I/P Port B (B)	One of two low-speed ARINC 429 input ports to provide frequency tuning data. Required for ARINC 716 VHF communication only.
MPC7	Input	Voice/data select	Discrete input that enables either the PTT key line (MPC1) or the Data key line (MPD7). Ground/low = data Key line enabled Open/High = PTT enabled. Required for ARINC 716 VHF communication only.
MPD7	Input	Data key line	Discrete input that keys the transmitter. Ground/low = transmitter keyed. Open/high = transmitter not keyed. Required for ARINC 716 VHF communication only.
MPA8	Input	Antenna monitor enable input	Discrete input that allows antenna monitor function at power-up. Ground/low = monitor enabled. Open/high = monitor disabled.
MPB8	Input	Data loader enable input	Discrete input to allow on-board data loading of software. Required for ARINC 750 VDR only.
MPC8	Input	Frequency offset enable	Not implemented.
MPD8	NA	Data key line return	Required for ARINC 716 VHF communication only.
MPA9	Input	SDI Bit 0 program	A discrete input pair pre-wired at the rear connector to identify the specific VHF radio location in the aircraft. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPB9	Input	SDI Bit 1 program	A discrete input pair pre-wired at the rear connector to identify the specific VHF radio location in the aircraft. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPD9	Output	AGC out	AGC output signal for test purposes.

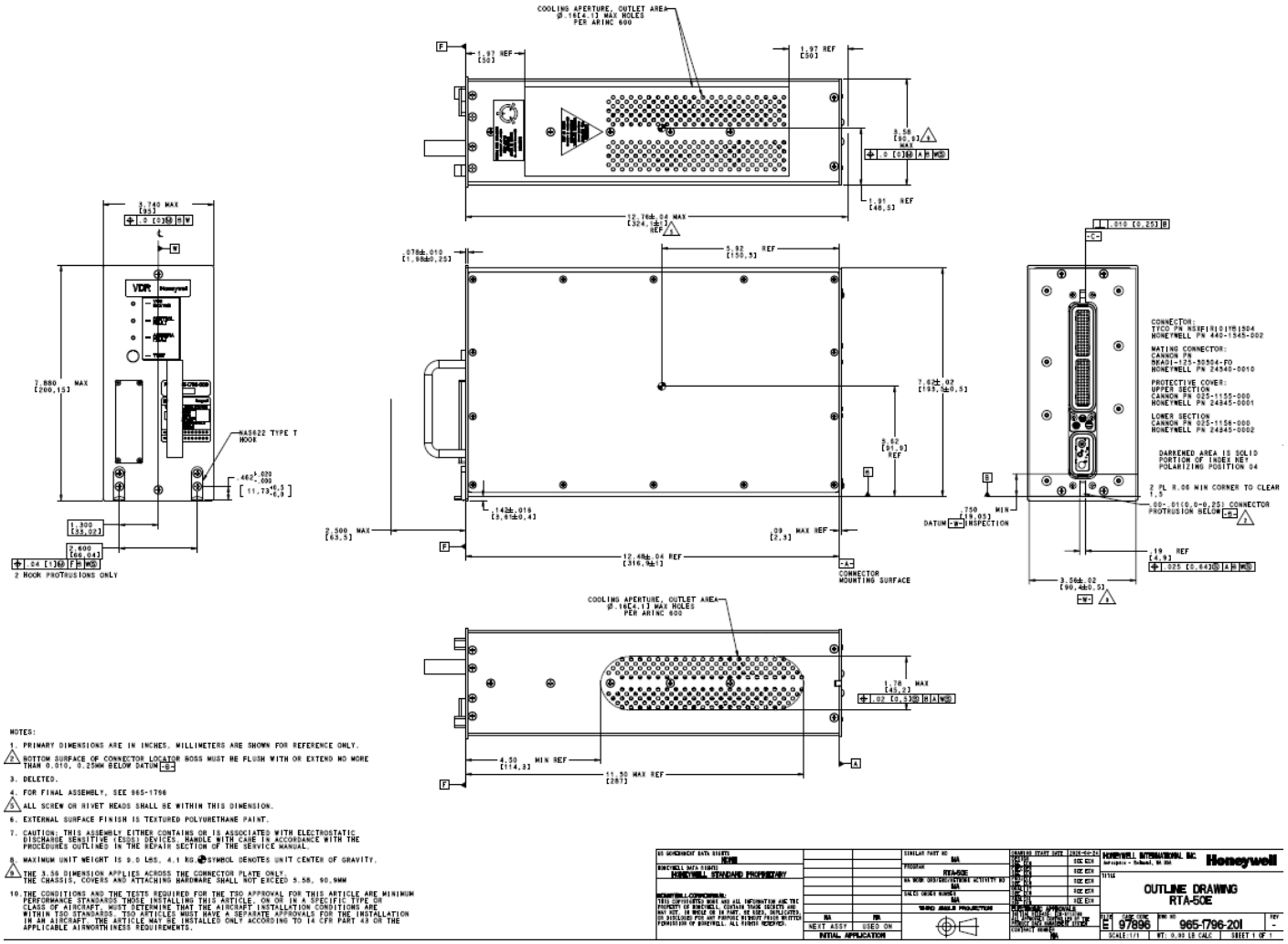
Pin No.	Type	Signal Name	Function
MPA10	NA	Spare	NA
MPB10	NA	Spare	NA
MPC10	Output	Data to CMU No. 1, CMU No. 2 output Port (A)	A high-speed ARINC 429 output port to CMU/MU/ATSU No. 1 and No. 2. Required for ARINC 750 VDR only.
MPD10	Output	Data to CMU No. 1, CMU No. 2 output Port (B)	A high-speed ARINC 429 output port to CMU/MU/ATSU No. 1 and No. 2. Required for ARINC 750 VDR only.
MPA11	Input	Frequency/function select data I/P Port A (A)	One of two low-speed ARINC 429 input ports to provide frequency tuning data. Required for ARINC 716 VHF communication only.
MPB11	Input	Frequency/function select data I/P Port A (B)	One of two low-speed ARINC 429 input ports to provide frequency tuning data. Required for ARINC 716 VHF communication only.
MPC11	Input	Maintenance system ID 1	Identifies CFDS type along with MPA14.
MPD11	Input	Frequency port select	Discrete input used to select either frequency/function select data l/P Port A or B. Ground/low = Select Port A. Open/high = Select Port B. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPA12	Input	CMU No. 1 input Bus A	A high-speed ARINC 429 input port from CMU/MU/ATSU No. 1. Used to receive commands/status/data in Williamsburg files, and periodic and aperiodic ARINC 429 words. Required for ARINC 750 VDR only.
MPB12	Input	CMU No. 1 input Bus B	A high-speed ARINC 429 input port from CMU/MU/ATSU No. 1. Used to receive commands/status/data in Williamsburg files, and periodic and aperiodic ARINC 429 words. Required for ARINC 750 VDR only.
MPC12	Input	CMU No. 2 input Bus A	A high-speed ARINC 429 input port from CMU/MU/ATSU No. 2. Used to receive commands/status data in Williamsburg files, and periodic and aperiodic ARINC 429 words. Required for ARINC 750 VDR only.
MPD12	Input	CMU No. 2 input Bus B	A high-speed ARINC 429 input port from CMU/MU/ATSU No. 2. Used to receive commands/status data in Williamsburg files, and periodic and aperiodic ARINC 429 words. Required for ARINC 750 VDR only.

Pin No.	Type	Signal Name	Function
MPA13	Output	SELCAL audio and data link output (high)	An analog output to provide 2400-bps MSK data to the ACARS MU. May also be used for SELCAL provisions. Required for ARINC 716 VHF communication only.
MPB13	Output	SELCAL audio and data link output (low)	An analog output to provide 2400-bps MSK data to the ACARS MU. May also be used for SELCAL provisions. Required for ARINC 716 VHF communication only.
MPC13	Input	Squelch disable	A discrete input to provide squelch override or disable capability. Required for ARINC 716 VHF communication only.
MPD13	NA	Squelch disable return	A discrete input to provide squelch override or disable capability. Required for ARINC 716 VHF communication only.
MPA14	Input	Maintenance system ID 0	Identifies CFDS type along with MPC11.
MPB14	Input	Air/ground discrete	A discrete input to indicate if the aircraft is in the air or on the ground. Ground/low = airborne. Open/high = on ground. Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
MPC14	Output	Data to OMS/CFDS output Port A	A low-speed ARINC 429 output port to one or two OMS/CFDSs. Required for both ARINC 716 VHF communication and ARINC 750 VDR. Functions are identical.
MPD14	Output	Data to OMS/CFDS output Port B	A low-speed ARINC 429 output port to one or two OMS/CFDSs. Required for both ARINC 716 VHF communication and ARINC 750 VDR. Functions are identical.
MPA15	Output	Audio/side-tone output (high)	An analog output for receiver audio during receive mode and side-tone audio during voice transmit modes. Required for ARINC 716 VHF communication only.
MPB15	Output	Audio/side-tone output (low)	An analog output for receiver audio during receive mode and side-tone audio during voice transmit modes. Required for ARINC 716 VHF communication only.
MPC15	Output	Muting	An optional two wire discrete output to provide a switch closure internal to the VHF communication for external system muting applications during transmit modes. Open = muting off. Ground = muting on. Required for ARINC 716 VHF communication only.
MPD15	NA	Muting return	An optional two wire discrete output to provide a switch closure internal to the VHF communication for external system muting applications during transmit modes. Open = muting off. Ground = muting on. Required for ARINC 716 VHF communication only.

Pin No.	Type	Signal Name	Function
BP1	Input /output	Antenna RF input	Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
BP2	Input	DC power input +27.5 VDC	Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
BP3	NA	Spare	NA
BP4	NA	DC power ground	Required for both ARINC 716 VHF communication and ARINC 750 VDR; functions are identical.
BP5	NA	Spare	NA

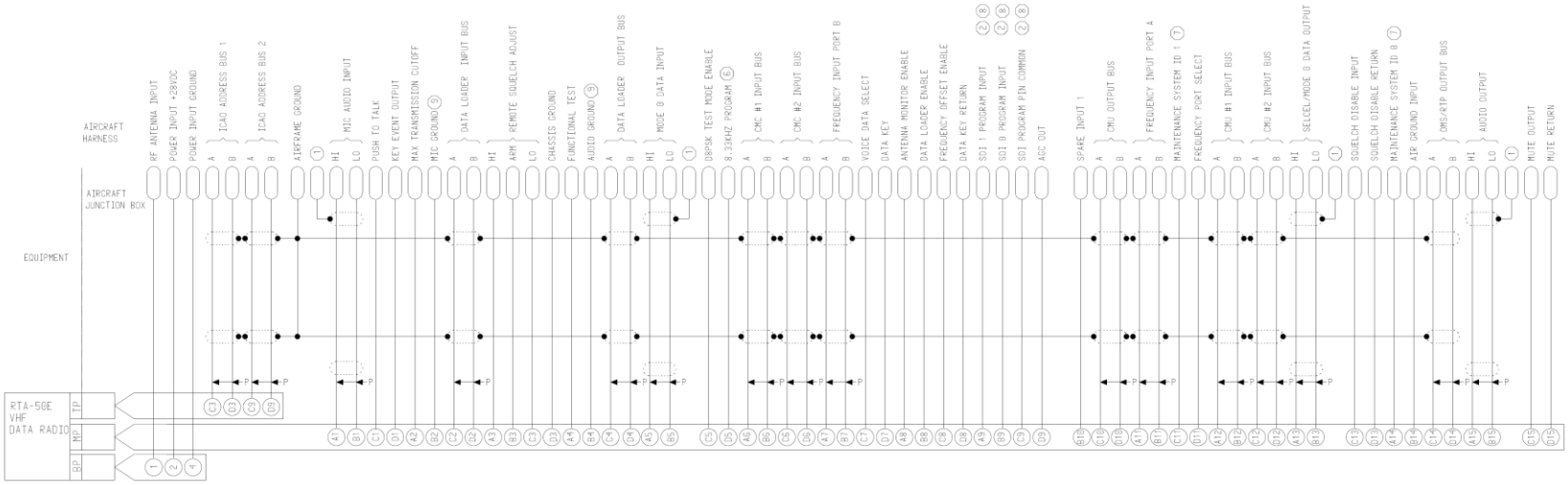
2.11. Outline and Installation Diagram

The figure shows the outline and installation diagram for the RTA-50E.



2.12. Wiring Diagram

The figure shows the wiring diagram for the RTA-50E.



NOTES:

① GROUND AT AUDIO SYSTEM END ONLY; NOT GROUNDED AT RADIO END.

② TO ENCODE LOCATION OF VHF DATA RADIO IN AIRCRAFT, LEAVE PINS AS OPEN CIRCUIT OR CONNECTED TO MPC9 AS FOLLOWS:

COMM NO.	CONNECTOR PIN		ARINC REQUIREMENT
	MPA9	MPB9	716
1/2/3	OPEN	OPEN	716,750
1 (LEFT)	OPEN	TO MPC9	716,750
2 (RIGHT)	TO MPC9	OPEN	716,750
3 (CENTER)	TO MPC9	TO MPC9	716,750

3. RACK MOUNT LOGIC CAN HELP IDENTIFY PROPER LRU ENGAGEMENT. TO ENABLE THIS FEATURE CONNECT PIN MPA14 TO GROUND AND ADD A JUMPER FROM MPB10 TO MPC11.

4. ◄►P INDICATES TWISTED PAIR.

5. CMC= CENTRAL MAINTENANCE COMPUTER.
CMU= COMMUNICATION MANAGEMENT UNIT.
OMS= ON-BOARD MAINTENANCE SYSTEM.
RTP= RADIO TUNING PANEL.

⑥ WHEN MPD5 IS INTERNALLY GROUNDED, THE VDR IS CAPABLE OF OPERATING IN EITHER OF 8.33 KHZ OR 25 KHZ MODES. CONTROL PANEL PROGRAMMING IS OPTIONAL.

⑦ MAINTENANCE SYSTEM IDENTIFICATION

MPC11	MPA14	AIRCRAFT / OMS TYPE	ARINC REQ.
GROUND	GROUND	AIRBUS	750-3 & UP
GROUND	OPEN	BOEING	750-3 & UP
OPEN	GROUND	UNDEFINED	UNDEFINED
OPEN	OPEN	RESERVED	RESERVED

⑧ WHEN CONFIGURING THE RTA-50D AS AN ARINC 750 VDR TO BE INTERFACED TO A CMU FOR MODE A, 2, OR 3 OPERATION, THE SDI STRAPS MUST BE SELECTED TO THE APPROPRIATE RADIO POSITION.

⑨ MICROPHONE WIRING IS PER ARINC 716 ATTACHMENT 6, AND AS FOLLOWS:
PIN MPB2 IS CONNECTED INTERALLY TO PIN MPB1.
THE MICROPHONE CAN BE GROUNDED BY EITHER OF THE FOLLOWING THREE METHODS:
A. PIN MPB2 CAN BE JUMPERED TO PIN MPB4 TO OBTAIN INTERNAL GROUNDING, OR
B. PIN MPB2 CAN BE CONNECTED TO SPASE, OR
C. PIN MPB1 CAN BE CONNECTED TO SPASE.
ONLY ONE OF THE THREE GROUND ALTERNATIVES SHOULD BE IMPLEMENTED IN ANY GIVEN INSTALATION (MPB2 TO SPASE, MPB1 TO SPASE, OR MPB2 TO MPB4).