MULTIPLE VDR

NOTE. THE MVDR SYSTEM IS AN OPTION ON THE NEO AIRCRAFT. THIS SECTION IS FOR INFORMATION ONLY AND WILL NOT BE EXAMINED

General

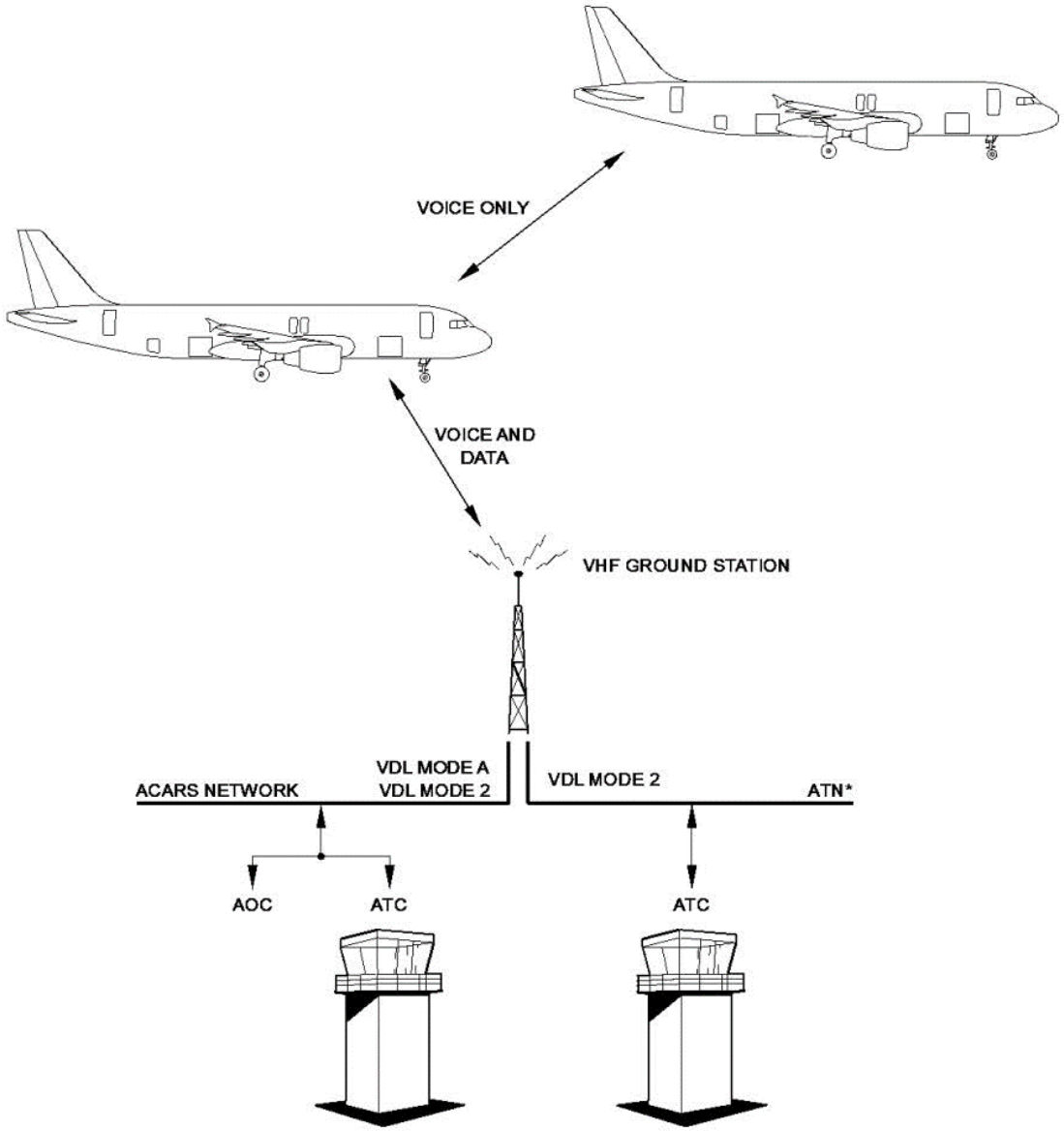
VHF System - Communication Principle

The Very High Frequency (VHF) system is used for all short-range voice communications between:

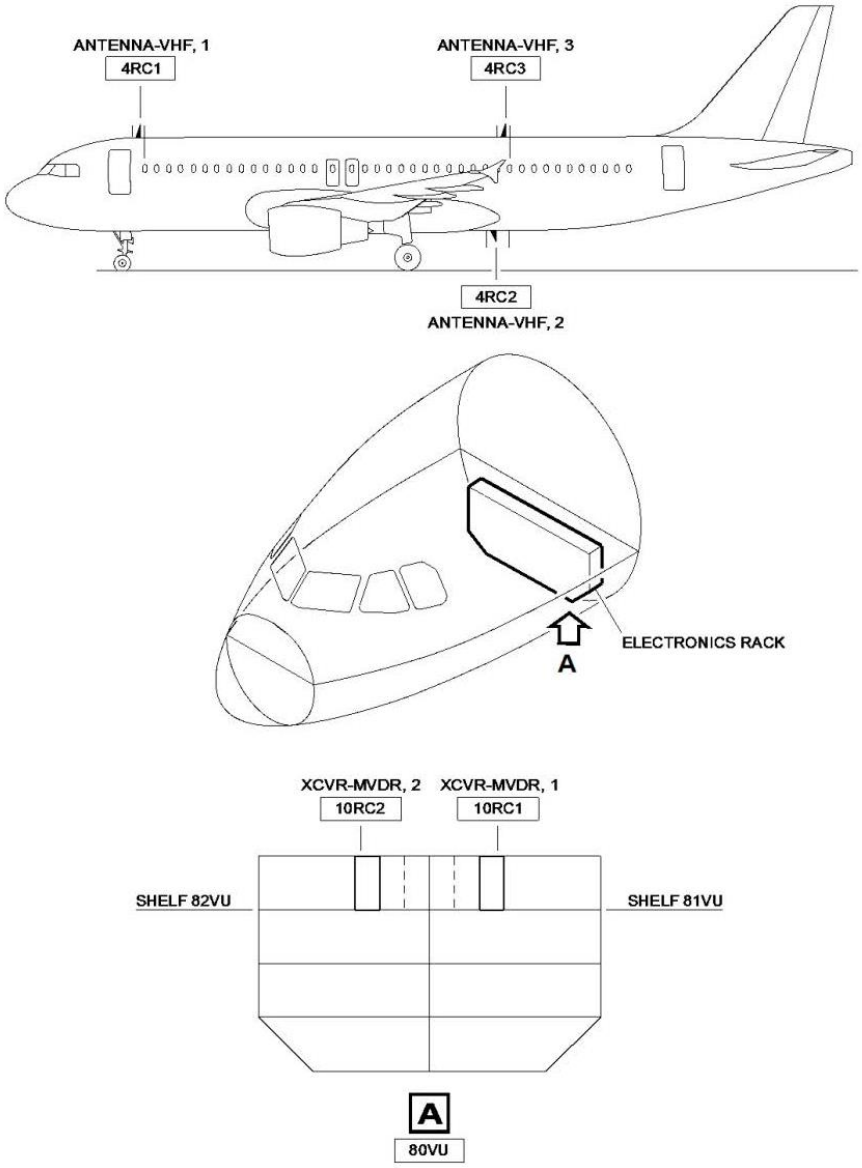
Different aircraft (in flight or on the ground) in voice mode

The aircraft and one or many ground stations in voice or data mode.

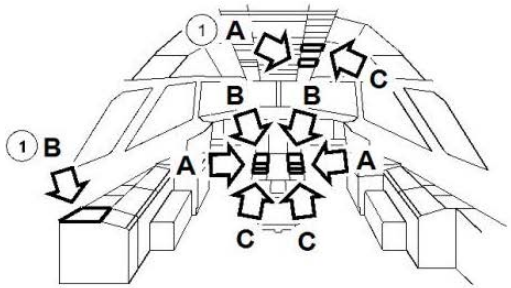
The VHF system operates within the frequency range defined by ARINC 716 (i.e. 118 to 136.975 MHz with 8.33 KHZ (VOICE)/25 KHZ (VOICE or DATA) spacing between channels).


VOICE ONLY
VOICE AND
DATA
VHF GROUND STATION
ACARS NETWORK
VDL MODE A
VDL MODE 2
VDL MODE 2
ATN*
AOC
ATC
ATC

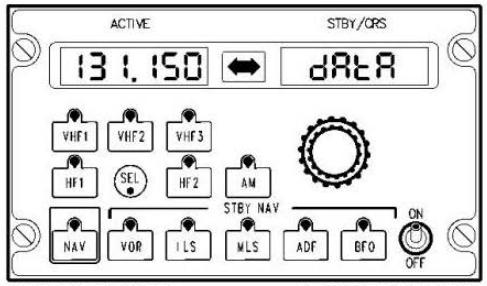
Component Location


ANTENNA-VHF, 1
4RC1
ANTENNA-VHF, 3
4RC3
4RC2
ANTENNA-VHF, 2
ELECTRONICS RACK
A
XCVR-MVDR, 2
10RC2
XCVR-MVDR, 1
10RC1
SHELF 82VU
SHELF 81VU
A
80VU

INTENTIONALLY BLANK

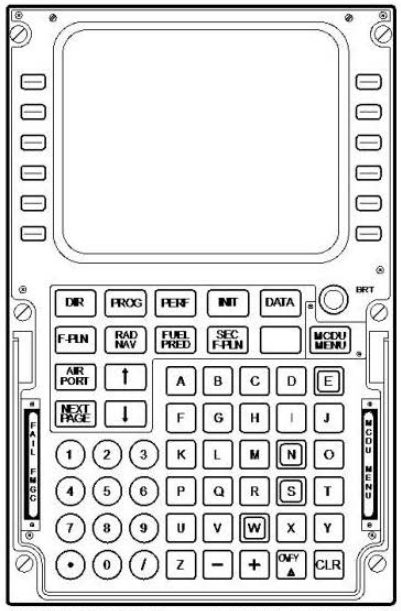


A



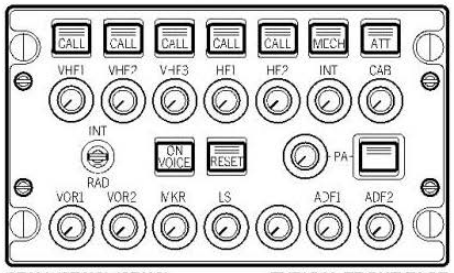
1RG1 (1RG2) (1RG3) TYPICAL FRONT FACE
RADIO MANAGEMENT PANEL

B



3CA1 (3CA2) (3CA3) TYPICAL FRONT FACE
MCDU

C



2RN1 (2RN2) (2RN3) TYPICAL FRONT FACE
ACP

System Description

MVDR Block Diagram - Dual LRU Configuration.

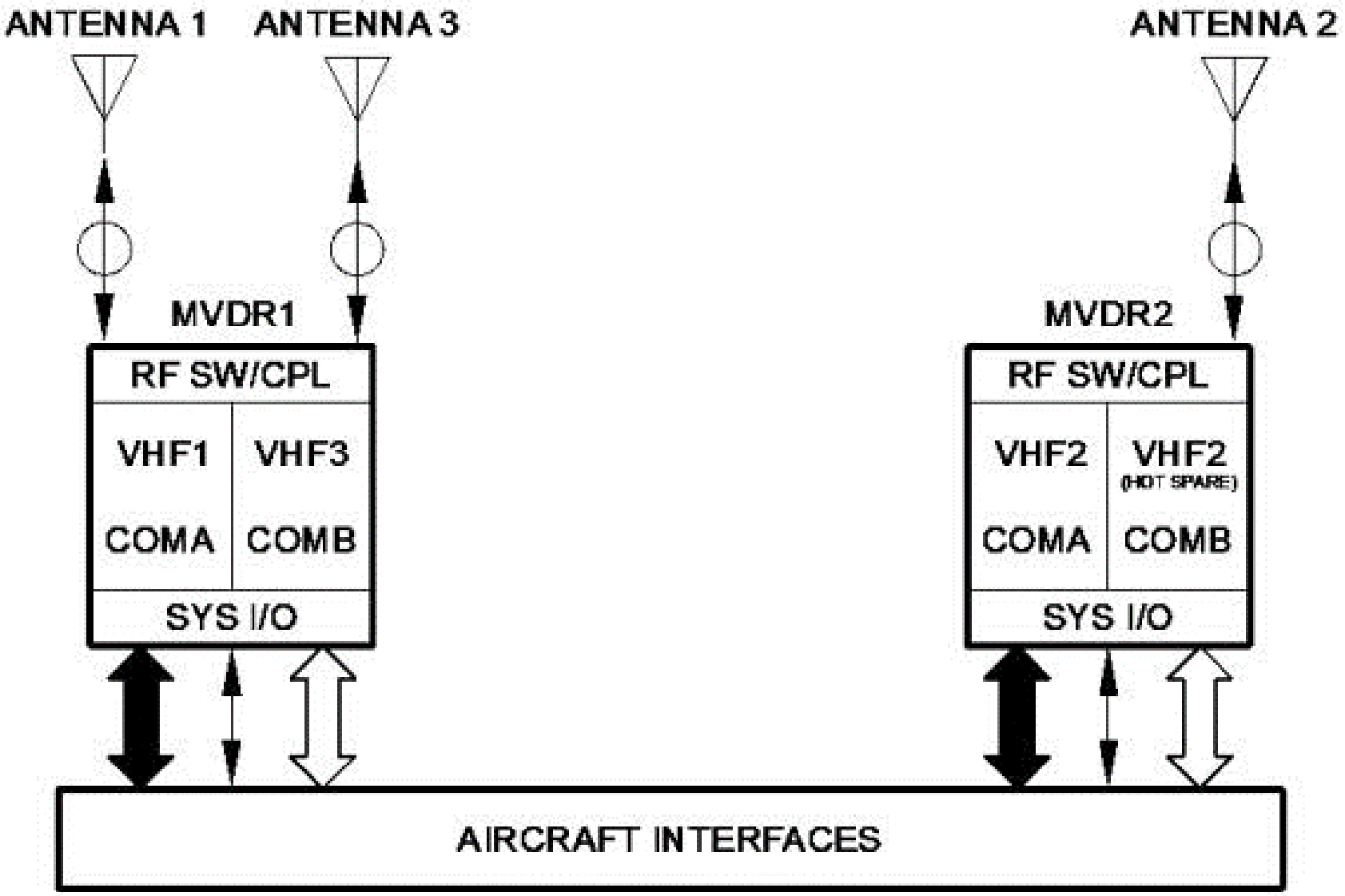
The VHF system operates for short-range communications:

In voice mode between different aircraft, and between the aircraft and the ground stations

In data mode between the aircraft and the ground stations only (Air Traffic Control (ATC) and/or Airline Operational Control (AOC)).

To do this, the VHF system has:

Two Multiple VHF Data Radio (MVDR) transceivers (10RC1 and 10RC2) installed with dual LRU configuration.


ANTENNA 1
ANTENNA 3
ANTENNA 2
MVDR1
MVDR2
RF SW/CPL
VHF1
VHF3
COMA
COMB
SYS I/O
RF SW/CPL
VHF2
VHF2
(HOT SPARE)
COMA
COMB
SYS I/O
AIRCRAFT INTERFACES

MVDR in Dual LRU Configuration

Three VHF Data Radio (VDR) antennas (4RC1, 4RC2 and 4RC3).

The MVDR transceivers send/receive a Radio Frequency (RF) signal to/from the VDR antennas.

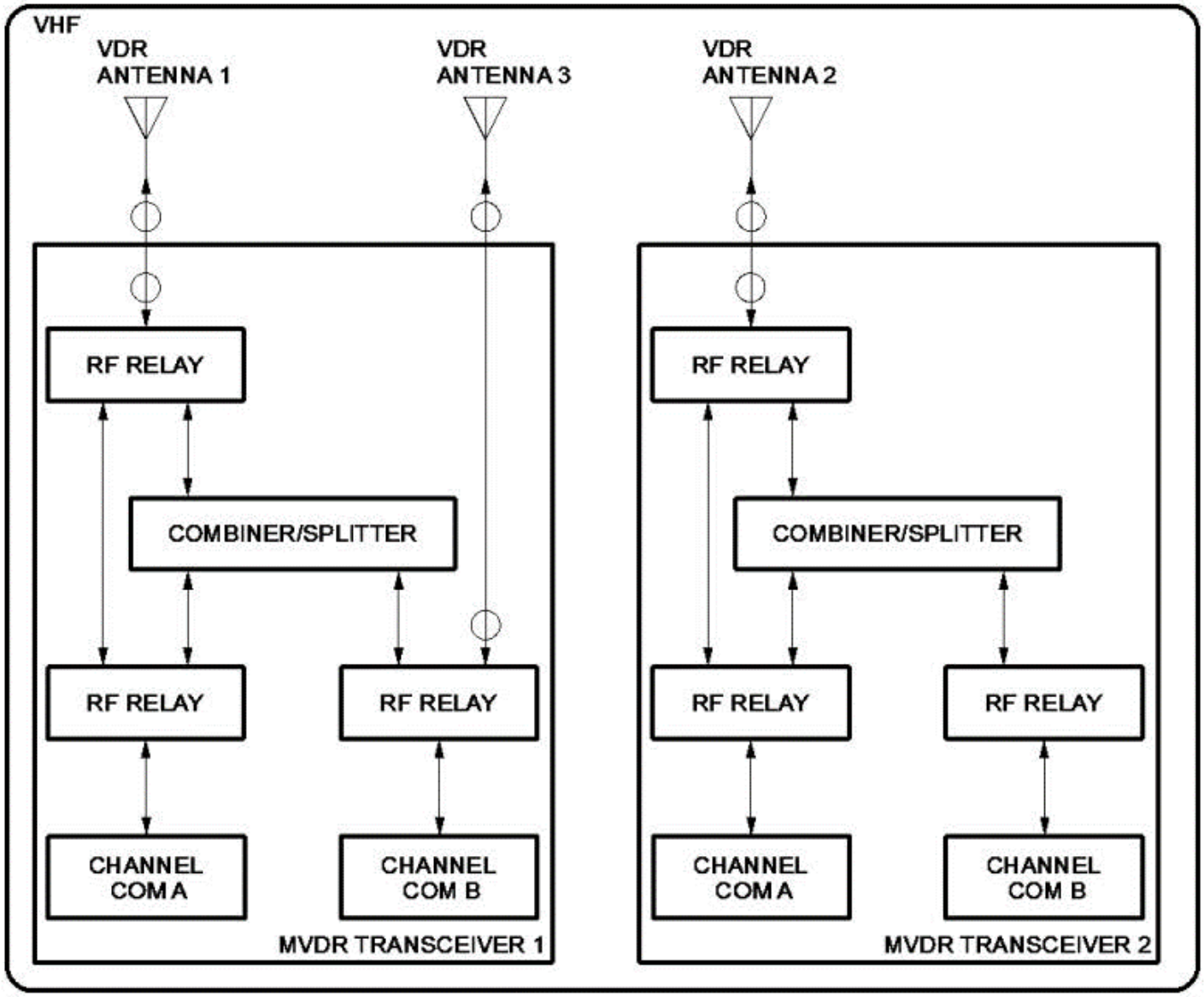
In dual LRU configuration, each MVDR has two channels:

COM (Communication) A: COM A channel of MVDR transceiver 1 hosts VHF1 and COM A channel of MVDR transceiver 2 hosts VHF2.

COM B: COM B channel of MVDR transceiver 1 hosts VHF3 and COM B channel of MVDR transceiver 2 is a spare channel.

VHF1, VHF2 and VHF3 channels can operate at the same time in voice and data modes.

MVDR transceiver 2 has a channel reconfiguration function (with three RF relays and a combiner/splitter) to keep VHF2 available on COM B spare channel if there is COM A channel failure.


VHF
VDR
ANTENNA 1
VDR
ANTENNA 3
VDR
ANTENNA 2
RF RELAY
COMBINER/SPLITTER
RF RELAY
RF RELAY
CHANNEL
COM A
CHANNEL
COM B
MVDR TRANSCEIVER 1
RF RELAY
COMBINER/SPLITTER
RF RELAY
RF RELAY
CHANNEL
COM A
CHANNEL
COM B
MVDR TRANSCEIVER 2

Power Supply

Dual LRU Configuration

The electrical power generation and distribution system supplies the 2 MVDR as mentioned below:

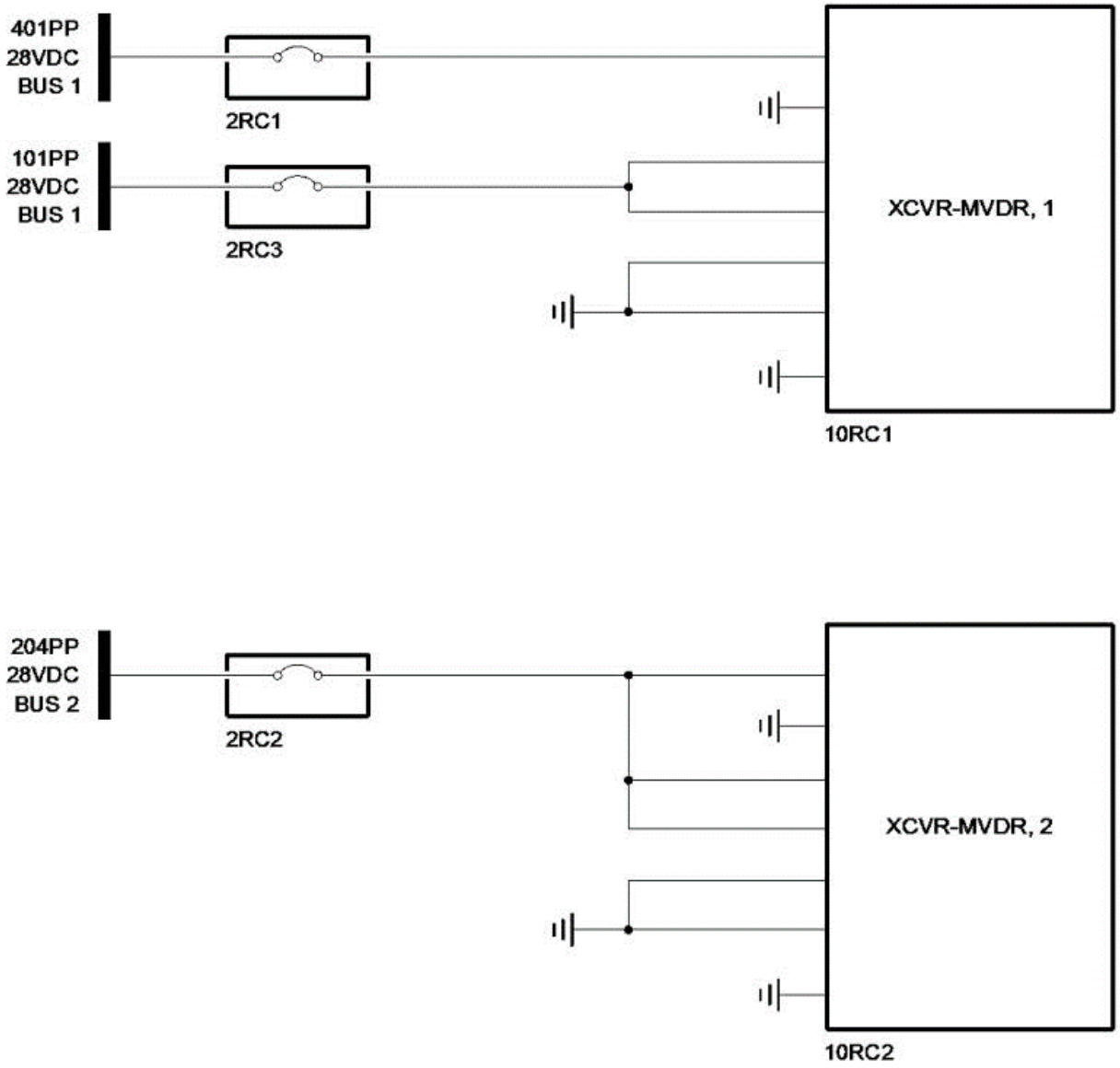
The MVDR1 COM A that hosts the VHF1 transceiver is supplied by the 28VDC ESS BUS (sub bus bar 401PP).

In case of emergency, this system is supplied by the DC emergency generation.

The MVDR1 COM B that hosts the VHF3 transceiver is supplied by the 28VDC1 BUS (sub bus bar 101PP).

The MVDR2 COM A that hosts the VHF2 transceiver and COM B that hosts its warm spare are both supplied by the 28VDC2 BUS (sub bus bar 204PP).

These components are supplied by the subsequent circuit breakers:


401PP
28VDC
BUS 1
2RC1
101PP
28VDC
BUS 1
2RC3
XCVR-MVDR, 1
10RC1
204PP
28VDC
BUS 2
2RC2
XCVR-MVDR, 2
10RC2

Interface

VHF System Interface Architecture - Dual LRU Configuration

In the dual LRU configuration, the MVDR transceivers are interfaced with:

Two Radio Management Panels (RMP1 and RMP2) (Ref. 23-13)

One Audio Management Unit (AMU) (Ref. 23-51)

One Centralized Fault Display Interface Unit (CFDIU) (Ref. 31-32)

One Data Loading Routing Box (DLRB) (Ref. 31-38) to get access to the configuration of the component and data loading.

Only MVDR1 is interfaced with the DLRB.

Two System Data Acquisition Concentrator (SDAC1 and SDAC2) (Ref. 31-54)

Two Landing Gear Control Interface Units (LGCIU1 and LGCIU2) (Ref. 32-31)

One Air Traffic Services Unit (ATSU) for the MVDR1 COM B (Ref. 46-20).

Interface with the Radio Management Panel (RMP)

The COM/NAV RMP subsystem centralizes radio communication control (VHF). It controls the frequencies (118 to 136.975 MHz) and the mode of the VHF transceivers through an ARINC 429 bus.

The channel width (8.33 KHz or 25 KHz) is selected according to the pin programming of the RMP.

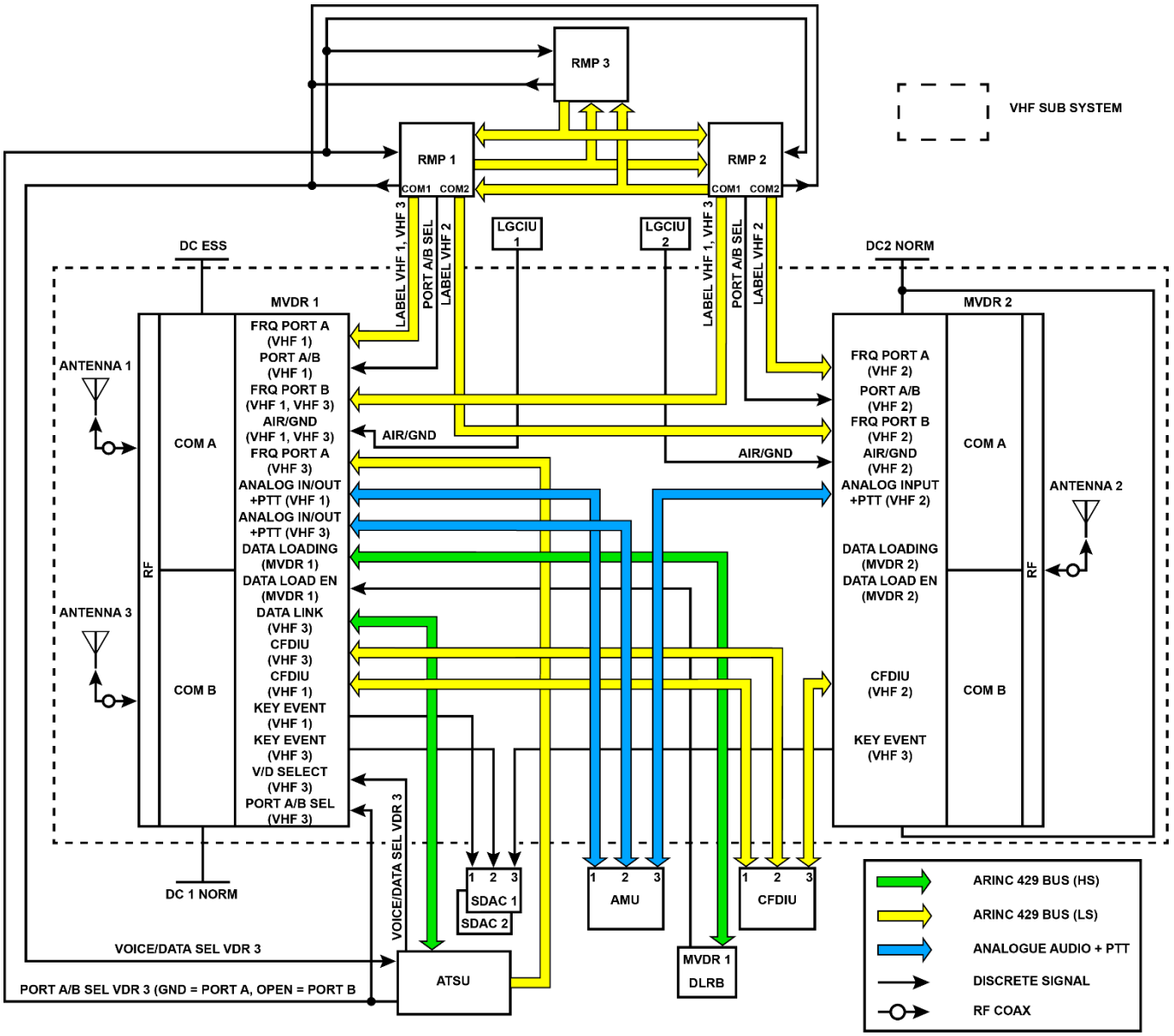
It is also used to control the frequency of the navigation equipment’s (VOR-DME, ILS, ADF) in case of failure of the Flight Management System (FMS).

The RMP subsystem consists of 3 RMPs (RMP1, RMP2 and RMP3) which are identical and interchangeable (the RMP3 is optional).

The RMP displays and selections are synchronized using ARINC 429 buses to enable the control of all radio communication via any RMP.

The synchronization of the RMPs also enables a reconfiguration in the case of a failure of one or more RMPs.

Each MVDR system is interfaced with RMPs through 2 ARINC 429 input low speed buses and one input discrete.


RMP 3
VHF SUB SYSTEM
RMP 1
RMP 2
COM1
COM2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
LGCIU 1
LGCIU 2
DC ESS
DC2 NORM
MVDR 1
MVDR 2
ANTENNA 1
ANTENNA 3
ANTENNA 2
COM A
COM B
RF
FRQ PORT A (VHF 1)
PORT A/B (VHF 1)
FRQ PORT B (VHF 1, VHF 3)
AIR/GND (VHF 1, VHF 3)
FRQ PORT A (VHF 3)
ANALOG IN/OUT +PTT (VHF 1)
ANALOG IN/OUT +PTT (VHF 3)
DATA LOADING (MVDR 1)
DATA LOAD EN (MVDR 1)
DATA LINK (VHF 3)
CFDIU (VHF 3)
CFDIU (VHF 1)
KEY EVENT (VHF 1)
KEY EVENT (VHF 3)
V/D SELECT (VHF 3)
PORT A/B SEL (VHF 3)
AIR/GND
FRQ PORT A (VHF 2)
PORT A/B (VHF 2)
FRQ PORT B (VHF 2)
AIR/GND (VHF 2)
ANALOG INPUT +PTT (VHF 2)
DATA LOADING (MVDR 2)
DATA LOAD EN (MVDR 2)
CFDIU (VHF 2)
KEY EVENT (VHF 3)
DC 1 NORM
VOICE/DATA SEL VDR 3
SDAC 1
SDAC 2
AMU
CFDIU
ATSU
MVDR 1 DLRB
PORT A/B SEL VDR 3 (GND = PORT A, OPEN = PORT B
ARINC 429 BUS (HS)
ARINC 429 BUS (LS)
ANALOGUE AUDIO + PTT
DISCRETE SIGNAL
RF COAX

Interface with Audio Management Unit (AMU)

The AMU centralizes the audio signals used by the crew:

In transmission mode, it collects the audio signals from the microphone input signal of the crew stations and routes them to the VHF communication system.

In reception mode, it collects audio output signals from the VHF transceivers and routes them to the crew stations.

It also monitors and decodes the selective calling audio output of the 3 transceivers.

When one equipment receives a tone which matches the programmed code, the AMU activates an annunciating light and chime in the cockpit.

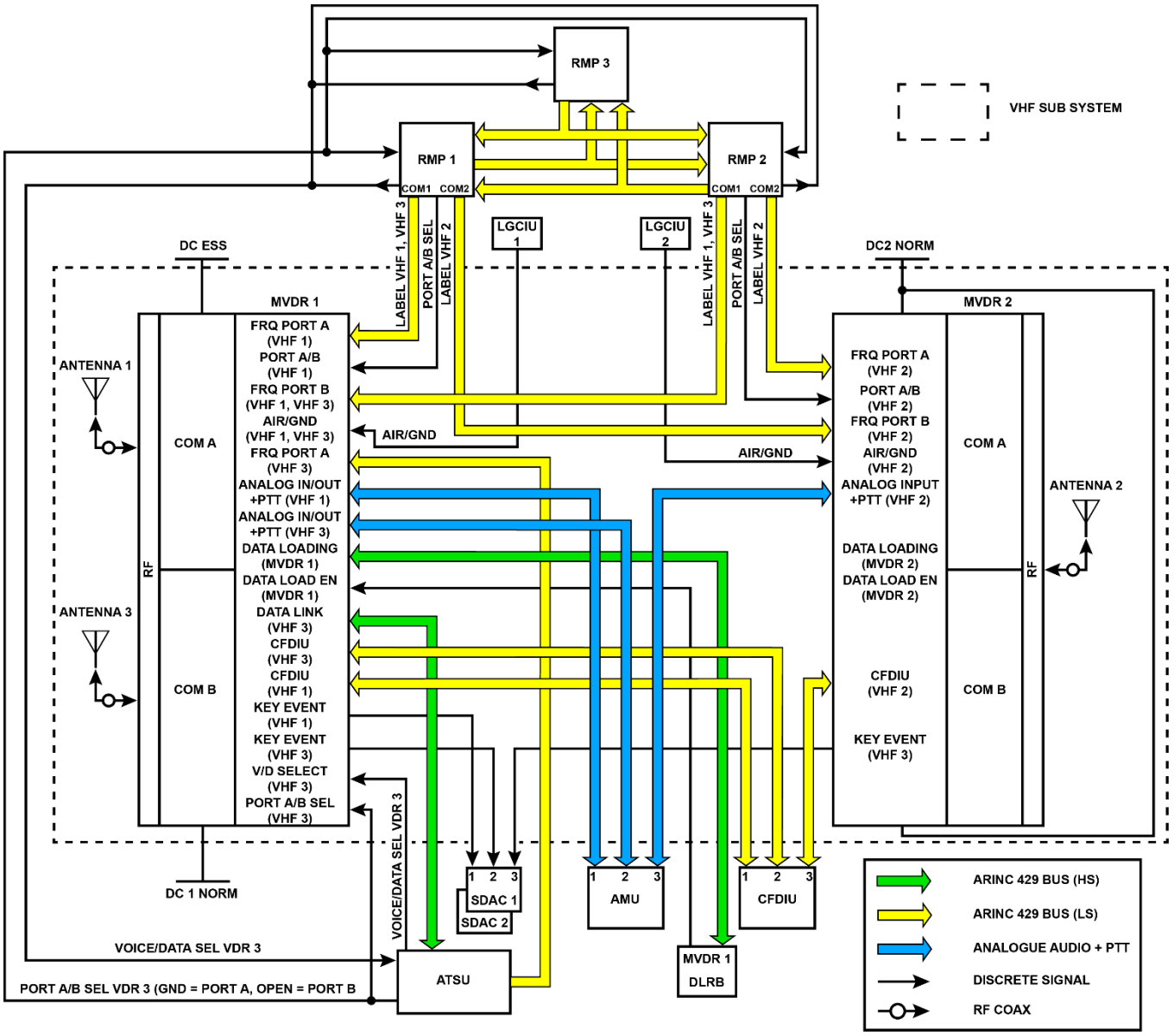
Each MVDR is connected with the AMU through 1 analog input, 2 analog outputs and 1 input discrete.

Interface with Centralized Fault Display Interface Unit (CFDIU)

The CFDIU communicates with each VHF transceiver through 3 independent, bi-directional ARINC 429 buses (2 with MVDR1 for VHF1 and VHF3 and 1 with MVDR 2 for VHF2) to obtain their health status and identification via the "Built-In Test Equipment (BITE)" embedded maintenance software.

Each VHF has a low speed bus ARINC 429 input from the CFDIU and a low speed bus ARINC 429 output.

This system is thus capable of two-way communication with the CFDIU.


RMP 3
RMP 1
RMP 2
COM1 COM2
COM1 COM2
VHF SUB SYSTEM
LGCIU 1
LGCIU 2
DC ESS
DC2 NORM
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
MVDR 1
MVDR 2
ANTENNA 1
ANTENNA 3
ANTENNA 2
COM A
COM B
RF
FRQ PORT A (VHF 1)
PORT A/B (VHF 1)
FRQ PORT B (VHF 1, VHF 3)
AIR/GND (VHF 1, VHF 3)
FRQ PORT A (VHF 3)
ANALOG IN/OUT +PTT (VHF 1)
ANALOG IN/OUT +PTT (VHF 3)
DATA LOADING (MVDR 1)
DATA LOAD EN (MVDR 1)
DATA LINK (VHF 3)
CFDIU (VHF 3)
CFDIU (VHF 1)
KEY EVENT (VHF 1)
KEY EVENT (VHF 3)
V/D SELECT (VHF 3)
PORT A/B SEL (VHF 3)
AIR/GND
AIR/GND
FRQ PORT A (VHF 2)
PORT A/B (VHF 2)
FRQ PORT B (VHF 2)
AIR/GND (VHF 2)
ANALOG INPUT +PTT (VHF 2)
DATA LOADING (MVDR 2)
DATA LOAD EN (MVDR 2)
CFDIU (VHF 2)
KEY EVENT (VHF 3)
DC 1 NORM
VOICE/DATA SEL VDR 3
VOICE/DATA SEL VDR 3
PORT A/B SEL VDR 3 (GND = PORT A, OPEN = PORT B
SDAC 1
SDAC 2
AMU
CFDIU
ATSU
MVDR 1
DLRB
1 2 3
ARINC 429 BUS (HS)
ARINC 429 BUS (LS)
ANALOGUE AUDIO + PTT
DISCRETE SIGNAL
RF COAX

Interface with Data Loading Routing Box (DLRB) (Only for DUAL LRU Configuration)

In the dual LRU configuration only MVDR1 is connected to the DLRB.

Thus, MVDR software is data loadable per module via the DLRB.

This function allows updating the operational software of the MVDR in case of upgrades.

The data loading procedure must be performed twice since only MVDR1 is connected to the DLRB.

Thus, once data loading of the first LRU is performed, the physical positions of MVDR1 and MVDR2 must be switched in the electronic bay.

Then, the second LRU can be data loaded.

Interface with System Data Acquisition Concentrator (SDAC)/Flight Warning Computer (FWC)

The SDAC 1 or 2 collects transmission information from the VHF system and allows the transmit mode of the VHF system to be recorded.

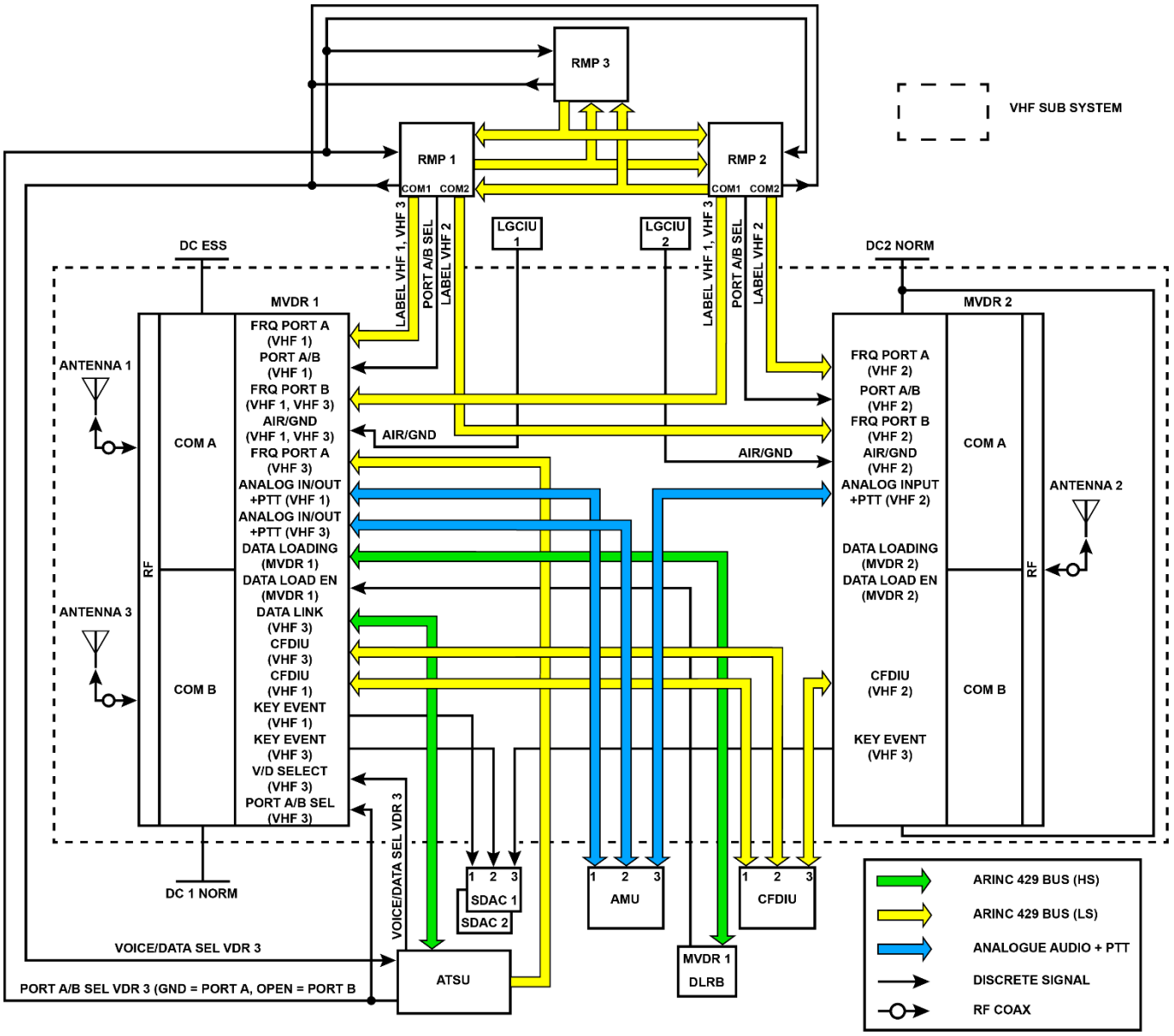
The connection is obtained through the KEY EVENT discrete output information of the VHF transceiver.

Each SDAC receives 3 discrete links, one for each VHF channel.

Interface with Landing Gear Control and Interface Unit (LGCIU)

The LGCIU provides leg information (flight/ground) through discrete signals to each VHF transceiver in order to disable the "interactive" mode of the BITE function during a flight.

Each MVDR system is interfaced with the LGCIU through 1 input discrete cable.


RMP 3
RMP 1
RMP 2
COM1 COM2
COM1 COM2
VHF SUB SYSTEM
LGCIU 1
LGCIU 2
DC ESS
DC2 NORM
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
MVDR 1
MVDR 2
ANTENNA 1
ANTENNA 3
ANTENNA 2
COM A
COM B
RF
FRQ PORT A (VHF 1)
PORT A/B (VHF 1)
FRQ PORT B (VHF 1, VHF 3)
AIR/GND (VHF 1, VHF 3)
FRQ PORT A (VHF 3)
ANALOG IN/OUT +PTT (VHF 1)
ANALOG IN/OUT +PTT (VHF 3)
DATA LOADING (MVDR 1)
DATA LOAD EN (MVDR 1)
DATA LINK (VHF 3)
CFDIU (VHF 3)
CFDIU (VHF 1)
KEY EVENT (VHF 1)
KEY EVENT (VHF 3)
V/D SELECT (VHF 3)
PORT A/B SEL (VHF 3)
AIR/GND
AIR/GND
FRQ PORT A (VHF 2)
PORT A/B (VHF 2)
FRQ PORT B (VHF 2)
AIR/GND (VHF 2)
ANALOG INPUT +PTT (VHF 2)
DATA LOADING (MVDR 2)
DATA LOAD EN (MVDR 2)
CFDIU (VHF 2)
KEY EVENT (VHF 3)
DC 1 NORM
VOICE/DATA SEL VDR 3
VOICE/DATA SEL VDR 3
PORT A/B SEL VDR 3 (GND = PORT A, OPEN = PORT B
SDAC 1
SDAC 2
AMU
CFDIU
ATSU
MVDR 1
DLRB
1 2 3
ARINC 429 BUS (HS)
ARINC 429 BUS (LS)
ANALOGUE AUDIO + PTT
DISCRETE SIGNAL
RF COAX

Interface with Air Traffic Service Unit (ATSU)

The ATSU sends and receives data with VHF3 through a bidirectional high speed ARINC 429 bus.

The ATSU is a modular hosting platform which centralizes all data communications.

ATSU hosts 3 main software components:

Aircraft Communication Addressing and Reporting System (ACARS) and Air Traffic Network (ATN) (depending on the Future Air Navigation System (FANS) product)

Airline Operational Control (AOC) applications

Air Traffic Control (ATC) datalink applications.

ACARS and ATN routers (depending on the FANS product).

They route received messages from the ground to appropriate end-systems onboard the aircraft (Flight Management Computer (FMC), Aircraft Condition Monitoring System (ACMS), cabin terminal, airshow and cabin printer).

They also route to the ground reports automatically generated by aircraft systems or by the pilots.

AOC applications

They provide operational data communications between the aircraft and the airline facilities on the ground (departure/arrival time reports, delay/estimated time of arrival, gate assignment, etc.).

ATC datalink applications

They warn the crew of any upcoming ATC message and also send the appropriate data to the peripherals to sustain the communication tasks (e.g. selection of the appropriate ATC center for datalinks all along the flight).

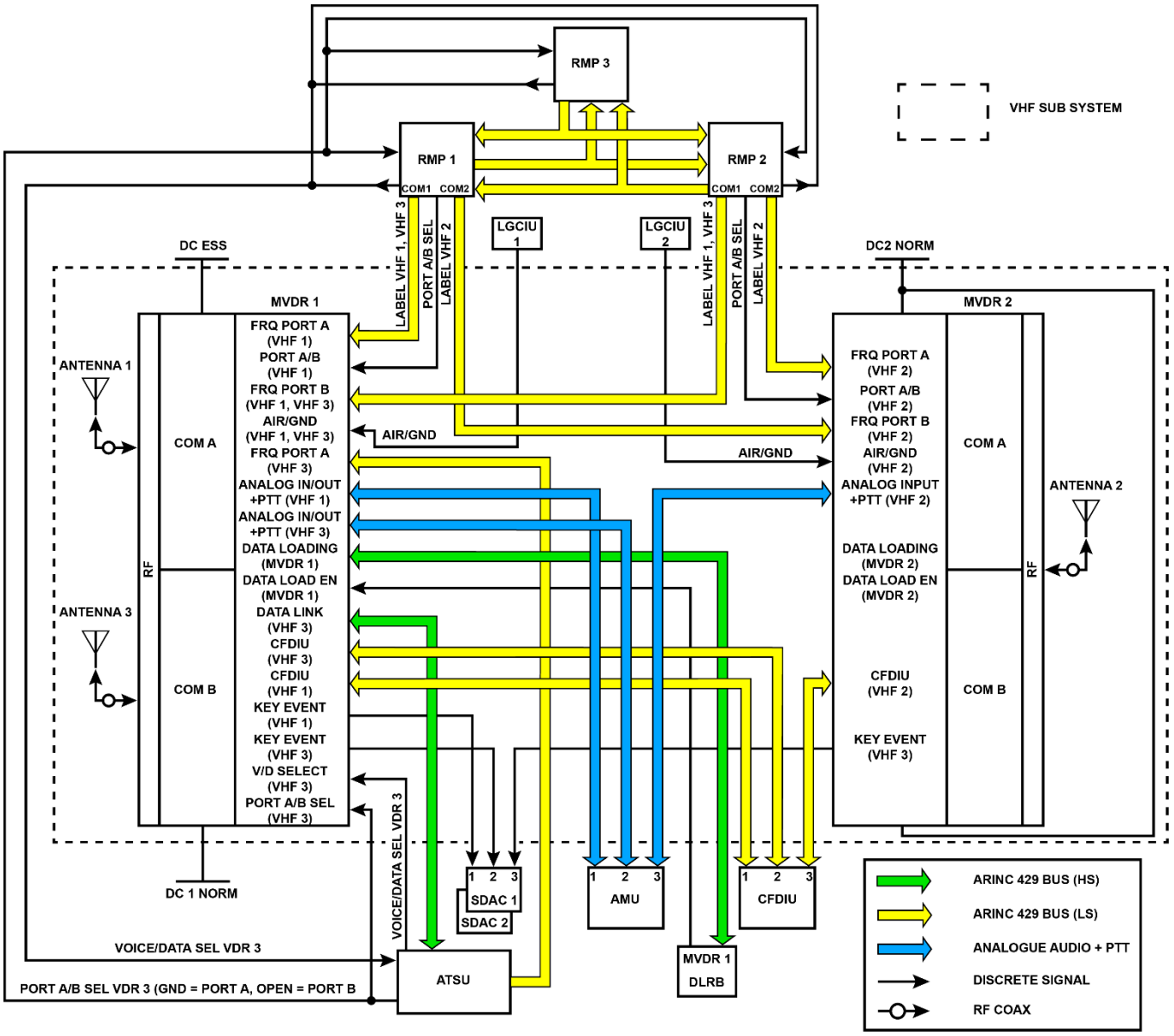
The ATSU uses the services provided by the VHF3 to communicate with the ground in DATA mode.

Two output discrete signals from the ATSU are used to control:

VHF3 switching between voice and data mode: voice/data select discrete

VHF3 frequency selection (Port A for ATSU, Port B for RMP): port select discrete.

Broadcast data are sent on output bus SYS5 of the ATSU to the VDR3 port A VHF3 frequency selection.


RMP 3
VHF SUB SYSTEM
RMP 1
RMP 2
COM1 COM2
COM1 COM2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
LGCIU 1
LGCIU 2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
DC ESS
DC2 NORM
MVDR 1
MVDR 2
ANTENNA 1
ANTENNA 3
COM A
COM B
RF
FRQ PORT A (VHF 1)
PORT A/B (VHF 1)
FRQ PORT B (VHF 1, VHF 3)
AIR/GND (VHF 1, VHF 3)
FRQ PORT A (VHF 3)
ANALOG IN/OUT +PTT (VHF 1)
ANALOG IN/OUT +PTT (VHF 3)
DATA LOADING (MVDR 1)
DATA LOAD EN (MVDR 1)
DATA LINK (VHF 3)
CFDIU (VHF 3)
CFDIU (VHF 1)
KEY EVENT (VHF 1)
KEY EVENT (VHF 3)
V/D SELECT (VHF 3)
PORT A/B SEL (VHF 3)
AIR/GND
AIR/GND
FRQ PORT A (VHF 2)
PORT A/B (VHF 2)
FRQ PORT B (VHF 2)
AIR/GND (VHF 2)
ANALOG INPUT +PTT (VHF 2)
DATA LOADING (MVDR 2)
DATA LOAD EN (MVDR 2)
CFDIU (VHF 2)
KEY EVENT (VHF 3)
ANTENNA 2
DC 1 NORM
VOICE/DATA SEL VDR 3
SDAC 1
SDAC 2
AMU
CFDIU
MVDR 1
DLRB
ATSU
VOICE/DATA SEL VDR 3
PORT A/B SEL VDR 3 (GND = PORT A, OPEN = PORT B
ARINC 429 BUS (HS)
ARINC 429 BUS (LS)
ANALOGUE AUDIO + PTT
DISCRETE SIGNAL
RF COAX

The ATSU COM2 and VHF/3 buses support:

VHF3 status transmission to the ATSU (voice/data mode, failure...)

ATSU status transmission to the VHF3 (primary source/destination, failure...)

VHF3 configuration and control by the ATSU

ARINC 618 downlink and uplink block exchanges.

Functional split

The functional split between ATSU and VHF3 is the following:

1. In Voice mode:

a The ATSU controls the VHF3 switching between data and voice mode.

b The ATSU controls VHF3 port select.

c The ATSU provides the VHF3 voice frequency on port A.

2. In Data mode:

a The ATSU configures the VHF3 in the appropriate protocol.

b The ATSU sends ARINC 618 messages in digital format to the VHF3.

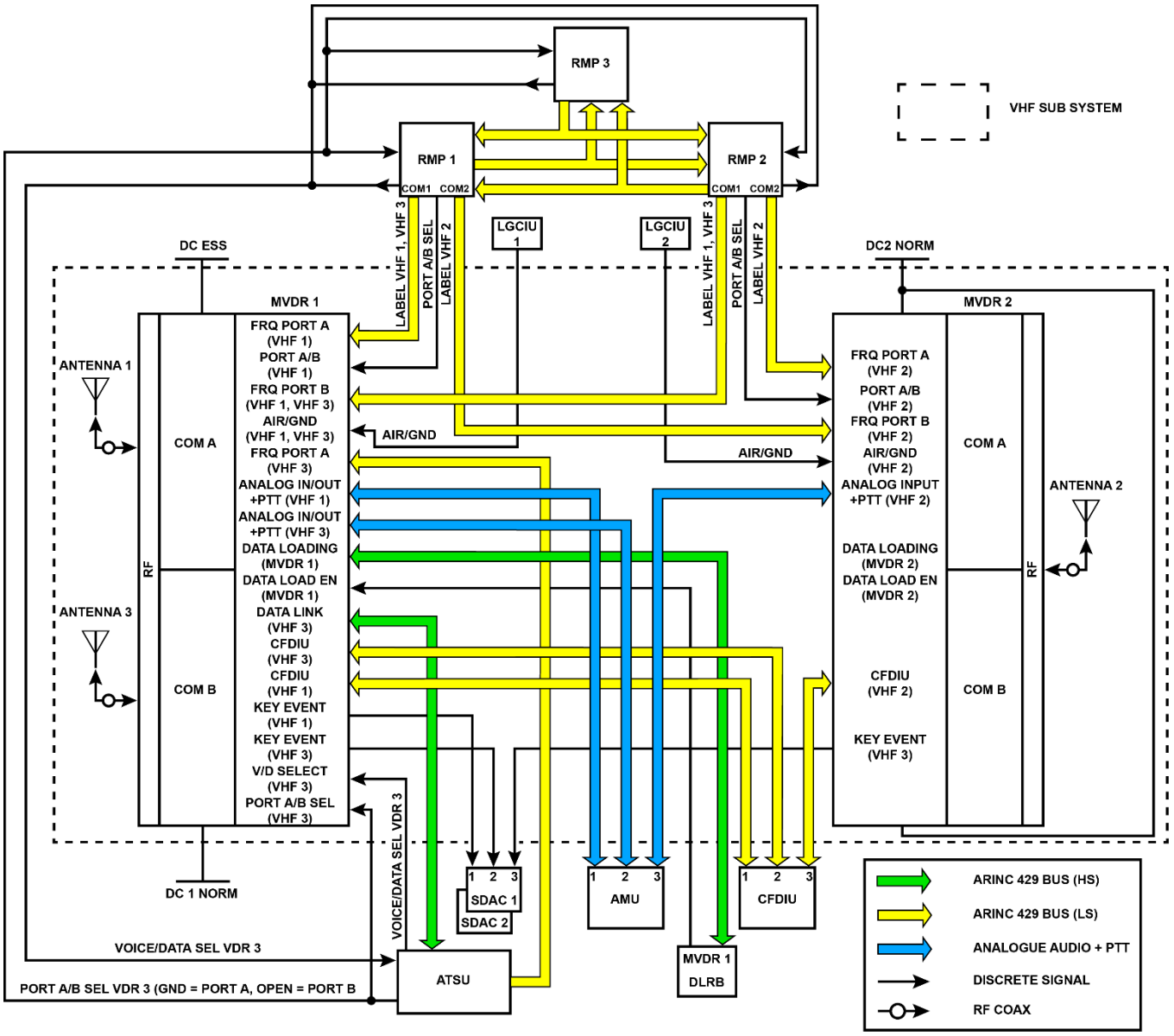
c The VHF3 adds the VHF protocol overhead and performs the modulation operation on the VHF signal.

d The VHF3 demodulates the received VHF signal, eliminates the VHF overhead and sends the received messages to the ATSU in digital format.

e The ATSU controls the VHF operational parameters of the VHF3 (frequency...).

When the ATSU transmits ARINC 618 blocks to the VHF3, it waits for the effective transmission to the ground before transmitting other ones.

In case where the transmission is not completed by the VHF3, the ATSU sends a purge down-link' command, in order to clear the failed VHF3 downlink transmission.


RMP 3
RMP 1
RMP 2
COM1 COM2
COM1 COM2
VHF SUB SYSTEM
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
LGCIU 1
LGCIU 2
LABEL VHF 1, VHF 3
PORT A/B SEL
LABEL VHF 2
DC ESS
DC2 NORM
MVDR 1
MVDR 2
ANTENNA 1
ANTENNA 3
COM A
COM B
RF
FRQ PORT A (VHF 1)
PORT A/B (VHF 1)
FRQ PORT B (VHF 1, VHF 3)
AIR/GND (VHF 1, VHF 3)
FRQ PORT A (VHF 3)
ANALOG IN/OUT +PTT (VHF 1)
ANALOG IN/OUT +PTT (VHF 3)
DATA LOADING (MVDR 1)
DATA LOAD EN (MVDR 1)
DATA LINK (VHF 3)
CFDIU (VHF 3)
CFDIU (VHF 1)
KEY EVENT (VHF 1)
KEY EVENT (VHF 3)
V/D SELECT (VHF 3)
PORT A/B SEL (VHF 3)
AIR/GND
AIR/GND
FRQ PORT A (VHF 2)
PORT A/B (VHF 2)
FRQ PORT B (VHF 2)
AIR/GND (VHF 2)
ANALOG INPUT +PTT (VHF 2)
DATA LOADING (MVDR 2)
DATA LOAD EN (MVDR 2)
CFDIU (VHF 2)
KEY EVENT (VHF 3)
ANTENNA 2
DC 1 NORM
VOICE/DATA SEL VDR 3
VOICE/DATA SEL VDR 3
PORT A/B SEL VDR 3 (GND = PORT A, OPEN = PORT B
ATSU
SDAC 1
SDAC 2
AMU
MVDR 1
DLRB
CFDIU
1 2 3
ARINC 429 BUS (HS)
ARINC 429 BUS (LS)
ANALOGUE AUDIO + PTT
DISCRETE SIGNAL
RF COAX

Key Event Data

When the VHF system is transmitting (PTT switch on) for 30 seconds, an aural warning starts and sounds every second for five seconds (i.e. five times in five seconds).

After these 35 seconds of continuous transmission, the transmission is automatically cut off. 25 seconds later, if the Push-to-Talk (PTT) switch is still on (i.e. PTT lasting more than 1 minute), the following warnings are generated:

Level 1: VHF-X EMITTING message displayed on the Electronic Centralized Aircraft Monitoring (ECAM) Display Unit (DU)

Level 2: single chime + master caution.

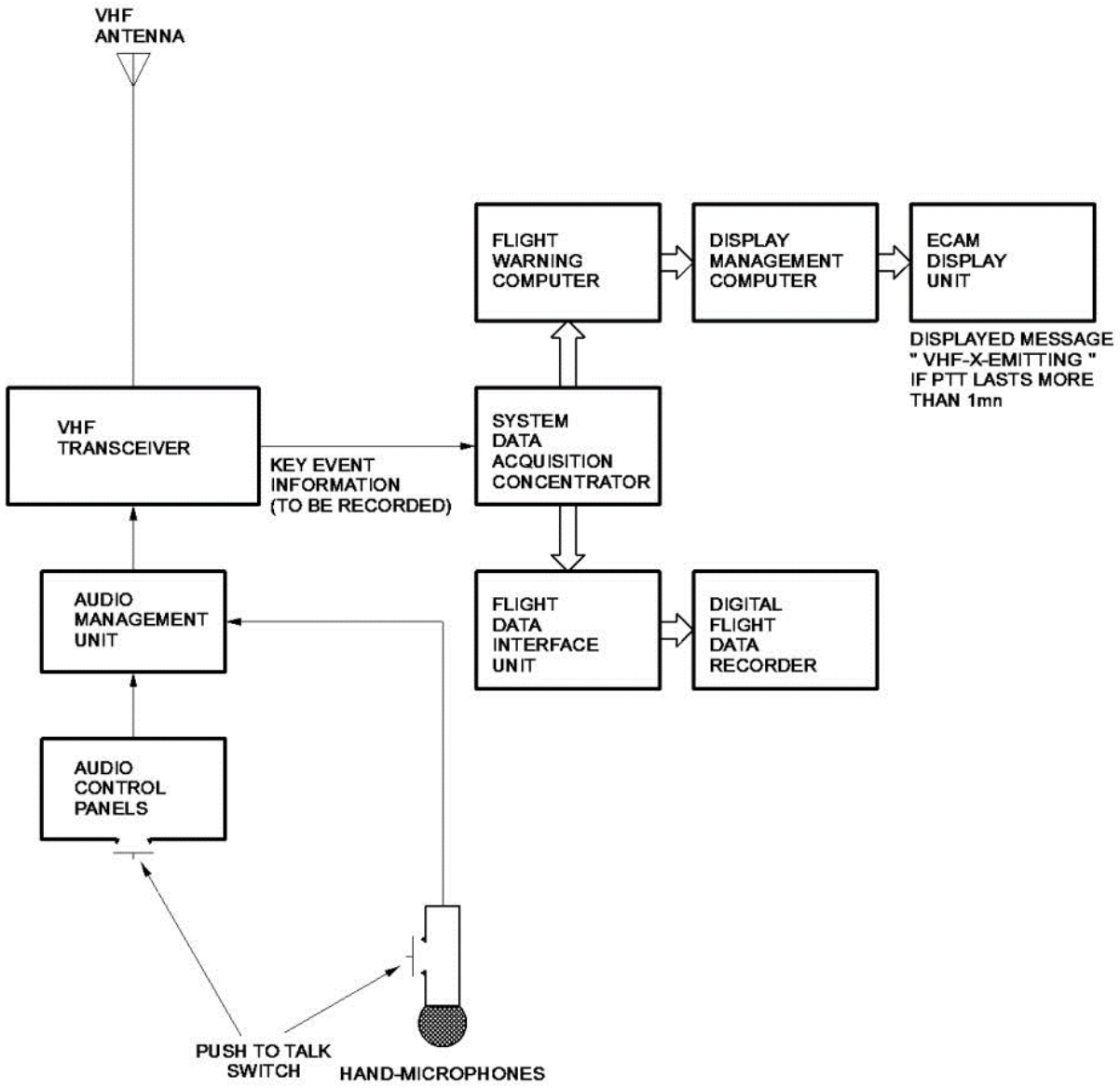
The PTT has to be released, then activated again for a new transmission to be allowed.

NOTE: This behaviour may be different depending on the Flight Warning System (FWS) standard installed on the aircraft.

Interface with Landing Gear Control and Interface Unit (LGCIU)

The LGCIU provides leg information (flight/ground) through discrete signals to each VHF transceiver in order to disable the "interactive" mode of the BITE function during a flight.

Each MVDR system is interfaced with the LGCIU through 1 input discrete cable.


VHF
ANTENNA
FLIGHT
WARNING
COMPUTER
DISPLAY
MANAGEMENT
COMPUTER
ECAM
DISPLAY
UNIT
DISPLAYED MESSAGE
" VHF-X-EMITTING "
IF PTT LASTS MORE
THAN 1mn
VHF
TRANSCEIVER
KEY EVENT
INFORMATION
(TO BE RECORDED)
SYSTEM
DATA
ACQUISITION
CONCENTRATOR
AUDIO
MANAGEMENT
UNIT
FLIGHT
DATA
INTERFACE
UNIT
DIGITAL
FLIGHT
DATA
RECORDER
AUDIO
CONTROL
PANELS
PUSH TO TALK
SWITCH
HAND-MICROPHONES

Component Description

MVDR Transceiver - Description 10RC1 10RC2

The MVDR transceiver conforms to ARINC 600 specifications.

Its case size is 3MCU and its nominal weight is 4.61kg.

MVDR Transceiver

MVDR transceiver face

The face features:

A self-test switch

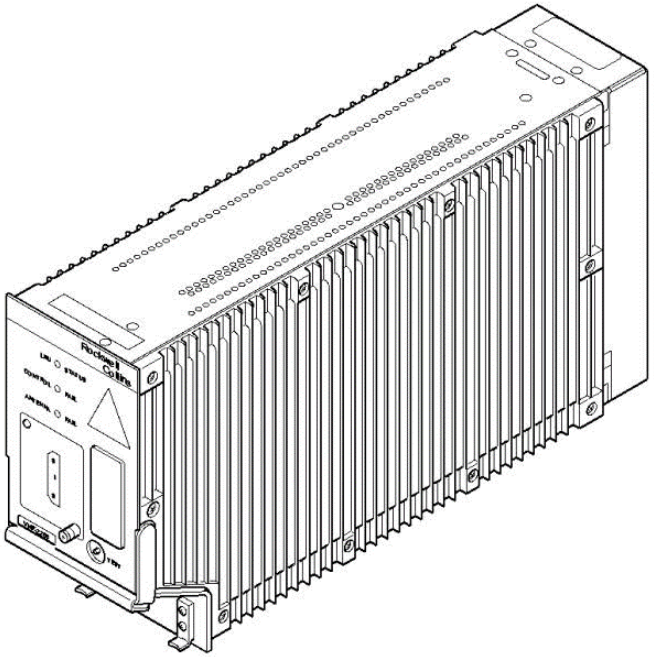
Three LED indicators

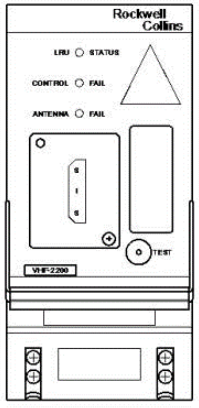
A serial bus monitor jack

A fold-away carrying handle

An Airbus proprietary standalone identification system connector

An equipment identification plate.





TYPICAL FRONT FACE

MVDR transceiver back

The back side is composed by an ARINC 600 connector size 1 to enable connection with:

MVDR Transceiver - Rear Connector 1/2

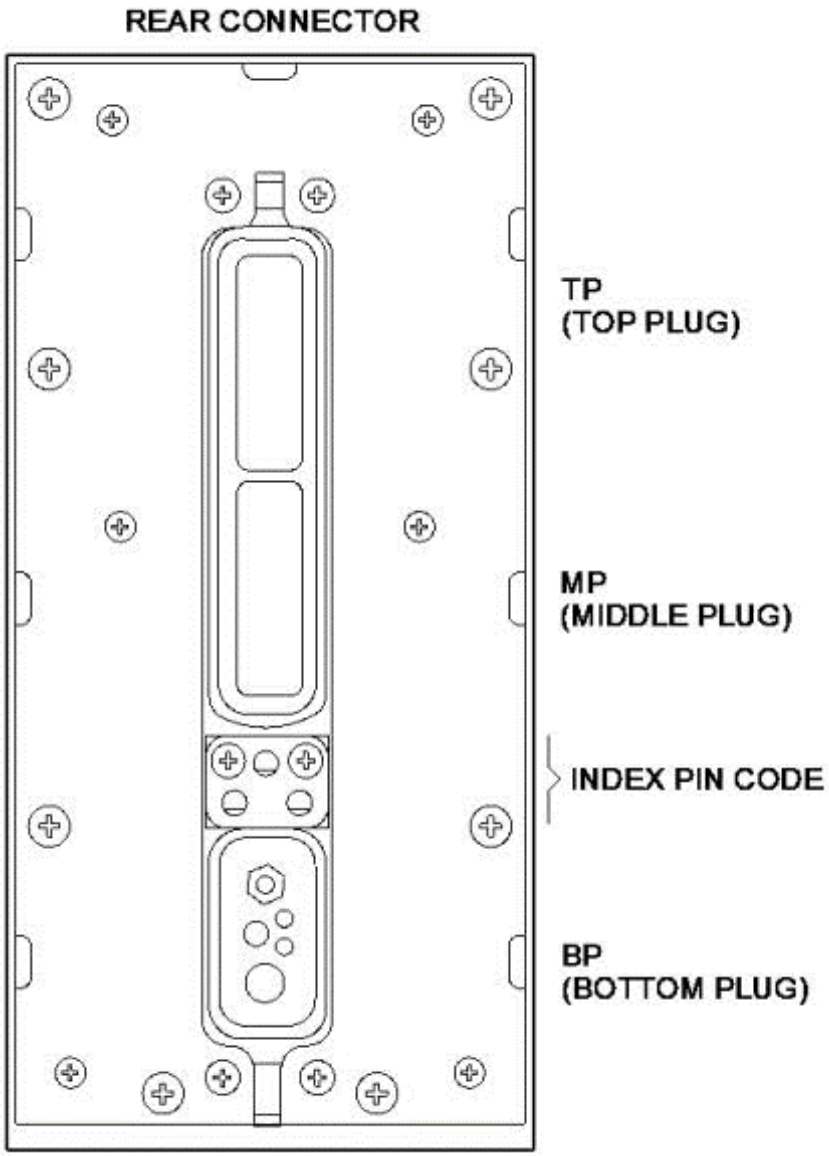
MVDR Transceiver - Rear Connector 2/2

Top Plug (TP): 60 pin arrangement with contact size 22

Middle Plug (MP): 60 pin arrangement with contact size 22

Bottom Plug (BP): pin/coax arrangement with 2 coax size 5, 2 contact size 16 and 1 contact size 12.

NOTE: In dual LRU configuration, since there are not enough plugs to connect COM A and COM B power supplies to the BP, COM B power supply had to be connected to the TP.


REAR CONNECTOR
TP
(TOP PLUG)
MP
(MIDDLE PLUG)
INDEX PIN CODE
BP
(BOTTOM PLUG)

VHF Antenna

An aluminium base plate

A laminated radome

A duralinox leading edge

A C-type coaxial connector surrounded by a seal.

The maximum size of the VHF antenna is 74mm x 405mm x 423 mm, in compliance with ARINC 716.

The antenna is connected to the transceiver by means of a coaxial cable.

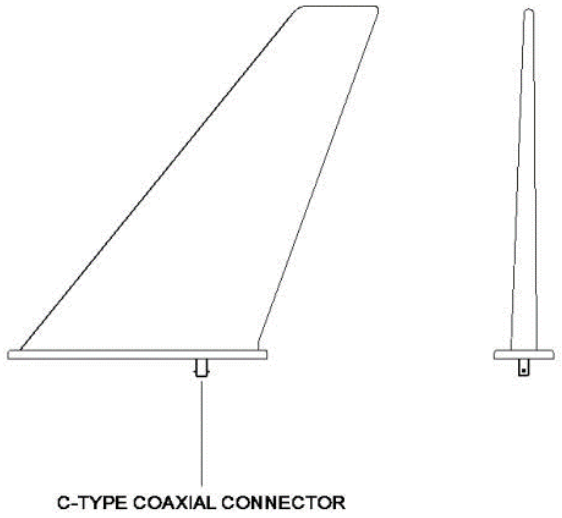
VHF antennas 1 and 3 are installed on the top of the aircraft fuselage, on the longitudinal center axis.

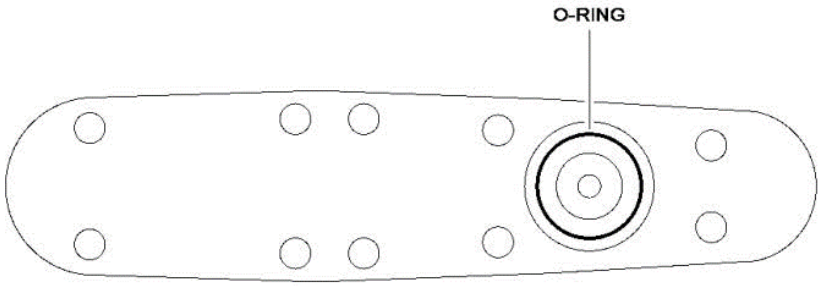
VHF antenna 2 is installed at the bottom of the aircraft fuselage, on the longitudinal center axis.

VHF antenna description 4RC1 4RC2 4RC3

The VHF antenna is a vertically polarized antenna and provides omni-directional azimuth radiation pattern coverage.

The antenna impedance is 50 ohms.


C-TYPE COAXIAL CONNECTOR


O-RING

Operation/Control and Indicating

Operation

The MVDR contains two independent VHF communication transceivers.

Each transceiver within the MVDR operates in a frequency range defined by ARINC 716 (118.000 to 136.975 MHz).
It can operate in the following modes:

Voice mode

Data mode.

The VHF system operates in voice mode on the three VHF channels, and the data mode is active on the VHF3 channel only.

Thus, the VHF system can use three channels at the same time:

Three VHF voice channels, or

Two VHF voice channels and one VHF data channel.

Voice mode

When operating in voice mode, the MVDR transmits/receives voice signals in one-way mode with 8.33 kHz or 25 kHz channel spacing using amplitude modulation to fulfil European airspace requirements.

(a) Transmit function

In voice mode, the Audio Frequency (AF) signals from the microphones are transmitted to the VHF transceiver through the AMU.

The VHF transceiver tuned on the frequency selected on one RMP modulates the AF signals into VHF signals.

These VHF signals are sent to the antenna by a coaxial cable.

Then, they are transmitted to the various stations.

A connection between the VHF transceiver and the SDAC enables to record the use of the VHF system in transmit mode.

The connection is obtained through the KEY EVENT output information of the VHF Transceiver.

(b) Receive function

The antenna picks up the VHF radio-communication signals from the stations.

These signals are transmitted to the transceiver by a coaxial cable.

In voice mode, the transceiver, tuned on the frequency selected on one RMP, demodulates the VHF received signals into AF signals.

The AF signals are transmitted via the AMU to the audio equipment.

Data mode

Two different forms of VHF data link mode (mode A and mode 2) are defined by ARINC 750:

Mode A:

Transmits/receives data signals in one-way mode through an Amplitude-Minimum Shift Keying (AM-MSK) modulation.

The signal rate is 2.4 KB/s.

This mode has been especially designed to use ACARS modulation equipment and radio.

ACARS and VDL mode A is a low speed bit-oriented data transfer system.

It uses Carrier Sense Multiple Access methodology.

Mode 2:

It is an improved version of the VDL mode A to transmit/receive data signals in one-way mode through D8PSK modulation.

The signal rate is 31.5 KB/s.

VDL mode 2 can be used over both ACARS and ATN networks.

(a) Transmit function

In data mode, the digital information is transmitted from the ATSU to VHF3 (tuned on the frequency selected on one MCDU and transmitted to the transceiver through an ARINC 429 HS bus) which modulates it.

The VHF signals are sent to the antenna by a coaxial cable.

Then, they are transmitted to the various stations.

(b) Receive function

The antenna picks up the VHF radio-communication signals from the stations.

These signals are transmitted to the transceiver by a coaxial cable.

In data mode, the transceiver is tuned on the frequency corresponding to the DSP providers (selected on one MCDU).

The VHF received signals are transmitted to the transceiver through an ARINC429 HS bus.

The transceiver demodulates the VHF received signals into digital information.

This information is transmitted to the ATSU through an ARINC 429 HS bus (only the messages addressed to the aircraft are transmitted to the ATSU, the others are filtered by the VHF).

MVDR voice/data mode selection

The system has direct control over the VHF3 switching between voice and data modes.

A voice/data switching can be requested by:

The RMP (Ref. 23-13)

The Multipurpose Control and Display Unit (MCDU) through the Air Traffic and

Information Management System (ATIMS) (Ref. 46-21) and (Ref. 46-23).

Self-test selection

The purpose of the self-test is to determine the functional health and integrity of the MVDR by testing certain portions of its hardware functions and elements to determine whether they are functioning within nominal performance specifications.

It is launched on power-up, and it can also be user-initiated by pushing the self-test pushbutton on the front panel. Self-test is only possible when the air/ground discrete from the LGCIU indicates ON GROUND.

The front panel LEDs (LRU, CONTROL and ANTENNA) show the self-test progress and status.

These LEDs indicate the following information:

LRU STATUS indicates the health of the Line Replaceable Unit (LRU).

CONTROL FAIL indicates if tuning data is received or not.

ANTENNA FAIL indicates if a Voltage Standing Wave Ratio (VSWR) fault is correct or not.

In response to an initiated self-test mode running as a result of the front panel self-test pushbutton being asserted, the following LED display operations sequence shall occur:

All indicators are set to RED for at least two (2) seconds.

The LRU indicator is set to GREEN and all other indicators are set to RED for at least two (2) seconds.

All indicators are set to OFF for at least five (5) seconds.

The LRU STATUS, CONTROL FAIL and ANTENNA FAIL indicators display the test results for at least 30 seconds.

If no faults are present, the LRU STATUS indicator is set to

GREEN while the CONTROL FAIL and ANTENNA FAIL indicators are set to OFF.

BITE

The BITE facilitates maintenance on in-service aircraft. It detects and determines a failure related to the MVDR system.

The BITE of the MVDR transceiver is connected to the CFDIU.

The BITE Transmits permanently the MVDR system status and an identification message to the CFDIU:

Memorizes the failures occurred during the last 63 flight legs

Monitors data input from the various peripherals (e.g. RMP and CFDIU)

Transmits to the CFDIU the result of the tests and self-tests performed

Can communicate with the CFDIU by the menus in the interactive mode.

BITE Architecture and Perimeter System BITE is standard A, type 1. BITE architecture and MVDR FIN depend on the MVDR configuration.

To determine the correct maintenance message format, the MVDR installation configuration is transmitted to the ATSU through the bit 25 of the label 172 ("0" = legacy, "1"= dual LRU).

BITE architecture and perimeter in dual LRU configuration

BITE Architecture - Dual LRU Configuration

In this configuration, the MVDR1 FIN is 10RC1 and the MVDR2 FIN is 10RC2.

The standard

A maintenance message formatting for accusing MVDR is:

23-12-33 VHF1-MVDR1 (10RC1)

23-12-33 VHF3-MVDR1 (10RC1)

23-12-33 VHF2-MVDR2 (10RC2).

Each VHF side system BITE has a dedicated ARINC 429 low speed bus.

Operational Modes

The BITE has 2 operational modes:

The normal mode

The interactive mode.

Normal mode

During the normal mode, the BITE monitors cyclically the instantaneous status of the MVDR system.

It transmits these information signals to the CFDIU during the flight concerned.

In case of fault detection, the BITE stores the information signals in the fault memories.

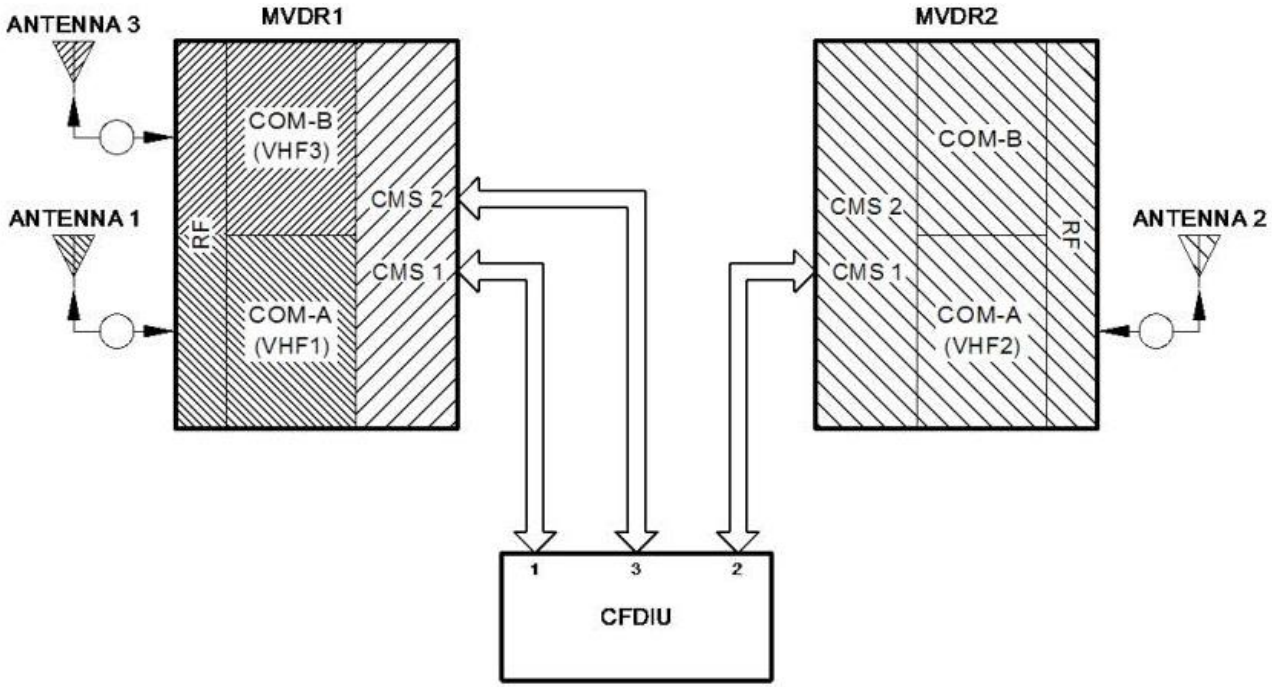
These information signals are transmitted to the CFDIU every 250 ms by an ARINC 429 message with label 356.

Interactive mode

The interactive mode can only be activated on the ground.

This mode enables communication between the CFDIU and the MVDR transceiver BITE.

This is by means of the MCDU.



NOTE:

COMPONENTS/EQUIPMENTS MONITORED BY VHF1 SIDE SYSTEM BITE

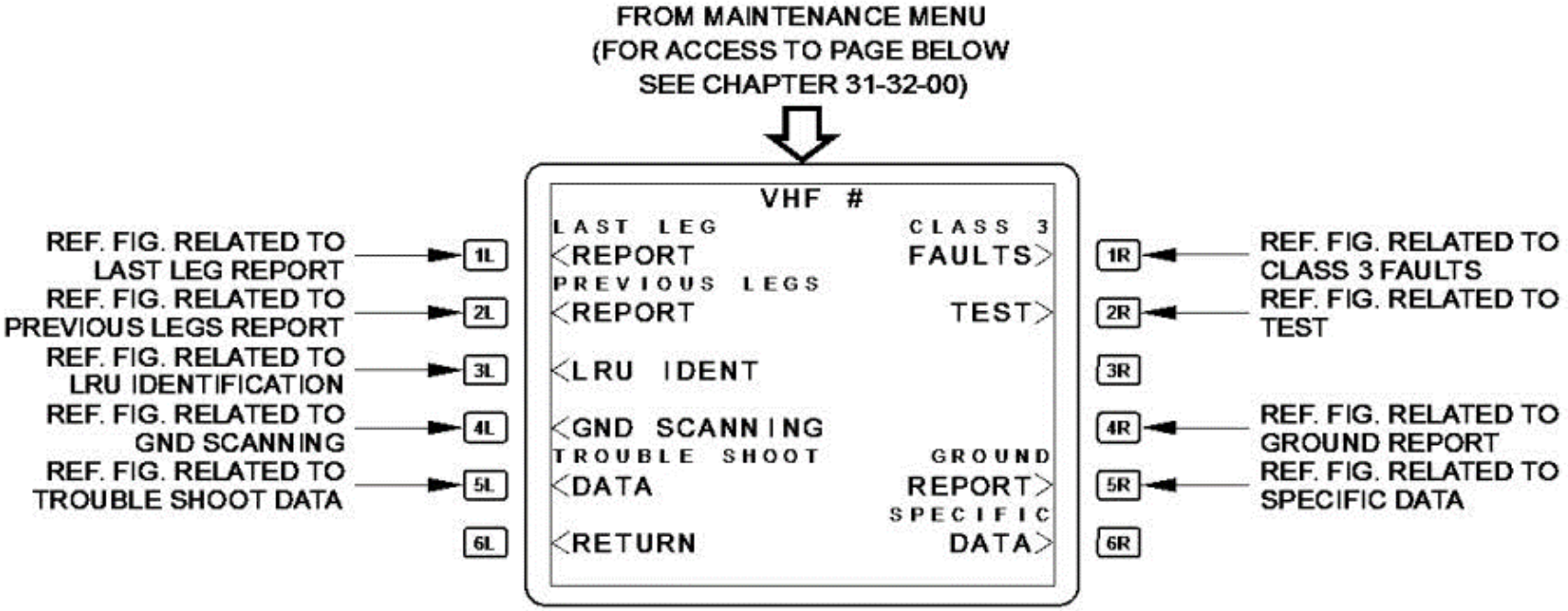
COMPONENTS/EQUIPMENTS MONITORED BY VHF2 SIDE SYSTEM BITE

COMPONENTS/EQUIPMENTS MONITORED BY VHF3 SIDE SYSTEM BITE

COMPONENTS/EQUIPMENTS MONITORED BY BOTH VHF1 AND VHF3 SIDE SYSTEM BITE

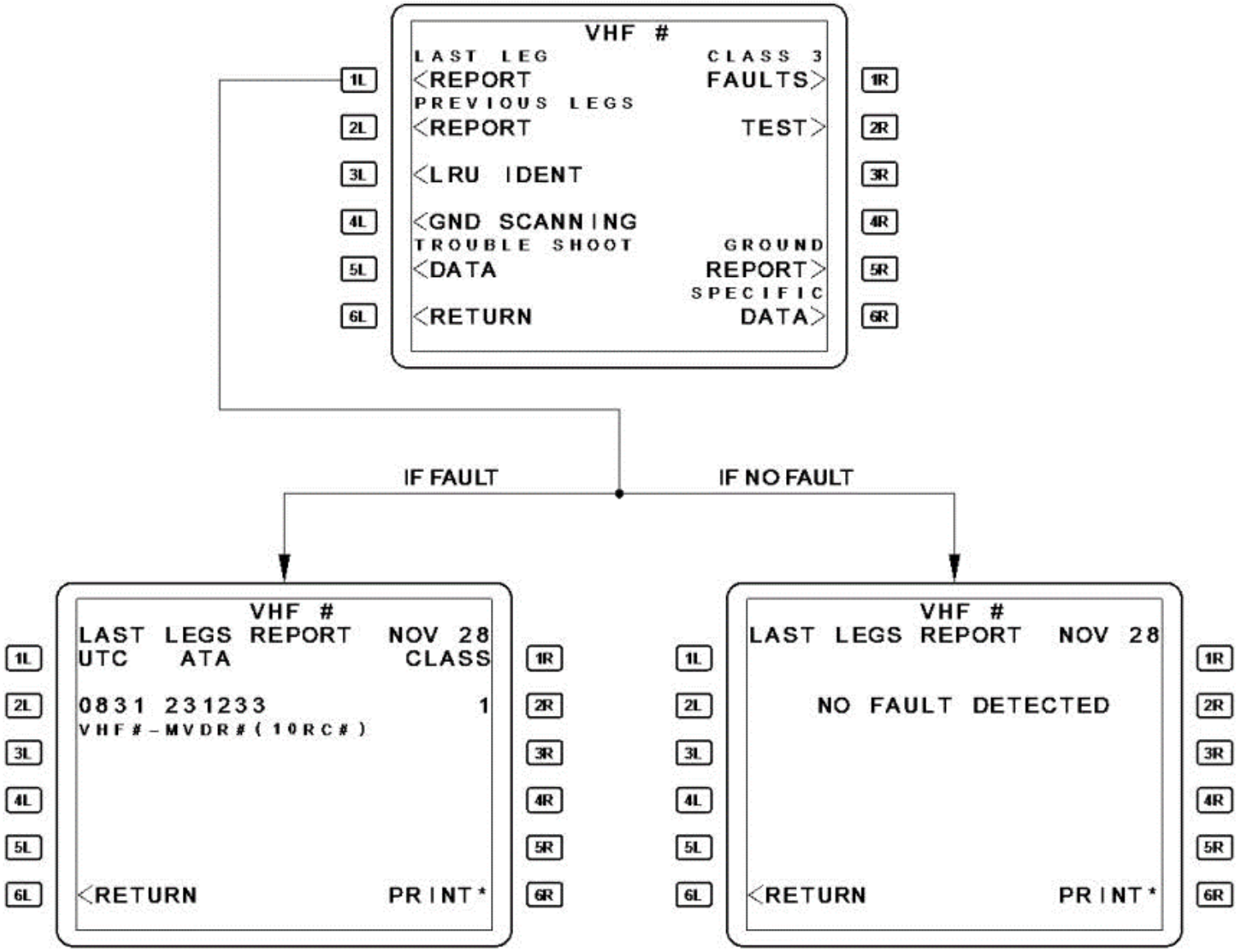
REPORT/MAIN MENU

The MVDR transceiver interactive mode is composed of:


FROM MAINTENANCE MENU
(FOR ACCESS TO PAGE BELOW
SEE CHAPTER 31-32-00)
VHF #
LAST LEG
<REPORT
PREVIOUS LEGS
<REPORT
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
<RETURN
CLASS 3
FAULTS>
TEST>
GROUND
REPORT>
SPECIFIC
DATA>
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
REF. FIG. RELATED TO LAST LEG REPORT
REF. FIG. RELATED TO PREVIOUS LEGS REPORT
REF. FIG. RELATED TO LRU IDENTIFICATION
REF. FIG. RELATED TO GND SCANNING
REF. FIG. RELATED TO TROUBLE SHOOT DATA
REF. FIG. RELATED TO CLASS 3 FAULTS
REF. FIG. RELATED TO TEST
REF. FIG. RELATED TO GROUND REPORT
REF. FIG. RELATED TO SPECIFIC DATA

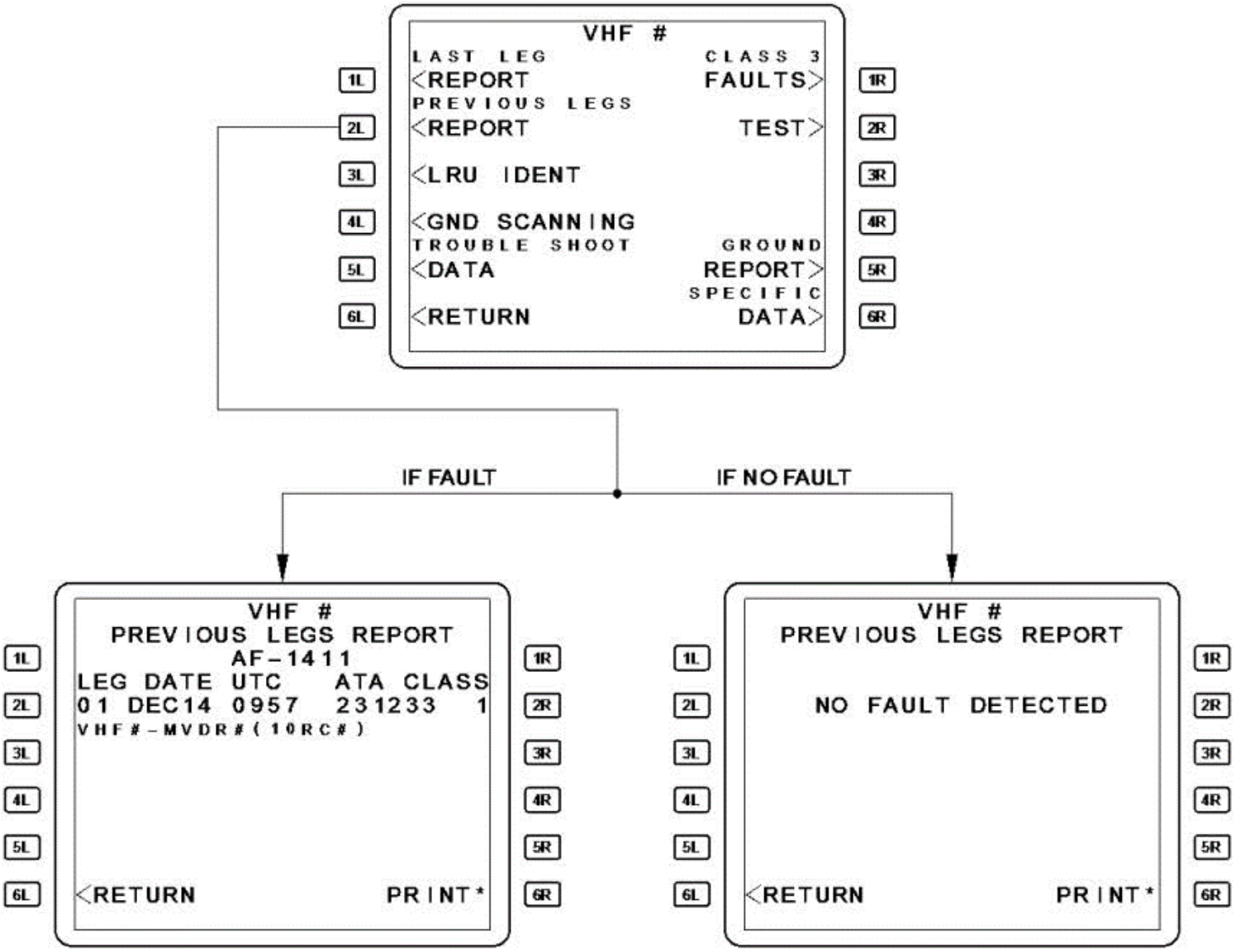
LAST LEG REPORT

This report contains the class 1 and 2 internal and external faults recorded during the last flight.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
LAST LEGS REPORT NOV 28
UTC ATA
CLASS
0831 231233
1
VHF#-MVDR#(10RC#)
<RETURN
PRINT*
VHF #
LAST LEGS REPORT NOV 28
NO FAULT DETECTED
<RETURN
PRINT*

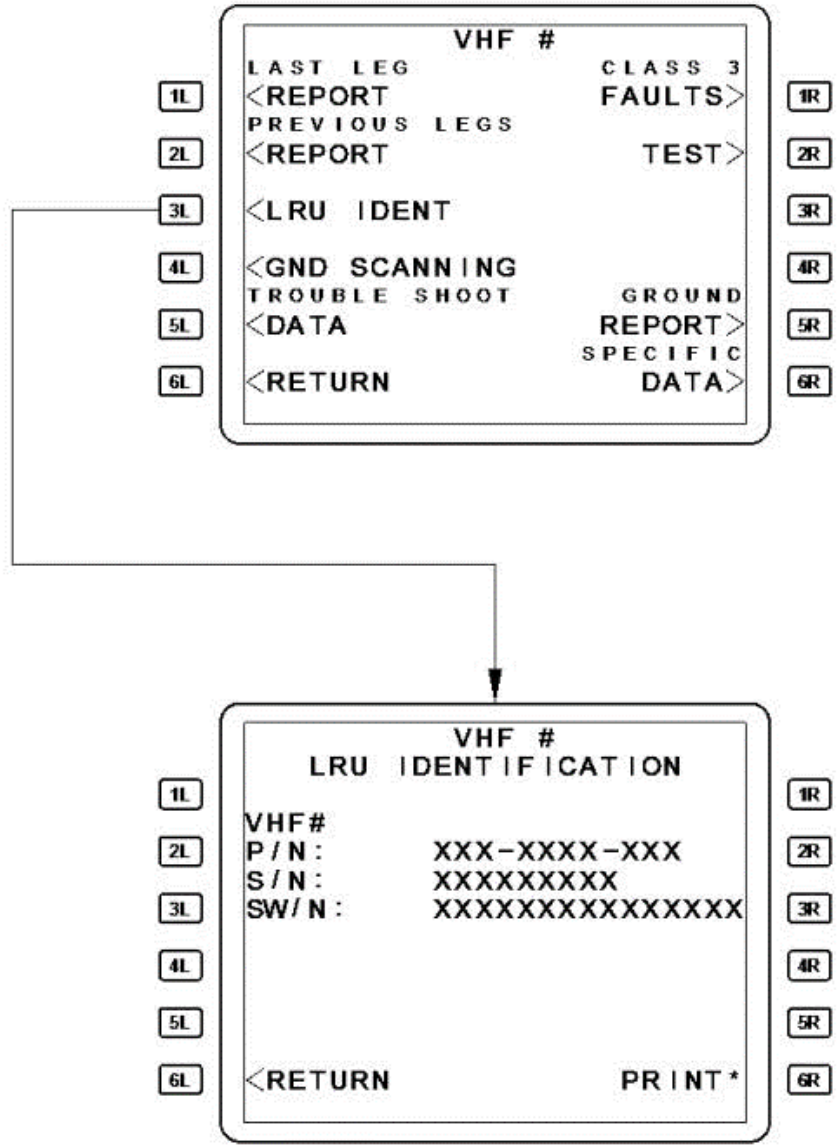
PREVIOUS LEGS REPORT

The messages are identical to those given in the paragraph above,
but concern the faults occurred during the last 63 flights.


VHF #
LAST LEG REPORT
CLASS 3 FAULTS
PREVIOUS LEGS REPORT
TEST
LRU IDENT
GND SCANNING
TROUBLE SHOOT DATA
GROUND REPORT
SPECIFIC DATA
RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
PREVIOUS LEGS REPORT
AF-1411
LEG DATE UTC ATA CLASS
01 DEC14 0957 231233 1
VHF#-MVDR#(10RC#)
RETURN
PRINT*
VHF #
PREVIOUS LEGS REPORT
NO FAULT DETECTED
RETURN
PRINT*

LRU IDENT

This report displays all the LRU identification data for digital units such as the Part Number (P/N), the Serial Number (S/N) and the Software Part Number.


VHF #
LAST LEG
CLASS 3
<REPORT
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
GROUND
<DATA
REPORT>
SPECIFIC
<RETURN
DATA>
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
VHF #
LRU IDENTIFICATION
VHF#
P/N: XXX-XXXX-XXX
S/N: XXXXXXXXX
SW/N: XXXXXXXXXXXXXXX
<RETURN
PRINT*

GND SCANNING

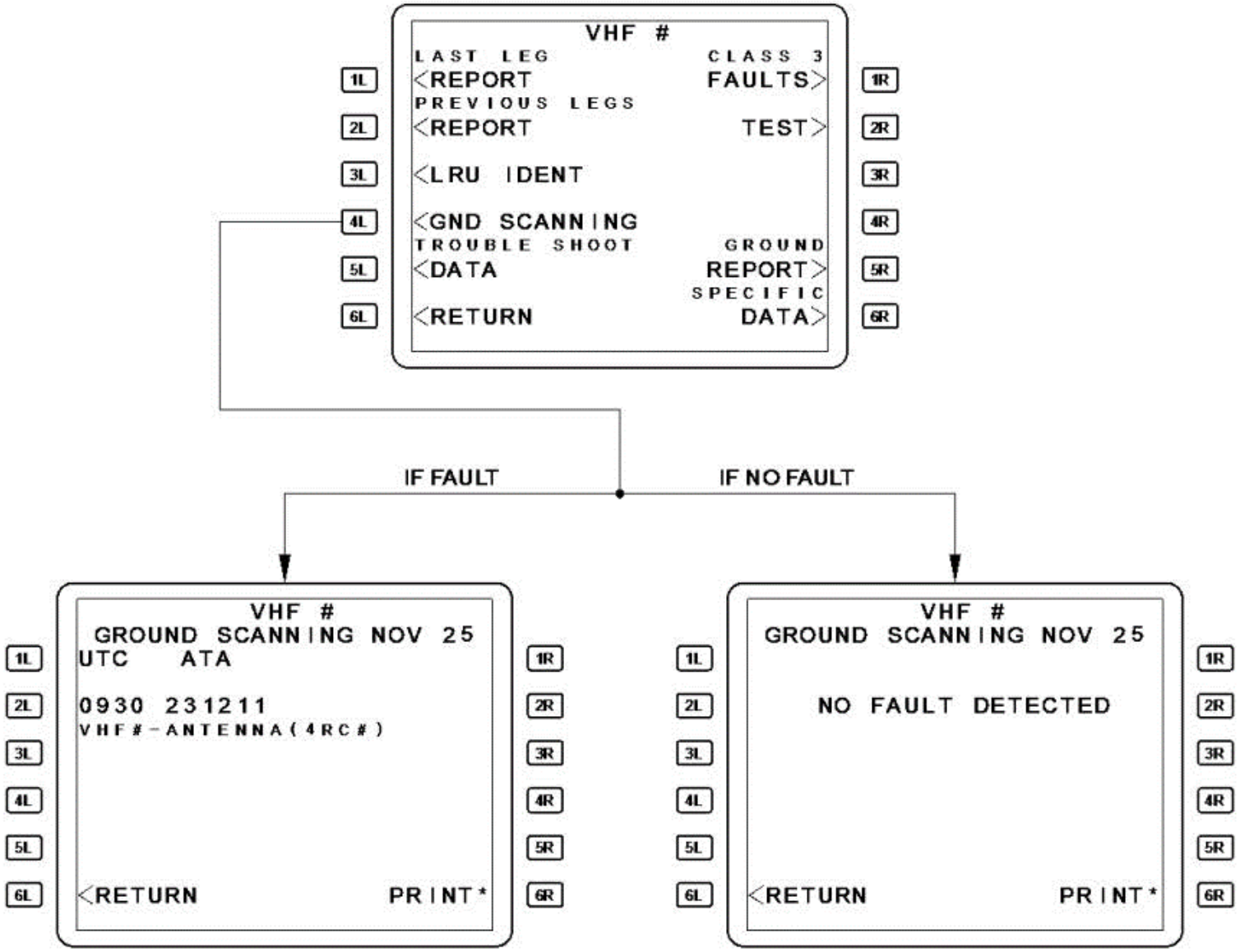
This function is used to monitor and detect anomalies on ground. It presents all faults detected in real time.

The Universal Time Coordinated (UTC) displayed in the ground scanning corresponds to:

The time when the menu was accessed, if the fault was present before launching the ground scanning.

The time when the fault appears, if the fault appears while the ground scanning is activated.

After leaving the test, if a ground scanning is performed again and if a fault was detected during previous ground scanning, the UTC of this fault will be updated with the start time of the new ground scanning.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
GROUND SCANNING NOV 25
UTC ATA
0930 231211
VHF#-ANTENNA(4RC#)
<RETURN
PRINT*
VHF #
GROUND SCANNING NOV 25
NO FAULT DETECTED
<RETURN
PRINT*

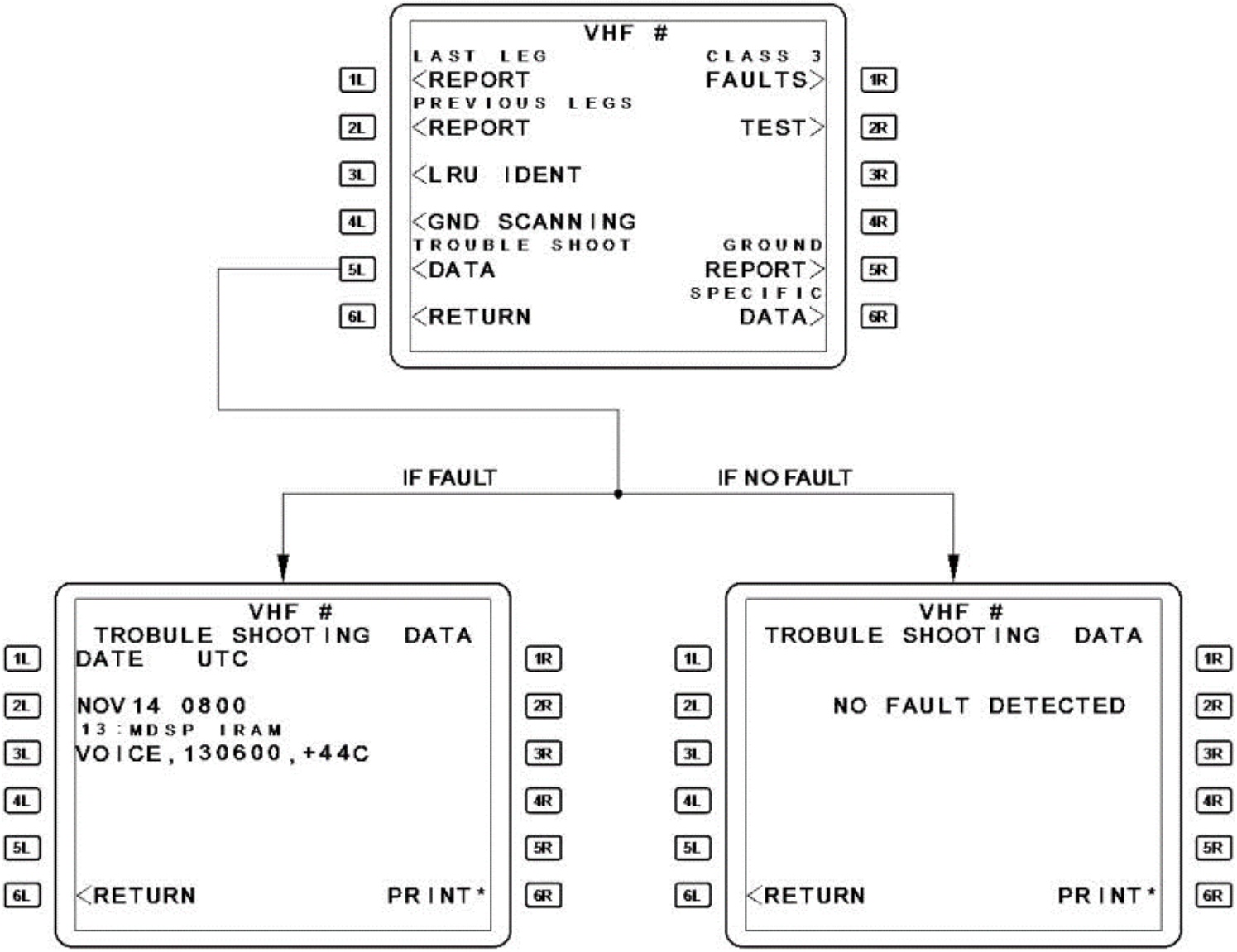
TROUBLE SHOOT DATA

This function permits to analyse the snapshot of the recorded fault to detect any software bug.

Two types of data are displayed on the MCDU:

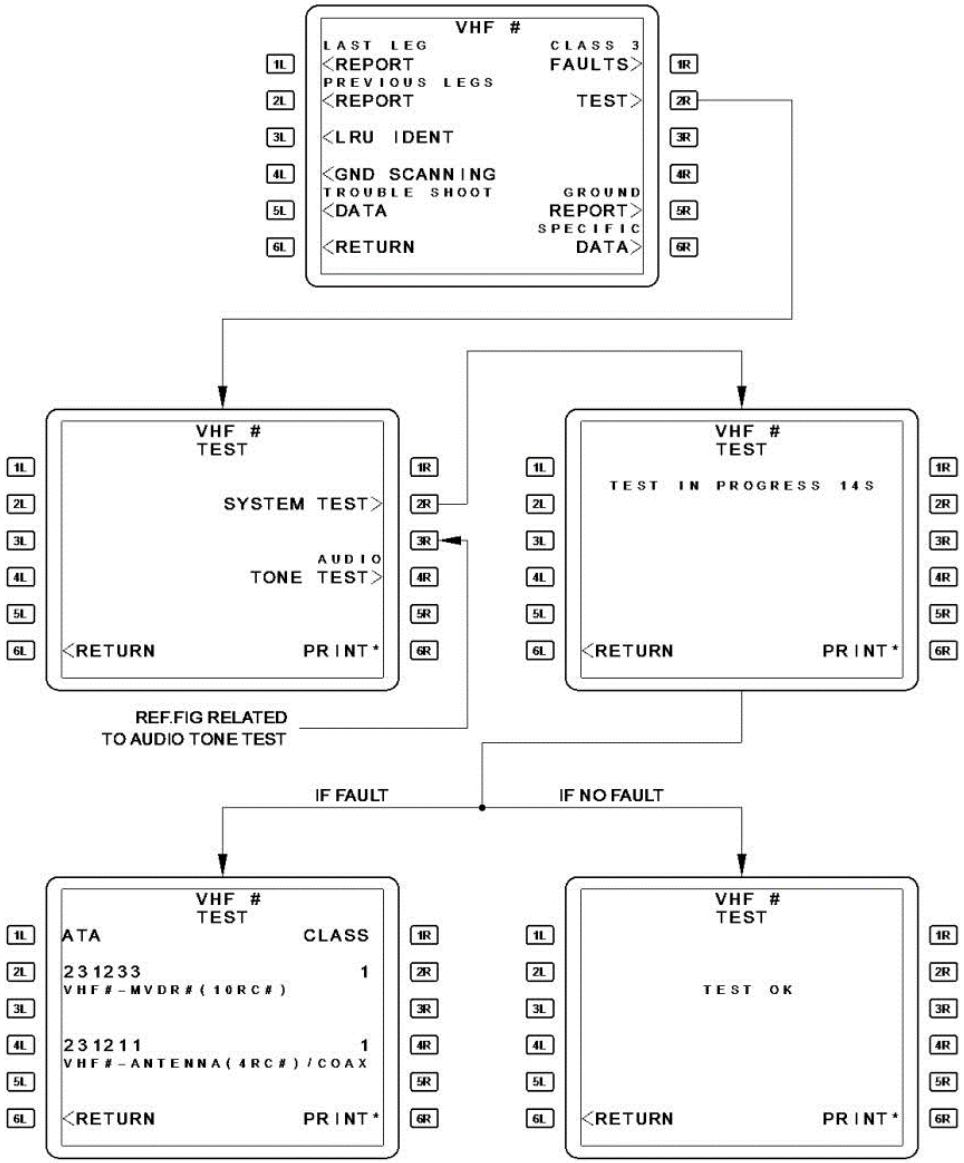
Correlation parameters which are the date and the UTC

Snapshot data.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
TROBULE SHOOTING DATA
DATE UTC
NOV 14 0800
13 :MDSP IRAM
VOICE,130600,+44C
<RETURN
PRINT*
VHF #
TROBULE SHOOTING DATA
NO FAULT DETECTED
<RETURN
PRINT*

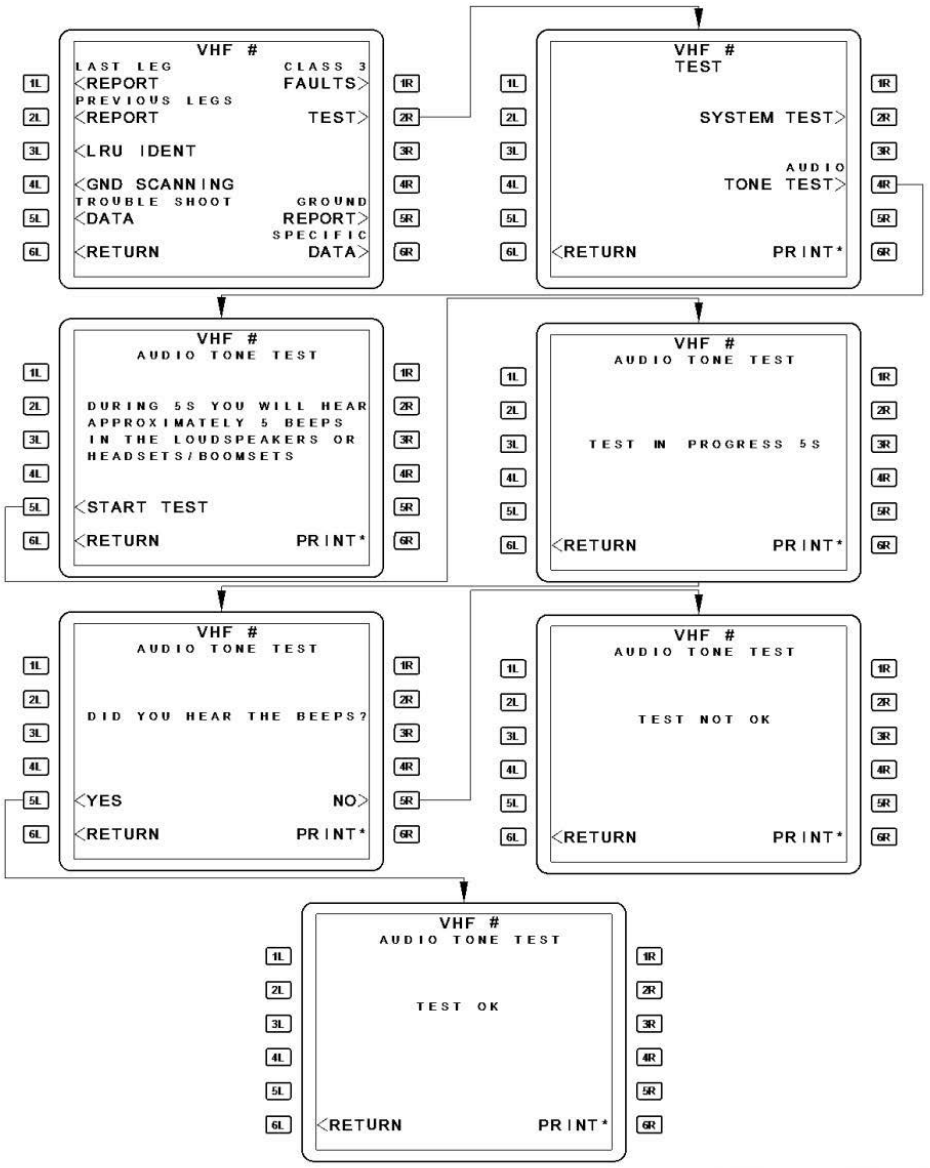
TEST

System Test


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
VHF #
TEST
SYSTEM TEST>
AUDIO
TONE TEST>
<RETURN
PRINT*
VHF #
TEST
TEST IN PROGRESS 14S
<RETURN
PRINT*
REF.FIG RELATED
TO AUDIO TONE TEST
IF FAULT
IF NO FAULT
VHF #
TEST
ATA
CLASS
231233
1
VHF#-MVDR#(10RC#)
231211
1
VHF#-ANTENNA(4RC#)/COAX
<RETURN
PRINT*
VHF #
TEST
TEST OK
<RETURN
PRINT*

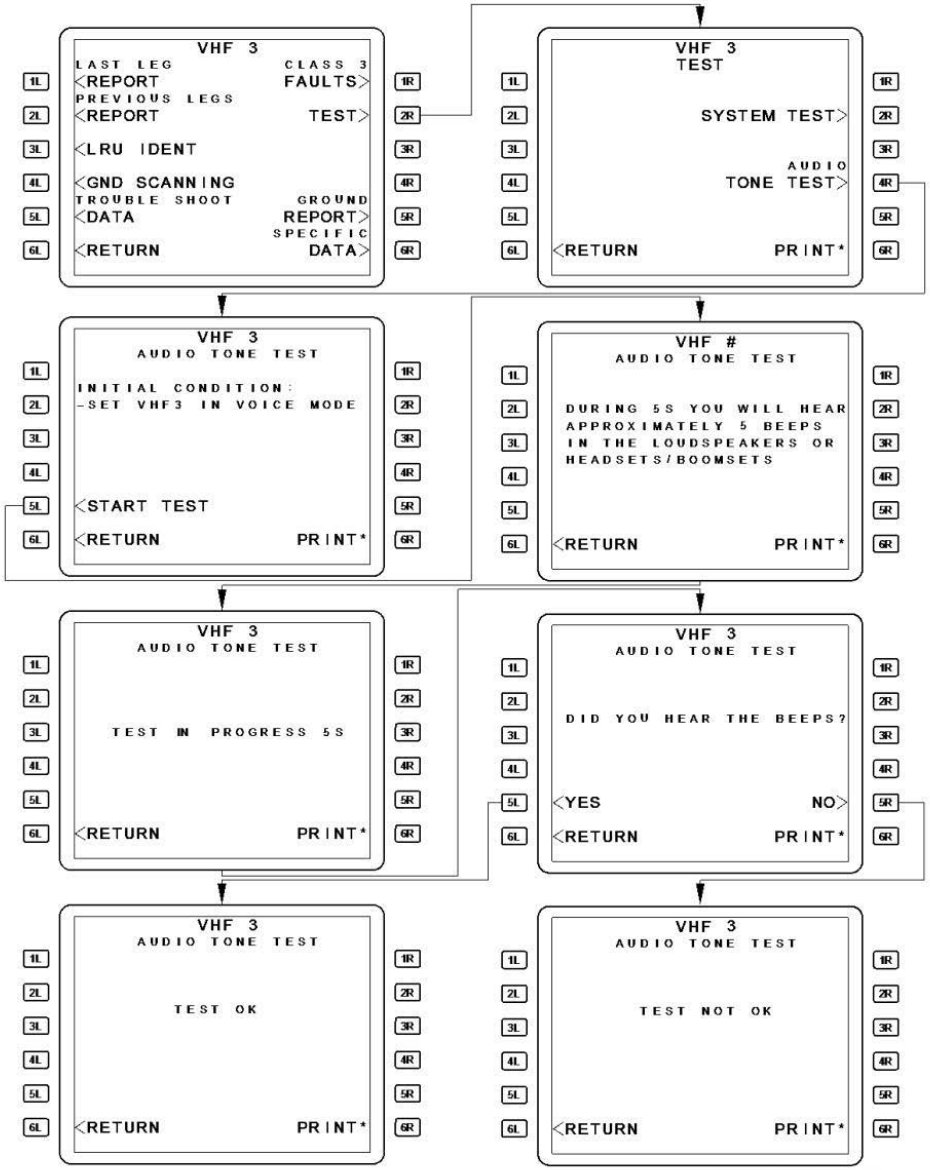
VHF System - Test

Audio Tone Test - VHF1, 2


VHF #
LAST LEG
CLASS 3
<REPORT
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
GROUND
<DATA
REPORT>
SPECIFIC
<RETURN
DATA>
VHF #
TEST
SYSTEM TEST>
AUDIO
TONE TEST>
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
DURING 5S YOU WILL HEAR
APPROXIMATELY 5 BEEPS
IN THE LOUDSPEAKERS OR
HEADSETS/BOOMSETS
<START TEST
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
TEST IN PROGRESS 5S
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
DID YOU HEAR THE BEEPS?
<YES
NO>
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
TEST NOT OK
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
TEST OK
<RETURN
PRINT*

Audio Tone Test - VHF3

A VHF built-in functional test can be initiated by pushing on the MCDU the line key adjacent to the TEST indication on the VHF maintenance sub-menu.


VHF 3
LAST LEG
CLASS 3
<REPORT
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
GROUND
<DATA
REPORT>
SPECIFIC
<RETURN
DATA>
VHF 3
TEST
SYSTEM TEST>
AUDIO
TONE TEST>
<RETURN
PRINT*
VHF 3
AUDIO TONE TEST
INITIAL CONDITION:
-SET VHF3 IN VOICE MODE
<START TEST
<RETURN
PRINT*
VHF #
AUDIO TONE TEST
DURING 5S YOU WILL HEAR
APPROXIMATELY 5 BEEPS
IN THE LOUDSPEAKERS OR
HEADSETS/BOOMSETS
<RETURN
PRINT*
VHF 3
AUDIO TONE TEST
TEST IN PROGRESS 5S
<RETURN
PRINT*
VHF 3
AUDIO TONE TEST
DID YOU HEAR THE BEEPS?
<YES
NO>
<RETURN
PRINT*
VHF 3
AUDIO TONE TEST
TEST OK
<RETURN
PRINT*
VHF 3
AUDIO TONE TEST
TEST NOT OK
<RETURN
PRINT*

GROUND REPORT

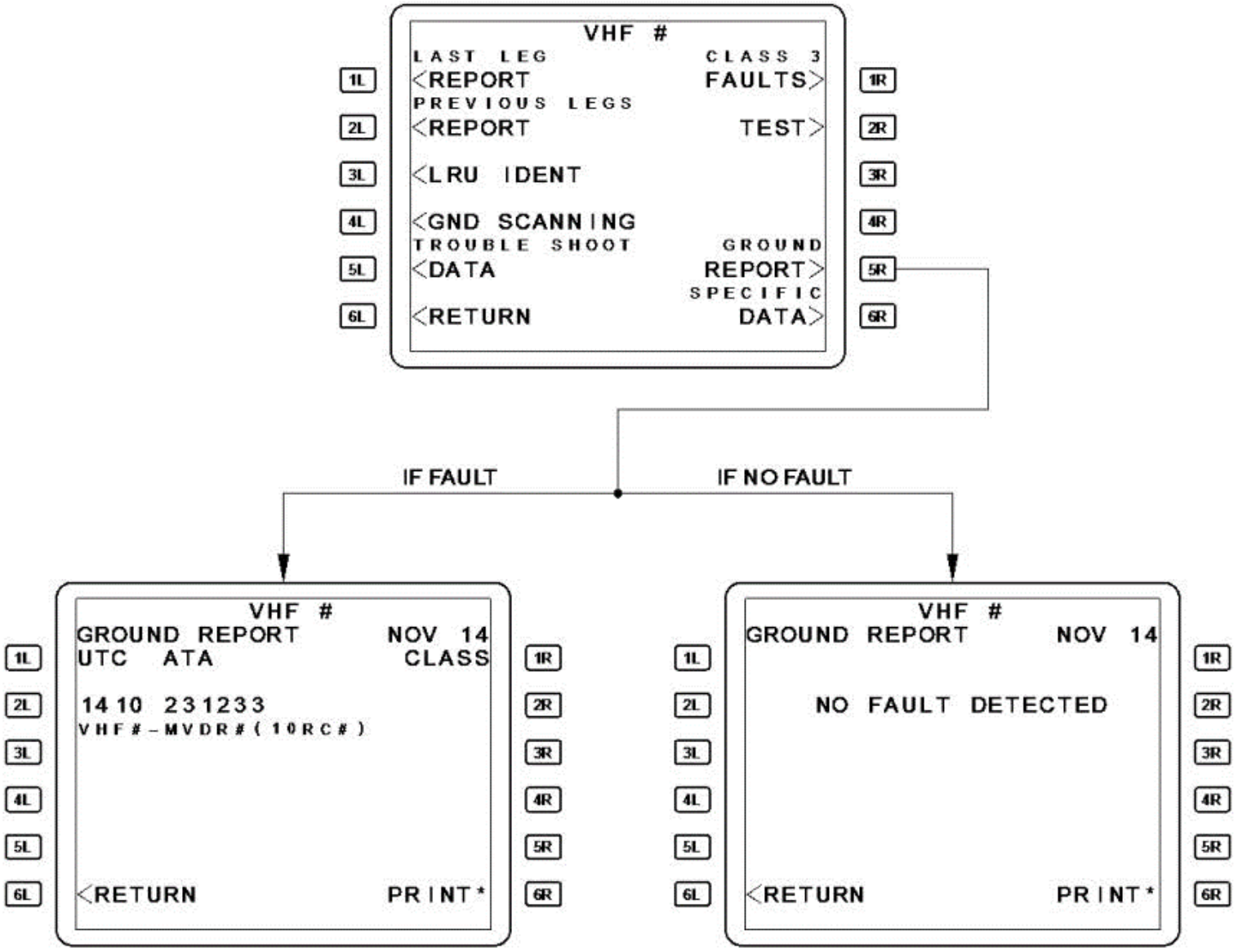
This function is used to display all system-internal faults only detected when the aircraft is on ground by results of:

Power On Test

Continuous monitoring

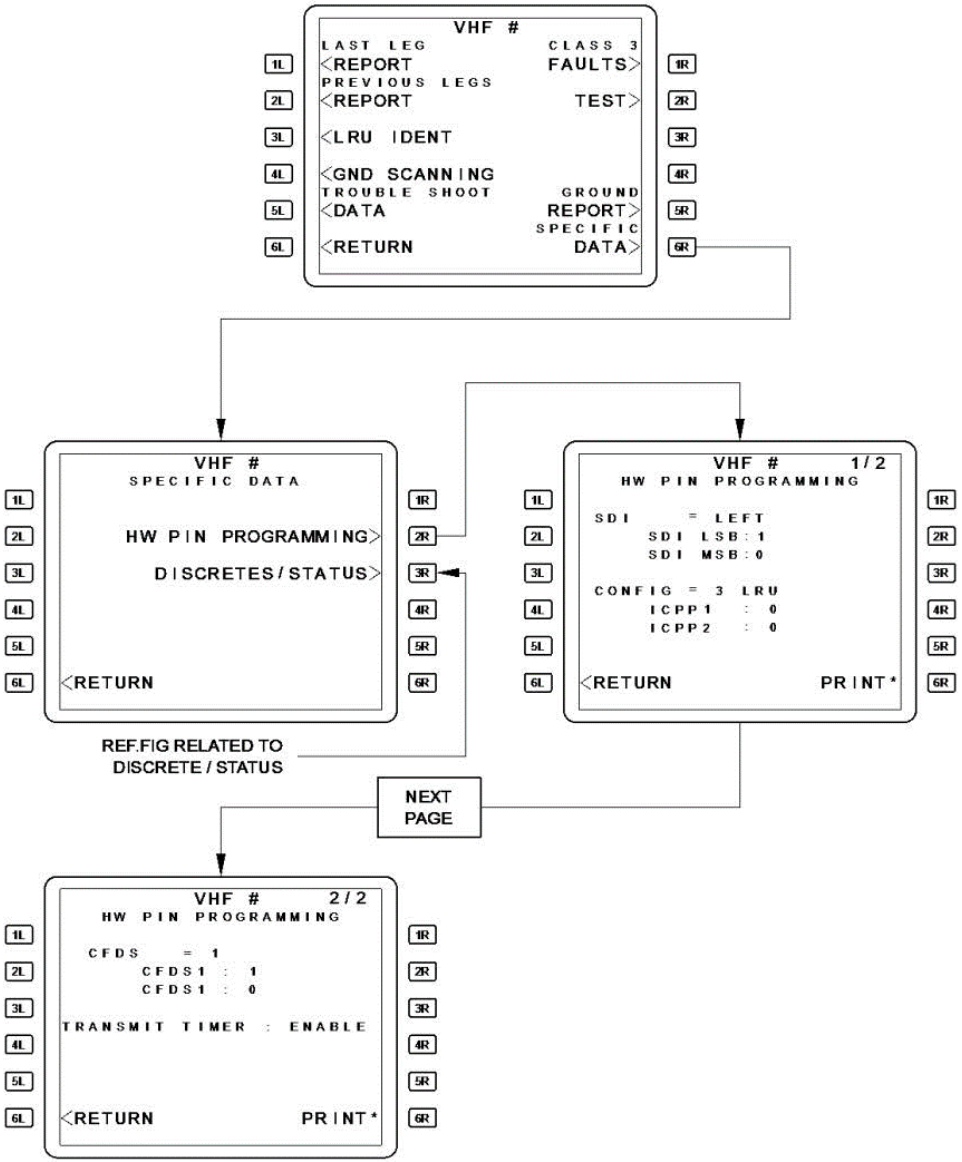
BITE manual test and BITE specific function

Ground scanning.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
GROUND REPORT
NOV 14
UTC ATA
CLASS
14 10 231233
VHF#-MVDR#(10RC#)
<RETURN
PRINT*
VHF #
GROUND REPORT
NOV 14
NO FAULT DETECTED
<RETURN
PRINT*

SPECIFIC DATA

Information on discrete status


VHF #
LAST LEG
CLASS 3
<REPORT
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
GROUND
<DATA
REPORT>
SPECIFIC
<RETURN
DATA>
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
VHF #
SPECIFIC DATA
HW PIN PROGRAMMING>
DISCRETES/STATUS>
<RETURN
VHF # 1/2
HW PIN PROGRAMMING
SDI = LEFT
SDI LSB: 1
SDI MSB: 0
CONFIG = 3 LRU
ICPP1 : 0
ICPP2 : 0
<RETURN
PRINT*
REF.FIG RELATED TO
DISCRETE / STATUS
NEXT
PAGE
VHF # 2/2
HW PIN PROGRAMMING
CFDS = 1
CFDS1 : 1
CFDS1 : 0
TRANSMIT TIMER : ENABLE
<RETURN
PRINT*

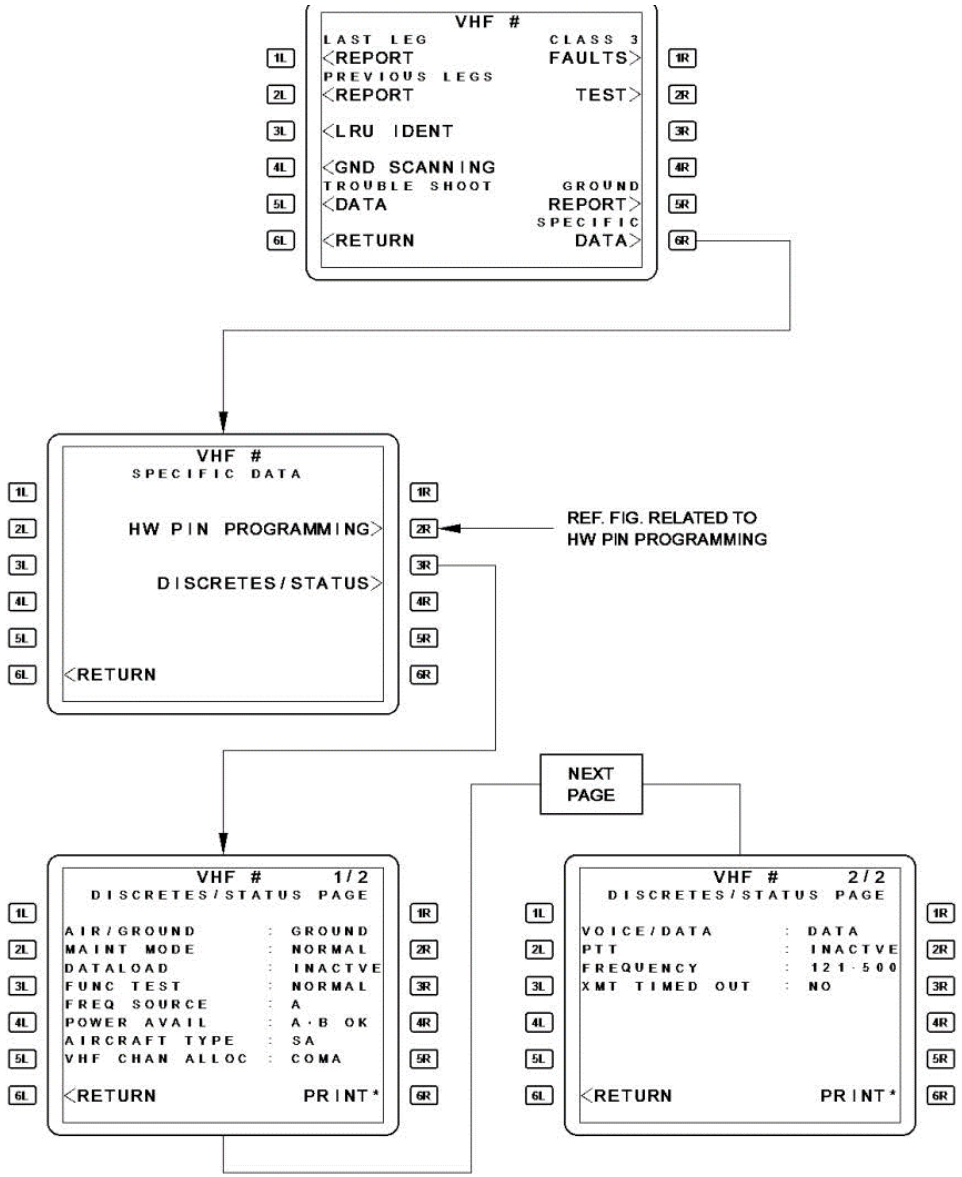
VHF System - Specific Data

LRU Status, Hardware Pin Programming

VHF System - Specific Data

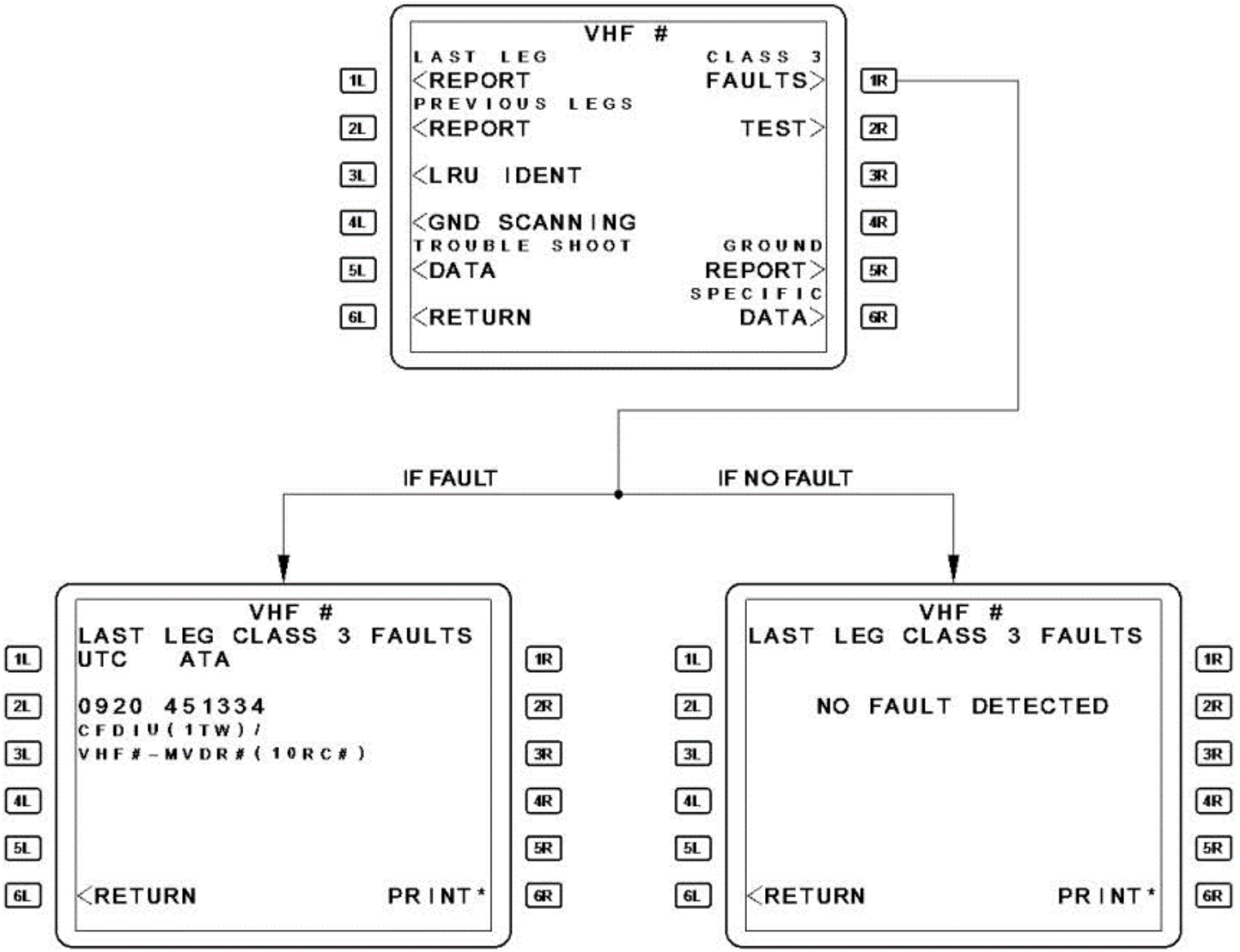
LRU Status, Discrete/Status Page

This function provides information about the discrete status, the ARINC 429 status and the A/C configuration.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
<RETURN
DATA>
1L 2L 3L 4L 5L 6L
1R 2R 3R 4R 5R 6R
VHF #
SPECIFIC DATA
HW PIN PROGRAMMING>
DISCRETES/STATUS>
<RETURN
REF. FIG. RELATED TO
HW PIN PROGRAMMING
NEXT
PAGE
VHF # 1/2
DISCRETES/STATUS PAGE
AIR/GROUND : GROUND
MAINT MODE : NORMAL
DATALOAD : INACTVE
FUNC TEST : NORMAL
FREQ SOURCE : A
POWER AVAIL : A-B OK
AIRCRAFT TYPE : SA
VHF CHAN ALLOC : COMA
<RETURN
PRINT*
VHF # 2/2
DISCRETES/STATUS PAGE
VOICE/DATA : DATA
PTT : INACTVE
FREQUENCY : 121.500
XMT TIMED OUT : NO
<RETURN
PRINT*

CLASS 3 FAULTS

This report contains the class 3 internal and external faults recorded during the last flight.


VHF #
LAST LEG
<REPORT
CLASS 3
FAULTS>
PREVIOUS LEGS
<REPORT
TEST>
<LRU IDENT
<GND SCANNING
TROUBLE SHOOT
<DATA
GROUND
REPORT>
SPECIFIC
DATA>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
IF FAULT
IF NO FAULT
VHF #
LAST LEG CLASS 3 FAULTS
UTC ATA
0920 451334
CFDIU(1TW)/
VHF#-MVDR#(10RC#)
<RETURN
PRINT*
VHF #
LAST LEG CLASS 3 FAULTS
NO FAULT DETECTED
<RETURN
PRINT*

INTENTIONALLY BLANK