

FDAMS DFDAU

DIGITAL FLIGHT DATA ACQUISITION UNIT

Product Description

FDAMS DFDAU

(Flight Data Acquisition Management System
Digital Flight Data Acquisition Unit)



Includes information on:

FDAMS DFDAU, Honeywell Part Number: 967-0310-001

FDAMS DFDAU, Honeywell Part Number: 967-0320-001

Honeywell

General FDAMS Overview

Honeywell Electronic and Avionics Systems has been a supplier of flight data acquisition and recording systems for over 30 years. Honeywell is also a leading supplier of Aircraft Condition Monitoring Systems (ACMS) for nearly all types of commercial aircraft.

Honeywell's FDAMS family of products begins with a dedicated Data Management Units (DMUs) for B747-400, MD11, and A330/340 aircraft, includes a stand-alone 3-MCU (Modular Concept Unit) sized FDAMS DFDAU and culminates at the fully-integrated FDAMS DFDAU -- DFDAU, ACMS and PC Card mass data storage combined into one unit. Honeywell currently provides numerous airlines with superior aircraft monitoring equipment for both older and state-of-the-art aircraft.

The Honeywell FDAMS product family provides diverse levels of capability - from digital and analog data acquisition to powerful, full-featured ACMS functionality and innovative data storage. They are designed for **single end-item part number application across a variety of similar aircraft types**. For Business Jets, General Aviation, commercial transport, helicopter and military aircraft the 3-MCU FDAMS DFDAU was designed to improve the data acquisition system. A single part number FDAMS product can be applied across a variety of aircraft types. The 967-0212-002 is used across B737, B747, B757, B767 and New Generation B737. The 967-0214-001 is used across MD-10, MD-11, MD-80 and MD-90. For Airbus aircraft a single part number DMU can be applied to both the A330 and A340 aircraft.

To bring the power of data management to the hands of the user, Honeywell has developed a comprehensive set of PC-based ground support software tools. These can be used to complement the powerful flexibility and versatility of the airborne equipment as well as real-time analysis of data while working with the aircraft on the ground. This provides Honeywell's customers with an end-to-end solution to their data management and communications needs, from configuring the collection of data on-board the aircraft to translation of that data into user information.

Basic 3-MCU FDAMS DFDAU

Honeywell's 3-MCU FDAMS DFDAU hardware configuration represents the standard system. It is intended to meet the specified requirements of the regulatory agencies for mandatory flight recorder parameter acquisition.

The FDAMS DFDAU is an integral part of the flight recording system. The unit is a 3-MCU size design and is an offshoot of Honeywell's immensely popular 6-MCU box that is sold to the Air Transport market. The intent was to provide a lightweight recording solution to the Business Jet, General Aviation, Helicopter & Military markets, enabling these aircraft to effectively acquire required and/or valuable parameters.

The FDAMS DFDAU design includes up to 16 independent flight data recorder frame formats stored in the unit as separate databases. Which database is active is determined by the aircraft strapping at the connector on the back of the unit. Strapping is defined by the aircraft type and is checked at each power up of the unit. The ability to recognize different aircraft types allows the same unit to operate on multiple aircraft configurations. The 3-MCU FDAMS DFDAU is currently flown on aircraft required to meet FAR 121.344 and JAR OPS.

The DFDAU hardware and software are designed to interface with ARINC 429 databuses and standard ARINC 717 analog sensor input signals. The basic Honeywell FDAMS DFDAU, for mandatory flight recording, is available as a common hardware part number with field-loadable database software custom defined and created for specific aircraft types. The hardware part number along with the database software upload disk part numbers define the complete configuration of the unit for a specific aircraft installation. This is explained in detail in the following sections.

The following simplified diagram (Figure 1) illustrates the major 3-MCU FDAMS DFDAU aircraft interfaces. Technical details about the FDAMS DFDAU can be provided upon request.

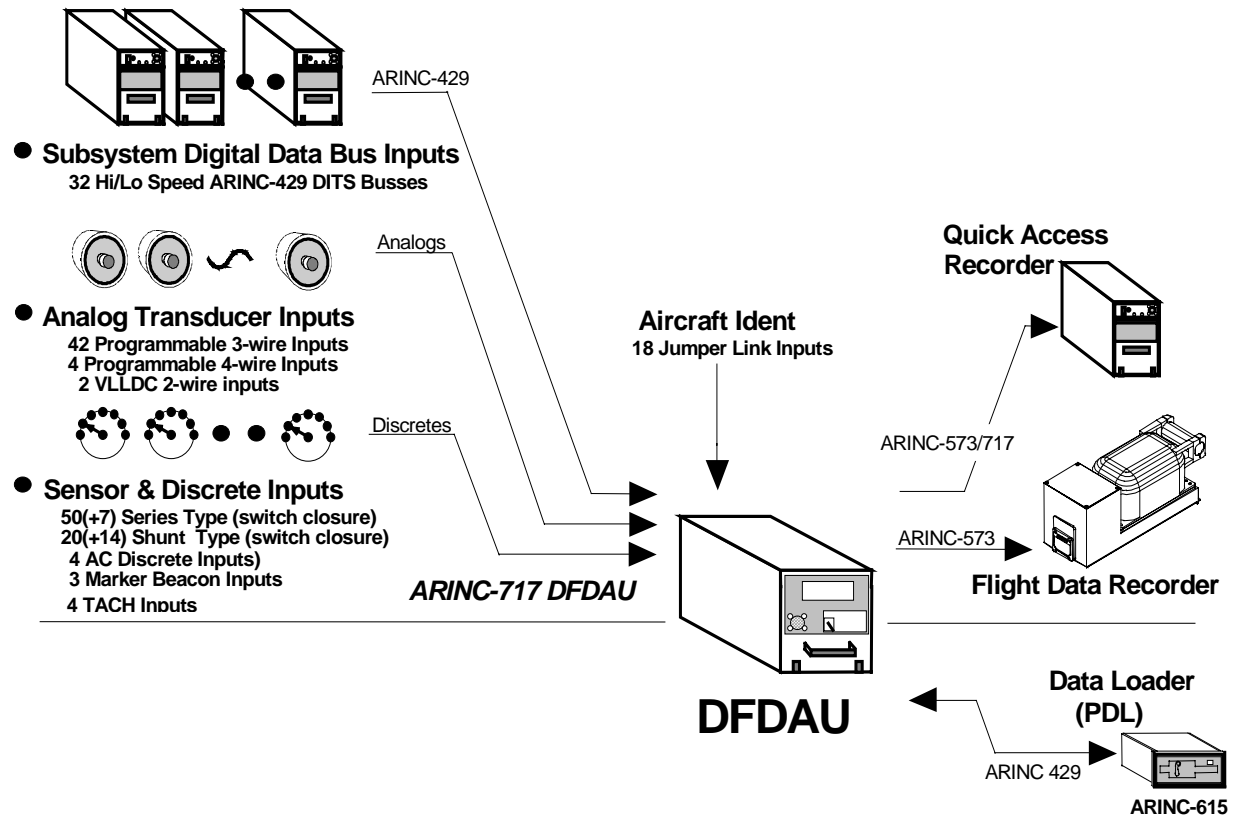


Figure 1: FDAMS DFDAU Aircraft Interfaces

Technical Characteristics

Regulatory Compliance	FAA PMA Approval.
Weight:	13.5 pounds max.
Rear Connector:	Cannon BKAX2-400-40101-WB (mates with Cannon BKAD2-400-30001 or environmental Cannon BKAE2-400-30001 or equivalent)
Mounting:	3-MCU form factor
Height	7.88"
Width	3.73"
Length	12.76"
Power Requirements	28VDC
Power Consumption	25 Watts, max.

Hardware Design

Outline and Dimensions

Figure 2 represents an Interface Control (outline) Drawing of the Honeywell FDAMS DFDAU, 3-MCU family series. All box dimensions, mounting provisions, and connector attributes are in accordance with ARINC 600 for a 3-MCU standard case.



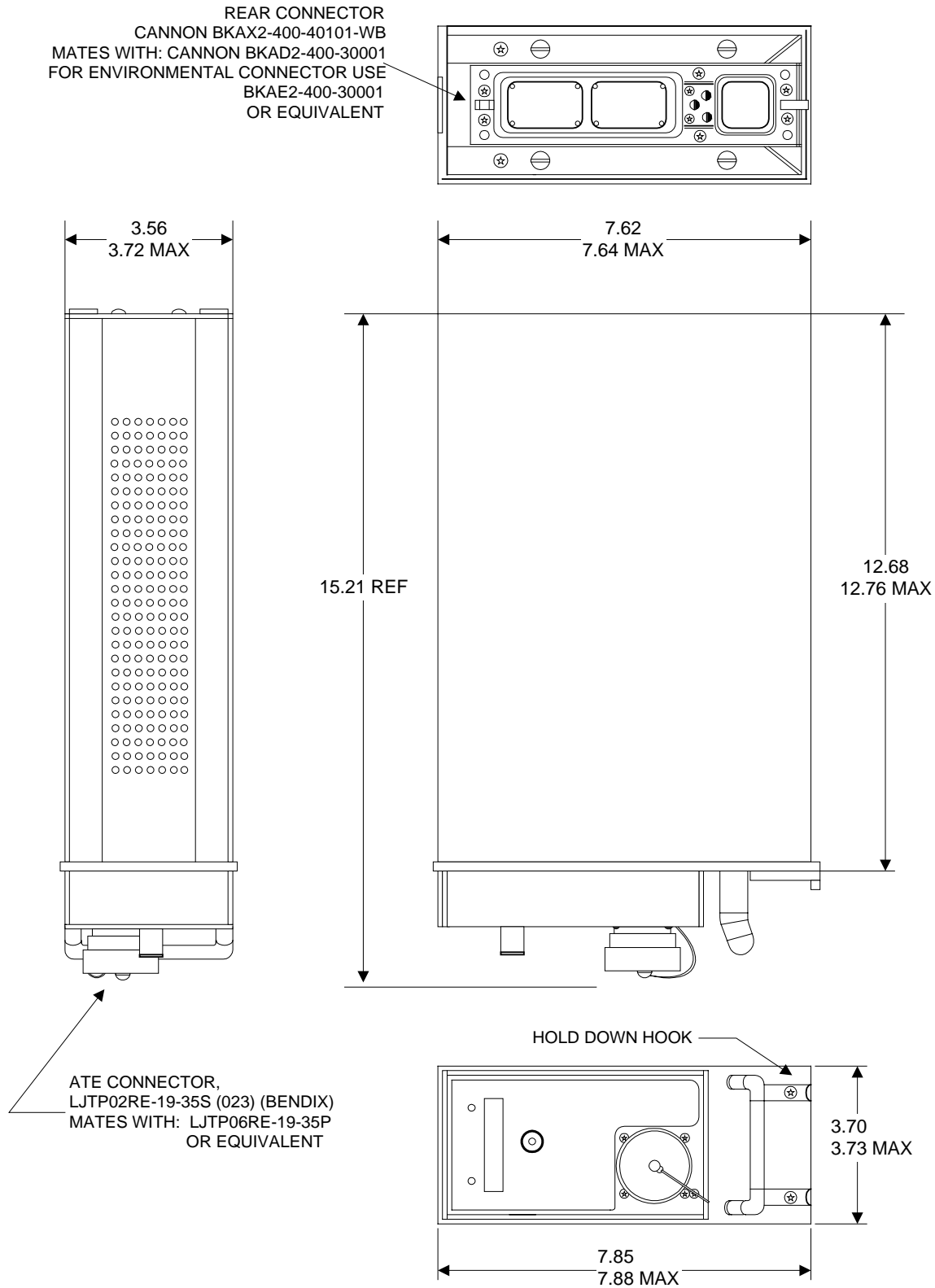


Figure 2: Interface Control (Outline) Drawing



Environmental Characteristics

The FDAMS DFDAU is designed to meet or exceed the following environmental conditions:

DO-160D Section	Test Description	Category
4.	Temperature –30C to +55 C	B2
4.	Altitude –1,000 to +45,000 feet	B2
4.	In-Flight Cooling	Not Applicable
4.	Decompression	A2
4.	Overpressure	A2
5.	Temperature Variation	B
6.	Humidity	A
7.	Shock-Operating	B
7.	Shock-Crash Safety	B
8.	Vibration	R2B12
9.	Explosion Proofness	X
10.	Waterproofness	X
11.	Fluid Susceptibility	X
12.	Sand and Dust	X
13.	Fungus Resistance	F
14.	Salt Spray	X
15.	Magnetic Effect	A
16.	Power Input	A ¹
17.	Voltage Spikes	A
18.	Audio Frequency Conducted Susceptibility	Z
19.	Induced Signal Susceptibility	Z
20.	Radio Frequency Conducted Susceptibility	U ³
20	Radio Frequency Radiated Susceptibility	U ³
21.	Radio Frequency Conducted and Radiated Emissions	M
22.	Lightning Transient Susceptibility ²	A3C3
23.	Lightning Direct Effects	X
24.	Icing Test	X
25.	Electro Static Discharge	A

NOTES:

¹ Normal surge qualified at "Z" category. Abnormal surge tested at 50 VDC.

² Lightning Pin Injection test is performed on I/O input pins only.

³ With exception of the tachometer channels. TACH channels are qualified to Category 'T'.

(X) - No testing required

FDAMS DFDAU Standard Interwiring and Pin Assignments

The Honeywell FDAMS DFDAU must be wired externally to aircraft systems and sensors. Figure 3 represents a standard System Interwiring. All pins designated by these figures are connected within the FDAMS DFDAU and represent sufficient input capacity to cover Mandatory Parameter recording requirements for most aircraft configurations.

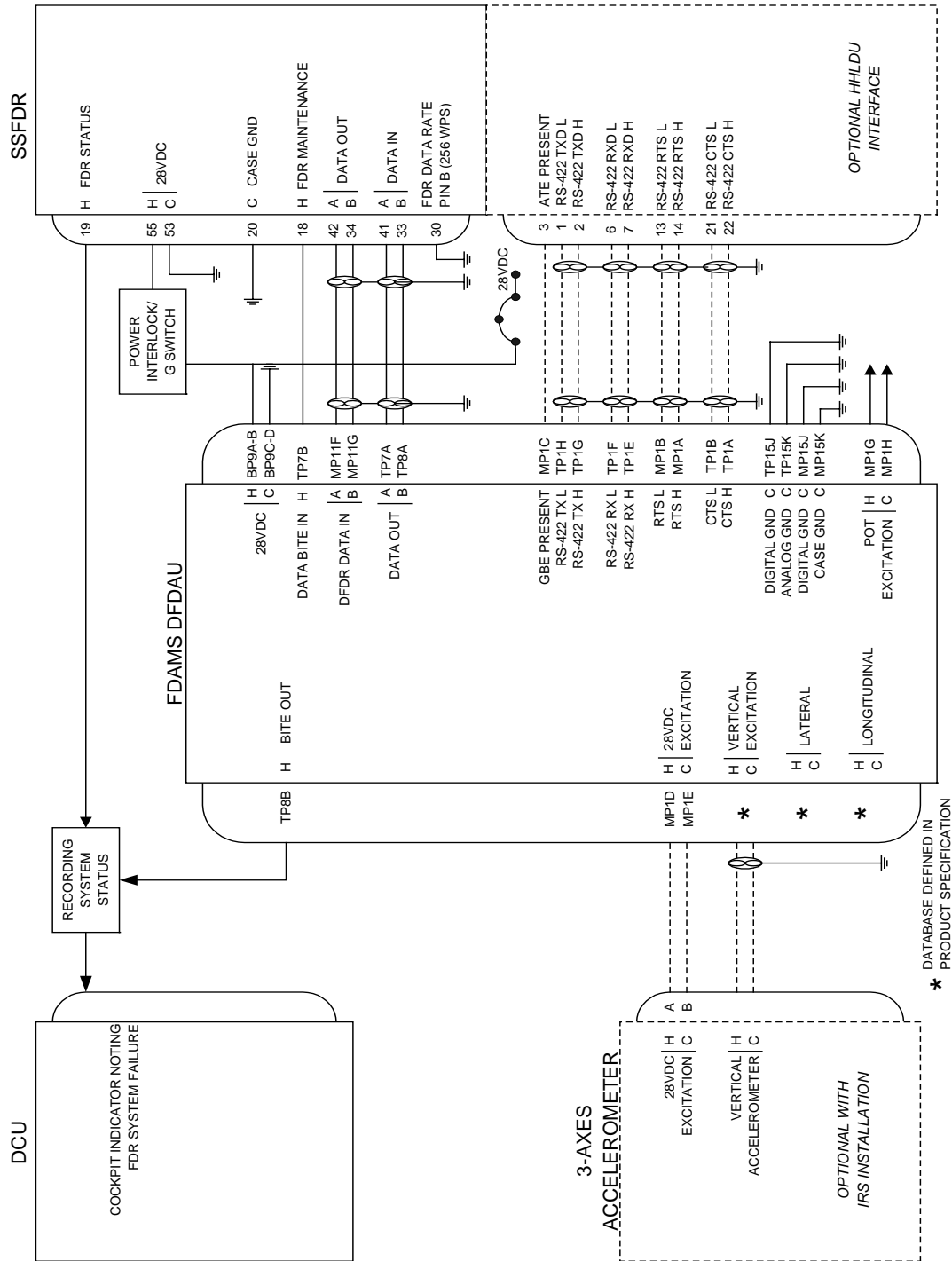


Figure 3: System Standard Interwiring



DFDAU Total Input Channel Capability

As configured to encompass the requirements of various aircraft types, the FDAMS DFDAU provides the following input channel capability:

DFDAU Input Channel Type	967-0310-001 Quantity	967-0320-001 Quantity*	Designation of Port in Dataframes
Programmable Analog 3-wire (<i>Note 1,3</i>)	42	42	A
Programmable Analog 4-wire (<i>Note 2</i>)	4	4	A
VLLDC Analog 2-wire	2	2	A
TACH	4	4	A
Series Discretes	50	57	B
Shunt Discretes	20	34	B
AC Discretes	-	4	B
Marker Beacon Discretes	3	3	B
ARINC 429 DITS Ports	32	32	D
FDEP/STP Transmit and Receive Ports (A429)	1	1	
Identification Discretes	18	18	B
PDL DFDAU Dataloader Interface	1	1	
HHDLU Interface through front connector	1	1	

* The 967-0320-001 contains an additional Circuit Card Assembly (CCA), the Auxiliary Acquisition Card, that includes additional discrete input capability.

Input Channel Capabilities

The following input types can be accommodated.

1. Programmable analog
 - LLDC,
 - DCVR 1&2
 - ACVR 1&2,
 - MLDC
 - HLDC
 - Potentiometer
 - Resistance (90.38 ohm, and 500 ohm)
 - Synchro
2. Discrete
 - Series
 - Shunt
 - Marker Beacon
 - Identification Discretes
3. ARINC 429 DITS buses
4. Digital data from an ARINC 429 FDEP
5. Synchro reference phases.
6. Very Low Level Analog (VLLDC).
7. AC discretes (with 967-032X only)
8. SSFDR data playback
9. Special AC ratio for brake pressure transducers (ACVR 3)

10. TACH inputs

11. LVDT based on identical signal characteristics of ACVR 1, 2, or 3

Excitation reference voltages and currents for dedicated transducers are provided by the FDAMS DFDAU in accordance with ARINC 717.

Software Design

Digital Flight Data Recorder (DFDR) Mandatory Database Configuration

The 3-MCU FDAMS DFDAU can include up to 16 independent flight data recorder formats designed to meet regulatory flight recording requirements for mandatory parameters. The frame formats are database driven and are determined by the aircraft strapping at the FDAMS DFDAUs back connector. The FDAMS DFDAU database defines the ARINC 573/717 style data stream that is sent to the crash survivable Flight Data Recorder for recording.

It is common for an aircraft OEM to define the FDR Mandatory Dataframe versions specific to an airframe configuration.

The different dataframe databases can be contained on a single database software Upload Disk.

NOTE:

Each Upload Disk is Custom built by Honeywell to specific Customer requirements.

The customer requirements result in an aircraft configuration document (Product Specification) which defines the complete dataframe: parameter locations, sensor types, sampling rate and accuracy/resolution of each input parameter.

Aircraft Systems Interfacing

Digital Flight Data Recorder (DFDR)

The DFDR aircraft interface is in strict compliance with both ARINC 573 and 717 requirements. Harvard Bi-Phase 1X, 2X, 4X or 8X signals generated by the FDAMS DFDAU in standard ARINC 573 frame format are coupled to the DFDR via a twisted shielded pair and a like signal is returned by the DFDR via a second twisted shielded pair. Rate selection is defined by the selected database as defined by the aircraft type strapping pins, as well as any dedicated selection discretes.

Auxiliary Data Output

An auxiliary output is provided to drive a QAR or other similar device per customer option. The output conforms to the "ARINC 575 Bi-Polar RZ Code" specified in ARINC 573-7, Attachment 10-5. The auxiliary output data stream is a bipolar equivalent of the mandatory DFDR output.

ARINC 429 Broadcast Data Output

An extra output is provided by the FDAMS DFDAU for primarily transmitting the analog data (i.e. Traix Accelerometer) being input to the unit. This additional ARINC 429 formatted output is intended for use by other LRUs and is commonly referred to as the Broadcast ARINC 429 data stream (BC429). It is available at the rear connector and is typically transmitted at high speed.

The BC429 output is database driven and can therefore be programmed to suit individual customer requirements. All parameters to be output on this bus are converted to ARINC 429 words.

System Status and BITE

System Status and BITE enunciation are in accordance with ARINC 717-8, Attachments 2-1 and 10.

The FDAMS DFDAU receives the output of the DFDR maintenance flag for the front panel display. System status, originating in the DFDR, is wired directly to the flight deck and is furnished to the FDAMS DFDAU. Two (2) failure indicator lights are mounted on the basic FDAMS DFDAU front panel. These indicate:

- DFDAU failure
- DFDR failure (FDR Maintenance Discrete).

The FDAMS DFDAU incorporates extensive BITE circuitry and software self test routines. A BITE status word is continuously generated and inserted into the DFDR data stream. The BITE status word identifies the particular failed self test which caused a FDAMS DFDAU BITE indication to be issued. The current status word can be displayed by the front panel LED display or GSE equipment such as a portable PC via an RS-232 interface.

A non-volatile listing (BITE History) of changes-of-state of the status is maintained to assist in fault diagnosis when faults of an indeterminate nature result in intermittent BITE indications. This listing may be called up by the GSE and may only be cleared when this device is attached.

FDR Status Output

The FDR provides a system status output to a cockpit indicator which is asserted if :

- No power is provided to the FDR
- No data input stream is present
- A Maintenance Fault is asserted

When the FDR is functioning properly, the FDR Status output is in an "open" state (>100,000 ohms). If any of the above errors occur, the FDR Status output will toggle to chassis ground (500 mA max, 1 Vdc max).

NOTE: The signal should be capable of controlling a lamp or relay load within the range of 10 to 100 milliamps where the power is derived from a standard +28VDC aircraft system.

FDR Maintenance Fault Output

The FDR Maintenance Fault provides an output from the FDR to the FDAU. This output is normally short circuited (using a relay) to chassis ground (500 mA max, 1 VDC max), but if an internal BIT fault is detected, this output will toggle to an "open" state (>100,000 ohms).

NOTE: The signal should be capable of controlling a lamp or relay load within the range of 10 to 100 milliamps where the power is derived from a standard +28VDC aircraft system.

FDR BITE Indicator

The FDR BITE indicator provides an indication of the health of the FDR. If the FDR detects a fault which requires removal of the unit from the aircraft installation, the BITE indicator will be activated. The BITE indicator remains inactive in all other cases. The following table lists the fault modes detected by the AR-FDR and the method of indicating the fault:

Fault Condition	Maintenance Discrete (1)	Status Discrete (1)	BITE Indicator	Continue Recording
Loss of Input Power (power off state)	NO	YES	NO	NO
Loss of Input Data	NO	YES	NO	NO
Data Rate Miscompare (incoming data does not agree with pin selected rate)	NO	YES	NO	YES
Insufficient memory to record 25 Hours of data at incoming rate	YES	YES	YES	YES
Catastrophic Microcontroller Failure	NO	YES	NO	NO

Software detected Fault (recording possible) (2)	YES	YES	YES	YES
Software detected Fault (recording not possible)	YES	YES	YES	NO
Download or Test Mode of operation	NO	YES	NO	NO

(1) "YES" indicates a fault condition

(2) Indication as long as fault is valid plus 5 seconds

FDAMS DFDAU Configuration Control Pins

Three (3) pin groups on the aircraft interface connector are utilized for specific customer aircraft recognition.

Group 1: Aircraft Type Identification

Used by the DFDAU to enable one of several internal ROM software programs corresponding to the host aircraft configuration and data frame requirements. These are critical for configuration control of a specific FDAMS DFDAU data frame. Aircraft configuration is selected by installing links between the "Identification Common" pin and up to seven (7) "A/C Type" pins.

Care should be taken with the assignment of additional codes to new aircraft types in order to prevent possible duplications in code usage.

Group 2: Fleet Identification No.

Used to identify the fleet of a particular customer. Fleet identification (parameter list select) is designated by installing links between the "Identification Common" pin and up to four (4) "Fleet Identification" pins.

Group 3: Aircraft Identification No.

Optionally used to code up to an 8-bit unique number for each aircraft into the FDAMS DFDAU generated output data stream to assist in ground data readout operations.

Data Loader

The DFDR and ARINC 429 Broadcast (BC429) data output databases are loadable via an ARINC 615 Portable Data Loader (PDL). For a complete description of the connection required for PDL database loading see the Software Loading Procedure, Honeywell Drawing Number: 050-2386-001.

Additional FDAMS DFDAU Generated Data

The following data is added to the ARINC-717 data stream going to the DFDR to assist in ground data readout operations.

1. An incrementing frame count that recycles at 4096 frames and resets to zero on initial power application or after a power interrupt in excess of 200msec.
2. A system BITE status word, signifying the particular reason that a BITE indication is issued.

Aircraft Configuration – Database determination

Aircraft Ident configurations are controlled by ARINC and therefore each must be defined by ARINC -717. When the appropriate AC Type Ident is connected to IDENT COMM (BP-7H) the corresponding database will be active on Power Up.

There may be dedicated shunts for MULTIPLE databases defined for the same aircraft type (for example 737). In this case refer to the specific FDAMS DFDAU product specifications and the ARINC definitions for the applicable aircraft Ident configuration.

Power up Database Detection - On POR the FDAMS DFDAU will check the first database in its memory and determine if the aircraft configuration strapping matches. If the database matches the aircraft configuration the FDAMS DFDAU will run this database. If the first database and aircraft



configuration don't match, the FDAMS DFDAU shall cycle through all the databases in EEPROM until a match is found or all the databases have been tested.

Data Frame Fail Annunciation – If the FDAMS DFDAU cannot determine a match between the database and the aircraft configuration pins, the DFDAU failure indicator light shall illuminate and the FDAMS DFDAU shall default to a specific database (dependent on upload disk).

After POR, the FDAMS DFDAU shall monitor data frame selection. If a change in aircraft ident configuration is sensed the DFDAU failure indicator light shall illuminate and the FDAMS DFDAU shall remain in the frame sensed at POR. The monitoring interval is no greater than 60 seconds.

Front Panel Interface

This display allows the annunciation of software configuration numbers and BITE fault codes using an alphanumeric display. The toggle switch is used to select the display mode.

Software Part Number/BITE Code Display

The FDAMS DFDAU has the ability to display software part numbers and BITE codes via an 8-character alpha/numeric display mounted on the front panel. The selection of the software part number or BITE code is through the use of a toggle switch mounted beside the FDAMS DFDAU BITE LED display. This is a three (3) position toggle switch with return to center position.

BITE

The BITE code display consists of the following format:

1. The letters "BM" (BITE Mandatory).
2. A three-digit hexadecimal number which corresponds to the failure code (i.e., BM123).

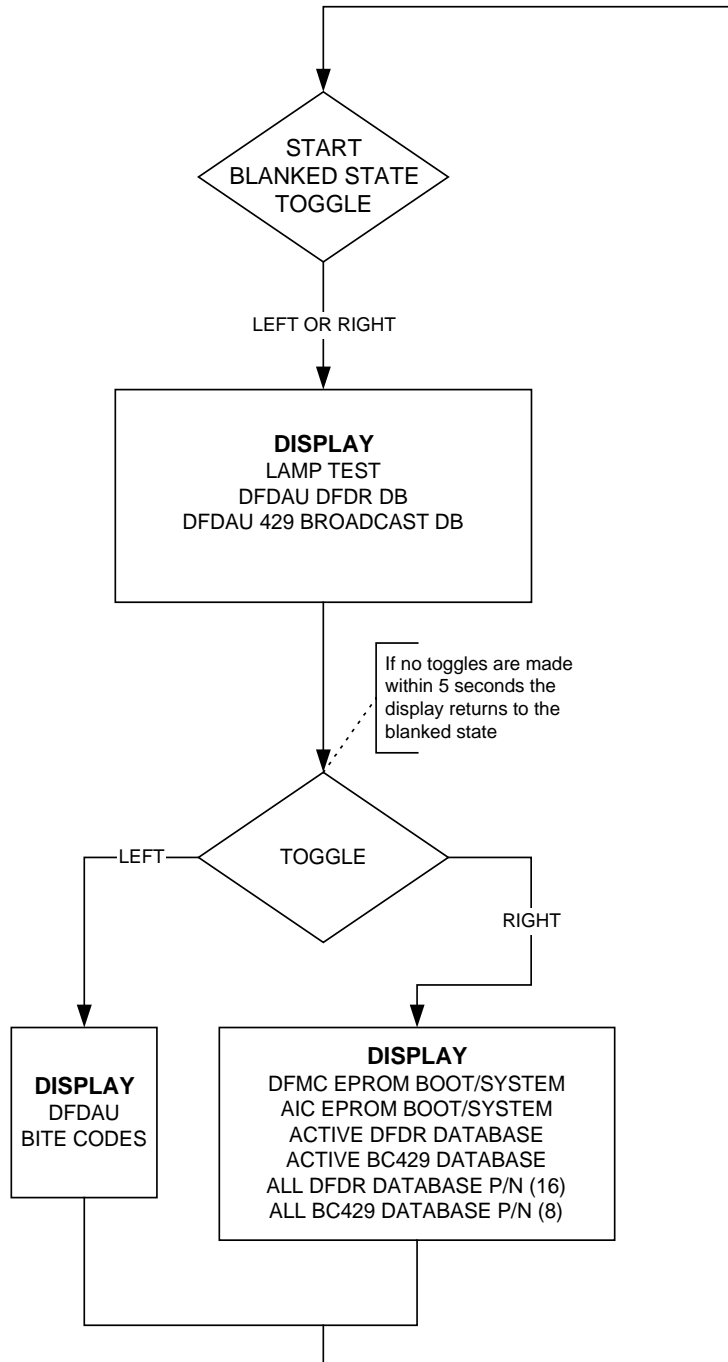


Figure 4: Front Panel TOGGLE Logic

FDAMS DFDAU Part Numbers and BITE LED Display.

1. Toggle the display switch to the left or right to acquire the FDAMS DFDAU umbrella database part numbers.

The lamp test lasts approximately 0.5 seconds and illuminates all segments of the display as well as briefly illuminating the BITE LEDs, in the order of DFDAU then DFDR.

The following DFDR (Mandatory) and BC429 part number names and numbers are displayed, where XXX is the software version number and YYYY is the part number. Each item is separated by a "/".

- a) **"DFDAU MANDATORY DB 998-YYYY-XXX"**, DFDR Database umbrella part number.
- b) **"DFDAU 429 BROADCAST DB 998-YYYY-XXX"**, BC429 Database umbrella part number.

Software part numbers are displayed as 10-digit Honeywell part numbers. Since the display is only eight (8) characters wide, the part numbers are scrolled across the display field.

To display all database part numbers toggle the switch to the right or to display all active mandatory BITE codes toggle the switch to the left. If the switch is not toggled, the FDAMS will automatically time out and the display will return to its blanked state.

2. Toggle the display switch to the right again to determine the active database and all databases loaded into the FDAMS DFDAU unit along with the FMC and AIC core part numbers.

The following DFDR and Broadcast 429 database part numbers names in italics are displayed.

- a) **"DFMC EPROM BOOT/SYSTEM 998-YYYY-XXX"**, FMC Boot/System EPROM code
- b) **"AIC EPROM BOOT/SYSTEM 998-YYYY-XXX"**, AIC Boot/System EPROM code
- c) **"ACTIVE DFDAU DATABASE 998-YYYY-XXX"**, Active DFDR Database.
- d) **"ACTIVE BC429 DATABASE 998-YYYY-XXX"**, Active BC429 Database.
- e) **"DFDAU DBn 998-YYYY-XXX"** All DFDR Database part numbers n from 0 to 15
- f) **"BC429 DBn 998-YYYY-XXX"** All BC 429 Database part numbers n from 0 to 7.

Software part numbers are displayed as 10-digit Honeywell part numbers. Since the display is only eight (8) characters wide, the part number is scrolled across the display field from left to right.

Pages which contain databases are the only pages displayed. If no databases are loaded the "DBn" will be replaced with the word "UNUSED PAGE".

When the switch is released the software will automatically time out and the display will return to its blanked state.

3. Toggle the display switch to the left while the part numbers are displayed, to display mandatory BITE CODES.

The DFDAU BITE fault codes are displayed in the following format.

"BMXXX" (Where XXX is the current BITE code.)

If no BITE errors are encountered, the following is displayed.

"NO FAULT"

When the switch is released the software will automatically time out and the display will return to its blanked state after 5 seconds.

Data Retrieval Interfaces

The data contained on a Honeywell Flight Data Recorder (FDR) can be retrieved by the use of a Honeywell Hand Held Down Load Unit (HHDLU) directly from the recorder. However, if the following additional wires are connected between the DFDAU and the FDR, the HHDLU can also be connected to the FDAMS DFDAU ATE connector, on the front of the unit, enabling the FDR data to be downloaded or examined. In this case, the FDAMS DFDAU acts as a straight pass-through between the FDR and HHDLU.

Installation Kits and Accessories

The FDAMS DFDAU requires some form of forced air cooling. This can be accomplished by locating the unit on a rack with an evacuation fan OR installing the unit in a tray with an integral fan.

Connector kits and mounting trays are available from Honeywell. Wiring, junction blocks, and common hardware items such as bolts and splices are not included in any installation kit. Equivalent vendor connector part numbers are acceptable.

PARTS LIST	
Part Number	Description
617-6195-105	FDAMS DFDAU Basic Tray Assembly

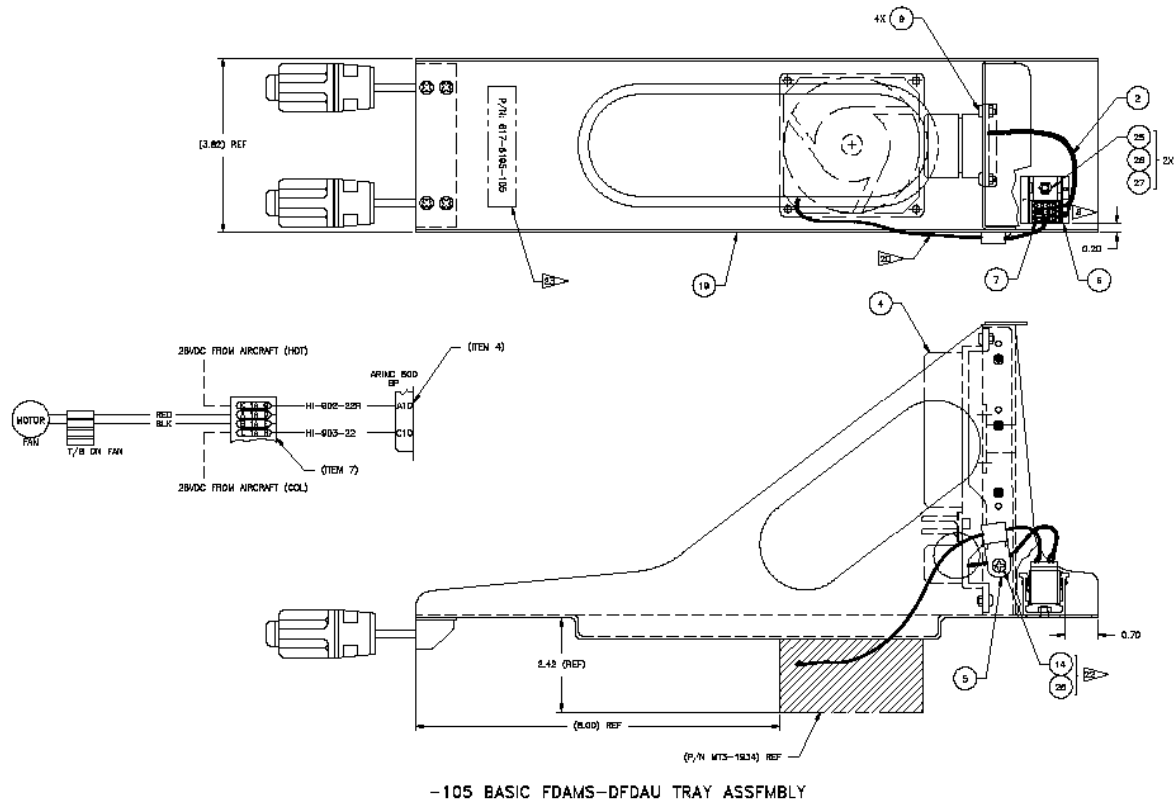


Figure 5: FDAMS DFDAU Basic Tray Assembly Tray

NOTE: Any design or installation deviations from this tray with integral fan design will require a custom tray to be designed and manufactured by the installer.

