N91-25458

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Title: NASA/Ames Research Center DC-8 Data System

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Discipline: Aircraft Data Management

NC473657
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In-flight facility data acquisition, distribution, and recording on the NASA Ames Research Center (ARC) DC-8 are performed by the Data Acquisition and Distribution System (DADS). Navigational and environmental data collected by the DADS are converted to engineering units and distributed real-time to investigator stations once per second. Selected engineering units data are printed and displayed on closed circuit television monitors throughout flights. An in-flight graphical display of the DC-8 flight track (with barbs indicating wind direction and magnitude) has recently been added to the DADS capabilities. Logging of data run starts/stops and commentary from the mission director are also provided. All data are recorded to hard disk in-flight and archived to tape medium post-flight. Post-flight, hard copies of the track map and mission director's log are created by the DADS.

The DADS is a distributed system consisting of a Data subsystem, an Avionic Serial Data-to-VMEbus (ASD2VME) subsystem, and a Host subsystem (see DC-8 DADS System Block Diagram). Each subsystem has a dedicated central processing unit (CPU) and is capable of stand-alone operation. All three subsystems are housed in a single 20-slot VME chassis (6U form factor) and communicate with each other over the VMEbus (see the DC-8 DADS Internal Configuration diagram).

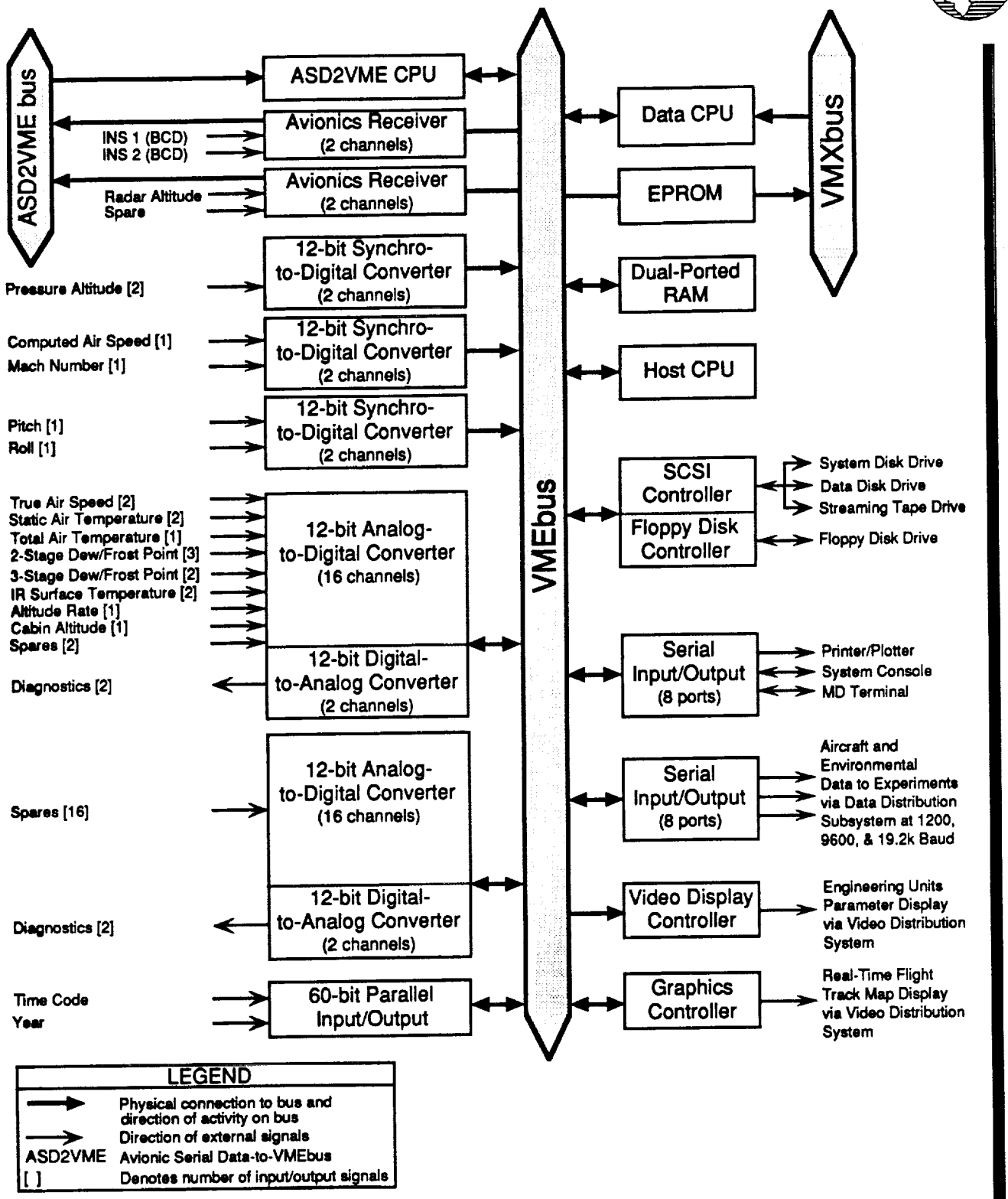
The Data subsystem is dedicated to acquiring and processing data from aircraft support systems, sensors and the ASD2VME subsystem; transmitting processed data to an external Data Distribution subsystem; and displaying processed data on video monitors. Information about data formats and transmission rates are available through the Medium Altitude Missions Branch at ARC. The Data subsystem is a real-time, turn key subsystem in which custom software is combined with the pSOS-68K Real-time, Multi-tasking Operating System Kernel.

The ASD2VME subsystem collects data from two inertial navigation systems plus radar altitude data. The ASD2VME subsystem converts this

data to engineering units, thus reducing processing on the Data subsystem. It is a real-time, turn key subsystem consisting of two custom-built avionics receiver boards controlled by a CPU board running custom software.

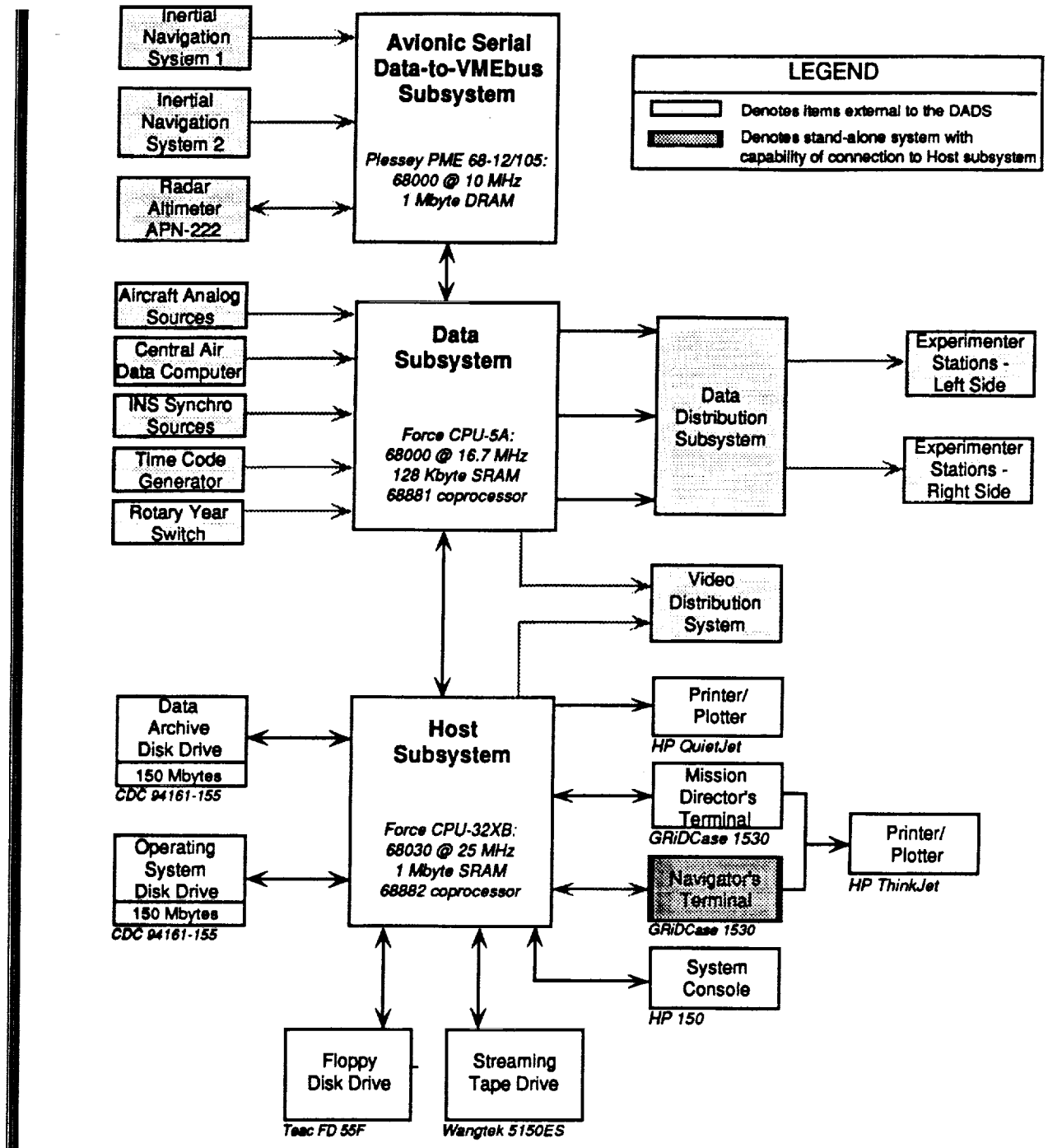
The Host subsystem performs functions that have no rigid real-time requirements, such as printing engineering units data on a character printer, recording data to disk files, logging mission director commentary, and post-flight data archival. Unlike the Data and ASD2VME subsystems, the Host subsystem is not turn key. The Host subsystem consists of custom software running under the UniFLEX Operating System.

Displayed and printed DADS data are configurable based on mission requirements. Calculated values, such as sun and moon azimuth and elevation, specific humidity and potential temperature, are available from the DADS. The majority of the avionics and environmental parameters that are displayed remains fairly constant from mission to mission.



DC-8 DATA ACQUISITION AND DISTRIBUTION SYSTEM (DADS)

INTERNAL CONFIGURATION



DC-8 DATA ACQUISITION AND DISTRIBUTION SYSTEM (DADS)
SYSTEM BLOCK DIAGRAM