MULTIPLEXER-DEMULTIPLEXER FOR HIGH SPEED DIGITAL RECORDERS

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ABSTRACT:

This paper describes a multiplexer-demultiplexer for high speed digital recorders.

The multiplexer-demultiplexer enables a single-channel recorder (for example, MIL-STD-2179 recorders) to be used with up to eight asynchronous data channels, each channel being analog or digital.

Time correlation between the different channels is preserved.
The multiplexer and the demultiplexer are modular products and can be used under different environments (ships, aircraft, laboratory, ...).

I - Objectives of the multiplexer-demultiplexer

The equipment presented in this paper is an interface for high speed digital recorders.

It enables the record/reproduce function for several asynchronous data channels (analog or digital) on a digital recorder with a single channel. It also performs several functions which are necessary for data storage and acquisition like recorders control, IRIG time code translation, data buffer, computer interface, etc...

II - Technical description

The equipment consists of two products : a multiplexer or, - recording interface and a demultiplexer, - or reproduce interface.

The multiplexer can be used under severe environments (aircraft, ships, ...) or in the laboratory.

Each product is modular. They are based on a high speed bus on which a various number of input/output modules for different channel types are connected. Other modules for time code translation, computer interface, data buffer etc ... may be inserted or not depending on the users requirements.

II.1 Multiplexer

The multiplexer converts each input signal into a digital format and multiplexes all the input data into a single frame which is sent to the recorder.

It consists of :

- a various number of input modules (up to eight)
- a multiplexer module

All these modules are connected to the same high speed bus. Analog input modules digitize the input signal. Digital input modules convert the input data which may be ECL, TTL, serial parallel, etc... into the same internal format.

The multiplexer module takes the data from each input module and generates a fixed length frame. This frame consists of a synchronization word, a header, and for each input channel, a header and the data block. When the aggregate rate is lower than the recording rate, filler is inserted at the end of the frame.

The headers contain all the information necessary for demultiplexing. The header of each data block contains the size of the data block. This size depends on the rate of the channels.

II.2 Demultiplexer

The demultiplexer demultiplexes the different channels and reconstructs the users data with the format and the rate they had when recorded.

It consists of :

- a demultiplexer module
- a various number of output modules (up to eight)

- optional modules for :
    - recorder control
    - time code translation
    - data buffer
    - computer interface

The demultiplexer module is connected to the recorder. It performs frame synchronization and sends each data block to the corresponding output module. In each output module data are converted to their original format (analog, digital, serial, parallel, ...) and the channel's rate is computed. Data are supplied at a continuous rate. To compute the output rate the output module uses the size of data block in the successive frames and the number of data words stored in it's internal memory.

II.3 Computer interface

When reproducing, the data can also be sent to a computer through a DMA link to any other high speed link. In this case the demultiplexer includes a computer interface module. This module is connected on the high speed bus. It receives the data from the demultiplexer module and sends them to the computer.

II.4 Recorder's control

The demultiplexer has the capability to control one or several recorders. When the demultiplexer is used with a recorder, the user does not have to control these two equipments separately. For each function to perform (reproduce, speed selection, time searching, etc ...) the demultiplexer sends the appropriate commands to the recorder. For example for time searching, the demultiplexer performs the time code translation and controls the recorder until the required time is found. In this case a time code translator is inserted in the demultiplexer. IRIG time is recorded on the linear auxiliary track of the recorder.

II.5 Data buffer

A buffer module may be inserted in the interface. It enables record and reproduce of data which is slower than the minimum recorder's rate (when data are sent to a computer for example).
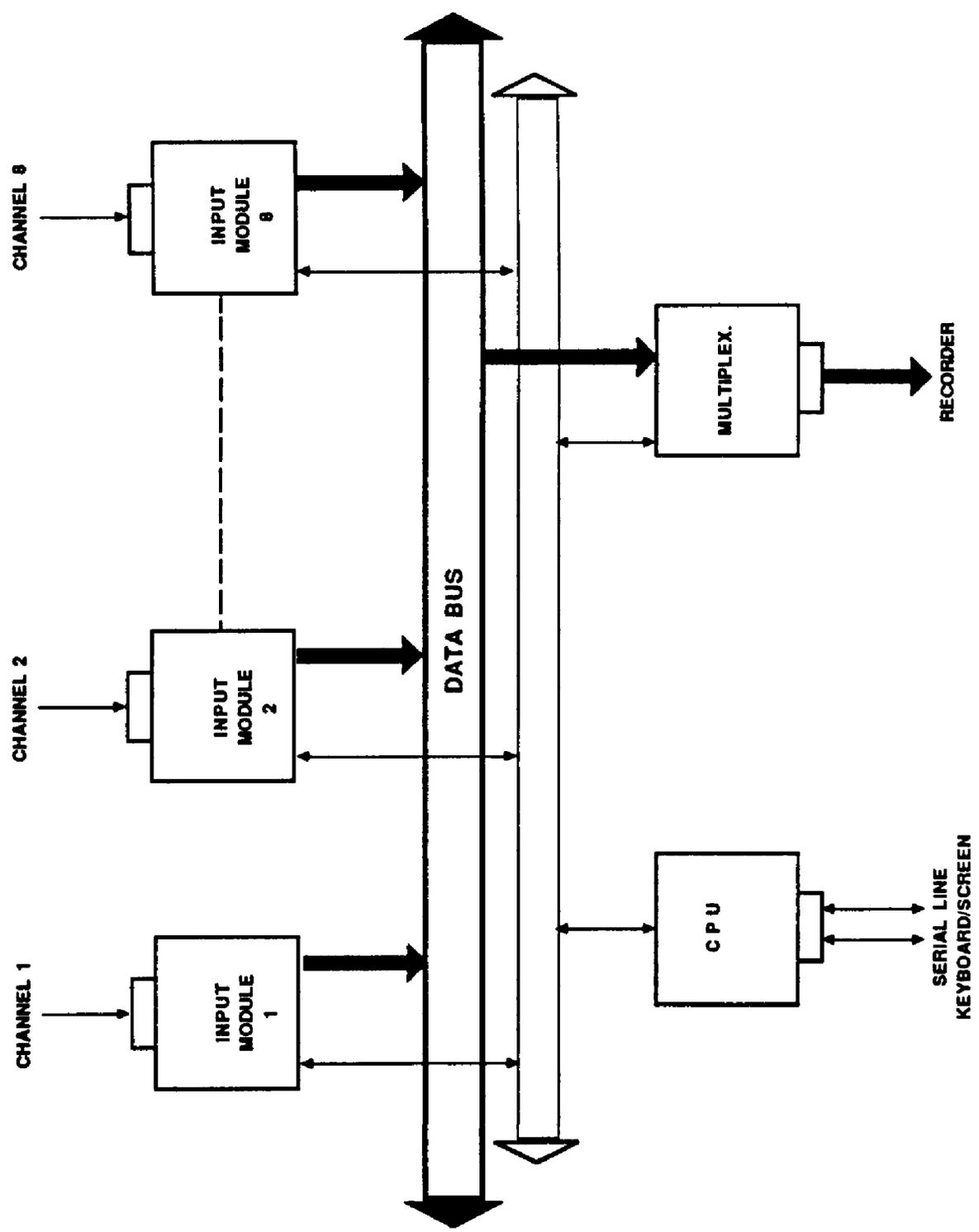
For recording, the buffer module is inserted between the multiplexer module and the recorder. For reproduce, the buffer module is inserted between the recorder and the demultiplexer module. The interface sends the start or stop commands to the recorder depending on the amount of data in the buffer.
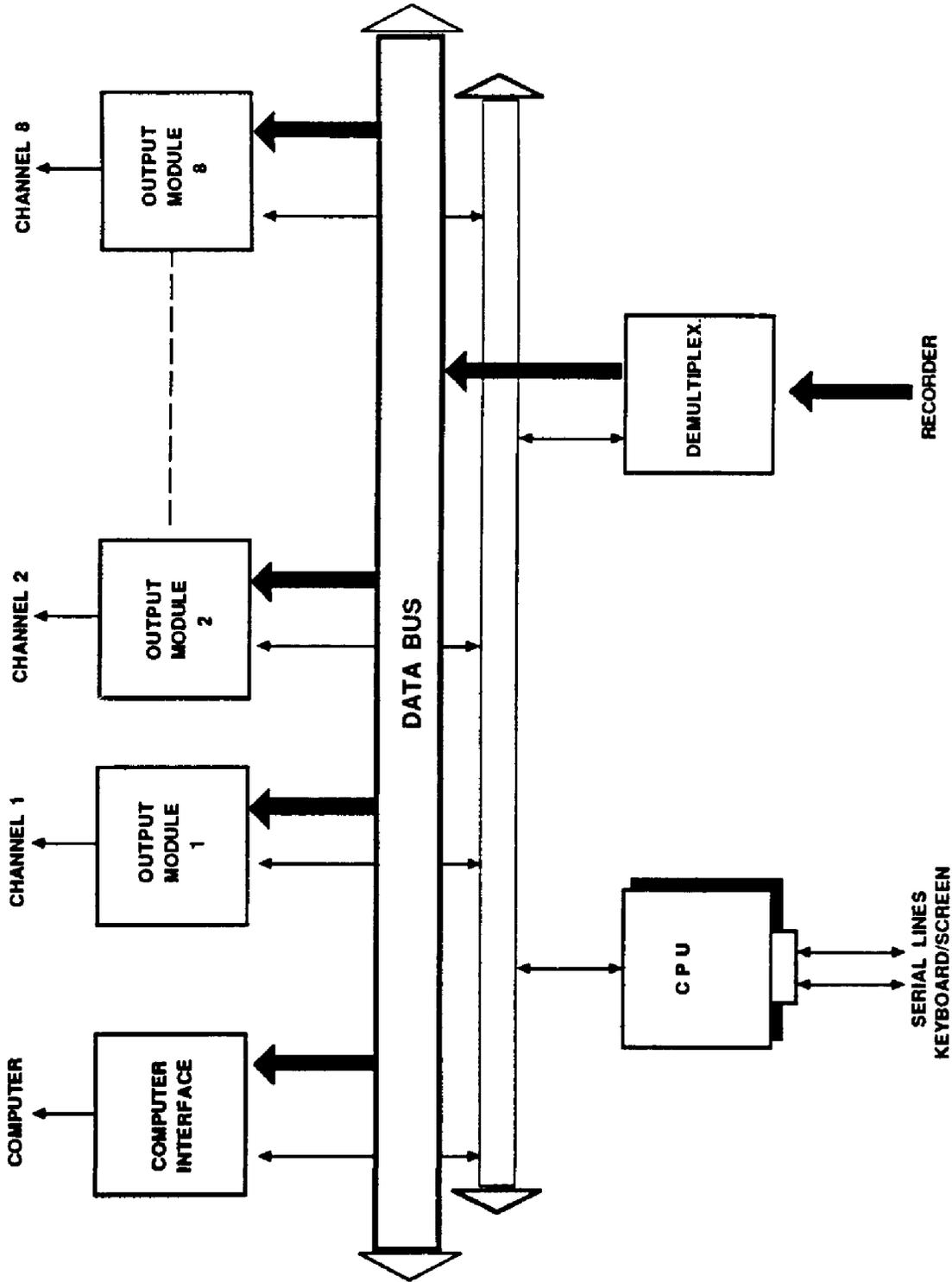
II.6 Physical description

The groundstation demultiplexer and the multiplexer are each constructed in a single box which can be rackmounted. Its height is 7 U or 3U depending upon the required module count, and its width 19". Set up may be done with through high level menus, on a keyboard and a screen connected to the demultiplexer, or through a serial line or IEEE interface.

The on-board multiplexer is a single ruggedized 1-ATR box. Set up is done through a serial line and the configuration is stored in non-volatile memory.

MULTIPLEXER

CHANNEL 1

CHANNEL 2

CHANNEL 8

INPUT MODULE 1

INPUT MODULE 2

INPUT MODULE 8

DATA BUS

CPU

MULTIPLEX.

RECORDER

SERIAL LINE
KEYBOARD/SCREEN

DEMULTIPLEXER

BLOCK STRUCTURE

SYNCHRONISATION WORD
HEADER
CHANEL 1 HEADER
CHANEL 1 DATA
CHANEL 2 HEADER
CHANEL 2 DATA
CHANEL8 HEADER
CHANEL 8 DATA
FILLER