A RE-ENTRY METERING DATA PROCESSING SYSTEM

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ABSTRACT

This article introduces a system for processing data from re-entry flying object's internal telemetry and its flying trace. That system receives data from various demodulators in re-entry synthetic metering systems, stores those data into disk in realtime and processes part of the data and displays the results in realtime(such as strip picture, parameter curve, value table, internal time-base, alarm and so on). Further processing may be completed afterwards using stored data. Multi-layer intelligent buffer and shared storage techniques are adopted in the system to get a high speed and large capacity data link between demodulators and super-microcomputer. The system's hardware and software design and its operation are described in the article.

There are two main tasks in re-entry metering. One is the telemetry of flying object's internal parameter. The other is to meter the object's flying trace. Conventional designs carry out re-entry metering in two seperate systems for the two tasks. Each has its own metering system and data processing system. Re-entry synthetic metering system design combines the two systems into one to take over the two tasks(re-entry telemetry and tracking) (refer to reference article No.1). The re-entry metering data processing system introduced here carry out data processing both for telemetering and tracking. The system possesses interfaces to various data demodulators in a re-entry metering system, receives data from those demodulators, processes the data and stores the data into disk in real-time and processes the data thoroughly afterwards.

With multilayer intelligent structure to receive data from demodulators and pre-process the data, the main computer's work is largely decreased. And with share memory technique

and buffer switch technique, the difficulty for transferring data into main computer with high speed is diminished and the main computer's burden is tightened even more. So it is possible for a microcomputer to be used as a main computer in the re-entry metering data processing system. The system is described in detail below:

I. System's configuration and its operation:

The system consists of a 8086 microcomputer system and a multi-layer intelligent data input/pre-processing interface.

a. Multi-layer intelligent data input/pre-processing interface, see fig 1 for the interface's structure frame diagram.

The interface is made up of upper layer intelligent data pre-processing module and several lower layer intelligent data acquisition/pre-processing modules.

fig 2. Shows the block configuration of a lower intelligent data acquisition/pre-processing module. The module is linked to upper layer intelligent data pre-processing module through local bus. They exchange data using share memory buffer on lower layer modules. Several lower layer module may be linked onto local bus. Each of them has different data demodulator interface. So the system can support various data demodulators in a re-entry metering system.

When data come into the lower layer module from the demodulator interface, the microcessor block then receives the data, pre-processes them and arranges them into one of the two share buffers. When the buffer is filled, the other buffer is switched on and the filled buffer is set for access by upper layer data pre-processing module, so the exchange of a large group of data is completed in a short time.

fig 3 Shows the diagram of upper layer intelligent data pre-processing module.

The upper layer module gets data from the share buffers on the lower layer modules through local bus, further pre-processes the data and puts the processed data into blocks and sends them into one of the two on-board buffers that are

shared with the main computer. The upper layer module exchange data with the main computer in the same way as the the lower layer module to the upper layer module. It uses the two onboard share buffers alternatively. When one buffer is filled with data, it is switched to use the other and inform the main computer that data is ready for processing. The upper layer module interfaces with the main computer through multibus. The two on-board share buffers can be accessed by the main computer, so that saves time for data exchange and tightens the main computer's reception burden.

b. 8086 microcomputer system:

This re-entry metering data processing system uses 8086 microcomputer as the system's main computer. It mainly consists of a 8086 microcomputer(include disk and disket), a high resolution graphic terminal, a plotter and a printer. The microcomputer uses multibus structure and directly accesses the share buffer on the upper layer module through multibus. The main computer carry out following tasks: overall system initialization, supervision the work of every part of the system, function selections and support entries to various functions. In real-time mode, the main computer further process the data in the share buffer on the upper board, stores the data into disk and output the processed data to the graphic terminal, printer and plotter in various formats to have a real-time report of the data (both for conventional telemetry and tracing). In afterwards mode, the main computer processes the stored data and output the results in various formats to the graphic terminal, printer and plotter to have a desirable view of the telemetry data and tracing data.

fig 4 Illustrate the block diagram of the main computer.

II. System software introduction:

Just as its hardware configuration, the system's software has a three layer structure. It consists of lower layer data acquisition/preprocessing software package, upper layer data preprocessing software package and the main computer data processing software package.

The lower layer and the upper layer software package are built-in softwares on the corresponding board. They both work under direction of the initial parameters transferred from the main computer software. There are various tower layer software packages that support interfaces to different data demodulators.

The main computer software is a multi task software. It consists of ten modules, such as main module, initialization module, interrupt service module, disk operation module, data computing module, keyboard module, graphic terminal module, plotter module, printer module and stored data processing module. Each module functions as a task and occupies the main computer according to its priority. The software offers three main functions. One is initialization, which inputs initial parameters, carries out system's self-test and gets the system ready for operation.

The second is real-timeprocessing, which stores the real-time data into disk, processes some of the internal telemetry parameters and computs tracking data and displays the results on the graphic terminal to have a quick view of real-time data. There are several real-time display patterns such as bar charts, value table, parameter curves, alarms, track display and a mixed-up of them.

The third is stored data processing, which carries out the various conventional telemetry data processing functions and computs the tracking data to get a more precise flying track, using the data stored in disk in real-time. The results can he printed, displayed or plotted in various modes to meet the requirements of the telemetry and tracking.

Thank Professor Liu Shi-Yan for his helpful suggestions.

REFERENCE:

[1] Xie Ming-Xun, Re-entry Synthetic Metering System, Telemetry and Telecontrol, 1987.2

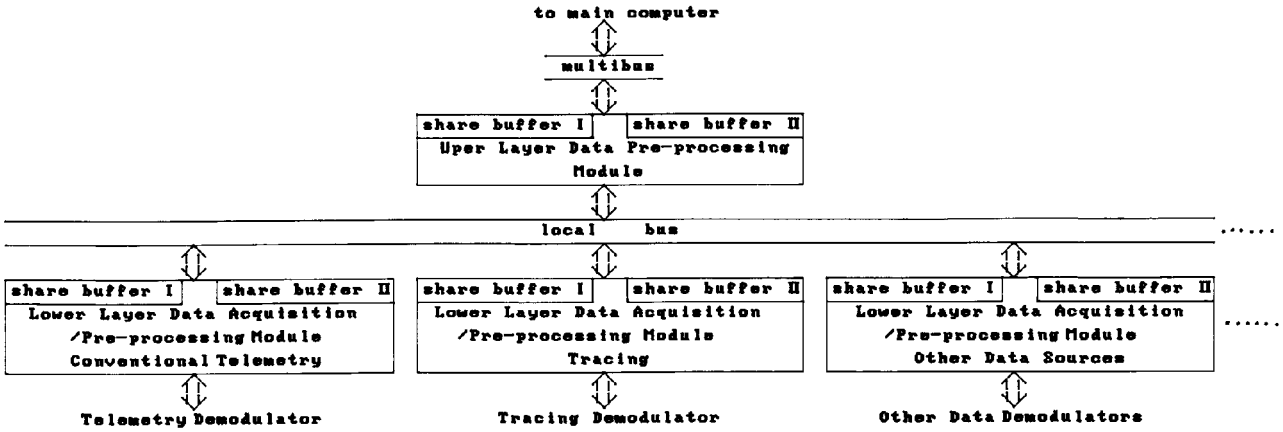

fig 1. Multi layer data acquisition/pre-processing configuration

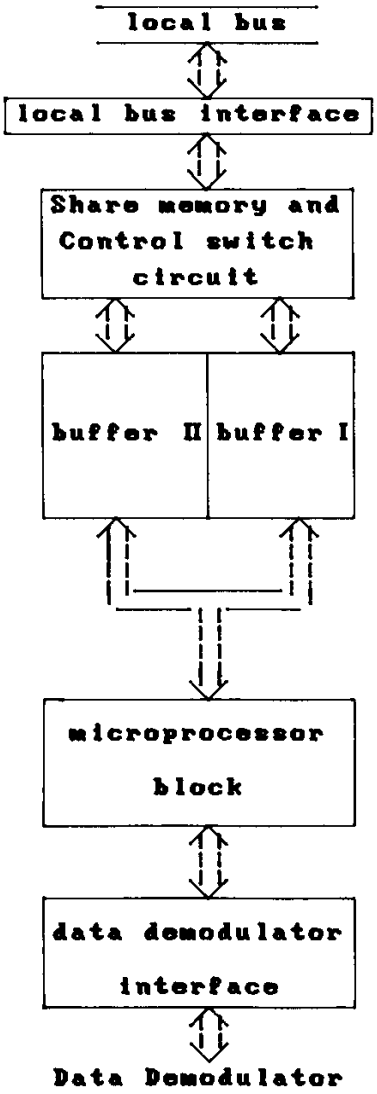

fig2. Lower layer intelligent data acquisition/pre-processing module diagram

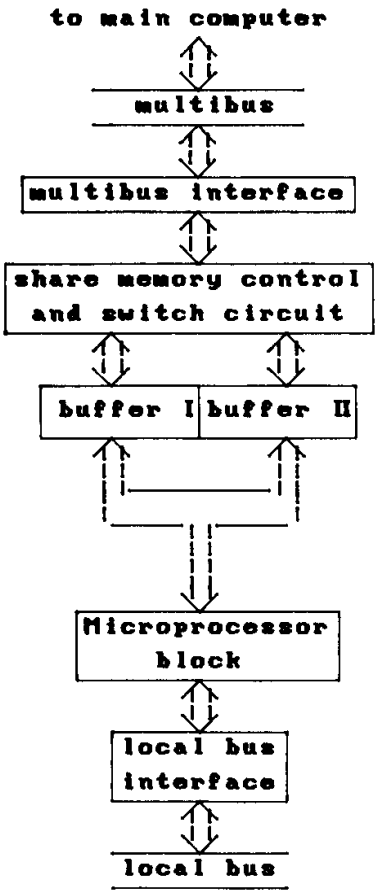

fig3. Upper layer intelligent data pre-processing module diagram

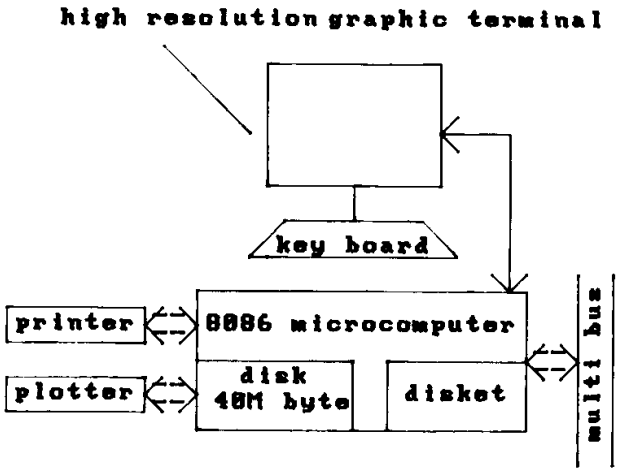

fig4. The main computer configuration