Inbound High-Speed and Wideband Data Synchronizers

P. F. Peavler
SFOF/GCF Development Section

The SFOF high-speed and wideband data synchronizers accept serial, blocked, digital data from the GCF. These synchronizers establish synchronization, detect and delete filler blocks, perform serial-to-parallel conversion, and output this data to two IBM 360/75 computers.

I. Introduction

The SFOF Mark IIIA computer configuration, as part of the DSN, includes inbound high-speed and wideband data capability. Outbound high-speed data conversion is described in Ref. 1. High-speed circuits will be used to handle tracking, telemetry, command, and monitor and operations control data. Wideband circuits will handle video information.

High-speed data is transmitted at a rate of 4800 bits/s; wideband data at 50,000 bits/s. High-speed and wideband data synchronizers are functionally identical except for speed of operation and input interface requirements.

II. Functional Characteristics

The high-speed and wideband data synchronizers (Fig. 1) were developed to perform the following functions:

(1) Accept serial-blocked digital data and control signals.

(2) Synchronize the incoming data by utilizing a sync word imbedded in each data block.

(3) Convert the serial data into computer words.

(4) Present these words to two digital computers.

In addition to the four basic functions, the synchronizers also detect and delete filler blocks. These filler blocks are not transmitted to the computer to minimize processing overhead because their prime function is to keep ground communication equipment in lock when data are not present.

III. Input

These synchronizers accept control and data signals at the terminator and receiver section. The terminators and receivers in the high-speed data synchronizers conform to Electronic Industries Association Standard RS-232-C. The wideband data unit conforms to characteristics outlined in JPL Service Specification LS 505391, Ground Communications Facility, Standard Wideband Data Interface.

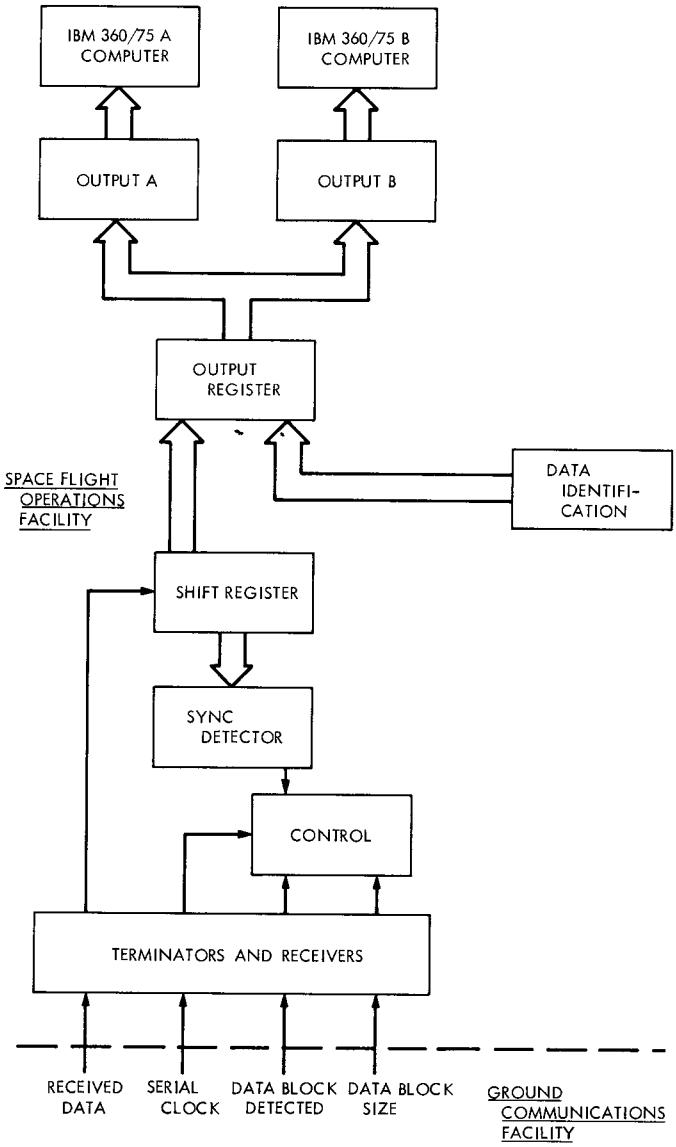

Fig. 1. Synchronizer block diagram

IV. Synchronization

Synchronization, or framing of the data blocks, is attempted in two ways: (1) by examining the serial data moving through a shift register for the standard sync word of 24 bits, and (2) by monitoring a control circuit supplied by the GCF. Data to the computer will be tagged by the addition of an extra word to indicate how synchronization was accomplished. These two methods are employed to provide synchronization of data blocks during conditions when bit errors would not otherwise allow synchronization. The sync detector connected to the shift register can be preset to allow 0-, 1-, 2-, or 3-bit errors. These errors may occur in any position within the sync word.

V. Conversion

Conversion of serial data to computer words is accomplished by use of a shift register of computer word length (32-bits) and an output register of the same size.

VI. Output

Presentation to the computer employs a modified demand response technique. The data demand indicates to the computer that a data word is ready for transfer. The technique is modified in the case of the computer response. This is done because the output is presented to two computers simultaneously.

The presentation to the computer includes a data identification word transferred after the last word of the block. This word identifies the synchronizer, the data circuit to which the synchronizer is connected, the number of bit errors allowed in the sync word by the sync detector, and the method of synchronization by which the block was framed.

VII. Conclusion

This equipment, as part of the SFOF, enables inbound communication. The synchronizers, with the capability of framing data that may have bit errors, enhance the synchronization ability of the inbound data path. These units also relieve the computer of the task of editing filler blocks.

Reference

1. Mullen, P. G., "High-Speed Data, SFOF Outbound Communication," in *The Deep Space Network,* Space Programs Summary 37-65, Vol. II, p. 101. Jet Propulsion Laboratory, Pasadena, Calif., Sep. 30, 1970.