IBM 360/75–Univac 1108 Computer Interface

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A serial synchronous communication method for short distances without the use of modems is described. Reducing the total resistance between the current mode drivers and receivers makes transmission lengths of 400 ft possible. External timing replaces the modem function, allowing the direct connection of serial synchronous devices.

I. Introduction

Reference 1 describes the functional design of the SFOF for the 1970–1972 era. As described therein, a capability for interfacing the Central Processing System with the Scientific Computing Facility will exist. This interface is required to implement the transfer of orbital and trajectory data between programs in the IBM 360/75 and the Univac 1108 computers for the *Mariner* Mars 1971 and *Pioneer F* missions. An electrical interface has been designed for this purpose. This interface will provide for the transmission of 10^7 bits of data from computer to computer in a time span of 10 min. This article describes the interface design which provides a method of synchronous communication for short distances without the use of modems.

II. Required Capabilities

The required capabilities for the interface were:

(1) A data transmission length between machines of 400 ft.

(2) A data path from each IBM 360/75 to both Univac 1108s.

(3) Actual data rates of 17 kbps or greater.

It was decided to switch single lines from each computer rather than having dedicated lines from each IBM 360/75 to each Univac 1108 (Fig. 1). This minimized the hardware costs and kept the address requirements to one

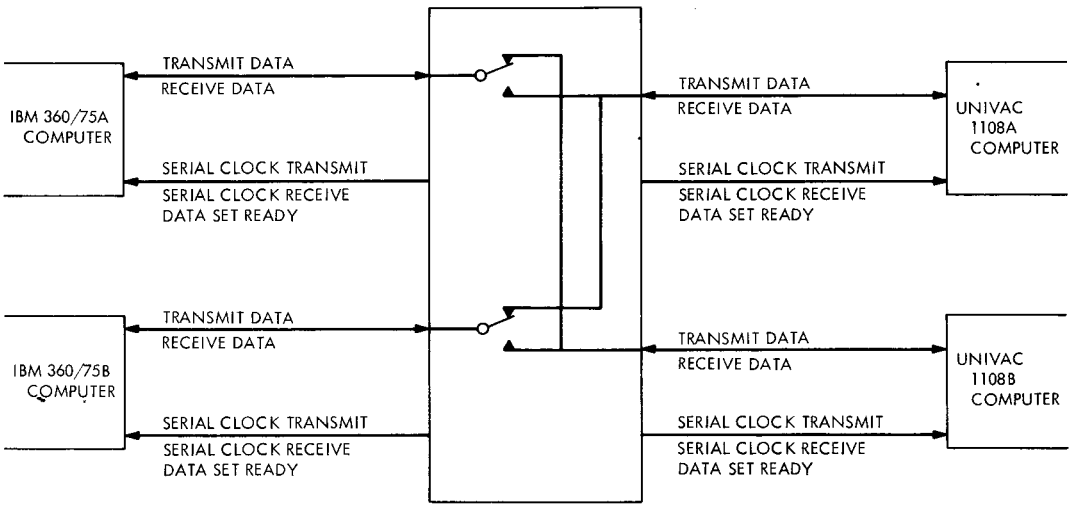

Fig. 1. IBM 360/75–Univac 1108 coupler interfaces

per machine. The decision also eliminated the possibility of a direct channel-to-channel connection because of the complexity of the related switch and the high cost.

A serial interface using modems offered the most direct method to meet the required capabilities. All other choices would require additional hardware for driving and receiving the signal lines. Additionally, modem communications were already supported on the Univac 1108.

Past experience with the current drivers of devices connected to modems suggested a modification: use low-resistance coaxial cable in place of the normal high-resistance cable. Since the length of the transmission path is limited by the total resistance between the driver and receiver, longer than normal lengths are feasible. Tests confirmed that the IBM and Univac drivers could drive in excess of 400 ft. Eliminating the modems would require additional logic to provide timing and enabling signals but would allow the use of JPL-owned lines and switch versus leased modems, lines, and switch.

III. Implementation

The 75–1108 coupler provides the signals normally supplied by a modem (Fig. 2). Logic within the coupler divides and squares a 100-kHz crystal clock for input to current mode drivers. Clock is sent to all serial devices at all times while DATA SET READY (DSR) is included in the switching. DSR at the serial device then is true only if the device is connected.

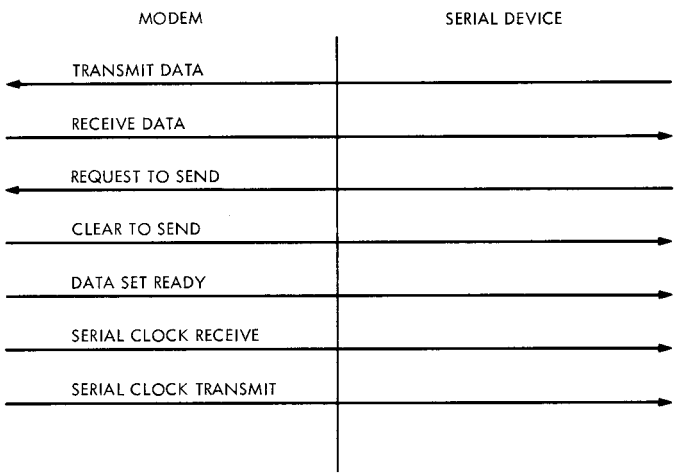

Fig. 2. Modem interface signals

Data lines, TRANSMIT DATA (TD), and RECEIVE DATA (RD) are connected within the switch (TD and RD to RD and TD, respectively, for the two connected devices). REQUEST TO SEND (RS) and CLEAR TO SEND (CS) are connected at each serial device. This is possible since RS can be raised only if DSR is valid, which means the line is either clear or the device is receiving. If the device is receiving, it will not raise RS.

An added advantage was the simplified switching problem since the number of lines was reduced when compared to a switch between a modem and two serial devices. Also, the difficulties of switching the modem-to-modem lines were avoided.

IV. Conclusion

The use of the coupler permitted a direct solution of the electrical interface requirement using serial synchronous devices. Design problems were simplified by using the coupler. Initial costs were comparable to using modems but with no further lease expenses for modems, lines, or switch.

Reference

1. Simon, H. S., "Functional Design of the Space Flight Operations Facility for the 1970–1972 Era," in *The Deep Space Network*, Space Programs Summary 37-66, Vol. II, pp. 90–94. Jet Propulsion Laboratory, Pasadena, Calif., Nov. 30, 1970.