

# NASA TECH BRIEF



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## Multiplexing Control Device Enables Handling of Wide Variations in Sampling Rates

A telecommunications system, which has been under study in conjunction with the NASA Emplaced Scientific Station (ESS) project, has two basic functions. The first is the task of collecting data from various lunar experiments and transmitting it to the earth. The second is to provide an earth control capability for the activation and adjustment of the various scientific instruments and control of other subsystem operations. Because of the experimental nature of the ESS, a versatile and flexible telecommunications system is required.

The proposed ESS telecommunication system concept provides the ability to change according to needs indicated by the data. Ordinary telemetry systems, such as those used in modern missile and space applications, measure quantities according to a rigid, unchangeable format (measurement sampling sequence). In the case of PCM or other sampled data systems, the frequency and order of sampling each parameter are fixed. This is a suitable technique for many applications, since time is generally not available during the life of the system for evaluating the data to a sufficient degree that changes might be determined. Such an approach is not suitable for the ESS system. The ESS concept will permit changes to the sampling frequencies and format as often as required during the life of the system without any change to the hardware situated on the moon. Based upon a study of the requirements of the planned experiments, it has been determined that the system must measure about 400 data values each second. As a matter of providing a margin and to optimize the flexibility of the system, 480 data measurements per second have been selected as nominal capacity. The system will

operate in such a way that any function or parameter can be measured periodically at times corresponding to certain subsets of the possible 480 measurement times. The system will include a magnetic core memory as the data multiplexing control device which will store a set of 480 numbers, called addresses. To each experiment output, or other source of data, there is assigned an address. The memory is initially "loaded" with a set of 480 addresses by use of the earth-to-moon command radio link. The system then automatically sequences the memory to readout, one by one, all 480 addresses in one second. For each address there is a switching device or gate which will connect the corresponding measurement point to the digital data encoder each time its address is produced by the sequencing memory. The encoder samples the measurement value and produces a digital code output corresponding to the measured value. The sequencing through the 480 addresses continues until a new address program is loaded or a command to stop is given.

### Notes:

1. Suggested applications for the data multiplexing control device to be included in the ESS are in systems requiring a flexible time division multiplex format for data accumulation and transmission.
2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B67-10150

(continued overleaf)

**Patent status:**

No patent action is contemplated by NASA.

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