

December 1971

Brief 71-10504

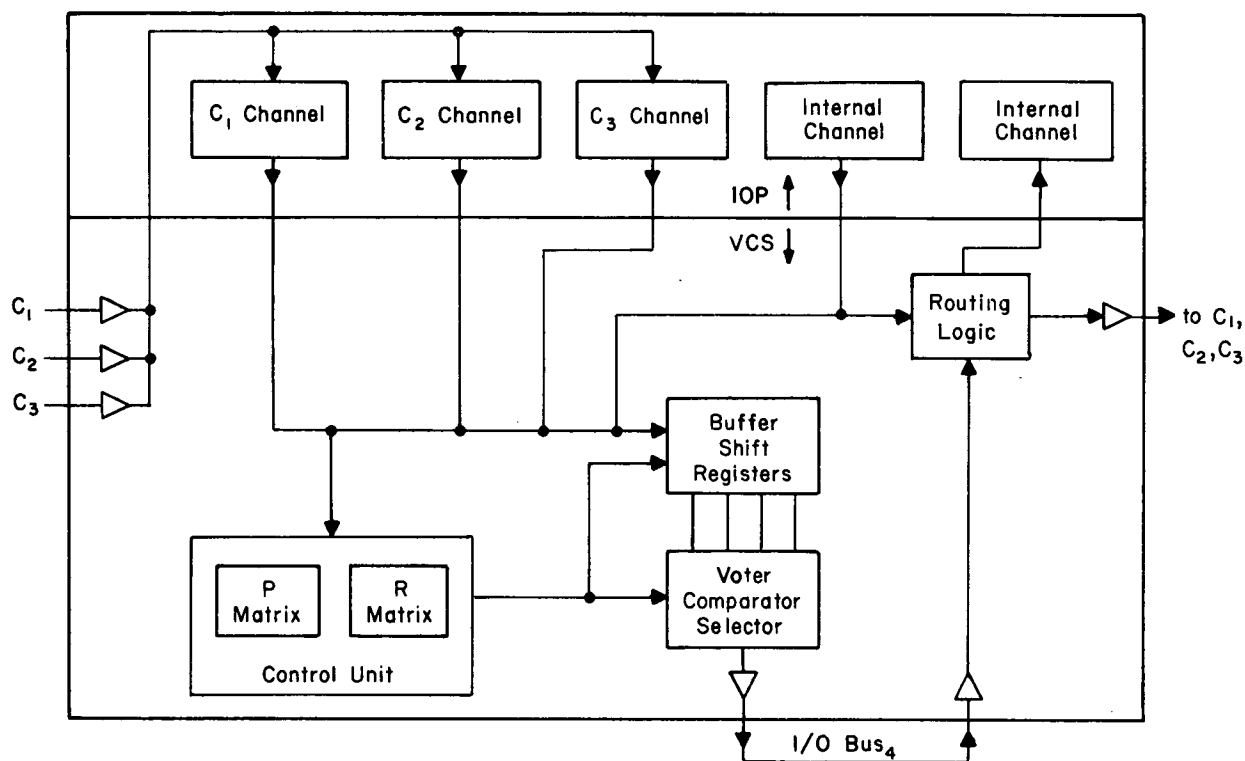
# NASA TECH BRIEF

## *Manned Spacecraft Center*



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### Voter Comparator Switch Provides Fail Safe Data Communications System: A Concept



Block Diagram

A voter comparator switch operates quad redundant computer systems in a fail-operative, fail-operative, fail safe mode. This new system indicates the status of the computers and controls the operational modes. It utilizes two matrices: one matrix relates to the permissible states of the system, the other matrix relates to the requested states of the system.

The illustration indicates the interface of the voter comparator switch (VCS) with the input-output processors (IOP).

The permissible states (P) matrix contains the failure status of each computer in the system. The requested states (R) matrix represents the desired mode of operation. Built-in test equipment performs go/no-go self

(continued overleaf)

tests on the P matrix to establish the failure status of a computer. Other computers in the system analyze this test data using adaptive majority logic to determine operational status. The R matrix operates under a majority decision rule. The R matrix ignores the computers which the P matrix designates as failed, and directs the connections of the selector logic to implement the mode of operation.

Buffer shift registers provide bit synchronous data to the selector logic. Routing logic determines the destination of all input data received over the input-output bus and determines which input-output processors are to receive copies of input data. For example, in a three-way voting mode, three input-output processors receive input data.

The system operates as a four-input voter, a three-input voter, a one-input comparator, a selector switch, or in a combination of modes. It operates on redundant data in a majority voting or comparison mode providing data redundancy reduction of 4:1, 3:1, or 2:1, or it operates on non-redundant data.

This concept may be useful to designers of digital data transmission systems and time shared computer systems.

**Note:**

No additional documentation is available. Specific questions however, may be directed to:

Technology Utilization Officer  
Manned Spacecraft Center, Code JM7  
Houston, Texas 77058  
Reference: B71-10504

**Patent status:**

No patent action is contemplated by NASA.

Source: L. J. Koczela and D. S. Wilgus  
North American Rockwell Corp.  
under contract to  
Manned Spacecraft Center  
(MSC-13932)