**PRODUCT FEATURE**

**CANbus-controlled Switch Matrices**

Coaxial electromechanical switch matrices are common in complex test equipment used in testing multiprotocol devices and subsystems. Electronic control of conventional switch matrices is based on standard interface buses, such as RS-232, RS-422 and the general-purpose interface bus (GPIB), and requires very complex wiring for control and power lines. As these switch matrices grow in complexity, the control-related interconnections between components become a real challenge, thus increasing design and integration time and affecting serviceability. A new series of electromechanical switch matrices has recently been developed based on the Controller Area Network (CAN).

**WHAT IS CAN?**

CAN is a serial network originally designed for the automotive industry that has become popular for other applications. The CANbus is primarily used in embedded systems and is the established network among micro-controllers. It is a two-wire, half-duplex, high-speed network system well suited for high-speed applications using short messages. The network is robust, reliable and enjoys extensive support from semiconductor manufacturers.

CAN theoretically links up to 2032 devices (assuming one node with one identifier) on a single network. It offers a high-speed communications rate of up to 1 Mbps, thus allowing real-time control. In addition, the error confinement and error detection features make it more reliable in a noisy-critical environment.

The CANbus system is a message-oriented not an address-oriented interface. To simplify the control process, each switch can have more than one identifier (address). For example, when there is a need to set a few selected switches to a required position during the matrix initiation process, an additional identifier can be implemented to all of these switches. All switches with this additional identifier will respond to one command from the outside control unit, which means they can be reset simultaneously.

**THE CANbus MATRIX DESIGN CONCEPT**

The basic building block of a CANbus matrix is an electromechanical switch incorporating a CANbus interface. Two versions of CANbus-controlled switches have been recently developed: an SP6T switch and a transfer switch. However, the CANbus interface can be easily implemented in any multiposition switch.

The control system design takes the form of a patch panel that allows connection of all of the switches to a common CANbus. No additional internal controller is required. The patch panel is connected directly to a standard PC using a National Instrument's CANbus interface card. CANbus cards are available in all popular standards, including PCI, AT and PCMCIA. The card is supplied with software that provides access to the CAN network. The CANbus matrix then is supplied with a complete software package that permits full control of all switches from a standard PC, including the ability to verify the status of the indicators for each individual switch.

**CANbus MATRIX CONFIGURATIONS**

Three basic CANbus matrix configurations are currently available. The model 2501 is a standard 6 × 6 CANbus switch matrix with six input and six output SP6T switches interconnected using semirigid cables. The model 2502 is a full access (fan-out) CANbus switch matrix utilizing six input broadband power dividers and six output SP6T switches interconnected with semirigid cables. The model 2503 is a 6 ×

Dow-Key Microwave Corp.
Ventura, CA

Reprinted with permission of *MICROWAVE JOURNAL*® from the September 2000 issue.

©2000 Horizon House Publications, Inc.
6 full access CANbus switch matrix incorporating six input low noise amplifiers (LNA), six broadband power dividers and six output SP6T switches interconnected with semirigid cable. Figure 1 shows the schematic of the model 2503 version. Table 1 lists the three models and their main performance parameters.

Selecting power dividers for the required frequency range can easily change the operating frequency of the fan-out matrix. Currently, the upper limit cannot exceed 18 GHz; however, future generations of the CANbus matrices will operate to 25 GHz. Selecting a fan-out matrix with the minimum frequency range necessary for a given application will ensure good performance at a reasonable cost.

**SERVICEABILITY**

The CANbus matrix design allows for easy replacement of switches. Each spare switch is provided with a unique identifier (address). If a defective switch must be replaced there is no need to order a switch with a particular identifier. The spare switch is installed in place of the defective one and, during the initiation of the control software, the self-test program will determine that one of the switches is missing and will identify the spare switch. The program then asks the operator if the address of the spare switch should be changed to the address of the missing switch. If the answer is yes, the spare switch identifier is changed to that of the removed switch and the matrix is ready to operate properly.

**APPLICATIONS**

Applications for the CANbus switch matrices center around automated test equipment (ATE), particularly for wireless applications such as base station equipment. In addition, the switch matrices find use in satellite earth stations, up and down link routing equipment, and terrestrial microwave links. The full access matrices are designed to cover all present and future wireless frequency applications. CANbus switch matrices are supplied in a rack-mountable cabinet approximately 19.0" W × 5.4" H × 18.3" D with all of the RF and control ports on the rear face. Additional information on the CANbus switch matrices may be obtained from the company's Web site at www.dowkey.com.

**Dow-Key Microwave Corp.**

Ventura, CA
(805) 650-0260