

TRAN Telecommunications Corporation M3000 Series Digital Circuit Switch

MANAGEMENT SUMMARY

The M3000 is a stand alone data communications switch that provides automatic routing of asynchronous terminal data streams to a user-selected destination. The M3000 operates in conjunction with TRAN time division, character-interleaved multiplexers; the high speed composite outputs of up to eight TRAN multiplexers can be handled by the basic switch with expansion in eight-trunk increments to a maximum of 48 trunks possible. The switch can accommodate up to 2048 low speed asynchronous channels (inputs to the multiplexers).

The terminal operator requests a certain network resource by entering the applicable address. The M3000 then locates the resource and makes a connection where possible; when the resource is not available, the requesting channel can be "camped on" in a first in/first out queue and a user selected message can be transmitted to the terminal. The switching is accomplished by assigning appropriate time slots in the high speed composite applicable to the resource selected; demultiplexing to the channel level is not required. In addition to high speed circuit switching, the M3000 design lends itself to port sharing and contention applications. M3000's can also be interconnected to communicate with one another in a large network; this capability requires a special software option.

The switch system employs TRAN M1100 Series and the M1308 Asynchronous Multitrans Multiplexers as the input/output subsystem at the nodes of an M3000 switched network. M2100 Series Synchronous Multitrans Multiplexers can be utilized to optimize telephone trunk usage, if desired. (More information on the TRAN multiplexers is contained in report C35-010-101.)

Additional TRAN devices that enhance the M3000 switch system include the Directran, Connectran, and Intertran short haul modems. The Directran and Connectran units employ a twisted pair to connect user terminals directly to a Multitrans Multiplexer. These modems also simulate dial-up protocol using Ring and Disconnect switches. The Intertran and Optran modems provide a high speed synchronous trunk to connect access nodes that are located in the proximity of the M3000 switch. Asynchronous channel switching is usually initiated at the terminal by depressing the Ring switch on the modem. (More information on these modems is presented in report C33-010-501.)

TRAN recommends use of its modems and multiplexers in the M3000 switch system. However, although there are certain features available with these products, (e.g., Ring switch on Directran and Connectran modems) that may not be offered with other manufacturers' like devices, there are no technical reasons why a compatible modem device could not be used in place of a TRAN device. ➤

Permits operators of asynchronous terminals to select specific computer resources in a network on a contention basis. Provides high speed circuit switching among up to eight trunks consisting of the composite outputs of TRAN time division multiplexers. Contention by up to 2048 low speed terminals is accommodated. The resources requested can be associated with multiple computers that are geographically dispersed.

The M3000 was designed to operate with TRAN multiplexers and data sets. A 200 channel, 8-trunk switch sells for approximately \$100,000.

CHARACTERISTICS

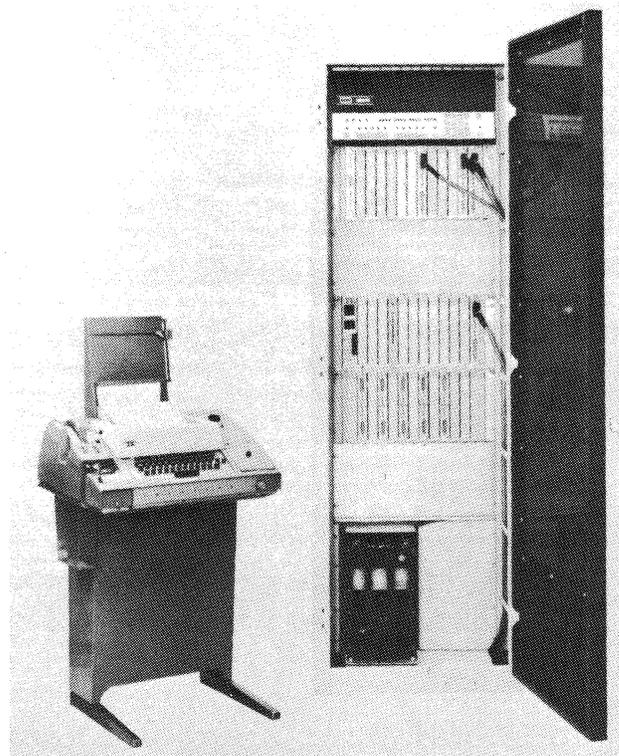
MANUFACTURER: TRAN Telecommunications Corporation, 2500 Walnut Avenue, Marina Del Rey, CA 90291. Telephone (213) 822-3202.

MODELS: The M3000 Digital Circuit Switch is available in one basic model, the M3000-3.

DATE OF ANNOUNCEMENT: July 1973.

DATE OF FIRST DELIVERY: November 1973.

NUMBER DELIVERED TO DATE: Approximately 25. ➤



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➤ The key features of the M3000 switch include the following:

- Features that permit selection of specific computer ports.
- Automatic speed recognition (autobaud) support for terminal access channels.
- Information/status messages to users.
- Network diagnostics including loopback and query tests.
- System control via M33 ASR Console.

Dedicated connect-on service is provided by TRAN data sets that employ private cables for interconnection. These devices simulate the dial-up protocol by using Ring and Disconnect switches. Thus a single telephone number may also be used for dial-up access by a number of terminals to multiple resources.

USER REACTION

In November 1979, Datapro conducted a telephone survey of four M3000 users having a total of six switches. The average length of installation was about four years. These users are operating very large systems in a quasi time sharing mode. The M3000 circuit switching and contention features ranked about equally in importance to these users. All were using at least some TRAN data sets in addition to the requisite time division multiplexers. The high speed trunks connected through the switch varied in number from 8 to 27 and averaged about 12. The trunk speeds ranged from 2400 bps to 72K bps. The ratings assigned by these users are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	0	3	1	0	2.8
Ease of installation	2	1	0	1	3.0
Ease of operation	3	1	0	0	3.8
Ease of expansion	2	1	0	1	3.0
Hardware reliability	0	3	1	0	2.8
Promptness of maintenance	1	1	1	0	3.0
Quality of maintenance	1	2	0	0	3.3

*Weighted Average based on 4.0 for Excellent.

➤ **SERVICED BY: TRAN Telecommunications Corporation.**

FUNCTION

The M3000 Digital Circuit Switches are designed to permit terminal operators using asynchronous terminals to select specific computer resources. These resources may be ports on a single computer; multiple computers at a single facility; or multiple computers at diverse locations accessible via transmission networks. The M3000 can provide a single telephone number for dial-up access to the computer resources.

CONFIGURATION

The M3000 switch is designed to operate in conjunction with TRAN asynchronous character-interleaved multiplexers. The M1125 and the M1308 Asynchronous Multiplexers (multiplexers) can be used with the M3000. These multiplexers support a wide range of resource channels and user access channels. Other TRAN equipment that enhances the capability of the M3000 switch system includes the Directran, Connectran, and Intertran data sets. The M3000-3 switch is mounted in the Model M116 Cabinet.

The Model M3000-3 Digital Circuit Switch is composed of the following basic components: Stored Program Controller, Model 33 ASR Console, Channel Subcontroller, Model 3020 Asynchronous I/O Controller, and provisions for accommodating up to 64 Model 301 RS-232 High Speed Synchronous Trunk Interfaces or up to 32 non-RS-232 Trunk Interfaces.

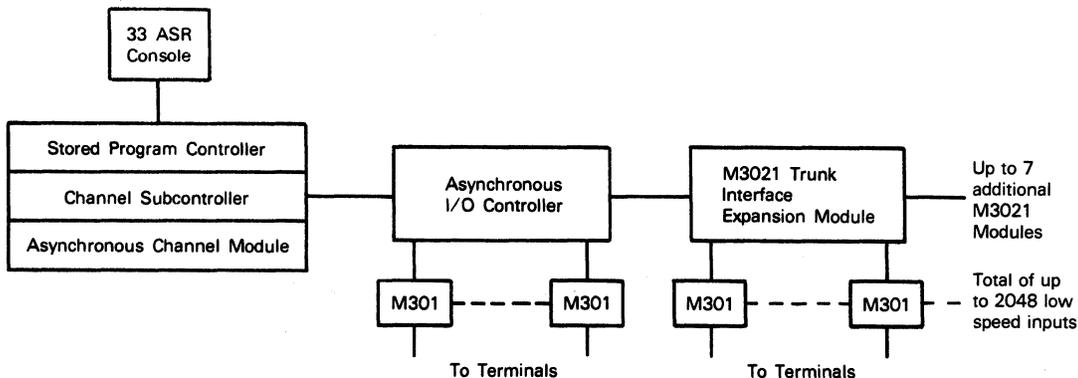
The Stored Program Controller, which consists of an internal stored program controller, channel controller, input/output and asynchronous channel module, employs a 16-bit word structure for internal logic and for directing the activities of the M3020 Controller.

A Model 33 Console connected to the Stored Program Controller provides for status inquiry, monitoring, and control.

The Channel Subcontroller resides on a printed circuit module and provides an interface to the asynchronous channel module.

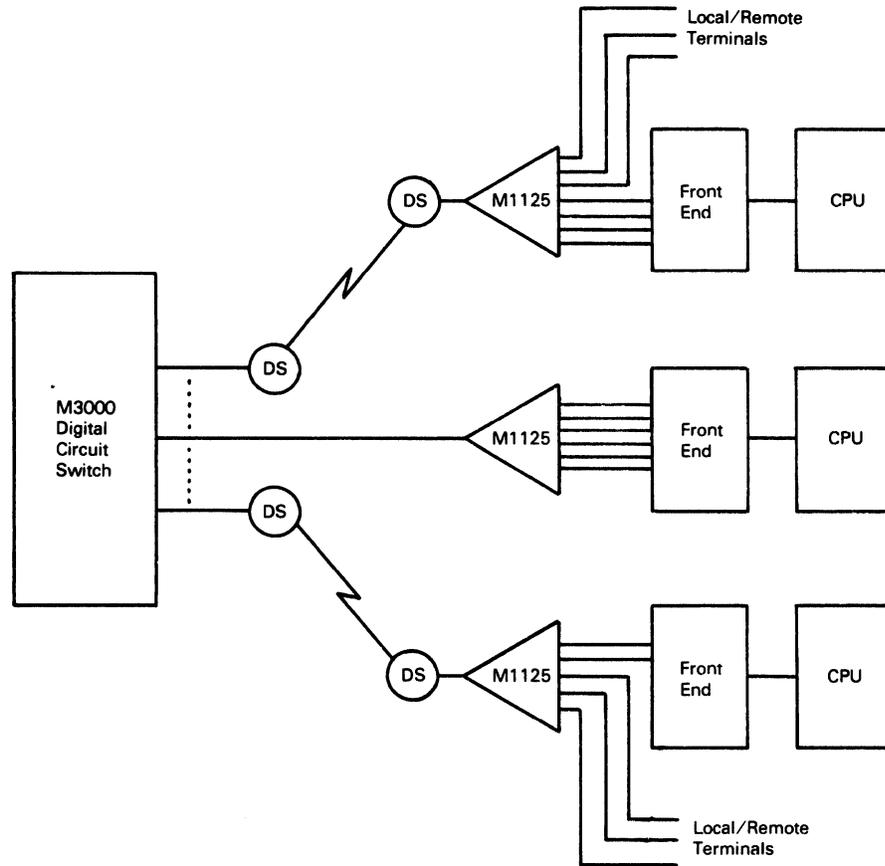
The M3020 Asynchronous I/O Controller controls the transfer of data between the High Speed Synchronous Trunk Interfaces as per system instructions.

The M3000 Series of trunk interfaces provide a full-duplex interface between the Asynchronous I/O Controller and the synchronous trunks. The data is serial in structure on the trunk side of the interface and parallel on the I/O Controller



M3000 Hardware Configuration

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Typical M3000 Switch System configuration

➤ Those contacted included a Fortune "500" company, a large university, a telephone company, and a government agency. One user did not rate maintenance because he performed his own. However, he did remark, as did all of the others, that support from the factory was poor. Turnaround time on repair parts and the availability of replacements were the two major complaints. One user said that the equipment was excellent but that he would tell anyone asking about it to "double TRAN's recommended spares list—you just can't get parts out of the factory". This seems to be the prevailing attitude although it is not indicated so strongly in the maintenance ratings because several users had resident TRAN customer engineers that were rated much better than factory support. The major complaint with the on site personnel is turnover, which TRAN has apparently had plenty of. The quality of documentation also tied in with maintenance to a degree. Aside from the manuals, internal factory documentation was criticized as being inadequate. Two users complained that TRAN wasn't careful about documenting what was in the field and sent technicians out with the wrong manuals and filled orders with the wrong revision level of card, which would not operate in their system.

The Poor rating for Ease of installation came from a user that had two switches installed some three years apart. He claimed that the first installation was fairly smooth but then there was plenty of time and service was ➤

➤ side. The Model M301 High Speed Synchronous Trunk Interface supports one high speed RS-232 data stream from an asynchronous multiplexer. Other interfaces available include M303 (MIL-STD-188) and M305 (Intertran short-haul modem). When a non-RS-232 trunk interface is used (i.e., other than the M301), the equivalent of two M301 interface slots is required for each non-RS-232 interface.

The M3000-3 supports 2048 asynchronous channels with each input channel equipped with automatic speed recognition capability. This capability allows the terminal operator to enter a predetermined character that is recognized by the Multitrans multiplexer. The multiplexer determines the data rate at which the terminal is operating and sends control signals along the data path to identify this speed. The M3000-3 is equipped to handle eight High Speed Synchronous Trunk Interfaces as standard. Seven Model M3021 Expansion Chassis can be optionally obtained. Each M3021 supports eight M301 Trunk Interfaces.

SYSTEM OPERATION

There are two levels of system operation. First, there is the user network management mode where the system control emanates from the console operator located at the M3000 Switch. Second, there is the control exercised by the terminal operator.

In the first level, once the system operator at the M33 ASR Console brings the network up and puts the system on-line, no further console intervention is necessary. The stored program includes operator commands that provide for status inquiry and monitoring. ➤

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▷ not disrupted as the system was slowly and carefully cut over. The second switch was another story. The two switches operate in tandem and any glitch on the second affects all users that had been operating on the first. He volunteered that the first switch was a year late in delivery and the second switch took over four months to cut over, with service disruption in the interim. This same user rated Ease of expansion as Poor for the same reason. The Reliability marks are fairly good, especially when considering the number of machine years of operation accounted for.

TRAN has been in the process of reorganization for some months, which provides users with some hope in the turnover and spares availability areas. A TRAN spokesman said that the documentation problems are known and corrective action is being taken. Despite the complaints, the Overall performance category indicates a reasonably well satisfied user base. The savings on line costs and flexibility in resource selection are highly appreciated, the support and documentation are not. The reorganization should correct most if not all of these problems. □

► Channel switching is initiated at the asynchronous terminal via a connect request. This request is facilitated by depressing the Ring switch on the Directran or Connectran data set. Upon receipt of the necessary input parameters, which are specified by the individual operator by entering a destination code, the M3000 switch identifies the port required to satisfy this request. When an available port has been found, the M3000 switch sends a connect request message to the CPU. Only after a favorable response is received from the CPU is the channel interconnected. The line connection is maintained until a disconnect request is received. With the automatic speed recognition capability, the operator must enter a single-character code prior to the destination code. The Multitran multiplexer uses this single-character code to determine the data rate.

The port selection procedure is initiated after receipt of a complete channel request from the terminal. If a port satisfying the requirements is available, the CPU connect protocol sequence is initiated. If no satisfactory port is presently available, the channel request is placed in a busy

queue until a satisfactory port is available or the channel request is timed out. The user specifies the length of the time-out period. Also, the switch transmits a "port busy" message to the requesting terminal when appropriate.

All channel requests that cannot be immediately serviced due to port unavailability are placed in a busy queue structured to connect requests on a first-in/first-out basis. In cases where a channel request is not granted due to an operator error or time-out, a message is sent to the terminal. In general, messages, contained in the stored program, inform the requesting terminal of the status of the request. The M3000-3 may utilize the optional M30-002 Information/Status Message feature to transmit a status message to all channels requesting interconnection.

The M30-002 Switch-to-Switch communications option allows the first M3000-3 switch in a series of switches to contend for data channels on a high speed synchronous trunk connected to the next switch in the series. That switch, in turn, contends either for ports associated with it or for data channels to another switch in the series.

The M3000 Switch supports a loopback test and a query test. The loopback test allows the console operator to send a message to any Multitran multiplexer which loops the message at the low speed channel, and the returned message is printed at the console. No intervention is required at the multiplexer to accomplish this test. The query test facilitates verification of network channel resources by allowing the console operator to query a particular terminal access channel and obtain the address of the resource connected to that channel. Diagnostic features of the Multitran are also available, including the capability of the M3000 to respond to remote loop tests conducted by the multiplexer. This test can be performed only when the pertinent channel is unconnected.

PHYSICAL SPECIFICATIONS

The M3000-3 Switch is designed to be mounted in the six-chassis M116 cabinet. The switch occupies two chassis positions. The optional trunk expansion feature occupies an additional chassis.

PRICING

The M3000 Asynchronous Digital Circuit Switches and the optional hardware features are available for purchase only.

		<u>Purchase Price</u>
M3000-3	Digital Circuit Switch	\$35,000
Optional Features		
M30-001	Switch-to-Switch Communications Option	2,500
M30-002	Information/Status Message Option	500
M3021	Trunk Interface Expansion Chassis	4,500
M301	RS-232 Synchronous Trunk Interface	1,300-1,350
M303	MIL-STD-188 Synchronous Trunk Interface	1,450
M305	Intertran Trunk Interface	2,200
M116	Six-chassis Cabinet with Power Supply	5,750
Multiplexers		
M1125	Asynchronous Multitran	5,250
M1308	Asynchronous Multitran	1,750-1,950
Data Sets		
	Directran	350
	Connectran	350-450
	Intertran	875-2,000■