

1200-TYPE DATA MULTIPLEXER DESCRIPTION

CONTENTS	PAGE
1. GENERAL	1
2. PHYSICAL DESCRIPTION	3
3. FUNCTIONAL DESCRIPTION	4
A. 1200-Type Data Multiplexer Components	4
B. Synchronous Arrangements	4
C. Asynchronous Arrangements	17
D. Data Multiplexer System Tests	17
4. REFERENCES	19

1. GENERAL

1.01 This section contains the physical and functional descriptions of the 1200-type Data Multiplexer (DM). The 1200-type DM consists of the 1200A and 1200B DMs.

1.02 This section is being reissued to include a description of the 1200B Data Multiplexer.

1.03 The 1200-type DMs are digital, time division multiplexers capable of multiplexing up to 16 asynchronous "low-speed" channels on one synchronous "high-speed" line for a 1200B DM and up to 3 synchronous "high-speed" lines for a 1200A DM. The addition of a 53A1 data mounting increases the asynchronous channel capacity from 16 to 32. The 1200-type DMs are apparatus-coded as follows:

- 1200A-L1/2—Remote DM
- 1200A-L1/2/5—Master DM

- 1200B L1 (16 channel)
- 1200B L1/2 (with adapter 32 channel).

1.04 In a Data Multiplex System (DMS), the master time division multiplexer must be a 1200A DM. The remote DMs may be either 1200A or 1200B DMs depending on the requirements of the system configuration being used. The master DM generates and delivers the frame for configuring the remote DMs. An example of a DMS is shown in Fig. 1.

1.05 The 1200A DM when used as a master DM generates timing, control, and test information for operation of the DMS. Bit timing normally taken from the synchronous data set or data service unit (DSU) serves synchronous port number 1 of the master 1200A DM. Channel speeds, codes, time slot assignments, and channel destinations are manually selected by an operator using an 1800A data control unit connected to the master 1200A DM (Fig. 2). The master 1200A DM internally constructs and transmits frame configuration information to the remote DMs specifying the speed and destination of all channels. Upon receipt of this control information, the remote DMs automatically configure themselves in the required manner.

1.06 The 1200A master DM has three synchronous ports and provides up to three different multiplexing frames per system. The beginning of each frame is identified by a sync word. The sync word is determined by the speed of the synchronous line involved. If two frames have the same speed they will have the same sync word. When all three synchronous ports are in use, one frame is sent through each port. The total number of frames constructed should be three or less. The sync word for each frame directs the frame to a specific remote 1200A or 1200B DM. "Drop" configurations are provided by sending two or three interleaved frames through one synchronous port.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

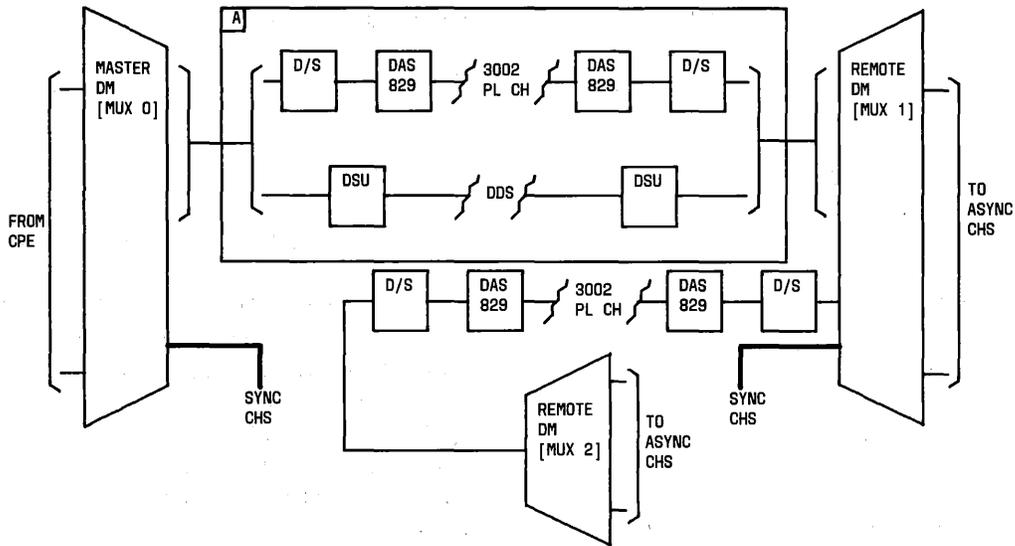


Fig. 1—Typical DMS Network Using 1200-Type DMs

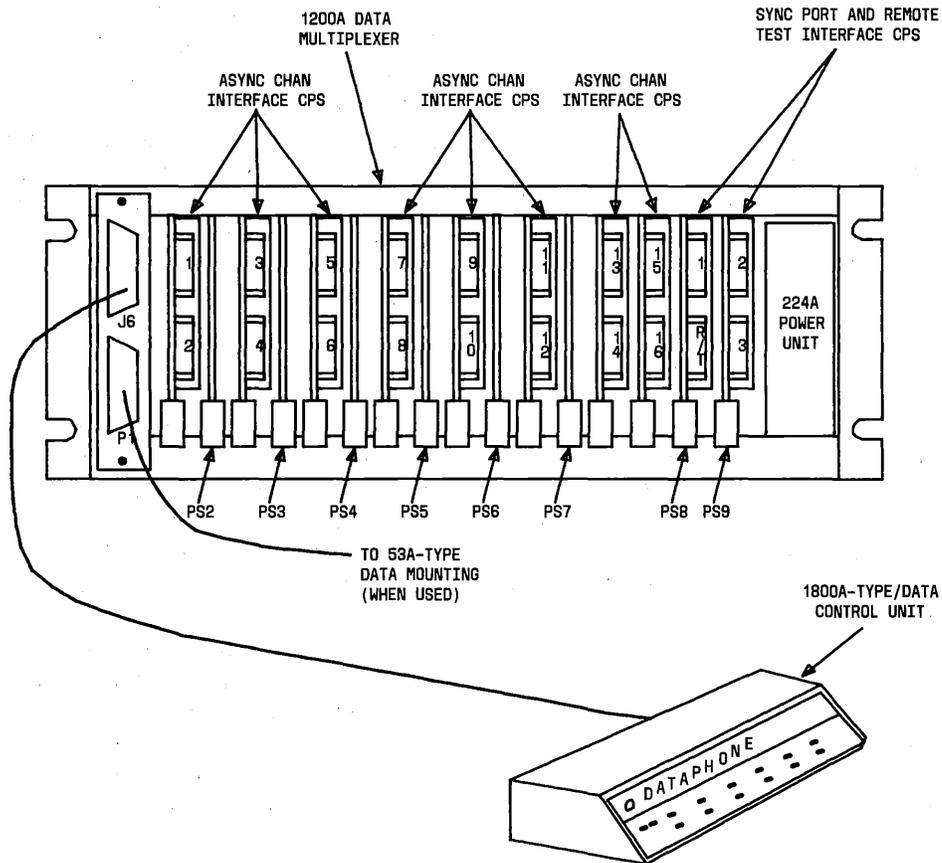


Fig. 2—1200A DM and 1800A-L1 Data Control Unit

In such configurations, one frame is dropped at an intermediate remote DM while the other frames are transmitted to the other remote DMs. The 1200B DM has only one synchronous port and cannot be used as an intermediate DM in "drop" configurations.

1.07 The master 1200A DM and the remote 1200A and/or 1200B DMs can be connected so that 18 DMS equipment arrangements are possible (Fig. 3). The total number of high-speed lines between DMs plus the number of derived synchronous channels in any configuration must be three or less. No more than three remote DMs can be in a configuration.

2. PHYSICAL DESCRIPTION

2.01 The 1200-type DMs consist of the 101A apparatus mounting, a 224-type power unit, and a rigid backplane for accepting circuit packs (CPs). See Fig. 4 and 5. The various system configurations and 1200-type DMs require a definite assortment of CPs.

2.02 The 1200-type DMs are 23 inches wide, 12 inches deep, and 8 inches high. The 1200A DM weighs approximately 42 pounds and the 1200B DM weighs approximately 32 pounds. They operate in an environment of 40 to 120°F, with a relative humidity of less than 95 percent.

2.03 The 1200A DM uses a 224A power unit and the 1200B uses a 224B power unit. Power requirements for the self-contained 224-type power units are 105 to 129 Vac at 57 to 63 Hz. The KS-14532 L20, power cord, 10 feet in length, is provided with the 1200-type DMs.

2.04 Customer provided equipment (CPE) used with the 1200-type DM and the EIA RS-232-C asynchronous channel interface must be terminated in a Cinch or Cannon DB-19604-432 or Amp 205784-1 (or equivalent) plug and a Cinch DB-51226-1 (or equivalent) hood. When Bell System data sets are used they must be connected to the 1200-type DM with a M25J cord. The asynchronous channel EIA interface is provided by a 25 pin connector on PS1. Each CP PS1 provides two EIA RS-232C asynchronous channel interfaces.

2.05 The 53A1 data mounting (Fig. 6) is used with the 1200-type DM to provide 16 additional asynchronous channels. It consists of the 101A

apparatus mounting, 224B power unit, backplane, and comcoded extender board (841 791 940). The 53A1 data mounting is 23 inches wide, 12 inches deep, 8 inches high, and weighs approximately 30 pounds. It will operate in an environment of 40 to 120°F, with a relative humidity of less than 95 percent.

2.06 Examples of cabinet arrangements for the 1200-type DM and associated equipment are shown in Fig. 7 and 8. These arrangements use KS-20018-type cabinets (or equivalent) to house the 1200-type DMs and associated synchronous and asynchronous channel data sets or DSUs and Data Auxiliary Set (DAS) 829s. Standard 23-inch frames may be used in central office arrangements.

2.07 Sixteen codes of CPs will be available for use in the 1200-type DMs.

- PS1—low speed, with dual 25-pin Electronic Industries Association (EIA) RS-232-C asynchronous channel connectors
- PS2—panel interface
- PS3—controller
- PS4—channel memory
- PS5—frame memory
- PS6—system control
- PS7—test circuit
- PS8—HS1 + remote test access, with dual 25-pin EIA connectors
- PS9B—HS2 + HS3, with dual 25-pin EIA connectors
- PS10—current interface circuit (20 mA or 62.5 mA) with dual 623P-4 modular telephone jacks
- PS11—MIL-188C, with dual 15-pin connectors
- PS12—low speed with dual 37-pin EIA asynchronous channel connectors (under development)

SECTION 590-104-101

- PS13—remote data set looping through interface (remote DM only) and central office display status
- PS14—memory circuit
- PS15—control circuit
- PS16—multiplexer test unit.

The CP requirements for 1200-type DM applications are shown in Table A.

3. FUNCTIONAL DESCRIPTION

A. 1200-Type Data Multiplexer Components

3.01 The 1200A DM, with 3 synchronous ports and 16 (expandable to 32) asynchronous channels, receives data from any asynchronous port. This data is time division multiplexed on a character-by-character basis onto any combination of the three synchronous ports. Synchronous data from one or two of the three ports can be interleaved on a character basis with asynchronous data and the combined stream directed to a synchronous port. Data from the synchronous terminals to the synchronous ports form derived synchronous channels. Therefore, derived synchronous and asynchronous channel intermixing is possible. Table B summarizes the permitted asynchronous and synchronous speeds.

3.02 The 1200B DM has only one synchronous port and 16 (expandable to 32) asynchronous channels. The asynchronous data from the asynchronous channels is time division multiplexed on a character-by-character basis onto a single synchronous line. Since a 1200B DM has a single synchronous port and this port must always be connected to another 1200A DM, derived synchronous channels are not possible with a 1200B DM.

3.03 The 1200A DM mode of operation is changeable since the rules for assigning time slots can

be varied by read-only-memory (ROM) change. One ROM will condition the multiplexer to operate in a standard time division format with fixed slots in the output frame for each input channel.

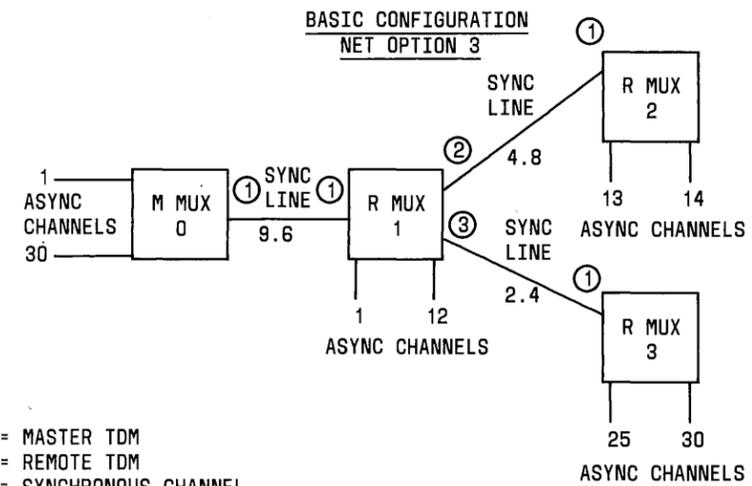
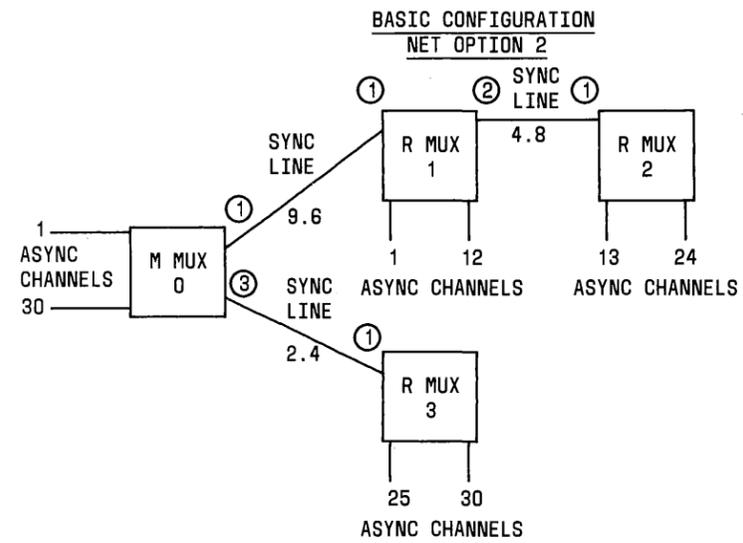
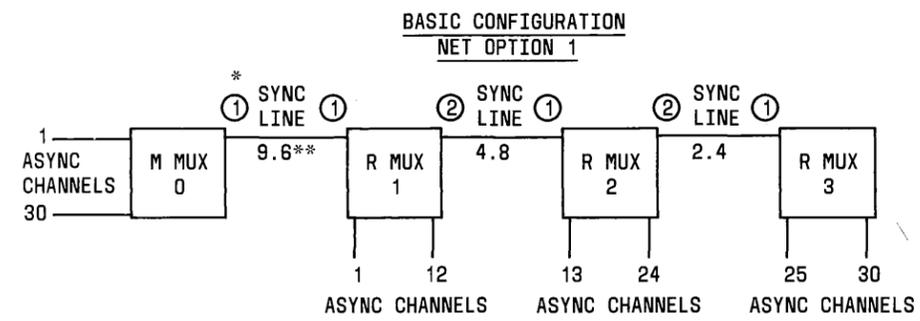
3.04 The 1200B DM is under control of the master 1200A DM and operates on fixed logic. The 1200B DM operates only in the standard multiplexing mode and receives time slot and channel assignment information from the master DM.

3.05 Control, monitoring, and testing can be accomplished through 1800-type data control units (Fig. 2) connected to the master 1200A-type DM after it is physically set up. The data control units (Section 590-104-103) provide the means to enter information for operation and testing of the DMS.

B. Synchronous Arrangements

3.06 The 1200A DM has the capacity to multiplex up to 16 (expandable to 32) asynchronous channels on up to 3 synchronous lines. The 3 synchronous lines, each operating at 1200, 2400, 4800, or 9600 bits per second (bps), handle various asynchronous speed combinations consistent with the synchronous line rate. The synchronous lines can be selected from either analog (3002 private line circuits) or digital transmission [digital data system (DDS)] circuit facilities. With a 1200A DM, any asynchronous channel may be directed to any synchronous line.

3.07 The 1200B DM also has the capacity to multiplex up to 16 (expandable to 32) asynchronous channels, but onto only 1 synchronous line. Since the 1200B DM has only one synchronous line, all synchronous channels connected to the 1200B are directed to the single synchronous line. The combined speeds of the asynchronous channels must not exceed the maximum speed of that synchronous line.



M MUX = MASTER TDM
 R MUX = REMOTE TDM
 SC = SYNCHRONOUS CHANNEL
 * = SYNCHRONOUS PORT NUMBER
 ** = SYNCHRONOUS LINE SPEED

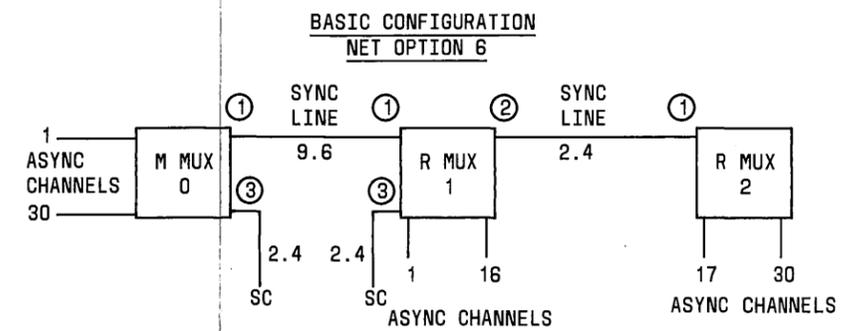
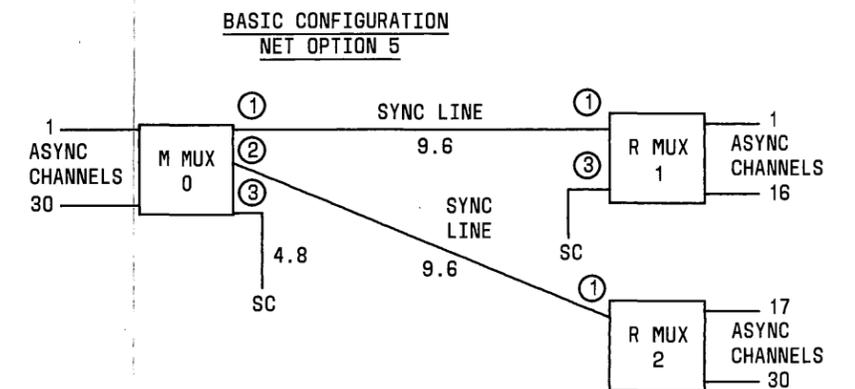
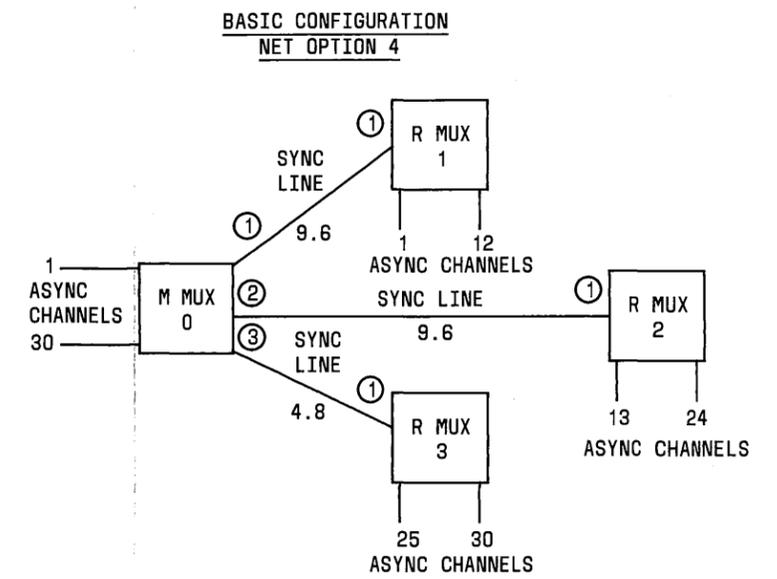


Fig. 3—DMS Equipment Arrangements (Sheet 1 of 3)

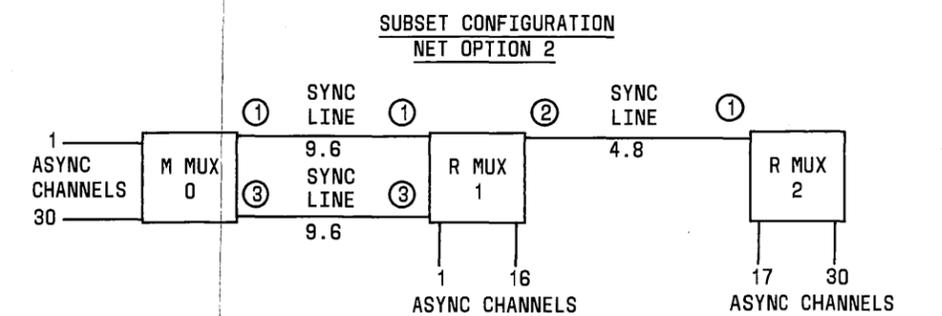
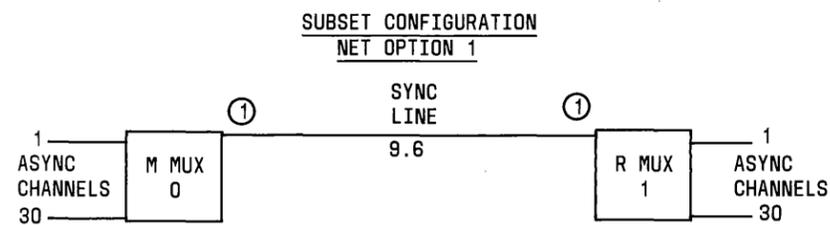
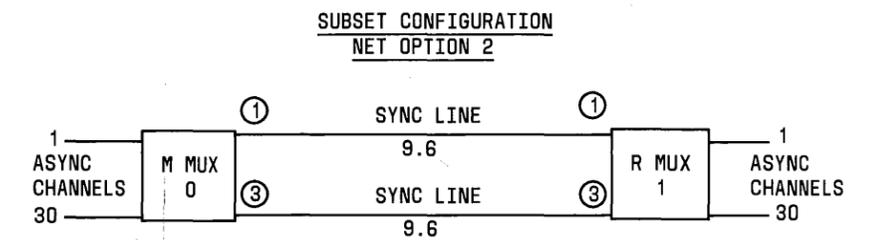
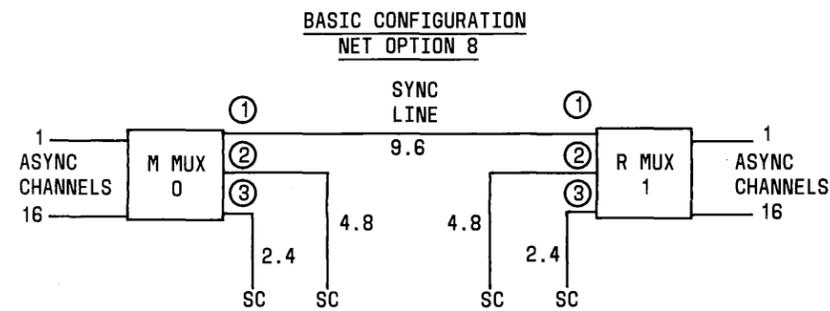
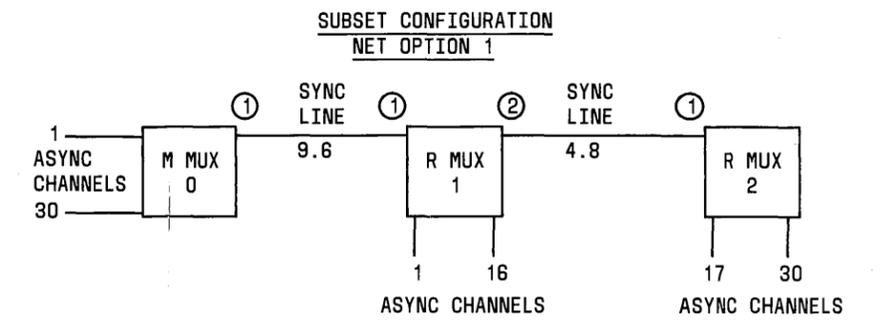
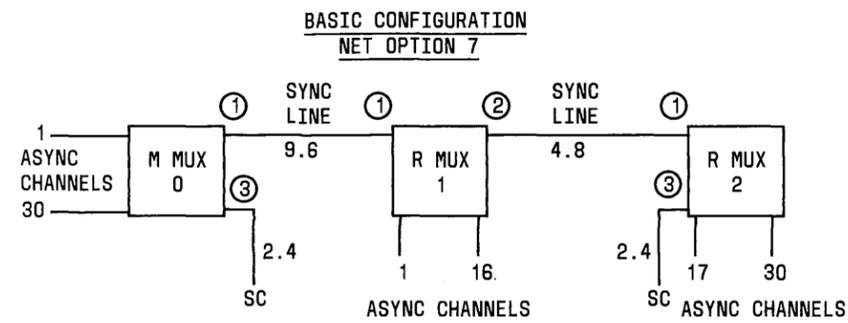


Fig. 3—DMS Equipment Arrangements (Sheet 2 of 3)

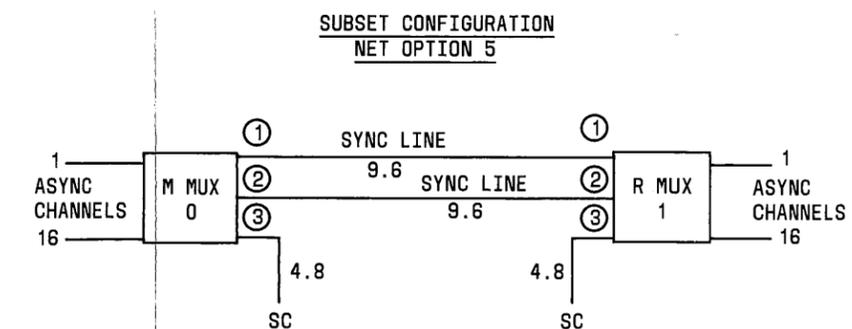
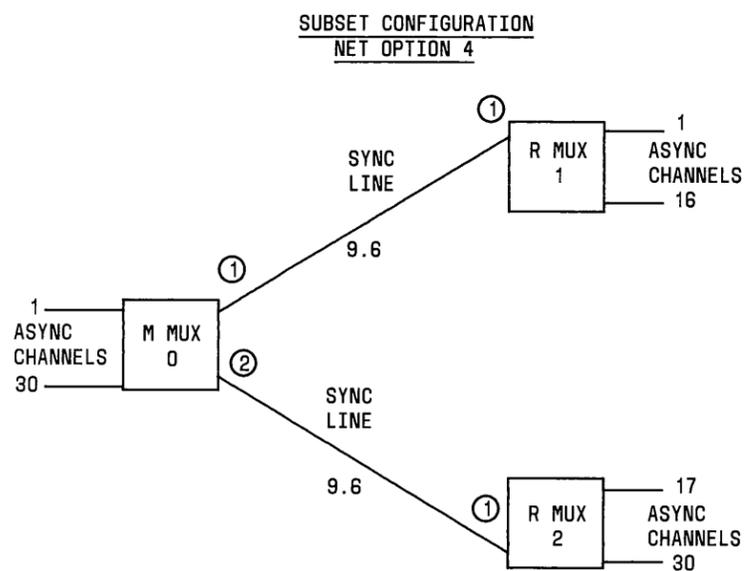
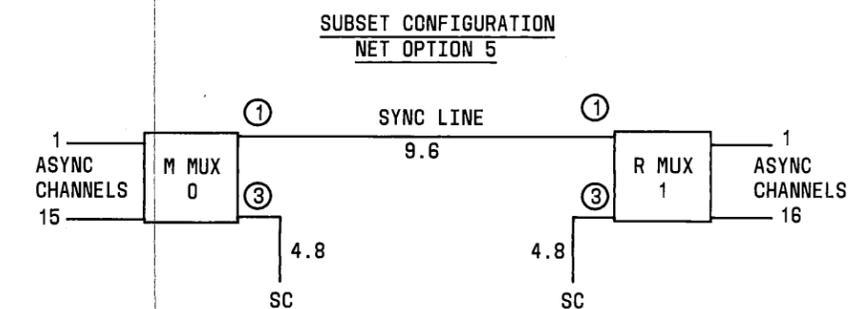
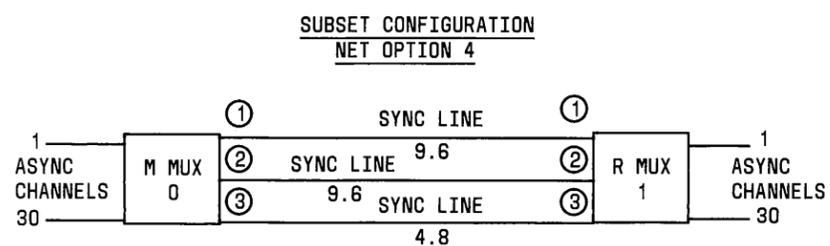
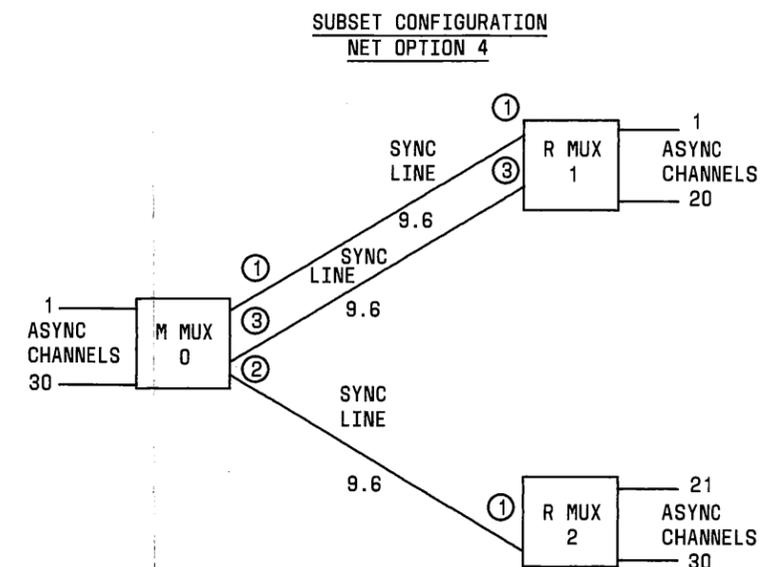
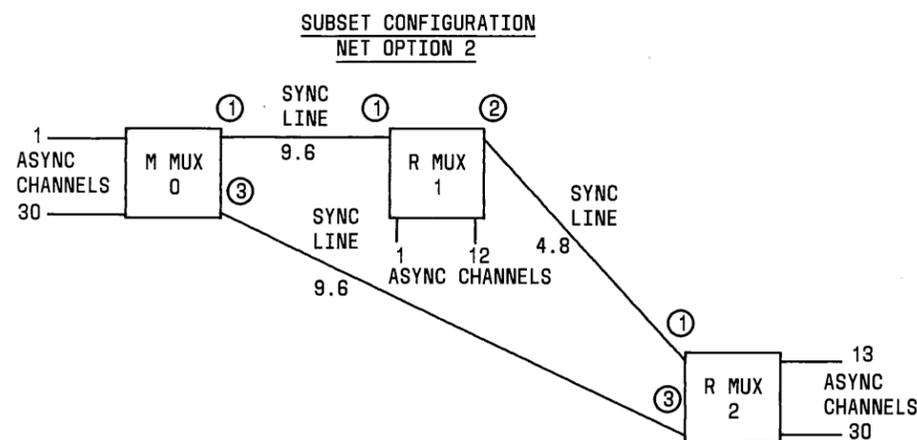


Fig. 3—DMS Equipment Arrangements (Sheet 3 of 3)

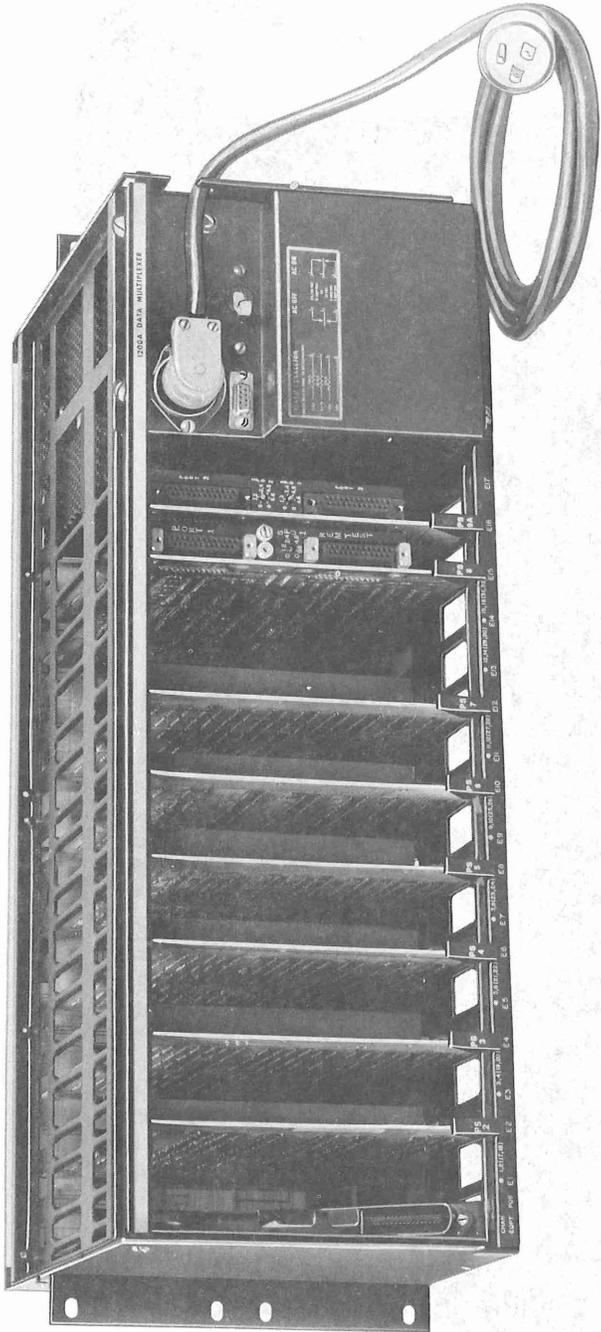


Fig. 4—1200A DM, Rear View

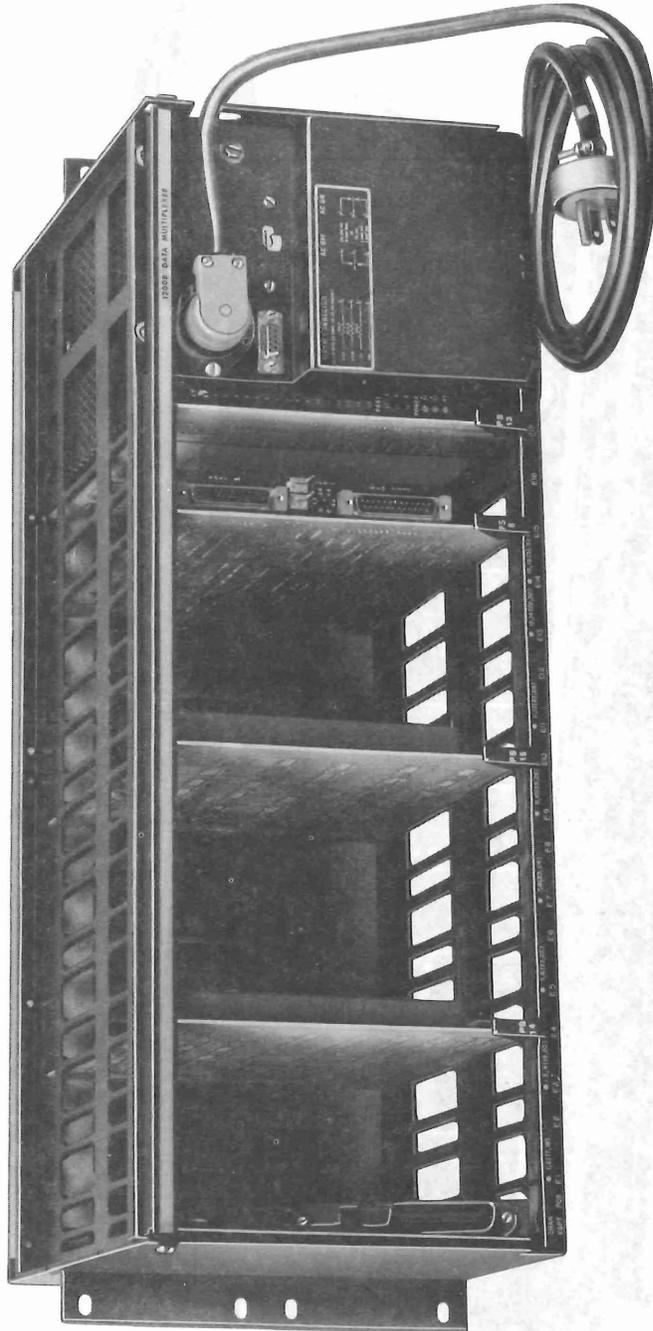


Fig. 5—1200B DM, Rear View

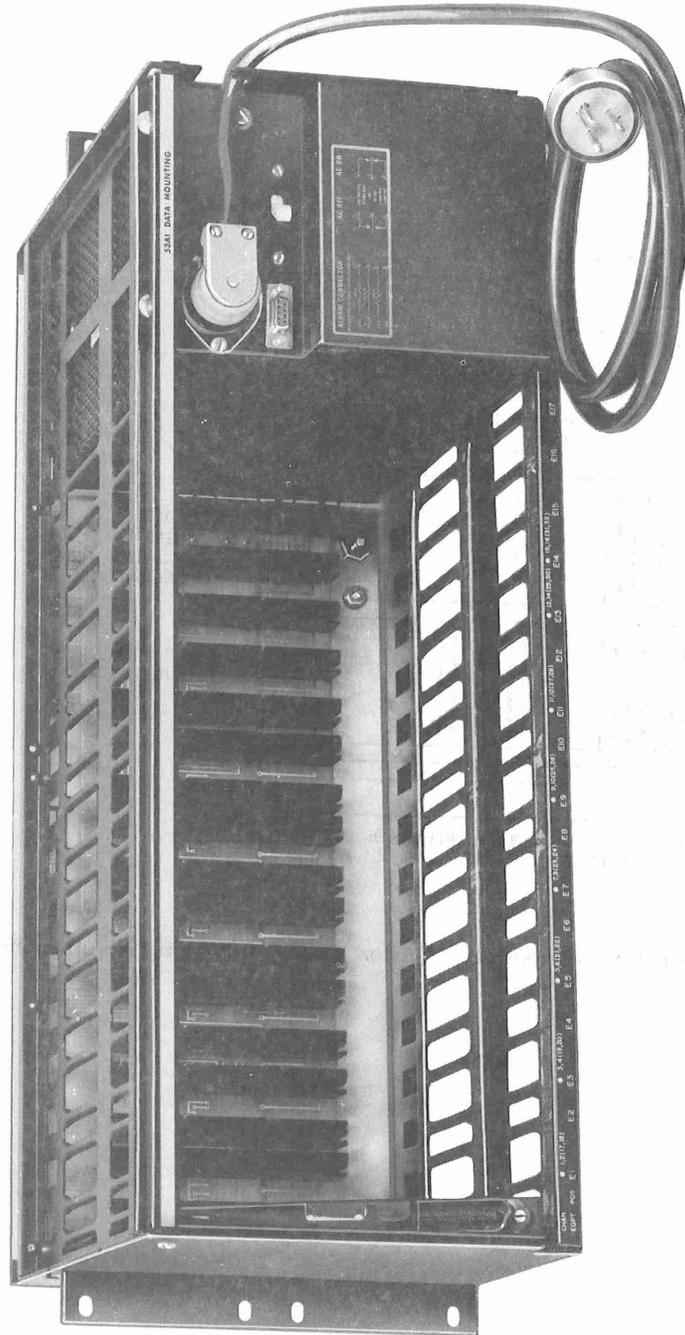


Fig. 6—53A1 Data Mounting

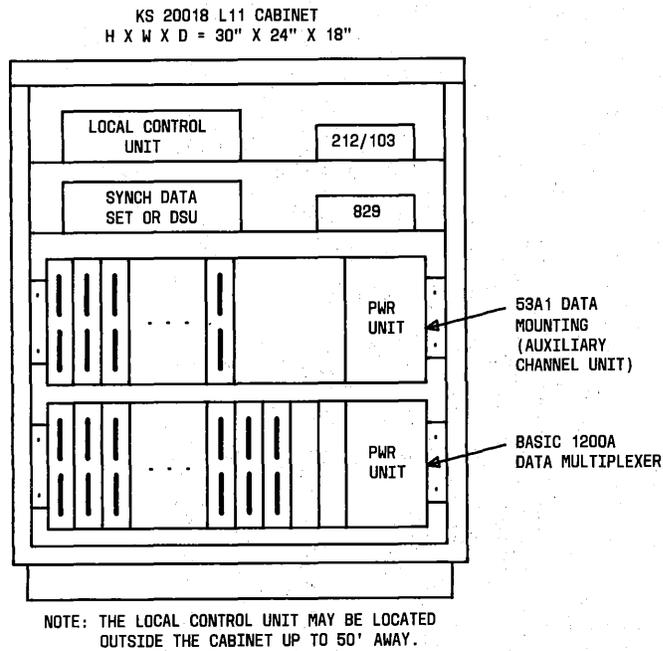


Fig. 7—Typical Equipment Arrangement for Master 1200A DM With No Asynchronous Data Sets

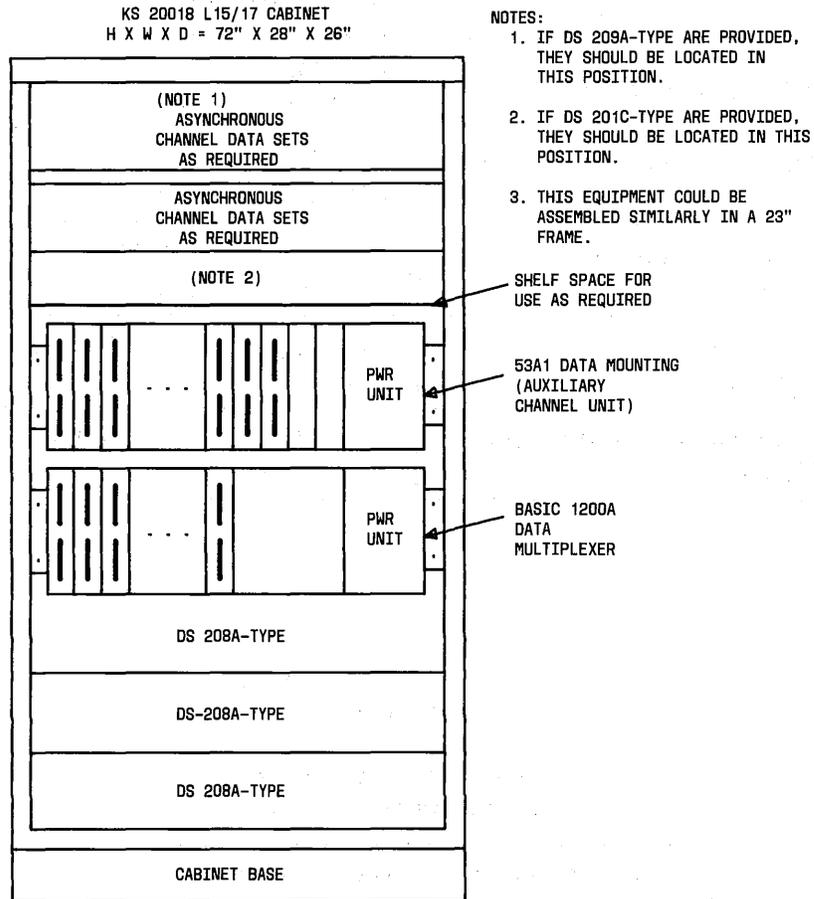


Fig. 8—Typical Equipment Arrangement for Remote 1200-Type DM With Asynchronous Data Sets

TABLE A

**CIRCUIT PACK REQUIREMENTS FOR
1200 TYPE DATA MULTIPLEXER APPLICATIONS**

DATA MULTIPLEXER (DM) APPLICATION	REQUIRED CIRCUIT PACK = (CPs)
1200A (Master DM)	CP PS 2 through CP PS 9B (CP PS 1 ^S as required)
1200A (Remote DM Customer Premises)	CP PS 3, 4, 5, 6, 8, 9B (CP PS 1 ^S as required)
1200A (Remote DM Central Office)	CP PS 3, 4, 5, 6, 8, 9B, 13 (CP PS 1 ^S as required)
1200B (Remote DM Customer Premises)	CP PS 8, 14, 15 (CP PS 1 ^S as required)
1200B (Remote DM Central Office)	CP PS 8, 13, 14, 15 (CP PS 1 ^S as required)

TABLE B

**DMS ASYNCHRONOUS &
SYNCHRONOUS SPEEDS**

ASYNCHRONOUS		SYNCHRONOUS (bps)	
bps	cps*	DERIVED CHANNELS	LINES
74.2	10	1200	1200
75	10	2400	2400
110	10	4800	4800
134.5	15		9600
150	15		
300	30		
600	60		
1200	120		

* Character per second for standard character structure at that speed. Other supported character structures may be used provided that the CPS shown for a speed is not exceeded by more than 10%.

3.08 The number and speeds of channels which may be multiplexed by a 1200-type DM depend on the total information rate and the multiplexing mode. For standard time division multiplexing, the total information rate in bits per second that may be directed to a synchronous port of a 1200A DM is approximately equal to the sum of the data rates of the asynchronous channels plus the sum of the data rates of any interleaved derived synchronous channels. For a 1200B DM, the total information rate is approximately equal to the sum of the data rates of the asynchronous channels. The data rate in bits per second of an asynchronous channel is considered to be just greater than ten times the character rate of that channel. The synchronous arrangement may be stated in the following formula and related to Table C:

1200A DM:

$$\Sigma \text{ Data rates of } \Sigma \text{ Data rates of } \text{Synchro-} \\ \text{interleaved } \text{asynchronous } \text{nous line} \\ \text{synchronous } + \text{ channels } < \text{capacity} \\ \text{capacity}$$

1200B DM:

$$\Sigma \text{ Data rates of } \text{Synchronous} \\ \text{asynchronous } < \text{line} \\ \text{channels } \text{capacity}$$

3.09 The information rate delivered to a 1200-type DM synchronous port determines the lowest speed data set or DSU which can be assigned to that port. If the sum of the speeds of the asynchronous channels assigned to a synchronous port exceeds the preset speed of that port, as determined by the maximum speed of the associated data set or DSU, the destination indicator on the associated 1800 data control unit will flash.

3.10 The synchronous ports are provided only with the EIA Standard RS232C interface.

C. Asynchronous Arrangements

3.11 Equipment arrangements necessary to connect asynchronous terminals to the asynchronous channels of the 1200-type DM are shown in Fig. 9. If a terminal is located within 50 feet (EIA interface) or within specified distance limits (MIL spec or

current interface) of a 1200-type DM, the terminal may be connected directly to the multiplexer asynchronous channel interface. However, when an asynchronous channel does not terminate near a 1200-type DM, remote access can be provided by means of 2-point private lines, multipoint private lines, or direct distant dialing (DDD) facilities with appropriate data equipment.

3.12 Each asynchronous channel is designated either as single speed or as autobaud. Autobaud channels are capable of operating at more than one speed and character structure, but only predetermined speed and character structures may be used. For a given call, the 1200-type DM determines the correct speed and character structure by examining the first character in the data stream. Table D lists the speed and character structures that apply for autobaud channel operation. The 600- and 1200-bps speeds can only be used with a special interface board (future option). The master 1200A DM assigns a channel of the highest speed in the set (300 or 1200 bps) for an autobaud channel.

3.13 The 1200-type DM may receive but may not originate DDD calls. For cases in which an asynchronous interface is associated with only one asynchronous channel and no other interfaces access that channel (standard multiplexing), the interface is busy when the channel is busy. If a group of such interfaces on a DM operate at the same speed and character structure or have the same autobaud, the interfaces may be assigned to a hunting group to permit the use of a single telephone directory number to gain access to any of the interfaces.

3.14 Asynchronous interfaces which are supported by the 1200-type DMs are optionally EIA Standard RS232C, military specification MIL 188C, or the current interface (20 mA or 62.5 mA).

D. Data Multiplexer System Tests

3.15 A test circuit in the master 1200A DM performs a continuous in-service test of each asynchronous channel. The test is performed by generating a test bit in all control characters directed toward the asynchronous interfaces of the master and remote DMs. The test bits are returned to the master DM in control characters which are returned from the asynchronous interfaces. The test circuit in the master DM checks the returned bits and gives an indication (flashing activity lamp)

TABLE C
 ASYNCHRONOUS CAPACITY
 (Characters Per Second)

SUM OF INTERLEAVED SYNCHRONOUS CHANNEL SPEED BITS PER SECOND (BPS)	TOTAL ASYNCHRONOUS CAPACITY	SYNCHRONOUS LINK SPEED (BPS)
	CHARACTERS PER SECOND (CPS)	
0	930	9600
0	465	4800
0	225	2400
0	105	1200
1200	810	9600
1200	345	4800
1200	105	2400
2400	690	9600
2400	225	4800
3600	570	9600
3600	105	4800
4800	450	9600
6000*	330*	9600*
7200	210	9600

* *EXAMPLE:* A total rate of 330 cps of asynchronous data with one 1200 bps synchronous channel and one 4800 bps channel (interleaved synchronous channel speed = 6000 bps) can be multiplexed onto a 9600 bps synchronous line.

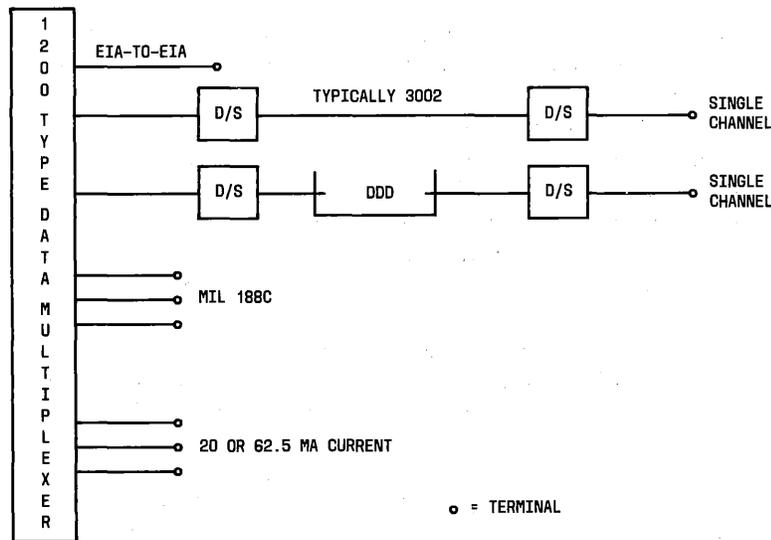


Fig. 9—Asynchronous Arrangements

TABLE D
SPEED AND CHARACTER STRUCTURE
FOR AUTOBAUD
ASYNCHRONOUS PORTS

SPEED (bps)	CHARACTER STRUCTURE (BITS-DATA/STOP)
110	8/2
134.5	7/1
150	8/1
300	8/1
*600	8/1
*1200	8/1

* An option with special interface card.

on the data control unit when errors occur. The test bits are not passed through the asynchronous interfaces; therefore, this test indicates the conditions of the multiplexers and the synchronous facilities between the multiplexers.

3.16 Two categories of loopback are provided; those within the DM in the system (internal), and those at other equipment in the system (external). The internal loopbacks are activated from the local data control unit (referred to as LCU) or remote data control unit (referred to as RCU) via control characters generated by the master DM. The external loopbacks are similarly activated from the LCU or an RCU but the control characters generated by the master DM cause EIA leads in the asynchronous interface to activate loopbacks in properly equipped data sets connected to the interface or in the absence of properly equipped data sets to generate a long space condition in the data stream.

3.17 The test circuit in the master DM may be used to perform out-of-service tests of any asynchronous channel. Only the asynchronous channel to be tested is taken out of service. This test may be conducted toward the asynchronous interface of the master DM (local) or toward the asynchronous interface of a remote DM. The test gives an indication of the condition of the facilities and equipment out to the loopback point. The test characters are passed through the DM interfaces when external loopbacks are activated.

3.18 Synchronous lines may be tested by loopback tests from the master DM if the associated data sets are in a test mode. Derived synchronous lines may be tested with associated test equipment when a loopback is initiated from the master DM.

3.19 Tests that are looped back within the DM do not include the interface circuitry (drivers and terminators) of the asynchronous interfaces. However, these circuits are tested when external loopbacks are activated. Twenty-five pin EIA interface plugs, prewired to loop back the data and control interface leads, are provided with each DM and may be connected to interface connectors as desired.

4. REFERENCES

4.01 For additional information relating to the 1200-type DMs, refer to the following.

NUMBER	TITLE
SD-&CD-1D264-01	1200-Type Data Multiplexer
EL 4445	Data Multiplex System— Description
EL 4446	Data Multiplex System— Equipment, Ordering, Pricing, and Availability Information
SECTION	TITLE
590-000-120	DATAPHONE® Multiplex Service— Data Multiplex System— Using 1200A-Type Data Multiplexer— Reference Guide
590-104-100	Data Multiplex System— Using 1200-Type Data Multiplexer— Description and Operation
590-104-102	1800B-L1 Data Control Unit— Description and Operation
590-104-103	1800A-L1 Data Control Unit— Description and Operation
590-104-104	Data Multiplex System—Using 1200-Type Data Multiplexer— Station Arrangements

SECTION 590-104-101

SECTION	TITLE	SECTION	TITLE
666-615-100	Data Multiplex System—Using 1200A-Type Data Multiplexer—Control Center—Description and Operation	880-101-100	Data Multiplex System—Transmission Objectives and System Application Engineering Considerations
666-615-101	Data Multiplex System— Using 1200A-Type Data Multiplexer—CSTC and MTF Procedures	880-101-190	Data Multiplex System— Engineering and Implementation Methods System
682-300-015	Data Multiplex System— Plant Assignments	999-100-161	Data Multiplex System— How to Operate Manual