DATA SYSTEMS—9600 BITS-PER-SECOND

MULTIPLEX SYSTEM USING DATA SET 209A-L1

DESCRIPTION

1. GENERAL

1.01 This section provides information on the multiplexing capabilities of data set 209A-L1. The purpose of this section is to support the installation and maintenance necessary on such multiplexing systems. For detailed information concerning data set 209A-L1, refer to Section 592-032-100.

1.02 Data set 209A-L1 is a synchronous, binary, serial 9600-bits per second (bps) data set for use on basic 3002-type, 4-wire private line telephone channels with high performance data conditioning (D1 conditioning). No C-type conditioning is required. The data set contains a multiplexing capability which provides data channels in multiples of 2400 bps up to 9600 bps as follows:

- One 9600-bps channel

- One 7200-bps and one 2400-bps channel (72/24)

- Two 4800-bps channels (48/48)

- One 4800-bps and two 2400-bps channels (48/24/24)

- Four 2400-bps channels (4-24).

1.03 The multiplex selector switch, which extends through the bottom of the data set, is accessible from the front of the data set. This is a continuous rotary-type switch which selects the multiplex mode of operation and illuminates the appropriate status indicator. The switch has one position reserved for factory testing in which all multiplex status indicators are extinguished.

1.04 The multiplex status indicators are light emitting diodes (LEDs) which illuminate translucent designations on the data set front faceplate. These LEDs indicate the position of the multiplex selector switch as follows:

- 96—This LED is illuminated when the data set is capable of operating with one channel at 9600 bps.

- 72—This LED is illuminated when the data set is capable of operating with one channel at 7200 bps and one channel at 2400 bps.

- 48—This LED is illuminated when the data set is capable of operating with two channels at 4800 bps or one channel at 4800 bps and two channels at 2400 bps.

- 24—This LED is illuminated when the data set is capable of operating with one channel at 7200 bps and one channel at 2400 bps; or with one channel at 4800 bps and two channels at 2400 bps; or with four channels at 2400 bps.

Table A summarizes the illuminated LEDs corresponding to the interface connectors being used.

2. FUNCTIONAL DESCRIPTION

2.01 This part contains a description of multiplexing applications for which data set 209A-L1 is designed. There are four multiplexing combinations:

- One 7200-bps and one 2400-bps channel (72/24)

- Two 4800-bps channels (48/48)

- One 4800-bps and two 2400-bps channels (48/24/24)

- Four 2400-bps channels (4-24).

All of these combinations can be used on any of the multiplexing applications.

2.02 The three multiplexing applications are as follows:

- Point-to-point multiplexing

- Many-point multiplexing

- One-to-many multiplexing.

2.03 When multiplexing is used, independent signals are supplied on the customer interfaces with the exception of signal quality detector (CG), data set ready (CC), and carrier on delayed (CF). Signals on those leads are changed simultaneously and provided to each interface connector on separate EIA drivers.

A. Point-to-Point Multiplexing

2.04 A typical point-to-point multiplexing application is shown in Fig. 1. To the customer-provided equipment (CPE) it appears as if each terminal is connected to an independent data set (except as explained in 2.03 and 2.05). The options needed for these applications are the same as for point-to-point 9600-bps operation and are given in Fig. 1. The multiplex selector switch at the bottom of the data set must be set to the desired multiplex mode. The position of the switch is indicated by the illuminated multiplex status indicators.

> *In point-to-point multiplexing, the CPE must not be more than 50 feet from the data set.*

2.05 Data set 209A-L1 can be operated in a switched carrier mode, although continuous carrier is most commonly used. When switched carrier is used with multiplexing, the first CPE to raise request-to-send (CA) initiates a start sequence and receives clear-to-send (CB) 147 milliseconds later. If a second CPE raises CA more than 8 milliseconds before the data set has completed its startup, the second CPE receives a CB indication 8 milliseconds after raising CA, thereby giving a CA-CB delay which is variable and less than 147 milliseconds. If the second CPE raises CA after the data set has completed its startup, the CA-CB delay is fixed at 8 milliseconds. The turning off of CA will drop CB without delay.

TABLE A

ILLUMINATED MULTIPLEX STATUS INDICATORS
FOR EACH OPERATING MODE

ILLUMINATED LEDS	OPERATING MODE	INTERFACE CONNECTOR			
		1	2	3	4
96	96	96	—	—	—
72 & 24	72/24	72	24	—	—
48	48/48	48	48	—	—
48 & 24	48/24/24	48	24	24	—
24	4-24	24	24	24	24
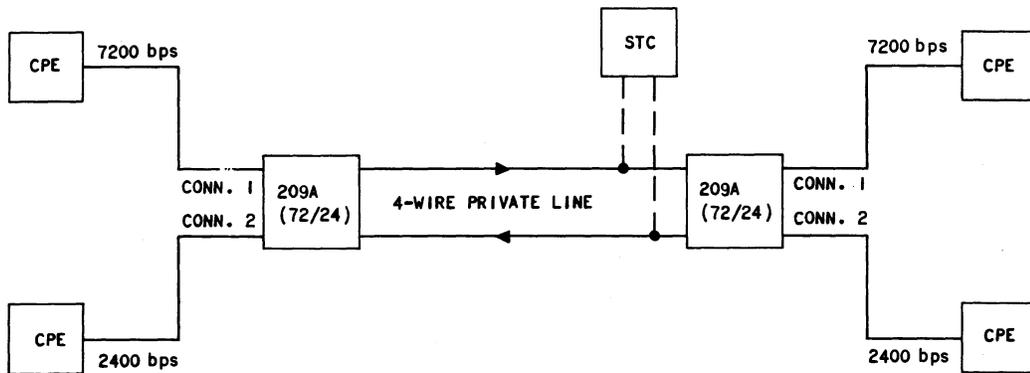
SELECT	DATA SET 209A OPTIONS	SELECT
* 72/24, 48/48, 48/24/24, OR 4-24	MULTIPLEX OPTION	* 72/24, 48/48, 48/24/24, OR 4-24
INTERNAL	TRANSMITTER TIMING	INTERNAL
CONTINUOUS	CARRIER CONTROL	CONTINUOUS
PER CPEs	REQUEST-TO-SEND CONTROL	PER CPEs
ALL DISABLED †	ELASTIC STORES	ALL DISABLED †
NOT PROVIDED †	SLAVED TIMING	NOT PROVIDED †
PER CPEs	DATA SET READY CONDITION IN AL MODE	PER CPEs
PER CPEs OR LOCAL PRACTICE	GROUNDING	PER CPEs OR LOCAL PRACTICE
IN	I - SECOND HOLDOVER	IN

* THE MULTIPLEX OPTION MUST BE THE SAME FOR BOTH DATA SETS.
† REQUIRED OPTION.

Fig. 1—Typical Customer Options, Point-to-Point Multiplex System

B. Many-Point Multiplexing

2.06 In a multiplex arrangement, if the distance between the CPE and data set 209A-L1 is more than 50 feet, many-point multiplexing must be used. Refer to Fig. 2 for a typical example of a many-point multiplex system. Data sets 208A-type and 201C are used to provide this extension over an appropriate 4-wire private line channel.

2.07 In arranging many-point multiplexing systems, one data set 209A-L1 is used as a master timing source for the entire system. The other data set 209A-L1 has its transmitter timing slaved to its receiver timing. The extension data sets (collocated 208A-type or 201C) are connected to data set 209A-L1 through an M8M cord (which must be ordered separately). In addition, an M23B cord (ordered separately) must be used between the extension data set (remote) and the CPE. Through use of these cords, the extension data sets are also timed by the master data set 209A-L1.

2.08 The proper options to be used in the system applications of the data sets are given in Fig. 2. As can be seen from the option table, the extension data sets which interface with data set 209A-L1 are optioned for switched carrier even though the total system is operated continuous carrier. This is to provide an indication to the CPE when the overall communication system is down. When either data set 209A-L1 loses signal, the CO indicator extinguishes at the corresponding extension data sets.

C. One-to-Many Multiplexing

2.09 Refer to Fig. 3 for an example of a typical one-to-many multiplexing system. CPE No.

1 transmits time-division multiplexed data at 9600 bps to a data set 209A-L1 (DS1). This data set transmits the data stream to a remote data set 209A-L1 (DS2). The data stream is demultiplexed in DS2 into two independent 4800-bps data streams. The system can be extended to a remote location by use of the a data set 208A-type. Signals DCR and DCT are provided by data set 209A-L1 to CPE No. 1 to synchronize the two, three, or four time-division multiplexed signals on customer connector 1. Figure 3 shows only one possibility for one-to-many multiplexing systems. Similar systems are possible for 72/24, 48/24/24, or 4-24 multiplex modes. The proper options to be used in the system application of the data sets are given in Fig. 3.

3. REFERENCES

3.01 Refer to the following Bell System Practices which provide more information pertaining to data set 209A-L1.

SECTION	TITLE
314-410-105	Voice Bandwidth Private Line Data Circuits— High Performance Data Option— Description and Operation

Data Set 208A-Type

|	
592-027-100	Description and Operation
592-027-200	Installation
592-027-300	Maintenance
592-027-500	Test Procedures
666-511-503	Test of Services Provided By Data Set 208A-Type From a Data Test Room

SECTION	TITLE

Data Set 201C

592-029-100	Description and Operation
592-029-200	Installation
592-029-300	Maintenance
592-029-500	Test Procedures
666-511-501	Test of Services Provided By Data Set 201C From a Data Test Room

Data Set 209A-L1 Point-to-Point

592-032-100	Description and Operation
592-032-200	Installation
592-032-300	Maintenance
592-032-500	Test Procedures
TI-388	Test of Point-to-Point Services Provided By Data Set 209A-L1 From a Private Line Data Test Room

Data Set 209A-L1 Multiplex

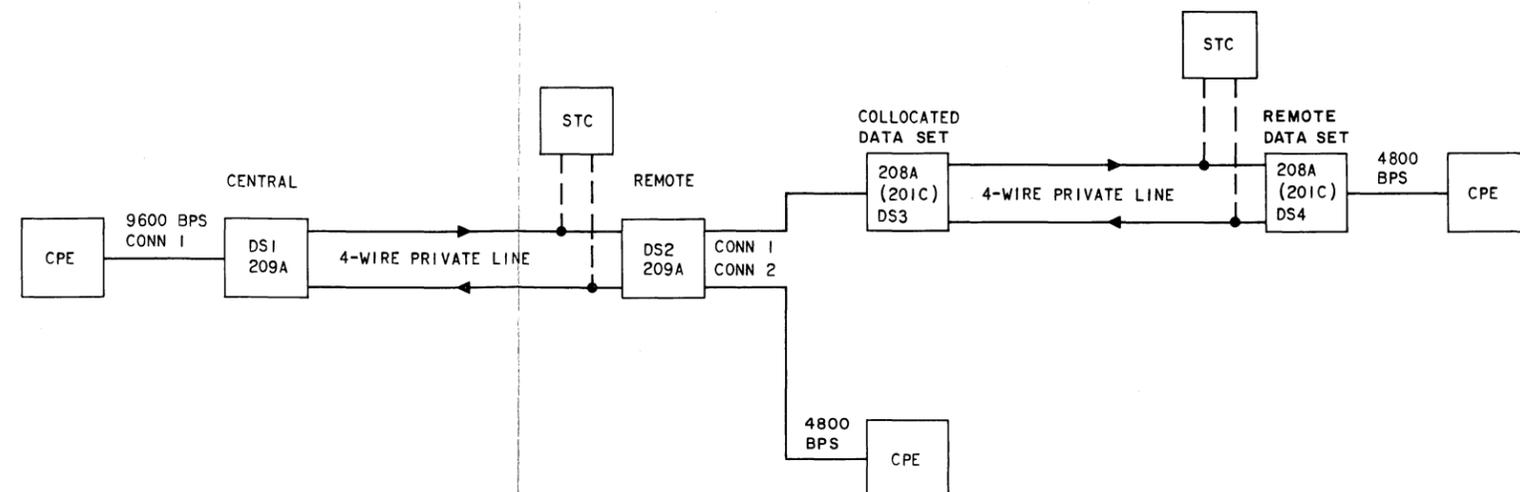|	
592-032-101	Description and Operation
592-032-201	Installation and Connections
592-032-301	Maintenance
TI-405	Test of 9600 Bits-Per-Second Multiplex System From a Privare Line Test Room.
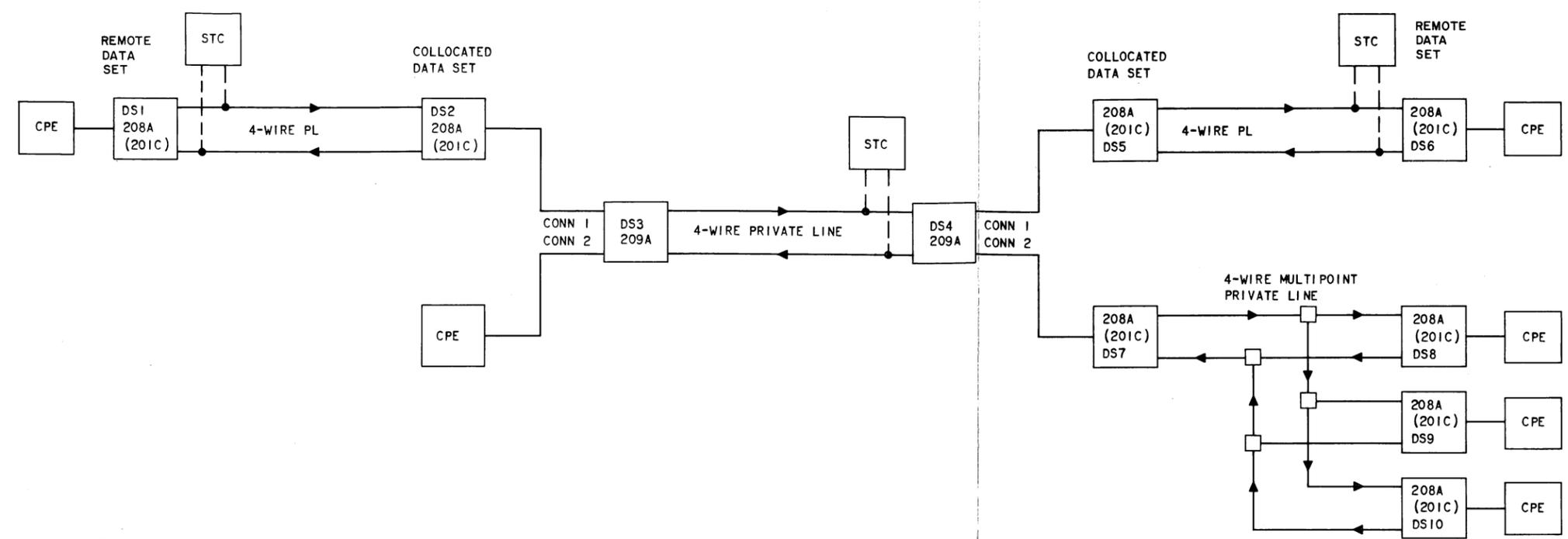
Fig. 2—Typical Customer Options, Many-Point Multiplex System

(REMOTE) SELECT	DATA SET 208A OPTIONS ON PT-TO-PT EXTENSION CHANNEL	(COLLOCATED) SELECT
EXTERNAL *	TRANSMISSION TIMING	EXTERNAL *
CONTINUOUS	CARRIER CONTROL	SWITCHED *
0 OR 8 MS PER CPE	REQUEST TO SEND OPERATION	NOT APPLICABLE
IN	1-SECOND HOLDOVER	IN
NOT USED *	NEW SYNC	NOT USED *
CC ON OR CC OFF PER CPE	DATA SET READY CONDITION IN AL TEST MODE	CC OFF IN AL TEST MODE *
PER CPE OR LOCAL PRACTICE	GROUNDING	AA CONNECTED TO AB *
(REMOTE) SELECT	DATA SET 201C OPTIONS ON PT-TO-PT EXTENSION CHANNEL	(COLLOCATED) SELECT
EXTERNAL *	TRANSMITTER TIMING	EXTERNAL *
CONTINUOUS	CARRIER CONTROL	SWITCHED *
0 OR 7 MS PER CPE	REQUEST-TO-SEND/CLEAR-TO-SEND DELAY	7 MS *
NOT USED *	NEW SYNC	NOT USED *
PER CPE OR LOCAL PRACTICE	GROUNDING	AA CONNECTED TO AB *

SELECT	DATA SET 209A OPTIONS	SELECT
ANY BUT 96 (48/48 FOR EXAMPLE SHOWN)	MULTIPLEX OPTION	ANY BUT 96 (48/48 FOR EXAMPLE SHOWN)
INTERNAL *	TRANSMITTER TIMING	INTERNAL *
CONTINUOUS *	CARRIER CONTROL	CONTINUOUS *
CONTINUOUS †	REQUEST-TO-SEND CONTROL	CONTINUOUS
1 IN / 2-4 OUT (FOR EXAMPLE SHOWN)	ELASTIC STORES *	1 & 2 IN / 3 & 4 OUT (FOR EXAMPLE SHOWN)
OUT / IN	SLAVED TIMING ‡ *	IN / OUT
PER CPE AT POLLING CENTRAL (FOR EXAMPLE SHOWN)	DATA SET READY CONDITION IN AL TEST MODE	CC OFF IN AL TEST MODE *
AA CONNECTED TO AB *	GROUNDING	AA CONNECTED TO AB *
IN	1-SECOND HOLDOVER	IN

† NOT REQUIRED EXCEPT FOR MULTIPOINT
‡ SLAVE TIMING IS USED IN ONE 209A OR THE OTHER, BUT NOT BOTH.
* REQUIRED

(COLLOCATED) SELECT	DATA SET 208A OPTIONS ON MULTIPOINT EXTENSION CHANNEL	(REMOTE) SELECT
EXTERNAL *	TRANSMITTER TIMING	EXTERNAL *
SWITCHED *	CARRIER CONTROL	SWITCHED *
NOT APPLICABLE	REQUEST TO SEND OPERATION	NOT APPLICABLE
OUT *	1-SECOND HOLDOVER	IN *
NOT USED *	NEW SYNC	NOT USED *
CC OFF IN AL TEST MODE *	DATA SET READY (CC) CONDITION IN AL TEST MODE	CC ON OR CC OFF PER CPE
AA CONNECTED TO AB *	GROUNDING	PER CPE OR LOCAL PRACTICE
(COLLOCATED) SELECT	DATA SET 201C OPTIONS ON MULTIPOINT EXTENSION CHANNEL	(REMOTE) SELECT
EXTERNAL *	TRANSMITTER TIMING	EXTERNAL *
SWITCHED *	CARRIER CONTROL	SWITCHED *
7 MS *	REQUEST-TO-SEND/CLEAR-TO-SEND DELAY	7 MS *
NOT USED *	NEW SYNC	NOT USED *
AA CONNECTED TO AB *	GROUNDING	PER CPE OR LOCAL PRACTICE

Fig. 3—Typical Customer Options, One-to-Many Multiplex System

(CENTRAL) SELECT	DATA SET 209A OPTIONS		(REMOTE) SELECT
96 ✻	MULTIPLEX OPTION	ANY MULTIPLEX OPTION	
INTERNAL ✻	TRANSMITTER TIMING	INTERNAL ✻	
CONTINUOUS	CARRIER CONTROL	CONTINUOUS ✻	
PER CPE	REQUEST TO SEND CONTROL	CONTINUOUS WITH EXTEN CHANNEL (CONT OR SWITCHED W/O EXTEN CHANNEL)	
ALL OUT ✻	ELASTIC STORES	1 IN ✻ 2-4 OUT ✻ (FOR EXAMPLE SHOWN)	
OUT	SLAVED TIMING † ‡	IN (WITH EXTENSION CHANNEL) OUT (WITHOUT EXTENSION CHANNEL)	
PER CPE	DATA SET READY CONDITION IN AL TEST MODE	CC OFF IN AL TEST MODE	
PER CPE OR LOCAL PRACTICE	GROUNDING	AA CONNECTED TO AB ✻ (ONLY IF USED WITH EXTENSION	
IN WHEN EXTENSION IS NOT USED	1-SECOND HOLDOVER	IN	

✻ REQUIRED
† REQUIRED WHEN AT LEAST ONE EXTENSION IS USED
‡ SLAVE TIMING IS USED IN ONE 209A OR THE OTHER, BUT NOT BOTH

WHEN AN EXTENSION CHANNEL IS USED, OPTIONS MUST BE SELECTED IN THE COLLOCATED AND REMOTE DATA SETS (EITHER 208A OR 201C).

(COLLOCATED) SELECT	DATA SET 208A OPTIONS ON PT-TO-PT EXTENSION CHANNEL	(REMOTE) SELECT
EXTERNAL ✻	TRANSMITTER TIMING	EXTERNAL ✻
SWITCHED ✻	CARRIER CONTROL	CONTINUOUS
NOT APPLICABLE	REQUEST-TO-SEND OPERATION	0 OR 8 MS PER CPE
IN	1-SECOND HOLDOVER	IN
NOT USED ✻	NEW SYNC	NOT USED ✻
CC OFF IN AL TEST MODE ✻	DATA SET READY (CC) CONDITION IN AL TEST MODE	CC ON OR CC OFF PER CPE
AA CONNECTED TO AB ✻	GROUNDING	PER CPE OR LOCAL PRACTICE
(COLLOCATED) SELECT	DATA SET 201C OPTIONS ON PT-TO-PT EXTENSION CHANNEL	(REMOTE) SELECT
EXTERNAL ✻	TRANSMITTER TIMING	EXTERNAL ✻
SWITCHED ✻	CARRIER CONTROL	CONTINUOUS
7 MS ✻	REQUEST-TO-SEND/CLEAR-TO-SEND DELAY	0 OR 7 MS PER CPE
NOT USED ✻	NEW SYNC	NOT USED ✻
AA CONNECTED TO AB ✻	GROUNDING	PER CPE OR LOCAL PRACTICE