SWITCHED ACCESS REMOTE TEST SYSTEM 1A

(SARTS-1A)

GENERAL DESCRIPTION

1. GENERAL

1.01 The Switched Access Remote Test System 1A (SARTS-1A) is a manually operated system with processor-controlled functions. The manual operation interface for SARTS-1A is a Dataspeed® Model 40 keyboard display (KD) which is part of the Test Position 52A (TP-52A) and Associated Equipment described in Section 666-612-100. The processor that controls all system functions is the Process Controller 1A (PC-1A) and Associated Equipment described in Section 666-611-100. One testperson can manually operate the SARTS-1A and perform one person testing on voice-frequency special service circuits which must be equipped with Switched Maintenance Access System (SMAS) access points and be available to a microprocessor-controlled Remote Test System similar to the Remote Test System 1A (RTS-1A) described in Section 666-613-100. One person testing is defined as:

> The ability for one person to access and test a circuit to verify and/or sectionalize reported trouble or perform initial circuit order work testing.

1.02 When this section is reissued, the reason for reissue will be given in this paragraph.

1.03 The SARTS-1A consists of three subsystems: two subsystems make up the near end and one makes up the far end. There may be several far-end locations. The two subsystems making up the near end are the PC-1A and the TP-52A and associated equipment. Any number of TP-52As, up to a maximum of 24, may be located in one to four test sites. The term "test site" is defined in Section 666-612-100 as consisting of one or more TP-52As and associated equipment. Each test site interfaces with the PC-1A over a 4-wire synchronous data link (Fig. 1). A SARTS-1A far-end location consists of the microprocessor-controlled RTS-1A, described in Section 666-613-100, or a similar system. The RTS controls a SMAS and performs all SARTS-1A circuit access and test functions under control of the PC-1A. One to fifty far-end locations may be assigned and are primarily controlled from one near-end location.

1.04 The near-end and far-end locations interface over 2-wire asynchronous data links. See
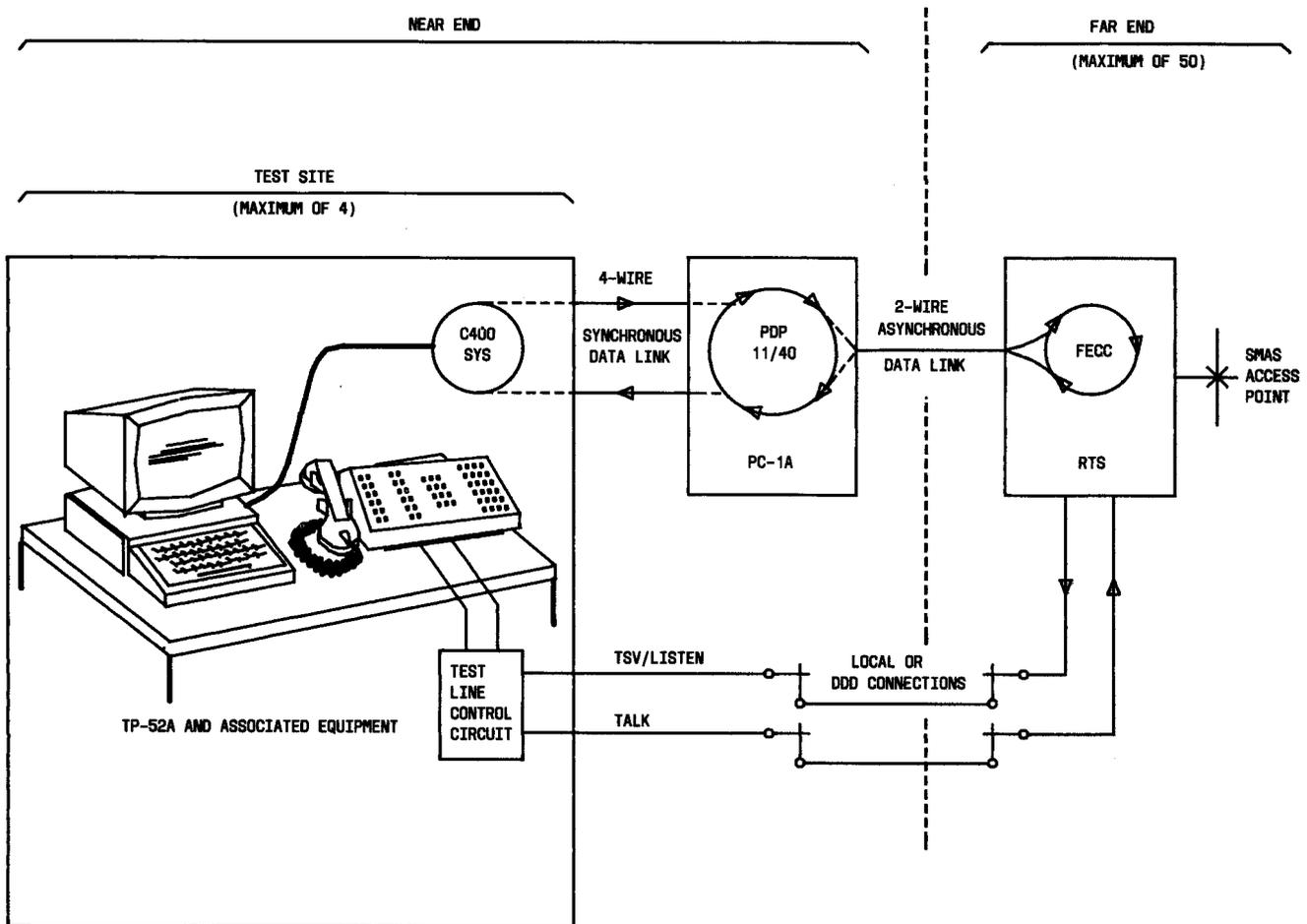
Fig. 1—SARTS-1A Subsystem Interfacing

Fig. 1. The near-end and far-ends are generally arranged for a SARTS-1A to coincide with a geographical or an operating area.

1.05 The circuit access points used in SARTS-1A testing are located in special service circuits in a way similar to that described for the SMAS-4A in Section 667-302-102. The standard format required for the Identification Data and Testing Data information assigned to the access points is described in Section 667-302-103. The formatted access point data appears on the circuit layout record (CLR) cards used in SARTS-1A testing.

Note: When the SARTS-1A is interfaced with the Circuit Maintenance System (CMS-2A or CMS-3A), the access point data is maintained in CMS and no CLR cards are required.

2. COMPONENTS

A. Test Site

2.01 The SARTS-1A test site consists of one or more TP-52As. Each test site interconnects to the PC-1A over one 4-wire null modem circuit (direct cabling) or a 4-wire private line data circuit. The TP-52A and Associated Equipment is described in Section 666-612-100.

B. Process Controller 1A (PC-1A)

2.02 The PC-1A is a Digital Equipment Corporation (DEC*) PDP* 11/40 minicomputer. The PC-1A and Associated Equipment is described in Section 666-611-100.

*Registered trade marks of the Digital Equipment Corporation.

C. Remote Test System 1A (RTS-1A)

2.03 The SARTS-1A remote test system is the RTS-1A or a similar system. The RTS-1A is described in Section 666-613-100.

D. Communication Lines

2.04 Four-wire private line facilities are required to interconnect a test site and one of the synchronous input/output ports of the PC-1A. The facility must have 208-type data sets at each end and must be arranged with options as shown in SARTS-1A System Application and Interconnection (SD-1P000-01).

> *Note:* A test site and PC-1A within 50 cable feet of each other interconnect with 4-wire null modem circuits shown in SD-1P000-01. No data sets are required with the null modem circuits.

2.05 Two-wire private line facilities or switched data service (local or DDD) are required to interconnect a PC-1A with an RTS. These facilities use 202-type data sets arranged with options as shown in SD-1P000-01 and SD-99623-01.

3. FUNCTIONS

3.01 A testperson at each TP-52A in a test site can control two circuit accesses at one time and specifically command SARTS-1A test functions to be performed at either access point. Both access points may be in one circuit or in two different circuits. All circuit accesses and test activities that are currently being controlled by a PC-1A for a TP-52A are displayed on the KD at the TP-52A in essentially real time.

3.02 The SARTS-1A circuit access request causes a telephone call to be originated by the RTS. This call appears on one of two test lines on the TP-52A telephone console and is an extension, by way of a local central office switch or the DDD network, of a test status verification (TSV) circuit connected at the *point of access* in the RTS. The *point-of-access* verification feature permits a testperson to verify the status of a circuit prior to beginning circuit tests which could interrupt customer service. The verification connection is also used as a listening connection whenever the listen/talk testing function is required at the *point of access.* This test function is also accompanied by a tester-initiated incoming call from the RTS. Both connections are illustrated in Fig. 1.

3.03 The principle testing functions of the SARTS-1A are:

(a) *Bridged verification* at the access points in a circuit

(b) *Talking and listening* at the access points of 2-wire, 4-wire, or 6-wire circuits either bridged or in split modes (transmission levels are adjustable in 5-dB increments for a range of +10 dB to -20 dB)

> *Note:* The verification or talking/listening features are extended from the RTS-1A to the TP-52A telephone console as message circuit connections that must be manually answered.

(c) *Electrical measuring* in accessed circuits to determine presence and/or value of ac or dc voltage, ac or dc current, resistance or capacitance within ranges shown in Table A

(d) *Termination* of accessed circuits in either direction with a short, open, 150-, 600-, 900-, or 1200-ohm impedance. (Any combination of terminations can be made, eg, open toward the loop and an impedance toward facility)

(e) *Reversals* in accessed circuits to turn over tip and ring in 2-, 4-, or 6-wire circuits or directions of transmissions in 4- and 6-wire circuits

(f) *Supervision* of accessed circuits requiring loop (loop-start, ground-start, high-low, or reverse battery and ground), DX, E&M, or SF

(g) *Signaling* on accessed circuits requiring 2- or 4-wire simplex, 20-Hz coded ringing, 20 Hz at 86 volts superimposed with 48 Vdc, 20 Hz at 105V nontrippable, or 2600 Hz at 20 PPS

(h) *Dialing* on accessed circuits with MF, TT, loop (loop-start, ground-start, high-low, or reverse battery and ground), DX, E&M, and SF

(i) *Transmission measurements* on accessed circuits for message circuit noise, voice-frequency

levels, and frequency within ranges shown in Table A

(j) **Transmission of Tone** on accessed circuits at frequencies of 404, 1004, 2600, 2713, and 2804 Hz. (Sending levels adjustable in 1-dB increments from +10 to -39 dBm)

(k) **Pulsing** on accessed circuits at 8, 10, or 12 PPS with 45, 58, or 70 percent break continuous for 15 seconds.

Note: Pulse measuring or controlled pulsing is not available.

3.04 A typical SARTS-1A is functionally illustrated in Fig. 2. One test site is shown for simplicity. The 4-wire synchronous data link(s) between a test site and PC-1A is direct cabling (4-wire private line null modems as shown in SD-1P000-01) when the cable distance is less than 50 feet. Greater distances require 4-wire private line data circuits equipped with local (or DDD) switched backup capabilities. The asynchronous data links between the PC-1A and RTS are generally local (or DDD) switched data service. However, to conserve PC-1A time, 2-wire private line circuits are used if a large volume of tests are to be performed with an RTS.

Note: All data sets, switched data service, and private line data circuits (synchronous and asynchronous) in the SARTS-1A are engineered locally for the operating requirements of the local environment.

3.05 The 126A6 telephone console (SD-1P008-01) on each TP-52A in the test site terminates two test line control circuits (SD-1P009-01) which connect to four central office line switch appearances dedicated to the test status verification and listen/talk calls from the RTSs. The telephone consoles are also connected to a 1A2 Key Telephone System (KTS). The trunks and central office lines from the KTS allow external communications.

Note: All central office line equipment and the 1A2 KTS are engineered locally for the operating requirements of the local environment.

TABLE A

TEST SET MEASUREMENT CAPABILITIES

MEASUREMENT	RANGES
Noise	0 — 60 dBrn ±1 dB with 3-kHz flat, C-notch, program, 15 kHz or 50 KB/S weighting at 150, 600, 900, or 1200 ohms
Signal power (level)	—50 to +10 dBm ± 0.1 dB at 150, 600, 900, and 1200 ohms
Frequency	100 to 50,000 Hz ±1 Hz to ±10 Hz
DC voltage	0 to ±199.9 V ±1%
AC voltage	0 to 199.9 V ±1% 50 Hz* to 50 kHz
DC current	0 to ±199.9 mA ±1%
AC current	0 to 199.9 mA ±1% 50 Hz* to 50 kHz
Resistance	0 to 9.99 megohm ±1%
Capacitance	0 to 19.99 μF ±1%

* Frequencies below 50 Hz are possible but with reduced accuracy.

Fig. 2—SARTS-1A Functional Layout

NOTES:
1. LINES OR TRUNKS ARE USED TO COORDINATE TESTING BETWEEN A SARTS-1A ACCESS AND A MANUAL TESTBOARD OR CUSTOMER LOCATION.
2. TEST SITE CAN BE REMOTE OR COLLOCATED PORTION OF TEST SITE IN THIS SARTS-1A OR PORTION OF TEST SITE FROM ANOTHER SARTS-1A.
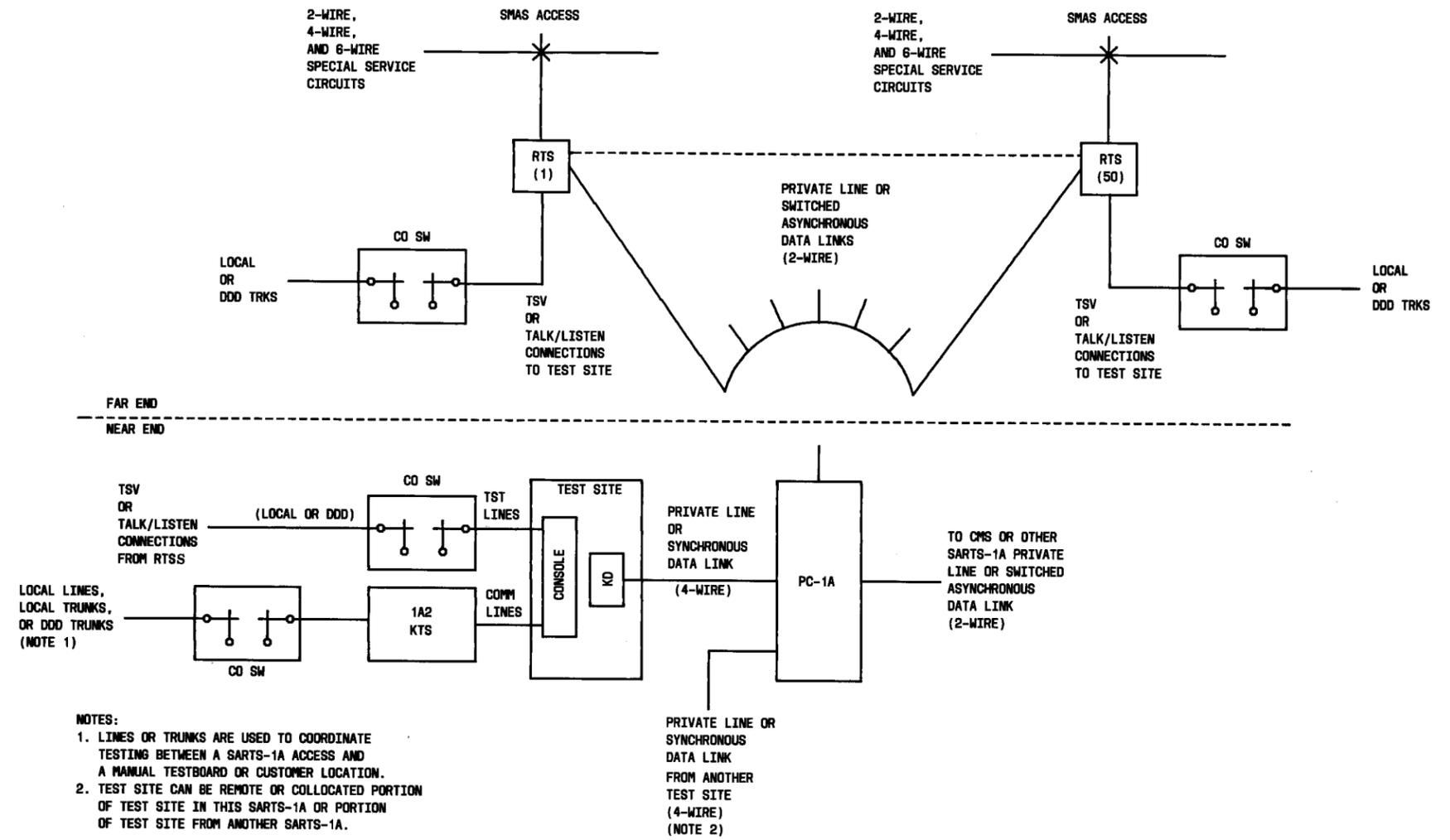
4. CAPABILITIES

4.01 The access and testing capabilities of a SARTS-1A are very broad and depend to some extent on subjective decisions and objective analysis by a testperson. Figure 3 illustrates a typical voice frequency (VF) special service circuit between two subscriber locations in two SARTS-1A testing areas. Five SARTS-1As in different geographical or operating areas are shown for completeness of the SARTS concept. Referring to area I, the SARTS-1A can be used to access and test between the RTSs in CO4 and CO3 without assistance. The RTS in either of these offices can also be used to perform tests with the private line testboard in CO1.

> *Note:* When performing tests between a SARTS-1A RTS and a manual testing location, the external communications (1A2 KTS) on the TP-52A telephone console is used to coordinate the RTS testing with the manual test location.

In CO3, two SARTS-1A accesses are made using the same RTS (an RTS can be equipped to allow up to eight remote accesses). In this case, a request to CO2 for a manual placement of the test shoe connection at the MDF would be required to test the circuit between CO2 and CO3 without further assistance.

4.02 The heavy dashed line between the SARTS-1A in areas I and II is a PC-1A to PC-1A asynchronous data link that the PC-1A in area I will establish automatically when access data for an RTS in CO5 or CO6 is entered by a testperson.

> *Note:* PC-1A to PC-1A communications are dependent on information contained in the Site Dependent Data software residing in the PC-1As.

The PC-1A in area II controls the access and testing as directed by the PC-1A in area I over the PC-1A to PC-1A data link. In this case, even though the access is made by a foreign PC-1A, the test status verification call from the RTS (or subsequent talk/listen connection, if required) is direct to a test line on the TP-52A originating the access request. This PC-1A to PC-1A interarea testing capability of the SARTS-1A permits RTS-to-RTS testing between any combination of CO3, CO4, CO5, and CO6 on a one-to-one basis. This capability

also allows RTS-to-customer testing by area I from CO6. Note that a testperson in area II has similar testing capabilities using the SARTS-1A in area I.
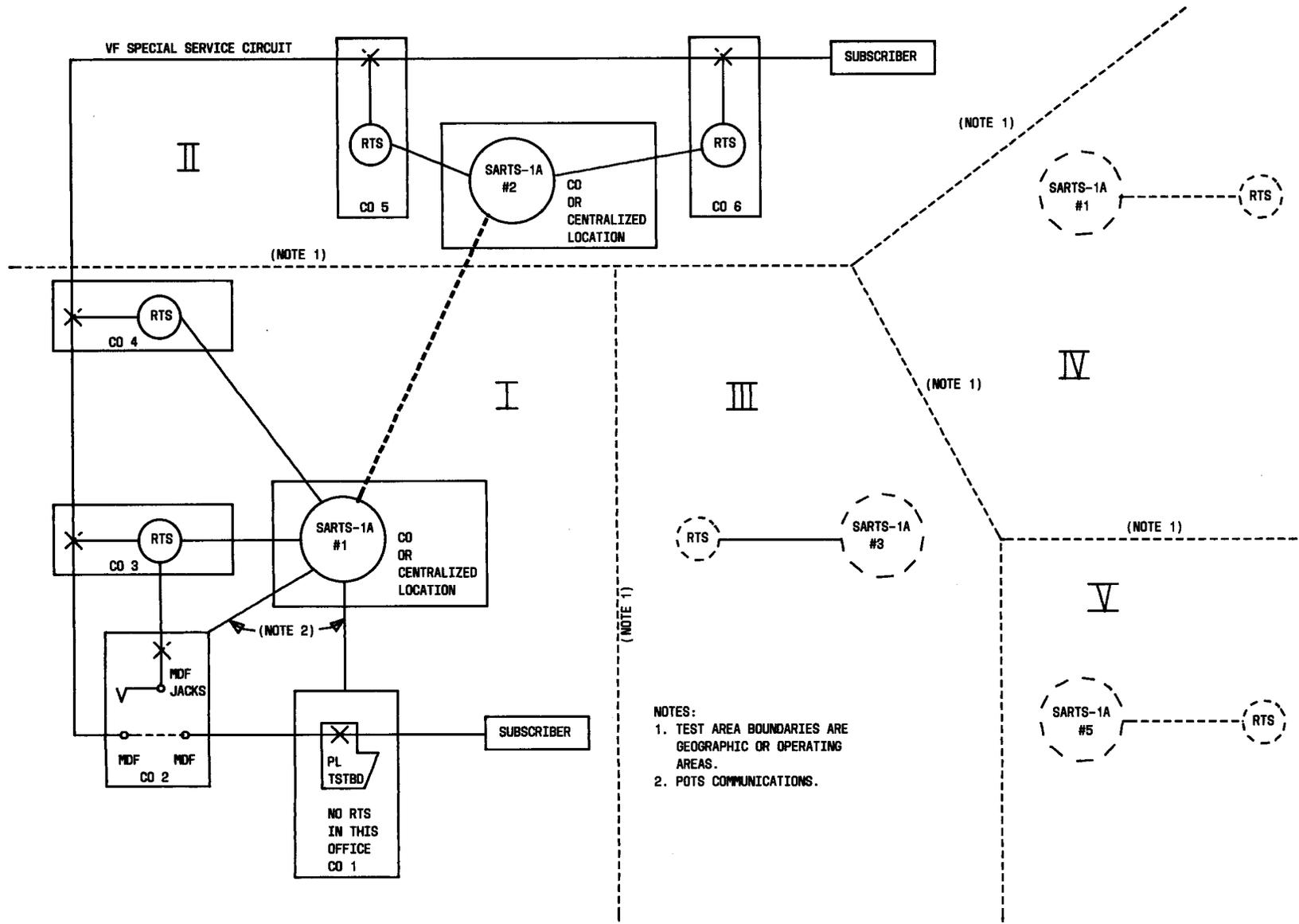
5. CONFIGURATIONS

A. Near End

5.01 The SARTS-1A near-end locations are locally engineered to meet local operating, facility, and building requirements. The engineering references are:

(a) Operations Support System—Common—SARTS-1A Specification for a PC-1A Processor System (J-1P016A-1)

(b) Operations Support System—Common—SARTS-1A Specification for Test Line Control Equipment Cabinet (J-1P011A-1)

(c) Operations Support System—Common—SARTS-1A Near End System Application and Interconnection (SD-1P000-01).

All data sets, data facilities, the Teletype C400 system, and the 1A2 KTS specified in the engineering references for SARTS-1A are customer-service equipments.

5.02 Figure 4 is an illustration of the near-end location showing an interconnection configuration in which a maxicluster and a minicluster arrangement of the Teletype C400 system is used. This arrangement is typical where one or more test sites are remotely located from the PC-1A. Note that the Station Cluster Controllers (SCCs), Minicluster Controllers (MCCs), and the KDs associated with each TP-52A are uniquely identified: the SCCs and MCCs by the numeral 0, which is set by an internal switch in the controller equipment in all cases, and each KD or printer by the numerals 00 through 33. Each Synchronous Interface (SI) is also identified by a single digit. By using these identities, the PC-1A is capable of identifying any device connected to the 4-wire synchronous interface lines. For example, in Fig. 4 the PC-1A uniquely identifies KD33, associated with the 23rd TP-52A, by the logical sequence 0033 (that is, SI0, SCC0, and KD33). Thus the interconnection and arrangement of all equipment in the Teletype C400 system is logically identified. These identities are entered in the Site Dependent Data portion of the PC-1A software. The identities are used in the PC-1A

VF SPECIAL SERVICE CIRCUIT

SUBSCRIBER

(NOTE 1)

II

RTS

CO 5

SARTS-1A
#2

RTS

CO 6

CO
OR
CENTRALIZED
LOCATION

SARTS-1A
#1

RTS

(NOTE 1)

RTS

CO 4

I

IV

RTS

CO 3

SARTS-1A
#1

CO
OR
CENTRALIZED
LOCATION

III

RTS

SARTS-1A
#3

(NOTE 1)

(NOTE 1)

(NOTE 2)

MDF
JACKS

V

MDF   MDF

MDF
CO 2

SUBSCRIBER

V

PL
TSTBD

NO RTS
IN THIS
OFFICE
CO 1

NOTES:
1. TEST AREA BOUNDARIES ARE
   GEOGRAPHIC OR OPERATING
   AREAS.
2. POTS COMMUNICATIONS.

SARTS-1A
#5

RTS

Fig. 3—SARTS Application

to associate command processing and displays with up to 24 input/output devices (KDs) and 12 receive-only printers.

5.03 The relationships between the identities of each KD, each telephone console, each of the two test lines terminating on the consoles, and each of the four subscriber numbers connected to the test line control circuits are also unique. This uniqueness is identified in the Site Dependent Data.

5.04 The Site Dependent Data includes logical identities assigned to each of the SIs connecting to an SCC or MCC, to the asynchronous interface ports and lines connecting to far-end locations or a PC-1A in another SARTS-1A, to the equipment in the far-end locations, and to other PC-1As. A detailed description of the Site Dependent Data is contained in Section 666-611-102.

> *Caution: A configuration (intercon- nections or equipment arrangements) change in the SARTS-1A cannot be made without coordinated changes in the Site Dependent Data portion of the PC-1A program.*

5.05 The basic PC-1A has two SIs (0 and 1). Two additional SIs (2 and 3) are optional. When a null modem is used to connect the PC-1A to the SCC or MCC, the null modem must be connected to SI 1 (or 2, if provided). Any of the four SIs may be used to interconnect a test site to the PC-1A with data sets and a 4-wire facility. In general, one test site is always collocated with the PC-1A for maintenance purposes.

5.06 The logical identities in the configuration of each test site interfacing with the PC-1A are assigned to a specific SI. The logical identities of the test site end of the interface must agree with the Site Dependent Data entered in the PC-1A for each port; therefore, SCC/PC-1A synchronous interfaces cannot be interchanged at the SCC or at the PC-1A without changing the Site Dependent Data entries in the PC-1A.

5.07 Several configurations of test site/PC-1A interface combinations are possible. The basic single or multiple test site configurations are illustrated in Fig. 5A and 5B. The number of TP-52As in any one test site and the number of

test sites in a near-end configuration is determined by local engineering.

5.08 A near-end location may also have an alternate configuration where one or more synchronous interfaces are changed to rehome all or some portion of a test site to another PC-1A for maintenance or backup purposes. In these cases, Site Dependent Data for the alternate configuration is also entered in the alternate PC-1A. Figure 5C illustrates an alternate configuration. Note that when an alternate configuration is in effect, the RTSs in the far-end location(s) normally controlled by the primary PC-1A respond to the alternate PC-1A. This is discussed further in Part C.

B. Far End

5.09 The SARTS-1A far-end locations are microprocessor-controlled remote test systems such as the RTS-1A. The RTS-1A is shown in SD-1P007-01 and consists of several circuits interconnected with a SMAS-4A. Figure 6 illustrates the configuration of equipment in an RTS-1A. The Far-End Control Circuit (SD-99623-01) is the microprocessor that controls all functions of the RTS-1A and interfaces with the PC-1A. A detailed description of the RTS-1A is contained in Section 666-613-100. The SMAS-4A is described in Section 667-302-100.

5.10 The PC-1A/RTS interfaces consist of outgoing, automatically dialed, asynchronous data services; incoming dialed data services; and, in some cases, private line data services.

> *Note:* If a private line facility interface exists, a switched data service is also provided for backup purposes.

These asynchronous services connect through multiplexing devices to asynchronous ports of the PC-1A. The basic PC-1A has two asynchronous ports (0 and 1) equipped with two line multiplexing devices. Sixteen asynchronous lines can be connected to port 0 and 15 to port 1. (The seventh position in the line multiplexing device in port 1 is dedicated to a processor-controlled Alarm Circuit [SD-1P104-01].) A third port and multiplexing device for additional 16 asynchronous lines are optional.

5.11 Logical identities are assigned for each asynchronous line, the multiplexer they connect to, and the PC-1A port the multiplexer

occupies. The unique configuration for the interconnection and arrangement of the asynchronous lines are entered in the Site Dependent Data in a similar manner as the synchronous lines.

C. System

5.12 The interconnection and equipment arrangements of a total SARTS-1A form a unique configuration consisting of communication facilities, test site(s), the PC-1A, and RTSs. Any addition, deletion, or rearrangement of the configuration requires coordinated changes in the Site Dependent Data program in the PC-1A. A SARTS-1A configuration with one test site is illustrated in Fig. 7A. A configuration to rehome the test site on another SARTS-1A is shown in Fig. 7B. Figure 7C illustrates a configuration which occurs whenever a circuit access is requested to be made by an RTS controlled by a PC-1A in another SARTS-1A. This configuration is supported by SARTS-1A programming only after the necessary Site Dependent Data has been entered in each SARTS-1A.

5.13 Preplanned reconfigurations, the necessary changes in Site Dependent Data, and a Fallback and Recovery subprogram in the SARTS-1A generic program provide maintenance and backup features for SARTS-1As. To implement these features, manual patching in the test site configuration and manual establishment of switched connections for data communications are required. All or a portion of a test site can be rehomed to an alternate PC-1A or to a PC-1A in another SARTS-1A.

5.14 All RTSs are arranged to respond and accept control from either a primary PC-1A or an alternate PC-1A. Thus, manual operations are not necessary to reconfigure the asynchronous data communications between PC-1As and RTSs in a maintenance or backup reconfiguration.

> *Note:* When the regular configuration has private line facilities between the primary PC-1A and an RTS, the data sets at the near-end location must be manually disabled to prevent transmission of secondary carrier to the RTS.

6. OPERATION

6.01 Operation of a SARTS-1A is controlled by a testperson from a TP-52A using 3-character commands. A specific command or a set of commands is defined for each SARTS-1A function. The commands are typed and entered on the KD. Commands that are incomplete, undefined, or contain errors are invalid and cannot be executed in the PC-1A. In some instances, command entries must also follow a specific sequence. In general, each command has one or more parameter descriptions. The structure of commands and parameters are described in detail in Section 666-610-102. Use of the commands is described in Section 666-612-101.

6.02 One of two methods may be used to make entries into the PC-1A from the TP-52A:

1. Command line/message line prompter entry

2. Numerical direct entry.

Method 1 is a step-by-step process that requires a minimum of familiarity with the SARTS-1A command and parameter structure. Method 2 requires command and parameter structure familiarity and allows bypassing some of the steps in method 1.

6.03 All commands or command/parameters are typed character-by-character on the KD. Each character is displayed on the command line at the top of the display area as it is typed. After a command line display is completed (and edited if necessary), it is entered into the PC-1A by depressing the S/R key on the KD.

> *Note:* The display is refreshed from a buffer associated with the KD. The command line is the only area in the buffer accessible from the KD. All buffer areas are accessible to the PC-1A.

Every entry is responded to by the PC-1A. The response is displayed on the KD monitor. The response may be a change in a display; a partial command/parameter and message line display that prompts the testperson with information for the next entry; an error message; or information tables requested by the entry such as test command menus, command sequences to perform an operation, etc.

6.04 Figure 8 illustrates an example and overview of the KD entries, system responses, and general SARTS-1A activity that occurs when a testperson uses the command line/message line prompter entry method of operation to make a SARTS-1A circuit access.
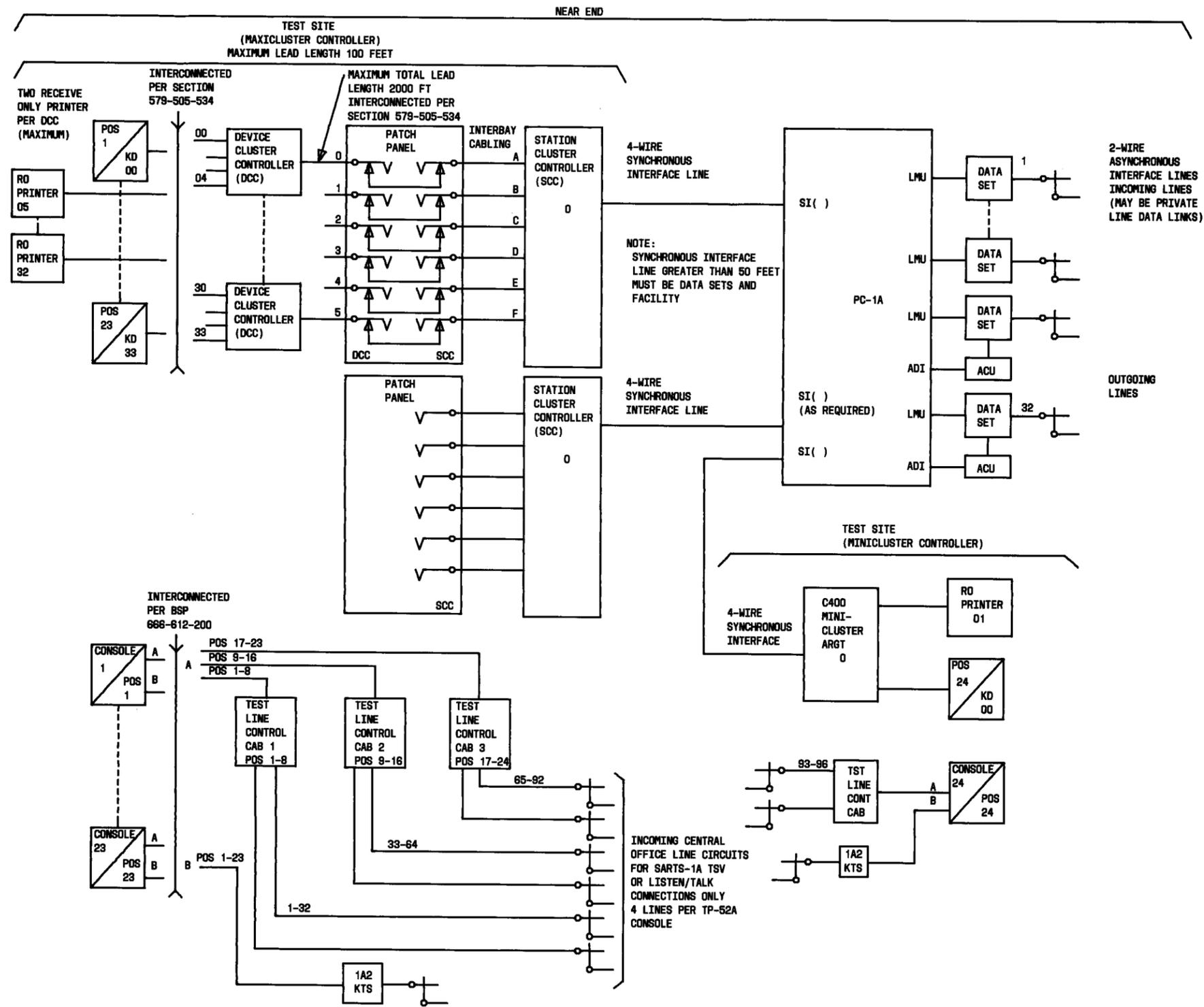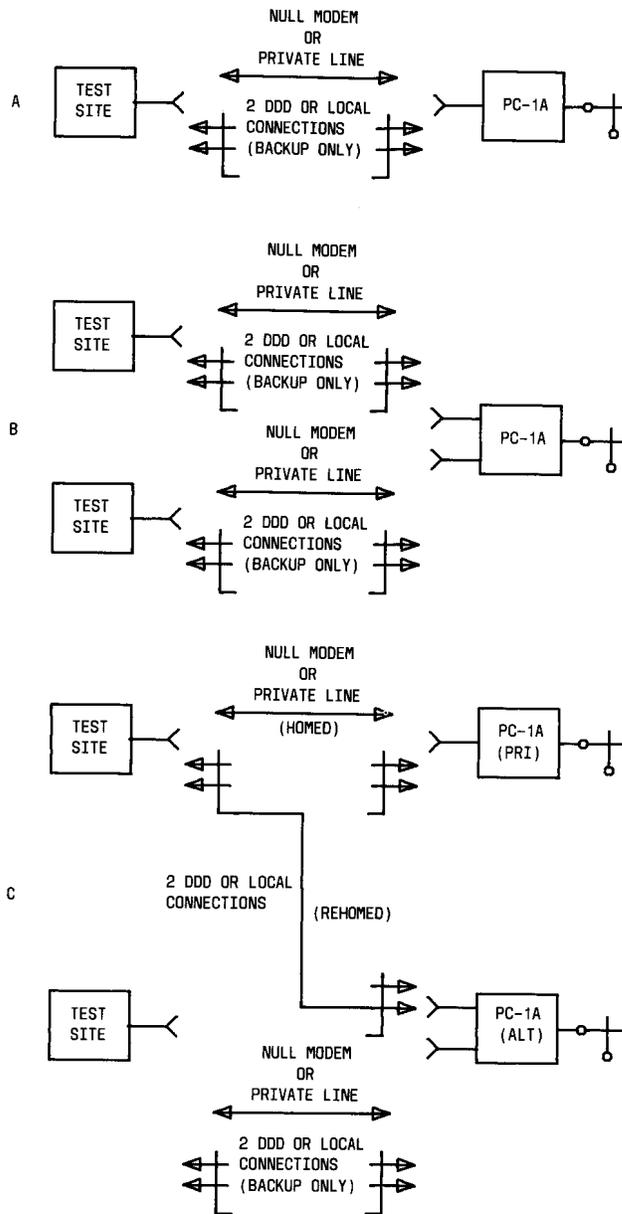
Fig. 4—SARTS-1A Near-End Location

Fig. 5—SARTS-1A Near-End Configurations

Note: The first KD entry shown at ① is the Sign On Command (000/). The Sign On Command and entry of the Sign Off Command, 000 without a slash (/), are required to activate and deactivate a TP-52A. Generally, the Sign On and Sign Off Commands are used only at the beginning and ending of a duty tour. Up to 75 characters can be entered after the slash in the Sign On Command. The Sign On Command and any subsequent characters entered become the first line of information in the position log that is initiated and maintained in the PC-1A after a TP-52A is signed on.

The next entry (700) shown at ⑪ is obtained from the 100 Table of Contents in the information area of the display returned in response to the Sign On entry (see Fig. 8, Note 1). The system response to this command is a display of a 700 TP Access table. This table lists the logical sequence for accessing a circuit at a SARTS-1A test point (TP). The 700 TP Access table replaces the 100 Table of Contents (see Fig. 8, Note 2). The first three commands (110, 120, and 130) shown in the Note 2 display are optional entries unless the SARTS-1A is interfaced with a CMS-2A or CMS-3A. Entry of these commands (if required locally) without a slash will cause a command line/message line prompter display to appear at the top of the display area. The display for the 130 command appears in the format shown at ⑪⑪ in Fig. 8. The top line is the command line. The symbol ⊞ indicates the initial position of a cursor that indicates where a character will be typed. The second line is the message line. All five valid parameter choices for the 130 command are shown on the message line. Each choice is separated by a colon (:) and counts from left to right.

6.05 Assuming that the circuit to be accessed will be identified by a telephone number, the parameter choice is 1. (If a circuit serial number was to be the identifier, the parameter choice would be 2.) When the parameter choice is typed on the KD and the S/R key is depressed, the command line received is the response shown at ⑪Ⅴ. The command line now has eight parameter fields defined. (Parameter fields are designated by the slashes.) Entry of the numeral 1 in the first field is defaulted by the system (displayed automatically) and the cursor is tab set to the second parameter field. Assuming that the identifier 919 727 3848 is sufficient for record purposes, the cursor must be manually tab set to the NPA field. The cursor will automatically tab set to the next data field (CO UN) when the 919 has been entered in the NPA field. When the complete identifier has been typed and entered, the response at Ⅴ is displayed. The parameters described in this message line agree with the format in the first line of data shown for an access point identity (Identity Data) on the special service CLR cards used in SARTS-1A (see Fig. 9A). After
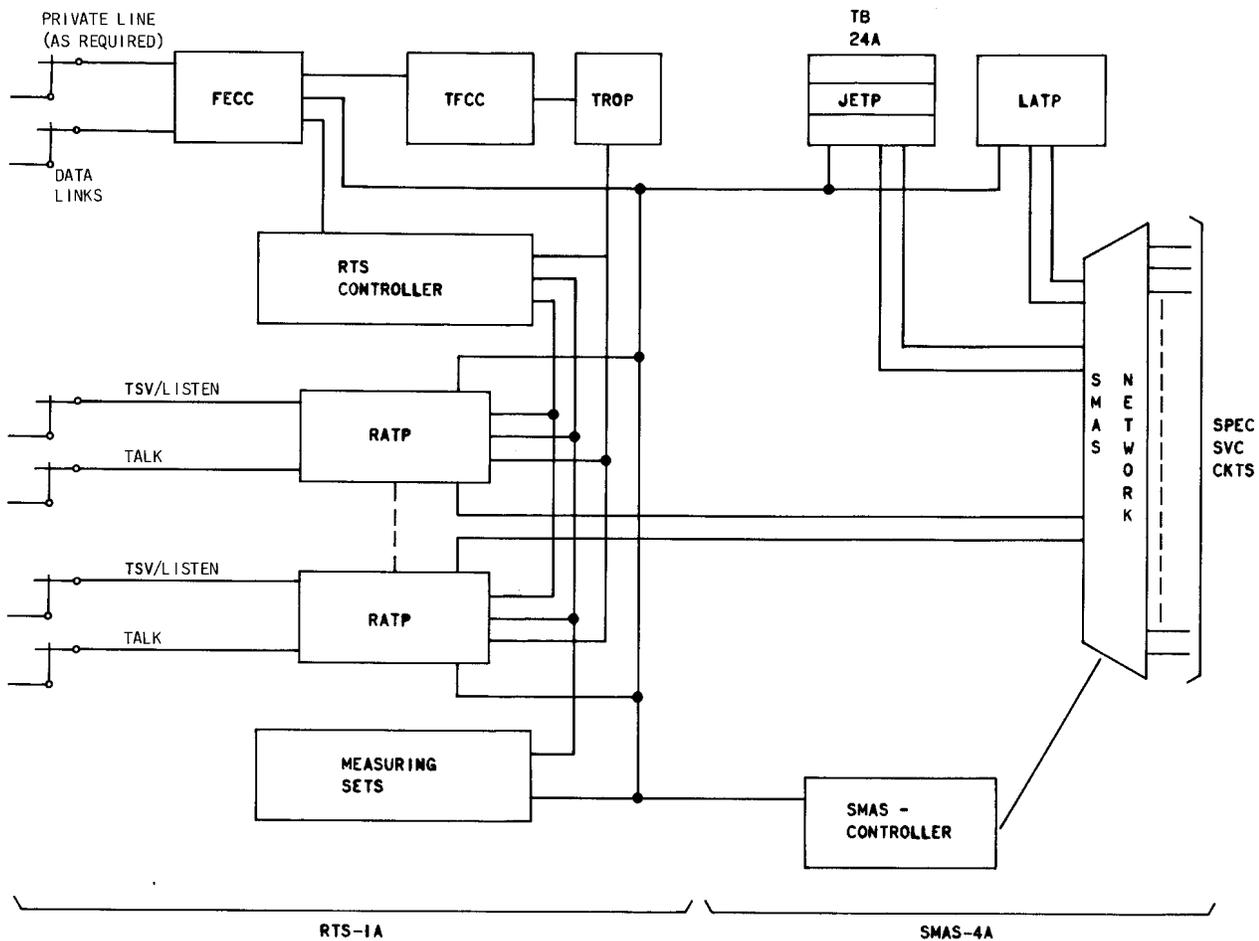
FECC - FAR-END CONTROL CIRCUIT
TFCC - TEST FUNCTION CONTROL CIRCUIT
TROP - TEST REGISTER OUTPULSE CIRCUIT
JETP - JACK-ENDED TEST PORT
LATP - LOCAL ACCESS TEST PORT
RATP - REMOTE ACCESS TEST PORT
MEASURING SETS - KS-21106 DIGITAL MULTIMETER
                 KS-21111 VF MEASURING SET

Fig. 6—SARTS-1A Far-End Location

typing in parameters on the command line, as copied from the CLR card example in Fig. 9B, the command parameters are entered and the next display (after successful completion of the access requested by the 701 command) is a command line/message line prompter for a 703 command as shown at (VI) . The parameters described in the message line of this display agree with the second line of data (Testing Data) on the CLR cards (see Fig. 9A). The parameters for this command are typed directly from the CLR (Fig. 9B) and entered in the same manner as the 701 command. (The

impedance parameter is defaulted on the command line; however, if the CLR card has a different value of impedance, it can be changed by placing the cursor over the defaulted characters and typing the value shown on the CLR card.) The command line/message line prompter entry method may be bypassed by using the numerical direct entry method. The same access just described can be obtained by sequentially typing and entering the following:
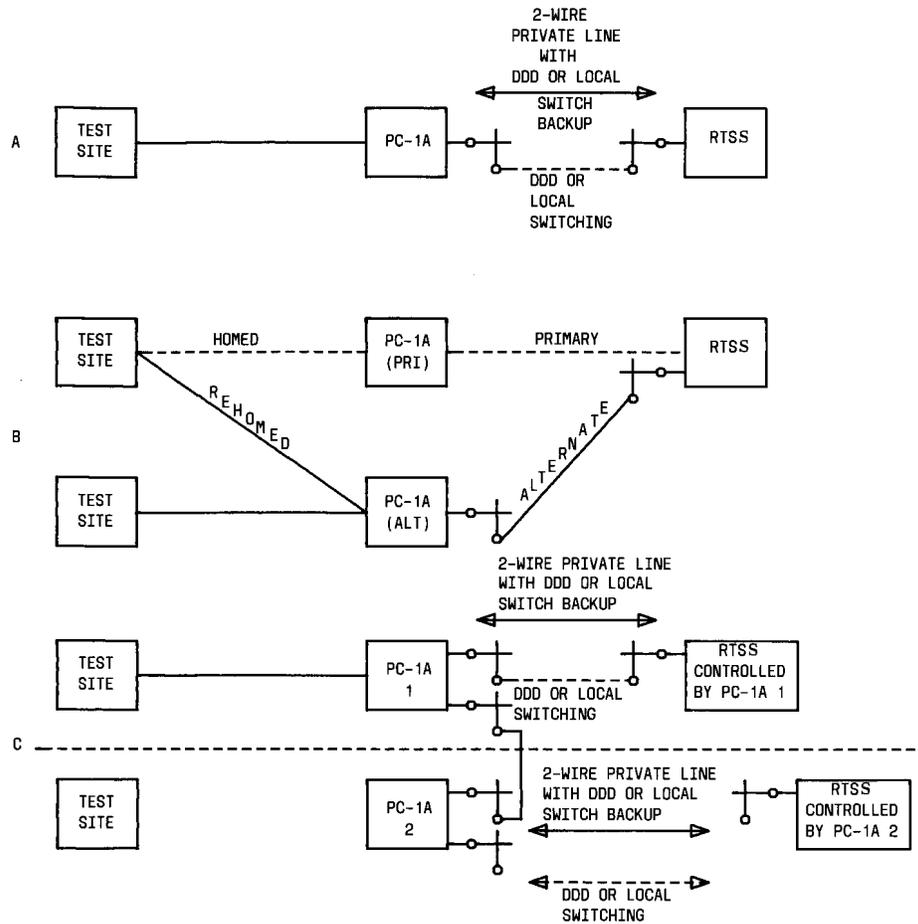
000/

2-WIRE
PRIVATE LINE
WITH
DDD OR LOCAL

Fig. 7—SARTS-1A System Configurations

130/ 1 919 727 3848 (blank spaces are required)

701/ first line of data from CLR (without slashes)

703/ second line of data from CLR (without slashes)

6.06 The PC-1A actually begins establishing, and in fact will complete, a circuit access upon receiving the 701 command; however, the 703 command is required before any testing commands can be entered. After entering the 701 command/parameters, a testperson must wait until the command has been executed and an incoming call from the far end is received on an ANS/TSV key of a test line. The actual waiting time depends on the current processing activities in the PC-1A,

whether the asynchronous data line to the far end must be dialed or is already established, and the connection time of the returned verification call. In some cases, and especially if a dedicated private line connects the PC-1A with the far end, the response for the access may be displayed prior to receiving the verification call.

> *Caution: The accessed circuit must be checked for idle condition prior to entering Test commands. If the accessed circuit is busy, service can be interrupted by certain Test commands.*

6.07 After making a circuit access and answering the incoming call on the ANS/TSV key of the telephone console, circuit testing can proceed. Circuit testing is also performed with command/parameter(s), and responses are displayed

in much the same manner as for circuit access described above. Figure 10A illustrates the effective interconnection in the testing mode that exists between the KD in the test site and the RTS access point in the circuit at the far end. The display shown in Fig. 10B is the initial display for a TP Access in a 2-wire circuit. The display is a graphic representation of the circuit access point that is connected to a Remote Access Test Port (RATP) [SD-1P001-01] by the RTS. Referring to Fig. 10B, the display indicates that the circuit identified in the 130 command is accessed at the TP 01 assigned to the circuit by the CLR card. (Test Point identity is in the first line of data.) The orientation of the equipment and facility at the TP as designated by the information on the CLR card is also shown. The display further indicates that the relay contacts in the RATP are configured for a normal through circuit condition since the lines are continuous. (This is similar to a circuit on normal through contacts at a testboard jackfield.) The CKT MON appearing in the TP status display area indicates that the verification circuit in the RATP is connected.

> *Note:* The verification circuit is bridge connected when the initial access is made. In the case of 4-wire and 6-wire circuits, the verification circuit is bridge connected to *both* directions of transmission at the same time. The CKT MON condition is removed when the circuit is split for testing.

6.08 When testing circuits with SARTS-1A, the TP Status display area is observed and the test commands structure is used to define the circuit and test conditions to be applied at the accessed TP. The PC-1A executes the commands, screens for missing data, checks for improper circuit or test conditions, and then sends a series of orders (with its own internal command sequence) to the Far End Control Circuit (FECC) [SD-99623-01]. The FECC and a second microprocessor, the Test Function Control Circuit (TFCC) [SD-1P003-01] which is controlled by the FECC, execute the PC-1A orders and set up relay contacts for circuit conditions in the RATP. The FECC and TFCC also connect test equipment and/or terminations and obtain results from test equipment. (This is similar to testing circuits at a testboard jackfield.) All data communications between the near end and far end are between the PC-1A and the FECC over asynchronous data lines as shown in Fig. 11. In the test mode, the PC-1A always sends either

commands or interrogations. The slaved FECC sends confirmations of receipt and execution of a command, apparent error detection, and data to answer an interrogation or report results of a test. The selection of a specific test, the technique of testing a circuit, and evaluation of test results are subjective actions of the testperson and not a function of the SARTS-1A. These subjective actions are limited only by the SARTS-1A testing capabilities and the sequences embedded in the test command structure used for KD entries.

6.09 The RATP that is physically connected to the circuit at the access point and graphically represented on the KD is illustrated functionally in Fig. 12. One 2-wire circuit is assigned to either the A *or* B side of the SMAS connector. One 4-wire circuit or the transmission paths of a 6-wire circuit must be assigned to the A *and* B sides of the same connector.

> *Note:* One RATP can be connected to one SMAS connector at a time. Two access points in the same 2-wire circuit are not assigned to both sides of the same connector in the same office.
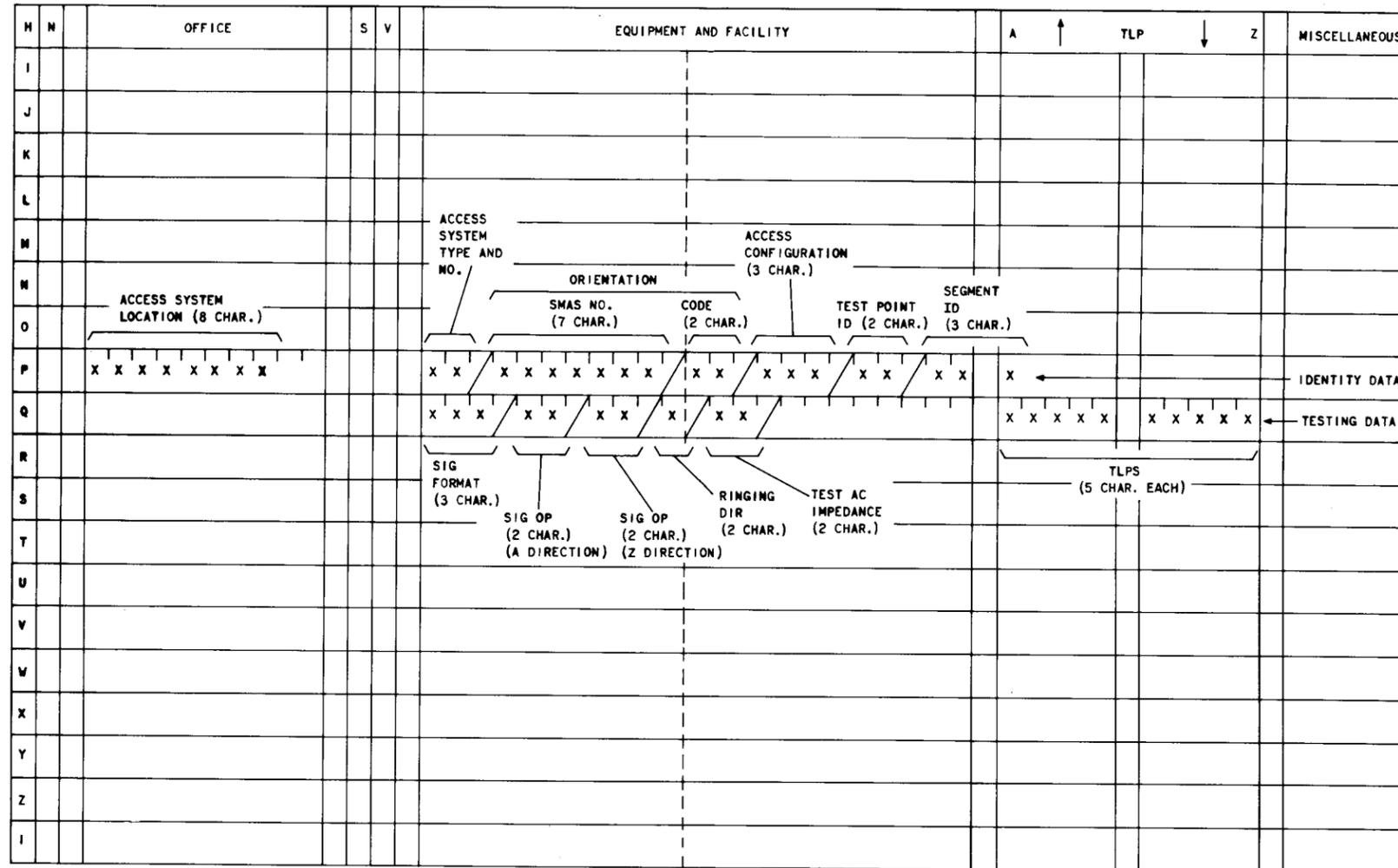
6.10 The verification circuit in the RATP is the originator of the ANS/TSV connection to the telephone console of the TP-52A on whose KD the RATP configuration is displayed. This circuit is also used in electrical testing and measuring. The supervisory and terminating circuits are used to maintain signaling conditions, connect transmission test equipment, and provide terminating impedances. A maximum of eight RATPs can be equipped in one RTS. Each RATP operates independently, and tests can be made between two RATPs in the same RTS in the same manner as if the RATPs were in different RTSs.

7. MAINTENANCE

7.01 The SARTS-1A is maintained as a system, primarily from the near-end location, specifically by the maintenance personnel having access to the Site Dependent Data, SARTS Maintenance Position (SMP), and a DECwriter. (The DECwriter is furnished with the PC-1A.)

7.02 The SMP is the TP-52A that is specifically identified at the DECwriter for initial program loading functions. Subsequent to the initial program loading of a SARTS-1A, other TP-52As may be designated as an SMP for maintenance purposes.

Fig. 8—Overview of SARTS-1A Access Method

9A—Access Point Data Format

HN	OFFICE	SV	EQUIPMENT AND FACILITY	A	↑ TLP ↓	Z	MISCELLANEOUS

ACCESS SYSTEM LOCATION (8 CHAR.)
ACCESS SYSTEM TYPE AND NO.
ORIENTATION
SMAS NO. (7 CHAR.)
CODE (2 CHAR.)
ACCESS CONFIGURATION (3 CHAR.)
TEST POINT ID (2 CHAR.)
SEGMENT ID (3 CHAR.)

X X X X X X X X   X X / X X X X X X X / X X / X X X X X / X X / X X   X → IDENTITY DATA
X X X / X X / X X / X I / X X   X X X X X   X X X X X ← TESTING DATA

SIG FORMAT (3 CHAR.)
SIG OP (2 CHAR.) (A DIRECTION)
SIG OP (2 CHAR.) (Z DIRECTION)
RINGING DIR (2 CHAR.)
TEST AC IMPEDANCE (2 CHAR.)
TLPS (5 CHAR. EACH)

9B—CLR Card Example

A	714 294-4483						C	OCSDCA01B0		0	WO
B		1ST NATIONAL BANK					MLG	40.0			
C PRI		SWSYS	SWA	BAL	NOISE	U					
D TFO		A					ICL	2.1			
E EML	2.5	Z	25X								
F											
G											

HN	OFFICE	SV	EQPT AND FACILITY			A	TLP	Z	MISC
I	- CSRSS	X2	HANDSET			-2.5		0.0	
J	LOCAL CHAN	X2	26 NL			-2.5		-2.1	
K			26-4299 24-35 BT-1620			RFS-364		DB-2.1	
L	OCSDCA01	X2	SMCG410A00	10073-01086A					
M	OCSDCA01		41/-01086-/EF/2WA/01/						
N			L2W/LN/LN/F/33/			-0.4		-2.1	
OA	OCSDCA01W1	X2	SFMOU20D00	153.01	19	-0.4		-16.0	
P	OCSDCA01		SFXSF10						SMAS ASSIGNMENT
Q	OCSDCA01		SF6DF00						IDENTITY DATA
R	OCSDCA01	X4	SMCG410A00	10073-01152-					TESTING DATA
S	OCSDCA01		41/-01152-/EF/4BA/02/						
T			SFC/LN/LN/E/22/			+7.0		-16.0	
U	OCSDCA01	X4	ONMT20	154.09	11	+7.0			
V			1 ON 2		1				
W	SNDGCA02	X4	ONMT200D00	147.09	31			+7.0	
X	SNDGCA02	X4	SMCG410A00	14032-00014-					
Y	SNDGCA02		41/-00014-/FE/4AB/03/						
Z			SFC/LN/LN/F/22/			-16.0		+7.0	
1	BASE SD		A SDIC240-02						

21SEG		CARD	01-02	ISS	09/17/74	ISSUING COMPANY	PT-LA	CKT LAYOUT OUTLINE 9 66

Fig. 9—Access Point Data Format and CLR Card Example

SARTS-1A
NEAR END

SARTS-1A
FAR END

TEST SITE

DEVICE
CLUSTER
CONTROLLER
(DCC)

PATCH
PANEL

STATION
CLUSTER
CONTROLLER
(SCC)

(NOTE 1)

PROCESS
CONTROLLER
(PC-1A)

I/O

I/O

DATA
SET

(NOTE 1)

DATA
SET

I/O

REMOTE TEST
SYSTEM 1A
(RTS-1A)

SMAS-
4A
NET

TO
2-WIRE ACCESS
POINTS

TO
4-WIRE ACCESS
POINTS

TO
6-WIRE ACCESS
POINTS

SYNCHRONOUS
DATA LINE

ASYNCHRONOUS
DATA LINE

4- OR 6-
WIRE
TX   RX

TELETYPE
C400 SYSTEM
(MAXICLUSTER
ARRANGEMENT)

1A2
KEY
TELEPHONE
SYSTEM

TELEPHONE
SERVICE
AS REQUIRED

TSV
OR LISTEN

TSV
(DDD CONNECTIONS)

TEST
LINE
CONTROL
CIRCUIT

TALK

(NOTES 2 AND 3)

TP-52A

MODEL 40
RECEIVE
ONLY
PRINTER

NOTES:
1. DATA LINK MAY BE A PRIVATE LINE.
2. LISTEN AND TALK REQUIRE BOTH DDD
   CONNECTIONS.
3. TSV/LISTEN AND TALK CONNECTIONS
   ARE ESTABLISHED BY RTS-1A AND
   MANUALLY ANSWERED AT THE TP-52A.

FIG. 10A

TP:01--SEG: ---CKT: 9197273848   --MON:1--
E
TP ID   CKT ID
(1ST LINE OF DATA)   (130 COMMAND)   TEST LINE
CKT MON   NO.
F

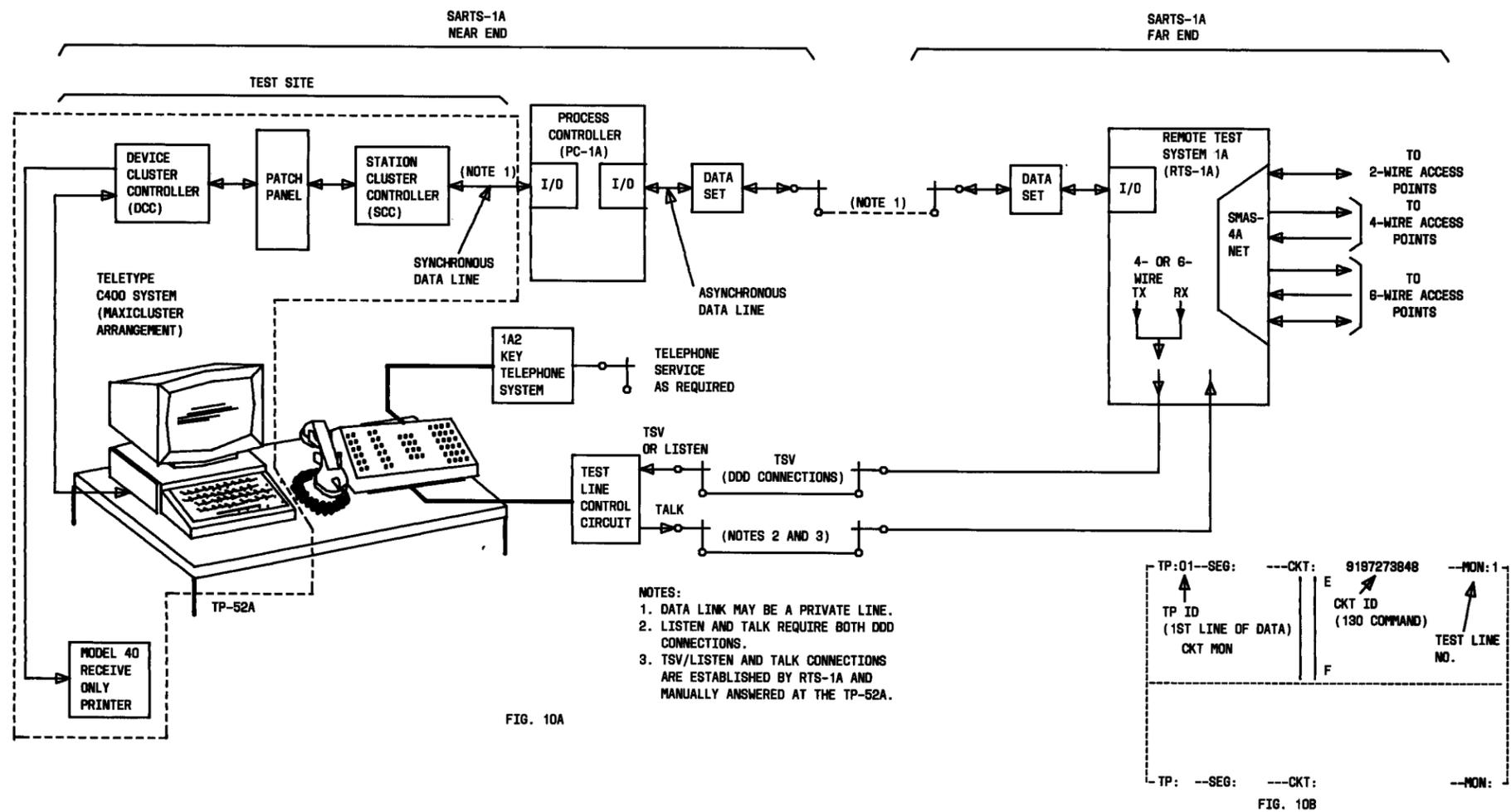TP: --SEG: ---CKT: --MON:
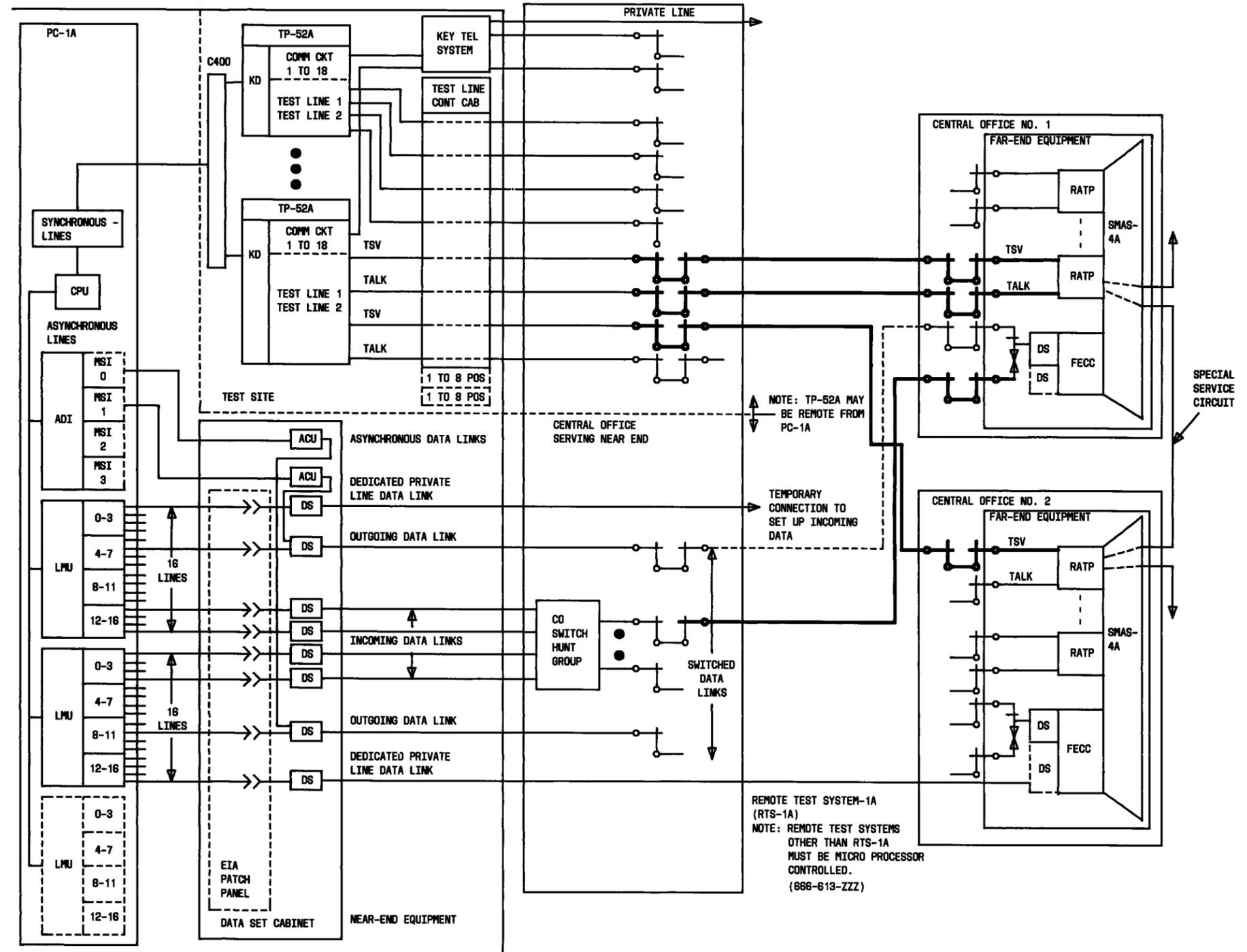
FIG. 10B

Fig. 10—SARTS-1A Testing Mode
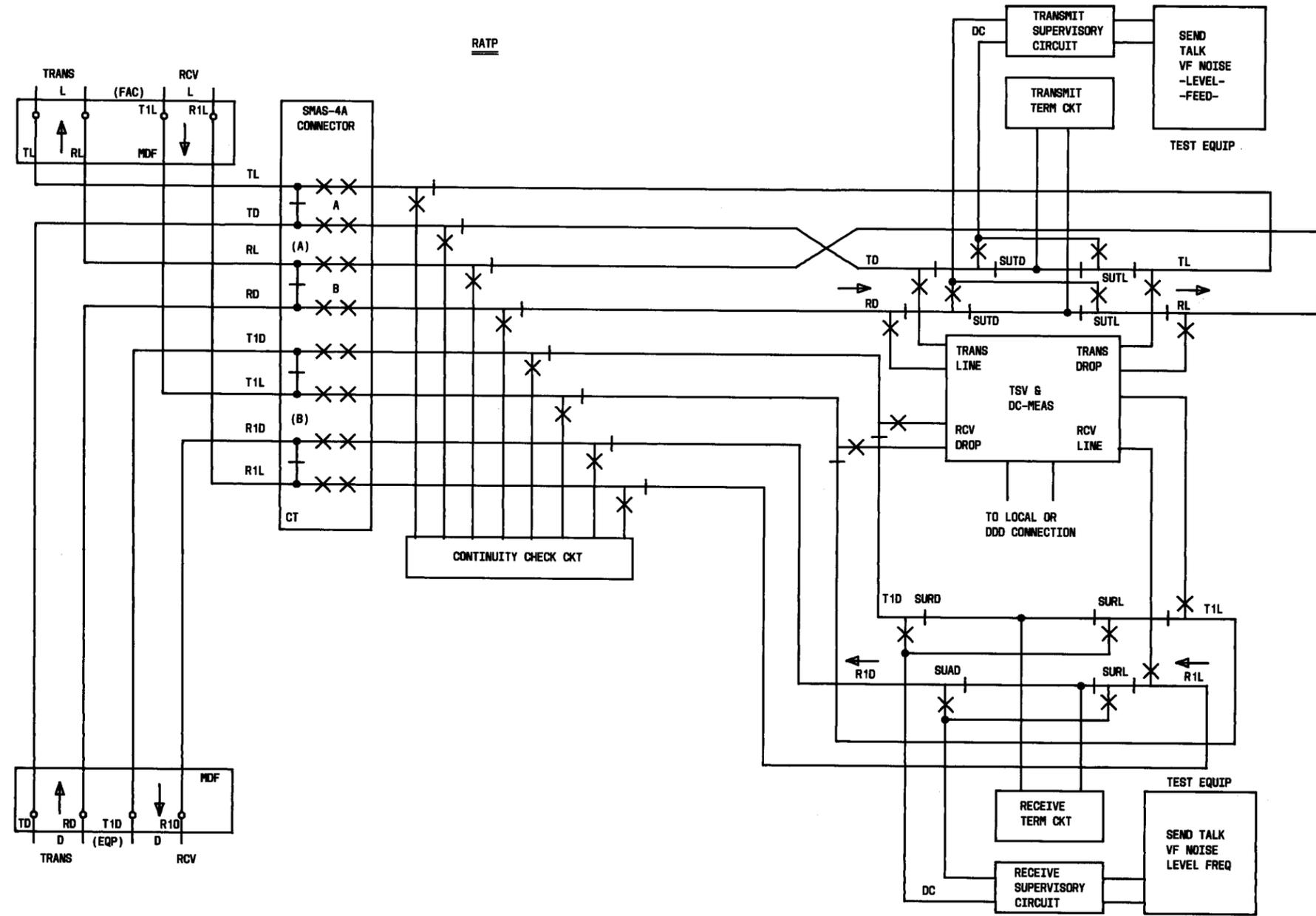
Fig. 11—Near-End to Far-End Communications

Fig. 12—Remote Access Test Port

7.03 The SMP is used to enter Site Dependent Data after initially entering the SARTS-1A generic program. See Section 666-611-102. After the system is initialized and operating, the SMP is used to perform maintenance on the system with the maintenance commands and operations described in Sections 666-610-300 and -500. The DECwriter types out the error messages and other processing functions of the PC-1A.

7.04 The SMP and the DECwriter are used in sectionalizing system malfunction to the data communication lines and data sets, a test site, the PC-1A, or an RTS. The performance of maintenance in any of these areas must be coordinated and controlled by SARTS-1A system maintenance personnel.

7.05 The PC-1A is locally maintained and tested as described in Sections 666-611-300 and -500. All local maintenance required for the TP-52A and associated equipment in a test site is described in Sections 666-612-300 and -500. The RTS-1A is locally maintained and tested as described in Sections 666-613-300 and -500. Data sets used in SARTS-1A are maintained as described in the applicable sections below.

DATA SET	SECTION
208A	592-027-ZZZ
202S	592-028-ZZZ
202T	592-031-ZZZ
801C4	598-012-ZZI

8. REFERENCES

8.01 The following schematic drawings cover near-end and far-end equipment.

NUMBER	TITLE
SD-1P000-01	Operations Support Systems—Common-Switched Access Remote Test System 1A—Near End Application Schematic and Interconnection

SD-1P001-01	Operations Support Systems—Common-Remote Test System 1A—Remote Access Test Port
SD-1P002-01	Operations Support Systems—Common-Remote Test System 1A—Controller Circuit
SD-1P003-01	Operations Support Systems—Common-Remote Test System 1A—Test Function Control Circuit
SD-1P004-01	Operations Support Systems—Common-Remote Test System 1A—Miscellaneous Fusing and Fuse Alarm Circuit
SD-1P005-01	Operations Support Systems—Common-Remote Test System 1A—Test Register and Outpulsing Circuit
SD-1P007-01	Operations Support Systems—Common-Remote Test System 1A—Keysheet
SD-1P007-02	Operations Support Systems—Common-Remote Test System 1A Current Drain Data
SD-1P008-01	Operations Support Systems—Common -Switched Access Remote Test System 1A—Test Position 52A— Telephone Console
SD-1P009-01	Operations Support Systems—Common-Switched Access Remote Test System 1A—Test Position 52A—Test Line Control Circuit
SD-1P012-01	Operations Support Systems—Common-Remote Test System 1A—Circuit Pack Schematic
SD-99328-01	Common Systems—Signal Generator Circuit
SD-99493-01	Common Systems—Signaling Receiving Circuit Multifrequency Pulsing

SD-99560-01   Common Systems—Switched Maintenance Access System 4A-Controller and Connector Circuit

SD-99561-01   Common Systems—Switched Maintenance Access System 4A-Jack Ended Test Port

SD-99562-01   Common Systems—Switched Maintenance Access System 4A-Continuity Check Circuit

SD-99563-01   Common Systems—Switched Maintenance Access System 4A-Local Access Test Port

SD-99623-01   Common Systems—Switched Maintenance Access System 4A-Far End Control Circuit

SD-99625-01   Common Systems—Switched Maintenance Access System 4A-Miscellaneous Fusing and Fuse Alarm Circuit

SD-99785-01   Common Systems—Switched Maintenance Access System 4A-Far End Control Circuit Fusing and Fuse Alarm Circuit

SD-99786-01   Common Systems—Switched Maintenance Access System 4A- Far End Maintenance Test Circuit

8.02 The following are miscellaneous circuits that may or may not be required depending on whether they are currently in an office or an equivalent exists in the office.

NUMBER	TITLE
SD-96618-01	Common Systems—Transmission Measuring—71G Precision Tone Generator
SD-73093-01	406A Tone Generator
SD-1C484-01	Common Systems—Flashing Circuit
SD-27860-1	Power, Ringing, and Tone Distribution Circuit

SD-99434-01   Universal Line and Trunk Circuit

SD-95277-02   Milliwatt Distributing Circuit

SD-25671-01   Office Alarm Circuit

SD-1P021-01   2600 Hz Supply Circuit

8.03 The following sections cover information for SARTS-1A.

SECTION	TITLE
103-126-100	KS-21111 Remote Digital Transmission Measuring Set Description
103-126-102	KS-21106 Remote Digital Multimeter Description
666-502-500	Testboard 24A and JETP Tests
666-610-100	SARTS-1A General Description
666-610-101	SARTS-1A Interconnections and Communications
666-610-102	**SARTS-1A Command, Display, and Hardcopy Descriptions**
666-610-300	SARTS-1A Maintenance Methods
666-610-500	SARTS-1A System Tests
666-611-100	Process Controller 1A and Associated Equipment—General Description
666-611-102	Process Controller 1A Operating Instructions
666-611-300	Process Controller 1A—Maintenance Methods—General Description
666-611-301	Process Controller 1A Maintenance Display
666-611-500	Process Controller 1A—Tests
666-612-100	Test Position 52A and Associated Equipment—Description
666-612-101	**Test Position 52A Command and Display Descriptions**
666-612-200	Test Position 52A—Installation