

## SARTS (SWITCHED ACCESS REMOTE TEST SYSTEM) 1A GENERAL DESCRIPTION

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1. GENERAL

1.01 The SARTS 1A (Switched Access Remote Test System 1A) is a manually operated system with processor-controlled functions. A single testperson can manually operate the SARTS 1A and perform one-person testing on voice-frequency special service and data circuits. These circuits should be equipped with SMAS (Switched Maintenance Access System) access points and the microprocessor-controlled RTS (Remote Test System). One-person testing is defined as one person having the capabilities to access and test a circuit, to verify/sectionalize a reported trouble, and/or to perform initial circuit order work testing.

1.02 This practice is being reissued to include Generic 2PC3 software and equipment changes. Revision arrows have been used to denote significant changes. The specific reasons for reissuing this practice are as follows:

- (a) To add information on the capabilities of the SARTS Generic 2PC3
- (b) To add the equipment changes for communication between the PC and RTSs
- (c) To add the equipment changes for communication between the PC and foreign PC(s)
- (d) To add information for the multi-point terminate and leave for DACS (Digital Access Cross-Connect System)
- (e) To add macro and scheduled testing
- (f) To add additional information of site dependent data
- (g) To update the SARTS reference information.

1.03 **Warning:** *This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a*

***residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.***

1.04 The manual operation interface for SARTS 1A is a DATASPEED\* 40/4 or 4540 keyboard/display which is part of the TP (test position) 52A and associated equipment as described in Practice 666-612-100. The processor that controls all system functions is the PC (process controller). The PC (and associated equipment) is described in Practices 666-611-100, 666-611-110, 666-611-120, and 666-611-130.

1.05 This practice includes descriptive information of the SARTS 1A PC. There are three versions of the SARTS 1A PC: the PC 1A, the No. 2 PC, and the No. 3 PC. When referring to the SARTS 1A PC and when descriptive information is common to both units, the term PC will be used. When descriptive information is different, the specific unit will be stated (PC 1A, No. 2 PC, or No. 3 PC).

1.06 The descriptive information in this practice describes the latest software generic for the No. 2 PC (Generic 2PC3) unless otherwise noted. This generic enhances the communications capabilities between the PC and the RTSs and between the PC and foreign PCs. In addition to a change in the software, changes in the hardware (data sets and smart modems) are required. The process of changing the hardware may require a few to several months. During the period that the hardware is being upgraded, an interim software generic (between 2PC2 and 2PC3) is required. This interim generic (2PC2.1) allows proper communications between the PC and RTSs when there is a mix of the older (half-duplex) hardware and the upgraded (full-duplex) hardware. Depending upon the number of inter-PC links, a combination of synchronous and asynchronous inter-PC links may exist during the use of Generic 2PC2.1. Once all hardware has been upgraded, then Generic 2PC3 is loaded to take full advantage of the enhanced communications capabilities.

1.07 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 and the test site. The term "test

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site" is defined as consisting of one or more TP 52As and associated equipment. Each test site interfaces with the PC over synchronous data links (Fig. 1). The SARTS 1A far-end location consists of a microprocessor-controlled RTS/SMAS system. The RTS controls SMAS and performs all SARTS 1A circuit access and test functions under control of the PC. Up to 100 far-end locations may be assigned and controlled from one primary near-end location depending on the generic used.

1.08 The near-end PC and far-end RTS locations interface over full-duplex asynchronous data links (Fig. 1). The near- and far-end locations are generally arranged for a SARTS 1A to coincide with a geographical or operating area.

1.09 The circuit access points used in SARTS 1A testing are located in special service circuits as described in Practice 667-000-001. The standard format required for inputting the access point identification and the testing data information (assigned to the access points) is also described in Practice 667-000-001. The formatted access point data appears on the CLR (circuit layout records) used in SARTS 1A testing.

1.10 When the SARTS 1A is used in conjunction with the CMS 3A (Circuit Maintenance System 3A), no physical CLRs are required.

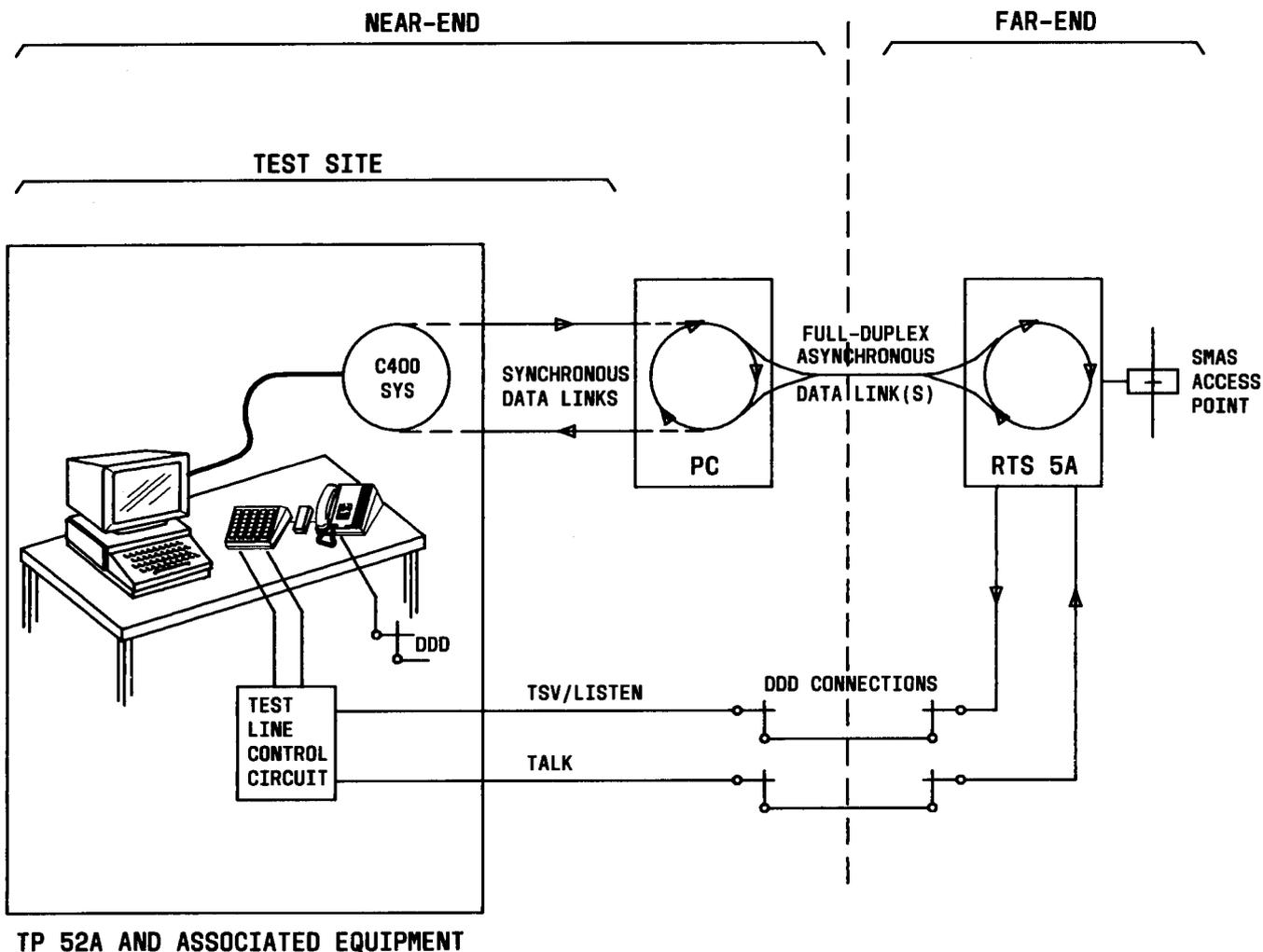


Fig. 1—SARTS 1A Subsystem Interface

## 2. COMPONENTS

### A. Test Site

**2.01** The TP 52A is the interface between the tester and SARTS 1A. The SARTS 1A test site (Fig. 1) contains one or more TP 52As. Each TP 52A consists of a desk with a DATASPEED 40/4 or 4540 keyboard/display and a 126A-type telephone console. The 126A telephone console has the features of a CALL DIRECTOR\* telephone. The 126A console also adds the test status verification and talk features to SARTS 1A. The 126C test line telephone console is used with a communication system (CALL DIRECTOR telephone set, MET [multibutton electronic telephone] set). Each test site interconnects to the PC over one 4-wire, null-modem circuit (direct cabling) or a 4800- or 9600-bps synchronous private line data circuit. The TP 52A (and associated equipment) is described in Practice 666-612-100.

**2.02** ♦The SARTS equipped with CPs (communications processors), instead of MCCs, SCCs, and DCCs, will utilize asynchronous terminals. These terminals replace the synchronous DATASPEED 40/4 and 4540 terminals. Most any terminal (up to 76 different types) similar to the TELETYPE\* 5410, 5420, or 5425 terminal is supported by the CP.

**2.03** The CP is a protocol converter that allows synchronous hosts (SARTS PC) to communicate with asynchronous terminals (including printers). All ports (synchronous and asynchronous) on the CP may be directly connected to the terminals or may utilize data sets. Figure 9 shows the CP connected to one of the synchronous ports on a PC (Generic 2PC3). For further information on the CP, refer to AT&T Practice 666-611-133.♦

### B. PC (Process Controller)

#### PC 1A (Process Controller 1A)

**2.04** The PC 1A, a PDP† -11 based minicomputer, contains the logic and software to control SARTS 1A from the near end.

**2.05** The PC 1A can support up to 24 active TP 52As. The PC 1A can control the testing process

for up to 300 RTSs; 50 of these RTSs can be assigned as home RTSs. The PC 1A can also handle up to five active inter-PC data links and 50,000 circuits or 112,500 access points. The PC 1A (and associated equipment) is further described in Practice 666-611-100.

#### No. 2 PC (No. 2 Process Controller)

**2.06** The No. 2 PC, a VAX‡ 11/780 minicomputer, contains the logic and software to control SARTS 1A from the near end.

**2.07** The No. 2 PC can support up to ♦120♦ TP 52As of which ♦85♦ can be active (logged on). The No. 2 PC can control the testing process for up to 512 RTSs; 100 of these RTSs can be assigned to the No. 2 PC as home RTSs. The No. 2 PC can handle up to 16 active inter-PC data links allowing a maximum of ♦32♦ test access points per link. The No. 2 PC can also handle a maximum of ♦150,000♦ circuits or ♦450,000♦ access points. The No. 2 PC (and associated equipment) is further described in Practices 666-611-110 and ♦666-611-130♦.

#### No. 3 PC (No. 3 Process Controller)

**2.08** The No. 3 PC, a PDP-11/24 minicomputer, contains the logic and software to control SARTS 1A from the near end. The No. 3 PC uses the features of Generic 2PC1.1.

**2.09** The No. 3 PC can support up to 16 active TP 52As. The No. 3 PC can control the testing process for up to 60 RTSs. The No. 3 PC can handle up to 32 inter-PC and PC-RTS links. The No. 3 PC can also handle a maximum of 25,000 circuits or 75,000 access points. The No. 3 PC (and associated equipment) is further described in Practice 666-611-120.

### C. RTSs (Remote Test Systems)

**2.10** The SARTS 1A far-end remote test system is the RTS 5A described in Practice 666-615-100. The RTS 5A SMAS 5A far end is designed for small-to medium-size offices with up to 400 maintenance connectors (9600 6-wire, 9600 4-wire or 19,200 2-wire circuits). A maximum of 20 test ports, either local or remote, can be assigned to the SMAS 5A system to access circuits. The RTS 5A SMAS 5B is designed for large offices. It has the capability of extending SMAS

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† Registered trademark of Digital Equipment Corporation.

‡ Registered trademark of Digital Equipment Corporation.

5A to 1600 maintenance connectors with 38,400 SMAS numbers. It can combine with a SMAS 4A system connector group of up to 40,000 SMAS numbers to provide a maximum SMAS 5B system of 78,400 SMAS numbers with a capability of 20 test ports. Figure 7 illustrates a SMAS 5B system.

**Note:** The maximum number of access points per SMAS system is determined by the mix of 2-, 4-, and 6-wire circuits.

**2.11** Arrangements are also available to install SARTS 1A/RTS capabilities into the small office environment (generally under 300 circuits). These arrangements facilitate deployment of SARTS 1A to support increased one-person remote testing of special service circuits. These arrangements are as follows:

- (a) A packaged, factory assembled and tested SMAS/RTS bay (J1P033M or N)
- (b) Minimum configuration versions of the current RTS and SMAS bays (J1P033A or C).

**2.12** The packaged bay arrangement is intended for small offices that have less than 300 special service circuits that are **not** growing rapidly. This arrangement can support up to 960 2-wire access points (or 480 4-wire access points).

**2.13** For small offices with about 300 special service circuits and a high special service circuit growth rate, the minimum configuration version RTS and SMAS should be considered as an alternative to the packaged bay arrangement.

#### D. Interconnection Facilities

**2.14** The following paragraphs describe the facilities used for the interconnection of the SARTS 1A components. For more information see Practice 666-610-101.

**2.15** A synchronous data facility with 4800- or 9600-bps data sets are required to interconnect a remote test site (TP 52As [test position 52As]) to one of the synchronous input/output ports of the PC. When a test site and PC are within 50 cable feet of each other, 4-wire null-modem circuits are used for interconnection. A null-modem clock is required, but no data sets are required, with the null-modem circuits.

**2.16** Exchange of information between the PC and RTSs is over asynchronous data facilities. Both 202T and 212AR data sets are utilized. The 202T is operated in full-duplex mode when private lines are the primary interconnection between PC and RTSs. The 212AR data set (backup) is used in full-duplex mode over DDD (direct distance dialing). The 212AR replaces the 202S data set.

**2.17** Exchange of information between a PC and a foreign PC is over private line synchronous data facilities. A DATAPHONE\* 2024A or DATAPHONE 2048A data set is used for this communication. The BX.25 protocol is utilized for inter-PC communications.

**2.18** Test status verification and talk communication lines are also established between the test site and the RTS. The interconnection facilities used are locally engineered with communications systems that are standard services. These interconnections can be dedicated or shared and may be local (or DDD) or private line (ringdown circuits).

### 3. FUNCTIONS

**3.01** A testperson at each TP 52A in a test site can control up to 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 being controlled by a PC for a TP 52A are displayed on the keyboard display 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. It is an extension, by way of a local central office switch or the DDD network, of a TSV (test status verification) circuit connected at the test point by the RTP (remote test port). The test point verification feature permits a testperson to verify the status of a circuit prior to beginning circuit tests. The verification connection is also used as a listening connection when the listen/talk testing function is required at the test point. This test function is also accompanied by a tester-initiated second incoming call from the RTS. Both connections are illustrated in Fig. 1.

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

**3.03** One test site is shown for simplicity in Fig. 1.

The synchronous data link(s) between a test site and PC is direct cabled (4-wire private line null-modems) when the cable distance is less than 50 feet. Greater distances require 4-wire private line 4800- or 9600-bps data circuits equipped with local (or DDD) switched backup capabilities. ♦The asynchronous data links between the PC and RTS(s) are usually 4-wire private line. Local (or DDD) switched data service is used as dial backup. The private line facilities provide more efficiency when large volumes of tests are performed on a particular 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.

**3.04** ♦A log feature provides a tester with a list of tests made and test results. The log is recorded in a data base. As each entry is entered into the log data base it is assigned a number. Entry number 1 is always the oldest entry in the data base. When the log is requested, it is formatted and displayed on the screen (up to 21 lines at a time). When the log is full and a new entry has been added, the oldest entry (number 1) is deleted.♦

**3.05** The 126-type telephone console on each TP 52A in the test site terminates two test line control circuits (SD-1P009-01). The telephone console connects 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 KTS (Key Telephone System), CALL DIRECTOR telephone set which connects to a 1A2 KTS, and a MET set which connects to a DIMENSION\* PBX, HORIZON communication system, or equivalent.

**Note:** All central office line equipment, 1A2 KTS, CALL DIRECTOR telephone set, and MET set are engineered locally for the operating requirements of the local environment.

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**3.06** The RTS 5A-SMAS 5A/5B provides maintenance access to UFT (unitized facility terminals) via types 2, 3, and/or 4 maintenance connectors. The maintenance connectors are described in Practice 667-000-002. Test points for UFT configuration are included in Practice 666-612-101.

**3.07** The accessing and testing of unitized arrangements that use a single SMAS number for more than one access point on the same circuit are restricted to accessing only one of these points at a time. For example, in the metallic facility terminal, 2-wire access points with the same SMAS number (see Practice 667-000-001) appear on both sides of a 2-wire to 2-wire repeater. Access and testing of these points can only be done at one 2-wire access point at a time. Should one of the points be under test, an access attempt for the other point will result in a SMAS BUSY indication.

**3.08** The principle testing functions of the SARTS 1A are as follows:

- (a) Bridged test status verification at the access points in a circuit
- (b) Talking and listening at the access points of 2-, 4-, or 6-wire access points (bridged or in split modes)
- (c) Electrical measurement of accessed circuits to determine presence/value of ac or dc voltage, ac or dc current, and resistance or capacitance
- (d) Termination of accessed circuits in either direction of transmission with 150-, 600-, 900-, or 1200-ohm ac impedance
- (e) Remotely terminate an access point equipped with a type 3 or type 4 maintenance connector and a T&L (terminate and leave) module or an access point in a DACS frame through the SARTS/DACS interface
- (f) Reversals in accessed circuits to turn over tip and ring in 2-, 4-, or 6-wire access points or directions of transmission pairs in 4- and 6-wire access points
- (g) Signaling on accessed circuits requiring loop, DX (duplex), E&M, or SF (single frequency) signaling conditions

- (h) Ringing on accessed circuits requiring 2- or 4-wire simplex, 20-Hz coded ringing, 20 Hz at 105 volts nontrippable, or 2600 Hz at 20 pps (pulses per second)
- (i) Dialing on accessed circuits with MF (multi-frequency), touch-tone service, DP (dial pulse), DX, E&M, SF and loop (loop-start, ground-start, high-low, or reverse battery and ground) dialing conditions
- (j) Transmission measurements on accessed circuits for message circuit noise, voice-frequency levels, and frequency
- (k) Transmission of tone on accessed circuits at frequencies of 404, 1004, 2600, 2713, and 2804 Hz
- (l) Pulsing on accessed circuits at 8, 10, or 12 pps with 45, 58, or 70 percent break and continuous pulsing for 15 seconds.

**Note:** Pulse measuring or controlled pulsing is not available.

#### A. Base-Line RTS 5A Test Features

**3.09** The base-line SARTS 1A test features are as follows:

- (a) **Multimeter Measurement Functions:** The following are the multimeter measurement ranges:
  - (1) DC voltage, 00.00 through  $\pm 224.0$  volts
  - (2) AC voltage, 00.00 through 200.0 volts
  - (3) DC current, 00.00 through  $\pm 224.0$  milliamperes
  - (4) AC current, 00.00 through 200.0 milliamperes
  - (5) Resistance, 0.000 through 2 megohms
  - (6) Capacitance, 00.00 through 5.000 microfarads.

(b) **Multimeter Configurations:** The following are the multimeter configurations:

- (1) Voltage, resistance, and capacitance measurements may be made from tip to ground, ring to ground, or tip to ring from either a bridged or split configuration.
- (2) Current measurements may be made in the tip or ring conductors.
- (3) Capacitive loops are discharged before voltage, resistance, or capacitance measurements are made and residual voltage, including ground potential differences, are compensated in the measurement.

(c) **Transmission Testing Functions:** The following are the transmission testing functions:

- (1) Signal level measurement range of  $-50.0$  through 10.0 dBm
- (2) Frequency measurement range of 60 Hz through 99 kHz
- (3) Noise measurement ranges. The following are the noise measurement ranges:
  - 3-kHz flat weighting, 15 through 60 dBm
  - C-notched weighting, 15 through 60 dBm
  - Program weighting, 20 through 60 dBm
  - 15-kHz weighting, 20 through 60 dBm.
- (4) Internal tones. The following internal tones can be sent on a circuit under test in 1.0-dB steps over the ranges shown:
  - 404 Hz, +10 through  $-50$  dBm
  - 1004 Hz, +10 through  $-50$  dBm
  - 2600 Hz, +5 through  $-55$  dBm
  - 2713 Hz, +10 through  $-50$  dBm
  - 2804 Hz, +10 through  $-50$  dBm.

(5) Transmission signal generation and measurement. These may be made at the following impedance levels:

- 150 ohms
- 600 ohms
- 900 ohms
- 1200 ohms
- High impedance (>200k ohms).

(6) Transmission compensation. This is provided in the RTP for SMAS network cabling losses up to 1000 feet of 24-gauge cable (51 ohms, looped) between the RTP and the SMAS maintenance connector.

(d) **Signaling and Supervision:** The following are the signaling and supervision features:

(1) The RTS has the capability to provide supervision, to provide address sequences, and to alert a circuit under test with various signaling formats.

(2) Address signaling. The following are the address signaling features:

- DP
- SF
- E&M
- DX
- MF pulsing
- touch-tone service.

(3) Ringing voltage. The following are the ringing voltage applications:

- 20 Hz, 86 volt
- 20 Hz, 105 volt.

(4) Dial pulsing. The following are the dial pulsing characteristics:

- Speeds—8, 10, 12 pps
- Percent break—45, 58, 70.

(e) **Loop Signaling Format:** The following are the loop signaling formats:

(1) Test direction signaling. The following are the test direction signaling conditions:

- Battery and ground conditions: -48 volts or -72 volts, normal or reversed, resistance lamp or fixed resistor

- Loop conditions: open or closed with ground, resistance lamp or fixed resistor

- Ringing: 20 Hz, 86 volt or 105 volt

- Dial pulsing: on start dial or automatic; telephone number, up to 13 digits; and loop start, ground start, or battery and ground

- touch-tone service: on start dial or automatic; telephone number, up to 13 digits; and loop start or ground start

- Continuous pulsing (15 seconds): loop or battery; 8, 10, or 12 pps with 45-, 58-, or 70-percent break

- MF pulsing for no test trunks

- MF pulsing automatic 1.5 seconds after seizure

- Special conditions: longitudinal load, loopback battery, 3-ringer load, split open.

(2) Nontest direction signaling. The following are the nontest direction signaling conditions:

- Battery and ground conditions: normal or reversed

- Loop conditions: open or closed

- Compromise ac termination (735 ohms).

(f) **SF Signaling Format:** The following are the SF signaling formats:

(1) Test direction signaling. The following are the test direction signaling conditions:

- SF condition: SF tone on or off, A- or B-pairs, tone level 20 dB below TLP (transmission level point)
- Ringing (2 seconds at 2600 Hz): loop start (up to fifteen 2-second bursts) or ground start (up to six 2-second bursts), tone level 5 dB below TLP
- Dial pulsing: on start dial signal or automatic; telephone number up to 13 digits; 8, 10, or 12 pps with 45-, 58-, or 70-percent break; tone level 5 dB below TLP
- Special conditions: split open A- or B-pair, SF tone level in 1 dB steps up to TLP on A- or B-pair.

(2) Nontest direction signaling. The nontest direction signaling condition is a compromise ac termination (735 ohms).

(g) **E&M Signaling Format:** The following are the E&M signaling formats:

(1) E&M conditioning: E- or M-side; E- or F-side; and open, battery, or ground

(2) Ringing in split direction: E or M and loop start normal, loop start inverted, or ground start (up to fifteen 2-second bursts)

(3) Dial pulsing in split direction: E or M; on start dial signal or automatic; telephone number, up to 13 digits; and 8, 10, or 12 pps with 45-, 58-, or 70-percent break.

## B. RTS 5A Test Enhancement Features

**3.10** The following enhancements to the RTS 5A include voiceband data parameter testing, digital data system testing, and ADTS (Automatic Data Test System) or DTC (Data Test Center) interface with SARTS 1A.

(a) **Impulse Noise Measurement:** The following are the impulse noise measurements:

(1) Termination modes. The following are the termination modes:

- Terminating 735 ohms
- Bridging 600 ohms
- Bridging 900 ohms
- Longitudinal to ground.

(2) Weighting functions. The following are the weighting functions:

- 3 kHz
- 15 kHz
- C-Message
- C-Notched
- Program.

(3) Threshold ranges. The following are the threshold ranges (in 1-dB steps):

- 30 to 130 dBrn terminating/bridging
- 60 to 160 dBrn longitudinal to ground.

(4) Measurement modes. The following are the measurement modes:

- Timed: 1 through 15 minutes, in 1-minute steps or continuous
- Early test termination
- Update counting.

(5) Counting rates. The following are the maximum counting rates:

- 7-pps range
- 200-pps range.

(6) Maximum count: 4095.

- (7) Self-test check.
- (b) **P/AR (Peak-To-Average Ratio):** The following are the P/AR indications:
- (1) Transmit level: -16 dBm0 over a transmission level point range of -36 through +10 and adjustable in 1-dB steps
  - (2) Receive level: -16 dBm0 over a transmission level point range of -24.5 through +10 and adjustable in 2.5-dB steps
  - (3) Measurement range: 0 through 120 P/AR units with resolution of 1 P/AR unit
  - (4) Out of range indication
  - (5) No signal acquisition indication
  - (6) Self-test check.
- (c) **Nonlinear Distortion:** The following are the nonlinear distortion indications:
- (1) Transmit level: -16 dBm0 over a transmission level point range of -36 through +10 and adjustable in 1-dB steps
  - (2) Receive level: -16 dBm0 over a transmission level point range of -24.5 through +10 and adjustable in 2.5-dB steps
  - (3) Range: Second and third order products 10 through 65 dBm below level of fundamental signal with resolution of 1 dB
  - (4) Out of range indication
  - (5) No signal acquisition indication
  - (6) Signal dropout indication
  - (7) Signal twist indication
  - (8) Incorrect test signal indication
  - (9) Signal to noise check
  - (10) Self-test check.
- (d) **Phase Jitter:** The following are the phase jitter indications:
- (1) Transmit level: -16 dBm0 over a transmission level point range of -39 through +10 and adjustable in 1-dB steps.
  - (2) Receive level: -16 dBm0 over a transmission level point range of -24.5 through +10 and adjustable in 2.5-dB steps.
  - (3) Measurement range: 0.0 through 25.5 degrees peak-to-peak, with resolution of 0.1 degree.
  - (4) Frequency weighting ranges. The following are the frequency weighting ranges:
    - 20 through 300 Hz
    - 4 through 20 Hz.
  - (5) No signal acquisition indication.
  - (6) Out-of-range indication.
  - (7) Self-test check.
- (e) **Digital Frequency Synthesizer:** The following are the digital frequency synthesizer ranges:
- (1) Transmit level: -10 dBm0 over a TLP range of -29 through +10 and adjustable in 1-dB steps
  - (2) The usable frequency range is approximately 300 Hz to 64,400 Hz. The following are the frequency resolution ranges:
    - 1 Hz through 4095 Hz: in 1-Hz steps
    - 4,100 Hz through 163,840 Hz: in 10-Hz steps.
  - (3) Self-test check.
- (f) **DDS (Digital Data System) Testing:** The following are used when making DDS tests:
- (1) Access. The following are the accesses to the test:
    - High-impedance monitor

- Split: Transmit and receive in test direction with 'test' control code capability in nontest direction.
- (2) Test. The following are the tests:
- DSU (data service unit) loopback test
  - CHAN (channel) loopback test
  - OCU (office channel unit) loopback test
  - DSU functional test
  - CSU (channel service unit) functional test
  - DSU straightaway test
  - CSU straightaway test
  - Test center to test center straightaway test
  - SRDM (subrate data multiplexer) test
  - DDGT (digital data group terminal) loopback test (56 kb/s [kbits/second])
  - Subrate off-net extension loopback test
  - 56 kb/s repeater loopback test
  - Test center to test center loopback test
  - MJU (multipoint junction unit) select, block, and clear.
- (3) Measurement modes. The following are the measurement modes:
- Timed
  - Early terminate
  - Update.
- (4) Anomaly indications. The following are the anomaly indications:
- Failure to synchronize DDS receiver
  - MJU answer back error.
- (5) Self-test check.
- (g) **DDS Loop Test:** The following are used when making DDS loop tests:
- (1) Access. The following are the accesses to the test:
- High impedance monitor
  - Split.
- (2) Foreign voltage
- (3) Insulation resistance
- (4) Loop and terminal resistance
- (5) OCU simplex voltage
- (6) Insertion loss
- (7) Background noise measurement
- (8) Impulse noise measurement
- (9) Self-test check.
- (h) **Data Test Module:** The following are used with the data test modules:
- (1) Interconnection modes. The following are the interconnection modes:
- DDD—rotary dial or touch-tone dialing
  - Private line.
- (2) Interconnecting link verifications and calibrations. The following are the interconnecting link verifications and calibrations:
- Automatic sequence—ADTS
  - Optional manual sequence—private line or DDD.
- (3) Compensation for level variation in transmission level point and interconnecting link.
- C. T&L (Terminate and Leave)**
- 3.11** The T&L circuit is used to split and terminate a circuit appearing on an associated type 3 or

4 maintenance connector in a SMAS 5A or 5B application. It will leave the circuit terminated without holding a path through the SMAS switching networks. The operation of the T&L to terminate or release a circuit can be controlled from the local test port (jack, key, and lamp access panel) or remotely from the SARTS TP 52A. An indication of the circuit termination is provided.

3.12 ♦The T&L capability is also available in DACS applications. Normal T&L is accomplished at a DTAC panel or a DACS administrative terminal. SARTS utilizes its connection to the DACS administrative terminals port to perform DACS T&L feature. Also available in DACS (Issue 7 firmware) is a DMB (digital multipoint bridge). The T&L feature also applies in the DMB.♦

**D. Interface With DACS (Digital Access Cross-Connect System)**

3.13 The interface between SARTS 1A and the DACS allows SARTS 1A to access and test circuits on T1 carrier lines via DACS. The interface between SARTS 1A and DACS is supplied via two links (a data communication link and a test access link) (Fig. 2). Digital terminations are provided in DACS by interrupting the cross-connection causing the transmittal of an idle channel code.

3.14 The data communication link is furnished by the RTS controller. This RTS controller is optioned with an enhancement shelf (DLM [data link module]). The DLM contains up to eight DLIs (data link interfaces). Each DLI is connected to an administrative port on a DACS frame. For more information, refer to Practices 666-610-101 and 666-615-100.

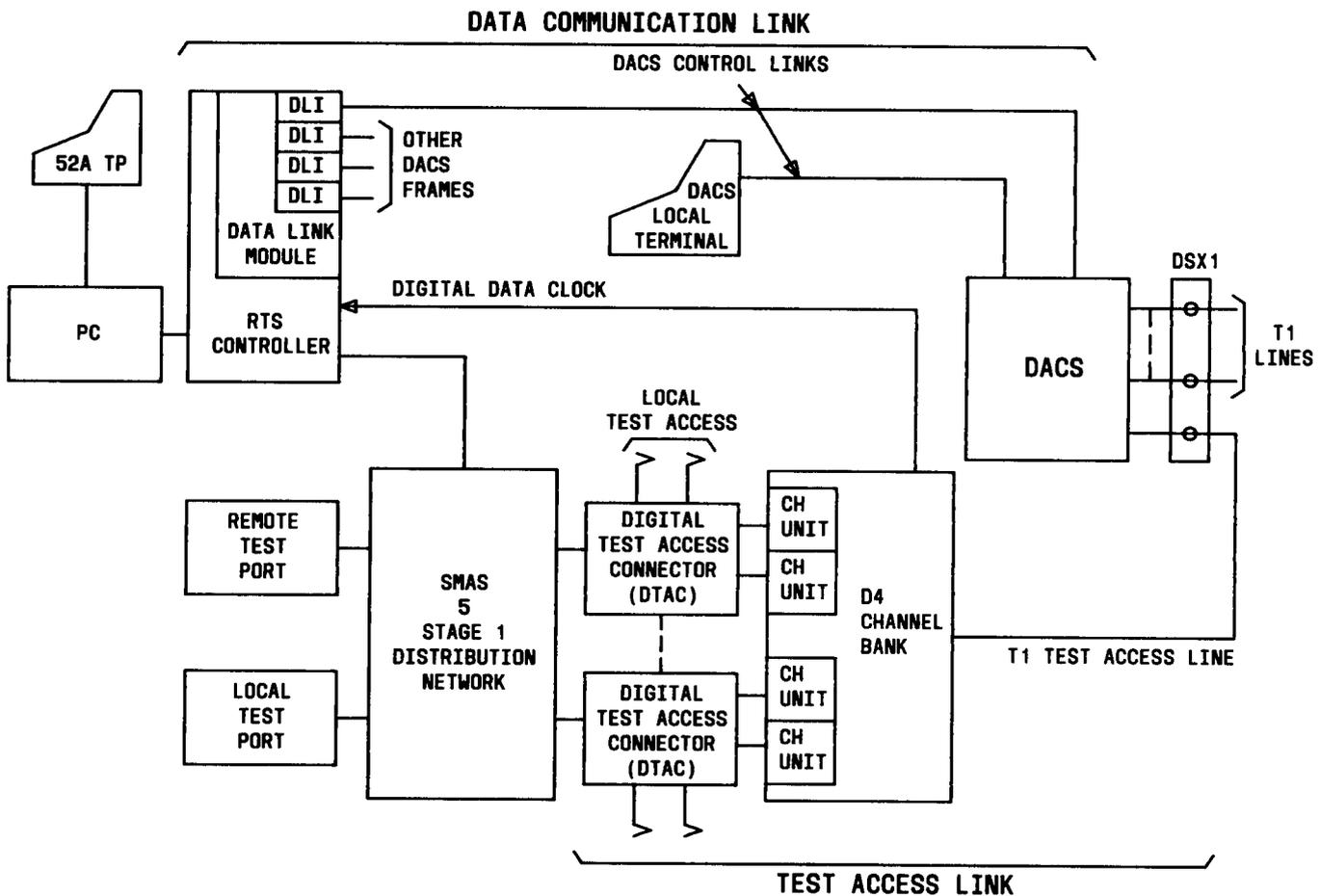


Fig. 2—SARTS 1A/DACS Interface

**3.15** The DACS provides DS-0 (64 kb/s) electronic cross-connection and voice frequency or DS-0 test access for digital signals at the DS-1 rate for each channel. The DACS terminates up to 127 DS-1 signals (3048 DS-0 channels) and provides a maximum of 1524 DS-0 cross-connections. There are up to 12 voice frequencies or DS-0 test access ports provided by a dedicated T1 test access line to the D4 or D5 channel bank units. This permits bridging or splitting test access to any circuit cross-connect by DACS.

**3.16** The test access link between SARTS 1A and DACS is furnished via the DTAC (digital test access connector). For more information on the DTAC, refer to Practice 667-303-112. The DTAC connects the SMAS 5B system of SARTS 1A to the D4 or D5 channel bank units of DACS. In addition, the DTAC provides the following types of interfaces to the D4 or D5 channel bank units:

- (a) Connection to only 4-wire transmission voice frequency circuits
- (b) Connection to 4-wire voice frequency circuits with 2-state signaling (6-wire access points)
- (c) Connection to 4-wire voice frequency circuits with 4-state signaling (8-wire access points)
- (d) Connection to 4-wire digital data DS0A circuits.

#### **E. Automated Traffic Data Collection and Analysis**

**3.17** The automated traffic data collection and analysis feature automates the traffic measurement process (data collection, data analysis, and report generation). The process is completely automated while controlled by the SMM (SARTS maintenance manager). The SMM has to initiate the traffic measurement process, turn the data collection on, request reports as desired, and deliver the reports to the appropriate people. This feature provides traffic reports of the primary SARTS components that need to be engineered in the Generic 2PC2 time frame. The reports allow the customers to manage their SARTS operation more effectively. The reports support component engineering, configuration engineering, tester administration, and growth planning.

**3.18** The traffic measurement feature is divided into SARTS PC and SARTS COER (central

office equipment report) components. The SARTS PC is responsible for measuring usage and collecting and storing the traffic measurement data daily. The SARTS COER is responsible for obtaining the data from SARTS, storing the data, and generating the traffic reports. The SARTS COER is a customized enhancement to COER specifically designed for SARTS applications. The COER is a centrally deployed operations system that is executed at the AT&T Corporate Computer Center in Piscataway, New Jersey.

**3.19** The SARTS PC automatically collects traffic measurement data on an hourly basis. The COER automatically polls each PC to collect the traffic measurement data for each day. The data is generally processed overnight and is available to the user the next morning. The user interface is normally via a dial-up access to COER from a standard asynchronous terminal. All traffic reports must be requested by the user. The COER users will be charged only for the usage of COER.

#### **F. Access Point Data Management**

**3.20** The APD (access point data) file enables the tester to access a circuit by circuit identification. This eliminates the need to type in the access point identification and testing data. The APD may be stored for up to 150,000 circuits, with up to 450,000 access points.

**3.21** Inputs to the APD file may be made with the circuit and test point edit command or by the TIRKS (Trunks Integrated Records Keeping System) APD feature. The TIRKS APD feature allows the initialization of the APD file and updates the data base using the TIRKS output tape.

**3.22** The APD utility commands are provided for the data base management during the normal work day. These commands provide a hard-copy printout of all circuits in the APD data base. A statistical summary provides the following:

- (a) The number of circuits and test points per RTS
- (b) The distribution of the number of test points per circuit
- (c) The identity of circuits with no test points

- (d) A list of RTSs with less than 10 test points
- (e) An accurate count of circuits and test points in the data base.

**3.23** Disk-to-tape and tape-to-disk file transfer capability is also provided for the provision of backup tapes.

**4. CAPABILITIES**

**4.01** The accessing and testing capabilities of SARTS 1A are very broad and depend to some extent on subjective decisions and objective analysis by a testperson. Figure 3 illustrates a typical VF (voice frequency) special service circuit between two subscriber locations in two SARTS 1A testing areas. For completeness of the SARTS concept, five SARTS 1As in different geographical or operating areas are shown. Referring to area I, the SARTS 1A can be used to access and test between the RTSs in central office 3 and central office 4 without assistance. The RTS in either of these offices can also be used to perform tests in cooperation with the private line testboard in central office 1.

*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 are used to coordinate the RTS testing with the manual test location.

**4.02** A request to central office 2 for a manual placement of the test shoe connection at the MDF (main distributing frame) would be required to test the circuit between central office 2 and central office 3 without further assistance.

**4.03** The heavy dashed line between the SARTS 1A in areas I and II on Fig. 3 is an inter-PC asynchronous data link. Inter-PC communications are dependent on mutual information contained in the site dependent data residing in the PCs.

**4.04** The PC in area II controls the access and testing as directed by the PC in area I over the inter-PC data link. In this case, even though the access is made by a foreign PC, the test status verification call from the RTS (or subsequent talk connection, if required) is directed to the TP 52A originating the access request. This inter-PC inter-area testing capability of the SARTS 1A permits RTS-to-RTS testing between any combination of central offices 3, 4, 5, and

6. This capability also allows RTS-to-customer testing by area I from central office 6. 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 as follows:

- (a) Operations Support System—Common—SARTS 1A Specification for a PC 1A (PDP-11/40) Processor System (J1P016A-1)
- (b) Operations Support System—SARTS 1A Specification for a PC 1A (PDP-11/34) Processor System (J1P016C)
- (c) Operations Support System—Common—SARTS 1A Specification for Test Line Control Equipment Cabinet (J1P011A-1)
- (d) Operations Support System—SARTS 1A—PC 1A PDP-11/40 (SD-1P000-01) and PDP-11/34 (SD-1P000-02)
- (e) Operations Support System—SARTS 1A—No. 2 PC Circuit (SD-1P189-01)
- (f) Operations Support System—SARTS 1A—No. 3 PC Circuit (SD-1P204-01).

**5.02** All data sets, data facilities, the TELETYPE C400 system, and the 1A2 KTS specified in the engineering references for SARTS 1A are customer-provided.

**PC 1A**

**5.03** Figure 8 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:* The keyboard displays and printers associated with each TP 52A are uniquely iden-

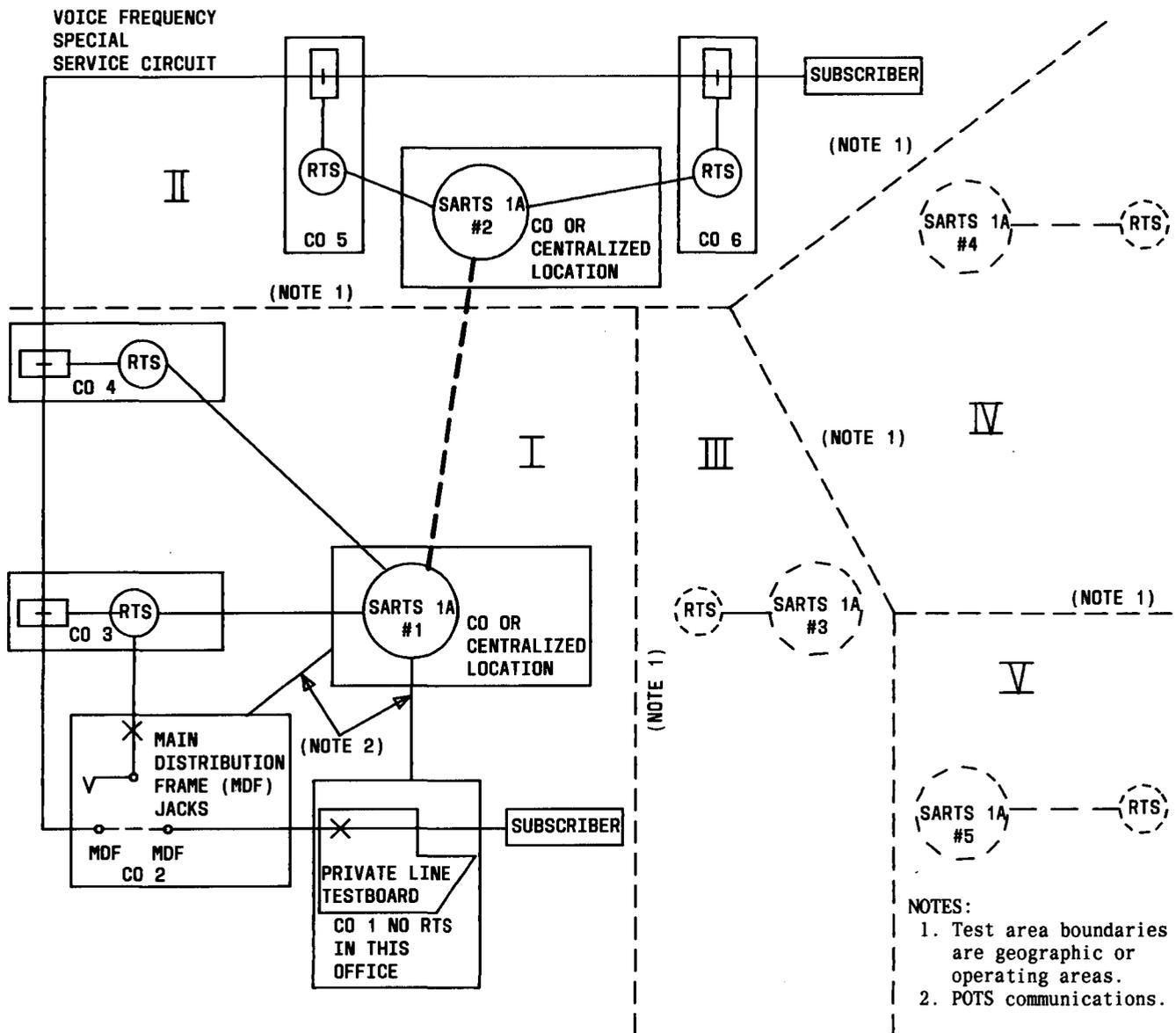


Fig. 3—SARTS 1A Applications (Notes)

tified. Each keyboard display or printer is identified by the numerals 00 through 33.

**5.04** Each SI (synchronous interface) is identified by a single digit (0, 1, 2, or 3). By using these identities, the PC 1A is capable of identifying any device connected to the synchronous interface. For example, in Fig. 8 the PC 1A uniquely identifies keyboard display 33, associated with the twenty-third TP 52A, by the logical sequence 033 (SI port 0 and keyboard display 33). 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 to associate command processing and displays with up to 24 keyboard displays and 12 receive-only printers.

**5.05** A PC 1A can support a maximum of 24 TP 52As. For a detailed description of how the

logical equipment identification data is assigned, refer to Practice 666-611-102.

### No. 2 PC

**5.06** Figure 9 is an illustration of the near-end location showing an interconnection configuration in which 4500 controllers are shown. This arrangement is typical where the test site is remotely located from the No. 2 PC. Each of the keyboard displays and printers associated with each TP 52A is uniquely identified. Each keyboard display is identified by the numerals 00 through 33 and each SM (synchronous multiplexer) port is identified by the numerals 00 through 15. By using these identities, the No. 2 PC is capable of identifying any device connected to the synchronous multiplexer. As shown in Fig. 9, the No. 2 PC uniquely identifies keyboard display 27, associated with the sixteenth TP 52A, by the logical sequence 0227 (SM port 02 and keyboard display 27). 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 No. 2 PC software. The identities are used in the No. 2 PC to associate command processing and displays with up to 100 keyboard displays and receive-only printers.

**5.07** A No. 2 PC can support a maximum of 120 TP 52As of which 85 can be active (logged on) at one time. For a detailed description of how the logical equipment identification data is assigned, refer to Practice 666-611-112 or 666-611-132 for Generic 2PC3.

### No. 3 PC

**5.08** Figure 10 is an illustration of the near-end location showing an interconnection configuration. The No. 3 PC is based on the PDP-11/24 minicomputer and is available in a variety of capacities to support different sized sites. In the smallest configuration, the No. 3 PC includes one synchronous link (SI) and up to eight asynchronous links. The asynchronous links are used for inter-PC and PC-RTS communications. In the largest configuration, the No. 3 PC can support up to 3 synchronous links and up to 32 asynchronous links.

**5.09** A No. 3 PC can support a maximum of 60 active TP 52As. For a detailed description of how the logical equipment identification data is assigned, refer to Practice 666-611-122.

### SDD (Site Dependent Data)

**5.10** The relationships between the identities of each keyboard display, 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.

**5.11** The site dependent data includes the following logical identities:

- (a) The SIs connecting to a cluster controller (SCC [station cluster], MCC [minicuster controller])
- (b) The SMs connecting to a 4500 controller
- (c) The asynchronous interface ports and lines connecting to far-end locations
- (d) The equipment in the far-end locations
- (e) The asynchronous interface ports and lines connecting to a PC in another SARTS 1A location
- (f) The foreign PCs
- (g) RTS maintenance data for automatic maintenance test strings.

**5.12** A detailed description of the site dependent data is contained in Practice 666-611-102, 666-611-112, 666-611-122, or 666-611-132.

**Note:** A configuration (interconnections or equipment arrangement) change in the SARTS 1A cannot be made without a coordinated change in the site dependent data portion of the PC program.

### Interconnections

**5.13** 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 provide a synchronous data line interconnect) to connect the PC 1A to the cluster controller, the null modem must be connected to SI 1 (or 2, if provided). Any of the SIs may be used to interconnect a test site to the PC 1A with data sets and a 4-wire facility.

**5.14** The basic No. 2 PC has one SM which provides 16 synchronous lines. When a null modem is used to connect the No. 2 PC to the cluster controller, any of the lines can be used. The synchronous line must be equipped with a null-modem clock. Any of the lines may be used to interconnect a test site to the No. 2 PC with data sets and a 4-wire facility.

**5.15** The basic No. 3 PC has one SI. Two additional SIs are optional. Any of the SIs may be used to interconnect a test site to the No. 3 PC with data sets and a 4-wire facility.

**5.16** The logical identities in the configuration of each test site interfacing with the PC are assigned to a specific synchronous port (SI or SM). The logical identities of the test site end of the interconnection must agree with the site dependent data entered in the PC for each synchronous port. Therefore, SCC/PC synchronous interconnection cannot be interchanged at the SCC or at the PC without changing the site dependent data entries in the PC.

**5.17** Several configurations of test site/PC interface combinations are possible. The basic single or multiple test site configurations are illustrated in (a) and (b) of Fig. 4. 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, but link delay may become significant if too many CRTs (cathode-ray tubes) are on a single line.

**5.18** 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 for backup purposes. In these cases, site dependent data for the alternate configuration is also entered in the alternate PC. An alternate test site configuration is shown in (c) of Fig. 4. When an alternate configuration is in effect, the RTSs normally controlled by the primary PC respond to the alternate PC. This is discussed further in paragraphs 5.25 through 5.27.

## B. Far End

**5.19** The SARTS 1A far-end locations are micro-processor-controlled RTSs. The RTS 5A is shown in SD-1P107-01 and is interconnected with a SMAS 5A or SMAS 5B. The RTS 5A is described in Practice 666-615-100; SMAS 5A, in Practice 667-303-100; and SMAS 5B, in Practice 667-303-110. Figure 5

illustrates the configuration of equipment in an RTS 5A and SMAS 5A.

**5.20** ♦The PC-RTS interface may consist of asynchronous private line or DDD data services. The DDD services are utilized when RTSs access is infrequent. Private line facilities to RTSs that are heavily used improve total testing time.♦

**Note:** If a private line facility interface exists, a switched data service should also be provided for backup purposes when the private line is out of service.

**5.21** These asynchronous data services connect through multiplexing devices to asynchronous multiplexer units of the PC. The asynchronous multiplexer units used in the PC 1A are called LMUs (line multiplexer units). The basic PC 1A has two LMUs (LMU0 and LMU1). The LMU0 can have 16 asynchronous lines connected to it and the LMU1 can have 15. The eighth line (07) in LMU1 is dedicated to a processor-controlled alarm circuit (SD-1P104-01). A third LMU (LMU3), for an additional 16 asynchronous lines, is optional.

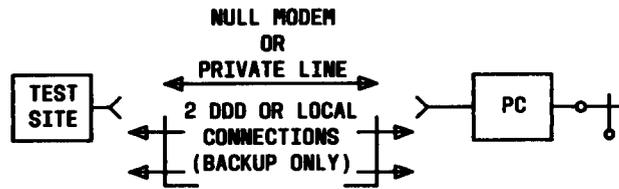
**5.22** ♦The basic No. 2 PC has eight AMs (AM1, AM2, AM3, AM4, AM5, AM6, AM7, and AM8). The AM1 can have seven asynchronous lines connected to it and eight to the remaining AMs. The first line (00) in AM1 is dedicated to a processor-controlled alarm circuit (SD-1P104-01). A ninth and tenth AM (AM9 and AM10), for an additional 16 asynchronous lines, are optional.♦

**5.23** The basic No. 3 PC has one AM with 16 asynchronous lines. A total of two AMs (32 asynchronous lines) can be supported.

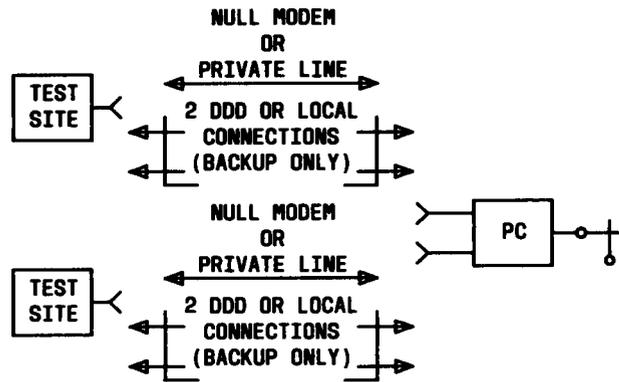
**5.24** Logical identities are assigned for each asynchronous line and their associated multiplexer in the PC. The unique configuration for the interconnection and arrangement of the asynchronous lines are entered in the site dependent data in a similar manner as the synchronous lines.

## C. System

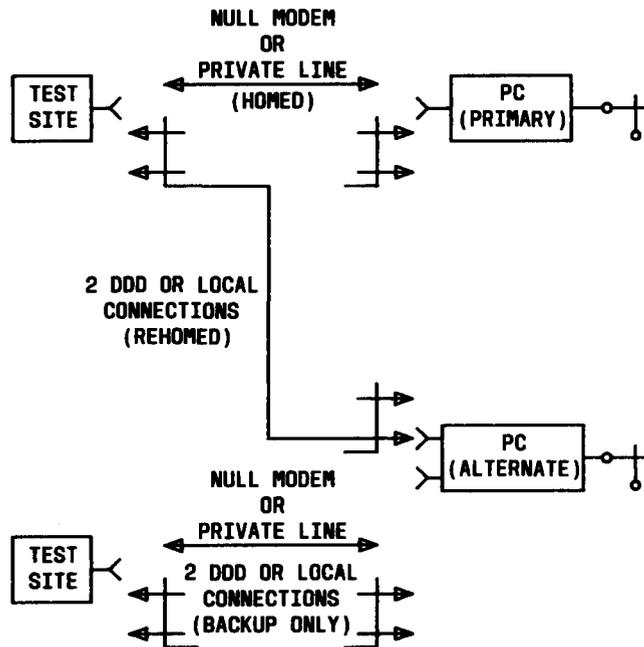
**5.25** The interconnection and equipment arrangements of a total SARTS 1A form a unique configuration consisting of communication facilities, test site(s), the PC, and RTSs. Any addition, deletion, or rearrangement of the configuration requires coor-



(a) BASIC SINGLE TEST SITE CONFIGURATION

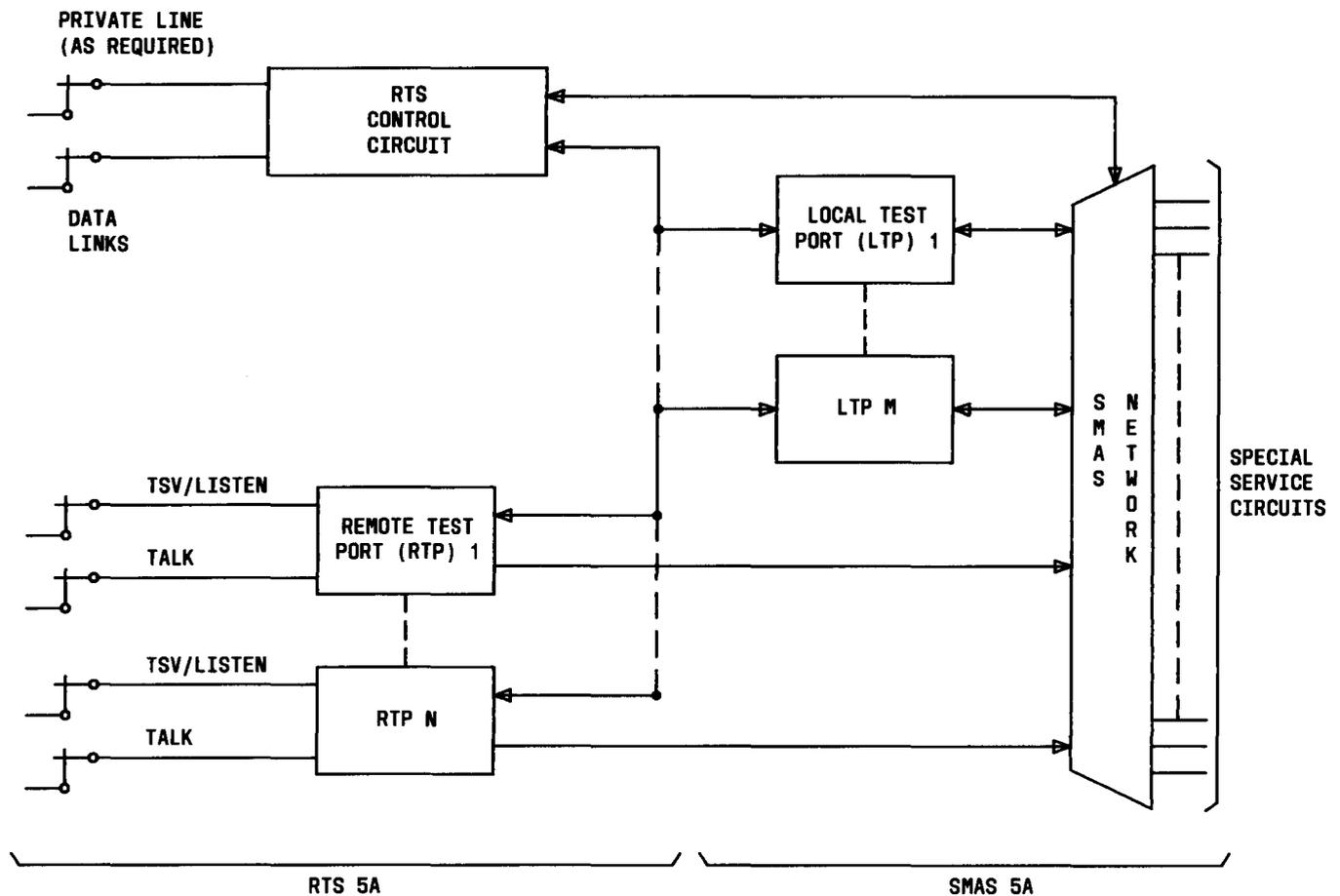


(b) MULTIPLE TEST SITE CONFIGURATION



(c) ALTERNATE TEST SITE CONFIGURATION

Fig. 4—SARTS 1A Near-End Configurations



## NOTE:

1. The number of RTPs and LTPs (N+M) cannot exceed 20. The RTS control circuit contains the remote measuring equipment.

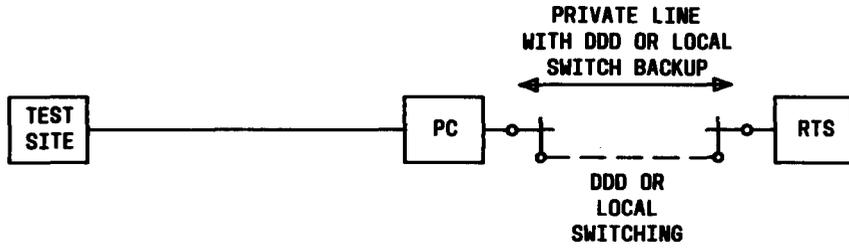
Fig. 5—RTS 5A/SMAS 5A Far-End Configuration (Note)

dinated changes in the site dependent data program in the PC. A SARTS 1A configuration with one test site is illustrated in (a) of Fig. 6. A configuration to rehome the test site on another PC is shown in (b) of Fig. 6. A configuration which occurs when a circuit access is requested to be made in an RTS controlled by a PC in another SARTS 1A is shown in (c) of Fig. 6. This configuration is supported by SARTS 1A programming only after the necessary site dependent data has been entered in each PC.

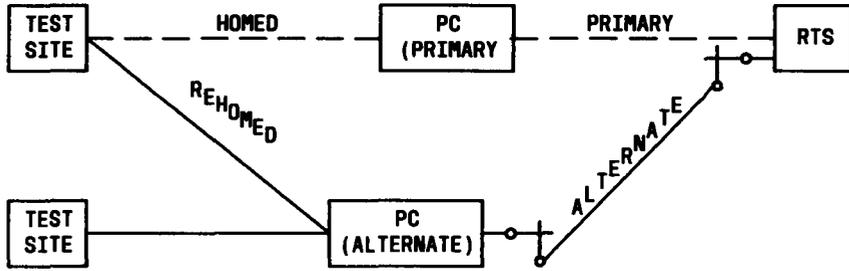
**5.26** Preplanned reconfigurations, the necessary changes in site dependent data, and a fallback

and recovery subprogram in the SARTS 1A generic program provide maintenance and backup features for SARTS 1As. To implement these features, patching or switching of 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 or to a PC in another SARTS 1A.

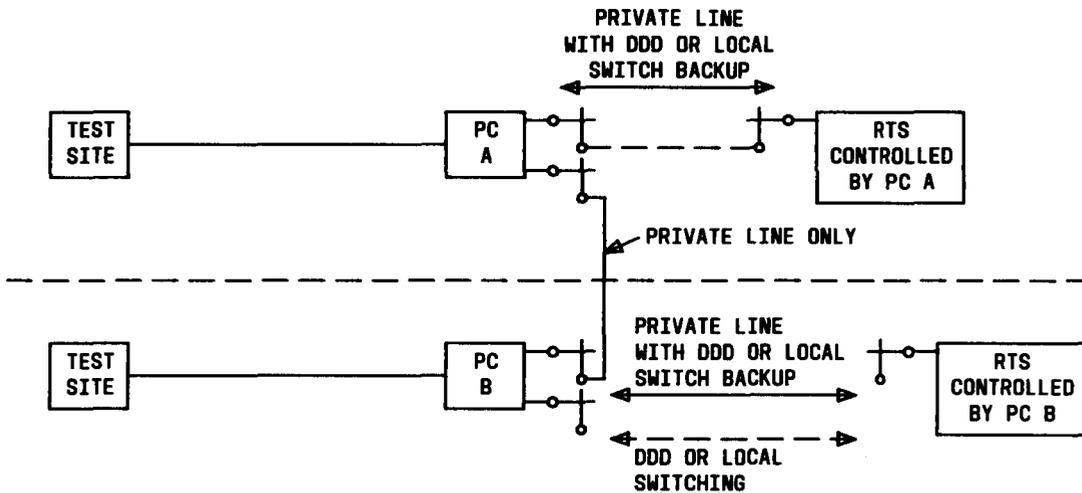
**5.27** All RTSs are arranged to respond and accept control from either a primary PC or an alternate PC. Thus, manual operations are not necessary to reconfigure the asynchronous data communica-



(a) SARTS CONFIGURATION WITH ONE TEST SITE



(b) REHOMED TEST SITE CONFIGURATION



(c) INTER-PC CONFIGURATION

Fig. 6—SARTS 1A System Configurations

tions between PCs and RTSs in a maintenance or backup reconfiguration.

**Note:** When the regular configuration has private line facilities between the primary PC 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 keyboard display. Commands that are incomplete, undefined, or contain errors cannot be executed in the PC and will result in error or failure messages. 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 is described in detail in Practice 666-610-102 and use of the commands in Practice 666-612-101.

**6.02** One of the following methods may be used to make entries into the PC from the TP 52A:

- (a) Command line/message line prompter entry
- (b) Numerical direct entry.

**6.03** The first method is a step-by-step process that requires basic familiarity with the SARTS 1A command and parameter structure. The second method requires command and parameter structure familiarity and allows bypassing some of the steps in the first method.

**6.04** All commands or command/parameters are typed character-by-character on the keyboard display. 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 by depressing the S/R (send/receive) key on the keyboard.

**Note:** The display is refreshed from a buffer associated with the keyboard display. The command line is the only area in the buffer accessible from the keyboard display.

**6.05** Every entry is responded to by the PC. The response is displayed on the keyboard display 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 (i.e., test command menus, command sequences to perform an operation, etc).

**6.06** The macro command feature provides high-level commands to execute key measurement functions. The macros are grouped into three categories. The categories are the voiceband test macros, digital test macros, and network termination macros. The test position log function allows for logging up to six pages of tester activity.

**6.07** Figure 11 illustrates an example and overview of the keyboard display 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. Figure 11 has callouts to help locate input data.

**6.08** The first keyboard display entry (denoted as **A**) 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. The tester should sign off upon completion of testing. 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 cluster controller after a TP 52A is signed on. The test point status areas and **100 TABLE OF CONTENTS** are displayed after sign on.

**6.09** The next entry (**700** denoted as **B**) is obtained from the 100 table of contents. The system response to this command is a display of a **700 TP ACCESS COM SEQUENCE** table. This table lists the logical sequence for accessing a circuit at a SARTS 1A test point and replaces the 100 table of contents. The first two commands (110 and 120) shown in the 700 TP access table are optional entries unless the SARTS 1A is interfaced with a CMS 3A. Entry of these commands 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 is denoted as **C**. The top line is the command line. The

second line is the message line where all valid parameter choices for the 130 command are shown. Each choice is separated by a colon (:). The symbol (□) indicates the initial position of a cursor. It indicates where a character will be typed.

**6.10** 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 keyboard display and the S/R key is depressed, the command line received is the response denoted as **D**. The command line has ten parameter fields (parameter fields are designated by the slashes). The first is the 130 command. The following are the remaining parameter fields:

- PRFX (prefix)
- TYPE
- NPA (numbering plan area, i.e., area code)
- CO UN (central office unit number)
- LINE# (line number, i.e., station number)
- EXT# (extension number)
- SEG (segment)
- LN-PG (line number page)
- AP PG (access point page).

**6.11** 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 714 294 4483 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 **714** has been entered in the NPA field.

**6.12** If the access point data option is being utilized and the identifier is on file in the access point data, the response denoted as **E** is displayed. To the right of each displayed test point is a 2-digit test point number. Executing the **K01** command (denoted as **F**) with the 2-digit test point number will provide the 701 prompter (denoted as **G**) with the access point data for the selected test point. Execution of the **701**

will result in **703** being displayed (denoted as **H**) with the testing data for the selected test point.

**6.13** If the identifier is not on file in the access point data or the access point data option is not being utilized, the displayed response will be the **K01** parameter without any test point information. Execution of the **K01** command will then result in a 701 prompter without any test point information. The parameters must then be filled in from the data shown for an access point identity (identity data) on the special service CLR cards used in SARTS 1A (see Fig. 12). After typing in parameters on the command line, copied from the CLR card example in (b) of Fig. 12, the command parameters are entered. 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 (denoted as **H** in Fig. 11).

**6.14** The parameters described in the message line of this display agree with the second line of data (testing data) on the CLR cards [(a) in Fig. 12, line Q]. The parameters for this command are typed directly from the CLR [(b) of Fig. 12] 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.

**6.15** The PC should establish 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 (answer/TSV) key of a test line. The actual waiting time depends on the present processing activities in the PC, whether the asynchronous data line to the far end must be dialed or whether the connection 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 with the far end, the response for the access may be displayed prior to receiving the verification call.

**Note:** The accessed circuit must be verified as available for test and checked for idle condition prior to entering test commands. If the ac-

cessed circuit is busy, service can be interrupted by certain test commands.

**6.16** After accessing the circuit 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 previously described. The effective interconnection in the testing mode that exists between the keyboard display in the test site and the RTS access point in the circuit at the far end is shown in (a) of Fig. 13. The display shown in (b) of Fig. 13 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 an RTP (SD-1P108-01) by the RTS 5A.

**6.17** Referring to (b) in Fig. 12, 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 RTP 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 display PR CKT MON appears in the TP status display area indicating that the verification circuit in a RTP is connected.

**Note 1:** The verification circuit is bridge-connected when the initial access is made. In the case of 4- and 6-wire circuits, the verification circuit is bridge-connected to **both** directions of transmission at the same time. The display PR CKT MON is removed when the circuit is split for testing. The PR CKT MON status means that the maintenance connector (used in SMAS 5A and SMAS 5B) has been split and the circuit is routed into the RTP where a verification condition is applied.

**Note 2:** The circuit is not split. Only the **maintenance connector** has been split to route the circuit into the RTP.

**6.18** 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 test

point. The PC 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 RTS. The RTS executes the PC orders and sets up relay contacts for circuit conditions in the RTP. The RTS also connects test equipment/terminations and obtains results from test equipment. This is similar to testing circuits at a testboard jackfield.

**6.19** All data communications between the near end and far end are between the PC and the RTS over asynchronous data lines as shown in Fig. 14. For detailed information on communications, see Practice 666-610-101. In the test mode, the PC always sends either commands or interrogations. The RTS 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 keyboard display entries.

## 7. ACCEPTANCE AND MAINTENANCE

### A. Acceptance

**7.01** When a SARTS 1A is installed, the PC, TP 52A, and RTS should be tested for proper operation. Information for testing the operation of the PC is supplied in Practice 666-611-500 or 666-611-510. Initial tests for the TP 52A are covered in Practice 666-612-200. Information for testing the operation of the RTS is furnished in Practices 666-610-501 and 666-615-500.

### B. Maintenance

**7.02** The SARTS 1A is maintained as a system, primarily from the near-end location, specifically by the system maintenance manager having access to the site dependent data, SMP, and a DECwriter\* terminal. The DECwriter terminal is furnished with the PC.

**7.03** The SMP is the TP 52A that is specifically identified at the DECwriter terminal during

\* Registered trademark of Digital Equipment Corporation.

the 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.

**7.04** The SMP is used to enter site dependent data after initially entering the SARTS 1A generic program (see Practice 666-611-102, 666-611-112, or 666-611-132). 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 Practices 666-610-300 and 666-610-501. The DECwriter terminal prints the error messages and other processing functions of the PC. A list of PC error messages that is printed at the DECwriter terminal is included in Practice 666-611-301. It also explains the format of how each type of error message is printed.

**7.05** The SMP and the DECwriter terminals are used in sectionalizing a system malfunction to the data communication lines and data sets, a test site, the PC, or an RTS. The performance of maintenance in any of these areas must be coordinated and controlled by the SARTS 1A system maintenance manager. Guidelines for developing a SARTS maintenance plan are contained in Practice 865-202-107.

**7.06** The PC is locally maintained and tested as described in Practices 666-611-300 and 666-611-500 (PC 1A), Practices 666-611-310 and 666-611-510 (No. 2 PC), and/or Practices 666-611-320 and 666-611-520 (No. 3 PC). All local maintenance required for the TP 52A (and associated equipment) in a test site is described in Practices 666-612-300 and 666-612-500. The RTS 5A is maintained and tested as described in Practices 666-615-500, 666-615-501, and 666-615-502. Data sets used in SARTS 1A are maintained as described in the applicable practices.

### **C. Automated Maintenance Strings**

**7.07** The automated maintenance strings execute test strings that detect most RTS problems before they affect the testers at the TP 52A.

**7.08** The SMM is required to enter the RMD (RTS maintenance data) via the 022 command before initiating execution of the maintenance strings. This data may be entered anytime after the system boot procedure has occurred.

**7.09** The automated maintenance strings can be scheduled to run at a predefined day and time (not attended). The ability to schedule a specific date and time will eliminate the need for the SMM to be at the SMP to run the automated maintenance strings.

**7.10** The measured and expected results in each test string are automatically compared to determine pass or fail conditions. If the string passes, the next test follows automatically until all predefined tests are completed or specified fault thresholds are exceeded.

**7.11** The tests are executed by the 024 maintenance test control command. The 022 RMD command and the 023 RTS test group command establish data which is used by the 024 command during execution.

**7.12** The 022 RMD command provides data which allows the RTS test strings to execute without the presence of an SMP operator at the terminal. The RMD is entered on the mask and stored by execution of the command identifying the equipment characteristics of each RTS. This information is used to automate the string, chart, and parameter selections which would otherwise require manual inputs.

**7.13** The 023 RTS test group command provides the capability for testing multiple RTSs as a group. The 100 RTS test groups, with up to 20 RTSs per group, may be created or changed. The 024 maintenance test control command allows selection of the run mode and the pertinent parameter choices for each mode.

**7.14** The two run modes for the RTS test strings are the routine and chart modes. The routine mode provides periodic testing of each RTS controller, the base-line RTP functions, and the RTS enhancements. The routine mode reports the RTS test results on the preassigned printer. Operation in the routine mode should be during off peak hours. This minimizes problems with testers for shared resources in the RTS and maximizes coverage of the RTS equipment. The routine mode bypasses execution of the RTP functions or enhancements which are in use by testers on the system at the time of the routine test. The chart mode provides the flexibility for fault location or acceptance testing on specific subsystems within the RTS. It allows a single maintenance chart, a single chart segment, or a group of

predefined charts to be executed on a preselected port.

#### D. Remote Test Port Status Control

7.15 The remote test port status is controlled by the SMM with an RTP control command. The command will change the RTP status from un-equipped to SMP busy, from busy to SMP available, and from SMP busy to idle.

7.16 A second command, RTP status display, allows the SMP operator to display the status of all RTPs associated with a specified RTS.

#### 8. REFERENCES

8.01 The following practices cover information for SARTS 1A:

SECTION	TITLE
666-611-101	Process Controller 1A—Program Features
666-611-102	Process Controller 1A—Operating Instructions
666-611-110	No. 2 Process Controller—General Description
666-611-112	No. 2 Process Controller—Operating Instructions
666-611-120	No. 3 PC—General Description—SARTS 1A
666-611-121	No. 3 PC—General Description—SARTS 1A
666-611-130	No. 2 Process Controller (Generic 2PC3)—General Description
666-611-132	No. 2 Process Controller (Generic 2PC3)—Operating Instructions
666-611-133	Communications Processor—General Description—SARTS 1A
666-610-101	SARTS 1A—Interconnections and Communications
666-610-102	SARTS 1A—Command and Display Description
666-610-300	SARTS 1A—Maintenance Methods
666-610-301	SARTS 1A—Automated Traffic Data Collection and Analysis Feature—COER
666-610-501	Remote Test System 5A—Acceptance and Maintenance Tests
666-610-502	SARTS 1A—RTS 5A—Automated Acceptance and Maintenance Tests
666-611-100	Process Controller 1A and Associated Equipment—General Description
666-611-300	Process Controller 1A—Maintenance Methods
666-611-301	Process Controller 1A—Maintenance Displays
666-611-310	No. 2 PC—Maintenance Methods
666-611-320	No. 3 PC—Maintenance Methods—SARTS 1A
666-611-321	No. 3 PC—Error Codes and Maintenance Messages—SARTS 1A
666-611-500	Process Controller 1A—Operating System Test
666-611-510	No. 2 Process Controller—Operating System Test
666-611-520	No. 3 PC—OSTEST—SARTS 1A
666-612-100	Test Position 52A and Associated Equipment—General Description

SECTION	TITLE	SECTION	TITLE
666-612-101	Test Position 52A—Test Functions and Displays	851-300-106	Standard Design of Switched Special Service Circuits—Administrative and Maintenance Considerations—SARTS, CMS 3A, SSC
666-612-200	Test Position 52A—Installation and Initial Tests		
666-612-300	Test Position 52A—Maintenance Methods	865-202-100	Special Service Center (SSC)—Planning Guide—General Information
666-612-500	Test Position 52A—Tests		
666-615-100	Remote Test System 5A—Description	865-202-101	Special Services—Present Method of Operation Study Plan
666-615-101	Packaged RTS 5A—Description and Tests—SARTS 1A	865-202-102	Special Service Center (SSC)—Far-End Equipment Requirements
666-615-300	Remote Test System 5A—Maintenance Methods	865-202-103	Special Service Center (SSC)—Force and Work Position (F&WP) Requirements
666-615-500	Remote Test System 5A Controller—Maintenance Tests	865-202-104	Summary of Economic Analysis Data for Special Service Operations Plans
666-615-501	Remote Test System 5A—Signature Analysis Tests		
666-615-502	Remote Test System 5A—Far-End Maintenance Tests	865-202-106	Special Service Center (SSC)—Implementation Guidelines—Switched Access Remote Test System 1A
667-000-001	SMAS—Access Point Information		
667-000-002	SMAS—Maintenance Connector—General Information	865-202-107	Special Service Center (SSC)—Maintenance Plan—Switched Access Remote Test System 1A
667-303-100	SMAS 5A—Description	951-702-100	SARTS 1A—General Descriptive Information.
667-303-101	SMAS 5A Local Test Port—Description and Operation		
667-303-103	SMAS 5A/5B—System Tests		
667-303-110	SMAS 5B—Description		
667-303-111	SMAS 5A/5B—Jack, Key, and Lamp Access Panel—Description and Operation	824-102-101	Test Position 52A—Equipment Design Requirements (J1P011A)
667-303-112	Digital Test Access Connector—Description and Operation	824-102-102	Process Controller 1A—Equipment Design Requirements (J1P016)

**8.02** The following specifications cover the equipment requirements for SARTS 1A:

SECTION	TITLE
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824-102-101	Test Position 52A—Equipment Design Requirements (J1P011A)
824-102-102	Process Controller 1A—Equipment Design Requirements (J1P016)

SECTION	TITLE
824-102-117	SMAS 5A/5B and RTS 5A— Equipment Design Requirements (J1P033)
824-102-126	No. 2 Process Controller—Equip- ment Design Requirements (J1P049).

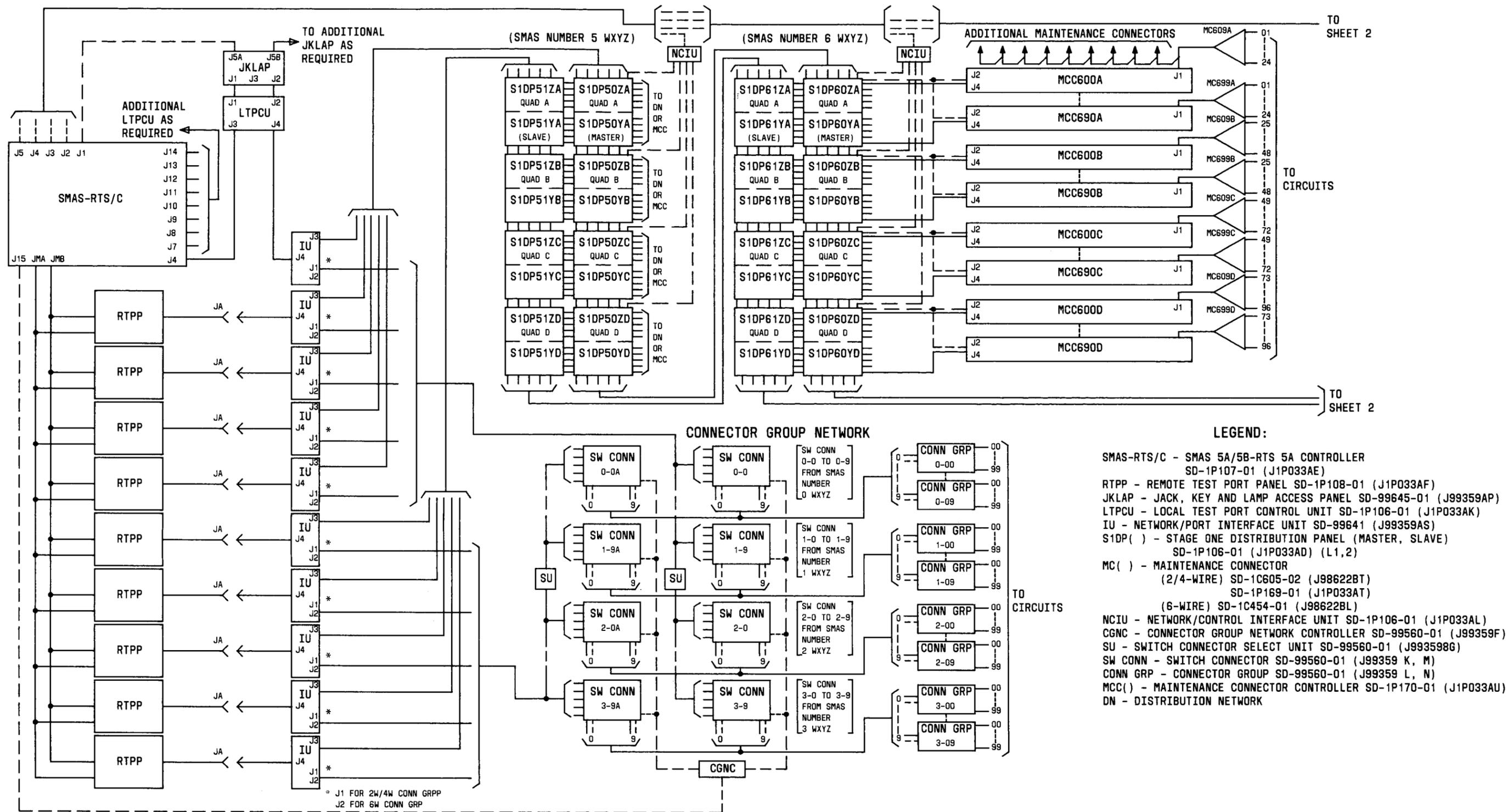


Fig. 7—SMAS 5B System (Sheet 1 of 2)

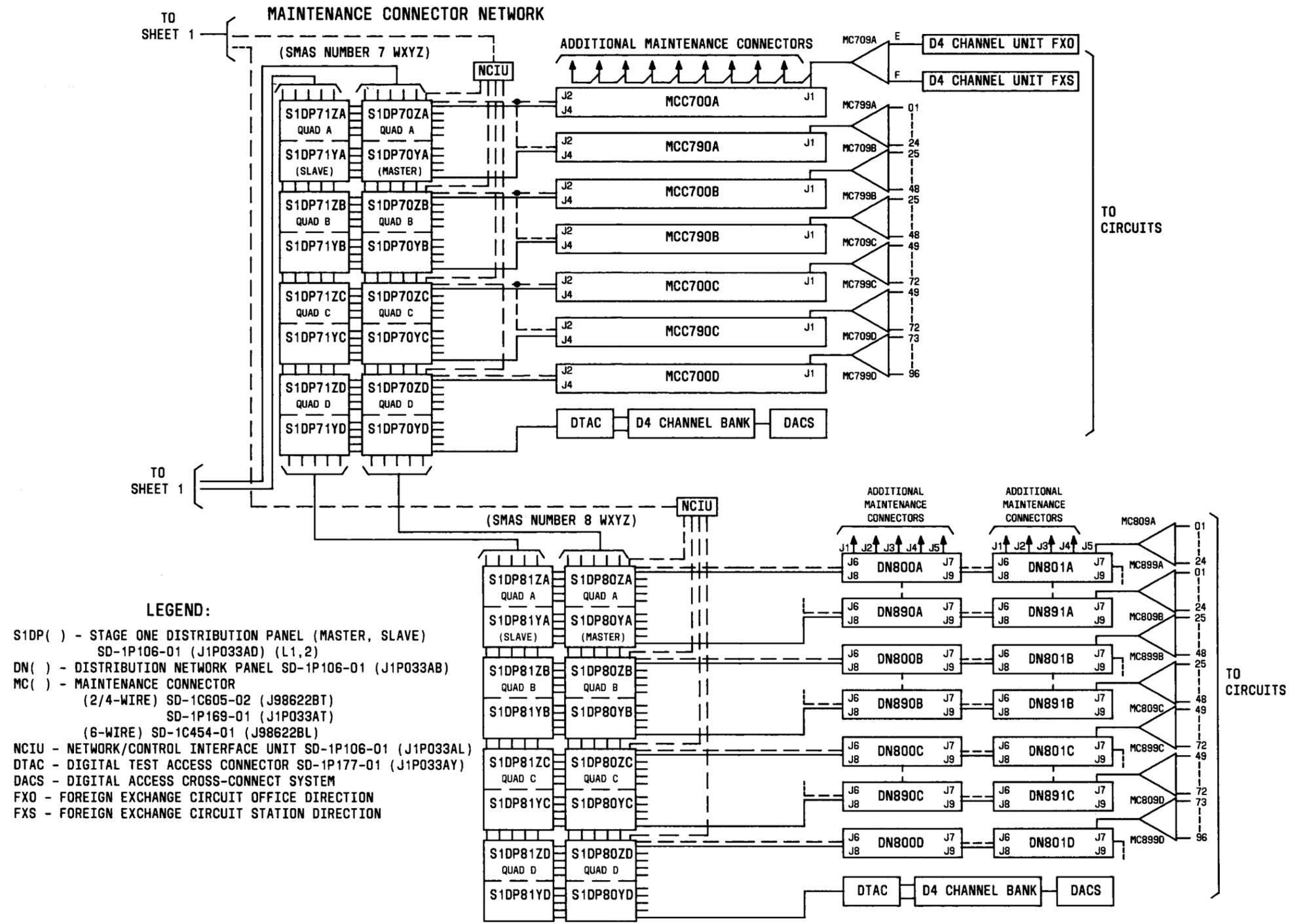


Fig. 7—SMAS 5B System (Sheet 2 of 2)

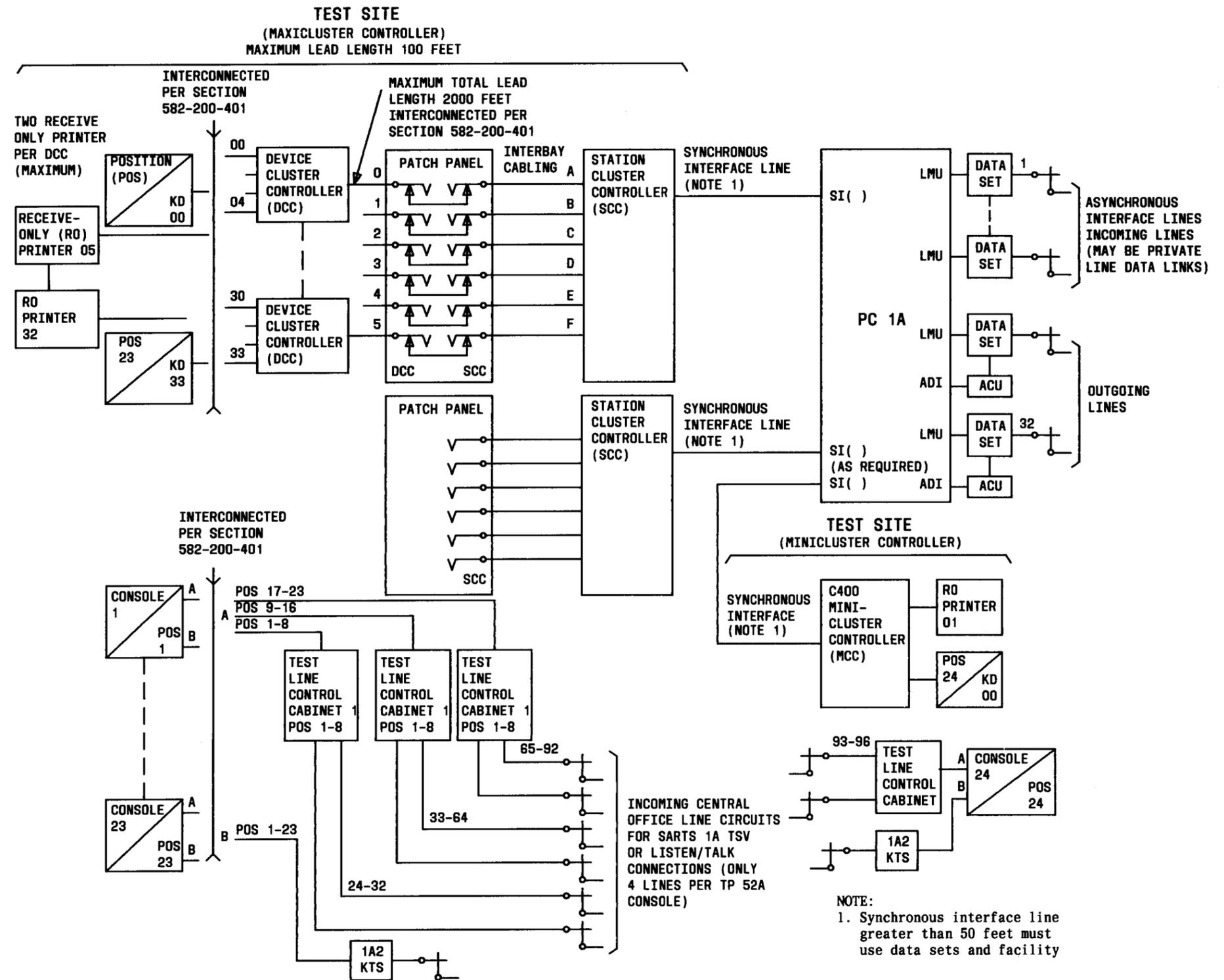
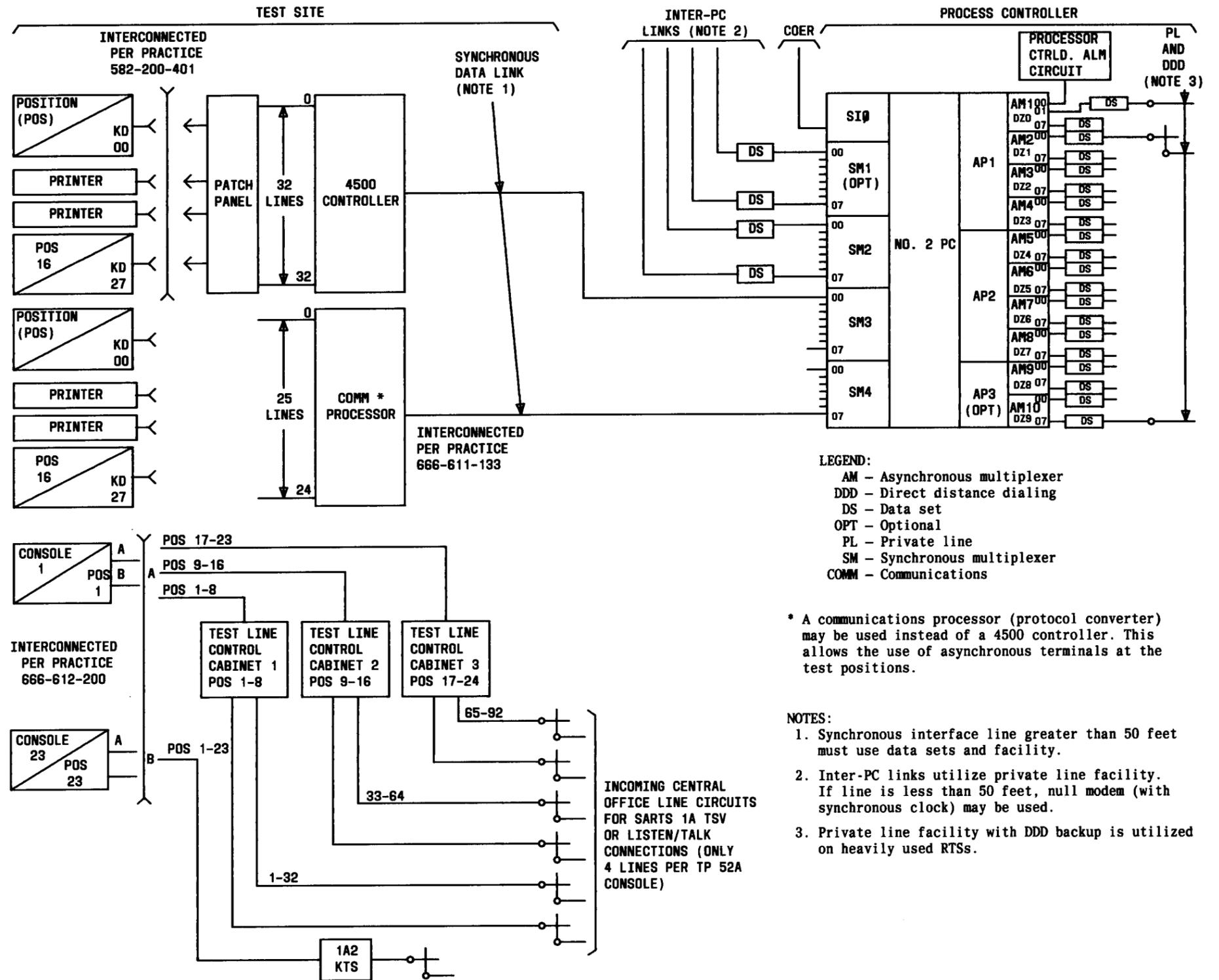


Fig. 8—SARTS 1A Near-End Location (PC 1A Application)



**LEGEND:**  
 AM - Asynchronous multiplexer  
 DDD - Direct distance dialing  
 DS - Data set  
 OPT - Optional  
 PL - Private line  
 SM - Synchronous multiplexer  
 COMM - Communications

\* A communications processor (protocol converter) may be used instead of a 4500 controller. This allows the use of asynchronous terminals at the test positions.

**NOTES:**

1. Synchronous interface line greater than 50 feet must use data sets and facility.
2. Inter-PC links utilize private line facility. If line is less than 50 feet, null modem (with synchronous clock) may be used.
3. Private line facility with DDD backup is utilized on heavily used RTSS.

Fig. 9—Typical SARTS Near-End Location (No. 2 PC Application) (NOTE 1)







A 714 294-4483										C OCSOCA01B0		O WO		
B 1ST NATIONAL BANK										MLG				
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	OCSOCA01	X2	SMCG410A00		10073-01086A									
M	OCSOCA01		41/-01086-/EF/2WA/01											
N			L2W/LN/LN/F/33				-0.4		-2.1					
OA	OCSOCA01W1	X2	SFMOU20D00	153.01		19	-0.4	-16.0						
P	OCSOCA01		SF6DF00											
Q	OCSOCA01		SF6DF00											
R	OCSOCA01	X4	SMCG410A00		10073-01152-									
S	OCSOCA01		41/-01152-/EF/4BA/02/											
T			SFC/LN/LN/E/22/				+7.0		-16.0					
U	OCSOCA01	X4	ONMT20	154.09		11	+7.0							
V			1 ON 2		1									
W	SNDGCA02	X4	ONMT20D00	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 SD1C240-02											
21SEG		CARD	01-02	ISS	09/17/74		ISSUING COMPANY			PT-LA	CKT LAYOUT OUTLINE 9 66			

(b) CLR CARD EXAMPLE

Fig. 12—Access Point Data Format and CLR Card Example (Sheet 2 of 2)

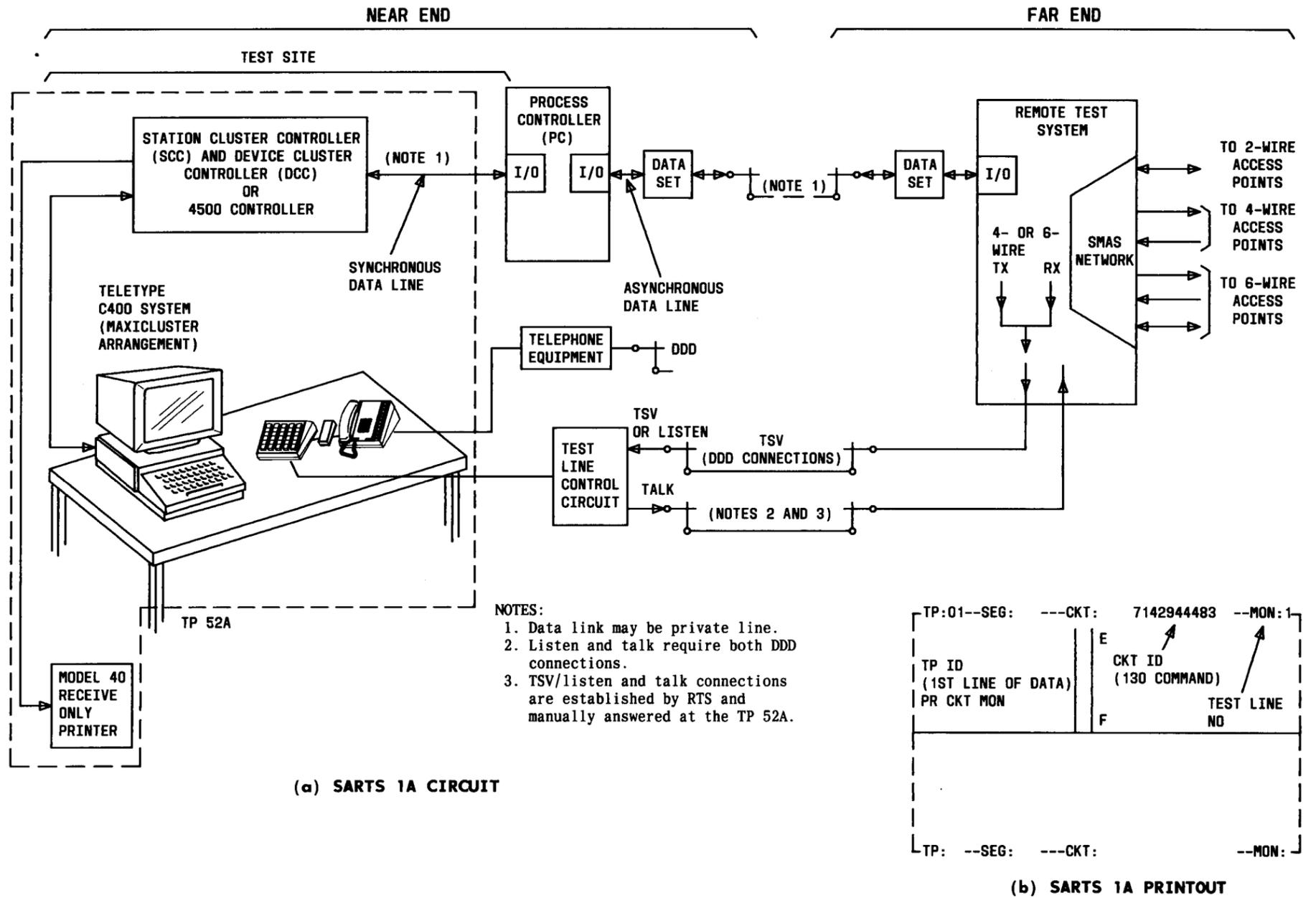


Fig. 13—SARTS 1A Testing Mode (NOTES)

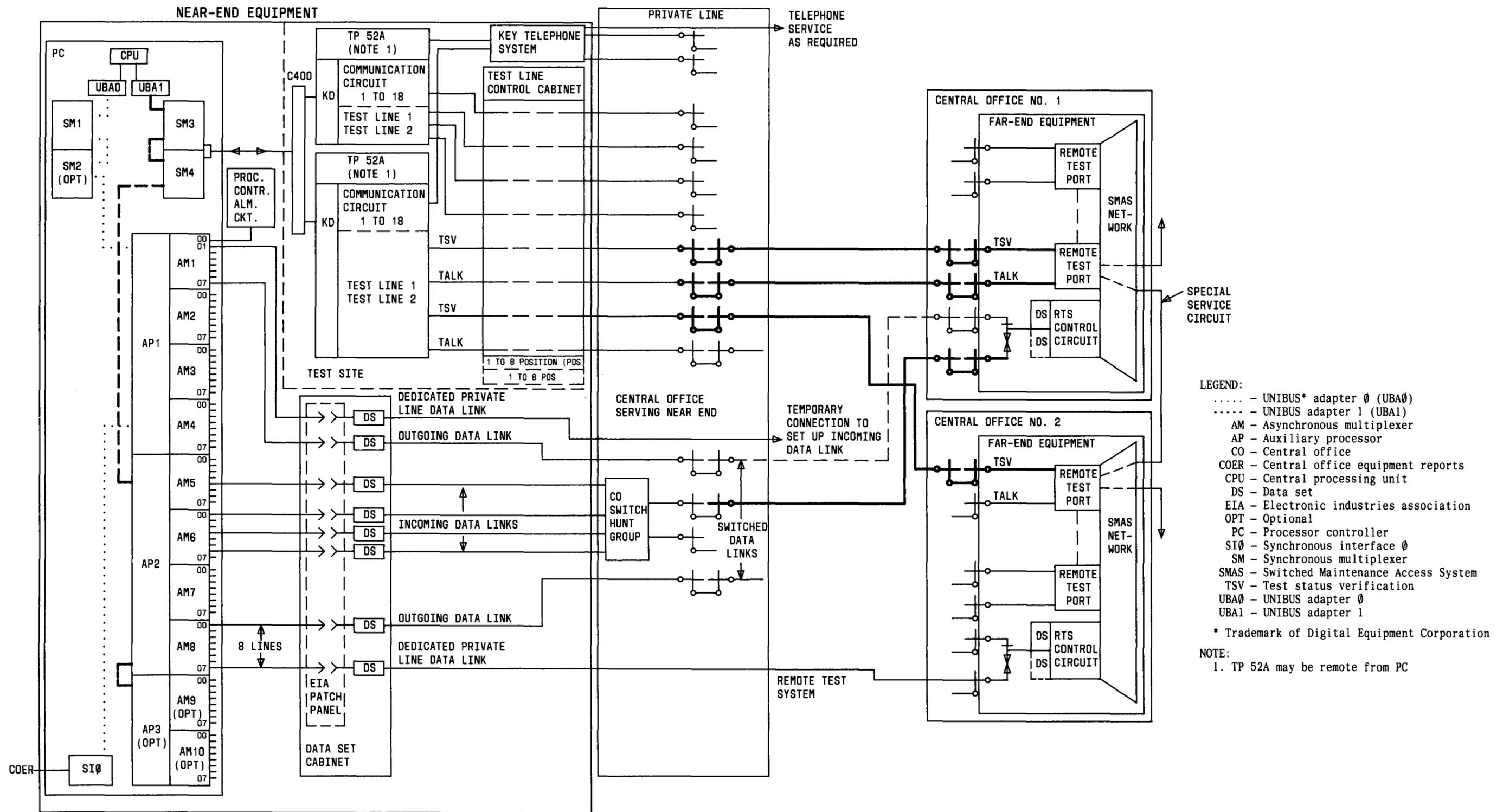


Fig. 14—Overview of a Typical SARTS 1A Near-End to Far-End Communications Path (NOTES)