SWITCHED ACCESS REMOTE TEST SYSTEM (SARTS 1A)
REMOTE TEST SYSTEM (RTS 1A)
DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the Remote Test System 1A (RTS 1A) which is part of the Switched Access Remote Test System 1A (SARTS 1A).

1.02 The reasons for reissuing this section are listed below. Since this is a general revision, no revision arrows have been used to denote significant changes.

(a) Changes the encoding information

(b) Revises Tables A and B

(c) Changes reference to SMAS 4A sections

(d) Adds reference to testing sections.

1.03 The RTS 1A is designed to test special service circuits at a remote point (called the far-end) and to send test information back to a test center (called the near-end) (Fig. 1). The tests include talking, test status verifying (TSV) sending, measuring, supervising, and signaling. Special service circuits may be 2-, 4-, and 6-wire circuits. Circuit continuity is maintained for bridged measurements but may be split and terminated with tests performed in each direction. Precautionary measures to verify the initial circuit status, such as TSV for busy, are instituted prior to any test instruction. The circuit layout record (CLR) or equivalent should furnish proper information for accessing a circuit for test.

1.04 The test center (near-end) of SARTS 1A consists of a process controller 1A (PC 1A) and associated test position 52As (TP 52A) and additional equipment. Information about the near-end is covered in Sections 666-611-100 and 666-612-100.

1.05 The far-end consists of the following equipment:

- Far-End Control Circuit (FECC) SD-99623-01
- Test Function Control Circuit (TFCC) SD-1P003-01
- Test Register and Outpulsing (TROP) Circuit SD-1P005-01
- RTS 1A Controller Circuit SD-1P002-01
- Remote Access Test Port (RATP) SD-1P001-01
- Switched Maintenance Access System 4A (SMAS 4A) SD-99560-01 to SD-99563-01

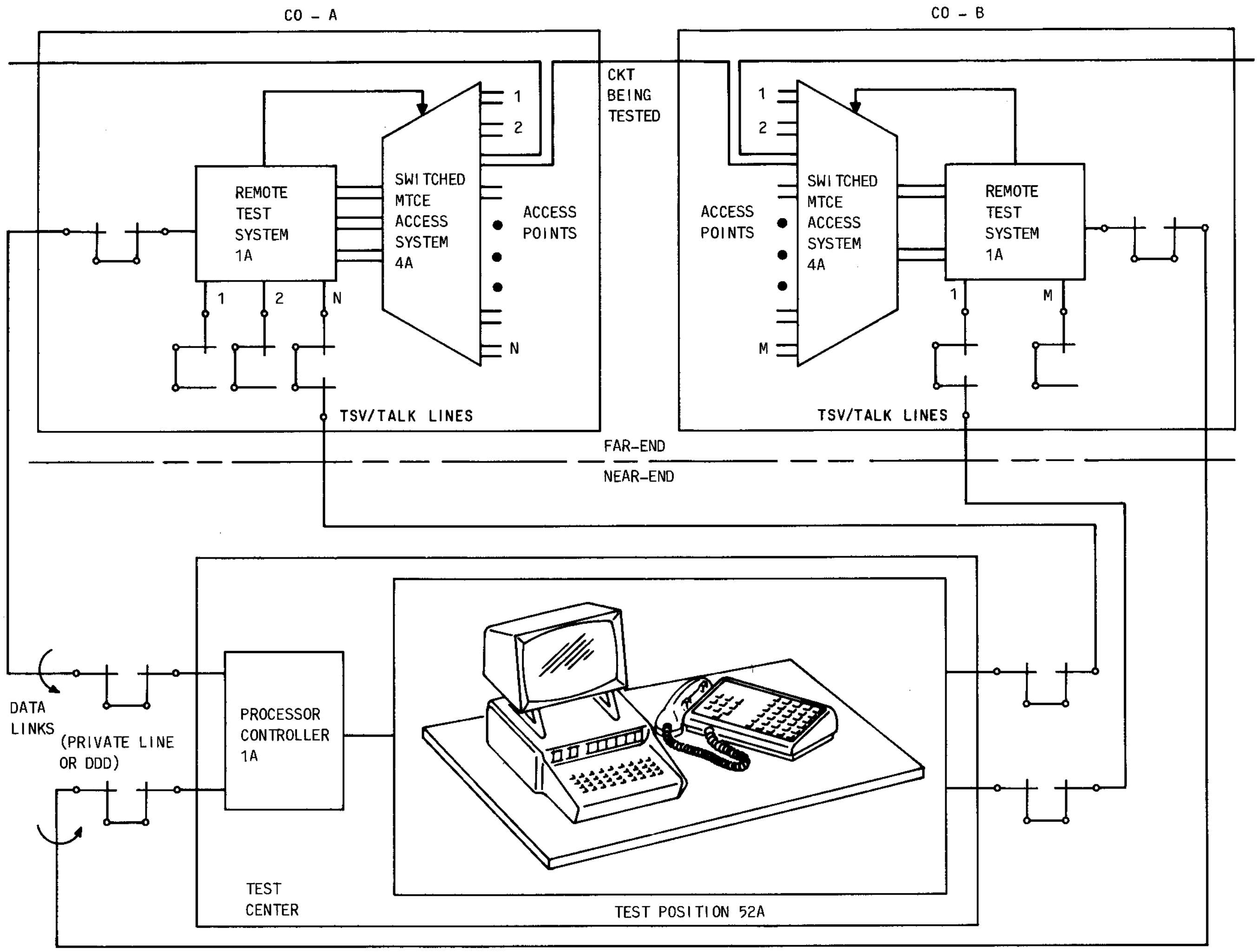


Fig. 1—Switched Access Remote Test System 1A

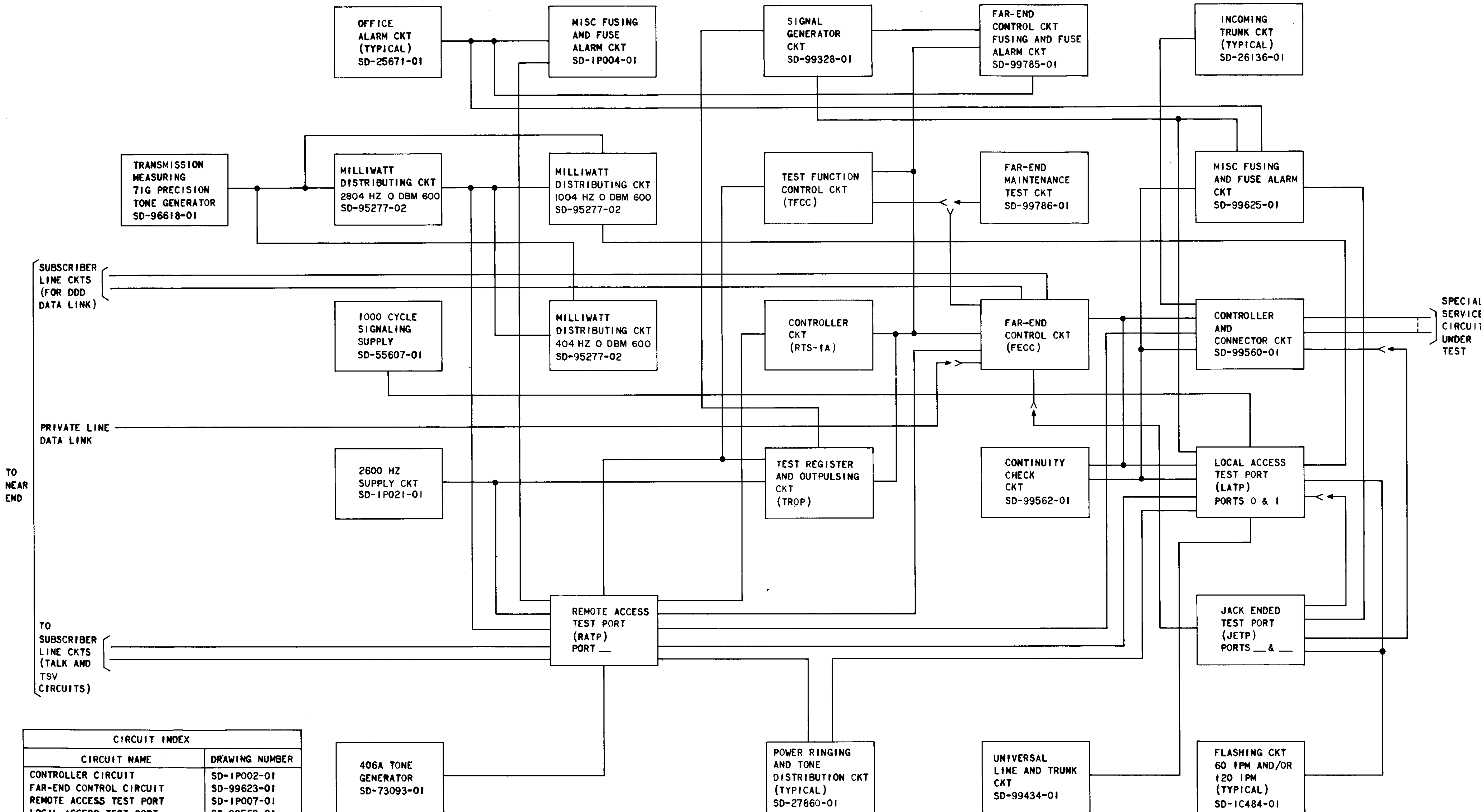
- Measuring Sets (optional).

The RTS 1A consists of the FECC, TFCC, TROP, RTS 1A controller circuit, and the RATP. Each of these items of equipment is discussed in detail in this section. The SMAS 4A is described in Section 667-302-101 and the measuring sets are described in Sections 103-126-100 and 103-126-102. Section 666-610-500 contains procedures for testing RTS 1A operation from the near-end and Section 666-613-500 contains procedures for testing RTS 1A operation from the far-end. For more information on the SARTS 1A, refer to Section 666-610-100.

1.06 The near-end and far-end interface is via a data link. Use of the data link is confined to the data interchange between the two machines; the near-end using it for controlling the far-end, the far-end for relaying status and results back to the near-end. It may be either a private line data link or a DDD data link.

1.07 The data link should not be confused with the link established in the course of remote testing for TSV and talking. The TSV and talk lines are established to allow the tester at the TP 52A to verify that the circuit under test is not being used or talk to a customer whose circuit is under test.

1.08 Figure 2 is a block diagram of all the components in the RTS 1A.



CIRCUIT INDEX	
CIRCUIT NAME	DRAWING NUMBER
CONTROLLER CIRCUIT	SD-1P002-01
FAR-END CONTROL CIRCUIT	SD-99623-01
REMOTE ACCESS TEST PORT	SD-1P007-01
LOCAL ACCESS TEST PORT	SD-99563-01
TEST FUNCTION CONTROL CIRCUIT	SD-1P003-01
TEST REGISTER AND OUTPULSING CIRCUIT	SD-1P005-01
JACK ENDED TEST PORT	SD-99561-01

Fig. 2—Block Diagram of RTS 1A

2. DESCRIPTION OF OPERATION

2.01 Figure 3 and the following paragraphs describe the operation of the RTS 1A.

2.02 The near-end sends to the FECC (1) a port number, a class code, and a SMAS 4A number of a special service circuit to be placed under test. The FECC conditions the output leads of the RTS 1A controller (2A) and (2B) to the RATP indicated by the port number. The FECC sends the SMAS 4A number (3) (after verifying it is a proper number) to the SMAS 4A controller, which switches the special service circuit to the RATP (4). Four-digit instruction codes are now sent to the RTS 1A controller (5) via the FECC to configure the port (6). Also on command from the near-end, the FECC transfers information to the TFCC (7) , eg, that information necessary to prepare the TROP to receive the circuit under test and to establish a holding path (8) (closure on lead-pair TH/THR) for the steering relay (shown as relay A). Relay A is energized as the result of an instruction (9) from the RTS 1A controller which steers certain leads from the RATP to the TROP (10).

2.03 Additional instruction codes may be required to steer additional leads to the TROP (shown as relays B and C), depending on the type of tests. Instruction codes may be sent to the RTS 1A controller to prepare the RATP to receive the circuit under test when the TFCC relinquishes control of the circuit to the port (6) (release of closure on lead-pair TH/THR).

2.04 On command from the near-end (1) via the FECC (7), the TFCC applies closures (or opens) to and looks for closures (or opens) from the TROP to accomplish the signaling functions (11). When the test has been completed, the closure on lead-pair TH/THR is removed (8), and the circuit is returned to the RATP.

2.05 It should be noted that the FECC—TFCC combination does not have the capability to evaluate the overall commands to assure that a test will be properly executed. For example, if the near-end instructs the FECC to make a meter reading, the FECC makes no check to verify that the meter reading leads were connected by previous instruction codes. If the commands sent to the far-end are not given in proper sequence, the test results could be invalid. It is the responsibility of the near-end to know and give proper commands in such a manner that the execution by the far-end results in a valid test procedure.

2.06 It is also important to note that the FECC has no knowledge of whether a 2- or 4-wire circuit is under test, how it is equipped, or how it is configured. Thus, the FECC cannot screen for instruction codes which are meaningless or which may damage the circuit under test.

3. FAR-END CONTROL CIRCUIT (FECC)

3.01 The FECC is a microprocessor controlled circuit and provides the interface between the near-end (location of the PC 1A) and the far-end (location of the SMAS 4A equipment)of the SARTS 1A.

3.02 All information, requests, and data transmitted between the near-end and far-end flow through the FECC. The FECC causes the RTS 1A controller to execute instructions, to record the status of other RTS 1A functions, record SMAS 4A status, and to update the near-end with this information. The RTS 1A controller accepts and uses the FECC output to configure the RATP, apply tones, terminations, and supervisory conditions to the special service circuit under test and to connect any required measuring equipment.

3.03 The FECC ensures that control of the RTS 1A is allowed only to legitimate users. This is accomplished by a call-back security arrangement between the FECC and the near-end. If the near-end and far-end are connected via a private line data link, the call-back security arrangement is not required. If they are connected by a DDD data link, the following is a brief description of what occurs between the near-end and far-end. The near-end calls the far-end over a DDD link and gives coded information to the FECC as to which of two near-ends are calling, the primary or alternate. The FECC via the TFCC instructs the TROP to dial the particular near-end using the number that is stored in switches on circuit packs in the TFCC (see paragraph 4.03). If that near-end made the original call, a data connection is established between the FECC and PC 1A.

3.04 The FECC accepts and controls the bidding that takes place between the local access test port (LATP), jack-ended test port (JETP), and RATP for control of the SMAS 4A controller

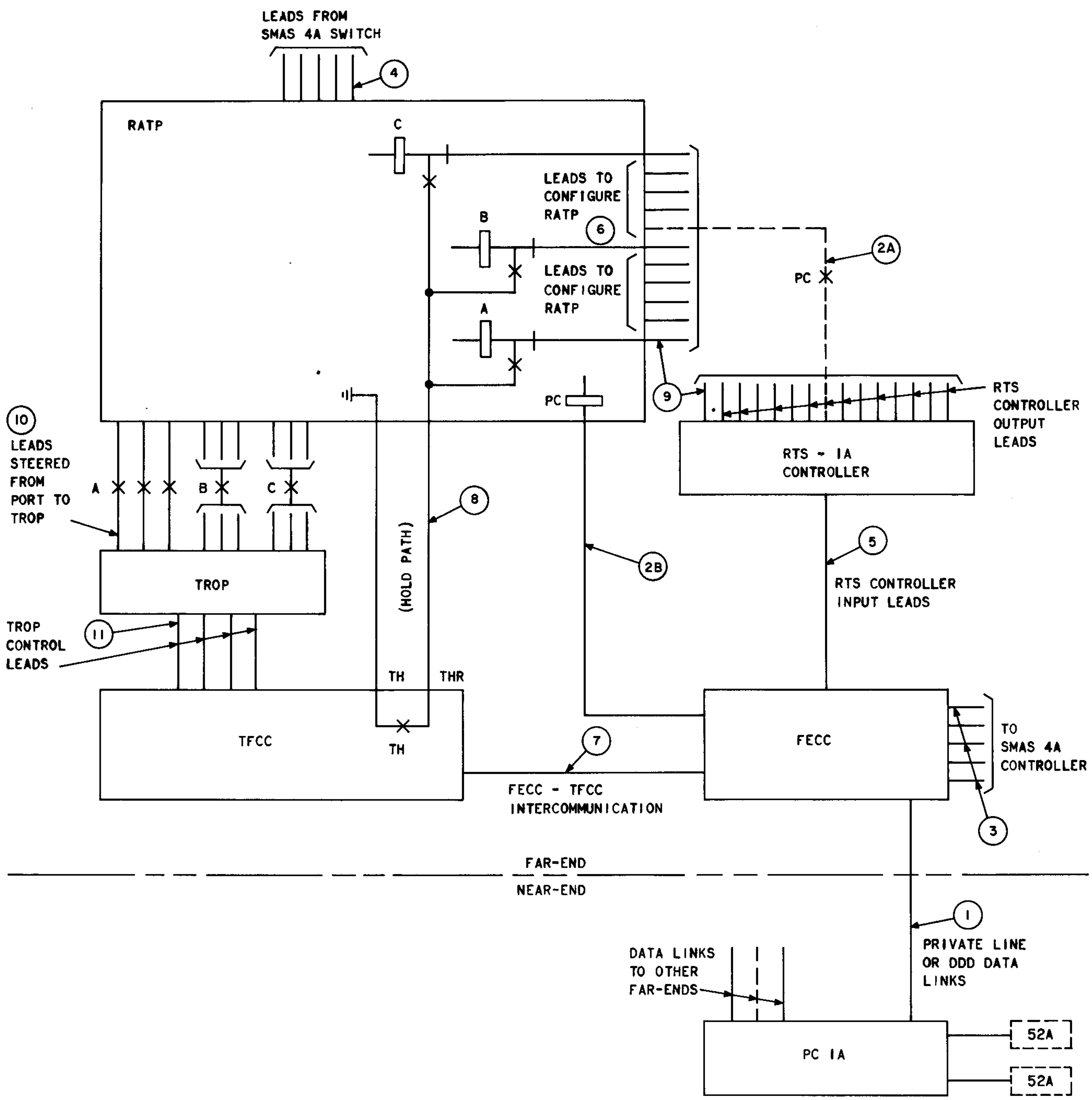


Fig. 3—Diagram of Description of Operation

and connector circuit. When the SMAS 4A is being accessed by a tester at a remote location, the SMAS 4A number and the RATP number are received over the data link directly into the FECC. The FECC operates appropriate relays and gains access to the controller via the RATP. The FECC converts the SMAS 4A number received to a 1/10 code and stores the number in memory. The FECC checks the SMAS 4A number to see that (1) it is a valid number, (2) it is not beyond the range of the switch connector, and (3) the connector group being accessed is not busy from a previous connection.

If the SMAS 4A number is valid, the FECC proceeds with the connection; if not, the appropriate indication is sent to the originating test location.

3.05 When the connection is complete, a continuity check is made. If continuity fails, an indication is given to the controller which drops the original connection. The FECC then reestablishes the connection from the SMAS 4A number in storage and continuity is again checked. If continuity is good, the connection is made; if it fails, the proper indication is sent to the originating test location.

4. TEST FUNCTION CONTROL CIRCUIT (TFCC)

4.01 The TFCC is an off-line microprocessor controlled circuit; however, when interfaced with the FECC, it is used as either an on-line or off-line machine. All TFCC commands are passed via the FECC from the PC 1A and the TFCC performs the relatively long-term tests of the RTS 1A. All control and timing functions for the generation of address signals and time-out procedures of the TROP are performed by the TFCC.

4.02 The functions of the TFCC are as follows:

- To establish a DDD data link between the near-end and far-end
- To control the TROP in establishing talk and TSV DDD links between the near-end tester at a TP 52A and the special service circuit under test
- To control the TROP in performing signaling tests on the circuit under test
- To directly control the RATP in providing various ringing functions, including code select ringing.

Encoding the DDD Number

4.03 Two of the circuit packs in the TFCC (PDDD and SDDD) are used for encoding the primary and alternate DDD numbers, respectively, and for encoding the mode of dialing, either TOUCH-TONE® or dial pulse. The circuit packs ***may be either*** CP 15 [ED-1P264-()] or CP 28 [ED-1P468-()]. The method of encoding a DDD number on CP 15 is slightly different from the method of encoding on CP 28.

A. Encoding CP 15

4.04 Encoding a DDD number on CP 15 is accomplished by setting binary coded decimal (BCD) switches. There are 13 BCD switches, S0 through S11, on the circuit pack. Each switch has four binary rockers to encode one decimal digit. A maximum of 12 digits can be encoded on the circuit pack including second dial tone detection. The first digit is encoded in switch S0, the second in S1, the third in S2, etc. To indicate the last digit of the DDD number, the ***next*** switch is encoded with a BCD value of 15 (all rockers depressed toward the label). However, if the last digit is encoded in switch S11, such action is impossible (as there is no switch S12) and is not required. The mode of dialing the DDD number is encoded in switch S15. If the mode of dialing is TOUCH-TONE, the rocker labeled 8 on S15 is depressed toward the label. If the mode of dialing is dial pulse, the rocker is not depressed. See Table A for encoding the DDD number and Table B for encoding the dial pulse mode.

B. Encoding CP 28

4.05 Encoding a DDD number on CP 28 differs slightly. There are 16 BCD switches on CP 28 providing for a maximum of 14 digits including second dial tone detection. Switch S14 ***must*** be encoded with a BCD value of 15 (all rockers depressed toward the label). The DDD number is then encoded in the same manner as described in the previous paragraph using switches S0 through S11. To indicate the last digit of the DDD number, the ***next*** switch is encoded with a BCD value of 15. Note that if the last digit is encoded in S13 this requirement is met as the next switch, S14, ***must*** be encoded with a BCD value of 15. The mode of dialing the DDD number is encoded in switch S15 as described previously.

4.06 Section 666-613-500, under DDD NUMBER TEST, gives the test procedure to verify that the proper numbers have been encoded.

5. TEST REGISTER AND OUTPULSING CIRCUIT (TROP)

5.01 The TROP is essentially made up of a large number of dry reed relays which respond to commands from the TFCC to configure the appropriate supervisory arrangements and to generate address signals.

TABLE A

ENCODING DDD NUMBER IN BCD SWITCHES S0 THRU S11 ON CP 15 S0 THRU S13 ON CP 28

DIGIT TO BE ENCODED	BCD SWITCH SETTING X INDICATES ROCKER DEPRESSED TOWARD LABEL			
	8	4	2	1
1	—	—	—	X
2	—	—	X	—
3	—	—	X	X
4	—	X	—	—
5	—	X	—	X
6	—	X	X	—
7	—	X	X	X
8	X	—	—	—
9	X	—	—	X
0	—	—	—	—
If second Dial-tone detection is required, encode	X	X	—	X
If previous digit is last DDD number or if switch is S14, encode	X	X	X	X

TABLE B

ENCODING DIAL PULSE MODE IN BCD SWITCH S15 ON CP 15 OR CP 28

MODE OF PULSING DDD NUMBER	SWITCH SETTING OF S15 X INDICATES ROCKER DEPRESSED TOWARD LABEL			
	8	4	2	1
TOUCH-TONE®	X	—	—	—
Dial Pulse	—	—	—	—

5.02 The TROP provides a wide variety of terminations and supervisory conditions and can address signals with dial pulses (DP), TOUCH-TONE (TT), 2/6 multifrequency (MF) and 2600-Hz single frequency (SF). The TROP has a dial tone detector, a 2600-Hz tone supply, and detector circuit, and is associated with a standard signal generator for TT and MF frequencies.

5.03 The commands which control the TROP are generated in the PC 1A, a minicomputer situated at the near-end location.

5.04 Coded information is sent between the PC 1A and the TFCC via the FECC to configure the TROP, to establish the sequence or events, and to select and control the address signaling. Once the coded control information is transmitted to the TFCC, the TFCC operates the appropriate TROP relays by means of relay drivers.

5.05 The call originating sequence and outpulsing characteristics of the TROP will always follow the same originating sequence and are covered in the following steps:

(a) The first step is to put the TROP in the idle condition. The idle condition is the supervisory on-hook state of the private line circuit itself, not the inactive condition of the TROP.

(b) The second step is the transferring of the special service circuit to be tested to the TROP from the RATP. The circuit will be held in an idle condition to ensure that any connections or conditions which may have been established prior to TROP access are removed.

(c) The third step is the seizure or off-hook condition. The seizure condition is applied to the circuit under test in the test direction of the switching equipment. When the switching equipment detects this condition, it will transmit a start dial signal back to the TROP which will pause 100 msec to allow the switch time to ready itself for impulsing and then proceed to the next step.

(d) The fourth step is the actual outpulsing of the address of the called party. In some cases, a second dial tone detect may be required before the remainder of the address can be outpulsed. In this case after detection of second dial tone, the TROP is sequenced back to step 3 and will proceed from there.

(e) The fifth step is the transferring of the circuit back to the RATP. To ensure that the circuit through the switch is not dropped when the transfer is made, the RATP must be preconditioned before the transfer.

5.06 When ordered by the PC 1A, the TROP outpulses the address in DP, MF, TT, or SF. It is possible to vary the percent make, percent break, and the interdigit timing of all types of outpulsing. The MF, TT, and SF tones go through the RATP attenuators and amplifiers. These amplifiers must be preset so that the tones applied to the circuit will be the correct level for the access point.

5.07 The TROP circuit must work with 2-, 4-, and 6-wire special service circuits. The RATP accesses the TROP on a first-come, first-served basis. Each RATP has a transmit, a receive, and an E/M supervisory circuit. If the special service circuit accessed by the RATP is a 2-wire circuit, it will be connected to either the transmit or receive supervisory circuit (and E/M supervisory circuit if it is a 2-wire with E/M signaling). If the circuit is a 4-wire circuit, it will be connected to both transmit and receive supervisory circuits (and E/M supervisory circuit if it is a 4-wire with E/M signaling). The supervisory circuits can individually make a transfer and only that portion required by the TROP will be transferred. The transfer of the special service circuit to the TROP is controlled by the RTS 1A controller. The transfer of the circuit back to the RATP is under control of the TFCC.

5.08 The TFCC has complete control of the TROP. Every operation performed by the TROP is the result of a command from the TFCC. If a set of operations were to be performed simultaneously by the TROP, individual commands for each step would simultaneously come from the TFCC. If the steps were to be performed sequentially, sequential commands would be issued from the TFCC.

6. RTS 1A CONTROLLER CIRCUIT

6.01 The RTS 1A controller circuit is essentially a sophisticated decoder. The RTS 1A controller receives a 4-digit instruction code in a serial one-out-of-ten (1/10) format from the FECC. Upon receipt of the fourth digit, the RTS 1A controller will provide ground on approximately 200 output leads (additional outputs are available for future use), one lead at a time or in combinations of 12 lead groups, to be used by the RATP. These grounds appearing on the output leads are the instructions used by the RATP to perform the required test function on a special service circuit.

6.02 The RTS 1A controller circuit can control up to a maximum of eight RATPs. The near-end via the FECC selects which RATP is to be used by a path independent of the RTS 1A controller circuit.

6.03 If no instruction code is applied by the FECC to the RTS 1A controller input leads, all output leads will be open. All input and output timing functions are controlled by the FECC.

6.04 The relay circuitry controlling the application of the meter leads to the RATP is under direct control of the signal from the RTS 1A controller.

7. REMOTE ACCESS TEST PORT (RATP)

7.01 The RATP is a multifunctional circuit which is configured and controlled through test instructions received via the FECC and RTS 1A controller from the near-end. The RATP is used to receive and hold the special service circuits to be tested when switched from the SMAS 4A network into the RATP.

7.02 The RATP is the interconnection point for the DDD TSV and talk lines, the RTS 1A and SMAS 4A network, the measuring test sets, and various test signal sources and terminations.

7.03 Up to eight RATPs can be provided with each far-end. Each RATP is assigned to a level in the crossbar switches of the SMAS 4A common control circuit.

7.04 Each RATP contains the control circuitry required to configure the test equipment and the special service circuit being tested according to the desired test and type of circuit. For example, the RATP separates 2-wire circuits from 4-wire circuits, provides lead reversals, and selects the proper pair (or pairs) for application to a particular test set.

8. BAY AND FRAME ARRANGEMENTS

8.01 Figures 4 and 5 show the 11-foot 6-inch frame arrangement for the local access test port frame and the far-end control and test frame. Figures 6 and 7 show the 7-foot frame arrangement housing the same units as Fig. 4 and 5, but in three frames. Figure 8 shows both the 11-foot 6-inch and 7-foot frame arrangement for the RATP.

8.02 The 7-foot frame arrangement meets the needs of Electronic Switching System (ESS) and New Equipment Building System (NEBS) type offices. The 7-foot design uses most of the equipment units used in the 11-foot 6-inch frame arrangement as described in Section 667-302-110; however, due to the regrouping of units, new filter units and fuse panels are required. Also, due to regrouping, the 7-foot arrangement permits the 4-wire with E/M signaling, 4-wire with A/B signaling, or 6-wire switch connector-connector group control frames to be increased from 900 access points to 1000 access points per switch connector and control unit. This is accomplished by adding one connector group and control unit with 100 access points.

8.03 All system operations are the same in both the 11-foot 6-inch and 7-foot type frame arrangements.

8.04 All frameworks are of the uniframe type (2 feet 2 inches wide) with the exception of the local access test port-far-end control frame which is a two-bay uniframe type (4 feet 4 inches wide).

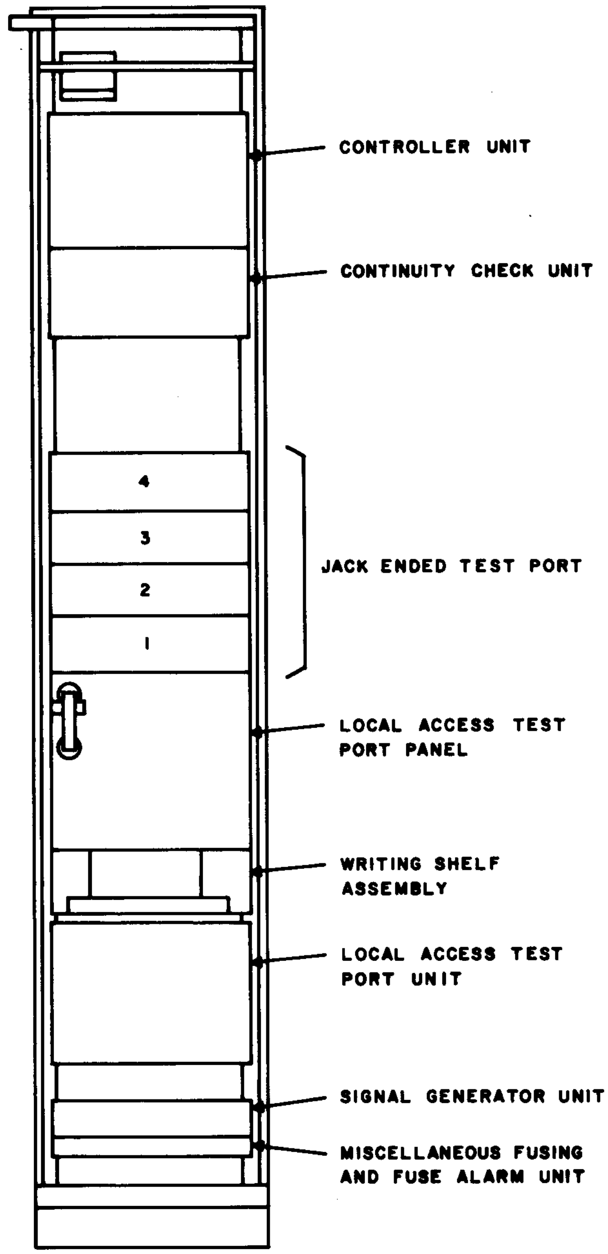
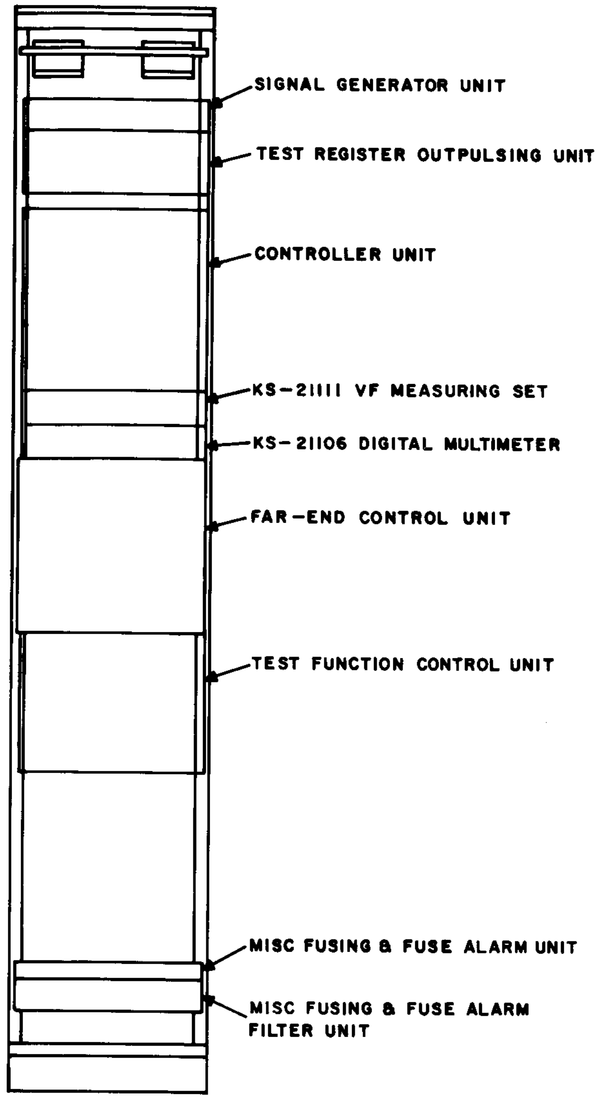


Fig. 4—Local Access Test Port Frame



NOTE:

SHOWN AS A 11'-6" FRAME. ALSO AVAILABLE IN A 7' FRAME ARRANGEMENT.

Fig. 5—Far-End Control and Test Frame

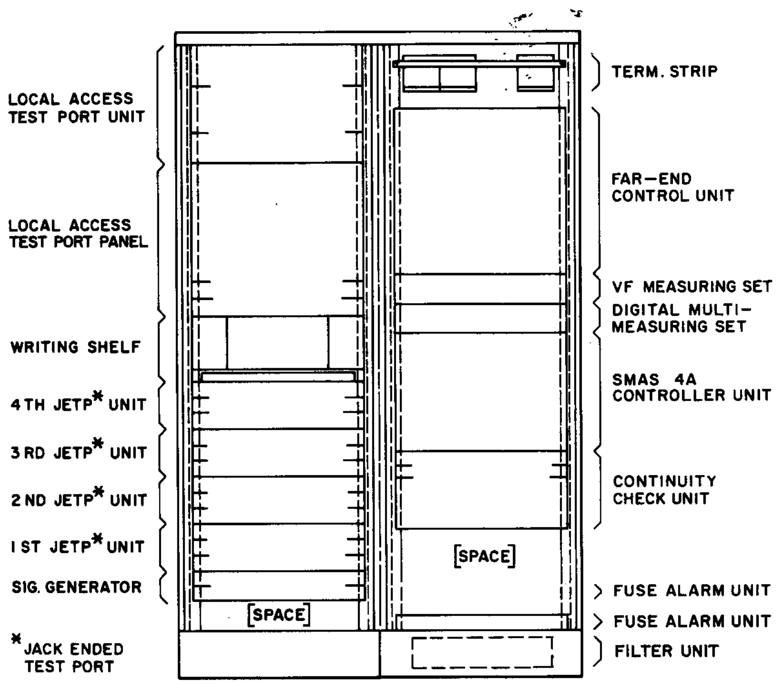


Fig. 6—7′ Local Access Test Port-Far-End Control Frame

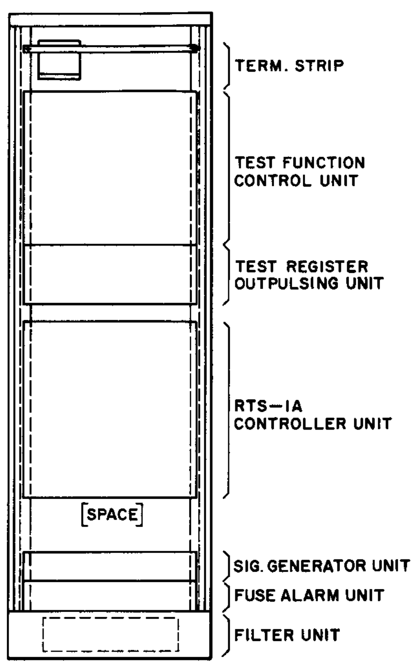


Fig. 7—7′ Test Function Control Frame

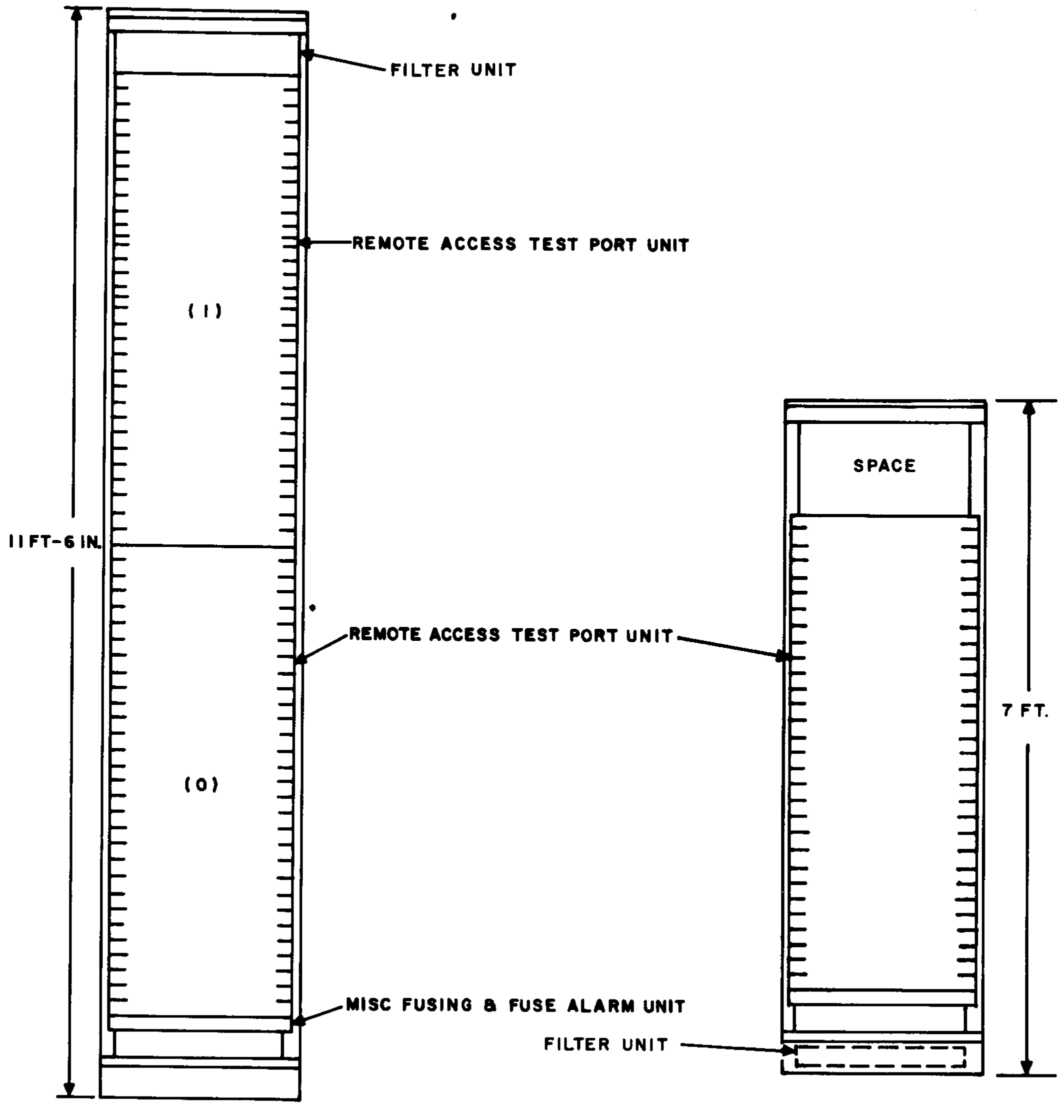


Fig. 8—Remote Access Test Port Frame