

21A TESTBOARD

GENERAL DESCRIPTION

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Status information is received either upon request or automatically, under some conditions.

1.04 The 21A testboard is part of a No. 1 ESS office maintenance complex which consists of a master control center (MCC); 904-type data test bays; an ATMS; and, in some applications, a 10C telegraph testboard. These maintenance systems are associated with the ESS through the testboard by means of test trunks over which operational checks may be made. A test trunk to a 5D switchboard is also provided.

1.05 Additional information on the 21A testboard may be obtained from the following associated sections:

- 310-282-300 Measurement and Adjustment of Transmission Test Trunks
- 310-282-500 Measurement of Office Losses
- 310-282-501 Operational Tests

A. Operational Features

1.06 All tests through the ESS, originated from the 21A testboard, are performed over test access circuits interconnecting the testboard and the ESS. Four test access circuits are provided at each testboard. A key and lamp panel is provided for each test access circuit. The keys are used for signaling a request to central control to perform a desired function. The lamps, when lighted, indicate the function requested or condition established.

1.07 Connection of a position TST cord to a test access circuit (ACC) jack signals central control, over a signaling lead, that access to the ESS is desired. When connection to the ESS is established, the following functions may be performed over the test access circuit:

- (a) Central control may be informed of the type of circuit to be tested.

1. GENERAL

1.01 This section provides a general description of the 21A testboard used for testing in a 4-wire No. 1, electronic switching system (ESS) provided for switched services networks (SSN).

1.02 Routine testing of network trunks, lines, and concentrator trunks connecting to the ESS is conducted automatically by the automatic transmission measuring system (ATMS). Manual testing may be performed at the 21A testboard, either on a routine basis or on a trouble basis.

1.03 A testboard line-up includes at least one auxiliary testing bay, containing transmission testing equipment, and one teletypewriter bay, containing a printer on which circuit status information is received from central control.

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- (b) Central control may be informed that the test is not to be preempted, if this is a requirement.
 - (c) Connection through the ESS to a network trunk or line, or to a line terminal, which provides the necessary closures for connecting to a concentrator trunk to reach external circuitry or line equipment may be requested.
 - (d) The ESS may be directed to outpulse, if required, on a trunk or to an inward dialing PBX line.
 - (e) Ringing on a controlled ringing line may be initiated.
 - (f) A teletype printout of digits pulsed to the ESS register may be requested.
 - (g) A monitoring connection to a service-busy or test-busy circuit may be requested.
 - (h) A trace by teletype on a line or trunk found service-busy or test-busy may be requested.
 - (i) ESS may be requested to release an established connection but to hold previously pulsed digits in its register during the release period.
 - (j) Reestablishment of a previously made connection following a release period, without repulsing may be requested.
- 1.08** By use of access circuit lamps and, in some cases, auxiliary audible alarms, central control provides the following responses to functions performed over the access circuit:
- (a) Indication that the requested connection to the ESS has been made
 - (b) Indication of the operating status of a line or trunk to which connection is requested
 - (c) Indication of the class of service on a line on which testing is desired
 - (d) Indication that a no-test monitoring connection has been made to a service-busy or test-busy circuit, when requested. Indication that a no-test connection is not available, when applicable
 - (e) Receipt of on-hook and off-hook supervision, relayed from the distant end by central control
 - (f) Provision of an alarm when a number of maintenance-busy trunks in a group exceeds a predetermined number
 - (g) Indication that an information printout is being made at the teletypewriter bay
 - (h) Indication of the presence of a permanent signal condition on a line connected to the ESS and alarm when the number of permanent signals exceeds a predetermined number
 - (i) Indication that a requested function has been acted upon, that a requested function cannot be accomplished, or that improper pulsing has been done
 - (j) Indication that a connection through the ESS has been released but that the ESS register is not cleared.
- 1.09** Connections to plant communication trunks, 101 test trunks, central office trunks, and order wires are made using a position CON cord. When the circuits just listed are multiplied, busy tests may be made using a CON cord. Trunks on which dialing is required, must be arranged for repeated dialing. Incoming manual tests to the testboard are routed over a 101 trunk.
- 1.10** Testboard cord and position circuits are arranged to permit performance of the following functions:
- (a) Connection of jack-ended trunks and lines to each other or to test equipment
 - (b) Talking or monitoring on one cord circuit at a time
 - (c) Connection of jack-ended trunks and lines to the telephone circuit for talking, monitoring, ringing, or dialing
 - (d) Keypulsing (4x4 or 2/6) on either cord of a cord pair
 - (e) Dialing through the signaling test circuit or an SS1 order wire
 - (f) Dialing on a CON cord.

1.11 The position and cord circuits of the testboard are arranged to provide the following capabilities:

- (a) To hold a connection into the position circuit in case the TALK-MON is restored to normal position while dialing or keypulsing is in progress
- (b) To hold the cord circuit connected to the position circuit while dialing or keypulsing until the dial or keyset is released, even though the TALK-MON key is restored to its normal position
- (c) To prevent more than one cord circuit at a time from being connected to the position circuit
- (d) To hold the keyset or dial circuit connected until the ST key is operated or the test key is disconnected.

1.12 When a network trunk or subscriber line is to be removed from service for maintenance purposes, the request is signaled to central control by the operation of an access circuit key. When the trunk or line is to be released to service, the request is signaled to central control in a similar manner. A concentrator trunk is removed from service by inserting a maintenance-busy plug in the MB jack of the testboard appearance of the trunk E and M leads. When a change in the operating status of a trunk or line is made, central control produces a confirming printout at the teletypewriter bay.

1.13 Testing facilities coded 100, 101, 102, 105, and 106 are provided for use with the 21A testboard. The testboard is designed for testing on a 4-wire basis, but 2-wire circuits may be connected using a position CON cord.

1.14 Manual transmission testing on multiaddress/broadcast bridge circuits, associated with the ESS, may be conducted from the 21A testboard.

B. Equipment Arrangements

1.15 Testboard equipment is mounted on standard 23-inch racks, 11½ feet high. A minimum installation consists of a testboard bay (Fig.

1, 1A), a teletypewriter bay (Fig. 1, 1B), and an auxiliary testing bay (Fig. 1, 1C). In a testboard line-up, one teletypewriter bay is furnished for each two testboard positions and one auxiliary testing bay is furnished for each testboard line-up. No patching bay, tandem bay, or P pad bay is required. A typical 4-position line-up is shown in Fig. 1, 1D.

2. TESTBOARD EQUIPMENT AND CIRCUITS

A. Equipment Arrangement

2.01 The testboard consists of: a lower unit containing the testing and control equipment; an upper unit containing the jack field, miscellaneous test equipment including an oscillator and a 2-type signaling test set; access circuits with associated key and lamp panels; and E and M lead splitting jacks. In early production equipment, splitting relays may be provided with E and M lead signaling jacks.

Upper Unit

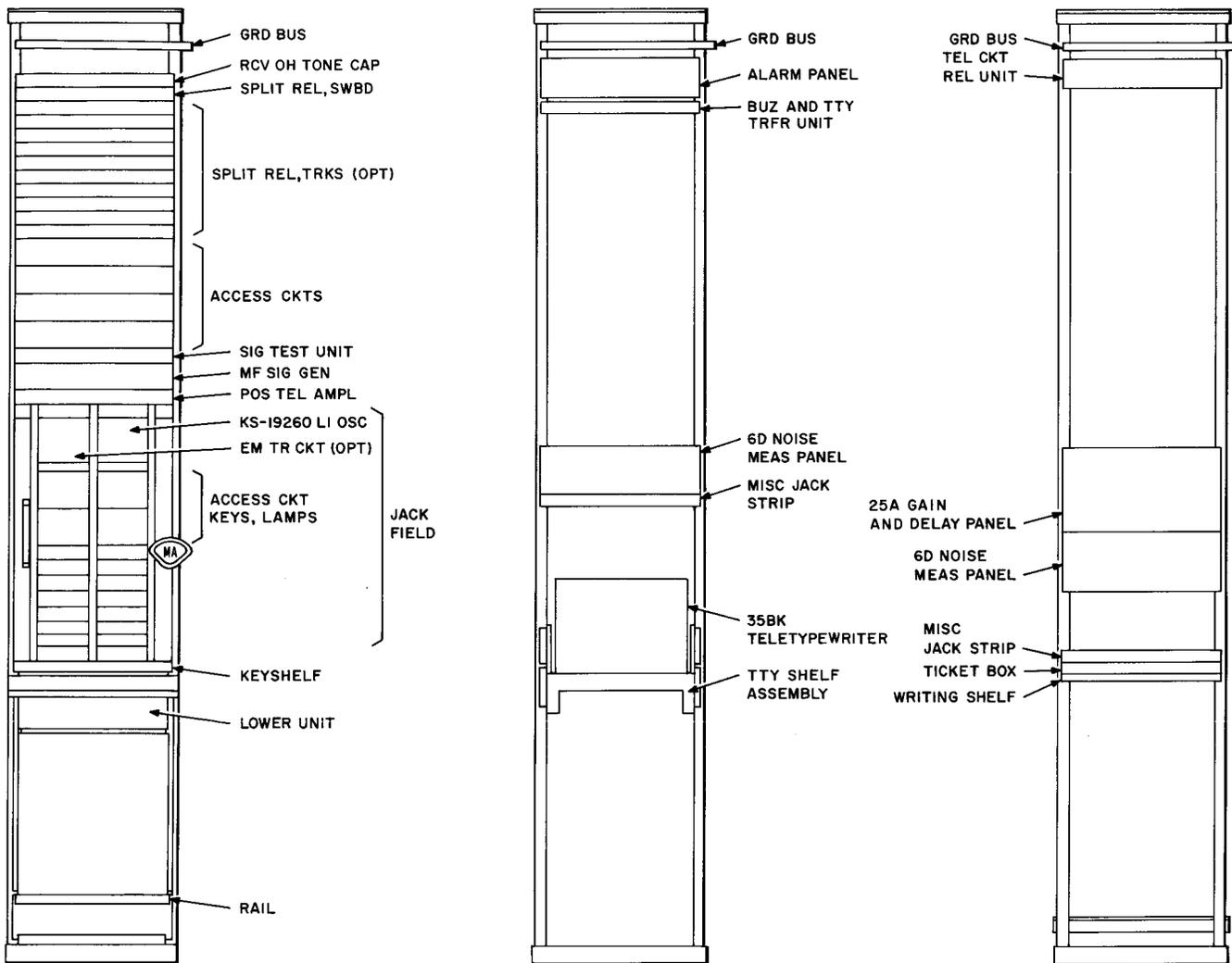
2.02 The jack field provides the required jacks and lamps for up to 200 network trunks, lines, and concentrator trunks. Additional space is provided for jacks used for connecting various communication trunks, access circuits, transmission measuring circuits, and their associated lamps. Four panels contain the control keys and indicating lamps that are associated with the access circuits. A KS-19260, L1 oscillator may be mounted in the upper part of the jack field.

2.03 Space is provided above the jack field for a position telephone amplifier, a multifrequency signal generator, a signaling test circuit, and four panels on which access circuit equipment is mounted. A KS-7995 milliammeter may be mounted adjacent to the jack field.

Lower Unit

2.04 The lower unit contains the keyshelf and plugshelf as well as the cord circuits and position circuit. Keyshelf and plugshelf arrangements are shown in Fig. 2. The keyshelf contains control keys for the position cord circuits, the signaling test panel, and the transmission measuring circuit, as well as the keyset and its associated keys and lamps.

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IA
TYPICAL
TESTBOARD
ARRANGEMENT

IB
TYPICAL
TELETYPEWRITER
BAY ARRANGEMENT

IC
TYPICAL AUX
TESTING BAY
ARRANGEMENT

TB	TTY BAY	TB	AUX TST BAY	TB	TTY BAY	TB
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ID-TYPICAL 4-POSITION LINE-UP

Fig. 1 — Typical Equipment Arrangements

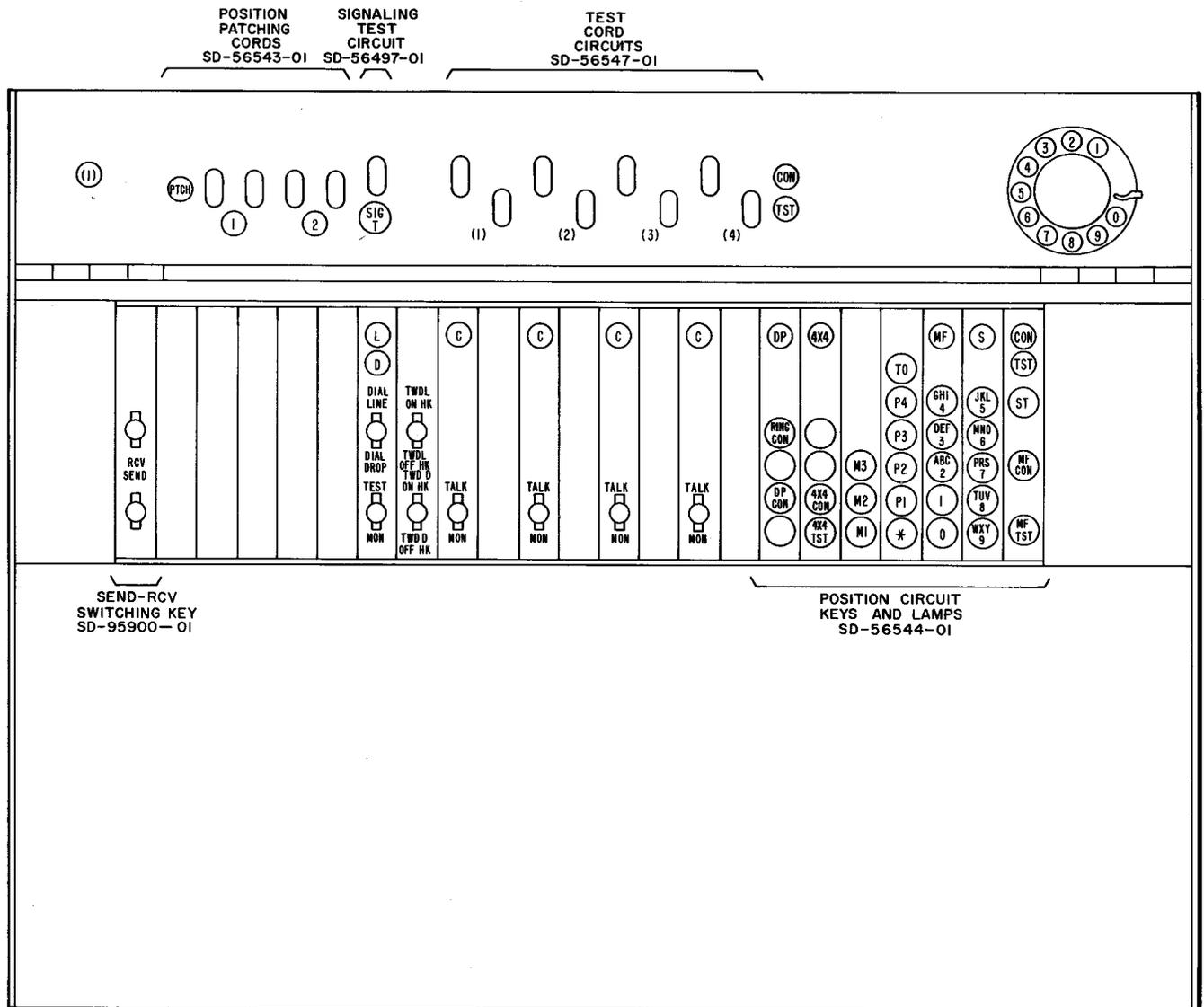


Fig. 2 — 21A Testboard, Keyshelf and Plugshelf Arrangement

2.05 The plugshelf contains four pairs of 2-ended testing cords, each pair consisting of one TST cord and one CON cord. One SIG T cord is provided to connect the signaling test panel to the signaling leads of a circuit under test. Two 2-ended patching cords are provided to permit circuits being tested to be connected to test equipment or other circuits. The position dial is also located on the plugshelf.

B. Testing Trunks

2.06 All outgoing tests conducted through the ESS are made through the access circuits

(ACC). Each access circuit contains a measuring pad which must be adjusted by procedures described in Section 310-282-300 before making measurements through the circuit. Typical circuit arrangements are shown in Fig. 3.

2.07 Incoming manual tests are conducted over 101 test trunks. Trunk jack circuits are equipped with answering lamps, which are lighted to indicate the presence of an incoming call. The trunk contains a measuring pad similar to the one found in an access circuit.

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2.08 Test trunks to the 5D switchboard, the 10C telegraph testboard (when required), and the 904-type data test bays are provided. Each of these trunks is equipped with a busy lamp. For effective use of these trunks, separate communication trunks are required. Testboard access to switchboard trunks and lines is shown in Fig. 4.

2.09 A test trunk to the repeater patch bay (RPTR) or to the voice-frequency channel patch bay (VF CHAN) is provided for tests to these locations. Single-frequency tone tests can be made from the testboard by using this trunk.

2.10 One permanent signal monitoring and queue indicating incoming trunk (PS) is provided for each testboard line-up. When the ESS seizes the line on which a permanent signal is detected, the line is connected to the permanent signal trunk. Lamp (PS) and buzzer alarms, associated with the trunk, are activated at the testboard. If the number of permanent signals exceeds a predetermined number, another lamp (PSA) is flashed.

2.11 A receiver off-hook tone trunk (ROH T) is provided as an aid in clearing a permanent signal condition when the station end of the line is off-hook.

Communication Trunks and Order Wires

2.12 Both 4-wire and 2-wire communication trunks appear at the testboard, as required. Sleeve supervision as used on 5D switchboard trunks may be used on either type of trunk. Sleeve supervision as used on trunks to 17B or 18B testboards may be used on 2-wire trunks. Answering lamps are provided, as required.

2.13 Two-wire telephone and SS1 order-wire circuits appear at the testboard, as required. When a position CON cord is connected to an SS1 order-wire jack, the position dial is automatically connected to the circuit, for a predetermined time, sufficient for dialing.

Miscellaneous Jack Circuits

2.14 Access circuits, trunks, and lines have E and M signaling leads and are jack-ended at the testboard. They are provided with SIG L/D

jacks at the testboard which permit access to the signaling leads for testing and monitoring purposes.

2.15 Test (TST) jacks permit access to 4-wire subscriber line and 2-way trunk circuits, between the ESS and a 5D switchboard, for testing purposes. These circuits are removed from service by inserting a plug into their associated out-of-service (OS) jacks.

2.16 Trunks which normally connect to the ESS but which are transferred to the 5D switchboard by the emergency transfer circuit, when provided, may be removed from service by inserting a plug into the out-of-service (OS) jack, associated with the switchboard 2-way trunk circuit.

2.17 Position extension (EXT) jacks permit access to interbay trunks connecting non-adjacent test positions.

2.18 Associated LARGE and SMALL jack circuits provide conversion of plug size, permitting a circuit terminating in a 310 plug to be patched to a circuit terminating in a 309 plug.

2.19 Four-wire branching jack circuits (BR, IN, A-B, and BR OUT C) permit making a bridging connection to two similar circuits connected to the branching circuit.

2.20 The 2B TST BAT jacks are provided for making power connections to a 2-type signaling test set.

3. TELETYPEWRITER BAY

3.01 The teletypewriter bay provides information printouts of status of circuits which are being tested or upon which testing has been requested. In some cases, the printout is produced upon request. In other cases, the printout is produced automatically.

A. Equipment Arrangement

3.02 A 35BK teletypewriter is mounted in the lower part of the bay. Where two bays are supplied, the sets are connected and operate in series, if both sets are in service. Either set may be removed from service.

3.03 A 6D noise measuring panel may be installed, optionally, above the miscellaneous jack strip. A buzzer and teletypewriter transfer panel, night alarm, and service alarm circuits are located at the top of the bay.

B. Miscellaneous Jack and Key Circuits

3.04 One or two sets of alarm lamp and cutoff key circuits, as appropriate, are furnished for use with the buzzer and teletypewriter transfer circuits. The lamps are lighted by the ESS and are extinguished by operation of the cutoff keys. Buzzers, as well as external alarms, are associated with these circuits, if desired.

3.05 Either teletypewriter may be removed from service by operating the appropriate out-of-service key. An out-of-service lamp is lighted at each end of the circuit. Restoration of the out-of-service key to its normal position restores the set to service and extinguishes the out-of-service lamp.

3.06 A night alarm (NA) key permits an incoming signal to the bay to operate visual and audible alarms in the night alarm circuit.

3.07 A service alarm (SA) key permits a permanent signal alarm circuit and teletypewriter alarm circuits to be connected to the office alarm circuits.

3.08 Monitor and input jacks connected to the 3-type noise measuring set and 6-type impulse counter are provided in the miscellaneous jack strip. Plug size conversion (310 to 309) circuits are also provided.

4. AUXILIARY TESTING BAY

4.01 The auxiliary testing bay contains testing equipment that may be associated with circuits being tested manually from a testboard position.

A. Equipment Arrangement

4.02 A 25A voiceband gain and delay set and a 6D noise measuring panel, containing a 3-type noise measuring set and a 6-type impulse counter, are mounted in the upper part of the bay. Below these sets are a writing shelf and a ticket

box. A telephone relay unit is located at the top of the bay.

B. Miscellaneous Jack Circuits

4.03 Monitor (3B/6E MON) and input (3B/6E IN) jacks, which connect to the 3-type noise measuring set and the 6-type impulse counter, are provided in the miscellaneous jack strip. An input (25A IN) jack provides access to the gain and delay set. These jack circuits are extended to a testboard position. A busy lamp is provided for each jack circuit. This lamp indicates when a connection has been made to its associated input circuit.

4.04 Position extension jacks; branching circuit jacks; 2-wire trunk and order-wire circuits; and telephone circuits, similar to those in the testboard, are provided in the auxiliary testing bay.

4.05 A telephone circuit is provided at the auxiliary testing bay.

5. TRANSMISSION MEASURING CIRCUIT, SD-95900-01

5.01 Only the transmission measuring portion of the SD-95900-01 system is supplied for this application, since noise measurements are made using the 6D noise measuring panel. Pads, which are sometimes located in the measuring circuits of this system, are located in the access circuits and 101 test trunks in this application.

5.02 The MEAS jack provides access to the system for both sending and receiving operations. Separate SEND and RCV keys permit simultaneous sending and receiving on a 4-wire circuit. A 1-milliwatt, 1000-cycle test tone is transmitted when the SEND key is operated, unless an oscillator is connected to the VF IN jack.

5.03 A variable-frequency oscillator may be patched to the VF IN jack for transmission testing when making frequency response tests.

5.04 Measurements of levels below 0 dbm are made on the meter B scale, using the B sensitivity keys (B+10, B+20) as required to obtain an on-scale reading. Measurements of levels above 0 dbm are made on the meter A scale, with the A key operated.

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5.05 A filter is provided which may be inserted into the measuring circuit when making measurements on circuits connecting to open-wire lines. A lamp is used to indicate the presence of the filter in the measuring circuit.

6. REFERENCES

6.01 Detailed information on 21A testboard circuits can be found in the following circuit descriptions:

- CD-56497-01 Signaling Test Circuit
- CD-56543-01 Jack Circuits
- CD-56544-01 Position Circuit
- CD-56545-01 Access Circuits
- CD-56546-01 101 Trunk Circuit
- CD-56547-01 Cord Circuit
- CD-95900-01 Transmission Measuring Circuit
- CD-6G004-01 Permanent Signal Trunk

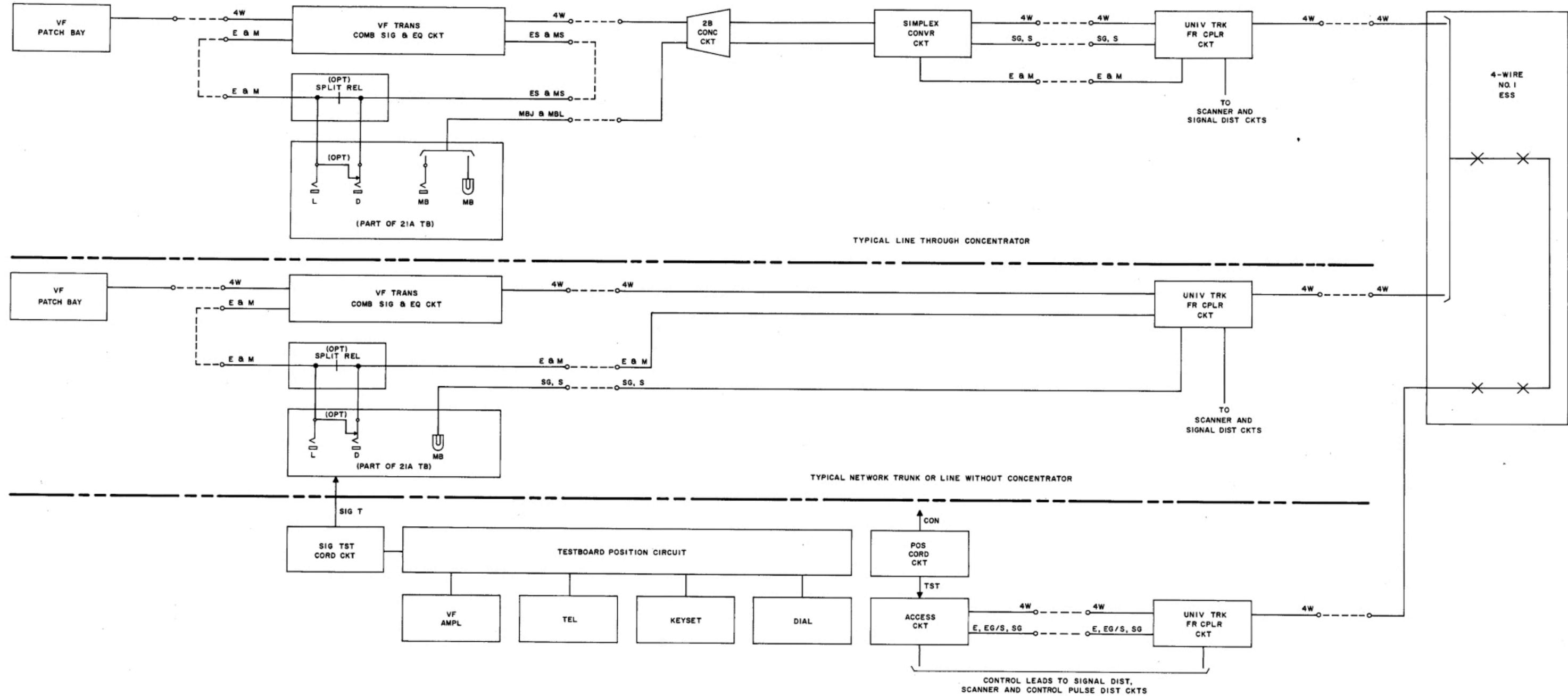


Fig. 3 — Typical Trunk and Line Circuits Connecting Through ESS to 21A Testboard

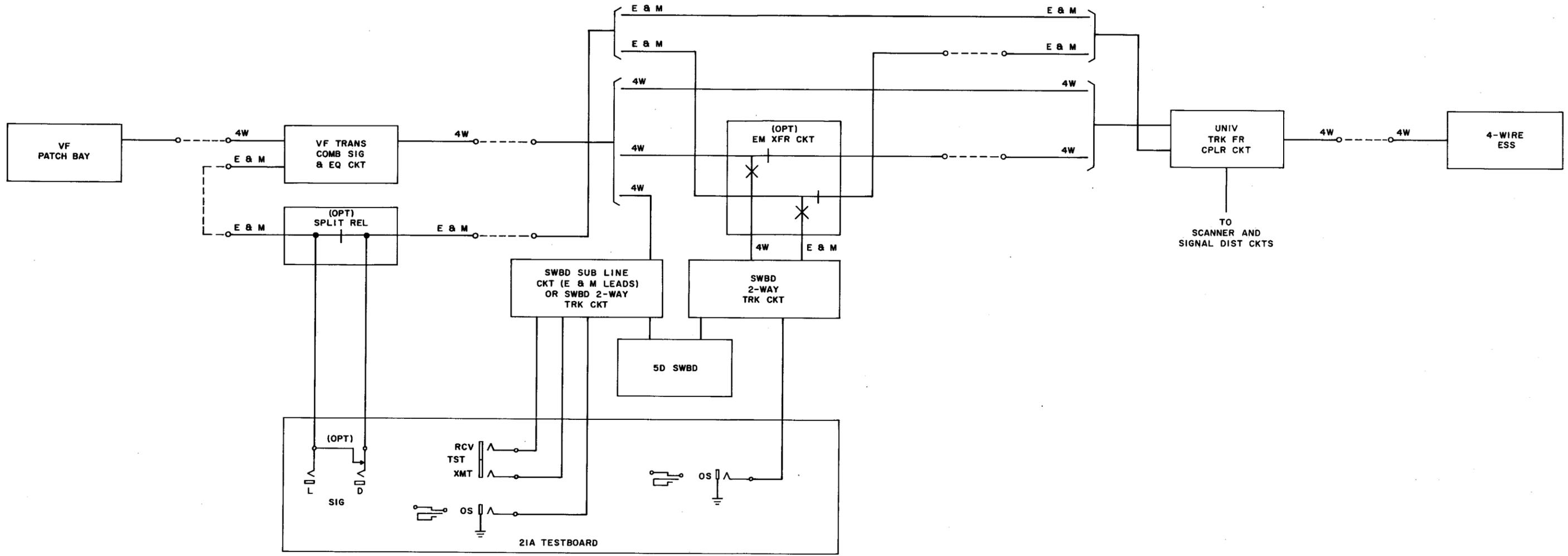


Fig. 4 — 21A Testboard Access to Switchboard Lines and Trunks