20A WADS TOLL TESTBOARD

CONTENTS

ILLUSTRATIONS

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1. GENERAL

1.01 This section describes the equipment, circuits, and operating principles for the 20A WADS toll testboard.

1.02 The 20A WADS toll testboard is an equipment arrangement designed to be used in WADS No. 5 crossbar (2-wire) offices for making over-all and sectionalizing tests of WADS intertoll trunks (voice-band and narrow-band) to facilitate the location of troubles and to expedite the restoration of WADS trunks to service following interruption.

1.03 The equipment and circuit sketches included in this section may or may not agree with a particular installation. If the exact wiring or equipment information for a particular installation is needed, reference should be made to the drawings for the installation involved.

2. EQUIPMENT ARRANGEMENT

A. General

2.01 The 20A WADS toll testboard equipment is mounted on standard 23-inch relay racks on frames 11-1/2 feet high and consists of units furnished in accordance with the requirements for the particular installation. Two face equipment bays are required for each testboard position. One of the bays (Fig. 1), in which the test position (lower unit) is mounted, is referred to as the "test bay;" the other bay of equipment (Fig. 2) is referred to as the "line test and patch bay."

2.02 The arrangement of the face equipment in each bay is flexible and depends upon the number of positions to be furnished and the type of trunks to be tested (narrow-band or a combination of voice-band and narrow-band). The test equipment may be placed in line with secondary or private line telephone testboards or with other testing equipment.

B. Floor Plan Arrangement

2.03 The test bay and line test and patch bay for each WADS toll test position will be placed in the same line-up, with growth being arranged from either left to right or right to left. The test bay and line test and patch bay for each position shall be placed adjacent to each other. The equipment arrangement for a 2-position 20A WADS toll testboard position arranged for left to right growth is shown in Fig. 3.

2.04 When three or more testboard positions are required for narrow- or combined voice- and narrow-band trunks, the associated line test and patch jacks for testboard positions two and three, four and five, etc, may be combined in one line test and patch bay on an optional basis. In this arrangement the line test and patch jacks associated with the test position to the left shall be located above the writing shelf; the line test and patch jacks associated with the test position to the right shall be located below the writing shelf.

C. Test Bay Arrangement

2.05 The test bay of a 20A WADS toll testboard position (Fig. 1) consists of a lower unit and a jack field framework arranged to mount two panels of jack and lamp mountings for 8-1/2 inch panels. The space above the jack field framework is used to mount associated test equipment, data test cord circuit components, and other miscellaneous items.

2.06 ***Lower Unit (Fig. 4):*** The lower unit framework consists essentially of the following items:

(a) Keyshelf, plugshelf, and cordshelf.

(b) Cord protection panel for protecting the wiring and relay equipment.

(c) Front panel for protecting relay equipment.

(d) Foot rail for use of attendant.

2.07 The keyshelf extends outward 18-1/2 inches from the face of the relay rack and is located 40 inches above the floor. The plugshelf is mounted on a 35-degree angle with respect to the plane of the keyshelf. A plan view of the keyshelf and plugshelf is shown in Fig. 5.

2.08 Mounted on the plugshelf are 15 test cords, a dial, and a dial-supervisory lamp. Associated keys and supervisory lamps are mounted on the keyshelf. Also mounted on the keyshelf are the multifrequency keyset keys and the channel select (CHAN SEL), distortion counter (DIST CTR), generator speed (GEN SPEED), and generator mode (GEN MODE) switches. The switches are used when performing distortion measuring tests of the WADS trunks.

2.09 The equipment installed in the space below the keyshelf in the lower unit is shown in Fig. 6.

2.10 ***Jack Field (Fig. 7 and 8):*** The jack field in the test bay is arranged on a 2-panel basis. The jack field includes the following equipment:

(a) Test trunk jacks (Fig. 8A, see 3.02).

(b) Intertoll trunk test, monitor, make busy, and signal jacks (Fig. 8B) for WADS narrow- or voice-band trunks. There is provision for a maximum of 200 WADS trunks per test position. The trunk assignments will be by central office from left to right and bottom to top in an alphabetical sequence, or as specified by the office. When the trunks can be reached from the 20A testboard directly over access test trunks, it is expected that the test jacks (shown in Fig. 8B) can be omitted.

(c) B1 data terminal supervisory lamp display (Fig. 8E) for monitoring the supervisory channels of the B1 data terminals.

(d) Line E and M keys, lamps, and jacks (Fig. 8F).

(e) Transmission measuring keys, lamps, and jacks (Fig. 8G).

(f) Miscellaneous jacks for the location of trunk and dial jacks and trunk answering lamps (Fig. 8C) on an "as required" basis.

(g) Miscellaneous jacks for the location of call-progress tone, ground-on-sleeve, trunk, and position extension jacks (Fig. 8D) on an "as required" basis.

(h) Miscellaneous, individually mounted jacks on an "as required" basis (Fig. 8H).

2.11 ***Test Equipment (Fig. 1):*** The following test equipment is mounted in the test bay above the jack field:

(a) KS-19247 electronic (frequency) counter provided on the basis of one per odd-numbered test position.

(b) 6D noise measuring panel or J79906AB data distortion display unit on the basis of one per two positions. When a testboard line-up includes two or more positions, the noise measuring panel and data distortion display unit are installed in adjacent test bays in order to be available to each position.

(c) Position control circuit switches provided on the basis of one set per position for out-dialing.

2.12 ***Miscellaneous Equipment:*** Miscellaneous equipment, as shown in Fig. 1, is mounted in the space above the test equipment. A meter, as shown, will be installed on the frame to the right of the jack field, except when a projection-type meter is provided. When a projection meter is provided, it will be installed so as to be visible to all testboard attendants.

D. Line Test and Patch Bay Arrangement (Fig. 2)

2.13 The line test and patch bay of the 20A WADS toll testboard consists primarily of a jack field mounted above a writing shelf. The space above the jack field is used to mount test equipment associated with the position and other miscellaneous circuit components.

2.14 ***Jack Field (Fig. 2 and 9):*** The following jacks may be located in the jack field of the line test and patch bay:

(a) Line test and patch jacks for voice-band trunks (Fig. 9A). These jacks are located electrically between the 4-wire terminating set and the 4-wire line facility.

(b) Line test and patch jacks for narrow-band trunks (Fig. 9B). These jacks are connected between the 4-wire side of the B1 data terminal and the 4-wire line facility. Included with the line test and patch jacks are individual trunk ALM lamps and ACO keys for use when an alarm condition exists on the associated narrow-band B1 terminal.

(c) The miscellaneous jack field (Fig. 9C) contains the night alarm and system release keys, telephone order wire jacks, and other miscellaneous telephone jacks. The remainder of the jacks are provided on an "as required" basis.

2.15 ***Test Equipment:*** The following test equipment is mounted in the line test and patch bay above the jack field:

(a) 6D noise measuring panel (Fig. 2), on the basis of one per two positions. When a test line-up includes two or more test positions, the noise measuring panel and data distortion display units are installed in adjacent test bays in order to be available to both positions.

(b) KS-19260, List 1 and 3, oscillator, provided on the basis of one per four positions.

(c) 906A data distortion measuring circuit, provided on the basis of one per every two positions.

(d) 909A oscillator, provided on the basis of one per four positions.

2.16 ***Miscellaneous Equipment:*** The battery supply unit (Fig. 2) is furnished whenever the testboard is equipped to test voice-band trunks. The night alarm and system alarm units are supplied on a one per line-up basis and should be installed in the first line test and patch bay of the position line-up.

E. Patching Cords and Plugs

2.17 Various types of patching cords and plugs are used with the 20A WADS toll testboard. The patching cords are used for making patches between the various circuits of the testboard. Plugs are supplied for making busy the circuits under test and for terminating 600-ohm circuits. The total number of each type of plug or patching cord, supplied for each installation is on an "as required" basis.

3. TESTING FACILITIES

3.01 The 20A WADS toll testboard is equipped with 15 cords (Fig. 5). These cords are located in the plugshelf of the test bay (Fig. 4) of each WADS toll testboard position and, in many respects, resemble those used at telephone switchboard positions. The test cords and their functions are as follows:

(a) ***1 through 4:*** These four cords (numbered 1 through 4), in association with a position and telephone circuit, are provided for monitoring, talking, and keypulsing on the intertoll trunk circuits. By operation of key TST, two of the four cords (cords 3 and 4) may be disconnected from the communication cord relay circuits and connected as terminal test cords for making transmission, noise, and data distortion tests on the WADS intertoll trunks.

(b) ***SIG TST:*** The SIG TEST (signaling test) cord has a double plug and is used for monitoring and testing on trunks equipped with E and M leads.

(c) ***HOLD:*** Two HOLD cords are provided at each WADS toll testboard position. These cords are used for holding connections forward on the WADS data trunks.

(d) ***DIAL:*** The DIAL cord is provided for dialing over trunks which might be located at WADS toll testboard positions where dial pulsing is required. In use the dial is associated with the SIG TST cord by operation of the DIAL key of that cord circuit.

(e) ***LD and MON (Line Test Cord):*** The LD (line-drop) and MON (monitor) cords are provided as part of the line test cord circuit at each testboard position and are used when making sectionalizing tests on the WADS intertoll trunk.

(f) ***SIG TST PATCH:*** Six SIG TST PATCH (signal test patching) cords are provided at each testboard position. These cords are associative with the line E and M circuit keys, lamps, and jacks (Fig. 8F) located in the test bay at each toll testboard position. They are used for testing supervisory signals on trunks associated with a B1 data terminal.

The test cords are associated with test keys and relay switching equipment which is used to connect the cords with the talking and testing facilities at the testboard position.

3.02 Access to the 2-wire side of WADS intertoll trunks for testing is obtained through the use of jacks (Fig. 8A) associated with an outgoing test trunk, two of which are provided per testboard position on a multiple basis. Incoming calls will appear at either an incoming line or an incoming trunk test jack, which will be located in the test bay jack field (Fig. 8C). Each incoming line jack will have an answering lamp associated with it. Each intertoll trunk having an appearance at a WADS toll testboard is equipped with a MON (monitoring), MB (make busy), TST (test), and SIG E and M (signaling E and M) jacks (Fig. 8B). The MON jack permits testboard busy monitoring on the associated WADS intertoll trunk without interrupting service. Provision of the TST jack is a temporary measure and this jack may be removed after the direct calling access feature has been introduced. The MB jack is used for making the trunk appear busy in order to take it out of service. The SIG E and M jacks are used for testing or monitoring on trunk E and M leads by means of the SIG TST cord. The TST jack provides access to the WADS intertoll trunk at the outgoing side on a "stop-gap" basis until the direct access feature is available. Testing may be performed at this jack, but when it is used for testing narrow-band trunks, the called station must be dialed up by the attendant at the master test frame. For voice-band trunks, keypulsing also is permitted at the TST jack.

3.03 Access to the 4-wire side of a voice-band intertoll trunk or a narrow-band B1 carrier data terminal is obtained through jacks located in the jack field of the line test and patch bay of each test board position (Fig. 2, 9A, and 9B). These jacks are used when performing sectionalizing tests upon the associated narrow- or voice-band WADS intertoll trunks.

3.04 A data test cord circuit consisting of two terminal test cord circuits, one line test cord circuit, one position control circuit, two hold cord circuits, and position and interlock circuits are provided at each WADS toll testboard position. These circuits consist primarily of relay and control equipment used for connecting the various test units associated with the 20A WADS toll testboard to the circuits under test. The connections are made by operation of keys located on the keyshelf of each testboard test bay (Fig. 5).

3.05 The keys and switches which control the seizure of the various items of equipment associated with the 20A WADS toll testboard are shown in Fig. 5. The position control circuit keys and switches are used to control the operation of the data distortion measuring equipment. The terminal test cord circuit keys are used to control operation of the testboard during performance of over-all tests of the WADS intertoll trunks. The communication cord circuit keys are used to control operation of the position and telephone circuit at the position. Line test cord circuit keys are used to control operation of the testboard during performance of sectionalizing tests on WADS trunks at the line test and patch bay. The signaling test cord circuit keys are used for controlling, testing, and monitoring on circuits including E and M leads. In addition these keys are used to control the dial pulsing function at the testboard. The position and telephone circuit keys are used to perform their designated functions in conjunction with the communication cord circuit. The multifrequency keyset keys are used for keypulsing over circuits connected to a communication cord. The meanings for the key, lamp, and switch designations located in the testboard keyshelf are given below.

Keys

DESIGNATION	MEANING
DATA	Data as Contrasted with Supervisory Signals
DATA READ	Read the Distortion of Data Signals

Keys

DESIGNATION	MEANING
DLY DIST +	Positive Delay Distortion
DLY DIST −	Negative Delay Distortion
DMO	Distortion Measurement Out
DMR	Read Distortion Measurement
DMS BIAS	Distortion Measuring Set Bias
DMS SUPV	Distortion Measuring Set Supervision
FREQ	Frequency Receive — Line Test Cord
FRR	Frequency Receive — Terminal Test Cord
FRS CHK	Frequency Send Check
LEV OUT HI	High Level Out
LEV OUT LO	Low Level Out
LEV OUT SUB AGC	Output Level Too Low to Be Recognized by the AGC
MK	Mark
NSE	Noise
READ	Read
SND	Send
SND LEV	Send Level
SND SUPV	Send Supervision
SP	Space
SUPV	Supervision
SUPV MON	Monitor Supervision
TMR	Transmission Measurement Read
TMS	Transmission Measurement Send
TST	Test
VBF1	Voice-Band — F1 Frequency

Switches

DESIGNATION	MEANING
CHAN SEL	Channel Selector
GEN MODE	Generator Mode
GEN SPEED	Generator Speed
DIST CTR	Distortion Counter

Lamps

CSB	Channel Selector Busy
DMB	Distortion Measurement Busy
FMB	Frequency Measurement Busy
GB	Data Signal Generator Busy
MB	Meter Busy
NSB	Noise Set Busy
TMB	Transmission Measurement Busy

3.06 Data distortion tests of the intertoll trunks are made using the 906A data distortion test equipment.

3.07 Transmission level measurements are made with the J94005 common systems transmission and noise measuring equipment, using either the 909A or KS-19260 oscillator or the data signal generator in the 906A data distortion test equipment as a source of test power. Jacks, keys, and lamps associated with the J94005 equipment are included in the jack field of the WADS toll testboard test bay.

3.08 Noise measurements are made using the 3B noise measuring set and the 6E impulse counter which are part of the 6D noise measuring panel. Keys, lamps, and jacks for the 6E impulse counter are located in the miscellaneous jack field in the toll testboard.

3.09 Frequency measurements are made using the KS-19247 electronic counter.

3.10 Four communication cord circuits, a position and telephone circuit, and a multifrequency keyset are provided at each testboard

position for performing talking, monitoring, and keypulsing functions at the testboard.

3.11 A signaling test circuit is provided at each testboard position for monitoring and testing trunks equipped with E and M leads. In addition a dial is provided which is associated with the signaling test circuit for dialing on those circuits at a testboard on which dial pulsing is required. The dial and an associated dial supervisory lamp are located on the keyshelf (Fig. 5) of each testboard position.

3.12 An assembly of sixteen position connector circuit switches is provided in each test bay for setting up WADS trunk test calls (Fig. 1).

4. DESCRIPTION OF CIRCUITS

A. Communication Cord Circuit (SD-64613-01)

4.01 This cord circuit performs the following operating functions in the 20A WADS toll testboard:

- Patching
- Talking
- Monitoring
- Talking on Two Cords
- Holding
- Supervision.

4.02 ***Patching:*** With all the keys of the cord circuit in the normal (center) position, the tips and rings of the front and rear cords are connected together. With this arrangement, it is possible to interconnect two jack-ended circuits, such as ringdown intertoll trunks, etc. In this condition, the supervisory lamps are arranged to receive nonlocked-in signals from either connection.

4.03 ***Talking:*** Operation of the TALK-MON key to the TALK position causes the cord circuit to be connected to the position and telephone circuit. While the TALK-MON key is operated to the TALK position, the positional keys for ringing, dialing, keypulsing, or splitting are effective on the cord. Should the TALK-MON key be restored to normal before the completion of dialing or keypulsing, the circuit will be held locked up until the completion of dialing or keypulsing. The circuit is so arranged that if two TALK-MON keys are operated to the TALK position simultaneously, only the first operated key is effective. While the TALK-MON key is in the TALK position, the holding feature of the cord circuit is made ineffective.

4.04 ***Monitoring:*** Operation of the TALK-MON key of the cord circuit to the MON position connects the tip and ring leads of the cords to the telephone set jacks of the position and telephone circuit, through the monitoring amplifier, and opens the sleeve leads of the cords, thereby permitting monitoring on the circuit without making it appear busy. The monitored circuit can be made busy while monitoring by operation of the associated HOLD-CLOSE 3RD key to the CLOSE 3RD position, thereby closing the sleeve leads of the cords which were opened by operation of the TALK-MON key to the MON position.

4.05 ***Talking on Two Cords:*** It is possible to talk on two of the cord circuits at the same time by operating the TALK-MON key of the lower-numbered cord to the TALK position and the TALK-MON and HOLD-CLOSE 3RD keys of the second cord to the MON and CLOSE 3RD positions, respectively. Ringing, dialing, keypulsing, and splitting can be performed only on the cord circuit with the TALK-MON key in the TALK position.

4.06 ***Holding:*** When the HOLD-CLOSE 3RD key is operated to the HOLD position, the tip and ring of the front and rear cords of the cord circuit are split and a resistor-capacitor termination is placed across the tip and ring leads of each cord. Ground is connected also to the night alarm relay to operate the night alarm circuit in case of recall. Battery is connected to the sleeves of both cords to apply a busy condition to any circuit to which it is patched. Thus, with the HOLD-CLOSE 3RD key in the HOLD position, any circuit to which the cords are connected is held busy and nonlocked-in incoming signals are received on the supervisory lamps. The circuit being held may be talked over while being held by operating the TALK-MON key to the TALK position.

4.07 ***Supervision:*** With cord circuit keys in the normal (center) position, the sleeves of the cords are connected to battery through a

night alarm relay and the two associated supervisory lamps. When a low-sleeve (ground-on-sleeve) condition exists on the sleeve of a jack to which one of the cords is connected, the night alarm relay operates and the associated supervisory lamp lights. If the HOLD-CLOSE 3RD key is in the HOLD position, the night alarm circuit will be activated. The sleeves of the cords are also connected as described, with either the TALK-MON and HOLD-CLOSE 3RD key operated to the MON and CLOSE 3RD positions, respectively, or the HOLD-CLOSE 3RD key in the hold position. When the TALK-MON key is in the TALK position, the sleeves of the cords and the lamp leads are carried into the position and telephone circuit where, when a low-sleeve condition exists on the jack circuit to which a cord is connected, relays are caused to operate, thereby lighting the associated supervisory lamp.

4.08 ***WADS Terminal Test Cords:*** In the 20A WADS toll testboard, two of the communication cord circuits (cords 3 and 4) are arranged so that by operating key TST of the data test cord circuit the cords are disconnected from the cord circuit equipment and connected to the terminal test cord equipment of the data test cord circuit. Until key TST that associates the cord with the terminal test cord equipment is operated, all the normal functions of the cord circuit can be performed. After the key is operated, supervision can still be received on the front cord.

B. Position and Telephone Circuit (SD-64616-01)

4.09 The position and telephone circuit provides the following operating functions in the 20A WADS toll testboard.

- Connection to Cord Circuit
- Connection to Telephone Set
- Ringing
- Busy Test
- Splitting
- Supervision
- Monitoring
- Talking over Two Cords
- Dialing or Keypulsing

4.10 ***Connection to Cord Circuit:*** When the TALK-MON key of a cord circuit is operated to the TALK position, relays within the cord circuit connect tip, ring, sleeve, and lamp leads to the position and telephone circuit and initiate a relay sequence within the position and telephone circuit which connects battery to the plug seating simplex and makes the MON and TALK operations of other cords in the test position ineffective.

4.11 ***Connection to Telephone Set:*** When a cord (front or rear) of a cord circuit is connected to a jack-ended circuit, tip and ring of the plugged-up cord circuit is connected to the telephone in the position and the position circuit is conditioned to permit dialing and ringing over the plugged-up cord.

4.12 ***Ringing:*** When the RING key of the position and telephone circuit is operated to the front RING position, 48-volt battery power is connected to the tip of a front plugged-up cord of an associated cord circuit. When the RING key is operated to the rear RING position, the 48-volt battery power will be applied to the tip of the rear cord.

4.13 ***Busy Test:*** When the TALK-MON key of an associated cord circuit is operated to the TALK position, if the tip of the cord plug is touched to the sleeve of a busy trunk, a busy signaling circuit in the position and telephone circuit will be activated and a clicking sound will be heard in the headset of the telephone circuit. Also heard in the headset will be a tone on the trunk sleeve, if present.

4.14 ***Splitting:*** When the SPLIT key of the position and telephone circuit is operated to the front SPLIT position, the tip and ring leads of an associated rear cord will be split off from the position and telephone circuit; a capacitor-resistor termination is placed across the tip and ring leads of the rear cord; the front cord remains connected to the telephone set; and ringing may be performed on the front cord. The operation of the SPLIT key to the rear SPLIT position terminates the front cord while leaving the rear cord connected to the telephone set and ringing key.

4.15 ***Supervision:*** When a trunk on which a call is received is answered or made busy (ground on sleeve of trunk circuit), the supervisory lamp for the plugged-in cord in the associated cord circuit will be lighted by a signal from the position and telephone circuit.

4.16 ***Monitoring:*** When the TALK-MON key of a cord circuit associated with the telephone circuit is operated to the MON position, a relay in the position and telephone circuit causes the plugged-up trunk circuit to be connected to the telephone set through the monitoring amplifier. Should the TALK-MON key of another cord circuit be operated to TALK while monitoring, the telephone set will be disconnected from the monitored circuit and connected to the circuit which is connected for talking. Monitoring on a trunk may be accomplished with the TALK-MON key and HOLD-CLOSE 3RD keys of a cord circuit set to MON and CLOSE 3RD, respectively. The monitoring function will exist the same as if the TALK-MON key only, is operated, with the exception that the operation of the TALK-MON key of another cord circuit to MON will not disable the cord circuit being monitored (see 4.17).

4.17 ***Talking over Two Cords:*** When the TALK-MON key of one cord circuit associated with the position and telephone circuit is operated to TALK, after the TALK-MON and HOLD-CLOSE 3RD keys of another cord circuit have been operated to MON and CLOSE 3RD, respectively, relays within the position and telephone circuit connect the two cord circuits in such a way that both cord circuits can be talked over at the same time.

4.18 ***Dialing or Keypulsing:*** With a cord (front or rear) of a cord circuit plugged-up and the TALK-MON key of the cord circuit operated to the TALK position, operation of the KP key (front KP key when front cord is plugged-up and rear KP key when rear cord is plugged-up) will connect the key set to the position and telephone circuit. If the associated KP lamp (green) is lighted, the keyset has been connected to the line. Pulsing should not be started until lamp S (amber) is lighted. The keypulsing circuits in the position and telephone circuit will be held up by a signal from the key set circuit until keypulsing or dialing is completed, even though the TALK-MON key is returned to normal position prior to completion of the keypulsing. If the cord is taken down while keypulsing or dialing, the dial circuit or keyset circuit will be released.

C. Dial Cord Circuit (SD-64761-01)

4.19 ***Dialing with a Dial Cord:*** To dial on a trunk, a communication cord is connected to a telephone line jack and the dialing cord is plugged into the associated dialing jack. The TALK-MON key of the communication cord circuit is operated to TALK. If the trunk is in a dialing condition, the start-dialing lamp will light as a start-dialing signal. When the dial is moved off-normal, the trunk is conditioned to receive the dial pulses.

D. MF Keyset Circuit (SD-55925-01)

4.20 The MF keyset circuit is used to establish test connections over outgoing MF keypulsing trunk circuits or outgoing test trunks. The sequence of operations when keypulsing into a trunk is given below.

(1) A communication cord is connected to the trunk circuit over which keypulsing is desired and the TALK-MON key of the talking-cord circuit is operated to the TALK position.

(2) The KP key is operated (front KP key used with front talking cord and rear KP key used with rear talking cord) to associate the keyset with the line.

(3) An outgoing sender will be selected by the central office equipment in which the call is originated. When a sender has been assigned, the sender (S) lamp will light.

(4) The testboard attendant keypulses the required digits, which will be registered in the sender.

(5) After the last digit is pulsed, the ST key is operated, releasing the MF keyset.

(6) If while keypulsing trouble occurs, or an error is made, the keyset circuit can be returned to normal by pulling down the cord associated with the keyset.

E. Signaling Test Circuit (SD-56497-01)

4.21 ***General:*** The signaling test circuit provides the means for monitoring and testing signaling circuits having sending M leads and

receiving E leads. For this purpose the cord is patched to the supervisory line and drop jacks of the trunk under test. In the 20A WADS toll testboard, this circuit is used to test an individual trunk. Testing is performed by making the trunk appear busy at both ends (Fig. 10), and by sending on-hook and off-hook signals back and forth between the testboards. The test results are indicated by lighted or unlighted supervisory lamps, which are part of the circuit. The following operating functions are provided with this circuit:

- Monitoring
- Testing.

4.22 ***Monitoring:*** The signaling test circuit may be used to monitor on the signaling leads of a WADS intertoll trunk without taking the trunk out of service. To monitor on the trunk, the SIG TST cord, knurled end up, is plugged into the SIG L and D jacks of the trunk; the TEST-MON key associated with the signaling test circuit is operated to MON. An on-hook or off-hook condition on either the E or M lead of the trunk is indicated by lighted or unlighted associated line (front) or drop (rear) supervisory lamps at the testboard. During an idle condition on the trunk (on-hook signals being received on both the E and M leads of the trunk), the line and drop supervisory lamps at the testboard will be illuminated. If an off-hook signal is present on the E lead, the line lamp will be extinguished. If an off-hook signal is present on the M lead, the drop lamp will be extinguished. Dial pulses also can be observed on the line and drop lamps.

4.23 ***Testing:*** The trunk is first made busy at both ends. To make tests on the trunk, the TEST-MON key of the circuit is operated to TEST. Operation of the key to TEST causes the E and M leads between the line and drop circuits to be split. Testing is accomplished by operating TWDL and TWDD keys to the on-hook and off-hook positions and observing the supervisory lamps. An on-hook condition will be indicated by a lighted supervisory lamp in the direction selected. An off-hook condition will be indicated by an extinguished lamp.

F. System Failure Alarm Circuit (SD-56527-01)

4.24 ***General:*** A system failure alarm is derived from the supervisory channel of each B1 data terminal. The system failure alarm circuit provides for indicating at a 20A WADS toll testboard when a major alarm condition exists on any associated B1 data terminal. A means is also provided for transferring the alarm condition to an office audible and visual alarm system when the testboard is unattended. The following operating functions are provided with this circuit:

- Alarm condition
- Silencing of the alarm
- Alarm transfer.

4.25 ***Alarm Condition:*** When an alarm condition exists in the supervisory channel of any B1 data terminal associated with a 20A WADS toll testboard, an associated alarm (ALM) lamp at the testboard is caused to flash and an audible SERV alarm will sound.

4.26 ***Silencing of the Alarm:*** When a system alarm is received at the testboard, the attendant depresses an associated alarm cutoff (ACO) key, which causes the ALM lamp to change from a flashing to a steadily lit condition and cuts off the audible alarm. When the malfunction in the B1 data terminal is corrected, the ALM lamp will be extinguished.

4.27 ***Alarm Transfer:*** When the testboard is to be unattended, an alarm transfer (ALM TRFR) key at the testboard is operated, thereby transferring the alarm signal to the office central alarm.

G. Night and Supervisory Alarm Circuit (SD-55039-01)

4.28 This circuit provides means for transferring an incoming call signal on a testboard telephone circuit to visual and audible night or supervisory alarm circuits when the testboard is unattended. To transfer the incoming call to the alarm devices, the NA or SA key located in the miscellaneous jack field of the line test and patch bay of the 20A WADS toll testboard is used. To transfer the incoming call to the alarm devices, the appropriate key is operated to the "on" position.

H. Telephone Circuit (SD-68330-01)

4.29 This circuit provides, at the line test and patch bay of the 20A WADS toll testboard, means for communicating on intertoll, auxiliary line, 2-wire communication, and telephone order-wire circuits. The telephone circuit connecting jacks are mounted in the miscellaneous jack field (Fig. 9C) in the line test and patch bay. The telephone set relay equipment is also installed in the line test and patch bay (Fig. 2). The following circuit functions are provided with the auxiliary telephone set and its associated jack circuit.

(a) ***Talking on TEL 2W Jacks:*** To establish a connection for talking on communication circuits, the communication circuit jack is patched to the TEL 2W jack and an operator telephone set is connected to the TEL SET jacks.

(b) ***Talking on TEL 4W Jack:*** To establish a connection on either WADS voice- or narrow-band 4-wire circuits, a patch is made between the TEL 4W jack and the LXMT and LRCV jacks of the trunk in the line test and patch bay for communicating toward the line. For communication toward the drop the TEL 4W jack is patched to the DRCV and DXMT jacks. A telephone set is patched to the 4-wire TEL jacks. When talking on the 4-wire side of WADS narrow-band trunks through the TEL 4W jacks, transmission pads are switched into the talking path to maintain the proper transmission levels.

(c) ***DC Signaling on Order-Wire Circuits:*** To signal on dc selective telephone order-wire circuits, the TEL 2W jack must be patched to the jack of the order-wire circuit. The O-W key is used for pulsing.

I. Jack, Lamp, and Key Circuits (Fig. 8A, 11, and 12)

4.30 ***Test Trunk Jacks:*** These jacks provide access to the WADS intertoll trunks for making over-all tests on the trunks. Access to the intertoll trunk is through a test trunk circuit (SD-27648-01) which normally terminates in the testboard in a test trunk jack. When the sleeve resistance between the test trunk jack and its test trunk circuit exceeds 10 ohms, access to this test trunk is through a sleeve repeater circuit (SD-56536-01).

4.31 ***WADS Voice-Band Test and Patch Jacks (Fig. 11):*** These jacks provide means for testing the WADS voice-band trunks from both the 2-wire and 4-wire sides of the trunk circuit. The operating functions of the jacks are described below.

(a) Jack TST provides access to the 2-wire side of the WADS trunk circuit.

(b) Jack MON provides access to the WADS intertoll trunk for monitoring purposes.

(c) Jack MB permits the trunk to be made busy from the outgoing side by insertion of a make-busy plug in the jack. With a make-busy plug in the MB jack and a HOLD cord of the data test circuit plugged in the trunk SIG L test jack (Fig. 10) the trunk may be made busy in both directions from one test board.

(d) SIG test jacks permit access to the trunk E and M leads for making signaling tests. These tests are made using the signaling test circuit, with the signaling test cord plugged in both the SIG L and SIG D jacks.

(e) DXMT, DRCV, LXMT, and LRCV jacks are used for performing sectionalizing tests on the WADS intertoll trunk circuit. Access is provided toward the carrier facility (line side) and toward the trunk side (drop side) of the 4-wire transmission leads of the trunk.

(f) SIG patch jacks provide a patching connection to the E and M leads of the trunk in the line test and patch bay of the test position.

4.32 ***WADS Narrow-Band Trunk Test and Patch Jacks (Fig. 12):*** These jacks provide means for testing the WADS narrow-band trunk from both the 2-wire office side and the 4-wire side of the B1 data terminal. The operating functions of the jacks are described below.

(a) Jack TST provides access to the 2-wire side for over-all testing of the WADS narrow-band trunk.

(b) Jack MON provides access to the WADS intertoll trunk for monitoring purposes.

(c) Jack MB permits the trunk to be made busy from the outgoing side by insertion of a make-busy plug in the jack. The SIG test jacks permit access to the trunk E and M

leads for making signaling tests. These tests are made using the signaling test circuit, with the SIG TST cord plugged in both the SIG L and SIG D jacks.

(d) DXMT, LXMT, DRCV, and LRCV jacks are used for performing sectionalizing tests on the WADS intertoll trunk.

(e) DRCV-MON and LXMT-MON jacks provide bridge access to the transmit and receive side, respectively, of the B1 data terminal.

4.33 The ALM light provides an alarm indication when a fault exists in the supervisory channel of the B1 data terminal. The ACO key is used to cut off an associated audible alarm signal, and at the same time, to cause the ALM lamp to go from a flashing condition to a steadily lit condition. The ALM TRANS key is used to transfer the alarm signal to a central alarm system when the 20A toll testboard is unattended. One ALM lamp and one ACO key is furnished per B1 terminal. One ALM TRFR relay is furnished per testboard.

4.34 ***Line E and M Key, Lamp, and Jack Circuit (Fig. 13):*** The line E and M key, lamp, and jack circuit is used to test the E and M leads of a WADS narrow-band trunk toward the line side of the trunk. To perform the test, a patch is made from the SIG L jack of this circuit to the SIG L test jack of the trunk to be tested. Ground on the sleeve of the SIG L jack of the trunk circuit will operate the splitting relay of the trunk. The E lamp will be extinguished if an off-hook condition exists on the trunk and will be illuminated if an on-hook condition exists. With the OFF-HK key in its normal position, ground is placed on the M lead (line side of the trunk circuit), simulating an on-hook condition. With the OFF-HK key operated, battery is placed on the M lead simulating an off-hook condition. In this way the E and M leads of the B1 data terminal may be tested individually toward the line.

4.35 ***Call Progress Tone Jacks (Fig. 14):*** The call progress tone jacks permit access to the call progress tones supplied by the central office call-progress-tone generator for test purposes. When supplied, these jacks will be located in the miscellaneous strip jack field of the test bay of the 20A WADS toll testboard position. Jack F2M provides access to the F2 mark frequency tones; jack F2S provides access to the F2 space tones; and jack F2MS provides access to mark and space tones modulated at 20 cps.

4.36 ***Ground on Sleeve Jack (Fig. 15):*** The ground on sleeve (GS) jack provides means for putting the data test cord circuit in the answering mode for measuring the peak distortion and bias of F1 signals and for sending F2 signals from the signal generator [see 4.56(b)]. This is accomplished by connecting a rear terminal test cord to the GS jack. This jack also may be used when a sleeve ground is required for other miscellaneous purposes. This jack is installed in the miscellaneous jack field of the test bay.

4.37 ***6E Impulse Counter Jack, Key, and Lamp Circuit (Fig. 16):*** The 6E IMP CTR key, lamp, and jack circuit is used when counting noise pulses on WADS intertoll trunks with the 6E impulse counter. The 6E impulse counter is normally connected to the 6E IMP CTR-4W and TST jacks. The 3B noise measuring set is normally connected to the data test cord circuit. When no cords are connected to either the 4W or TST jack, operation of the TTC-LTC key causes the NMT relay to operate. Operation of the NMT relay lights the TTC-LTC lamp and transfers the noise measuring leads of the data cord from the 3B noise measuring set to the 6E impulse counter, opening the normal connection to the TST and 4W jacks. With the NMT relay normal, the TST jack may be used to make a noise impulse count, with all the testboard keys normal, by connecting one cord of cord 1, 2, 3, or 4 to the 6E IMP CTR-TST jack and by connecting the other cord of the pair to the test trunk jack. A sectionalizing noise test from the 4-wire side of the trunk may be made by connecting a patch cord equipped with two 310-type plugs between the 6E IMP CTR-4W jack and one of the trunk 4-wire test jacks in the line test and patch bay with the TTC-LTC key unoperated. The 3B and 6E MON jacks provide external access to the inputs of the 3B noise measuring set and the 6E impulse counter for monitoring or other purposes as desired.

4.38 ***Extension Jacks (Fig. 17):*** Extension test jacks and patch jacks are provided for extending circuits between nonadjacent test positions of the 20A WADS toll testboard. To permit extension of the trunk 2-wire test jack

to a nonadjacent test bay, extension jacks may be provided in the test bay of the testboard. To permit extension of the 4-wire test and patch jacks to nonadjacent line test and patch bays, extension patch jacks may be provided in the miscellaneous jack fields of the line test and patch bay of the testboard. These extension jacks also may be used for extending a 3-wire jack circuit, as required, by utilizing the sleeve lead.

4.39 ***Trunk Jack and Answering Lamp (Fig. 18):*** The trunk jack, in conjunction with a terminal test cord, is used for answering an incoming test call at the 20A WADS toll testboard. When a call is received, the associated answering lamp will be illuminated. The call is answered by connecting a rear terminal test cord to the jack and by operating the associated TALK key, which will extinguish the answering lamp. If the incoming call is over a voice-band trunk, the attendant may communicate with the distant end over the connected cord. On narrowband trunks, a separate communication channel must be established. To make a test, the TST-DMO key at the testboard is operated to TST. The trunk jack circuit also can be used for establishing connections to central offices over local order wire trunks and various incoming and outgoing trunks. The answering lamp may or may not be used. The jacks and lamps are installed in a miscellaneous jack field in the position test bay (Fig. 7).

4.40 ***Dial Jack (Fig. 19):*** A dial jack is supplied when communication circuits requiring dial pulsing are included at the testboard position. To dial, a communication cord is connected to the TRK jack (4.39) and the test position DIAL cord is connected to the dial jack. The dial jack is installed in a miscellaneous jack field in the test bay of the testboard.

4.41 ***Profile Plug Conversion Jacks (Fig. 20):*** Most of the jacks in the line test and patch bay of the 20A WADS toll testboard are 238 (large) type jacks, while those in the test bay are 92 or 246 (small) type jacks. The profile plug conversion jacks are provided to permit interconnection between patch cords equipped with 310 (large) plugs and those equipped with 309 (small) plugs.

4.42 ***Communication Trunk Jack and Lamp Circuit (Fig. 21):*** The communication trunk jack and lamp circuit is provided for terminating incoming or 2-way talking trunks which may appear in the line test and patch bay. In use, the TK jack is connected to the TEL-2W jacks in the line test and patch bay via a patch cord. The L lamp provides supervision from the distant end.

4.43 ***Single Frequency Signal Test Jacks and Battery Supply Resistance Lamp Circuit (Fig. 22):*** The SF TST-LINE and DROP jacks provide a means for maintaining an off-hook condition toward the line on voice-band WADS trunks during functional or transmission tests. This is accomplished by patching from the SF TST LINE and DROP jacks to the voice-band SIG L and SIG D jacks in the line test and patch bay of the position, thereby placing ground on the E lead of the circuit toward the drop or trunk. By this means, connection continuity of the M lead is maintained throughout the transmission test, thus preventing loss of test connections or transmission of pulse-disconnect signals toward the receiving end (read end) during variable frequency tests on single-frequency signaling systems.

4.44 The SF TST-LOS jack provides a means of disabling the signaling equipment when a transmission test is being made on the line and it is not desired to hold the switches on the drop side of the signaling unit. This is accomplished by patching between the SF TST-LOS jack and the SIG D jack of the voice-band WADS test jack in the line test and patch bay. This places a resistance battery on the M lead toward the line or equipment, thereby removing the signaling tone, and opens the E lead toward the trunk to prevent seizure of switching equipment by line signals during a transmission test. These jacks are located in the miscellaneous jack field in the line test and patch bay of the WADS toll testboard.

4.45 ***2B Signaling Test Set Battery Jack and Battery Supply Filter (Fig. 23):*** This circuit provides the means by which the office −48 and +130 volt signaling batteries may be supplied to the 2B signaling test set through two cords which are part of the test set. Ground is supplied from the tip and ring and −48 volt battery from the sleeve of the A jack. The +130

volt battery is supplied over the tip and −48 volts over the sleeve of the B jack. These jacks are required at those test positions equipped to test WADS voice-band trunks only and are mounted in the miscellaneous field of the line test and patch bay.

4.46 ***B1 Data Terminal Supervisory Lamp Display (Fig. 24 and 8E):*** These lamps are provided for use when performing supervisory tests on the B1 data terminal and are used in conjunction with the data test cord circuit and the 906A data distortion measuring equipment.

4.47 ***Transmission Measuring Jacks, Keys, and Lamps (Fig. 8G):*** These jacks provide the jack facilities for making transmission and noise measuring tests in the 20A WADS toll testboard. The variable frequency (VF IN) jack provides the means for connecting the KS-19260 variable frequency oscillator into the transmission measuring equipment. Operation of the CAL key enables the calibration circuits for checking the sending power of the variable frequency oscillator and the data signal generator. The 1000-0-600 and 1000-0-900 jacks provide access to the measuring equipment milliwatt reference generator output at the indicated 600 and 900 output impedances. The B+10 and B+20 keys are used to change the scale of the transmission measuring equipment so that the associated meter indication is either the B meter scale reading plus 10 or the B meter scale reading plus 20. Operation of the GND key places a center tap ground on the termination of the meter. With this key operated, any change in the meter reading indicates an unbalance to ground in the circuit under test. When the A key is operated, the meter indication is read on the A scale of the associated meter.

4.48 ***Impedance Matching Jacks and Pad Circuit (Fig. 25):*** The TP900 and TP600 jacks and the 4-db pad and transformer circuit (Fig. 25) provide means for matching the 900-ohm terminal test cord circuits to the 600-ohm test trunk jack. These jacks appear in a miscellaneous jack field in the test bay of each 20A WADS toll testboard position.

4.49 ***906A Demodulator-In Jacks (Fig. 26):*** These jacks permit access to the input of the demodulator of the 906A data distortion measuring equipment for maintenance purposes. Connection to the 906 DEMOD-IN-TST jack permits access to the input to the demodulator while disconnecting the normal input from the demodulator. Connection to the 906 DEMOD-IN-MEAS jack provides access to the input transmission path to the demodulator while disconnecting the input from the demodulator. This permits the circuit feeding the demodulator to be observed.

J. Position Connector Circuit (SD-56538-01) (Fig. 1, 11, and 12)

4.50 The position connector circuit consists of 16 rotary switches and associated relay circuits which are used for setting up a test call between an originating 20A WADS toll testboard and a terminating testboard. The WADS intertoll trunk location, routing, and test call termination data are preset into the switches before a patch is made to the test trunk jack. The settings of the switches are transmitted on a dc basis to an MF test register (SD-27643-01).

K. Test Trunk Circuit (SD-27648-01) (Fig. 12)

4.51 The test trunk circuit provides a test connection between the 20A WADS toll testboard and the WADS intertoll trunks. It is terminated in a test trunk jack in the testboard test bay (Fig. 8A). The test trunk circuit has an impedance of 900 ohms as seen from the testboard. This is accomplished by equipping the test trunk with a switchable impedance transformation transformer and pad. The transformer and pad circuit is inserted in the test trunk when the test call simulates a call originating from a distant WADS office via an incoming trunk; it is omitted when the outgoing test call simulates a call originated by a local subscriber. A similar pad is omitted from the outgoing WADS intertoll trunk circuit in the first instance and included in the trunk circuit in the latter instance. The pad and transformer arrangement is determined by the information set into the position connector circuit keys when setting up the test call. Each test trunk circuit has multiple jack appearances at the testboard to permit its seizure from any testboard position and is equipped with a sleeve-busy indication.

L. Sleeve Repeater Circuit (SD-56536-01)

4.52 This circuit provides an intermediate connection between the 20A WADS testboard and the test trunk circuit (SD-27648-01) when it

is necessary to extend the range of the test trunk circuit beyond its nominal 10-ohm sleeve limit.

M. Incoming Test Line Circuit (SD-56530-01) (Fig. 12)

4.53 The incoming test line circuit is provided at the 20A WADS toll testboard to permit simulating a WADS call which would normally terminate in a subscriber line in the office served by the testboard. The circuit has a terminating impedance of 900 ohms and will have a multiple jack appearance at each testboard in order that incoming calls may be answered at each testboard test position. Each jack appearance of a test line circuit will be associated with an answering lamp. The circuit also will have a connection to the auxiliary signaling circuit to provide an alarm at the testboard when a call is received when the board is unattended.

N. Incoming Test Trunk Circuit (SD-25850-01) (Fig. 12)

4.54 The incoming test trunk circuit is provided at the 20A WADS toll testboard to permit simulating a through connection between an incoming WADS trunk and an outgoing trunk. The test trunk circuit will have an impedance of 900 ohms as seen from the testboard and 600 ohms as seen from the trunk link frame. This is accomplished by inserting a 600- to 900-ohm impedance transformation pad and transformer between the trunk link frame appearance of the incoming trunk and the test appearance at the testboard. The circuit will be terminated in multiple jack appearances at each testboard position to permit answering from any position. An answering lamp will be associated with each jack appearance. The trunk circuit also will have a connection to the auxiliary signaling circuit to provide an audible alarm when a call is received at an unattended testboard.

O. Data Test Cord Circuit (SD-56528-01)

4.55 ***General:*** The data test cord circuit provides the facilities for making over-all and sectionalizing tests on both voice-band and narrow-band WADS intertoll trunks when they are associated with the 20A WADS toll testboard. The circuits which make up the data test cord circuit are described below.

4.56 ***Terminal Test Cord Circuit:*** Two terminal test cord circuits are provided at each testboard position. The terminal test cord circuit consists of keys and relay control equipment which is provided primarily for performing over-all tests of the WADS intertoll trunks. The terminal test cord circuits are associated with cords 3 and 4 (Fig. 5) in the test bay plug shelf by operation of the TST-DMO key to the TST position. Outgoing tests are originated over the front terminal test cord with the cord connected to a jack appearance of a test trunk circuit (Fig. 8A). Incoming calls on either an incoming line circuit or an incoming trunk circuit are answered by connecting the rear cord to the line or trunk incoming test jack, located in the miscellaneous jack field in the test bay (Fig. 8C). The functions of the keys and lamps associated with the terminal cord circuits are given below.

(a) ***TMR-SND LEV key:*** In the TMR position, this key conditions the transmission measuring equipment to receive with a 900-ohm termination. In the SND LEV position, this key conditions the transmission measuring equipment for measuring the sending level of either the 909A oscillator or the data signal generator in the 906A data distortion measuring equipment.

(b) ***TST-DMO key:*** In the TST position, this key causes the front and rear cords of the cord circuit in use to be split off from their associated relay equipment and to be connected to the terminal test cord circuit. The data signal modulator in the data distortion test equipment and the 909A data distortion oscillator is conditioned to send F2 frequency on the rear terminal test cord. In the DMO position, this key conditions the data distortion measuring equipment to test the local data signal generator, provided the data signal generator and distortion measuring circuit are idle. With no terminal test cord up, the data signal generator and the distortion measuring circuit will be conditioned to operate in the F1 mode. To condition the data signal generator and distortion measuring circuit for operation in the F2 mode, the rear cord must be connected to a ground-on-sleeve (GS) jack (see 4.36).

(c) ***MK-SP key:*** When this key is operated to the MK position, marking tone from the 909A oscillator is connected to the terminal test cord at the normal sending level. When

this key is operated to the SP position, spacing tone from the 909A oscillator is connected to the terminal test cord at the normal sending level.

(d) ***SND-TMS key:*** When this key is operated to the SND position, the sending circuits of the data distortion measuring equipment are conditioned to send F1 signals from the originating testboard or F2 signals from the terminating testboard when performing an over-all data distortion test of a WADS intertoll trunk. When this key is operated to the TMS position, the output of the KS oscillator is connected to the terminal test cord with a 900-ohm impedance.

(e) ***FRR-FRS CHK key:*** When this key is operated to the FRR position, incoming tones on a connected WADS trunk are connected to the frequency counter at the testboard. When this key is operated to the FRS CHK position, transmitted outgoing tones are connected to the frequency counter.

(f) ***NSE-DMR key:*** When this key is set to the NSE position, the terminal test cord circuit is conditioned for performing noise measurements over the connected intertoll trunk. When this key is set to the DMR position, the receiving circuits of the data distortion measuring equipment are conditioned to receive.

(g) ***SUB AGC key:*** When this key is operated, while transmitting from the data signal generator in the 906A distortion measuring equipment or the 909A oscillator, the output signal level is −18 db below the normal sending level (normal sending level is −15 dbm for F1 signals and −10 dbm for F2 signals.)

(h) ***LEVEL-OUT key:*** When this key is operated to HI, the output signal level is 5 db higher than normal. When this key is operated to LO, the output signal level from the data signal generator or the 909A oscillator is 12 db below normal. When unoperated the output level is normal unless key SUB AGC is operated.

(i) ***DMB lamp:*** When the DMB lamp associated with a terminal test cord is extinguished, it indicates that the associated distortion measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the associated data distortion measuring equipment is busy with another test cord.

(j) ***FMB lamp:*** When the FMB lamp associated with a terminal test cord is extinguished, it indicates that the associated frequency counter is idle or in use with that cord. When the lamp is illuminated, it indicates that the counter is busy with another test cord.

(k) ***GB lamp:*** When the GB lamp associated with a particular terminal test cord is extinguished, it indicates that the associated data signal generator is idle or in use with that cord. When the lamp is illuminated, it indicates that the generator is busy with another test cord.

(*l*) ***MB lamp:*** When the MB lamp associated with terminal test cord is extinguished, it indicates that the associated test meter is idle or in use with that cord. When the lamp is illuminated, it indicates that the meter is busy with another test cord.

(m) ***TMB lamp:*** When the TMB lamp associated with a terminal test cord is extinguished, it indicates that the associated transmission measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the equipment is busy with another test cord.

(n) ***NSB lamp:*** When the NSB lamp associated with a terminal test cord is extinguished, it indicates that the associated 3B noise measuring set is idle or in use with that cord. When the lamp is illuminated, it indicates that the measuring set is busy with another test cord.

4.57 ***Line Test Cord Circuit:*** One line test cord circuit is provided at each 20A WADS toll testboard position. This cord circuit is used when making sectionalizing tests on WADS voice- and narrow-band intertoll trunks. Two cords are associated with each line test cord circuit. The front (MON) cord is equipped with a 309 plug and is used when performing tests at the DRCV MON and DXMT MON jacks in the narrow-band line test jacks, which are located in the line test and patch bay of the 20A WADS toll testboard position. The rear LD

(line-drop) cord is equipped with a 310 plug and is used for making a terminating connection to the DXMT, LXMT, DRCV, or LRCV jack in both the voice- and narrow-band trunk test jack fields, which are located in the line test and patch bay. When the rear (L-D) cord is connected to a XMT or RCV trunk test jack, the MON cord is disconnected from the line test cord circuit. The functions of the keys and lamps associated with the line test cord circuit are described below.

(a) ***SUPV-MON key:*** When this key is operated to the SUPV-MON position with the DATA-READ key operated, the output of the channel selector is connected to the supervisory channel demodulator and demultiplexer in the data distortion measuring unit. With the channel switch in the SUPV position, supervisory signals on the six channels of the B1 data terminal will be displayed on the SUPV-DEMULT lamps (Fig. 8E).

(b) ***DATA-SUPV key:*** When this key is operated to the DATA position with the DATA-READ key operated, the data distortion measuring equipment is conditioned to make data distortion measurements on both narrow- and voice-band WADS trunks. When this key is operated to the SUPV position with the DATA-READ key operated, the data distortion measuring equipment is conditioned to measure the distortion on the B1 data terminal supervisory channel.

(c) ***SEND-SUPV key:*** When this key is operated to the SEND-SUPV position, the data signal generator is conditioned to send either pseudorandom word or dotting signals over the supervisory channel of a B1 data terminal.

(d) ***DATA-READ key:*** When this key is operated to the DATA-READ position while the DATA-SUPV key is operated to the DATA or SUPV position, the data distortion measuring equipment is conditioned for making sectionalizing data distortion tests on both narrow- and voice-band WADS trunks.

(e) ***TMS-TMR key:*** When this key is operated to the TMS position, the transmission measuring equipment (KS oscillator) is put into the send condition with a 600-ohm termination. When this key is operated to the TMR position, the transmission measuring equipment is conditioned to receive with a 600-ohm termination.

(f) ***READ key:*** When this key is operated to the READ position with the MON cord of the line test cord circuit plugged into a narrow-band DXMT or DRCV MON jack, transmission, noise, or frequency offset can be measured on the channel selected by means of the channel selector switch. If an LD line test cord is connected to the DXMT, DRCV, LXMT, or LRCV jack and the key is operated to the READ position, the data path to the channel selector is opened and the incoming test data is applied to the data test cord circuit leads for noise, transmission, or frequency measurements.

(g) ***NSE-FREQ key:*** When this key is operated to the NSE position with the READ key operated, the noise measuring equipment is conditioned for measuring noise on the line facility associated with a B1 data terminal. When this key is operated to the FREQ position with the READ key operated, the frequency counter is conditioned to check the frequency of the connected circuit.

(h) ***VBF1 key:*** The demodulator in the data distortion measuring equipment is normally receiving F2 signals (key in normal F2 position). When this key is operated to the VBF1 position, the demodulator is conditioned to receive F1 signals. The VBF1 key permits distortion measurements to be made from signals passing in either direction over a voice-band line facility.

(i) ***CHAN-SEL switch:*** The channel selector switch, which is mounted on the keyshelf, when set to positions 1 through 6 or SUPV, operates channel selector relays to select the desired channel out of the seven on the 4-wire facility.

(j) ***DMB1 lamp:*** When the DMB1 lamp associated with a line test cord is extinguished, it indicates that the associated data distortion measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the equipment is busy with another test cord.

(k) ***GB1 lamp:*** When the GB1 lamp associated with a line test cord is extinguished, it indicates that the associated data signal generator is idle or in use with that cord. When the lamp is illuminated, it indicates that the generator is busy with another test cord.

(*l*) ***TMB1 lamp:*** When the TMB1 lamp associated with a line test cord is extinguished, it indicates that the associated transmission measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the equipment is busy with another test cord.

(m) ***MB1 lamp:*** When the MB1 lamp associated with a line test cord is extinguished, it indicates that the associated meter is idle or in use with that cord. When the lamp is illuminated, it indicates that the meter is busy with another test cord.

(n) ***NSB1 lamp:*** When the NSB1 lamp associated with a line test cord is extinguished, it indicates that the associated noise measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the equipment is busy with another cord.

(o) ***FMB1:*** When the FMB1 lamp associated with a line test cord is extinguished, it indicates that the associated frequency measuring equipment is idle or in use with that cord. When the lamp is illuminated, it indicates that the equipment is busy with another test cord.

(p) ***CSB lamp:*** When the CSB lamp is extinguished, it indicates that the associated channel select circuit is idle or in use with that cord. When the lamp is illuminated, it indicates that the circuit is busy with another cord.

4.58 ***Cord and Position Interlock Circuits:*** The cord and position interlock circuits consist of relay control equipment. When a test circuit associated with the 20A WADS toll testboard is seized by the attendant, associated relay equipment in the cord and position interlock circuits is operated. Operation of these relays causes make-busy indicator lights of other associated test cords to be illuminated, indicating that the seized equipment is unavailable for test use. At the same time, all relays other than the one seizing the equipment have battery removed by operation of the interlock relay, thereby preventing accidental seizure of the equipment while it is in use. In the event of simultaneous seizure, only one cord will be connected to the test equipment.

4.59 ***Position control circuit (Fig. 5):*** The position control circuit consists of three switches and two keys used to control the operation of the 906A data distortion test equipment. The switches and keys are mounted on the keyshelf of each 20A WADS toll testboard position. The functions of the switches and keys are explained below.

(a) ***GEN SPEED switch:*** The GEN SPEED switch is used to select the bit rate at which the data signal generator in the data distortion measuring unit is to transmit. Associated indicator lights are illuminated to indicate the selected generator speed.

(b) ***DIST CTR switch:*** The first five positions of the DIST CTR switch are used to select a limit of peak measured distortion beyond which distortion peaks will be counted. The per cent distortion specified by the switch setting determines the sensitivity of the distortion counter. The sixth (SUPV SYNC) position is used to condition the counter in the data distortion measuring equipment to count supervisory out-of-sync signals during testing of the B1 data terminal supervisory channel.

(c) ***GEN MODE switch:*** The GEN MODE switch is used to establish the transmission mode of the data signal generator of the 906A data distortion measuring equipment.

(d) ***DMS key:*** When this key is operated to the BIAS position, the 906A data measuring equipment is conditioned to measure the bias distortion of dotting signals on the connected WADS intertoll trunk. When this key is operated to the SUPV position, the data distortion measuring equipment is conditioned to measure peak synchronous distortion on a connected WADS intertoll trunk. In this case the measuring equipment does not require start-stop bits and consequently this type of measurement is used primarily for supervisory tests. When this key is in the DTA position the data distortion measuring equipment is conditioned to measure the peak distortion of

start-stop signals on the WADS intertoll trunk circuit.

(e) ***DLY DIST +, DLY DIST − keys:*** When this key is operated to the DLY DIST + position, signals having positive delay distortion are introduced into the circuit under test. When this key is operated to the DLY DIST — position, signals having negative delay distortion are introduced into the circuit under test.

4.60 ***Hold Cord Circuit:*** The hold cord circuit (Fig. 10) is provided for holding connections forward on WADS intertoll data trunks. Two HOLD cords are provided per testboard position. The HOLD cords are located in the plug-shelf of the test bay (Fig. 5). Each cord circuit consists of a cord arranged so that it connects battery to the ring lead and ground to the sleeve lead of the SIG L jack of the connected trunk circuit.

4.61 ***Signal Test Cord Circuit:*** The signal test cords are provided at each testboard position for manual testing of the supervisory signals on narrow-band trunks. The associated cords, designated SIG TEST PATCH, are located in the plugshelf of the test bay. Each cord is a 2-ended patch cord. During testing at each end of the trunk, each rear SIG TEST CORD is connected to the trunk SIG L jack (Fig. 8B) in the miscellaneius jack field of the 20A WADS toll testboard position test bay. The front SIG TEST CORD is connected to one of six SIG L jacks of the supervisory signal test jack and lamp circuit (Fig. 8F). Each connected narrow-band trunk should be made busy from both ends for the supervisory tests by the insertion of MB plugs in the trunk MB jacks.

P. Transmission Measuring Circuit

4.62 The J94005 common systems transmission and noise measuring circuit is used with the 20A WADS toll testboard when making transmission level measurements on WADS intertoll trunks. The jacks and keys in which the circuit is terminated at each testboard position are located in the miscellaneous jack field (Fig. 8G) in the test bay of the testboard, described in 4.47. The output of the KS-19260 oscillator is patched to the VF IN jack in the associated jack field. Received signal levels are measured on the meter located in the test bay of the test position. The received signals are normally read on the B scale of the meter. Keys located in the jack and key field provide means for changing the sensitivity of the meter circuit. Also provided are facilities for calibrating the meter circuit. The 1000-0-600 and 1000-0-900 jacks provide an external source of 1-MW, 1000-cps sending power, at the indicated impedance (600 or 900 ohms). The primary purpose of these jacks is to provide a point for checking the milliwatt supply level which is used for calibrating the measuring equipment in the testboard. For a more detailed discussion of the transmission measuring equipment, reference should be made to the BSP section on the particular equipment. The noise measuring portion of this circuit is omitted and the arrangement described below is provided.

Q. Noise Measuring System

4.63 The noise measuring system of the 20A WADS toll testboard consists of the 3B noise measuring set and the 6E impulse counter, which are part of the 6D noise measuring panel. They are installed in either the test or line test patch bay of the position (Fig. 1 or 2). The jack, key, and lamp field for the 6E impulse counter (Fig. 16) is located in a miscellaneous jack field of the test bay as described in 4.37. The 3B noise measuring set and the 6E impulse counter are arranged for connection to the data test cord circuit and they are associated with the circuit under test by noise test keys located on the key-shelf of the test bay. The noise measuring set is normally connected via the noise test key. When the TTC-LTC key in the 6E IMP jack, key, and lamp field is operated, the noise measuring set is disconnected from the data test cord circuit and the 6E impulse counter is connected to the circuit, provided that the TST and 4W patch jacks are not in use. The circuit is so arranged that when one or the other of the two noise measuring instruments is in use, the other cannot be seized by the data test cord. The noise measuring set shall be arranged for 3-KC flat weighting when making noise measurements on WADS intertoll trunks. The 6E impulse counter can be adjusted to count all noise pulses which exceed a predetermined level. For a more detailed discussion of the noise measuring set and 6E impulse counter, reference should be made to the BSP for the particular piece of equipment.

R. Frequency Measuring Equipment

4.64 The frequency of outgoing or incoming test tones is measured using the KS-19247 electronic counter. The counter is permanently connected to the data test cord circuit and is associated with the circuit under test by operation of test keys on the keyshelf of the position test bay. The frequency of a tone is read directly from indicators on the counter.

S. Test Signal Generators

4.65 ***909A Data Distortion Test Oscillator:*** The 909A data distortion test oscillator is an assembly composed of four individual, fixed frequency oscillators and is located in the line test and patch bay (Fig. 2). The outputs of the four oscillators are F1 space (1070 cps), F1 mark (1270 cps), F2 space (2025 cps), and F2 mark (2225 cps). The outputs of the oscillators are connected permanently to the terminal test cord circuit. The 909A oscillator is used when performing transmission and frequency tests on WADS intertoll trunks.

4.66 ***KS-19260 Oscillator:*** The KS-19260 oscillator is a variable frequency oscillator which in use is patched to the VF IN jack (Fig. 8G) in the transmission measuring jack field. From this jack, the output of the oscillator is connected to the terminal test cord circuit through the transmission measuring equipment circuits by operation of key TMS of the terminal test cord. The oscillator is used for making transmission level or frequency measurements on WADS intertoll trunks. For further information, refer to the BSP section describing the oscillator.

T. 906A Data Distortion Test Equipment

General

4.67 The data distortion test equipment consists of the J79906AA data distortion measuring unit (Fig. 27) and the J79906AB data distortion display panel (Fig. 28). These units are used when performing data distortion tests on WADS intertoll trunks from the 20A WADS toll testboard. The test equipment is seized and controlled when performing the tests by means of keys and switches located in the keyshelf of the WADS toll testboard (Fig. 5). The results of the tests are displayed on a distortion meter and a mechanical counter located on the data distortion display panel (Fig. 28). The display panel also contains controls for calibrating the data distortion test equipment. This involves the use of a distortion calibration circuit which is included on a separate frame mounted below the 906A equipment (not shown in Fig. 28). The functions of the front panel controls and indicators are given below.

(a) ***Per cent distortion meter:*** Used to indicate the distortion of the incoming data signals.

(b) ***M ZERO key:*** Used for checking the zero adjustment of the distortion meter.

(c) ***OPR key:*** Used when performing calibration adjustments for the distortion measuring circuit.

(d) ***CAL HI potentiometer:*** Used when calibrating the distortion meter. OPR key must be held operated to the CAL HI position when making adjustment.

(e) ***CAL LOW potentiometer:*** Used when calibrating the distortion meter. OPR key must be held operated to the CAL LOW position when making adjustment.

(f) ***BIAS key:*** Used when measuring bias distortion to determine whether mark or space bias is displayed on the meter.

(g) ***OUT SYN lamp:*** When the DMS key in the data test cord circuit is normal, the OUT SYN lamp is illuminated if the incoming data signals are out-of-sync with the measuring circuit or if a stop-start pulse cannot be detected.

(h) ***SYN RST key:*** Used to reset the OUT SYN lamp provided synchronization has been recovered.

(i) ***TIMER:*** Used to time the length of a distortion count test. The time that a test is to be run is preset on the timer.

(j) ***RST-ST switch:*** Used to start counter and timer and to clear the counter and extinguish OVFL lamp.

(k) ***TMR lamp:*** Used to indicate when timer is running.

(*l*) ***COUNT switch:*** Used to start and stop the counter when timer is not being used.

(m) ***OVFL lamp:*** Indicates when the distortion counts are coming into the counter faster than they can be registered.

(n) ***Timer ON-OFF switch:*** Used to apply power to timer motor.

(o) ***Fuse:*** Protective device for timer power circuits.

(p) ***BIAS F1 potentiometer:*** Used to adjust the bias of the demodulator for F1 signals.

(q) ***BIAS F2 potentiometer:*** Used to adjust the bias of the demodulator for F2 signals.

Circuit Description

4.68 The data distortion test equipment consists of the following major functional circuits.

(a) The data signal generator which produces the data test signals.

(b) The modulator which converts the dc output of the signal generator into a frequency shift signal.

(c) The demodulator which converts received frequency shift data signals to dc signals for the distortion measuring circuit.

(d) The distortion measuring circuit which measures the distortion of received data signals.

(e) The display panel which displays the results of the distortion measurements.

(f) The channel selector which selects the B1 channel to be tested and shifts the frequencies of the received data signals so they can be accepted by the demodulator. The channel selector is used only when the line test cord is patched to a DRCV MON or DXMT MON jack associated with a narrow-band WADS trunk.

(g) The supervisory demodulator-demultiplexer which demodulates and demultiplexes the supervisory signals.

Data Signal Generator Circuit

4.69 The data signal generator procduces test data signals having four speeds and six modes. The test speeds are 95.5 bps, which corresponds to the bit rate of the B1 supervisory channel; 110 bps, which corresponds to 100 speed 4-row teletype signals; 150 bps, which corresponds to the design requirements for the B1 data terminal 3-link connection; and 200 bps, which corresponds to the address signaling rate of the FSP senders.

4.70 The speed at which the data signal generator operates is controlled by the GEN SPEED switch located on the keyshelf of each testboard position (Fig. 5).

4.71 The six test modes produced by the data signal generator are marking tone, spacing tone, and random, dotting, + bias, and − bias signals. The random signals simulate data signals transmitted by a teletypewriter but are not compatible with teletypewriter operating signals. The so-called random signals consist of a repeating sequence of 63 different telegraph characters. The dotting signal consists of alternate mark and space pulses. The + bias and − bias signals are dotting signals with 12.5 per cent plus (mark) and minus (space) bias, respectively. These biased signals are used for checking the data distortion measuring circuit. Either the marking or spacing tone may be used when performing transmission level measurements. The type of signals generated by the data signal generator is controlled by the GEN MODE switch located in the keyshelf of each toll testboard position (Fig. 5). The output from the data signal generator is sent to the modulator circuit.

Modulator Circuit

4.72 The modulator circuit converts the dc signals from the data signal generator to frequency shift tones which are of a form that can be transmitted over regular voice-frequency telephone or B1 data circuits. Under control of the data test cord circuit, the modulator can transmit at either F1 (1170 ±100 cps) or F2 (2125 ±100 cps) data frequencies or at the B1 data channel supervisory frequency (350 ±35 cps).

4.73 The output from the modulator can be applied to delay networks which are used to test delay distortion in the WADS trunks. The output then goes to a set of attenuator pads which are used to control the level of the test signals. The attenuator pads, when required, are inserted into the signal path by the

operation of keys located in each testboard keyshelf. The different outputs provided are:

(a) ***Normal output:*** In the F1 mode, −15 dbm and in the F2 mode, −10 dbm. (These levels are those measured at the switches in the originating No. 5 crossbar office. The output levels are somewhat higher depending on the loss of the average originating test trunk.)

(b) ***Low output:*** 12 db below normal sending level.

(c) ***High output:*** 5 db above the normal sending level.

(d) ***Sub AGC output:*** 18 db below normal sending level.

4.74 The output from the modulator is applied to the data test cord circuit where it is associated with either a terminal test cord or a line test cord by operation of keys in each testboard keyshelf. The outputs are connected to the trunks under test after calls have been established over the trunks from terminal test cords at the two remote 20A testboards.

4.75 Under control of keys at the testboard, the output from the modulator also can be connected to the demodulator for a local check of the signal generator, modulator, demodulator, and measuring circuits. The modulator output is applied to the demodulator through a 20-db pad.

4.76 ***Demodulator Circuit:*** The data test signals from a WADS trunk under test are applied through a line amplifier to F1-F2 filters in the demodulator circuit. The selection of the desired filter and discriminator section, thus establishing the mode (F1 or F2) for the demodulator, is controlled by the data test cord circuit. From the filters the signals are applied to the demodulator which converts the F1 and F2 frequency shift data signals to dc signals. The dc data signals from the demodulator are sent to the data distortion measuring circuit.

Distortion Measuring Circuit and Display Panel (Fig. 28)

4.77 The signals from the demodulator circuit are applied to comparison circuits which measure the peak or bias distortion of the incoming test data. The distortion measurements are obtained by timing the transitions in the incoming data signals against clock signals obtained from the local data signal generator. The per cent distortion of the received data signals is displayed on the distortion meter. The measurements are made on a digital basis and converted to analog values for meter presentation. The meter is designed so that the readings remain present long enough for accurate readings to be taken. The selection as to whether peak or bias distortion is to be measured is controlled by operation of keys located in the testboard keyshelf.

4.78 In addition to the meter display, during peak distortion measurements the digital measurements may be applied to a mechanical counter. The counter counts and displays the number of times that the distortion exceeds a predetermined reference level. The reference level for the counter is selected by the setting of the DIST CTR switch located in the testboard keyshelf (Fig. 5). A timer associated with the counter can be used to pretime the length of the count tests. Included in the display circuits are controls for calibrating the distortion measuring circuit. The function of the front panel controls of the display unit are explained in 4.68.

Channel Selector

4.79 The line side of each B1 data terminal appears on jacks in the line test and patch bay of each 20A WADS toll testboard (Fig. 9B and 12). When performing sectionalizing tests upon narrow-band WADS trunks, the MON line test cord is connected to the DRCV MON or DXMT MON test jack for the trunk under test. The incoming signals from the B1 (narrow band) data trunk under test are applied in the data test cord circuit through a bridging amplifier to a set of seven filters which are the equivalent of the receiving filters used in a WADS B1 data terminal. The filters permit the measurement of signals on a selected channel without interference from other working channels of the data terminal. To select the B1 data trunk to be tested, the CHAN SEL switch (Fig. 5) is set to the appropriate channel position and keys in the testboard keyshelf are operated. From the channel selector, the signals may be checked for level, noise, or frequency offset, or are applied either to the supervisory demodulator-demultiplexer or the data channel demodulator.

4.80 Using the appropriate carrier frequency from a B1 data carrier supply, the data channel demodulator shifts the frequency of the selected signal to F2 (2125 ±100 cps). The demodulator of the distortion measuring set, previously described in 4.76, can convert these frequency shift signals to dc signals suitable for performing distortion measurements.

4.81 ***Supervisory Demodulator-Demultiplexer:*** The supervisory demodulator-demultiplexer is similar in design to the supervisory demodulator and demultiplexer circuits of the B1 data carrier terminals. These circuits are used when performing tests on supervisory signals associated with B1 data carrier trunks.

4.82 ***Supervisory Demodulator Circuit:*** The supervisory demodulator circuit converts the supervisory frequency shift tones from the WADS B1 trunk under test to dc signals. The output from the demodulator is applied to the supervisory demultiplexer and may be connected by key control to the distortion measuring set. The measuring circuit performs its regular function as previously described. The function of the demultiplexer circuit is explained below.

4.83 ***Supervisory Demultiplexer Circuit:*** In the supervisory demultiplexer circuit the demodulated supervisory signal is converted to lamp signals which are displayed in the SPV DEMULT lamp field (Fig. 8E) located in the testboard test bay. When performing the tests, an off-hook signal from a B1 data channel will extinguish the SPV DEMULT lamp associated with that channel and an on-hook signal will illuminate the lamp. If the demultiplexer is in synchronism with the incoming supervisory signals, the SYN lamp in the SPV DEMULT lamp field will be illuminated. (Provision is made to count on a mechanical counter the number of times synchronism is lost during a time interval set on the timer.) The clock frequency for the demultiplexer is obtained from a B1 data carrier supply.

4.84 ***Supervisory E Lead Distribution Circuit:*** The E lead distribution circuit connects the demultiplexer output to the set of SPV DEMULT lamps associated with the proper test position. One set of SPV DEMULT lamps serves two positions, whereas a demultiplexer serves a maximum of four positions.

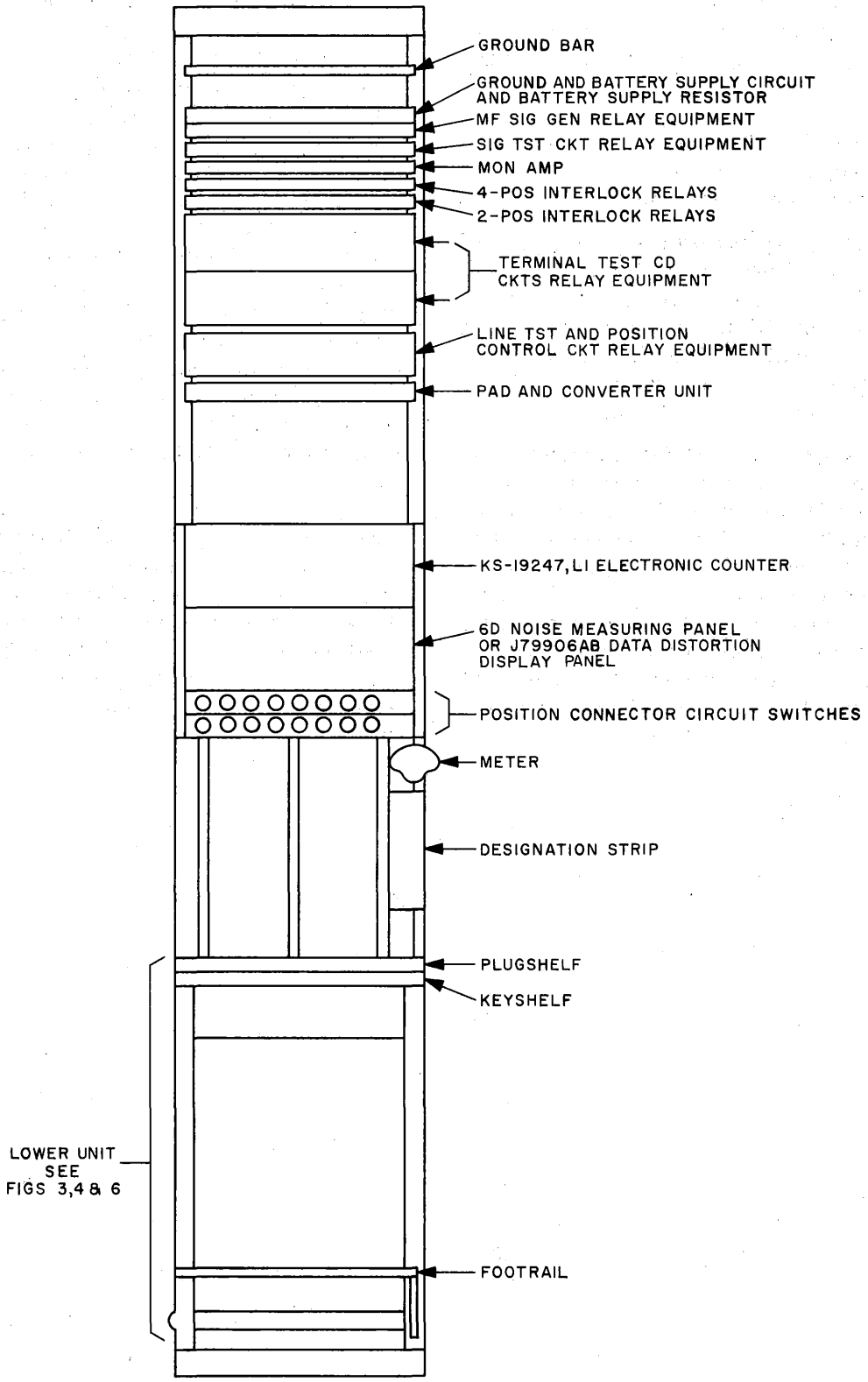


Fig. 1 – Test Bay — Typical Arrangement

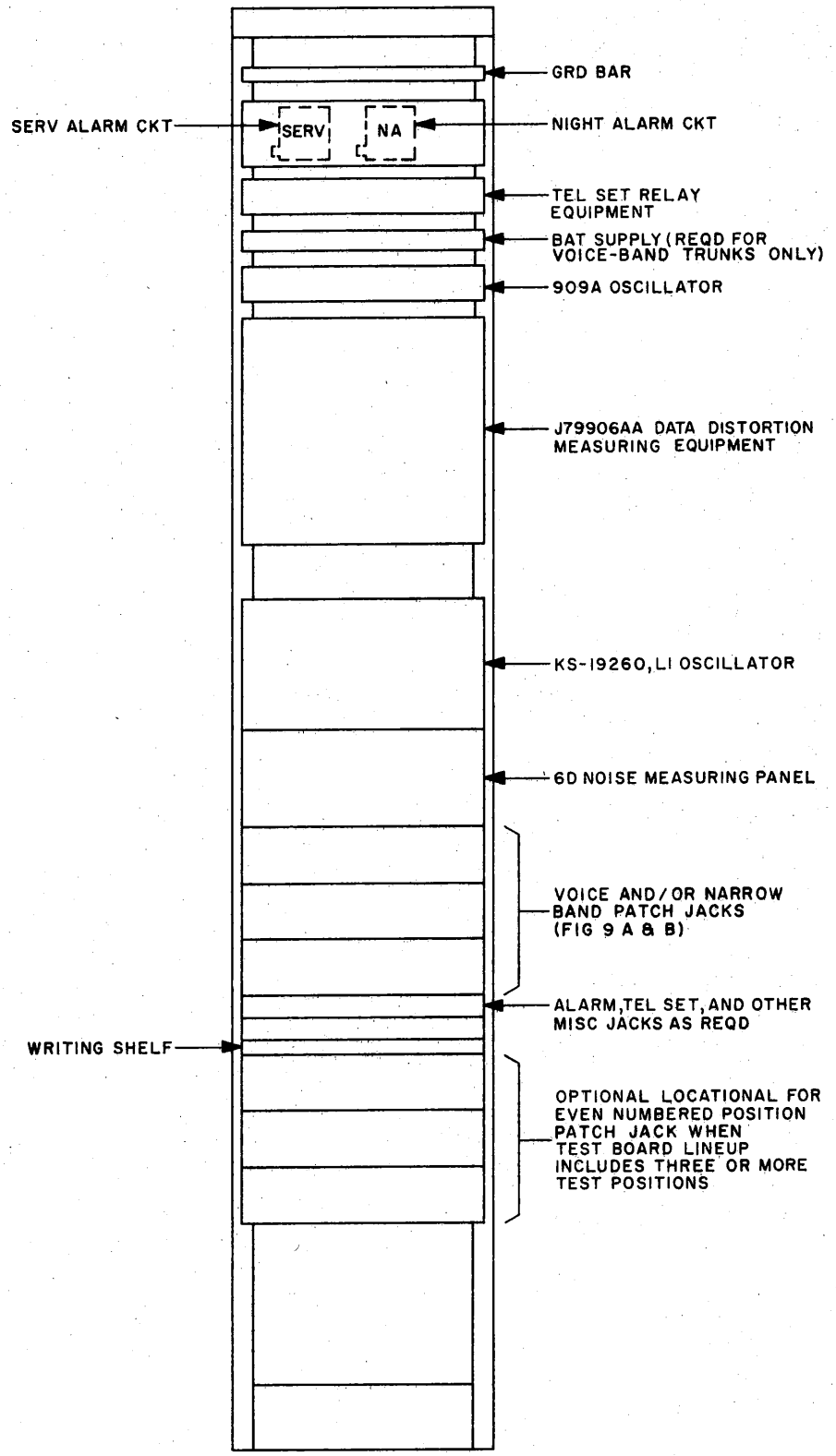


Fig. 2 – Line Test and Patch Bay — Typical Arrangement for Voice- and Narrow-Band WADS Trunks

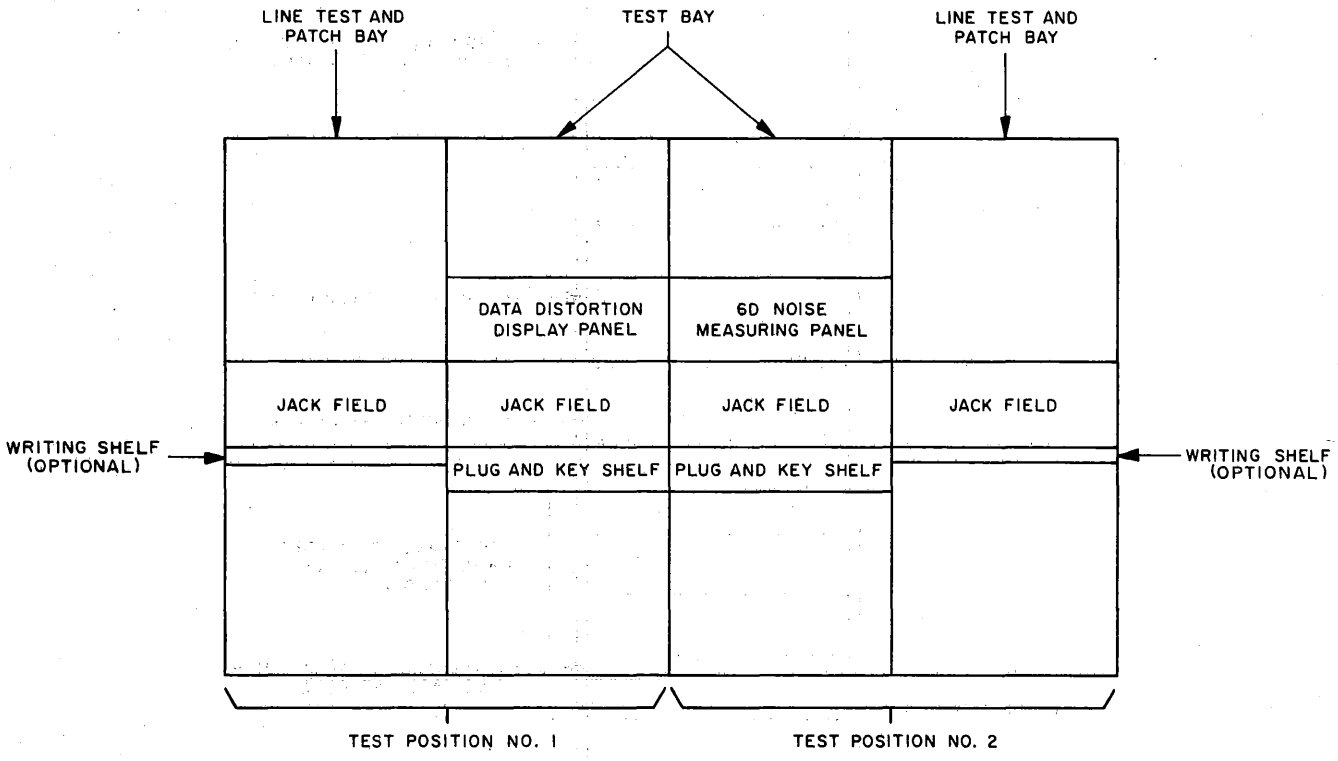


Fig. 3 – 20A WADS Toll Testboard — Two Position Line-Up

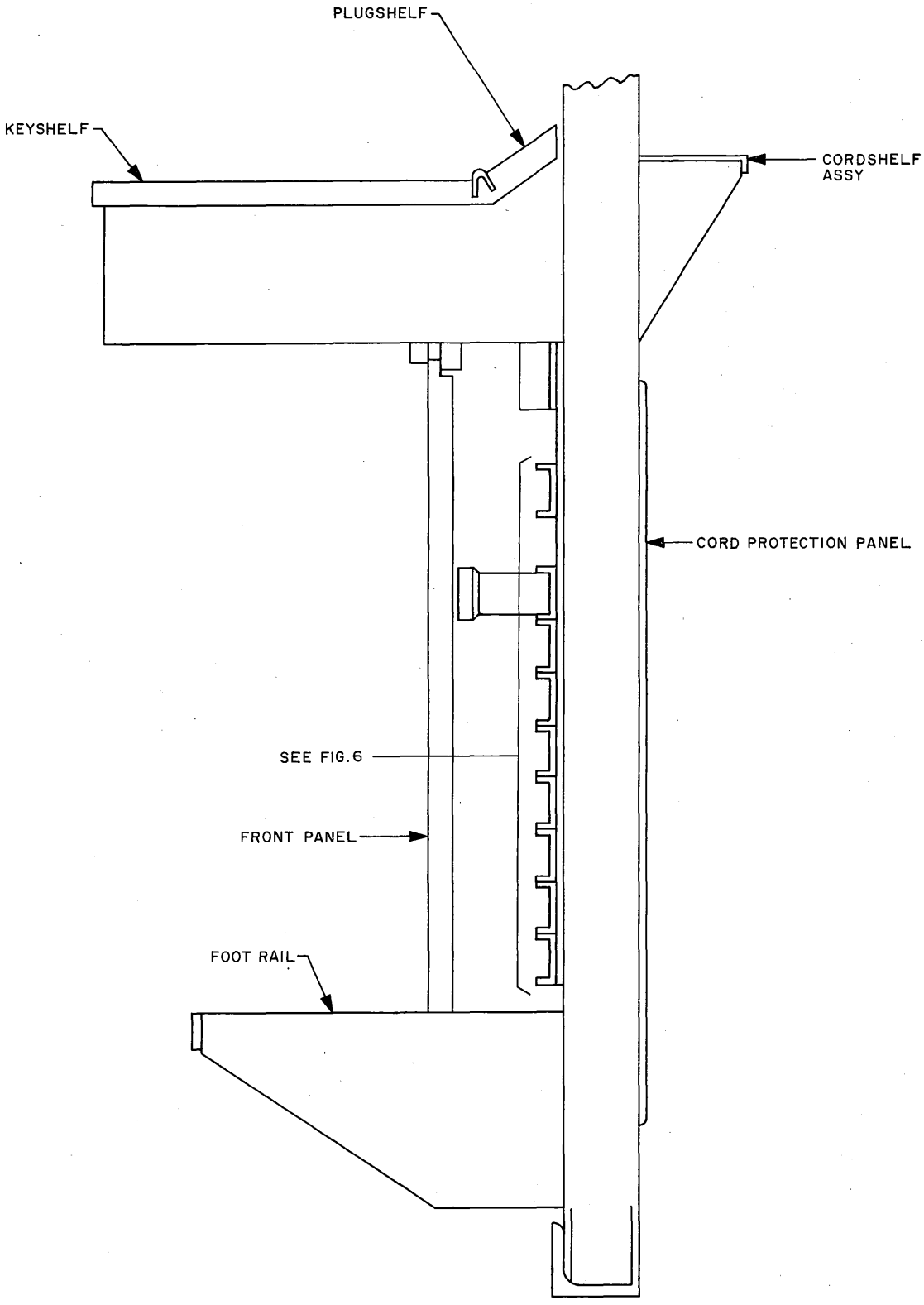


Fig. 4 – Test Bay — Lower Unit

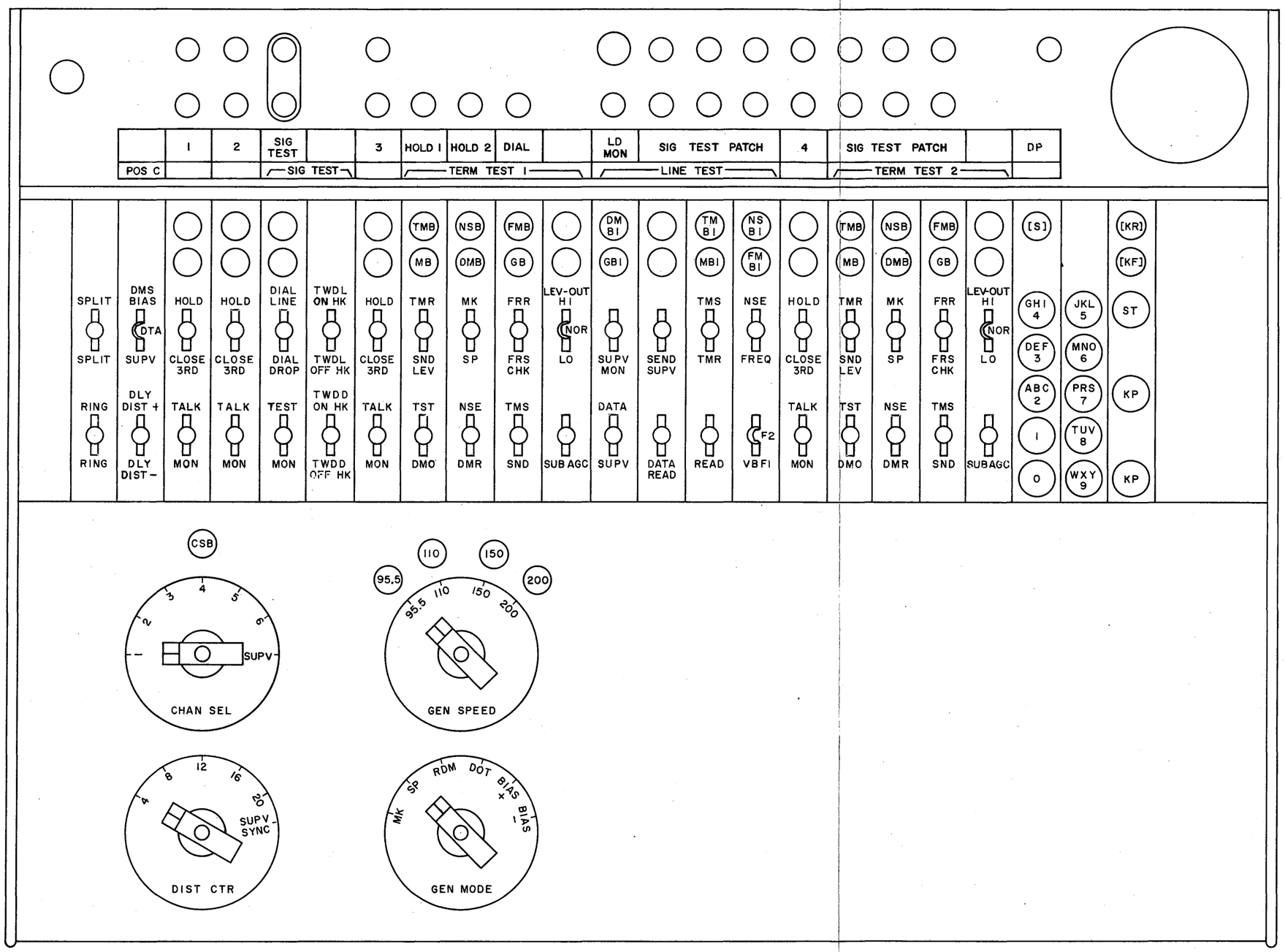


Fig. 5 – Keyshelf and Plugshelf Arrangement

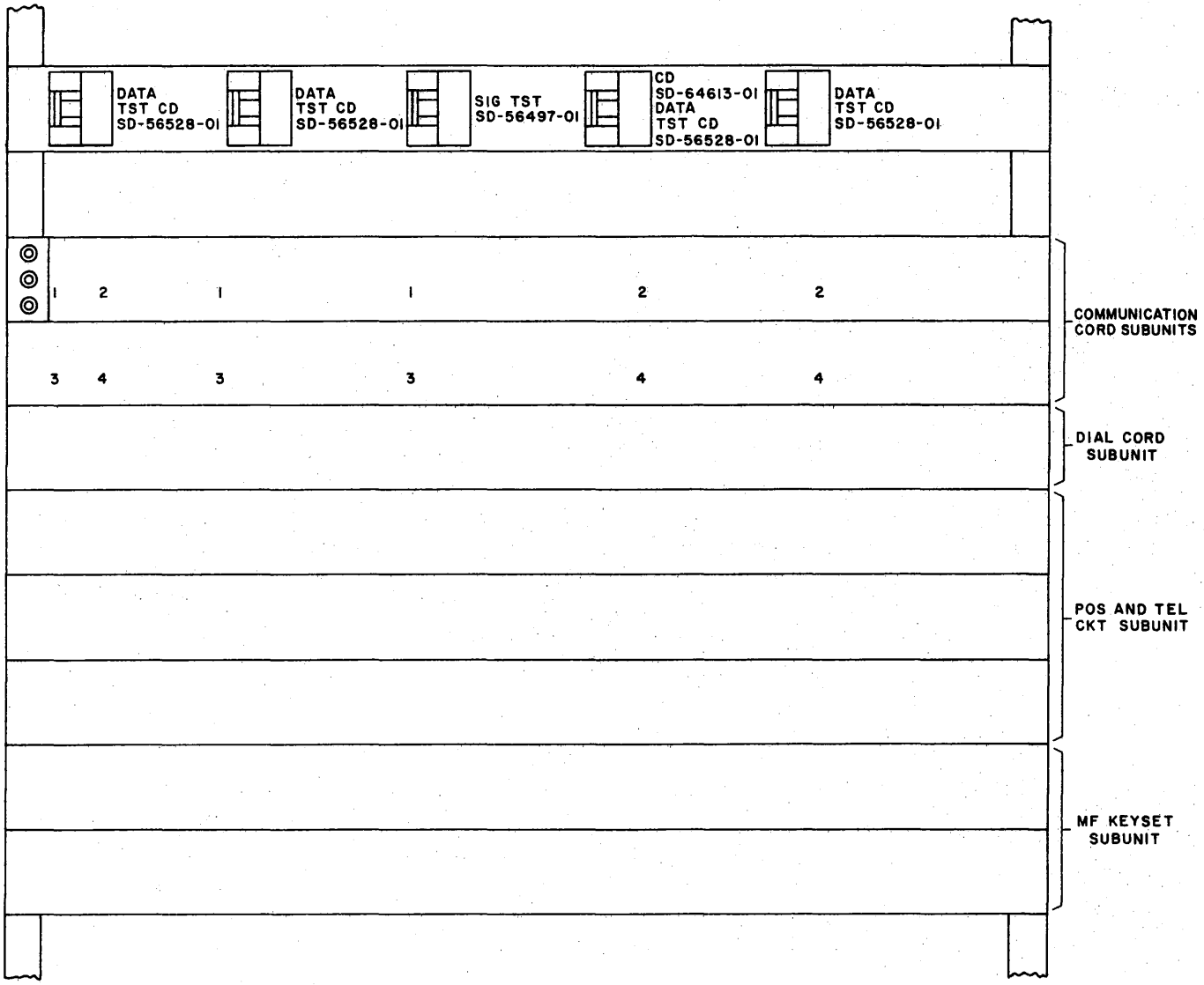


Fig. 6 – Lower Unit Relay Equipment Identification

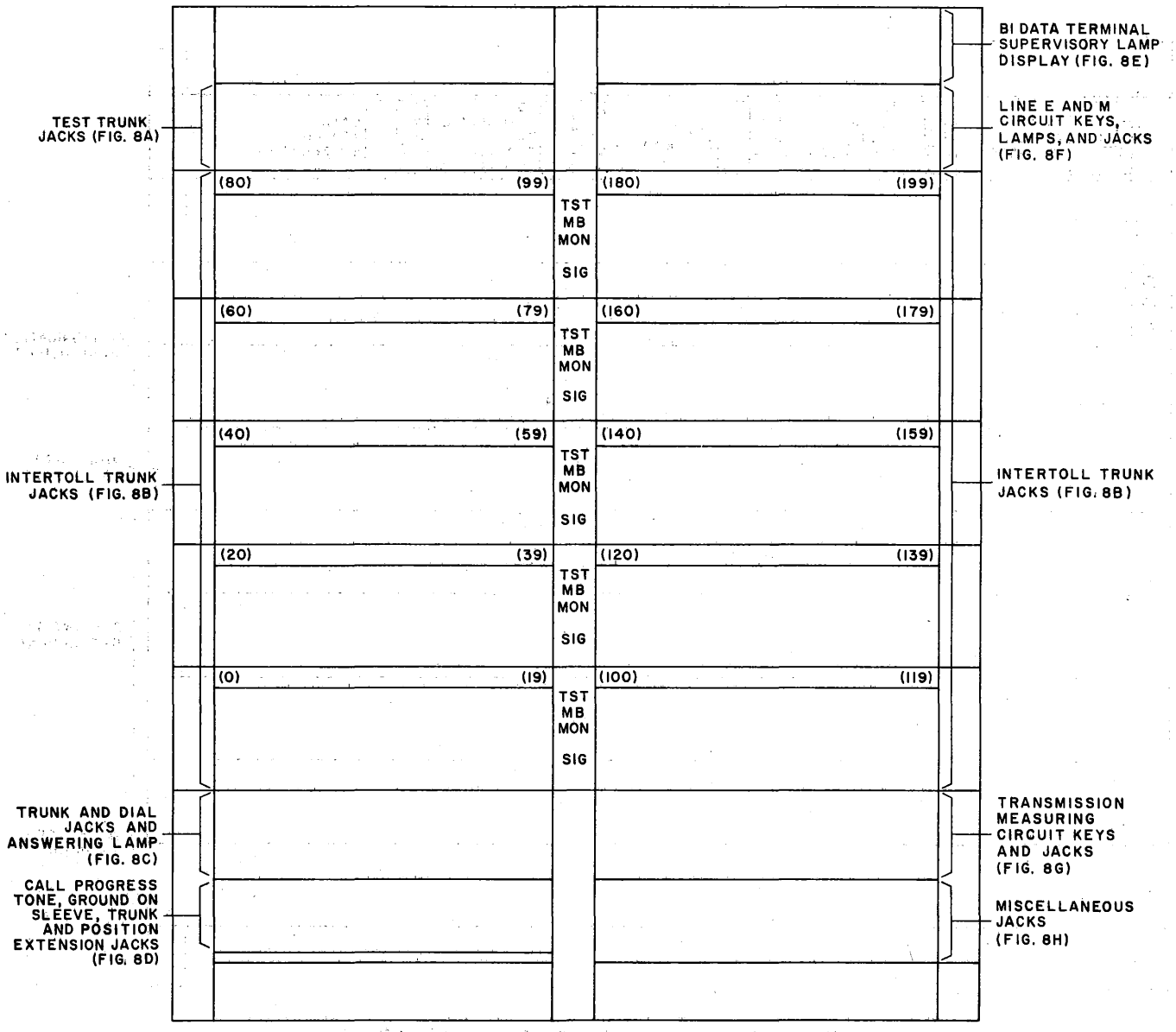


Fig. 7 – Test Bay — Jack Field Arrangement

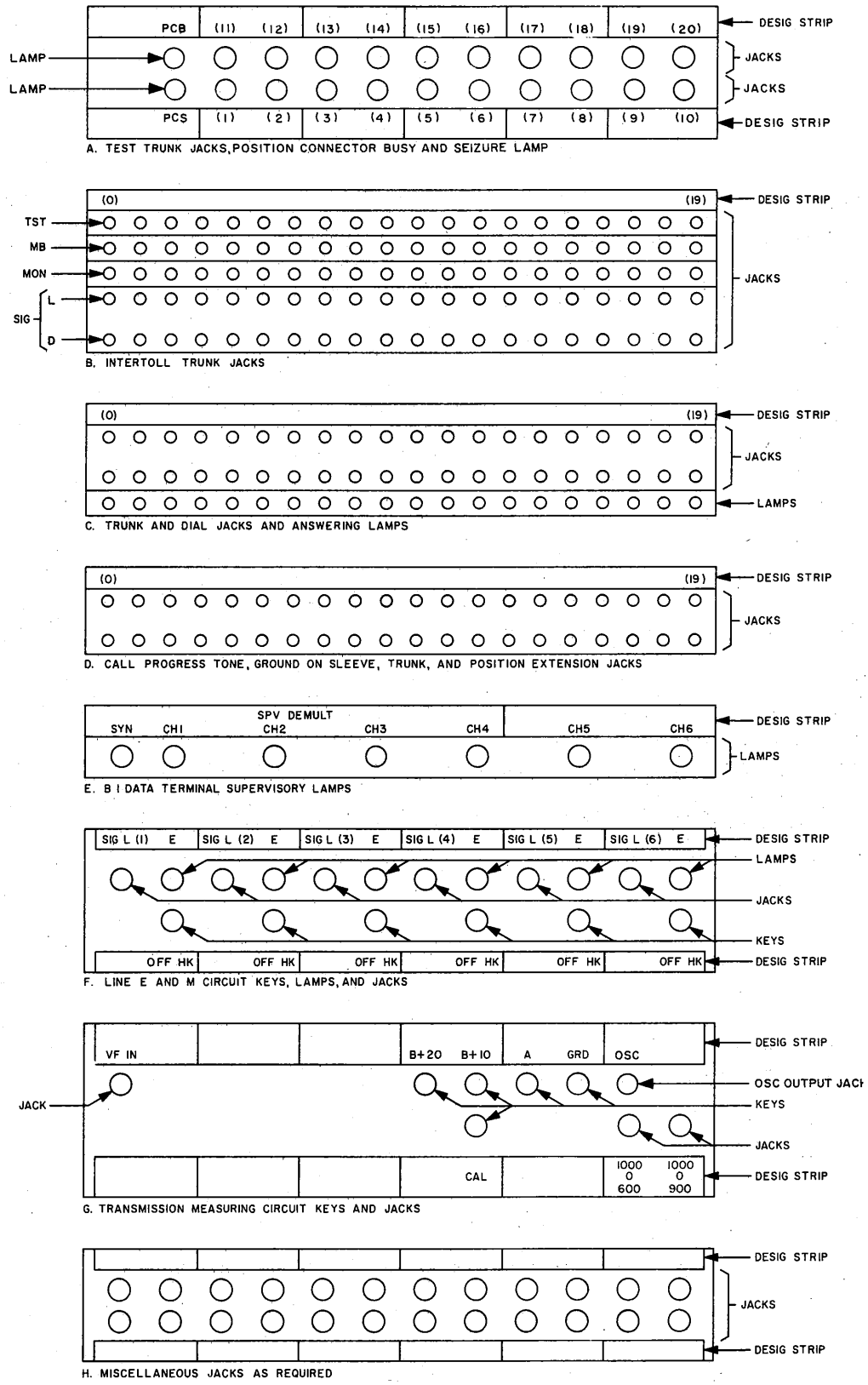
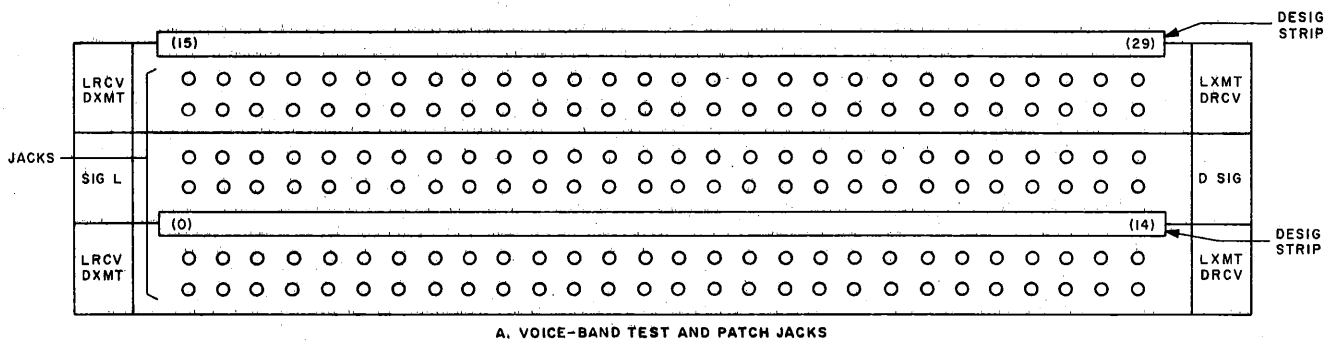
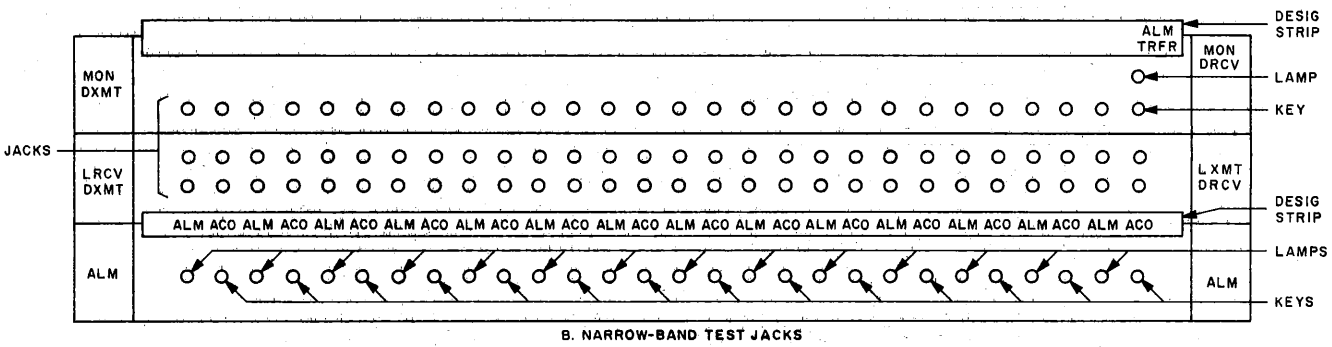


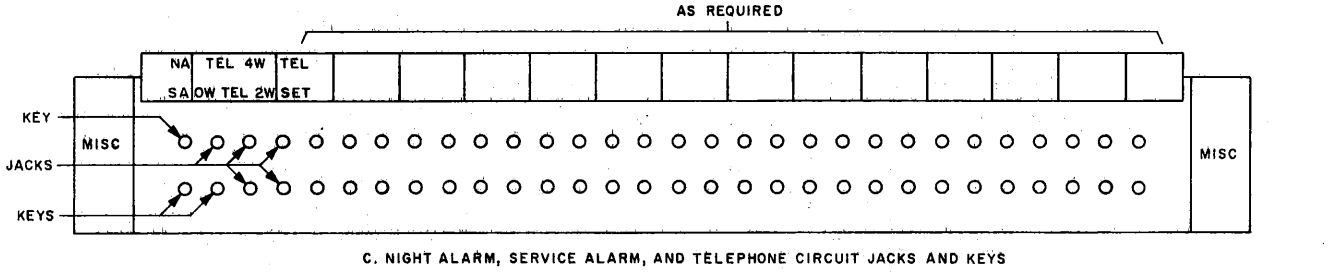
Fig. 8 – Test Bay Jacks, Lamps, and Keys — Identification



A. VOICE-BAND TEST AND PATCH JACKS



B. NARROW-BAND TEST JACKS



C. NIGHT ALARM, SERVICE ALARM, AND TELEPHONE CIRCUIT JACKS AND KEYS

Fig. 9 – Line Test and Patch Bay Jacks — Identification

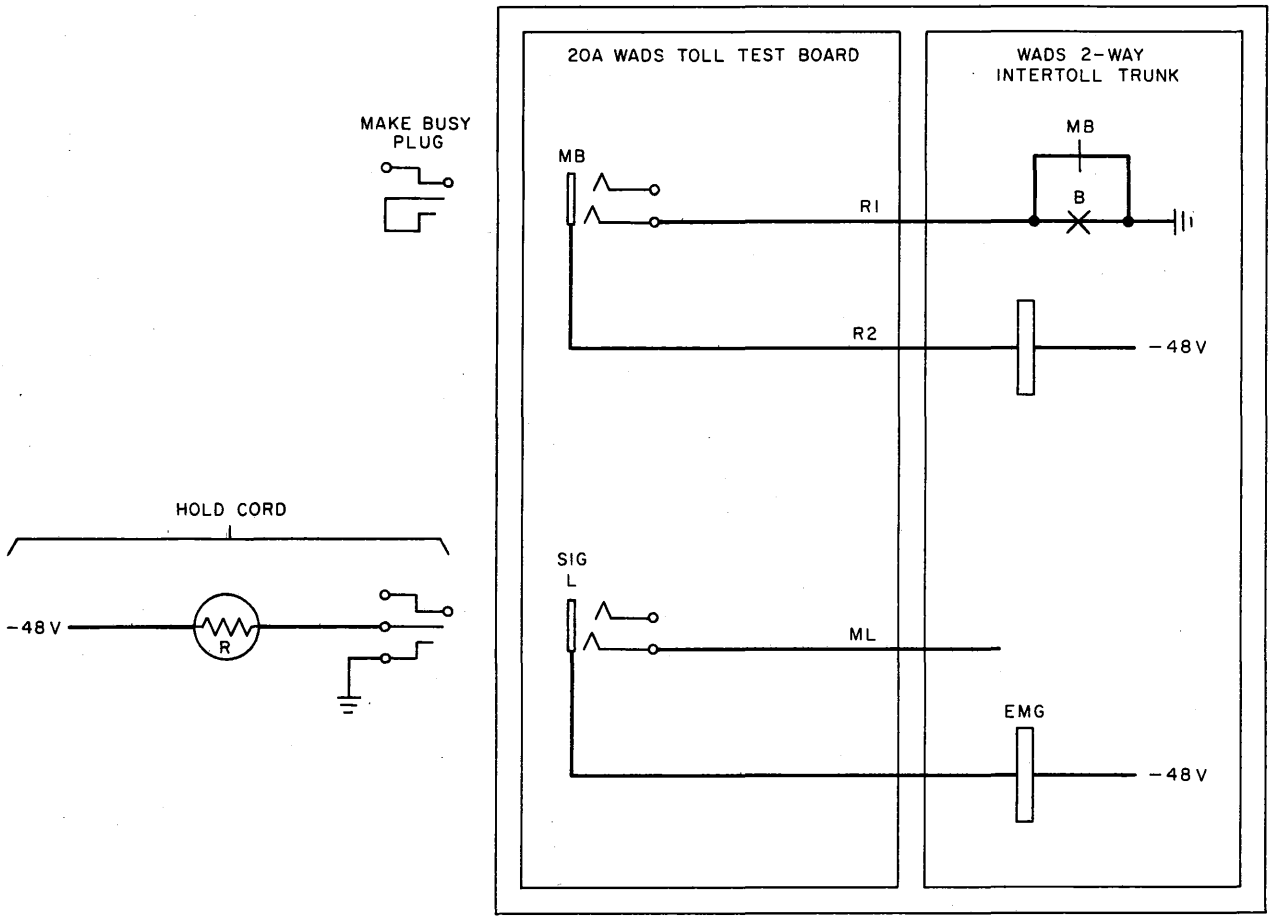


Fig. 10 – Making Trunk Appear Busy in Both Directions

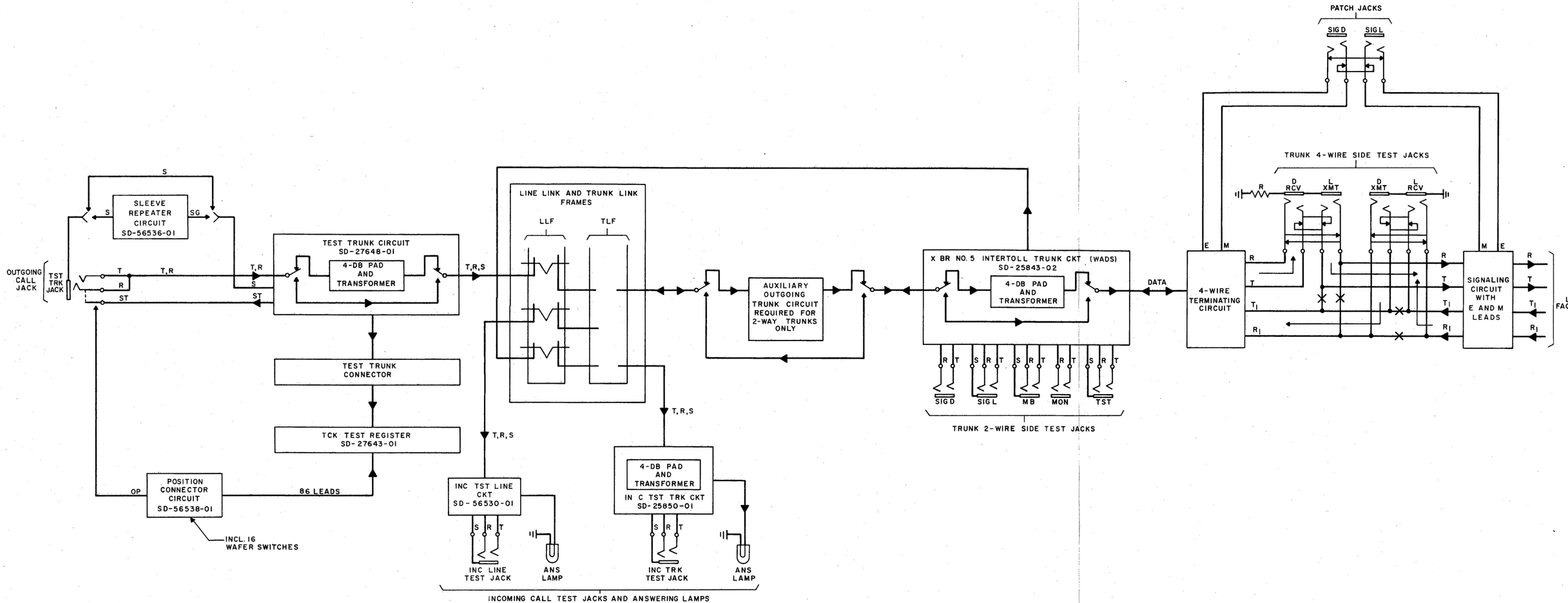


Fig. 11 — Typical WADS Voice-Band Trunk and Trunk Test Jacks — Block Diagram

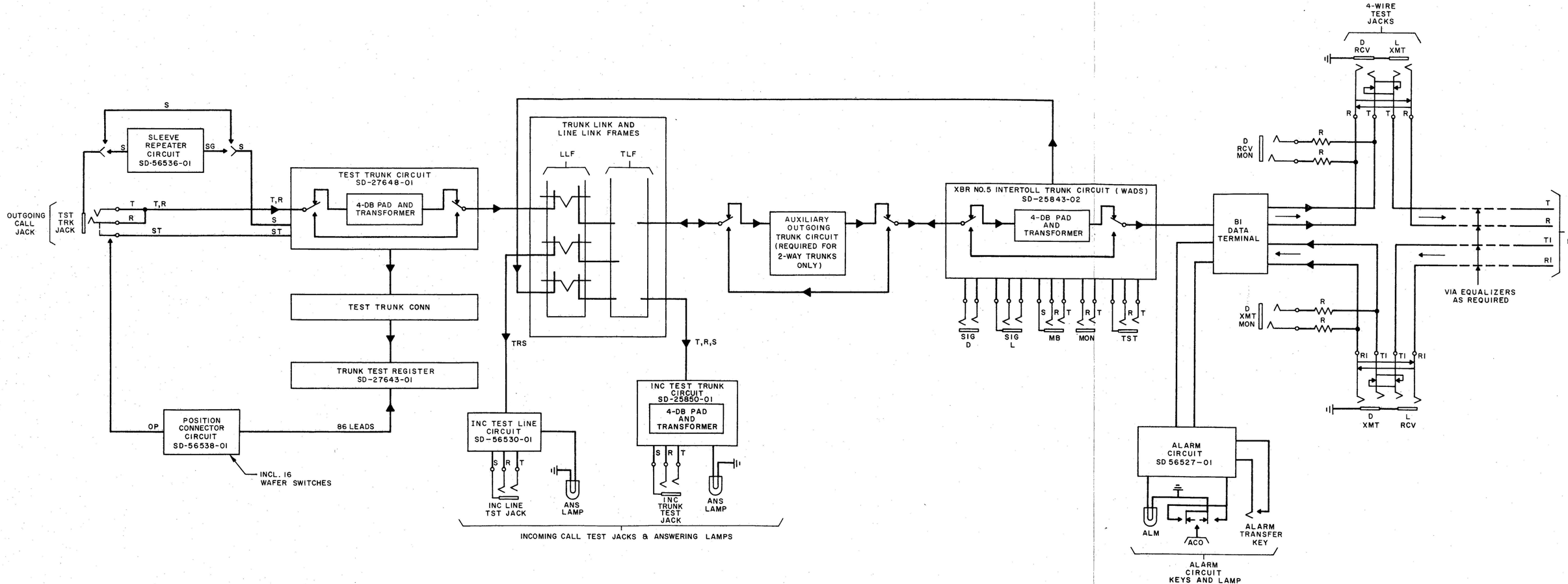


Fig. 12 – Typical WADS Narrow-Band Trunk an
Trunk Test Jacks — Block Diagram

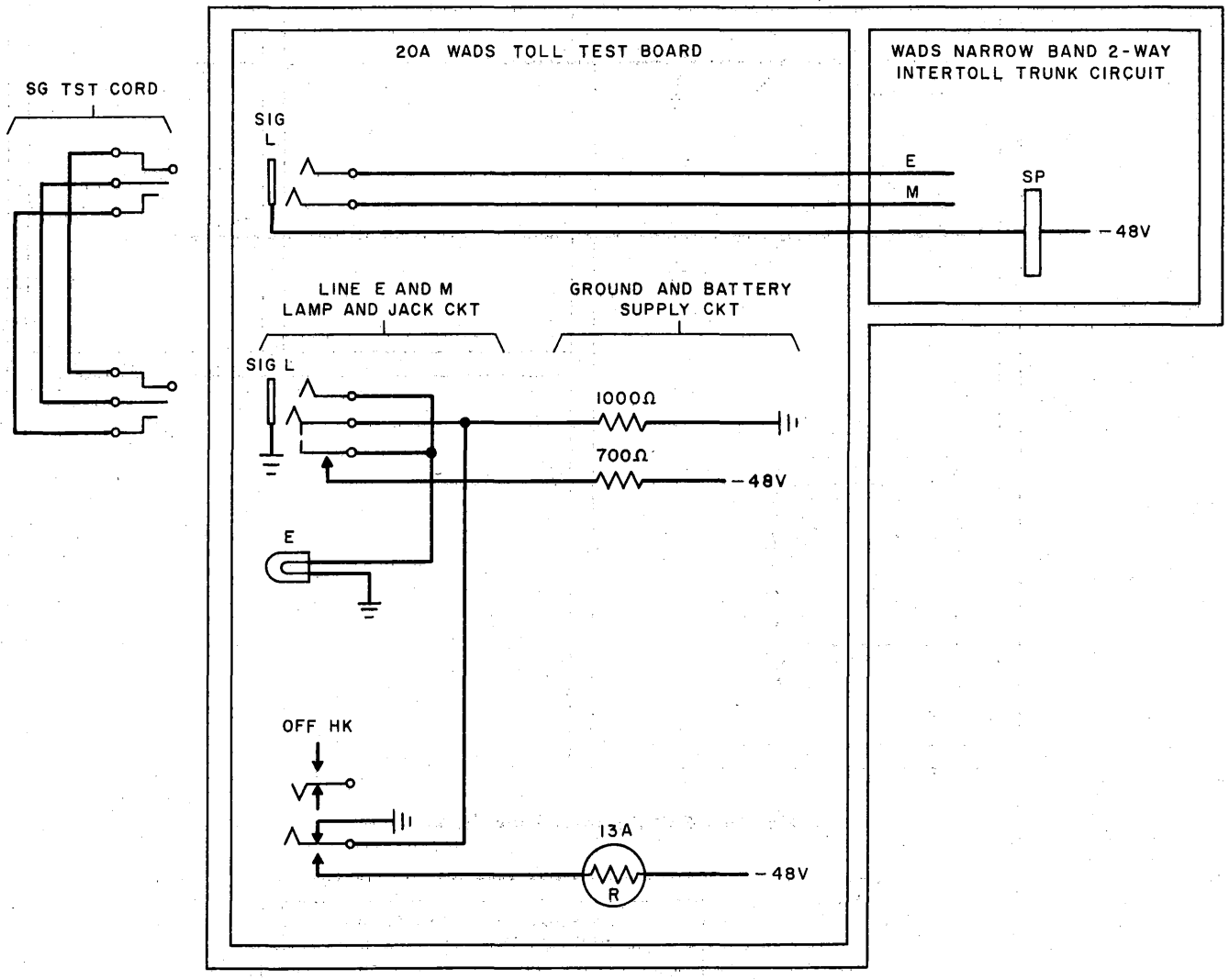


Fig. 13 – Line E and M Lamp and Jack Circuit

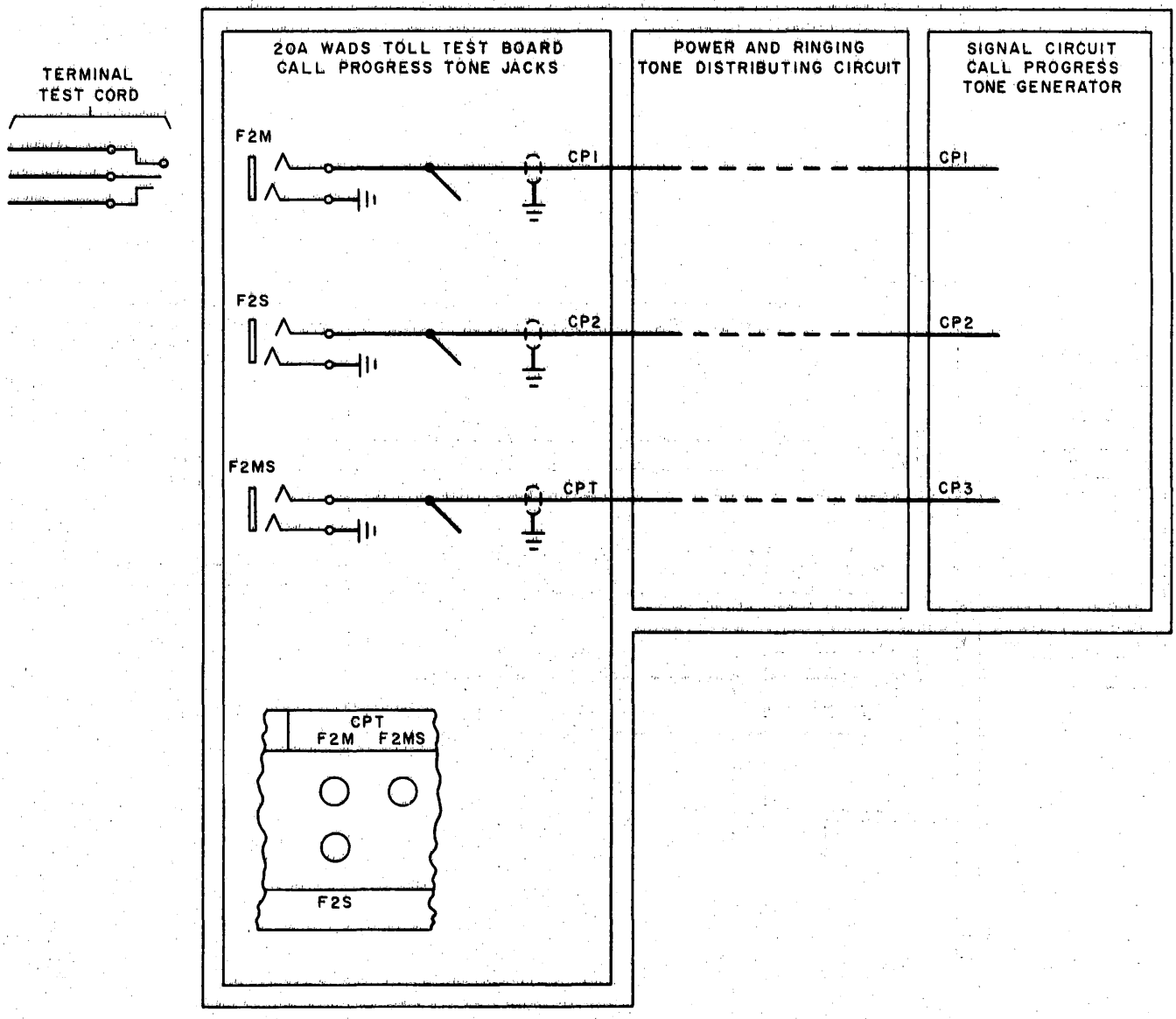


Fig. 14 – Call Progress Tone Jacks

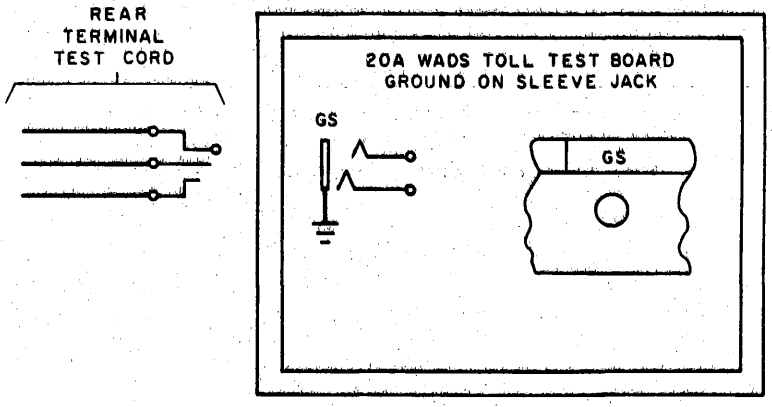


Fig. 15 – Ground on Sleeve Jack

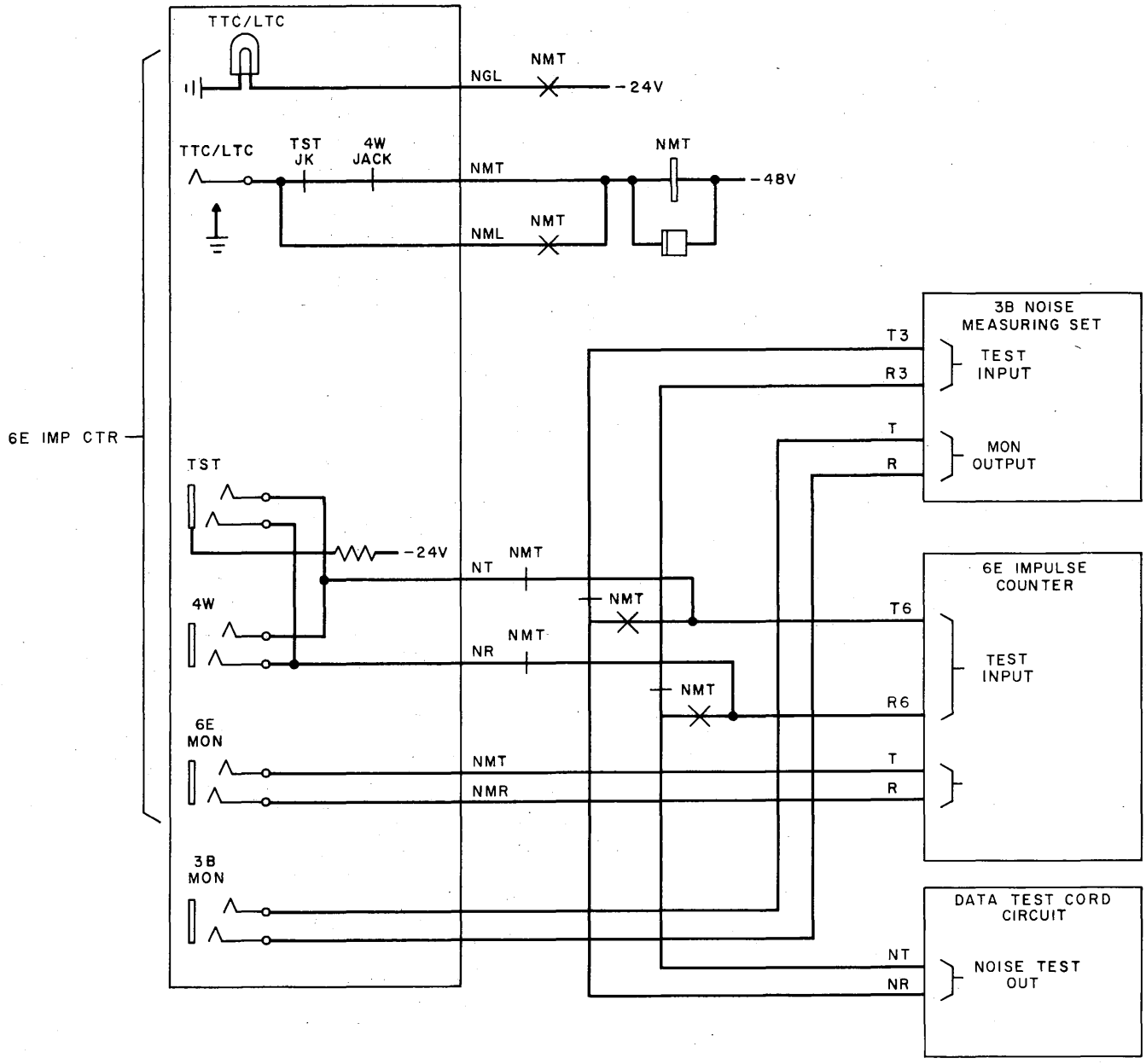


Fig. 16 – 6E Impulse Counter Key, Lamp, and Jack Circuit

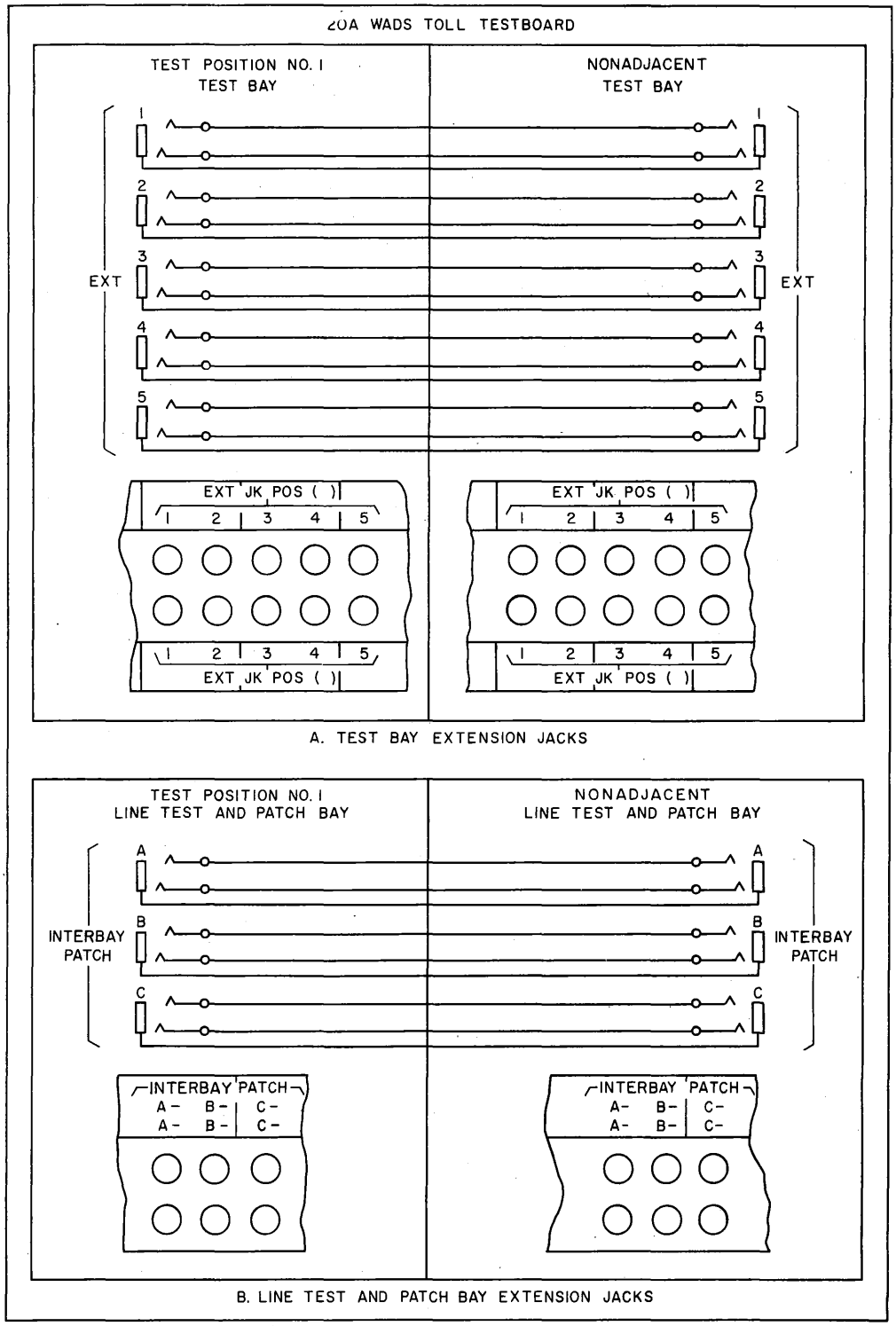


Fig. 17 – Extension Jacks

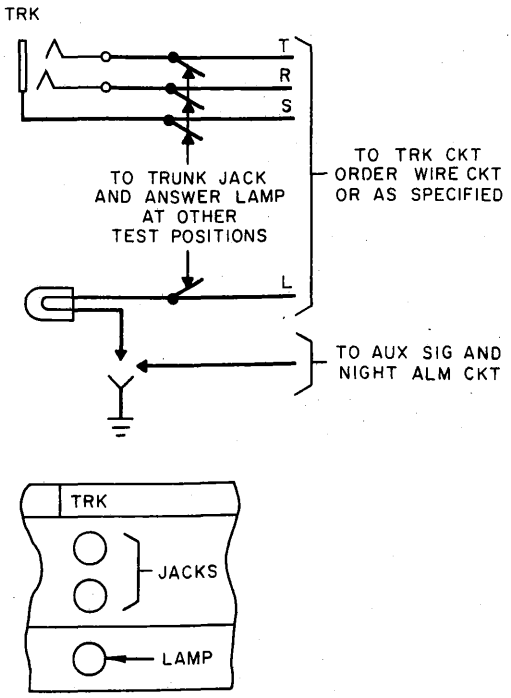


Fig. 18 – Trunk Jack and Answering Lamp (Test Bay)

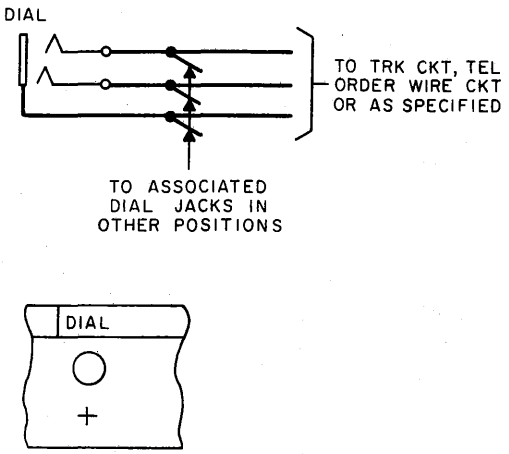


Fig. 19 – Dial Jack (Test Bay)

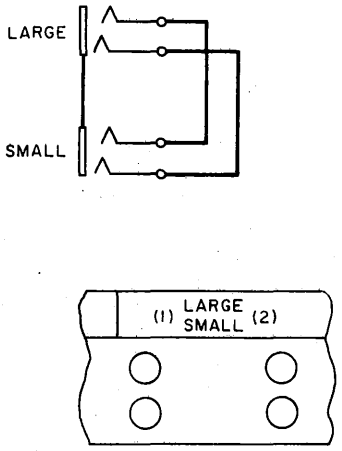


Fig. 20 – Profile Plug Conversion Jacks (Line Test and Patch Bay)

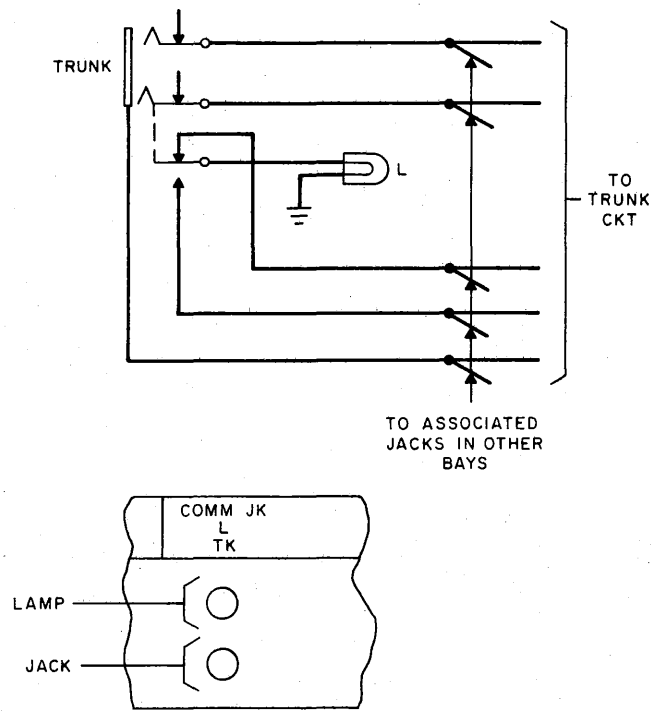


Fig. 21 – Communication Trunk Jack and Lamp Circuit (Line Test and Patch Bay)

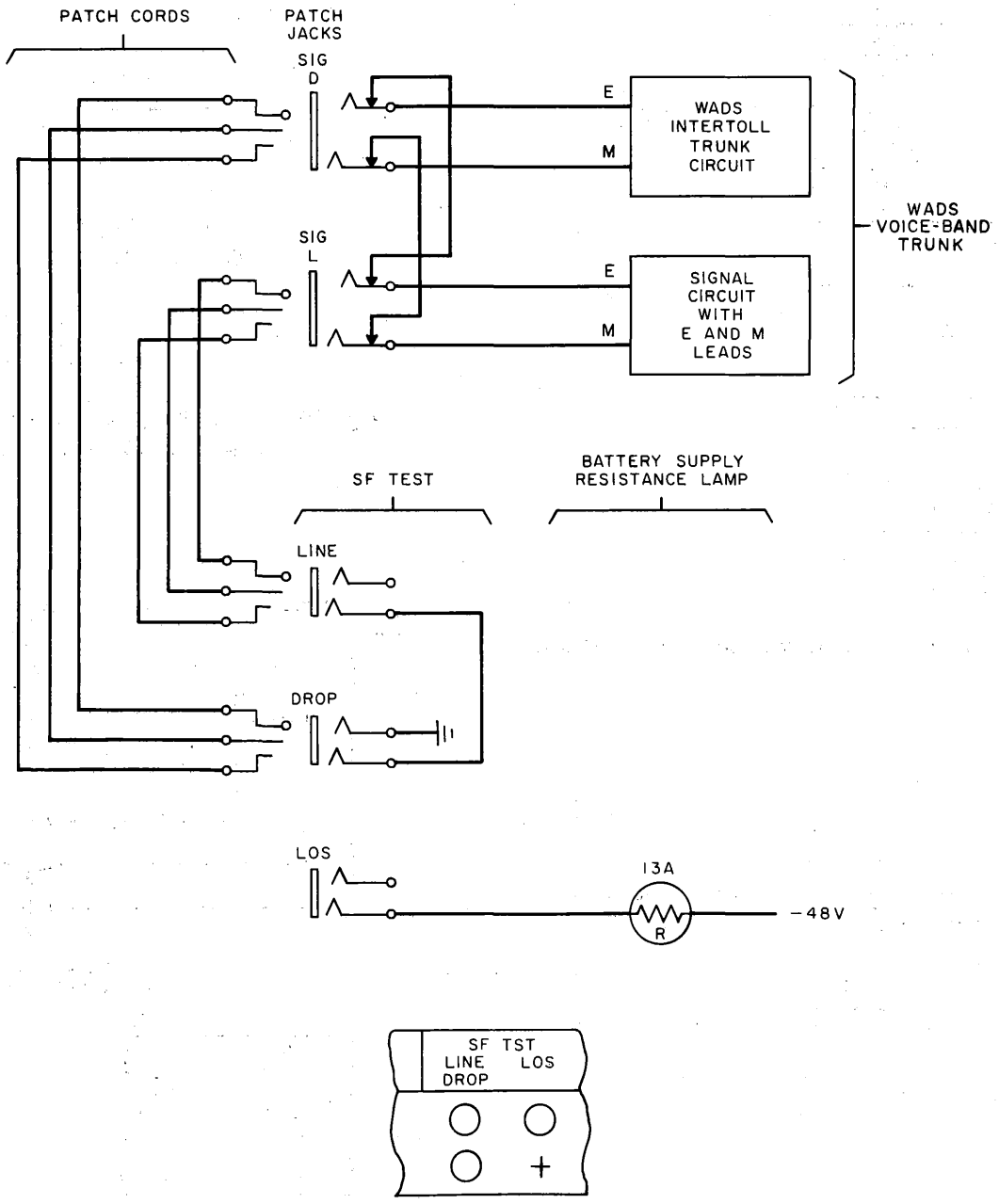


Fig. 22 – Single Frequency Signal Test Jacks and Battery Supply Resistance Lamp

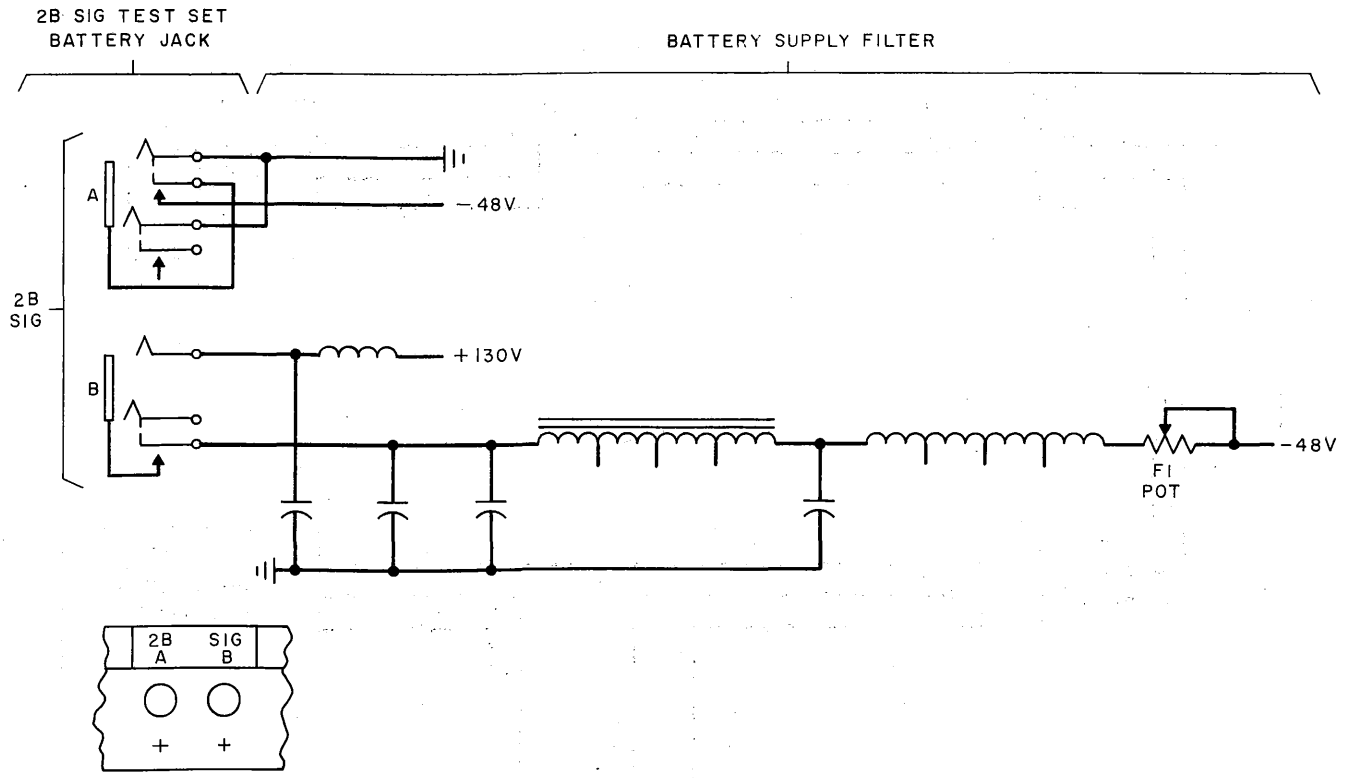


Fig. 23 – 2B Sig Test Set Battery Jack and Battery Supply Filter

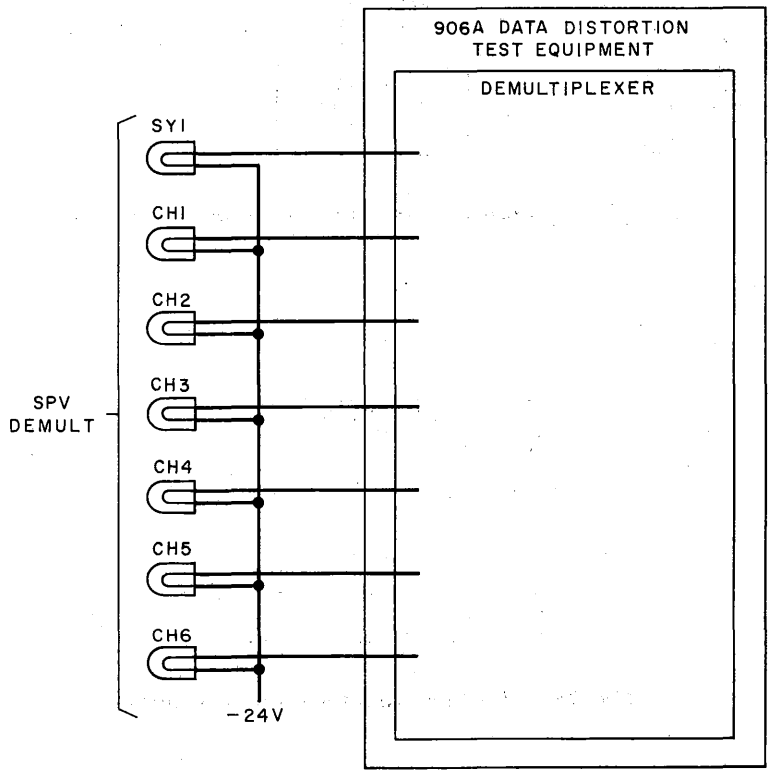


Fig. 24 – B1 Data Terminal Supervisory Lamp Display

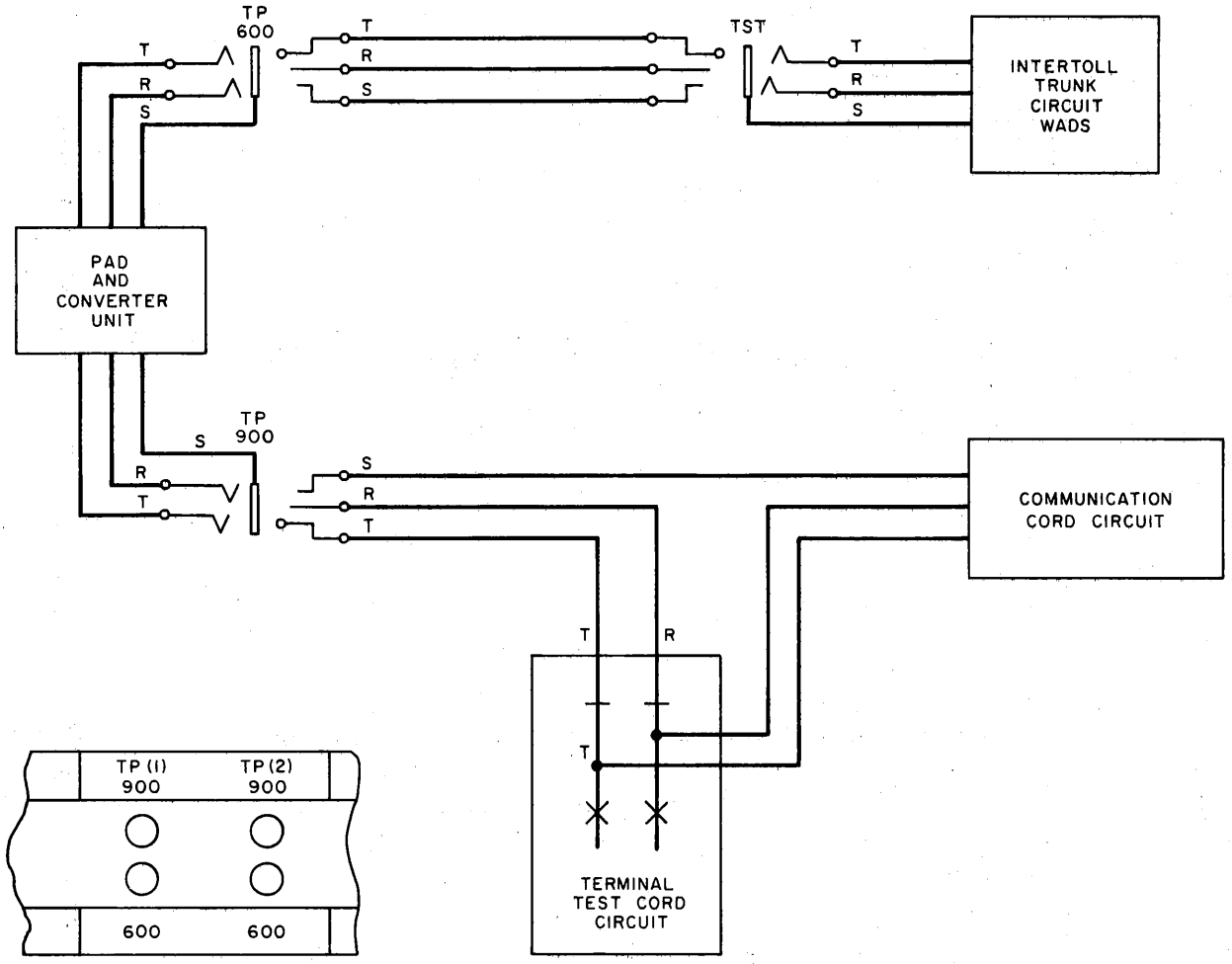


Fig. 25 – Impedance Matching Jack and Pad Circuit

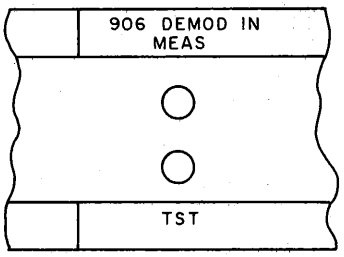


Fig. 26 – 906 Demodulator Input Test Jacks

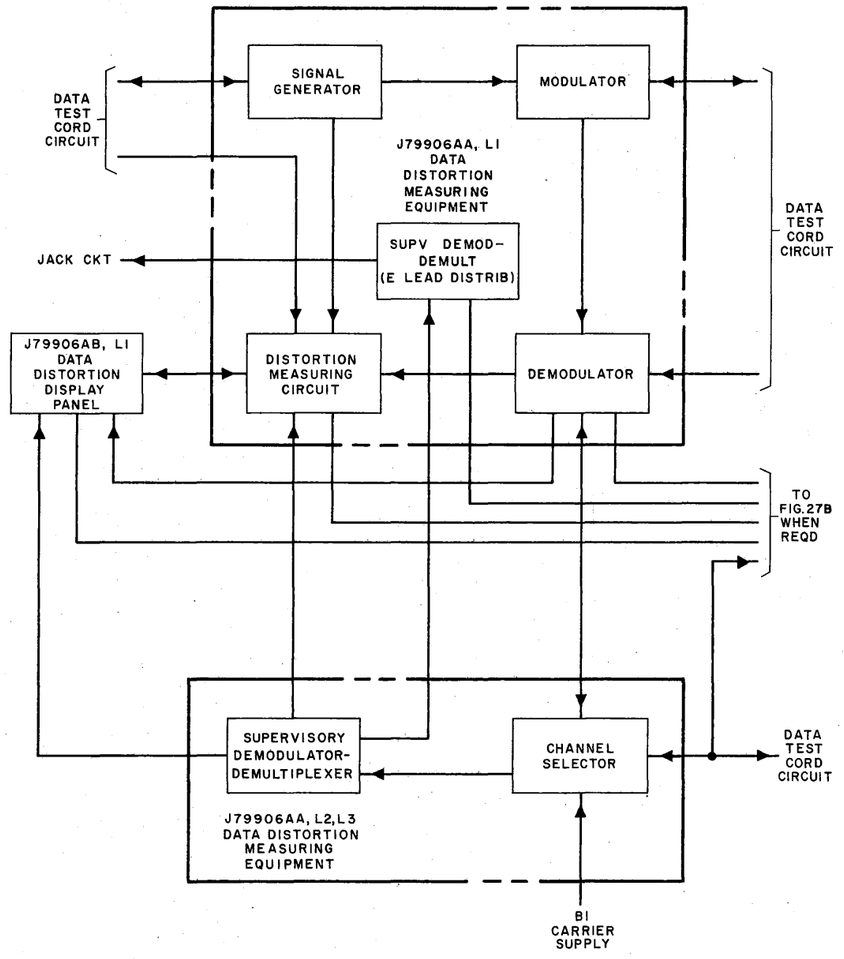


Fig. 27A

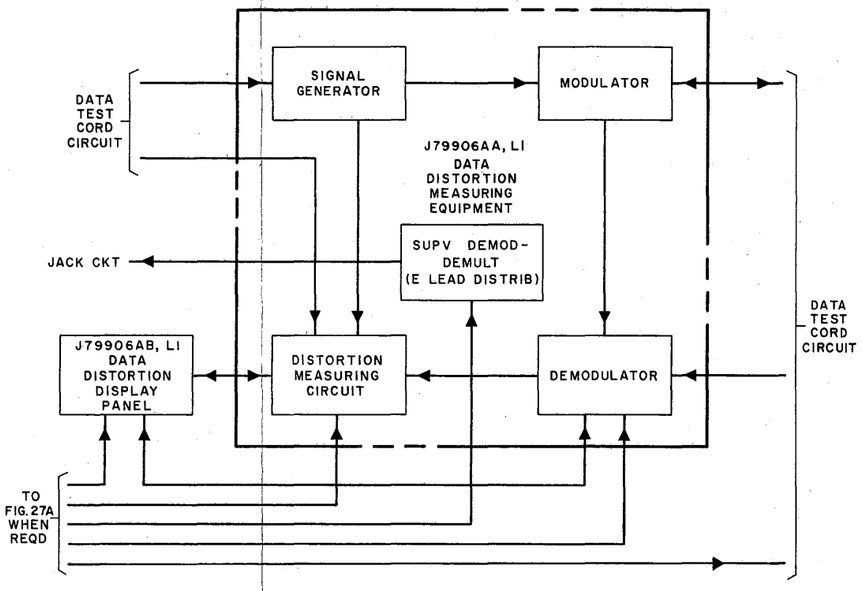


Fig. 27B

Fig. 27 – 906A Data Distortion Test Circuit — Block Diagram

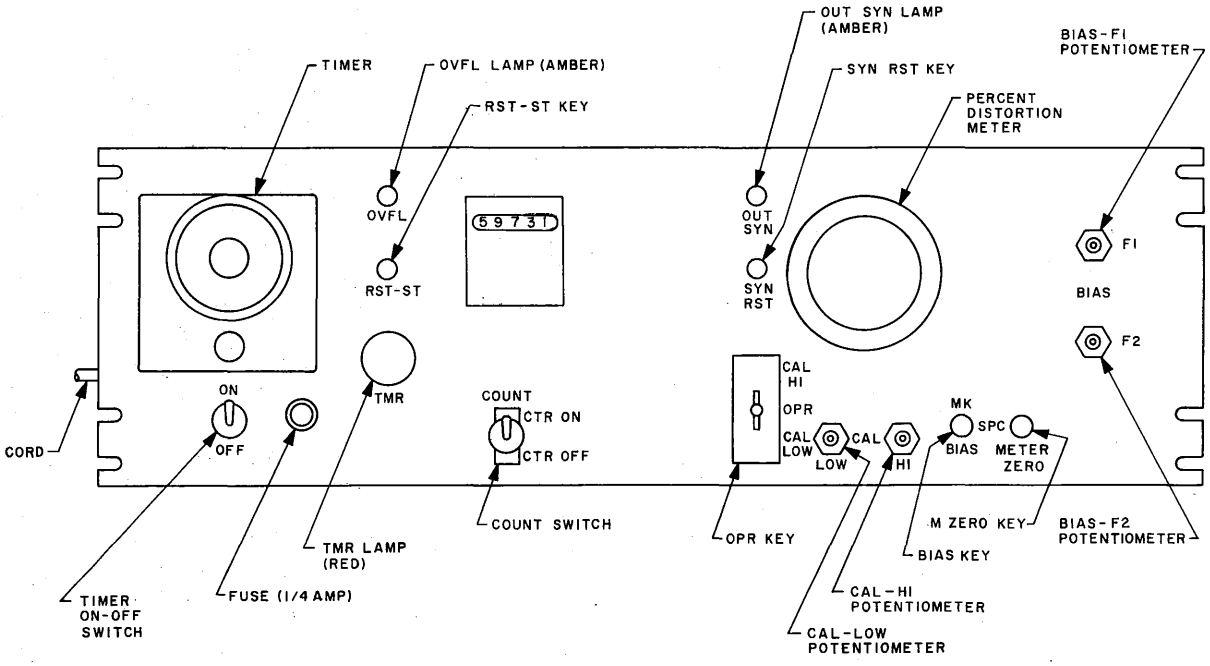


Fig. 28 – 906A Data Distortion Display Unit — Front Panel Controls and Indicators