

18B TESTBOARD

DESCRIPTION AND OPERATING PRINCIPLES

| <u>CONTENTS</u> | <u>PAGE</u> |
|--|-------------|
| 1. GENERAL | 1 |
| (A) Testing Facilities | 1 |
| (B) Equipment Layout | 2 |
| 2. EQUIPMENT ARRANGEMENTS | 2 |
| (A) General Appearance | 2 |
| (B) Face Equipment | 4 |
| (C) Key Shelf and Plug Shelf | 6 |
| (D) Lower Unit | 7 |
| (E) Patching Cords and Plugs | 7 |
| 3. DESCRIPTION OF CIRCUITS | 7 |
| (A) Primary and Telegraph Circuits | 7 |
| Primary Test Circuit | 7 |
| Key Functions | 7 |
| Wheatstone Bridge Test Circuit | 8 |
| Jack Arrangements | 8 |
| Primary Line Jack Circuits | 8 |
| Telegraph Line Jack Circuits | 8 |
| Telegraph Loop Terminal Jack Circuits | 8 |
| Miscellaneous Jack Circuits | 10 |
| Telegraph Test Set No. 3 | 10 |
| Holding and Recall Circuits | 11 |
| Cable Gas Pressure Alarm and Calling-In Signal | 11 |
| (B) Secondary Testing Circuits | 11 |
| Cord and Position Circuits | 11 |
| Key Functions | 11 |
| Dial Cord Dialing | 13 |
| Test and Out-of-Service Jack Circuits | 13 |
| Patching Jack Circuits | 13 |
| Signal Testing Circuit | 14 |
| Through Patching Circuit | 15 |
| Timed Ringing Circuit | 15 |
| Telephone Order Wire Circuit | 15 |
| (C) Transmission and Noise Measuring Circuits | 15 |
| 40B Transmission Measuring System | 15 |
| 43A Noise Measuring System | 15 |
| (D) Talking Trunks | 16 |

1. GENERAL

- 1.01 This section describes the equipment, circuits and operating principles of the 18B toll testboard.
- 1.02 The 18B toll testboard is an equipment arrangement designed for making primary and secondary tests on intertoll trunks, for testing telegraph circuits and for making primary and secondary patches

in offices having No. 3 toll switchboards and No. 11 switchboards.

1.03 The equipment and circuit sketches included in this section are for the purpose of illustrating the text. They may or may not agree in detail with a particular installation. If the exact wiring or equipment information is required, reference should be made to the drawings for the installation involved.

(A) Testing Facilities

1.04 The primary testing facilities provide means for analyzing line troubles by making voltage and current measurements, for locating faults with a Wheatstone Bridge by either Varley loop or open location measurements and for talking, monitoring and 20-cycle ringing on toll lines or on teletype-writer subscriber lines. Primary line jacks are on a four-jack basis and provide access to open wire or to cable lines for testing or for patching purposes.

1.05 Telegraph testing facilities may be provided when required and include the use of the volt-milliammeter for line and loop current measurements, a No. 3 telegraph test set for communicating and monitoring or a portable monitoring teletypewriter. Telegraph lines may be provided on a two-jack basis to obtain an appearance between the telegraph legs of the composite sets and the line sides of the telegraph repeaters for testing and monitoring purposes.

1.06 The secondary test cords and the position circuit provide means for the making of busy tests, monitoring, talking, ringing, dialing or key pulsing and miscellaneous other tests. Many of the associated testing units are terminated on jacks rather than on key contacts and cords, thus reducing the amount of equipment on the key staff. Access to intertoll trunk circuits for making secondary tests is obtained through the use of jacks designated TEST, which are simply an appearance at the testboard of the switchboard intertoll trunk circuit multiple. Out-of-service jacks which are associated with the TEST jacks are designated OS and provide means for making circuits appear busy so that they may be taken out of service.

1.07 Where it is desired to provide patching arrangements for interchanging the line and drop equipments of ringdown intertoll trunks, the trunks are wired to patching jacks which are located in the jack field of the toll testboard. These patching jacks together with those furnished in connection

SECTION 664-600-100

with full period talking circuits and long line circuits provide means for rearranging the line facilities in the required manner and are also used for testing purposes.

1.08 The signal testing circuit is an arrangement for picking up a line at the patching jacks and provides for the making of signaling tests toward either the line side or toward the drop side of trunks. Sectional transmission or noise measurements may also be made with this device.

1.09 1000-cycle transmission measurements on intertoll trunks are made by means of the 40B transmission measuring system which has jacks, keys and other equipment mounted in the face of the testboard. Part of this equipment includes means for making zero level sensitivity tests on trunks equipped with echo suppressors. Multi-frequency transmission measurements may also be made by the use of an oscillator mounted at the toll testboard or by means of a jack-terminated trunk arranged for patching to a multi-frequency measuring bay.

1.10 Noise or noise and crosstalk volume tests may also be made on the trunks by means of the 43A noise measuring system.

(B) Equipment Layout

1.11 The equipment is mounted on standard 23-1/2 inch relay racks on frames 11-1/2 feet high, and consists of units furnished in accordance with the requirements of the individual positions. The key shelf is located 3 feet, 4 inches above the floor line.

1.12 The jack field is made up of jack mountings wired to meet the particular requirements of the office and consists of the required number of primary line jacks, telegraph line jacks or loop terminals, patching jacks, test and out-of-service jacks and miscellaneous jacks, keys and lamps associated with the various testing units and trunks.

1.13 The number of equipment units which may be provided on the key shelf vary with the testing requirements of the position. A fully equipped position consists of primary test cords with associated keys, lamps and a volt-milliammeter, a telegraph cord, a telegraph key, a Wheatstone Bridge, secondary test cords and associated keys and lamps, a dial or key set and a dialing cord where dial cord dialing is used.

2. EQUIPMENT ARRANGEMENTS

(A) General Appearance (See Figs. 1 and 2)

2.01 The front view of a typical single position is shown in Fig. 1. The jack field of such a position includes primary line jacks, telegraph line jacks, TLT jacks, patching jacks, test and out-of-service jacks

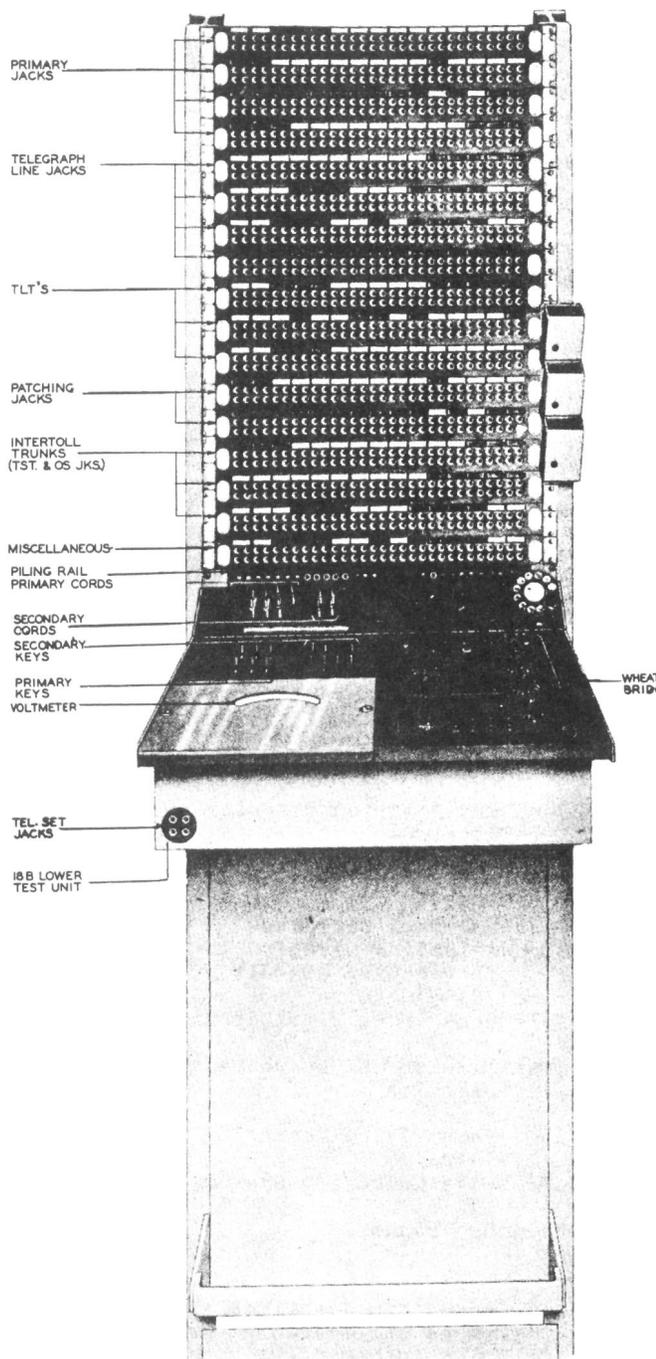


Fig. 1 - 18B Lower Test Unit with Jack Field for Single Bay Installations

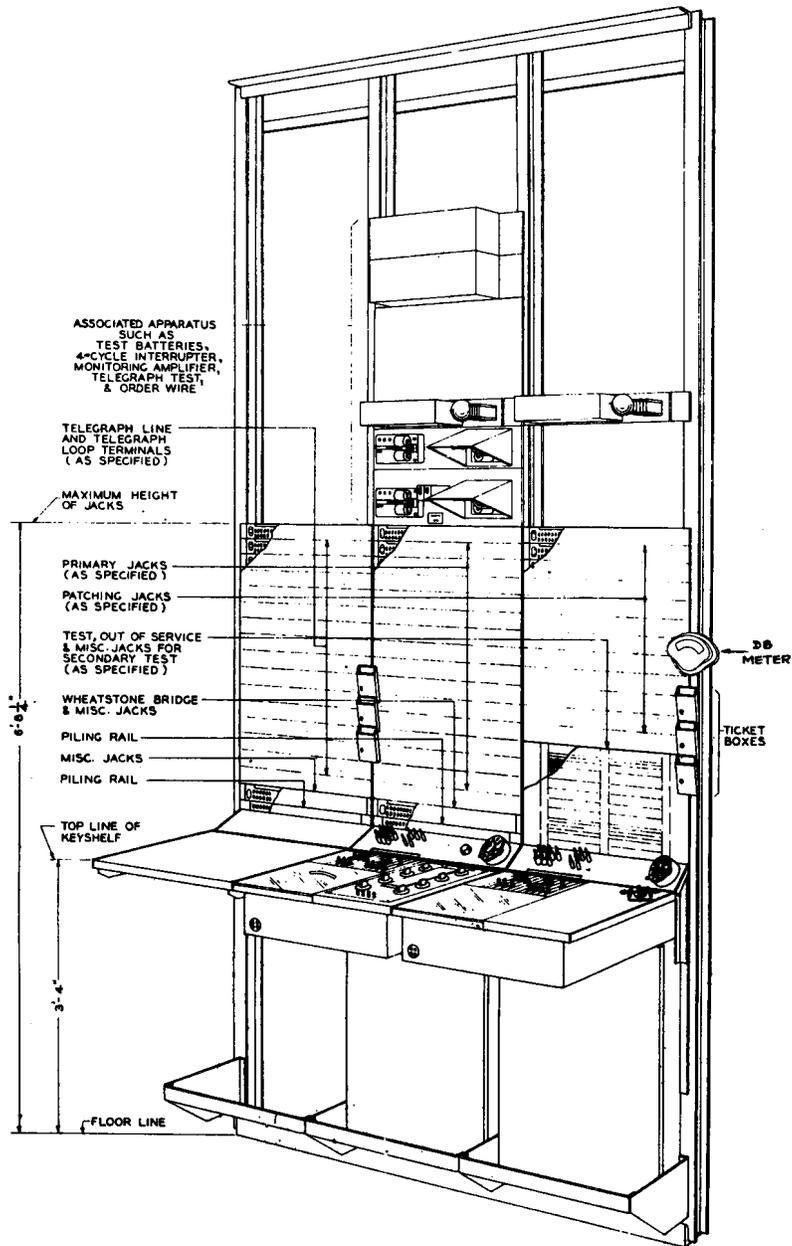


Fig. 2 - Typical 18B Three Position Installation

SECTION 664-600-100

together with miscellaneous jacks, keys and lamps for the various types of testing equipment, talking trunks, etc. A typical three-position layout is shown in Fig. 2.

(B) Face Equipment

2.02 As indicated in Figs. 1 and 2, the test and out-of-service jacks and the miscellaneous jack mountings are located in the lower part of the jack field. This section of the jack field may be arranged either on a single or on a two-panel basis. The two-panel arrangement consists of 92-type switchboard jacks which are mounted in units of 20 jacks per strip. Typical mounting units in the two-panel section are shown in Fig. 3.

2.03 In the single-panel section, each mounting strip is equipped with two rows of jacks, each row containing 30 or 34 jacks. Typical mounting units of this kind are shown in Fig. 4.

2.04 The test jacks are mounted just above the corresponding out-of-service jacks in each row. These are designated TEST and OS, respectively, as shown in Fig. 4A.

2.05 The jacks and keys associated with the signal testing circuit are located on a mounting strip in the lower part of the jack field. Fig. 3B shows the arrangement when this equipment is mounted in the two-panel section.

2.06 Jacks and keys for the 40B transmission measuring system and for the 40A noise measuring system are also mounted in the lower part of the jack field. Typical arrangements of this kind are shown in Figs. 3C and 3E.

2.07 Patching jacks when furnished in the position are mounted just above the TEST and OS jacks. Four jacks are used per circuit providing line and drop appearances for the tip, ring, signal and pad control wires of a terminating circuit. 4C shows the mounting arrangement of these patching jacks.

2.08 Through patching circuits provide means for connecting ringdown trunks together for making up through circuits. These circuits terminate in four jacks which are mounted in the patching jack section of the jack field.

2.09 TLT and telegraph line jacks when furnished are generally mounted above the patching jack section of the jack field. Mounting units of this kind are shown in Figs. 4D and 4E.

2.10 Primary line jacks are located at the top of the jack field. Four jacks are required for each line, providing access to the line or to the equipment for testing or for patching purposes. Mounting units are shown in Fig. 4B.

2.11 When the position is equipped for key pulsing and a dial is also required for dialing on local trunks, provisions are made for mounting this dial on the right-hand frame upright.

2.12 A three-compartment ticket box is arranged for mounting on the right-hand frame upright.

2.13 Two types of meters are available for use with the transmission or noise measuring equipment. For a small installation, the meter is mounted on a swivel bracket either on the left or on the right frame uprights. For larger installations, the projection type meter and screen is generally furnished. These are supported overhead at a height suitable for observation from any position in a lineup.

2.14 The space above the jack field is used for the mounting of various units of equipment such as the miscellaneous apparatus panel, the telegraph order wire and sounder, the position monitoring amplifier, the four-cycle interrupter associated with the Wheatstone Bridge circuit and the cabinet which holds the dry batteries.

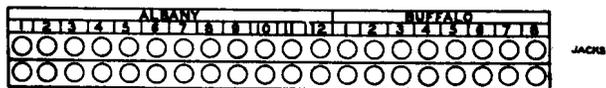


Fig. 3A

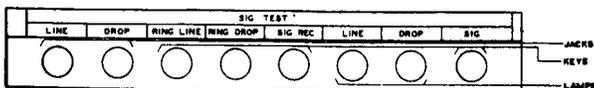


Fig. 3B

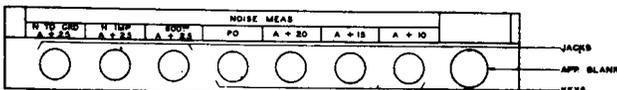


Fig. 3C

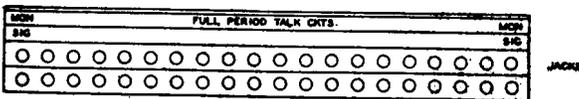


Fig. 3D

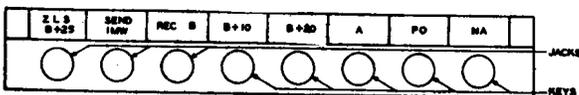


Fig. 3E

Fig. 3 - Typical Face Equipment Mounting Units - Two-Panel Section

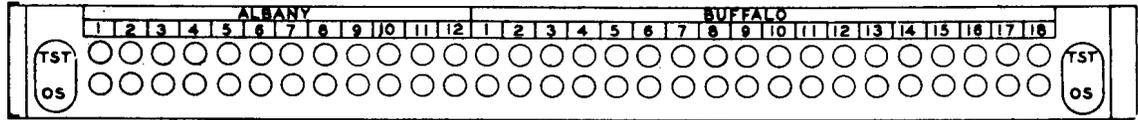


Fig. 4A

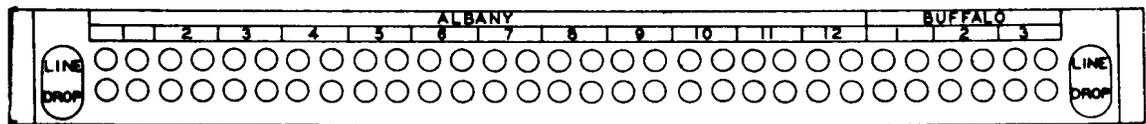


Fig. 4B

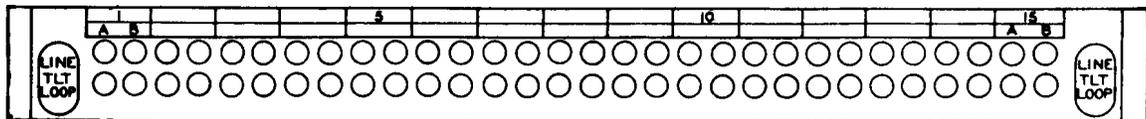


Fig. 4C

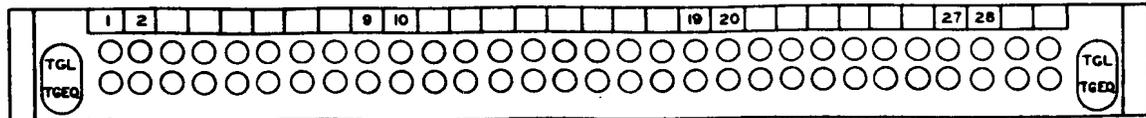


Fig. 4D

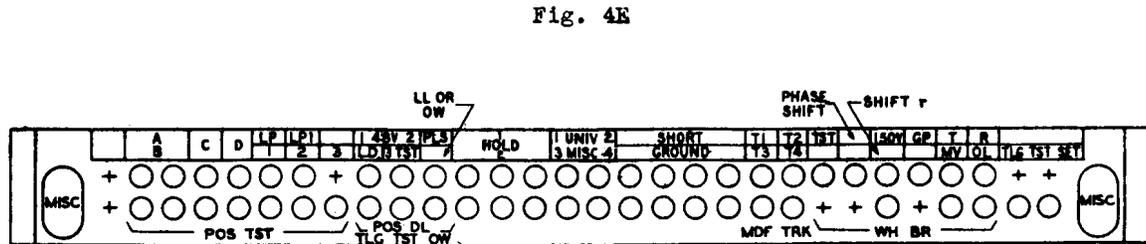


Fig. 4E

Fig. 4 - Typical Face Equipment Mounting Units - Full Width of Bay

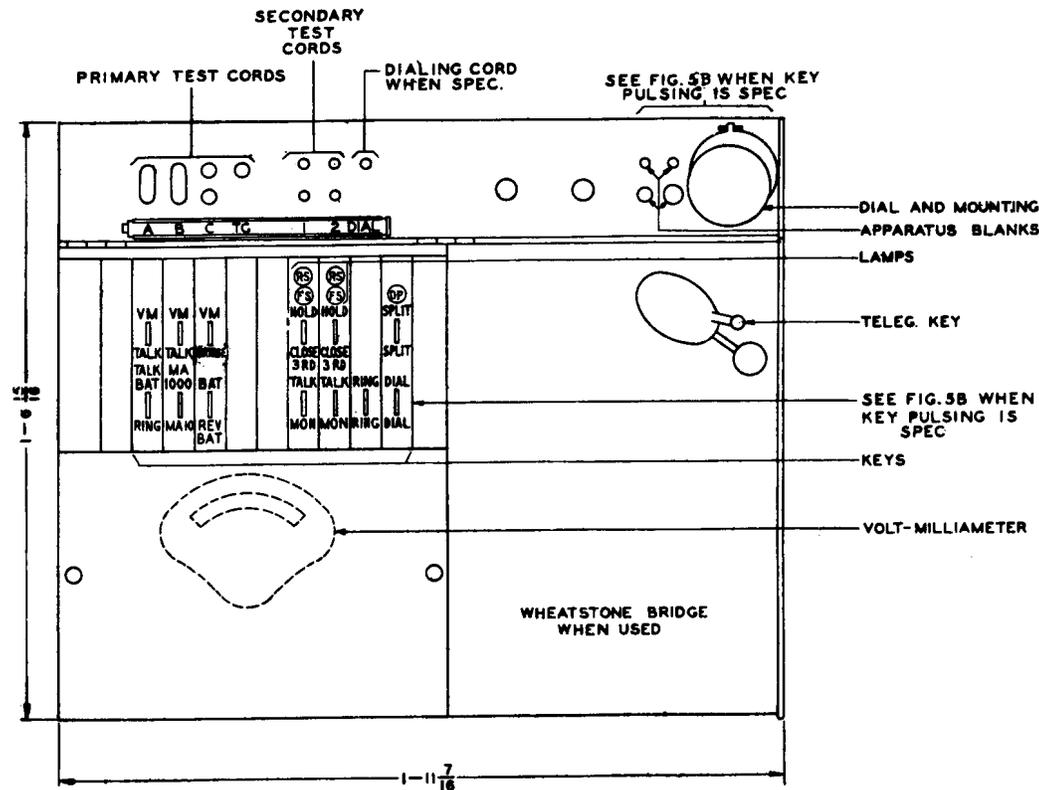


Fig. 5A

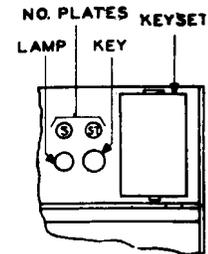


Fig. 5B

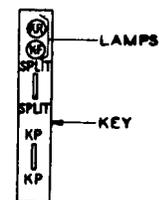


Fig. 5C

Fig. 5 - Keyshelf and Plugshelf

(C) Key Shelf and Plug Shelf

2.15 Fig. 5 is a plan view of the key shelf and plug shelf. The equipment shown may be divided into three principal functional groups as follows: the volt-milliammeter test circuit and primary test cords, the Wheatstone Bridge, and the secondary test cords and associated circuits.

2.16 The volt-milliammeter testing equipment is located at the extreme left of the key shelf and includes a volt-milliammeter and primary test and talking keys. These keys provide for connecting the volt-milliammeter circuit to any of the plugs in the primary test circuit. The test cords which are located at the extreme left side of the plug shelf include two twin plugs, designated A and B, two single conductor plugs, designated C, and a single two-conductor plug designated TG. The last mentioned is used for measuring telegraph currents and for talking on teletypewriter station loops.

2.17 Just to the right of the primary cords are located two pairs of double-ended secondary test cords while in line with these cords and just to the right of the primary keys are located the associated secondary keys and supervisory lamps.

2.18 Keys which are common to the position and which control the dialing or key pulsing circuits as well as ringing are mounted to the right of the secondary keys.

2.19 The dialing cord when used is located in the rear position to the right of the secondary cords.

2.20 The volt-milliammeter is located in front of the keys and under the left half of the key shelf. A glass bulletin holder covers the space from the keys to the front of the position and is used to file information frequently used such as order wire code numbers, etc.

2.21 The dial or key set occupies the position at the extreme right of the plug shelf. Figs. 5B and 5C show the alternate arrangements when key pulsing instead of positional dialing is provided.

2.22 The Wheatstone Bridge when furnished is located on the right side of the key shelf. The jack terminations and keys for the bridge are mounted in the miscellaneous jack strip. When a bridge is not provided in the position, a blank shelf is furnished which serves for a writing shelf. A telegraph key associated with the No. 3 telegraph test set may be provided on this shelf if required.

2.23 To provide access to the keys for maintenance purposes, the construction of the key shelf is such that the part containing the keys may be raised independently of the part which acts as the writing shelf or which mounts the Wheatstone Bridge.

(D) Lower Unit

2.24 The space under the key shelf and to the rear of the bay is used to mount relays, condensers, resistances, etc. associated with the primary and secondary testing circuits. A cord protection panel made of sheet steel faced with linoleum is hung on the uprights and serves to protect the wiring of the apparatus from the cords and cord weights. A removable front panel protects the apparatus below the key shelf. At the bottom of the position is an insulated foot rail.

(E) Patching Cords and Plugs

2.25 Various types of patching cords are used with the 18B toll testboard. Some are equipped with single plugs and some with double plugs. The double plugs are knurled on one side and when inserted in a jack, the knurled side should be at the left or at the top.

2.26 Cordless plugs of various types are used at the 18B toll testboard. Some of these are of the dummy variety and are used to open circuits associated with out-of-type jacks while others are arranged with the sleeve and ring short-circuited and are used in connection with out-of-service jacks to remove trunks from service.

3. DESCRIPTION OF CIRCUITS

(A) Primary and Telegraph Circuits

Primary Test Circuit (See Fig. 6)

3.01 This circuit provides means for making the following volt-milliammeter tests on intertoll trunks or on telegraph circuits:

- Voltage of test battery
- Continuity and resistance measurements
- Foreign potentials
- Grounds and crosses
- Insulation resistance
- Capacitance tests
- Measurement of telegraph currents

3.02 Either of the twin plugs A or B, the single plug TG or the two single plugs C are used to provide connections to the circuit under test when making volt-milliammeter tests. When making these tests the VM key corresponding to the cord used must be in the operated position. The single cord TG is used to measure telegraph currents and to talk over teletypewriter loops.

Key Functions

3.03 All keys normal - Under this condition, the meter is used as a 100,000-ohm volt-meter and is connected in series with the tip and ring of the test cord which has its associated VM key operated. Under this condition the meter scale reads in volts and the full scale deflection is 150. External potentials across the tip and ring of a line may thus be measured or a potential from

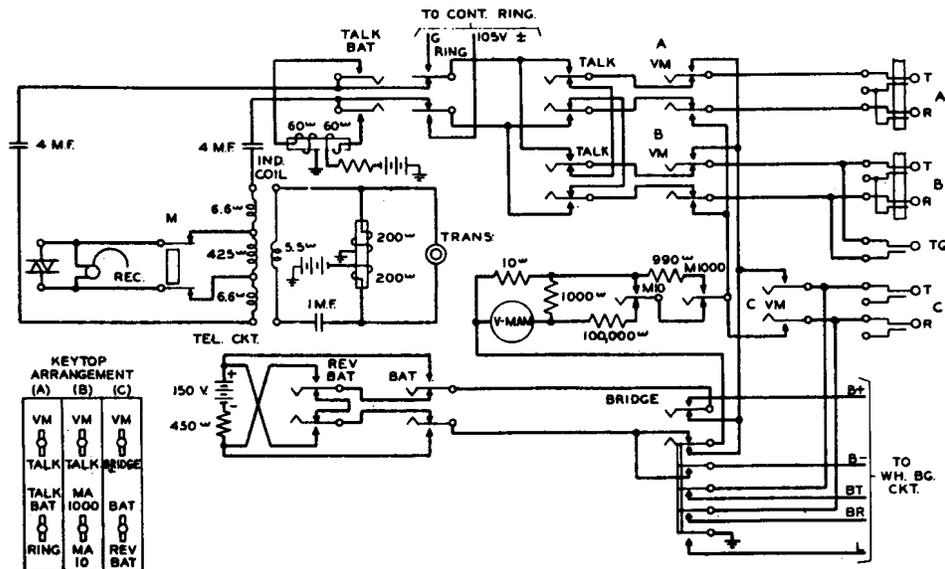


Fig. 6 - Primary Test Circuit

ground may be measured on the tip or ring of a line by inserting the ring plug of the C cord into a grounded jack while the tip plug of the C cord is inserted in the tip or ring jack of the line under test.

3.04 **MA1000** - The operation of this key converts the meter to a 1000-ohm milliammeter or voltmeter. Under this condition the meter scale reads in milliamperes or volts, respectively, and full scale deflection is 150.

3.05 **MA10** - The operation of this key converts the meter to a 10-ohm milliammeter for any required test. Under this condition, the meter scale reads in milliamperes and full scale deflection is 150.

3.06 **BAT** or **REV BAT** - When either of these keys is operated, the test battery is connected in series with the volt-milliammeter, thus providing for the making of continuity, resistance or capacitance measurements across the tip and ring of the line under test. Under this condition, the voltage of the test battery may be measured by connecting test cords A or B to short-circuited jacks. Leaks to ground may be measured on the tip or ring by connecting the ring plug of the C cord to a grounded jack while the tip plug of the C cord is connected to the tip or ring jack of the line under test. Capacitance tests either across the tip and ring of the line or from the tip or ring of the line to ground are made in the same manner or, if desired, successive deflections in opposite directions may be obtained by alternately operating the **BAT** and the **REV BAT** keys.

3.07 **TALK** - The operation of a **TALK** key connects the associated cord to the position telephone circuit. When talking to an outside repairman or to a teletypewriter subscriber, talking battery may be supplied to the trunk if necessary by the operation of the **TALK BAT** key. 20-cycle ringing current may be connected if required by the operation of the **RING** key. In case a 20-cycle recall signal is expected, the connection is patched to a jack-ended holding circuit which is described in another paragraph under jack circuits.

Wheatstone Bridge Test Circuit

3.08 This arrangement provides facilities for making measurements such as:

- Loop resistance
- Insulation resistance
- Crosses and grounds
- Varley loop
- Resistance unbalance
- Capacitance or open location measurements

3.09 The detailed description of the KS-3011 Wheatstone Bridge and of its associated test circuit is covered in

other sections of the E40 series of B.S.P.'s. For the methods to be followed in making these tests in connection with the 18B toll testboard, reference should be made to the E30 series of B.S.P.'s covering the Wheatstone Bridge and its associated test circuit.

3.10 Connection of the Wheatstone Bridge test circuit to the circuit under test is provided by means of the two single plugs C and the operation of the **BRIDGE** key. Resistance measurements with d-c or capacitance measurements with a-c may also be made by connecting the apparatus or circuit to be tested across the T and R binding posts on the top of the bridge. The four-cycle current supply circuit is used in connection with the Wheatstone Bridge test circuit when making capacitance and open location tests.

Jack Arrangements (See Figs. 7 and 8)

3.11 The general testing and patching arrangement of primary, secondary and telegraph jack circuits associated with intertoll ringdown and intertoll dialing trunks is shown in Fig. 7. The arrangement for master office trunks is similar except that patching jacks or OS jacks are not provided. Full period talking circuits and long line circuits are arranged in a similar manner except that the jack which provides access to the tip and ring of the trunk is designated **MCN** instead of **TEST** and the OS jack is not provided. Fig. 8 shows the arrangement for through lines.

Primary Line Jack Circuits

3.12 The line conductors from the distributing frame and connections from the toll office equipment are terminated at these jacks, thus providing means for patching or for testing the line or its associated equipment. The tests are made by connecting the primary test cords A, B or C to the **LINE** or to the **EQ** jacks. By means of these jacks, toll lines and toll equipment may be patched in any manner required by the use of two-conductor patching cords equipped with twin plugs.

Telegraph Line Jack Circuits

3.13 These jacks, which are shown just below the primary line jacks in Fig. 7, are used for terminating or patching telegraph lines and equipment. The **TGL** jacks are connected to the line while the **TG EQ** jacks are connected to the repeater or to the telegraph subscriber loop. The sleeve of the **TG EQ** jack is strapped in such a manner as to permit the measuring of telegraph currents, using the **TG** test cord in the primary test circuit for this purpose.

Telegraph Loop Terminal Jack Circuits

3.14 These jacks, which are designated **TLT**, are shown in Fig. 7. They are used for testing and patching telegraph subscriber loops, neutral telegraph lines and telegraph repeaters.

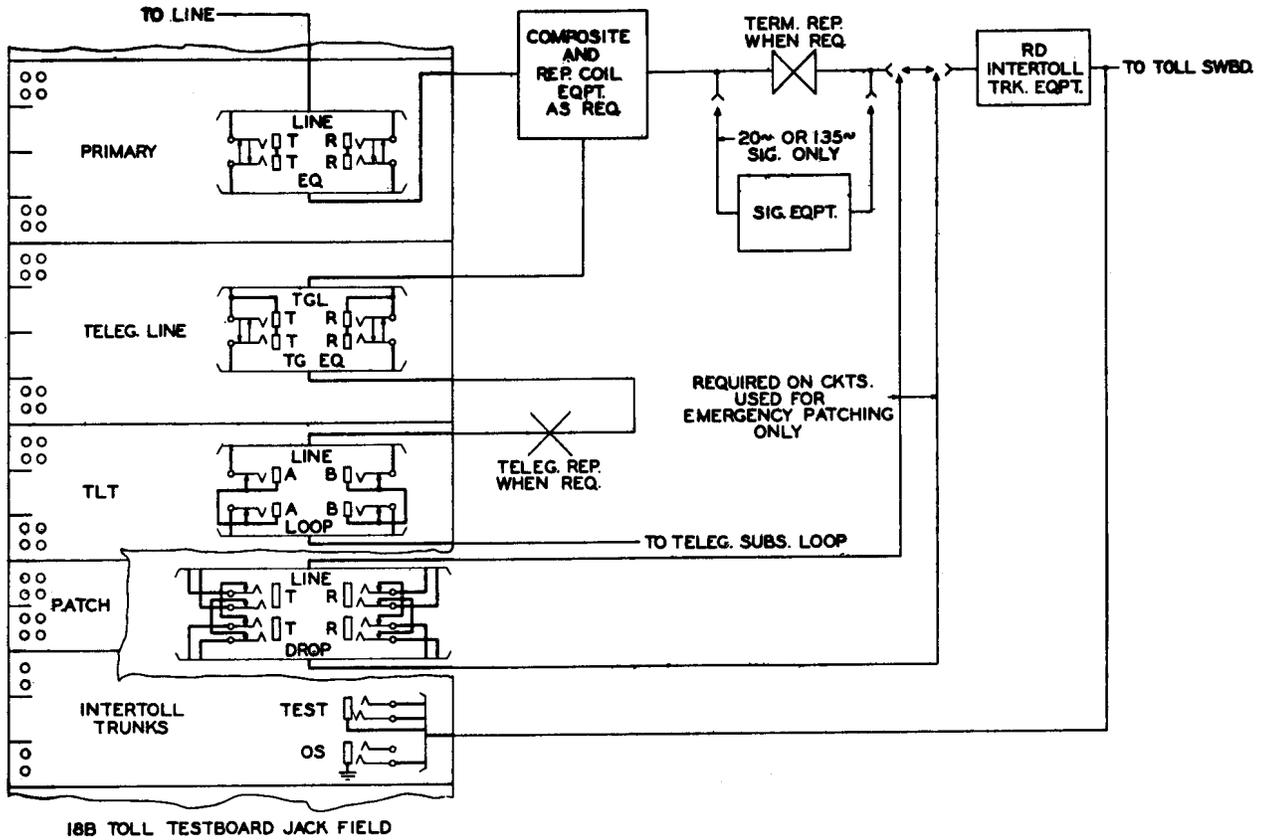


Fig. 7 - Testing and Patching Arrangement - Intertoll Ringdown Trunk

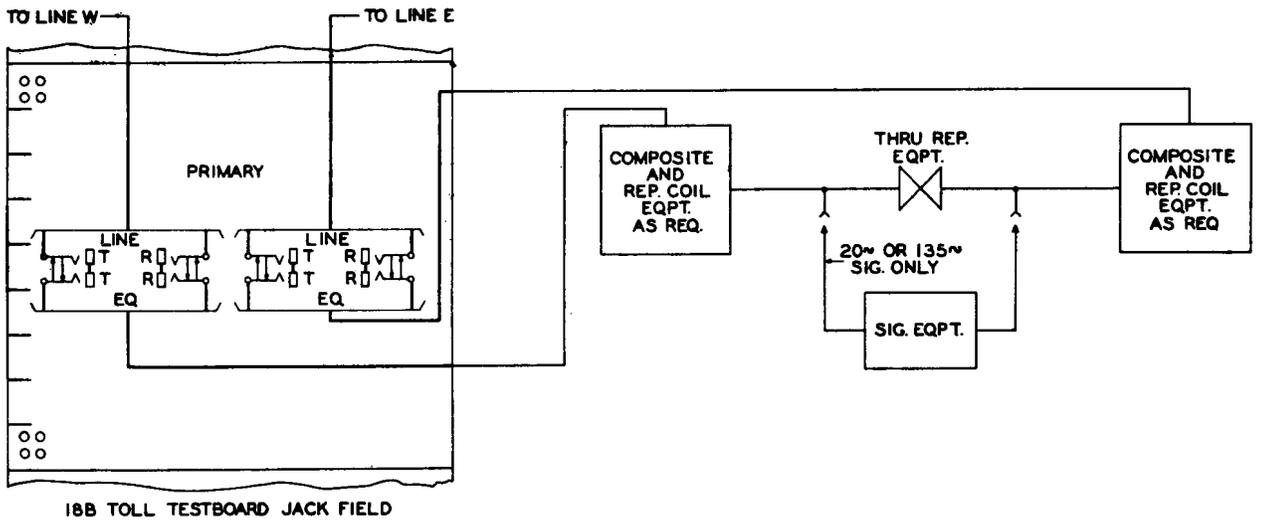


Fig. 8 - Testing and Patching Arrangement - Through Circuit

Miscellaneous Jack Circuits (See Fig. 9)

3.15 Fig. 9A shows the single jack arrangement which may be used for various purposes as follows:

(1) As a spare battery or spare ground tap, when it is desired to attach the battery or ground tap in place of the one normally associated with a telegraph loop terminal.

(2) As a sending leg battery jack, with balanced loop telegraph repeaters which are not equipped with a switch for reversing the polarity of the battery connected to the loop apex when the repeater is operated on a full duplex basis.

(3) As a series looping jack, providing ready means for picking up the spare test wires throughout the testboard.

(4) As a receiving leg battery jack for open and closed loop repeaters not equipped with a key for reversing the receiving leg battery and only for such of these repeaters as may be using full duplex for temporary intermediate operation with repeaters using balanced loops.

(5) As terminating jacks for terminating the legs of a 48-130-volt interconnecting single line repeater, providing means for patching the single repeaters between 130-volt terminal repeaters and 48-volt loops and vice versa.

3.16 Fig. 9B shows splitting and turnover jacks which may be used to provide additional outlets to a circuit for connecting either temporarily or permanently additional subscriber loops, monitoring testing circuits, monitoring teletypewriters or telephone test wires. The tip and ring conductors of a circuit may be separated by patching the circuit into the SPLIT L jack with a two-conductor patching cord. The tip of the circuit may be picked up at the SPLIT T jack and the ring of the SPLIT R jack. The tip and ring conductors of a circuit may be turned over by patching the circuit to the TO L jack and patching it up at the TQ jack.



Fig. 9A

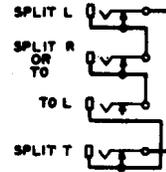


Fig. 9B

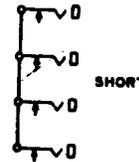


Fig. 9C



Fig. 9D

Fig. 9 - Miscellaneous Jack Arrangements

3.17 Figs. 9C and 9D are short-circuiting and grounding jacks for use in arranging conductors for wheatstone Bridge measurements and for volt-milliammeter tests.

Telegraph Test Set No. 3 (See Fig. 10)

3.18 This circuit is normally used in connection with a telegraph loop terminal circuit or with a telegraph line as an order wire for communicating with other offices or test positions. It can be used with any other telegraph circuit by patching to the desired circuit. The LD jack provides for measuring telegraph currents or for patching additional circuits.

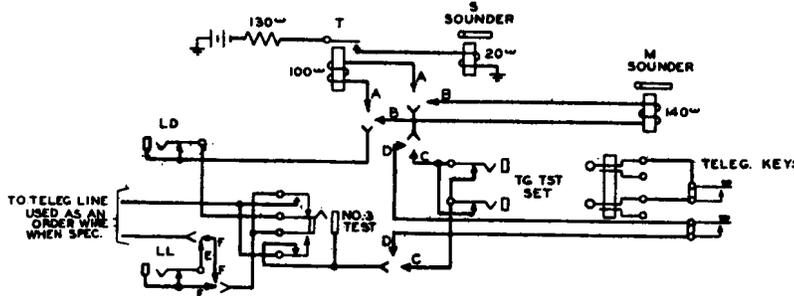


Fig. 10 - Telegraph Test Set No. 3

Holding and Recall Circuits (See Fig. 11)

3.19 This circuit when patched to the line side of the primary line jack circuit provides for the reception of incoming calls by lighting the HOLD lamp. A termination consisting of a 600-ohm resistance and a 1-mf condenser is placed across the tip and ring of the line at all times.

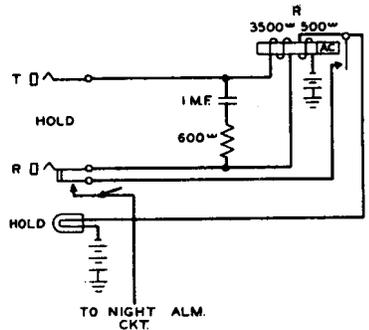


Fig. 11 - Holding and Recall Circuit

Cable Gas Pressure Alarm and Calling-in Signal

3.20 This circuit is arranged to operate an audible and visual alarm when the gas pressure in a cable falls below a given point. The audible alarm is silenced by operating the ALM key, while the PA lamp is under control of the pressure contactor in the cable or of the PA key in the test-board. A talking pair is also provided for answering calling-in signals when a cableman calls in from points on the cable. This talking pair terminates at the test-board in primary line jacks associated with a lamp designated TK. The call is answered with the primary test cord A or B. A non-locking key designated TK is also provided for the purpose of extinguishing the answering lamp when the cableman wishes to converse with the opposite end of the line.

(B) Secondary Testing Circuits

Cord and Position Circuits (See Fig. 12)

3.21 Fig. 12 is a combined diagram of the secondary test cord and position circuits. The following operating functions are performed by this apparatus:

- Busy testing
- Monitoring
- Talking
- Ringling
- Dialing or key pulsing
- Making connections

Key Functions

3.22 All Keys Normal - Under this condition, the tip and ring of the front and rear cords of each cord circuit are connected together, and the supervisory lamps are ar-

ranged to receive non-locked-in signals from either connection. Under this condition, a cord circuit may be used for connecting any two jack-ended circuits.

3.23 HOLD - The operation of this key connects terminations, each consisting of a 600-ohm resistance and a 1-mf condenser in series across the tip and ring of the front and of the rear cords. The sleeve circuit of each cord is connected to the supervisory lamps and battery, causing any connected toll circuits to appear busy. Non-locked-in incoming signals are received on the supervisory lamps.

3.24 MON - Operation of the monitoring key connects the associated cord circuit to the input of the monitoring amplifier and connects the induction coil and receiver of the position telephone set to the output of the monitoring amplifier. The sleeve circuit is normally open while monitoring so that trunks will not appear busy. When using one end of a cord pair for monitoring, the other end cannot be used for talking, dialing, key pulsing, holding or for any other purpose.

3.25 CLOSE 3RD - Operation of this key while monitoring makes the connected trunk appear busy and incoming signals will be indicated by the lighting of the associated supervisory lamp. If, while talking over one cord circuit (TALK key operated), it is desired to talk on trunks over another cord circuit at the same time, this may be done by operating the MON and CLOSE 3RD key of the other cord circuit.

3.26 TALK - Operation of this key connects the position telephone set to the cord circuit for talking and for making busy tests.

3.27 RING - This key, when operated forward will signal on a ringdown trunk connected to the front cord and when operated to the rear will signal on a ringdown trunk connected to the rear cord. Arrangements are included to prevent ringing, dialing or key pulsing on more than one cord at a time.

3.28 SPLIT - When the SPLIT key is operated to the front position with the TALK key operated, any trunk connected to the rear cord will be disconnected from the talking and position circuit and a 600-ohm termination will be placed across the tip and ring of the trunk. When the SPLIT key is operated to the rear with the TALK key operated, any trunk connected to the front cord will be disconnected from the talking and position circuit and will have a 600-ohm termination placed across the tip and ring. This will permit talking, monitoring, dialing, or key pulsing on the cord which is not terminated.

3.29 DIAL - This key connects the positional dialing equipment to the front or rear

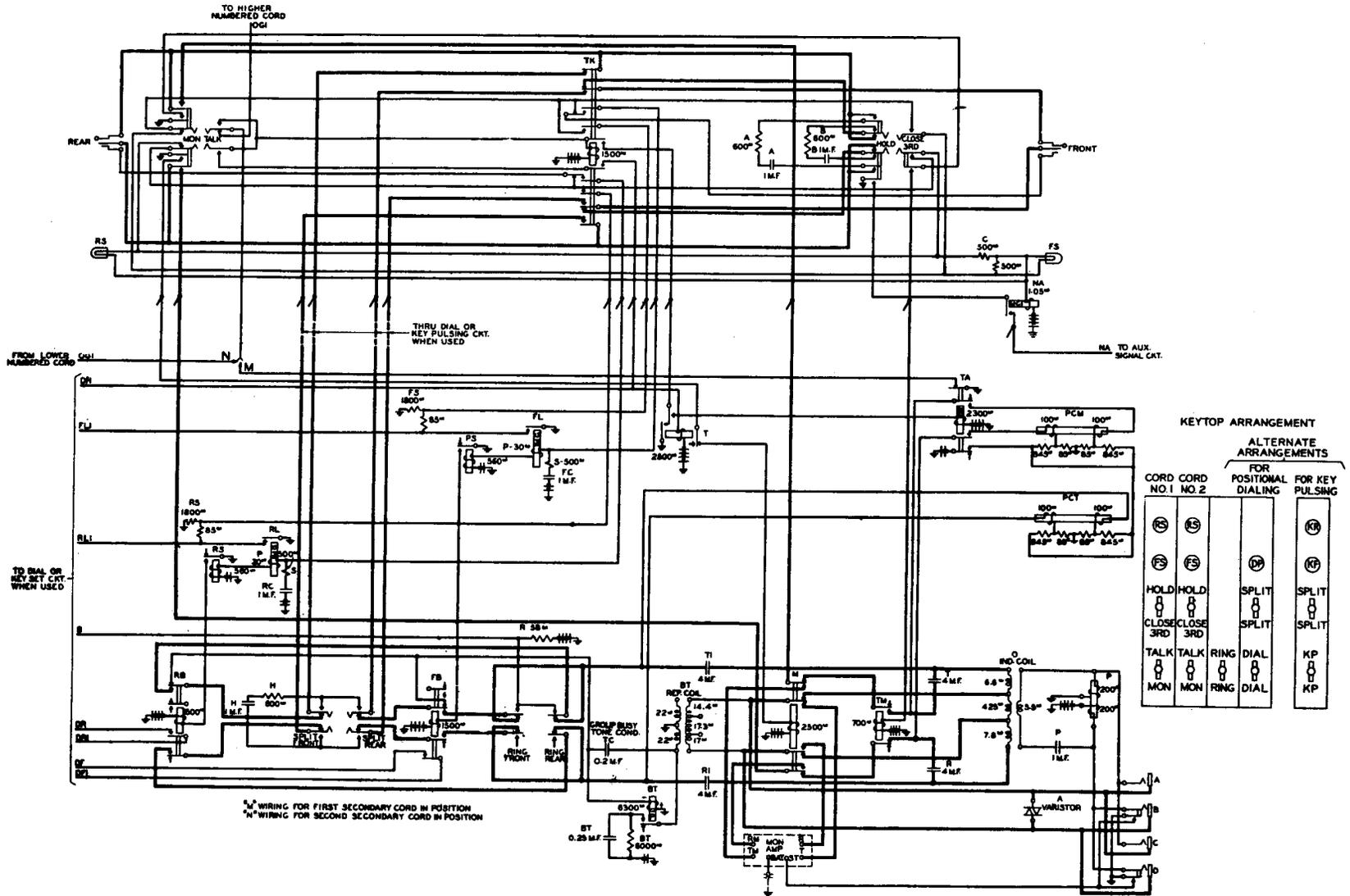


Fig. 12 - Secondary Cord and Position Circuits (Combined) - 18B Toll Testboard

cord toward which it is operated. An associated DP (red) lamp and the supervisory lamp light when the circuit is ready to receive dial pulses. If the cord is connected to a trunk arranged for stop dialing indication, the DP lamp and the supervisory lamp will be extinguished if the sleeve resistance of the trunk increases. This serves as a signal to stop dialing until the lamp lights again, when dialing may be resumed. These lamps flash at the rate of 60 or 120 interruptions per minute if a busy trunk or a busy line is reached. Another feature of the position dial circuit permits restoration of the TALK key of a cord circuit before all of the digits have been dialed without interfering with the completion of dialing. This interlocking device also permits the completion of dialing when the DIAL key is restored before the dial has fully returned to normal on the last digit.

3.30 KP - When key pulsing equipment is provided, the momentary operation of the KP key connects the key set to the trunk. When a sender has been reached, a red supervisory lamp designated S and located at the left of the key set provides an indication that a sender has been reached and that key pulsing may proceed. The lamps KP and KR which are located in the plug shelf behind the KP key provide the indication that the key set has become connected to the front or to the rear cord. The circuits are designed to take care of trunks which automatically release the key set or of trunks which require the momentary operation of the ST key as a signal that key pulsing has been completed. The ST key is located just to the left of the key set.

Dial Cord Dialing (See Fig. 13)

3.31 When the position is equipped for key pulsing and provisions for dialing on local trunks are also required, an additional jack is provided for each appearance of the multiple jacks of the dialing trunk. These jacks are located just above the multiple jacks and are designated DIAL. The dial in this case is installed on the vertical framework because the space at the right end of the plug shelf is occupied by the key set. The dial pulsing contacts are wired to a dial cord, installed at the right of the secondary test cord. When it is desired to dial on the trunk, a front or rear cord is connected to the trunk jack with the TALK key operated, then the dial cord is connected to the corresponding DIAL jack and the number dialed as soon as dial tone is heard. No supervision is received on trunks of this type.

Test and Out-of-Service Jack Circuits (See Fig. 7)

3.32 Jacks which are a multiple of the tip, ring and sleeve of intertoll trunks and of master office trunks provide access

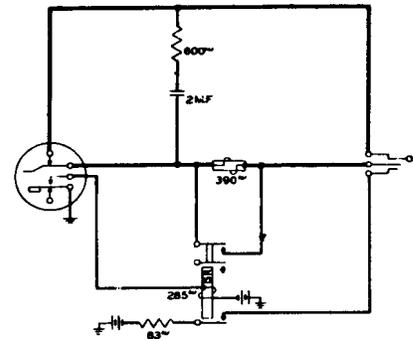


Fig. 13 - Dial Cord for Dial Cord Dialing

to these trunks for making busy tests, overall talking tests, monitoring, ringing, dialing or key pulsing and general testing. Out-of-service jacks are provided only in connection with outgoing or two-way intertoll trunks for making these trunks busy to outgoing traffic, thus removing them from service. These jacks are designated TEST and OS, respectively, and are shown in the lower section of the jack field in Fig. 7.

Patching Jack Circuits (See Figs. 7 and 14)

3.33 Patching jacks for ringdown intertoll, full period talking circuits and long line circuits are used for making tests on these circuits, for interchanging the drop equipments and for building up through connections. Fig. 14 shows the arrangement for patching the line side of any ringdown intertoll trunk, full period talking circuit or long line circuit to the drop side of other similar circuits.

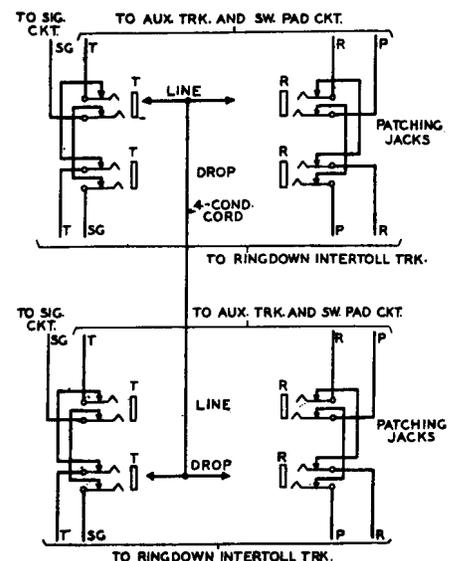


Fig. 14 - Drop Patch at Patching Jacks

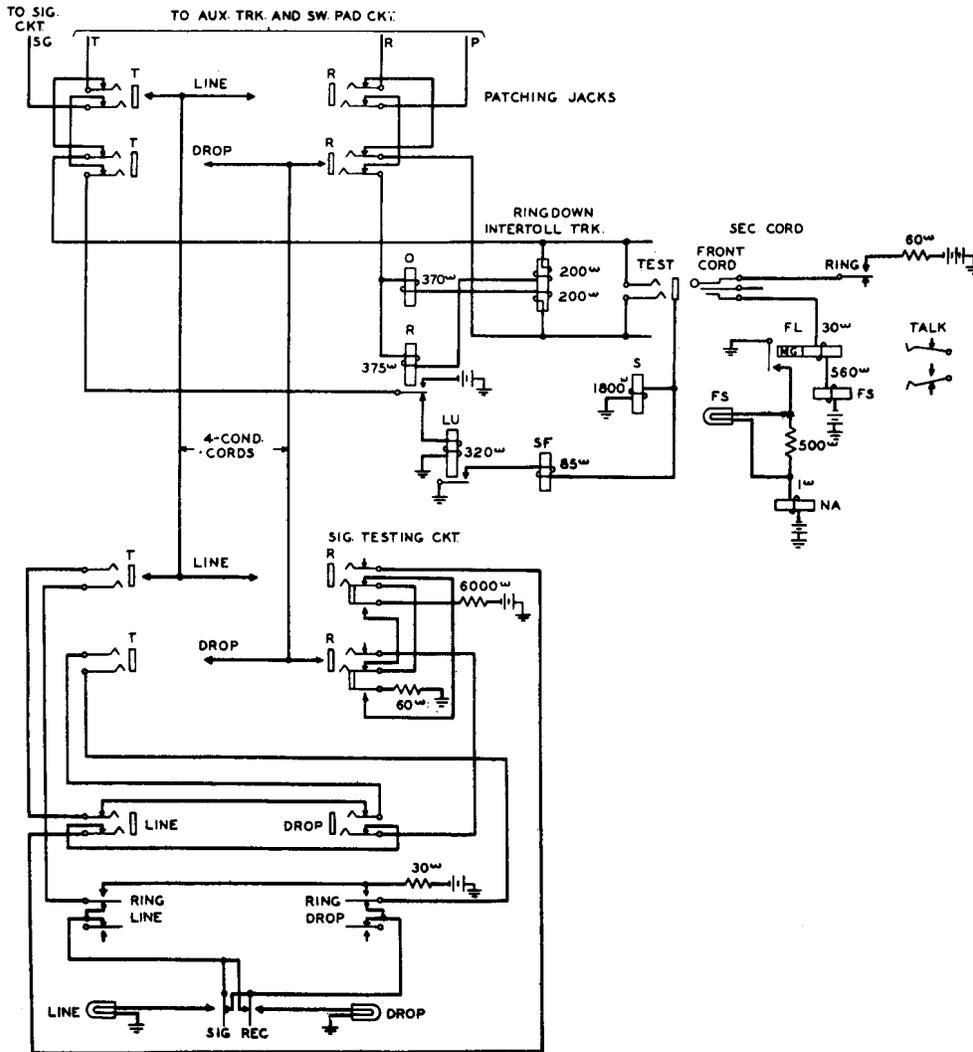


Fig. 15 - Signal Testing Circuit - Arrangement for Ringdown Toll Trunk

Signal Testing Circuit (See Fig. 15)

3.34 This is an arrangement for picking up a trunk circuit at the patching jacks in such a manner that the attendant may talk, signal or make sectional transmission or noise measurements toward either the line or toward the drop. The signal testing circuit is provided with two pairs of line jacks, designated LINE and DROP, which are patched to the respective LINE and DROP jacks of the circuits under test. To test the signaling circuit toward the line side, the RING LINE key is depressed, and to test the signaling circuit toward the drop side, the RING DROP key is depressed. To test for incoming signals, the SIG REC key is held

in the operated position and the reception of the signal from either direction is indicated by the lighting of the LINE or DROP lamps. The arrangement of the jacks and keys in their mountings is shown in fig. 3B. Transmission tests and talking tests also may be made in either direction by connecting a test cord or patching cord to the signal testing circuit jacks LINE or DROP. For testing the signaling features of full period talking circuits and long line circuits, the SIG jack associated with a particular circuit is connected by means of a secondary cord circuit to the SIG jack of the signal testing circuit. Signals may then be sent in either direction by operating the RING LINE or RING DROP keys, while signals may be

received from either direction on the LINE or DRCP lamps by holding operated the SIG REC key.

Through Patching Circuit (See Fig. 16)

3.35 This circuit provides a method by which two ringdown intertoll trunks may be patched for through connections. Relays are provided for repeating the signals received from either direction, the arrangement being such as to prevent the signals from being cut short. The arrangement also includes terminations which are applied to the circuits during the signaling operations for the purpose of preventing the repeaters from singing.

Timed Ringing Circuit

3.36 This circuit provides means for checking the signaling features of intertoll ringdown trunks, full period talking circuits and long line circuits. This is accomplished by applying a signal of definite length at the sending end and having an observer or operator at the distant end report whether the signal was received. The

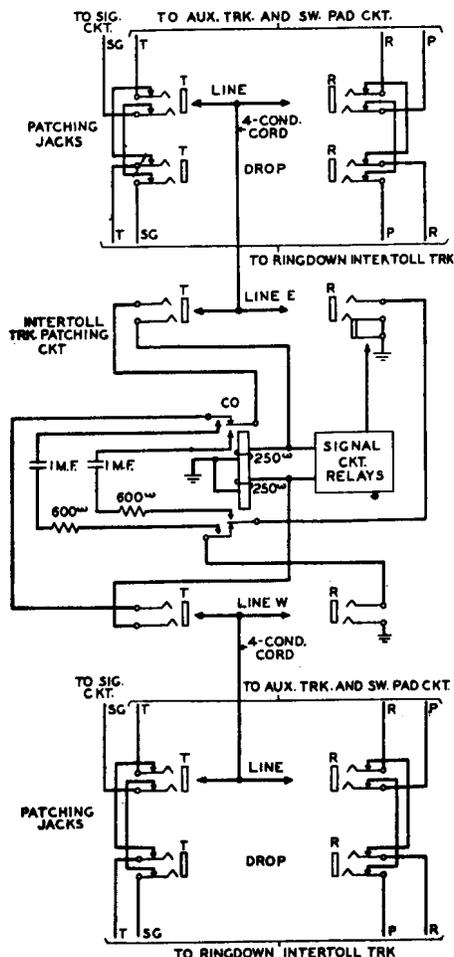


Fig. 16 - Through Patching

circuit is arranged to send a signal of precisely 1, 1-1/2 or 2 seconds depending upon which optional wiring arrangement has been specified for the timed ringing circuit. To send a timed ring on a trunk, the front or rear cord of a cord circuit is first connected to the TEST or SIG jack of the trunk, then the associated cord is connected to the TIMED RING jack of the timed ringing circuit. The cord supervisory signal lights during the interval that the timed ringing signal is being transmitted. To repeat the test, the cord is removed from and then is reconnected to the TIMED RING jack.

Telephone Order Wire Circuit

3.37 These circuits are terminated in jacks designated TEL OW in the miscellaneous jack field. Corresponding lamps are designated LL. When selectors are used for multiple point order circuits, code calling is accomplished by operating the position ringing key to send out pulses corresponding to the code for the called point. The LL lamp lights when each pulse is transmitted and flickers when it is time to start sending another digit. The associated selector circuit is described in another section of the E40 series of B.S.P.'s.

(C) Transmission and Noise Measuring Circuits

40B Transmission Measuring System

3.38 The 40B transmission measuring system is terminated in a group of jacks in the miscellaneous jack field as shown in Fig. 3E. Jacks designated SEND 1 MW are provided which may be patched to any desired circuit for the purpose of sending testing power of 1 MW at 1000 cycles. For measuring received testing power, jacks designated REC B are provided. The receiving measuring range covered is from 15 db above 1 MW to 35 db below 1 MW and is controlled by the operation of keys designated A, B + 10 or B + 20. Testing power at 1000 cycles or at other frequencies may be measured with this arrangement. The readings are obtained on the db meter located at the toll testboard.

3.39 The zero level sensitivity test circuit is used for checking the operation of echo suppressors associated with intertoll trunks terminating at the office. A supply of 1000-cycle testing power in the range from 26 db to 36 db below 1 MW is under control of an adjustable resistance designated ZLS TEST. The trunk under test is patched to the ZLS B + 25 jack by means of a secondary cord circuit.

3.40 Detailed description of the 40B transmission measuring system is given in other sections of the E40 series of B.S.P.'s.

43A Noise Measuring System

3.41 This equipment is capable of measuring noise and crosstalk volume between

10 and 40 db above reference on a message weighting basis. The same db meters which are used in connection with the 40B transmission measuring equipment are also used for making noise measurements.

3.42 The trunk under test is patched by means of a secondary cord circuit to the H IMP A + 25 or to the 600 ω A + 25 jack, both of which are shown in Fig. 3C. These jacks perform the same function of connecting the circuit under test to the 1W amplifier-rectifier but in the case of the H IMP A + 25 jack, the high impedance arrangement is such that connections to the trunk may be made without causing interference to service. The 600 ω A + 25 jack is arranged for patching to trunks which have been removed from service and which therefore require a termination across the tip and ring of the trunk for the purpose of preventing the associated repeaters from singing. Sensitivity control keys designated A + 20, A + 15 and A + 10 are provided for changing the range as required. The regular monitoring arrangements provided in connection with the secondary cord circuits are used during the tests.

3.43 Measurements may also be made from the primary line jacks. In this case, the line under test is connected to jacks designated 600 ω A + 25 or N to GRD, depending upon whether it is desired to make metallic circuit noise or noise to ground measurements. Monitoring on the trunk under these conditions is accomplished by means of a secondary cord circuit, the front or rear cord of which is connected to the H IMP A + 25 jack associated with the secondary noise measuring jacks of the noise measuring system.

3.44 Detailed description of the 43A noise measuring system is given in other sections of the E40 series of B.S.P.'s.

(D) Talking Trunks

3.45 Outgoing, incoming and two-way talking trunks are provided at the 18B toll testboard for the purpose of enabling the attendants to communicate with such other locations as may be required. These trunks are arranged for multiplying as required. Lamp signals are provided on the incoming and two-way trunks. All of these trunks may be provided with a simplex bridge across the tip and ring conductors for the purpose of controlling the switching pads in any intertoll trunk circuits to which they may be connected.

3.46 Interposition Trunk to Toll Switchboards Nos. 3, 3B, 3C, Toll Tandem Switchboard No. 3, Switchboard No. 11 - This trunk may be used as an outgoing automatic trunk, terminating at the testboard in a multiple of tip, ring and sleeve connections or it may be used as an incoming automatic trunk terminating at the testboard in a multiple of tip, ring, sleeve and lamp connections. In either case, the other end ter-

minates at such positions of the switchboard as may be required. This trunk is used as the principal means of communication between the operators and the 18B toll testboard. Full supervision is provided in both directions except that on outgoing calls to the toll tandem switchboard No. 3, the supervisory lamp is not lighted initially. Recall signals are obtained at either end when the cord at the other end is withdrawn and reconnected.

3.47 Talking Trunk to Relay Rack, Selector Frame or Repeater Attendant's Telephone Set - This trunk is arranged for two-way automatic operation, terminating at the testboard end in a multiple of tip, ring, sleeve and lamp connections. The other end terminates either at a telephone set located at the relay or repeater racks or at a switchman's talking trunk at the selector frames. Lamps and a subset at the relay or repeater racks or at the selector frames provide visual and audible signals on calls to these points. The supervisory lamp in a connected testboard cord circuit responds to the insertion or removal of a telephone set at the relay racks or frames, thus providing supervision and recall signals at the testboard end.

3.48 Two-Way Ringdown Intertoll Trunk - This trunk terminates at the testboard end in a multiple of tip, ring, sleeve and lamp connections. The other end terminates at an intertoll ringdown trunk terminating in a similar manner at another toll testboard. A non-locked-in recall signal may be sent from either end but no other supervision is received.

3.49 Two-Way Trunk to Dial Office Arranged for Positional Dialing - This trunk terminates at the testboard end in a multiple of tip, ring, sleeve and lamp connections and at the other end in a subscriber's line circuit in a dial office. On outgoing calls, dial tone will be received at the testboard when the dial key is operated as a signal to proceed with dialing instead of the lighting of the dial pilot and supervisory lamps as in the case of intertoll dialing trunks. No supervision is received on either outgoing or on incoming calls.

3.50 Two-Way Trunk to Dial Office Arranged for Dial Cord Dialing - This trunk terminates at the testboard end in a multiple of tip, ring, sleeve and lamp connections and has tip, ring and sleeve connections for multiple appearances of a dialing jack. The other end terminates in a subscriber's line circuit in a dial office. No supervision is received on either outgoing or on incoming calls.

3.51 Two-Way Trunk to Test Desks Nos. 12B, 12C or 14 or to Repair Service Desk No. 2 - This trunk provides outgoing automatic and incoming ringdown operation, terminating at the testboard end in a multiple of tip, ring, sleeve and lamp connections. The other end terminates at a test or repair service desk. Full supervision and locked-in recall signals are obtained at the testboard end.

3.52 Two-Way Trunk to Manual Office or to Official P.B.X. - This trunk provides outgoing automatic and incoming ringdown operation, terminating at the testboard end in a multiple of tip, ring, sleeve and lamp connections. The other end terminates in a common battery line at a manual local office or at the official P.B.X. No supervision is provided at the testboard, but full supervision is furnished at the local manual office or at the official P.B.X.

3.53 Two-Way Trunk to Local Test Desk No. 13 - This trunk provides automatic outgoing and incoming operation terminating at the testboard end in a multiple of tip, ring, sleeve and lamp connections. The other end terminates at the local test desk No. 13. Full supervision is received at both ends of the trunk including recall signals.

3.54 Two-Way Automatic Trunk to Voice Frequency Channel Bay or Sealed Test Terminal Bay - This trunk provides outgoing and incoming automatic operation, terminating at the testboard in a multiple of tip, ring, sleeve and lamp connections. The other end terminates at the voice frequency channel bay or at the sealed test terminal bay. Full supervision is received at both ends of the trunk and recall signals may be sent from either end by removing and reinserting the cords.

3.55 Outgoing Trunk to Information Desk No. 17MC - This trunk provides automatic operation, terminating at the testboard in a multiple of tip, ring and sleeve connections. The other end terminates in a multiple of tip, ring, sleeve and lamp connections at the information desk and at the DSA board if the night transfer feature is provided. Full supervision including recall features is provided at both ends.

3.56 Outgoing Trunk to Central Information Desks Nos. 1, 2, 3, or 4 or to Operating Room Desk No. 19 or to Nos. 14C, 14D or 15C "A" Switchboard - This trunk provides automatic operation, terminating at the testboard in a multiple of tip, ring and sleeve connections. The other end terminates in the trunk at information or operating room desks or at the "A" switchboard. Full supervision is provided at both ends of the circuit including recall features.

3.57 Incoming Trunk from Intertoll Selector Multiple or Intertoll Two-Way Trunk - This trunk provides incoming automatic operation, terminating at the testboard in a multiple of tip, ring, sleeve and lamp connections. The other end terminates at the intertoll selector banks or at the two-way intertoll trunk. Full supervision at both ends including locked-in flashing recall at the testboard is provided. Recall to the outgoing end is obtained by operating the ringing key in the cord circuit.

3.58 Two-Wire Incoming Trunk from Information Desks Nos. 1, 2, 3 or 6 or from No. 19 Operating Room Desk - This trunk provides incoming automatic operation, terminating at the testboard in a multiple of tip, ring, sleeve and lamp connections. The other end terminates in a trunk at the information or operating room desk. Full supervision with recall features is provided at both ends of the trunk.

3.59 Incoming Trunk from Local Operating Room Desks Nos. 14-11, 14-CL, 15-L, 13-CL, 21-L or 21-CL - This trunk provides incoming automatic operation, terminating at the testboard in a multiple of tip, ring, sleeve and lamp connections. The other end terminates in a multiple of tip, ring and sleeve connections at the test desk. Supervision with recall features is received at the testboard only.

Bell Telephone Laboratories, Inc.