

AUTOMATIC CALL-THRU TEST SET ITE 4557-T DESCRIPTION

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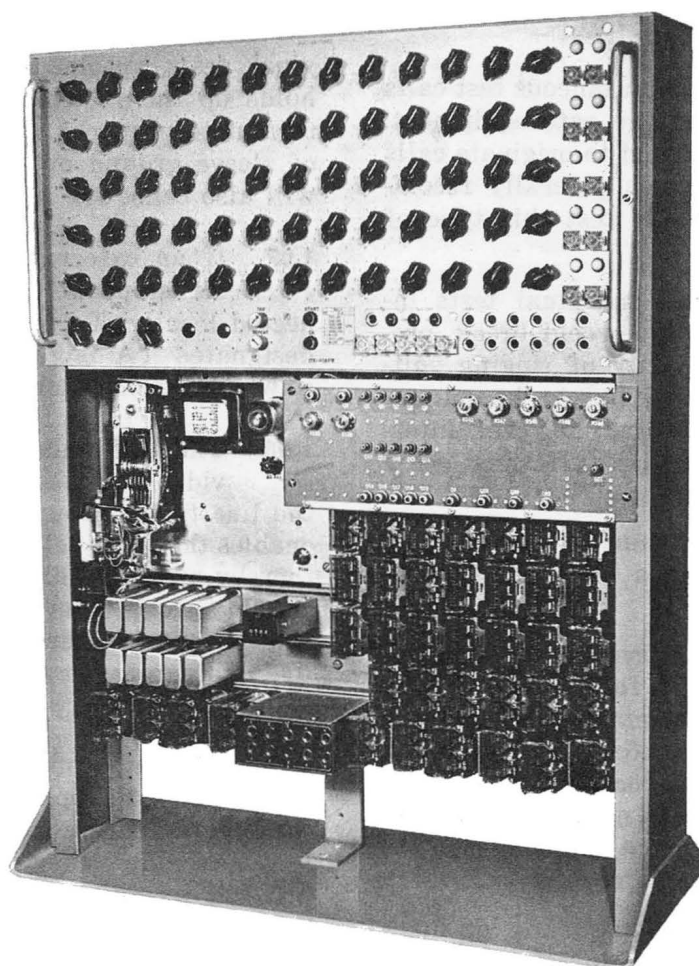


Fig. 1 – ITE 4557-T Test Set

1. GENERAL

1.01 This section describes the ITE 4557-T call-thru test set and its application in step-by-step type central office and PBX.

1.02 Two models of this test set are currently in use, those serially numbered 1-150 and those serially numbered 151 and above. Test sets numbered 151 and above are equipped with an improved line finder progression circuit and an improved sleeve holding circuit. Sets numbered 1-150 may be modified to include these improvements. Modified sets will be identified by the addition of the letter M to the serial number and are considered as included in any reference to sets numbered 151 and above. Only those sets which contain the improved progression circuit should be used to test PBX equipment.

A. Features

1.03 The ITE 4557-T test set provides the following capabilities:

(a) To make up to five simultaneous test calls on flat rate or message rate equipment. Although the set is equipped to originate calls from coin groups, it is not generally recommended that it be used to test this type of equipment.

(b) To perform variable marginal tests including loop or leak, per cent break, pre-trip, amplitude and polarity of ringing voltage and interdigital timing. Due to the manner in which digits are outputted, however, interdigital timing tests can be performed on a one line at a time basis only.

(c) To output a maximum of eleven digits to each test line at a rate of 10 or 20 pulses per second.

(d) To detect a loss of sleeve ground, reversal of tip and ring and failure of tripping battery. Test sets serially numbered 1 through 150 will hold the switch train in case of sleeve failure only if the failure occurs during pulsing. Later models serially numbered 151 and above will hold the switch train regardless of when the sleeve failure occurs.

(e) To recycle either automatically or manually as desired. The duration of each test cycle is variable but is usually set at approximately 25 seconds.

1.04 Two methods are provided for gaining access to the originating equipment used for test calls, they are:

(a) Using test line terminal of line group under test. This method is employed when the line finder progression feature is used.

(b) Using any nonworking terminal in the line group under test. This method is employed when the line finder progression feature is not used.

1.05 In order to terminate test calls back into the test set, nonworking connector terminals must be selected and connected to the test set. The test set automatically seizes the originating equipment, output pulses the digits required to reach the connector terminals selected, and trips the ring, after which it recycles and repeats the process.

1.06 Failure of the switching equipment to respond properly to the established marginal tests automatically blocks the set and holds up the switch train. Failure of a call to terminate properly, failure of trip battery, loss of sleeve ground or a reversal of tip and ring will also cause the set to block.

1.07 If an external alarm, to indicate a test set stoppage is desired, it may be connected locally. To facilitate this feature a jack designated TA is provided, the tip and sleeve of which become shorted when a stoppage occurs.

1.08 The line finder progression feature provided in the set works in conjunction with the line finder group start circuit. This feature enables the set to select line finders progressively thereby providing dispersion of calls throughout the line group. Provision is also made to bypass this circuit in offices equipped with combined line and cutoff relays and allotter (control) circuits.

1.09 When the progression circuit is used, the test set supplies low resistance ground to the line finder start and commutator leads. The first available finder is seized and steps to the test line terminal. As soon as the connection to this terminal is completed, the test set replaces the low resistance ground on the commutator lead with a high resistance ground and reapplies low resistance ground to the start lead. This

start lead ground activates a second line finder which steps vertically to the test terminal level. When the switch commutator wiper contacts the high resistance ground supplied by the test set the finder C (or its equivalent) relay locks operated halting vertical stepping. However, due to the high resistance ground condition the current flow is insufficient to operate the finder E (or its equivalent) relay, therefore, no rotary stepping can take place. This second finder will remain in the position described until the test call originated through the first finder is completed and the test set recycled, at which time low resistance ground is again applied to the commutator lead enabling the second finder to step rotary to the test line terminal. As the finders within the group are used and released, their respective D relays are held operated by the chain circuit until all finders have been utilized, at which time they are released before an all finder busy alarm is sounded. Should a customer request for service be initiated while the second finder is in the waiting position, the progression circuit is overridden and the waiting finder will resume vertical stepping in search of the customer's line. If this finder does not find the line, it will release and the next available finder will handle the customer's request.

B. Description

1.10 The approximate weight of the set is 85 pounds. A shipping case with a compartment for carrying the necessary connecting cords is provided for the set. The combined weight of the set and shipping case is 140 pounds.

1.11 The equipment is mounted on a standard upright frame 24 inches wide and 30-1/2 inches high. Mounted between the verticals at the top front of the set is a control panel 23 inches wide and 11-1/4 inches high. Located on the control panel are the following switches, lamps, keys and jacks (see Fig. 6):

Class Switches (CLASS 1-5): There is one class switch per test line. Each switch has five positions with each position corresponding to the class of service or condition to be simulated for the line under test. Position designations are as follows:

Bypass (BYP) — Disables the associated line when not in use.

Coin (COIN) — Places 2000-ohm ground on tip of originating test line.

Regular (REG) — Presets conditions for lines other than coin.

Hold (HOLD) — Holds up the line under test.

Monitor (MON) — Provides for monitoring and manual dialing of the test line.

Digit Switches (DIGIT A-K): There are eleven digit switches per test line. Each switch has eleven positions: One OFF position and 10 positions designated 1 thru 0 corresponding to the numbers found on the telephone dial. Test calls are directed to the terminating test line by setting the office code and line number on the digit switches. Should a wrong number be placed on the switches or the wrong connection made for the number chosen, the set will pulse out the numbers but will block due to improper termination.

Ring Switches (RINGING 1-5): There is one ringing switch per test line. Each switch has five positions and is set to verify the ringing condition on the terminating line. The position designations are as follows:

(T-) Negative ringing on tip.

(T+) Positive ringing on tip.

(R-) Negative ringing on ring.

(R+) Positive ringing on ring.

(BSY) Busy on nonterminated lines.

When the line is not in use, i.e., not terminated, the associated switch is set to BSY. Should the switch be set to the wrong position, the test set will block.

Loop and Pulse Speed Switch (LPS): There is one LPS switch for the five lines. The eight positions of the switch used to control both

the loop resistance of the originating lines and the pulsing speed of the output pulses are:

SW POS	LOOP	PPS
1	600	10
2	800	10
3	1200	10
4	1400	10
5	2000	10
6	No Loop	10
7	1400	20
8	No Loop	20

In any one position, the LPS switch simulates the same loop condition and pulse speed on all lines in operation.

Leak Switch (LK): There is one LK switch for the five test lines. The four switch positions used to control the leak condition applied across the originating lines are designated:

LEAK A
LEAK C
16,000-OHM LEAK
NO LEAK

In any one position, the LK switch simulates the same leak condition on all lines in operation.

Variable Pretrip Switch (TPR): There is one TPR switch for the five test lines. In any one position the same pretrip requirement is simulated on all five lines. Five switch positions are used to establish the pretrip conditions, they are:

SW POS	PRETRIP RESISTANCE IN OHMS
1	1400
2	2200
3	2500
4	3000
5	3200

Line Sleeve Lamps (LS1-5): There is one LS lamp per test line. In normal operation, ground on the originating line sleeve will light the lamp. Should a loss of sleeve ground occur the lamp will extinguish and the test set will block.

Reverse Lamps (RV1-5): There is one RV lamp per test line. This lamp will light upon a polarity reversal of the tip and ring of the originating line.

Coin Lamps (CC1-5 and CR1-5): There is one CC lamp and one CR lamp per test line. When coin lines are used for test, these lamps will light to give a visual indication of coin collect (CC) and coin return (CR) battery on the originating lines.

Ringling Lamps (RINGING 1-5): A group of ringling lamps, one per terminating line, is provided. During the cycle of operation, when ringling occurs, these lamps will flash during ringling intervals to give a visual indication of ringling.

Originating Sleeve Check Lamp (OR): One OR lamp is provided in the set. The lamp lights and remains lighted when ground is present on all five sleeves of the originating lines. To meet this requirement when one of the lines is not being used, the class switch is placed in the BYP position to provide the necessary ground to the line not used. If ground is momentarily lost on any line, the lamp is extinguished and the test set blocks.

Terminating Sleeve Check Lamp (TERM): One TERM lamp is provided in the set. The lamp lights and remains lighted when ground is present on all five sleeves of the terminating test lines. To meet this requirement when one of the lines is not terminated, the ringling switch is placed in the BSY position to provide the necessary ground to the line not terminated. If ground is momentarily lost on any line, the lamp is extinguished and the test set blocks.

Time Alarm Lamp (TA): One TA lamp is provided in the test set. This lamp extinguishes to indicate a time-out condition in the operation of the set, e.g., a trouble condition or between cycles of operation.

Start Key (START): Operation of this key starts the test cycle.

Call Advance Key (CA): Operation of the CA key at any time during a cycle of operation or when the set has blocked due to a trouble condition will advance the set to its normal start position. A short time delay is provided after operation of this key before the set will cycle on automatic recycle or before operation of the ST key on manual recycle will permit the set to start the cycle.

Repeat Key (REPEAT): In the OFF position, this key provides for single cycle operation of the test set on each operation of the ST key. The set will recycle automatically when this key is in the ON position if the TRIP key is in the AUTO position.

Automatic and Manual Trip Key (TRIP): In the MAN position, the trip feature of the test set is disabled allowing unlimited time to verify the ringing codes on the ringing lamps. If operated to the AUTO position, the key will allow the test set to trip in six to ten seconds after all test lines in operation have terminated.

TA Jack: This jack can be used to connect the set to an external audible or visual alarm circuit. The external alarm will operate when a metallic loop is completed between the tip and sleeve of the jack should the set time out on a trouble condition and block.

TEL Jack: This jack provides access to any one of the five originating lines for monitoring and manual dialing of test numbers using the 1011G handset, or equivalent. To use this feature, it is necessary to position the class switch of the line to MON and the TALK-MON key of the 1011G handset to TALK.

-48V Jack: This jack is used to connect the negative 48-volt dc office supply to the test set. The ITE-9598 cord is provided for this purpose.

OL1-5 Jacks: There is one OL jack per originating line. Connection of the set to the originating lines selected for the test is made by plugging the ITE-9639 cord into the jack and connecting the other end, which is equipped with an ITE-4413 four-point connecting fixture, to the tip, ring and sleeve of the line used to gain access to the finder group.

TL1-5 Jacks: There is one TL jack per terminating line. Connection of the test set to the connector terminals selected for the test is made by plugging the 310 plug of the ITE-9639 cord into the jack and connecting the other end, which is equipped with an ITE-4413 four-point connecting fixture, to the tip, ring and sleeve of the selected connector terminal.

1.12 Mounted on the bottom mounting strip are the following (see Fig. 1):

Test Sets Serially Numbered 1-150

A1-5 Jacks: There is one A jack per originating line. These jacks are internally multiplied to the OL jacks and are used in place of the OL jacks when the line finder progression circuit is to be used. In this case, a line finder test line terminal is used as the originating line terminal (see Fig. 2). When this jack is used, a 258-type busy plug must be inserted into the corresponding OL jack.

LF1-5 Jacks: There is one LF jack per test line. These jacks are used only when the line finder progression circuit is used. Their function is to extend control of the line finder chain circuit, start lead and commutator lead into the test set, using leads for line finder test terminal 10. The connections at the finder group are made as follows (see Fig. 2):

TIP	(Chain Circuit)	— To jack spring 13 at rear of switch number two.
RING	(Start Lead)	— To jack spring 14 at rear of switch number two.
SLEEVE	(Commutator Lead)	— To commutator lead found on A, B or 48V jack of line finder group as indicated in associated SD drawing.

Test Sets Serially Numbered 151 and Above:

PROG CKT Key: This key, when operated to the OFF position, removes battery from the sleeves of the OL1-5 jacks. This feature is used only when testing in offices equipped with combination line and cutoff relays.

LF1-5 Jacks: There is one LF jack per test line. These jacks are used only when the line finder progression circuit is used. Their function is to extend control of the line finder start lead, commutator lead and call block

alarm lead into the test set. The connections at the finder group are made as follows (see Fig. 3, 4 and 5) :

TIP	(Call Block Alarm Lead)	— To contact of group circuit G relay.
RING	(Commutator Lead)	— To sleeve of switch test jack or ring of 48V jack depending on type of line finder in use.
SLEEVE (Start Lead)		— To contact of group circuit G relay.

1.13 Eight potentiometers are provided which control the various functions of the test set. The potentiometers and the functions with which they are associated are as follows (see Fig. 6) :

POTENTIOMETER	FUNCTION
* R 141	Recycle time after completed cycle.
R 142	Pulse speed.
R 143	Per cent break.
R 144	Pulse shape.
R 145	Interdigital timing.
R 146	Terminating sleeve check.
* R 147	Ringing time before trip.
* R 148	Over-all timing.

* These timing adjustments are not considered critical for proper operation of the test set.

1.14 Located directly below the control panel is the electronic equipment, i.e., digital counter tube, transistors, and potentiometers. To avoid a top-heavy unit, the relay equipment is mounted at the bottom of the set below the electronic equipment. All relays are of the wire-spring type.

1.15 The 110-volt ac input plug is mounted on the left side upright, facing the front panel, approximately four inches from the base of the set. The input jack for the negative 48 volts is on the control panel. A full wave rectifier circuit, used to supply high voltage for the digital counter tube V1, is completely enclosed for safety.

C. Accessories

1.16 The cords and connecting clips provided with the test set are shown in Table A.

D. Power Supply

1.17 Power requirements for the test set are 110-volts ac at a maximum current drain of 10 milliamperes and negative 48-volts at a maximum current drain of 0.9 amperes.

E. Precautions

1.18 *Under no circumstances should a test pick be used when checking the circuits in the test set.* The characteristics of some of the components of the test set are such that even momen-

TABLE A — TEST SET ACCESSORIES

CORDS AMT.	ITE#	LENGTH	CDRS	ONE END	OTHER END	USE
1	9354	12 ft.	2	Hubbell Polarized Plug	Hubbell 7464 Conn. Body	110V ac supply
1	9598	12 ft.	2	310 Plug	310 Plug	—48V supply
15	9639	12 ft.	3	310 Plug	Three 2455 Plugs	Connect switching equipment to test set
15	9547	12 ft.	1	2455 Plug	2455 Plugs	Connections at line finder group equipment
CONNECTING CLIPS AMT.	ITE#	DESCRIPTION				
30	8507	Alligator Clip				
15	4413	Four-point connecting fixture				

tary application of excessive battery or ground to these components will damage them. For this reason use a volt-ohmmeter only, and then only when familiar with associated circuit drawings. The voltmeter used should have a minimum ratio of 20,000 ohms per volt.

1.19 When the test set and its accessories are packed for storage or shipment, it is of the utmost importance that the cords and connecting clips are placed in the compartment provided or a separate container, if desired. Drawings, practices, etc, must not be placed alongside the front or back of the test set. This is necessary to prevent damage to those components of the test set, which, because of their delicate construction and exposed position are particularly subject to damage.

2. PLACING TEST SET IN OPERATION

2.01 Location: In those offices where this test set is used on a temporary basis, consideration must be given to the most advantageous location for the set. The primary factors involved are:

- (a) Access to all originating and terminating equipment.
- (b) Availability of 110-volt ac and negative 48-volt dc supplies.
- (c) Minimum obstruction to aisles, ladders, etc.

In central offices, a location near the distributing frame is usually best suited to meet these needs.

2.02 Originating Line Connections When Line Finder Progression Is Used: When the line finder progression feature is used, relays within the test set (ST 1-5 and CO 1-5) are substituted for the L and CO relays of the subscriber line circuit. Line finder test terminal 99 (upper bank) in PBX or 110 in central offices is used to gain access to the line finder equipment. Cable conductors for test terminal 10 in central offices may be used to extend finder control leads to test set (see Fig. 2, 3, and 4). For PBX connections, see Fig. 5. To attain the maximum of five simultaneous test calls, it is necessary to establish these connections to five different line groups.

2.03 Originating Line Connections When Line Finder Progression Is Not Used: When the line finder progression feature is not used, access to line finders is gained using any non-working terminal. The terminals selected are connected to the test set OL- jacks using ITE 9639 cords equipped with ITE 4413 four-point connecting clips. Only one terminal per line group should be used.

2.04 Terminating Line Connections: Terminating line connections are the same when the line finder progression feature is used as when it is not used. Nonworking connector terminals are selected and connected by means of ITE 9639 cords equipped with ITE 4413 four-point connecting clips to the test set TL- jacks. In central offices, intercept straps must be removed and battery placed on the sleeves of the connector terminals to simulate the idle line condition required by the connectors. A convenient method of connecting this battery to the sleeve is to strap the connector sleeve to any nonworking originating line terminal sleeve using an 893 cord or a single conductor jumper wire. In PBX, lines under test must be removed from intercept or busy as applicable and wired as if for normal operation. Only one terminal per connector group should be used.

2.05 Key and Switch Operation: All digits normally required to direct a call to each of the connector terminals selected must be set up on the digit switches located on the face of the test set. Class of service, loop or leak, ringing polarity, and pretrip value switches must be set to the desired position according to the requirements of the office. Trip and recycle keys should be set to either the automatic or manual position as desired.

2.06 Power Connections: Using power cords provided with the test set, 110V ac and -48V dc must be connected to the appropriate test set jacks.

2.07 Although it is intended that this set be used primarily to test local step-by-step trains, it may be used to test trunks where a loop around circuit can be provided to terminate calls back to the set.

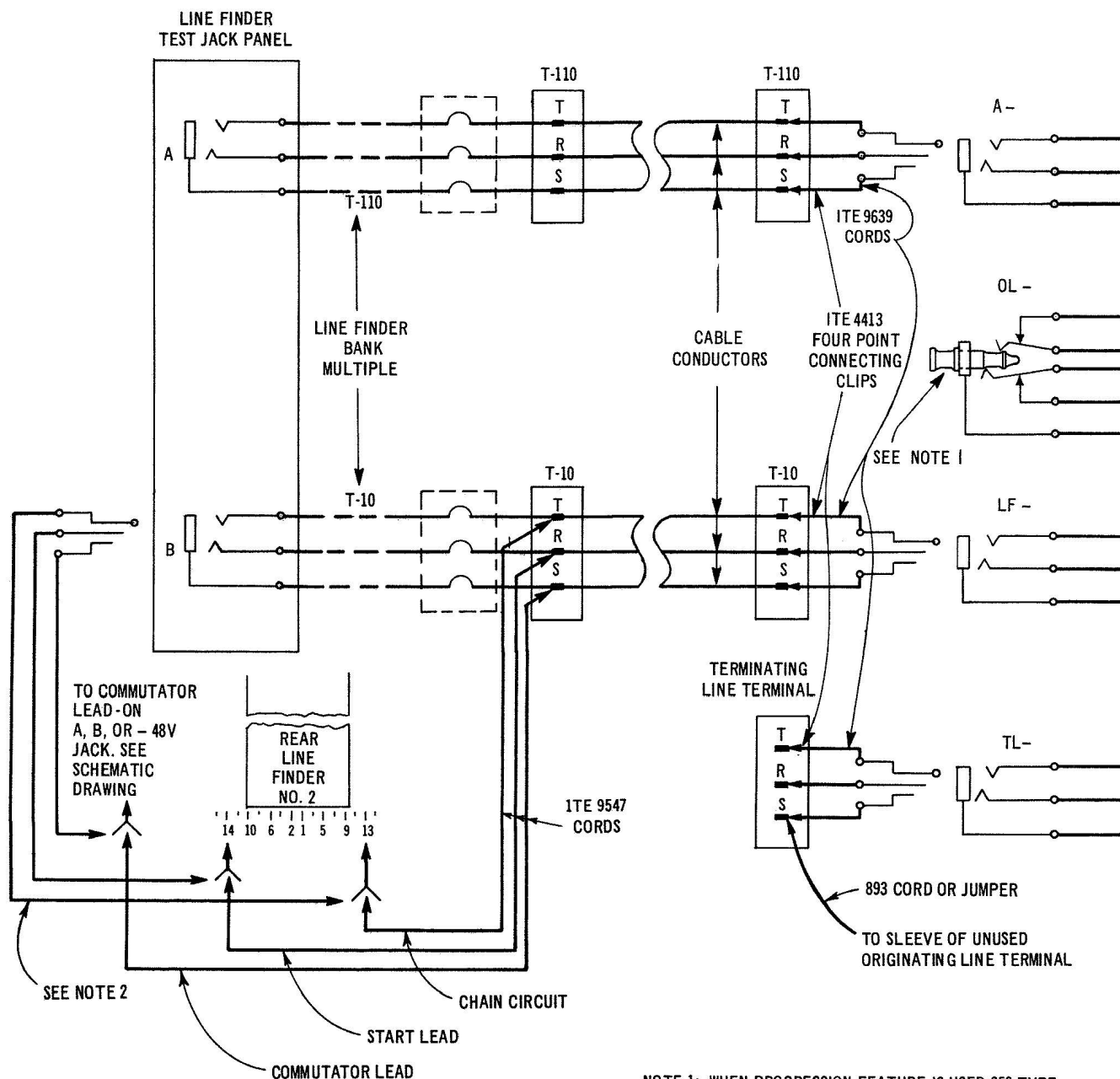
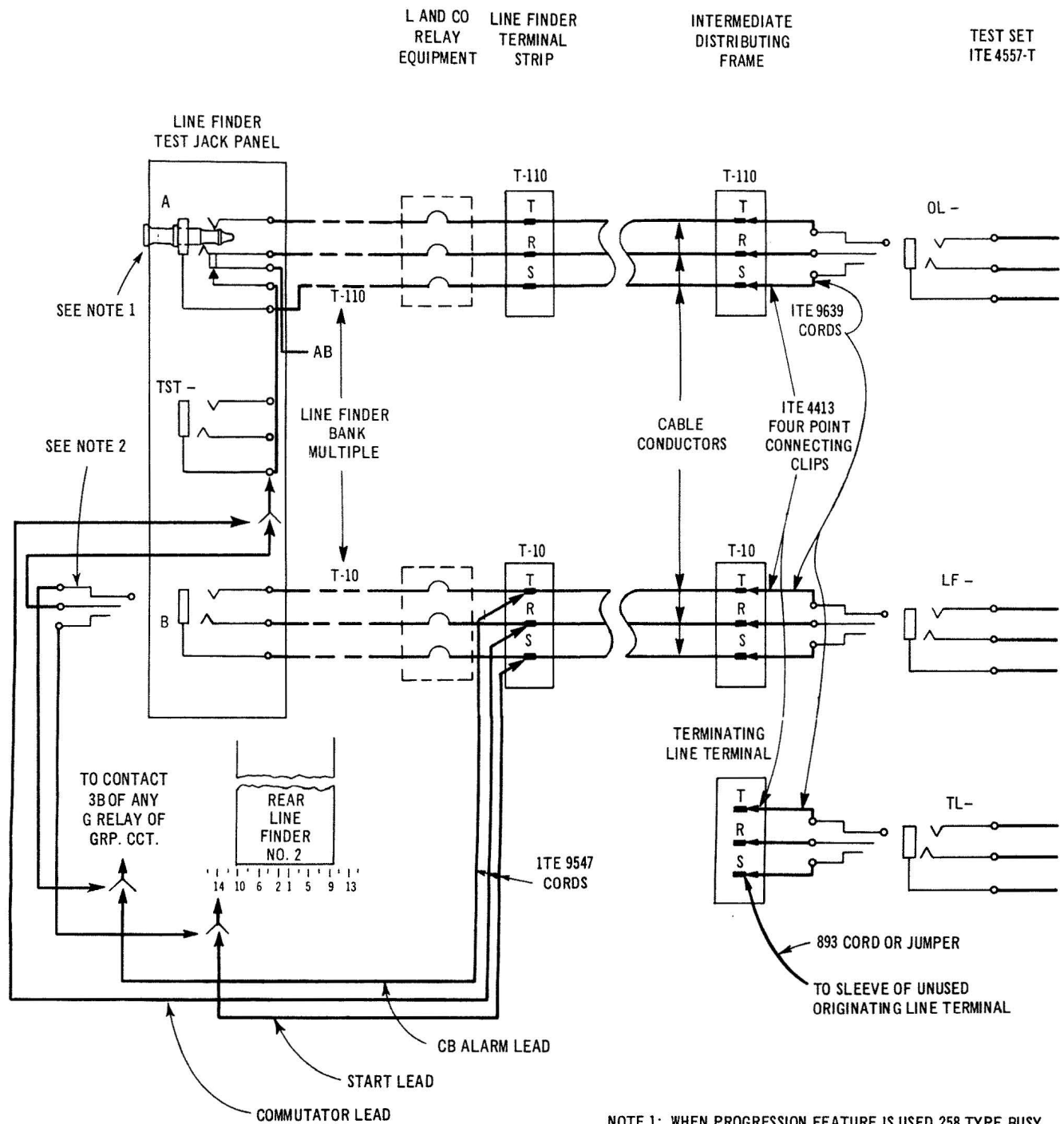
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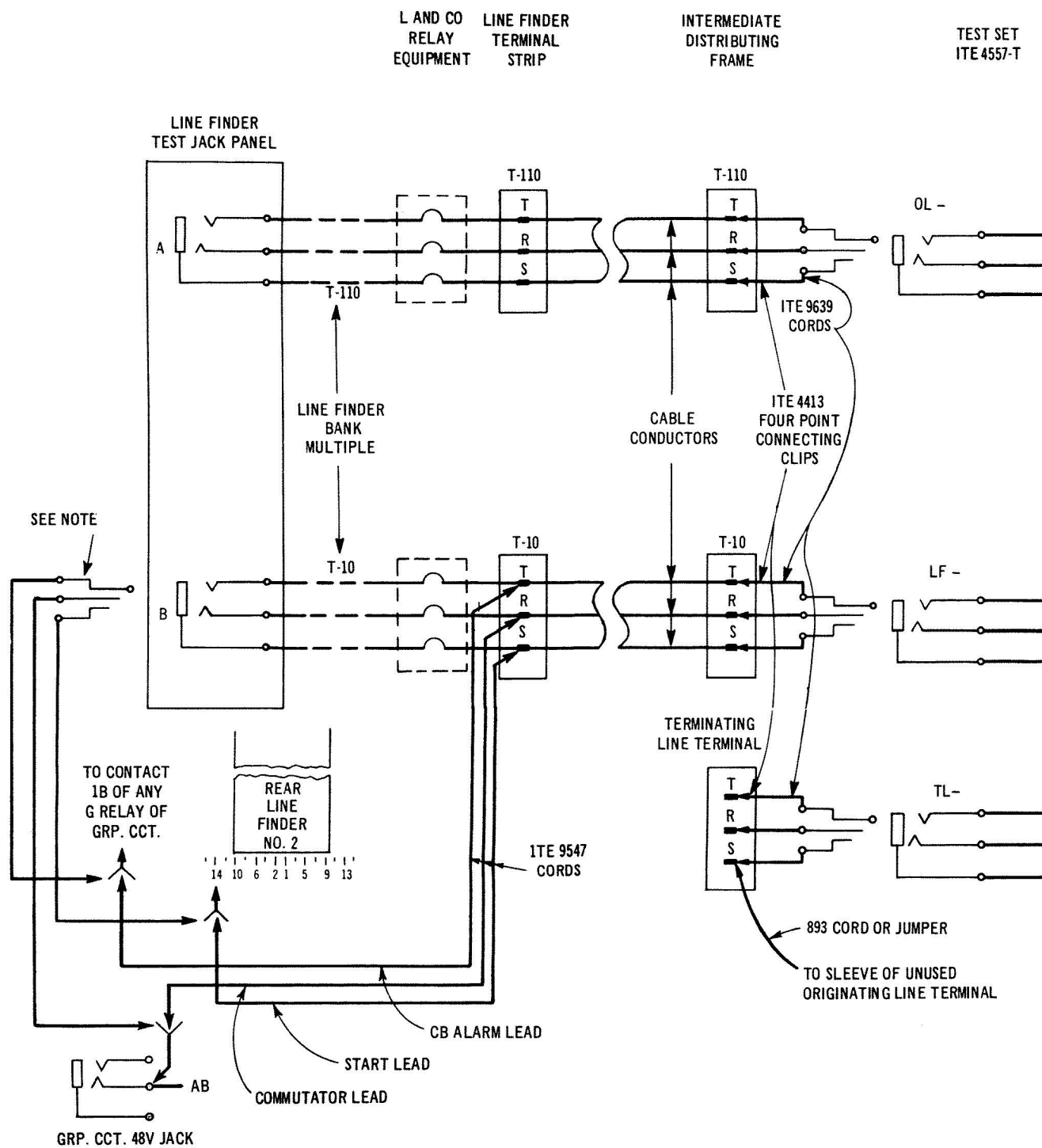
Fig. 2 - Progression Feature Connections — Sets 1-150



NOTE 1: WHEN PROGRESSION FEATURE IS USED 258 TYPE BUSY PLUG MUST BE INSERTED INTO A JACKS OF LINE FINDER GROUPS UNDER TEST.

NOTE 2: IF W3A CORDS ARE AVAILABLE CONNECTION MAY BE MADE DIRECTLY TO B JACK.

Fig. 3 – Progression Feature Connections (Sets 151 and Above) When Testing Line Finders SD-30427-01, SD-30996-01 or SD-31530-01



NOTE: IF W3A CORDS ARE AVAILABLE CONNECTION MAY BE MADE DIRECTLY TO B JACK.

Fig. 4 – Progression Feature Connections (Sets 151 and Above) When Testing Line Finders SD-33012-01, SD-33013-01, SD-33014-01 or SD-33015-01

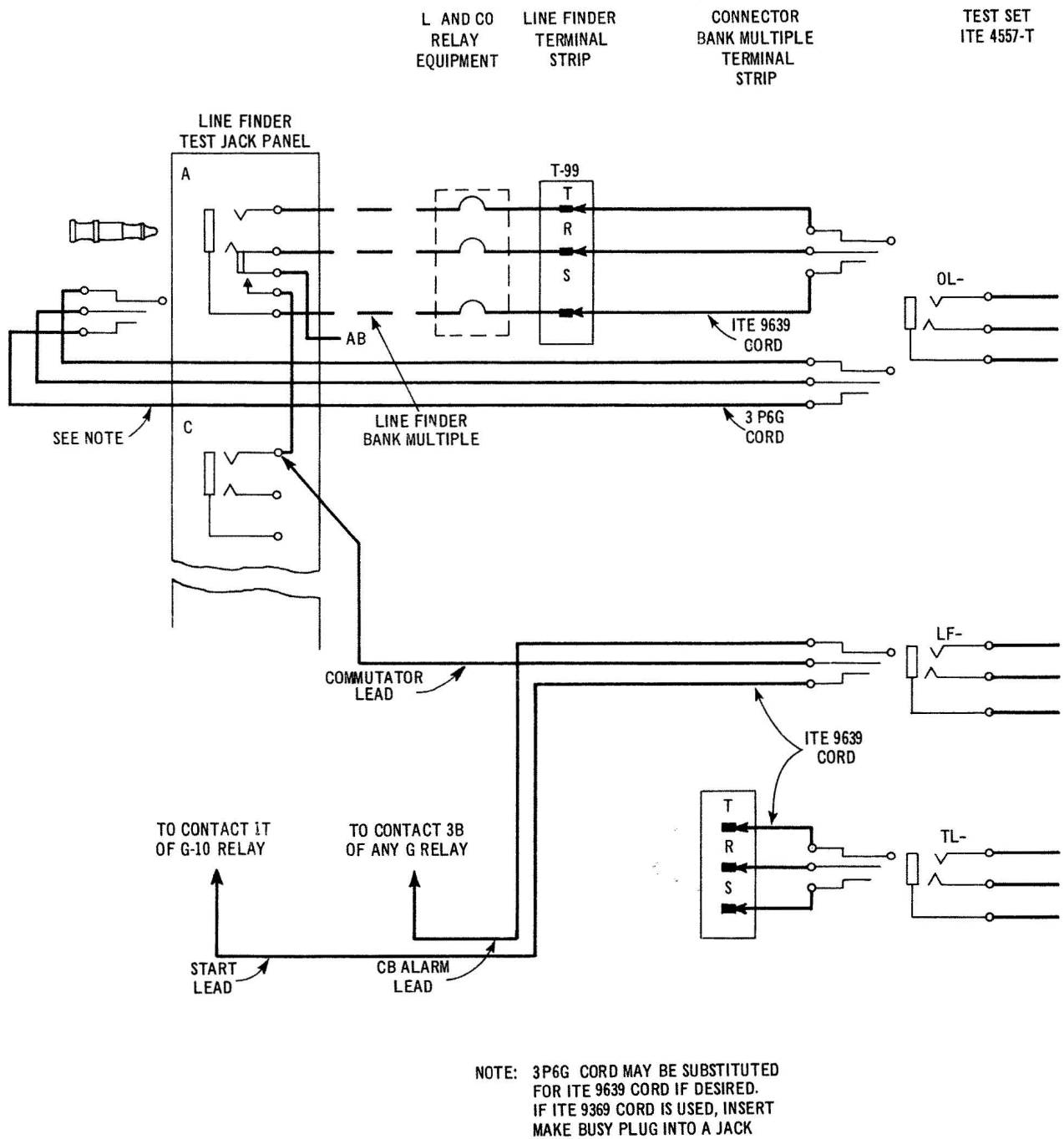


Fig. 5 – Progression Feature Connections When Testing PBX

3. EXTENT OF TESTS

3.01 In order to assure adequate dispersion of calls through higher choice selectors and connectors, the test should be programmed so as to include various load periods. In the event equipment dispersion is not considered adequate, or if the tests are conducted during periods of light load, consideration may be given to a "busy out" program.

Care must be exercised during heavy load periods so as not to interfere with customer access to equipment. Should call blocks or overflow conditions occur, tests should be suspended until such conditions subside.

4. LIST OF DRAWINGS

4.01 For a detailed description of test set circuit operation, Western Electric instructions TMO 4557 and WTI 4557, furnished with

each test set, should be consulted. Circuit drawings provided with the test set are included in ITD 4557-01. Schematic diagrams included in this group are:

SCHEMATIC DRAWINGS

ITD 4557-01 A1 (Index)

ITD 4557-01 B1 thru B4 (Schematic Drawings)

ITD 4557-01 C1 and C2 (Apparatus Figs. 1 and 2)

ITD 4557-01 F1 (Circuit Requirements)

T Drawings are not furnished with the set but are available on order. Drawings available are:

ITD 4557-40 thru 43.

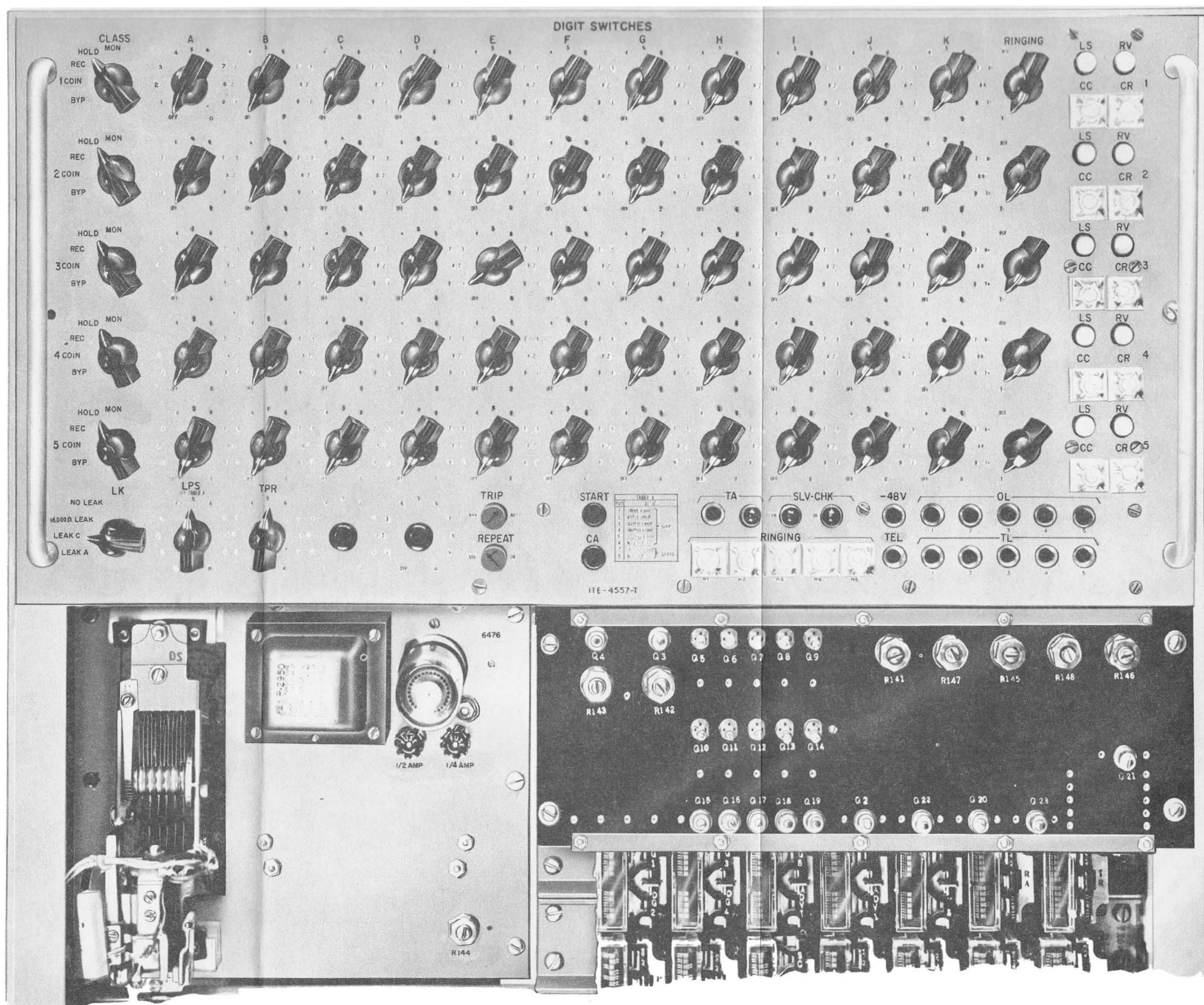


Fig. 6 – ITE 4557-T Control Panel