PREFACE

This pamphlet is issued for the benefit of W. E. employees assigned as instructors, in training men who will be delegated the responsibility of performing Routine Tests on Connector Switches, analyzing and clearing trouble.

It can also be used as a guide by more experienced men assigned such responsibility, who do not require or are unable to obtain the instruction outlined herein.

Supervisors responsible for performing Routine Tests on Connector Switches may find the text and exhibits helpful in training employees in performing these tests.

INSTRUCTOR'S GUIDE

A simplified but detailed training course is outlined in the following pages to familiarize the tester with the Connector under test and to help him in clearing the more common types of trouble.

The material is a condensed version of standard methods and is not intended as a replacement of these methods.

Routine tests are those tests which are repeated a sufficient number of times on a particular type of apparatus to insure satisfactory operation. In order to perform routine tests properly the tester should have a basic knowledge in the fundamentals of the equipment to be tested.

CLASSROOM EQUIPMENT

The following procedure is suggested for setting up the necessary training equipment and conducting instruction in such operations and service safeguards, as can be taught effectively in a classroom, when other training methods are not feasible.

Obtain the following equipment, apparatus, test sets, supplies, etc.

Chairs for 10 students.

Table, (See Fig. 1.)

Blackboard, Chalk and Eraser

Instructor's desk, chair and drawer unit

Drawing display board for blue prints

Waste basket, stationery, first aid kit

Handbooks 16 and 91

1 Connector Shelf installed on demonstration unit. (See Fig. 2)

Testing and adjusting equipment as follows:

1 Ite-4104 Connector Routine Test Set

1 Ite-4019 Pulsing Test Set

1 Ite-2580A Combination Talking Set

The following cords are included in the above sets

1 Ite-9596

1 Ite-9598

1 Ite-9600

4 Ite-9601

1 Ite-9630

1 Ite-9805 or 40A (Remote Control Unit)

1 Ite-9575 Test Receiver with cord and plug

1 505 SxS Apparatus Kit

8 6Volt Storage Batteries

35' #12 BRC Wire, White

35' #12 BRC Wire, Black

16 Storage Battery type terminal lugs

1 Copy SD-30228-01

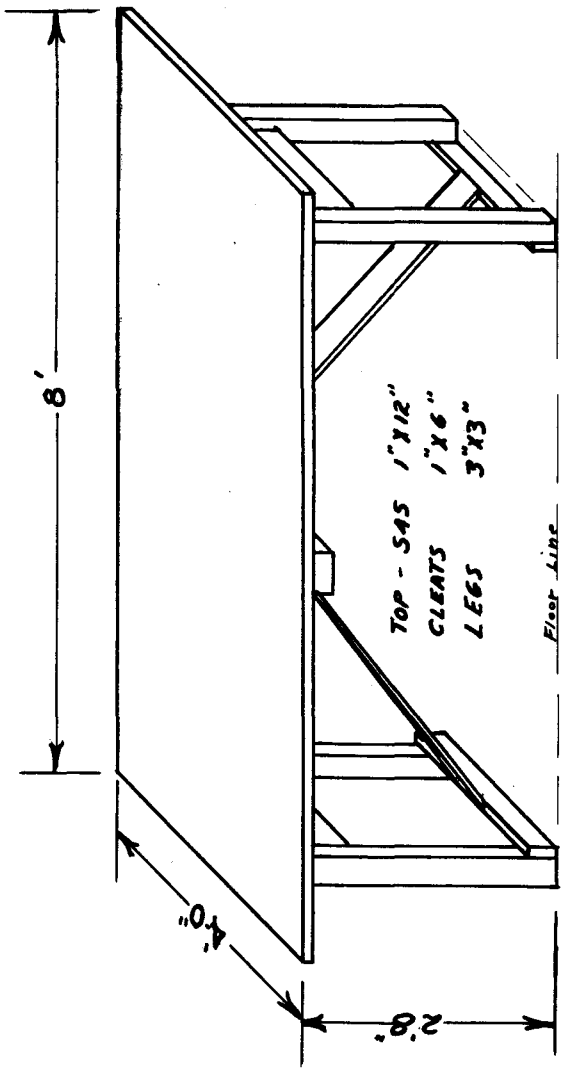
1 Copy CD-30228-01

1 Pad Id-1313 Test Trouble Record

NOTE: The equipment and apparatus may be obtained through arrangements with the Installation Stockkeeping Division at Hawthorne. It is expected that such tools as are required to set up the equipment may be temporarily obtained from a nearby job.

The classroom should be approximately 20 feet square with ample lighting arrangements. A 110V service outlet will be needed if it is found necessary to charge storage batteries in the classroom.

Machine ringing and busy tone should be furnished from nearest central office over cable pairs if available.



TRAINING ROOM TABLE

FIG. 1

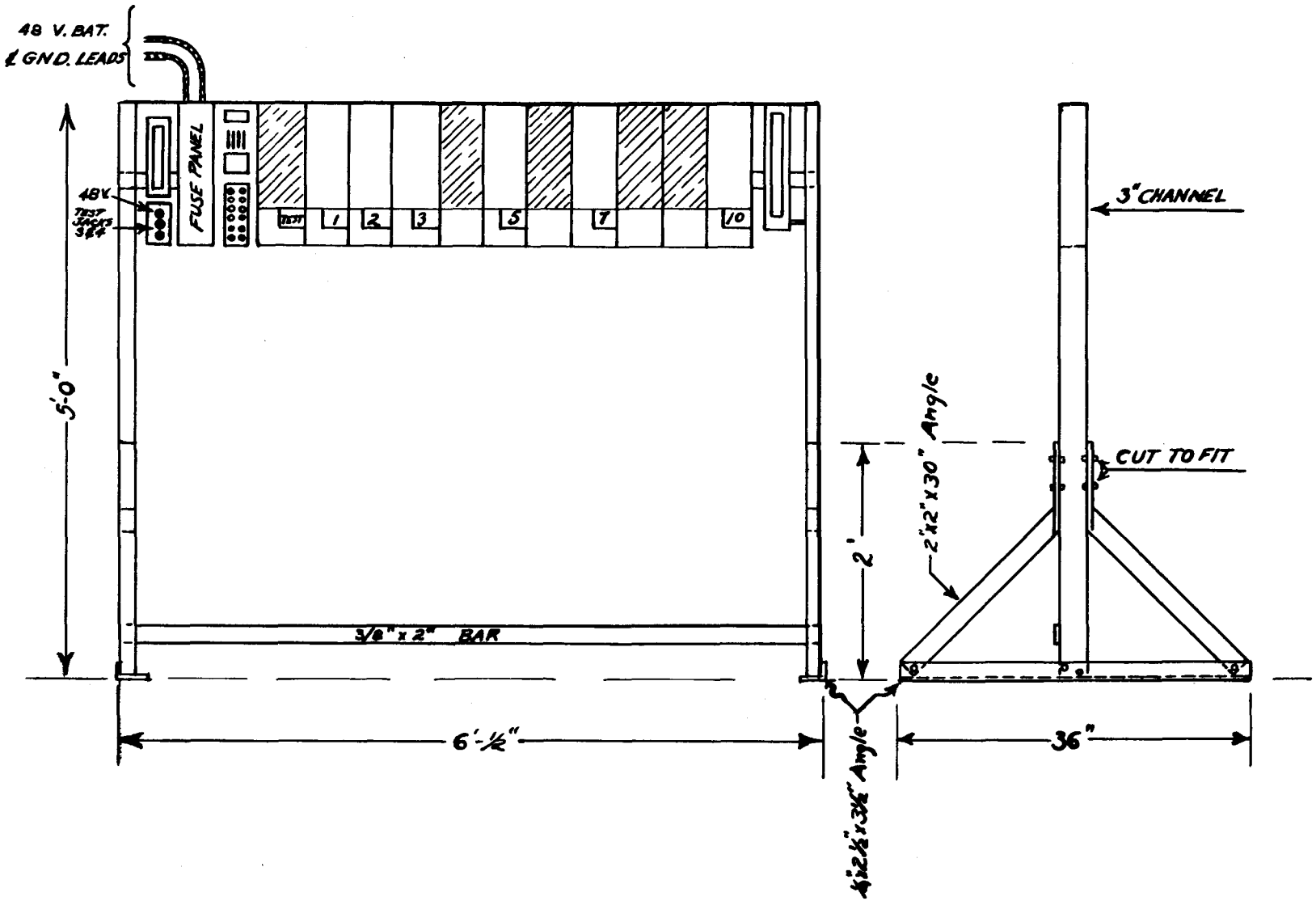


FIG. 2. - COMBINATION TOLL & LOCAL CONNECTOR

INSTRUCTOR'S OUTLINE

The following outline is intended for use by the instructor as a guide for proper sequence of the training operations and the proposed hours to be devoted to each particular subject under discussion. In such cases the time scheduled for certain operations will be altered to meet conditions, but the day to day totals should be maintained. This outline is submitted in brief form and insertions by the instructor are recommended to clarify points he feels will be brought up.

INSTRUCTOR'S OUTLINE 1st DAY

Introduction of students by instructor, informal, with name only.

1. Purpose and Objectives of Course

   A. Refer to Introductory

      1. Encourage questions

   B. Routine Tests of Connectors

      1. Explanation of Routine Tests in relation to adjustments, verifications and previous tests.

      2. Simplified explanation of Connector Pulsing, Operation, and Cut-In and Release tests.

At this point a discussion of the following will be advisable. 4 Hrs

Service Interruptions

Safety and Housekeeping

Care and Handling of Test Equipment

Responsibility of the Western Electric Company

Informal discussion with all students concerning background, previous service, experience with this type of equipment, or experience in reading schematics.

Presentation of Connector Switch and its function in the dialing train. 4 Hrs

Encourage questions and general discussion.

Refer to block diagram and pamphlet.

2nd DAY

Presentation of Switch

(Explanation by instructor that switch under discussion is a Combination switch only. Brief explanation of other types.)

Explanation of Connector Bay equipment 4 Hrs

Location and Numbering

Physical Description of Switch

1. Names of parts (rels, mags, shaft, etc)

2. Explanation of banks, levels, etc.

At this point the relation between the physical parts of the switch and their appearance in schematic form should be discussed.

4 Hrs

1. Purposes of a schematic.

2. Symbols (rels, mags, bat, grd, etc.)

The above points are merely for identification purpose only and are not intended to show electrical paths.

3rd and 4th DAY REVIEW 2 HRS

Discussion of actual circuit conditions.

1. Relay operation.

2. Magnet operation.

3. Electrical paths.

16 Hrs

Talking, etc.

Demonstrate with open and closed relay contacts on switch as schematic paths are traced. (Let each man perform and explain)

5th DAY

Local Connector Operation Test

Purpose and Theory

General Description of Test (Including Test Line Ckt and Pulsing

Test Set-Up

4 Hrs

Explanation by instructor & participation by students (4S Method)

Performance of Test

1. Busy Line Condition (Leak)

a. Connector Response

4 Hrs

Each student to perform and explain

6th DAY

2. Idle Line Conditions (Loop)

Each student to perform and explain. NOTE: Particular emphasis should be placed on the sequence of the PRE-TRIP & RING and TRIP operations. — 8 Hrs

7th DAY

Review, each student to set up and perform all tests. — 8 Hrs

8th DAY

Failures

Cause (Trace on schematic and CD, both regular & simplified

Set up and perform, show failures due to contacts, shorts, etc.) — 8 Hrs

9th DAY

Simple cases of trouble should be introduced by instructor and located by students. — 8 Hrs

Set up and perform Operation Test

(All Students)

10th DAY

Cut In and Release Test

Purpose and Theory

General Description of Set — 8 Hrs

Set-Up (4S Method) as before

Performance of Test

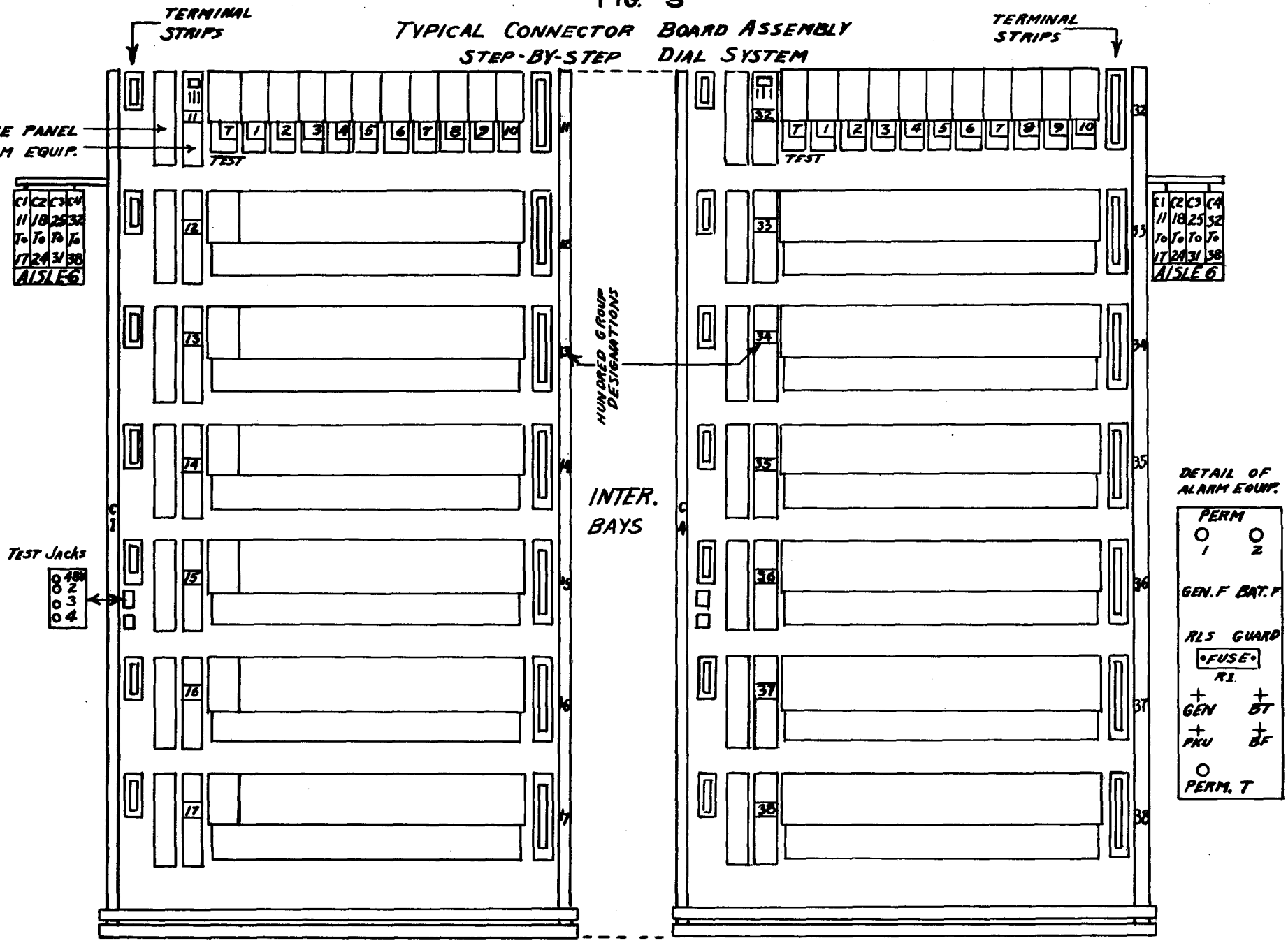
General Review

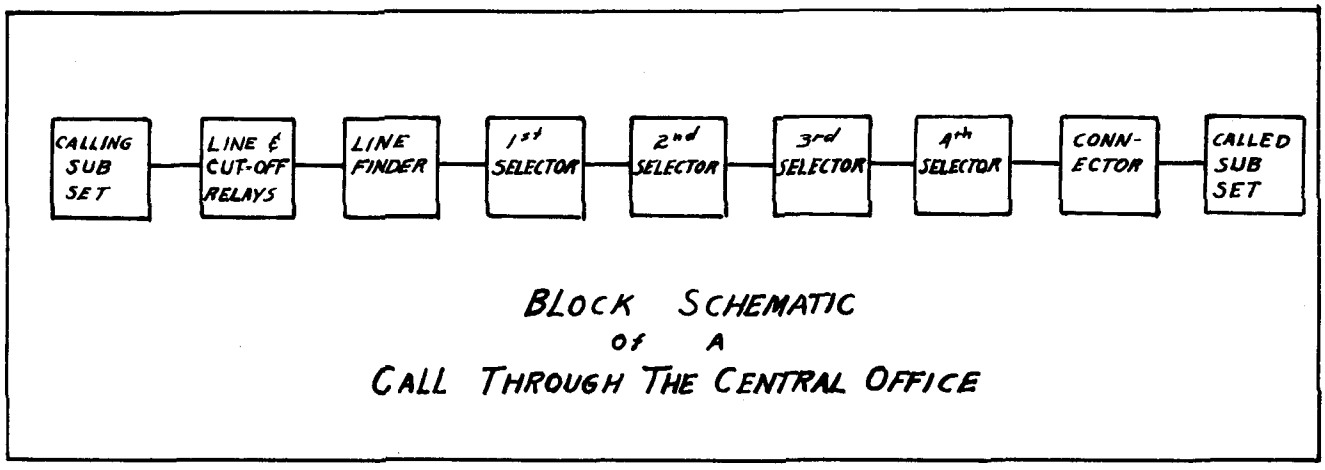
Explanation of ID 1313

FIG. 3

TYPICAL CONNECTOR BOARD ASSEMBLY

STEP-BY-STEP DIAL SYSTEM





BLOCK SCHEMATIC
OF A
CALL THROUGH THE CENTRAL OFFICE

FIG 4.

THE CONNECTOR SWITCH

The Connector Switch is the last item of equipment in the step-by-step dialing system that is directly controlled by the subscribers dial. Both the vertical and rotary action are under control of the dial.

The principal functions of the connector switch are:

(a) To make the final tens and units selection of the called number.

(b) To connect the calling party to the called party.

(c) To supply ringing current to the called subscriber, and also supply ringing induction to the calling subscriber as an indication that the called party is being rung.

(d) On a connection local to the originating office, to supply talking battery to both subscribers, or on a connection not local to the originating subscriber, to supply talking battery to the called subscriber. On a toll connection, to supply a transmission path free from all obstructions, under control of the toll transmission selector.

(e) To make a busy test and if the called line is found busy, to return busy tone to the calling subscriber, or in the case of a toll connection, return busy flash to the toll operator for

flashing her cord circuit supervisory lamp.

(f) To bring in an alarm if the calling party remains on the line after the called party had hung up.

Connectors are divided into the following classes:

(a) Local connectors - Used on local connections only.

(b) Toll connectors - Used on toll connections only.

(c) Combination connectors - Used on both toll and local connections.

(d) Local trunk hunting connector - Used on local calls to lines in a P.B.X. group.

(e) Toll trunk hunting connectors - Used on toll calls to lines in a P.B.X. group.

(f) Test connectors - Used by test deskmen and D.S.A. board operators only.

When a call has been terminated, the connector will assume its normally unoperated position upon the breaking of the connection by the calling party, and thereby release all preceding switches in the dialing train for re-seizure.

Circuit Description

When this connector is seized by an incoming call (local selector) a circuit is established and

(A) RELAY OPERATES

Negative battery, winding of (A) relay, normal contacts of (D) relay, preceding selectors, line finder, subscribers loop, normal contacts of (D) relay, relay winding of (A) relay, ground.

Closing a circuit over which

(B) RELAY OPERATES

Negative battery, winding of (B) relay, operated contacts of (A) relay, ground.

Which in turn supplies ground to the release trunk (S lead) for holding preceding switches in their operated position, and to guard the connector from seizure by another selector, opens in part the release circuit, and in part prepares the operating circuit of the vertical magnet.

At the first break of the pulse spring of the dial, the subscribers loop is momentarily opened and

(A) RELAY RELEASES

establishing a series circuit over which

VERTICAL MAGNET AND (C) RELAY OPERATE

Negative battery, winding of vertical magnet, winding of (C) relay, normal contacts (VON) springs, operated contacts (B) relay, normal contacts (A) relay, ground.

NOTE: Relays (B) & (C) are slow to release and remain operated during subsequent dial pulses of the digit dialed.

The vertical magnet steps the vertical shaft up one step. The (VON) springs operate and transfer the original operating path of the vertical magnet and (C) relay from the normally made springs (5 & 7) of (VON) to operated closed springs (6 & 7) (VON) and operated contacts of (C) relay.

An instant later the pulse contacts of the dial close and

(A) RELAY RE-OPERATES

over the previously described circuit,

which opens the circuit to the vertical magnet and (C) relay, ((C) relay being slow to release, does not restore at this time) and

VERTICAL MAGNET RELEASES

At the next break of the pulse of the dial

(A) RELAY RELEASES

Closing a circuit over which the

VERTICAL MAGNET OPERATES

Negative battery, winding of vertical magnet, winding of (C) relay, operated contacts of (C) relay, operated springs (VON) operated contacts (B) relay, normal contacts (A) relay, ground.

NOTE: The energy created in the vertical magnet is absorbed by the condenser which is connected from the contact of (B) relay to ground. This serves as a protection for the contacts of the (A) relay.

An instant later the pulse contacts of the dial close and

(A) RELAY RE-OPERATES

as described before

and

VERTICAL MAGNET RELEASES

at next break of the dial.

This action repeats itself until the switch is stepped to the level corresponding to the number of pulses as indicated on the subscriber's dial. The return of the dial to normal holds the (A) relay operated for a sufficient length of time to permit the release of the (C) relay. This interval is the time between the dialing of the digits.

(C) RELAY RELEASES

and prepares the circuit for

ROTARY STEPPING

A pulse sent out by the dial will now operate as before

(A) RELAY OPERATES

over circuit described as before

and

(B) RELAY OPERATES

over the circuit described as before

and

(A) RELAY RELEASES

and prepares a parallel circuit over which

ROTARY MAGNET AND (E) RELAY OPERATE

(Rotary Magnet) Negative battery, winding of rotary magnet, normal contacts of (K) relay, normal contacts of (G) relay, normal contacts (C) relay, operated contacts (VON), operated contacts of (B) relay, normal contacts (A) relay, ground.

((E) Relay) Negative battery, winding of (E) relay, normal contacts (G) relay, normal contacts (C) relay, operated contacts (VON), operated contacts of (B) relay, ground.

The operation of the rotary magnet steps the switch horizontally one step.

At the next closure of the dial contacts

(A) RELAY RE-OPERATES

over previously described circuit

and opens the circuit to the rotary magnet and (E) relay. (The (E) relay is slow to release and remains operated).

The

ROTARY MAGNET RELEASES

at the next break of the dial

(A) RELAY RELEASES

and the

ROTARY MAGNET OPERATES

over previously described circuit

to step switch another rotary step. The operation and release of the rotary magnet contines as before until the switch stops at the terminal corresponding to the digit dialed. At the completion of the pulses, the wipers are standing on the bank terminals dialed.

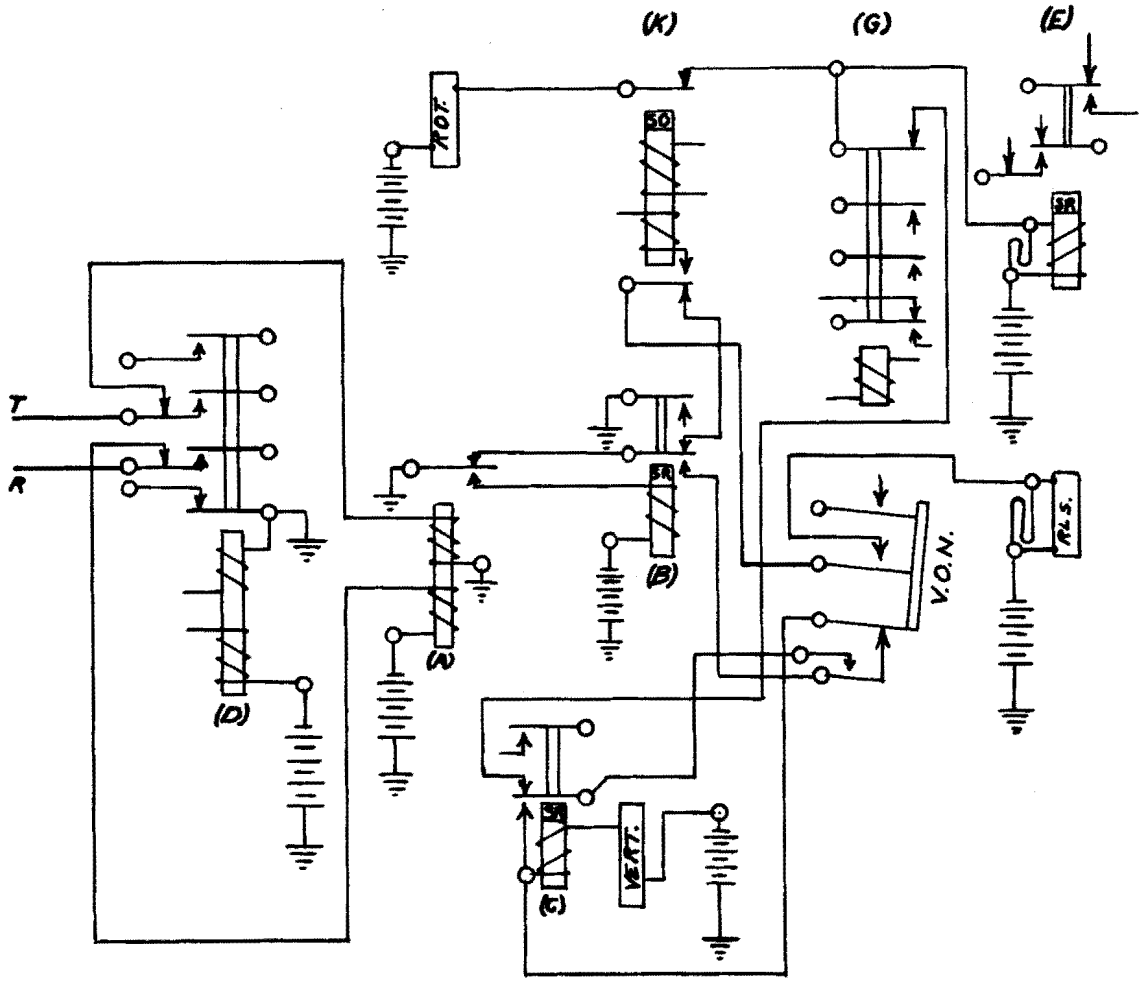
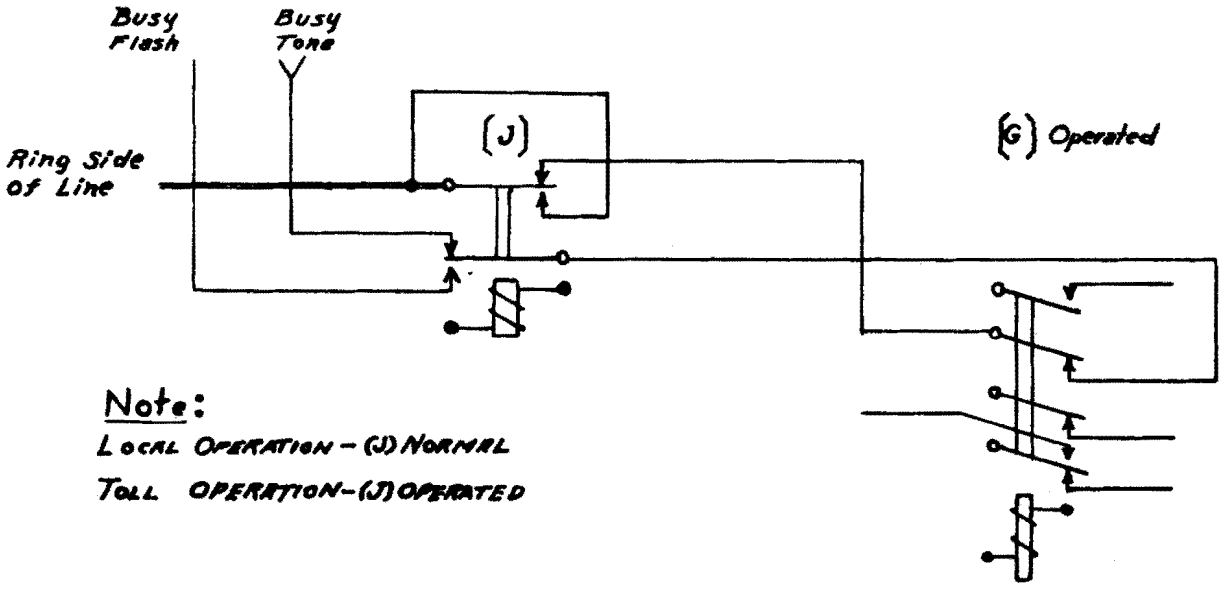


FIG 6 - VERTICAL, ROTARY & RELEASE OPERATING PATHS, LOCAL CONNECTOR



Note:
LOCAL OPERATION - (J) NORMAL
TOLL OPERATION - (J) OPERATED

FIG 7 - BUSY CONDITIONS CONNECTOR

BUSY TEST

If the line dialed is busy, ground will be standing on the (S) terminal of the bank which closes a circuit and

(G) RELAY OPERATES

Negative battery, winding of (G) relay, normal contacts of (K) relay, operated contacts of (E) relay, sleeve wiper, (S) bank terminal, ground.

NOTE: The (E) relay has not restored at this time.

After a moment the

(E) RELAY RESTORES

and

(G) RELAY LOCKS

Negative battery, winding of (G) relay, normal contacts of (K) relay, normal contacts of (E) relay, operated contacts of (G) relay to sleeve lead ground.

(G) RELAY OPERATED AND LOCKED

Furnishes Busy Tone to calling party.

Jack #14, normal contacts of (J) relay, operated contacts of (G) relay, normal contacts of (J) relay to ring side of line.

At the completion of the dialing pulses the wipers are standing on the dialed line. Battery is standing on the sleeve terminal of the bank. (From the Line Finder Line and Cut-Off Relay circuit.)

CUTTING THRU TO THE CALLED LINE

(K) RELAY OPERATES

(Primary winding only)

Negative battery sleeve bank terminal, normal contacts of (E) relay, primary winding of (K) relay, normal contacts of (G) relay, sleeve lead, ground.

Operated contacts of 1 and 2B of (K) relay close a circuit for operating the secondary winding of (K) relay.

(Secondary winding)

Negative battery, rotary magnet winding, secondary winding (K) relay, operated contacts (K) relay (1 and 2B), operated contacts (VON), normal contacts of (H) relay to sleeve lead ground. This circuit provides a locking path for (K) relay.

NOTE: Battery to the secondary winding of (K) relay is supplied through the rotary magnet to prevent the operation of the (K) relay if a pulse is transmitted to the rotary magnet by an irregular operation at the calling station after springs 1 and 2B have made but before springs 3 and 4T have broken. If relay (K) were permitted to operate under conditions described in the foregoing it might result in the calling party cutting in on a busy connection.

Operation of (K) relay places ground on the called line sleeve,

Ground, operated contacts (K) relay, sleeve wiper to (S) contact.

and closes path for generator to ring called party.

Machine ring (JK22) operated contacts of (K) relay, Jacks 24 & 8 primary winding (F) relay, Jacks 6 & 5, normal contacts (F) relay, operated contacts of (K) relay, ring wiper, called subscriber's loop, tip wiper, operated contacts of (K) relay, normal contacts (F) relay to Jack 13 (gen. ground).

NOTE 1: (F) relay does not operate at this time because of the resistance in the ringer located in the called party's sub-set.

NOTE 2: Ringing induction is returned to the calling subscriber thru condenser (A) and ring side of calling line.

When the receiver is removed from the switch hook by the called party,

the ringer in the sub-set is shorted out and

(F) RELAY OPERATES

(over previously described circuit) and locks thru its own contacts.

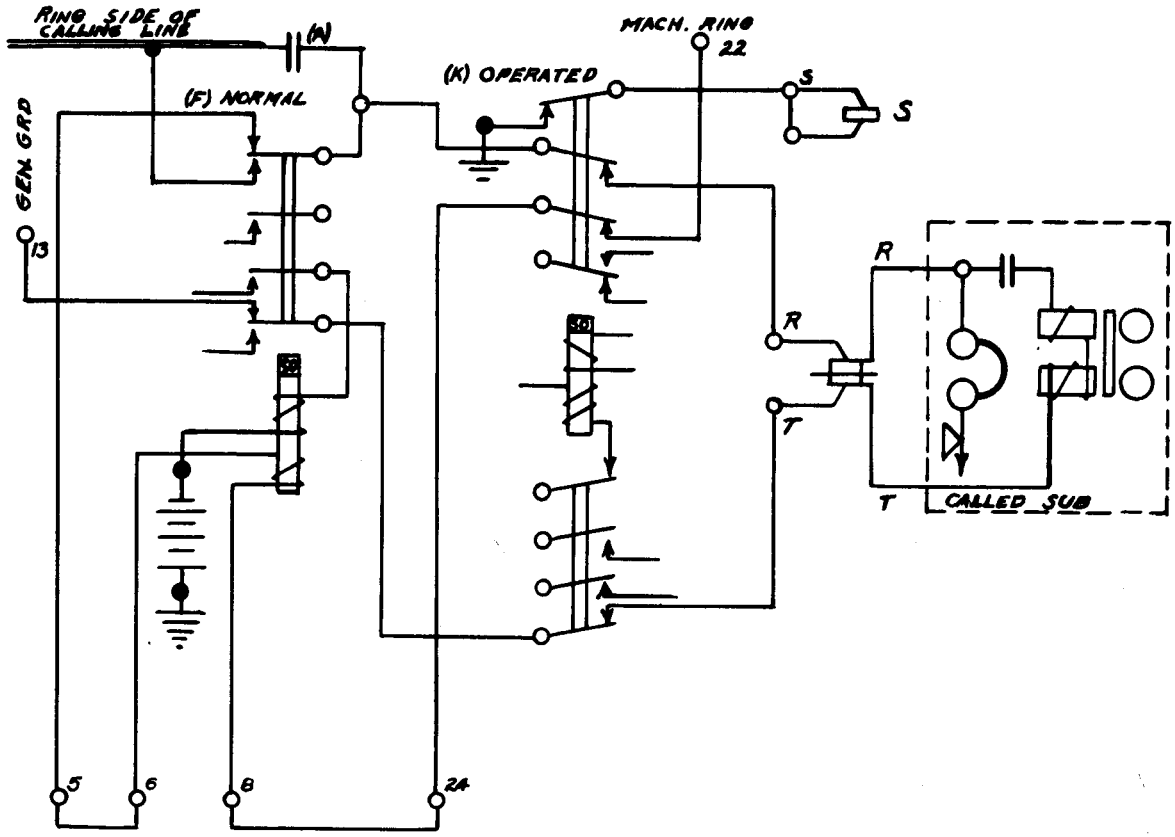
Negative battery, secondary winding (F) relay, operated contacts (F) relay, normal contacts of (J) relay, normal contacts (H) relay, operated contacts (B) relay, ground. (Sleeve)

and opens ringing path to called station, closes the incoming tip and ring

thru its operated contacts, and closes a path where-by

(D) RELAY OPERATES

Negative battery, winding (D) relay, normal contacts (J) relay, operated contacts (F) relay, operated contacts (K) relay, tip



NOTE:

(F) RELAY OPERATES WHEN RECEIVER IS REMOVED FROM CALLED SUB SWITCH-HOOK

FIG. 8 RINGING LOCAL & TOLL CONNECTOR

wiper, subscribers loop, ring wiper, operated contacts (K) relay, operated contacts (F) relay, normal contacts (J) relay, winding (D) relay, ground.

and reverses the battery to the calling line for supervisory purposes. The (D) relay furnishes the transmission battery and ground to the called party whereas the (A) relay furnishes transmission battery and ground to the calling party.

NOTE: Condensers are inserted between calling and called line.

If the called party hangs up first

(D) RELAY RELEASES

(DC loop to called subscriber is opened)

and places ground on alarm lead (Supv #1) as an indication of an alarm condition.

Ground, normal contacts of (D) relay, operated contacts of (F) relay, normal contacts of (H) relay, Jack 16 (Supv #1) to battery from Switch Trouble Alarm Circuit.

NOTE: No other circuit conditions are affected and switch remains operated.

When the calling party hangs up the operating circuit for the (A) relay is opened and

(A) RELAY RELEASES

and opens the operating path for the (B) relay

and

(B) RELAY RELEASES

and removes the ground from the release trunk (sleeve lead), permitting the preceding switches to restore, opens the operating path to (F) relay, which restores, opens the path to the (K) relay

and

(K) RELAY RESTORES

and closes a circuit where-by the

RELEASE MAGNET OPERATES

Negative battery, Jack #10, release magnet winding, operated contacts (VON), operated contacts (K) relay, normal contacts (B) relay, normal contacts (A) relay, ground.

and the release mechanism of the switch restores it to its normally unoperated position. In so doing

(D) RELAY RELEASES

(If called party remained on line after calling party had hung up)

and

(VON) SPRINGS RESTORE

and open the operating path where-by the

RELEASE MAGNET RELEASES

and

(K) RELAY RELEASES

and switch is restored and is now available for re-seizure.

When the calling party hangs up after a busy line condition, the (F) and (K) relays are not operated, but the (G) relay is operated and the switch restores to normal as described before.

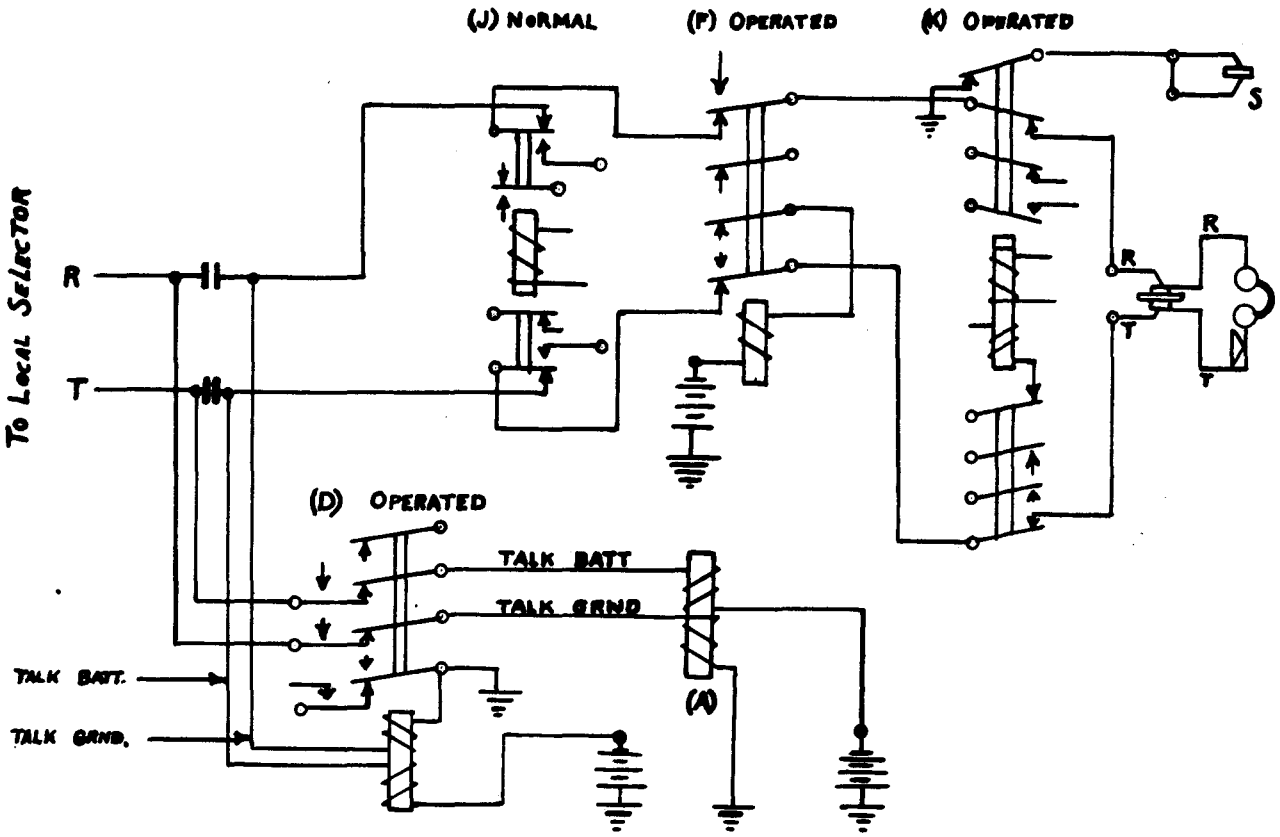


FIG 9 - TALKING & TRANSMISSION LOCAL CONNECTOR

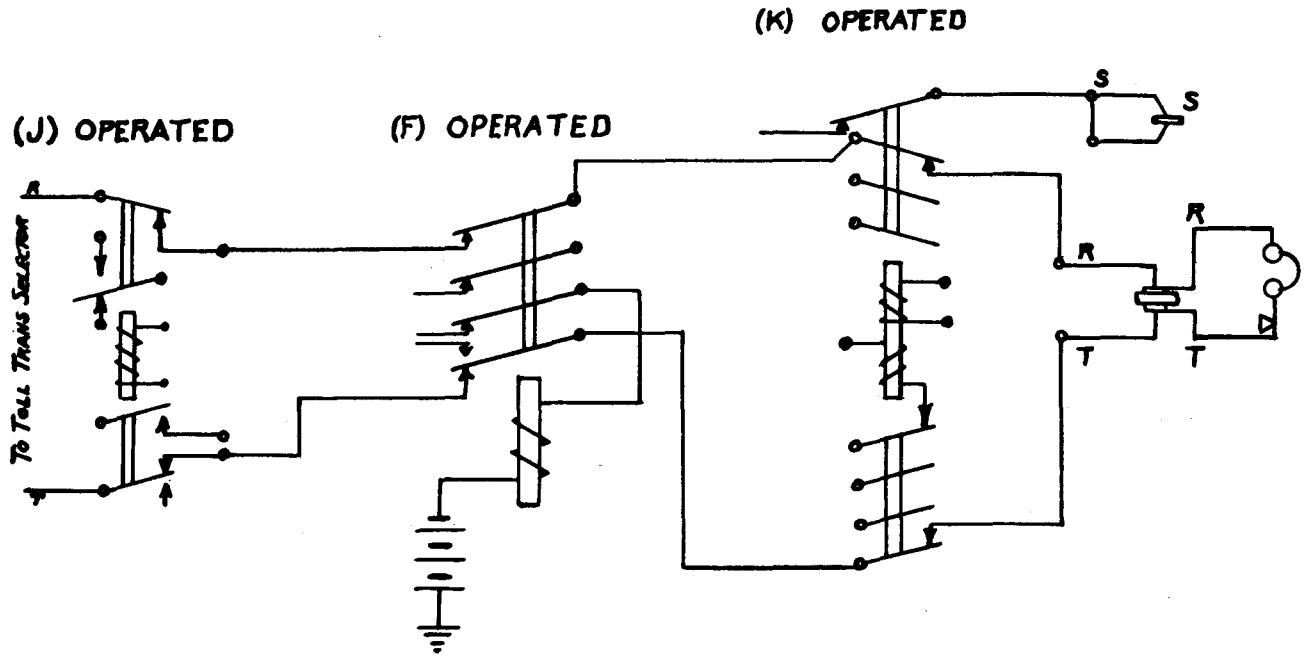


FIG.10 - TALKING & TRANSMISSION TOLL CONNECTOR

TOLL CONNECTOR OPERATION

CIRCUIT DESCRIPTION

When this connector is seized by a toll selector, a loop is extended across the toll tip and ring lead, and ground is supplied from the incoming toll sleeve lead and

(A) AND (H) RELAY OPERATE

Negative battery, winding of (A) relay, primary winding (H) relay, normal contacts (J) relay, Jack #19 (R) toll loop, Jack #20 (T) normal contacts (J) relay, winding (A) relay, ground.

(A) relay in operating closes a circuit over which

(B) RELAY OPERATES

Negative battery, winding of (B) relay, operated contacts of (A) relay, ground.

The vertical and rotary stepping procedure is the same as described under Local Operation with the exception of the (H) relay which operates on the first vertical step, and locks thru its own contacts:

((H) Relay Locking path)

Negative battery, winding of (H) relay, operated on contacts of (H) relay, ground. (Toll Sleeve Lead)

and (H) relay operated opens the Supv. 1 lead to prevent an alarm.

Also on the first vertical step, (F) relay operates

Negative battery, winding (F) relay, operated contacts (C) relay, operated contacts (H) relay to sleeve lead ground.

(F) relay then locks thru its operated contacts.

Negative battery, winding (F) relay, operated contacts (F) relay, normal contacts (J) relay to sleeve lead ground.

BUSY CONDITION

After the connector has been stepped to the desired terminals (as described under Local Operation) the wipers are standing on the dialed line banks, and ground is standing on the (S) bank terminal. (As described before). The sleeve wiper will close a circuit where-by

(G) RELAY OPERATES

Negative battery, winding (G) relay, normal contacts (K) relay, operated contacts (E) relay, sleeve wiper, ground. When (E) relay restores, (G) relay locks thru its own contacts.

Negative battery, winding of (G) relay, normal contacts (K) relay, normal contacts (E) relay, operated contacts (G) relay to sleeve lead ground.

and closes a path over which

(J) RELAY OPERATES

Negative battery, rotary magnet winding, normal contacts (K) relay, normal contacts (E) relay, operated contacts (G) relay, winding (J) relay, operated contacts (H) relay, to toll sleeve lead ground.

and furnishes busy flash to the calling operator over the ring side of the line

Jack #23, resistance (A) operated contacts (J), operated contacts (G) relay, operated contacts (J) relay, ring side of line.

and removes ground from the toll (C) lead, and transfers the incoming toll tip and ring to the contacts of the (F) relay

and transfers ground on the sleeve lead to hold the (A) relay operated.

Negative battery, winding of (A) relay, winding (H) relay, resistance (B), operated contacts (J) relay, sleeve lead ground.

The busy flash (interrupted ground) causes the toll operator's supervisory lamp in the cord circuit to flash as an indication that the dialed line is busy.

SEIZURE

At the completion of the dialing pulses the wipers are standing on the dialed line. Battery from the Line Finder Line and Cut-Off Relay Circuit is standing on the (S) bank terminal.

(K) RELAY OPERATES
(See Local Operation)

and extends tip and ring thru to the called line. It also places ground on the sleeve bank contact, and locks to ground on the sleeve lead.

Negative battery, rotary magnet winding, secondary winding (K) relay, operated contacts (VON) to sleeve lead ground.

and closes a circuit over which

(J) RELAY OPERATES

Negative battery, rotary magnet winding, operated contacts (K) relay, winding (J) relay, operated contacts (H) relay, to sleeve lead ground.

and removes the (A) relay from across the tip and ring of the toll trunk, extends the toll trunk to the called line, removes the ground from the control (C) lead and provides a circuit for holding the (A) relay operated.

Negative battery, winding of (A) relay, primary winding of (H) relay, resistance (B), operated contacts of (J) relay, to sleeve lead ground.

With ground removed from the control (C) lead the transmission selector functions to transfer the operator's position dial circuit to the cord circuit. The cord supervisory lamp will light as a signal to the operator that the line dialed has been seized and is ready for ringing. The removal of the ground on the control (C) lead opens the holding circuit where-by

(F) RELAY RELEASES

and starts machine ringing

RINGING then proceeds as described under Local Operations. As described before when the called station removes the receiver, the

(F) RELAY OPERATES

As described under Local Operation.

With relays (F), (J), & (K) operated the subscriber's line is connected thru to the toll trunk and the toll transmission selector, which furnishes transmission free from all transmission obstructions.

RELEASE

Removal of ground from the incoming (S) lead by the operator and toll transmission selector, opens the holding path for the (A) relay which releases, and the switch releases under very similar conditions as described under Local Operation.

CONNECTOR TEST LINE AND JACKS

GENERAL. All un-assigned connector terminals are strapped together and connected to intercepting trunks, so that when a subscriber (or operator) lands on one of these terminals, he will be informed by an intercepting operator that the line has been disconnected or not assigned.

Step by Step systems reserve 99 of each connector hundred group for testing purposes by the maintenance force. It is therefore necessary to remove 99 of each connector hundred group from the intercepting trunk for testing purposes, but return terminals 99 to the intercepting trunk in the event of seizure by a subscriber who has dialed this number in error.

DESCRIPTION. Test jacks, designated (3) & (4) are located in each connector bay, for use by the tester. Terminals 99 of each connector hundred group in the bay are multipled together and connected thru a relay (INT) to the intercepting trunk.

When cords are inserted in these jacks by the tester for connection to a test set, the plug of the cord in jack (4) will cause relay (INT) to operate over the (SI) lead.

The operation of relay (INT) opens the multipled 99 terminals of the connector hundred groups in the bay, from the intercepting trunk. The connector 99 multiple then appears at jacks (3) & (4) as follows:

Conn. 99 Mult	Jack
T	(3) Sleeve
R	(3) Ring
S	(4) Tip

Battery and ground are also furnished to the test set from these jacks as follows:

48V Battery	JK (3) Tip
Ground	JK (4) Ring

It is therefore imperative that the test set be connected to Jacks (3) & (4) corresponding to the connector hundred group being tested.

LOCAL CONNECTOR ROUTINE OPERATION TEST

Preliminary Information

The Connector

The connector is the final piece of equipment in the chain of the dialing operation. It actually connects the calling party to the called party; and in so doing, performs the following functions:

1. Steps up and in corresponding to the last two digits dialed.
2. Connects the calling party to the called party.
3. Rings the called party.
4. Furnishes busy tone to the calling party if the called party's line is in use.

Purpose of Test

The purpose of the following test is to simulate the above conditions, and to observe that the connector responds in the proper manner.

The Test Set

The test set is so arranged that as conditions are applied to the connector, the lamps on the set give a visual indication of the condition being imposed. A remote control unit is used, whereby the tester may select the condition to be applied to the switch under test. The head set receiver is used to supply tones to the tester as an audible indication that the connector is functioning satisfactorily.

The conditions imposed by the test set are applied in the following sequence:

LAMP LIGHTED	Test Set Conditions
1. Busy Line	Called party's line is busy
2. Idle Line	Called party's line is available
3. Pre-trip	Ringing is not stopped
4. Ring	Called party's phone is ringing

5. Trip — Ringing is stopped if Called party removes the receiver from the instrument while it is still ringing.

6. Tone - Co — Called party hangs up, but switch does not fall down.

These conditions are selected by the operation and release of key STP. Key STP, key PLS and key RLS are located on the Remote Control Unit. All other keys and lamps are on the test set.

Testing Equipment

Test Sets Required

1 ITE 4104 Connector Routine Test Set

1 ITE 4019 Pulsing Test Set.

The following cords required are included in the above sets.

1 ITE 9598

1 ITE 9600

4 ITE 9601

1 ITE 9596

1 ITE 9630

1 ITE 9805 or 40A (Remote Control Unit)

1 ITE 9575 Test Receiver with cord and plug

Set-up for Test

1. Locate the test set near the connectors to be tested, leaving adequate space for use of the rolling ladder. The ladder will be required by the tester for testing connectors on the upper shelves.

2. Make connections to the test set as show on Fig. 11 using caution to insert plugs of cord ITE 9598 (BAT/ G & 48V) in proper sequence as shown in encircled numbers.

Preliminary Operations

Operate key SUP-TST on the test set. Place test receiver on head, hold Remote Control Unit in left hand, and with the other hand insert plug of ITE 9630 into test jacks of first connector

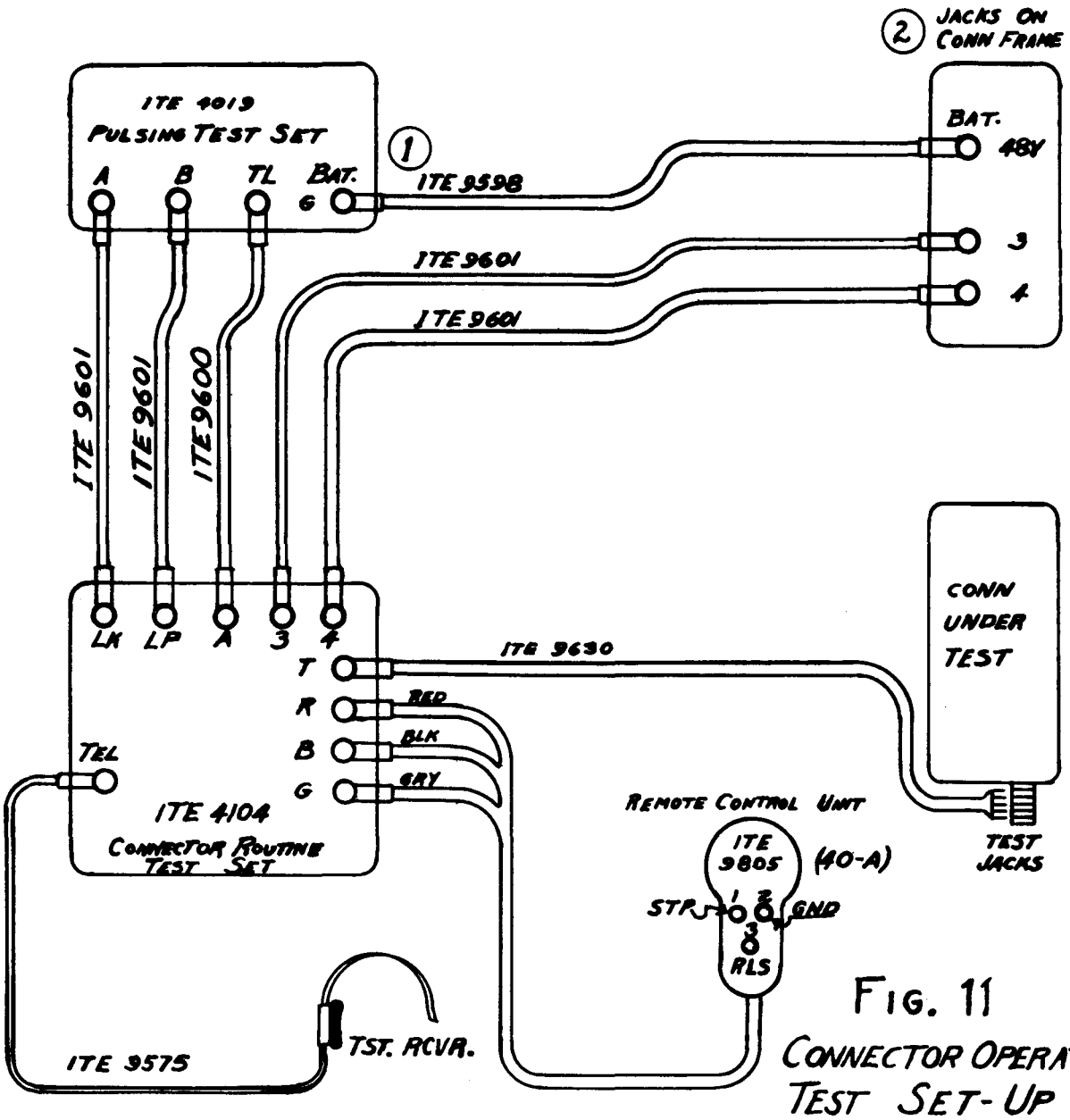


FIG. 11
CONNECTOR OPERATION
TEST SET-UP

to be tested. Observe that there are no lamps lighted on the test set, and that the connector is in its normal unoperated position.

Test Operations

1. Operate key STP a sufficient number of times until BUSY LINE lamp lights on the test set.

2. Depress and hold key PLS until connector steps up to the ninth level and starts to rotate horizontally. Connector should stop at terminal 9-9. Lamp BUSY lights, and BUSY TONE is heard in the tester's receiver.

3. Momentarily operate key RLS. The connector restores to its normally unoperated position, lamp BUSY is extinguished, and BUSY TONE is removed from the receiver.

4. Operate key STP and the lamp IDLE LINE lights.

5. Depress and hold key PLS until connector steps up to the ninth level and starts to rotate horizontally. Connector should stop at terminal 9-9. Lamp BUSY lights, and RINGING tone is heard in the test receiver. Note that lamp RS lights while RINGING tone is being heard.

6. At the beginning of a ringing period (ordinarily the second), operate key STP to light lamp PRE-TRIP and immediately reoperate key STP to light lamp RING, before the ringing has ceased. (The above sequence must be made during the actual ringing interval and may require a little practice to insure the proper test condition being applied.) Note that ringing continues by observing that lamp RS lights and RINGING TONE is still heard in the test receiver.

7. Shortly after the start of the next ringing interval, operate key STP to light lamp TRIP. Note that ringing is stopped, observe that lamp RS goes out, and that RINGING TONE in the test receiver is replaced by a steady tone.

8. Operate key STP to light lamp TONE CO. Tone is removed from the test receiver.

9. Momentarily operate key RLS. The connector restores to its normally un-operated position, and all lamps on the test set are extinguished. (Lamp GUARD may be lighted, but this can be disregarded.)

10. Remove cord from connector test jacks, insert in next switch, and repeat operations 1 to 10.

PULSING TEST

NOTE: This test is incorporated in the Local Connector Operation Routine Test and is made in conjunction with this test. The information herein contained is for reference only, or when the Pulsing Test is to be made independently.

The pulsing test provides a means of making more accurate tests of the connector pulsing relay (A) and the switch vertical and rotary motor mechanism.

In performing the Loop Test, actual operating conditions on the loop are simulated by introducing predetermined resistance values into the loop through operation of keys on the pulsing test set. An increase in loop resistance lowers the amount of current flowing in the winding of the connector pulsing relay (A) resulting in a weaker pull on the relay armature; faulty adjustment of the (A) relay (too much spring tension, etc.) will result in a failure of the switch to meet the test. A decrease in loop resistance increases the amount of current flow in the relay winding resulting in a stronger pull on the relay armature. Operation of relay (A) Controls the switch vertical and rotary motor mechanism. This being true, any departure from specified adjustments on the (A) relay will result in the failure of the vertical and the rotary operation of the switch. However, an additional test is described in this method to isolate failures encountered, indicating whether the failure is due to the (A) relay or to the vertical or rotary motor mechanism.

The LEAK test imposes a current leak condition on the circuit loop through a series condenser in the test set. Release of the charge within the test set condenser results in a surge of current through the pulsing relay (A) winding resulting in a tendency of the relay to remain operated. Under the leak condition, the relay is required to release at the same time

that current is being applied to the relay winding. It may readily be observed therefore, that the test applies maximum operating conditions on the switch.

When the LOOP and LEAK conditions are applied in the foregoing, and if these tests are made in conjunction with the Local Connector Operation Test, the Connector Routine Test Set imposes these conditions when the switch is operated initially for IDLE LINE and BUSY LINE tests respectively.

GENERAL DESCRIPTION of PULSING TEST SET

The pulsing test set is a portable unit and may be conveniently located on the rolling test stand for ease in transporting on the job. It is designed to supply a series of nine accurately timed pulses spaced at definite intervals which are transmitted to the switch under test.

Three push button type keys designated (200), (400) and (800) are provided to insert resistance values of from 0-1400 ohms in the loop circuit in 200 ohm steps. Lever type keys (LK A), (LK B), and (LK C) when operated impose the various leak conditions upon the loop. Jacks are provided for connection to the source of power, equipment under test, and for remote control operation of the set.

TEST SET-UP

Set up the test set as described under SET UP for Local Connector Routine Test using Fig. 11 of that section. Depress push-button type keys (200), (400) & (800). Operate lever type key (LK A).

PERFORMING THE LEAK TEST (BUSY LINE LAMP)

This operation is performed as operations 1 and 2 under Test Operations in the Connector Operation Test section. The connector switch shaft shall rise smoothly to the ninth bank level, and rotate smoothly to terminal 9-9. Perform operation 3 as described under Local Connector Routine Operation Test.

PERFORMING THE LOOP TEST (IDLE LINE LAMP)

This test is performed as operations 4, 5, & 9 under Test Operations in the Local Connector Routine Operation Test. The connector shaft shall rise smoothly to the ninth bank level, and rotate smoothly to terminal 9-9. If no trouble is encountered in the performance of operations 4 & 5, proceed with operations 6, 7, 8 & 9 as described in the Local Connector Routine Operation Test.

SUPPLEMENTARY MAGNET TEST

This test is intended only for those cases in which the switch under test fails to operate on the preceding pulsing tests, and is primarily used on failures which occur on the LEAK test. This test determines whether the trouble which caused the failure is due to the (A) relay or the switch motor mechanism. In this test the (A) relay is operated and remains operated throughout the test.

A comparison between the LEAK test and the MAGNET test may be made simply by returning the lever key (M A G) to its normal position after the switch shaft has returned to normal. The LEAK test may then be repeated in the usual manner.

SET UP FOR MAGNET TEST

The set up for this set is identical with the original set up, except for the addition of one cord and the operation of one key. Insert the 110 plug of the ITE-9596 Cord in the (MAG) jack of the test set and clip the tip (T) conductor of this cord to the right hand (facing the front of the switch) contact of the connector (A) relay. Operate the lever type key (MAG) on the pulsing set.

PERFORMING THE MAGNET TEST

Observe that lamp BUSY LINE is lighted on the Connector Test Set.

Depress and hold key PLS until connector steps up to the ninth level and starts to rotate horizontally. If the preceding LEAK test failure had been due to the (A) relay, the switch shaft will rise smoothly to the ninth level and rotate smoothly to terminal 9-9. If the switch motor mechanism is in trouble the switch shaft will not operate smoothly as described as above. Operation of key RLSE will restore the switch to its normally unoperated position.

Upon completion of the MAGNET test, remove the ITE-9596 cord from the MAG jack and the (A) relay, restore the lever type key MAG and proceed with regular test.

CONNECTOR CUT IN & RELEASE TEST

PURPOSE OF TEST

This test is made to insure proper operation of the vertical, rotary and release action of the connector. The pulsing test checks the vertical and rotary action as far as the ninth level is concerned, but this test checks these features and the release on all levels. Therefore, the test should be performed on a different level on each cycle of test.

TESTING EQUIPMENT REQUIRED

1 ITE 2580 - A Combination Talking Set.

TEST OPERATIONS

1. Insert the test plug of the Combination Talking Set in the test jack of the connector under test. Operate C button.

2. Dial the number which will step the switch to the proper level to be used on this particular cycle.

3. Dial a second digit, and observe that the switch rotates smoothly to the proper terminal dialed.

4. Release the C button of the Combination Talking Set. Observe that the switch releases without chattering.

ID-1313 (1-45)

FIG 12

SAMPLE COPY

TEST TROUBLE RECORD

NAME OF TEST OR NAME OF CIRCUIT: LOCAL CONNECTOR ROUTINE OPERATION TEST			FILE NO. 3
HB 91	SEC. 303	MANLOAD / MAN HOURS	DATE 1/23/46
TOWN THISTOWN CALIF.	ORDER NO. 12345-H	TOTAL NO. OF CCTS. 482	FOR ROUTINE TESTS ONLY CYCLE NO. 3
		NO. OF CIRCUITS TESTED PER THIS SHEET 200	SHEET NO. 1
MAIN #6 OFFICE	L.A. DIV.	☐ NEW ☑ ADD. ☐	NO. OF SHEETS 2

☐ GENERAL ☑ ROUTINE ☐ OTHER

BAY OR UNIT #	CCT. #	TROUBLE INDICATION	TROUBLE FOUND	CLEARED BY
C-4	09/3	OVERSTEPS ON BUSY		
11	07/4	R3. LAMP DOESN'T LIGHT		
C-5	11/6	TRIPS ON PRE-TRIP		

GENERAL TESTS MAY BE IDENTIFIED BY NUMBER

1. CONTINUITY
2. VOLTMETER
3. OPERATION
4. TALKING OR TONE
5. ADJUSTMENT
6. RESISTANCE MEASUREMENT
7. CIRCUIT INDUCTION
8. CONTACT PROTECTION

SIGNED: John Doe

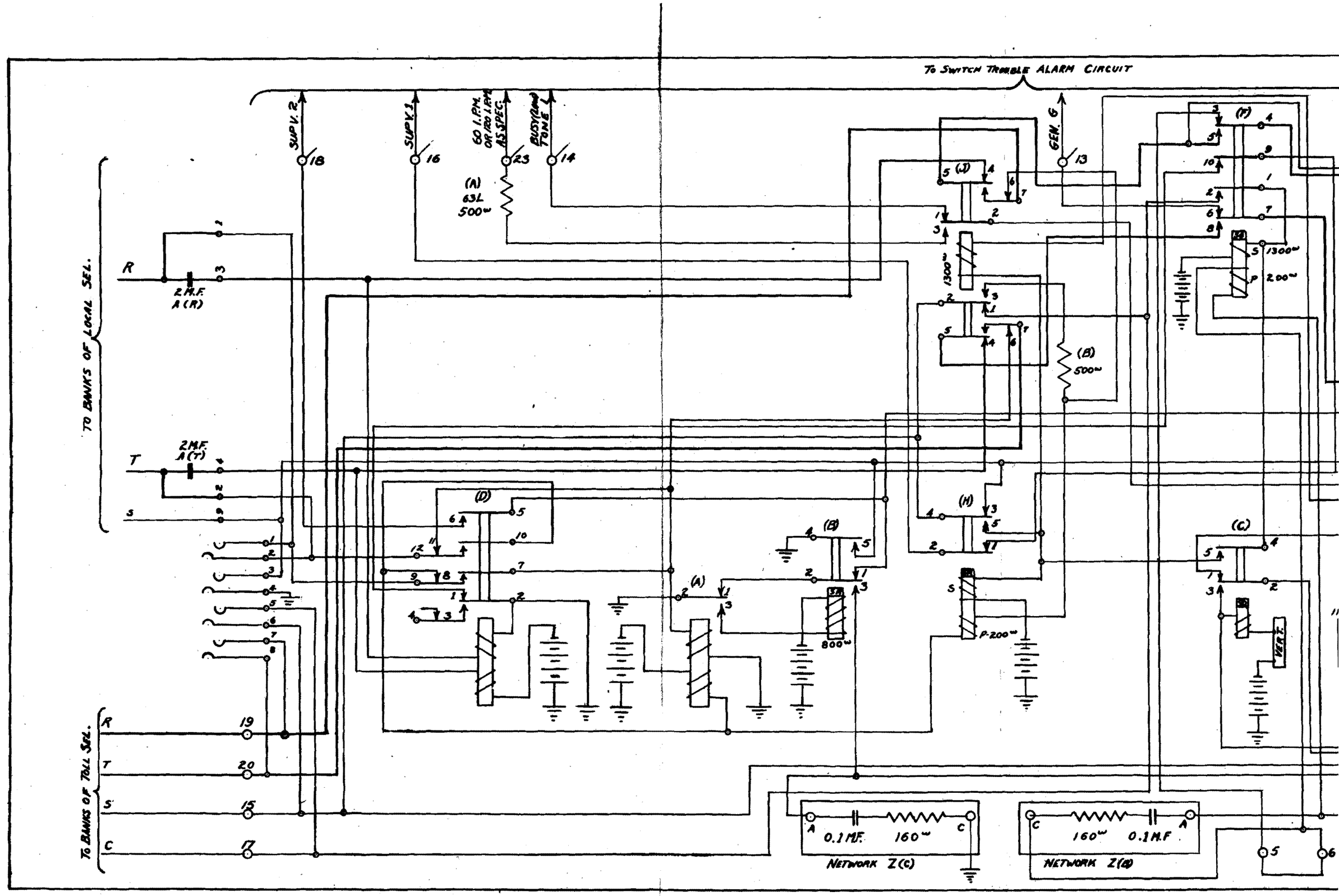


FIG. 5

To Switch Trouble Alarm Circuit

GEN. 6

RLS. BAT.

MACH. RING

MULTIPLE BANK ASSEMBLY

(A) .04 M.F.

(B) 500ω

(C)

(D)

(E)

(F)

(H)

(J)

(K)

1300ω

P 200ω

P 125ω

1100ω

1300ω

800ω

P. 200ω

NOT.

VERT.

115ω

H.L.S.

V.A.N.

0.1 M.F. 160ω

NETWORK Z(C)

160ω 0.1 M.F

NETWORK Z(D)

STEP BY STEP SYSTEMS

CONNECTOR CIRCUIT COMBINATION TOLL AND LOCAL LOOP DIALING TOLL TRAIN

SELECTIVE OR

I RING SEMI-SELECTIVE RINGING

SD-30228-01

FIG. 5