

THE BELL TELEPHONE CO. OF CANADA  
ENGINEERING DEPARTMENT

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MACHINE SWITCHING  
STATIONS

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## DESCRIPTION

**Machine Switching Stations** are substantially the same as common battery manual stations, except that a dial is required to enable the subscriber to actuate the Central Office switches to complete local connections without the aid of an operator, and to call an operator for toll and long distance connections, information calls, etc. The installation and maintenance practices for machine switching stations will therefore, be practically the same as for manual stations except where they relate to the dial. These exceptions are covered in these specifications.

The mounting of the dial has required mechanical changes in the station apparatus, and to provide the proper station circuit for dialing changes have been necessary in the wiring of the subscriber sets and desk stands.

The dial consists of two sets of spring contacts known as the "Pulse" and "Off Normal" contacts and a mechanism to control the movements of these contacts. This mechanism consists of a finger wheel, pulse cam, main spring and governor. Mounted directly under the finger wheel is a number plate bearing the digits (numbers, or letters and numbers) required for dialing. The finger wheel contains ten holes which, in the normal position, are directly over the digits. When in this position, the finger wheel is capable of a rotary motion in a clockwise direction.

To make a call the subscriber first removes his receiver from the hook and hears a "Dial Tone" indicating that the Central Office apparatus is ready to receive the dial impulses. He then inserts his finger in the hole in the finger wheel corresponding to the first letter or number of the station desired and rotates the wheel until his finger comes in contact with the finger stop. The finger is then removed and the wheel returns to normal. The remaining digits are dialed in a similar manner. During the return movement of the finger wheel, the "Pulse Contacts" are intermittently opened and closed by the pulse cam, the number of interruptions corresponding to the digit dialed. These interruptions in the circuit operate the Central Office apparatus to complete the connection.

When the finger wheel is released after dialing, it is driven back to the normal position by the main spring. The speed of the finger wheel in returning to normal, and consequently the rate of interruption of the "Pulse Contacts," is regulated by the governor on the back of the dial. In order that the Central Office apparatus may function properly, it is important that the rate of interruption of the "Pulse Contacts" be uniform and therefore no attempt should be made to adjust the dial except as described in separate specifications covering Maintenance of Northern Electric Co. No. N6 type dial.

As soon as the finger wheel is operated and until it returns to normal, the "Off Normal" contacts are operated. These contacts eliminate dialing noises by opening the receiver circuit and establish a uniform resistance through the subscriber set by shunting the transmitter which has a variable resistance.

The ringing of the called station bell is automatic, and the bell rings intermittently until the called party answers or the calling party hangs up. An audible "Ringing Signal" is given to the calling subscriber while the ringing is in progress. If the called line is busy a "Busy Signal" is sent back to the calling subscriber to indicate this condition. If the call is for a station which has been disconnected, reported out of order, or a spare, the calling subscriber is automatically connected to an operator who will report this condition to him.

The switch-hook should not be operated after the receiver has been removed from the hook to make a call. Operation of the switch-hook during dialing or talking may release the connection and make it necessary to start over again. Operation of the dial while talking may also release the connection.

The Machine Switching System referred to in these specifications is known as Step-by-Step system.

## STATION APPARATUS

The apparatus given below in alphabetical order is required for the work covered by these specifications:—

**Apparatus Blanks: No. N50-A APPARATUS BLANK**

Round metal blank of sufficient weight to balance desk stand. Used to cover dial hole on machine switching desk stands when used at manual stations.

**No. 50-C APPARATUS BLANK**

Rectangular metal plate. Equipped with frame P.111560, and glass P.111848, for holding instruction card. Used to cover dial hole on machine switching coin collectors when used at manual stations.

**No. N104-A APPARATUS BLANK**

Round wood blank used to cover dial hole on machine switching wall sets when used at manual stations.

**Apparatus Blank  
Repair Parts:**

**FOR No. N50-A APPARATUS BLANK**

Round metal weighted blank..P.P.11951  
Metal strap for holding P.P.11951  
on desk stand.....P.P.11952  
Screw for P.P.11952.....P.P.2506

**FOR No. 50-C APPARATUS BLANK**

Instruction card frame.....P.111560  
Instruction card glass.....P.111848  
Instruction card frame screws.....P.29973

**FOR No. N104-A APPARATUS BLANK**

Round wood blank, detail No. 1 per drawing  
No. 26950  
Metal clamp plate for holding wood  
blank on No. 293 type wall set.....PP. 9379  
Screws for P.P..9379.....P.P.2149

**Backboards:**

**No. N132-A BACKBOARD**

Wood backboard on which to mount No. 293 type subscriber set where writing shelf is required.

**No. 152-A BACKBOARD**

Wood backboard used as protection for No. 392 type subscriber sets when so mounted as to be exposed to the elements.

**Battery Box:**

**No. 1-A BATTERY BOX**

Metal box for holding three dry cells at common battery signalling and local battery talking stations.

**Brush:**

**BRUSH, TYPEWRITER**

A short handle, stiff bristle brush for cleaning No. 26 and No. 27 protector blocks.

**Carrying Cases:**

**No. 3-A CARRYING CASE**

Metal case for carrying protector blocks to protect them from injury

**CARRYING CASE AS PER SPECIFICATION MKS. 181**

Cardboard box with metal ends for carrying dial to protect it from injury.

**Card Holder:**

**No. 1-B CARD HOLDER**

Metal frame arranged to mount instruction card, frame and glass, on top of No. 50 type coin collectors when operating on machine switching basis.

**Card Holder**

**FOR No. 1-B CARD HOLDER**

**Repair Parts:**

Nuts, hexagon.....P.165486  
Screws, R. H. slotless machine.....P.201135  
Washers, lock.....P.16549

**Coin Collector:**

**No. 50-E COIN COLLECTOR**

Multi coin collector for machine switching pay stations. Arranged to mount dial. To be used also, in accordance with supplemental instructions, at manual pay stations. When so used collector is equipped with No. 50-C apparatus blank in place of dial. When change to machine switching is made apparatus blank is removed and dial added.

**Station apparatus:**

**SPRING ASSEMBLY D. 22990**

One set of springs with wires attached for use on backboard of No. 50 type manual coin collector when these collectors are being converted to No. 50 type machine switching coin collectors.

**Cords:**

**No. N19-A CORD**

Strap cord for connecting terminal plate in handle to terminal plate in base of No. N50-AL desk stand.

**No. 92 CORD**

Receiver cord for wall sets and No. 50 coin collectors.

**No. 541 CORD**

Black, waterproof desk stand cord (three conductors). Use only as required by specifications for Station Apparatus Installation.

**No. 542 CORD**

Black waterproof receiver cord. Use only as required by specifications for Station Apparatus Installation.

**No. 547 CORD**

Transmitter cord for use on wall sets, No. 50 coin collect and desk stands. Two cords required with each station.

**No. 549 CORD**

Receiver cord for desk stand.

**No. 550 CORD**

Desk stand cord (three conductors).

**Cord Tip:**

**No. 76 CORD TIP**

Semi-hard rubber sleeve. For use on exposed cord tips connected to auxiliary receivers, head receivers, etc.

## **Desk Stands**

### **No. N50-AL DESK STAND**

Desk stand for all machine switching stations. Arrange to mount dial. To be used also, in accordance with supplement instructions, at manual stations which are soon to be changed to machine switching. When so used, stand is equipped with No. N50-A apparatus blank in place of dial. When change to machine switching is made, apparatus blank is removed and dial added.

### **No. 50-CM DESK STAND OR APPROVED EQUIVALENT**

Desk stand for machine switching stations. Provided with transmitter cut-out button. Use only under special conditions as required by specifications for Station Apparatus Installation.

## **Dials:**

### **No. N6-A DIAL**

For use on all machine switching stations and P.B.X. local stations where required. Equipped with No. N13-A cord and No. N-135-A number plate.

### **No. N6-D DIAL**

For use on all P.A.B.X. local stations. Equipped with No. N13-A cord and No. N135-B number plate.

### **No. N6-F DIAL**

For use on No. 50-E coin collectors. Equipped with No. N13-C cord and No. 135-A number plate.

## **Dial Adapter:**

### **No. N1-B DIAL ADAPTER**

For attaching No. N6 type dial to No. 50 type coin collector.

### **No. N1-D DIAL ADAPTER**

For attaching No. N6 type dial to No. 35-A dial mounting.

**Station Apparatus:**

**Dial Mounting:**

**No. 35-A DIAL MOUNTING**

Angle dial mounting. For use on No. 50-E coin collectors, to turn the dial face at an angle either to left or right at installations when there would not be sufficient light for dialing in case the dial were mounted directly on the collector. Use only as required by specifications for No. 50 Coin Collector Installation.

**Instruction Cards: FORMS E314 AND E315**

Temporary instruction cards to inform the subscribers regarding the change in service. To be hung over transmitter mouth piece.

**No. 50 COIN COLLECTOR INSTRUCTION CARD**

See No. 50-C apparatus blank.

**REVERTING CALL INSTRUCTION CARDS**

See station apparatus installation in these specifications.

**Fuse:**

**No. 11-C FUSE**

Tabular type fuse for use on No. 58 A.P. Protector.

**Key:**

**No. 6002-B KEY**

Two-position lever making and breaking two sets of contacts. For silencing a ringer which is wired in series with another.

**Number Plates:**

**No. N104-J NUMBER PLATE**

Metal disc, black finish, having "To call Long Distance dial 110". "For further information see Telephone Directory."

**No. 126-A NUMBER PLATE**

Metal plate stamped "Out of Service." Covers coin gauge of No. 50 coin collectors. To be used on collectors which have not been cut into service or which cannot be readily restored to service. (A card is generally furnished to subscriber for use in case collector is temporarily out of service).

**No. N128-B NUMBER PLATE**

Metal black finished frame, in which is celluloid and card bearing office name and station number. To be mounted on face of transmitter.

**Protector:**

**No. 58-AP PROTECTOR**

Station protector equipped with No. 11-C fuses and No. 26 and No. 27 protector blocks.

**Protector Blocks:**

**No. 26 PROTECTOR BLOCK**

Plain carbon block for use with No. 27 protector block.

**No. 27 PROTECTOR BLOCK**

Grooved porcelain block for use with No. 26 protector block.

**Receivers:**

**No. 144 RECEIVER**

For use on desk stands, wall sets and No. 50 coin collectors.

**No. 146-A RECEIVER**

Auxiliary receiver to be used only as required by specifications for Station Apparatus Installation. Exposed cord tips connected to this receiver to be equipped with No. 76 cord tips. Requires a No. 1-A receiver holder.

**Receiver Holder:**

**No. 1-A RECEIVER HOLDER**

For holding No. 146-A receiver on desk stand.

**Subscriber Sets:**

**No. 43-F OR APPROVED EQUIVALENT SUBSCRIBER SET**

Extension ringer. Contains biased ringer only. For use at all subscriber stations.

**No. N293-G SUBSCRIBER SET**

Wall set without writing shelf for machine switching stations. Arranged to mount dial. For use at individual line, P.B.X. local stations and two-party selective stations. If writing shelf is required, use No. N132-A backboard. To be used also, in accordance with supplemental instructions at manual

**Station Apparatus:**

**Subscriber Sets:** stations which are soon to be changed to machine switching. When so used set is equipped with No. 104-A apparatus blank in place of dial. When change to machine switching is made apparatus blank is removed and dial added.

**Cont'd**

**No. 295-A SUBSCRIBER SET**

Desk stand bell box with ringer. For use at individual line, P.B.X. local stations and two-party selective stations.

**No. 295-AA SUBSCRIBER SET**

Desk stand bell box with ringer. For use at common battery signalling and local battery talking stations.

**No. 392-J SUBSCRIBER SET**

Extension ringer. Loud ringing bell (1000 ohms biased). For use at individual line P.B.X. local stations and two-party selective stations.

**No. 533-Y OR APPROVED EQUIVALENT SUBSCRIBER SET**

Wall set without writing shelf for use at common battery signalling and local battery talking stations. Arranged to mount dial. If writing shelf is required, use No. N132-A backboard.

**No. 534-D OR APPROVED EQUIVALENT SUBSCRIBER SET**

Extension ringer. Contains ringer and condenser. For use at individual line, P.B.X. local stations and two-party selective stations. Use as required by Station Connections in these specifications.

**Switch:**

**No. 2047 SWITCH**

Indicating snap switch for use in silencing a ringer which is wired in parallel with another ringer.

**Test Set:****No. S913-AG HAND TEST SET**

Hand test set for Machine Switching Central officemen, linemen, repairmen and installers' use. Consists of metal handle on which are mounted, a transmitter, receiver and No. N6-A dial (less cord). Inside handle is mounted, a 1-10 M.F. condenser and a 1200 ohm resistance.

**Note:** When received, test set is equipped with plug for Central Office use. When required for outside use equip with No. 50 cord tips (snappers).

**Transmitter:****No. 323 TRANSMITTER**

For use on desk stands, wall sets and No. 50 type coin collectors.

**APPARATUS ARRANGED ACCORDING TO LINES**

For convenience in selecting subscriber sets and desk stands they are grouped below according to the class of line. Only standard apparatus regularly used on these lines is included.

**Apparatus for Individual Lines****Apparatus for P.B.X. Local Stations with Dials\*****Apparatus for Two-Party Selective Lines.**

Main Set		Extension Set		Desk Stand**
Desk	Wall**	Desk	Wall**	
No. 295-A	No. 293-G	No. 295-A	No. N293-G	No N50-AL

**Apparatus for Common Battery Signalling and Local Battery Talking Stations**

No. 295-AA	No. 533-Y	No. 295-AA	No. 533-Y	No. N50-AL
or approved equivalent		or approved equivalent		

\*At P.B.X. local stations without dials use manual station equipment.

\*\*If station is to operate temporarily on a manual basis, machine switching desk stands and wall sets should be equipped with apparatus blanks, otherwise they should be equipped with dials.

## DROP AND BLOCK WIRING

Install drop and block wiring according to separate specifications covering Drop Wiring and Block Wiring.

### STATION PROTECTOR INSTALLATION

Install protectors and protector blocks according to separate specifications covering Station and Private Branch Exchange Protector Installation.

### STATION APPARATUS INSTALLATION

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## STATION APPARATUS INSTALLATION

Install machine switching station apparatus according to separate specifications covering STATION APPARATUS INSTALLATION and separate specifications covering # 50 COIN COLLECTOR INSTALLATION, except as modified and added to by these specifications.

### Handling Apparatus:

Handle machine switching apparatus with care to avoid injury to the dial and other parts.

### Locating Apparatus:

At new stations locate desk stands, wall sets and # 50 coin collectors where there will always be sufficient light for dialing. At existing desk set stations, if necessary to re-locate to obtain sufficient light, it will be advisable in most cases to leave bell box in its present location and run inside wire to a connecting block at new desk stand location. At existing wall set stations where there is not sufficient light for dialing it will be necessary to re-locate set. Re-locating existing apparatus should be avoided wherever possible. In re-locating avoid danger of wet cords due to open windows. When a manual wall set is replaced by machine switching wall set, locate the machine switching wall set in same location occupied by manual wall set (unless change is required to obtain sufficient light for dialing as covered in these specifications.) This means that the requirement of 56½ inches for transmitter height will generally be reduced slightly, but this practice should be followed except in cases where lowering of the transmitter height is not satisfactory to the subscriber.

### Angle Dial Mounting:

For use on existing # 50 type coin collectors which are so located that there is not sufficient light for dialing. Use only as required by Supp. A to separate specifications for # 50 Coin Collector Installation.

### Receivers and Transmitters:

All stations having machine switching type apparatus, either with dials or apparatus blanks, shall be equipped with # 144 Receivers and # 323 or # 337 Transmitters as required by the transmission zoning practice. In step-by-step areas side tone reduction is not required because of the type of central office circuit, with the following exceptions:

- a. When large toll users complain of excessive side tone on toll connections.
- b. When machine switching sets equipped with apparatus blanks are installed in manual areas at some time prior to three months before the cut takes place. In this case side tone reduction circuits shall be installed when called for by the zoning instructions.

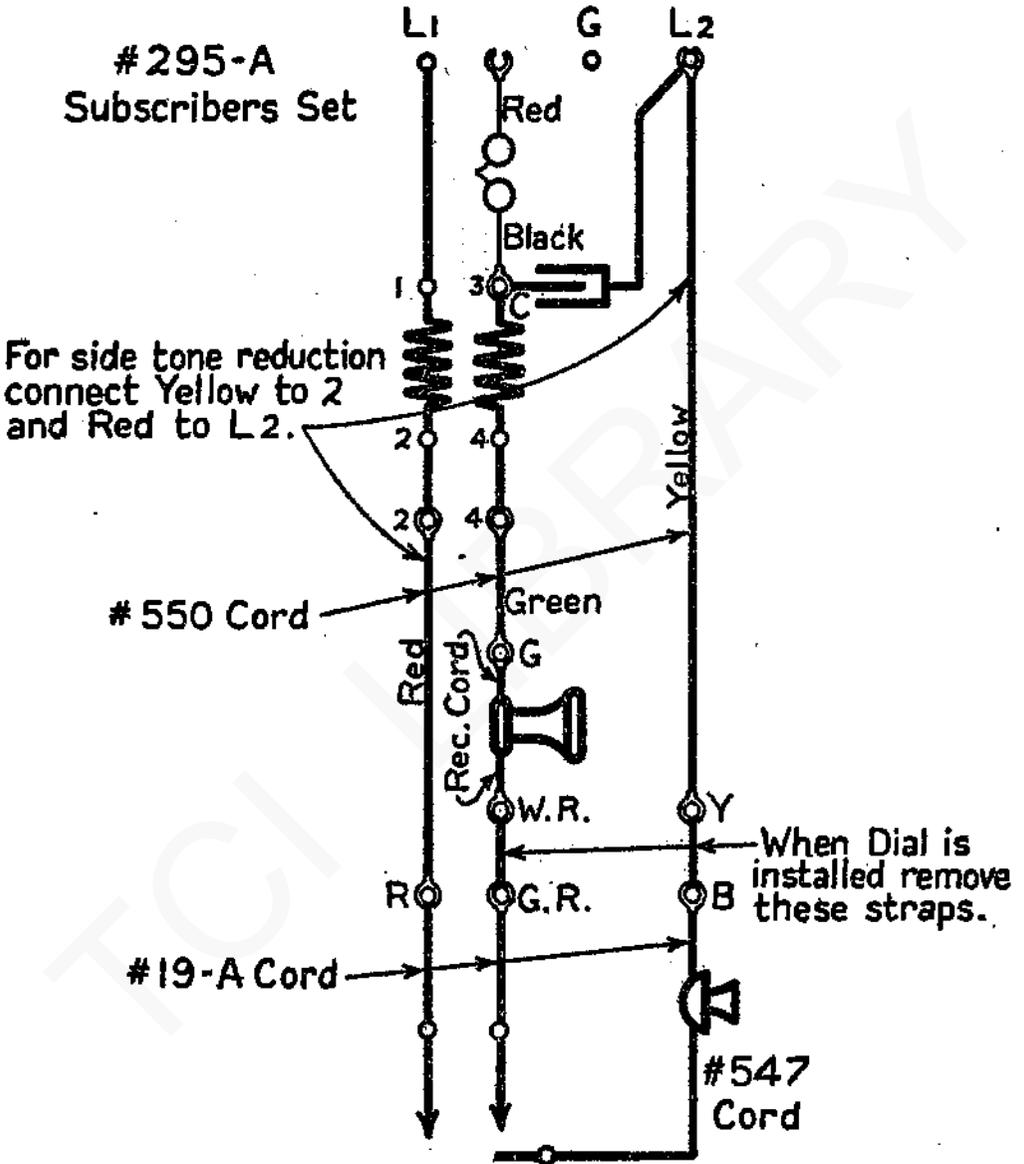
### Installing Machine Switching Apparatus

#### with Apparatus Blanks:

In manual districts which are soon to be cut over to machine switching, desk stands, wall sets and # 50 coin collectors equipped



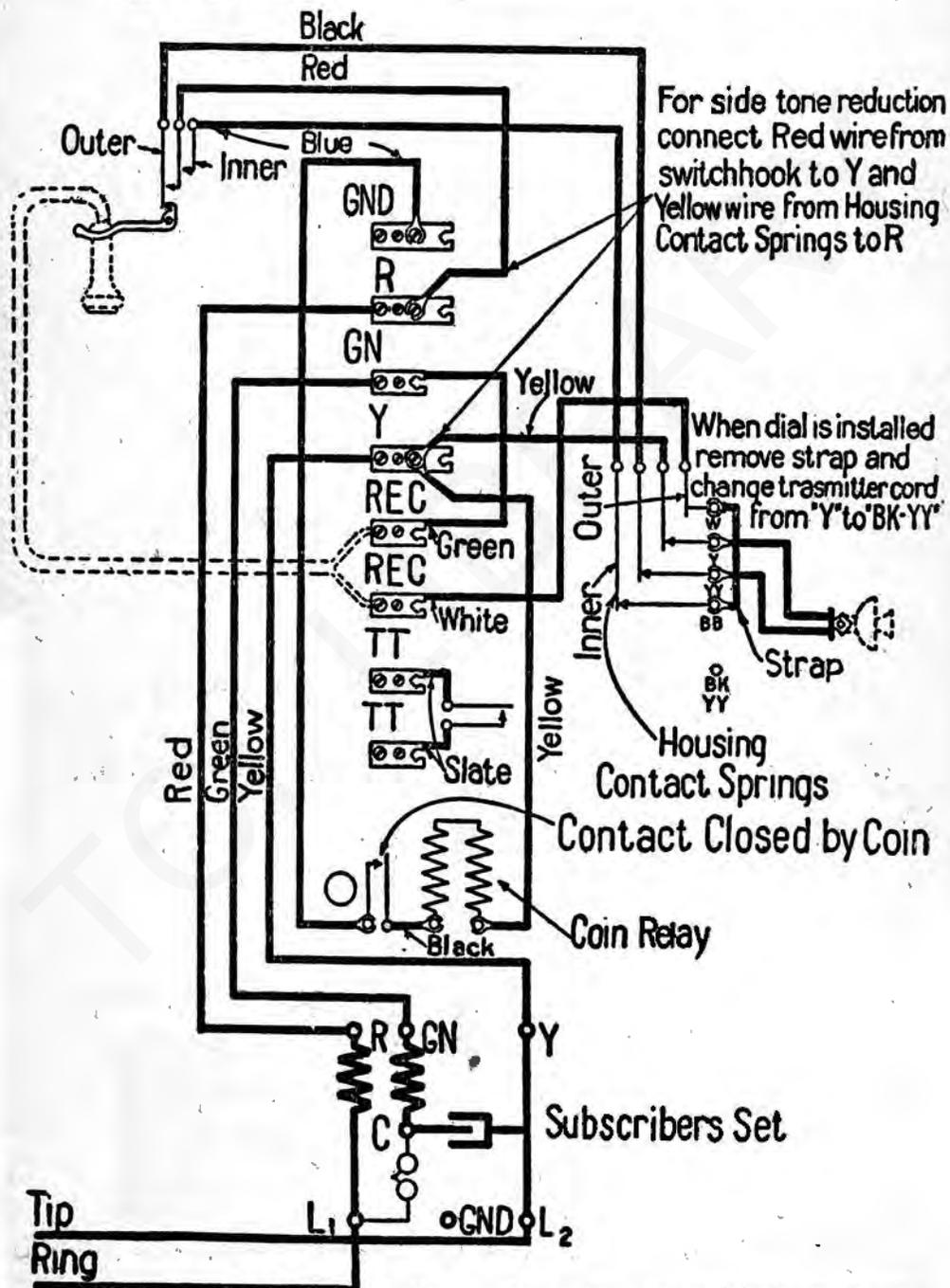
**Circuit for Desk Stand with #N50-A Apparatus Blank:**



**#N50-AL Desk Stand**

### Installing Machine Switching Apparatus With Apparatus Blanks:

Circuit for #50 Type Machine Switching Coin Collector Equipped with Apparatus Blank:



If housing of #50 Coin Collector is equipped with #50-C Apparatus Blank, mount coin collector instruction card in frame attached to this blank.

## Tests — All Lines:

Make tests as given for manual practice in separate specifications covering Station Apparatus Installation, No. 50 Coin Collector Installation and No. 50 Coin Collector Maintenance.

## Installing Machine Switching Apparatus with Dials at Existing Stations in Working Manual Districts:

### **Individual Lines**

#### **P.B.X. Local Stations with Dials**

#### **Two-Party Selective Lines**

- (a) Replace manual desk stand by machine switching desk stand and connect machine switching desk stand to bell box already installed. If bell box already installed is not provided with biased ringer (or ringer to which biasing spring cannot easily be added), replace with a No. 295-A subscriber set.
- (b) Connect bell box and ringer lead as specified in Station Connections in these specifications.
- (c) See that ringer air gaps are according to separate specifications covering Adjustment of Station Apparatus.
- (d) See that ringer is equipped with biasing spring.
- (e) Replace manual wall sets by machine switching wall sets.
- (f) Equip loud ringing bells with biasing spring (red cord) and stop screws of No. 392-J subscriber set and adjust air gaps to .024" for biasing spring side, and .012" for other side. If bell is not equipped for biasing spring, replace with No. 392-J set.
- (g) Replace all manual transmitter arms with machine switching desk stands, unless otherwise specified in supplemental instructions. This is because transmitter arms have a tendency to rotate and interfere with dialing.
- (h) See that wiring plans are suitably connected for machine switching operation as specified in separate specifications covering Wiring Plans.

## **COIN COLLECTOR STATIONS**

- (a) See LOCATING APPARATUS, page 13,
- (b) At No. 50 Coin Collector stations remove housing and, referring to figure on page 19, proceed as follows:
  - (1) Disconnect white wire at switch hook and REC terminal.
  - (2) Disconnect yellow wire at switch hook.
  - (3) Disconnect clip of yellow wire (from housing contact springs) from "Y" terminal on connecting block.

## Coin Collector Stations — Con't

- (4) Unlace form, take out white wire and remove housing contact spring assembly with two yellow wires from backboard.
- (5) Install new housing contact spring assembly on backboard. Assembly will be furnished with wires attached. See figure on page 20.
- (6) Solder spring assembly wires as follows:
  - Black wire to outer terminal of switch-hook.
  - Blue wire to inner terminal of switch-hook.
  - White wire to REC terminal on connecting block.
- (7) Connect yellow wire clip to "Y" terminal on connecting block.
- (8) Lace up wires.
- (9) Place housing equipped with wire on collector.
- (10) Mount instruction card as provided in Supplement A to separate specifications covering No. 50 COIN COLLECTOR INSTALLATION.
- (11) Make tests for operation of collector according to separate specifications covering No. 50 COIN COLLECTOR INSTALLATION and No. 50 COIN COLLECTOR MAINTENANCE.
- (12) If old housing without dial is to be left on collector until shortly before the cut over to machine switching, strap inner and outer terminals of housing contact springs on backboard to complete receiver circuit (see page 16).  
When housing with dial is placed on collector remove this strap and connect dial cord as shown.

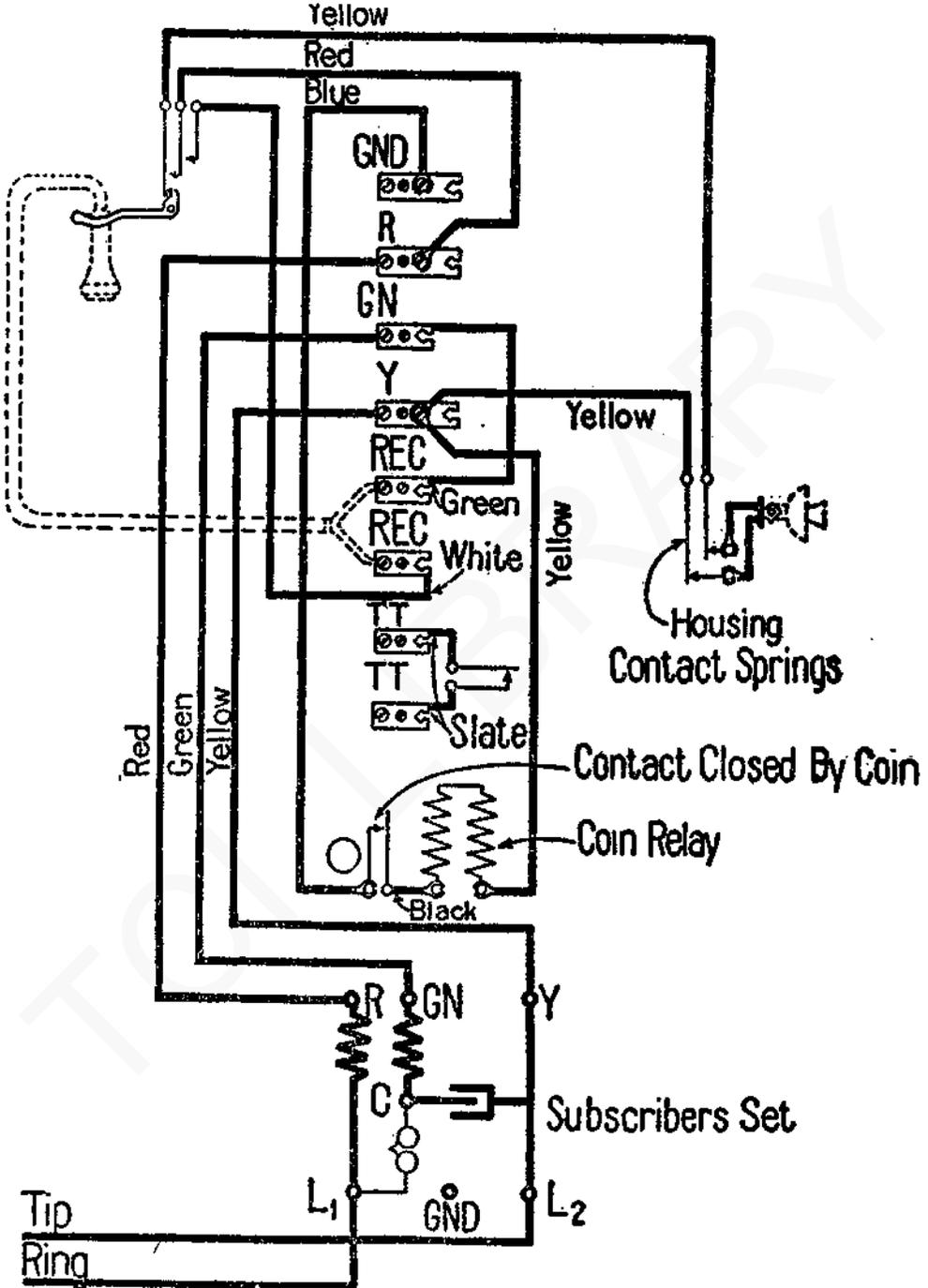
### **Tests — All Lines:**

Make tests as given for manual practice in separate specifications covering STATION APPARATUS INSTALLATION, No. 50 COIN COLLECTOR INSTALLATION and No. 50 COIN COLLECTOR MAINTENANCE.

Instruct subscribers and test apparatus as given under INSTRUCTING SUBSCRIBERS AND TESTING APPARATUS pages 24-25, on last visit to station before cut-over.

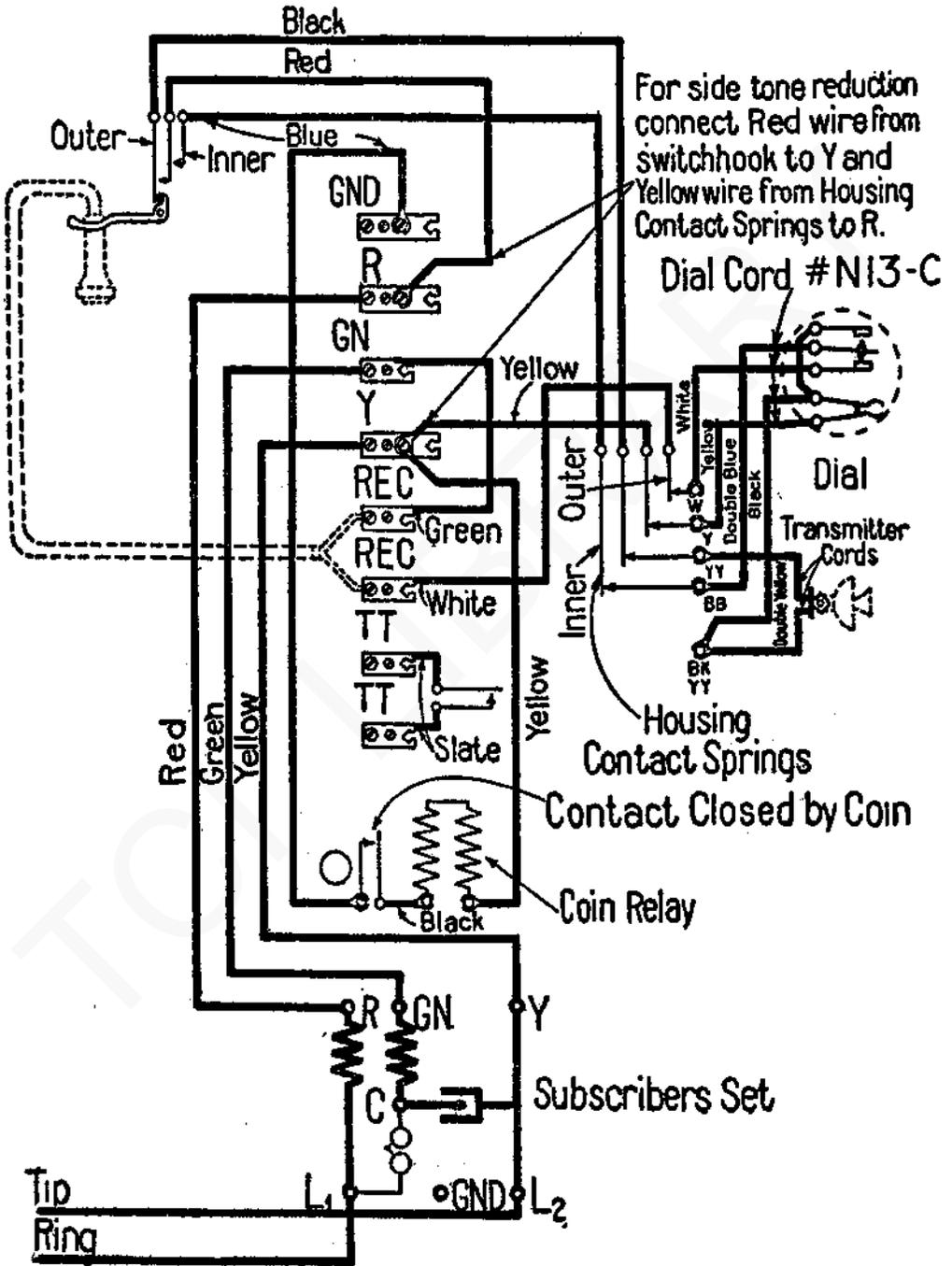
**Installing Machine Switching Apparatus With Dials at Existing Stations in Working Manual Districts:**

**Circuit for #50 Type Manual Coin Collector:**

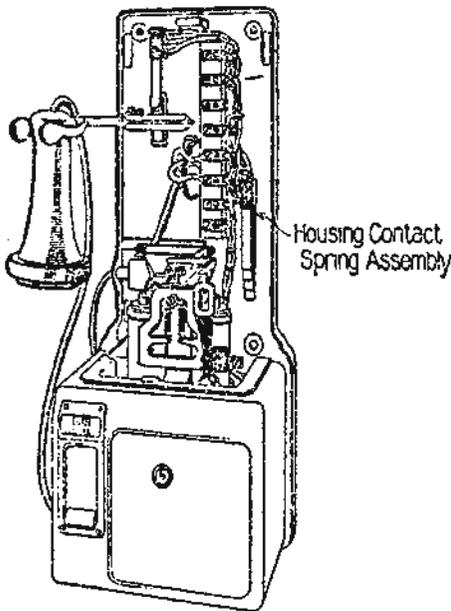


**Installing Machine Switching Apparatus With Dials at Existing Stations in Working Manual Districts:**

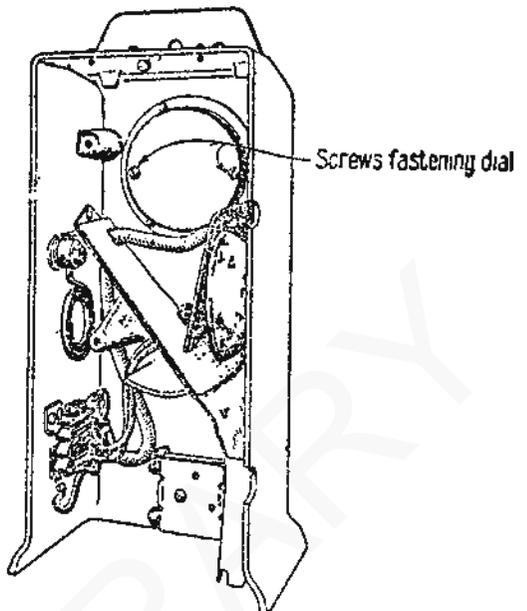
**Circuit for #50 Type Machine Switching Coin Collector Equipped with Dial:**



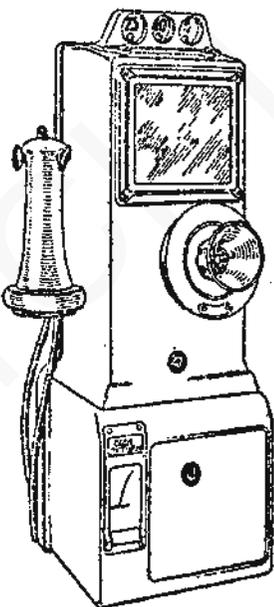
**Installing Machine Switching Apparatus With Dials at Existing Stations in Working Manual Districts:**



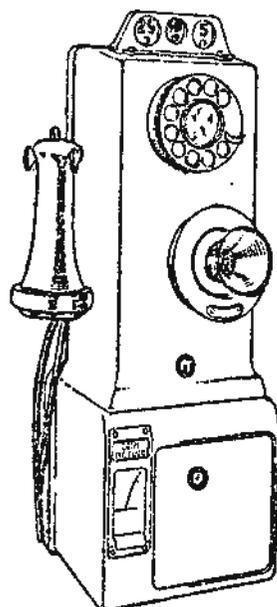
**#50-E COIN COLLECTOR WITH HOUSING REMOVED**



**HOUSING WITH DIAL COIN CHUTE REMOVED TO SHOW LOCATION OF DIAL CORD**



**#50-E COIN COLLECTOR EQUIPPED WITH #50-C APPARATUS BLANK**



**#50-E COIN COLLECTOR EQUIPPED WITH DIAL**

## **Installing Dials at Stations Having Machine Switching**

### **Apparatus with Apparatus Blanks:**

#### **Individual Lines.**

#### **P.B.X. Local Stations.**

#### **Two-Party Selective Lines.**

- (a) At desk stand stations remove apparatus blank from stand and install dial. To attach the dial to desk stand, two screws P.P.7928 and two lock washers P.P.11949 are required and must be ordered separately. Remove straps from terminals Y and B; and G.R. and W.R. in base of No. N50-AL desk stand (see page 15 of these specifications) and connect dial cord as shown on page 30 of these specifications.
- (b) At No. N293-G wall set stations remove apparatus blank from set and install dial. To attach the dial to set, two screws P.P.22718 and two lock washers P.P. 10785 are required and must be ordered separately. Remove straps from terminals R and G; and Y and B, No. N293-G subscriber set (see page 14 of these specifications) and connect dial cord as shown on page 31 of these specifications.

### **COIN COLLECTOR STATIONS**

- (a) At No. 50 Coin Collector stations proceed as follows:—
  - (1) Remove coin chute and take off apparatus blank. (Handle coin chute carefully to avoid damage).
  - (2) Remove wire strap connecting terminals "W" and "BB" together. (See page 16).
  - (3) Change transmitter cord from terminal "Y" to terminal "BK-YY". (See page 20).
  - (4) Install dial, and connect dial cord as shown on page 20 in these specifications.
  - (5) Replace coin chute.
  - (6) Mount instruction card as provided in Supplement A to separate specifications covering No. 50 COIN COLLECTOR INSTALLATION.
  - (7) Make tests for operation of collector according to separate specification covering No. 50 COIN COLLECTOR INSTALLATION and No. 50 COIN COLLECTOR MAINTENANCE.
- (b) If No. 50 machine switching type coin collector is equipped with manual housing, remove strap connecting inner and outer terminals of housing contact springs on backboard and place machine switching housing with dial on connector.

### **Tests — All Lines:**

Make tests as given for manual practice in separate specifications covering STATION APPARATUS INSTALLATION, No. 50 COIN COLLECTOR INSTALLATION and No. 50 COIN COLLECTOR MAINTENANCE.

Instruct subscribers and test apparatus as given under INSTRUCTING SUBSCRIBERS AND TESTING APPARATUS, pages 24-25, on last visit to station before cut over.

### **Installing Machine Switching Apparatus with Dials at New Stations in Working Machine Switching Districts (All Lines)**

Install apparatus for each class of line as shown in table on page 11 and connect as shown under STATION CONNECTIONS in these specifications. At No. 50 Coin Collector stations mount instruction card as provided in separate specifications covering No. 50 COIN COLLECTOR INSTALLATION. At party line stations in cases where connecting block instead of protector is used at point of entrance, place tag in set showing location of ground clamp.

At all stations when extension ringer is bridged on line between point of entrance and main station, place tag in main station set showing location of extension ringer.

### **Tests — All Lines:**

Instruct subscribers and test apparatus as given under INSTRUCTING SUBSCRIBERS AND TESTING APPARATUS, pages 24-25. Also check line number by dialing "Operator" and asking operator to call your number. Then hang up receiver and see that bell rings.

## **INSTRUCTION CARDS**

### **Reverting Call Instruction Cards:**

Instruction cards furnished by Telephone Company will be mailed to party line subscribers, informing them as to method of calling other party on same line.

### **Temporary Instruction Cards:**

When installing machine switching apparatus with dials at existing stations in working manual districts, or when installing dials at stations having machine switching apparatus with apparatus blanks, place temporary instruction card on transmitter. Use forms as covered by supplemental instructions and make sure that subscriber understands instructions given on cards.

## Instruction Cards — Cont'd

### **No. N128-B Number Plate:**

Place card in No. N128-B number plate, giving:—

- (a) Name of central office to which station is connected.
- (b) Station number (and suffix, if party line).
- (c) Mount number plate on face of transmitter.

To attach number plate to transmitter remove mouth piece, and screw from upper side transmitter cup, place number plate by inserting screw through hole provided to mount number plate straight, and fasten to upper side of transmitter, replace mouth piece through hole provided for it in number plate.

### Instructing Subscribers and Testing Apparatus:

Give instructions to subscribers and make all apparatus tests in the order given below.

In order to prevent operating a trouble signal when receiver is off hook always:

- (a) Begin dialing within 30 seconds.
- (b) When having subscriber listen to dial tone, replace receiver on hook within 30 seconds.
- (c) Complete dialing by dialing all letters and numbers.

### **Instructing Subscribers:**

Instruct subscribers as to the method of making machine switching calls as covered by supplemental instructions and have subscriber make practice calls given below.

In order that subscriber's line may be temporarily connected over a test trunk to the machine switching office for instruction and test purposes give "A" operator the line number and ask for "Machine Test" unless otherwise required in supplemental instructions. Replace receiver on hook for a brief interval and upon removing receiver from hook dial tone should be heard indicating that the line is connected through to the machine switching office.\*

- (a) Have subscriber listen to dial tone. Replace receiver on hook.
- (b) Have subscriber call the official number designated in supplemental instructions for making ringing signal tests. The object of this call is that subscriber will receive and learn to recognize the "Ringing Signal" indicating that the called party is being rung. Replace receiver on hook.
- (c) Have subscriber dial the number designated in supplemental instructions for making busy tests. The object of this call is that subscriber will receive and learn to recognize the "Busy Signal." Replace receiver on hook.

\*At new stations in working machine switching districts numbers may be dialed without first asking "A" operator for "Machine Test."

### **Crosses in Desk Stand:**

Make test for crosses at all desk stand installations according to STATION MAINTENANCE, page 43 in these specifications.

## Ringers — All Stations:

To prevent tapping of subscribers' bells from condenser discharge when dials are operated and insure satisfactory ringing make sure that:—

- (a) Subscriber sets and red and black ringer leads are connected according to STATION CONNECTIONS in these specifications. Have receiver on hook while making this inspection.
- (b) All ringers and loud ringing bells are equipped with biasing springs and these springs are adjusted so that the dial, when operated in making test "C" does not cause bell tapping. Where an extension ringer is so located that its tapping would not be audible at the dial station, hand test set may be connected to tip and ring sides of the line near extension ringer (provided tip and ring are both available) and the hand test set dial used in testing for tapping of extension ringer. Same test may be made by having subscriber operate dial, or extension ringer may be adjusted against tapping by temporary wiring it in the circuit at the dial station, and then installing ringer at the proper location.

At stations where switches are used make tests for bell tapping and ringing with the switches in both normal and operated positions.

- (c) Ringer operates satisfactorily. Remove receiver from hook and proceed as follows:

For individual line stations	Dial 1197*
First party and two-party selective lines (W or F)	Dial 1198*
Second party on two-party selective lines (J or M)	Dial 1199*
Other party on same line	Dial 1191*

After dialing as above, replace receiver on hook and bell should ring intermittently as in regular calls. To stop ringing remove receiver from hook.

\*In some exchanges other numbers may be used.

If necessary to make ringer adjustments (in addition to that of biasing spring), adjust according to separate specifications covering Adjustment of Station Apparatus.

## Coin Collector Stations:

Make tests as provided in Supplement A to separate specifications covering No. 50 COIN COLLECTOR INSTALLATION.

### **Dials:**

At all stations at which connection has been established to Test Board for testing ringer, make dial test immediately after ringer tests. At other stations remove receiver from hook and dial Test Board number.

At all stations ask Test Board for dial test and when dial tone is heard dial "zero." Test Board will ask that this be repeated at least once so that test man can determine whether successive operations are between the required limits of not less than eight pulses or more than twelve pulses per second. If dial speed is not between these limits, follow instructions according to separate specifications covering Maintenance of Northern Electric Company No. N6 Type Dial.

If difficulty is experienced with station dial, use hand-set dial to call Test Board. Have receiver on hook when hand-set dial is used.

In order to insure that subscriber's line is disconnected from test trunk after completion of all tests, advise Test Board that all tests have been completed and proceed, unless otherwise required in supplemental instructions, as follows:\*

Leave receiver off hook until "A" operator answers. This will show that subscriber's line is again connected to the manual office. If "A" operator does not answer in a reasonable length of time, dial Test Board number and report that subscriber's line is not disconnected from test trunk. Leave receiver off hook until "A" operator answers.

\*At new stations in working machine switching districts replace receiver on hook when through testing.

## **STATION WIRING**

Install station wiring according to separate specifications covering  
**STATION WIRING.**

# STATION CONNECTIONS

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## STATION CONNECTIONS

Connect machine switching subscriber sets and associated apparatus according to these specifications where no switching keys or auxiliary equipment for signalling between main and extension stations is required. Where switching keys or auxiliary signalling equipment is required connect keys and signalling equipment according to separate specifications covering STATION WIRING PLANS.

There will be no machine switching magneto lines or two or four-party common battery non-selective lines.

### Tip and Ring:

“Tip” (ground) side of line is connected to ground side of Central Office battery.

“Ring” (battery) side of line is connected to live side of Central Office battery.

Prepayment coin collector lines are connected as above.

Test for “Tip” and “Ring” by connecting one terminal of receiver or test set to ground and other terminal alternately to each side of line. “Ring” side gives louder click in receiver.

At individual line stations if ground is not convenient, test for “Tip” and “Ring” as follows:—

Remove tension from biasing spring. Connect one side of line to L1 and the other side to C (See Fig. 1)'. If armature is pulled towards biasing spring side, “Ring” side of line is connected to L1. If armature is pulled away from biasing spring side, the “Tip” side of line is connected to L1. The foregoing applies to areas having the positive side of central office battery grounded. In areas having the negative side grounded, the armature pull is reversed with the same line connections.

**Note:** As battery is reversed on subscriber's line when connection is established, it will be necessary to make above tests when line is not in use.

### Station Connections:

#### Color Scheme:

Connect tracers of inside wire as follows:

Red tracer to “Ring” side of line.

Green tracer to “Tip” side of line.

Use yellow tracer for signalling ground wire or other purpose where a third wire is required.

Tracer conductor of outside wire corresponds to red tracer of inside wire and should be connected to “Ring” side of line.

In connecting wires and cords, connect like tracers (red to red yellow to yellow, etc.).

## Number of Ringers Allowed:

Do not install for any subscriber more than the following number of ringers (including main station ringer):

Individual Lines	4 (Fig. 4)
P.B.X. Local Lines	4 (Fig. 4. See note)
Two-Party Lines	4 (Fig. 9)

**Note:** The capacity limit for machine switching stations, with the exception of P.B.X. local stations, is not more than 4 M.F. across the line or from either side of the line to ground. The STATION CONNECTIONS covered in these specifications are so arranged that subscriber sets having either 1 M.F. or 2 M.F. condensers may be used on all lines (except P.B.X. local lines and four-party selective lines) without exceeding the limit of 4 M.F.

To avoid premature tripping on incoming night connections made with regular cords, the capacity of P.B.X. local lines (except No. 600-C.P.B.X. local lines) is limited to 2 M.F. If night connections are made with patching cords, a maximum capacity of 4 M.F. may be connected to one trunk.

The limit with the No. 600-C.P.B.X. is 1 M.F., due to the fact that when night connections are made with regular cords and the battery-cut-off switch is operated, the trunk ring-up relay and condenser are left in service. If night connections at the No. 600-C.P.B.X. are made with patching cords, a maximum substation capacity of 3 M.F. may be connected to one trunk.

## Ringer Leads:

To prevent tapping of subscribers' bells when dials are operated and to ensure satisfactory ringing, make sure that red and black ringer leads are connected according to the figures on pages 30-45.

## Selection of Apparatus for Extension Stations:

Where ringer is required at extension station, use set with induction coil, condenser and ringer. Where ringer is not required at extension desk set make sure that desk stand only is used (see Fig. 3), except under the following unusual conditions, where a set with induction coil and condenser (ringer disconnected should be used):

- (a) Where wire run between main and extension stations is over 250 feet.
- (b) Where main and extension stations are in different buildings (in accordance with contract order).
- (c) At common battery signalling and local battery talking stations.

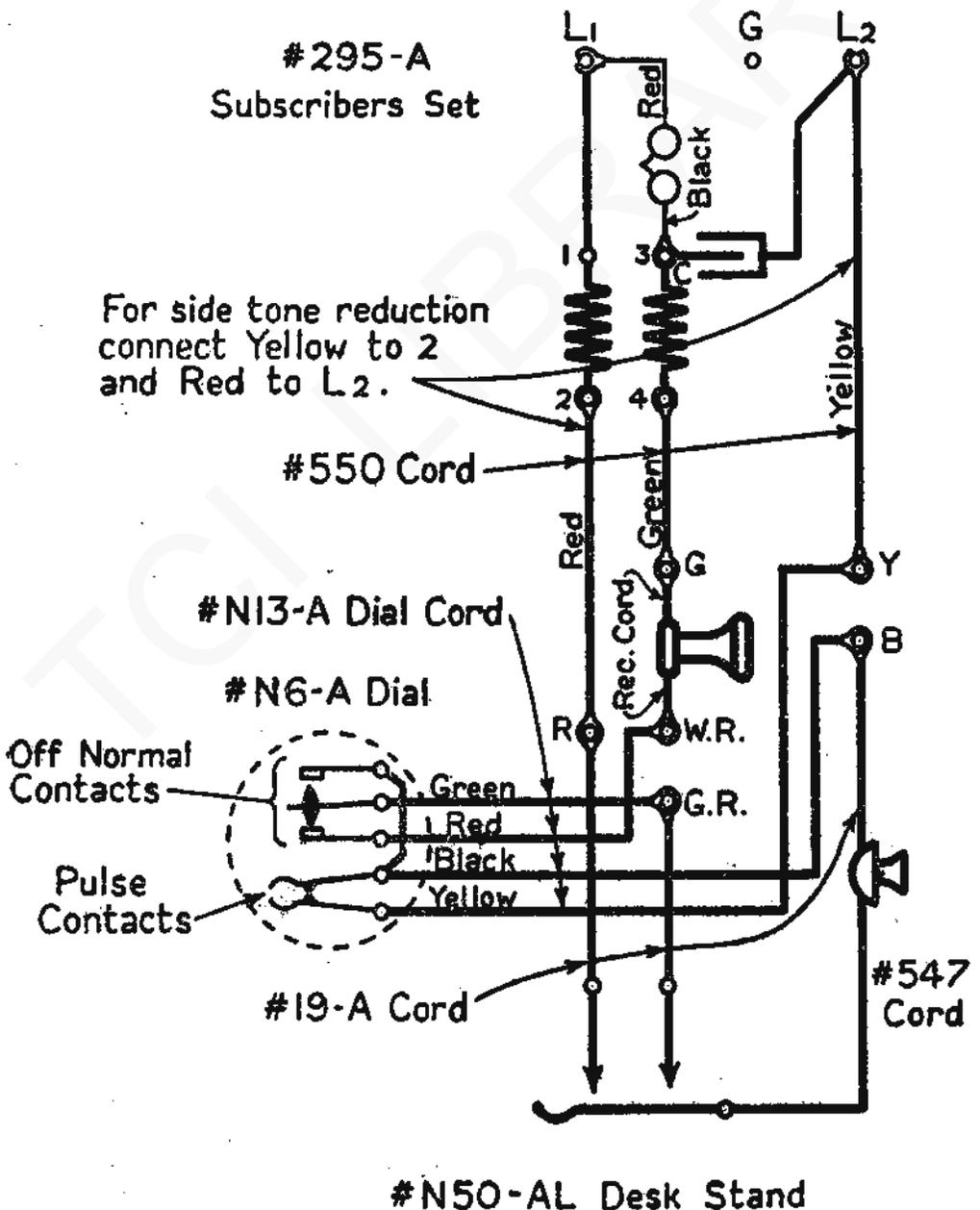
Where wall set without ringer is required at extension station, use wall set (ringer disconnected).

**P.B.X. Local Stations With Dials:**

For all P.B.X.'s except No. 700 type, connect as for individual lines. For No. 700 type P.B.X. connect either as for individual lines or, as for two-party selective lines. The connection to be used will be specified on the detail specifications or contract order covering each installation. For allowable capacity see Note on page 29.

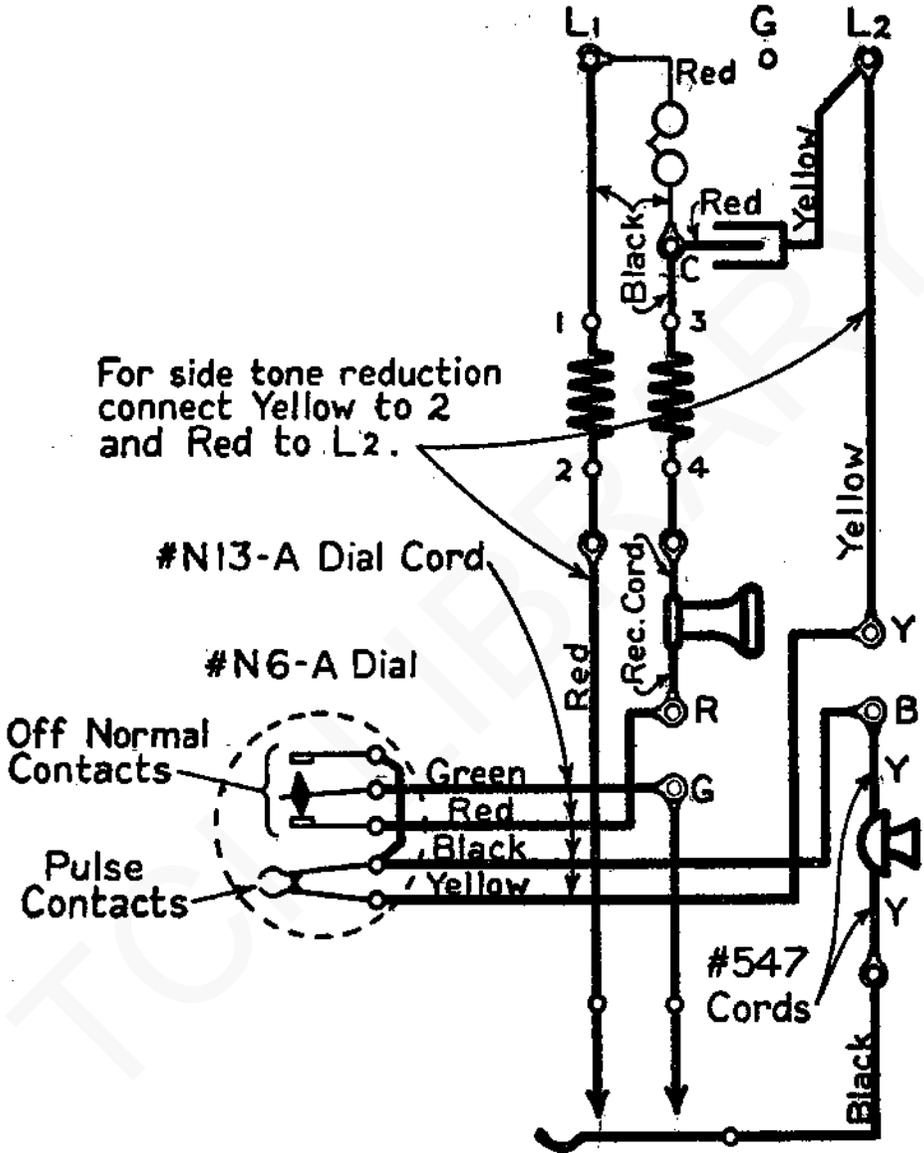
**Individual Lines:**

**Desk Set Connections:**



**Individual Lines:**

**Wall Set Connections:**



**#N293-G Subscribers Set.**

**Individual Lines:**

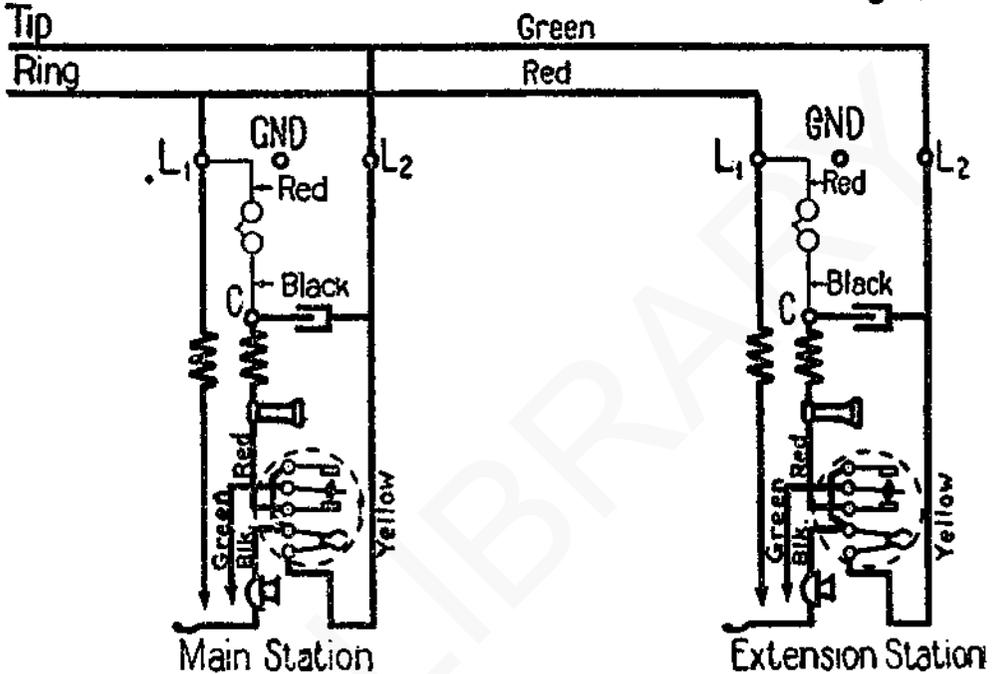
**Line and Ringer Connections:**

**Main Stations.**

Connect as for Main Station, Figure 1.

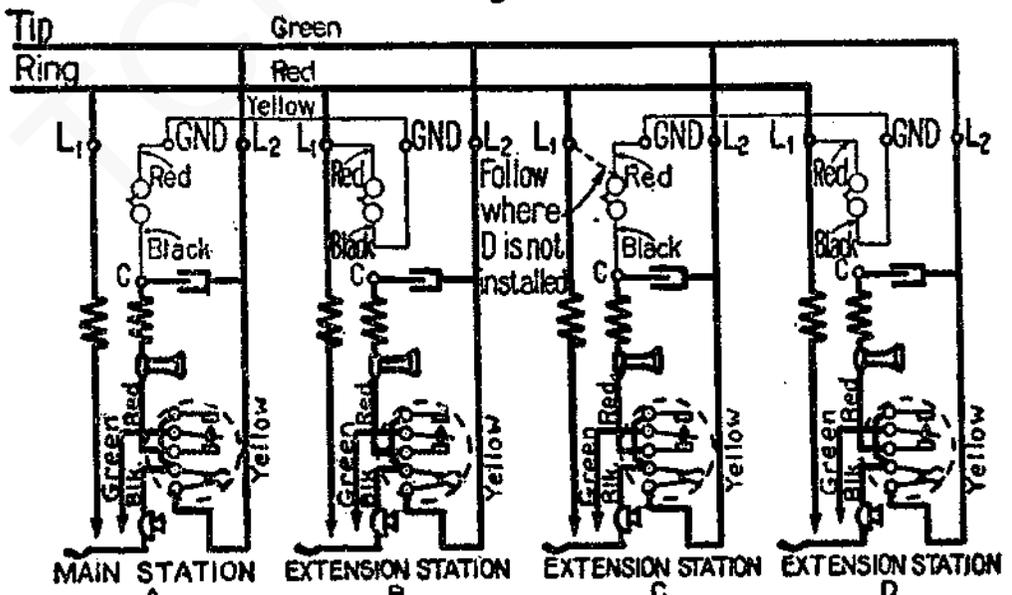
**Figure 1.**

**Main Station and One Extension Station With Ringer.**



**Figure 2.**

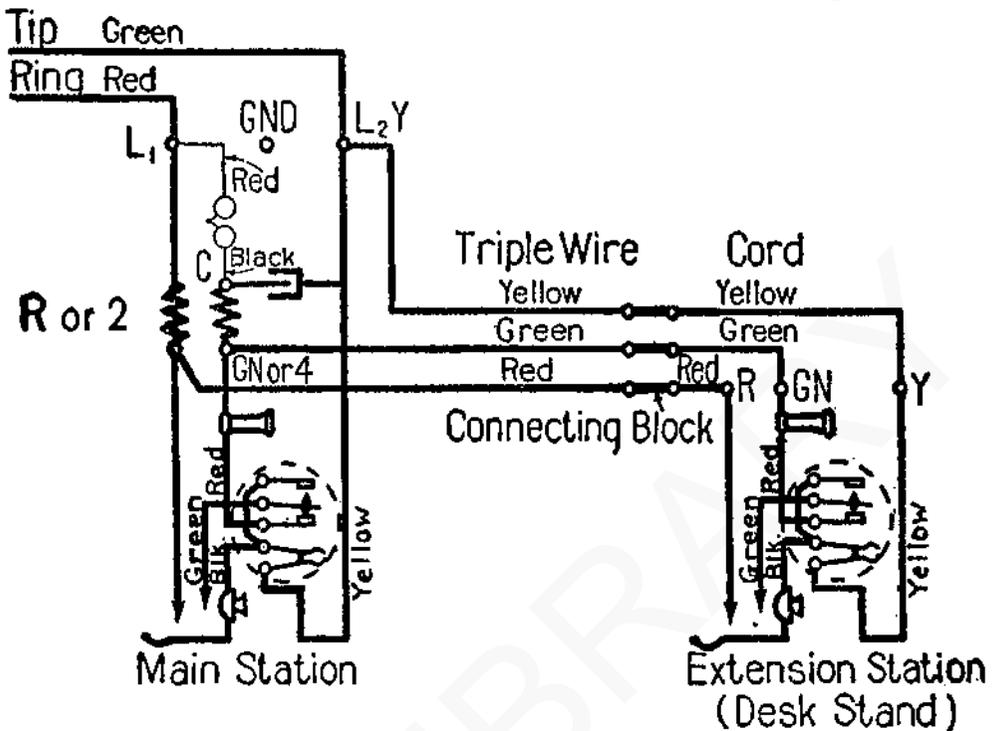
**Main Station and Two or Three Extension Stations With Ringers.**



With 2 extension stations connect as shown for AB and C  
 A, B, C and D

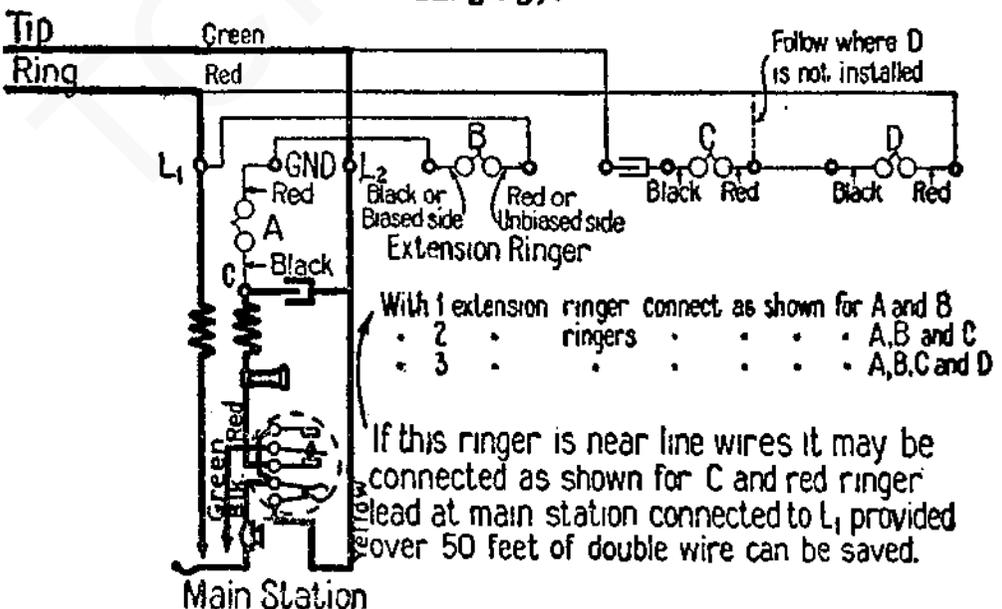
**Individual Lines:**

**Figure 3.**  
**Main Station and Extension Station Without Ringer.**



Where desk set with induction coil and condenser (but no ringer) or wall set (ringer disconnected) is used at extension station, bridge set on line same as main station set. (See Selection of Apparatus for Extension Stations).

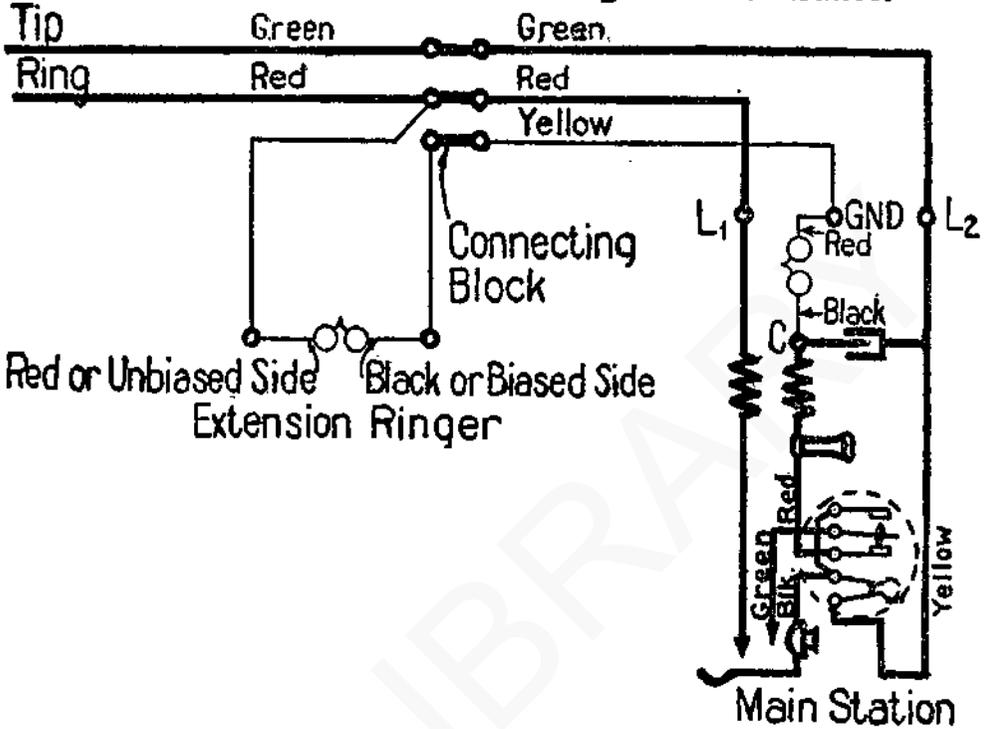
**Figure 4.**  
**Main Station With Extension Ringers (Normal or Loud Ringing).**



Individual Lines:

**Figure 5.**

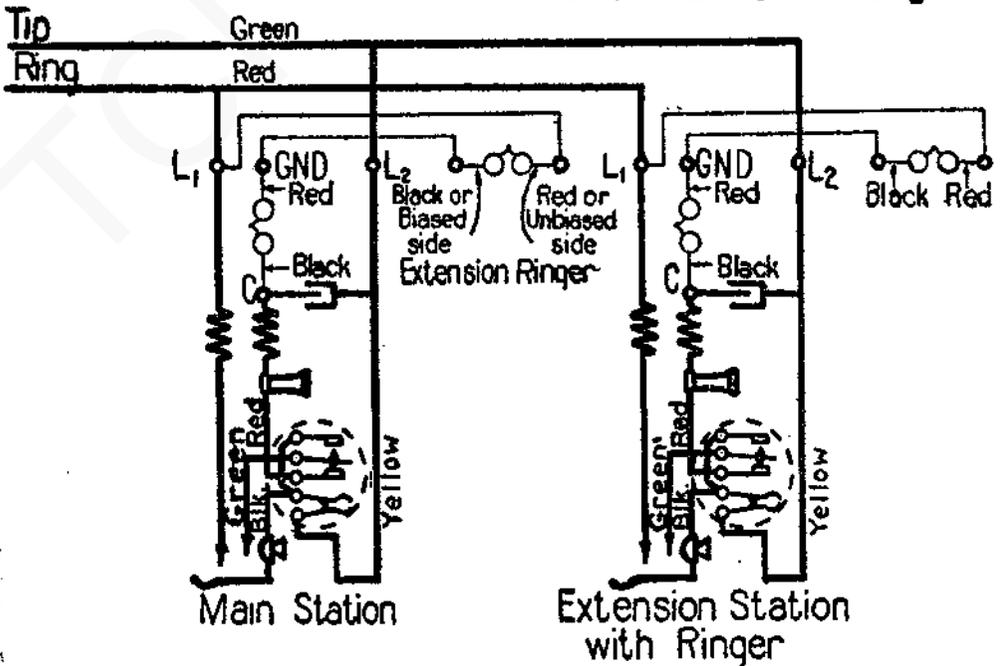
**Main Station With Extension Ringer Near Entrance.**



Connect as above where it involves less work than B, Figure 4.

**Figure 6.**

**Main Station and Extension Station With Extension Ringers.**



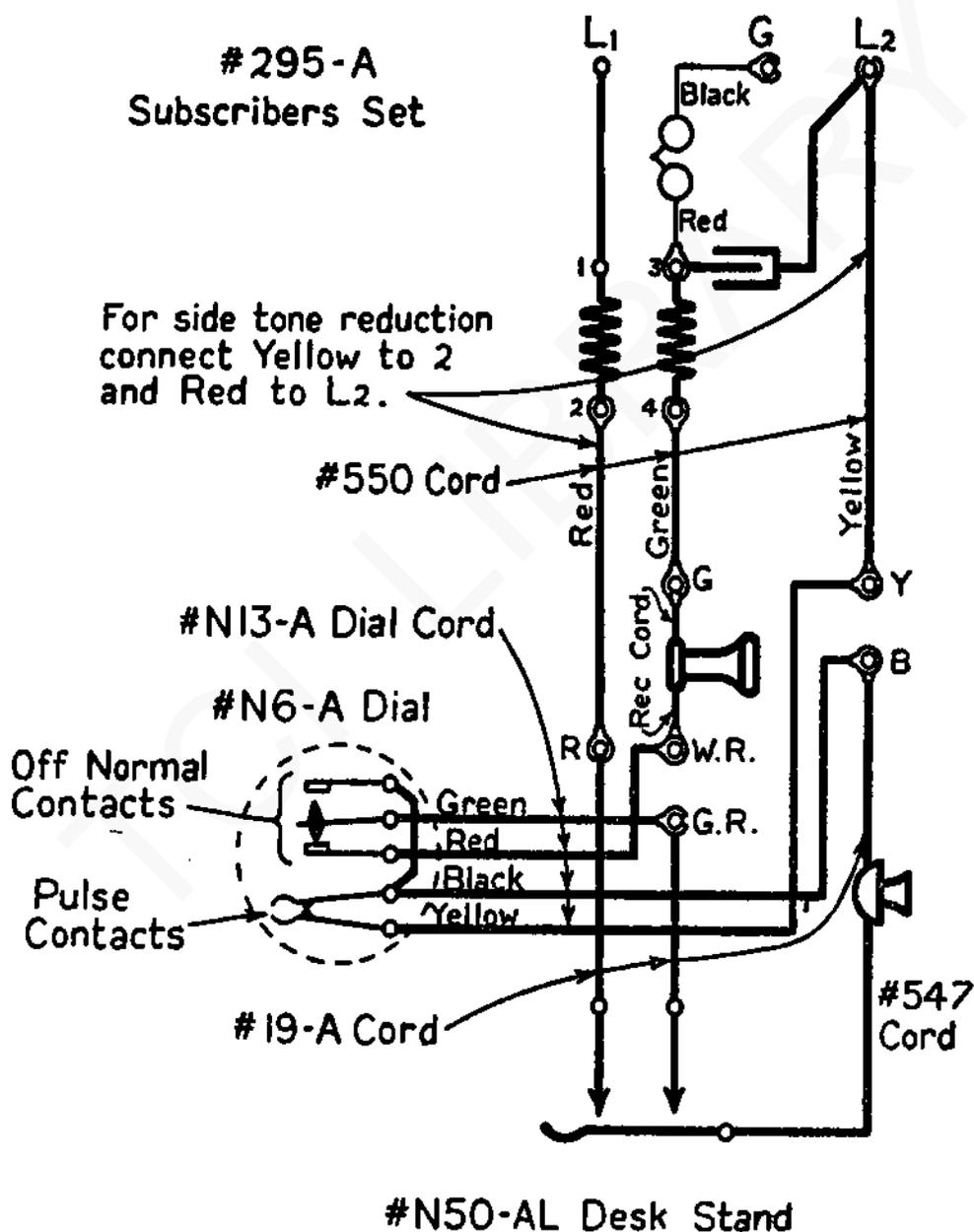
## Two-Party Selective Lines:

Main Station, and Extension Station Without Ringer.

Where desk stand only is used at extension station, connect to terminals of main station set as in Figure 3.

Where desk set with induction coil and condenser (ringer disconnected) or wall set (ringer disconnected) is used at extension station, bridge set on line same as main station set. (Set Selection of Apparatus for Extension Station).

### Desk Set Connections:



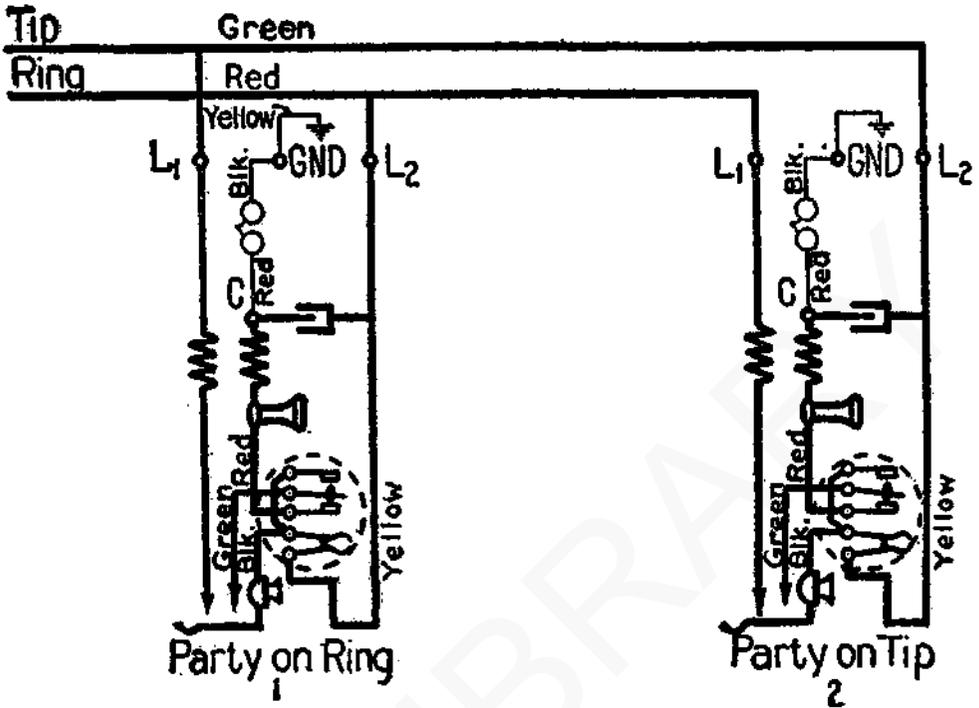


**Two-Party Selective Lines:**

**Line and Ringer Connections:**

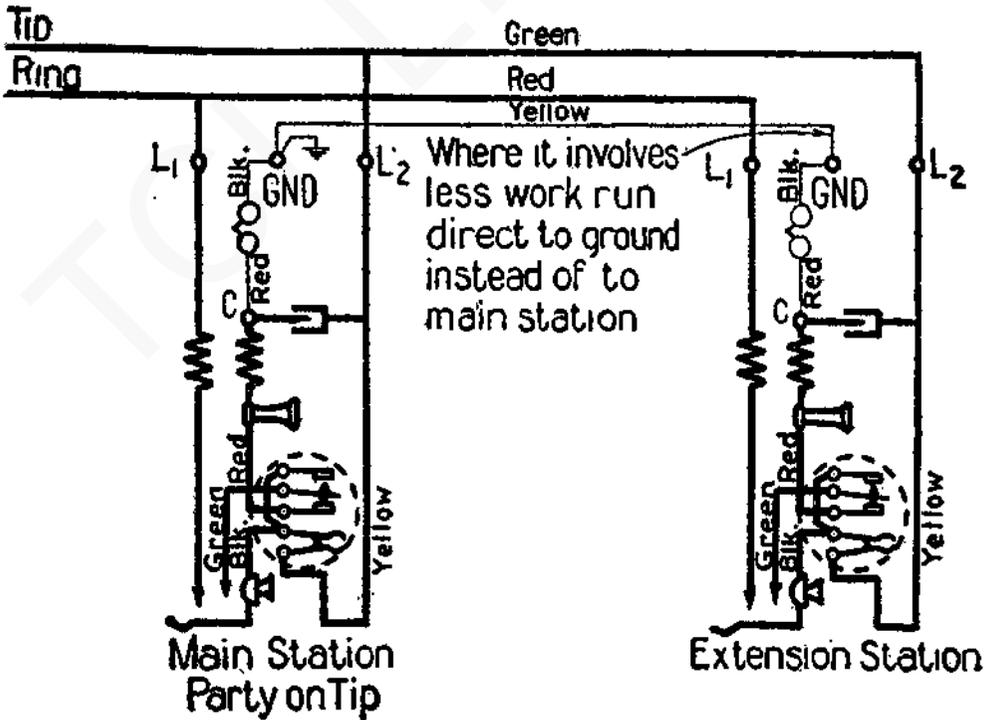
**Figure 7.**

**Main Stations.**



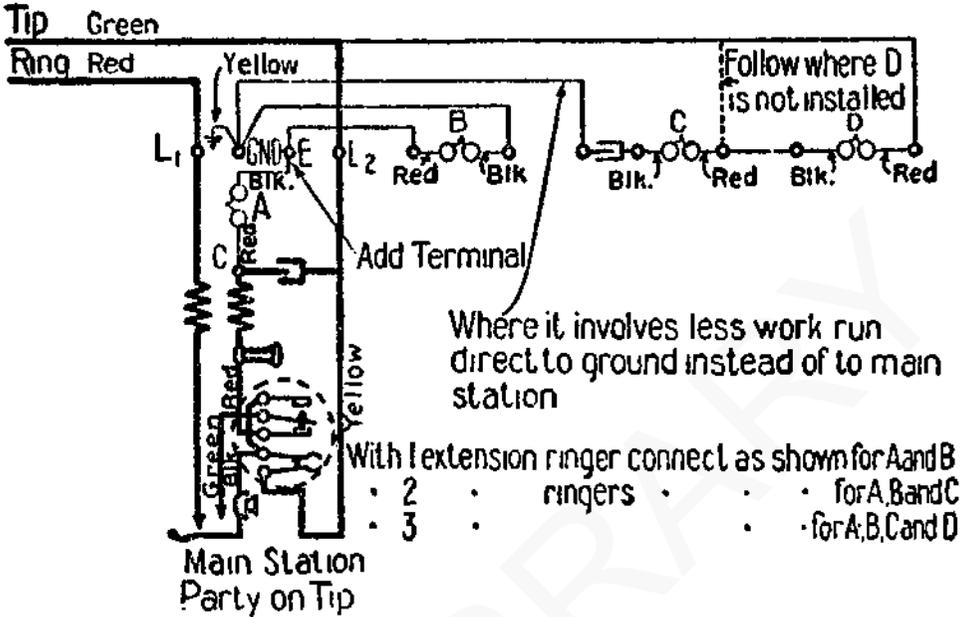
**Figure 8.**

**Main Station and Extension Station With Ringer.**

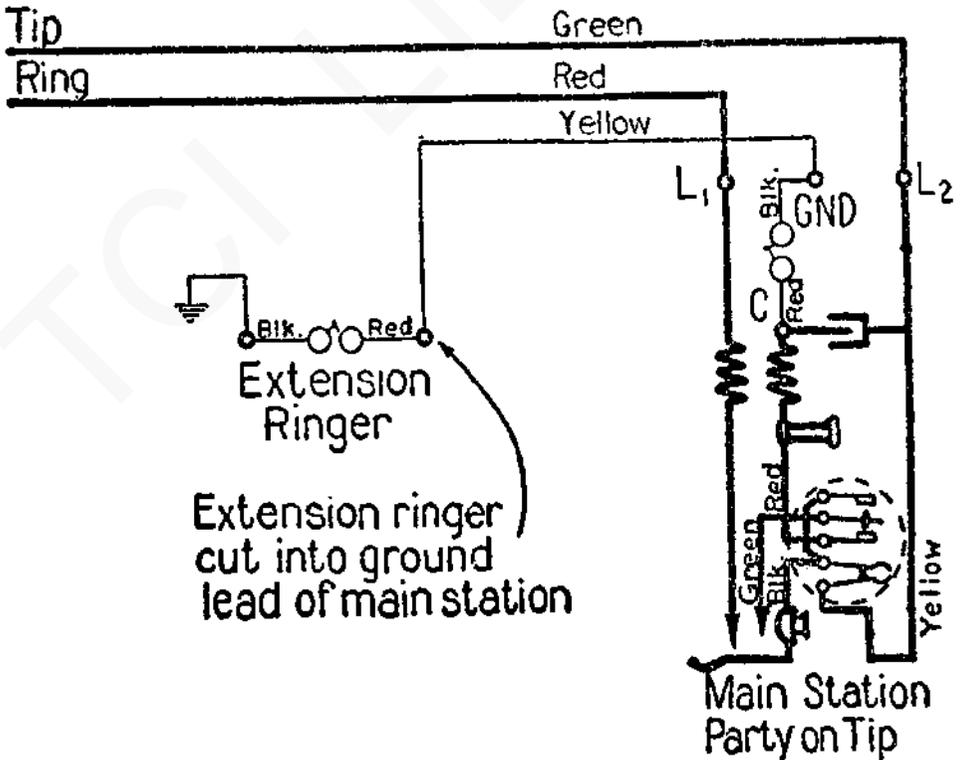


**Two-Party Selective Lines:**

**Figure 9.**  
**Main Station With Extension Ringers (Normal or Loud Ringing).**



**Figure 10.**  
**Main Station With Extension Ringer Cut Into Signaling Ground Wire.**

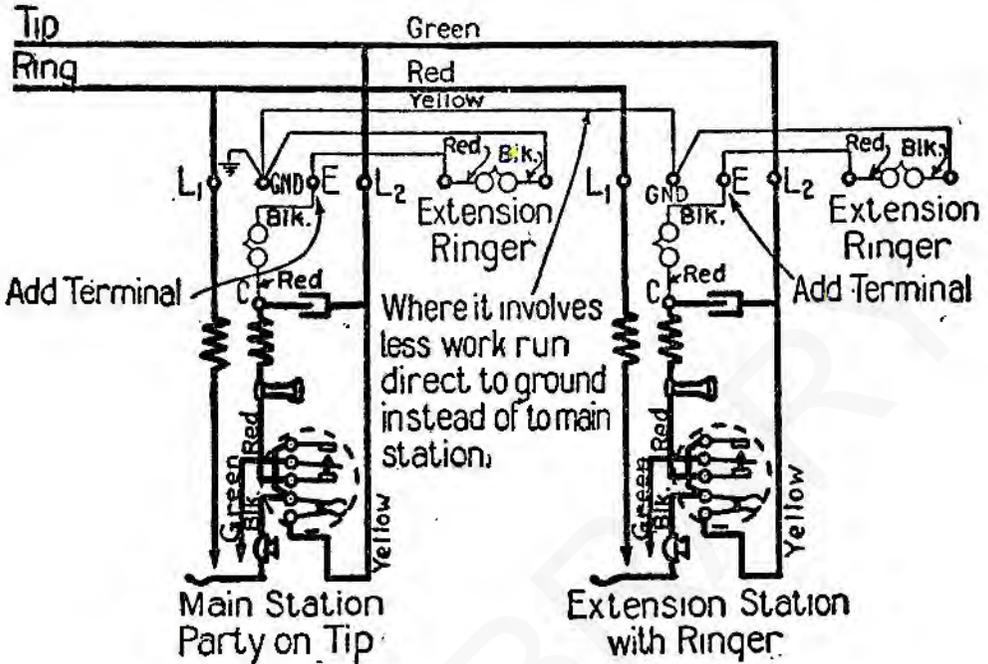


Connect as above where it involves less work than B. Figure 9.

**Two-Party Selective Lines:**

**Figure 11.**

**Main Station and Extension Station With Extension Ringers.**



**Two-Party Selective Lines:**

**Main Station and Extension Station Without Ringer**

Where desk stand only is used at extension station, connect to terminals of main station set as in Figure 3.

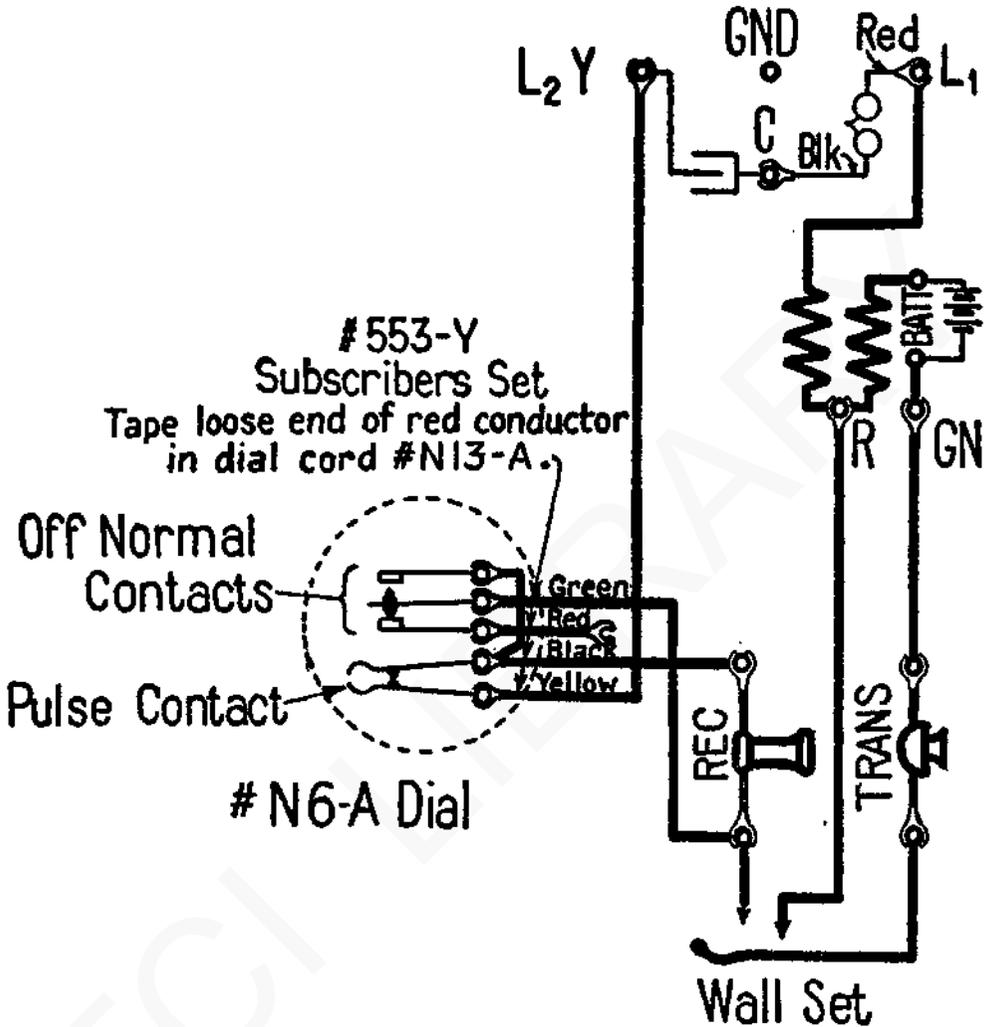
Where desk set with induction coil and condenser (ringer disconnected) or wall set (ringer disconnected) is used at extension station bridge set on line same as main station set. (See Selection of Apparatus for Extension Stations, page 29.)



# Common Battery Signaling and Local Battery Talking

## Stations:

### Wall Set Connections:



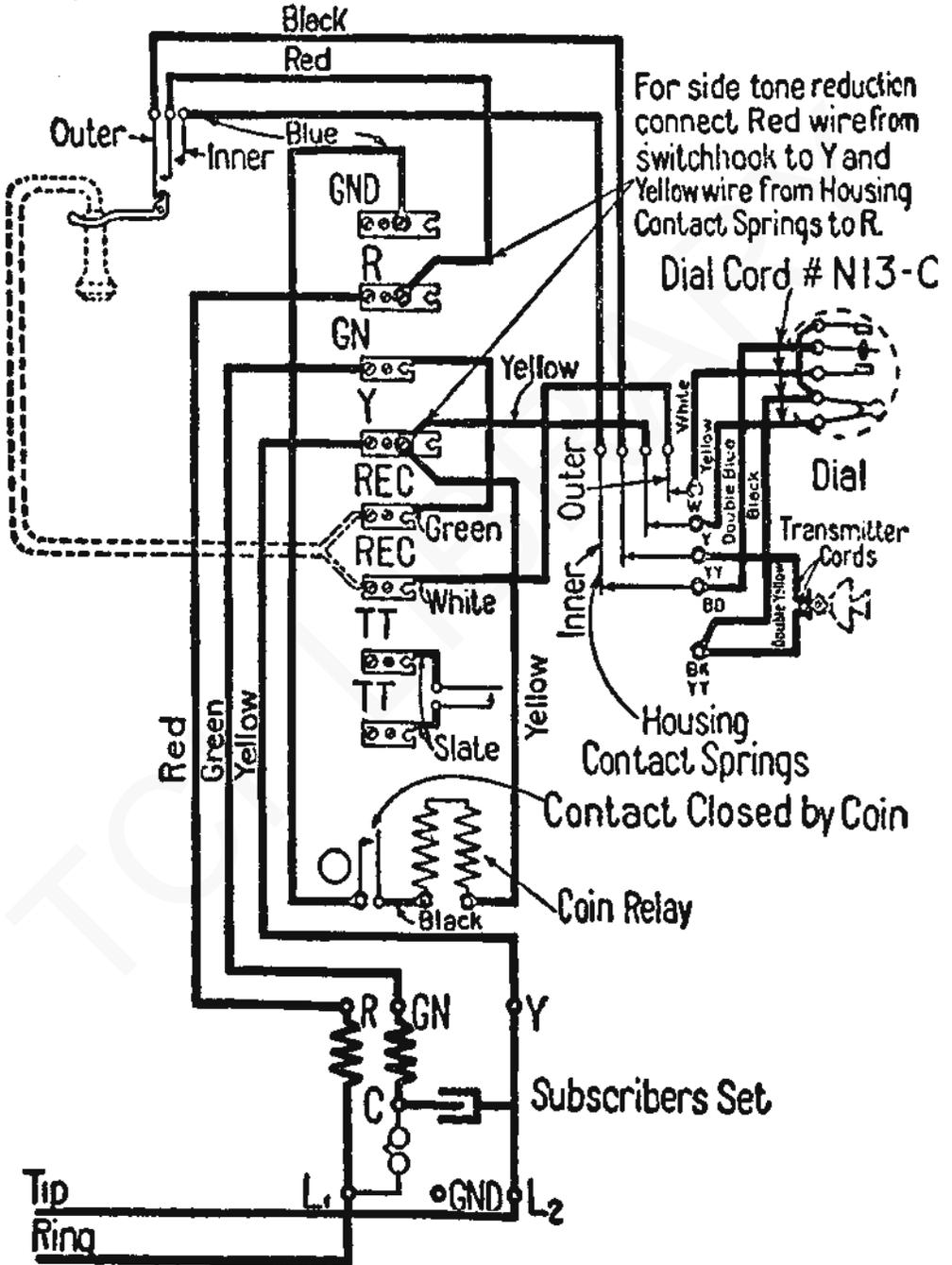
### Line and Ringer Connections:

Connect according to kind of line on which stations are connected.  
Pole receiver by connecting so line current increases pull on diaphragm with receiver off hook.

**Coin Collector Stations:**

**#50 Type Machine Switching Coin Collectors on Individual Lines.**

**Figure 12.**

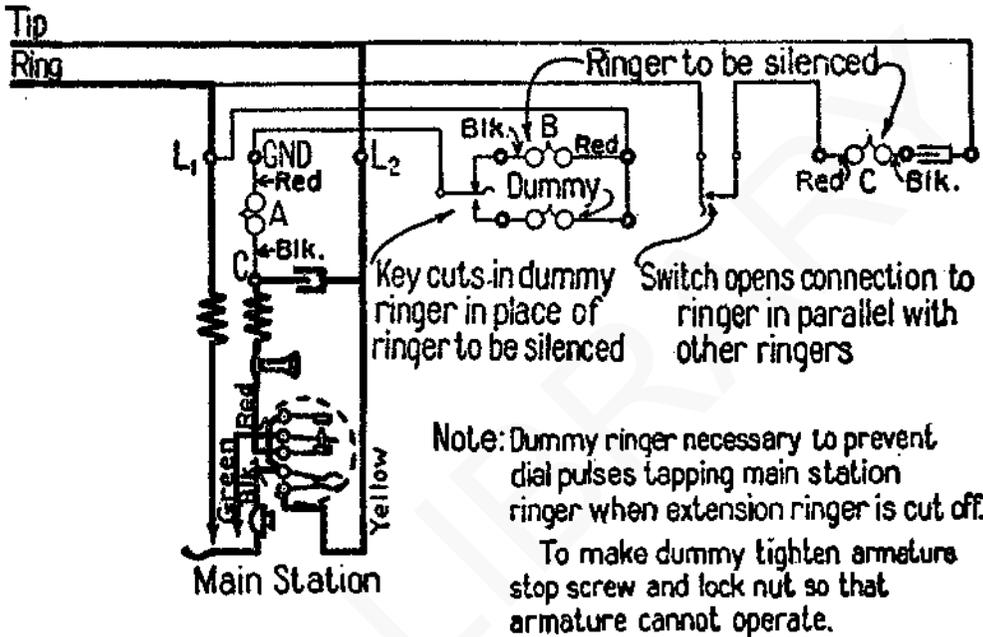


## Keys and Switches to Silence Ringers

Keys and switches may be installed for temporarily cutting out ringers (either extension ringers or ringers at extension station). Connections should insure at least one ringer connected to line at all times.

### Keys and Switches to Silence Ringers:

Figure 13.



With one extension ringer connect as shown for A & C and strap L<sub>1</sub> & Grd.  
 With two extension ringers connect as shown for A, B & C.

## STATION MAINTENANCE

### Detailed Table of Contents:

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RINGERS.....	44
TESTS FOR CROSSES IN DESK STANDS.....	45
TESTS FOR NOISE, CORDS CUTTING-OUT, ETC.....	36
TEST SET.....	46

### **Protector Blocks:**

When No. 26 and No. 27 protector blocks are removed from protector on account of trouble or for inspection:

- (a) Brush operating surfaces of both blocks with typewriter brush
- (b) Re-install blocks if both are free from defects given in (c).
- (c) Replace both blocks with new No. 26 and No. 27 blocks if either block shows pits on the operating surface, or if there is a black deposit on porcelain which extends from carbon insert to raised edge of porcelain block.
- (d) Do not replace blocks because of discoloration of carbon surfaces.

### **Receivers and Transmitters:**

If defective, replace with No. 144 Receiver or No. 323 Transmitter.

Should subscriber complain of loud side tone, follow instructions in separate specifications covering STATION APPARATUS INSTALLATION.

### **Dial:**

Whenever a machine switching station is visited for any reason inspect and if necessary repair dial according to separate specifications covering Maintenance of Northern Electric Company No. N6 Type Dials.

### **Ringers, Adjusting and Testing:**

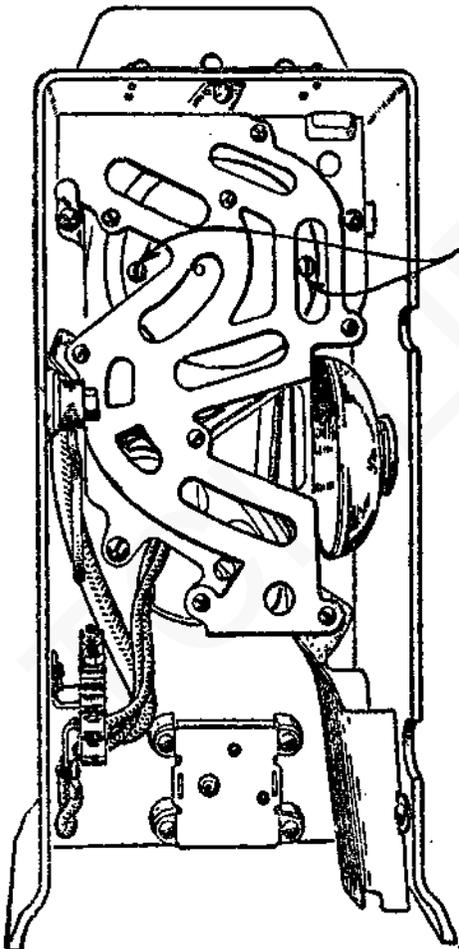
See page 25 in these specifications.

## Test for Crosses in Desk Stand:

When dials are added or changed make the following test:

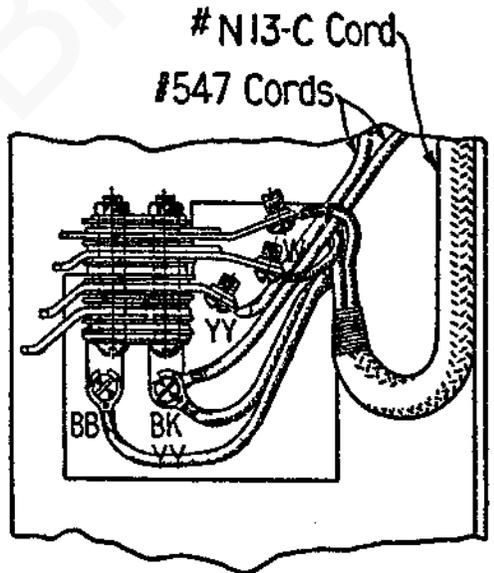
With receiver off hook, connect one cord of hand test set to bare part of transmitter lug holder and the other cord to terminal L1. Then dial "9" (using hand test set dial) and if loud clicks are heard in desk stand receiver there is a cross to frame of stand which must be cleared. Slight clicks will be heard even though no cross exists. Replace receiver on hook. Repeat tests with cord connected to L2 instead of L1. Replace receiver on hook.

## Coin Collectors:



**Housing of #50 Type Machine  
Switching Coin Collector**

Loosen these screws to  
replace dial. Do not  
remove chute.



**Arrangement of #N13-C and #547  
Cords In #50 Type Machine  
Switching Coin Collector**

**Tests for Noise, Cords Cutting Out, Etc.**

Dial 1197 and with receiver to ear listen for trouble while gently touching or moving the parts likely to be affected.

**Note:** Do not attempt to locate trouble with receiver off hook without first dialing number, otherwise trouble alarm in Central Office will operate.

**Wall Sets and Desk Stands:**

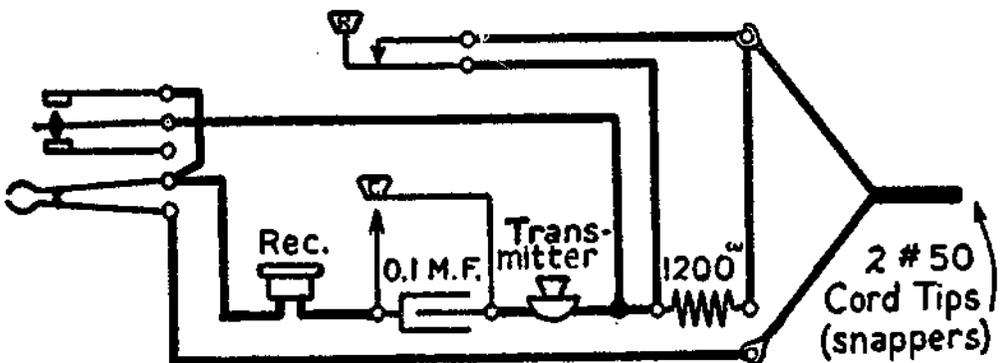
Disconnect leads from L1 and L2 terminals while doing any work on wall sets or desk stands, which might result in switch-hook operation, short circuited terminals, or other causes of false operation of central office equipment and interference with incoming calls.

**Hand Test Set No. S913-AG:**

Hand test set for central officemen's, installers' and repairmen's use, equipped with transmitter, receiver, No. N6A dials (less cord) resistance, condenser, two buttons marked "C" and "R", and a two-conductor cord. Button "R" normally shunts out the 1200 ohm resistance and is never used by installers or outside repairmen. Button "C" when depressed, shunts out 1-10 M.F. condenser. Connect hand test set cords in the usual manner with "C" and "R" buttons normal and listen on line. If line is not in use, depress "C" button and if dial tone is heard dial number desired. Do not release "C" button during dialing or talking as this will release the connection in central office. To immediately dial another number release "C" button for about two seconds, depress it and then dial. Never depress "C" button until sure that line is not in use, because if dial pulses or ringing current are being transmitted over the line it will cause interference.

Test (and if necessary adjust) speed of hand test set dial with test board daily when first call to test board is made. Make this test and adjustment according to separate specifications covering Maintenance of Northern Electric Company No. N6 Type Dials.

**Circuit of Hand Test Set #S913-AG.**



## REFERENCE SPECIFICATIONS

The following handbook specifications (including any Supplement thereto) are referred to herein and installers and repairmen should have all of these specifications for use in connection with this work:

- 4170 STATION AND PRIVATE BRANCH  
EXCHANGE PROTECTOR INSTALLATION.
- 3852 STATION APPARATUS INSTALLATION.
- 3853 STATION WIRING.
- 3854 STATION CONNECTIONS.
- 3855 ADJUSTMENT OF STATION APPARATUS.
- 3857 No. 50 COIN COLLECTOR INSTALLATION.
- 3858 No. 50 COIN COLLECTOR MAINTENANCE.
- 3930A DROP WIRING.
- 3932 BLOCK WIRING.

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