

## INDUCTIVE NOISE

### 1. GENERAL

**1.01** This section covers the relative contributions to inductive noise which may be controlled or minimized by the proper use of subscriber station equipment.

**1.02** This section is reissued to:

- Add information on the P-90D011 ringer isolator.
- Delete descriptive information on 425- and 426-type tubes (which is covered in Section 501-320-100).

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** Inductive noise, as used in this section, is caused by telephone plant being within the electromagnetic field of:

- Power circuits
- Transformers
- Neon lights
- Fluorescent lights
- Office machines

Such fields create foreign voltages on the telephone circuit. Unbalance of the telephone circuit will result in noise (static). The purpose of this section is to show methods of balancing or isolating this condition.



*Station apparatus and associated wiring should not be located closer to possible sources of inductive noise than the separations specified in the sections covering wiring, clearances, and station set location.*

### 2. CONTROL OF INDUCTIVE NOISE

**2.01** Poor insulation or resistance unbalance of the telephone circuit contributes to noise resulting from inductive interference. If tests on circuits with inductive noise indicate high leakage or resistance unbalance, the cause should be located and corrected. The clearing of these troubles may adequately solve the problem.

**2.02** The balance-to-ground of the customer station sets is often the controlling factor in the line's susceptibility to inductive noise.

*Note:* The unbalance between the two sides of a line which has only the capacitance afforded by the air dielectric between the tip and ring shall not exceed three volts on the meter at the local test desk.

**2.03** The unbalances due to nongrounded ringers are small and noise resulting from the action of induced voltages on these unbalances is usually negligible.

**2.04** The steps required for the control of inductive noise (in order of practical application) are:

- (1) Balance line
- (2) Install 3-element tube
- (3) Install 4-element tube
- (4) Install solid state ringer isolator

### 3. STATION RINGING BRIDGES

**3.01** B-type ringers, which were manufactured with magnetic iron core ringer coils, have red-striped markings on both coil covers. These red-striped ringers are lower in impedance and increase the susceptibility to inductive noise when used for grounded ringing.

**SECTION 500-112-100**

**3.02** All low-impedance ringers on grounded ringing lines troubled with inductive noise should be replaced by high-impedance capacitor-type ringing bridges.

**3.03** The high-impedance station ringers connected on each side of a line should balance within certain limits. Section 500-114-100 lists figures as units of unbalance which may be applied to the various station ringers to determine the unbalance between the two sides of the line.

**3.04** When inductive noise is excessive on lines with high-impedance capacitor-type grounded ringing bridges, tubes or ringer isolators may be utilized to minimize the effects of the induced voltage.

**3.05** From the standpoint of inductive noise susceptibility, a grounded station ringer equipped with a tube or ringer isolator is equivalent to a nongrounded ringer (provided the induced voltage between the line and ground is not high enough to cause conduction of the tube).

**4. DEVICES TO MINIMIZE INDUCTIVE NOISE**

**4.01** Three different electrical devices may be used to minimize the effect of inductive noise.

- 426-type, 3-element, gas-filled cold cathode electron tube
- 425-type, 4-element, gas-filled cold cathode electron tube
- P-90D011, solid-state ringer isolator

**4.02** Table A shows usage of the tubes and ringer isolator for the various party services.

**4.03** Tube equipped sets usually require either superimposed ringing (ac ringing voltage plus

a dc bias voltage), or a pulsating ringing current, in order to assure satisfactory ringer operation. If a suitable supply is not available, tube equipped sets cannot be used unless changes are made in the ringing supply.

**4.04** The limitations on the number of tube equipped ringing bridges and the permissible loop resistance are more restricted than for regular capacitor-type ringing bridges. The reduction in limitations is different for various central office ringing arrangements. For the limitations, refer to Section 500-114-100.

**4.05** Tube equipped sets may be used on 2-party lines provided tip-party identification is not required.

**3-ELEMENT TUBE (426-TYPE)**

**4.06** The 426-type 3-element tube may be added to high-impedance grounded ringers to minimize the effects of inductive noise.

**4.07** When 3-element tubes are used to combat inductive interference, station ringers should be connected as shown in Fig. 1.

**4.08** For positive stations on lines experiencing inductive interference, induced voltages of 20 to 30 volts in series with the central office battery may be sufficient to cause the control gap to conduct. This conduction ("flashover") will result in noise (sputtering) on the line during conversation.

**4.09** For negative stations, the control gap is bridged across the line, and the main gap is connected between the line and ground in series with the ringing bridge (Fig. 1, negative stations). The main gap will normally withstand 70 to 80 induced volts in series with the central office battery before "flashover" (conduction) occurs.

**TABLE A**

DEVICE	2-PARTY	4-PARTY FULL SELECTIVE RINGING	4- AND 8-PARTY SEMISELECTIVE RINGING	2-PARTY WITH TIP PARTY IDENTIFICATION
3-Element Tube	•	•	•	
4-Element Tube	•	•	•	
Ringer Isolator	•			•

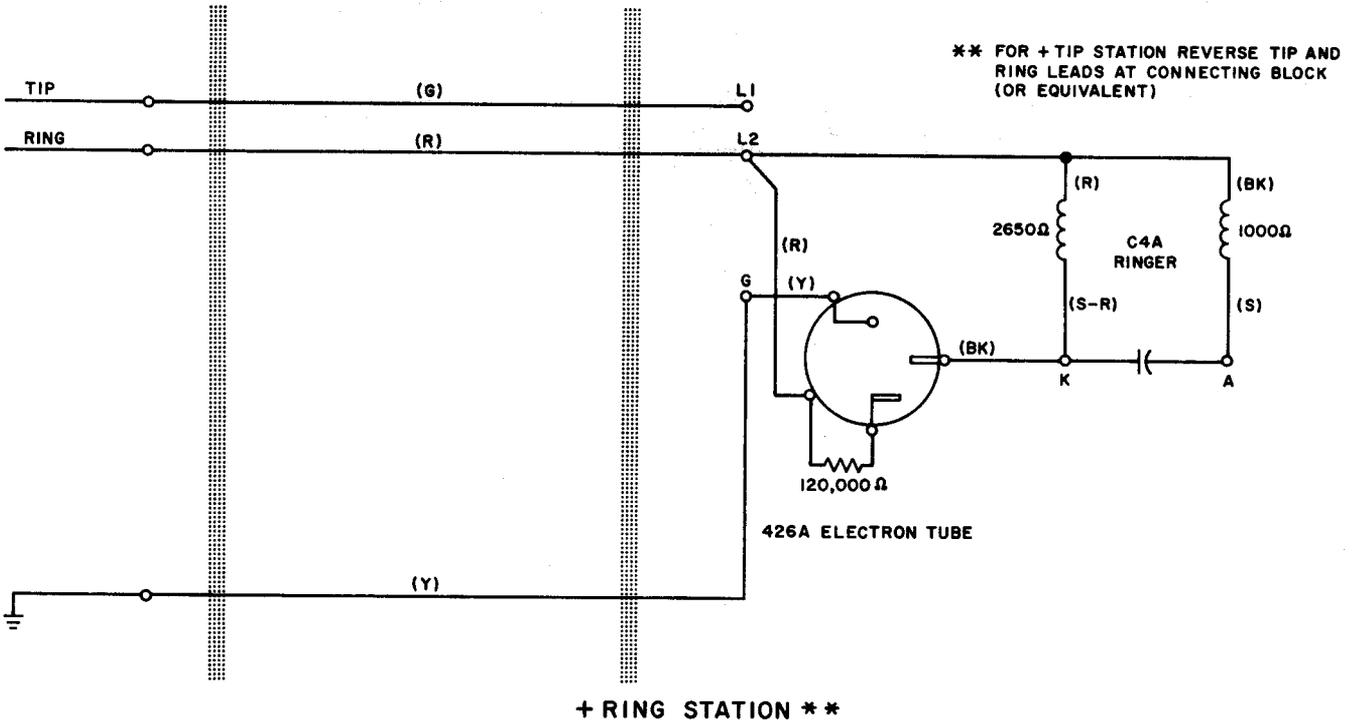
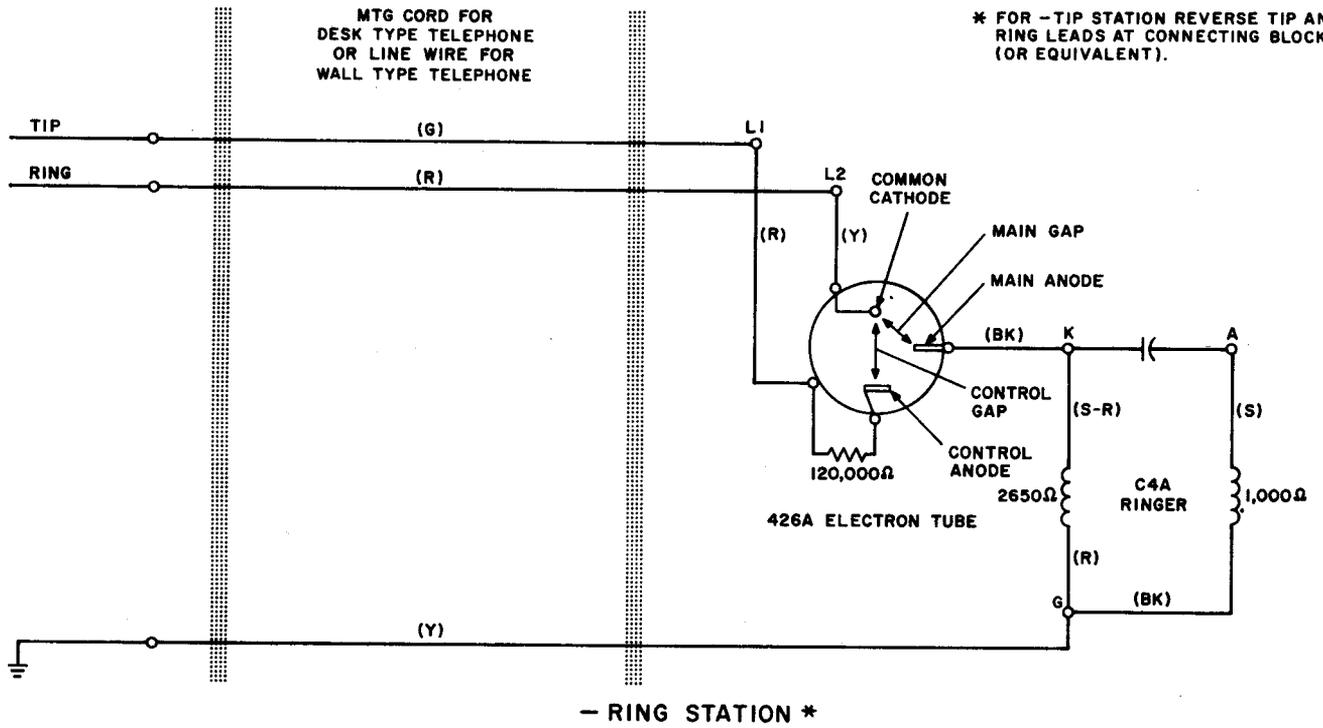


Fig. 1—3-Element Tube Typical Ringing Bridge Connections

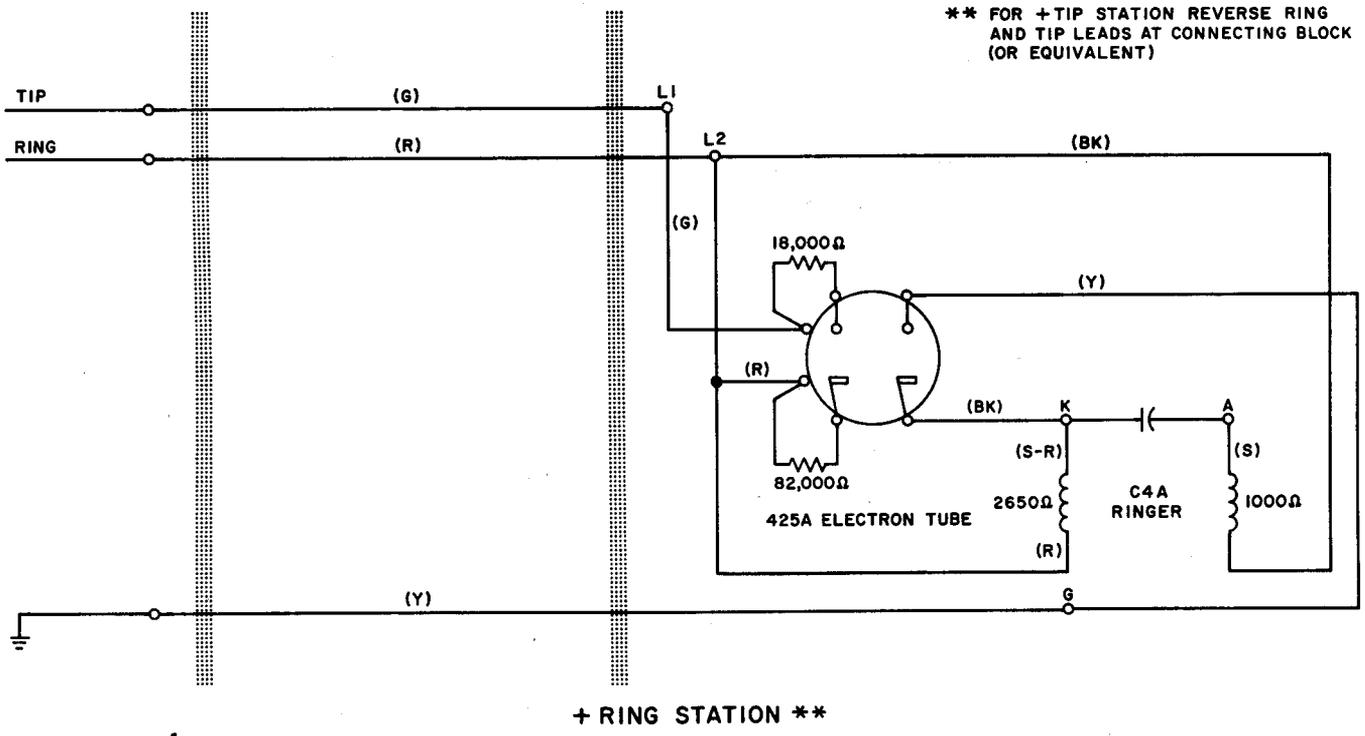
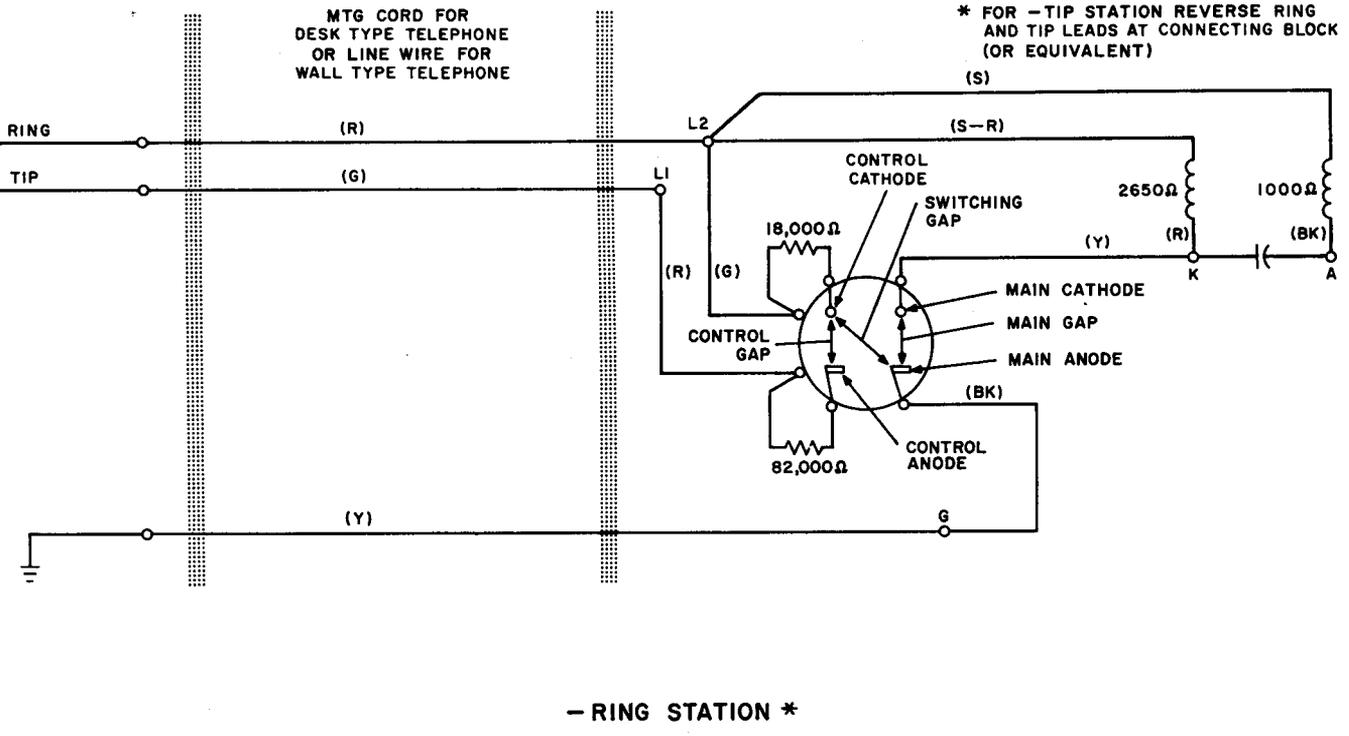


Fig. 2—4-Element Tube Typical Ringing Bridge Connections

4.10 For additional information on the 3-element tube see Section 501-320-100.

**4-ELEMENT TUBE (425-TYPE)**

4.11 The 425-type 4-element tube may be required in cases where the induced voltage on the telephone line exceeds the values for satisfactory operation of the 3-element tube.

4.12 The control gap of the 4-element tube is bridged across the line (and the main gap connected between the line and ground) for both positive and negative stations (Fig. 2). The line is protected from induced noise by the high breakdown point of the main gap.

4.13 For additional information on the 4-element tube see Section 501-320-100.

**RINGER ISOLATOR (P-90D011)**

4.14 The P-90D011 ringer isolator may be used in those cases where the induced voltage on the telephone line exceeds the value for satisfactory operation of the 4-element tube.

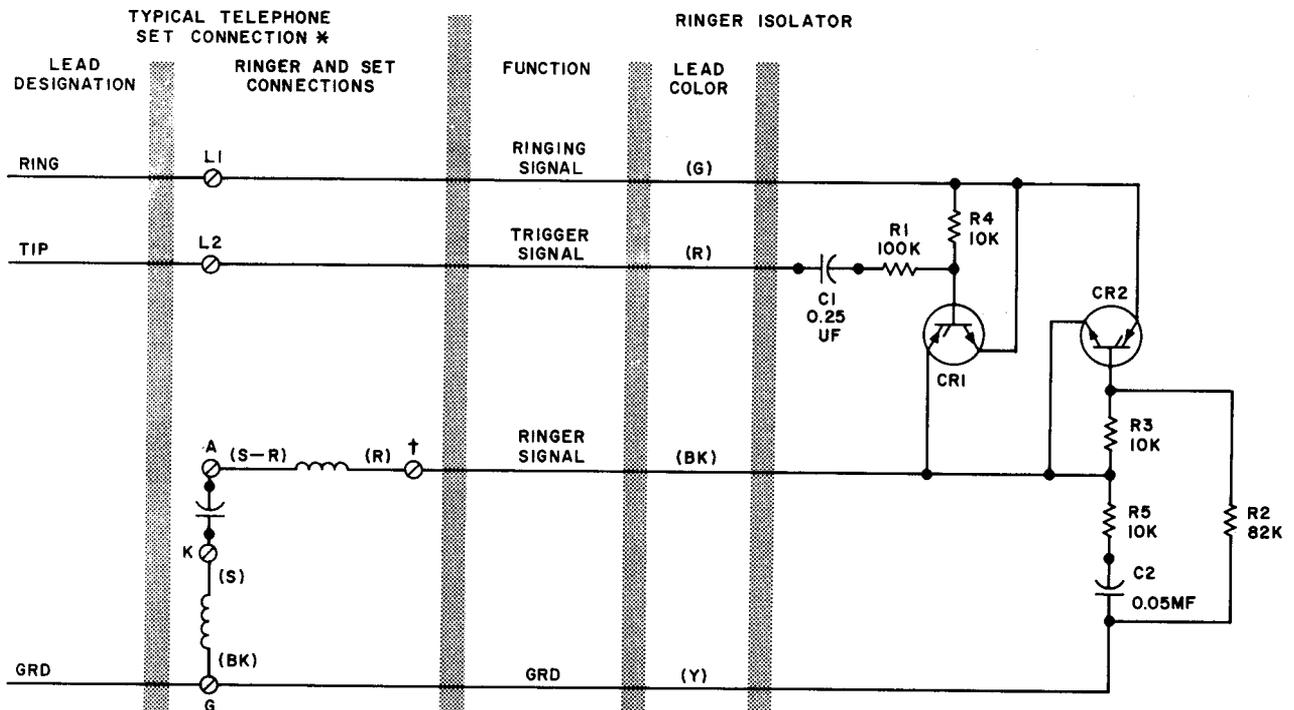
4.15 The ringer isolator is intended for use with all grounded ringers except those used in 4-party full selective and 8-party semiselective ringing service (Fig. 3). The ringer isolator may be used at subscriber stations requiring tip party identification (identification connection made in the normal manner). One ringer isolator is required for each grounded ringer.



*Lines equipped with ringer isolators cannot be tested for continuity by conventional test desk procedures.*

4.16 For additional information on the P-90D011 ringer isolator see Section 501-375-100.

4.17 If situations are encountered where induced voltage exceeds the capabilities of the electron tubes and ringer isolator, the problem must be referred to the proper supervision for other corrective arrangements.



\* RING STATION, FOR TIP STATION REVERSE TIP AND RING LEADS AT CONNECTING BLOCK (OR EQUIVALENT).  
 † USE SPARE TELEPHONE SET TERMINAL OR D-161488 CONNECTOR.

**Fig. 3— Ringer Isolator, Typical Ringing Bridge Connections**