RINGING LIMITATIONS

1. GENERAL

1.01 This section contains data on the maximum number and different types of ringers used in various service arrangements. Connection information is also included.

1.02 This section is reissued to:

- Add information on 96-volt dial long line circuits
- Include C4B, H1B, M1B, P1B, and T1A ringer
- Include ESS office, Table B(b)

2. CLASSIFICATION

2.01 Ringers are classified in two groups:

(a) High impedance — having a total dc coil resistance of 2500 ohms or more.

(b) Low impedance — having a total dc coil resistance of less than 2500 ohms.

2.02 Ringing bridges are also classified in two groups:

(a) High impedance — consisting of one high-impedance ringer in series with a capacitor of 0.4 to 0.65 microfarads.

(b) Low impedance — consisting of one low-impedance ringer in series with a capacitor of 1.0 or 2.0 microfarads.

2.03 Ringing bridges are also classified as:

(a) Capacitor type—using a capacitor in series with a ringer.

(b) Tube type — using a cold cathode electron tube in series with a ringer.

(c) Diode type—using a solid state device in series with a ringer.

3. NONPOLARIZED RINGING

3.01 Any ringing system where ringing selectivity is not provided, or is accomplished by means other than polarized ringing current, is classified as nonpolarized.

3.02 Individual line bridged ringing (Fig. 1) consists of a ringer, in series with a capacitor, bridged across the line.

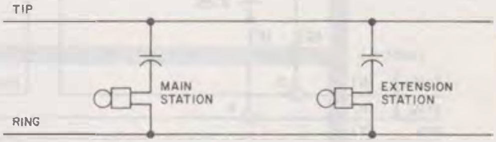


Fig. 1—Individual Line Bridged Ringing

3.03 For two-party full selective ringing (Fig. 2), connect a ringer in series with a capacitor from the ring side of the line to ground, and a ringer in series with a capacitor from the tip side of the line to ground.

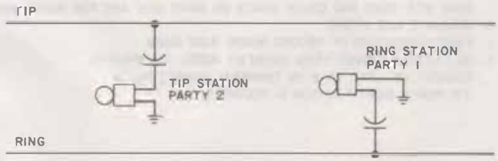


Fig. 2—Two-Party Full Selective Grounded Ringing

3.04 Four-party semiselective ringing (Fig. 3) is accomplished by connecting two capacitor-type ringing bridges from the ring side of the line to ground, and two capacitor-type ringing bridges from the tip side of the line to ground. Code ringing is used to differentiate between stations on same side of line.

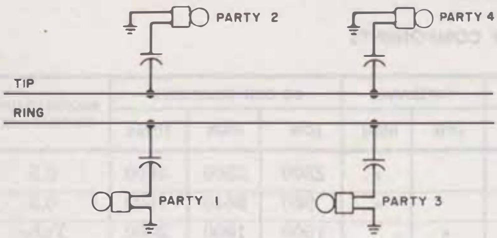


Fig. 3—Four-Party Semiselective Grounded Ringing

3.05 Multiparty divided code ringing is accomplished by same method employed for 4-party semiselective ringing. On a full line, one half the ringing bridges are connected between one side of the line and ground.

4. POLARIZED RINGING

4.01 This is any ringing system which accomplishes ringing selectivity through ringing bridges which are connected, poled, and biased to operate on a particular polarity ringing current.

4.02 Four-party full selective or 8-party semiselective ringing (Fig. 4) is accomplished by using sets employing a cold cathode electron tube or a diode in the ringing circuit.

4.03 Tube or diode, and ringer at the station are connected and poled to operate on only positive or only negative superimposed ringing voltage.

4.04 One code—two code ringing signals, used as required, alert desired station.

4.05 The application of extension ringers is shown in Fig. 5.

5. MAGNETO RINGING

5.01 This is a ringing system employing ac (alternating current) to operate ringers.

5.02 Four-party selective ringing is accomplished by employing two oppositely poled biased ringers connected directly from each side of the line to ground. Series capacitors are not used.

5.03 Ringing is accomplished by applying correctly poled pulsating current between one side of the line and ground.

6. RINGING BRIDGE LIMITATIONS

6.01 The following information covers limitations on the number and type of ringing bridges used on:

- Individual lines.
- 2-party full selective lines.
- 4-party semiselective lines.

6.02 Table A lists various ringing bridge components. Table B lists the maximum number of ringing bridges permitted per main station for each class of service.

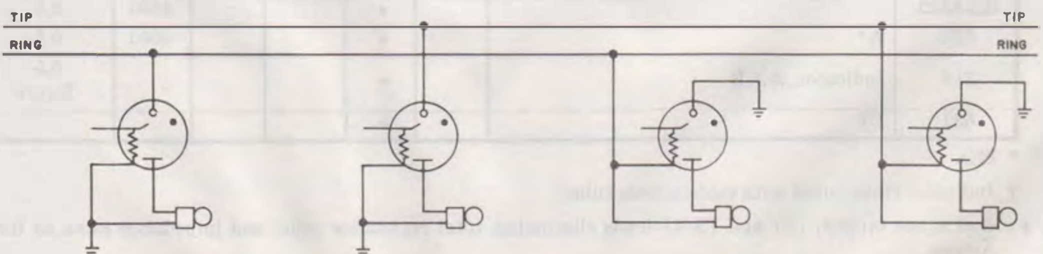


Fig. 4—Four-Party Full Selective and Eight-Party Semiselective Tube Type Ringing

TABLE A

RINGING BRIDGE COMPONENTS

RINGERS		IMPEDANCE		DC COIL RESISTANCE			MICROFARADS CAPICITANCE
TYPE	CODE	LOW	HIGH	LOW	HIGH	TOTAL	
B1	A,* D,* E,* F,* AA,* AL*		•	2300	2300	4600	0.5
B2	A,* AL*		•	960	3640	4600	0.5
B3	A*†	•		1000	1000	2000	Tube
B4	A*	•		510	510	1020	2.0
C2	A*		•	1000	2650	3650	0.45
C3	A*	•		2075		2075	2.0
C4	A, B‡		•	1000	2650	3650	0.45
C5	A		•	1000	2650	3650	0.45
D1	A,* B,* C, D, E		•	1000	2650	3650	0.45
E1	A,* B,* C, D		•	1000	2650	3650	0.45
F1	A		•	1000	2650	3650	0.45
G1	A, B, C‡		•	1000	2650	5150	0.45
H1	A, B‡		•	1000	2650	3650	0.45
J1	A		•	1000	2650	3650	0.45
L1	A		•	1000	2650	3650	0.45
M1	A†, B‡		•	1000	2650	5150	0.45
M2	A,*† B		•	1000	2650	5150	0.45
N1	A		•	1000	2650	5150	0.45
P1	A, B§		•	500/500	2650	5200	0.45
S1	A		•	1000	2650	3650	0.45
T1	A¶		•			5200	0.45
392	J*	•		500	500	1000	1.0
392	L*		•			2500	0.5
KS-16626	L8, L9, L10, L13, L1,* L2,* L3,* L6*		•			4500	0.45-0.5
KS-16626	L14,† L7*†	•				1100	
KS-8227			•			4660	0.5
KS-8228			•			4660	0.5
KS-8229			•			4660	0.5
592	A*		•			4660	0.5
21A	Indicator, A,* B		•				0.5 Equiv
687	B†		•				

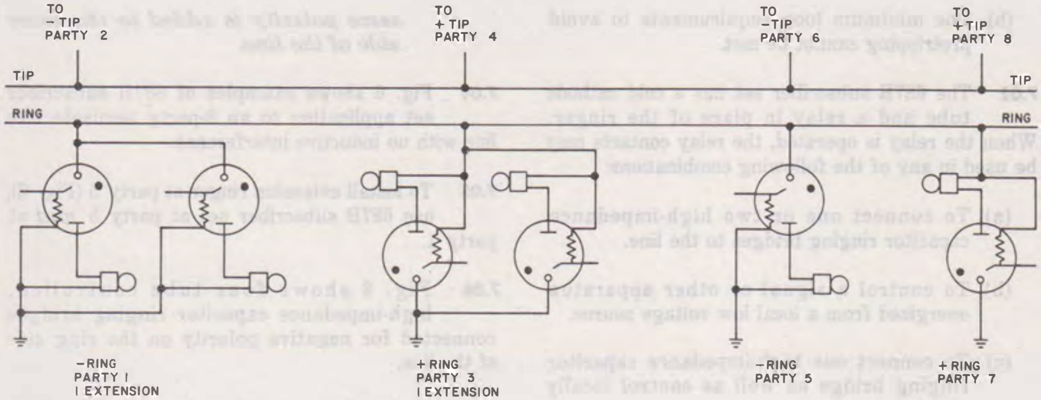
* MD.

† Indicates ringer used with cold-cathode tube.

‡ Coil is not tapped, (S) and (S-R) leads eliminated, total resistance value and impedance same as for A-type.

§ Single coil, (S), (S-R), and (BL) leads eliminated, total resistance value and impedance same as for A-type.

¶ Coil is not tapped.



NOTES:
1. PARTY 1 HAS ONE EXTENSION RINGER = TOTAL OF 3 NEGATIVE BRIDGES ON RING.
2. PARTY 3 HAS ONE EXTENSION RINGER = TOTAL OF 3 POSITIVE BRIDGES ON RING.
3. PARTY 2 OR 6 COULD HAVE ONE EXTENSION RINGER = TOTAL OF 3 NEGATIVE BRIDGES ON TIP.
4. PARTY 4 OR 8 COULD HAVE ONE EXTENSION RINGER = TOTAL OF 3 POSITIVE BRIDGES ON TIP.
= TOTAL OF 12 RINGING BRIDGES ON LINE.

TPA 532099

Fig. 5—Application of Extension Ringers

6.03 Where high-impedance ringers are used on grounded ringing lines to limit inductive noise, it is necessary to limit the unbalance between the two sides of the line.

6.04 Table C lists figures as units of unbalance. These may be applied to ringing bridges to determine balance between two sides of the line.

6.05 Unbalance between two sides of a line shall not exceed three units. (See Table D.)

6.06 Table E outlines ringing bridge limitations for:

(a) 4-party full selective and 8-party semiselective service using tube or diode type ringing bridges.

(b) Divided code ringing service using capacitor ringing bridges.

(c) 4-party semiselective and divided code ringing service using tube ringing bridges to combat inductive noise.

6.07 The 4-element cold cathode electron tubes may be substituted for 3-element tubes where inductive voltages are high enough to break down starter gaps and cause noise (sputtering). See Section 500-112-100 covering inductive noise. The use of 4-element tubes in no way alters the number of ringing bridges permitted.

> ***Note:*** ◆For 3-element tubes, special connections apply for 96-volt dial long line circuits, Fig. 8 and 9. For additional information, refer to Section 500-112-100 on Inductive Noise.◆

6.08 If required, the 687B subscriber set may be used to increase the number of ringing bridges per polarity on each side of the line.

7. APPLICATION OF 687B SUBSCRIBER SET

7.01 The 687B subscriber set may be employed to advantage if:

(a) It is necessary to accommodate a greater total number of ringers than those allowed on first line of A in column 1, Table E.

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(b) The minimum loop requirements to avoid pretripping cannot be met.

7.02 The 687B subscriber set has a cold cathode tube and a relay in place of the ringer. When the relay is operated, the relay contacts may be used in any of the following combinations:

(a) To connect one or two high-impedance capacitor ringing bridges to the line.

(b) To control a signal or other apparatus energized from a local low voltage source.

(c) To connect one high-impedance capacitor ringing bridge as well as control locally energized apparatus.

7.03 For connection of 687B subscriber set, refer to section on subscriber sets, ringers, and relay type polarized ringing.

If a 687B subscriber set is used to connect one or two high impedance capacitor ringing bridges at one station on the line, a like connection is required when another station of the same polarity is added to the same side of the line.

7.04 Fig. 6 shows examples of 687B subscriber set application to an 8-party semiselective line with no inductive interference.

7.05 To install extension ringer at party 5 (Fig. 6), use 687B subscriber set at party 5 *and* at party 1.

7.06 Fig. 6 shows four tube controlled, high-impedance capacitor ringing bridges connected for negative polarity on the ring side of the line.

7.07 To install an extension ringer connected for positive polarity at party 7 (Fig. 6), use 687B subscriber set at both party 7 *and* party 3.

7.08 These arrangements are necessary because the tube and relay of the 687B subscriber sets plus the high-impedance capacitor ringing bridges under their control present a lower impedance to the line than does a single tube type ringing bridge. This lower impedance would deprive the regular tube ringing bridge (of same polarity) of the necessary ringing current for proper operation.

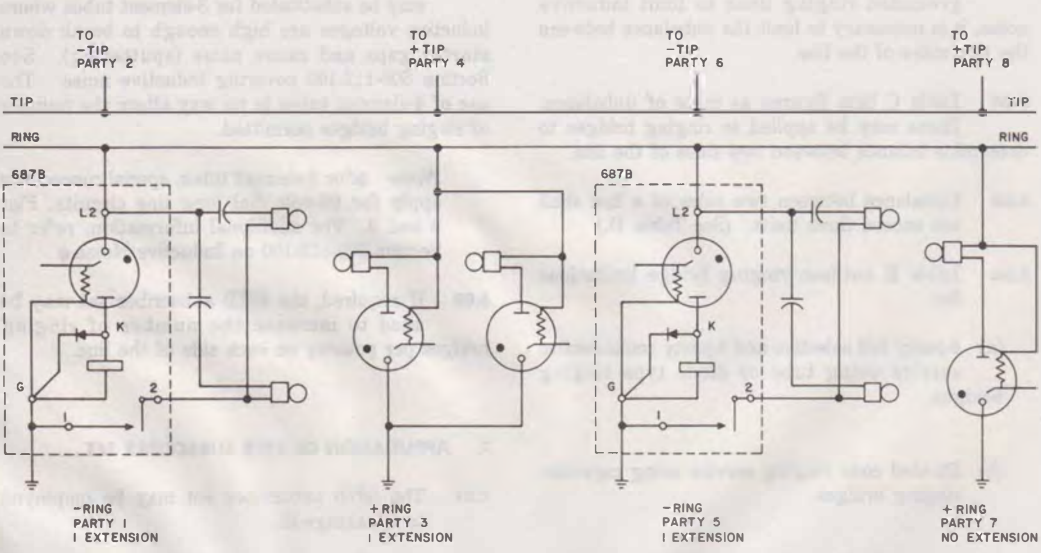

Fig. 6—Application of 687B Subscriber Set

7.09 If capacitor ringing bridges are not used it is not necessary to change other tube ringing bridges of the same polarity on the same side of line when ringers are added.

8. SPECIAL RINGING BRIDGE LIMITATIONS

8.01 For each intercept line, neon lamp, or gong (3-, 4-, or 6-inch) used with other audible or visual line signals, deduct one ringing bridge from the allowable number.

8.02 For each automatic answering set used on individual or 2-party lines, deduct two ringing bridges from the number allowed. For each automatic answering set used on 4-party lines, deduct one ringing bridge from the number allowed.

8.03 Each audible signal (R) relay associated with a 1A or 1A1 KTS is equivalent to two high-impedance ringers. (With a 1A2 KTS it is equal to one.)

8.04 Not more than three high-impedance ringers may be connected in any combination across the line ahead of or behind the line circuit KTU in the 1A1 or 1A2 Key Telephone System.

9. UNIGAUGE

9.01 Unigauge is a design or customer loops using 26-gauge cable for all loops not exceeding 30 kf in length. Loops less than 15 kf (Standard Unigauge) can presently be served by 26-gauge cable. To maintain adequate levels for transmission and signaling, central office circuit additions and modifications are required to handle those loops between 15 and 30 kf (Long Loop Unigauge). The feature of the unigauge range extender can be utilized to serve customer loops between 30 and 52 kf in length (Fig. 7).

9.02 The ringing generator will operate only four bridged ringers on the 15 to 20 kf loops, and only three ringers on the longer loops. Operation of more than three ringers on the longer loops requires that the ringers be connected from the line to ground, and equipped with ringer isolators to limit inductive noise. In the Long Loop Unigauge areas (beyond 15 kf) the ringer biasing spring, generally, will have to be adjusted to its low position when there are three or more ringers.

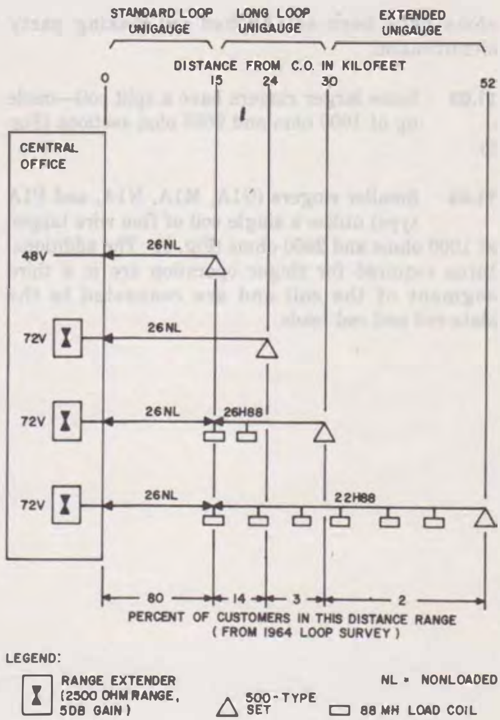

Fig. 7—Unigauge Loop Plant Layout

9.03 In the normal application of unigauge, the ringer adjustments can be made as a part of the new station installation. In areas where existing working lines are transferred to unigauge facilities, station visits will have to be scheduled to make the necessary ringer adjustments.

10. F1A RINGER IN CHIME CONDITION

10.01 The chime feature is obtained by rectifying ac ringing current with an integral halfwave rectifier and applying the dc to the ringer coil. One gong is struck when ringing voltage is applied and the other gong when ringing voltage is removed.

11. PARTY IDENTIFICATION

11.01 Depending upon the central office circuit, dc resistance values of 1000 ohms and 2650

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ohms have been established for making party identification.

11.02 Some larger ringers have a split coil—made up of 1000 ohm and 2650 ohm sections (Fig. 8).

11.03 Smaller ringers (G1A, M1A, N1A, and P1A type) utilize a single coil of fine wire tapped at 1000 ohms and 2650 ohms (Fig. 9). The additional turns required for ringer operation are in a third segment of the coil and are connected to the slate-red and red leads.

11.04 ♦The C4B, H1B, M1B, P1B, and T1A ringers can also be classified as small ringers having a single coil and only two leads. These ringers are not intended for use where tip party identification is required. Refer to the appropriate Reference section in Division 501 for connections when these ringers are required.♦

11.05 Fig. 8 through 13 shows schematic diagrams and connection information for various ringers when adapted to available services.

TABLE B

MAXIMUM NUMBER OF RINGING BRIDGES PERMITTED PER MAIN STATION

CLASS OF SERVICE	TOTAL RINGING BRIDGES								
	HIGH-IMPEDANCE BRIDGES						LOW-IMPEDANCE BRIDGES		
	CAPACITORS								
	0.45 UF		0.5 UF		0.5 TO 0.65 UF		1 UF		2 UF
Individual line, PBX station (except as below); 2-party selective flat and message manual; 2-party selective flat dial (without tip party identification); coin collectors	5	or	4	or	4	and	0		0
	2	or	2	or	2	and	1	or	0
	0		0		0	and	2	or	0
	0		0		0	and	0	or	1
PBX Stations for night and through dial connections when there is an ac bridge in PBX trunk or cord circuit	4	or	3	or	2	and	0		0
	2	or	1	or	1	and	1	or	0
2-party selective flat and message dial and tip party identification. See Note	5	or	4	or	0	and	0		0
	2	or	2	or	0	and	0		0
	0		0		0	and	2		0
4-Party semiselective	3*	or	2	or	2	and	0		0
	0		0		0	and	1	or	0

Note: Tip party identification requirements:

(a) In crossbar automatic message accounting (AMA), zone registration, and/or message rate 2-party service, a 1000-ohm ground from the tip party in dial areas.

(b) In step-by-step automatic ticketing, step-by-step with AMA, and modified crossbar with AMA, a 3640-ohm ground (B-type ringer) or 2650-ohm ground (C-type ringer) from tip party flat rate service.

(c) If high impedance ringers are used in these central office areas, only B2A, C2A, or C4A ringers may be installed. High-impedance ringing bridges other than those mentioned above may be used as extension ringers when they are not required for tip party identification.

* Four-party semiselective service may have one additional ringing bridge at one station on either side of the line when all ringers on the side of the line involved are C type.

TABLE C

UNITS OF UNBALANCE

HIGH-IMPEDANCE RINGING BRIDGES CONTINUALLY CONNECTED TO GROUND	UNITS OF UNBALANCE
Electron tubes used to control signals	0
Indicator — 21A	0
Ringer — plain coil cover	1
Ringer — red stripe coil cover	2
KS-Type ringers	1
592A Ringer — red stripe coil cover	2

TABLE D

EXAMPLE — LINE UNBALANCE

STATIONS ON LINE	TIP SIDE	RING SIDE
First Station	1 C4A ringer equals 1 unit	2 C4A ringers equals 2 units
Second Station	1 C4A ringer equals 1 unit	3 C4A ringers equals 3 units
Total	2 units*	5 units*

* Maximum allowable unbalance is three units.

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TABLE E

RINGING BRIDGE LIMITATIONS FOR 4-PARTY FULL SELECTIVE, MULTIPARTY LINES, AND LINES USING TUBE TYPE RINGING BRIDGES TO COMBAT INDUCTIVE INTERFERENCE

CENTRAL OFFICE RINGING ARRANGEMENT		(1) 4-PARTY FULL SELECTIVE AND 8-PARTY SEMI-SELECTIVE SERVICE (DIODE OR TUBE TYPE RINGING BRIDGES)					(2) DIVIDED CODE RINGING SERVICE (CAPACITOR RINGING BRIDGES)*			(3) 4-PARTY SEMI-SELECTIVE AND DIVIDED CODE RINGING SERVICE (TUBE RINGING BRIDGES USED TO COMBAT INDUCTIVE INTERFERENCE, AC-DC RINGING)		
		MAXIMUM NUMBER OF RINGING BRIDGES				TOTAL ON LINE	MAXIMUM NUMBER OF RINGING BRIDGES		TOTAL ON LINE	MAXIMUM NUMBER OF RINGING BRIDGES		TOTAL ON LINE
		RING		TIP			RING	TIP		RING	TIP	
		+	−	+	−							
A	Ringing current through trip relay	3 4	3 4	3 4	3 4	12†‡ 16§	5	5	10			
B	Ringing current through a 220-ohm resistor, trip relay in ground return side	4	4	4	4	16	5	5	10	6	6	12
C	Ringing current through a 13D lamp, trip relay in ground return side	6	6	6	6	24	5	5	10	6	6	12
D	Long line circuit arranged to repeat ringing through a 13G lamp, tripping during silent interval only¶	6	6	6	6	24						
E	Manual ringing through 13D lamps or lower resistance	6	6	6	6	24	10	10	20	6	6	12

* C-type ringers are required on dial lines to meet maximum nominal value capacity limits.

† 300-ohm minimum loop resistance is required to prevent pretrip if more than two ringing bridges per polarity are used on the same side of the line.

‡ Three tubes of each polarity on each side of the line is the maximum unless auxiliary circuits or equipment are employed.

§ The use of 687B subscriber sets makes possible the use of four tube-controlled capacitor ringing bridges for each polarity on each side of the line. Not more than two 687B subscriber sets per polarity may be used on each side of the line.

¶ This long line equipment does not provide for additional ringing bridges in all cases, but does appreciably increase the ranges at which the same number of ringing bridges will operate.

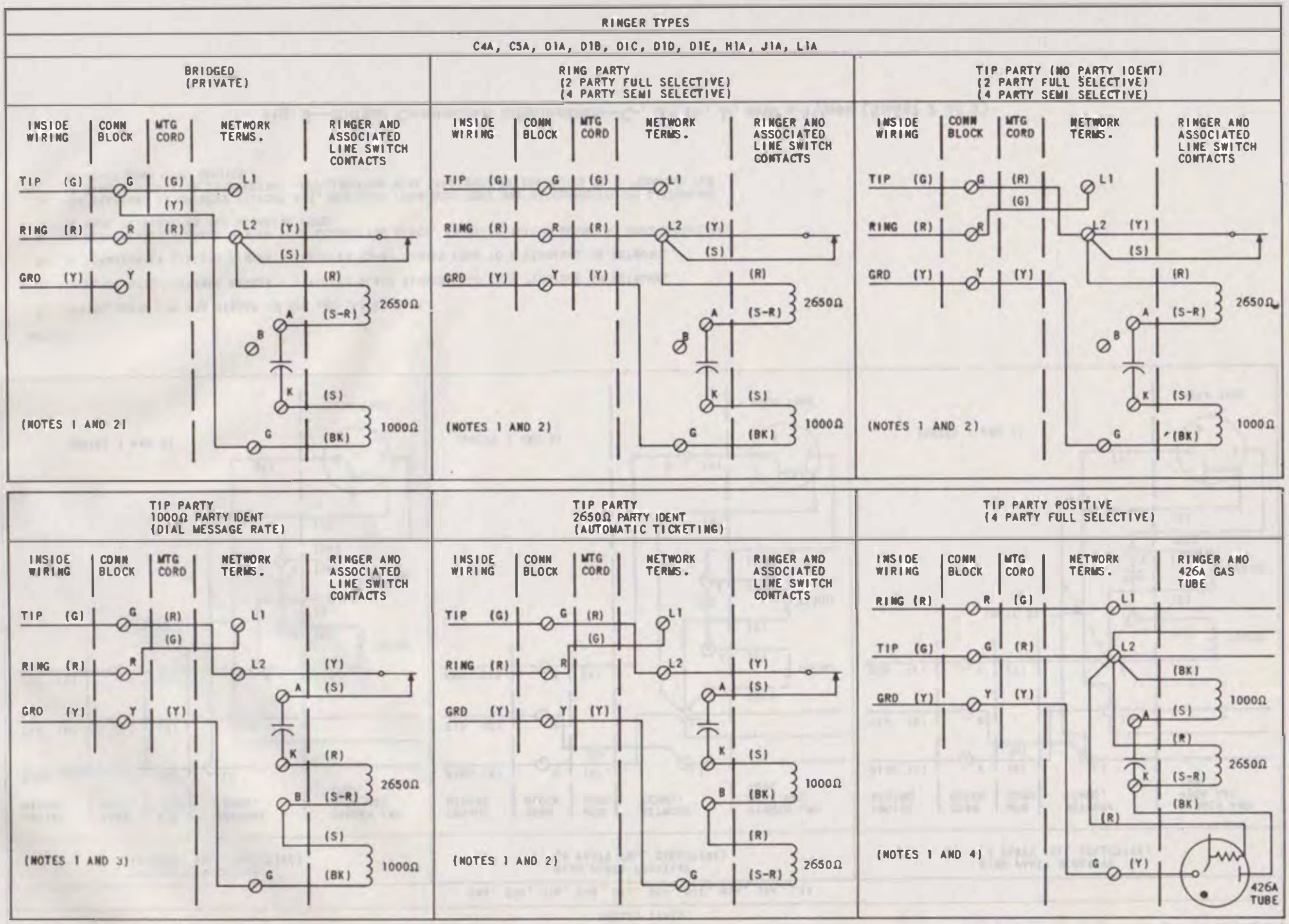
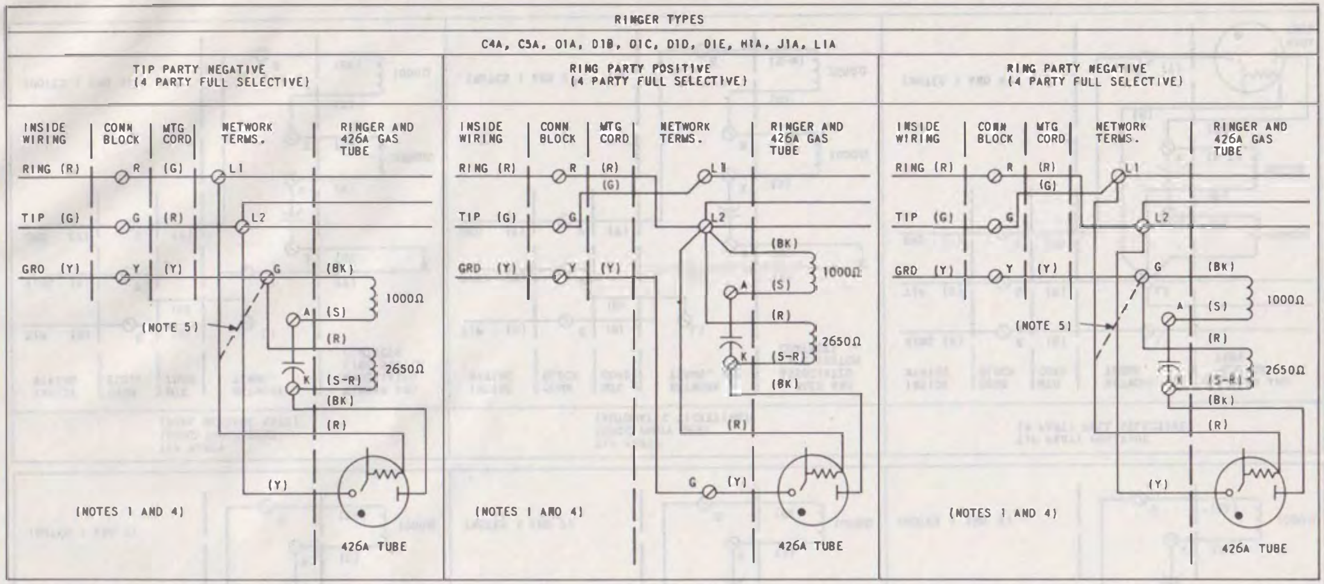


Fig. 8—Ringer Connection Information—C-, D-, H-, J-, and L-Types (Sheet 1 of 2)



NOTES:

1. WIRING SHOWN FOR C4A RINGER IN 500 AND 501 TEL SET.
2. TO PERMANENTLY SILENCE RINGER - TRANSFER BLACK RINGER LEAD TO K TERMINAL ON NETWORK.
3. TO PERMANENTLY SILENCE RINGER - TRANSFER (S-R) RINGER LEAD TO K TERMINAL ON NETWORK.
4. TO PERMANENTLY SILENCE RINGER - AT CONNECTING BLOCK, TRANSFER YELLOW MOUNTING CORD CONDUCTOR TO SAME TERMINAL AS RED MOUNTING CORD.
5. FOR STATIONS IN OFFICES WITHOUT ANI, RED LEAD FROM 426A TUBE MAY BE CONNECTED TO G TERMINAL IF RINGER OPERATION IS MARGINAL. RED LEAD FROM 426A TUBE MUST BE CONNECTED TO G TERMINAL FOR 96 VOLTS LONG LINE SERVICE.

Fig. 8—Ringer Connection Information—C-, D-, H-, J-, and L-Types (Sheet 2 of 2)

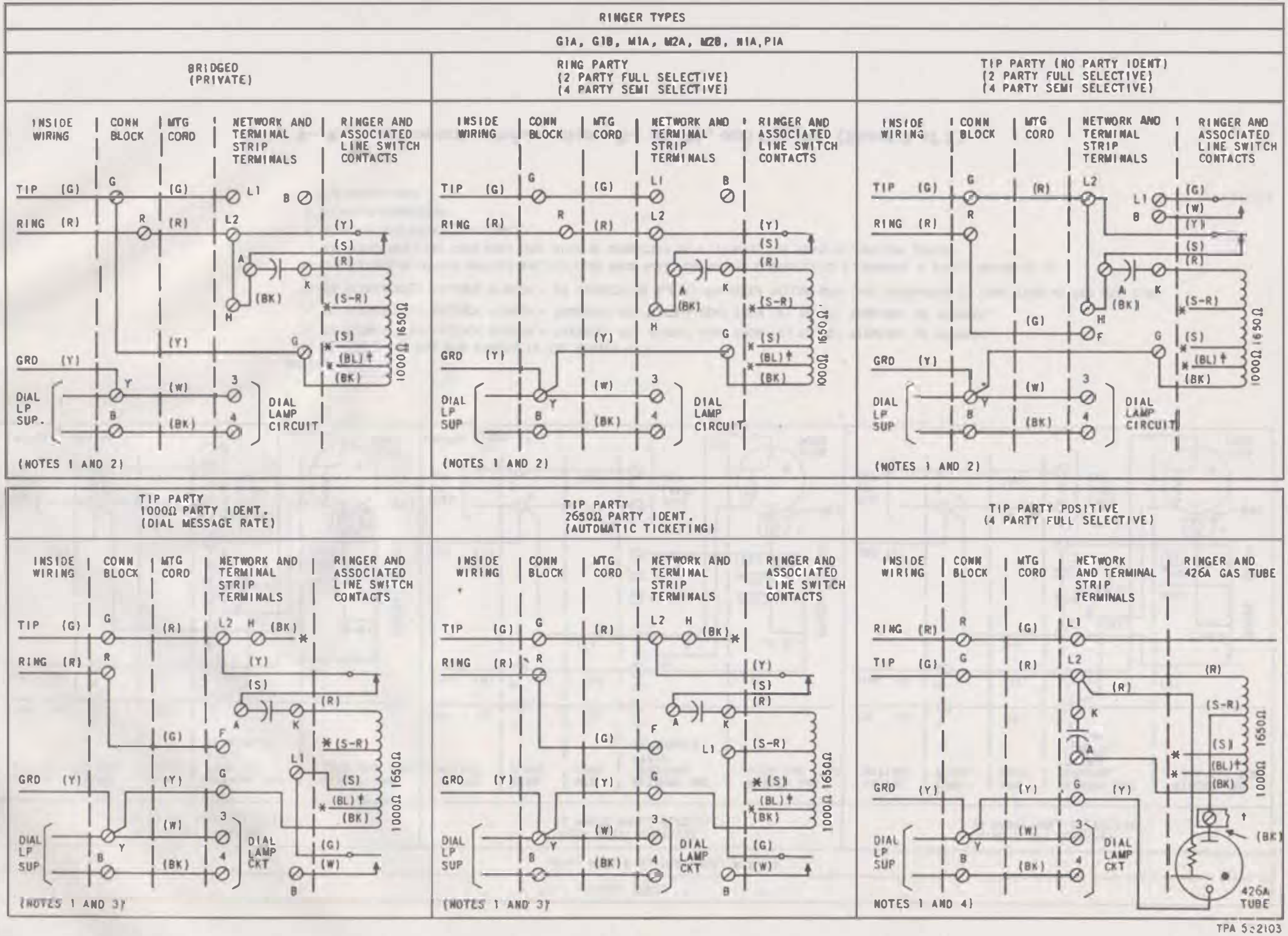
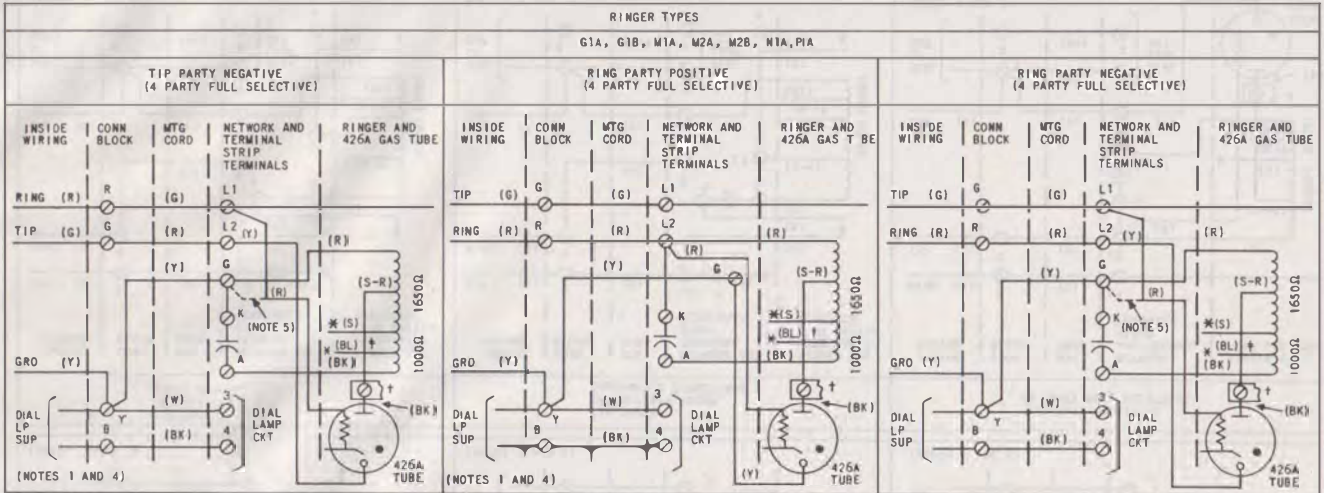


Fig. 9—Ringer Connection Information—G-, M-, N-, and P-Types (Sheet 1 of 2)



NOTES:

1. WIRING SHOWN FOR M1A RINGER IN 702 SERIES SET.
2. TO PERMANENTLY SILENCE RINGER - TRANSFER RED RINGER LEAD FROM (K) TO (G) TERMINAL ON NETWORK.
3. TO PERMANENTLY SILENCE RINGER - TRANSFER RED RINGER LEAD FROM (K) TO (B) TERMINAL ON NETWORK.
4. TO PERMANENTLY SILENCE RINGER - AT CONNECTING BLOCK, TRANSFER YELLOW MTG CORD CONDUCTOR TO SAME TERM. AS RED MTG CORD.
5. FOR STATIONS IN OFFICES WITHOUT ANI, RED LEAD FROM 426A TUBE MAY BE CONNECTED TO G TERMINAL IF RINGER OPERATION IS MARGINAL. RED LEAD FROM 426A TUBE MUST BE CONNECTED TO G TERMINAL FOR 96 VOLTS LONG LINE SERVICE.

* INSULATE AND STORE INDIVIDUALLY.

† D-161488 CONNECTOR.

‡ P1A RINGER ONLY

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Fig. 9—Ringer Connection Information—G-, M-, N-, and P-Types (Sheet 2 of 2)

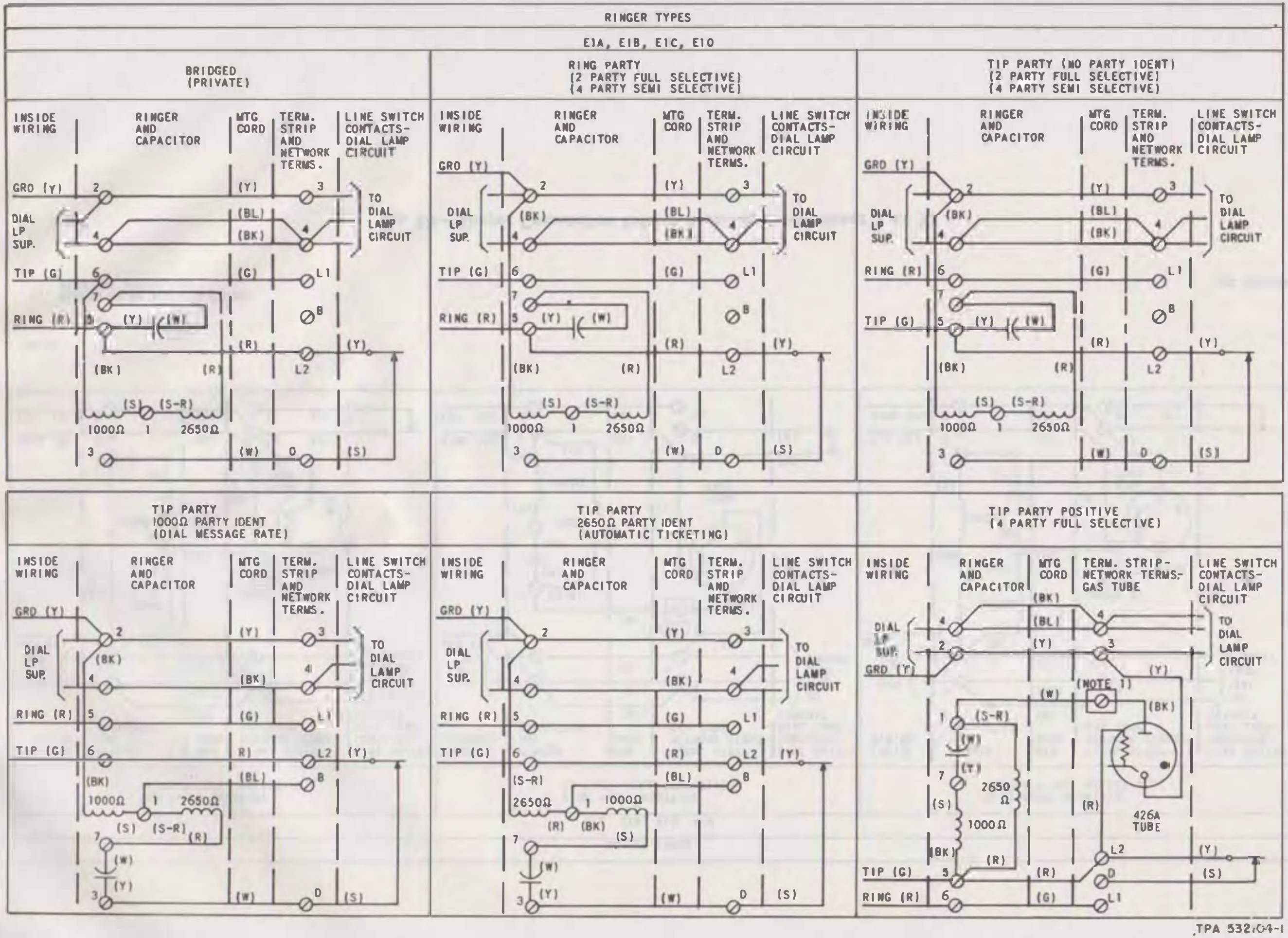
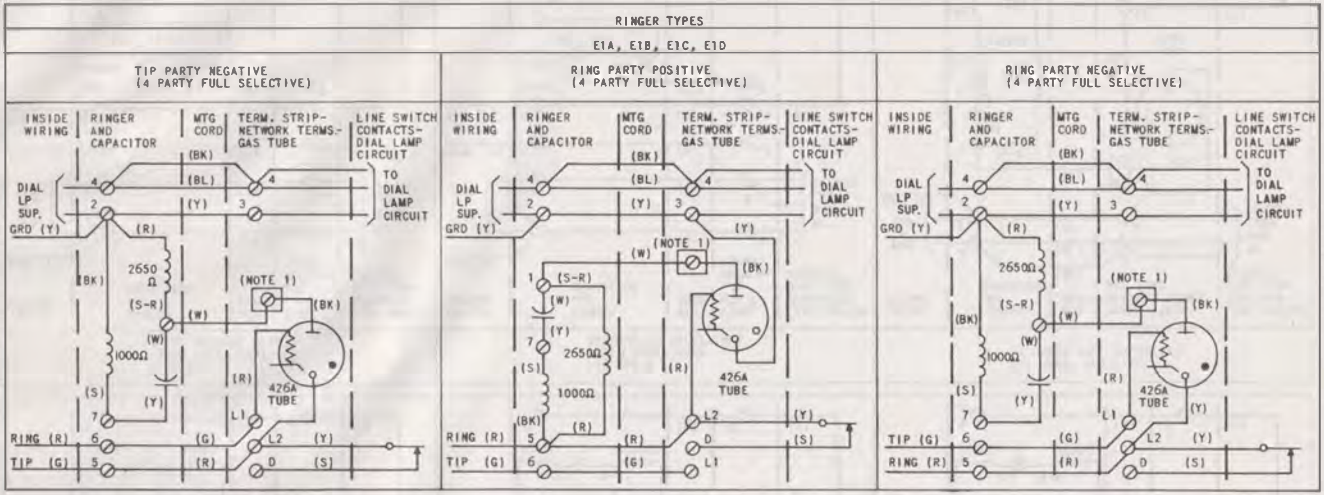


Fig. 10—Ringer Connection Information—E-Type (Sheet 1 of 2)



NOTES:

1. D-161488 CONNECTOR
2. WIRING SHOWN FOR E1A RINGER WITH 701 SERIES SET

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Fig. 10—Ringer Connection Information—E-Type (Sheet 2 of 2)

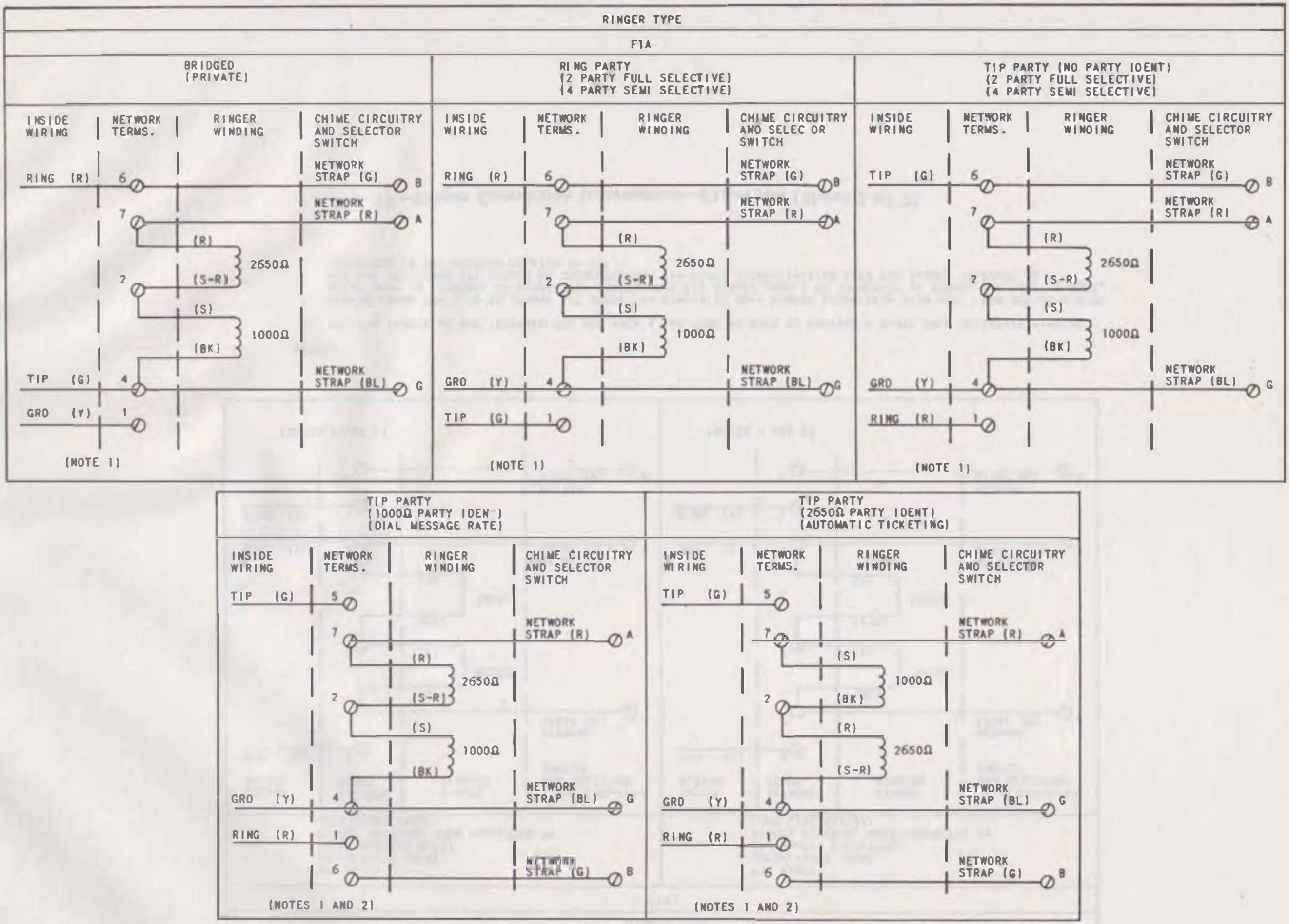
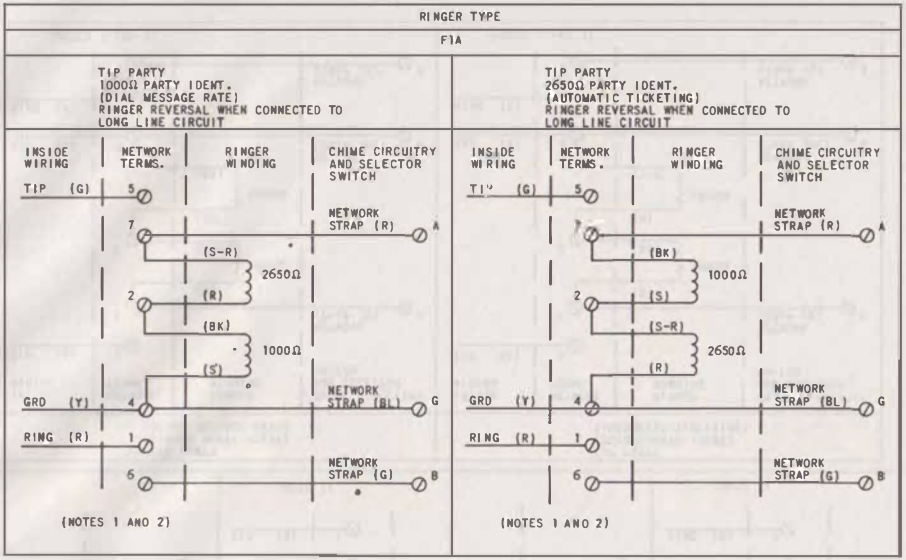


Fig. 11—Ringer Connection Information—F1A-Type (Sheet 1 of 2)



NOTES:

1. THE F1A RINGER IS NOT INTENDED FOR USE WHEN A GAS TUBE IS USED TO PROVIDE 4 PARTY FULL SELECTIVE RINGING.

2. WIRING SHOWN FOR 703B TELEPHONE SET WHERE F1A RINGER IS ONLY RINGER ASSOCIATED WITH SET. FOR USE WITH SETS WHICH HAVE AN INTEGRAL OR ASSOCIATED RINGER, THE F1A RINGER SHOULD BE CONNECTED AS NORMAL TIP PARTY RINGER, AND THE TELEPHONE SET SHOULD BE CONNECTED FOR TIP PARTY IDENTIFICATION WITH THE RINGER SILENCED AS DESCRIBED IN THE SECTION RELATED TO SET.

Fig. 11—Ringer Connection Information—F1A-Type (Sheet 2 of 2)

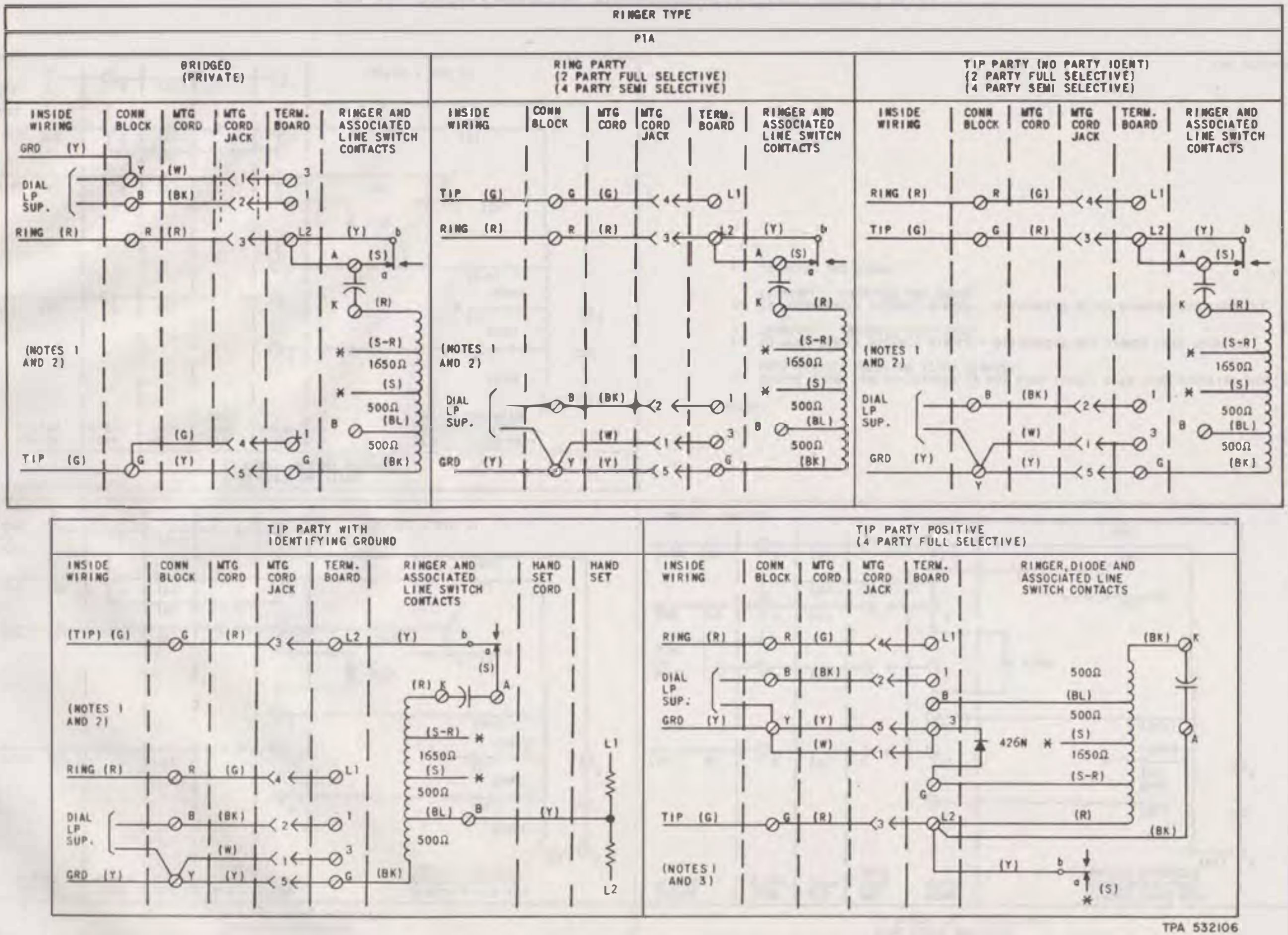
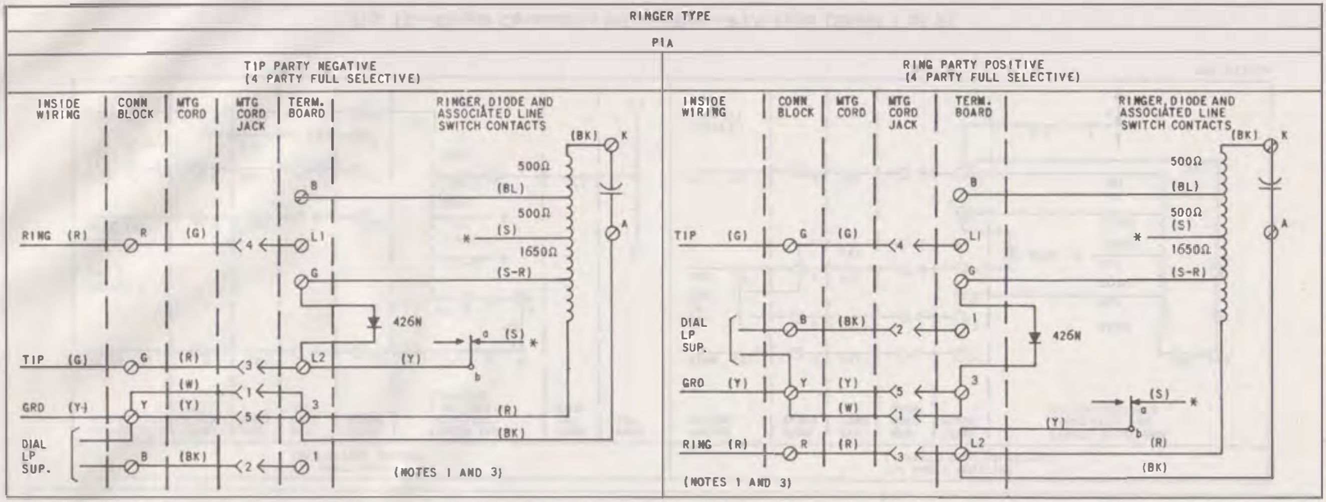
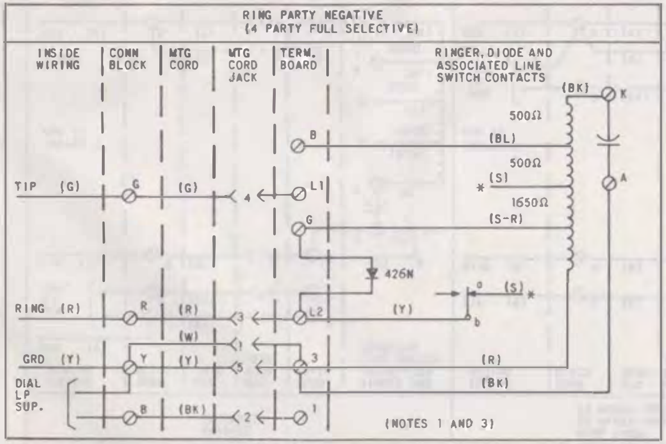


Fig. 12—Ringer Connection Information—P1A-Type (Sheet 1 of 2)





NOTES:

1. WIRING SHOWN FOR P1A RINGER IN AD1 BASE (DESK) WITH D5AL MOUNTING CORD, H5AA HANDSET CORD AND 1220A HANDSET.

2. TO PERMANENTLY SILENCE RINGER - DISCONNECT RED RINGER LEAD FROM (K) TERMINAL. INSULATE AND STORE.

3. TO PERMANENTLY SILENCE RINGER - DISCONNECT BLACK RINGER LEAD FROM (K) TERMINAL. INSULATE AND STORE.

* INSULATE AND STORE.

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Fig. 12—Ringer Connection Information—P1A-Type (Sheet 2 of 2)

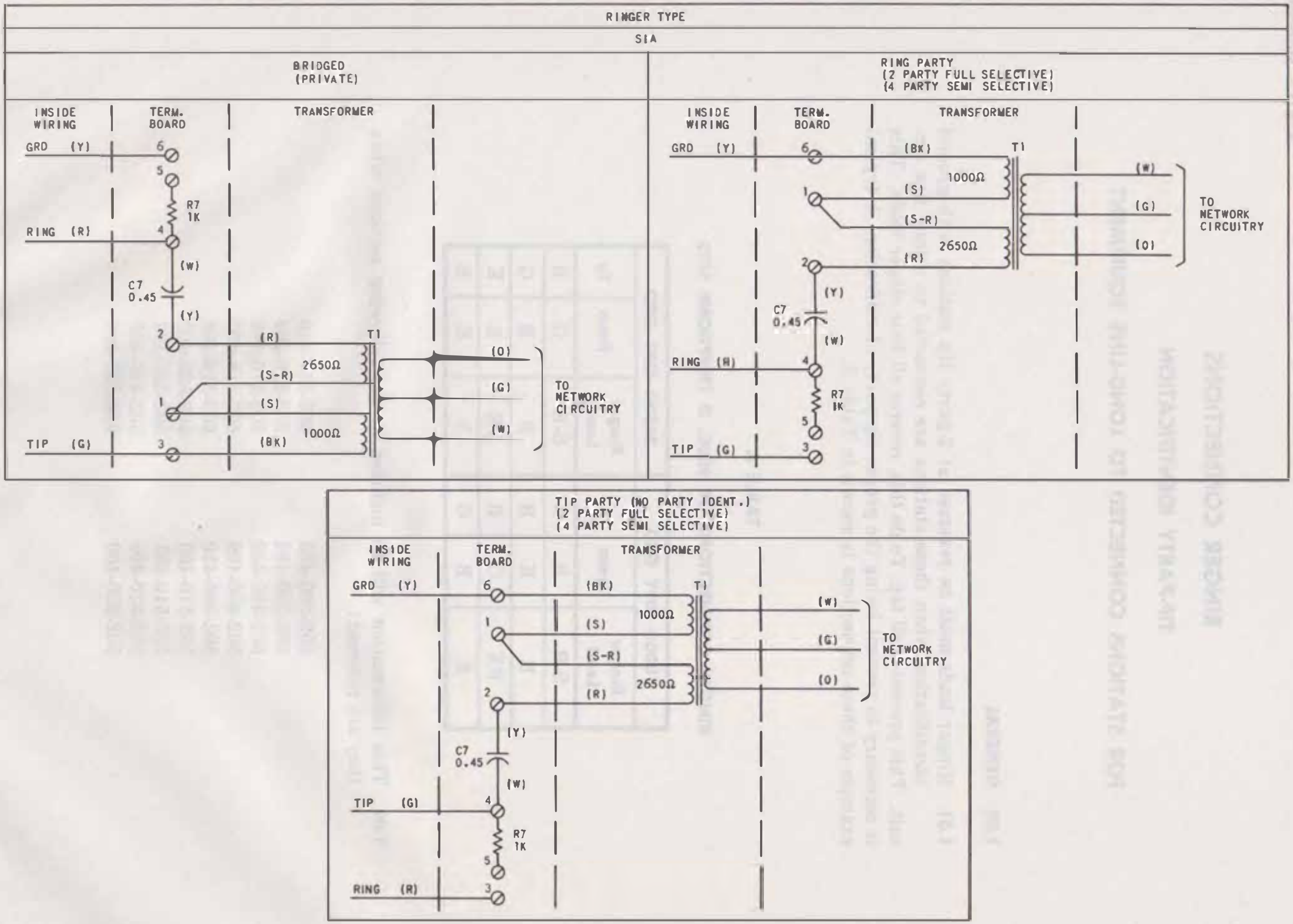

Fig. 13—Ringer Connection Information—S1A-Type