

RINGING BRIDGE LIMITATIONS

1. GENERAL

1.01 This section covers maximum number and types of ringing bridges which may be employed for various service arrangements.

1.02 This section is reissued to add:

- ANI (Automatic Number Identification).
- New ringers.
- F1A ringer—chime condition.
- G-, M-, and N-type ringers.
- Additional information affecting ringing bridges.

1.03 General information defining types of service and types of ringing bridges is included.

1.04 Ringing bridge limitations for special services are subject to SD drawings and section covering specific equipment involved.

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 uf (microfarads).

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

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.

3.03 Two-party full selective ringing (Fig. 2) is accomplished by connecting a ringer, in series with a capacitor, from each side of the line to ground.

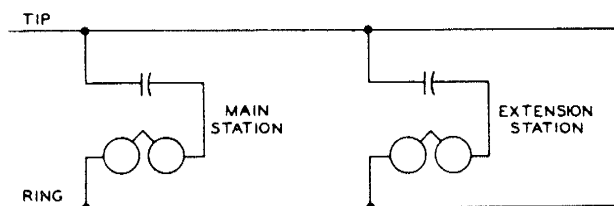


Fig. 1 — Individual Lines — Bridged Ringing

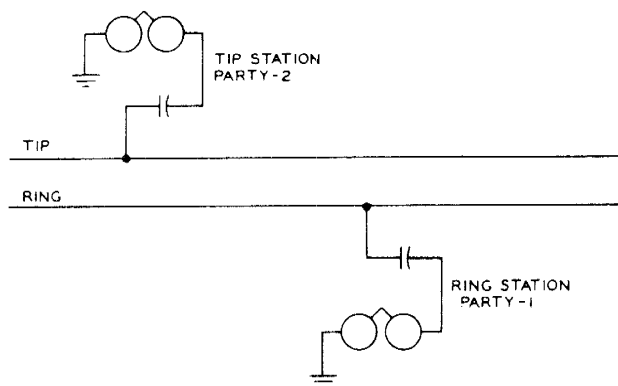


Fig. 2 — Two-Party Full Selective Grounded Ringing

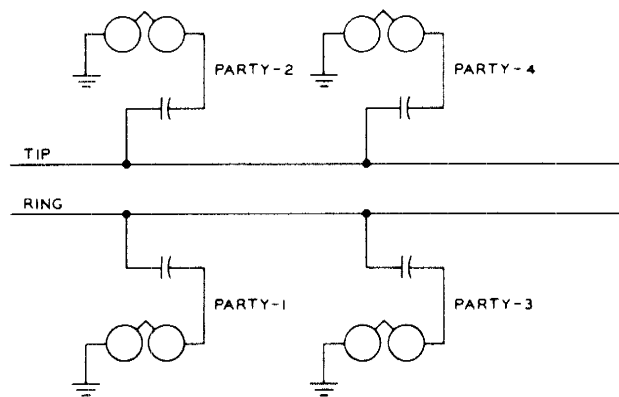


Fig. 3 — Four-Party Semiselective Grounded Ringing

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

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 in the ringing circuit.

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

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

5. MAGNETO RINGING

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

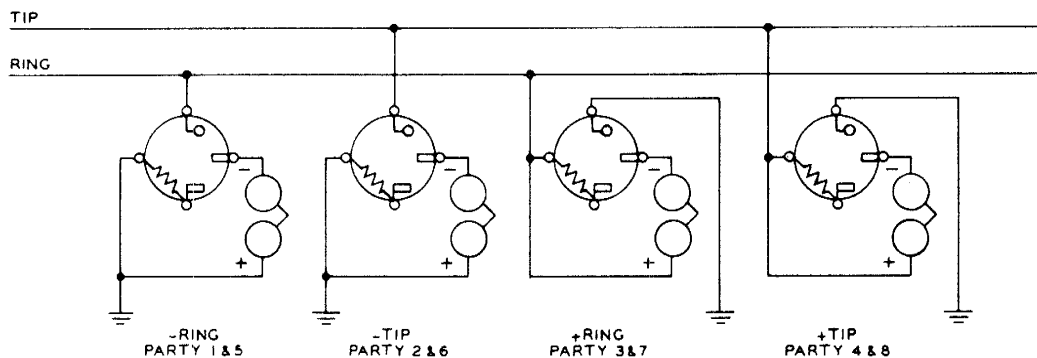


Fig. 4 — Four-Party Full Selective and Eight-Party Semiselective Tube Type Ringing Bridges

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 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.

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 The following information covers maximum number of ringing bridges which may be employed for various central office arrangements providing the following services:

- 4-party full selective.
- 8-party semiselective.

- Divided code.

- 4-party semiselective lines using tube type ringing bridges to combat inductive interference.

6.07 Table E outlines ringing bridge limitations for:

- (a) 4-party full selective and 8-party semiselective service using tube 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.

6.08 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 covering inductive noise. The use of 4-element tubes in no way alters the number of ringing bridges permitted.

6.09 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.
- (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 a ringer. When the relay is operated, the signal 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.



There is one important restriction on the use of this subscriber set. When such a set is used at a given station to connect one or two high-impedance capacitor ringing bridges to the line, a similar set must be used at any other station of the same polarity on same side of the line.

7.04 Fig. 5 and 6 show examples of 687B subscriber set application to an 8-party semi-selective line with no inductive interference.

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

7.06 The condition illustrated in Fig. 6 gives four negative, tube controlled, high-impedance capacitor ringing bridges on the ring side of the line.

7.07 To install an extension at positive 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 presents a lower impedance to the line than does a single tube type ringing bridge. This deprives the regular tube ringing bridge of same polarity of necessary ringing current for proper operation.

7.09 Where no capacitor ringing bridges are involved, it is not necessary to change other tube ringing bridges of the same polarity on the same side of line when signals are added.

8. SPECIAL RINGING BRIDGE LIMITATIONS

8.01 Deduct one ringing bridge from the allowable number for each of the following associated with other audible or visual signal:

- Intercept line.
- Peatrophone.
- 3-, 4-, and 6-inch gongs.
- Neon lamp.
- Control equipment.

8.02 Deduct two ringing bridges on individual or 2-party lines, and one ringing bridge on 4-party lines from allowable number for each:

- Automatic answering and recording set.
- Automatic answering set.

8.03 Each audible signal (R) relay associated with a wiring plan (1A, 1A1, 1A2) is equivalent to two high-impedance ringers.

8.04 Not more than two high-impedance ringers may be connected to a wiring plan line circuit.

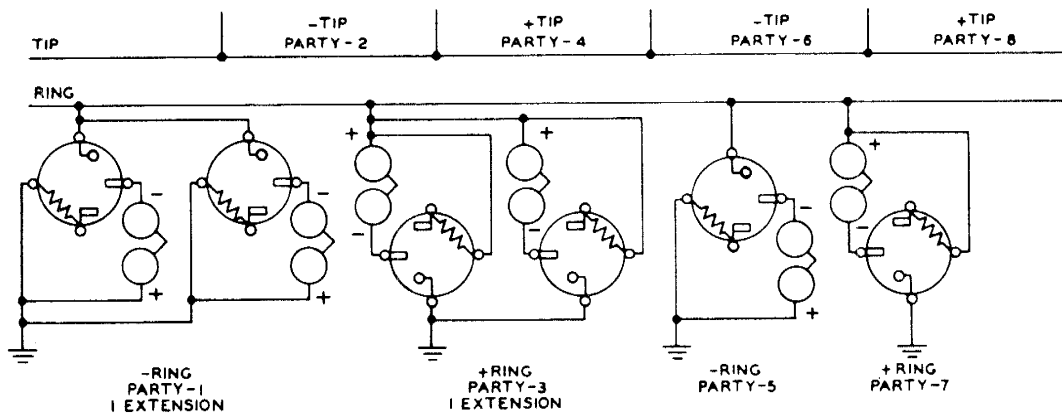
9. F1A RINGER IN CHIME CONDITION

9.01 The chime feature is obtained by rectifying ac ringing current with an integral half-wave rectifier and applying the dc to the ringer coil. One gong is struck as ringing voltage is applied and the other gong as ringing voltage is removed.

10. AUTOMATIC NUMBER IDENTIFICATION

10.01 The dc resistance required for party identification has been established at 1000 and 2650 ohms.

10.02 Where space permits, a split coil of 1000-ohm and 2650-ohm segments is used. This type ringer provides a mechanical advantage in connecting the ringer in the telephone set.



Note: Party 1 has one extension ringer = Total of 3 negative bridges on ring.
 Party 3 has one extension ringer = Total of 3 positive bridges on ring.
 Party 2 or 6 could have one extension ringer = Total of 3 negative bridges on tip.
 Party 4 or 8 could have one extension ringer = Total of 3 positive bridges on tip.
 = Total of 12 ringing bridges on line.

Fig. 5 — Application of Extension Ringers

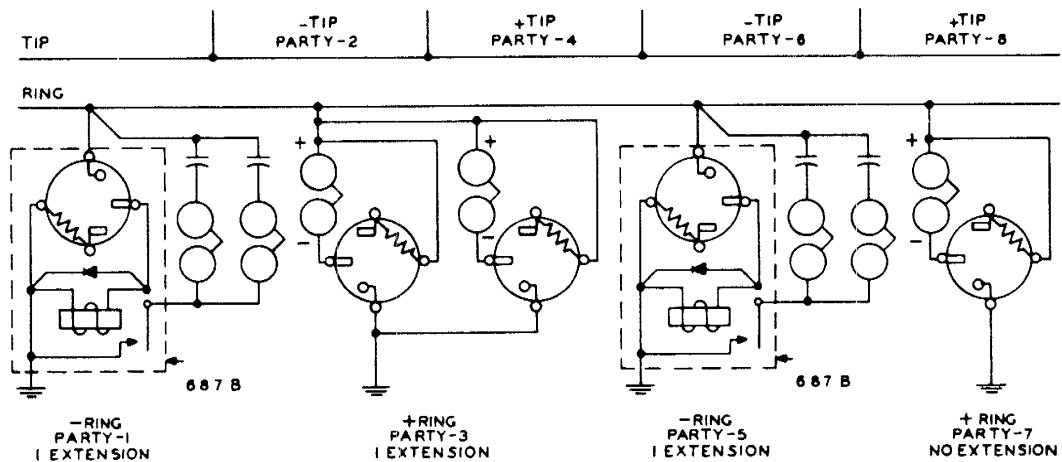


Fig. 6 — Application of 687B Subscriber Set

10.03 Smaller ringers (G, M, and N types) utilize a single coil of fine wire tapped out at 1000 ohms and 2650 ohms. The additional turns required for ringer operation appear in a third segment of the coil between the slate-red and red leads.

10.04 Fig. 7 shows schematic diagrams and connection information for various ringers as adapted to available services.

TABLE A — RINGING BRIDGE COMPONENTS

Ringers		Impedance		DC Coil Resistance			Microfarads Capacitance
Type	Code	Low	High	Low	High	Total	
B1	A,* D, E,* F, AA,* AB, 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		•	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		•	1000	2650	3650	0.45
H1	A		•	1000	2650	3650	0.45
J1	A		•	1000	2650	3650	0.45
L1	A		•	1000	2650	3650	0.45
M1	A†		•	1000	2650	3650	0.45
M2	A†		•	1000	2650	3650	0.45
N1	A		•	1000	2650	3650	0.45
P-	(Trimline Sets)‡		•	1000	2650	3650	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*		•			4600	0.5
21A	Indicator		•				0.5 Equiv
687	B†		•				

* Rated Manufacture Discontinued (MD).

† Indicates ringer used with cold cathode tube.

‡ Ringer is used in Trimline sets (have an F- number at present).

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	4	4	0	0
	2	2	2	1	0
	0	0	0	2	0
	0	0	0	0	1
PBX Stations for Night and through Dial Connections when there is an AC Bridge in PBX Trunk or Cord Circuit	4	3	2	0	0
	2	1	1	1	0
2-party Selective Flat and Message Dial and Tip Party Identification. See Note	5	4	0	0	0
	2	2	0	0	0
	0	0	0	2	0
4-party Semiselective	3*	2	2	0	0
	0	0	0	1	0

Note: Tip party identification requirements:

- In crossbar automatic message accounting, zone registration, and/or message rate 2-party service, a 1000-ohm ground from the tip party in dial areas.
- 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.
- 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	2 C4A Ringers
	= 1 Unit	= 2 Units
Second Station	1 C4A Ringer	3 C4A Ringers
	= 1 Unit	= 3 Units
Total	2 Units*	5 Units*

* 3 units — Maximum Allowable Unbalance.

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 (Tube type Ringing Bridges)					(2) Divided Code Ringing Service (Capacitor Ring- ing Bridges)*			(3) 4-party Semi- selective and Divided Code Ringing Service (Tube Ringing Bridges Used to Combat Induc- tive 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	3	3	3	12†‡	5	5	10			
		4	4	4	4	16**						
B	Ringing Current through a 220-ohm Resistor, Trip Re- lay 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 Dur- ing 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.

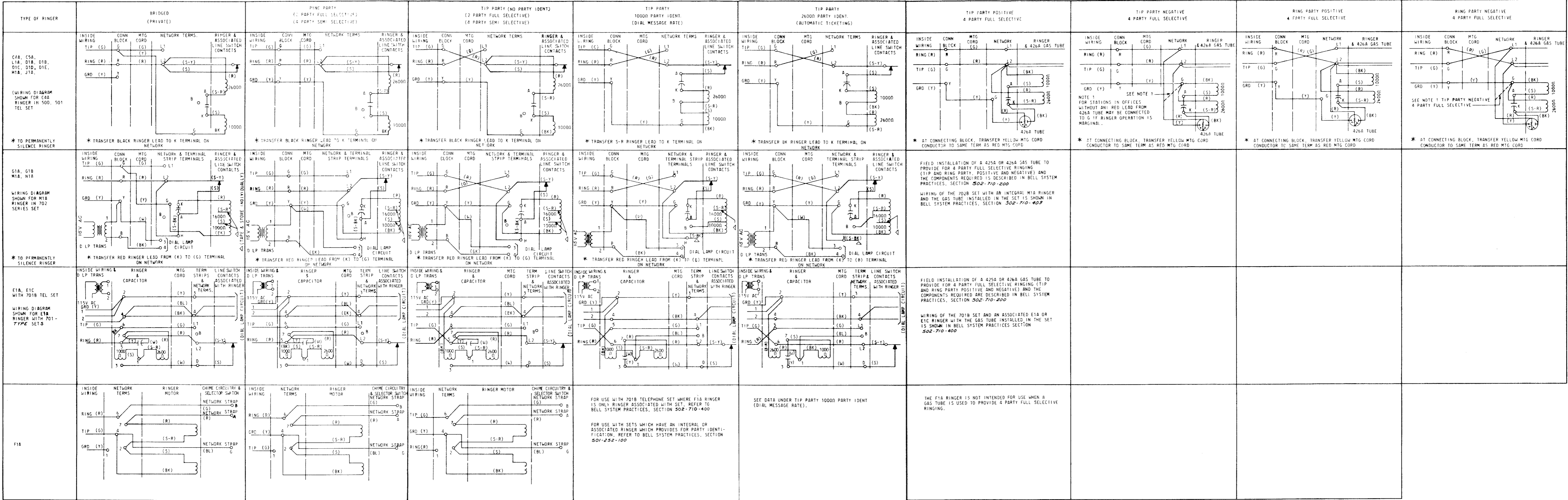


Fig. 7 — Ringer Connection Information