

RADIO SIGNAL SUPPRESSION FOR TELEPHONE SETS IDENTIFICATION, INSTALLATION, AND MAINTENANCE

1. GENERAL

1.01 This practice contains information on the reduction of Radio Frequency Interference (RFI), also referred to as Electromagnetic Interference (EMI), in telephone sets.

1.02 The reasons for reissuing this practice are listed below. Revision arrows are used to emphasize the more significant changes.

- Provide information on the Z100A filter, Fig. 8.
- Provide information on a new design for the 40BA capacitor.

1.03 The RFI frequency occurs where a radio station transmitter or citizens band (CB) radio equipment is located near telephone facilities. Generally the radio signal is picked up by the wire, which acts as an antenna, or the signal is radiated directly into the telephone set, and demodulated (changed to audio frequency) by nonlinear components, such as varistors, transistors, and diodes in the telephone set. ***However, demodulation can also result from other sources. Refer to paragraph 1.04.***

1.04 Before ordering a telephone set modified for radio signal suppression, check for the following and correct as needed:

- Corroded connections (inside and outside plant)
- Loose wire terminations (including set wiring)
- Abandoned drop wire still connected to line
- Inside wire connected but not used

- Foreign attachments.

Installing a modified telephone set on the customers premises will not be effective if demodulation is caused by any of the above conditions.

1.05 Telephone set components that may act as demodulators are:

- Transistors in amplifiers of some networks and handsets
- Varistors and transistors in touch-tone telephone dials
- Diodes in polarity guards
- Light emitting diodes in TRIMLINE® telephone sets
- Click suppression varistors across receiver units
- Carbon transmitters
- Speech equalization varistors in networks.

1.06 With the introduction of the 4228D and 4228J networks, the cause of radio signal demodulation in networks other than those in the TRIMLINE telephone sets has effectively been minimized. In these networks the speech equalization varistors have been replaced by resistors and a strapping option which provides speech (transmission) equalization for various loop lengths.

1.07 All telephone sets, including TRIMLINE telephone sets but excluding coin, (refer to paragraph 1.08) will be available from the local distributing house or service center modified for radio signal suppression. Modification will include changing to new network, where applicable, and plac-

ing bypass capacitors across all other components that may act as demodulators as listed in paragraph 1.05.



Before ordering a modified telephone set make sure that demodulation is not occurring external to the telephone set (see paragraph 1.04).

1.08 Single slot coin telephones are not modified at the service center, and where RFI is a problem, it is recommended that a 40BA capacitor be added at the protector and/or a 1542A manufacture discontinued (MD) or 1542AM inductor be substituted in place of the connecting block.

1.09 Where demodulation is attributed to components in a telephone set, or associated voice coupler, in addition to changing to a modified set it is recommended that a 40BA capacitor be placed at the protector and a 1542A (MD) or 1542AM inductor be substituted in place of the connecting block. Refer to section in Division 463 for voice coupler modifications. The capacitor will bypass, to ground, radio signals picked up by the drop wire while the inductor will tend to attenuate radio signals picked up by the inside wire. These capacitors and inductors are ineffective above 10 megahertz (mHz) and thus will not eliminate interference from citizens band and certain short wave radios.

1.10 Where an adjacent (touch-tone telephone) dial forms a part of the customers equipment and

a modified telephone set is installed for RFI reasons, the adjunct dial should also be replaced by one modified for RFI.

1.11 The (MD) telephone sets will not be modified for radio suppression. Where a telephone set rated (MD) is encountered, it should be replaced by an equivalent modular set in the current series, modified for radio suppression.

1.12 Arrange trouble visit during operation of the radio station in order that the effectiveness of corrective measures taken may be evaluated immediately.

1.13 A customer installable filter which may be placed in series with desk-type sets is now available and known as the Z100A filter.

2. IDENTIFICATION

A. Suppression Devices

2.01 Networks, 425J (MD) (Fig. 1), 4010E (MD) (Fig. 2), 4228D (Fig. 3), and 4228J (Fig. 4) have strapping options for loop equalization. These networks can be used on rotary or touch-tone dial applications. The 4228J network has leads terminated on a connector. Refer to Section 501-135-100 for additional information on networks.

2.02 The 1542A (MD) inductor (Fig. 5) is used with nonmodular telephone sets. It attenuates RF

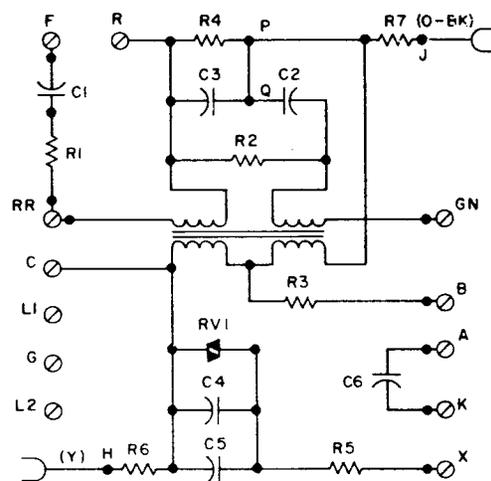
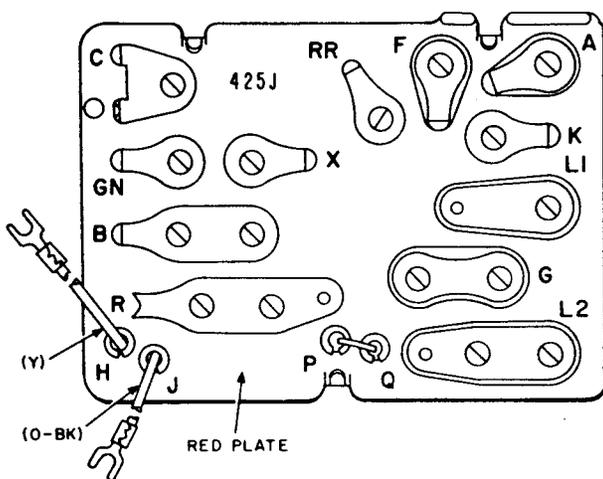


Fig. 1—425J (MD) Network, Terminal Layout, and Schematic

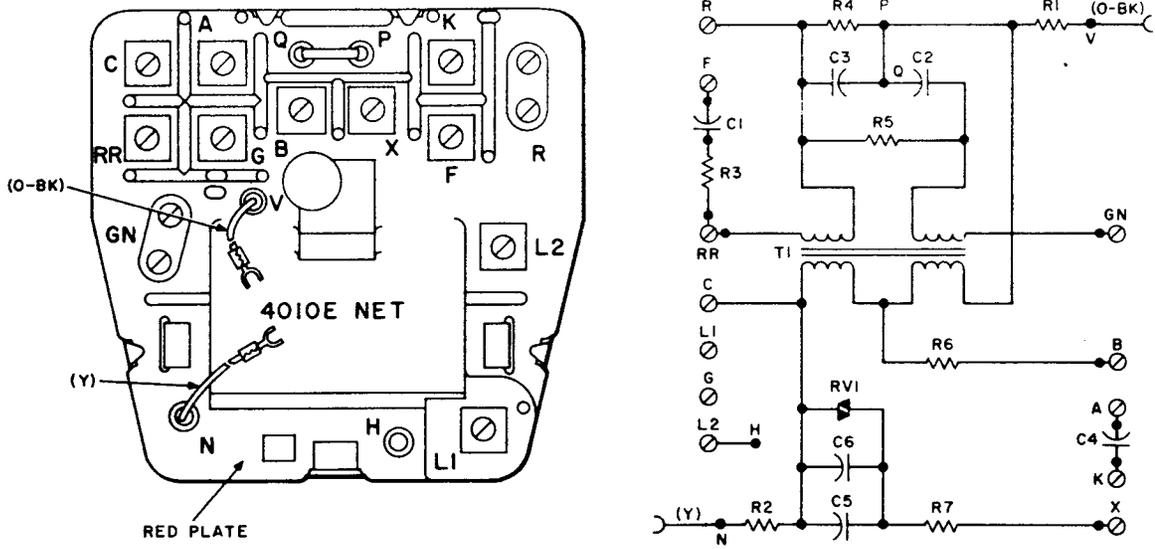


Fig. 2—4010E (MD) Network, Terminal Layout, and Schematic

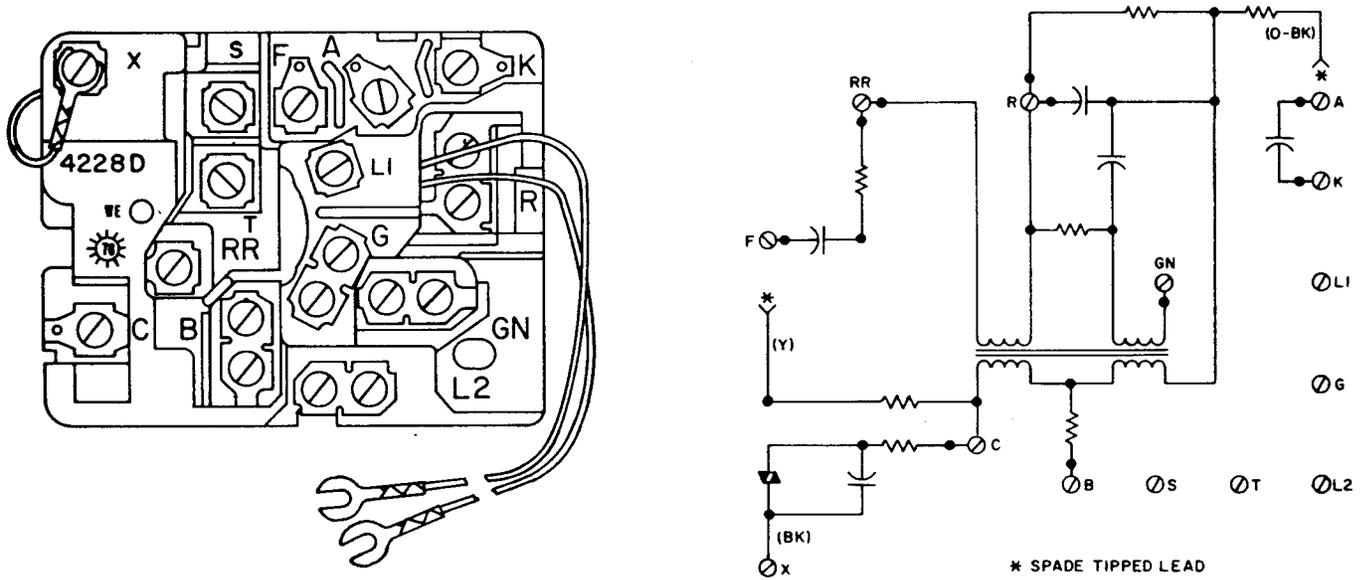


Fig. 3—Network, Terminal Layout, and Schematic

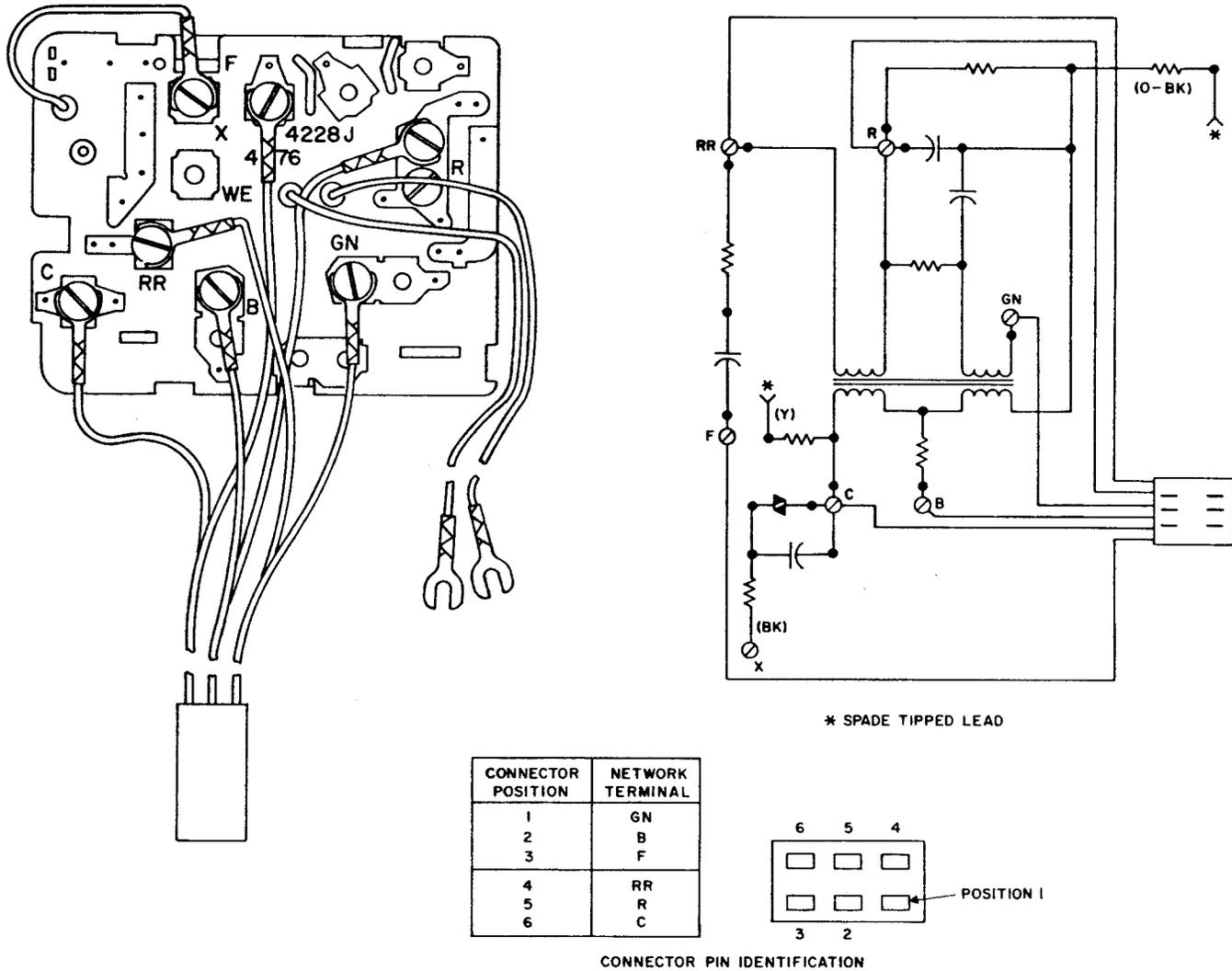


Fig. 4—4228J Network, Terminal Layout, and Schematic

line current for signals under 10 mHz. It can be substituted for the 42A connecting block. A removable link between terminals B and Y must be removed when used as connecting block for telephone sets with dial lamps or with 30A voice coupler.

Note: A 157A cover assembly may be ordered separately to convert existing nonmodular 1542A (MD) inductors to modular. The 157A cover assembly consists of a plastic cover assembly (Fig. 6) and a 652A4 jack.

2.03 The 1542AM inductor (Fig. 6) is used with modular telephone sets. It attenuates RF line current for signals under 10 mHz. It can be substituted

for 625-type connecting block. The 1542AM is equipped with a 157A cover assembly which includes a 652A4 (modular) jack. The jack mates with a modular D4BU mounting cord (ordered separately). A removable link between terminals B and Y must be removed when used as connecting block for telephone sets with dial lamps or with 30A voice coupler.

2.04 The 40BA capacitor (Fig. 7) is located at the protector to bypass RF signals under 10 mHz to ground.

Note: The early model 40BA capacitor had its backboard reduced to 5 inches wide by 5-3/4 inches long to allow it to be used in the D Cus-

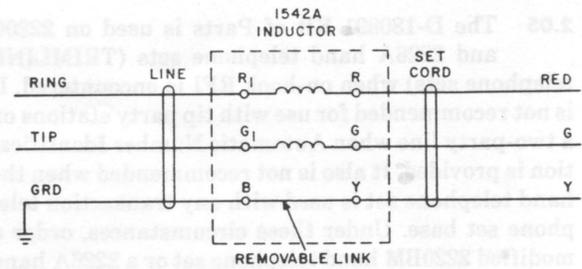
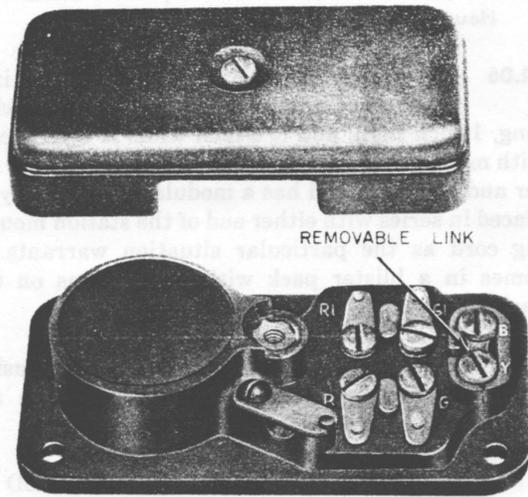
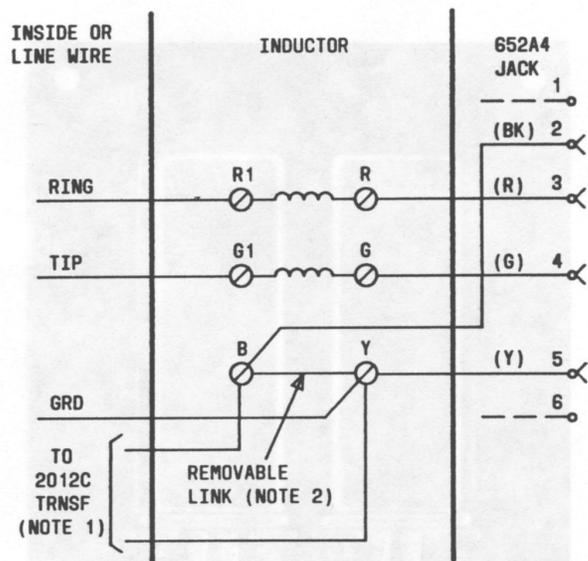
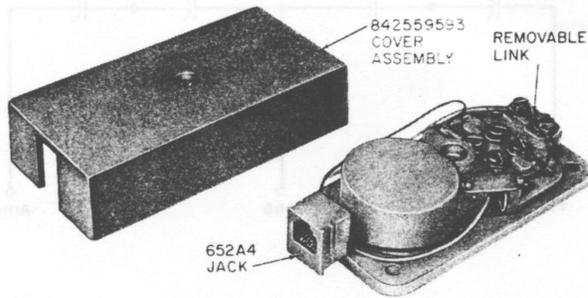


Fig. 5—1542A (MD) Inductor and Schematic



- NOTES:
1. FOR TELEPHONE SETS WITH INCANDESCENT DIAL LIGHT.
 2. DISCONNECT LINK WHEN INCANDESCENT DIAL LIGHT IS PROVIDED.

Fig. 6—1542AM Inductor and Schematic

tomer Service Closure. The backboard size was later reduced to 3-7/16 inches wide by 5-3/8 inches long to allow it to fit into the C Customer Service Closure. All new products will fit into the C or D Customer Service Closures.⚡

2.05 The D-180891 Kit of Parts is used on 2220C and 2226A hand telephone sets (TRIMLINE telephone sets) when on-hook RFI is encountered. It is not recommended for use with tip party stations on a two-party line when Automatic Number Identification is provided. It also is not recommended when the hand telephone set is used with any transaction telephone set base. Under these circumstances, order a modified 2220BM hand telephone set or a 2226A hand telephone set if receiver amplification is required. Refer to Section 502-303-101 for additional information.

B. Telephone Set Modification By Local Distributing House or Service Center

2.06 The Z100A filter (Fig. 8) is contained in a plastic housing approximately 1-1/2 inches long, 1-inch high, and 3/4-inch wide. A 6-inch cord with modular plug is hard wired to one end of the filter and the other end has a modular jack. It may be placed in series with either end of the station mounting cord as the particular situation warrants. It comes in a blister pack with instructions on the package.⚡

2.07 Telephone sets, except coin, currently using the 425-, 4010-, or 4228-type networks are modified as follows.

- Existing network replaced by a 4228D or 4228J network, whichever is applicable.
- Touch-tone dial will have bypass capacitors installed across the varistors and transistors

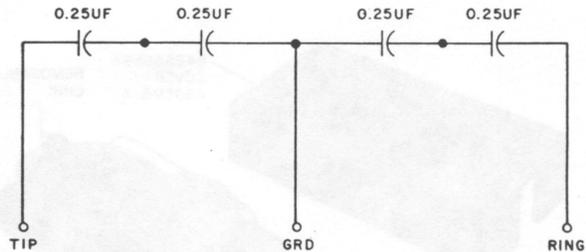
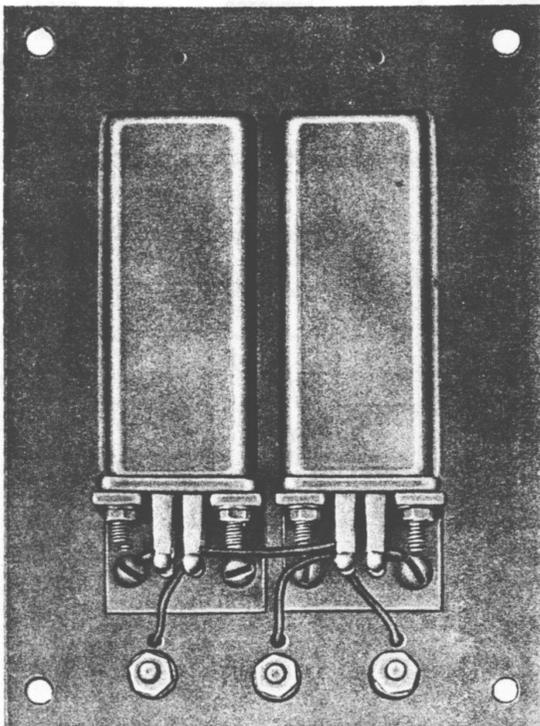
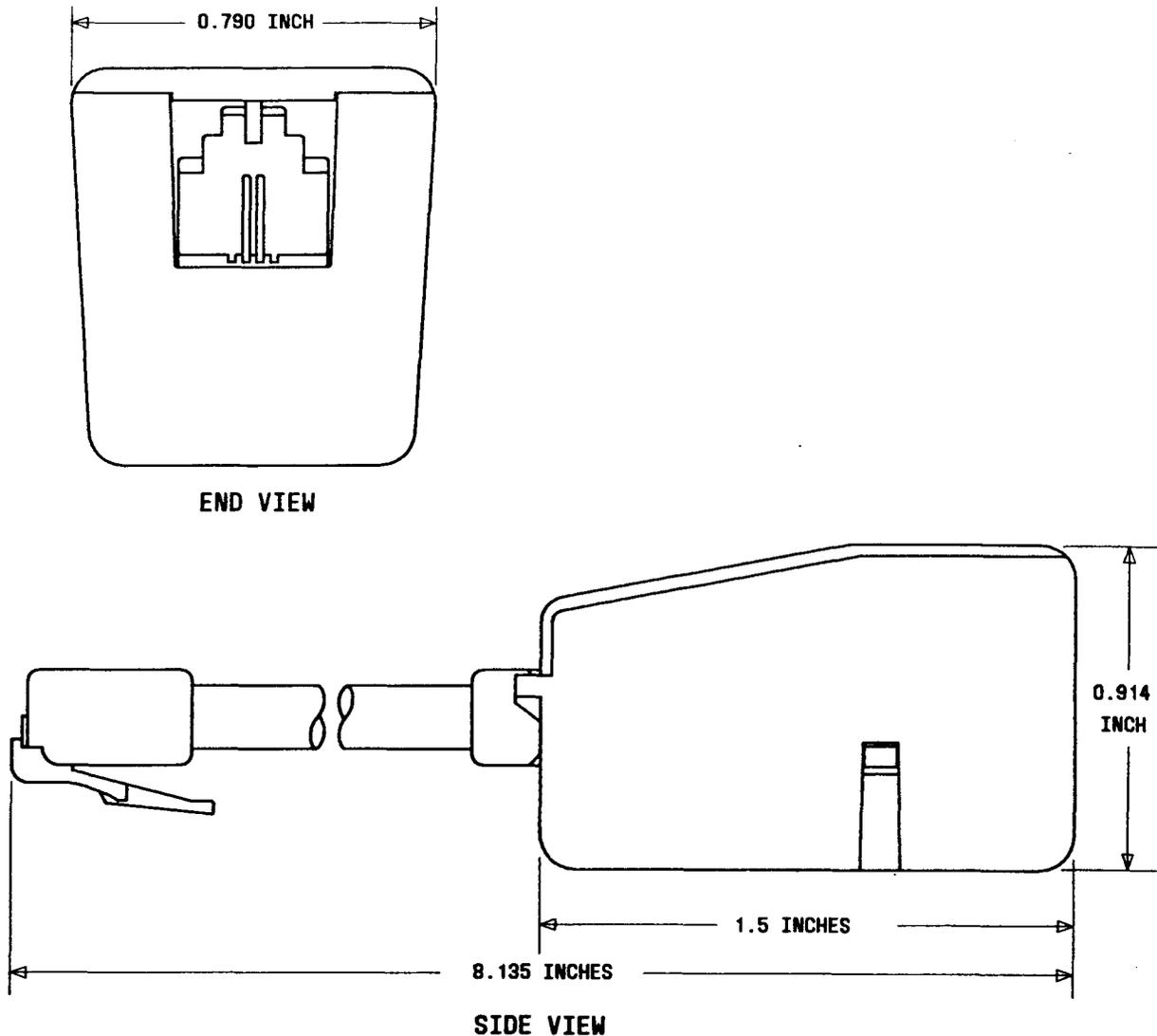


Fig. 7—40BA Capacitor and Schematic



♦Fig. 8—Z100A Filter♦

and will also have a (R-S) lead. The 35AR3A, 35AU3A, 35AY3A, and 35BA3A dials have an additional (BR-W) lead.

- Bypass capacitors installed across all other components of the telephone set that may act as demodulators, such as transmitter unit, receiver unit, transistors in amplifiers, polarity guards, etc.

2.08 The TRIMLINE telephone sets will be modified by having bypass capacitors placed across

all the components in the set that may act as demodulators.

2.09 Modified sets will not be recoded but will be identified in some manner by the local distributing house or service center.

C. Associated Apparatus Modification By Local Distributing House or Service Center

2.10 The touch-tone dials and all G-type handsets will be available from the local distributing house or service center modified for radio suppres-

sion. These will be used where an adjunct dial must be installed or where the dial or handset must be replaced for maintenance reasons.

2.11 Other modified telephone set components include 241B, 242B, and 277A amplifiers; D-180191 and D-180229 polarity guard assemblies; and 694A and 694B subsets. Modified versions of additional items will be made available in the future when they are needed.

3. ORDERING GUIDE

3.01 Associated apparatus or equipment (ordered separately) is as follows:

- Capacitor, 40BA
- Inductor, 1542AM-49 Gray (only)
- Set, Telephone, (add code) - RF modified
- Set, Telephone, Hand, 220AM, AL, or C and 226A— RF Modified
- Set, Telephone, Hand, 2220BM or C and 2226A—RF Modified
- D-180891 Kit of Parts
- ♦Filter, Z100A.♦

3.02 Replaceable components are as follows:

- Cover, 157A
- Dial - (touch-tone dial only) RF Modified
- Set, Hand, G - RF Modified.

4. INSTALLATION

4.01 Modify telephone sets equipped with 425J (MD), 4010E (MD), 4228D, or 4228J networks as follows.

- (1) Install in usual manner.
- (2) For connections, see connection section of type set modified.

Note: The network terminal F of the 870-, 872-, 2870-, and 2872-type telephone sets is not to be used as a spare terminal or tie point.

(3) Sets are shipped with speech equalization option leads insulated and stored.

(a) For loops greater than 500 ohms leave insulated and stored.

(b) For loops 500 ohms or less connect (yellow) and (orange-black) leads to terminals RR and R, respectively, on the 425J (MD), 4010E (MD), 4228D, and 4228J network.

(3) The (R-S) and (BR-W) dial leads are as follows.

(a) For sets with a 35AR3A, 35AU3A, 35AY3A, or 35BA3A dial, connect the (R-S) dial lead to network terminal X for loops greater than 500 ohms. For loops less than 500 ohms, connect the (BR-W) dial lead to network terminal X.

(b) For all other type dials, connect the (R-S) dial lead to network terminal X for all loops.

4.02 Modified TRIMLINE telephones are installed in usual manner. Refer to connection section in Division 502.

4.03 The 1542A (MD) inductor (Fig. 5) is used as a connecting block for nonmodular telephone set cord or install as near to telephone set as possible. Locate as near as possible to wall-type sets.

4.04 The 1542AM inductor (Fig. 6) is used as a connecting block to terminate inside or line wire. Modular mounting cord plugs into jack provided with inductor and the telephone set. Install as near as possible to wall-type sets.

4.05 The 40BA capacitor (Fig. 10) is installed near and connected to protector with as short as possible piece of inside wire. Station wires must connect to the capacitor. Must be mounted in C or D Customer Service Closure when used outdoors or in damp exposed locations. Protector ground must be upgraded to the best possible ground available.

4.06 Refer to Section 502-303-102 for connection information of the D-180891 Kit of Parts in

the 2220C and 2226A hand telephone sets. If the 73B control unit of the 50A1 portable conference telephone set is subjected to RFI, refer to Section 512-630-111 for suppression information.

Note: When this kit of parts is installed in the 2220C or 2226A hand telephone set, the base also must be modified per Table A, B, C, or D of this section.

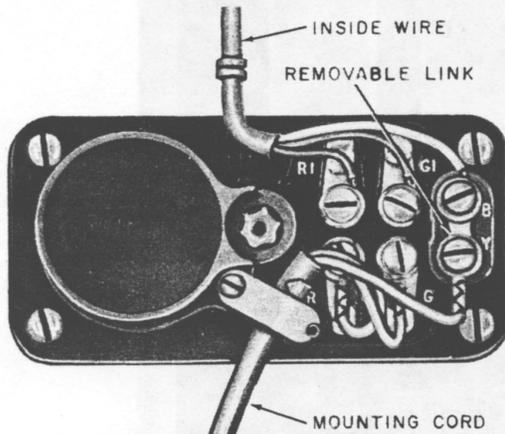


Fig. 9—Cording Diagram, 1542A (MD)
Inductor

5. MAINTENANCE

5.01 Normal maintenance can be performed on modified telephone sets. Modified touch-tone telephone dials and G-type handsets are available from the local distributing house or service center for maintenance.

5.02 The 1542-type filter has a nominal 6 ohm dc resistance per conductor and the Z100A filter has a nominal 8 ohm resistance per conductor. This may affect transmission in areas with marginal transmission loop resistance.

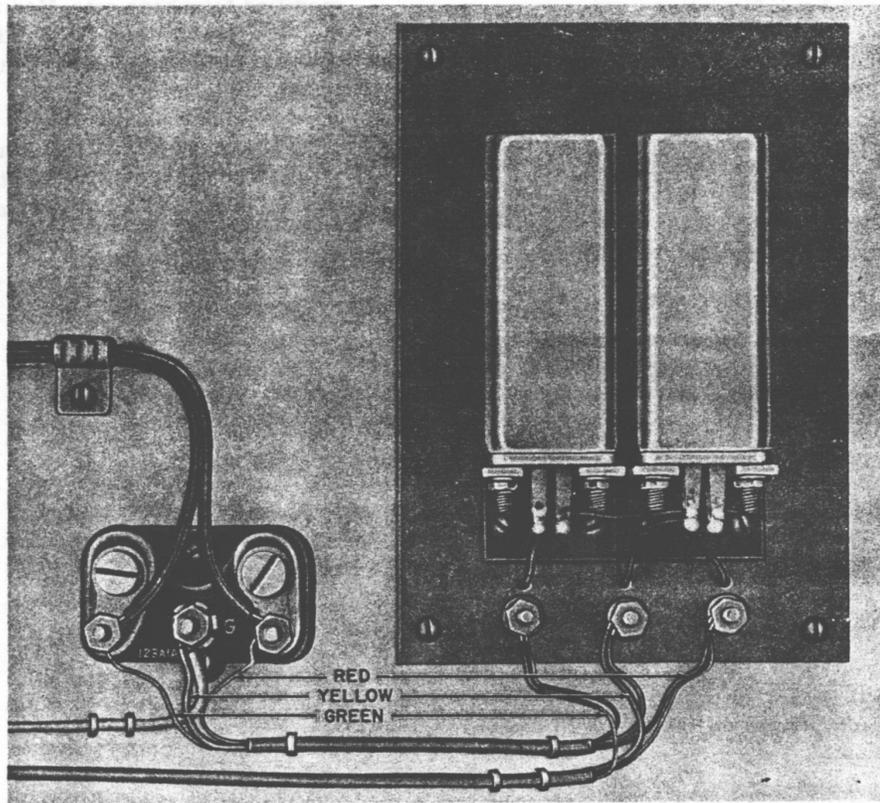


Fig. 10—123A1A Protector with 40BA Capacitor Installed (Early Model Show)

TABLE A
MODIFICATION OF AC- AND AD-TYPE
TELEPHONE BASES WHEN D-180891 KIT OF
PARTS IS INSTALLED IN 2220C OR 2226A
HAND TELEPHONE SET

LEADS	COLOR	TERM. BOARD	
		REMOVE FROM TERM.	CONNECT TO TERM.
Handset Cord Jack	(Y) or (W)	3	1
Inside Wire, 523-Type Plug, Mtg. Cord Jack, or 623T4 Jack	(BK)	1	3

TABLE B
MODIFICATION OF 2950A-TYPE TELEPHONE
SETS WHEN D-180891 KIT OF PARTS IS
INSTALLED IN ASSOCIATED HAND
TELEPHONE SET

LEADS	COLOR	TERM. BOARD	
		REMOVE FROM TERM.	CONNECT TO TERM.
Line Switch	(S)	L2	*
	(Y)	L2	4
	(BR)	L2	1

* Insulate and store.

TABLE C
MODIFICATION OF AL1 TELEPHONE BASE
WHEN D-180891 KIT OF PARTS IS INSTALLED
IN 2220C OR 2226A HAND TELEPHONE SET

LEADS	COLOR	TERM. BOARD	
		REMOVE FROM TERM.	CONNECT TO TERM.
Line Switch	(BL)	2	10
Cord Jack (Mtg. Plate Assy.)	(Y)	10	2

TABLE D
MODIFICATION OF 50A1 CONFERENCE SET
WHEN D-180891 KIT OF PARTS IS INSTALLED
IN 2220C OR 2226A HAND TELEPHONE
SET (SEE NOTE)

LEADS	COLOR	TERM. BOARD	
		REMOVE FROM TERM.	CONNECT TO TERM.
Hand Tel Set	(W)	*	14
Cord Jack Leads	(BK)	*	15

Note: This modification applies to sets with serial numbers 100,000 and higher preceded by the letter prefix A, only.

* Insulated and stored.